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Colin Hinson

In the village of Blunham, Bedfordshire.



**AP115H-0102-1A2**

(Formerly AP115H-0102-1,  
Sections 6 to 10)

# **RADAR TYPE 84**

TECHNICAL LIBRARY  
RAF SIGNALS ENGINEERING  
ESTABLISHMENT

## **DESCRIPTION OF RADAR HEAD**

Service users should send their comments through  
the channel prescribed for the purpose in:  
AP 100B-01, Order 0504

AMENDMENT RECORD SHEET

To record the incorporation of an Amendment List in this publication, sign against the appropriate A.L. No. and insert the date of incorporation.

| A.L. No. | AMENDED BY     | DATE     |
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| 1        | B. Friend      | 14/3/73  |
| 2        | M. Oxley       | 6.5.74   |
| 3        | M. Oxley       | 26.6.74  |
| 4        | M. Oxley       | 18.9.74  |
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# WARNINGS

CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH

MAKE SURE YOU KNOW THE SAFETY PRECAUTIONS AND FIRST AID INSTRUCTIONS BEFORE YOU USE A HAZARDOUS SUBSTANCE.

READ THE LABEL ON THE CONTAINER IN WHICH THE SUBSTANCE IS SUPPLIED.

READ THE DATA SHEET OR ORDER APPLICABLE TO THE SUBSTANCE.

OBEY THE LOCAL ORDERS AND REGULATIONS.

## WARNINGS

- (1) RADIO FREQUENCY (RF) RADIATION. THIS EQUIPMENT CONTAINS RF TRANSMITTING DEVICES. REFER TO JSP 392 FOR SAFETY PRECAUTIONS.
- (2) LETHAL VOLTAGES. DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT REFER TO AP100D-20 FOR SAFETY PRECAUTIONS.

## PREFACE

## ASSOCIATED PUBLICATIONS

## RADAR TYPE 84

|   |  |
|---|--|
| Leading particulars and general information | CD115H-0101-1                          |
| Description of radar head                   | AP115H-0102-1A1                        |
| Description of signal processing equipment  | AP115H-0103-1A1 and<br>AP115H-0103-1A2 |
| Special-to-type test equipment              | AP115H-0104-1                          |
| Functional diagrams                         | AP115H-0105-10                         |
| Aerial mount and turning gear               | AP115J-0100-1 (AP2886H)                |

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[A5H001021A2]

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## SECTION 6

# AUTOMATIC CONTROL AND PROTECTION CIRCUITS



Chapter 1

AUTOMATIC CONTROL AND PROTECTION CIRCUITS  
DESCRIPTION OF SYSTEM

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INTRODUCTION

1 Once initiated, the switching-on and making operational of the Radar Type 84 transmitter/receiver is completely automatic. The various units, supplies and services are made available in a set sequence, the sequence being controlled by the timing circuits in control panel M15. Interlock devices ensure that the conditions at various stages in the switching sequence are correct before e.h.t. is applied to the modulator circuit. Indicator lamps are provided to show the stages reached in the switching sequence, and to give indication should a fault condition arise at the cabinet gate power units.

2 Pneumatic interlocks, which operate in a set sequence, are employed to lock the transmitter cabinet gates, close and lock the annexe doors and operate the electrostatic dischargers, prior to the e.h.t. supply being switched on.

3 The level of e.h.t. applied to the modulator circuit is controlled by a motor-driven 3-phase voltage regulator. The correct operating level of e.h.t. is automatically maintained irrespective of fluctuations in the mains 3-phase supply - this level will depend on the type of magnetron in use. The supplies to energize the regulator motor are controlled by the e.h.t. control circuits in control panel M15.

4 In the event of an overload condition, the e.h.t. supply is switched off and restored after a suitable delay; if the overload condition persists or is recurrent during a second delay period, then the e.h.t. supply is switched off and the regulator runs down. The e.h.t. is then restored and the regulator runs up, to produce the normal operating level of e.h.t.

TEN-MINUTE SWITCHING-ON SEQUENCE (fig.1)

5 When the MAINS ON switch on the LH light and switch assembly is depressed, the main isolator (contactor A in the LH annexe) closes and routes a 3-phase supply to the regulator assembly and to the circuit breaker assembly (Chap 3). A 240V a.c. supply (red phase) from the circuit breaker assembly is routed via the LOCAL/REMOTE switch in the external air compressor unit (Sect 2, Chap 2) to the TRANSMITTER ON switch on the RH light and switch assembly. The LOCAL/REMOTE switch must be in the REMOTE position before the transmitter can be switched on. This ensures that the switching-on of the dehumidifer and two air compressors within the external air compressor unit is controlled, in the correct sequence, by supplies from control panel M15.

6 When the TRANSMITTER ON switch is depressed, the 240V a.c. supply is routed to energize the 50V power unit M7. The +50V d.c. supply produced by power unit M7 is fed to control panel M15 (Chap 2). With the application of this supply the following sequence of operations take place:

6.1 A 240V a.c. supply is fed from control panel M15 to the operating coil of contactor RLC in the external air compressor unit. Contactor RLC controls the 3-phase supply to the refrigerant compressor motor, which produces the correct temperature conditions in the dehumidifer unit.

6.2 A 240V a.c. supply from control panel M15 is fed to the operating coil of contactor A on the circuit breaker assembly. Contactor A routes a.c. supplies to the thyatron heaters, the heater transformers of the gate power units and the h.t. transformers of the two -250V power units at gate positions 5F and 4G.

6.3 The two -250V d.c. supplies (which become available within 30s of the a.c. supplies being applied to the -250V power units) are fed to the circuit breaker assembly. These -250V d.c. supplies energize relays RLD and RLE on the circuit breaker assembly, the contacts of which route a 240V a.c. supply to the operating coil of contactor D. This contactor routes a.c. supplies to the h.t. transformers of all the positive power units mounted on the cabinet gates. The above sequence of operations ensures that the various h.t. supplies are only switched on when the -250V d.c. bias supplies are available.

6.4 A 240V a.c. is fed from control panel M15 to the operating coil of contactor C in the circuit breaker assembly. Contactor C controls an a.c. supply to the magnetron heater transformers, in conjunction with contactor A on the magnetron heater circuit breaker assembly (6M). After 8 min (by which time the magnetron is warmed up) the thermal overloads on contactor C operate, not to open the main contacts, but to close in the e.h.t. interlock circuit. When e.h.t. is eventually applied to the system, the supply voltage to the magnetron heater transformer is decreased as the e.h.t. voltage is increased (para 13). The effect is to reduce the current flowing in the thermal overloads of contactor C and to allow the overloads to reset themselves.

7 The +300V d.c. and +500V d.c. outputs from the power units at gate positions 5E and 5H respectively, are fed to control panel M15. With the application of these two supplies the ten-minute sequence control circuits in control panel M15 are initiated and produce the following sequence of operations, as described in Chap.2:

▶ 7.1 After 2 min +50V is switched to the air conditioner unit and the circuit breaker assembly. This initiates the closing of contactors X3 and X4 which switch a 3-phase supply to the air conditioner fan motors (Sect.9, Chap.4) and also enable contactor F in the circuit breaker to close and route a 3-phase supply to the fan motors in the cooling units (Sect.2, Chap.4). ◀

7.2 After 4 min RLB and contactors G and H on the circuit breaker assembly are operated. Relay RLB routes 240V a.c. to the Waveguide Air Flow alarm and the moisture Monitor. Contactors G and H route a 3-phase supply to Water Pumps 1 and 2 in the RH annexe.

### PNEUMATIC CONTROL SYSTEM

8 On completion of the ten-minute switching-on sequence, the 240V a.c. interlock supply is fed to two solenoid-operated air valves and a pressure switch on the pneumatic control panel (Sect.2, Chap.2). The pressure switch routes the interlock supply to a warning bell which gives warning that the annexe doors are going to close and the e.h.t. supply is about to be switched on. The air valves route a high pressure air supply to the interlock manifold. Air supplies are taken from this manifold to operate the cabinet gate interlocks and the annexe door interlocks. The cabinet gates, which have to be closed manually, are locked in the closed position. The annexe doors are automatically closed and locked by the air operated interlock devices.

9 A high pressure air supply is also fed from the interlock manifold via a pneumatic delay coil to the earthing manifold. The earthing manifold becomes charged with air after a 5s delay and feeds air supplies to operate the electrostatic dischargers. The electrostatic dischargers are air operated contactors, which open when a high pressure air supply is applied to them. The two electrostatic dischargers in the RH annexe connect the high voltage points on the pulse forming network direct to earth and the two in the LH cabinet connect the e.h.t. supply line to the earth through bleeder resistors (Sect.3, Chap.3). The earth connections are removed from these points when an air supply is fed to the electrostatic dischargers.

10 From the earthing manifold an air supply is fed via a further pneumatic delay coil (10s) to the tell-back manifold. When this manifold becomes charged with air, the pressure switch operates and removes the 240V a.c. interlock supply to the warning bell and routes it to control panel M15. From a normally closed overload contact in control panel M15 the 240V a.c. interlock supply is routed via the aerial turning interlock and the a.c. overloads to the operating coil of the e.h.t. contactor. The high pressure air system including the function of the pneumatic control panel, is described in Sect.2, Chap.2.

EHT INTERLOCK CIRCUIT

11 The 240V a.c. supply to the operating coil of the e.h.t. contactor (contactor B in the LH annexe) is routed via a number of series connected interlock devices. As the various units supplies and services throughout the transmitter become operational these interlocks close, and on completion of the ten-minute transmitter switching-on sequence (and if all the units supplies and services are functioning normally) the interlock circuit is made complete. Supplies are taken from the interlock circuit at various points to feed the indicator circuits on the light and switch assemblies (Chap.5). The indicators on these assemblies, apart from showing the stage reached in the transmitter switching-on sequence, also indicate up to what point the e.h.t. interlock is complete. The e.h.t. interlock circuit is described in Chap.4.

EHT CONTROL SYSTEM

12 The voltage of the e.h.t. supply to the modulator circuit is dependent upon the voltage of the 3-phase supply to the e.h.t. transformer. This 3-phase supply is controlled by the regulator assembly in the LH annexe. The regulator assembly is a 3-phase motor-driven voltage regulator which comprises a star-connected auto-transformer. The output of the transformer is continuously variable between 208/415V and is controlled by the direction of rotation of the regulator motor. The e.h.t. control circuits in control panel M15 control the a.c. supplies to the regulator motor through contactors L (lower) and M (raise) and hence control the level of the e.h.t. supply to the modulator circuit.

13 The primary of the magnetron heater transformer is connected between the yellow phase of the main 3-phase supply and the variable yellow phase output from the regulator (0-120V), via the respective contactors. Connected in this manner the magnetron heater supply is decreased when the regulator runs up to increase the e.h.t. supply. The correct magnetron cathode temperature is maintained by electron bombardment when the e.h.t. is fully up and the magnetron heater supply is cut.

14 There are two systems of e.h.t. control, voltage or current; the selection is made by a manual switch on control panel M15. When switched to VOLTAGE control the regulator runs up to a level set by the HT VOLTS control on control panel M15. The transmitter normally operates with the switch set to CURRENT CONTROL. With the switch in this position the regulator runs up to the level set by the HT VOLTS control and when this level is reached the e.h.t. current is maintained at a constant level by the current control system. The complete e.h.t. control system is described in Chap.2.

PROTECTION CIRCUITS

15 Three separate protection circuits are employed to switch off the e.h.t. supply in the event of an overload condition as follows:

- (1) AC overload.
- (2) EHT current overload.
- (3) Overswing diode overload.

If any of these circuits register an overload condition the protection circuits in control panel M15 function and remove the 240V a.c. interlock supply to the operating coil of the e.h.t. contactor, thus switching off the e.h.t. supply. This supply is normally restored after a one-second delay, but should the overload condition persist during a second period of one minute then the e.h.t. supply is switched off and the regulator runs down. The e.h.t. supply is then restored and the regulator runs up to the preset level of e.h.t. When this level is reached the current control circuit operates to maintain the e.h.t. current at the correct level.

#### AC overloads

16 The a.c. overloads consist of three relays, the armatures of which are magnetically coupled to the 3-phase supply lines that feed the e.h.t. transformer and rectifiers. A nominal current of 80A flows in each line of this 3-phase supply, but during an overload condition (e.g. due to one of the e.h.t. rectifiers flashing over) the a.c. line current is considerably increased. This increase in current causes the overload relay to operate and feed +50V d.c. to control panel M15. This 50V d.c. supply energizes the overload relay causing the overload and reset circuits in control panel M15 to function. Each a.c. overload relay also has a normally closed contact; the 20V a.c. interlock supply is routed, via these series connected contacts, to the operating coil of the e.h.t. contactor. These contacts open during an a.c. overload and open circuit the e.h.t. interlock circuit.

For resetting of coil-less relays see Sect 3, Chap 3, para 13.

#### EHT current overload

17 A sample of the e.h.t. current is taken from the earth return line of the e.h.t. rectifier (Sect 3, Chap 3). The potential developed across a sampling resistor is fed to the overload relay in control panel M15. Under normal operating conditions this potential is not sufficient to operate the overload relay, but if the e.h.t. current is increased due to an overload condition, the relay operates causing the overload and reset circuits in control panel M15 to function.

#### Overswing diode overload

18 The mean current flowing through the overswing diodes is monitored and should this exceed a pre-determined level for a period longer than 0.5s a +50V d.c. supply is routed to the overload relay in control panel M15: causing the overload and reset circuits to function and switch off the e.h.t. supply.

#### Overload protection back up system

18A When contactor B re-engages after the 1 second reset sequence with a sustained fault present, there is a possibility of contactor B contacts welding removing the overload protection. A back up to the existing overload protection system was introduced by Mods CA8271/48 and 8272/4. This ensures that if contactor B does not release then contactor A releases to switch the Rx/Tx to MAINS OFF (Chap.2, para.56 to 60 refers).

INDICATOR LAMPS CIRCUITS

19 The indicator lamps on the light and switch assemblies indicate the stage reached in the ten-minute switching-on sequence. The 240V a.c. supply to a number of these indicators is taken direct from the e.h.t. interlock circuit as shown in Chap 4. Indicator lamps on the light and switch assemblies flash on/off to give warning of a fault condition at the gate power units and the TWT field supply unit. The functions of all these indicators are described in Chap 5.

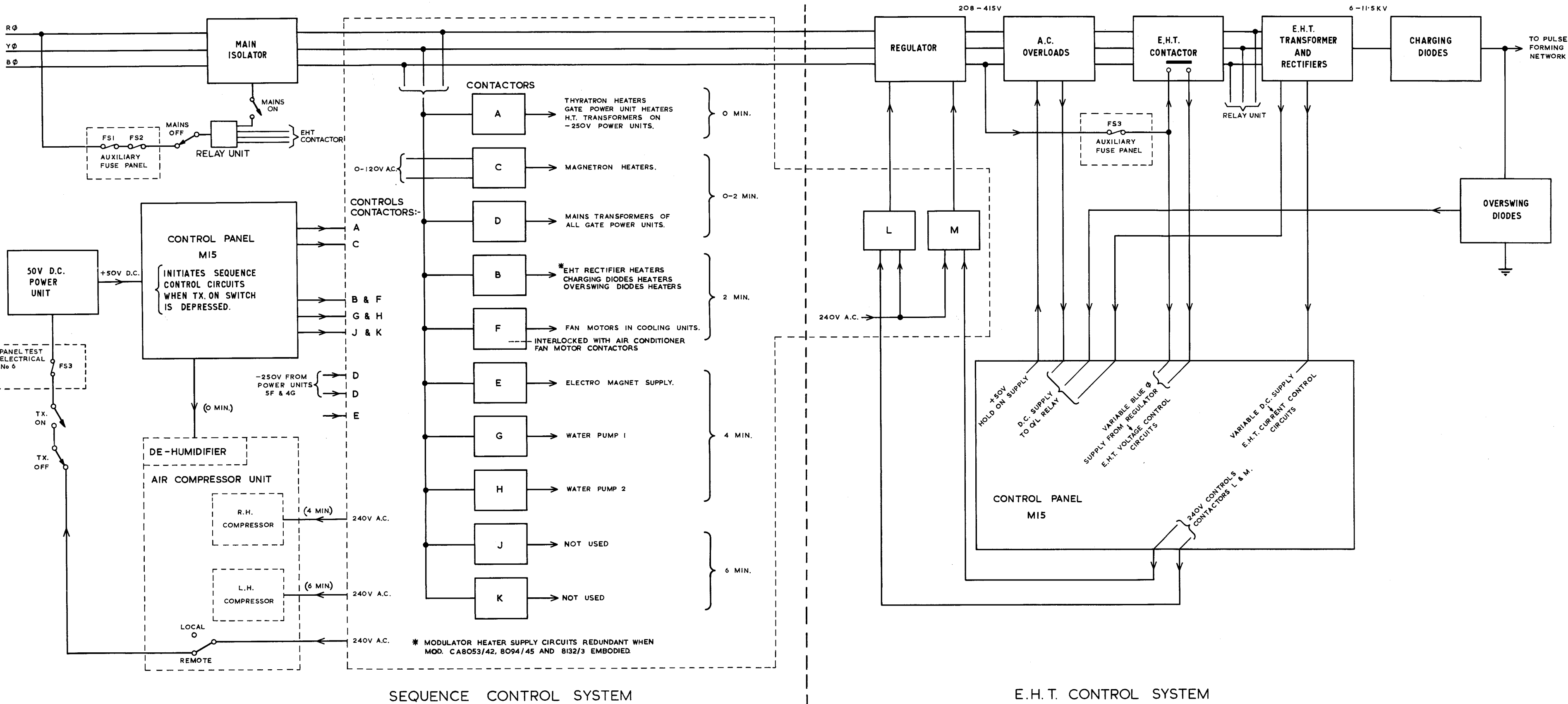


Fig. 1  
Nov. 83 (Amdt. 21)

Automatic control & protection circuits: functional schematic

Fig. 1  
Chap I  
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Chapter 2(completely revised)  
PANEL CONTROL M15

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INTRODUCTION

1 Control panel M15 (fig. 1 and 2), mounted on the R.H. cabinet at gate position 1F, has four main functions:-

1.1 It controls the sequential switching-on of the various units, supplies and services throughout the radar Type 84 transmitter/receiver, and provides a visual indication of the stage reached in the sequence.



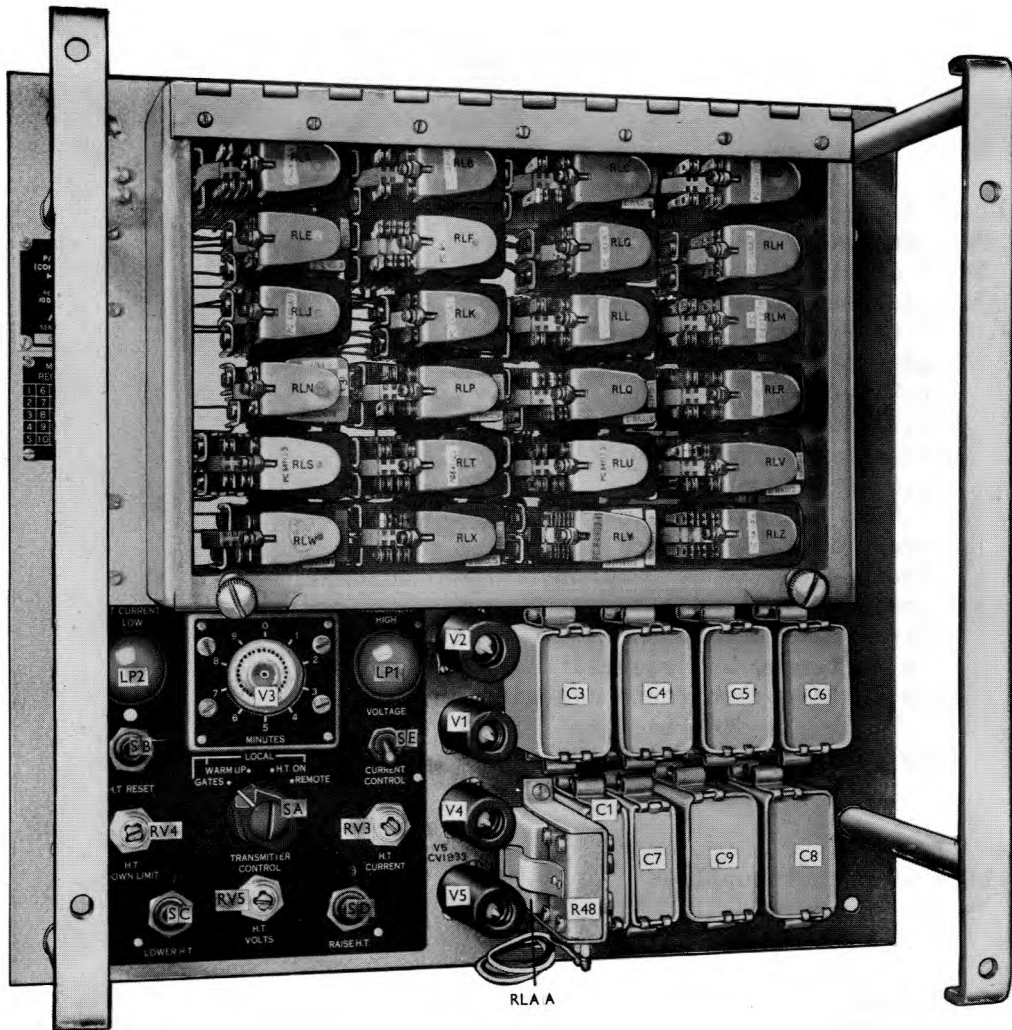


Fig.1 Panel (control) M15: front view

1.2 It controls the a.c. applied to the magnetron heater transformer to prevent a current surge through the magnetron heater during the initial switching-on sequence. This supply is automatically decreased as e.h.t. is applied to the modulator circuit and when the e.h.t. is fully up the supply to the magnetron heater transformer is cut off by contactor A on the magnetron circuit breaker assembly 6M (Chap.7) and the correct magnetron cathode temperature is maintained by electron bombardment.

1.3 It provides automatic control of the e.h.t. supply to the modulator circuits.

1.4 It switches off the e.h.t. supply in the event of an overload condition and restores the supply after a suitable time delay.

1.5 It de-energizes contactor A in the event of a malfunction of contactor B during overload conditions.

2 The unit has overall dimensions of length 15 3/8 in., height 15 in., depth 6 in., and weighs 20 lb.

### PERFORMANCE CHARACTERISTICS

3 The input supplies to the panel are as follows:-

3.1 6.3V +3V a.c., fed in at terminal TB3/3 and TB3/4 from power supply stabilized a.c. heaters M8 (gate position 3D).

3.2 50V +5V positive d.c. fed in at terminal TB3/10 from the 50V power unit M7.

3.3 240V +14V a.c. fed in at terminal TB1/1 from the circuit breaker assembly.

3.4 300V +6V positive d.c., fed in at terminal TB3/9 from power unit 5E.

3.5 500V +10V positive d.c., fed in at terminal TB3/8 from power unit 5H.

3.6 250V +5V negative d.c., fed in at terminal TB3/11 from power unit 5F.

3.7 Variable blue phase supply (120V to 240V) fed in at terminals TB4/11 and TB4/12 from the regulator assembly.

4 The various output supplies and the sequence in which they become available is shown in Table 1.

### BRIEF DESCRIPTION

5 When the TRANSMITTER ON switch (situated on the R.H. light and switch assembly) is depressed, the 50V power unit M7 is energized and its +50V d.c. output is fed to control panel M15. With the application of this supply, the control sequence is initiated and supplies are fed from the panel to operate the dehumidifier contactor (RLC) in the external air compressor unit and contactor A on the circuit breaker assembly. Contactor A routes a.c. supplies to the thyatron heaters transformer on switch electronic M6, the heater transformers of all the gate power units and the h.t. transformers of the two -250V power units at gate positions 5F and 4G. When the -250V power units have warmed up and are producing their normal outputs (within one minute of the a.c. supplies being applied) the two -250V d.c. supplies energize relays on the circuit breaker assembly, which in turn route a 240V a.c. supply to the operating coil of contactor D on the circuit breaker assembly. This contactor closes and routes a.c. supplies to the h.t. transformers of all the positive gate power units. The +300V d.c. and +500V d.c. supplies produced by power units 5E and 5H respectively are fed to control panel M15.

6 With the application of the 300V and 500V d.c. supplies, the 10-minute control sequence is initiated. At intervals of 2, 4 and 6 minutes, supplies are routed from the control panel to operate the contactors on the circuit breaker assembly as described in Chap 3. After an interval of 10 minutes, and when all the units, supplies and services are operational (making the e.h.t. interlock circuit Chap 4, complete) e.h.t. is applied to the modulator circuit and maintained at the correct level by the e.h.t. control circuits in control panel M15.

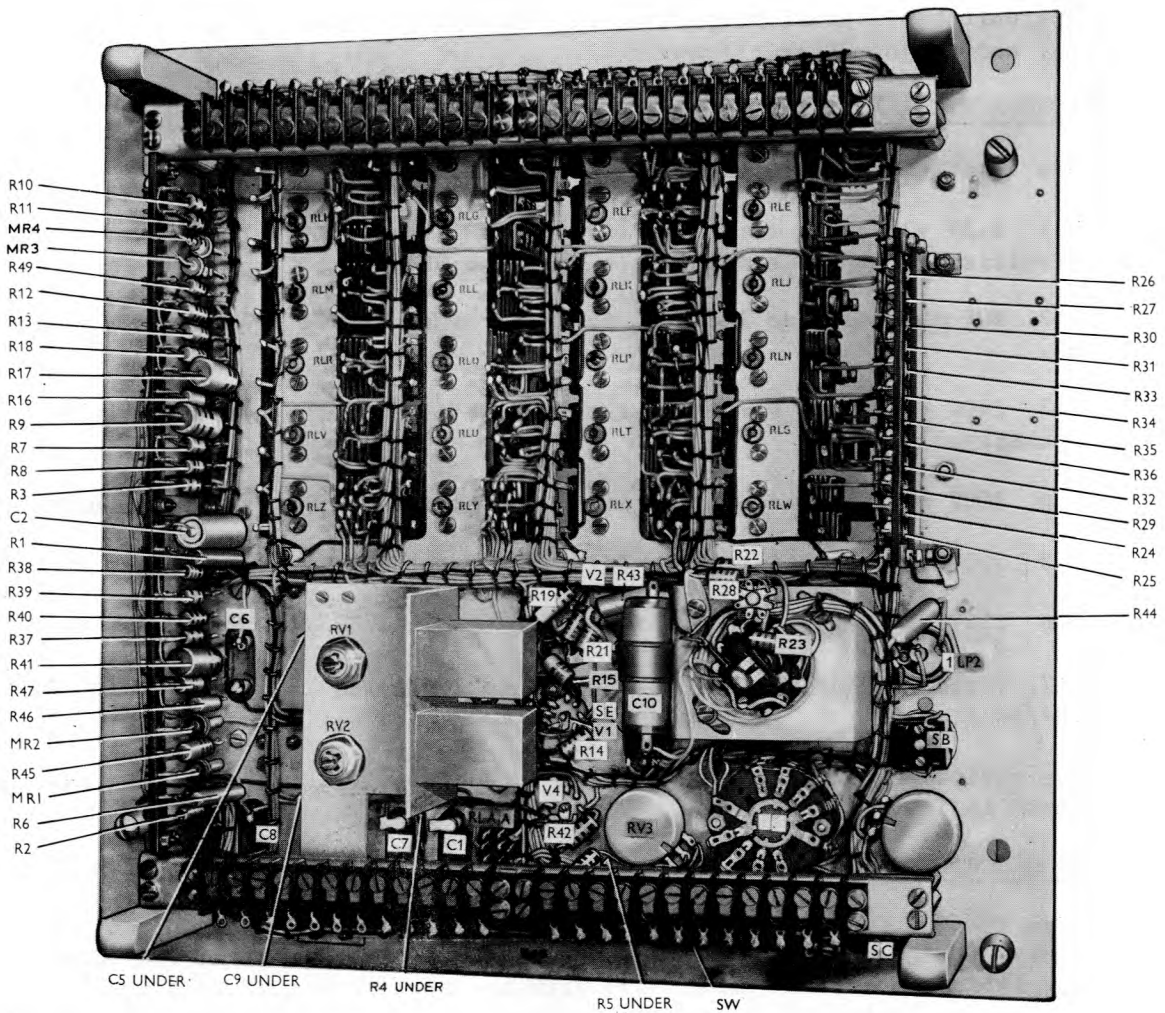


Fig.2 Panel (control) M15: rear view

7 The a.c. supply to the magnetron heater transformer is derived from the variable yellow phase output of the regulator assembly and the yellow phase of the main 3-phase supply. Supplied in this manner the magnetron heater supply is decreased when the 3-phase supply to the e.h.t. transformer (and hence the resultant e.h.t. applied to the modulator circuit) is increased.

8 The a.c. supply to the magnetron heater transformer is controlled by contactor C on the circuit breaker assembly and contactor A on 6M. Before a 240V a.c. supply is fed from control panel M15 to operate this contactor the regulator is automatically run up, thus reducing the a.c. supply fed to contactor C. When contactor C has closed the regulator is run down and the a.c. supply to the magnetron heater transformer increased; this operation prevents a heavy current surge through the magnetron heater during the initial application of the a.c. supply.

9 When the transmitter is fully run up contactor A on the magnetron heater circuit breaker assembly (6M) operates from the H.T. UP 1-amp circuit to cut the magnetron heater supply, thus reducing any f.m. of the output pulse to a minimum (Chap 7).

10 Three separate protection circuits are employed to protect the modulator and magnetron. Should any of these circuit register a fault condition, a d.c. potential is routed to an overload relay in control panel M15. When this relay is energized the overload circuit functions, open-circuits the e.h.t. interlock circuit and removes the e.h.t. supply. The e.h.t. supply is restored after an interval of one second, but should the overload condition persist or be recurrent during the next minute, then the e.h.t. supply is switched off and the regulator automatically runs down. The e.h.t. supply is then restored and the regulator runs up to its normal operating level. (See also para 56 to 60).

11 The limited run-up switch on control panel M15 facilitates the stopping of the automatic control sequence at various stages, and prevents the transmitter being switched on at the remote position while work is being carried out at the transmitter.

#### DETAILED DESCRIPTION

12 A circuit of the unit is given in fig.3. In addition, the relay sequence charts (fig 4 and 5) provide an easy means of establishing the state of the various relays at any point in the automatic control sequence.

13 When the TRANSMITTER ON switch is depressed, a 240V a.c. supply is routed to energize the 50V power unit M7. The +50V d.c. supply from this unit is fed to control panel M15 via terminal TB3/10 (fig. 3). This supply energizes relay RLA. Contact RLA1, connected across the TRANSMITTER ON switch, closes and provides a hold-on circuit for the 240V supply to the 50V power unit. RLA3 routes a 240V a.c. supply to the dehumidifier contactor (RLC) in the external air compressor unit. RLA2 routes a 240V a.c. supply to the operating coil of contactor A on the circuit breaker assembly. Contactor A closes and routes a.c. supplies to the thyatron heater transformers in switch electronic M6, the heater transformers of all the gate power units and the h.t. transformers of the -250V power units 5F and 4G. The -250V d.c. supplies operate contactor D on the circuit breaker assembly (Chap 3) which closes and routes a.c. supplies to the h.t. transformers of all the positive gate power units. The +300V d.c. and +500V d.c. supplies from power units 5E and 5H respectively are fed to control panel M15. With the application of these two d.c. supplies, the 10-minute control sequence and the magnetron heater control circuit are initiated.

#### Ten-minute control sequence

14 The +300V d.c. supply fed in at TB3/9 provides an h.t. supply for V1, V2 and V4. The 500V d.c. supply fed in at TB3/8 provides h.t. for V3 and energizes relay RLC. RV1, connected in series with RLC, is adjusted so that the relay does not operate until the output from the +500V power unit, at gate position 2H, exceeds +450V. V1, a miller integrator with a run-down time of one minute, V2, a Schmitt trigger, V3, a dekatron, and V4, another miller integrator with a run-down time of one second, comprise the ten-minute sequence control circuit.

15 When relay RLC is energized contact RLC4 closes and energizes relay RLW, RLW1 opens and removes the negative bias to cathode 10 of the dekatron V3. (Cathode 10 is held negative so that when the +500V is first applied to the anode of the dekatron, conduction is only to cathode 10.) Contact RLC1 opens when relay RLC is energized and removes the discharge resistor R8 from across the miller feedback capacitor C1. RLC2 opens and removes the negative bias to the suppressor grid of V1. This allows V1 to start its normal miller run-down action. The negative-going sawtooth voltage appearing at the anode of V1 is directly coupled to the grid of V2a. In the quiescent stage V2a is conducting,

its grid resting at approximately +40V. After a miller run-down period of one minute (set by RV2) the voltage at the anode of V1 is sufficiently negative to switch the Schmitt trigger V2: V2a is now cut-off and V2b conducting. The current flowing in V2b energizes relay RLE. Contact RLE1 opens and removes the negative bias to the suppressor grid of V4. With this bias removed, V4 starts its miller run-down action and after one second the current flowing through the valve is sufficient to energize relay RLQ. This relay has two main functions, it resets the one-minute timing circuit V1 and V2, and energizes relay RLF which advances the dekatron one step.

16 The dekatron functions as a single-pole ten-position switch, and is advanced one step every minute by the application of a negative pulse to its guide electrodes. The direction in which the dekatron steps, that is the order in which the cathodes conduct, is dependent on the sequence in which the guide electrodes are negatively pulsed. Surrounding the end of the dekatron is an engraved scale, calibrated in minutes (0-10 min). The dekatron cathodes become illuminated when ionized, thus giving a visual indication of the point reached in the ten-minute timing sequence.

17 When relay RLQ is energized (i.e. on completion of the one-second run-down of V4) contact RLQ4 closes and re-applies the negative bias to the suppressor grid of V1; RLQ3 also closes and shunts R13, the anode load of V1, with R12. This cuts off V1 and increases its anode voltage, consequently driving the grid of V2a positive and switching the Schmitt trigger V2 to its original state, i.e. V2a conducting and V2b cut-off. With V2b cut-off RLE is de-energized. RLE1 closes and re-applies the negative bias to the suppressor grid of V4; cutting-off V4 and de-energizing relay RLQ. Contact RLQ3 and RLQ4 open and allow V1 to commence another one-minute run-down action.

18 During the time that RLQ is energized RLQ1 is closed and relay RLF is energized; RLF5 routes the negative potential developed across the potential divider R10 and R11 to guide electrodes 11 and 12 of the dekatron. The negative pulse to guide electrode 11 is retarded approximately 5 mS by the integrator action of R23 and C2. When V4 resets and RLQ is de-energized, RLQ1 opens and de-energizes RLF. RLF5 opens and removes the negative bias to the guide electrodes 11 and 12 of the dekatron. With the bias removed, the dekatron conduction is switched from guide electrode 11 to cathode 9, which is at 0V potential and therefore negative with respect to guide 11.

19 During the next minute (that is the second one-minute run-down of V1) the current flowing in the dekatron via cathode 9 charges C3 via R27 to approximately +50V. At the end of the one-minute run-down of V1, RLQ is again energized which in turn energizes RLF. The dekatron is advanced a further step when RLF5 closes, relay RLG is energized by the charge on C3 when RLF1 closes, and a hold-on circuit for RLG is provided via contact RLG1. Contact RLG2 routes a +50V d.c. supply to the circuit breaker assembly.

20 The one-minute sequence just described is repeated a further eight times, and from the time that the relay RLC is energized, the following sequence of operations take place:-

20.1 After an interval of 2 minutes relay RLG is energized. Contact RLG2 routes the +50V d.c. supply to relay RLA on the circuit breaker assembly and RLA of the air conditioner unit (Sect 9, Chap 2). These relays switch a 220V 50 Hz supply to the operation coils of contactor F in the circuit breaker

assembly and contactors X3 and X4 in the air conditioner unit. The contactors control the 3-phase supplies to the Tx cooling unit (contactor F) and the air conditioner fan motors.

20.2 After an interval of 4 minutes relay RLH is energized. Contact RLH2 closes and routes the +50V d.c. supply to relay RLB on the circuit breaker assembly (Chap 3). This relay routes a 240V a.c. supply to the operating coils of contactors G and H. Contactors G and H control the 3-phase supply to water pumps 1 and 2 respectively.

21 Contacts RLG1 and RLH1 ensure that their respective relays operate in the correct sequence. Capacitor C10 decouples the positive bias supply developed across the potential divider R28, R29. This positive potential is fed direct to cathodes 8, 6, 4, 3 and 2 of the dekatron.

22 After an interval of 10 minutes, relay RLK is energized by the charge on C6. This relay initiates the e.h.t. switching-on sequence and its function is described in para 28.

23 When the TRANSMITTER OFF switch is depressed, the earth connection to relay RLA is open-circuited. Contact RLA1 opens, removing the 240V a.c. supply to the +50V d.c. power unit M7. With this unit de-energized, the +50V supply to control panel M15 is switched off.

#### Magnetron heater control

24 As described in para. 7, when the regulator is in the h.t. up position the a.c. available to the magnetron heater transformer is at a low level. If the regulator is not in the h.t. up position when the TRANSMITTER ON switch is depressed, contact RLU4 will be open and relay RLZ will be de-energized, therefore contact RLZ1 will be closed. This allows the +50V d.c. supply fed in TB3/10 to be routed via RLB1, RLZ1, SC and RLY2 to relay RLR. With relay RLR energized contact RLR3 is closed. When the +500V d.c. supply becomes available (para. 5) relay RLC is energized and contact RLC3 closes. The 240V a.c. supply fed in at TB1/1 is now routed via contacts RLC3 and RLR3 to the operating coil of contactor M on the circuit breaker assembly. This contactor feeds an a.c. supply to the regulator motor which starts running up. The blue phase of the 3-phase output of the regulator is fed to control panel M15 at TB4/11. This voltage, which is fed to RLU via contact RLB2, increases as the regulator runs up, and when the level preset by H.T. VOLTS control RV5 is reached, relay RLU operates and contact RLU4 closes. Contact RLU4 routes a +50V supply to relay RLZ: contact RLZ1 opens and removes the +50V d.c. supply fed to relay RLR. Contact RLR3 opens and removes the 240V a.c. supply fed to contactor M, which in turn opens, and stops the regulator running up. The regulator is now in the h.t. up position and the a.c. supply fed to contactor C on the circuit breaker assembly is at a low level.

25 When the h.t. up relay RLZ is energized (para. 24) contact RLZ4 closes and routes the +50V d.c. supply to relay RLB, a hold-on circuit for this relay is provided by RLB3. Contact RLB4 routes the 240V a.c. supply to the operating coil of contactor C, which closes and feeds an a.c. supply to the magnetron heater transformer via contactor A on 6M. When relay RLR is de-energized (para 24) the +50V d.c. supply fed in at TB2/10 is routed via RLR2, RLP4, RLD1, SD and RLY1 to relay RLL. Contact RLL2 closes and routes the 240V a.c. supply to the operating coil of contactor L on the circuit breaker assembly. This contactor feeds an a.c. supply to the regulator motor which starts running down. As the regulator runs down, the a.c. supply to the magnetron heater transformer is increased. The

regulator runs down until the blue phase of the 3-phase output of the regulator is sufficiently reduced to operate relay RLD. The point at which this occurs is preset by the H.T. DOWN LIMIT control RV4. Relay RLD is connected between the variable blue phase supply from the regulator, and the blue phase of the main 3-phase supply fed into control panel M15 at TB1/1. Connected in this manner, the voltage across the relay increases when the voltage of the blue phase from the regulator decreases, i.e. when the regulator is running down. When RLD is energized RLD1 opens and removes the +50V d.c. h.t. off supply to relay RLL. Contact RLL2 opens and removes the 240V a.c. supply fed to the operating coil of contactor L which opens: the regulator now stops running down.

26 This sequence of operations ensures that when the a.c. supply is first fed to the magnetron heater transformer it is at a low level, thus preventing a heavy current surge through the magnetron heater. When applied to the magnetron heater, the a.c. supply is gradually increased as the regulator runs down to the level set by the H.T. DOWN LIMIT control RV4.

27 On completion of the 10-minute switching sequence, the e.h.t. supply is switched on and the regulator is automatically run up to produce the correct operating level of the e.h.t. As the regulator runs up, the a.c. supply to the magnetron heater is once more decreased. The correct magnetron cathode temperature is maintained by electronic bombardment when the e.h.t. is fully up and the supply to the magnetron heater transformer is cut.

#### E.H.T. voltage control

28 On completion of the 10-minute control sequence described in para 13, relay RLK is energized by the charge on C6; a hold-on circuit for this relay is provided by contact RLK1. RLK2 closes to energize RLX and contact RLX1 routes the 240V a.c. interlock supply (Chap 4) to the WARM-UP COMPLETE indicator. RLX2 opens and removes the 500V h.t. supply to the anode of the dekatron V3, switching the valve off and extinguishing the glow at cathode 1. RLX4 applies a negative bias to the suppressor grid of V1, this cuts the valve off and prevents it repeating its one-minute miller run-down action. RLX3 closes and energizes the h.t. on relay RLV. The +50V d.c. supply to this relay is maintained via RLV4. Contact RLV1 opens removing the +50V d.c. to relay RLF and RLN. This is to prevent relay RLF being energized when RLQ1 closes during an overload and reset sequence. Contact RLN1, which closes when RLN is de-energized, completes the circuit of the trip store relay RLT. It is necessary to make relay RLN 'slow to release' to ensure that RLN1 does not open before RLQ2 has changed over, this is to avoid the 'trip store' relay RLT being energized every time RLV is operated and the e.h.t. supply switched on. Contact RLV3 closes and completes the e.h.t. interlock circuit to the pneumatic control panel in the R.H. cabinet.

29 When the pneumatic devices in the radar Type 84 transmitter/receiver have operated (Sect 2, Chap 2) the 240V a.c. interlock supply is fed back to control panel M15. This supply enters the panel at TB1/10 and is fed via the normally closed contact RLP1 to the operating coil of the e.h.t. contactor (contactor B in the L.H. annexe). The complete e.h.t. interlock circuit is described in Chap 4.

30 When the e.h.t. contactor closes the 3-phase output of the regulator assembly is fed to the e.h.t. transformer and rectifiers (transformer assembly M3) which produces the e.h.t. to feed the modulator (Sect 3 Chap 3). On the e.h.t. contactor is an auxiliary contact which closes when the contactor is operated, and routes a +50V d.c. supply to TB2/11 on control panel M15. This +50V supply is fed via RLL1, RLZ1, SC, and RLY2 to relay RLR. When RLR is

energized RLR3 closes and routes a 240V a.c. supply to the operating coil of contactor M on the circuit breaker assembly. This contactor feeds an a.c. supply to the regulator motor which starts running up. This increases the voltage of the 3-phase supply fed to the e.h.t. transformer and rectifier, resulting in an increase in the e.h.t. applied to the modulator circuit. The blue phase of the 3-phase regulator output is routed via a second auxiliary contact on the e.h.t. contactor to TB4/12 on control panel M15 (this ensures that this supply is only available when the e.h.t. supply is switched on). When the blue phase supply from the regulator has reached a level set by the H.T. VOLTS control RV5, relay RLU is energized. RLU4 closes and energizes RLZ. RLZ2 provides a hold-on circuit for relay RLZ, RLZ1 opens and removes the +50V d.c. h.t. off supply to relay RLR, which via RLR3 removes the supply to contactor M and stops the regulator running up. RLZ3 closes and short-circuits R47, thus increasing the current through relay RLU and maintaining this relay in the energized condition irrespective of fluctuations in the blue phase supply fed in at TB4/12 from the regulator.

31 The regulator is now in the h.t. up position and supplying the correct level of e.h.t. (as preset by the H.T. VOLTS control RV5). Contact RLU3 feeds the 240V a.c. interlock supply to the H.T. UP indicator to give visual indication that this condition has been reached, and to the magnetron heater circuit breaker assembly (6M) to cut the magnetron heater supply (Chap 7).

#### E.H.T. current control

32 When switch SE on control panel M15 is set to CURRENT CONTROL, the regulator output, and therefore the e.h.t. supply to the modulator circuit, is controlled automatically to maintain a constant e.h.t. current.

33 When the regulator has run up to a level set by the H.T. VOLTS control RV5, relay RLU is energized. RLU1 routes the +50V d.c. supply to relay RLY, and via TB2/6 to the a.f.c. system. With the application of the +50V d.c. supply the magnetron frequency control circuit of the a.f.c. system becomes operational, as described in Sect 4, Chap 7. When relay RLY is energized RLY3 and RLY4 open and remove the earth connections to the regulator control relays RLL and RLR. The only earth connection to these two relays is now via contact RLAA1. Contacts RLY1 and RLY2 also change over when RLY is energized and complete the +50V d.c. supply circuits from the a.f.c. system to relays RLL and RLR. The +50V d.c. supplies from the a.f.c. system only become available when the magnetron frequency drift is greater than 50 KHz. (Sect 4, Chap 7).

34 A potential proportional to the modulator e.h.t. current supply, which is developed across shunt resistors connected in series with the e.h.t. bridge rectifier network (Sect 3, Chap 3) is fed to control panel M15 at terminal TB4/10. This supply is routed via R2 to one coil of the centre-stable relay RLAA. The other coil of relay RLAA is energized by a stabilized reference supply. The level of this supply, and therefore the current through the relay coil, is controlled by the H.T. CURRENT control RV3, which forms part of the potential divider R48, R49, RV3, R5 and R6. The reference supply is stabilized by V5 and variations in the reference current through the relay coil due to temperature changes are compensated by R48, which is a thermistor. If the e.h.t. current sample deviates from the reference current set by RV3, relay RLAA becomes unbalanced and its changeover contact connects to one of the side contacts. Assume the potential produced by the e.h.t. current sample is less than the reference potential set by RV3 (due to a drop in the 3-phase supply to the e.h.t. transformer) this would cause the changeover contact of RLAA to connect the side contact 9, providing an earth connection for relay RLR. If the



drop in magnetron frequency, due to the lowering of the e.h.t. applied to the modulator circuit, is greater than 50 KHz, the a.f.c. system routes a 50V d.c. supply to TB4/4 in control panel M15. This supply is fed to relay RLR via RLY2. Contact RLR3 closes when relay RLR is energized and routes the 240V a.c. supply to contactor M which causes the regulator to start running up, thus increasing the e.h.t. supply. When the e.h.t. current sample has increased to the level set by H.T. CURRENT control RV3, relay RLAA returns to the null condition and the earth connection to relay RLR is removed. With RLR de-energized RLR3 opens and removes the 240V a.c. supply to contactor M on the circuit breaker assembly. Contactor M opens and removes the a.c. supply to the regulator motor which stops running up.

35 If the required correction to the e.h.t. supply is in the opposite sense to that just described, the changeover contact of RLAA connects to side contact 11 and relay RLL is energized by a +50V d.c. supply from the a.f.c. system fed into control panel M15 at TB4/5. When RLL is energized RLL2 routes the 240V a.c. supply to the operating coil of contactor L on the circuit breaker assembly. This contactor feeds an a.c. supply to the regulator motor which starts running down.

36 Contacts RLL4 and RLR4 provide a +50V d.c. hold-on supply for their respective relays once they have become energized by the +50V d.c. inputs from the a.f.c. system. This ensures that the regulator stops running up or down only when the e.h.t. current sample is the same as that preset by the H.T. CURRENT control RV3. When this state is reached, relay RLAA is returned to the null condition and the earth connection, via contact RLAA1, to the regulator control relays RLL and RLR is removed. Indicator lamps ILP1 or ILP2 light during the period that RLAA is unbalanced, and indicate that e.h.t. current is high or low.

37 This system of automatic control in conjunction with the a.f.c. system maintains the correct level of the e.h.t. to the modulator circuit, irrespective of fluctuations in the 3-phase supply to the transmitter/receiver.

38 Push switches SC and SD provide a manual means of raising and lowering the e.h.t. supply. When switch SC is depressed, the +50V d.c. h.t. on supply fed in at TB2/11 is routed via SC, RLD1, the normally closed contacts of switch SD, and RLY1, to the regulator lower relay RLL. Contact RLD1 opens when the regulator has run down to the level set by the H.T. DOWN LIMIT control RV4. When switch SD is operated, the +50V d.c. h.t. on supply at TB2/11 is routed via RLL1, SD, the normally closed contacts of SC, and RLY1, to the regulator raise relay RLR. Switch SD, when operated, short-circuits contact RLZ1 of the h.t. up relay RLZ; thus allowing the regulator to be run-up beyond the level set by the H.T. VOLTS control RV5. Limit switches within the regulator assembly remove the supply to the regulator motor when the top and bottom limits of the regulator are reached (Sect 3 Chap 3).

#### Overload and reset control

39 The following three protection circuits form part of the e.h.t. supply and modulator circuit (Sect 3, Chap 3), and are employed to switch off the e.h.t. supply to the modulator in the event of an overload condition:-

39.1 A.C. overloads.

39.2 E.H.T. current overload.

39.3 Overswing diode overload.

If any of these three circuits register an overload condition a d.c. potential is fed to RLAB, RLM or RLAC respectively via Control Panel M15. Each of these relays will initiate the trip and reset control circuit (para 43).

#### A.C. overloads

40 The a.c. overloads (Chap 1) monitor the current flowing in each line of the 3-phase supply to the e.h.t. transformer and rectifiers. If excessive current flows in any of these lines (e.g. due to one of the e.h.t. rectifiers flashing) the a.c. overload relays become energized and route a +50V d.c. supply to TB2/9 in control panel M15. Because the a.c. overload condition may exist for only a short time a +50V d.c. supply, routed via contact RLQ2 is fed to the hold-on coils of the a.c. overload relays, which once energized remain energized until just before the e.h.t. supply is restored and contact RLQ2 changes over.

#### E.H.T. current overload

41 The d.c. potential that is fed as an e.h.t. current sample to RLAA (para 34) is also fed via a variable resistor RV1 (mounted on transformer assembly M3) to control panel M15. RV1 (M3) is adjusted so that when the transmitter is operating at full e.h.t. the voltage fed into the panel at TB2/8 is not sufficient to operate the overload relay RLM. If due to an overload condition the current flowing through the e.h.t. rectifiers is increased, relay RLM operates and initiates the trip and reset circuits in control panel M15.

#### Overswing diode overload

42 If excessive current flows in the overswing diodes, as would result if the magnetron developed a short circuit, a +50V d.c. supply is fed from the overswing diodes circuit (Sect 3, Chap 3) to TB2/8 in control panel M15. This +50V d.c. supply initiates the trip and reset sequence.

#### Primary overload

43 When the appropriate overload relay RLM, RLAB or RLAC is energized due to a fault condition at any of the three protection circuits, contact RLM2, RLAB2 or RLAC2 closes and energizes relay RLP. Contact RLP3 provides a hold-on circuit for RLP; RLP1 open-circuits the e.h.t. interlock circuit causing the e.h.t. contactor to open, thus switching off the e.h.t. supply. RLP4 opens and prevents relay RLL being energized. RLP2 removes the negative bias to the suppressor grid of V4, which commences its one-second miller rundown action. After the one-second run down of V4, relay RLQ2 changes over and momentarily removes the +50V d.c. supply to RLP and the hold-on coils of the a.c. overload relays. Contact RLP1 closes, once more completing the e.h.t. interlock circuit and thus restoring the e.h.t. supply. V4 is reset when RLP2 re-applies the negative bias to the suppressor grid of this valve. When RLQ2 changes over relay RLT is energized, and is held in this state via RLT1 and RLE2. When RLT is energized, RLT2 opens and removes the negative bias to the suppressor grid of V1, which starts its one-minute run-down action. RLT4 closes and routes the 240V a.c. supply to the TRIP indicator lamp on the R.H. light and meter assembly. On completion of the one-minute run-down of V1, the Schmitt trigger V2 changes over and energizes relay RLE. Contact RLE2 opens and de-energizes RLT. Contact RLT2 closes and applies the negative bias to the suppressor grid of V1. RLT4 opens, extinguishing the TRIP indicator lamp. When RLE is energized contact RLE1 opens and removes the negative bias to the suppressor grid of V4, which starts its one-second run-down action. Relay RLQ is energized on completion of the one-second run-down of V4 and contacts RLQ3 and RLQ4 reset V1 and V2, which de-energizes RLE.

44 Summarizing, the e.h.t. supply is switched off when a primary overload occurs, and is restored after an interval of one second (the run-down time of V4). The trip condition is stored for one minute (the run-down time of V1) by relay RLT. This sequence is repeated each time a primary overload occurs, but if a secondary overload occurs during the one-minute trip store period of RLT a further sequence of operations take place.

#### Secondary overload

45 If relay RLM, RLAB or RLAC is energized, due to a secondary overload, during the one-minute period that relay RLT is energized, relay RLS will be energized via RLT3 and RLM3, RLAB3 or RLAC3. RLS is held in the energized state via RLS1 and RLM3 opens on expiry of the secondary overload condition. When RLM, RLAB or RLAC is energized, RLP is energized via RLM2, RLAB2 or RLAC2. The sequence of operations as for a primary overload now takes place, and the e.h.t. supply is switched off when RLP1 opens. Contact RLS3 short-circuits RLP2 and prevents V4 starting its one-second run-down when RLP2 opens. RLS2 closes and routes the +50V d.c. supply fed in at TB2/10 to relay RLL. With RLL energized RLL2 closes and routes the 240V a.c. supply to the operating coil of contactor L on the circuit breaker assembly. Contact L closes and the regulator starts running down. When the regulator has run down to a level set by RV4 (H.T. DOWN LIMIT), relay RLD is energized. Contact RLD1 opens and removes the +50V d.c. supply to RLL: contact RLL2 opens removing the 240V a.c. supply to the operating coil of contactor L, causing the regulator to stop running down. RLD2 opens and de-energizes RLS and RLZ. Contact RLD3 closes and provides a signal for an extra 'H.T. DOWN' outlet. (Mod. CA8104/4). RLD4 closes allowing the 240V a.c. out to the "H.T. DOWN" lamp. Contact RLS3 opens and removes the negative bias fed to the suppressor grid of V4. This allows V4 to start its one-second run-down action. The sequence that follows is the same as for a primary overload; i.e. the e.h.t. supply is restored after the one-second run-down period of V4 and the trip condition is stored for one minute by relay RLT.

46 A +50V d.c. supply is fed to TB2/11 in control panel M15 when the e.h.t. contactor closes. This supply is routed via RLL1, SC and RLY2 to relay RLR. Contactor M is energized via RLR3 and the regulator starts running up. When the regulator has run up to a level set by RV5 (H.T. VOLTS), relay RLU is energized. RLU1 routes a +50V d.c. supply to the a.f.c. system, which functions to control the e.h.t. supply as described in para.26. During the time that the e.h.t. supply is switched off, the e.h.t. current control system is made inoperative due to contact RLU1 being open. RLU4 closes when RLU is energized and routes the +50V d.c. supply to relay RLZ. RLZ1 opens and removes the +50V d.c. supply to relay RLR. Contact RLR3 opens and de-energizes contactor M which stops the regulator running up. The transmitter is now fully operational.

47 Summarizing, if a secondary overload occurs during the one-minute trip store period, the e.h.t. supply is switched off and the regulator runs down to a preset level. The e.h.t. supply is then restored and the regulator runs up to produce the normal operating level of e.h.t. When this level is reached the a.f.c. system functions to maintain the correct level of e.h.t.

48 If an overload occurs during the time that the regulator is running up or down, contact RLM4, RLAB1 or RLAC1 opens and removes the +50V d.c. supply fed to relay RLK (when the regulator is in the h.t. up position contact RLZ5 is closed and prevents this happening). Contact RLK2 opens and removes the +50V d.c. supply to relay RLX, thus switching off the e.h.t. supply at RLX1. The e.h.t. supply can only be restored by operating the manual H.T. RESET, switch SE. To prevent contact RLK2 reapplying the +500V d.c. supply to the anode of the dekatron when RLX is re-energized, contact RLV2, which remains open during an overload condition, is connected in series with RLX2.

Limited run-up switch

49 The limited run-up switch (SA) on control panel M15 allows the automatic switching-on control sequence of the transmitter/receiver to be stopped at various stages in the sequence. It also prevents the transmitter being switched on at the remote TRANSMITTER ON switch, thus allowing safe access to the transmitter. SA is a four-position switch, i.e. GATES, WARM-UP, H.T. ON and REMOTE. When switched to GATES, SA1B open-circuits the 500V supply line to the panel and removes the +50V supply to relay RLB. SA2B open-circuits the 240V a.c. supply line to the dehumidifier in the external air compressor unit. When the TRANSMITTER ON switch is depressed the sequence described in para.12 takes place and the gate power units are made fully operational. The 10-minute timing circuit and the magnetron heater control circuit do not function because the +500V supply to relay RLC is removed. In position 2 (WARM UP) the 10-minute switching-on sequence described in para 13 is completed but switch contact SA3B prevents the h.t. on relay RLV being energized, and switch SA2B the h.t. up relay RLZ being energized. It is most important that the transmitter does not operate with switch SA in the WARM-UP position for more than a two-hour period. (With the switch in this position, the heaters of the modulator valves will be on, and it is undesirable for the valves to operate in this state for a long period with the e.h.t. supply removed.) With switch SA in the H.T. ON position the transmitter is allowed to become fully operational. Position 4 (REMOTE) is the same as the H.T. ON position, except that SA3B makes possible the switching on of the transmitter at the remote TRANSMITTER ON switch.

Trip Indicator and associated buzzer (Modifications CA 4578/3, 4579/39 and 4580) (Fig.7)

50 Modification action has been taken to install an electrical trip indicator on the wall of the transmitter hall in the Type 84 building (R17), and an associated buzzer on the wall of the transmitter hall annexe, (Sect 1, fig.1 refers), to record any transmitter trips. This additional information will be available as an aid to fault diagnosis.

51 Transmitter trips can be caused by a.c., d.c., or overswing overloads, and these will operate the trip indicator and its associated buzzer whenever they occur.

52 When a trip does occur, the indicator will identify the type of trip, an appropriate lamp will be lit, and a separate count will be registered on one of three sets of five figure counters.

53 When a series of trips occur, (the Transmitter going through a normal trip sequence), the indicator will identify the first trip of the series. The identity of the other trips will be obtained by checking the readings on the three trip recorders against a log which must be maintained, listing the trip recorder readings at each trip and the reason, when known.

54 Cable changes are made between left and right-hand cabinets, and are detailed in the relevant wiring tables of Sect 10, Chap 1. An interconnection diagram is shown at fig.6, and a circuit diagram at fig.7.

TABLE 1 LIST OF OUTPUT SUPPLIES

| Supply           | Terminal | Fed to                                  | Sequence       |
|------------------|----------|---|----------------|
| 240V a.c.        | TB1/2    | Contactor A on circuit breaker assembly | 0 min          |
| 240V a.c.        | TB1/4    | Contactor RLC in air compressor unit    | 0 min          |
| 240V a.c.        | TB1/3    | Contactor C on circuit breaker assembly | 0-2 min        |
| +50V d.c.        | TB1/6    | Relay RLA on circuit breaker assembly   | 2 min          |
| +50V d.c.        | TB1/7    | Relay RLB on circuit breaker assembly   | 4 min          |
| +50V d.c.        | TB1/8    |   | 6 min          |
| 240V d.c.        | TB4/3    | WARM-UP COMPLETE indicator lamp         | 10 min         |
| 240V d.c.        | TB4/2    | Pneumatic control panel                 | 10 min         |
| interlock supply | TB2/4    | E.H.T. contactor coil                   | 10 min         |
|                  | TB2/7    | H.T. UP indicator lamp                  | Not applicable |
| 240V a.c.        | TB1/11   | Contactor L on circuit breaker assembly | Not applicable |
| 240V a.c.        | TB1/12   | Contactor M on circuit breaker assembly | Not applicable |
| 240V a.c.        | TB2/5    | H.T. DOWN indicator lamp                | Not applicable |
| 240V a.c.        | TB2/12   | TRIP indicator lamp                     | Not applicable |

Note ...

0 min means the time when the TRANSMITTER ON switch is depressed.

#### Trip Indicator (Circuit Description)

55 There are three identical trip circuits, one for each trip function. Operation of the overswing trip relay, RLW, in the O/S TRP unit applies +50V d.c. to TB1 pin 2 on the trip indicator. This operates counter 1 through 1 digit, energizes RLA via contacts RLD1 and energizes RLD via RLD1 and D4. Contacts RLA1 hold RLA2. Contacts RLA2 light the Overswing Trip indicator lamp. Contactors RLD1, RLD2 and RLD3 open to ensure that further trips only operate the appropriate counter. RLD is slugged by R4 and C1 to ensure that hold contacts RLA1, RLB1 or RLC1 have made before contacts RLD1, RLD2 or RLD3 have removed the appropriate incoming 50V signal. The 50V via D4 provides a reduced

voltage via R6 to operate the remote buzzer. This condition holds until the reset switch SWA is operated. Operation of relay RLM in Panel (Control) M15 by an excessive increase in modulator current applies +50V d.c. to TB1 pin 3, which operates counter 2 through 1 digit and energizes RLB and RLD. Contacts RLB1 hold RLB, RLB2 lights the d.c. overload Trip Indicator lamp. RLD1, RLD2 and RLD3 contacts open to prevent further trips altering the lamp indication. A d.c. voltage is passed to the remote buzzer via D5 and R6. Operation of any one of the three coilless RLA, RLB and RLC in the left-hand annexe due to an a.c. overload applies a 50V d.c. to TB1 pin 5. This operates counter 3 through 1 digit, energizes RLC and RLD. Contacts RLC2 light the a.c. trip indicator lamp. Contacts RLC1 provide hold for RLC and the d.c. voltage to operate the remote buzzer via D5 and R6. Reset switch SWA de-energizes all relays within the unit and extinguishes all lamps.

#### E.H.T. trip system back up

56 When contactor B re-engages after the 1 second reset sequence with a sustained fault present, there is a possibility of contactor B contacts welding so removing the overload protection for the modulator.

57 In order to overcome this, Modification CA8271/48 which introduced a new Relay Unit S-53-3757-01 (Sect 3, Chap 3, Fig.9 and CA8272/4 which utilises contacts RLAB4, RLAC4 together with RLM1 in the Panel Control M15 (Sect 6, Chap 2, Fig.3) were embodied.

58 The relay unit acts as a back up to the existing e.h.t. trip system whilst relay contacts RLAB4, RLAC4 and RLM1 are used to prime the back up trip. The trip is delayed sufficiently to allow a normal trip to occur. If contactor B does not release then contactor A is released to switch the system to MAINS OFF.

#### Trip system back up (circuit description)

59 The circuit for the overload protection back up system is shown at Sect 3, Chap 3, Figs.8a and 9 together with Sect 6, Chap 2, Fig.3. When the MAINS ON switch is depressed the red phase of the 3-phase supply is routed via FS1 and FS2, the Fire Detection Interlock RLS1 and the mains 'OFF' switch SC/SD to TB75/1 on the Relay Unit S-53-3757-01. The red phase is then routed through RLX1 and TB 75/2 on the relay unit to the operating coil of contactor A via the mains 'ON' switch SE/SF at switch 'ON' and via contactor A auxiliary hold on contacts, when the mains 'ON' switch is released.

60 As described in paras 39 to 48, if a normal overload occurs relays RLAB, RLAC or RLM in the Panel Control M15 energize and initiate the trip circuit releasing contactor B. If however contactor B contacts have welded the closing of contacts RLAB4, RLAC4 or RLM1 cause RLY in the relay unit to energize via TB3/6 in PANEL CONTROL and TB 75/6. Contact RLY1 closes energizing RLX, RLX1 changes over the red phase from the operating coil of contactor A to lamp ILP10. Contactor A releases to switch the Rx/Tx to MAINS OFF. Indicator ILP10 illuminates to indicate that the back up system has operated. The energizing of relay RLY is delayed by the action of R131 and C108 while the energizing of RLX is delayed by the action of R13 and C104 to 107 so allowing to normal trip to occur, when contactor B is functioning normally.

#### Note ...

To reset the trip circuit after the fault is cleared, operation of the mains 'OFF' switch will de-energize RLX and extinguish lamp ILP10. The switch must remain depressed until ILP10 extinguishes to allow for the discharge of RLX delaying capacitors.

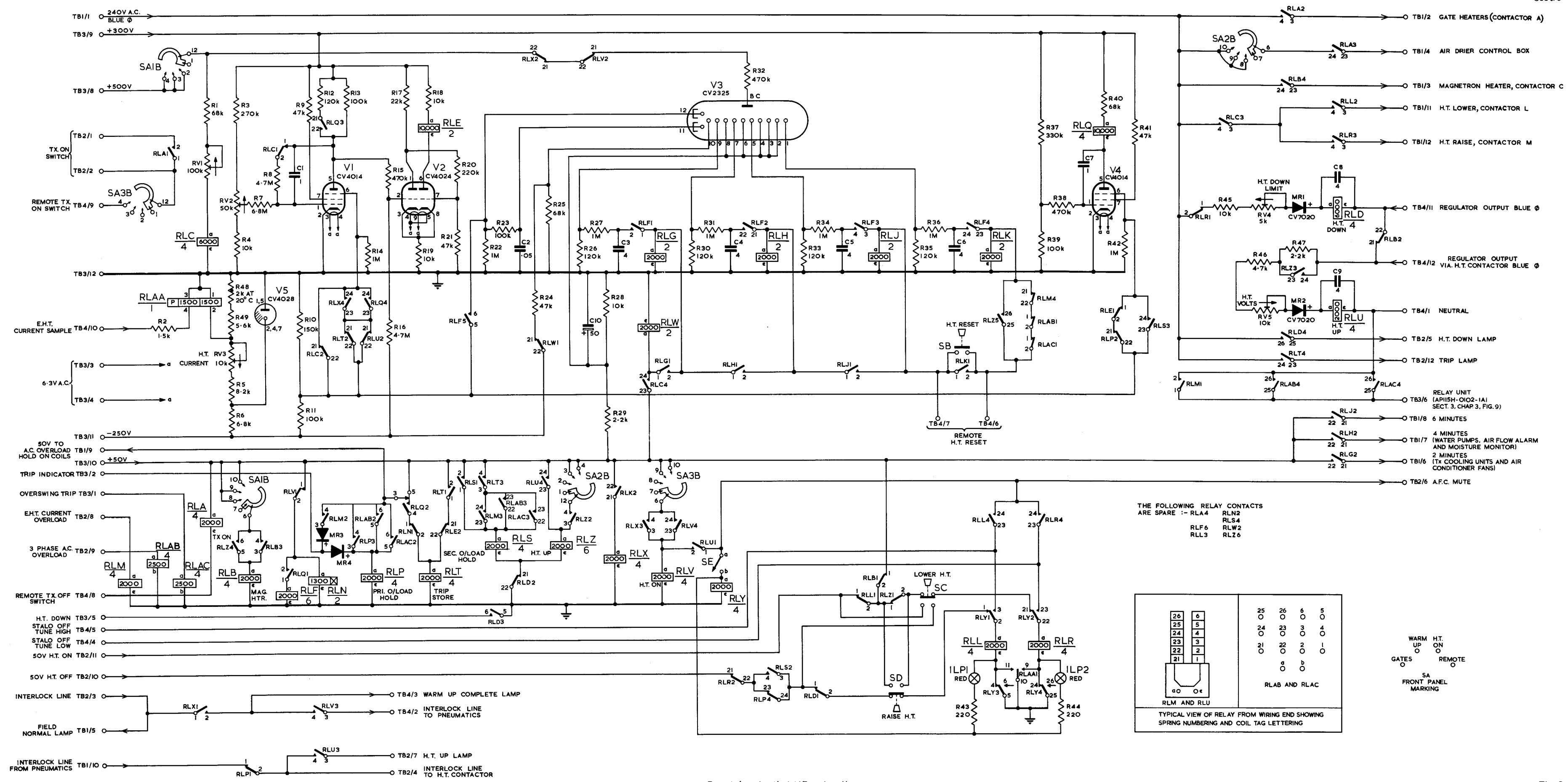


Fig. 3

Jan 88 (Amdt 27)

Panel (control) M15 : circuit

Fig. 3  
Chap. 2  
Page 17/18

Time sequence and service

0 minutes transmitter on

Gate power unit heaters on. De-humidifier on

0-2 minutes All gate power units operating

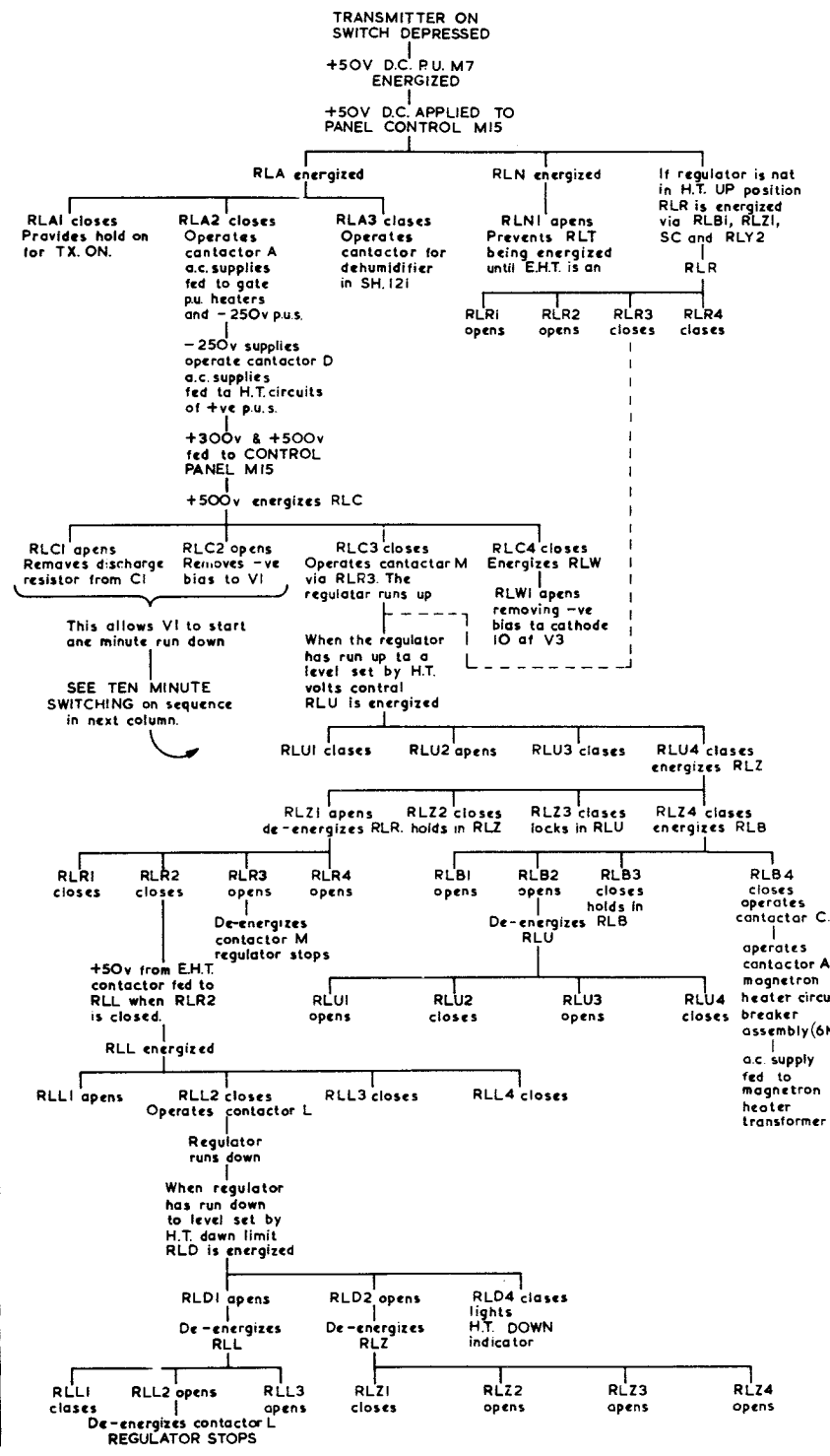
10 minute sequence circuits initiated

Magnetron heater on (low level)

Magnetron heater supply increased to high level

0-2 minutes

MAGNETRON HEATER CONTROL



Time sequence and service

0-2 minutes PLUS

1 minute

2 minutes Tx cooling unit and air conditioner fans ON

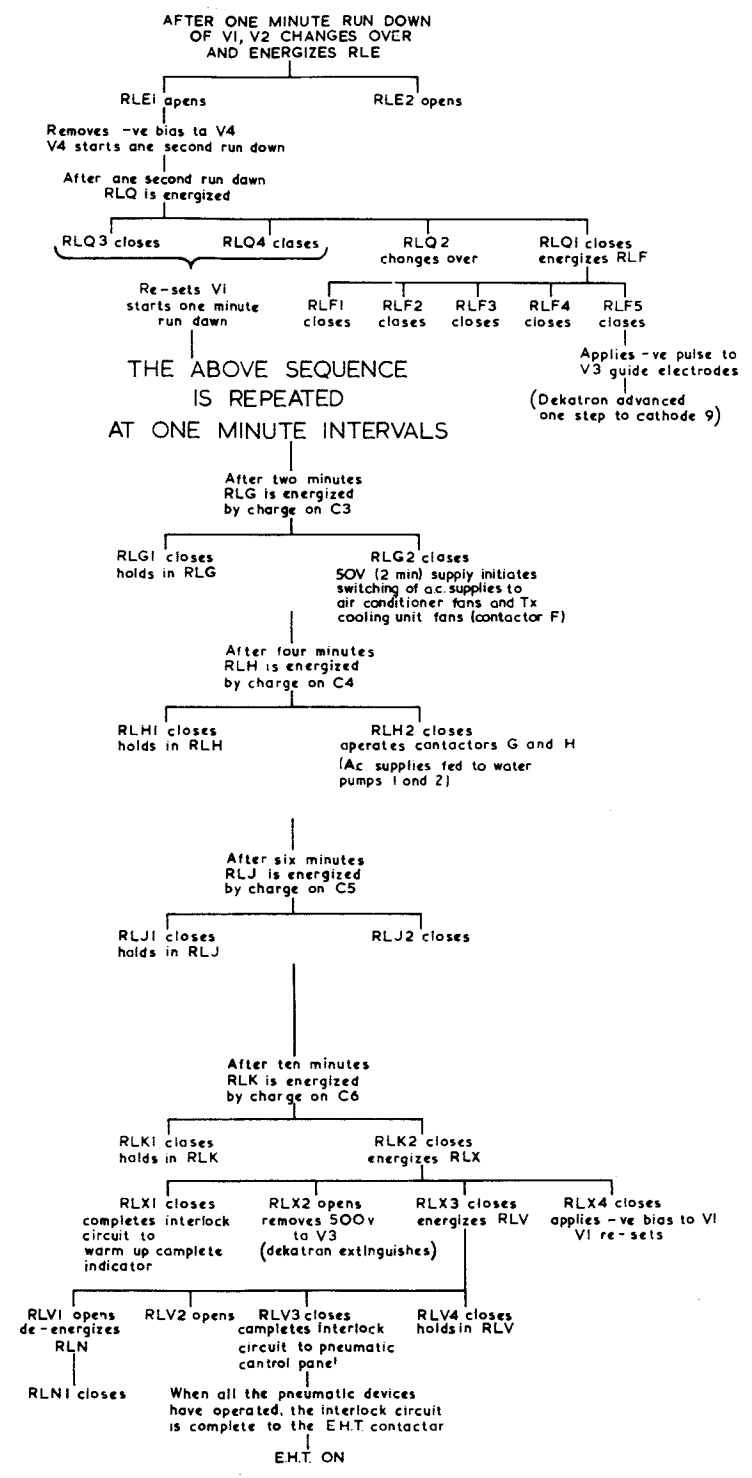
4 minutes Water pumps 1 and 2 on.

6 minutes

10 minutes warm up complete

E.H.T. on.

TEN MINUTE SWITCHING ON SEQUENCE



E.H.T. supply on

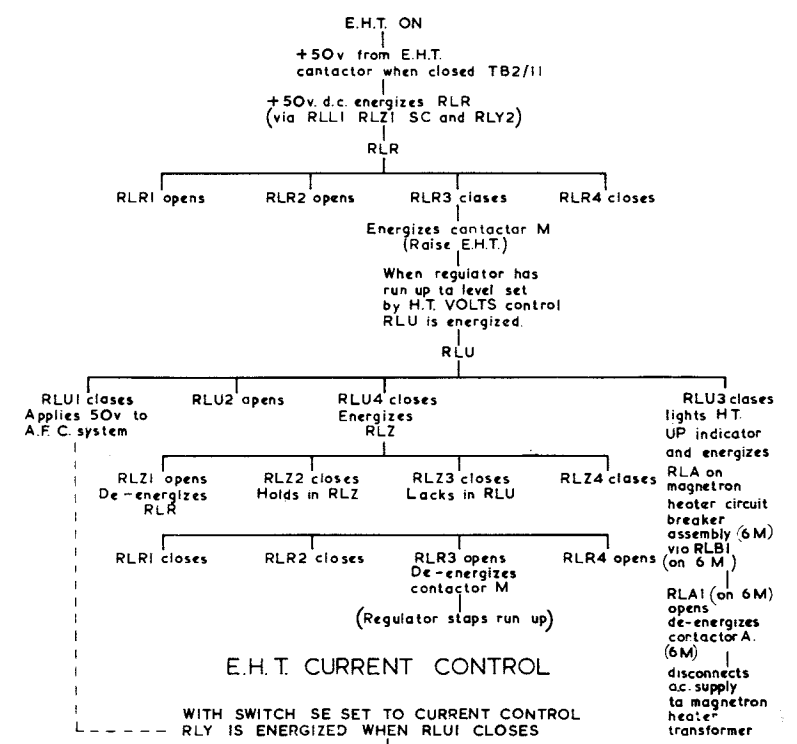
Regulator runs up

E.H.T. supply increased to level set by H.T. VOLTS control.

Regulator stops run up. Transmitter fully operational

Regulator runs up or down increasing or decreasing E.H.T. supply to compensate for changes in mains supply

E.H.T. VOLTAGE CONTROL



THIS SWITCHES THE REGULATOR CONTROL RELAYS RLL AND RLR TO CURRENT CONTROL.

If E.H.T. current sample deviates from reference set by H.T. CURRENT control RLAA operates

RLAA1 closes Provides earth connection for RLL or RLR

When A.F.C. system registers frequency change greater than 50Kc/s at magnetron, +50v is fed to RLL via TB4/5 or to RLR via TB4/4

RLL2 or RLR3 close and operate contactors L or M

Regulator runs up or down raising or lowering E.H.T. supply to the magnetron to correct for frequency drift

Resultant change to E.H.T. current sample operates RLAA

RLAA1 opens De-energizes RLL or RLR  
Regulator stops

This control sequence maintains the correct level of E.H.T. despite any fluctuation in the 3 phase supply.

Fig. 4

Panel (control) M15: relay sequence chart 1

Fig. 4

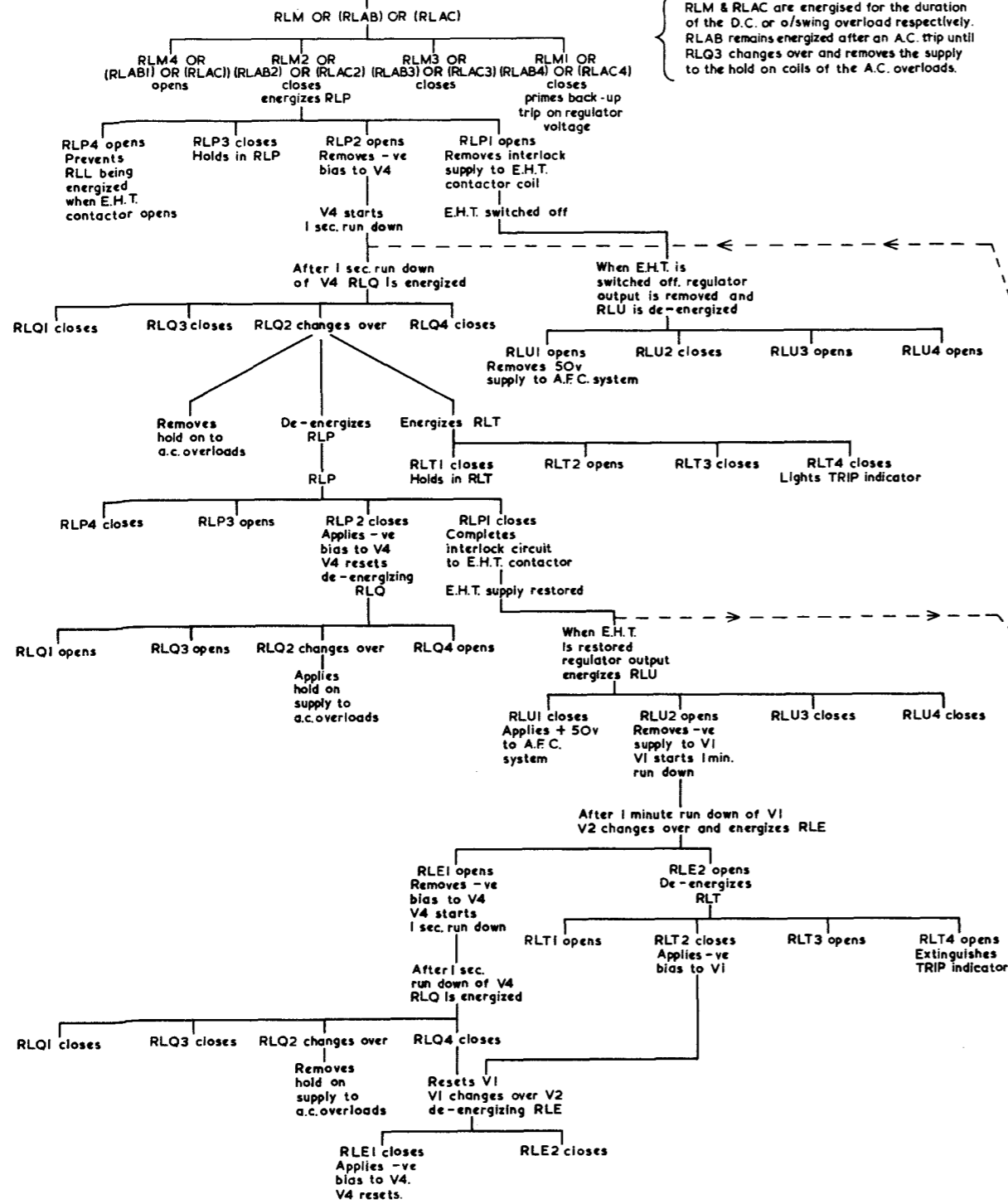


OPERATION

OVERLOAD AND PROTECTION SYSTEM  
PRIMARY OVERLOAD

DURING AN OVERLOAD CONDITION, D.C. AC OR O/SWING A D.C. SUPPLY IS FED TO CONTROL PANEL M15 (TB2/8, TB3/9 OR TB3/1 RESPECTIVELY). THIS SUPPLY ENERGIZES EITHER RLM, RLAB OR RLAC.

RLM & RLAC are energised for the duration of the D.C. or o/swing overload respectively. RLAB remains energized after an A.C. trip until RLQ3 changes over and removes the supply to the hold on coils of the A.C. overloads.



E.H.T. supply switched off

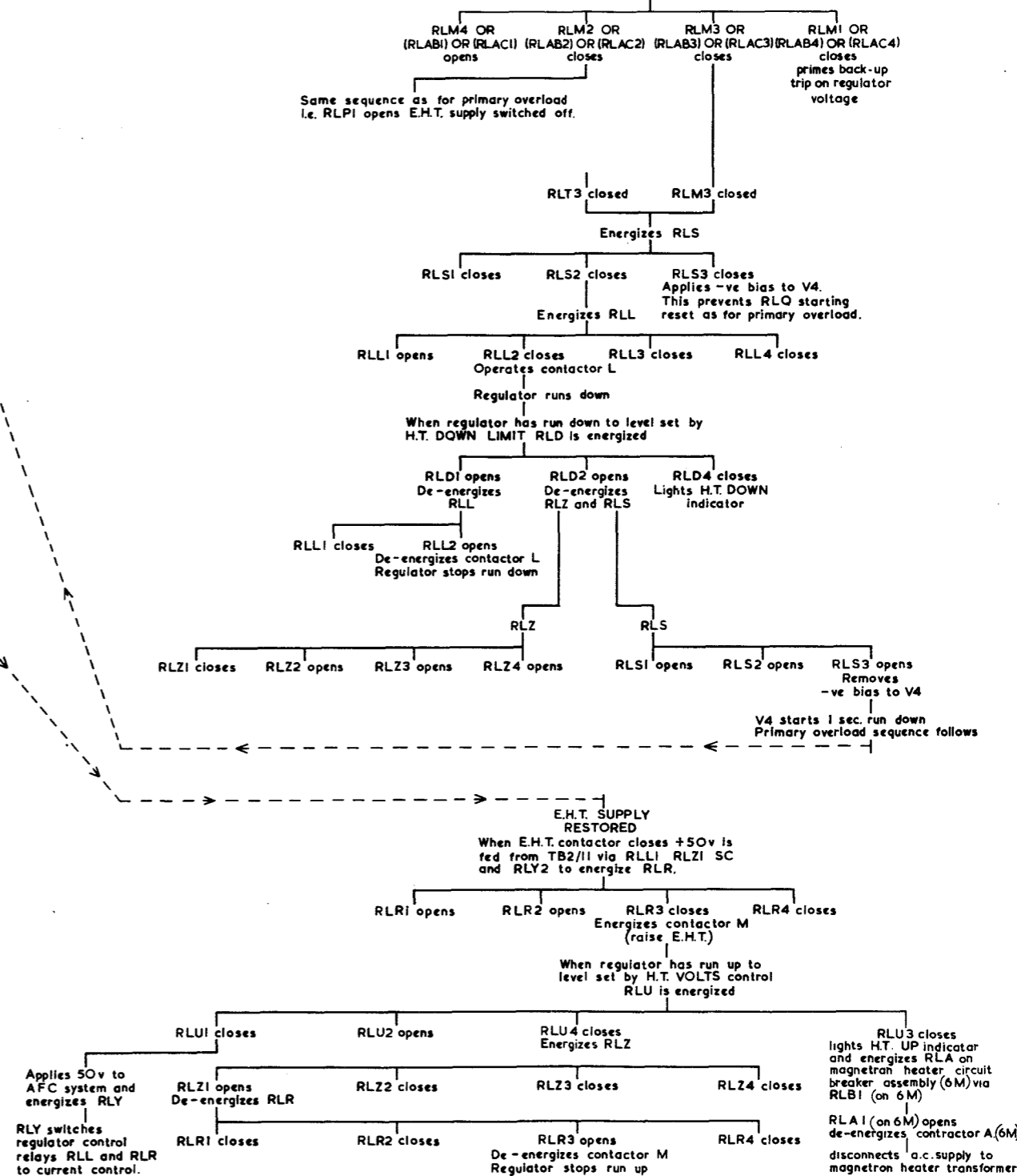
1 sec. run down of V4

E.H.T. supply restored

1 minute trip store period

OVERLOAD AND PROTECTION SYSTEM  
SECONDARY OVERLOAD.

IF A SECOND OVERLOAD OCCURS DURING THE 1 MINUTE TRIP STORE PERIOD RLM OR (RLAB) OR (RLAC) IS ENERGIZED AND THE PRIMARY OVERLOAD SEQUENCE TAKES PLACE.



OPERATION

E.H.T. supply switched off

Regulator runs down

E.H.T. supply restored

Regulator stops run up transmitter fully operational

Fig. 5

Panel (control) M15: relay sequence chart 2

Fig. 5

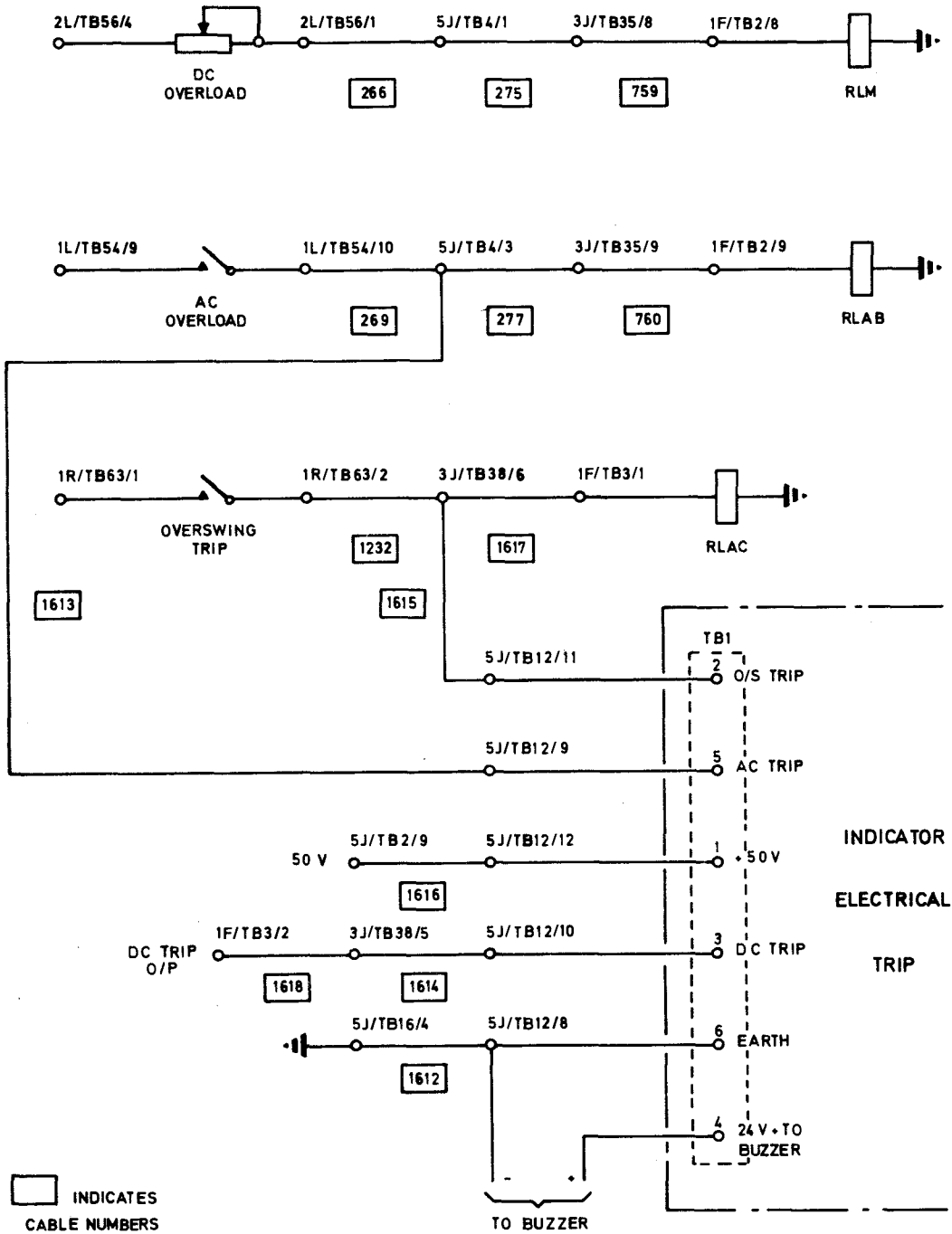


Fig.6 Interconnection diagram for trip indicator (post mods. CA4578/3, 4579/39 and 4580)

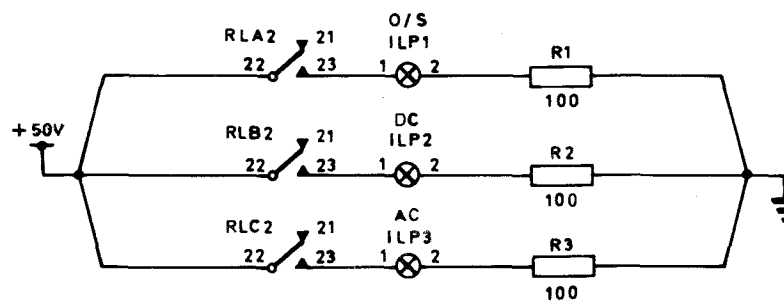
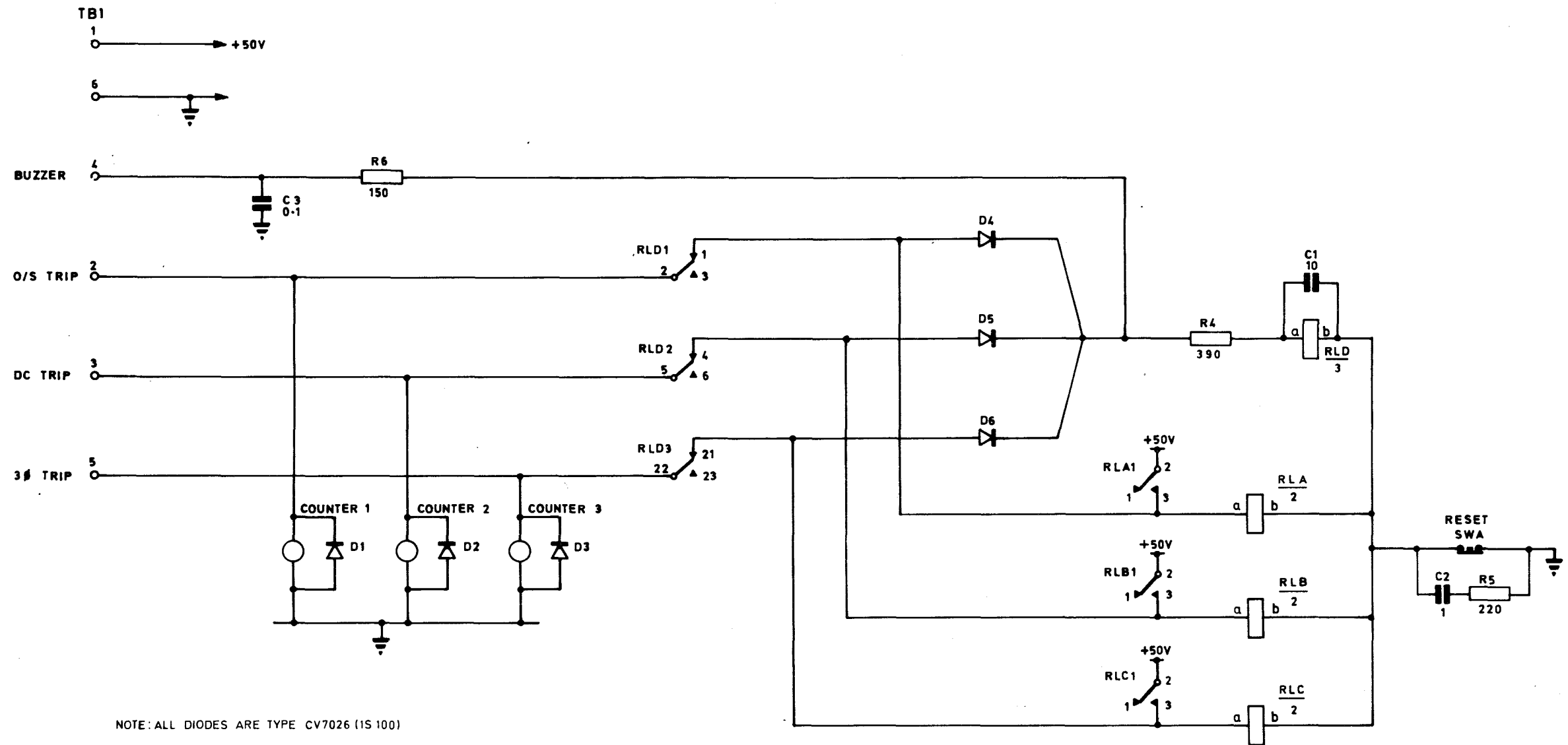


Fig. 7

Indicator electrical trip 5840-99-633-7633 circuit

Fig. 7

## Chapter 3

(Completely revised)

### CIRCUIT BREAKER ASSEMBLY

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#### Introduction

1. Located in the left-hand cabinet, this assembly (fig. 1) controls the switching, distribution, and fusing of the a. c. supplies to the various units and components in the radar Type 84 transmitter/receiver. Contactors, mounted on the front of the assembly, control a. c. supplies (fig. 3) and are operated in the correct time sequence by 240V a. c. supplies, which are controlled by control panel M15 (Chap. 2). Each line of the a. c. supplies is fused and neon indicator lamps are connected across each fuse, and light to indicate a fuse failure.

2. The whole of the assembly is constructed in the form of a gate, hinged down the righthand side to allow easy access to the rear of the assembly.

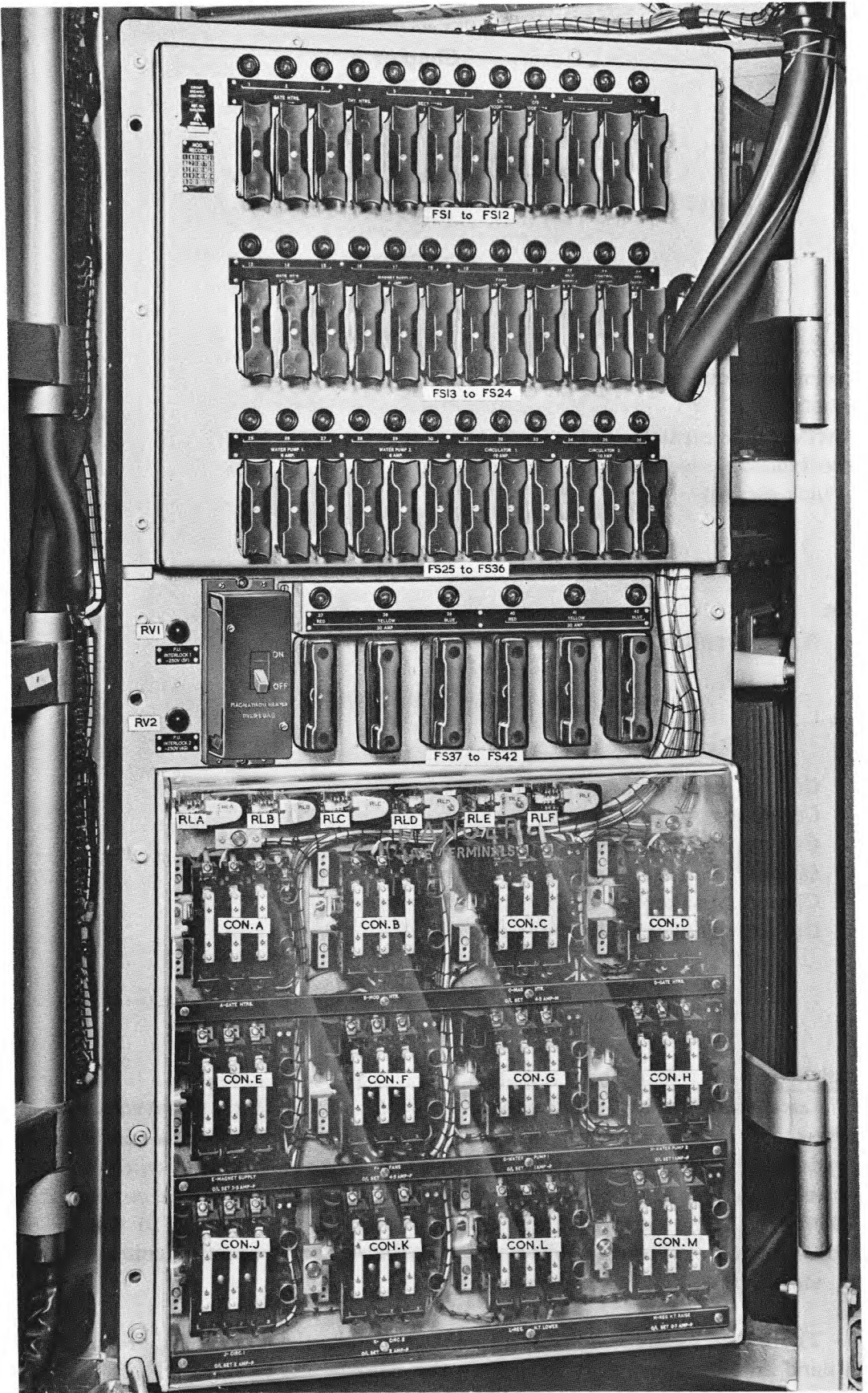


Fig. 1. Circuit breaker assembly: front

Performance characteristics

3. The input supplies to the assembly are:

3.1 A four-wire 3-phase supply from the main isolator.

3.2 A 50V  $\pm$ 5V d.c. positive supply, fed into the assembly at terminal TB6(4) from the 50V power unit M7 (Sect.5, Chap.4).

3.3 A 250V  $\pm$ 5V d.c. negative supply, fed into the assembly at terminal TB5/7 from the -250V power unit M10 on gate 5F.

3.4 A 250V  $\pm$ 5V d.c. negative supply, fed into the assembly at terminal TB5/8 from the -250V power unit M10 on gate 4G.

3.5 A variable 0-120V a.c. supply (referred to the yellow-phase) fed into the assembly at terminal TB4/3 from the regulator assembly (Sect.3, Chap.3).

4. The various a.c. output supplies and associated fuses are shown in table 1.

Contactors

5. The twelve contactors mounted on the front of the assembly are identical in construction (fig.2) and have three pairs of contacts, which close when the contactor coil is energized by a single-phase supply. Eight of the contactors incorporate thermal overloads in each of the three switched lines. The 240V a.c. supply to the contactor coil is fed via the normally closed overload

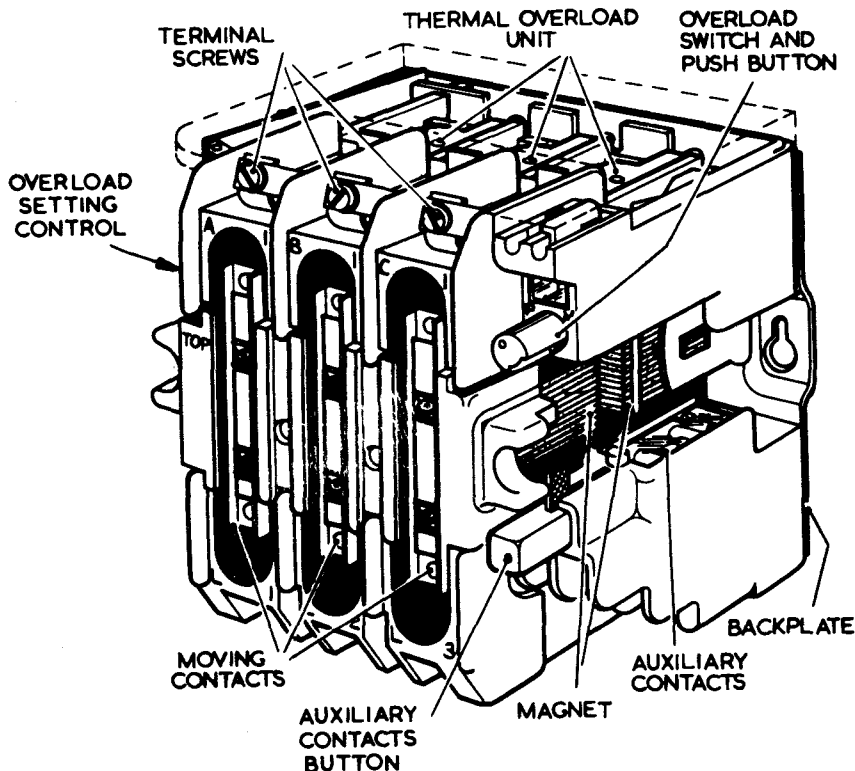


Fig.2 Contactor: general view

contact, which opens when excessive current flows in any one of the three switched lines. The current setting at which these overloads operate is preset manually and indicated on a scale calibrated in amperes. The push-button switch on the front of the contactor has two switched positions. When switched to position M the overload resets automatically. When switched to position P the overload has to be reset manually by depressing the push-button. The overload switch of contactor C is switched to position M. The overload switches on the rest of the contactors are switched to position P and have to be reset manually. Each contactor has an auxiliary pair of contacts which change over when the contactor is operated. These contacts form part of the e.h.t. interlock circuit (Chap.4).

#### Circuit description

6. The 3-phase supply to the assembly from the main isolator is split into two separate supplies (fig.6). One 3-phase supply, fed via fuses FS37, FS38 and FS39, is taken to the input terminals of contactors A, B, E, G and J. The second 3-phase supply, fed via fuses FS40, FS41 and FS42 is taken to the input terminals of contactors D, F, H and K.

#### Contactor A

7. This contactor controls the a.c. supplies to the heater transformers of all the h.t. power units on the transmitter cabinet gates and the mains transformers of the -250V power units M10 on gates 5F and 4G. The 240V a.c. interlock supply is taken from the switched side of this contactor via fuse FS12. FS4 is connected to the thyatron heaters transformer as described in Chap.4. Contactor A is operated by a 240V a.c. supply from control panel M15 when the TX ON switch is depressed. When the TX ON button is depressed the sequence control circuits in the control panel M15 are initiated, and supplies are fed from the panel in the correct time sequence to operate the contactors on the circuit breaker assembly.

#### Contactor B

8. This contactor originally switched the modulator heater transformer supplies (overswing, charging and e.h.t. rectifier diodes) at the transmitter run-up 2 min. stage. With the replacement of thermionic diodes by solid state devices (Modifications CA8123/2, CA8036/41 and CA8094/45) these supplies are no longer required. It should be noted however that pending further modification, the contactor auxiliary contact set still forms part of the Tx H.T. interlock circuit and the single phase output via TB1-9 still supplies the Modulator Heaters Lamp and the Modulator Heater Hours Meter. ◀

#### Contactor C

9. This contactor controls the a.c. heater supply to the magnetron in conjunction with contactor A on the magnetron circuit breaker assembly 6M (Chap.7). It is necessary for normal heater current to flow for a period of 8 min, to allow the magnetron to warm up, before the e.h.t. supply is applied. The thermal overload of contactor C is used to produce the required switching delay and functions as follows. Contactor C is operated in the correct time sequence, by a 240V a.c. supply from control panel M15 at TB4/2. When the contactor closes the main contacts connected to L3 and L2 route an a.c. supply to the magnetron heater transformer which is part of the pulse transformer assembly, via contactor A on the magnetron heater circuit breaker assembly 6M (Chap.7). The thermal overload of contactor C is preset so that the current flowing (approximately 6.2 amp) causes the overload to operate after a delay Chap.3

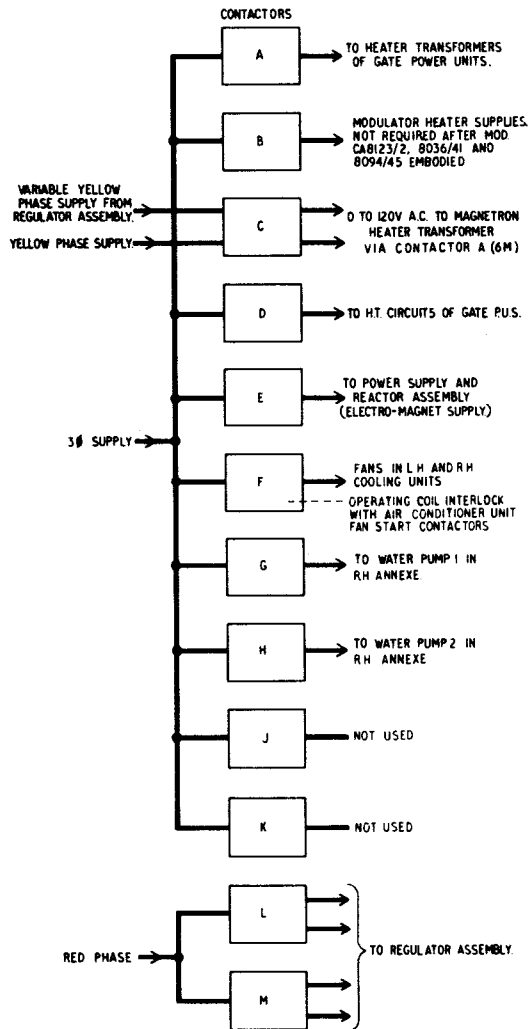


Fig.3 Circuit breaker assembly: schematic

time of 8 min. This overload contact closes, a +50V d.c. supply, fed via the third main contact of Contactor C, is routed to the coil of RLF. Relay contact RLF1, connected in parallel with the overload contact, closes, providing a hold-on supply for RLF during the time that contactor C is operated. Relay contact RLF2, which forms part of the e.h.t. interlock circuit, also closes and routes the 240V a.c. interlock supply to light the MAGNETRON READY lamp, thus indicating that the e.h.t. interlock circuit is complete up to this stage. With the application of e.h.t. to the system, the a.c. supply voltage to the magnetron heater transformer is decreased as the e.h.t. voltage is increased (Chap.1). This reduces the current flowing through the thermal overloads of contactor C and when sufficiently reduced allows the overloads to reset automatically. As the overload of contactor C is utilized to produce a switched time delay, a separate 3-phase electro-magnetic overload is inserted in the a.c. supply line to the magnetron heater transformer and also in the 50V d.c. supply line to RLF. This electro-magnetic overload, situated on the front of the circuit breaker assembly, trips if the magnetron heater current exceeds 10 amperes and removes the 50V d.c. supply to RLF, ensuring that contacts RLF2 break the e.h.t. inter-



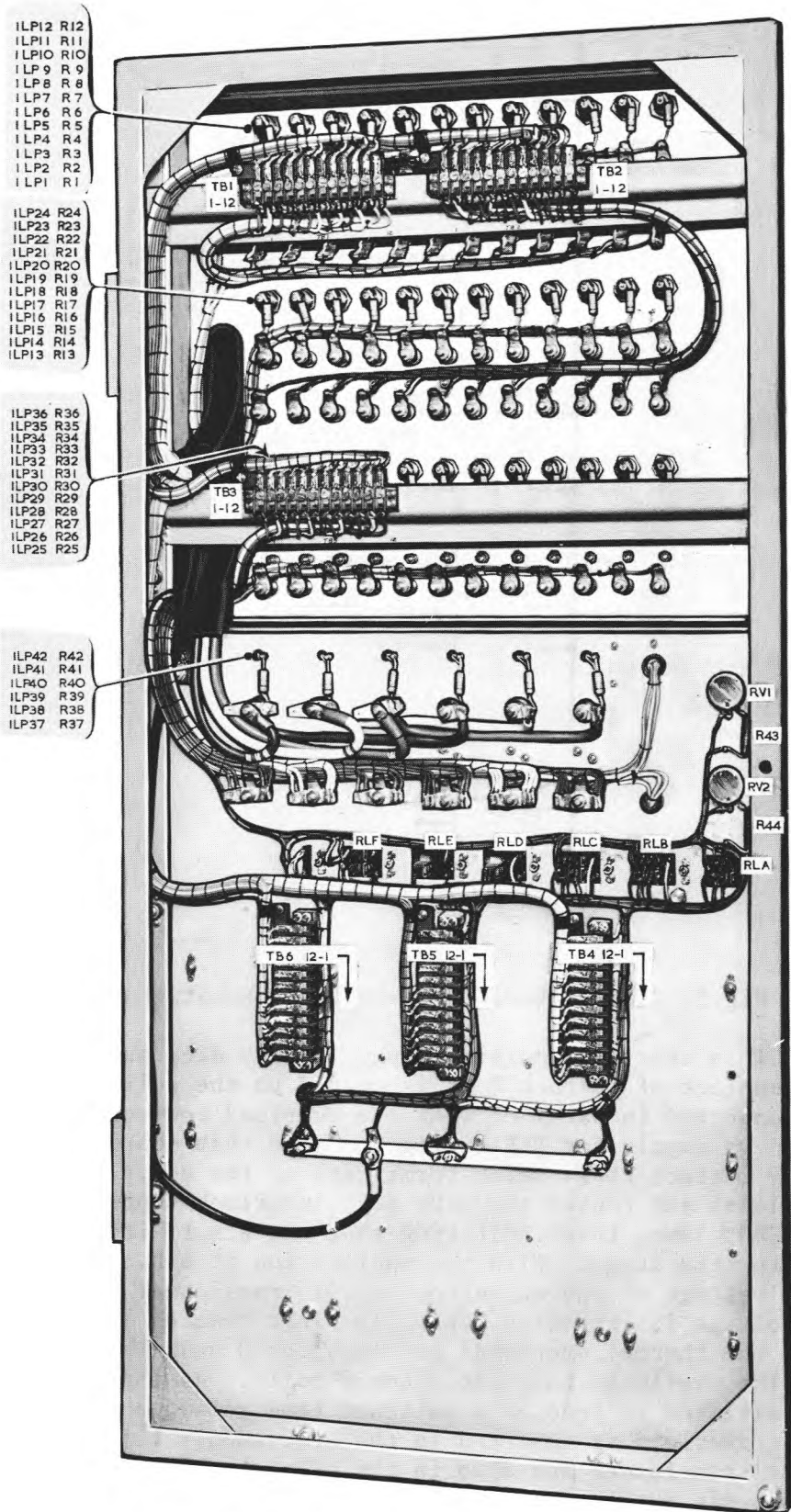


Fig.4 Circuit breaker assembly: rear

lock circuit. The MAGNETRON READY lamp is then extinguished. This 3-phase electro-magnetic overload can only be reset manually.

#### Contactor D

10. This contactor controls the a.c. supplies to the h.t. circuits of the positive gate power units. This contactor is operated by a 240V a.c. supply fed via series connected relay contacts RLD1 and RLE1. RLD is operated by the 250V negative supply from the -250V power unit M10 on gate 5F, and relay RLE by the 250V negative supply from the -250V power unit M10 on gate 4G. The a.c. supply to these power units is controlled by contactor A. This arrangement ensures that the a.c. supplies to the h.t. transformers of the power units on the transmitter cabinet gates are applied only when the negative bias supplies are available. Potentiometers RV1 and RV2, connected in series with relays RLD and RLE respectively, are adjusted so that the relays do not operate until the negative bias voltages from power units on gates 5F and 4G exceed -240V. When operated, the relays will not release until the negative bias supplies drop below -150V.

#### Contactor E

11. This contactor controls the 3-phase supply to the electro-magnet power unit (power unit and reactor assembly M34) and is operated by the 240V a.c. interlock supply when the necessary interlocks have closed, as described in Chapter 4.

#### Contactor F

- ▶ 12. This contactor switches the 3-phase supply to the fan motors in the left and right-hand transmitter cooling units. The operating coil neutral return is interlocked through the auxiliary contacts of the air conditioner unit contactors, X3 and X4, (Sect.9, Chap.2). Thus the Tx HT interlock provided by this contactor will not close unless both the transmitter and air conditioner fan motor supply circuits are closed. The operating coil supply is fed via RLA2. RLA is energized from the 50V (2 min) supply. ◀

#### Contactor G

13. This contactor controls the 3-phase supply to water pump 1 and is operated by a 240V a.c. supply fed via relay contact RLB1, which closes when relay RLB is energized in the correct time sequence by the 50V d.c. supply from control panel M15.

#### Contactor H

14. This contactor controls the 3-phase supply to water pump 2 and is operated by a 240V a.c. supply fed via relay contact RLB2. When the radar Type 84 transmitter is switched off after operating, it is necessary to maintain the flow of coolant round the magnetron coolant circuit until the magnetron is cooled to avoid overheating the coolant in the magnetron cooling jacket, which may cause damage to the magnetron and a pressure build up in the coolant system. A second pair of auxiliary contacts, which close when the contactor is operated, are fitted to this contactor. These contacts are connected in parallel with relay contact RLB2 and provide a hold-on supply for this contactor when relay RLB is de-energized due to the transmitter being switched off. Contactor H remains closed and water pump 2 continues to run until the 3-phase supply is switched off at the main isolator, when the MAINS OFF switch is depressed.

## Contactor J

15. Not used.

## Contactor K

16. Not used.

## Contactors L and M

17. These contactors form part of the e.h.t. control system (Chap. 1). The regulator assembly controls the 3-phase supply to the primary of the e.h.t. transformer and hence the resultant e.h.t. voltage. The regulator assembly is a motor driven 3-phase voltage regulator. The regulator motor has two field connections and the direction of rotation will depend upon which field is energized from the 240V a.c. supply and hence whether the e.h.t. voltage is raised or lowered.

18. An electrically operated brake is fitted to stop the motor instantaneously and prevent overrunning when the supply is removed. This brake is normally on and is released only when energized from the 240V a.c. supply. Contactors L and M control the 240V a.c. supply to the regulator motor and the electrically operated brake and functions as follows. Both contactors are operated by 240V a.c. supplies from control panel M15. These supplies are controlled by the e.h.t. control circuit (Chap. 2). Contactor L, when operated, feeds a 240V a.c. supply to release the brake and to one of the field windings of the regulator motor which, when energized, turns the motor in the direction required to lower the h.t. voltage. Contactor M, when operated, feeds a 240V a.c. supply to release the brake and to the field winding of the regulator motor which, when energized, turns the motor in the direction required to raise the e.h.t. voltage. To ensure that only one contactor is operated at any one time, the neutral line to the coil of contactor L is routed via the normally closed auxiliary contact of contactor M. Likewise the neutral line to the coil of contactor M is routed via the normally closed auxiliary contact of contactor L.

Miscellaneous supplies

19. A 240V a.c. supply from fuse FS23 is routed to the following units:

- (1) Control panel M15 (Chap. 2)-fed out of the assembly at terminal TB2/11.
- (2) Air compressor unit (Sect. 2, Chap. 2)-fed out of the assembly at terminals TB6/2 and TB6/3. These supplies operate the contactors of the left-and right-hand compressor motors when the LOCAL/REMOTE switch in the unit is in the REMOTE position.

Interlock circuit

20. A 240V a.c. supply from fuse FS12 is routed via the series-connected interlock devices and is finally fed to operate the e.h.t. contactor (Chap. 1). The auxiliary contacts of contactors B,C,E,F,G and H, form part of this interlock circuit as shown in fig. 5.

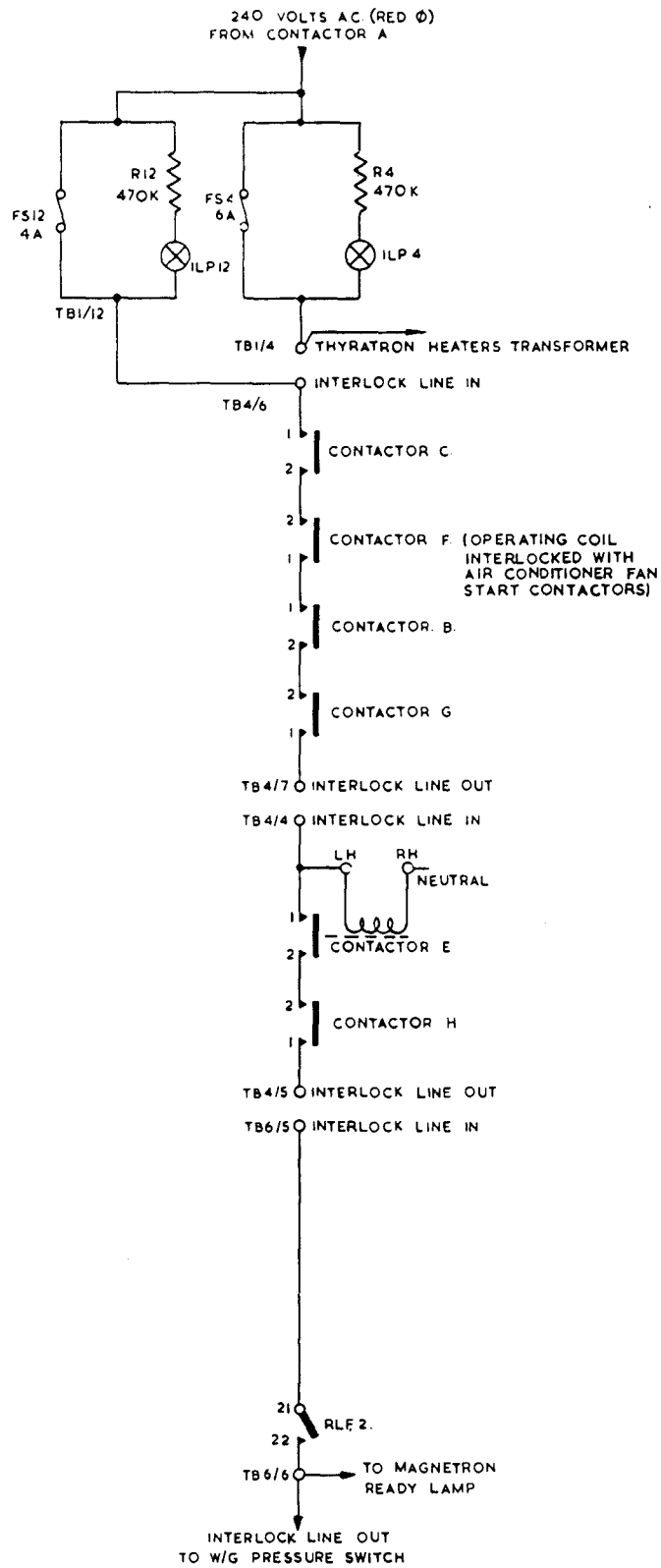


Fig.5 Circuit breaker assembly: interlock circuit

TABLE 1 AC SUPPLIES AND ASSOCIATED FUSES

| Service                         | Controlling contractor | Fuses        | Fuse rating (amp) | Output terminals | Contactor overload settings (amp) | Sequence of operation |
|---------------------------------|------------------------|--------------|-------------------|------------------|-----------------------------------|-----------------------|
| Thyratron heaters               | A                      | FS4          | 6                 | TB1/4            |                                   | 0-min                 |
| Interlock supplies              | A                      | FS12         | 4                 | TB1/12           |                                   | 0-min                 |
| Gate power units, heaters       | A                      | FS1, 2, 3    | 15                | TB1/1, 2, 3      |                                   | 0-min                 |
|                                 | B                      | FS5, 6, 7    | 6                 | TB1/5, 6, 7      |                                   | 2-min                 |
| See note                        | B                      | FS8          | 6                 | TB1/8            |                                   | 2-min                 |
|                                 | B                      | FS9          | 6                 | TB1/9            |                                   | 2-min                 |
| Magnetron heaters               | C                      | -            | -                 | TB1/10, 11       | 4.75                              | 0-2 min               |
| Gate power units, H.T. supplies | D                      | FS13, 14, 15 | 10                | TB2/1, 2, 3      |                                   | 0-2 min               |
| Magnet supply                   | E                      | FS16, 17, 18 | 6                 | TB2/4, 5, 6      | 3.5                               | 4-min                 |
| Fans (cooling units)            | F                      | FS19, 20, 21 | 15                | TB2/7, 8, 9      | 4.5                               | 2-min                 |
| Water pump 1                    | G                      | FS25, 26, 27 | 6                 | TB3/1, 2, 3      | 1.2                               | 4-min                 |
| Water pump 2                    | H                      | FS28, 29, 30 | 6                 | TB3/4, 5, 6      | 1.2                               | 4-min                 |
| Not used                        | J                      | FS31, 32, 33 | 10                | TB3/7, 8, 9      | 1.5                               | 6-min                 |
| Not used                        | K                      | FS34, 35, 36 | 10                | TB3/10, 11, 12   | 1.5                               | 6-min                 |
| EHT regulator                   | L and M                |              |                   |                  |                                   |                       |
| Brake (lower)                   | L                      | -            | -                 | TB5/1            |                                   |                       |
| Lower                           | L                      | -            | -                 | TB5/4            | 0-7                               | Not applicable        |
| Brake (raise)                   | M                      | -            | -                 | TB5/2            |                                   |                       |
| Raise                           | M                      | -            | -                 | TB5/3            |                                   |                       |

Note...

Contactor B: the embodiment of modifications CA8053/42, CA8094/45 and CA8123 remove the requirements for charging, overswing and e.h.t. diode heater transformer supplies.

Table 1 (cont.)

| Service             | Controlling contactor | Fuses | Fuse rating (amps) | Output terminals | Contactor overload settings (amps) | Sequence of operation |
|---------------------|-----------------------|-------|--------------------|------------------|------------------------------------|-----------------------|
| 240V a.c. supply to | Relay Contact         |       |                    |                  |                                    |                       |
| Control panel M15   | -                     | FS23  | 6                  | TB2/11           |                                    | -                     |
| W/G air monitor     | RLB3                  | FS24  | 2                  | TB6/2,3          |                                    | 4-min                 |
| 50V Power unit M7   | -                     | FS22  | 2                  | TB2/10           |                                    | -                     |

Note...

- (1) The distribution and routing of the above a.c. supplies are described in Sect. 5, Chap. 1.
- (2) The sequence in which the contactors operate is shown in the right-hand column; starting from the time that contactor A is operated (i.e. 0-min) when the TX ON switch is depressed.

## Chapter 4

## EHT INTERLOCK CIRCUIT

## Para.

- 1 Introduction
- 3 Circuit description

## Fig.

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| 1B EHT interlock circuit Part B ... .. | 7    |
| 1C EHT interlock circuit Part C ... .. | 8    |

INTRODUCTION

1. The e.h.t. supply to the modulator becomes available when the e.h.t. contactor (contactor B) in the LH annexe is operated. A 240V a.c. supply is routed to the operating coil of this contactor via the e.h.t. interlock circuit. The interlock circuit consists of a number of series-connected interlock devices which close only when various units, supplies and services throughout the transmitter are functioning normally.

2. Supplies are taken from the interlock circuit at various points to feed the indicator circuits on the cabinet light and switch assemblies (Chap.5). These indicators provide an easy means of fault finding by indicating up to what stage the e.h.t. interlock circuit is complete.

Circuit description (fig.1)

3. The 240V a.c. interlock supply is taken from the red phase of the 3-phase supply controlled by contactor A on the circuit breaker assembly (Chap.3). This contactor closes and makes the interlock supply available at FS4 when the TRANSMITTER ON switch on the RH light and switch assembly is depressed. The interlock supply is fed out of the circuit breaker assembly and is routed to the thyatron heaters transformer in switch electronic M6 and to the THYRATRON HEATERS indicator. The interlock supply is also taken to the series connected, normally open, auxiliary contacts of contactors C, F, B and G. These contactors close during the ten-minute transmitter switching-on sequence described in Chap.1.

► 4. From the auxiliary contact of contactor G the interlock supply is fed to diode thermal switch X30 in the RH cooling unit. The thermal switch monitors the temperature of the air being drawn from the charging circuit components and is normally closed, but opens if the temperature of the air exceeds 70°C.

5. The next interlock device is SQ flow switch 1, in the RH annexe. This flow switch is in the ferrite isolator and electro-magnet cooling circuit, and closes when the flow of liquid coolant reaches 3 gallons per minute. ◀

6. Magnet thermal switch X28 is the next interlock, and monitors the temperature of the liquid coolant flowing from the electro-magnet. The thermal switch is normally closed, but opens if the temperature of the coolant exceeds 70°C.

7. From magnet thermal switch X28 the overload supply is routed via the normally closed relay contact RLBI, in the rectifier protection unit M1 (Sect.3, Chap.5), to the operating coil of contactor E on the circuit breaker assembly. If the d.c. current flow to the magnetron electro-magnet exceeds a preset level, relay RLB is energised and RLBI opens to remove the interlock supply to the operating coil of contactor E. Contactor E controls the 3-phase supply to the electro-magnet power supply system, and is operated only when the coolant conditions at the electro-magnet are correct, i.e. flow rate (SQ flow switch 1), and coolant temperature (magnet thermal switch X28). When contactor E operates, the interlock supply is routed via the auxiliary contact of this contactor to the auxiliary contact of contactor H.
8. Contactor H controls the 3-phase supply to water pump 2, which circulates the liquid coolant through the magnetron coolant circuit. When contactor H closes the interlock supply is routed to the next interlock device, SR flow switch 2.
9. SR flow switch 2, mounted on the magnetron cooling control valve assembly in the RH cabinet, monitors the rate of flow of coolant through the magnetron. The switch closes when the coolant flow reaches 3 gallons per minute. (Sect.2, Chap.4.)
10. Magnetron thermal switch X29 is the next interlock and is positioned in the magnetron coolant line. The switch is normally closed, but opens if the temperature of the coolant flowing from the magnetron exceeds 70°C.
11. From the magnetron thermal switch X29 the interlock supply is routed to CONTACT RLF2 of relay RLF/4 on the circuit breaker assembly.
12. Relay RLF/4 is energised eight to ten minutes after contactor C has operated to feed an a.c. supply to the magnetron heater transformer as described in Chap.3. The delay allows the magnetron heater to reach its operating temperature before the interlock circuit is completed to the next interlock and the MAGNETRON READY indicator. A 3-phase electro-magnetic overload (X1) (Chap.3, fig.6) trips if an overload occurs on the Y phase or variable Y phase to the magnetron heaters. Such a trip will open circuit both phases and also remove the 50V d.c. supply from RLF/4.
13. The next interlock device is a waveguide pressure switch SU located on the magnet frame assembly (Sect.2, Chap.2). This switch is normally open, but closes when the air pressure in the waveguide launching section reaches 15 lb/in<sup>2</sup>.
14. From the waveguide pressure switch SU, the interlock supply is routed to contact RLAI of relay RLA/4 in the trigger unit. This relay is energised and RLAI closed when the trigger unit is functioning normally and producing the correct trigger pulses (Sect.3, Chap.2).
15. From the trigger unit the interlock supply is routed to relay contacts RLD2 and RLE3 in the d.c. amplifier unit M31. Contact RLE3 closes when the electro-magnet current conditions are correct and forms part of the field protection system described in Sect.3, Chap.5. When relay contact RLE3 closes the interlock supply is routed to control panel M15.
16. The next two interlock stages are contained in control panel M15. The first of these, relay contact RLX1, closes when relay RLX/4 is energised on completion of the ten-minute switching-on sequence described in Chap.2. When RLX1 closes, the interlock supply is routed to the WARM-UP COMPLETE indicator and also to contact RLV3. If switch SA on control panel M15 is in the HT ON or REMOTE position contact RLV3 closes simultaneously with relay contact RLX1.



and when closed routes the 240V a.c. interlock supply to the pneumatic control panel, enabling the various pneumatic devices to operate as described in Sect.2, Chap.2.

17. When all the pneumatic devices have operated, the interlock supply is routed via pressure switch SZ on the pneumatic control panel to contact RLP1 in control panel M15. This contact is normally closed, but opens during an overload condition to remove the interlock supply to the operating coil of the e.h.t. contactor, thus switching off the e.h.t. supply.

18. The next interlock device is a waveguide pressure switch SUA located behind the transmitter cabinet. This switch is normally open but closes when the air pressure in the air line to the external waveguide reaches 15 lb/in<sup>2</sup>. From this switch the interlock supply is routed to the aerial turning interlock.

19. The aerial turning interlock (see AP 115J-0100-1) prevents the modulator e.h.t. supply being switched on until the aerial is turning. This is to reduce any possible radiation hazard. When the aerial is turning, the circuit between TBI-5 and TBI-6 is completed and routes the interlock supply to the final interlock stage.

20. The final interlock stage consists of the a.c. overloads, situated in the L.H. annexe. These comprise three relays, which monitor the current flowing in each line of the 3-phase supply to the e.h.t. transformer. The current flowing in these supply lines induces a magnetic field in the armatures of the a.c. overload relays. If excessive current flows in any of these lines, e.g. due to the e.h.t. rectifiers flashing over, the relay operates. Each overload relay has a normally closed and a normally open contact. The 240V a.c. interlock supply is routed via the three normally closed contacts (RLA, RLB, RLC) connected in series, to the operating coil of the e.h.t. contactor. If any one of the relays operates, due to an a.c. overload, the interlock circuit is interrupted and the e.h.t. contactor opens, switching off the e.h.t. supply. The a.c. overloads form part of the protection circuits described in Sect.6, Chap.2.

21. When all the units, supplies and services are functioning normally the e.h.t. interlock circuit is complete and the 240V a.c. interlock supply is routed to the operating coil of the e.h.t. contactor (contactor B) in the L.H. annexe. When this contactor operates, the 3-phase regulator output is routed to the e.h.t. transformer which feeds the e.h.t. rectifiers.

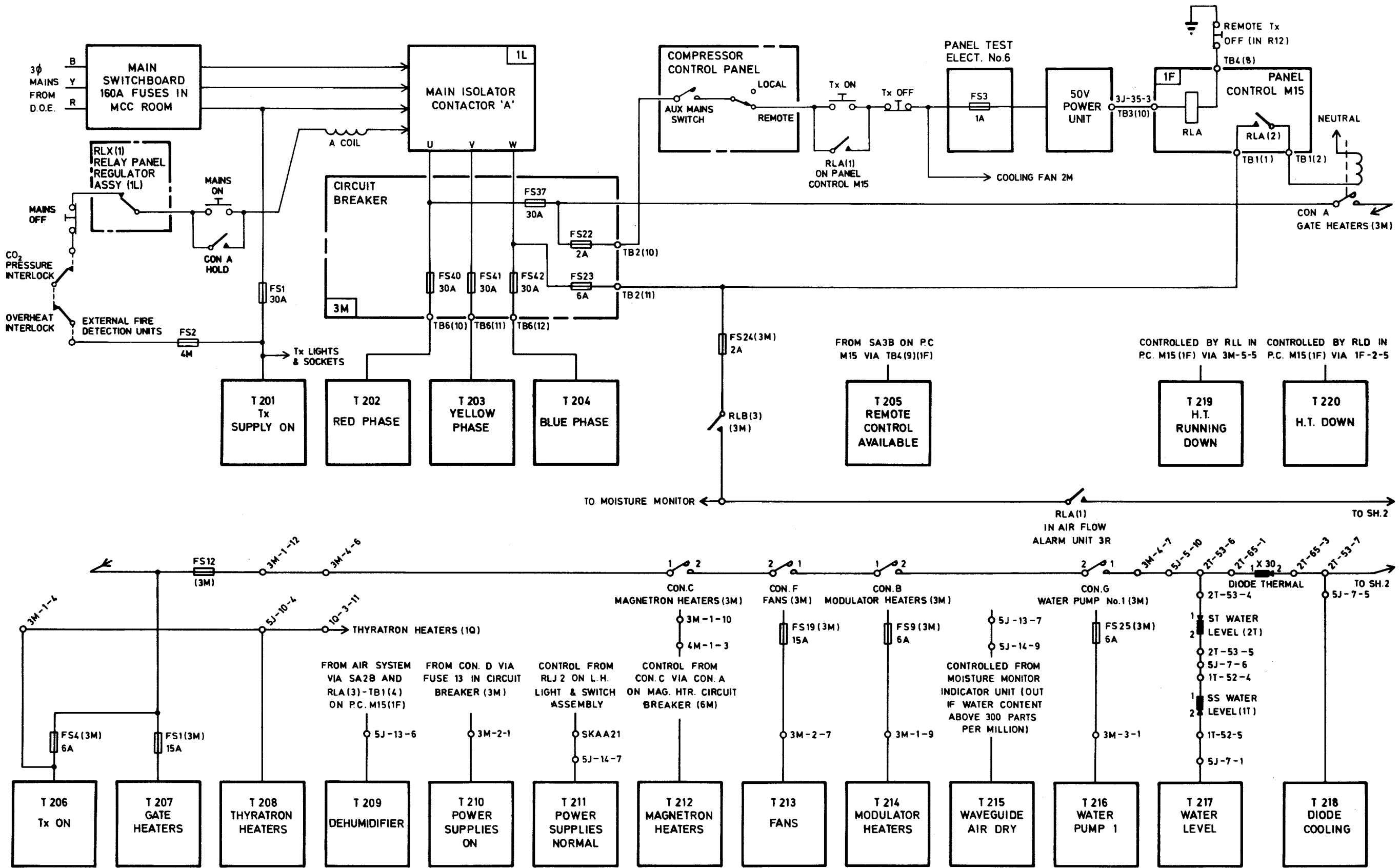


Fig.1A

E H T interlock circuit (modification CA 2988/30 embodied)

Fig.1A

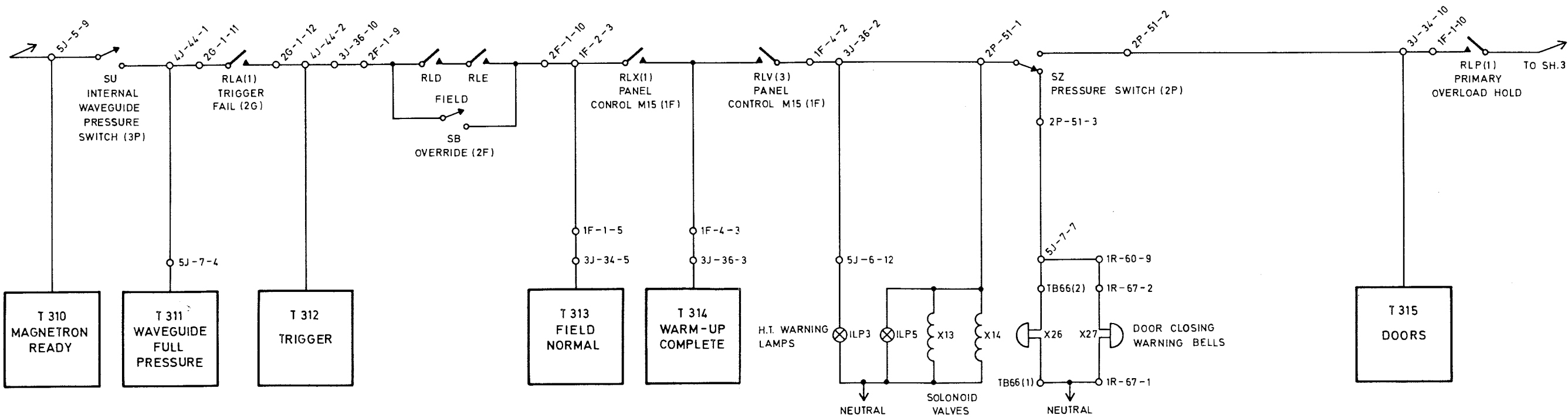
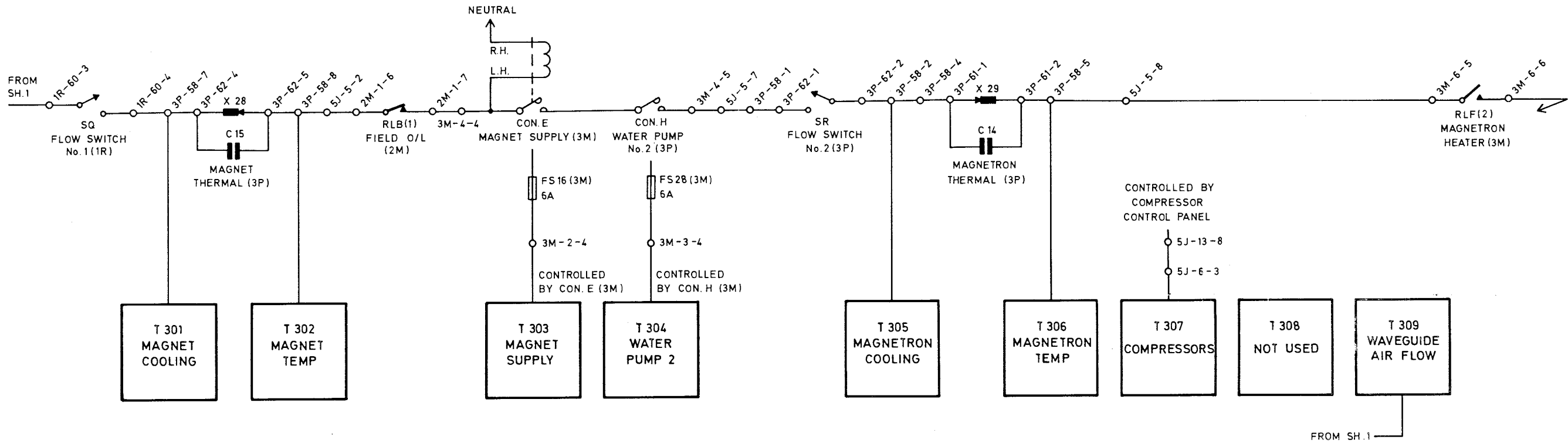
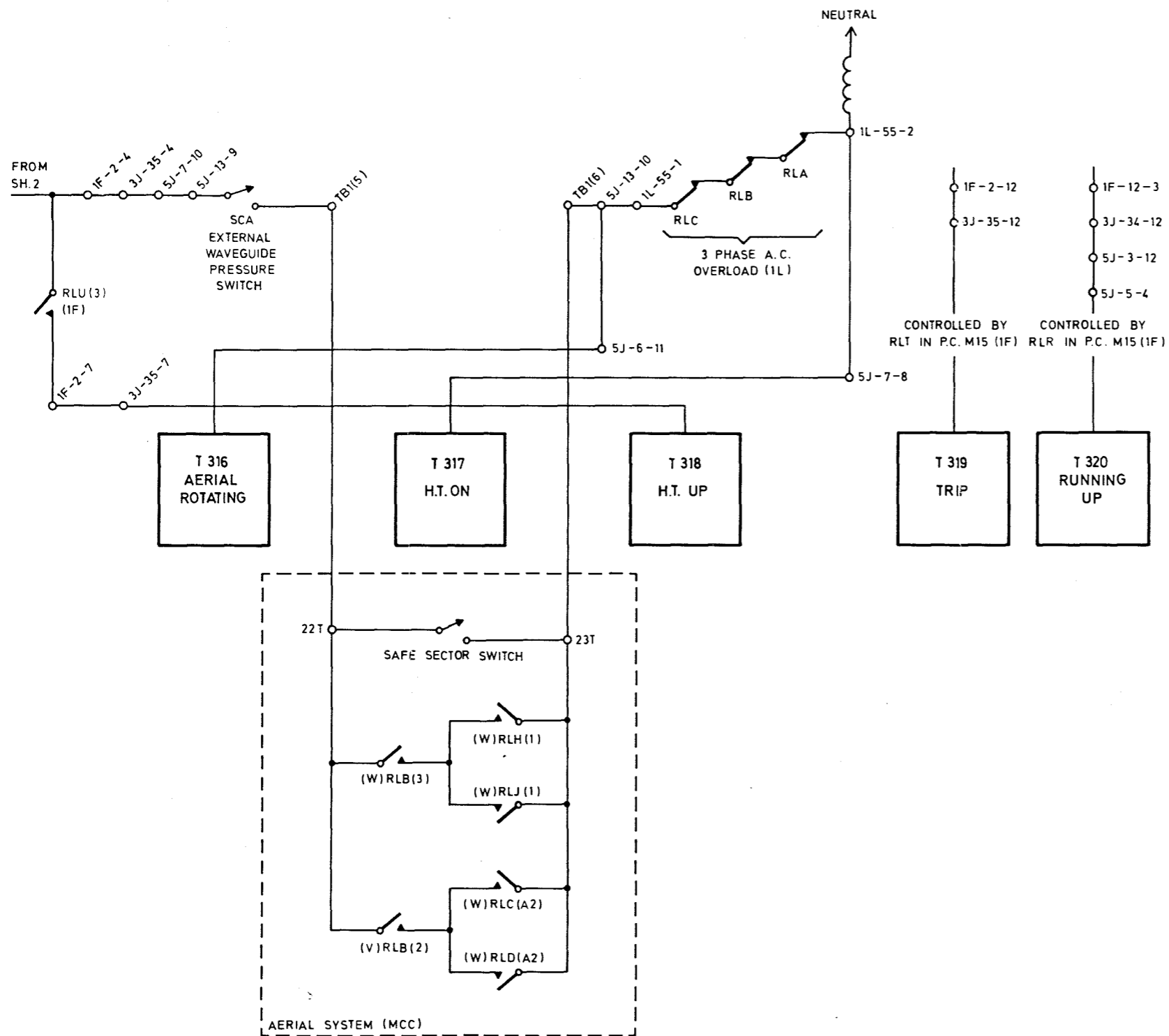


Fig.1B

E HT interlock circuit (modification CA 2988/30 embodied)

Fig.1B



| UNIT & COMPONENTS CODING<br>(SECTION 2, CHAPTER 1, APPENDIX 1, REFERS) |   |
|--|---|
| 1F   | PANEL CONTROL M15                               |
| 1L   | REGULATOR ASSEMBLY                              |
| 1Q   | SWITCH ELECTRONIC M6                            |
| 1R   | R.H. ANNEX                                      |
| 1T   | L.H. COOLING ASSEMBLY                           |
| 2F   | AMP D.C. M31                                    |
| 2G   | PULSE GENERATOR M12                             |
| 2M   | RECTIFIER (PROTECTION) M1                       |
| 2P   | PNEUMATIC CONTROL PANEL                         |
| 2T   | R.H. COOLING ASSEMBLY                           |
| 3J   | JUNCTION PANEL L.H.                             |
| 3M   | CIRCUIT BREAKER ASSEMBLY                        |
| 3P   | HYDRAULIC CONTROL PANEL & MAGNET FRAME ASSEMBLY |
| 3R   | CONTROL BOX. AIRFLOW ALARM                      |
| 4J   | JUNCTION PANEL R.H.                             |
| 5J   | JUNCTION PANEL TERMINATION                      |
| 6M   | MAGNETRON HEATER CONTACTOR ASSEMBLY             |

INDICATORS OR LIGHT & SWITCH ASSEMBLIES

T

E HT interlock circuit (modification CA 2988/30 embodied)

Chapter 5

INDICATOR LAMP CIRCUITS

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| 7    | Circuit description            |
| 8    | L.H. light and switch assembly |
| 26   | R.H. light and switch assembly |
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INTRODUCTION

1 Indicator lamps on the light and switch assemblies, situated at the top of the transmitter cabinet, indicate the stage reached in the automatic switchin on sequence of the radar Type 84 transmitter/receiver. The indicators are arranged g- on the assemblies so that the sequence in which they light is from 1 to right; thus providing a quick method of fault finding by indicating up to what stage eft the transmitter is operational.

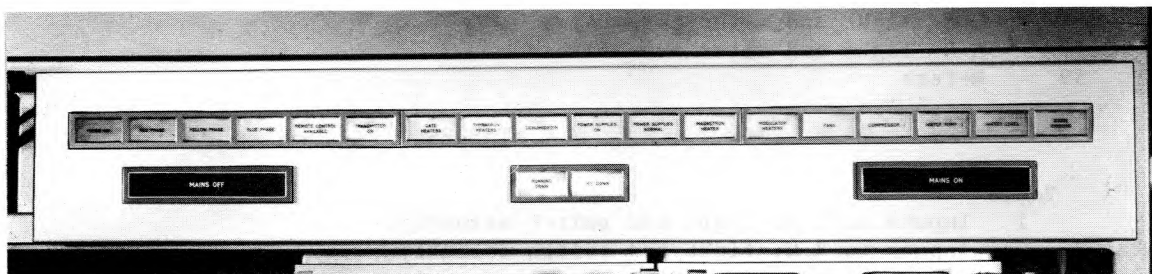
2 The function of the push switches on these assemblies is described in Chapter 1.

3 The indicator lamps on the light and meter assemblies, situated alongside the light and switch assemblies, give warning of a fault condition in the gate power units and the TWT field circuits. These fault indicator lamps are normally extinguished, but flash on and off during a fault condition at their relevant units.

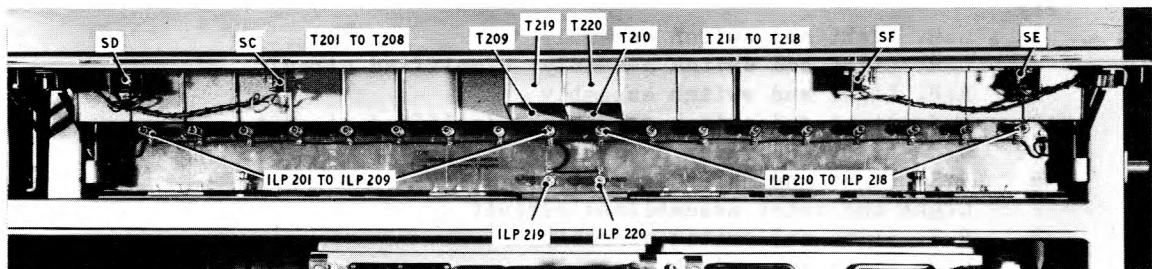
4 There are four separate assemblies arranged in line. The light and meter assemblies are situated on the extreme right and left with the two light and switch assemblies arranged centrally.

5 The fronts of all four assemblies consist of hinged flaps which are held in the closed position by permanent magnets. The flaps may be raised to give access to the indicator lamps mounted on inner panels. The inner panels are also hinged and can be withdrawn from the assemblies to expose the components mounted on the rear of the panels.

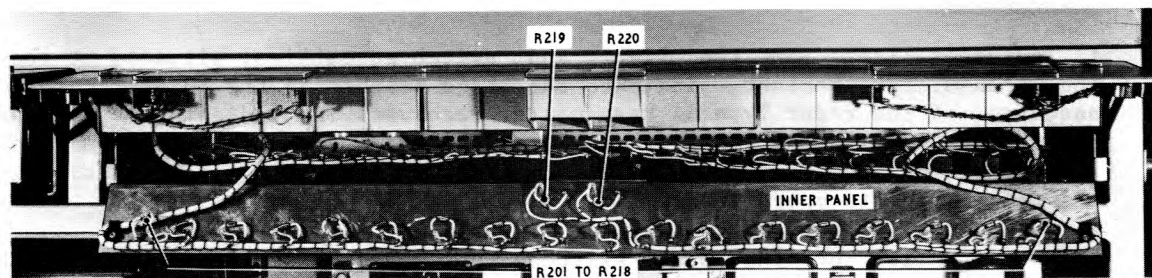
LIGHT AND SWITCH ASSEMBLIES



FRONT VIEW



INTERIOR



INNER PANEL REMOVED

Fig.1 L.H. light and switch assembly

## General

6 The indicator lamps on the light and switch assemblies are fed with 6.3V a.c. supplies, produced by individual transformers. A 240V a.c. supply is routed to the primaries of these transformers when the particular unit, supply or service associated with the indicator, is functioning normally. A 240V a.c. supply is routed via the e.h.t. interlock circuit to the operating coil of the e.h.t. contactor. Supplies are taken from the interlock circuit at various points to feed a number of the indicator circuits as shown in Chapter 4. A 1.0 ohm surge limiting resistor is connected in series with each indicator lamp.

## Circuit description

7 The functions of the indicator lamps on the light and switch assemblies will now be described in the order in which they light when the radar Type 84 transmitter/receiver is switched on.

### L.H. Light and switch assembly

8 TX SUPPLY ON. This indicates that the 3-phase supply from the auxiliary switchboard in the motor generator room corridor is available at the radar Type 84 transmitter/receiver. The 240V a.c. supply to this indicator circuit is taken from the auxiliary fuse panel in the L.H. cabinet.

9 RED PHASE, YELLOW PHASE, BLUE PHASE. When the MAINS ON switch is depressed the 3-phase supply is fed to the circuit breaker assembly. The supplies to the phase indicator lamps are taken from fuses FS40, FS41 and FS42 on this assembly.

10 REMOTE CONTROL AVAILABLE. This indicates that switch SAB on control panel M15 is in the REMOTE position; this enables the transmitter to be controlled by the remote control panel near the radar operator's console suite (Part 3, Sect.8). The 240V a.c. supply to this indicator circuit is taken from TB4/9 in control panel M15.

11 TRANSMITTER ON. This indicator lights when the TRANSMITTER ON switch is depressed, and indicates that the automatic switching sequence has been initiated. The 240 a.c. supply to this indicator circuit is taken from TB4/1 on the circuit breaker assembly.

12 GATE HEATER. This indicates that contactor A on the circuit breaker assembly has closed and routed a.c. supplies to the heater transformers of all the gate power units. The 240V a.c. supply is taken from TB1/1 on the circuit breaker assembly.

13 THYRATRON HEATERS. This indicator also lights when contactor A closes. The red phase of the 3-phase supply controlled by this contactor is fed to the thyatron heaters transformer. This same supply is routed via the e.h.t. interlock circuit to the operating coil of the e.h.t. contactor. The 240V a.c. supply to this indicator circuit is taken from TB1/4 on the circuit breaker assembly.

14 DEHUMIDIFIER. This indicates that the dehumidifier unit in the external air compressor unit is functioning. The 240V a.c. supply to this indicator circuit is taken from TB2/8 in the air compressor, and becomes available when the dehumidifier contactor RLC, in this unit, closes (Sect.2, Chap.2).

15 POWER SUPPLIES ON. This indicator lights when contactor D on the circuit breaker assembly closes and routes a.c. supplies to the h.t. transformers of the gate power units, thus making available the various d.c. supplies produced by these units. The 240V a.c. supply to this indicator circuit is taken from TB2/1 on the circuit breaker assembly.

16 POWER SUPPLIES NORMAL. This indicator lights when the gate power units are functioning and producing their specified output voltages. If any of the power units fail, or their voltage outputs are outside a set tolerance, then this indicator flashes on and off to give warning of this failure. The 240V a.c. supply to this indicator is taken from SKAA21 in the L.H. light and meter assembly. It should be noted that this indicator will flash when the transmitter is first switched on, but will remain on when all the gate power units have warmed-up and become fully operational.

17 MAGNETRON HEATER. This lights when contactor C on the circuit breaker assembly closes and routes an a.c. supply to the magnetron heater transformer. The 240V a.c. supply to this indicator circuit is taken from TB1/10 on the circuit breaker assembly.

18 MODULATOR HEATERS. This lights when contactor B on the circuit breaker assembly closes. The 240V a.c. supply to this indicator circuit is taken from TB1/9 on the circuit breaker assembly.

Note...

Modulator heater supply circuits disconnected when solid state components (Mod. CA8053/42, 8094/45 and 8123/2) fitted.

19 FANS. This lights when contactor F on the circuit breaker assembly closes and routes a 3-phase supply to the fan motors in the cooling units. It also indicates that the interlocked air conditioner unit fan motor supply contactors are closed. The 240V a.c. supply to this indicator circuit is taken from TB2/7 on the circuit breaker assembly.

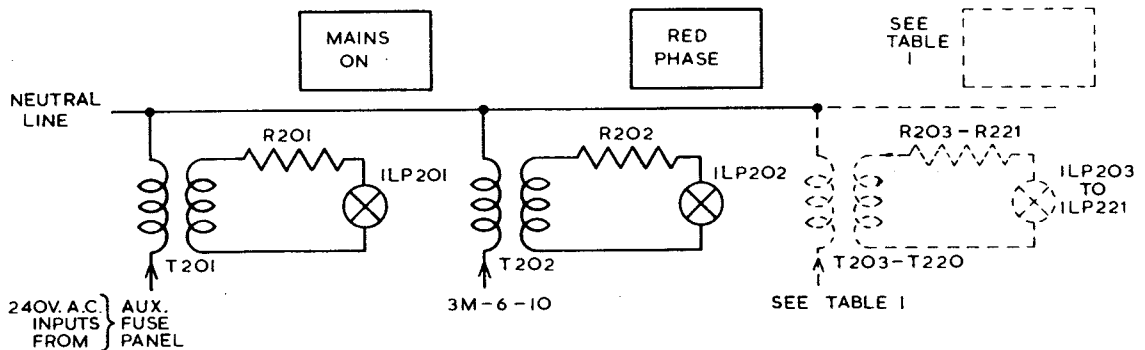


Fig.2 L.H. light and switch assembly: simplified circuit

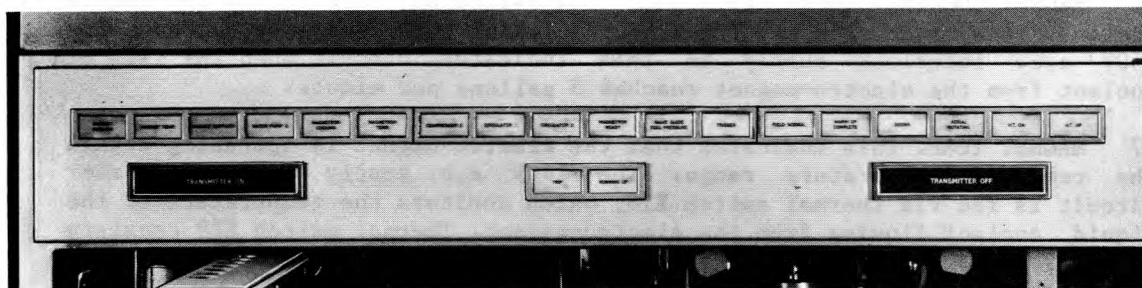


20 WAVEGUIDE AIR DRY. This lights when RL1 in the Moisture Detector control box energizes with a normal air moisture content. The 240V a.c. supply to this indicator circuit is taken from the unit at SKB1.

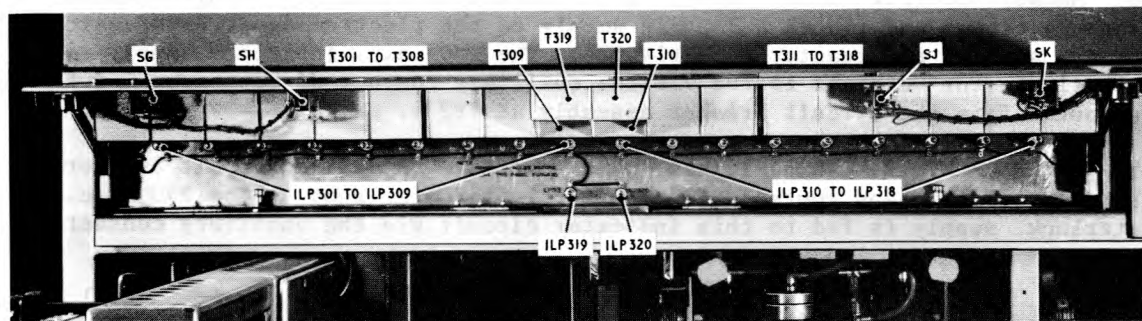
21 WATER PUMP 1. This lights when contactor G on the circuit breaker assembly closes and routes a 3-phase supply to water pump 1. The 240V a.c. supply to this indicator circuit is taken from TB3/1 on the circuit breaker assembly.

22 WATER LEVEL. The 240V a.c. interlock supply is routed to this indicator circuit via the series connected float switches SS and ST. This indicator extinguishes if the level of the liquid coolant in the cooling unit header tanks drops below a predetermined level.

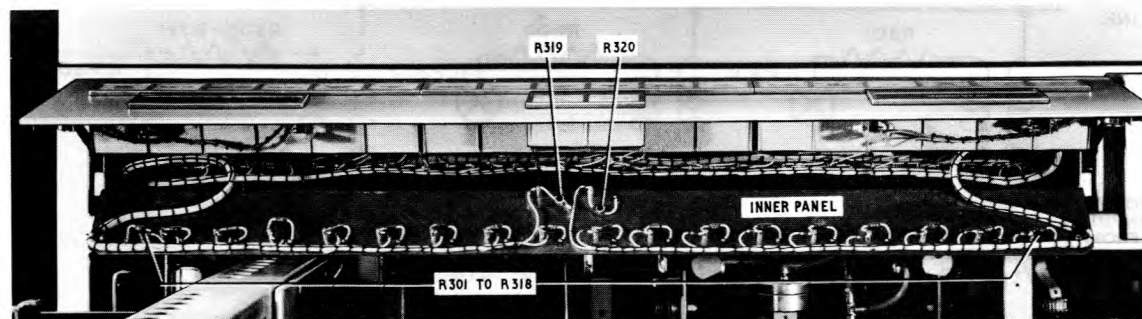
23 DIODE COOLING. This indicates that the charging diode (D7-D10) and damping resistor assemblies in the R.H. cabinet are not overheating. The 240V a.c. supply is routed to the indicator via thermal switch X30. This switch is positioned in the air ducting between the resistor assembly and the extractor fan in the R.H. cooling unit, and is set to operate (open) if the air temperature exceeds 70°C.



FRONT VIEW



INTERIOR



INNER PANEL REMOVED

24 RUNNING DOWN. This lights to indicate that the motor-driven voltage regulator which forms part of the e.h.t. control system, is in the process of running down. The a.c. applied to drive regulator motor when running-down is controlled by contactor D on the circuit breaker assembly. The 240V a.c. supply to the operating coil of this contactor is fed from TB5/5 on the circuit breaker assembly: the supply at this terminal is also fed to the RUNNING DOWN indicator lamp circuit.

25 H.T. DOWN. This indicates that the motor-driven voltage regulator has run-down to a level set by the H.T. DOWN control on control panel M15. The 240V a.c. supply to this indicator is taken from TB2/5 in control panel M15.

25A RADAR SILENCE. This gives a flashing indication when RADAR SILENCE is selected. (Mod.CA8089). NEAT ONLY. Refer to Sect.2, Chap.1, Fig.6 for location.

R.H. light and switch assembly

26 MAGNET COOLING. This lights when flow switch SQ, inserted in the liquid coolant line from the electro-magnet, closes. This flow switch routes the 240V a.c. interlock supply to this indicator circuit when the flow of coolant from the electro-magnet reaches 3 gallons per minute.

27 MAGNET TEMP. This indicates that the electro-magnet is operating within the required temperature range. The 240V a.c. supply to this indicator circuit is fed via thermal switch X28, which monitors the temperature of the liquid coolant flowing from the electro-magnet. Thermal switch X28 consists of a preset thermostat the contacts of which open if the temperature of the liquid coolant exceeds 70°C.

28 MAGNET SUPPLY. This lights when contactor E on the circuit breaker assembly closes and routes a 3-phase supply to the electro-magnet power unit (power supply and reactor assembly M34). The 240V a.c. interlock supply to this indicator circuit is fed via the auxiliary contact of contactor E and is routed from the circuit breaker assembly at TB2/4.

29 WATER PUMP 2. This lights when contactor H on the circuit breaker assembly closes and routes a 3-phase supply to water pump 2. The 240V a.c. interlock supply is fed to this indicator circuit via the auxiliary contact

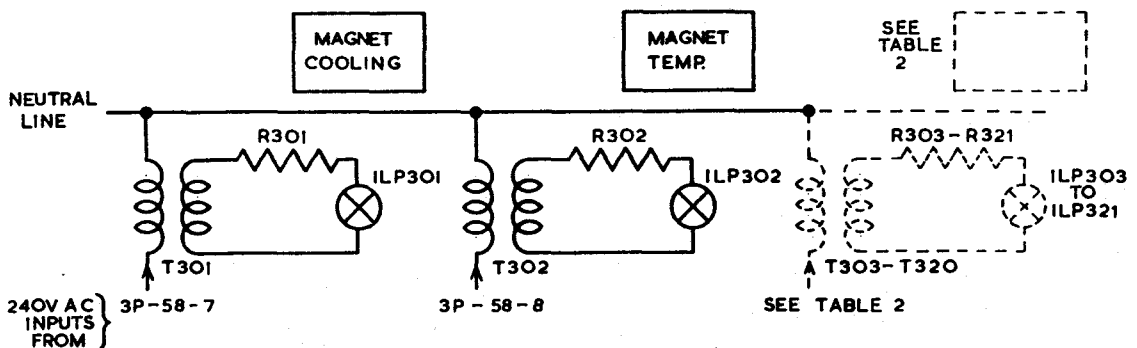


Fig.4 R.H. light and switch assembly: simplified circuit

of contactor H and out of the circuit breaker assembly via TB3/4. When the radar Type 84 transmitter/receiver is switched off after operating, it is necessary for water pump 2 to maintain the flow of liquid coolant through the magnetron, until the magnetron is cooled. This means that the WATER PUMP 2 indicator will remain on when the TRANSMITTER OFF switch is depressed and will only extinguish when the MAINS OFF switch is depressed.

30 MAGNETRON COOLING. This lights when flow switch SR, in the magnetron coolant line, closes and routes the 240V a.c. interlock supply to this indicator circuit. Flow switch SR is preset so that it closes when the flow of coolant from the magnetron reaches 3 gallons per minute.

31 MAGNETRON TEMP. This indicates that the magnetron is operating within the required temperature range. The 240V a.c. interlock supply is routed to this indicator circuit via thermal switch X29, which monitors the temperature of the liquid coolant flowing from the magnetron. Thermal switch X29 consists of a preset thermostat, the contacts of which open if the temperature of the liquid coolant exceeds 70°C.

32 COMPRESSORS. This lights when contactor RLB, in the external air compressor unit closes and routes a 3-phase supply to the L.H. compressor in this unit. The 240V a.c. supply to circuit is fed from the unit via TB2/7.

33 RADAR SILENCE. This gives a flashing indication when radar silence is selected. (Neat only) Refer to Sect.2, Chap.1, Fig.7 for locations. X

34 W/G AIRFLOW. This lights when RLA in the AIRFLOW ALARM UNIT (3R) is energized. The 240V a.c. supply for this indicator is fed from the AIRFLOW ALARM UNIT via TB1/2.

35 MAGNETRON READY. This lights when the eight-minute magnetron warm-up period has elapsed (Chap.3). The 240V a.c. interlock supply to this indicator is fed from the circuit breaker assembly via TB6/6.

36 WAVEGUIDE FULL PRESSURE. This light indicates that the waveguide launching section is fully pressurized. The 240V a.c. interlock supply is fed to this indicator via pressure switch SU which closes when the air pressure in the waveguide launching section is 15 lb per sq.in.

37 TRIGGER. This light indicates that the pulse generator M12 (at gate position 2G) is functioning and producing the correct trigger pulses. The 240V a.c. interlock supply to this indicator circuit is fed from TB1/12 in the pulse generator unit.

38 FIELD NORMAL. This light indicates that the correct d.c. supply is being fed to the electro-magnet. The 240V a.c. interlock supply is fed to this indicator circuit from TB1/5 in control panel M15 when relay RLE in the trigger pulse amplifier M25 is energized (Sect.3, Chap.2).

39 WARM-UP COMPLETED. This indicates that the ten minute switching-on sequence is complete, and the various units, supplies and services are functioning correctly. The 240V a.c. interlock supply is fed to this indicator circuit from TB4/3 in control panel M15.

40 DOORS. This indicates that the pneumatic devices in the transmitter have operated, including the automatic closing and locking of the annexe doors. The 240V a.c. interlock supply, which controls the operation of the pneumatic system (Sect.2, Chap.2), is fed to this indicator circuit from TB51/2 on the pneumatic control panel.

41 AERIAL ROTATING. This indicates that the aerial is rotating. This is a requirement sequenced before the e.h.t. interlock circuit is complete and the e.h.t. applied to the modulator circuit. The 240V a.c. interlock supply to this indicator circuit is fed from the aerial rotating interlock at TB1/6. This final interlock ensures that the aerial is rotating before radar transmissions commence to reduce any radiation hazard and is described in AP 115J-0100-1.

42 H.T. ON. This lights when the e.h.t. contactor (contactor B in the L.H. annexe) closes and routes a 3-phase supply to the e.h.t. transformer and rectifiers. The 240V a.c. supply to this indicator is taken from the operating coil of the e.h.t. contactor and is fed out of the L.H. annexe at TB55/2.

43 H.T. UP. This indicates that the motor driven voltage regulator has run-up to a level set by the H.T. UP control on control panel M15. The 240V a.c. interlock supply to this indicator circuit is fed from control panel M15 at TB2/7.

44 TRIP. This lights to give warning of an overload condition and forms part of the protection circuits described in Chap.2. The 240V a.c. supply to this indicator circuit is fed from TB2/12 in control panel M15.

45 RUNNING UP. This lights to indicate that the motor-driven voltage regulator is in the process of running-up. The a.c. supply to the regulator motor is controlled by contactor M on the circuit breaker assembly. The 240V a.c. supply to the operating coil of this contactor is fed from TB5/6 on the circuit breaker assembly: the supply at this terminal is also fed to the running-up indicator circuit.

#### LIGHT AND METER ASSEMBLIES

##### General

46 On the L.H. light and meter assembly (fig.5) are the fault indicators associated with the power units at gate position 3C(+200V), 4D(+200V), 5D(+200V) and 2H(+300V). These indicators are normally extinguished but flash on and off if these units fail or their specified output voltages are outside the tolerance of  $\pm 3.3\%$ . Also on this assembly are indicators N.F. BAD, T.W.T. FIELD, A.C. HEATERS and D.C. HEATERS. Indicators A.C. HEATERS and D.C. HEATERS flash when the heater supplies from gate power units 3D and 4B respectively, fail, or their output voltages are outside the tolerance of  $\pm 4\%$ . The N.F. BAD indicator forms part of the noise figure measurement system (Sect.7, Chap.5), and T.W.T. FIELD indicator forms part of the T.W.T. system (Sect.4, Chap.2).

47 The -250V d.c. supply from gate power unit position 5F is fed as a reference voltage to the fault indicator circuits of gate power units 3C, 4D, 5D and 2H. If this reference supply fails, or is outside the tolerance of  $\pm 3.3\%$ , then all four indicators will flash to give notice of this failure.

48 On the R.H. light and meter assembly (Fig.6) are the fault indicators for the power units at gate positions 2E(+300V), 3E(+300V), 4E(+300V), 5E(+300V), 5G(+500V), 3H(+300V), 4H(+300V) and 5H(+500V). These indicators flash on/off if the supplies from their respective power units fail, or are outside the tolerance of 3.3%.

49 The reference supply to all eight indicator circuits on the R.H. assembly is fed from the -250V power unit at gate position 4G. If this supply fails, or is outside the tolerance of ±3.3%, then all eight indicators flash to give notice of this failure.

50 When the transmitter is switched 'on', all the indicators, with the exception of the N.F. BAD indicator, will flash. The indicators extinguish when their respective units have warmed up, and are functioning normally.

### Circuit description

#### L.H. light and meter assembly

51 Relays RLD, RLE, RLF and RLG (Fig.7) in this assembly are double wound, centre-stable-contact relays. When the current through both coils of the relays is the same, the changeover contact of the relay is held in the null position and does not connect to either side contact. If the current through either coil becomes unbalanced with respect to the other, the relay is biased and its centre contact connects to one of the side contacts. The -250V d.c. supply from gate power unit 5F is fed via R102 and R101 to one coil of each relay connected in series. This produces a current flow of approximately 4mA through these coils. The +200V d.c. supply from gate power unit 3C is fed via RV101, R104 and R103 to the second coil of relay RLD. The variable resistor RV1 is adjusted so that RLD is held in the null position when power unit 3C is producing its specified 200V d.c. output. If the +200V power unit fails, or its output voltage goes outside the tolerance of ±3.3%, then RLD will become biased and contact RLD1 will close. RLD1 routes the +50V d.c. supply via indicator lamp ILP103 (3C 200V) and R111 to relay RLH. The indicator lamp is rated at 24V, 0.3 amperes and as the current flowing through the lamp is approximately 15 mA the lamp does not light, but RLH is energized. Contact RLH1 closes and feeds the +50V d.c. supply to RLJ. Contact RLJ1 closes and short-circuits relay RLH, increasing the current flow through indicator lamp ILP3, which lights. When RLH is short-circuited RLH1 opens, removing the +50V supply to RLJ. This relay will remain energized for approximately half a second, the time taken for C101, connected across RLJ, to discharge. During this half-second period indicator lamp ILP103 will be lit. When C101 is sufficiently discharged RLJ is de-energized and RLJ2 opens, removing the short-circuit across RLH: once more reducing the current flow through ILP3. This sequence will continue and indicator lamp ILP103 will flash on and off to indicate a failure at gate power unit 3C.

52 During the time that RLJ is energized, RLJ2 opens and interrupts the 240V a.c. supply to the POWER SUPPLIES NORMAL indicator, on the L.H. light and switch assembly, causing it to flash on and off.

53 The series connected resistor and capacitor across contacts RLH1 and RLJ1 are spark suppression circuits.

54 The fault indicator circuits for gate power units 4D, 5D and 2H are functionally the same as the fault indicator circuit for power unit 3C, described in para.51.

55 Indicators D.C. HEATERS (ILP102), T.W.T. FIELD (ILP105) and A.C. HEATERS (ILP106), flash on and off when a +50V d.c. supply is fed to them from their respective units during a fault condition. The double wound centre-stable relays of these indicator circuits are contained within the individual units and their function is described in the chapters dealing with these units.

56 The push switches on the L.H. light and meter assembly function as follows:- Switch SV (CHECK N.F.) when depressed routes a +50V d.c. supply to the monitor noise figure panel at gate position 3B, and forms part of the noise figure measurement system (Sect.7, Chap.5). Switch SW (PRESS FOR V.S.W.R.) is not now used (Sect.7, Chap.6). Switch SX mounted on the inner panel of the assembly, provides an easy means of setting up the flashing indicator circuits. When depressed this switch short circuits relay RLH, causing the indicator lamps to be permanently on. This makes it possible to adjust the variable resistors in series with the supplies to the double-wound relays until the exact null point of the relays is found, and the indicator lamps extinguish. This task would be difficult to perform if the indicator lamps were flashing.

#### R.H. light and meter assembly

57 The fault indicator circuits on this assembly are functionally the same as those on the L.H. assembly (para.51). The -250V d.c. reference supply to the double-wound relays on the R.H. assembly is fed from gate power unit 4G and should this supply fail, or go out of tolerance by more than 3.3%, then all eight indicators on this assembly will flash to give warning of this failure.

58 Switch SY on the inner panel of the R.H. light and meter assembly provides an easy means of setting up the indicator circuits on this assembly and functions the same as switch SX on the L.H. assembly (para.56).

#### Meters

59 M1: NOISE FIGURE (DB). This ratio meter is fed with two 0-500 uA supplies DO from unit, monitor noise Figure M1, at cabinet gate position 3B (Sect.7, Chap.5).

60 M2: MODULATOR HEATERS HOURS. This hour meter is fed with a 240V a.c. supply when the modulator heater supplies are switched on (Sect.3, Chap.3).

61 M3: KILOWATTS. This meter (F.S.D.2 mA) indicates the mean r.f. power and is fed by two thermocouples (Sect.7, Chap.6).

62 M4: KILOVOLTS MODULATOR H.T. monitors the e.h.t. voltage applied to the modulator (F.S.D. 500  $\mu$ A) (Sect.3, Chap.3).

63 M5: MODULATOR H.T. HOURS. This hour meter is fed with a 240V a.c. supply from the H.T. ON indicator circuit.

64 M6: AMPERES MODULATOR H.T. (0-5A). This meter monitors the current flowing in the e.h.t. rectifiers (F.S.D. 500  $\mu$ A) (Sect.3, Chap.3).

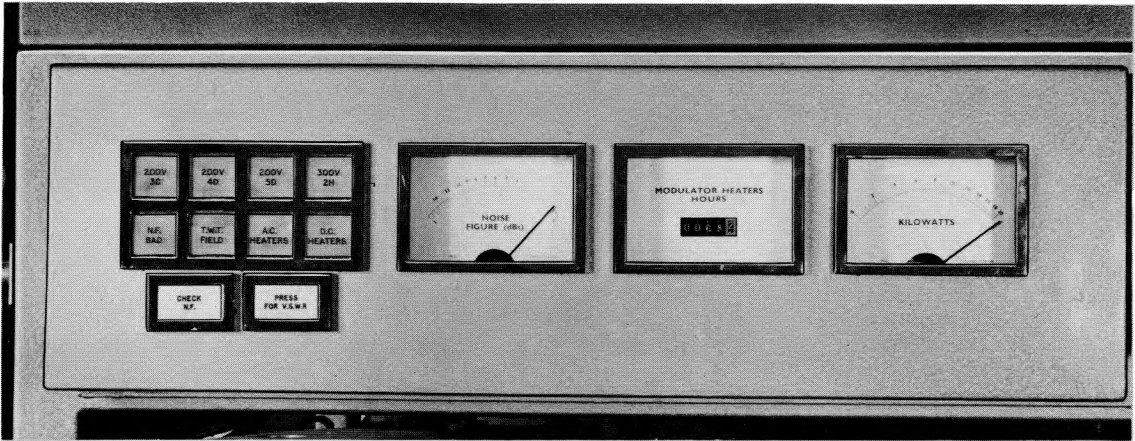
TABLE 1  
Inputs to L.H. light and switch assembly

| Indicator                | 240V A.C. supply from         | Terminal | Phase | Circuit Ref. |     |
|--------------------------|-------------------------------|----------|-------|--------------|-----|
| Mains On                 | Auxiliary fuse panel          | FS1      | Red   | 201          |     |
| Red Phase                | Circuit breaker assembly      | 6/10     | R     | 202          |     |
| Yellow Phase             |                               |          | 6/11  | Yellow       | 203 |
| Blue Phase               |                               |          | 6/12  | Blue         | 204 |
| Remote Control Available | Control panel M15             | 4/9      | R     | 205          |     |
| Transmitter On           | Circuit breaker assembly      | 4/1      | B     | 206          |     |
| Gate Heaters             |                               |          | 1/1   | R            | 207 |
| Thyratron Heaters        |                               |          | 1/4   | R            | 208 |
| Dehumidifier             | Air Compressor unit           | 2/8      | R     | 209          |     |
| Power Supplies On        | Circuit breaker assembly      | 2/1      | R     | 210          |     |
| Power Supplies Normal    | L.H. light and meter assembly | SK AA21  | R     | 211          |     |
| Magnetron Heater         | Circuit breaker assembly      | 1/10     | Y     | 212          |     |
| Modulator Heaters        |                               |          | 1/9   | B            | 213 |
| Fans                     |                               |          | 2/7   | R            | 214 |
| Waveguide Air Dry        | Moisture Monitor              | SKB1     | B     | 215          |     |
| Water Pump               | Circuit breaker assembly      | 3/1      | R     | 216          |     |
| Water Level              | R.H. cooling unit             | 53/6     | R     | 218          |     |
| Diode Cooling            | R.H. cooling unit             | 53/7     | R     | 218          |     |
| Running Down             | Circuit breaker assembly      | 5/5      | B     | 219          |     |
| H.T. Down                | Control panel M15             | 2/5      | B     | 220          |     |
| ■ Radar Silence          | Relay Unit 5P (50V)           | TB1/6    |       | 221 ■        |     |

TABLE 2  
Inputs to R.H. light and switch assembly

| Indicator               | 240V A.C. supply from                    | Terminal | Phase | Circuit Ref.   |
|-------------------------|--|----------|-------|----------------|
| Magnet Cooling          | Magnetron cooling control valve assembly | 58/7     | Red   | 301            |
| Magnet Temp.            |  | 58/8     | R     | 302            |
| Magnet Supply           | Circuit breaker assembly                 | 2/4      | R     | 303            |
| Water Pump 2            |  | 3/4      | R     | 304            |
| Magnetron Cooling       | Magnetron cooling control                | 58/2     | R     | 305            |
| Magnetron Temp.         |  | 58/5     | R     | 306            |
| Compressors             | Air compressor unit                      | 2/7      | R     | 307            |
| -                       | -  | -        | -     | 308 (not used) |
| Waveguide Air Flow      | Air flow alarm unit                      | 1/2      | B     | 309            |
| Magnetron Ready         | Circuit breaker assembly                 | 6/6      | R     | 310            |
| Waveguide Full Pressure | Pressure switch S.V.                     |          | R     | 311            |
| Trigger                 | Pulse generator M12                      | 1/12     | R     | 312            |
| Field Normal            | Control panel M15                        | 1/5      | R     | 313            |
| Warm-up complete        |  | 4/3      | R     | 314            |
| Doors                   |  | 1/10     | R     | 315            |
| Aerial Rotating         | Interlock aerial turning                 | 1/6      | R     | 316            |
| H.T. ON                 | Regulator assembly                       | 55/2     | R     | 317            |
| H.T. UP                 |  | 2/7      | R     | 318            |
| TRIP                    | Control panel M15                        | 2/12     | B     | 319            |
| Running Up              | Circuit breaker assembly                 | 5/6      | B     | 320            |
| ☒ Radar Silence         | Relay Unit 5P (50V)                      | TB1/6    |       | 321 ☒          |

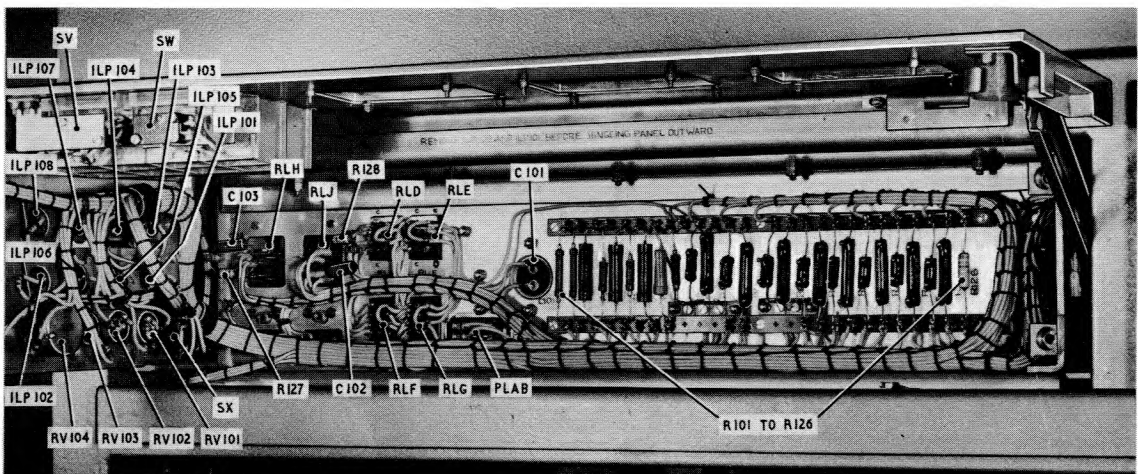




FRONT VIEW

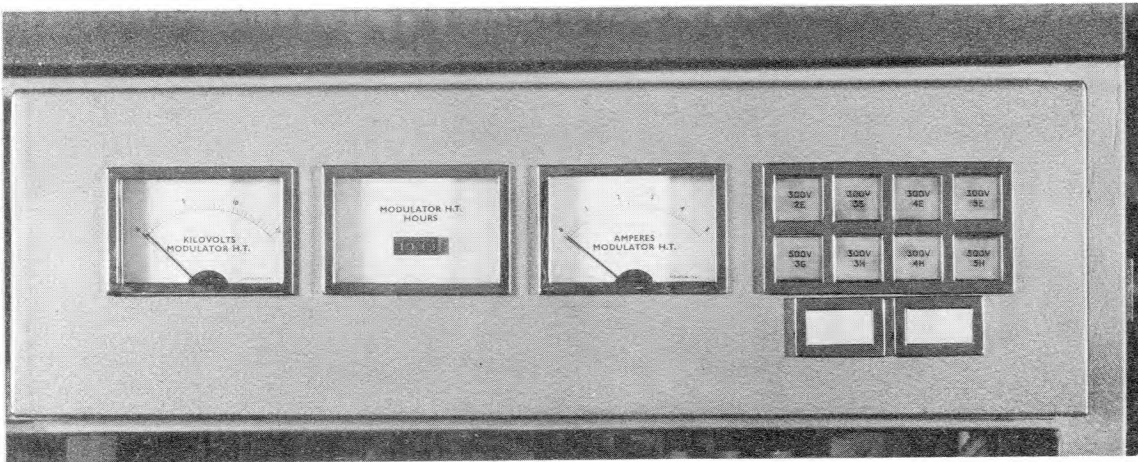


INTERIOR

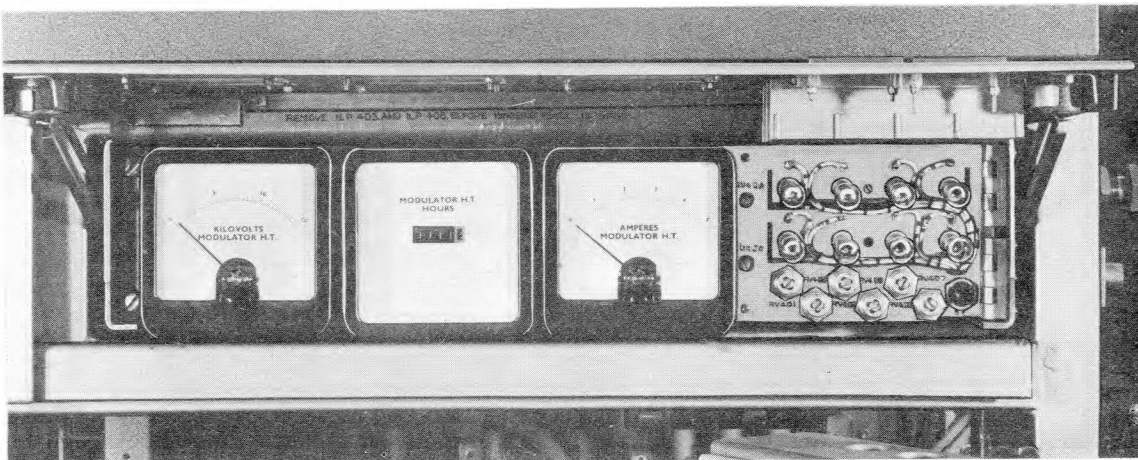


INNER PANEL REMOVED

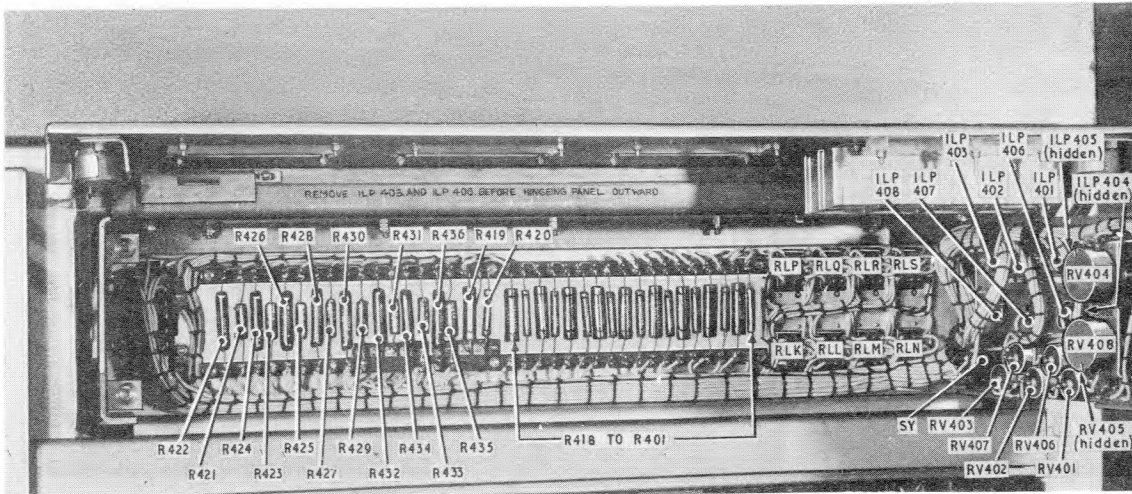
Fig. 5. L.H. light and meter assembly



FRONT VIEW



INTERIOR



INNER PANEL REMOVED

Fig. 6. R.H. light and meter assembly

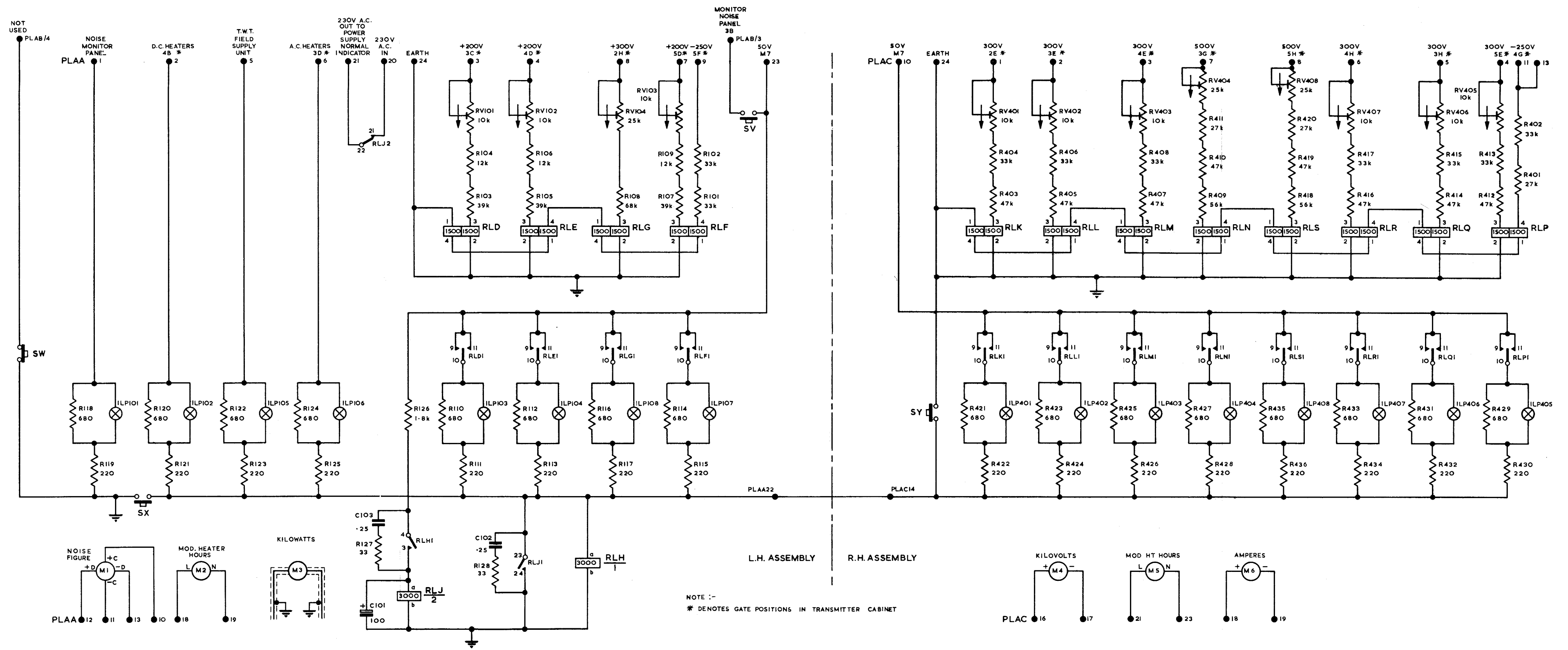


Fig. 7  
 52000-M.F.P

Light and meter assemblies: circuit

Fig. 7

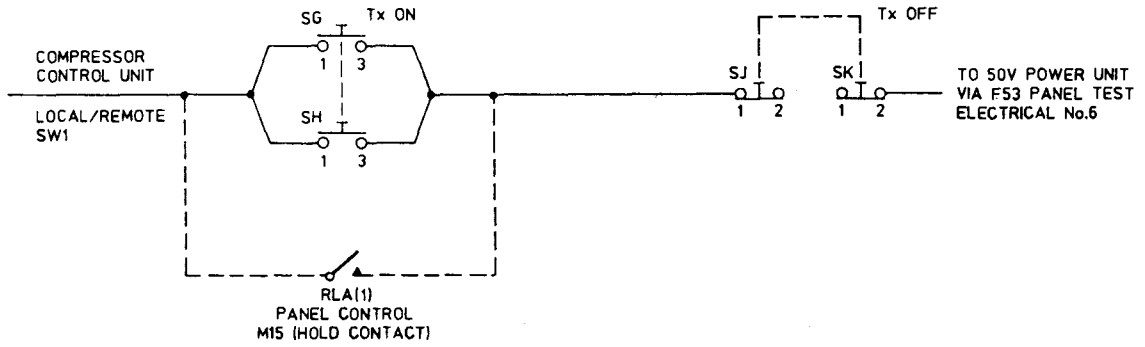


Fig.8 R.H. light and switch assembly

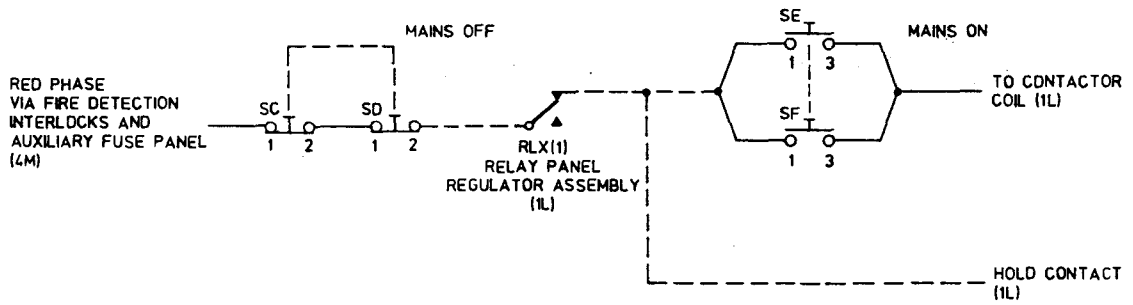


Fig.9 L.H. light and switch assembly

## Chapter 6

### AERIAL TURNING INTERLOCK

1. This unit has now been replaced by the unit described in A.P.2886H. The function of the new unit in the e.h.t. interlock circuit is described in Part 2, Sect. 6, Chap. 4.

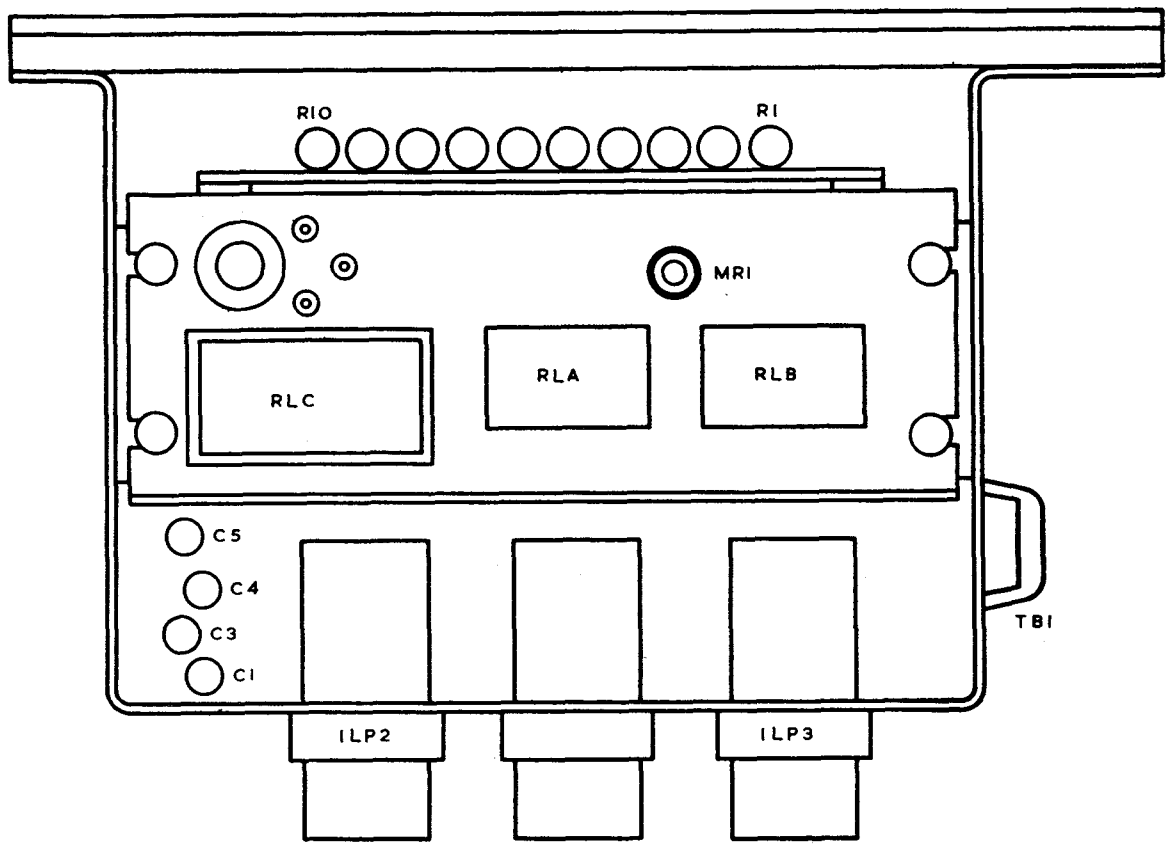


Fig. 3. Interlock aerial turning : top view

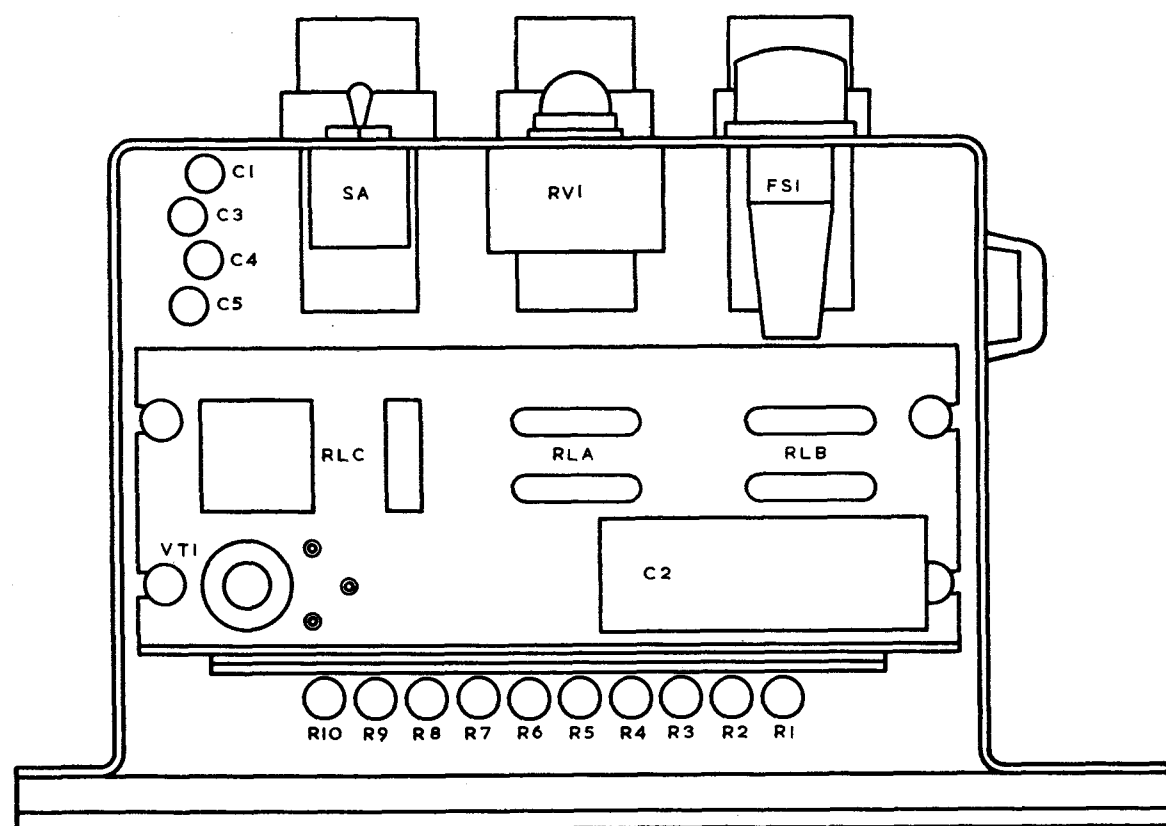


Fig. 4. Interlock aerial turning : bottom view

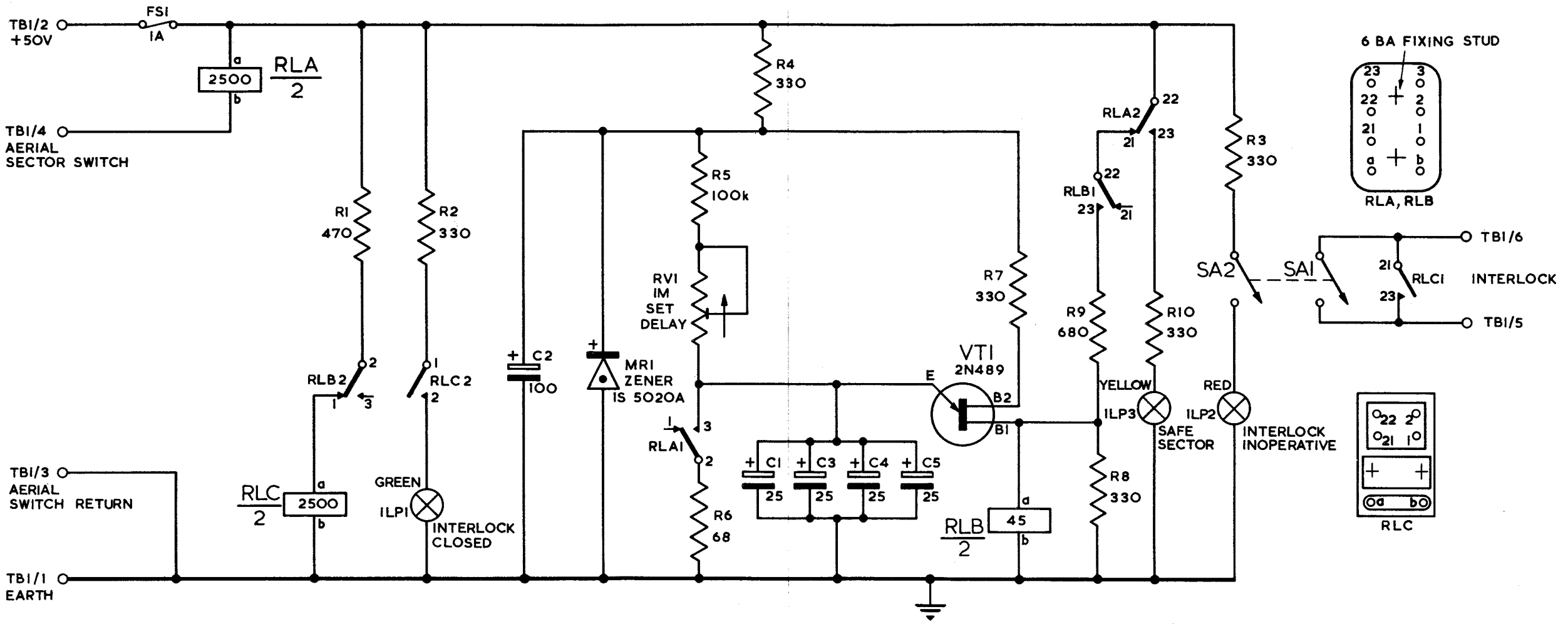


Fig. 5

Interlock aerial turning: circuit

Fig. 5

Chapter 7

MAGNETRON HEATER, CIRCUIT BREAKER ASSEMBLY

CONTENTS

Para

- 1 General
- 3 Circuit description

Fig

Page

- 1 Magnetron heater, circuit breaker assembly: component layout 1
- 2 Magnetron heater circuit breaker assembly: circuit 2

GENERAL

1 The purpose of this unit is to switch off the a.c. supply to the magnetron heater when the magnetron mean current is at the correct operating level. This is necessary to minimize the effect of frequency modulation of the magnetron. The unit (fig. 1) is fitted in the rear of the L.H. cabinet (location reference 6M) immediately behind gate S.

2 As described in Chap 2, the primary winding of the magnetron heater transformer is energized by a variable 0-120V a.c. supply. This supply is derived from the yellow phase of the mains 3-phase supply and the variable

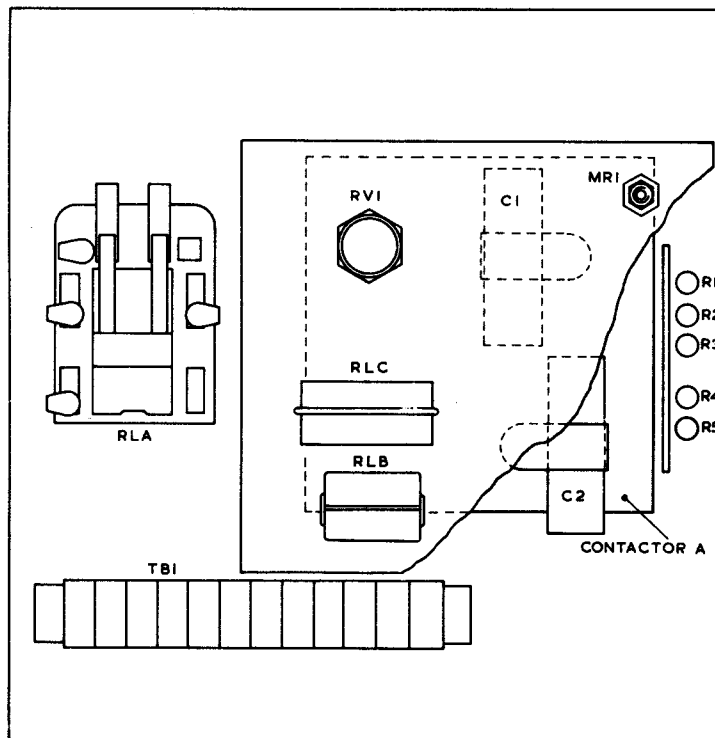


Fig.1 Magnetron heater, circuit breaker assembly: component layout



yellow phase output of the modulator h.t. voltage regulator (Sect 3, Chap 3). The 0-120V a.c. supply is routed to the magnetron heater transformer (contained in pulse transformer T6 (Chap 4) via contactor C on the circuit breaker assembly (Chap 3) and contactor A on the magnetron heater, circuit breaker assembly.

CIRCUIT DESCRIPTION (fig. 2)

3 The +50V d.c. supply, fed into the unit at TBI/10, develops a stabilized 33V potential across zener diode MR1. This potential is applied via RV1 to one coil of relay RLC, which is polarized so that contacts 10 and 11 are normally open. The other coil of RLC is energized by the modulator h.t. voltage sample fed to control panel M15 (Chap 2). RV1 is adjusted so that when the modulator h.t. reaches the level required to give a magnetron mean current of 500 mA, relay RLC changes over, and contact RLC1 energizes relay RLB. When the modulator is operating at full h.t. a 240V a.c. supply is routed from control panel M15 (Chap 2) to the H.T. UP indicator lamp on the R.H. light and switch assembly (Chap 5). This supply is also routed via RLB1 to relay RLA, which when energized disconnects the neutral line to contactor A, thus switching off the magnetron heater supply.

4 Should the modulator h.t. supply be reduced (e.g. during the modulator overload and reset sequence described in Chap 2) then relay RLC changes over to the polarized condition, and the magnetron heater supply is restored.

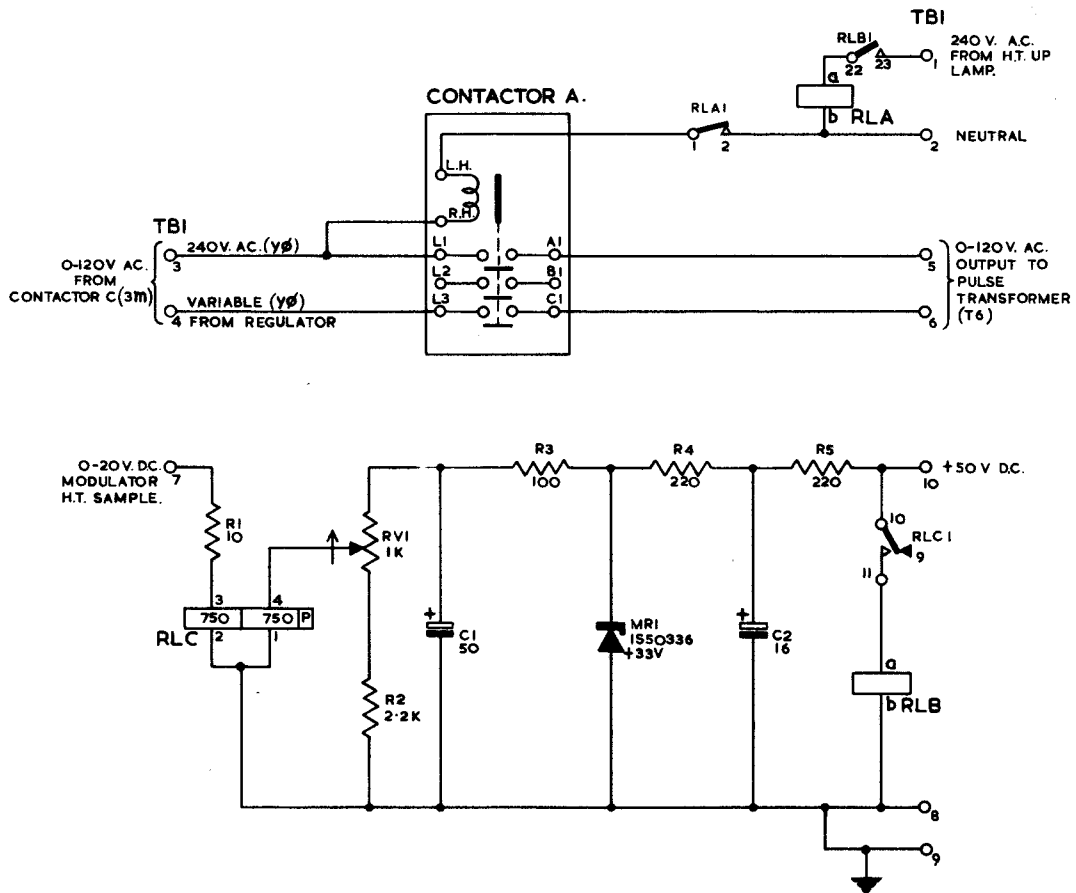


Fig.2 Magnetron heater, circuit breaker assembly: circuit

Chapter 8

RADAR SILENCE  
(Neatishead only)

CONTENTS

| Para |                  | Page |
|------|------------------|------|
| 1    | Introduction     |      |
| 3    | Relay Unit       |      |
| 4    | System Operation |      |

| Fig |   | Page |
|-----|---|------|
| 1   | Relay Unit (5P) 5840-99-652-4411: circuit | 5/6  |
| 2   | Relay Unit: external connections          | 7/8  |

Introduction

1 As a result of Mod CA 8089, Relay Unit S-53-0617-01, NSN 5840-99-652-4411 has been fitted to the Transmitter Receiver at Neatishead. This enables the transmitter to be run down to standby condition from a remote point and normal operation to be resumed, in less than one minute when required.

2 Two 'Radar Silence' warning lamps are mounted symmetrically on the left and right hand Switch and Meter Assemblies. These lamps flash to inform maintenance personnel that the transmitter has been switched to the standby condition.

Relay Unit

3 The unit provides the necessary interface with existing control circuits. It operates from the Type 84 50 V supply and contains a printed circuit oscillator for the flashing warning lamps, a voltage stabilising circuit for the PCB and three interface relays. It is mounted on the left hand wall of the RH Transmitter/Receiver Cabinet.

System Operation (Figs.1 and 2)

'Radar Silence' is initiated by the operation of a push-button in the control unit at the operations building and closes the circuit between TBl-7 and TBl-8 on the Relay Unit. The transmitter 50V supply is thus connected as follows:

- 4.1 RLA, which is returned to earth - energises.
- 4.2 RLB, no return circuit - remains de-energised.
- 4.3 RLC, no return circuit - remains de-energised.
- 4.4 Voltage regulator for Flasher - 'Radar Silence' lamps commence flashing.

Contact RLAl opens and breaks the transmitter interlock line, between 'Primary Trip Hold' and 'Pneumatics' via TBl-3 and 4, thus opening the circuit for the external main HT contactor (CONTACTOR B) and cutting off R.F. transmission. An auxiliary contact of CON B (normally closed when de-energised) closes, and completes the circuit of relay RLC on the Relay Unit. RLC energises and contact RLC1 completes the circuit to illuminate the remote 'Radar Silence' lamp, on the control unit at the operation building. After the interruption of transmitter HT, restoration of HT and thus radar transmission may not be resumed until the HT regulator has run down. Hence some twenty seconds after the interruption of HT, the regulator reaches 'EHT DOWN'. This causes RLD in the Panel (Control) to be energised, providing an earth return for Relay RLB in the Relay Unit, via TBl-5. RLB therefore, energises and performs two functions:-

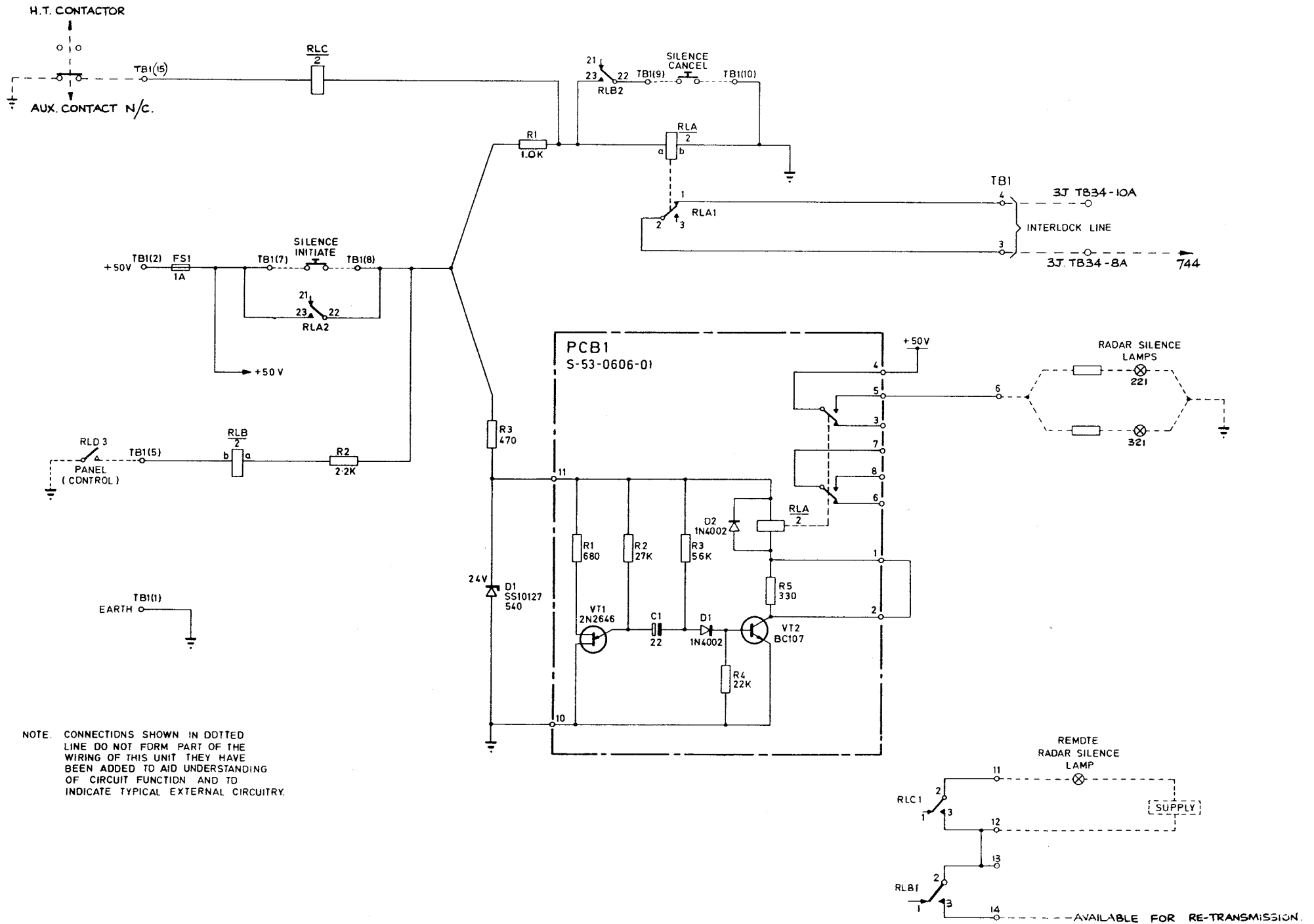
- 5.1 RLB1 closes to provide a facility for the illumination of a 'Transmission Available' indicator, if required (via TBl-13 and 14).
- 5.2 RLB2 closes to prepare the circuit for operation of the 'Silence Cancel' push button at the remote position.

Returning to the initial energising of Relay RLA, RLA2 closes and provides a hold circuit for RLA and maintains +50V to the voltage regulator circuit R3 and R1 to provide 24 volts to PCB1 while RLA is energised.

PCB1 is a unijunction relaxation oscillator circuit operating at approximately 50 Hz. The operating coil of RLA on the printed board is incorporated in the collector circuit of VT2 and alternately closes and opens contacts in the supply to the Radar Silence warning lamps mounted on the T84 Switch and Meter Assemblies.

Radar Silence is cancelled by operation of the remote 'Silence Cancel' push button, thus completing the circuit between TBl-9 and TBl-10. RLB-2, which is closed only when the HT Regulator is at Regulator down position, is included in the circuit to prevent cancellation while the T84 is running down.

- 9 Completing the circuit between TBl-9 and TBl-10 when RLB2 is closed, short circuits the operating coil of RLA, de-energising the relay and opening the hold circuit via RLA2. Relay contact RLAl in the EHT interlock circuit closes, contactor B closes, and the Transmitter runs up to HT UP condition.
- 10 The 50 V supply is removed from the voltage regulator circuit and the warning lights extinguish.
- 11 Relays RLB and RLC de-energise cancelling their appropriate remote indicators, and RLB2 prepares the 'Silence Cancel' circuit for the next sequence.



DERIVED FROM  
S-53-06172 Sh.1

Fig.1

Relay unit (SP) S-53-0617-01 (5840-99-625-4411) : circuit

Mar 88 (Amdt 28)

Fig.1

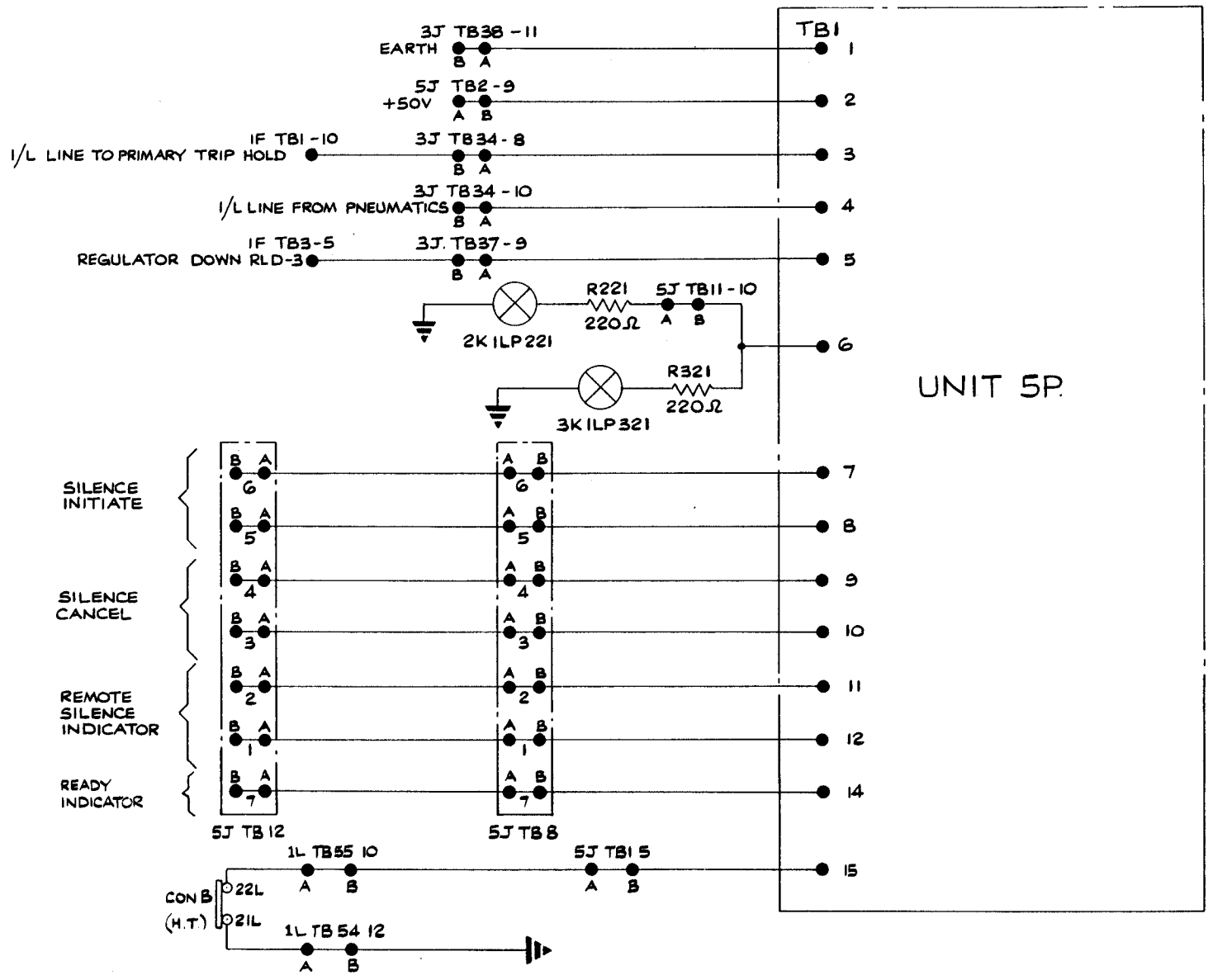


Fig 2 Relay unit : external connections

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S-53-8089 Sh.4

Mar 88 (Amdt 28)

**SECTION 7**

**MONITORING SYSTEM**

Chapter 1

MONITOR FACILITIES

CONTENTS

Para

- 1 Introduction
- 2 Waveform monitoring
- 3 Spectrum analyser
- 4 R.F. wavemeter
- 5 Noise figure measurement
- 6 Power measurement
- 7 Voltage and current monitoring

Introduction

1 The radar Type 84 transmitter/receiver has built-in facilities for monitoring all essential voltages, currents and waveforms. Meters are incorporated to give a direct and continuous indication of the transmitter power output and receiver noise figure, provision is also made for checking the frequency spectrum of the magnetron and local oscillator and for checking the frequency response of the intermediate frequency and a.f.c. circuits.

Waveform monitoring

2 A waveform monitoring unit (panel monitor M13) is provided in the R.H. transmitter cabinet. Waveforms are selected by means of push-button switches, and are displayed on a five-inch cathode ray tube. The timebase circuit of the monitor is triggered by the transmitter pre-pulse: the sweep velocity and the c.r.t. bias shift voltages are automatically switched to suit the displayed waveform. Waveform amplitudes can be measured using a built-in Y shift voltmeter. An internal oscillator generates sweep calibration markers. The waveform monitor is described in Chapter 2.

Spectrum analyser

3 The frequency spectrum of the transmitted r.f. pulse can also be observed on the monitor c.r.t. The display is produced by an analyser unit (analyser, spectrum M1) located on gate B. The analyser employs a double superheterodyne circuit with a swept-frequency second local oscillator, and the display is in the form of a series of vertical 'spikes' on the c.r.t. trace. Superimposed on the display is an additional 'spike' due to the receiver stable local oscillator. When the STALO is tuned to the correct frequency, this spike appears in the centre of the display. A crystal-controlled oscillator, in the analyser, produces a marker 'spike' to indicate the precise tuning point for the STALO. The second local oscillator in the analyser also supplies a swept-frequency signal, centred on 13.5 MHz, for checking the frequency response of the receiver i.f. and a.f.c. stages. The spectrum analyser is described in Chapter 3.



#### R.F. wavemeter

4 A concentric-line wavemeter, covering the frequency range 1000 to 2000 MHz, is provided to check the frequency of the transmitter, the receiver stable local oscillator and the standby local oscillator. The wavemeter is located at gate position 2B and is described in Chapter 4.

#### Noise figure measurement

5 The noise figure of the receiver can be measured without interrupting the normal operation of the radar system. A noise monitoring unit (monitor, noise figure M1) located at gate position 3B, automatically measures the ratio of two voltages, one proportional to the receiver background noise, the other proportional to the noise produced at the output of the receiver when a noise source, in the receiver input circuit, is triggered. The ratio of the two voltages is indicated by a meter, directly calibrated in terms of noise factor, which is mounted on the L.H. light and meter panel. Should the receiver noise figure be outside the acceptable limit, a red warning lamp lights. Details of the system are given in Chapter 5.

#### Power measurement

6 Two thermo-couples, positioned a quarter wavelength apart in the waveguide launching section immediately following the magnetron, are connected to a meter located on the L.H. light and meter assembly. This meter is calibrated 0 to 20 kW and indicates the mean transmitter power. A 30dB directional coupler is fitted in the waveguide run to pick up breakthrough power. The coupler output is fed to an external monitoring point, fitted to the top panel of the transmitter cabinet, into which a Microwave Power Meter, fitted with a suitable thermistor head can be plugged to monitor the breakthrough power. Details are given in Chapter 6.

#### Voltage and current monitoring

7 Five test panels (panels, test electrical Nos. 1, 2, 3, 4 and 6) are provided on the transmitter gates, to monitor h.t. voltages and currents throughout the transmitter. Each of these panels is fitted with a voltmeter and a milliammeter which can be switched into the required circuit by means of push-button switches. An additional test panel (panel, test electrical No. 5) has meters which indicate continuously the magnetron cathode and filament currents, the overswing current the electro-magnet field current, the inlet and outlet temperatures of the magnetron and electro-magnet cooling water, and the regulator oil running temperature. Details of these panels are given in Chapter 7.

## Chapter 2

### PANEL MONITOR M13

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#### Introduction

1. The panel monitor M13 is mounted on gate C of the transmitter-receiver and forms the basis of the transmitter waveform monitoring system. The panel contains a five-inch electrostatic cathode ray tube and its associated timebase, video and e.h.t. circuits.

2. A push-button system of waveform selection is incorporated. This enables a number of key modulator and receiver waveforms to be automatically displayed while the transmitter is in operation. The required waveform is selected by

pressing the appropriate button on a selector panel above the c.r.t., solenoid-operated rotary switches and relays within the unit then automatically select a suitable sweep velocity, shift potentials and c.r.t. bias to display the waveform at a normal brilliance and focus.

3. Push-buttons are also provided to control the spectrum analyzer panel mounted on gate B (Chap. 3). When this unit is functioning, either the transmitter r.f. pulse spectrum or the receiver i.f. channel response curves can be displayed on the monitor c.r.t.

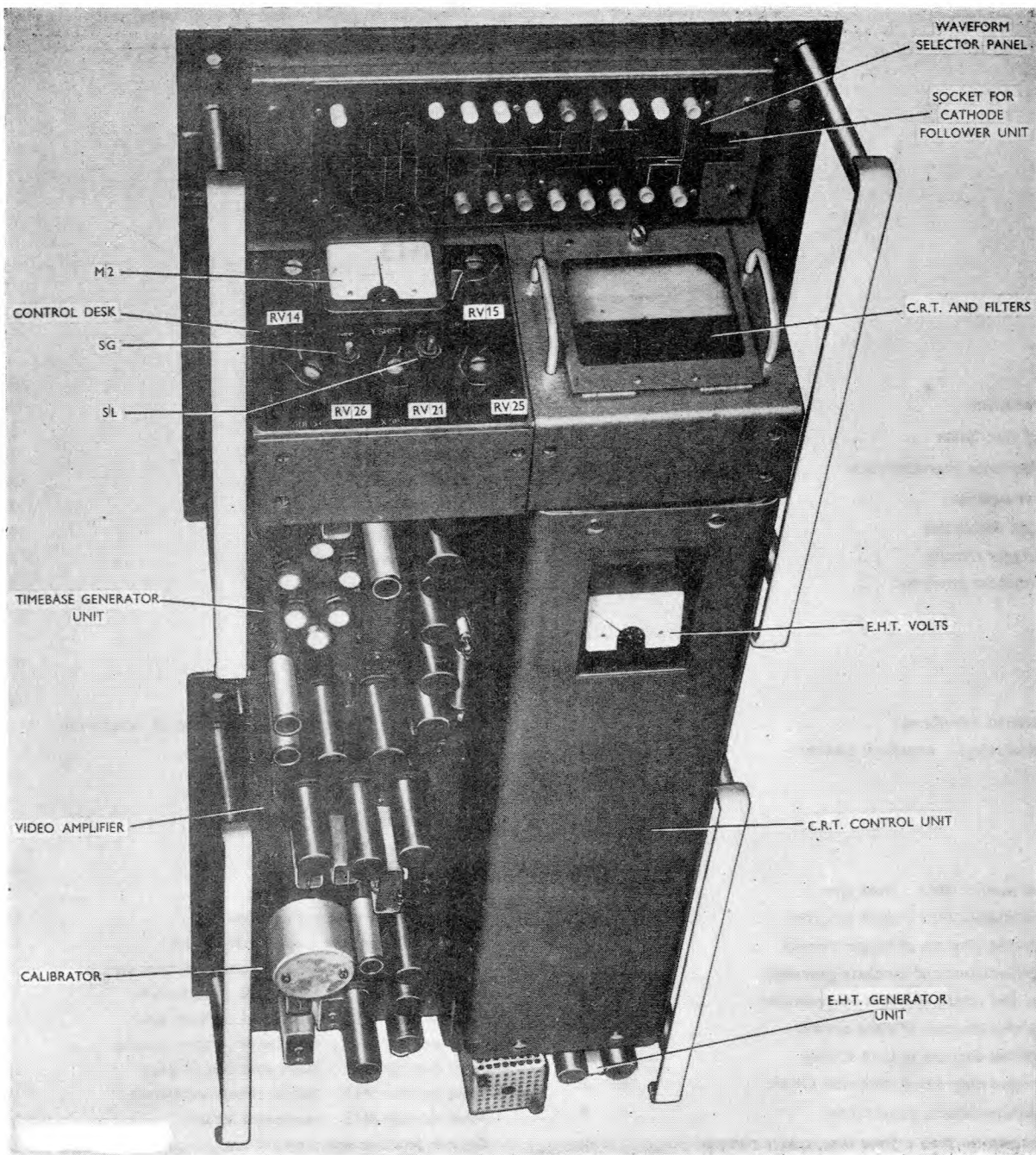


Fig. 1. Panel monitor M13: front view

4. The panel consists of a main frame (*fig. 1*) on which are mounted several sub-units and switch assemblies. The operating controls are grouped together on a control desk beside the c.r.t.

5. A separate cathode follower probe unit (*fig. 12*) is provided to enable waveforms at any of the various test sockets throughout the transmitter, to be monitored.

#### Brief description

6. A block diagram of the waveform monitor is shown in *fig. 2*. Each monitoring point in the transmitter is connected by coaxial cable to one of a series of multi-contact push-button switches

mounted on a panel above the c.r.t. When a button is pressed, one set of contacts connects the output from the monitoring point to the input of a two-stage video amplifier. The remaining switch contacts connect a +50V d.c. supply to the actuating solenoids of the rotary switches and relays controlling the timebase, shift and c.r.t. circuits.

7. The video amplifier consists of a triode pre-amplifier stage (V16a) followed by a paraphase output stage (V17, V18). High-amplitude waveforms (e.g. modulator waveforms) are applied direct to the output stage; low-amplitude waveforms (e.g. receiver and spectrum analyzer signals)

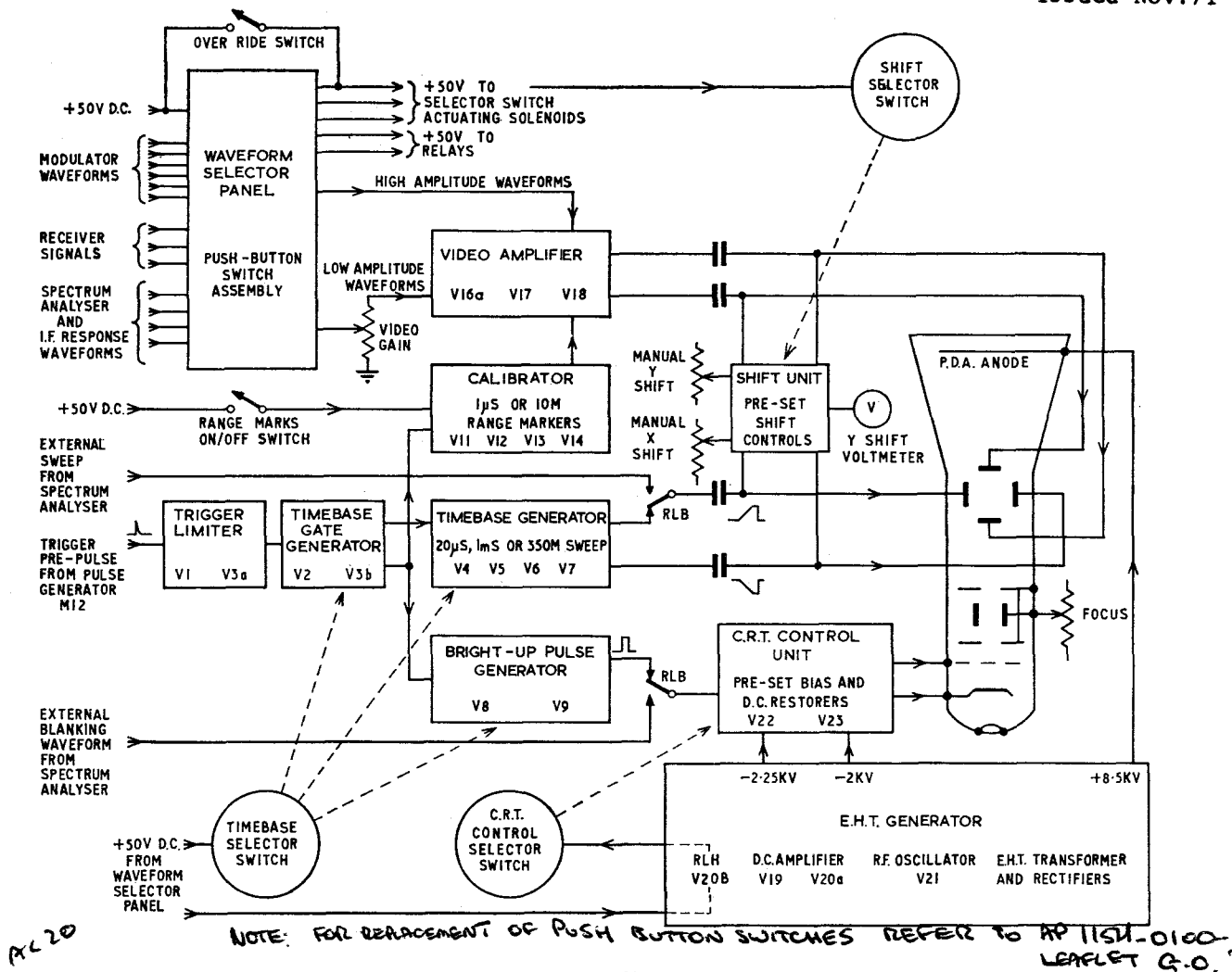


Fig. 2. Panel monitor MI3 : block diagram

are taken via a gain control on the control desk to the pre-amplifier input. The paraphase output stage is capacity-coupled to the c.r.t. Y deflection plates.

8. The c.r.t. timebase sweep waveform is generated by a boot-strap cathode follower circuit (V5, V6). A cathode-coupled flip-flop circuit (V2), which is triggered by the 5 microsecond pre-pulse from the transmitter pulse generator unit M12, produces a rectangular gating waveform to operate this circuit. A second cathode-coupled flip-flop (V8, V9) generates a bright-up pulse for the c.r.t. grid. The duration of the gating waveform, the timebase sweep velocity and the bright-up pulse duration is controlled by a four-position rotary-selector switch (timebase selector) mounted on the rear of the timebase unit. The timebase sweep ranges are as follows:—

- (1) 20 microseconds.
- (2) 1 millisecond.
- (3) 350 nautical miles.

9. The 20 microsecond sweep is automatically selected when a modulator waveform is displayed and the 350 mile sweep when receiver signals are displayed. When the external monitoring probe is used, the sweep velocity can be selected by means of separate push-buttons. When the spectrum analyzer or i.f. response displays are selected, the internal timebase and bright-up circuits are disconnected, relay RLB is energized, and external sweep and blanking waveforms, generated in the spectrum analyzer panel, are applied to the c.r.t. X deflection plates and grid respectively.

10. The cathode ray tube is a double screen electrostatic tube with post-deflection acceleration. Modulator waveforms are displayed on the lower half of the screen which has a medium persistence. The upper half of the screen has a long persistence to retain the slow-speed spectrum analyzer trace. Colour filters are fitted to the c.r.t. assembly. Waveforms are positioned on the correct part of the screen by pre-set d.c. shift potentials which are selected by a second rotary selector switch (shift selector) mounted on the rear of the main frame.

11. Manual X and Y shift controls and a centre-zero Y shift voltmeter mounted on the control desk can be brought into circuit by operating an **OVER-RIDE** switch. Waveform amplitudes can then be measured directly.

12. A third rotary selector switch (c.r.t. control selector) mounted on the c.r.t. control unit controls the c.r.t. bias and d.c. restoration circuits to maintain a pre-determined level of brilliance on all waveforms.

13. The e.h.t. supplies for the c.r.t. are obtained from a stabilized self-oscillating r.f. generator (V21) operating at 20 kc/s. An oil-filled transformer and rectifier unit (power supply set M11) mounted on the rear of the e.h.t. unit supplies the following voltages :—

- (1) +8.5kV for the c.r.t. post-deflection accelerator anode.
- (2) -2.0kV for the c.r.t. electron gun.
- (3) -2.25kV for the c.r.t. bias circuits.

| Supply volts | Current |
|--------------|---------|
| 6.3V a.c.    | 5A      |
| 6.3V a.c.    | 5A      |
| 6.3V a.c.    | 5A      |
| +500V d.c.   | 30 mA   |
| +300V d.c.   | 230 mA  |
| +300V d.c.   | 150 mA  |
| -250V d.c.   | 25 mA   |
| +50V d.c.    | 2.5 A   |

14. To protect the c.r.t. when supplies are first applied to the monitor, a delay circuit (V20b, RLH) in the e.h.t. unit holds the c.r.t. control selector switch in an 'off' position for about 10 secs. This ensures that the tube is biased beyond cut-off until the e.h.t. supplies are fully stabilized.

15. An internal calibrator unit, mounted on the lower left-hand corner of the main frame generates 1 microsecond range markers when the 20 microsecond sweep is selected, and 10 nautical mile markers when the 1 millisecond or 350 mile sweep is selected. A gated oscillator (V12) operating at 1 Mc/s or 8 kc/s feeds two pulse shaping stages (V13, V15) to produce negative-going calibration pulses. These are applied to the paraphase output stage in the video amplifier. The calibrator can be switched on or off by means of a switch (**RANGE MARKS**) on the control desk.

**Performance characteristics**

16. Table 1 (column 1) list the transmitter waveforms which can be monitored by means of the push-button selection system. Columns 2 and 3 indicate the corresponding circuit monitoring point and the input connections to the push-button switch assembly. The buttons to be pressed to obtain the required display are shown in column 4. In some instances it is necessary to press TWO buttons to obtain a display (e.g.

receiver signals: RX SIGS, linear i.f. channel: (LIN). When **EXTERNAL MONITORING** is selected the subsidiary buttons control the timebase and video circuits.

17. The following additional trigger and sweep inputs are used :—

- (1) Timebase trigger pulse—TB3/8. Positive going 3-15  $\mu$ sec. 80V pre-pulse from pulse generator M12.
- (2) External sweep waveform—TB3/2. Negative-going 180V sawtooth waveform at 3-25 c.p.s. from spectrum analyzer M1.
- (3) External blanking waveform—TB2/12. Negative-going 120V square-wave at 3-25 c.p.s. from spectrum analyzer M1.

**Power supplies**

18. Heater, h.t. and relay supplies for the waveform monitor are obtained from the power supply units mounted on the transmitter gates :—

| Tag block connection   | Power unit | Gate position |
|------------------------|------------|---------------|
| TB5/4.5                | M10        | 3C            |
| TB5/6.7 }<br>TB5/8.9 } | M10        | 4D            |
| TB5/1                  | M6         | 5H            |
| TB5/3                  | M10        | 3H            |
| TB5/2                  | M10        | 3E            |
| TB5/10                 | M10        | 5F            |
| TB5/11                 | M7         | —             |

E.H.T. supplies for the c.r.t. are generated by an internal r.f. oscillator (*para.* 34-36).

**Circuit description**

19. Detailed circuit diagrams of the monitor units are given in figs. 14, 15, 16 and 17. An interconnection diagram is given in fig. 18. Typical circuit waveforms which can be monitored at sockets SKTA-SKTM are illustrated in fig. 19.

**Trigger circuits**

20. A simplified diagram of the timebase trigger circuits is shown in fig. 3. The positive-going 5 microsecond pre-pulse generated in the transmitter pulse generator unit M12 is applied via wafer 4F on the timebase selector switch and via a series diode limiter stage V1 to the grid of a cathode follower stage V3a. This stage provides a low-impedance trigger source for the timebase gate generator V2. The diode limiter is positively biased by the potentiometer network R2, R3 to limit the amplitude of the trigger pulse at V3a cathode to about 35V, this prevents any variation in amplitude of the input pulse from affecting the operation of the gate generator.

21. The timebase gate waveform (*fig.* 19 SKTD) is generated by a conventional cathode-coupled flip-flop circuit V2a, V2b. Normally V2a is cut off and V2b is conducting heavily due to the positive

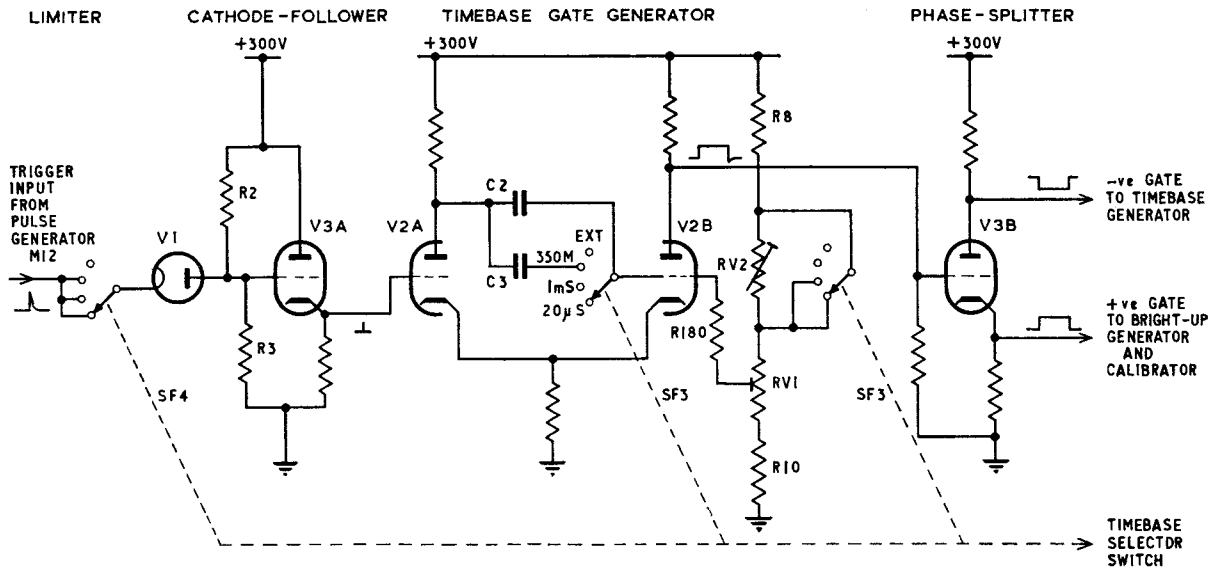


Fig. 3. Simplified diagram of trigger circuits

bias from the potentiometer network R8, RV2, RV1, R10. The trigger pulse at V3a cathode (fig. 19 SKTB) causes current to be switched from V2b to V2a, producing a positive-going rectangular wave at the anode of V2b. This waveform is applied to the grid of an unbalanced phase-splitter V3b to provide two outputs :—

- (1) A negative-going waveform at the anode for the timebase generator circuit.
- (2) A positive-going waveform at the cathode to operate the calibrator and bright-up pulse generator circuits.

22. The duration of the gate waveform is determined by the effective time constant of the coupling network between V2a anode and V2b grid, which in turn depends upon the setting of the pre-set controls RV1, RV2. The coupling capacitors and pre-set controls are selected by the timebase selector switch in the following manner :—

| Selector switch contacts | Coupling network | Pre-set controls | Gate duration |
|--------------------------|------------------|------------------|---------------|
| 1/7—20 $\mu$ s sweep     | C2, R180         | RV1              | 3 mS          |
| 2/8—1 ms sweep           | C2, R180         | RV1              | 3 mS          |
| 3/9—350M sweep           | C2+C3, R180      | RV1+RV2          | 6 mS          |
| 4/10—Ext. sweep          | —                | —                | —             |

**Timebase generator**

23. The timebase sweep waveform is generated by a boot-strap cathode follower circuit shown in simplified form in fig. 4. The grid of the cathode follower valve V6 is normally clamped at a positive potential of 95V (derived from the potentiometer network R15, R16) by a diode V4a; the cathode current of V6 being taken by the gate valve V5. The timebase capacitor C9, C10 or C11 is thus initially discharged. When the negative-going gate waveform from V3b anode drives the grid of V5 beyond cut-off, the selected capacitor commences to charge towards h.t. potential at a rate determined by the setting of the corresponding preset velocity control RV3, RV4 or RV5. The rise in

potential across the capacitor is transferred to the grid of V6 by capacitor C8; causing a corresponding rise at the cathode. A constant voltage is thus applied across the charging resistors and a linear positive-going sawtooth waveform is produced at the cathode of V6 (fig. 19 SKTF).

24. The timebase capacitors and pre-set velocity controls are selected by the timebase selector switch as follows :—

| Selector switch contacts | Timebase capacitor | Velocity control | Sweep duration |
|--------------------------|--------------------|------------------|----------------|
| 1/7                      | C11                | RV3              | 20 $\mu$ s     |
| 2/8                      | C10                | RV4              | 1 ms           |
| 3/9                      | C9                 | RV5              | 350M           |
| 4/10                     | —                  | —                | —              |

The sawtooth waveform at V6 cathode is applied via C17 to the c.r.t. X2 deflection plate. The X1 deflection plate is fed with a negative-going waveform produced by a unity-gain phase inverter stage V7.

25. When the spectrum analyzer or i.f. response waveforms are displayed (SPECT.ANAL or I.F. WOB buttons) the timebase selector switch rotates to position 4/10, disconnecting the trigger input, gate generator and timebase generator circuits. Relay RLB is energized and the sweep waveform from the spectrum analyzer panel is applied to the c.r.t. X1 plate.

**Bright-up pulse generator**

26. A positive-going pulse, having a duration sufficient to display the linear portion of the timebase waveform, is generated by a cathode-coupled flip-flop circuit V8, V9. A simplified diagram of this circuit is given in fig. 5.

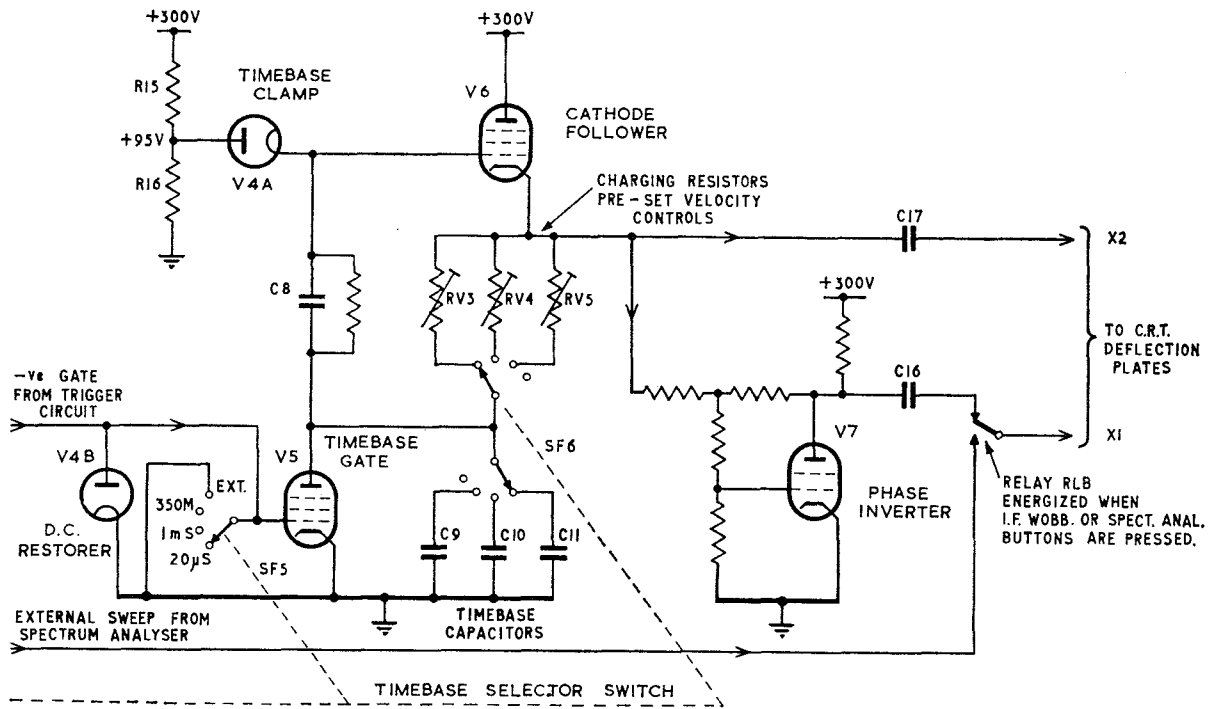


Fig. 4. Simplified circuit of timebase generator

27. The grid of V9 is returned to a positive potential via R49 and the selected pre-set duration control RV6, RV7 or RV8. The grid of V8 is held at approx. +50V (i.e. beyond cut-off) by resistors R42, R43. The gate waveform from V3b cathode is differentiated by C21, R39 and the positive leading edge of the resultant waveform causes current to be switched from V9 to V8. A positive-going pulse of about 60V amplitude is produced at V9 anode (fig. 19 SKTH) and is applied via relay RLB contacts 1, 2 and capacitor C80 (c.r.t. control unit) to the grid of the c.r.t.

28. The pre-set duration controls are selected by the timebase selector switch as follows :—

| Selector switch contacts | Coupling capacitor | Duration control | B.U. pulse duration |
|--------------------------|--------------------|------------------|---------------------|
| 1/7                      | C26                | RV6              | 20 $\mu$ s          |
| 2/8                      | C27                | RV7              | 1 ms                |
| 3/9                      | C29                | RV8              | 350 M               |
| 4/10                     | —                  | —                | —                   |

When the spectrum analyzer or i.f. response waveforms are displayed (timebase selector switch position 4/10, relay RLB energized) the external blanking waveform from the analyzer panel is applied via RLB contacts 3, 2 to the c.r.t. grid.

#### Video circuits

29. A simplified diagram of the monitor video circuits is given in fig. 6. When a low-amplitude waveform (i.e. receiver signals, i.f. response or spectrum analyzer waveform) is selected for display, the input from the transmitter monitoring point is connected via the VIDEO GAIN potentiometer RV26 to the grid of the video pre-amplifier

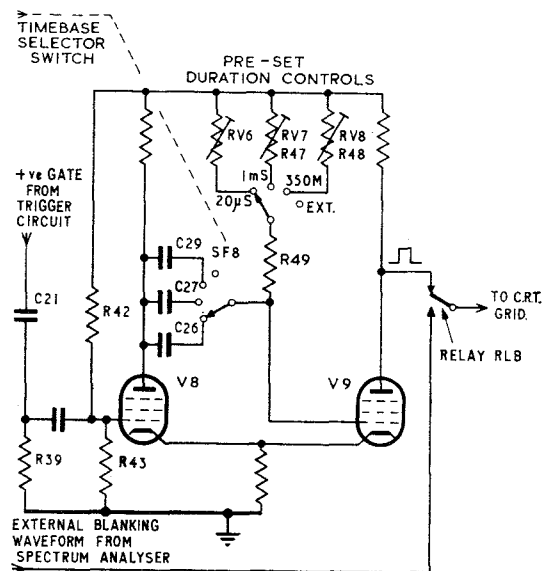


Fig. 5. Simplified circuit of bright-up generator

stage V16a. This stage is a conventional triode voltage amplifier, the cathode being unbypassed to preserve the high-frequency response. The anode of V16a is coupled by C57, R87 to the grid of V17; this valve together with V18 forms the paraphase output amplifier. Relay RLF is energized by a 50V d.c. supply from the push-button switch assembly. The amplified waveforms at the anodes of V17 and V18 are applied via C67 and C68 to the c.r.t. Y deflection plates.

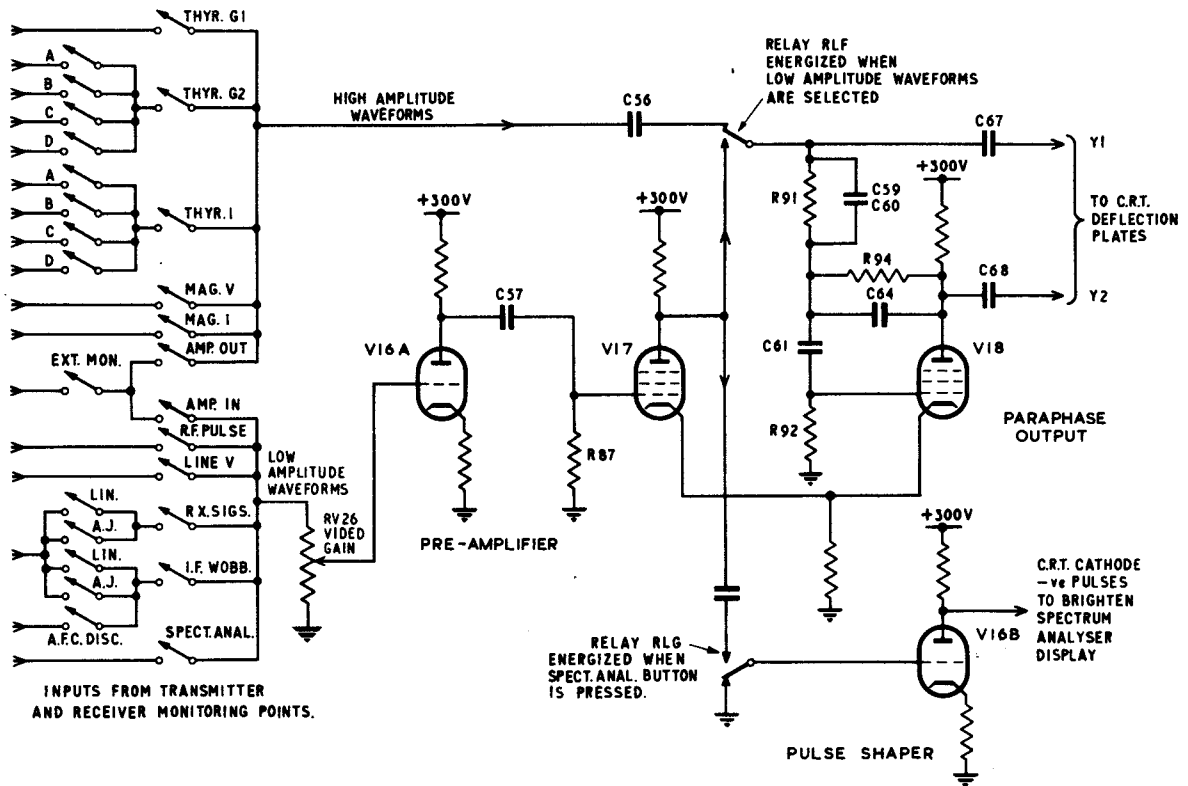


Fig.6. Simplified diagram of video circuits

30. An attenuator/feedback network, comprising R91, R94, R92 and h.f. compensating capacitors C59, C60, C64, between the grid and anode of V18, ensures that this stage operates with a gain of unity. The overall gain of the video amplifier is about 60.

31. When a high-amplitude waveform (i.e. modulator or magnetron waveform) is displayed, relay RLF is de-energized and the monitoring point is connected via C56 and C67 to the c.r.t. Y1 plate; V18 operates as a phase inverter to supply an inverted deflection waveform for the Y2 plate.

32. Range marker pulses from the calibrator circuit are applied via C67 and via V18, C68 to the c.r.t. Y plates.

33. The video amplifier unit also includes a triode pulse shaping stage V16b. This is used only when the spectrum analyzer display is selected. Relay RLG is then energized and the positive-going video pulses at V17 anode (produced as the swept oscillator in the spectrum analyzer panel passes through the transmitter pulse spectrum, see Chap.3) are applied to the grid of V16a. Negative-going amplified and sharpened pulses produced at the anode of V16b are fed to the c.r.t. cathode to brighten the displayed spectrum. The amplitude of the brightening pulse is set by RV28 to suit the c.r.t. phosphor characteristics.

#### E.H.T. supplies

34. The circuit diagram of the e.h.t. generator is given in fig.15. The r.f. generator V21 operates as

a tuned grid oscillator at 20 KHz, to supply power to the primary of the e.h.t. transformer T1. A high voltage secondary winding C, on this transformer, feeds a voltage doubler circuit V2, V3, C1 and C6, to produce a  $150\mu\text{A}$  d.c. supply at +8.5 kV for the c.r.t. post-deflection accelerator anode; the 20 KHz ripple voltage is removed by an r.c. filter network R4, C7. An additional half-wave rectifier circuit V1, C5, R2, C8 provides a  $500\mu\text{A}$  supply at -2 kV for the c.r.t. gun potential divider network. The -2.25 kV supply for the c.r.t. bias network is obtained from a separate 250V  $200\mu\text{A}$  half-wave rectifier circuit MR1, C2, R1, C3 and secondary winding D. This circuit is referred to the -2 kV output. The rectifier heaters are supplied from the low voltage secondary windings, E, F and G. The -2 kV supply can be measured on a built-in meter M1 (GUN VOLTS) which forms part of the c.r.t. gun potentiometer network (fig. 16). The pre-set control RV27 (METER CALIBRATION) shunted across the meter is adjusted during manufacture and should not be altered unless an electrostatic voltmeter is available to check the calibration.

35. The amplitude of the 20 KHz r.f. voltage across the primary of T1 is controlled by a pre-set potentiometer RV13 (E.H.T. SET). This control varies the bias on one grid of a double-triode cathode-coupled amplifier V19 between -100V and -150V; the other grid is connected to a tap on the c.r.t. gun potentiometer network R118-R125 at approx. -110V. The anode of V19a is d.c. coupled to the grid of a cathode



follower stage V20b which supplies the oscillator screen voltage. The level of the d.c. outputs is thus controlled by RV13, and the -2 kV supply is stabilized by the action of the feedback loop formed by the c.r.t. potentiometer chain, V19 and V20b. The other half of the double triode V20 is used to provide a delay for the c.r.t. control selector switch when supplies are first applied to the panel (see paras. 39 and 40).

36. To prevent interference with adjacent circuits, and to provide adequate insulation for the high voltage components, the r.f. transformer, e.h.t. rectifiers and smoothing networks are enclosed in a screening can (POWER SUPPLY M11) mounted horizontally on the rear of the e.h.t. unit. As an air gap is provided inside the can to allow for oil expansion the unit must only be operated in the horizontal position. To prevent insulation breakdown should the unit be operated in any other position (e.g. during servicing) a mercury switch (Hg) is connected internally in series with the h.t. feed to the oscillator anode; h.t. is thus only applied to the oscillator valve when the unit is horizontal.

**C.R.T. circuit**

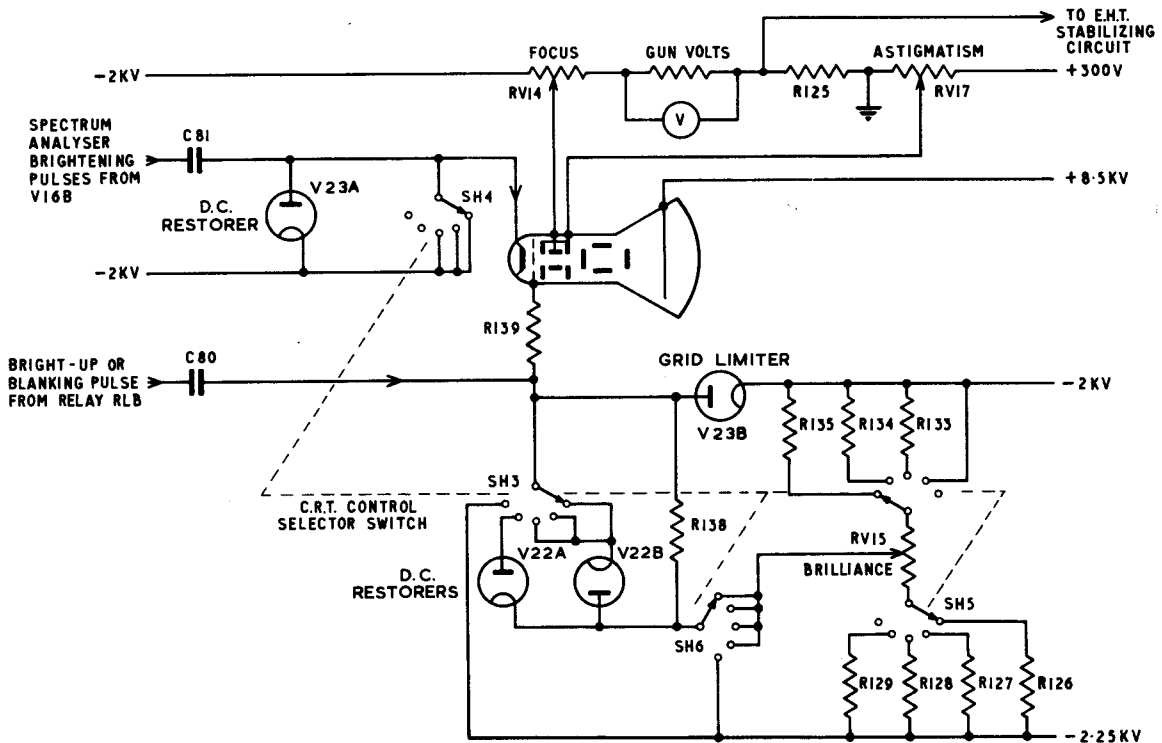
37. A simplified diagram of the c.r.t. circuit is given in fig. 7. The c.r.t. electron gun is operated at -2 kV with respect to earth; the cathode is returned to the -2 kV supply line; the potential on the grid is controlled by the BRILLIANCE potentiometer RV15 mounted on the monitor control desk. This control forms part of a potentiometer network between the -2 kV and -2.25 kV supplies. To maintain a constant level of brilliance on all wave-

forms, the fixed resistors forming this network are selected by the c.r.t. control selector switch to provide a bias to suit the sweep velocity in use. The positive-going bright-up pulse from V9 anode or the negative-going blanking waveform from the spectrum analyser panel is applied to the c.r.t. grid via C80. The negative-going brightening pulses from V16b (video amplifier) are applied via C81 to the c.r.t. cathode when the spectrum analyzer display is selected. Diodes V22a, V22b and V23a provide d.c. restoration for these waveforms. Diode V23b prevents the grid from being driven positive with respect to the cathode.

38. This bias networks and the d.c. restoration diodes are selected by the c.r.t. control selector switch in the following manner:-

| Sweep duration | C.R.T. control selector contacts | Bias network     | D.C. restoration diodes |
|----------------|----------------------------------|------------------|-------------------------|
| 20µs           | 1/7                              | R126, RV15, R135 | V22b                    |
| 1 ms           | 2/8                              | R127, RV15, R134 | V22b                    |
| 350M           | 3/9                              | R128, RV15, R133 | V22b                    |
| Ext            | 4/10                             | R129, RV15       | V22a, V23a              |

The operation of the selector switch is controlled by the waveform selector push-button switches. These apply +50V d.c. to relay RLJ via contact 7, 8, 9 or 10 (depending on the waveform selected) on wafer SH2F. Relay RLJ contacts 22/2, 23/3 complete the 50V circuit to the actuating solenoid SHDM causing the switch to rotate to the required position.



39. When the +50V and -250V supplies are first applied to the monitor panel (about 2 mins. before the +300V and +500V supplies), the 50V supply is connected to contact 11 on wafer SH2F via relay RLH (e.h.t. unit) contacts 22, 21. The selector switch thus rotates to position 5/11. In this position the c.r.t. grid is connected direct to the -2.25 kV supply line.





40. When the +300V h.t. supply is applied to the monitor panel, V20a in the e.h.t. generator unit remains cut-off until the negative potential on its grid falls towards earth as C76 discharges through R110. After a delay of from 5-10 seconds, V20a conducts energizing relay RLH. The +50V supply holding the c.r.t. control selector switch in position 5/11 is removed and instead is applied to the push-button switch assembly to allow normal operation of the selector switch to commence. The c.r.t. grid is thus biased beyond cut-off until the e.h.t. generator is fully stabilized and the e.h.t. supplies are at their correct levels.





41. The FOCUS control RV14 which forms part of the c.r.t. gun potentiometer network R118-R125, varies the potential on the c.r.t. second anode between -1.6 kV and -2 kV. The potential on the first and third anodes can be varied between earth and +50V by means of the pre-set ASTIGMATISM control RV17. To correct any 'barrel' or 'pin-cushion' distortion of the display, the potential at the end of the post-deflection accelerator spiral can be varied about earth by means of a pre-set control RV16 (GEOMETRY).

42. As the c.r.t. cathode is at a potential of -2 kV, the 6.3V heater and also the heaters of the d.c. restoration diodes are fed via an isolating transformer T1, located on a bracket at the rear of the e.h.t. unit. This bracket is hinged to the main frame to allow access to the base connections of V19 and V20.

#### Shift controls

43. Balanced horizontal and vertical shift voltages are obtained from potentiometer networks between the +300V and -250V supplies. The four-position shift selector switch SJ3-4 connects the c.r.t. X and Y deflection plates either to ganged pre-set potentiometers mounted on a panel on the rear of the main frame, or to the manual SHIFT controls on the control desk, as follows:—

| Waveform selected                    | Shift selector contacts | X plates        | Y plates   |
|--------------------------------------|-------------------------|-----------------|--|
| Thyratron<br>Magnetron<br>R.F. pulse | 1/7                     | RV18            | RV22*    |
| Line volts<br>Rx. sigs               |                         | RV19            |  RV23  * |
| I.F. Wobb.<br>Spect. Anal            |                         | 3/9             | RV20   |
| Ext. Mon.                            | 4/10                    | RV21<br>X SHIFT | RV25<br>Y SHIFT  |

\* Relay RLK is energized when THYR.I A and C  LINE V,  or MAG. v buttons are pressed,  switching in RV23. 

44. The X shift controls RV18, RV19, RV20 are adjusted to centre the trace about the vertical axis of the tube. The Y shift controls are adjusted as follows:—

- (1) RV22 to position trace 3.5 cm below horizontal axis.
- (2) RV23 to position trace 2 or 3 mm below horizontal axis.
- (3) RV24 to position trace 2 or 3 mm above horizontal axis.

The Y SHIFT VOLTMETER (M2) a centre-zero milliammeter connected with series resistors R165, R166 across the sliders of the ganged Y SHIFT potentiometer RV25, is scaled to read 50-0-50V. The meter gives a direct indication of the Y shift voltage and thus enables waveform amplitudes to be read directly.

#### Calibrator unit

45. The circuit diagram of the calibrator unit is given in fig. 14. The 1-microsecond or 10-microsecond range marker pulses are displayed when the RANGE MARKS ON/OFF switch on the control desk is operated. This switch completes the +50V circuit to relay RLD on the calibrator chassis, thereby applying +300V h.t. to valves V11-V15. (When the spectrum analyzer or i.f. response waveforms are selected, the timebase selector switch wafer SF7F breaks the +50V circuit to relay RLD thus automatically switching off the calibrator).

46. The timing of the marker pulses is controlled by a Hartley oscillator circuit V12b. This stage produces a burst of oscillations at either 1 Mc/s (20 microsecond sweep) or 8.1 kc/s (1 millisecond and 350 microsecond sweep). The oscillator tuned circuit and also the coupling networks between the succeeding pulse-shaping stages V13, V15, are selected by relays RLC and RLE. These relays are energized when the timebase selector switch is in the 20 microsecond position.

47. A simplified diagram of the calibrator circuit is shown in fig. 8. For the sake of clarity the relay switching has been omitted. The positive-going rectangular gate waveform from V3b cathode is fed via C33 to the grid of V11, a triode-connected CV4014 amplifier stage. The negative-going waveform produced at the anode of this valve (fig. 19 SKTJ) is applied via C34 to the grid of V12a. This stage, which is connected as a clamp valve across the oscillator tuned circuit, is normally conducting,

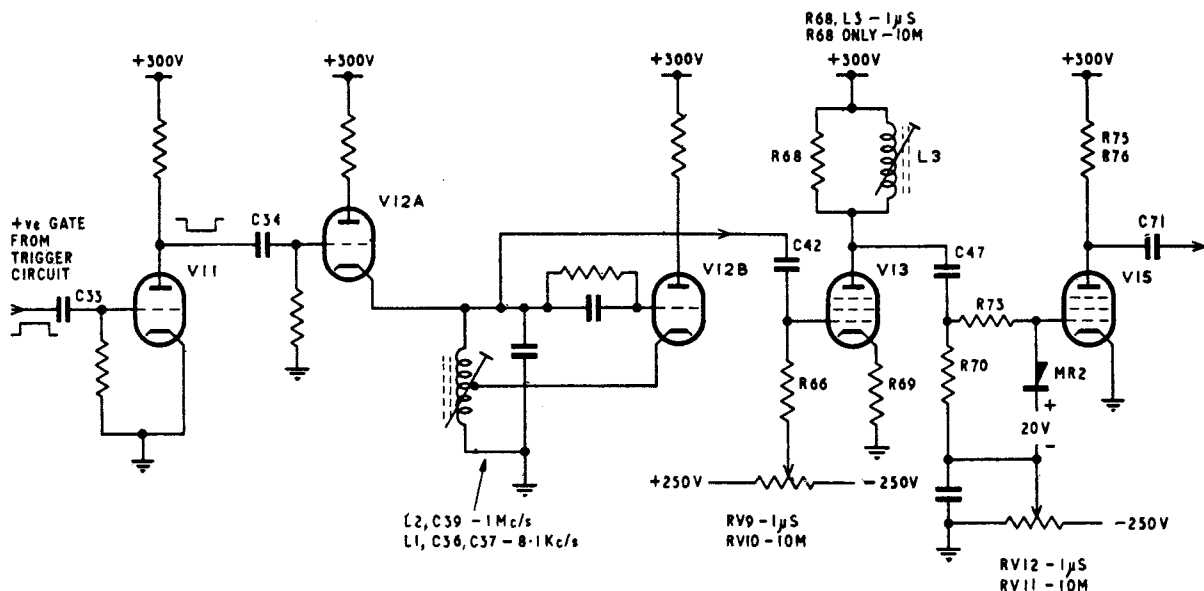


Fig. 8. Simplified diagram of calibrator circuit

thus damping the tuned circuit sufficiently to prevent oscillation. When V12a is driven beyond cut-off by the gate waveform on its grid, the tuned circuit commences to ring. Oscillations are then maintained by the feedback from V12b cathode.

48. The output from the oscillator (*fig. 19 SKTK*) is taken from the grid circuit and applied to the grid of a pulse-shaping stage V13. When the oscillator is tuned to 1 Mc/s, the anode circuit of V13 consists of a choke L3 damped by resistor R68. The negative half-cycles of the grid waveform drive V13 grid beyond cut-off, causing L3 to ring and produce a series of sharp positive-going pulses at 1 microsecond intervals (*fig. 19 SKTL*). When the oscillator is tuned to 8.1 kc/s, V13 operates as a positive squarer, the anode circuit consisting of R68 only. The positive peaks of the grid waveform drive V13 into conduction producing flat-topped negative pulses at 10 mile intervals at the anode (*fig. 19 SKTL*). Bias for V13 is obtained from R69 in the cathode and from RV9 or RV10 in the grid circuit.

49. The output from V13 anode is fed via C47, R73 to the grid of a final pulse shaping stage V15. This valve is biased beyond cut-off by the negative potential from RV12 or RV11, and is driven into conduction by the positive peaks of the 1 microsecond waveform, or by the positive peaks of the differentiated 10 mile pulses (differentiated by C47, R70) at V13 anode. A germanium diode MR2, positively biased by the voltage drop across R72, is connected between V15 grid and earth to provide a constant-amplitude input to V15.

50. The output from V15 anode, ◀of▶ negative-going pulses at 1 microsecond or 10 mile intervals (*fig. 19 SKTM*), is fed via C71 or C52 to the video amplifier unit described in para. 29. To compensate

for the increased amplitude of the 10 mile pulses compared with the 1 microsecond pulses, an attenuating resistor R79 is included in series with the 10 mile output. To eliminate the slight high-frequency shunting effect of C71/C52, R76/R75 and the h.t. de-coupling capacitor C51, on the output from the video amplifier, relay contacts RLD2 break the h.t. circuit to V15 anode when the calibrator is switched off.

51. The pre-set controls RV9, RV10, are adjusted to produce an even marker height for the duration of the sweep; RV11 and RV12 are adjusted to produce a marker height on the display of about 1 cm.

#### 50V control circuits

52. The circuit diagram of the push-button switch assembly and 50V control circuits is given in *fig. 17*. The +50V d.c. supply enters the panel at TB5/11 and is distributed to the three rotary selector switches and circuit relays by contacts on the push-button switches SA1-12, SB1-4, SC1-3, SD1-3 and SE1-2. An additional +50V d.c. supply, which is used to control the i.f. wobblator on/off and i.f. channel muting relays, enters the panel at TB1/3. The supply is obtained from the transmitter 50V power unit and is routed via the WOBB. ON/OFF switch on the trigger indicator panel at the signal processing control position. This switch must be in the ON position in order to obtain an i.f. response display on the monitor c.r.t.

53. The arrangement of the push-buttons on the waveform selector panel is shown in *fig. 9*. The main control buttons SA1-12 are mounted above the subsidiary buttons SB, SC, SD and SE. The diagram also shows the relays energized when each button is pressed. The function of each relay is given in Tables 2 and 3.

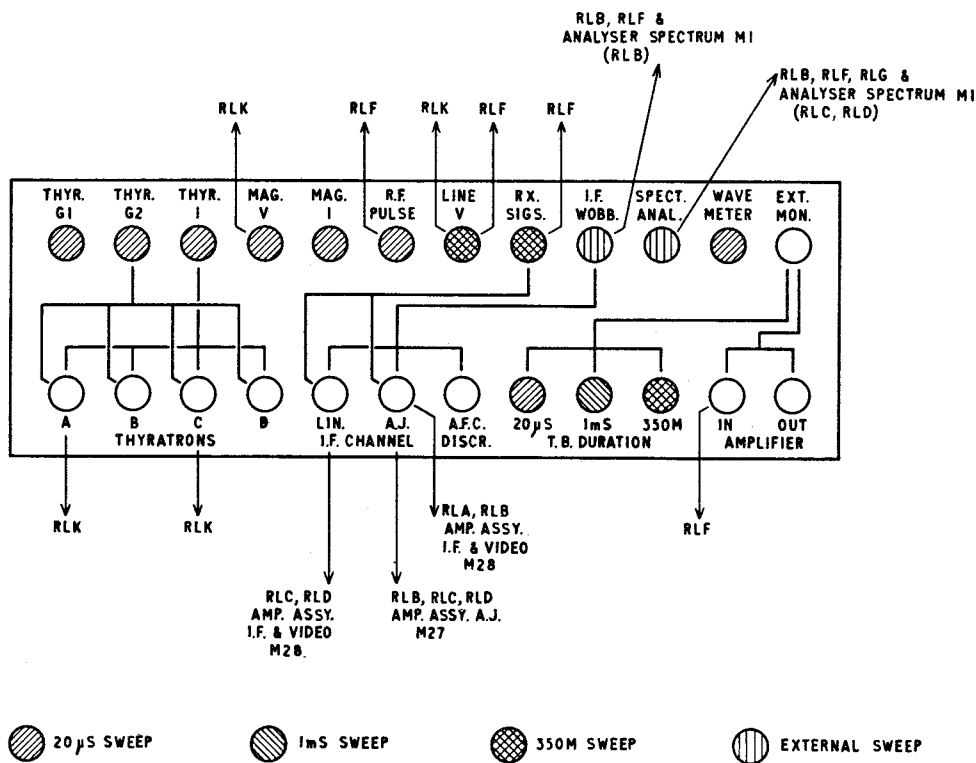


Fig. 9: Waveform selector panel layout

54. The rotary selector switch solenoids are fed from the +50V supply via two thermal overload cut-outs (CUT-OUT NO. 1 and CUT-OUT NO. 2) mounted on the rear of the c.r.t. assembly. These protect the solenoids in the event of a switch mechanism jamming. The supply to each solenoid is switched by a relay (RLA, RLJ, RLL) which is energized via the corresponding position locating wafer (SF2, SH2, SJ2) and the push-button switches. Table 4 shows the position selected by each selector switch when a button is pressed.

*Cathode follower unit*

55. The cathode follower probe unit (fig. 12) contains a switched variable attenuator and a cathode follower stage. The unit is fitted with an input probe designed to mate with the various monitoring sockets provided on the transmitter and receiver panels, and enables waveforms of up to 500V amplitude to be displayed on the monitor c.r.t. when the EXT. MON. button, on the monitor selector panel, is pressed.

56. A circuit diagram of the unit is given in fig. 21. The heater and h.t. supplies for the cathode follower valve V1 are obtained from SKTT on the monitor panel; the unit being provided with a 4-pole plug PLT and 11 ft of connecting cable.

57. A four-position switch SA connects the probe either direct to the grid of V1 or via one of three fixed attenuating networks as follows:—

| Switch position | Network       |
|-----------------|---------------|
| ÷ 1.1           | —             |
| ÷ 5             | R1, R2 and R8 |
| ÷ 10            | R3, R4 and R8 |
| ÷ 20            | R5, R6 and R8 |

To preserve the shape of pulse waveforms, high frequency compensating capacitors C2, C3, C4 and C5, C6, C7 are connected across these networks. The pre-set trimmers C2, C3, C4 are adjusted during manufacture; should these require readjustment at any time, care should be taken to allow for the slight change in capacitance which occurs when the cover is placed in position.

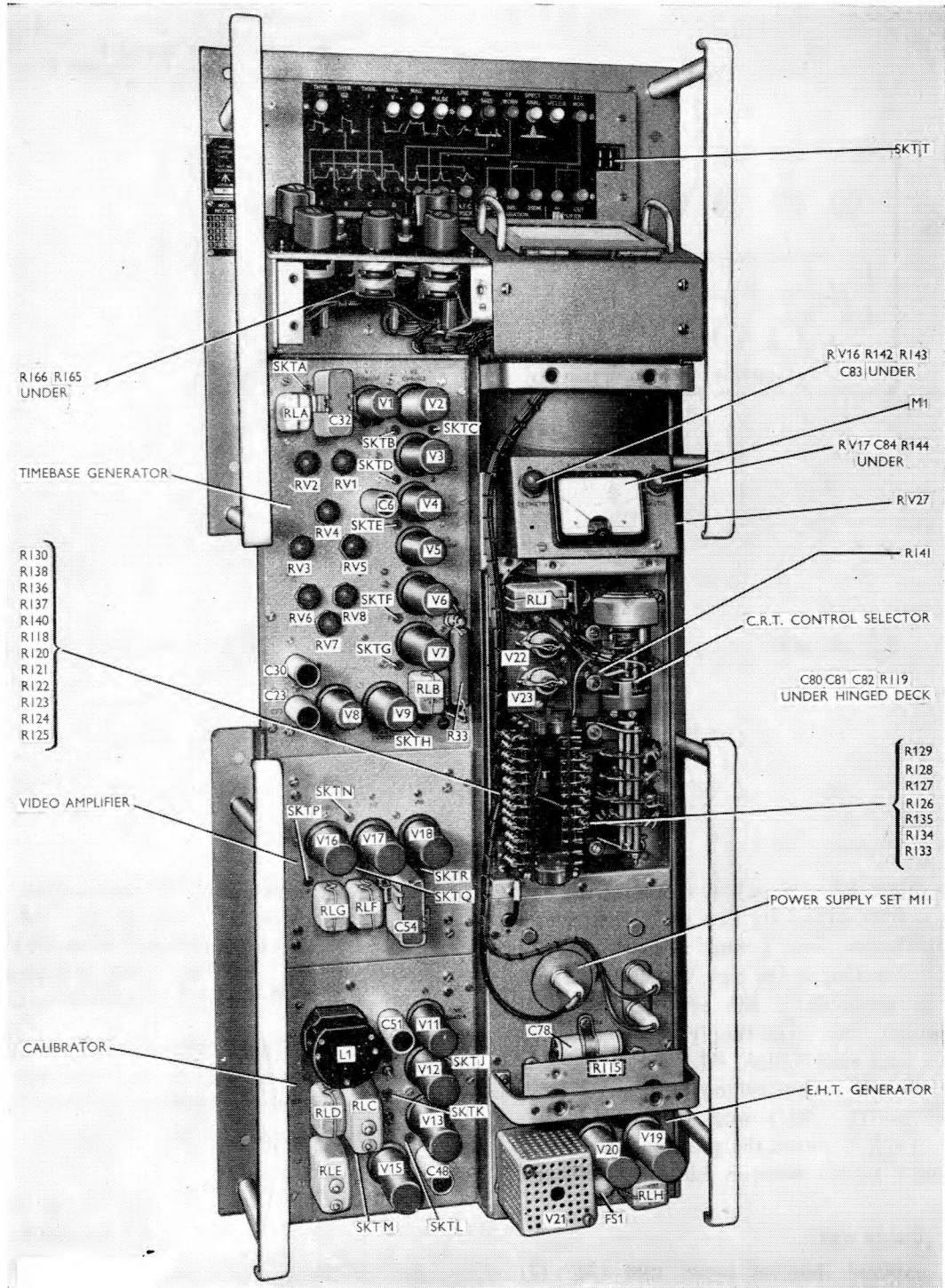


Fig. 10. Panel monitor M13 : front view, covers removed

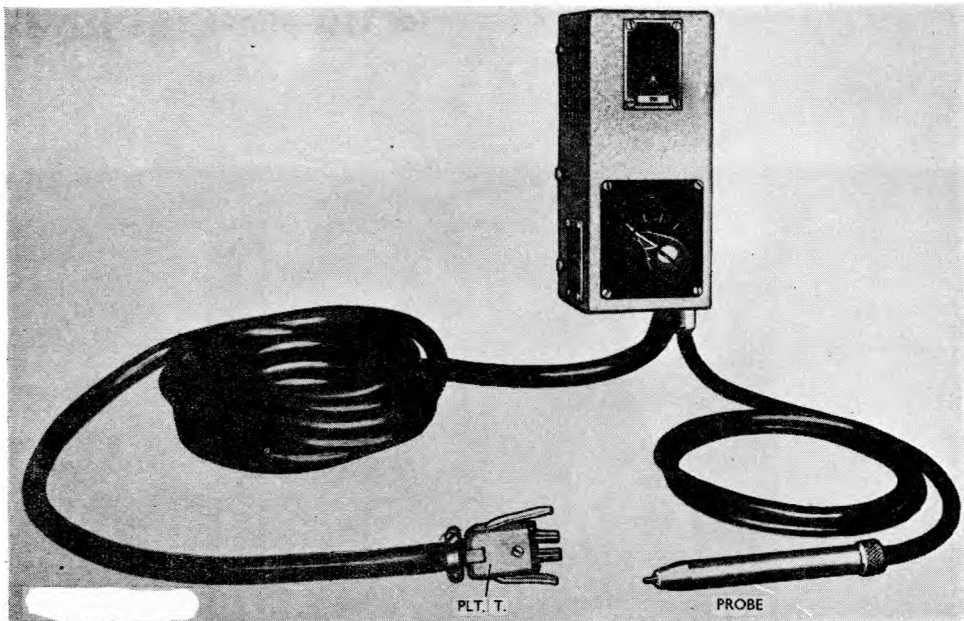


Fig. 12. Cathode follower unit : front view

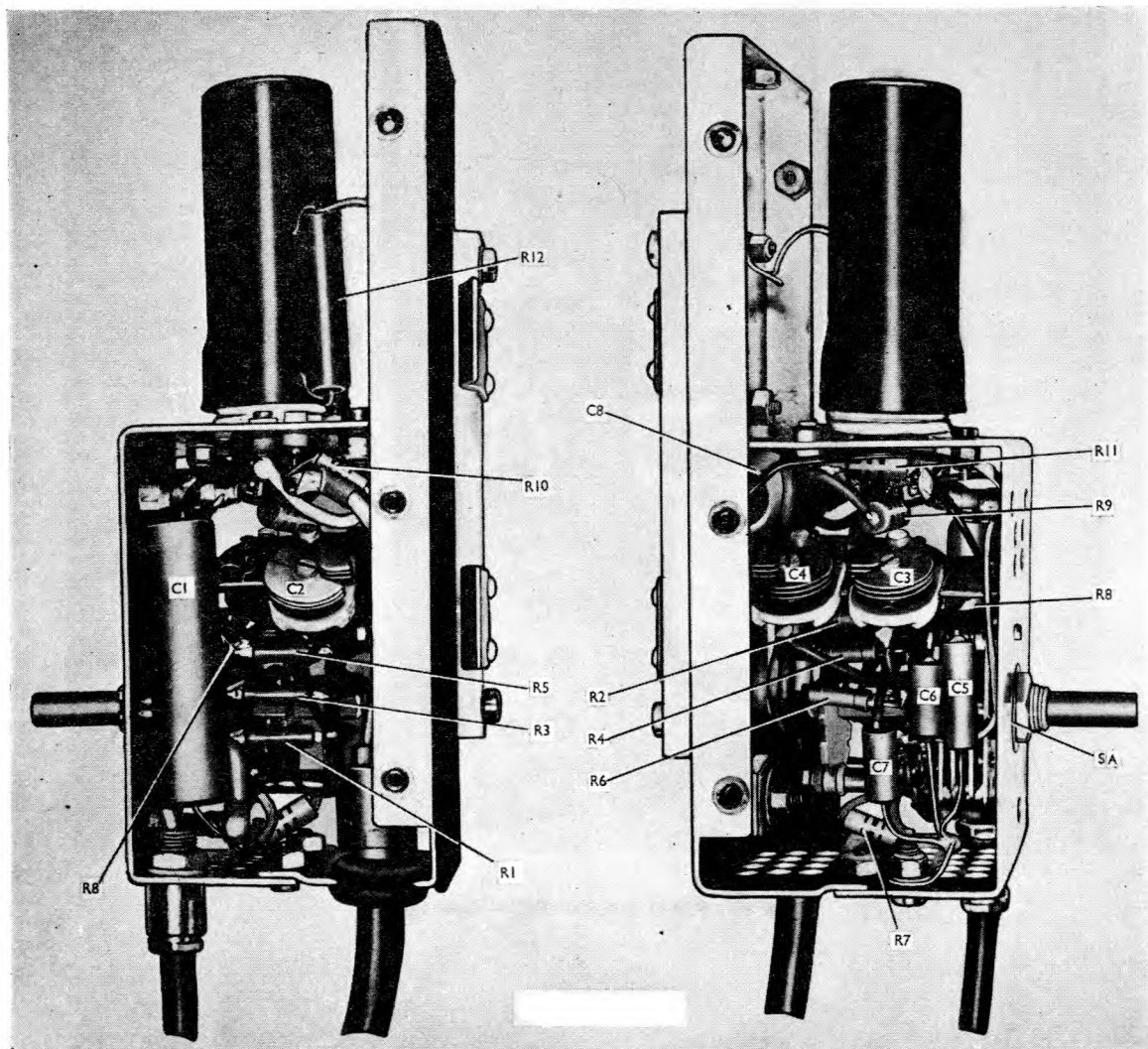


Fig. 13. Cathode follower unit : component layout

**TABLE 1**  
**Monitored waveforms**

| Waveform   | Monitoring point   | Monitor input                                   | Push-buttons |   |
|--|--|---|--------------|---|
|  |  |   | Main         | Subsidiary                                    |
| Thyratron G1 priming pulse                       | Electronic switch M6 Thyratron G1 grids<br>TB1/12, 11  | TB2/8, 7  | THYR. G1     |   |
| Thyratron G2 firing pulses                       | Electronic switch M6 Thyratron G2 grids<br>TB4/5, 6<br>TB4/7, 8<br>TB4/9, 10<br>TB4/11, 12         | TB4/12, 11<br>TB4/10, 9<br>TB4/8, 7<br>TB4/6, 5 | THYR. G2     | A<br>B<br>C<br>D                              |
| Thyratron cathode current pulses                 | Electronic switch M6<br>T6 sec. TB2/8, 7<br>T8 sec. TB2/6·5<br>T9 sec. TB2/4·3<br>T11 sec. TB2/2·1 | TB4/4·3<br>TB4/2·1<br>TB3/12, 11<br>TB3/10, 9   | THYR. I      | A<br>B<br>C<br>D                              |
| Magnetron pulse (voltage)                        | R48 in pot. chain across pulse trans. primary  | TB2/6, 5  | MAG. V       |   |
| Magnetron pulse (current)                        | Pulse transformer T6/11, 12  | TB2/4, 3  | MAG. I       |   |
| Transmitted r.f. pulse                           | Panel A.F.C. M48 PLF part of control (stalo) M4  | TB1/12, 11                                      | R.F. PULSE   |   |
| P.F.N. charging current                          | R16 in pot. chain across charging diode circuit  | TB2/2, 1  | LINE V       |   |
| Receiver video signals (linear or A.J. channels) | Amplifier assembly I.F. and Video M28<br>TB2/1,2   | TB3/6, 5  | RX SIGS      | LIN. A.J.                                     |
| Receiver i.f. response curves                    | Amplifier assembly I.F. and Video M28<br>TB2/1, 2  | TB3/6, 5  | I.F.WOBB.    | LIN. A.J.                                     |
| A.F.C. discriminator response curve              | Panel A.F.C. M48 PLG part of control (stalo) M4  | TB3/4, 3  | I.F.WOBB.    | A.F.C. DISCR.                                 |
| Transmitted r.f. pulse spectrum                  | Analyzer spectrum M1<br>TB2/5, 6   | TB1/8, 7  | SPECT.ANAL.  |   |
| ◀ Transmitted r.f. pulse                         | R.F. wavemeter   | TB2/10, 9                                       | WAVE-METER ▶ |   |
| Circuit waveforms                                | Any test socket (using cathode-follower probe unit)  | SKT.T.  | EXT.MON.     | 20 μs<br>1 MS<br>350 M<br>AMP. IN<br>AMP. OUT |

**TABLE 2**  
**Control relays : waveform monitor**

| Relay           | Contact | Function                                  | Energized by  |
|-----------------|---------|---|---|
| $\frac{RLA}{1}$ | RLA1    | Applies +50V to selector SF. solenoid     | Main push-buttons   |
| $\frac{RLB}{2}$ | RLB1    | Selects external blanking waveform        | I.F. WOBB. and SPECT. ANAL. push-buttons                      |
|                 | RLB2    | Selects external sweep waveform           |   |
| $\frac{RLC}{4}$ | RLC1    | Selects 1 Mc/s cal. osc. coil             | Timebase selector switch SF (20 $\mu$ s sweep)                |
|                 | RLC2    |   |   |
|                 | RLC3    | Selects 1 Mc/s cal. osc. coupling network |   |
|                 | RLC4    |   |   |
| $\frac{RLD}{1}$ | RLD1    | Applies +300V h.t. to calibrator          | RANGE MARKS ON/OFF switch                                     |
| $\frac{RLE}{4}$ | RLE1    | Selects V13 anode choke (calibrator)      | Timebase selector switch SF (20 $\mu$ s sweep)                |
|                 | RLE2    | Selects V13 bias potentiometer            |   |
|                 | RLE3    | Selects V13 anode load                    |   |
|                 | RLE4    | Selects calibrator output                 |   |
| $\frac{RLF}{1}$ | RLF1    | Selects amplified video signals           | Main push-buttons   |
| $\frac{RLG}{1}$ | RLG1    | Selects output from video pulse shaper    | SPECT. ANAL. push-button                                      |
| $\frac{RLH}{2}$ | RLH1    | C.R.T. bias delay control                 | V20b e.h.t. unit  |
|                 | RLH2    |   |   |
| $\frac{RLJ}{1}$ | RLJ1    | Applies +50V to selector SH solenoid      | Main push-buttons   |
| $\frac{RLK}{2}$ | RLK1    | Selects Y shift potentiometer RV23        | MAG.V. and Thyatron A & C<br>◀ and LINE. V. ▶<br>push-buttons |
|                 | RLK2    |   |   |
| $\frac{RLI}{1}$ | RLI1    | Applies +50V to selector S.J. solenoid    | Main push-buttons   |



**TABLE 3**

**Control relays : spectrum analyzer and i.f. wobulator**

The following relays on the spectrum analyzer and i.f. amplifier panels are also controlled by the monitor push-buttons.

| Panel                                 | Relay           | Function                                     | Energized by                  |
|---------------------------------------|-----------------|--|-------------------------------|
| Analyzer spectrum M1                  | $\frac{RLB}{2}$ | Wobulator on/off                             | I.F.WOBB. push-button         |
|                                       | $\frac{RLC}{2}$ | Spectrum analyzer on/off                     | SPECT.ANAL. push-button       |
|                                       | $\frac{RLD}{2}$ |  |                               |
| Amplifier, I.F. M22                   | $\frac{RLA}{2}$ | I.F. channel change-over                     | A.J. push-button              |
| Amplifier assembly i.f. and Video M28 | $\frac{RLB}{2}$ | Controls amplitude of O/P from i.f. channels | I.F.WOBB. push-button         |
|                                       | $\frac{RLC}{2}$ | Linear channel muting                        | I.F.WOBB. + LIN. push-buttons |
|                                       | $\frac{RLD}{2}$ |  |                               |
| Amplifier assembly AJ., M27           | $\frac{RLB}{2}$ | A.J. channel muting                          | I.F.WOBB. + A.J. push-buttons |
|                                       | $\frac{RLC}{2}$ |  |                               |
|                                       | $\frac{RLD}{2}$ |  |                               |
|                                       | ◀RLE            | Compensation for Linear/A.J. channel levels▶ |                               |

**TABLE 4**

**Selector switch positions**

| Button  | Timebase selector SF      | C.R.T. control selector SH | Shift selector SJ |
|---|---------------------------|----------------------------|-------------------|
| THYR. G1<br>THYR. G2<br>THYR. I<br>MAG. V<br>MAG. I<br>R.F. PULSE | 1/7<br>(20 $\mu$ s sweep) | 1/7                        | 1/7               |
| LINE V<br>RX.SIGS.  | 3/9<br>(350M sweep)       | 3/9                        | 2/8               |
| I.F.WOBB.<br>SPECT.ANAL.  | 4/10<br>(external sweep)  | 4/10                       | 3/9               |
| EXT.MON. 20 $\mu$ s<br>1 ms<br>350 M                              | 1/7<br>2/8<br>3/9         | 1/7<br>2/8<br>3/9          | 4/10              |

**Note . . .**

*When the OVER-RIDE switch is operated the shift selector rotates to position 4/10 (i.e. selects manual shift controls) irrespective of the position of the timebase and c.r.t. control selectors. Simultaneously the +50V supply is removed from the push-button switch wafers controlling these selectors so that no further waveform selection can take place until the OVER-RIDE switch is returned to OFF.*

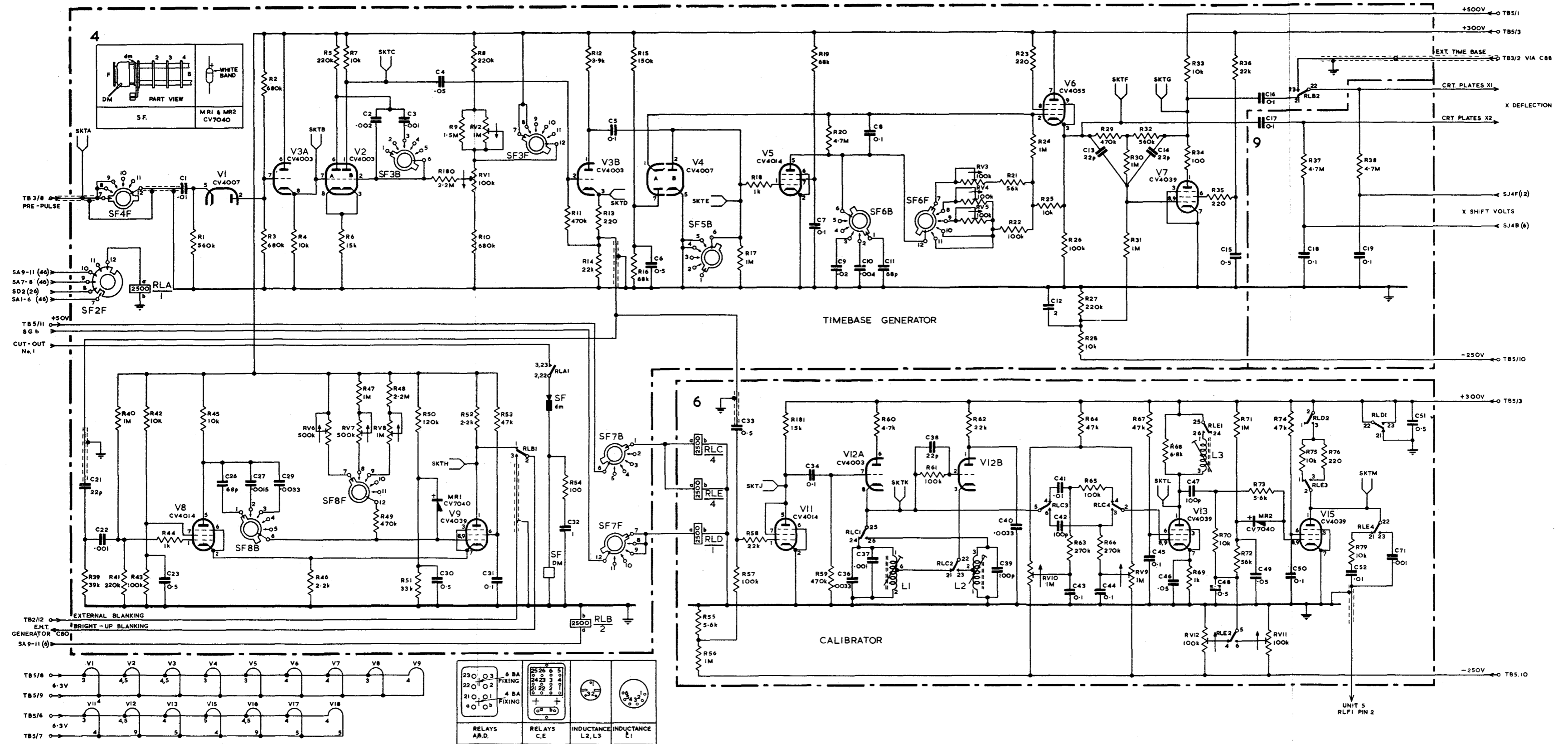
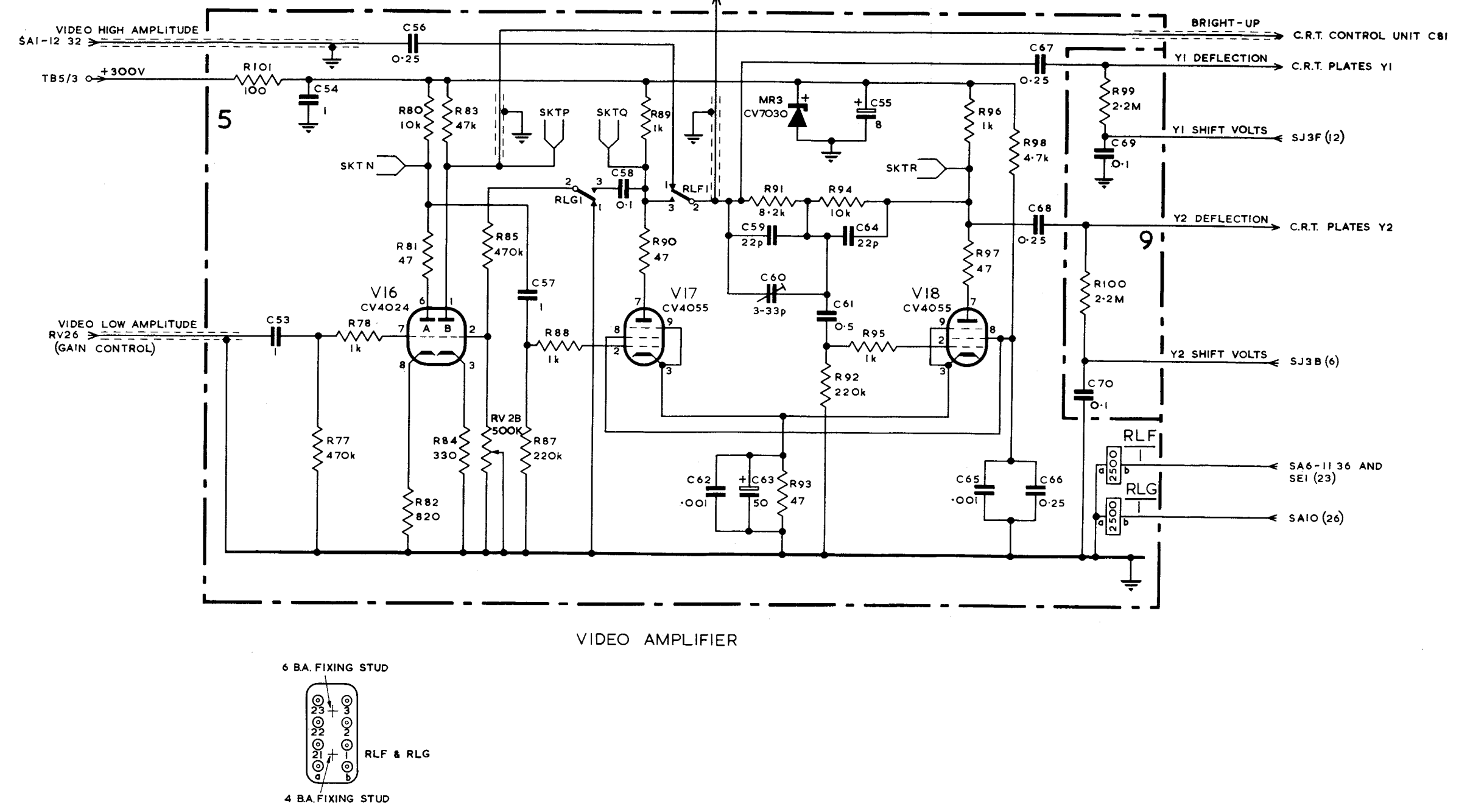
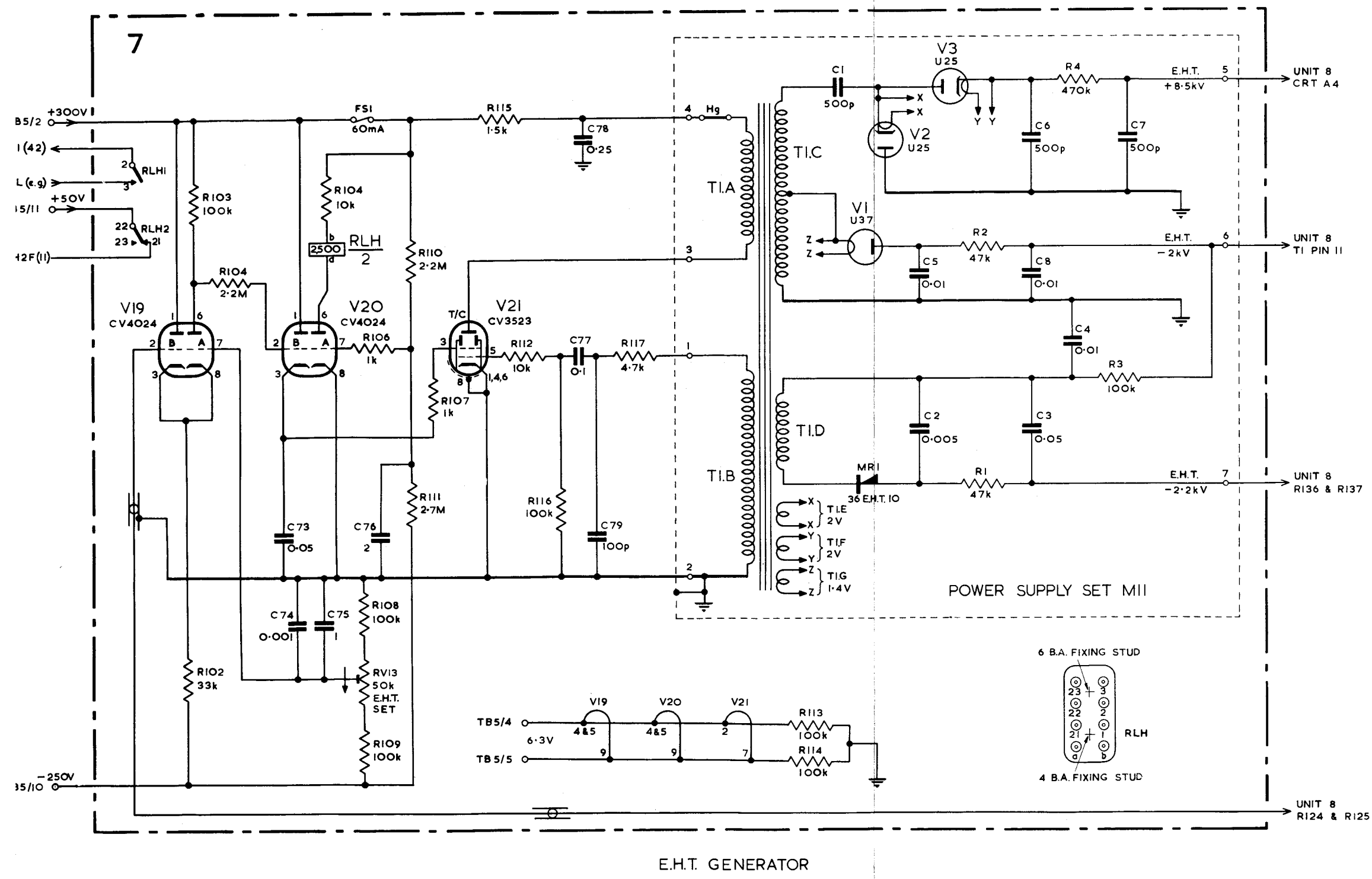


Fig.14.

Panel monitor M13: timebase & calibrator circuits

Fig.14



ig.15

Panel monitor M13: E.H.T. and video circuits

Fig. 15

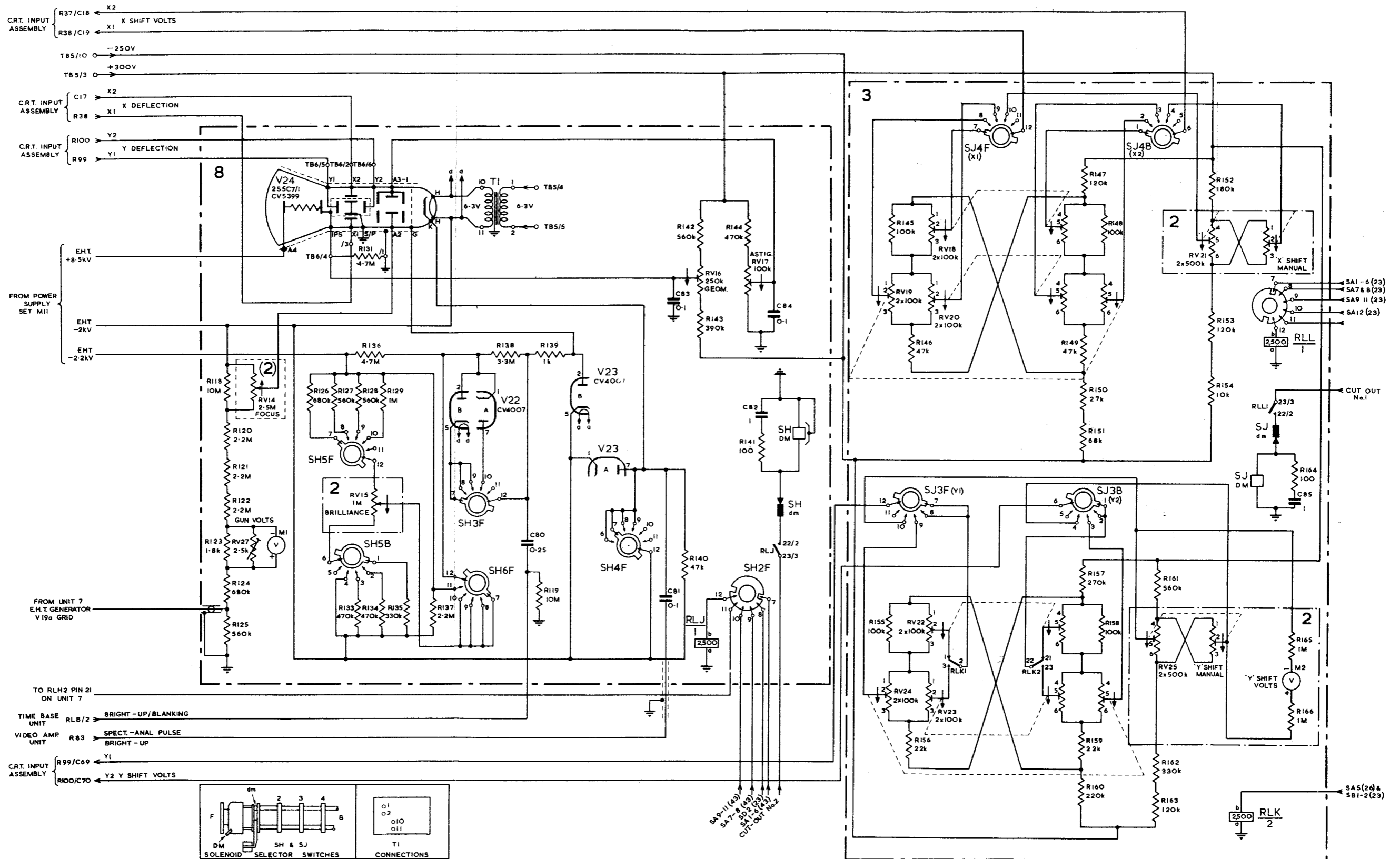
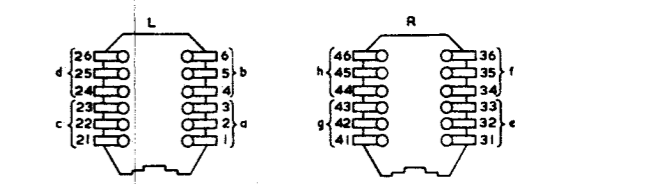
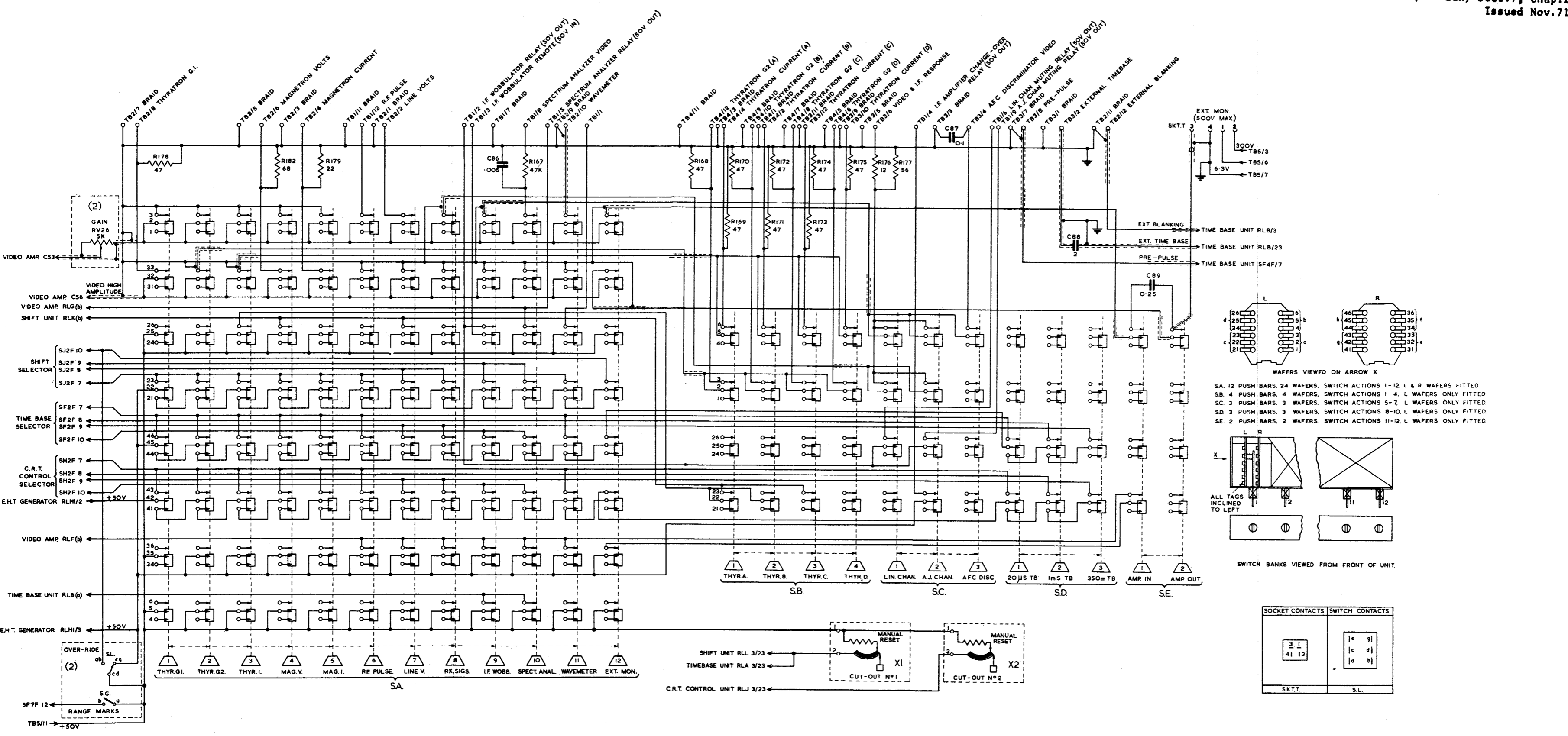


Fig. 16  
 (M.F.P.)

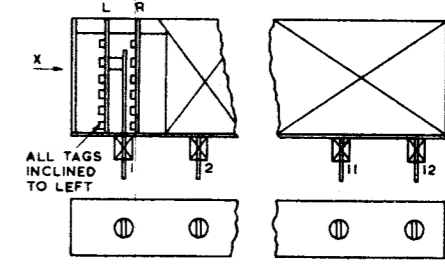
Panel monitor M13: C.R.T. and shift circuits.

Fig. 16



WAFERS VIEWED ON ARROW X

SA. 12 PUSH BARS, 24 WAFERS, SWITCH ACTIONS 1-12, L & R WAFERS FITTED  
 SB. 4 PUSH BARS, 4 WAFERS, SWITCH ACTIONS 1-4, L WAFERS ONLY FITTED  
 SC. 3 PUSH BARS, 3 WAFERS, SWITCH ACTIONS 5-7, L WAFERS ONLY FITTED  
 SD. 3 PUSH BARS, 3 WAFERS, SWITCH ACTIONS 8-10, L WAFERS ONLY FITTED  
 SE. 2 PUSH BARS, 2 WAFERS, SWITCH ACTIONS 11-12, L WAFERS ONLY FITTED



SWITCH BANKS VIEWED FROM FRONT OF UNIT

| SOCKET CONTACTS  | SWITCH CONTACTS |   |   |    |  |    |   |    |   |    |   |
|--|-----------------|---|---|----|--|----|---|----|---|----|---|
| <table border="1"> <tr><td>3</td><td>1</td></tr> <tr><td>4</td><td>12</td></tr> </table> | 3               | 1 | 4 | 12 | <table border="1"> <tr><td>1c</td><td>9</td></tr> <tr><td>1c</td><td>d</td></tr> <tr><td>1a</td><td>b</td></tr> </table> | 1c | 9 | 1c | d | 1a | b |
| 3  | 1               |   |   |    |  |    |   |    |   |    |   |
| 4  | 12              |   |   |    |  |    |   |    |   |    |   |
| 1c   | 9               |   |   |    |  |    |   |    |   |    |   |
| 1c   | d               |   |   |    |  |    |   |    |   |    |   |
| 1a   | b               |   |   |    |  |    |   |    |   |    |   |
| SKT.T.   | S.L.            |   |   |    |  |    |   |    |   |    |   |

Fig.17

Panel monitor M13:push-button control circuits

Fig.17

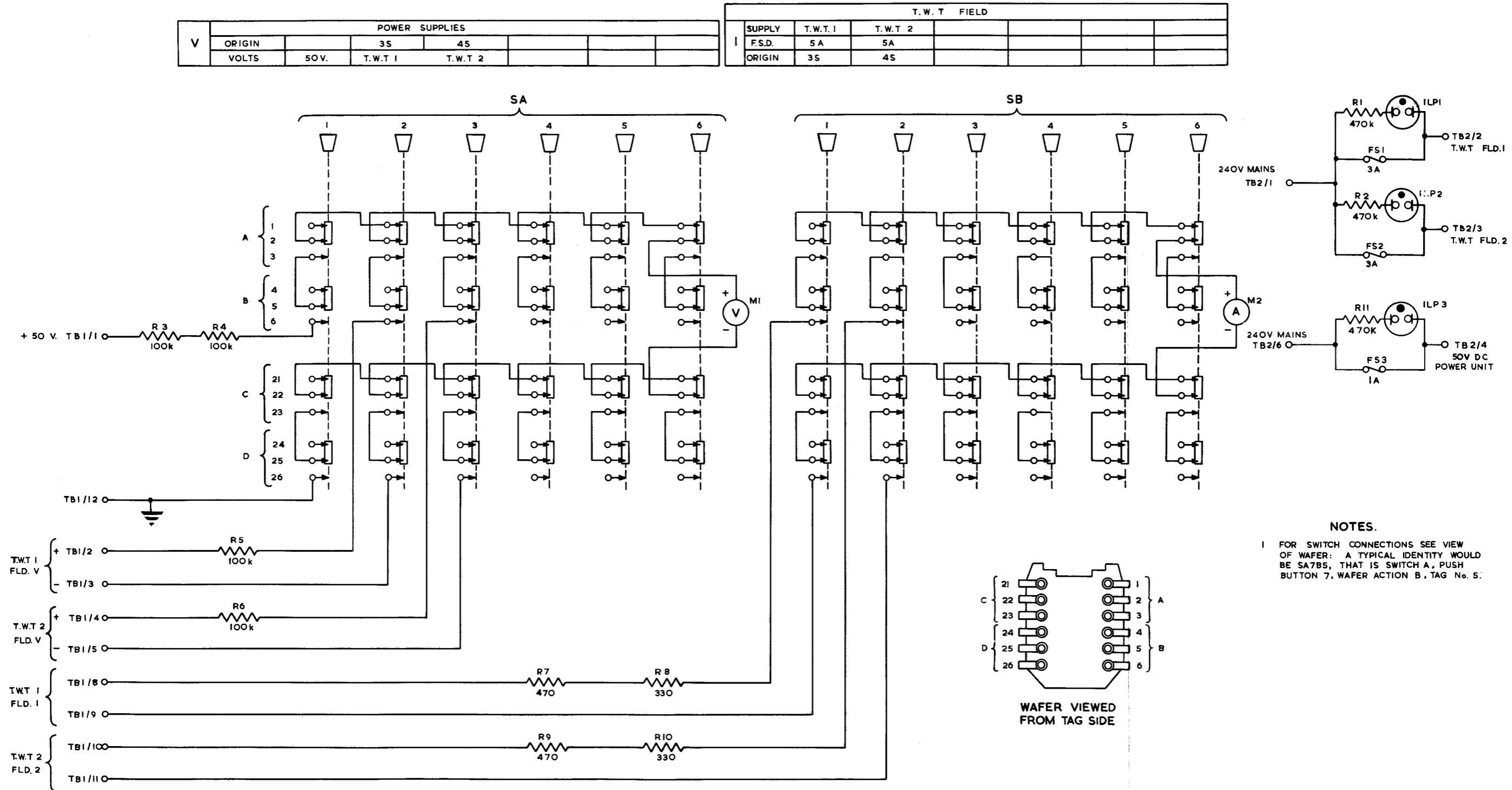
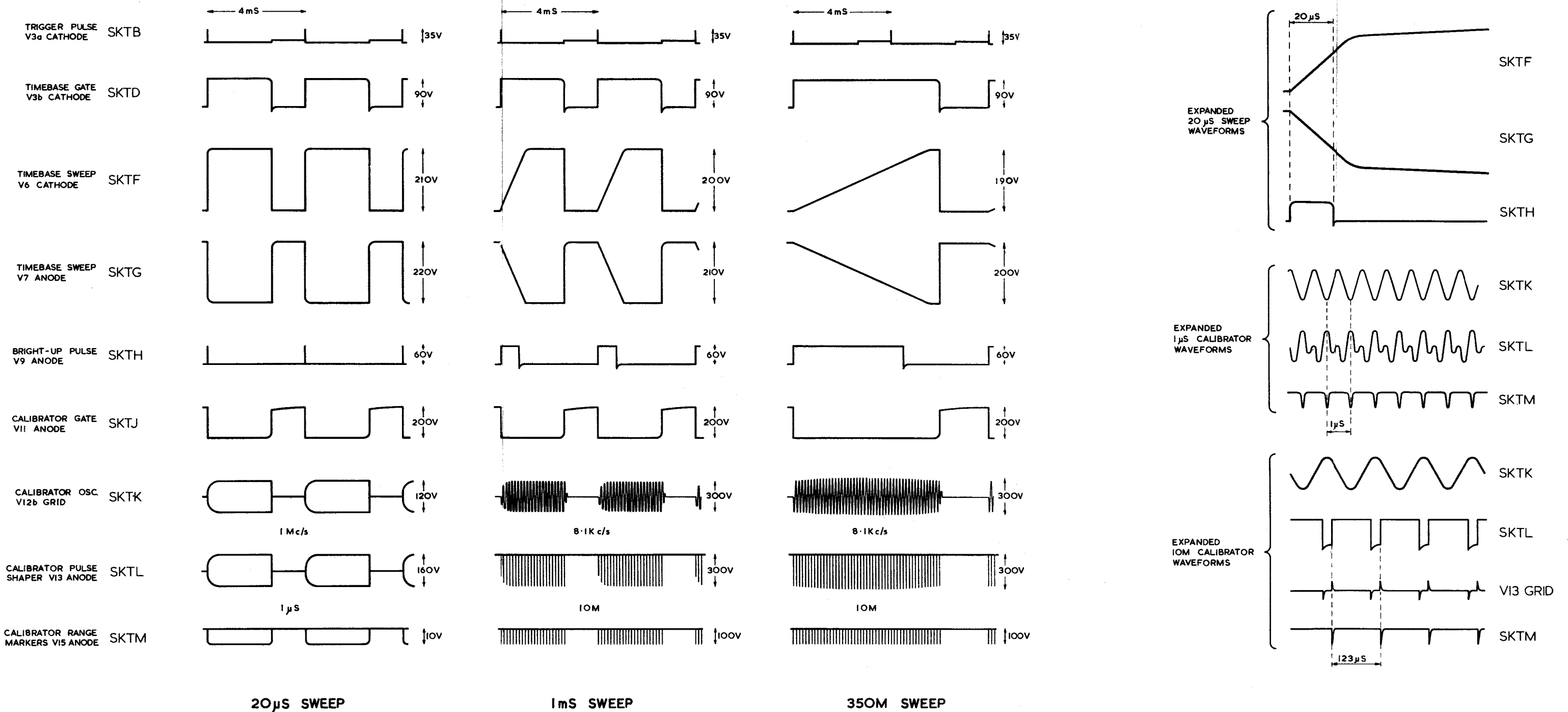


Fig. 18  
AL 6, Feb. 77

Panel, test electrical (No. 6) M58: circuit

Fig. 18  
Chap. 7  
Page 21/22



20µS SWEEP

1mS SWEEP

350M SWEEP

Fig.19  
 (M.F.P.)

Panel monitor M13: typical circuit waveforms

Fig.19

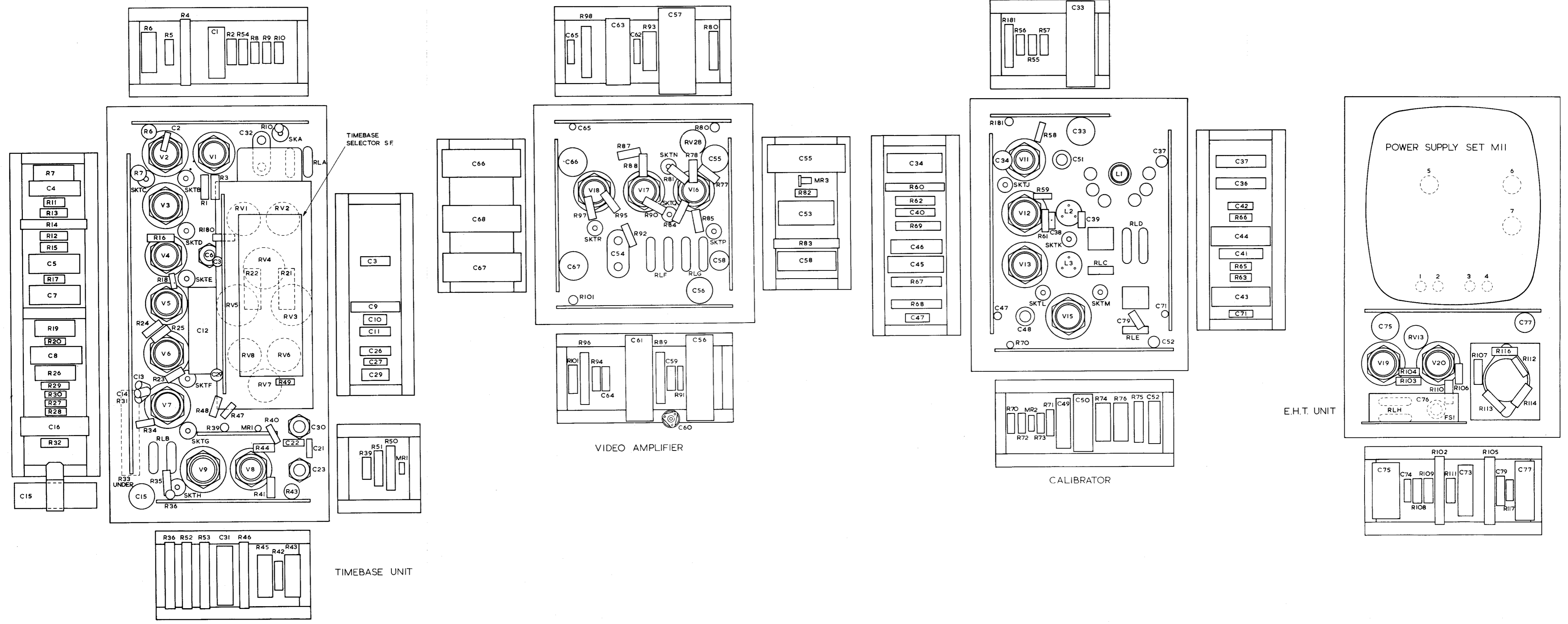


Fig. 20

Panel monitor MI3: component layout

Fig. 20



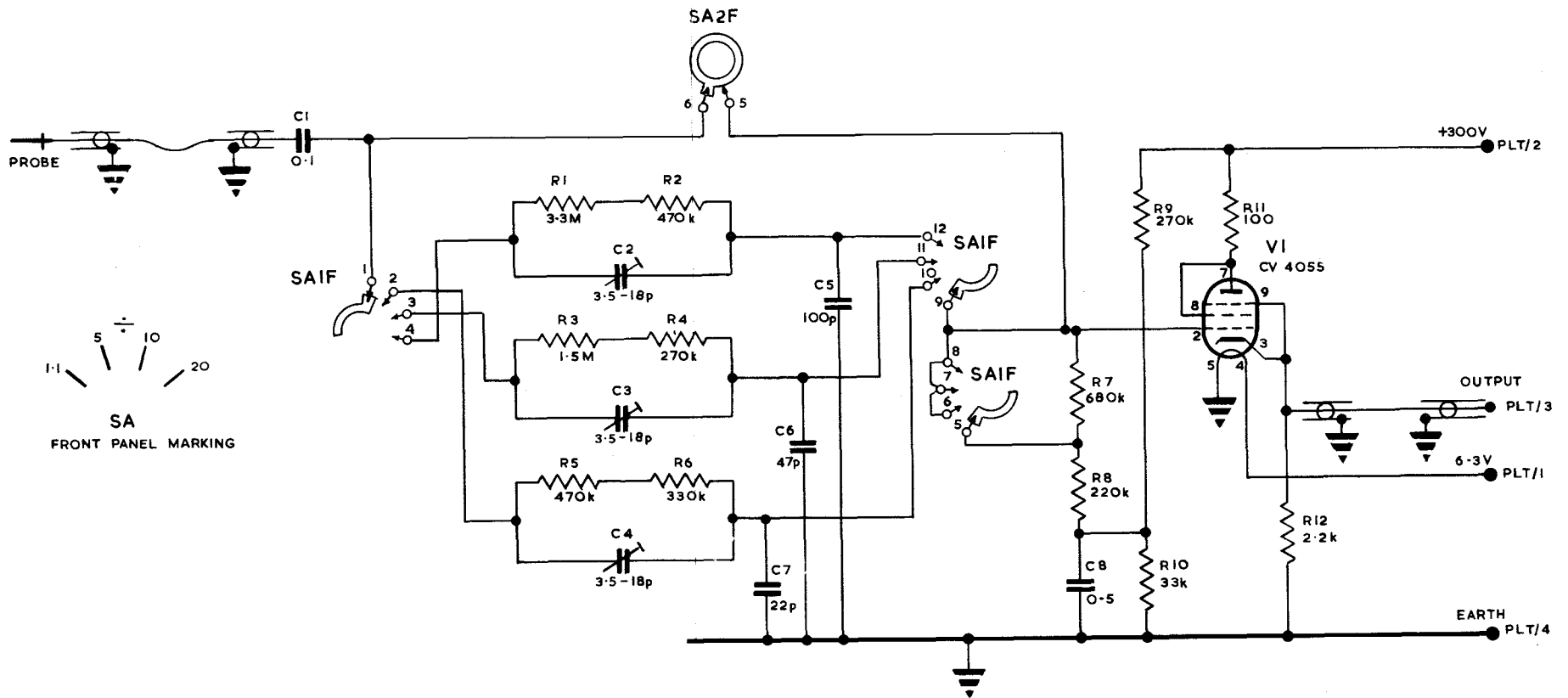


Fig. 21

Cathode follower unit: circuit

Fig. 21

## Chapter 2

### PANEL MONITOR M13—ADDENDA

#### **WARNING . . .**

**Before touching any c.r.t. connections or associated components, ensure that each e.h.t. supply is discharged to earth.**

#### **Caution . . .**

*The bleed resistance for the 8.5kV supply is provided by the internal coating of the c.r.t. To prevent breakdown of components, the equipment should not be operated with the A4 side-cap or the i.p.s. side-pin c.r.t. connections removed.*

## Chapter 3

# SPECTRUM ANALYSER

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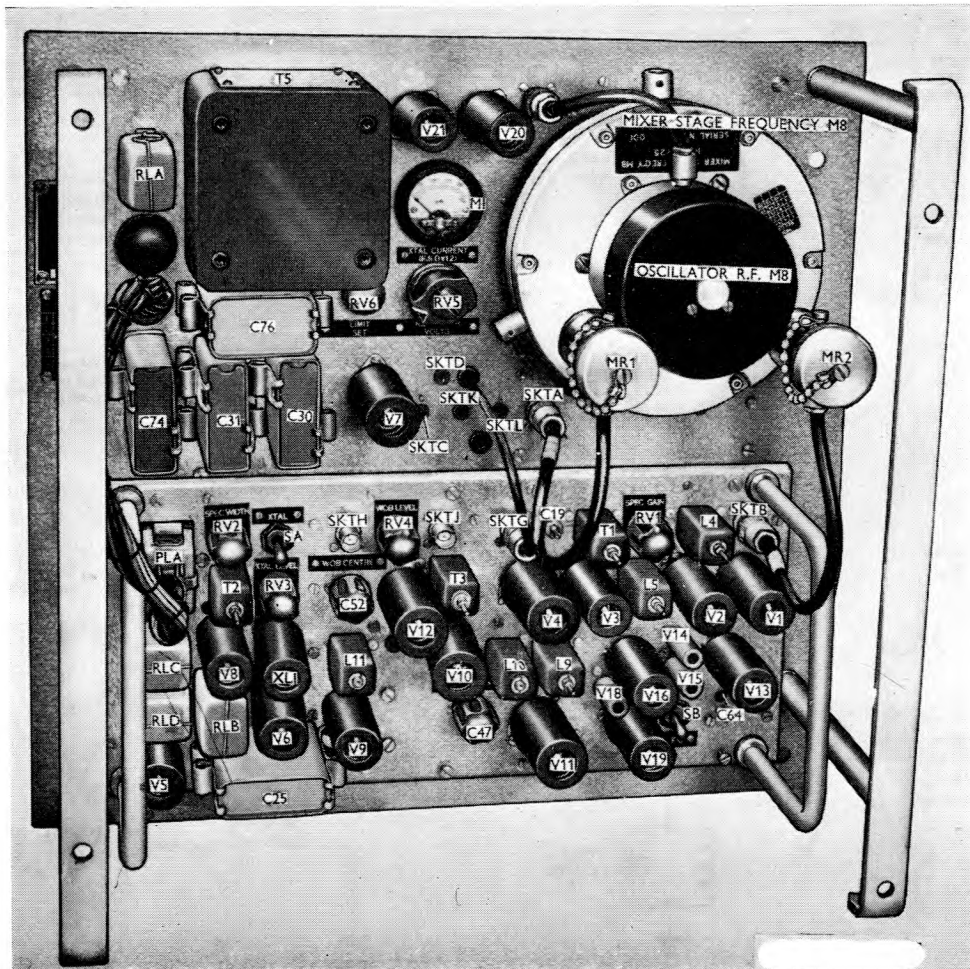
|                                       | <i>Para.</i> |                                   | <i>Para.</i> |
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| Analyser, spectrum M1: block diagram .. .. . | 2           | Analyser, spectrum M1: circuit of sub-chassis .. .. .       | 6           |
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**Fig. 1. Analyser, spectrum M1 : front view**

## Introduction

1. The spectrum analyser panel (*fig. 1*), which is mounted on gate B of the transmitter-receiver, is designed to operate in conjunction with panel monitor M13 (*Chap. 2*) to provide:—

- (1) A visual indication of the performance of the magnetron and a.f.c. system.
- (2) A swept-frequency signal, centred on 13.5 Mc/s, for receiver alignment purposes.

2. The operation of the panel is controlled by push-buttons on the panel monitor M13. When the SPECTRUM ANALYSER button is pressed, the magnetron and the receiver local oscillator frequency spectra are automatically displayed on the monitor c.r.t. When the I.F. WOBBULATOR button is operated, the swept-frequency signal can be fed to either the linear or the anti-jam i.f. channels, or to the a.f.c. discriminator circuit on the stalo control panel to produce a frequency response curve on the monitor screen.

## Description of operation

3. A block diagram of the analyser circuit is given in *fig. 2*. The unit is essentially a double-superheterodyne microwave receiver with a klystron 1st local oscillator and a swept-frequency 2nd local

oscillator. Samples of the transmitted r.f. pulse and the receiver stalo signal are applied to the signal mixer stage; the video output from the analyser is fed to the vertical deflection plates of the monitor c.r.t. The 2nd local oscillator is frequency modulated by means of a sawtooth voltage from an internal sweep generator which also supplies the timebase waveform for the horizontal deflection plates of the c.r.t.

4. The timebase sweep lasts for approximately  $\frac{1}{4}$  second; during this time the 2nd local oscillator sweeps through a 2 Mc/s band of frequencies. Each time the transmitter fires, a video pulse is produced at the output of the analyser and is displayed on the monitor screen as a vertical deflection of the trace. As the amplitude of the video pulse is proportional to the power transmitted in that part of the frequency spectrum to which the analyser is tuned at that particular instant, a complete pictorial representation of the magnetron spectrum, in the form of a series of vertical peaks along the c.r.t. trace, is built up during each sweep. A stationary display is produced by the long-persistence characteristic of the c.r.t.

5. The analyser i.f. is 6.75 Mc/s and the klystron 1st local oscillator is tuned to a frequency 6.75 Mc/s

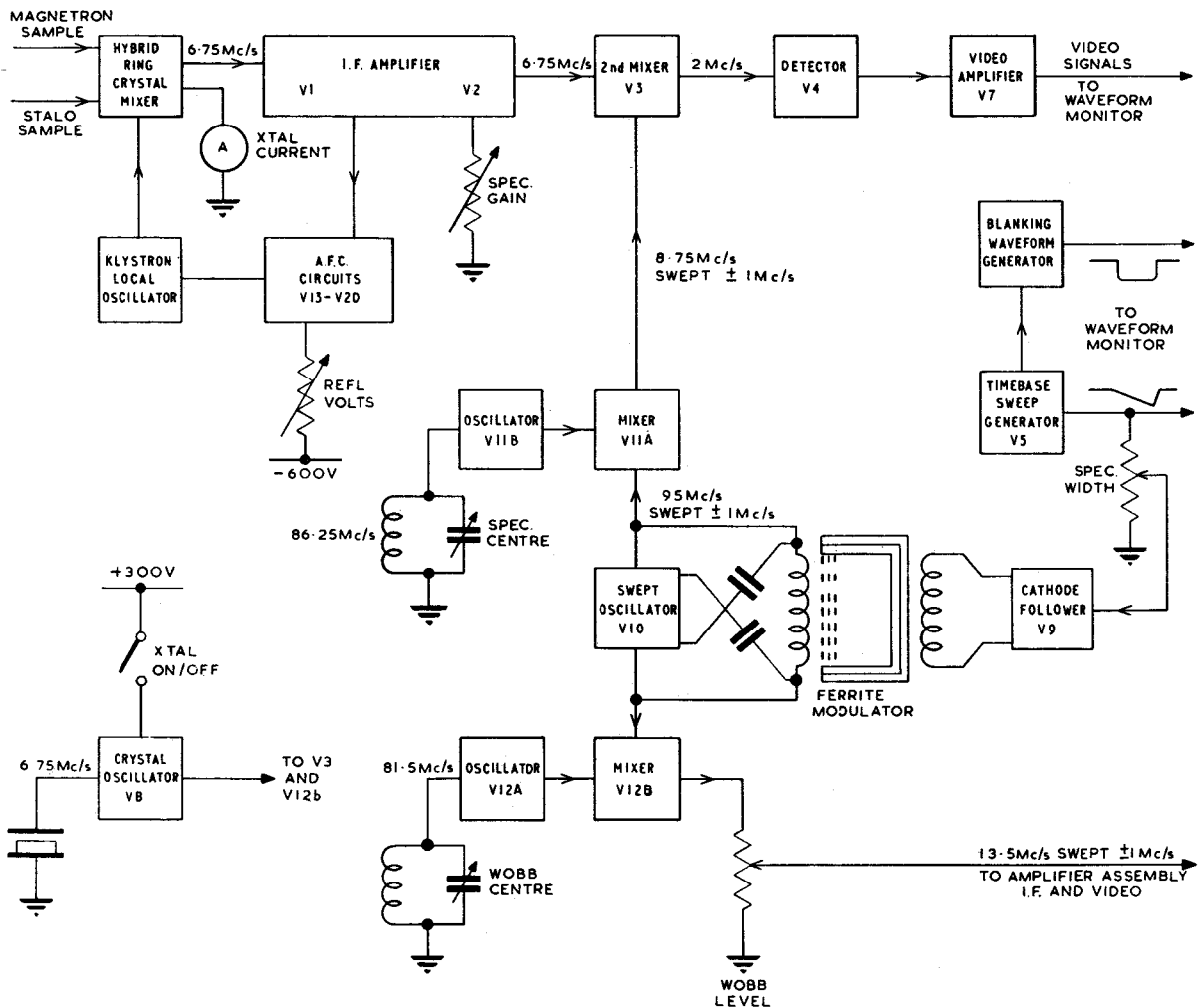


Fig. 2. Analyser, spectrum M1 : block diagram

above that of the magnetron (i.e. mid-way between the magnetron and the stalo frequencies) and is maintained at this frequency by an internal a.f.c. system. The spectrum due to the receiver stalo thus appears as a spike superimposed on the magnetron spectrum. When the stalo is correctly tuned the spike appears in the centre of the display. An internal 6.75 Mc/s crystal-controlled oscillator provides a marker spike to indicate the exact tuning point.

6. When an i.f. channel response curve is displayed (by means of the LIN. or A.J. push-buttons on the monitor panel) the second harmonic of the crystal oscillator provides a marker pip at 13.5 Mc/s to indicate the centre frequency for i.f. alignment. When the a.f.c. discriminator response is displayed (A.F.C. DISCR. push-button) the marker pip indicates the crossover point at 13.5 Mc/s.

#### Performance characteristics

7. The following is a summary of the major parameters:—

- (1) Frequency coverage 1213.25 to 1390 Mc/s.
- (2) Spectrum width continuously variable up to 2 Mc/s.
- (3) Scanning rate:
  - (a) Spectrum analyser, 3 to 5 c.p.s.
  - (b) I.F. wobulator, 15 to 25 c.p.s.
- (4) Intermediate frequencies:
  - (a) 6.75 Mc/s (bandwidth 1.5 Mc/s at 3 dB down).
  - (b) 2 Mc/s (bandwidth 10 kc/s at 3 dB down).

#### Inputs

8. The following inputs are required:—

- (1) Magnetron sample, 2.5 mW peak power at 75 ohms, from PLX1 coupler, directional (waveguide).
- (2) Receiver local oscillator sample, 250 μW at 75 ohms, from amplifier, frequency multiplier M24, ◀via the r.f. wavemeter▶.

#### Outputs

9. The following outputs are provided:—

- (1) Video pulse TB2/5, positive-going 0.5V to panel monitor M13.
- (2) Sawtooth sweep waveform TB2/1, negative-going 180V to panel monitor M13.
- (3) Blanking square wave TB2/3, negative-going 120V to panel monitor M13.
- (4) Swept-frequency signal centred on 13.5 Mc/s, 0–10 mV into 75 ohms, swept ±2 Mc/s, to panel a.f.c. M48 and to amplifier assembly (i.f. and video) M28 (SKTH and SKTJ).

#### Power supplies

10. A 6.3V a.c. supply for the valve heaters (fig. 5 and 6) is provided by a power transformer T5 on the front of the panel. H.T. supplies are obtained from the transmitter power units as shown in Table 2.

#### Circuit description

11. Circuit diagrams of the spectrum analyser are given in fig. 5 and 6. The components shown in fig. 5 are mounted on the main panel; the components shown in fig. 6 are mounted on a removable sub-chassis which is secured to the main panel by six 4BA screws. Connections between the main panel and the sub-chassis are taken via a 12-pole socket SKTA and coaxial plugs PLB and PLG.

#### Signal mixer

12. The signal mixer stage (mixer stage, frequency M8 in fig. 5) consists of a  $3\lambda/2$  coaxial hybrid ring balanced mixer with two crystals and their associated impedance matching transformers. The complete assembly, which is similar in design to the receiver signal mixer described in Sect. 4, Chap. 3, is mounted together with the klystron local oscillator unit on the front of the main panel (fig. 1). Samples of the transmitter r.f. pulse and the receiver stalo signal are applied to the inner conductor at SKTB and SKTA; the output from the klystron oscillator is applied at SKTC.

13. The input sockets are spaced  $\lambda/2$  apart; signals at one input thus arrive out of phase at the other two inputs and cancel out. Signals arrive in phase at the mixer crystals, MR1 and MR2, and add. The 6.75 Mc/s i.f. output is taken from MR2 to the grid of the 1st i.f. amplifier V1 (fig. 6). A 0–250 μA meter M1, shunted by means of R1 to read 0–3 mA, is provided in the d.c. return path of the two crystals, to measure crystal current.

#### Intermediate frequency stages

14. The two 6.75 Mc/s i.f. stages V1 and V2 are mounted on the analyser sub chassis (fig. 6). Two high-slope r.f. pentodes are employed giving a gain of approximately 40 dB. The anode inductors L4 and ◀L8▶ are tuned to the centre frequency of 6.75 Mc/s by means of adjustable iron dust cores. An overall bandwidth of 1.5 Mc/s at 3 dB down is obtained by the damping effect of the grid resistors R5 and R9. To provide a means of controlling the height of the displayed spectrum, the gain of the second stage can be varied with a pre-set cathode bias resistor RV1 (SPEC. GAIN).

#### 2nd mixer and detector

15. A heptode frequency changer V3 is used in the 2nd mixer stage. The 6.75 Mc/s i.f. signals, together with the output from the marker crystal oscillator (para. 27), are applied to the control grid; the output from the swept frequency oscillator (para. 24) is applied to the oscillator grid. The 2 Mc/s difference frequency is selected in the mixer anode circuit by a sharply tuned L.C. circuit consisting of the primary of transformer T1 and a fixed capacitor C16.

16. A bandwidth of approximately 10 kc/s is obtained from this circuit by the application of a small amount of positive feedback from the secondary of T1 to the mixer oscillator grid. The trimmer C19, in series with the secondary winding, enables the feedback voltage to be adjusted to give the required response.

17. The 2 Mc/s i.f. signals from the anode of V3 are demodulated by an infinite impedance triode detector V4b, and are fed via a cathode follower stage V4a, to the video amplifier stage on the main panel.

#### *Video amplifier*

18. The video amplifier stage V7 (fig. 5), which is mounted on the main panel below the XTAL CURRENT meter, is a high-slope double-triode in a cathode-coupled circuit. Automatic bias is provided by resistors R36 and R37 in the cathode; the anode circuit is decoupled by an electrolytic capacitor C29. As this capacitor is subject to a reverse voltage in the event of a failure of the +300V supply, a silicon diode MR1 is connected in parallel to conduct the reverse current.

#### *Timebase generator*

19. The sweep waveform for the monitor c.r.t. is produced by a Miller transitron stage V5 (fig. 6). When the panel is functioning as a spectrum analyzer, relays RLD and RLC are energized by a +50V d.c. supply from panel monitor M13, and a negative-going sawtooth waveform is produced at a frequency of 4 c.p.s. The sawtooth waveform is taken from V5 anode to the X1 deflection plate of the monitor c.r.t. and via a potentiometer network R27, RV2 and R28, to the swept-frequency oscillator circuit.

20. A blanking pulse for the c.r.t. grid is produced during the sweep flyback period at the anode of V6. This valve remains cut off during the sweep run-down period due to the coupling between V5 anode and V6 grid and conducts on the positive flyback portion of the sweep waveform to produce a negative-going pulse of 120V amplitude.

#### *Swept-frequency circuits*

21. The swept-frequency oscillator V10, is a push-pull Hartley circuit, the frequency of which is varied in synchronism with the timebase sweep by means of a ferrite modulator ◀L5-6-7.▶ A centre frequency in the range 90-100 Mc/s is used in order to obtain a deviation of  $\pm 1$  Mc/s. The final swept-frequency of 8.75 Mc/s  $\pm 1$  Mc/s is obtained by feeding the output from V10 to a double-triode frequency changer V11.

22. The sawtooth waveform produced at the anode of the timebase valve V5, is fed to the grid of a cathode follower V9. This stage supplies the current for the control winding ◀L6▶ of the ferrite modulator and thus determines the permeability of the ferrite core on which is wound the oscillator tuning inductor ◀L7.▶ As the current increases, the magnetic saturation of the core rises and the resonant frequency of the oscillator tuned circuit is increased. The amplitude of the sawtooth waveform fed to the grid of V9 can be varied by means of RV2 (SPEC. WIDTH) to control the oscillator deviation and thus the width of the displayed spectrum.

23. To obtain a linear change in frequency, a steady d.c. current, derived from a potentiometer network R46, R47 and R49 across the +200V supply, is passed through a bias winding ◀L5▶ on

the ferrite modulator. A thermistor R48, connected in parallel with R49, prevents any drift in frequency due to temperature change.

24. From the anode of V10a, the swept-frequency signal is applied to the grid of the mixer section of the double-triode frequency changer V11. The oscillator section V11b is tuned to a frequency 8.75 Mc/s below the centre frequency of the swept signal. The mixer anode circuit L9, C44 is tuned to 8.75 Mc/s and is damped by R58 to provide a relatively level output, over the range 7.75 Mc/s to 9.75 Mc/s, to the oscillator grid of the 2nd mixer heptode. To enable the spectrum to be centred on the monitor screen, a variable trimmer C47 (SPEC. CENTRE) is provided on the front of the panel to adjust the frequency of the oscillator section of V11.

#### *I.F. wobblator*

25. The swept-frequency signal from V10 is also applied to a second double-triode frequency changer V12, to produce the swept 13.5 Mc/s signal. When the I.F. WOBB button on the monitor panel is pressed, relay RLB is energized and relays RLC and RLD release. The frequency of the sawtooth waveform from the time base valve V5 is increased to 20 c.p.s. (relay contacts RLD2 short R22) and the output to the ferrite modulator is increased (relay contacts RLD1 disconnect R26). H.T. is removed from V11 and is applied to V12 (contacts RLC2, RLB2).

26. The oscillator section of V12 is tuned to a frequency 13.5 Mc/s below the centre frequency of the swept oscillator. A wide-band transformer T3 in the anode circuit of the mixer V12b, tuned to 13.5 Mc/s, feeds two 75 ohm output sockets SKTH and SKTJ. The level of the 13.5 Mc/s output can be varied from 0-10 mV by means of a potentiometer RV4 (WOBB. LEVEL) connected across the secondary of T3.

#### *Marker oscillator*

27. The crystal controlled marker oscillator uses a B7G based plug-in crystal in a tuned anode circuit employing a triode-connected pentode V8. The output is taken from a coupling link on the anode coil to the grid of the 2nd mixer V3 and to the grid of the wobblator mixer V12b. An output attenuator RV3 (XTAL LEVEL) is provided to control the height of the marker spike on the monitor screen.

#### *A.F.C. system*

28. The intermediate frequency output from the anode of V1 is fed via C12 and a further stage of amplification V13, to a Foster-Seeley discriminator circuit, consisting of T4, V14 and V15. The discriminator is tuned to operate at 6.75 Mc/s by means of pre-set capacitors C61 in the primary circuit and C64 in the secondary. The output from the discriminator (V14 cathode) consists of video pulses of amplitude and polarity proportional to the i.f. error. When the intermediate frequency is exactly 6.75 Mc/s the output is zero.

29. The video pulses from the discriminator (positive-going for i.f. above 6.75 Mc/s, negative-going for i.f. below) are amplified and inverted by

V16 and are fed to a pulse lengthening circuit V17, C70 and V18, C71. A negative output from V16 causes V17 to conduct and charge C70 for the duration of each pulse. Between pulses C70 slowly discharges via R78, R79, V18 and R77. A negative-going sawtooth waveform, proportional to the i.f. error is thus produced at the grid of V19. Similarly, a positive output from V16 results in a positive charge on C71 and a positive-going sawtooth waveform at the grid of V19.

30. V19 operates as a Miller integrator to produce a steady d.c. voltage, proportional to the mean d.c.

level of the input waveform, at its anode. This voltage is used to control the reflector voltage of the klystron local oscillator (*para.* 32). During the transmitter switching-on sequence the grid of V19 is earthed (via relay contacts RLA2) until the modulator h.t. supply is at the correct operating level. A 50V d.c. supply, from control panel M15, then energizes relay RLA to allow the a.f.c. system to function normally. An indicator lamp, ILP1 (A.F.C. ON) on the main panel, lights when relay RLA contacts close. The grid of V19 can also be earthed by means of switch S.B. (A.F.C.) on the front of the unit.

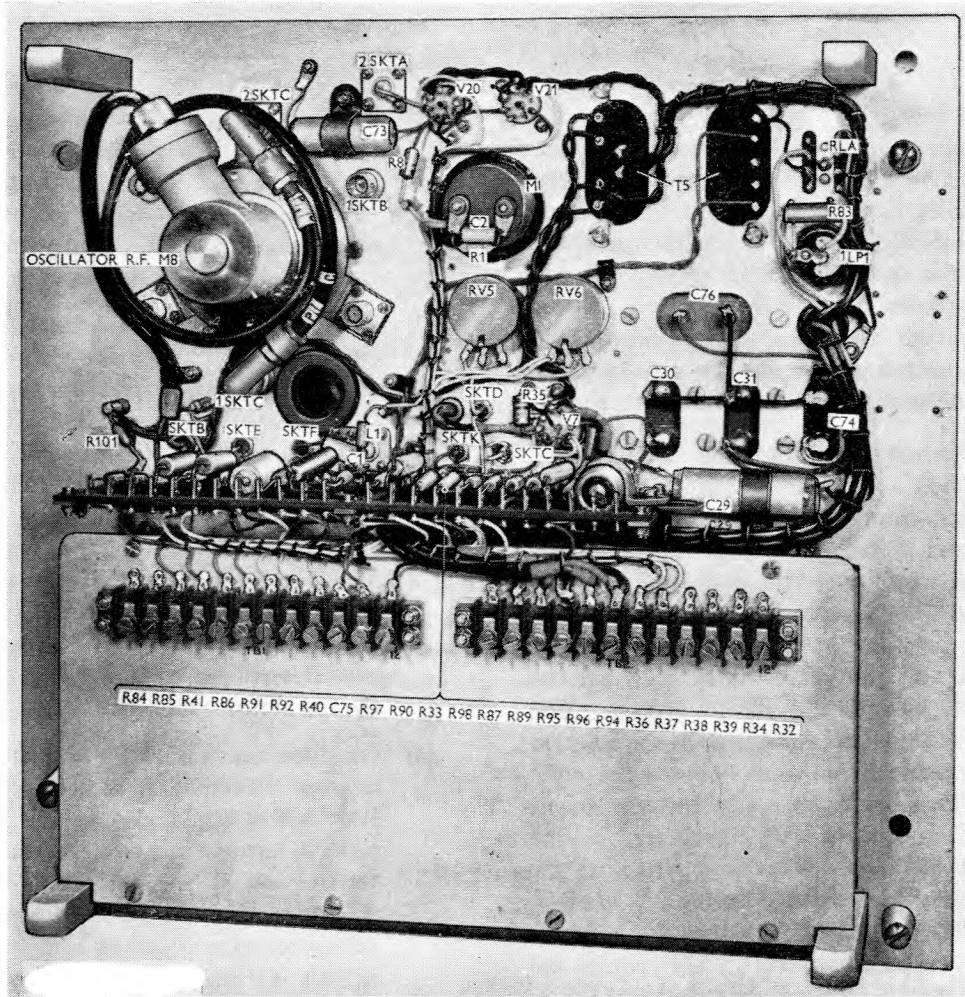


Fig. 3. Analyser, spectrum MI : rear view

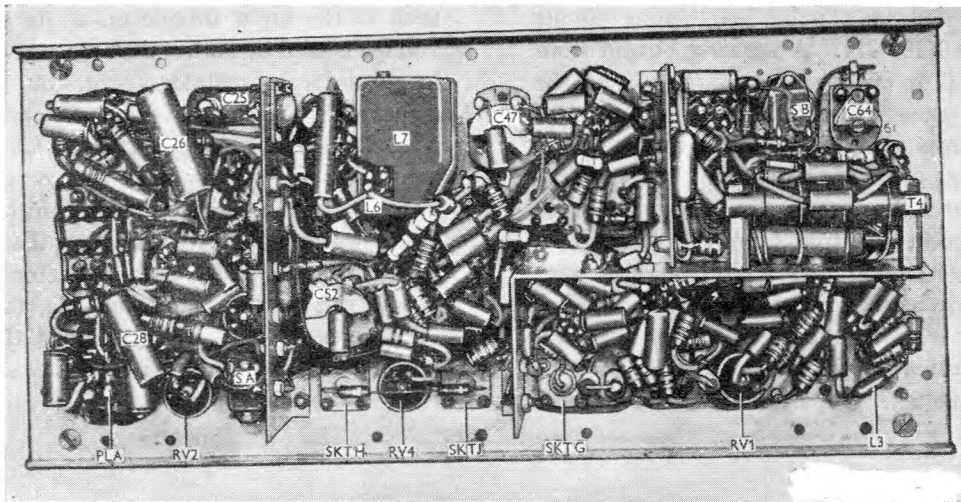


Fig. 4. Analyser, spectrum M1 : sub-chassis

#### Klystron local oscillator

**31.** The klystron local oscillator unit (oscillator, radio frequency M8 in fig. 5) is identical with the receiver standby local oscillator unit on the stalo control panel (*Sect. 4, Chap. 7*). The oscillator uses a reflex klystron and can be mechanically tuned to cover the frequency band 1220–1400 Mc/s. Three adjustable output couplings are provided, each supplying an output of 15 milliwatts into 75 ohms. The output to the signal mixer is taken from SKTC.

**32.** The klystron operates with a resonator potential of 250V and a reflector potential of 300V. The cathode is returned to the –250 supply via decoupling and metering resistors R94 and R96. A cathode follower stage V20, connected between earth and the –600V supply and with its grid connected to a potentiometer network between the anode of the a.f.c. integrator valve V19 and the –600V supply, controls the reflector voltage. The REFLECTOR VOLTS control RV3, enables the reflector voltage to be manually adjusted between the limits 265–315V. These limits are set by the adjustment of the LIMIT SET control RV6, which controls the bias applied to diodes V21a and V21b in the cathode follower grid circuit. Test points are provided at TB1/8 and TB1/7 to measure reflector voltage and cathode current. These points are connected to meters on panel, test electrical No. 1.

#### Tuning procedure

**33.** The following procedure should be adopted when tuning the klystron local oscillator:—

- (1) On panel monitor M13, press the SPECT. ANAL. button and set the VIDEO GAIN control half-way through its travel.

- (2) On the spectrum analyser, switch A.F.C. OFF, turn the SPEC. WIDTH control fully counter-clockwise, switch XTAL ON and adjust the XTAL LEVEL control to produce a convenient marker on the monitor c.r.t. Centre the marker on the trace with the SPEC. CENTRE control.
- (3) Starting with the klystron tuning control right out, tune the oscillator slowly through its range until the magnetron spectrum appears, moving from right to left, on the monitor screen. Maintain the crystal current at about 50  $\mu$ A by means of the REFLECTOR VOLTS control and the oscillator output coupling. Centre the spectrum over the crystal marker, switch A.F.C. ON and check that the spectrum disappears. Switch A.F.C. OFF and check that the spectrum reappears. This is the incorrect oscillator setting (i.e. 6.75 Mc/s below the transmitter frequency).
- (4) Continue tuning until the spectrum reappears, moving this time from left to right. The stalo spike should also appear moving from right to left and the two spectra will meet on the marker if the stalo a.f.c. is correctly adjusted. Switch A.F.C. ON and check that the spectrum is locked by tuning the oscillator slightly each way and by turning the REFLECTOR VOLTS control each way.

#### Voltage readings

**34.** With all controls turned fully clockwise the voltages at various points in the circuit, measured with a multimeter Type 1, should be within the limits shown in Table 1.



AP

**TABLE I**  
**Voltage readings**

| Test point           | Multimeter range | Volts                 |
|----------------------|------------------|-----------------------|
| V1 Pin 2             | 2.5V             | 1.3-2.2V              |
| V2 Pin 2             | 2.5V             | 1.3-2.2V              |
| V3 Pin 2             | 10V              | 1.8-3.0V              |
| V4 Pin 3             | 10V              | 5.0-8.2V              |
| V6 Pin 2             | 2.5V             | 1.0-1.7V (see note 1) |
| V7 Pin 3             | 25V              | 8.4-14.0V             |
| V9 Pin 2             | 10V              | 2.6-4.3V (see note 1) |
| V11a Pin 8           | 10V              | 3.6-6.0V (see note 2) |
| V12b Pin 3           | 10V              | 3.5-5.7V (see note 3) |
| V13 Pin 2            | 2.5V             | 1.1-1.9V              |
| V16 Pin 2            | 2.5V             | 1.0-1.7V              |
| V19 Pin 2            | 2.5V             | 1.0-1.7V (see note 4) |
| SKT G                | 25V              | 6.75-11.25V           |
| Junction T2 and R43  | 1000V            | 190-220V (see note 5) |
| Junction R51 and R52 | 1000V            | 162-217V              |
| Junction R46 and R47 | 100V             | 22-30V (see note 6)   |

**Notes . . .**

- Note 1. *A small periodic variation of this reading, due to the timebase scanning waveform should be ignored.*
- Note 2. *Press SPECT. ANAL. button for this reading.*
- Note 3. *Press I.F.WOBB button for this reading.*
- Note 4. *Set switch SB to OFF for this reading.*
- Note 5. *Set switch SA to ON for this reading.*
- Note 6. *Thermistor R48 to be 2K (i.e. cold) for this reading.*

**TABLE 2**  
**Power supplies**

| Supply volts | Current | Terminal block | Power unit | Gate position |
|--------------|---------|----------------|------------|---------------|
| +300V d.c.   | 45 mA   | TB1/3          | M10        | 2E            |
| +200V d.c.   | 65 mA   | TB1/4          | M10        | 5D            |
| -250V d.c.   | 40 mA   | TB1/5          | M10        | 5F            |
| -600V d.c.   | 12 mA   | TB1/6          | M9         | 4F            |
| Earth        | —       | TB1/12         | —          | —             |

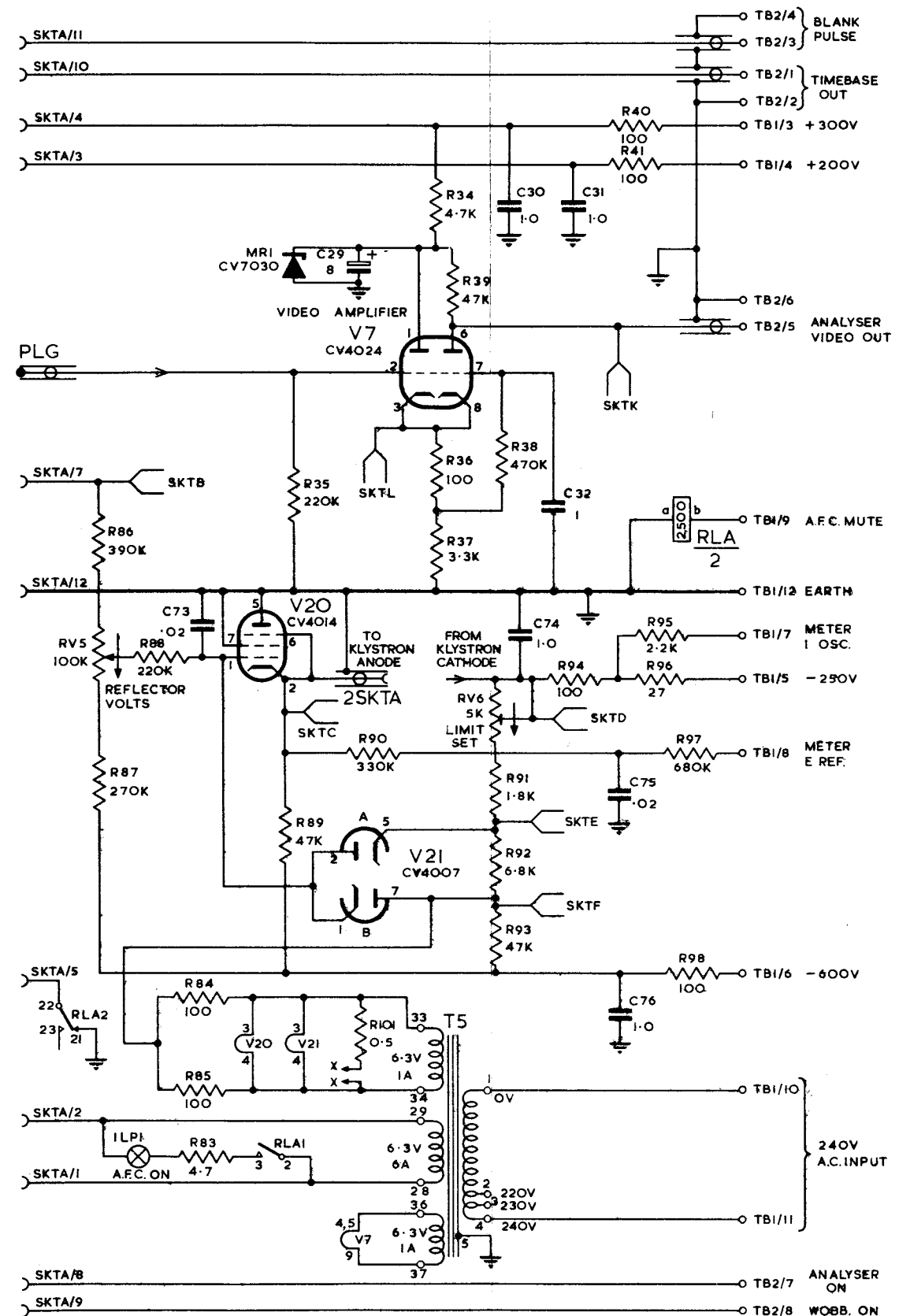
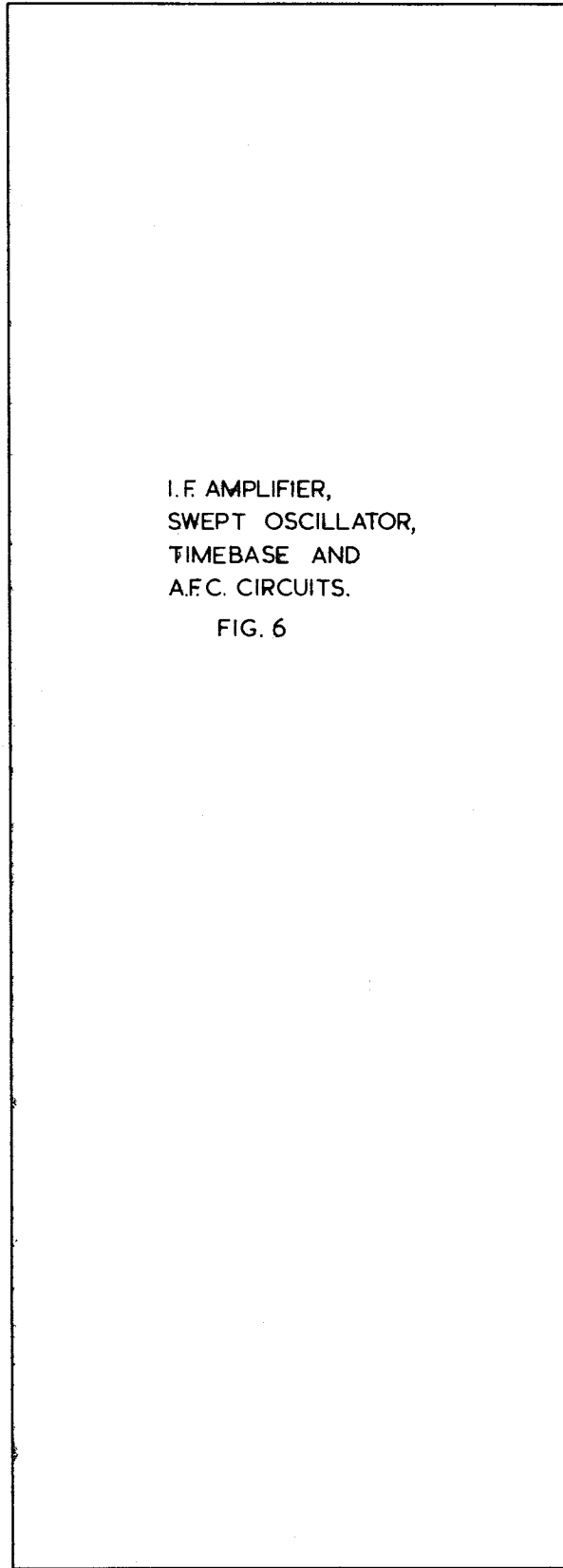
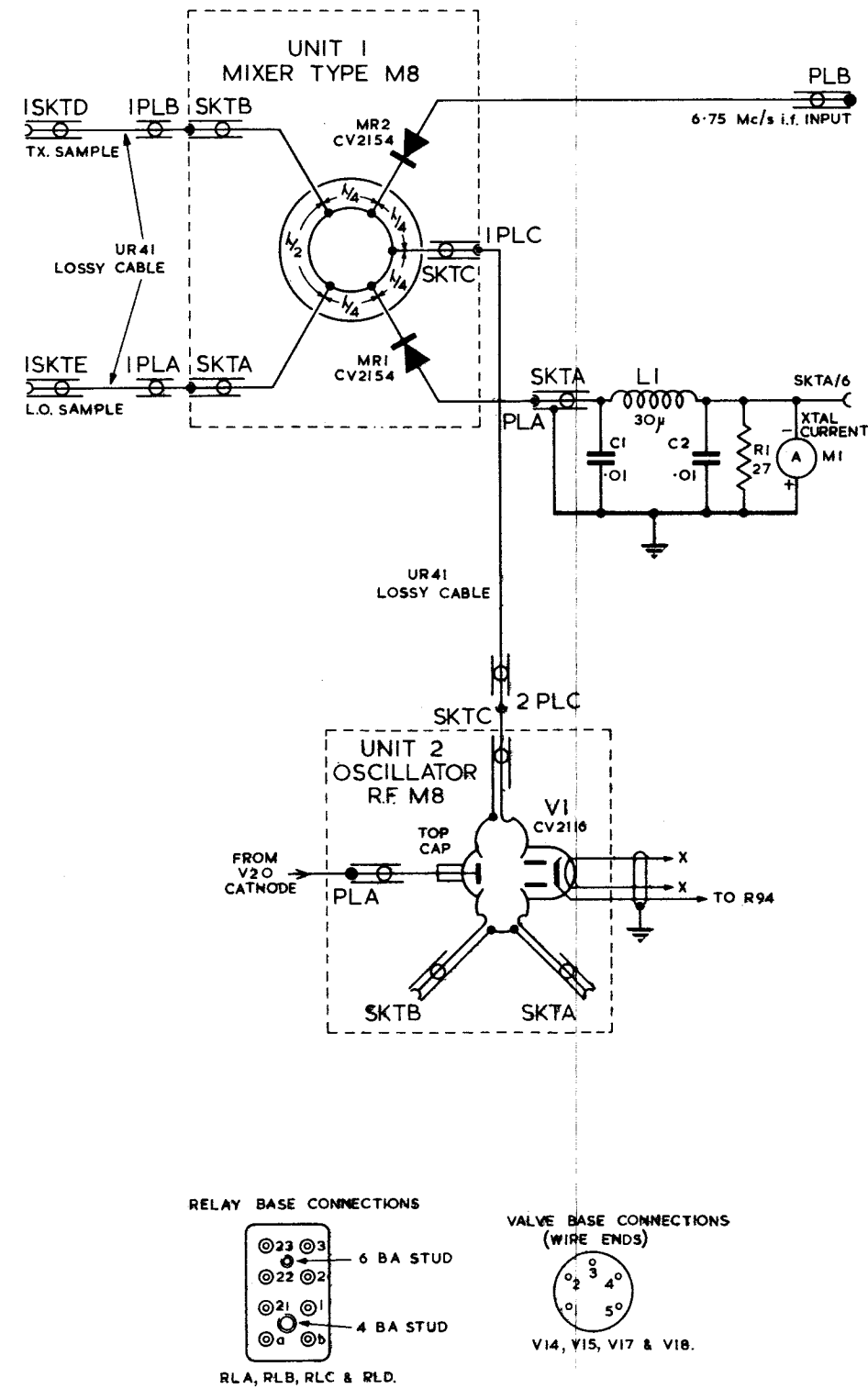


Fig. 5

Analyser, spectrum M1: circuit of main panel

Fig. 5

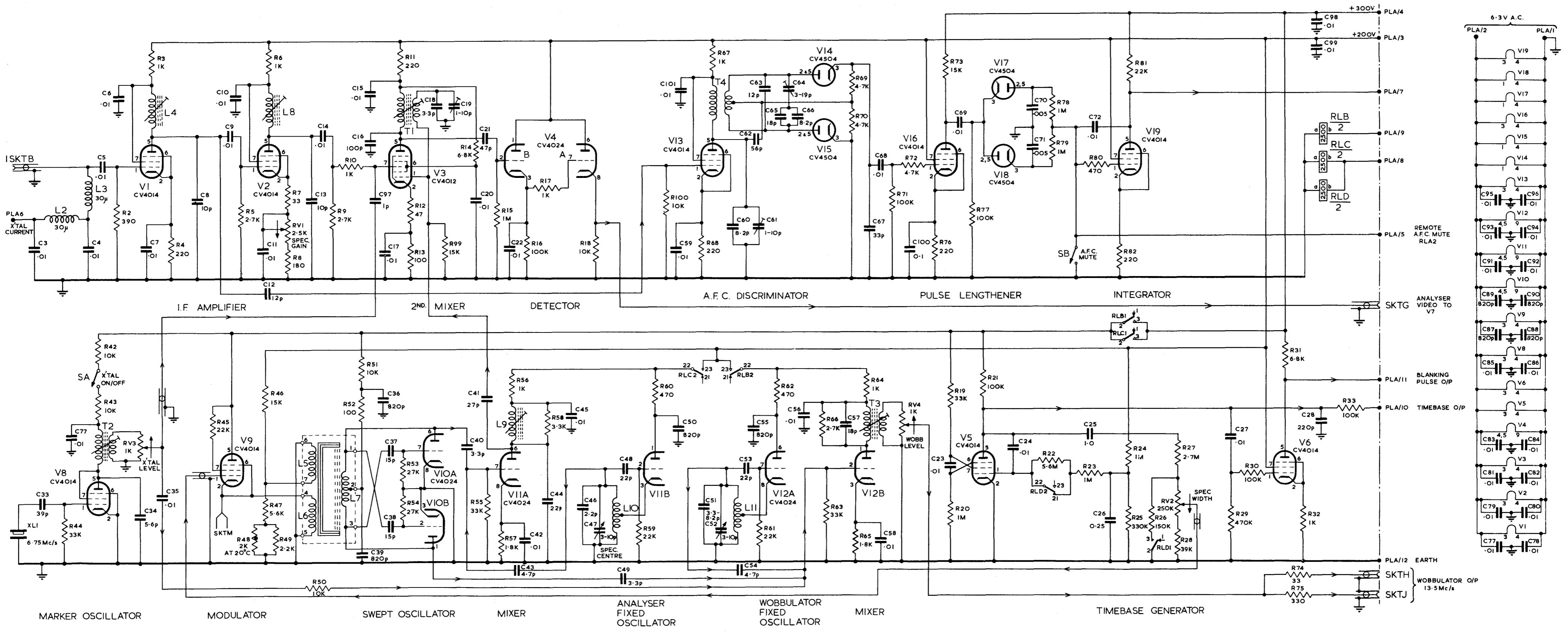


Fig.6

Analyser, spectrum MI: circuit of sub chassis

Fig.6

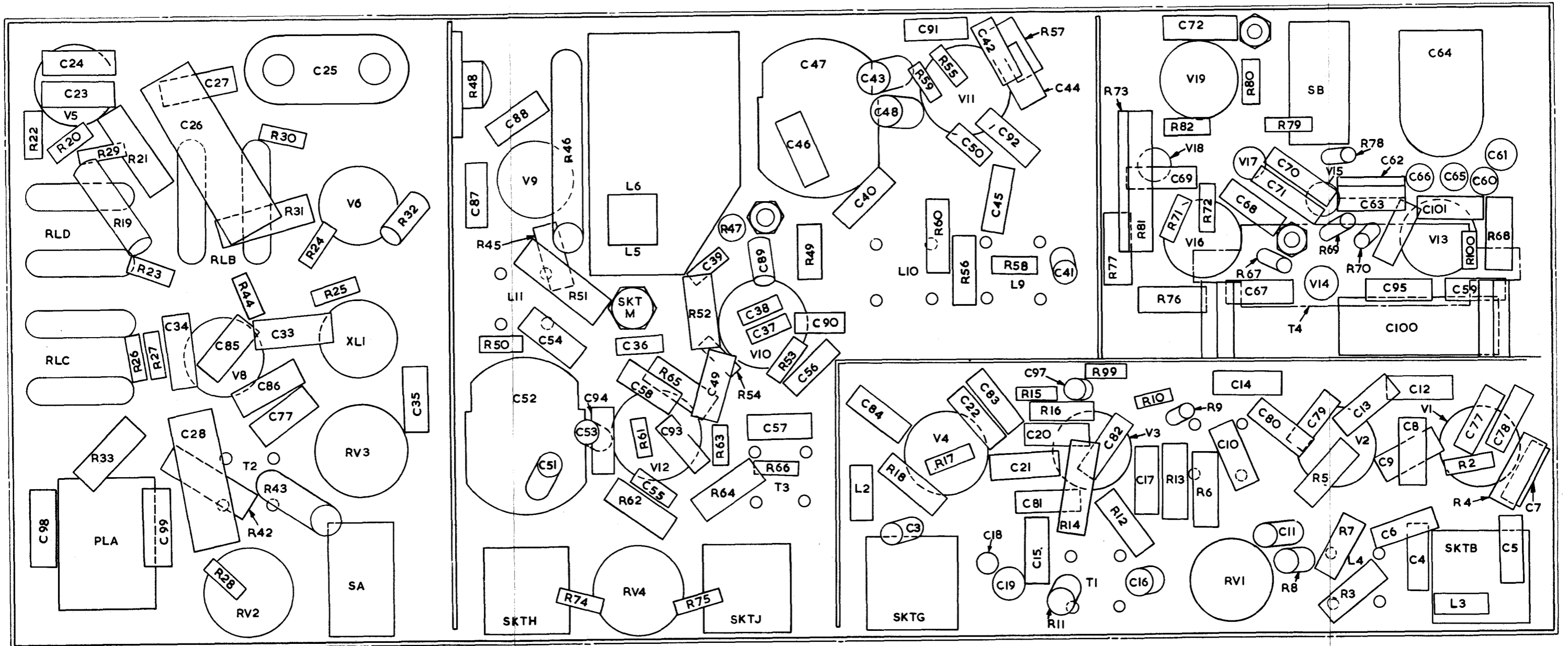


Fig. 7

Analyser, spectrum MI: sub chassis component layout

## Chapter 4

### R.F. WAVEMETER

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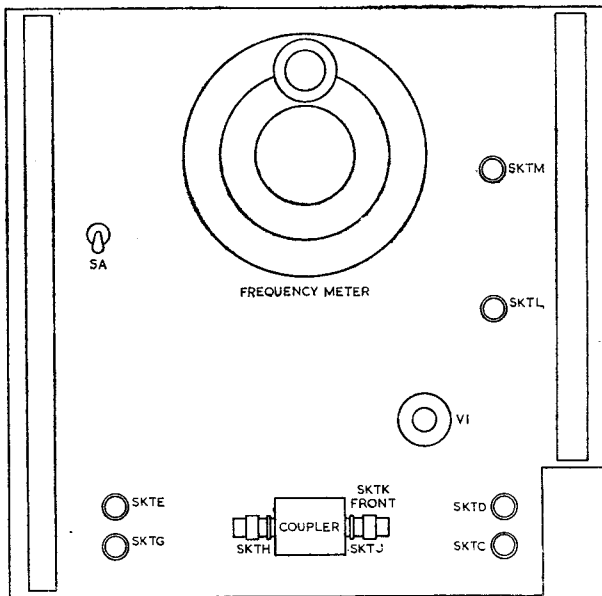


Fig. 1. R.F. wavemeter: front view

#### Introduction

1. The r.f. wavemeter (fig. 1) is used on the radar Type 84 transmitter/receiver to perform the following functions:—

- (1) To provide direct measurement of the local oscillator and standby local oscillator frequencies.
- (2) To provide a detected transmitter output pulse sample for display on the panel (monitor) M13.
- (3) To provide a local oscillator sample for the spectrum analyzer M1.
- (4) To provide a local oscillator feed to the signal mixer M4.

#### Performance characteristics

2. Power supplies  $6.3V \pm 0.3V$  a.c. at 1A required  
 $200V \pm 2.0V$  a.c. at 15 mA

Accuracy of frequency measurement Not worse than 2 parts in 1000

#### Mechanical description

3. The mechanical construction and layout of the unit can be seen from fig. 1 and 2. The unit is mounted on the left-hand cabinet gate at position 2B. The overall dimensions are  $15\frac{1}{2}$  in.  $\times$  15 in.  $\times$  9 in., and the approximate weight is 11 lb.

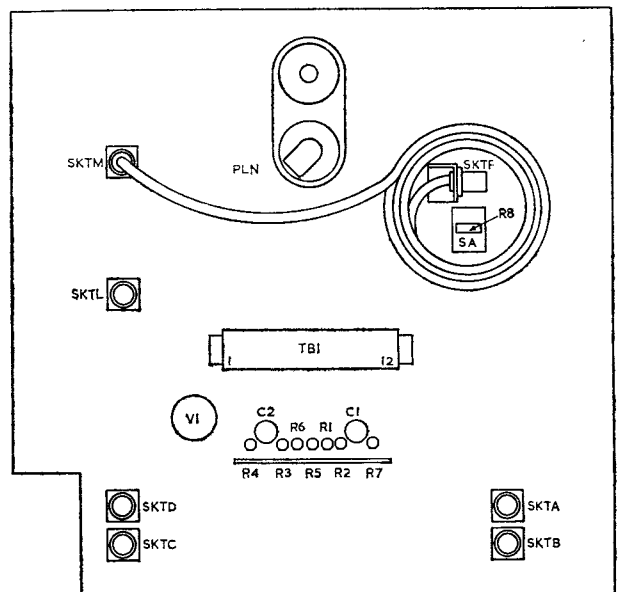


Fig. 2. R.F. wavemeter: rear view

### Circuit description

4. The circuit of the r.f. wavemeter is shown in fig. 4. It utilizes a modified frequency meter (Marconi Instruments Type TF.1026/3) covering the frequency range 1000–2000 Mc/s.

5. Selection of any one of the three inputs for frequency measurement is accomplished by connection to the frequency meter via the appropriate plug and socket as in Table 1. These plugs and sockets are mounted on the front of the panel. The transmitter and stand by local oscillator pulse samples are fed via long cables providing an attenuation of approximately 10dB and 3.5dB respectively.

6. The signal mixer drive input to SKTB is normally (when not performing frequency measurements) fed to a coupler, via PLH and SKTH, which functions capacitively to provide a local oscillator sample for the spectrum analyzer, fed out at SKTD. The coupler also provides a straight through feed for the signal mixer, fed out at SKTC.

7. The detected transmitter output pulse from the frequency meter (para. 9) is fed via change-over switch SA and capacitor C2 to the grid circuit of a cathode follower stage VI. This stage provides a suitable low output impedance feed to panel (monitor) M13, to allow visual monitoring of the transmitter output pulse.

### Frequency meter

8. The circuit of the frequency meter is shown in fig. 3. It consists essentially of a concentric line resonator, closed at one end and tuned at the other by means of a variable capacitor. The nominal input impedance is 70 ohms.

9. A pick-up loop within the concentric line feeds a silicon crystal rectifier and a 250  $\mu$ A f.s.d. microammeter, which functions as the tuning indicator. The frequency meter is modified to enable a detected output sample of the transmitter pulse to be taken from the crystal rectifier and fed to the cathode follower VI (para. 7).

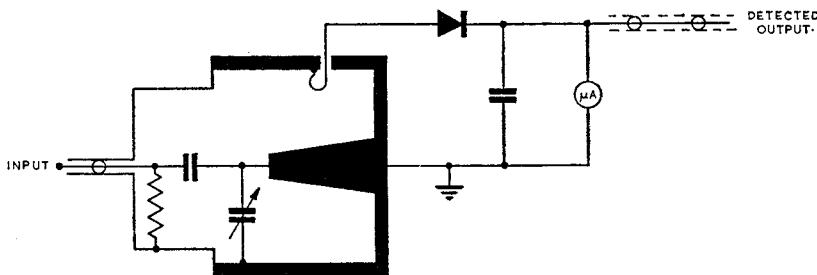


Fig. 3. Frequency meter: circuit

TABLE 1

Selection of inputs to frequency meter

| Function                        | PLE  | PLG  | PLL  | SA                   |
|---------------------------------|------|------|------|----------------------|
| Standby L.O. frequency          | SKTE | SKTG | SKTL | C.W. meter           |
| L.O. frequency                  | SKTG | SKTE | SKTL | C.W. meter           |
| Trans. pulse monitor (see note) | SKTE | SKTG | SKTM | Trans. pulse monitor |

### Note . . .

In this application the frequency meter should be tuned for maximum amplitude of the transmitter pulse as displayed by depressing the WAVEMETER button on panel (monitor) M13.

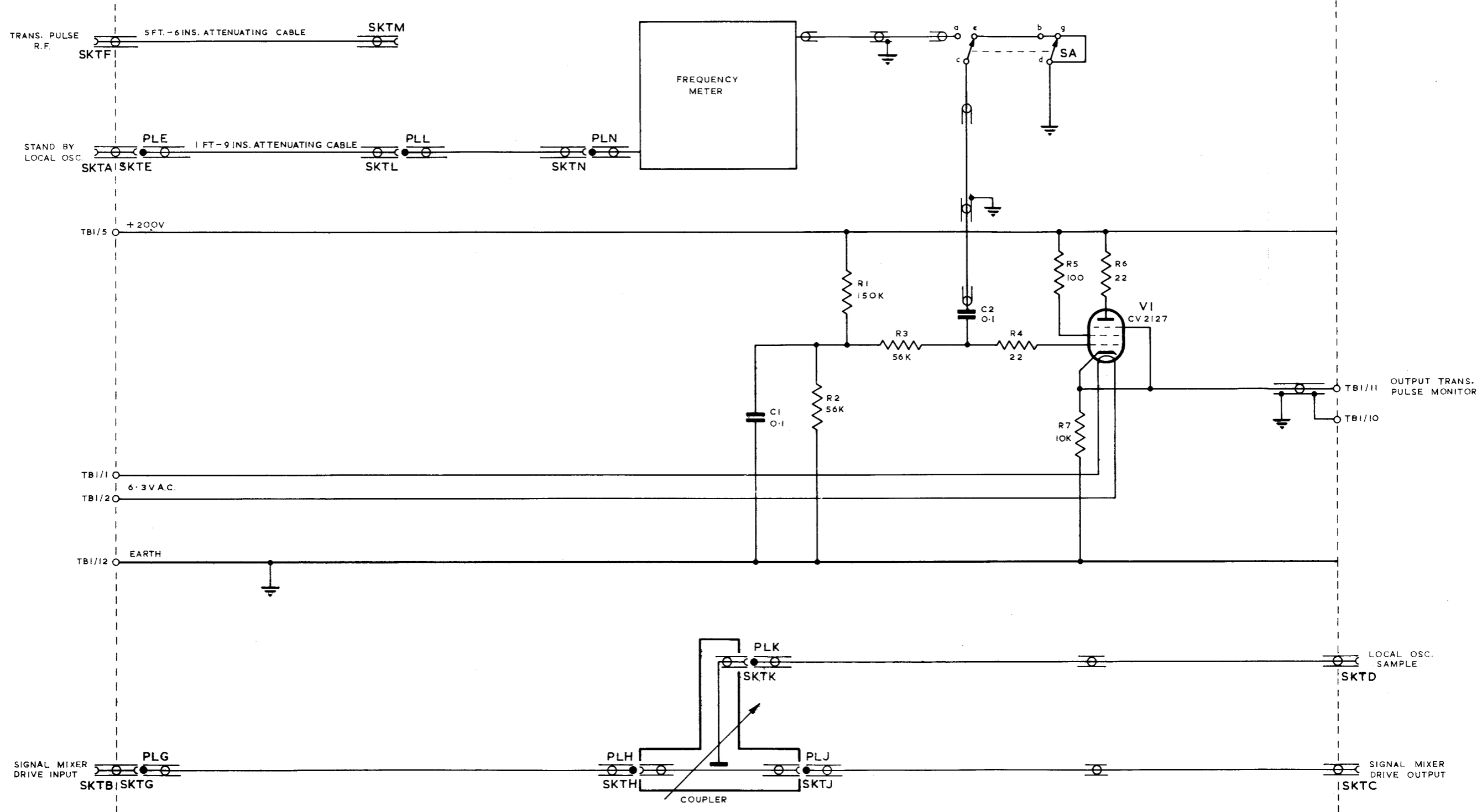


Fig. 4

R.F. wavemeter :circuit

Fig. 4

Chapter 5  
(Completely revised)

NOISE FIGURE MEASUREMENT

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INTRODUCTION

1 The noise figure of the receiving system can be checked in one of three different ways, whilst the transmitter is in operation, according to operational or servicing requirements:

1.1 By setting a selector switch on monitor, noise figure M1 (fig.1) to NORMAL and by pressing a button marked CHECK NOISE FIGURE. The noise source in the receiver input circuit is then pulsed (once every 20 radar pulses) for a period of approximately 10 seconds and the ratio of receiver noise plus injected noise to receiver background noise is automatically indicated on a meter located on the L.H. light and meter assembly. This meter is directly calibrated in noise figure dB's. Normal reception is not interrupted. This check can also be made by pressing the CHECK N.F. button on the transmitter light and meter assembly or by operating a switch on the signal processing console suite.



1.2 By setting the selector switch to CONT. The noise source is then pulsed continuously and the noise figure is indicated on the meter continuously. This enables the receiving system to be adjusted for optimum performance whilst the transmitter is in operation. Again, normal reception is not interrupted.

1.3 By pressing a button the monitor, marked N.T. CONT. The noise source is then operating for the whole time that the button is pressed. This enables a direct comparison to be made of receiver second detector current with and without the noise source. Should the automatic circuits fail for any reason, the performance of the receiver can still be checked by this method. While the button is pressed, normal reception is interrupted.

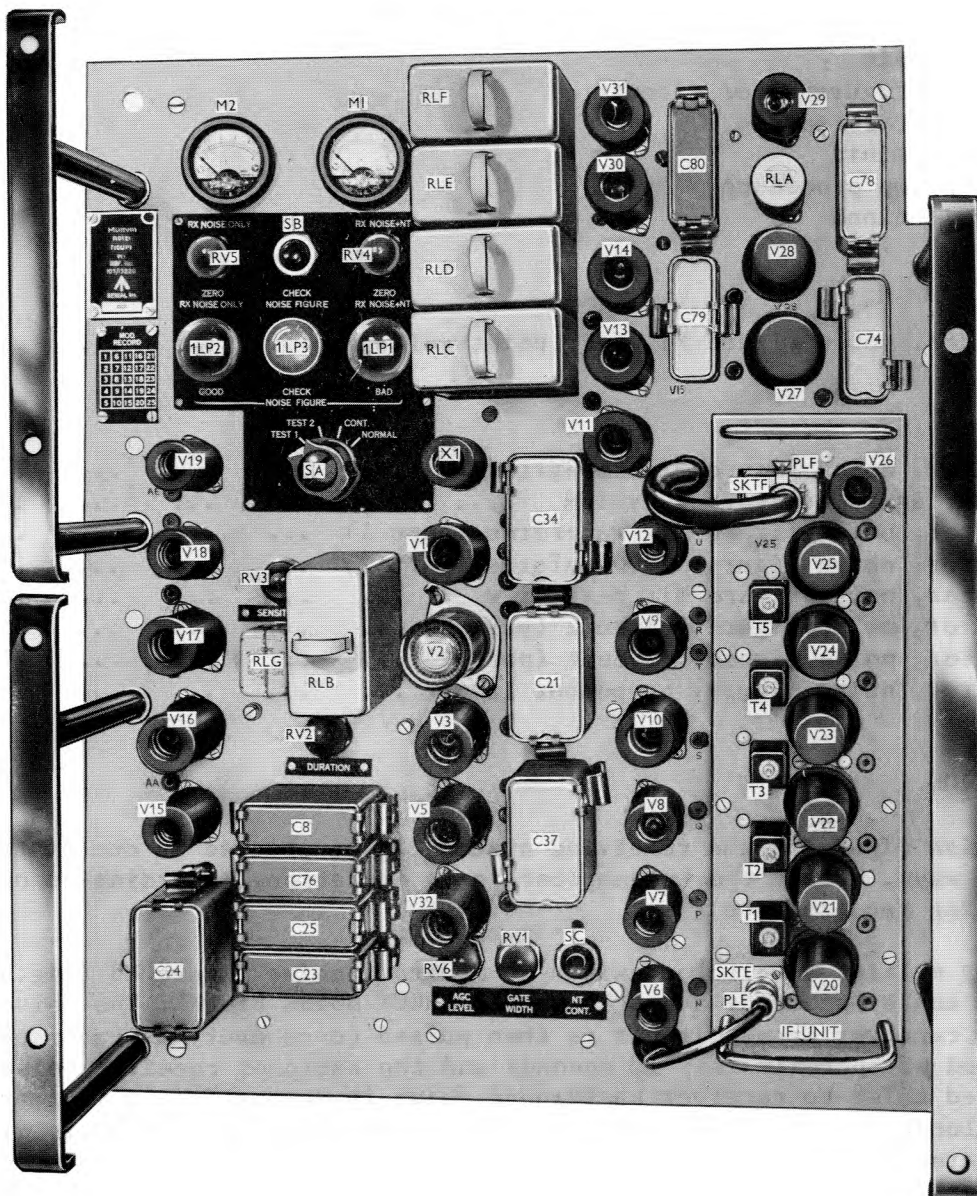


Fig.1. Monitor, noise figure M1: front view

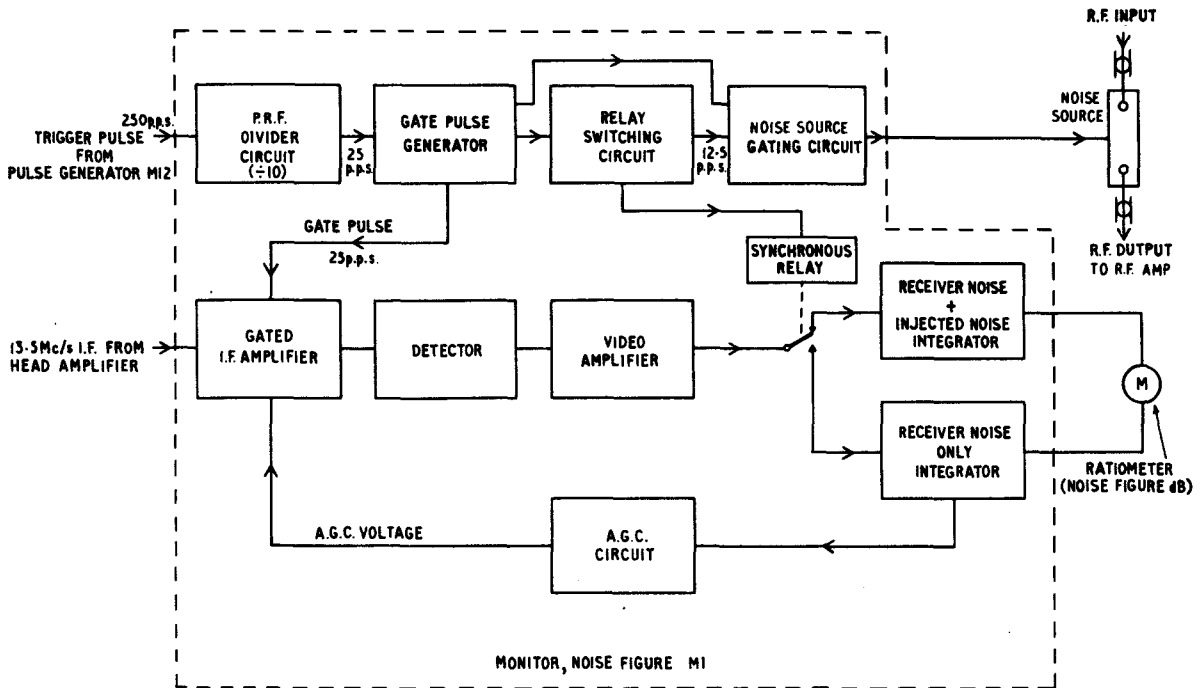


Fig.2. Noise figure monitoring system

#### DESCRIPTION OF SYSTEM

2 A block diagram of the system is shown in fig.2. The noise diode is part of the noise source and limiter-assembly (-1A1, Sect 4, Chap 2) and is driven by the noise source drive p.e.c. When triggered, the source produces a noise signal at a level of 16 dB above aerial thermal noise. By measuring the amount by which this additional noise increases the noise level at the output of the receiver, the noise figure of the receiver is obtained. This measurement is performed automatically by monitor, noise figure M1.

3 The monitor contains a five-stage 13.5 MHz amplifier which is 'gated' so that the output of the receiver head amplifier is amplified during the last 500 us of the interpulse period following every 10th transmitter pulse. The output of the amplifier is detected and the resultant noise pulses are fed alternately to two separate integrating circuits by the contacts of a synchronous relay operating at a frequency of 12.5 Hz. When a noise figure check is made the diode is triggered for the last 500 us of the interpulse period following every 20th transmitter pulse so that one integrating circuit receives pulses of 'receiver noise plus injected noise' whilst the other integrating circuit receives pulses of 'receiver noise only'.

4 Each integrating circuit has a time constant of several seconds. Two d.c. voltages are thus produced, one proportional to the level of noise at the output of the receiver when the noise diode is triggered, the other proportional to the level of receiver back-ground noise. The latter voltage is held at a constant level by an a.g.c. circuit and the ratio of the two voltages is indicated by a moving-coil ratiometer. This is calibrated in terms of noise figure from 4 to 14 dB. (The normal noise figure of the receiver is between 3 and 4.5 dB).

5 Indicator lamps are provided on the monitor, and on the transmitter light and meter assembly and signal processing console suite, to give a visual warning of any deterioration of receiver performance.

#### MONITOR, NOISE FIGURE M1

6 The noise figure monitor (fig.1 and 5) is constructed on a flat panel measuring 15.3/8 in x 18 in x 9 in. This is located at gate position 3B. Its weight is approximately 30 lb. The 13.5 MHz amplifier is a removable sub-unit mounted on the front of the panel. Circuit diagrams of the panel are given in fig.6 and 7. In these diagrams the selector switch SA is shown in the NORMAL position.

#### Performance characteristics

##### 7 Inputs

- 7.1 SKT C 13.5 MHz i.f. signal from Amplifier I.F. (HEAD) M21, 1 mV to 10 mV R.M.S. at 75 ohms (unterminated).
- 7.2 SKT A Trigger pulse from pulse generator M12, 3-15 us, 20-80V positive-going pulse at 250 p.p.s.
- 7.3 TB1/1,2 6.3V a.c. at 3.5A - from power transformer.
- 7.4 TB1/3,4 6.3V a.c. at 5A - T7 at position 5M.
- 7.5 TB1/5,6 6.3V a.c. at 2.5A (at rear of L.H. light and meter assembly).
- 7.6 TB1/8 +200V d.c. at 20 mA - from power supply M10 at position 5D.
- 7.7 TB1/9 +500V d.c. at 1 mA - from power supply M6 at position 5H.
- 7.8 TB1/10 +300V d.c. at 150 mA - from power supply M10 at position 4E.
- 7.9 TB1/11 -250V d.c. at 80 mA - from power supply M10 at position 5F.

##### 8 Outputs

- 8.1 SKT B Switch pulse to noise source drive p.e.c. M1, 500 us negative-going pulse, 48-54V, 12.5 p.p.s.
- 8.2 TB2/1,2 0-500 uA d.c. control current to noise figure meter.
- 8.3 TB2/3,4 0-500 uA d.c. deflection current to noise figure meter.

#### P.R.F. divider and gate pulse generator (fig.6)

9 The monitor is triggered by the positive-going 3-15 us pre-pulse from the transmitter pulse generator panel (Sect 3, Chap 2). In order to obtain a gating pulse after each tenth radar pulse, the pre-pulse is fed to a frequency divider circuit. This comprises a cathode follower input stage V1a, a negatively biased squarer V1b and a dekatron counting tube V2. The duration of the input pulse is

increased to approximately 100 us by means of a pulse stretching network C2, R2 in V1a cathode circuit, the pulse is then amplified and inverted by V1b to provide a suitable drive pulse for V2. The output of the dekatron (cathode 6) is a positive-going pulse of 1/p.r.f. duration (fig.3). This is applied via differentiating network C7, R15 to the grid of a second cathode follower V3a.

10 V3a operates with a negative bias and accepts the positive-going edge of the pulse from V2, this 'spike' is used to trigger a cathode-coupled flip-flop delay circuit V5a and V5b.

11 V5b, which is normally conducting due to the positive bias from R31 and RV1, produces a positive-going output pulse lasting for approximately 3.5 ms, the actual duration being adjusted by means of RV1 (GATE WIDTH) so that the pulse terminates 500 us before the arrival of the next trigger pulse from the pulse generator (see fig.3). The pulse is then fed via a differentiating network C11, R32 to the suppressor grid of V6 which, together with V7, is connected in an Eccles Jordan bi-stable circuit.

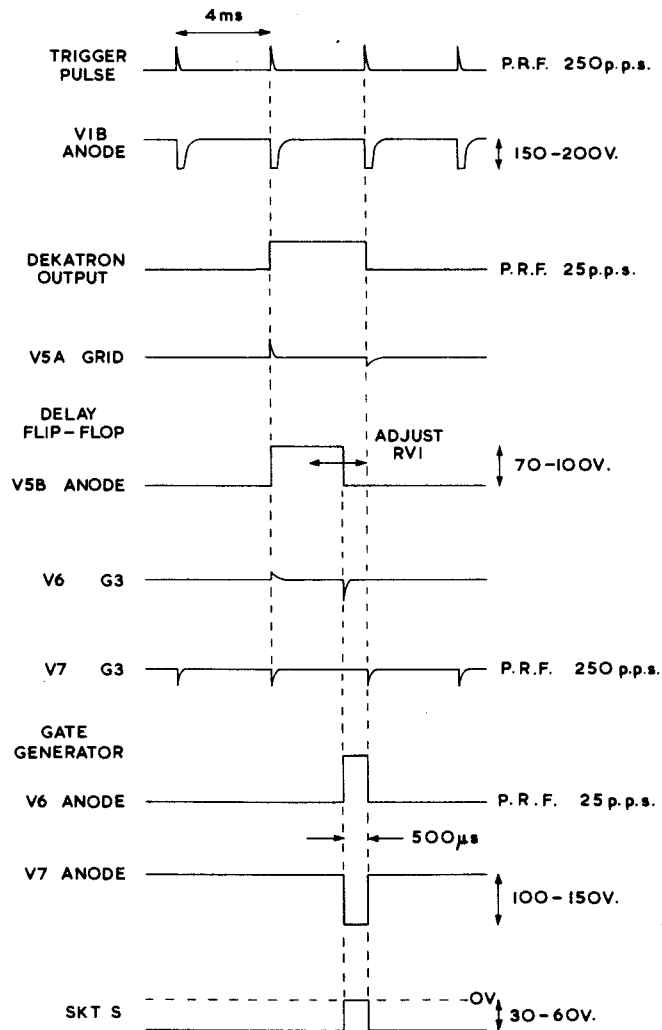


Fig.3 Monitor, noise figure M1: waveforms (part 1)

12 The negative-going pulse produced at the anode of V1b (at the transmitter p.r.f.) is also applied to the suppressor of V7; this valve is thus normally cut-off and V6 is conducting heavily. On the termination of each pulse from V5, however, a negative-going 'pip' is applied to V6 suppressor (V4 clips the positive-going edge of the differentiated waveform) and current is switched to V7 anode until the arrival of the next pulse from V1b. A negative-going pulse is thus produced at V7 anode during the last 500 us of the interpulse period following every 10th radar pulse (see fig.3). A corresponding positive-going pulse is produced at V6 anode.

13 The positive-going pulse from V6 anode is fed, by a cathode follower stage V10b, to the grids of the last three pentodes in the i.f. unit. To ensure that these valves are normally cut-off, a negative bias of approximately 40V is applied to the grid of V10b. V10a is connected as a diode d.c. restorer to prevent V10b grid from rising above earth potential.

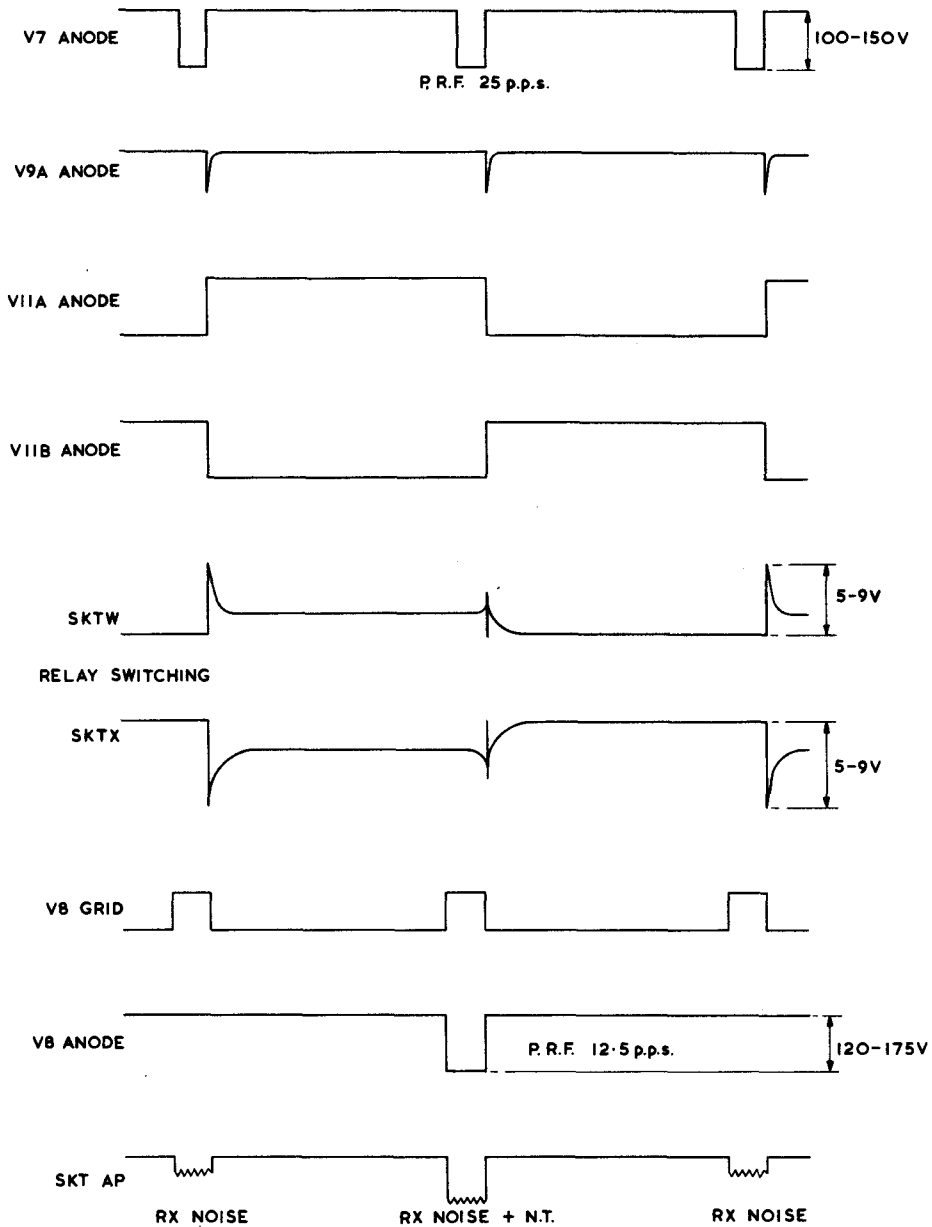
#### Synchronous relay switching

14 A plug-in type synchronous relay RLA is used to switch the noise output of the i.f. unit, alternately, to two integrating networks in the noise figure meter circuit (para 22). This relay has an 85 ohm coil. Current to energize the relay is supplied by a pair of cathode followers V13 and V14. These valves are biased beyond cut-off and are driven into conduction alternately by a second Eccles Jordan bi-stable circuit V11a and V11b, direct coupling being employed from the anodes of V11a and V11b and the grids of the cathode followers. The bi-stable is switched from one state to the other by a negative-going pulse which is applied via diodes V12a and V12b to the grids of V11a and V11b. This negative-going pulse is produced by a negatively-biased amplifier V9a which accepts the positive-going edge of the pulse produced at V7 anode (see fig.4). Current in the relay coil, is thus reversed upon the termination of each 'gate'.

#### Noise source control circuit

15 The negative-going switch pulse for the noise source is produced by feeding the positive-going 'gate' pulse from V6 anode (fig.3) to the grid of a negatively-biased amplifier V8. The suppressor grid of this valve is 'gated' by the waveform from V11a anode (fig.4), used to switch the synchronous relay, so that a pulse is produced at its anode only during the interpulse period following every 20th radar pulse, when the output of the i.f. unit is switched to the 'receiver noise pulse injected noise' integrating circuit. A cathode follower stage V9b provides a low-impedance output to the noise-source drive p.e.c.

16 The operation of V8 is controlled by the monitor selector switch SA. When this is in the TEST 1 or TEST 2 positions, h.t. is removed from V8 screen, thus suppressing the modulator pulse, to facilitate adjustment of the noise figure meter circuit. When the switch is in the CONT. position, h.t. is applied via R49 to V8 screen so that the noise source is pulsed continuously. When the switch is set to the NORMAL position h.t. is applied to V8 screen only when relay RLB is de-energized.



17 Relay RLB forms part of a timing circuit and is normally energized by V15 anode current. When CHECK NOISE FACTOR button SB is pressed or when relay RLG is energized by the operation of the CHECK N.F. button on the transmitter light and meter panel, a negative bias of approximately 125V is applied momentarily to the suppressor grid of V15, and relay RLB releases. Due to the Miller action of V15 relay RLB remains de-energized for a period determined by the setting of RV2 (DURATION). This control is adjusted so that the noise source is pulsed for a period of 10 seconds.

18 To provide a means of checking the receiver 2nd detector current with and without the noise source, a spring-loaded switch SC (N.T. CONT.) is connected in

the output circuit of V9b. When this switch is pressed, a steady negative voltage is applied to the noise source drive p.e.c; the noise source is then triggered for as long as the button is pressed.

#### I.F. unit (fig.7)

19 The narrow-band output of the receiver head amplifier is fed to the linear i.f. channel of the receiver via a straight-through connector box (SKTC-SKTD) mounted on the rear of the monitor panel. A 22 pF capacitor C112 within this box provides the 13.5 MHz signal for the i.f. unit.

20 The i.f. unit contains five transformer-coupled pentode amplifiers V20 to V24 and a diode detector V25. The first two pentodes V20 and V21 are variable- $\mu$  valves and a negative a.g.c. voltage, derived from the noise figure meter circuit, is applied to their control grids. The a.g.c. voltage is adjusted to provide a suitable control current, proportional to receiver background noise, for the noise figure ratiometer (para.23). The remaining pentodes V22 to V24 are normally biased beyond cut-off by the negative bias from V10b (para.13) except during the last 500 us of the interpulse period following every 10th radar pulse, when the positive-going gate pulse is produced. Coupling transformers T1 to T5 are permeability-tuned to a centre frequency of 13.5 MHz, the over-all bandwidth being 400 kHz at 3 dB down. L5, L6, C70, C71 and C72 form a low-pass output filter for the detector.

#### Noise figure meter circuit

21 The output of the detector is fed to a video amplifier stage V27. Negative feedback is used to improve the linearity of this stage, which has a voltage gain of approximately 3, and the output is fed via a diode rectifier V28 to synchronous relay switch RLA. When the noise diode is pulsed, the output of V27 consists of negative-going pulses of receiver noise and receiver noise plus injected noise (fig.4, SKT AP). These pulses are fed alternately, by the contacts of RLA, to two identical integrating networks C79, R138 and C80, R140. C80 is charged to a level proportional to the receiver background noise and C79 is charged to a level proportional to the receiver noise plus the injected noise. Due to the slow reverse time constant of the time integrating networks steady negative potentials are developed at the grids of V31a and V30a. These two valves are connected as differential cathode-followers and feed the control and deflection coils of a 500 uA moving-coil ratiometer (RM). A direct indication of the ratio 'receiver noise plus injected noise' to 'receiver noise only' is thus obtained. The ratiometer is calibrated in terms of noise figure from 4 to 14 dB. The noise figure is equal to:

$$\text{Noise source in dB} = 10 \log_{10} (R^2 - 1)$$

where R = voltage ratio (receiver noise plus noise source: receiver noise only)

22 An a.g.c. circuit is incorporated to maintain the ratiometer control current at a constant value. Any deterioration in receiver noise figure thus causes the ratiometer deflection current to fall. The circuit consists of a differential d.c. amplifier V32 and a cathode-follower stage V3b which provides a negative bias of 7 to 13V for the grids of the first two i.f. amplifiers. One grid of V32 (pin 2) is connected to the cathode of V31a; the potential on this grid is thus

proportional to the level of receiver noise. The other grid is connected to a stabilized reference potential. Any difference between these potentials is thus amplified and the gain of the i.f. amplifier is reduced or increased accordingly.

23 Preset controls RV4 and RV5 are provided for zeroing the ratiometer and RV6 for setting the a.g.c. level. The full procedure for adjusting these controls is given in para.32. To facilitate the adjustments two 0-250 uA meters M1 and M2 are connected in series with the ratiometer coils and two test positions TEST 1 and TEST 2 are provided on the monitor selector switch. With the switch in the TEST 1 position relay RLE is energized (this earths the grids of V30a and V31a) and h.t. is removed from the i.f. unit. With the switch in the TEST 2 position h.t. is applied to the i.f. unit but not to the noise source switching stage V8. The external connections to the ratiometer are shown in fig.6 and in Sect 6, Chap 5, fig.7.

24 To prevent possible damage to the meters when supplies are first applied to the panel, a second relay RLF is included in the meter circuit. This relay shorts M1, M2 and the control and deflection coils of the ratiometer, and earths the grids of V30a and V31a, until a thermal delay switch X1 (fig.6) closes. This occurs approximately 1½ minutes after the heater supplies come on. Relay RLF is then energized and the 6.3V a.c. supply to the delay switch heater is removed; a hold-on contact RLF5 prevents the relay de-energizing.

#### Indicator lamps

25 Three indicator lamps are mounted on the front of the panel: a yellow lamp ILP3 which is illuminated during the 10-second check period, a green lamp ILP2 (GOOD) which indicates a normal noise figure, and a red lamp ILP1 (BAD) which lights if the noise figure exceeds 4.5 dB. The operation of these lamps is controlled by relays RLD and RLB (fig.6).

26 During the check period when relay RLB is de-energized, 6.3V a.c. is applied via relay contacts RLB3 to the yellow CHECK lamp. At the end of the check period, when relay RLB is energized again, this supply is switched to either ILP1 or ILP2 depending on the position of relay contacts RLD1.

27 Relay RLD is energized by V17b anode current (fig.7). This valve, together with V17a, forms a bistable trigger circuit which is switched from one stable state to the other by relay RLC. Relay RLC is connected in the anode circuit of a differential amplifier V16, one grid of which is directly coupled to the cathode of V30a (receiver noise plus noise source). The other grid of V16 is returned to a negative bias of between 3 and 7V and this is adjusted by means of RV3 (SENSITIVITY), so that the current taken by V16b is sufficient to energize the relay as long as the noise figure is better than 4.5 dB.

28 Should the noise figure exceed 4.5 dB during the check period, relay RLC releases due to the fall in the negative potential at V31a cathode (i.e. due to the fall in the level of receiver noise plus injected noise.) A positive bias, from R91 and R167 is then applied to V17a grid. This causes V17a to conduct, V17b is then cut off and relay RLD releases. At the end of the check period, relay RLC is again energized (due to the removal of the noise source) but the bistable is prevented from returning to its former state by relay contacts RLB1 which open. Relay RLD thus remains de-energized and the red lamp remains on until the next check is made.



30 On continuous operation, relay contacts RLB1 remain open. To enable the circuit to function, therefore, these contacts are shorted by monitor selector switch SA. Relay contacts RLD2 and RLB4 operate the remote indicator lamps.

#### Test points

31 Test sockets are provided at various points in the circuit for monitoring purposes. The d.c. voltages at these points under static conditions (i.e. with trigger input removed, with all controls turned fully clockwise and with switch SA set to CONT.) are given in Table 1. A multimeter Type 1 should be used to check these voltages.

#### SETTING UP PROCEDURE

32 The following procedure should be followed when setting up the system:

32.1 Ensure that the bandpass r.f. filter control on the waveguide frame assembly is set to the position appropriate to the crystal in use in the stable local oscillator and check that the oscillator is correctly tuned.

32.2 Set monitor selector switch SA to the TEST 1 position. Check that dekatron counter V2 is operating (e.g. that the glow is uniformly distributed round the electrodes), and trigger oscilloscope CT316 from SKT K. Connect the Y input of the oscilloscope to SKT S and adjust the timebase controls to display one complete cycle of waveform. This will be a positive-going pulse of between 30 and 60V amplitude (fig.3). Set the pulse duration to 500 us by adjusting GATE WIDTH control RV1.

32.3 Adjust the oscilloscope timebase controls so that four complete waveforms are displayed. Transfer the Y input of the oscilloscope, set to the 10V range, to SKT W and SKT X and check that the waveforms at these points are of the approximate form shown in fig.4. Check aurally that synchronous relay RLA is operating.

32.4 Set the monitor selector switch to the TEST 1 position. Adjust RV4 to make meter M1 RX.NOISE + N.T. indicate on the red T1 mark. Adjust RV5 to make meter M2 RX.NOISE ONLY indicate on the red T1 mark.

32.5 Set the selector switch to the TEST 2 position. Adjust RV6 A.G.C. LEVEL so that meter M2 indicates on the red T2 mark. (N.B. this adjustment may seem 'spongy' due to the time constants of the integrator). Adjust RV4 as necessary to make the noise figure meter (L.H. light and meter assembly) indicate 1 on the lower scale.

32.6 Set the selector switch to the CONT. position. Check that a noise figure of 4 dB or less is indicated on the noise figure meter. Turn the sensitivity control RV3 on the monitor fully clockwise; the green GOOD lamp should light. Turn RV3 slowly counter-clockwise and establish the point at which the green GOOD lamp goes out and the red BAD lamp comes on. Finally set RV3 5 degrees clockwise from that point.

32.7 Set the monitor selector to CONTINUOUS and check that the noise figure meter reads 4 dB or less and that the green GOOD lamp is lit.

32.8 Adjust the gain of the receiver to give a 2nd detector current of 150  $\mu$ A.

32.9 Press the N.T. CONT. button on monitor, noise figure M1 and check that the 2nd detector current increases to greater than 220  $\mu$ A.

32.10 Set the monitor selector switch to NORMAL and allow 15 seconds for the circuits to settle down. Press the CHECK NOISE FIGURE button and check that the yellow CHECK lamp comes on and stays on for 10 seconds, that the noise figure is correctly indicated during this period and that after 10 seconds the yellow lamp goes out and the GOOD lamp comes on.

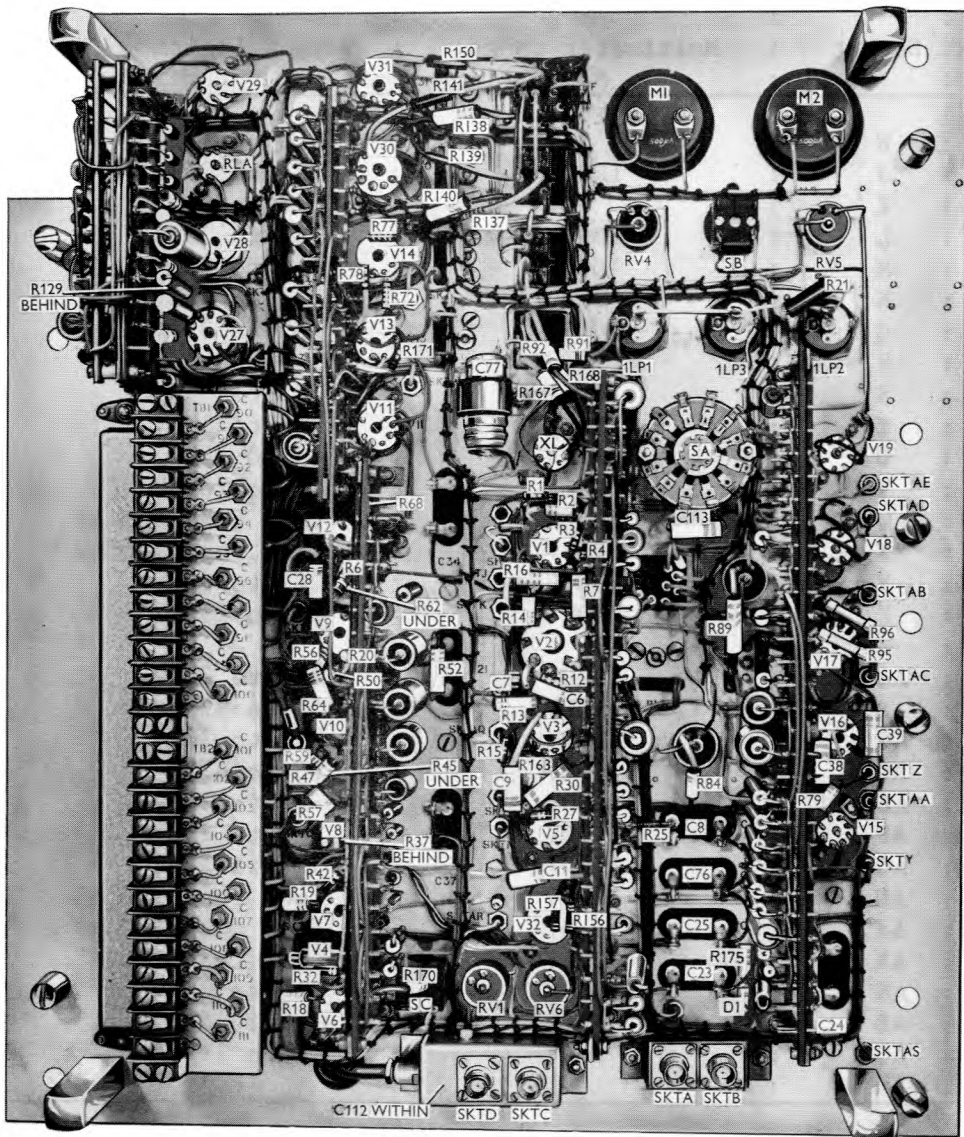


Fig.5 Monitor, noise figure M1: rear view

33 Special test equipment consisting of a solid state noise source, its associated power supply, a waveguide cross bar transition and two variable attenuators are provided for checking the accuracy of the built in equipment. In use, the waveguide cross bar transition is connected to the waveguide output flange of the transmitter and the attenuators are inserted and adjusted. The noise figure is read off from a calibration chart. Full details of this equipment are given in AP 115H-0104-1, Sect 7, Chap 1.

#### Modifications

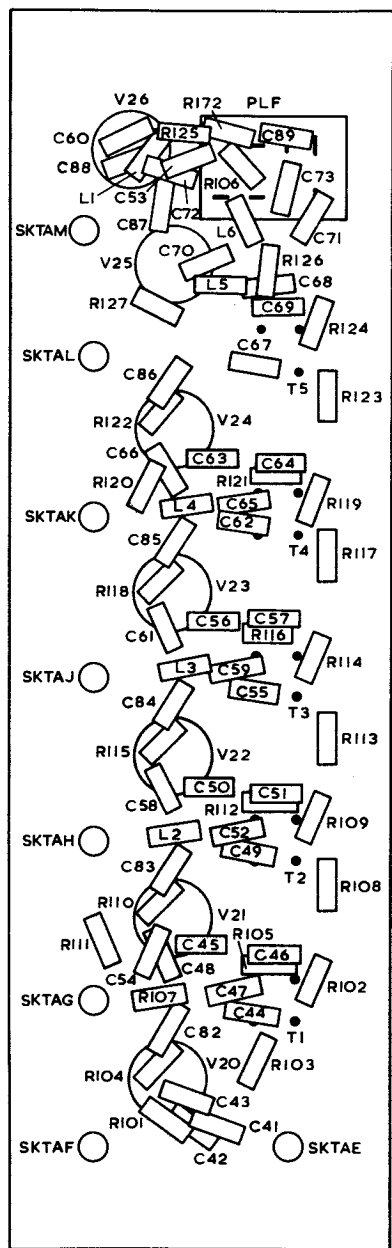
34 The latest modifications incorporated in the text and illustrations of this chapter are:

CA 8335/2, CA 8336/2, CA 8337/50.

TABLE 1 MONITOR, NOISE FIGURE M1: TEST POINT VOLTAGES

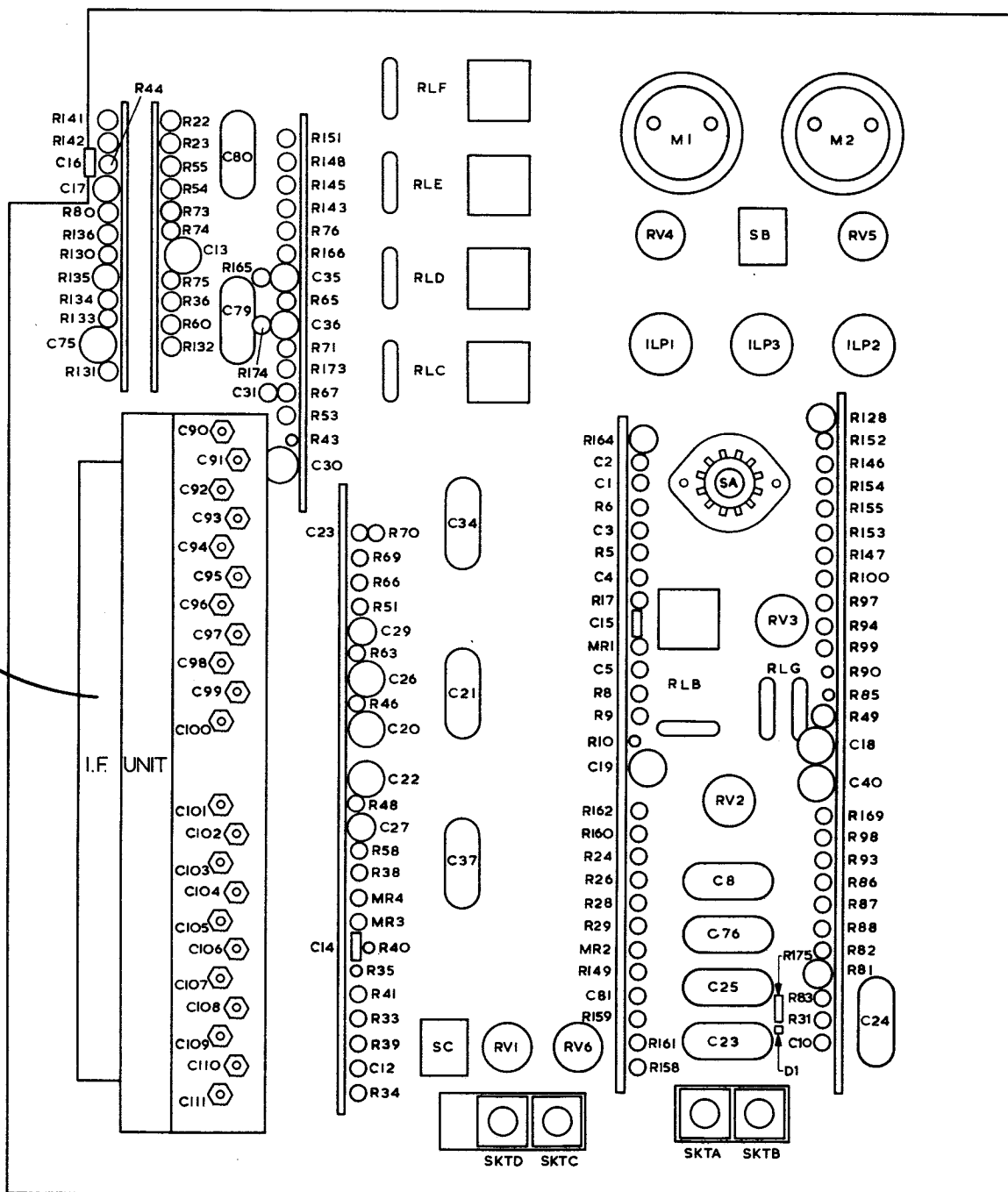
| Socket | Multimeter range | Limits           |
|--------|------------------|------------------|
| H      | 25V              | 6.6 to 11.0V     |
| J      | 1000V            | 227 to 253V      |
| K      | 10V              | 5.6 to 9.4V      |
| L      | 1000V            | 287 to 300V      |
| M      | 1000V            | 196 to 238V      |
| N      | 250V             | 137 to 203V      |
| Q      | 1000V            | 287 to 300V      |
| R      | 10V              | 2.55 to 4.25V    |
| S      | 100V             | -25 to -45V      |
| T      | 1000V            | 287 to 300V      |
| U      | 100V             | 45 to 75V        |
| V      | 100V             | 45 to 75V        |
| W      | 2.5V             | Less than 2.5 mV |
| X      | 2.5V             | Less than 2.5 mV |
| Y      | 1000V            | 287 to 300V*     |
| Z      | 250V             | 96 to 168V       |
| AA     | 1000V            | 270 to 300V      |
| AB     | 100V             | 57 to 95V        |
| AC     | 1000V            | 270 to 300V      |
| AD     | 100V             | 83 to 87V        |
| AE     | 100V             | -83 to -87V      |
| AF     | 10V              | 1.7 to 2.8V      |
| AG     | 10V              | 1.7 to 2.8V      |
| AH     | 2.5V             | Less than 100 mV |
| AJ     | 2.5V             | Less than 100 mV |
| AK     | 2.5V             | Less than 100 mV |
| AN     | 1000V            | 240 to 264V      |
| AB     | 10V              | 3.3 to 5.5V      |
| AQ     | 100V             | 10 to 29V        |

\*Press switch SB to obtain this reading



I.F. UNIT

Fig. 8



Monitor noise figure M1: component layout

Fig. 8

Chapter 6

R.F. POWER MEASUREMENT SYSTEM  
(Completely revised)

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- 1 Introduction
- 2 Thermo-couple mounts
- 3 Power measurement
- 4 Breakthrough monitor

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| 2 Power and breakthrough monitor circuits | 3    |

Introduction

1 The r.f. power measurement system continuously monitors transmitted power in the waveguide system immediately after the magnetron launching section. Two thermo-couples, a quarter wavelength apart, are mounted on the waveguide assembly. There are two versions of each waveguide assembly as follows:

| <u>Frequency band</u> | <u>Transmission</u>                    |
|-----------------------|--|
| Blue/yellow           | Waveguide assembly<br>5840-99-971-1200 |
| Red/yellow            | Waveguide assembly<br>5840-99-970-5101 |

Transmitted power is indicated by a meter on the L.H. light and meter assembly.

Thermo-couple mounts

2 The element of each thermo-couple is in the form of a loop which couples with the H.field in the waveguide. Insertion depth and orientation controls the level of coupling and hence D.C. output. The whole waveguide section containing the thermo-couples may be removed and fitted in the calorimeter and heat exchanger trolley for calibration. An identical power meter with lead lengths similar to those in the transmitter is provided in the kit. Insertion depth and orientation of each thermo-couple may then be adjusted until the meter and calibrated calorimeter load readings correspond. (Refer AP 115H-0104-1 Sect 6 Chap 2).

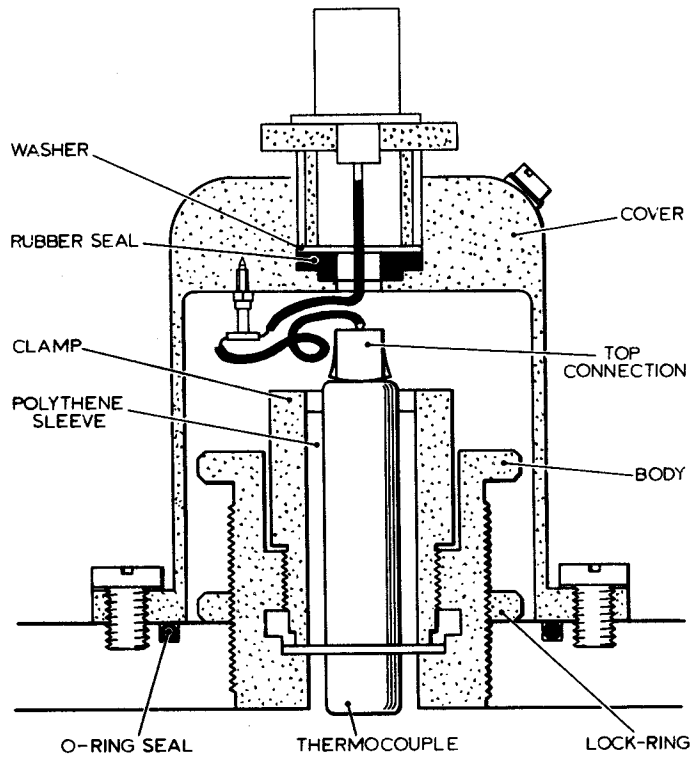


Fig.1 Thermo-couple mount: sectional view

Power measurement

3 Two types of thermo-couple are used: one to give a positive output (N.S. No. 6655-99-911-6365) and the other a negative output (6685-99-943-6974). This effectively places them in series and their D.C. outputs are combined to provide a reading on the power meter proportional to transmitted mean power. Direct coaxial connections are provided between thermo-couples and the meter (M3 on the L.H. light and meter assembly - Sect 6 Chap 5). A low resistance meter (F.S.D. 2 mA, 5 ohm) is used due to the very low output impedance of the thermo-couples.

Breakthrough monitor

4 A directional coupler, set to 30 dB of coupling, is fitted in the receiver arm, immediately after the duplexer and before the first bandpass filter. This provides a means of monitoring the breakthrough from the duplexer in terms of

power, and deterioration of T/R cell condition. The coupler output is fed via a 50 ohm coaxial cable to an external monitoring point fitted to the top panel of the transmitter cabinet (L.H. Annexe). A 13A mains power point is also provided adjacent to the monitor point. These facilities allow permanent connection to an external microwave power meter with a suitable thermistor head. For checking operation refer to AP 115H-0101-45, Schedule 1.

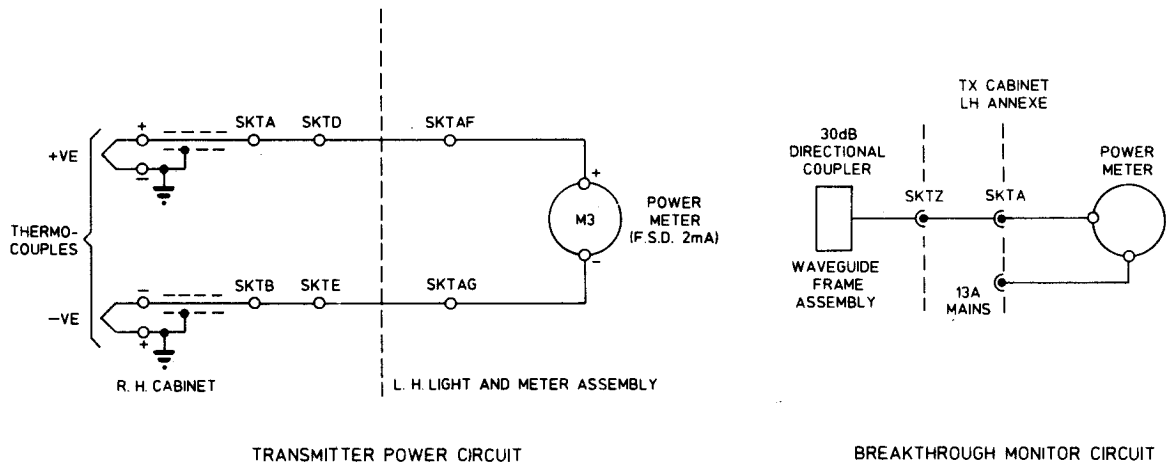


Fig.2 Power and breakthrough monitor circuits

## Chapter 7

# VOLTAGE AND CURRENT MONITORING

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#### Introduction

1. Six electrical test panels (M9, M11, M14, M10, M12 and M58) facilitate voltage and current monitoring on the radar Type 84 transmitter/receiver. One of these test panels (M12) also monitors the temperature of the liquid coolant through the magnetron and associated magnet.

2. The test panels measure voltages to an accuracy of  $\pm 2\%$ , currents to an accuracy of  $\pm 4\%$  and temperatures to an accuracy of  $\pm 2\%$ , in association with the related components in the transmitter/receiver.

#### PANEL, TEST ELECTRICAL (No. 1) M9

3. This test panel (*fig. 1 and 2*) is located on the L.H. cabinet gate at position 1A. The panel dimensions are: height 9 in., length 9 in., width  $15\frac{3}{8}$  in., and the weight is  $6\frac{1}{2}$  lb. Eighteen push-buttons mounted on the front of the panel select the various functions.

4. Switch-bank SA (*fig. 13*) of which only the first three sections are used, switches voltmeter M1 to

monitor the voltages as indicated on the front of the panel, by means of R5, R6 and associated external series multiplying resistances.

5. Switch-bank SB switches ammeter M2 to monitor the current as indicated on the front of the panel through shunts R7 to 18.

6. Certain power supply outputs are directly distributed to various panels as shown in *fig. 13*.

7. The red phase of the mains supply, from contactor A of the circuit breaker assembly, is distributed via individual fuses FS1 to FS4 to various units as in *fig. 13*. Neon indicator lamps ILP1-4 give visual indication of fuse failure.

#### PANEL, TEST ELECTRICAL (No. 2) M11

8. This test panel (*fig. 3 and 4*) is located on the L.H. cabinet gate at position 1D. The panel dimensions are: height 9 in., length 9 in., width  $15\frac{3}{8}$  in., and the weight is 8 lb. Twelve push-buttons mounted on the front of the panel select the various functions.



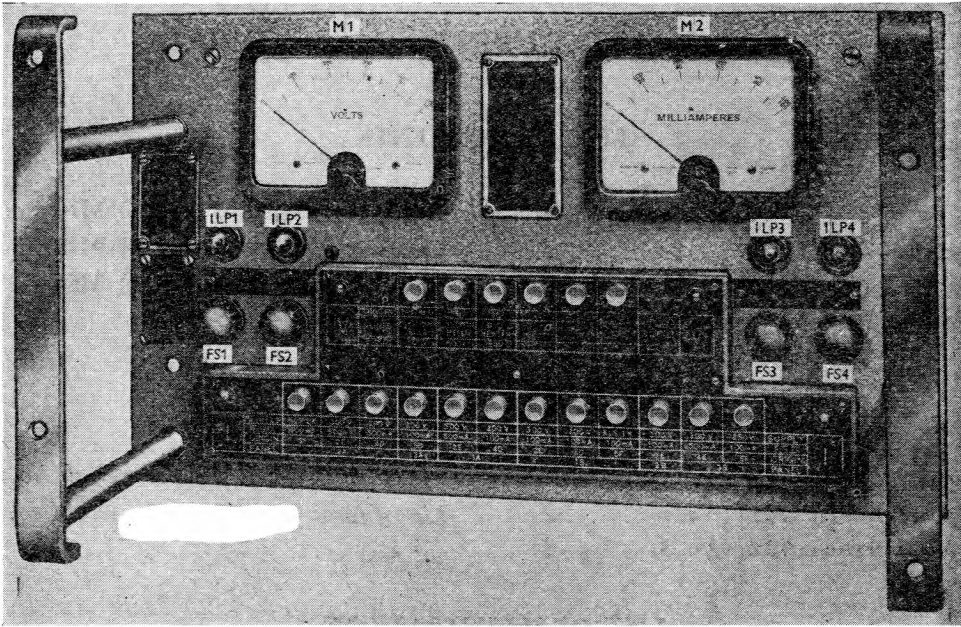


Fig. 1. Panel, test electrical (No. 1) M9: front view

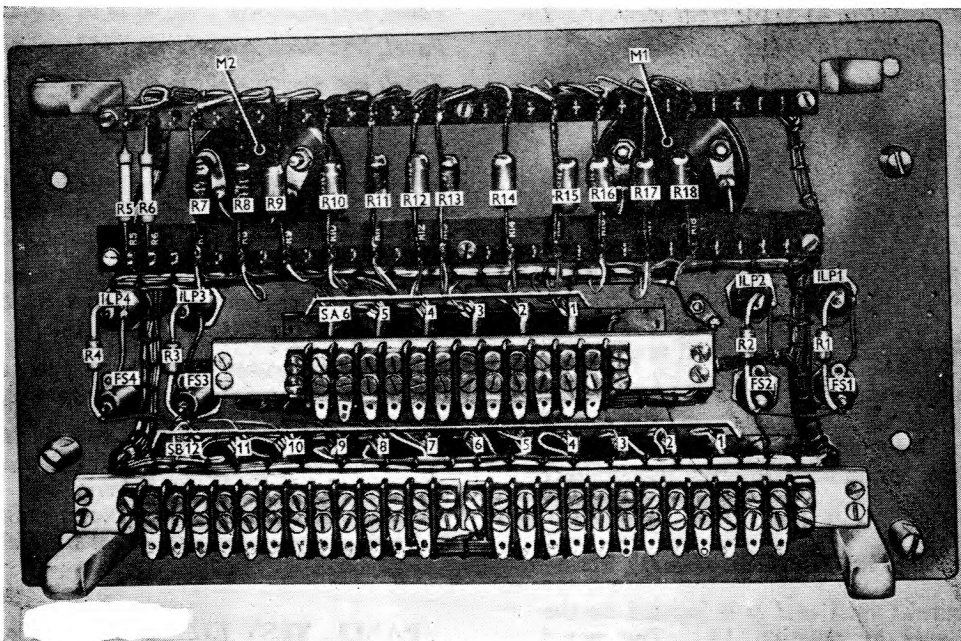


Fig. 2. Panel, test electrical (No. 1) M9: rear view

AP

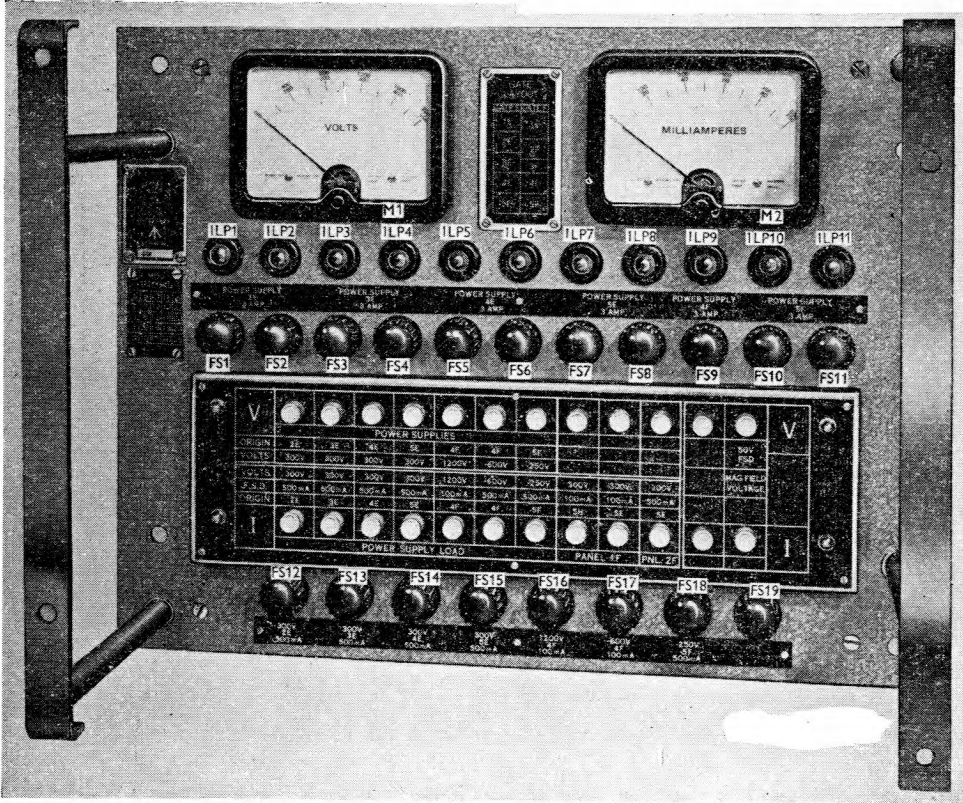


Fig. 5. Panel, test electrical (No. 3) M14: front view

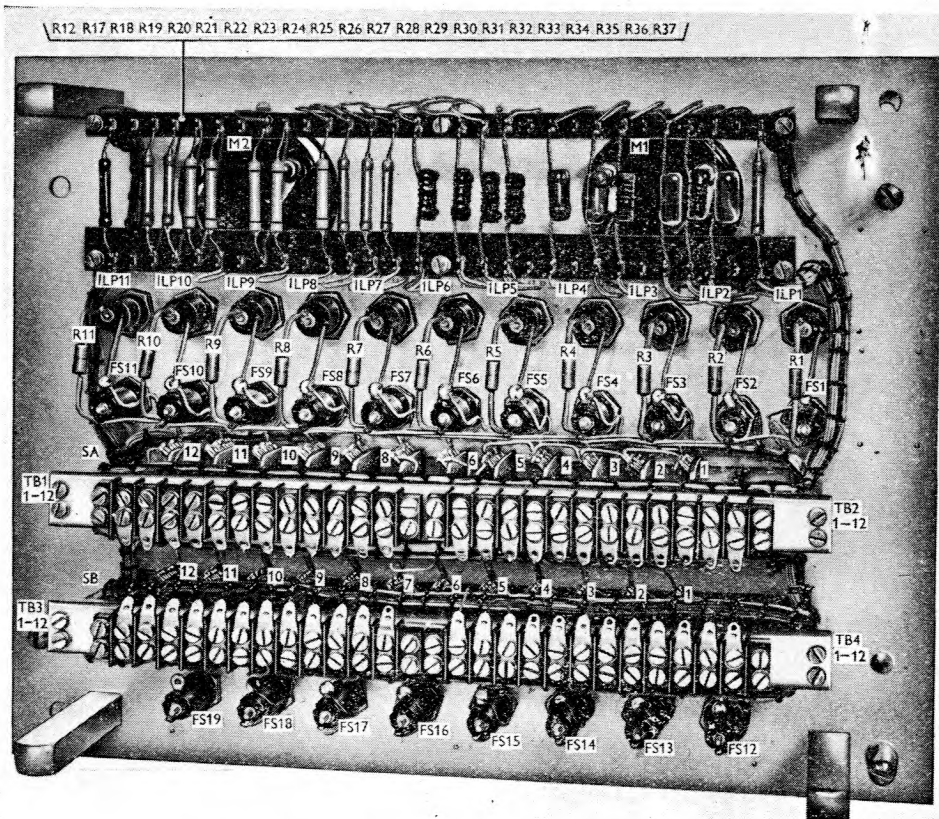


Fig. 6. Panel, test electrical (No. 3) M14: rear view

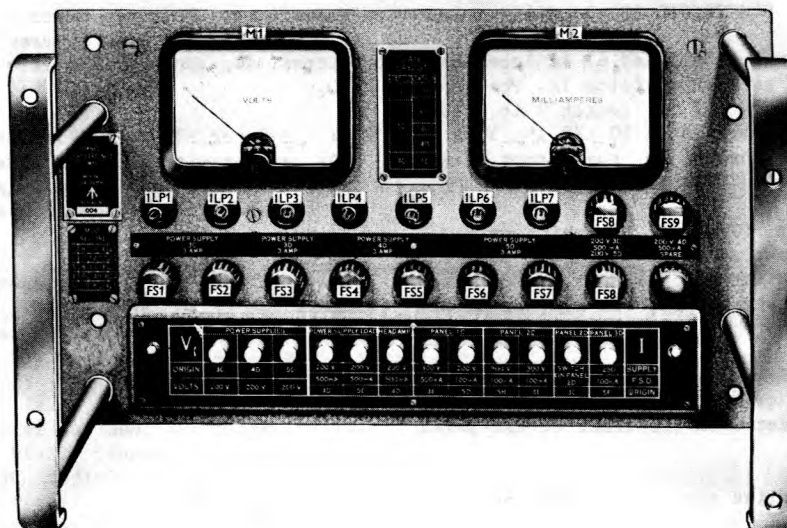


Fig.3 Panel, test electrical (No.2) M11: front view

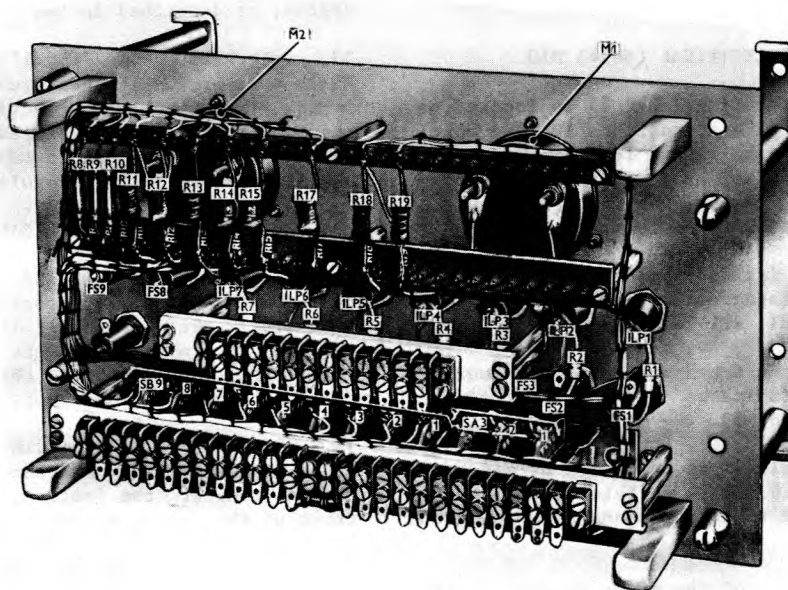


Fig.4 Panel, test electrical (No.2) M11: rear view

9. Switch-bank SA (fig.14) switches voltmeter M1 to monitor the voltages as indicated on the front of the panel, via R8 to R10.

10. Switch-bank SB switches ammeter M2 to monitor the currents as indicated on the front of the panel, through R11 to R19.

11. The power supplies are protected by means of fuses FS8 to FS10, and certain supplies are

directly distributed to various panels as on fig.14.

12. The red phase of the mains supply and the delayed red phase, from contactor D of the circuit breaker assembly, are distributed via individual fuses FS1 to FS7 to various units as on fig.14. Neon indicator lamps ILP1 to ILP7 give visual indication of fuse failure.

PANEL, TEST ELECTRICAL (No.3) M14

13. This test panel (fig.5 and 6) is located on the R.H. cabinet gate at position 1E. The panel dimensions are: height 12 in, length 9 in, width 15 3/8 in, and the weight is 10 1/2 lb. Twenty-four push-buttons mounted on the front of the panel select the various functions.

14. Switch-bank SA (fig.15) of which only the first seven and last sections are used, switches voltmeter M1 to monitor the voltages as indicated on the front of the panel, via R12, 17-26 and R37.

15. Switch-bank SB, of which only the first ten sections are used, switches ammeter M2 to monitor the current as indicated on the front of the panel through R27-36.

16. The power supplies are protected by means of fuses FS12 to FS18.

17. The yellow phase of the mains supply and the delayed yellow phase from the circuit breaker assembly are distributed via individual fuses FS1 to FS11 to various units as shown on fig.15. Neon indicator lamps ILP1 to ILP11 give indication of fuse failure.

PANEL, TEST ELECTRICAL (No.4) M10

18. This test panel (fig.7 and 8) is located on the R.H. cabinet gate at position 1H. The panel dimensions are: height 12 in, length 9 in, width 15 3/8 in, and the weight is 10 1/2 lb. Twenty-four push-buttons mounted on the front of the panel select the various functions.

19. Switch-bank SA (fig.16) switches voltmeter M1 to monitor the voltages as indicated on the front of the panel, via MR1, R11 to R21.

20. Switch-bank SB switches ammeter M2 to monitor the currents as indicated on the front of the panel, through R22 to R33.

21. The power supplies are protected by means of fuses FS11 to FS16, and certain supplies are directly distributed to various panels as shown on fig.16.

22. The blue phase of the mains supply and the delayed blue phase from the circuit breaker assembly are distributed via individual fuses FS1 to FS10 to various units as shown on fig.16. Neon indicator lamps ILP1-10 give visual indication of fuse failure.

PANEL, TEST ELECTRICAL (No.5) M12

23. This test panel (fig.9 and 10) is located on the R.H. cabinet gate at position 3F. The panel dimensions are: height 8 7/8 in, length 9 in, width 15 3/8 in, and the weight is 6 lb. Four push-buttons mounted on the front of the panel select the various temperature functions.

24. Ammeter M1 (fig.17) continuously monitors the MAGNETRON CATHODE CURRENT through pulse

transformer T6, as described in Sect.3, Chap.4. The optimum cathode current for the magnetron fitted is shown on the label adjacent to ammeter M1.

25. Ammeter M2 has two ranges (selected by switch SD) and monitors the OVERSWING CURRENT from the e.h.t. power supply and modulator, in the event of a mismatch in the magnetron circuit, as described in Sect.3, Chap.3.

26. Ammeter M3 continuously monitors the MAGNETRON FILAMENT CURRENT, in terms of the a.c. supply current to the primary of the magnetron filament transformer (part of T6), as described in Sect.3, Chap.4.

27. Ammeter M4 has two ranges, and continuously monitors the magnet field current (see also Sect.3, chap.5). Switch SB, a biased toggle switch, shorts out multiplier R2 (fig.17) giving M4 a 30A range. When setting up the limit trips, SB is operated, giving M4 a 60A range.

28. Temperature monitoring is performed by means of ratiometer type thermometer indicator M5 and associated circuit. The temperatures are monitored by means of thermo-bulbs inserted in the coolant system, as described in Sect.2, Chap.4.

29. Switch-bank SA (fig.17) switches ratiometer M5 to monitor the temperatures as indicated on the front of the panel, by selection of the respective thermo-bulb circuits. Biased switch SC (fig.17) allows switch-bank SA to be bypassed, so that M5 can display the voltage regulator temperature.

PANEL, TEST ELECTRICAL (No.6) M58

30. This test (fig.11 and 12) is located inside the L.H. cabinet at position 2S. The panel dimensions are: height 12 in, length 9 in, width 15 3/8 in, and the weight is 10 1/2 lb. Twelve push-buttons mounted on the front of the panel select the various functions.

31. Switch-bank SA (fig.18) of which only the first three sections are used, switches voltmeter M1 to monitor the voltages as indicated on the front of the panel, via R3 to R6.

32. Switch-bank SB is not used.

33. The delayed red phase from the circuit breaker assembly is distributed via individual fuses FS1-2 to units as shown on fig.18. Neon indicator lamps ILP1 and ILP2 give visual indication of fuse failure. FS3 provides an anti-surge link for the mains input to the power supply 50V in power supply and reactor assembly M34, with visual indication of fuse rupture ILP3 (CA2643).

34. Deleted.

FUSE DETAILS

35. Tables 1 to 5 give details of mains supply distribution fuses in the test panels, and actual power supply sources.

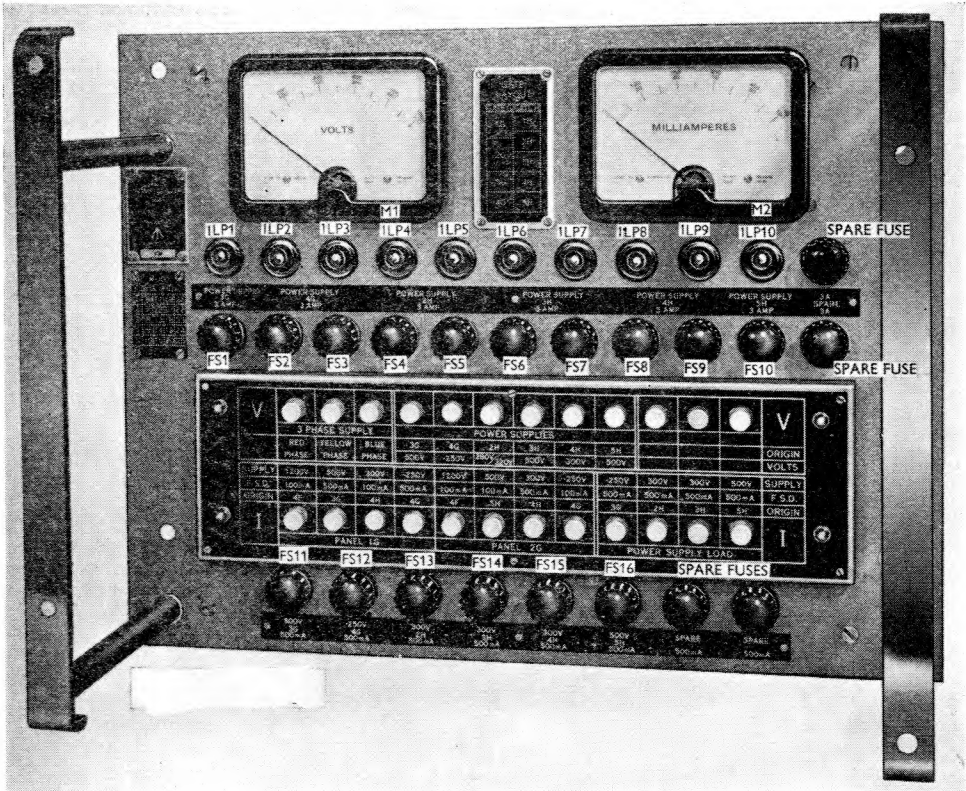


Fig. 7. Panel, test electrical (No. 4) M10: front view

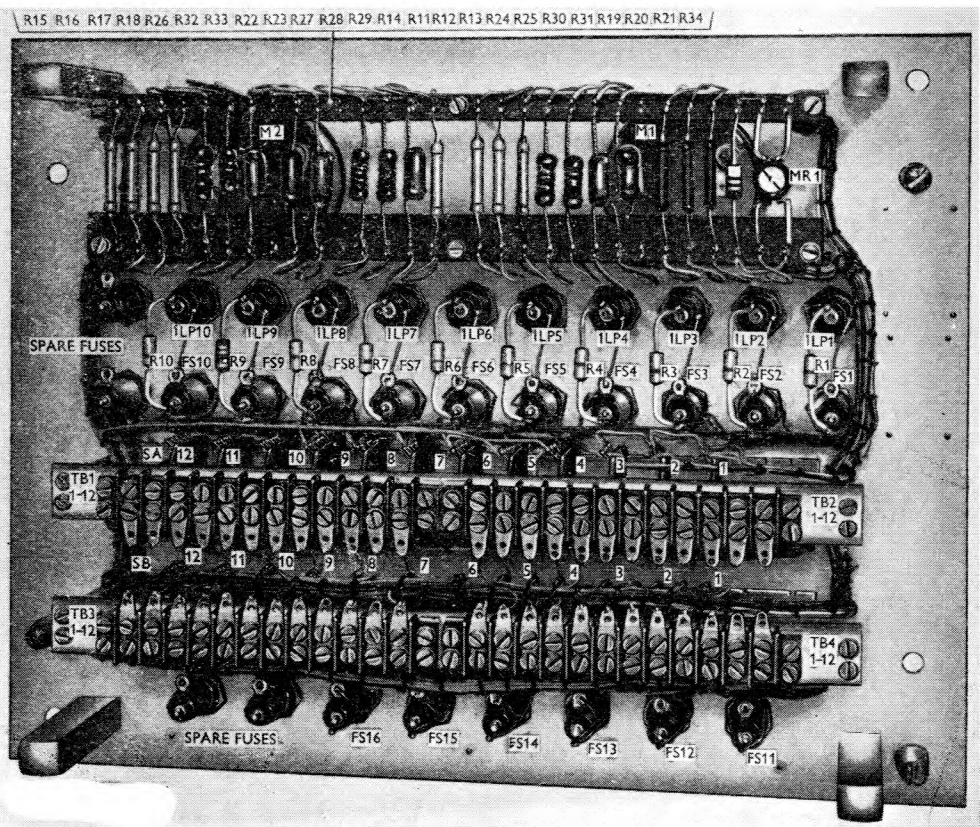


Fig. 8. Panel, test electrical (No. 4) M10: rear view

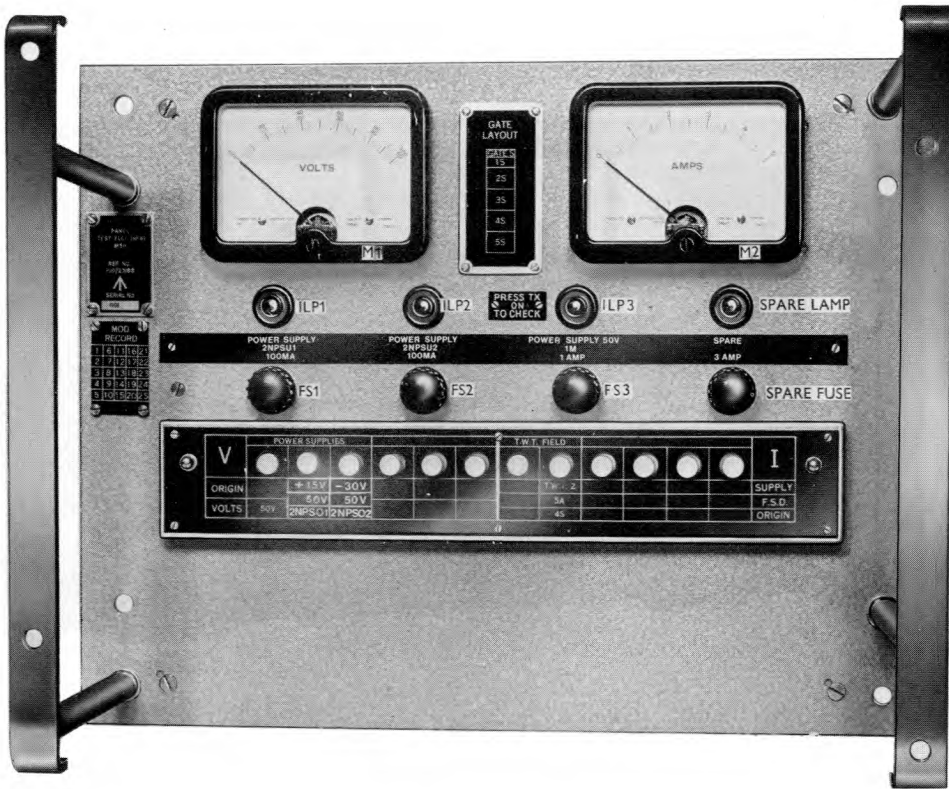


Fig.11. Panel test electrical (No.6) M58: (5840-99-999-9036) front view

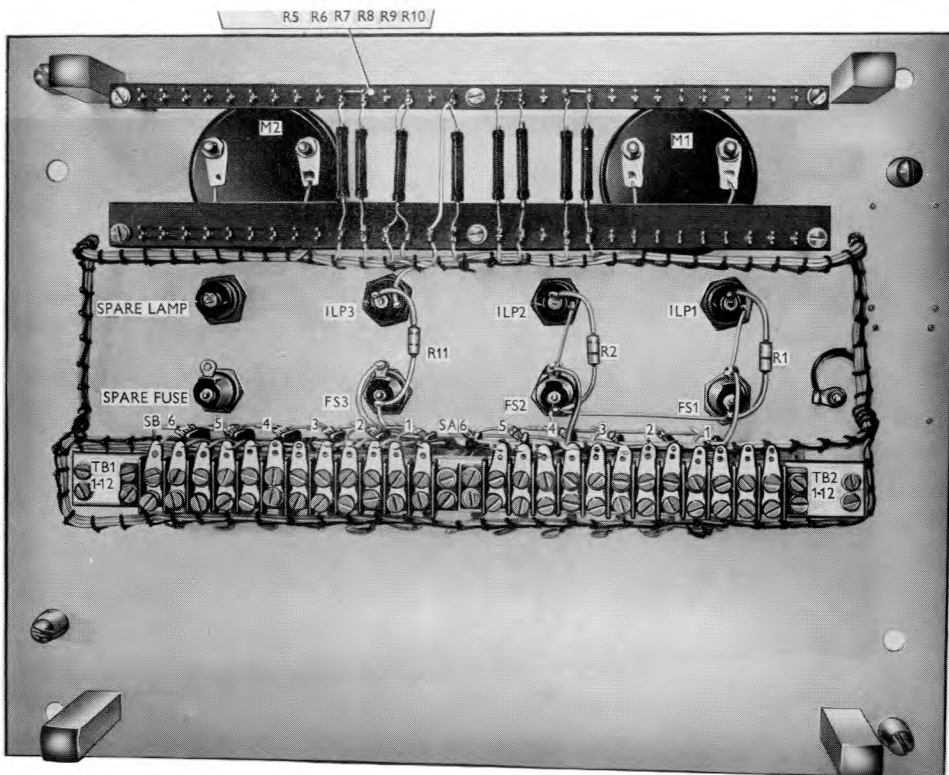


Fig.12. Panel, test electrical (No.6) M58: rear view

TABLE 1 LIST OF FUSES—PANEL, TEST ELECTRICAL (No.1)

| Circuit Ref. | Rating | Supply    | Origin    |
|--------------|--------|-----------|-----------|
| FS1          | 3 Amp. | 240V a.c. | Red phase |
| FS2          | 3 Amp. | 240V a.c. | Red phase |
| FS3          | 3 Amp. | 240V a.c. | Red phase |
| FS4          | 3 Amp. | 240V a.c. | Red Phase |

TABLE 2 LIST OF FUSES—PANEL, TEST ELECTRICAL (No.2)

| Circuit Ref. | Rating | Supply     | Origin            |
|--------------|--------|------------|-------------------|
| FS1          | 3 Amp. | 240V a.c.  | Red phase         |
| FS2          | 3 Amp. | 240V a.c.  | Delayed red phase |
| FS3          | 3 Amp. | 240V a.c.  | Red phase         |
| FS4          | 3 Amp. | 240V a.c.  | Red phase         |
| FS5          | 3 Amp. | 240V a.c.  | Delayed red phase |
| FS6          | 3 Amp. | 240V a.c.  | Red phase         |
| FS7          | 3 Amp. | 240V a.c.  | Delayed red phase |
| FS8          | 500 mA | +200V d.c. | 3C                |
| FS9          | 500 mA | +200V d.c. | 4D                |
| FS10         | 500 mA | +200V d.c. | 5D                |

TABLE 3 LIST OF FUSES—PANEL, TEST ELECTRICAL (No.3)

| Circuit Ref. | Rating | Supply       | Origin               |
|--------------|--------|--------------|----------------------|
| FS1          | 3 Amp. | 240V a.c.    | Yellow phase         |
| FS2          | 3 Amp. | 240V a.c.    | Delayed yellow phase |
| FS3          | 3 Amp. | 240V a.c.    | Yellow phase         |
| FS4          | 3 Amp. | 240V a.c.    | Delayed yellow phase |
| FS5          | 3 Amp. | 240V a.c.    | Yellow phase         |
| FS6          | 3 Amp. | 240V a.c.    | Delayed yellow phase |
| FS7          | 3 Amp. | 240V a.c.    | Yellow phase         |
| FS8          | 3 Amp. | 240V a.c.    | Delayed yellow phase |
| FS9          | 3 Amp. | 240V a.c.    | Delayed yellow phase |
| FS10         | 3 Amp. | 240V a.c.    | Yellow phase         |
| FS11         | 3 Amp. | 240V a.c.    | Yellow phase         |
| FS12         | 500 mA | +300V d.c.   | 2E                   |
| FS13         | 500 mA | +300V d.c.   | 3E                   |
| FS14         | 500 mA | +300V d.c.   | 4E                   |
| FS15         | 500 mA | +300V d.c.   | 5E                   |
| FS16         | 100 mA | +1200 V d.c. | 4F                   |
| FS17         | 100 mA | -600V d.c.   | 4F                   |

TABLE 4 LIST OF FUSES—PANEL, TEST ELECTRICAL (No.4)

| Circuit Ref. | Rating | Supply     | Origin             |
|--------------|--------|------------|--------------------|
| FS1          | 3 Amp. | 240V a.c.  | Delayed blue phase |
| FS2          | 3 Amp. | 240V a.c.  | Blue phase         |
| FS3          | 3 Amp. | 240V a.c.  | Blue phase         |
| FS4          | 3 Amp. | 240V a.c.  | Blue phase         |
| FS5          | 3 Amp. | 240V a.c.  | Delayed blue phase |
| FS6          | 3 Amp. | 240V a.c.  | Blue phase         |
| FS7          | 3 Amp. | 240V a.c.  | Delayed blue phase |
| FS8          | 3 Amp. | 240V a.c.  | Blue phase         |
| FS9          | 3 Amp. | 240V a.c.  | Delayed blue phase |
| FS10         | 3 Amp. | 240V a.c.  | Delayed blue phase |
| FS11         | 500 mA | +500V d.c. | 3G                 |
| FS12         | 500 mA | -250V d.c. | 4G                 |
| FS13         | 500 mA | +300V d.c. | 2H                 |
| FS14         | 500 mA | +300V d.c. | 3H                 |
| FS15         | 500 mA | +300V d.c. | 4H                 |
| FS16         | 500 mA | +500V d.c. | 5H                 |

TABLE 5 LIST OF FUSES—PANEL, TEST ELECTRICAL (No.6)

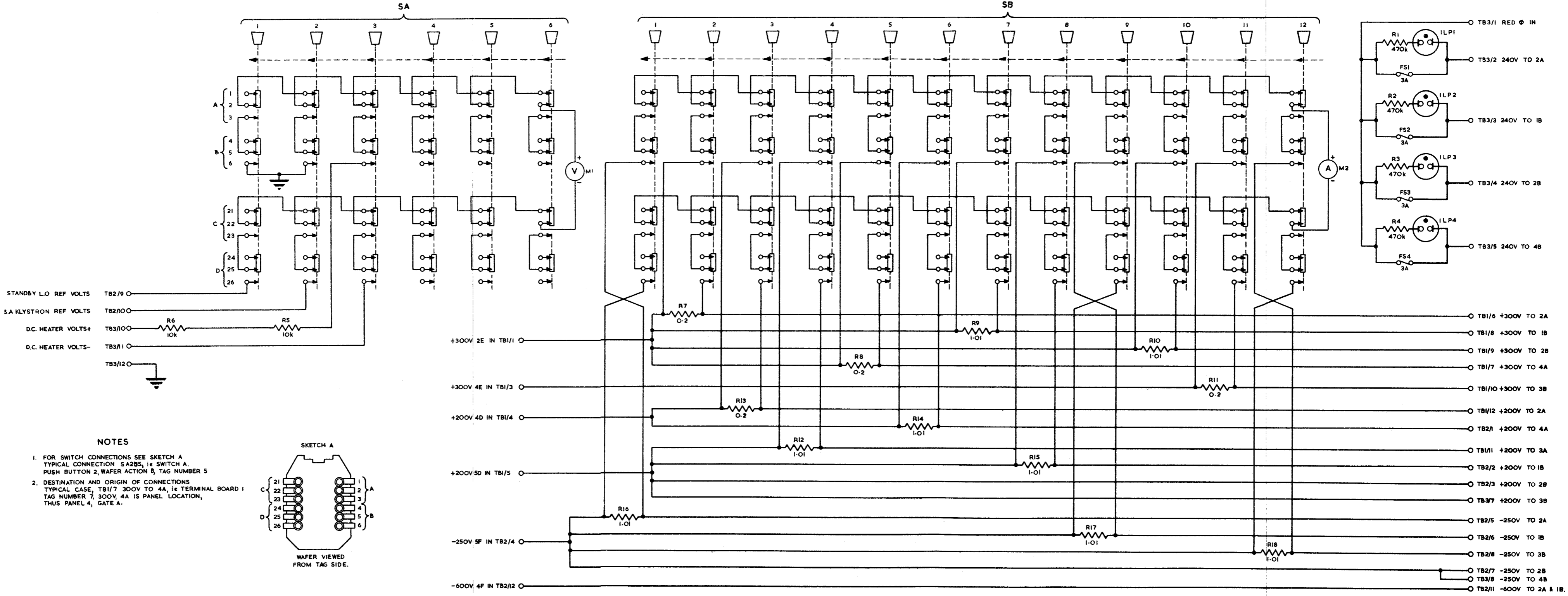
| Circuit Ref. | Rating | Supply    | Origin            |
|--------------|--------|-----------|-------------------|
| ▶ FS1        | 100 mA | 240V a.c. | Delayed red phase |
| FS2          | 100 mA | 240V a.c. |                   |
| FS3          | 3 Amp. | 240V a.c. |                   |

Note . .

For replace of push-button switches refer to AP 115H-0100-2B leaflet G.O.3. ◀



| V | ORIGIN | 2A            | 1B            | 4B           |  |  |  |  |  |  |  |  |  |  |  | SUPPLY |        | I |
|---|--------|---------------|---------------|--------------|--|--|--|--|--|--|--|--|--|--|--|--------|--------|---|
|   | VOLTS  | KLYSTRON REFL | KLYSTRON REFL | D.C. HEATERS |  |  |  |  |  |  |  |  |  |  |  | F.S.D. | F.S.D. |   |
|   | F.S.D  | 500V          | 500V          | 10V          |  |  |  |  |  |  |  |  |  |  |  | ORIGIN | ORIGIN |   |
|   |        | 500V          | 500V          | 10V          |  |  |  |  |  |  |  |  |  |  |  | 5F     | 5F     |   |
|   |        | 2A            | 2A            | 2A           |  |  |  |  |  |  |  |  |  |  |  | 2E     | 2E     |   |
|   |        | 2A            | 2A            | 2A           |  |  |  |  |  |  |  |  |  |  |  | 4D     | 4D     |   |
|   |        | 3A            | 3A            | 3A           |  |  |  |  |  |  |  |  |  |  |  | 5D     | 5D     |   |
|   |        | 4A            | 4A            | 4A           |  |  |  |  |  |  |  |  |  |  |  | 2E     | 2E     |   |
|   |        | 4A            | 4A            | 4A           |  |  |  |  |  |  |  |  |  |  |  | 4D     | 4D     |   |
|   |        | 1B            | 1B            | 1B           |  |  |  |  |  |  |  |  |  |  |  | 2E     | 2E     |   |
|   |        | 2B            | 2B            | 2B           |  |  |  |  |  |  |  |  |  |  |  | 5D     | 5D     |   |
|   |        | 3B            | 3B            | 3B           |  |  |  |  |  |  |  |  |  |  |  | 4E     | 4E     |   |
|   |        | 3B            | 3B            | 3B           |  |  |  |  |  |  |  |  |  |  |  | 5F     | 5F     |   |
|   |        | 3B            | 3B            | 3B           |  |  |  |  |  |  |  |  |  |  |  | ORIGIN | ORIGIN |   |
|   |        |               |               |              |  |  |  |  |  |  |  |  |  |  |  | PANEL  | PANEL  |   |



**NOTES**

- FOR SWITCH CONNECTIONS SEE SKETCH A TYPICAL CONNECTION 5A2B5, i.e. SWITCH A, PUSH BUTTON 2, WAFER ACTION B, TAG NUMBER 5
- DESTINATION AND ORIGIN OF CONNECTIONS TYPICAL CASE, TB1/7 300V TO 4A, i.e. TERMINAL BOARD 1 TAG NUMBER 7, 300V, 4A IS PANEL LOCATION, THUS PANEL 4, GATE A.

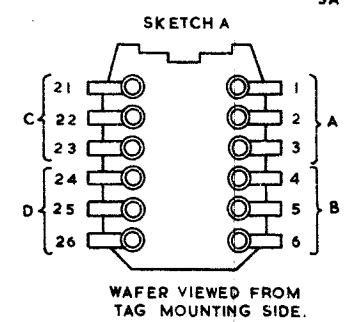
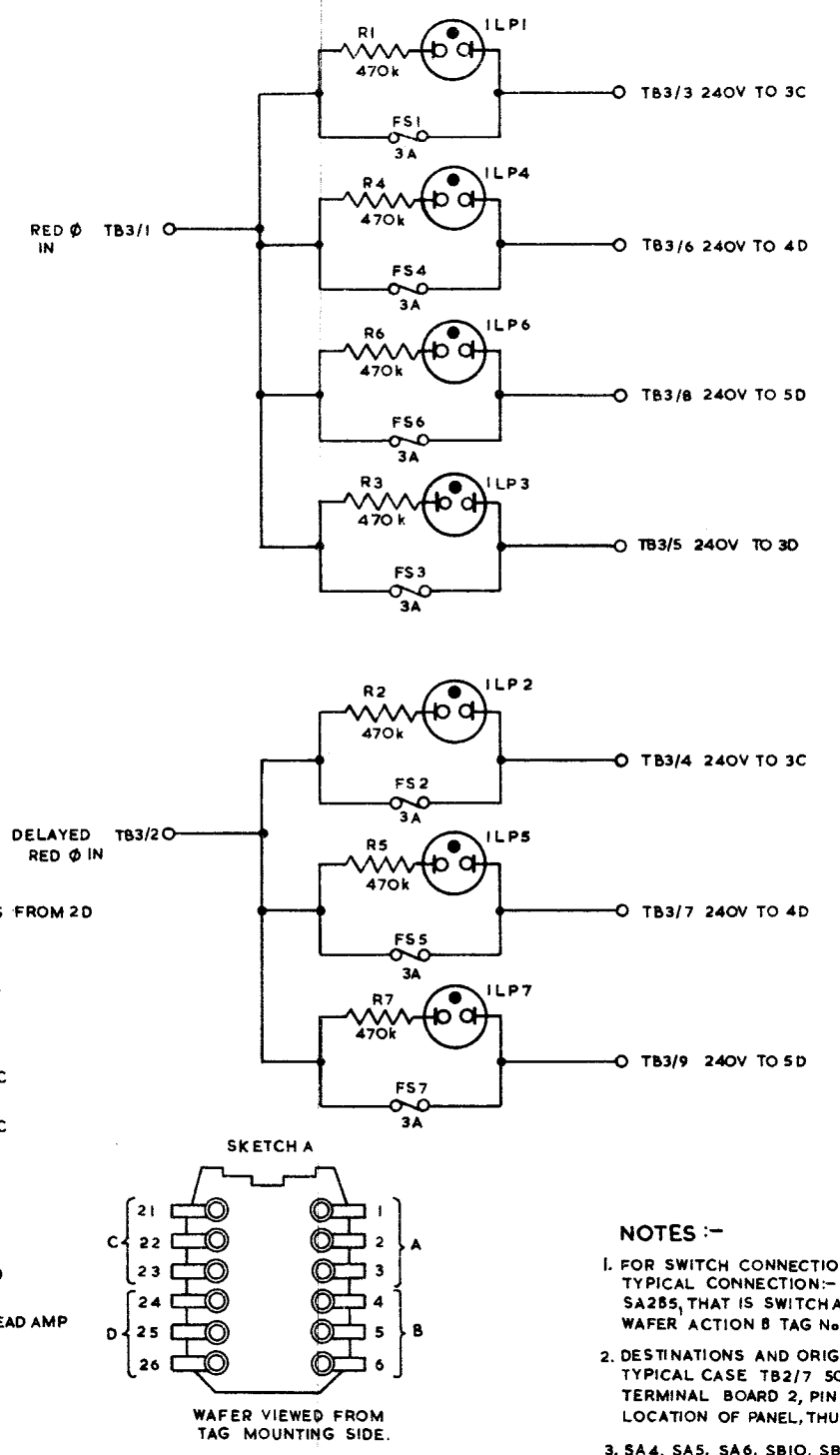
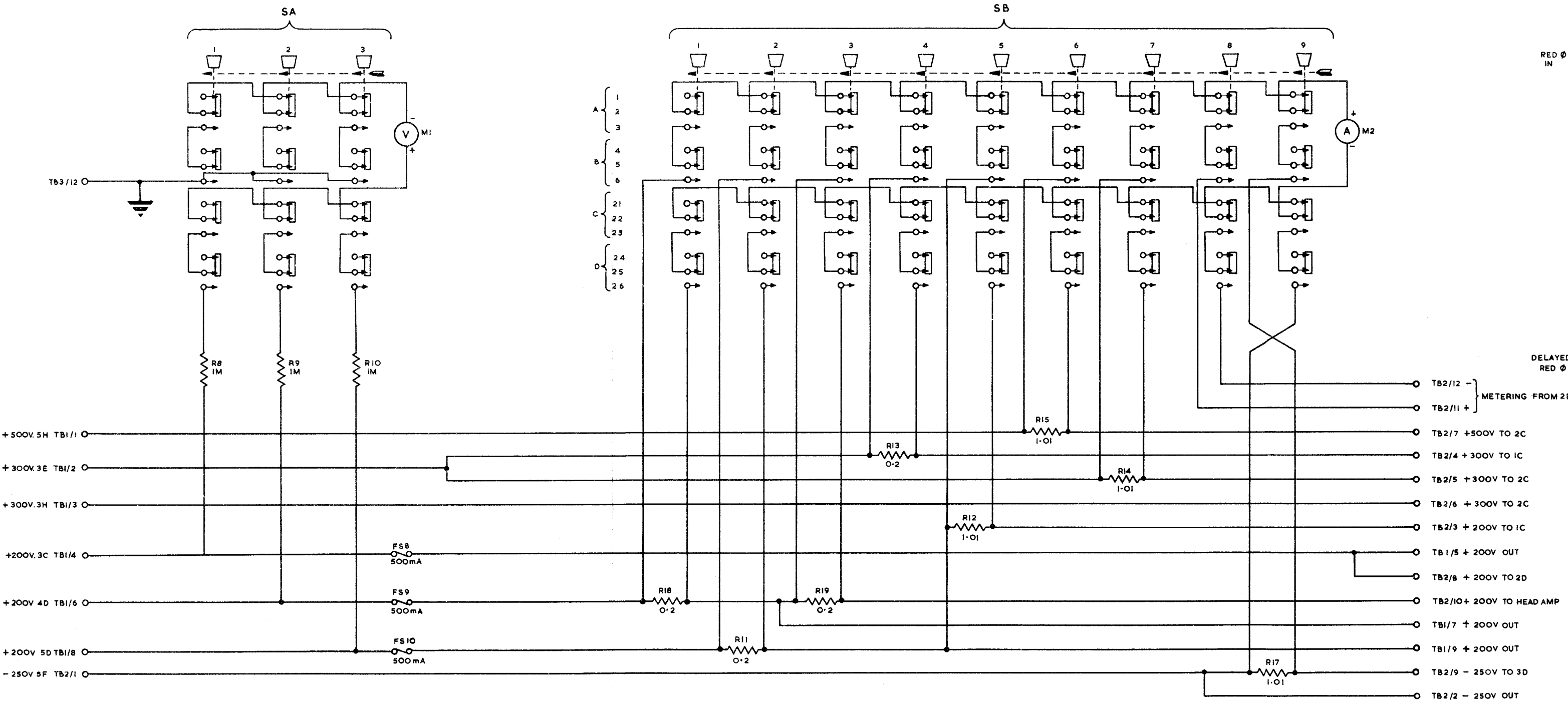
Fig. 13  
C.B.H. 2385

Panel, test electrical (No. 1) M9: circuit.

Fig. 13

| V      | POWER SUPPLIES |      |      | V      |
|--------|----------------|------|------|--------|
| ORIGIN | 3C             | 4D   | 5D   | ORIGIN |
| VOLTS  | 200V           | 200V | 200V | VOLTS  |

| I      | POWER SUPPLY LOAD | HEAD AMP. | PANEL 1C | PANEL 2C | PANEL 2D | PANEL 3D | I     |                             |       |        |
|--------|-------------------|-----------|----------|----------|----------|----------|-------|-----------------------------|-------|--------|
| SUPPLY | 200V              | 200V      | 200V     | 300V     | 200V     | 500V     | 300V  | SELECTOR SWITCH ON PANEL 2D | -250V | SUPPLY |
| F.S.D. | 500mA             | 500mA     | 500mA    | 500mA    | 100mA    | 100mA    | 100mA |                             | 100mA | F.S.D. |
| ORIGIN | 4D                | 5D        | 4D       | 3E       | 5D       | 5H       | 3E    | 3C                          | 5F    | ORIGIN |



- NOTES :-
- FOR SWITCH CONNECTIONS SEE SKETCH A TYPICAL CONNECTION:- SA2B5, THAT IS SWITCH A, PUSH BUTTON 2, WAFER ACTION B TAG No 5.
  - DESTINATIONS AND ORIGINS OF WIRES TYPICAL CASE TB2/7 500V 2C, THAT IS TERMINAL BOARD 2, PIN 7, 2 C GIVES LOCATION OF PANEL, THUS PANEL 2 ON GATE C.
  - SA 4, SA 5, SA 6, SB 10, SB 11 AND SB 12 ARE NOT USED.

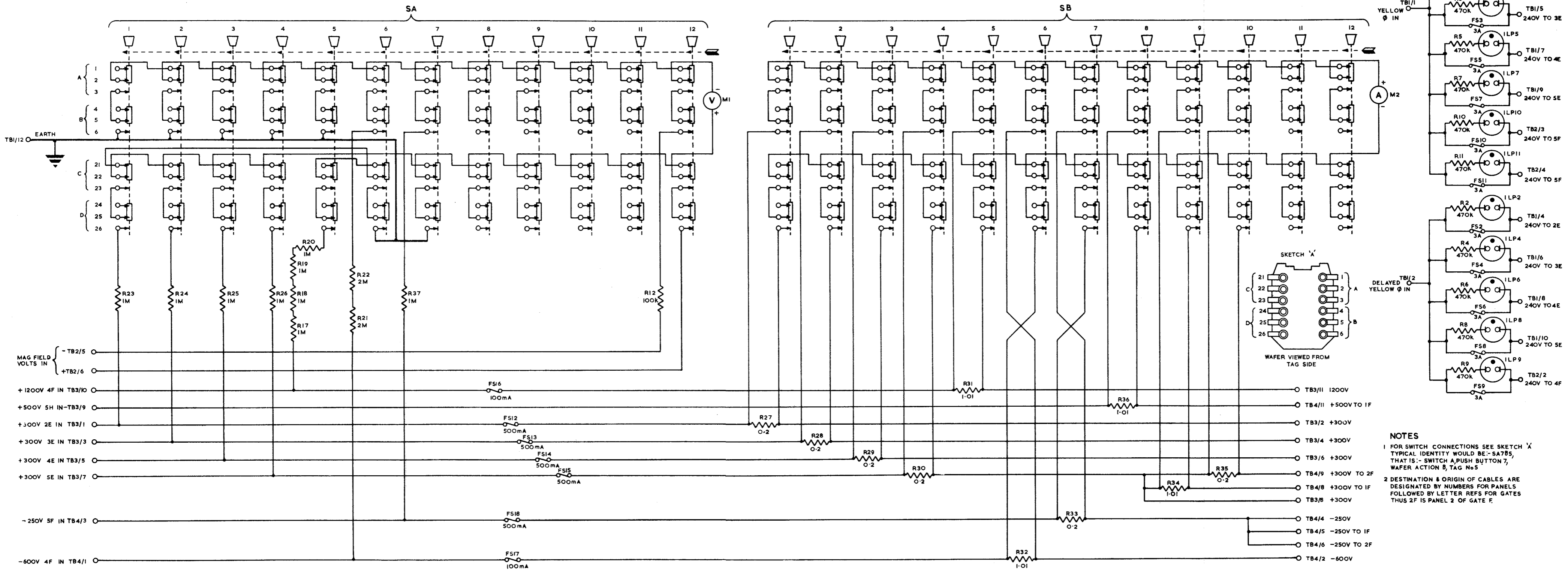
Fig. 14

Panel, test electrical (No. 2) MII: circuit

Fig. 14

| POWER SUPPLIES |        |      |      |      |      |       |       |       | 50V F.D.S.<br>MAG FIELD<br>VOLTAGE |
|----------------|--------|------|------|------|------|-------|-------|-------|------------------------------------|
| V              | ORIGIN | 2E   | 3E   | 4E   | 5E   | 4F    | 4F    | 5F    |                                    |
|                | VOLTS  | 300V | 300V | 300V | 300V | 1200V | -600V | -250V |                                    |

| POWER SUPPLY LOAD |       |       |       |       |       |       |       | PANEL 1F |       | PANEL 2F |  |
|-------------------|-------|-------|-------|-------|-------|-------|-------|----------|-------|----------|--|
| VOLTS             | 300V  | 300V  | 300V  | 300V  | 1200V | -600V | -250V | 500V     | 300V  | 300V     |  |
| F.S.D.            | 500mA | 500mA | 500mA | 500mA | 100mA | 100mA | 500mA | 100mA    | 100mA | 500mA    |  |
| ORIGIN            | 2E    | 3E    | 4E    | 5E    | 4F    | 4F    | 5F    | 5H       | 5E    | 5E       |  |



**NOTES**

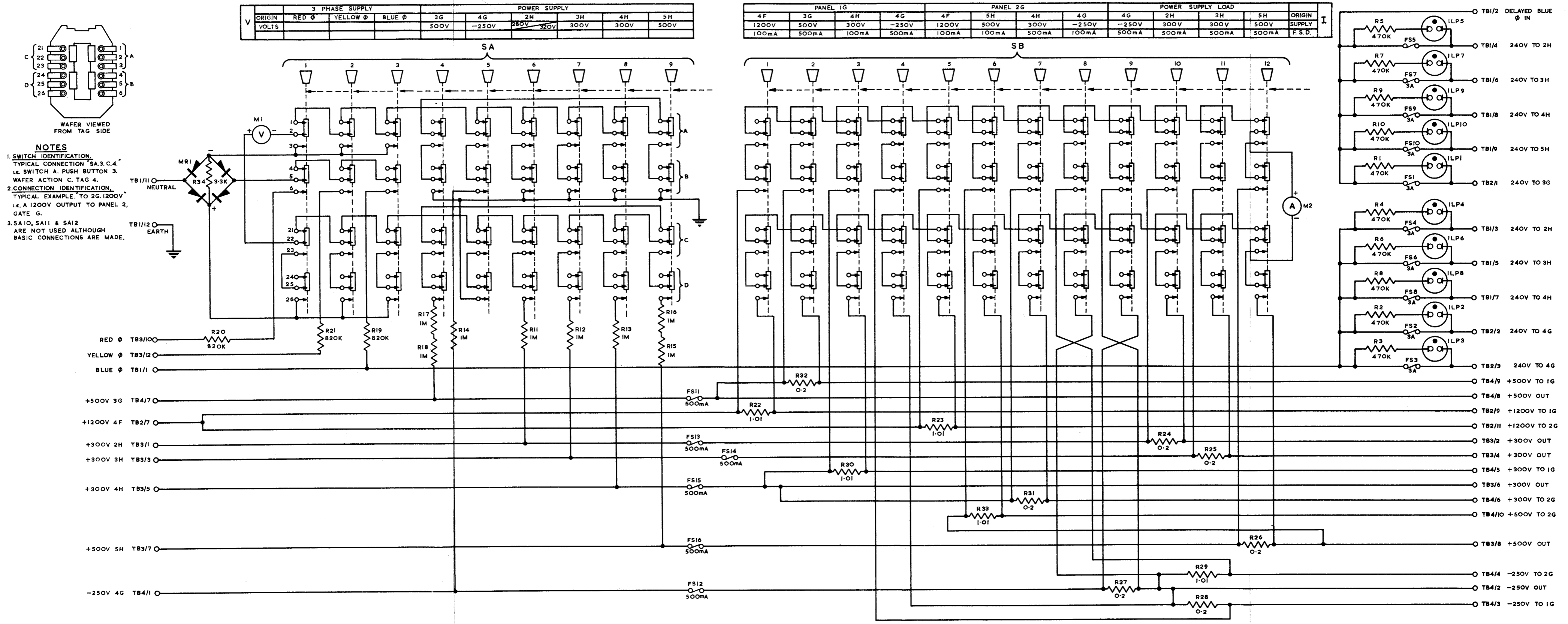
1 FOR SWITCH CONNECTIONS SEE SKETCH 'X' TYPICAL IDENTITY WOULD BE:- SA7B5, THAT IS:- SWITCH A, PUSH BUTTON 7, WAFER ACTION B, TAG No 5

2 DESTINATION & ORIGIN OF CABLES ARE DESIGNATED BY NUMBERS FOR PANELS. FOLLOWED BY LETTER REFS FOR GATES. THUS 2F IS PANEL 2 OF GATE F.

Fig. 15  
 C.B.H. 2385

Panel, test electrical (No. 3) M14: circuit

Fig. 15



**NOTES**  
 1. SWITCH IDENTIFICATION.  
 TYPICAL CONNECTION "SA.3.C.4."  
 I.E. SWITCH A. PUSH BUTTON 3.  
 WAFER ACTION C. TAG 4.  
 2. CONNECTION IDENTIFICATION.  
 TYPICAL EXAMPLE TO 2G. 1200V.  
 I.E. A 1200V OUTPUT TO PANEL 2,  
 GATE G.  
 3. SA10, SA11 & SA12  
 ARE NOT USED ALTHOUGH  
 BASIC CONNECTIONS ARE MADE.

Fig. 16

Panel, test electrical (No.4) MIO: circuit

Fig. 16

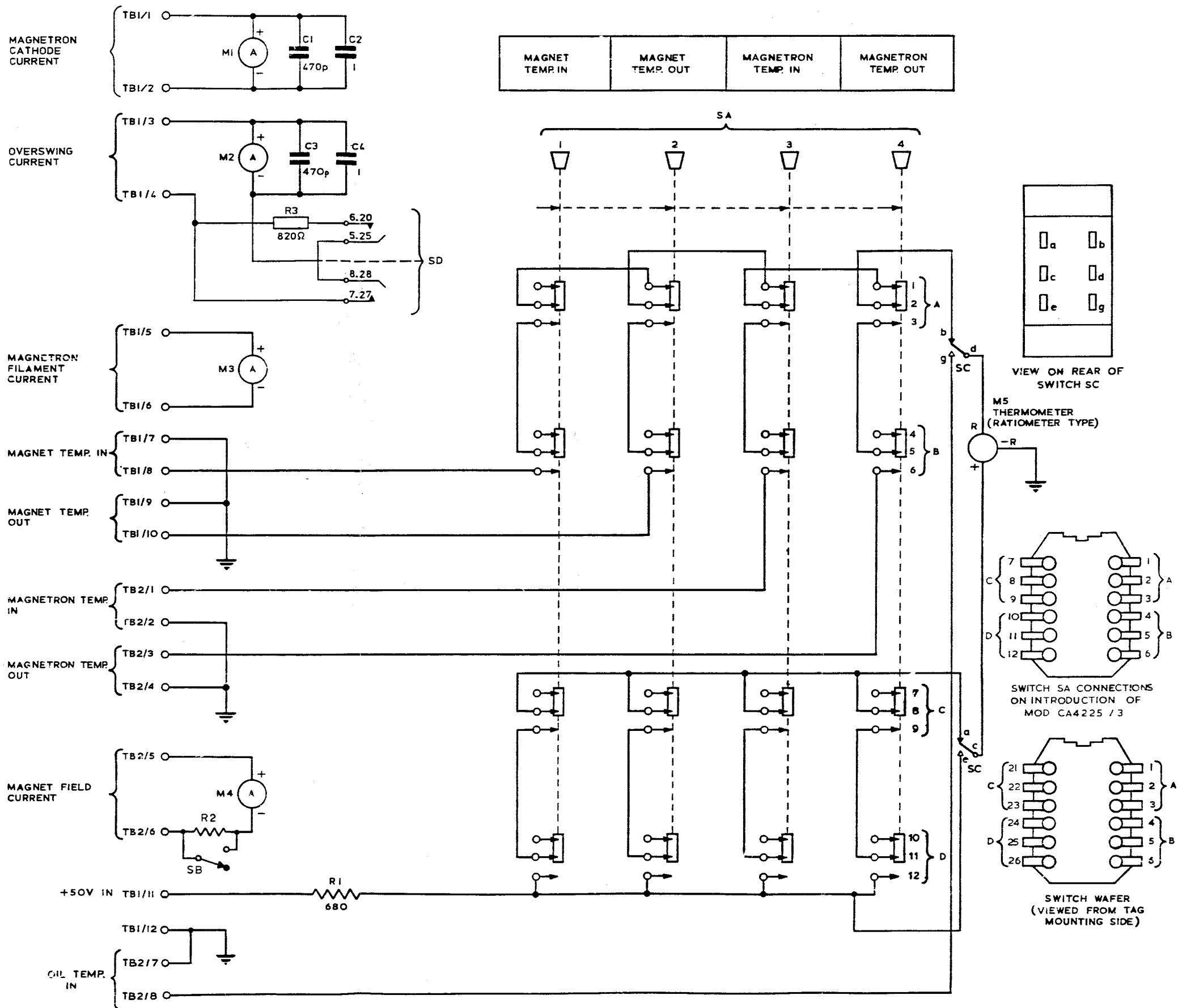


Fig.17

Panel, test electrical (No.5) M12: circuit

Fig.17

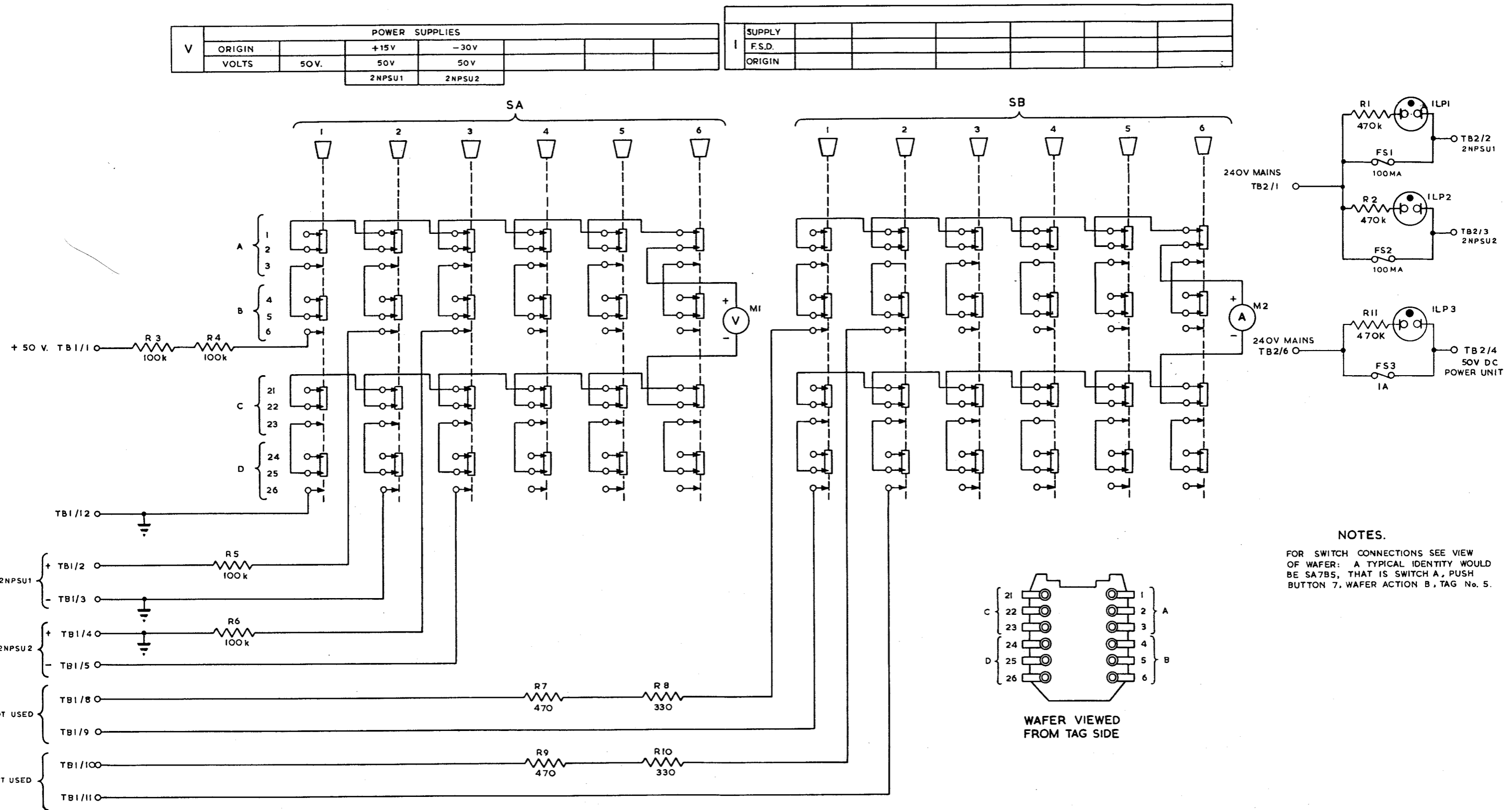


Fig. 18  
July 84 (Amdt.22)

Panel, test electrical (No. 6) M58: circuit

Fig. 18  
Chap. 7  
Page 21/22

AP

## SECTION 8

# AERIALS AND FEED SYSTEMS

## Chapter 1

AERIAL STRUCTURE (MECHANICAL ASSY)  
(Completely revised)

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## APPENDICES

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GENERAL

1. The aerial structure shown in fig.1 forms the microwave aerial for Radar Type 84. The structure, which surmounts the aerial turntable described in AP 115J-0100-1, comprises a reflector assembly incorporating two paraboloidal reflector faces, a support beam assembly and an adapter.
2. The reflector assembly is secured to the support beam by four mounting feet whilst the support beam is attached to the aerial turntable by the adapter.
3. The assembly incorporates two paraboloidal reflector faces mounted back-to-back on a rigid, cross-braced steel support frame completely closed between the peripheries of each reflector by detachable fairings.



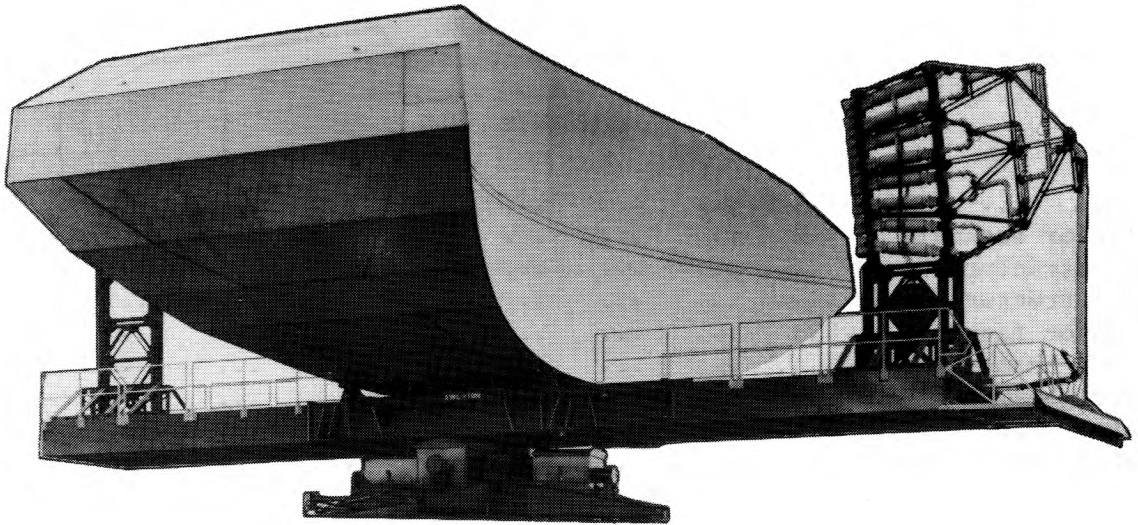


Fig.1 Aerial reflector and hornstack feed

4. Four lights and three sockets are provided within the reflector assembly, the wiring being enclosed in conduit. The support beam encloses the waveguide run and coaxial cables and wiring for the hornstacks.

#### REFLECTOR ASSEMBLY

5. The reflector assembly (fig.5) is composed of four upper and four lower structural units, each mounting a quarter section of a reflector face. The units are located by shear blocks and secured to each other by tension bolts through clearance holes. Each lower structural unit has a mounting foot attached to it which locates on mounting brackets secured to the support beam centre section. The structure is retained by tie-down bolts, sideways movement being prevented by foot positioning blocks and locking bolts which are tightened onto the four side faces of each foot.

6. A hoist beam, having a lifting capacity of ten tons, is positioned transversely within the structure and is used to mount hoisting equipment for removing the main bearing ring from the aerial turning gear.

7. A hoist beam located within one of the upper structural units has a lifting capacity of one ton and this is used, together with a hoist, to handle the turning gear hoisting equipment above the gantry platform level.

8. Access walkways and ladders within the structure facilitate maintenance.

#### LOWER STRUCTURAL UNIT

9. Each lower structural unit is of similar construction being fabricated of welded steel angle-section members, cross-braced for rigidity and having a quarter section of a reflector face attached to it by expansion links. A mounting foot, attached to each lower unit, projects downwards to locate the assembly to the mounting brackets of the support beam centre section. A ladder within one of the units leads to the access catwalk.

UPPER STRUCTURAL UNIT

10. The upper structural units are similar in construction except that one unit incorporates a ladder which gives access to a covered opening in the upper fairing of the assembly, and one unit houses the one-ton hoist rail.

11. The frame is of welded, cross-braced steel angle construction to which one-quarter of a reflector face is attached by expansion links. Each unit contains a section of the access catwalk, the end of each section being provided with handrails.

REFLECTOR FACES

12. Two identical parabolic reflector faces are employed, each being composed of four segments fabricated of stiff  $1\frac{1}{2}$  in deep, aluminium alloy, corrugated core sandwich section, the opening between each segment being covered by an aluminium alloy closing strip.

13. The assembly attaches to the support frame by expansion links which are so arranged that differential expansion between the aluminium alloy reflectors and the steel structure, due to temperature change, may take place without restriction. The links along the joints of the segments are allowed to pivot along the joints only; all the other links are universal.

14. The reflector expands outwards from its vertex with the central vertical row of links reacting side forces and the central horizontal row reacting the vertical forces. Because the support frame and the support beam assembly are manufactured of steel, the apertures of the hornstacks will remain on the foci of the expanded or contracted reflectors throughout the temperature range.

SUPPORT BEAM ASSEMBLY

15. The support beam assembly (fig.2) supports the reflector assembly and hornstacks and incorporates a hoist beam, used together with a hoist when servicing the drive motors of the turning gear and to transfer the aerial turning gear hoist equipment from the ground to the gantry platform or from the platform to the ground.

16. The assembly is composed of a centre section and two end sections, each being of welded steel box section construction stiffened internally by a cross-braced welded steel frame. The end sections are provided with guardrails.

SUPPORT BEAM CENTRE SECTION

17. The support beam centre section is flanged at each end and has a central aperture around which, on the upper surface, is a ring of studs which locate the adapter. Four brackets project upwards to mate with the aerial mounting feet, four brackets project downwards to support the aerial structure when removing the aerial turning gear, and two brackets support one end of the one-ton hoist rail. Two brackets each incorporating a drilled lug, attach beneath two of the support brackets and these are provided to accept the locking member of a tubular 'A' frame which attaches to the gantry and allows the aerial structure to be mechanically locked in either of two positions. An aperture in one side plate of the centre section, closed by a cover plate, gives access to the interior when fitting the adapter.

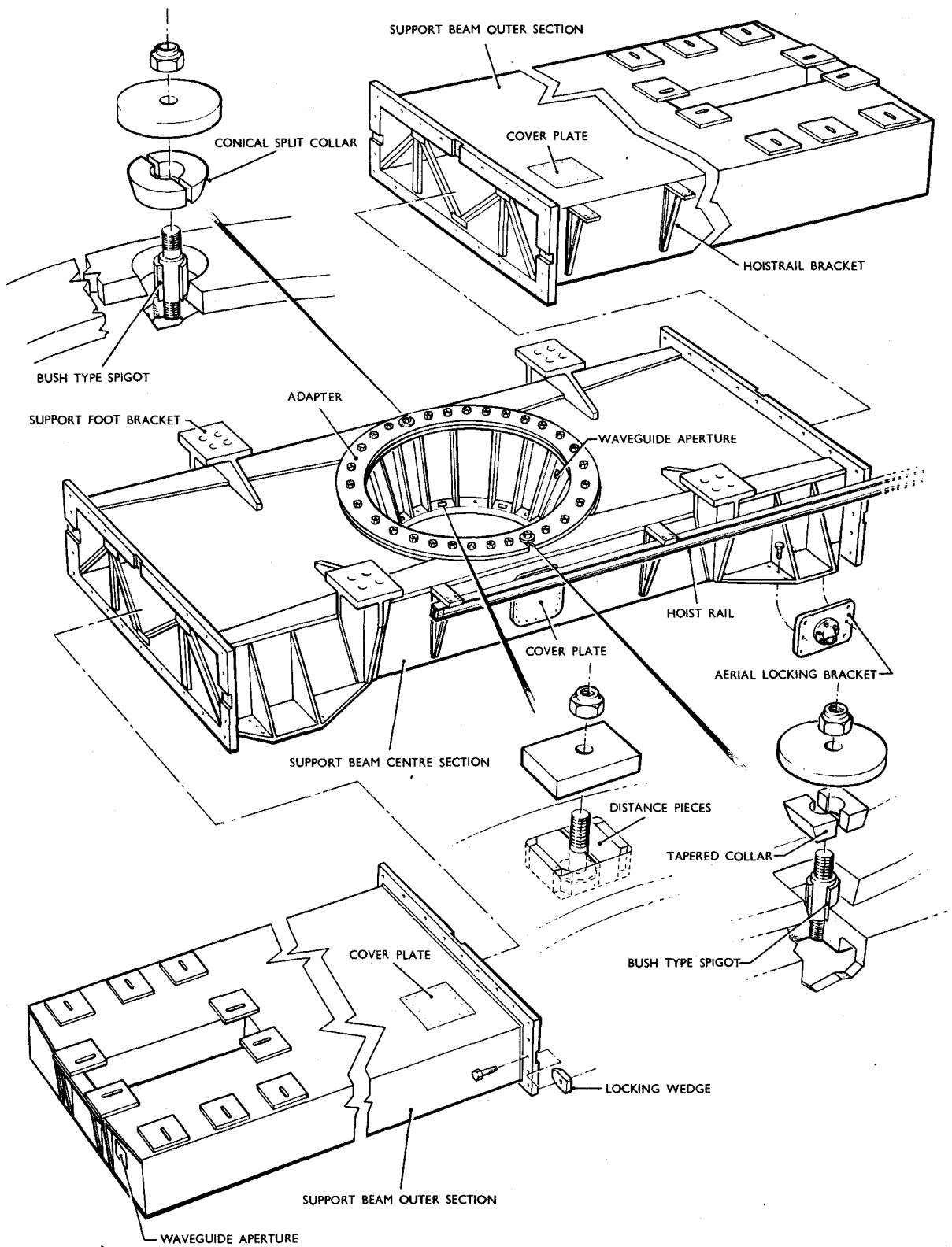


Fig.2 Support beam: exploded view

## ADAPTER

18. The adapter is a steel, truncated, conically shaped member, web stiffened along its length and flanged at each end. The lower flange mates with the aerial turning gear whilst the upper flange locates over the ring of studs in the upper face of the support beam centre section. Both flanges are locked to their mating components, to prevent any angular movement relative to each other, by tapered collars and distance pieces.

## SUPPORT BEAM END SECTION

19. The end sections of the support beam assembly are of similar construction, being flanged at the inner end to mate with the flanges of the centre section, all three sections being secured together by tension bolts through clearance holes and located by wedges driven into slots formed in the flanges.

20. An aperture, closed by a cover plate, is provided in the upper surface of each end section to give access to the interior, apertures at each end are provided for the waveguide run, rectangular slots at the outer end of each section are provided to allow the hornstacks to be raised or lowered, and screw jacks are provided for the adjustment of the hornstacks.

21. Mounting pads having threaded holes are positioned around each slot and these accept securing bolts for the hornstacks.

## REFLECTOR OPTICAL ALIGNMENT CHECKS

22. The accuracy of alignment of the reflector is of paramount importance, and should be checked whenever the structure alignment is suspect, especially if any part of the main reflector, its associated structure, or the secondary radar array has been moved or renewed for any reasons. Displacement or misalignment of the structure is not anticipated under normal circumstances; these checks are introduced as a precautionary measure.

23. To carry out the necessary checks, both on vertical and horizontal axes, an optical sighting system is used, part of which is a fixture to the main structure, and the remainder consisting of components which are installed as necessary. The optical sighting points, and positions for the telescope are diagrammatically shown in fig.6. The sight lines are formed by target holders which are positioned on the cross-members of the reflector during manufacture, as shown in fig.3.

24. Details of residual manufacturing errors are marked on the faces of the target holders (fig.4). Measured readings should be corrected for these errors but, if any are unknown due to obliteration of the markings, their effect can be ignored. Measurements are now required for comparison only; e.g. before and after disturbance of the structure.

25. A proforma similar to that in Appendix 1 should be completed, so that readings can be compared with those taken at the previous alignment check. It is estimated that two technicians, experienced in this task, will require two days to do a complete alignment check.

Equipment list

26. The items of equipment required to carry out optical sighting checks are listed in Table 1. The items are contained in the aerial alignment kit boxes identified as follows:-

Box 26, NSN 5840-99-954-8778 (containing items 17, 18, 19 in equipment list)

Box 34, (A to E) NSN 6625-99-971-1786.

Note...

Items 20 to 22 inclusive are not contained in the kit boxes, therefore they must be obtained separately.

TABLE 1  
Equipment list for aerial alignment checks

| Item No. (1) | NSN (2)          | Manufacturers Identity (3) | Description (4)   | No. off (5) |
|--------------|------------------|----------------------------|---|-------------|
| 1            | 6650-99-913-1132 | 112/443                    | Target circular pattern<br>1½ in dia.                                 | 3           |
| 2            | 6650-99-913-1133 | 112/475                    | Target circular pattern<br>2¼ in dia.                                 | 2           |
| 3            | 6650-99-913-1134 | 112/568                    | Lens telescope (right angled eyepiece adapter)                        | 1           |
| 4            | 6650-99-913-1135 | 112/536                    | Telescope micro alignment   | 1           |
| 5            | 6650-99-913-1136 | 112/610                    | Optical square (zero offset)  | 1           |
| 6            | 6650-99-913-1137 | 112/556                    | Level striding  | 1           |
| 7            | 6650-99-913-1141 | 112/645                    | Bracket adjustable  | 1           |
| 8            | 6650-99-913-1139 | 116/27                     | Clamp key   | 1           |
| 9(a)         | 6650-99-913-1140 | 112/376                    | Adapter spherical (mounting sphere)                                   | 3           |
| 9(b)         | 6650-99-972-4321 | 112/465                    | Target shoulder ring  | 2           |
| 10           | 6650-99-913-1138 | 112/656                    | Base horizontal   | 1           |
| 11           | 6650-99-913-1142 | 112/657                    | Clamp spherical   | 2           |
| 12           | 6650-99-913-1143 | 112/471                    | Mounting spherical cup  | 3           |
| 13           | 6650-99-971-1766 | { 112/642<br>A1/429        | Target illuminating assembly holders (complete with lamps) and Cables | } 6         |
| 14           | 5840-99-953-7572 | -                          | Clinometer (Hilgar and Watts Mk.5)                                    | 1           |
| 15           | 5840-99-195-5512 | RD24.315                   | Vee block (mounting jig for clinometer)                               | 1           |

TABLE 1 (Contd.)

| Item No. (1) | NSN (2)          | Manufacturers Identity (3) | Description (4)   | No. off (5) |
|--------------|------------------|----------------------------|---|-------------|
| 16(a)        | -                | -                          | Screws cap head $1\frac{1}{4}$ in x $\frac{1}{4}$ in (for assembly of items 7 and 11) | 3           |
| 16(b)        | -                | -                          | Plug $1\frac{1}{4}$ in x $\frac{7}{8}$ in (for locating item 12 on support bracket)   | 3           |
| 16(c)        | -                | -                          | Bolts UNF 1 in x 5/16 in complete with nuts (for fixing item 12 on support bracket)   | 9           |
| 17           | 5120-99-970-5618 | E/Rad/B85503               | Wire measuring  | 1           |
| 18           | -                | E/Rad/A93078               | Weight  | 1           |
| 19           | -                | E/Rad/B85502               | Plate   | 1           |
| 20           | -                | E/Rad/C80220               | Hydraulic jack  | 2           |
| 21           | -                | V30-0461                   | Support plates slotted  | 16          |
| 22           | -                | E/Rad/B69412/1             | Support plates blank  | 16          |

27. During optical checks, it is advisable to observe the following precautions to ensure accurate measurements:

27.1 The engraved side of the target must always be placed towards the telescope.

27.2 Do not focus through one target to observe a second target.

27.3 During sighting, care must be taken to avoid any deflection of target positions, due to other personnel standing on adjacent aerial structure cross-members.

27.4 To avoid deflection of the telescope mount by the observers weight, seats are provided to distribute the weight, and to enable the observer to be in a comfortable position when taking sightings.

27.5 Any set of readings should be taken three times, and an average recorded. Any deviation between the sets of readings should not exceed  $\pm 0.005$  in.

27.6 Not all the target holders or telescope support brackets are used during sighting checks. The complete set of holders and brackets were for use only during initial installation alignment.

27.7 Reliable results can only be obtained from practice, based on the observers experience in the use of precision optical equipment, and by adopting techniques best suited to the individual.

27.8 Remove any foreign matter that may cause any assembly to be located unevenly on its support brackets or mountings. Use the locating plugs (item 16(b) in equipment list) to accurately position the telescope or illuminating assemblies on their supports.

27.9 Ensure that when taking readings through the telescope, the direction and plane of any displacement is interpreted correctly, e.g. the error displacement, as viewed in the eyepiece, may be interpreted as reciprocals of 90 or 180°.

#### Horizontal checks (fig.6)

28. In-text numbers in brackets refer to item numbers in the equipment list at Table 1.

28.1 Assemble the telescope (4) with its base assembly (7, 9(a), 10, 11 and 12), and mount at end 'C' of the bottom horizontal line of sight, on the support provided.

28.2 Mount the target circular pattern 2½ in (2) at end 'D' of the bottom horizontal line of sight.

28.3 Assemble the target illuminating assembly (9, 11, 12 and 13). Locate at end 'D', and plug the connector into the adjacent switched 5A three-pin socket.

28.4 Switch on the illumination, and align the telescope to the target. This alignment is now taken as a datum reference (zero).

28.5 Take the target circular pattern (1), and locate at each intermediate position numbered one to eight, in turn. Measure and record the deviation from linearity. (Proposed recording proforma at App.1.)

28.6 After taking the first set of readings, check that the datum set-up in sub-para.28.4 above is still aligned at zero.

28.7 Repeat for two further sets of readings. Record and determine the average value.

Notes...

- (1) The centres of all intermediate target positions should be on the zero line, within an average of 0.040 in horizontally and 0.080 in vertically. This includes the target holder error incurred due to manufacturing tolerances.
- (2) Correct the average readings by taking into account target holder error if known.
- (3) During checking procedures, use the reading sequence of 'left, upper, right, down' for target directions.

28.8 Repeat sub-paras.28.1 to 28.7 for the top horizontal line of sight, mounting the telescope at end 'A', and the illuminated target at end 'B'.

#### Vertical checks (fig.6)

29. In-text numbers in brackets refer to item numbers in the equipment list at Table 1.

29.1 Assemble the telescope (4) with its base assembly (7, 9(a), 10, 11 and 12), and with the optical square (zero offset) (5).

29.2 Position on the right-hand vertical line of sight, viewed from the hornstack.

Note...

The vertical line of sight is 7½° from vertical in the normal plane of the reflector.

29.3 Mount the target circular pattern 2½ in (2), in location nine, at the uppermost position of the sight line.

29.4 Align the telescope to the target. This alignment is now taken as datum reference (zero).

Note...

Illumination of this target may be by battery operated hand lamp for convenience.

29.5 Take the target circular pattern 1½ in (1), and locate at the two intermediate positions numbered 10 and 11. Measure and record the deviation from linearity. (Proposed recording proforma at App.1.)

29.6 After taking the first set of readings, check that the datum set up in sub-para.29.4 above is still aligned at zero.

29.7 Repeat for two further sets of readings. Record and determine the average value.

Note...

The centres of the two intermediate positions should be on the zero line, within an average of 0.040 in.

#### Diagonal checks (fig.6)

30. In-text numbers in brackets refer to item numbers in the equipment list at Table 1.

30.1 Assemble the telescope (4) with its base assembly (7, 9(a), 10, 11 and 12). Fit the lens (right angle eyepiece adapter) (3), and the optical square (zero offset) (5).

30.2 Position the assembly with the zero offset square at the intersection of the bottom, vertical and diagonal lines of sight, with the telescope axis in line with an aperture in the reflector. Rotation of the telescope enables each of five targets to be viewed in turn.

Note...

The aperture in the reflector enables the telescope to be aligned to a reference point on the hornstack identified as position 'F', which provides a constant reference, should the telescope setting be misaligned whilst it is being rotated.

30.3 Align the telescope to zero on the target at location nine, at the uppermost position of the vertical line of sight, (as described in para.29), and to zero on the target at location eight on the bottom horizontal line of sight, (as described in para.28).

30.4 Now view the target at location one on the bottom horizontal line of sight, and measure the amount of deviation from zero.

30.5 Halve the reading, and readjust to provide equal readings on target at locations one and eight on the bottom horizontal line of sight.

30.6 After readjustment, recheck readings from all three target positions.

30.7 Assemble the clinometer (14) on its mounting jig (15), and mount on the barrel of the telescope.

30.8 Measure the angle the telescope makes with the horizontal, which should be  $7\frac{1}{2}^{\circ} \pm 0.1^{\circ}$ .



30.9 By again rotating the barrel of the telescope, view the targets at locations one and eight, at either end of the top horizontal line of sight. The centres of these targets should be within 0.060 in of zero, in the plane normal to the reflector.

Hornstack alignment (fig.7)

31. In-text numbers in brackets refer to item numbers in the equipment list at Table 1.

Note...

The hornstack has to be checked for correct setting in the following directions; vertical, angle of focal axis, focal length and squareness. Checks are described in the following paragraphs, with details of action necessary to correct any errors.

31.1 Vertical alignment:

31.1.1 Mount the clinometer (14) on to the pad provided on the side of the hornstack structure.

31.1.2 Check that vertical alignment is within two minutes of arc of vertical.

31.1.3 Should the reading obtained be outside the tolerance quoted, slacken the bolts holding down the feet of the structure (do not remove split pins).

31.1.4 Insert necessary shims to provide alignment correction.

31.1.5 Tighten holding down bolts, and recheck clinometer reading.

31.2 Focal axis angle alignment.

31.2.1 Assemble the telescope (4) with its base assembly (7, 9(a), 10, 11 and 12), and with the optical square (zero offset) (5).

31.2.2 Set up and align the assembly as described in para.30.

31.2.3 Set the sighting targets, mounted on the side of the hornstack, to the  $7\frac{1}{2}^{\circ}$  calibration position.

31.2.4 View the hornstack sighting targets through the telescope. They should be within  $\frac{1}{8}$  inch in the vertical plane, and 1/16 inch in the horizontal plane.

Note...

Should the hornstack be required to be repositioned at any other angle, carry out operations described in sub-para.31.2.5 to 31.2.8 below.

31.2.5 Set the sighting targets to the required angle by adjustment against the calibrated scales on the hornstack.

31.2.6 Position the two hydraulic jacks, (identified as J1 and J2) to take the weight of the hornstack.

31.2.7 Remove the eight 1 in diameter studs, and adjust the hornstack to the angle required, moving the assembly in the vertical plane to bring the sighting targets into line.

31.2.8 When the new position has been finally obtained, fit new blank support plates (22), mark off and drill to suit.

Notes...

- (1) During initial alignment, use slotted support plates (21) to facilitate temporary fixing of the hornstack.
- (2) Table 2 shows the vertical and horizontal adjustments needed to cover a range of  $\pm 1^\circ$  angular variation in  $\frac{1}{4}^\circ$  increments, about a  $7\frac{1}{2}^\circ$  focal axis. The horizontal adjustment is to maintain the correct focal length, and is shown as positive values for movement away from the reflector.

TABLE 2  
Hornstack focal axis adjustments

| Required focal axis in degrees<br>(1) | Jack J1 lift in inches<br>(2) | Jack J2 lift in inches<br>(3) | Horizontal movement in inches<br>(4) |
|---------------------------------------|-------------------------------|-------------------------------|--------------------------------------|
| $8\frac{1}{2}$                        | +4.58                         | +6.00                         | +2.0                                 |
| $8\frac{1}{4}$                        | +3.43                         | +4.50                         | +1.5                                 |
| 8                                     | +2.29                         | +3.00                         | +1.0                                 |
| $7\frac{3}{4}$                        | +1.14                         | +1.50                         | +0.5                                 |
| $7\frac{1}{2}$                        | 0.0                           | 0.0                           | 0.0                                  |
| $7\frac{1}{4}$                        | -1.14                         | -1.50                         | -0.5                                 |
| 7                                     | -2.29                         | -3.0                          | -1.0                                 |
| $6\frac{3}{4}$                        | -3.43                         | -4.5                          | -1.5                                 |
| $6\frac{1}{2}$                        | -4.58                         | -6.0                          | -2.0                                 |

### 31.3 Focal length.

Note...

Focal length is checked by a direct measurement from centre of the aperture of the third horn down (from the top) of the hornstack, to the centre point (vortex) of the reflector.

31.3.1 Secure the plate (19) to the face of the third horn.

31.3.2 Take the end of the wire measuring (17), terminated with a nipple, and insert the nipple in the slot provided in the plate.

31.3.3 Pass the shackled end of the measuring wire through the gap between the closing plates in the centre of the reflector, over the rod behind the reflector. Suspend the weight (18) on the shackle to tension the wire.

31.3.4 Measure the distance from the inner face of the fixed stop, to the inner face of the adjustable stop, which should be 7 in  $\pm 1/64$ . This will give an overall length at  $259\frac{1}{4}$  in, which is the focal length.

Note...

If adjustment is necessary to obtain the correct focal length, carry out operations as described in sub-paras.31.3.5 to 31.3.8 below.

31.3.5 Slacken hornstack holding down bolts.

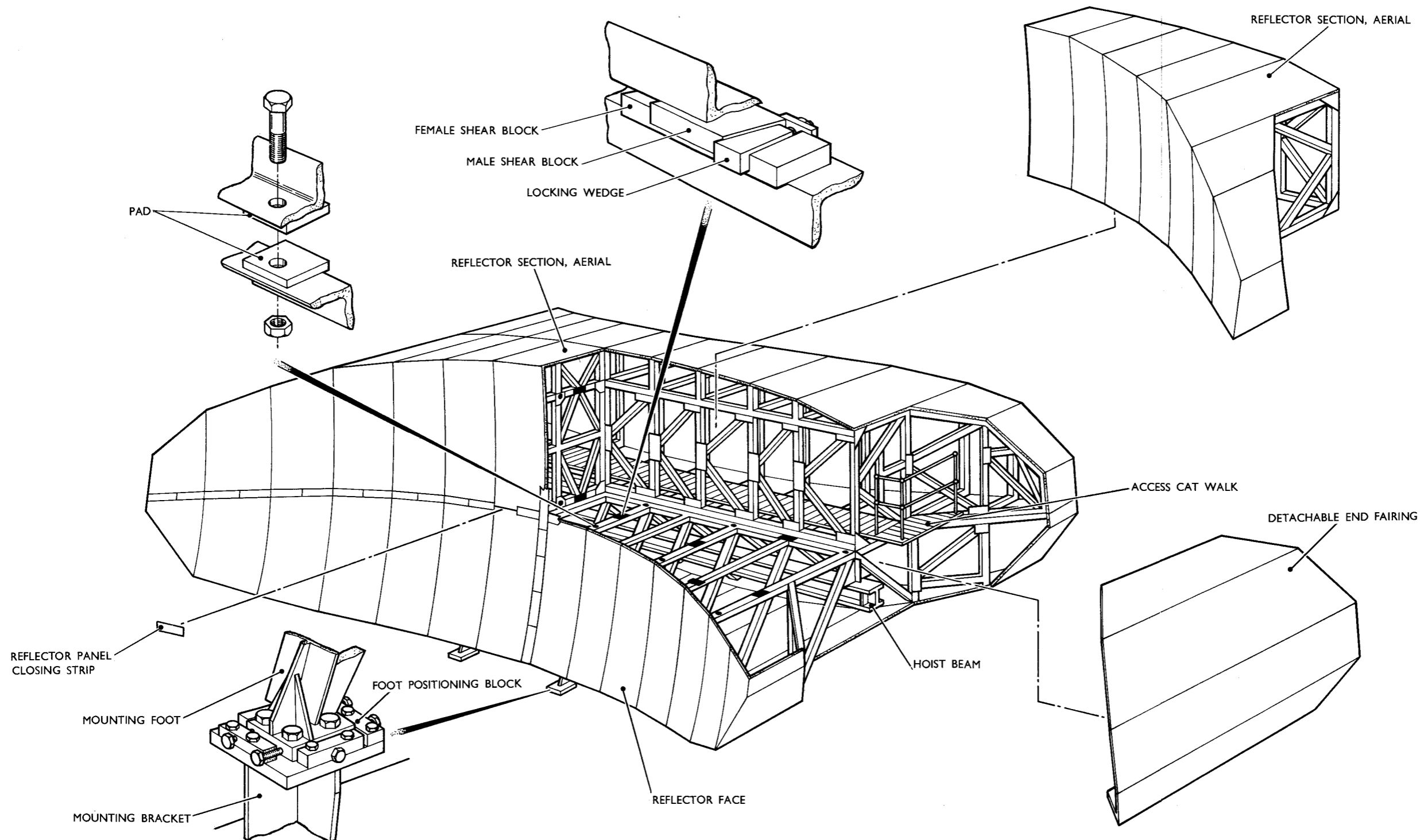
31.3.6 Operate built-in jack assemblies located on the feet of the hornstack, until adjustment of hornstack is complete.

31.3.7 Tighten holding down bolts.

31.3.8 Ensure that any previous setting of hornstack alignment, i.e. vertical, focal axis or squareness, is still correct.

31.4 Squareness.

31.4.1 When making adjustments for correct focal axis angle or focal length, the squareness of the axis in a horizontal plane must be adjusted. This is done by operation of the built-in jack assemblies located on the feet of the hornstack.



Reflector assy : exploded view

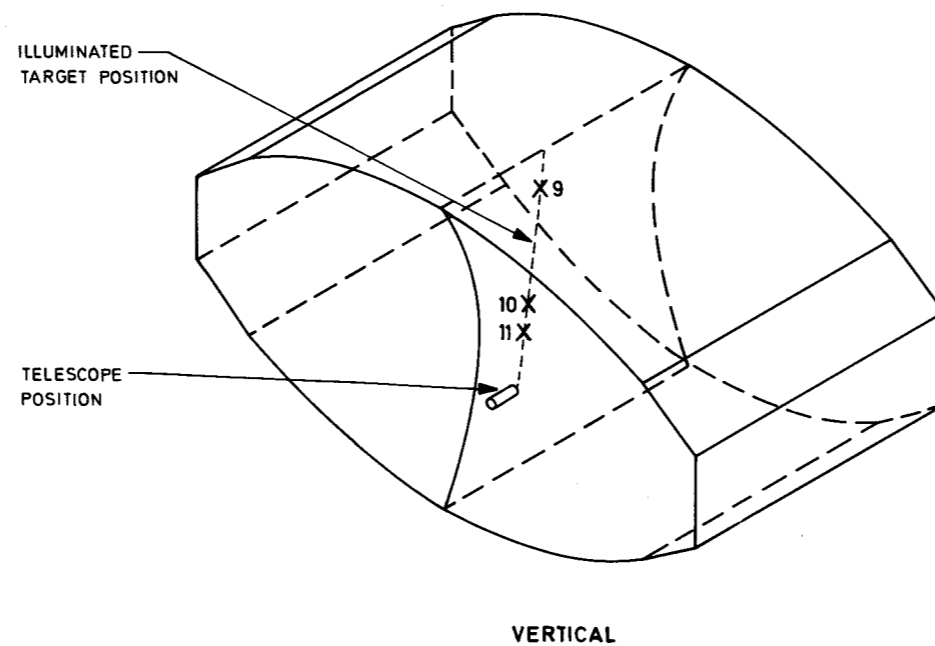
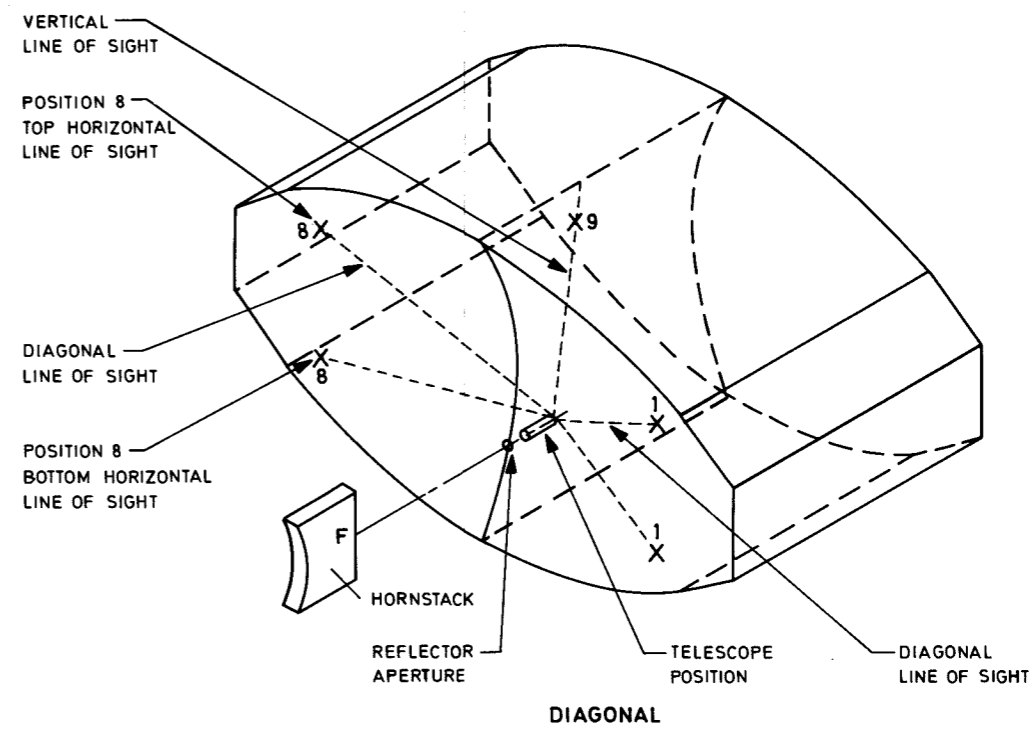
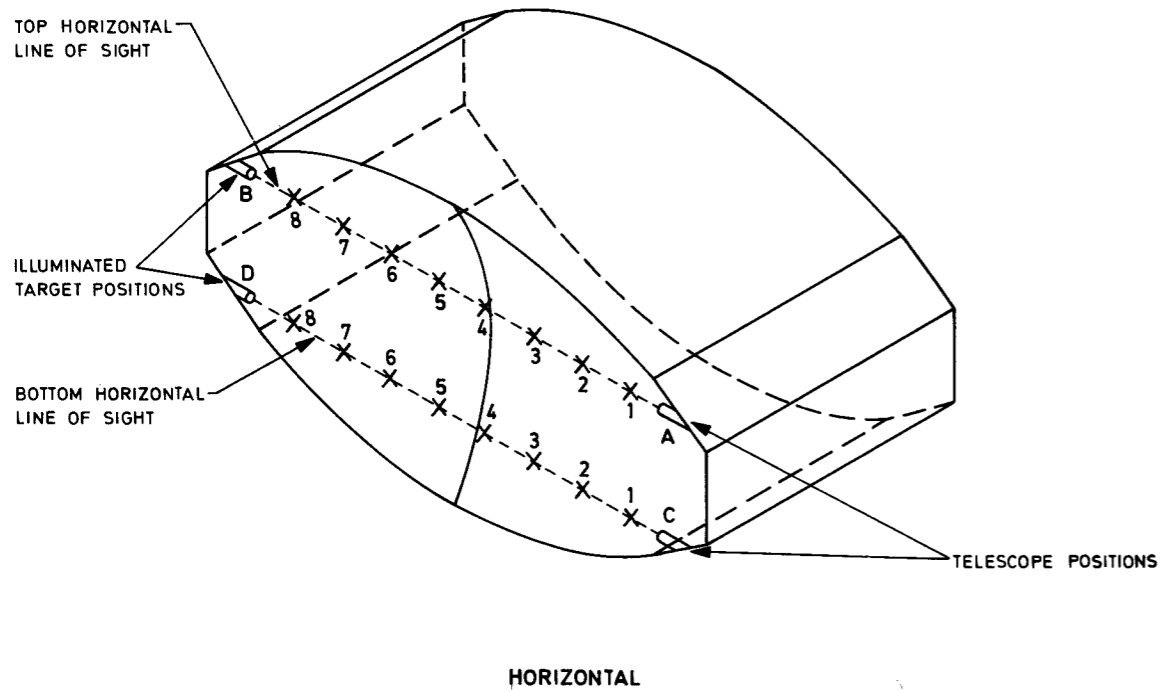


Fig. 6

Sept. 77 (Amdt. 9)

Optical sighting checks : location of telescope and target positions

Fig. 6.

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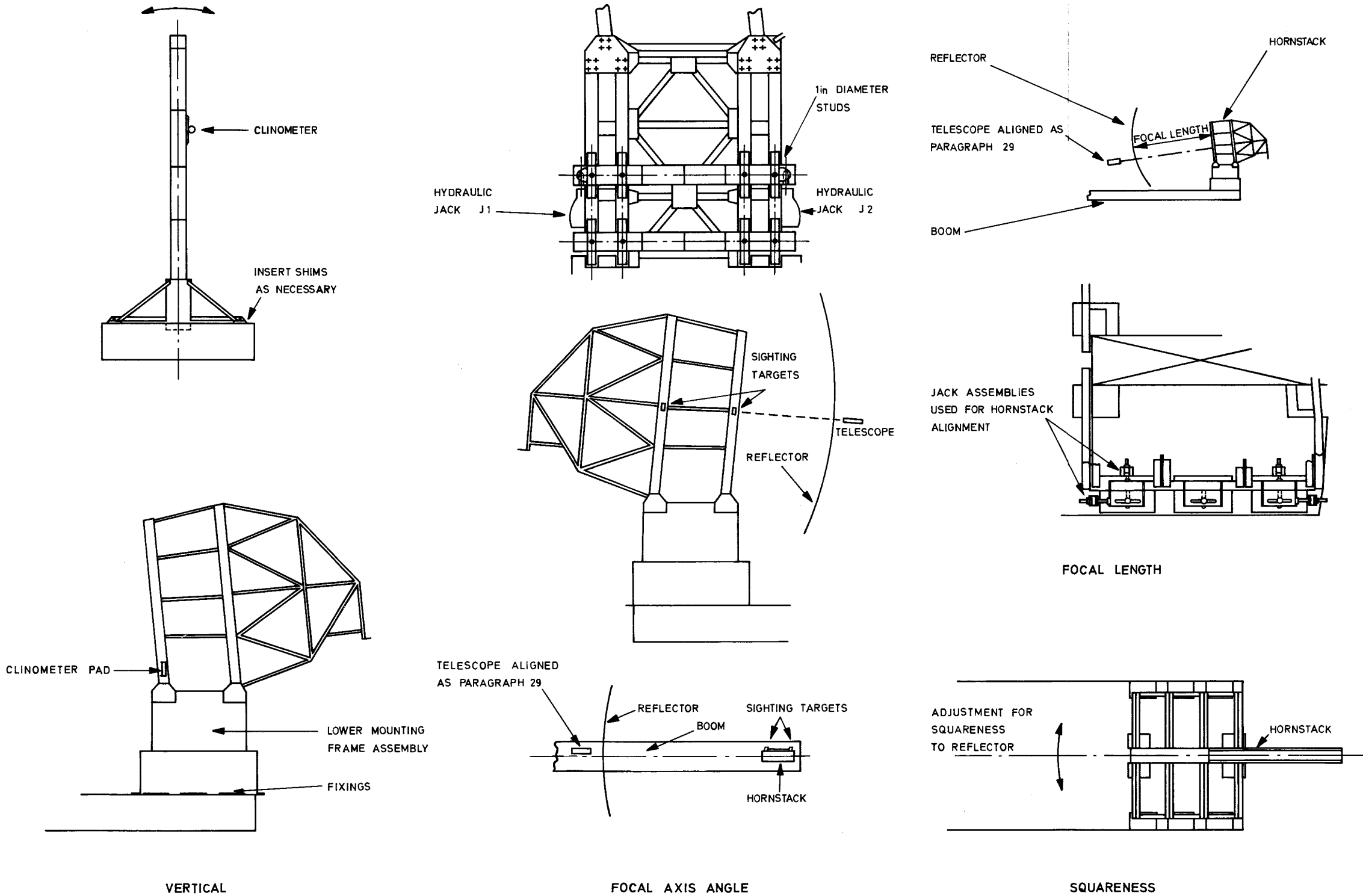


Fig. 7

Hornstack alignment

Fig. 7

TYPE 84 REFLECTOR  
RECORD OF ALIGNMENT CHECKS

Site - .....

Date - .....

Measurements taken by - .....

HORIZONTAL CHECKS

|                |                     | Bottom horizontal line of sight (BHLS) |   |   |   |   |   |   |   | Top horizontal line of sight (THLS) |   |   |   |   |   |   |   |
|----------------|---------------------|--|---|---|---|---|---|---|---|-------------------------------------|---|---|---|---|---|---|---|
|                |                     | 1                                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1                                   | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Up<br><br>down | Readings (i)        |  |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |
|                | " (ii)              |  |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |
|                | " (iii)             |  |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |
|                | Average             |  |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |
|                | Target Holder Error |  |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |
|                | Corrected Value     |  |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |
| Left Right<br> | Readings (i)        |  |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |
|                | " (ii)              |  |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |
|                | " (iii)             |  |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |
|                | Average             |  |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |
|                | Target Holder Error |  |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |
|                | Corrected Value     |  |   |   |   |   |   |   |   |                                     |   |   |   |   |   |   |   |

Note: Suffix above values with L, U, R or D as appropriate

VERTICAL CHECK

VLS 10 .....  
VLS 11 .....

DIAGONAL CHECKS

THLS 1 ..... Away from/Towards\* reflector  
THLS 8 ..... Away from/Towards reflector

\* delete as appropriate.

All values are given in units of thousandths of an inch.

Chapter 2

WAVEGUIDE SYSTEM

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Introduction

1. The L-band waveguide components described in this chapter are all those between the transmitter output flange and the aerial feed horns with the exception of the rotating joint (coupler, rotary, r.f.) this being described in Sect 8, Chap.4. The waveguide components up to the hornstack consist principally of straight sections, right-angle bends and lengths of flexible waveguide. An r.f. phase shifter and a low pass r.f. filter are incorporated in the run near the transmitter; these components compensate for the imperfect matching of the long waveguide run, ensuring satisfactory operation of the magnetron. At the hornstack (fig.1) power is distributed in varying proportions via a series of waveguide splitters to eight waveguide polarizers and feed horns. Each polarizer is a length of circular waveguide containing a dielectric vane

which can be rotated through forty-five degrees. The vane enables the polarization of the transmitted energy to be changed from horizontal to circular and vice versa as required through the medium of bowden cables operated from an electro-mechanical actuator situated below the hornstack.

Waveguide run: transmitter to hornstack

2. Details of the waveguide run are shown in figs.7,8,9 and 10. The run commences with an E-plane bend from the transmitter output flange (reference 1 on fig.7) leading, via an eighteen inch flexible section and an H-plane bend, to a window pressure, waveguide (reference 4) and a straight length of waveguide (reference 5) containing an inlet for air pressurized at 15 lb per sq. in. The window consists of a 0.003 in. thick Melinex film clamped between two electro-tinned brass frames. The film offers negligible



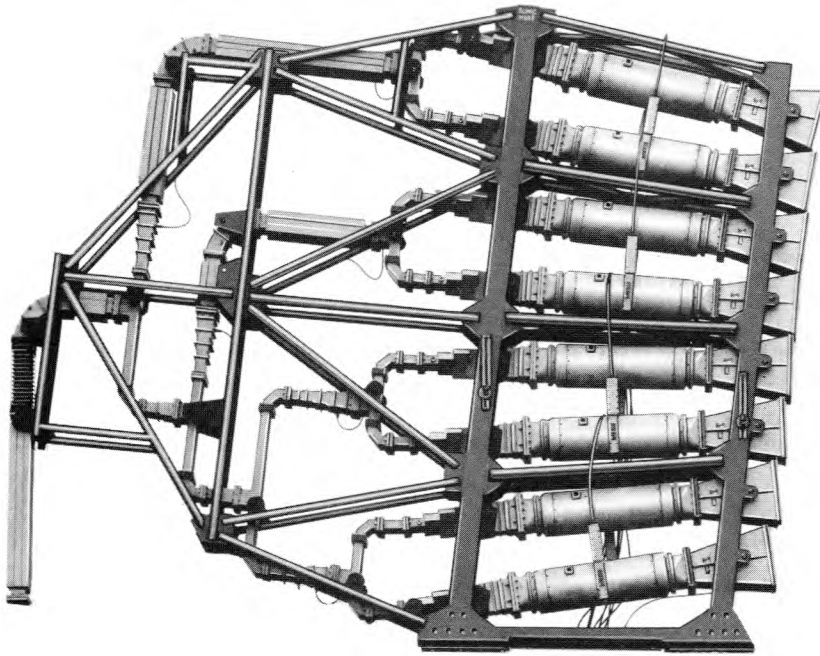


Fig. 1 Hornstack in mounting frame

obstruction of r.f. waves; provided it is kept absolutely clean there is no tendency to high power breakdown across the waveguide. The other components in the transmitter room include the waveguide assembly (phase shifter), the waveguide assembly (low pass filter) which is connected into the waveguide run via a double E-plane bend, and the waveguide assembly (harmonic filter) introduced by CA.2531. The purpose of the harmonic filter is to reduce interference with external radio equipment caused by the transmission of unwanted harmonics of the magnetron frequency (para. 14-17). Two filters may be inserted in series, depending on site requirements. The run continues up to the cabin containing the coupler, rotary, r.f. and connection is made to this item via the waveguide assembly (joggle), a fabricated brass E-plane double bend. The run from the top of the coupler, rotary, r.f. continues with a second waveguide assembly (joggle) which restores the offset waveguide output flange of the rotating joint by 3 1/4 in. onto the rotational axis of the aerial. From this point the run continues up inside the torque tube to the centre of the main horizontal boom. Two support plates are used in the torque tube in which apertures corresponding to the waveguide internal dimensions are cut; each plate thus forms a spacer between the standard rectangular waveguide flanges of the adjoining components, flanges and plate being bolted through together. The interconnecting waveguide components in the run are described in the following three paragraphs and consist of various straight lengths strengthened for pressurization, various lengths of flexible waveguide, H-plane bends and E-plane bends.

3. The waveguides assembly (pressurized) consists of a straight length of aluminium alloy waveguide, size No.6 (6.50 in. by 3.25 in. internal

dimensions) with standard L-band rectangular aluminium alloy flanges secured in position with Araldite. An aluminium alloy honeycomb structure is fitted to the outside walls with Redux adhesive to strengthen the waveguide against the working internal air pressure of 15 lb per sq.in.

4. The waveguide assembly (flexible) consists of two U-sections of corrugated beryllium copper sheet hard soldered together down the centre line of each narrow wall of the waveguide thus produced. Flanges at each end are of electro-tinned brass to alloy joining to aluminium or copper waveguide. Weather protection is afforded by rubberized paint on the outside surfaces. Longitudinal expansion is prevented by two restraining wires, one at each side of the waveguide, connected to the flanges at each end.

5. The waveguide assembly (H-plane bend) and the waveguide assembly (E-plane bend) are short 90° circular bends. All waveguide bends outside the transmitter are machined castings of aluminium alloy, made in halves and joined together.

Waveguide Assembly (phase shifter) (fig.2)

6. The magnetron will only operate satisfactorily when the impedance of the load lies within certain limits. Due to the long waveguide run it is difficult to control this impedance for all frequencies in the band and the purpose of the phase shifter is to ensure that the magnetron will operate in the stable region of its characteristic Rieke diagram.

7. The phase shifter consists of a thick dielectric vane, parallel to the E-plane, which can be moved to any position between the side wall and the centre of the broad dimension of a length of standard

$\pi'$  mode frequency. The frequency characteristic of the low pass filter ensures that the magnetron sees matched loads up to and above the  $\pi''$  frequency, effectively padding out any high system mismatches in the system beyond this point. The purpose of the low pass filter is thus to absorb the unwanted modes of r.f. energy and to pass the required mode without loss.

**11. Mechanical construction.** The first component of the low pass filter is a special aluminium alloy 3dB directional coupler where the coupling slot is formed by the removal of a section of the common dividing wall in the narrow dimension of the waveguide. The slot is sub-divided by a number of wires, closely toleranced in diameter and position, joining the broad faces of the waveguide; the slot and wires are in the form of a separate frame which is soldered in during the assembly. A waveguide spacer of critical length is connected between the coupler and the transfer assembly and forms a part of the 3dB directional coupler. Two editions of the 3dB directional coupler (and spacer) are made, one for Red and Yellow magnetron frequency bands and the other for Yellow and Blue bands; the differences between the two editions concern the configuration of the wires in the coupling element and the critical length of the spacer.

**12.** The remaining components form the transfer assembly which is a double waveguide assembly, each channel consisting of a cosine taper, two straight sections of reduced width, a Melinex film pressure window and a second cosine taper section containing a dissipative polyiron and resin load. The cosine tapers and straight sections are made of electroformed high conductivity copper which reduces wall losses and improves the transfer efficiency; this construction also ensures the close dimensional tolerances necessary to achieve the same cut-off frequency in each channel of the transfer assembly. The 0.003 in. thick Melinex film is clamped between two electro-tinned brass double window frames and is by-passed by two nylon air bleed tubes which provide an air flow of approximately one cubic foot per minute to each load; after cooling the loads the stream of air is exhausted through holes in the end plate. The loads are carefully positioned in the second cosine taper to preserve the high frequency match of the whole transfer assembly.

**13. Principle of operation.** The r.f. pulse from the transmitter divides equally at the 3dB directional coupler in the forward direction, as shown in fig. 4, the wave passing through the slot lagging the direct wave by  $90^\circ$  in phase. At a point within each cosine taper, depending on frequency, the waveguide dimension is such that it is cut-off for the  $\pi$  mode wave; at this point the  $\pi$  mode waves in each half of the taper are almost totally reflected. On reaching the coupling slot each reflected wave again divides equally, the components passing through the slot lagging the direct components by  $90^\circ$  in phase. The reflected waves will therefore add in phase in the aerial arm and cancel (through being  $180^\circ$  out of phase) in the transmitter arm. The frequency cut-off characteristic of the transfer assembly is such that all  $\pi$  mode frequencies in the operational band are reflected while at the same time the corresponding  $\pi'$  and  $\pi''$  mode frequencies are transmitted down the straight sections of reduced width waveguide to the absorbing load. The load also absorbs the highly attenuated residue of the  $\pi$  mode, approximately 30 to 35dB down on the transmitter pulse. By thus diverting signals above 1400 Mc/s to the loads, a match has been presented to the magnetron at these frequencies. Effectively a series pad of approximately 20dB has been introduced against system mismatches above 1400 Mc/s.

#### ◀ Waveguide assembly (harmonic filter)

**14.** A certain amount of energy at harmonics and anharmonics (spurious frequencies but not harmonics) of the magnetron is radiated from the aerial, causing interference with adjacent radio installations operating at higher frequencies. The chief frequencies concerned are the third and fifth harmonics. This harmonic energy is not only propagated in the normal rectangular waveguide TE<sub>10</sub> mode but also in many complex higher-order modes. The filter, which is introduced by CA.2531, is designed to absorb harmonics in any mode sufficiently to reduce the amount of interference to adjacent radio installations to an acceptable level.

**15. Location.** The harmonic filter is inserted between the low-pass filter and the vertical section of the waveguide run leading to the rotating joint. A U-shaped loop is formed in the waveguide run, suspended from the ceiling of the transmitter building by brackets, and the filter forms one leg of the U. There is sufficient space available to enable

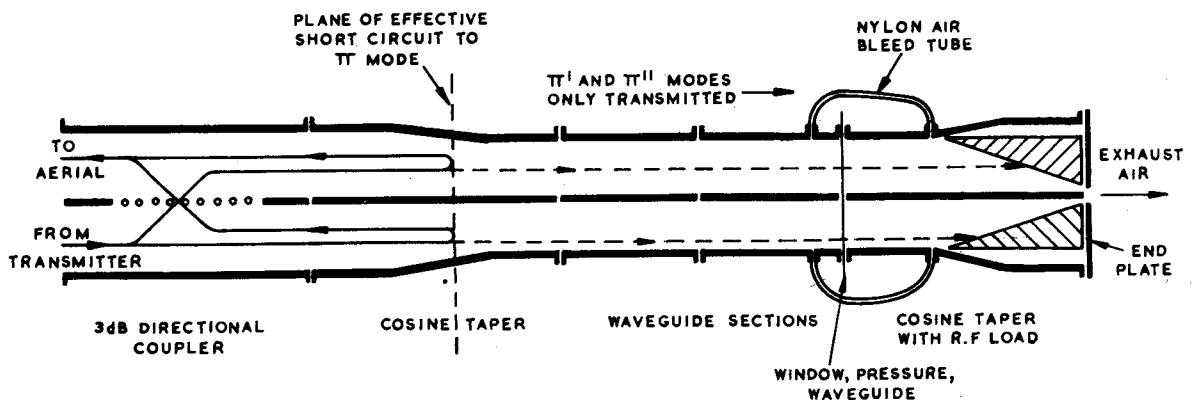


Fig. 4. Low pass filter: explanatory diagram

either one filter, or two filters in series to be used. On certain sites conditions make it necessary to employ two filters.

16. *Mechanical construction (fig. 4A).* The harmonic filter assembly is approximately 4 ft long and 2 ft square, weighing 600 lb. Basically it is constructed from a length of rectangular aluminium waveguide, size No. 6, perforated on all faces with rows of broadband resonant slots. Machined cast aluminium T-sections are assembled on eight guide rods round the main waveguide. The T-sections form sets of short auxiliary waveguides, two on each broad face, and one on each narrow face, into which the resonant slots couple. The subsidiary waveguide channels thus formed are terminated in lossy ceramic wedge-type r.f. loads of very broadband performance. The broad dimensions of these auxiliary waveguides is such that they are cut-off for the fundamental frequency, and so only a small amount of the fundamental frequency power passes to the loads.

17. *Principle of operation.* Complex field patterns are set up in the waveguide system due to mode conversion in the various waveguide components and in the filter itself. The rows of resonant slots are positioned to give maximum coupling for all modes of propagation possible at the harmonic frequencies. The slots are resonant at the third and fifth harmonics of the fundamental frequency but are of such a broadband design that a considerable amount of fourth-harmonic energy is also coupled. The r.f. energy in the operational frequency band of 1215 Mc/s to 1365 Mc/s is passed with negligible attenuation. For any fundamental frequency in the pass band the total attenuation of each filter to all third harmonic energy in either the  $TE_{10}$  mode or the  $TE_{01}$  mode is at least 15dB, and the degree of attenuation for the higher order TE and TM modes is similar. The attenuation to fifth harmonic energy is 15dB for the normal  $TE_{10}$  and TM modes and is at least 1.5dB for the  $TE_{01}$ ,  $TE_{02}$  and  $TE_{03}$  modes.

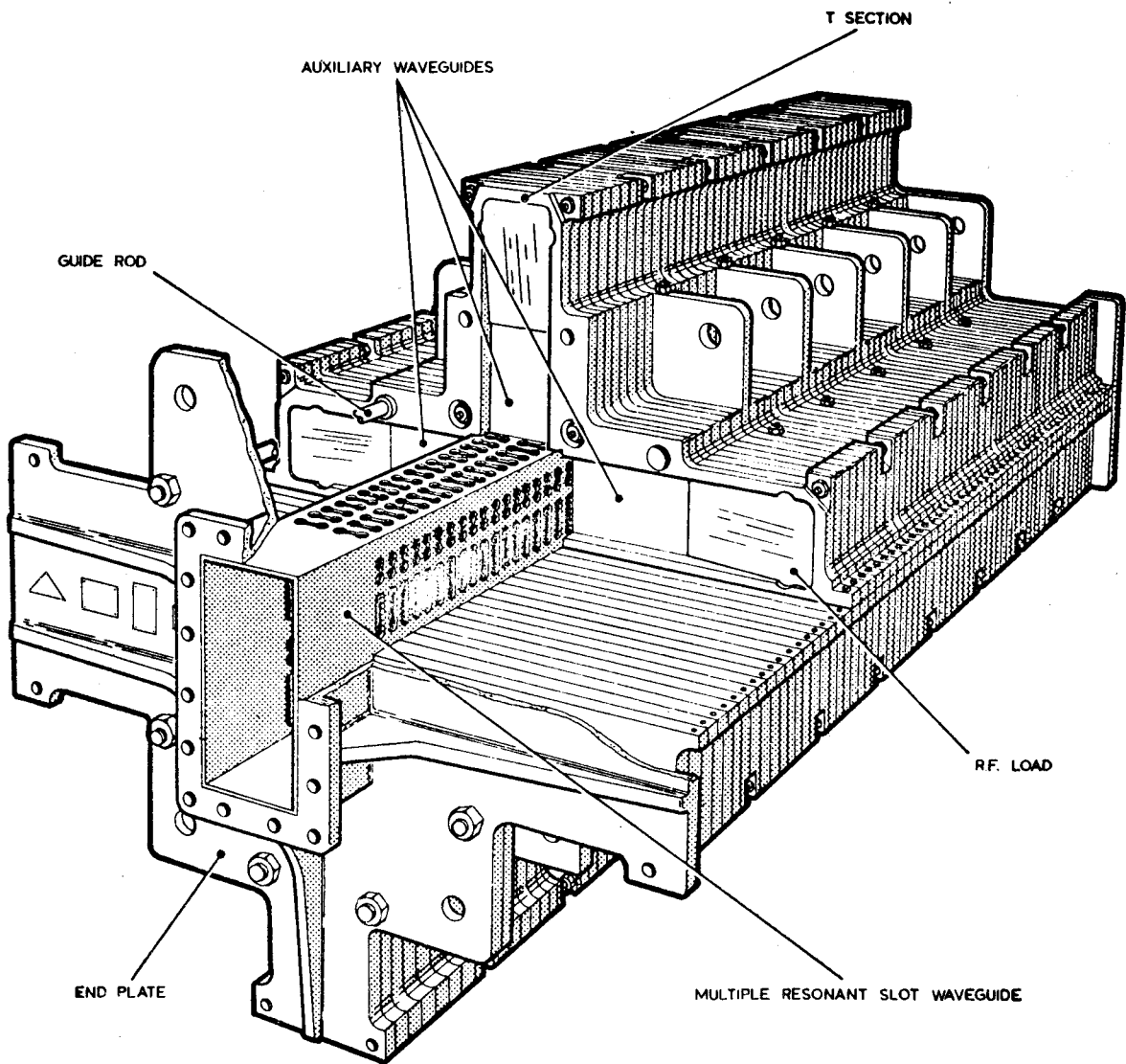


Fig.4A Harmonic filter: construction

**Waveguide assembly (leaky wall filter and double vane reflector) R.A.F. Neatishead only.**

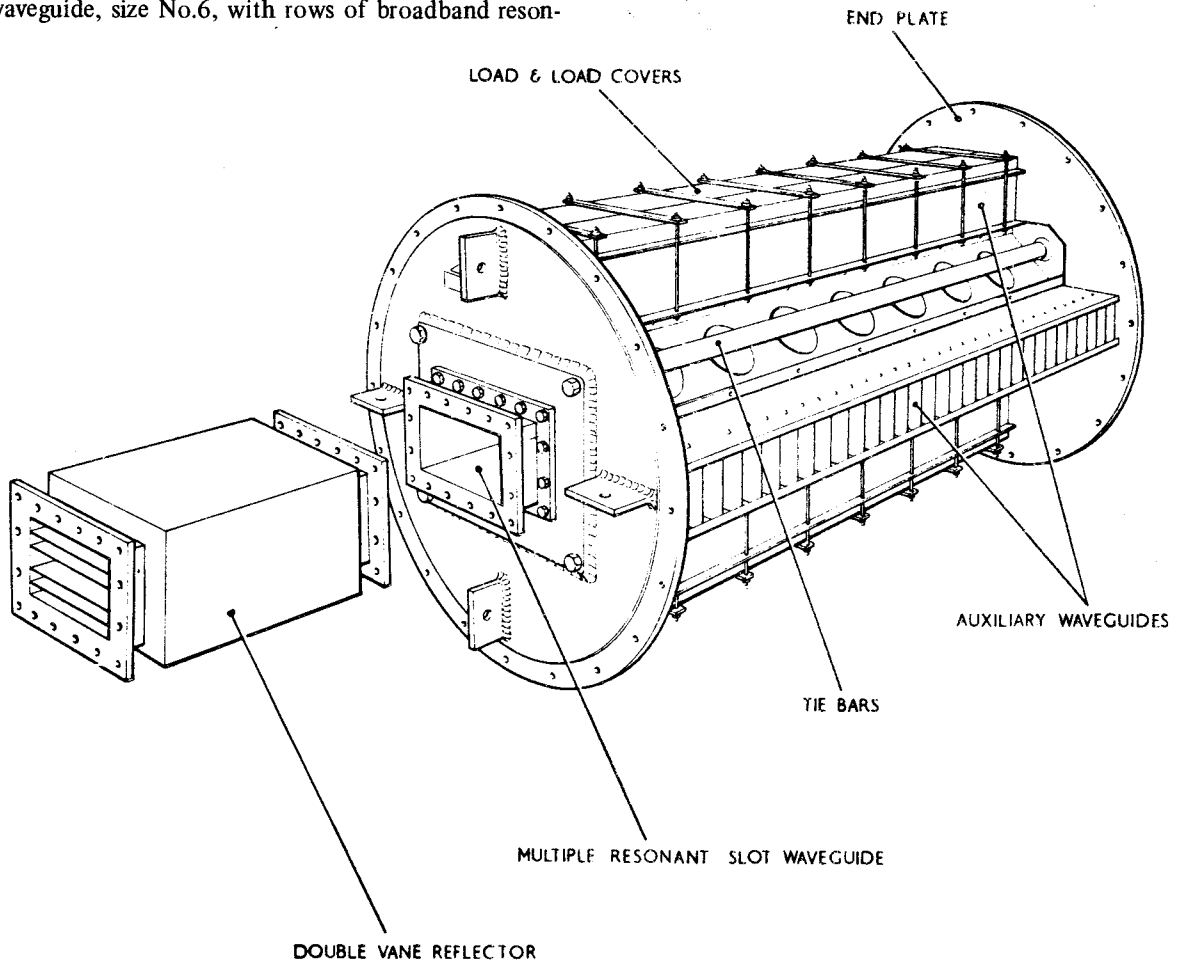
**17A.** A certain amount of energy at harmonics and anharmonics (spurious frequencies but not harmonics) of the magnetron is radiated from the aerial causing interference with adjacent radio installations operating at higher frequencies. The chief frequencies concerned are below second harmonic. This harmonic energy is not only propagated in the normal rectangular waveguide TE<sub>10</sub> mode but also in many complex higher-order modes. The leaky wall filter unit, which is introduced by CA4258 will absorb harmonics in any mode sufficiently to reduce the amount of interference to adjacent radio installations to an acceptable level. The double vane reflector unit boosts the overall performance of the leaky wall filter to the TE<sub>0n</sub> and TE/TM<sub>mn</sub> modes.

**17B.** Location (fig. 7). The leaky wall filter and the double vane reflector are inserted in series with the harmonic filter between the low-pass filter and the vertical section of the waveguide run leading to the rotating joint.

**17C.** Mechanical construction (fig. 4B). The leaky wall filter unit is approximately 4 ft long and 2 ft in diameter, weighing 265 lb, and the double vane reflector unit is approximately 1 ft 4 in long, weighing 35 lb. Basically the leaky wall filter is similar to a waveguide, size No.6, with rows of broadband reson-

ant slots. Auxiliary waveguide units, constructed from sheet steel are mounted around the perforated main waveguide section. The subsidiary waveguide channels thus formed are terminated in r.f. ferrite type broadband loads. The broad dimension of these auxiliary waveguides is such that they are cut-off for the fundamental frequency and a very small amount of the fundamental frequency power passes to the loads. The double vane reflector unit, which acts as a booster to the leaky wall filter, is machined from aluminium. Inserted internally across its waveguide section are two sets of vanes which form short sections of reduced height waveguide.

**17D.** Principle of operation. Complex field patterns are set-up in the waveguide system due to mode conversion in the various waveguide components and in the leaky wall filter itself. The resonant slots are positioned to give maximum coupling for all modes of propagation possible at the harmonic frequencies. The slots are resonant at below second harmonic but are of such a broadband design that a considerable amount of second harmonic energy is also coupled. The r.f. energy in the operational frequency band of 1215Mc/s to 1365Mc/s is passed with negligible attenuation. For any fundamental frequency in the pass band the total attenuation of each filter unit to all anharmonic energy in the band 1800Mc/s to 2200Mc/s is at least 35dB.



**Fig.4B Leaky wall filter and double vane reflector**

### The hornstack

18. The hornstack (*fig. 1*) constitutes the multiple horn feed of the aerial. The waveguide components are mounted in the top structure assembly which can be removed as one unit from the lower frame assembly on the end of the boom. Under normal operating conditions the r.f. wavefront from the horns is horizontally polarized, the circular polarization facility being used only to reduce the effects of heavy rain clutter. The narrow top structure assembly houses the eight arms containing the twist and taper sections, the polarizers and the horns. The axes of these arms converge at the vertex of the paraboloid reflector and the vertical stacking arrangement causes little obstruction to the field pattern radiated from the reflector. In order to give the required vertical polar diagram of the aerial, and hence the range coverage pattern of the radar, the amplitude and phase relationship of the r.f. waves emerging from the eight horns is accurately determined by the component dimensions. The amplitude distribution of energy is determined by the dividing ratios of the seven waveguide splitters and the phase distribution by the individual path lengths from the common hornstack waveguide input to the apertures of the eight horns.

19. The hornstack waveguide components are detailed in *fig. 11*. The waveguide run along the boom is connected to a length of flexible waveguide (1) and a 90° E-plane bend (2). Connected to the bend is a 'cheese'-shaped spacer (3) with angled flanges.

20. From the 'cheese' spacer (3) the output is conveyed via a straight pressurized waveguide (4) to splitter (1:1.73) (5). The upper arm of the splitter (5) is a tapered waveguide section passing the output via a straight pressurized waveguide section (6), and E plane bend (2) and a further straight pressurized section (7) to a final 1:1 splitter (8) feeding the top two horns (see para. 25 to 28). The lower arm of splitter (5) is connected via a 90° bend and a tapered section (9) to a further splitter (1:1.73) (10). The upper arm of splitter (10) carries a portion of the output via a tapered section, a straight pressurized section (11), an E plane bend (2) and a further straight pressurized section (12) to a (1:1.73) splitter (13) feeding a further pair of horns below the top-most pair. The lower arm of splitter (10) feeds via a 90° bend and a tapered section (9) another splitter (1:2.05) (14). A matching iris (15) is included between the 90° bend and the tapered section (9). The upper arm of splitter (14) feeds a portion of the output via a 90° bend and a tapered section (16) to a further splitter (1:1.37) (18). This splitter feeds the two penultimate horns. The lower arm of splitter (14) feeds the remainder of the output via a matching iris (15), a tapered section (16) and another iris (17) to a final splitter (1:1.37) (18) which feeds the two lowest horns of the hornstack.

21. Each of the splitters is a T-shaped double corner where the split ratio is determined by the position of the dividing wedge; the wedge forms a hollow V when viewed externally (*fig. 1*). Impedance matching is improved by making each dividing arm in half height waveguide (6.5 in by 1.625 in). Broadband matching is achieved by posts in the half height arms.

22. The two short taper sections (9) restoring the half height splitter output flanges to standard dimensions are precision castings having three quarter-wavelength stepped taper sections. The height ratios of the taper sections are arranged to give a good match in the 1215 to 1365 Mc/s band. The four long taper sections are not stepped.

23. A window, pressure, waveguide (19) (*para. 2*) is inserted before the input flanges of the four final waveguide splitters. The waveguide system from the transmitter up to the four windows is pressurized at 15 lb. per sq. in from the transmitter compressor system.

24. Each window is by-passed by a nylon air bleed tube connected via adaptors (21) to the adjacent splitter and taper sections. This allows a steady low pressure stream of air to pass into the horns where it exhausts to atmosphere. The adaptors in the taper sections have restrictions to ensure the correct pressure drop.

25. The pressure reduction prevents the large horn output windows being damaged by a high pressure differential. A high air pressure in the polarizers and horns is not required as their physical dimensions are large and the power handled has been reduced by the final splitting stage.▶

26. Brass spacers, separated by electro-tinned gaskets, join the ends of the four splitters to twist and taper sections which perform the functions of rotating the plane of polarization from vertical to horizontal and of tapering from the half-height waveguide dimensions of the brass spacers to square waveguide of 6.50 in. by 6.50 in. internal dimensions. Each waveguide assembly (twist and taper) is made of two precision castings, a ninety degree stepped twist in half height rectangular waveguide and a stepped taper from half-height to square waveguide. The twist has three intermediate quarter-wave long sections and the taper has one; the angles of the twist sections and the heights of the taper sections are arranged to give a good overall match over the band 1215 to 1365 Mc/s.

27. Square to circular section cast transitions connect the twist and taper sections to the waveguide assemblies (polarizer), similar transitions being included in the waveguide assemblies (horn).

28. The air stream through the feed arms (*fig. 11*) is exhausted through air outlet connectors in the sides of the horns. The air connectors of all eight horns are coupled with nylon tubing which is led to

an air filter and dryer and a high frequency whistle situated in the lower mounting frame below the hornstack. The air filter and dryer prevents moist or contaminated air from entering the waveguide system when the air pressurizing system is switched off. The whistle sounds continuously while the waveguide system is pressurized and is thus a warning to personnel not to expose themselves to radiation hazard by being in proximity to or in the line of fire of the aerial. It is necessary to ensure a free flow of air to atmosphere through the exhaust to prevent an excessive pressure build-up in the horn which might damage the aperture window.

#### *Waveguide assembly (polarizer) (fig. 12)*

29. The polarizer consists of a matched polystyrene vane which is set in a rotatable waveguide cylinder (the inner tube assembly) of  $7\frac{5}{8}$  in. inside diameter. Two bearing support rings round the waveguide cylinder each carries a number of ball bearing races which run on the inside circumference of the flanged extensions of the r.f. choke assemblies. Two brackets on the waveguide cylinder carry indicating letters 'H' (horizontal) and 'C' (circular) which are visible through windows on the outer tube of the polarizer according to the setting of the polystyrene vane.

30. The r.f. choke assemblies each consists of a cylindrical connecting flange forming the stationary extension of the waveguide cylinder and an r.f. choke system designed to close the gap electrically between the rotating and stationary waveguide walls. The choke system consists of a low characteristic impedance narrow quarter-wave section from the break in the waveguide wall followed by a series high characteristic impedance broad quarter-wave section folded back and concentric with the first section. The short circuit at the end of the high characteristic impedance section is reflected as a high impedance at the junction of the two sections and as a very low impedance at the break in the waveguide wall. A second double section choke behind the first reflects a very low series impedance across the wall gap between the two sections of the first choke, thereby increasing its efficiency. Each r.f. choke assembly is attached to the outer tube of the polarizer by a number of socket headed screws.

31. The actuating mechanism for the waveguide cylinder and vane is housed in a cover attached to the outer tube assembly. It consists of a hollow operating rod which slides in a bush and is connected to a bracket on the outside of the cylinder by a hinged link. The hollow rod contains a plunger, spring-loaded in each direction, which is connected by an inner shaft and a turnbuckle coupling to the wire of a bowden (Bowdenex) cable. When the hollow operating rod is pushed out of the cover by the action of the bowden cable the vane occupies a vertical position where it does not interfere with the horizontally polarized r.f. energy from the preceding twist and taper waveguide section. The waveguide cylinder is held in its exact position against the spring in the operating rod by a stop on each bearing support ring which bears against a stop pin set into each r.f. choke assembly.

32. When the operating rod is withdrawn into the cover by the bowden cable the vane is turned through  $45^\circ$ , the stops on the bearing support rings being held against two more stop pins in the r.f. choke assemblies. In the  $45^\circ$  position the vane affects the polarization of the r.f. energy from the preceding twist and taper section. The horizontally polarized wave may be considered as being resolved into two components, one perpendicular to the vane and one parallel to it. The vane has little effect on the component perpendicular to it, as is the case when the vane is set for horizontal polarization. The component parallel to the vane, however, becomes advanced in phase by  $90^\circ$  resulting in circular polarization of the wave as it leaves the polarizer.

#### *Waveguide assembly (horn) (fig. 5)*

33. Three editions of the horn are made, one for each of the three magnetron frequency bands, the only differences being in the matching and phase correcting elements. A circular to square section transition connects the  $7\frac{5}{8}$  in. inside diameter flange of the adjacent waveguide polarizer to the throat of the horn, where a matching iris, identical for all three frequency bands, is fitted.

34. From the throat the horn tapers on all sides to a vertical rectangular aperture of dimensions 13.460 in. by 8.225 in. Polystyrene vanes in the vertical plane of the horn, with dimensions dependent on the frequency band, are used to maintain the correct phase relationship between the vertical and horizontal components of circularly polarized waves. Matching is partially corrected by vertical rods near the orifice. Final matching of both horizontal and vertical components is accomplished by means of a 'corner' iris, with dimensions depending on the frequency band, which is placed adjacent to the aperture between Melinex film gaskets. The aperture is air sealed by a window, pressure, waveguide which also clamps the iris to the horn.

35. The polystyrene vanes are screwed to top and bottom of the horn, each with two 2 B.A. nylon screws which are inserted through bushes on the outside of the horn casting and protected by screw plugs. A polystyrene adapter section is screwed to each vane with two 4 B.A. nylon screws. The dimensions of the adapter depend on the frequency band, red or yellow; no adapter is fitted to the blue band edition.

#### **Polarizer actuator control**

##### *Electro-mechanical actuator (fig. 13)*

36. The polarizer actuator is situated in the lower frame assembly below the hornstack. It consists of a single phase 0.4 h.p. electric motor geared to an actuating ram. A piston at the top of the ram provides the anchoring points for the inner wires of the eight Bowdenex cables from the polarizers. Load limit cut-out and positional tell-back switches are automatically operated by the actuator when the ram is either fully extended (horizontal or linear polarization condition) or fully retracted (circular polarization condition). The operational travel of the ram is about four inches and the operational speed 24 inches per minute, motor speed being 1500 rev/min. The cut-out load at which the load

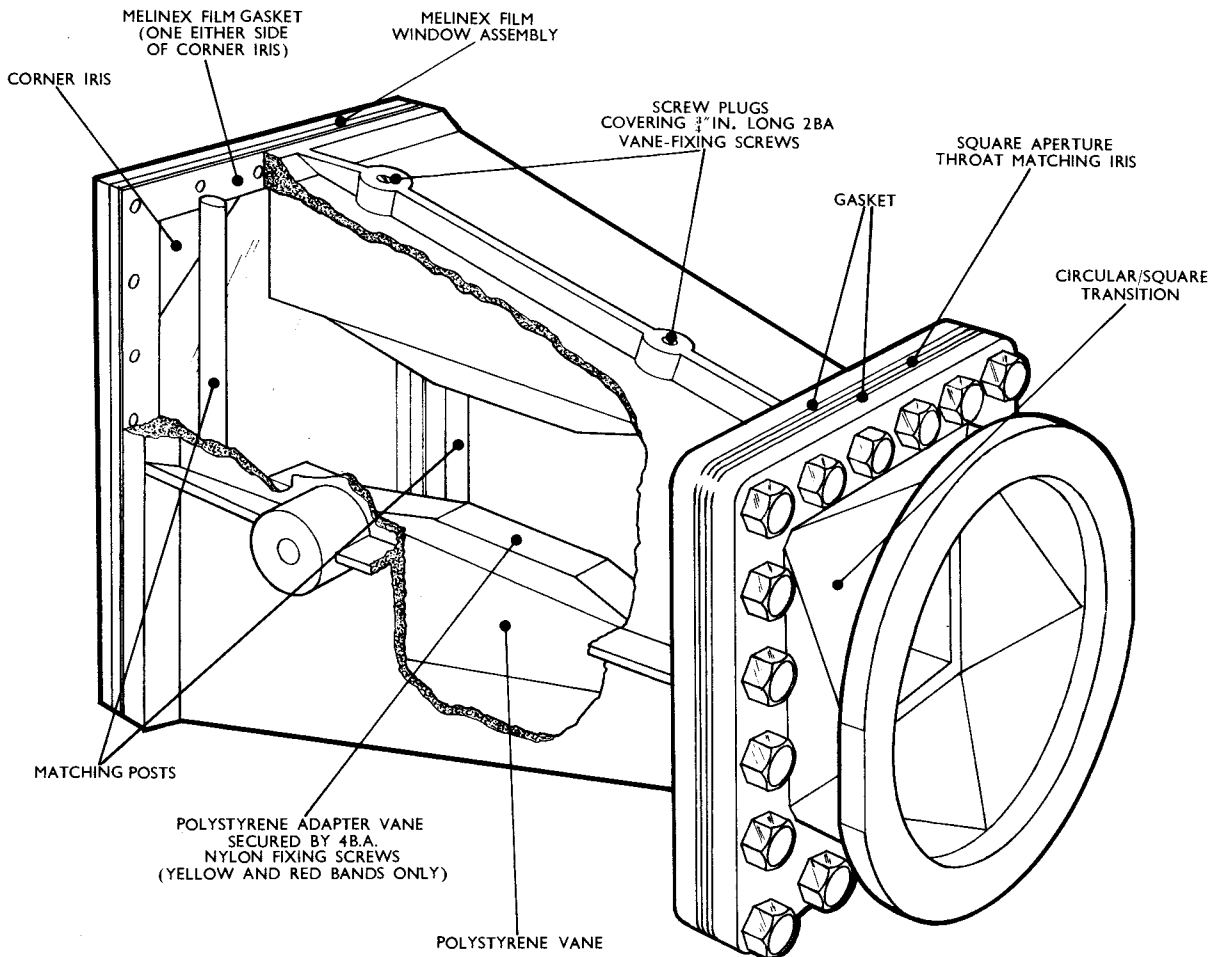


Fig 5. Feedhorn

limit switches operate is 300 lb; this load is reached when the springs in the operating rods of the waveguide polarizers have been sufficiently tensioned by the over-run plungers. The actuator motor is fitted with an electro-magnetically released brake which remains on as long as the power supply to the motor is disconnected.

37. Emergency manual control of the ram can be effected by inserting a key through a hole in a cranked spring-loaded arm immediately below the gearbox and locating the key in a recessed square hole in a shaft. The action of finding the square hole necessitates moving the spring-loaded arm sufficiently for it to operate a safety cut-out switch (SW5 on fig 14) in the power supply circuit to the driving motor; thus it is impossible to operate the ram electrically while the key is in position.

Relay polarizer (fig. 6)

38. The relay, polarizer, is a small wall-mounted unit, situated in the transmitter cabin, containing the forward and reverse drive power switching contactor for the actuator motor. The other components in the unit, besides the terminal blocks, are a control relay of the plug-in Carpenter type, a thermal overload cut-out relay, a resistor-capacitor combination providing a phase

quadrature supply to the start winding of the actuator motor, and a six ampere fuse in the line circuit of the 240 volt single phase power input to the unit.

Circuit description (fig. 14)

39. The switching for the actuator is controlled by a two position switch on the remotely situated control desk (L.H.). This switch makes or breaks the - 50V d.c. supply to the control relay RLA in the relay polarizer unit. Assuming the control desk switch is in the open or LINEAR position relay RLA is unoperated and the line circuit of the input power is connected via contacts 2 and 1 of the relay to coil 'B' of the contactor. The contactor, however, remains unenergized as the return circuit of coil 'B' to power neutral is broken by the contacts of switch SW2, opened when the ram previously reached the fully extended (linear) position. No supply is made to the actuator motor.

40. If now the control desk switch is moved to the closed or CIRCULAR position relay RLA operates and the line circuit of the input power is connected via contacts 2 and 3 of the relay to coil 'A' of the contactor. The return circuit of coil 'A' to power neutral is completed via the normally closed contacts B-L6, TB1/3 and

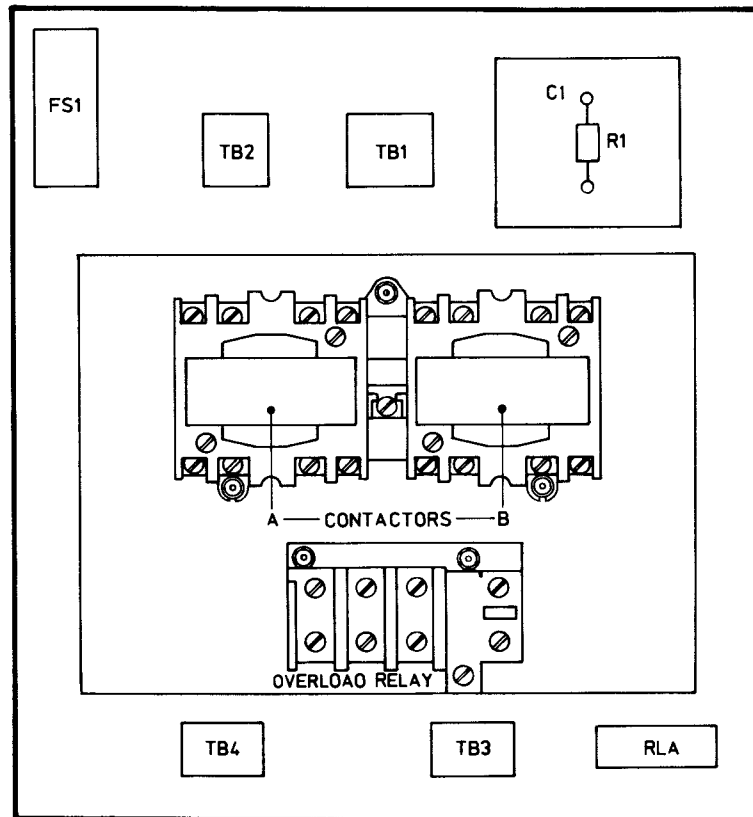


Fig 6. Relay Polarizer

switch SW1. Contacts A-L1, AL2, A-L3 and A-L6 now operate. A-L1 (closing) switches the 240V a.c. line circuit to the main winding of the actuator motor and to the brake release winding which is in parallel with it; both these windings are returned directly to power neutral and hence are energized. A-L2 and A-L3 (closing) switch 240V a.c. line and neutral to the start winding of the actuator motor which commences to turn in the direction necessary for retracting the ram. A-L6 (opening) breaks the circuit to coil 'B'. As the ram commences to retract switch SW2 closes preparing for subsequent operation of coil 'B' through the monitor desk switch. When the ram becomes fully retracted load limit switch SW1 opens, breaking the circuit to coil 'A'; the contactor immediately releases, isolating power from the actuator motor windings and causing the actuator brake to be applied simultaneously. The tell-back switch SW3 indicating linear polarization opens and the switch SW4 indicating circular polarization closes during retraction of the ram.

41. When the control desk switch is next moved to the open or linear position relay RLA releases and coil 'B' energizes through contacts A-L6 and switch SW2. Contacts B-L3, BL-2, B-L1 and B-L6 now operate. B-L3 (closing) switches the 240V a.c. line circuit to the main and brake release actuator windings as before but B-L2 and B-L1 (closing) now reverse line and neutral to the start winding; the phase quadrature network components R1 and C1 are now switched from the neutral to the line side of the start winding and the direction of rotation of the motor is reversed.

42. The thermal overload relay carries the normal running current of the actuator motor (about 1.5 amps) and will trip within 45 seconds should the motor stall (locked rotor current 2.5 amp). The relay can be manually reset from an overload trip after a delay of 20 seconds by pressing the reset actuator button on the front panel of the relay polariser assembly. (Fig. 14A).



Operation, setting-up and maintenance

43. There are no turning or other adjustments, other than for the phase shifter (para. 9), in the waveguide run between the transmitter and the hornstack. The only regular maintenance necessary, apart from lubrication of the polarizer and actuator mechanism, is a systematic check of the run to ensure that all components are clean and free from damage or corrosion, particularly at the joins of the flanges and gaskets. It is especially important in a long waveguide run carrying high power that the interior waveguide walls are absolutely clean and dry; the inside of any component removed, and as far as possible the adjacent components also, must therefore be thoroughly cleaned before reassembly. Maintenance of the rotating joint (coupler, rotary, r.f.) is referred to in Sect. 8 Chap. 4.

Pressurized air circuit

44. A regular inspection must be carried out to ensure that the pressurizing system is functioning correctly, in particular that:-

- (1) The air bleed across the waveguide pressure window is clean and unobstructed.
- (2) The air exhaust system from the horns is clean and unobstructed.
- (3) The horn windows are intact. (A small amount of permanent bowing is acceptable.)

Waveguide flanges

45. The method recommended in this paragraph for connecting standard size waveguide flanges must be followed to eliminate risk of distortion. A similar method should be followed with nonstandard size flanges. Referring to fig. 15:-

- (1) Insert four bolts in holes marked with an asterisk to locate the flanges; fit nuts but do not tighten.
- (2) Fit remaining nuts and bolts. Tighten all nuts gradually in the sequence shown, final tightening being done with a torque spanner.

Final torque spanner loading:-

- 12 lb ft on corner nuts 13, 14, 15 and 16.
- 15 lb ft on nuts 1 to 12.

- (3) Do not stretch or compress flexible sections of waveguide more than 1/4 in. from nominal for 18 in. lengths or 1/2 in. from nominal for 3 lengths.

46. The torque spanner must not be used without the extension spanner, which must be fitted in line with the torque spanner body. The load must be applied only at the ball end of the handle.

Waveguide pressure windows and horn aperture windows

47. If a window is removed from the waveguide system, it must be examined before reassembly to

ensure that the Melinex film is free from fold-lines, dust, dirt and grease (including fingerprints). If necessary the Melinex film can be cleaned with a clean dust-free rag or soft brush moistened with petroleum ether only. The Melinex film horn aperture windows must be similarly examined and cleaned when necessary.

Setting-up the phase shifter, r.f.

48. In the transmitter the loading conditions seen by the magnetron are largely independent of the aerial match due to the reverse attenuation of the ferrite isolator. Nevertheless, circumstances may arise where the electrical length of the waveguide between the transmitter and the aerial can 'pull' the magnetron frequency and give rise to slight instability. The adjustable external phase shifter proves a means of trimming the electrical length of the waveguide system to overcome this effect. The matching conditions change according to whether horizontal or circular polarization is employed and the procedure described below ensures that an electrical line length satisfactory to both is achieved.

49. The object is to choose a phase shifter position which enables either polarization to be used without frequency instability. This could be done by observation of the magnetron spectrum but since on the spectrum display it is sometimes difficult to see a sudden change, the alternative frequency/time plot of the magnetron pulse derived from the AFC discriminator is to be preferred.

50. This display is obtained by pressing the 'R.F. PULSE' button on panel, monitor 2C, interchanging PLE and PLF on panel, a.f.c. and adjusting the video gain to give a suitable picture. The 'rabbit's ears' display (fig. 16(a)) consists of a relatively flat section indicating minimum frequency shift during the pulse with an ear at each end representing the frequency change as the oscillation builds up at the start and decays at the end of the pulse. A change in the vertical position of the relatively flat central section thus indicates a change in magnetron frequency or a change in STALO frequency (fig. 16(b) and (c)).

51. Setting-up procedure:-

- (1) Stop the aerial and leave it pointing to a safe sector, i.e. an area free from nearby obstructions.
- (2) Switch off a.f.c. and tune STALO by means of the manual tuning key until the section between the ears is aligned with the trace (fig. 16(a)).
- (3) With the magnetron running at a mean current in the range 550 to 600 mA, switch to HORIZONTAL polarization and, observing the 'rabbit's ears', adjust the phase shifter over the whole of its travel. Note any point where a marked change of frequency occurs, reading the small scale in the window on the phase shifter.
- (4) Repeat on CIRCULAR polarization and finally set the phase shifter to a position where the frequency is stable in either polarization.

Modifications

52. The text and drawings of this chapter have been amended to include information on Mod. No. CA8408/3. ■

**KEY TO FIG. 7**

**(Waveguide components between transmitter and rotating joint)**

*Note:-* Items marked with double circles and suffix letters are sub-components of matched waveguide assemblies.

- |     |   |      |   |
|-----|---|------|---|
| 1   | WAVEGUIDE ASSEMBLY ('E' BEND)                             | 12L  | BLANKING PLATE ASSEMBLY                                       |
| 2   | WAVEGUIDE ASSEMBLY (FLEXIBLE) 18 IN.                      | 12M  | SPACER, CRITICAL LENGTH                                       |
| 3   | WAVEGUIDE ASSEMBLY ('H' BEND)                             | 13   | WAVEGUIDE ASSEMBLY (FLEXIBLE) 18 IN.                          |
| 4   | WINDOW, PRESSURE, WAVEGUIDE                               | 14   | WAVEGUIDE ASSEMBLY ('H' BEND)                                 |
| 5   | WAVEGUIDE ASSEMBLY, AIR INLET                             | 15   | WAVEGUIDE ASSEMBLY (PRESSURIZED)<br>5 FT 6 15/16 IN.          |
| 6   | WAVEGUIDE ASSEMBLY (FLEXIBLE) 18 IN.                      | 16   | WAVEGUIDE ASSEMBLY (FLEXIBLE) 18 IN.                          |
| 7   | WAVEGUIDE ASSEMBLY ('E' BEND)                             | 17   | WAVEGUIDE ASSEMBLY (JOGGLE)                                   |
| 8   | WAVEGUIDE SPACER 3 13/16 IN. LONG                         | 18   | WAVEGUIDE ASSEMBLY, HARMONIC FILTER                           |
| 9   | WAVEGUIDE ASSEMBLY (PRESSURIZED) 3 FT 8 IN.               | 19   | E-PLANE BENDS   |
| 10  | WAVEGUIDE ASSEMBLY (PHASE SHIFTER)                        | 20   | WAVEGUIDE SPACER 7½ IN.                                       |
| 11  | WAVEGUIDE ASSEMBLY (DOUBLE 'E' CORNER)                    | 21   | WAVEGUIDE ASSEMBLY PRESSURISED 3 FT 11 IN.                    |
| 12  | WAVEGUIDE ASSEMBLY (LOW PASS FILTER)                      | 22   | WAVEGUIDE ASSEMBLY PRESSURISED 5 FT 1⅞ IN.                    |
| 12A | FIXING FLANGE (LARGE)                                     | 23   | BASE OF TORQUE TUBE WAVEGUIDES                                |
| 12B | COUPLER, DIRECTIONAL, ASSEMBLY                            | ◀ 24 | WAVEGUIDE ASSEMBLY HARMONIC FILTER (LEAKY WALL) R.A.F. NEATI- |
| 12C | WAVEGUIDE COSINE TAPER ASSEMBLY                           | ◀ 25 | WAVEGUIDE ASSEMBLY (DOUBLE VANE REFLECTOR) SHEAD ONLY ▶       |
| 12D | FIXING FLANGE (SMALL)                                     | G1   | GASKET, ALUMINIUM   |
| 12E | WAVEGUIDE ASSEMBLY (ELECTROFORMED)                        | G2   | GASKET, ELECTRO-TINNED COPPER                                 |
| 12F | WAVEGUIDE ASSEMBLY (ELECTROFORMED WITH AIR OUTLET BOSSES) | G3   | GASKET, ELECTRO-TINNED COPPER, DOUBLE                         |
| 12G | FIXING FLANGE (SMALL)                                     | G4   | GASKET, ELECTRO-TINNED COPPER, DOUBLE SMALL                   |
| 12H | WINDOW, PRESSURE, WAVEGUIDE (DOUBLE)                      |      |   |
| 12J | WAVEGUIDE ASSEMBLY, LOAD                                  |      |   |
| 12K | FIXING FLANGE (LARGE)                                     |      |   |

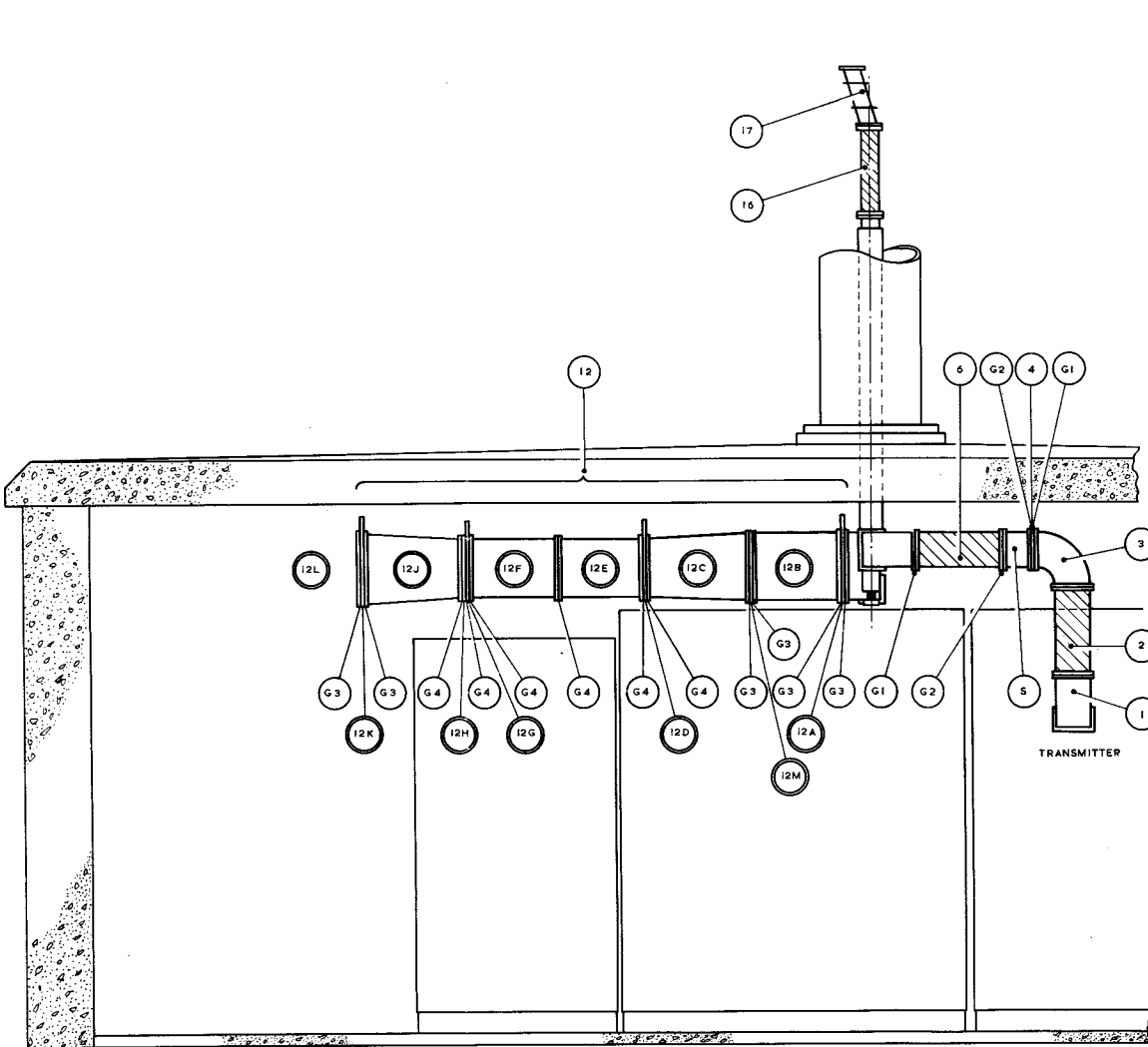
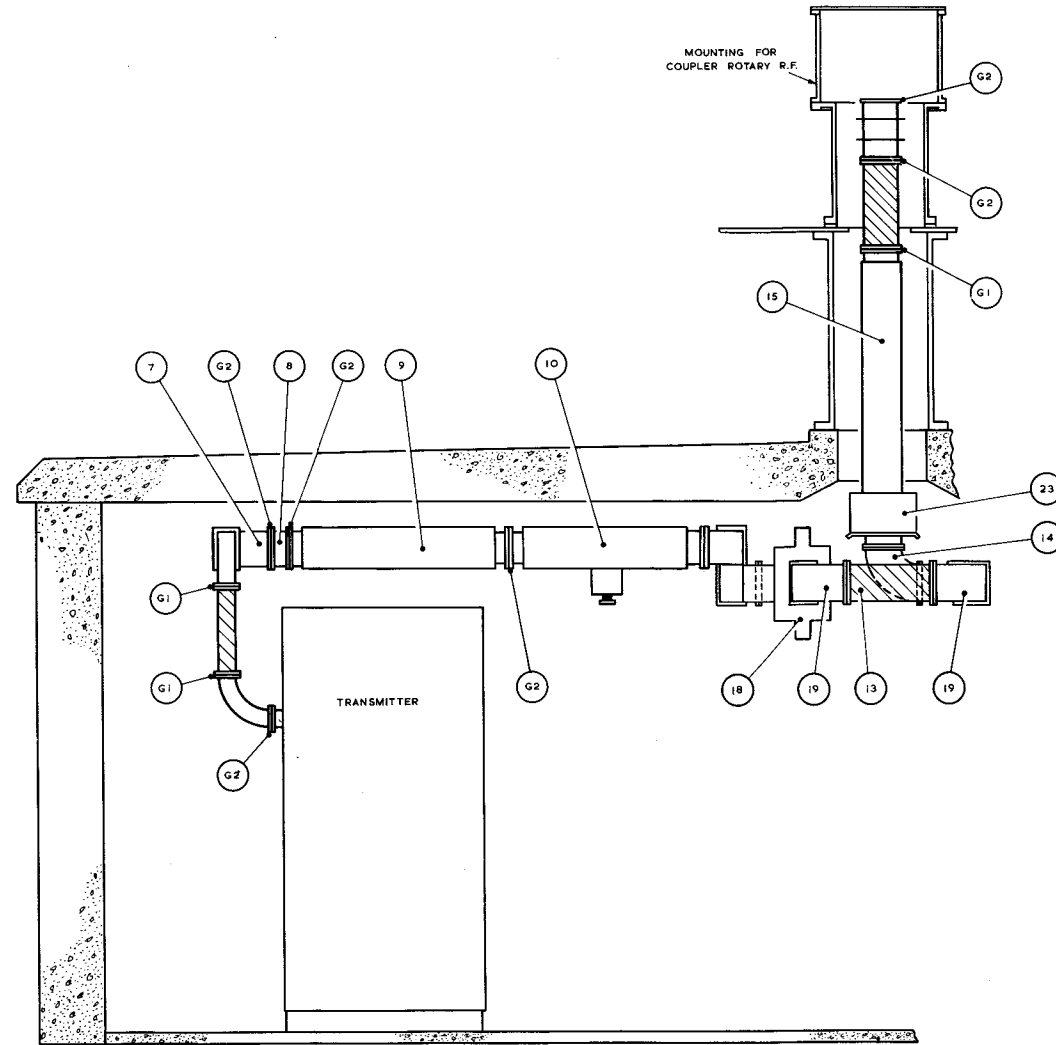


Fig. 7  
AL.1



Waveguide components between transmitter and rotating joint

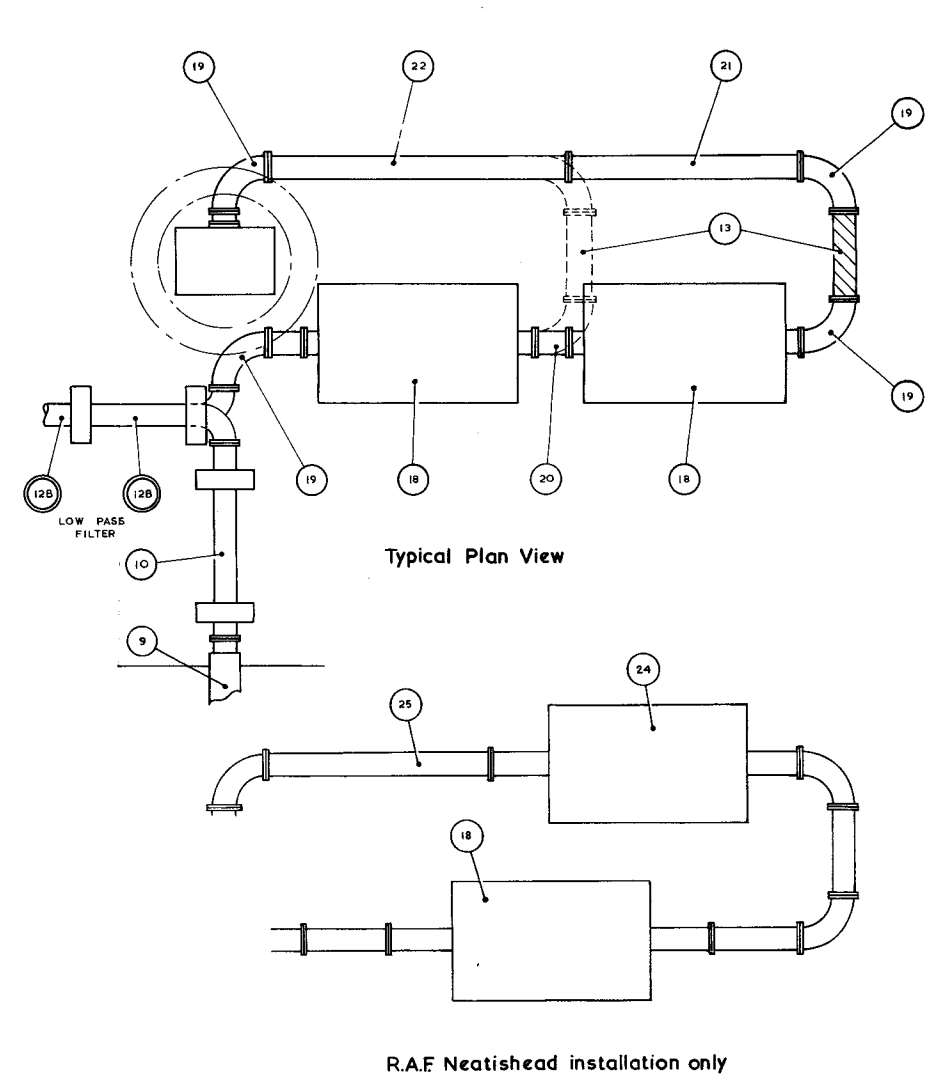


Fig. 7

**Key to fig. 8**  
**(Waveguide run inside torque tube)**

| <i>Reference</i> | <i>Description</i>                          |
|------------------|---|
| 1                | WAVEGUIDE ASSEMBLY (JOGGLE)                 |
| 2                | WAVEGUIDE ASSEMBLY (FLEXIBLE) 18 IN.        |
| 3                | SUPPORT PLATE (SMALL)                       |
| 4                | WAVEGUIDE ASSEMBLY (PRESSURIZED) 7 FT 0 IN. |
| 5                | WAVEGUIDE ASSEMBLY (FLEXIBLE) 18 IN.        |
| 6                | SUPPORT PLATE (LARGE)                       |
| 7                | WAVEGUIDE ASSEMBLY ('E' BEND)               |
| G1               | GASKET, ALUMINIUM                           |
| G2               | GASKET, ELECTRO-TINNED COPPER               |

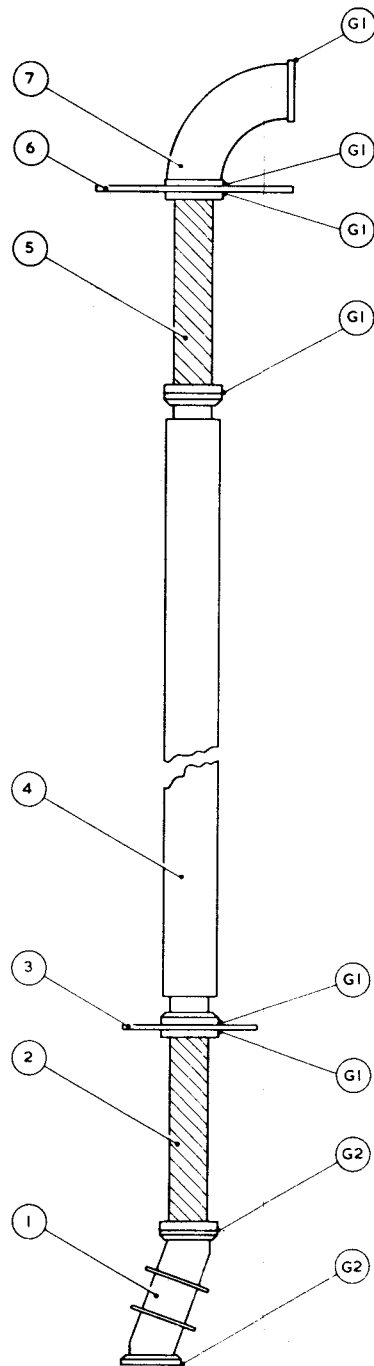
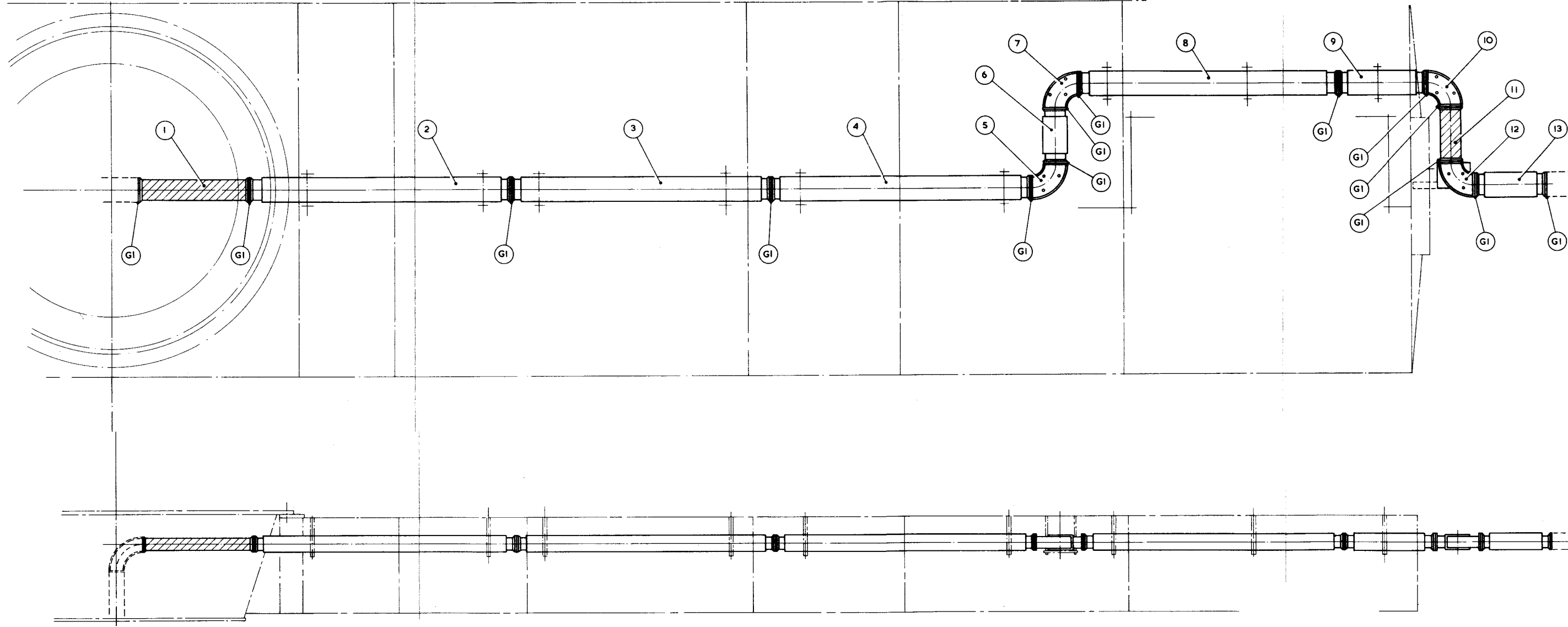


Fig.8. Waveguide run inside torque tube



**Key to fig. 9**

**(Waveguide run: centre to end of boom)**

| Reference | Description                                     |
|-----------|---|
| 1         | WAVEGUIDE ASSEMBLY (FLEXIBLE) 3 FT 0 IN.        |
| 2         | WAVEGUIDE ASSEMBLY (PRESSURIZED) 7 FT 0 IN.     |
| 3         | WAVEGUIDE ASSEMBLY (PRESSURIZED) 7 FT 0 IN.     |
| 4         | WAVEGUIDE ASSEMBLY (PRESSURIZED) 7 FT 0 IN.     |
| 5         | WAVEGUIDE ASSEMBLY ('H' BEND)                   |
| 6         | WAVEGUIDE ASSEMBLY (PRESSURIZED) 18 IN.         |
| 7         | WAVEGUIDE ASSEMBLY ('H' BEND)                   |
| 8         | WAVEGUIDE ASSEMBLY (PRESSURIZED) 7 FT 0 IN.     |
| 9         | WAVEGUIDE ASSEMBLY (PRESSURIZED) 2 FT 4 1/2 IN. |
| 10        | WAVEGUIDE ASSEMBLY ('H' BEND)                   |
| 11        | WAVEGUIDE ASSEMBLY (FLEXIBLE) 18 IN.            |
| 12        | WAVEGUIDE ASSEMBLY ('H' BEND)                   |
| 13        | WAVEGUIDE ASSEMBLY (PRESSURIZED) 1 FT 7 7/8 IN. |
| G1        | GASKET, ALUMINIUM                               |

Fig.9.

Waveguide run: centre to end of boom

Fig.9.

**KEY TO FIG. 10**

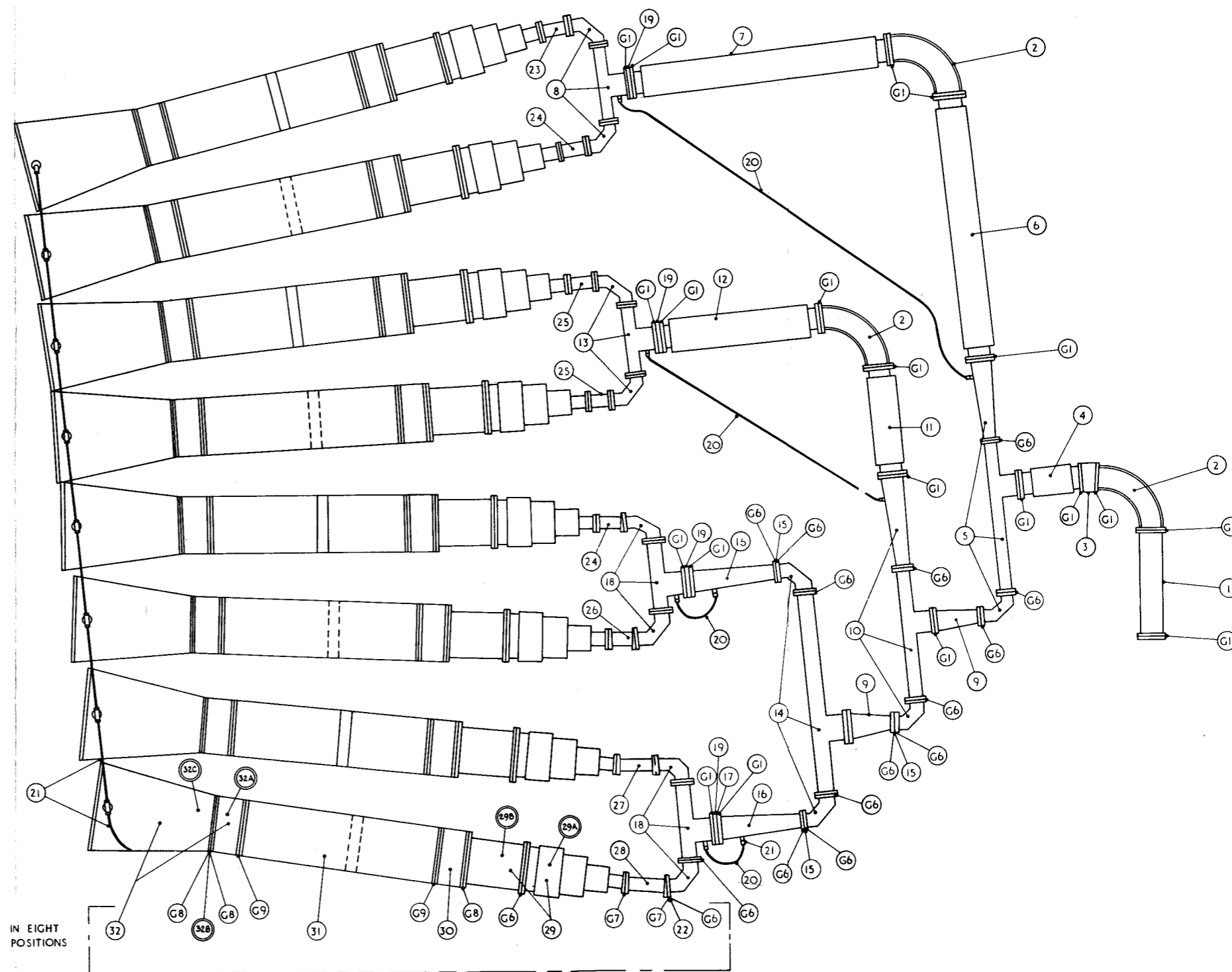
**(Waveguide run: end of boom to hornstack)**

- 1 WAVEGUIDE ASSEMBLY (FLEXIBLE) 3 FT,
- 2 WAVEGUIDE ASSEMBLY ('E' BEND)
- 3 WAVEGUIDE PACKER 3½ IN.
- 4 WAVEGUIDE PACKER 7 IN.
- ◀5 WAVEGUIDE ASSEMBLY (PRESSURIZED) 7 FT.
- 6 WAVEGUIDE ASSEMBLY (PRESSURIZED) 3 FT. 5 1/8 IN.▶
- G1 GASKET, ALUMINIUM
- G2 GASKET. ELECTRO-TINNED COPPER

**KEY TO FIG. 11.**

(HORNSTACK WAVEGUIDE COMPONENTS)

- |   |  |
|---|--|
| 1 WAVEGUIDE ASSEMBLY (FLEXIBLE)           | 23 WAVEGUIDE ASSEMBLY (SPACER No. 1)                   |
| 2 WAVEGUIDE ASSEMBLY (E PLANE BEND)       | 24 WAVEGUIDE ASSEMBLY (SPACER No. 2)                   |
| 3 WAVEGUIDE ASSEMBLY (SPACER CHEESE)      | 25 WAVEGUIDE ASSEMBLY (SPACER No. 3)                   |
| 4 WAVEGUIDE ASSEMBLY                      | 26 WAVEGUIDE ASSEMBLY (SPACER No. 6)                   |
| 5 WAVEGUIDE ASSEMBLY (SPLITTER—G 1:1-73)  | 27 WAVEGUIDE ASSEMBLY (SPACER No. 7)                   |
| 6 WAVEGUIDE ASSEMBLY                      | 28 WAVEGUIDE ASSEMBLY (SPACER No. 8)                   |
| 7 WAVEGUIDE ASSEMBLY                      | 29 WAVEGUIDE ASSEMBLY (TWIST AND TAPER)                |
| 8 WAVEGUIDE ASSEMBLY (SPLITTER—A 1:1)     | 29A WAVEGUIDE ASSEMBLY (TWIST)                         |
| 9 WAVEGUIDE ASSEMBLY (TAPER)              | 29B WAVEGUIDE ASSEMBLY (TAPER 3½ in TO 6½ in)          |
| 10 WAVEGUIDE ASSEMBLY (SPLITTER—F 1:1-73) | 30 WAVEGUIDE ASSEMBLY (TRANSITION)                     |
| 11 WAVEGUIDE ASSEMBLY                     | 31 WAVEGUIDE ASSEMBLY (POLARIZER)                      |
| 12 WAVEGUIDE ASSEMBLY                     | 32 WAVEGUIDE ASSEMBLY (HORN)                           |
| 13 WAVEGUIDE ASSEMBLY (SPLITTER—B 1:1-73) | 32A WAVEGUIDE ASSEMBLY (TRANSITION) (HORN)             |
| 14 WAVEGUIDE ASSEMBLY (SPLITTER—E 1:2-05) | 32B IRIS 9½ in × 9½ in                                 |
| 15 IRIS                                   | 32C WAVEGUIDE HORN CASTING ASSEMBLY                    |
| 16 WAVEGUIDE ASSEMBLY (TAPERED SECTION)   |  |
| 17 IRIS                                   |  |
| 18 WAVEGUIDE ASSEMBLY (SPLITTER—D 1:1-37) | G1 GASKET, ALUMINIUM                                   |
| 19 WINDOW, PRESSURE, WAVEGUIDE            | G6 GASKET, ALUMINIUM, 1½ in HIGH WAVEGUIDE             |
| 20 NYLON TUBE ¾-in O/D, ⅝-in I/D          | G7 GASKET, ELECTRO-TINNED COPPER, 1½ in HIGH WAVEGUIDE |
| 21 ADAPTOR (IN 8 POSITIONS)               | G8 GASKET, ALUMINIUM, 6½ in SQUARE WAVEGUIDE           |
| 22 IRIS                                   | G9 GASKET, ALUMINIUM, CIRCULAR WAVEGUIDE               |



IN EIGHT POSITIONS

**Fig. 11**

D.200004. R.C.1646.

**Hornstack waveguide components**

**Fig. 11**



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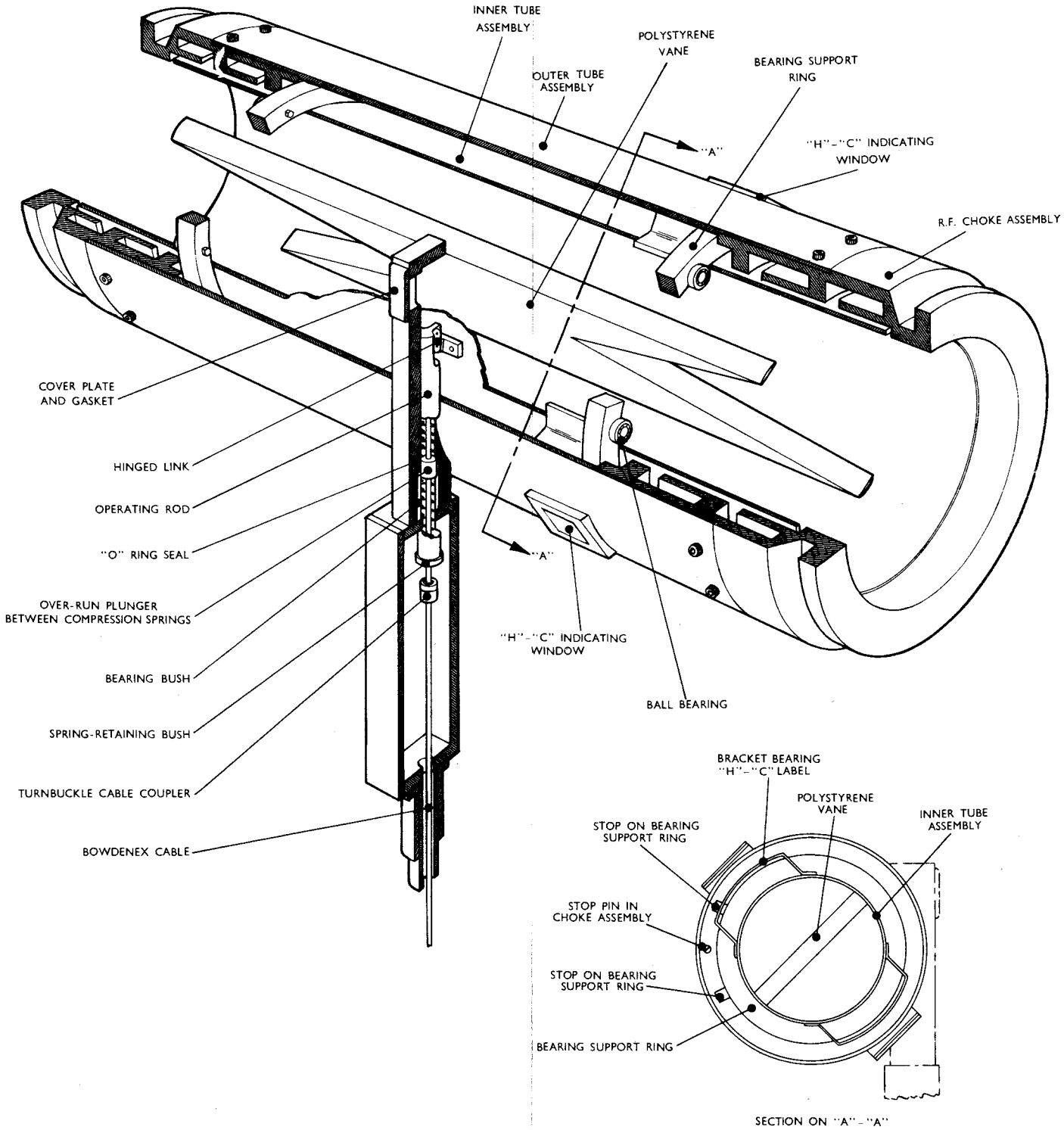


Fig I2

Waveguide polarizer

Fig I2

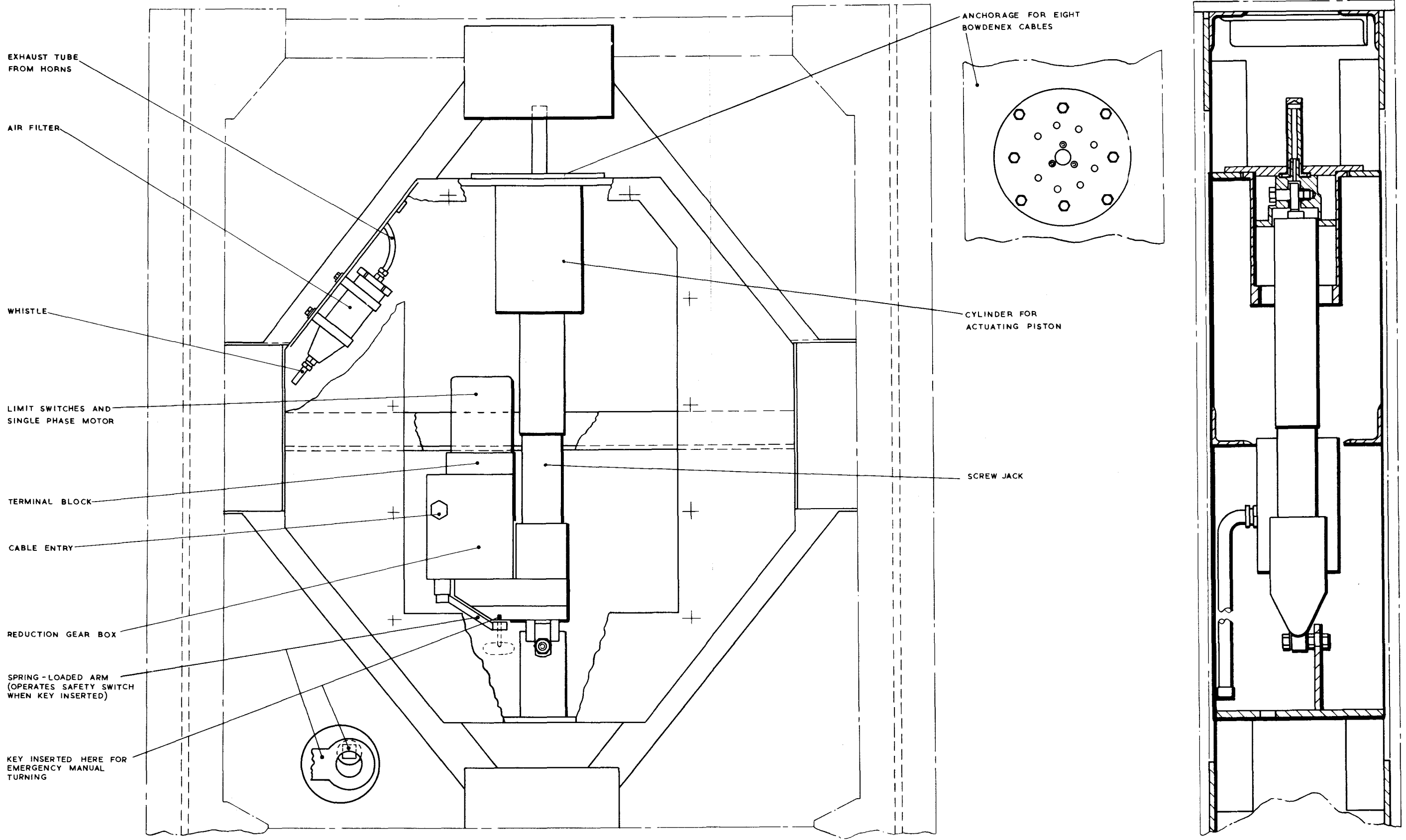


Fig. 13

Polarizer actuator

Fig.13

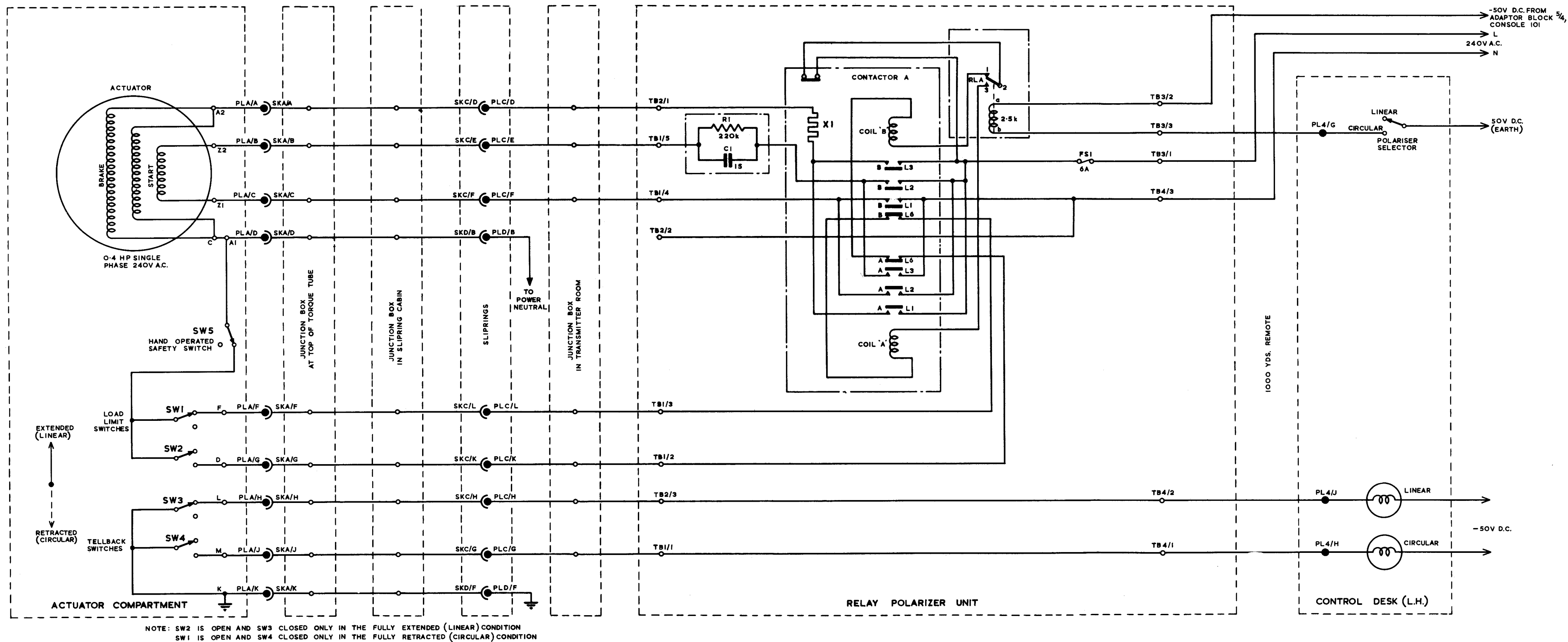


Fig. 14

Polarizer actuator control: circuit diagram.

Fig. 14

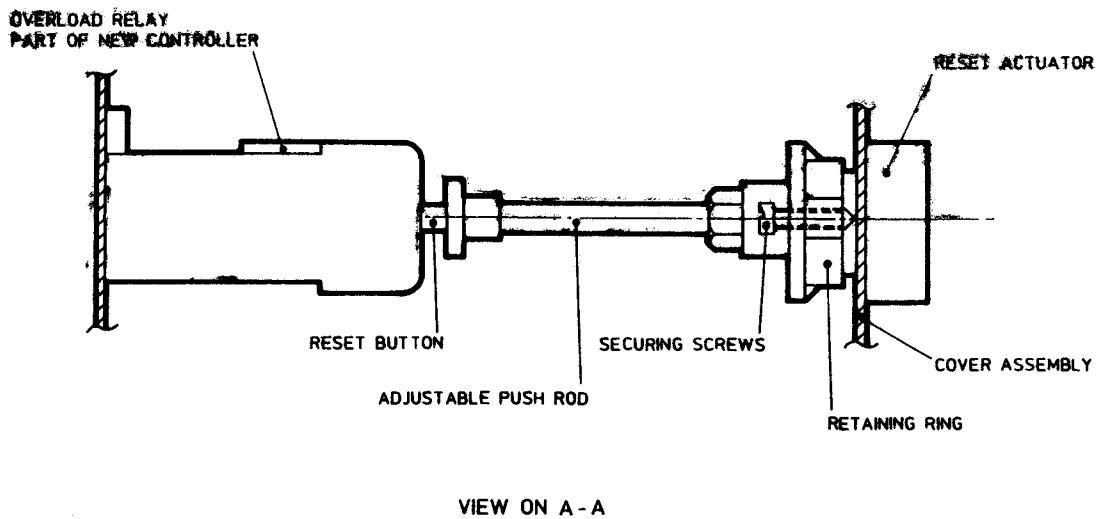
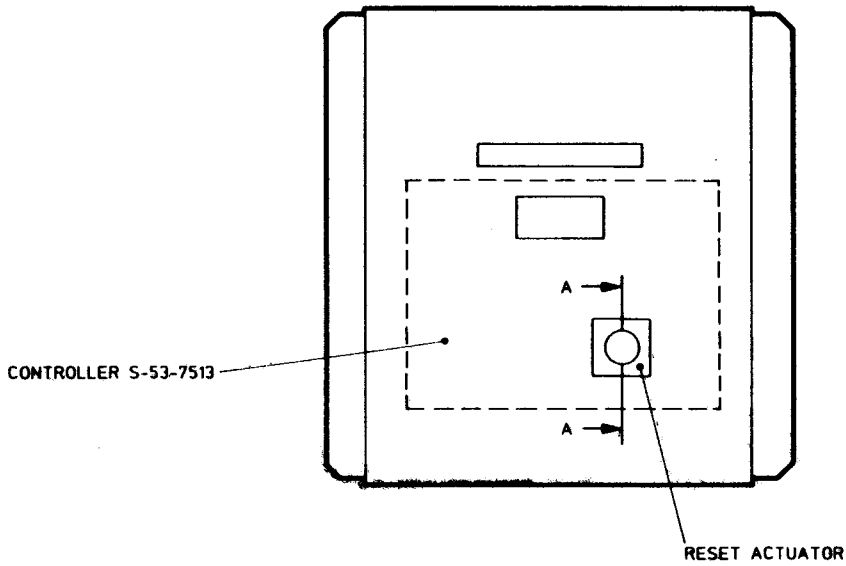
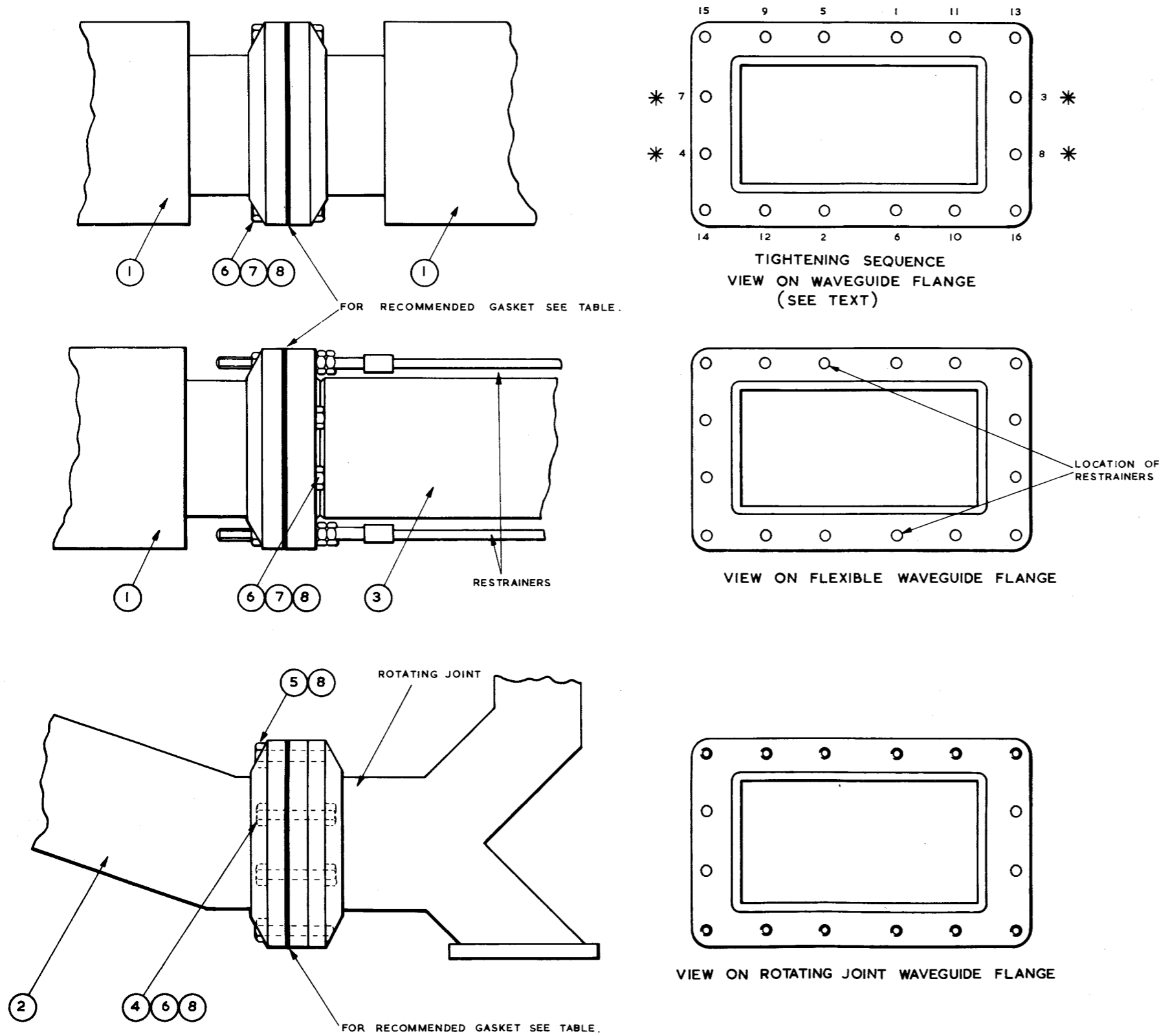


Fig.14A Relay polariser assembly E/RAD/D70052-A  
5945-99-913-1580, post modification CA8408/3



**TABLE**  
TYPICAL PARTS

| ITEM No. | DESCRIPTION                                      |
|----------|--|
| 1        | W/G ASSY PRESSURIZED 7'-0" LONG                  |
| 2        | W/G SECT. 3/4" OFF-SET                           |
| 3        | W/G ASSY. FLEXIBLE                               |
| 4        | SCREW 5/16" - 24 UNF X 2" LONG SOCKET (HEX.)     |
| 5        | SCREW 5/16" - 24 UNF X 1 1/2" LONG SOCKET (HEX.) |
| 6        | NUT 5/16" - 24 UNF HEX. FULL                     |
| 7        | BOLT 5/16" 24 UNF X 3/4" LONG                    |
| 8        | WASHER 5/16" CRINKLE                             |

**TYPE OF GASKET**

| FLANGE MATING TO FLANGE |                 | USE GASKET      |
|-------------------------|-----------------|-----------------|
| MATL. OR FINISH         | MATL. OR FINISH | MATL. OR FINISH |
| ALUMINIUM               | ALUMINIUM       | ALUMINIUM       |
| ALUMINIUM               | BRASS           | COPPER          |
| BRASS                   | BRASS           | COPPER          |
| ALUMINIUM               | ELECTRO-TIN     | ALUMINIUM       |
| BRASS                   | ELECTRO-TIN     | COPPER          |
| ELECTRO-TIN             | ELECTRO-TIN     | COPPER          |

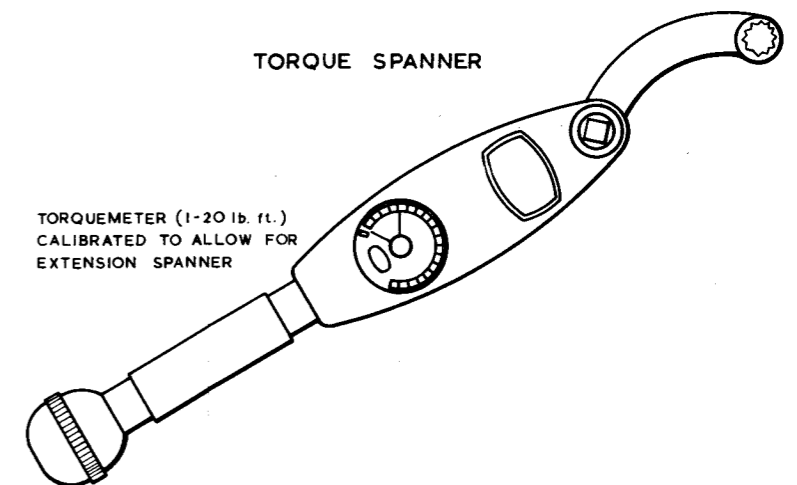


Fig. 15

Mar. 78 (Amdt. 11)

Mating of standard size waveguide flanges

Fig. 15

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AP

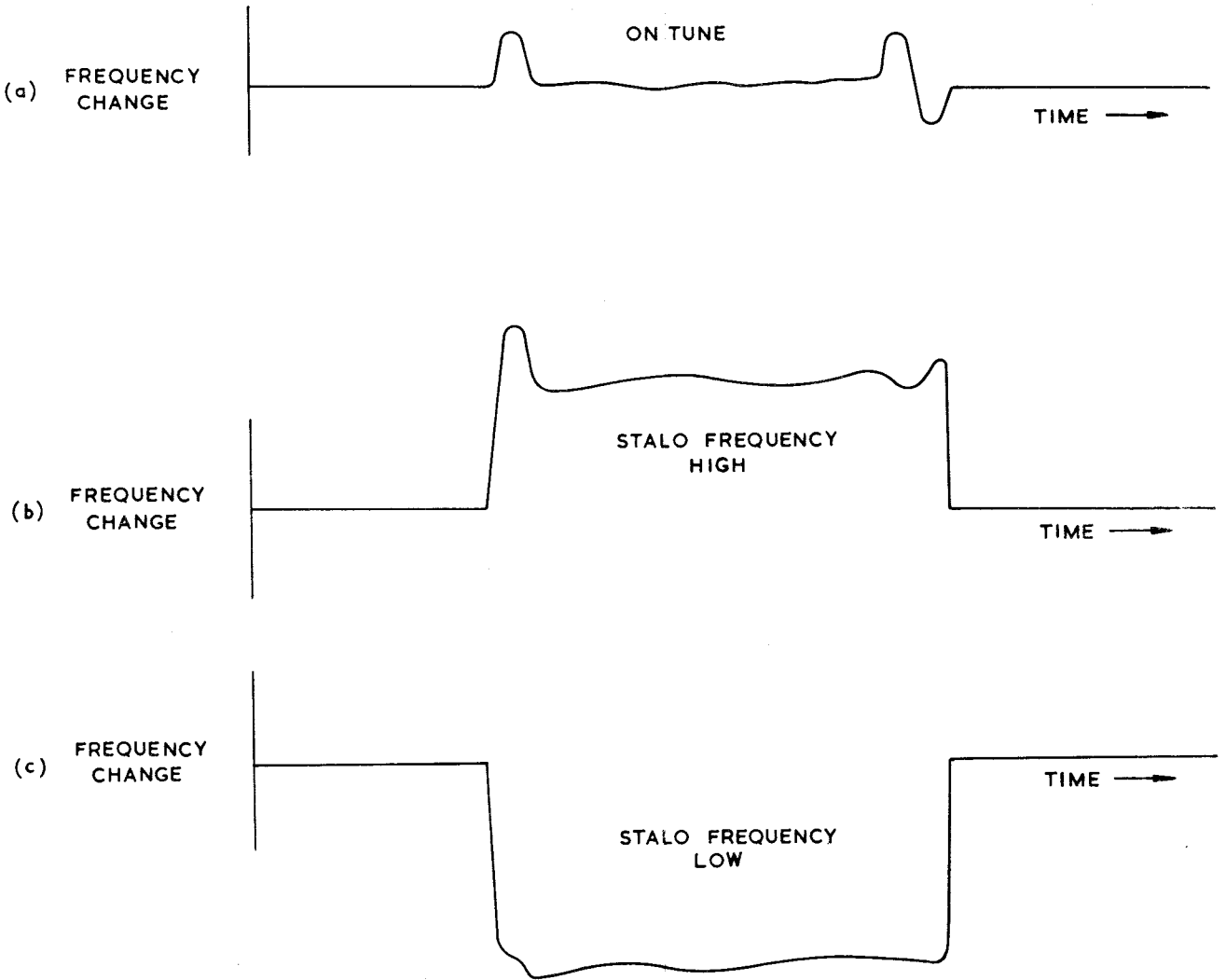


Fig. 16.

Phase shifter setting up waveforms

Fig. 16

## Chapter 3

### IFF FEEDER SYSTEM

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#### Introduction

1. The IFF feeder run extends from the distribution box 106, part of the IFF aerial equipment Type 4992, to the rack, IFF equipment, Type 4464 in the transmitter room. The feeder system passes through the coupler, rotary, r.f., which includes the IFF rotating joint and is described in Section 8, Chapter 4. The characteristic impedance of all sections of the feeder run is 50 ohms.

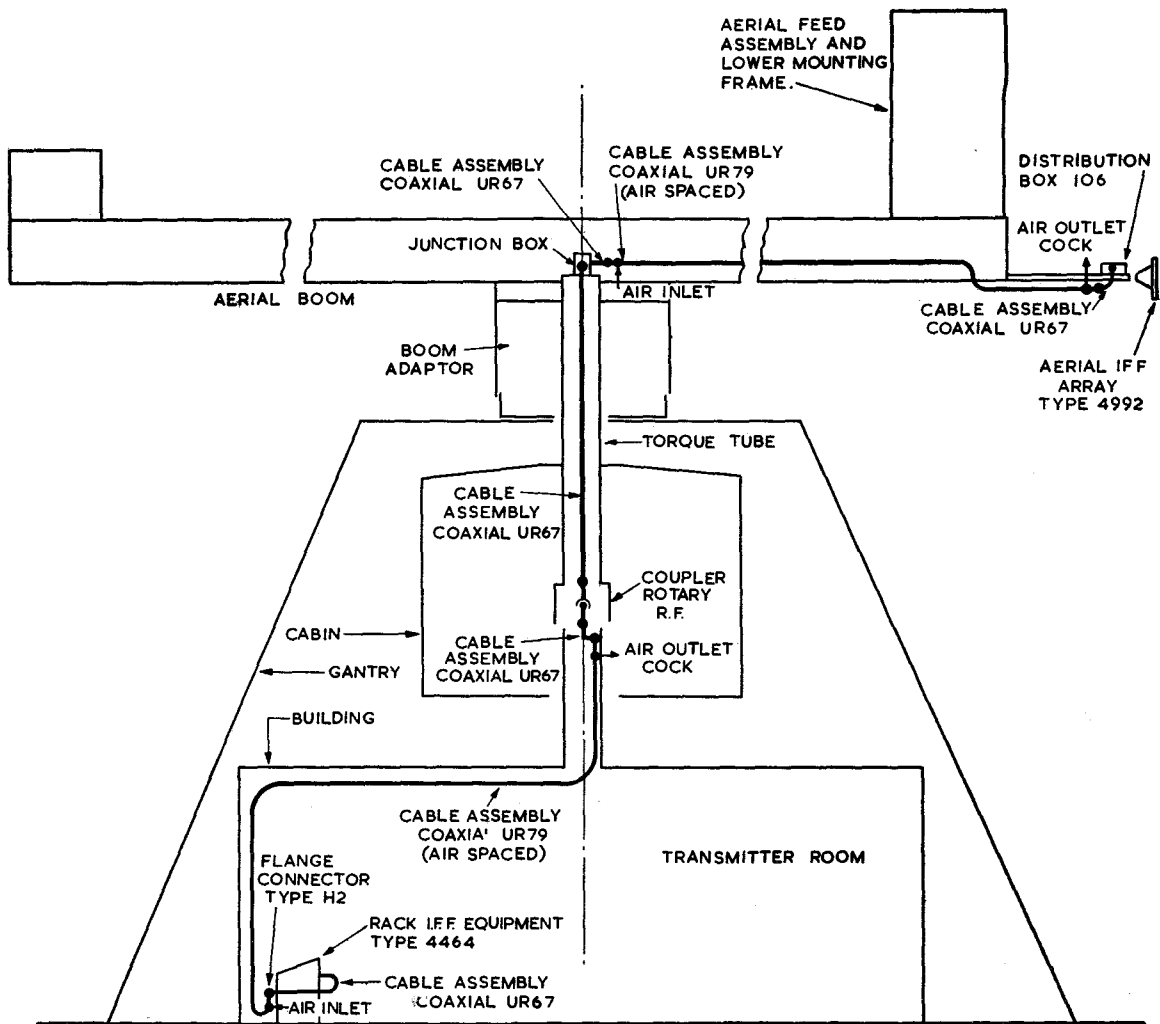
#### Coaxial feeder run

2. The distribution of the coaxial cables is shown in fig. 1. Starting at the distribution box 106 a few inches length of dielectric-filled Uniradio UR67 cable connects to a long length of air-spaced Uniradio UR79 cable. This cable is pressurized at 15lb per sq. in. from an adaptor in the E-plane waveguide bend at the top of the torque tube; air bled from the waveguide bend is taken to the special connector on the end of the UR79 cable via a length of nylon pipe and a non-return valve. Air pressurizing is used only to prevent the ingress of moisture into the cable; an outlet valve cock is built on to the connector at the opposite end of the UR79 cable to allow air to be blown through the cable if the air compressor has been out of service for some days. The UR79 cable is connected to a

flanged fitting on the boom adaptor junction box with a few inches length of UR67 cable.

3. A 12ft. 9in. length of UR67 cable extends down the torque tube from the adaptor junction box to the IFF output connector at the top of the coupler, rotary, r.f. A short length of similar UR67 cable connects the lower IFF input connector to the lower UR79 cable run. This length of UR79 cable is also pressurized at 15lb per sq. in., the air inlet being taken, via a nylon pipe and non-return valve, from the air compressor pipe line which feeds the waveguide air inlet external to the transmitter. An outlet air valve cock is also fitted on the upper connector of this cable. The lower UR79 cable is connected via a flanged connector and a 4ft length of UR67 cable to the rack, IFF equipment, Type 4464.

4. The UR67 cable connectors to the coupler, rotary, r.f. and to the boom adaptor junction box are standard 50 ohm connectors Type H7 (Marconi), the UR67 connectors at the junctions to the UR79 cables being Type H2. The UR79 cable connectors are of special design, incorporating the air inlets and outlets, but are based on Type H1 and H2 connectors. The UR67 connectors at the ends of the feeder run are the complements of those used on the IFF aerial equipment Type 4992 and the rack, IFF equipment, Type 4464.



**Fig. 1. IFF feeder system**



Chapter 3A

MK2 SECONDARY RADAR FEEDER SYSTEMS

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Introduction

1. This chapter describes the two secondary radar IFF channels. The IFF channel 1 Feeder Run extends from the interrogator rack in the transmitter room to the power divider box, part of the secondary radar aerial system (Sect. 8, Chap. 5) situated on top of the main aerial. The IFF channel 2 Feeder Run extends from the interrogator rack to the main Horn Assembly. The two feeder systems pass through the coupler, rotary, radio frequency, which is described in Section 8, Chapter 4A. All cables of the feeder systems are air-spaced coaxial of either 3.1/8in, 1.1/8in or 3/8in nominal diameter Hackethal "Flexwell" type CU. 2Y. All sections of both feeder runs have a characteristic impedance of 50 ohms, and each feeder run is fitted with an air inlet adaptor near to the input end to allow the system to be pressurised at 15 lb/in<sup>2</sup>, and an air bleed and desiccator unit near to the output end to allow the system to be continually purged with dry air. The bleed rate is approximately 0.1 cu. ft. per minute and can be turned off, for test purposes, by means of a tap fitted to the air bleed and desiccator unit. Compressed air for both IFF channels is supplied by the same compressor as the L-band channel waveguide system. All lengths of coaxial cable are terminated in Marconi type H2 connectors, which allow air to flow, except the connectors at each end of both feeder runs, which are type HN and do not allow air to flow. Transitions from 3.1/8 in coaxial to Marconi type H2 is by Marconi adaptors.

IFF channel 1 Feeder Run

2. The distribution of the IFF channel 1 coaxial cable is shown in fig. 1. Starting at the IFF/SSR interrogator rack a 3/8 in CU. 2Y cable of approximately 3ft length connects to a 1.1/8 in CU. 2Y cable of approximately 4 to 6 ft. length via a type H2 connector. The 1.1/8 in cable is run across the transmitter room ceiling to the base of the torque tube where it connects to a 11 ft 6 in length of 3/8 in CU. 2Y cable. The 3/8 in cable assembly extends up the torque tube to the IFF channel 1

input (PLE) of the rotary coupler. This cable terminates in a right-angle type H2 socket.

3. The output connector (SKE) of the rotary coupler, mates with a right-angle type H2 plug fitted to a 14 ft length of 3/8 in CU.2Y cable which extends to the top of the torque tube and connects to a 44 ft. length approximately of 3.1/8 in CU.2Y cable via an adaptor. The 3.1/8 in cable connects via an adaptor to a 2 ft length of CU.2Y cable which passes through the wall of the divider box assembly via a sealing gland and terminates in a type HN connector which mates with a connector 8 in inside the box.

4. Air at 15 lb/in<sup>2</sup> is fed into a union on the 1.1/8 in connector at the input end of the 1.1/8 in cable and bleeds from an air bleed and desiccator unit at the 3.1/8 in connector at the output end of the 3.1/8 in cable.

#### IFF channel 2 Feeder Run

5. The distribution of the IFF channel 2 coaxial is shown in fig. 1. Starting at the IFF/SSR interrogator rack, a 3/8 in CU.2Y cable of approximately 4 to 6 ft length via a type H2 connector. The 1.1/8 in cable is run across the transmitter room ceiling to the base of the torque tube where it connects to an 12 ft.length of 3/8 in CU.2Y cable. The 3/8 in cable assembly extends up the torque tube to the IFF channel 2 input (SKF) of the rotary coupler.

6. From the IFF channel 2 output (PLF) of the rotary coupler, a 14 ft.6 in length of 3/8 in CU.2Y cable extends to the top of the torque tube and connects to a 3.1/8 in CU.2Y of approximately 32 ft.length via an adaptor. The 3.1/8 in cable connects via an adaptor to a 1 ft. 6 in length of 3/8 in CU.2Y cable which terminates in a type HN connector which mates with a connector on the Horn Assembly.

7. Air at 15 lb/in<sup>2</sup> is fed into a union on the 1.1/8 in connector at the input end of the lower 1.1/8 in cable and bleeds from an air bleed and desiccator unit at the 3.1/8 in connector at the output end of the upper 3.1/8 in cable.

#### Air bleed and desiccator unit

8. These units are mounted at the top 3.1/8 in connector of each IFF feeder run and connect to the air union on these connectors. The unit consists of the following components in order: input union, tape, desiccator and silencer. The silencer incorporates a restrictor jet which limits the air flow to approximately 0.1 cu. ft/min with the tap fully open under normal working conditions. The action of the desiccator is reversible. Under normal operation the desiccant is dried by the air bleed. When the feeder pressurisation is off and due to ambient temperature or pressure changes air is drawn into the feeder system via the unit, this air is dried by the desiccator thus keeping the air in the feeders dry at all times. The tap is normally wired in the fully open position and is only closed for pressure tests on the feeder run. The operating life of the desiccator unit before replacement is required is one year.

#### Installation and renewal of feeders

9. If feeder cables are renewed, care must be exercised to ensure that the new cables follow the same run as those removed and that new end connectors are fitted as detailed in AP 115G-0201-1B, Part 3, Sect. 1, Chap. 4.

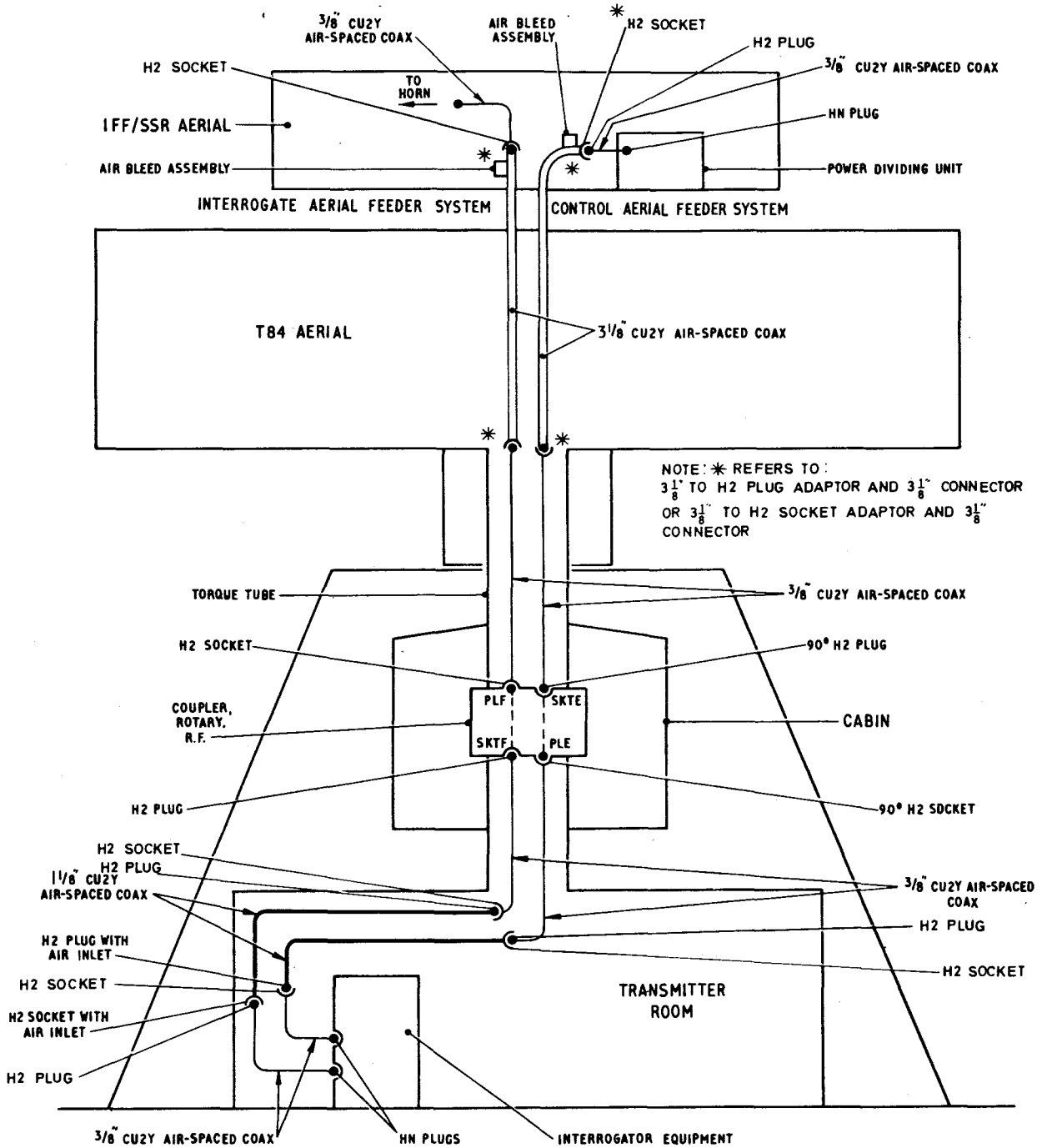


Fig.1 IFF Feeder System

## Chapter 4

### ROTATING JOINT ASSEMBLY

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#### Introduction

1. The coupler, rotary, radio frequency (*fig. 1 and 2*) is a rotating joint having two separate channels, L-band (1215–1365 Mc/s) and IFF (970–1130 Mc/s). The L-band channel carries high transmitter peak power levels. It consists of a coaxial rotating joint having door knob type transitions at either end. The transitions are followed by split, half-height waveguide sections terminated with rectangular waveguide flanges. The flanges form the input and output connections. The IFF channel, carrying low power levels, is coaxial throughout and is taken within the L-band coaxial inner conductor from a separate coaxial rotating joint attached to

the lower, stationary, part of the coupler. A slipring chamber, fitted with six inspection hatches, is built round the central coaxial rotating joint and carries five heavy duty 30A sliprings, fourteen 5A sliprings and five other sliprings which are used to provide a single fully screened telephone circuit. The L-band channel of the rotating joint is pressurized and an air bleed from the L-band coaxial section supplies an air blast to the slipring chamber to keep the air pressure slightly above atmospheric and to clear brush dust from the sliprings. The complete assembly of the coupler, rotary, radio frequency is bolted to a mounting cylinder (A.P. 2886H) which also acts as a lifting cradle.

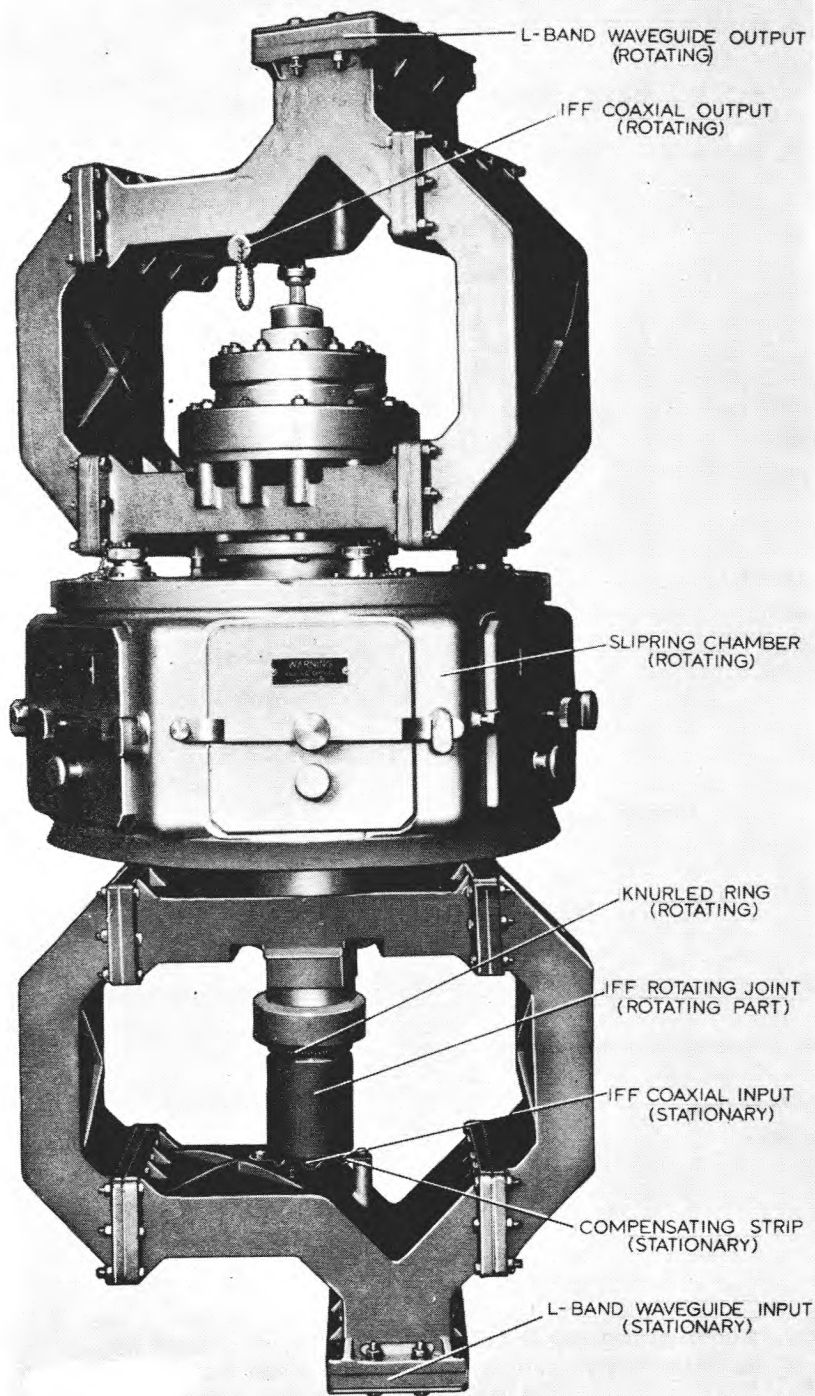


Fig. 1. Coupler, rotary, radio frequency: general view (1)

## L-band channel

### Electrical characteristics

2. The electrical characteristics are as follows:—
  - (1) Frequency band: 1215 to 1365 Mc/s.
  - (2) V.S.W.R.: less than 1.2 to 1 over the band.
  - (3) Change in v.s.w.r. with rotation is less than 0.02 over the band.
  - (4) Power handling (with a system v.s.w.r. of 2 to 1, 10  $\mu$ s pulse width and in the band 1215 to 1365 Mc/s):—
    - (a) at atmospheric pressure:  
4 MW peak pulse, maximum working, mean power at least 20 kW.
    - (b) at 15 lb per sq. in.:  
15 MW peak pulse, maximum working, mean power at least 20 kW.

### Note . . .

*With improved system v.s.w.r., the power handling increases proportionately.*

### Principle of operation (fig. 6)

3. The input and output L-band waveguide flanges are offset from the longitudinal axis of the rotating joint by a distance equivalent to a quarter-guide wavelength at the centre of the band. After entering the input port at the waveguide taper section (*coloured blue in fig. 6*) power is split into two equal parts by a series splitter vane (which accurately divides the waveguide into two channels, each channel having half the height of normal-sized waveguide). Due to the quarter-guide wavelength offset of the input flange, the two half-powers appear at the door knob transition phased so as to excite the coaxial section in the principal TEM mode. The half-height waveguides feeding either side of the door knob form a shunt junction, hence the impedance presented at the coaxial junction (the door knob) is a quarter that of normal sized waveguide. Broad-band impedance matching by quarter-guide wavelength transformers on either side of the door knob is facilitated by this arrangement.
4. Power now proceeds along the coaxial section to the upper door knob, the intermediate series break in the outer conductor (where rotation occurs) being electrically closed by a multiple concentric r.f. choke system designed to present minimum discontinuity in the coaxial line and to protect the ball bearings from damage due to r.f. burning. At the upper door knob (*coloured red in fig. 6*) the power is again split and recombined at the output waveguide taper section. The series break between the fixed inner conductor and the rotating door knob is electrically closed by another multiple r.f. choke system. There is negligible change in matching or in phase shift of the L-band section during rotation.
5. The multiple r.f. chokes each consist of a number of quarter-guide wavelength channels. The concentric choke system in the main bearing casting consists basically of a low characteristic impedance narrow quarter-wave section, connecting with the break in the outer conductor wall, followed by a series high characteristic impedance broad quarter-wave section. The short circuit at the end of the high characteristic impedance section

is reflected as a high impedance at the junction of the two sections and as a very low impedance at the break in the outer conductor wall. The series wall gap between the fixed and rotating parts at the junction of the high and low sections is electrically closed by a second double choke system similar to the first; the series gap impedance in this second system is reduced to a very low value through being connected to a long choke of very low characteristic impedance. This last choke is fitted with a polyiron sleeve cast to the inner (stationary) wall in order to absorb any residual r.f. leakage, thus protecting the main bearings from possible damage due to r.f. burning. The multiple choke system at the upper door knob is similar in principle to that just described, but all sections except the first concentric low characteristic impedance section are radial, the final r.f. absorber being an annular polyiron ring cast to the stationary part of the joint.

### Mechanical description

6. General views of the coupler, rotary, radio frequency are shown in figs. 1 and 2. The rotating joint is designed round a double coaxial line carrying the L-band and IFF channels. The L-band inner conductor is a brass tube attached to the lower, fixed, part of the rotating joint; the upper part of this conductor passes through the upper door knob with its concentric radial system of quarter-wave r.f. chokes and is located in a support bearing held in a large bearing housing which is bolted to the top transition casting. The L-band outer conductor, as part of the main bearing and slipring assembly, is split between the fixed and rotating parts, the concentric quarter-wave r.f. choke system being contained within the assembly. The inside parts of the main bearing and slipring assembly forming the L-band outer conductor are aluminium alloy castings to which the aluminium alloy door knob transition castings are bolted.

7. The non-coaxial L-band channel is constructed of aluminium alloy waveguide having half the height of normal No. 6 size waveguide, the inside dimensions being 6.50 in. by 1.625 in. Input and output connections are by taper sections to flanges suiting standard L-band rectangular flanges and gaskets, the purpose of the taper being to compensate for the thickness of the splitter vane in the transformation to normal size waveguide. The axes of the input and output connections are parallel to the longitudinal axis of the joint but are displaced  $3\frac{1}{4}$  in. transversely off this axis due to the method used to couple into the coaxial section of the joint. Although the method of coupling, by splitting and recombining the waveguide channel at the coaxial section is employed primarily for electrical reasons, mechanical strength is also gained by the arrangement.

8. The L-band waveguide input and output taper sections are constructed of electro-tinned brass and are fitted with sealing rings. They are bolted to the ends of the splitter castings. Dismantling of splitter castings on site should not normally be attempted. Before a splitter casting can be removed, however, it is necessary to slacken completely all forty-eight screws between the transition casting, side arm castings and splitter castings in the same loop. Removal of the bottom casting also involves releasing the two screws which hold the

IFF coaxial input section via the compensating strip. Each of the side arm castings is fitted with a cast-in matching iris. If any side arm casting is removed, care must be taken to ensure that it is replaced with the iris in the same position as before. The side arm casting flanges and their adjacent transition casting flanges are marked accordingly before installation. Each side arm casting flange is fitted with a sealing O-ring. Great care must be taken when replacing a splitter casting to hold both side arm castings apart and to ensure that sealing O-rings are undamaged when refitting.

9. Each rotating joint is individually matched as a unit and if it becomes necessary to replace either a side arm casting or splitter casting on account of damage, the v.s.w.r. of the whole L-band section of the joint must be checked as soon as possible. The castings are not interchangeable on site except in emergency when, as a temporary measure, the matching is likely to prove acceptable.

10. All bearings are packed with grease on assembly, the grease being retained by air and grease seals, and no further greasing should be required. The manufacturers state that it is not possible to dismantle the bearings on site.

#### IFF channel

##### *Electrical characteristics*

11. The electrical characteristics are as follows:—

- (1) Frequency band: 970 to 1130 MHz.
- (2) V.S.W.R.:
  - (a) less than 1.25 to 1 over the band 970 to 1130 MHz.
  - (b) less than 1.2 to 1 between 1000 and 1110 MHz.
- (3) Power handling at atmospheric pressure (with a system v.s.w.r. of 2 to 1 and in the band 970 to 1130 MHz):—

2 kW peak pulse, normal working.

Note . . .

*With improved system v.s.w.r., the power handling increases proportionately.*

##### *Principle of operation (fig. 6)*

12. The IFF channel is of air-spaced 50-ohm coaxial line throughout and is not normally pressurized. Power entering the joint passes through a right-angled bend into a separate IFF rotating joint in which the series breaks in the inner and outer of the coaxial are electrically closed by multiple choke sections acting in the same way as those described for the L-band section outer conductor. The power then passes up through a rotating coaxial line in the body of the main rotating joint to a second right-angled bend and the output connector.

##### *Mechanical description*

13. All the IFF conductor components are made of brass, the inner and outer conductors being separated by P.T.F.E. spacers. 50-ohm coaxial connectors Type H7, details of which are shown in fig. 5, mate with the input and output elbow connectors. The stationary input elbow connector is integral with the stationary part of the IFF rotating joint and the top output elbow connector is detachable from the end of the rotating coaxial line, the axes of the connectors being spaced apart by  $35\frac{5}{8}$  in.

14. The IFF rotating joint is attached to the bottom splitter casting by means of a compensating strip bolted to the stationary portion of the joint in two places and to two pillars cast-in with the bottom splitter casting. The compensating strip allows differential expansion to take place between the L-band aluminium alloy waveguide components and the central brass IFF components. The IFF joint is coupled to the rotating coaxial line by means of a large knurled captive ring engaging a threaded flange of the outer conductor. When removing the joint it is first necessary to unbolt the compensating strip and dismantle the bottom splitter casting. The knurled ring is then unscrewed so that the joint can be withdrawn downwards. Withdrawal disengages a pin on the joint from its locating hole in the body of the main coupler. The IFF inner conductor of the coupler is held in spring fingers forming part of the inner conductor assembly of the IFF rotating joint; the outer conductor of the coupler is a sliding fit in the IFF rotating joint outer conductor assembly which contains a sealing ring in a recessed channel.

15. The rotating IFF coaxial line, on entering the IFF rotating joint, tapers up to a wider diameter line of the same impedance in order to accommodate the r.f. choke system within the inner conductor; it tapers down again to the input elbow connector from the stationary part of the joint. Within the body of the IFF rotating joint, the gap between the rotating and stationary walls of the outer conductor is electrically closed by a double quarter-guide wavelength r.f. choke consisting of a concentric low impedance section of line followed by a concentric high impedance section. The gap between the rotating and stationary walls of the inner conductor is closed by a similar r.f. choke system, the stationary choke walls being lined with a P.T.F.E. sleeve. The sleeve provides a locating bearing surface for the cylindrical choke wall of the rotating inner conducting assembly of the IFF rotating joint.

16. The IFF rotating joint bearings are packed with grease during assembly and protected by air and grease seals. No replenishment of grease should be necessary during the life of the unit. The rotating outer conductor of the main coupler is located in a support bearing which is similarly protected and packed with grease.

## Main bearing and slipring assembly

### Electrical characteristics

17. The electrical characteristics are as follows:—

- (1) Insulation at 1000V d.c.:—
  - (a) between adjacent sliprings: greater than 200 Megohms.
  - (b) between sliprings and earth: greater than 200 Megohms.
- (2) Capacitance of telephone circuit sliprings:—
  - (a) between telephone line rings: not greater than 320 pF.
  - (b) between either telephone line ring and earth: not greater than 360 pF.

(3) Crosstalk:—

between telephone line rings: better than 50 dB.

### Circuit description

18. In fig. 7, the circuit diagram for the slipring and brush connections, each brush shown is, in fact, a pair of brushes connected to the same terminal, the identification of the brush block unit to which it belongs being given on the diagram for each brush pair. Each 5A slipring is served from two brush block units and each 30A slipring is served from three brush block units. Slipring numbers are marked near the brush terminals and are repeated on sleeve labels on the connecting wires as shown in fig. 3.

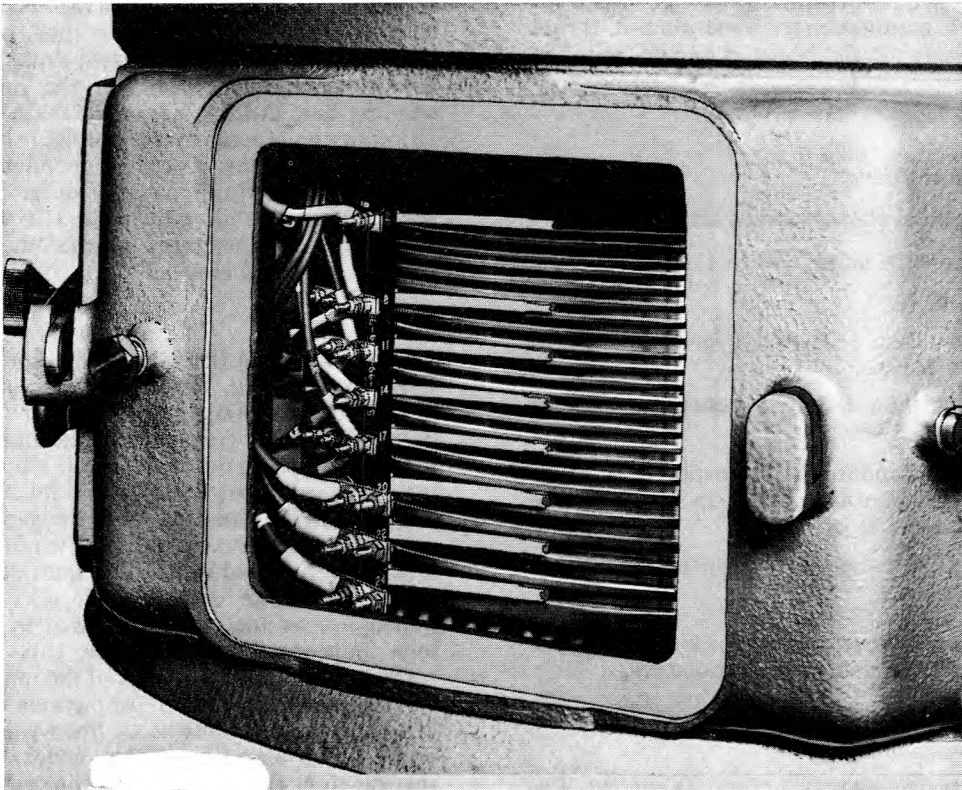


Fig. 3. Brush block unit and sliprings



**TABLE 1**

**Slipping services**

| Slipping No. | Plug (pin)                           | Service   |
|--------------|--------------------------------------|---|
| 1            | PLC (pin J)                          | Screening ring earthed via brushes; for use as an earth return. |
| 2            | PLB                                  | Low noise ring for a telephone line (with slipping 4).          |
| 3            | PLC (pin J)                          | Screening ring, connected to slipping 1; no brushes.            |
| 4            | PLA                                  | Low noise ring for a telephone line (with slipping 2).          |
| 5            | PLC (pin J)                          | Screening ring, connected to slipping 1; no brushes.            |
| ◀ 6          | PLC (pin N)                          | From terminal 26 on control drive set, aerial.                  |
| 7            | PLC (pin L)                          | Polarizer actuator control circuit.                             |
| 8            | PLC (pin H)                          | Polarizer actuator control circuit.                             |
| 9            | PLC (pin R)                          | Spare.  |
| 10           | PLC (pin G)                          | Polarizer actuator control circuit.                             |
| 11           | PLC (pin K)                          | Polarizer actuator control circuit.                             |
| 12           | PLC (pin M)                          | From terminal 27 on control drive set, aerial.                  |
| 13           | PLC (pin D)                          | Polarizer actuator control circuit.                             |
| 14           | PLC (pin P)                          | From terminal 25 on control drive set, aerial.                  |
| 15           | PLC (pin Q)                          | From terminal 24 on control drive set, aerial.                  |
| 16           | PLC (pin E)                          | Polarizer actuator control circuit.                             |
| 17           | PLC (pin O)                          | From terminal 23 on control drive set, aerial.                  |
| 18           | PLC (pin S)                          | Spare.  |
| 19           | PLC (pin F)                          | Polarizer actuator control circuit.                             |
| 20           | PLD (pin D)                          | Spare.  |
| 21           | PLD (pin C)                          | 30 A channel, 240V a.c., 50 c/s, line.                          |
| 22           | PLD (pin <sup>E</sup> <del>D</del> ) | 30 A channel, 240V a.c., 50 c/s, neutral.                       |
| 23           | PLD (pin <sup>B</sup> <del>E</del> ) | Spare.  |
| 24           | PLD (pin F)                          | 30 A earth.▶  |

AL2  
AL2

*Mechanical description*

19. The aluminium alloy slipring unit is built round the central part of the rotating joint and employs silver-graphite brushes running on silver sliprings. Details of the brushes and sliprings are shown in figs. 3 and 4. The sliprings, numbered 1 to 24, are of solid silver electro-deposited in a ribbed former made of Araldite and marble dust. Sliprings 2 and 4 carry telephone lines with earth screens either side on sliprings 1, 3 and 5. The silver-graphite tipped brushes are mounted in pairs on silvered beryllium-copper springs attached to six brush block units, labelled XA, XB, XC, XD, XE and XF.

20. Brush block units with pure graphite brushes may be encountered; these brush block units are marked with a suffix letter A after the manufacturer's part number. It is important to note that all brushes in the slipring chamber must be of the same material; this is because the two types of brush have quite different resistances. If a change is made from one type of brush to another all six brush block units must therefore be changed together.

21. Spring pressure, on installation, of brushes for sliprings 1, 2, 4 and 6 to 19 is 70 to 110 grammes, that of brushes for the lower sliprings 20 to 24 being 110 to 170 grammes. The pressure is measured on a spring balance applied to the rear of the brush

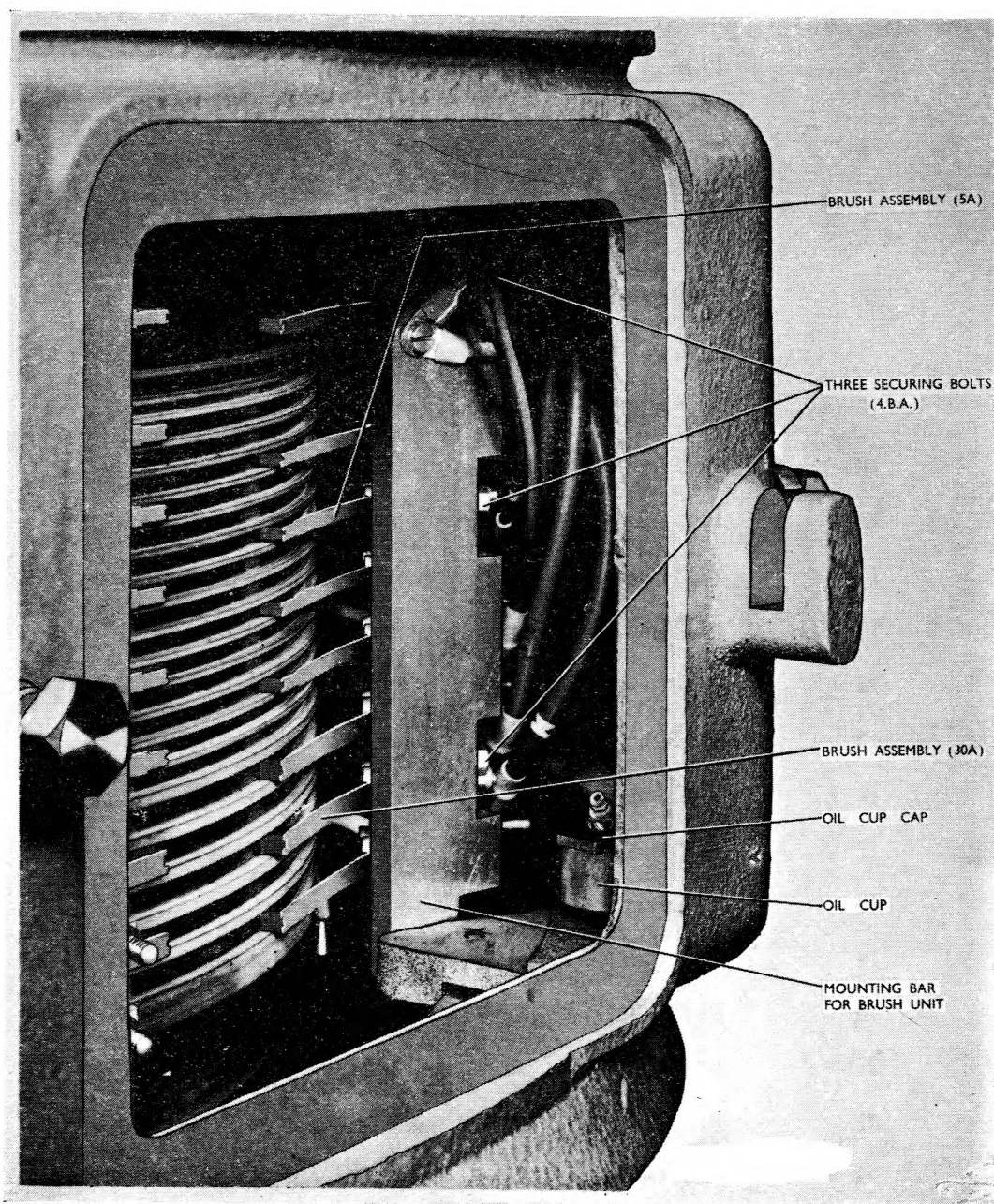


Fig. 4. Brush block unit mounting

spring within one-eighth of an inch of the brush tip and pulling radially to the slipring; the pressure is read when the brush just lifts from the slipring. Access to the brush block units and sliprings is by means of six easily removable hatches on the slipring chamber casing.

22. The slipring chamber is kept dry and accumulation of brush dust is delayed by a dry air blast from an air distribution pipe in the chamber which is fed by a nylon air bleed tube connected to the L-band pressurized coaxial section of the rotating joint at a bleed valve adaptor. This adaptor is simply a reduced section, of No. 48 drill size, to control the rate of air flow. It is normal for a high pitched whistle to be heard when air at the correct pressure is being blown through the distribution pipe. A silicone rubber seal between the fixed and rotating parts of the slipring chamber casing prevents dirt or moisture from entering the chamber and at the same time allows the air blown from the air distribution pipe to leak out. The seal is lubricated from an oil-charged felt pad fed with light oil from six oil cups, one of which can be seen just inside the bottom right-hand corner of the hatch opening in fig. 4. Each oil cup cap is fitted with a nipple set at 45° so that the oil (9150-99-910-0570

On Lubricating OM13 to DEF 2001, Aeroshell Fluid 1) can be applied from a suitable non-locking type of grease gun such as the Tecalemit Type LPH. Oil is applied freely to all six oil cups until the felt pad is saturated and oil begins to exude from the base of the slipring chamber, surplus oil being carefully cleaned off. Due to the silicone-rubber seal and to other internal air and grease seals, a substantial torque (of about 20 lb ft) is required for turning the rotating joint. It is important that the sliprings and former be kept free from all traces of grease. The sliprings must never be wiped with a cloth but may be brushed with carbon tetrachloride. Trichlorethylene may be used sparingly if care is taken to prevent contact with brushes.

23. Slipring connectors and cabling:—

- (1) 30A plugs and sockets: Plessey Type UK-AN.7 contact.
- (2) 5A plugs and sockets: Plessey Mk. 4 18 contact.
- (3) Coaxial connectors: Marconi Type H7 (panel mounting) (fig. 5).
- (4) Coaxial cabling to brushes: Uniradio 72 (50 ohms).

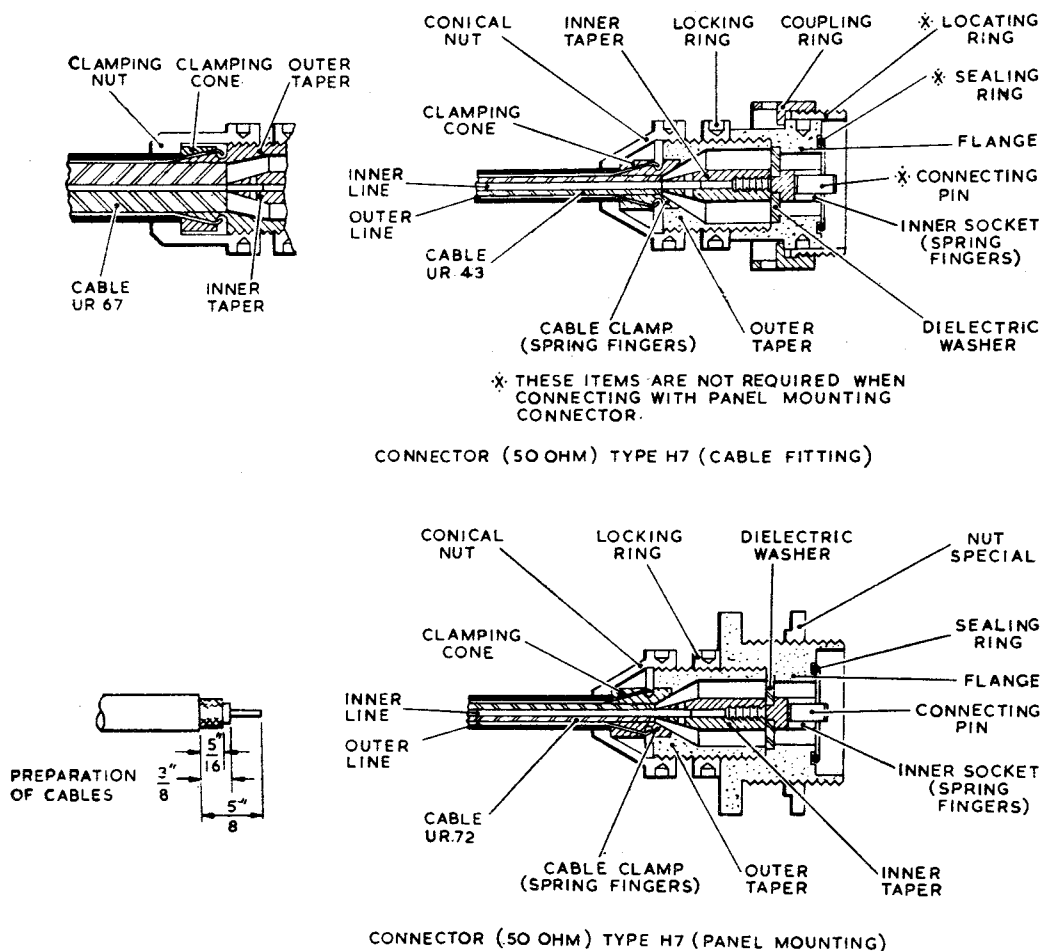


Fig. 5. Coaxial connectors Type H7: assembly details

24. The main double bearing is held in a steel bearing housing; it is packed with grease on assembly and protected by air and grease seals. No replenishment of grease should be necessary in the life of the unit.

#### User information

##### *Installation, operation and servicing*

25. During installation or removal, the coupler, rotary, radio frequency must only be lifted by means of the lugs on the integral mounting cylinder (fig. 8). Dismantling from the cylinder should not normally be necessary on site but if it is carried out, the rotating joint must only be lifted from the mounting cylinder by means of a rope sling positioned as shown in fig. 8. On no account must the cylinder be lifted *with the rotating joint* from this slinging position. There are no setting-up adjustments to be made after installation. The only routine attention required is to the slipring chamber where the six oil cups must be kept well supplied with Aeroshell Fluid 1 light lubricating oil and where the condition of the brushes must be regularly checked and all dust in the chamber removed with a vacuum cleaner or brush. Note that dust must never be wiped from the sliprings. No greasing is required on any part of the rotating joint.

##### *Climatic and durability characteristics*

26. To K114/E and DEF5000. Temperature extremes minus 50°C to plus 70°C.

##### *Starting torque*

27. The maximum static torque (i.e. the maximum torque required before the joint will rotate) is less than 30 lb ft at atmospheric internal pressure, increasing by 100 per cent at 15 lb per sq. in. internal pressure.

##### *Air pressure and leakage rates*

28. (1) Normal working pressure (L-band): 15 lb per sq. in.  
(2) Normal working pressure (IFF): atmospheric.

(3) Maximum working pressure (L-band): 15 lb per sq. in.

(4) Maximum working pressure (IFF): 3 lb per sq. in.

(5) Air leakage rate with bleed to sliprings: 1.3 ft<sup>3</sup>/min at 15 lb per sq. in.

(6) Air leakage rate with no bleed to sliprings (test only): 0.02 ft<sup>3</sup>/min at 30 lb per sq. in.

##### *Waveguide flange loadings*

29. Maximum forces which can be applied simultaneously through input or output waveguide flange:—

(1) Perpendicular to flange face: 100 lb.

(2) Parallel to flange face: 50 lb.

(3) Torque about waveguide axis: 100 lb ft.

##### *IFF connector loadings*

30. Loading on horizontal axis of input or output coaxial connector:—

(1) Along axis: 10 lb.

(2) Perpendicular to axis: 10 lb.

(3) Torque about axis: 10 lb ft.

##### *Dimensions*

31. The dimensions of the assembly are as follows:—

(1) Overall height, including mounting cylinder: 50 $\frac{5}{8}$  in.

(2) Overall diameter, including mounting cylinder: 27 in.

(3) Maximum diameter of rotating portion: 23 in.

(4) Distance between L-band waveguide flange faces: 50 $\frac{1}{4}$  in.

(5) Distance between IFF connector axes: 35 $\frac{5}{8}$  in.

(6) Weight, including mounting cylinder: 4 cwt 45 lb.

(7) Weight, without mounting cylinder: 2 cwt 95 lb.

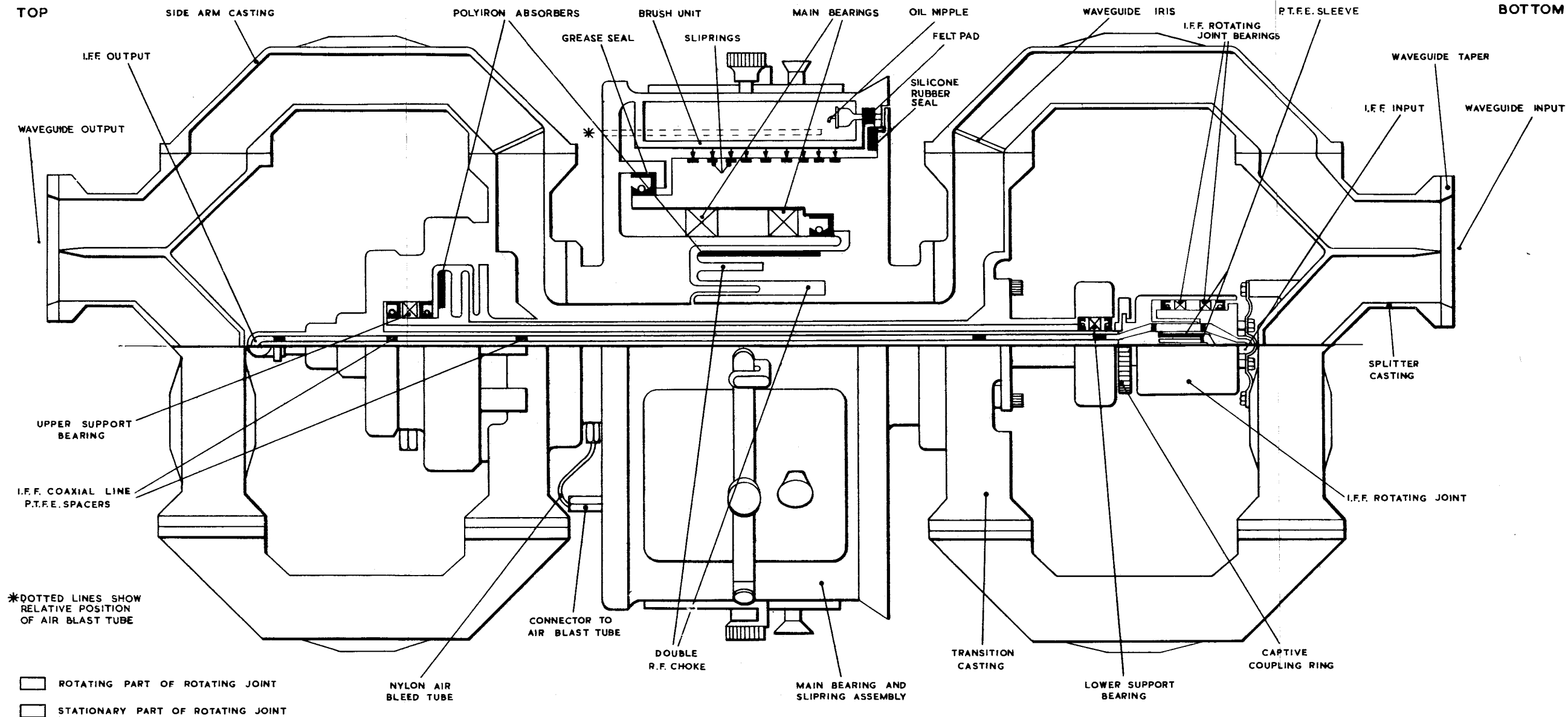


Fig.6

Coupler, rotary, radio frequency: explanatory diagram

Fig.6

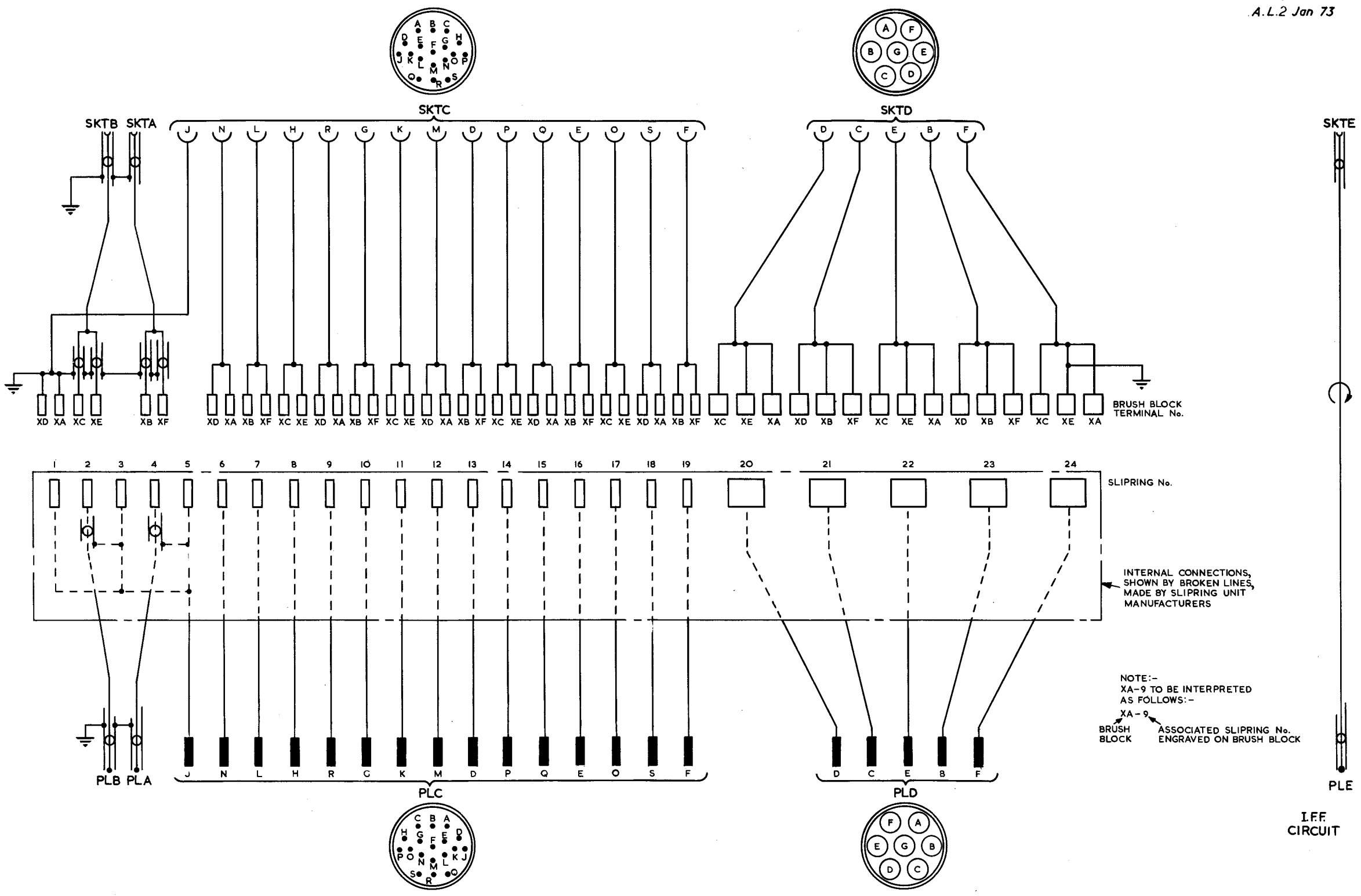


Fig. 7

Coupler, rotary, r.f. : circuit diagram

Fig. 7

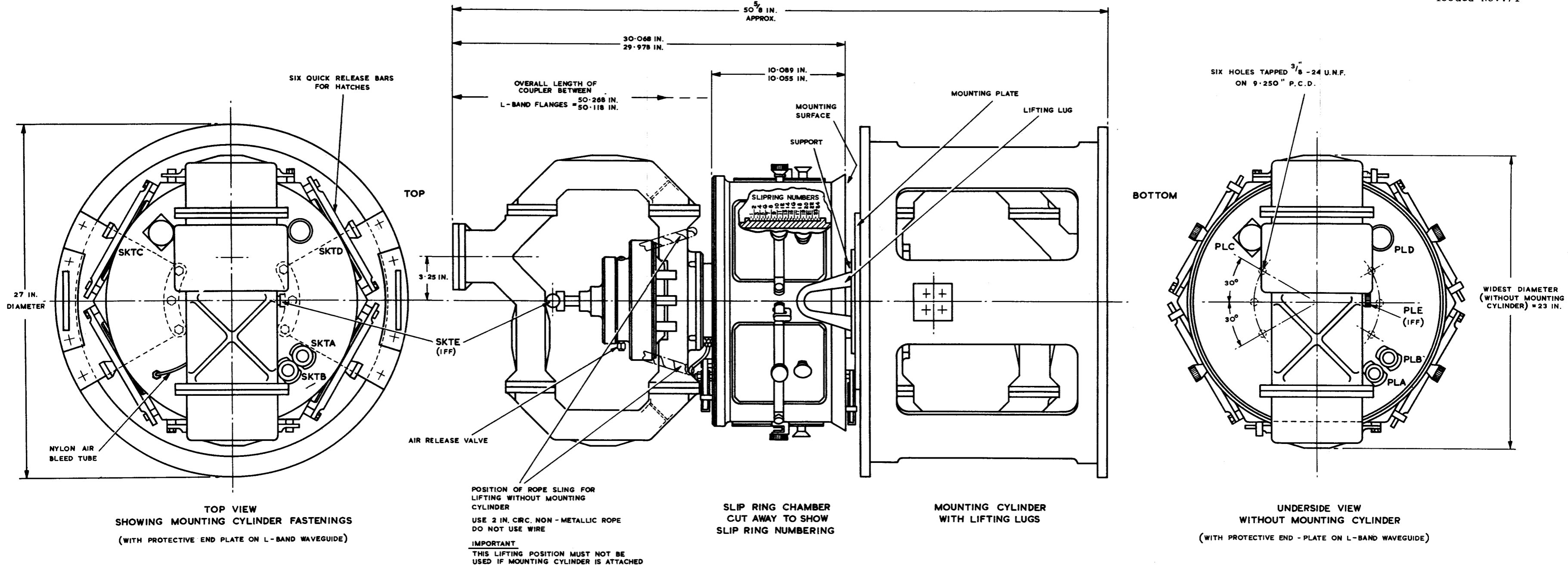


Fig. 8

Coupler, rotary, r.f.: mounting arrangement

Fig. 8

Chapter 4A

MK2 ROTATING JOINT ASSEMBLY

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### Introduction

1. The coupler, rotary, radio frequency (fig. 1 and 2) is a rotating joint having three separate channels, L-band (1215-1365MHz), IFF channel 1 (1020-1115MHz) and IFF channel 2 (1020-1115MHz). The L-band channel carries high transmitter peak power levels and consists of a coaxial rotating joint having symmetrically fed door-knob transitions at either end. The transitions are fed via half-height waveguide sections which combine at an E-Plane splitter into full-height waveguide terminated with rectangular waveguide flanges forming the input and output connections. The IFF channel 2 carries low power levels and consists of a coaxial section concentric with and inside the L-band coaxial section, coupled at each end into reduced height ridged waveguide via small door-knob transitions, and terminated in waveguide to coaxial transitions to the input and output connectors. The IFF channel 1, also carrying low power levels, is coaxial through-out and is taken within the IFF channel 2 coaxial section from a separate coaxial rotating joint attached to the lower, stationary, part of the coupler. A slipring chamber, fitted with six inspection hatches, is built round the central coaxial rotating joint and carries five heavy duty 30A sliprings, fourteen 5A sliprings and five other sliprings which are used to provide two fully screened telephone circuits. All channels of the rotating joint are normally pressurised, and an air bleed from the L-band coaxial section supplies an air blast to the slipring chamber to keep the chamber free of moisture and the pressure slightly above atmospheric. The complete assembly of the coupler, rotary, radio frequency, is bolted to a mounting cylinder (AP115J-0100-1) which also serves as a lifting cradle.

### L-Band channel

#### Electrical characteristics

2. The electrical characteristics are as follows:

- (1) Frequency band: 1215 to 1365 MHz
- (2) V. S. W. R. less than 1.2 to 1 over the band.
- (3) Change in v. s. w. r. with rotation is less than 0.02 over the band.
- (4) Power handling (with a system v. s. w. r. of 2 to 1, 10  $\mu$ s pulse width and in the band 1215 to 1365MHz):-

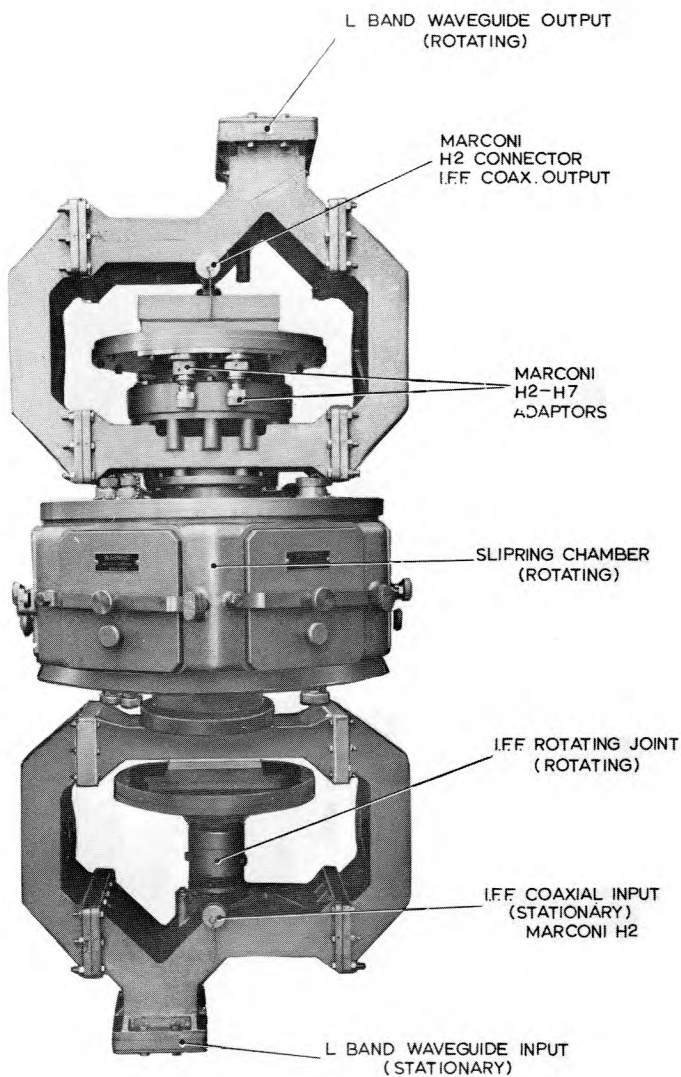


Fig. 1. Coupler, rotary, radio frequency: general view (1)

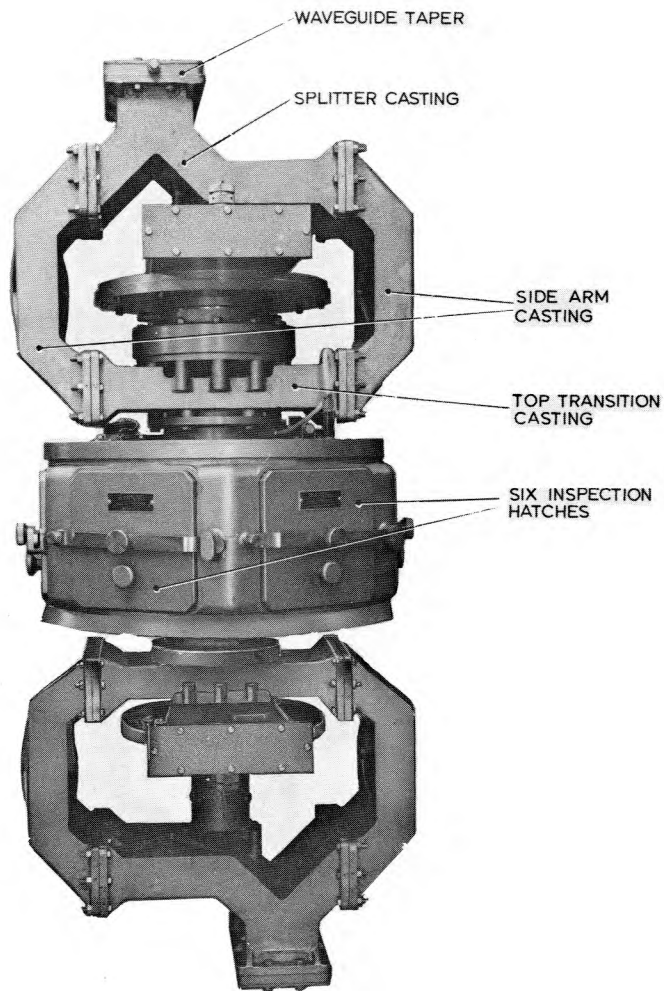


Fig. 2. Coupler, rotary, radio frequency: general view (2)

- (a) At atmospheric pressure:  
4MW peak pulse, maximum working, mean power at least 20kW.
- (b) At 15 lb/in<sup>2</sup>:  
15MW peak pulse, maximum working, mean power at least 20kW.

Note. . .

With improved system v. s. w. r. the power handling increases proportionately.

### Principle of operation (fig. 3)

3. The input and output L-band waveguide flanges are offset from the longitudinal axis of the rotating joint by a distance equivalent to a quarter-guide wavelength at the centre of the band. After entering the input port at the waveguide taper section power is split equally into two half-height waveguide channels. Due to the quarter-guide wavelength offset of the input flange, the two half powers appear at the door-knob transition phased so as to excite the coaxial section in the principal TEM mode. The half-height waveguides feeding either side of the door-knob transition, form a shunt junction, where the impedance presented is a quarter that of normal sized waveguide. Broad-band impedance matching by quarter-guide wavelength transformers on either side of the door-knob transition is facilitated by this arrangement.

4. Power now proceeds along the coaxial section to the upper door-knob transition, the intermediate series break in the outer conductor (where rotation occurs) being electrically closed by a multiple concentric r. f. choke system designed to present minimum discontinuity in the coaxial line and to protect the ball bearings from damage due to r. f. burning. At the upper door-knob transition the power is again split and recombined at the output waveguide taper section. The series break between the fixed inner conductor and the rotating door-knob transition is electrically closed by another multiple r. f. choke system. There is negligible change in matching or in phase shift of the L-band section during rotation.

5. The multiple r. f. chokes each consist of a number of quarter-guide-wave-length channels. Basically a low characteristic impedance narrow quarter-wave section connecting with the break in the outer conductor wall is followed by a series high characteristic impedance broad quarter-wave section. The short circuit at the end of the high characteristic impedance section is reflected as a high impedance at the junction of the two sections, and as a very low impedance at the break in the outer conductor wall. The series wall gap between the fixed and rotating parts at the junction of the high and low sections is electrically closed by a second double choke system similar to the first; the series gap impedance in this second system is reduced to a very low value through being connected to a long choke of very low characteristic impedance. This last choke is fitted with a polyiron sleeve cast to the inner (stationary) wall in order to absorb any residual r. f. leakage, thus protecting the main bearings from possible damage due to r. f. burning. The multiple choke system at the upper door-knob transition is similar in principle to that just described, but all sections, except the first concentric low impedance section, are radial, the final r. f. absorber being an annular polyiron ring cast to the stationary part of the joint.

## Mechanical description

6. General views of the coupler, rotary, radio frequency are shown in fig. 1 and 2. The rotating joint is designed round a triple coaxial line carrying the L-band and the two IFF channels. The L-band inner conductor (which also serves as the outer conductor of IFF channel 2) is a brass tube attached to the lower, fixed, part of the rotating joint; the upper part of this conductor passes through the upper L-band knob with its concentric radial system of quarter-wave r.f. chokes, to the upper IFF 2 door-knob transition and is located in a support bearing held in a large bearing housing which is bolted to the L-band transition casting. The L-band outer conductor, as part of the main bearing and slipping assembly, is split between the fixed and rotating parts, the concentric-wave r.f. choke system being contained within the assembly. The inside parts of the main bearing and slipping assembly, forming the L-band outer conductor, are aluminium alloy castings to which the aluminium alloy L-band door knob transitions are bolted.
  
7. The non-coaxial sections of the L-band channel are constructed of aluminium alloy waveguide having half the height of normal No. 6 waveguide, the inside dimensions being 6.5 in by 1.625 in. Input and output connections are by taper sections to flanges suiting standard L-band rectangular flanges and gaskets, the purpose of the taper being to compensate for the thickness of the splitter vane in the transformation to normal size waveguide. The axes of the input and output connections are parallel to the longitudinal axis of the joint, but are displaced  $3\frac{1}{4}$  in transversely off this axis due to the method used to couple into the coaxial section of the joint. Although this method of coupling is employed primarily for electrical reasons, mechanical strength is also gained by this arrangement.
  
8. The L-band waveguide input and output taper sections are of electro-tinned brass and are fitted with sealing rings and bolted to the end of the splitter castings. Dismantling of splitter castings on site is not recommended and should not normally be attempted. However, if a splitter casting must be removed, it is necessary to first slacken completely all forty-eight screws between the transition casting, side-arm castings and splitter casting in the same loop. Removal of the bottom casting also involves releasing the two screws which hold the IFF channel 1 input section via the compensating strip. Each of the side-arms contains a cast-in matching iris which must be in the same position on reassembly as before dismantling. The mating flanges on the side-arms and the transition castings are marked accordingly before installation. Care must also be taken to hold both side-arms castings apart, when refitting a splitter casting, to avoid damaging the sealing O-rings fitted to the side-arm flanges.
  
9. Each rotating joint is individually matched as a unit, and if it becomes necessary to replace either a side-arm or splitter casting because of damage, the v. s. w. r. of the whole L-band channel must be checked as soon as possible. The castings are not interchangeable on site except in emergency, when, as a temporary measure, the matching may prove acceptable.
  
10. All bearings are pre-packed with grease on assembly, the grease being retained

by air and grease seals, and no further greasing should be necessary during the service life. It is not possible to dismantle the bearings on site.

### IFF channel 1

#### Electrical characteristics

11. The electrical characteristics are as follows:

- (1) Frequency band: 1020 to 1115MHz.
- (2) V. S. W. R: less than 1.2 to 1 over the band 1020 to 1115MHz.
- (3) Change in v. s. w. r. with rotation is less than 0.02 over the band.
- (4) Power handling (in the band 1020-1115MHz).
  - (a) Normal working: 10kW peak pulse at 15 lb/in<sup>2</sup> dry air pressure.
  - (b) High altitude: 10kW peak pulse at 700mb dry air pressure absolute (test only).

#### Principle of operation (fig. 3)

12. IFF channel 1 is of air-spaced 50-ohm coaxial line throughout, and is normally pressurized at 15 lb/in<sup>2</sup>. Power entering the joint passes through a right-angled bend into a separate IFF 1 rotating joint in which the series breaks in the inner and outer conductors of the coaxial are electrically closed by multiple choke sections functioning similarly to those described for the L-band channel outer conductor. The power then passes up through a rotating coaxial line in the body of the main rotating joint to a second right-angled bend of the output connector.

#### Mechanical description

13. All the IFF channel 1 conductor components are made of brass, the inner and outer conductors being separated by P. T. F. E. spacers; 50-ohm coaxial connectors (Marconi type H2), mate with the input and output elbow connectors. The stationary input elbow connector is integral with the stationary part of the IFF 1 rotating joint, and the top output elbow connector is detachable from the end of the rotating coaxial line, the axis of the connectors being spaced apart by 35 5/32 in.

14. The IFF 1 rotating joint is attached to the bottom splitter casting by means of a compensating strip bolted to the stationary portion of the joint in two places, and to two pillars cast-in with the bottom splitter casting. The compensating strip allows differential expansion to take place between the aluminium alloy waveguide components and the brass coaxial components. The IFF 1 joint is coupled to the rotating coaxial line by means of a large knurled captive ring engaging the outer thread of the lower support bearing locking ring. If the joint must be removed, it is first necessary to unbolt the compensating strip and dismantle the bottom splitter casting. The knurled ring may then be unscrewed and the joint withdrawn downwards. The IFF 1 inner conductor of the rotating coaxial line is held in spring fingers formed in the inner

conductor of the IFF 1 rotating joint; the outer conductor of the rotating coaxial line is a sliding fit in the outer conductor of the IFF 1 joint, which contains a recessed sealing O-ring.

15. The rotating IFF 1 coaxial line, on entering the IFF 1 rotating joint, tapers up to a wider diameter line of the same impedance in order to accommodate the r. f. choke system within the inner conductor; it tapers down again to the input elbow connector from the stationary part of the joint. Within the body of the IFF 1 rotating joint, the gap between the rotating and stationary walls of the outer conductor is electrically closed by a double quarter-guide wavelength r. f. choke consisting of a concentric low impedance section of line followed by a concentric high impedance section. The gap between the rotating and stationary walls of the inner conductor is closed by an open circuit quarter wavelength r. f. choke system, the stationary walls being lined with a P. T. F. E. sleeve to maintain concentricity and to provide a locating bearing surface for the rotating inner conductor.

16. The IFF 1 rotating joint bearings are pre-packed with grease and protected by air and grease seals and no further greasing should be necessary during the service life. The outer conductor of the rotating coaxial line is located in a support bearing which is similarly protected and packed with grease.

#### IFF channel 2

##### Electrical characteristics

17. The electrical characteristics are as follows:

- (1) Frequency band: 1020 to 1115MHz.
- (2) V. S. W. R: less than 1. 2 to 1 over the band.
- (3) Change in v. s. w. r. with rotation is less than 0. 02 over the band.
- (4) Power handling (in the band 1020 to 1115MHz):-
  - (a) Normal working: 10kW peak pulse at 15 lb/in<sup>2</sup>.
  - (b) High altitude: 10kW peak pulse at 700mb dry air pressure absolute (test only).

##### Principle of operation (fig. 3)

18. The IFF channel 2 is of coaxial and waveguide construction. The coaxial section is concentric with IFF channel 1, the waveguides being fitted to provide the necessary offset position to separate the IFF 2 input and output from those of IFF 1. Upon entering the input connector, power proceeds via a coaxial-to-waveguide, transition, a ridged waveguide, and the lower IFF 2 door-knob transition. The upper door-knob transition is similar to the lower one, and feeds power to the output connector via another ridged waveguide and a waveguide-to-coaxial transition. Series breaks, where rotation takes place in the inner and outer conductors are electrically closed by r. f. choke assemblies in the lower and upper mounting adaptors respectively

Although both this channel and IFF 1 are capable of handling peak power at high altitudes without pressurization, they are normally pressurized at 15 lb/in<sup>2</sup> to prevent ingress of moisture.

#### Mechanical description

19. The inner conductor of the coaxial section of IFF channel 2 is the same brass tube that is used as the outer conductor of IFF channel 1, and extends from the output elbow of IFF channel 1 down through the centre of the upper, rotating IFF 2 door-knob transition and the lower fixed, IFF 2 door-knob transition, to the IFF 1 rotating joint. The lower support bearing is fitted to a thread on the outside of the tube, and is secured by a locking ring engaging the same thread. The bearing sleeve incorporates a flange which forms the rotating part of the lower IFF 2 r. f. choke and which is fitted with a cast polyiron r. f. absorber to protect the bearing from r. f. burning.

20. The stationary part of the upper IFF 2 choke assembly, also incorporating a flange with a polyiron r. f. absorber insert, is fitted to a brass tube which forms the outer conductor of the IFF 2 coaxial section and the inner conductor of the L-band channel. The lower end of this tube is cemented to the inside of the brass section of the IFF 2 input arm and transition assembly.

21. The brass and aluminium alloy input arm and transition assembly is bolted to the lower L-band transition via an aluminium adaptor plate. The 50-ohm input connector (SKF) and the lower mounting adaptor are fitted to the aluminium section. The circular lower mounting adaptor is of aluminium alloy and forms the lower support bearing housing, and with the aluminium section of the IFF 2 transition, forms the stationary part of the lower IFF 2 r. f. choke assembly.

22. The upper mounting adaptor is also circular and of aluminium alloy, and is bolted to the upper support bearing housing. The aluminium alloy IFF 2 output arm and transition assembly is bolted to the upper mounting adaptor, thus forming a housing for the upper IFF 2 r. f. choke assembly. The 50-ohm output connector (PLF) is fitted to the top of the output arm and transition assembly.

23. A Marconi type H2 plug mates with the input connector, and the output connector accepts a type H2 socket. Details of type H2 connectors are described in Chap. 3A. Two adaptors (Marconi type H2 to H7) one male type H2 and H7, the other female type H2 and H7, are stowed on the underside of the output arm and transition assembly. These can be fitted to the input and output connectors of either IFF channel to permit connection of Marconi type H7 connectors on sites with unmodified feeders (Cyprus).

#### Main bearing and slipring assembly

##### Electrical characteristics

24. The electrical characteristics are as follows:

- (1) Insulation at 1000V d. c. :
  - (a) Between adjacent sliprings: greater than 200 Megohms.



- (b) Between sliprings and earth: greater than 200 Megohms.
- (2) Capacitance of telephone circuit sliprings:
  - (a) Between telephone line rings: not greater than 320 pF.
  - (b) Between either telephone line and earth: not greater than 360pF.
- (3) Crosstalk between telephone line rings: better than 50dB.

Circuit description

25. In fig. 4, the circuit diagram for the slipring and brush connections, each brush shown is, in fact, a pair of brushes connected to the same terminal, the identification of the brush block unit to which it belongs being given on the diagram for each pair. Each 5A slipring is served from two brush block units, and each 30A slipring is served from three brush block units. Slipring numbers are marked near the brush terminals and are repeated on sleeve labels on the connecting wires as shown in fig. 4.

TABLE 1  
Slipring Services

| Slipring No. | Plug (pin)  | Service   |
|--------------|-------------|---|
| 1            | PLC (pin J) | Screening ring earthed via brushes; for use as an earth return. |
| 2            | PLB         | Low noise ring for a telephone line (with slipring 4).          |
| 3            | PLC (pin J) | Screening ring, connected to slipring 1; no brushes.            |
| 4            | PLA         | Low noise ring for a telephone line (with slipring 2).          |
| 5            | PLC (pin J) | Screening ring, connected to slipring 1; no brushes.            |
| 6            | PLC (pin N) | From terminal 26 on control drive set, aerial.                  |
| 7            | PLC (pin L) | Polarizer actuator control circuit.                             |
| 8            | PLC (pin H) | Polarizer actuator control circuit.                             |
| 9            | PLC (pin R) | Spare   |
| 10           | PLC (pin G) | Polarizer actuator control circuit.                             |
| 11           | PLC (pin K) | Polarizer actuator control circuit.                             |

Table 1 (contd)

| Slipring No. | Plug (pin)  | Service  |
|--------------|-------------|--|
| 12           | PLC (pin M) | From terminal 27 on control drive set, aerial. |
| 13           | PLC (pin D) | Polarizer actuator control circuit.            |
| 14           | PLC (pin P) | From terminal 25 on control drive set, aerial. |
| 15           | PLC (pin Q) | From terminal 24 on control drive set, aerial. |
| 16           | PLC (pin E) | Polarizer actuator control circuit.            |
| 17           | PLC (pin O) | From terminal 23 to control drive set, aerial. |
| 18           | PLC (pin S) | Spare.   |
| 19           | PLC (pin F) | Polarizer actuator control circuit.            |
| 20           | PLD (pin D) | Spare.   |
| 21           | PLD (pin C) | 30A channel, 240V a. c. , 50 Hz, line.         |
| 22           | PLD (pin E) | 30A channel, 240V a. c. , 50 Hz, neutral.      |
| 23           | PLD (pin B) | Spare.   |
| 24           | PLD (pin F) | 30A earth.                                     |

**Mechanical description**

26. The aluminium alloy slipring unit is built around the central part of the rotating joint and employs platinum alloy wire brushes running on silver sliprings. Details of brushes and sliprings are shown in Chap. 4, fig. 3 and 4. The sliprings numbered 1 to 24, are of solid silver electro-deposited in a ribbed former made of Araldite and marble dust. Sliprings 2 and 4 carry telephone lines with earth screens either side on sliprings 1, 3 and 5, no brushes are used on sliprings 3 and 5 which are connected internally to slipring 1. Sliprings 6 to 19 carry control circuits (sliprings 9 and 18 are spare), sliprings 20 to 24 carry a 240V a. c. 50 Hz supply (sliprings 20 and 23 are spare). The brushes are mounted in pairs on silvered beryllium-copper springs attached to six brush block units.

27. Spring pressure, on installation, is 20 gm. for 5A units (on sliprings 1, 2, 4 and 6 to 19) and 40 gm. for 30A units, (on sliprings 20 to 24) brush spring pressures must be checked when carrying out routine lubrication on the sliprings.

28. The slipring chamber is kept dry by a dry air blast from an air distribution

pipe in the chamber which is fed by a nylon bleed tube connected to the L-band pressurized coaxial section of the rotating joint at a bleed valve adaptor, which is simply a reduced section of No. 48 drill size, to control the rate of air flow. It is normal for a high-pitched whistle to be heard when air at the correct pressure is being blown through the distribution pipe. A dry-running felt seal, in two parts, between the fixed and rotating sections of the slipring chamber casting prevents dirt or moisture from entering the chamber and at the same time allows the air blown from the distribution pipe to leak out. Due to the felt seal, and to other internal air and grease seals, a substantial torque (of up to 15 lb. ft) is required for turning the rotating joint.

29. Slipring connectors and cabling:

- (1) 30A plugs and sockets: Plessey type UK-AN, 7 contact.
- (2) 5A plugs and sockets: Plessey MK4, 18 contacts.
- (3) Coaxial connectors: Marconi type H7.
- (4) Coaxial cabling to brushes: Uniradio 72 (50 ohms).

30. The double main bearing is held in a steel bearing housing; it is packed with grease on assembly and protected by grease and air seals. No maintenance should be necessary during the life of the unit.

### User information

#### Installation

31. During installation and removal, the coupler, rotary, radio frequency must only be lifted by means of the lugs on the integral mounting cylinder (fig. 5). Dismantling from the cylinder should not normally be necessary on site, but if it is carried out, the rotating joint must only be lifted from the mounting cylinder by means of a non-metallic rope sling positioned as shown in fig. 5. On no account must the cylinder be lifted with the rotating joint from this slinging position. There are no setting up adjustments to be made after installation.

#### Maintenance

32. The only routine maintenance necessary is to the sliprings and brushes at 500 hours and 1000 hours turning after initial installation, or replacement of brushes. Subsequently sliprings and brushes should be inspected at 2000 hr. intervals.

For spring pressure measurements the following procedure should be adopted:

- (1) Remove the six hatches on the slipring chamber casting to gain access to the brush block units and sliprings.
- (2) Remove residual grease from the sliprings by wiping with a clean lint-free cloth. Do not disturb the brush arm position or brush wire form.

(3) Apply a spring balance (0-200gm) to the rear of the brush spring within one-eighth of an inch of the brush tip and pull radially to the slipring, the pressure is read when the brush just lifts from the slipring and must be within the tolerances given below.

- (a) 30A brushes (on sliprings 20 to 24); between  $32\frac{1}{4}$  and  $47\frac{1}{2}$ gm.
- (b) 5A brushes (on sliprings 1, 2, 4 and 6 to 19); between 15 and 27gm.

Note. . .

Pressures of each brush spring must also be balanced, i. e. the pressure of one brush spring of a pair must not be more than 5gm. greater than the other.

- (4) Smear each slipring with fresh grease, XG-250 Midland Silicone MS4, NSN 6850-99-942-4829.
- (5) Check the condition of the gaskets and replace if necessary.
- (6) Refit the hatches.

#### Pressure leak check

33. During normal maintenance procedure it would not normally be required to check the pressure leakage of the rotating joint, if however a leak is suspected in the low power coaxial channels the following procedure should be adopted:

- (1) Check that each Marconi type H2 connector is fitted with an O-ring and that both connector and O-ring are in good condition. Replace O-ring if necessary
- (2) Ensure that each connector has been firmly tightened using suitable spanners.
- (3) Connect the top type H2 connector of each low power channel to a blanking cap.
- (4) Connect the bottom type H2 connector of each cable run to a pressurizing adaptor with pressure gauge.
- (5) Connect a foot pump to each adaptor in turn and pressurize each rotating joint channel run to 15 lb/in<sup>2</sup>.
- (6) Remove foot pump and ensure that the time for the pressure to drop from 15 lb/in<sup>2</sup> to 12 lb/in<sup>2</sup> exceeds 15 minutes.
- (7) Remove the pressurizing adaptors.

34. To check the pressure leakage of the L-band high power waveguide channel,

the following procedure should be adopted:

- (1) Connect a blanking plate with pressure gauge to the top waveguide flange, using an airtight gasket under the plate.
- (2) Connect a blanking plate with schradar valve to the bottom waveguide flange, using an airtight gasket under the plate.
- (3) Connect the foot pump to the schradar valve and pressurise the channel to 15 lb/in<sup>2</sup>.
- (4) Remove the foot pump and ensure that the time for the pressure to drop from 15 lb/in<sup>2</sup> to 10 lb/in<sup>2</sup>, exceeds 15 minutes.

#### Renewal of brushes and brush leads

35. To renew brushes and brush leads proceed as follows:

- (1) Brushes (Platinum alloy wire)

Note. . .

Where graphite type brushes are to be renewed with the newer platinum wire brushes all six pillars must be renewed at the same time.

- (2) Damaged or worn wire brushes can be replaced individually or as a set. Details are as follows:

Holder Assy. Electrical Contact Brush E/RAD/C62006-4

NSN 5977-99-954-8241 (Quantity 2 per Coupler)

Holder Assy. Electrical Contact Brush E/RAD/C62007-4

NSN 5977-99-954-8242 (Quantity 2)

Holder Assy. Electrical Contact Brush E/RAD/C62008-4

NSN 5977-99-954-8243 (Quantity 2)

Holder Assy. Electrical Contact Brush E/RAD/C62009-4

NSN 5977-99-954-8244 (Quantity 1)

Brush Electrical Contact R30-6250-50

NSN 5977-99-953-7971 (5A)

Brush Electrical Contact R30-9250-51

NSN 5977-99-953-7972 (30A)

- (3) Before commencing reassembly check the condition of the silver slipping surfaces for signs of arcing.

- (4) Brush leads, but not slipping leads, may be renewed on site.

#### Climatic and durability characteristics

36. To K114/E and DEF 5000. Temperature extreme: -50°C to +70°C.

#### Starting torque

37. The maximum static torque (i. e. the maximum torque required before the joint will rotate) is less than 15 lb ft. at atmospheric internal pressure, increasing

by approximately 100 per cent when normal operating pressure of 15 lb/in<sup>2</sup> is applied.

Air pressure and leakage rates

38. (1) Normal working pressure (all channels): 15 lb/in<sup>2</sup>.
- (2) Maximum working pressure (all channels): 15 lb/in<sup>2</sup>.
- (3) Air leakage rate (L-band, with bleed to sliprings, test only): less than 1.3 cu. ft/min. at 15 lb/in<sup>2</sup>.
- (4) Air leakage rate (L-band, without bleed to sliprings, test only): less than 0.02 cu. ft/min. at 30 lb/in<sup>2</sup>.
- (5) Air leakage rate (IFF channels 1 and 2): less than 0.02 cu. ft/min. at 15 lb/in<sup>2</sup>.

Waveguide and flange loadings

39. Maximum forces which can be applied simultaneously through input or output waveguide flange:

- (1) Perpendicular to flange face: 100 lb.
- (2) Parallel to flange face: 50 lb.
- (3) Torque about waveguide axis: 100 lb ft.

IFF channel 1 connector loadings

40. Maximum loading on horizontal axis of input or output coaxial connector:-

- (1) Along axis: 10 lb.
- (2) Perpendicular to axis: 10 lb.
- (3) Torque about axis: 10 lb ft.

IFF channel 2 connector loadings

41. Maximum loading on vertical axis of input or output coaxial connector:-

- (1) Along axis: 20 lb.
- (2) Perpendicular to axis: 20 lb.
- (3) Torque about axis: 20 lb ft.

Dimensions

42. The dimensions of the assembly are as follows:

- (1) Overall height, including mounting cylinder: 50 5/8 in.
- (2) Overall diameter, including mounting cylinder: 27 in.
- (3) Maximum diameter of rotating portion: 23 in.
- (4) Distance between L-band waveguide flange faces: 50 $\frac{1}{4}$  in.
- (5) Distance between IFF 1 connector axis: 35 5/32 in.
- (6) Vertical distance between IFF 2 connectors: approximately 34 in.
- (7) Weight, including mounting cylinder: 5 cwt 14 lb.
- (8) Weight, without mounting cylinder: 3 cwt 74 lb.

Service life

43. The service life recommendations for the coupler, rotary, radio frequency are as follows:-

- (1) Slipping surfaces: 5 years continuous running.
- (2) Platinum alloy brush gear: 10,000 hours continuous running.
- (3) Pre-packed bearings: 5 years from new (shelf life or running service).

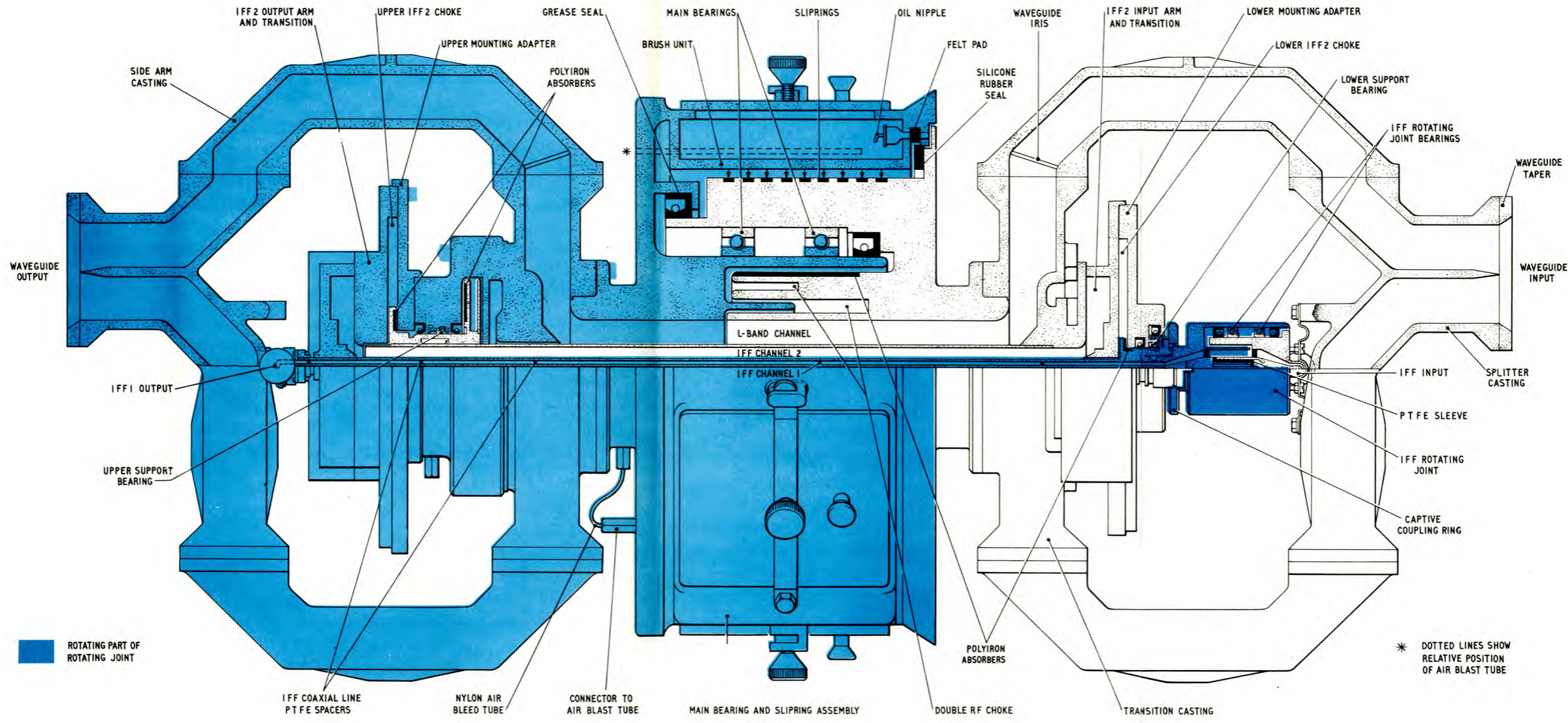


Fig. 3  
 A.L. 2, Jan. 73

Coupler rotary, r.f: explanatory diagram



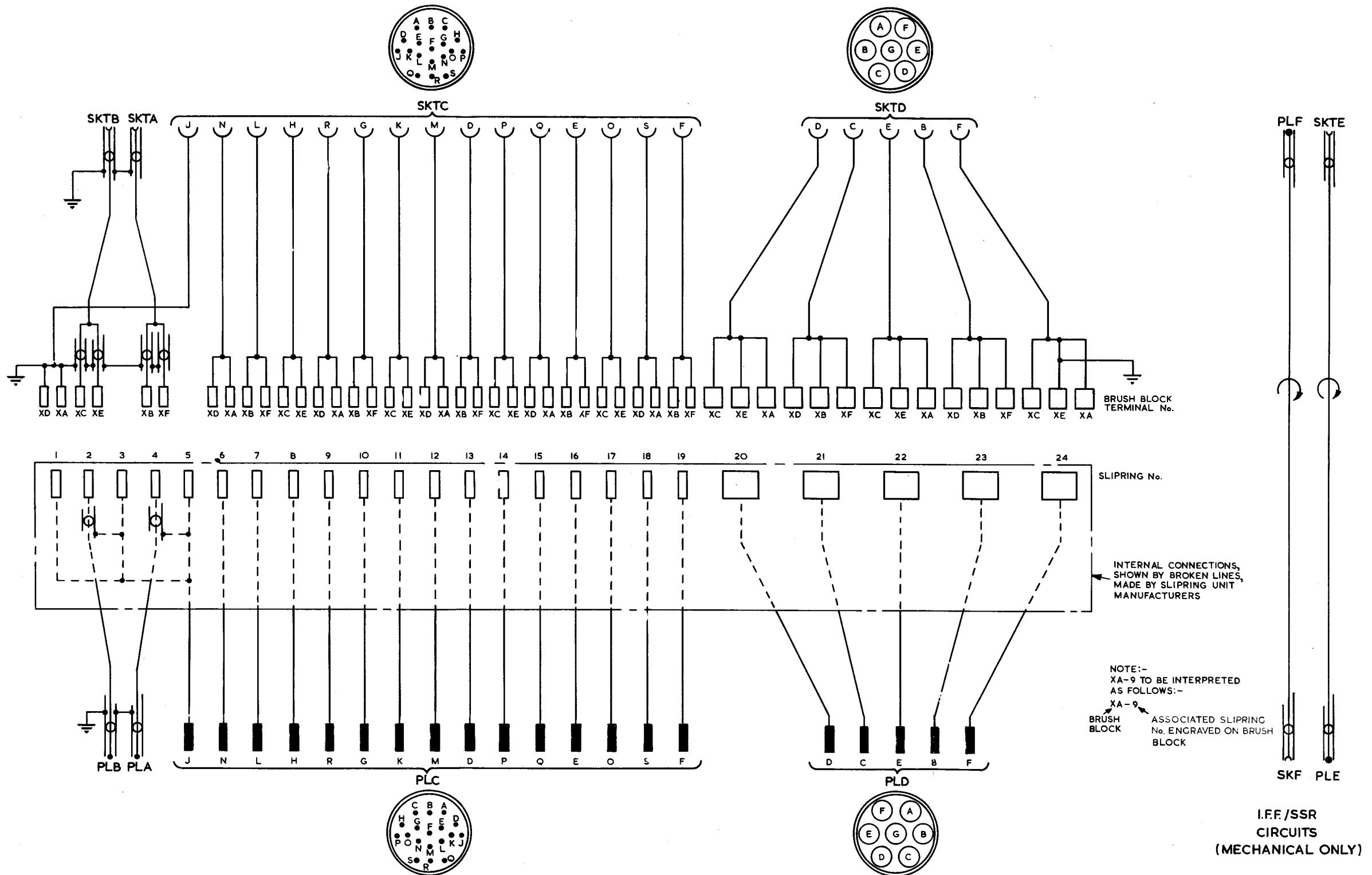
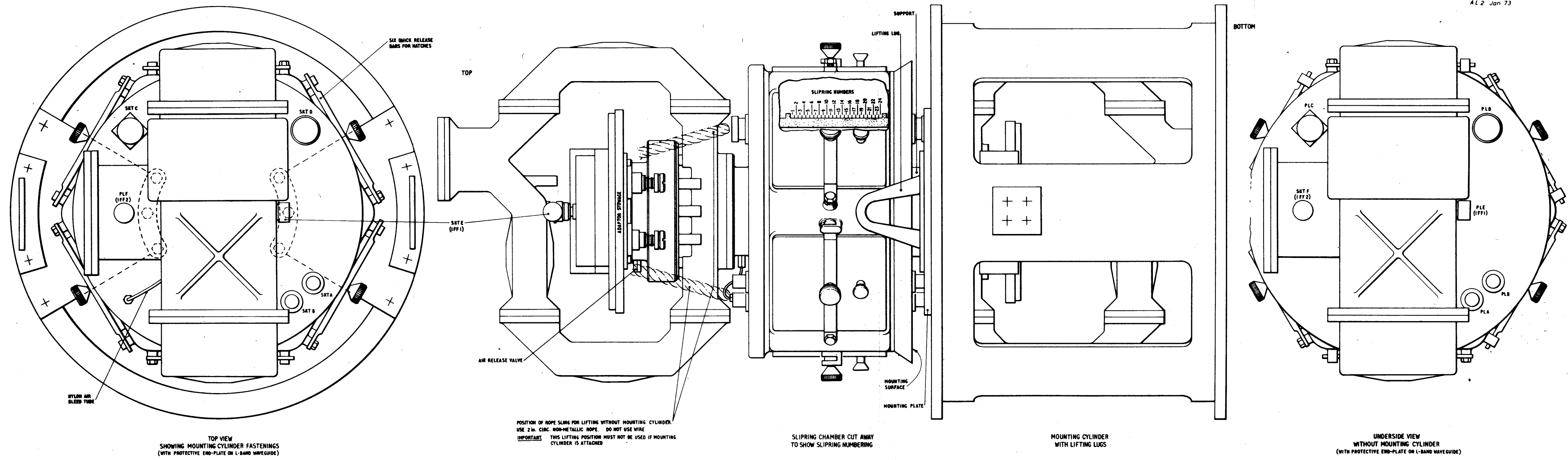


Fig. 4

Coupler, rotary, r.f. : circuit diagram

Fig. 4



POSITION OF ROPE SLING FOR LIFTING WITHOUT MOUNTING CYLINDER.  
 USE 2 in. CIRC. NON-METALLIC ROPE. DO NOT USE WIRE  
**IMPORTANT** THIS LIFTING POSITION MUST NOT BE USED IF MOUNTING  
 CYLINDER IS ATTACHED

SLIPRING CHAMBER CUT AWAY  
 TO SHOW SLIPRING NUMBERING

MOUNTING CYLINDER  
 WITH LIFTING LUGS

UNDERSIDE VIEW  
 WITHOUT MOUNTING CYLINDER  
 (WITH PROTECTIVE END-PLATE ON L-BAND WAVEGUIDE)

Coupler, rotary, r.f.: mounting arrangement

Fig. 5  
 A.L.1

Fig 5

Chapter 5

SECONDARY RADAR AERIAL ADAPTER FRAMEWORK  
 USED WITH RADAR TYPE 84 AERIAL  
 (Completely revised)

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GENERAL

1. Figure 1 shows the structure of the aerial for the Radar Type 84 with the secondary radar (SR) aerial mounted on it. When the SR equipment is added to the Radar Type 84 it becomes Radar Type 84 Mk.2.
2. This chapter describes the aerial adapter, framework for the secondary radar aerial, electrical alignment of the aerial assembly with the Radar Type 84 aerial, and details of the installation and removal procedures.

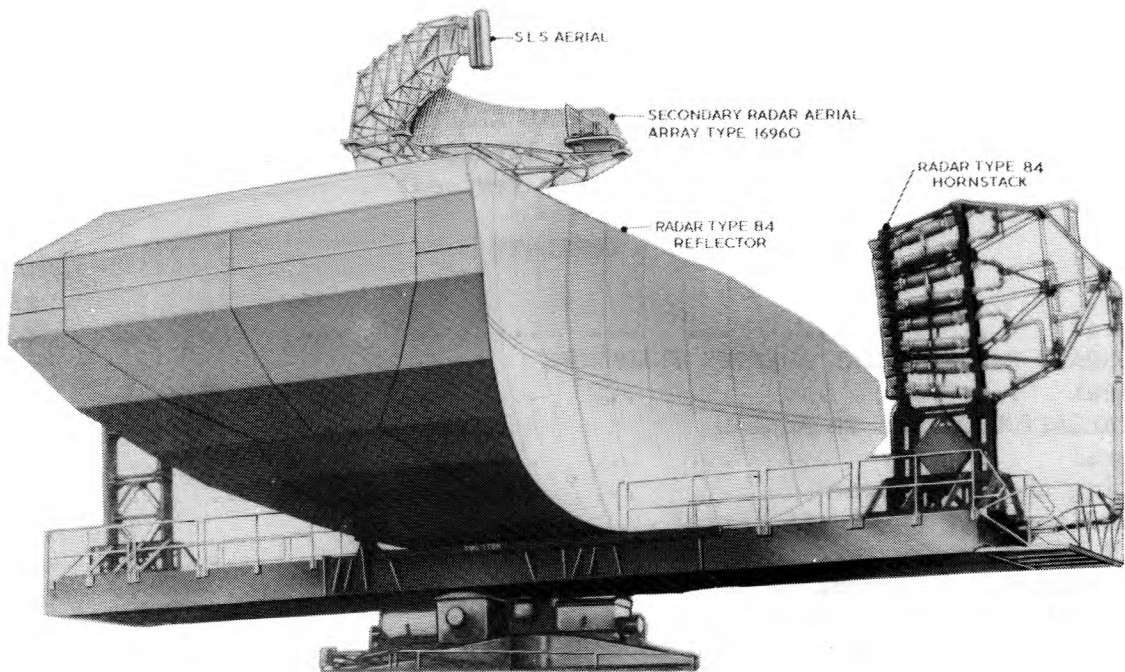


Fig.1 Radar Type 84 aerial with secondary radar aerial mounted on top  
SECONDARY RADAR AERIAL ADAPTER FRAMEWORK

GENERAL

3. The secondary radar aerial adapter framework, which is used to support the SR aerial, comprises three main elements. These are a stub tower, an aerial sub-frame, and a horn boom (fig.2). They are open lattice work structures of welded mild steel, cross-braced for rigidity.
4. The stub tower is mounted on four legs fixed in, and forming part of, the main Radar Type 84 aerial reflector assembly. The tops of the four legs just project through cut-outs in the upper surface of the fairing between the two Radar Type 84 reflector faces, and the brackets on the feet of the stub tower are bolted to the tops of these legs. The stub tower is a permanent fixture.
5. Cowlings and weather seals are fitted at the interfaces between the stub tower and the support legs to prevent the ingress of water.
6. The SR aerial sub-frame is in turn bolted to four mounting plates on the stub tower. Two  $\frac{7}{8}$  in diameter LIB high tensile steel bolts, nuts and washers are used at each plate. Slots in the mounting plates permit adjustment of  $\pm \frac{1}{2}^{\circ}$  for alignment purposes.
7. Eight plates are provided on top of the aerial sub-frame for mounting the SR aerial reflector, and four  $\frac{3}{4}$  in diameter high tensile bolts and nuts hold it in position on each of these. The associated SR feeder horn boom is fixed to the sub-frame at four positions, and the feeder horn is held in position at the outer end of the boom by four cylindrical clamps.

INSTALLATION OF THE SR AERIAL

## Note...

The LIB high tensile steel bolts and nuts used here and elsewhere in the secondary radar aerial adapter framework must not be used again if they have to be slackened off after having once been fully tightened. Care should be taken to ensure that the mating surfaces are clean and free from paint or other foreign material when reassembly is necessary.

GENERAL

8. The SR aerial, (AP 115G-0201-1B Part 2, Sect.2, Chap.3) including the SR aerial reflector, horn boom with horn attached, power divider box and SLS stacked dipole omni-directional aerial, is assembled on the SR aerial sub-frame (para.3 to 7), and mechanical alignment of the horn to reflector both carried out on the ground (para.24 to 27). The assembly is then lifted into position for attachment to the stub tower (para.31 and 32). Electrical alignment of the SR aerial is performed at the same time as the alignment of the Radar Type 84 aerial.

9. The stacked dipole omni-directional aerial, required for side lobe suppression (SLS) is attached to the end of the SR aerial as can be seen in fig.1. The SLS aerial is fed by a power divider box mounted at the rear of the SR aerial reflector. Pressurised air spaced coaxial feeders of  $\frac{3}{8}$  in,  $1\frac{1}{8}$  in, and  $3\frac{1}{8}$  in diameter, using HN and H2 plugs and sockets, are employed in the feeder run (Sect.2, Chap.3A) between the interrogator, power divider box and the aeriels.

FITTING THE STUB TOWER

10. Lift the stub tower on to the four mounting legs fitted in the radar type 84 reflector assembly by means of a mobile crane. The S face of the stub tower has to face forwards.
11. Bolt the stub tower to the mounting legs. Any misalignment should be corrected by easing off the bottom leg  $\frac{3}{4}$  in LIB high tensile steel bolts fixing the legs of the framework, and not by use of a tapered bar.
12. Check the level of the top pads of the stub tower with a water gauge before finally clamping the bottom leg LIB bolts. For this purpose make the highest pad the datum. The remaining pads should be within 1/16 in of this surface level.
13. Clamp up the LIB bolts, as necessary. Note that when clamping up these bolts, only that part of the nut assembly should be rotated that is over the special washer, or two washers should be used and the nut or bolt tightened. Tighten the assembly until a 0.030 in feeler gauge will just enter the gaps around the bolt head.
14. Inspect all jointed surfaces, and in cases where gaps between flanges present possible water traps, fill these with Bostick C compound.
15. Paint all jointed areas when fitment is completed. Use two undercoats to DEF Spec.1044 tint dark grey 632 followed by one top coat to DEF Spec. 1044A finishing paint vehicle high gloss light Admiralty grey tint 697.

## GROUND ASSEMBLY OF THE SR AERIAL

### SR aerial reflector, horn boom and horn

16. As already stated, the SR aerial and horn with its boom have to be mounted on the aerial sub-frame and mechanical alignment carried out before installation is begun. This procedure is given in para.24 to 27.
17. The aerial sub-frame is positioned on a solid ground surface and the feet shimmed up to provide level planes across diagonals of the four central aerial reflector mounting pads so that the difference between the highest and lowest point does not exceed 0.030 in.
18. Next assemble the horn boom framework to the aerial sub-frame.
19. Use the sling provided with the SR aerial and mount the reflector on the sub-frame, using the spherical headed dowels supplied with the reflector to locate the two assemblies. Fit the 32 LIB nuts and bolts ( $\frac{3}{4}$  in 10 UNC  $2\frac{1}{2}$  in long bolts) but do not clamp until any necessary shims have been introduced to ensure good seating between the contact surfaces.
20. When this has been done, clamp up the LIB bolts. Note that when this is being carried out rotate only that part of the nut assembly which is over the special flat round hardened washer provided, or use two washers and tighten the nut or bolt. Tighten now until a 0.030 in feeler gauge will just not enter the gaps around the bolt head.
21. Inspect all jointed surfaces and, in cases where gaps between pads might be considered possible water traps, fill these gaps with Bostick C or other approved mastic compound.
22. Check that the front and rear rails of the horn boom are lying parallel with respect to each other to better than 0.30 in between clamps, and are also lying together within this same tolerance in a horizontal plane. Shim the rail clamping blocks, as necessary.
23. Mount the horn on to the rails but do not tighten the half clamps at this stage.

### Mechanical alignment of horn and aerial assembly

24. Set up the horn alignment jig on the two spherical-headed dowels coupling the aerial sub-frame with the aerial reflector. Adjust the jig foot to give the indicated clinometer reading on the cross strap with the clinometer reading in the direction perpendicular to the aperture of the reflector. With this clinometer setting, the jig will give the required horizontal dimension of 83.91 in between the centre of the dowels and the tip of the jig. Now adjust the horn so that the tip of the jig touches the front perspex face of the horn of the centre cross lines.
25. Check and record the extent to which the horn aperture lies centrally with respect to the reflector profile by means of a stick micrometer. This is done by measuring from the eighth reflector rod in from both ends to the upper corner of the horn window frame, and also to the upper corners of the waveguide flange plate, to determine the extent to which the horn lies in a plane normal to the reflector axis.

26. Use a clinometer to determine the slope of the horn face. Record this information.
27. On completion of the above alignment procedure secure the horn assembly fixing bolts.

#### Assembly of power divider box and SLS aerial

28. Mount the power divider box on the rear of the reflector frame and bolt in position with fixing bolts supplied.
29. Mount the SLS dipole assembly on the reflector wing tip, adjacent to the power divider box with the fixing bolts supplied.
30. Check that both assemblies have their covers firmly secured in position to prevent the ingress of water.

#### ERECTION OF AERIAL REFLECTOR ON TO STUB TOWER

31. Use the sling provided with the aerial reflector to lift the complete aerial on to the stub tower. Make sure that the mating surfaces are free from dirt before the aerial assembly is finally lowered on to the stub tower.
32. Position the aerial assembly roughly central on the adjusting blocks on the stub tower and temporarily secure with the eight 3 in long  $\frac{3}{4}$  in diameter high tensile steel bolts, nuts and flat, round, hardened washers provided.

#### Aerial feeders

33. Fit the aerial feeder sections and connect up air lines. Connect the feeders to the rotary coupler, SR aerial horn, power divider box, and SLS aerial (AP 115G-0201-1B, Part 2, Sect.2, Chap.4).

#### ELECTRICAL ALIGNMENT OF THE SR AERIAL WITH THE RADAR TYPE 84 AERIAL

##### Introduction

34. The following procedure details the steps to be followed to ensure that the the electrical axis of the SR aerial is aligned with the optical axis of the Radar Type 84 aerial reflector to an accuracy of  $\pm 1.5'$  of arc i.e. better than a least significant digit on the azimuth digital readout.

##### Note...

A telescope, which is aligned with the Radar Type 84 electrical axis, is also on a surveyed point, and therefore the azimuth data output of the Radar Type 84 correctly reads out the bearing of the surveyed point with respect to the Radar Type 84 turntable axis.

35. The method of alignment of the SR aerial electrical axis with the optical axis of the telescope utilises the bracket principle in which the Radar Type 84 aerial assembly, with the SR aerial on top, is slowly rotated so that the signal amplitude received by the SR aerial from a remote site transmitter varies from the -3 dB point through maximum to the other -3 dB point on the main lobe of the SR horizontal polar diagram. The mean of the two bearings is the bearing of the SR aerial electrical axis. This procedure may be repeated, as necessary.

36. The equipment or its approved equivalent required for this electrical alignment is as follows:

- 36.1 Receiving equipment at SR head.
  - 36.1.1 Interrogator UPX6 (normally available on site)
  - 36.1.2 Testmeter (20000 $\Omega$ /V)
  - 36.1.3 VHF communications set (FGRI 18135 - Ref. No. 10D/22104)
  - 36.1.4 Auto transformer 240V - 110V for the UPX6.
  - 36.1.5 Coaxial cable (UR67) 75 ft fitted with HN plug at each end
  - 36.1.6 12V battery
  - 36.1.7 3 dB pad (at 1 GHz).
- 36.2 Remote site transmitting equipment.
  - 36.2.1 Rhode and Schwartz signal generator (Cat. No. 6625-12-133-432)
  - 36.2.2 Rhode and Schwartz UHF resonance meter type WAL BN4321/2
  - 36.2.3 Two coaxial T-junctions (Cat. No. 5935-99-999-0974)
  - 36.2.4 Constant voltage transformer
  - 36.2.5 Generator set (Ref. No. 10AG/913)
  - 36.2.6 Aerial system 12861 (Ref. No. 10B/19272)
  - 36.2.7 L-band dipole feed (Cat. No. 5840-99-970-5652)
  - 36.2.8 Zip up aerial tower - 100 ft (AP 115Z-1001-1)
  - 36.2.9 VHF communications set FGRI 18138 (Ref. No. 10D/22107)
  - 36.2.10 12V battery.
- 36.3 Coaxial connectors as follows:
  - 36.3.1 Dezifix FS/501/75 - Marconi HZ 6 ft
  - 36.3.2 Dezifix FS/501/75 - BNC 6 ft
  - 36.3.3 Marconi HZ - BNC 6 ft
  - 36.3.4 BNC
- 36.4 100W lamp.

Note...

Certain items of the above mentioned test equipment, are described in AP 115H-0104-1, Sect.5, Chap.1.

#### Siting conditions for remote aerial

37. The site for the remote transmitter aerial should preferably be not less than 550 yards from the Radar Type 84 aerial. However, a shorter distance may be necessary and may be used but 300 yards must be considered as the absolute minimum.



38. There must be no obstacles such as masts, buildings, etc in the sector  $20^{\circ}$  either side of the line between the remote site and the Radar Type 84 aerial.
39. The remote site aerial minimum height must be such that the remote aerial and the SR aerial on the Radar Type 84 are on the same horizontal plane.
40. The line of sight from the remote aerial to the SR aerial must not be obscured by local obstruction such as trees, bushes, etc in the vicinity of the remote site.
41. The requirements of para.39 and 40 may necessitate the use of the zip up aerial tower. The manner of erection of the tower is covered in AP 115Z-1001-1.

#### Calibration of test gear

##### Signal source

42. Remove the UPX6 from its case and set up the controls as detailed below:
- 42.1 Set the LOCAL/REMOTE switch to LOCAL
  - 42.2 Remove valve V113, if fitted
  - 42.3 Remove V101
  - 42.4 Set the I/L switch for use with the case removed
  - 42.5 Set the GTC switch to OFF.
43. Connect the signal source to be used into the -20 dB input socket on front of the UPX6. Switch on the UPX6 and the signal source, and allow to warm up for 30 minutes.
44. Connect the test meter, set to the 0-5V or 0-10V range, between the test point J303 on the UPX6 and the chassis. Note a negative reading will be obtained.
45. Adjust the frequency and output controls of the signal source, and the gain control of the UPX6 for a maximum meter indication of approximately 4V. Check that the signal source frequency is approximately 1090 MHz.
46. Adjust the frequency of the signal source either side of the centre frequency found in previous paragraph and note the two frequencies at which the output from the receiver starts to fall off rapidly. Set the signal source frequency to the mean of the two frequencies thus obtained and note the frequency.

##### Frequency meter

47. Couple the frequency meter into the circuit between the signal source and the UPX6.
48. Ensure that the signal source frequency is as determined at para.46 above, and then adjust the wavemeter tuning for maximum response as indicated on its meter. Note this frequency for future reference. It should be approximately 1090 MHz.

#### Setting-up procedure for equipment at the remote transmitter site

49. Erect the zip up aerial tower, if necessary, to meet the conditions specified in para.39 to 41.
50. Assemble the aerial system 12861 and mount it at the required height, aimed in the Radar Type 84 direction with the dish clear of the face of the mast. Also mount the 100W lamp 18 in to the left of the centre of the aerial when looking at the aerial from the Radar Type 84. The lamp may be mounted above or below the aerial as long as its horizontal separation is 18 in.

51. Install the signal source, frequency meter, constant voltage transformer, and power unit as near to the aerial on the mast as possible and connect to the supply. It should be noted that the signal source and its frequency must have been calibrated as in para.46.

52. Switch on the equipment on the mast and allow 20-30 minutes to stabilise. Then use the settings obtained during calibration as a guide to set the signal source frequency to give maximum indication at the frequency meter dial setting obtained at para.48, adjusting the signal source outputs to approximately  $\frac{3}{4}$  maximum, and also adjusting frequency meter sensitivity to suit the power level involved. Repeat the frequency checks at intervals as circumstances dictate. Detune the frequency meter to 1000 MHz after each frequency check.

#### Setting-up procedure for equipment at the Radar Type 84

53. Install the UPX6 transmitter receiver on the bench in the rotating cabin. Remove its cover and set up as described in para.42.

54. Connect the UPX6 to the mains via the 230V/115V auto transformer, switch on and allow to warm up for 20-30 minutes.

55. Connect the testmeter between test point J303 on the UPX6 and the chassis, with the range set to 0-10V, and note that a negative reading is obtained.

56. Energise the turning gear, and set for cabin control. Cause the Radar Type 84 aerial to rotate until the crosswires of the telescope on top of the Radar Type 84 reflector are centred on the centre of the remote 100W lamp. Note the bearing indicated on the illuminated scale in degrees and minutes of arc.

57. Cause the Radar Type 84 aerial to be rotated  $5^{\circ}$  either side of the bearing obtained above until a maximum signal is obtained from the remote aerial as indicated on the meter. Determine working levels of signal to give a convenient working indication by adjustment of the UPX6 gain control.

58. Remove the aerial feeder from the UPX6 input socket and check that the meter indication is negligible.

59. Reconnect the feeder, recheck that the Radar Type 84 is aligned for maximum signal on the meter, and note the meter indication. Now insert a 3 dB pad in series with the feeder system and note the new meter indication. This should be approximately 70% of the first indication but it is not critical and the nearest scale mark to the meter pointer should be taken. The purpose of this check is to ensure that the receiver is being used over a reasonably linear part of its characteristic.

60. Cause the Radar Type 84 aerial to be driven slowly to  $5^{\circ}$  in a counterclockwise direction, and then reverse and drive as slowly as possible in a clockwise direction to  $5^{\circ}$  on the other side of the maximum meter indication, noting the bearings at which the meter indicates the point on the scale selected in para.59. The mean of the two bearings is the actual bearing of the SR aerial on top of the Radar Type 84, and should ideally be the same as that obtained for para.56.

61. Repeat the process of swinging the Radar Type 84 aerial either side of maximum at least six times so that six pairs of bearing indications are obtained where the received signal is equal to the selected point on the meter scale. The mean of these pairs of indications should all be within  $\pm 2$  minutes of arc of each other.

62. Calculate the mean of the six mean bearing indications obtained and compare the results with the bearing obtained at para.56.

63. If there is a difference of more than  $\pm 2$  minutes then the SR aerial should be repositioned, as indicated in para.65, to reduce this error to a minimum, and the procedure detailed in para.60 repeated. Continue to reposition the aerial, as necessary, to achieve the required results.

64. If, on the other hand, there is a difference of less than  $\pm 2$  minutes of arc, an additional set of six bearing readings should be obtained and then the mean bearing of the twelve mean bearings calculated. Should the result be a bearing which is within  $\pm 1.5$  minutes of arc of that obtained at para.56, clamp and lock all four adjusting screws and the four holding down bolts. When this is completed proceed as at para.68 below.

65. If the difference in angle obtained at para.56 and para.60 exceeds  $\pm 2$  minutes of arc then there is a need to adjust the relative position of the SR aerial with respect to that of the Radar Type 84. In this case the procedure detailed below should be followed:

65.1 Slacken the four bolts holding down the sub-frame to the stub tower.

65.2 Nip up all four adjusting screws on the diagonal feet of the stub tower.

65.3 Depending upon the direction of the angle of difference, slacken off one screw, half a turn at a time, and nip up on the opposing screw. This operation should be carried out on one adjusting clamp at a time. If there is a large discrepancy in the aerial axis it may be necessary to slacken off both adjusters together and inch the SR aerial round by manipulating the appropriate adjusting screws at the same time.

66. Between adjustments, pairs of indications should be taken as at para.60 and the error reduced to within  $\pm 2$  minutes of arc.

67. On completion of the above procedure, clamp up and lock all four adjusting screws and the four holding down bolts.

68. When the stage is reached at which no further reduction of error is considered to be practical, cause the Radar Type 84 aerial to be driven  $5^{\circ}$  either side of maximum signal position and note the bearing at which the signal reached the selected point on the meter scale. Repeat this 12 times and calculate the mean bearing from the 12 indications obtained.

69. Compare the mean bearing determined at para.68 with that obtained at para.56 and readjust the SR aerial position, repeating the procedure given in para.56 to minimise the difference until it is equal to or less than  $\pm 1.5$  minutes of arc. Make a careful check of the bearing position of the remote 100W lamp as viewed through the telescope to ensure that nothing has moved throughout this alignment procedure. Now proceed to para.75 unless the conditions specified in para.70 apply.

70. Although it is most unlikely, if it is found that the SR aerial cannot be moved any further mechanically to reduce the error to 1.5 minutes of arc, establish the remaining angular error between the SR aerial electrical axis and the telescope as indicated on the bearing readout dial. The magnitude of this error will indicate the subsequent action to be taken.

71. Obtain an AID recheck of the alignment between the telescope and the azimuth readout scale with respect to the survey point. If the result is satisfactory, and the error as determined at para.70 is not greater than  $1^{\circ}$ , proceed as indicated below (para.72 to 75).

72. Since no further movement of the SR aerial assembly with respect to its supporting structure is possible it is now necessary to make use of any small amount of lateral movement in the position of the SR aerial horn feed in relation to its reflector which can be achieved. The extent of this movement is limited, due to electrical considerations, to a maximum of  $\pm 2$  in either side of its installed position. This is equivalent to a beam deviation of approx.  $\pm 1^{\circ}$ . Therefore when the angular error remaining between the SR aerial electrical axis and the telescope has been determined, calculate the lateral shift of the horn feed assembly necessary to reduce the error to a minimum, given that:-

72.1 The mechanical angular correction is equal to the electrical axis error x 1.8 in degrees.

72.2 The equivalent horn shift in inches is equal to the mechanical angular error x 1.74.

73. Adjust the horn assembly by the amount determined at para.72.

74. Proceed as before to swing the Radar Type 84 aerial through maximum signal and note the bearings at which the received signal passes through the selected point on the meter scale. Calculate the mean bearing and readjust the horn position within the limits stated until the requirements specified in para.71 are satisfied.

75. When the tolerance specified in para.68 has been achieved, check the tightness of all bolts, etc., which have been adjusted or slackened during the alignment procedure. Paint over all holding-down bolts, and grease the adjusting screws and clamps. Make good all damaged paintwork.

#### REMOVAL OF SR AERIAL

76. The procedure for removal of the SR aerial is given in para.77 to 78.

77. Disconnect the interrogator from the power divider box but leave the power divider box and the SLS aerial fixed in position, and the aerial reflector fixed to the aerial sub-frame. Care should be exercised to avoid disturbing the alignment of the horn.

78. Fix the sling provided to the aerial and then remove the eight bolts holding the aerial sub-frame in position on the stub tower. The aerial can then be lifted clear.

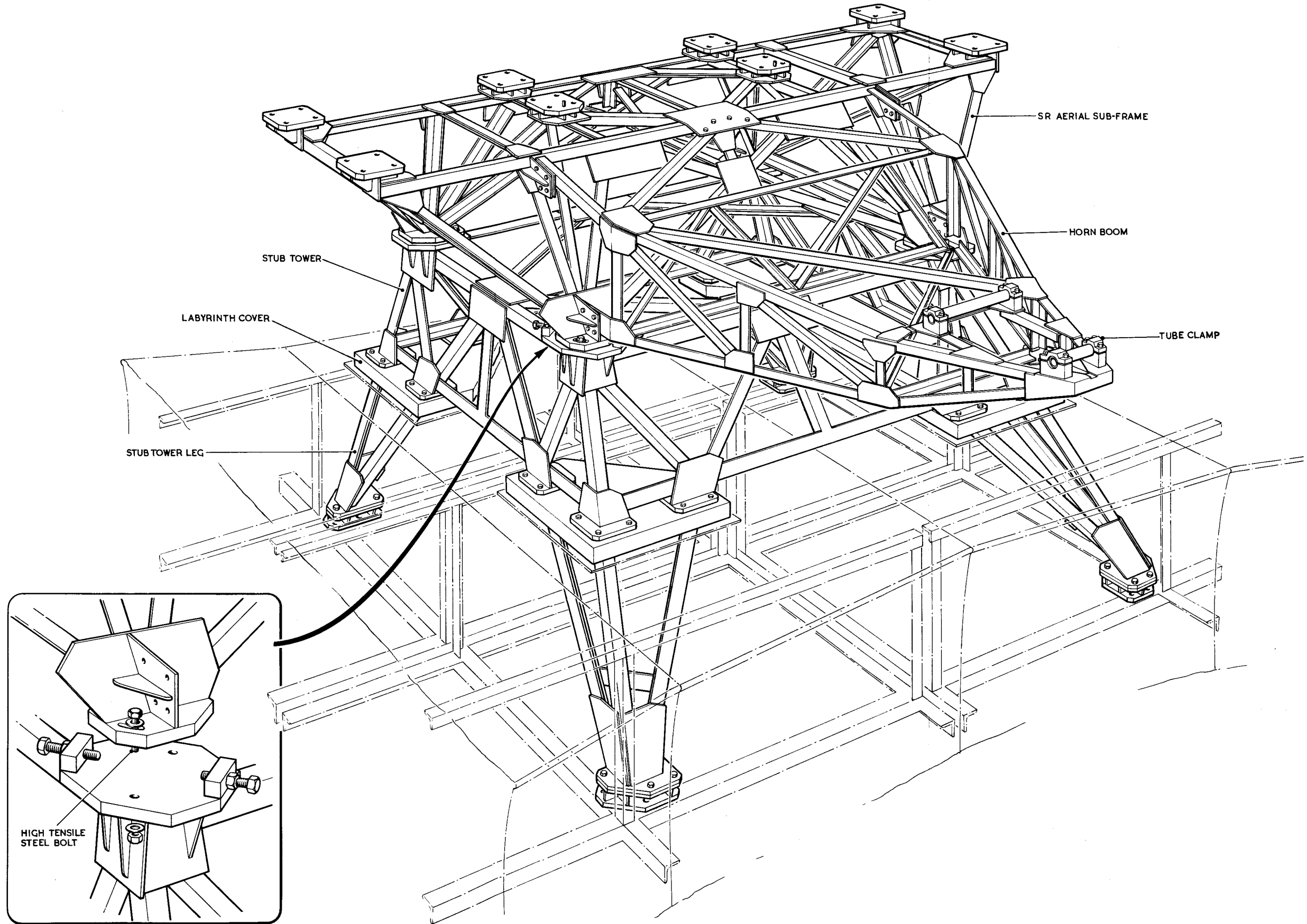


Fig. 2

SR aerial adapter framework mounted on the radar Type 84 reflector assembly

AP

**SECTION 9**

**ANCILLARIES**

## Chapter 1

## MODULATOR VALVE CONDITIONER M2

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## Introduction

1. The modulator valve conditioner (*fig. 1*) is used to test suspect hydrogen thyratrons, Type CV8563. Four valves of this type are used in switch, electronic M6 of the transmitter trigger system (*Sect. 3, Chap. 2*). The unit incorporates a modulator circuit which is used to pulse suspect thyratrons, thus allowing the thyatron operating conditions to be simulated and spare valves to be tested. Meters are provided to monitor the peak anode voltage and the mean current flow of the thyatron being pulsed.

2. The unit operates from a 240V, 50c/s supply, and is constructed in the form of a trolley, which allows it to be operated at any convenient location in the transmitter room.

## Brief description

3. The modulator valve conditioner has overall dimensions: height 40 in., width 20 in., depth 30 in., and weighs 335 lb.

4. As shown in *fig. 1*, the various controls, meters and indicator lamps are mounted on a control panel on the top of the unit. Access to the two thyratrons and the components contained inside the unit is gained by lifting the front panel (*fig. 2*). Mechanical interlocks prevent this panel being opened when the modulator e.h.t. supply is switched on. The modulator circuit incorporates a protection circuit which automatically removes the modulator e.h.t. supply if the mean current through the thyatron being pulsed exceeds 20 mA.

5. As shown in *fig. 3*, a 240V a.c. supply is routed to transformers T1, T2 and T3 when the MAINS switch (SA) is operated. From T1 and T2 6.3V a.c. supplies are fed to the heaters of the two thyratrons (V1 and V2). Transformer T3 feeds a.c. supplies to the full-wave rectifier network of MR21-MR24 and to valve rectifier V3. The negative d.c. output of MR21-MR24 is smoothed to provide a collector potential (-22V) for transistors VT1-VT5 of the trigger circuit. The d.c. output of V3 is smoothed, and stabilized to -108V by V4, to provide a negative bias for the screen grids (G2) of the thyratrons. A 6.3V a.c. supply is fed from T3 to the input stage (VT1) of the trigger circuit. The negative half-cycles of this supply are amplified and differentiated by the trigger circuit and fed via switch SB to the control grid (G1), and the screen grid (G2) of V1 or V2 to provide firing pulses. These positive firing pulses have an amplitude of 750V and a nominal pulse length of 400  $\mu$ s.

6. When H.T. switch (SD) is closed and the H.T. ON button (SE) is depressed, contactor A closes and routes a 240V a.c. supply to variac T7. The setting of the variac controls the level of the a.c. applied to the e.h.t. transformer T4 (i.e. 0-240V a.c.). The a.c. output of T4 (0-20 kV r.m.s.) charges the pulse forming network (p.f.n.) positive via the half-wave rectifier network of MR1-MR20, which is an oil filled unit. The p.f.n., which is also oil filled, comprises an open-ended artificial delay line and has a total two-way delay time of 1  $\mu$ s. The p.f.n. is discharged into a 50 ohm resistive dummy load each time thyratrons V1 or V2 conduct, i.e. with the application of the firing pulses produced by the trigger circuit.



Fig.1 Modulator valve conditioner: front view



## Circuit description

### Trigger circuit

7. The trigger circuit, situated inside the thyatron assembly (*fig. 4 and 5*), comprises five p.n.p. transistors (VT1–VT5) connected to form a common-emitter amplifier as shown in *fig. 7*. The d.c. output of the bridge rectifier network of MR21–MR24 is smoothed by C10 to provide a potential of  $-22\text{V}$  for the transistor collectors.

8. The input signal to the trigger circuit is taken from a  $6.3\text{V}$  secondary winding of transformer T3, and is fed to the base of VT1. The negative half-cycles of the  $6.3\text{V}$  a.c. supply cause VT1 to conduct and produce positive-going pulses at the collector. These positive pulses are differentiated by C7 and R14 and applied to the base of VT2. The negative-going spike of the differentiated output of VT1 causes VT2 to conduct. The positive-going pulses that appear at the collector of VT2 are further differentiated by C8 and R17 and are applied to the base of VT3. Due to the fixed negative base bias fed from the junction of R16 and R17, VT3 is normally conducting, but is cut off by the positive spikes of the output pulses of VT2. The short duration negative-going pulses at the collector of VT3 are coupled via C9 to the emitter follower stage VT4, which provides the correct impedance matching to the output transistor VT5. The positive output pulses of VT5 developed across the primary of T6 have an amplitude of  $22\text{V}$  and a nominal duration of  $400\ \mu\text{s}$ . From the secondary of T6 the positive pulses are fed to the control grid (G1) and via C3 to the screen grid (G2) of thyatron V1 or V2, as controlled by changeover switch SB. Due to the voltage step-up ratio of T6 the amplitude of the firing pulses applied to the thyatrons is approximately  $750\text{V}$ : this amplitude is substantially reduced when either thyatron conducts due to the limiting effect of R5 and R7.

9. As the input signal to the trigger circuit is derived from an a.c. output of transformer T3, the firing pulses have a p.r.f. of the mains frequency, i.e.  $50\ \text{c/s}$ .

### Negative bias circuit

10. The negative bias supply for G2 of thyatrons V1 and V2 is provided by rectifier V3 (*fig. 7*). This d.c. supply is smoothed by C1 and stabilized to  $-108\text{V}$  by V4. Relay RLB, which becomes energized when the  $-108\text{V}$  bias supply is available, forms part of the modulator interlock circuit. Valves V3 and V4 and their associated circuit components are contained in the thyatron assembly (*fig. 4 and 5*).

### Modulator circuit

11. When the MAINS switch SA and the H.T. switch SD are closed, a  $240\text{V}$  a.c. supply is routed

to contactor A mounted on the rear of the control panel (*fig. 6*). Contactor A closes and feeds the  $240\text{V}$  a.c. supply to transformer T5 and to variac T7, when the H.T. ON switch (SE) is operated. A  $6.3\text{V}$  a.c. supply is fed from the secondary of T5 to the H.T. ON indicator lamp ILP1. Variac T7 controls the level of the a.c. applied to e.h.t. transformer T4. The a.c. output of T4 ( $0\text{--}20\ \text{kV}$ ) charges the p.f.n. positive via the half-wave rectifier network of MR1–MR20. With the variac set to give a maximum a.c. output (i.e.  $240\text{V}$  a.c.) the p.f.n. charges to a maximum peak voltage of  $28.5\ \text{kV}$ . When thyatron V1 or V2 conducts (i.e. with the application of the firing pulses from the trigger circuit) the p.f.n. is discharged into the dummy load. The result is a  $1\ \mu\text{s}$  pulse (the total delay time of the p.f.n. (with an amplitude of half the voltage charge of the p.f.n. is developed across the  $50\text{-ohm}$  dummy load. The dummy load, R8–10, and R22–R24, is mounted in the rear of the trolley and is cooled by fan BL1.

12. Switch SC is mechanically coupled to the H.T. switch SD, and discharges the p.f.n. to earth when switch SD is opened and the modulator h.t. supply is switched off. The negative pulse developed across R23 and R24 of the dummy load is fed to socket SKA (PULSE) on the control panel to facilitate monitoring of the modulator pulse.

### Interlock circuit

13. The  $240\text{V}$  a.c. supply to the operating coil of contactor A is routed via a series connected interlock circuit. The function of each interlock will now be described.

14. Contact RLA1 is normally closed but opens if the mean current through the thyatron being pulsed exceeds a pre-determined level. Relay RLA is connected in series with the secondary winding of the e.h.t. transformer T4: RV1, connected across RLA, is normally adjusted so that relay RLA operates when the mean current through the thyatron being pulsed exceeds  $20\ \text{mA}$ . Relay RLA and its associate circuit components are mounted on the rear of the control panel (*fig. 6*).

15. The contacts of thermostat X2, which is in thermal contact with the e.h.t. rectifier assembly (MR1–MR20), open if the temperature of the assembly exceeds  $60^\circ\text{C}$ .

16. Relay RLB becomes energized and contact RLB1 closes when the  $-108\text{V}$  negative bias supply becomes available.

17. Microswitch SG prevents the modulator e.h.t. supply being switched on when the front panel of the unit is open. The microswitch is operated by a mechanical interlock, when H.T. switch SD is closed.

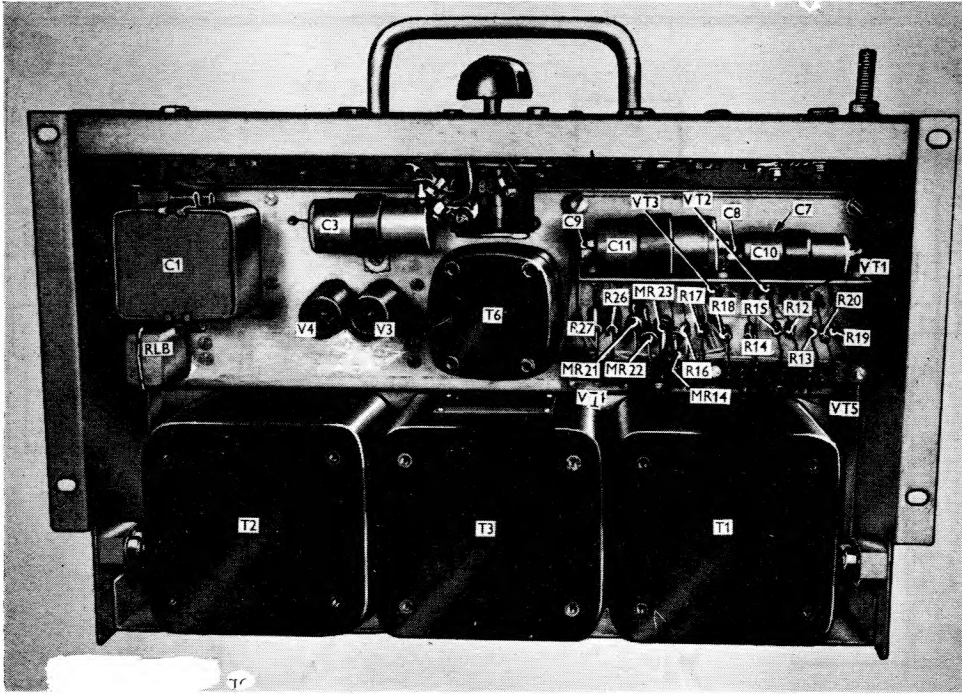


Fig. 4. Thyratron assembly : front view

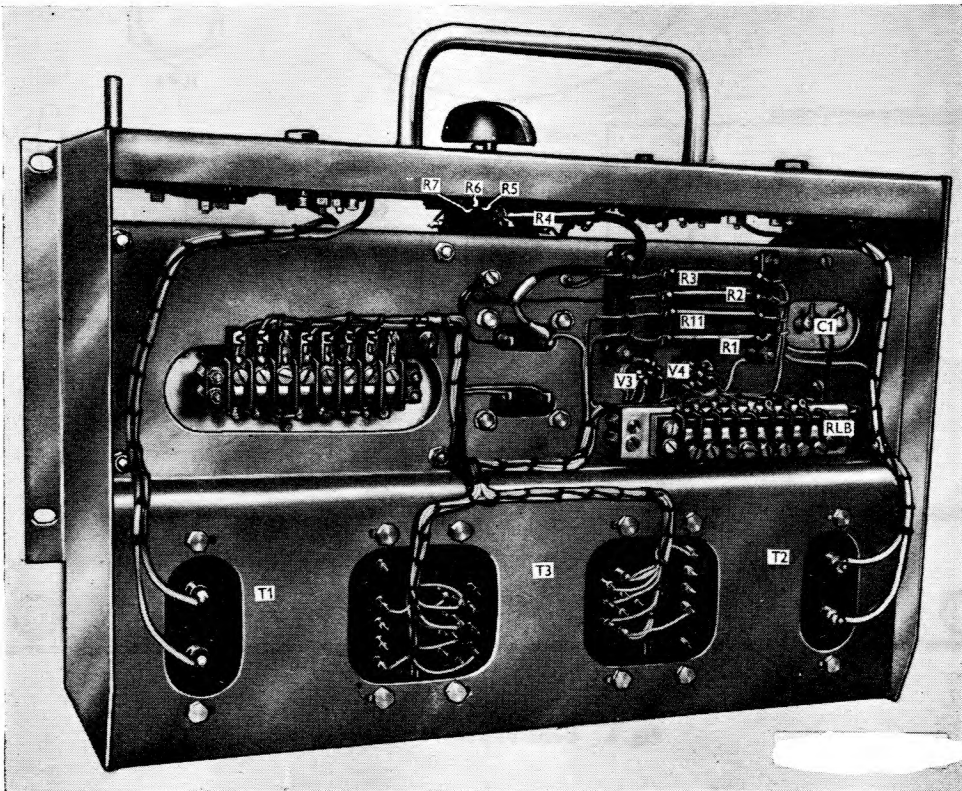


Fig. 5. Thyratron assembly : rear view

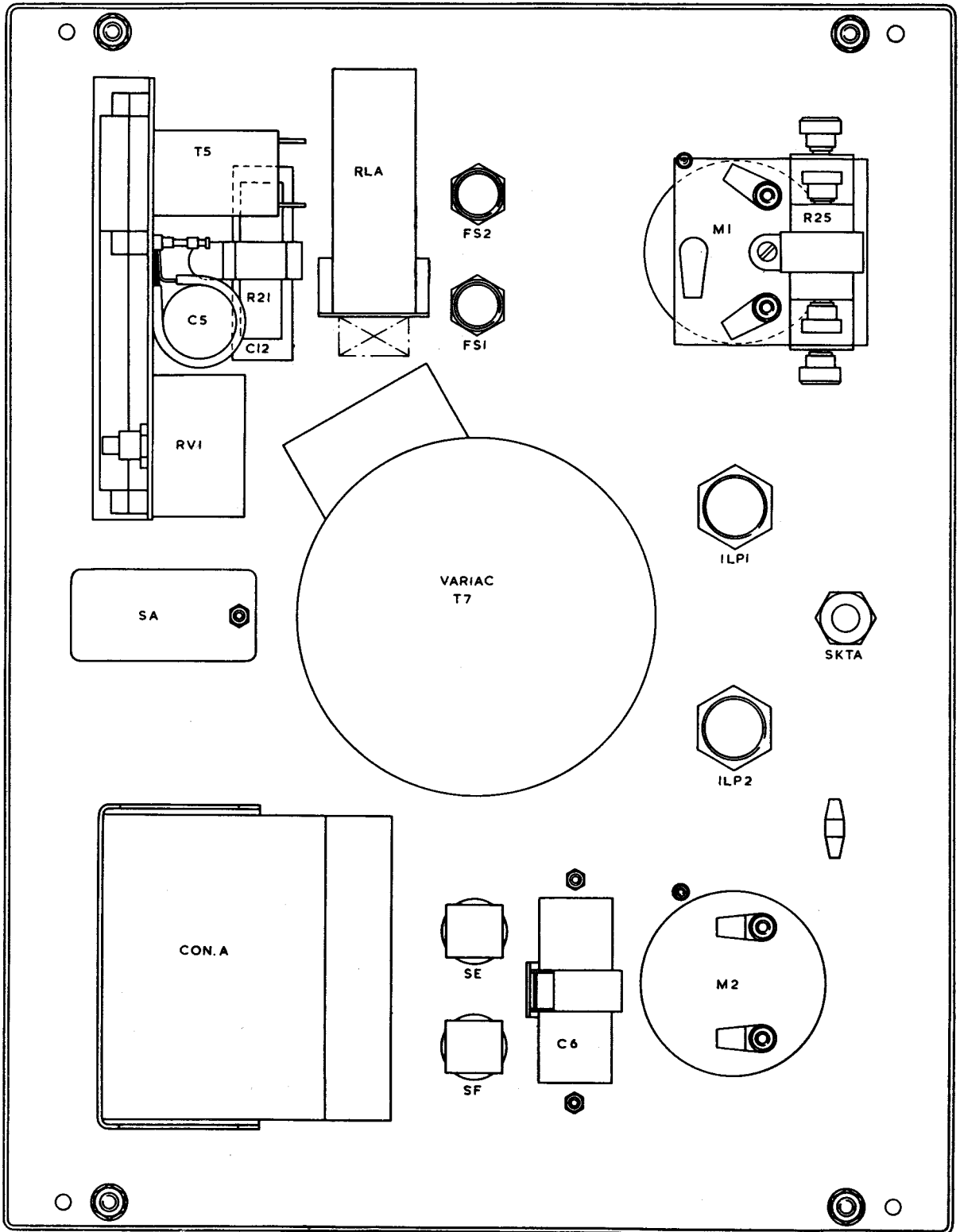


Fig. 6. Control panel : rear view

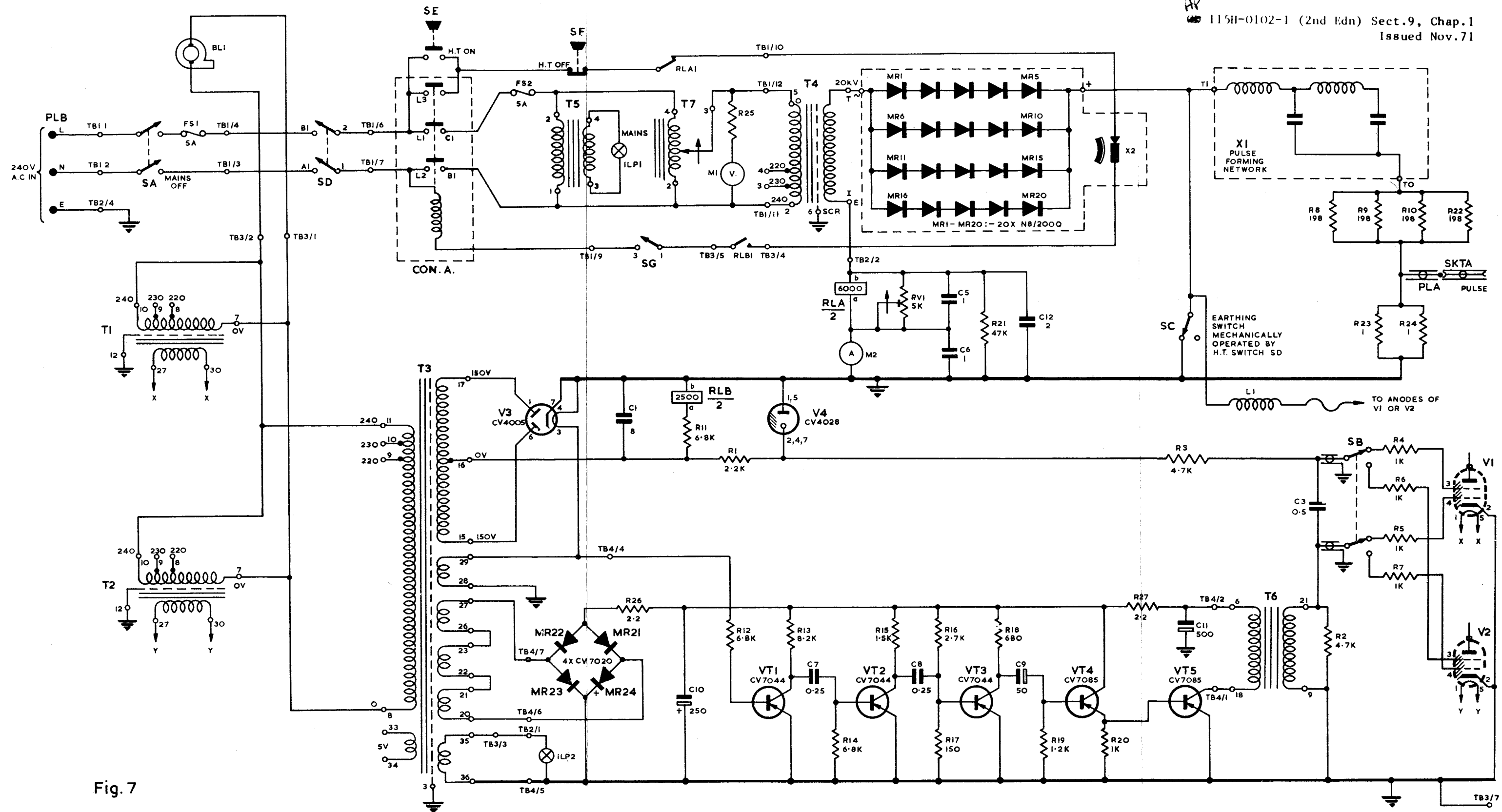


Fig. 7

Modulator valve conditioner M2: circuit.

Fig. 7

Chapter 2TRANSMITTER AIR CONDITIONER UNIT

(completely revised)

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## App.

- 1 Air conditioner control system post Mod. No. CA4570/4 and CA4571/NA

INTRODUCTION

1 The function of the air conditioner unit (fig. 1) is to produce a forced flow of air to cool the units and components contained in the Radar Type 84 transmitter cabinets, and to maintain the temperature of this air within predetermined limits.

2 Two flap valves (fig. 2) built into the air mixing chamber of the unit are controlled by a servo system so that the flow of air can be either recirculated, or discharged from the system and replaced by fresh air drawn in from the atmosphere through the air intake filters. The ratio of recirculated to fresh air can be varied from 0 to 100 per cent.

DESCRIPTION OF SYSTEM

Note ...

If Modifications CA4570/4 and CA4571/NA have been embodied refer to Appendix 1 for control system description and functional details.

3 The system relies for its operation on the characteristics of the regulator which is mounted in the outgoing duct of the air conditioner. This regulator is a resistor which has a resistance of 1000 ohms at a temperature of 21°C and a positive temperature coefficient of 0.0054 per °C. It is connected by a screened twin cable to the control unit and forms part of the unit input bridge circuit (fig. 6) to which is applied an a.c. energizing voltage.

4 A change of resistance of the regulator, resulting from a change of temperature of the air leaving the transmitter cabinets, causes the bridge to be unbalanced. In the unbalanced condition an a.c. voltage is present at the output of the bridge, there being a phase difference of 180° between the voltage due to an increase of air temperature and the voltage due to a decrease of air temperature.

5 After amplification, the voltage is fed to the input of a phase sensitive detector (fig. 5) which has a relay coil in each of its two output circuits. Power for these two circuits is derived from a 50 Hz source rectified by half-wave rectifiers so that the d.c. voltage applied is pulsating at 50 Hz.

6 A voltage in phase with the a.c. voltage applied to the bridge circuit causes current to flow in the coil of one of the relays which operates and switches the 240V single phase supply to a two-phase motor so that the motor drives the flap valves in a particular direction.

7 Conversely, an anti-phase voltage causes current to flow in the coil of the other relay which operates and switches the a.c. supply to the motor so that it drives the flap valves in the opposite direction (para. 21).

8 The flap valves move to give an increased proportion of fresh air when the temperature of the regulator is above 20°C and a decreased proportion when the temperature is below 20°C. These movements of the flap valves and the resultant decrease or increase of the temperature of the circulating air tend to restore the resistance of the regulator towards its nominal value.

9 In addition to controlling the position of the flap valves the motor drives the slider of a potentiometer contained in the actuator assembly (fig.4), the position of the slider being synchronized with the position of the flap valves.

10 This potentiometer is connected by a screened cable to the control unit and is connected so that it is part of the left-hand arms of the bridge circuit (fig. 6). Movement of the slider transfers resistance from or to the arm containing the regulator and this tends to damp the response of the system and prevent hunting.

Air condition unit

11 The air conditioner unit (fig. 1), together with an additional fan fitted to the exhaust duct, produces a flow of air of 6000 cubic feet per minute at a pressure of 2.25 in water gauge and maintains this air at a temperature of 20°C.

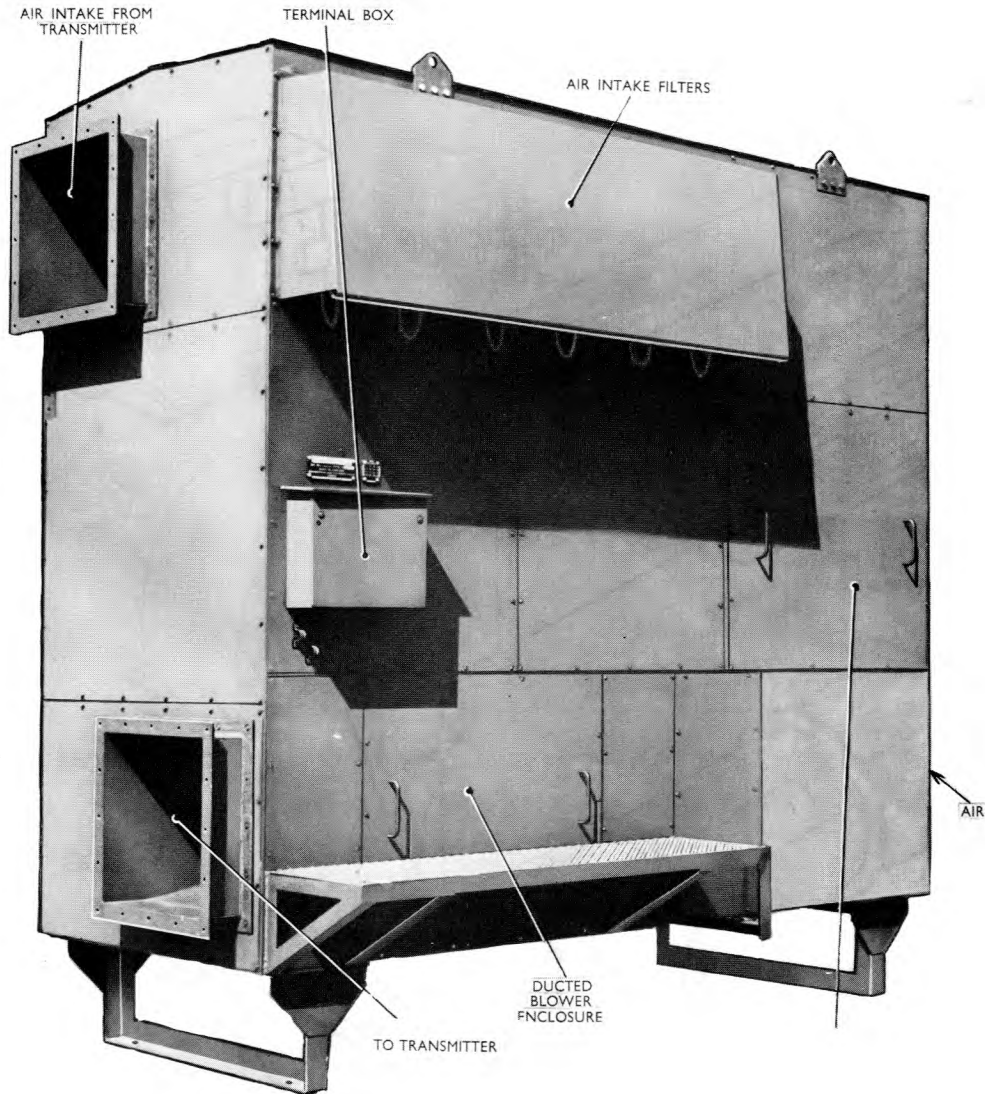


Fig.1 Air conditioner unit: general view

12 The weight of the complete assembly is 3024 lb and over-all dimensions (including the pedestal and side platform) are length 9 ft 6 in, width 6 ft and height 11 ft.

13 Power supplies are 415V, 3-phase at 6.2A for the exhaust and blower motors via closing contactors X3 and X4 (fig. 7) controlled by the Tx sequential switching, and 240V 50 Hz for the control and actuator circuits.

14 The air conditioner unit is situated outside the transmitter building and is connected to the transmitter cabinets by steel ducting. The outgoing ducting runs from the bottom of the unit to the underside of the Tx cabinets. A thermometer probe which is connected to a distant-reading thermometer attached to the wall within the transmitter, is fixed in the duct beneath the cabinets. This thermometer gives an indication of the temperature of the cooling air entering the transmitter. The regulator (temperature sensitive resistor) is also located in this section of under-floor duct.

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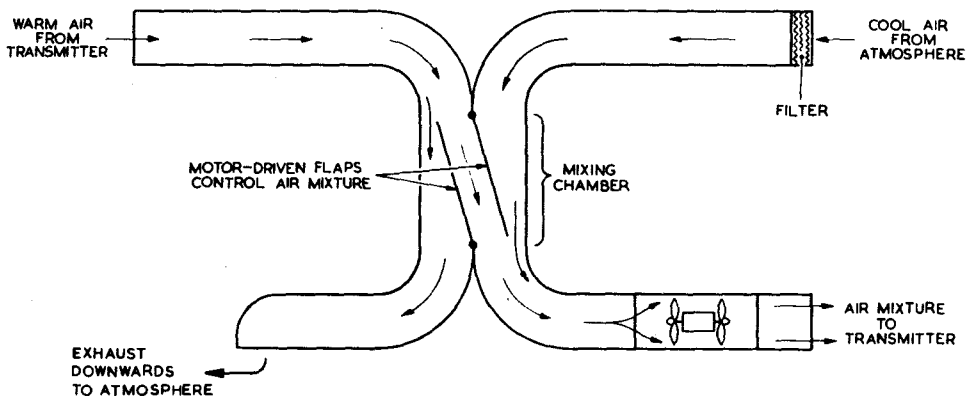
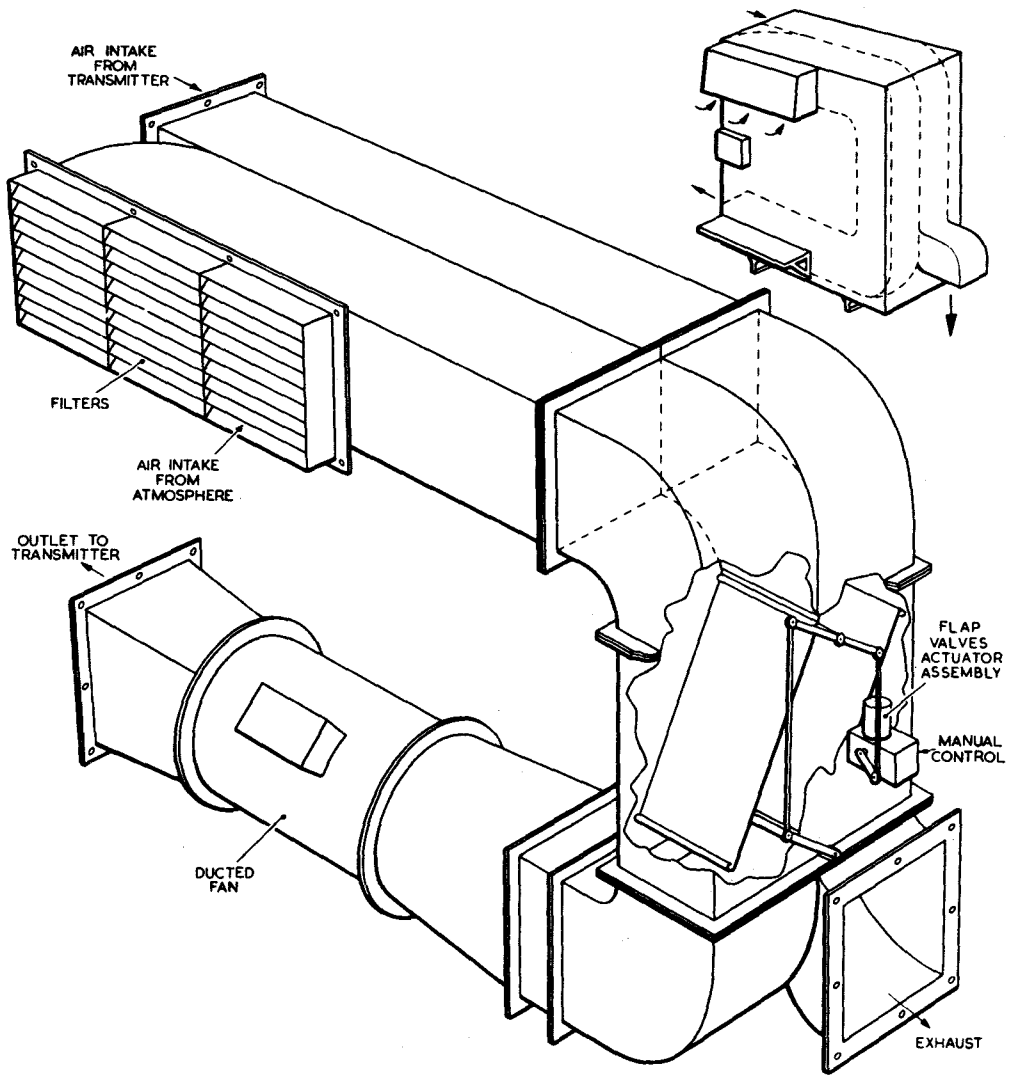


Fig. 2 Air conditioner unit: functional schematic



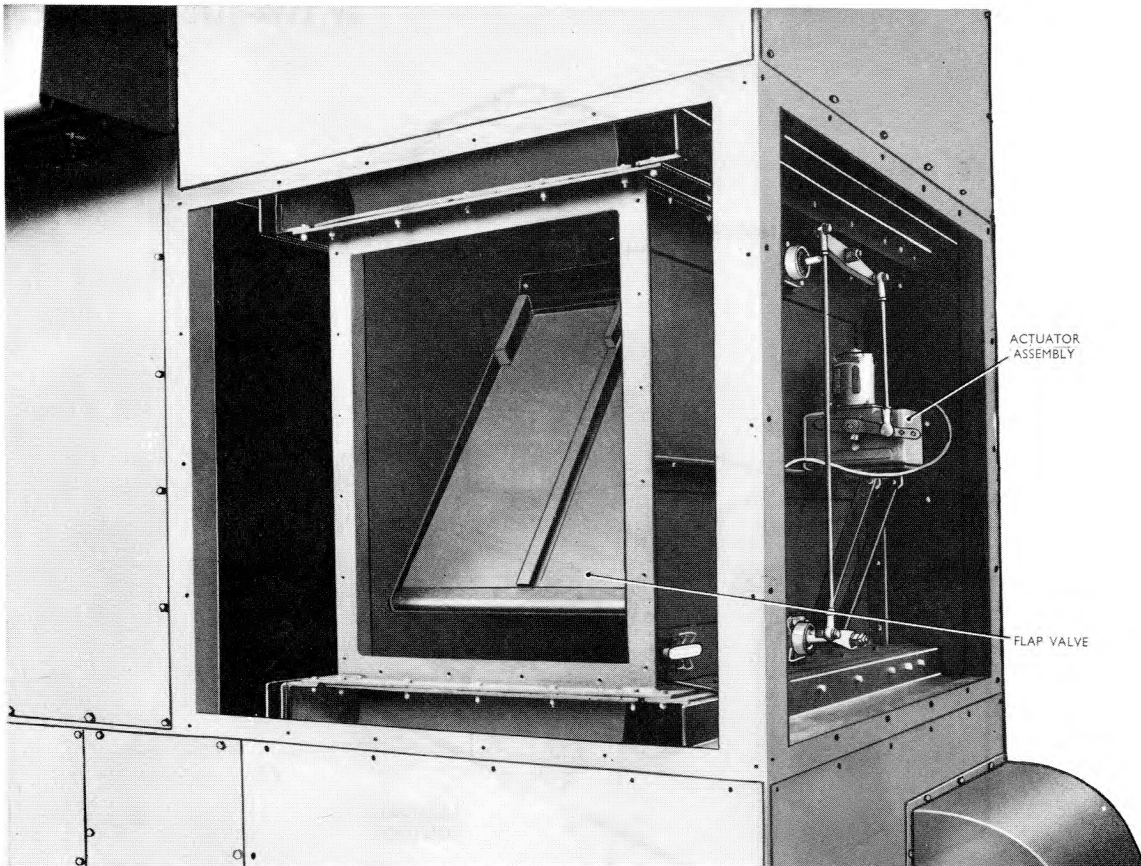


Fig. 3 Air conditioner mixing chamber

15 The functional diagram (fig. 2) shows the ducting, and the mixing chamber (fig. 3). The blower is a two-stage unit containing two separate blower motors. The air is forced through the out-going duct to the base of the transmitter cabinets, flows to the top of the cabinets through the radiators of two cooling units (Sect. 2, Chap. 4) and returns to the conditioner unit through overhead ducting. The position of the flap valves determines the amount of fresh air drawn through the filters into the mixing chamber and thus the temperature of the air mixture to the transmitter.

Note ...

At regular intervals the three-filters must be removed and cleaned in accordance with Topic 45 servicing instructions.

### Regulator

16 The regulator is an immersion temperature-sensitive resistor of 1000 ohms at 21°C and has a positive temperature coefficient of 0.0054 per °C.

17 Dimensions and weight of the unit are:

Head diameter 4 in, length 2½ in  
 Stem diameter 5/8 in, length 12 in  
 Weight 1 lb.

A test resistor of 1000 ohms  $\pm 1$  per cent is fitted in the head under the cover.

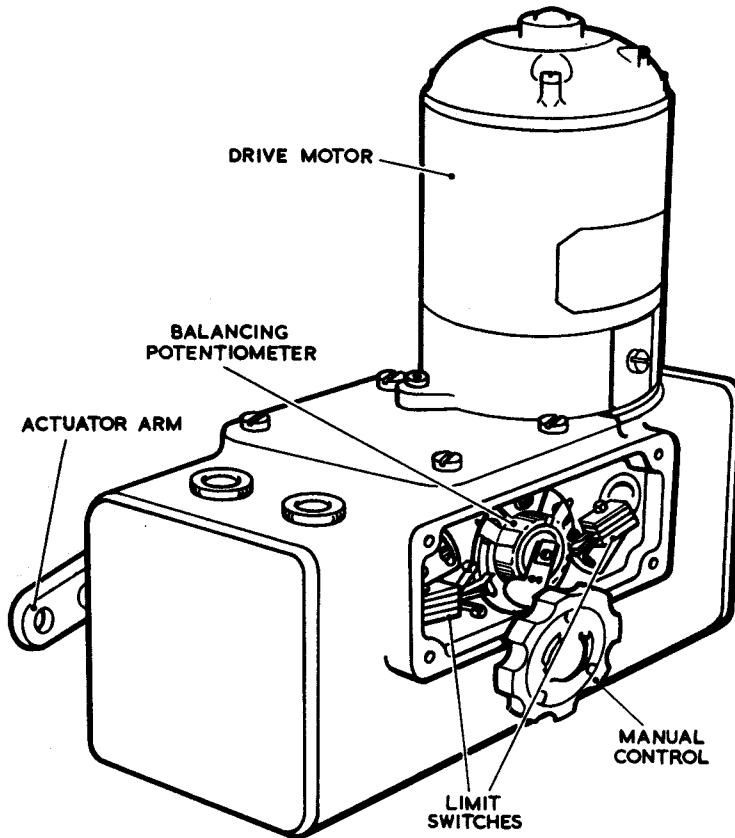


Fig. 4 Actuator assembly

18 The unit is mounted in a section of the under floor ducting within the transmitter building, and is connected to the control unit by a length of twin screened cable.

#### Actuator (fig. 4)

19 The actuator is a torque unit incorporating a motor-driven reduction gear box, a balancing potentiometer and a capacitor start motor. The motor operates on 240V, 50 Hz and two limit switches are built in to switch it off at each end of its travel. The power consumption is 30 watts.

20 A hand wheel, with a motor declutching device, is used to position the flap valves manually when setting-up or in the event of the equipment being unserviceable.

21 The motor can be made to drive clockwise or counter-clockwise by switching the starting capacitor in series with one winding or the other and this switching is carried out by the relays in the control unit. Dimensions and weight of the unit are height 10 in, width  $7\frac{1}{2}$  in, length  $8\frac{1}{2}$  in, weight 19 lb.

22 The connections to the control unit are made by a four-way cable and a twin screened cable (fig. 7).

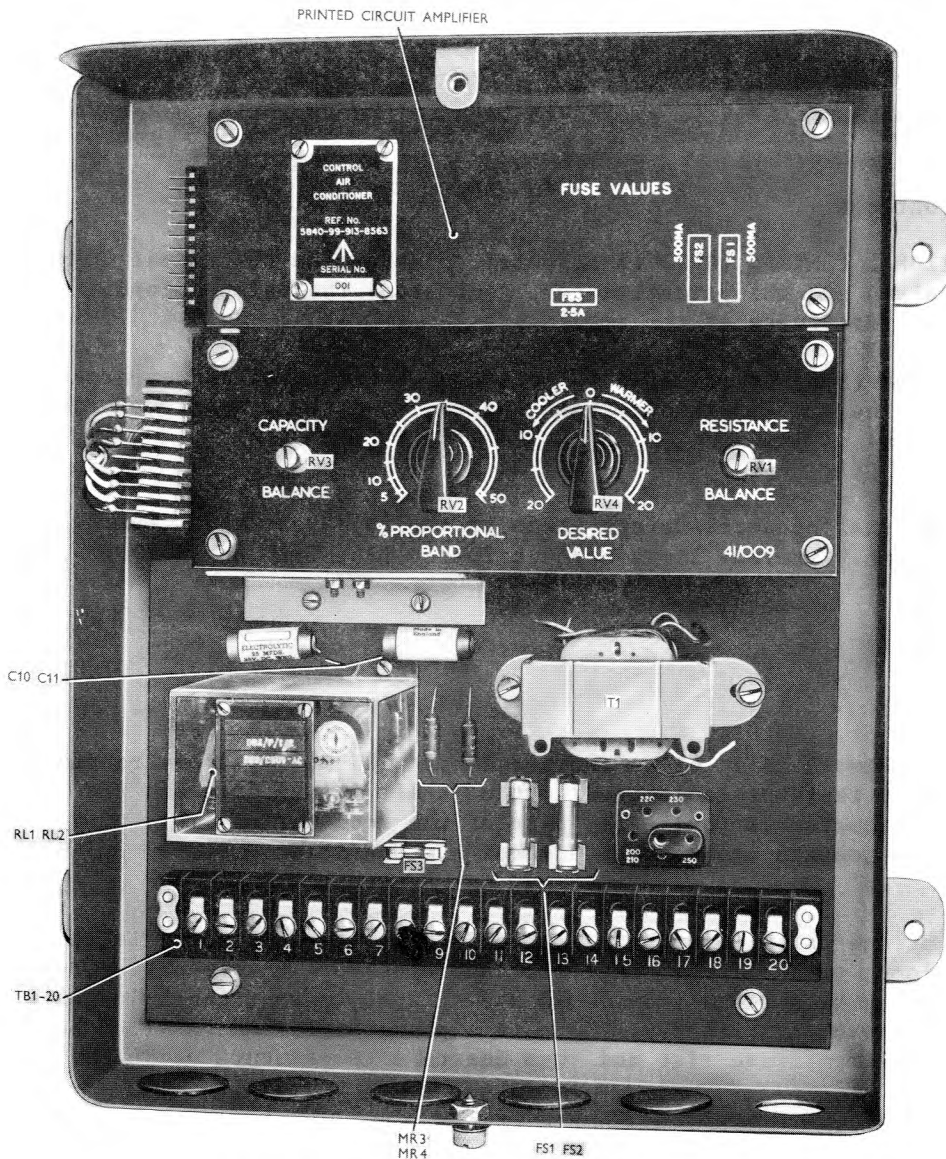


Fig. 5 Control unit: front view

### Control, air conditioner (fig. 5)

23 The remote control for the air conditioner unit is mounted on the left-hand wall inside the transmitter building and is connected electrically to the air conditioner, the regulator and the mains supply by cables run in screwed conduit.

24 The weight of the unit is 5 lb and the overall dimensions are: height 12 in, width 10 in and depth 4 in.

#### Preset controls

25 CAPACITY BALANCE (RV3) is preset to balance the reactive elements in the bridge circuit, including the capacitance of each of the two screened cables connecting the regulator and the motor-driven balancing potentiometer to the control unit.

26 RESISTANCE BALANCE (RV1) is preset to balance the resistive elements in the bridge circuit.

#### Operational controls

27 % PROPORTIONAL CONTROL (RV2) is adjusted to determine the amount of movement of the flap valves and the potentiometer, to restore the balance condition for a given change of resistance of the regulator.

28 DESIRED VALUE (RV4) is adjusted to determine the controlled temperature of the air leaving the air conditioner unit and entering the transmitter cabinets.

#### Interconnections (fig. 7)

29 All the external connections are taken to the 20-way terminal board at the bottom of the unit. External links connect TB4 to TB5, TB10 to TB12 and TB9 to TB14.

### CIRCUIT DESCRIPTION

#### Bridge Network

30 The bridge network (fig. 6) is energised with 12V, 50 Hz from transformer T1. The regulator resistor is located in the Tx air intake duct and the balancing potentiometer is physically part of the actuator assembly (fig. 4). The remaining components are part of Control Air Condition (5840-99-913-8563)-fig. 5.

31 With the bridge in balance the slider of RV4 is at earth potential and there is no signal input to amplifier stage VT1. A temperature change at the regulator will unbalance the bridge and provide an a.c. signal, proportional in amplitude to the temperature change, at RV4. There is a phase difference of 180° between a signal due to a temperature rise and that due to a temperature decrease.

#### Amplifier (fig. 6)

32 The a.c. voltage at the output of the bridge is fed to the base of VT1 through R1 which forms part of the impedance presented to the bridge circuit. The transistor derives its base bias from the voltage developed across R5 and R2 by the base current and this bias is decoupled by C2. The emitter circuit consists of R6 which is common to VT1 and VT3. R4 is the output load and the a.c. voltage across this resistor is fed to the base of the second transistor VT2 by C4. The components R3 and C1 decouple the collector load.

33 VT2 base is biased from the junction of R8 and R9 in the potential divider formed by R7, R8 and R9 and this bias is decoupled by C3. The emitter circuit consists of R11 and C5 and the output load is R10. The a.c. voltage developed across this output load is fed directly to the base of the third transistor VT3, so the resistor R10 also provides the base bias for VT3.

34 The emitter circuit of VT3 consists of R13 shunted by C9 in series with the emitter resistor of VT1, and this connection to VT1 provides a high degree of negative feedback in the three stages. The collector circuit consists of the feedback capacitor C7 and the output load R12. The a.c. voltage developed across R12 is fed to the unbiased bases of VT4 and VT5 via C8 and T2 so that the voltage applied to VT4 is antiphase to the voltage applied to VT5.

35 The collector circuit of each transistor consists of the coil of a relay shunted by an electrolytic capacitor. A negative voltage pulsating at 50 half-cycles per second is applied to each circuit. Depending on the phase of the signal when it is of sufficient amplitude one of the relays becomes energised and its contacts perform three functions.

35.1 Short circuits the emitter resistor R16, causing an increase in the effective voltage applied to the collector circuit of the conducting transistor, thus increasing the current in the coil of the operated relay.

35.2 Connects a resistor in the emitter circuit of the non-conducting transistor, causing a decrease in the effective voltage applied to the non-conducting transistor.

35.3 Completes the connection of the a.c. supply to the two-phase motor so that the motor drives the flap valves and the slider of the potentiometer in either a clockwise or counter-clockwise direction.

#### Rebalancing the bridge circuit

36 The motor-driven potentiometer is part of the bridge circuit (fig. 6). Movement of the slider tends to restore the balance of the bridge by transferring resistance to or from the arm containing the regulator.

37 At the same time the change in the temperature of the air flow tends to restore the temperature of the regulator to that giving a resistance which restores the bridge balance. When balance is reached the signal fed into T2 falls to a value which allows the relay in use to be de-energized.

#### Transmitter interlock and fan motor supply circuits (fig. 7)

38 Modification No. CA8126/5 in conjunction with modifications CA8127/6 and CA8128/46 introduced an electrical interlock between the circuit breaker assembly (contactor F) and the air conditioner fan motor contactors X3 and X4. This interlock ensures that unless contactors X3 and X4 are closed, contactor F (Sect. 6, Chap. 3, Fig. 6a) cannot be energised. As this contactor, which switches the Tx cooling fan supplies has an auxiliary contact set on the e.h.t. interlock circuit, Tx e.h.t. cannot be applied unless both Tx cooling and air conditioner fan circuits are closed.

39 RLA (Plate Mounting Wired Assembly S53-3549) is energised from the 50V (2 min) supply and RLA1 contacts close to switch 240V 50 Hz (B phase) to the operating coils of contactors X3 and X4. The 415V 3-phase supply is then switched to the air conditioner exhaust and blower fans.

40 The neutral return for X3, X4 and contactor F (Tx) operating coils is routed from the transmitter (location 5J) to RS3-6 and wired directly to X3 and X4 RH coil terminals. The neutral return for contactor F operating coil is via X3 and X4 series connected auxiliary contact sets and TS3-5; thus interlocking contactor F operation with the closure of X3 and X4.

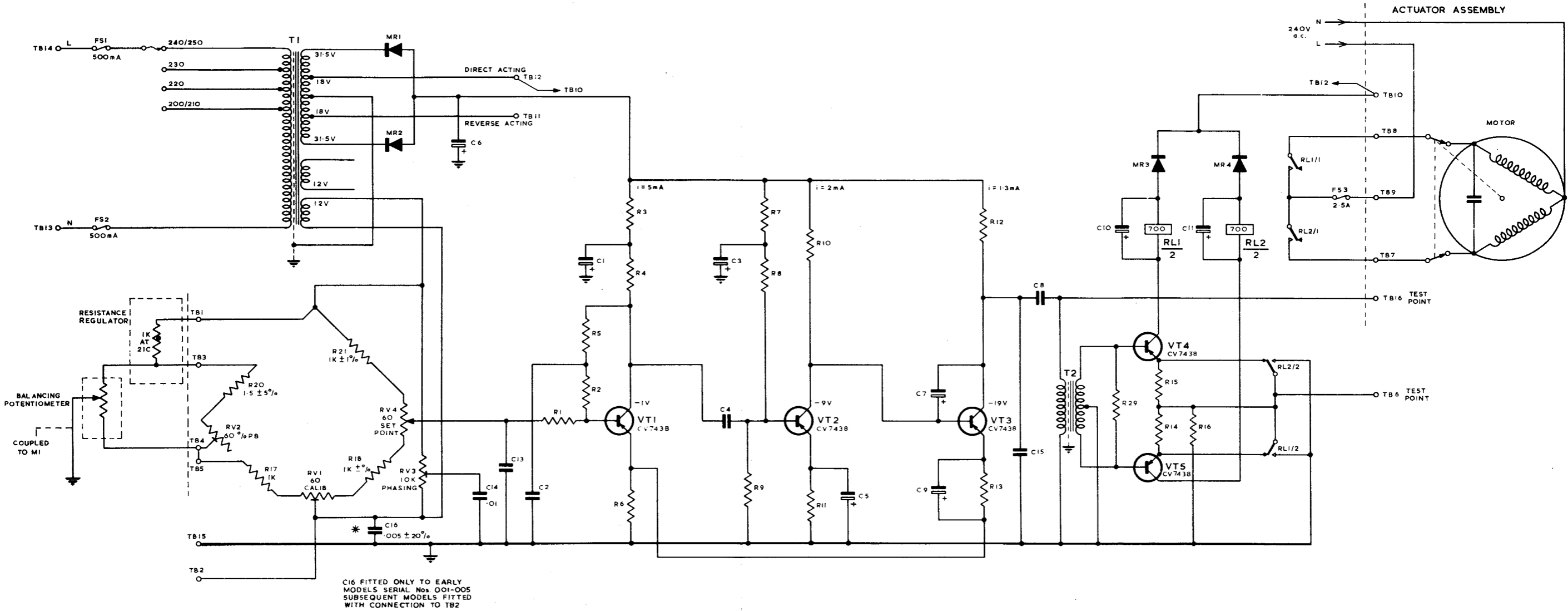


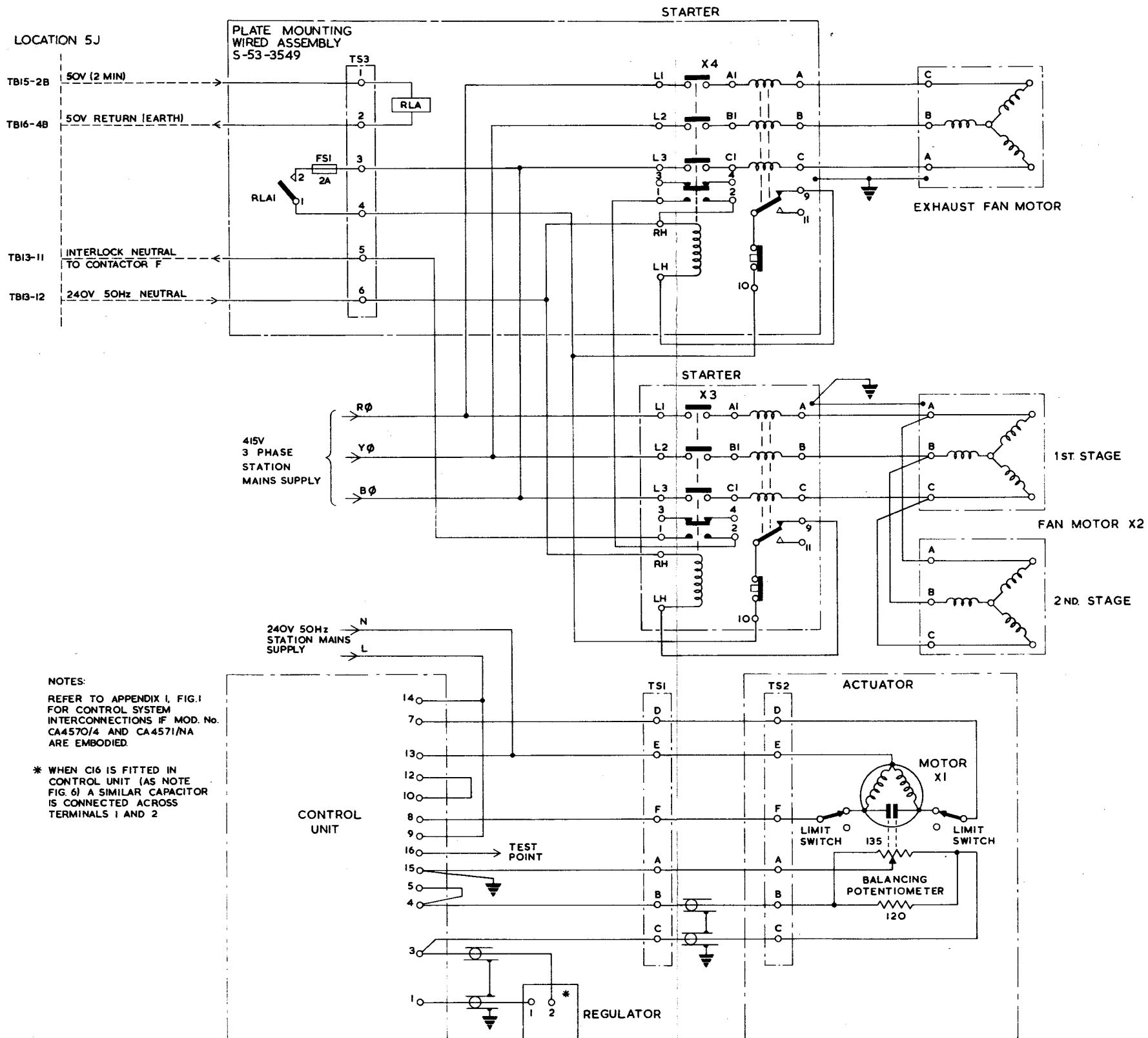
Fig. 6

Jan. 81 (Amdt. 19)

Control unit: circuit, pre mod. no. CA4570/4 and CA4571/NA

Fig. 6

Chap. 2  
Page 11



NOTES:  
REFER TO APPENDIX I, FIG.1  
FOR CONTROL SYSTEM  
INTERCONNECTIONS IF MOD. No.  
CA4570/4 AND CA4571/NA  
ARE EMBODIED.

\* WHEN C16 IS FITTED IN  
CONTROL UNIT (AS NOTE  
FIG. 6) A SIMILAR CAPACITOR  
IS CONNECTED ACROSS  
TERMINALS 1 AND 2

Chapter 2 Appendix 1AIR CONDITIONER CONTROL SYSTEMPOST MODIFICATIONS CA4570/4 and CA4571/NA

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- 3 Description of system
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- 8 Power supply B
- 11 detector temperature control
- 12 Actuator electro-mechanical rotary
- 15 Actuator controls  
Checks and setting up
- 16 Detector temperature control
- 17 Actuator electro-mechanical rotary
- 18 Power supply A
- 19 Power supply B

## Fig.

- 1 air conditioner control system: circuit diagram... ..

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INTRODUCTION

1 Replacements for the components of the original air conditioner control system are no longer available. When any one of the following become unserviceable and beyond economic repair all the original components must be removed and modifications CA4570/4 and CA4571/NA embodied:

|                           |                  |
|---------------------------|------------------|
| Control air conditioner   | 5840-99-913-8563 |
| Regulator air conditioner | 5840-99-913-8564 |
| Actuator                  | 5840-99-914-9713 |

2 The new control system consists of the following component parts:

|                                    |                  |
|------------------------------------|------------------|
| Power supply A                     | 5840-99-631-6594 |
| Power supply B                     | 5840-99-631-6593 |
| Detector temperature control       | 5840-99-631-6591 |
| Actuator electro-mechanical rotary | 5840-99-631-8515 |

DESCRIPTION OF SYSTEM (fig. 1)

3 To maintain the input air flow to the transmitter at the required temperature the system relies upon the characteristics of the detector temperature control. This is a temperature sensitive resistor with a pronounced positive resistance-temperature coefficient. It is located in the underfloor air duct to the transmitter cabinet and is connected as one element of a d.c. energised bridge circuit.



4 An output is taken from the bridge circuit to the two stage differential amplifier VT1-VT4. Relays 1 and 2 in the collector circuits of VT3 and VT4 respectively, provide the switching contacts for the 24V a.c. actuator drive motor supply. With the bridge in balance, both relays are energised and there is no drive to the motor.

5 A temperature change in the Tx air supply, and consequent change in the detector temperature control resistance, will cause bridge unbalance and a potential difference between VT1 and VT2 base circuits. VT3, VT4 collector currents will no longer be equal and one relay will de-energise to switch the 24V a.c. to one side of the motor split field circuit.

6 The actuator is then driven to reposition the flap valves in the air conditioner mixing chamber to correct for the temperature change. Bridge balance is restored as the mechanically coupled potentiometer MOTOR POT is driven to compensate for the change in detector resistance and restore balanced current conditions (RL1 and RL2 energised) to VT3 and VT4.

#### POWER SUPPLY A

7 A 240V 50 Hz supply is routed through the junction panel, (mounted below Power Units A and B) to the 240/24V transformer in Power Unit A. This transformer supplies the normal power requirements of the control system including the actuator drive motor. The power unit also contains the potentiometer DESIRED VALUE F, the setting of which determines the operating temperature of the system.

#### POWER SUPPLY B

8 This unit has two functions:

8.1 Under normal operating conditions it acts as a battery charger to maintain an emergency battery in a fully charged condition.

8.2 If the mains supply fails, the battery supply is switched to an inverter circuit and the inverter output used to drive the actuator motor.

9 Under conditions 8.2, RL1 is de-energised on mains failure. RL2, normally energised via coil 1, is maintained in an energised condition by the charge on G1 until coil 2 takes over to maintain the relay energised from the battery system via contacts RL2/1 and RL1/1. The inverter output is switched to the motor field (terminal A) via contact RL1/2. The motor will drive the actuator until the flap valves are fully open and the supply circuit is broken by the limit switch.

10 Power supplies A and B are wall mounted in the transmitter room and both have the following dimensions:

| Length | Width  | Height |
|--------|--------|--------|
| 8 in   | 5.4 in | 3.5 in |

#### DETECTOR, TEMPERATURE CONTROL

11 The detector has a resistance of 2 kohm at 21°C and is designed to provide

control over the ambient temperature range of -18 to +49°C. It has the following dimensions:

Head: length 2.2 in, diameter 4.7 in  
 Stem: length 11.75 in, diameter 0.5 in  
 Weight: 17 oz.

#### ACTUATOR ELECTRO-MECHANICAL ROTARY

12 This unit houses the 2-phase, 24V 50 Hz squirrel cage induction motor, drive mechanism and actuator arm. The latter is bolted to a connector rod through which the actuator operates the flap valves in the air mixing chamber. In addition the unit contains:

12.1 The bridge circuit components other than the detector temperature control and potentiometer DESIRED VALUE F. The potentiometer MOTOR POT, is mechanically coupled to the actuator drive.

12.2 The two stage differential amplifier, VT1-VT4 including the 24V rectifier components and motor supply switching relays RL1 and RL2.

13 Relays RL1 and RL2 are both energised when the bridge is balanced with VT3, VT4 collector current set by RV1 (SET RELAY CURRENT). With the bridge unbalanced either RL1 or RL2 will be energised to switch the motor supply to terminal A (actuator or drives to open flap valves) or terminal B (actuator drives to close flap valve).

14 Dimensions and weight of the unit are:

| Length overall | width  | height | weight |
|----------------|--------|--------|--------|
| 8 in           | 5.4 in | 7.5 in | 9.5 lb |

#### Actuator controls

15 The actuator is provided with the following four controls:

15.1 PROPORTIONAL BAND (RV1); adjustable over a scale graduated 0 to 20, this control is set for a lively but stable response with no 'hunting' of the actuator drive motor.

15.2 THERMAL FEEDBACK (RV2); this control modifies the degree of feedback due to the indirectly heated thermistors. It has a scale graduated 0 to 8 and is set to minimize actuator overshoot/undershoot.

15.3 BRIDGE TRIM (RV3); used to balance the bridge when setting-up the control circuit response.

15.4 SET ZERO (RV4); adjusted in conjunction with RV2 to obtain sensible equal system response to an increase or decrease in air temperature.

#### CHECKS AND SETTING-UP

##### Detector temperature control

16 Ensure that the transmitter and the mains supply to power unit A are OFF.

16.1 Disconnect the lead to pin 1 of the detector and connect a multimeter, set to the ohms range, across pins 1 and 2. Check that the detector resistance is within tolerance for the prevailing ambient temperature by reference to the following data:

| Ambient temperature |    | Resistance<br>+20 ohm |
|---------------------|----|-----------------------|
| °C                  | °F |                       |
| 10                  | 50 | 1900                  |
| 15.56               | 60 | 1950                  |
| 21.1                | 70 | 2000                  |
| 26.7                | 80 | 2050                  |
| 30.2                | 90 | 2100                  |

16.2 Remove the multimeter and reconnect the lead to pin 1.

Actuator electro-mechanical rotary

17 Set the temperature control DESIRED VALUE F (power unit A) to maximum (fully clockwise), disconnect the actuator arm from the connecting rod and set the control SET ZERO (RV4) to mid position.

17.1 Switch on the mains supply to the air conditioner control system. Check that the actuator operates to the end of its travel corresponding to the full recirculatory position.

17.2 Turn DESIRED VALUE F to minimum and check that the actuator operates to the other end of its travel (fully exhaust).

17.3 Reconnect the actuator arm to the connecting rod. Adjust the position of the shoulder bolt in the actuator arm slot and the length of the connecting rod until the flap valves close to within 0.25 in of the stop. If necessary adjust the actuator arm movement to operate the flap valves over their full range.

17.4 Set DESIRED VALUE F to maximum and check that the actuator stops when the flap valves are within 0.25 in of the stop.

17.5 Set DESIRED VALUE F to the temperature of the Tx air supply duct as indicated by the remote reading thermometer in the Tx hall.

18 Set actuator controls THERMAL FEEDBACK (RV2) to zero and PROPORTIONAL BAND (RV1) to 20. Check that the actuator operates to its mid-position.

18.1 Set RV1 to zero; the actuator should remain stationary; if it operates adjust BRIDGE TRIM (RV3) to stop the actuator.

18.2 Set RV1 alternately to 20 and zero, and adjust RV3 until there is no movement of the actuator for any position of RV1.

18.3 Reset DESIRED VALUE F to 20°C.

19 Switch on the transmitter and carry out the procedures to achieve normal operational conditions.

19.1 Check that the actuator responds to any alteration of DESIRED VALUE F setting without sluggishness or hunting. If either are present adjust RV1 until actuator operation is stable. Increase the setting of RV1 to remove sluggishness; decrease the setting to stop hunting.

19.2 Reset DESIRED VALUE F to 20°C and set RV2 to 5.

19.3 Reduce the setting of DESIRED VALUE F to 15°C and check the actuator response for under/overshoot. Adjust RV2 for optimum response with minimum overshoot. Reset DESIRED VALUE F to 10°C and again check the actuator response for under/overshoot. If necessary adjust RV2 for optimum response.

19.4 Repeat the actuator response checks as follows:

19.4.1 Reset DESIRED VALUE F from 10°C to 15°C and note the actuator response.

19.4.2 Reset DESIRED VALUE F from 15°C to 20°C and note the actuator response.

19.5 If there is any difference in actuator response between increasing values (19.4) and decreasing values (19.3) of DESIRED VALUE F, carefully adjust the SET ZERO (RV4) control to balance out the difference.

#### Power supply B

Note ...

Before carrying out the following checks ensure that the batteries are fully charged.

20 Simulate a mains supply failure by switching OFF the supply to the air conditioner control system, i.e. to power supply A. Check that:

20.1 The inverter output is switched to the actuator.

20.2 The actuator operates to OPEN the flap valves and stops (limit switch operates) when the flap valves are fully open (full exhaust position).

21 Restore the mains supply and check that the control system functions normally and that DESIRED VALUE F is set to the specified temperature for normal transmitter operating conditions.

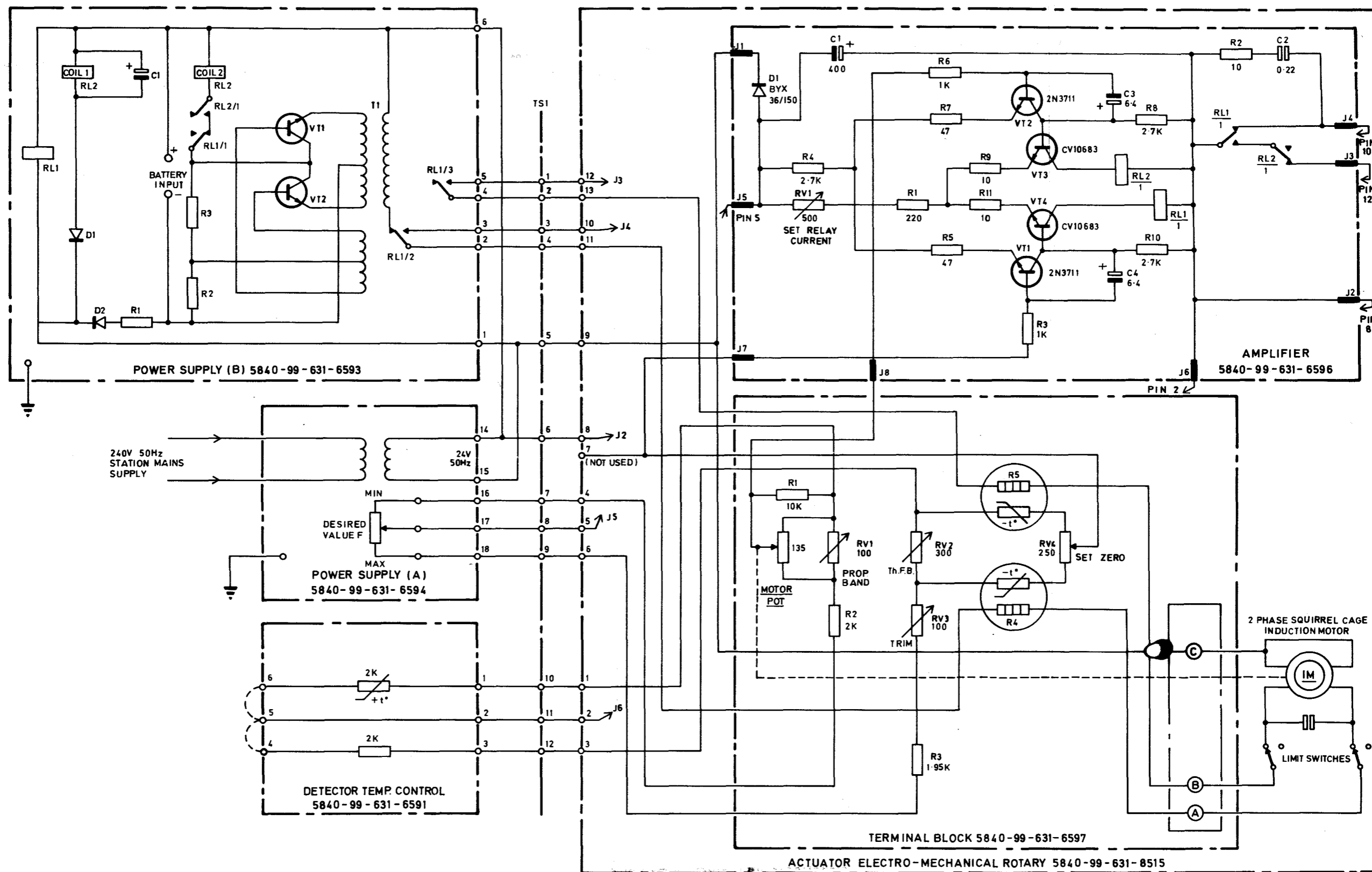


Fig.1

Air conditioning control system simplified circuit diagram.

Chapter 3

BATTERY CHARGERS

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- 3 Performance characteristics
- 4 Brief description
- 5 Circuit description
- Setting-up instructions
- 16 Preliminary checks
- 18 Setting of RV1

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| 5 Battery charger: circuit ... ..              | 9    |

App.

- 1 Battery charger (6630-99-945-0036), fire detection system

INTRODUCTION-BATTERY CHARGER (6130-99-914-3608), EMERGENCY STANDBY PUMP SUPPLY H

1 The battery charger (fig. 1) is used to charge the lead acid accumulator which provides the power to operate the emergency standby pump. The latter is connected so as to duplicate the action of the main pump, which circulates the magnetron coolant, as described in Sect.2, Chap.4.

2 The unit provides an adjustable supply of 12-15V d.c. at a nominal maximum of 5A. The charging current supplied is automatically regulated by the battery condition, using the battery terminal voltage as a reference to a transistor amplifier. The unit is designed so that it is self-compensating for any fluctuation in the mains supply voltage, within the specified limits.

PERFORMANCE CHARACTERISTICS

- 3 (1) Main supply: 228-252V a.c. 50 Hz, single-phase.
- (2) Output: 12-15V d.c., continuously variable at 5A nominal maximum, with less than 0.1V variation of output for a mains variation of 215-265V at an output loading of 3A.

BRIEF DESCRIPTION

4 The mechanical construction and layout of the unit can be seen from figs. 1, 2 and 3. The unit is wall-mounted in the transmitter room. The overall dimensions are 11½ x 6½ x 5½ in and the approximate weight is 8½ lb. Input and output connections are made via a five-way terminal strip mounted at the rear of the unit.

CIRCUIT DESCRIPTION

- 5 The circuit of the battery charger is shown in fig. 5. The unit supplies a charging current, which is regulated by the terminal voltage of the battery.
- 6 The mains supply is fed from an auxiliary socket in the transmitter room, to the primary of transformer T1. The a.c. potential from the 18V secondary of T1 is applied to a bridge rectifier circuit consisting of two silicon rectifiers MR3, MR4, and two silicon controlled rectifiers MR1, MR2. The silicon controlled rectifiers are triggered to conduct by means of pulses fed from a uni-junction transistor VT3 (para.12).
- 7 Series resistance R20-23 serves to limit the maximum charge applied to the battery, so as not to exceed approximately 6A. Meter M1 continuously monitors the mean charging current.
- 8 Relay RLA functions to disconnect the battery from the charger in the event of mains failure, spark filter R17, C4 being connected across the contacts.
- 9 The mean charge level is set by adjusting RV1, setting the voltage at the base of VT1.
- 10 VT1 and VT2 form a long-tailed pair amplifier the base of VT2 being held at a fixed potential across R10 by means of two Zener diodes MR12 and MR13.
- 11 The a.c. potential from the 100V secondary of transformer T1 is applied to a bridge rectifier, consisting of four silicon rectifiers MR7-10. The d.c. output from the rectifier is unsmoothed and consists of 100 Hz pulses which are in phase with the 100 Hz d.c. output voltage of MR1-4. The Zener diode MR11 functions to limit the 100 Hz pulses through R4 to a nominal level of -33V.
- 12 VT3 is a uni-junction transistor, which operates to trigger the silicon controlled rectifiers MR1 and MR2 to conduct (para.6). The 100 Hz ripple of the unsmoothed -33V d.c. supply functions to charge up C2 during each hundred-cycle peak, the charging rate of C2 being proportional to the effective voltage level of the emitter of VT3, as controlled through R19. When the potential across C2 reaches the peak point voltage of VT3, dependent upon the relative potential existing across R11, the uni-junction transistor 'fires' and discharges through R12, sending a pulse via C3, R1/R2, to trigger the silicon controlled rectifiers MR1 and MR2 to conduct.
- 13 The sequence of operation is shown graphically in fig.4. All the waveforms are drawn to the same time and approximate voltage scales. The input from the 50 Hz a.c. mains is shown in fig. 4A. The half-charge condition is represented in fig. 4B and the maximum charge condition in fig. 4C.
- 14 The negative portions of the firing pulses fed through C3, R1, R2 are clipped by MR6, which functions to clip those negative-going pulses exceeding approximately -0.7V in amplitude.
- 15 In the event of the battery becoming excessively discharged the automatic charging circuit would be inoperative due to the fact that the battery supply is used to provide a reference voltage. In this condition a trickle charge circuit is provided via R3 and rectifier MR5.



Fig.1 Battery charger: front view



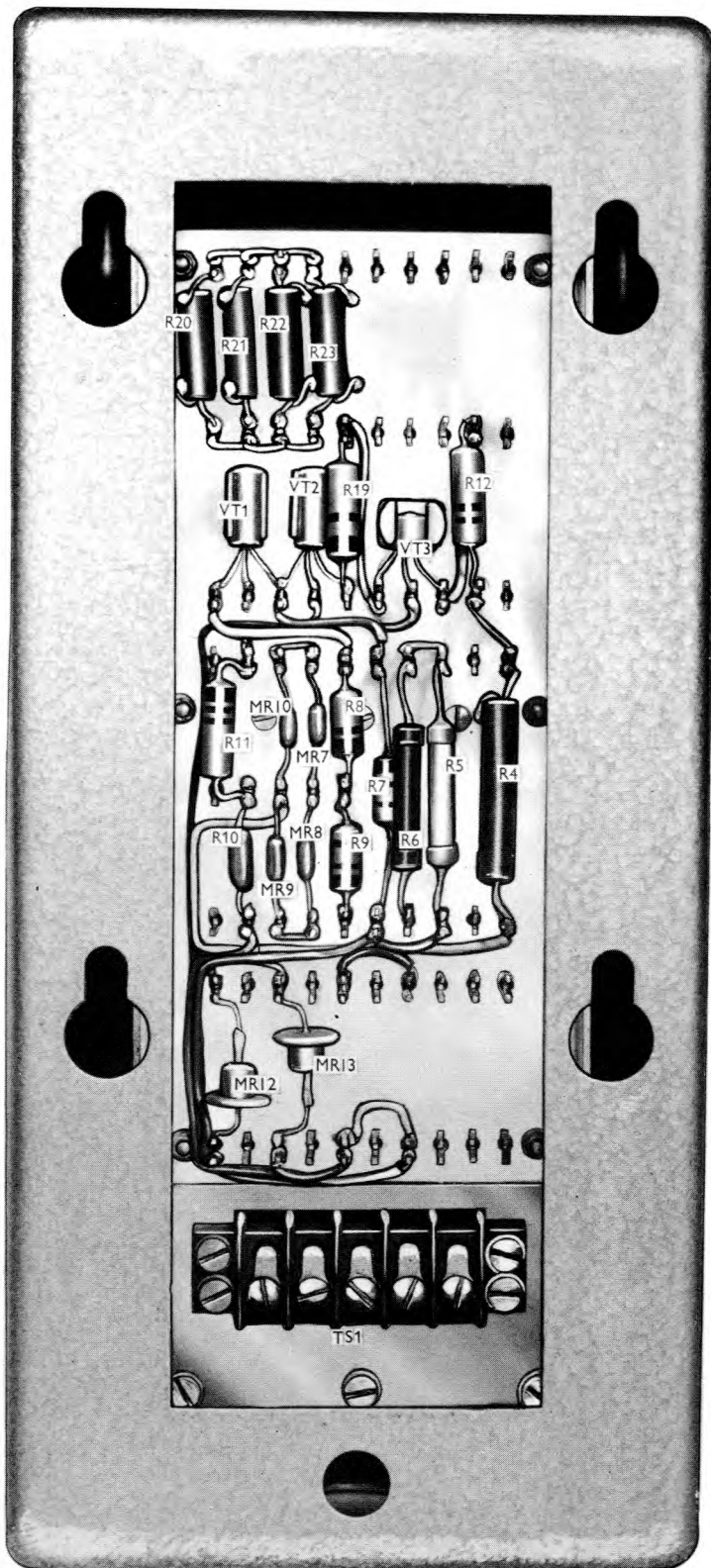
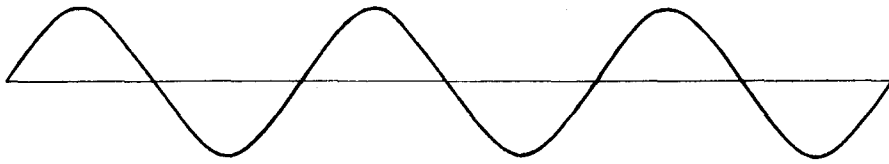


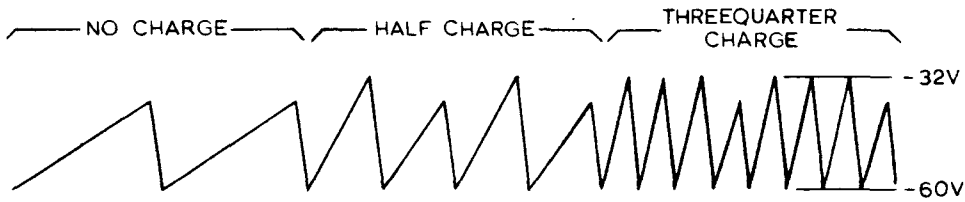
Fig.2 Battery charger: rear view



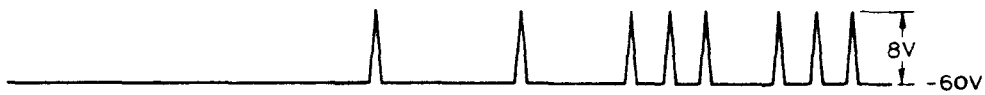
(a) INPUT VOLTAGE TO MR1 & MR2



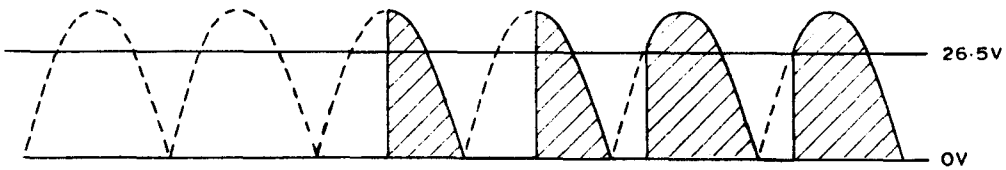
(b) MR11 ANODE VOLTAGE



(c) VOLTAGE ACROSS C2



(d) VOLTAGE ACROSS R12



(e) OUTPUT CURRENT FROM MR1 & MR2

Fig.4 Graphical representation of operation

SETTING-UP INSTRUCTIONS

Note ...

Before proceeding, the state of the battery must be established. It should be fully charged and serviced, then to have stood off load for 12 hours and have a specific gravity of at least 1.250.

Preliminary checks

16 With the charger battery fitted in the box, switch off the mains to the charger. Check the ammeter M1 is correctly zeroed.

17 Reconnect the mains to the charger. On the front of the charger check the d.c. voltages at the monitoring points, these should be within the following figures:

|                          |            |
|--------------------------|------------|
| 100V Nominal sockets     | 80 to 100V |
| 27V Nominal ref. sockets | 24 to 31V  |

Setting of RV1

18 Ensure the emergency standby pump is not running.

19 Connect in series with a  $6.8\Omega$  40W resistor a multimeter (on 10A d.c. range) and a test switch set to OFF. Connect these across the battery.

20 Put the test switch to on and check that the ammeter on the charger reads the same as the multimeter. Allow ample time for this condition to become established.

21 If the two meters read the same for fifteen minutes then RV1 is correctly set. If necessary adjust RV1 and then allow a settling period. If after fifteen minutes the two readings remain the same lock RV1.

22 Put the test switch to off and remove the resistor, multimeter and test switch from across the battery.

23. Check when the emergency standby pump is running, the current shown on charger ammeter reads between 5A and 7A.

24 Check when the emergency standby pump switches off, the current continues to register but gradually reduces to zero.

Note ...

On some batteries the charging current may not fall to zero, but if it falls to 100 mA or less and remains constant for at least one hour this is satisfactory.

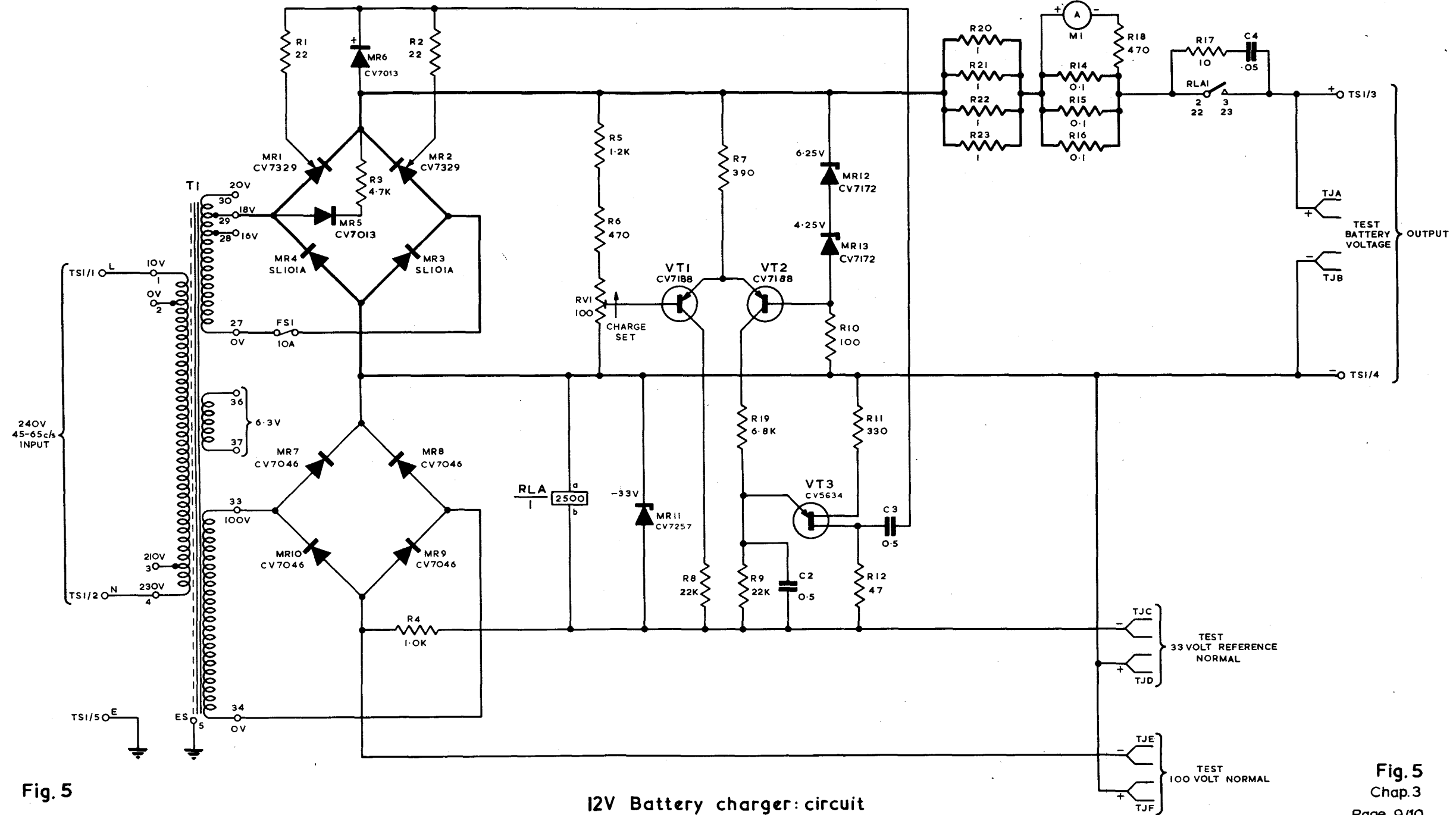


Fig. 5

12V Battery charger: circuit

Chapter 3 Appendix 1

BATTERY CHARGER (6130-99-945-0036), FIRE DETECTION SYSTEM

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- 1 Introduction
- 4 Circuit description  
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INTRODUCTION

- 1 The d.c. supplies to the fire detection and prevention system are independent of those of the transmitter/receiver. This is necessary as a fault in the transmitter/receiver may cause the mains breakers to trip, in which event it is essential that the fire detection system should continue to operate.
  
- 2 The battery charger provides an adjustable supply of 24 to 30V at 0 to 2A. The terminal voltage of the associated bank of batteries is used as a reference and, in conjunction with a preset control, determines the charging rate. Variation of the charging rate is achieved by means of silicon controlled rectifiers (s.c.r.).
  
- 3 During normal transmitter/receiver operating conditions the charger provides a charging current sufficient to keep the batteries, which provide current to the fire detection circuit, fully charged. In the event of mains failure there are automatic facilities for disconnecting the charger from the batteries, thus preventing their discharge through the charger. The d.c. supply for the fire detection and prevention system under these conditions is provided by the batteries which will become heavily discharged. On reinstatement of the mains supply the battery charger can provide to the batteries a charging current of up to 2A but is unable to recharge a discharged battery. The chargers are self-compensating for minor fluctuations in the mains supply voltage: see Chap. 4, para. 42 for recommendations in the event of mains supply failure or disconnection.

CIRCUIT DESCRIPTION (fig.3)

- 4 The battery charger output current is initially preset and is therefore dependent upon the battery voltage. Variation of the charging rate is achieved by the use of silicon controlled rectifiers (SCR). Automatic facilities disconnect the charger from the batteries in the event of power failure or shut-down.
- 5 The blue phase of the 250V 50Hz supply is applied to the primary of T1. The output of the 33V secondary of T1 is fused by FS1 and applied to the bridge rectifying circuit formed by MR3, MR4 and the SCR MR1 and MR2; this is the main charging supply. The output of the 100V secondary of T1 is fused by FS2 and rectified by MR7 to MR10; this is the supply for VT3 and VT4 in the control circuit. The collectors of VT1 and VT2 are also supplied from this source, but the base/emitter circuits are supplied from the battery. The battery terminal voltage determines the base/emitter voltage of VT1, and hence, via the control circuits, the charging current. If the battery is not connected, the control circuits reduce the output voltage to approximately 1V. The 100V supply is not smoothed but is clipped at 33V by R4 and the Zener diode MR11.
- 6 With the mains supply present, RLA is energized and RLA1 connects the charging supply line to the battery. The battery can now receive the controlled charging current from MR1 to MR4.
- 7 Transistors VT1 and VT2 form an emitter-coupled amplifier, which charges C2 at a rate dependent on the setting of RV1 (CURRENT SET) and the terminal voltage of the batteries connected across TS1(3) and (4). The Zener diodes MR12 to MR15 and R10 provide a stabilized reference potential of approximately 21V at VT2 base.
- 8 The transistors VT3 and VT4 form a monostable pulse-generating circuit which operates when the charge on C2 overcomes the emitter-base bias of VT4. The positive-going output pulse from this circuit is developed across R12 and used to trigger the SCR MR1 and MR2.
- 9 The positive line of the 33V supply from the cathode of Zener diode MR11 is connected to the negative side of the output from the bridge rectifier, MR1 to MR4. This is the 'B' line on fig.2 whose level is dependent on the battery voltage. The 'A' line voltage (MR11 anode) is therefore approximately -60V with respect to the 0V line, with spikes rising to the 'B' line level as the mains input voltage passes through zero (fig.2(b)).
- 10 The emitter voltage of the emitter-coupled amplifier VT1/VT2 is controlled by VT1 base/emitter current, the mean base voltage of VT1 being adjusted by RV1 and thereafter varying according to the 'B' line voltage, whilst VT2 base, under normal battery conditions, is maintained at approximately -21V by the Zener diodes MR12 to MR15. When the 'A' line commences to fall by 33V (fig.2) capacitor C2 commences to charge via R19 and VT2 collector/emitter, the initial voltage across the capacitor being zero.
- 11 The voltage towards which C2 charges is that at the junction of VT1 and VT2 emitters. The more negative this voltage with respect to 0V, the longer will the potential across C2 take to rise to a given level. Conversely, the less negative the voltage, the quicker the potential across C2 rises to the same level (fig.1).

12 When C2 charges to a level less negative than VT4 base (set by R11 and R13 to approximately -3V with respect to earth), VT4 conducts, completing the base circuit of VT3 and causing VT3 to conduct in turn. The positive feedback between VT3 collector and VT4 base gives a cumulative action through VT4, VT3 and R12. When C2 is discharged, VT4 cuts-off and the circuit reverts rapidly to its previous state. The result of this action is a narrow, positive-going pulse across R12 (fig.2(d)). This pulse is limited in amplitude to 8V by MR16 coupled to the gate electrodes of the MR1 and MR2 via C3, R1 and R2. MR6 clamps the base line of the positive-going pulses to earth. The SCR receiving the positive-going half cycle from T1 at the moment of arrival of the trigger pulse conducts for the remainder of the half cycle and charging current flows to the battery (fig.2(e)).

13 The current flow from the SCR causes a voltage pulse on the 'B' line, negative-going with respect to 0V. This pulse is fed via RV1 to VT1 base driving the transistor on. The resulting voltage rise across the common emitter resistor R7 causes VT2 to be cut off during the pulse time (0 to approximately 3ms depending on charging rate see fig.2(c)). At the end of this time, C2 may commence to charge again, but the process is always ended prematurely by the collapse of the 'A' line voltage at the end of the half cycle (fig.2(c)). When this occurs, and before the 'A' line has reached the 'B' line level, a point is reached where the charge on C2 causes VT4 emitter to be more positive than the bias remaining at VT4 base and VT4 conducts again, the cumulative action resulting in another pulse at VT3 emitter (fig.2(d)). However, when an SCR is conducting it can only be cut off when its anode/cathode voltage falls to zero and thus the second pulse has no effect. The cycle is repeated when the 'A' line again falls by 33V (para.10).

14 As the battery charges and its voltage increases, the 'B' line voltage across the potential divider R5, R6 and RV1 approaches 26V and VT1/VT2 emitter voltage is increased. Therefore C2 charges towards a more negative voltage and takes longer to acquire the voltage necessary to overcome the base-emitter bias on VT4. Consequently, the trigger pulse to the SCR occurs later in each half cycle and the supply of current to the battery is restricted to a shorter period. The CURRENT SET control RV1 is adjusted so that when the battery is fully charged the rate of charge of C2 is such that the potential it acquires during each half cycle of the input voltage is just insufficient to overcome the base-emitter bias on VT4, with the result that the first trigger pulse (para.13) is not generated (fig.2(c)).

15 When the battery voltage is very low (less than 20V), Zener diodes MR12 to MR15 cease to stabilize VT2 base voltage, which is then dependent on the battery voltage. The rate of charging of C2 and therefore the battery charging current is then dependent only on the setting of RV1.

16 When the battery is disconnected, the 'B' line voltage falls to about -2V when MR5 conducts on alternative half cycles. VT2 is turned on only during the half cycles when MR5 conducts and when the 'A' line falls by 33V. The time of VT2 turn on relative to the commencement of the fall of the 'A' line is later than under normal conditions since it is dependent on MR5 conducting. Capacitor C2 does not commence to charge until the 'A' line has fallen by the full 33V (normally charging commences as soon as the 'A' line commences to fall), and then charges from about -30V towards VT2 emitter voltage (about -1V). Since the

available charging time is reduced, VT4 is not brought into conduction until the end of the half cycle when the SCR anode/cathode voltage is too low for the SCR to conduct.

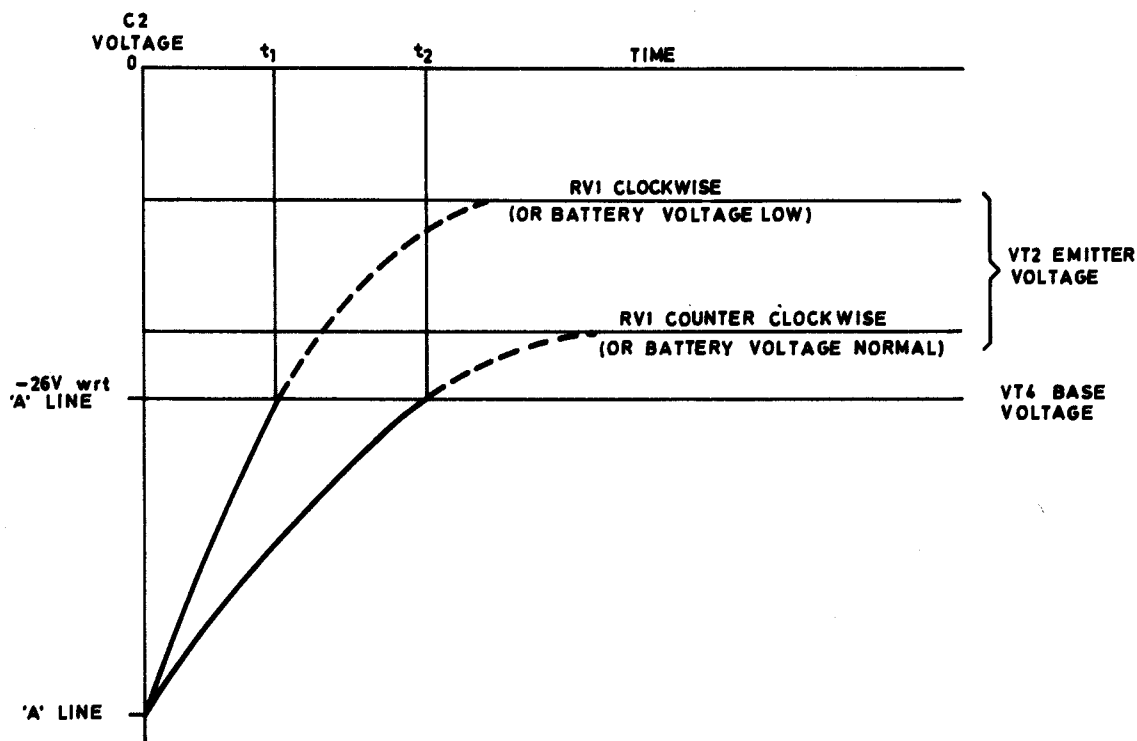


Fig.1 C2 Charging Rate

17 A regulating circuit, formed, by VT5, VT6 and VT7, limits the charging current to a maximum of approximately 2 amps. The voltage drop across R21 and R22 is amplified by VT6, VT5 and VT7. The amplified voltage at the collector of VT7 is developed across R7 which also forms the emitter load for VT1 and VT2. This ensures that the potential to which C2 charges is made more negative as the current through R21 and R22 increases to a maximum of 2 amps. RV2 is initially adjusted to give a steady state charge current of 2.2. amps and should not be disturbed. C6 acts as a reservoir to maintain a steady VT6 base voltage.

18 The relay RLA, which is operated by the output of MR7 to MR10, disconnects the battery from the charger when the mains input is switched off or fails, thus removing the discharge path that R5, R6 and RV1 would otherwise create. Arcing across the contacts of RLA1 is prevented by R17 and C4. The ammeter M1 continuously indicates the battery charging current, R14 to R16 acting as meter shunts.



CONTROLS

19 The controls in the system are RV1 and RV2; these are classed as technician controls and should be adjusted only when new batteries are installed.

SETTING-UP INSTRUCTIONS (Mod Strike 1 installed)

Note ...

Before proceeding, the state of the batteries must be established. They should be fully charged and serviced, then to have stood off charge and off load for 12 hours and have a specific gravity of at least 1.250.

Preliminary checks

20 With the charger battery fitted in the charger battery - distribution unit, switch off SA (mains to charger). Remove FS2, FS3, FS4 and FS5, leaving FS1 (charger) and FS6 (charger mains) fuses fitted.

21 Check the charger and distribution meters are correctly zeroed. Replace FS4 (voltmeter) fuse.

22 Connect the charged batteries to the distribution unit leads.

23 In the distribution unit switch on SA (mains to charger).

24 On the front of the charger check the d.c. voltages at the monitoring points; these should be within the following figures:

|                          |            |
|--------------------------|------------|
| 100V Nominal sockets     | 80 to 100V |
| 27V Nominal ref. sockets | 24 to 31V  |

Setting of RV1

25 Adjust CURRENT SET to give 26.5V on distribution unit voltmeter.

26 Allow the charging current (as indicated on the charger ammeter M1) to fall to zero, readjust CURRENT SET to maintain the correct voltage of 26.5V.

Note ...

On some batteries the charging current may not fall to zero, but if it falls to 100 mA or less and remains constant for at least one hour this residual value should be noted.

27 Connect a 27 ohm 40W resistor in series with a multimeter (on 10A d.c. range) and a test switch set to OFF. Connect these between the -26V and the earth bus bars on distribution unit.

28 Switch on test switch and adjust CURRENT SET to give a reading of 26.5V on distribution unit voltmeter. Allow ample time for the new conditions to become established, after adjusting CURRENT SET.

29 When the charging current (as indicated by the charger ammeter M1) equals the load current (as indicated on the multimeter) plus the residual current noted in para.26, and the battery terminal voltage is 26.5V, lock CURRENT SET control. Check this required condition is maintained for at least 15 minutes. Switch off test switch.

#### Setting of RV2

30 Replace the 27 ohm resistor with three 18 ohm 40W resistors connected in parallel; this will give a load current of approximately 4.4A. Switch on test switch and check that the charger ammeter, on connecting the load rises to 4A +1A but after a period of less than 4 seconds fall to 2A.

31 RV2 (inside the charger) is preset. If the current does not now read 2A then RV2 should be reset and locked with red cellulose paint.

32 Switch off charger at switch SA, remove the test switch, load resistors and multimeter. Replace the fuses removed from the distribution unit.

33 Switch on charger at switch SA. After a settling period check the voltage is 26.5V. Note the current as presented by the fire detection equipment.

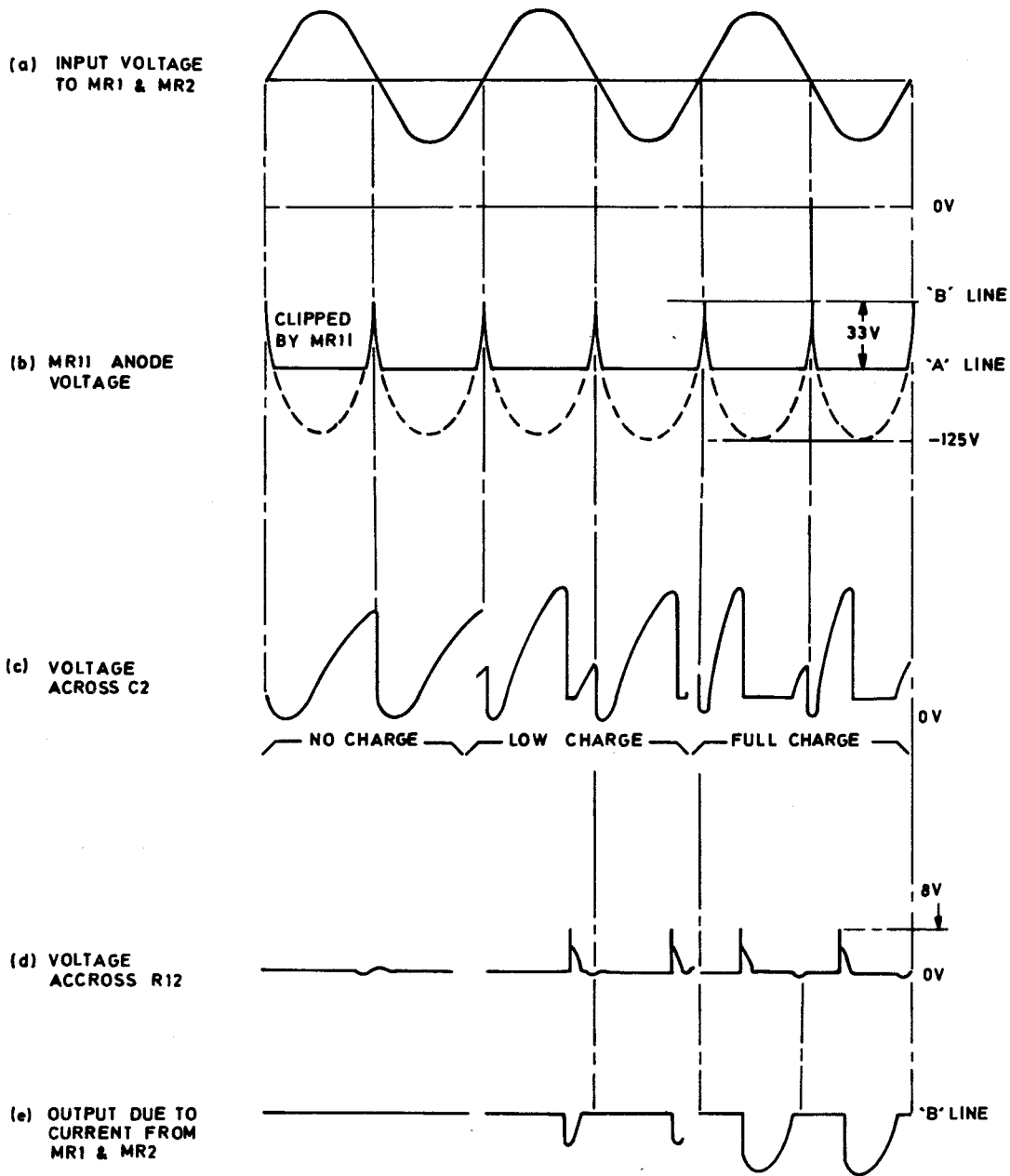
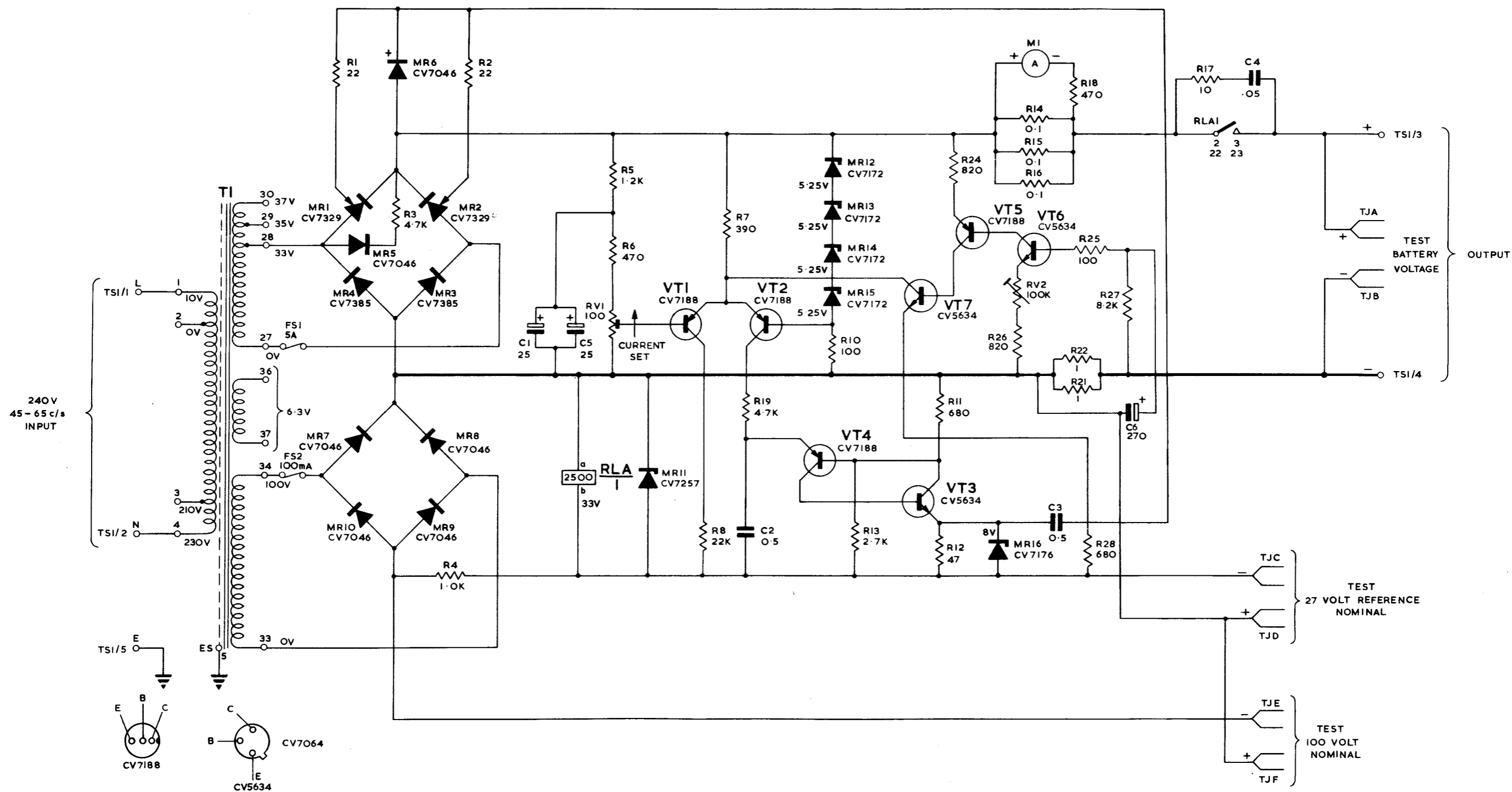


Fig.2 Battery charger: explanatory waveforms



CA 2417  
2418

Fig. 3

Battery charger: circuit

Chapter 4FIRE DETECTION AND PREVENTION SYSTEM

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## App.

- 1 Overheat detector thermostatic switches

H

INTRODUCTION

1 The fire detection system automatically carries out the following functions in the event of a fire or overheating within the Radar type 84 transmitter/receiver.

- 1.1 The mains 3-phase supply to the transmitter is switched off.
- 1.2 CO<sub>2</sub> extinguishers are operated and CO<sub>2</sub> gas is released into the transmitter/receiver.
- 1.3 A visual and audible warning is given in the transmitter room and at a remote site.
- 1.4 Local location of fault source.

These functions are controlled by the alarm monitor and the associated control auto-release. The alarm monitor is wall-mounted in the transmitter room; the control auto-release is situated at the entrance to the Radar type 84 building. Operation of the alarm monitor is controlled by fire detectors and overheat detectors, comprising temperature-sensitive switches situated at various points in the transmitter/receiver.

2 Indication, both visual and audible, of an overheat or fire condition prevailing at the transmitter/receiver is duplicated at a selected remote site (e.g. guardroom) as well as in the transmitter building.

3 The d.c. supplies to the alarm monitor, control auto-release and remote site (control alarm) are independent to those of the transmitter. This is necessary, as a fault condition in the transmitter producing overheat or fire may cause the mains breakers to trip, in which event it is essential that the fire detection system should continue to operate. Accumulators and a charger unit located in the R17 building provide the alarm monitor and control auto-release with a nominal 26V d.c. supply. The control alarm at the remote site is supplied with 26V d.c. derived from the station no-break 50V d.c. supply.

DETAILED DESCRIPTIONOverheat detectors

4 A total of 50 overheat detectors are fitted; connected to form two separate

circuits as shown in fig. 9. Heat resistant cable (Uninyvin), with in-line plug and socket connections to each detector, are used throughout the overheat detector circuits.

5 Two types of detector, both utilizing a normally closed thermostat switch are used. Details of the two types are as follows:

5.1 Overheat detectors intended to monitor air temperature (fig. 1); the thermostat is mounted in a black copper box with a fibreglass lid that also serves as a thermal insulating mounting for the detector. These detectors are mounted on the transmitter gate structures and are set to operate at 80°C.

5.2 Overheat detectors intended to monitor individual component temperature; the thermostats are screwed to a copper conductor plate and fixed firmly to a suitable surface on the component concerned. The thermostats are set to operate at 50, 60 or 70°C, depending upon the nature and application of the component.

CAUTION ...

- (1) The overheat detectors should only be serviced using the special-to-type test equipment and procedures detailed in AP 115H-0104-1, Sect.10 and AP 115H-0101-45.
- (2) The overheat detector fixings (screws, nuts and washers) are of a special type; other types of fixings must not be used.
- Ⓜ (3) App.1 to this chapter should be referred to when thermostatic switches, fitted to the overheat detector circuits, become defective and require replacement.

Fire detectors

6 A total of 16 fire detectors are fitted in the top of the transmitter/receiver assembly. The detectors are mounted in pairs on brackets (fig. 1); the location of each pair is shown in fig. 9.

7 The fire detectors have normally open contacts and operate on the differential expansion principle giving a temperature rate of rise operating characteristic. With negligible rate of rise the detectors operate at 75°C, but with a rapid rate of rise a much lower operating temperature is obtained (approximately 60°C).

8 The 16 detectors are parallel-connected to a ring circuit (fig. 9) of fire-proof cable (Unitersil), and all terminations are via high temperature crimped tags.

CAUTION ...

The operating temperature of the fire detectors has been preset by the manufacturers, no attempt should be made to adjust it.

Test tongs

9 The test tongs shown in fig. 1 are provided to check the operation of the fire detectors. The jaws of the tongs are heated by a built-in element, rated 18V 50 Hz at 7A. The tongs require approximately five minutes to reach operating temperature before being clamped to the fire detector under test.

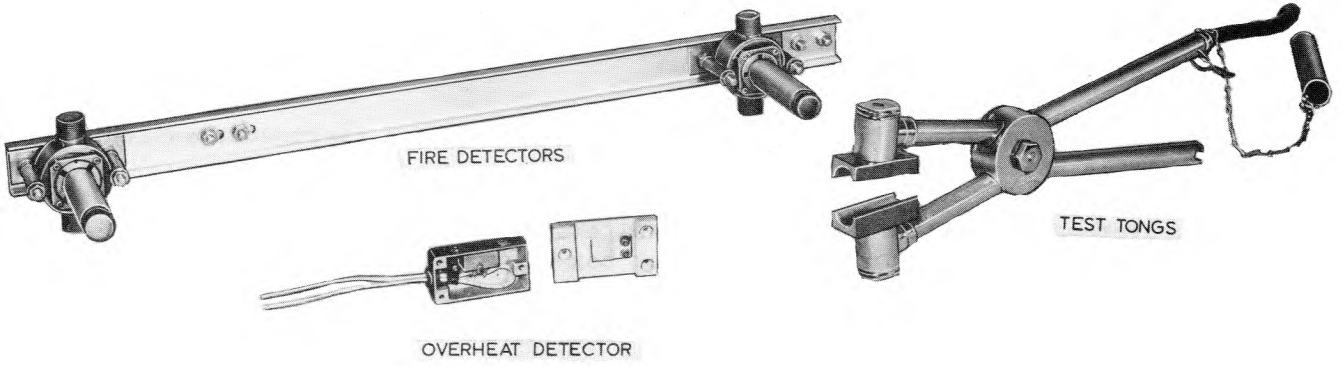


Fig. 1 Overheat detector, fire detector and test tongs

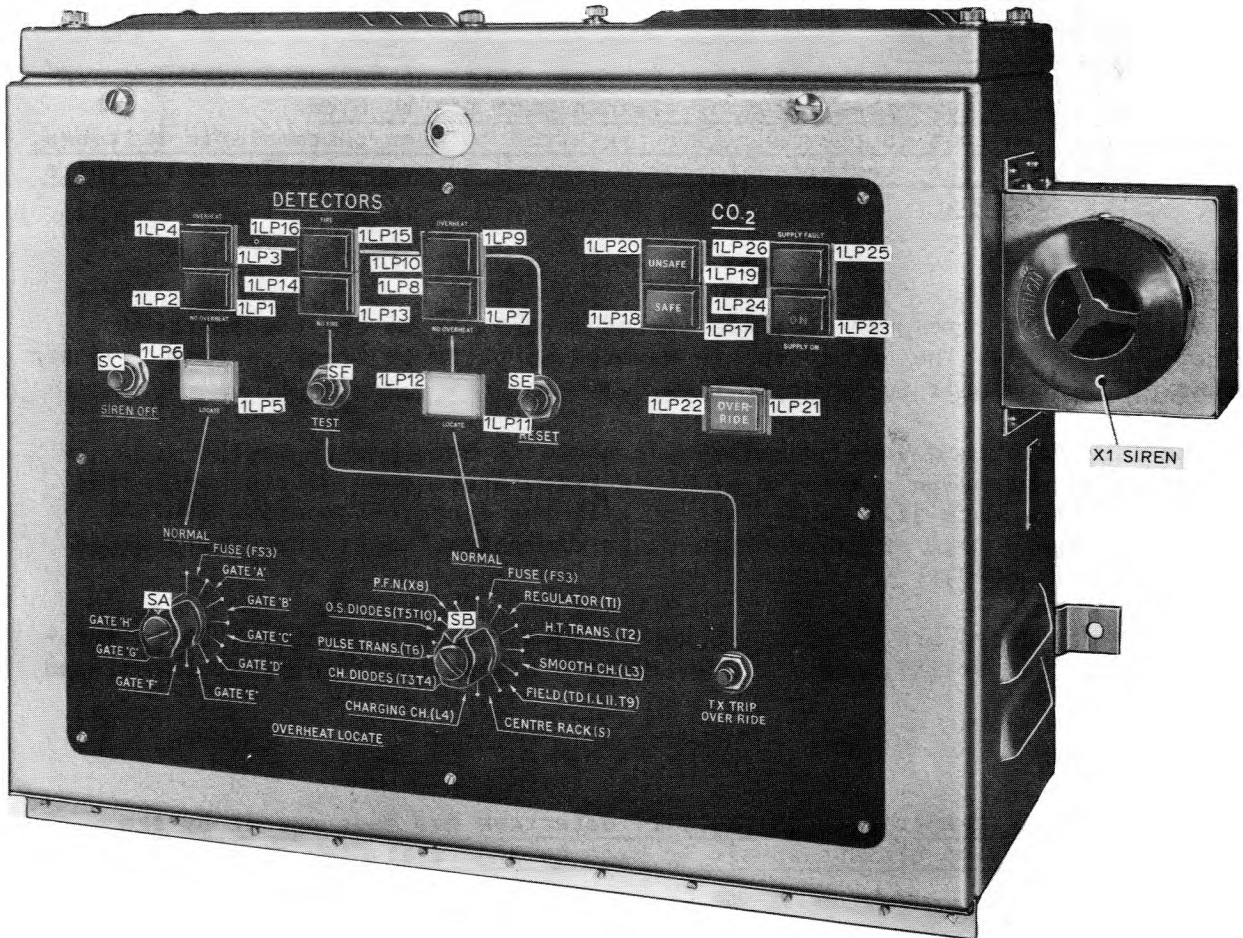


Fig. 2 Alarm monitor, fire unit: front



Overheat indicator circuit (fig.8)

- 11 The transmitter gate overheat detector circuit consists of 35 series- ◀ connected detectors, connected to the alarm monitor at TB2/1 and TB2/12. The detectors are split up into sections within the series circuit, each section made up of between three and five detectors (fig.9). The connecting points of each section are returned sequentially to progressive poles of the LOCATE switch SA. During normal operating conditions a 26V d.c. supply is passed through the series-connected detector circuit and the NO OVERHEAT lamps (ILP1 and ILP2) are lit. Operation of the RESET switch SE when resetting the fire detection circuit, allows relay RLN to be energized. Contact RLN1 closes and relay RLA is energized through the series-detector circuit. Contact RLA2 closes and energizes relay RLB, the contacts of which remove the supplies from the OVERHEAT lamps (ILP3 and ILP4).

12 Should overheating occur at the transmitter gates, or a break occur in the detector circuit, the d.c. supply through the detectors is broken; the NO OVERHEAT lamps are extinguished and relay RLA is de-energized. Contact RLA2 breaks the supply to relay RLB and completes the circuit to the LOCATE lamps (ILP5 and ILP6), indicating a ready condition for fault location; RLB1 and RLB2 close and the OVERHEAT lamps are lit. Contacts RLA3, RLA4, RLB3 function to switch off the transmitter, de-energize the CO<sub>2</sub> release circuit and energize the local siren. Contact RLB4 opens in the remote site interlock energizing remote siren and FIRE lamps. These functions are described later in this chapter.

- 13 The transmitter component and centre rack (gate S) overheat detector circuit, consisting of fifteen series-connected detectors is connected to the alarm monitor at TB3/1 and TB3/12. The function of the switching circuit is identical to that of the gate circuit described in previous paragraphs. Contacts RLC3, RLC4, RLD3 function to switch off the transmitter, de-energize the CO<sub>2</sub> release circuit and energize the local siren. Contact RLD4 opens in the remote site interlock, energizing the remote siren and fire lamps. ◀

Location circuit

14 Two identical switching circuits are employed to indicate the location of overheating. The function of the switching circuit associated with the gate overheat detector circuit will now be described.

15 When overheating occurs, causing one of the detectors to become open-circuit, relay RLA is de-energized and a d.c. supply is routed to the LOCATE lamps via RLA2; switch SA is set to the NORMAL position. Advancing the switch SA one position to FUSE, causes the LOCATE lamps to be lit directly from the d.c. line, not through RLA2; this indicates the presence of a d.c. feed to the series detector circuit. Investigation of the detector circuit is by rotation of the locate switch, step by step, until the LOCATE lamp is extinguished. The markings of the locate switch are engraved on the front panel between switch positions; thus the section marking, immediately preceding the switch position at which the LOCATE lamp was extinguished, gives the location of the fault.

Note ...

When the source of overheating has been established the LOCATE switch should be returned to the NORMAL position.

#### Fire indication circuit

16 The 16 fire detectors are connected in parallel across TB1/1, 1/4 and TB1/2, 1/3. The double ring circuit formed by this parallel connection is completed through relay contacts RLR2 and RLR3. One side of this ring is connected to earth at TB1/4, the other side being connected to the 26V d.c. supply through relay RLG. During normal operating conditions the fire detectors are open-circuit, relay RLG is de-energized and the NO FIRE lamps (ILP13 and ILP14) are lit via RLG2. Relay RLE is energized through RLG1 and RLN3 (relay RLN is energized by operation of RESET switch SE), which in turn causes relay RLF to be energized through RLE2 and RLG3. The contacts of relay RLF open and disconnect the d.c. supply from the FIRE lamps (ILP15 and ILP16).

17 A fire in the transmitter/receiver will cause one or more of the fire detectors to go short-circuit, energizing relay RLG and thus causing relays RLE and RLF to be de-energized. The d.c. supply to the NO FIRE lamps is broken via RLG2 and the FIRE lamps are lit through RLF1 and RLF2. Contacts RLE3, RLF4 and RLF3 function to switch off the transmitter, actuate the CO<sub>2</sub> release circuit and energize the local siren. Contact RLE4 opens in the remote interlock circuit, energizing the remote siren and the FIRE lamps. These functions are described later in this chapter.

#### Control auto-release

18 This unit (figs. 4, 5 and 10<sup>23</sup>) situated at the entrance to the Radar type 84 building, provides indication, by operation of a switch, of SAFE or UNSAFE conditions prevailing in the transmitter hall.

19 On entering the building the SAFE/UNSAFE switch should be set to SAFE. This operation which prevents the release of CO<sub>2</sub> should illuminate the SAFE indicator lamps and extinguish the UNSAFE lamps. Only when the SAFE lamps are lit, should entry be made to the transmitter hall.

20 During normal operating conditions relays RLA and RLB are energized from a 26V d.c. supply through the CO<sub>2</sub> pressure switch. With the SAFE/UNSAFE 3-pole switch set to SAFE, the SAFE lamps (ILP7 and ILP8) are lit through relay contacts RLB1 and RLB3, and the control lines to the CO<sub>2</sub> release solenoid are broken. A 26V d.c. supply is fed from this unit at TB1/4 to the alarm monitor at TB1/8, providing an energizing supply for relay RLP, on pressing TEST switch SF (para.24). The PRESS TO CHECK switch SB provides a means of continuous monitoring of the CO<sub>2</sub> release circuit (para.30). With the SAFE/UNSAFE switch set to UNSAFE, one pole of the switch connects the d.c. supply to the UNSAFE lamp (ILP5 and ILP6) and the duplicate set (ILP19 and ILP20) at the alarm monitor. The remaining two poles of the switch complete the circuit from the alarm monitor to the CO<sub>2</sub> release solenoid.

21 In the event of a fire at the transmitter/receiver, the actual release of CO<sub>2</sub> at pressure would actuate the CO<sub>2</sub> pressure switch causing a permanent UNSAFE condition to be indicated at this unit and at the alarm monitor (para.33).

Fire detection test circuit

22 Because the fire detectors do not fail safe, i.e. they have normally open contacts, a test circuit is provided to check the operation of the fire detection circuit. This test can be a full systems check covering all circuit operations with the exception of the CO<sub>2</sub> release, or a limited continuity check of the fire circuit, allowing the transmitter to remain on the air and inhibiting any action at the control alarm which might cause inconvenience to personnel.

Fuel systems check

23 At the control auto-release the CO<sub>2</sub> SAFE/UNSAFE switch is set to SAFE, thus rendering the CO<sub>2</sub> release circuit inoperative and feeding 26V to the TEST switch in the alarm monitor. This action also causes the SAFE lamps at the auto-release and the alarm monitor to be lit. At the alarm monitor the TEST push-button switch SF is pressed, causing relay RLP to be energized. Contact RLP1 closes and relay RLQ is energized; relay RLR is energized through RLP2 and RLQ2. Operation of RLR causes RLR2 and RLR3 to place a short-circuit across the remote end of the fire detector ring circuit. If the circuit is continuous, relay RLG is energized from the 26V d.c. supply, through the detector loop to earth at TB1/4. Relays RLE and RLF are de-energized by RLG1 and RLG3; RLG2 opens to extinguish the NO FIRE lamps. The closing of contacts RLF1 and RLF2 causes the FIRE LAMPS TO BE LIT. Contacts RLE3, RLF3 and RLE4 function to switch off the transmitter, energize the local siren and give indication of FIRE at the remote site.

Continuity check

24 The SAFE/UNSAFE switch at the control auto-release is set to SAFE, resulting in the same circuit action as the full systems check. At the alarm monitor the OVERRIDE button switch SD is pressed and held; OVERRIDE lamps (ILP21 and ILP22) are lit. TEST switch (SF) is then pressed to energize relay RLP; contact RLP1 closes to energize relay RLQ. Contact RLQ1 closes and extinguishes the OVERRIDE lamps; RLQ1 and RLQ3 close to provide a hold-on path for relay RLE. The holding-on of this relay prevents the transmitter being switched off and inhibits any action at the control alarm. The action of energizing relay RLR and all subsequent circuitry is identical to that of the full systems check, ending with the FIRE lamps being lit and the local siren sounding. On completion of the test the TEST switch is released, restoring the circuit to normal; at this point the OVERRIDE lamps are lit, indicating to the operator that it is safe to release the OVERRIDE button switch.

25 When the continuity check is carried out, the operation of relay RLR is slightly delayed due to the time constants of R5 and C4 charging through MR2. This delay ensures that relay contacts RLQ1 and RLQ3 are firmly closed across RLG1, thus providing a hold-on path for relay RLE. Similarly, when the TEST switch is released the operation of relay RLQ is delayed for approximately one second by the discharge of C4 through MR1, ensuring that relay RLG is de-energized and RLG1 is closed before RLQ1 and RLQ3 open and remove the sustaining path for relay RLE.

Siren circuit

26 An audible warning of fire or overheat at the transmitter/receiver is given by a motor-driven siren fitted to the right-hand side of the alarm monitor (fig.2).

27 Under normal conditions, relay RLH is energized and contacts RLH1 and RLH3 open, removing the d.c. supply to the siren (X1). Fire or overheat will cause one or more of the series-connected contacts RLB3, RLD3 and RLF3 to open, de-energizing RLH and causing the siren to be energized. Should a fault develop in the siren during its run-up causing excessive current to flow, then the circuit breaker CON.A will open and silence the siren; visual indication of FIRE however, will remain indicated by the FIRE lamps. In order that the siren fault should not be overlooked, an auxiliary contact of CON.A opens the sustaining circuit of RLS, so preventing reapplication of mains to the transmitter until the siren fault is cleared and CON.A reset, by operation of its reset button.

28 A manual means of locking-out the siren after it has sounded, is provided by the SIREN OFF push-button switch SC, which when operated energizes relay RLJ. Contact RLJ2 provides a hold-on circuit; RLJ1 and RLJ3 open, removing the supply to the siren. As the visual indicators are not affected by this action, fire or overheat source location may proceed without the distraction of the siren noise.

AL20 CO<sub>2</sub> release circuit (FIG. 11)

29 The release of CO<sub>2</sub> into the transmitter/receiver is initiated by energization of the CO<sub>2</sub> release solenoid which releases a catch, allowing heavy weights to drop under the action of gravity; levers attached to these weights operate the CO<sub>2</sub> valve. The solenoid is rated at 26V, 1.2A, d.c. supplied via a parallel circuit connected to terminals TB4/8 and 9 of the alarm monitor.

30 The CO<sub>2</sub> SAFE/UNSAFE 3-pole switch at the control auto-release is set to the UNSAFE position if the transmitter is unmanned. In this position two poles of the switch are closed completing the circuit to the CO<sub>2</sub> release solenoid from the alarm monitor. A 26V d.c. supply is provided for the CO<sub>2</sub> release solenoid from TB4/11 and TB4/12 of the alarm monitor. During the normal transmitter operating conditions relay RLK is energized through relay contacts RLA4, RLC4 and RLF4. Relay contacts RLK1 and RLK2 open and the duplicated circuits to the CO<sub>2</sub> release solenoid are broken; the duplication of lines to the CO<sub>2</sub> release solenoid is an additional safety factor. It is essential due to the important function of this circuit and the long connecting leads involved, that a permanent check of continuity is made. This is achieved by connecting a resistor (R3) in series with relay RLM across contact RLK1. Since this contact is normally open, the relay and resistor are in series with the CO<sub>2</sub> release solenoid. It is arranged that a small amount of current flows through this circuit, enough to operate relay RLM, but insufficient for operation of the CO<sub>2</sub> release solenoid. Contact RLM1 closes and an indication of continuity existing is shown by lamps (ILP1-4) being lit at the control auto-release when the PRESS TO CHECK switch is operated.

31 The d.c. supply for the CO<sub>2</sub> release circuit energizes relay RLL, the contacts of which close to allow SUPPLY ON lamps (ILP23 and ILP24) to be lit. In the event of this supply failing relay RLL is de-energized and its contacts change over to complete the circuit to the SUPPLY FAULT lamp (ILP25 and ILP26). Contact RLL3 functions to switch off the transmitter.

32 In the event of a fire at the transmitter, one of the contacts (RLA4, RLC4, RLF4) in series with relay RLK opens, causing RLK1 AND RLK2 to close, routing the 26V d.c. supply to the CO<sub>2</sub> release solenoid. The release of CO<sub>2</sub>

operates a pressure switch which is connected in the CO<sub>2</sub> delivery pipes to the transmitter and situated adjacent to the CO<sub>2</sub> cylinders, causes relays RLA and RLB in the control auto-release to be de-energized. Relay contact RLA1 in the transmitter interlock opens and breaks the circuit to the transmitter mains contactor. Relay contacts RLB1 and RLB3 fall back and the UNSAFE lamps at the control auto-release and alarm monitor are lit.

- ▶ 33 For emergency use a manual means of operating the CO<sub>2</sub> release solenoid is provided by a lever mounted outside the transmitter/receiver building. This lever is linked by a chain to the solenoid on the inside wall of the building. No automatic alarm is given, as personnel must already be aware of the situation. The release of CO<sub>2</sub> operates a pressure switch in the CO<sub>2</sub> delivery pipes which functions to break the transmitter mains interlock and causes an UNSAFE condition to be indicated at the control auto-release and alarm monitor (para.32). ◀

#### Transmitter interlock circuit

34 As described in Part 2, Sect.3, Chap.3, the 3-phase supply to the transmitter/receiver is controlled by CON.A situated in the LH annexe. Relay contact RLS1 in the alarm monitor and RLA1 in the control auto-release (figs.8 and 10) are connected in series with the 230V a.c. supply to the operating coil of CON.A. Relay RLS is energized via the normally closed series contacts RLA3, RLC3, RLE3 and RLL3. In the event of overheat or fire one or more of these contacts open and relay RLS is de-energized, thus switching off the transmitter/receiver.

#### Remote site (control alarm)

35 Since the transmitter building may be unmanned, it is necessary that overheating or fire at the transmitter/receiver will give a warning to a site where personnel are always in attendance. The selected site (e.g. guardroom) houses the control alarm (figs.6 and 7) for details of the power supplies refer to para.47.

36 During normal operating conditions relay RLA is energized from the 26V d.c. supply through the series relay contacts circuit RLB4, RLD4 and RLE4 situated in the alarm monitor. Relay contact RLA2 closes and the NORMAL lamps (ILP3 and ILP4) are lit, RLA1 and RLA3 open, disconnecting the supply to the siren and FIRE lamps (ILP1 and ILP2).

37 Should overheating or fire occur at the transmitter/receiver, relay RLA will be de-energized and contact RLA2 will open, extinguishing the NORMAL lamps. Contacts RLA1 and RLA3 fall back, completing the circuit to the FIRE lamps and energizing the siren through the circuit breaker CON.A and contacts RLB1 and RLB3. Once personnel have been alerted of a fault condition the siren can be silenced by operation of the SIREN OFF button SA, thus causing relay RLB to be energized and illuminating the SIREN OFF lamps (ILP5-ILP8). Contacts RLB1 and RLB3 remove supplies to the siren, RLB2 providing hold-on for switch SA; visual indication of a fault remains evident by the illuminated FIRE lamp. Normal conditions are restored to the control alarm when the series relay contact circuit closes at the alarm monitor.

38 If a fault develops on the siren during run up, the circuit breaker will operate and isolate the siren circuit. If the circuit breaker has operated due to a fault condition, it will have to be reset upon restoration of normal conditions before NORMAL lamps are lit.

Operation and switching

39 Under normal operating conditions (i.e. no fire or overheat and the CO<sub>2</sub> SAFE/UNSAFE switch set to the SAFE position at the control auto-release) all the green indicator lamps at the alarm monitor are illuminated. The green indicator lamps are arranged in a continuous horizontal line, thus giving 'at a glance' indication of the state of the fire detection and prevention system. Warning of fire, overheat, CO<sub>2</sub> release circuit fault and supply failure is given by red indicator lamps which displace the continuous line presented by the green indicator lamps.

## Note ...

Removal and replacement of a Honeywell indicator lamp requires the use of a special tool; this is normally clipped to the base of the monitor unit (fig.3).

40 When the cause of fire or overheating has been rectified, indication that the detector circuits have returned to their normal state is given by the green indicator lamps. At the same time the red indicator lamps will continue to show a fault condition. The fire detection system can be reset by operating the RESET switch (SE), but only when the detector circuits have returned to their normal state, as indicated by the green lamps. When the reset switch is operated relay RLN is momentarily energized and contacts RLN1, RLN2 and RLN3 reset the detector indicator circuits, thus extinguishing the red warning lamps.

Power supplies (fig.10)

▶ 41 The independent d.c. supplies (see para.3) are provided by two 12V series connected lead-acid batteries. Under normal operating conditions these batteries are on trickle charge from Battery Charger 6130-99-945-0036 (Chap.3, App.1), part of Charger Battery and Distribution Unit 6130-99-953-4172. In addition to the charging facility, this unit provides:

41.1 Input (240V 50 Hz) switching, fusing and 'mains on' indication for the battery charger.

41.2 Output (26V d.c. nominal) voltage metering and distribution fusing.

41.3 Mains failure warning indication (Mod. CA8086/1).

42 In the event of a mains failure or inadvertent disconnection due to some unrelated servicing operation, the batteries will continue to supply the fire detection equipment, but will become discharged if the condition is prolonged. On reinstatement of the mains supply, the battery charger will provide a charging current limited to 2A. This charging rate will be insufficient, in most cases, to rapidly restore the operational voltage to a level consistent with full system reliability. Warning of this situation is therefore provided by a flashing indicator (ILP2, charger battery and distribution unit) to draw attention to the need for one of the following actions:

42.1 Restore the mains supply to the Fire Detection System immediately, if this does not interfere with servicing operations.

OR,

▶ 42.2 Disconnect the batteries from the system until mains restoration is practicable.

OR

42.3 Fit serviceable fully charged replacement batteries immediately prior to the eventual restoration of the mains supply.

#### Restore mains supply indicator

43 A failure or disconnection of the 240V 50 Hz supply to the charger battery and distribution unit will cause RLB to de-energize and contacts RLBl to close; switching the battery supply to the two stage PEC, VT1-VT2. The uni-junction transistor VT1 and associated components form a relaxation oscillator operating at approximately 50 p.p.s. to produce a 1:1 switching waveform at the base of the relay drive stage VT2. Thus, in the absence of a mains supply input to the battery charger, the battery voltage is switched, at the oscillator frequency, by contacts RLAl to the RESTORE MAINS lamp (ILP2) circuit.

#### Battery supply - Maintenance

44 It should be understood that disconnection of the batteries at the transmitter location will cause the complete fire detection system to be ineffective as the battery charger will produce no output in the absence of a battery voltage to sense. Owing to the fail-safe nature of the system, disconnection will thus interrupt the main interlock line and shut down the transmitter. Battery disconnection would therefore, under normal conditions, only be attempted when the transmitter is off. If emergency disconnection is imperative then the penalty sustained will be total loss of the radar facility until the situation is resolved.

Note ...

When the batteries are to be disconnected for servicing, during a scheduled servicing period, it is desirable that fully charged and serviced replacement batteries are available in order to minimise the time that the fire detector system is ineffective.

45 Battery disconnection. Before disconnecting the batteries the transmitter should be OFF; the disconnection procedure is then as follows:

45.1 Ensure that the control auto-release safety switch is in the SAFE position.

45.2 Warn personnel at the remote alarm location of the intention to disconnect thereby causing the remote siren to sound and the FIRE lamp to be illuminated. They should press SIREN OFF when this occurs and understand that the FIRE indication will remain until the batteries are reconnected.

45.3 Disconnect the battery positive lead.

45.4 Switch off the battery charger mains supply at switch SA inside the charger battery and distribution unit.

45.5 Disconnect the battery negative lead and the battery connecting link. ◀

▶ 46 Battery reconnection. After installation of the replacement batteries proceed as follows:

- 46.1 Connect the battery negative lead and the connecting link.
- 46.2 Switch on the battery charger mains supply.
- 46.3 Connect the battery positive lead.
- 46.4 The local siren will now sound. On the alarm monitor fire, press SIREN OFF and then RESET; the remote unit will reset without further action.
- 46.5 Allow time for the charging rate to settle and the battery terminal voltage to produce a steady indication on the voltmeter (charger battery and distribution unit). Adjust, if necessary, the CURRENT SET control on the Battery Charger 6130-99-945-0036 to obtain a voltmeter indication of 26.5V.

Remote site control alarm (fig.10)

47 This unit was originally intended to be supplied from a charger and battery arrangement similar to that fitted in the transmitter building, for the fire detection circuits. The Control Alarm 5840-99-953-4170 is now fed from a reliable, no break, station 50V d.c. supply via suitable voltage reduction circuit (Mod. No. CA2907/1). The 50V input is protected by fuse FS2(7A) and regulated to 26V by voltage regulator diode D1 and resistor R4. D1 and R4 are mounted on separate heat sinks on the rear of the control alarm unit case.

Tx operation with fire detection system inoperative

CAUTION ...

The following procedure should only be adopted when absolutely necessary and with the prior permission of the engineering officer responsible. The equipment must be manned and monitored for overheating/fire risks.

WARNING ...

SERVICING PERSONNEL SHOULD TAKE NOTE OF THE CONDITIONS UNDER WHICH CERTAIN TERMINALS REFERRED TO IN THE FOLLOWING PARAGRAPH ARE AT MAINS (240V 50Hz) POTENTIAL.

48 Should it be necessary to run the transmitter when the fire detection system is inoperative, a temporary shorting link may be placed across terminals TB7(1) and (3) in the alarm-monitor fire (fig.8). Note that these terminals are at mains (240V) potential until the transmitter mains supply circuit-breaker, on the distribution switchboard is opened. The shorting link therefore, should only be installed after first opening this circuit-breaker. Ensure that the shorting link is removed when the fire detection system is restored - again, only after first opening the transmitter mains supply circuit-breaker. ◀



TABLE 1 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-CENTRE RACK CR

| CCT.<br>REF. | PIN<br>NO. | UNIT<br>NO. | CCT.<br>REF. | PIN<br>NO. | No. | TYPE    | Col. | SERVICE    |
|--------------|------------|-------------|--------------|------------|-----|---------|------|------------|
| XF42         | -ve        | 6J          | TB20         | 10B        | F57 | 19/0076 | W    | 24V (Fire) |
| XF42         | +ve        | CR          | XF43         | -ve        | F58 | 19/0076 | W    | 24V (Fire) |
| XF43         | +ve        | CR          | XF44         | -ve        | F59 | 19/0076 | W    | 24V (Fire) |
| XF44         | +ve        | CR          | XF45         | -ve        | F60 | 19/0076 | W    | 24V (Fire) |
| XF45         | +ve        | CR          | XF46         | -ve        | F61 | 19/0076 | W    | 24V (Fire) |
| XF46         | +ve        | 6J          | TB20         | 12B        | F62 | 19/0076 | W    | 24V (Fire) |

TABLE 2 INTERCONNECTIONS TO THE FIRE DETECTION SYSTEM-UNIT FJ1

|       |     |       |      |     |      |         |    |                      |
|-------|-----|-------|------|-----|------|---------|----|----------------------|
| TB1   | 1A  | 1J    | TB71 | 10A | F44  | 70/0076 | W  | 24V (Fire)           |
| TB1   | 2A  | 1J    | TB71 | 11A | F45  | 33/0076 | W  | 24V (Fire)           |
| TB1   | 3A  | 2J    | TB33 | 10A | F53  | 33/0076 | W  | 24V (Fire)           |
| TB1   | 4A  | 2J    | TB33 | 11A | F47  | 33/0076 | W  | 24V (Fire)           |
| TB1   | 5A  | 2J    | TB33 | 12A | F54  | 33/0076 | W  | 24V (Fire)           |
| TB1   | 6A  | 3J    | TB39 | 11A | F49  | 33/0076 | W  | 24V (Fire)           |
| TB1   | 7A  | 3J    | TB39 | 12A | F55  | 33/0076 | W  | 24V (Fire)           |
| TB1   | 8A  | 4J    | TB46 | 11A | F51  | 33/0076 | W  | 24V (Fire)           |
| TB1   | 9A  | FJ1   | TB1  | 12A | F56  | 33/0076 | W  | 24V (Fire)           |
| TB1   | 12A | 4J    | TB46 | 12A | F52  | 70/0076 | W  | 24V (Fire)           |
| TB1   | 12A | FJ1   | TB1  | 9A  | F56  | 19/0076 | W  | 24V (Fire)           |
| TB2   | 1A  | FJ2   | TB1  | 1A  | F63  | 70/0076 | W  | 24V (Fire)           |
| TB2   | 2A  | FJ2   | TB1  | 2A  | F65  | 33/0076 | W  | 24V (Fire)           |
| TB2   | 3A  | FJ2   | TB1  | 4A  | F67  | 33/0076 | W  | 24V (Fire)           |
| TB2   | 4A  | FJ2   | TB1  | 6A  | F69  | 33/0076 | W  | 24V (Fire)           |
| TB2   | 5A  | FJ3   | TB1  | 4A  | F73  | 33/0076 | W  | 24V (Fire)           |
| TB2   | 6A  | 6J    | TB20 | 12A | F75  | 33/0076 | W  | 24V (Fire)           |
| TB2   | 7A  | FJ4   | TB1  | 2A  | F78  | 33/0076 | W  | 24V (Fire)           |
| TB2   | 8A  | FJ4   | TB1  | 6A  | F81  | 33/0076 | W  | 24V (Fire)           |
| TB2   | 9A  | FJ5   | TB1  | 2A  | F83  | 33/0076 | W  | 24V (Fire)           |
| TB2   | 10A | FJ6   | TB1  | 4A  | F86  | 33/0076 | W  | 24V (Fire)           |
| TB2   | 11A | FJ1   | TB2  | 12A | F88  | 33/0076 | W  | 24V (Fire)           |
| TB2   | 12A | FJ6   | TB1  | 6A  | F87  | 70/0076 | W  | 24V (Fire)           |
| TB2   | 12A | FJ1   | TB2  | 11A | F88  | 33/0076 | W  | 24V (Fire)           |
| TB3   | 1   |       | XF69 | A   | F89  | 33/0076 | 0  | 24V (Fire)           |
| TB3   | 2   |       | XF69 | B   | F91  | 33/0076 | 0  | 24V (Fire)           |
| TB3   | 3   |       | XF68 | B   | F130 | 33/0076 | 0  | 24V (Fire)           |
| TB3   | 4   |       | XF68 | A   | F129 | 33/0076 | 0  | 24V (Fire)           |
| TB4   | 2   | FJ2   | TB2  | 1B  | F131 | 33/0076 | 0  | 240V-TX<br>Mains Off |
| TB4   | 2   | 4M    | FS2  | B   | F134 | 33/0076 | 0  | 240V-TX<br>Mains Off |
| EARTH | TAG | EARTH | BAR  |     | F136 | 70/0076 | BK | EARTH                |

TABLE 3 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-UNIT FJ2

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE |                      |
|-------------|---------|-------------|-----------|---------|-------|---------|---------|----------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col.    |                      |
| TB1         | 1A      | FJ1         | TB2       | 1A      | F63   | 70/0076 | W       | 24V (Fire)           |
| TB1         | 2A      | FJ2         | TB1       | 3A      | F64   | 1/048   |         |                      |
| TB1         | 2A      | FJ1         | TB2       | 2A      | F65   | 33/0076 | W       | 24V (Fire)           |
| TB1         | 3A      | FJ2         | TB1       | 2A      | F64   | 1/048   |         |                      |
| TB1         | 4A      | FJ2         | TB1       | 5A      | F66   | 1/048   |         |                      |
| TB1         | 4A      | FJ1         | TB2       | 3A      | F67   | 33/0076 | W       | 24V (Fire)           |
| TB1         | 5A      | FJ2         | TB1       | 4A      | F66   | 1/048   |         |                      |
| TB1         | 6A      | FJ2         | TB1       | 7A      | F68   | 1/048   |         |                      |
| TB1         | 6A      | FJ1         | TB2       | 4A      | F69   | 33/0076 | W       | 24V (Fire)           |
| TB1         | 7A      | FJ2         | TB1       | 6A      | F68   | 1/048   |         |                      |
| TB1         | 8A      | FJ3         | TB1       | 1A      | F70   | 70/0076 | W       | 24V (Fire)           |
| TB1         | 1B      | T1          | XF36      | -ve     |       | 19/0076 | W       |                      |
| TB1         | 2B      | T1          | XF36      | +ve     |       | 19/0076 | W       |                      |
| TB1         | 3B      | T2          | XF37      | -ve     |       | 19/0076 | W       |                      |
| TB1         | 4B      | T2          | XF37      | +ve     |       | 19/0076 | W       |                      |
| TB1         | 5B      | L3          | XF38      | -ve     |       | 19/0076 | W       |                      |
| TB1         | 6B      | L3          | XF38      | +ve     |       | 19/0076 | W       |                      |
| TB1         | 7B      | TD1         | XF39      | -ve     |       | 19/0076 | W       |                      |
| TB1         | 8B      | TD1         | XF39      | +ve     |       | 19/0076 | W       |                      |
| TB2         | 1A      | FJ2         | TB2       | 2A      | F132  | 33/0076 | O       | 240V TX<br>Mains Off |
| TB2         | 2A      | FJ2         | TB2       | 1A      | F132  | 33/0076 | O       | 240V TX<br>Mains Off |
| TB2         | 1B      | FJ1         | TB4       | 2       | F131  | 33/0076 | O       | 240V TX<br>Mains Off |
| TB2         | 2B      | 2K          | SC        | 1       | 713   | 23/0076 | R       | 240V Tx<br>Mains Off |
| EARTH       | TAG     | EARTH       | BAR       |         |       | 70/0076 | Bk      | Earth                |

TABLE 4 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-UNIT FJ3

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE |            |
|-------------|---------|-------------|-----------|---------|-------|---------|---------|------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col.    |            |
| TB1         | 1A      | FJ2         | TB1       | 8A      | F70   | 70/0076 | W       | 24V (Fire) |
| TB1         | 2A      | FJ3         | TB1       | 3A      | F71   | 1/048   |         |            |
| TB1         | 3A      | FJ3         | TB1       | 2A      | F71   | 1/048   |         |            |
| TB1         | 4A      | 6J          | TB20      | 10A     | F72   | 70/0076 | W       | 24V (Fire) |
| TB1         | 4A      | FJ1         | TB2       | 5A      | F73   | 33/0076 | W       | 24V (Fire) |
| TB1         | 1B      | L11         | XF40      | -ve     |       | 19/0076 | W       |            |
| TB1         | 2B      | L11         | XF40      | +40     |       | 19/0076 | W       |            |
| TB1         | 3B      | T9          | XF41      | -ve     |       | 19/0076 | W       |            |
| TB1         | 4B      | T9          | XF41      | +ve     |       | 19/0076 | W       |            |

TABLE 5 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-UNIT FJ4

|     |    |     |      |     |     |         |   |            |
|-----|----|-----|------|-----|-----|---------|---|------------|
| TB1 | 1A | 6J  | TB20 | 12A | F74 | 70/0076 | W | 24V (Fire) |
| TB1 | 2A | FJ4 | TB1  | 3A  | F77 | 1/048   |   |            |
| TB1 | 2A | FJ1 | TB2  | 7A  | F78 | 33/0076 | W | 24V (Fire) |
| TB1 | 3A | FJ4 | TB1  | 2A  | F77 | 1/048   |   |            |
| TB1 | 4A | FJ4 | TB1  | 5A  | F79 | 1/048   |   |            |
| TB1 | 5A | FJ4 | TB1  | 4A  | F79 | 1/048   |   |            |
| TB1 | 6A | FJ5 | TB1  | 1A  | F80 | 70/0076 | W | 24V (Fire) |
| TB1 | 6A | FJ1 | TB1  | 8A  | F81 | 33/0076 | W | 24V (Fire) |
| TB1 | 1B | L4  | XF47 | -ve |     | 19/0076 | W |            |
| TB1 | 2B | L4  | XF47 | +ve |     | 19/0076 | W |            |
| TB1 | 3B | FJ4 | TB1  | 6B  |     | 19/0076 | W |            |

TABLE 6 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-UNIT FJ5

|     |    |     |      |     |     |         |   |            |
|-----|----|-----|------|-----|-----|---------|---|------------|
| TB1 | 1A | FJ4 | TB1  | 6A  | F80 | 70/0076 | W | 24V (Fire) |
| TB1 | 2A | FJ6 | TB1  | 1A  | F82 | 70/0076 | W | 24V (Fire) |
| TB1 | 2A | FJ1 | TB2  | 9A  | F83 | 33/0076 | W | 24V (Fire) |
| TB1 | 1B | T6  | XF50 | -ve |     | 19/0076 | W |            |
| TB1 | 2B | T6  | XF50 | +ve |     | 19/0076 | W |            |

TABLE 7 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-UNIT FJ6

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE |                  |
|-------------|---------|-------------|-----------|---------|-------|---------|---------|------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col.    |                  |
| TB1         | 1A      | FJ5         | TB1       | 2A      | F82   | 70/0076 | W       | 24V (Fire)       |
| TB1         | 2A      | FJ6         | TB1       | 3A      | F84   | 1/048   |         |                  |
| TB1         | 3A      | FJ6         | TB1       | 2A      | F84   | 1/048   |         |                  |
| TB1         | 4A      | FJ6         | TB1       | 5A      | F85   | 1/048   |         |                  |
| TB1         | 4A      | FJ1         | TB2       | 10A     | F86   | 33/0076 | W       | 24V (Fire)       |
| TB1         | 5A      | FJ6         | TB1       | 4A      | F85   | 1/048   |         |                  |
| TB1         | 6A      | FJ1         | TB2       | 12A     | F87   | 70/0076 | W       | 24V (Fire)       |
| TB1         | 1B      | X33         | XF51      | -ve     |       | 19/0076 | W       | Via 1R<br>TB71/1 |
| TB1         | 4B      | X33         | XF51      | +ve     |       | 19/0076 | W       | Via 1R<br>TB71/2 |
| TB1         | 5B      | X8          | XF53      | -ve     |       | 19/0076 | W       |                  |
| TB1         | 6B      | X8          | XF53      | +ve     |       | 19/0076 | W       |                  |

TABLE 8 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-GATE

Unit A, B

|     |     |      |      |     |     |         |   |            |
|-----|-----|------|------|-----|-----|---------|---|------------|
| XF1 | -ve | 1J   | TB71 | 10B | F1  | 19/0076 | W | 24V (Fire) |
| XF1 | +ve | GATE | XF2  | -ve | F2  | 19/0076 | W | 24V (Fire) |
|     |     | A    |      |     |     |         |   |            |
| XF2 | +ve | GATE | AF3  | -ve | F3  | 19/0076 | W | 24V (Fire) |
|     |     | A    |      |     |     |         |   |            |
| XF3 | +ve | GATE | XF4  | -ve | F4  | 19/0076 | W | 24V (Fire) |
|     |     | A    |      |     |     |         |   |            |
| XF4 | +ve | GATE | XF8  | -ve | F5  | 19/0076 | W | 24V (Fire) |
|     |     | B    |      |     |     |         |   |            |
| XF4 | +ve | 1J   | TB71 | 11B | F6  | 19/0076 | W | 24V (Fire) |
| XF8 | +ve | GATE | XF7  | -ve | F7  | 19/0076 | W | 24V (Fire) |
|     |     | B    |      |     |     |         |   |            |
| XF7 | +ve | GATE | XF6  | -ve | F8  | 19/0076 | W | 24V (Fire) |
|     |     | B    |      |     |     |         |   |            |
| XF6 | +ve | GATE | XF5  | -ve | F9  | 19/0076 | W | 24V (Fire) |
|     |     | B    |      |     |     |         |   |            |
| XF5 | +ve | GATE | TB1  | 12B | F10 | 19/0076 | W | 24V (Fire) |
|     |     | B    |      |     |     |         |   |            |

TABLE 9 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-GATE

Unit CD

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE |            |
|-------------|---------|-------------|-----------|---------|-------|---------|---------|------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col.    |            |
| XF9         | -ve     | 2J          | TB33      | 10N     | F11   | 19/0076 | W       | 24V (Fire) |
| XF9         | +ve     | GATE<br>C   | XF10      | -ve     | F12   | 19/0076 | W       | 24V (Fire) |
| XF10        | +ve     | GATE<br>C   | XF11      | -ve     | F13   | 19/0076 | W       | 24V (Fire) |
| XF11        | +ve     | GATE<br>D   | XF16      | -ve     | F14   | 19/0076 | W       | 24V (Fire) |
| XF16        | -ve     | 2J          | TB33      | 11B     | F15   | 19/0076 | W       | 24V (Fire) |
| XF16        | +ve     | GATE<br>D   | XF15      | -ve     | F16   | 19/0076 | W       | 24V (Fire) |
| XF15        | +ve     | GATE<br>D   | XF14      | -ve     | F17   | 19/0076 | W       | 24V (Fire) |
| XF14        | +ve     | GATE<br>D   | XF13      | -ve     | F18   | 19/0076 | W       | 24V (Fire) |
| XF13        | +ve     | GATE<br>D   | XF12      | -ve     | F19   | 19/0076 | W       | 24V (Fire) |
| XF12        | +ve     | 2J          | TB33      | 12B     | F20   | 19/0076 | W       | 24V (Fire) |



TABLE 10. INTERCONNECTIONS TO FIRE DETECTION SYSTEM-GATE

Unit E, F

|      |     |      |      |     |     |         |   |            |
|------|-----|------|------|-----|-----|---------|---|------------|
| XF17 | -ve | 3J   | TB39 | 10B | F21 | 19/0076 | W | 24V (Fire) |
| XF17 | +ve | GATE | XF18 | -ve | F22 | 19/0076 | W | 24V (Fire) |
|      |     | E    |      |     |     |         |   |            |
| XF18 | +ve | GATE | XF19 | -ve | F23 | 19/0076 | W | 24V (Fire) |
|      |     | E    |      |     |     |         |   |            |
| XF19 | +ve | GATE | XF20 | -ve | F24 | 19/0076 | W | 24V (Fire) |
|      |     | E    |      |     |     |         |   |            |
| XF20 | +ve | GATE | XF21 | -ve | F25 | 19/0076 | W | 24V (Fire) |
|      |     | E    |      |     |     |         |   |            |
| XF21 | +ve | GATE | XF26 | -ve | F26 | 19/0076 | W | 24V (Fire) |
|      |     | F    |      |     |     |         |   |            |
| XF21 | +ve | 3JTE | TB39 | 11B | F27 | 19/0076 | W | 24V (Fire) |
| XF26 | +ve | GATE | XF25 | -ve | F28 | 19/0076 | W | 24V (Fire) |
|      |     | F    |      |     |     |         |   |            |
| XF25 | +ve | GATE | XF24 | -ve | F29 | 19/0076 | W | 24V (Fire) |
|      |     | F    |      |     |     |         |   |            |
| XF24 | +ve | GATE | XF23 | -ve | F30 | 19/0076 | W | 24V (Fire) |
|      |     | F    |      |     |     |         |   |            |
| XF23 | +ve | GATE | XF22 | -ve | F31 | 19/0076 | W | 24V (Fire) |
|      |     | F    |      |     |     |         |   |            |
| XF22 | +ve | 3J   | TB39 | 12B | F32 | 19/0076 | W | 24V (Fire) |

















TABLE 18 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-FUSE PANEL

Unit Location 4M

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE           |
|-------------|---------|-------------|-----------|---------|-------|---------|------|-------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |                   |
| FS2         | 6       | FJ1         | TB4       | 4       | 134   | 33/0076 | 0    | 240V Tx Mains Off |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |

TABLE 19 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-UNIT XF

Unit XF36 to 41

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |      |      | SERVICE |
|-------------|---------|-------------|----------|---------|-------|------|------|---------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE | COL. |         |
| XF36        | -ve     | FJ2         | TB1      | 1B      |       |      |      |         |
| XF36        | +ve     | FJ2         | TB1      | 2B      |       |      |      |         |
| XF37        | -ve     | FJ2         | TB1      | 3B      |       |      |      |         |
| XF37        | +ve     | FJ2         | TB1      | 4B      |       |      |      |         |
| XF38        | -ve     | FJ2         | TB1      | 5B      |       |      |      |         |
| XF38        | +ve     | FJ2         | TB1      | 6B      |       |      |      |         |
| XF39        | -ve     | FJ2         | TB1      | 7B      |       |      |      |         |
| XF39        | +ve     | FJ2         | TB1      | 8B      |       |      |      |         |
| XF40        | -ve     | FJ3         | TB1      | 1B      |       |      |      |         |
| XF40        | +ve     | FJ3         | TB1      | 2B      |       |      |      |         |
| XF41        | -ve     | FJ3         | TB1      | 3B      |       |      |      |         |
| XF41        | +ve     | FJ3         | TB1      | 4B      |       |      |      |         |

TABLE 20 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-UNIT XF

Unit XF 47 to 53 (See Note)

| UNIT ORIGIN   |         | DESTINATION |          |         | CABLE |      |      | SERVICE       |
|---|---------|-------------|----------|---------|-------|------|------|---------------|
| CCT REF.  | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE | COL. |               |
| XF47  | -ve     | FJ4         | TB1      | 1B      |       |      |      |               |
| XF47  | +ve     | FJ4         | TB1      | 2B      |       |      |      |               |
| XF50  | -ve     | FJ5         | TB1      | 1B      |       |      |      |               |
| XF50  | +ve     | FJ5         | TB1      | 2B      |       |      |      |               |
| XF51  | -ve     | FJ6         | TB1      | 1B      |       |      |      | Via 1R TB71/1 |
| XF51  | +ve     | FJ6         | TB1      | 4B      |       |      |      | Via 1R TB71/2 |
| XF53  | -ve     | FJ6         | TB1      | 5B      |       |      |      |               |
| XF53  | +ve     | FJ6         | TB1      | 6B      |       |      |      |               |
| NOTE ...  |         |             |          |         |       |      |      |               |
| Overheat detectors XF52 and XF48, 49 removed by modifications CA8053 and CA8094. (Introduction of solid state overswing and charging diodes.) ◀ |         |             |          |         |       |      |      |               |

TABLE 21 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-LH ANNEX

Unit XF69 and 54

| UNIT ORIGIN  |         | DESTINATION |              |         | CABLE |         |      | SERVICE    |
|--------------|---------|-------------|--------------|---------|-------|---------|------|------------|
| CCT. REF.    | PIN NO. | UNIT NO.    | CCT. REF.    | PIN NO. | NO.   | TYPE    | COL. |            |
| XF69         | a       | FJ1         | TB3          | 1       | F89   | 33/0076 | 0    | 24V (Fire) |
| XF69         | a       | -           | XF54         | a       | F90   | 33/0076 | 0    | 24V (Fire) |
| XF69         | b       | FJ1         | TB3          | 2       | F91   | 33/0076 | 0    | 24V (Fire) |
| XF69         | b       | -           | XF54         | b       | F92   | 33/0076 | 0    | 24V (Fire) |
|              |         |             |              |         |       |         |      |            |
| XF54         | a       | -           | XF69         | a       | 90    | 33/0076 | 0    | 24V (Fire) |
| XF54         | a       | -           | XF55         | a       | 93    | 33/0076 | 0    | 24V (Fire) |
| XF54         | b       | -           | XF69         | b       | 92    | 33/0076 | 0    | 24V (Fire) |
| XF54         | b       | -           | XF55         | b       | 94    | 33/0076 | 0    | 24V (Fire) |
|              |         |             |              |         |       |         |      |            |
| XF69<br>XF54 | E       | -           | XF55<br>XF56 | E       | F95   | 70/0076 | Bk   | Earth      |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |
|              |         |             |              |         |       |         |      |            |

TABLE 22 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-LH CABINET

(Sheet 1 Continued on Sheet 2)

Unit XF 55 to 60

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE    |
|-------------|---------|-------------|-----------|---------|-------|---------|------|------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |            |
| XF55        | a       | -           | XF54      | a       | F93   | 33/0076 | 0    | 24V (Fire) |
| XF55        | a       | -           | XF56      | a       | F96   | 33/0076 | 0    | 24V (Fire) |
| XF55        | b       | -           | XF54      | b       | F94   | 33/0076 | 0    | 24V (Fire) |
| XF55        | b       | -           | XF56      | b       | F97   | 33/0076 | 0    | 24V (Fire) |
| XF56        | a       | -           | XF55      | a       | F96   | 33/0076 | 0    | 24V (Fire) |
| XF56        | a       | -           | XF57      | a       | F98   | 33/0076 | 0    | 24V (Fire) |
| XF56        | b       | -           | XF55      | b       | F97   | 33/0076 | 0    | 24V (Fire) |
| XF56        | b       | -           | XF57      | b       | F99   | 33/0076 | 0    | 24V (Fire) |
| XF55        | E       | -           | XF53      | E       | F95   | 70/0076 | Bk   | Earth      |
| XF56        | E       | -           | XF54      | E       | F95   | 70/0076 | Bk   | Earth      |
| XF55        | E       | -           | XF57      | E       | F100  | 70/0076 | Bk   | Earth      |
| XF56        | E       | -           | XF58      | E       | F100  | 70/0076 | Bk   | Earth      |
| XF57        | a       | -           | XF56      | a       | F98   | 33/0076 | 0    | 24V (Fire) |
| XF57        | a       | -           | XF58      | a       | F101  | 33/0076 | 0    | 24V (Fire) |
| XF57        | b       | -           | XF56      | b       | F99   | 33/0076 | 0    | 24V (Fire) |
| XF57        | b       | -           | XF58      | b       | F102  | 33/0076 | 0    | 24V (Fire) |
| XF58        | a       | -           | XF57      | a       | F101  | 33/0076 | 0    | 24V (Fire) |
| XF58        | a       | -           | XF59      | a       | F103  | 33/0076 | 0    | 24V (Fire) |
| XF58        | b       | -           | XF57      | b       | F102  | 33/0076 | 0    | 24V (Fire) |
| XF58        | b       | -           | XF59      | b       | F104  | 33/0076 | 0    | 24V (Fire) |
| XF57        | E       | -           | XF55      | E       | F100  | 70/0076 | Bk   | Earth      |
| XF58        | E       | -           | XF56      | E       | F100  | 70/0076 | Bk   | Earth      |
| XF57        | E       | -           | XF59      | E       | F105  | 70/0076 | Bk   | Earth      |
| XF58        | E       | -           | XF60      | E       | F105  | 70/0076 | Bk   | Earth      |
| XF59        | a       | -           | XF58      | a       | F103  | 33/0076 | 0    | 24V (Fire) |
| XF59        | a       | -           | XF60      | a       | F106  | 33/0076 | 0    | 24V (Fire) |
| XF59        | b       | -           | XF58      | b       | F104  | 33/0076 | 0    | 24V (Fire) |
| XF59        | b       | -           | XF60      | b       | F107  | 33/0076 | 0    | 24V (Fire) |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |

TABLE 22 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-LH CABINET  
(Sheet 2)

Unit XF 55 to 60

| UNIT ORIGIN  |         | DESTINATION |              |         | CABLE |         |      | SERVICE    |
|--------------|---------|-------------|--------------|---------|-------|---------|------|------------|
| CCT. REF.    | PIN NO. | UNIT NO.    | CCT. REF.    | PIN NO. | NO.   | TYPE    | COL. |            |
| XF60         | a       | -           | XF59         | a       | F106  | 33/0076 | 0    | 24V (Fire) |
| XF60         | a       | -           | XF61         | a       | F108  | 33/0076 | 0    | 24V (Fire) |
| XF60         | b       | -           | XF59         | b       | F107  | 33/0076 | 0    | 24V (Fire) |
| XF60         | b       | -           | XF61         | b       | F109  | 33/0076 | 0    | 24V (Fire) |
| XF59<br>XF60 | E       | -           | XF57<br>XF58 | E       | F105  | 70/0076 | Bk   | Earth      |
| XF59<br>XF60 | E       | EARTH BAR   |              |         | F110  | 70/0076 | Bk   | Earth      |
|              |         |             |              |         |       |         |      |            |
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TABLE 23 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-RH CABINET

Unit XF61 to 66

| UNIT ORIGIN  |         | DESTINATION |              |         | CABLE |         |      | SERVICE    |
|--------------|---------|-------------|--------------|---------|-------|---------|------|------------|
| CCT. REF.    | PIN NO. | UNIT NO.    | CCT. REF.    | PIN NO. | NO.   | TYPE    | COL. |            |
| XF61         | a       | -           | XF60         | a       | F108  | 33/0076 | 0    | 24V (Fire) |
| XF61         | a       | -           | XF62         | a       | F111  | 33/0076 | 0    | 24V (Fire) |
| XF61         | b       | -           | XF60         | b       | F109  | 33/0076 | 0    | 24V (Fire) |
| XF61         | b       | -           | XF62         | b       | F112  | 33/0076 | 0    | 24V (Fire) |
| XF62         | a       | -           | XF61         | a       | F111  | 33/0076 | 0    | 24V (Fire) |
| XF62         | a       | -           | XF63         | a       | F113  | 33/0076 | 0    | 24V (Fire) |
| XF62         | b       | -           | XF61         | b       | F112  | 33/0076 | 0    | 24V (Fire) |
| XF62         | b       | -           | XF63         | b       | F114  | 33/0076 | 0    | 24V (Fire) |
| XF61<br>XF62 | E       | -           | EARTH BAR    |         | F115  | 70/0076 | Bk   | Earth      |
| XF61<br>XF62 | E       | -           | XF63<br>XF64 | E       | F116  | 70/0076 | Bk   | Earth      |
| XF63         | a       | -           | XF62         | a       | F113  | 33/0076 | 0    | 24V (Fire) |
| XF63         | a       | -           | XF64         | a       | F117  | 33/0076 | 0    | 24V (Fire) |
| XF63         | b       | -           | XF62         | b       | F114  | 33/0076 | 0    | 24V (Fire) |
| XF63         | b       | -           | XF64         | b       | F118  | 33/0076 | 0    | 24V (Fire) |
| XF64         | a       | -           | XF63         | a       | F117  | 33/0076 | 0    | 24V (Fire) |
| XF64         | a       | -           | XF65         | a       | F119  | 33/0076 | 0    | 24V (Fire) |
| XF64         | b       | -           | XF63         | b       | F118  | 33/0076 | 0    | 24V (Fire) |
| XF64         | b       | -           | XF65         | b       | F120  | 33/0076 | 0    | 24V (Fire) |
| XF63<br>XF64 | E       | -           | XF61<br>XF62 | E       | F116  | 70/0076 | Bk   | Earth      |
| XF63<br>XF64 | E       | -           | XF65<br>XF66 | E       | F121  | 70/0076 | Bk   | Earth      |
| XF65         | a       | -           | XF64         | a       | F119  | 33/0076 | 0    | 24V (Fire) |
| XF65         | a       | -           | XF66         | a       | F122  | 33/0076 | 0    | 24V (Fire) |
| XF65         | b       | -           | XF64         | b       | F120  | 33/0076 | 0    | 24V (Fire) |
| XF65         | b       | -           | XF66         | b       | F123  | 33/0076 | 0    | 24V (Fire) |
| XF66         | a       | -           | XF65         | a       | F122  | 33/0076 | 0    | 24V (Fire) |
| XF66         | a       | -           | XF67         | a       | F124  | 33/0076 | 0    | 24V (Fire) |
| XF66         | b       | -           | XF65         | b       | F123  | 33/0076 | 0    | 24V (Fire) |
| XF66         | b       | -           | XF67         | b       | F125  | 33/0076 | 0    | 24V (Fire) |
| XF65<br>XF66 | E       | -           | XF63<br>XF64 | E       | F121  | 70/0076 | Bk   | Earth      |
| XF65<br>XF66 | E       | -           | XF67<br>XF68 | E       | F126  | 70/0076 | Bk   | Earth      |

TABLE 24 INTERCONNECTIONS TO FIRE DETECTION SYSTEM-RH ANNEX

Unit XF67 and 68

| UNIT ORIGIN   |         | DESTINATION |              |         | CABLE |         |      | SERVICE    |
|---------------|---------|-------------|--------------|---------|-------|---------|------|------------|
| CCT. REF.     | PIN NO. | UNIT NO.    | CCT. REF.    | PIN NO. | NO.   | TYPE    | COL. |            |
| XF67          | a       | -           | XF66         | a       | F124  | 33/0076 | 0    | 24V (Fire) |
| XF67          | a       | -           | XF68         | a       | F127  | 33/0076 | 0    | 24V (Fire) |
| XF67          | b       | -           | XF66         | b       | F125  | 33/0076 | 0    | 24V (Fire) |
| XF67          | b       | -           | XF68         | b       | F128  | 33/0076 | 0    | 24V (Fire) |
|               |         |             |              |         |       |         |      |            |
| XF68          | a       | -           | XF67         | a       | F127  | 33/0076 | 0    | 24V (Fire) |
| XF68          | a       | FJ1         | TB3          | 4       | F129  | 33/0076 | 0    | 24V (Fire) |
| XF68          | b       | -           | XF67         | b       | F128  | 33/0076 | 0    | 24V (Fire) |
| XF68          | b       | FJ1         | TB3          | 3       | F130  | 33/0076 | 0    | 24V (Fire) |
|               |         |             |              |         |       |         |      |            |
| XF67/<br>XF68 | E       | -           | XF65<br>XF66 | E       | F126  | 70/0076 | Bk   | Earth      |
|               |         |             |              |         |       |         |      |            |
|               |         |             |              |         |       |         |      |            |
|               |         |             |              |         |       |         |      |            |
|               |         |             |              |         |       |         |      |            |
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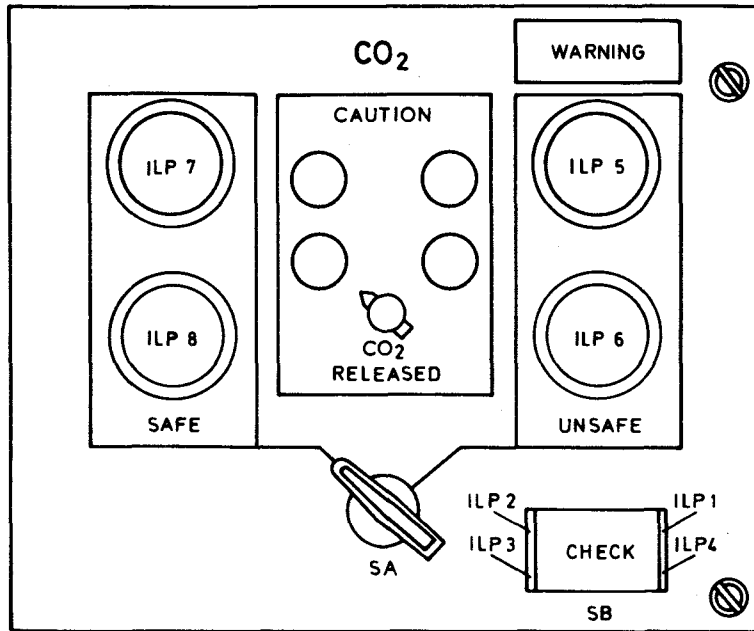


Fig.4 Control auto-release: front (5940-99-953-4168)

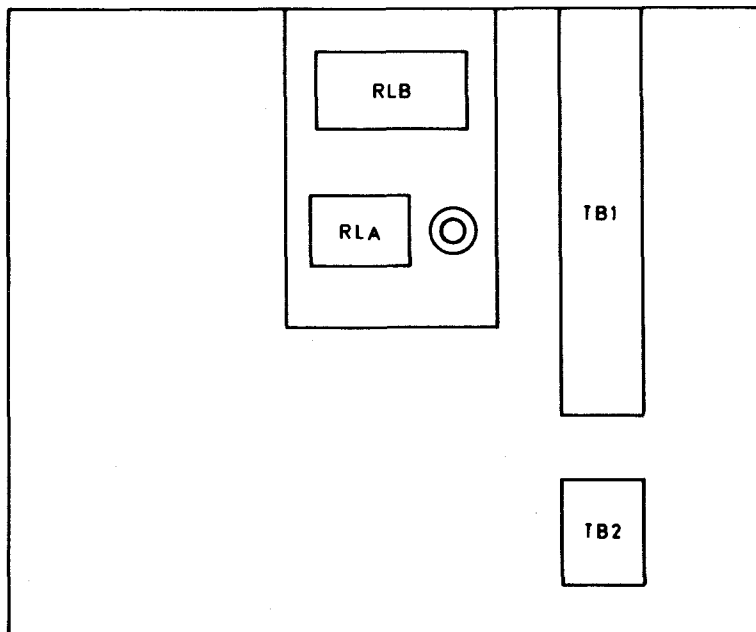


Fig.5 Control auto-release: interior

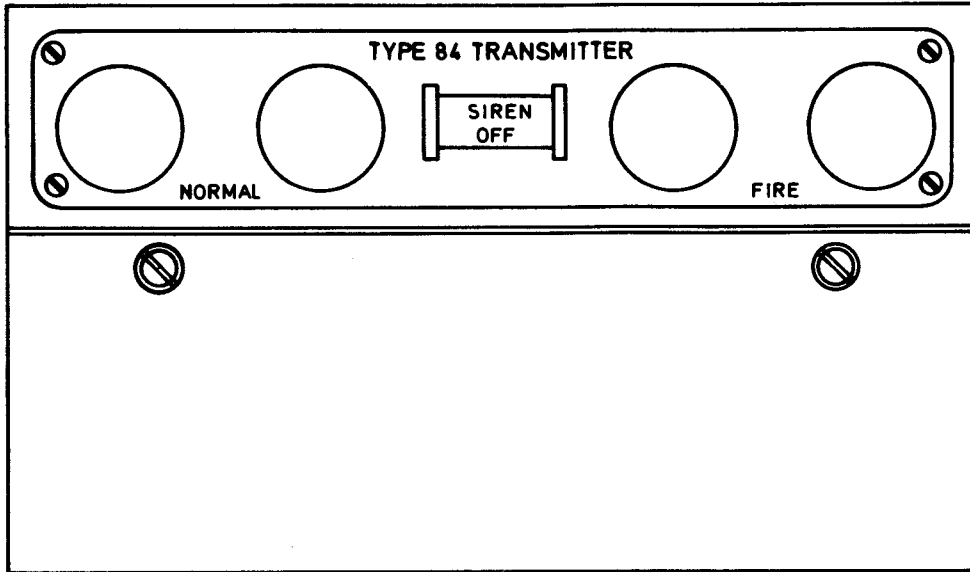


Fig.6 Control alarm: front (5840-99-4170)

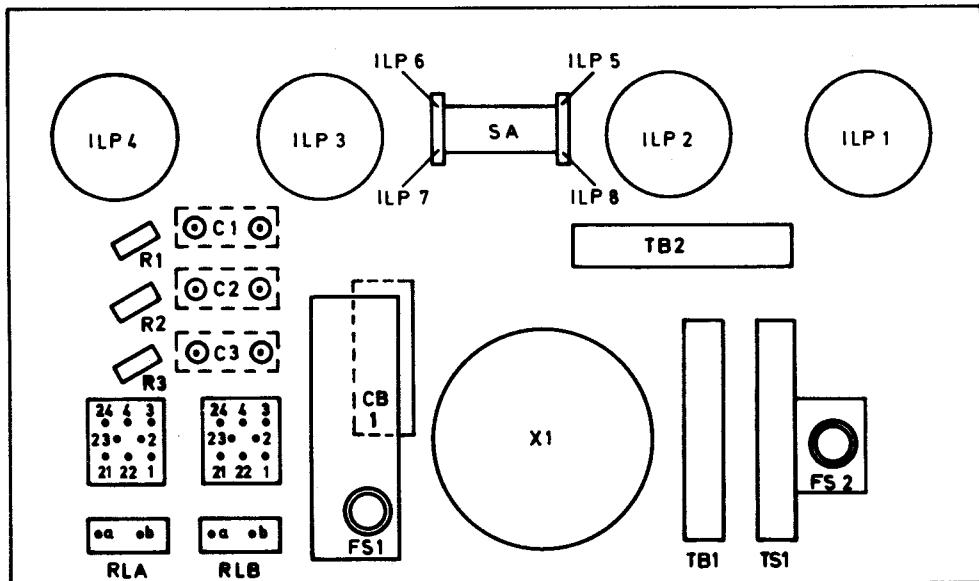
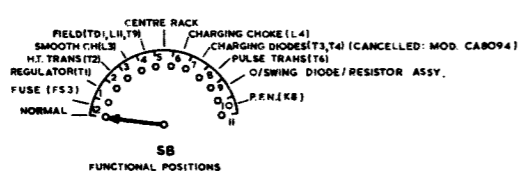
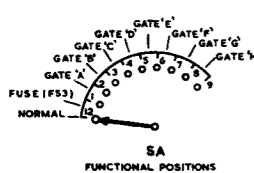
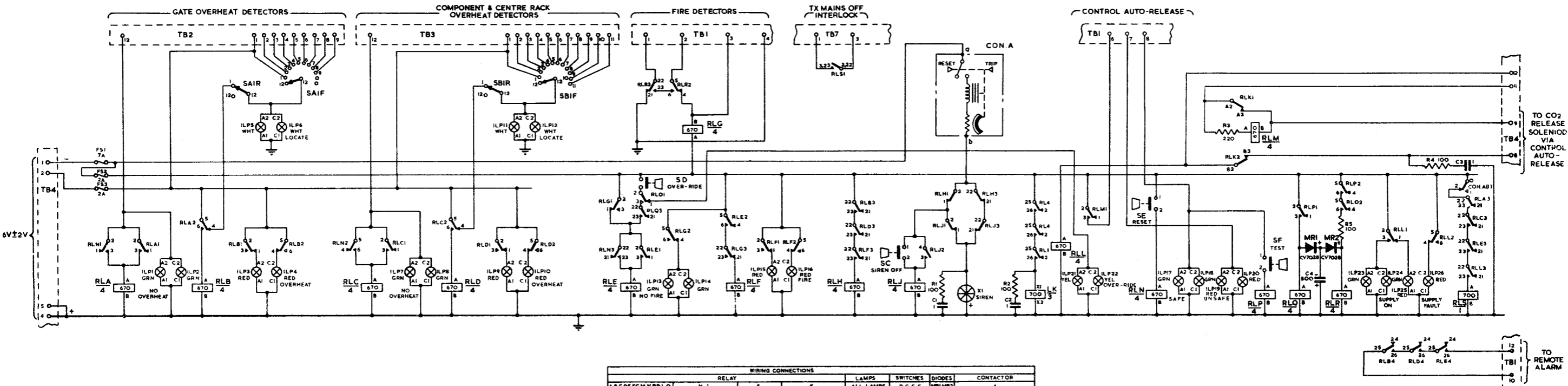


Fig.7 Control alarm: interior



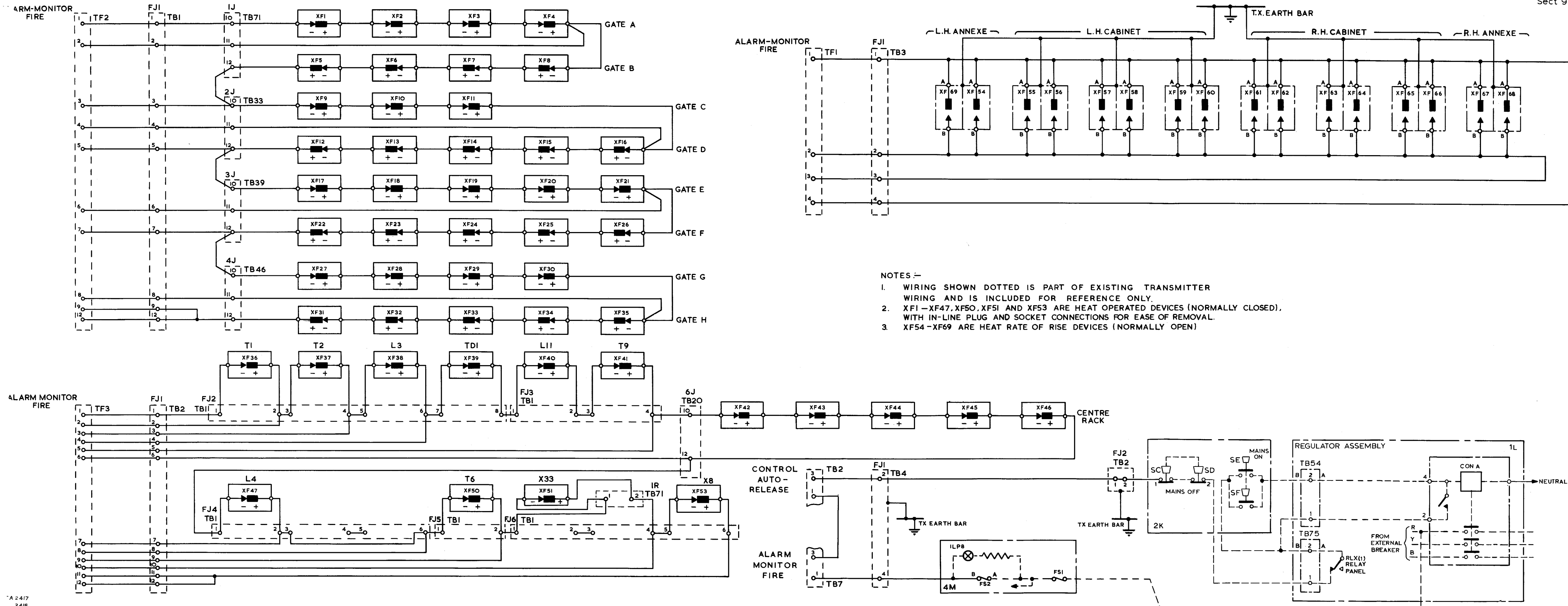
| WIRING CONNECTIONS          |       |       |          |           |           |         |
|-----------------------------|-------|-------|----------|-----------|-----------|---------|
|                             | RELAY | LAMPS | SWITCHES | DIODES    | CONTACTOR |         |
| A.B.C.D.E.F.G.H.M.N.P.R.L.O | H.J   | S     | K        | ALL LAMPS | D.C.E.F   | MRL/MR2 |
|                             |       |       |          |           |           |         |

NOTE - THE FOLLOWING RELAY SWITCH ACTIONS ARE UNUSED -  
 RLG4, RLM2, RLH4, RLJ4, RLK3, RLM2, RLM3,  
 RLM4, RLH4, RLP3, RLP4, RLQ4, RLL4, RLP1, RLH4.

Fig. 8

Alarm-monitor, fire circuit

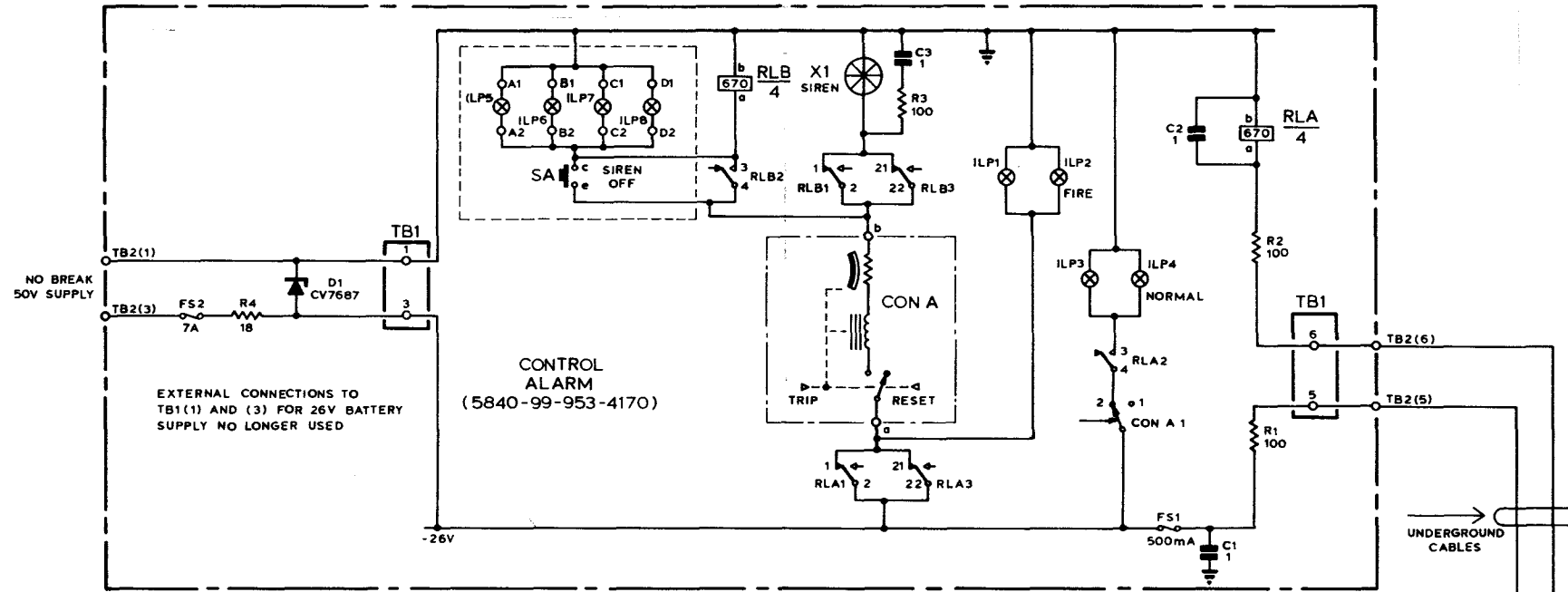
Fig. 8  
 Chap. 4  
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- NOTES :-
1. WIRING SHOWN DOTTED IS PART OF EXISTING TRANSMITTER WIRING AND IS INCLUDED FOR REFERENCE ONLY.
  2. XF1 - XF47, XF50, XF51 AND XF53 ARE HEAT OPERATED DEVICES (NORMALLY CLOSED), WITH IN-LINE PLUG AND SOCKET CONNECTIONS FOR EASE OF REMOVAL.
  3. XF54 - XF69 ARE HEAT RATE OF RISE DEVICES (NORMALLY OPEN)

Overheat and fire detector : circuit

REMOTE LOCATION



NOTE:  
TERMINAL BLOCKS SHOWN DOTTED  
ARE PART OF ALARM MONITOR  
FIRE CCT DIAGRAM

EXTERNAL CONNECTIONS TO  
TB1(1) AND (3) FOR 26V BATTERY  
SUPPLY NO LONGER USED

CONTROL  
ALARM  
(5840-99-953-4170)

R17 BUILDING (TRANSMITTER)

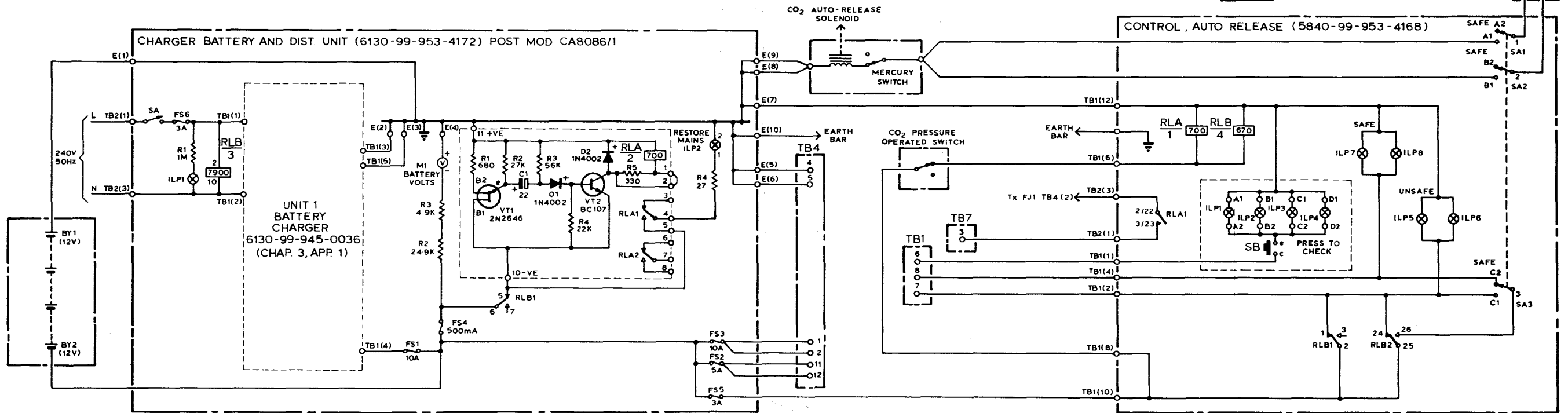


Fig.10

Jan. 81 (Amdt. 19)

Fire detection system: CO<sub>2</sub> control and remote alarm circuit

Fig.10

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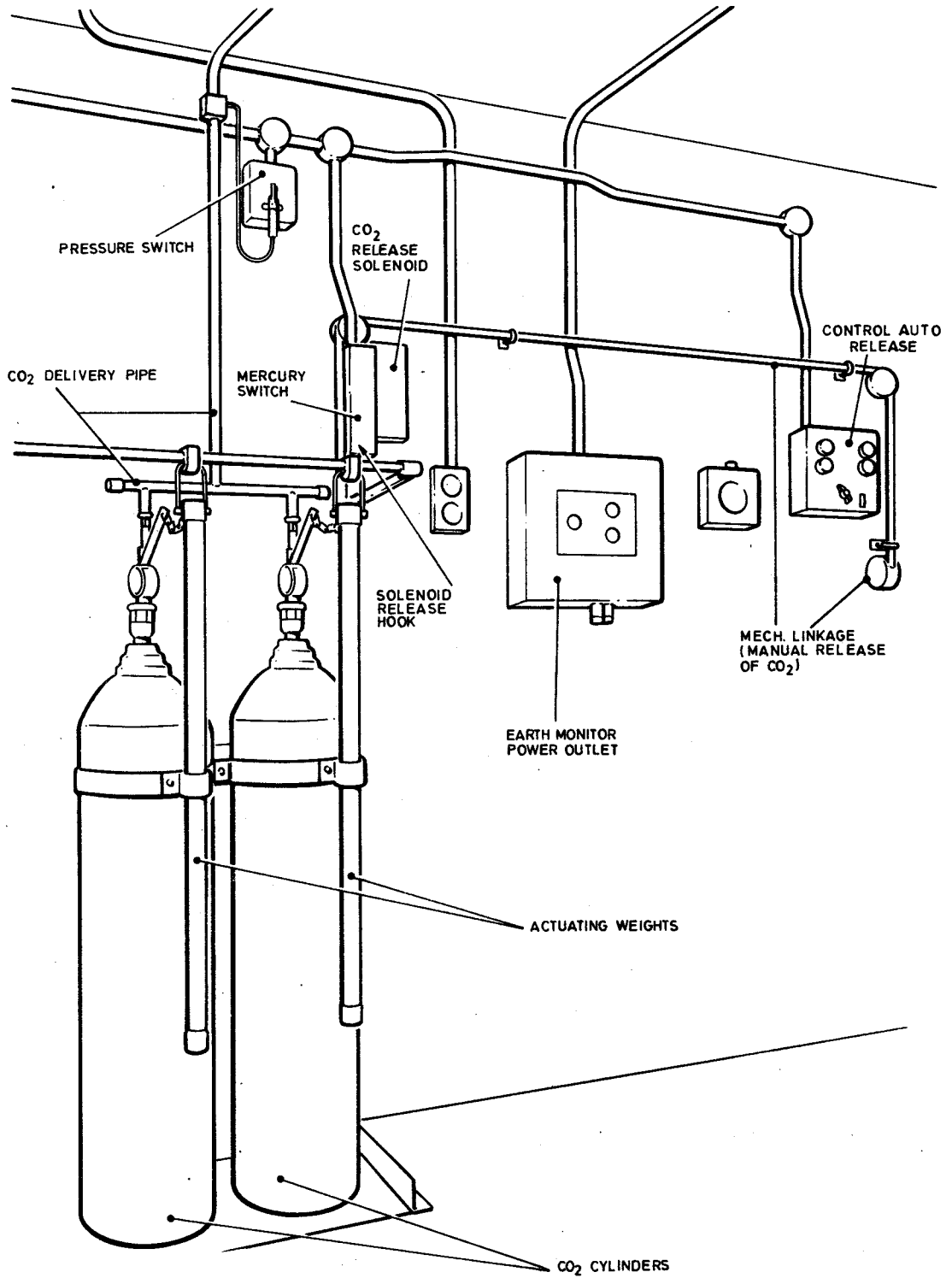


Fig.11 CO2 cylinder installation: location of components

Chapter 4 Appendix 1OVERHEAT DETECTOR THERMOSTATIC SWITCHES

## CONTENTS

## Para.

- 1 Introduction
- 3 Alternative switches
- 4 Future replacement switches
- 5 Fitting replacement Fenwall type switches
- 7 Operating temperature checks

INTRODUCTION

1 Replacements for the following thermostatic switches scheduled for use in the overheat detector circuits are no longer obtainable.

- 1.1 10F/5930-99-953-1858 Gravinette Type TCS 3150, set to 60°C
- 1.2 10F/5930-99-970-9190 Gravinette Type TCS 3150, set to 70°C
- 1.3 Niv Gravinette Type TCS 3150, set to 80°C

2 The Gravinette switch set to 80°C (para.1.3) is not a referenced component but forms part of the sensing elements 10F/4210-99-970-5650, fitted as air temperature sensing detectors in the TX/RX compartment gates. The sensing element must be replaced if this thermostatic switch is found to be defective.

ALTERNATIVE SWITCHES

3 Any of the following thermostatic switches held as spares may be used as indicated to replace those listed in para.1.1 and 1.2. Any resetting necessary should be carried out in accordance with the procedures given in AP 115H-0104-1, Sect.10, Chap.1, Paras.21 and 22.

- 3.1 10F/5930-99-956-7029, set to 70°C or 10F/5930-99-622-0232 set to 70°C. May be used as an alternative for para.1.2 and may also be used as an alternative for para.1.1 after resetting to 60°C.
- 3.2 10F/5930-99-112-7532, no specific initial setting. May be used as an alternative for para.1.1 or para.1.2 after setting to the appropriate temperature.
- 3.3 10F/5930-99-622-0234, set to 60°C. May be used as an alternative for para.1.1 and may also be reset to 70°C for use as an alternative for para.1.2.

FUTURE REPLACEMENT SWITCHES

4 As stocks of the switches quoted in paras.1 and 2 are exhausted, hermetically sealed and temperature preset thermostatic switches, Fenwall Incorporated Type 32410-2, will be supplied as follows:

| NATO No.         | Temp. setting | Circuit reference<br>(Sect.9, Chap.4, Fig.9) |
|------------------|---------------|--|
| 5930-99-659-5332 | 50°C          | XF51   |
| 5930-99-525-4100 | 60°C          | XF36-38                                      |
| 5930-99-519-4877 | 70°C          | XF39, 40, 47, 50 and 53                      |

FITTING REPLACEMENT FENWALL TYPE SWITCHES

5 The original Gravinette Type TCS3150 thermostatic switches are held in position by two 6BA shouldered screws (5305-99-194-6740) and 6BA spring tension washers (5310-99-913-2134). The replacement switch, Fenwall Type 32410-2 is held by a separate spring clip, (supplied with each switch) which is in turn secured by:

- (1) Screw 6BA, 1/8 in. lg. Ch. Hd. ss Qty.2 (5305-99-915-0550).
- (2) Washer 6BA, spring tension Qty.2 (5310-99-913-2134).

6 When a Gravinette type switch is to be replaced with a Fenwall type, the above fixings should be used and the 6BA shouldered screws returned to the reserve stock of thermostat fixing spares; part of Test Set Fire Detector (5840-99-194-6737) housed in Box 39.

OPERATING TEMPERATURE CHECKS

7 The operating temperature of the Fenwall Type 32410-2 switches may be checked using the procedures detailed in AP 115H-0104-1, Sect.10, Chap.1. Any switch that fails to operate within +5% of its specified operating temperature must be discarded; no attempt should be made to reset the operating point. The adjustment procedures detailed in the AP reference apply to the original Gravinette type switches only.



AP  
10

## SECTION 10

# INTERCONNECTIONS

Chapter 1

TRANSMITTER INTERCONNECTIONS

CONTENTS

Para  
1 Introduction

TABLES

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| 6 Wavemeter r.f. ... ..                             | 2B 8  |
| 7 Monitor noise figure M1 ... ..                    | 3B 9  |
| 8 Power supply d.c. heaters M5 ... ..               | 4B 10 |
| 9 Amplifier assembly (i.f. and video) M28 ... ..    | 1C 11 |
| 10 Panel Monitor M13 ... ..                         | 2C 12 |
| 11 Power supply (+200V) M10 ... ..                  | 3C 14 |
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| 15 Power supply (+200V) M10 ... ..                  | 4D 19 |
| 16 Power supply (+300V) M10 ... ..                  | 5D 20 |
| 17 Panel test electrical (No.3) M14 ... ..          | 1E 21 |
| 18 Power supply (+300V) M10 ... ..                  | 2E 23 |
| 19 Power supply (+300V) M10 ... ..                  | 3E 24 |
| 20 Power supply (+300V) M10 ... ..                  | 4E 25 |
| 21 Power supply (+300V) M10 ... ..                  | 5E 26 |
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| 23 Amplifier direct current M31 ... ..              | 2F 29 |
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| 33 Power supply (+300V) M10 ... ..                  | 3H 40 |
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| 35 Power supply (500V) M6 ... ..                    | 5H 42 |
| 36 Junction panel L.H. ... ..                       | 1J 43 |
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| 39 Junction panel R.H. ... ..                       | 4J 61 |
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(Contd.)

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| 43    | Light and switch assembly L.H.                                   | ... | ... | ... | ... | ... | 2K | 86   |
| 44    | Light and switch assembly R.H.                                   | ... | ... | ... | ... | ... | 3K | 88   |
| 45    | Light and meter panel R.H.                                       | ... | ... | ... | ... | ... | 4K | 90   |
| 46    | Regulator assembly 1   | ... | ... | ... | ... | ... | 1L | 96   |
| 47    | Transformer assembly   | ... | ... | ... | ... | ... | 2L | 99   |
| 48    | Power supply and reactor assembly M34                            | ... | ... | ... | ... | ... | 1M | 100  |
| 49    | Rectifier (protection unit, mag. field) M1                       | ... | ... | ... | ... | ... | 2M | 101  |
| 50    | Circuit breaker assembly   | ... | ... | ... | ... | ... | 3M | 102  |
| 51    | Fuse panel   | ... | ... | ... | ... | ... | 4M | 105  |
| 52    | Transformer assembly   | ... | ... | ... | ... | ... | 5M | 106  |
| 53    | Magnetron heater circuit breaker assembly                        | ... | ... | ... | ... | ... | 6M | 107  |
| 54    | Waveguide frame assembly   | ... | ... | ... | ... | ... | 1N | 108  |
| 54A   | Amplifier r.f. and noise source                                  | ... | ... | ... | ... | ... | 2N | 111  |
| 55A   | Probe waveguide  | ... | ... | ... | ... | ... | 7N | 111  |
| 55B   | Probe waveguide  | ... | ... | ... | ... | ... | 8N | 111  |
| 56    | Charging diode assembly  | ... | ... | ... | ... | ... | 1P | 112  |
| 57    | Pneumatics assembly  | ... | ... | ... | ... | ... | 2P | 113  |
| 58    | Magnetron cooling and frame assembly                             | ... | ... | ... | ... | ... | 3P | 114  |
| 59    | Switch electronic M6   | ... | ... | ... | ... | ... | 1Q | 116  |
| 60    | Pulse transformer  | ... | ... | ... | ... | ... | 2Q | 118  |
| 61    | Right-hand annexe  | ... | ... | ... | ... | ... | 1R | 119  |
| 62    | Relay assembly   | ... | ... | ... | ... | ... | 2R | 122  |
| 63    | Not allocated  | ... | ... | ... | ... | ... |    | 123  |
| 64    | Panel test electrical (No.6) M58                                 | ... | ... | ... | ... | ... | 2S | 124  |
| 65    | Not allocated  | ... | ... | ... | ... | ... |    | 125  |
| 66    | Panel termination  | ... | ... | ... | ... | ... | 5S | 126  |
| 67    | Left-hand cooling assembly                                       | ... | ... | ... | ... | ... | 1T | 127  |
| 68    | Right-hand cooling assembly                                      | ... | ... | ... | ... | ... | 2T | 128  |
| 69    | Right-hand cabinet miscellaneous                                 | ... | ... | ... | ... | ... |    | 130  |
| 70    | Left-hand cabinet miscellaneous                                  | ... | ... | ... | ... | ... |    | 132  |
| 71    | Control box airflow alarm (Mod. CA2988)                          | ... | ... | ... | ... | ... | 3R | 135  |
| 72    | Relay Unit S53-3757-01 (Mod CA8271)                              | ... | ... | ... | ... | ... | 1L | 137  |
| 73    | Relay Unit S53-0617-01 (Mod CA8089) 5840-99-662-4411 (Neat only) | ... | ... | ... | ... | ... | 5P | 139  |

INTRODUCTION

1 In this chapter details are given in table form of unit inter-connections in the transmitter. Each table lists the connections leaving the unit to which it refers (UNIT ORIGIN) and the unit to which it is connected (DESTINATION). The tables are arranged in the alphabetical and numerical sequence of the coding of the units to which they refer as detailed in the List of Tables.

2 Under the heading, CABLE, in the tables is given in cable No., a number allocated to a connection between two points and repeated in the tables at both ends; the type, enabling an inter-connection to be replaced by a cable of the correct type should an existing cable become damaged, and the colour to facilitate identification of a particular cable in a cableform.

3 Where possible detail of the service carried out by each inter-connection is indicated in the final column, SERVICE.

TABLE 1  
Panel test electrical (No.1) M9: connections  
5840-99-999-9031

Unit location 1A

| UNIT ORIGIN |         |          | DESTINATION |         |      | CABLE   |      | SERVICE      |
|-------------|---------|----------|-------------|---------|------|---------|------|--------------|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | NO.  | TYPE    | COL. |              |
| TB1         | 1B      | 1J       | TB24        | 1B      | 47   | 23/0076 | R    | 300V (2E)    |
| TB1         | 3B      | 1J       | TB24        | 2B      | 48   | 23/0076 | R    | 300V (4E)    |
| TB1         | 4B      | 1J       | TB24        | 3B      | 49   | 23/0076 | R    | 200V (4D)    |
| TB1         | 5B      | 1J       | TB24        | 4B      | 50   | 23/0076 | R    | 200V (5D)    |
| TB1         | 6B      | 2A       | TB1         | 4B      | 494  | 23/0076 | R    | 300V (2E)    |
| TB1         | 7B      | 2A       | TB2         | 9B      | 495  | 23/0076 | R    | 300V (2E)    |
| TB1         | 8B      | 1B       | TB1         | 3B      | 496  | 23/0076 | R    | 300V (2E)    |
| TB1         | 10B     | 3B       | TB1         | 10B     | 504  | 23/0076 | R    | 300V (4E)    |
| TB1         | 11B     | 3A       | TB1         | 5B      | 505  | 23/0076 | R    | 200V (5D)    |
| TB1         | 12B     | 2A       | TB1         | 3B      | 506  | 23/0076 | R    | 200V (4D)    |
| TB2         | 1B      | 4A       | TB1         | 9B      | 507  | 23/0076 | R    | 200V (4D)    |
| TB2         | 2B      | 1B       | TB1         | 4B      | 508  | 23/0076 | R    | 200V (5D)    |
| TB2         | 3B      | 2B       | TB1         | 5B      | 509  | 23/0076 | R    | 200V (5D)    |
| TB2         | 4B      | 1J       | TB24        | 5B      | 51   | 23/0076 | V    | -250V        |
| TB2         | 5B      | 2A       | TB1         | 2B      | 510  | 23/0076 | V    | -250V        |
| TB2         | 6B      | 1B       | TB1         | 5B      | 511  | 23/0076 | V    | -250V        |
| TB2         | 7B      | 2B       | TB1         | 6B      | 512  | 23/0076 | V    | -250V        |
| TB2         | 8B      | 3B       | TB1         | 11B     | 513  | 23/0076 | V    | -250V        |
| TB2         | 9B      | 2A       | TB2         | 3B      | 514  | 23/0076 | P    | L.O. Refl. V |
| TB2         | 10B     | 1B       | TB1         | 8B      | 515  | 23/0076 | P    | S.A. Refl. V |
| TB2         | 11B     | 2A       | TB1         | 1B      | 516  | 23/0076 | V    | -600V        |
| TB2         | 12B     | 1J       | TB24        | 6B      | 52   | 23/0076 | V    | -600V (4F)   |
| TB3         | 1B      | 1J       | TB24        | 10B     | 54   | 23/0076 | R    | Red Phase    |
| TB3         | 2B      | 2A       | TB1         | 10B     | 517  | 23/0076 | R    | 240V         |
| TB3         | 3B      | 1B       | TB1         | 11B     | 518  | 23/0076 | R    | 240V         |
| TB3         | 5B      | 4B       | TB1         | 10B     | 520  | 23/0076 | R    | 240V         |
| TB3         | 7B      | 3B       | TB1         | 8B      | 521  | 23/0076 | R    | 200V         |
| TB3         | 8B      | 4B       | TB1         | 7B      | 1278 | 23/0076 | V    | -250V        |
| TB3         | 10B     | 4B       | TB1         | 5B      | 523  | 70/0076 | Bn   | D.C. Heaters |
| TB3         | 11B     | 4B       | TB1         | 6B      | 524  | 70/0076 | Bn   | D.C. Heaters |
| TB3         | 12B     | 2A       | TB1         | 12B     | 525  | 23/0076 | Bk   | Earth        |
| TB3         | 12B     | 1J       | TB24        | 12B     | 56   | 23/0076 | Bk   | Earth        |

TABLE 2  
Control (STALO) M4  
5840-99-999-9017

Unit location 2A

| UNIT ORIGIN |         |          | DESTINATION |         |      | CABLE   |      | SERVICE            |
|-------------|---------|----------|-------------|---------|------|---------|------|--------------------|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | NO.  | TYPE    | COL. |                    |
| TB1         | 1B      | 1A       | TB2         | 11B     | 516  | 23/0076 | V    | -600V              |
| TB1         | 1B      | 1B       | TB1         | 6B      | 1229 | 23/0076 | V    | -600V              |
| TB1         | 2B      | 1A       | TB2         | 5B      | 510  | 23/0076 | V    | -250V              |
| TB1         | 3B      | 1A       | TB1         | 12B     | 506  | 23/0076 | R    | 200V               |
| TB1         | 4B      | 1A       | TB1         | 6B      | 494  | 23/0076 | R    | 300V               |
| TB1         | 5B      | 4A       | TB1         | 5B      | 518  | 23/0076 | P    | MOTOR CON.1        |
| TB1         | 6B      | 4A       | TB1         | 6B      | 519  | 23/0076 | P    | MOTOR CON.4        |
| TB1         | 7B      | 4A       | TB1         | 7B      | 520  | 23/0076 | P    | MOTOR CON.3        |
| TB1         | 8B      | 4A       | TB1         | 8B      | 521  | 23/0076 | P    | MOTOR CON.2        |
| TB1         | 9B      | 1B       | TB1         | 10B     | 522  | 23/0076 | Bk   | Neutral            |
| TB1         | 9B      | 1J       | TB23        | 12B     | 34   | 23/0076 | Bk   | Neutral            |
| TB1         | 10B     | 1A       | TB3         | 2B      | 517  | 23/0076 | R    | 240V               |
| TB1         | 11B     | 1B       | TB1         | 9B      | 21   | 23/0076 | P    | A.F.C. Mute        |
| TB1         | 11B     | 1J       | TB23        | 1B      | 31   | 23/0076 | P    | A.F.C. Mute        |
| TB1         | 12B     | 1A       | TB3         | 12B     | 525  | 23/0076 | Bk   | Earth              |
| TB1         | 12B     | 3A       | TB1         | 12B     | 1510 | 23/0076 | Bk   | Earth              |
|             |         |          |             |         |      |         |      |                    |
| TB2         | 1B      | 4A       | TB1         | 10B     | 1511 | 23/0076 | P    | Sector Phase       |
| TB2         | 2B      | 3A       | TB1         | 10B     | 526  | 23/0076 | P    | STALO Mute         |
| TB2         | 3B      | 1A       | TB2         | 9B      | 514  | 23/0076 | P    | L.O. Refl. V       |
| TB2         | 4B      | 4A       | TB1         | 11B     | 529  | 23/0076 | P    | Sector Phase       |
| TB2         | 6B      | 1J       | TB24        | 9B      | 53   | 23/0076 | P    | ON TUNE (50V Out)  |
| TB2         | 7B      | 1J       | TB24        | 11B     | 55   | 23/0076 | P    | Tune Common        |
| TB2         | 8B      | 3A       | TB1         | 7B      | 527  | 23/0076 | Y    | 50V                |
| TB2         | 8B      | 3B       | TB1         | 7B      | 528  | 23/0076 | Y    | 50V                |
| TB2         | 9B      | 1A       | TB1         | 7B      | 495  | 23/0076 | R    | 300V               |
| TB2         | 10B     | 4A       | TB1         | 4B      | 530  | 23/0076 | R    | 300V               |
| TB2         | 11B     | 1J       | TB23        | 2B      | 32   | 23/0076 | Y    | STALO Low          |
| TB2         | 12B     | 1J       | TB23        | 3B      | 33   | 23/0076 | Y    | STALO High         |
|             |         |          |             |         |      |         |      |                    |
| 3PLC        |         | 3A       | PLC         |         | 531  | UR.70   |      | L.O.I/P            |
| 3PLD        |         | 1N       | 1PLX2       |         | 532  | UR.70   |      | Tx Sample          |
| 1PLC        |         | 1B       | 3PLH        |         | 533  | UR.70   |      | A.F.C. WOB.        |
| 1PLF        |         | 1J       | TB21        | 1B      | 7    | UR.70   |      | Monitor R.F. Pulse |
| 1PLF        |         | 1J       | TB21        | 2B      | 7    | SCREEN  |      |                    |
| 1PLG        |         | 1J       | TB21        | 3B      | 8    | UR.70   |      | A.F.C. Disc        |
| 1PLG        |         | 1J       | TB21        | 4B      | 8    | SCREEN  |      |                    |
| 1PLX        |         | 5J       | SKTL        |         | 449  | UR.70   |      | Lock Pulse         |
| 2PLB        |         | 2B       | PLA         |         | 534  | UR.70   |      | Standby L.O.       |

TABLE 1  
 Panel test electrical (No. 1) M9: connections  
 5840-99-999-9031

Unit location 1A

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE      |
|-------------|---------|-------------|----------|---------|-------|---------|------|--------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |              |
| TB1         | 1B      | 1J          | TB24     | 1B      | 47    | 23/0076 | R    | 300V (2E)    |
| TB1         | 3B      | 1J          | TB24     | 2B      | 48    | 23/0076 | R    | 300V (4E)    |
| TB1         | 4B      | 1J          | TB24     | 3B      | 49    | 23/0076 | R    | 200V (4D)    |
| TB1         | 5B      | 1J          | TB24     | 4B      | 50    | 23/0076 | R    | 200V (5D)    |
| TB1         | 6B      | 2A          | TB1      | 4B      | 494   | 23/0076 | R    | 300V (2E)    |
| TB1         | 7B      | 2A          | TB2      | 9B      | 495   | 23/0076 | R    | 300V (2E)    |
| TB1         | 8B      | 1B          | TB1      | 3B      | 496   | 23/0076 | R    | 300V (2E)    |
| TB1         | 10B     | 3B          | TB1      | 10B     | 504   | 23/0076 | R    | 300V (4E)    |
| TB1         | 11B     | 3A          | TB1      | 5B      | 505   | 23/0076 | R    | 200V (5D)    |
| TB1         | 12B     | 2A          | TB1      | 3B      | 506   | 23/0076 | R    | 200V (4D)    |
| TB2         | 1B      | 4A          | TB1      | 9B      | 507   | 23/0076 | R    | 200V (4D)    |
| TB2         | 2B      | 1B          | TB1      | 4B      | 508   | 23/0076 | R    | 200V (5D)    |
| TB2         | 3B      | 2B          | TB1      | 5B      | 509   | 23/0076 | R    | 200V (5D)    |
| TB2         | 4B      | 1J          | TB24     | 5B      | 51    | 23/0076 | V    | -250V        |
| TB2         | 5B      | 2A          | TB1      | 2B      | 510   | 23/0076 | V    | -250V        |
| TB2         | 6B      | 1B          | TB1      | 5B      | 511   | 23/0076 | V    | -250V        |
| TB2         | 7B      | 2B          | TB1      | 6B      | 512   | 23/0076 | V    | -250V        |
| TB2         | 8B      | 3B          | TB1      | 11B     | 513   | 23/0076 | V    | -250V        |
| TB2         | 9B      | 2A          | TB2      | 3B      | 514   | 23/0076 | P    | L.O. Refl.V  |
| TB2         | 10B     | 1B          | TB1      | 8B      | 515   | 23/0076 | P    | S.A. Refl.V  |
| TB2         | 11B     | 2A          | TB1      | 1B      | 516   | 23/0076 | V    | -600V        |
| TB2         | 12B     | 1J          | TB24     | 6B      | 52    | 23/0076 | V    | -600V (4F)   |
| TB3         | 1B      | 1J          | TB24     | 10B     | 54    | 23/0076 | R    | Red Phase    |
| TB3         | 2B      | 2A          | TB1      | 10B     | 517   | 23/0076 | R    | 240V         |
| TB3         | 3B      | 1B          | TB1      | 11B     | 518   | 23/0076 | R    | 240V         |
| TB3         | 5B      | 4B          | TB1      | 10B     | 520   | 23/0076 | R    | 240V         |
| TB3         | 7B      | 3B          | TB1      | 8B      | 521   | 23/0076 | R    | 240V         |
| TB3         | 8B      | 4B          | TB1      | 7B      | 1278  | 23/0076 | V    | -250V        |
| TB3         | 10B     | 4B          | TB1      | 5B      | 523   | 70/0076 | Bn   | D.C. Heaters |
| TB3         | 11B     | 4B          | TB1      | 6B      | 524   | 70/0076 | Bn   | D.C. Heaters |
| TB3         | 12B     | 2A          | TB1      | 12B     | 525   | 23/0076 | Bk   | Earth        |
| TB3         | 12B     | 1J          | TB24     | 12B     | 56    | 23/0076 | Bk   | Earth        |

TABLE 2  
Control (STALO) M4  
5840-99-999-9017

Unit location 2A

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE            |
|-------------|---------|-------------|----------|---------|-------|---------|------|--------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                    |
| TB1         | 1B      | 1A          | TB2      | 11B     | 516   | 23/0076 | V    | -600V              |
| TB1         | 1B      | 1B          | TB1      | 6B      | 1229  | 23/0076 | V    | -600V              |
| TB1         | 2B      | 1A          | TB2      | 5B      | 510   | 23/0076 | V    | -250V              |
| TB1         | 3B      | 1A          | TB1      | 12B     | 506   | 23/0076 | R    | 200V               |
| TB1         | 4B      | 1A          | TB1      | 6B      | 494   | 23/0076 | R    | 300V               |
| TB1         | 5B      | 4A          | TB1      | 5B      | 518   | 23/0076 | P    | MOTOR CON.1        |
| TB1         | 6B      | 4A          | TB1      | 6B      | 519   | 23/0076 | P    | MOTOR CON.4        |
| TB1         | 7B      | 4A          | TB1      | 7B      | 520   | 23/0076 | P    | MOTOR CON.3        |
| TB1         | 8B      | 4A          | TB1      | 8B      | 521   | 23/0076 | P    | MOTOR CON.2        |
| TB1         | 9B      | 1B          | TB1      | 10B     | 522   | 23/0076 | Bk   | Neutral            |
| TB1         | 9B      | 1J          | TB23     | 12B     | 34    | 23/0076 | Bk   | Neutral            |
| TB1         | 10B     | 1A          | TB3      | 2B      | 517   | 23/0076 | R    | 240V               |
| TB1         | 11B     | 1B          | TB1      | 9B      | 21    | 23/0076 | P    | A.F.C. Mute        |
| TB1         | 11B     | 1J          | TB23     | 1B      | 31    | 23/0076 | P    | A.F.C. Mute        |
| TB1         | 12B     | 1A          | TB3      | 12B     | 525   | 23/0076 | Bk   | Earth              |
| TB1         | 12B     | 3A          | TB1      | 12B     | 1510  | 23/0076 | Bk   | Earth              |
| TB2         | 1B      | 4A          | TB1      | 10B     | 1511  | 23/0076 | P    | Sector Phase       |
| TB2         | 2B      | 3A          | TB1      | 10B     | 526   | 23/0076 | P    | STALO Mute         |
| TB2         | 3B      | 1A          | TB2      | 9B      | 514   | 23/0076 | P    | L.O.Ref1.V         |
| TB2         | 4B      | 4A          | TB1      | 11B     | 529   | 23/0076 | P    | Sector Phase       |
| TB2         | 6B      | 1J          | TB24     | 9B      | 53    | 23/0076 | P    | ON TUNE (50V Out)  |
| TB2         | 7B      | 1J          | TB24     | 11B     | 55    | 23/0076 | P    | Tune Common        |
| TB2         | 8B      | 3A          | TB1      | 7B      | 527   | 23/0076 | Y    | 50V                |
| TB2         | 8B      | 3B          | TB1      | 7B      | 528   | 23/0076 | Y    | 50V                |
| TB2         | 9B      | 1A          | TB1      | 7B      | 495   | 23/0076 | R    | 300V               |
| TB2         | 10B     | 4A          | TB1      | 4B      | 530   | 23/0076 | R    | 300V               |
| TB2         | 11B     | 1J          | TB23     | 2B      | 32    | 23/0076 | Y    | STALO Low          |
| TB2         | 12B     | 1J          | TB23     | 3B      | 33    | 23/0076 | Y    | STALO High         |
| 3PLC        |         | 3A          | PLC      |         | 531   | UR.70   |      | L.O.I/P            |
| 3PLD        |         | 1N          | 1PLX2    |         | 532   | UR.70   |      | Tx.Sample          |
| 1PLC        |         | 1B          | 3PLH     |         | 533   | UR.70   |      | A.F.C. WOB.        |
| 1PLF        |         | 1J          | TB21     | 1B      | 7     | UR.70   |      | Monitor R.F. Pulse |
| 1PLF        |         | 1J          | TB21     | 2B      | 7     | SCREEN  |      |                    |
| 1PLG        |         | 1J          | TB21     | 3B      | 8     | UR.70   |      | A.F.C.Disc         |
| 1PLG        |         | 1J          | TB21     | 4B      | 8     | SCREEN  |      |                    |
| 1PLX        |         | 5J          | SKTL     |         | 449   | UR.70   |      | Lock Pulse         |
| 2PLB        |         | 2B          | PLA      |         | 534   | UR.70   |      | Standby L.O        |

TABLE 3  
 Amplifier frequency multiplier M24  
 5840-99-999-9013

Unit location 3A

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE            |
|-------------|---------|-------------|----------|---------|-------|---------|------|--------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                    |
| TB1         | 1B      | 4B          | TB1      | 1B      | 535   | 70/0076 | Bn   | 6.3V D.C.          |
| TB1         | 2B      | 4B          | TB1      | 2B      | 536   | 70/0076 | Bn   | 6.3V D.C.          |
| TB1         | 5B      | 1A          | TB1      | 11B     | 505   | 23/0076 | R    | 200V               |
| TB1         | 7B      | 2A          | TB2      | 8B      | 527   | 23/0076 | Y    | 50V                |
| TB1         | 7B      | 1J          | TB25     | 8B      | 75    | 23/0076 | Y    | 50V                |
| TB1         | 10B     | 2A          | TB2      | 2B      | 526   | 23/0076 | P    | STALO Mute         |
| TB1         | 11B     | 1J          | TB22     | 5B      | 23    | 23/0076 | Bk   | Sig. L.O. STOP     |
| TB1         | 12B     | 2A          | TB1      | 12B     | 1510  | 23/0076 | Bk   | Earth              |
| TB1         | 12B     | 4A          | TB1      | 12B     | 537   | 23/0076 | Bk   | Earth              |
| PLA         |         | 4A          | PLG      |         | 539   | UR.70   |      | 600 Mc/s           |
| PLB         |         | 2B          | PLB      |         | 540   | UR.70   |      | Sig. Mixer Drive   |
| PLC         |         | 2A          | 3PLC     |         | 531   | UR.70   |      | A.F.C. Mixer Drive |



TABLE 4  
 Frequency multiplier (oscillator) M1  
 5840-99-999-9019

Unit location 4A

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE      |
|-------------|---------|-------------|----------|---------|-------|---------|------|--------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |              |
| TB1         | 1B      | 4B          | TB1      | 3B      | 542   | 70/0076 | Bn   | 6.3V D.C.    |
| TB1         | 2B      | 4B          | TB1      | 4B      | 543   | 70/0076 | Bn   | 6.3V D.C.    |
| TB1         | 4B      | 2A          | TB2      | 10B     | 530   | 23/0076 | R    | 300V         |
| TB1         | 5B      | 2A          | TB1      | 5B      | 518   | 23/0076 | P    | MOTOR CON.1  |
| TB1         | 6B      | 2A          | TB1      | 6B      | 519   | 23/0076 | P    | MOTOR CON.4  |
| TB1         | 7B      | 2A          | TB1      | 7B      | 520   | 23/0076 | P    | MOTOR CON.3  |
| TB1         | 8B      | 2A          | TB1      | 8B      | 521   | 23/0076 | P    | MOTOR CON.2  |
| TB1         | 9B      | 1A          | TB2      | 1B      | 507   | 23/0076 | R    | 200V         |
| TB1         | 10B     | 2A          | TB2      | 1B      | 511   | 23/0076 | P    | Sector Phase |
| TB1         | 11B     | 2A          | TB2      | 4B      | 529   | 23/0076 | P    | Sector Phase |
| TB1         | 12B     | 3A          | TB1      | 12B     | 537   | 23/0076 | Bk   | Earth        |
| TB1         | 12B     | 4B          | TB1      | 12B     | 545   | 23/0076 | Bk   | Earth        |
| PLG         |         | 3A          | PLA      |         | 539   | UR.70   |      | 600 Mc/s     |

TABLE 5  
 Analyser, spectrum M1  
 5840-99-999-9015

Unit location 1B

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE        |
|-------------|---------|-------------|----------|---------|-------|---------|------|----------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                |
| TB1         | 3B      | 1A          | TB1      | 8B      | 496   | 23/0076 | R    | 300V           |
| TB1         | 4B      | 1A          | TB2      | 2B      | 508   | 23/0076 | R    | 200V           |
| TB1         | 5B      | 1A          | TB2      | 6B      | 511   | 23/0076 | V    | -250V          |
| TB1         | 6B      | 2A          | TB1      | 1B      | 1229  | 23/0076 | V    | -600V          |
| TB1         | 8B      | 1A          | TB2      | 10B     | 515   | 23/0076 | P    | S.A. Refl.V    |
| TB1         | 9B      | 2A          | TB1      | 11B     | 21    | 23/0076 | P    | A.F.C. Mute    |
| TB1         | 10B     | 2A          | TB1      | 9B      | 522   | 23/0076 | Bk   | Neutral        |
| TB1         | 10B     | 4B          | TB1      | 11B     | 546   | 23/0076 | Bk   | Neutral        |
| TB1         | 11B     | 1A          | TB3      | 3B      | 518   | 23/0076 | R    | 240V           |
| TB1         | 12B     | 2B          | TB1      | 12B     | 547   | 23/0076 | Bk   | Earth          |
| TB2         | 1B      | 1J          | TB21     | 9B      | 11    | K16M    |      | T/B OUT        |
| TB2         | 2B      | 1J          | TB21     | 10B     | 11    | SCREEN  |      |                |
| TB2         | 3B      | 1J          | TB21     | 7B      | 10    | K16M    |      | Blanking Pulse |
| TB2         | 4B      | 1J          | TB21     | 8B      | 10    | SCREEN  |      |                |
| TB2         | 5B      | 1J          | TB21     | 5B      | 9     | K16M    |      | S.A. Video     |
| TB2         | 6B      | 1J          | TB21     | 6B      | 9     | SCREEN  |      |                |
| TB2         | 7B      | 1J          | TB22     | 4B      | 22    | 23/0076 | Y    | S.A.ON         |
| TB2         | 8B      | 1J          | TB22     | 3B      | 1509  | 23/0076 | P    | WOB.-ON        |
| 1PLE        |         | 2B          | PLD      |         | 541   | UR.70   |      | L.O.Sample     |
| 1PLD        |         | 1N          | 1PLX1    |         | 550   | UR.70   |      | Tx. Sample     |
| 3PLH        |         | 2A          | 1PLC     |         | 533   | UR.70   |      | A.F.C.WOB.     |
| 3PLJ        |         | 1J          | TB22     | 1B      | 20    | UR.70   |      | WOB.O/P        |
| 3PLJ        |         | 1J          | TB22     | 2B      | 20    | SCREEN  |      |                |

TABLE 6  
WAVEMETER R/F  
5840-99-999-9662

Unit location 2B

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE               |
|-------------|---------|-------------|----------|---------|-------|---------|------|-----------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                       |
| TB1         | 1B      | 1J          | TB22     | 7B      | 25    | 70/0076 | Bn   | 6.3V 5A               |
| TB1         | 2B      | 1J          | TB22     | 8B      | 26    | 70/0076 | Bn   | 6.3V 5A               |
| TB1         | 5B      | 1A          | TB2      | 3B      | 509   | 23/0076 | R    | 200V                  |
| TB1         | 6B      | 1A          | TB2      | 7B      | 512   | 23/0076 | V    | -250V                 |
| TB1         | 10B     | 1J          | TB21     | 12B     | 1570  | Screen  | Bk   | Monitor Wavemeter     |
| TB1         | 11B     | 1J          | TB21     | 11B     | 1570  | K16M    |      | Pulse                 |
| TB1         | 12B     | 1B          | TB1      | 12B     | 547   | 23/0076 | Bk   | Earth                 |
| TB1         | 12B     | 3B          | TB1      | 12B     | 553   | 23/0076 | Bk   | Earth                 |
| PLA         |         | 2A          | 2PLB     |         | 534   | JR.70   |      | Standby LO.IN         |
| PLB         |         | 3A          | PLB      |         | 540   | UR.70   |      | Sig.Mixer Drive In    |
| PLC         |         | 1N          | PLS      |         | 1224  | UR.70   |      | Sig.Mixer Drive Out   |
| PLD         |         | 1B          | 1PLA     |         | 541   | UR.70   |      | L.O.Sample            |
| PLF         |         | 1N          | PLX3     |         | 1571  | K16M    |      | Transmitter R.F.Pulse |

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TABLE 7  
Monitor noise figure M1  
5840-99-999-9025

Unit location 3B

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE           |
|-------------|---------|-------------|----------|---------|-------|---------|------|-------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                   |
| TB1         | 1B      | 1J          | TB25     | 1B      | 68    | 70/0076 | Bn   | 6.3V 5A           |
| TB1         | 2B      | 1J          | TB25     | 2B      | 69    | 70/0076 | Bn   | 6.3V 5A           |
| TB1         | 3B      | 1J          | TB25     | 3B      | 70    | 70/0076 | Bn   | 6.3V 5A           |
| TB1         | 4B      | 1J          | TB25     | 4B      | 71    | 70/0076 | Bn   | 6.3V 5A           |
| TB1         | 5B      | 1J          | TB25     | 5B      | 72    | 70/0076 | Bn   | 6.3V 5A           |
| TB1         | 6B      | 1J          | TB25     | 6B      | 73    | 70/0076 | Bn   | 6.3V 5A           |
| TB1         | 7B      | 2A          | TB2      | 8B      | 528   | 23/0076 | Y    | 50V               |
| TB1         | 7B      | 4B          | TB1      | 8B      | 556   | 23/0076 | Y    | 50V               |
| TB1         | 8B      | 1A          | TB3      | 7B      | 521   | 23/0076 | R    | 200V              |
| TB1         | 9B      | 1J          | TB25     | 7B      | 74    | 23/0076 | R    | 500V              |
| TB1         | 10B     | 1A          | TB1      | 10B     | 504   | 23/0076 | R    | 300V              |
| TB1         | 11B     | 1A          | TB2      | 8B      | 513   | 23/0076 | V    | -250V             |
| TB1         | 12B     | 2B          | TB1      | 12B     | 553   | 23/0076 | Bk   | Earth             |
| TB1         | 12B     | 4B          | TB1      | 12B     | 557   | 23/0076 | Bk   | Earth             |
| TB2         | 1B      | 1J          | TB26     | 2B      | 91    | 23/0076 | P    | METER CON. +ve    |
| TB2         | 2B      | 1J          | TB26     | 3B      | 92    | 23/0076 | P    | METER CON. -ve    |
| TB2         | 3B      | 1J          | TB26     | 4B      | 93    | 23/0076 | P    | METER DEF +ve     |
| TB2         | 4B      | 1J          | TB26     | 5B      | 94    | 23/0076 | P    | METER DEF -ve     |
| TB2         | 5B      | 1J          | TB26     | 6B      | 95    | 23/0076 | P    | N.F.BAD - Remote  |
| TB2         | 6B      | 1J          | TB26     | 7B      | 96    | 23/0076 | P    | N.F.GOOD - Remote |
| TB2         | 7B      | 1J          | TB26     | 8B      | 97    | 23/0076 | P    | N.F.TEST Lamp     |
| TB2         | 8B      | 1J          | TB26     | 9B      | 98    | 23/0076 | P    | N.F. Lamp Common  |
| TB2         | 9B      | 1J          | TB26     | 1B      | 90    | 23/0076 | P    | CHECK NF          |
| TB2         | 10B     | 1J          | TB23     | 4B      | 1512  | 23/0076 | P    | N.F. BAD- Local   |
| PLA         |         | 1J          | TB25     | 11B     | 77    | UR.70   |      | Trigger           |
| PLA         |         | 1J          | TB25     | 12B     | 77    | SCREEN  |      |                   |
| PLB         |         | 1J          | TB26     | 11B     | 99    | UR.70   |      | N.T.Pulse         |
| PLB         |         | 1J          | TB26     | 12B     | 99    | SCREEN  |      |                   |
| PLC         |         | 1N          | PLQ      |         | 559   | UR.70   |      | LIN.I.F.IN        |
| PLD         |         | 1N          | PLX      |         | 560   | UR.70   |      | LIN.I.F.OUT       |

TABLE 8  
Power supply d.c. heaters M5  
5840-99-999-9041

Unit location 4B

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE         |
|-------------|---------|-------------|----------|---------|-------|---------|------|-----------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                 |
| TB1         | 1B      | 3A          | TB1      | 1B      | 535   | 70/0076 | Bn   | 6.3V D.C.       |
| TB1         | 2B      | 3A          | TB1      | 2B      | 536   | 70/0076 | Bn   | 6.3V D.C.       |
| TB1         | 3B      | 4A          | TB1      | 1B      | 542   | 70/0076 | Bn   | 6.3V D.C.       |
| TB1         | 4B      | 4A          | TB1      | 2B      | 543   | 70/0076 | Bn   | 6.3V D.C.       |
| TB1         | 5B      | 1A          | TB3      | 10B     | 523   | 70/0076 | Bn   | Metering        |
| TB1         | 6B      | 1A          | TB3      | 11B     | 524   | 70/0076 | Bn   | Metering        |
| TB1         | 7B      | 1A          | TB3      | 8B      | 1278  | 23/0076 | V    | -250V           |
| TB1         | 8B      | 3B          | TB1      | 7B      | 556   | 23/0076 | Y    | 50V             |
| TB1         | 9B      | 1J          | TB25     | 10B     | 76    | 23/0076 | Y    | D.C.Heaters I/L |
| TB1         | 10B     | 1A          | TB3      | 5B      | 520   | 23/0076 | R    | 240V            |
| TB1         | 11B     | 1B          | TB1      | 10B     | 546   | 23/0076 | Bk   | Neutral         |
| TB1         | 12B     | 3B          | TB1      | 12B     | 557   | 23/0076 | Bk   | Earth           |
| TB1         | 12B     | 4A          | TB1      | 12B     | 545   | 23/0076 | Bk   | Earth           |

TABLE 9  
 Amplifier assembly (I.F. and video) M28  
 5840-99-999-9007

Unit location 1C

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE             |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                     |
| TB1         | 1B      | 3C          | TB2      | 5B      | 561   | 70/0076 | Bn   | 6.3V 5A             |
| TB1         | 2B      | 3C          | TB2      | 6B      | 562   | 70/0076 | Bn   | 6.3V 5A             |
| TB1         | 3B      | 3D          | TB2      | 7B      | 563   | 70/0076 | Bn   | 6.3V 1.5A           |
| TB1         | 4B      | 3D          | TB2      | 8B      | 564   | 70/0076 | Bn   | 6.3V 1.5A           |
| TB1         | 5B      | 1D          | TB2      | 3B      | 565   | 23/0076 | R    | 200V                |
| TB1         | 6B      | 1D          | TB2      | 4B      | 566   | 23/0076 | R    | 300V                |
| TB1         | 7B      | 2C          | TB5      | 10B     | 567   | 23/0076 | V    | -250V               |
| TB1         | 8B      | 2C          | TB5      | 11B     | 568   | 23/0076 | Y    | 50V                 |
| TB1         | 12B     | 2C          | TB5      | 12B     | 569   | 23/0076 | Bk   | Earth               |
| TB2         | 1B      | 2C          | TB3      | 6B      | 570   | K16M    |      | Video Monitor       |
| TB2         | 2B      | 2C          | TB3      | 5B      | 570   | SCREEN  |      |                     |
| TB2         | 3B      | 2J          | TB30     | 5B      | 135   | 23/0076 | P    | Green Xtal I        |
| TB2         | 4B      | 2J          | TB30     | 6B      | 136   | 23/0076 | P    | Red Xtal I          |
| TB2         | 5B      | 2J          | TB30     | 7B      | 137   | 23/0076 | P    | Xtal Common         |
| TB2         | 6B      | 2J          | TB30     | 8B      | 138   | 23/0076 | Bk   | SIG.L.O.STOP        |
| TB2         | 7B      | 2C          | TB1      | 2B      | 571   | 23/0076 | Y    | Linear I.F.Response |
| TB2         | 8B      | 2D          | TB1      | 11B     | 572   | 23/0076 | P    | I.F.Bias            |
| TB2         | 10B     | 2C          | TB1      | 4B      | 573   | 23/0076 | P    | I.F.Monitor C/O     |
| TB2         | 11B     | 2C          | TB1      | 6B      | 574   | 23/0076 | Y    | Signal Mute         |
| PLA         |         | 1N          | PLY      |         | 1222  | UR70    |      | Linear I.F.IN       |
| PLB         |         | 2D          | PLD      |         | 575   | UR70    |      | I.F.WOB.IN          |
| PLE         |         | 5J          | SKTM     |         | 450   | UR70    |      | I.F.OUT             |
| 2PLA        |         | 2D          | PLH      |         | 1230  | UR70    |      | I.F.(A.J.Monitor)IN |

TABLE 10 (Sheet 1. Continued on Sheet 2)  
 Panel monitor M13  
 5840-99-999-9030

Unit location 2C

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE                 |
|-------------|---------|-------------|----------|---------|-------|---------|------|-------------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                         |
| TB1         | 1B      | 2J          | TB31     | 10B     | 164   | 23/0076 | P    | S.G.ON                  |
| TB1         | 2B      | 2J          | TB30     | 9B      | 139   | 23/0076 | P    | WOB.Control Line        |
| TB1         | 2B      | 1C          | TB2      | 7B      | 571   | 23/0076 | Y    | Linear I.F.Response     |
| TB1         | 3B      | 2J          | TB31     | 12B     | 166   | 23/0076 | Y    | Remote WOB.Line         |
| TB1         | 4B      | 1C          | TB2      | 10B     | 573   | 23/0076 | P    | I.F.Monitor C/O         |
| TB1         | 5B      | 2J          | TB30     | 10B     | 140   | 23/0076 | Y    | S.A.On                  |
| TB1         | 6B      | 1C          | TB2      | 11B     | 574   | 23/0076 | Y    | Linear I.F.Mute         |
| TB1         | 6B      | 2J          | TB30     | 3B      | 498   | 23/0076 | Y    | Linear I.F.Lamp         |
| TB1         | 7B      | 2J          | TB29     | 4B      | 125   | SCREEN  |      |                         |
| TB1         | 8B      | 2J          | TB29     | 3B      | 125   | K16M    |      | S.A.Video               |
| TB1         | 9B      | 2D          | TB1      | 9B      | 499   | 23/0076 | Y    | AJ.I.F.Mute             |
| TB1         | 9B      | 2J          | TB30     | 4B      | 576   | 23/0076 | Y    | AJ.I.F.Lamp             |
| TB1         | 11B     | 2J          | TB29     | 2B      | 124   | SCREEN  |      |                         |
| TB1         | 12B     | 2J          | TB29     | 1B      | 124   | UR70    |      | Monitor R.F.Pulse       |
| TB2         | 1B      | 2J          | TB28     | 12B     | 123   | SCREEN  |      |                         |
| TB2         | 2B      | 2J          | TB28     | 11B     | 123   | K16M    |      | Line V                  |
| TB2         | 3B      | 2J          | TB27     | 12B     | 111   | SCREEN  |      |                         |
| TB2         | 4B      | 2J          | TB27     | 11B     | 111   | K16M    |      | MAGNETRON I             |
| TB2         | 5B      | 2J          | TB27     | 10B     | 110   | SCREEN  |      |                         |
| TB2         | 6B      | 2J          | TB27     | 9B      | 110   | K16M    |      | MAGNETRON V             |
| TB2         | 7B      | 2J          | TB28     | 2B      | 118   | SCREEN  |      |                         |
| TB2         | 8B      | 2J          | TB28     | 1B      | 118   | K16M    |      | THYR.G-1                |
| TB2         | 9B      | 2J          | TB29     | 5B      | 126   | SCREEN  |      |                         |
| TB2         | 10B     | 2J          | TB29     | 6B      | 126   | K16M    |      | Monitor Wavemeter Pulse |
| TB2         | 11B     | 2J          | TB29     | 8B      | 127   | SCREEN  |      |                         |
| TB2         | 12B     | 2J          | TB29     | 7B      | 127   | K16M    |      | S.A.Blanking            |
| TB3         | 1B      | 2J          | TB29     | 10B     | 128   | SCREEN  |      |                         |
| TB3         | 2B      | 2J          | TB29     | 9B      | 128   | K16M    |      | Ext. T/B                |
| TB3         | 3B      | 2J          | TB29     | 12B     | 129   | SCREEN  |      |                         |
| TB3         | 4B      | 2J          | TB29     | 11B     | 129   | UR70    |      | AFC.Disc                |
| TB3         | 5B      | 1C          | TB2      | 2B      | 570   | SCREEN  |      |                         |
| TB3         | 6B      | 1C          | TB2      | 1B      | 570   | K16M    |      | Video Monitor           |
| TB3         | 7B      | 5J          | TB4      | 12A     | 274   | SCREEN  |      |                         |
| TB3         | 8B      | 5J          | TB4      | 11A     | 274   | UR70    |      | Pre-Pulse               |
| TB3         | 9B      | 2J          | TB27     | 8B      | 109   | SCREEN  |      |                         |
| TB3         | 10B     | 2J          | TB27     | 7B      | 109   | K16M    |      | THYR.I-D                |
| TB3         | 11B     | 2J          | TB27     | 6B      | 108   | SCREEN  |      |                         |

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TABLE 10 (Sheet 2)  
Panel monitor M13  
5840-99-999-9030

Unit location 2C

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE    |
|-------------|---------|-------------|----------|---------|-------|---------|------|------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |            |
| TB3         | 12B     | 2J          | TB27     | 5B      | 108   | K16M    |      | THYR.I-C   |
| TB4         | 1B      | 2J          | TB27     | 4B      | 107   | SCREEN  |      |            |
| TB4         | 2B      | 2J          | TB27     | 3B      | 107   | K16M    |      | THYR.I-B   |
| TB4         | 3B      | 2J          | TB27     | 2B      | 106   | SCREEN  |      |            |
| TB4         | 4B      | 2J          | TB27     | 1B      | 106   | K16M    |      | THYR.I-A   |
| TB4         | 5B      | 2J          | TB28     | 10B     | 122   | SCREEN  |      |            |
| TB4         | 6B      | 2J          | TB28     | 9B      | 122   | K16M    |      | G2-D Pulse |
| TB4         | 7B      | 2J          | TB28     | 8B      | 121   | SCREEN  |      |            |
| TB4         | 8B      | 2J          | TB28     | 7B      | 121   | K16M    |      | G2-C Pulse |
| TB4         | 9B      | 2J          | TB28     | 6B      | 120   | SCREEN  |      |            |
| TB4         | 10B     | 2J          | TB28     | 5B      | 120   | K16M    |      | G2-B Pulse |
| TB4         | 11B     | 2J          | TB28     | 4B      | 119   | SCREEN  |      |            |
| TB4         | 12B     | 2J          | TB28     | 3B      | 119   | K16M    |      | G2-A Pulse |
| TB5         | 1B      | 1D          | TB2      | 7B      | 577   | 23/0076 | R    | 500V       |
| TB5         | 2B      | 1D          | TB2      | 5B      | 578   | 23/0076 | R    | 300V       |
| TB5         | 3B      | 1D          | TB2      | 6B      | 579   | 23/0076 | R    | 300V       |
| TB5         | 4B      | 3C          | TB2      | 7B      | 580   | 70/0076 | Bn   | 6.3V 5A    |
| TB5         | 5B      | 3C          | TB2      | 8B      | 581   | 70/0076 | Bn   | 6.3V 5A    |
| TB5         | 6B      | 4D          | TB2      | 5B      | 582   | 70/0076 | Bn   | 6.3V 5A    |
| TB5         | 7B      | 4D          | TB2      | 6B      | 583   | 70/0076 | Bn   | 6.3V 5A    |
| TB5         | 8B      | 4D          | TB2      | 7B      | 584   | 70/0076 | Bn   | 6.3V 5A    |
| TB5         | 9B      | 4D          | TB2      | 8B      | 585   | 70/0076 | Bn   | 6.3V 5A    |
| TB5         | 10B     | 1C          | TB1      | 7B      | 567   | 23/0076 | V    | -250V      |
| TB5         | 10B     | 2D          | TB1      | 10B     | 586   | 23/0076 | V    | -250V      |
| TB5         | 11B     | 1C          | TB1      | 8B      | 568   | 23/0076 | Y    | 50V        |
| TB5         | 11B     | 2D          | TB1      | 8B      | 587   | 23/0076 | Y    | 50V        |
| TB5         | 12B     | 1C          | TB1      | 12B     | 569   | 23/0076 | Bk   | Earth      |
| TB5         | 12B     | 3C          | TB2      | 1B      | 588   | 23/0076 | Bk   | Earth      |



TABLE 11  
 Power supply ( 300V )M10  
 5840-99-999-2058

Unit location 3C

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE     |
|-------------|---------|-------------|----------|---------|-------|---------|------|-------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |             |
| TB1         | 5B      | 3C          | TB1      | 6B      | 589   | 23/0076 | P    | Link        |
| TB1         | 10B     | 3C          | TB1      | 12B     | 590   | 23/0076 | P    | Link        |
| TB2         | 1B      | 2C          | TB5      | 12B     | 588   | 23/0076 | Bk   | Earth       |
| TB2         | 1B      | 3C          | TB2      | 9B      | 591   | 23/0076 | Bk   | Link        |
| TB2         | 2B      | 3C          | TB3      | 8B      | 592   | 23/0076 | Bk   | Neutral     |
| TB2         | 2B      | 5D          | TB2      | 2B      | 593   | 23/0076 | Bk   | Neutral     |
| TB2         | 3B      | 1D          | TB3      | 3B      | 594   | 23/0076 | R    | 240V Heater |
| TB2         | 4B      | 1D          | TB3      | 4B      | 595   | 23/0076 | R    | 240V Heater |
| TB2         | 5B      | 1C          | TB1      | 1B      | 561   | 70/0076 | Bn   | 6.3V 5A     |
| TB2         | 6B      | 1C          | TB1      | 2B      | 562   | 70/0076 | Bn   | 6.3V 5A     |
| TB2         | 7B      | 2C          | TB5      | 4B      | 580   | 70/0076 | Bn   | 6.3V 5A     |
| TB2         | 8B      | 2C          | TB5      | 5B      | 581   | 70/0076 | Bn   | 6.3V 5A     |
| TB2         | 9B      | 5D          | TB2      | 1B      | 1210  | 23/0076 | Bk   | Earth       |
| TB2         | 12B     | 1D          | TB1      | 4B      | 1211  | 23/0076 | R    | 200V Out    |
| TB3         | 1B      | 3C          | TB3      | 3B      | 596   | 23/0076 | P    | Link        |
| TB3         | 4B      | 3C          | TB3      | 5B      | 597   | 23/0076 | P    | Link        |
| TB3         | 8B      | 3C          | TB3      | 9B      | 598   | 23/0076 | Bk   | Link        |
| TB3         | 11B     | 3C          | TB3      | 12B     | 599   | 23/0076 | P    | Link        |
| TB3         | 8B      | 3C          | TB2      | 2B      | 592   | 23/0076 | Bk   | Neutral     |

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TABLE 12  
Panel test electrical (No.2) M11  
5840-99-999-9032

Unit location 1D

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE        |
|-------------|---------|-------------|----------|---------|-------|---------|------|----------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                |
| TB1         | 1B      | 2J          | TB31     | 1B      | 155   | 23/0076 | R    | 500V (5H)      |
| TB1         | 2B      | 2J          | TB31     | 2B      | 156   | 23/0076 | R    | 300V (3E)      |
| TB1         | 3B      | 2J          | TB31     | 3B      | 157   | 23/0076 | R    | 300V (3H)      |
| TB1         | 4B      | 3C          | TB2      | 12B     | 1211  | 23/0076 | R    | 200V           |
| TB1         | 5B      | 2J          | TB31     | 4B      | 158   | 23/0076 | R    | 200V (3C)      |
| TB1         | 6B      | 4D          | TB2      | 12B     | 600   | 23/0076 | R    | 200V           |
| TB1         | 7B      | 2J          | TB31     | 5B      | 159   | 23/0076 | R    | 200V (4D)      |
| TB1         | 8B      | 5D          | TB2      | 12B     | 601   | 23/0076 | R    | 200V           |
| TB1         | 9B      | 2J          | TB31     | 6B      | 160   | 23/0076 | R    | 200V (5D)      |
| TB2         | 1B      | 2J          | TB31     | 7B      | 161   | 23/0076 | V    | -250V (5F)     |
| TB2         | 2B      | 2D          | TB1      | 10B     | 602   | 23/0076 | V    | -250V          |
| TB2         | 3B      | 1C          | TB1      | 5B      | 565   | 23/0076 | R    | 200V           |
| TB2         | 4B      | 1C          | TB1      | 6B      | 566   | 23/0076 | R    | 300V           |
| TB2         | 5B      | 2C          | TB5      | 2B      | 578   | 23/0076 | R    | 300V (3E)      |
| TB2         | 6B      | 2C          | TB5      | 3B      | 579   | 23/0076 | R    | 300V (3H)      |
| TB2         | 7B      | 2C          | TB5      | 1B      | 577   | 23/0076 | R    | 500V           |
| TB2         | 8B      | 2D          | TB1      | 5B      | 603   | 23/0076 | R    | 200V           |
| TB2         | 9B      | 3D          | TB1      | 11B     | 604   | 23/0076 | V    | -250V          |
| TB2         | 10B     | 2J          | TB31     | 9B      | 163   | 23/0076 | R    | 200V           |
| TB2         | 11B     | 2D          | TB1      | 6B      | 605   | 23/0076 | R    | 200V Meter +ve |
| TB2         | 12B     | 2D          | TB1      | 7B      | 606   | 23/0076 | R    | 200V Meter -ve |

TABLE 12 (Contd.)  
 Panel test electrical (No.2) M11  
 5840-99-999-9032

Unit location 1D

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE           |
|-------------|---------|-------------|----------|---------|-------|---------|------|-------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                   |
| TB3         | 1B      | 2J          | TB32     | 1B      | 179   | 23/0076 | R    | Red Phase         |
| TB3         | 2B      | 2J          | TB32     | 2B      | 180   | 23/0076 | R    | Delayed Red Phase |
| TB3         | 3B      | 3C          | TB2      | 3B      | 594   | 23/0076 | R    | 240V.HTR.         |
| TB3         | 4B      | 3C          | TB2      | 4B      | 595   | 23/0076 | R    | 240V.H.T.         |
| TB3         | 5B      | 3D          | TB1      | 4B      | 607   | 23/0076 | R    | 240V.H.T.         |
| TB3         | 6B      | 4D          | TB2      | 3B      | 608   | 23/0076 | R    | 240V.Heaters      |
| TB3         | 7B      | 4D          | TB2      | 4B      | 609   | 23/0076 | R    | 240V.Heaters      |
| TB3         | 8B      | 5D          | TB2      | 3B      | 610   | 23/0076 | R    | 240V.Heaters      |
| TB3         | 9B      | 5D          | TB2      | 4B      | 611   | 23/0076 | R    | 240V.Heaters      |
| TB3         | 12B     | 2J          | TB32     | 12B     | 190   | 23/0076 | Bk   | Earth             |
| TB3         | 12B     | 2D          | TB1      | 12B     | 612   | 23/0076 | Bk   | Earth             |

AP

TABLE 13  
 Amplifier Assembly (A.J.) M27  
 5840-99-999-9008

Unit location 2D

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE              |
|-------------|---------|-------------|----------|---------|-------|---------|------|----------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                      |
| TB1         | 1B      | 3D          | TB2      | 3B      | 613   | 70/0076 | Bn   | 6.3V 2.5A            |
| TB1         | 2B      | 3D          | TB2      | 4B      | 614   | 70/0076 | Bn   | 6.3V 2.5A            |
| TB1         | 3B      | 3D          | TB2      | 5B      | 615   | 70/0076 | Bn   | 6.3V 2.5A            |
| TB1         | 4B      | 3D          | TB2      | 6B      | 616   | 70/0076 | Bn   | 6.3V 2.5A            |
| TB1         | 5B      | 1D          | TB2      | 8B      | 603   | 23/0076 | R    | 200V.                |
| TB1         | 6B      | 1D          | TB2      | 11B     | 605   | 23/0076 | R    | 200V. - Meter +ve    |
| TB1         | 7B      | 1D          | TB2      | 12B     | 606   | 23/0076 | R    | 200V. - Meter -ve    |
| TB1         | 8B      | 2C          | TB5      | 11B     | 587   | 23/0076 | Y    | 50V.                 |
| TB1         | 8B      | 3D          | TB2      | 12B     | 617   | 23/0076 | Y    | 50V.                 |
| TB1         | 9B      | 2C          | TB1      | 9B      | 499   | 23/0076 | Y    | A.J. Mute Line       |
| TB1         | 10B     | 2C          | TB5      | 10B     | 586   | 23/0076 | V    | -250V.               |
| TB1         | 10B     | 1D          | TB2      | 2B      | 602   | 23/0076 | V    | -250V.               |
| TB1         | 11B     | 1C          | TB2      | 8B      | 572   | 23/0076 | P    | I.F. Bias            |
| TB1         | 11B     | 2J          | TB30     | 12B     | 141   | 23/0076 | P    | I.F. Bias            |
| TB1         | 12B     | 1D          | TB3      | 12B     | 612   | 23/0076 | Bk   | Earth                |
| TB1         | 12B     | 3D          | TB1      | 12B     | 618   | 23/0076 | Bk   | Earth                |
| TB2         | 1B      | 2J          | TB32     | 3B      | 181   | 23/0076 | P    | Remote Meter SW.     |
| TB2         | 2B      | 2J          | TB32     | 4B      | 182   | 23/0076 | P    | Remote Meter Grid I. |
| TB2         | 3B      | 2J          | TB32     | 5B      | 183   | 23/0076 | P    | Remote Meter Return  |
| TB2         | 4B      | 2J          | TB32     | 6B      | 184   | 23/0076 | P    | Remote Limiter Level |
| TB2         | 5B      | 2J          | TB32     | 7B      | 185   | 23/0076 | P    | Remote A.J. Level    |
| TB2         | 6B      | 2J          | TB32     | 8B      | 186   | 23/0076 | P    | Remote Quiet Level   |
| TB2         | 7B      | 2J          | TB32     | 9B      | 187   | 23/0076 | P    | Remote Bias Return   |
| 1PLB        |         | 1N          | PLR      |         | 619   | UR.70   |      | I.F. I/P             |
| PLF         |         | 5J          | SKFN     |         | 620   | UR.70   |      | I.F. O/P             |
| PLB         |         | 2J          | TB30     | 1B      | 134   | UR.70   |      | I.F. WOB. In         |
| PLB         |         | 2J          | TB30     | 2B      | 134   | SCREEN  |      |                      |
| PLD         |         | 1C          | PLB      |         | 575   | UR.70   |      | I.F. WOB. Out        |
| PLH         |         | 1C          | 2PLA     |         | 1230  | UR.70   |      | I.F. (Monitor) Out   |

TABLE 14  
Power Supply (Stabilised A.C. Heaters) M8  
5840-99-999-9040

Unit location 3D

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE         |
|-------------|---------|-------------|----------|---------|-------|---------|------|-----------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                 |
| TB1         | 4B      | 1D          | TB3      | 5B      | 607   | 23/0076 | R    | 240V.           |
| TB1         | 5B      | 4D          | TB2      | 2B      | 621   | 23/0076 | Bk   | Neutral         |
| TB1         | 5B      | 2J          | TB32     | 10B     | 188   | 23/0076 | Bk   | Neutral         |
| TB1         | 11B     | 1D          | TB2      | 9B      | 604   | 23/0076 | V    | -250V.          |
| TB1         | 12B     | 2D          | TB1      | 12B     | 618   | 23/0076 | Bk   | Earth           |
| TB1         | 12B     | 4D          | TB2      | 9B      | 622   | 23/0076 | Bk   | Earth           |
| TB2         | 1B      | 2J          | TB33     | 1B      | 199   | 70/0076 | Bn   | 6.3V. 2A        |
| TB2         | 2B      | 2J          | TB33     | 2B      | 200   | 70/0076 | Bn   | 6.3V. 2A        |
| TB2         | 3B      | 2D          | TB1      | 1B      | 613   | 70/0076 | Bn   | 6.3V. 2.5A      |
| TB2         | 4B      | 2D          | TB1      | 2B      | 614   | 70/0076 | Bn   | 6.3V. 2.5A      |
| TB2         | 5B      | 2D          | TB1      | 3B      | 615   | 70/0076 | Bn   | 6.3V. 2.5A      |
| TB2         | 6B      | 2D          | TB1      | 4B      | 616   | 70/0076 | Bn   | 6.3V. 2.5A      |
| TB2         | 7B      | 1C          | TB1      | 3B      | 563   | 70/0076 | Bn   | 6.3V. 1.5A      |
| TB2         | 8B      | 1C          | TB1      | 4B      | 564   | 70/0076 | Bn   | 6.3V. 1.5A      |
| TB2         | 9B      | 2J          | TB33     | 3B      | 201   | 70/0076 | Bn   | 6.3V. 1.5A      |
| TB2         | 10B     | 2J          | TB33     | 4B      | 202   | 70/0076 | Bn   | 6.3V. 1.5A      |
| TB2         | 11B     | 2J          | TB31     | 11B     | 165   | 23/0076 | Y    | A.C. Htrs. Lamp |
| TB2         | 12B     | 2D          | TB1      | 8B      | 617   | 23/0076 | Y    | 50V.            |
| TB2         | 12B     | 2J          | TB31     | 8B      | 162   | 23/0076 | Y    | 50V.            |

TABLE 15  
 Power Supply ( 300V ) M10  
 5840-99-999-2058

Unit location 4D

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE       |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |               |
| TB1         | 5B      | 4D          | TB1      | 6B      | 623   | 23/0076 | P    | Link          |
| TB1         | 10B     | 4D          | TB1      | 12B     | 624   | 23/0076 | P    | Link          |
| TB2         | 1B      | 4D          | TB2      | 9B      | 625   | 23/0076 | Bk   | Link          |
| TB2         | 1B      | 5D          | TB2      | 9B      | 626   | 23/0076 | Bk   | Earth         |
| TB2         | 2B      | 4D          | TB3      | 8B      | 627   | 23/0076 | Bk   | Neutral       |
| TB2         | 2B      | 3D          | TB1      | 5B      | 621   | 23/0076 | Bk   | Neutral       |
| TB2         | 3B      | 1D          | TB3      | 6B      | 608   | 23/0076 | R    | 240V. Heaters |
| TB2         | 4B      | 1D          | TB3      | 7B      | 609   | 23/0076 | R    | 240V. H.T.    |
| TB2         | 5B      | 2C          | TB5      | 6B      | 582   | 70/0076 | Bn   | 6.3V. 5A      |
| TB2         | 6B      | 2C          | TB5      | 7B      | 583   | 70/0076 | Bn   | 6.3V. 5A      |
| TB2         | 7B      | 2C          | TB5      | 8B      | 584   | 70/0076 | Bn   | 6.3V. 5A      |
| TB2         | 8B      | 2C          | TB5      | 9B      | 585   | 70/0076 | Bn   | 6.3V. 5A      |
| TB2         | 9B      | 3D          | TB1      | 12B     | 622   | 23/0076 | Bk   | Earth         |
| TB2         | 12B     | 1D          | TB1      | 6B      | 600   | 23/0076 | R    | 200V.         |
| TB3         | 1B      | 4D          | TB3      | 3B      | 628   | 23/0076 | P    | Link          |
| TB3         | 4B      | 4D          | TB3      | 5B      | 629   | 23/0076 | P    | Link          |
| TB3         | 8B      | 4D          | TB3      | 9B      | 630   | 23/0076 | Bk   | Link          |
| TB3         | 11B     | 4D          | TB3      | 12B     | 631   | 23/0076 | P    | Link          |

TABLE 16  
Power Supply ( 300V ) M10  
5840-99-999-2058

Unit location 5D

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE     |
|-------------|---------|-------------|----------|---------|-------|---------|------|-------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |             |
| TB1         | 5B      | 5D          | TB1      | 6B      | 632   | 23/0076 | P    | Link        |
| TB1         | 10B     | 5D          | TB1      | 12B     | 633   | 23/0076 | P    | Link        |
| TB2         | 1B      | 5D          | TB2      | 9B      | 634   | 23/0076 | Bk   | Link        |
| TB2         | 1B      | 3C          | TB2      | 9B      | 1210  | 23/0076 | Bk   | Earth       |
| TB2         | 2B      | 3C          | TB2      | 2B      | 593   | 23/0076 | Bk   | Neutral     |
| TB2         | 2B      | 5D          | TB3      | 8B      | 635   | 23/0076 | Bk   | Neutral     |
| TB2         | 3B      | 1D          | TB3      | 8B      | 610   | 23/0076 | R    | 24.0V, Htr. |
| TB2         | 4B      | 1D          | TB3      | 9B      | 611   | 23/0076 | R    | 24.0V, H.T. |
| TB2         | 5B      | 2J          | TB33     | 5B      | 203   | 70/0076 | Bn   | 6.3V. 5A    |
| TB2         | 6B      | 2J          | TB33     | 6B      | 204   | 70/0076 | Bn   | 6.3V. 5A    |
| TB2         | 7B      | 2J          | TB33     | 7B      | 205   | 70/0076 | Bn   | 6.3V. 5A    |
| TB2         | 8B      | 2J          | TB33     | 8B      | 206   | 70/0076 | Bn   | 6.3V. 5A    |
| TB2         | 9B      | 4D          | TB2      | 1B      | 626   | 23/0076 | Bk   | Earth       |
| TB2         | 12B     | 1D          | TB1      | 8B      | 601   | 23/0076 | R    | 200V        |
| TB3         | 1B      | 5D          | TB3      | 3B      | 636   | 23/0076 | P    | Link        |
| TB3         | 4B      | 5D          | TB3      | 5B      | 637   | 23/0076 | P    | Link        |
| TB3         | 8B      | 5D          | TB3      | 9B      | 638   | 23/0076 | Bk   | Link        |
| TB3         | 9B      | 2J          | TB32     | 11B     | 189   | 23/0076 | Bk   | Neutral     |
| TB3         | 11B     | 5D          | TB3      | 12B     | 639   | 23/0076 | P    | Link        |
| TB3         | 8B      | 5D          | TB2      | 2B      | 635   | 23/0076 | Bk   | Neutral     |

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TABLE 17 (Sheet 1. Continued on Sheet 2)  
 Panel Test Electrical (No.3) ML4  
 5840-99-999-9033

Unit location 1E

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE              |
|-------------|---------|-------------|----------|---------|-------|---------|------|----------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                      |
| TB1         | 1B      | 3J          | TB38     | 1B      | 797   | 23/0076 | W    | Yellow Phase         |
| TB1         | 2B      | 3J          | TB38     | 2B      | 798   | 40/0076 | W    | Delayed Yellow Phase |
| TB1         | 3B      | 2E          | TB2      | 3B      | 990   | 23/0076 | W    | 240V. Heaters        |
| TB1         | 4B      | 2E          | TB2      | 4B      | 991   | 23/0076 | W    | 240V. H.T.           |
| TB1         | 5B      | 3E          | TB2      | 3B      | 992   | 23/0076 | W    | 240V. Heaters        |
| TB1         | 6B      | 3E          | TB2      | 4B      | 993   | 23/0076 | W    | 240V. H.T.           |
| TB1         | 7B      | 4E          | TB2      | 3B      | 994   | 23/0076 | W    | 240V. Heaters        |
| TB1         | 8B      | 4E          | TB2      | 4B      | 995   | 23/0076 | W    | 240V. H.T.           |
| TB1         | 9B      | 5E          | TB2      | 3B      | 996   | 23/0076 | W    | 240V. Heaters        |
| TB1         | 10B     | 5E          | TB2      | 4B      | 997   | 23/0076 | W    | 240V. H.T.           |
| TB1         | 12B     | 2E          | TB2      | 9B      | 998   | 23/0076 | Bk   | Earth                |
| TB1         | 12B     | 1F          | TB3      | 12B     | 999   | 23/0076 | Bk   | Earth                |
| TB2         | 2B      | 4F          | TB1      | 9B      | 1000  | 23/0076 | W    | 240V. H.T.           |
| TB2         | 3B      | 5F          | TB2      | 3B      | 1001  | 23/0076 | W    | 240V. Heater         |
| TB2         | 4B      | 5F          | TB2      | 4B      | 1002  | 23/0076 | W    | 240V. H.T.           |
| TB2         | 5B      | 3J          | TB37     | 10B     | 791   | 23/0076 | P    | Magnet Field V -ve   |
| TB2         | 5B      | 2F          | TB1      | 8B      | 1003  | 23/0076 | F    | Magnet Field V       |
| TB2         | 6B      | 3J          | TB37     | 11B     | 792   | 23/0076 | P    | Magnet Field V +ve   |
| TB3         | 1B      | 2E          | TB2      | 12B     | 1004  | 23/0076 | R    | 300V. In             |
| TB3         | 2B      | 3J          | TB39     | 1B      | 807   | 23/0076 | R    | 300V. Out            |
| TB3         | 3B      | 3E          | TB2      | 12B     | 1005  | 23/0076 | R    | 300V. In             |
| TB3         | 4B      | 3J          | TB39     | 2B      | 808   | 23/0076 | R    | 300V. Out            |
| TB3         | 5B      | 4E          | TB2      | 12B     | 1006  | 23/0076 | R    | 300V. In             |
| TB3         | 6B      | 3J          | TB39     | 3B      | 809   | 23/0076 | R    | 300V. Out            |
| TB3         | 7B      | 5E          | TB2      | 12B     | 1007  | 23/0076 | R    | 300V. In             |
| TB3         | 8B      | 3J          | TB39     | 4B      | 810   | 23/0076 | R    | 300V. Monitor        |
| TB3         | 9B      | 3J          | TB39     | 6B      | 812   | 23/0076 | R    | 500V. In             |
| TB3         | 10B     | 4F          | TB1      | 2B      | 1008  | 23/0076 | R    | 1200V. In            |
| TB3         | 11B     | 3J          | TB39     | 5B      | 811   | 23/0076 | R    | 1200V. Out           |



TABLE 17 (Sheet 2)  
 Panel Test Electrical (No.3) ML4  
 5840-99-999-9033

Unit location 1E

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE    |
|-------------|---------|-------------|----------|---------|-------|---------|------|------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |            |
| TB4         | 1B      | 4F          | TB1      | 11B     | 1009  | 23/0076 | V    | -600V. In  |
| TB4         | 2B      | 3J          | TB39     | 8B      | 814   | 23/0076 | V    | -600V. Out |
| TB4         | 3B      | 5F          | TB2      | 9B      | 1010  | 23/0076 | V    | -250V. In  |
| TB4         | 4B      | 3J          | TB39     | 7B      | 813   | 23/0076 | V    | -250V. Out |
| TB4         | 5B      | 1F          | TB3      | 11B     | 1011  | 23/0076 | V    | -250V. Out |
| TB4         | 6B      | 2F          | TB1      | 5B      | 1012  | 23/0076 | V    | -250V. Out |
| TB4         | 8B      | 1F          | TB3      | 9B      | 1013  | 23/0076 | R    | 300V.      |
| TB4         | 9B      | 2F          | TB1      | 4B      | 1014  | 23/0076 | R    | 300V.      |
| TB4         | 11B     | 1F          | TB3      | 8B      | 1015  | 23/0076 | R    | 500V.      |

TABLE 18  
 Power Supply (+300V) M10  
 5840-99-999-2058

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Unit location 2E

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE       |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |               |
| TB1         | 4B      | 2E          | TB1      | 5B      | 1023  | 23/0076 | P    | Link          |
| TB1         | 10B     | 2E          | TB1      | 12B     | 1024  | 23/0076 | P    | Link          |
| TB2         | 1B      | 2E          | TB2      | 9B      | 1025  | 23/0076 | Bk   | Link          |
| TB2         | 1B      | 3E          | TB2      | 9B      | 1026  | 23/0076 | Bk   | Earth         |
| TB2         | 2B      | 2E          | TB3      | 8B      | 1027  | 23/0076 | Bk   | Neutral       |
| TB2         | 2B      | 1F          | TB4      | 1B      | 1028  | 23/0076 | Bk   | Neutral       |
| TB2         | 3B      | 1E          | TB1      | 3B      | 990   | 23/0076 | W    | 240V. Heaters |
| TB2         | 4B      | 1E          | TB1      | 4B      | 991   | 23/0076 | W    | 240V. H.T.    |
| TB2         | 9B      | 1E          | TB1      | 12B     | 998   | 23/0076 | Bk   | Earth         |
| TB2         | 12B     | 1E          | TB3      | 1B      | 1004  | 23/0076 | R    | 300V. Out     |
| TB3         | 1B      | 2E          | TB3      | 2B      | 1029  | 23/0076 | P    | Link          |
| TB3         | 5B      | 2E          | TB3      | 6B      | 1030  | 23/0076 | P    | Link          |
| TB3         | 8B      | 2E          | TB2      | 2B      | 1027  | 23/0076 | Bk   | Neutral       |
| TB3         | 8B      | 2E          | TB3      | 9B      | 1031  | 23/0076 | Bk   | Link          |
| TB3         | 9B      | 3E          | TB2      | 2B      | 1032  | 23/0076 | Bk   | Neutral       |

TABLE 19  
 Power supply (+300V) M10  
 5840-99-999-2058

Unit location 3E

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE       |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |               |
| TB1         | 4B      | 3E          | TB1      | 5B      | 1033  | 23/0076 | P    | Link          |
| TB1         | 10B     | 3E          | TB1      | 12B     | 1034  | 23/0076 | P    | Link          |
| TB2         | 1B      | 3E          | TB2      | 9B      | 1035  | 23/0076 | Bk   | Link          |
| TB2         | 1B      | 4E          | TB2      | 9B      | 1036  | 23/0076 | Bk   | Earth         |
| TB2         | 2B      | 2E          | TB3      | 9B      | 1032  | 23/0076 | Bk   | Neutral       |
| TB2         | 2B      | 3E          | TB3      | 8B      | 1038  | 23/0076 | Bk   | Neutral       |
| TB2         | 3B      | 1E          | TB1      | 5B      | 992   | 23/0076 | W    | 240V. Heaters |
| TB2         | 4B      | 1E          | TB1      | 6B      | 993   | 23/0076 | W    | 240V. H.T.    |
| TB2         | 9B      | 2E          | TB2      | 1B      | 1026  | 23/0076 | Bk   | Earth         |
| TB2         | 12B     | 1E          | TB3      | 3B      | 1005  | 23/0076 | R    | 300 V. Out    |
| TB3         | 1B      | 3E          | TB3      | 2B      | 1039  | 23/0076 | P    | Link          |
| TB3         | 5B      | 3E          | TB3      | 6B      | 1040  | 23/0076 | P    | Link          |
| TB3         | 8B      | 3E          | TB2      | 2B      | 1038  | 23/0076 | Bk   | Neutral       |
| TB3         | 8B      | 3E          | TB3      | 9B      | 1041  | 23/0076 | Bk   | Link          |
| TB3         | 9B      | 4E          | TB2      | 2B      | 1042  | 23/0076 | Bk   | Neutral       |

TABLE 20  
 Power Supply (+300V) M10  
 5840-99-999-2058

Unit location 4E

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE       |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |               |
| TB1         | 4B      | 4E          | TB1      | 5B      | 1043  | 23/0076 | P    | Link          |
| TB1         | 10B     | 4E          | TB1      | 12B     | 1044  | 23/0076 | P    | Link          |
| TB2         | 1B      | 4E          | TB2      | 9B      | 1045  | 23/0076 | Bk   | Link          |
| TB2         | 1B      | 5E          | TB2      | 9B      | 1046  | 23/0076 | Bk   | Earth         |
| TB2         | 2B      | 3E          | TB3      | 9B      | 1042  | 23/0076 | Bk   | Neutral       |
| TB2         | 2B      | 4E          | TB3      | 8B      | 1047  | 23/0076 | Bk   | Neutral       |
| TB2         | 3B      | 1E          | TB1      | 7B      | 994   | 23/0076 | W    | 240V. Heaters |
| TB2         | 4B      | 1E          | TB1      | 8B      | 995   | 23/0076 | W    | 240V. H.T.    |
| TB2         | 9B      | 3E          | TB2      | 1B      | 1036  | 23/0076 | Bk   | Earth         |
| TB2         | 12B     | 1E          | TB3      | 5B      | 1006  | 23/0076 | R    | 300V. Out     |
| TB3         | 1B      | 4E          | TB3      | 2B      | 1048  | 23/0076 | P    | Link          |
| TB3         | 5B      | 4E          | TB3      | 6B      | 1049  | 23/0076 | P    | Link          |
| TB3         | 8B      | 4E          | TB2      | 2B      | 1047  | 23/0076 | Bk   | Neutral       |
| TB3         | 8B      | 4E          | TB3      | 9B      | 1050  | 23/0076 | Bk   | Link          |
| TB3         | 9B      | 5E          | TB2      | 2B      | 1051  | 23/0076 | Bk   | Neutral       |

TABLE 21  
Power Supply (+300V) M10  
5840-99-999-2058

Unit location 5E

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE       |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |               |
| TB1         | 4B      | 5E          | TB1      | 5B      | 1052  | 23/0076 | P    | Link          |
| TB1         | 10B     | 5E          | TB1      | 12B     | 1053  | 23/0076 | P    | Link          |
| TB2         | 1B      | 5E          | TB2      | 9B      | 1054  | 23/0076 | Bk   | Link          |
| TB2         | 1B      | 3J          | TB38     | 11B     | 801   | 23/0076 | Bk   | Earth         |
| TB2         | 2B      | 4E          | TB3      | 9B      | 1051  | 23/0076 | Bk   | Neutral       |
| TB2         | 2B      | 5E          | TB3      | 8B      | 1055  | 23/0076 | Bk   | Neutral       |
| TB2         | 3B      | 1E          | TB1      | 9B      | 996   | 23/0076 | W    | 24OV. Heaters |
| TB2         | 4B      | 1E          | TB1      | 10B     | 997   | 23/0076 | W    | 24OV. H.T.    |
| TB2         | 9B      | 4E          | TB2      | 1B      | 1046  | 23/0076 | Bk   | Earth         |
| TB2         | 12B     | 1E          | TB3      | 7B      | 1007  | 23/0076 | R    | 300V. Out     |
| TB3         | 1B      | 5E          | TB3      | 2B      | 1056  | 23/0076 | P    | Link          |
| TB3         | 5B      | 5E          | TB3      | 6B      | 1057  | 23/0076 | P    | Link          |
| TB3         | 8B      | 5E          | TB2      | 2B      | 1055  | 23/0076 | Bk   | Neutral       |
| TB3         | 8B      | 5E          | TB3      | 9B      | 1058  | 23/0076 | Bk   | Link          |
| TB3         | 9B      | 3J          | TB38     | 9B      | 800   | 23/0076 | Bk   | Neutral       |

TABLE 22  
Panel (Control) M15 (Sheet 1)  
5840-99-999-9029

Unit location 1F

| UNIT ORIGIN |         |          | DESTINATION |         |      | CABLE   |      | SERVICE               |
|-------------|---------|----------|-------------|---------|------|---------|------|-----------------------|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | NO.  | TYPE    | COL. |                       |
| TB1         | 1B      | 3J       | TB34        | 1B      | 735  | 40/0076 | B    | Blue Phase            |
| TB1         | 2B      | 3J       | TB34        | 2B      | 736  | 23/0076 | B    | 240V to Contactor A   |
| TB1         | 3B      | 3J       | TB34        | 3B      | 737  | 23/0076 | B    | 240V to Contactor C   |
| TB1         | 4B      | 3J       | TB34        | 4B      | 738  | 23/0076 | B    | 240V to Dehumidifier  |
| TB1         | 5B      | 3J       | TB34        | 5B      | 739  | 23/0076 | O    | Field Lamp            |
| TB1         | 6B      | 3J       | TB34        | 6B      | 740  | 23/0076 | Y    | 50V (2 Minutes)       |
| TB1         | 7B      | 3J       | TB34        | 7B      | 741  | 23/0076 | Y    | 50V (4 Minutes)       |
| TB1         | 9B      | 3J       | TB34        | 9B      | 743  | 23/0076 | Y    | 50V to Latching Relay |
| TB1         | 1CB     | 3J       | TB34        | 10B     | 744  | 23/0076 | O    | I/L From Pneumatics   |
| TB1         | 11B     | 3J       | TB34        | 11B     | 745  | 23/0076 | B    | REGULATOR LOWER       |
| TB1         | 12B     | 3J       | TB34        | 12B     | 746  | 23/0076 | B    | REGULATOR RAISE       |
|             |         |          |             |         |      |         |      |                       |
| TB2         | 1B      | 3J       | TB35        | 1B      | 752  | 23/0076 | R    | Tx. On Hold           |
| TB2         | 2B      | 3J       | TB35        | 2B      | 753  | 23/0076 | R    | Tx. On Hold           |
| TB2         | 3B      | 2F       | TB1         | 10B     | 1059 | 23/0076 | O    | Field I/L In          |
| TB2         | 4B      | 3J       | TB35        | 4B      | 755  | 23/0076 | Y    | 50V                   |
| TB2         | 5B      | 3J       | TB35        | 5B      | 756  | 23/0076 | B    | H.T. Down             |
| TB2         | 6B      | 3J       | TB35        | 6B      | 757  | 23/0076 | P    | A.F.C. Mute           |
| TB2         | 7B      | 3J       | TB35        | 7B      | 758  | 23/0076 | R    | H.T. Up Lamp          |
| TB2         | 8B      | 3J       | TB35        | 8B      | 759  | 23/0076 | R    | D.C. O/L              |
| TB2         | 9B      | 3J       | TB35        | 9B      | 760  | 23/0076 | Y    | 3 Phase O/L           |
| TB2         | 10B     | 3J       | TB35        | 10B     | 761  | 23/0076 | Y    | H.T. Off              |
| TB2         | 11B     | 3J       | TB35        | 11B     | 762  | 23/0076 | Y    | H.T. On               |
| TB2         | 12B     | 3J       | TB35        | 12B     | 763  | 23/0076 | B    | Trip Lamp             |

TABLE 22 (Contd)  
Panel (Control) M15 (Sheet 2)  
5840-99-999-9029

Unit location 1F

| UNIT ORIGIN |         | DESTINATION |           |         |      | CABLE   |      | SERVICE             |
|-------------|---------|-------------|-----------|---------|------|---------|------|---------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.  | TYPE    | COL. |                     |
| TB3         | 1B      | 3J          | TB38      | 6B      | 1617 | 23/0076 | Y    | 0/swing Trip        |
| TB3         | 2B      | 3J          | TB38      | 5B      | 1618 | 23/0076 | Y    | D.C. Trip O/P       |
| TB3         | 3B      | 5F          | TB2       | 7B      | 1060 | 70/0076 | Bn   | 6.3V 5A             |
| TB3         | 4B      | 5F          | TB2       | 8B      | 1061 | 70/0076 | Bn   | 6.3V 5A             |
| ▣ TB3       | 5B      | 3J          | TB37      | 9B      | 1637 | 24/0.2  | P    | Reg. down           |
| TB3         | 6B      | 3J          | TB38      | 10B     | 1656 | 24/0.2  | B    | E.H.T. trip back up |
| TB3         | 8B      | 1E          | TB4       | 11B     | 1015 | 23/0076 | R    | 500V                |
| TB3         | 9B      | 1E          | TB4       | 8B      | 1013 | 23/0076 | R    | 300V                |
| TB3         | 10B     | 3F          | TB1       | 11B     | 1062 | 23/0076 | Y    | 50V                 |
| TB3         | 10B     | 3J          | TB35      | 3B      | 754  | 23/0076 | Y    | 50V                 |
| TB3         | 11B     | 1E          | TB4       | 5B      | 1011 | 23/0076 | V    | -250V               |
| TB3         | 12B     | 1E          | TB1       | 12B     | 999  | 23/0076 | Bk   | Earth               |
| TB3         | 12B     | 2F          | TB1       | 1B      | 1063 | 23/0076 | Bk   | Earth               |
|             |         |             |           |         |      |         |      |                     |
| TB4         | 1B      | 2E          | TB2       | 2B      | 1028 | 23/0076 | Bk   | Neutral             |
| TB4         | 1B      | 4F          | TB1       | 8B      | 1064 | 23/0076 | Bk   | Neutral             |
| TB4         | 2B      | 3J          | TB36      | 2B      | 768  | 23/0076 | 0    | I/L to Pneumatics   |
| TB4         | 3B      | 3J          | TB36      | 3B      | 769  | 23/0076 | 0    | Warm-up Complete    |
| TB4         | 4B      | 3J          | TB36      | 4B      | 770  | 23/0076 | Y    | Stalo Low           |
| TB4         | 5B      | 3J          | TB36      | 12B     | 777  | 23/0076 | Y    | Stalo High          |
| TB4         | 6B      | 3J          | TB36      | 5B      | 771  | 23/0076 | P    | Remote H.T. Reset   |
| TB4         | 7B      | 3J          | TB36      | 6B      | 772  | 23/0076 | P    | Remote H.T. Reset   |
| TB4         | 8B      | 3J          | TB36      | 7B      | 773  | 23/0076 | Y    | Remote Tx. Off      |
| TB4         | 9B      | 3J          | TB36      | 1B      | 767  | 23/0076 | R    | Remote Tx. On       |
| TB4         | 10B     | 3J          | TB37      | 12B     | 793  | 23/0076 | P    | Magnetron I Sample  |
| TB4         | 11B     | 3J          | TB36      | 11B     | 776  | 23/0076 | B    | Blue Brush          |
| TB4         | 12B     | 3J          | TB36      | 9B      | 774  | 23/0076 | B    | H.T. Contactor O/P  |

TABLE 23  
 Amplifier Direct Current M31  
 5840-99-999-9014

Unit location 2F

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE             |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                     |
| TB1         | 1B      | 1F          | TB3      | 12B     | 1063  | 23/0076 | Bk   | Earth               |
| TB1         | 1B      | 3F          | TB1      | 12B     | 1065  | 23/0076 | Bk   | Earth               |
| TB1         | 2B      | 5F          | TB2      | 5B      | 1066  | 70/0076 | Bn   | 6.3V. 5A            |
| TB1         | 3B      | 5F          | TB2      | 6B      | 1067  | 70/0076 | Bn   | 6.3V. 5A            |
| TB1         | 4B      | 1E          | TB4      | 9B      | 1014  | 23/0076 | R    | 300V                |
| TB1         | 5B      | 1E          | TB4      | 6B      | 1012  | 23/0076 | V    | -250V               |
| TB1         | 6B      | 3J          | TB37     | 3B      | 785   | 23/0076 | B    | Reactor Anode       |
| TB1         | 7B      | 3J          | TB37     | 4B      | 786   | 23/0076 | B    | Reactor H.T.        |
| TB1         | 8B      | 1E          | TB2      | 5B      | 1003  | 23/0076 | P    | Field Volts In      |
| TB1         | 9B      | 3J          | TB36     | 10B     | 775   | 23/0076 | O    | I/L From Trigger    |
| TB1         | 10B     | 1F          | TB2      | 3B      | 1059  | 23/0076 | O    | I/L Out From Field  |
| PLA         |         | 3J          | TB37     | 1B      | 784   | SCREN   |      |                     |
| PLA         |         | 3J          | TB37     | 2B      | 784   | UR.70   |      | Magnet Field Sample |



TABLE 24  
Panel Test Electrical (No.5) M12  
5840-99-999-9035

Unit location 3F

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE             |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                     |
| TB1         | 1B      | 3J          | TB40     | 1B      | 825   | 23/0076 | P    | Magnetron Mean I    |
| TB1         | 2B      | 3J          | TB40     | 2B      | 826   | 23/0076 | P    | Magnetron Mean I    |
| TB1         | 3B      | 3J          | TB40     | 3B      | 827   | 23/0076 | P    | O/Swing Current     |
| TB1         | 4B      | 3J          | TB40     | 4B      | 828   | 23/0076 | P    | O/Swing Current     |
| TB1         | 5B      | 3J          | TB40     | 5B      | 829   | 23/0076 | P    | Magnetron Heater I  |
| TB1         | 6B      | 3J          | TB40     | 6B      | 830   | 23/0076 | P    | Magnetron Heater I  |
| TB1         | 7B      | 3J          | TB40     | 7B      | 831   | 23/0076 | P    | Magnet Temp. In     |
| TB1         | 8B      | 3J          | TB40     | 8B      | 832   | 23/0076 | P    | Magnet Temp. In     |
| TB1         | 9B      | 3J          | TB40     | 9B      | 833   | 23/0076 | P    | Magnet Temp. Out    |
| TB1         | 10B     | 3J          | TB40     | 10B     | 834   | 23/0076 | P    | Magnet Temp. Out    |
| TB1         | 11B     | 1F          | TB3      | 10B     | 1062  | 23/0076 | Y    | 50V                 |
| TB1         | 12B     | 2F          | TB1      | 1B      | 1065  | 23/0076 | Bk.  | Earth               |
| TB1         | 12B     | 4F          | TB1      | 7B      | 1068  | 23/0076 | Bk   | Earth               |
| TB2         | 1B      | 3J          | TB37     | 5B      | 787   | 23/0076 | P    | Magnetron Temp. In  |
| TB2         | 2B      | 3J          | TB37     | 6B      | 788   | 23/0076 | P    | Magnetron Temp. In  |
| TB2         | 3B      | 3J          | TB37     | 7B      | 789   | 23/0076 | P    | Magnetron Temp. Out |
| TB2         | 4B      | 3J          | TB37     | 8B      | 790   | 23/0076 | P    | Magnetron Temp. Out |
| TB2         | 5B      | 3J          | TB40     | 11B     | 835   | 23/0076 | P    | Magnet Field I +ve  |
| TB2         | 6B      | 3J          | TB40     | 12B     | 836   | 23/0076 | P    | Magnet Field I -ve  |
| TB2         | 7B      | 3J          | TB38     | 3B      | 1603  | 40/0076 | P    | )                   |
| TB2         | 8B      | 3J          | TB38     | 4B      | 1604  | 40/0076 | P    | ) Regulator temp.   |

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TABLE 25  
Power Supply M9  
5840-99-999-9037

Unit location 4F

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE         |
|-------------|---------|-------------|----------|---------|-------|---------|------|-----------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                 |
| TB1         | 2B      | 1E          | TB3      | 10B     | 1008  | 23/0076 | R    | 1200V.          |
| TB1         | 4B      | 3J          | TB38     | 8B      | 799   | 23/0076 | R    | 500V. Reference |
| TB1         | 6B      | 3J          | TB36     | 8B      | 1277  | 23/0076 | R    | 200V. (4D)      |
| TB1         | 7B      | 3F          | TB1      | 12B     | 1068  | 23/0076 | Bk   | Earth           |
| TB1         | 7B      | 5F          | TB2      | 12B     | 1069  | 23/0076 | Bk   | Earth           |
| TB1         | 8B      | 1F          | TB4      | 1B      | 1064  | 23/0076 | Bk   | Neutral         |
| TB1         | 8B      | 5F          | TB2      | 2B      | 1070  | 23/0076 | Bk   | Neutral         |
| TB1         | 9B      | 1E          | TB2      | 2B      | 1000  | 23/0076 | W    | 240V.           |
| TB1         | 11B     | 1E          | TB4      | 1B      | 1009  | 23/0076 | V    | -600V           |

TABLE 26  
Power Supply ( 300V ) M10  
584C-99-999-2058

Unit location 5F

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE      |
|-------------|---------|-------------|----------|---------|-------|---------|------|--------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |              |
| TB1         | 4B      | 5F          | TB1      | 5B      | 1071  | 23/0076 | P    | Link         |
| TB1         | 10B     | 5F          | TB1      | 12B     | 1072  | 23/0076 | P    | Link         |
| TB2         | 1B      | 5F          | TB2      | 12B     | 1073  | 23/0076 | Bk   | Link         |
| TB2         | 2B      | 4F          | TB1      | 8B      | 1070  | 23/0076 | Bk   | Neutral      |
| TB2         | 2B      | 5F          | TB3      | 8B      | 1074  | 23/0076 | Bk   | Neutral      |
| TB2         | 3B      | 1E          | TB2      | 3B      | 1001  | 23/0076 | W    | 240V. Heater |
| TB2         | 4B      | 1E          | TB2      | 4B      | 1002  | 23/0076 | W    | 240V. H.T    |
| TB2         | 5B      | 2F          | TB1      | 2B      | 1066  | 70/0076 | Bn   | 6.3V 5A      |
| TB2         | 6B      | 2F          | TB1      | 3B      | 1067  | 70/0076 | Bn   | 6.3V 5A      |
| TB2         | 7B      | 1F          | TB3      | 3B      | 1060  | 70/0076 | Bn   | 6.3V 5A      |
| TB2         | 8B      | 1F          | TB3      | 4B      | 1061  | 70/0076 | Bn   | 6.3V 5A      |
| TB2         | 9B      | 1E          | TB4      | 3B      | 1010  | 23/0076 | V    | -250V Out    |
| TB2         | 12B     | 4F          | TB1      | 7B      | 1069  | 23/0076 | Bk   | Earth        |
| TB3         | 1B      | 5F          | TB3      | 2B      | 1075  | 23/0076 | P    | Link         |
| TB3         | 5B      | 5F          | TB3      | 6B      | 1076  | 23/0076 | P    | Link         |
| TB3         | 8B      | 5F          | TB2      | 2B      | 1074  | 23/0076 | Bk   | Neutral      |
| TB3         | 8B      | 5F          | TB3      | 10B     | 1077  | 23/0076 | Bk   | Link         |

TABLE 27  
 Amplifier Trigger Pulse M25  
 5840-99-999-2832

Unit location 1G

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE     |
|-------------|---------|-------------|----------|---------|-------|---------|------|-------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |             |
| TB1         | 2B      | 4J          | TB41     | 12B     | 862   | Screen  |      | G2-D. Bias. |
| TB1         | 3B      | 4J          | TB41     | 11B     | 862   | KL6M    |      |             |
| TB1         | 4B      | 4J          | TB41     | 10B     | 861   | Screen  |      |             |
| TB1         | 5B      | 4J          | TB41     | 9B      | 861   | KL6M    |      |             |
| TB1         | 6B      | 4J          | TB41     | 8B      | 860   | Screen  |      |             |
| TB1         | 7B      | 4J          | TB41     | 7B      | 860   | KL6M    |      |             |
| TB1         | 8B      | 4J          | TB41     | 6B      | 859   | Screen  |      |             |
| TB1         | 9B      | 4J          | TB41     | 5B      | 859   | KL6M    |      |             |
| TB1         | 11B     | 1H          | TB2      | 9B      | 1078  | 23/0076 | R    |             |
| TB2         | 1B      | 2H          | TB2      | 5B      | 1079  | 70/0076 | Bn   | 6.3V 5A     |
| TB2         | 2B      | 2H          | TB2      | 6B      | 1080  | 70/0076 | Bn   | 6.3V 5A     |
| TB2         | 3B      | 2H          | TB2      | 7B      | 1081  | 70/0076 | Bn   | 6.3V 5A     |
| TB2         | 4B      | 2H          | TB2      | 8B      | 1082  | 70/0076 | Bn   | 6.3V 5A     |
| TB2         | 5B      | 4G          | TB2      | 5B      | 1083  | 70/0076 | Bn   | 6.3V 5A     |
| TB2         | 6B      | 4G          | TB2      | 6B      | 1084  | 70/0076 | Bn   | 6.3V 5A     |
| TB2         | 7B      | 4G          | TB2      | 7B      | 1085  | 70/0076 | Bn   | 6.3V 5A     |
| TB2         | 8B      | 4G          | TB2      | 8B      | 1086  | 70/0076 | Bn   | 6.3V 5A     |
| TB2         | 9B      | 1H          | TB4      | 3B      | 1087  | 23/0076 | V    | -250V.      |
| TB2         | 10B     | 2G          | TB1      | 2B      | 1088  | 23/0076 | Bk   | Earth       |
| TB2         | 10B     | 1H          | TB1      | 12B     | 1089  | 23/0076 | Bk   | Earth       |
| TB2         | 11B     | 1H          | TB4      | 5B      | 1090  | 23/0076 | R    | 300V.       |
| TB2         | 12B     | 1H          | TB4      | 9B      | 1091  | 23/0076 | R    | 500V.       |
| TB3         | 12B     | 4J          | TB42     | 4B      | 869   | KL6M    |      | G2-A Pulse  |
| TB3         | 11B     | 4J          | TB42     | 3B      | 869   | Screen  |      | G2-B Pulse  |
| TB3         | 10B     | 4J          | TB42     | 6B      | 870   | KL6M    |      |             |
| TB3         | 9B      | 4J          | TB42     | 5B      | 870   | Screen  |      | G2-C Pulse  |
| TB3         | 4B      | 4J          | TB42     | 8B      | 871   | KL6M    |      |             |
| TB3         | 3B      | 4J          | TB42     | 7B      | 871   | Screen  |      | G2-D Pulse  |
| TB3         | 2B      | 4J          | TB42     | 10B     | 872   | KL6M    |      |             |
| TB3         | 1B      | 4J          | TB42     | 9B      | 872   | Screen  |      |             |

TABLE 28  
Pulse Generator M12.  
5840-99-999-2663

Unit location 2G

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE             |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                     |
| TB1         | 1B      | 1H          | TB4      | 4B      | 1092  | 23/0076 | V    | -250V.              |
| TB1         | 2B      | 1G          | TB2      | 10B     | 1088  | 23/0076 | Bk   | Earth               |
| TB1         | 2B      | 3G          | TB1      | 2B      | 1093  | 23/0076 | Bk   | Earth               |
| TB1         | 3B      | 1H          | TB4      | 6B      | 1094  | 23/0076 | R    | 300V.               |
| TB1         | 4B      | 1H          | TB4      | 10B     | 1095  | 23/0076 | R    | 500V.               |
| TB1         | 4B      | 4J          | TB4.5    | 9B      | 898   | 23/0076 | R    | 500V.               |
| TB1         | 5B      | 1H          | TB2      | 11B     | 1096  | 23/0076 | R    | 1200V.              |
| TB1         | 7B      | 4J          | TB4.2    | 2B      | 868   | KL6M    |      | G 1 Pulse           |
| TB1         | 8B      | 4J          | TB4.2    | 1B      | 868   | Screen  |      |                     |
| TB1         | 9B      | 4H          | TB2      | 5B      | 1097  | 70/0076 | Bn   | 6.3V 5A             |
| TB1         | 10B     | 4H          | TB2      | 6B      | 1098  | 70/0076 | Bn   | 6.3V 5A             |
| TB1         | 11B     | 4J          | TB4.4    | 1B      | 877   | 23/0076 | 0    | Trigger 1/L IN      |
| TB1         | 12B     | 4J          | TB4.4    | 2B      | 878   | 23/0076 | 0    | Trigger 1/L OUT     |
| TB2         | 1B      | 4J          | TB4.1    | 3B      | 858   | KL6M    |      | Pre-Pulse Monitor   |
| TB2         | 2B      | 4J          | TB4.1    | 4B      | 858   | Screen  |      |                     |
| TB2         | 3B      | 4J          | TB4.6    | 4B      | 909   | 23/0076 | P    | Thyr. D. Sample     |
| TB2         | 4B      | 4J          | TB4.6    | 3B      | 908   | 23/0076 | P    | Thyr. C. Sample     |
| TB2         | 5B      | 4J          | TB4.6    | 2B      | 907   | 23/0076 | P    | Thyr. B. Sample     |
| TB2         | 6B      | 4J          | TB4.6    | 1B      | 906   | 23/0076 | P    | Thyr. A. Sample     |
| TB2         | 7B      | 4J          | TB4.6    | 5B      | 910   | 23/0076 | P    | Thyr. A. & B Sample |
| TB2         | 8B      | 4J          | TB4.6    | 6B      | 911   | 23/0076 | P    | Thyr. C. & D Sample |
| TB2         | 9B      | 3H          | TB2      | 5B      | 1099  | 70/0076 | Bn   | 6.3V 5A             |
| TB2         | 10B     | 3H          | TB2      | 6B      | 1100  | 70/0076 | Bn   | 6.3V 5A             |
| TB2         | 11B     | 3H          | TB2      | 7B      | 1101  | 70/0076 | Bn   | 6.3V 5A             |
| TB2         | 12B     | 3H          | TB2      | 8B      | 1102  | 70/0076 | Bn   | 6.3V 5A             |
| PLA         |         | 4J          | TB4.3    | 9B      | 873   | U.R. 70 |      | Trigger IN          |
| PLA         |         | 4J          | TB4.3    | 10B     | 873   | Screen  |      |                     |

TABLE 29  
 Power Supply (500V) M6  
 5840-99-999-9039

Unit location 3G

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |         |
| TB1         | 1B      | 4G          | TB2      | 2B      | 1103  | 23/0076 | Bk   | Neutral |
| TB1         | 2B      | 2G          | TB1      | 2B      | 1093  | 23/0076 | Bk   | Earth   |
| TB1         | 2B      | 3G          | TB1      | 7B      | 1104  | 23/0076 | Bk   | Link    |
| TB1         | 3B      | 1H          | TB2      | 1B      | 1105  | 23/0076 | B    | 240V.   |
| TB1         | 5B      | 1H          | TB4      | 7B      | 1106  | 23/0076 | R    | 500V.   |
| TB1         | 7B      | 4G          | TB2      | 12B     | 1107  | 23/0076 | B    | Earth   |

TABLE 30  
Power Supply (300V) M10  
5840-99-999-2058

Unit location 4G

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE      |
|-------------|---------|-------------|----------|---------|-------|---------|------|--------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |              |
| TB1         | 4B      | 4G          | TB1      | 5B      | 1108  | 23/0076 | P    | Link         |
| TB1         | 10B     | 4G          | TB1      | 12B     | 1109  | 23/0076 | P    | Link         |
| TB2         | 1B      | 4G          | TB2      | 12B     | 1110  | 23/0076 | Bk   | Link         |
| TB2         | 2B      | 3G          | TB1      | 1B      | 1103  | 23/0076 | Bk   | Neutral      |
| TB2         | 2B      | 4G          | TB3      | 8B      | 1111  | 23/0076 | Bk   | Neutral      |
| TB2         | 3B      | 1H          | TB2      | 2B      | 1112  | 23/0076 | B    | 240V. Heater |
| TB2         | 4B      | 1H          | TB2      | 3B      | 1113  | 23/0076 | B    | 240V. H.T.   |
| TB2         | 5B      | 1G          | TB2      | 5B      | 1083  | 70/0076 | Bn   | 6.3V. 5A     |
| TB2         | 6B      | 1G          | TB2      | 6B      | 1084  | 70/0076 | Bn   | 6.3V. 5A     |
| TB2         | 7B      | 1G          | TB2      | 7B      | 1085  | 70/0076 | Bn   | 6.3V. 5A     |
| TB2         | 8B      | 1G          | TB2      | 8B      | 1086  | 70/0076 | Bn   | 6.3V 5A      |
| TB2         | 9B      | 1H          | TB4      | 1B      | 1114  | 23/0076 | V    | -250V.       |
| TB2         | 12B     | 3G          | TB1      | 7B      | 1107  | 23/0076 | Bk   | Earth        |
| TB3         | 1B      | 4G          | TB3      | 2B      | 1115  | 23/0076 | P    | Link         |
| TB3         | 5B      | 4G          | TB3      | 6B      | 1116  | 23/0076 | P    | Link         |
| TB3         | 8B      | 4G          | TB2      | 2B      | 1111  | 23/0076 | Bk   | Neutral      |
| TB3         | 8B      | 4G          | TB3      | 10B     | 1117  | 23/0076 | Bk   | Link         |
| TB3         | 10B     | 5H          | TB1      | 1B      | 1118  | 23/0076 | Bk   | Neutral      |

TABLE 31 (Sheet 1. Continued on Sheet 2)  
Panel Test Electrical (No.4) M10  
5840-99-999-9034

Unit location LH

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE            |
|-------------|---------|-------------|----------|---------|-------|---------|------|--------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                    |
| TB1         | 1B      | 4J          | TB44     | 7B      | 881   | 23/0076 | B    | Blue phase         |
| TB1         | 2B      | 4J          | TB44     | 9B      | 882   | 40/0076 | B    | Delayed blue phase |
| TB1         | 3B      | 2H          | TB2      | 3B      | 1119  | 23/0076 | B    | 240V Heaters       |
| TB1         | 4B      | 2H          | TB2      | 4B      | 1120  | 23/0076 | B    | 240V H.T.          |
| TB1         | 5B      | 3H          | TB2      | 3B      | 1121  | 23/0076 | B    | 240V Heaters       |
| TB1         | 6B      | 3H          | TB2      | 4B      | 1122  | 23/0076 | B    | 240V H.T.          |
| TB1         | 7B      | 4H          | TB2      | 3B      | 1123  | 23/0076 | B    | 240V Heaters       |
| TB1         | 8B      | 4H          | TB2      | 4B      | 1124  | 23/0076 | B    | 240V H.T.          |
| TB1         | 9B      | 5H          | TB1      | 3B      | 1125  | 23/0076 | B    | 240V H.T.          |
| TB1         | 11B     | 4J          | TB44     | 12B     | 883   | 40/0076 | Bk   | Neutral            |
| TB1         | 11B     | 2H          | TB2      | 2B      | 1126  | 23/0076 | Bk   | Neutral            |
| TB1         | 12B     | 1G          | TB2      | 10B     | 1089  | 23/0076 | Bk   | Earth              |
| TB1         | 12B     | 2H          | TB2      | 1B      | 1127  | 23/0076 | Bk   | Earth              |
| TB2         | 1B      | 3G          | TB1      | 3B      | 1105  | 23/0076 | B    | 240V H.T.          |
| TB2         | 2B      | 4G          | TB2      | 3B      | 1112  | 23/0076 | B    | 240V Heaters       |
| TB2         | 3B      | 4G          | TB2      | 4B      | 1113  | 23/0076 | B    | 240V H.T.          |
| TB2         | 7B      | 4J          | TB45     | 2B      | 891   | 23/0076 | R    | 1200V IN           |
| TB2         | 9B      | 1G          | TB1      | 11B     | 1078  | 23/0076 | R    | 1200V OUT          |
| TB2         | 11B     | 2G          | TB1      | 5B      | 1096  | 23/0076 | R    | 1200V OUT          |



TABLE 31 (Sheet 2)  
Panel Test Electrical (No.4) M10  
5840-99-999-9034

Unit location LH

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE         |
|-------------|---------|-------------|----------|---------|-------|---------|------|-----------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                 |
| TB3         | 1B      | 2H          | TB2      | 12B     | 1128  | 23/0076 | R    | 300V.IN         |
| TB3         | 2B      | 4J          | TB45     | 4B      | 893   | 23/0076 | R    | 300V.OUT (N.T.) |
| TB3         | 3B      | 3H          | TB2      | 12B     | 1129  | 23/0076 | R    | 300V.IN         |
| TB3         | 4B      | 4J          | TB45     | 5B      | 894   | 23/0076 | R    | 300V.OUT (2C)   |
| TB3         | 5B      | 4H          | TB2      | 12B     | 1130  | 23/0076 | R    | 300V. IN        |
| TB3         | 7B      | 5H          | TB1      | 5B      | 1131  | 23/0076 | R    | 500V. IN        |
| TB3         | 8B      | 4J          | TB45     | 3B      | 892   | 23/0076 | R    | 500V. OUT       |
| TB3         | 10B     | 4J          | TB44     | 3B      | 879   | 23/0076 | R    | Red phase       |
| TB3         | 12B     | 4J          | TB44     | 5B      | 880   | 23/0076 | W    | Yellow phase    |
|             |         |             |          |         |       |         |      |                 |
| TB4         | 1B      | 4G          | TB2      | 9B      | 1114  | 23/0076 | V    | -250V. IN       |
| TB4         | 2B      | 4J          | TB45     | 6B      | 895   | 23/0076 | V    | -250V. OUT      |
| TB4         | 3B      | 1G          | TB2      | 9B      | 1087  | 23/0076 | V    | -250V. OUT      |
| TB4         | 4B      | 2G          | TB1      | 1B      | 1092  | 23/0076 | V    | -250V. OUT      |
| TB4         | 5B      | 1G          | TB2      | 11B     | 1090  | 23/0076 | R    | 300V. OUT       |
| TB4         | 5B      | 4J          | TB45     | 7B      | 896   | 23/0076 | R    | 300V. Metering  |
| TB4         | 6B      | 2G          | TB1      | 3B      | 1094  | 23/0076 | R    | 300V. OUT       |
| TB4         | 7B      | 3G          | TB1      | 5B      | 1106  | 23/0076 | R    | 500V. IN        |
| TB4         | 8B      | 4J          | TB45     | 8B      | 897   | 23/0076 | R    | 500V. Metering  |
| TB4         | 9B      | 1G          | TB2      | 12B     | 1091  | 23/0076 | R    | 500V. OUT       |
| TB4         | 10B     | 2G          | TB1      | 4B      | 1095  | 23/0076 | R    | 500V. OUT       |

TABLE 32  
 Power Supply (+300V) M10  
 5840-99-999-2058

Unit location 2H

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE       |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |               |
| TB1         | 4B      | 2H          | TB1      | 5B      | 1132  | 23/0076 | P    | Link          |
| TB1         | 10B     | 2H          | TB1      | 12B     | 1133  | 23/0076 | P    | Link          |
| TB2         | 1B      | 1H          | TB1      | 12B     | 1127  | 23/0076 | Bk   | Earth         |
| TB2         | 1B      | 2H          | TB2      | 9B      | 1134  | 23/0076 | Bk   | Link          |
| TB2         | 2B      | 1H          | TB1      | 11B     | 1126  | 23/0076 | Bk   | Neutral       |
| TB2         | 2B      | 2H          | TB3      | 8B      | 1135  | 23/0076 | Bk   | Neutral       |
| TB2         | 3B      | 1H          | TB1      | 3B      | 1119  | 23/0076 | B    | 240V. heaters |
| TB2         | 4B      | 1H          | TB1      | 4B      | 1120  | 23/0076 | B    | 240V. H.T.    |
| TB2         | 5B      | 1G          | TB2      | 1B      | 1079  | 70/0076 | Bn   | 6.3V. 5A      |
| TB2         | 6B      | 1G          | TB2      | 2B      | 1080  | 70/0076 | Bn   | 6.3V. 5A      |
| TB2         | 7B      | 1G          | TB2      | 3B      | 1081  | 70/0076 | Bn   | 6.3V. 5A      |
| TB2         | 8B      | 1G          | TB2      | 4B      | 1082  | 70/0076 | Bn   | 6.3V. 5A      |
| TB2         | 9B      | 3H          | TB2      | 1B      | 1136  | 23/0076 | Bk   | Earth         |
| TB2         | 12B     | 1H          | TB3      | 1B      | 1128  | 23/0076 | R    | 300V. Out     |
| TB3         | 1B      | 2H          | TB3      | 2B      | 1137  | 23/0076 | P    | Link          |
| TB3         | 5B      | 2H          | TB3      | 6B      | 1138  | 23/0076 | P    | Link          |
| TB3         | 8B      | 2H          | TB2      | 2B      | 1135  | 23/0076 | Bk   | Neutral       |
| TB3         | 8B      | 2H          | TB3      | 9B      | 1139  | 23/0076 | Bk   | Link          |
| TB3         | 9B      | 3H          | TB2      | 2B      | 1140  | 23/0076 | Bk   | Neutral       |

TABLE 33  
 Power Supply (+300V) M10  
 5840-99-999-2058

Unit location 3H

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE      |
|-------------|---------|-------------|----------|---------|-------|---------|------|--------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |              |
| TB1         | 4B      | 3H          | TB1      | 5B      | 1141  | 23/0076 | P    | Link         |
| TB1         | 10B     | 3H          | TB1      | 12B     | 1142  | 23/0076 | P    | Link         |
| TB2         | 1B      | 2H          | TB2      | 9B      | 1136  | 23/0076 | Bk   | Earth        |
| TB2         | 1B      | 3H          | TB2      | 9B      | 1143  | 23/0076 | Bk   | Link         |
| TB2         | 2B      | 2H          | TB3      | 9B      | 1140  | 23/0076 | Bk   | Neutral      |
| TB2         | 2B      | 3H          | TB3      | 8B      | 1144  | 23/0076 | Bk   | Neutral      |
| TB2         | 3B      | 1H          | TB1      | 5B      | 1121  | 23/0076 | B    | 240V Heaters |
| TB2         | 4B      | 1H          | TB1      | 6B      | 1122  | 23/0076 | B    | 240V H.T.    |
| TB2         | 5B      | 2G          | TB2      | 9B      | 1099  | 70/0076 | Bn   | 6.3V 5A      |
| TB2         | 6B      | 2G          | TB2      | 10B     | 1100  | 70/0076 | Bn   | 6.3V 5A      |
| TB2         | 7B      | 2G          | TB2      | 11B     | 1101  | 70/0076 | Bn   | 6.3V 5A      |
| TB2         | 8B      | 2G          | TB2      | 12B     | 1102  | 70/0076 | Bn   | 6.3V 5A      |
| TB2         | 9B      | 4H          | TB2      | 1B      | 1145  | 23/0076 | Bk   | Earth        |
| TB2         | 12B     | 1H          | TB3      | 3B      | 1129  | 23/0076 | R    | 300V Out     |
| TB3         | 1B      | 3H          | TB3      | 2B      | 1146  | 23/0076 | P    | Link         |
| TB3         | 5B      | 3H          | TB3      | 6B      | 1147  | 23/0076 | P    | Link         |
| TB3         | 8B      | 3H          | TB2      | 2B      | 1144  | 23/0076 | Bk   | Neutral      |
| TB3         | 8B      | 3H          | TB3      | 9B      | 1148  | 23/0076 | Bk   | Link         |
| TB3         | 9B      | 4H          | TB2      | 2B      | 1149  | 23/0076 | Bk   | Neutral      |

TABLE 34  
Power Supply (+300V) M10  
5840-99-999-2058

Unit location 4H

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE       |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |               |
| TB1         | 4B      | 4H          | TB1      | 5B      | 1150  | 23/0076 | P    | Link          |
| TB1         | 1CB     | 4H          | TB1      | 12B     | 1151  | 23/0076 | P    | Link          |
| TB2         | 1B      | 3H          | TB2      | 9B      | 1145  | 23/0076 | Bk   | Earth         |
| TB2         | 1B      | 4H          | TB2      | 9B      | 1152  | 23/0076 | Bk   | Link          |
| TB2         | 2B      | 3H          | TB3      | 9B      | 1149  | 23/0076 | Bk   | Neutral       |
| TB2         | 2B      | 4H          | TB3      | 8B      | 1153  | 23/0076 | Bk   | Neutral       |
| TB2         | 3B      | 1H          | TB1      | 7B      | 1123  | 23/0076 | B    | 24.0V Heaters |
| TB2         | 4B      | 1H          | TB1      | 8B      | 1124  | 23/0076 | B    | 24.0V H.T.    |
| TB2         | 5B      | 2G          | TB1      | 9B      | 1097  | 70/0076 | Bn   | 6.3V 5A       |
| TB2         | 6B      | 2G          | TB1      | 10B     | 1098  | 70/0076 | Bn   | 6.3V 5A       |
| TB2         | 9B      | 5H          | TB1      | 2B      | 1154  | 23/0076 | Bk   | Earth         |
| TB2         | 12B     | 1H          | TB3      | 5B      | 1130  | 23/0076 | R    | 300V Out      |
| TB3         | 1B      | 4H          | TB3      | 2B      | 1155  | 23/0076 | P    | Link          |
| TB3         | 5B      | 4H          | TB3      | 6B      | 1156  | 23/0076 | P    | Link          |
| TB3         | 8B      | 4H          | TB2      | 2B      | 1153  | 23/0076 | Bk   | Neutral       |
| TB3         | 8B      | 4H          | TB3      | 9B      | 1157  | 23/0076 | Bk   | Link          |
| TB3         | 9B      | 5H          | TB1      | 1B      | 1158  | 23/0076 | Bk   | Neutral       |

TABLE 35  
Power Supply (500V) M6  
5840-99-999-9039

Unit location 5H

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE        |
|-------------|---------|-------------|----------|---------|-------|---------|------|----------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                |
| TB1         | 1B      | 4G          | TB3      | 10B     | 1118  | 23/0076 | Bk   | Neutral        |
| TB1         | 1B      | 4H          | TB3      | 9B      | 1158  | 23/0076 | Bk   | Neutral        |
| TB1         | 2B      | 4H          | TB2      | 9B      | 1154  | 23/0076 | Bk   | Earth          |
| TB1         | 2B      | 5H          | TB1      | 7B      | 1159  | 23/0076 | Bk   | Link           |
| TB1         | 3B      | 1H          | TB1      | 9B      | 1125  | 23/0076 | B    | 240V           |
| TB1         | 5B      | 1H          | TB3      | 7B      | 1131  | 23/0076 | R    | 500V Out       |
| TB1         | 7B      | 4J          | TB45     | 12B     | 899   | 23/0076 | Bk   | Earth          |
| TB1         | 9B      | 4J          | TB45     | 10B     | 1515  | 23/0076 | R    | 700V Reference |

AP

TABLE 36 (Sheet 1. Continued on Sheet 2)  
 Junction Panel L.H.

Unit location 1J

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |        |                   | SERVICE |
|-------------|---------|-------------|----------|---------|-------|--------|-------------------|---------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE   | COL.              |         |
| TB21        | 1A      | 2J          | TB29     | 1A      | 1     | UR70   | Monitor RF Pulse  |         |
| TB21        | 2A      | 2J          | TB29     | 2A      | 1     | Screen |                   |         |
| TB21        | 3A      | 2J          | TB29     | 11A     | 2     | UR70   | A.F.C. Disc       |         |
| TB21        | 4A      | 2J          | TB29     | 12A     | 2     | Screen |                   |         |
| TB21        | 5A      | 2J          | TB29     | 3A      | 3     | K16M   | S.A. Video        |         |
| TB21        | 6A      | 2J          | TB29     | 4A      | 3     | Screen |                   |         |
| TB21        | 7A      | 2J          | TB29     | 7A      | 4     | K16M   | Blanking Out      |         |
| TB21        | 8A      | 2J          | TB29     | 8A      | 4     | Screen |                   |         |
| TB21        | 9A      | 2J          | TB29     | 9A      | 5     | K16M   | T/B Out           |         |
| TB21        | 10A     | 2J          | TB29     | 10A     | 5     | Screen |                   |         |
| TB21        | 11A     | 2J          | TB29     | 6A      | 6     | K16M   | Monitor Wavemeter |         |
| TB21        | 12A     | 2J          | TB29     | 5A      | 6     | Screen | Pulse             |         |
|             |         |             |          |         |       |        |                   |         |
| TB21        | 1B      | 2A          | 1PLF     |         | 7     | UR70   | Monitor RF Pulse  |         |
| TB21        | 2B      | 2A          | 1PLF     |         | 7     | Screen |                   |         |
| TB21        | 3B      | 2A          | 1PLG     |         | 8     | UR70   | A.F.C. Disc       |         |
| TB21        | 4B      | 2A          | 1PLG     |         | 8     | Screen |                   |         |
| TB21        | 5B      | 1B          | TB2      | 5B      | 9     | K16M   | S.A. Video        |         |
| TB21        | 6B      | 1B          | TB2      | 6B      | 9     | Screen |                   |         |
| TB21        | 7B      | 1B          | TB2      | 3B      | 10    | K16M   | Blanking Out      |         |
| TB21        | 8B      | 1B          | TB2      | 4B      | 10    | Screen |                   |         |
| TB21        | 9B      | 1B          | TB2      | 1B      | 11    | K16M   | T/B Out           |         |
| TB21        | 1CB     | 1B          | TB2      | 2B      | 11    | Screen |                   |         |
| TB21        | 11B     | 2B          | TB1      | 11B     | 1570  | K16M   | Monitor Wavemeter |         |
| TB21        | 12B     | 2B          | TB1      | 10B     | 1570  | Screen | Pulse             |         |

TABLE 36 (Sheet 2. Continued on Sheet 3).  
Junction Panel L.H.

Unit location 1J

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE        |
|-------------|---------|-------------|----------|---------|-------|---------|------|----------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                |
| TB22        | 1A      | 2J          | TB30     | 1A      | 13    | UR70    |      | WOB. 0/P       |
| TB22        | 2A      | 2J          | TB30     | 2A      | 13    | Screen  |      |                |
| TB22        | 3A      | 2J          | TB30     | 9A      | 14    | 23/0076 | P    | WOB. ON        |
| TB22        | 4A      | 2J          | TB30     | 10A     | 15    | 23/0076 | Y    | S.A. ON        |
| TB22        | 5A      | 2J          | TB30     | 8A      | 16    | 23/0076 | Bk   | Sig.L.O. Stop  |
| TB22        | 6A      | 2J          | TB31     | 10A     | 17    | 23/0076 | P    |                |
| TB22        | 7A      | 5M          | TB47     | 7B      | 18    | 70/0076 | Bn   | 6.3V 5A        |
| TB22        | 8A      | 5M          | TB47     | 8B      | 19    | 70/0076 | Bn   | 6.3V 5A        |
| TB22        | 1B      | 1B          | 3PLJ     |         | 20    | UR70    |      | WOB. 0/P       |
| TB22        | 2B      | 1B          | 3PLJ     |         | 20    | Screen  |      |                |
| TB22        | 4B      | 1B          | TB2      | 7B      | 22    | 23/0076 | Y    | S.A. ON        |
| TB22        | 5B      | 3A          | TB1      | 11B     | 23    | 23/0076 | Bk   | Sig. L.O. Stop |
| TB22        | 7B      | 2B          | TB1      | 1B      | 25    | 70/0076 | Bn   | 6.3V 5A        |
| TB22        | 8B      | 2B          | TB1      | 2B      | 26    | 70/0076 | Bn   | 6.3V 5A        |
| TB22        | 3B      | 1B          | TB2      | 8B      | 1509  | 23/0076 | P    | WOB. ON        |
| TB23        | 1A      | 5J          | TB3      | 10A     | 27    | 23/0076 | P    | AFC MUTE       |
| TB23        | 2A      | 5J          | TB4      | 7A      | 28    | 23/0076 | Y    | Stalo Low      |
| TB23        | 3A      | 5J          | TB4      | 5A      | 29    | 23/0076 | Y    | Stalo High     |
| TB23        | 12A     | 5J          | TB9      | 2A      | 30    | 40/0076 | Bk   | Neutral        |
| TB23        | 12A     | 1J          | SKTA     | N       | 431   | 40/0076 | Bk   | Neutral        |
| TB23        | 4A      | 1K          | SKTAA    | 1       | 85    | 23/0076 | P    | N.F. BAD-Local |
| TB23        | 1B      | 2A          | TB1      | 11B     | 31    | 23/0076 | P    | AFC MUTE       |
| TB23        | 2B      | 2A          | TB2      | 11B     | 32    | 23/0076 | Y    | Stalo Low      |
| TB23        | 3B      | 2A          | TB2      | 12B     | 33    | 23/0076 | Y    | Stalo High     |
| TB23        | 12B     | 2A          | TB1      | 9B      | 34    | 23/0076 | Bk   | Neutral        |
| TB23        | 4B      | 3B          | TB2      | 10B     | 1512  | 23/0076 | P    | N.F. BAD-Local |

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TABLE 36 (Sheet 3. Continued on Sheet 4)  
Junction Panel L.H.

Unit location 1J

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE     |
|-------------|---------|-------------|----------|---------|-------|---------|------|-------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |             |
| TB24        | 1A      | 5J          | TB2      | 2A      | 35    | 23/0076 | R    | 300V (2E)   |
| TB24        | 2A      | 5J          | TB2      | 3A      | 36    | 23/0076 | R    | 300V (4E)   |
| TB24        | 3A      | 2J          | TB31     | 5A      | 37    | 23/0076 | R    | 200V (4D)   |
| TB24        | 4A      | 2J          | TB31     | 6A      | 38    | 23/0076 | R    | 200V (5D)   |
| TB24        | 5A      | 5J          | TB2      | 11A     | 39    | 23/0076 | V    | -250V (5F)  |
| TB24        | 5A      | 3M          | TB5      | 7B      | 40    | 23/0076 | V    | -250V (5F)  |
| TB24        | 6A      | 5J          | TB2      | 12A     | 41    | 23/0076 | V    | -600V (4F)  |
| TB24        | 9A      | 5J          | TB16     | 3A      | 42    | 23/0076 | P    | ON TUNE     |
| TB24        | 10A     | 2J          | TB32     | 1A      | 43    | 40/0076 | R    | Red Phase   |
| TB24        | 10A     | 5M          | TB47     | 10B     | 44    | 23/0076 | R    | Red Phase   |
| TB24        | 11A     | 5J          | TB16     | 4A      | 45    | 23/0076 | P    | Tune Common |
| TB24        | 12A     | EARTH STRIP |          |         | 46    | 23/0076 | Bk   | Earth       |
|             |         |             |          |         |       |         |      |             |
| TB24        | 1B      | 1A          | TB1      | 1B      | 47    | 23/0076 | R    | 300V (2E)   |
| TB24        | 2B      | 1A          | TB1      | 3B      | 48    | 23/0076 | R    | 300V (4E)   |
| TB24        | 3B      | 1A          | TB1      | 4B      | 49    | 23/0076 | R    | 200V (4D)   |
| TB24        | 4B      | 1A          | TB1      | 5B      | 50    | 23/0076 | R    | 200V (5D)   |
| TB24        | 5B      | 1A          | TB2      | 4B      | 51    | 23/0076 | V    | -250V (5F)  |
| TB24        | 6B      | 1A          | TB2      | 12B     | 52    | 23/0076 | V    | -600V (4F)  |
| TB24        | 9B      | 2A          | TB2      | 6B      | 53    | 23/0076 | P    | ON TUNE     |
| TB24        | 10B     | 1A          | TB3      | 1B      | 54    | 23/0076 | R    | Red Phase   |
| TB24        | 11B     | 2A          | TB2      | 7B      | 55    | 23/0076 | P    | Tune Common |
| TB24        | 12B     | 1A          | TB3      | 12B     | 56    | 23/0076 | Bk   | Earth       |



TABLE 36 (Sheet 4. Continued on Sheet 5)  
Junction Panel L.H.

Unit location 1J

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE        |
|-------------|---------|-------------|----------|---------|-------|---------|------|----------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                |
| TB25        | 1A      | 5M          | TB47     | 1B      | 57    | 70/0076 | Bn   | 6.3V 5A        |
| TB25        | 2A      | 5M          | TB47     | 2B      | 58    | 70/0076 | Bn   | 6.3V 5A        |
| TB25        | 3A      | 5M          | TB47     | 3B      | 59    | 70/0076 | Bn   | 6.3V 5A        |
| TB25        | 4A      | 5M          | TB47     | 4B      | 60    | 70/0076 | Bn   | 6.3V 5A        |
| TB25        | 5A      | 5M          | TB47     | 5B      | 61    | 70/0076 | Bn   | 6.3V 5A        |
| TB25        | 6A      | 5M          | TB47     | 6B      | 62    | 70/0076 | Bn   | 6.3V 5A        |
| TB25        | 7A      | 5J          | TB2      | 1A      | 63    | 23/0076 | R    | 500V (5H)      |
| TB25        | 8A      | 1K          | SKTAA    | 23      | 64    | 23/0076 | Y    | 50V            |
| TB25        | 8A      | 3M          | TB6      | 4B      | 65    | 23/0076 | Y    | 50V            |
| TB25        | 10A     | 1K          | SKTAA    | 2       | 66    | 23/0076 | Y    | DC Heaters I/L |
| TB25        | 11A     | 5J          | TB4      | 11A     | 67    | UR70    |      | Trigger        |
| TB25        | 12A     | 5J          | TB4      | 12A     | 67    | Screen  |      |                |
| TB25        | 1B      | 3B          | TB1      | 1B      | 68    | 70/0076 | Bn   | 6.3V 5A        |
| TB25        | 2B      | 3B          | TB1      | 2B      | 69    | 70/0076 | Bn   | 6.3V 5A        |
| TB25        | 3B      | 3B          | TB1      | 3B      | 70    | 70/0076 | Bn   | 6.3V 5A        |
| TB25        | 4B      | 3B          | TB1      | 4B      | 71    | 70/0076 | Bn   | 6.3V 5A        |
| TB25        | 5B      | 3B          | TB1      | 5B      | 72    | 70/0076 | Bn   | 6.3V 5A        |
| TB25        | 6B      | 3B          | TB1      | 6B      | 73    | 70/0076 | Bn   | 6.3V 5A        |
| TB25        | 7B      | 3B          | TB1      | 9B      | 74    | 23/0076 | R    | 500V (5H)      |
| TB25        | 8B      | 3A          | TB1      | 7B      | 75    | 23/0076 | Y    | 50V            |
| TB25        | 10B     | 4B          | TB1      | 9B      | 76    | 23/0076 | Y    | DC Heaters I/L |
| TB25        | 11B     | 3B          | PLA      |         | 77    | UR70    |      | Trigger        |
| TB25        | 12B     | 3B          | PLA      |         | 77    | Screen  |      |                |

TABLE 36 JUNCTION PANEL LH (Sheet 5 Continued on Sheet 6)

Unit location 1J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE             |
|-------------|---------|-------------|-----------|---------|-------|---------|------|---------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |                     |
| TB26        | 1A      | 1K          | SKTAB     | 3       | 78    | 23/0076 | Y    | Check NF            |
| TB26        | 1A      | 5J          | TB15      | 9A      | 79    | 23/0076 | Y    | Check NF-Remote     |
| TB26        | 2A      | 1K          | SKTAA     | 10      | 80    | 23/0076 | P    | Meter Con. +ve      |
| TB26        | 3A      | 1K          | SKTAA     | 11      | 81    | 23/0076 | P    | Meter Con. -ve      |
| TB26        | 4A      | 1K          | SKTAA     | 12      | 82    | 23/0076 | P    | Meter Def. +ve      |
| TB26        | 5A      | 1K          | SKTAA     | 13      | 83    | 23/0076 | P    | Meter Def. -ve      |
| TB26        | 6A      | 5J          | TB15      | 11A     | 84    | 23/0076 | P    | NF BAD-Remote       |
|             |         |             |           |         |       |         |      |                     |
| TB26        | 7A      | 5J          | TB15      | 12A     | 86    | 23/0076 | P    | NF GOOD-Remote      |
| TB26        | 8A      | 5J          | TB15      | 10A     | 87    | 23/0076 | P    | Remote NF Test Lamp |
| TB26        | 9A      | 5J          | TB15      | 8A      | 88    | 23/0076 | P    | NF Lamp Common      |
| TB26        | 11A     | 6J          | TB17      | 5A      | 89    | UR70    |      | NT Pulse            |
| TB26        | 12A     | 6J          | TB17      | 6A      | 89    | Screen  |      |                     |
|             |         |             |           |         |       |         |      |                     |
|             |         |             |           |         |       |         |      |                     |
| TB26        | 1B      | 3B          | TB2       | 9B      | 90    | 23/0076 | P    | Check NF            |
| TB26        | 2B      | 3B          | TB2       | 1B      | 91    | 23/0076 | P    | Meter Con. +ve      |
| TB26        | 3B      | 3B          | TB2       | 2B      | 92    | 23/0076 | P    | Meter Con. -ve      |
| TB26        | 4B      | 3B          | TB2       | 3B      | 93    | 23/0076 | P    | Meter Def. +ve      |
| TB26        | 5B      | 3B          | TB2       | 4B      | 94    | 23/0076 | P    | Meter Def. -ve      |
| TB26        | 6B      | 3B          | TB2       | 5B      | 95    | 23/0076 | P    | NF BAD-Remote       |
| TB26        | 7B      | 3B          | TB2       | 6B      | 96    | 23/0076 | P    | NF GOOD-Remote      |
| TB26        | 8B      | 3B          | TB2       | 7B      | 97    | 23/0076 | P    | Remote NF Test Lamp |
| TB26        | 9B      | 3B          | TB2       | 8B      | 98    | 23/0076 | P    | NF Lamp Common      |
| TB26        | 11B     | 3B          | PLB       |         | 99    | UR70    |      | NT Pulse            |
| TB26        | 12B     | 3B          | PLB       |         | 99    | Screen  |      |                     |
|             |         |             |           |         |       |         |      |                     |
|             |         |             |           |         |       |         |      |                     |

TABLE 36 JUNCTION PANEL LH (Sheet 6)

Unit location 1J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE    |
|-------------|---------|-------------|-----------|---------|-------|---------|------|------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |            |
| TB71        | 10A     | FJ1         | TB1       | 1A      | F44   | 70/0076 | W    | 24V (Fire) |
| TB71        | 11A     | FJ1         | TB1       | 2A      | F45   | 33/0076 | W    | 24V (Fire) |
| TB71        | 12A     | 2J          | TB33      | 10A     | F46   | 70/0076 | W    | 24V (Fire) |
|             |         |             |           |         |       |         |      |            |
| TB71        | 10B     | GATE<br>A   | XF1       | -ve     | F1    | 19/0076 | W    | 24V (Fire) |
| TB71        | 11B     | GATE<br>A   | XF4       | +ve     | F6    | 19/0076 | W    | 24V (Fire) |
| TB71        | 12B     | GATE<br>B   | XF5       | +ve     | F10   | 19/0076 | W    | 24V (Fire) |
|             |         |             |           |         |       |         |      |            |
| FS4         | A       | 4M          | FS1       | B       | 428   | 40/0076 | R    | 240V       |
| SKTA        | L       | 1J          | FS4       | B       | 429   | 40/0076 | R    | 240V       |
| SKTA        | L       | 1J          | SKTB      | L       | 430   | 40/0076 | R    | 240V       |
| SKTA        | N       | 1J          | TB23      | 12A     | 431   | 40/0076 | Bk   | Neutral    |
| SKTA        | N       | 1J          | SKTB      | N       | 432   | 40/0076 | Bk   | Neutral    |
| SKTA        | E       | EARTH       | STRIP     |         | 433   | 40/0076 | Bk   | Earth      |
| SKTB        | E       | EARTH       | STRIP     |         | 434   | 40/0076 | Bk   | Earth      |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |
|             |         |             |           |         |       |         |      |            |

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IssuedTABLE 37 (Sheet 1. Continued on Sheet 2)  
Junction Panel R.H.

Unit location 2J

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |        |      | SERVICE     |
|-------------|---------|-------------|----------|---------|-------|--------|------|-------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE   | COL. |             |
| TB27        | 1A      | 1Q          | TB2      | 8B      | 100   | K16M   |      | THYR. I - A |
| TB27        | 2A      | 1Q          | TB2      | 7B      | 100   | Screen |      |             |
| TB27        | 3A      | 1Q          | TB2      | 6B      | 101   | K16M   |      | THYR. I - B |
| TB27        | 4A      | 1Q          | TB2      | 5B      | 101   | Screen |      |             |
| TB27        | 5A      | 1Q          | TB2      | 4B      | 102   | K16M   |      | THYR. I - C |
| TB27        | 6A      | 1Q          | TB2      | 3B      | 102   | Screen |      |             |
| TB27        | 7A      | 1Q          | TB2      | 2B      | 103   | K16M   |      | THYR. I - D |
| TB27        | 8A      | 1Q          | TB2      | 1B      | 103   | Screen |      |             |
| TB27        | 9A      | 1R          | TB60     | 10B     | 104   | K16M   |      | Magnetron V |
| TB27        | 10A     | 1R          | TB60     | 11B     | 104   | Screen |      |             |
| TB27        | 11A     | 2Q          | T6       | 12      | 105   | K16M   |      | Magnetron I |
| TB27        | 12A     | 2Q          | T6       | 11      | 105   | Screen |      |             |
| TB27        | 1B      | 2C          | TB4      | 4B      | 106   | K16M   |      | THYR. I - A |
| TB27        | 2B      | 2C          | TB4      | 3B      | 106   | Screen |      |             |
| TB27        | 3B      | 2C          | TB4      | 2B      | 107   | K16M   |      | THYR. I - B |
| TB27        | 4B      | 2C          | TB4      | 1B      | 107   | Screen |      |             |
| TB27        | 5B      | 2C          | TB3      | 12B     | 108   | K16M   |      | THYR. I - C |
| TB27        | 6B      | 2C          | TB3      | 11B     | 108   | Screen |      |             |
| TB27        | 7B      | 2C          | TB3      | 10B     | 109   | K16M   |      | THYR. I - D |
| TB27        | 8B      | 2C          | TB3      | 9B      | 109   | Screen |      |             |
| TB27        | 9B      | 2C          | TB2      | 6B      | 110   | K16M   |      | Magnetron V |
| TB27        | 10B     | 2C          | TB2      | 5B      | 110   | Screen |      |             |
| TB27        | 11E     | 2C          | TB2      | 4B      | 111   | K16M   |      | Magnetron I |
| TB27        | 12B     | 2C          | TB2      | 3B      | 111   | Screen |      |             |

TABLE 37 (Sheet 2. Continued on Sheet 3)  
Junction Panel L.H.

Unit location 2J

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |        |      | SERVICE           |
|-------------|---------|-------------|----------|---------|-------|--------|------|-------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE   | COL. |                   |
| TB28        | 1A      | 1Q          | TB1      | 12B     | 112   | K16M   |      | THYR-G1           |
| TB28        | 2A      | 1Q          | TB1      | 11B     | 112   | Screen |      |                   |
| TB28        | 3A      | 1Q          | TB4      | 5B      | 113   | K16M   |      | G2 - A Pulse      |
| TB28        | 4A      | 1Q          | TB4      | 6B      | 113   | Screen |      |                   |
| TB28        | 5A      | 1Q          | TB4      | 7B      | 114   | K16M   |      | G2 - B Pulse      |
| TB28        | 6A      | 1Q          | TB4      | 8B      | 114   | Screen |      |                   |
| TB28        | 7A      | 1Q          | TB4      | 9B      | 115   | K16M   |      | G2 - C Pulse      |
| TB28        | 8A      | 1Q          | TB4      | 10B     | 115   | Screen |      |                   |
| TB28        | 9A      | 1Q          | TB4      | 11B     | 116   | K16M   |      | G2 - D Pulse      |
| TB28        | 10A     | 1Q          | TB4      | 12B     | 116   | Screen |      |                   |
| TB28        | 11A     |             | R16      | B       | 117   | K16M   |      | Line Volts        |
| TB28        | 12A     |             | R16      | A       | 117   | Screen |      |                   |
| TB28        | 1B      | 2C          | TB2      | 8B      | 118   | K16M   |      | THYR - G1         |
| TB28        | 2B      | 2C          | TB2      | 7B      | 118   | Screen |      |                   |
| TB28        | 3B      | 2C          | TB4      | 12B     | 119   | K16M   |      | G2 - A Pulse      |
| TB28        | 4B      | 2C          | TB4      | 11B     | 119   | Screen |      |                   |
| TB28        | 5B      | 2C          | TB4      | 10B     | 120   | K16M   |      | G2 - B Pulse      |
| TB28        | 6B      | 2C          | TB4      | 9B      | 120   | Screen |      |                   |
| TB28        | 7B      | 2C          | TB4      | 8B      | 121   | K16M   |      | G2 - C Pulse      |
| TB28        | 8B      | 2C          | TB4      | 7B      | 121   | Screen |      |                   |
| TB28        | 9B      | 2C          | TB4      | 6B      | 122   | K16M   |      | G2 - D Pulse      |
| TB28        | 10B     | 2C          | TB4      | 5B      | 122   | Screen |      |                   |
| TB28        | 11B     | 2C          | TB2      | 2B      | 123   | K16M   |      | Line V            |
| TB28        | 12B     | 2C          | TB2      | 1B      | 123   | Screen |      |                   |
| TB29        | 1A      | 1J          | TB21     | 1A      | 1     | UR70   |      | Monitor RF Pulse  |
| TB29        | 2A      | 1J          | TB21     | 2A      | 1     | Screen |      |                   |
| TB29        | 3A      | 1J          | TB21     | 5A      | 3     | K16M   |      | S.A.Video         |
| TB29        | 4A      | 1J          | TB21     | 6A      | 3     | Screen |      |                   |
| TB29        | 7A      | 1J          | TB21     | 7A      | 4     | K16M   |      | S.A.Blanking      |
| TB29        | 8A      | 1J          | TB21     | 8A      | 4     | Screen |      |                   |
| TB29        | 9A      | 1J          | TB21     | 9A      | 5     | K16M   |      | Ext.T/B           |
| TB29        | 10A     | 1J          | TB21     | 10A     | 5     | Screen |      |                   |
| TB29        | 11A     | 1J          | TB21     | 3A      | 2     | UR70   |      | A.F.C.Disc        |
| TB29        | 12A     | 1J          | TB21     | 4A      | 2     | Screen |      |                   |
| TB29        | 6A      | 1J          | TB21     | 11A     | 6     | K16M   |      | Monitor Wavemeter |
| TB29        | 5A      | 1J          | TB21     | 12A     | 6     | Screen |      | Pulse             |

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TABLE 37 (Sheet 3. Continued on Sheet 4)  
Junction Panel R.H.

Unit location 2J

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE           |
|-------------|---------|-------------|----------|---------|-------|---------|------|-------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                   |
| TB29        | 1B      | 2C          | TB1      | 12B     | 124   | UR70    |      | Monitor RF Pulse  |
| TB29        | 2B      | 2C          | TB1      | 11B     | 124   | Screen  |      |                   |
| TB29        | 3B      | 2C          | TB1      | 8B      | 125   | K16M    |      | SA Video          |
| TB29        | 4B      | 2C          | TB1      | 7B      | 125   | Screen  |      |                   |
| TB29        | 7B      | 2C          | TB2      | 12B     | 127   | K16M    |      | SA Blanking       |
| TB29        | 8B      | 2C          | TB2      | 11B     | 127   | Screen  |      |                   |
| TB29        | 9B      | 2C          | TB3      | 2B      | 128   | K16M    |      | Ext.T/B           |
| TB29        | 10B     | 2C          | TB3      | 1B      | 128   | Screen  |      |                   |
| TB29        | 11B     | 2C          | TB3      | 4B      | 129   | UR70    |      | AFC Disc          |
| TB29        | 12B     | 2C          | TB3      | 3B      | 129   | Screen  |      |                   |
| TB29        | 6B      | 2C          | TB2      | 10      | 126   | K16M    |      | Monitor Wavemeter |
| TB29        | 5B      | 2C          | TB2      | 9       | 126   | Screen  |      | Pulse             |
| TB30        | 1A      | 1J          | TB22     | 2A      | 13    | UR70    |      | Wob O/P           |
| TB30        | 2A      | 1J          | TB22     | 1A      | 13    | Screen  |      |                   |
| TB30        | 3A      | 5J          | TB16     | 1A      | 426   | 23/0076 | Y    | Linear I.F.Lamp   |
| TB30        | 4A      | 5J          | TB16     | 2A      | 427   | 23/0076 | Y    | A.J.I.F.Lamp      |
| TB30        | 5A      | 1N          | TB50     | 6B      | 130   | 23/0076 | P    | Green Xtal 1      |
| TB30        | 6A      | 1N          | TB50     | 7B      | 131   | 23/0076 | P    | Red Xtal 1        |
| TB30        | 7A      | 1N          | TB50     | 11B     | 132   | 23/0076 | P    | Xtal Common       |
| TB30        | 8A      | 1J          | TB22     | 5A      | 16    | 23/0076 | Bk   | Sig.LO.Stop       |
| TB30        | 9A      | 1J          | TB22     | 3A      | 14    | 23/0076 | P    | Wob.Control Line  |
| TB30        | 10A     | 1J          | TB22     | 4A      | 15    | 23/0076 | Y    | S.A.On            |
| TB30        | 12A     | 1N          | TB50     | 5B      | 133   | 23/0076 | P    | Bias To Head Amp. |
| TB30        | 1B      | 2D          | PLB      |         | 134   | UR70    |      | Wob.O/P           |
| TB30        | 2B      | 2D          | PLB      |         | 134   | Screen  |      |                   |
| TB30        | 3B      | 2C          | TB1      | 6B      | 498   | 23/0076 | Y    | Linear I.F.Lamp   |
| TB30        | 4B      | 2C          | TB1      | 9B      | 576   | 23/0076 | Y    | A.J.I.F.Lamp      |
| TB30        | 5B      | 1C          | TB2      | 3B      | 135   | 23/0076 | P    | Green Xtal 1      |
| TB30        | 6B      | 1C          | TB2      | 4B      | 136   | 23/0076 | P    | Red Xtal 1        |
| TB30        | 7B      | 1C          | TB2      | 5B      | 137   | 23/0076 | P    | Xtal Common       |
| TB30        | 8B      | 1C          | TB2      | 6B      | 138   | 23/0076 | Bk   | Sig.LO.Stop       |
| TB30        | 9B      | 2C          | TB1      | 2B      | 139   | 23/0076 | P    | Wob.Control Line  |

TABLE 37 (Sheet 4. Continued on Sheet 5)  
Junction Panel R.H.

Unit location 2J

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE                     |
|-------------|---------|-------------|----------|---------|-------|---------|------|-----------------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                             |
| TB30        | 10B     | 2C          | TB1      | 5B      | 140   | 23/0076 | Y    | S.A.On<br>Bias to Head Amp. |
| TB30        | 12B     | 2D          | TB1      | 11B     | 141   | 23/0076 | P    |                             |
| TB31        | 1A      | 5J          | TB2      | 1A      | 142   | 23/0076 | R    | 500V (5H)                   |
| TB31        | 1A      | 1N          | TB49     | 5B      | 143   | 23/0076 | R    | 500V                        |
| TB31        | 2A      | 5J          | TB2      | 4A      | 144   | 23/0076 | R    | 300V (3E)                   |
| TB31        | 3A      | 5J          | TB2      | 6A      | 145   | 23/0076 | R    | 300V (3H)                   |
| TB31        | 4A      | 1K          | \$KTAA   | 3       | 146   | 23/0076 | R    | 200V Metering               |
| TB31        | 5A      | 1J          | TB24     | 3A      | 37    | 23/0076 | R    | 200V (4D)                   |
| TB31        | 5A      | 1K          | \$KTAA   | 4       | 147   | 23/0076 | R    | 200V Metering               |
| TB31        | 6A      | 1J          | TB24     | 4A      | 38    | 23/0076 | R    | 200V (5D)                   |
| TB31        | 6A      | 1K          | \$KTAA   | 7       | 148   | 23/0076 | R    | 200V Metering               |
| TB31        | 7A      | 5J          | TB2      | 11A     | 149   | 23/0076 | V    | -250V (5F)                  |
| TB31        | 7A      | 1K          | \$KTAA   | 9       | 150   | 23/0076 | V    | -250V Metering              |
| TB31        | 8A      | 5J          | TB2      | 9A      | 151   | 23/0076 | Y    | 50V                         |
| TB31        | 9A      | 5J          | TB1      | 6A      | 1275  | 23/0076 | R    | 200V (4D)                   |
| TB31        | 9A      | 1N          | TB50     | 4B      | 152   | 23/0076 | R    | 200V                        |
| TB31        | 10A     | 1J          | TB22     | 6A      | 17    | 23/0076 | P    | S/G On Line                 |
| TB31        | 11A     | 1K          | \$KTAA   | 6       | 153   | 23/0076 | Y    | Stab.Heaters I/L            |
| TB31        | 12A     | 5J          | TB16     | 12A     | 154   | 23/0076 | Y    | Remote Wob.Line             |
| TB31        | 1B      | 1D          | TB1      | 1B      | 155   | 23/0076 | R    | 500V (5H)                   |
| TB31        | 2B      | 1D          | TB1      | 2B      | 156   | 23/0076 | R    | 300V (3E)                   |
| TB31        | 3B      | 1D          | TB1      | 3B      | 157   | 23/0076 | R    | 300V (3H)                   |
| TB31        | 4B      | 1D          | TB1      | 5B      | 158   | 23/0076 | R    | 200V (3C)                   |
| TB31        | 5B      | 1D          | TB1      | 7B      | 159   | 23/0076 | R    | 200V (4D)                   |
| TB31        | 6B      | 1D          | TB1      | 9B      | 160   | 23/0076 | R    | 200V (5D)                   |
| TB31        | 7B      | 1D          | TB2      | 1B      | 161   | 23/0076 | V    | -250V (5F)                  |
| TB31        | 8B      | 3D          | TB2      | 12B     | 162   | 23/0076 | Y    | 50V                         |
| TB31        | 9B      | 1D          | TB2      | 10B     | 163   | 23/0076 | R    | 200V (4D)                   |
| TB31        | 10B     | 2C          | TB1      | 1B      | 164   | 23/0076 | P    | S/G On Line                 |
| TB31        | 11B     | 3D          | TB2      | 11B     | 165   | 23/0076 | Y    | Stab.Heaters I/L            |
| TB31        | 12B     | 2C          | TB1      | 3B      | 166   | 23/0076 | Y    | Remote Wob.Line             |

TABLE 37 JUNCTION PANEL RH (Sheet 5 Continued on Sheet 6)

Unit location 2J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE              |
|-------------|---------|-------------|-----------|---------|-------|---------|------|----------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |                      |
| TB32        | 1A      | 1J          | TB24      | 10A     | 43    | 40/0076 | R    | Red Phase            |
| TB32        | 1A      | 5J          | TB10      | 1A      | 167   | 40/0076 | R    | Red Phase            |
| TB32        | 2A      | 5J          | TB11      | 1A      | 168   | 23/0076 | R    | Delayed Red Phase    |
| TB32        | 3A      | 5J          | TB16      | 5A      | 169   | 23/0076 | P    | Remote Meter SW      |
| TB32        | 4A      | 5J          | TB16      | 6A      | 170   | 23/0076 | P    | Remote Meter Grid 1  |
| TB32        | 5A      | 5J          | TB16      | 7A      | 171   | 23/0076 | P    | Remote Meter Return  |
| TB32        | 6A      | 5J          | TB16      | 8A      | 172   | 23/0076 | P    | Remote Limiter Level |
| TB32        | 7A      | 5J          | TB16      | 9A      | 173   | 23/0076 | P    | Remote A.J. Level    |
| TB32        | 8A      | 5J          | TB16      | 10A     | 174   | 23/0076 | P    | Remote Quiet Level   |
| TB32        | 9A      | 5J          | TB16      | 11A     | 175   | 23/0076 | P    | Remote Bias Return   |
| TB32        | 10A     | 5J          | TB9       | 3A      | 176   | 23/0076 | Bk   | Neutral              |
| TB32        | 11A     | 5J          | TB9       | 4A      | 177   | 23/0076 | Bk   | Neutral              |
| TB32        | 12A     | EARTH STRIP |           |         | 178   | 23/0076 | Bk   | Earth                |
| TB32        | 1B      | 1D          | TB3       | 1B      | 179   | 23/0076 | R    | Red Phase            |
| TB32        | 2B      | 1D          | TB3       | 2B      | 180   | 23/0076 | R    | Delayed Red Phase    |
| TB32        | 3B      | 2D          | TB2       | 1B      | 181   | 23/0076 | P    | Remote Meter SW      |
| TB32        | 4B      | 2D          | TB2       | 2B      | 182   | 23/0076 | P    | Remote Meter Grid 1  |
| TB32        | 5B      | 2D          | TB2       | 3B      | 183   | 23/0076 | P    | Remote Meter Return  |
| TB32        | 6B      | 2D          | TB2       | 4B      | 184   | 23/0076 | P    | Remote Limiter Level |
| TB32        | 7B      | 2D          | TB2       | 5B      | 185   | 23/0076 | P    | Remote AJ Level      |
| TB32        | 8B      | 2D          | TB2       | 6B      | 186   | 23/0076 | P    | Remote Quiet Level   |
| TB32        | 9B      | 2D          | TB2       | 7B      | 187   | 23/0076 | P    | Remote Bias Return   |
| TB32        | 10B     | 3D          | TB1       | 5B      | 188   | 23/0076 | Bk   | Neutral              |
| TB32        | 11B     | 5D          | TB3       | 9B      | 189   | 23/0076 | Bk   | Neutral              |
| TB32        | 12B     | 1D          | TB3       | 12B     | 190   | 23/0076 | Bk   | Earth                |
| TB33        | 1A      | 1N          | TB50      | 1B      | 191   | 70/0076 | Bn   | 6.3V 2A              |
| TB33        | 2A      | 1N          | TB50      | 2B      | 192   | 70/0076 | Bn   | 6.3V 2A              |
| TB33        | 3A      | 1N          | TB49      | 7B      | 193   | 70/0076 | Bn   | 6.3V 1.5A            |
| TB33        | 4A      | 1N          | TB49      | 8B      | 194   | 70/0076 | Bn   | 6.3V 1.5A            |



TABLE 37 JUNCTION PANEL RH SHEET 6

Unit location 2J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE             |
|-------------|---------|-------------|-----------|---------|-------|---------|------|---------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |                     |
| TB33        | 5A      | 6J          | TB17      | 1A      | 195   | 70/0076 | Bn   | 6.3V 5A             |
| TB33        | 6A      | 6J          | TB17      | 2A      | 196   | 70/0076 | Bn   | 6.3V 5A             |
| TB33        | 7A      | 6J          | TB18      | 3A      | 197   | 70/0076 | Bn   | 6.3V 5A             |
| TB33        | 8A      | 6J          | TB18      | 4A      | 198   | 70/0076 | Bn   | 6.3V 5A             |
| TB33        | 10A     | 1J          | TB71      | 12A     | F46   | 70/0076 | W    | 24V (Fire)          |
| TB33        | 10A     | FJ1         | TB1       | 3A      | F53   | 33/0076 | W    | 24V (Fire)          |
| TB33        | 11A     | FJ1         | TB1       | 4A      | F47   | 33/0076 | W    | 24V (Fire)          |
| TB33        | 12A     | 3J          | TB39      | 10A     | F48   | 70/0076 | W    | 24V (Fire)          |
| TB33        | 12A     | FJ1         | TB1       | 5A      | F54   | 33/0076 | W    | 24V (Fire)          |
| TB33        | 1B      | 3D          | TB2       | 1B      | 199   | 70/0076 | Bn   | 6.3V 2A             |
| TB33        | 2B      | 3D          | TB2       | 2B      | 200   | 70/0076 | Bn   | 6.3V 2A             |
| TB33        | 3B      | 3D          | TB2       | 9B      | 201   | 70/0076 | Bn   | 6.3V 1.5A           |
| TB33        | 4B      | 3D          | TB2       | 10B     | 202   | 70/0076 | Bn   | 6.3V 1.5A           |
| TB33        | 5B      | 5D          | TB2       | 5B      | 203   | 70/0076 | Bn   | 6.3V 5A             |
| TB33        | 6B      | 5D          | TB2       | 6B      | 204   | 70/0076 | Bn   | 6.3V 5A             |
| TB33        | 7B      | 5D          | TB2       | 7B      | 205   | 70/0076 | Bn   | 6.3V 5A             |
| TB33        | 8B      | 5D          | TB2       | 8B      | 206   | 70/0076 | Bn   | 6.3V 5A             |
| TB33        | 10B     | GATE C      | XF9       | -ve     | F11   | 19/0076 | W    | 24V (Fire)          |
| TB33        | 11B     | GATE D      | XF16      | -ve     | F15   | 19/0076 | W    | 24V (Fire)          |
| TB33        | 12B     | GATE D      | XF12      | +ve     | F20   | 19/0076 | W    | 24V (Fire)          |
| FS5         | A       | 4M          | FS1       | B       | 435   | 40/0076 | R    | 240V                |
| FS5         | A       | 2J          | SA        | 1       | 436   | 23/0076 | R    | 240V                |
| SKTC        | L       | 2J          | FS5       | B       | 437   | 40/0076 | R    | 240V-Service SKT    |
| SKTC        | L       | 2J          | SKTD      | L       | 438   | 40/0076 | R    | 240V-Service SKT    |
| SKTC        | N       | 5J          | TB9       | 9A      | 439   | 40/0076 | Bk   | Neutral-Service SKT |
| SKTC        | N       | 2J          | SKTD      | N       | 440   | 40/0076 | Bk   | Neutral-Service SKT |
| SKTC        | E       | EARTH STRIP |           |         | 441   | 40/0076 | Bk   | Earth               |
| SKTD        | E       | EARTH STRIP |           |         | 442   | 40/0076 | Bk   | Earth               |
| FS6         | A       | 2J          | SA        | 2       | 443   | 23/0076 | R    | 240V Light          |
| FS6         | B       |             | L1        | A       | 444   | 23/0076 | R    | 240V                |

TABLE 38 (Sheet 1, Continued on Sheet 2)  
Junction Panel L.H.

Unit location 3J

| UNIT ORIGIN |         |          | DESTINATION |         |      | CABLE   |      | SERVICE                        |
|-------------|---------|----------|-------------|---------|------|---------|------|--------------------------------|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | NO.  | TYPE    | COL. |                                |
| TB34        | 1A      | 5J       | TB3         | 3B      | 256  | 40/0076 | B    | Blue Phase                     |
| TB34        | 2A      | 5J       | TB3         | 4B      | 257  | 23/0076 | B    | 240V to Contactor A            |
| TB34        | 3A      | 5J       | TB3         | 5B      | 258  | 23/0076 | B    | 240V to Contactor C            |
| TB34        | 4A      | 5J       | TB3         | 6B      | 259  | 23/0076 | B    | 240V to Dehumidifier           |
| TB34        | 5A      | 5J       | TB7         | 9D      | 558  | 23/0076 | O    | REMOTE MAG. READY              |
| TB34        | 5A      | 3K       | T313        | 1       | 732  | 23/0076 | O    | Field Lamp                     |
| TB34        | 6A      | 5J       | TB3         | 7B      | 260  | 23/0076 | Y    | 50V (2 Minutes)                |
| TB34        | 7A      | 5J       | TB3         | 8B      | 261  | 23/0076 | Y    | 50V (4 Minutes)                |
| TB34        | 9A      | 5J       | TB4         | 4B      | 278  | 23/0076 | Y    | 50V to LatchingRelay           |
| TB34        | 10A     | 2P       | TB51        | 2B      | 733  | 23/0076 | O    | I/L From Pneumatics            |
| TB34        | 10A     | 3K       | T315        | 1       | 734  | 23/0076 | O    | Doors Closed Lamp              |
| TB34        | 11A     | 5J       | TB3         | 11B     | 264  | 23/0076 | B    | Regulator Lower                |
| TB34        | 12A     | 5J       | TB3         | 12B     | 265  | 23/0076 | B    | Regulator Raise                |
| ☒ TB34      | 10A     | 5P       | TB1         | 4       | 1626 | 24/0.2  | O    | I/L Line                       |
| TB34        | 8A      | 5P       | TB1         | 3       | 1625 | 24/0.2  | O    | I/L Line NEAT only             |
| TB34        | 1B      | 1F       | TB1         | 1B      | 735  | 40/0076 | B    | Blue Phase                     |
| TB34        | 2B      | 1F       | TB1         | 2B      | 736  | 23/0076 | B    | 240V to Contactor A            |
| TB34        | 3B      | 1F       | TB1         | 3B      | 737  | 23/0076 | B    | 240V to Contactor C            |
| TB34        | 4B      | 1F       | TB1         | 4B      | 738  | 23/0076 | B    | 240V to Dehumidifier           |
| TB34        | 5B      | 1F       | TB1         | 5B      | 739  | 23/0076 | O    | Field Lamp                     |
| TB34        | 6B      | 1F       | TB1         | 6B      | 740  | 23/0076 | Y    | 50V (2 Minutes)                |
| TB34        | 7B      | 1F       | TB1         | 7B      | 741  | 23/0076 | Y    | 50V (4 Minutes)                |
| TB34        | 9B      | 1F       | TB1         | 9B      | 743  | 23/0076 | Y    | 50V to LatchingRelay           |
| TB34        | 10B     | 1F       | TB1         | 10B     | 744  | 23/0076 | O    | I/L From Pneumatics            |
| TB34        | 11B     | 1F       | TB1         | 11B     | 745  | 23/0076 | B    | Regulator Lower                |
| TB34        | 12B     | 1F       | TB1         | 12B     | 746  | 23/0076 | B    | Regulator Raise                |
| ☒ TB34      | 8B      | 1F       | TB1         | 10B     | 744  |         | O    | I/L Prim Trip hold (NEAT only) |
| TB35        | 1A      | 5J       | TB6         | 5B      | 403  | 23/0076 | R    | Remote Tx-ON                   |
| TB35        | 1A      | 3K       | S.J         | 1       | 747  | 23/0076 | R    | Tx.ON                          |
| TB35        | 2A      | 5J       | TB3         | 1B      | 254  | 23/0076 | R    | 240V-Tx ON                     |
| TB35        | 2A      | 3K       | S.G.        | 1       | 748  | 23/0076 | R    | Tx.-ON                         |
| TB35        | 3A      | 5J       | TB2         | 9B      | 236  | 23/0076 | Y    | 50V                            |
| TB35        | 3A      | 1R       | TB63        | 1B      | 749  | 23/0076 | Y    | 50V                            |
| TB35        | 4A      | 5J       | TB7         | 10B     | 321  | 23/0076 | O    | I/L to H.T.Contactor           |
| TB35        | 5A      | 5J       | TB5         | 6B      | 297  | 23/0076 | B    | H.T. Down                      |
| TB35        | 6A      | 5J       | TB3         | 10B     | 263  | 23/0076 | P    | AFC Mute                       |
| TB35        | 7A      | 5J       | TB6         | 9B      | 407  | 23/0076 | R    | H.T. Up Lamp Remote            |
| TB35        | 7A      | 3K       | T318        | 1       | 750  | 23/0076 | R    | H.T. Up Lamp                   |
| TB35        | 8A      | 5J       | TB4         | 1B      | 275  | 23/0076 | R    | D.C. 0/L                       |

TABLE 38 (Sheet 2. Continued on Sheet 3)  
Junction Panel L.H.

Unit location 3J

| UNIT ORIGIN |         |          | DESTINATION |         |      | CABLE   |      | SERVICE              |
|-------------|---------|----------|-------------|---------|------|---------|------|----------------------|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | NO.  | TYPE    | COL. |                      |
| TB35        | 9A      | 5J       | TB4         | 3B      | 277  | 23/0076 | Y    | 3 Phase O/L          |
| TB35        | 10A     | 5J       | TB4         | 8B      | 282  | 23/0076 | Y    | H.T. Off             |
| TB35        | 11A     | 5J       | TB4         | 9B      | 283  | 23/0076 | Y    | H.T. On              |
| TB35        | 12A     | 5J       | TB6         | 10B     | 408  | 23/0076 | B    | Trip Lamp-Remote     |
| TB35        | 12A     | 3K       | T319        | 1       | 751  | 23/0076 | B    | Trip Lamp            |
| TB35        | 1B      | 1F       | TB2         | 1B      | 752  | 23/0076 | R    | Tx.On Hold           |
| TB35        | 2B      | 1F       | TB2         | 2B      | 753  | 23/0076 | R    | Tx.On Hold           |
| TB35        | 3B      | 1F       | TB3         | 10B     | 754  | 23/0076 | Y    | 50V                  |
| TB35        | 4B      | 1F       | TB2         | 4B      | 755  | 23/0076 | O    | I/L to H.T.Contactor |
| TB35        | 5B      | 1F       | TB2         | 5B      | 756  | 23/0076 | B    | H.T. Down            |
| TB35        | 6B      | 1F       | TB2         | 6B      | 757  | 23/0076 | P    | AFC Mute             |
| TB35        | 7B      | 1F       | TB2         | 7B      | 758  | 23/0076 | R    | H.T. Up Lamp         |
| TB35        | 8B      | 1F       | TB2         | 8B      | 759  | 23/0076 | R    | D.C. O/L             |
| TB35        | 9B      | 1F       | TB2         | 9B      | 760  | 23/0076 | Y    | 3 Phase O/L          |
| TB35        | 10B     | 1F       | TB2         | 10B     | 761  | 23/0076 | Y    | H.T. Off             |
| TB35        | 11B     | 1F       | TB2         | 11B     | 762  | 23/0076 | Y    | H.T. On              |
| TB35        | 12B     | 1F       | TB2         | 12B     | 763  | 23/0076 | B    | Trip Lamp            |
| TB36        | 1A      | 5J       | TB6         | 4B      | 402  | 23/0076 | R    | Tx. On Remote        |
| TB36        | 2A      | 2P       | TB51        | 1B      | 764  | 23/0076 | O    | I/L to Pneumatics    |
| TB36        | 2A      | 5J       | TB6         | 12B     | 725  | 23/0076 | O    | Warning Lamp         |
| TB36        | 3A      | 3K       | T314        | 1       | 765  | 23/0076 | O    | Warm-Up Complete     |
| TB36        | 4A      | 5J       | TB4         | 7B      | 281  | 23/0076 | Y    | Stalo Low            |
| TB36        | 5A      | 5J       | TB6         | 7B      | 405  | 23/0076 | P    | Remote H.T. Reset    |
| TB36        | 6A      | 5J       | TB6         | 8B      | 406  | 23/0076 | P    | Remote H.T. Reset    |
| TB36        | 7A      | 5J       | TB6         | 6B      | 404  | 23/0076 | Y    | Remote H.T. Off      |
| TB36        | 8A      | 5J       | TB1         | 6B      | 1276 | 23/0076 | R    | 200V (4D)            |
| TB36        | 9A      | 5J       | TB4         | 6B      | 280  | 23/0076 | B    | H.T. Contactor O/P   |
| TB36        | 10A     | 4J       | TB44        | 2A      | 766  | 23/0076 | O    | I/L From Trigger     |
| TB36        | 11A     | 5J       | TB4         | 2B      | 276  | 23/0076 | B    | Blue Brush           |
| TB36        | 12A     | 5J       | TB4         | 5B      | 279  | 23/0076 | Y    | Stalo High           |
| TB36        | 1B      | 1F       | TB4         | 9B      | 767  | 23/0076 | R    | Tx - On Remote       |
| TB36        | 2B      | 1F       | TB4         | 2B      | 768  | 23/0076 | O    | I/L to Pneumatics    |
| TB36        | 3B      | 1F       | TB4         | 3B      | 769  | 23/0076 | O    | Warm-Up Complete     |
| TB36        | 4B      | 1F       | TB4         | 4B      | 770  | 23/0076 | Y    | Stalo Low            |
| TB36        | 5B      | 1F       | TB4         | 6B      | 771  | 23/0076 | P    | Remote H.T. Reset    |
| TB36        | 6B      | 1F       | TB4         | 7B      | 772  | 23/0076 | P    | Remote H.T. Reset    |
| TB36        | 7B      | 1F       | TB4         | 8B      | 773  | 23/0076 | Y    | Remote H.T. Off      |

TABLE 38 (Sheet 3, Continued on Sheet 4)  
Junction Panel L.H.

Unit location 3J

| UNIT ORIGIN |         |          | DESTINATION |         |      | CABLE   |      | SERVICE                 |
|-------------|---------|----------|-------------|---------|------|---------|------|-------------------------|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | NO.  | TYPE    | COL. |                         |
| TB36        | 8B      | 4F       | TB1         | 6B      | 1277 | 23/0076 | R    | 200V (4D)               |
| TB36        | 9B      | 1F       | TB4         | 12B     | 774  | 23/0076 | B    | H.T. Contactor O/P      |
| TB36        | 10B     | 2F       | TB1         | 9B      | 775  | 23/0076 | O    | I/L From Trigger        |
| TB36        | 11B     | 1F       | TB4         | 11B     | 776  | 23/0076 | B    | Blue Brush              |
| TB36        | 12B     | 1F       | TB4         | 5B      | 777  | 23/0076 | Y    | Stalo High              |
| TB37        | 1A      | 5J       | TB1         | 1B      | 214  | Screen  |      |                         |
| TB37        | 2A      | 5J       | TB1         | 2B      | 214  | UR70    |      | Magnet Field Sample     |
| TB37        | 3A      | 5J       | TB2         | 8B      | 237  | 23/0076 | B    | Reactor Anode           |
| TB37        | 4A      | 5J       | TB2         | 7B      | 238  | 23/0076 | B    | Reactor H.T.            |
| TB37        | 5A      | 3P       | TB57        | 1B      | 778  | 23/0076 | P    | Magnetron Temp In       |
| TB37        | 6A      | 3P       | TB57        | 2B      | 779  | 23/0076 | P    | Magnetron Temp In       |
| TB37        | 7A      | 3P       | TB57        | 3B      | 780  | 23/0076 | P    | Magnetron Temp Out      |
| TB37        | 8A      | 3P       | TB47        | 4B      | 781  | 23/0076 | P    | Magnetron Temp Out      |
| ☒ TB37      | 9A      | 5P       | TB1         | 5       | 1627 | 24/0.2  | P    | Reg. down (NEAT ONLY) ☒ |
| TB37        | 10A     | 3P       | L10         | B       | 782  | 23/0076 | P    | Field V -ve             |
| TB37        | 11A     | 3P       | L10         | A       | 783  | 23/0076 | P    | Field V +ve             |
| TB37        | 12A     | 5J       | TB7         | 12B     | 711  | 23/0076 | P    | Magnetron I Sample      |
| TB37        | 1B      | 2F       | PLA         |         | 784  | Screen  |      |                         |
| TB37        | 2B      | 2F       | PLA         |         | 784  | UR70    |      | Magnet Field Sample     |
| TB37        | 3B      | 2F       | TB1         | 6B      | 785  | 23/0076 | B    | Reactor Anode           |
| TB37        | 4B      | 2F       | TB1         | 7B      | 786  | 23/0076 | B    | Reactor H.T.            |
| TB37        | 5B      | 3F       | TB2         | 1B      | 787  | 23/0076 | P    | Magnetron Temp In       |
| TB37        | 6B      | 3F       | TB2         | 2B      | 788  | 23/0076 | P    | Magnetron Temp In       |
| TB37        | 7B      | 3F       | TB2         | 3B      | 789  | 23/0076 | P    | Magnetron Temp.Out      |
| TB37        | 8B      | 3F       | TB2         | 4B      | 790  | 23/0076 | P    | Magnetron Temp.Out      |
| ☒ TB37      | 9B      | 1F       | TB3         | 5       | 1637 | 24/0.2  | P    | Reg down (NEAT ONLY) ☒  |
| TB37        | 10B     | 1E       | TB2         | 5B      | 791  | 23/0076 | P    | Field V -ve             |
| TB37        | 11B     | 1E       | TB2         | 6B      | 792  | 23/0076 | P    | Field V +ve             |
| TB37        | 12B     | 1F       | TB4         | 10B     | 793  | 23/0076 | P    | Magnetron I Sample      |

TABLE 38 (Sheet 4, Continued on Sheet 5)  
Junction Panel L.H.

Unit location 3J

| UNIT ORIGIN |         |          | DESTINATION |         |      | CABLE   |      | SERVICE                   |
|-------------|---------|----------|-------------|---------|------|---------|------|---------------------------|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | NO.  | TYPE    | COL. |                           |
| TB38        | 1A      | 5J       | TB10        | 2B      | 350  | 40/0076 | W    | Yellow Phase              |
| TB38        | 1A      | 4J       | TB44        | 5A      | 794  | 23/0076 | W    | Yellow Phase              |
| TB38        | 2A      | 5J       | TB11        | 2B      | 376  | 40/0076 | W    | Delayed Yellow Phase      |
| TB38        | 3A      | 5J       | TB1         | 7B      | 1605 | 40/0076 | P    | Regulator Temp. Monitor   |
| TB38        | 4A      | 5J       | TB1         | 8B      | 1606 | 40/0076 | P    | Regulator Temp. Monitor   |
| TB38        | 6A      | 1R       | TB63        | 2B      | 1232 | 23/0076 | Y    | O/Swing D.C. O/L          |
| TB38        | 6A      | 5J       | TB12        | 11A     | 1615 | 23/0076 | Y    | O/Swing Trip to Trip Ind. |
| TB38        | 5A      | 5J       | TB12        | 10A     | 1614 | 23/0076 | Y    | D.C. Trip to Trip Ind.    |
| TB38        | 8A      | 4J       | TB45        | 10A     | 795  | 23/0076 | R    | 700V Reference            |
| TB38        | 9A      | 5J       | TB9         | 2B      | 328  | 40/0076 | Bk   | Neutral                   |
| TB38        | 11A     | EARTH    | STRIP       |         | 796  | 23/0076 | Bk   | Earth                     |
| ☒ TB38      | 11A     | 5P       | TB1         | 1       | 1623 | 24/0.2  | Bk   | Earth (NEAT ONLY) ☒       |
| TB38        | 1B      | 1E       | TB1         | 1B      | 797  | 23/0076 | W    | Yellow Phase              |
| TB38        | 2B      | 1E       | TB1         | 2B      | 798  | 40/0076 | W    | Delayed Yellow Phase      |
| TB38        | 3B      | 3F       | TB2         | 7B      | 1603 | 40/0076 | P    | Regulator Temp.           |
| TB38        | 6B      | 1F       | TB3         | 1B      | 1617 | 23/0076 | Y    | O/Swing D.C. O/L          |
| TB38        | 4B      | 3F       | TB2         | 8       | 1604 | 40/0076 | P    | Regulator Temp.           |
| TB38        | 5B      | 1F       | TB3         | 2B      | 1618 | 23/0076 | Y    | D.C. Trip O/P             |
| TB38        | 8B      | 4F       | TB1         | 4B      | 799  | 23/0076 | R    | 700V Reference            |
| TB38        | 9B      | 5E       | TB3         | 9B      | 800  | 40/0076 | Bk   | Neutral                   |
| TB38        | 11B     | 5E       | TB2         | 1B      | 801  | 23/0076 | Bk   | Earth                     |
| ☒ TB38      | 10      | 1F       | TB3         | 6B      | 1656 | 24/0.2  | Bk   | E.H.T. back up            |
| TB38        | 10B     | 1L       | TB75        | 6B      | 1655 | 24/0.2  | Bk   | trip ☒                    |

TABLE 38 JUNCTION PANEL LH (Sheet 5 Continued on Sheet 6)

Unit location 3J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE           |
|-------------|---------|-------------|-----------|---------|-------|---------|------|-------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |                   |
| TB39        | 1A      | 5J          | TB2       | 2B      | 231   | 23/0076 | R    | 300V (2E)         |
| TB39        | 1A      | 4K          | SKTAC     | 4       | 884   | 23/0076 | R    | 300V Metering     |
| TB39        | 2A      | 5J          | TB2       | 4B      | 233   | 23/0076 | R    | 300V (3E)         |
| TB39        | 2A      | 4K          | SKTAC     | 1       | 802   | 23/0076 | R    | 300V Monitor      |
| TB39        | 3A      | 5J          | TB2       | 3B      | 232   | 23/0076 | R    | 300V (4E)         |
| TB39        | 3A      | 4K          | SKTAC     | 2       | 803   | 23/0076 | R    | 300V Monitor      |
| TB39        | 4A      | 4K          | SKTAC     | 3       | 804   | 23/0076 | R    | 300V (5E) Monitor |
| TB39        | 5A      | 4J          | TB45      | 2A      | 805   | 23/0076 | R    | 1200V (4F)        |
| TB39        | 6A      | 4J          | TB45      | 3A      | 806   | 23/0076 | R    | 500V (5H)         |
| TB39        | 7A      | 5J          | TB2       | 11B     | 240   | 23/0076 | V    | -250V (5F)        |
| TB39        | 8A      | 5J          | TB2       | 12B     | 241   | 23/0076 | V    | -600V (4F)        |
| TB39        | 10A     | 2J          | TB33      | 12A     | F48   | 70/0076 | W    | 24V (Fire)        |
| TB39        | 11A     | FJ1         | TB1       | 6A      | F49   | 33/0076 | W    | 24V (Fire)        |
| TB39        | 12A     | 4J          | TB46      | 10A     | F50   | 70/0076 | W    | 24V (Fire)        |
| TB39        | 12A     | FJ1         | TB1       | 7A      | F55   | 33/0076 | W    | 24V (Fire)        |
| TB39        | 1B      | 1E          | TB3       | 2B      | 807   | 23/0076 | R    | 300V              |
| TB39        | 2B      | 1E          | TB3       | 4B      | 808   | 23/0076 | R    | 300V              |
| TB39        | 3B      | 1E          | TB3       | 6B      | 809   | 23/0076 | R    | 300V              |
| TB39        | 4B      | 1E          | TB3       | 8B      | 810   | 23/0076 | R    | 300V              |
| TB39        | 5B      | 1E          | TB3       | 11B     | 811   | 23/0076 | R    | 1200V             |
| TB39        | 6B      | 1E          | TB3       | 9B      | 812   | 23/0076 | R    | 500V              |
| TB39        | 7B      | 1E          | TB4       | 4B      | 813   | 23/0076 | V    | -250V             |
| TB39        | 8B      | 1E          | TB4       | 2B      | 814   | 23/0076 | V    | -600V             |
| TB39        | 10B     | GATE<br>E   | XF17      | -ve     | F21   | 19/0076 | W    | 24V (Fire)        |
| TB39        | 11B     | GATE<br>E   | XF21      | +ve     | F27   | 19/0076 | W    | 24V (Fire)        |
| TB39        | 12B     | GATE<br>F   | XF22      | +ve     | F32   | 19/0076 | W    | 24V (Fire)        |
| TB40        | 1A      | 2Q          | T6        | 9       | 813   | 23/0076 | P    | Magnetron Mean I  |
| TB40        | 2A      | 2Q          | T6        | 10      | 816   | 23/0076 | P    | Magnetron Mean I  |

TABLE 38 JUNCTION PANEL LH (Sheet 6)

Unit location 3J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE            |
|-------------|---------|-------------|-----------|---------|-------|---------|------|--------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |                    |
| TB40        | 3A      | 1R          | TB60      | 5B      | 817   | 23/0076 | P    | 0/Swing Current    |
| TB40        | 4A      | 1R          | TB60      | 6B      | 818   | 23/0076 | P    | 0/Swing Current    |
| TB40        | 5A      | 2P          | TB51      | 6B      | 819   | 23/0076 | P    | Magnetron Heater I |
| TB40        | 6A      | 2P          | TB51      | 7B      | 820   | 23/0076 | P    | Magnetron Heater I |
| TB40        | 7A      | 1R          | TB60      | 7B      | 821   | 23/0076 | P    | Magnet Temp. In    |
| TB40        | 8A      | 1R          | TB60      | 8B      | 822   | 23/0076 | P    | Magnet Temp. In    |
| TB40        | 9A      | 3P          | TB57      | 7B      | 823   | 23/0076 | P    | Magnet Temp. Out   |
| TB40        | 10A     | 3P          | TB57      | 8B      | 824   | 23/0076 | P    | Magnet Temp. Out   |
| TB40        | 11A     | 5J          | TB1       | 3B      | 215   | 23/0076 | P    | Magnet Field I     |
| TB40        | 12A     | 5J          | TB1       | 4B      | 216   | 23/0076 | P    | Magnet Field I     |
| TB40        | 1B      | 3F          | TB1       | 1B      | 825   | 23/0076 | P    | Magnetron Mean I   |
| TB40        | 2B      | 3F          | TB1       | 2B      | 826   | 23/0076 | P    | Magnetron Mean I   |
| TB40        | 3B      | 3F          | TB1       | 3B      | 827   | 23/0076 | P    | 0/Swing current    |
| TB40        | 4B      | 3F          | TB1       | 4B      | 828   | 23/0076 | P    | 0/Swing current    |
| TB40        | 5B      | 3F          | TB1       | 5B      | 829   | 23/0076 | P    | Magnetron Heater I |
| TB40        | 6B      | 3F          | TB1       | 6B      | 830   | 23/0076 | P    | Magnetron Heater I |
| TB40        | 7B      | 3F          | TB1       | 7B      | 831   | 23/0076 | P    | Magnet Temp. In    |
| TB40        | 8B      | 3F          | TB1       | 8B      | 832   | 23/0076 | P    | Magnet Temp. In    |
| TB40        | 9B      | 3F          | TB1       | 9B      | 833   | 23/0076 | P    | Magnet Temp. Out   |
| TB40        | 10B     | 3F          | TB1       | 10B     | 834   | 23/0076 | P    | Magnet Temp. Out   |
| TB40        | 11B     | 3F          | TB2       | 5B      | 835   | 23/0076 | P    | Magnet Field I     |
| TB40        | 12B     | 3F          | TB2       | 6B      | 836   | 23/0076 | P    | Magnet Field I     |
| FS7         | A       |             | PLE       | L       | 950   | 40/0076 | R    | 240V               |
| SKTF        | L       | 3J          | FS7       | B       | 951   | 40/0076 | R    | 240V               |
| SKTF        | L       | 3J          | SKTG      | L       | 952   | 40/0076 | R    | 240V               |
| SKTF        | N       |             | PLE       | N       | 953   | 40/0076 | Bk   | Neutral            |
| SKTF        | N       | 3J          | SKTG      | N       | 954   | 40/0076 | Bk   | Neutral            |
| SKTF        | E       | EARTH       | STRIP     |         | 955   | 40/0076 | Bk   | Earth              |
| SKTG        | E       | EARTH       | STRIP     |         | 956   | 40/0076 | Bk   | Earth              |

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TABLE 39 (Sheet 1. Continued on Sheet 2)  
Junction Panel R.H.

Unit location 4J

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |        |      | SERVICE      |
|-------------|---------|-------------|----------|---------|-------|--------|------|--------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE   | COL. |              |
| TB4.1       | 3A      | 5J          | TB4      | 11B     | 284   | UR70   |      | Pre-Pulse    |
| TB4.1       | 4A      | 5J          | TB4      | 12B     | 284   | Screen |      |              |
| TB4.1       | 5A      | 1Q          | TB2      | 10B     | 854   | K16M   |      | G.2-A Bias   |
| TB4.1       | 6A      | 1Q          | TB2      | 9B      | 854   | Screen |      |              |
| TB4.1       | 7A      | 1Q          | TB2      | 12B     | 855   | K16M   |      | G.2-B Bias   |
| TB4.1       | 8A      | 1Q          | TB2      | 11B     | 855   | Screen |      |              |
| TB4.1       | 9A      | 1Q          | TB4      | 2B      | 856   | K16M   |      | G.2-C Bias   |
| TB4.1       | 10A     | 1Q          | TB4      | 1B      | 856   | Screen |      |              |
| TB4.1       | 11A     | 1Q          | TB4      | 4B      | 857   | K16M   |      | G.2-D Bias   |
| TB4.1       | 12A     | 1Q          | TB4      | 3B      | 857   | Screen |      |              |
| TB4.1       | 3B      | 2G          | TB2      | 1B      | 858   | UR70   |      | Pre-Pulse    |
| TB4.1       | 4B      | 2G          | TB2      | 2B      | 858   | Screen |      |              |
| TB4.1       | 5B      | 1G          | TB1      | 9B      | 859   | K16M   |      | G.2-A Bias   |
| TB4.1       | 6B      | 1G          | TB1      | 8B      | 859   | Screen |      |              |
| TB4.1       | 7B      | 1G          | TB1      | 7B      | 860   | K16M   |      | G.2-B Bias   |
| TB4.1       | 8B      | 1G          | TB1      | 6B      | 860   | Screen |      |              |
| TB4.1       | 9B      | 1G          | TB1      | 5B      | 861   | K16M   |      | G.2-C Bias   |
| TB4.1       | 10B     | 1G          | TB1      | 4B      | 861   | Screen |      |              |
| TB4.1       | 11B     | 1G          | TB1      | 3B      | 862   | K16M   |      | G.2-D Bias   |
| TB4.1       | 12B     | 1G          | TB1      | 2B      | 862   | Screen |      |              |
| TB4.2       | 1A      | 1Q          | TB1      | 1B      | 863   | Screen |      |              |
| TB4.2       | 2A      | 1Q          | TB1      | 2B      | 863   | K16M   |      | G.1 - Pulse  |
| TB4.2       | 3A      | 1Q          | TB1      | 3B      | 864   | Screen |      |              |
| TB4.2       | 4A      | 1Q          | TB1      | 4B      | 864   | K16M   |      | G.2 -A Pulse |
| TB4.2       | 5A      | 1Q          | TB1      | 5B      | 865   | Screen |      |              |
| TB4.2       | 6A      | 1Q          | TB1      | 6B      | 865   | K16M   |      | G.2 -B Pulse |
| TB4.2       | 7A      | 1Q          | TB1      | 7B      | 866   | Screen |      |              |
| TB4.2       | 8A      | 1Q          | TB1      | 8B      | 866   | K16M   |      | G.2 -C Pulse |
| TB4.2       | 9A      | 1Q          | TB1      | 9B      | 867   | Screen |      |              |
| TB4.2       | 10A     | 1Q          | TB1      | 10B     | 867   | K16M   |      | G.2-D Pulse  |



TABLE 39 (Sheet 2. Continued on Sheet 3)  
Junction Panel R.H.

Unit location 4J

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE            |             |
|-------------|---------|-------------|----------|---------|-------|---------|------|--------------------|-------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                    |             |
| TB42        | 1B      | 2G          | TB1      | 8B      | 868   | Screen  |      | G.1 Pulse          |             |
| TB42        | 2B      | 2G          | TB1      | 7B      | 868   | K16M    |      |                    |             |
| TB42        | 3B      | 1G          | TB3      | 11B     | 869   | Screen  |      |                    |             |
| TB42        | 4B      | 1G          | TB3      | 12B     | 869   | K16M    |      |                    | G.2-A Pulse |
| TB42        | 5B      | 1G          | TB3      | 9B      | 870   | Screen  |      |                    |             |
| TB42        | 6B      | 1G          | TB3      | 10B     | 870   | K16M    |      |                    | G.2-B Pulse |
| TB42        | 7B      | 1G          | TB3      | 3B      | 871   | Screen  |      |                    |             |
| TB42        | 8B      | 1G          | TB3      | 4B      | 871   | K16M    |      |                    | G.2-C Pulse |
| TB42        | 9B      | 1G          | TB3      | 1B      | 872   | Screen  |      |                    |             |
| TB42        | 10B     | 1G          | TB3      | 2B      | 872   | K16M    |      |                    | G.2-D Pulse |
| TB43        | 9A      | 5J          | TB5      | 11B     | 302   | UR70    |      | Trigger            |             |
| TB43        | 10A     | 5J          | TB5      | 12B     | 302   | Screen  |      |                    |             |
| TB43        | 9B      | 2G          | PLA      |         | 873   | UR70    |      | Trigger            |             |
| TB43        | 10B     | 2G          | PLA      |         | 873   | Screen  |      |                    |             |
| TB44        | 1A      | S.U         | N.0      |         | 874   | 23/0076 | 0    | Pressure I/L       |             |
| TB44        | 1A      | 5J          | TB7      | 4B      | 316   | 23/0076 | 0    | Pressure Lamp      |             |
| TB44        | 2A      | 3J          | TB36     | 10A     | 766   | 23/0076 | 0    | Trigger I/L        |             |
| TB44        | 2A      | 3K          | T312     | 1       | 875   | 23/0076 | 0    | Trigger Lamp       |             |
| TB44        | 3A      | 5J          | TB10     | 1B      | 349   | 23/0076 | R    | Red Phase          |             |
| TB44        | 5A      | 3J          | TB38     | 1A      | 794   | 23/0076 | W    | Yellow Phase       |             |
| TB44        | 7A      | 5J          | TB10     | 3B      | 351   | 23/0076 | B    | Blue Phase         |             |
| TB44        | 9A      | 5J          | TB11     | 3B      | 377   | 40/0076 | B    | Delayed Blue Phase |             |
| TB44        | 12A     | 5J          | TB9      | 4B      | 330   | 40/0076 | Bk   | Neutral            |             |
| TB44        | 12A     | 1R          | TB60     | 1B      | 876   | 23/0076 | Bk   | Neutral            |             |
| TB44        | 1B      | 2G          | TB1      | 11B     | 877   | 23/0076 | 0    | Trigger I/L        |             |
| TB44        | 2B      | 2G          | TB1      | 12B     | 878   | 23/0076 | 0    | Trigger I/L        |             |
| TB44        | 3B      | 1H          | TB3      | 10B     | 879   | 23/0076 | R    | Red Phase          |             |
| TB44        | 5B      | 1H          | TB3      | 12B     | 880   | 23/0076 | W    | Yellow Phase       |             |
| TB44        | 7B      | 1H          | TB1      | 1B      | 881   | 23/0076 | B    | Blue Phase         |             |
| TB44        | 9B      | 1H          | TB1      | 2B      | 882   | 40/0076 | B    | Delayed Blue Phase |             |
| TB44        | 12B     | 1H          | TB1      | 11B     | 883   | 40/0076 | Bk   | Neutral            |             |

TABLE 39 JUNCTION PANEL RH (Sheet 3 Continued on Sheet 4)

Unit location 4J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE            |
|-------------|---------|-------------|-----------|---------|-------|---------|------|--------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |                    |
| TB45        | 2A      | 3J          | TB39      | 5A      | 805   | 23/0076 | R    | 1200V (4F)         |
| TB45        | 3A      | 3J          | TB39      | 6A      | 806   | 23/0076 | R    | 500V (5H)          |
| TB45        | 3A      | 5J          | TB2       | 1B      | 230   | 23/0076 | R    | 500V               |
| TB45        | 4A      | 5J          | TB2       | 5B      | 234   | 23/0076 | R    | 300V (2H)          |
| TB45        | 5A      | 5J          | TB2       | 6B      | 235   | 23/0076 | R    | 300V (3H)          |
| TB45        | 5A      | 4K          | SKTAC     | 5       | 885   | 23/0076 | R    | 300V               |
| TB45        | 6A      | 5J          | TB2       | 10B     | 239   | 23/0076 | V    | -250V              |
| TB45        | 6A      | 4K          | SKTAC     | 11      | 886   | 23/0076 | V    | -250V              |
| TB45        | 7A      | 4K          | SKTAC     | 6       | 887   | 23/0076 | R    | 300V Metering (4H) |
| TB45        | 8A      | 4K          | SKTAC     | 7       | 888   | 23/0076 | R    | 500V Metering (3G) |
| TB45        | 10A     | 3J          | TB38      | 8A      | 795   | 23/0076 | R    | 700V Reference     |
| TB45        | 9A      | 4K          | SKTAC     | 8       | 889   | 23/0076 | R    | 500V Metering (5H) |
| TB45        | 12A     | EARTH STRIP |           |         | 890   | 23/0076 | Bk   | Earth              |
|             |         |             |           |         |       |         |      |                    |
| TB45        | 2B      | 1H          | TB2       | 7B      | 891   | 23/0076 | R    | 1200V              |
| TB45        | 3B      | 1H          | TB3       | 8B      | 892   | 23/0076 | R    | 500V               |
| TB45        | 4B      | 1H          | TB3       | 2B      | 893   | 23/0076 | R    | 300V               |
| TB45        | 5B      | 1H          | TB3       | 4B      | 894   | 23/0076 | R    | 300V               |
| TB45        | 6B      | 1H          | TB4       | 2B      | 895   | 23/0076 | V    | -250V              |
| TB45        | 7B      | 1H          | TB4       | 5B      | 896   | 23/0076 | R    | 300V Metering      |
| TB45        | 8B      | 1H          | TB4       | 8B      | 897   | 23/0076 | R    | 500V Metering      |
| TB45        | 9B      | 2G          | TB1       | 4B      | 898   | 23/0076 | Red  | 500V Metering      |
| TB45        | 12B     | 5H          | TB1       | 7B      | 899   | 23/0076 | Bk   | Earth              |
| TB45        | 10B     | 5H          | TB1       | 9B      | 1515  | 23/0076 | R    | 700V Reference     |
|             |         |             |           |         |       |         |      |                    |
| TB46        | 1A      | 1Q          | TB3       | 6B      | 900   | 23/0076 | P    | Thyr.-A Sample     |
| TB46        | 2A      | 1Q          | TB3       | 5B      | 901   | 23/0076 | P    | Thyr.-B Sample     |
| TB46        | 3A      | 1Q          | TB3       | 4B      | 902   | 23/0076 | P    | Thyr.-C Sample     |
| TB46        | 4A      | 1Q          | TB3       | 3B      | 903   | 23/0076 | P    | Thyr.-D Sample     |

TABLE 39 JUNCTION PANEL RH (Sheet 4)

Unit location 4J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE             |
|-------------|---------|-------------|-----------|---------|-------|---------|------|---------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |                     |
| TB46        | 5A      | 1Q          | TB3       | 2B      | 904   | 23/0076 | P    | Thyr.-A+B Sample    |
| TB46        | 6A      | 1Q          | TB3       | 1B      | 905   | 23/0076 | P    | Thyr.-C+D Sample    |
| TB46        | 10A     | 3J          | TB39      | 12A     | F50   | 70/0076 | W    | 24V (Fire)          |
| TB46        | 11A     | FJ1         | TB1       | 8A      | F51   | 33/0076 | W    | 24V (Fire)          |
| TB46        | 12A     | FJ1         | TB1       | 12A     | F52   | 70/0076 | W    | 24V (Fire)          |
| TB46        | 1B      | 2G          | TB2       | 6B      | 906   | 23/0076 | P    | Thyr.-A Sample      |
| TB46        | 2B      | 2G          | TB2       | 5B      | 907   | 23/0076 | P    | Thyr.-B Sample      |
| TB46        | 3B      | 2G          | TB2       | 4B      | 908   | 23/0076 | P    | Thyr.-C Sample      |
| TB46        | 4B      | 2G          | TB2       | 3B      | 909   | 23/0076 | P    | Thyr.-D Sample      |
| TB46        | 5B      | 2G          | TB2       | 7B      | 910   | 23/0076 | P    | Thyr.-A+B Sample    |
| TB46        | 6B      | 2G          | TB2       | 8B      | 911   | 23/0076 | P    | Thyr.-C+D Sample    |
| TB46        | 10B     | GATE G      | XF27      | -ve     | F33   | 19/0076 | W    | 24V (Fire)          |
| TB46        | 11B     | GATE H      | XF35      | -ve     | F38   | 19/0076 | W    | 24V (Fire)          |
| TB46        | 12B     | GATE H      | XF31      | +ve     | F43   | 19/0076 | W    | 24V (Fire)          |
| FS8         | A       |             | PLE       | L       | 1013  | 40/0076 | R    | 240V                |
| FS8         | A       | 4J          | SB        | 1       | 1014  | 23/0076 | R    | 240V                |
| SKTH        | L       | 4J          | FS8       | B       | 1015  | 40/0076 | R    | 240V-Service SKT    |
| SKTH        | L       | 4J          | SKTJ      | L       | 1016  | 40/0076 | R    | 240V-Service SKT    |
| SKTH        | N       |             | PLE       | N       | 1017  | 40/0076 | Bk   | Neutral-Service SKT |
| SKTH        | N       | 4J          | SKTJ      | N       | 1018  | 40/0076 | Bk   | Neutral-Service SKT |
| SKTH        | E       | EARTH STRIP |           |         | 1019  | 40/0076 | Bk   | Earth               |
| SKTJ        | E       | EARTH STRIP |           |         | 1020  | 40/0076 | Bk   | Earth               |
| FS9         | A       | 4J          | SB        | 2       | 1021  | 23/0076 | R    | 240V-Light          |
| FS9         | B       |             | L2        | A       | 1022  | 23/0076 | R    | 240V                |
|             |         |             |           |         |       |         |      |                     |
|             |         |             |           |         |       |         |      |                     |
|             |         |             |           |         |       |         |      |                     |
|             |         |             |           |         |       |         |      |                     |

TABLE 40 (Sheet 1. Continued on Sheet 2)  
Junction Panel Termination

Unit location 5J

| UNIT ORIGIN |         | DESTINATION |           |         |      | CABLE   |      | SERVICE             |
|-------------|---------|-------------|-----------|---------|------|---------|------|---------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.  | TYPE    | Col. |                     |
| TB1         | 1A      | 2M          | TB1       | 11B     | 207  | Screen  |      |                     |
| TB1         | 2A      | 2M          | TB1       | 10B     | 207  | UR70    |      | Magnet Field Sample |
| TB1         | 3A      | 2M          | TB1       | 8B      | 208  | 23/0076 | P    | Field Current +ve   |
| TB1         | 4A      | 2M          | TB1       | 9B      | 209  | 23/0076 | P    | Field Current -ve   |
| ☒ TB1       | 5A      | 1L          | TB55      | 10B     | 1651 | 24/0.2  | P    | Neat only H.T. Off☒ |
| TB1         | 6A      | 2J          | TB31      | 9A      | 1275 | 23/0076 | R    | 200V                |
| TB1         | 7A      | 1L          | TB55      | 8A      | 1607 | 40/0076 | P    | )Regulator Temp.    |
| TB1         | 8A      | 1L          | TB55      | 9A      | 1608 | 40/0076 | P    | )Monitor            |
| TB1         | 9A      |             | R6        | A       | 210  | 23/0076 | P    | H.T. Volts +ve      |
| TB1         | 10A     |             | R6        | B       | 211  | 23/0076 | P    | H.T. Volts -ve      |
| TB1         | 11A     | 2L          | TB56      | 3B      | 212  | 23/0076 | P    | H.T. Amps +ve       |
| TB1         | 12A     | 2L          | TB56      | 2B      | 213  | 23/0076 | P    | H.T. Amps -ve       |
| TB1         | 1B      | 3J          | TB37      | 1A      | 214  | Screen  |      |                     |
| TB1         | 2B      | 3J          | TB37      | 2A      | 214  | UR70    |      | Magnet Field Sample |
| TB1         | 3B      | 3J          | TB40      | 11A     | 215  | 23/0076 | P    | Field Current +ve   |
| TB1         | 4B      | 3J          | TB40      | 12A     | 216  | 23/0076 | P    | Field Current -ve   |
| ☒ TB1       | 5B      | 5P          | TB1       | 15      | 1649 | 24/0.2  | P    | Neat only H.T. Off☒ |
| TB1         | 6B      | 3J          | TB36      | 8A      | 1276 | 23/0076 | R    | 200V                |
| TB1         | 7B      | 3J          | TB38      | 3A      | 1605 | 40/0076 | P    | )Regulator Temp     |
| TB1         | 8B      | 3J          | TB38      | 4A      | 1606 | 40/0076 | P    | )Monitor            |
| TB1         | 9B      | 4K          | SKTAC     | 16      | 217  | 23/0076 | P    | H.T. Volts +ve      |
| TB1         | 10B     | 4K          | SKTAC     | 17      | 218  | 23/0076 | P    | H.T. Volts -ve      |
| TB1         | 11B     | 4K          | SKTAC     | 18      | 219  | 23/0076 | P    | H.T. Amps +ve       |
| TB1         | 12B     | 4K          | SKTAC     | 19      | 220  | 23/0076 | P    | H.T. Amps -ve       |
| TB2         | 1A      | 1J          | TB25      | 7A      | 63   | 23/0076 | R    | 500V (5H)           |
| TB2         | 1A      | 2J          | TB31      | 1A      | 142  | 23/0076 | R    | 500V                |
| TB2         | 2A      | 1J          | TB24      | 1A      | 35   | 23/0076 | R    | 300V (2E)           |
| TB2         | 3A      | 1J          | TB24      | 2A      | 36   | 23/0076 | R    | 300V (4E)           |
| TB2         | 4A      | 2J          | TB31      | 2A      | 144  | 23/0076 | R    | 300V (3E)           |
| TB2         | 4A      | 6J          | TB18      | 5A      | 222  | 23/0076 | R    | 300V                |
| TB2         | 5A      | 1K          | SKTAA     | 8       | 221  | 23/0076 | R    | 300V Metering       |
| TB2         | 5A      | 6J          | TB17      | 7A      | 223  | 23/0076 | R    | 300V (2H)           |
| TB2         | 6A      | 2J          | TB31      | 3A      | 145  | 23/0076 | R    | 300V (3H)           |
| TB2         | 7A      | 1M          | TB1       | 1B      | 224  | 23/0076 | B    | Reactor H.T.        |
| TB2         | 8A      | 1M          | TB1       | 2B      | 225  | 23/0076 | B    | Reactor Anode       |
| TB2         | 9A      | 2J          | TB31      | 8A      | 156  | 23/0076 | Y    | 50V                 |
| TB2         | 9A      | 6J          | TB19      | 6A      | 419  | 23/0076 | Y    | 50V                 |
| TB2         | 9A      | 5J          | TB12      | 12A     | 1616 | 23/0076 | Y    | 50V to Trid Ind.    |

TABLE 40 (Sheet 2. Continued on Sheet 3)  
Junction Panel Termination

Unit location 5J

| UNIT ORIGIN |         |          | DESTINATION |         |      | CABLE   |      | SERVICE                 |
|-------------|---------|----------|-------------|---------|------|---------|------|-------------------------|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | No.  | TYPE    | Co1. |                         |
| TB2         | 10A     | 6J       | TB19        | 8A      | 228  | 23/0076 | V    | -250V (4G)              |
| TB2         | 10A     | 3M       | TB5         | 8A      | 229  | 23/0076 | V    | -250V                   |
| TB2         | 11A     | 1J       | TB24        | 5A      | 39   | 23/0076 | V    | -250V (5F)              |
| TB2         | 11A     | 2J       | TB31        | 7A      | 149  | 23/0076 | V    | -250V                   |
| TB2         | 12A     | 1J       | TB24        | 6A      | 41   | 23/0076 | V    | -600V (4F)              |
| TB2         | 1B      | 4J       | TB45        | 3A      | 230  | 23/0076 | R    | 500V (5H)               |
| TB2         | 2B      | 3J       | TB39        | 1A      | 231  | 23/0076 | R    | 300V (2E)               |
| TB2         | 3B      | 3J       | TB39        | 3A      | 232  | 23/0076 | R    | 300V (4E)               |
| TB2         | 4B      | 3J       | TB39        | 2A      | 233  | 23/0076 | R    | 300V (3E)               |
| TB2         | 5B      | 4J       | TB45        | 4A      | 234  | 23/0076 | R    | 300V (2H)               |
| TB2         | 6B      | 4J       | TB45        | 5A      | 235  | 23/0076 | R    | 300V (3H)               |
| TB2         | 7B      | 3J       | TB37        | 4A      | 238  | 23/0076 | B    | Reactor H.T.            |
| TB2         | 8B      | 3J       | TB37        | 3A      | 237  | 23/0076 | B    | Reactor Anode           |
| TB2         | 9B      | 3J       | TB35        | 3A      | 236  | 23/0076 | Y    | 50V                     |
| ✕ TB2       | 9B      | 5P       | TB1         | 2       | 1624 | 24/0.2  | Y    | 50V (Neat only)         |
| TB2         | 10B     | 4J       | TB45        | 6A      | 239  | 23/0076 | V    | -250V (4G)              |
| TB2         | 11B     | 3J       | TB39        | 7A      | 240  | 23/0076 | V    | -250V (5F)              |
| TB2         | 12B     | 3J       | TB39        | 8A      | 241  | 23/0076 | V    | -600V (4F)              |
| TB3         | 1A      | 5J       | TB13        | 5A      | 242  | 23/0076 | R    | I/L From Sh.121         |
| TB3         | 2A      | 2S       | TB2         | 6B      | 1590 | 23/0076 | R    | Tx. Off                 |
| TB3         | 2A      | 2M       | TB1         | 2B      | 1591 | 23/0076 | R    | 240V AC                 |
| TB3         | 3A      | 3M       | TB2         | 11B     | 244  | 40/0076 | B    | Blue Phase              |
| TB3         | 4A      | 5J       | TB15        | 1A      | 245  | 23/0076 | B    | Tx. On Lamp             |
| TB3         | 4A      | 3M       | TB4         | 1B      | 246  | 23/0076 | B    | 240V To<br>Contactor A  |
| TB3         | 5A      | 3M       | TB4         | 2B      | 247  | 23/0076 | B    | 240V To<br>Contactor C  |
| TB3         | 6A      | 5J       | TB13        | 1A      | 248  | 23/0076 | B    | 240V To<br>Dehumidifier |
| TB3         | 7A      | 3M       | TB4         | 10B     | 249  | 23/0076 | Y    | 50V (2 Minutes)         |
| TB3         | 8A      | 3M       | TB4         | 11B     | 250  | 23/0076 | Y    | 50V (4 Minutes)         |
| TB3         | 10A     | 1J       | TB23        | 1A      | 27   | 23/0076 | P    | A.F.C. Mute             |
| TB3         | 11A     | 3M       | TB5         | 5B      | 252  | 23/0076 | B    | Regulator Lower         |
| TB3         | 11A     | 5J       | TB15        | 4A      | 424  | 23/0076 | B    | Running Down Lamp       |
| TB3         | 12A     | 3M       | TB5         | 6B      | 253  | 23/0076 | B    | Regulator Raise         |
| TB3         | 12A     | 5J       | TB5         | 4A      | 286  | 23/0076 | B    | Running Up Lamp         |
| TB3         | 1B      | 3J       | TB35        | 2A      | 254  | 23/0076 | R    | I/L to Tx On<br>Switch  |
| TB3         | 2B      | 3K       | S.K         |         | 255  | 23/0076 | R    | Tx. Off                 |
| TB3         | 3B      | 3J       | TB34        | 1A      | 256  | 40/0076 | B    | Blue Phase              |
| TB3         | 4B      | 3J       | TB34        | 2A      | 257  | 23/0076 | B    | 240V To<br>Contactor A  |

TABLE 40 (Sheet 3. Continued on Sheet 4)

Unit location 5J

Junction Panel Termination

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE                  |
|-------------|---------|-------------|----------|---------|-------|---------|------|--------------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                          |
| TB3         | 5B      | 3J          | TB34     | 3A      | 258   | 23/0076 | B    | 240V To Contactor C      |
| TB3         | 6B      | 3J          | TB34     | 4A      | 259   | 23/0076 | B    | 240V To Dehumidifier     |
| TB3         | 7B      | 3J          | TB34     | 6A      | 260   | 23/0076 | Y    | 50V (2 Minutes)          |
| TB3         | 8B      | 3J          | TB34     | 7A      | 261   | 23/0076 | Y    | 50V (4 Minutes)          |
| TB3         | 10B     | 3J          | TB35     | 6A      | 263   | 23/0076 | P    | A.F.C. Mute              |
| TB3         | 11B     | 3J          | TB34     | 11A     | 264   | 23/0076 | B    | Regulator Raise          |
| TB3         | 12B     | 3J          | TB34     | 12A     | 265   | 23/0076 | B    | Regulator Lower          |
| TB4         | 1A      | 2L          | TB56     | 1B      | 266   | 23/0076 | R    | D.C. O/L                 |
| TB4         | 2A      | 4M          | FS3      | 6b      | 267   | 40/0076 | B    | Blue Brush               |
| TB4         | 2A      | 1L          | TB55     | 3B      | 268   | 40/0076 | B    | Blue Brush               |
| TB4         | 3A      | 1L          | TB54     | 10B     | 269   | 23/0076 | Y    | 3 Phase O/L              |
| TB4         | 3A      | 5J          | TB12     | 9A      | 1613  | 23/0076 | Y    | 3 Phase O/L to Trip Ind. |
| TB4         | 4A      | 1L          | TB54     | 11B     | 270   | 23/0076 | Y    | 50V To Latching Relay    |
| TB4         | 5A      | 1J          | TB23     | 3A      | 29    | 23/0076 | Y    | Stalo High               |
| TB4         | 6A      | 1L          | TB55     | 4B      | 271   | 23/0076 | B    | H.T. Contactor O/P       |
| TB4         | 7A      | 1J          | TB23     | 2A      | 28    | 23/0076 | Y    | Stalo Low                |
| TB4         | 8A      | 1L          | TB55     | 5B      | 272   | 23/0076 | Y    | H.T. Off                 |
| TB4         | 9A      | 1L          | TB55     | 6B      | 273   | 23/0076 | Y    | H.T. On                  |
| TB4         | 11A     | 2C          | TB3      | 8B      | 274   | UR70    |      | Pre-Pulse                |
| TB4         | 11A     | 1J          | TB25     | 11A     | 67    | UR70    |      | Pre-Pulse                |
| TB4         | 12A     | 2C          | TB3      | 7B      | 274   | Screen  |      |                          |
| TB4         | 12A     | 1J          | TB25     | 12A     | 67    | Screen  |      |                          |
| TB4         | 1B      | 3J          | TB35     | 8A      | 275   | 23/0076 | R    | D.C. O/L                 |
| TB4         | 2B      | 3J          | TB36     | 11A     | 276   | 23/0076 | B    | Blue Brush               |
| TB4         | 3B      | 3J          | TB35     | 9A      | 277   | 23/0076 | Y    | 3 Phase O/L              |
| TB4         | 4B      | 3J          | TB34     | 9A      | 278   | 23/0076 | Y    | 50V To Latching Relay    |
| TB4         | 5B      | 3J          | TB36     | 12A     | 279   | 23/0076 | Y    | Stalo High               |
| TB4         | 6B      | 3J          | TB36     | 9A      | 280   | 23/0076 | B    | H.T. Contactor O/P       |
| TB4         | 7B      | 3J          | TB36     | 4A      | 281   | 23/0076 | Y    | Stalo Low                |
| TB4         | 8B      | 3J          | TB35     | 10A     | 282   | 23/0076 | Y    | H.T. Off                 |
| TB4         | 9B      | 3J          | TB35     | 11A     | 283   | 23/0076 | Y    | H.T. On                  |
| TB4         | 11B     | 4J          | TB41     | 3A      | 284   | UR70    |      | Pre-Pulse                |
| TB4         | 12B     | 4J          | TB41     | 4A      | 284   | Screen  |      |                          |

TABLE 40 (Sheet 4. Continued on Sheet 5)

Unit location 5J

Junction Panel Termination

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE                 |
|-------------|---------|-------------|----------|---------|-------|---------|------|-------------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                         |
| TB5         | 2A      | 2M          | TB1      | 6B      | 285   | 23/0076 | 0    | I/L From Magnet Thl.    |
| TB5         | 4A      | 5J          | TB3      | 12A     | 286   | 23/0076 | B    | Running Up Lamp         |
| TB5         | 4A      | 5J          | TB15     | 5A      | 287   | 23/0076 | B    | Remote Running Up Lamp  |
| TB5         | 6A      | 5J          | TB15     | 3A      | 288   | 23/0076 | B    | H.T. Down               |
| TB5         | 6A      | 2K          | T220     | 1       | 289   | 23/0076 | B    | H.T. Down Lamp          |
| TB5         | 7A      | 3M          | TB4      | 5B      | 290   | 23/0076 | 0    | I/L                     |
| TB5         | 8A      | 3M          | TB6      | 5B      | 291   | 23/0076 | 0    | I/L From Magnetron Thl. |
| TB5         | 9A      | 3M          | TB6      | 6B      | 292   | 23/0076 | 0    | Interlock To S.U.       |
| TB5         | 10A     | 3M          | TB4      | 7B      | 293   | 23/0076 | 0    | I/L To Diode Thermal    |
| TB5         | 11A     | 5J          | SKTK     |         | 294   | UR70    |      | Trigger In              |
| TB5         | 12A     | 5J          | SKTK     |         | 294   | Screen  |      |                         |
| TB5         | 2B      | 3P          | TB58     | 8B      | 295   | 23/0076 | 0    | I/L From S.S.           |
| TB5         | 4B      | 3K          | T320     | 1       | 296   | 23/0076 | B    | Running Up Lamp         |
| TB5         | 6B      | 3J          | TB35     | 5A      | 297   | 23/0076 | B    | H.T. Down               |
| TB5         | 7B      | 3P          | TB58     | 1B      | 298   | 23/0076 | 0    | I/L To S.R.             |
| TB5         | 8B      | 3P          | TB58     | 5B      | 299   | 23/0076 | 0    | I/L From S.T.           |
| TB5         | 9B      | 3P          | S.U.     | Com.    | 300   | 23/0076 | 0    | I/L To S.U.             |
| TB5         | 9B      | 3K          | T310     | 1       | 1171  | 23/0076 | 0    | Magnetron Ready         |
| TB5         | 10B     | 2T          | TB53     | 6B      | 301   | 23/0076 | 0    | I/L To Diode Thermal    |
| TB5         | 11B     | 4J          | TB43     | 9A      | 302   | UR70    |      | Trigger                 |
| TB5         | 12B     | 4J          | TB43     | 10A     | 302   | Screen  |      |                         |

TABLE 40 (Sheet 5. Continued on Sheet 6)  
Junction Panel Termination

Unit location 5J

| UNIT ORIGIN |         |          | DESTINATION |         |      | CABLE   |      | SERVICE                    |
|-------------|---------|----------|-------------|---------|------|---------|------|----------------------------|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | No.  | TYPE    | Col. |                            |
| TB6         | 1A      | 2K       | T212        | 1       | 388  | 23/0076 | W    | Magnetron on Lamp          |
| TB6         | 3A      | 5J       | TB13        | 8A      | 390  | 23/0076 | B    | Compressor 2 Lamp          |
| TB6         | 4A      | 5J       | TB14        | 12A     | 416  | 23/0076 | R    | 240V to RemoteTx-On        |
| TB6         | 5A      | 5J       | TB14        | 1A      | 392  | 23/0076 | R    | Remote Tx.On               |
| TB6         | 6A      | 5J       | TB14        | 3A      | 393  | 23/0076 | Bk   | Remote Tx.Off              |
| TB6         | 7A      | 5J       | TB14        | 4A      | 394  | 23/0076 | P    | Remote H.T. Reset          |
| TB6         | 8A      | 5J       | TB14        | 5A      | 395  | 23/0076 | P    | Remote H.T. Reset          |
| TB6         | 9A      | 5J       | TB15        | 6A      | 396  | 23/0076 | R    | Remote H.T. Up Lamp        |
| TB6         | 10A     | 5J       | TB15        | 7A      | 397  | 23/0076 | B    | Remote Trip Lamp           |
| TB6         | 11A     | 5J       | TB13        | 10A     | 398  | 23/0076 | O    | Aerial Turning Lamp        |
| TB6         | 12A     |          | 1LP3        | 1       | 724  | 23/0076 | O    | Warning Lamp               |
|             |         |          |             |         |      |         |      |                            |
| TB6         | 1B      | 2P       | TB51        | 4B      | 399  | 70/0076 | W    | 240V Magnetron Htr.        |
| TB6         | 2B      | 2Q       | T6          | 8       | 400  | 70/0076 | W    | Yellow Brush               |
| TB6         | 3B      | 3K       | T307        | 1       | 401  | 23/0076 | B    | Compressor 2 Lamp          |
| TB6         | 4B      | 3J       | TB36        | 1A      | 402  | 23/0076 | R    | 240V to RemoteTx-On        |
| TB6         | 5B      | 3J       | TB35        | 1A      | 403  | 23/0076 | R    | Remote Tx. On              |
| TB6         | 6B      | 3J       | TB36        | 7A      | 404  | 23/0076 | Y    | Remote Tx. Off             |
| TB6         | 7B      | 3J       | TB36        | 5A      | 405  | 23/0076 | P    | Remote H.T. Reset          |
| TB6         | 8B      | 3J       | TB36        | 6A      | 406  | 23/0076 | P    | Remote H.T. Reset          |
| TB6         | 9B      | 3J       | TB35        | 7A      | 407  | 23/0076 | R    | Remote H.T. Up Lamp        |
| TB6         | 10B     | 3J       | TB35        | 12A     | 408  | 23/0076 | B    | Remote Trip Lamp           |
| TB6         | 11B     | 3K       | T316        | 1       | 409  | 23/0076 | O    | Aerial Turning Lamp        |
| TB6         | 12B     | 3J       | TB36        | 2A      | 725  | 23/0076 | O    | Warning Lamp               |
| TB6         | 1B      | 6M       | TB1         | 5B      | 1576 | 70/0076 | W    | 240V Magnetron Htr.<br>Out |
| TB6         | 2B      | 6M       | TB1         | 6B      | 1577 | 70/0076 | W    | Yellow Brush Out           |
| TB6         | 9B      | 6M       | TB1         | 1B      | 1572 | 23/0076 | R    | 240V from H.T.UP<br>Lamp   |
|             |         |          |             |         |      |         |      |                            |
| TB7         | 1A      | 1T       | TB52        | 5B      | 303  | 23/0076 | O    | Water Level                |
| TB7         | 1A      | 2K       | T217        | 1       | 304  | 23/0076 | O    | Water Level                |
| TB7         | 3A      | 5J       | TB14        | 10A     | 305  | 23/0076 | R    | Magnet on Lamp             |
| TB7         | 3A      | 1M       | TB1         | 3B      | 306  | 23/0076 | R    | Magnet On                  |
| TB7         | 5A      | 2K       | T218        | 1       | 308  | 23/0076 | O    | Diode Cooling Lamp         |
| TB7         | 6A      | 1T       | TB52        | 4B      | 309  | 23/0076 | O    | I/L to S.AB                |
| TB7         | 7A      |          | TB66        | 2B      | 310  | 23/0076 | O    | Bell Supply                |
| TB7         | 8A      | 1L       | TB55        | 2B      | 311  | 23/0076 | O    | H.T. On                    |
| TB7         | 9A      | 5J       | TB14        | 11A     | 307  | 23/0076 | O    | Remote Magnetron<br>Ready  |
| TB7         | 10A     | 5J       | TB13        | 9A      | 312  | 23/0076 | O    | I/L to H.T.<br>Contactor   |



TABLE 40 (Sheet 6. Continued on Sheet 7)  
Junction Panel Termination

Unit location 5J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE |                        |                            |
|-------------|---------|-------------|-----------|---------|-------|---------|---------|------------------------|----------------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col.    |                        |                            |
| TB7         | 11A     | 1K          | SKTAA     | 22      | 313   | 23/0076 | Y       | 50V                    |                            |
| TB7         | 12A     | 2L          | TB56      | 4B      | 710   | 23/0076 | P       | Magnetron I. Sample    |                            |
| TB7         | 3B      | 3K          | T303      | 1       | 314   | 23/0076 | R       | Magnet On Lamp         |                            |
| TB7         | 4B      | 3K          | T311      | 1       | 315   | 23/0076 | O       | W/G Pressure Lamp      |                            |
| TB7         | 4B      | 4J          | TB44      | 1A      | 316   | 23/0076 | O       | I/L                    |                            |
| TB7         | 5B      | 2T          | TB53      | 7B      | 317   | 23/0076 | O       | Diode Cooling I/L      |                            |
| TB7         | 6B      | 2T          | TB53      | 5B      | 318   | 23/0076 | O       | I/L from S.AB          |                            |
| TB7         | 7B      | 2P          | TB51      | 3B      | 319   | 23/0076 | O       | Bell Supply            |                            |
| TB7         | 8B      | 3K          | T317      | 1       | 320   | 23/0076 | O       | H.T. On                |                            |
| TB7         | 9B      | 3J          | TB34      | 5A      | 558   | 23/0076 | O       | Remote Magnetron Ready |                            |
| TB7         | 10B     | 3J          | TB35      | 4A      | 321   | 23/0076 | O       | I/L to H.T. Contactor  |                            |
| TB7         | 11B     | 4K          | SKTAC     | 14      | 322   | 23/0076 | Y       | 50V Return             |                            |
| TB7         | 12B     | 3J          | TB37      | 12A     | 711   | 23/0076 | P       | Magnetron I. Sample    |                            |
| TB7         | 12B     | 6M          | TB1       | 7B      | 1578  | 23/0076 | P       | MOD. Current Sample    |                            |
| ☒           | TB8     | 1A          | 5J        | TB12    | 1A    | 1640    | 24/0.2  | P                      | Remote "SILENCE" Indicator |
|             | TB8     | 2A          | 5J        | TB12    | 2A    | 1641    | 24/0.2  | P                      |                            |
|             | TB8     | 3A          | 5J        | TB12    | 3A    | 1646    | 24/0.2  | P                      | "SILENCE" cancel           |
|             | TB8     | 4A          | 5J        | TB12    | 4A    | 1647    | 24/0.2  | P                      |                            |
|             | TB8     | 5A          | 5J        | TB12    | 5A    | 1644    | 24/0.2  | P                      | "SILENCE" Initiate         |
|             | TB8     | 6A          | 5J        | TB12    | 6A    | 1645    | 24/0.2  | P                      | *                          |
|             | TB8     | 7A          | 5J        | TB12    | 7A    | 1650    | 24/0.2  | P                      | "READY" Indicator ☒        |
| ☒           | TB8     | 1B          | 5P        | TB1     | 12    | 1635    | 24/0.2  | P                      | Remote "SILENCE" Indicator |
|             | TB8     | 2B          | 5P        | TB1     | 11    | 1634    | 24/0.2  | P                      |                            |
|             | TB8     | 3B          | 5P        | TB1     | 10    | 1633    | 24/0.2  | P                      | "SILENCE" Cancel           |
|             | TB8     | 4B          | 5P        | TB1     | 9     | 1632    | 24/0.2  | P                      |                            |
|             | TB8     | 5B          | 5P        | TB1     | 8     | 1631    | 24/0.2  | P                      | "SILENCE" Initiate         |
|             | TB8     | 6B          | 5P        | TB1     | 7     | 1630    | 24/0.2  | P                      |                            |
|             | TB8     | 7B          | 5P        | TB1     | 14    | 1648    | 24/0.2  | P                      | "READY" Indicator ☒        |
| TB9         | 1A      | 3M          | TB5       | 11B     | 323   | 70/0076 | Bk      | Neutral                |                            |
| TB9         | 1A      | 5J          | TB9       | 2A      |       | 16G.T.C |         | Link                   |                            |
| TB9         | 2A      | 5J          | TB9       | 3A      |       | 16G.T.C |         | Link                   |                            |
| TB9         | 2A      | 1J          | TB23      | 12A     | 30    | 40/0076 | Bk      | Neutral                |                            |
| TB9         | 3A      | 5J          | TB9       | 4A      |       | 16G.T.C |         | Link                   |                            |
| TB9         | 3A      | 2J          | TB32      | 10A     | 176   | 23/0076 | Bk      | Neutral                |                            |
| TB9         | 4A      | 5J          | TB9       | 5A      |       | 16G.T.C |         | Link                   |                            |
| TB9         | 4A      | 2J          | TB32      | 11A     | 177   | 23/0076 | Bk      | Neutral                |                            |
| TB9         | 5A      | 5J          | TB9       | 6A      |       | 16G.T.C |         | Link                   |                            |

\* NEAT only

TABLE 40 (Sheet 7. Continued on Sheet 8)  
Junction Panel Termination

Unit location 5J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE                       |
|-------------|---------|-------------|-----------|---------|-------|---------|-------------------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    |                               |
| TB9         | 5A      | 5M          | TB1       | 11B     | 324   | 23/0076 | Bk Neutral                    |
| TB9         | 6A      | 5J          | TB9       | 7A      |       | 16G.T.C | Link                          |
| TB9         | 6A      | 6J          | TB18      | 1A      | 325   | 23/0076 | Bk Neutral                    |
| TB9         | 7A      | 5J          | TB9       | 8A      |       | 16G.T.C | Link                          |
| TB9         | 7A      | 2K          | NEUTRAL   |         | 326   | 23/0076 | Bk Neutral                    |
| TB9         | 8A      | 5J          | TB9       | 9A      |       | 16G.T.C | Link                          |
| TB9         | 8A      | 5J          | TB13      | 12A     | 327   | 23/0076 | Bk Neutral                    |
| TB9         | 9A      | 5J          | TB9       | 10A     |       | 16G.T.C | Link                          |
| TB9         | 9A      | 2J          | SKTC      | N       | 439   | 40/0076 | Bk Neutral                    |
| TB9         | 10A     | 5J          | TB9       | 11A     |       | 16G.T.C | Link                          |
| TB9         | 11A     |             | SKTE      | N       | 732   | 40/0076 | Bk Neutral                    |
| TB9         | 2B      | 3J          | TB38      | 9A      | 328   | 40/0076 | Bk Neutral                    |
| TB9         | 3B      | 1P          | T3        | 0V      | 329   | 40/0076 | Bk Neutral                    |
| TB9         | 4B      | 4J          | TB44      | 12A     | 330   | 40/0076 | Bk Neutral                    |
| TB9         | 5B      | 1Q          | TB3       | 12B     | 331   | 40/0076 | Bk Neutral                    |
| TB9         | 7B      | 3K          | NEUTRAL   |         | 332   | 23/0076 | Bk Neutral                    |
| TB9         | 8B      | 2P          | TB51      | 11B     | 333   | 23/0076 | Bk Neutral                    |
| TB9         | 10B     | 6M          | TB1       | 2B      | 1573  | 23/0076 | Bk Neutral                    |
| TB10        | 1A      | 3M          | TB1       | 1B      | 334   | 40/0076 | R Red Phase Gate Htrs         |
| TB10        | 1A      | 2J          | T332      | 1A      | 167   | 40/0076 | R Gate Heaters                |
| TB10        | 2A      | 3M          | TB1       | 2B      | 335   | 40/0076 | W Yellow Phase Gate Htrs.     |
| TB10        | 3A      | 3M          | TB1       | 3B      | 336   | 40/0076 | B Blue Phase Gate Htr         |
| TB10        | 4A      | 3M          | TB1       | 4B      | 337   | 40/0076 | R Red Phase-Thyr.Htrs         |
| TB10        | 6A      | 5J          | TB14      | 8A      | 413   | 23/0076 | R Remote Modulator Htrs. Lamp |
| TB10        | 5A      | 3M          | TB1       | 8B      | 339   | 40/0076 | W 240V Yellow Phase           |
| TB10        | 6A      | 3M          | TB1       | 9B      | 340   | 40/0076 | R 240V Blue Phase             |
| TB10        | 6A      | 2K          | T214      | 1       | 341   | 23/0076 | R Modulator Htrs. On Lamp     |
| TB10        | 7A      | 3M          | TB3       | 1B      | 342   | 23/0076 | R Red Phase Water Pump 1      |
| TB10        | 7A      | 2K          | T216      | 1       | 343   | 23/0076 | R Water Pump 1 Lamp           |
| TB10        | 8A      | 3M          | TB3       | 2B      | 344   | 23/0076 | W Yellow Phase-Pump 1         |
| TB10        | 9A      | 3M          | TB3       | 3B      | 345   | 23/0076 | B Blue Phase - Pump 1         |
| TB10        | 12A     | 3M          | TB6       | 3B      | 412   | 23/0076 | B 240V Air Flow Alarm         |
| TB10        | 4A      | 2K          | T208      | 1       | 421   | 23/0076 | R Thyatron Htrs.Lamp          |
| TB10        | 1B      | 4J          | TB44      | 3A      | 349   | 23/0076 | R Red Phase Gate Htrs         |
| TB10        | 2B      | 3J          | TB38      | 1A      | 350   | 40/0076 | W Yellow Phase G.Htrs         |
| TB10        | 3B      | 4J          | TB44      | 7A      | 351   | 23/0076 | B Blue Phase Gate Htr         |
| TB10        | 4B      | 1Q          | TB3       | 11B     | 352   | 40/0076 | R Red Phase-Thyr.Htrs         |
| TB10        | 7B      | 1R          | TB59      | 10B     | 384   | 40/0076 | R Red Phase - Pump 1          |
| TB10        | 8B      | 1R          | TB59      | 11B     | 385   | 40/0076 | W Yellow Phase-Pump 1         |
| TB10        | 9B      | 1R          | TB59      | 12B     | 386   | 40/0076 | B Blue Phase - Pump 1         |
| TB10        | 10B     | 1R          | TB59      | 7B      | 358   | 40/0076 | R                             |

TABLE 40 (Sheet 8. Continued on Sheet 9)  
Junction Panel Termination

Unit location 5J

| UNIT ORIGIN |         |          | DESTINATION |         |      | CABLE   |        | SERVICE                 |  |
|-------------|---------|----------|-------------|---------|------|---------|--------|-------------------------|--|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | No.  | TYPE    | Col.   |                         |  |
| TB10        | 12B     | 1R       | TB59        | 9B      | 360  | 40/0076 | B      | 240V Air Flow Alarm     |  |
| TB11        | 1A      | 2J       | TB32        | 2A      | 168  | 23/0076 | R      | Red Phase Gate HT       |  |
| TB11        | 1A      | 1N       | TB48        | 1B      | 361  | 40/0076 | R      | Red Phase Gate HT       |  |
| TB11        | 2A      | 3M       | TB6         | 2B      | 362  | 40/0076 | W      | Yellow Phase Gate HT    |  |
| TB11        | 2A      | 1N       | TB48        | 3B      | 363  | 23/0076 | W      | Yellow Phase Gate HT    |  |
| TB11        | 3A      | 3M       | TB2         | 3B      | 364  | 40/0076 | B      | Blue Phase Gate HT      |  |
| TB11        | 3A      | 1N       | TB48        | 5B      | 365  | 23/0076 | B      | Blue Phase Gate HT      |  |
| TB11        | 4A      | 3M       | TB2         | 7B      | 366  | 40/0076 | R      | Red Phase - Fans        |  |
| TB11        | 4A      | 2K       | TB13        | 1       | 367  | 23/0076 | R      | Fans on Lamp            |  |
| TB11        | 5A      | 3M       | TB2         | 8B      | 368  | 40/0076 | W      | Yellow Phase - Fans     |  |
| TB11        | 6A      | 3M       | TB2         | 9B      | 369  | 40/0076 | B      | Blue Phase - Fans       |  |
| TB11        | 7A      | 3M       | TB35        | 4B      | 370  | 23/0076 | R      | Red Phase-Wtr.Pump2     |  |
| TB11        | 8A      | 3M       | TB3         | 5B      | 371  | 23/0076 | W      | Yellow Phase-Pump 2     |  |
| TB11        | 9A      | 3M       | TB3         | 16B     | 372  | 23/0076 | B      | Blue Phase - Pump 2     |  |
| ⊠           | TB11    | 10A      | 2K          | ILP221  | a    | 1636    | 24/0.2 | P                       | Flashing SILENCE lamps (NEAT only) ⊠                               |
| TB11        | 2B      | 3J       | TB38        | 2A      | 376  | 40/0076 | W      | Yellow Phase Gate HT    |  |
| TB11        | 3B      | 4J       | TB44        | 9A      | 377  | 40/0076 | B      | Blue Phase Gate HT      |  |
| TB11        | 4B      | 2T       | TB53        | 1B      | 378  | 40/0076 | R      | Red Phase - Fans        |  |
| TB11        | 5B      | 2T       | TB53        | 2B      | 379  | 40/0076 | W      | Yellow Phase - Fans     |  |
| TB11        | 6B      | 2T       | TB53        | 3B      | 380  | 40/0076 | B      | Blue Phase - Fans       |  |
| TB11        | 7B      | 1R       | TB59        | 4B      | 381  | 23/0076 | R      | Red Phase Wtr Pump 2    |  |
| TB11        | 7B      | 3K       | T304        | 1       | 1164 | 23/0076 | R      | Pump 2 - Light          |  |
| TB11        | 8B      | 1R       | TB59        | 5B      | 382  | 23/0076 | W      | Yellow Phase Pump 2     |  |
| TB11        | 9B      | 1R       | TB59        | 6B      | 383  | 23/0076 | B      | Blue Phase Pump 2       |  |
| ⊠           | TB11    | 10B      | 5P          | TB1     | 6    | 1628    | 24/0.2 | P                       | Flashing indicator (NEAT only) ⊠                                   |
| TB12        | 1A      | 6J       | TB20        | 1A      | 500  | 23/0076 | P      | Remote Meter +ve        |  |
| TB12        | 2A      | 6J       | TB20        | 2A      | 501  | 23/0076 | P      | Remote Meter -ve        |  |
| TB12        | 3A      | 6J       | TB20        | 3A      | 502  | 23/0076 | P      | Remote Meter Return     |  |
| TB12        | 4A      | 6J       | TB20        | 4A      | 503  | 23/0076 | P      |                         |  |
| TB12        | 8A      | 5J       | TB16        | 4A      | 1612 | 23/0076 | Bk     | Earth                   |  |
| TB12        | 9A      | 5J       | TB4         | 3A      | 1613 | 23/0076 | T      | 3 Phase O/L to Trip Ind |  |
| TB12        | 10A     | 3J       | TB38        | 5A      | 1614 | 23/0076 | T      | DC Trip to Trip Ind     |  |
| TB12        | 11A     | 3J       | TB38        | 6A      | 1615 | 23/0076 | T      | O/Swing to Trip Ind     |  |
| TB12        | 12A     | 5J       | TB2         | 9A      | 1616 | 23/0076 | T      | 50V to Trip Ind.        |  |
| ⊠           | TB12    | 1A       | 5J          | TB8     | 1A   | 1640    | 24/0.2 | P                       | Remote "SILENCE" Indicator "SILENCE" Cancel "SILENCE Initiate" } * |
| TB12        | 2A      | 5J       | TB8         | 2A      | 1641 | 24/0.2  | P      |                         |  |
| TB12        | 3A      | 5J       | TB8         | 3A      | 1646 | 24/0.2  | P      |                         |  |
| TB12        | 4A      | 5J       | TB8         | 4A      | 1647 | 24/0.2  | P      |                         |  |
| TB12        | 5A      | 5J       | TB8         | 5A      | 1644 | 24/0.2  | P      |                         |  |
| TB12        | 6A      | 5J       | TB8         | 6A      | 1645 | 24/0.2  | P      |                         |  |
| TB12        | 7A      | 5J       | TB12        | 8A      | 1650 | 24/0.2  | P      | READY Indicator ⊠       |  |

\* NEAT. only

TABLE 40 (Sheet 9. Continued on Sheet 10)  
Junction Panel Termination

Unit location 5J

| UNIT ORIGIN |         | DESTINATION |           |         |     | CABLE   |      | SERVICE                         |
|-------------|---------|-------------|-----------|---------|-----|---------|------|---------------------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No. | TYPE    | Col. |                                 |
| TB13        | 1A      | 5J          | TB3       | 6A      | 248 | 23/0076 | B    | 240V to Air Drier Control Box   |
| TB13        | 2A      | 3M          | TB6       | 2B      | 410 | 23/0076 | B    | 240V to Moisture Meter          |
| TB13        | 4A      | 3M          | TB2       | 10B     | 338 | 23/0076 | R    | I/L to Air Drier Control        |
| TB13        | 5A      | 5J          | TB3       | 1A      | 242 | 23/0076 | R    | I/L from Air Drier Control      |
| TB13        | 6A      | 2K          | T209      |         | 415 | 23/0076 | R    | Dehumidifier Lamp               |
| TB13        | 7A      | 5J          | TB14      | 9A      | 411 | 23/0076 | B    | WG Air Dry Lamp                 |
| TB13        | 8A      | 5J          | TB6       | 3A      | 390 | 23/0076 | B    |                                 |
| TB13        | 9A      | 5J          | TB7       | 10A     | 312 | 23/0076 | O    | AE I/L Out                      |
| TB13        | 10A     | 1L          | TB55      | 1B      | 418 | 23/0076 | O    | AE I/L In                       |
| TB13        | 10A     | 5J          | TB6       | 11A     | 398 | 23/0076 | O    | AE Turning Lamp                 |
| ■ TB13      | 11A     | 3M          | TB6       | 1B      | 665 | 23/0076 | B    | Interlock Neutral A/Cond - Tx ■ |
| TB13        | 12A     | 5J          | TB9       | 8A      | 327 | 23/0076 | Bk   | Neutral                         |
| TB13        | 12A     | 5J          | TB14      | 6A      | 666 | 23/0076 | Bk   | Neutral                         |

TABLE 40 (Sheet 10. Continued on Sheet 11)  
Junction Panel Termination

Unit location 5J

| UNIT<br>ORIGIN |            | DESTINATION |              |            | CABLE |         | SERVICE                    |
|----------------|------------|-------------|--------------|------------|-------|---------|----------------------------|
| CCT.<br>REF.   | PIN<br>NO. | UNIT<br>NO. | CCT.<br>REF. | PIN<br>NO. | No.   | TYPE    | Col.                       |
| TB14           | 1A         | 5J          | TB6          | 5A         | 392   | 23/0076 | R Remote Tx.On             |
| TB14           | 2A         | 6J          | FS10         | B          | 227   | 23/0076 | Y 50V-Fused                |
| TB14           | 3A         | 5J          | TB6          | 6A         | 393   | 23/0076 | Bk Tx.Off                  |
| TB14           | 4A         | 5J          | TB6          | 7A         | 394   | 23/0076 | P Remote H.T.Reset         |
| TB14           | 5A         | 5J          | TB6          | 8A         | 395   | 23/0076 | P Remote H.T.Reset         |
| TB14           | 6A         | 5J          | TB13         | 12A        | 666   | 23/0076 | Bk Neutral                 |
| TB14           | 7A         | 2K          | T211         | 1          | 705   | 23/0076 | P P.U.s Normal Lamp        |
| TB14           | 7A         | 1K          | SKTAA        | 21         | 420   | 23/0076 | P P.U.s Normal             |
| TB14           | 8A         | 5J          | TB10         | 6A         | 413   | 23/0076 | R Remote Mod.Htrs.<br>Lamp |
| TB14           | 9A         | 5J          | TB13         | 7A         | 411   | 23/0076 | B Compressor 1 On          |
| TB14           | 9A         | 2K          | T215         | 1          | 422   | 23/0076 | B WG Air Dry               |
| TB14           | 10A        | 5J          | TB7          | 3A         | 305   | 23/0076 | R Magnet On Lamp           |
| TB14           | 11A        | 5J          | TB7          | 9A         | 307   | 23/0076 | O Magnetron Ready<br>Lamp  |
| TB14           | 12A        | 5J          | TB6          | 4A         | 416   | 23/0076 | R 240V to Remote<br>Tx.On  |
| TB14           | 12A        | 2K          | T205         | 1          | 417   | 23/0076 | R Remote Control<br>Lamp   |

TABLE 40 (Sheet 11. Continued on Sheet 12)  
Junction Panel Termination

Unit location 5J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE |                    |
|-------------|---------|-------------|-----------|---------|-------|---------|---------|--------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col.    |                    |
| TB15        | 1A      | 5J          | TB3       | 4A      | 245   | 23/0076 | B       | Tx.On Lamp         |
| TB15        | 1A      | 2K          | T206      | 1       | 423   | 23/0076 | B       | Tx.On Lamp         |
| TB15        | 3A      | 5J          | TB5       | 6A      | 288   | 23/0076 | B       | Reg.Down Lamp      |
| TB15        | 4A      | 5J          | TB3       | 11A     | 424   | 23/0076 | B       | Running Down Lamp  |
| TB15        | 4A      | 2K          | T219      | 1       | 425   | 23/0076 | B       | Running Down Lamp  |
| TB15        | 5A      | 5J          | TB5       | 4A      | 287   | 23/0076 | B       | Running Up Lamp    |
| TB15        | 6A      | 5J          | TB6       | 9A      | 396   | 23/0076 | R       | H.T.Up Lamp        |
| TB15        | 7A      | 5J          | TB6       | 10A     | 397   | 23/0076 | B       | Remote Trip Lamp   |
| TB15        | 8A      | 1J          | TB26      | 9A      | 88    | 23/0076 | P       | N.F.Lamp Common    |
| TB15        | 9A      | 1J          | TB26      | 1A      | 79    | 23/0076 | P       | N.F.Check (50V In) |
| TB15        | 10A     | 1J          | TB26      | 8A      | 87    | 23/0076 | P       | N.F.Test Lamp      |
| TB15        | 11A     | 1J          | TB26      | 6A      | 84    | 23/0076 | P       | N.F. BAD Lamp      |
| TB15        | 12A     | 1J          | TB26      | 7A      | 86    | 23/0076 | P       | N.F. GOOD Lamp     |
| ■ TB15      | 2A      | 5J          | TB3       | 7A      | 1624  | 24/02   | Y       | 50V (2 min) ■      |

TABLE 40 (Sheet 12)  
Junction Panel Termination

Unit location 5J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE |                     |
|-------------|---------|-------------|-----------|---------|-------|---------|---------|---------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col.    |                     |
| TB16        | 1A      | 2J          | TB30      | 3A      | 426   | 23/0076 | Y       | Linear I.F. Lamp    |
| TB16        | 2A      | 2J          | TB30      | 4A      | 427   | 23/0076 | Y       | A.J.I.F. Lamp       |
| TB16        | 3A      | 1J          | TB24      | 9A      | 42    | 23/0076 | P       | Stalo On Tune (50V) |
| TB16        | 4A      | 1J          | TB24      | 11A     | 45    | 23/0076 | P       | Earth               |
| TB16        | 5A      | 2J          | TB32      | 3A      | 169   | 23/0076 | P       | Meter SW            |
| TB16        | 6A      | 2J          | TB32      | 4A      | 170   | 23/0076 | P       | Meter Grid 1        |
| TB16        | 7A      | 2J          | TB32      | 5A      | 171   | 23/0076 | P       | Meter Return        |
| TB16        | 8A      | 2J          | TB32      | 6A      | 172   | 23/0076 | P       | Limiter Level       |
| TB16        | 9A      | 2J          | TB32      | 7A      | 173   | 23/0076 | P       | A.J. Level          |
| TB16        | 10A     | 2J          | TB32      | 8A      | 174   | 23/0076 | P       | Linear Level        |
| TB16        | 11A     | 2J          | TB32      | 9A      | 175   | 23/0076 | P       | Bias Return         |
| TB16        | 12A     | 2J          | TB31      | 12A     | 154   | 23/0076 | Y       | Wob. SW. Line       |
| TB16        | 4A      | EARTH       | STRIP     |         | 1506  | 23/0076 | Bk      | Earth               |
| SKTK        |         | 5J          | TB5       | 11A     | 294   | UR70    |         | Trigger In          |
| SKTK        |         | 5J          | TB5       | 12A     | 294   | Screen  |         |                     |
| SKTL        |         | 2A          | 1PLX      |         | 449   | UR70    |         | Lock Pulse Out      |
| SKTM        |         | 1C          | PLE       |         | 450   | UR70    |         | I.F. Linear Out     |
| SKTN        |         | 2D          | PLF       |         | 620   | UR70    |         | I.F.A. J. Out       |

TABLE 41 JUNCTION PANEL - SLIDING GATE

Unit location 6J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE              |
|-------------|---------|-------------|-----------|---------|-------|---------|------|----------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col. |                      |
| TB17        | 1A      | 2J          | TB33      | 5A      | 195   | 70/0076 | Bn   | 6.3V 5A              |
| TB17        | 2A      | 2J          | TB33      | 6A      | 196   | 70/0076 | Bn   | 6.3V 5A              |
| TB17        | 3A      | 1N          | TB48      | 8B      | 452   | 70/0076 | Bn   | 6.3V                 |
| TB17        | 4A      | 1N          | TB48      | 9B      | 453   | 70/0076 | Bn   | 6.3V                 |
| TB17        | 5A      | 1J          | TB26      | 11A     | 89    | UR.70   |      | Noise source trigger |
| TB17        | 6A      | 1J          | TB26      | 12A     | 89    | Screen  |      |                      |
| TB17        | 7A      | 5J          | TB2       | 5A      | 223   | 23/0076 | R    | 300V                 |
| TB17        | 12A     | EARTH STRIP |           |         | 454   | 23/0076 | Bk   | Earth                |
| TB17        | 5B      | 1N          | PLP       |         | 683   | UR.70   |      | Noise source trigger |
| TB17        | 6B      | 1N          | PLP       |         | 683   | Screen  |      |                      |
| TB17        | 12B     | 6M          | TB1       | 8B      | 1579  | 23/0076 | Bk   | Earth                |
| H TB17      | 12B     | 2S          | TB1       | 12B     | 1662  | 24/0.2  | Bk   | Earth                |
| SKTT        |         | 1N          | PLX3      |         | 462   | UR.70   |      | Forward Power        |
| SKTU        |         | 1N          | PLX4      |         | 463   | UR.70   |      | Backward Power       |
| PLT         |         | 5S          | 1PLE      |         | 703   | UR.70   |      | Forward Power        |
| PLU         |         | 5S          | PLF       |         | 704   | UR.70   |      | Backward Power       |
| FS10        | A       | 1M          | TB2       | 6B      | 486   | 23/0076 | Y    | 50V                  |
| FS10        | A       | 6J          | TB19      | 6A      | 1484  | 23/0076 | Y    | 50V                  |
| FS10        | B       | 5J          | TB14      | 2A      | 227   | 23/0076 | Y    | 50V (Fused)          |
| TB18        | 1A      |             | 1LP3      | 2       | 1215  | 23/0076 | Bk   | Neutral              |
| TB18        | 1A      | 5J          | TB9       | 6A      | 325   | 23/0076 | Bk   | Neutral              |
| TB18        | 2A      | 3M          | TB2       | 1B      | 464   | 40/0076 | R    | 240V                 |
| TB18        | 2A      | 1N          | TB48      | 1B      | 465   | 40/0076 | R    | 240V                 |
| TB18        | 3A      | 2J          | TB33      | 7A      | 197   | 70/0076 | Bn   | 6.3V 5A              |
| TB18        | 4A      | 2J          | TB33      | 8A      | 198   | 70/0076 | Bn   | 6.3V 5A              |
| TB18        | 5A      | 5J          | TB2       | 4A      | 222   | 23/0076 | R    | 300V                 |
| TB18        | 6A      | 1K          | SKTAB     | 4       | 466   | 23/0076 | Y    | V. S.W.R. Power      |
| TB18        | 9A      | 1K          | SKTAA     | 16      | 467   | 23/0076 | P    | Def. Coil +ve        |
| TB18        | 10A     | 1K          | SKTAA     | 14      | 468   | 23/0076 | P    | Con. Coil +ve        |
| TB18        | 11A     | 1K          | SKTAA     | 17      | 469   | 23/0076 | P    | Def. Coil -ve        |
| TB18        | 12A     | 1K          | SKTAA     | 15      | 470   | 23/0076 | P    | Con. Coil -ve        |

(Cont.d)



TABLE 41 (Cont.)

Unit location 6J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE           |
|-------------|---------|-------------|-----------|---------|-------|---------|------|-------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col. |                   |
| TB18        | 1B      | 1N          | TB48      | 7B      | 1669  | 24/0.2  | Bk   | Neutral           |
| TB18        | 2B      | 2S          | TB2       | 1B      | 472   | 23/0076 | R    | 240V              |
| TB18        | 3B      | 5S          | TB1       | 1B      | 473   | 70/0076 | Bn   | 6.3V 5A           |
| TB18        | 4B      | 5S          | TB1       | 2B      | 474   | 70/0076 | Bn   | 6.3V 5A           |
| TB18        | 5B      | 5S          | TB1       | 3B      | 475   | 23/0076 | R    | 300V              |
| TB18        | 6B      | 5S          | TB1       | 4B      | 476   | 23/0076 | Y    | V.S.W.R/Power C/O |
| TB18        | 9B      | 5S          | TB1       | 8B      | 477   | 23/0076 | P    | Def.Coil +ve      |
| TB18        | 10B     | 5S          | TB1       | 9B      | 478   | 23/0076 | P    | Con. Coil +ve     |
| TB18        | 11B     | 5S          | TB1       | 10B     | 479   | 23/0076 | P    | Def.Coil -ve      |
| TB18        | 12B     | 5S          | TB1       | 11B     | 480   | 23/0076 | P    | Con. Coil -ve     |
| TB19        | 1A      | 1N          | TB49      | 1B      | 481   | 70/0076 | W    | T.W.T.1 Field +   |
| TB19        | 2A      | 1N          | TB49      | 2B      | 482   | 70/0076 | W    | T.W.T.1 Field -   |
| TB19        | 3A      | 1N          | TB49      | 11B     | 483   | 70/0076 | W    | T.W.T.2 Field +   |
| TB19        | 4A      | 1N          | TB49      | 12B     | 484   | 70/0076 | W    | T.W.T.2 Field -   |
| TB19        | 5A      | 1K          | SKTAA     | 5       | 485   | 23/0076 | Y    | I/L P.U. Monitor  |
| TB19        | 6A      | 6J          | FS10      | A       | 1484  | 23/0076 | Y    | 50V               |
| TB19        | 6A      | 5J          | TB2       | 9A      | 419   | 23/0076 | Y    | 50V               |
| TB19        | 8A      | 5J          | TB2       | 10A     | 228   | 23/0076 | V    | -250V             |
| TB19        | 1B      | 2S          | TB1       | 2B      | 487   | 70/0076 | W    | T.W.T.1 Field +   |
| TB19        | 4B      | 2S          | TB1       | 5B      | 490   | 70/0076 | W    | T.W.T.2 Field -   |
| TB19        | 6B      | 2S          | TB1       | 1B      | 492   | 23/0076 | Y    | 50V               |
| TB19        | 6B      | 6M          | TB1       | 10B     | 1580  | 23/0076 | Y    | 50V               |
| TB19        | 11      | 1N          | TB48      | 10      | 1665  | 24/0.2  | R    | PSU1 Line         |
| TB19        | 12      | 1N          | TB48      | 11      | 1666  | 24/0.2  | R    | PSU2 Line         |
| TB19        | 11      | 2S          | TB2       | 2       | 1663  | 24/0.2  | R    | PSU1 Line         |
| TB19        | 12      | 2S          | TB2       | 3       | 1667  | 24/0/2  | R    | PSU2 Line         |

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TABLE 41 JUNCTION PANEL-SLIDING GATE (Sheet 3)

Unit location 6J

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE             |
|-------------|---------|-------------|-----------|---------|-------|---------|------|---------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |                     |
| TB20        | 1A      | 5J          | TB12      | 1A      | 500   | 23/0076 | P    | Remote Meter +ve    |
| TB20        | 2A      | 5J          | TB12      | 2A      | 501   | 23/0076 | P    | Remote Meter -ve    |
| TB20        | 3A      | 5J          | TB12      | 3A      | 502   | 23/0076 | P    | Remote Meter Return |
| TB20        | 4A      | 5J          | TV12      | 4A      | 503   | 23/0076 | P    |                     |
| TB20        | 10A     | FJ3         | TB1       | 4A      | F72   | 70/0076 | W    | 24V (Fire)          |
| TB20        | 12A     | FJ4         | TB1       | 1A      | F74   | 70/0076 | W    | 24V (Fire)          |
| TB20        | 12A     | FJ1         | TB2       | 6A      | F75   | 30/0076 | W    | 24V (Fire)          |
| TB20        | 1B      | 5S          | TB1       | 5B      | 1225  | 23/0076 | P    | Remote Meter +ve    |
| TB20        | 2B      | 5S          | TB1       | 6B      | 1226  | 23/0076 | P    | Remote Meter -ve    |
| TB20        | 3B      | 5S          | TB1       | 12B     | 1560  | 23/0076 | Bk   | Remote Meter Return |
| TB20        | 10B     | CR          | XF42      | -ve     | F57   | 19/0076 | W    | 24V (Fire)          |
| TB20        | 12B     | CR          | XF46      | +ve     | F62   | 19/0076 | W    | 24V (Fire)          |
|             |         |             |           |         |       |         |      |                     |
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TABLE 42 LIGHT AND METER PANEL LH (Sheet 1) (Continued on Sheet 2)

Unit location 1K

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |               |      | SERVICE |
|-------------|---------|-------------|-----------|---------|-------|---------------|------|---------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE          | COL. |         |
| R113        | B       | 1K          | R111      | B       |       | 14/0076       | P    |         |
| R113        | B       | 1K          | R115      | B       |       | 14/0076       | P    |         |
| R117        | B       | 1K          | R115      | B       |       | 14/0076       | P    |         |
| R117        | B       | 1K          | R121      | B       |       | 14/0076       | P    |         |
| R123        | B       | 1K          | R121      | B       |       | 14/0076       | P    |         |
| R123        | B       | 1K          | R125      | B       |       | 14/0076       | P    |         |
| R101        | A       | 1K          | R102      | A       |       | 22 SWG<br>TCW |      |         |
| R103        | A       | 1K          | R104      | A       |       | 22 SWG<br>TCW |      |         |
| R105        | A       | 1K          | R106      | A       |       | 22 SWG<br>TCW |      |         |
| R110        | A       | 1K          | R111      | A       |       | 22 SWG<br>TCW |      |         |
| R112        | A       | 1K          | R113      | A       |       | 22 SWG<br>TCW |      |         |
| R114        | A       | 1K          | R115      | A       |       | 22 SWG<br>TCW |      |         |
| R116        | A       | 1K          | R117      | A       |       | 22 SWG<br>TCW |      |         |
| R118        | A       | 1K          | R119      | A       |       | 22 SWG<br>TCW |      |         |
| R120        | A       | 1K          | R121      | A       |       | 22 SWG<br>TCW |      |         |
| R122        | A       | 1K          | R123      | A       |       | 22 SWG<br>TCW |      |         |
| R124        | A       | 1K          | R125      | A       |       | 22 SWG<br>TCW |      |         |
| RLD         | 1       | 1K          | ET        | 1       |       | 14/0076       | P    |         |
| RLD         | 1       | 1K          | RLD       | 2       |       | 22 SWG<br>TCW |      |         |
| RLD         | 2       | 1K          | RLE       | 2       |       | 14/0076       | P    |         |
| RLE         | 2       | 1K          | RLG       | 2       |       | 14/0076       | P    |         |
| RLG         | 2       | 1K          | RLF       | 2       |       | 14/0076       | P    |         |
| RLE         | 9       | 1K          | PLAA      | 23      |       | 14/0076       | P    |         |
| RLE         | 9       | 1K          | PLE       | 11      |       | 14/0076       | P    |         |
| RLD         | 9       | 1K          | RLE       | 11      |       | 14/0076       | P    |         |
| RLD         | 9       | 1K          | RLD       | 11      |       | 14/0076       | P    |         |
| RLF         | 9       | 1K          | RLD       | 11      |       | 14/0076       | P    |         |
| RLF         | 9       | 1K          | RLF       | 11      |       | 14/0076       | P    |         |
| RLG         | 9       | 1K          | RLF       | 11      |       | 14/0076       | P    |         |

TABLE 42 LIGHT AND METER PANEL LH (Sheet 2)

Unit location 1K

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE |
|-------------|---------|-------------|-----------|---------|-------|---------|------|---------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |         |
| RLG         | 9       | 1K          | RLG       | 11      |       | 14/0076 | P    |         |
| RLG         | 11      | 1K          | R126      | A       |       | 14/0076 | P    |         |
| RLD         | 4       | 1K          | RLE       | 1       |       | 14/0076 | P    |         |
| RLE         | 4       | 1K          | RLG       | 1       |       | 14/0076 | P    |         |
| RLG         | 4       | 1K          | RLF       | 1       |       | 14/0076 | P    |         |
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TABLE 42 (Sheet 2. Continued on Sheet 3) Issued Nov.71  
Light and Meter Panel L.H.

Unit location 1K

| UNIT ORIGIN |           | DESTINATION |          |         | CABLE |         |      | SERVICE |
|-------------|-----------|-------------|----------|---------|-------|---------|------|---------|
| CCT REF.    | PIN NO.   | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |         |
| RLF         | 4         | 1K          | R101     | B       |       | 14/0076 | P    |         |
| RLD         | 3         | 1K          | R103     | B       |       | 14/0076 | P    |         |
| RLE         | 3         | 1K          | R105     | B       |       | 14/0076 | P    |         |
| RLF         | 3         | 1K          | R107     | B       |       | 14/0076 | P    |         |
| RLG         | 3         | 1K          | R108     | A       |       | 14/0076 | P    |         |
| R110        | B         | 1K          | RLD      | 10      |       | 14/0076 | P    |         |
| R110        | B         | 1K          | ILP      |         |       |         |      |         |
|             |           |             | 103      | 1       | 1443  | 14/0076 | P    |         |
| R112        | B         | 1K          | RLE      | 10      |       | 14/0076 | P    |         |
| R112        | B         | 1K          | ILP      |         |       |         |      |         |
|             |           |             | 104      | 1       | 1444  | 14/0076 | P    |         |
| R114        | B         | 1K          | RLF      | 10      |       | 14/0076 | P    |         |
| R114        | B         | 1K          | ILP      |         |       |         |      |         |
|             |           |             | 107      | 1       | 1445  | 14/0076 | P    |         |
| R116        | B         | 1K          | RLG      | 10      |       | 14/0076 | P    |         |
| R116        | B         | 1K          | ILP      |         |       |         |      |         |
|             |           |             | 108      | 1       | 1446  | 14/0076 | P    |         |
| R118        | B         | 1K          | PLAA     | 1       |       | 14/0076 | P    |         |
| R118        | B         | 1K          | ILP      |         |       |         |      |         |
|             |           |             | 101      | 1       | 1447  | 14/0076 | P    |         |
| R120        | B         | 1K          | PLAA     | 2       |       | 14/0076 | P    |         |
| R120        | B         | 1K          | ILP      |         |       |         |      |         |
|             |           |             | 102      | 1       | 1448  | 14/0076 | P    |         |
| R122        | B         | 1K          | PLAA     | 5       |       | 14/0076 | P    |         |
| R122        | B         | 1K          | ILP      |         |       |         |      |         |
|             |           |             | 105      | 1       | 1449  | 14/0076 | P    |         |
| R124        | B         | 1K          | PLAA     | 6       |       | 14/0076 | P    |         |
| R124        | B         | 1K          | ILP      |         |       |         |      |         |
|             |           |             | 106      | 1       | 1450  | 14/0076 | P    |         |
| R126        | B         | 1K          | RLH      | 4       |       | 14/0076 | P    |         |
| C101        | Red Tag   | 1K          | RLH      | 3       |       | 14/0076 | P    |         |
| C101        | Red Tag   | 1K          | RLJ      | A       |       | 14/0076 | P    |         |
| RLJ         | B         | 1K          | ET2      |         |       | 14/0076 | P    |         |
| RLH         | B         | 1K          | ET2      |         |       | 14/0076 | P    |         |
| C101        | Black Tag | 1K          | ET2      |         |       | 14/0076 | P    |         |
| RLJ         | 23        | 1K          | R111     | B       |       | 14/0076 | P    |         |
| R125        | B         | 1K          | PLAA     | 22      |       | 14/0076 | P    |         |
| R113        | B         | 1K          | SX       | 1       | 1451  | 14/0076 | P    |         |
| R119        | B         | 1K          | ET1      |         |       | 14/0076 | P    |         |
| R104        | B         | 1K          | RV101    | 1       | 1452  | 14/0076 | P    |         |
| R106        | B         | 1K          | RV102    | 1       | 1453  | 14/0076 | P    |         |
| R109        | A         | 1K          | RV103    | 1       | 1454  | 14/0076 | P    |         |
| R108        | B         | 1K          | RV104    | 1       | 1455  | 14/0076 | P    |         |

TABLE 42 (Sheet 3. Continued on Sheet 4)  
Light and Meter Panel L.H.

Unit location 1K

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |                     |      | SERVICE |
|-------------|---------|-------------|----------|---------|-------|---------------------|------|---------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE                | COL. |         |
| PLAA        | 3       | 1K          | RV101    | 3       | 1456  | 14/0076             | P    |         |
| PLAA        | 4       | 1K          | RV102    | 3       | 1457  | 14/0076             | P    |         |
| PLAA        | 7       | 1K          | RV103    | 3       | 1458  | 14/0076             | P    |         |
| PLAA        | 8       | 1K          | RV104    | 3       | 1459  | 14/0076             | P    |         |
| PLAA        | 9       | 1K          | R102     | B       |       | 14/0076             | P    |         |
| PLAA        | 10      | 1K          | M1       | C+      | 1460  | 14/0076             | P    |         |
| PLAA        | 11      | 1K          | M1       | C-      | 1461  | 14/0076             | P    |         |
| PLAA        | 12      | 1K          | M1       | D+      | 1462  | 14/0076             | P    |         |
| PLAA        | 13      | 1K          | M1       | D-      | 1463  | 14/0076             | P    |         |
| PLAA        | 18      | 1K          | M2       | L       | 1468  | 14/0076             | P    |         |
| PLAA        | 19      | 1K          | M2       | N       | 1469  | 14/0076             | P    |         |
| PLAA        | 20      | 1K          | RLJ      | 21      |       | 14/0076             | P    |         |
| PLAA        | 21      | 1K          | RLJ      | 22      |       | 14/0076             | P    |         |
| PLAA        | 24      | 1K          | ET1      |         |       | 14/0076             | P    |         |
| PLAB        | 3       | 1K          | SV       | 3       | 1470  | 14/0076             | P    |         |
| PLAB        | 4       | 1K          | SW       | 1       | 1471  | 14/0076             | P    |         |
| SW          | 2       | 1K          | ET2      |         | 1496  | 14/0076             | P    |         |
| ET2         |         | 1K          | ET3      |         | 1472  | 14/0076             | P    |         |
| SV          | 1       | 1K          | R126     | A       | 1497  | 14/0076             | P    |         |
| R115        | B       | 1K          | RLH      | A       |       | 14/0076             | P    |         |
| RLJ         | 24      | 1K          | RLJ      | B       |       | 14/0076             | P    |         |
| RLJ         | 23      | 1K          | RLH      | A       |       | 14/0076             | P    |         |
| R110        | A       | 1K          | ILP      |         |       |                     |      |         |
|             |         |             | 103      | 2       | 1483  | 14/0076             | P    |         |
| R112        | A       | 1K          | ILP      |         |       |                     |      |         |
|             |         |             | 104      | 2       | 1484  | 14/0076             | P    |         |
| R114        | A       | 1K          | ILP      |         |       |                     |      |         |
|             |         |             | 107      | 2       | 1486  | 14/0076             | P    |         |
| R116        | A       | 1K          | ILP      |         |       |                     |      |         |
|             |         |             | 108      | 2       | 1487  | 14/0076             | P    |         |
| R118        | A       | 1K          | ILP      |         |       |                     |      |         |
|             |         |             | 101      | 2       | 1488  | 14/0076             | P    |         |
| R120        | A       | 1K          | ILP      |         |       |                     |      |         |
|             |         |             | 102      | 2       | 1489  | 14/0076             | P    |         |
| R122        | A       | 1K          | ILP      |         |       |                     |      |         |
|             |         |             | 105      | 2       | 1490  | 14/0076             | P    |         |
| R124        | A       | 1K          | ILP      |         |       |                     |      |         |
|             |         |             | 106      | 2       | 1491  | 14/0076             | P    |         |
| R107        | A       | 1K          | R109     | B       |       | 22 S.W.G.<br>T.C.W. |      |         |

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TABLE 42 (Sheet 4. Continued on Sheet 5)  
Light and Meter Panel L.H.

Unit location 1K

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |                     |      | SERVICE |
|-------------|---------|-------------|----------|---------|-------|---------------------|------|---------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE                | COL. |         |
| SX          | 2       | 1K          | ET3      |         |       | 14/0076             | P    |         |
| RV101       | 2       | 1K          | RV101    | 3       |       | 22 S.W.G.<br>T.C.W. |      |         |
| RV102       | 2       | 1K          | RV102    | 3       |       | 22 S.W.G.<br>T.C.W. |      |         |
| RV103       | 2       | 1K          | RV103    | 3       |       | 22 S.W.G.<br>T.C.W. |      |         |
| RV104       | 2       | 1K          | RV104    | 3       |       | 22 S.W.G.<br>T.C.W. |      |         |
| ILP         |         |             |          |         |       |                     |      |         |
| 103         | 1       | 1K          | R110     | B       | 1443  | 14/0076             | P    |         |
| ILP         |         |             |          |         |       |                     |      |         |
| 104         | 1       | 1K          | R112     | B       | 1444  | 14/0076             | P    |         |
| ILP         |         |             |          |         |       |                     |      |         |
| 107         | 1       | 1K          | R114     | B       | 1445  | 14/0076             | P    |         |
| ILP         |         |             |          |         |       |                     |      |         |
| 108         | 1       | 1K          | R116     | B       | 1446  | 14/0076             | P    |         |
| ILP         |         |             |          |         |       |                     |      |         |
| 101         | 1       | 1K          | R118     | B       | 1447  | 14/0076             | P    |         |
| ILP         |         |             |          |         |       |                     |      |         |
| 102         | 1       | 1K          | R120     | B       | 1448  | 14/0076             | P    |         |
| ILP         |         |             |          |         |       |                     |      |         |
| 105         | 1       | 1K          | R122     | B       | 1449  | 14/0076             | P    |         |
| ILP         |         |             |          |         |       |                     |      |         |
| 106         | 1       | 1K          | R124     | B       | 1450  | 14/0076             | P    |         |
| SX          | 1       | 1K          | R113     | B       | 1451  | 14/0076             | P    |         |
| RV101       | 1       | 1K          | R104     | B       | 1452  | 14/0076             | P    |         |
| RV102       | 1       | 1K          | R106     | B       | 1453  | 14/0076             | P    |         |
| RV103       | 1       | 1K          | R109     | B       | 1454  | 14/0076             | P    |         |
| RV104       | 1       | 1K          | R108     | B       | 1455  | 14/0076             | P    |         |
| RV101       | 3       | 1K          | PLAA     | 3       | 1456  | 14/0076             | P    |         |
| RV102       | 3       | 1K          | PLAA     | 4       | 1457  | 14/0076             | P    |         |
| RV103       | 3       | 1K          | PLAA     | 7       | 1458  | 14/0076             | P    |         |
| RV104       | 3       | 1K          | PLAA     | 8       | 1459  | 14/0076             | P    |         |
| M1          | C+      | 1K          | PLAA     | 10      | 1460  | 14/0076             | P    |         |
| M1          | C-      | 1K          | PLAA     | 11      | 1461  | 14/0076             | P    |         |
| M1          | D+      | 1K          | PLAA     | 12      | 1462  | 14/0076             | P    |         |
| M1          | D-      | 1K          | PLAA     | 13      | 1463  | 14/0076             | P    |         |
|             |         |             |          |         |       |                     |      |         |
| M2          | L       | 1K          | PLAA     | 18      | 1468  | 14/0076             | P    |         |
| M2          | N       | 1K          | PLAA     | 19      | 1469  | 14/0076             | P    |         |
| SV          | 3       | 1K          | PLAB     | 3       | 1470  | 14/0076             | P    |         |
| SW          | 2       | 1K          | PLAB     | 4       | 1471  | 14/0076             | P    |         |
|             |         |             |          |         |       |                     |      |         |
| ET3         |         | 1K          | ET       | 2       | 1472  | 14/0076             | P    |         |

TABLE 42 (Sheet 5. Continued on Sheet 6)  
Light and Meter Panel L.H.

Unit location 1K

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE             |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                     |
| SKTAA       | 1       | 1J          | TB25     | 4A      | 85    | 23/0076 | P    | N.F.Bad             |
| SKTAA       | 2       | 1J          | TB25     | 10A     | 66    | 23/0076 | Y    | D.C.Heaters I/L     |
| SKTAA       | 3       | 2J          | TB31     | 4A      | 146   | 23/0076 | R    | 200V Metering (3C)  |
| SKTAA       | 4       | 2J          | TB31     | 5A      | 147   | 23/0076 | R    | 200V Metering (4D)  |
| SKTAA       | 5       | 6J          | TB19     | 5A      | 485   | 23/0076 | Y    | T.W.T.Field         |
| SKTAA       | 6       | 2J          | TB31     | 11A     | 153   | 23/0076 | Y    | Stab.A.C.Heaters    |
| SKTAA       | 7       | 2J          | TB31     | 6A      | 148   | 23/0076 | R    | 200V Metering (5D)  |
| SKTAA       | 8       | 5J          | TB2      | 5A      | 221   | 23/0076 | R    | 300V Metering (2H)  |
| SKTAA       | 9       | 2J          | TB31     | 7A      | 150   | 23/0076 | V    | -250V Metering (5F) |
| SKTAA       | 10      | 1J          | TB26     | 2A      | 80    | 23/0076 | P    | Meter Con.+ve       |
| SKTAA       | 11      | 1J          | TB26     | 3A      | 81    | 23/0076 | P    | Meter Con.-ve       |
| SKTAA       | 12      | 1J          | TB26     | 4A      | 82    | 23/0076 | P    | Meter Def.+ve       |
| SKTAA       | 13      | 1J          | TB26     | 5A      | 83    | 23/0076 | P    | Meter Def.-ve       |
| SKTAA       | 14      | 6J          | TB18     | 10A     | 468   | 23/0076 | P    | Con.Coil +ve        |
| SKTAA       | 15      | 6J          | TB18     | 12A     | 470   | 23/0076 | P    | Con.Coil -ve        |
| SKTAA       | 16      | 6J          | TB18     | 9A      | 467   | 23/0076 | P    | Def.Coil +ve        |
| SKTAA       | 17      | 6J          | TB18     | 11A     | 469   | 23/0076 | P    | Def.Coil -ve        |
| SKTAA       | 18      | 2K          | T214     | 1       | 706   | 23/0076 | R    | 240V - Hourmeter    |
| SKTAA       | 19      | 2K          | NEUTRAL  |         | 707   | 23/0076 | Bk   | Neutral             |
| SKTAA       | 20      | 2K          | T210     | 1       | 708   | 23/0076 | R    | 240V                |
| SKTAA       | 21      | 5J          | TB14     | 7A      | 420   | 23/0076 | P    | P.U.s Normal        |
| SKTAA       | 22      | 5J          | TB7      | 11A     | 313   | 23/0076 | Y    | 50V Return          |
| SKTAA       | 23      | 1J          | TB25     | 8A      | 64    | 23/0076 | Y    | 50V                 |
| SKTAA       | 24      | EARTH       | STRIP    |         | 709   | 23/0076 | Bk   | Earth               |
| SKTAB       | 3       | 1J          | TB26     | 1A      | 78    | 23/0076 | P    | N.F.Test            |
| SKTAB       | 4       | 6J          | TB18     | 6A      | 466   | 23/0076 | Y    | VSWR/Power/C/O      |



TABLE 42 (Sheet 6)  
Light and Meter Panel L.H.

Unit location 1K

| UNIT ORIGIN |         | DESTINATION |           |         |      | CABLE   |      | SERVICE |
|-------------|---------|-------------|-----------|---------|------|---------|------|---------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.  | TYPE    | COL. |         |
| ILP 103     | 2       | 1K          | R110      | A       | 1483 | 14/0076 | P    |         |
| ILP 104     | 2       | 1K          | R112      | A       | 1484 | 14/0076 | P    |         |
| ILP 107     | 2       | 1K          | R114      | A       | 1486 | 14/0076 | P    |         |
| ILP 108     | 2       | 1K          | R116      | A       | 1487 | 14/0076 | P    |         |
| ILP 101     | 2       | 1K          | R118      | A       | 1488 | 14/0076 | P    |         |
| ILP 102     | 2       | 1K          | R120      | A       | 1489 | 14/0076 | P    |         |
| ILP 105     | 2       | 1K          | R122      | A       | 1490 | 14/0076 | P    |         |
| ILP 106     | 2       | 1K          | R124      | A       | 1491 | 14/0076 | P    |         |
| R126        | A       | 1K          | SV        | 1       | 1496 | 14/0076 | P    |         |
| SV          | 1       | 1K          | SW        | 3       |      | 14/0076 | P    |         |
| SKTAF       |         | 7J          | SKTAD     |         | 1583 | UR.70   |      |         |
| SKTAG       |         | 7J          | SKTAE     |         | 1584 | UR.70   |      |         |
| SKTAF       |         | M3          | +         |         | 1585 | UR.70   |      |         |
| SKTAG       |         | M3          | -         |         | 1586 | UR.70   |      |         |
| M3          | +       |             | SKTAF     |         | 1585 | UR.70   |      |         |
| M3          | -       |             | SKTAG     |         | 1586 | UR.70   |      |         |

TABLE 43 (Sheet 1, Continued on Sheet 2)  
Light and switch assembly L.H.

Unit location 2K

| UNIT ORIGIN |         |          | DESTINATION |         |     | CABLE   |      | SERVICE                         |   |
|-------------|---------|----------|-------------|---------|-----|---------|------|---------------------------------|---|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | NO. | TYPE    | COL. |                                 |   |
| T201        | 1       | 4M       | FS1         | B       | 712 | 23/0076 | R    | Mains On Lamp                   |   |
| T202        | 1       | 3M       | TB6         | 10B     | 667 | 23/0076 | R    | Red Phase                       |   |
| T203        | 1       | 3M       | TB6         | 11B     | 668 | 23/0076 | W    | Yellow Phase                    |   |
| T204        | 1       | 3M       | TB6         | 12B     | 669 | 23/0076 | B    | Blue Phase                      |   |
| T205        | 1       | 5J       | TB14        | 12A     | 417 | 23/0076 | R    | Remote Control Lamp             |   |
| ■ T206      | 1       | 5J       | TB15        | 1A      | 423 | 23/0076 | B    | Mains On                        | ■ |
| T207        | 1       | 5M       | TB1         | 10B     | 681 | 23/0076 | R    | Gate-Heaters                    |   |
| T208        | 1       | 5J       | TB10        | 4A      | 421 | 23/0076 | R    | Thyratron Heaters               |   |
| T209        | 1       | 5J       | TB13        | 6A      | 415 | 23/0076 | R    | Dehumid Lamp                    |   |
| T210        | 1       | 3M       | TB2         | 1B      | 651 | 23/0076 | R    | P.U.'s On                       |   |
| T210        | 1       | 1K       | SKTAA       | 20      | 708 | 23/0076 | R    | P.U.'s On                       |   |
| T211        | 1       | 5J       | TB14        | 7A      | 705 | 23/0076 | P    | P.U.'s Normal                   |   |
| T212        | 1       | 5J       | TB6         | 1A      | 388 | 23/0076 | W    | Magnetron On                    |   |
| T213        | 1       | 5J       | TB11        | 4A      | 367 | 23/0076 | R    | Fans Lamp                       |   |
| T214        | 1       | 1K       | SKTAA       | 18      | 706 | 23/0076 | R    | Modulator Heaters               |   |
| T214        | 1       | 5J       | TB10        | 6A      | 341 | 23/0076 | R    | Modulator Heaters               |   |
| T215        | 1       | 5J       | TB14        | 9A      | 422 | 23/0076 | B    | WG Air Dry                      |   |
| T216        | 1       | 5J       | TB10        | 7A      | 343 | 23/0076 | R    | Water Pump 1                    |   |
| T217        | 1       | 5J       | TB7         | 1A      | 304 | 23/0076 | O    | Water Level                     |   |
| T218        | 1       | 5J       | TB7         | 5A      | 308 | 23/0076 | O    | Diode Cooling                   |   |
| T219        | 1       | 5J       | TB15        | 4A      | 425 | 23/0076 | B    | Running Down                    |   |
| T220        | 1       | 5J       | TB5         | 6A      | 289 | 23/0076 | B    | Regulator Down                  |   |
| NEUTRAL     |         | 5J       | TB9         | 7A      | 326 | 23/0076 | Bk   | Neutral                         |   |
| NEUTRAL     |         | 1K       | SKTAA       | 19      | 707 | 23/0076 | Bk   | Neutral                         |   |
| ■ SC        | 1       | FJ2      | TB2         | 2       | 713 | 23/0076 | R    | 240V via Fire Detection Circuit | ■ |
| SC          | 2       | 2K       | SD          | 1       | 714 | 23/0076 | R    | Mains Off                       |   |
| SD          | 2       | 1L       | TB75        | 1B      | 715 | 24/0.2  | R    | Mains Off                       |   |
| SE          | 1       | 2K       | SF          | 1       | 717 | 23/0076 | R    | 240V                            |   |
| SE          | 1       | 1L       | TB54        | 1B      | 716 | 24/0.2  | R    | Mains On                        |   |
| SE          | 3       | 2K       | SF          | 3       | 718 | 23/0076 | R    | Mains On                        |   |
| SE          | 3       | 1L       | TB54        | 2B      | 719 | 23/0076 | R    | Mains On                        | ■ |

TABLE 43 (Sheet 2)  
Light and switch assembly L.H.

Unit location 2K

| UNIT ORIGIN |         | DESTINATION |                 |              | CABLE |         | SERVICE |       |
|-------------|---------|-------------|-----------------|--------------|-------|---------|---------|-------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF.       | PIN NO.      | NO.   | TYPE    | COL.    |       |
| T201        | 3       | 2K          | R201            | a            | 1300  | 23/0076 | P       | 6V    |
| T202        | 3       | 2K          | R202            | a            | 1301  | 23/0076 | P       | 6V    |
| T203        | 3       | 2K          | R203            | a            | 1302  | 23/0076 | P       | 6V    |
| T204        | 3       | 2K          | R204            | a            | 1303  | 23/0076 | P       | 6V    |
| T205        | 3       | 2K          | R205            | a            | 1304  | 23/0076 | P       | 6V    |
| T206        | 3       | 2K          | R206            | a            | 1305  | 23/0076 | P       | 6V    |
| T207        | 3       | 2K          | R207            | a            | 1306  | 23/0076 | P       | 6V    |
| T208        | 3       | 2K          | R208            | a            | 1307  | 23/0076 | P       | 6V    |
| T209        | 3       | 2K          | R209            | a            | 1308  | 23/0076 | P       | 6V    |
| T210        | 3       | 2K          | R210            | a            | 1309  | 23/0076 | P       | 6V    |
| T211        | 3       | 2K          | R211            | a            | 1310  | 23/0076 | P       | 6V    |
| T212        | 3       | 2K          | R212            | a            | 1311  | 23/0076 | P       | 6V    |
| T213        | 3       | 2K          | R213            | a            | 1312  | 23/0076 | P       | 6V    |
| T214        | 3       | 2K          | R214            | a            | 1313  | 23/0076 | P       | 6V    |
| T215        | 3       | 2K          | R215            | a            | 1314  | 23/0076 | P       | 6V    |
| T216        | 3       | 2K          | R216            | a            | 1315  | 23/0076 | P       | 6V    |
| T217        | 3       | 2K          | R217            | a            | 1316  | 23/0076 | P       | 6V    |
| T218        | 3       | 2K          | R218            | a            | 1317  | 23/0076 | P       | 6V    |
| T219        | 3       | 2K          | R219            | a            | 1318  | 23/0076 | P       | 6V    |
| T220        | 3       | 2K          | R220            | a            | 1319  | 23/0076 | P       | 6V    |
| EARTH TAG   |         | EARTH TAG   | STRIP Earth Tag | (R.H.) Front | 1320  | 23/0076 | Bk      | Earth |
| EARTH TAG   |         | R.H. Rear   | Earth Tag       | (R.H.) Front | 1478  | 23/0076 | Bk      | Earth |
| ILP221      | c       | 2K          | Earth Tag       | (R.H.) Front | 1638  | 24/0.2  | Bk      | Earth |
| ILP221      | a       | 5J          | TB11            | 10A          | 1636  | 24/0.2  | P       | 24V   |

} NEAT only

TABLE 44 (Sheet 1, Continued on Sheet 2)  
Light and switch assembly R.H.

Unit location 3K

| UNIT ORIGIN |         |          | DESTINATION |         |      | CABLE   |      | SERVICE            |
|-------------|---------|----------|-------------|---------|------|---------|------|--------------------|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | NO.  | TYPE    | COL. |                    |
| T301        | 1       | 3P       | TB58        | 7B      | 1169 | 23/0076 | 0    | Magnet Cooling     |
| T302        | 1       | 3P       | TB58        | 8B      | 1170 | 23/0076 | 0    | Magnet Temp.       |
| T303        | 1       | 5J       | TB7         | 3B      | 314  | 23/0076 | R    | Magnet On          |
| T304        | 1       | 5J       | TB11        | 7B      | 1164 | 23/0076 | R    | Water Pump 2       |
| T305        | 1       | 3P       | TB58        | 2B      | 1166 | 23/0076 | 0    | Magnetron Cooling  |
| T306        | 1       | 3P       | TB58        | 5B      | 1167 | 23/0076 | 0    | Magnetron Temp.    |
| T307        | 1       | 5J       | TB6         | 3B      | 401  | 23/0076 | B    | Compressors        |
| T309        | 1       | 1R       | TB59        | 8B      | 1185 | 23/0076 | R    | WG Air Flow        |
| T310        | 1       | 5J       | TB5         | 9B      | 1171 | 23/0076 | 0    | Magnetron Ready    |
| T311        | 1       | 5J       | TB7         | 4B      | 315  | 23/0076 | 0    | W/G Pressure       |
| T312        | 1       | 4J       | TB44        | 2A      | 875  | 23/0076 | 0    | Trigger            |
| T313        | 1       | 3J       | TB34        | 5A      | 732  | 23/0076 | 0    | Field Normal       |
| T314        | 1       | 3J       | TB36        | 3A      | 765  | 23/0076 | 0    | Warm-up Complete   |
| T315        | 1       | 3J       | TB34        | 10A     | 734  | 23/0076 | 0    | Doors Closed       |
| T316        | 1       | 5J       | TB6         | 11B     | 409  | 23/0076 | 0    | Aerial Turning     |
| T317        | 1       | 5J       | TB7         | 8B      | 320  | 23/0076 | 0    | H.T. On            |
| T317        | 1       | 4K       | SKTAC       | 21      | 1187 | 23/0076 | 0    | H.T. Hourmeter     |
| T318        | 1       | 3J       | TB35        | 7A      | 750  | 23/0076 | R    | H.T. Up            |
| T319        | 1       | 3J       | TB35        | 12A     | 751  | 23/0076 | B    | Trip               |
| T320        | 1       | 5J       | TB5         | 4B      | 296  | 23/0076 | B    | Running Up         |
| Neutral     |         | 5J       | TB9         | 7B      | 332  | 23/0076 | Bk   | Neutral            |
| Neutral     |         | 4K       | SKTAC       | 23      | 1188 | 23/0076 | Bk   | Neutral            |
| SG          | 1       | 3K       | SH          | 1       | 1189 | 23/0076 | R    | 240V               |
| SG          | 1       | 3J       | TB35        | 2A      | 748  | 23/0076 | R    | 240V               |
| SG          | 3       | 3K       | SH          | 3       | 1190 | 23/0076 | R    | 240V - Tx On       |
| SG          | 3       | 3K       | SJ          | 1       | 1191 | 23/0076 | R    | 240V               |
| SJ          | 1       | 3J       | TB35        | 1A      | 747  | 23/0076 | R    | 240V               |
| SJ          | 2       | 3K       | SK          | 1       | 1192 | 23/0076 | R    | 240V Tx Off        |
| SK          | 2       | 5J       | TB3         | 2B      | 255  | 23/0076 | R    | 240V - To 50V P.U. |

TABLE 44 (Sheet 2)  
Light and switch assembly R.H.

Unit location 3K

| UNIT ORIGIN |          | DESTINATION      |           |              | CABLE |         |      | SERVICE                       |
|-------------|----------|------------------|-----------|--------------|-------|---------|------|-------------------------------|
| CCT. REF.   | PIN NO.  | UNIT NO.         | CCT. REF. | PIN NO.      | NO.   | TYPE    | COL. |                               |
| T301        | 3        | 3K               | R301      | a            | 1279  | 23/0076 | P    | 6V                            |
| T302        | 3        | 3K               | R302      | a            | 1280  | 23/0076 | P    | 6V                            |
| T303        | 3        | 3K               | R303      | a            | 1281  | 23/0076 | P    | 6V                            |
| T304        | 3        | 3K               | R304      | a            | 1282  | 23/0076 | P    | 6V                            |
| T305        | 3        | 3K               | R305      | a            | 1283  | 23/0076 | P    | 6V                            |
| T306        | 3        | 3K               | R306      | a            | 1284  | 23/0076 | P    | 6V                            |
| T307        | 3        | 3K               | R307      | a            | 1285  | 23/0076 | P    | 6V                            |
| T308        | 3        | 3K               | R308      | a            | 1286  | 23/0076 | P    | 6V                            |
| T309        | 3        | 3K               | R309      | a            | 1287  | 23/0076 | P    | 6V                            |
| T310        | 3        | 3K               | R310      | a            | 1288  | 23/0076 | P    | 6V                            |
| T311        | 3        | 3K               | R311      | a            | 1289  | 23/0076 | P    | 6V                            |
| T312        | 3        | 3K               | R312      | a            | 1290  | 23/0076 | P    | 6V                            |
| T313        | 3        | 3K               | R313      | a            | 1291  | 23/0076 | P    | 6V                            |
| T314        | 3        | 3K               | R314      | a            | 1292  | 23/0076 | P    | 6V                            |
| T315        | 3        | 3K               | R315      | a            | 1293  | 23/0076 | P    | 6V                            |
| T316        | 3        | 3K               | R316      | a            | 1294  | 23/0076 | P    | 6V                            |
| T317        | 3        | 3K               | R317      | a            | 1295  | 23/0076 | P    | 6V                            |
| T318        | 3        | 3K               | R318      | a            | 1296  | 23/0076 | P    | 6V                            |
| T319        | 3        | 3K               | R319      | a            | 1297  | 23/0076 | P    | 6V                            |
| T320        | 3        | 3K               | R320      | a            | 1298  | 23/0076 | P    | 6V                            |
| Rear Earth  | L.H. Tag | Front L.H. Earth | L.H. Tag  |              | 1483  | 23/0076 | Bk   | Earth                         |
| Earth       | Tag      | Earth Strip      |           |              | 1299  | 23/0076 | Bk   | Earth                         |
| ILP321      | c        | 3K               | Earth Tag | (L.H.) Front | 1639  | 24/0.2  | Bk   | Earth                         |
| ILP321      | a        | 5P               | TB1       | 6            | 1629  | 24/0.2  | P    | Flashing Indicator<br>SILENCE |

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TABLE 45 (Sheet 1, Continued on Sheet 2)  
Light and meter panel R.H.

Unit location 4K

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |                     | SERVICE |
|-------------|---------|-------------|-----------|---------|-------|---------------------|---------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE                | COL.    |
| R411        | A       | 4K          | R410      | B       |       | 14/0076             | P       |
| R412        | A       | 4K          | R413      | A       |       | 22 S.W.G<br>T.C.W.  |         |
| R414        | A       | 4K          | R415      | A       |       | 22 S.W.G.<br>T.C.W. |         |
| R416        | A       | 4K          | R417      | A       |       | 22 S.W.G.<br>T.C.W. |         |
| R419        | B       | 4K          | R420      | A       |       | 14/0076             | P       |
| R421        | A       | 4K          | R422      | A       |       | 22 S.W.G.<br>T.C.W. |         |
| R423        | A       | 4K          | R424      | A       |       | 22 S.W.G.<br>T.C.W. |         |
| R425        | A       | 4K          | R426      | A       |       | 22 S.W.G.<br>T.C.W. |         |
| R427        | A       | 4K          | R428      | A       |       | 22 S.W.G.<br>T.C.W. |         |
| R429        | A       | 4K          | R430      | A       |       | 22 S.W.G.<br>T.C.W. |         |
| R431        | A       | 4K          | R432      | A       |       | 22 S.W.G.<br>T.C.W. |         |
| R433        | A       | 4K          | R434      | A       |       | 22 S.W.G.<br>T.C.W. |         |
| R435        | A       | 4K          | R436      | A       |       | 22 S.W.G.<br>T.C.W. |         |
| RLK         | 1       | 4K          | E.T.1     |         |       | 14/0076             | P       |
| RLK         | 1       | 4K          | RLK       | 2       |       | 22 S.W.G.<br>T.C.W. |         |
| RLL         | 2       | 4K          | RLK       | 2       |       | 14/0076             | P       |
| RLL         | 2       | 4K          | RLM       | 2       |       | 14/0076             | P       |
| RLN         | 2       | 4K          | RLM       | 2       |       | 14/0076             | P       |
| RLN         | 2       | 4K          | RLS       | 2       |       | 14/0076             | P       |
| RLQ         | 2       | 4K          | RLP       | 2       |       | 14/0076             | P       |
| RLQ         | 2       | 4K          | RLR       | 2       |       | 14/0076             | P       |
| RLS         | 2       | 4K          | RLR       | 2       |       | 14/0076             | P       |
| RLK         | 9       | 4K          | PLAC      | 10      |       | 14/0076             | P       |
| RLK         | 9       | 4K          | RLK       | 11      |       | 14/0076             | P       |
| RLL         | 9       | 4K          | RLK       | 11      |       | 14/0076             | P       |
| RLL         | 9       | 4K          | RLL       | 11      |       | 14/0076             | P       |
| RLM         | 9       | 4K          | RLL       | 11      |       | 14/0076             | P       |
| RLM         | 9       | 4K          | RLM       | 11      |       | 14/0076             | P       |
| RLN         | 9       | 4K          | RLM       | 11      |       | 14/0076             | P       |
| RLN         | 9       | 4K          | RLN       | 11      |       | 14/0076             | P       |
| RLP         | 9       | 4K          | RLN       | 11      |       | 14/0076             | P       |
| RLP         | 9       | 4K          | RLP       | 11      |       | 14/0076             | P       |
| RLQ         | 9       | 4K          | RLP       | 11      |       | 14/0076             | P       |
| RLQ         | 9       | 4K          | RLQ       | 11      |       | 14/0076             | P       |
| RLR         | 9       | 4K          | RLQ       | 11      |       | 14/0076             | P       |

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TABLE 45 (Sheet 2. Continued on Sheet 3)  
Light and meter panel R.H.

Unit location 4K

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |         |
| RLR         | 9       | 4K          | RLR      | 11      |       | 14/0076 | P    |         |
| RLS         | 9       | 4K          | RLR      | 11      |       | 14/0076 | P    |         |
| RLS         | 9       | 4K          | RLS      | 11      |       | 14/0076 | P    |         |
| RLL         | 1       | 4K          | RLK      | 4       |       | 14/0076 | P    |         |
| RLL         | 4       | 4K          | RLM      | 1       |       | 14/0076 | P    |         |
| RLN         | 1       | 4K          | RLM      | 4       |       | 14/0076 | P    |         |
| RLN         | 4       | 4K          | RLS      | 1       |       | 14/0076 | P    |         |
| RLQ         | 4       | 4K          | RLP      | 1       |       | 14/0076 | P    |         |
| RLQ         | 1       | 4K          | RLR      | 4       |       | 14/0076 | P    |         |
| RLS         | 4       | 4K          | RLR      | 1       |       | 14/0076 | P    |         |
| RLP         | 4       | 4K          | R401     | B       |       | 14/0076 | P    |         |
| R436        | B       | 4K          | SY       | 1       | 1402  | 14/0076 | P    |         |
| R404        | B       | 4K          | RV401    | 1       | 1403  | 14/0076 | P    |         |
| R406        | B       | 4K          | RV402    | 1       | 1404  | 14/0076 | P    |         |
| R408        | B       | 4K          | RV403    | 1       | 1405  | 14/0076 | P    |         |
| R411        | B       | 4K          | RV404    | 1       | 1406  | 14/0076 | P    |         |
| R413        | B       | 4K          | RV405    | 1       | 1407  | 14/0076 | P    |         |
| R415        | B       | 4K          | RV406    | 1       | 1408  | 14/0076 | P    |         |
| R417        | B       | 4K          | RV407    | 1       | 1409  | 14/0076 | P    |         |
| R420        | B       | 4K          | RV408    | 1       | 1410  | 14/0076 | P    |         |
| PLAC        | 1       | 4K          | RV401    | 3       | 1411  | 14/0076 | P    |         |
| PLAC        | 2       | 4K          | RV402    | 3       | 1412  | 14/0076 | P    |         |
| PLAC        | 3       | 4K          | RV403    | 3       | 1413  | 14/0076 | P    |         |
| PLAC        | 4       | 4K          | RV405    | 3       | 1414  | 14/0076 | P    |         |
| PLAC        | 5       | 4K          | RV406    | 3       | 1415  | 14/0076 | P    |         |
| PLAC        | 6       | 4K          | RV407    | 3       | 1416  | 14/0076 | P    |         |
| PLAC        | 7       | 4K          | RV404    | 3       | 1417  | 14/0076 | P    |         |
| PLAC        | 8       | 4K          | RV408    | 3       | 1418  | 14/0076 | P    |         |
| PLAC        | 11      | 4K          | R402     | B       |       | 14/0076 | P    |         |
| PLAC        | 11      | 4K          | PLAC     | 13      |       | 14/0076 | P    |         |
| PLAC        | 14      | 4K          | R422     | B       |       | 14/0076 | P    |         |
| PLAC        | 16      | 4K          | M4       | +       | 1419  | 14/0076 | P    |         |
| PLAC        | 17      | 4K          | M4       | -       | 1420  | 14/0076 | P    |         |
| PLAC        | 18      | 4K          | M6       | +       | 1421  | 14/0076 | P    |         |
| PLAC        | 19      | 4K          | M6       | -       | 1422  | 14/0076 | P    |         |
| PLAC        | 21      | 4K          | M5       | L       | 1423  | 14/0076 | P    |         |
| PLAC        | 23      | 4K          | M5       | N       | 1424  | 14/0076 | P    |         |
| PLAC        | 24      | 4K          | ET1      |         |       | 14/0076 | P    |         |
| ET1         |         | 4K          | ET2      |         | 1425  | 14/0076 | P    |         |
| RLK         | 3       | 4K          | R403     | B       |       | 14/0076 | P    |         |
| RLL         | 3       | 4K          | R405     | B       |       | 14/0076 | P    |         |
| RLM         | 3       | 4K          | R407     | B       |       | 14/0076 | P    |         |
| RLN         | 3       | 4K          | R409     | B       |       | 14/0076 | P    |         |
| RLP         | 3       | 4K          | R412     | B       |       | 14/0076 | P    |         |
| RLQ         | 3       | 4K          | R414     | B       |       | 14/0076 | P    |         |
| RLR         | 3       | 4K          | R416     | B       |       | 14/0076 | P    |         |
| RLS         | 3       | 4K          | R418     | B       |       | 14/0076 | P    |         |

TABLE 45 (Sheet 3. Continued on Sheet 4)  
Light and meter panel R.H.

Unit location 4K

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |         |
| R421        | B       | 4K          | RLK      | 10      |       | 14/0076 | P    |         |
| R421        | B       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 401      | 1       | 1426  | 14/0076 | P    |         |
| R423        | B       | 4K          | RLL      | 10      |       | 14/0076 | P    |         |
| R423        | B       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 402      | 1       | 1427  | 14/0076 | P    |         |
| R425        | B       | 4K          | RLM      | 10      |       | 14/0076 | P    |         |
| R425        | B       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 403      | 1       | 1428  | 14/0076 | P    |         |
| R427        | B       | 4K          | RLN      | 10      |       | 14/0076 | P    |         |
| R427        | B       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 404      | 1       | 1429  | 14/0076 | P    |         |
| R429        | B       | 4K          | RLP      | 10      |       | 14/0076 | P    |         |
| R429        | B       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 405      | 1       | 1430  | 14/0076 | P    |         |
| R431        | B       | 4K          | RLQ      | 10      |       | 14/0076 | P    |         |
| R431        | B       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 406      | 1       | 1431  | 14/0076 | P    |         |
| R433        | B       | 4K          | RLR      | 10      |       | 14/0076 | P    |         |
| R433        | B       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 407      | 1       | 1432  | 14/0076 | P    |         |
| R435        | B       | 4K          | RLS      | 10      |       | 14/0076 | P    |         |
| R435        | B       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 408      | 1       | 1433  | 14/0076 | P    |         |
| R421        | A       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 401      | 2       | 1434  | 14/0076 | P    |         |
| R423        | A       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 402      | 2       | 1435  | 14/0076 | P    |         |
| R425        | A       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 403      | 2       | 1436  | 14/0076 | P    |         |
| R427        | A       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 404      | 2       | 1437  | 14/0076 | P    |         |
| R429        | A       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 405      | 2       | 1438  | 14/0076 | P    |         |
| R431        | A       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 406      | 2       | 1439  | 14/0076 | P    |         |
| R433        | A       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 407      | 2       | 1440  | 14/0076 | P    |         |
| R435        | A       | 4K          | LLP      |         |       |         |      |         |
|             |         |             | 408      | 2       | 1441  | 14/0076 | P    |         |



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TABLE 45 (Sheet 4. Continued on Sheet 5)  
Light and meter panel R.H.

Unit location 4K

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE          |
|-------------|---------|-------------|----------|---------|-------|---------|------|------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                  |
| SKTAC       | 1       | 3J          | TB39     | 2A      | 802   | 23/0076 | R    | 300V (3E)        |
| SKTAC       | 2       | 3J          | TB39     | 3A      | 803   | 23/0076 | R    | 300V (4E)        |
| SKTAC       | 3       | 3J          | TB39     | 4A      | 804   | 23/0076 | R    | 300V (5E)        |
| SKTAC       | 4       | 3J          | TB39     | 1A      | 884   | 23/0076 | R    | 300V (2E)        |
| SKTAC       | 5       | 4J          | TB45     | 5A      | 885   | 23/0076 | R    | 300V (3H)        |
| SKTAC       | 6       | 4J          | TB45     | 7A      | 887   | 23/0076 | R    | 300V (4H)        |
| SKTAC       | 7       | 4J          | TB45     | 8A      | 888   | 23/0076 | R    | 500V (3G)        |
| SKTAC       | 8       | 4J          | TB45     | 9A      | 889   | 23/0076 | R    | 500V (5H)        |
| SKTAC       | 10      | 1R          | TB63     | 1B      | 1231  | 23/0076 | Y    | 50V              |
| SKTAC       | 11      | 4J          | TB45     | 6A      | 886   | 23/0076 | V    | -250V            |
| SKTAC       | 14      | 5J          | TB7      | 11B     | 322   | 23/0076 | Y    | 50V Return       |
| SKTAC       | 16      | 5J          | TB1      | 9B      | 217   | 23/0076 | P    | H.T.Volts +ve    |
| SKTAC       | 17      | 5J          | TB1      | 10B     | 218   | 23/0076 | P    | H.T.Volts -ve    |
| SKTAC       | 18      | 5J          | TB1      | 11B     | 219   | 23/0076 | P    | H.T.Amps +ve     |
| SKTAC       | 19      | 5J          | TB1      | 12B     | 220   | 23/0076 | P    | H.T.Amps -ve     |
| SKTAC       | 21      | 3K          | T317     | 1       | 1187  | 23/0076 | 0    | 240V - Hourmeter |
| SKTAC       | 23      | 3K          | Neutral  |         | 1188  | 23/0076 | Bk   | Neutral          |
| SKTAC       | 24      | Earth Strip |          |         | 1193  | 23/0076 | Bk   | Earth            |
| R401        | A       | 4K          | R402     | A       |       | 14/0076 | P    |                  |
| R403        | A       | 4K          | R404     | A       |       | 14/0076 | P    |                  |
| R405        | A       | 4K          | R406     | A       |       | 14/0076 | P    |                  |
| R407        | A       | 4K          | R408     | A       |       | 14/0076 | P    |                  |
| R409        | A       | 4K          | R410     | A       |       | 14/0076 | P    |                  |
| R418        | A       | 4K          | R419     | A       |       | 14/0076 | P    |                  |
| R422        | B       | 4K          | R424     | B       |       | 14/0076 | P    |                  |
| R424        | B       | 4K          | R426     | B       |       | 14/0076 | P    |                  |
| R426        | B       | 4K          | R428     | B       |       | 14/0076 | P    |                  |
| R428        | B       | 4K          | R430     | B       |       | 14/0076 | P    |                  |
| R430        | B       | 4K          | R432     | B       |       | 14/0076 | P    |                  |
| R432        | B       | 4K          | R434     | B       |       | 14/0076 | P    |                  |
| R434        | B       | 4K          | R436     | B       |       | 14/0076 | P    |                  |

TABLE 45 (Sheet 5. Continued on Sheet 6)  
Light and meter panel R.H.

Unit location 4K

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |                     |      | SERVICE |
|-------------|---------|-------------|-----------|---------|-------|---------------------|------|---------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF.  | PIN NO. | NO.   | TYPE                | COL. |         |
| RV<br>401   | 2       | 4K          | RV<br>401 | 3       |       | 22 S.W.G.<br>T.C.W. |      |         |
| RV<br>402   | 2       | 4K          | RV<br>402 | 3       |       | 22 S.W.G.<br>T.C.W. |      |         |
| RV<br>403   | 2       | 4K          | RV<br>403 | 3       |       | 22 S.W.G.<br>T.C.W. |      |         |
| RV<br>404   | 2       | 4K          | RV<br>404 | 3       |       | 22 S.W.G.<br>T.C.W. |      |         |
| RV<br>405   | 2       | 4K          | RV<br>405 | 3       |       | 22 S.W.G.<br>T.C.W. |      |         |
| RV<br>406   | 2       | 4K          | RV<br>406 | 3       |       | 22 S.W.G.<br>T.C.W. |      |         |
| RV<br>407   | 2       | 4K          | RV<br>407 | 3       |       | 22 S.W.G.<br>T.C.W. |      |         |
| RV<br>408   | 2       | 4K          | RV<br>408 | 3       |       | 22 S.W.G.<br>T.C.W. |      |         |
| SY          | 1       | 4K          | R436      | B       | 1402  | 14/0076             | P    |         |
| RV<br>401   | 1       | 4K          | R404      | B       | 1403  | 14/0076             | P    |         |
| RV<br>402   | 1       | 4K          | R406      | B       | 1404  | 14/0076             | P    |         |
| RV<br>403   | 1       | 4K          | R408      | B       | 1405  | 14/0076             | P    |         |
| RV<br>404   | 1       | 4K          | R411      | B       | 1406  | 14/0076             | P    |         |
| RV<br>405   | 1       | 4K          | R413      | B       | 1407  | 14/0076             | P    |         |
| RV<br>406   | 1       | 4K          | R415      | B       | 1408  | 14/0076             | P    |         |
| RV<br>407   | 1       | 4K          | R417      | B       | 1409  | 14/0076             | P    |         |
| RV<br>408   | 1       | 4K          | R420      | B       | 1410  | 14/0076             | P    |         |
| RV<br>401   | 3       | 4K          | PLAC      | 1       | 1411  | 14/0076             | P    |         |
| RV<br>402   | 3       | 4K          | PLAC      | 2       | 1412  | 14/0076             | P    |         |
| RV<br>403   | 3       | 4K          | PLAC      | 3       | 1413  | 14/0076             | P    |         |
| RV<br>405   | 3       | 4K          | PLAC      | 4       | 1414  | 14/0076             | P    |         |
| RV<br>406   | 3       | 4K          | PLAC      | 5       | 1415  | 14/0076             | P    |         |
| RV<br>407   | 3       | 4K          | PLAC      | 6       | 1416  | 14/0076             | P    |         |
| RV<br>404   | 3       | 4K          | PLAC      | 7       | 1417  | 14/0076             | P    |         |

TABLE 45 (Sheet 6)  
Light and meter panel R.H.

Unit location 4K

| UNIT ORIGIN |         | UNIT NO. | DESTINATION |         |      | CABLE   |      | SERVICE |
|-------------|---------|----------|-------------|---------|------|---------|------|---------|
| CCT. REF.   | PIN NO. |          | CCT. REF.   | PIN NO. | NO.  | TYPE    | COL. |         |
| RV          |         | 4K       | PLAC        | 8       | 1418 | 14/0076 | P    |         |
| 408         | 3       | 4K       | PLAC        | 16      | 1419 | 14/0076 | P    |         |
| M4          | +       | 4K       | PLAC        | 17      | 1420 | 14/0076 | P    |         |
| M4          | -       | 4K       | PLAC        | 18      | 1421 | 14/0076 | P    |         |
| M6          | +       | 4K       | PLAC        | 19      | 1422 | 14/0076 | P    |         |
| M6          | -       | 4K       | PLAC        | 21      | 1423 | 14/0076 | P    |         |
| M5          | L       | 4K       | PLAC        | 23      | 1424 | 14/0076 | P    |         |
| M5          | N       | 4K       | PLAC        |         | 1425 | 14/0076 | P    |         |
| ET2         |         | 4K       | ET1         |         |      |         |      |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 401         | 1       | 4K       | R421        | B       | 1426 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 402         | 1       | 4K       | R423        | B       | 1427 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 402         | 1       | 4K       | R425        | B       | 1428 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 404         | 1       | 4K       | R427        | B       | 1429 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 405         | 1       | 4K       | R429        | B       | 1430 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 406         | 1       | 4K       | R431        | B       | 1431 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 407         | 1       | 4K       | R433        | B       | 1432 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 408         | 1       | 4K       | R435        | B       | 1433 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 401         | 2       | 4K       | R421        | A       | 1434 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 402         | 2       | 4K       | R423        | A       | 1435 | 24/0074 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 403         | 2       | 4K       | R425        | A       | 1436 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 404         | 2       | 4K       | R427        | A       | 1437 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 405         | 2       | 4K       | R429        | A       | 1438 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 406         | 2       | 4K       | R431        | A       | 1439 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 407         | 2       | 4K       | R433        | A       | 1440 | 14/0076 | P    |         |
| 1LP         |         |          |             |         |      |         |      |         |
| 408         | 2       | 4K       | R435        | A       | 1441 | 14/0076 | P    |         |
| ET2         |         | 4K       | SY          | 2       |      | 14/0076 | P    |         |

TABLE 46 (Sheet 1, Continued on Sheet 2)  
Regulator assembly

Unit location 1L

| UNIT ORIGIN |         |          | DESTINATION |         |         | CABLE                      |      | SERVICE             |
|-------------|---------|----------|-------------|---------|---------|----------------------------|------|---------------------|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | NO.     | TYPE                       | COL. |                     |
| CON A       | U       | 1L       | T1          | A3      | 1247    | 19/064                     | R    |                     |
| CON A       | V       | 1L       | T1          | B3      | 1248    | 19/064                     | W    |                     |
| CON A       | W       | 1L       | T1          | C3      | 1249    | 19/064                     | B    |                     |
| CON B       | U       | 1L       | T1          | A2      | 1250    | 19/064                     | R    |                     |
| CON B       | V       | 1L       | T1          | B2      | 1251    | 19/064                     | W    |                     |
| CON B       | W       | 1L       | T1          | C2      | 1252    | 19/064                     | B    |                     |
| CON B       | MP      | 1L       | T1          | N       | 1253    | 19/064                     | Bk   | (Pre-mod CA4057/28) |
| TB55        | 6A      | 1L       | CON B       | 8       | 1235    | 23/0076                    | Y    |                     |
| TB55        | 5A      | 1L       | CON B       | 9       | 1236    | 23/0076                    | Y    |                     |
| TB55        | 4A      | 1L       | CON B       | 4       | 1237    | 23/0076                    | B    |                     |
| TB55        | 3A      | 1L       | CON B       | 2       | 1238    | 40/0076                    | B    |                     |
| TB54        | 8A      | 1L       | T1          | 4       | 1239    | 40/0076                    | B    |                     |
| TB54        | 7A      | 1L       | T1          | 3       | 1240    | 40/0076                    | B    |                     |
| TB54        | 6A      | 1L       | T1          | 2       | 1241    | 40/0076                    | B    |                     |
| TB54        | 5A      | 1L       | T1          | 1       | 1242    | 40.0076                    | B    |                     |
| TB54        | 4A      | 1L       | CON A       | 3       | 23/0076 |                            | B    |                     |
| TB54        | 3A      | 1L       | CON A       | 5       | 1244    | 23/0076                    | B    |                     |
| TB54        | 2A      | 1L       | CON A       | 4       | 1245    | 23/0076                    | R    |                     |
| TB54        | 1A      | 1L       | CON A       | 2       | 1246    | 23/0076                    | R    |                     |
| TB54        | 1B      | 1L       | TB75        | 2B      | 1654    | 24/0.2                     | R    | Mains ON            |
| CON B       | 6       | 1L       | TB54        | 9A      | 1254    | 23/0076                    | Y    |                     |
| CON B       | 6       | 1L       | CON B       | 7       | 1255    | 23/0076                    | Y    |                     |
| CON B       | R       | 2L       | T2          | a x     | 1256    | 19/064                     | R    |                     |
| CON B       | S       | 2L       | T2          | b x     | 1257    | 19/064                     | W    |                     |
| CON B       | T       | 2L       | T2          | c x     | 1258    | 19/064                     | B    |                     |
| CON B       | R       | 1L       | TP1         |         | 1657    | 24/0.2                     | R    | Overload protection |
| CON B       | S       | 1L       | TP2         |         | 1658    | 24/0.2                     | W    | circuit back up     |
| CON B       | T       | 1L       | TP3         |         | 1659    | 24/0.2                     | B    | Relay S-53-3757-01  |
| CON A       | Mp      | 1L       | TB55        | 12A     | 1321    | 23/0076                    | Bk   | (Pre-mod CA4057/28) |
| TB55        | 2A      | 1L       | CON B       | 1       | 1504    | 23/0076                    | O    |                     |
| CON B       | a       | 1L       | NCP         | 1b      | 1601    | 23/0076                    | Bk   |                     |
| CON A       | a       | 1L       | NCP         | 1b      | 1602    | 23/0076                    | Bk   | Post mod CA4057/28  |
| CON A       | 14      | 1L       | CON A       | b       | 1603    | 16 SWG<br>Tinned<br>copper |      |                     |
| TB55        | 8A      | 5J       | TB1         | 7A      | 1607    | 40/0076                    | P    | Regulator Temp.     |
| TB55        | 9A      | 5J       | TB1         | 8A      | 1608    | 40/0076                    | P    | Monitor             |
| ☒ TB55      | 10A     | 1L       | CON B       | 22L     | 1652    | 24/0.2                     | P    | H.T. Off            |
| CON B       | 21L     | 1L       | TB54        | 12A     | 1653    | 24/0.2                     | P    | Earth               |

} NEAT only ☒

TABLE 46 (Sheet 2, Continued on Sheet 3)  
Regulator Assembly

Unit location 1L

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE   |
|-------------|---------|-------------|-----------|---------|-------|---------|-----------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL.      |
| TB54        | 11A     |             | RLC       | a       | 1259  | 23/0076 | Y 50V     |
| TB54        | 12A     |             | RLC       | b       | 1260  | 23/0076 | Bk Earth  |
| TB54        | 9A      |             | RLC       | 1       | 1269  | 23/0076 | Y 50V     |
| TB54        | 10A     |             | RLC       | 2       | 1270  | 23/0076 | Y AC -0/L |
| TB55        | 2A      |             | RLA       | 22      | 1268  | 23/0076 | 0 HT On   |
| TB55        | 1A      |             | RLC       | 21      | 1265  | 23/0076 | 0 HV 1/L  |
| RLC         | 2       |             | RLB       | 2       | 1271  | 23/0076 | Y AC -0/L |
| RLC         | b       |             | RLB       | b       | 1262  | 23/0076 | Bk Earth  |
| RLC         | a       |             | RLB       | a       | 1261  | 23/0076 | Y 50V     |
| RLC         | 1       |             | RLB       | 1       | 1272  | 23/0076 | Y 50V     |
| RLC         | 22      |             | RLB       | 21      | 1266  | 23/0076 | 0 HV 1/L  |
| RLB         | a       |             | RLA       | a       | 1263  | 23/0076 | Y 50V     |
| RLB         | b       |             | RLA       | b       | 1264  | 23/0076 | Bk Earth  |
| RLB         | 1       |             | RLA       | 1       | 1273  | 23/0076 | Y 50V     |
| RLB         | 22      |             | RLA       | 21      | 1276  | 23/0076 | 0 HV 1/L  |
| RLA         | 2       |             | RLB       | 2       | 1274  | 23/0076 | Y AL -0/L |

TABLE 46 (Sheet 3)  
Regulator Assembly

Unit location 1L

| UNIT ORIGIN |         |          | DESTINATION |         |      | CABLE   |      | SERVICE                           |
|-------------|---------|----------|-------------|---------|------|---------|------|-----------------------------------|
| CCT. REF.   | PIN NO. | UNIT NO. | CCT. REF.   | PIN NO. | NO.  | TYPE    | COL. |                                   |
| TB54        | 1B      | 2K       | SE          | 1       | 716  | 24/0.2  | R    | 240V Mains On                     |
| TB54        | 2B      | 2K       | SE          | 3       | 719  | 23/0076 | R    | 240V-Mains On                     |
| TB54        | 5B      | 3M       | TB5         | 1B      | 658  | 40/0076 | B    | Brake-Lower                       |
| TB54        | 6B      | 3M       | TB5         | 4B      | 661  | 40/0076 | B    | Motor-Lower                       |
|             |         |          |             |         |      |         |      |                                   |
| TB54        | 7B      | 3M       | TB5         | 2B      | 659  | 40/0076 | B    | Brake Raise                       |
| TB54        | 8B      | 3M       | TB5         | 3B      | 660  | 40/0076 | B    | Motor-Raise                       |
|             |         |          |             |         |      |         |      |                                   |
| TB54        | 9B      | 3M       | TB6         | 4B      | 664  | 23/0076 | Y    | 50V                               |
| TB54        | 9B      | TB1      | 5B          | 5B      | 677  | 23/0076 | Y    | 50V                               |
| TB54        | 10B     | 5J       | TB4         | 3A      | 269  | 23/0076 | Y    | AC-0/L                            |
| TB54        | 11B     | 5J       | TB4         | 4A      | 270  | 23/0076 | Y    | 50V to Latching Relay             |
| TB54        | 12B     | EARTH    | STRIP       |         | 1213 | 23/0076 | Bk   | Earth                             |
|             |         |          |             |         |      |         |      |                                   |
| TB55        | 1B      | 5J       | TB13        | 10A     | 418  | 23/0076 | O    | HV 1/L In.                        |
| TB55        | 2B      | 5J       | TB7         | 8A      | 311  | 23/0076 | O    | HT On                             |
| TB55        | 3B      | 5J       | TB4         | 2A      | 268  | 40/0076 | B    | Regr 0/P                          |
| TB55        | 4B      | 5J       | TB4         | 6A      | 271  | 23/0076 | B    | Regr 0/P to IF                    |
| TB55        | 5B      | 5J       | TB4         | 8A      | 272  | 23/0076 | Y    | HT Off                            |
| TB55        | 6B      | 5J       | TB4         | 9A      | 273  | 23/0076 | Y    | HT On                             |
| TB55        | 8B      | 1L       | T1          | L1      | 1610 | 40/0076 | P    | Regulator Temp.                   |
| TB55        | 9B      | 1L       | T1          | L2      | 1611 | 40/0076 | P    | Monitor                           |
| TB55        | 12B     |          | TB66        | 1B      | 1322 | 23/0076 | Bk   | Neutral                           |
| TB55        | 12B     | 1L       |             | TP4     | 1660 | 24/0.2  | Bk   | Neutral to relay unit             |
| ☒ TB55      | 10B     | 5J       | TB1         | 5A      | 1651 | 24/0.2  | P    | H.T. Off(NEAT only)☒              |
|             |         |          |             |         |      |         |      |                                   |
| CONA        | R       | 4M       | FS1         | A       | 1172 | 140/010 | R    | Red Phase                         |
| CONA        | U       | 3M       | FS40        | A       | 644  | 195/010 | R    | Red Phase                         |
| CONA        | V       | 3M       | FS41        | A       | 645  | 195/010 | W    | Yellow Phase                      |
| CONA        | W       | 3M       | FS42        | A       | 646  | 195/010 | B    | Blue Phase                        |
| CONA        | Mp      | 3M       | Neutral Bar |         | 647  | 195/010 | Bk   | Neutral                           |
| T1          | B2      | 3M       | TB4         | 3B      | 655  | 70/0076 | W    | Pre-mod CA4057/28<br>Yellow Brush |
| T1          | C2      | 4M       | FS3         | A       | 1177 | 40/0076 | B    | Blue Brush                        |

TABLE 47  
Transformer Assembly

Unit location 2L

| UNIT ORIGIN  |         | DESTINATION |           |         | CABLE |                |      | SERVICE               |
|--------------|---------|-------------|-----------|---------|-------|----------------|------|-----------------------|
| CCT. REF.    | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE           | Col. |                       |
| TB56         | 1A      | 2L          | RV1       | 2       |       | 40/0076        | P    |                       |
| TB56         | 2A      | 2L          | R3        | B       |       | 40/0076        | P    |                       |
| TB56         | 3A      | 2L          | R3        | A       |       | 40/0076        | P    |                       |
| TB56         | 4A      | 2L          | R1/R2     | A       |       | 40/0076        | P    |                       |
| RV1          | 1       | 2L          | RV1       | 2       |       | 22 swg<br>T.C. |      |                       |
| RV1          | 3       | 2L          | R1/R2     | A       |       | 40/0076        | P    |                       |
| R1/R2        | A       | 2L          | V6        | Anode   |       | 110/0076       | P    |                       |
| R1/R2        | B       | 2L          | R3        | B       |       | 110/0076       | P    |                       |
| R3           | A       | 2L          | Earth     | Bolt    |       | 110/0076       | Bk   |                       |
| TB56         | 1B      | 5J          | TB4       | 1A      | 266   | 23/0076        | R    | D.C. O/L              |
| TB56         | 3B      | 5J          | TB1       | 11A     | 212   | 23/0076        | P    | H.T. Amps +ve         |
| TB56         | 2B      | 5J          | TB1       | 12A     | 213   | 23/0076        | P    | H.T. Amps -ve         |
| TB56         | 4B      | 5J          | TB7       | 12A     | 710   | 23/0076        | P    | Magnetron I<br>Sample |
| Earth<br>Tag |         | EARTH       | STRIP     |         | 723   | 140/010        | Bk   | Earth                 |
| T2           | ax      | 1L          | Con B     | R       | 1256  | 19/064         | R    | Red Phase             |
| T2           | bx      | 1L          | Con B     | S       | 1257  | 19/064         | W    | Yellow Phase          |
| T2           | cx      | 1L          | Con B     | T       | 1258  | 19/064         | B    | Blue Phase            |

TABLE 48  
Power supply and reactor assembly M34  
5840-99-999-9043

Unit location 1M

| UNIT ORIGIN |         | DESTINATION |           | CABLE   |      | SERVICE |                        |
|-------------|---------|-------------|-----------|---------|------|---------|------------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.  | TYPE    | Col.                   |
| TB1         | 1B      | 5J          | TB2       | 7A      | 224  | 23/0076 | B Reactor H.T.         |
| TB1         | 2B      | 5J          | TB2       | 8A      | 225  | 23/0076 | B Reactor Anode        |
| TB1         | 3B      | 3M          | TB2       | 4B      | 652  | 40/0076 | R Red Phase-Reactor    |
| TB1         | 3B      | 5J          | TB7       | 3A      | 306  | 23/0076 | R Magnet On            |
| TB1         | 4B      | 3M          | TB2       | 5B      | 653  | 40/0076 | W Yellow Phase-Reactor |
| TB1         | 5B      | 3M          | TB2       | 6B      | 654  | 40/0076 | B Blue Phase-Reactor   |
| TB1         | 6B      |             | T9        | 4       | 668  | 40/0076 | R Red Phase-Reactor    |
| TB1         | 7B      |             | T9        | 8       | 669  | 40/0076 | W Yellow Phase Out     |
| TB1         | 8B      |             | T9        | 12      | 670  | 40/0076 | B Blue Phase Out       |
| TB2         | 1B      | 1M          | TB2       | 5B      | 671  | 23/0076 | Bk Earth-Link          |
| TB2         | 1B      | 2M          | TB1       | 12B     | 672  | 23/0076 | Bk Earth               |
| TB2         | 2B      | 2M          | TB1       | 1B      | 673  | 23/0076 | Bk Neutral             |
| TB2         | 2B      | 3M          | TB5       | 11B     | 662  | 23/0076 | Bk Neutral             |
| TB2         | 3B      | 2S          | TB2       | 4B      | 1589 | 23/0076 | R 240V                 |
| TB2         | 5B      | EARTH STRIP |           |         | 675  | 23/0076 | Bk Earth               |
| TB2         | 6B      | 2M          | TB1       | 5B      | 676  | 23/0076 | Y 50V                  |
| TB2         | 6B      | 6J          | FS10      | A       | 486  | 23/0076 | Y 50V                  |

Note: TB2 = TB1 of Power Supply 50V (M7)



TABLE 49  
Rectifier (protection unit mag. field) M1  
5840-99-999-9045

Unit location 2M

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |      | SERVICE |    |                       |
|-------------|---------|-------------|-----------|---------|-------|------|---------|----|-----------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE | Col.    |    |                       |
|             | TB1     | 1B          | 1M        | TB2     | 2B    | 673  | 23/0076 | Bk | Neutral               |
| ■           | TB1     | 2B          | 5J        | TB3     | 2A    | 1591 | 23/0076 | R  | 240V                  |
|             | TB1     | 5B          | 1M        | TB2     | 6B    | 676  | 23/0076 | Y  | 50V                   |
|             | TB1     | 5B          | 1L        | TB54    | 9B    | 677  | 23/0076 | Y  | 50V                   |
|             | TB1     | 6B          | 5J        | TB5     | 2A    | 285  | 23/0076 | O  | I/L from Magnet Th1   |
|             | TB1     | 7B          | 3M        | TB4     | 4B    | 656  | 23/0076 | O  | I/L from Magnet Field |
|             | TB1     | 8B          | 5J        | TB1     | 3A    | 208  | 23/0076 | P  | Field Current +ve     |
|             | TB1     | 9B          | 5J        | TB1     | 4A    | 209  | 23/0076 | P  | Field Current -ve     |
|             | TB1     | 10B         | 5J        | TB1     | 2A    | 207  | UR.70   |    | Magnet Field Sample   |
|             | TB1     | 11B         | 5J        | TB1     | 1A    | 207  | Screen  |    |                       |
|             | TB1     | 12B         | 1M        | TB2     | 1B    | 672  | 23/0076 | Bk | Earth                 |
|             | TB1     | 12B         | 2M        | TB2     | 8B    | 678  | 23/0076 | Bk | Earth                 |
|             | TB2     | 1B          |           | T9      | 14    | 1199 | 140/010 | R  | Red Phase             |
|             | TB2     | 2B          |           | T9      | 15    | 1200 | 140/010 | W  | Yellow Phase          |
|             | TB2     | 3B          |           | T9      | 17    | 1201 | 140/010 | B  | Blue Phase            |
|             | TB2     | 4B          |           | L11     | 1     | 1202 | 140/010 | P  | Smoothing Choke       |
|             | TB2     | 5B          |           | L11     | 2     | 1203 | 140/010 | P  | Smoothing Choke       |
|             | TB2     | 6B          |           | TB69    | 1A    | 679  | 195/010 | P  | Field -ve             |
|             | TB2     | 7B          |           | TB69    | 2A    | 680  | 195/010 | P  | Field +ve             |
|             | TB2     | 8B          | 2M        | TB1     | 12B   | 678  | 23/0076 | Bk | Earth                 |

■ Note: TB69 = Electromagnet Terminals ■

TABLE 50 (Sheet 1 Continued on Sheet 2)  
Circuit breaker assembly  
5840-99-999-9016

Unit location 3M

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE |                           |
|-------------|---------|-------------|-----------|---------|-------|---------|---------|---------------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col.    |                           |
| TB1         | 1B      | 5J          | TB10      | 1A      | 334   | 40/0076 | R       | Red Phase-Gate<br>Htrs    |
| TB1         | 2B      | 5J          | TB10      | 2A      | 335   | 40/0076 | W       | Yellow Phase-Gate<br>Htrs |
| TB1         | 3B      | 5J          | TB10      | 3A      | 336   | 40/0076 | B       | Blue Phase-Gate<br>Htrs   |
| TB1         | 4B      | 5J          | TB10      | 4A      | 337   | 40/0076 | R       | Red Phase-modulator       |
| TB1         | 8B      | 5J          | TB10      | 5A      | 339   | 40/0076 | W       | 240V Yellow Phase         |
| TB1         | 9B      | 5J          | TB10      | 6A      | 340   | 40/0076 | R       | 240V Blue Phase           |
| TB1         | 10B     | 6M          | TB1       | 3B      | 1574  | 70/0076 | W       | 240V Magnetron<br>Htr In  |
| TB1         | 11B     | 6M          | TB1       | 4B      | 1575  | 70/0076 | W       | Yellow Brush In           |
| TB1         | 12B     | 3M          | TB4       | 6B      | 414   | 20/0076 | O       | I/L Link                  |
| TB2         | 1B      | 6J          | TB18      | 2A      | 464   | 40/0076 | R       | Red Phase-Gate HT         |
| TB2         | 1B      | 2K          | T210      | 1       | 651   | 23/0076 | R       | PU's On Lamp              |
| TB2         | 2B      | 5J          | TB11      | 2A      | 362   | 40/0076 | W       | Yellow Phase-Gate<br>HT   |
| TB2         | 3B      | 5J          | TB11      | 3A      | 364   | 40/0076 | B       | Blue Phase-Gate HT        |
| TB2         | 4B      | 1M          | TB1       | 3B      | 652   | 40/0076 | R       | Red Phase-magnet          |
| TB2         | 5B      | 1M          | TB1       | 4B      | 653   | 40/0076 | W       | Yellow Phase-magnet       |
| TB2         | 6B      | 1M          | TB1       | 5B      | 654   | 40/0076 | B       | Blue Phase-magnet         |
| TB2         | 7B      | 5J          | TB11      | 4A      | 366   | 40/0076 | R       | Red Phase-fans            |
| TB2         | 7B      | 1T          | TB52      | 1B      | 640   | 40/0076 | R       | Red Phase-fans            |
| TB2         | 8B      | 5J          | TB11      | 5A      | 368   | 40/0076 | W       | Yellow Phase-fans         |
| TB2         | 8B      | 1T          | TB52      | 2B      | 641   | 40/0076 | W       | Yellow Phase-fans         |
| TB2         | 9B      | 5J          | TB11      | 6A      | 369   | 40/0076 | B       | Blue Phase-fans           |
| TB2         | 9B      | 1T          | TB52      | 3B      | 642   | 40/0076 | B       | Blue Phase-fans           |
| TB2         | 10B     | 5J          | TB13      | 4A      | 338   | 23/0076 | R       | 240V Tx On CCT            |
| TB2         | 11B     | 5J          | TB3       | 3A      | 244   | 40/0076 | B       | 240V Control CCT          |

TABLE 50 (Sheet 2. Continued on Sheet 3)  
 Circuit breaker assembly  
 5840-99-999-9016

Unit location 3M

| UNIT ORIGIN |         | DESTINATION |           |         |     | CABLE   |      | SERVICE                  |
|-------------|---------|-------------|-----------|---------|-----|---------|------|--------------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No. | TYPE    | Col. |                          |
| TB3         | 1B      | 5J          | TB10      | 7A      | 342 | 23/0076 | R    | Red Phase-Pump 1         |
| TB3         | 2B      | 5J          | TB10      | 8A      | 344 | 23/0076 | W    | Yellow Phase-Pump 1      |
| TB3         | 3B      | 5J          | TB10      | 9A      | 345 | 23/0076 | B    | Blue Phase-Pump 1        |
| TB3         | 4B      | 5J          | TB11      | 7A      | 370 | 23/0076 | R    | Red Phase-Pump 2         |
| TB3         | 5B      | 5J          | TB11      | 8A      | 371 | 23/0076 | W    | Yellow Phase-Pump 2      |
| TB3         | 6B      | 5J          | TB11      | 9A      | 372 | 23/0076 | B    | Blue Phase-Pump 2        |
| TB4         | 1B      | 5J          | TB3       | 4A      | 246 | 23/0076 | B    | 240V to Contactor A      |
| TB4         | 2B      | 5J          | TB3       | 5A      | 247 | 23/0076 | B    | 240V to Contactor C      |
| TB4         | 3B      | 1L          | T1        | B2      | 655 | 70/0076 | W    | Yellow Brush I/P         |
| TB4         | 4B      | 2M          | TB1       | 7B      | 656 | 23/0076 | O    | I/L from Magnet<br>Field |
| TB4         | 5B      | 5J          | TB5       | 7A      | 290 | 23/0076 | O    | I/L to R.F.              |
| TB4         | 6B      | 3M          | TB1       | 12B     | 414 | 23/0076 | O    | I/L - Link               |
| TB4         | 7B      | 5J          | TB5       | 10A     | 293 | 23/0076 | O    | I/L to Diode<br>Thermal  |
| TB4         | 10B     | 5J          | TB3       | 7A      | 249 | 23/0076 | Y    | 50V to RLA               |
| TB4         | 11B     | 5J          | TB3       | 8A      | 250 | 23/0076 | Y    | 50V to RLB               |

TABLE 50 (Sheet 3)  
Circuit breaker assembly  
5840-99-999-9016

Unit location 3M

| UNIT ORIGIN |             | DESTINATION |           |         |     | CABLE   |         | SERVICE         |                                 |
|-------------|-------------|-------------|-----------|---------|-----|---------|---------|-----------------|---------------------------------|
| CCT. REF.   | PIN NO.     | UNIT NO.    | CCT. REF. | PIN NO. | No. | TYPE    | Col.    |                 |                                 |
| TB5         | 1B          | 1L          | TB54      | 5B      | 658 | 40/0076 | B       | Brake-Lower     |                                 |
| TB5         | 2B          | 1L          | TB54      | 7B      | 659 | 40/0076 | B       | Brake-Raise     |                                 |
| TB5         | 3B          | 1L          | TB54      | 8B      | 660 | 40/0076 | B       | Motor-Raise     |                                 |
| TB5         | 4B          | 1L          | TB54      | 6B      | 661 | 40/0076 | B       | Motor-Lower     |                                 |
| TB5         | 5B          | 5J          | TB3       | 11A     | 252 | 23/0076 | B       | Regulator-Lower |                                 |
| TB5         | 6B          | 5J          | TB3       | 12A     | 253 | 23/0076 | B       | Regulator-Raise |                                 |
| TB5         | 7B          | 1J          | TB24      | 5A      | 40  | 23/0076 | V       | -250V I/L       |                                 |
| TB5         | 8B          | 5J          | TB2       | 10A     | 229 | 23/0076 | V       | -250V I/L       |                                 |
| TB5         | 11B         | 5J          | TB9       | 1A      | 323 | 70/0076 | Bk      | Neutral         |                                 |
| TB5         | 11B         | 1M          | TB2       | 2B      | 662 | 23/0076 | Bk      | Neutral         |                                 |
| TB5         | 12B         | EARTH       | STRIP     |         | 663 | 23/0076 | Bk      | Earth           |                                 |
| ■           | TB6         | 1B          | 5J        | TB13    | 11A | 665     | 23/0076 | B               | Interlocked N from ■<br>A/Cond. |
|             | TB6         | 2B          | 5J        | TB13    | 2A  | 410     | 23/0076 | B               | 240V to Comp.1                  |
|             | TB6         | 3B          | 5J        | TB10    | 12A | 412     | 23/0076 | B               | 240V to Air Flow<br>Alarm       |
|             | TB6         | 4B          | 1L        | TB54    | 9B  | 664     | 23/0076 | Y               | 50V                             |
|             | TB6         | 4B          | 1J        | TB25    | 8A  | 65      | 23/0076 | Y               | 50V                             |
|             | TB6         | 5B          | 5J        | TB5     | 8A  | 291     | 23/0076 | O               | I/L from Magnetron<br>Th.1      |
|             | TB6         | 6B          | 5J        | TB5     | 9A  | 292     | 23/0076 | O               | I/L to S.U.                     |
|             | TB6         | 10B         | 2K        | T202    | 1   | 667     | 23/0076 | R               | Red Phase Lamp                  |
|             | TB6         | 11B         | 2K        | T203    | 1   | 668     | 23/0076 | W               | Yellow Phase Lamp               |
|             | TB6         | 12B         | 2K        | T204    | 1   | 669     | 23/0076 | B               | Blue Phase Lamp                 |
|             | FS40        | A           | 1L        | Con A   | U   | 644     | 195/010 | R               | Red Phase                       |
|             | FS41        | A           | 1L        | Con A   | V   | 645     | 195/010 | W               | Yellow Phase                    |
|             | FS42        | A           | 1L        | Con A   | W   | 646     | 195/010 | B               | Blue Phase                      |
|             | NEUTRAL BAR | 1L          | Con A     | MP      |     | 647     | 195/010 | Bk              | Black                           |

TABLE 51 FUSE PANEL

Unit location 4M

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE                    |
|-------------|---------|-------------|-----------|---------|-------|---------|------|----------------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |                            |
| FS1         | a       | 1L          | CON A     | R       | 1172  | 140/010 | R    | Red Phase                  |
| R41         | a       | 4M          | FS1       | a       |       |         |      |                            |
| R41         | b       | 4M          | ILP7      | 1       |       |         |      |                            |
| FS1         | b       | 4M          | ILP7      | 2       | 1173  | 23/0076 | R    | 240V                       |
| FS1         | b       |             | SKTE      | L       | 730   | 70/0076 | R    | 240V - 1/C                 |
| FS1         | b       | 1J          | FS4       | a       | 428   | 40/0076 | R    | 240V-Power Skts.           |
| FS1         | b       | 2J          | FS5       | a       | 435   | 40/0076 | R    | 240V-Skts and Light        |
| FS1         | b       | 2K          | T201      | 1       | 712   | 23/0076 | R    | 240V-Mains on Lamp         |
| FS1         | b       | 4M          | FS2       | a       | 1175  | 40/0076 | R    | 240V                       |
| R42         | a       | 4M          | FS2       | a       |       |         |      |                            |
| R42         | b       | 4M          | ILP8      | 1       |       |         |      |                            |
| FS2         | b       | 4M          | ILP8      | 2       | 1176  | 23/0076 | R    | 240V                       |
| FS2         | b       | FJ1         | TB4       | 4       | 713   | 23/0076 | R    | 240V via Fire Detection Cc |
| FS3         | a       | 1L          | T1        | C2      | 1177  | 40/0076 | B    | Regulator O/P in           |
| R43         | a       | 4M          | FS3       | a       |       |         |      |                            |
| R43         | b       | 4M          | ILP9      | 1       |       |         |      |                            |
| FS3         | b       | 4M          | ILP9      | 2       | 1178  | 23/0076 | B    | 240V                       |
| FS3         | b       | 5J          | TB4       | 2A      | 267   | 40/0076 | B    | Regulator O/P out          |
|             |         |             |           |         |       |         |      |                            |
|             |         |             |           |         |       |         |      |                            |
|             |         |             |           |         |       |         |      |                            |
|             |         |             |           |         |       |         |      |                            |
|             |         |             |           |         |       |         |      |                            |
|             |         |             |           |         |       |         |      |                            |
|             |         |             |           |         |       |         |      |                            |
|             |         |             |           |         |       |         |      |                            |
|             |         |             |           |         |       |         |      |                            |
|             |         |             |           |         |       |         |      |                            |

TABLE 52 TRANSFORMER ASSEMBLY

Unit location 5M

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE           |
|-------------|---------|-------------|-----------|---------|-------|---------|------|-------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE    | COL. |                   |
| TB47        | 1B      | 1J          | TB25      | 1A      | 57    | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 2B      | 1J          | TB25      | 2A      | 58    | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 3B      | 1J          | TB25      | 3A      | 59    | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 4B      | 1J          | TB25      | 4A      | 60    | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 5B      | 1J          | TB25      | 5A      | 61    | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 6B      | 1J          | TB25      | 6A      | 62    | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 7B      | 1J          | TB22      | 7A      | 18    | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 8B      | 1J          | TB22      | 8A      | 19    | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 10B     | 1J          | TB24      | 10A     | 44    | 23/0076 | R    | 240V              |
| TB47        | 10B     | 2K          | T207      | 1       | 681   | 23/0076 | R    | Gate Heaters Lamp |
| TB47        | 11B     | 5J          | TB9       | 5A      | 324   | 23/0076 | Bk   | Neutral           |
| TB47        | 12B     | EARTH STRIP |           |         | 682   | 23/0076 | Bk   | Earth             |
|             |         |             |           |         |       |         |      |                   |
| TB47        | 1A      | 5M          | T7        | 23      | 843   | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 2A      | 5M          | T7        | 22      | 844   | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 3A      | 5M          | T7        | 36      | 845   | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 4A      | 5M          | T7        | 35      | 846   | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 5A      | 5M          | T7        | 34      | 847   | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 6A      | 5M          | T7        | 33      | 848   | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 7A      | 5M          | T7        | 21      | 849   | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 8A      | 5M          | T7        | 20      | 850   | 70/0076 | Bn   | 6.3V 5A           |
| TB47        | 10A     | 5M          | T7        | 11      | 851   | 23/0076 | R    | 240V              |
| TB47        | 11A     | 5M          | T7        | 8       | 852   | 23/0076 | Bk   | Neutral           |
| TB47        | 12A     | 5M          | T7        | 3       | 853   | 23/0076 | Bk   | Earth             |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |
|             |         |             |           |         |       |         |      |                   |

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TABLE 53

## Magnetron Heater Circuit Breaker Assembly

Unit location 6M

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE               |
|-------------|---------|-------------|----------|---------|-------|---------|------|-----------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                       |
| TB1         | 1B      | 5J          | TB6      | 9B      | 1572  | 23/0076 | R    | 240V from H.T.UP lamp |
| TB1         | 2B      | 5J          | TB9      | 10B     | 1573  | 23/0076 | Bk   | Neutral               |
| TB1         | 3B      | 3M          | TB1      | 10B     | 1574  | 70/0076 | W    | 240V Mag.Htr.in       |
| TB1         | 4B      | 3M          | TB1      | 11B     | 1575  | 70/0076 | W    | Yellow brush in       |
| TB1         | 5B      | 5J          | TB6      | 1B      | 1576  | 70/0076 | W    | 240V Mag.Htr. out     |
| TB1         | 6B      | 5J          | TB6      | 2B      | 1577  | 70/0076 | W    | Yellow brush out      |
| TB1         | 7B      | 5J          | TB7      | 12B     | 1578  | 23/0076 | P    | Mod I sample          |
| TB1         | 8B      | 6J          | TB17     | 12B     | 1579  | 23/0076 | Bk   | Earth                 |
| TB1         | 10B     | 6J          | TB19     | 6B      | 1580  | 23/0076 | Y    | 50V                   |

TABLE 54 (Sheet 1. Continued on Sheet 2)  
Waveguide frame assembly

Unit location 1N

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE              |
|-------------|---------|-------------|----------|---------|-------|---------|------|----------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                      |
| TB48        | 1B      | 5J          | TB11     | 1A      | 361   | 40/0076 | R    | Red Phase-Delayed    |
| TB48        | 1B      | 6J          | TB18     | 2A      | 465   | 40/0076 | R    | 240V-Delayed         |
| TB48        | 3B      | 5J          | TB11     | 2A      | 363   | 23/0076 | W    | Yellow Phase-Delayed |
| TB48        | 5B      | 5J          | TB11     | 3A      | 365   | 23/0076 | B    | Blue Phase-Delayed   |
| TB48        | 8B      | 6J          | TB17     | 3A      | 452   | 70/0076 | Bn   | 6.3V                 |
| TB48        | 9B      | 6J          | TB17     | 4A      | 453   | 70/0076 | Bn   | 6.3V                 |
| TB48        | 12B     | 1N          | TB49     | 6B      | 720   | 23/0076 | Bk   | Earth (N.T.)         |
| TB49        | 1B      | 6J          | TB19     | 1A      | 481   | 70/0076 | W    | Field 1 +ve          |
| TB49        | 2B      | 6J          | TB19     | 2A      | 482   | 70/0076 | W    | Field 1 -ve          |
| TB49        | 5B      | 2J          | TB31     | 1A      | 143   | 23/0076 | R    | 500V                 |
| TB49        | 6B      | 1N          | TB48     | 12B     | 720   | 23/0076 | Bk   | Earth                |
| TB49        | 6B      | 1N          | TB50     | 12B     | 721   | 23/0076 | Bk   | Earth                |
| TB49        | 7B      | 2J          | TB33     | 3A      | 193   | 70/0076 | Bn   | 6.3V 1.5 Amps        |
| TB49        | 8B      | 2J          | TB33     | 4A      | 194   | 70/0076 | Bn   | 6.3V 1.5 Amps        |
| TB49        | 11B     | 6J          | TB19     | 3A      | 483   | 70/0076 | W    | Field 2 +ve          |
| TB49        | 12B     | 6J          | TB19     | 4A      | 484   | 70/0076 | W    | Field 2 -ve          |



TABLE 54 (Cont.)

Unit location 1N

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE         |
|-------------|---------|-------------|-----------|---------|-------|---------|-----------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col.            |
| TB50        | 1B      | 2J          | TB33      | 1A      | 191   | 70/0076 | Bn 6.3V 2A      |
| TB50        | 2B      | 2J          | TB33      | 2A      | 192   | 70/0076 | Bn 6.3V 2A      |
| TB50        | 4B      | 2J          | TB31      | 9A      | 152   | 23/0076 | R 200V (4D)     |
| TB50        | 5B      | 2J          | TB30      | 12A     | 133   | 23/0076 | P I.F. Gain     |
| TB50        | 6B      | 2J          | TB30      | 5A      | 130   | 23/0076 | P Green Xtal    |
| TB50        | 7B      | 2J          | TB30      | 6A      | 131   | 23/0076 | P Red Xtal      |
| TB50        | 11B     | 2J          | TB30      | 7A      | 132   | 23/0076 | P Xtal Common   |
| TB50        | 12B     | 1N          | TB49      | 6B      | 721   | 23/0076 | Bk Earth        |
| TB50        | 12B     | EARTH       | STRIP     |         | 722   | 23/0076 | Bk Earth        |
| ■ PLP       |         | 6J          | TB17      | 5B      | 683   | UR.70   | Noise source    |
| PLP         |         | 6J          | TB17      | 6B      | 683   | Screen  | trigger         |
| PLQ         |         | 3B          | PLC       |         | 559   | UR.70   | LIN.I.F.Out     |
| PLR         |         | 2D          | 1PLB      |         | 619   | UR.70   | A.J.I.F.Out     |
| PLS         |         | 2S          | PLC       |         | 1224  | UR.70   | Sig.Mixer Drive |
| PLX         |         | 3B          | PLD       |         | 560   | UR.70   | I.F. from 3B    |
| PLY         |         | 1C          | PLA       |         | 1222  | UR.70   | I.F. to 1C      |
| 1PLX1       |         | 1B          | IPLB      |         | 550   | UR.70   | TX Sample       |
| 1PLX2       |         | 2A          | 3PLB      |         | 532   | UR.70   | TX Sample       |
| PLX3        |         | 6J          | SKTT      |         | 462   | UR.70   | Forward Power   |
| PLX4        |         | 6J          | SKTU      |         | 463   | UR.70   | Backward Power  |

(Cont.)

TABLE 54 (cont.)

Unit location 1N

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE |                        |    |
|-------------|---------|-------------|-----------|---------|-------|---------|---------|------------------------|----|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col.    |                        |    |
| TB48        | 1A      | 1N          | X7        | 3       | 837   | 23/0076 | R       | Red Phase-Fan          |    |
| TB48        | 3A      | 1N          | X7        | 2       | 838   | 23/0076 | W       | Yellow Phase-Fan       |    |
| TB48        | 5A      | 1N          | X7        | 1       | 839   | 23/0076 | B       | Blue Phase-Fan         |    |
| ☒ TB48      | 7B      | 6J          | TB18      | 1B      | 1669  | 24/0.2  | Bk      | Neutral                | DO |
| TB48        | 7A      | 2N          | TS1       | 3       | 1670  | 24/0.2  | Bk      |                        |    |
| TB48        | 10      | 6J          | TB19      | 11      | 1665  | 24/0.2  | R       | PSU1 Line              | DO |
| TB48        | 10      | 2N          | TS1       | 2       | 1667  | 24/0.2  | R       |                        |    |
| TB48        | 11      | 2N          | TS1       | 1       | 1668  | 24/0.2  | R       | PSU2 Line              | DO |
| TB48        | 11      | 6J          | TB19      | 12      | 1666  | 24/0/2  | R       |                        |    |
| TB48        | 12      | 2N          | TS1       | 4       | 1671  | 24/0.2  | Bk      | Earth                  |    |
| TB49        | 1       | 2N          | TS1       | 5       | 1672  | 24/0.2  | R       | +15V Metering          |    |
| TB49        | 12      | 2N          | TS1       | 6       | 1673  | 24/0.2  | R       | -30V Metering          | ☒  |
| TB50        | 1A      | 5N          | SKTA      | 1       | 920   | 70/0076 | Bn      | 6.3V                   |    |
| TB50        | 2A      | 5N          | SKTA      | 2       | 921   | 70/0076 | Bn      | 6.3V                   |    |
| TB50        | 4A      | 5N          | SKTA      | 3       | 922   | 23/0076 | R       | 200V                   |    |
| TB50        | 5A      | 5N          | SKTA      | 4       | 923   | 23/0076 | P       | I.F.Gain               |    |
| TB50        | 6A      | 5N          | SKTA      | 5       | 924   | 23/0076 | P       | Green Xtal             |    |
| TB50        | 7A      | 5N          | SKTA      | 6       | 925   | 23/0076 | P       | Red Xtal               |    |
| TB50        | 11A     | 5N          | SKTA      | 8       | 926   | 23/0076 | Bk      | Xtal Common            |    |
| TB50        | 12A     | 5N          | SKTA      | 7       | 927   | 23/0076 | Bk      | Earth                  |    |
| TB50        | 12A     | 1N          | X7        | EARTH   | 1505  | 23/0076 | Bk      | Earth                  |    |
| PLX1        |         | 1N          | 1SKT      |         |       |         |         |                        |    |
|             |         |             | X1        |         | 1507  | UR.41   |         |                        |    |
| PLX2        |         | 1N          | 1SKT      |         |       |         |         |                        |    |
|             |         |             | X2        |         | 1508  | UR.41   |         |                        |    |
| 7N          | PLA     | 6N          | PLD       |         |       | UR.65   |         |                        |    |
| 6N          | PLC     | 2N          | PLC       |         |       | UR.65   |         |                        |    |
| 2N          | PLD     | 8N          | PLA       |         |       | UR.65   |         |                        |    |
| 9N          | PLA     | 5N          | 1PLD      |         |       | UR.65   |         | I/P to Mixer           |    |
| SKTX        |         | 1N          | SKTY      |         | 1223  | UR.70   |         | I.F.Link               |    |
| ☒ SKTP      |         | 2N          | PLA       |         | 1661  | UR.70   |         | Noise source trigger   | ☒  |
| SKTQ        |         | 5N          | PLE       |         | 938   | UR.70   |         | I.F. Linear            |    |
| SKTR        |         | 5N          | PLD       |         | 939   | UR.70   |         | I.F.A.J.               |    |
| SKTS        |         | 5N          | 1PLC      |         | 940   | UR.70   |         | Sig.Mixer Drive        |    |
| PLX3        |         | 2B          | PLF       |         | 1571  | K16M    |         | Transmitter r.f. pulse |    |

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TABLE 54A AMPLIFIER R.F. AND NOISE SOURCE

Unit location 2N

| UNIT ORIGIN |         | DESTINATION |           |         |            | CABLE        |      | SERVICE               |
|-------------|---------|-------------|-----------|---------|------------|--------------|------|-----------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.        | TYPE         | Col. |                       |
| TS1         | 1       | 1N          | TB48      | 11      | 1668       | 24/0.2       | R    | PSU1 } Line<br>PSU2 } |
| TS1         | 2       | 1N          | TB48      | 10      | 1667       | 24/0.2       | R    |                       |
| TS1         | 3       | 1N          | TB48      | 7       | 1670       | 24/0.2       | Bk   | Neutral               |
| TS1         | 4       | 1N          | TB48      | 12      | 1671       | 24/0.2       | Bk   | Earth                 |
| TS1         | 5       | 1N          | TB49      | 1       | 1672       | 24/0.2       | R    | PSU1 +15V Metering    |
| TS1         | 6       | 1N          | TB49      | 12      | 1673       | 24/0.2       | R    | PSU2 -30V Metering    |
| PLA         |         | 1N          | SKTP      |         | 1661       | UR.70        |      | Noise source trigger  |
| PLB         |         | 7N          | PLA       |         | Coax. assy | S-53-6511-02 |      | RF in                 |
| PLC         |         | 8N          | PLA       |         | Coax. assy | S-53-6511-01 |      | RF to Noise Diode     |

TABLE 55A PROBE WAVEGUIDE

Unit location 7N

| UNIT ORIGIN |         | DESTINATION |           |         |            | CABLE        |      | SERVICE            |
|-------------|---------|-------------|-----------|---------|------------|--------------|------|--------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.        | TYPE         | Col. |                    |
| PLA         | -       | 2N          | PLB       | -       | Coax. Assy | S-53-6511-02 |      | RF to Noise Source |

TABLE 55B PROBE WAVEGUIDE

Unit location 8N

| UNIT ORIGIN |         | DESTINATION |           |         |            | CABLE        |      | SERVICE             |
|-------------|---------|-------------|-----------|---------|------------|--------------|------|---------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.        | TYPE         | Col. |                     |
| PLA         |         | 2N          | PLC       |         | Coax. Assy | S-53-6511-01 |      | RF out to Head Amp. |

TABLE 56 CHARGING DIODE ASSEMBLY

Unit location 1P

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         |      | SERVICE |
|-------------|---------|-------------|-----------|---------|-------|---------|------|---------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col. |         |
| R11         | a       | 5J          | TB10      | 5B      | 353   | 40/0076 | W    | 240V    |
| R11         | a       | 1P          | R13       | a       | 1194  | 40/0076 | W    | 240V    |
| R11         | b       | 1P          | T3        | 199V    | 1195  | 40/0076 | W    | 200V    |
| R13         | b       | 1P          | T4        | 199V    | 1196  | 40/0076 | W    | 200V    |
| T3          | 0V      | 1P          | T4        | 0V      | 1197  | 40/0076 | Bk   | Neutral |
| T3          | SCR     | Earth Strip |           |         | 1198  | 23/0076 | Bk   | Earth   |
| T4          | SCR     | Earth Strip |           |         | 1199  | 23/0076 | Bk   | Earth   |
| T3          | 0V      | 5J          | TB9       | 3B      | 329   | 40/0076 | Bk   | Neutral |

} Pre-mod.  
CA8094/45

Note ...

For post-mod. CA8094/45 charging circuit interconnections see Table 69.

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115H-0102-1 (2nd Edn) Sect.10,  
 TABLE 57 Pneumatics assembly Issued

Unit location 2P

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE             |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                     |
| TB51        | 1A      | 2P          | X13      | 1       | 978   | 23/0076 | 0    | I/L In              |
| TB51        | 1A      | 2P          | SZ       | 1       | 979   | 23/0076 | 0    | I/L                 |
| TB51        | 2A      | 2P          | SZ       | 3       | 980   | 23/0076 | 0    | I/L Out             |
| TB51        | 3A      | 2P          | SZ       | 2       | 981   | 23/0076 | B    | Bell Supply         |
| TB51        | 4A      | 2P          | T8       | 1       | 982   | 70/0076 | W    | Yellow Phase In     |
| TB51        | 5A      | 2P          | T8       | 2       | 983   | 70/0076 | W    | Yellow Phase Out    |
| TB51        | 6A      | 2P          | T8       | 3       | 984   | 23/0076 | P    | Magn. Heater I      |
| TB51        | 7A      | 2P          | T8       | 4       | 985   | 23/0076 | P    | Magn. Heater I      |
| TB51        | 11A     | 2P          | X13      | 2       | 986   | 23/0076 | Bk   | Neutral             |
| TB51        | 12A     | 2P          | EARTH    | TAG     | 987   | 23/0076 | Bk   | Earth               |
| X13         | 1       | 2P          | X14      | 1       | 988   | 23/0076 | 0    | 240V                |
| X13         | 2       | 2P          | X14      | 2       | 989   | 23/0076 | Bk   | Neutral             |
| TB51        | 1B      | 3J          | TB36     | 2A      | 764   | 23/0076 | 0    | 1/L to Pneumatics   |
| TB51        | 1B      |             | ILP5     | 1       | 1205  | 23/0076 | 0    | 240V - Warning      |
| TB51        | 2B      | 3J          | TB34     | 10A     | 733   | 23/0076 | 0    | 1/L from pneumatics |
| TB51        | 3B      | 5J          | TB7      | 7B      | 319   | 23/0076 | 0    | 240V - Bell (L.H.)  |
| TB51        | 3B      | 1R          | TB60     | 9B      | 1206  | 23/0076 | 0    | 240V - Bell (R.H.)  |
| TB51        | 4B      | 5J          | TB6      | 1B      | 399   | 70/0076 | W    | Yellow Phase IN     |
| TB51        | 5B      | 2Q          | T6       | 7       | 1204  | 70/0076 | W    | Yellow Phase OUT    |
| TB51        | 6B      | 3J          | TB40     | 5A      | 819   | 23/0076 | P    | Magnetron Heater I  |
| TB51        | 7B      | 3J          | TB40     | 6A      | 820   | 23/0076 | P    | Magnetron Heater I  |
| TB51        | 11B     | 5J          | TB9      | 8B      | 333   | 23/0076 | Bk   | Neutral             |
| TB51        | 12B     | Earth       | Strip    |         | 1208  | 23/0076 | Bk   | Earth               |
| TB51        | 11B     |             | ILP5     | 2       | 1207  | 23/0076 | Bk   | Neutral             |

TABLE 58 (Sheet 1. Continued on Sheet 2)  
Magnetron cooling and frame assembly

Unit location 3P

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE               |
|-------------|---------|-------------|----------|---------|-------|---------|------|-----------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                       |
| TB57        | 1B      | 3J          | TB37     | 5A      | 778   | 23/0076 | P    | Magnetron Temp In.    |
| TB57        | 2B      | 3J          | TB37     | 6A      | 779   | 23/0076 | P    | Magnetron Temp In.    |
| TB57        | 3B      | 3J          | TB37     | 7A      | 780   | 23/0076 | P    | Magnetron Temp Out    |
| TB57        | 4B      | 3J          | TB37     | 8A      | 781   | 23/0076 | P    | Magnetron Temp Out    |
| TB57        | 7B      | 3J          | TB40     | 9A      | 823   | 23/0076 | P    | Magnet Temp Out       |
| TB57        | 8B      | 3J          | TB40     | 10A     | 824   | 23/0076 | P    | Magnet Temp Out       |
| TB58        | 1B      | 5J          | TB5      | 7B      | 298   | 23/0076 | 0    | I/L to Flow SW2       |
| TB58        | 2B      | 3P          | TB58     | 4B      | 1165  | 23/0076 | 0    | Link                  |
| TB58        | 2B      | 3K          | T305     | 1       | 1166  | 23/0076 | 0    | Magnetron Cooling     |
| TB58        | 5B      | 5J          | TB5      | 8B      | 299   | 23/0076 | 0    | I/L to Magnetron Thl. |
| TB58        | 5B      | 3K          | T306     | 1       | 1167  | 23/0076 | 0    | Magnetron Temp.       |
| TB58        | 7B      | 1R          | TB60     | 4B      | 1168  | 23/0076 | 0    | I/L to Magnet Thl.    |
| TB58        | 7B      | 3K          | T301     | 1       | 1169  | 23/0076 | 0    | Magnet Cooling        |
| TB58        | 8B      | 5J          | TB5      | 2B      | 295   | 23/0076 | 0    | I/L from Magnet Thl.  |
| TB58        | 8B      | 3K          | T302     | 1       | 1170  | 23/0076 | 0    | Magnet Temp.          |
| V13         | SKTZ    | 2Q          | T6       | 1 & 2   |       | UR67    |      | Magnetron Htrs.       |
| SU          | Com     | 5J          | TB5      | 9B      | 300   | 23/0076 | 0    | I/L to Pressure SW.   |
| SU          | N.O.    | 4J          | TB44     | 1A      | 874   | 23/0076 | 0    | I/L to Trigger        |
| L10         | A       | 3P          | C10      | A       | 1516  | 23/0076 | P    |                       |
| L10         | A       |             | TB69     | 2B      | 1521  | 195/010 | P    | Field +ve             |
| L10         | A       | 3J          | TB37     | 11A     | 783   | 23/0076 | P    | Field V +ve           |
| L10         | B       | 3J          | TB37     | 10A     | 782   | 23/0076 | P    | Field V -ve           |
| L10         | B       |             | TB69     | 1B      | 1520  | 195/010 | P    | Field -ve             |
| L10         | B       | 3P          | C10      | B       | 1517  | 23/0076 | P    |                       |
| TB64        | 1B      | 2T          | TB53     | 1B      | 1322  | 23/0076 | R    | Magnetron Fan         |
| TB64        | 2B      | 2T          | TB53     | 2B      | 1323  | 23/0076 | W    | Magnetron Fan         |
| TB64        | 3B      | 2T          | TB53     | 3B      | 1324  | 23/0076 | B    | Magnetron Fan         |
| TB64        | 4B      | EARTH       | STRIP    |         | 1485  | 23/0076 | Bk   | Earth                 |

AP

TABLE 58 (Sheet 2)

Magnetron cooling and frame assembly

Unit location 3P

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE         |
|-------------|---------|-------------|----------|---------|-------|---------|------|-----------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                 |
| TB57        | 1A      | 3P          | X9       | 1       | 957   | 23/0076 | P    | Magn.Temp.In    |
| TB57        | 2A      | 3P          | X9       | 2       | 958   | 23/0076 | P    | Magn.Temp In    |
| TB57        | 3A      | 3P          | X10      | 1       | 959   | 23/0076 | P    | Magn.Temp Out   |
| TB57        | 4A      | 3P          | X10      | 2       | 960   | 23/0076 | P    | Magn.Temp.Out   |
| TB57        | 7A      | 3P          | X11      | 1       | 961   | 23/0076 | P    | Magnet Temp.Out |
| TB57        | 8A      | 3P          | X11      | 2       | 962   | 23/0076 | P    | Magnet Temp.Out |
| TB62        | 1A      | 3P          | SR       | Red     | 963   |         | R    | Flow Switch 2   |
| TB62        | 2A      | 3P          | SR       | Com     | 964   |         | G    | Flow Switch 2   |
| TB62        | 3A      | 3P          | SR       | N.C     | 965   |         | Bk   | Flow Switch 2   |
| TB62        | 4A      | 3P          | X28      | 1       | 967   |         | Bn   | Magnet Thermal  |
| TB62        | 5A      | 3P          | X28      | 2       | 968   |         | Bn   | Magnet Thermal  |
| TB62        | 1B      | 3P          | TB58     | 1A      | 969   | 23/0076 | 0    | Flow Switch 2   |
| TB62        | 2B      | 3P          | TB58     | 2A      | 970   | 23/0076 | 0    | Flow Switch 2   |
| TB62        | 3B      | 3P          | TB58     | 3A      | 971   | 23/0076 | 0    | Flow Switch 2   |
| TB62        | 4B      | 3P          | TB58     | 7A      | 972   | 23/0076 | 0    | Magnet Thermal  |
| TB62        | 5B      | 3P          | TB58     | 8A      | 973   | 23/0076 | 0    | Magnet Thermal  |
| TB61        | 1A      | 3P          | X29      | 1       | 974   |         | Bn   | Magn.Thermal    |
| TB61        | 2A      | 3P          | X29      | 2       | 975   |         | Bn   | Magn.Thermal    |
| TB61        | 1B      | 3P          | TB58     | 4A      | 976   | 23/0076 | 0    | Magn.Thermal    |
| TB61        | 2B      | 3P          | TB58     | 5A      | 977   | 23/0076 | 0    | Magn.Thermal    |

TABLE 59 (Sheet 1. Continued on Sheet 2)  
 Switch electronic M6  
 5840-99-999-9047

Unit location 1Q

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE         |
|-------------|---------|-------------|----------|---------|-------|---------|------|-----------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                 |
| TB1         | 1B      | 4J          | TB42     | 1A      | 863   | Screen  |      | G1-Pulse        |
| TB1         | 2B      | 4J          | TB42     | 2A      | 863   | K16M    |      |                 |
| TB1         | 3B      | 4J          | TB42     | 3A      | 864   | Screen  |      | G2-A Pulse      |
| TB1         | 4B      | 4J          | TB42     | 4A      | 864   | K16M    |      |                 |
| TB1         | 5B      | 4J          | TB42     | 5A      | 865   | Screen  |      | G2- B Pulse     |
| TB1         | 6B      | 4J          | TB42     | 6A      | 865   | K16M    |      |                 |
| TB1         | 7B      | 4J          | TB42     | 7A      | 866   | Screen  |      | G2-C Pulse      |
| TB1         | 8B      | 4J          | TB42     | 8A      | 866   | K16M    |      |                 |
| TB1         | 9B      | 4J          | TB42     | 9A      | 867   | Screen  |      | G2-D Pulse      |
| TB1         | 10B     | 4J          | TB42     | 10A     | 867   | K16M    |      |                 |
| TB1         | 11B     | 2J          | TB28     | 2A      | 112   | Screen  |      | Monitor G.1     |
| TB1         | 12B     | 2J          | TB28     | 1A      | 112   | K16M    |      |                 |
|             |         |             |          |         |       |         |      |                 |
| TB2         | 1B      | 2J          | TB27     | 8A      | 103   | Screen  |      |                 |
| TB2         | 2B      | 2J          | TB27     | 7A      | 103   | K16M    |      | THYR - I-D      |
| TB2         | 3B      | 2J          | TB27     | 6A      | 102   | Screen  |      |                 |
| TB2         | 4B      | 2J          | TB27     | 5A      | 102   | K16M    |      | THYR -I-C       |
| TB2         | 5B      | 2J          | TB27     | 4A      | 101   | Screen  |      |                 |
| TB2         | 6B      | 2J          | TB27     | 3A      | 101   | K16M    |      | THYR -I-B       |
| TB2         | 7B      | 2J          | TB27     | 2A      | 100   | Screen  |      |                 |
| TB2         | 8B      | 2J          | TB27     | 1A      | 100   | K16M    |      | THYR - I-A      |
| TB2         | 9B      | 4J          | TB41     | 6A      | 854   | Screen  |      |                 |
| TB2         | 10B     | 4J          | TB41     | 5A      | 854   | K16M    |      | G2 - A Bias     |
| TB2         | 11B     | 4J          | TB41     | 4A      | 855   | Screen  |      |                 |
| TB2         | 12B     | 4J          | TB41     | 7A      | 855   | K16M    |      | G2 - B Bias     |
|             |         |             |          |         |       |         |      |                 |
| TB3         | 1B      | 4J          | TB46     | 6A      | 905   | 23/0076 | P    | THYR C+D Sample |
| TB3         | 2B      | 4J          | TB46     | 5A      | 904   | 23/0076 | P    | THYR A+B Sample |
| TB3         | 3B      | 4J          | TB46     | 4A      | 903   | 23/0076 | P    | THYR D Sample   |
| TB3         | 4B      | 4J          | TB46     | 3A      | 902   | 23/0076 | P    | THYR C Sample   |
| TB3         | 5B      | 4J          | TB46     | 2A      | 901   | 23/0076 | P    | THYR B Sample   |
| TB3         | 6B      | 4J          | TB46     | 1A      | 900   | 23/0076 | P    | THYR A Sample   |
| TB3         | 11B     | 5J          | TB10     | 4B      | 352   | 40/0076 | R    | 240V            |
| TB3         | 12B     | 5J          | TB9      | 5B      | 331   | 40/0076 | Bk   | Neutral         |



AP

TABLE 59 (Sheet 2)  
Switch electronic M6  
5840-99-999-9047

Unit location 1Q

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |        |           | SERVICE    |
|-------------|---------|-------------|----------|---------|-------|--------|-----------|------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE   | COL.      |            |
| TB4         | 1B      | 4J          | TB4.1    | 10A     | 856   | Screen | G2-C Bias |            |
| TB4         | 2B      | 4J          | TB4.1    | 9A      | 856   | K16M   |           |            |
| TB4         | 3B      | 4J          | TB4.1    | 12A     | 857   | Screen |           |            |
| TB4         | 4B      | 4J          | TB4.1    | 11A     | 857   | K16M   |           | G2-D Bias  |
| TB4         | 5B      | 2J          | TB28     | 3A      | 113   | K16M   |           | G2-A Pulse |
| TB4         | 6B      | 2J          | TB28     | 4A      | 113   | Screen |           | G2-B Pulse |
| TB4         | 7B      | 2J          | TB28     | 5A      | 114   | K16M   |           |            |
| TB4         | 8B      | 2J          | TB28     | 6A      | 114   | Screen |           | G2-C Pulse |
| TB4         | 9B      | 2J          | TB28     | 7A      | 115   | K16M   |           |            |
| TB4         | 10B     | 2J          | TB28     | 8A      | 115   | Screen |           | G2-D Pulse |
| TB4         | 11B     | 2J          | TB28     | 9A      | 116   | K16M   |           |            |
| TB4         | 12B     | 2J          | TB28     | 10A     | 116   | Screen |           |            |

TABLE 60  
Pulse transformer

Unit location 2Q

| UNIT ORIGIN |         | DESTINATION |            |         | CABLE |         |      | SERVICE                 |
|-------------|---------|-------------|------------|---------|-------|---------|------|-------------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF.   | PIN NO. | NO.   | TYPE    | COL. |                         |
| T6          | 7       | 2P          | TB51       | 5B      | 1204  | 70/0076 | W    | Yellow Phase            |
| T6          | 8       | 5J          | TB6        | 2B      | 400   | 70/0076 | W    | Yellow Brush            |
| T6          | 9       | 3J          | TB40       | 1A      | 815   | 23/0076 | P    | Magnetron Mean I        |
| T6          | 10      | 3J          | TB40       | 2A      | 816   | 23/0076 | P    | Magnetron Mean I        |
| T6          | 12      | 2J          | TB27       | 11A     | 105   | K16M    |      | Magnetron Current       |
| T6          | 11      | 2J          | TB27       | 12A     | 105   | Screen  |      |                         |
| T6          | 7       | 2Q          | C7         | 1       | 1475  | 23/0076 | W    |                         |
| T6          | 8       | 2Q          | C7         | 2       | 1476  | 23/0076 | W    |                         |
| T6          | 9       | 2Q          | C6         | 1       | 1473  | 23/0076 | P    |                         |
| T6          | 10      | 2Q          | C6         | 2       | 1474  | 23/0076 | P    |                         |
| T6          | 3       |             | R26/<br>35 | A       |       | UR74    |      | H.V.-Earth Braid at T6. |
| T6          | 4       |             | X8         | To B    |       | UR74    |      | H.V.-Earth Braid at T6  |
| T6          | 3       |             | X8         | To A    |       | UR74    |      | H.V.-Earth Braid at T6  |
| T6          | 1 & 2   | 3P          | V13        | SKTZ    |       | UR67    |      | Magnetron Htrs.         |

TABLE 61  
Right-hand annexe

Unit location 1R

| ORIGIN      |            | DESTINATION |             |            | CABLE       |         |        | SERVICE                                    |
|-------------|------------|-------------|-------------|------------|-------------|---------|--------|--|
| CCT<br>REF. | PIN<br>NO. | UNIT<br>NO. | CCT<br>REF. | PIN<br>NO. | NO.         | TYPE    | COL.   |  |
| TB59        | 4A         | 1R          | X32         | 3          | 1323        | 23/0076 | R      | Red Phase - Pump 2                         |
| TB59        | 5A         | 1R          | X32         | 2          | 1324        | 23/0076 | W      | Yellow Phase - Pump 2                      |
| TB59        | 6A         | 1R          | X32         | 1          | 1325        | 23/0076 | B      | Blue Phase - Pump 2                        |
| TB59        | 10A        | 1R          | X31         | 3          | 1326        | 23/0076 | R      | Red Phase - Pump 1                         |
| TB59        | 11A        | 1R          | X31         | 2          | 1327        | 23/0076 | W      | Yellow Phase - Pump 1                      |
| TB59        | 12A        | 1R          | X31         | 1          | 1328        | 23/0076 | B      | Blue Phase - Pump 1                        |
| TB59        | 8A         | 3R          | TB1         | 2B         | 1597        | 23/0076 | Bk     | W/G Air Flow Lamp                          |
| TB59        | 9A         | 3R          | TB1         | 4B         | 1598        | 23/0076 | B      | 240V Air Flow Monitor                      |
|             | Earth      |             |             |            |             |         |        |  |
| X32         | Tag        | Earth       | Strip       |            | 1335        | 23/0076 | Bk     | Earth                                      |
|             | Earth      |             |             |            |             |         |        |  |
| X31         | Tag        | Earth       | Strip       |            | 1336        | 23/0076 | Bk     | Earth                                      |
| TB60        | 1A         | 1R          | TB67        | 1B         | 1340        | 23/0076 | Bk     | Neutral - Bell                             |
| TB60        | 3A         | 1R          | SQ          | Com.       | 1342        | 23/0076 | O      | I/L to FL Switch 1                         |
| TB60        | 4A         | 1R          | SQ          | NO         | 1343        | 23/0076 | O      | I/L from FL Switch 1                       |
| TB60        | 7A         | 1R          | X12         | 1          | 1345        | 23/0076 | P      | Magnet Temp. IN                            |
| TB60        | 8A         | 1R          | X12         | 2          | 1346        | 23/0076 | P      | Magnet Temp. IN                            |
| TB60        | 9A         | 1R          | TB67        | 2B         | 1347        | 23/0076 | O      | 240V - Bell                                |
| TB60        | 12A        | 1R          | TB67        | 3B         | 1350        | 23/0076 | Bk     | Earth - Bell                               |
| TB67        | 1A         | 1R          | X27         | 1          | 1498        | 23/0076 | Bk     | Neutral                                    |
| TB67        | 2A         | 1R          | X27         | 2          | 1499        | 23/0076 | O      | 240V - Bell                                |
| TB67        | 3A         | 1R          | X27         | Earth tag  | 1500        | 23/0076 | Bk     | Earth                                      |
| XF51        | -ve        | 1R          | TB71        | 1B         |             |         |        | } Fanning strip connections<br>X33 - TB71B |
| XF51        | +ve        | 1R          | TB71        | 2B         |             |         |        |  |
| X33         | 1          | 1R          | TB71        | 4B         |             |         |        |  |
| X33         | 2          | 1R          | TB71        | 5B         |             |         |        |  |
| X33         | 3          | 1R          | TB71        | 6B         |             |         |        |  |
| TB71        | 1A         | FJ6         | TB1         | 1          | Uninyvin 20 |         | W      | Overheat detector                          |
| TB71        | 2A         | FJ6         | TB1         | 4          | Uninyvin 20 |         | W      | circuit                                    |
| TB71        | 4A         | 1R          | TB59        | 4A         | 1620        | 32/0.2  | B      | Blue Phase } X33                           |
| TB71        | 5A         | 1R          | TB59        | 5A         | 1621        | 32/0.2  | W      | Yellow Phase } Cooling                     |
| TB71        | 6A         | 1R          | TB59        | 6A         | 1622        | 32/0.2  | R      | Red Phase } Fan                            |
| X54         | Mon'r      | 1R          | TB60        | 10A        | 1358        | URM76   | Inner  | Magnetron volts                            |
| X54         | Earth      | 1R          | TB60        | 11A        | 1358        |         | Screen |  |
| X54         | Earth      | Earth       | strip       |            | 1358        | 63/ .02 | Bk     | Earth                                      |
| X54         | HV         | 1R          | X8          | TOB        |             | UR74    |        | HV unscreened                              |

TABLE 61 (Contd.) (Sheet 2)

Right-hand annexe

Unit location 1R

| UNIT        |     | DESTINATION |      |     | CABLE |          |      | SERVICE                        |
|-------------|-----|-------------|------|-----|-------|----------|------|--------------------------------|
| CCT         | PIN | UNIT        | CCT  | PIN |       |          |      |                                |
| REF.        | NO. | NO.         | REF. | NO. | NO.   | TYPE     | COL. |                                |
| Earth strip |     | 1R          | R40  | b   | 1495  | 70/0076  | Bk   |                                |
| TB67        | 1B  | 1R          | TB60 | 1A  | 1340  | 23/0076  | Bk   | Neutral - Bell                 |
| TB67        | 2B  | 1R          | TB60 | 9A  | 1347  | 23/0076  | O    | 240V - Bell                    |
| TB67        | 3B  | 1R          | TB60 | 12A | 1350  | 23/0076  | Bk   | Earth - Bell                   |
| TB68        | 1B  | Earth strip |      |     | 1514  | 23/0076  | Bk   | Earth                          |
| TB68        | 1A  |             |      |     |       |          |      | Earth                          |
| TB68        | 2A  | 1R          | RLW  | 2   |       |          |      | 50V                            |
| TB68        | 3A  | 1R          | TLW  | 3   |       |          |      | O/S O/C                        |
| TB59        | 4A  | 2R          | TB70 | 1   | 1525  | 23/0076  | R    | Red Phase                      |
| TB59        | 5A  | 2R          | TB70 | 2   | 1526  | 23/0076  | W    | Yellow Phase                   |
| TB59        | 10A | 1R          | X36  | 3   | 1527  | 40/0076  | R    | Red Phase - Cooling Fan        |
| TB59        | 11A | 1R          | X36  | 2   | 1528  | 40/0076  | W    | Yellow Phase -<br>Cooling Fan  |
| TB59        | 12A | 1R          | X36  | 1   | 1529  | 40/0076  | B    | Blue Phase - Cooling<br>Fan    |
| X37         | 1   | 2R          | TB70 | 5   | 1530  | 110/0076 | R    | Aux. Pump                      |
| X37         | 2   | 2R          | TB70 | 6   | 1531  | 110/0076 | Bk   | Aux. Pump                      |
| TB59        | 4B  | 5J          | TB11 | 7B  | 381   | 23/0076  | R    | Red Phase - Pump 2             |
| TB59        | 5B  | 5J          | TB11 | 8B  | 382   | 23/0076  | W    | Yellow Phase - Pump 2          |
| TB59        | 6B  | 5J          | TB11 | 9B  | 383   | 23/0076  | B    | Blue Phase - Pump 2            |
| TB59        | 9B  | 5J          | TB10 | 12B | 360   | 40/0076  | B    | 240V Air Flow<br>Failure Alarm |
| TB59        | 8B  | 3K          | T309 | 1   | 1185  | 23/0076  | R    | W/G Air Flow Lamp              |
| TB59        | 10B | 5J          | TB10 | 7B  | 384   | 40/0076  | R    | Red Phase Pump 1               |
| TB59        | 11B | 5J          | TB10 | 8B  | 385   | 40/0076  | W    | Yellow Phase Pump 1            |
| TB59        | 12B | 5J          | TB10 | 9B  | 386   | 40/0076  | B    | Blue Phase Pump 1              |
| TB60        | 1B  | ILP2        | SKTB | 2   | 1221  | 23/0076  | Bk   | Neutral                        |
| TB60        | 1B  | 4J          | TB44 | 12A | 876   | 23/0076  | Bk   | Neutral                        |
| TB60        | 3B  | 2T          | TB53 | 7B  | 1208  | 23/0076  | O    | I/L from Diode THL.            |
| TB60        | 4B  | 3P          | TB58 | 7B  | 1168  | 23/0076  | O    | I/L to Magnet THL.             |
| TB60        | 5B  | 3J          | TB40 | 3A  | 817   | 23/0076  | P    | O/Swing Current                |
| TB60        | 6B  | 3J          | TB40 | 4A  | 818   | 23/0076  | P    | O/Swing Current                |
| TB60        | 7B  | 3J          | TB40 | 7A  | 821   | 23/0076  | P    | Magnet Temp. In                |
| TB60        | 8B  | 3J          | TB40 | 8A  | 822   | 23/0076  | P    | Magnet Temp. In                |
| Earth Tag   |     | 3R          | TB1  | 6B  | 1600  | 40/0076  | Bk   | Earth                          |

TABLE 61 (Contd.) (Sheet 3)

Right-hand annexe

Unit location 1R

| ORIGIN    |         | DESTINATION |          |         | CABLE |         |       | SERVICE                      |
|-----------|---------|-------------|----------|---------|-------|---------|-------|------------------------------|
| CCT REF.  | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL.  |                              |
| TB60      | 9B      | 2P          | TB51     | 3B      | 1206  | 23/0076 | 0     | 240V - Bell                  |
| TB60      | 10B     | 2J          | TB27     | 9A      | 104   | K16M    |       | Magnetron V                  |
| TB60      | 11B     | 2J          | TB27     | 10A     | 104   | Screen  |       |                              |
| TB60      | 12B     | Earth Strip |          |         | 1209  | 23/0076 | Bk    | Earth                        |
| TB63      | 1B      | 3J          | TB35     | 3A      | 749   | 23/0076 | Y     | 50V                          |
| TB63      | 1B      | 4K          | SKTAC    | 10      | 1231  | 23/0076 | Y     | 50V                          |
| TB63      | 2B      | 3J          | TB38     | 6A      | 1232  | 23/0076 | Y     | 0/Swing DC 0/L               |
| TB68      | 6A      | 1R          | R52      |         |       |         |       | 0/Swing current              |
| X33       | D11     | 1R          | X8       | T1A     |       | UR74    |       | HV unscreened                |
|           | +ve     |             |          |         |       |         |       |                              |
| X33       | D13     | 1R          | X8       | T1B     |       | UR74    |       | HV unscreened                |
|           | +ve     |             |          |         |       |         |       |                              |
| X33 lower |         |             |          |         |       |         |       |                              |
| LH busbar |         | 1R          | T11      | P       | 1547  | 84/0.3  | R     | 0/Swing current              |
| PLAJ      | 1       | 1R          | TB60     | 5       | 1685  | 24/0.2  | Pk    |                              |
| PLAJ      | 2       | 1R          | TB63     | 2       | 1683  | 24/0.2  | Or    | 0/Swing DC 0/L               |
| PLAJ      | 4       | 1R          | TB63     | 1       | 1684  | 24/0.2  | Or    | 50V                          |
| PLAJ      | 6       | 1R          | TB60     | 6       | 1682  | 24/0.2  | Pk    |                              |
| SKAM      |         | 1R          | T11      | F       | 1680  | Coax.   | Inner | } BNC Plug }<br>} BNC Plug } |
| SKAM      |         | 1R          | T11      | S       | 1680  | Coax.   | Scrn  |                              |
| SKAN      |         | 1R          | T12      | F       | 1681  | Coax.   | Inner |                              |
| SKAN      |         | 1R          | T12      | S       | 1681  | Coax.   | Scrn  |                              |
| TS1       |         | 1R          | TS3      |         | 1679  | 50/0.25 | Red   |                              |
| TS1       |         | 1R          | TS3      |         | 1679  | 50/0.25 | Red   |                              |
| TS2       |         | 1R          | Earth    |         | 1678  | 84/0.3  | Gn/Y  |                              |
|           |         |             | Bar      |         |       |         |       |                              |
| R321      | }       | 1R          | T11      | P       | 1676  | 50/0.25 | Red   |                              |
| R324      |         | 1R          |          |         |       |         |       |                              |
| R325      |         | 1R          | T12      | P       | 1677  | 50/0.25 | Red   |                              |
| R328      |         | 1R          |          |         |       |         |       |                              |

TABLE 62

Relay assembly

Unit location 2R

| UNIT        |            |             |             |            |       |          |         |
|-------------|------------|-------------|-------------|------------|-------|----------|---------|
| ORIGIN      |            | DESTINATION |             |            | CABLE |          | SERVICE |
| CCT<br>REF. | PIN<br>NO. | UNIT<br>NO. | CCT<br>REF. | PIN<br>NO. | NO.   | TYPE     | COL.    |
| TB70        | 1          | 2R          | RLU         | B          |       | 23/0076  | R       |
| TB70        | 1          | 2R          | RLT         | A          |       | 23/0076  | R       |
| TB70        | 2          | 2R          | RLU         | A          |       | 23/0076  | G       |
| TB70        | 2          | 2R          | RLT         | B          |       | 23/0076  | G       |
| TB70        | 3          | 2R          | RLU         | 1          |       | 110/0076 | R       |
| TB70        | 4          | 2R          | RLV         | A          |       | 23/0076  | Bk      |
| TB70        | 4          | 2R          | TB70        | 6          |       | 110/0076 | Bk      |
| TB70        | 5          | 2R          | RLV         | 2          |       | 110/0076 | R       |
| RLT         | 3          | 2R          | RLV         | 1          |       | 23/0076  | R       |
| RLT         | 4          | 2R          | RLV         | B          |       | 23/0076  | R       |
| RLU         | 2          | 2R          | RLV         | 1          |       | 110/0076 | R       |

TABLE 64 PANEL TEST ELECTRICAL (NO.6) M58  
5840-99-999-9036

Unit location 2S

| UNIT ORIGIN |         | DESTINATION |           |         |      | CABLE   |      | SERVICE         |    |
|-------------|---------|-------------|-----------|---------|------|---------|------|-----------------|----|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.  | TYPE    | Col. |                 |    |
| ■ TB1       | 1B      | 5S          | TBS       | 7B      | 1675 | 24/0.2  | Y    | 50V             |    |
| TB1         | 1B      | 6J          | TB19      | 6B      | 492  | 23/0076 | Y    | 50V             |    |
| TB1         | 2B      | 6J          | TB19      | 1B      | 487  | 70/0076 | W    | T.W.T.1 Field + |    |
| TB1         | 3B      | 2S          | TB1       | 4B      | -    | 24/0.2  | Bk   | Earth           |    |
| TB1         | 5B      | 6J          | TB19      | 4B      | 490  | 70/0076 | W    | T.W.T.2 Field - |    |
| TB1         | 12B     | 6J          | TB17      | 12B     | 1662 | 24/0.2  | Bk   | Earth           | DO |
| TB1         | 12B     | 2S          | TB1       | 3B      | -    | 24/0.2  | Bk   |                 |    |
| TB2         | 1B      | 6J          | TB18      | 2B      | 472  | 23/0076 | R    | 240V            |    |
| TB2         | 2B      | 6J          | TB19      | 11B     | 1663 | 24/0.2  | R    | PSU1 Line       |    |
| TB2         | 3B      | 6J          | TB19      | 12B     | 1664 | 24/0.2  | R    | PSU1 Line       |    |
| TB2         | 4B      | 1M          | TB1       | 3B      | 1589 | 23/0076 | R    | 240V AC         |    |
| TB2         | 6B      | 5J          | TB3       | 2A      | 1590 | 23/0076 | R    | 240V AC         |    |

TABLE 66 PANEL, TERMINATION  
5840-99-947-5271

Unit location 5S

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |         | SERVICE                |
|-------------|---------|-------------|-----------|---------|-------|---------|------------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | No.   | TYPE    | Col.                   |
| TB1         | 1B      | 6J          | TB18      | 3B      | 473   | 70/0076 | Bn 6.3V 5A             |
| TB1         | 2B      | 6J          | TB18      | 4B      | 474   | 70/0076 | Bn 6.3V 5A             |
| TB1         | 3B      | 6J          | TB18      | 5B      | 475   | 23/0076 | R 300V                 |
| TB1         | 4B      | 6J          | TB18      | 6B      | 476   | 23/0076 | Y VSWR/Power C/O       |
| TB1         | 5B      | 6J          | TB20      | 1B      | 1225  | 23/0076 | P Remote Meter +ve     |
| TB1         | 6B      | 6J          | TB20      | 2B      | 1226  | 23/0076 | P Remote Meter -ve     |
| TB1         | 7       | 2S          | TB1       | 1       | 1675  | 24/0.2  | Y 50V                  |
| TB1         | 8B      | 6J          | TB18      | 9B      | 477   | 23/0076 | P Def.Coil +ve         |
| TB1         | 9B      | 6J          | TB18      | 10B     | 478   | 23/0076 | P Con.Coil +ve         |
| TB1         | 10B     | 6J          | TB18      | 11B     | 479   | 23/0076 | P Def.Coil -ve         |
| TB1         | 11B     | 6J          | TB18      | 12B     | 480   | 23/0076 | P Con.Coil -ve         |
| TB1         | 12B     | 6J          | TB20      | 3B      | 1560  | 23/0076 | Bk Remote Meter Return |
| 1PLE        |         | 6J          | PLT       |         | 703   | UR.70   | Forward Power          |
| PLF         |         | 6J          | PLU       |         | 704   | UR.70   | Backward Power         |



TABLE 67  
 Left hand cooling assembly

Unit location 1T

| UNIT ORIGIN |           | DESTINATION |          |         | CABLE |         |      | SERVICE           |
|-------------|-----------|-------------|----------|---------|-------|---------|------|-------------------|
| CCT REF.    | PIN NO.   | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                   |
| X19         | 3         | 1T          | TB52     | 1A      | 1380  | 40/0076 | R    | Red Phase         |
| X19         | 3         | 1T          | X18      | 3       | 1383  | 40/0076 | R    | Fan               |
| X19         | 2         | 1T          | TB52     | 2A      | 1381  | 40/0076 | W    | Yellow Phase      |
| X19         | 2         | 1T          | X18      | 2       | 1384  | 40/0076 | W    | Fan               |
| X19         | 1         | 1T          | TB52     | 3A      | 1382  | 40/0076 | B    | Blue Phase        |
| X19         | 1         | 1T          | X18      | 1       | 1385  | 40/0076 | B    | Fan               |
| X19         | Earth Tag | 1T          | TB52     | 12A     | 1395  | 23/0076 | Bk   | Earth             |
| X19         | Earth Tag | 1T          | FX18     | Tag     | 1396  | 23/0076 | Bk   | Earth             |
| X17         | 3         | 1T          | X18      | 3       | 1386  | 40/0076 | R    | Red Phase         |
| X17         | 3         | 1T          | X16      | 3       | 1389  | 40/0076 | R    | Fan               |
| X17         | 2         | 1T          | X18      | 2       | 1387  | 40/0076 | W    | Yellow Phase      |
| X17         | 2         | 1T          | X16      | 2       | 1390  | 40/0076 | W    | Fan               |
| X17         | 1         | 1T          | X18      | 1       | 1388  | 40/0076 | B    | Blue Phase        |
| X17         | 1         | 1T          | X16      | 1       | 1391  | 40/0076 | B    | Fan               |
| X17         | Earth Tag | 1T          | X18      | Tag     | 1397  | 23/0076 | Bk   | Earth             |
| X17         | Earth Tag | 1T          | X16      | Tag     | 1398  | 23/0076 | Bk   | Earth             |
| X15         | 3         | 1T          | X16      | 3       | 1392  | 40/0076 | R    | Red Phase         |
| X15         | 2         | 1T          | X16      | 2       | 1393  | 40/0076 | W    | Yellow Phase      |
| X15         | 1         | 1T          | X16      | 1       | 1394  | 40/0076 | B    | Blue Phase        |
| X15         | Earth Tag | 1T          | X16      | Tag     | 1399  | 23/0076 | Bk   | Earth             |
| TB52        | 4A        | 1T          | SS       | 1       | 1400  | 23/0076 | O    | 240V              |
| TB52        | 5A        | 1T          | SS       | 2       | 1401  | 23/0076 | O    | Water Level 1     |
| TB52        | 1B        | 3M          | TB2      | 7B      | 640   | 40/0076 | R    | Red Phase-Fans    |
| TB52        | 2B        | 3M          | TB2      | 8B      | 641   | 40/0076 | W    | Yellow Phase-Fans |
| TB52        | 3B        | 3M          | TB2      | 9B      | 642   | 40/0076 | B    | Blue Phase-Fans   |
| TB52        | 4B        | 5J          | TB7      | 6A      | 309   | 23/0076 | O    | I/L to S.AB       |
| TB52        | 5B        | 5J          | TB7      | 1A      | 303   | 23/0076 | O    | Water Level       |
| TB52        | 12B       | Earth       | Strip    |         | 643   | 23/0076 | Bk   | Earth             |

TABLE 68 (Sheet 1. Continued on Sheet 2)  
Right hand cooling assembly

Unit location 2T

| UNIT ORIGIN |           | DESTINATION |          |           | CABLE |         |      | SERVICE            |
|-------------|-----------|-------------|----------|-----------|-------|---------|------|--------------------|
| CCT REF.    | PIN NO.   | UNIT NO.    | CCT REF. | PIN NO.   | NO.   | TYPE    | COL. |                    |
| X20         | 3         | 2T          | TB53     | 1A        | 1352  | 40/0076 | R    | Red Phase          |
| X20         | 3         | 2T          | X21      | 3         | 1355  | 40/0076 | R    | Fan                |
| X20         | 2         | 2T          | TB53     | 2A        | 1353  | 40/0076 | W    | Yellow Phase       |
| X20         | 2         | 2T          | X21      | 2         | 1356  | 40/0076 | W    | Fan                |
| X20         | 1         | 2T          | TB53     | 3A        | 1354  | 40/0076 | B    | Blue Phase         |
| X20         | 1         | 2T          | X21      | 1         | 1357  | 40/0076 | B    | Fan                |
| X20         | Earth Tag | 2T          | TB53     | 12A       | 1370  | 23/0076 | Bk   | Earth              |
| X20         | Earth Tag | 2T          | X21      | Earth Tag | 1371  | 23/0076 | Bk   | Earth              |
| X22         | 3         | 2T          | X21      | 3         | 1358  | 40/0076 | R    | Red Phase          |
| X22         | 3         | 2T          | X23      | 3         | 1361  | 40/0076 | R    | Fan                |
| X22         | 2         | 2T          | X21      | 2         | 1359  | 40/0076 | W    | Yellow Phase       |
| X22         | 2         | 2T          | X23      | 2         | 1362  | 40/0076 | W    | Fan                |
| X22         | 1         | 2T          | X21      | 1         | 1360  | 40/0076 | B    | Blue Phase         |
| X22         | 1         | 2T          | X23      | 1         | 1363  | 40/0076 | B    | Fan                |
| X22         | Earth Tag | 2T          | X21      | Earth Tag | 1372  | 23/0076 | Bk   | Earth              |
| X22         | Earth Tag | 2T          | X23      | Earth Tag | 1373  | 23/0076 | Bk   | Earth              |
| X24         | 3         | 2T          | X23      | 3         | 1364  | 40/0076 | R    | Red Phase          |
| X24         | 3         | 2T          | X25      | 3         | 1367  | 40/0076 | R    | Fan                |
| X24         | 2         | 2T          | X23      | 2         | 1365  | 40/0076 | W    | Yellow Phase       |
| X24         | 2         | 2T          | X25      | 2         | 1368  | 40/0076 | W    | Fan                |
| X24         | 1         | 2T          | X23      | 1         | 1366  | 40/0076 | B    | Blue Phase         |
| X24         | 1         | 2T          | X25      | 1         | 1369  | 40/0076 | B    | Fan                |
| X24         | Earth Tag | 2T          | X23      | Earth Tag | 1374  | 23/0076 | Bk   | Earth              |
| X24         | Earth Tag | 2T          | X25      | Earth Tag | 1375  | 23/0076 | Bk   | Earth              |
| TB53        | 4A        | 2T          | ST       | 1         | 1376  | 23/0076 | 0    | 240V               |
| TB53        | 5A        | 2T          | ST       | 2         | 1377  | 23/0076 | 0    | Water Level 2      |
| TB53        | 6A        | 2T          | TB65     | 1A        | 1378  | 23/0076 | 0    | I/L to Diode Th1   |
| TB53        | 7A        | 2T          | TB65     | 3A        | 1379  | 23/0076 | 0    | I/L from Diode Th1 |
| X30         | 1         | 2T          | TB65     | 1B        |       |         |      |                    |
| X30         | 2         | 2T          | TB65     | 3B        |       |         |      |                    |

TABLE 68 (Sheet 2)  
Right-hand cooling assembly

Unit location 2T

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |      | SERVICE             |
|-------------|---------|-------------|----------|---------|-------|---------|------|---------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |                     |
| TB53        | 1B      | 5J          | TB11     | 4B      | 378   | 40/0076 | R    | Red Phase-fans      |
| TB53        | 2B      | 5J          | TB11     | 5B      | 379   | 40/0076 | W    | Yellow Phase-fans   |
| TB53        | 3B      | 5J          | TB11     | 6B      | 380   | 40/0076 | B    | Blue Phase-Fans     |
| TB53        | 4B      | 2T          | TB53     | 6B      | 1212  | 23/0076 | O    | 240V to Water Level |
| TB53        | 5B      | 5J          | TB7      | 6B      | 318   | 23/0076 | O    | Water Level         |
| TB53        | 6B      | 5J          | TB5      | 10B     | 301   | 23/0076 | O    | I/L to Diode Thl.   |
| TB53        | 7B      | 5J          | TB7      | 5B      | 317   | 23/0076 | O    | Diode Cooling       |
| TB53        | 7B      | 1R          | TB60     | 3B      | 1208  | 23/0076 | O    | I/L to Flow SW1     |
| TB53        | 12B     | Earth Strip |          |         | 1213  | 23/0076 | Bk   | Earth               |
| TB53        | 1B      | 3P          | TB64     | 1B      | 1322  | 23/0076 | R    | } Magnetron Fan     |
| TB53        | 2B      | 3P          | TB64     | 2B      | 1323  | 23/0076 | W    |                     |
| TB53        | 3B      | 3P          | TB64     | 3B      | 1324  | 23/0076 | B    |                     |

TABLE 69 (Sheet 1. Continued on Sheet 2)  
Right-hand cabinet, Miscellaneous

Unit location

| UNIT ORIGIN                    |                              | DESTINATION |                      |         | CABLE |            |      | SERVICE                                  |
|--------------------------------|------------------------------|-------------|----------------------|---------|-------|------------|------|--|
| CCT REF.                       | PIN NO.                      | UNIT NO.    | CCT REF.             | PIN NO. | NO.   | TYPE       | COL. |  |
| ILP2                           | A/1                          |             | X6                   | B2      | 1218  | 23/0076    | R    | 240V                                     |
| ILP2                           | A/2                          |             | X6                   | C1      | 1219  | 23/0076    | R    | 240V - Starter                           |
| ILP2                           | B/1                          |             | X6                   | C2      | 1220  | 23/0076    | R    | 240V                                     |
| ILP2                           | B/2                          | 1R          | TB60                 | 1B      | 1221  | 23/0076    | Bk   | Neutral                                  |
| X6                             | Earth Tag                    | Earth Strip |                      |         | 1234  | 23/0076    | Bk   | Earth                                    |
| PLE                            | L                            | 3J          | FS7                  | A       | 950   | 40/0076    | R    | 240V                                     |
| PLE                            | L                            | 4J          | FS8                  | A       | 1013  | 40/0076    | R    | 240V                                     |
| PLE                            | N                            | 3J          | SKTF                 | N       | 953   | 40/0076    | Bk   | Neutral                                  |
| PLE                            | N                            | 4J          | SKTH                 | N       | 1017  | 40/0076    | Bk   | Neutral                                  |
| R16                            | A                            | 2J          | TB28                 | 11B     | 117   | K16M       |      | Line Volts                               |
| R16                            | B                            | 2J          | TB28                 | 12B     | 117   | Screen     |      |  |
| R16                            | B                            | Earth Strip |                      |         | 1480  | 23/0076    | Bk   | Earth                                    |
| ILP5                           | 1                            | 2P          | TB51                 | 1B      | 1205  | 23/0076    | O    | Warning Lamp                             |
| ILP5                           | 1                            |             | ILP6                 | 1       | 1481  | 23/0076    | O    | 240V                                     |
| ILP5                           | 2                            | 2P          | TB51                 | 11B     | 1207  | 23/0076    | Bk   | Neutral                                  |
| ILP5                           | 2                            |             | ILP6                 | 2       | 1482  | 23/0076    | Bk   | Neutral                                  |
| L2                             | A                            | 4J          | FS9                  | B       | 1022  | 23/0076    | R    | 240V                                     |
| X6                             | B1                           |             | L2                   | B       | 1505  | 23/0076    | R    | 240V                                     |
| ▶ Earth busbar                 | Earth tag on support bracket |             |                      | R329    | 1198  | 23/0076    | Bk   |  |
| X8                             | T2A                          |             | X8                   | T2B     |       | UR74       |      | Link unscreened                          |
| X8                             | T2A                          |             | R329 HV anchor point |         |       | UR74       |      | HV - Earth braid at R329 support bracket |
| X8                             | TOA                          | 2Q          | T6                   | 3       |       | UR74       |      | HV - Earth braid at T6                   |
| X8                             | TOB                          |             | X54                  | HV      |       | UR74       |      | HV - Unscreened                          |
| X8                             | TOB                          | 2Q          | T6                   | 4       |       | UR74       |      | HV - Earth braid at T6                   |
| X8                             | T1A                          | 1R          | SN                   | A       |       | UR74       |      | HV - Earth braid at SP                   |
| X8                             | T1B                          |             | L6/7                 | A       |       | UR74       |      | HV - Unscreened                          |
| X8                             | T1B                          | 1R          | SP                   | A       |       | UR74       |      | HV - Earth braid at SN                   |
| X8                             | T1A                          |             | L8/9                 | A       |       | UR74       |      | HV - Unscreened                          |
| R329 HV Anchor point           |                              |             | R15                  | A       |       | 50/0.25    |      | HV - Unscreened                          |
| R329                           | B                            |             | D9                   | +ve     |       |            |      |  |
| R329                           | C                            |             | D10                  | +ve     |       |            |      |  |
| D7                             | -ve                          |             | Diode assembly       |         |       | 50/0.25    | R    | HV - Unscreened                          |
| D8                             | -ve                          |             | HV anchor point      |         |       | 50/0.25    | R    | HV - Unscreened                          |
| Diode assembly HV anchor point |                              |             | L4                   | 2       |       | 1/0.188 RF |      |  |

AP

115H-0102-1 (2nd Edn) Sect.10,

TABLE 69 (Sheet 2)

Issued

Right hand cabinet, Miscellaneous

| UNIT ORIGIN  |         | DESTINATION |          |         | CABLE |         |      | SERVICE   |
|--------------|---------|-------------|----------|---------|-------|---------|------|-----------|
| CCT REF.     | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL. |           |
| TB69         | 1A      | 2M          | TB2      | 6B      | 679   | 195/010 | P    | Field -ve |
| TB69         | 2A      | 2M          | TB2      | 7B      | 680   | 195/010 | P    | Field +ve |
| TB69         | 1B      | 3P          | L10      | B       | 1520  | 195/010 | P    | Field -ve |
| TB69         | 2B      | 3P          | L10      | A       | 1521  | 195/010 | P    | Field +ve |
| 4P/<br>SKTA  |         | 7J          | SKTAD    |         | 1581  | UR70    |      |           |
| 4P/<br>SKTB  |         | 7J          | SKTAE    |         | 1582  | UR70    |      |           |
| 7J/<br>SKTAD |         | 4P          | SKTA     |         | 1581  | UR70    |      |           |
| 7J/<br>SKTAE |         | 4P          | SKTB     |         | 1582  | UR70    |      |           |
| 7J/<br>SKTAD |         | 1K          | SKTAF    |         | 1583  | UR70    |      |           |
| 7J/<br>SKTAE |         | 1K          | SKTAG    |         | 1584  | UR70    |      |           |

TABLE 70 (Sheet 1. Continued on Sheet 2)  
 Left hand cabinet, miscellaneous

| UNIT ORIGIN |         | DESTINATION |             |         | CABLE |                |      | SERVICE                |
|-------------|---------|-------------|-------------|---------|-------|----------------|------|------------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF.    | PIN NO. | NO.   | TYPE           | COL. |                        |
| V5          | Cathode |             | L3          | 1       |       | UR74<br>Screen |      | H.V. Earth braid at L3 |
| R7/R8       | A       | Earth       | R4          | A       |       | 110/0076       | R    | H.V.-Link              |
| R4          | B       |             | R5          | A       |       | 110/0076       | R    | H.V.-Link              |
| R9/R10      | B       |             | SL          | A       |       | UR74           |      | H.V.-Discharger        |
| L3          | 2       |             | C1          | A       |       | UR74           |      | H.V. Unscreened        |
| L3          | 2       |             | R7/R8       | A       |       | UR74           |      | H.V.-Unscreened        |
| C1          | A       |             | L4          | 1       |       | UR74           |      | H.V.-Earth braid at C1 |
|             |         |             | EARTH STRIP |         |       | Screen         |      |                        |

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TABLE 70 (Sheet 2)  
Left hand cabinet, miscellaneous

| UNIT ORIGIN |           | DESTINATION |          |           | CABLE |         |      | SERVICE       |
|-------------|-----------|-------------|----------|-----------|-------|---------|------|---------------|
| CCT REF.    | PIN NO.   | UNIT NO.    | CCT REF. | PIN NO.   | NO.   | TYPE    | COL. |               |
| LL          | A         | 2J          | FS6      | B         | 444   | 23/0076 | R    | 240V          |
| ILP1        | A/1       |             | X5       | B2        | 726   | 23/0076 | R    | 240V          |
| ILP1        | A/2       |             | X5       | C1        | 727   | 23/0076 | P    | Starter       |
| ILP1        | B/1       |             | X5       | C2        | 728   | 23/0076 | P    | Starter       |
| ILP1        | B/2       |             | SKTE     | N         | 729   | 23/0076 | Bk   | Neutral       |
| SKTE        | L         | 4M          | FS1      | B         | 730   | 40/0076 | R    | 240V          |
| SKTE        | N         | 5J          | TB9      | 11A       | 732   | 40/0076 | Bk   | Neutral       |
| SKTE        | E         | EARTH       | STRIP    |           | 731   | 23/0076 | Bk   | Earth         |
| X5          | Earth Tag | EARTH       | STRIP    |           | 1233  | 23/0076 | Bk   | Earth         |
| ILP3        | 1         | 5J          | TB6      | 12A       | 724   | 23/0076 | 0    | Warning Lamp  |
| ILP3        | 1         |             | ILP4     | 1         | 1214  | 23/0076 | 0    | 240V          |
| ILP3        | 2         | 6J          | TB18     | 1A        | 1215  | 23/0076 | Bk   | Neutral       |
| ILP3        | 2         |             | ILP4     | 2         | 1216  | 23/0076 | Bk   | Neutral       |
| R6          | A         | 5J          | TB1      | 9A        | 210   | 23/0076 | P    | H.T.Volts +ve |
| R6          | B         | 5J          | TB1      | 10A       | 211   | 23/0076 | P    | H.T.Volts -ve |
| R6          | B         | EARTH       | STRIP    |           | 1498  | 40/0076 | Bk   | Earth         |
| TB66        | 1B        | 1L          | TB55     | 12B       | 1322  | 23/0076 | Bk   | Neutral       |
| TB66        | 2B        | 5J          | TB7      | 7A        | 310   | 23/0076 | 0    | 240V-Bell     |
| TB66        | 3B        | EARTH       | STRIP    |           | 1492  | 23/0076 | Bk   | Earth         |
| TB66        | 1A        |             | X26      | 1         | 1501  | 23/0076 | Bk   | Neutral       |
| TB66        | 2A        |             | X26      | 2         | 1502  | 23/0076 | 0    | 240V-Bell     |
| TB66        | 3A        |             | X26      | Earth Tag | 1503  | 23/0076 | Bk   | Earth         |
| X5          | B1        |             | L1       | B         | 1506  | 23/0076 | R    | 240V          |

TABLE 71

Control box air flow alarm

Unit location 3R

| UNIT ORIGIN |         | DESTINATION |          |         | CABLE |         |       | SERVICE                 |
|-------------|---------|-------------|----------|---------|-------|---------|-------|-------------------------|
| CCT REF.    | PIN NO. | UNIT NO.    | CCT REF. | PIN NO. | NO.   | TYPE    | COL.  |                         |
| TB1         | 1B      | 3R          | TB1      | 4B      | 1596  | 23/0076 | Blue  | Link                    |
| TB1         | 2B      | 1R          | TB59     | 8A      | 1597  | 23/0076 | Pink  | Waveguide Air Flow Lamp |
| TB1         | 3B      | 3R          | RLA      | 1       |       |         |       | Not Connected           |
| TB1         | 4B      | 1R          | TB59     | 9A      | 1598  | 23/0076 | Blue  | Blue Phase 240V         |
| TB1         | 5B      | 1R          | TB67     | 1B      | 1599  | 23/0076 | Black | Neutral                 |
| TB1         | 6B      | 1R          | Earth    | Tag     | 1600  | 40/0076 | Black | Earth                   |
| TB1         | 7B      | X55         |          |         |       |         | Blue  | Lower FL from X55       |
| TB1         | 8B      | X55         |          |         |       |         | Grn   | Upper FL from X55       |
| TB1         | 8B      | X55         |          |         |       |         | Grn   | Lower FL from X55       |
| TB1         | 9B      | X55         |          |         |       |         | Blue  | Upper FL from X55       |
| TB1         | 10B     | X55         |          |         |       |         | Wh    | Upper FL from X55       |
| TB1         | 10B     | X55         |          |         |       |         | Wh    | Lower FL from X55       |
| TB1         | 11B     | X55         |          |         |       |         | R     | Upper FL from X55       |
| TB1         | 12B     | X55         |          |         |       |         | R     | Lower FL from X55       |



TABLE 72  
Relay Unit S-53-3757-01

Unit location 1L

| UNIT ORIGIN |         | DESTINATION |           |         | CABLE |        |      | SERVICE  |
|-------------|---------|-------------|-----------|---------|-------|--------|------|--|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.   | TYPE   | COL. |  |
| TB75        | 1B      | 2K          | SD        | 2       | 715   | 24/0.2 | R    | } Spare Spare<br>Overload protection circuit back up |
| TB75        | 2B      | 1L          | TB54      | 1B      | 1654  | 24/0.2 | R    |  |
| TB75        | 3       |             |           |         |       |        |      |  |
| TB75        | 4       |             |           |         |       |        |      |  |
| TB75        | 6B      | 3J          | TB38      | 10B     | 1655  | 24/0.2 | Bk   |  |
| TP          | 1       | 1L          | CON B     | R       | 1657  | 24/0.2 | R    |  |
| TP          | 2       | 1L          | CON B     | S       | 1658  | 24/0.2 | W    |  |
| TP          | 3       | 1L          | CON B     | T       | 1659  | 24/0.2 | B    |  |
| TP          | 4       | 1L          | TB55      | 12B     | 1660  | 24/0.2 | Bk   |  |

TABLE 73 (Sheet 1)  
Relay Unit S-53-0617-01 (5840-99-662-4411) Neat only

Unit location 5P

| UNIT ORIGIN |         | DESTINATION |           |         |      | CABLE  |      | SERVICE             |
|-------------|---------|-------------|-----------|---------|------|--------|------|---------------------|
| CCT. REF.   | PIN NO. | UNIT NO.    | CCT. REF. | PIN NO. | NO.  | TYPE   | COL. |                     |
| TB1         | 1       | 3J          | TB38      | 11A     | 1623 | 24/0.2 | Bk   | Earth               |
| TB1         | 2       | 5J          | TB2       | 9B      | 1624 | 24/0.2 | Y    | 50V                 |
| TB1         | 3       | 3J          | TB34      | 8A      | 1625 | 24/0.2 | 0    | I/L Line            |
| TB1         | 4       | 3J          | TB34      | 10A     | 1626 | 24/0.2 | 0    | I/L Line            |
| TB1         | 5       | 3J          | TB37      | 9A      | 1627 | 24/0.2 | P    | Reg. down           |
| TB1         | 6       | 5J          | TB11      | 10B     | 1628 | 24/0.2 | P    | L.H.Flashing Indic. |
|             | 6       | 3K          | ILP321    |         | 1629 | 24/0.2 | P    | R.H.Flashing Indic. |
| TB1         | 7       | 5J          | TB8       | 6B      | 1630 | 24/0.2 | P    | "SILENCE"           |
| TB1         | 8       | 5J          | TB8       | 5B      | 1631 | 24/0.2 | P    | } Initiate          |
| TB1         | 9       | 5J          | TB8       | 4B      | 1632 | 24/0.2 | P    | } "SILENCE"         |
| TB1         | 10      | 5J          | TB8       | 3B      | 1633 | 24/0.2 | P    | } Cancel            |
| TB1         | 11      | 5J          | TB8       | 2B      | 1634 | 24/0.2 | P    | } Remote "SILENCE"  |
| TB1         | 12      | 5J          | TB8       | 1B      | 1635 | 24/0.2 | P    | } Indicator         |
| TB1         | 14      | 5J          | TB8       | 7B      | 1648 | 24/0.2 | P    | } "READY" Indicator |
| TB1         | 15      | 5J          | TB1       | 5B      | 1649 | 24/0.2 | P    | } H.T. Off          |

Chapter 2

EXTERNAL CONNECTIONS TO THE TRANSMITTER/RECEIVER

CONTENTS

Para.

1 Introduction

Table

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| 1 | Connections to equipment in the transmitter building | 1 |
| 2 | Connections to signal processing equipment           | 2 |
| 3 | Connections to relay polarizer unit                  | 3 |

Introduction

1. The external connections to the units in the transmitter building, and to the air conditioner unit situated immediately outside the transmitter building, are listed in Table 1.

2. The connections to the signal processing equipment in the operations room are listed in Table 2. This table lists only the ultimate terminations of the signal processing equipment, for information on the intermediate connections reference should be made to the station wiring schedules.

3. Table lists the connections to the relay polarizer unit (wall-mounted in the transmitter room) from the transmitter/receiver and the signal processing equipment. The connections between the relay polarizer and the actuator unit on the aerial are given in AP115J-0100-1 Sect.6, Chap.14.

4. The connections between the transmitter/receiver and the alarm, monitor fire unit in the transmitter room are independent of all other interconnections and are given in Sect.10, Chap.4.

TABLE 1 CONNECTIONS TO EQUIPMENT IN THE TRANSMITTER BUILDING

|                                   | Transmitter termination panel 5J  | Destination       |                   | Service   |        |        |                      |       |         |
|-----------------------------------|---|-------------------|-------------------|---|--------|--------|----------------------|-------|---------|
|                                   |   | Unit              | Circuit reference |   |        |        |                      |       |         |
| U.K.                              | TB13/1B   | Air Drier Control | TB2/10            | Remote on from Tx<br>240V a.c. IN   |        |        |                      |       |         |
|                                   | 2B  | Moisture Meter    | SKB3              |   |        |        |                      |       |         |
|                                   | 3B  | Not used          |                   |   |        |        |                      |       |         |
|                                   | 4B  | Air Drier Control | TB2/9             | 'Tx ON' Interlock<br>Line<br>Dehumidifier Lamp (240V a.c.)<br>W.G. Air Drier Lamp (240V a.c.) |        |        |                      |       |         |
|                                   | 5B  |                   | TB2/8             |   |        |        |                      |       |         |
|                                   | 6B  |                   | TB1/4             |   |        |        |                      |       |         |
|                                   |   | 7B                | Moisture Meter    | SKB1  |        |        |                      |       |         |
|                                   |   | 8B                | Not used          |   |        |        |                      |       |         |
| U.K. and Overseas (Mod. CA8126/46 | <table border="0"> <tr><td rowspan="5">}</td><td>TB13/11</td></tr> <tr><td>TB13/12</td></tr> <tr><td>TB15/2</td></tr> <tr><td rowspan="2">TS16/4</td></tr> </table> | }                 | TB13/11           | TB13/12   | TB15/2 | TS16/4 | Air Conditioner Unit | TS3-6 | Neutral |
|                                   |   |                   | }                 | TB13/11   |        |        |                      |       |         |
|                                   |   |                   |                   | TB13/12   |        |        |                      |       |         |
|                                   |   |                   |                   | TB15/2  |        |        |                      |       |         |
|                                   |   |                   |                   | TS16/4  |        |        |                      |       |         |
| TS3-5                             | Interlocked neutral to unit 3M  |                   |                   |   |        |        |                      |       |         |
| TS3-1                             | +50V (2 min)  |                   |                   |   |        |        |                      |       |         |
| TS3-2                             | 50 return (earth)   |                   |                   |   |        |        |                      |       |         |
|                                   |   |                   |                   |   |        |        |                      |       |         |

**TABLE 1 Continued**

|          | Transmitter termination panel 5J | Destination              |                   | Service            |
|----------|----------------------------------|--------------------------|-------------------|--------------------|
|          |                                  | Unit                     | Circuit reference |                    |
| Overseas | TB13/1B                          | Moisture Meter           | SKB3              | 240V a.c. IN       |
|          | 2B                               | Compressor               | TB3/2             | Compressor Start   |
|          | 3B                               | Electrical               | —                 | —                  |
|          | 4B                               | Changeover               | TB3/4             | 'Tx ON' Interlock  |
|          | 5B                               | Switch                   | TB3/5             | 'Tx ON' Interlock  |
|          | 6B                               | Panel                    | TB3/6             | Dehumidifer Lamp   |
|          | 7B                               | Moisture Meter           | SKB1              |                    |
|          | 8B                               | Compressor s/w c/o Panel | TB3/8             | Compressor on Lamp |

**TABLE 2 CONNECTIONS TO SIGNAL PROCESSING EQUIPMENT**

| Transmitter termination panel 5J | Destination                       |   | Service                                      |
|----------------------------------|-----------------------------------|---|--|
|                                  | Unit                              | Circuit reference   |  |
| TB12/1B                          | Indicator rack, trigger panel     | TB10/1  | Power meter +ve                              |
| 2B                               |                                   | TB10/2  | Power meter -ve                              |
| 3B                               |                                   | TB11/7  | Power meter return                           |
| TB14/1B                          |                                   | TB10/3  | Switched 240V a.c. (TX ON switch return)     |
| 2B                               |                                   | TB12/6  | 50V input to WOBB switch                     |
| 3B                               |                                   | TB10/4  | Switched earth from the TX OFF switch        |
| 4B                               |                                   | TB10/5  | Switched line (remote H.T. RESET switch)     |
| 5B                               |                                   | TB10/6  |  |
| 6B                               |                                   | TB10/7  | Neutral (remote lamps common)                |
| 7B                               |                                   | TB10/8  | Switched 240V a.c. (POWER SUPPLIES lamp)     |
| 8B                               |                                   | TB10/9  | Switched 240V a.c. (MODULATOR HEATERS lamp)  |
| 9B                               |                                   | TB10/10   | Switched 240V a.c. (COMPRESSOR lamp)         |
| 10B                              | TB10/11                           | Switched 240V a.c. (MAGNET SUPPLY lamp)                   |  |
| 11B                              | TB10/12                           | Switched 240V a.c. (MAGNETRON READY lamp)                 |  |
| 12B                              | TB11/1                            | Switched 240V a.c. (TX AVAILABLE lamp) (and TX ON switch) |  |
| TB15/1B                          |                                   | TB11/2  | Switched 240V a.c. (TX ON lamp)              |
| 2B                               |                                   |   | See Table 1                                  |
| 3B                               |                                   | TB11/3  | Switched 240V a.c. (REGULATOR DOWN lamp)     |
| 4B                               |                                   | TB11/4  | Switched 240V a.c. (RUNNING DOWN lamp)       |
| 5B                               |                                   | TB11/5  | Switched 240V a.c. (RUNNING UP lamp)         |
| 6B                               |                                   | TB11/6  | Switched 240V a.c. (H.T. UP lamp)            |
| 7B                               |                                   | TB12/7  | Switched 240V a.c. (TRIP lamp)               |
| TB15/8B                          | Panel (control desk) left-hand M3 | PL4/B   | 50V (noise factor lamps common)              |
| 9B                               |                                   | PL4/O   | Switched 50V from CHECK NOISE FACTOR9 switch |
| 10B                              |                                   | PL4/C   | Switched 50V to TEST lamp                    |
| 11B                              |                                   | PL4/E   | Switched 50V to POOR lamp                    |
| 12B                              |                                   | PL4/D   | Switched 50V to GOOD lamp                    |

**TABLE 2 Continued**

| Transmitter termination panel 5J                            | Destination                   |  | Service  |  |   |
|---|-------------------------------|--|--|--|---|
|   | Unit                          | Circuit reference                              |  |  |   |
| TB16/1B }<br>2B }<br>3B }<br>4B }                           | Indicator rack, trigger panel | TB12/8 }<br>TB12/9 }<br>TB12/10 }<br>TB12/11 } | Switched +50V<br>Switched +50V to RLA (STALO ON TUNE)<br>Earth connection to RLA and TX OFF switch |  |   |
| TB16/5B }<br>6B }<br>7B }<br>8B }<br>9B }<br>10B }<br>11B } |                               | IF cabinet                                     | PLD8 }<br>PLD5 }<br>PLD6 }<br>PLD1 }<br>PLD2 }<br>PLD3 }<br>PLD4 }                                 | LIMIT LEVEL switch<br>Meter (go)<br>Meter (return)<br>LIMIT LEVEL control<br>A.J. LEVEL control<br>LINEAR LEVEL control<br>Common bias |   |
| TB16/12B  |                               |  | Indicator rack, trigger panel  | TB12/12  | Switched 50V (WOBB ON/OFF switch)         |
| SKTK  |                               |  | p.r.f. system (Distributor unit pulse)   | SKTD   | Selected - 8 $\mu$ s No.6 (trigger pulse) |
| SKTL }<br>SKTM }<br>SKTN }                                  | I.F. cabinet                  |  | SKA }<br>SKH }<br>SKJ }  | Lock pulse input<br>Linear i.f. signal input<br>A.J. i.f. signal input   |   |

**TABLE 3 CONNECTIONS TO RELAY POLARIZER UNIT**

| Relay polarizer termination | Destination                       |                               | Service   |
|-----------------------------|-----------------------------------|-------------------------------|---|
|                             | Unit                              | Circuit reference             |   |
| TB3/1                       | —                                 | —                             | 240V a.c. supply  |
| 2                           | Transmitter termination panel 5J  | TB14/2                        | 50V d.c. input  |
| TB3/3 }<br>TB4/1 }<br>2 }   | Panel (control desk) left-hand M3 | PL4/G }<br>PL4/H }<br>PL4/J } | Switched earth (select CIRCULAR or LINEAR)<br>Switched (CIRCULAR lamp)<br>Earth (LINEAR lamp) |
| TB4/3                       |                                   | —                             | Neutral   |