TECHNICAL INSTRUCTION
R.8

Power Supplies to Recording Areas

First Issue, March 1956

AMENDMENT RECORD

Amendment Sheet No.	*Initials*	*Date*	*Amendment Sheet No.*	*Initials*	*Date*
R.8-1	H. Phillips	14/7/60.			
R.8-2					
R.8-3					
R.8-4					
R.8-5					
R.8-6					
R.8-7					
R.8-8					
R.8-9					
R.8-10					
R.8-11					
R.8-12					
R.8-13					
R.8-14					
R.8-15					
R.8-16					
R.8-17					
R.8-18					
R.8-19					
R.8-20					

CONTENTS

CONTENTS (continued)

ILLUSTRATIONS IN THE TEXT

ILLUSTRATIONS AT THE END

POWER SUPPLIES TO RECORDING AREAS

SECTION 1

INTRODUCTION

1.1 MAINTAINED AND NON-MAINTAINED SUPPLIES

Under normal conditions the electrical power used in recording areas is drawn from the public supply mains, although at most BBC premises a standby diesel-driven alternator set is available to provide a supply to certain 'maintained' circuits in the event of mains failure. Usually the diesel set is self-starting* and commences to run up immediately upon the interruption of the public supply; if the interruption continues, after some ten to fifteen seconds, the set reaches the required speed and automatically takes over the 'maintained' load.

Wherever possible all technical circuits are fed from the maintained supply but, due to limitations in standby-set capacity, it is usually necessary to wire non-technical, or 'general service', outlets to the non-maintained supply.

1.2 CONTROLLED-FREQUENCY SUPPLIES

The frequency-accuracy of the public supply is usually adequate for recording purposes, except on occasion at times of peak load. The frequency-accuracy of the standby diesel-sets, on the other hand, may often be poor, and the voltage of both supplies is liable to variation. To overcome these difficulties, stabilised-frequency supply equipment with a good voltage regulation is installed at most recording centres for use when required. At the main London centres this equipment comprises a 12-kVA or 17·5-kVA frequency-stabilised motor-alternator set, and at the six main regional centres (also in London at Rothwell House) a 1-kW power-amplifier bay working from a 50-c/s fork drive.

To enable correction to be applied for speed errors in original recordings, a variable-frequency supply may also be required. A 40 to 60 c/s oscillator Type OS/13 is used with the 1-kW power bay in these circumstances instead of the fork drive.

At the main London centres, to enable a variable-frequency supply to be obtained in editing channels without interfering with the motor-alternator frequency, a 200-W power-amplifier bay is provided for use with the OS/13. The 200-W variable-frequency supply is intended to feed the drive motor and neon stroboscope lamp of a single BTR/2 magnetic-tape machine.

* Note that the diesel set at Broadcasting House, London, is *not* self-starting.

SECTION 2

DISTRIBUTION ARRANGEMENTS

2.1 General

In current installation practice, two different arrangements are adopted, one for general-service and one for technical supplies. General-service supplies are fed via non-technical isolators to 3-pin 5-amp B.S.S. switched sockets which are usually mounted at a level just above the microphone skirting. Technical supplies are routed in most instances via recording supply cabinets feeding a maintained supply to black sockets (and to signal-lamps and certain other circuits) and a choice of controlled or maintained supplies to white sockets. These black or white technical sockets are a 3-pin type made by Dorman and Smith and are used with plugs of which one pin is a fuse rated at 3, 7, or 13 amps as needed; the sockets are normally mounted at waist level. (Note: The voltage existing between the line connections to the black and the white sockets can vary between zero and approximately twice the phase voltage, this variation occurring at the difference frequency of the maintained and controlled supplies.)

In general, white sockets are used to supply recorder motors and associated stroboscopic lighting, whereas black sockets are used for feeding amplifiers and other non-rotating items. On BTR/2 machines, two power-supply cables are fitted, one taken to a white socket and the other to a black socket; the drive motor and stroboscope neon can be switched at the machine to either socket, but the spooling motors and amplifiers are connected permanently to the black socket to minimise the drain on the stabilised-frequency supply. On R.G.D machines the supply to the drive-motor and stroboscope neon is not wired separately, and the single mains cable is normally plugged to a white socket. On disk machines, the turntable motor is fed from a white socket and the suction motor from a black socket; to ensure correct stroboscopic indication, the fluorescent overhead lighting is fed from a ceiling socket wired in parallel with the white socket providing the turntable-motor supply.

Where a power-supply amplifier bay is installed, the bay output is brought out via a cable terminating in a 3-pin Niphan 450A (female) cable-grip entry connector, which engages with a corresponding wall-mounted connector. Where a 1-kW power bay is concerned, the wall connector is wired to the controlled-frequency supply circuits in the area. Where a 200-W power bay is concerned, if this bay provides the only controlled supply available, the wall connector is wired in the same manner as that from a 1-kW bay; otherwise it is wired directly to a suitably labelled white socket. (With a 200-W bay the output of which is available at a number of sockets, care must be exercised to avoid an overload.)

Most installations include a frequency meter, which is provided with fuses and is capable of being switched to any available supply.

2.2 Recording Supply Cabinets

Six types of recording supply cabinet are in use:

Cabinet RSC/1
Cabinet RSC/1A
Cabinet RSC/2
Cabinet RSC/2A
Cabinet RSC/2B
Cabinet RSC/3

2.2.1 Cabinet RSC/1 (Figs. 1 and 2.1)

The RSC/1 is the cabinet used in standard recording channels. It has two inputs controlled by a change-over-and-isolating switch and three outputs via individual miniature circuit-breakers.

The inputs are:

1. Maintained supply,
2. Controlled supply, from
   (a) E.D.C. set, or
   (b) 1-kW power bay (with 50-c/s fork or OS/13), or
   (c) 200-W power bay (with OS/13 only).

The outputs are:

1. Ring-main feed to black sockets via 30-amp (instantaneous) circuit-breaker.
2. Ring-main feed to white sockets via 10-amp (instantaneous) circuit-breaker.
3. Feed to signal-lamps via 2·5-amp (instantaneous) circuit-breaker.

NOTE: The current ratings of these circuit-breakers may occasionally have to be varied to suit local conditions.

The circuit-breakers are mounted behind a door in the left-hand half of the cabinet, which also houses a set of spare D. and S. fuses. The right-hand half comprises an entry-box for cables carrying incoming supplies; these cables are terminated at the change-over-and-isolating switch already mentioned, also mounted in this half of the cabinet which, in addition, carries a neon indicator-lamp connected across the incoming controlled supply. Since the cable terminations are always live so long as supplies are incoming, an insulating safety-cover is fitted; in front of this is an engraved steel panel, through which protrude the switch-shaft with control-knob and also the neon. The

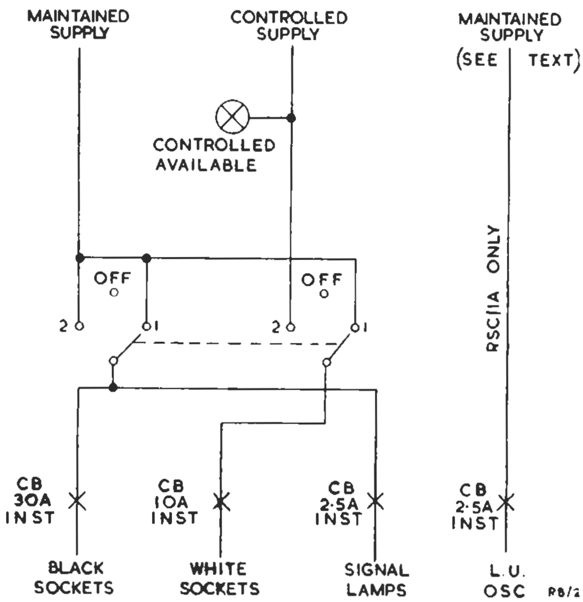


FIG. 2.1 RECORDING SUPPLY CABINETS RSC/1 AND RSC/1A: SCHEMATIC DIAGRAM

switch has three conditions, *1*, *2* and *Off*. Under condition *1* all three outputs are fed from the maintained supply, whereas under condition *2* the white sockets are fed from the controlled supply and the black sockets and signal-lamps from the maintained supply; in the *Off* condition of the switch, the left-hand half of the cabinet becomes completely dead, as it is disconnected from both incoming supplies.

2.2.2 CABINET RSC/1A (FIGS. 2.1 AND 2.2)

This is similar to the RSC/1, but with an extra 2·5 amp instantaneous rating circuit-breaker providing a maintained supply to a D. and S. socket for a line-up tone oscillator. Where the RSC/1A is installed in an ordinary channel, the connection of this circuit-breaker to the maintained supply is made within the cabinet on the line side of the isolator, but where the RSC/1A is installed in a central room the connection is made on the line side of the isolator of an RSC/2 (q.v.) feeding the RSC/1A.

2.2.3 CABINET RSC/2 (FIG. 1)

The RSC/2 is used in central rooms to feed a number of other cabinets. It has two inputs via an isolating-switch and four outputs via circuit-breakers. There is no indicator-lamp on the controlled supply.

The inputs are:

1. Maintained supply.
2. Controlled supply from E.D.C. set.

The outputs are:

1. Feed of maintained supply to other cabinets via 30-amp (delayed) circuit-breaker.
2. Feed of controlled supply to other cabinets via 10-amp (delayed) circuit-breaker.
3. Feed of maintained supply to signal-lamps via 2·5-amp (instantaneous) circuit-breaker.
4. Feed of maintained supply to line-up tone oscillator via 2·5-amp (instantaneous) circuit-breaker (and possibly via a further R.S.C.).

The cabinet differs from the RSC/1 and RSC/1A in that no input change-over arrangements are provided, the isolator having an *On* and an *Off* condition only. As usual, the feed to the line-up tone oscillator is taken from the live side of the supply

2.2.4 CABINET RSC/2A

The RSC/2A is used in S.R.E.'s offices in which there is an RCT/51 bay with OS/10. It may take its inputs either direct or via another cabinet, corresponding in this respect to the RSC/1A. Apart from differences in circuit-breaker ratings, the cabinet is otherwise identical with the RSC/2. It has a simple *On-Off* isolator, and there is no neon indicator for the controlled supply.

The inputs are:

1. Maintained supply, direct or via RSC/2.
2. Controlled supply, direct from E.D.C set or via RSC/2.

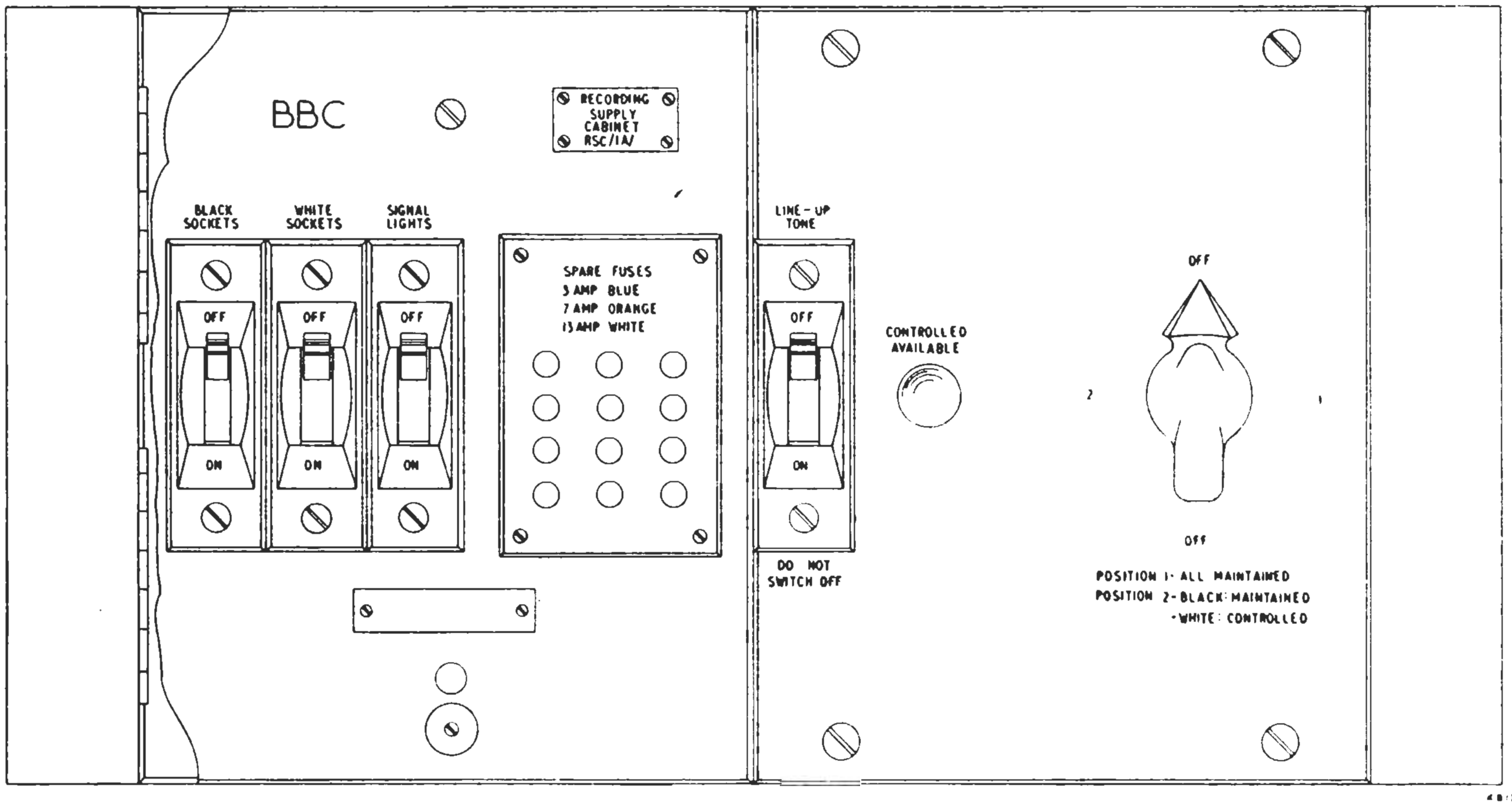


FIG. 2.2 RECORDING SUPPLY CABINET RSC/1A: GENERAL VIEW WITH LEFT-HAND DOOR REMOVED

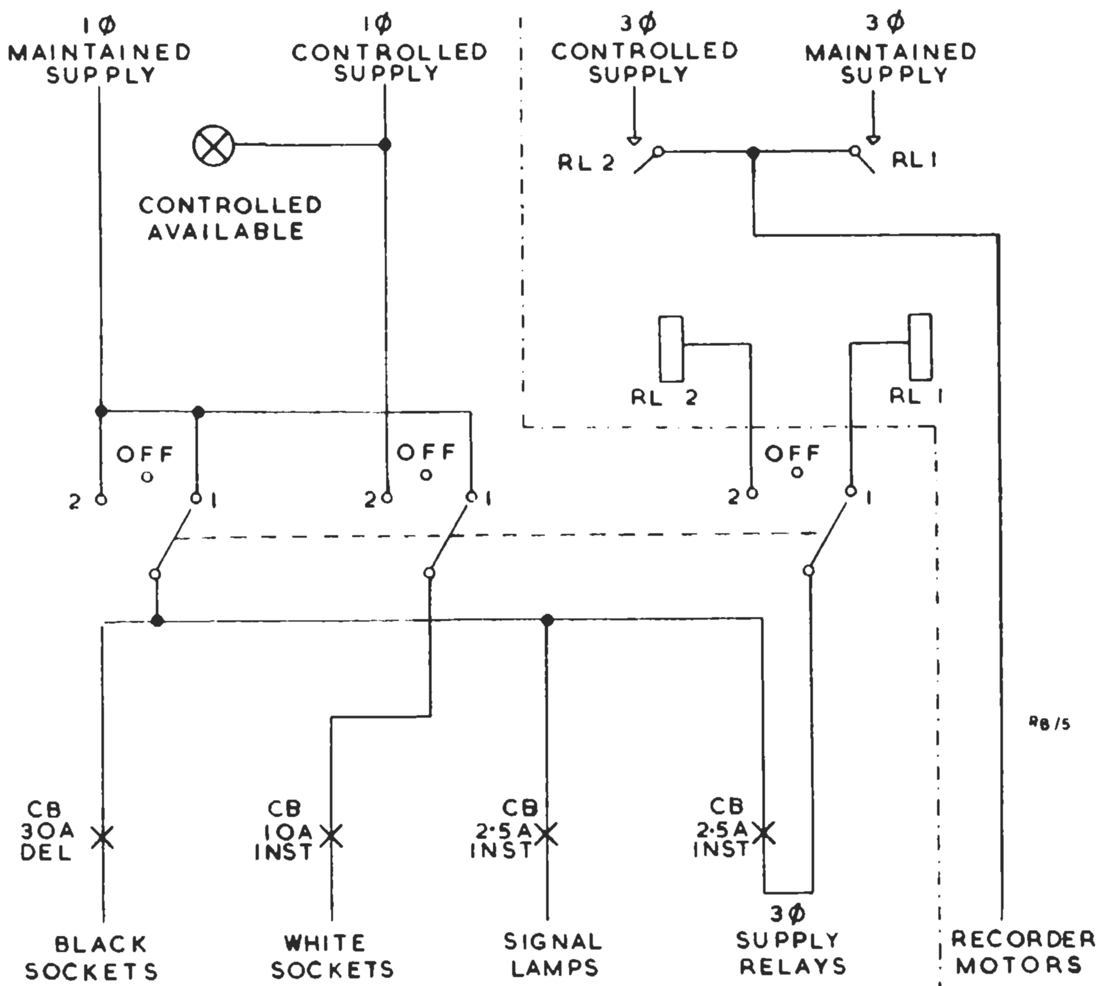


FIG. 2.3 RECORDING SUPPLY CABINET RSC/3 AND ASSOCIATED RELAY BOX: SCHEMATIC DIAGRAM

The outputs are:

1. Ring-main feed to black sockets of maintained supply via 5-amp (instantaneous) circuit-breaker.
2. Ring-main feed to white sockets of controlled supply via 2·5-amp (instantaneous) circuit-breaker.
3. Feed to signal-lamps of maintained supply via 2·5-amp (instantaneous) circuit-breaker.
4. Feed to line-up tone oscillator socket of maintained supply via 2·5-amp (instantaneous) circuit-breaker.

2.2.5 Cabinet RSC/2B

The RSC/2B is used in the cubicles of central recording and reproducing rooms. This cabinet differs from the RSC/2 only in the absence of a line-up tone circuit-breaker.

2.2.6 Cabinet RSC/3 (Fig. 2.3)

The RSC/3 is used in tape-editing rooms in which there is also a Type-D disk recorder, and where provision must therefore be made for changing over both single-phase and three-phase circuits from the maintained to the controlled supply.

The cabinet has two inputs controlled by a change-over-and-isolating switch and four outputs via miniature circuit-breakers.

The inputs are:

1. Single-phase maintained supply, and
2. Single-phase controlled supply (with a neon indicator across it).

The outputs are:

1. Ring-main feed to black sockets (including Type-D recorder suction plant) via 30-amp (delayed) circuit-breaker.
2. Ring-main feed to white sockets via 10-amp (instantaneous) circuit-breaker.
3. Feed to signal-lamps via 2·5 amp (instantaneous) circuit-breaker.
4. Feed via 2·5-amp (instantaneous) circuit-breaker to separately housed selecting relays controlling the three-phase supply.

The change-over-and-isolating switch has three conditions, *1*, *2* and *Off*. Under condition *1* the black sockets, white sockets and signal-lamps are fed from the single-phase maintained supply, which also energises the *maintained three-phase supply* selecting relay so that the recorder motors are fed from this supply. Under condition *2* the black sockets and signal-lamps continue to be fed from the single-phase maintained supply, but the white sockets are fed from the single-phase controlled supply; the *controlled three-phase supply* selecting relay is now energised (from the single-phase maintained supply), so that the recorder motors receive a controlled supply.

In Fig. 2.3 this arrangement is shown by a schematic diagram. Note that the circuits drawn to the left of the chain line are in the RSC/3, while those to the right are in a separate relay box.

2.3 Numbering of Technical Outlets

Each R.S.C. or other technical isolator bears a number (inside the door, on an R.S.C.) and the circuit-breakers in the individual cabinets are also allocated numbers (from left to right); the ring-main outlets fed through each circuit-breaker are given further numbers. Thus, if circuit-breaker No. 2 in cabinet No. 78 feeds two outlets, these will be labelled 78/2/1 and 78/2/2.

SECTION 3

MUIRHEAD VALVE-MAINTAINED FORK

3.1 General Description

This Muirhead instrument (Type D–418–D) is slightly modified for BBC use and is mounted on the 1-kW power bay. It is mains-operated from a 200/250-volt 50-c/s (nominal) supply and generates an accurate 50-c/s frequency. The instrument has an output impedance of 180 ohms and normally delivers zero level into a 2·4-kilohm load presented by the input impedance of the bay.

The apparatus is built on to a 19-in. panel. The main level control, output voltmeter and on-off switch are at the front, and the input and output connectors and a pre-set control at the rear. Turning the pre-set control clockwise increases the fork amplitude and decreases the frequency slightly; the range of frequency adjustment thus provided is, however, so small that for normal purposes it can be ignored.

In the instrument as originally designed, the output voltage was variable between 150 and 250 volts into a 20-kilohm load. For BBC use, a loss-pad has been added to the output circuit, such that for a meter reading of 200 volts, the output is at zero level with a load impedance of 2·4 kilohms. The gain control has also been altered to prevent the output from being much increased beyond that represented by the 200-volt reading on the meter.

3.2 Circuit Description (Fig. 2)

V1 and V2 form an oscillator-amplifier with positive feedback from V2 cathode to V1 grid via the tangs of the fork, which are the mechanical equivalent of a tuned coupling circuit in which the resonance frequency falls slightly as signal amplitude increases. The maximum signal on V2 anode, and consequently the vibration amplitude and frequency, is controlled by rectifier V3, with its cathode connected to a point on R17 in the potential-divider chain across neon stabiliser V4. If the amplitude set by R17 is exceeded, V3 conducts during a part of the positive half-cycle of V2 anode, thus preventing energy from being supplied to the fork, and limiting the amplitude of its motion. V5 is a buffer stage with its input taken from V2 cathode circuit. R22 is the main volume control. V6 and V7 are amplifying stages.

The built-in mains unit, embodying V8, is shown at the bottom of the diagram.

3.3 Valve Data

Stage	*Type*
V1	EF37A
V2	EF37
V3	EA50
V4	4313
V5	L63
V6	SP61
V7	6L6G
V8	5Z4

Power Supply

Mains supply: 200–250 volts, 50 c/s. a.c. (nominal)

3.4 General Data

Impedances

Output $Z = 180\ \Omega$

Normal load $Z = 2{\cdot}4\ \mathrm{k}\Omega$ (1-kW bay)

Output Frequency

Nominal frequency: 50 c/s.

Stability: $\pm$ 50 parts in 10^6.

Range of adjustment is of same order as stability.

Test Output Level

Zero level into 2·4 kΩ with voltmeter reading 200.

A 10% change in supply voltage causes a level change of not more than 1 db.

Total Percentage Harmonic Distortion

TR2 loaded with 20 kΩ only. Voltmeter reading 200 volts.

Distortion: 6% approximately.

SECTION 4

OSCILLATOR OS/13

4.1 General Description

The OS/13 is an RC oscillator of the Wien-bridge type. It has a 600-ohm source impedance and delivers zero-level output if connected to a 600-ohm load. The range of frequency adjustment is from 40 to 60 c/s approximately, and the oscillator is used with a 200-W or 1-kW power bay to provide a variable-frequency supply for operating magnetic-tape equipment. The instrument is normally mounted in a tape-linking console of the Type-A or D series.

4.2 Circuit Description (Fig. 3)

The two sections of V1 form an oscillator-amplifier which operates on similar principles to the PTS/16 (Instructions S.4), the frequency adjustment being obtained by varying the setting of the ganged capacitors C1A and C1B. V2A and V2B provide a push-pull output stage like that of the GPA/4 and 4A and the LIM/5 (Instruction S.3). The coupling between V1B and V2A is via potential divider R8–R9, which prevents overloading of V2A grid, while permitting adequate amplitude of oscillation in the first two stages to allow the thermistor TH1 to exercise proper control. Negative voltage feedback from a tertiary winding of output transformer TR1 is applied to V2A input in series with R9.

A built-in mains unit is provided, embodying transformer TR2 and rectifiers MR1 and MR2. The h.t. supply to V2 has choke-capacitance smoothing, and there is additional RC smoothing for V1 h.t. supply.

4.3 Valve Data

Valve	*Stage*	*Anode Current mA*	*Heater Volts*	*Heater Amps*
CV455	V1A	1·2 ± 15%	6·0	0·3
	V1B	5·6 ± 15%	6·0	0·3
CV455	V2A	7·8 ± 10%	6·0	0·3
	V2B	7·8 ± 10%	6·0	0·3

Note: V2A and V2B anode currents should not differ by more than 3 per cent.

Power Supplies

Mains supply: 205–250 volts, 50 c/s nominal.

H.T. supply: 280 ± 15 volts.

L.T. supply: 6·0 ± 0·15 volts.

Note: The tolerances given for h.t. and l.t. voltages and for valve feeds apply when the a.c. supply voltage is accurately suited to the transformer tap in use.

4.4 General Data

Frequency Range

38 ± 1 c/s to 62 ± 1 c/s.

Output Level

Zero ± 1·5 db into 600 Ω.

Output Impedance

600 Ω ± 10%, measured by resistance substitution at about mid-scale frequency.

Thermistor

The alternating current through the thermistor should be between 2·0 and 2·5 mA.

4.5 Performance

Waveform

The output waveform when viewed on an oscilloscope should appear sinusoidal.

Locking

There should be no tendency to lock with mains frequency, even when the oscillator frequency is set very close to that of the mains. To check on this point, a 1 : 1 Lissajou figure should be obtained on an oscilloscope by applying the oscillator output and the mains frequency to the two pairs of plates. By varying the oscillator frequency, it should be possible to take the figure *gradually* through the stationary condition.

Warming Up

Both frequency and output level fall slowly for about half-an-hour after switching on, to the extent of some 3% for frequency and 0·7 db for level. The subsequent drift is negligibly small.

Calibration

The frequency scale is calibrated at 1-c/s intervals from 40 to 60 c/s. The accuracy of calibration at 40, 45, 50, 55 and 60 c/s is within 0·2 c/s.

SECTION 5

E.M.I. 200-W POWER BAY

5.1 General Description

This bay is a modified E.M.I. public-address amplifier Type PA149E. It is used in tape-editing channels to provide a controlled supply for the drive motor and stroboscope lamp of a single BTR/2 machine. The controlled-frequency input to the bay is normally taken from an OS/13 oscillator, and the output appears at a white wall-socket, which is suitably labelled.

The bay carries two separate units, an upper unit comprising voltage-gain and driver stages (which are together termed the 'driver amplifier') and a lower unit comprising a power-output stage. Each unit has its own power supplies. The valves for each ~~unit~~ are mounted on a deck at the front and are protected by guard rails.

On the front of the valve-deck of the driver unit are fitted a milliameter, a brilliance control (not used), a meter change-over switch, a gain control and a feed-metering switch.

The power amplifier has separate rectifiers for grid-bias and for h.t. supplies, and incorporates an automatic delay circuit which operates whenever the mains voltage is removed and re-applied. On the front of the valve-deck are two independent bias controls intended for adjusting the quiescent anode currents of the two output valves.

A mains switch is fitted at the top left-hand corner of the front of the bay. Usually a frequency meter is mounted above the driver unit; this meter, where provided, is capable of being switched to any available technical power supply.

5.2 Circuit Description (Fig. 4)

The driver-amplifier unit comprises the three stages embodying V1 to V5, together with h.t. rectifying valve V6. The power-amplifier unit comprises the output stage V7–V8, together with delay valve V9, grid-bias rectifier V10 and h.t. rectifiers V11–V12.

The input to V1 is via level control VR1. V1 is coupled via the shunt-fed transformer TR2 to the second stage V2–V3.VR3 in series with C4 across TR2 secondary winding provided the now superfluous *Brilliance* control. The second stage is conventionally coupled to the driver stage V4–V5 via TR3. The driver stage is transformer coupled through the cathode circuits to the power stage, which operates in class AB. Individual grid-bias adjustment for V7 and V8 is provided by VR4 and VR5. The two transformers TR6 and TR10 in cascade provide an output at the required supply voltage, which is 230 or 240 volts in most instances. To ensure a suitably low output impedance, voltage negative feedback from TR6 secondary is applied to the anode circuit of V1.

The meter change-over switch, SW2, allows the meter M1 to be connected across the output as a check on the voltage obtained, or alternatively to be used in conjunction with selector-switch SW1 for measuring the valve feeds.

5.3 Delayed H.T. Switching (Fig. 4)

The system of delayed h.t. switching provided for the power stage depends on d.c.-operated relay RL1, which is energised via delay valve V9; the valve contains a bimetal strip that closes a contact when heated by a filament for a sufficient time, the period of delay being variable according to the setting of V9 filament resistor, VR6. The delay circuit operates every time the mains supply is interrupted and restored, whether due to normal switching or as the result of a mains fault; in addition, the grid-bias arrangements for the power stage are so interlinked with the h.t. delay system that a bias failure also causes disconnection of the h.t. supply.

As soon as the mains switch is made, TR7 (supplying V11–V12 filaments) has power applied, but the h.t. transformer TR8 remains disconnected since springs 1–6 and 5–10 of RL1 are not in contact. V9 filament circuit is completed via TR9, VR6, RL1 springs 4–8 and earth.

After a delay period determined by the setting of V9 filament resistor VR6, V9 'makes'. RL1 winding is now energised by V7–V8 bias supply from V10 via L3, L2, R22, RL1, V9 and earth.

RL1 operates, and springs 6 and 10 make with 1 and 5, thus putting mains on to TR8 and completing the h.t. supply circuit from V11–V12 to

V7–V8. Spring 8 breaks from 4 and makes with 3, removing V9 filament supply and holding RL1 operated. V9 cools down and its contact opens, but RL1 continues to hold in so long as the mains supply is maintained, although any interruption of the mains (or a final-stage bias failure) causes the relay to release and cut off the h.t. supply; even when the interruption is only momentary, the h.t. supply is not restored until the delay cycle has been completed again.

5.4 Lining-up Procedure

i. Turn the gain control to zero, switch on the mains supply and wait until the h.t. delay circuit has operated and the anode feeds of V7 and V8 have reached stability.
ii. Adjust V7 and V8 bias controls to obtain a standing feed of 50 mA d.c. on each valve.
iii. Switch on the OS/13, in order to provide an input for the bay.
iv. Switch the built-in meter across the bay output, and fade up the gain until the meter pointer arrives opposite the red mark on the scale.
v. Load the bay output by switching one of the BTR/2 machines in the channel to reproduction and supplying its constant-speed motor from the bay.
vi. Re-adjust the gain to bring the meter pointer opposite the red mark again.

5.5 Conditioning of GU50 H.T. Rectifying Valves

The following procedure for the conditioning of the GU50 h.t. rectifying valves V11 and V12 should be carried out when the power bay is first installed and whenever new GU50 valves are fitted. The procedure is also advisable before bringing the equipment into use after it has been out of service for any length of time.

i. With the mains supply off, turn the gain control to zero.
ii. Remove the DLS10 delay valve V9, switch on the mains, and wait for 15 minutes to allow the GU50 valves V11 and V12 to warm up.
iii. Switch off the mains and replace V9. Then switch on again.
iv. The bay may now be brought into normal service.

Note: Certain models of the equipment employ hard-vacuum rectifying valves Type U19/23 in place of the mercury-vapour valves, Type GU50. Where the hard-vacuum valves are fitted, the conditioning procedure is not necessary.

5.6 Calibration of Output-metering Circuit

The following procedure is normally carried out at the time of installation, and need only be repeated if the calibration requires alteration or becomes disturbed.

i. Switch off the OS/13 oscillator providing the drive to the power bay.
ii. Adjust the feeds of V7 and V8 to 50 mA each.
iii. Connect an external voltmeter across the bay output, and switch on the OS/13.
iv. Increase the amplifier gain-control setting until the external meter registers the voltage required (e.g. 230 volts) on load. The correct load conditions should be obtained by switching one of the BTR/2 machines in the channel to reproduction and supplying its constant-speed motor from the amplifier.
v. Switch the internal meter across the output of the bay and adjust the 10-kilohm pre-set potentiometer VR7, which can be reached by opening the front cover of the upper deck after undoing four screws. VR7 should be adjusted until the meter pointer rests opposite the red mark at the centre of the scale. The front cover of the upper deck should then be restored.

5.7 Valve Data

Valve	*Type*	*Anode Volts*	*Anode Current mA*	*Bias Volts*
V1	MHL4	90	3·0–4·0	3·5
V2–V3	ML4	300	15–20	14
V4–V5	PX25	500	57–63	40
V7–V8	DA100	1,100*	50*	140–170
		1,050†	150†	

* Quiescent † Full output

Rectifiers Etc.
Driver h.t., V6: U18.
Thermal delay, V9: DLS10.
Output grid bias, V10: MU14.
Main h.t., V11–V12: GU50 (mercury vapour) or U19/23 (hard vacuum).

Power Supply
Mains supply: 200–250 volts, 50 c/s a.c.
Consumption: 580 VA quiescent or 750 VA at full output.

5.8 General Data

Impedances

Normal source	$Z = 600\ \Omega$ (OS/13)
Input	$Z = 50\ k\Omega$
Output	$Z = 35\ \Omega$ approx.
Normal Load	$Z = 600\ \Omega$ approx. (BTR/2 drive motor)

Driving Voltage
1·55 volts r.m.s. (equivalent to +6 db from 600-Ω source (i.e.OS/13) lined up to deliver 0 db into 600-Ω load).

Output Voltage
200–250 volts r.m.s.

SECTION 6

BRYAN SAVAGE 1-kW POWER BAY

6.1 General Description

This bay is a modified Bryan Savage public-address amplifier. It is intended for use in the regions and at smaller London centres to provide a controlled supply to operate a complete channel normally comprising a pair of BTR/2 machines. The controlled-frequency input to the bay may be taken either from a 50-c/s fork or from an OS/13 oscillator as required, the change-over switching arrangements being shown in Fig. 6.1. The OS/13 delivers zero level into 600 ohms, while the 50-c/s fork is lined up to deliver zero level into 2·4 kilohms, so there should be no difference in level on switching from one to the other. The output from the bay is normally wired to white wall-sockets via an R.S.C.

The bay (Fig. 6.2) carries the following apparatus starting from the top:

- Voltage amplifier V1–V6
- Control panel
- Muirhead fork unit
- Meter panel
- Output valves V7–V8, delay valve V13, subsidiary rectifiers V14–V16
- Mains-switching panel
- Main-h.t. rectifiers V9–V12

The control panel is shown in the diagram slightly below its correct position to avoid masking the lower portion of the voltage amplifier.

The meters and main controls are mounted on steel panels bolted to the front of the bay; further panels, giving access to the valves, are held in place by snap fasteners. The two output valves are carried in floating sockets fitted with screws to grip the valve pins.

WARNING: The back cover of the bay can be removed without switching off the main 2,670-volt H.T. supply.

6.2 Circuit Description (Fig. 5)

6.2.1 General

The circuit comprises four push-pull amplifying stages, RC-coupled, with input and output transformers. The main-gain control R1 follows the input transformer TR1. The output stage, V7 and V8, is operated in class AB2 and feeds into a BBC-designed transformer TR2, which provides 200–250 volts on its secondary side. The output-level meter M4 (see inset sketch) is connected across TR2 secondary winding; the meter calibration is adjusted by R53.

Negative feedback, producing a gain-reduction of about 30 db, is applied between the anodes of the output stage and the opposite cathodes of the pre-drive stage, i.e., from V7 to V4 and from V8 to V3. A feedback balance adjustment is provided by R54.

6.2.2 H.T. Supply Circuits

The h.t. supply for V1–V4 is provided by V14. The anodes of V5 and V6 are directly coupled to the grids of V7 and V8, which require a negative bias, and for this reason it is necessary to operate V5 and V6 with their anodes at a negative voltage with respect to earth; the cathode circuit of the stage receives a supply at 510 volts negative from V15 and V16 in parallel.

The h.t. supply system for V7 and V8 comprises a full-wave bridge of mercury rectifiers, V9 to V12. Rectifier protection is provided by an electronic delay and contactor system, which also protects the output stage against bias faults. On interruption of the mains, the amplifier is shut down instantaneously, and when the mains supply is restored, the h.t. is re-connected after some 90-seconds delay; this arrangement protects the mercury-vapour rectifiers from damage by ensuring that they alway have time to warm up before they are placed on load. If V5 and V6 become unbalanced, or if either valve should fail, the h.t. supply circuit to V7 and V8 is broken, thus safeguarding these valves against damage due to insufficient or zero grid bias. See Section 6.3.

Further protection for the bay is provided in the form of two overload circuit-breakers, one (mounted at the rear) on the mains input and the other (mounted at the front) on the output circuit.

A separate feed meter is provided in the cathode circuit of each output valve, and all other valve circuits can be monitored by a switched meter. The circuit positions of the meters are shown in Fig. 5, and their location on the bay is indicated in Fig. 6.2.

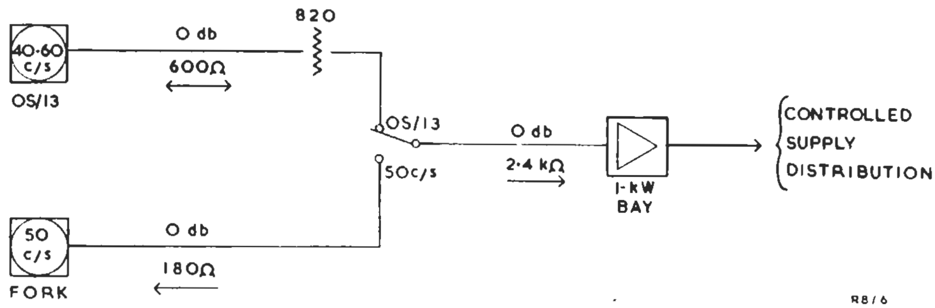


Fig. 6.1 Input Change-over Arrangements for 1-kW Power Bay

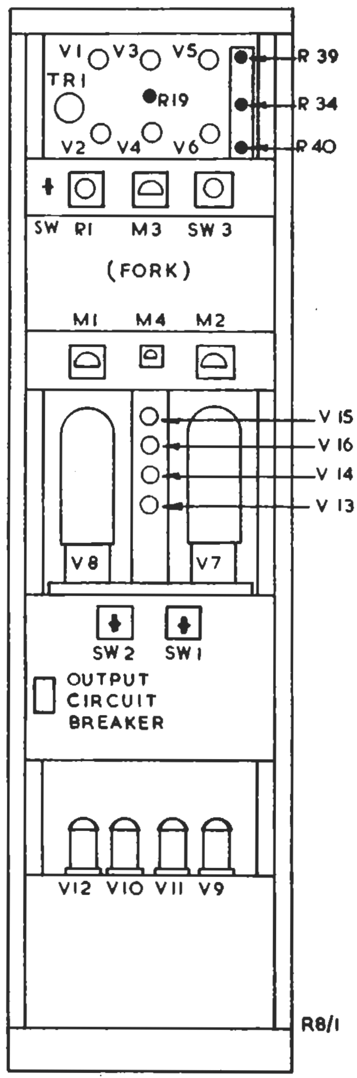


Fig. 6.2 Layout of 1-kW Power Bay

6.3 H.T. Switching and Protection Circuits

When mains switch SW1 is closed, the main h.t. contactor controlling the supply to TR3 remains open, but TR4, TR5 and TR6 are energised immediately. The l.t. supply for all valves is provided at once, and the negative h.t. supply becomes available as soon as V15 and V16 have warmed up; grid bias for V7 and V8 is then applied via V5 and V6 anodes as previously stated. Subsidiary contacts A and B on the main h.t. contactor prevent V14 from supplying h.t. to V1–V4.

The anode circuits of V5 and V6 are connected to earth (h.t. positive) via L1, R37–R40, the B-relay windings, contact B–1, R34 and R35. V5 and V6 anode feeds flowing through R34 and R35 thus make the junction of R34 and B–1 negative, and this negative potential is applied via relay A and R45 to the cathode of the delay valve V13, which has its anode circuit earthed via contact B–2. V13 passes limited anode current at first while capacitor C15 is charging via R46 and A–1, but by the end of the 90-second delay period the increasing charge on this capacitor makes V13 grid voltage sufficiently positive to drive the valve to maximum anode current, so operating relay A.

When relay A operates, contact A–1 changes over and contact A–2 closes. A–1 discharges C15 via R44 in preparation for the next delay cycle. A–2 powers the main h.t. contactor. When this contactor operates, contacts A and B in V14 cathode circuit are bridged, and thus complete the h.t. supply circuit of V1–V4. The contactor further connects TR6 output to the primary of TR3, the transformer supplying the bridge of rectifiers V9–V12; these rectifiers now provide V7 and V8 with their 2,670-volt h.t. supply. If the mains supply should later fail, the contactor opens immediately, and when the supply is restored the sequence of operations begins again. The length of the delay cycle—of the order of 90 seconds—will be increased somewhat if the mains supply is not restored immediately, since V13 heater will then have time to cool down.

If V5 or V6 fails, the balance of the currents in the two windings of relay B is destroyed, and the relay operates. Contact B–1 opens and places R36 in the h.t. supply circuit of the valves in series with the windings; the result is to reduce the anode volts on V5 and V6 immediately, thus driving the grids of the output valves more negative and reducing their anode currents. B–2 opens and breaks the anode circuit of V13, and relay A therefore releases, but due to the effects of h.t. smoothing capacitance, an appreciable delay occurs before the main-h.t. contactor subsequently opens; it is this unwanted delay that makes it necessary to provide the additional protection afforded by contact B–1. If any serious degree of unbalance occurs between V5 and V6, the result is the same as a total failure of either of these valves.

Further protection for the h.t. supply circuits is given by various fuses shown in Fig. 5.

6.4 Lining-up Procedure

The controls required for normal line-up purposes are all at the front of the bay, and their respective positions are shown on Fig. 6.2. The lining-up procedure is as follows:

i. Set gain control R1 to 0.
ii. Close mains switch SW1.
iii. Set valve-current check switch SW3 to positions 5 and 6 in turn and wait until the pointer of meter M3 comes to rest within the red band on the scale. If necessary, adjust the balance of V5 and V6 by means of R54.
iv. Set h.t. switch SW2 to LOCAL, and wait until V7 and V8 feed-meters M1 and M2 indicate that the main h.t. is on.
v. If M1 and M2 do not both settle down to a reading of 60 mA, adjust R39 to alter V7 feed (indicated by M1) or R40 to alter V8 feed (indicated by M2). If necessary, adjust R34, which affects both valve feeds simultaneously.
vi. Set valve-current check switch to positions 1 to 4 in turn, and in each instance check that the pointer of meter M3 comes to rest within the red band on the scale. The feeds of V1 and V2 (positions 1 and 2) cannot be adjusted, but those of V3 and V4 (positions 3 and 4) are adjustable by means of R19.
vii. Select the required input, either *50 c/s* or *OS/13*, by means of the switch to the left of R1.
viii. Fade up R1 until the pointer of output-level meter M4 arrives opposite the right-hand end of the red band on the scale.

NOTE: The gain control R1 should always be set to 0 before switching over from *50 c/s* to *OS/13*. This is to avoid the risk of an excessive output voltage being produced due to a possible difference of input levels, as could happen, for example, if the gain control of the fork unit should happen to be disturbed.

6.5 Valve Replacements

6.5.1 Feedback Adjustments to V3 and V4

If either V3 or V4 is replaced, the feedback conditions may be disturbed. To balance the feedback to these valves, proceed as follows:

i. First make sure that the mains supply is switched off at SW1 (Fig. 6.2).
ii. Remove the back cover of the bay.
iii. Turn R1 to 0 and connect to the output terminals a valve-voltmeter with a full-scale deflection of about a quarter of a volt.
iv. Switch on the mains and wait until the h.t. delay circuit has operated.
v. Remembering that there is now a voltage of 2,670 volts d.c. on various internal components, insert an insulated-handled, long-shanked grub screwdriver into the hole in the centre of the bakelite cover of the feedback resistors and engage the slotted spindle of potentiometer R54.
vi. Adjust R54 for a minimum reading on the valve-voltmeter. To be satisfactory, this adjustment must be carried out slowly.

The provisions of Section 2.5 of BBC Safety Regulations must always be observed.

6.5.2 Alternative Valve Types for V5 and V6

If necessary, valves Type KT66 may be used instead of Type EL37 for V5 and V6. To obtain a satisfactory balance, it is necessary to fit two valves of the same type.

6.5.3 Replacement of Output Valves V7 and V8

First make sure that the mains supply is switched off. Then remove the protective grill on the front of the bay, loosen the set-screws securing the pins of the valve to be replaced, and withdraw the valve. Insert the new valve, coaxing the pins into the floating sockets, which will move to the appropriate positions to allow the valve pins to enter to their full extent.

6.5.4 Conditioning of Main H.T. Rectifying Valves V9 to V12

When new RG1 240A rectifying valves are fitted, they should be left with an *l.t. supply only* for half-an-hour to allow all mercury to evaporate from the filaments before h.t. is applied.

6.6 Calibration of Output-Level Meter

This operation is normally carried out by P. and I.D. at the time of installation. The procedure is to remove the back cover of the bay and to adjust R53 until, with an output voltage (as measured by an external meter) equal to that of the normal mains supply, the pointer of the bay output-level meter M4 is opposite the right-hand end of the red band on the scale.

Care should be taken to avoid contact with other internal components, some of which are at 2,670 volts d.c.

The mains must be switched off while the back cover is being removed and replaced and the provisions of Section 2.5 of BBC Safety Regulations must always be observed.

6.7 General Data

Mains Supply
200–250 V, 50 c/s a.c.

Impedances

Normal source	$Z = 180\ \Omega$ (fork) or $600\ \Omega$ (OS/13)
Input	$Z = 2{\cdot}4\ \mathrm{k}\ \Omega$
Output	$Z = 15\text{–}20\ \Omega$

Normal Driving Voltage
0·775 V r.m.s.

Output Voltage
200–250 V r.m.s.

6.8 Test Data

Output Power (with BBC modifications)
800 W minimum (i.e., 240 V, 3·48 A (min.) into 66 Ω (max.)).

The available gain should be such that this output power can be delivered for an input of not more than 0·3 V.

Voltage Regulation

With input adjusted to give a no-load output voltage of 230 V, the output voltage should not fall by more than 12% on connection of the normal load.

Mains Interference

On full-load output, the amplitude of beats between the mains and a signal differing from mains frequency by 1 c/s should not exceed plus and minus 1 V.

Frequency Response

With output of 800 W and 230 V.

c/s	*db*
40	−0·3
50	0
60	+0·3

SECTION 7

E.D.C. FREQUENCY-STABILISED MOTOR-ALTERNATOR SET

7.1 Introduction

A frequency-stabilised motor-alternator set as described in Section 7.2 is installed at each of the four main London centres. Brief operating instructions for the sets at Broadcasting House, Bush House and 200 Oxford Street are given in Section 7.3 and a control schematic is given in Fig. 6; for additional details the maker's handbooks should be consulted. Brief instructions for operating the set at Maida Vale are given in Section 7.4; for further information regarding this equipment reference must be made to the station diagrams and instructions provided by Planning and Installation Department.

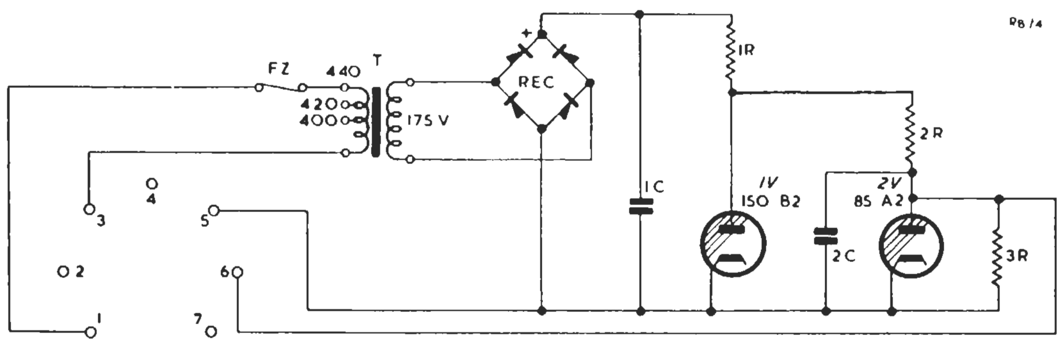


Fig. 7.1 Stabilised Reference Voltage Unit for Motor-alternator Set

7.2 General Description

These sets are supplied by the Electro Dynamic Construction Company and are rated at 17·5 kVA or 12 kVA according to local needs. The motor is d.c.-operated via a three-phase metal rectifier connected directly to the a.c. mains. The motor and alternator field windings are energised from individual three-phase rectifiers transformer-connected to the mains. The output voltage of the alternator is controlled by an automatic carbon-pile regulator.

Coupled to the motor-alternator set is a permanent magnet tacho-generator. This machine has an output voltage which is directly proportional to speed and is compared with a stabilised reference voltage which it normally slightly exceeds. The difference voltage, or 'error signal', caused by deviations of the speed from the reference value, is amplified electronically and used to energise the field of a d.c. booster generator. This generator is driven by a separate induction motor, and has its armature connected in series opposition with the main field windings of the alternator-driving motor. Any changes in the speed of rotation of the set thus tend to be self-compensating.

The stabilised reference voltage may be derived from a battery, or from a unit of the type illustrated in Fig. 7.1.

Most of the controls for the equipment are mounted on the top of a desk, the lower portion of which houses the error-signal amplifier.

7.3 Operating Instructions (Broadcasting House, Bush House and 200 Oxford Street)

7.3.1 Starting Up

i. Check that the auto/hand frequency-control selector-switch is set to *Auto*.
ii. Check that the auto/hand voltage-control selector-switch is set to *Auto* and the hand voltage control is turned *fully* clockwise.
iii. Close the BBC isolating-switch con trolling the incoming mains.
iv. Check that the isolating-switch on the right-hand side of the rectifier cabinet is closed. The red *Supply Available* and *Stabilised Supply Off* lamps should light.

v. Press the *Driving Motor Start* button. The white *Field Healthy* and the green *Motor On* lamp should light.

vi. Vary the speed of the motor by means of the *Auto Frequency Control* until the indicated frequency reaches the required value, normally 50 c/s. If the speed of the set is increased until the generated frequency reaches 52 c/s approximately, the *Excessive Speed* lamp lights, and at the same time the e.h.t. is removed from the final stage of the control amplifier, causing the set to slow down until the frequency is below 48 c/s. Before the speed-control circuit can subsequently be restored to normal operation, it is necessary first of all to remove the cause of excessive speed and then to press the button labelled *Overspeed Relay Reset.*

NOTE: A certain amount of frequency drift may occur in the first half-hour of use, and this should be corrected as necessary.

vii. Press the *Stabilised Supply On* button. The green *Stabilised Supply On* lamp should now light in place of the red *Stabilised Supply Off* lamp, thus indicating that this supply is available for switching into circuit via recording supply cabinets in individual machine rooms and listening cubicles, or in acordance with any other local arrangements. When the BBC isolating-switch controlling the stabilised-frequency output from the motor-generator room is closed, the *Controlled Available* lamps on certain recording supply cabinets should light.

NOTE: A pre-set voltage-control potentiometer is mounted directly on the automatic voltage regulator behind the rear panel of the motor-generator set control-desk. The correct position for this potentiometer is determined when the set is installed, and further adjustment should rarely be required.

7.3.2 SHUTTING DOWN

i. Open the BBC isolating-switch controlling the motor-generator set output.

ii. Press the *Stabilised Supply Off* button.

iii. Press the *Driving Motor Stop* button.

iv. Open the BBC isolating-switch controlling the mains supply incoming to the set.

7.4 OPERATING INSTRUCTIONS (MAIDA VALE)

7.4.1 STARTING UP

i. Check that the auto/hand speed-control selector-switch on the control-desk is set to *Auto*.

ii. Check that the change-over switch on the regulator next to the small booster motor-generator is in one of its two *On* positions.

iii. Close the BBC isolating-switch controlling the incoming mains.

iv. Close the isolating-switch on the right-hand side of the cabinet housing the metal rectifiers. The red *Supply Available* lamp on the control-desk should now light.

v. Press the *Driving Motor Start* button on the desk. The white *Field Energised* lamp and the red *Stabilised Supply Off* lamp should light at once, to be followed after a few seconds by the green *Motor On* lamp.

vi. Vary the speed of the motor by means of the *Auto Speed Control* until the indicated frequency reaches the required value (normally 50 c/s). Note that the setting of the *Auto Speed Control* is critical, and that any adjustment must be carried out with extreme care, the control being moved only a very small amount at a time. If the motor-alternator is allowed to reach a speed equivalent to 55 c/s, a brown *Excessive Speed* lamp lights, and the speed at once falls to the lowest point available on the automatic control. Before the speed-control circuit can be restored to normal operation, it is necessary first to remove the cause of the excessive speed and then to press the *Excess Speed Reset* button on the front of the control-desk.

vii. Now switch the desk voltmeter across any pair of output phases, and check that the nominal voltage (400 volts) is being obtained. Adjust the *Auto Control Voltage Setting* potentiometer if necessary.

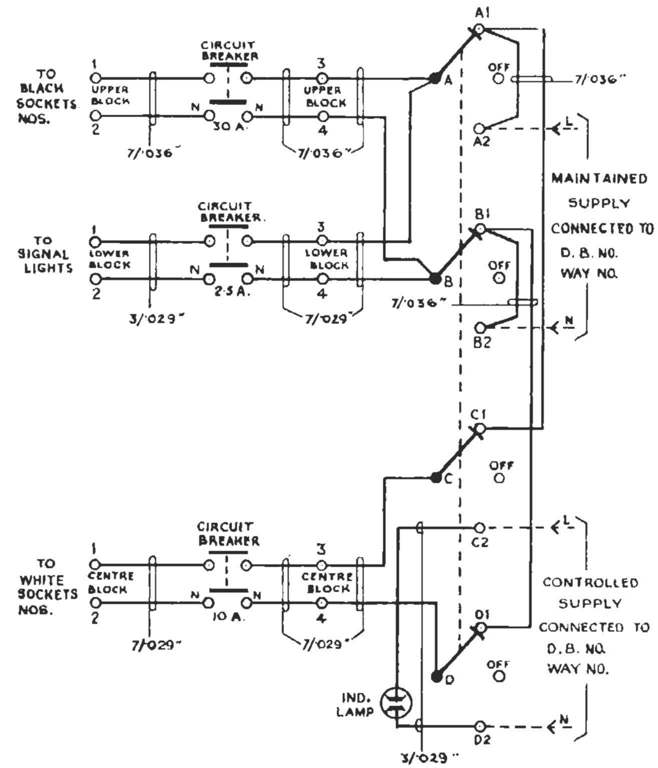
NOTE: A certain amount of frequency drift may occur in the first half-hour of use; this must be corrected as necessary.

viii. Press the *Stabilised Supply On* button. The green *Stabilised Supply On* lamp should now light in place of the red *Stabilised Supply Off* lamp, thus indicating that the stabilised supply is available for switching into circuit in accordance with local arrangements, as soon as the BBC isolating switch controlling the output of the set is closed.

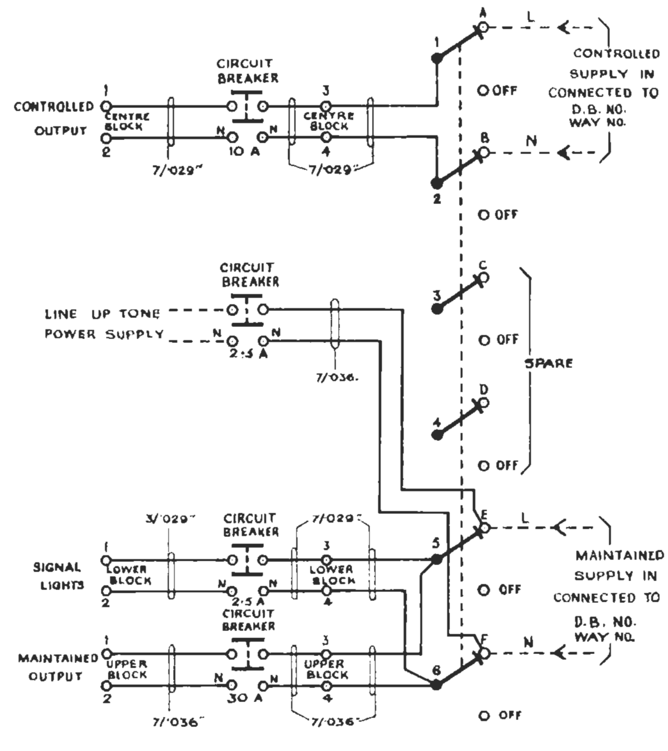
7.4.2 Shutting Down

i. Open the BBC isolating-switch controlling the motor-generator set output.
ii. Press the *Stabilised Supply Off* button.
iii. Press the *Driving Motor Stop* button.
iv. Open the BBC isolating-switch controlling the incoming mains supply to the set.

G.H. 1255



RSC/1 : CIRCUIT



RSC/2 : CIRCUIT

RECORDING SUPPLY CABINETS RSC/1 & RSC/2

FIG 1

COMPONENT TABLE: FIG. 2

Comp.	Loc.	Type	Tolerance Per Cent	Comp.	Loc.	Type	Tolerance Per Cent
C1	C4			R11	J5	0·25 W	
C2	E4			R12	B5	,,	
C3	K4			R13	D5	,,	
C4	D7			R14	C7		
C5	H6			R15	E6	0·5 W	
C6	F6			R16	G7	,,	
C7	K6			R17	H6		
C9	A7			R18	H6	,,	
C10	C3			R19	C7	,,	
C11	D3			R20	J7	,,	
C12	F2			R21	K6	,,	
C13	K2			R22	L5		
C14	N4			R23	K1	1 W	
C15	N6			R24	K3	0·5 W	
C16	M6			R25	D1	2 W	
C17	P7			R26	E6	0·5 W	
C18	O7			R27	M1	,,	
C19	N2			R28	M1	,,	
C20	P2			R29	O1	1 W	
C21	C2			R30	M3	0·5 W	
C22	L9			R31	O4		
C22A	M9			R32	M5	0·25 W	
				R33	O5	,,	
L1	M9	Muirhead D–312–A		R34	N7	0·5 W	
				R35	O7	,,	
R1	A2	0·5 W		R36	P7	2 W	
R2	B2	,,		R37	L7	0·5 W	
R3	D2	,,		R37A	L5	,,	
R4	E2	,,		R38	S1		
R5	J2	6 W		R39	S2		
R6	B3	0·5 W		R40	S1		
R7	C3	1 W					
R8	E3	0·5 W		TR 1	P1	Muirhead D–517–B–2	
R9	F5	,,		TR 1	O10	Muirhead D–311–A	
R10	G5	,,					

55/GH/110/MG
MUIRHEAD
3008. 69.4B.

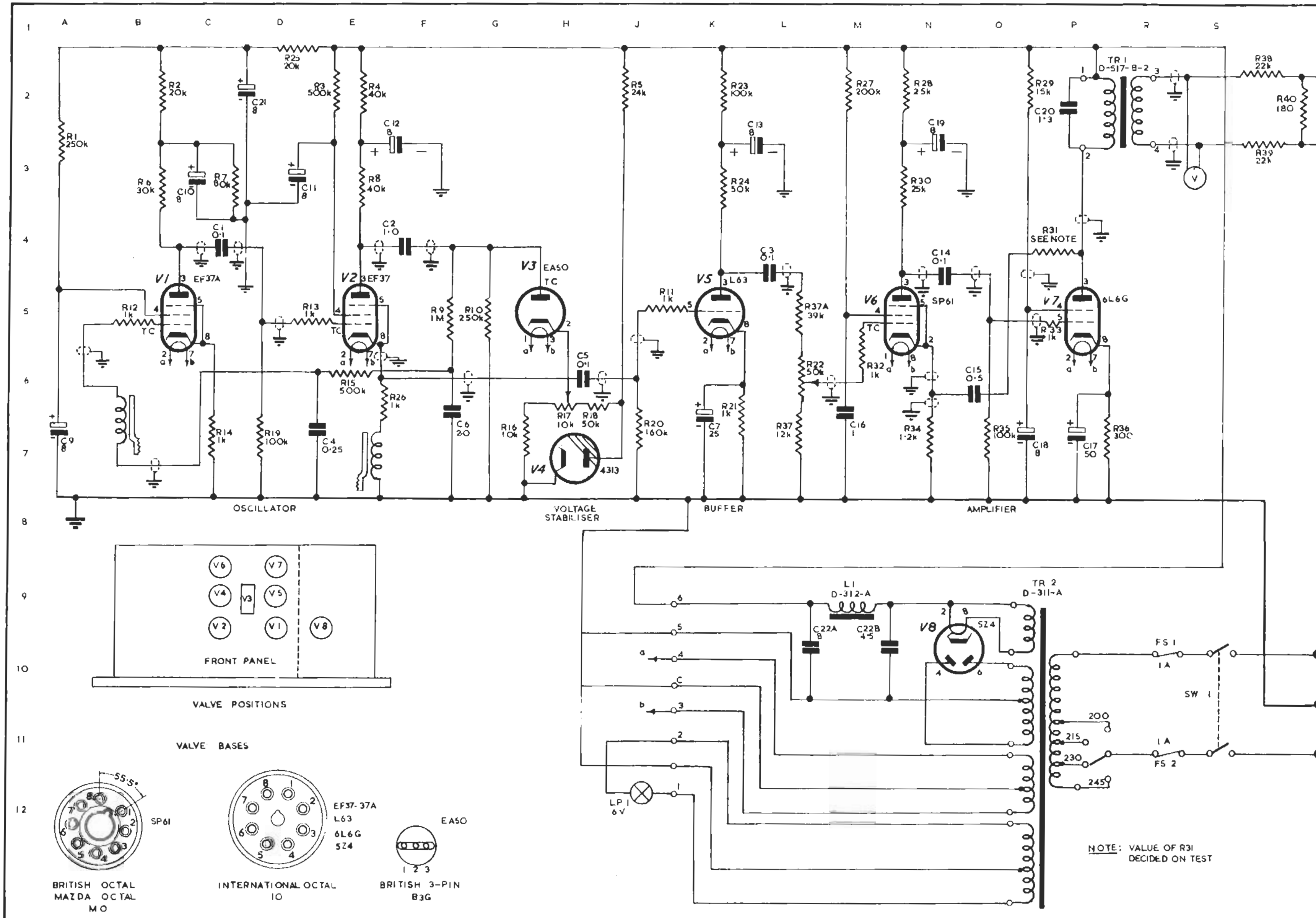


FIG 2

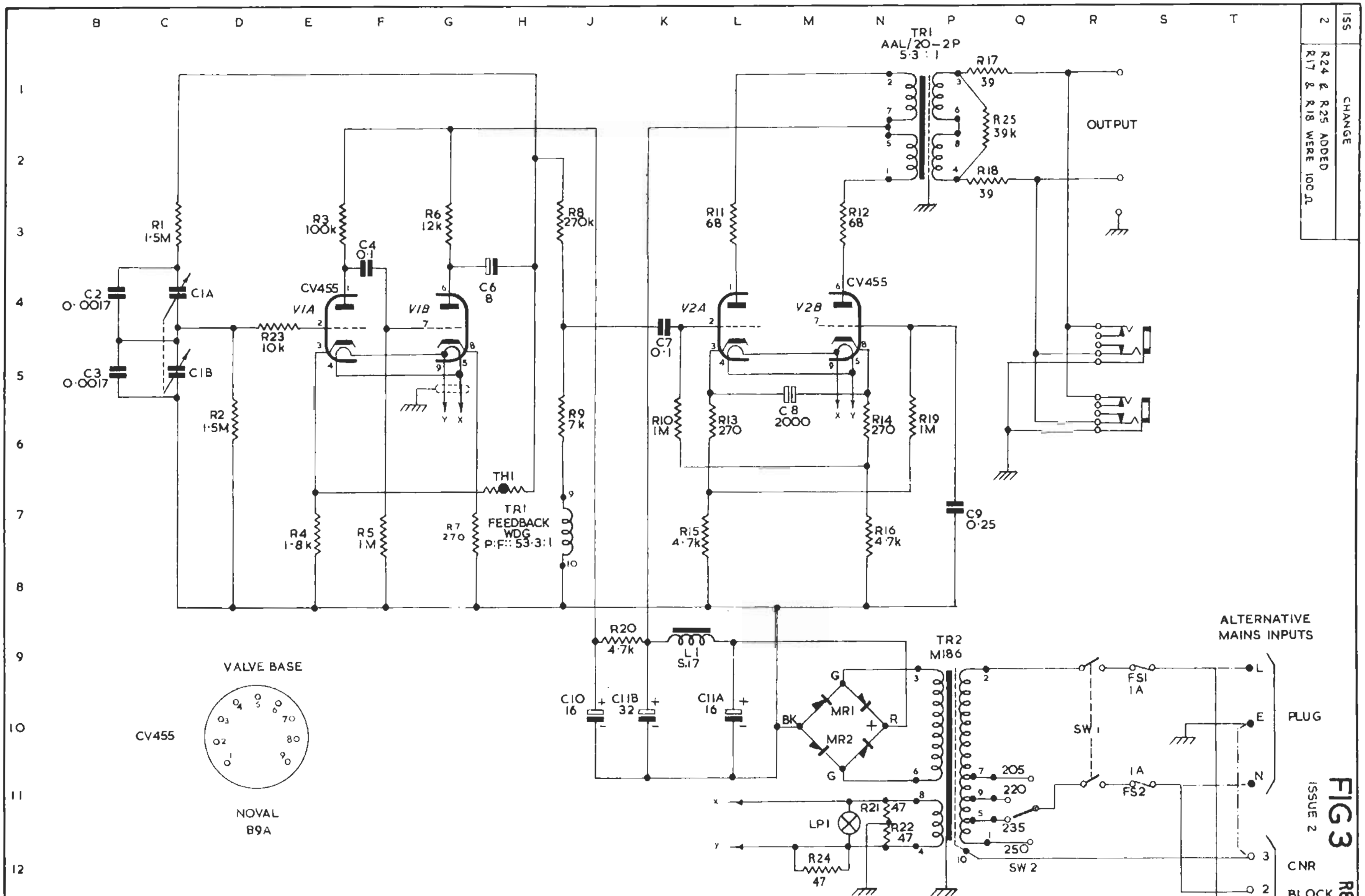
MUIRHEAD VALVE – MAINTAINED TUNING FORK TYPE D-418-D: CIRCUIT

R8.

COMPONENT TABLE: FIG. 3

Comp.	Loc.	Type	Tolerance Per Cent	Comp.	Loc.	Type	Tolerance Per Cent
C1A	C4 }	Wingrove and Rogers		R4	E7	Erie 9	± 10
C1B	C5 }	4-gang C60–04/1		R5	F7	" 9	± 20
C2	B4	L.E.M. 2010	± 1	R6	G3	" 8	± 10
C3	B5	L.E.M. 2010	"	R7	G7	" 9	± 5
C4	F3	T.C.C. Metalpack CP54N		R8	J3	Painton 72	± 1
		450 V		R9	J5	" 72	"
C6	H4	B.E.C. Electrolytic CE 808/1		R10	K5	Erie 9	± 20
C7	K7	T.C.C. Metalpack CP45N		R11	L3	" 16	"
C8	L5	T.C.C. Reversible Electro-		R12	M3	" 16	"
		lytic CE25AAR		R13	L6	" 9	± 5
C9	P7	Hunts W 49 B501		R14	N6	" 9	"
C10	J10	B.E.C. Electrolytic CE 809		R15	L7	Painton 73	± 1
C11A	K10	B.E.C. Electrolytic CE 911		R16	N7	" 73	"
C11B	L10	B.E.C. Electrolytic CE 911		R17	P1	" 72	± 5
				R18	P2	" 72	"
L1	K9	S.17		R19	N6	Erie 9	± 20
				R20	J8	" 9	"
LP 1	M11	P.O. 6-V No. 2		R21	N11	" 8	± 5
				R22	N11	" 8	"
MR 1	M9	S.T.C. D18–18–1RB2W					
MR 2	M10	S.T.C. D18–1RBRW		TH 1	H6	S.T.C. A5412/100	
R1	C3	Painton 76	± 1	TR 1	N1	AAL/20–2P	
R2	D6	" 76	"	TR 2	P9	M.186	
R3	E3	Erie 9	± 20				

55/GH/109/MG
DSKB 2545



OSCILLATOR OS/13: CIRCUIT

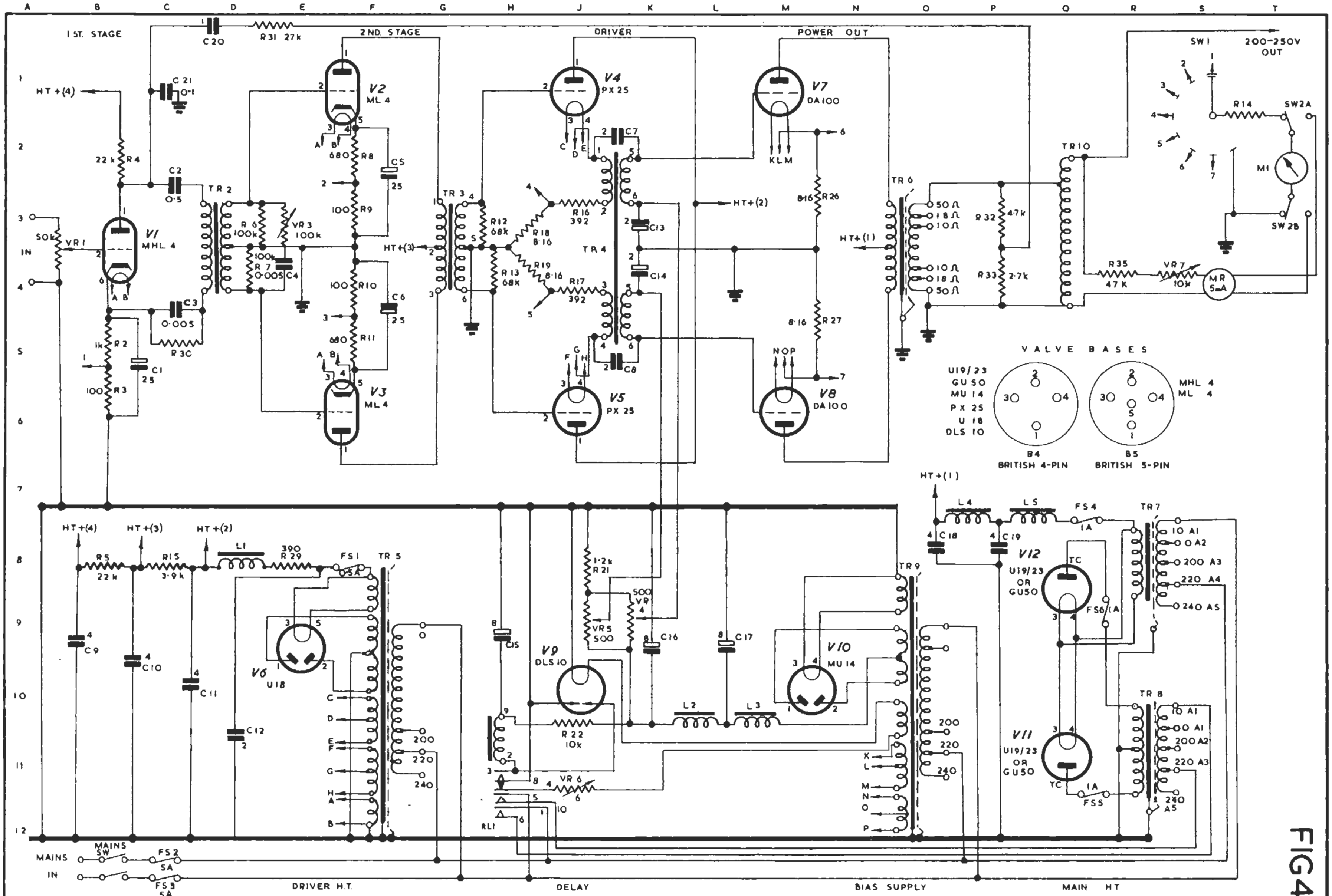
FIG 3
ISSUE 2
R8

COMPONENT TABLE: FIG. 4

Comp.	Loc.	Type	Tolerance Per Cent	Comp.	Loc.	Type	Tolerance Per Cent
C1	B5	12 V		R11	F5	0·5 W	
C2	C2	450 V		R12	H3	1 W	
C3	C4	,,		R13	H4	,,	
C4	E3	,,		R14	S1		
C5	F2	25 V		R15	C8	6 W	
C6	F4	,,		R16	U2	Wirewound	
C7	J2	500 V		R17	U4	,,	
C8	J5	,,		R18	H3	,,	
C9	B9	750 V		R19	H4	,,	
C10	B9	,,		R21	U8	20 W	
C11	C10	,,		R22	J10	2 W	
C12	D10	,,		R26	N2	Wirewound	
C13	K3	350 V		R27	N4	,,	
C14	K4	,,		R29	E8	12 W	
C15	H9	,,		R30	C5		
C16	K9	,,		R31	D1		
C17	L9	,,		R32	D2		
C18	O7	1,500 V		R33	D3		
C19	P7	,,		R35	R3		
C20	D1						
C21	C1			TR 2	C3	16297E	
				TR 3	G3	T.434	
L1	D8			TR 4	J3	T.432	
L2	K10			TR 5	F10	T.516	
L3	L10			TR 6	N3	T.512	
L4	O7			TR 7	R8	T.515	
L5	P7			TR 8	R11	T.514	
R2	B5	0·25 W		TR 9	O11	T.511	
R3	B6	Wirewound		TR 10	Q3	Auto	
R4	B2	2 W		VR 1	A3		
R5	B8	,,		VR 3	E3		
R6	D3	0·5 W		VR 4	J9		
R7	D4	,,		VR 5	U9		
R8	F2	,,		VR 6	H10		
R9	F3	Wirewound		VR 7	S4		
R10	F4	,,					

This drawing is the property of the British Broadcasting Corporation and may not be reproduced or disclosed to a third party in any form without the written permission of the Corporation.

55/GH/111/DFE
SPM 2912



EMI 200-W POWER BAY : CIRCUIT

FIG 4 R8

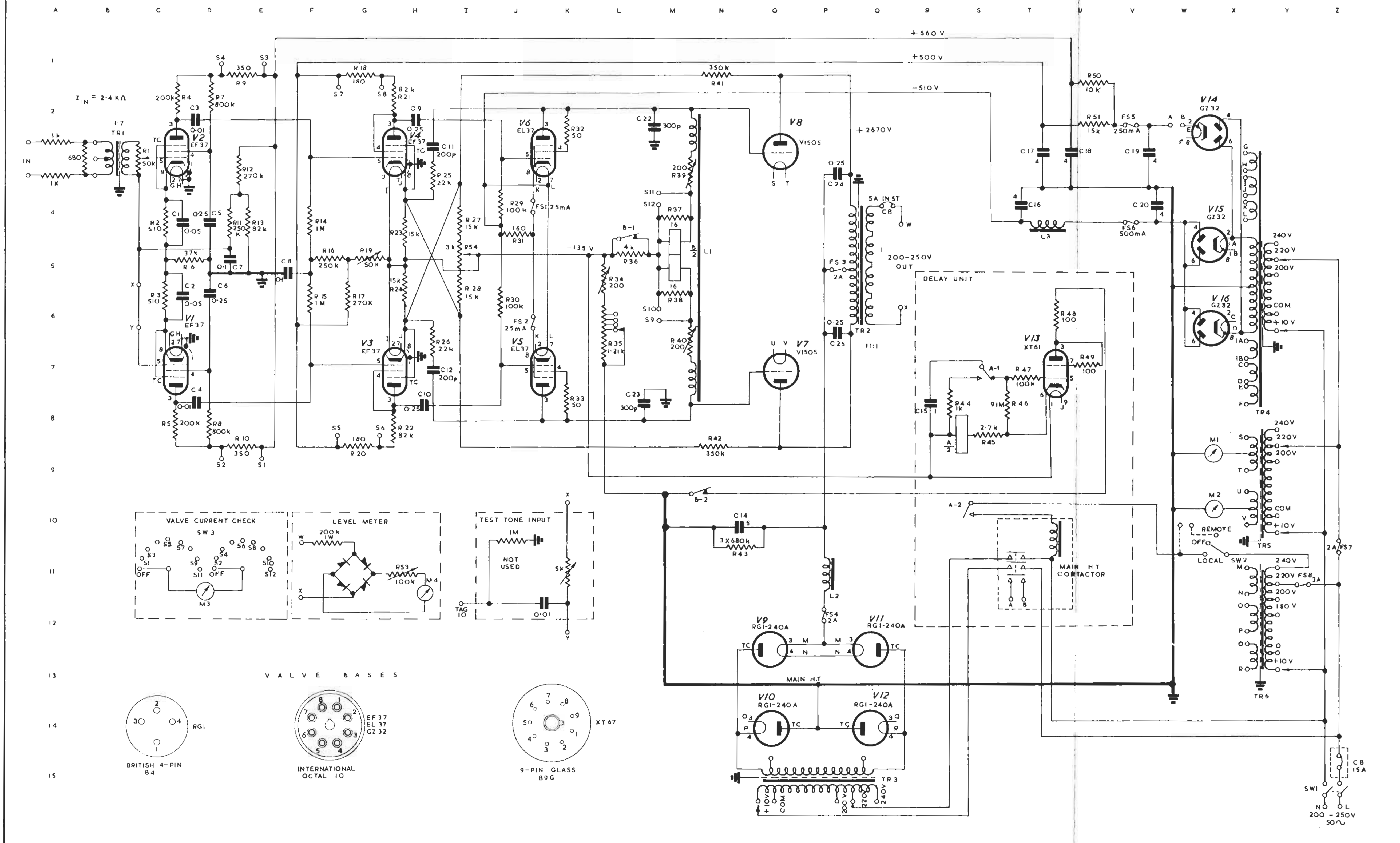
COMPONENT TABLE: FIG. 5

Comp.	Loc.	Type	Tolerance Per Cent	Comp.	Loc.	Type	Tolerance Per Cent
C1	C4	350 V tubular		R17	F6	1 W	± 20
C2	C5	350 V ,,		R18	G1	0·25 W	± 5
C3	D2	750 V mica		R19	G4	lin. pot.	
C4	C8	750 V ,,		R20	G8	0·25 W	± 5
C5	D4	500 V tubular		R21	G2	3 W	,,
C6	D5	500 V ,,		R22	G8	,,	,,
C7	D5	350 V ,,		R23	G4	1 W	,,
C8	E5	350 V ,,		R24	G5	,,	,,
C9	H2	2000 V ,,		R25	H3	0·25 W	,,
C10	H8	2000 V ,,		R26	H6	,,	,,
C11	H2	350 V mica		R27	I4	1 W	,,
C12	H7	350 V ,,		R28	I5	,,	,,
C14	N10	3000 V paper		R29	J4	0·25 W	,,
C15	R8	600 V ,,		R30	J6	,,	,,
C16	T4	800 V ,,		R31	J4	4 W	,,
C17	T3	600 V ,,		R32	J2	0·25 W	± 20
C18	U3	800 V ,,		R33	K2	,,	,,
C19	V3	800 V ,,		R34	L5	pot. ww.	
C20	V4	800 V ,,		R35	L6		
C22	M2			R36	L5	30 W	± 20
C23	M7			R37	M4	0·25 W	± 10
C24	P3			R38	M5	,,	,,
C25	P6			R39	M3	pot. ww.	
				R40	M6	,,	
L1	N5	GCC		R41	N1		± 5
L2	P11	FKB		R42	N8		,,
L3	T4	SV1B		R43	N10	2 W	± 20
				R44	R8	0·25 W	,,
R1	C3	log. pot.	± 5	R45	S8	,,	± 5
R2	C4	0·25 W	,,	R46	T8	,,	± 10
R3	C5	,,	,,	R47	T7	,,	± 20
R4	C2	0·5 W	,,	R48	U6	,,	,,
R5	C8	,,	,,	R49	U7	,,	,,
R6	C5	,,	± 10	R50	U1	2 W	± 10
R7	D2	0·25 W	± 5	R51	U2	,,	,,
R8	D8	,,	,,	R53	H11	lin. pot.	
R9	E1	,,	,,	R54	I4		
R10	E8	,,	,,				
R11	D4	,,	± 20	TR 1	B3	PO1–8E	
R12	D3	1 W	± 5	TR 2	Q5	GK 213	
R13	E4	0·25 W	,,	TR 3	P14	HTKG	
R14	F4	,,	,,	TR 4	Y5	MTVG	
R15	F6	,,	,,	TR 5	Y9	VF750D	
R16	F5	,,	± 20	TR 6	Y12	HTFE	

55/GH/112/DFE
1227 5 B
BRYAN SAVAGE

FIG 5

R8



BRYAN SAVAGE 1-kW POWER BAY: CIRCUIT

KEY AND LOCATION TABLE: FIG. 6

Code	Loc.	Terminals	Description
A			Ammeter (general symbol)
AFR	E9		Alternator field regulator (manual)
AS	M3		Auto-starter:
AS	F15	63–70	operating coil
AS	C15	61–62	economy contact
AS	C14	56–57	start-interlock contact
ASS	U5		Ammeter-selector switch
AVR	G11		Automatic voltage regulator
C			Contactor or capacitor (general symbol)
1C	G3		A.C. line contactor:
1C	F14	59–70	operating coil
1C	A15	52–61	auxiliary contact energising AS
1C	C14	57–60	auxiliary contact maintaining 1C
2C	T3		Alternator output contactor
2C	F16	66–70	operating coil
2C	B11	44–47	auxiliary contact energising 4SL
2C	B12	44–48	auxiliary contact energising 5SL
2C	B17	64–65	auxiliary contact maintaining 2C
COR	E9		Change-over resistor in AVR
1CR	—		Auxiliary relay (excitation):
1CR	D6	81–83	operating coil
1CR	B10	44–45	auxiliary contact energising 2SL
1CR	B14	55–60	contact maintaining 1C
2CR	—		Auxiliary relay (servo-regulator):
2CR	F16	69–70	operating coil
2CR	B16	65–66	contact energising 2C
2CR	K15	126–143	contact in ref. battery circuit
2CR	T10	130–132	contact in regulator h.t. circuit
3CR	—		Auxiliary relay (overspeed protection):
3CR	F17	68–70	operating coil
3CR	B11	44–46	contact energising 3SL
3CR	B18	67–68	contact maintaining 3CR
3CR	V10	132–133	contact in regulator h.t. circuit
CS			Control switch (general symbol)
CT			Current-transformer (general symbol)

Code	Loc.	Terminals	Description
F	T5		Frequency meter
FZ			Fuse (general symbol)
IS	B3		Isolator mechanically interlocked with front door of rectifier cabinet:
IS	B4	1–40	auxiliary contact breaking in advance of main contact
mA	U14		Milliammeter
MFR	Z13		Manual field regulator
MJ	F10		AVR operating coil
OL	I3		Combined thermal overload and single-phasing preventor:
OL	E14	57–58	trip contact
P			Potentiometer (general symbol)
PSR	E8		Pile series resistor for AVR
R			Carbon resistor (general symbol)
REC			Metal rectifier (general symbol)
RES			Wirewound resistor (general symbol)
SL			Signal-lamp (general symbol):
1SL	C10		'Supply Available'
2SL	C10		'Motor On'
3SL	C11		'Excessive Speed'
4SL	C11		'Stabilised Supply Off'
5SL	C12		'Stabilised Supply On'
6SL	C7		'Field Healthy'
SR	M3		Starting resistor
STF	H10		Stabilising transformer for AVR
T			Transformer (general symbol)
TBR	F10		Transformer-balancing resistors in AVR
TCR	G12		Temperature-compensating resistors in AVR
TG	G16		Tacho-generator
THR	—		Thermal-delay relay
THR	F14	59–70	heating element
THR	A18	52–69	delayed-closing contact
V			Valve or voltmeter (general symbol)
VCR	G12		Voltage-calibrating resistor
VSS	R5		Voltage-selector switch

5/GH/113/DJE
CD1549E

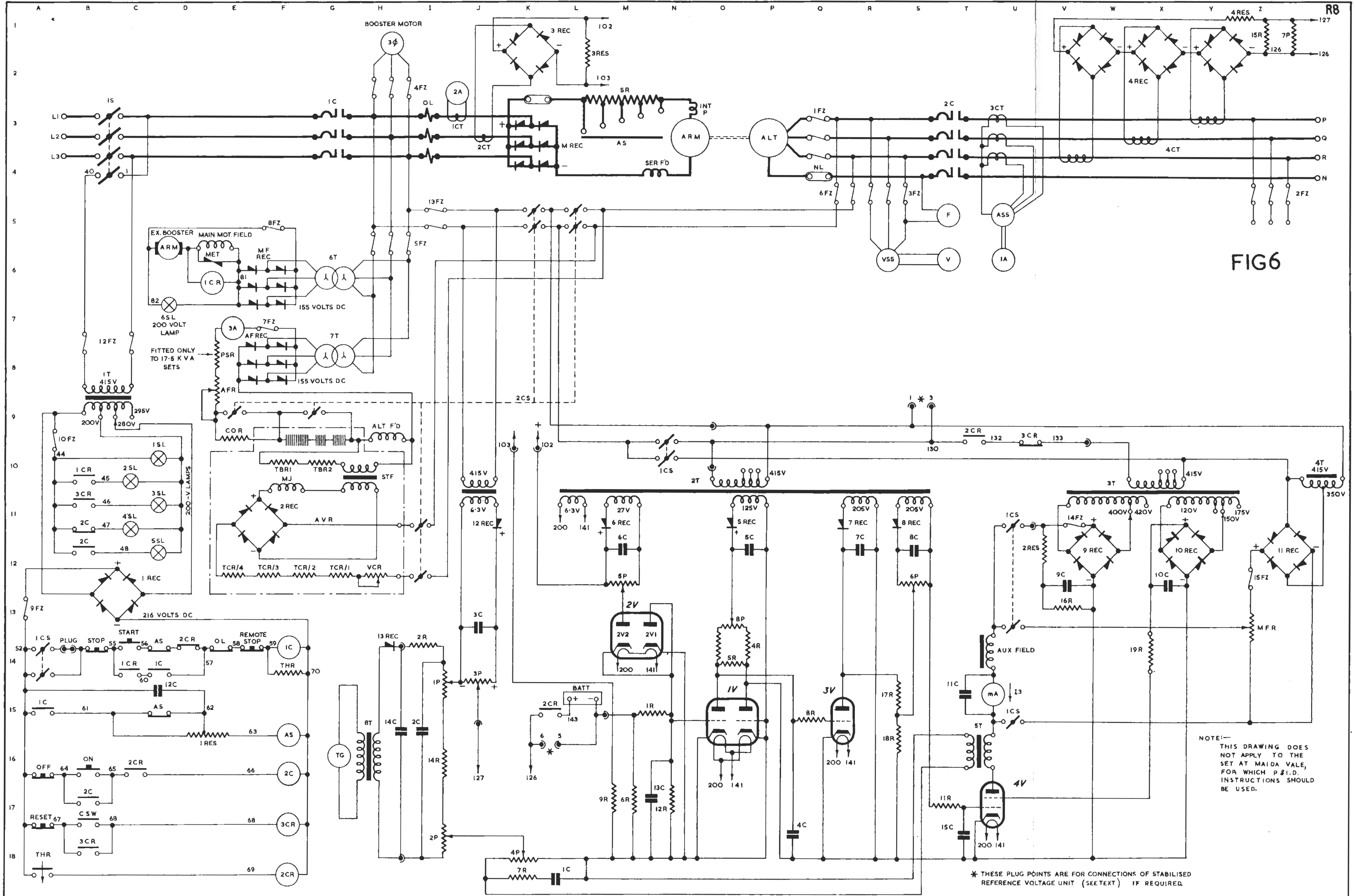


FIG6

NOTE:— THIS DRAWING DOES NOT APPLY TO THE SET AT MAIDA VALE, FOR WHICH P & I.D. INSTRUCTIONS SHOULD BE USED.

* THESE PLUG POINTS ARE FOR CONNECTIONS OF STABILISED REFERENCE VOLTAGE UNIT (SEE TEXT) IF REQUIRED.

E.D.C. FREQUENCY-STABILISED MOTOR-ALTERNATOR: CONTROL SCHEMATIC

ERRATA

To Editor,

Technical Instructions,

305, *St. Hilda's, Maida Vale.*

The following errors have been noted in **Instruction**

Station............................... *Date*............................ *Signature*..........................

ERRATA

To Editor,

Technical Instructions,

305, *St. Hilda's, Maida Vale.*

The following errors have been noted in **Instruction**

Station............................... *Date*............................ *Signature*..........................

ERRATA

To Editor,

Technical Instructions,

305, *St. Hilda's, Maida Vale.*

The following errors have been noted in **Instruction**

Station............................... *Date*............................ *Signature*..........................

ERRATA

To Editor,

Technical Instructions,

305, *St. Hilda's, Maida Vale.*

The following errors have been noted in **Instruction**

Station............................... *Date*............................ *Signature*..........................