INSTRUCTION MANUAL

5.5 KW MEDIUM FREQUENCY
RADIO BROADCAST TRANSMITTER
S.T.C. TYPE 4-SU-55 B/V

Standard Telephones and Cables Pty. Limited

SYDNEY

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HIGH POWER MODULATED

RADIO BROADCAST TRANSMITTER

S.T.C. TYPE 4-SU-55B

C O N T E N T S

SECTION 1 - GENERAL DESCRIPTION

1.1 General

The type 4-8U-55B transmitter is designed to deliver an output of 5.5kW unmodulated carrier power over the frequency range 525-1610 Kc/s. The equipment is completely self contained and occupies a floor area of 2'-6" by 5'-4", the cabinet being 6'-6" high.

The two-unit cabinet is fitted with two hinged doors at the front and two easily removeable panels at the rear giving complete access to every part of the equipment. Windows are fitted to the front doors of the cabinet to permit inspection of the internal components and dry type incoming air filters are built into the rear panels.

All operating controls are brought to the front panel and external connections are limited to the incoming mains and speech leads and the outgoing R.F. and monitoring leads. Where the environment of the transmitter will not readily absorb the heat losses, the exhaust air from the transmitter must be ducted away.

Full protection is provided for operating personnel and with the doors open no potential in excess of 50 volts D.C. may be contacted. Built in control circuits provide for a variety of local or remote systems.

1.2 Principal Features

(a) Frequency Range : 525-1610 Kc/s

(b) Power Output : 5.5kW Carrier Power capable of 100% modulation

(c) Power Requirements (5.5kW carrier)

Zero Modulation KVA ..... P.F. .....

100% Modulation KVA ..... P.F. .....

(d) Power Supply : 380-440V 3 phase 4 wire

(e) R.F. Output Resistance : 200 ohms ±10% unbalanced

Other impedances to order

(f) Frequency Control : The carrier frequency is maintained by a high stability quartz crystal contained in a temperature-controlled holder.

(g) Speech input level Odbm for 100% modulation. A 16db pad in the audio input may be removed if desired.

(h) Dimensions 2'-8" deep, 5'-4" wide, 6'-6" high.

(j) Spare rectifier tubes Provision is made to maintain one spare rectifier tube with the filament heated ready for immediate use.

(k) Protection of personnel and equipment Operating personnel and equipment are fully protected by electrical interlocks. All doors and panels are equipped with gate switches which immediately cause the H.T. contactors to release should they be opened.

(l) Remote control facilities The transmitter is designed to allow operation from a control desk remote from the transmitter.

(m) Artificial aerial A fully rated artificial aerial is mounted just below the exhaust air duct.

1.3 Performance

(a) A.F. Distortion The total harmonic distortion is less than 3% at 100% modulation for all frequencies in the range 50 to 7500 c/s.

(b) Frequency response Within ±1db for frequencies in the range 30 to 10000 c/s.

(c) Noise Better than 60db unweighted, below a reference level of 100% modulation at 1000 c/s.

SECTION 2 - SCHEDULE OF EQUIPMENT

Item	Qty.	Description	Type No.
1	1	Transmitter framework	
2	1	Fan motor and blower	Richardson 1½ BMV
3	1	H.T. supply transformer	RS508
4	1	Modulation transformer	74-SU-179A
5	1	Modulation Inductor	192-SU-38A
6	1	Modulation Capacitor	17N20
7	1	H.T. Filter Inductor	192-SU-19A
8	3	H.T. Filter Capacitors	14N80
9	1	Set of electron tubes	

Type	Qty.	Type	Qty.
EF37A	2	872A	6
4-125A	3	807	2
3X2500F3	3	6X5GT	1

SECTION 3 - R.F. CIRCUITS

Reference to the simplified schematic 4-SU-55B will show that the R.F. section has 4 tubes V1 to V4. The R.F. exciter, comprising V1 and V2 and their components are contained in a small box directly behind the ISOLATOR TUNING control on the front panel. Access to the tubes, and crystal in this box may be obtained by removing the top cover. The components may be reached by removing the side cover which is accessible from the power side of the cabinet.

The grid-screen section of V1 is used as a conventional Pierce oscillator. A fine frequency control of ±30 cycles is afforded by means of C1, which may be adjusted after removing the side cover. An additional fine frequency control of ±2 cycles appears on the front panel immediately above the A.F. ATTENUATOR. Approximately equal R.F. voltages appear from the grid and screen V1 to ground and the grid voltage should be set to approximately 10 volts RMS, by means of the potentiometer R9 mounted in the front of the exciter box.

The anode of V1 acts as an untuned amplifier and is fed to the grid of V2 via the contacts LA-2 of the line arc-over relay LA. This relay operates to suppress the R.F. and A.F. drives during a lightning strike or other conditions producing a short circuit on the R.F. transmission line.

V_2 and V_3 are conventional Class "C" voltage amplifiers providing the necessary driving power for the Power Amplifier V_4. The anode voltage of V_3 is partially modulated via a partial modulation winding on the modulation inductor, L14. V_2 anode circuit is tuned from the front panel by means of the isolator tuning capacitor C14. V_3 anode circuit is made up of components, C21, C22, C23, and L5. The frequency bands are set by changing the capacitors C21 and C23. Tuning within the bands is by means of tapping L5 and the fine tuning capacitor C22.

The anode circuit of the Power Amplifier V_4 consists of C28, L8, C29, C30 and the primary of T1. Again the frequency bands are set by choice of the fixed capacitor C29. L8 serves the dual purpose of stabilising the amplifier and adjusting the operating condition of V_4 for optimum efficiency. V_4 is neutralised by means of C24, C85 and C86. The output circuit is tuned by C31 and C32 and tapping the secondary of T1. Output loading may be varied by means of the variable coupling of T1.

A fully rated artificial aerial of appropriate resistance is built into the air duct outlet and this may be selected by means of the Dummy load switch SW14 which operates the contactor DL. R.F. line current is measured by means of the R.F. transformer T2. An external R.F. Line current meter may be connected across terminals 7 and 8.

V19 acts as a demodulator for the A.F. monitor, the 600 ohms output of which appears across terminald 4 and 5. A carrier failure relay C.F. is operated from the R.F. monitoring loop, on T1, and has its contacts brought out to terminals 18 to 23 to allow incorporation in control circuits if desired.

The line arc-over relay LA is operated by feeding 50 volts D.C. to the transmission line, and a D.C. short circuit or Arc-over from the R.F. output terminal will then cause LA to be operated and suppress the A.F. and R.F. drives, while the short circuit persists.

SECTION 4 - A.F. CIRCUITS

The A.F. Section of the transmitter comprises tubes V5 to V12. The Amplifier is a four stage push-pull system with feed back from the anodes of the modulators V11 and V12 to the grids of the first A.F. amplifiers V5 and V6. Stabilising networks C47, C48, R51 and R52; for the low frequency end and R87, R88, C74 and C73; for the high frequency end ensure a margin against oscillation of at least 4db.

Approximately 12db of feedback is applied over the whole of the audio frequency range.

A pad of approximately 16db is incorporated to give an input level, for 100% modulation, of 0 dbm.

The capacitor C87 is incorporated to ensure a response within ±1 db. Small changes may be made to this component to suit the individual requirements of a particular transmitter.

The A.F. signal is supplied via the 16db pad, a 16db variable attenuator, and a high quality permalloy cored and screened input transformer, T4 to the grids of the first A.F. amplifier tubes, V5 and V6. Conventional R.C. coupling is used to the next stage of audio amplification. The potentiometers R129 and R130 are used to minimise the 50 c/s noise introduced at this low level stage by any slight unbalance in the tube filaments.

The A.F. driver stage is a cathode follower stage to ensure good regulation for the Class B modulators. The cathode followers are biassed from the bias supply via the bias adjusting potentiometers, R93 and R94. The bias adjustment for the modulators is by means of R95 and R96. It should be noted that adjustment of the modulator bias will alter the bias on the cathode followers.

The output to the power amplifier is via the modulation transformer and choke T6 and L14.

SECTION 5 - POWER CIRCUITS

5.1 General

The entire transmitter operates from a 415 volt 3 phase, 4 wire, 50 c/s supply.

The main H.T. is supplied from the mains via the H.T. transformer and a 3 phase full wave rectifier. The fan is also supplied from the 3 phase mains. The rest of the transmitter including control circuits and filament heating is supplied by 240 volt single phase transformers. All tube filaments are energised with alternating current.

Switching of low and high tension supplies is controlled from the main panel on the front of the transmitter.

From the drawings it can be seen that the entire input to the transmitter is supplied via the mains isolating switch S1.

5.2 H.T. Supply

The main H.T. system is supplied via the H.T. ISOLATOR, S2, the H.T. Contactors HT1 and HT2, and the H.T. Transformer, T7, from six type 872A H.C.M.V. rectifier tubes V13 to V18. A spare tube may be kept with its filament energised ready for immediate use, should one of the working tubes fail.

The ½ H.T. supply is taken from the star point of the secondary while the full H.T., 5000 volts, is taken from the cathodes of V13 to V15. The H.T. voltage is metered by M-7. A H.T. overload relay is incorporated in the common negative of both H.T. and ½ H.T. supplies. Adjustment is by means of the potentiometer R116.

The resistors across HT2, R117 to R119, limit the starting current surges and may be left in circuit for a period not exceeding 10 minutes, whilst the transmitter is being tuned. The resistors are shorted out by HT2 which is operated by moving the TUNE/TRANSMIT switch to TRANSMIT.

Choke input filters are used in both H.T. supplies. These are composed of L15 and C76 for the H.T., and L13 and C78 for the ½ H.T. supplies.

5.3 Minor H.T. Supply

The minor H.T. supply is fed from the red phase on the load side of HT1. The transformer T8, supplies the selenium rectifier, MR12, to give an output of approximately 430 volts.

This supplies all the low power stages in the transmitter including the R.F. Exciter.

Metering is by means of the MIN. H.T. SUPPLY voltmeter, M-8. An overload relay with adjusting potentiometer, MO and R115, respectively, provide protection for the minor H.T. supply.

Filtering is by means of C79 and L11.

5.4 Bias Supply

The bias supply is fed from the yellow phase on the load side of the MAINS ISOLATOR, S1, via the L.T. ISOLATOR, S3, and the filament contactor FL. The transformer, T17, supplies the selenium rectifier, MR13, to give an output of approximately 400 volts.

This supplies the fixed bias for all the high power stages in the transmitter.

The bias supply voltage is metered by the BIAS SUPPLY voltmeter, M-9, a bias marginal relay is included to prevent the operation of the H.T. contactors, if the bias is insufficient, and switch the H.T. off should the bias voltage fall during operation of the transmitter. The adjustment for the bias marginal relay BM is by means of R97.

Filtering is by means of L16, C80, and C81.

5.5 Control Supplies

The 50 volt D.C. control supply is fed from the blue phase via the L.T. ISOLATOR. The transformer, T9, has 2 two secondary windings, one to give the D.C. supply (via rectifier MR14) and the other a 10 volt supply for the lamps and crystal heater.

The A.C. control circuits are supplied via the L.T. ISOLATOR S-3, from the red phase.

SECTION 6 - CONTROL CIRCUITS

6.1 Normal Operation

For normal operation of the equipment from the front panel of the transmitter, the terminals:- 10 and 11, 13 and 14, 16 and 17, 37 and 38, and 39 and 40 are bridged. These terminals are used to allow a variety of remote control operations to be carried out.

With reference to the schematic diagram 4-SU-55B, the operation is as follows:-

When the circuit breakers, S_1 to S_n are closed, the 50 volt control voltage is established and the crystal heater with its associated lamp LP-1 energised. Also the MAINS ON lamp LP-2 will be lit.

The LT relay operates, causing the blower delay relay BR, and the blower contactor BL, to operate, when the L.T. ON switch S4 is closed.

When the cooling air pressure reaches normal working pressure the air switch S17 will be closed and cause the filaments to be energised by operating the filament contactor FL. The contact FL-4 makes the 50 volt D.C. supply available to the H.T. control circuits. The relay LO will be operated, since only one side is energised, causing its two contacts to be opened.

After approximately two minutes the rectifier filament delay relay RD operates, allowing ample time for the rectifier tubes to reach normal operating conditions. Expiry of the time delay period is indicated by the lighting of the TIME DELAY EXPIRED Lamp LP4. The relay RDH will be energised, and hence lock itself in circuit and, provided all gate switches, on doors and panels, are closed the circuit will be complete to the H.T. ON switch S-7. The GATES CLOSED Lamp LP5 will light when all gate switches are closed and the filaments energised.

Pressing the H.T. ON button will now supply power to the C and H relays. Relay C locks itself in and closes the primary circuit to the bias transformer, T17.

When the bias voltage is established contact BM-1 will close causing relay ST to operate and energise the first H.T. contactor, HT1. Contact HT1-4 will close operating the H.T. delay relay, HD, this relay has approximately one second delay to reduce starting surge currents. If the TUNE/TRANSMIT switch S-8 is closed the second H.T. contactor, HT2, will bring on the full high tension voltage.

Should the transmitter be required before the expiration of the two minute H.T. delay a short time delay facility has been supplied. Before the two minute delay has finished the relay RDH may be operated by pressing the button H.T. ON SHORT TIME S5. The H.T. may be brought on as described above.

6.2 Overload Sequence

Overload relays are fitted to the H.T. supply, min. H.T. supply, modulators and R.F. Power amplifier and driver tubes. In the event of an overload in one of these circuits the appropriate relay will operate and open the circuit to relay ST which will release causing its contact to open and drop the H.T. contactors out.

When an overload relay operates the contact number 1 will close the circuit to the appropriate drop indicator and also send a pulse of current through the stepping coil of the counter relay RLC which will step along one contact and open circuit the supply to Relay H. The capacitor C83 will hold H operated for approximately 5 seconds.

Immediately the H.T. voltage drops, the overload relay which has been operated will release and the first H.T. contactor, etc. will operate again. If the overload persists, then the procedure above will be repeated up to a total of four overloads by which time the counter relay RLC will have moved to position 5, short-circuiting the relay C and hence switching off the H.T. until such time as the H.T. ON push button is pressed manually. The 1000 ohm resistor R113 in series with the Relay C prevents short circuiting of the 50 volt supply.

Regardless of whether the overload occurs once only or the H.T. supply finally remains off, the relay H releases after about five seconds due to the discharge of C83. The contact H-2 then operates the 250 ohm re-setting coil of the counter relay RLC, restoring it to the original position, thereby re-operating the relay H and re-charging the capacitor C83.

Two other protective relays are included. A line arc over relay LA short circuits the drive to the R.F. amplifier and modulator, should an arc occur on the R.F. line. This relay has an appropriate drop relay and operates the counter such that after 4 successive line arcs the H.T. is switched off. The H.T. is not dropped at each arc. The bias marginal relay B.M. is arranged to release relay ST and hence drop the H.T. contactors, should the bias voltage fall.

A carrier fail relay CF has its contacts taken to terminals 18 to 23.

6.3 Brief Mains Failure

In the event of an interruption to the mains supply all relays and contactors will release except the Mains Hold relay H, which will remain operated for about 5 seconds.

If the mains supply is restored within this period, the contacts, LT-1, BR-1 and S-17 will close. Upon the Closing of S-17 relay LO will have both coils energised at once, and hence will not operate. Relay RDH operates immediately the mains supply returns. Since the contact LO-2 is closed relay C is energised and will bring on the HT supplies.

When the contact HT1-5 opens the relay LO will be operated and the system restored to its normal condition.

6.4 Automatic Starting

The transmitter may be made to follow the complete starting sequence automatically following the closing of the LT ON switch. For this purpose the bridge on terminals 16 and 17 is removed and a bridge placed on terminals 15 and 16. The starting sequence is then normal until the operation of the rectifier delay relay RD. When HD-1 closes the normally discharged capacitor C82 is rapidly charged to 50 volts, the current flowing being sufficient to operate relay C which causes the H.T. to be applied.

The brief mains failure reclosing facility operates in this case and a longer mains failure will result in a normal 2 minute starting period.

Should a series of overloads drop the transmitter H.T. supply the starting sequence may be initiated again by turning off the L.T. "ON" switch and then re-closing.

6.5 Remote Control

The L.T. ON, H.T. ON, H.T. OFF, switches are all brought out to terminals and may be wired for remote control of the transmitter. Remote control may be automatically or manually started depending on the bridging of terminals 15 and 16 or 16 and 17. The choice of local over-riding of the remote control or not is available depending on the connection to the remote control terminals. If remote supervision of H.T. ON is required it will be necessary to run leads from LP3 or otherwise make use of the contacts HT2-4 of the second H.T. contactor, HT2.

SECTION 7 - COMPONENTS LIST

	ITEM	CIRCUIT FUNCTION	DESCRIPTION	SUPPLIER	SUPPLIER'S TYPE NO
		CAPACITORS			
	C1	Crystal Trim, coarse	50pF 11 plate	Polar	C803
	C2	Crystal Anode	120pF	Duc on	SM
	C3	Anode Blocking	0.01μF	Duc on	SM
	C4	Crystal Grid	50pF	Duc on	SM
	C5	Crystal Trim, fine	4-12pF 7 plate	Polar	C804
	C6	Grid blocking	0.01μF	Duc on	SM
	C7	C.O. Cath. bypass	0.01μF	Duc on	SM
	C8	C.O. Anode bypass	0.01μF	Duc on	SM
	C9	Isol. Grid Blocking	0.01μF	Duc on	SM
	C10	Isol. Cath. Bypass	0.01μF	Duc on	SM
	C11	Isol. Screen bypass	0.01μF	Duc on	SM
	C12	Isol. Anode bypass	0.01μF 1kV	Duc on	M
	C13	Isol. Tune Blocking	0.01μF 1kV	Duc on	M
	C14	Isol. Tuning	200pF	STC	SP29574
	C15	Driver Grid blocking	0.01μF 1kV	Duc on	M
	C16	Driver Grid bypass	0.01μF 1kV	Duc on	SM
	C17	Driver Fil. bypass	0.01μF 1kV	Duc on	SM
	C18	Driver Fil. bypass	0.01μF 1kV	Duc on	SM
	C19	Driver Screen bypass	0.001μF	Duc on	SM
X	C20	P.A. Grid blocking	0.001μF	Duc on	CAA75
	C21	Dr. fixed tuning			
		525-655 kc/s	1000pF	Duc on	CAA75
		655-820 kc/s	560pF	Duc on	CAA75
		820-1030 kc/s	500pF	Duc on	CAA75
		1030-1290 kc/s	390pF	Duc on	CAA75
		1290-1610 kc/s	330pF	Duc on	CAA75
	C22	Dr. fine tuning	30-280pF	STC	41-SU-31B
	C23	Dr. fixed tuning			
		525-655 kc/s	2000pF	Duc on	CAA140
		655-820 Kc/s	1300pF	Duc on	CAA100
		820-1030 kc/s	1000pF	Duc on	CAA75
		1030-1290 kc/s	800pF	Duc on	CAA75
		1290-1610 kc/s	700pF	Duc on	CAA75
	C24	P.A. neutralising	5 plates 3/8" spacing	STC	A673-C
	C25	P.A. Fil. bypass	0.01μF	Duc on	M
	C26	P.A. Fil. bypass	0.01μF	Duc on	M
X	C27	P.A. Anode blocking	500pF	Duc on	CAA75
X	C28	P.A. Harm. Tuning	2x200pF Series	Duc on	CAA75

ITEM	CIRCUIT FUNCTION	DESCRIPTION	SUPPLIER	SUPPLIER'S TYPE NO.
C29	P.A. Fixed Tuning			
	525-655 Kc/s	(2x2000pF series) parallel (2x1000pF series)	Ducon	CAA140
			"	CAA 75
	655-820 Kc/s	2x2000pF series	"	CAA140
× →	820-1030 Kc/s	2x2000pF series	"	CAA140
	1030-1290 Kc/s	2x1000pF series	"	CAA140
	1290-1610 Kc/s	2x1000pF series	"	CAA140
× C30	P.A. fine tuning	10-500pF 15kV Var.	Vacap	VAC
C31)	Line Tuning			
to)	525-655 Kc/s	3x2000pF Parallel	Ducon	CAA140
C32)	655-820 Kc/s	(2x2000pF) Parallel (1x500pF)	"	CAA140
			"	CAA 75
× →	820-1030 Kc/s	2x2000pF parallel	"	CAA140
	1030-1290 Kc/s	(1x2000pF) parallel (1x1000pF)	"	CAA140
			"	CAA100
	1290-1610 Kc/s	(1x2000pF) parallel (1x500 pF)	"	CAA140
			"	CAA 75
C33	Line Blocking	0.04µF	Ducon	ME114 ×
C34	C.F. Bypass	0.01µF	Ducon	SM
C35	Line C.T. bypass	0.01µF	Ducon	SM
C36	L.A. bypass	0.01µF	Ducon	SM
C37	Mon. Feed	5pF	Ducon	HVD1 ×
C38	Mon. Divider	27pF	Ducon	SM
C39	Mon. Rect.	27pF	Ducon	SM
C40	Mon. Filter	200pF	Ducon	SM
C41	Mon, Blocking	0.1µF	UCC	PMM
C42	D.L. Blocking	0.04µF	Ducon	ME114
C43	Multi meter bypass	0.01µF	Ducon	SM
C44	AF1 decoupling	10µF	Ducon	4S100
C45	AF1 anode coupling	2µF	Ducon	4S20
C46	AF1 anode coupling	2µF	Ducon	4S20
C47	AF2 anode coupling	0.05µF	Ducon	10S005
C48	AF2 anode coupling	0.05µF	Ducon	10S005
C49	CF Screen bypass	16µF	Ducon	4S160
C50	CF Screen bypass	16µF	Ducon	4S160
C51)				
to)	Feedback Divider	50pF	Ducon	MB113
C60)				
C61	Not used			
C62)				
to)	Feedback Divider	50pF	Ducon	MB113
C71)				
C72	Not used			
C73	Feedback term.	0.04µF	Ducon	ME114
C74	Feedback term.	0.04µF	Ducon	ME114
C75	Mod. Coupling	2µF	Ducon	17N20

ITEM	CIRCUIT FUNCTION	DESCRIPTION	SUPPLIER	SUPPLIER'S TYPE NO.
C76	H.T. Filtering	24μF 3x8μF	Ducon	14N80
C77	AF2 Decoupling	4μF	Ducon	10N40
C78	½ H.T. filtering	8μF 2x4μF	Ducon	10N40
C79	Min. H.T. filtering	20μF	Ducon	5S200
C80	Bias tuning	0.25μF	UCC	CP47S
C81	Bias filter	20μF	Ducon	5S200
C82	Auto Start	300μF Electro	Ducon	EMG1570
C83	Relay H Holding	300μF Electro	Ducon	EMG1570
C84	Spark quench	0.5μF	UCC	PMP
C85	Neut. blocking	56pF	Ducon	CAA33
C86	Neut. blocking	56pF	Ducon	CAA33
C87	H.F. Equalising	0.039μF	Ducon	DFB231
	FUSES			
F1	Minor H.T.	Cartridge NSP 6A	Eng.Elect.	NS6
F2	50 Volt	Cartridge NSP 2A	Eng.Elect.	NS2
	INDUCTORS			
L1	Osc. screen choke	1.25mH	Eddystone	1010
L2	Dsel.Tuning	300μH	STC	SP76582
L3	Driver Grid Choke	1.25mH	Eddystone	1010
L4	Driver Anode Feed	8mH	STC	SP4201-L
L5	Driver tuning	120μH	STC	20-SU-39
L6	PA Grid Choke	4mH	STC	SP4201-E
L7	PA Anode Feed	2mH	STC	SP87080
L8	PA Harm.Tuning	37μH	STC	SP76584
L9	Line Arc Feed	2.5mH	STC	SP4201-C
L10	Diode D.C. Return	1.25mH	Eddystone	1010
L11	Min. H.T. Filter	[illegible] 0.6A	STC	K5400-6
L12	AF2 Decoupling	1CH 0.06A	STC	192-SU-36
L13	½HT Filter	2x6H 0.6A series	STC	K5400-6
L14	Mod. Reactor	18H	STC	192-SU-38
L15	H.T. filter	3H 3A	STC	192-SU-19A
L16	Bias Filter	6H 0.6A	STC	K5400-6
L17	Mod. stabilising	8 turns on R59	STC	
L18	Mod. stabilising	8 turns on R60	STC	
	LAMPS			
LP1	Crystal oven	12V MES	Mazda	8003D
LP2	Mains on	12V ASBC	Bulgin	D230
LP3	H.T. On	12V ASBC	"	D230
LP4	Rect. time delay	50V No. 2	STC	313
LP5	Gate switch	50V No. 2	STC	313

ITEM	CIRCUIT FUNCTION	DESCRIPTION	SUPPLIER	SUPPLIER'S TYPE NO.
	METERS			
M1	Multimeter	0-1mA DC scale 0-5	Paton	K425
M2	P.A. cathode	0-2A DC	Paton	K425
M3	R.F. Line	0-1mA DC scaled 5A RF	Paton	K425
M4	D/L R.F. current	Int. thermocouple	Paton	35
M5	Mod. A cathode	0-1A DC	Paton	K425
M6	Mod. B cathode	0-1A DC	Paton	K425
M7	H.T. voltmeter	0-10mA DC scaled 0-5KV	Paton	K425
M8	Min. H.T. voltmeter	0-500V DC	Paton	35
M9	Bias voltmeter	0-500V DC	Paton	35
M10	Mains voltmeter	0-500V AC	Paton	K425
M11	Elapsed hours	Hours 240V 50 c/s	Sangamo	S16
	RESISTORS			
R1	Crystal devolter	470KΩ 10%	Morganite	AY
R2	Crystal devolter	470KΩ 10%	Morganite	AY
R3	Oscillator grid	100K ±10%	Morganite	AY
R4	Oscillator grid stopper	47Ω ±20%	Morganite	AY
R5	Osc. Cath. meter	20.4Ω ±10%	IRC	RWV4J
R6	Osc. screen stopper	47Ω ±20%	Morganite	AY
R7	Osc. screen feed	100KΩ ±10%	Morganite	AY
R8	Osc. screen divider	4.7KΩ ±10%	IRC	PW10
R9	Osc. screen divider	8KΩ Pot.	IRC	PR50
R10	Osc. screen divider	10KΩ ±10%	IRC	PW10
R11	Osc. anode load	10KΩ ±10%	IRC	RWV4L
R12	Isol. grid	100KΩ ±10%	Morganite	AY
R13	Isol. grid stopper	47Ω ±20%	Morganite	AY
R14	Isol. cath. bias	500Ω ±5%	IRC	RWV4L
R15	Isol. cath. meter	20.4Ω ±2%	IRC	RWV4J
R16	Isol. screen stopper	100Ω ±10%	Morganite	AY
R17	Isol. screen feed	150KΩ ±10%	IRC	BTR
R18	Isol. anode feed	2KΩ ±5%	IRC	RWV4L
R19	Dr. Grid stopper	47Ω ±20%	Morganite	AY
R20	Dr. Cath. meter	2Ω ±2%	IRC	RWV4J
R21	Dr. overload	15Ω Pot.	IRC	PR25
R22	Dr. screen stopper	47Ω ±20%	Morganite	AY
R23	Dr. screen meter	20.4Ω ±2%	IRC	RWV4J
R24	Dr. screen feed	4.7KΩ ±10%	IRC	PW10
R25	Dr. anode feed	1000Ω ±10%	IRC	FRW24B
R26	PA Grid leak	1000Ω ±10%	IRC	FRW24B
R27	PA Overload	2Ω Pot.	IRC	PR25
R28	Line C.T. load	2x12Ω	Erie	Type 10
R29	R.F. meter adjust	10KΩ pot.	IRC	ZW
R30	Dummy load	2x100Ω nominal series	STC	177-SU-1C
R31	C.F. protection	200Ω ±10%	Morganite	AY
R32	C.F. dropping	2KΩ ±10%	IRC	RWV4J

ITEM	CIRCUIT FUNCTION	DESCRIPTION	SUPPLIER	SUPPLIER'S TYPE NO.
R33	Diode filter	220KΩ ±5%	Morganite	AY
R34	Diode load	33KΩ ±5%	Morganite	AY
R35	T4 terminating	22KΩ ±5%	IRC	BTA
R36	T4 terminating	22KΩ ±5%	IRC	BTA
R37	A.F.1 Cath.Bias	500Ω ±5%	IRC	RWV4J
R38	A.F.1 screen dropping	220KΩ ±10%	IRC	BTA
R39	A.F.1 anode load	100KΩ ±5%	IRC	BTA
R40	A.F.1 anode load	100KΩ ±5%	IRC	BTA
R41	A.F.1 metering	250Ω ±2%	IRC	RWV4J
R42	A.F.1 metering	250Ω ±2%	IRC	RWV4J
R43	A.F.2 grid leak	150KΩ ±5%	IRC	BTA
R44	A.F.2 grid leak	150KΩ ±5%	IRC	BTA
R45	A.F.2 Cath. bias	1KΩ ±5%	IRC	RWV4L
R46	A.F.1 decoupling	33KΩ ±10%	IRC	BTA
R47	A.F.2 metering	20.4Ω ±2%	IRC	RWV4J
R48	A.F.2 metering	20.4Ω ±2%	IRC	RWV4J
R49	A.F.2 anode load	40KΩ ±5%	IRC	FRW24B
R50	A.F.2 Anode load	40KΩ ±5%	IRC	FRW24B
R51	C.F. Grid leak	150KΩ ±5%	IRC	BTA
R52	C.F. Grid leak	150KΩ ±5%	IRC	BTA
R53	C.F. Screen dropping	2x40KΩ ±5%	IRC	FRW24B
R54	C.F. Screen dropping	2x40KΩ ±5%	IRC	FRW24B
R55	C.F. Screen bleed	20KΩ ±5%	IRC	FRW24B
R56	C.F. Screen bleed	20KΩ ±5%	IRC	FRW24B
R57	C.F. Metering	20.4Ω ±2%	IRC	RWV4J
R58	C.F. Metering	20.4Ω ±2%	IRC	RWV4J
R59	Mod. Grid stopper	47Ω ±10%	Erie	Type 10
R60	Mod. Grid stopper	47Ω ±10%	Erie	Type 10
R61	Mod. O/L Adjust	2Ω Pot.	IRC	PR25
R62	Mod. O/L Adjust	2Ω Pot.	IRC	PR25
R63) to R72)	Feedback Divider	330KΩ ±5%	IRC	BTB
R74) to R83)	Feedback Divider	330KΩ ±5%	IRC	BTB
R85	Feedback Bleed	390Ω ±5%	IRC	RWV4J
R86	Feedback Bleed	390Ω ±5%	IRC	RWV4J
R87	Feedback stabilising	56Ω ±5%	IRC	BTA
R88	Feedback stabilising	56Ω ±5%	IRC	BTA
R89	H.T. Meter mult.	10x50KΩ ±2%	IRC	FRW24B
R90	H.T. Meter bleed	2.2KΩ ±10%	IRC	BTA
R91	L12 Damping	5KΩ ±10%	IRC	RWV4L
R92	C.F. bias bleed	8.2KΩ	IRC	FRWB-21
R93	C.F. bias Pot.	8KΩ Pot.	IRC	PR50
R94	C.F. bias Pot.	8KΩ Pot.	IRC	PR50

ITEM	CIRCUIT FUNCTION	DESCRIPTION	SUPPLIER	SUPPLIER'S TYPE NO.
R95	Mod. bias Pot.	3.5KΩ Pot	IRC	PR50
R96	Mod. bias Pot.	3.5KΩ Pot.	IRC	PR50
R97	Mod. bias bleed	2.5KΩ Pot.	IRC	PR50
R98	P.A. bias bleed	1.5KΩ ±5%	IRC	FRW24B
R99	Dr. bias bleed	500Ω ±5%	IRC	FRW24B
R100	P.A. Grid meter	2Ω ±2%	IRC	RWV4J
R101	Dr. Grid meter	20.4Ω ±2%	IRC	RWV4J
R102	Dr. Grid bias	3.3KΩ ±10%	IRC	PW10
R103	Meter Multi.	850Ω ±2%	IRC	RWV4J
R104	Counter dropping	560Ω ±10%	IRC	RWV4J
R105	A.F.2 Grid stopper	470Ω ±10%	IRC	BTA
R106	A.F.2 Grid stopper	470Ω ±10%	IRC	BTA
R107	Lamp Dropping	5Ω ±10%	IRC	RWV4L
R108	Lamp Dropping	5Ω ±10%	IRC	RWV4L
R109	Lamp Dropping	200Ω ±10%	IRC	RWV4J
R110	Lamp Dropping	200Ω ±10%	IRC	RWV4J
R111	C59 Discharge	10KΩ ±10%	IRC	RWV4L
R112	Current limiting	1KΩ ±10%	IRC	RWV4J
R113	C83 limiting	250Ω ±10%	IRC	RWV4J
R114	Spark Quench	200Ω ±10%	IRC	RWV4J
R115	Minor H.T. O/L adjust	15Ω Pot.	IRC	PR25
R116	H.T. O/L Adjust	2Ω Pot.	IRC	PR25 — 25 watt
R117	Tune/Trans dropping	20Ω	STC	62-SU-1L
R118	Tune/Trans.dropping	20Ω	STC	62-SU-1L
R119	Tune/Trans.dropping	20Ω	STC	62-SU-1L
R120) to R125)	Arc back dropping	2Ω ±10%	IRC	DGA-C-3
R126	Drop dropping	2KΩ ±10%	IRC	RWL4L
R127	Fil. dropping	10Ω 5W	IRC	AB-C-1
R128	Fil. dropping	10Ω 5W	IRC	AB-C-1
R129	Fil. balance	15Ω 2W Pot	Colvern	CLF24-5T
R130	Fil. balance	15Ω 2W Pot	Colvern	CLF24-5T
R131	Fil. dropping	10Ω 5W	IRC	AB-C-1
R132	Fil. dropping	10Ω 5W	IRC	AB-C-1
R133	Min. H.T. Bleed	15KΩ	IRC	FRW22
PAD	16db 600Ω	1K Series 820Ω Shunt	IRC	BTA
	SWITCHES			
S1	Mains isolate	45A curve 2	Heineman	3363S
S2	H.T. isolate	30A curve 2	Heineman	3363S
S3	L.T. isolate	8A curve 2	Heineman	3363S
S4	L.T. ON	S.P. Toggle	Painton	501085
S5	H.T. ON SH. T delay	Push button black	Acelec	540
S6	H.T. OFF	Push button red)	Industrial	
S7	H.T. ON	Push button green)	Interior	

ITEM	CIRCUIT FUNCTION	DESCRIPTION	SUPPLIER	SUPPLIER'S TYPE NO.
S8	Tune/Transmit	S.P. Toggle	Painton	501085
S9	Rear Rect. Door	Micro Switch	Den Dee	PM1
S10	Rear R.F. Door	Micro Switch	Den Dee	PM1
S11	Tube Window	Micro Switch	Den Dee	PM1
S12	Front R.F. Door	Micro Switch	Den Dee	PM1
S13	Front Rect. Door	Micro Switch	Den Dee	PM1
S14	Dummy Load	S.P. Toggle	Painton	501085
S15	Utility	D.P. Toggle	Cutler Hammer	7360K5
S16	Multimeter	12 Psn. 2 Bank	Oak	SP29301AE
S17	Air Flow	Micro Switch	Den Dee	PM1
	TRANSFORMERS			
T1	P.A. Tank	Prim. 21T, Sec. 9T	STC	20-SU-29
T2	R.F. Line	Prim. IT, Sec. 10T	STC	SP-4-D
T3	Mon. Output	600Ω/25K, 25KΩ	STC	CF5223-7
T4	A.F. Input	600Ω/25K, 25KΩ	STC	CF5223-7
T5	C.F. Choke	40/40H	STC	192-SU-34B
T6	Modulation trans.		STC	74-SU-179A
T7	H.T. Trans.	440V 3 phase	Hanson	RS508-AN
T8	Min. H.T. Trans.	240V/378,495V	STC	74-SU-129B
T9	50 Volt supply	240V/10,60V	STC	74-SU-135
T10	Mod. A. Fil.	240V/2x7.5V	STC	74-SU-132A
T11	Mod. B. Fil.	240V/2x7.5V	STC	74-SU-132A
T12	Hot. Rect. Fil.	240V/5V 30A	STC	K5631-2
T13	Cold Rect. Fil.	240V/5V 7A	STC	74-SU-113C
T14	Cold Rect. Fil.	240V/5V 7A	STC	74-SU-113C
T15	Cold Rect. Fil.	240V/5V 7A	STC	74-SU-113C
T16	P.A. Fil.	240V/2x7.5V	STC	74-SU-132A
T17	Bias Fil.	240V/379,495V	STC	74-SU-129B
T18	R.F. Dr. and 6.3V Fil.	240V/6.3, 5V	STC	74-SU-133
T19	AF2 Fil.	240V/2x5V	STC	74-SU-127B
T20	C.F. Fil.	240V/2x5V	STC	74-SU-127B
	ELECTRON TUBES			
V1	Xtal Osc.	Beam tetrode	Brimar	807
V2	Isolator	Beam tetrode	Brimar	807
V3	R.F. Driver	Radiation Cooled Tetrode	Eimac	4-125A
V4	Power amplifier	Air Blast triode	Eimac	3x2500F3
V5) V6)	1st A.F. Amp.	Low noise pentode	Mullard	EF37A
V7) V8)	2nd A.F. Amp.	Radiation cooled Tetrode	Eimac	4-125A
V9) V10)	Cath. Foll.	Radiation cooled Tetrode	Eimac	4-125A

ITEM	CIRCUIT FUNCTION	DESCRIPTION	SUPPLIER	SUPPLIER'S TYPE NO.
V11) V12) V13) to V18)	Modulators H.T. rectifiers	Air Blast triode H.C.M.V. Rectifiers	Eimac STC	3x2500F3 872A
V19	Monitor Diode	Vacuum diode	Brimar	6x5GT
	RECTIFIERS			
MR1	Line Meter	2 Silicon diodes	Mullard	OA202
MR2	Carrier Fail	2 Germanium Diodes	STC	GD8
MR3	Bias marginal	Zener Diode	STC	Z2A159
MR4	Relay H Blocking	Silicon Diode	STC	FST¼
MR5	Count and Gate	Germanium Diode	STC	GD8
MR6	Count and Gate	Germanium Diode	STC	GD8
MR7	Count and Gate	Germanium Diode	STC	GD8
MR8	Count and Gate	Germanium Diode	STC	GD8
MR9	Count and Gate	Germanium Diode	STC	GD8
MR10	Count and Gate	Germanium Diode	STC	GD8
MR11	Count and Gate	Germanium Diode	STC	GD8
MR12	Min. H.T. Rect.	Selenium Rect.	STC	B450-20-1/H4
MR13	Bias Rect.	Selenium Rect.	STC	B450-20-1/H4
MR14	-50 Control	Selenium Rect.	STC	B450-3-1
MR15) to MR20)	Arc Back Blocking	Germanium Rect.	STC	GD8
	CONTACTORS			
BL	Blower Contactor	240V 50 c/s	Nilsen	OJ15AU
FL	Filament contactor	240V 50 c/s	Nilsen	OJ15C
HT1	1st H.T. contactor	240V 50 c/s	Siemens	K915-111-2
HT2	2nd H.T. contactor	240V 50 c/s	Siemens	K915-111-2
DL	Dummy load contactor	240V 50 c/s	A.G.E.	
	RELAYS			
LT	L.T. ON	2000Ω 1 M.S.	STC	5119GTFS
RDH	Rect. Delay Hold	2000Ω 2C	STC	5102JXTFS
C	Control	2000Ω 2 M.S.	STC	5119CDTFS
H	Hold	5000Ω 1B 1C	STC	5102ZTTFS
LO	Look out	1000/1000Ω 2B	STC	5102BHJTFS
BM	Bias Marginal	1000Ω 1 M.S.	STC	5119AQTFS
DR	R.F. Driver O/L	50Ω 1 M.S.	STC	5119YTFS
PA	Power Amp. O/L	50Ω 1 M.S.	STC	5119YTFS
MA	Modulator A O/L	50Ω 1 M.S.	STC	5119YTFS
MB	Modulator B O/L	50Ω 1 M.S.	STC	5119YTFS

ITEM	CIRCUIT FUNCTION	DESCRIPTION	SUPPLIER	SUPPLIER'S TYPE NO.
HTO	High Tension O/L	50Ω 1 M.S.	STC	5119YTFS
MO	Min. H.T. O/L	50Ω 1 M.S.	STC	5119YTFS
LA	Line Arc	2000Ω 2mlC	STC	5103FQTFS
CF	Carrier Fail	2000Ω 2C	STC	5102JXTFS
ST	Start Relay	2000Ω 1 M.S.	STC	5119GTFS
RLC	O/L counter	150/250Ω 10m	M&G	ZM53
BR	Blower release	240V 50 c/s 0-1 Min	ECE	PT60M1
HD	H.T. Delay	240V 50 c/s 0-1 Min	ECE	PT60M
RD	Rect. delay	240V 50 c/s 0-3 min	ECE	PT60M
D1 to D7	O/L indicators		STC	4008
D8 to D13	Arc back indicators		STC	4008
	Blower	½ H.P. 1450 rpm R.H.Upcast 1½ MMV	Richardson	
	Attenuator	0-16-Inf. db 600Ω	Trans. Prod.	101ES

SECTION 8 - INSTALLATION

For shipment, the crystal, all tubes, the relay box, and all components mounting in the base of the transmitter are removed and packed separately. Loose controls and cable ends are tied to prevent damage.

Upon arrival the equipment should be unpacked and carefully examined for damage. The H.T. transformer and filter capacitors should be installed and connected up, followed by the blower making sure that the frame is earthed. The modulator coupling capacitor should next be installed followed by the H.T. choke, modulation transformer and choke as shown in the photographs in Section 11. The Mod. transformer is placed at the rear with terminals 1, 2, and 3 at the rear. Terminals 3 and 4 on the Mod. choke are to the front. Particular care should be taken to ensure that the connections to the modulation transformer and choke are correct in order that the feed-back and partial modulation connections are not reversed.

Cable entry to the transmitter is by means of bushes at the bottom of the rear centre panel. The three mains and neutral should be connected to the mains terminals, to the right of the centre panel, and the protective cover pbplaced.

Speech entry, the cabinet earth, monitoring and other facilities required are connected to the terminal boards to the right of the centre panel.

For local operation the remote L.T. ON terminals 10 and 11, the remote H.T. OFF, terminals 13 and 14 and the terminals 16 and 17 should be bridged. Where no remote R.F. current indication is required, the terminals 7 and 8 should be bridged.

All transformer primaries should next be set to the tap closest to the nominal supply voltage. T9 and T18 are located at the bottom of the centre dividing panel. T10, T11, T19 and T20 are located in the rear of the R.F. Modulator cabinet. It should be noted that adjustment of the rectifier filament transformers is by auto-transformer action via the primary of T16.

Check that all shorting wires on meters have been removed.

The unit is now ready for testing as in Section 9.

SECTION 9 - TESTING AND OPERATION

9.1 Preparation

(a) On completion of installation check all wiring for correct termination and continuity. NOTE make certain that the mains supply is disconnected while these tests are being carried out.

(b) Check that the fan and all shafts move freely.

(c) Check that all bolts and nuts are tight.

(d) Check that the fuses are correctly loaded.

(e) Check that transformer tappings, potentiometers, capacitors, coils relays and spark gaps are adjusted in accordance with the tables in Section 10.

9.2 Control Circuits

(a) Do not install any tubes. Check that the filament leads are insulated from earth and from each other.

NOTE Some of the filament transformer secondary windings have a low resistance path to earth via a centre tap.

(b) Close the MAINS ISOLATOR and L.T. ISOLATOR circuit breakers. Install the relay. With the 50 VOLT CONTROL fuse, F2, installed and mains supply connected the MAINS ON lamp should light.

(c) Ensure that the H.T. ISOLATOR circuit breaker is open and close the LT ON switch. Check that the blower rotates in the correct direction. (The fan should rotate anti-clockwise when viewed from the air entry). If incorrect reverse two of the leads to the motor or the mains input. Check that the filament voltages are approximately as shown in the table below.

(d) Insert the crystal and all tubes. The plastic pipes for the 3X2500F3 tubes should be brought close to the filament stems so as to direct a stream of air into the annular space between the inner and outer filament connectors. Replace the air box front panel and secure by means of the quick fasteners.

(e) Close the LT ON switch and check that all tube filaments and the crystal heater lamp, LP1, now come on. Allow 30 minutes to "Bake Out" the S72A rectifiers. During the interval the tube filament voltages should be measured with an accurate A.C. voltmeter, at the base pins of the tubes. The voltage should be within 5% of the nominal voltages as below.

Tube	Voltage	Limits
3X2500F3	7.5	7.13 to 7.87
4-125A;872A	5.0	4.75 to 5.25
807; EF37A	6.3	6.0 to 6.6

Note that the TIME DELAY EXPIRED lamp LP4 lights after the filaments have been on for 2 minutes. With all doors closed and the blower operating the GATES CLOSED lamp, LP5 should be alight.

Check that the filament hours meter is working.

(f) Insert the MIN. H.T. fuse, F1, and place the TUNE/TRANSMIT switch, S8, in the TUNE position and check that the DUMMY LOAD switch is closed.

(g) Press the H.T. ON button, it should be possible to hear the H.T. contactor HT1 close. Switch to TRANSMIT and the second H.T. contactor will close lighting the H.T. ON lamp, LP3.

(h) Switch to TUNE, turn the OUTPUT COUPLING to zero and close the H.T. ISOLATOR. Set the A.F. ATTENUATOR to infinity and the remaining controls to the settings given in Section 10, and press the H.T. ON button.

The transmitter should now be tuned as in Section 9.4.

(j) When fully loaded to 5.5kW carrier power the H.T. voltmeter should read 4.8KV. If the H.T. is not 4.8KV then the primary taps on the H.T. transformer, T-7 should be adjusted to give this voltage

9.5 Audio Frequency Circuits

(a) Short circuit terminals 3 and 8 to earth on the input transformer T4. Set the A.F. ATTENUATOR to a convenient value, say 5db. Connect a low distortion audio frequency oscillator to the program input terminals 1,2 and 3 via an accurately calibrated 600 ohm balanced attenuator.

(b) Couple a detector type distortion and noise meter to the monitor terminals 4, 5 and 6. If available an external modulation monitor should be used (an R.F. monitor socket is located under the centre partition) and its output fed to the distortion and noise meter. If no Mod. monitor is available a cathode ray oscilloscope should be used.

Start the transmitter and feed a 1000 c/s signal to the audio amplifier. Adjust the level to 50% modulation. Set the gain control of the distortion and noise meter to a convenient reading and note the reading.

Remove the earthing leads from the input transformer. Decrease the attenuator setting until the same level of modulation is obtained. The difference in the attenuator settings will be the amount of feedback applied to the A.F. Amplifier and should be approximately 12 db.

(c) Measure the distortion and check that it is within the values specified in Section 1.3.

(d) Using a vacuum-tube voltmeter to ensure a constant output from the oscillator, measure the response using 1000 c/s at 50% modulation as reference. Check that the results comply with those specified in Section 1.3.

(e) Using 100% modulation at 1000 c/s as reference check that the noise level of the carrier is at least 60db. down.

If the noise level is above -60db it may be because the potentiometers R129 and R130 are out of adjustment.

(f) Check, distortion, response, and noise from the built-in detector.

(g) Record all circuit settings and meter readings for the unmodulated condition as well as for selected depths of modulation. Conduct a heat run with the carrier modulated approximately 40%.

(h) Switch off the transmitter and switch from DUMMY LOAD to the aerial. Operate the transmitter and check that it performs satisfactorily under these conditions.

The equipment is now ready to carry normal program.

9.4 Frequency Changing

NOTE When making adjustments inside the transmitter the MAINS ISOLATOR should always be switched off.

(a) When the transmitter is to be set up for a new carrier frequency the correct components, shown in the components list Section 7, should be installed.

The components involved are: C21, C23, and C29, C31 and C32.

If the required new frequency varies widely from that which the exciter was tuned to it may be necessary to alter the tap on coil L2 or the number of gangs in C14.

(b) Connect a calibrated R.F. ammeter (0-10 amps) in series with the Dummy load. Switch to DUMMY LOAD and move the TUNE/TRANSMIT switch to TUNE.

(c) Reduce the OUTPUT COUPLING to zero and start the transmitter.

With the multimeter set to the D.R. Grid position, the ISOLATOR TUNE knob is adjusted to peak the driver grid current.

(d) Set the multimeter to PA GRID and peak the PA GRID current by adjusting the DRIVER TUNE knob.

If the maximum P.A. grid current should occur when the driver tuning capacitor, C22, is at a minimum the tap on the driver tuning coil L5 should be moved to include one turn less in circuit and vice versa.

(e) The power amplifier should now be tuned by adjusting the P.A. TUNING control for minimum P.A. cathode current.

If the minimum P.A. cathode current occurs when the P.A. tuning capacitor C30 is at minimum capacitance, the tap on the P.A. tuning coil T1, should be moved to include one less turn in circuit and vice versa.

(f) Neutralising of the power amplifier. If the P.A. is correctly neutralised, the P.A. GRID current should decrease when the P.A. TUNING is detuned either way from the setting at which minimum P.A. CATHODE current is obtained. If this is not so, the neutralising capacitor C24 should be adjusted as follows.

If the P.A. GRID current increases when the P.A. tuning control is rotated clockwise (i.e. C30 toward minimum capacitance) the stage is under-neutralised and the neutralising capacitor C24, should be increased and vice versa.

(g) Output Coupling. Move the TUNE/TRANSMIT switch to TRANSMIT and increase the coupling until the P.A. CATHODE current is approximately 1.5A checking the P.A. TUNING as the coupling is increased.

If it is necessary to rotate the P.A. TUNING control clockwise (i.e. less capacitance) for correct tuning the inductance of the output coupling coil, T1, should be reduced slightly and vice versa.

NOTE: If the output is tuned to the DUMMY LOAD the load itself should be tuned to the new frequency.

(h) R.F. LINE Meter Compare the reading of the R.F. LINE meter, M-8, with the calibrated R.F. ammeter connected in the output. If necessary, adjust the potentiometer, R29, in small increments by trial and error to make the R.F. LINE meter read correctly.

(j) Harmonic Tuning Coil. The harmonic tuning coil, L8, serves the dual purpose of stabilising the power amplifier, and by tuning to a low harmonic of the carrier, increasing the P.A. Anode efficiency to 80% or more.

To adjust the Harmonic tuning coil the coupling is increased until the P.A. CATHODE current is about 1.5 amperes. If the P.A. CATHODE current, P.A. GRID current H.T. voltage, R.F. LINE current and the Dummy load resistance are measured. The P.A. anode efficiency may be calculated.

This procedure is repeated for various numbers of turns in circuit in the harmonic tuning coil, say 8, 9 etc. The efficiency for each number of turns is tabulated and the optimum value chosen.

Check that the P.A. and Driver circuits are still tuned.

(k) Adjust the OUTPUT COUPLING to give the rated 5.5kW output and check all meter readings with the representative values given in Section 10.

Check the carrier frequency of the transmitter against the frequency standard and adjust to the exact value with the frequency adjusting capacitors C1 and C5.

Switch the transmitter off.

9.5 Normal Operation

To start the equipment once the transmitter has been tuned correctly it is only necessary to turn the L.T. ON switch S-4, ON and after the rectifier delay relay has operated, as indicated by the TIME DELAY EXPIRED lamp, the H.T. ON button may be pressed to energise the H.T. supplies.

To switch off it is only necessary to open the L.T. ON switch or press the H.T. OFF button and then open the L.T. ON switch.

NOTE: Once the transmitter has been placed in normal service, the MAINS ISOLATOR should be left closed (except during periods of maintenance) in order to maintain the crystal oven in the R.F. exciter at a constant temperature.

Each time the transmitter is started a check should be made of all meter readings to ensure that no abnormalities exist.

9.6 Maintenance

The routine maintenance will obviously depend on whether or not the transmitter operates unattended, however, it is desirable to record all meter readings at least twice daily if this is possible.

The weekly routine should include attention to the following points:-

(a) The importance of keeping the equipment free from dust can not be over emphasised. In addition to the cleaning rag a vacuum cleaner will be found most useful.

(b) Remove and clean the dry type air filters mounted on the rear doors. Where the dust is of a dry sandy nature it should only be necessary to shake or gently tap on the side of the filter to remove the dust. More finely divided dust particles may be removed by blowing from the clean side of the filter with compressed air or with a vacuum cleaner.

(c) Clean the glass of all tubes.

(d) Clean all insulators.

(e) Check the operation of the air flow switch

(f) Check that the overload relays, when manually operated, cause their respective indicators to work.

(g) Check that the control relays and contactors operate smoothly and correctly.

(h) Check the pilot lamps and replace if burnt out.

(j) Inspect the blower motor for any signs of overheating of the windings or bearings.

(k) Check the output power, audio frequency response, distortion and noise.

(l) Inspect all items for loose connections or faulty contacts. The following items should be attended to at monthly intervals.

(m) Clean the contacts of 3000 type telephone relays with a burnishing tool.

(n) Clean with carbon-tetrachloride and lubricate sparingly with paraffin oil the studs and wiper arms of the input attenuator. At yearly intervals the blower motor bearings should be lubricated and the electrolytic capacitors C82, and C83 should be replaced.

Care of H.C.M.V. rectifier tubes

When a tube is received it will have deposits of mercury on all parts of the tube due to handling. Any tube which has been displaced from its normal operating position should have its filaments operated for 30 minutes before applying H.T.

Care of thoriated tungsten filament tubes

In making connections care should be exercised not to subject the terminals to bending or twisting stresses which may damage the seals. Dust should not be permitted to collect on tubes since this will result in an increased operating temperature. The tubes must be protected from shock and vibration and the glass surfaces must not be scratched or subjected to thermal shock, such as laying a hot tube on a cold metal surface.

The thoriated tungsten filaments should be operated at the rated voltage as measured at the tube terminals. It should be noted that a decrease in filament voltage of 5% will result in a decrease in emission of 25% and no increase in life may be expected from this procedure.

In cases where severe overloads have caused loss of emission the activity of the filament may frequently be restored by operating the filament only for 10 minutes at 30% over-voltage and then for 1 hour at normal voltage. If the overload is sufficient to soften the tube the liberated gas will rapidly destroy the filament and no recovery is possible.

It is recommended that spare and working tubes be interchanged regularly so that no tube remains idle for more than 4 months. Provision is made in the transmitter for the spare H.C.M.V. tube to have its filament heated ready for use.

SECTION 10 - CIRCUIT SETTINGS AND METER READINGS

DATE TESTED .....

Transmitter Serial No. .....

Frequency .....

Circuit Settings

C21 .....

C23 .....

C24 .....

C29 .....

C31 .....

C32 .....

L5 .....

L8 .....

T12 Prim. .....

Sec. .....

Tuning

Isolator .....

Driver .....

Power Amp. .....

Coupling .....

Transformer Tap

T7 .....

T8 .....

T9 .....

Transformer Tap (cont'd)

T10 .....

T11 .....

T12-15.....

T16 .....

T17 .....

T18 .....

T19 .....

T20 .....

Arc Gaps

Mod. Trans. Terms.

1-2 .....

2-3 .....

4-5 .....

Mod. Choke Terms

1-2 .....

3-4 .....

Measurements

Artificial Aerial .....

V1 Grid R.F. Volts .....

V1 Screen D.C. Volts .....

Overloads

R21 and D.R. .....

R27 and P.A. .....

R61 and M.A. .....

Overloads (cont'd)

R62 and M.B. .....

R115 and M.O.....

R116 and HTO .....

R97 and BM .....

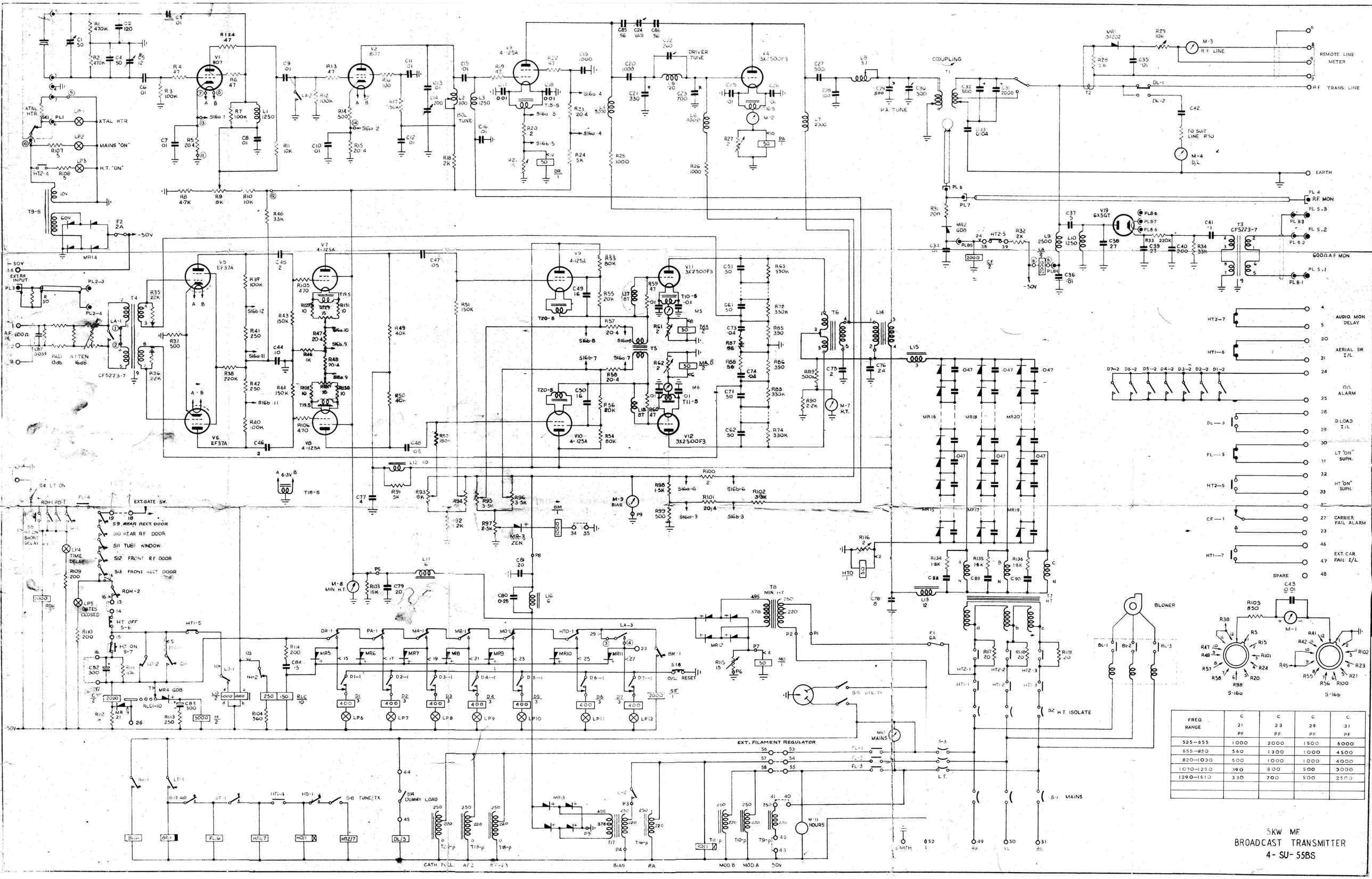
PERFORMANCE

Frequency	30	50	100	400	1 Kc	3 Kc	5Kc	7.5Kc	10 Kc
Response db									
Distortion % 100% Mod.									
Distortion % -2db "									
Distortion % -6db "									
Noise level ref. 100% Mod.									
Input level for 100% Mod.									

METER READINGS

Frequency of Modulation

Modulation		0%	40%	100%
Mod.	A			
Mod.	B			
P.A.				
XTAL	K			
ISOL	K			
DR	G			
DR	S			
DR	K			
PA	G			
CFA	K			
CFB	K			
AF2A	K			
AF2B	K			
AF1A	A			
AF1B	A			
RF	LINE			
HT	SUPPLY			
MAINS	SUPPLY			
RF	AMPS			
BIAS	SUPPLY			
MIN.H.T.	SUPPLY			



FREQ. RANGE	C 21 PF	C 23 PF	C 29 PF	C 31 PF
525–655	1000	2000	1500	6000
655–820	560	1300	1000	4500
820–1030	500	1000	1000	4000
1030–1220	390	800	500	3000
1290–1610	330	700	500	2500