ADMIRALTY

TYPE 619

AND

RECEIVER OUTFIT CAT

PRELIMINARY
TECHNICAL INFORMATION

NOTE.

This very abridged information, issued in advance of quantity production, will be superseded shortly by a full handbook on the equipment covering description, adjustment, working, maintenance, and repair.

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CONTENTS

The right is reserved to vary these specifications in the light of further technical development.

21st September, 1953.

ERRATA

Page 4. Paragraph 10.
Line 12. For RV3 read RV5.
Line 13. For RV3 read RV5.

Page 8. Paragraph 23, line 7, column 3.
For Diode 1 read Diode 2.
For Diode 2 read Diode 1.

Page 10. Paragraph 27, line 2, column 3.
Add after VN , W and I.

Page 12. Paragraph 39, line 1.
For 2nd diode read left diode.

Fig. 1. Delete the " strap " indication across R22.

Fig. 2. Switches SWJ and SWK. Amend wafer lettering—For " a " read " b."
,, " c " read " d."
,, " e " read " f."

Switch SWG, wafer d. Number the contact connected to L5a as " 5."

Switch SWM, wafer a. Amend " a " to read " b."
Amend all contact numbers to read one more.

Switch SWM, wafer b. Amend " b " to read " a."
Amend all contact numbers to read one less.

At 9 points in circuit, where arrows indicating connecting wires are shown, make corresponding corrections, e.g., Arrow " To SWM b 5 " should read " To SWM a 4," and " To SWM a 4 " should read " To SWM b 5."

Valve V6. Re-draw *upper* anode as a cathode.

Component Identification strip—Miscellaneous—For " L1 L1 L1 " read " L1 L2 L3."

Relay contacts of RLF. Amend contact " d " to read " 4."

C73. Amend position in circuit to be between R77 and SWL 12, connecting R76 to earth.

L7. Amend position to tap " C " to the centre turn of inductor.

L8. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,

L9. ,, ,, ,, ,, ,, ,, ,, lower ,, ,, ,,

Fig. 3. Table top left corner. Line 7, col. 4 to read Ig V4 and V5.

Fig. 4. Transformer TR1. Re-label terminal " e " as " f."
,, ,, " f " as " e."

5*th October*, 1953.

ERRATA No. 2

Page 2. Paragraph 4 (*b*), line 1. After "wire" insert "except earth leads."

Page 4. Paragraph 10, Aerial Metering Circuit, line 2. For "L20" read "L22."

Page 14. Paragraph 2, line 1. For "0.24 amps" read "0.42 amps."

Page 15. Paragraph 4, table column 5, lines 9 and 10. For "215" read "210."

Page 16. Paragraph 8, table column 5, Range 1. For "throughout band" read "at top of band."

Page 16. Paragraph 9, line 1. For "1.5 Mc/s" read "3.3 Mc/s."

Fig. 3. In 2 places amend value of R24 to read 47K.

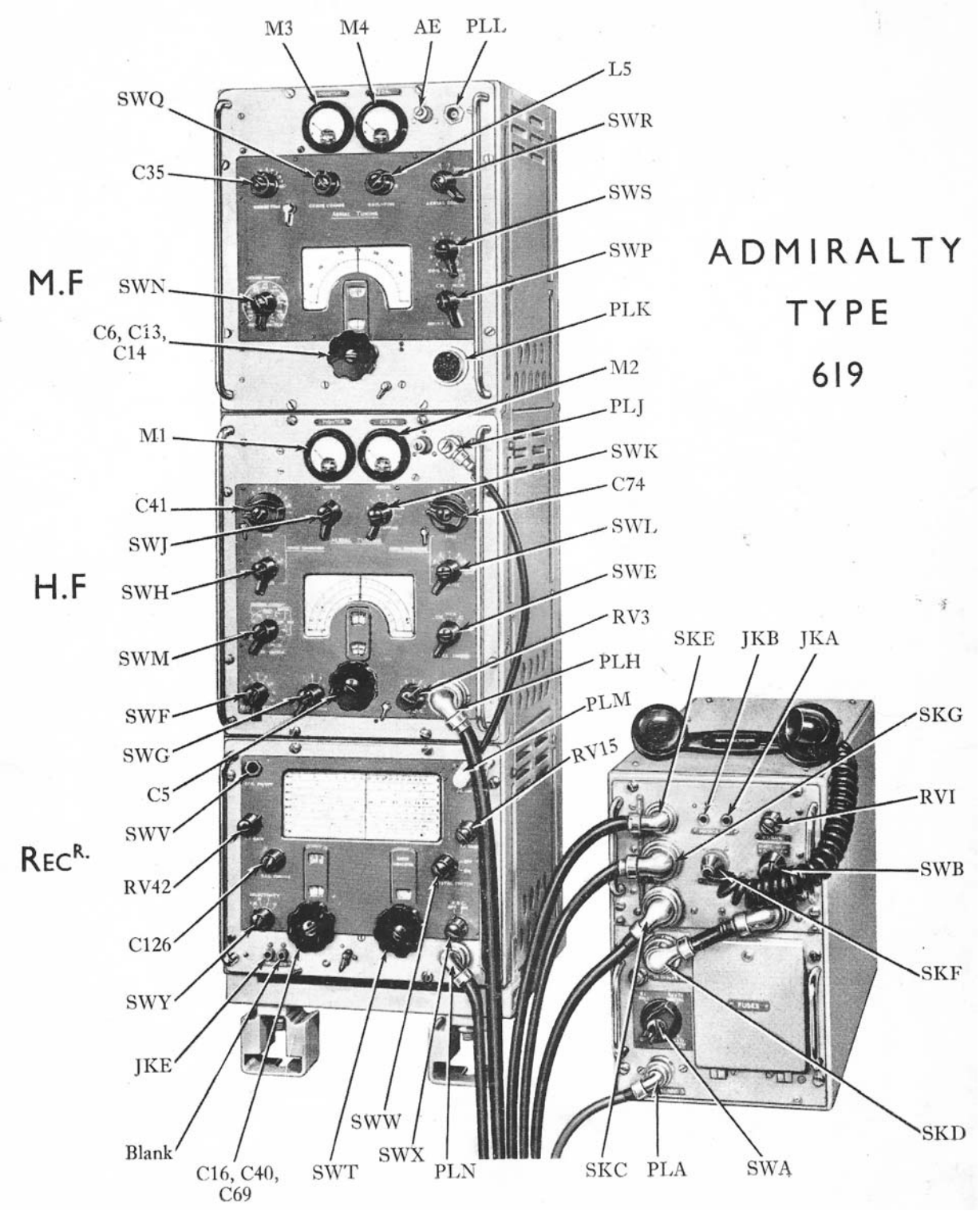
,, ,, ,, ,, ,, ,, R25 ,, ,, 220K.

,, ,, ,, ,, ,, ,, R27 ,, ,, 220K.

Delete completely C27 and its connections.

Amend connection from C20 to be to R16.

,, ,, ,, C19 ,, ,, ,, R19.


ADMIRALTY
TYPE
619
M.F
H.F
REC^R.
M3
M4
AE
PLL
L5
SWQ
SWR
C35
SWS
SWP
SWN
PLK
C6, C13, C14
M2
PLJ
M1
SWK
C74
C41
SWL
SWJ
SWE
SWH
RV3
SWM
SKE
JKB
JKA
PLH
SKG
SWF
PLM
SWG
RV15
RVI
C5
SWV
SWB
RV42
C126
SKF
SWY
JKE
SKD
SWW
Blank
SWX
C16, C40, C69
SWT
PLN
SKC
PLA
SWA

ABRIDGED DESCRIPTION.

1. An equipment can be supplied as either Type 619, or Type 619H, with or without Receiver Outfit CAT in addition. There are four main units, the table shewing which of the above includes which.

	619	619H	CAT	A.P. No.
Power Pack	✓	✓		100340
H.F Transmitter 1.5 - 16 Mc/s, 40 watt.	✓	✓		100337
M.F Transmitter 330 - 550 kc/s, 15 watt.	✓			100338
Receiver 60 kc/s - 30 Mc/s.			✓	100339

POWER PACK

This has two chassis, upper and lower, numbered 2 and 1 respectively.

2. **Chassis No. 1 Front Panel.** (*See Frontispiece*).

PLA — Input of 50 c/s A.C, Single Phase, 450 watts, 100 - 125 volts or 200 - 250 volts.
See that soldered connections to all three transformers on underside of chassis are for the correct voltage. See that Fuses 1 - 6 and 12 - 13 are for correct voltage. (Details are on Fig. 1).

FS12, FS13, LP1 — across mains input.

SWA — A.C. Mains Switch, 4 position click switch.

Posn.	Transformers connected	Outputs	Services Supplied
1	—	—	OFF
2	TR1 (FS1 - 2)	+245 D.C. 6.3 A.C.	Receiver (SKE)
3	add TR3 (FS5 - 6)	6.3 A.C.	adds Transmitter Heaters (SKG)
4	add TR2 (FS3 - 4)	+500 D.C. † +300 D.C. — 50 D.C. bias — 50 D.C. relay	adds Transmitter H.T. (SKG) ON

† Output is in two parts, one fully filtered, one partly filtered.

Interconnection between upper and lower chassis is by 18-core cable between SKD and PLB.

3. **Chassis No. 2 Front Panel.** (*See Frontispiece*).

SKE — Outputs to Receiver, 12 core lead.
SKG — Outputs to either H.F. or M.F. Transmitter, 18 core lead.
SKC — Outputs to Remote Control, 25 core lead.
SWB — Remote/Local Switch. Keying, microphone and headphones.
NOTE. Local headphones always in circuit.
JKA — Local morse key jack.
JKB — Local headphones jack, 100 Ω.
JKD — Loudspeaker jack, 600 Ω.
SKF — Local microphone socket.
RV1 — Audio Gain control across headphone leads.

The upper chassis contains 5 relays :—

RLD — Operated by –50 volt bias supply and SWC.
RLA — „ „ RLD and 300 volt supply.
RLB — „ „ RLA and 500 volt supply.
RLC — „ „ SWE and bias supply.
RLE — „ „ RLC and SWD and bias supply.

This assumes that 5 terminal cross-connections, shewn in Fig. 1 in the Equipment Junction Box, or their equivalent if this is not fitted, are made.

4. **Wiring Identification Code.**

(*a*) *Coloured coverings to wires.*

Red	indicates	D.C. supply positive to chassis.
White	„	D.C. supply negative to chassis.
Brown	„	A.C. heater circuits.
Black	„	Earth leads.
Blue	„	A.C. mains leads.
Orange	„	Microphone operating circuits.
Pink	„	All other wiring.

(*b*) *Terminal numbering sleeves.* Every end of every wire is identified by short coloured sleeves placed on the covering, the colour indicating a digit as follows :—

Black	0	Green	5
Brown	1	Blue	6
Red	2	Violet	7
Orange	3	Grey	8
Yellow	4	White	9

The digital value is also printed on the sleeve to assist the colour blind.

The number is read starting from the end of the wire, or joint ; *e.g.*, Wire 73 will have a Violet sleeve at the end, with an Orange one touching it. These numbers correspond with those on the diagram.

5. **Valves.**

Description	Circuit No.	Circuit Function	Commercial Type	Admiralty Type
Rectifier	V1, V2	Receiver, H.T.	R17	CV 2218
„	V3, V4	Transmitter, 500 volts	53 KU	CV 378
„	V5	„ 300 „	6X4	CV 493
„	V6	„ , bias –50 „	6X4	CV 493
„	V7	Relay, –50 „	6X4	CV 493

6. **Salient Features.**

Frequency Range.	Master Oscillator control.	Range 1 1.5 - 3.3 Mc/s. Range 2 3.3 - 7.3 Mc/s. Range 3 7.3 - 16 Mc/s.
	Crystal control.	Any eight spot frequencies between 1.5 Mc/s. and 16 Mc/s. Crystal 0.75 Mc/s. to 8 Mc/s.
Services.	CW, MCW, R/T.	
Power Radiated.	40 watts.	
Operation.	Simplex, with listening through on a single aerial.	

7. **Power Supplies.** The inputs from the power pack at PLH are allocated :—

Supply		Anodes	Screens	Grids	Cathodes
Fully Filtered	500 volts	V9, V10, V11, V12	V10, V11, V12		
Partly Filtered	500 ,,	V4, V5			
	300 ,,	V1, V3, V6, V8, V7 heptode	V4, V5, V8, V9, V7 heptode		
Stabilised	150 ,, (from V6)	V7 triode			
	−50 ,, Bias			V4, V5, V9	V2
	6.3 ,,	Two supplies, about equal, to heaters			
	−50 ,, Relay	Aerial changeover and keying relays			

8. **Valves.**

Description	Circuit No.	Circuit Function	Commercial Type	Admiralty Type
		Modulator		
Double Triode	V1	MCW Osc'r., Voice Pre-Amp'r.	12AX7	CV 492
,, Diode	V2	Limiter	EB91	CV 140
,, Triode	V3	Phase Splitter	12AX7	CV 492
2 Beam Tetrodes	V4, V5	Power Amplifier	5B/251M	CV 428
		Carrier		
Triode Heptode	V7	Master Osc'r., Freq. Doubler	ECH81	CV 2128
Beam Tetrode	V8	Buffer Amplifier	5763	CV 2129
R.F. Pentode	V9	Clamp	EF91	CV 138
3 Beam Tetrodes	V10, 11, 12	Power Amplifier	5B/251M	CV 428
Stabilovolt	V6	*Stabiliser*	QS150/15	CV 287

9 **Front Panel Controls.** (*See Frontispiece*).

SWE	—	Service Switch.	Selects CW, MCW, or R/T.
SWF	—	Crystal Switch.	Selects one of 8 crystals, or master oscillator.
SWG	—	Range Switch.	Selects coil in 3 tuned circuits of V7 and V8, 2 in aerial monitor.
C5	—	Tuning Capacitor.	Ganged for 3 tuned circuits of V7 and V8, 2 in aerial monitor.
SWH	—	Anode Condenser Coarse. §	Tune aerial matching unit.
C41	—	,, ,, Fine. §	
SWJ	—	Aerial Tuning Coil *	
SWK	—	,, ,, Coil Tapping.*	
SWL	—	Aerial Condenser Coarse. † *	
C74	—	,, ,, Fine *	
RV3	—	Mod. level.	Controls RV3 in grid circuit of V1.
SWM	—	Meter Switch	Selects one of eleven positions to be monitored.

† Clockwise position selects dummy aerial.

* Anticlockwise position selects maximum value.
§ Anticlockwise position selects minimum value.

10. **R/F Circuit.** (*See fig* 2).

V7. Triode section works at half final frequency. Tuned circuit is Hartley oscillator for M-O. but coil disconnected from grid in crystal control. Crystal, when connected, is between grid and earth.

Heptode section is grid fed via C8 from triode anode. Selects second harmonic *i.e.*, final frequency, in tuned anode circuit.

V8. Grid is capacity fed through C23. Amplifier stage. Also isolates V7 from power amplifier stage. Anode tapped down on tuned circuit. Coupled to P.A. Stage via C32.

V10. V11. V12. R56, R62, and R66 are grid parasite stoppers. H.T. fed through secondary of modulation transformer and RF choke L10. Screens fed through R65 and at V9 anode potential. Cathode biassed positive to earth by R59, R60, R61, proportional to total current drawn. Feeds aerial matching circuit through C42.

V9. Grid at a potential between that of P.A. cathodes and –50 volts through RV3, R68, R70, dependent upon RV3 adjustment and P.A. current. Normal adjustment slightly negative. If P.A. current rises, V9 grid goes positive, V9 anode current rises and potential drops, decreasing P.A. screen potential. This sets a safe maximum to P.A. cathode current when aerial is detuned.

Aerial Matching. Circuit is a π filter with C41 and switchable C43 to C48 across input, and C74 and switchable C49 to C72 across output. Coils L11, L12, L13 can be selected and tapped, and on range 3, L14.

RLF Connects aerial to transmitter or receiver to provide listening through.

RLG. Removes short circuit between anode and cathode of V7. Earths grid and cathode circuits of V8, and cathode circuit of V10, V11, V12.

Aerial Metering Circuit. Used when tuning aerial matching unit. Has two tuned circuits, one capacity coupled to aerial via C76 to C79, the other inductively coupled by L20. Capacitors of both are ganged to the circuits of V7, V8. These feed via crystal rectifiers into common meter M2. Meter therefore reads the sum of a voltage and a current indication, which ensures a reasonable reading on both high and low impedance aerials.

11. **Modulation Circuit.**

V1.	One half acts as pre amplifier in R/T, fed through low pass filter FL1. Other half acts as phase shift oscillator at 1,000 c/s in MCW, the phase shift network being C10 - C12, R15 - R17. Service Switch SWEba connects C6 accross R8 in R/T, R14 in MCW, and neither in C.W. position.
V2.	First cathode is fed through C19 on R/T; and R10, C19 on MCW. Cathodes biassed negatively from potentiometer chain R26, RV4, R24. Anodes earthed. Acts as a limiter, valve conducting whilst anodes are positive to cathodes. Coupling between two halves of valve due to common anode load R23.
V3.	Second half of valve has grid at audio earth by C26. Valve fed through C21, and so has first half grid fed, and second half cathode fed, thereby acting as phase splitter.
V4. V5.	Grids fed through C30 and C31, and have fixed bias from potentiometer R40, R41. Valves in class AB1 operation. Anodes feed through primary of TR1, impressing modulation on HT of PA valves V10, V11, V12 passing through its secondary.
TR1.	Transformer has monitoring winding feeding through MR1 to M1.

12. **Aerial Tuning Instructions.**

(*a*) Set SWE to CW; SWH, SWJ, SWK, SWL, C41, C74 fully anticlockwise; SWM to " P.A. Total."

(*b*) Press morse key.

(*c*) Swing C41 to get a dip in M1. It should be down to about 100μa.

(*d*) If no dip put SWK to B, C, D, etc., and repeat (*c*).

(*e*) If still no dip, put SWJ to 2, and repeat (*c* and *d*), and then to 3, until dip is obtained.
Dip should be on Coil 1 | 1.5 to 2 Mcs. approx.
,, 2 | 3 ,, 6 ,, ,,
,, 3 | 7 ,, 16 ,, ,,

(*f*) Turn SWL and/or C74 clockwise, and at each change retune to dip by turning SWH and/or C41 clockwise. Continue until current on dip is, for R/T or MCW 300 μa, and for CW 350 - 400 μa. When aerial is correctly loaded meter M2 should read between 40 μa and 450 μa, and its peak should correspond approximately with the dip in M1.

13. **Modulation Gain Adjustment.**

(*a*) When aerial circuit is tuned, set SWE to R/T, SWM to " Limiter," and RV3 fully clockwise.

(*b*) Speak into microphone the continuous letter aaaaaaa, and turn RV3 anticlockwise until reading of M1 starts to fall.

14. **Switching On.**

(*a*) Connect aerial, power supply plug, morse key, headphones, microphone.

(*b*) Select frequency, and crystal or master oscillator, and set all tuning controls, including aerial, to this frequency.

(*c*) Select CW, MCW, or R/T.

(*d*) Select Remote or Local Control.

(*e*) Make SWA on Power Pack.

15. **Salient Features.**

Frequency Range. 330 to 550 kc/s.

Services. CW, MCW.

Power Radiated. 15 watts.

Operation. Simplex, with listening through on a single aerial.

16. **Power Supplies.** The inputs from the power pack at PLK are allocated :—

Supply	Anode	Screen	Grid
Fully Filtered 500 volts	V3†, V4, V5	V3†, V4†, V5†	
Partly Filtered 500 ,,	V8, V9		
300 ,,	V1, V2, V6, V7	V1, V2, V8, V9	
−50 ,, Bias			V3, V8, V9
6.3 ,,	Two supplies, about equal, to the heaters.		
−50 ,, Relay	Aerial changeover and keying relays RLJ and RLH.		

† Through R50.

17. **Valves.**

Description	Circuit No.	Circuit Function	Commercial Type	Admiralty Type
		Carrier		
R.F. Pentode	V1	Master Oscillator	EF91	CV 138
Beam Tetrode	V2	Buffer Amplifier	5763	CV 2129
R.F. Pentode	V3	Clamp	EF91	CV 138
2 Tetrodes	V4, V5	Power Amplifier	5B/251M	CV 428
		Modulator		
Pentode	V6	MCW Oscillator	EF91	CV 138
Double Triode	V7	Phase Splitter	12AX7	CV 492
2 Tetrodes	V8, V9	Power Amplifier	5B/251M	CV 428

18. **Front Panel Controls.** (*See Frontispiece*).

SWP	—	Service Switch.	Selects CW or MCW.
C6, 13, 14	—	Tuning Condenser.	Ganged to tune circuits of V1 and aerial metering.
SWQ	—	Condenser Coarse*	Tune aerial matching unit.
C35	—	Condenser Fine §	
SWS	—	Coil Tapping. †	
L5	—	Coil Fine. †	
SWR	—	Aerial Condenser *	Fourth position selects dummy aerial.
SWN	—	Meter Switch.	Selects one of ten positions to be monitored by M3.

* Anticlockwise position selects zero value

† Anticlockwise position selects maximum value

§ Anticlockwise position selects minimum value

19. **R/F Circuit.** (*See Fig.* 3).

V1. — Electron coupled Hartley oscillator with tuned circuit between grid and screened grid, part of coil tapped off to cathode. Screen grid is potentiometer fed (R23, R24). Anode circuit has resistance load R21.

V2. — Grid is capacity fed through C23. Amplifier stage. Also isolates V1 from Power Amplifier stage. R.F. choke L3 used as anode load. Screen grid is potentiometer fed (R34, R33).

V4, V5. — Power Amplifiers in Class C operation, with grids capacity fed through C29. Self bias derived from cathode resistance, and grid bias due to grid current. Anode receives H.T. through R.F. choke L4 and modulation transformer secondary. Screens fed through R50 and at V3 anode potential.

Parasite stoppers fitted in anode, screen, and cathode leads. Feeds aerial matching circuit through C34.

V3. — Grid at a potential between P.A. cathodes and –50 volts through RV48, R47, R37, R28, dependent upon RV48 pre-set adjustment and P.A. cathode current. Normal adjustment negative. If P.A. current rises, V3 grid goes positive, and V3 anode current rises and potential falls, decreasing P.A. screen potential. This sets a safe maximum to the P.A. cathode current when aerial is detuned.

With morse key up, additional positive voltage impressed on V3 grid from +300 volts, via contact of RLH1, R36.

Aerial Matching. Circuit is a π filter with C35 and switchable C36 to C43 across the input, and switchable C45, C46 across output. Coil L5 has tappings and variometer adjustment.

RLJ. — Connects aerial to transmitter or receiver to provide listening through.

RLH. — Disconnects +300 H.T. line from V3 grid circuit, and connects it to anode of V1.

Aerial Metering Circuit. Used when tuning aerial matching circuit to oscillator frequency. Tuned circuit L1, C6, C9, C10 is ganged to tuned circuit of V1. Capacity coupled to aerial by C1, C2, C3. Feeds meter M4 through crystal rectifier.

20. **Modulation Circuits.**

V6. — Connected as a phase shift oscillator at 1,000 c/s. the network being C5 R2, C7 R3, C8 R5. Coupled to V7 through C47, R10, RV11, R12, C15.

V7. — First half of phase splitter is grid fed, second half cathode fed, since second grid is at audio earth through C21.

V8, V9. — Grids fed through C19, C20, and have fixed bias from potentiometer R28, R26.

Valves in Class AB1 operation. Anodes fed through primary of TR1. Modulation impressed on H.T. of P.A. valves V4, V5, passing through TR1 secondary. Modulation level adjusted by pre-set RV11.

Service Switching. In CW the screens of V6, V8, and V9 are disconnected from +300 H.T. by SWP.

21. **Aerial Tuning Instructions.**

(*a*) Set SWN to P.A. total, SWP to C.W, SWQ to 2, SWR to 3, C35 fully clockwise, SWS and L5 fully anti-clockwise, tuning dial to required frequency. Press morse key.

(*b*) Swing L5 to get a dip in M3. If no dip repeat with SWS on stops B and C.

(*c*) If no dip, turn SWR to 2, SWS back to A, and repeat (*b*) with SWS on stops A to G.

(*d*) If no dip, turn SWR to 1, SWS back to A, and repeat again until dip is found.

(*e*) If SWR is on 2 or 3, reduce one stop and attempt to retune by turning SWS towards A and swinging L5. This is not always possible, but try to get SWR to stop 1 whenever practicable. Note readings of M3 and M4.

(*f*) Attempt to get a higher peak reading on M4 for dip reading of M3 by turning C35 + SWQ clockwise or anticlockwise, retuning by turning L5 + SWS in the same direction. Direction will be clockwise when M3 dip reading is low, and anticlockwise when it is high. Correct dip reading is about 200 μa.

22. Salient Features.

Frequency Range.

Range 1.	60 - 125 kc/s.	I.F. 460 kc/s.	
,, 2.	100 - 260 kc/s.		
,, 3.	260 - 660 kc/s.	I.F. 1.4 Mc/s. and 460 kc/s.	
,, 4.	0.66 - 1.5 Mc/s.	I.F. 460 kc/s.	
,, 5.	1.5 - 3.4 Mc/s.		
,, 6.	3.4 - 7.0 Mc/s.	I.F. 1.4 Mc/s. and 460 kc/s.	
,, 7.	7 - 15 Mc/s.		
,, 8.	15 - 32 Mc/s.		

Sensitivity.

Frequency	Input for 2 watt output in db/1 μv		Signal/Noise for those inputs	
	MCW	CW	Selectivity	Ratio
60 - 160 kc/s.	—	30	Narrow	10 db
160 - 1500 kc/s.	30	30	Int.	16 db
1.5 - 10 Mc/s.	20	16	Wide	10-20 db
10 - 32 Mc/s.	36	26	Wide	25 db

I.F Selectivity when operating as single superheterodyne, expressed as a bandwidth.

db	Wide	Intermediate	Narrow	V. Narrow
-6	6.5 kc/s.	4.6 kc/s.	1.0 kc/s.	700 c/s.
-20	10 ,,	7.5 ,,	3.0 ,,	1.1 kc/s.
-60	20 ,,	15.5 ,,	10.0 ,,	9.5 ,,

Power Outputs. 2 watts into 600 Ω load, and 60 mW into 100 Ω load.

23. Valves.

Description	Circuit No.	Circuit Function		Commercial Type	Inter-service Type
		Ranges 1, 2, 4, 5	Ranges 3, 6, 7, 8		
R.F Pentode	V1	R.F amplifier high slope variable μ		6BA6	CV 454
Triode Heptode	V2 Hep	1st mixer to 460 kc/s.	1st mixer to 1.4 Mc/s.	ECH81	CV 2128
	V2 Tri	Xtal circuit oscillator	Xtal circuit oscillator		
Triode	V3	1st oscr. (Signal + 460 kc/s.)	1st oscr. (Signal + 1.4 Mc/s.)	6C4	CV 133
Triode Heptode	V4 Hep	Amplifier	2nd mixer to 460 kc/s.	ECH81	CV 2128
	V4 Tri	—	2nd oscillator at 1.86 Mc/s.		
R.F Pentode	V5	Amplifiers low slope variable μ		EF92	CV 131
,, ,,	V6				
Double Diode	V7	Diode 1 - Signal Rectifier, diode 2 - A.G.C rectifier		EB91	CV 140
,, ,,	V8	Both used in Noise Limiter action		EB91	CV 140
Pentode	V9	A.F amplifier		EF92	CV 131
Beam Tetrode	V10	High Slope Output Pentode		6CH6	CV 2127
Stabilovolt	V11	Voltage Stabiliser		QS150/45	CV 395
Pentode	V12	Beat Frequency Oscillator		EF92	CV 131

24. **Power Supplies.** H.T. Potential, either 245 volts, or Stabilised at 150 volts from V11, is fed to the valves through the resistances as detailed in the table :—

Valve	V1	V2		V3	V4		V5	V6	V9	V10	V11	V12
		Hep	Tri		Hep	Tri						
Anode	245 R5	245 R23	Stab. R13, R12	Stab. R13, R4	245 R39, L35	Stab. R28, R34	245 R47, L38	245 R50, L42	245 R41, R38	245 TR6	245 R1	Stab. R63, R61
Screen	Stab. R7	Stab. R17			Stab. R28, R27		245 R47	245 R50	245 R40	245 R64		Stab. R63, R62

25. **Front Panel Controls.** (*See Frontispiece*)

SWT	—	Band Switch. Selects one of 8 frequency bands. 9 wafer switch.
C16, 40, 69	—	Tuning Condensers. Tune aerial, 1st mixer, 1st oscillator circuits.
SWY	—	Selectivity Switch. Wide, Intermediate, Narrow, or Very Narrow. 3 wafer switch.
SWV	—	B.F.O. Switch. ON/OFF.
C126	—	,, Tuning.
RV15	—	R.F Gain control when A.G.C is OFF.
RV42.	—	A.F Gain control.
SWW	—	Crystal Switch. On/Off.
SWX	—	ON—Gain Control Automatic. OFF—Gain Control by RV15.

26. **Detail of Switch SWT, wafer functions.**

The wafers are lettered alphabetically from front to back.

Circuit and Valves	Wafer	Function
Aerial Circuit V1	q	Short circuits unused inductors.
	r	Connects selected inductor to V1 heptode grid via C12.
	s	Connects C10 to earth on ranges 6, 7, 8. Connects C9 on ranges 1, 2, 4.
	t	Short circuits FL1 on ranges 3, 5. Connects coupling inductor to aerial on ranges 6 - 8.
1st Oscillator Circuit V3	e	Short circuits unused tuning inductors. Adds C38 on ranges 6, 7.
	f	Connects selected tuned circuit to V3 anode via C39.
	g	Short circuits R3 on range 8 to increase V3 anode volts.
	h	Switches C40.
	j	Short circuits unused coupling windings.
	k	Connects selected coupling winding to V3 grid via C17, R11.
1st Mixer Circuit V2	l	Short circuits unused secondaries. Adds C62 on ranges 6, 7, and C63 on 8.
	m	Connects selected secondary to V2 heptode grid via C64.
	n	Short circuits unused primaries. Switches in L19, C45 on ranges 3, 6.
	p	Connects selected primary to V1 anode.
Selection of I.F Transformers V2 to V4	a	Short circuits unused L30 or L32. Short circuits C90 to earth on ranges 1, 2, 4, 5.
	b	Connects used TR4 or TR5 secondary to V4 heptode grid via C79.
	c	Short circuits unused L31 or L29.
	d	Connects used TR4 or TR5 primary to V2 heptode anode.

27. **Detail of Switch SWY, wafer functions.**

Circuit and Valves	Wafer	Function
Coupling V4 - V5	b	Puts L37 in series with L36 in W.
Coupling V5 - V6	c	Puts C102 in circuit in VN.
	d	Puts L40 in series with L39 in W. Earths Xtal gate circuit input in W and I. Connects Xtal gate circuit input across TR2 secondary in N. " " " " " half TR2 secondary in VN.
	e	Connects { Secy. of TR2 in W and I / Xtal gate output in N and VN } to V6 grid via C112. Connects C107 in N, C108 in VN.

28. **Aerial Circuit.** Aerial is coupled to the tuned circuit on ranges 1 - 5 by C10 in series with C11, and on ranges 6, 7, 8 by low impedance coupling to L6, L7, L8 respectively.

Tuned circuit consists of
- C16 — Variable tuning condenser.
- one of L1 - L8. — Inductors pre-set by iron dust cores.
- one of C1 - C8. — Pre-set air spaced trimmers across L1 - L8.
- C11. — Extra parallel trimmer on ranges 6, 7, 8.

Tuned circuit is coupled to V1 grid via C12 and R6.

Filter FL1, tuned to 460 kc/s is in series with aerial lead, acting as an I.F attenuator, except on ranges 3, 5.

29. **1st Mixer Circuit.** Coupling between V1 anode and V2 heptode grid is by R.F Transformer, and is of the high impedance type. The primaries of L20 - L27 have fixed tuning to a frequency about half that of the lowest frequency of their ranges. L20 - L25 are tuned by C54 - C59 across them, and L26, L27 by stray capacity. The secondary windings of L20 - L27 are pre-set by iron dust cores. C46 - C53 are pre-set secondary trimmers.

C60, C62, C62, C63 are additional parallel trimmers on ranges 5, 6, 7, 8 respectively.

C69 is secondary tuning condenser.

L19, C45 form a series filter in parallel with the primary of the R.F transformer, tuned to 1.4 Mc/s., to attenuate I.F signals on ranges 3 and 6.

C61 is used to increase the gain of this stage at the high frequency end of each range.

30. **1st Oscillator Circuit.** This is of the tuned anode type.

The tuned circuit consists of
- One of main windings L10 - L17 pre-set by iron dust cores.
- One of C19 - C26 pre-set airspaced trimmers.
- One of C27 - C34 padding condensers.
- C40 Two section tuning condenser.

The tuned circuit is connected to the anode via C39, and the coupling winding of L10 - L17 in use is connected to the grid via C17.

C37, L18 form a booster circuit to increase the oscillatory voltage at the L.F end of range 8.

R11 eliminates squegging at the H.F end of the higher frequency bands.

The output from V3 is fed to the switch SWW.

31. **Crystal Switch SWW.** This switch has two functions :—

(*a*) It connects Stabilised H.T. to V2 triode anode in ON position, and to V3 anode in OFF position.

(*b*) In OFF position, it connects output from 1st oscillator V3 anode, via C65 to grid of V2 triode.

In ON position V2 triode is a crystal oscillator of the "Pierce" type, with the crystal frequency the appropriate I.F away from the desired signal frequency. SWW connects the crystal between anode and grid.

32. **V2 - V4 Circuit.** I.F., Output from V2 heptode anode is 460 kc/s on ranges 1, 2, 4, 5, ; and 1.4 Mc/s on ranges 3, 6, 7, 8 ; and is fed to primary of TR5 or TR4 respectively, whose secondaries are connected to V4 heptode grid. For switch detail see para 26. Primaries and secondaries have preset iron dust cores.

33. **2nd Mixer Circuit.** On ranges 3, 6, 7, 8, V4 triode circuit oscillates at 1.86 Mc/s as 2nd oscillator, " Colpitts " type, with tuned circuit L34, C89, C90, coupled to grid by C87 R32, and anode by C88 R34. L34 has pre-set iron dust core. A filter, L33, C86 (both pre-set), attenuate its 2nd Harmonic.

On ranges 1, 2, 4, 5, V4 triode circuit does not oscillate because C89 is short circuited to earth, and V4 heptode, therefore, becomes an I.F amplifier.

On all ranges, output from V4 heptode anode is at 460 kc/s, and is fed to primary of TR3.

34. **I.F Stages V4 - V5 - V6.** The selectivity switch SWY governs the transformer coupling of these two stages. It has 4 positions, WIDE, INTERMEDIATE, NARROW, VERY NARROW.

(*a*) WIDE. Extra link windings L37, L40, increase the coupling between primary and secondary of TR3 and TR2 respectively. Junction of C104 C105, connected to V6 grid through C112.

(*b*) INTERMEDIATE. Coupling between primary and secondary of TR3 and TR2 is the normal mutual inductance. Junction C104, C105, still connected to V6 grid through C112.

(*c*) NARROW. Top of TR2 secondary connected to junction of XL2, XL3, connecting this band pass crystal filter, of peak separation about 500 c/s, between TR2 secondary and the balanced split tuned circuit L41, C109, C110, C111. Coupling to V6 grid through C112 is from output of the tuned circuit.

(*d*) VERY NARROW. The circuit is as for NARROW except that the junction of C104, C105, is connected to crystal gate centre point, so the gate circuit is fed from half of TR2 secondary only.

C106 is pre-set neutralising condenser in N and VN.

C107 ,, ,, ,, ,, ,, N.

C108 ,, ,, ,, ,, ,, VN.

C102 is condenser to compensate for difference in tuning of TR2 secondary when this is tapped halfway down in VN, W, and 1.

35. **Rectifier Diode V7.** Output from V6 anode is transformer coupled by TR1 (pre-set iron dust cores) to one diode anode of V7 (Signal Diode). This diode cathode is earthed. The diode load is R54, RV53 (pre-set), R52. A.F output taken from junction between R52 and RV53, to V8.

36. **Beat Frequency Oscillator V12.** This is an electron coupled oscillator on 460 kc/s, variable by about plus or minus 5 kc/s by tuning condenser C126. L44 has pre-set iron dust core.

The oscillator is switched on by SWV applying H.T. to anode. Used for CW only.

Output is fed via C128 to signal diode of V7.

The heater lead is choked by L45, and by pass C127, to isolate oscillation.

37. **Noise Limiter, V8.** Rectified signal is fed to one anode. Other anode is fed from the pre-set clipping level control RV53, and is held steady by large condenser C99 to earth. Noise pulses above the pre-determined level will for the instant drive one diode to a non-conducting, and the other to a conducting condition.

38. **A.F Circuits, V9, V10.** Audio voltage from cathodes of V8 is fed via C98, RV42, to reach V9 grid via C95, R37. Thus RV42 controls proportion of audio voltage tapped off.
V9 is " RC " coupled to V10 via C84, R26.
A large negative feedback from V10 anode applied to V9 cathode by R31, C81. This keeps the audio output voltage in secondary of output transformer TR6 constant with varying loads.

39. **A.G.C, R.F Gain Control, and Muting Relay RLK.**

A.G.C voltage is applied to 2nd diode anode of V7 from V6 anode via C122.

Cathode of this diode has a delay voltage applied from 245 volt H.T. via R51, R55.

The diode load is composed of R57, R56.

Full A.G.C voltage is fed via R58, SWXb to grids of V4, V5.

Half A.G.C voltage is fed via R59, SWXb to grid of V1.

R.F Gain Control, RV15, only operates when A.G.C switch SWX is at OFF. A variable bias tapped off chain, R21, RV22, RV15, between +245, volts and earth, is applied through SWXb to unoperated contact of RLK, and so to cathodes of V1, V4, V5.

Muting Relay RLK. This operates when transmitter key is pressed, and then applies a bias, pre-set by RV22, through operated contact of RLK, to cathodes of V1, V4, V5.

40. **Radiation.**

Ten screened R/F filters (C131 to C150, L46 to L55) in all leads entering at PLN and JKE prevent external radiation.

TESTING

The information herein covers the progressive checking of the complete chassis in successive stages, each stage assuming that the previous ones have been carried out, and been found correct, or aligned, as appropriate. It does not cover testing of individual components, or sub assemblies.

It has not been found possible, in time for this interim publication, to translate all tests into those capable of being performed with known instruments available in ships. In such cases, it may be found nccessary to adapt or omit them.

POWER PACK

1. **Resistance Check** At all sockets and plugs.

All readings taken with Avometer Model 7, upper and lower chassis disconnected.

SKD — A - 100K, B - 45K, C - 100K, M - 0, N - 0, remainder infinity.

PLB — C - 50K, D - 27K, M - 0, N - 0, O - 22K, remainder infinity.

SKE — J - 22K, M - 0, remainder infinity.

SKG — A - 45K, B - 45K, D - 27K, K - 28K, M - 0, O - 22K, Q - 3.5K or infinity, remainder infinity.

SKC — C - 0, J - 22K, K - 0, M - 27K, Y - 0, remainder infinity.

2. **Consumption.** Valves removed - no load. Input 230 volts - 0.24 amps.
,, inserted - full ,, ,, 230 ,, - 2.0 ,,

3. **Outputs.**

Socket	Terminal	No Load	All loads connected
SKE	A - B	7.4 volts	6.3 volts at 4.7 amps.
	C - D	7.4 ,,	6.3 ,, ,, 4.7 ,,
	E	405 ,,	260 ,, ,, 0.112 ,,
SKG	A	750 volts	500 volts at 0.115 amps.
	B	750 ,,	490 ,, ,, 0.076 ,,
	C	400 ,,	305 ,, ,, 0.055 ,,
	D	73 ,,	49 ,, ,, 0.050 ,,
	E	7.5 ,,	6.3 ,, ,, 4.5 ,,
	F	7.5 ,,	6.3 ,, ,, 4.5 ,,
	O - P	78 ,,	50 ,, ,, 0.032 ,,

4. **Meter M1, Switch SWM.** For the switch positions indicated, apply the voltages stated in column 2, where stated in column 3, adjust as in column 4, and the meter M1 should read as per column 5.

Switch Position	Volts Applied	Position	Adjustment external meter	M1 Reading
H.T. 500	500 D.C.	+PLH contact (A) —Chassis	—	245 μa
H.T. 300	300 D.C.	+PLH ,, (C) —Chassis	—	315 ,,
V10	0.6 D.C. approx.	across R55	current to 40 ma	210 ,,
V11	,,	,, R58	,, ,, 40 ,,	210 ,,
V12	,,	,, R67	,, ,, 40 ,,	210 ,,
PA Total	,,	,, R59, R60	,, ,, 80 ,,	210 ,,
IG	,,	,, R46	,, ,, 5 ,,	210 ,,
V8	,,	,, R32	,, ,, 15 ,,	215 ,,
V4	,,	,, R53	,, ,, 40 ,,	215 ,,
V5	,,	,, R52	,, ,, 40 ,,	215 ,,
LIMITER	5 A.C.	,, TR1 monitor winding	—	175 ,,

5. Check the mechanical alignment of C5 with its pointer and scale.

6. **Voltages at Valves.**

Set RV5 to centre position, SWE to CW, SWF to M - O, connect PLH to SKG.

Switch on. Check voltages at valves to be approximately as given in para 14, making allowance for transmitter being unaligned.

7. **Alignment frequency control stage (V7).**

Couple up a wavemeter covering the range of the transmitter to the middle compartment of the coil assembly. Set SWE to CW, SWF to M - O. Switch on and press key. Adjust the trimmers of the components indicated in the table below, for low frequency or maximum loudness, as indicated, completing one range at a time.

Range SWG	Frequency C5	1st Adj. to low audio note	2nd Adj. to max. loudness	Subsequent Adjustment for low audio note (almost zero)
1	(*a*) 1.5 Mc/s. (*b*) 3.3 ,,	L1 C2	L4 C20	L1, C2 — Adjustments are repeated on alternate frequencies until the reading of wavemeter agrees with C5 within 1,000 c/s.
2	(*a*) 3.3 ,, (*b*) 7.3 ,,	L2 C3	L5 C18	L2, C3 — ditto
3	(*a*) 7.3 ,, (*b*) 16 ,,	L3 C4	L6 C17	L3, C4 — ditto

8. **Alignment of buffer amplifier stage (V8).**

Set SWE to CW, SWM to IG P.A., SWF to M - O, switch on and press key.

Adjust trimmers as in the table below to give maximum reading of M1.

Range SWG	Frequency C5	1st Adjust.	2nd Adjust.	Subsequent
1	(*a*) 1.5 Mc/s. (*b*) 3.3 ,,	L7 C29	L4 C20	Repeat (*a*) and (*b*) alternately to get maximum deflection. Check that drive exceeds 100 μa throughout band.
2	(*a*) 3.3 ,, (*b*) 7.3 ,,	L8 C28	L5 C18	ditto
3	(*a*) 7.3 ,, (*b*) 16 ,,	L9 C27	L6 C17	ditto

9. **Adjustment of Clamp Valve (V9) circuit.**

Set SWE to CW, SWF to M - O, SWM to P.A. Total, SWG to 1, C5 to 1.5 Mc/s.

Check that aerial is detuned, switch on and press key.

Adjust RV5 until M1 reads 450 μa.

10. **Alignment of Aerial Indicator Circuits.**

Set SWE to CW, SWF to M - O, SWM to P.A. Total, SWL to Dummy load, switch on and press key.

With the settings in cols. 1 to 7, M1 should read as in col. 8. Then adjust trimmers as in cols 9 and 10 for maximum deflection of M2.

Range SWG	Freq. C5	Anode Coarse SWH	Anode Fine C41	Coil Coarse SWJ	Coil Fine SWK	Aerial Fine C47	P.A. Total M1	Adjust.		Subsequently
1	(*a*) 1.5 (*b*) 3.3	4 3	2 4	1 2	D E	10 4	340 350	L16 C80	L19 C85	Repeat (*a*) and (*b*)
2	(*a*) 3.3 (*b*) 7.3	3 2	4 4.5	2 3	E A	4 4	360 350	L17 C81	L20 C86	,, ,, ,, ,,
3	(*a*) 7.3 (*b*) 16	2 1	4.5 4	3 3	A F	4 8.5	350 350	L18 C82	L21 C87	,, ,, ,, ,,

11. **Power Output measurement.**

Set SWE to CW, SWF to M - O, SWM to P.A. Total, SWL to Dummy Load, Switch on and press key. Load up transmitter according to cols. 1 to 7, adjust anode fine and aerial fine controls to give a dip in M1, and adjust dip to give a maximum in M2, *vide* description, para 12.

The maximum on M2 should be approximately as given in column 9.

Range	Freq.	Anode		Coil		Aerial Fine	P.A. Total	
SWG	C5	Coarse SWH	Fine C41	Coarse SWJ	Fine SWK	C74	M1	M2
	1.5	4	2	1	D	10	340	420
1	2.0	3	9	1	G	6	350	350
	3.3	3	4	2	E	4	350	260
	3.3	3	4	2	E	4	360	440
2	4.5	2	7	2	G	5	350	390
	7.3	2	4.5	3	A	4	350	240
	7.3	2	4.5	3	A	4	350	330
3	10	1	8	3	C	8	350	180
	16	1	4	3	F	8.5	350	200

12. **M.C.W Percentage Test.**

Set SWE to CW, SWF to M - O, SWG to 1, SWM to P.A. Total, SWL to dummy load.

Set C5 to 2 Mc/s., switch on and press key. Load to 300 μa on M1.

Couple into the load a coupling coil from Y plates of oscilloscope (CT52). Adjust coupling to give a trace about 2 ins. high. Retune Transmitter.

Set SWE to MCW. Turn RV4 fully clockwise.

Check that modulation percentage as measured on the oscilloscope is between 60% and 70%, and waveform is approximately sinusoidal.

N.B.—On dummy aerial the modulation is artificially reduced by about 25%.

13. **R/T Percentage Test.**

Connect cathodes of V2 together.

Set SWE to CW, SWF to M - O, SWG to 1, SWL to dummy load, SWM to P.A. Total.

Set C5 to 2 Mc/s. Switch on, press key, load to 300 μa on M1.

Connect Beat Frequency Oscillator (G205) with 600 Ω attenuator between PLH (R) and earth, and adjust *f* to 400 c/s, and voltage to 0.135 volts.

Couple oscilloscope (CT52) to load. Set SWE to R/T. Turn RV3 to maximum.

Check modulation percentage to be greater than 70%.

N.B.—On dummy aerial the modulation is artificially reduced by about 25%.

Adjust RV3 until modulation percentage is reduced to 70%, and check that waveform is then truly sinusoidal.

Disconnect cathodes of V2 from each other, and adjust RV4 so that V2 just starts clipping at 60%.

14. **Voltage Analysis.** With the transmitter correctly tuned, V9 set at 450 μa, and loaded to 350 μa on CW and MCW, and 300 μa on R/T, the voltages at various points in the circuits, as measured with an Avometer 20,000 ohms/volt (A.P. 12945) should be approximately as given below :—

Component	Pin or Contact	C.W.		M.C.W.		R/T	
		OFF	ON	OFF	ON	OFF	ON
V7	Triode anode		110		105		110
	Heptode anode	285	300	265	290	290	290
	Heptode screen	140	155	135	150	130	155
	Cathode	1.2	1.1	1.1	1.1	1.2	1.1
V8	Anode	300	270	280	260	300	270
	Screen	170	235	155	225	200	230
	Cathode	70	55	66	50	75	50
V9	Anode	135	245	220	220	230	215
	Screen	160	235	150	225	185	230
V10, V11, V12	Anode	520	460	550	480	600	480
	Screen	135	245	220	220	230	215
	Cathode	60	30	60	30	70	30
V6	Stabiliser	150	150	150	150	150	150
V1	Oscillator anode	130	120	220	220	130	125
	Oscillator cathode	1.4	1.3	1.2	1.2	1.4	1.3
	Amplifier anode	220	210	205	205	220	210
	Amplifier cathode	2.0	1.9	1.9	1.8	2.0	1.9
V2	1st Cathode*	3.2	3.2	3.1	3.1	4.5	2.9
	2nd Cathode*	2.6	2.6	2.3	2.3	4.0	2.6
V3	1st Anode	170	165	155	160	170	165
	1st Cathode	45	43	44	42	45	43
	2nd Anode	170	165	155	160	170	165
	2nd Cathode	45	43	44	42	45	43
V4, V5	Anode	510	495	550	500	600	495
	Screen	305	300	300	300	320	300
	Cathode	0.5	0.5	0.5	0.6	0	0.6

*Voltages are with RV4 set to give 6.5 volts key down MCW.

15. **Meter M3 Switch SWN.** For the switch positions indicated, apply the voltages stated in column 2, where stated in column 3, adjusted as in column 4, and the meter should read as per column 5.

Switch SWN Position	Volts Applied	Position	Adjustment	Meter M3 Reading
H.T. 500	500 D.C.	+ PLK contact B — Chassis	—	225
H.T. 300	300 D.C.	+ PLK contact C — Chassis	—	275
V3	2.5 app.	R31 + R59 — Chassis	Current to 25 ma	245
V4	2.5 ,,	Across R49	,, ,, 50 ,,	230
V5	2.5 ,,	,, R53	,, ,, 50 ,,	230
P.A. Total	2.5 ,,	,, R56	,, ,, 100 ,,	215
I_G. P.A.	2.5 ,,	,, R40	,, ,, 10 ,,	210
V7	2.5 ,,	,, R13	,, ,, 1 ,,	180
V8	2.5 ,,	,, R30	,, ,, 50 ,,	230
V9	2.5 ,,	,, R32	,, ,, 50 ,,	230

16. Check the mechanical alignment of gang condenser with its pointer and scale.

17. Set RV48 to centre position, SWP to MCW, connect PLK to SKG.

Make SWA and press MK.

Check voltages at all valves against those given in paragraph 24, making allowance for transmitter being unaligned.

18. **Alignment M - O stage (V2).**

Couple a wavemeter, G73, to buffer anode choke, L3.

(*a*) Set pointer and wavemeter to 330 kcs., and adjust core of L2 for minimum beat.

(*b*) ,, ,, ,, ,, ,, 550 ,, ,, ,, trimmer C16 ,, ,, ,,

(*c*) Repeat (*a*) and (*b*) until calibration agrees with wavemeter within 100 c/s.

19. **R.F Drive Test.**

Set SWP to CW, SWN to I_G P.A., switch on and press MK.

Tune from 330 to 550 kcs. and check that M3 reads more than 100 μa throughout.

20. **Adjustment of Clamp Valve (V3) Circuits.**

Set SWP to CW, SWN to P.A. total, switch on and press MK. Detune aerial by turning SWQ, SWS, SWR fully anticlockwise.

Adjust RV48 until M3 reads 300 μa.

Release MK and check that M3 falls below 240μa.

21. **Alignment Aerial Indicator Circuit. Dummy Aerial Test.** (*See description para* 21).

Set SWP to CW, SWR to Dummy, switch on and press MK.

(*a*) Load transmitter into dummy load at 330 kcs. and adjust L1 for maximum reading on M4.

(*b*) Load at 550 kcs. and adjust C9 for maximum on M4.

(*c*) Repeat (*a*) and (*b*).

22. **Power Output Measurement.**

Set SWP to CW, SWN to P.A. total, SWR to Dummy, switch on and press MK.

Set the controls to the positions indicated in cols. 1 - 3, and adjust C35 and L5 to give a dip in M3 and a maximum in M4.

Increase M3 dip current by turning C35 clockwise and re-adjusting on L5, until M3 reading is between 180 and 230 μa.

The reading of M4 should be about that in col. 4.

Frequency	SWQ	SWS	M4
330	4	A	220
350	4	B	230
400	4	D	230
450	3	F	210
500	3	G	200
550	3	H	180

23. **MCW Percentage Adjustment.**

Set SWP to CW, SWR to dummy load, SWN to P.A. total, switch on. Load to 200 μa on M3.

Couple a search coil from Y plates of oscilloscope to aerial coil. Adjust coupling to give a trace about 3 ins. high.

Re-adjust aerial tuning and put SWP to MCW.

Adjust RV11 to give 60% modulation as measured on the oscilloscope.

Check that modulation envelope is approximately sinusoidal.

24. **Voltage Analysis.** With the transmitter correctly tuned and loaded to 200 μa on MCW, the voltage to earth at various points in the circuits, as measured with an Avometer 20,000 Ω/volt (A.P. 12945) should be approximately as given below :—

Key	Pin	V1	V2	V3	V4, V5	V6	V7	V8, V9
UP	Anode	0	307	195	496	154	208	500
	Screen	0	259	195	195	132	—	304
	Cathode	0	10.5	0	13.8	1.94	66	4.02
DOWN	Anode	203	305	168	480	157	212	495
	Screen	122	150	168	167	134	—	310
	Cathode	0	9	0	22.5	1.98	67	4.11

25. **Resistance and Voltage.**

(*a*) Insulation. Check resistance to earth at PLN(E) to be 16K Ω, and at V11 anode to be 18.2K Ω, both with RV15 at minimum.

(*b*) Connect supplies, switch on.

Set SWV to off, SWY to N, SWT to 4, SWX to off, SWW to off, RV15 to maximum.
Check voltages as per table using Avometer 20,000 Ω/volt (A.P. 12945).

	V1	V2	V3	V4	V5	V6	V7†	V9	V10
Anode-Earth	230	Hep. Osc. 238 105 (No Xtal)	56	Hep. Osc. 236 65	222	217		73	245
Screen-Earth	115	95		95	222	217		45	245
Across Cathode Resistance	(R8) 0.9	(R19) 1.9		(R33) 1.8	(R46) 2.8	(R49) 3.4	(R55) 50	(R35) 3.0	(R24) 4.0

† Use highest possible Avometer range.

(*c*) Set SWT to 3. Measure grid current of V4 Triode. 40μa.

(*d*) Set SWV to ON. Measure volts across R63. 12.5 volts.

26. **I.F Alignment.**

Set SWV, SWX, SWW to OFF, SWT to 3, RV15 to maximum, SWY to N.

Set C102, C106, C107, C108 to mid setting.

Set A.P.74707 Cossor Ganging Oscillator Model 343 to 460 kc/s., frequency modulated at about 20 kc/s., and inject through 0.1 μF to V4 heptode grid.

Connect oscilloscope, Type 13A or Cossor Double Beam, between Earth and connection RV53-R54, via 1M Ω.

Tie X plates of oscilloscope to " external " of Ganging Oscillator.

(*a*) Tune L41 and dust cores of TR1, TR2, TR3 primaries and secondaries for maximum amplitude on oscilloscope, reducing on oscillator as necessary to prevent overload.

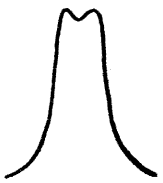


FIG a

(*b*) Reduce bandwith of oscillator to 10 kc/s. Neutralise crystal circuit by adjustment of C106 to give a symmetrical curve on oscilloscope, like Fig (*a*).

(*c*) Retune secondary of TR2 to give minimum " saddle " in curve, Fig. (*a*).

(*d*) Retune L41 for symmetrical response.

(*e*) Adjust C107 roughly to give approximate bandwidth required.

(*f*) Repeat (*c*) and (*d*).

(*g*) Set SWY to " VN " and adjust C102 for maximum amplitude.

(*h*) Adjust C108 to give response curve similar to Fig. (*b*).

FIG b.

(*j*) Retune L41 for minimum " saddle."

(*k*) Set SWY to " I," adjust bandwidth to 20 kc/s, and observe symmetry of curve.

(*l*) Set SWY to " W," and observe symmetry of curve.

(*m*) Set SWT to 4. This should only reduce amplitude, not alter symmetry.

(*n*) Set SWY to N, and ganging oscillator to 460 kc/s, and inject into V2 grid, reducing on attenuator as necessary. Tune cores of TR5 for maximum amplitude.

(*o*) Set SWY to " I " and then " W " and observe symmetry and return to " N."

(*p*) Set SWT to 3, ganging oscillator to 1.4 Mc/s.

(*q*) Tune TR4 primary and secondary and L34 for maximum amplitude. Set SWY to " I " and " W " and observe symmetry.

27. Response Curve of I.F.

Select a signal generator capable of variation, with an accuracy measurable to 10 c/s, up to 20 kc/s, either side of 460 kc/s and 1.4 Mc/s; and with output graduated in db. Inject signal at V2 heptode grid.

Note.—Standard instruments such as Marconi TF144G or TF867 will only give a very approximate indication.

Put Avometer 50μa range, between R52 and earth.

For the variation in db in columns 3 to 7 below, measure the *total* bandwidth in kc/s to maintain constant reading of 20 μa on Avometer. The result should be within the figures quoted for the various frequencies and selectivity settings.

Signal Frequency	SWY setting	Variation in db input from that at midband				
		6	10	20	40	60
460 kc/s.	W	6.5	7.8	10	15	20
	I	4.6	5.7	7.5	11.1	15.5
	N	1.0*	1.37	3.0*	6.9	10
	VN†	0.72	0.84	1.08	6.4	9.5
1.4 Mc/s.	W	8.5	10	13.5	19	28
	I	5.2	6.4	8.9	14	19

†The two humps shewn in Fig. (*b*) para 25, should not be less than 30 db down, as also should ± 750 c/s. These are controlled by C108.

*The bandwidth at these points is controlled by C106.

28. Overall Sensitivity of I.F.

Put Avometer, 50 μa range, between R52 and earth.

Inject 460 kc/s or 1.4 Mc/s at grid of V2, from Signal Generator.

Measure the input in dbs. relative to 1 μv for a diode current of 20 μa.

Signal Injected	SWT setting	SWY setting			
		Wide	Intermediate	Narrow	Very Narrow
460 kc/s.	3	16	15	21	23
1.4 Mc/s.	4	23	21	26	28

The result should be as in table ± 6 dbs.

Seal the inductor and capacitance trimmers.

29. Beat Frequency Oscillator Alignment.

Put Avometer, 250 μa range, between R52 and earth. Set SWY to " N."

Inject 460 kc/s CW at grid of V4, from Signal Generator, and tune Generator to centre of passband by maximum diode current measurement.

(*a*) Switch on B.F.O. and, with C126 at zero, adjust L44 to give zero beat.

(*b*) Remove signal and check that diode current due to B.F.O. is 70 μa ± 10%.

(*c*) Seal B.F.O. coil.

30. **1st Oscillator alignment.**

Check the mechanical position of C40 against its pointer and the scale.

Connect 500 Ω impedance output meter to JKD, and 100 Ω headphones to JKE.

Set SWV to ON, SWY to N, SWX to OFF. SWW to OFF, RV15 at maximum.

Connect Signal Generator to inject CW signal into grid of V2.

Inject signal and set C40 at frequencies in table below, and adjust the trimmers indicated to give zero beat.

Range	1	2	3	4	5	6	7	8
Frequency	60	100	260	0.7	1.6	3.4	7	15
Trimmer	L10	L11	L12	L13	L14	L15	L16	L17
Frequency	125	260	660	1.5	3.4	7.0	15	30
Trimmer	C19	C20	C21	C22	C23	C24	C25	C26

31. **R.F Circuits Alignment.**

Set SWV to OFF, SWX to OFF, SWW to OFF, SWY to " I."

Connect Signal Generator into aerial plug, using a 75 Ω impedance for frequencies above 4 Mc/s, and about 10 Ω and 200 pF for frequencies below 4 Mc/s. Use an input of about 30 μv modulated 30%.

Align the mixer and aerial circuits at the frequencies given in the table below, by adjustment of the trimmers indicated for maximum output, repeating adjustment on the two frequencies of each range until no further increase is obtained, and reducing on the R.F Gain Control RV15 to prevent overload.

Range	Freq.	Coil Mixer	Coil Aerial	Freq.	Condenser Mixer	Condenser Aerial
1	60 kc/s.	L20	L1	120 kc/s.	C46	C1
2	105 kc/s.	L21	L2	240 kc/s.	C47	C2
3	270 kc/s.	L22	L3	630 kc/s.	C48	C3
4	710 kc/s.	L23	L4	1480 kc/s.	C49	C4
5	1.62 Mc/s.	L24	L5	3.3 Mc/s.	C50	C5
6	3.6 Mc/s.	L25	L6	7.0 Mc/s.	C51	C6
7	7.4 Mc/s.	L26	L7	14.7 Mc/s.	C52	C7
8	15.7 Mc/s.	L27	L8	†30.7 Mc/s.	C53	C8

† Some pulling will be experienced, and main tuning control will need to be varied during trimming.

After alignment is completed :—

(*a*) Tune receiver to 240 kc/s, inject 460 kc/s from signal generator at aerial plug and tune L9 to give minimum audio output.

(*b*) Tune receiver to 630 kc/s, inject 1.4 Mc/s from signal generator at aerial plug and tune L19 for minimum audio output.

Component List

Cir. No.	Description.	Pye Ref. No.	I.S. Ref. No.	Value	Rating.	Tol.
C1	T.C.C.	669860	Z115552	10 n	350 V	
C2 to C4	Mullard Trimmer	280038		3-30 p		
C5 (4) (3) (2) (1)	W. and R. Variable	280010				
C5 (6) (5)	Cyldon Variable	280007		0-350 p		
C6	T.C.C. Picopack	667233	Z145004	2μ	150 V	
C7	T.C.C.	669860	Z115552	10 n	350 V	
C8	Erie Hi - K - K	666648		220 p		20%
C9	T.C.C. CE 17 N	667575		2μ	350 V	
C10 to C12	Lemco 1510 M	664857		470 p		5%
C13	Lemco 1510 M	664797		150 p		
C14	Lemco 1510 M	664713		15 p		5%
C15 and C16	T.C.C.	668962	Z115627	10 n	200 V	
C17 and C18	Mullard Trimmer	800065		3-30 p		
C19	T.C.C.	668960	Z115552	10 n	350 V	
C20	Mullard Trimmer	800065		3-30 p		
C21 and C22	T.C.C.	668960	Z115552	10 n	350 V	
C23	Erie Ceramicon	650484		10 p		20%
C24	T.C.C.	668962	Z115627	10 n	200 V	
C25	T.C.C.	668968	Z115506	100 n	350 V	
C26	T.C.C. CP 112 H	668962	Z115627	10 n	200 V	
C27 to C29	Mullard Trimmers	800065		3-30 p		
C30 and C31	T.C.C.	668960	Z115552	10 n	350 V	
C32	Erie Hi. K	666648		220 p		20%
C33	T.C.C.	668960	Z115552	10 n	350 V	
C34	T.C.C.	668959	Z115552	10 n	500 V	
C35	T.C.C.	668960	Z115552	10 n	350 V	
C36	T.C.C.	668962	Z115627	10 n	200 V	
C37	T.C.C.	668959	Z115555	10 n	500 V	
C38	T.C.C. CE 19 B	667212		50μ	50 V	
C39	T.C.C.	668959	Z115525	10 n	500 V	
C40	T.C.C.	668960	Z115552	10 n	350 V	
C41	Cyldon Variable	280006		0/250 p		
C42	T.C.C. Mica	666126		5 n	1500 V	
C43 to C48	T.C.C. Tubular Ceramic	266018		230 p		
C49 to C56	T.C.C. Tubular Ceramic	266020		390 p		2%
C57 to C68	T.C.C. Tubular Ceramic	266019		292.5 p		2%
C69 to C72	T.C.C. Tubular Ceramic	266020		390 p		2%
C73	T.C.C. Ceramic K3552/F	666825		45 p		20%
C74	Cyldon Special Variable	280005		25/225 p		
C75	T.C.C.	668962	Z115627	10 n	200 V	

Cir. No.	Description	Pye Ref. No.	I.S. Ref. No.	Value	Rating.	Tol.
C76 to C78	T.C.C. Ceramic	664713		15 p		
C79	Hunts W99	667082		10 n	150 V	
C80 to C82	Mullard Trimmer	800065		3-30 p		
C84	Lemco 1510 M	665219		18 p		5%
C85 to C87	Mullard Trimmer	800065		3-30 p		
C88	Lemco 1510M	664725		22 p		
C89	T.C.C. CP 113 N	668960		10 n	350 V	
C90 and C91	T.C.C. CP 112 H	668962	Z115627	10 n	200 V	
C92	Erie Hi - K - K	666657		330 p		20%
C93 to C95	T.C.C. CP 112 H	668962	Z115627	10 n	200 V	
C96 and C97	Lemco 1510M	665219		18 p		5%
C98	T.C.C. CP 112 H	668962	Z115627	10 n	200 V	
RLF	Vacuum Relay	987194	A.P.101978	700 Ω		
RLG	Siemens H.S. Relay H.96	701375	Z530040	3.4 K		
FL1	Parmeko B5038	780896				
TR1	Parmeko B5036	770957				
MR1	Westinghouse Rectifier Unit	704486			1mA	
MR2, MR3	Germanium Crystal GEX55/1	704509				
M1, M2	Microammeter 0 - 500 Elliott 2 H/S.	271374				
R1	Erie RMA 9	670523	Z222059	2.7K	¼ W	10%
R2	Erie RMA 8	670458	Z222174	22K	½ W	10%
R3	Erie RMA 8	670458	Z222174	22K	½ W	10%
R4	Erie RMA 9	670522	Z223143	680K	¼ W	10%
R5	Erie RMA 8	670445	Z222039	1.8K	½ W	10%
R7	Erie RMA 8	670456	Z222153	15 K	½ W	10%
R8	Erie RMA 9	670524	Z222068	3.3 K	¼ W	10%
R9	Erie RMA 8	670464	Z223018	68 K	½ W	10%
R10	Erie RMA 9	670522	Z223143	680 K	¼ W	10%
R11	Erie RMA 9	670523	Z222059	27 K	¼ W	10%
R12	Erie RMA 9	670538	Z222215	47 K	¼ W	10%
R13	Erie RMA 8	670474	Z223123	470 K	½ W	10%
R14	Erie RMA 9	670524	Z222068	3.3 K	¼ W	10%
R15 to R17	Erie RMA 9	670543	Z223050	120 K	¼ W	10%
R18	Erie RMA 9	670538	Z222215	47 K	¼ W	10%
R19	Erie RMA 8	670446	Z222048	22 K	½ W	10%
R20	Erie RMA 8	670464	Z223018	68 K	½ W	10%
R21, R23	Erie RMA 9	670542	Z223038	100 K	¼ W	10%
R24	Erie RMA 9	670506		33 K	¼ W	10%
R25	Erie RMA 9	670547	Z223092	270 K	¼ W	10%

Cir. No.	Description.	Pye Ref. No.	I.S. Ref. No.	Value	Rating.	Tol.
R26	Erie RMA 9	670522	Z222047	2.2 K	¼ W	10%
R27	Erie RMA 8	670459	Z222186	27 K	½ W	10%
R28	Erie RMA 9	670554	Z223164	1 M	¼ W	10%
R29	Erie RMA 9	670522	Z222047	2.2 K	¼ W	10%
R30	Erie RMA 8	670455	Z222144	12 K	½ W	10%
R31	Erie RMA 8	670440	Z221216	680	½ W	
R32	Erie RMA 9	670500	Z221047	33	¼ W	
R33	Erie RMA 8	670472	Z223102	330 K	½ W	10%
R34	Erie RMA 9	670524	Z223068	3.3 K	¼ W	10%
R35	Erie RMA 8	670463	Z223009	56 K	½ W	10%
R36	Erie RMA 9	670524	Z222068	3.3 K	¼ W	10%
R37	Erie RMA 8	670472	Z223102	330 K	½ W	10%
R38	Erie RMA 9	670554	Z223164	1 M	¼ W	10%
R39	Erie RMA 8	670454	Z222132	10 K	½ W	
R40	Erie RMA 9	670531	Z222143	12 K	¼ W	10%
R41	Erie RMA 9	670532	Z222152	15 K	¼ W	
R42	Erie RMA 9	670542	Z223038	100 K	¼ W	10%
R43	Erie RMA 9	670542	Z223638	100 K	¼ W	10%
R44 and R45	Erie RMA 9	670502	Z221068	47	¼ W	10%
R46	Erie RMA 9	670506	Z221110	100	¼ W	10%
R47	Morganite Type R	671671	Z212256	12 K	1 W	
R48	Erie RMA 8	670443	Z222018	1.2 K	½ W	10%
R50 and R51	Erie RMA 8	670426	Z221069	47	½ W	
R52, R53, R55	Erie RMA 9	670495	Z221008	12	¼ W	10%
R56	Erie RMA 8	670426	Z221069	47	½ W	
R58 to R60	Erie RMA 9	670495	Z221008	12	¼ W	10%
R61	Welwyn	672147	Z243121	180		
R62	Erie RMA 8	670426	Z221069	47	½ W	
R64	Erie RMA 8	670443	Z222018	1.2 K	½ W	
R65	Welwyn	671831	Z244121	18 K		
R66	Erie RMA 8	670426	Z221069	47	½ W	
R67	Erie RMA 9	670495	Z221008	12	¼ W	10%
R68	Erie RMA 9	670528	Z222110	6.8 K	¼ W	10%
R69	Erie RMA 8	672251	Z223162	1 M	½ W	5%
R70	Erie RMA 9	670531	Z222143	12 K	¼ W	10%
R71	Erie RMA 8	672251	Z223162	1 M	½ W	5%
R72	Erie RMA 8	672252	Z223120	470 K	½ W	5%
R73 and R74	Erie RMA 9	670776	Z222044	2.2 K	¼ W	5%
R75	Erie Type 108	672485		2.2 K	½ W	2%
R76 and R77	Welwyn	672238	Z243222	1		5%

H.F TRANSMITTER

Cir. No.	Description.	Pye Ref. No.	I.S. Ref. No.	Value.	Rating.	Tol.
R78	Erie RMA 9	670506	Z221047	33	¼ W	
R79	Erie RMA 9	670538	Z222215	47 K	¼ W	10%
R80	Erie RMA 9			100 K	¼ W	10%
R81	Erie RMA 9	670538	Z222215	47 K	¼ W	10%
R82	Erie RMA 9	670504	Z221089	68	¼ W	10%
RV3	Colvern 1206/269	281000		1 K		
RV4, RV5	Colvern 1106/95	281003		5 K		
V1	Double Triode 12AX7		CV492			
V2	Double Diode EB91		CV140			
V3	Double Triode 12AX7		CV492			
V4, V5	Beam Tetrode 5B/251M		CV428			
V6	Stabilovolt QS150/15		CV287			
V7	Triode Heptode ECH81		CV2128			
V8	Beam Tetrode 5763		CV2129			
V9	R.F Pentode EF91		CV138			
V10, 11, 12	Beam Tetrode 5B/251M		CV428			

Component List

Cir. No.	Description.	Pye Ref. No.	I.S. Ref. No.	Value.	Rating.	Tol.
C1 to 8	Mullard Trimmer	800065		3-30 p	75 V	
C9	Lemco	665255		47 p	350 V	10%
C10	Erie Ceramicon N750K	650484	Z132253	10 p	750 V	10%
C11	Lemco	665239	Z132283	33 p	350 V	10%
C12	Erie Ceramicon N750L	650691	Z132300	100 p	750 V	10%
C13	Erie Ceramicon N750K	650520	Z132073	15 p	750 V	10%
C14 and 15	Lemco	666781		470 p	350 V	2%
C16	Gang Condenser (AE)	280001				
C17	Erie Ceramicon N750L	650691	Z132300	100 p	750 V	10%
C18	Erie Ceramicon N750	650592	Z132283	33 p	750 V	10%
C19 to 26	Mullard Trimmer	800065		3-30 p	75 V	
C27	Lemco	664093		82 p	350 V	2%
C28 to 29	Lemco	664101		100 p	350 V	2%
C30	Lemco	666261		500 p	350 V	2%
C31	Lemco	664341		1.1 n	350 V	2%
C32	Lemco	666904		850 p	350 V	2%
C33	Lemco	664365		1.5 n	350 V	2%
C34	Lemco	663808		2.7 n	350 V	2%
C35 and 36	Erie Ceramicon N750K	650484	Z132253	10 p	750 V	10%
C37	Lemco	665263		56 p	350 V	10%
C38	Erie Ceramicon N750K	650484	Z132253	10 p	750 V	10%
C39	Lemco	665319		220 p	350 V	2%
C40	Gang Condenser (Osc)					
C41	T.C.C. Metamite	668968	Z115506	100 n	350 V	
C42	Hunts	985705	Z115256	100 n	150 V	
C43	T.C.C. Metamite	668963	Z115629	20 n	500 V	
C44	Hunts	985705	Z115256	100 n	150 V	
C45	Lemco	666784		47 p	350 V	2%
C46 to 53	Mullard Trimmer	800065		3-30 p	75 V	
C54	T.C.C. Metamite			5 n	350 V	
C55	Erie Ceramicon Hi - KL	666652		2.2 n	350 V	
C56	Erie Ceramicon Hi-KL	666652		2.2 n	350 V	
C57	Erie Ceramicon Hi - KK	666551		1 n	350 V	20%
C58	Erie Ceramicon Hi - KK	666657		330 p	350 V	20%
C59	Erie Ceramicon N750K	650655		62 p	750 V	10%
C60	Erie Ceramicon N750K	650520	Z132073	15 p	750 V	10%
C61	Erie Ceramicon P100K	650452	Z132421	5.6 p	750 V	10%
C62	Erie Ceramicon N750K	650574	Z132280	27 p	750 V	10%
C63	Erie Ceramicon N750K	650592	Z132283	33 p	750 V	10%
C64 and 65	Erie Ceramicon N750L	650691	Z132300	100 p	750 V	10%

Cir. No.	Description.	Pye Ref. No.	I.S. Ref. No.	Value.	Rating.	Tol.
C66	Erie Ceramicon Hi - KK	666657		330 p	750 V	
C67	Hunts	985705	Z115256	100 n	150 V	
C68	T.C.C. Metalmite	666861	Z115625	10 n	350 V	
C69	Gang Condenser (Mix)					
C70 and 71	Hunts	985705	Z115256	100 n	150 V	
C72	T.C.C. Metalmite	668968	Z115506	100 n	350 V	
C73 to 76	Lemco	666781		470 p	350 V	2%
C77	Hunts Electrolytic	667143	Z145027	4 μ	350 V	
C78	Hunts	668902		100 n	150 V	
C79	Erie Ceramicon N750L	650691	Z132300	100 p	750 V	10%
C80	T.C.C. Metalmite	668951		10 n	500 V	
C81	Erie Ceramicon	666554		270 p	750 V	20%
C82	T.C.C. Metalmite	668963	Z115629	20 n		
C83	Hunts	985705	Z115256	100 n	150 V	
C84	T.C.C. Metalmite	668959	Z115525	10 n	500 V	
C85	Erie Ceramicon Hi - KL	666652		2.2 n	350 V	
C86	Mullard Trimmer	800065		3-30 p	75 V	
C87 and 88	Erie Ceramicon N750L	650691	Z132300	100 p	750 V	10%
C89 and 90	Lemco	666783		2 n	350 V	2%
C91	T.C.C. Metalmite	668968	Z115506	100 n	350 V	
C92 and 93	Lemco	666781		470 p	350 V	2%
C94	T.C.C. Metalmite	668963	Z115629	20 n	500 V	
C95	T.C.C. Metalmite	668951		1 n	500 V	
C96	T.C.C. Metalmite	668968	Z115506	100 n	350 V	
C97	Hunts Electrolytic	667143	Z145027	4 μ	350 V	
C98	T.C.C. Metalmite	668951		1 n	500 V	
C99	T.C.C. Metalmite	668968	Z115506	100 n	350 V	
C100	Hunts	985705	Z115256	100 n	150 V	
C101	T.C.C. Metalmite	668968	Z115506	100 n	350 V	
C102	Mullard Trimmer	800065		3-30 p	75 V	
C103	Lemco	666781		470 p	350 V	2%
C104	Lemco	666903		850 p	350 V	2%
C105	Lemco	664331		1 n	350 V	2%
C106 to 108	Mullard Trimmers			2-8 p	75 V	
C109	Erie Ceramicon N750K	650484	Z132253	10 p	750 V	20%
C110 and 111	Lemco	666782		1 n	350 V	2%
C112	Erie Ceramicon N750L	650691	Z132300	100 p	750 V	10%
C113	T.C.C. Metalmite	668959	Z115525	10 n	500 V	
C114	T.C.C. Metalmite	668963	Z115629	20 n	500 V	
C115	Hunts	985705	Z115256	100 n	150 V	

Cir. No.	Description.	Pye Ref. No.	I.S. Ref .No.	Value.	Rating.	Tol.
C116	T.C.C. Metalmite	668968		100 n	350 V	
C117 and 118	Lemco	666781		470 p	350 V	2%
C119	Lemco	666906		2.7 p	350 V	2%
C120 and 121	Erie Ceramicon N750L	650691	Z132300	100 p	750 V	10%
C122	Erie Ceramicon P100K	650476	Z132426	10 p	750 V	
C123	Hunts	985705	Z115560	100 n	150 V	
C124	Erie Ceramicon N750L	650691	Z132300	100 p	750 V	10%
C125	Erie Ceramicon Hi - KL	666651		2 n	350 V	20%
C126	Trimmer	800162		3.8 - 50 p		
C127	Erie Ceramicon Hi - KL	666652		2.2 n	350 V	20%
C128	Erie Ceramicon P100K	650452	Z132431	5.6 p	750 V	10%
C129 and 130	Hunts	985705	Z115256	100 n	150 V	
C131 to 150	Erie 3ft/2404/100	985706		1·n		$\begin{cases} +80\% \\ -20\% \end{cases}$
C151	Erie Ceramicon Hi - KK	666551		1 n	350 V	20%
R1	Welwyn	671841	Z244033	2.2 K	6 w	10%
R2	Erie RMA 8	670464	Z223018	68 K	$\frac{1}{2}$ w	10%
R3	Erie RMA 8	670460	Z222195	33 K	$\frac{1}{2}$ w	10%
R4	Erie RMA 8	670450	Z222090	4.7 K	$\frac{1}{2}$ w	10%
R5	Erie RMA 8	670446	Z222048	2.2 K	$\frac{1}{2}$ w	10%
R6	Erie RMA 9	670552	Z223143	680 K	$\frac{1}{4}$ w	10%
R7	Erie RMA 9	670530	Z222131	10 K	$\frac{1}{4}$ w	10%
R8	Erie RMA 9	670504	Z221089	68	$\frac{1}{4}$ w	10%
R9	Erie RMA 9	670542	Z223038	100 K	$\frac{1}{4}$ w	10%
R10	Erie RMA 9	670538	Z222215	47 K	$\frac{1}{4}$ w	10%
R11	Erie RMA 9	670502	Z221068	47	$\frac{1}{4}$ w	10%
R12	Erie RMA 8	670454	Z222132	10 K	$\frac{1}{2}$ w	10%
R13	Erie RMA 9	670519	Z222017	1.2 K	$\frac{1}{4}$ w	10%
R14	Erie RMA 9	670502	Z221068	47	$\frac{1}{4}$ w	10%
R16	Wirewound	672229	Z243393	820		5%
R17	Erie RMA 8	670454	Z222132	10 K	$\frac{1}{2}$ w	10%
R18	Erie RMA 9	670550	Z223122	470 K	$\frac{1}{4}$ w	10%
R19	Erie RMA 9	670510	Z221152	220	$\frac{1}{4}$ w	10%
R20	Erie RMA 9	670542	Z223038	100 K	$\frac{1}{4}$ w	10%
R21	Welwyn	670812	Z244098	10 K	4.5 w	5%
R23	Erie RMA 8	670446	Z222048	2.2 K	$\frac{1}{2}$ w	10%
R24	Erie RMA 8	670431	Z221123	120	$\frac{1}{2}$ w	10%
R25	Erie RMA 9	670526	Z222089	4.7 K	$\frac{1}{4}$ w	10%
R26	Erie RMA 9	670547	Z223092	270 K	$\frac{1}{4}$ w	10%
R27	Erie RMA 8	670454	Z222132	10 K	$\frac{1}{2}$ w	10%

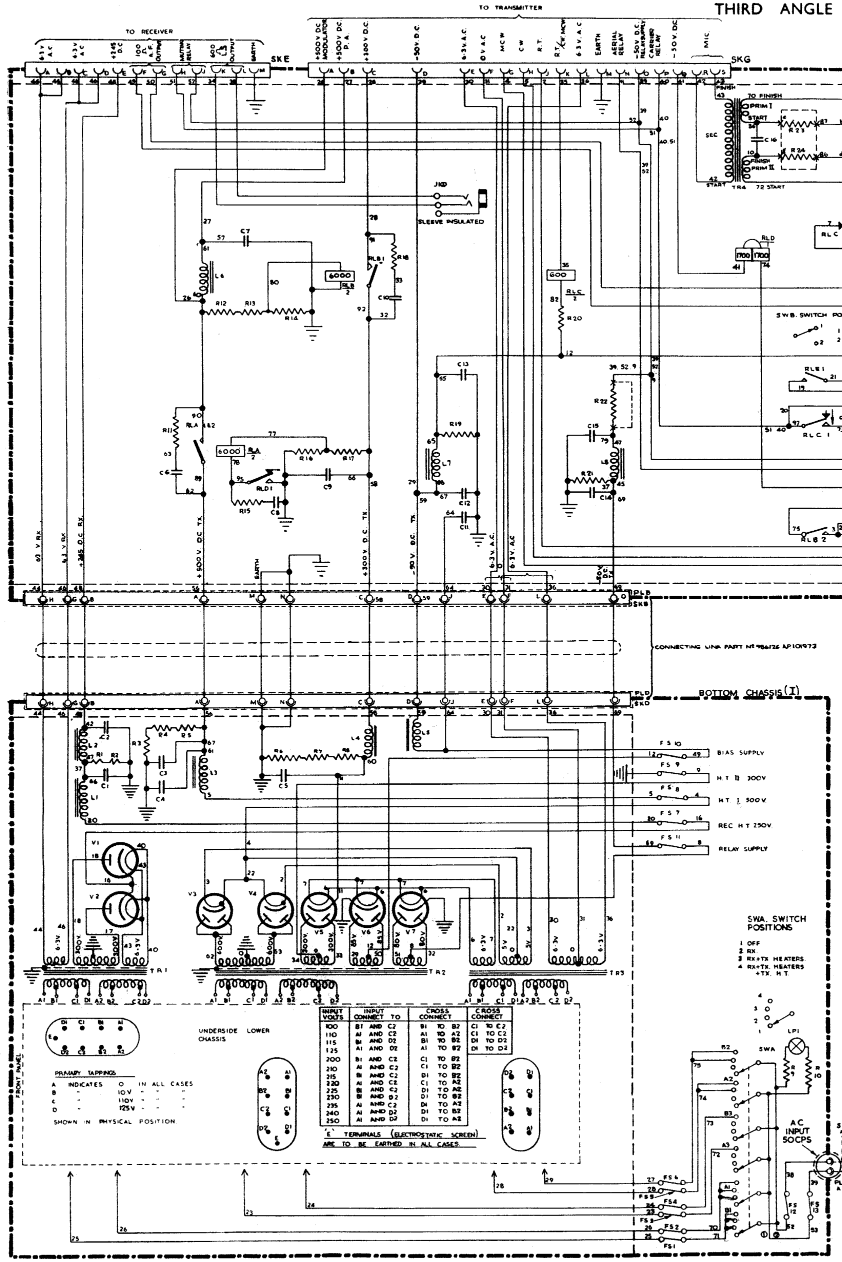
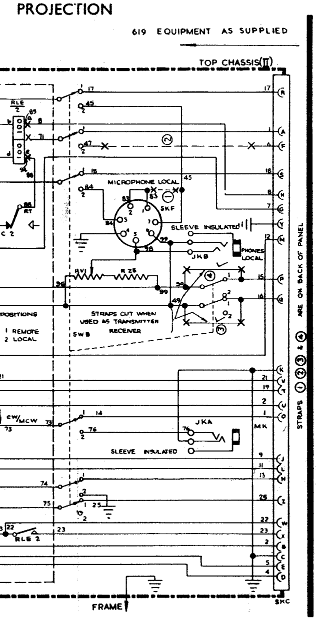
Cir. No.	Description.	Pye Ref. No.	I.S. Ref. No.	Value	Rating.	Tol.
R28	Erie RMA 8	670450	Z222090	4.7 K	½ w	10%
R29	Erie RMA 9	670550	Z223122	470 K	¼ w	10%
R30	Erie RMA 9	670542	Z223038	100 K	¼ w	10%
R31	Erie RMA 9	670547	Z223092	270 K	¼ w	10%
R32	Erie RMA 9	670542	Z223038	100 K	¼ w	10%
R33	Erie RMA 9	670508	Z221131	150	¼ w	10%
R34	Erie RMA 9	670532	Z222152	15 K	¼ w	10%
R35	Erie RMA 9	670519	Z222017	1.2 K	¼ w	10%
R36	Erie RMA 9	670519	Z222017	1.2 K	¼ w	10%
R37	Erie RMA 9	670558	Z223206	2.2 M	¼ w	10%
R38	Erie RMA 9	670550	Z223122	470 K	¼ w	10%
R39	Erie RMA 8	670446	Z222048	2.2 K	½ w	10%
R40	Erie RMA 9	670558	Z223206	2.2 M	¼ w	10%
R41	Erie RMA 9	670538	Z222215	47 K	¼ w	10%
R43	Erie RMA 9	670542	Z223038	100 K	¼ w	10%
R44 and 45	Erie RMA 9	670546	Z223080	220 K	¼ w	10%
R46	Erie RMA 9	670512	Z221173	330	¼ w	10%
R47	Erie RMA 8	670446	Z222048	2.2 K	½ w	10%
R48	Erie RMA 9	670554	Z223164	1 M	¼ w	10%
R49	Erie RMA 9	670512	Z221173	330	½ w	10%
R50	Erie RMA 8	670446	Z222048	2.2 K	½ w	10%
R51	Erie RMA 9	672270	Z223203	2.2 M	¼ w	10%
R52	Erie RMA 9	670541		82 K	¼ w	10%
R54	Erie RMA 9	670538	Z222215	47 K	¼ w	10%
R55	Erie RMA 9			680 K	¼ w	5%
R56 and 57	Erie RMA 9	670550	Z223122	470 K	¼ w	10%
R58	Erie RMA 9	670554	Z223164	1 M	¼ w	10%
R59	Erie RMA 9	670550	Z223122	470 K	¼ w	10%
R60	Erie RMA 9	670538	Z222215	47 K	¼ w	10%
R61	Erie RMA 8	670460	Z222195	33 K	½ w	10%
R62	Erie RMA 9	670538	Z222215	47 K	¼ w	10%
R63	Erie RMA 8	670450	Z222090	4.7 K	½ w	10%
R64	Erie RMA 9			100	¼ w	
RLK	Siemens Relay H.S. H.96	701375	Z530040	3.4 K		
RV15	Colvern Wirewound	281000		1 K		
RV22	Colvern Wirewound	810127		5 K		
RV42	Morganite Carbon Potr.	281002	Z262936	2.5 M		
RV53	Morganite Carbon Potr.	281001		100 K		

Component List

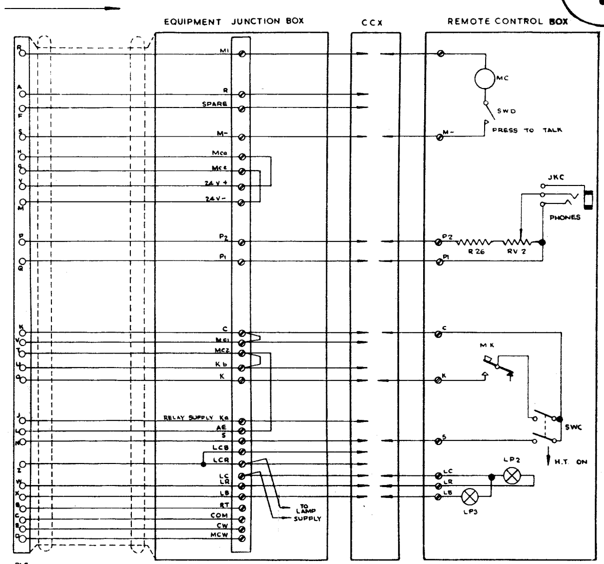
CIR. NO.	DESCRIPTION.	PYE REF. NO.
L1	Range 1 Aerial Tuning Inductance	278011
L2	Range 2 Aerial Tuning Inductance	278012
L3	Range 3 Aerial Tuning Inductance	278013
L4	Range 4 Aerial Tuning Inductance	278014
L5	Range 5 Aerial Tuning Inductance	278015
L6	Range 6 Aerial Tuning Inductance	278016
L7	Range 7 Aerial Tuning Inductance	278017
L8	Range 8 Aerial Tuning Inductance	278018
L9	Tuning Inductance of FL1	278029
L10	Range 1 Osc. Tuning Inductance	278019
L11	Range 2 Osc. Tuning Inductance	278020
L12	Range 3 Osc. Tuning Inductance	278021
L13	Range 4 Osc. Tuning Inductance	278022
L14	Range 5 Osc. Tuning Inductance	278023
L15	Range 6 Osc. Tuning Inductance	278024
L16	Range 7 Osc. Tuning Inductance	278025
L17	Range 8 Osc. Tuning Inductance	278026
L18	Range 8 Osc. Booster Inductance	620093
L19	Tuning Inductance of FL2	278029
L20	Range 1 Mixer Tuning Inductance	278003
L21	Range 2 Mixer Tuning Inductance	278004
L22	Range 3 Mixer Tuning Inductance	278005
L23	Range 4 Mixer Tuning Inductance	278006
L24	Range 5 Mixer Tuning Inductance	278007
L25	Range 6 Mixer Tuning Inductance	278008
L26	Range 7 Mixer Tuning Inductance	278009
L27	Range 8 Mixer Tuning Inductance	278010
L28	Xtal Osc. Anode Choke	279009
L29	Tuning Inductance TR5	277004
L30	Tuning Inductance of TR5	227005
L31 and 32	Tuning Inductance of TR4	277003
L33	2nd Osc. 2nd Harmonic Filter Ind.	278046
L34	Tuning Inductance of (1.86 Osc.)	278027
L35 to 37	Tuning Inductance of TR3	277005
L38 to 40	Tuning Inductance of TR2	277006
L41	Inductance for FL3	278030
L42 and 43	Tuning Inductance of TR1	277005
L44	Tuning Inductance of B.F.O.	278045
L45	B.F.O. Filament Choke	279003
L46 to 55	Feed through Filter Choke	987602

Cir. No.	Description.	Pye Ref. No.
TR6	Audio Output Trans.	770192
V1	C.V. 454	860253
V2	C.V. 2128	860298
V3	C.V. 133	860169
V4	C.V. 2128	860298
V5 - 6	C.V. 131	860022
V7 - 8	C.V. 140	860017
V9	C.V. 131	860022
V10	C.V. 2127	860290
V11	C.V. 395	860184
V12	C.V. 131	860022
JKE	Jack Socket	830167
XL1 XL2 - 3	Double Xtal Filter Unit	270871

THIRD ANGLE PROJECTION

INPUT VOLTS	INPUT CONNECT TO	CROSS CONNECT	CROSS CONNECT
100	B1 AND C2	B1 TO B2	C1 TO C2
110	B1 AND C2	B1 TO A2	C1 TO C2
115	B1 AND D2	B1 TO B2	C1 TO D2
125	B1 AND D2	B1 TO A2	C1 TO D2
200	B1 AND C2	C1 TO B2	
210	B1 AND C2	C1 TO A2	
215	B1 AND D2	C1 TO B2	
220	A1 AND C2	C1 TO B2	
225	B1 AND D2	C1 TO A2	
230	A1 AND C2	C1 TO A2	
235	A1 AND D2	D1 TO B2	
240	A1 AND D2	D1 TO A2	
250	A1 AND D2	D1 TO A2	

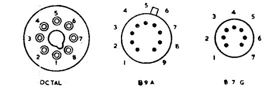


PLD	1 WAY MARK IV FREE PLUG	Z 560391
SKB	1 WAY MARK IV FREE SOCKET	Z 560211

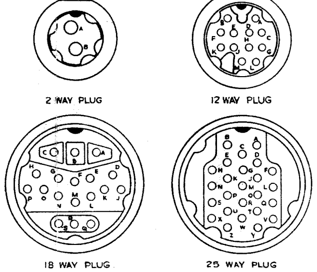
NOTES
1 —×✓×— DENOTES STRAPPING TAGS SUPPLIED STRAPPED
2 —×– –×— DOTTED LINES INDICATE POSSIBLE STRAPS

VALVE BASE CONNECTIONS
(AS SEEN FROM UNDERNEATH)

VALVE	BASE	PINS 1	2	3	4	5	6	7	8	TC
53 KU CV 378	OCTAL	—	H	—	a_1	—	a_2	—	H	—
R17 CV 2218	B9A	—	—	c	H	H	—	—	—	a
6X4 CV493	B7G	a_1	—	H	H	—	a_2	c	—	—



PLUG DIAGRAMS
(AS SEEN FROM PIN SIDE)

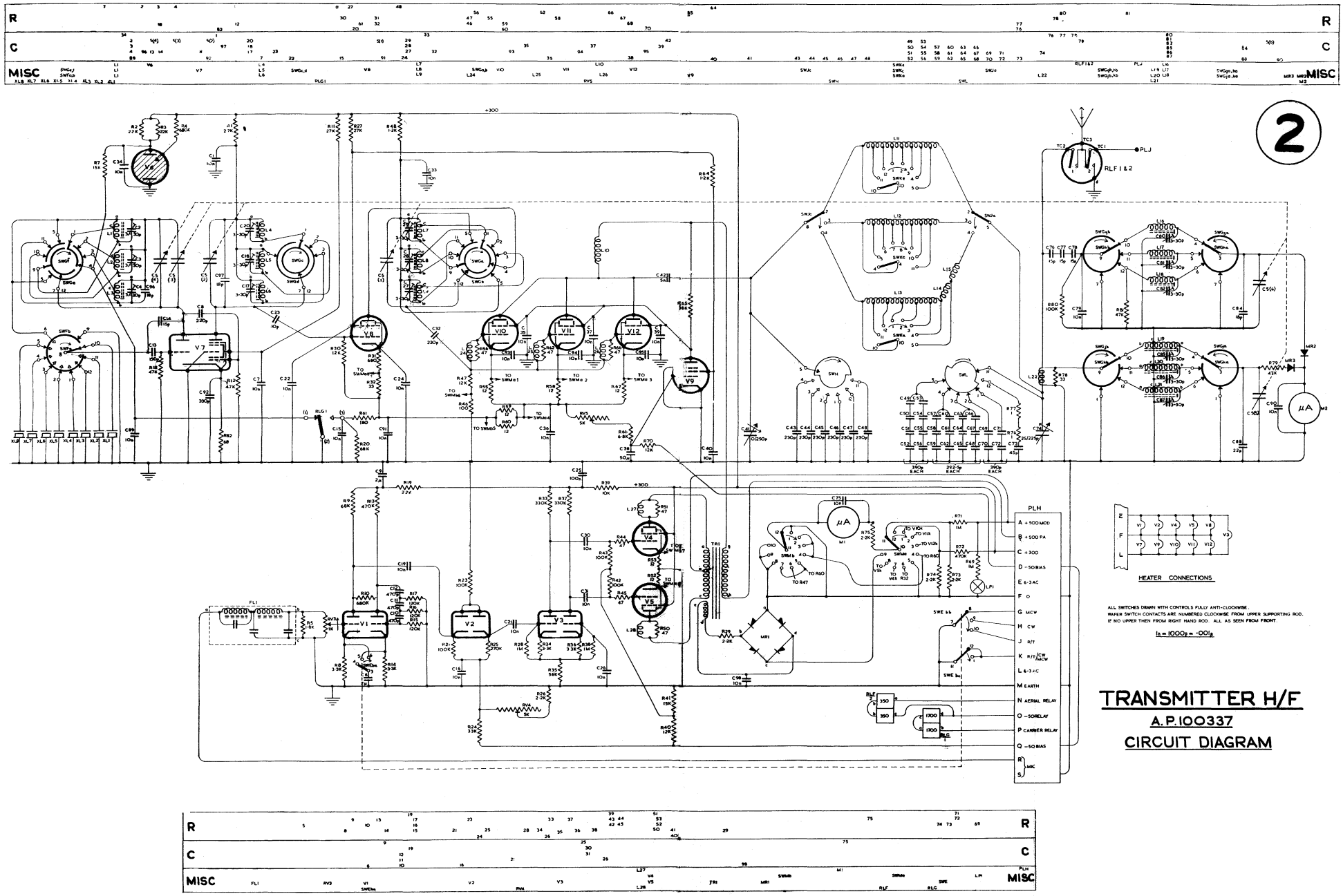


CODE LIST

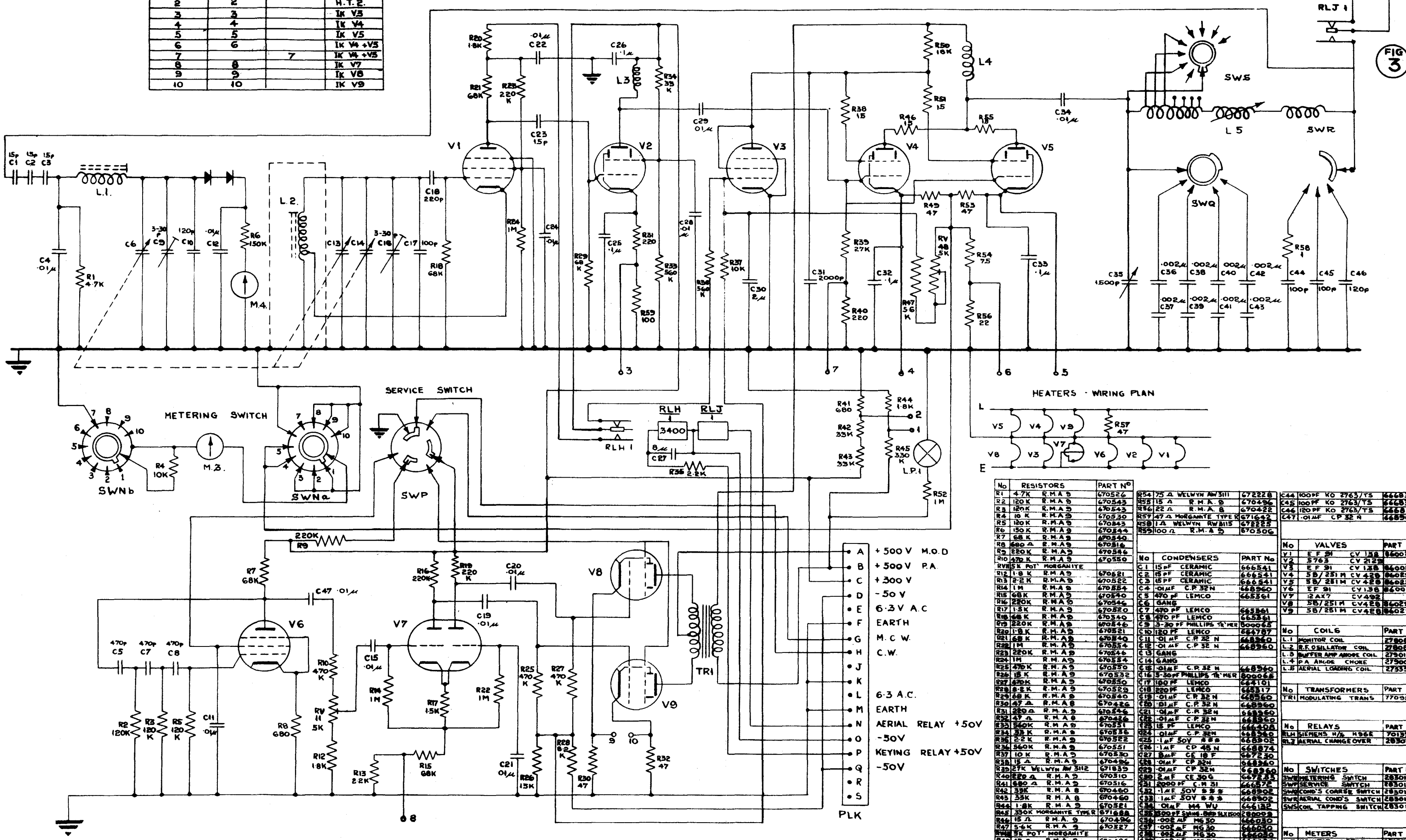
	CAPACITORS	PYE PART No	INTER SERV
C 1	8 mfd 600/400 NITROGOL	266053	Z 112825
C 2	8 mfd 600/400 NITROGOL	266053	Z 112825
C 3	4 mfd 1000/800 NITROGOL	266051	Z 112535
C 4	4 mfd 1000/800 NITROGOL	266051	Z 112535
C 5	8 mfd 600/400 NITROGOL	266053	Z 112825
C 6	.5 mfd 1000/750 TCC METALPACK	266055	Z 111377
C 7	4 mfd 1000/800 NITROGOL	266051	Z 112535
C 8	.5 mfd 350 V TCC CP47N	668879	Z 115511
C 9	8 mfd 600/400 NITROGOL	266053	Z 112825
C 10	.5 mfd 500 V TCC CP91S	668880	Z 115512
C 11	8 mfd 200/100 NITROGOL	266052	Z 112884
C 12	8 mfd 200/100 NITROGOL	266052	Z 112884
C 13	8 mfd 200/100 NITROGOL	266052	Z 112884
C 14	8 mfd 200/100 NITROGOL	266052	Z 112884
C 15	4 mfd 200/100 NITROGOL	266050	Z 112883
C 16	8 mfd 200/100 NITROGOL	266052	Z 112884
	RESISTORS	PYE PART No	INTER SERV
R 1	22K Ω W.W. 6 WATT WELWYN 5%	670813	Z 244129
R 2	22K Ω W.W. 6 WATT WELWYN 5%	670813	Z 244129
R 3	33K Ω W.W. 6 WATT WELWYN 5%	670815	Z 244141
R 4	33K Ω W.W. 6 WATT WELWYN 5%	670815	Z 244141
R 5	33K Ω W.W. 6 WATT WELWYN 5%	670815	Z 244141
R 6	33K Ω 1 WATT MORGANITE ±10%	671676	Z 212261
R 7	33K Ω 1 WATT MORGANITE ±10%	671676	Z 212261
R 8	33K Ω 1 WATT MORGANITE ±10%	671676	Z 212261
R 9	220K Ω R.M.A.B. ±10%	670470	Z 223081
R 10	220K Ω R.M.A.B. ±10%	670470	Z 223081
R 11	47 Ω R.M.A.B. ±10%	670426	Z 221069
R 12	22K Ω W.W. 6 WATT WELWYN 5%	670813	Z 224129
R 13	18K Ω W.W. 6 WATT WELWYN 5%	672224	Z 244122
R 14	27K Ω W.W. 6 WATT WELWYN 5%	671840	Z 244135
R 15	47 Ω R.M.A.B. ±10%	670426	Z 221069
R 16	27K Ω W.W. 6 WATT WELWYN 5%	671840	Z 244135
R 17	22K Ω W.W. 6 WATT WELWYN 5%	670813	Z 244129
R 18	47 Ω R.M.A.B. ±10%	670426	Z 221069
R 19	27K Ω W.W. 6 WATT WELWYN 5%	671840	Z 244135
R 20	470 Ω TYPE 'R' MORGANITE	671654	Z 211270
R 21	22K Ω W.W. 6 WATT WELWYN 5%	670813	Z 244129
R 22	150 Ω TYPE 'R' MORGANITE	671648	Z 211264
R 23	220 Ω R.M.A.B. ±10%	670434	Z 221158
R 24	220 Ω R.M.A.B. ±10%	670434	Z 221153
R 25 & 26	1.2K Ω R.M.A.B. ±10%	670443	Z 222018
RV 1 & 2	25K Ω W.W. POT	810176	Z 272302
	VALVES	PYE PART No	INTER SERV
V1 V2	R 17	860294	CV 2218
V3 V4	53 KU	860235	CV 378
V5 V6	6 X 4	860179	CV 493
V7	6 X 4	860179	CV 493

	TRANSFORMERS	PYE PART No	INTERSERV. No
TR 1	RECEIVER H.T + L.T. TRANS.	770952	AP 67380
TR 2	TRANSMITTER H.T TRANS.	770953	AP 67381
TR 3	TRANSMITTER L.T	770954	AP 67378
TR 4	MICROPHONE TRANSF.	770955	AP 67375
	INDUCTANCES		
L 1	5 HENRY 140 m A DC 100Ω	790292	AP 67379
L 2	5 HENRY 140 m A DC 100Ω	790292	AP 67379
L 3	5 HENRY 270 m A DC 50Ω	790293	AP 67382
L 4	5 HENRY 140 m A DC 100Ω	790292	AP 67379
L 5	20 HENRY 70 m A DC 400Ω	790292	AP 67379
L 6	5 HENRY 140 m A DC 100Ω	790292	AP 67379
L 7	20 HENRY 70 m A DC 400Ω	790292	AP 67379
L 8	5 HENRY 140 m A DC 100Ω	790292	AP 67379
	RELAYS		
RLA	H.T. SWITCHING RELAY	283042	105/3HV
RLB	H.T. SWITCHING RELAY	283042	105/3HV
RLC	R.T./C.W. MCW. RLY.	283044	I.S.C. 20/6
RLD	BIAS RELAY	701375	Z 530040
RLE	MICROPHONE RELAY	283043	AP 60203
	SWITCHES		
SWA	A.C. MAINS SWITCH	283117	
SWB	REMOTE / LOCAL SWITCH	283018	
SWC	M.K. & H.T. SWITCH	—	—
SWD	MIC. PRESSEL SWITCH	—	—
	PLUGS & SOCKETS		
PLA	2 WAY MARK IV FIXED PLUG	270574	Z 560050
PLB	18 WAY MARK IV FIXED PLUG	270575	Z 560191
PLC	25 WAY MARK IV FREE PLUG		Z 560400
SK A	2 WAY MARK IV FREE SOCKET		Z 560090
SK D	18 WAY MARK IV FIXED SOCKET	270555	Z 560371
SK C	25 WAY MARK IV FIXED SOCKET	270558	Z 560380
SK E	12 WAY MARK IV FIXED SOCKET	270556	Z 560330
SK G	18 WAY MARK IV FIXED SOCKET	270587	Z 560370
SK F	MICROPHONE SKT. ADM. PKT.	270359	A.P.W. 6981 A
	MISCELLANEOUS		
FS1–6	A.C. FUSES 1 AMPS (200 VOLTS) 2 AMPS (100 VOLTS)		
FS 7	D.C. FUSE 250 mA	704387	
FS 8	D.C. FUSE 500 mA	700487	Z 590108
FS 9	D.C. FUSE 250 mA	704387	
FS 10	D.C. FUSE 250 mA	704387	
FS 11	D.C. FUSE 250 mA	704387	
FS12 & 13	D.C. FUSE 4 AMPS (200 VOLTS) 8 AMPS (100 VOLTS)		
LP1	SIGNAL LAMP, NEON	270594	C.F. 2429/50
LP2 & 3	SIGNAL LAMPS	—	—
JKABC & D	3 POINT P.O. JACKS	830167	No P.O. 61061
MC	P.O. MICROPHONE INSERT	—	—
MK	MORSE KEY	—	—

TYPE 619/H
POWER PACK A.P. 100340
WIRING DIAGRAM


2
PLH
A +500 MOD
B +500 PA
C +300
D -50 BIAS
E 6·3 AC
F 0
G MCW
H CW
J R/T
K R/T/CW/MCW
L 6·3 AC
M EARTH
N AERIAL RELAY
O -50 RELAY
P CARRIER RELAY
Q -50 BIAS
R MIK
S
PLJ
RLF 1 & 2
HEATER CONNECTIONS
ALL SWITCHES DRAWN WITH CONTROLS FULLY ANTI-CLOCKWISE.
WAFER SWITCH CONTACTS ARE NUMBERED CLOCKWISE FROM UPPER SUPPORTING ROD.
IF NO UPPER THEN FROM RIGHT HAND ROD. ALL AS SEEN FROM FRONT.
Is = 10000 Ip = ·001 Ip
TRANSMITTER H/F
A.P.100337
CIRCUIT DIAGRAM

CONNECTION TO METERING SWITCH			
CONNECTION Nº	SWNb	SWNa	POSITION
1	1		H.T.1.
2	2		H.T.2.
3	3		IK V3
4	4		IK V4
5	5		IK V5
6	6		IK V4 +V5
7		7	IK V4 +V5
8	8		IK V7
9	9		IK V8
10	10		IK V9



No	RESISTORS	PART Nº
R1	4·7K R.M.A 9	670526
R2	120K R.M.A 9	670543
R3	120K R.M.A 9	670543
R4	10 K R.M.A 9	670530
R5	120K R.M.A 9	670543
R6	150K R.M.A 9	670544
R7	68 K R.M.A 9	670540
R8	680 Ω R.M.A 9	670516
R9	220K R.M.A 9	670546
R10	470 K R.M.A 9	670550
RV11	5K POT' MORGANITE	
R12	1·8 K R.M.A 9	670521
R13	2·2 K R.M.A 9	670522
R14	1M R.M.A 9	670554
R15	68K R.M.A 9	670540
R16	220K R.M.A 9	670546
R17	1·5K R.M.A 9	670520
R18	68K R.M.A 9	670540
R19	220K R.M.A 9	670546
R20	1·8K R.M.A 9	670521
R21	68K R.M.A 9	670540
R22	1M R.M.A 9	670554
R23	220K R.M.A 9	670546
R24	1M R.M.A 9	670554
R25	470K R.M.A 9	670550
R26	15 K R.M.A 9	670532
R27	470K R.M.A 9	670550
R28	8·2 K R.M.A 9	670529
R29	68 K R.M.A 9	670540
R30	47 Ω R.M.A 8	670426
R31	220 Ω R.M.A 9	670546
R32	47 Ω R.M.A 8	670426
R33	560K R.M.A 9	670551
R34	33 K R.M.A 9	670536
R35	2·2 K R.M.A 9	670522
R36	560K R.M.A 9	670551
R37	10 K R.M.A 9	670530
R38	15 Ω R.M.A 9	670496
R39	27K WELWYN AW 3112	671839
R40	220 Ω R.M.A 9	670510
R41	680 Ω R.M.A 9	670516
R42	33K R.M.A 8	670460
R43	33K R.M.A 8	670460
R44	1·8K R.M.A 9	670521
R45	330K MORGANITE TYPE R	671688
R46	15 Ω R.M.A. 9	670496
R47	5·6K R.M.A 9	670527
RV48	5K POT' MORGANITE	
R49	47 Ω R.M.A. 8	670426
R50	18K WELWYN AW 3112	672224
R51	15 Ω R.M.A. 9	670496
R52	1M R.M.A. 9	670554
R53	47 Ω R.M.A. 8	670426

R54	75 Ω WELWYN AW3111	672228
R55	15 Ω R.M.A. 9	670496
R56	22 Ω R.M.A. 8	670422
R57	47 Ω MORGANITE TYPE R	671642
R58	1 Ω WELWYN RW3115	672225
R59	100 Ω R.M.A 9	670506

No	CONDENSERS	PART No
C1	15 pF CERAMIC	666541
C2	15 pF CERAMIC	666541
C3	15 PF CERAMIC	666541
C4	·01 µF C.P. 32 N	668960
C5	470 pF LEMCO	665361
C6	GANG	
C7	470 PF LEMCO	665361
C8	470 PF LEMCO	665361
C9	3-30 PF PHILLIPS TR'MER	800065
C10	120 PF LEMCO	664787
C11	·01 µF C.P. 32 N	668960
C12	·01 µF C.P. 32 N	668960
C13	GANG	
C14	GANG	
C15	·01 µF C.P. 32 N	668960
C16	5-30 pF PHILLIPS TR'MER	800065
C17	100 PF LEMCO	664101
C18	220 PF LEMCO	665317
C19	·01 µF C.P. 32 N	668960
C20	·01 µF C.P. 32 N	668960
C21	·01 µF C.P. 32 N	668960
C22	·01 µF C.P. 32 N	668960
C23	15 PF LEMCO	666408
C24	·01 µF C.P. 32N	668960
C25	·1 µF 50V ***	668902
C26	·1 µF CP 45 N	668874
C27	8 µF CE 18 F	667230
C28	·01 µF CP 32N	668960
C29	·01 µF CP 32N	668960
C30	2 µF CE 30G	667283
C31	2000 pF C.M 31	666572
C32	·1 µF 50V ***	668902
C33	·1 µF 50V ***	668902
C34	·01 µF M4 WU	666132
C35	1500 pF SWING-ARM SLX1500	280009
C36	·002 µF MG 30	666030
C37	·002 µF MG 30	666030
C38	·002 µF MG 30	666030
C39	·002 µF MG 30	666030
C40	·002 µF MG 30	666030
C41	·002 µF MG 30	666030
C42	·002 µF MG 30	666030
C43	·002 µF MG 30	666030
C44	100 PF KO 2763/TS	666831
C45	100 PF KO 2763/TS	666831
C46	120 PF KO 2763/TS	666835
C47	·01 µF CP 32 N	668960

*** HUNTS OR DUBILIER

No	VALVES	PART NO
V1	EF 91 CV 138	860025
V2	5763 CV 2129	
V3	EF 91 CV 138	860025
V4	5B/251M CV 428	860295
V5	5B/251M CV 428	860295
V6	EF 91 CV 138	860025
V7	12AX7 CV492	
V8	5B/251M CV428	860295
V9	5B/251M CV428	860295

No	COILS	PART No
L.1	MONITOR COIL	279082
L.2	R.F. OSILLATOR COIL	278084
L.3	BUFFER AMP ANODE COIL	279010
L.4	P.A. ANODE CHOKE	279002
L.5	AERIAL LOADING COIL	275338

No	TRANSFORMERS	PART No
TR1	MODULATING TRANS	770956

No	RELAYS	PART No
RLH	SIEMENS H/S H96E	701375
RLJ	AERIAL CHANGEOVER	283039

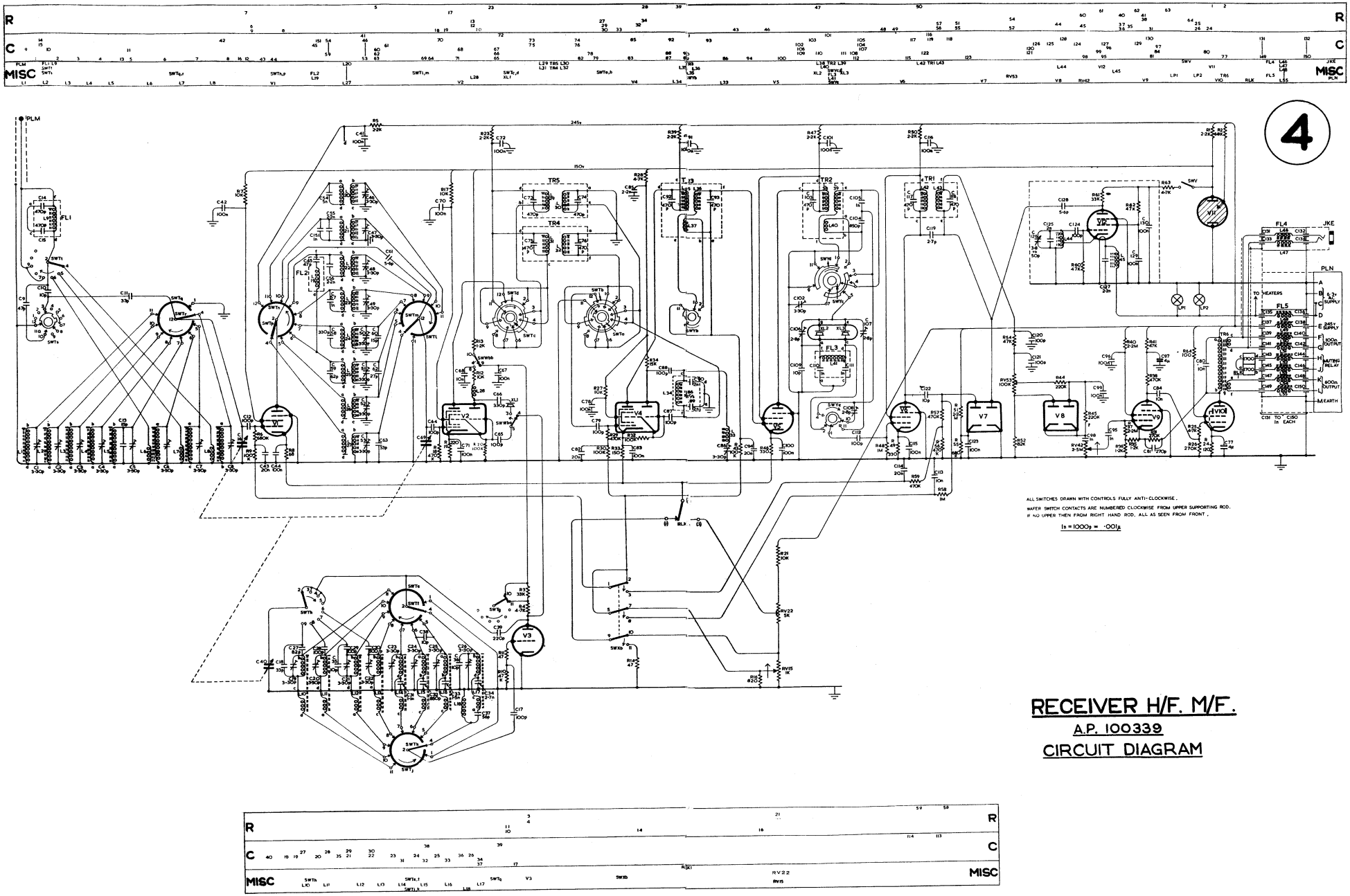
No	SWITCHES	PART No
SWN	METERING SWITCH	283014
SWP	SERVICE SWITCH	283013
SWQ	COND'S COARSE SWITCH	283015
SWR	AERIAL COND'S SWITCH	283017
SWS	COIL TAPPING SWITCH	283016

No	METERS	PART No
M3	MONITOR METER	271274
M4	AERIAL TUNE METER	271274

No	BULBS	PART No
LP1	NEON BULB G.E.C.	270594

M.F. TRANSMITTER
WIRING DIAGRAM

DRAWING No
C/D 284092


4
ALL SWITCHES DRAWN WITH CONTROLS FULLY ANTI-CLOCKWISE.
WAFER SWITCH CONTACTS ARE NUMBERED CLOCKWISE FROM UPPER SUPPORTING ROD.
IF NO UPPER THEN FROM RIGHT HAND ROD. ALL AS SEEN FROM FRONT.
In = 1000p = ·001μ
RECEIVER H/F. M/F.
A.P. 100339
CIRCUIT DIAGRAM