INSTRUCTION BOOK NO. 61650R

500 WATT M.F. BROADCAST TRANSMITTER BTM_P5

TYPE 1J61650

Amalgamated Wireless (Australasia) Limited,
47 York Street,
SYDNEY

211261

DANGER

LIVE WIRES

MEAN DEAD MEN

A. **EARTH** ALL EQUIPMENT

B. **DISCONNECT** ALL POWER BEFORE OPENING DOORS OR ENCLOSURES OR REMOVING PROTECTIVE COVERS

C. **DISCHARGE** ALL CAPACITORS BEFORE WORKING ON EQUIPMENT

D. **CHECK** ALL SAFETY SWITCHES AND H.T. SHORTING BARS AT REGULAR INTERVALS

NEVER WORK ON LIVE CIRCUITS

A.W.A. FORM 6000–A745

HANDBOOK 61650R - ADDENDUM

The following changes and additions should be noted in the component schedule.

Page 7/5:

C615	0.01 μF	Simplex SM
L602	Choke	AWA 19V57973
L603	Choke	AWA 19V57973

Page 7/6:

R622	10 kΩ ±5%, 8W, wire-wound	IRC DG
R626	Selected value	

Page 7/7:

C330	2 μF -10+20%, 3 kVDCW, paper	Ducon 9N20

Page 7/8:

R320	22Ω, style RWV4-L	
R321	22Ω, style RWV4-L	
R330	15 kΩ ±5%, wire-wound, coating B, with mounting feet	IRC EP

Date of Issue: 7 March 1969

HANDBOOK 61650R - ADDENDUM

Because some components used in early production are no longer available, it has been necessary to use components which differ slightly in value and mechanical specification in late models. In some instances the mounting details are different; therefore when ordering replacement parts the actual component should be quoted on the order.

Full details of the new components are as follows;

S210 Circuit breaker, 415 V, 50 Hz, 20A, time delay curve 3, Heineman C.F2

C401 Capacitor, 16 μF ±20%, 600 VDCW, paper, oil impregnated, Ducon DPB622

C402 Capacitor, 4 μF ±20%, 600 VDCW, paper, oil impregnated, Ducon DPB602

C403 Capacitor, 8 μF ±20%, 200 VDCW, paper, oil impregnated, Ducon DPB202

C404 Capacitor, 16 μF ±20%, 200 VDCW, paper, oil impregnated, Ducon DPB210

S405 Switch, thermal delay, 240 V, 50H3, insulated, adjusting screw, A.E.I. TDF5/1

Date of Issue: 26 February 1969

TABLE OF CONTENTS

APPENDICES

1. GENERAL DESCRIPTION

1.1 Application

The AWA Transmitter BTH-P5 type 1J61650, is a crystal controlled medium frequency transmitting equipment suitable for use as a fixed station in a broadcasting system employing amplitude modulation. The transmitter will provide an r.f. output of not less than 500 watts and may be operated on any fixed frequency in the range 535 to 1605 kc/s.

1.2 Features of Design

(a) Compact construction utilising a cabinet with standard 19 inch panels.

(b) Tetrodes or pentodes are used throughout, thereby simplifying circuitry and increasing overall efficiency.

(c) H.T. interlocks prevent accidental contact with high voltages.

(d) Comprehensive metering facilities for servicing and maintenance.

(e) Suitable for tropical operation up to 6000 ft. above sea level in temperature and humidity conditions not exceeding 45°C and 95% respectively.

(f) Forced air ventilation.

1.3 Summary of Performance

Frequency Range:	Frequency-determining components are provided for any one spot frequency within the range of 535 to 1605 kc/s.
Power Output:	The power output is not less than 500 watts, measured at the output terminals of the transmitter.
Output Impedance:	200 ohms unbalanced or other impedances to order.
Frequency Stability:	better than ± 5 c/s.
Harmonic and Parasitic Radiation:	Not greater than 50 mW (-40 db with reference to 500 watts).
Modulation Capability:	100%

A.F. Response: (40 to 10,000 c/s)	± 1 db with reference to level at 1000 c/s
50% modulation: (30 - 40 c/s)	± 1½ db ref. level 1000 c/s.
Harmonic Distortion: (50 to 7500 c/s; 96% modulation)	Less than 2.5% total.
Carrier Shift:	Less than 5%.
Carrier Noise: (unweighted)	58 db or more below the equivalent of 100% modulation at 1000 c/s.
Audio Input Impedance:	600 ohms balanced.
Power Supply:	220 - 230 - 240V, 50 c/s, single-phase
Power Input:	2600 watts (100% modulation) 2200 watts (carrier only) Power Factor: 0.85 at full load.

1.4 Valve and Crystal Complement

1.4.1 Valve Complement

Circuit Ref.No.	Type	Function	Qty.
V401, V402	872A or GXU2	H.T. Rectifiers	2
V101	6AK5	Crystal Oscillator	1
V102	5763	Buffer Amplifier	1
V601	6146	Driver Amplifier	1
V602, V603	2E26	Push-Pull Audio Amplifier	2
V301, V302	4-250A	Modulated Amplifier	2
V303, V304	4-250A	Modulator	2

1.4.2 Crystal Complement

AWA type 3R3535, temperature controlled crystal; frequency as specified in the range 535 to 1605 kc/s. Quantity one or two as required.

1.5 Construction and Dimensions

The transmitter is built into a cabinet 23 inches wide, 27 inches deep and 6 feet 1 inch high.

The complete transmitter comprises four main assemblies:-

(a) Modulator and modulated-amplifier.
(b) Low-Power a.f. and r.f. stages.
(c) Rectifier and control section.
(d) Assembly mounting the main h.t. transformer and filter and the modulation transformer and inductor.

All assemblies have standard 19-inch front panels and, with the exception of (d), are arranged tc carry components vertically from a centre panel forming a "T" with the front panel.

All operating controls are mounted from the front panel. The heavy components constituting assembly (d) are mounted on the base of the cabinet.

The cabinet and panels are of heavy gauge aluminium. Access to the cabinet is from both sides where quickly removable panels give access to all valves and components. Safety interlocking switches remove all high-voltage rectifier supplies and ground the h.t. supply when the side panels are removed.

Forced ventilation is given by a blower mounted in the lower section of the cabinet; air is drawn in through a dry filter in the cabinet side and exhausted through the cabinet top.

Supervisory meters and pilot lights are provided on the unit assembly with which they are associated. Fine tuning control for the MOD. AMP. stage and switching controls for the power supply are located on the front panels.

2. INSTALLATION

2.1 General

All valves and heavy components e.g., main h.t. and modulation transformers, are removed from the cabinet and packed separately prior to despatch. All components removed from the transmitter and the disconnected leads have labels attached which are numerically indexed to correspond with other labels inside the cabinet.

The type and circuit reference of each valve and major component are stencilled adjacent to the valve holder or component mounting position.

Rectifiers type 872A are normally supplied and will be satisfactory provided ambient temperatures prevailing do not allow the rectifiers to operate outside the temperature range 20 to 70°C.

For operation outside, these limits, GXU2 rectifiers can be supplied.

2.2 Assembly

After unpacking the transmitter and other components proceed with the assembly as follows:-

1. Prepare a channel in the floor of the transmitter site to carry the mains input cable. This channel is only necessary if it is desired to connect the mains through the opening provided in the base of the transmitter. Otherwise a suitable opening must be cut in the rear cover of the transmitter.

2. Place the cabinet in position and ensure that the site is level and the cabinet rests squarely on the floor.

3. Install the heavy components which were packed separately for transit. These items must be carefully aligned with the stencilled outlines on the base.

4. Fit the artificial aerial and protective cover. For intermittent short term testing the artificial aerial may be mounted on top of the transmitter. If long term testing into this load is attempted there will be a visible change in the transmitter loading as the load heats up.

   To improve cooling of this load and thus reduce the loading change it should be mounted on a wall to allow free circulation of air through the centre tube of the resistors forming the load.

5. Check all relays, gate switches and grounding switches for mechanical operation.

6. Check all wiring to ensure that no leads remain disconnected and that all components are mounted in the correct position.

2.3 External Connections

The external connections are made as follows:-

1. The 240V a.c. 15-20A mains are connected to terminals 201 (active), 202 (neutral) and 203 (earth).

2. Ancillary mains are connected to terminals 204 (active), 205 (neutral) and 203 (earth).

3. Connect the aerial line as follows:-

Looking from the rear of the transmitter, the four aerial terminals are from left to right, artificial aerial, transmitter output, aerial line and earth.

4. Connect the programme source to terminals 207 and 208. Earth screening to 206.

5. If remote control is to be used the connections are made as follows:-

L.T. ON terminals 209-216

L.T. OFF terminals 210-211

Remote functions are obtained by a momentary push-button make (ON) or break (OFF) between the above terminal pairs or by equivalent circuits in the remote control system employed.

3. OPERATING INSTRUCTIONS

3.1 Post-Installation Checks

1. Set all switches to OFF.
   Set LOCAL-REMOTE switch S409 to LOCAL.

2. Install crystal oven(s) 3R3535 in crystal oscillator.

3. Set ANCILLARY circuit breaker to ON.

4. Check ANCIL. MAINS pilot LP601 lights.

5. Check that approximately 12V a.c. is present between terminals 625, 626 and that both ovens are heating.

6. Remove in turn F601, F602 and check that ANCIL. MAINS pilot LP601 is extinguished for each removal.

7. The operating current in each of the overload relays should be checked and adjusted, if necessary, as follows:-

   Connect an ammeter (1.0A F.S.D.) in series with an external d.c. source, adjustable between 4 and 8 volts, and capable of supplying up to 1.0 amps between earth and the appropriate point specified in column 3 of the following table. Vary the external voltage (a series resistor may be used) until the correct current for the relay (see column 5) is obtained. Adjust the appropriate preset resistor (column 4) until the associated overload relay just operates.

   After the adjustments have been made, disconnect the external d.c. source and meter.

O/L Relay	Function	Apply Voltage to	Adjust	Set Current to
K401	P.A. O/L	Negative to earth. Positive to terminal 303.	RV404	450 mA
K402	MCD. O/L	Negative to earth. Positive to terminal 304.	RV405	400 mA
K403	Minor h.t. O/L	Negative to earth. Positive to non-earthy side of R408	RV406	400 mA

8. Set MAINS circuit breaker S210 to ON. Check that mains meter M401 registers.

9. Set BLOWER circuit breaker S407 to ON.

10. Press L.T. ON button S401 and check that contactor K407 operates and locks in.

11. Check that blower BW401 starts.

12. Press L.T. OFF button S402 and check that contactor K407 releases and that blower stops.

13. Set FILS circuit breaker S406 to ON.

14. Restart the transmitter by pressing the L.T. ON button and check that following the thermal delay of switch S405 (30-35 secs.), it operates and completes the circuit for contactor K404 which should lock in. Check that the H.T. READY pilot LP402 lights.

15. Check that bias voltage (-170V d.c. approximately) is present on capacitor C403.

16. Check that bias voltage is actually present on the grid pins (pin 3) of valves V303 and V304.

    Bias adjustment may be made if necessary, by adjusting V303 BIAS control (RV402) or V304 BIAS control (RV403).

    Adjustment of these controls should not be necessary as they have been preset during factory testing.

17. Press L.T. OFF button.

18. Insert all valves.
    The full valve complement is as follows:-

Type	Circuit Reference	Quantity
872A or GXU2	V401, V402	2
6AK5	V101	1
5763	V102	1
6146	V601	1
2E26	V602, V603	2
4-250A	V301, V302, V303, V304	4

19. Re-start the transmitter and check that all valve filaments are alight. The filament voltage limits are as follows:-

Valve	Nominal	Minimum	Maximum
872A or GXU2	5	4.75	5.25
6AK5	6.3	6.0	6.6
5763	6.0	5.3	6.6
6146	6.3	5.7	6.9
2E26	6.3	6.0	6.6
4-250A	5.0	4.75	5.25

20. Check the above voltages with a sub-standard moving-iron or dynamometer meter. Allowance should be made for any variation from 240V in the actual mains voltage.

21. Check that MAINS meter M401 reads correctly for mains voltage in use.

22. If rectifiers type 872A are used the filaments must be run for one hour to "condition" the rectifiers.

    This procedure is not necessary if GXU2 rectifiers are used.

23. Switch off transmitter.

24. Check with a multimeter that the h.t. line resistance to earth is 56 kΩ approximately.

25. Set grounding switches S214 and S216 "open" and "close" the associated micro switches S213 and S215.

    Remove resistor R328 and remove link across resistor R501.

    Set RV601 tap to approximately mid position.

26. Restart the transmitter and after the filament delay press the H.T. ON button S403.

    Check that contactor K406 operates and locks and that MAIN H.T. meter M302 reads approximately 2.9kV.

    Rapidly check for excessive current in any metering position.

27. Check that releasing either of the micro switches S213 or S215 and manual operation of any of the three overload relays K401, K402, K403 causes contactor K406 to release. Contactor K406 should not operate again until the H.T. ON button is pressed.

28. Press H.T. OFF button and check that K406 releases.

29. Press L.T. OFF button.

30. If the remote control unit is connected, set the LOCAL-REMOTE switch to REMOTE and check that momentarily pressing the remote L.T. ON button causes the transmitter to start and similarly the remote L.T. OFF button causes the transmitter to close down.

31. Check that h.t. is applied automatically after the filament delay.

4. TUNING PROCEDURE

4.1 R.F. Tuning

1. Insert crystals in positions 1 and 2 of the crystal oscillator.

2. Set crystal switch S101 to the required crystal position. Set tap on RV601 to give approximately 250V.

3. Check that some grid current is flowing in V601 grid. (Approximately 1.0mA.)

4. If hot crystal is in use, ensure that the ancillary mains are on for at least one hour before starting to enable oven to reach a stabilised temperature.

5. Solder the "wander" lead on L601 to short out the appropriate section of L601 as indicated in the following table:-

Frequency	Short
535 - 670 kc/s	1 - 2
670 - 720 kc/s	1 - 5
720 - 800 kc/s	1 - 6
800 - 1100 kc/s	1 - 7
1100 - 1650 kc/s	1 - 8

6. Check that the link across the thermocouple in the output is "open". Short only if the thermocouple should become open circuit.

7. Switch on the h.t. and check for some grid current flowing in V301 and V302 grids. This current should be approximately 10 mA.

8. Switch h.t. off. Check that tappings on inductors L301 and L302 and values of capacitors C304-309, 327-329 are as shown in section C of the test report supplied with the transmitter and the tuning chart 61650C1. See also nominal values as listed on 61650D5. Replace resistor R328.

9. Switch on the h.t. and adjust the TUNE control for a broad dip in P.A. ANODE current. This dip will normally reduce the anode current to approximately 150mA. The MAIN H.T. voltage will be reduced to approximately 1.5kV.

   If this dip cannot be obtained, switch off the h.t. and alter the tap on L301, two turns at a time, until a dip can be obtained. It is important not to depart too far from the turns indicated on the tuning chart 61650C1 as it is possible to "double" in the power amplifier by extreme mistuning.

10. Switch off the transmitter and replace the link across resistor R501.

11. Switch on the transmitter and re-tune the anode current for a dip.

    Check that the P.A. ANODE current is not greater than 300 mA with a corresponding aerial current of at least 1.6 amps when working into a 200 Ω artificial aerial or transmission line.

    If necessary increase or decrease the number of turns in circuit of L302 to obtain, as near as possible, this correct loading figure.

4.2 Application of Modulation

1. Check that power can be fed from the R.F. MONITOR to drive an amplitude modulation monitor and oscilloscope. Adjust the taps on L305 if necessary.

2. Adjust V303 and V304 BIAS controls until each valve is drawing 60 mA cathode current.

3. Apply modulation and increase the input until 100% modulation is obtained. Check that the currents in the following valves are

V602	10 - 15 mA
V603	10 - 15 mA
V303	150 mA approximately
V304	150 mA approximately

4. Adjust RV602 "AFA1 CATH" for lowest distortion performance at say 100 c/s.

4.3 Voltage and Current Analysis

The following readings were taken with a 1000 Ω/volt meter.

4.3.1 Supply Voltages

Bias (measured on C403)	-160V
Minor H.T. (measured on C401)	550V
Crystal Oscillator (measured on terminal 631)	250V

4.3.2 Valve Electrode Voltages

(Full carrier - no modulation)

Valve	Cathode	Grid	Screen	Anode
V101	0.8V	-	-	100V
V102	0.4V	-	125V	150V
V601	27V	-	150V	550V (on C603)
V301	3V terminal 306	-	380V	main h.t.
V302	3V terminal 305	-	380V	main h.t.
V602	33V	-	140V	315V
V603	33V	-	140V	350V
V303	0.8V	-110V	550V	main h.t.
V304	0.8V	-105V	550V	main h.t.

4.3.3 Inbuilt Meter Readings

Meter Position	Carrier		50% Mod. 1000 c/s	100% Mod. 1000 c/s
	TUNE	FULL		
MAINS	240V	240V	240V	240V
MAIN H.T.	1.5 kV	2.7 kV	2.7 kV	2.65 kV
P.A. ANODE	130 mA	260 mA	260 mA	250 mA
V101 CATH.	3 mA	3 mA	3 mA	3 mA
V102 CATH.	30 mA	30 mA	30 mA	30 mA
V601 CATH.	50 mA	50 mA	50 mA	50 mA
V601 GRID	1.1 mA	1.0 mA	1 mA	1 mA
V301-2 GRID	18 mA	18 mA	18 mA	18 mA
V301 CATH.	95 mA	180 mA	175 mA	170 mA
V302 CATH.	95 mA	180 mA	170 mA	170 mA
V602 CATH.	5.5 mA	7 mA	7 mA	7 mA
V603 CATH.	2.5 mA	3 mA	3 mA	3 mA
V303 CATH.	25 mA	40 mA	75 mA	130 mA
V304 CATH.	30 mA	50 mA	80 mA	140 mA

5. TECHNICAL DESCRIPTION

5.1 General

The transmitter consists of a crystal oscillator followed by an aperiodic class "A" buffer amplifier, a driver stage and a parallel modulated amplifier stage. Modulation is effected by a push-pull modulator stage which modulates the screen and anode of the modulated amplifier through a modulation transformer and inductor.

5.2 Crystal Oscillator

The crystal oscillator is a two-stage unit consisting of the oscillator followed by an aperiodic amplifier. The oscillator employs a type 6AK5 pentode V101 in a Pierce circuit with the crystal connected between the anode and grid. Crystal trimmers C101 and C102 permit fine adjustment about the mid-frequency.

The crystal is contained in a plug-in temperature-controlled oven which enables the frequency to be maintained within ± 5 c/s. Space is provided for two such crystal ovens and a changeover switch S101. The oven heaters are supplied from a step-down transformer connected to the ancillary mains supply allowing the crystals to be maintained at operating temperature when the transmitter is shut down.

The output of the oscillator is resistance-capacitance coupled to the aperiodic amplifier which uses a type 5763 pentode V102 operating under class "A" conditions. The output of this stage is resistance-capacitance coupled to the driver stage.

The cathode currents of V101 and V102 are metered in separate positions of the meter switch S601 by the meter M601 located on the front panel of the low-power a.f. and r.f. unit.

5.3 R.F. Amplifiers

The driver amplifier stage uses a type 6146 valve (V601) operating under class "C" conditions with an aperiodic anode circuit consisting of a tapped inductor L601. Thus the whole frequency range from 535 kc/s to 1605 kc/s is covered without change of components.

The driver stage is resistance-capacitance coupled to the modulated amplifier stage which employs two type 4-250A tetrodes in parallel V301 and V302 operating under class "C" conditions - no neutralisation is necessary. The anode circuit is coupled to the aerial feeder through a double "pi" network which provides correct matching to the feeder together with a high degree of harmonic suppression. According to the band in which the nominated frequency falls, a selection is made from fixed capacitors

and the tappings on the inductors L301 and L302. Fine tuning is effected by adjusting a slug in the anode inductor L301.

The cathode currents of V301 and V302 are metered in separate positions of S601 while individual meters continuously monitor the modulated amplifier h.t. (M302), the aerial feeder current (M303) and the modulated amplifier anode current (M301). All other electrode currents and supply voltages are metered on separate positions of S601.

A low voltage r.f. output is available for connection to an external modulation monitor by means of a tap from inductor L305. The power is in excess of one watt into a 50-ohm coaxial cable.

5.4 Audio Frequency Section

Programme input from the station audio equipment is connected directly to the input transformer TR601. The secondary of TR601 has two separate windings feeding the first a.f. amplifier valves V602 and V603. This stage uses push-pull type 2E26 valves which are biased for class "A" operation by the cathode resistor RV602.

This stage is resistance-capacitance coupled to the modulator stage which employs two type 4-250A valves V303 and V304 operating in class "AB1" push-pull. Fixed bias is used in this stage and a differential control consisting of RV402 and RV403 is incorporated for balancing the zero-signal cathode currents. The modulation transformer TR501 and the inductor L402 are used to modulate the anode and screen of the modulated amplifier in the appropriate ratio to give a high degree of modulation linearity. Overall inverse feedback is used to obtain a further improvement in linearity.

All electrode currents in the modulator section are measured by separate positions of S601.

5.5 Power Supplies

Three d.c. power supplies are incorporated in the transmitter, namely:-

(1)	main h.t.:	2700V
(2)	auxiliary h.t.:	550V
(3)	modulator bias:	-170V

5.5.1 Filaments

Four filament transformers supply the valves as indicated in the following table.

Circuit Ref. No.	Valve(s) Supplied
TR301	V301, V302
TR302	V303, V304
TR602	V101, V102, V601
TR603	V602, V603

5.5.2 Main H.T. Rectifier

The main h.t. supply employs two type 872A mercury-vapour or two type GXU2 inert gas-filled rectifiers V401 and V402, depending upon the range of temperature in which the transmitter is to operate.

The output of the rectifiers, the anodes of which are connected to the secondary winding of the main h.t. transformer TR502, is smoothed by the choke input filter comprising filter choke L502 and capacitors C502 and C503. Bleed resistors R331 and R332 ensure that C502 and C503 are discharged when the h.t. is switched off; the switches S214 and S216 operated by the two side panels, earth the main h.t. line whenever either panel is not properly in place.

The removal of the link across the resistor R501 in the primary circuit of the main h.t. transformer, reduces the main h.t. voltage to a level which will not damage the valves in the event of maladjustment during tuning procedure. This link is replaced when tuning is complete and the main h.t. returns to its normal value.

The main h.t. voltage is metered by M302.

5.5.3 Auxiliary H.T. Rectifier

The auxiliary h.t. supply employing silicon rectifiers provide the h.t. requirements of the low power stages of the transmitter and the modulator screens.

Silicon rectifiers MR405 through MR416 are connected in a single phase bridge circuit across the secondary winding of the auxiliary h.t. transformer TR402. The output of the rectifiers is smoothed by the choke input filter comprising filter choke L401 and capacitors C401, C402. The supply delivers 550 volts.

5.5.4 Modulator Bias Rectifier

The modulator bias supply employs transformer TR403 and silicon rectifiers MR401 through MR404 in a single phase bridge circuit to provide the -170V bias for the

modulator valves. Individual bias adjustments for V303 and V304 are provided by potentiometers RV402 and RV403 respectively.

NOTE: Control relays are operated directly from the 240V a.c. mains.

5.6 Index of Circuit Breakers, Contactors and Relays

All circuit breakers, contactors and relays and their functions are indexed below.

Circuit Ref. No.	Circuit Function
Circuit Breakers	
S210	Mains
S406	Filaments
S407	Blower
Contactors	
K404	H.T. ready
K405	Filament delay
K406	High tension
K407	Low tension
Relays	
K401	Modulated amplifier overload
K402	Modulator overload
K403	Auxiliary h.t. overload

5.7 Power Control Section

5.7.1 H.T. Interlocks

The h.t. safety interlock circuit is provided by micro-switches S213 and S215 which in association with the grounding switches S214 and S216 operate when either side panel of the transmitter is removed. The interlock affords protection for operating personnel by preventing the h.t. being applied to the transmitter unless the access panels are properly closed.

The micro-switches are connected in series with the h.t. contactor K406 and are operated when the access panels are shut. Under these conditions the h.t. switching sequence may be completed and h.t. applied to the transmitter. If, however, both or either of the access panels are not in position, the appropriate micro-switch will be open and prevent the h.t. switching sequence being completed.

Should an access panel be opened while the h.t. is applied to the transmitter the appropriate micro-switch will break the circuit to contactor K406 and thus cause the h.t. to be removed from the transmitter. The main h.t. line will also be shorted to ground by either of the grounding switches S214 or S216. When the access panel is replaced and the micro-switch again operated, h.t. will not be reapplied until the H.T. ON button is pressed.

5.7.2 L.T. Switching

The transmitter is controlled by the L.T. ON-OFF and H.T. ON-OFF push-buttons. All circuit breakers normally remain in the ON position unless isolation of the various circuits is required for maintenance purposes or a complete shut-down is required.

The l.t. switching (on) sequence is started by pushing the L.T. ON button and the subsequent actions occur in the manner tabulated below.

Action	Contact	Result
S401 momentarily pressed.		Contactor K407 energised.
K407 operated.	K407/1	Completes active line to filament transformers, blower and contactors K404 and K405.
	K407/2	Locks in K407.
	K407/3	Prepares circuit for K406.
	K407/4	Completes neutral line to filament transformers, blower and contactor K405.
K405 operated. (after 30-35 secs. thermal delay).	K405/1	Completes circuit to K404.
K404 operated.	K404/1	Locks in K404.
	K404/2	Lights H.T. READY indicator pilot LP402.

Action	Contact	Result
	K404/3	Opens circuit to K405. Prepares circuit for K406.
	K404/4	Prepares circuit for remote fail indication.

5.7.3 H.T. Switching

S403 momentarily pressed.		Contactor K406 energised.
K406 operated.	K406/1	Locks in K406.
	K406/2) K406/3)	Completes circuit to main and auxiliary h.t. transformers. Lights H.T. ON indicator pilot LP401.
	K406/4	Opens circuit to remote fail indication.

5.7.4 Overload Circuits

The modulated-amplifier, modulator and auxiliary h.t. supply are protected from damage due to overloads by three overload relays K401, K402 and K403 respectively. The three contacts of these relays K401/1, K402/1 and K403/1 are connected in series with the h.t. contactor K406 circuit. When an overload occurs, the associated overload relay operates and its corresponding contact opens the circuit to K406 and h.t. is removed from the transmitter.

When the overload is cleared, h.t. cannot be re-applied to the transmitter until the H.T. ON button S403 is pressed.

5.7.5 Remote Control

When remote control is required, the remote control unit is connected to terminals 209, 216, 210 and 211 and the LOCAL-REMOTE switch S409 set to REMOTE position. The ON circuit should be connected between 209 and 216 and the OFF circuit between 210 and 211. It is important that the ON and OFF controls be isolated from each other. The first operation of the ON contact closes K408, which closes K407, and the transmitter starts up until the delay switch S405 closes. H.T. can then be applied by a second

operation of the ON contact. K408/2 will then complete circuit to K406. The LOCAL-REMOTE switch S409/2 prevents accidental switching from the remote point when the transmitter is under local control.

The transmitter is closed down by opening the remote OFF circuit.

Remote indication of h.t. failure is available from terminals 212 and 213.

6. MAINTENANCE

6.1 General

At frequent intervals, preferably daily, all meter readings under operating conditions should be taken and recorded. This procedure provides a record of performance of the valves and of the equipment as a whole, besides indicating any deterioration of components.

A large quantity of wire used in the equipment has an insulating coating of polyvinyl chloride (P.V.C.), a thermo-plastic which must not be subject to excessive heat. When servicing therefore, take care against a hot soldering iron coming into contact with or being placed near the wiring forms.

The majority of the circuit breakers are sealed assemblies and when faulty must be replaced by a spare unit of the same type.

Pitted contacts on the switching contactors may be cleaned with a fine file. The use of abrasive material for cleaning contacts is not recommended because of the danger of embedding small particles in the face of the soft silver and thus impairing the contact.

Suspect valves are best tested by the substitution of a spare of known merit. A guide to the performance of the valves in the transmitter may be readily obtained by reference to the daily log of meter readings as a steady falling off in the cathode current reading of a particular valve over a period of time will normally indicate deterioration in emission.

6.2 Relays and Contactors

All relays and contactors are mechanically adjusted during factory testing of the transmitter and should require no further setting up when the transmitter is placed into service after installation. However, if a relay is definitely known to be out of adjustment or requires maintenance or repair, the procedures outlined in this section should be followed.

Cleaning of contactor contacts should be carried out only as recommended.

6.2.1 Type 3000 Relays

All relevant information concerning these relays is contained in Appendix 1 of this book.

6.2.2 Nilsen Contactors, type OJ15

Replacement of defective coil

(a) Disconnect leads. Release the three screws that secure the contactor to the cabinet, and remove the contact assembly.

(b) Remove the screw and spring washer securing the top of the plunger to the moving contact carrier. When this screw is removed it will be necessary to manipulate the plunger and carrier in order to disengage the top of the plunger from the recess in the contact carrier.

(c) Punch together the free ends of the split pin passing through the centre of the top half of the core frame and withdraw the pin.

(d) Release the screws holding the two plunger return springs at the base of the contactor assembly, and disengage the ends of each spring from the plunger. Withdraw the pin and washers from the bottom part of the plunger. Withdraw the plunger from the base of the core.

(e) Using a screwdriver, carefully raise the two plunger guides on either side of the space previously occupied by the plunger. Remove the guides.

(f) Remove the coil by sliding it sideways out of the core.

(g) Fit a spare coil in place of the one removed, and reassemble the guides, plunger and return springs by carrying out steps (a) to (f) in the reverse order.

Replacement of Defective Moving Contact Carrier

(a) Remove the screw and spring washer securing the moving contact carrier to the top of the plunger.

(b) Remove the three screws securing the fixed contact carrier to the contactor core frame.

(c) Lift the fixed contact carrier clear of the frame and slide the moving contact carrier out in a sideways direction.

(d) Fit the spare moving contact carrier in position, and reassemble the contactor by carrying out steps (a) and (b) in the reverse order.

6.2.3 Sunvic Thermal Delay Contactor

Maintenance on this contactor would not involve anything more than a replacement of the heating element. These elements are readily available and may be fitted quite simply.

6.2.4 Klockner-Moeller Contactors

The relevant information concerning these contactors is contained in Appendix 2 of this book.

6.3 Neon Pilot Lamps

The neon pilot lamps have a life expectancy of approximately 10,000 hours. When any lamp fails to glow at the appropriate time, check that the circuit is complete to the terminals of the lamp and that the correct voltage is applied thereto.

If there is evidence that the pilot is definitely faulty replace with a new one.

The pilot, cowls and bakelite case are moulded in one piece and can only be replaced as such. Remove the connections and unscrew the nut at the rear of the panel on which the lamp is mounted, then extract the complete assembly from the front. Replace with a new lamp by reversing these operations.

6.4 Blower Motor

The centrifugal blower is driven by a single-phase Pacific Electric Motor. Maintenance of this assembly entails the periodic check of the motor bearings for signs of overheating and escape of grease.

For complete lubricating details of this motor see Lubrication Chart drg. number 55111D5.

7. COMPONENT SCHEDULE

When ordering replacement parts, please quote ALL details given below for a particular component, TOGETHER WITH the unit type number and circuit reference number of component.

The component supplied against the order may not be identical with the original item in the equipment, but will be a satisfactory replacement differing in only minor mechanical or electrical details; such differences will not impair the operation of the equipment.

CAPACITORS

The following table gives voltage rating and capacitance tolerance for capacitors described in the component schedule only by their capacitance and manufacturer's type. Non-standard tolerances, where used, are specified in the component schedule.

DUCON CERAMIC DISC: RATING 500VW

TYPE	TOLERANCE				
	± 0.5pF	± 1pF	± 5%	± 20%	+100% -20%
CDS.NPO	1-6.8pF	10-15pF	18-100pF		
CDS.N750	3.3-6.8pF	8pF, 10pF	12-330pF		
CDS.HI-K, styles AY-FY				100-10000pF	
CDS.HI-K, styles AZ-FZ					470-15000pF

DUCON CERAMIC TUBULAR: RATING 5000VW

TYPE	TOLERANCE				
	± 0.5pF	± 1pF	± 5%	± 20%	+100% -0%
CTR.NPO	6.8pF	10-18pF	22-330pF		
CTR.N750		10-18pF	22-1000pF		
CTR.K1000				220-470pF	
CTR.K2000				680-4700pF	
CTR.K6000					1500-15000pF

PAPER, TUBULAR, METAL CASE, INSULATED

TYPE	RATING D.C.V.W.	TOLERANCE ± 20%	± 25%
Ducon PRC	200	0.25µF-1µF	.05µF, 0.1µF
PRC	350		.02µF-.0[illegible]F
PRC	750	.05µF-0.25µF	
PRC	1000	.05µF-0.25µF	
PRM (stud mtg.)	200,350,500	0.1µF-0.5µF	

TYPE	RATING D.C.V.W.	± 20%	± 25%
U.C.C. PMM	200		.05µF, 0.1µF
PMM	350		.005µF, .02µF, .05µF
PMM	500		.001µF-.02µF
PMM	1000		.001µF, .002µF
PMP	350	0.1µF-1.0µF	
PMP	500	.05µF-0.5µF	

SIMPLEX FOIL AND METALLISED MICA: RATING 500VW

TOLERANCE

Type	± 1pF	± 5%	± 10%
PT (foil)			470-1000pF
SM (foil)			1500-10000pF
MS (metallised)	10-33pF	47-330pF	
SS (metallised)		470-1000pF	
SM (metallised)		1500-10000pF	

RESISTORS

Composition and wire-wound vitreous enamelled resistors described by the "style" nomenclature are made by various manufacturers to RCS standards, except where marked *. Resistances available are shown where each manufacturer does not make the complete range. Wattage ratings are for 70°C ambient. Non-standard tolerances, where used, are specified in the Component Schedule.

COMPOSITION RESISTORS

STYLE	DESCRIPTION	MANUFACTURER	RANGE (ohms)
RC2-B	grade 1, ± 5%, 1W	I.R.C. type DCG Welwyn C24 Painton.	120-1M all 10-3.9M
RC2-C	grade 1, ± 5%, ¾W	I.R.C. type DCE Welwyn C23 Painton 74	120-1M all 10-1.8M
RC2-E	grade 1, ± 5%, ¼W	I.R.C. type DCC Welwyn C21 Painton 72	100-1M all 10-100k
RC7-H	grade 2, ± 10%, ½W	I.R.C. type BTA	all
RC7-J	grade 2, ± 10%, ¼W	Erie 9	
RC7-K	grade 2, ± 10%, ¼W	Erie 16 I.R.C. type BTS	all 390-820k

WIRE-WOUND RESISTORS, VITREOUS ENAMEL COATED

Tolerance on all these resistors is ± 10% up to and including 47 ohms; ± 5% above 47 ohms. RWV3, 4, 5 have wire terminations; RWV1 has ferrule terminations.

		MANUFACTURER					
STYLE	RATING	DUCON	I.R.C.	WELWYN	PAINTON	ERG.	RECO
RWV3-J	1.1/2W	RWV3-J		AW3101	MV1A	74BW	
RWV4-J	3W	RWV4-J	RWV4-J	AW3115	306A	58AV	
RWV4-K	4.1/2W	RWV4-K	RWV4-K	AW3111	301A	16AV	
RWV4-L	6W	RWV4-L	RWV4-L	AW3112	302A	17AV	
RWV5-J	10W	RWV5-J					RWV5-J
RWV5-K	15W	RWV5-K					RWV5-K
*RWV1-J	10W	RWV1-J					RWV1-J
*RWV1-K	15W	RWV1-K					RWV1-K
*RWV1-L	30W	RWV1-L					RWV1-L
*RWV1-M	45W						RWV1-M
*RWV1-N	70W			C46 (10 to 22 ohms)	P2006F (10 to 22 ohms)		RWV1-N (33 to 68k ohms)
*RWV1-P	100W			C47 (10 to 47 ohms)	P2007F (10 to 47 ohms)		RWV1-P (68 to 100k ohms)

Circuit Ref.No.	Description	Type & Manufacturer
7.1	Transmitter 1J61650	
(a)	Capacitors	
C501	0.5 µF +20% -10%, 4kVW, paper, rect., met. case	Ducon type 10N05
C502	8 µF, 3kVW, paper, rect., met. case	Ducon type 9N80
C503	8 µF, 3kVW, paper, rect., met. case	Ducon type 9N80
(b)	Circuit Breaker	
S210	415V, 50 c/s 20 amps, time daley curve 3	Heineman, series 2263
(c)	Inductors	
L501	Modulation, 83H, 0.3A. d.c., 50 c/s	AWA 1TN 61571
L502	H.T. Filter, 12H, 0.65A d.c., 50 c/s	AWA 2TN 60556

7.1 Transmitter 1J61650 (continued)

(d) Resistors

R501	27 Ω, former wound with 22 SWG nichrome wire	AWA type 6R57607

(e) Switches

S213	Safety, micro-switch	Burgess MS4131
S214	Grounding	1B60117
S215	Safety, micro-switch	Burgess MS4131
S216	Grounding	1B60117

(f) Terminal Blocks

TS		
201-208	8 - way	AWA Drg. 50885W15
209-220	15A, 12 - way, front connected	Carr Fastener 77/508-12
221-226	15A, 6 - way, front connected	Carr Fastener 77/508-6

(g) Transformers

TR501	Modulation, 16 kΩ, C.T./9.2 kΩ	AWA 1L61570
TR502	Main h.t. primary: 210-240V, 50 c/s secondary: 3100V + 3100V, 0.65 A.d.c.	AWA 1L61572

(h) Units

Modulator and R.F. Unit, 1J61652
Exciter Unit 1J61653
H.V. Rectifier and Control Unit, 1H61654.

7.2 Exciter Type 1J61653

(a) Capacitors

C601	Not used	
C602	1000 pF	Simplex PT
C603	0.01 µF ±20%, 1000V peak, mica foil	Ducon MA111
C604	0.001 µF ±10%, 3000V peak, mica foil	Ducon MA321
C605	Not used	
C606	Not used	
C607	Not used	
C608	10 µF +20% -10%, 600V d.c. wkg. paper, rect., met. case.	Ducon 3S Series
C609	1 µF +20% -10%, 600V d.c. wkg. paper, rect., met. case	Ducon 3S Series
C610	0.1 µF ±20%, 600VW, paper, rect. met. case.	Ducon 3S Series

7.2 Exciter type 1J61653 (continued)

C611	0.1 µF ±20%, 600VW, paper, rect. met. case	Ducon 3S Series
C612	0.003 µF ±10%, 2000V peak, mica foil	Ducon MA223
C613	Not used	
C614	0.01 µF	Ducon CTR.K6000B

(b) Fuses

F601	Fuse - link, glass cartridge, 1 amp.	U.I.C. type B
XF601	Fuse - holder	Belling Lee (AWA code 400027)
F602	Fuse - link, glass cartridge, 1 amp.	U.I.C. type B
XF602	Fuse - holder	Belling Lee (AWA code 400027)

(c) Inductors

L601	R.F. inductor	AWA 204V57962

(d) Lamps

LP601	Pilot, gas discharge, round, 240V. orange.	Lumolite PL2/NB

(e) Meters

M601	0-5 Multiplier 1 mA, f.s.d. AWA drg. 58693V71	Paton 225

(f) Resistors

R601	470 Ω, style RWV3-J	
R602	2.04 Ω, style RWV3-J	
R603	27k Ω, style RC7-H	
R604	25 Ω, style RWV3-J	
R605	15k Ω ± 5%, 8W, wire wound, term 2, coating C	I.R.C. type DG
R606	25k Ω ± 5%, 10W, wire wound, term 2, coating C, soldering lugs	I.R.C. type DH
R607	2.04 Ω, style RWV3-J	
R608	Not used	
R609	33k Ω, style RC7-H	
R610	33k Ω, style RC7-H	
R611	100 Ω, style RC7-H	
R612	100 Ω, style RC7-H	
R613	2.04 Ω, style RWV3-J	
R614	Not used	
R615	2.04 Ω, style RWV3-J	

7.2 Exciter type 1J61653 (continued)

R616	20k Ω ± 5%, 10W, wire wound, term 2, coating C	IRC type DH
R617	56k Ω ± 5%, 16W, wire wound, term 2, coating C, with brackets.	IRC type EN
R618	100k Ω, type RC41	IRC type BTB
R619	100k Ω, type RC41	IRC type BTB
R620	100k Ω, type RC41	IRC type BTB
R621	100k Ω, type RC41	IRC type BTB
R622	Not used	
R623	100k Ω, type RC41	IRC type BTB
R624	100k Ω, type RC41	IRC type BTB

Variable Resistors

RV601	6.8k Ω, ± 5%, 56W, wire wound, cement coated.	IRC type FRWA-24
RV602	5k Ω ±10%, 1W, wire wound, rotary, linear law, screwdriver slot.	Colvern type CLR4239/263

(g) Switches

S601	Metering, Oak type, single-pole, 11 position, 2 section.	AWA drg. 61653V78

(h) Terminal Blocks

TS 625-636	12 way, 15 amp., front connected	Carr Fastener 77/508-12
601-624	12 way, 15 amp., back connected	Carr Fastener 77/903-12

(i) Transformers

TR601	Audio input; primary: 600 ohms, secondary: 33,000/33,000 ohms.	AWA 2TW56577
TR602	Filament; primary: 200-240V, 50 c/s, sec: 6.3V, 1.5A	AWA 1TU60875
TR603	Filament; primary: 200-240V, 50 c/s, sec: 6.3V, 3.0A	AWA 2TX61543
TR604	Ancillary mains; primary: 200-240V, 50 c/s, sec: 12.6V, 1.5A	AWA 1TX60542

(j) Valve-holders

XV601	International Octal B8-0	W.J. McLellan & Co.
XV602	International Octal B8-0	W.J. McLellan & Co.
XV603	International Octal B8-0	W.J. McLellan & Co.

7.2 Exciter type 1J61653 (continued)

(k) Miscellaneous

Crystal Oscillator type 2J60099

7.3 Modulator and R.F. Unit, type 1J61652

(a) Capacitors

C301	0.004 µF ±10%, 2000V peak, mica foil	Ducon type MA224
C302	0.004 µF ±10%, 2000V peak, mica foil	Ducon type MA224
C303	620 pF ±10%, 20kVA, ceramic, disc	Ducon type CAA75
C304) C305) C306) C307) C308) C309)	Select appropriate value for tuning. Refer to sect. 4.1 for value and type of capacitor used for the particular frequency required.	
C310	0.004 µF ±10%, 2000V peak, mica foil	Ducon type MA224
C311	0.004 µF ±10%, 2000V peak, mica foil	Ducon type MA224
C312	0.001 µF ±10%, 3000V peak, mica foil	Ducon type MA321
C313	1000 pF ±10%, 20kVA, ceramic, disc	Ducon type CAA75
C314) C315) C316) C317) C318) C319) C320) C321) C322) C323)	See Feedback Network 3R56721 for type and description.	
C324	0.01 µF	Ducon type CTR.K6000B
C325	0.01 µF	Ducon type CTR.K6000B
C326	0.01 µF	Ducon type CTR.K6000B
C327) C328) C329)	Select appropriate value for tuning. Refer to sect. 5.3 for value and type of capacitor used for the particular frequency required.	

(b) Connectors

CN301	Coaxial, receptacle, P.R.8.A	G.P.O. type

(c) Inductors

L301	R.F. tuning	AWA 1V61656
L302	R.F. matching, 57 µH	AWA 506V60101
L303	R.F. choke	AWA 255V57970
L304	Not used	
L305	R.F. monitor	AWA 183V57970

7.3 Modulator and R.F. Unit, type 1J61652 (Continued)

(d) Meters

M301	0-500 mA, milliammeter, AWA drg. 58693V65	Paton type 225
M302 *	0-5 kV, voltmeter, AWA drg. 58693V67	Paton type 225
M303	0-3 amps. R.F. ammeter, AWA drg. 58693V57	Paton type 225

* NOTE: On transmitter serial No. 1, M302 was 0-3 kV.

(e) Resistors

R301	100 Ω, style RC7-H	
R302	100 Ω, style RC7-H	
R303	Not used	
R304	5M Ω, comprising 10 resistors 0.5M Ω, assembled to AWA drg. 56731V1	IRC type DCF
R305	Not used	
R306) R307) R308) R309) R310) R311) R312) R313) R314) R315)	See Feedback network 3R56721 for type and description.	
R316	0.2 Ω ± 1%, 400V, wire wound, precision	IRC type WW4
R317	0.2 Ω ± 1%, 400V, wire wound, precision	IRC type WW4
R318	0.2 Ω ± 1%, 400V, wire wound, precision	IRC type WW4
R319	0.2 Ω ± 1%, 400V, wire wound, precision	IRC type WW4
R320	10 Ω, style RWV4-J	
R321	10 Ω, style RWV4-J	
R322	100k Ω, style RC7-H	
R323	100 Ω, style RC7-H	
R324	100 Ω, style RC7-H	
R325	Not used	
R326	100 Ω, style RC7-H	
R327	100 Ω, style RC7-H	
R328	22k Ω, style RWV1-P	Reco RWV1-P
R329	22k Ω, style RWV1-P	Reco RWV1-P
R330	33k Ω, style RWV1-M	Reco RWV1-M
R331	28k Ω, style RWV1-N	Reco RWV1-N
R332	28k Ω, style RWV1-N	Reco RWV1-N

(f) Terminal Blocks

TS 301-312	15A, 12 way, front-connected	Carr Fastener 77/508/12

7.3 Modulator and R.F. Unit, type 1J61652 (continued)

(g) Transformers

TR301	Filament; primary: 210-240V, 50 c/s secondary: two windings each 5.1V.14·5A	AWA 1TK61560
TR302	Filament; primary: 210-240V, 50 c/s secondary: two windings each 5.1V.14·5A	AWA 1TK61560

(h) Valve-holders

XV301-4	Giant, 5 pin	Philips No. 40211A

(i) Miscellaneous

Feedback network, 3R56721

7.4 H.V. Rectifier and Control, type 1H61654

(a) Capacitors

C401	16 µF +20-10%, 600VW, paper, rect., metal case.	Ducon 3S Series
C402	4 µF +20-10%, 600VW, paper, rect., metal case.	Ducon 3S Series.
C403	16 µF +20-10%, 200VW, paper, rect., metal case.	Ducon IBS Series.
C404	8 µF +20-10%, 200VW, paper, rect., metal case	Ducon IBS Series.
C405	0.25 µF, 350VW	UCC type PMP
C406	0.05 µF, 350VW	UCC type PMM
C407	0.5 µF, 500VW	UCC type PMP
C408	0.5 µF, 500VW	UCC type PMP
C409	0.5 µF, 500VW	UCC type PMP

(b) Contactors

K404	4 pole, 6A, 240V, 50 c/s	Klockner Moeller type DIL00/56
K405	Not used	
K406	4 - make, 2 break, 240V, 50 c/s	Nilsen type OJ15C
K407	4 pole, 6A, 240V, 50 c/s	Klockner Moeller type DIL00/56
K408	2-pole, 2-make, 240V, 50 c/s	Relays Pty. Ltd. 2R/A240F

(c) Inductors

L401	Filter, 9H, 0.22A d.c.	AWA 2TK56572
L402	Compensating, 110 MH -10%, 31 Ω ±10%	AWA 212V57970

7.4 H.V. Rectifier and Control, type 1H61654 (continued)

(d) Lamps

LP401	Pilot, gas discharge, round 240V orange	Lumolite type PL2/NB
LP402	Pilot, gas discharge, round 240V orange	Lumolite type PL2/NB

(e) Meters

M401	0-300V a.c. voltmeter, AWA drg. 58693V66	Paton 225

(f) Relays

K401 3000 type
Coil: 16/SCO/438
Armature: 2/SAR/38
fitted with micro-switch to T.E.I. drg. ES182 sheet 1 assy. 1, tropic proofed.

K402 3000 type
Coil 16/SCO/438
Armature: 2/SAR/38
fitted with micro-switch to T.E.I. drg. ES182 sheet 1, assy. 1, tropic proofed.

K403 3000 type
Coil: 10/SCO/438
Armature: 2/SAR/38
fitted with micro-switch to T.E.I. drg. ES182. Sheet 1, assy. 1, tropic proofed.

(g) Resistors

R401	1k Ω ± 5%, style RWV5-J	
R402	Not used	
R403	Not used	
R404	2.2k Ω, style RWV4-K	
R405	Not used	
R406	Not used	
R407	Not used	
R408	10 Ω, style RWV4-L	
R409	3.3k Ω, style RWV4-K	
R410	3.3k Ω, style RWV4-K	

Variable Resistors

RV401	Not used	
RV402	5k Ω ±10%, 1W, wire wound, rotary, linear law, screwdriver slot.	Colvern type CLR4239/263

7.4 H.V. Rectifier and Control, type 1H61654 (continued)

RV403	5k Ω ±10%, 1W, wire wound, rotary, linear law, screwdriver slot.	Colvern type CLR4239/263
RV404	250 Ω ±10%, ½W, wire wound, rotary, linear law, screwdriver slot.	Colvern type CLR1206/9S
RV405	250 Ω ±10%, ½W, wire wound, rotary, linear law, screwdriver slot.	Colvern type CLR1206/9S
RV406	250 Ω ±10%, ½W, wire wound, rotary, linear law, screwdriver slot.	Colvern type CLR1206/9S

(h) Semiconductors

MR401 to MR416	Silicon	1N1763

(i) Switches

S401) S402)	Push-button each pair comprising 1 black and red button.	S.3520
S403) S404)	Push-button each pair comprising 1 black and red button.	S.3520
S405	Thermal delay, 240V, 50 c/s	Sunvic TYEM2
S406	Meter, with heater MS031OH	Sentinel MS2F
S407	Meter, with heater MS0100H	Sentinel MS2F
S408	Meter, with heater MS0100H	Sentinel MS2F
S409	Toggle, 3A, D.P.D.T.	N.S.F. type 8373B3

(j) Terminal Blocks

TS1-3	15A, 3 way front connected	Carr Fastener 77/508-3
TS401-12	15A, 12 way, front connected	Carr Fastener 77/508-12
TS413-24	15A, 12 way, front connected	Carr Fastener 77/508-12

(k) Transformers

TR401	Rectifier filaments, primary: 210-240V, 50 c/s. Secondary: 5V, 23A C.T.	AWA 1TK61574
TR402	Minor H.T., primary: 210-240V, 50 c/s Secondary: 550V, 0.22A	AWA 1TK61561
TR403	Bias; Primary: 210-240V, 50 c/s Secondary: 175V, 50 mA	AWA 1TX61569

(l) Valve-holders

XV401	B4F, grade 1	Ediswan (clix) type VH709/4C1 SPS

7.4 H.V. Rectifier and Control, type 1H61654 (continued)

XV402	B4F, grade 1	Ediswan (clix) type VR709/401 SPS

(m) Miscellaneous

BW401	Blower, multivane	Pacific Electric M.F.

7.5 Crystal Oscillator, type 2J60099

(a) Capacitors

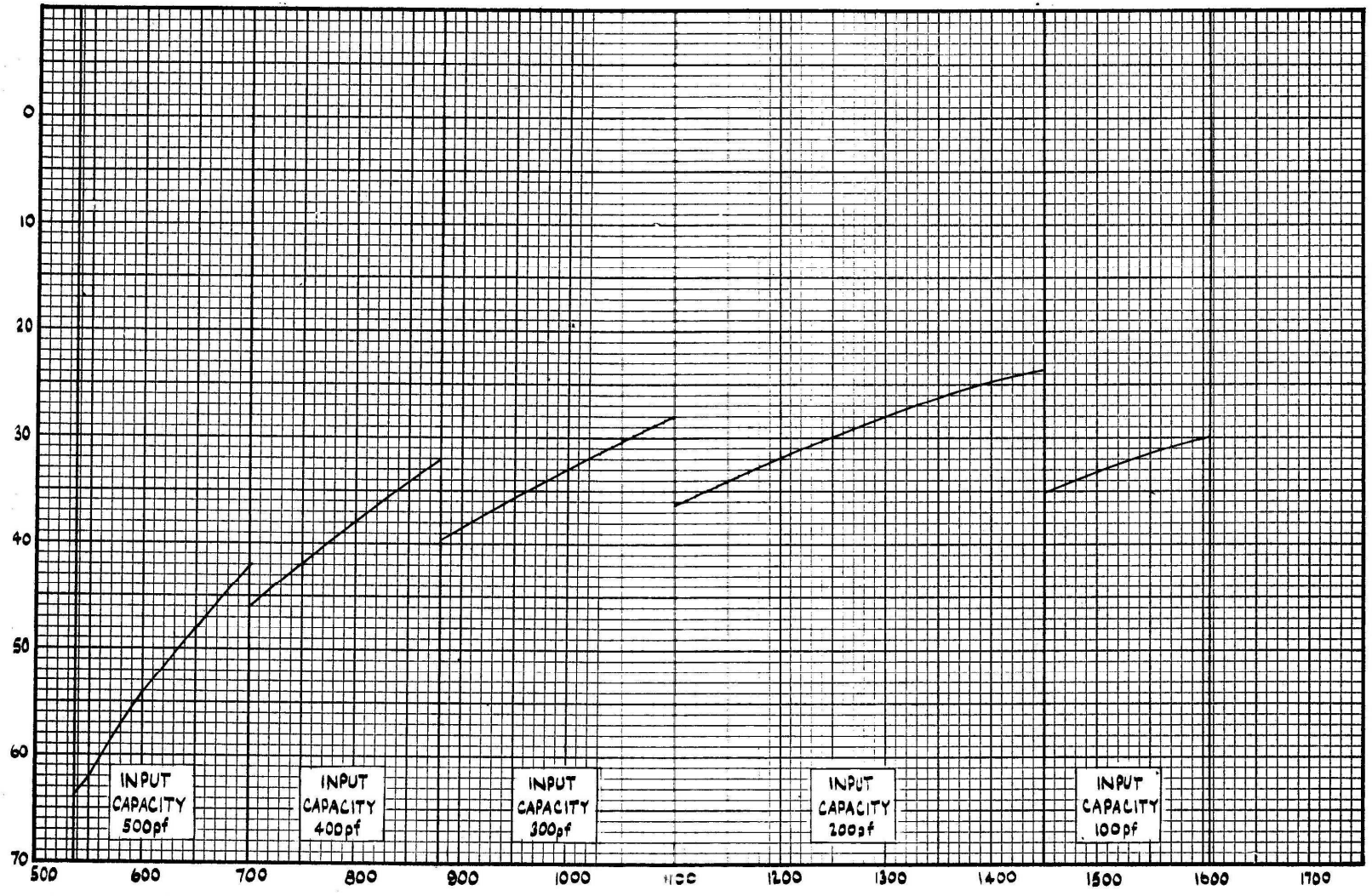
C101	Variable, 23.1 pF swing, rotary, locking CVA5	Plessey 5910-Z160003
C102	Variable, 23.1 pF swing, rotary, locking CVA5	Plessey 5910-Z160003
C103	22 pF	Ducon CDS NPO style B
C104	Not used	
C105	100 pF	Ducon CTR.NPO style C
C106	470 pF	Simplex SS
C107	470 pF	Simplex SS
C108	4700 pF	Simplex SM
C109	4700 pF	Simplex SM
C110	4700 pF	Simplex SM
C111	0.01 µF	Ducon CTR.K6000B
C112	Not used	
C113	0.01 µF	Ducon CTR.K6000B
C114	0.01 µF	Ducon CTR.K6000B

(b) Inductors

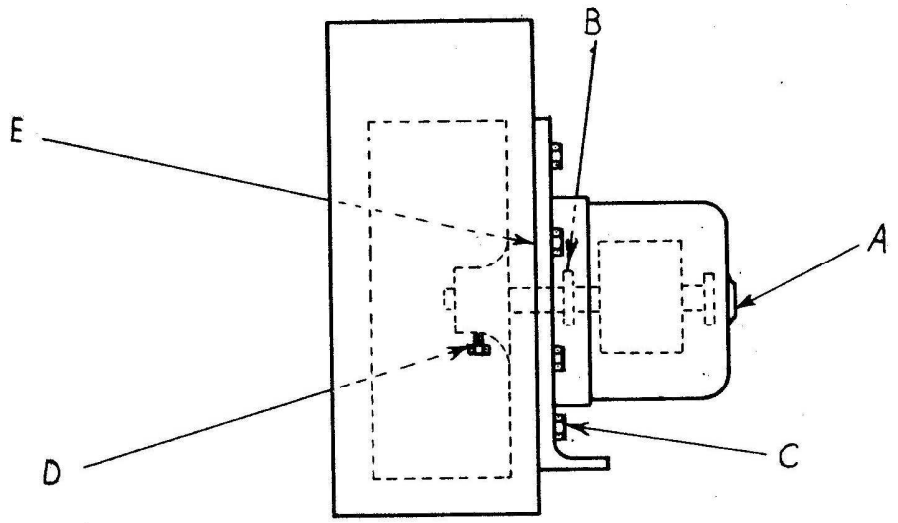
L101		AWA 52V57973

(c) Resistors

R101	100k Ω, style RC7-H	
R102	100k Ω, style RC7-H	
R103	100k Ω, style RC7-H	
R104	4.7k Ω, style RC7-H	
R105	47k Ω, type RC41	IRC type BTB
R106	33k Ω, type RC41	IRC type BTB
R107	3.9k Ω, style RWV4-L	
R108	Not used	
R109	2.04 Ω, style RWV3-J	
R110	11.1 Ω, style RWV3-J	
R111	220 Ω, style RC7-H	
R112	15 Ω, style RC7-H	



TUNING CHART
500W BROADCAST TRANSMITTER BTM-P5
TYPE 1J61650
DRG 61650C1



1. LUBRICATE AFTER EVERY 1500 HOURS OPERATION.
2. TO GAIN ACCESS TO BEARING 'A', REMOVE THE COVER PLATE, SPRING WASHER AND PACKING WASHERS. TAKE CARE WITH THE LATTER THAT THEY ARE RE-INSERTED IN THE SAME ORDER AS WHEN REMOVED.
3. TO GAIN ACCESS TO BEARING 'B', REMOVE THE FAN HOUSING BY UNDOING THE BOLTS AT 'C', AND TAKE OFF THE FAN AFTER LOOSENING THE SET-SCREW 'D'. UNDO THE FOUR SCREWS THUS EXPOSED, AND SLIDE THE CASING 'E' OFF THE SHAFT.
4. EVERY 12 MONTHS DISMANTLE THE MOTOR, THOROUGHLY CLEAN BOTH BALL BEARINGS WITH CARBON TETRACHLORIDE OR SIMILAR SOLVENT, AND RE-GREASE.
5. AVOID OVER-GREASING. THE SPACE AROUND THE BALLS SHOULD NOT BE MORE THAN HALF FILLED. TOO MUCH GREASE DECREASES THE MOTOR EFFICIENCY AND CAN HARM THE WINDINGS.
6. USE A LITHIUM BASED GREASE SUITABLE FOR TEMPERATURES BETWEEN -20° AND $+95^{\circ}C$. SUCH A GREASE IS VACUUM TYPE HI-LO.

LUBRICATION CHART
PACIFIC ELECTRIC MULTIVANE FAN
TYPE MF
DRG. 55111 D5

AMALGAMATED WIRELESS (AUSTRALASIA) LTD. – SYDNEY				1ST. SHEET REF.
	ARGT.			
	DRN.			
	TRCD.	V.R.STOCKMAN	25.10.54	TYPE

CRYSTAL OSCILLATOR
2JG0099

* SELECT ON TEST

PROGRAMME INPUT

ANCILLARY MAINS 220 - 250V

MAINS INPUT

220-250V. MAINS

ACTIVE

MAINS S210 20A

METERING.

1	OFF	
2	V101 CATH.	0-10mA
3	V102 CATH.	0-50mA
4	VG01 CATH.	0-50mA
5	VG01 GRID	0-5 mA
6	V301-2 GRID	0-50mA
7	V301 CATH.	0-500mA
8	V302 CATH.	0-500mA
9	VG02 CATH.	0-50 mA
10	VG03 CATH.	0-50mA
11	V303 CATH.	0-500mA
12	V304 CATH.	0-500mA

ALL UNCODED WIRES TO BE 20SW.G. P.V.C. COVERED - DIRECT WIRING - FREE OF ANY CABLE FORMS.

FOR WIRING CODE SEE DRG. G0100D1. COLOURS AS INDICATED.

AWA

500W. BROADCAST TRANSMITTER BTM-P5
TYPE 1JG1650
DRG. G1650A1.