VK1BG

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF CIVIL AVIATION

H A N D B O O K

for

R.F. POWER AMPLIFIER

D.C.A. Type No. AM17A

Equipment Ident. No. Y5/1351

Manufacturers Type No. 70/170PA3

Manufactured by

C.E.ELECTRONICS PTY. LTD.

Sydney Hobart

AUSTRALIA

The V.H.F. Power Amplifier type AM17A can be operated as a Class C or Linear Amplifier in the frequency range of 70-175 MHz. Power output is 100 watts linear or 250 watts Class C.

HANDBOOK IDENT. No. Y5/HB1290

R.F. POWER AMPLIFIER

100 WATT LINEAR, 250 WATT CLASS "C"

TYPE AM17A

D.C.A. IDENT No. Y5/1351

T A B L E O F C O N T E N T S

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R.F. POWER AMPLIFIER

100 WATT LINEAR, 250 WATT CLASS "C"

TYPE AM17A

PART 1 : BRIEF SPECIFICATION

1.1 Classification

The V.H.F. Power Amplifier, Type AM17A, (D.C.A. Ident No. Y5/1351) can be operated as a Class "C" amplifier or a linear amplifier, to meet the requirements of D.C.A. Specification E/2278. It is intended for use as the final stage for V.H.F. amplitude, or angle modulated transmitters, providing an output power of not less than 100 watts in the linear mode, nor less than 250 watts in the Class "C" mode. It is capable of being used at any frequency in the range 70-175 MHz.

1.2 Composition and Type Numbers

The complete Power Amplifier comprises the following units:-

1. Cabinet Assembly
2. Power Supply Unit
3. R.F. Unit, including
4. Power Amplifier Assembly

1.3 Brief Description

The amplifier is housed in a self-contained cabinet, and the complete assembly may be mounted on a standard rack. Within the cabinet the components are mounted on two separate chassis units, each of which can be slid forward on runners, for access to components and for adjustments.

The power supply unit contains the H.T. transformer and the major and minor H.T. rectifier assemblies and associated components. The R.F. unit contains the remainder of the equipment.

The power amplifier unit is contained in a metal box, which is fully enclosed in order to provide good electrical shielding and to facilitate air cooling of the valves.

The amplifier consists of two ceramic air-cooled tetrodes, type 4CX250B, in push-pull. The frequency range is covered with two sets of anode tuning lines and three sets of grid tuning circuits together with appropriate coupling links. The circuits are tuned by variable capacitors which, together with the coupling links, are brought out to front panel controls.

1.3 Brief Description (Cont.)

To change from linear to Class "C" operation, or vice versa, it is necessary to make a few simple adjustments as outlined in Part 3.

Overloads of the major or minor H.T. supplies cause all supplies to be switched off. The amplifier cannot be brought into service until the circuits are manually reset and the equipment operates correctly.

The amplifier can be switched on by push buttons on the front panel, or alternatively a function switch is provided which, in the "remote" position, causes the L.T. filament supply and H.T. to switch on in sequence, as soon as the mains isolating switch is closed.

Application of high tension is delayed by a time delay circuit.

1.4 Power Requirements

Number of Phases:	One
Voltage and Frequency:	220-260 volts, 50 Hz ± 2 Hz.
	NOTE: The control, bias and H.T. transformers have taps at 10 volt intervals over the range.
Permissible Input Regulation:	±5%
Power Consumption:	Class "C" - H.T. ON - 275 watts carrier output: 0.9 kvA
	Linear - H.T. ON - 100 watts carrier output,
	100% modulation: 0.9 kvA
	- Remote - "Ready for Use": 0.3 kvA
Power Factor under above conditions:	approx. 0.95

1.5 Remote Control and Monitoring Facilities:

1.5.1 Remote Control

a) Amplifier on. Mains power is applied to the amplifier by switching on the mains isolator switch on the front panel of the power supply unit. Under class "C" conditions there is no further remote control for switching on. In the linear mode the amplifier is on standby and is switched to operate by the application of a balanced 50V D.C. supply to terminals 1TL2-1, 1TL2-2.

1.5 Remote Control and Monitoring Facilities: (Cont.)

1.5.1 Remote Control (cont.)

b) Remote Indication. A pair of relay contacts is extended to terminals for remote indication of the P.T.T. in the linear mode ONLY.

1.5.2 Monitoring

a) R.F. Monitoring. A coaxial "U.H.F." type socket is fitted to the front panel to facilitate attachment of a C.R.O. or other monitoring device.

An output of 0.5 watts is available as this outlet is terminated with 50Ω.

b) A.F. Monitoring

The A.F. Monitor output is derived from the demodulated carrier and connected by an adjustable resistor 4R13 to twin jacks on the front panel. The output level is nominally one m/w. in 600 ohms for 100% modulation. This output is adjusted by 4R13 to the desired level out of the attached monitoring circuits.
(a) Local, 3JK1 and 3JK2.
(b) Remote, Terminals 1TL 2-3 and 4

1.6 Performance Specification

NOTE: A 50Ω load is used on all tests.

R.F. Power Output:	(i)	Linear - not less than 100 watts unmodulated.
	(ii)	Class "C" - not less than 250 watts. With drive power levels as shown below.
R.F. Power Input required:	(i)	Linear - not more than 2.5 watts unmodulated.
	(ii)	Class "C" - not more than 5 watts.
Frequency Range:		70 - 175 MHz, continuous coverage with amplifier circuits provided for the following frequency bands:-
P.A. Grid Coupling and Tuning:		70-100 MHz, 100-130 MHz, 130-175 MHz,
P.A. Anode Coupling:		70-118 MHz, 118-175 MHz,
P.A. Anode Tuning:		70-118 MHz, 118-175 MHz.

Unless specifically stated on accompanying documents and test sheets, the amplifiers are not fitted with P.A. grid and anode circuits for the band 70-118 MHz.

1.6 Performance Specification (cont.)

~~Unless specifically stated on accompanying documents and test sheets, the amplifiers are not fitted with P.A. grid and anode circuits for the band 70-118 MHz.~~

A.F. Distortion: (i) Linear - signal to distortion ratio not degraded by more than 3dB for a signal to distortion ratio of the driving source of 43dB at 95% modulation.

(ii) Class "C" - distortion does not exceed 1dB degrading on standard CCIR channel.

A.F. Noise: (i) Linear - signal to noise ratio not degraded by more than 3dB for signal to noise of the driving source of 43dB.

(ii) Class "C" - residual noise level at least 55dB below carrier level.

Harmonic & Spurious Radiation: Greater than 70dB below carrier level for both modes of operation.

Input Impedance: 50Ω unbalanced.

Output Impedance: 50Ω unbalanced.

Output Mismatch: Power output level obtainable with antenna circuit mismatch up to 2:1 SWR

1.7 Electron Tube and Semiconductor Complements

Type No.	Description	Quantity per Amplifier
Electron Tubes		
4CX250B	Power Tetrode	2
OD3 (VR/150)	Voltage Regulator	1
Semiconductors		
RAS310 AF	Silicon Avalanche Rectifier	20
STV5	Silicon Rectifier	20
1N3195	Silicon Rectifier	2
OA91	Germanium Diode	4

1.7 Electron Tube and Semiconductor Complements

Semiconductors (Cont.)

Type No.	Description	Quantity per Amplifier
FD100	Silicon Diode	3

1.8 Special Tools

Each amplifier is equipped with a special tool for tuning the concentric air trimmer capacitor in the grid coupling circuit of the Power Amplifier. An Allen Key is provided to fit the Allen-head grub screws used in some bushes.

Both these tools are mounted on the side of the air filter box and are accessible on the left hand side when the R.F. unit is slid forward.

1.9 Dimensions

The equipment is contained in a single cabinet of the following dimensions:

Height	....	3'10"
Depth	....	1"10"
Width	....	1' 6"
Weight	....	Cabinet - 50 lbs
		R.F. Unit - 85 lbs
		Power Supply - 140 lbs

PART 2 : TECHNICAL DESCRIPTION

This part provides a detailed technical description of all sections of the amplifier. A schematic diagram is available for reference purposes at the back of the Handbook. (Drawing No. 26-55, Sheets 1 and 2).

2.1 Circuit Reference Numbering

The prefix number to all component circuit references identifies the major unit in which the component will be found. The prefix numbers corresponding to the units are as follows:-

1. Cabinet Assembly
2. Power Supplies
3. Control Circuits and Components on R.F. Unit
4. P.A. Circuits

2.2 P.A. Circuit

2.2.1 Amplifier Details

The power amplifier assembly is enclosed within a complete metal screen and employs two type 4CX250B tetrode tubes in push-pull. These tubes are operated under class AB1 conditions when the equipment is used as a linear amplifier for amplitude modulated telephony signals, or Class C, as an amplifier for frequency/phase modulated transmissions.

The anode supply voltage in both modes of operation is nominally 1900V. The screen supply voltage is nominally 350V in the linear mode and 150V in the Class "C" mode. The control grid bias is set individually for each tube to a value of approximately 55V for the linear mode, the exact setting being chosen so that under the "key down" condition the anode-current of each tube is 100mA with no drive.

When the amplifier is operated under remote control, it is desirable, in the interest of power economy and prolonged tube life, to reduce the standing anode current during standby when operating in the linear mode.

On the other hand some standing anode current is necessary to avoid cathode poisoning of the tube. The bias supply under standby is determined by the voltage dividers 3R10 and 3R11 (series arms) and 3R12, 3R13 and 3R80 (shunt arms). Under "press-to-talk" condition 3R80 is shorted, reducing the grid bias to the point where approximately 100mA anode current flows in each tube.

2.2.1 Amplifier Details (cont.)

In the Class "C" mode the grid bias for each of the tubes is determined by grid current flowing through 4R3 and 4R4 and through the appropriate networks in the bias supply section of the power supply, i.e. resistors 3R12, 3R13 and 3R78. Under condition of no drive and no grid current, protective bias is applied to each of the tubes through 3R10, 3R12 and 3R11, 3R13; when the tubes are driven and bias voltage is developed by grid current then diodes 3W7 and 3W8 become reverse biased and effectively disconnect the fixed bias supply from the tubes, thus, although the tubes are provided with fixed bias for their protection in the event of drive failure, under normal operation conditions bias is determined entirely by grid current. This ensures a measure of regulation of balance of drive and loading between the two tubes.

The grid tuning circuit consists of a split stator variable capacitor, 4C9, located at the top of the grid tuning compartment, and one of three interchangeable inductor units (4L4) which may be fitted to brackets mounted on the grid terminals of the tube sockets.

The three interchangeable inductor units allow the grid circuit to be tuned over the ranges of 70-100, 100-130 and 130-175 MHz, with adequate overlap between ranges. Each inductor unit consists of two straight conductors insulated from each other and joined mechanically by an assembly encapsulated in a polyester resin casting. The assembly contains capacitor 4C4 which has a value of 3,300pF and in the case of the assembly for operation between 70 and 100 MHz, a series inductance to increase the effective electrical length of the tuning line. The tuning capacitor 4C9 is driven from the "grid tune" control on the front panel by means of a gear drive.

The R.F. input to the amplifier is fed by means of a coaxial cable to a type N connector (4SK1) at the rear of the grid circuit compartment whence it travels along a flexible polyethylene insulated conductor along the inside of the hollow shaft which carries the input coupling circuit, thus maintaining coaxial construction as far as the terminals of the input coupling assembly. The latter consists of a concentric air-trimmer capacitor, 4C2, permanently mounted on the hollow shaft, and fitted with terminals to which may be mounted any one of the three coupling loops 4L5 which correspond to the three grid tuning inductor units. The degree of coupling to the grid tuning circuit may be set from the front panel by the "Grid coupling" control which causes the hollow shaft to rotate through a small angle. The tuning capacitor 4C2 is accessible through a hole in the grid compartment cover so that its value may be adjusted to tune out the reactance of the coupling loop 4L5 connected to it.

Direct current connections for grid bias are made through 4R3, 4L1, and 4L3, 4R4 to the terminal pillars which support the lower end of the grid inductor circuits.

2.2.1 Amplifier Details (Cont.)

When the amplifier is used in the Class "C" mode the grid circuit is adequately loaded by the grid input impedance of the two amplifier tubes. However, in the linear mode the energy absorbed by the grids of the tubes is approximately zero (in the absence of grid current) and suitable loading is effected by means of resistors 4R6 and 4R7 which are mounted within the grid circuit compartment and which may be connected by means of wire links to the grid terminals of the tubes. The associated capacitors 4C6 and 4C10 provide D.C. isolation for these loading resistor circuits. In addition, it is necessary to connect a further loading resistor to the incoming coaxial feed in order to achieve a low value of standing wave ratio at the amplifier input . The resistor, 4R12, is mounted adjacent to the input coaxial terminal at the rear of the grid compartment and is connected in circuit when required by means of a soldered link.

Note that in Class "C" condition it is necessary to short out 4W1, (the grid voltmeter rectifier) to prevent it being damaged.

Also connected to the grid terminals of the tube sockets are the two neutralising capacitors which are made up in the form of insulated bushes in the partition of the unit with screws protruding through them to allow the capacitance to the tube anodes to be correctly adjusted. The neutralising capacitors (4C37, 4C38) are cross-connected to the grids of the amplifier.

Also housed in the grid circuit compartment are the screen voltage feeds of the two tubes with their associated isolating resistors 4R8 and 4R9, and the by-pass capacitors connected between each of the four cathode terminals of each tube and ground, and the heater pins and ground. The screen grids of the tubes are by-passed to ground by means of capacitors 4C19 and 4C20, of value 2700pF each, which are integral with the mounting flange of the tube socket.

The anode tuning circuit employs two sets of components to cover the frequency ranges of 70-118 and 118-175 MHz. The variable "ANODE TUNE" capacitor 4C24 is connected to a position near the mid point of a Lecher type inductor unit, 4L7, which is supported by terminals fitted to 4C24 and by finger contacts which grip the anode cooling fins of the two amplifier tubes. The Lecher unit is provided with a removable shorting bar which may be clamped to known positions on the Lecher unit. The clamping positions are shown in Sheet 2 of Drawing No. 26-55.

The output coupling circuits are generally similar to those employed in the grid tuning compartment, and are connected to the outgoing coaxial cable in a similar manner by means of a flexible conductor inside the hollow shaft. The tuning circuit constants are such that it is possible by means of the anode tuning capacitor 4C24 to completely tune out the effects of the reactance of the loop 4L8.

2.2.1 Amplifier Details (Cont.)

Anode voltage is fed to the tubes through the choke 4L11, which is mounted between the anode tuning circuit and the top end of the ceramic by-pass capacitor 4C29. From this point the anode supply connection goes to the power supply unit through a high tension connector in the rear wall of the power amplifier assembly.

2.2.2 Low Pass Filters

A low-pass filter network is connected in the output of the amplifier to remove harmonic components.

Two filter assemblies are available, 3X1 covering the range of 70-118 MHz and 3X2 from 118-175 MHz. Note that filter assembly 3X1 is not supplied on amplifiers which are not equipped for the low frequency range.

The filter consists of three ZOBEL type ladder sections to provide maximum attenuation at the second, third and fourth harmonics. Circuit details are shown on Sheet 2 of the Circuit Schematic (Drawing No. 26-55). The circuits are preset at the factory and the assemblies sealed. Should service be required, it would be best to fit new filters altogether.

2.2.3 Reflectometer and Associated Metering Circuits

There are two reflectometers with each amplifier - one in the input and one in the output. These reflectometers provide metering information for forward and reflected power levels. Both reflectometers are of similar construction, consisting of a length of transmission line, made of square section outer conductor and a tube inner conductor.

Forward and reflected power is taken from two auxiliary lines - one on each side of the inner conductor and providing signals in opposite phase. Full circuit details are shown on Sheet 2 of the Circuit Schematic (Drawing No. 26-55).

Power indications, selected by 3S10 are displayed on the "POWER" meter 3M5.

(a) Input Reflectometer Circuit

The D.C. output corresponding to forward power is applied to Position 1, (IN FWD) of the power meter switch 3S10. The calibration method is described in paragraph 3.4.7 (a); since reflectometer efficiencies vary over the frequency range additional multiplying resistors 3R54 and 3R55 are provided, which may be strapped in as desired. In some cases it may be necessary to choose other values for 3R54 or 3R55.

2.2.3 Reflectometer and Associated Metering Circuits (Cont.)

(a) Input Reflectometer Circuit (cont.)

The D.C. quantity corresponding to reflected power is applied to Position 2 (IN REV) of the power meter switch (3S10) by way of calibrating resistors 3R31, 3R56 and 3R57, the latter two being strapped in as desired. In some cases it may be necessary to choose other values for 3R56 or 3R57.

(b) Output Reflectometer Circuit

The forward power D.C. potential from the output is applied to Position 3 (OUT FWD) of the power meter switch 3S10 by way of calibrating resistor 3R32. The method of calibration is described in paragraph 3.4.7 (b).

The reflected power D.C. potential is connected to Position 4 (OUT REV) of the power meter switch 3S10 by way of calibrating resistor 3R33.

It should be noted that the polarity derived from the input and output reflectometers is opposite, i.e. a negative potential is derived from the input reflectometer and a positive potential from the output reflectometer.

2.3 Control Circuits

The control circuits are mounted in the R.F. unit and provide LOCAL and REMOTE operation. In LOCAL, the equipment is switched on by pushbuttons, whilst in REMOTE it will switch on as soon as mains voltage is switched on.

Control Circuit Components

The following relays and switches are used as control functions:-

Relays	3RLA	Press-to-talk (Linear Mode only)
	3RLB	Bias Interlock
	3RLC	Screen Supply Overload
	3RLD	Anode Supply Overload
	3RLF	Overload Lockout
	3RLG	L.T. On
	3RLH	Time Delay
	3RLL	H.T. Start
	3RLM	Tune/Transmit

2.3 Control Circuits (cont.)

Switches	2MS1	Mains Isolator Switch
	3S1	Airflow Switch
	3S5	Local-Remote
	3S6	L.T. Off
	3S7	L.T. On
	3S8	H.T. Off
	3S9	H.T. On
	3S10	Power Meter Selector
	3S11	Tune/Transmit

Control Circuit Functioning

The functioning of the control unit can be understood from the following table; it should be read in conjunction with the Schematic Circuit Diagram.

(a) LOCAL CONTROL

Equipment Condition	Component Affected	Action	Caused by and/or through
3S5: LOCAL			
Mains Switch closed	2MS1	Closed	Manual operation
Mains available	2LP1	Illuminated	240V A.C.
	3T2	Energised	240V A.C. 3T2 secondary
Balanced 50V D.C. Supply Available			
-25V D.C. Available			3T2 secondary 3RLF-2, 3S5b, 3S6
L.T. ON	3S7	Closed	Manual operation
	3RLG	Energised	-25V D.C., 3RLF-2, 3S5b, 3S6, 3S7
	3RLG	Held on	-25V D.C., 3RLF-2, 3S5b, 3S6, 3RLG-2 closing
	3LP3	Illuminated	In parallel with 3RLG

2.3 Control Circuits (Cont.)

Equipment Condition	Component Affected	Action	Caused by and/or through
L.T. ON	3BL1, blower motor	Starts	240V A.C. 3RLG-1 closing
	3S1, airflow switch	Closed	Airflow from blower, provided the grid cover of the P.A. box is closed.
	3T1	Energised	240V A.C. 3S1 closing
	3RLB	Energised	100V at 3T1 secondary
P.A. Filament supply available			
Thermal delay tube filament supply available			
Bias supply available			
	3THA-1 Contact	Closes after 45-60 seconds	3THA filaments energised
	3RLH	Energised	-25V D.C., 3RLF-2, 3S5b, 3S6, 3RLG-2, 3THA-1 closing
	3RLH	Held on	-25V D.C., 3RLF-2, 3S5b, 3S6, 3RLG-2, 3RLH-2 closing
3S11: TUNE	3THA	OPEN CIRCUIT	3RLH-1 opening Manual operation
H.T. ON	3S9	Closed	Manual operation
	3RLL	Energised	-25V D.C. (at 3S5C) 3S8, 3S9 closing
	3RLL	Held on	-25V D.C. (at 3S5C) 3S8, 3RLL-2 closing

2.3 Control Circuits (Contd.)

(a) Local Control (cont.)

Equipment Condition	Component Affected	Action	Caused by and/or through
	2T1	Energised with A.C.	3RLL-1 closing in series with 3R37, 3R38
	3LP3	Illuminated	-25V D.C. (at 3S5C) 3RLL-3 closing
3S11 : TRANSMIT	3RLM	Energised	-25V D.C. (at 3S5C) 3RLL-3, 3S11 closing
	2T1	Energised with 240V A.C.	3LRM-1 closing

(b) Remote Control

Equipment Condition	Component Affected	Action	Caused by and/or through
3S5 : REMOTE			
3S11: TRANSMIT			
Mains Switch closed	2MS1	Closed	Manual operation
	2LP1	Illuminated	240V AC
	3T2	Energised	240V AC
Balanced 50V DC supply available	3RLG	Operates	3RLF-2 and 3S5B
	Blower motor 3BL1	Starts	240V AC, 3RLG-1
	3S1 air flow switch	Closed	air flow available
	3T1	Energised	240V AC, 3S1

2.3 Control Circuits (Cont.)

(b) Remote Control (cont.)

Equipment Condition	Component Affected	Action	Caused by and/or through
	3LP3	Illuminated	3RLF2, 3S5b
	3RLB	Operates	Bias supply available
Filament supply available Bias supply available	3THA1 contact	Closes after 45-60 seconds	Filaments energised
	3RLH	Operates	Through 3RLF-2 3S5b and 3THA-1
	3RLH 3THA 3RLL	Locks up OPEN CIRCUIT Operates	Through 3RLH-2 " 3RLH-1 Through 3RLF-2, 3S5b, 3RLH-2, 3RLB-1 and 3S5C
	3RLM	Operates	Through 3RLL-3, 3S11
	3LP4	Illuminated	3RLL-3
H.T.AVAILABLE Class "C" mode: amplifier ready to receive signal, linear mode: amplifier in standby			
Press-to-talk by applying 50V between 1TL2-1 and 1TL2-2	3RLA	Operates	Control voltage
	P.A.Bias	Switched to normal operation	3RLA-1 and 3S5a

2.4 Overload Circuits

The overload circuit is actuated by either or both of the two relays 3RLC and 3RLD, across the coils of which are connected adjustable resistors 3R15 and 3R14 respectively. These resistors are adjusted so

2.4 Overload Circuits (cont.)

that the relays operate for the specified overload condition.

The closing of contacts 3RLC-1 or 3RLD-1 energises 3RLF from the 50V supply, and also 3LP2 "OVERLOAD". Contacts 3RLF-1 close and hold on 3RLF; 3RLF-2 opens and de-energises 3RLG, 3RLH, 3RLL and 3RLM. H.T. and L.T. are switched off and the fan is switched off; after the air flow ceases, 3S1 opens and removes filament and bias supplies.

To re-apply H.T., it is necessary to de-energise 3RLF. This can only be done by opening the mains isolator 2MS1 for a brief period, then commencing the switching-on sequence. In REMOTE the mains supply should be temporarily interrupted.

2.5 Power Supplies

The power supply unit contains the H.T. transformer, as well as the major H.T. rectifier bridge, the minor H.T. rectifier bridge, filter chokes and capacitors for both supplies, mains switch and fuses, and the H.T. bleed resistors. The circuit diagram prefix for the power supply unit is 2.

The remainder of the power supply components are mounted in the R.F. Unit, whose circuit diagram prefix is 3.

2.5.1 Mains Supply

The mains supply voltage is connected to terminals 1TL1-A and 1TL1-N of the cabinet. These terminals are wired to 2TL1-A and 2TL1-N of the Power Supply Unit. When the mains switch 2MS1 is ON, mains voltage is available to the equipment, and the neon indicator 2LP1 on the front panel is illuminated.

All the transformers, 2T1, 3T1 and 3T2, have primary taps covering the voltage range 220-260 volts in 10 volt steps.

2.5.2 Control Voltage Supply

The mains are connected to the appropriate taps of the primary of the control supply transformer, 3T2, through the 0.5 amp fuse 2F4, and terminals 2TL2-4 and 3TL1-4.

A surge suppression network 3C2 and 3R3 is connected permanently to the 240 volt taps of 3T2. The secondary voltage is rectified by the bridge 3W3-3W6; 3C3 filters the rectifier output.

The control voltage is 50V D.C. balanced to earth, and supplies the control relays and lamps.

2.5.3 L.T. Supply

The L.T. Supply transformer 3T1 is energised from the mains via the 0.5 amp fuse 2F3 and terminals 2TL2-3, 3TL1-3, 4TL1-3 and 4TL1-2, and fuse 2F3-0.5A, when the microswitch 3S1 is closed. 3S1 will close when the air flow is supplied to the P.A. box, provided the grid side of the P.A. box is closed.

A surge suppression network 3C1 and 3R2 is connected to the 240 volt taps of 3T1. There are three secondaries on 3T1:-

The first winding provides 6.2 volts A.C. for the heaters of the P.A. tubes; the second winding supplies 6.2 volts A.C. to the heaters of the thermal delay tube 3THA, via the normally closed contacts of 3RLM-3.

2.5.4 Bias Supply

The third winding of transformer 3T1 provides 200V A.C., centre tapped which is rectified by the full wave rectifier 3W1, 3W2 and provides an output of -100V for the grid bias supply. 3L1 and 3C6 is a ripple filter. The bias interlock relay 3RLD is fed through 3R7.

For convenience the bias supply is described with reference to the two modes of operation.

a) Class "C" Mode

With link straps 3LK1, 3LK3 connected to the Class "C" position and 3LK4 removed, fixed bias is applied to the amplifier tubes through 3R8, 3R9, 3R10, and 3R11, 3R12 and 3R13 and 3R78. 3R12, 3R13 and 3R78 form the shunt arms of the bias voltage dividers and 3R10 and 3R11 are adjustable resistors for setting all grid bias. As previously described grid leak bias is developed across 3R12, 3R13 and 3R78 and the protective fixed grid bias only appears in the case of drastic reduction of R.F. grid drive. The two negative potential sources are added through diodes 3W7 and 3W8.

Metering of grid current is across 3R78, 3R79 being the meter multiplier resistor.

b) "Linear" Mode

Under this condition wiring links 3LK1 and 3LK3 are connected to the "Linear" position and link 3LK4 is strapped to earth.

Under LOCAL, grid bias is set through 3R10, 3R11, 3R12 and 3R13 for a standing anode current of 100mA in each tube. Under REMOTE condition an additional grid bias is developed across 3R80 in order to reduce the standing anode current to approximately 35mA. When press-to-talk control potential is applied, 3R80 is short circuited and the full operating anode current is obtained.

2.5.5 H.T. Power Supply

The main H.T. supply is energised in two steps in sequence. The H.T. transformer 2T1 is connected to the mains, through the 5 amp fuse, 2F1, terminals 2TL2-1, 3TL1-1, relay contacts 3RLL-1 and 3RLM-1, and terminals 3TL1-5 and 2TL2-5.

The H.T. limiting resistors 3R37 and 3R38 are in series with the supply, before 3RLM-1 shorts them out.

(a) Major H.T. Supply

2T1 has two secondary windings.

One secondary winding supplies 2,200 volts A.C. to the full-wave bridge rectifier, each leg of which comprises 5 silicon avalanche diodes, 2W57 - 2W76. One of the equalising capacitors 2C6 - 2C25 is in parallel with each diode. The rectifier output is filtered by the choke input filter, 2L1 and 2C2, and provides +1900 volts D.C. for the anodes of the Power Amplifier valves.

The anode current is measured by 3M1, which is connected between the negative end of the supply, and earth, in series with the overload relay 3RLD.

(b) Minor H.T. Supply

The other secondary winding of 2T1 supplies 430 volts A.C. to the full wave bridge rectifier, with 3 silicon diodes in each leg, 2W45 -2W56. Each diode has one of the equalising resistors 2R77-2R88 in parallel with it.

The rectifier output is filtered by the two-stage choke input filter 2L2, 2C3, 2L3 and 2C4, and provides + 350 volts D.C. in the Linear mode for the screens of the P.A. valves, via terminals 2TL2-9, 3TL1-9, 3LK2 and 4TL1-12. The screen supply has a current bleed consisting of 2R71 - 2R75 in series with 3V3, a 150 volt voltage regulator tube. Discharge-resistors 3R48 and 3R49 are in parallel with 3V3.

For Class "C" operation, where a screen voltage of 150V is required, the screen supply is connected to the anode of 3V3, and disconnected from the +350 volts supply by means of the link 3LK2.

Negative screen current is metered by multimeter 3M3 when 3S3 is in the "SCREEN - 25mA" position. No provision is made for metering positive screen current.

PART 3 INSTALLATION AND OPERATING INSTRUCTIONS

3.1 Packaging

The equipment is packed in two wooden cases, the largest containing the cabinet complete with R.F. unit; the second the power supply. Case weights and dimensions are as follows:

	Width	Depth	Height	Weight
Cabinet	23"	25½"	42"	250 lbs
Power Supply	21¾"	23"	15"	192 lbs

The power amplifier tubes are removed from their sockets and packed inside the cabinet.

3.2 Assembly and Interwiring

3.2.1 Cabinet Installation

The equipment is designed for two physical mounting arrangements, i.e. either rack or bench mounted. For a rack installation bolt the mounting angles on either side of the cabinet with the mounting face of the angle to the rear. When installed, the front panel of the transmitter will then project approximately 1" from the front face of the rack.

Feed the mains supply cable through the access hole in the left hand side of the back panel, i.e., right hand side when facing from the front, and connect to the terminal strip 1TL1 as follows:

1TL1 Terminal	Wire
A	Active or "A"
N	Neutral or "N"
E	Earth or "E"

The external lines are fed through the left hand side of the back panel and terminated on the strip 1TL2 as follows:

1TL2 Terminal	Wire
1 & 2	50 volts D.C. Press-to-Talk
3 & 4	REMOTE AUDIO MONITOR.
5,6 & 7	Time Delay Changeover Contacts

3.2.1 Cabinet Installation (Cont.)

A bench installation requires the provision of a substantial table or bench to which the cabinet is bolted, using the four mounting holes in the base of the cabinet. Steel bolts 3/8" diameter, hexagon heads, are suitable. The installation then follows the same pattern as for a rack installation.

3.2.2 Fitting of Power Supply

(a) Draw out slides to fully extended and locked position.

(b) Position power supply so that the rear of the unit is facing the front of the cabinet and the top of the unit is about level with the slides.

(c) Lift rear end of the power supply, pivoting on the bottom of the front panel and locate slots in rear mounting brackets onto chassis mountings at rear end of slides.

(d) Lift front end of power supply and align holes of slides to those in unit and fix in position using 2BA mild steel, Cad. Pl. C'S'K x 3/4" long screws.

(e) Fit cable looms to tagblocks 2TL1 and 2TL2 using a cable clip on rear mounting bracket to locate cable loom to 2TL2.

3.2.3 P.A. Assembly-Tuning and Coupling Circuits

To assemble the tuning lines for the grid and anode circuits of the amplifier, see photographs 8, 9 and 13. Photo No. 13 shows the shadow board fitted with the full complement of tuning and coupling circuits. The photograph clearly shows the items to be selected for the various operating frequency ranges.

Reference is made to "Low", "Medium" and "High" frequency bands. Adequate overlap exists between these bands and approximately they cover the following frequency ranges:

"Low" Band	70 - 100 MHz
"Medium" Band	100 - 130 MHz
"High" Band	130 - 175 MHz

NOTE: In the case of the anode tuning circuit the frequency coverage is in two bands only:

"Low" Band	70 - 118 MHz
"High" Band	118 - 175 MHz

3.2.3 P.A. Assembly-Tuning and Coupling Circuits (cont.)

The assembly details of the anode enclosure are shown in Photograph No. 8, whilst those of the grid enclosure are shown in Photograph No. 9.

3.2.4 Removal of the Shadow Board

The shadow board for the mounting of the grid, anode and coupling components is located on the inside of the rear wall of the cabinet. This is just below 1TL1 and 1TL2.

To gain access to this shadow board, carry out the following procedure:

1. Remove the A.C. input power from the amplifier by unplugging the A.C. input cable at the Power Distribution Unit; or isolating the rack from the A.C. Mains Supply at the Switch board.

2. Remove the top panel located on the rear of the cabinet between the input and the output R.F. sockets, by removing (6) six 4BA C.H. screws.

3. Withdraw the amplifier chassis full out on its runners.

4. Place the left hand through the rear of the cabinet to support the board and remove the 4-4BA C.H. mounting screws.

5. By allowing the board to move forward, the holding centre spigots become dis-engaged from their holes thus enabling the board to be withdrawn through the rear of the cabinet.

6. Remove the appropriate components for the required frequency coverage by referring to photo 13 at the rear of the Handbook, restoring the holding screws and clamps to the board.

7. To replace the shadow board, reverse the procedure of Steps 1 to 5 inclusive.

3.2.5 Removal of R.F. Unit

If it becomes necessary to remove the unit from the cabinet, remove the cover at the top rear of the cabinet and disconnect the cable from 3TL2 as well as the coaxial cables between the unit and the cabinet. Also disconnect the high tension cable from 4PL1. It is then necessary to pull the unit as far forward as the runner assembly will allow. Carefully lift the unit free of the runners. To replace the unit, fit it into the runners, locating the holes in the bottom members onto the two pins on the runners.

3.3 Personnel Safety Precautions

All accessible terminals carrying A.C. mains when the mains isolating switch 2MS1 is not switched on are covered with protective panels and warning labels. When the mains switch is on, the neon indicator on the front panel lights.

CAUTION: DANGEROUS VOLTAGES ARE ACCESSIBLE WHEN THE R.F. UNIT OR POWER SUPPLY ARE PULLED FORWARD IN THE CABINET. THE AMPLIFIER SHOULD ONLY BE OPERATED UNDER THESE CONDITIONS WHEN ABSOLUTELY NECESSARY FOR ADJUSTMENTS OR MAINTENANCE.

3.4 Installation Tests and Adjustments

This section contains all adjustments and testing procedures necessary during the amplifier installation.

3.4.1 Mains Voltage

The terminal connections on the primaries of the transformers 2T1, 3T1 and 3T2 are as follows:

Neutral Line	Active Line
0	220
10	240
	260

When despatched from the factory the equipment is set up for a 240 volts mains input, i.e., neutral line to terminal "0", and active line to the "240" terminal. Other mains voltages may be used by suitable adjustment of both neutral and active line taps.

3.4.2 Preparation for Testing

(a) Fit the appropriate tuning and coupling circuits to the amplifier to suit the mode of operation and operating frequency (see Section 3.2.3). Connect the appropriate R.F. low pass filter.

(b) Place the LOCAL/REMOTE switch in position "LOCAL".

(c) Check the fuse links against the following table:

Fuse	Current Rating	Location
2F1	5 amp.	Front Panel of Power Supply
2F2	1 amp. S.B.	" " " " "
2F3	0.5 amp.	" " " " "
2F4	0.5 amp.	" " " " "

3.4.2 Preparation for Testing

(d) The following test equipment is normally used to test the amplifier, and either the same or a similar type will be required.

Equipment	Suitable Type
Noise & Distortion Meter	AWA Type 1A56068
Power Meter	"Termaline" (Bird)
Multimeter	AVO8

Connect the R.F. power meter to the output of the amplifier.

3.4.3 Initial Switching On

(a) Close the Mains switch 2MS1 on the front panel of the power supply. unit. Check that the mains indicator lamp 2LP1 is illuminated. Check that with meter selector switch 3S3 in "CONT." position, the multimeter 3M3 at this stage reads 60-65V.

(b) Press the "L.T. ON" button and check that relay 3RLG operates, and the blower starts. After the blower reaches operating speed, check that the air pressure switch interlock, 3S1, closes. Note that the air pressure interlock switch 3S1 is prevented from closing by a mechanical interlock, if the screening cover has not been fitted to the grid circuit (left hand) end of the power amplifier unit.

(c) Check that with multimeter 3M3 selector in the G1 and G2 positions, bias voltage is indicated. Check that after a time delay of about 60 seconds, relay 3RLH operates. Check that relay 3RLB has operated.

(d) Bias Adjustment. The control sequence described above having been checked, it is now possible to proceed with the adjustment of the bias voltages for the two amplifier tubes. Open MAINS switch 2MS1. The four links, 3LK1 (bias), 3LK2 (S.G.) 3LK3 (bias) and 3LK4 must be connected in position "LIN" as indicated in Photograph No.6, being located at the rear of the left hand side of the amplifier. Close MAINS switch and operate "L.T. ON" pushbutton.

Place the tune/transmit switch (3S11) on the panel on the left hand side of the amplifier unit in the upward position. (Tune). At the expiry of the time delay (when 3RLH is closed) operate the "H.T.ON" pushbutton. Check that relay 3RLL operates. Check that multimeter 3M3 indicates a small reading in positions "H.T." and "MINOR HT Volts". Meter 3M1 will probably indicate negligible anode current at this stage. Operate "H.T. OFF" pushbutton and turn the Tune/Transmit switch (3S11) downwards (Transmit).

3.4.3 Initial Switching On (cont.)

(d) Bias Adjustment (cont.)

Operate "H.T. ON" pushbutton. Check that relays 3RLL and 3RLM operate. Check that multimeter 3M3 in position "H.T. Volts" reads approximately 1800-1900V, and in position "MINOR HT" reads approximately 350V.

Also, 3M3 should indicate in positions 1K1 and 1K2 readings of the order of 100mA each; the anode current meter 3M1 should indicate a reading of the order of 200mA. The two bias setting resistors 3R10 and 3R11 on the panel on the left side of the amplifier unit, which are associated with amplifier tubes V1 and V2 respectively, should now be set, one at a time, so that the total anode current is 200mA and the cathode currents of the two tubes are equal. Note that the sum of the readings of 3M3 in positions 1K1 and 1K2 will not necessarily exactly equal the readings of the anode current meter 3M1 owing to the amount of screen current and to the errors inherent in the metering circuits. The objective in adjusting resistors 3R10 and 3R11 is to achieve a total anode current as shown by 3M1 of 200mA and that the respective cathode currents as shown by multimeter 3M3 should be equal.

(e) Standby Bias Adjustment. Open MAINS switch 2MS1. Switch LOCAL/REMOTE switch on front panel to REMOTE and close MAINS switch. Check that blower starts, and that at expiry of time delay both minor and major H.T. are available. 3R80, on the panel on the left side of the amplifier unit, should now be adjusted so that the combined anode current is approximately 70mA. (Do NOT alter 3R10 or 3R11). Having set 3R80 open MAINS switch and reset LOCAL/REMOTE switch to LOCAL.

3.4.4 Tuning Procedure - Linear Operation

(Note: See Section 2.2.1 for introductory remarks)

Step 1: Connect the R.F. drive (approximately 2.5 watts unmodulated) to the input to the amplifier.

Step 2: Calibrate the input reflectometer in both directions (see 3.4.7 (a)).

Step 3: Check that the links to 4R6, 4R7 and 4R12 are connected, that 4W1 is not shorted out and that the links 3LK1, 3LK2, 3LK3 and 3LK4 are strapped for "Linear". Refer to Drawing No. 26-67 showing details of these wiring links.

Step 4: Operate the L.T. push-button. DO NOT OPERATE THE H.T. PUSHBUTTON

3.4.4 Tuning Procedure - Linear Operation (cont.)

Step 5: Tune grid circuit for maximum peak grid voltage (as read on 3M3 with 3S3 in the "GpK" position), by means of the GRID TUNE capacitor, and the phasing capacitor C2. For calibration, refer page 26, 3.4.6 (a) Step 5.

Step 6: Ensure that external wattmeter is connected to the R.F. output socket. After H.T. delay has expired operate the H.T. ON push-button.

Step 7: Adjust coupling (maintaining the grid tuning) to obtain:

(a) An R.F. grid peak voltage equal to one third to one quarter of the grid bias voltage of V1 or V2 (read with 3S3 in positions G1 and G2, whichever reads less) and

(b) A reading of between 2.5 and 6 watts on the power meter 3M5, with 3S10 in the "IN FWD" position. If these two conditions cannot be met remove the link to 4R12 and repeat Step 7.

NOTE: To read R.F. grid peak voltage, switch 3S3 should be in position marked GpK and to read grid bias voltages the switch should be in positions G1 and G2.

Step 8: Set the ANODE COUPLING to an indication of approximately 30 and tune the anode by means of the ANODE TUNE capacitor, for maximum RF output.

WARNING: Switch off H.T. before making following adjustment. If the correct tuning point falls outside the range of the ANODE TUNE capacitor it will be necessary to adjust the position of the shorting bar on the anode lecher line.

Step 9: IMPORTANT: During tuning, drive must be adjusted so that maximum output power does not exceed 125 watts.

Increase the anode coupling, and keep the anode tuned (for maximum RF output) until an output of 100W is indicated on the external wattmeter. Continue to increase the coupling in small degrees, at the same time re-tuning as necessary, until the output reaches a maximum and then begins to fall off. The correct adjustment is at the point where an R.F. output of 100W is again reached. A further indication that the correct adjustment has been made is that the screen current will now be zero or negative.

Step 10: Calibrate the output reflectometer (see 3.4.7 (b)).

Step 11: Connect to aerial (see 3.4.9). Lock all controls.

3.4.4. Tuning Procedure - Linear Operation (contd.)

Alternative method of tuning the ANODE and ANODE COUPLING is as follows :-

Step 8a: Switch the TUNE/TRANSMIT switch 3S11 to "TUNE" switch on the HT. Tune the anode for maximum RF on the external wattmeter, or for a maximum on the inbuilt output meter 3M5 with 3S10 switched to the "OUT FWD" position. Then tune the anode coupling for maximum on either or both meters.
Switch off the HT and switch 3S11 to the "TRANSMIT" position.

Step 9a: Switch on the HT. Tune the anode for maximum RF on the external wattmeter or 3M5 and/or a dip in anode current on the meter 3M1. If the output is greater than 100 watts, reduce this by tightening the anode coupling towards 30 on the dial at the same time resonating the anode. Continue these steps until the desired RF output and the anode tuning is coincident. If the output power is less than 100W adjust the anode coupling towards 0 on the dial and establish the optimum LOAD point as above.

Step 9b: Application of Modulation

Apply modulation to the driver at 95% depth. Apply PTT and observe the O/P power. If a drop in power is observed it is downward modulation.

Remove the modulation to the driver and increase the drive in small stages to the amplifier, retuning the amplifier controls after each change in the unmodulated condition for 100 watts O/P after each change of driver input power. Re-apply the modulation and continue this procedure until an increase in power is observed on application of the modulation. The RF input from the driver will vary and is dependant on the matching of a driver to an amplifier. This will differ with each combination due to the mechanical and electrical parameters of each matched units. The nominal value of RF input from the driver to the amplifier will be in the order of 2 to 5 watts. A separate set of alignment figures should be recorded for each driver/amplifier combinations.

3.4.4. Tuning Procedure - Linear Operation (contd.)

Notes:

1. By initially tuning the ANODE and ANODE COUPLING with 3S11 in the TUNE position; this avoids excessive anode current and arrives at the correct loading point without searching for it. Also the screen is the same as stated in STEP 9 thus establishing the correct conditions desired.

2. This method of tuning the ANODE and ANODE COUPLING applies equally as well when in the Class 'C' mode and may be substituted for STEP 7 in Section 3.4.5.

For steps 10 and 11 refer back to page 24.

3.4.5 Tuning Procedure - Class C Operation

(Note: See Section 2.2.1 for introductory remarks)

Step 1: Remove the links to 4R6, 4R7 and 4R12 and short out 4W1.

Strap the wiring links 3LK1, 3LK2, 3LK3 and 3LK4 for class "C" operation. Strapping details of these wiring links are shown on Drawing No. 26-67.

Step 2: Apply R.F. drive of not more than 5 watts unmodulated.

Step 3: Operate L.T. push-button. DO NOT OPERATE H.T. PUSH-BUTTON.

Step 4: With GRID COUPLING set to maximum and 3S3 to "GRID", tune the grid circuit for maximum grid current as indicated on 3M3 by means of the GRID TUNE capacitor and the phasing capacitor 4C2. If the grid current is much greater than 50mA it will be necessary to reduce the drive to the amplifier. This can be done most conveniently by reducing the grid coupling to the point where the grid current lies between 30 and 50mA (see 4.1 for typical readings).

Step 5: Calibrate the input reflectometer (see 3.4.7 (a)). Connect external wattmeter to R.F. output socket.

Step 6: Press H.T. ON button.

Step 7: With ANODE COUPLING approximately half way, tune anode by means of ANODE TUNE capacitor for minimum anode current as indicated on 3M1. Increase the coupling, monitoring the anode dip, until an output of 250 watts is indicated on the external wattmeter.

Step 8: Calibrate the output reflectometer. (see 3.4.7 (b)).

Step 9: Connect to aerial (see 3.4.9). Lock all controls.

3.4.6 Voltmeter Calibrations

(a) Calibration of Grid Peak Voltmeter

Step 1: Connect links 3LK1 to 3LK4 for linear operation (see Drawing No. 26-67)

Step 2: Remove links to 4R6, 4R7 and 4R12 and remove shorting link from 4W1.

Step 3: Set driver to give 2.5 watts unmodulated (into a 50 ohm load) and connect to amplifier.

Step 4: Switch on L.T.

3.4.6 Voltmeter Calibrations (cont.)

(a) cont.

Step 5: With an external voltmeter connected across 3R12, tune the grid circuit (GRID TUNE) until grid current commences to flow as indicated by a change in voltmeter reading. At this point the peak RF voltage is equal to the D.C. grid bias.

Step 6: Meter the grid bias (positions G_1 or G_2 on 3S3). Switch to "GpK" and adjust 3R41 until the reading is the same as the indicated bias.

Step 7: Switch off. Restore links to 4R6, 4R7 and 4R12.

(b) Calibration of Anode Peak Voltmeter

Step 1: Set up for linear operation, no modulation.

Step 2: With an R.F. output of 100 watts adjust 3R40 to give a reading in the "Apk" position of the multimeter of 800 volts. (only applies when Step 9 of 3.4.4 correct).

Step 3: Note: In some cases it may be found that a reading of 800 volts cannot be obtained with 3R40 at its limit. If this occurs a slight adjustment should be made to the anode voltmeter probe, 4C25. Switch off the power, remove the top cover from the P.A. assembly and adjust the probe screw as required. In most cases calibration can be achieved with the exposed length of the screw assembly projecting 5/8" . Replace the cover.

3.4.7 Calibration of Reflectometers

(a) Calibration of Input Reflectometer

(Note: See Section 2.2.3 for introductory remarks)

Step 1: Remove primary power.

Step 2: Apply R.F. drive to the "OUT" end of the Input Reflectometer. Connect an external wattmeter to the "IN" end of the reflectometer. Select "IN REV" on the meter switch and adjust 3R31 in conjunction with 3R56 and 3R57 so that the power meter 3M5 reads the same as the wattmeter.

Step 3: Reverse connections, i.e. R.F. drive to the "IN" connections and the external wattmeter to the "OUT" connection, and now select the "IN FWD" position and adjust 3R30 in conjunction with 3R54 and 3R55 so that the power meter 3M5 reads the same as the external wattmeter. It may be necessary to choose other values for 3R54, 3R55, 3R56 and 3R57 in order to achieve satisfactory calibration.

3.4.7 Calibration of Reflectometers (cont.)

(b) Calibration of Output Reflectometer

Step 1: With equipment operating under selected condition, set for full power (100 watts Linear, 250 watts Class "C") using a Wattmeter as a load.

Step 2: With the selector switch in the position "OUT FWD" adjust 3R32 to make the power meter 3M5 read the same as the external wattmeter.

Step 3: Switch off, reverse the connections to the reflectometer and switch on again. Select "OUT REV" and adjust 3R33 to make the power meter 3M5 read the same as the external wattmeter.

Step 4: Switch off and restore connections to normal.

3.4.8 Neutralising Check

The amplifier was neutralised during factory tests and should not require further adjustment. A check for correct neutralising is coinciding readings of maximum grid current and minimum anode current when tuned to resonance. Should neutralising be necessary refer to Section 4.3.4. this handbook for the adjustment procedure.

3.4.9 Connection to Aerial

Switch equipment off and replace R.F. Wattmeter with the aerial feeder. If necessary, re-tune anode and coupling circuits to give the same power output (derived from 3M5 readings) as was obtained when the output was terminated in the wattmeter.

3.5 Operation

3.5.1 Local Operation

Component	Action	Observation
(a) Switching On		
REMOTE/LOCAL switch	LOCAL position	--------
MAINS switch	ON position	Neon illuminated
LT ON Button	Press	LT ON pilot illuminated Blower Motor starts

3.5 Operation (cont.)

3.5.1 Local Operation

Component	Action	Observation
HT ON Button	Press (H.T. circuit inoperative until 45 seconds delay elapsed)	HT ON pilot illuminated

The amplifier will now operate normally when drive is applied.

(b) Personnel Protection

No gate switches are fitted to the amplifier unit. Consequently, DANGEROUS voltages are exposed when either the R.F. Unit or Power Supply unit is withdrawn from the cabinet. The amplifier should only be operated under such conditions when absolutely necessary.

(c) Overload Circuits

Should an overload occur in an H.T. circuit, L.T. is switched off automatically and the alarm given by the "OVERLOAD" indicator.

To restore, switch MAINS OFF and ON again.

3.5.2 Remote Operation

Component	Action	Observation
(a) Switching On		
REMOTE/LOCAL Switch	REMOTE position	
MAINS Switch	On position	Neon illuminated LT ON pilot illuminated Blower Motor starts after 45 seconds HT ON pilot illuminated
	Class C operation only	Amplifier operating normally.

Press-to-Talk Operation (Linear Mode Only)

Grid bias will be decreased to -55V (normal operation) when 50V is applied across terminals 1TL2-1 and 1TL2-2.

3.5.2 Remote Operation

(b) Overload Circuits

To restore, switch off at MAINS switch and switch on again.

PART 4 : MAINTENANCE

4.1 Meter Readings

Typical readings are shown below. Anode and Grid R.F. Voltmeter to be calibrated for each frequency. Amplifier adjusted for 100 watts Linear unmodulated and 250 watts Class C.

Note 1: Screen current in Class "C" mode is largely dependent of drive.

Note 2: Anode Peak voltmeter will read in the Class "C" mode, but since readings are not relevant they are not shown.

Cct. Code	Posi-tion	Metering	Full Scale Deflection	118 MHz Linear	170 MHz Class C
3M1	-	Anode Current	0-500mA	320mA	300mA
3M3	1	H.T. Voltage	0-2500V	1750V	1750V
	2	Anode Peak RF Volts	0-2500V	800V	-
	3	Screen Volts	0-500V	350V	150V
	4	Cathode V1 current	0-250mA	158mA	160mA
	5	Cathode V2 current	0-250mA	158mA	160mA
	6	Grid Bias Volts V1	0-100V	55V	40V
	7	Grid Bias Volts V2	0-100V	55V	40V
	8	Grid Peak RF V	0-100V	26V	-
	9	Control Volts	0-100V	54V	54V
	10	Grid Current	0-50mA	-	25mA
	11	Screen Current	0-25mA	-10mA	0
3M5	1	Input Power forward	0-6 Watts	2W	5W

cont.

4.1 (cont.)

Cct. Code	Posi-tion	Metering	Full Scale Deflection	118MHz Linear	170 MHz Class C
	2	Input Power reflected	0-6 Watts	0.5W	0.5W
	3	Output Power forward	0-300 Watts	100W	250W
	4	Output Power reflected	0-300 Watts	5W	10W

4.2 Table of Voltages

Measurement using 20,000 ohms per volt meter.
The mains should be held constant at 240V RMS.

Item	Voltage	Measurement Point
Heater Volts	6.0V ±5%	4TL1-5 and 4TL1-6
Thermal delay volts	6.2V A.C.	Across pins 1 & 7 of 3THA

4.3 Maintenance Adjustments and Alignments

4.3.1 Tube Replacement

The two tetrode tubes are mounted with their axes horizontal on a vertical baffle which separates the grid circuit and anode circuit compartments of the power amplifier unit. Access to these compartments is gained by loosening the clamping screws on the two end covers and the top cover by one or two turns and disengaging the keyhole shaped slots in the covers from beneath the head of the screws.

The tubes may be removed or changed by removing the two covers fixed to the anode compartment of the unit, loosening the anode tuning inductor from the tuning capacitor and removing the connections to the monitoring and metering detectors and the H.T. feed, the inductor may be then withdrawn thus allowing the tubes to be withdrawn from their sockets and air chimneys.

4.3.2 Overload Adjustment

With equipment switched off, proceed as follows:

4.3.2 Overload Adjustment (cont.)

(a) Apply a 12V supply (e.g. a battery) in series with a variable resistor between terminal 3TL1-8 and chassis (+ to chassis). Adjust for "ANODE" reading on 3M1 of 400mA. Set 3R14 for relay 3RLD to commence operation at this current.

(b) Apply a 12V supply in series with a variable resistor and an 0-100mA meter between terminal 3TL1-11 and chassis (- to chassis). Adjust 3R15 so that 3RLC commences to operate with a current of 60mA.

4.3.3 Blower Motor and Air Filter Maintenance

(a) Blower Motor

The blower motor employs sealed ball bearings with an expected life of ten years.

(b) Air Filter

To gain access to the filter remove the four thumb screws holding it in front of the R.F. Unit and remove the whole of the filter assembly. Remove the filter and clean it by tapping it sharply. Replace the assembly. Should the filter unit be too dirty it should be replaced.

4.3.4. Neutralising

A change of the existing parameters with 4V1, and 4V2 or tube replacement may require the stage to be neutralised. When the amplifier is not completely neutralised a self-excited frequency is generated in the T.A.T.G. mode and is generally near to, or the same frequency as the drivers.

Symptoms of an un-neutralised stage can be a number of conditions such as:

(a) assymmetrical cathode currents greater than 15 mA;

(b) overload by excessive anode currents;

(c) breakdown across the anode tuning capacitor;

(d) grid not resonating;

(e) excessive noise and high distortion.

Notes:

1. Ensure the 4C37 and 4C38 are correctly assembled i.e. the thickest section of the insulated spacer is mounted inside the PA cage. (minimum capacity).

2. A suitable insulated tuning tool should be used to adjust 4C37 and 4C38.

3. Access to the neutralising capacitors 4C37 and 4C38 for tuning purposes is gained through the grid enclosure cover of the amplifier assembly (Refer to photographs No. 5 and 9).

4. The amount of adjustment of the neutralising capacitors 4C37, 4C38 is dependent on the magnitude of the interfering frequency :-

   (a) where there is sufficient activity whereby RF is present on the wattmeter when the driver PTT is released;

   (b) where there is no visible reading on the wattmeter when the driver PTT is released.

PART 5 SCHEDULE OF COMPONENTS

5.1 Suppliers' Key Numbers

			Phone No.
1.	Commonwealth Electronics Pty. Ltd. 60 Chard Road, Brookvale.	N.S.W.	936111
2.	Amalgamated Wireless Valve Co.Pty.Ltd. 348 Victoria Road, Rydalmere.	N.S.W.	6380411
3.	Belling & Lee (Aust.) Pty. Ltd. 170 Burwood Road, Burwood.	N.S.W.	744277
4.	British Merchandising Pty. Ltd. 60 Clarence Street, Sydney.	N.S.W.	291571
5.	Cannon Electrical (Aust.) Pty. Ltd. Fifth Street, Kingsford Smith Airport Mascot	N.S.W.	671488
6.	Carr Fasteners Co. of Aust. Ltd. 7 West Street, Petersham	N.S.W.	566228
7.	Ducon Condenser Pty. Ltd. Christina Road, Villawood	N.S.W.	720133
8.	General Electronic Services Pty. Ltd. 5 Rydge Street, North Sydney	N.S.W.	9298453
9.	H.J.Gilbert, 2 Regatta Road, Fivedock	N.S.W.	743128
10.	International Resistance Co. (A'asia) Pty. Ltd. The Crescent, Kingsgrove	N.S.W.	500111
11.	Manufacturers Special Products Pty.Ltd. 47 York Street, Sydney	N.S.W.	20233

4.3.4. Neutralising (contd.)

(c) Adjustment of the neutralising capacitors alternately and equally is for equal reduction of RF power rather than the number of physical turns of the respective screws. At the final stage of tuning one capacitor may have more influence than the other, therefore an appraisal of the condition is necessary to finalise the tuning of each capacitor to arrive at the minima symmetrically.

Step 1: To neutralise the stage, the amplifier is connected for Class 'C' operation and tuned for optimum output 250 watts in a Termaline Wattmeter or Thru-Line wattmeter terminated in a 50 ohm load. (Refer Section 3.4.5.)

Step 2: Switch off the driver unit.

Step 3a: With RF present on the external wattmeter, tune the grid anode and aerial coupling for maximum and proceed to adjust 4C37 and 4C38 alternately and equally until a zero reading on the external wattmeter is reached; then switch the HT off and on, the same time observing the wattmeter needle. If the meter needle kicks upward, continue to adjust 4C37 and 4C38 alternately and equally, repeating the HT OFF/ON sequence with the adjustment of the neutralising capacitors until there is no kick upwards on the external wattmeter. Increase the sensitivity of the wattmeter if necessary to achieve this.

Step 3b: With no apparent RF on the external wattmeter, reapply PTT and ensure that the amplifier is tuned correctly to the driver frequency. Lock all controls. Switch the HT off. Remove the HT fuse and external wattmeter. Connect a sensitive test instrument such as a HP RF Power meter type 431A or equivalent via a HP Fuseholder type 608A - 95A to 1SK1, RF output socket. Adjust 4C37 and 4C38 equally and alternately until a minimum is reached on the test meter.

Step 4: Remove the RF power meter and fuseholder. Reconnect the HT fuse and external wattmeter. Switch on driver unit and HT to Amplifier retune the amplifier as per Section 3.4.5. Carry out check as Section 3.4.8.

Step 5: Restore amplifier to mode of operation, realign as per handbook and connect to aerial (See 3.4.9.).

5.1 Suppliers' Key Numbers (cont.)

			Phone No.
12.	Master Instruments Pty. Ltd. cnr. Sloane & Saywell Streets, Marrickville	N.S.W.	516173
13.	Miniwatt (Division of Philips Electrical Industries) 20 Herbert Street, Artarmon	N.S.W.	432171
14.	Morganite Aust. Pty. Ltd., 65 Bourke Road, Alexandria	N.S.W.	671371
15.	Mullard-Australia Pty. Ltd., 35 Clarence Street, Sydney	N.S.W.	292006
16.	W.J. McLellan & Co. Pty. Ltd. The Crescent, Kingsgrove	N.S.W.	500111
17.	R.K.Oliver Pty. Ltd. South Creek Road, Dee Why West	N.S.W.	987364
18.	Paton Electrical Pty. Ltd., 90 Victoria Street, Ashfield	N.S.W.	710381
19.	E.S. Rubin & Co. Pty. Ltd., 73 Whiting Street, Artarmon	N.S.W.	434141
20.	Standard Telephones & Cables Pty. Ltd. 252 Botany Road, Alexandria	N.S.W.	690444
21.	Telcon Australia Pty. Ltd., 17 Wyndham Street, Alexandria	N.S.W.	695937
22.	Torrington Manufacturing Co. (Aust.) Pty. Ltd., 46 Ferndell Street, Granville	N.S.W.	6442031
23.	Transmission Products Pty. Ltd. Denison Street, North Sydney	N.S.W.	924018

5.1 Suppliers' Key Numbers (cont.)

			Phone
24.	Vokes Australia Pty. Ltd., 422 West Botany Road, Rockdale	N.S.W.	59.3367
25.	Varian Pty. Ltd., 38 Oxley Street, Crows Nest	N.S.W.	43.0673
26.	Fairchild Aust. Pty. Ltd., Macquarie Street, Parramatta	N.S.W.	6354088
27.	Centre Industries, Allamby Road, North Manly	N.S.W.	408222

5.2 Schedule of Components

Cct. No.	Description	Circuit Function	Supplier	Suppliers' Type No.
CAPACITORS:				
2C1	Not used			
2C2	4µF 3000V D.C. Paper	Major H.T. Filtering	7	9N40
2C3	4µF 600V D.C. Paper	Screen H.T. Filtering	7	3S40
2C4	4µF 600V D.C. Paper	Minor H.T. Filtering	7	3S40
2C5	Not used			
2C6-2C25	470pF 2000V D.C. Ceramic	Equalising Condensers	7	CDH
3C1	0.5µF 600V DCW 300V ACW + 20% -10%	3T1 Surge Suppression	7	3S05
3C2	0.5µF 600V DCW 300V ACW +20% -10%	3T2 Surge Suppression	7	3S05
3C3	100µF 350V DC Electrolytic	Control Supply Filtering	7	EMG1037S
3C4-3C5	Not used			

5.2 Schedule of Components

Cct No.	Description	Circuit Function	Supplier	Supplier's Type No.
3C6	40μF 125V DC Paper	Bias Supply Filtering	7	1S400
3C7 3C8	not used			
3C9	.0022pF ±10% Ceramic	3RF2 REV.D.C. Bypass	7	CDS-AZ
3C10	.0022μF ±10% Ceramic	3RF2 FWD.D.C. Bypass	7	CDS-AZ
3C11	.0022μF ±10% Ceramic	3RF1 FWD.D.C. Bypass	7	CDS-AZ
3C12 3C13	not used			
3C14	.0022μF ±10% Ceramic	3RF1 REV.D.C. Bypass	7	CDS.AZ
4C1	1000pF ±10% Ceramic 500V DC W	4V1 Bias Supply decoupling	7	CDS-AY
4C2	Concentric Trimmer	Input Tuning	13	C005AA/25E
4C3	1000pF ±10% Ceramic 500V DC W	4V2 Bias Supply decoupling	7	CDS-AY
4C4	3300pF ±10% Ceramic 500V DC W	Grid Circuit D.C. blocking	7	CDS-BY
4C5	1000pF ±10% Ceramic 500V DC W	R.F. Grid Volt-meter decoupling	7	CDS-AY
4C6	1000pF ±10% Ceramic 500V DC W	D.C. Blocking	7	CDS-AY
4C7	1pF ±30% Ceramic 500V DC W	R.F.Grid Voltmeter	7	CDS-F
4C8	1pF ±30% 500V DC W	R.F. Grid Voltmeter	7	CDS-F
4C9	4-63pF split stator air variable Jackson Bros.	Grid Tuning	4	C808
4C10	1000pF ±10% Ceramic 500V DC W	D.C. Blocking	7	CDS-AY

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
4C11) 4C12) 4C13) 4C14)	Each 1000pF ±10% Ceramic 500V DCW	4V1 Cathode Bypass	7	CDS-AY
4C15) 4C16) 4C17) 4C18)	1000pF ±10% Ceramic 500V DCW	4V2 Cathode Bypass	7	CDS-AY
4C19	2700pF (part of valve socket)	4V1 Screen Bypass		
4C20	2700pF (part of valve socket)	4V2 Screen Bypass		
4C21	0.2pF nominal Air spaced 1 plate ½" diam. and 1 plate 3/4" diam.	R.F. Anode Monitor	1	A-513
4C22	22pF ±10% Ceramic 500V DCW	R.F. Monitor	7	CDS-B-NPO
4C23	1000pF ±10% Ceramic 500V DCW	Audio Monitor Filtering	7	CDS-AY
4C24	Split Stator 35 + 35pF type C12/SS Drg. No. Jackson Bros 5021/SS/9B (modified)	Anode Tune	1	A518
4C25	0.2pF nominal Air spaced 1 plate ½" diam. and 1 plate 3/4" diam.	R.F.Anode Voltmeter	1	A-514
4C26	10pF ±30% Ceramic 500V DCW	R.F.Anode Voltmeter	7	CDS-A
4C27	1000pF ±10% Ceramic 500V DCW	R.F. Voltmeter Filtering	7	CDS-AY

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
4C28	Not used			
4C29	1000pF 20KV DCW Ceramic, Epoxy	Anode R.F. Bypass	7	CVB-100
4C30	1000pF ±20% 2KV DCW Feed through	Filament supply Bypass	7	CAD
4C31	1000pF ±20% 2KV DCW Feed through	4V1 Bias Supply Bypass	7	CAD
4C32	1000pF ±20% 2KV DCW Feed through	4V2 Bias Supply Bypass	7	CAD
4C33	1000pF ±20% 2KV DCW Feed through	Grid Voltmeter out, Bypass	7	CAD
4C34	1000pF ±20% 2KV DCW Feed through	4V1 Cathode Metering Bypass	7	CAD
4C35	1000pF ±20% 2KV DCW Feed through	4V2 Cathode Metering Bypass	7	CAD
4C36	1000pF ±20% 2KV DCW Feed through	Screen Supply Bypass	7	CAD
4C37) 4C38)	Mechanical assembly	Neutralising	1	A519
4C39) 4C40)	1000pF ±10% 500V DCW Ceramic	Heater Bypass	7	CDS-AY
4C41	2.2pF ±10% 500V Ceramic NPO	R.F. current Bleed	7	CDS-F-NPO
FILTERS:				
3X1	70-110 MHz	Low Band Low Pass Harmonic Filter	1	A511A
3X2	110-180 MHz	High Band Low Pass Harmonic Filter	1	A511

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Suppliers Type No.
INDUCTORS				
2L1	15H, 0.35A 2500V W 20Ω Open Core Frame Mtg. Centres 4-13/16x3-1/16	Major H.T. Filtering	17	15/351
2L2	30H, 40mA, 400V W 200Ω Open Core Frame Mtg. Centres 2-1/32x1-1/32	Minor H.T. Filtering Screen	17	30/400
2L3	Same as for 2L2	Minor H.T. Filtering Screen	17	30/400
3L1	20H, 0.6A 100Ω D.C. Open Core Frame Mtg. Centres 2-¼" x 1"	Bias Supply	17	20/600
4L1	12µH ±10% Wound on Ceramic Former	Bias Supply R.F. Choke	1	0515
4L2	Not used			
4L3	12µH ±10% Wound on Ceramic Former	Bias Supply R.F. Choke	1	0515
4L4	Tuned Line	Grid Tuning Line	1	A-516
4L5	Coupling Loop	Grid Coupling	1	0521
4L6	12µH ±10%	R.F. Grid Voltmeter Choke	1	0517
4L7	Lecher line	R.F. Anode Tuning	1	A522
4L8	Coupling loop	Anode Coupling	1	A523

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
INDUCTORS (cont.)				
4L9	12µH ±10%	R.F.Anode Monitor Choke	1	0517
4L10	12µH ±10%	R.F.Anode Voltmeter Choke	1	0517
4L11	12µH ±10% Wound on Ceramic Former	Anode Feed Choke	1	0515
METERS				
3M1	0-500mA DC Scaled 0-500	Anode Current	12	S225
3M2	Not used			
3M3	0-1mA DC 100Ω Scaled 0-250 0-100 0-500	Multimeter	12	S225
3M4	Not used			
3M5	0-1mA DC 100 Ω Scaled 0-300 WRF 0-6 WRF	Power	12	S225
RECTIFIERS				
2W1-2W44	Not used			
2W45-2W56	Silicon Diode	Minor H.T. Rectifiers	8	RAS310AF ~~STV5~~
2W57-2W76	Silicon Avalanche Rectifier	Major H.T. Rectifiers	20	RAS 310 AF
3W1) 3W2)	Silicon Diodes	Bias Supply Rectifier	8	RAS310AF ~~STV5~~

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
RECTIFIERS (cont.)				
3W3-3W6	Silicon Diodes	Control Voltage Supply Rectifier	8	RAS310AF ~~STV5~~
3W7	Silicon Diode	4V1 Bias Supply Blocking	8	RAS310AF ~~STV5~~
3W8	Silicon Diode	4V2 Bias Supply Blocking	8	RAS310AF ~~STV5~~
3W9	Germanium Diodes	3RF2 FWD. Rectifier	26	FD100
3W10	Germanium Diodes	3RF2 REV. Rectifier	26	FD100
3W11, 3W12	not used			
3W13	Germanium Diodes	3RF1 FWD Rectifier	15	OA91
3W14	Germanium Diode	3RF1 REV.		
3W15-3W17	not used			
3W18) 3W19)	Silicon Diode	Screen Current Metering	2	1N3195
4W1	Germanium Diode	Peak Grid Voltmeter	15	OA91
4W2	Germanium Diode	Audio Monitor	26	FD100
4W3	Germanium Diode	Peak Anode Voltmeter	20	OA91
REFLECTOMETERS				
3RF1	118-175 Mc/s	Input Reflectometer 1		A512
3RF2	118-175 Mc/s	Output Reflectometer 1		A512-A

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
REGULATOR:				
3V3	Voltage Regulator Tube	Screen Supply Regulator	13	0D3
RELAYS				
3RLA	3000 Type Coil 1000Ω Arm.12 mil. Springsets LH 1C RH 1C	Press-to-talk	27	WDB/BOQ
3RLB	3000 Type Coil 1000Ω Arm. 12 mil. Springsets LH 1C RH 1C	Bias failure	27	WDB/BOQ
3RLC	3000 Type Coil 100Ω Arm. 12 mil. Springsets LH 1C RH 1C	Screen Overload	27	WDB/BOB
3RLD	3000 Type Coil 100Ω Arm. 12 mil. Springsets LH 1C RH 1C	Anode Overload	27	WDB/BOB
3RLE	Not used			
3RLF	3000 Type Coil 1000Ω Arm. 12 mil. Springsets LH 1C RH 1C	Interlock (overload)	27	WDB/BOQ-
3RLG	3000 Type Coil 2000Ω Arm. 12 mil. Springsets LH1 microswitch RH 2C	L.T. Control	27	WFB/BOD

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
RELAYS (cont.)				
3RLH	3000 Type Coil 1000Ω Arm. 12 mil. Springsets LH 1C RH 1C	Time Delay	27	WDB/BOQ
3RLL	3000 Type Coil 2000Ω Arm. 12 mil. Springsets LH 1 microswitch RH 2C	H.T. Limiting	27	WFB/BOD
3RLM	3000 type Coil 2000Ω Arm. 12 mil. Springsets LH 1 microswitch RH 2C	H.T. On	27	WFS/BOE
THERMAL TIME DELAY				
3THA	Thermal Delay Relay	Thermal Time Delay	20	VLS631
RESISTORS				
2R1-2R50	Not used			
2R51-2R68	Each 5.6KΩ ±5% 4.5 Watts W.W.	Major H.T. Bleed	7	RWV4K
2R69	3.3KΩ ±5% 4.5 Watts W.W.	Major H.T. Bleed & Metering	7	RWV4K
2R70	1KΩ ±5% 4.5 Watts W.W.	Major H.T. Bleed & Metering	7	RWV4K
2R71-2R75	Each 1.2KΩ ±5% 4.5 Watts W.W.	Minor H.T. Bleed	7	RWV4K
2R76	not used			

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
2R77-2R88	Each 220K ohms ±5% 0.25 Watts	2W45-2W56 Voltage Equalising	13	B8/305/05B
3R1	1K ohm ±5% 3 Watts W.W.	3RLA Current Limiting	7	RWV4J
3R2	680 ohms ±5% 1.5 Watts W.W.	3T1 Surge Suppression	7	RWV3J
3R3	680 ohms ±5% 1.5 Watts W.W.	3T2 Surge Suppression	7	RWV3J
3R4) 3R5)	5 ohms ±10% 3 Watts W.W.	3T2 Secondary Current Limiting	7	RWV4J
3R6	Not used			
3R7	2.2K ohms ±5% 1.5 Watts W.W.	3RLB Series	7	RWV4J
3R8	1K ohms ±5% 3 Watts W.W.	Class "C" Bias Dropping	7	RWV4J
3R9	1.2K ohms ±5% 3 Watts W.W.	Bias Dropping	7	RWV4J
3R10	2.5K ohms ±5% 20 Watts variable	4V1 Bias Adjusting	7	DGA-V
3R11	2.5K ohms ±5% 20 Watts variable	4V2 Bias Adjusting	7	DGA-V
3R12	2.7K ohms ±5% 3 Watts W.W.	4V1 Bias Shunting	7	RWV4J
3R13	2.7K ohms ±5% 3 Watts W.W.	4V2 Bias Shunting	7	RWV4J
3R14	5 ohms ±10% 20 Watts variable	3RLD O/L Adjustment	7	DGA-V

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
RESISTORS (cont.)				
3R15	100 ohms ±5% 20 Watts variable	3RLC O/L Adjustment	7	DGA-V
3R16-3R17	Not used			
3R18	22K ohms ±5% 0.5 Watts	3C3 Bleed	13	B8-305-06B
3R19	Not used			
3R20	1K ohm ±5% 3 Watts W.W.	3RLF Series	7	RWV4J
3R21	1K ohm ±5% 3 Watts W.W.	3RLH Series	7	RWV4J
3R22-3R26	Not used			
3R27	500K ohms ±2% 0.5 Watts	Screen Volts Supply Metering	10	DCF
3R28	100K ohms ±2% 0.25 Watts	H.T. Volts Supply Metering	10	DCC
3R29	Not used			
3R30	2.5K ohms Carbon linear pot ±20% 0.25W	Power IN-FWD Metering	14	L.H.
3R31	2.5K ohms Carbon linear pot. ±20% 0.25W	Power IN-REV. Metering	14	L.H.
3R32	50K ohms carbon linear pot. ±20% 0.25W	Power OUT-FWD Metering	14	L.H.
3R33	50K ohms carbon linear pot. ±20% 0.25W	Power OUT-REV Metering	14	L.H.
3R34	Not used			

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
RESISTORS (cont.)				
3R35	2400 ohms ±2% 0.25 Watts	4V1 Cathode Metering	10	DCC
3R36	2400 ohms ±2% 0.25 Watts	4V2 Cathode Metering	10	DCC
3R37) 3R38)	Each 820 ohms ±5% 70 Watts	H.T. Limiting	7	RWV1-N
3R39	100K ohms ±2% 0.25 Watts	Bias Voltage Metering	10	DCC
3R40	10K ohms carbon linear pot. 5/8" spindle ±20% 0.25 watts	R.F. Anode	14	L.H.
3R41	10K ohms carbon linear pot. 5/8" spindle ±20% 0.25 watts	R.F. Grid Metering	14	L.H.
3R42	100K ohms ±2% 0.25 Watts	Control Voltage	10	DCC
3R43	Not used			
3R44	82 ohms ±5% 6 watts metal oxide	3RF2 REV. terminating	5	F33
3R45	82 ohms ±5% 6 watts metal oxide	3RF2 FWD terminating	5	F33
3R46	Not used			
3R47	3.9 ohms ±10% 1.5 watts W.W.	In series with 3R14	7	RWV3-J

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
RESISTORS (cont.)				
3R48) 3R49)	Each 220K ohms ±5% 1 Watt	Screen Supply Bleed	13	B8-305-07B
3R50	82 ohms ±5% .1 Watt	3RF1 REV terminating	13	B8-305-07B
3R51	82 ohms ±5% 1 Watt	3RF1 FWD terminating	13	B8-305-07B
3R52	8.2K ohms ±5% 0.5 Watts	Grid Peak Metering Series	13	B8-305-06B
3R53	8.2K ohms ±5% 0.5 Watts	R.F. Anode Metering Series	13	B8-305-06B
3R54	Select Value ±5% 0.5 Watts	IN-FWD Power Metering	13	B8-305-06B
3R55	Select Value ±5% 0.5 Watts	IN-FWD Power Metering	13	B8-305-06B
3R56	Select Value ±5% 0.5 Watts	IN-REV Power Metering	13	B8-305-06B
3R57	Select Value ±5% 0.5 Watts	IN-REV Power Metering	13	B8-305-06B
3R58-3R66	Not used			
3R67	470 ohms ±5% 0.5 Watts	Power OUT-FWD Metering	13	B8-305-06B
3R68	470 ohms ±5% 0.5 Watts	Power IN-FWD Metering	13	B8-305-06B
3R69-3R73	Not used			
3R74	1K ohms ±5% 0.5 Watts	3RF2 Filter	13	B8-305-06B

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
RESISTORS (cont.)				
3R75	1K ohms ±5% 0.5 Watts	3RF2 Filter	13	B8-305-06B
3R76	18 ohms ±2% 0.25 Watts	Screen Current Metering	10	DCC
3R77	330 ohms ±2% 0.25 Watts	Screen Current Metering	10	DCC
3R78	18 ohms ±2% 0.25 Watts	Grid Current Metering	10	DCC
3R79	820 ohms ±2% 0.25 watts	Grid Current Metering	10	DCC
3R80	5K ohms ±5% 20 Watts Variable	Standby bias adjusting	7	DCA-V
4R1	10 ohms ±1% 1 Watt W.W.	4V1 Cathode Metering	10	RW3
4R2	10 ohms ±1% 1 Watt W.W.	4V2 Cathode Metering	10	RW3
4R3	470 ohms ±5% 0.25 Watts	4V1 Grid Leak	13	B8-305-06B
4R4	470 ohms ±5% 0.25 Watts	4V2 Grid Leak	13	B8-305-06B
4R5	not used			
4R6	470 ohms ±5% 3 Watts metal oxide	4V1 Grid Swamping (linear mode only)	5	F33
4R7	470 ohms ±5% 3 watts metal oxide	4V2 Grid Swamping (linear mode only)	5	F33

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
4R8	33 ohms ±5% 0.25 Watts	4V1 Screen Isolation	13	B8-305-05B
4R9	33 ohms ±5% 0.25 Watts	4V2 Screen Isolation	13	B8-305-05B
4R10-4R11	Not used			
4R12	68 ohms ±5% 3 watts metal oxide	R.F. Input Loading	5	F33
4R13	5K ohms ±20%	AF Monitor level control	Y8/1815	
SWITCHES				
2MS1	Cutler Hammer 240V 10A D.P.S.T.	Mains	11	7360/K8
3S1	1 oz Microswitch Den Dee	Airflow	9	Q2
3S2	Not used			
3S3	2-pole 11 pos. 2 bank Rotary	Multimeter Selector	18	A
3S4	Not used			
3S5	3-pole, 2 pos., 1 bank Rotary	Local-Remote	18	A
3S6	Push button RAF1 1 amp red	L.T. OFF	19	0101
3S7	Push button RAF1 1 amp green	L.T. ON	19	1101
3S8	Push button RAF1 1 amp red	H.T. OFF	19	1101
3S9	Push button RAF1 1 amp green	H.T. ON	19	1101

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
SWITCHES (cont.)				
3S10	2-pole, 4 pos. 1 bank Rotary	Power Meter Selector	18	A
3S11	D.P.S.T. Toggle 3A 250V	H.T. Tune/ Transmit	11	8370K8
TUBES, ELECTRON				
4V1	Power Tetrode Eimac Amplifier		25	4CX250B
4V2	Power Tetrode Eimac Amplifier		25	4CX250B
TRANSFORMERS				
2T1	Primary 0-10 220, 240, 260 No. 1 Secondary 2200V 0.35A No. 2 Secondary 430V 0.04A Open Core Frame Mtg. Centres 4-13/16x3-1/16	H.T. Supply	17	791T
3T1	Primary 0-10 220, 240, 260 No. 1 Secondary 6.2V 6 amps No. 2 Secondary 6.2V 0.5 Amps No. 3 Secondary 200V 60mA Centre Tapped: Open Core Frame Mtg. Centres 2-3/8" x 1-1/8"	Bias rectifier and heater supplies	17	T20/600
3T2	Primary 0-10 220, 240, 260 Secondary 48V 0.5 amps Centre tapped, open core frame Mtg. centres 1-1/4" x 1"	Control Supply	17	240T

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
MISCELLANEOUS:				
BLOWER MOTOR:				
3BL1	Centrifugal fan c/w 0.05 HP single phase motor. 240V 0.61A (anti-clockwise rotation)	Cooling	22	SB0096
-	Air Filter		24	5016-3F
FUSES				
2F1	5 amp	H.T.	3	L1055
2F2	1 amp Delay	Blower Motor	3	L1055
2F3	0.5 amp	L.T.	3	L1055
2F4	0.5 amp	Control	3	L1055
FUSEHOLDERS				
2FH1-2FH4	5 amp for 1-3/4" standard cartridges	Fuseholders standard cartridges	3	L1348
JACKS				
3JK1) 3JK2)	2 single Tip Sleeve Jacks	A.F. Monitor Jack	23	TP1001
LAMPS				
2LP1	Lumolite 240V Neon 0.5W	Mains Supply	16	PL2RB
3LP1	not used			

5.2 Schedule of Components (cont.)

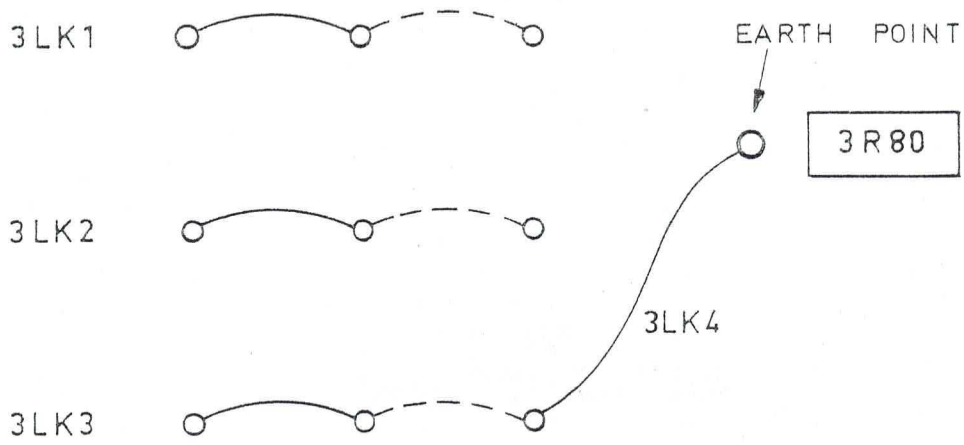
Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
LAMPS				
3LP2	60V 20mA	Overload	19	Lilliput
3LP3	60V 20mA	L.T. ON	19	Lilliput
3LP4	50V 20mA	H.T. ON	19	Lilliput
PLUGS				
1PL1-1PL5	not used			
1PL6	Coaxial Plug Cable Mtg. Type N	3RF2 output	5	UG21DU
1PL7	Not used			
1PL8	Coaxial Plug Cable Mtg. Type Ni (Suit RG58AU Cable)	3RF1 input	5	UG536AU
2PL1	Single contact chassis mounting	Major H.T.	3	L623/S
3PL1	Coaxial Plug Cable Mtg. N Type (suit RG58AU cable)	R.F. Input from Reflectometer	5	UG536-AU
3PL2	Coaxial Plug Cable Mtg. N. Type (suit RG58AU cable)	R.F. Input to P.A.	5	UG536-AU
3PL3	Coaxial Plug Cable Mtg. N. Type	R.F. Output from P.A.	5	UG21-DU

5.2 Schedule of Components (cont.)

Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
PLUGS (cont.)				
3PL4	Coaxial Plug cable Mtg. N Type	R.F. Output to 3X2	5	UG21-DU
3PL5	Coaxial Plug Cable Mtg. N Type	R.F. Output 3X2	5	UG21-DU
3PL6	Coaxial Plug Cable Mtg. N Type	R.F. Output to Reflectometer	5	UG21-DU
3PL7	Cable Plug Cable Mtg. Type BNC	R.F. Monitor Output	5	UG88-CU
4PL1	Single Contact Chassis Mtg.	Major H.T.	3	L623/S
SOCKETS				
1SK1	R.F. Output	Coaxial, N Type, Female, Panel Jack	5	UG22DU
1SK2	R.F. Input	Coaxial, UHF Type Female	20	3B50868 (R125R)
1SK3) 1SK4)	Major H.T. from P/S to P.A.	Single Contact Cable Mounting	3	L623/S
3SK5	Coaxial Socket	R.F. Monitor	21	3B50868
4SK1	Coaxial Socket Chassis Mtg. Type N	R.F. In	5	UG58AU
4SK2	Coaxial Socket Chassis Mtg. Type N	R.F. Out	5	UG58AU

5.2 Schedule of Components (cont.)

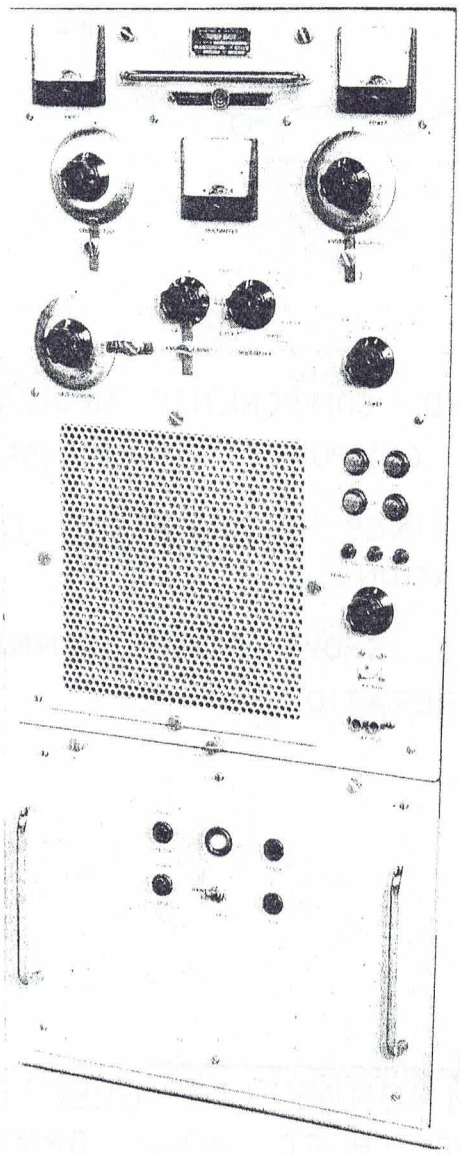
Cct. No.	Description	Circuit Function	Supplier	Supplier's Type No.
SOCKETS (cont.)				
4SK3	Coaxial Socket Chassis Mtg. Type BNC	R.F.Monitor Output	5	UG290AU
4SK4) 4SK5)	PA Tubes	Tube Socket	25	SK600
TERMINAL STRIP				
1TL1	Mains Input	3 Term. Strip	6	77/508/3
1TL2	Remote Control	7 Term. Strip	6	77/508/7
2TL1	5 Term. Strip	Mains Input	6	77/508/5
2TL2	11 Term. Strip	Mains & H.T.	6	77/508/11
3TL1	12 Term. Strip	Mains and H.T.	3	L744
3TL2	9 Term. Strip	Control Circuits	3	L744
3TL3	3 Term. Strip	Blower Motor	3	L744
4TL1	12 Term. Strip	P.A. Connections	6	77/508/12



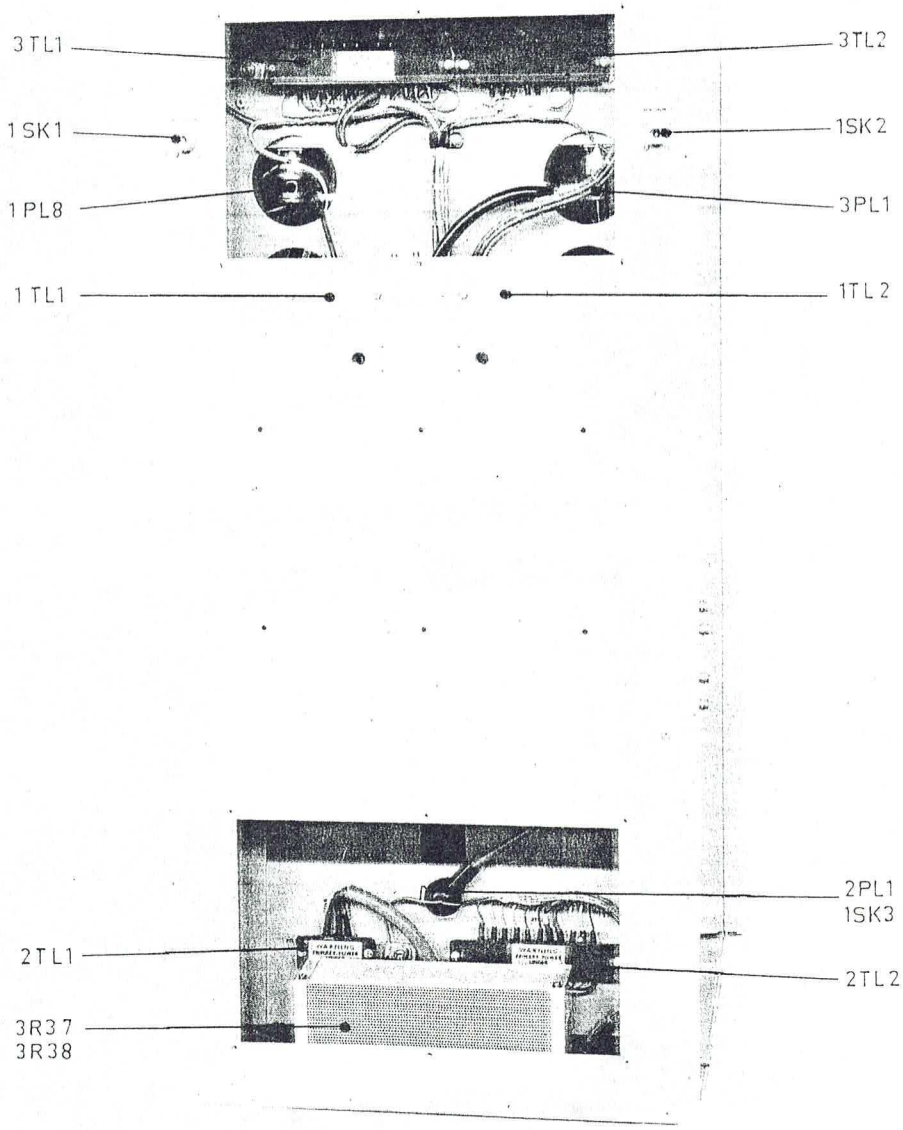
NOTES.

1. TERMINALS AND COMPONENTS INDICATED ARE LOCATED ON R.F. UNIT COMPONENT PANEL (SEE ALSO PHOTOGRAPH Nº 6).
2. CONTINUOUS LINES SHOW STRAP CONNECTIONS FOR LINEAR OPERATION.
3. DOTTED LINES SHOW STRAP CONNECTIONS FOR CLASS "C" OPERATION.

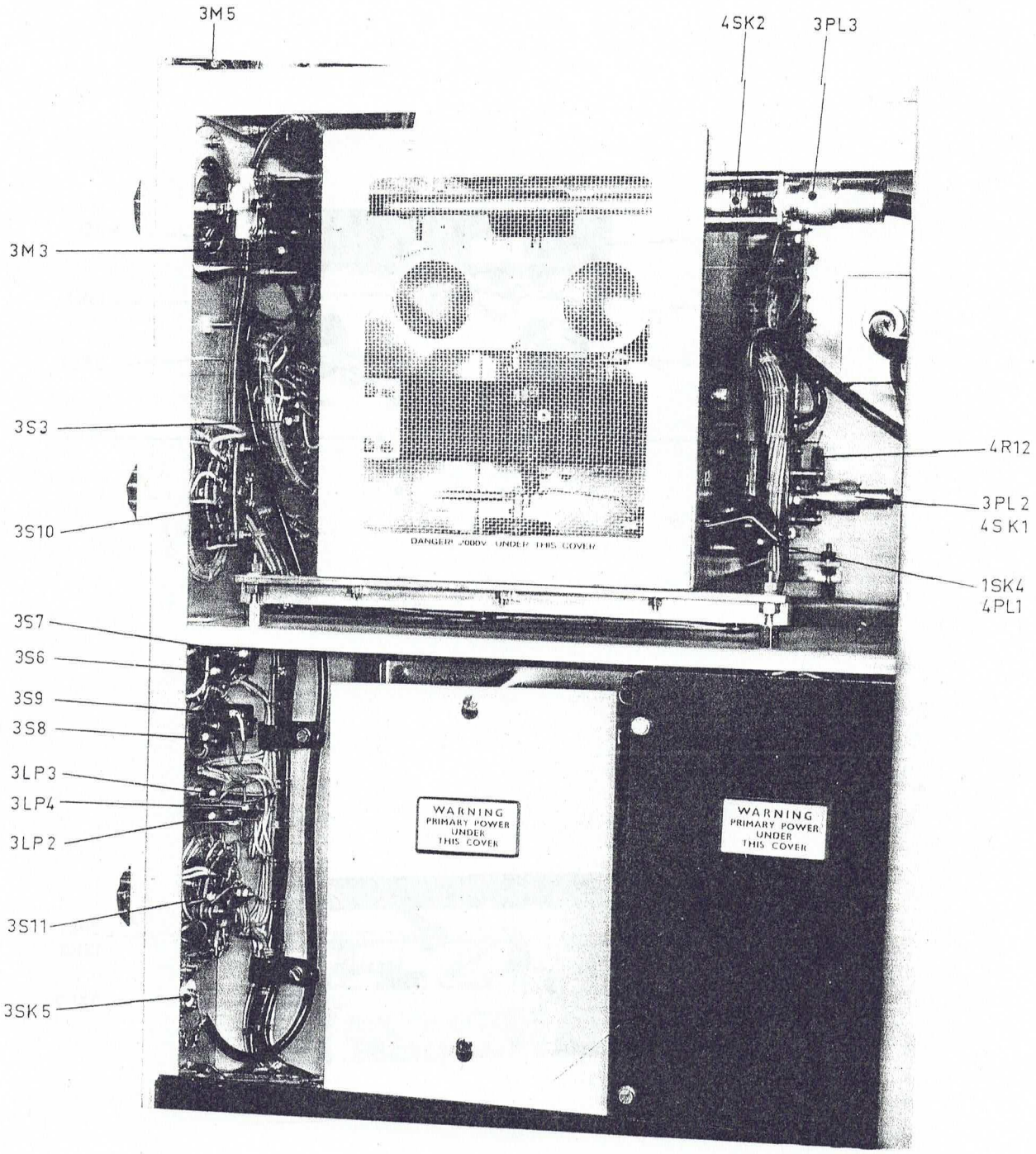
COMMONWEALTH ELECTRONICS PTY. LTD. 60 CHARD ROAD, BROOKVALE, N.S.W.			
R.F. POWER AMPLIFIER TYPE AM17A LINEAR / CLASS "C" STRAPPING DETAILS			
DRAWN JW 29-9-67	CHECKED RG	APPROVED RG	DRAWING Nº. 26 - 67



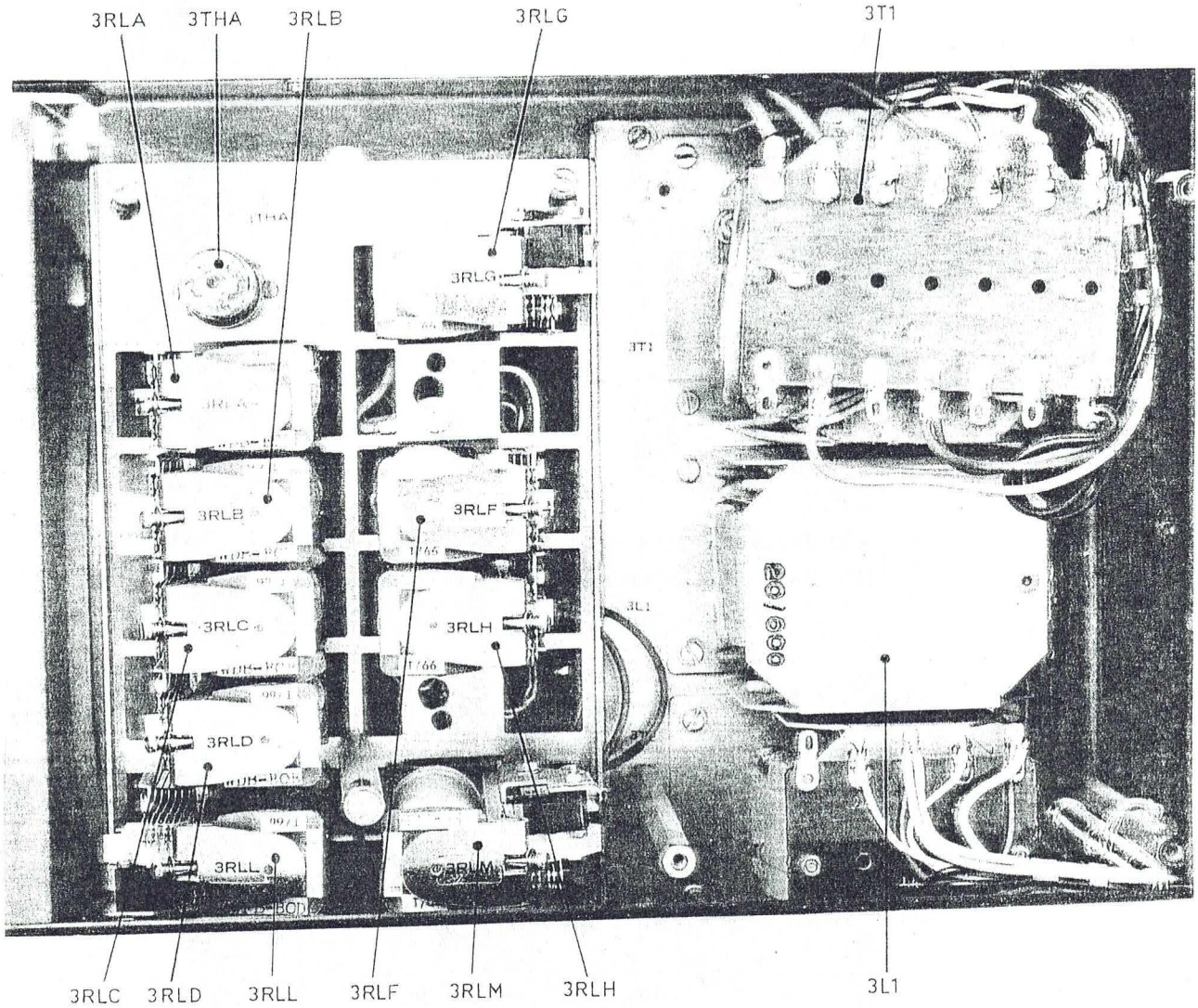
PHOTOGRAPH Nº 1
TYPE AM17A AMPLIFIER
FRONT VIEW



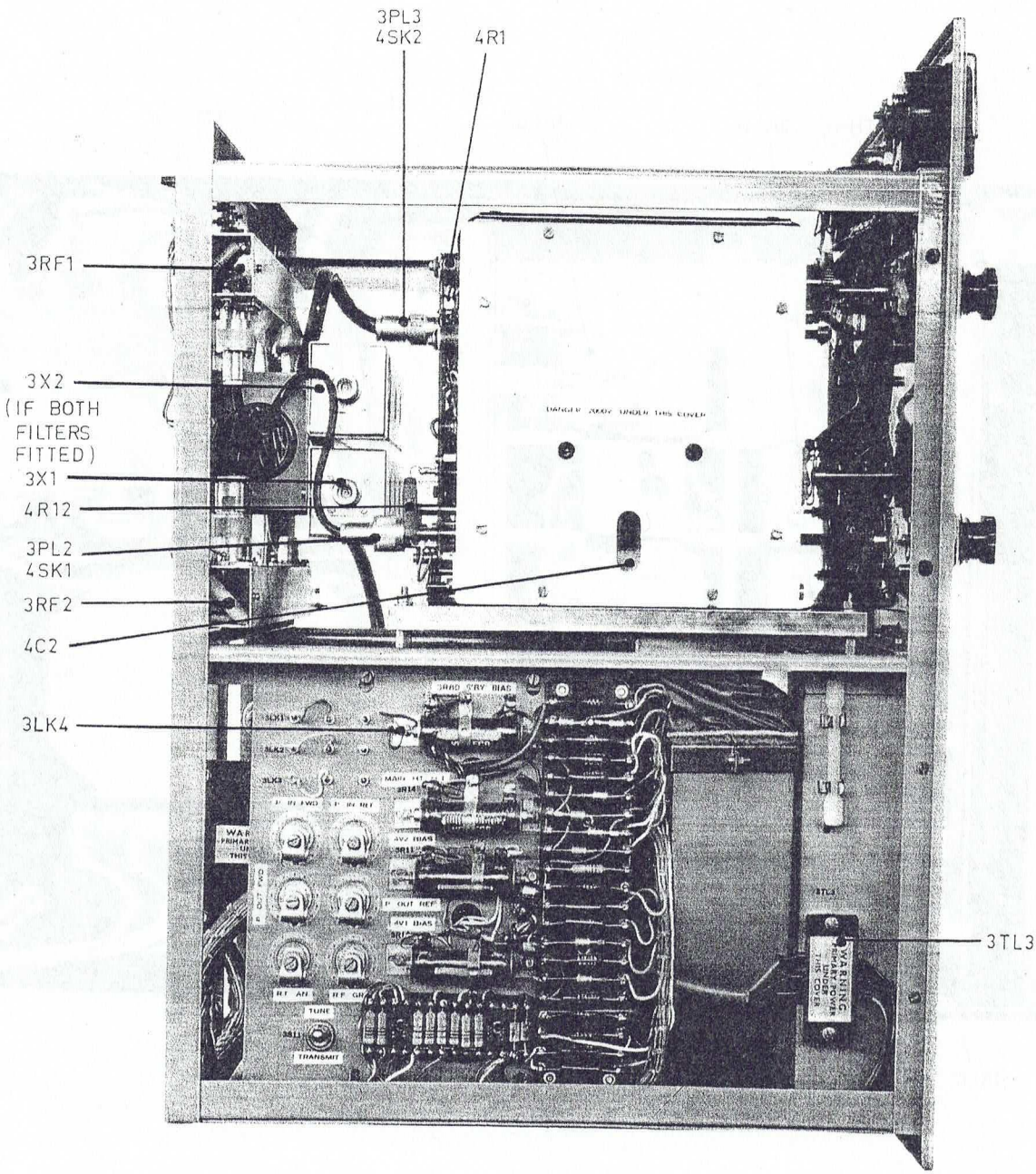
PHOTOGRAPH Nº 2
TYPE AM17A AMPLIFIER
REAR VIEW WITH COVERS REMOVED



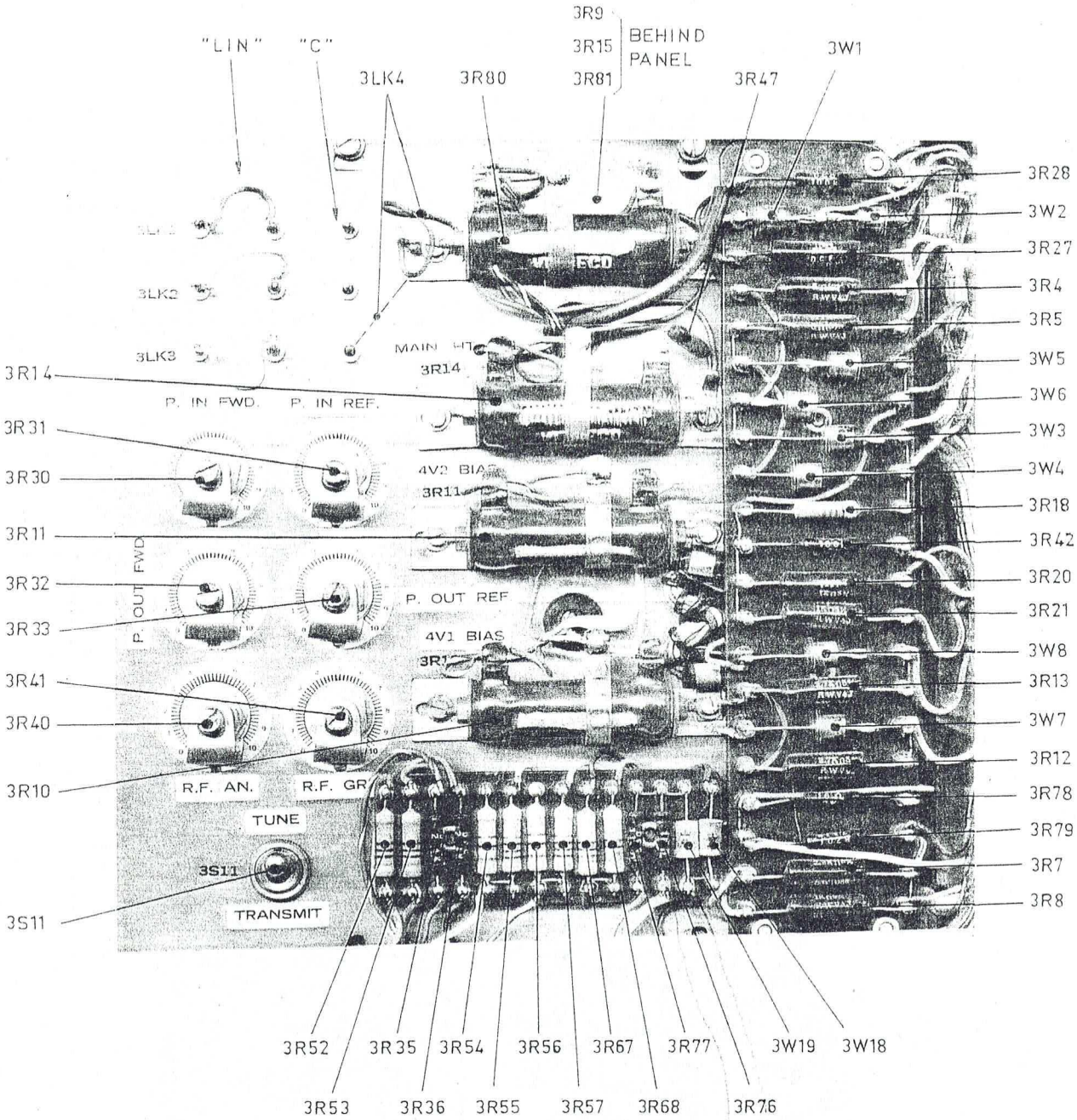
PHOTOGRAPH Nº 3
R.F. UNIT
RIGHT HAND VIEW



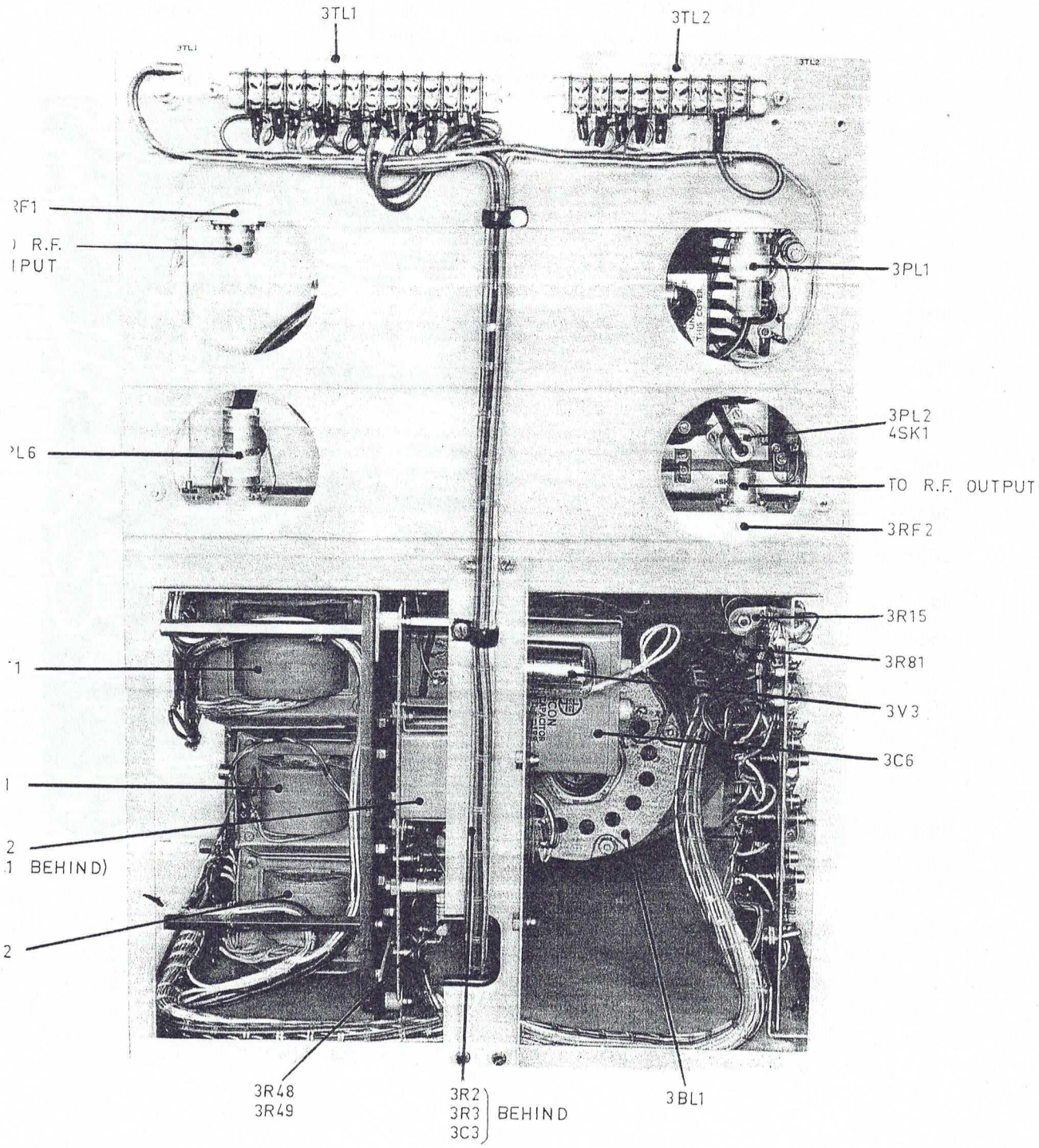
PHOTOGRAPH Nº 4
R.F. UNIT
RELAY CHASSIS & L.T. SUPPLY



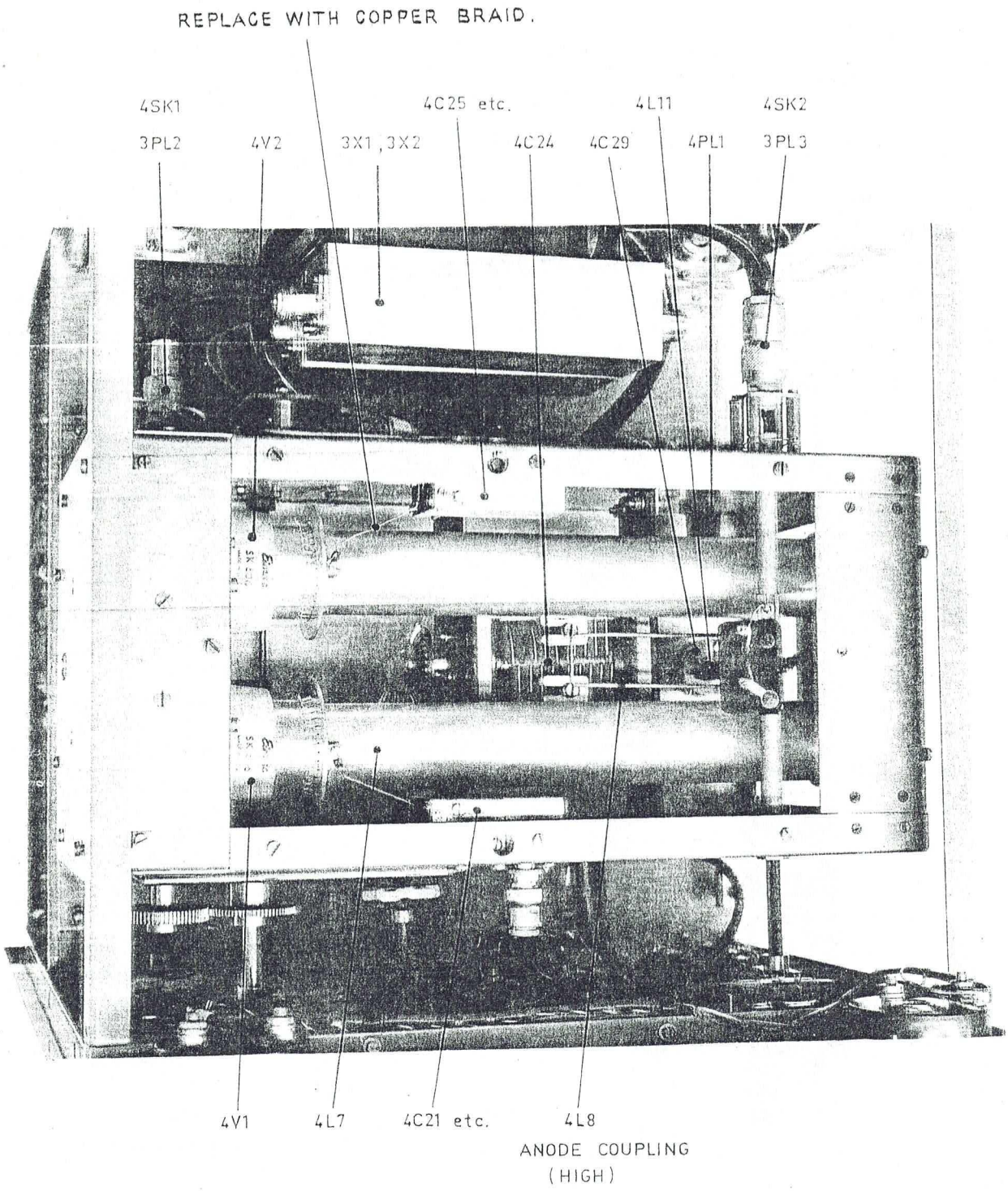
PHOTOGRAPH Nº 5
R.F. UNIT
LEFT HAND VIEW



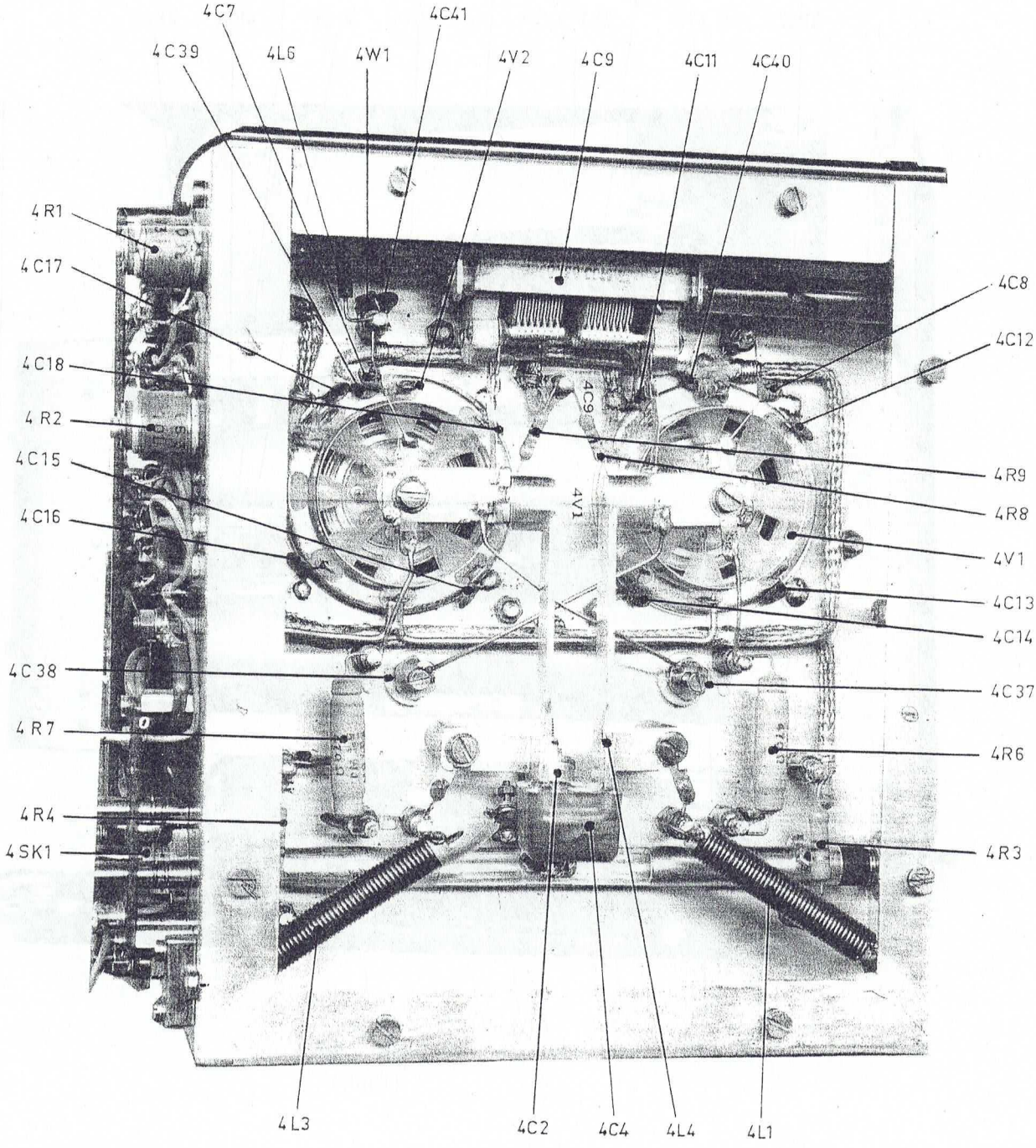
PHOTOGRAPH Nº 6
R.F. UNIT
COMPONENT PANELS



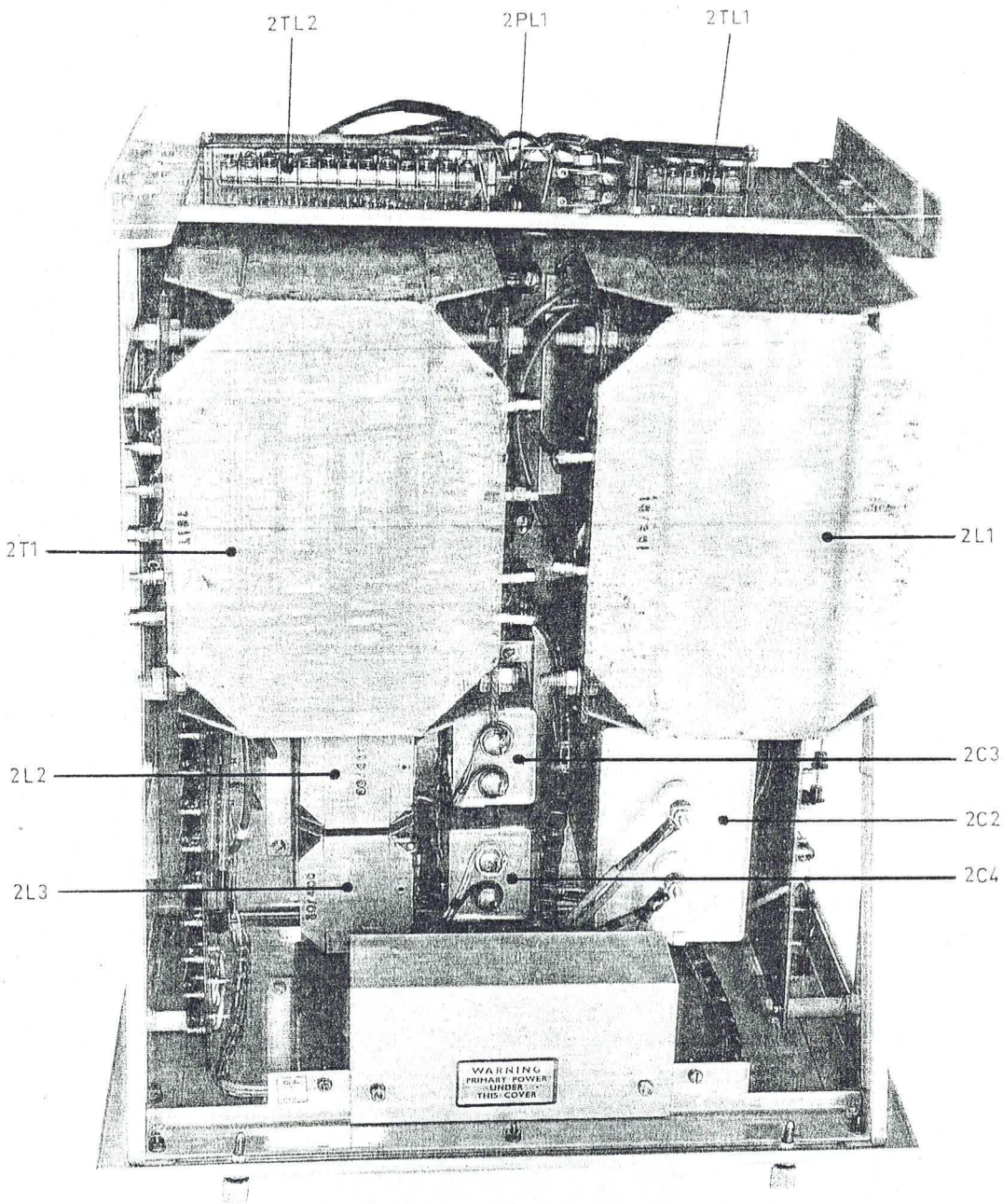
PHOTOGRAPH Nº 7
R.F. UNIT
REAR VIEW



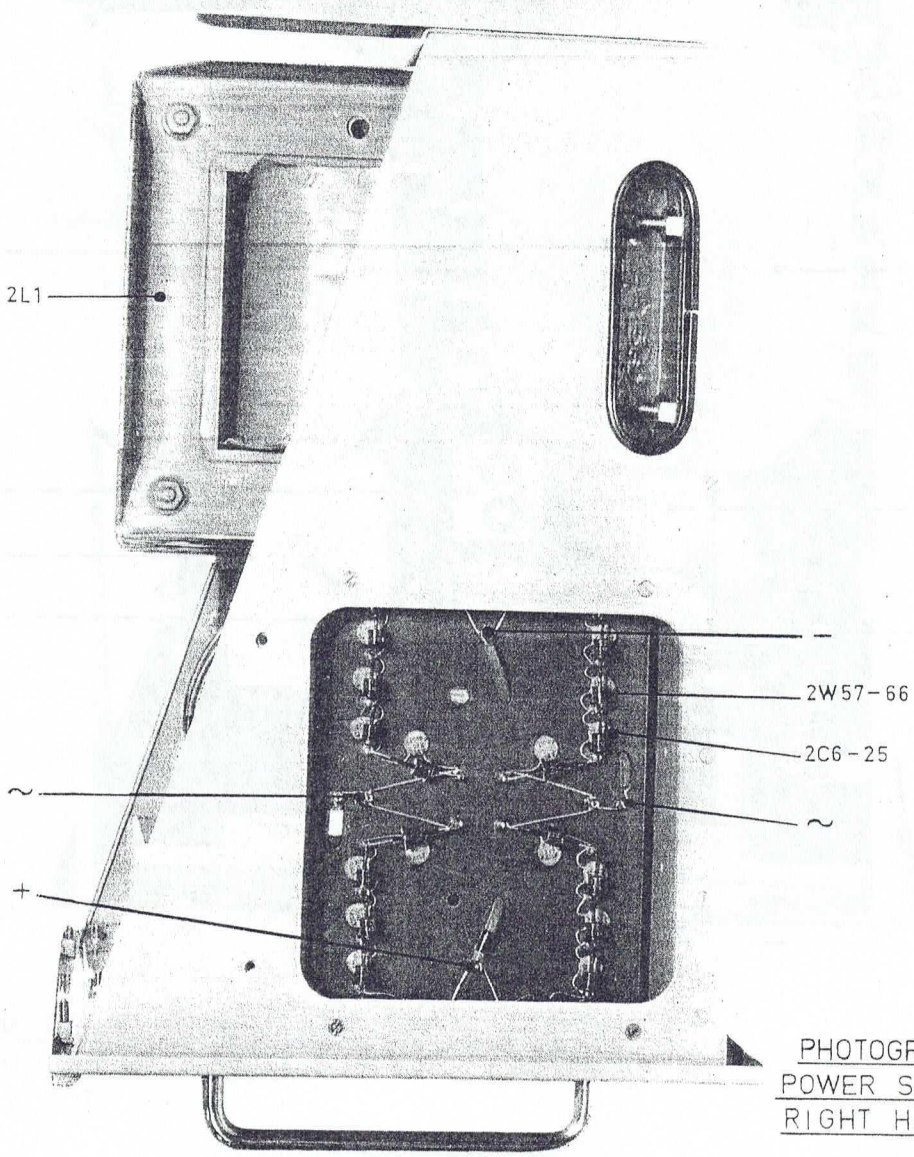
PHOTOGRAPH Nº 8
P.A. ASSEMBLY
TOP VIEW



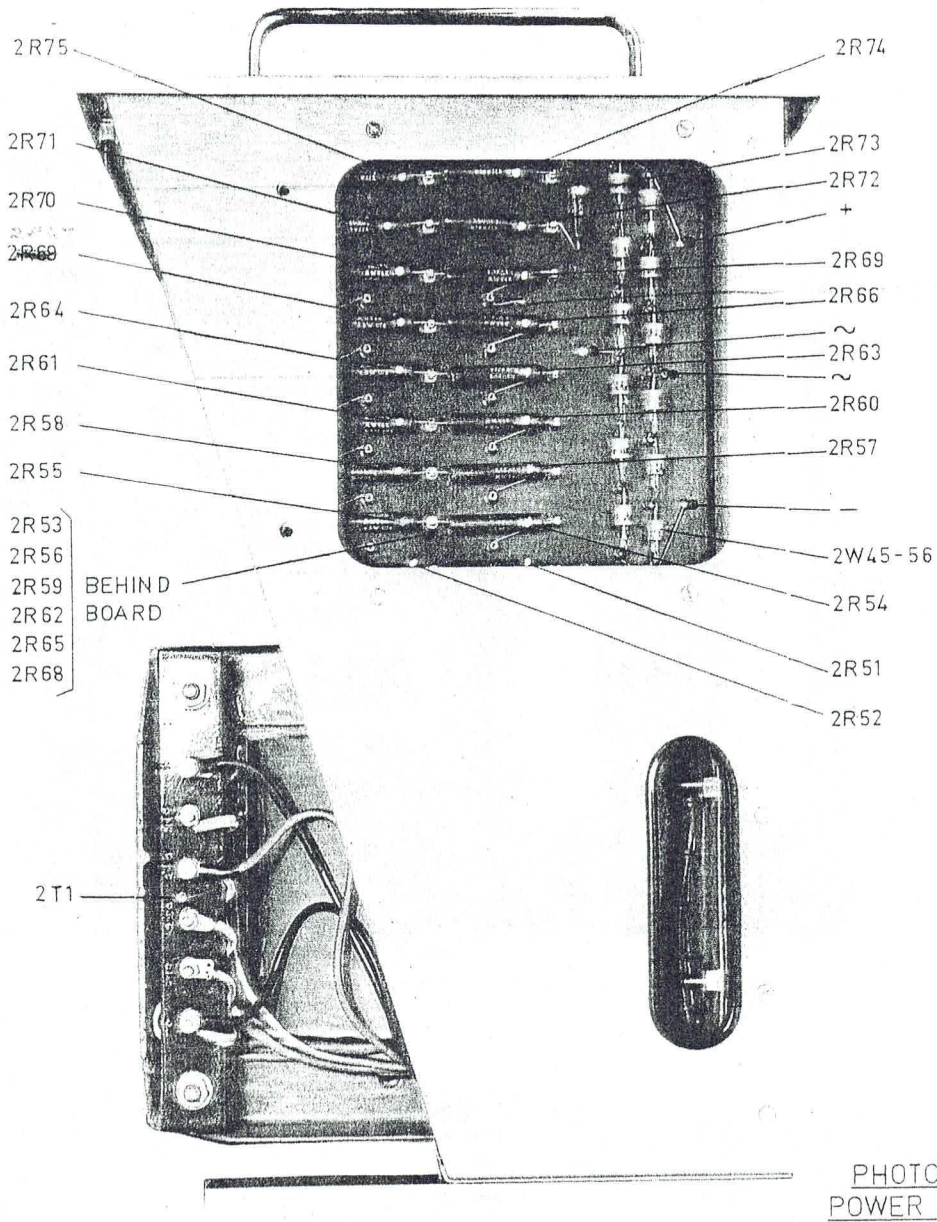
PHOTOGRAPH Nº 9
P.A. ASSEMBLY
GRID CIRCUITS



PHOTOGRAPH Nº 10
POWER SUPPLY UNIT
TOP VIEW



PHOTOGRAPH Nº 11
POWER SUPPLY UNIT
RIGHT HAND VIEW



PHOTOGRAPH Nº 12
POWER SUPPLY UNIT
LEFT HAND VIEW

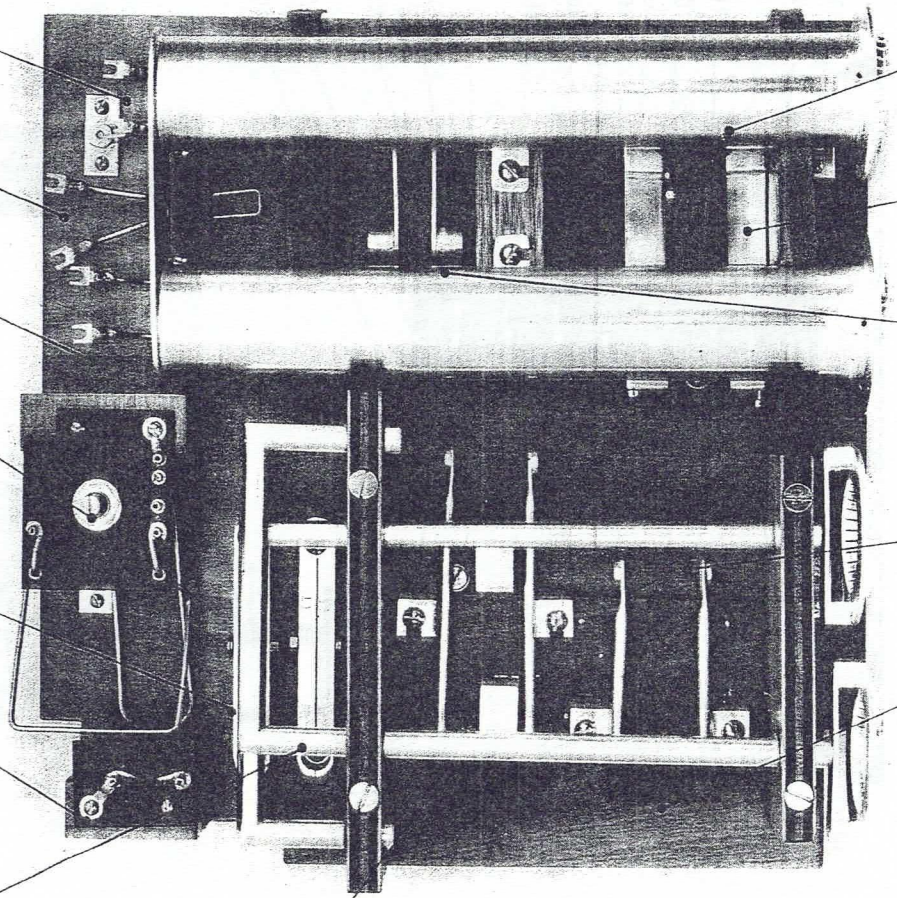
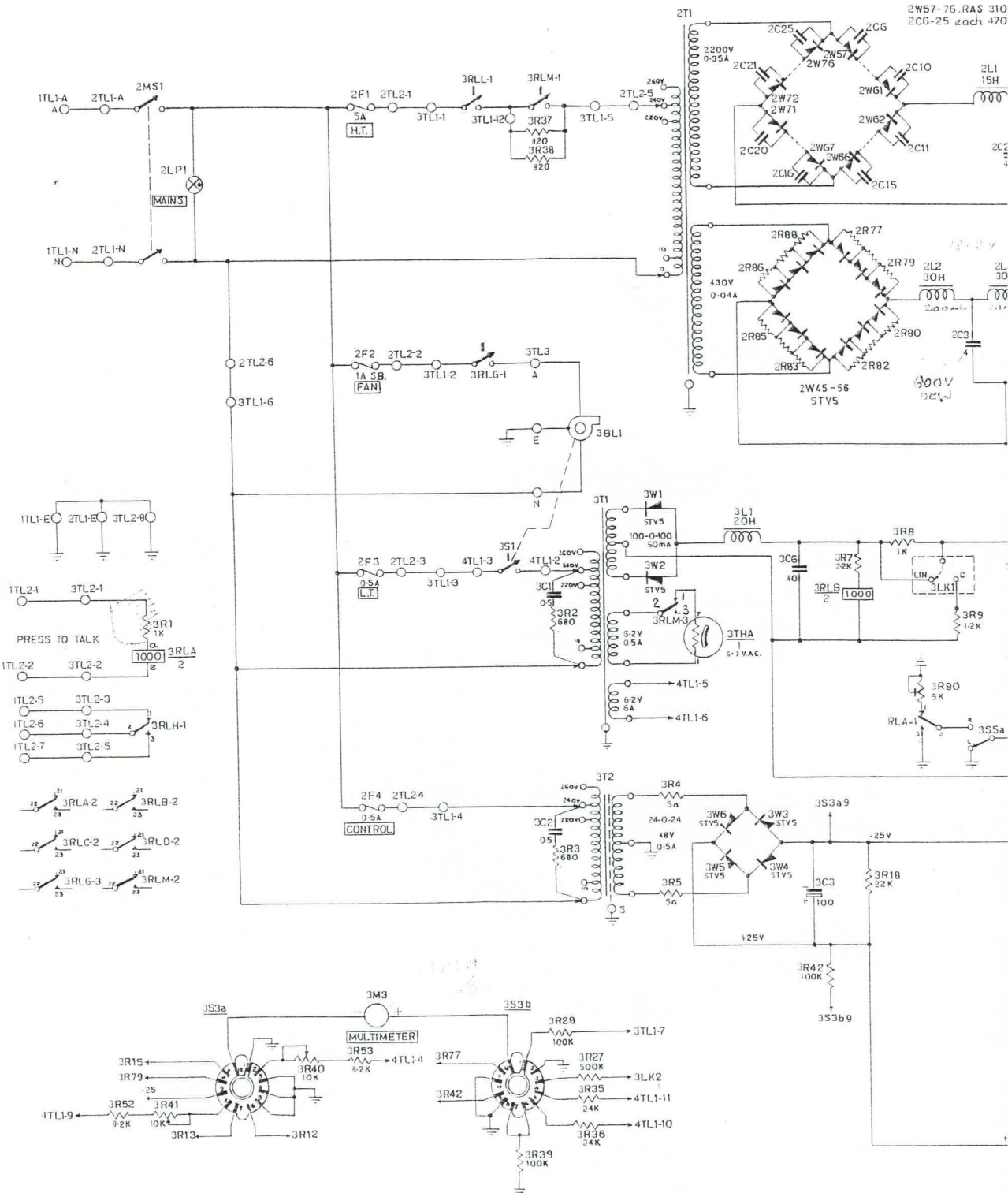


PHOTO Nº 13

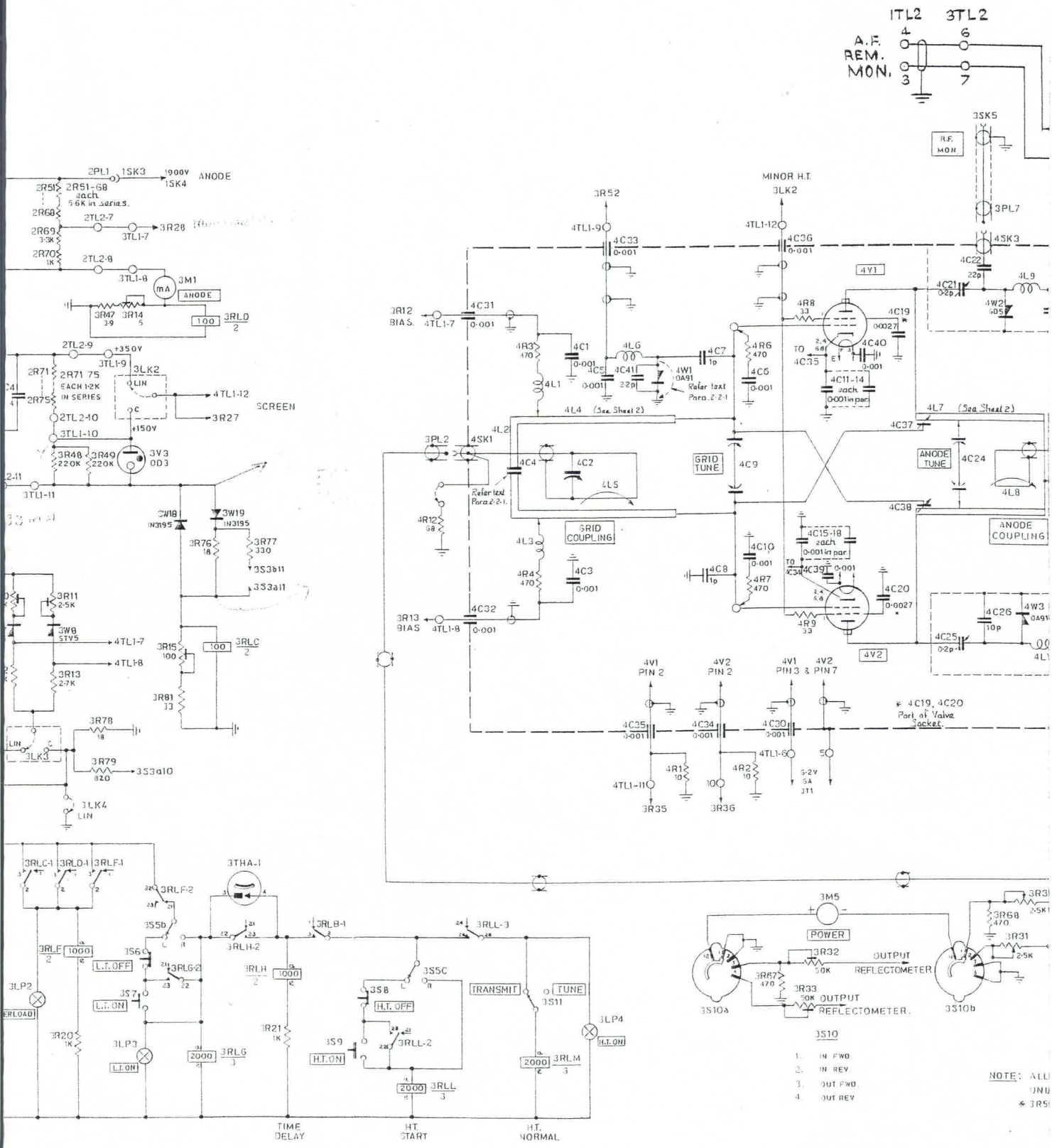
SHADOW BOARD CONTAINING GRID AND ANODE TUNING PARTS

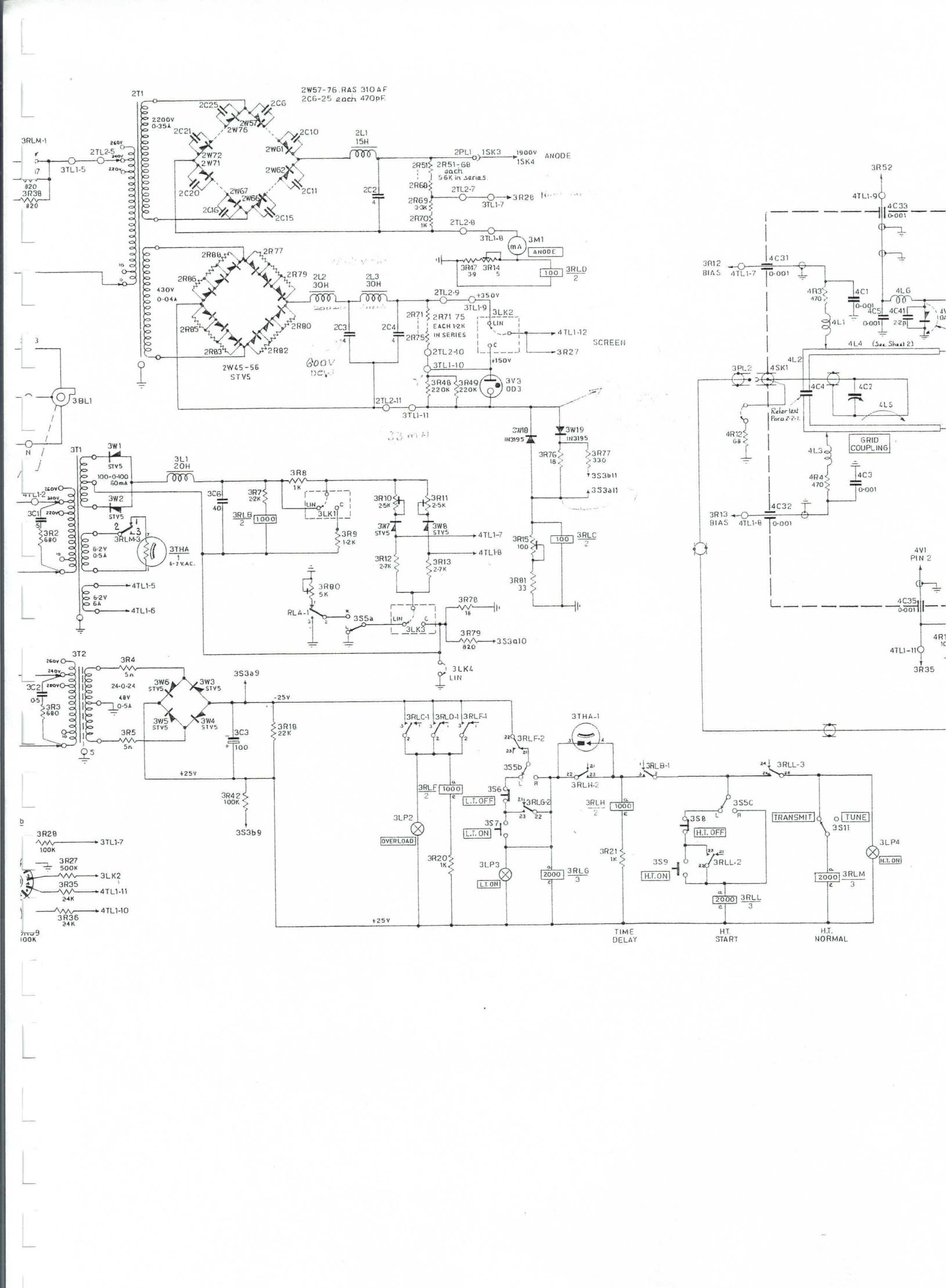


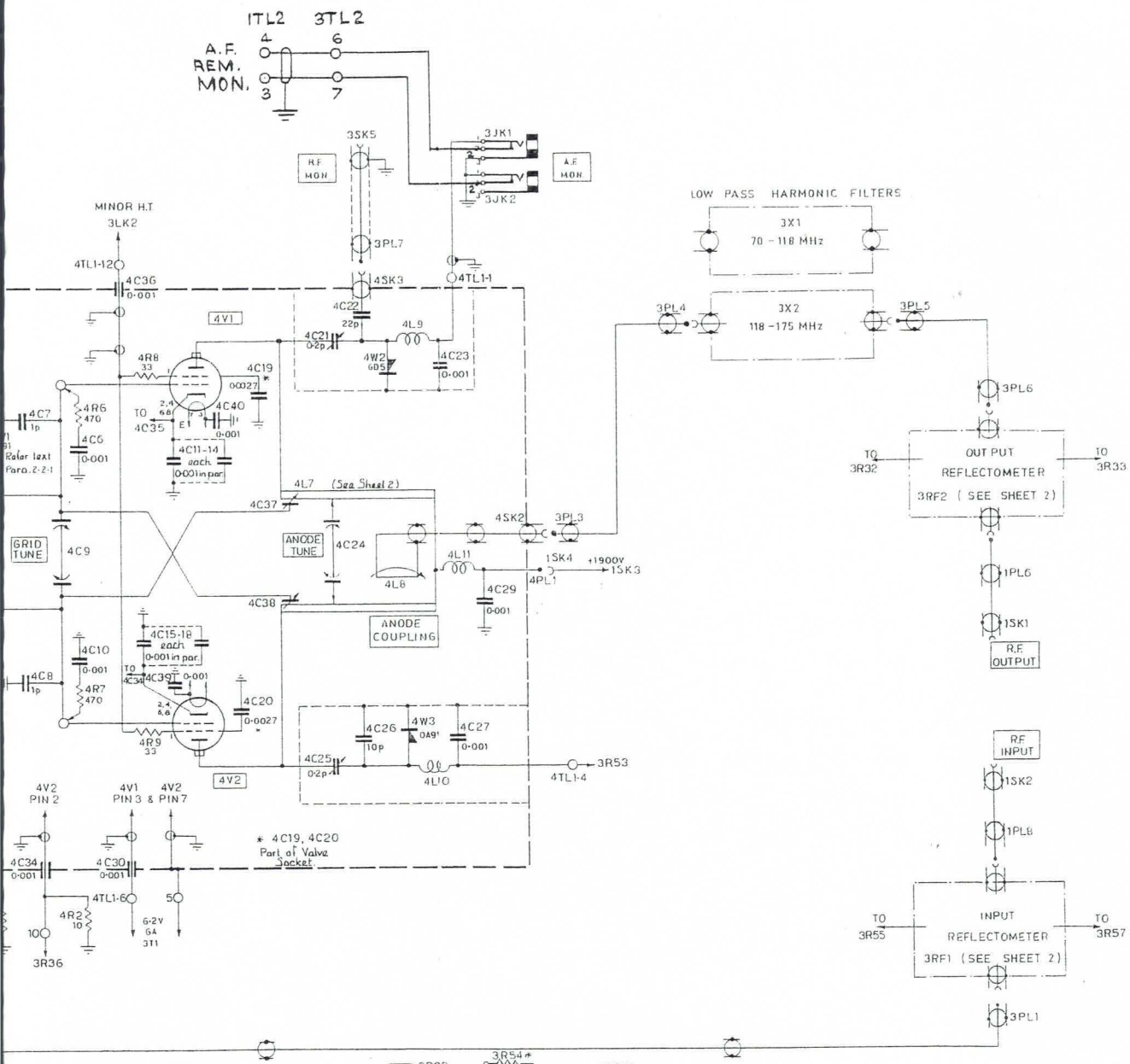
3S3a & 3S3b

SWITCH LEGEND

1.	H.T.	2500 V
2.	ApK	2500 V
3.	MINOR HT	500 V
4.	IK1	250 mA
5.	IK2	250 mA
6.	G1	100 V
7.	G2	
8.	GpK	
9.	CONT.	
10.	GRID	50 mA
11.	SCREEN	−25 mA


1TL2 3TL2
4 6
A.F. REM. MON.
3 7
3SK5
R.F. MON.
3PL7
4SK3
MINOR H.T.
3LK2
3R52
4TL1-9
4C33 0·001
4TL1-12
4C36 0·001
4V1
4C22 22p
4L9
4C21 0·2p
4W2 6D5
3R12 BIAS
4TL1-7
4C31 0·001
4R8 33
4C19 0·0027 *
4R3 470
4C1 0·001
4L6
4C7 1p
4R6 470
4C5 0·001
4C41 22p
4W1 OA91
Refer text Para. 2·2·1
4L1
4C40 0·001
TO 4C35
4C11-14 each 0·001 in par.
4L4 (See Sheet 2)
4L7 (See Sheet 2)
4C37
3PL2
4SK1
4L2
4C4
4C2
4L5
GRID TUNE
4C9
ANODE TUNE
4C24
4L8
4C38
Refer text Para. 2·2·1.
4R12 68
GRID COUPLING
4L3
4R4 470
4C3 0·001
4C10 0·001
4C8 1p
4R7 470
4C15-18 each 0·001 in par.
TO 4C34
4C39 0·001
4C20 0·0027
4R9 33
ANODE COUPLING
4C26 10p
4W3 OA91
4C25 0·2p
4V2
3R13 BIAS
4TL1-8
4C32 0·001
4V1 PIN 2
4V2 PIN 2
4V1 PIN 3 & PIN 7
* 4C19, 4C20 Part of Valve Socket.
4C35 0·001
4C34 0·001
4C30 0·001
4TL1-6
5
4R1 10
4R2 10
6·2V 3A 3T1
4TL1-11
3R35
3R36
2PL1 1SK3 1900V 1SK4 ANODE
2R51 2R51-68 each 5·6K in Series.
2R68
2R69 3·3K
2R70 1K
2TL2-7
3TL1-7
3R28
2TL2-8
3TL1-8
3M1 mA ANODE
3R47 3·9
3R14 5
100
3RLD 2
2TL2-9
+350V
3TL1-9
2R71 2R71 75 EACH 1·2K IN SERIES
2R75
3LK2 LIN
4TL1-12
SCREEN
3R27
2TL2-10
+150V
3TL1-10
3R48 220K
3R49 220K
3V3 0D3
3TL1-11
3W18 IN3195
3W19 IN3195
3R76 18
3R77 330
3S3b11
3S3a11
3R11 2·5K
3W8 STV5
4TL1-7
4TL1-8
3R13 2·7K
3R15 100
100
3RLC 2
3R81 33
3R78 18
LIN
3LK3
3R79 820
3S3a10
3LK4 LIN
3RLC-1 3RLD-1 3RLF-1
3THA-1
3RLF-2
3S5b
3RLH-2
3RLB-1
3RLL-3
3RLF 2
1000
3S6
L.T. OFF
3RL6-2
3RLH 2
1000
3S5C
3LP2
ERLOAD
3S7
L.T. ON
3S8
H.T. OFF
TRANSMIT
TUNE
3S11
3LP4
H.T. ON
3R20 1K
3LP3
L.T. ON
3R21 1K
3S9
H.T. ON
3RLL-2
2000
3RLG 3
2000
3RLL 3
2000
3RLM 3
TIME DELAY
H.T. START
H.T. NORMAL
3M5
POWER
3R32 50K
OUTPUT REFLECTOMETER
3R67 470
3R33 50K OUTPUT REFLECTOMETER.
3S10a
3S10b
3R68 470
3R31 2·5K
3S10
1. IN FWD.
2. IN REV.
3. OUT FWD.
4. OUT REV.
NOTE: ALL
UNL
* 3R5


2W57-76. RAS 310 AF
2C6-25 each 470pF
2T1
2200V 0·35A
2W45-56 STV5
430V 0·04A
800V DCW
3T1
100-0-100 60mA
6·2V 0·5A
6·7V.A.C.
6·2V 6A
3T2
24-0-24 48V 0·5A
5A
3RLM-1
3RLM-3
3THA
3THA-1
3BL1
2L1 15H
2L2 30H
2L3 30H
3L1 20H
2R51-68 each 56K in Series.
2R71 75 EACH 1·2K IN SERIES
3R38 820
3R28 100K
3R27 500K
3R35 24K
3R36 24K
3R42 100K
3R52
4C33 0·001
4C31 0·001
4C1 0·001
4C5 0·001
4C41 22p
4C32 0·001
4C35 0·001
4L1
4L2
4L3
4L4 (See Sheet 2)
4L5
4R3 470
4R4 470
4R12 68
3R12 BIAS
3R13 BIAS
GRID COUPLING
4V1 PIN 2
3R35
3R47 3·9
3R14 5
3R48 220K
3R49 220K
3V3 OD3
3M1 mA ANODE
1SK3 1900V 1SK4 ANODE
3LK1 LIN
3LK2 LIN
3LK3 LIN
3LK4 LIN
3R7 22K
3R8 1K
3R9 1·2K
3R10 2·5K
3R11 2·5K
3R12 2·7K
3R13 2·7K
3R15 100
3R18 22K
3R75 18
3R76 18
3R77 330
3R78 18
3R79 820
3R80 5K
3R81 33
3W1 STV5
3W2 STV5
3W3 STV5
3W4 STV5
3W5 STV5
3W6 STV5
3W7 STV5
3W8 STV5
3W10 IN3195
3W19 IN3195
RL4-1
3S5a
3S5b
3S6
3S7
3S8
3S9
3S10
3S11
3S3a9
3S3a10
3S3a11
3S3b9
3S3b11
3RLB-1
3RLC-1
3RLD-1
3RLF-1
3RLF-2
3RLG-2
3RLH-2
3RLL-2
3RLL-3
L.T. OFF
L.T. ON
L.T. OH
OVERLOAD
H.T. OFF
H.T. ON
TRANSMIT
TUNE
3LP2
3LP3
3LP4
3R20 1K
3R21 1K
3C3 100
TIME DELAY
H.T. START
H.T. NORMAL
SCREEN
ANODE
+350V
+150V
-25V
+25V
Refer text Para 2-2-1.



3S10

1. IN FWD.
2. IN REV.
3. OUT FWD.
4. OUT REV.

NOTE: ALL VALUES ARE IN OHMS & μF UNLESS OTHERWISE STATED.
* 3R54-57 MAY BE SELECTED ON TEST.

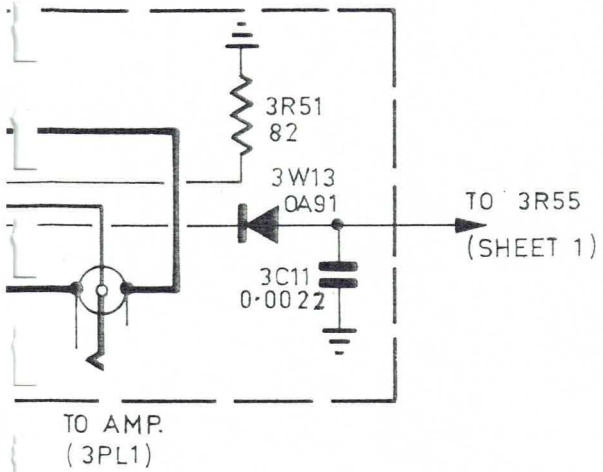
ISSUE	MODIFICATION	DATE
2	VARIOUS	15-6-67
1	ORIGINAL	23-1-67

COMMONWEALTH ELECTRONICS P/L
60 CHARD ROAD, BROOKVALE N.S.W.

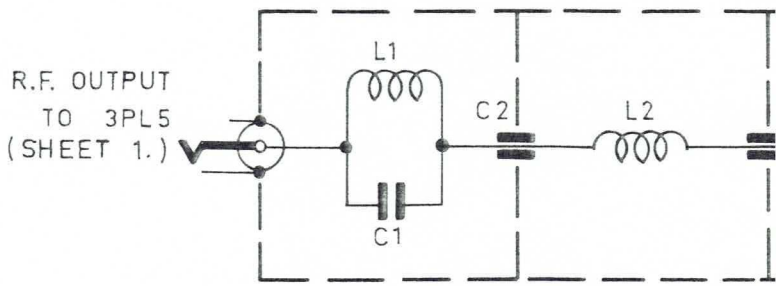
CIRCUIT SCHEMATIC
R.F. AMPLIFIER
TYPE AM17A
IDENT. Nº Y5/1351

DRAWN	CHECKED	APP'D.	DRG. Nº	SHT. 1 OF 2 SHTS
E. COOPER 26-5-66			26-55	

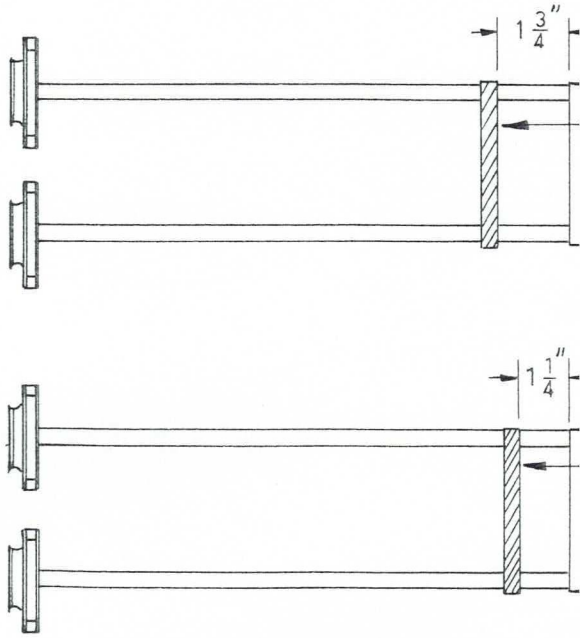
ASSEMBLY



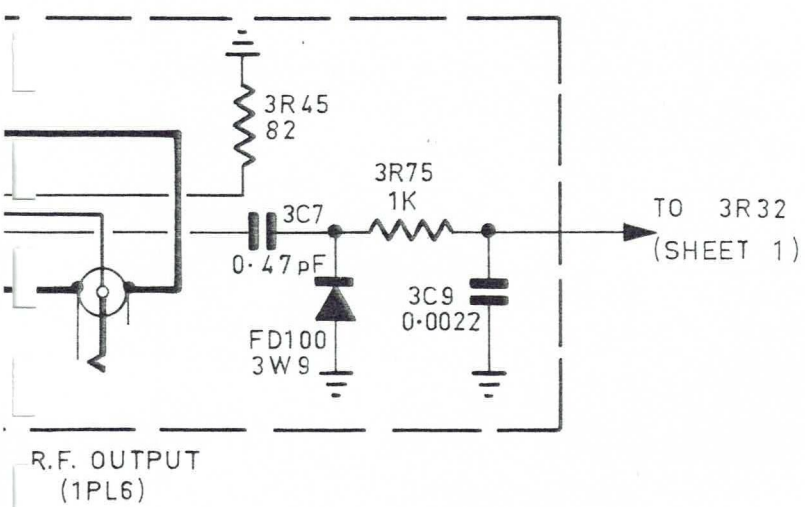
L. P. FILTER



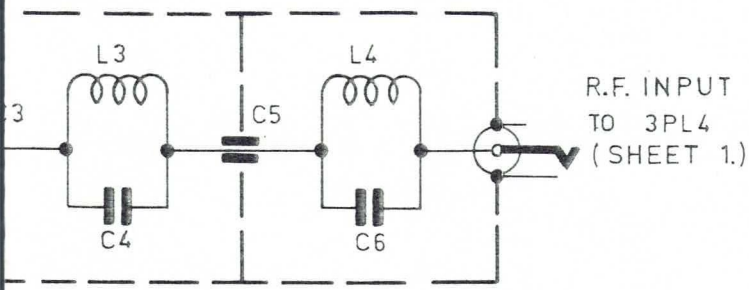
ANODE TUNING CIRCUIT SHORTI



SSEMBLY



ASSEMBLY



CCT. Nº	3X1 70 – 118 MHz	3X2 118 – 175 MHz
C1	26·2 pF	17·1 pF
C2	39·2 pF	25·6 pF
C3	45·8 pF	29·9 pF
C4	3·5 pF	2·3 pF
C5	36 pF	23·5 pF
C6	26·2 pF	17·1 pF

NOTE: THESE ARE NOMINAL CAPACITANCE VALUES.

NG BAR SETTINGS

SHORTING BAR IN POSITION SHOWN — 150-175 MHz.

SHORTING BAR REMOVED — 118 -150 MHz.

SHORTING BAR IN POSITION SHOWN — 90 – 118 MHz.

SHORTING BAR REMOVED — 70 – 90 MHz.

ISSUE	MODIFICATION	DATE

COMMONWEALTH ELECTRONICS PTY. LTD.
60 CHARD ROAD, BROOKVALE N.S.W.

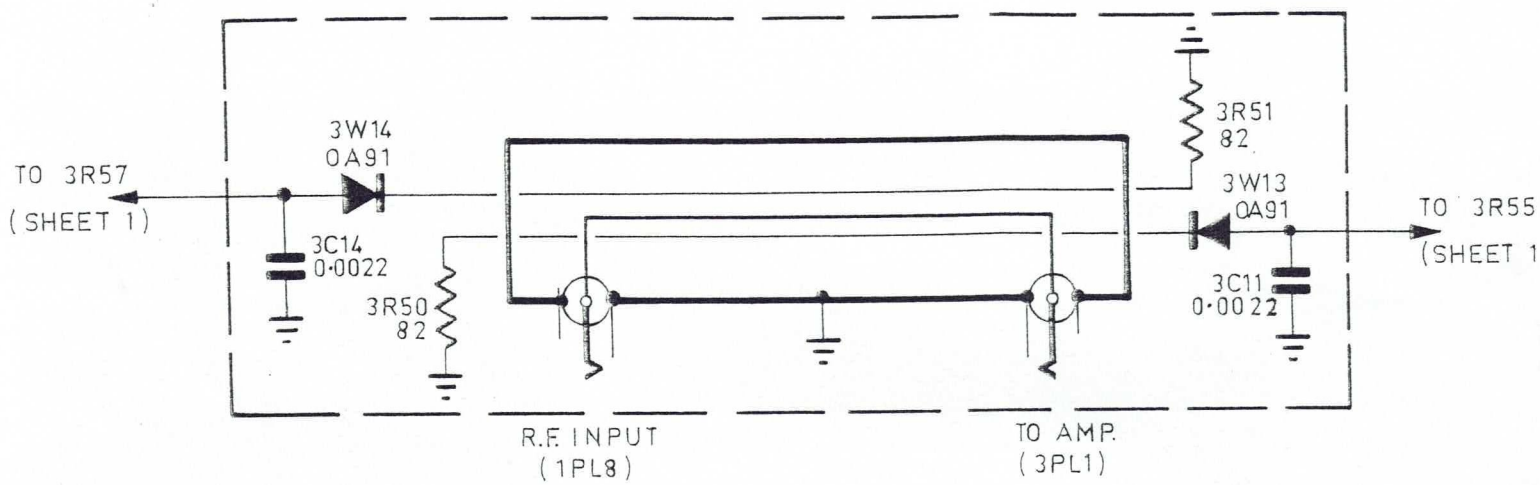
SUNDRY DETAILS
R.F. AMPLIFIER TYPE AM17A

IDENT. Nº Y5 /1351

DRAWN	CHECKED	APP'D.	DRG. Nº
24/8/67		4/1/68.	26-55 SHT. 2 OF 2

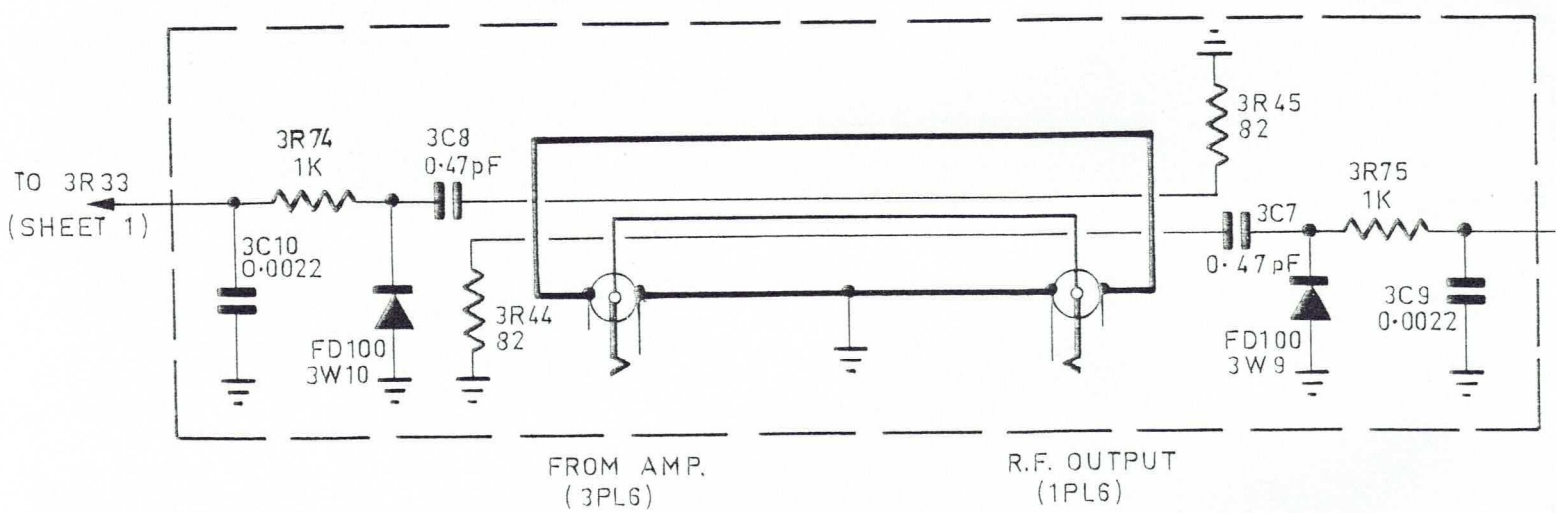
3RF1

INPUT REFLECTOMETER ASSEMBLY

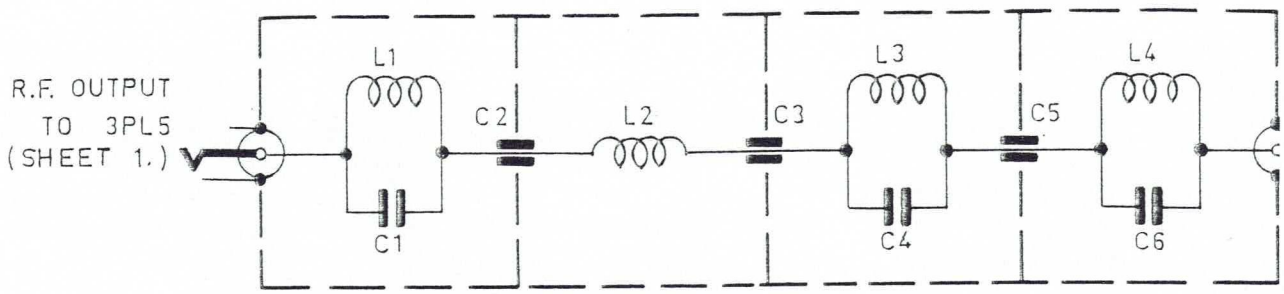


3RF2

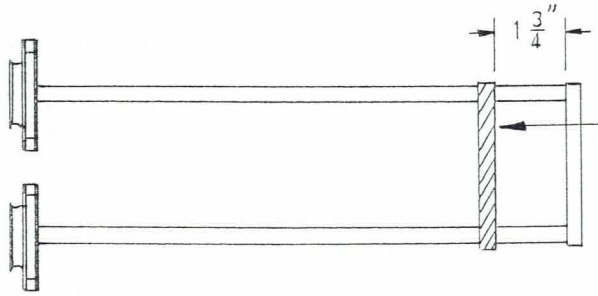
OUTPUT REFLECTOMETER ASSEMBLY



L.P. FILTER ASSEMBLY



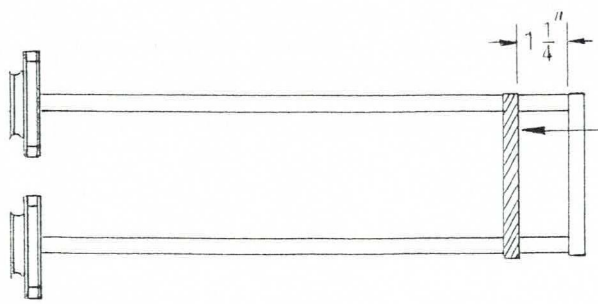
ANODE TUNING CIRCUIT SHORTING BAR SETTINGS



SHORTING BAR IN POSITION SHOWN — 150-175 MHz.

SHORTING BAR REMOVED — 118 -150 MHz

TO 3R32
(SHEET 1)



SHORTING BAR IN POSITION SHOWN — 90 -118 MHz.

SHORTING BAR REMOVED — 70 - 90 MHz.