

RESTRICTED.

Instruction Manual

R.A.A.F.

UNIT POWER SUPPLY

TYPE Y1

(Indent No. Y10D/70450)

Bland Radio Limited,
Coromandel Place,
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RESTRICTED.

R.A.A.F. UNIT POWER SUPPLY---TYPE YI.

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INSTRUCTIONAL MANUAL—POWER SUPPLY TYPE Y1.

INTRODUCTION.

1. Power Supply Unit Type Y1 has been specifically designed to enable the Frequency Meter Type SCR211 to be operated from the 230-volt or 115-volt A.C. supply mains in place of the battery source.

2. The power supply delivers a regulated D.C. voltage of 135 volts at 20 m.a., and an A.C. heater supply of 6.3 volts.

3. In order that satisfactory calibration of the Frequency Meter Type SCR211 is maintained, it is essential that the H.T. supply remain constant. Voltage regulation is accomplished by means of a 6V6G regulator valve, which ensures that the output H.T. voltage is constant irrespective of mains fluctuation.

4. Until such time as a R.A.A.F. Publication is issued covering the SCR211 equipment and the Power Supply Type Y1, this Instructional Manual is to be read in conjunction with Technical Order No. 08-10-100, which deals specifically with the Frequency Meter under battery operated conditions.

CHAPTER 1

SPECIFICATIONS AND TECHNICAL DETAILS

Chapter 1.

SPECIFICATIONS AND TECHNICAL DETAILS.

MECHANICAL CONSTRUCTION.

1. The unit is housed in a metal case measuring $9\frac{1}{4}$ in. x $6\frac{3}{4}$ in. x $6\frac{3}{4}$ in. Its approximate weight complete with connecting cables and power cord is 20 lbs.
2. The panel and chassis assembly may be readily removed for servicing or adjustment by releasing the catches on either side of the case and then withdrawing the chassis. See Figs. 1 and 2.
3. All components are solidly mounted and have been so placed as to facilitate servicing should this become necessary.
4. External equipment used with this unit is as follows:—
 - (1) 3-wire shielded cable fitted at one end with 3-pin plug type 11R5585 and at the other with 4-pin plug type D118 which connects to:—
 - (2) Service Frequency Meter Type SCR211.
5. The plugs fitted to either end of the shielded connecting cable are provided with knurled lock nuts which should be screwed up tight, after the plugs have been inserted, thereby locking the plugs into position.

DESIGN.

6. The valves used in this unit are as under:—

Circuit Symbol.	Type No.	Description.	Function.
V1	5Y3G	Rectifier	Full Wave Rectifier.
V2	6V6G	Beam Pentode	Regulator Valve.
V3	6J7G	R.F. Pentode	Control Valve.

7. The 5Y3G valve is used in its normal application as a full wave rectifier. The 6V6G valve is used as a Regulator Valve and in this application the plate and screen grid are connected together. The 6J7G is used as the Control Valve and a fixed bias of 3 volts is provided by means of two 1.5 volt batteries mounted underneath the chassis. To enable correct control to be maintained, the variable resistor R5 (see Fig. 1 and 3) must be adjusted according to the load placed on this unit.

8. In addition to the circuit diagram (Fig. 3), which is included in the Instruction Manual, an etched plate showing the circuit diagram is rivetted to the back of the chassis box (inside) and can be readily referred to after removal of the chassis.

ELECTRICAL CHARACTERISTICS.

9. The power input from the standard 230 volt 50 cycle A.C. Mains supply is 40 watts.
10. The rectified D.C. voltage supplied at a current drain of 20 M.A. is 135 volts.
11. Provision is also made for supplying external equipment with a heater supply of 6.3 volts at 1.0 amp.
12. By means of suitable tappings provided on the transformer primary, this equipment may be operated from either 115 volt or 200-260 Volt 50 Cycle mains supply.

THEORY OF OPERATION.

RECTIFIER VALVE.

13. In its application in this unit the Full Wave Vacuum Type Rectifier Valve 5Y3G (see VI, Fig. 3) operates in a conventional manner to rectify the H.T. supplied by the Transformer T1.

14. The rectified H.T. is filtered by means of Condenser C1, Choke CH1, and Condenser C2 and is then fed to the anode of the Regulator Valve V2.

REGULATOR VALVE.

15. The application of the 6V6G Valve (V2) in this unit differs from its usual application as a Beam Power Tetrode.

16. It will be noted that, in this circuit (see Fig. 3) the Screen Grid and Anode are connected together and the valve is operated as a Triode.

17. In this connection V2 is capable of passing current up to approx. 80 M.A.

18. The Control Grid of V2 is directly connected to the anode of the Control Valve V3.

19. The bias for the Regulator Valve (V2) is obtained from the voltage drop across the Resistor R1 (Fig. 3) which is also in series with the H.T. supply of the Control Valve V3.

20. Under these conditions any variation in the voltage drop across Resistor R1 will effect corresponding but increased variations in the current passed by the Regulator Valve V2.

21. As the Anode-Cathode circuit of the Regulator Valve (V2) is connected in series with the "load" circuit, this valve therefore functions as an automatically variable series resistor.

CONTROL VALVE.

22. The 6J7G (V3) is a High Gain Voltage Amplifier Valve and is used in this unit in a conventional manner.

23. It is called the Control Valve since, by means of small voltage fluctuations in the Grid Circuit, which are amplified in its Anode Circuit, this valve controls the voltage passed by V2.

24. It will be seen from the circuit diagram (Fig. 3) that a fixed bias of +3 volts is applied to the Cathode Circuit of V3.

25. The Screen Grid is supplied from the resistor network R3, R2.

26. The Control Grid is connected to Variable Resistor R5, which is in series with R4 across the H.T. Supply.

27. It will be seen that the voltage which appears at the Grid of V3 is the difference between the fixed negative bias of 3 volts and the positive voltage taken from the resistor network by means of the Variable Resistor R5, which is termed the Output Control.

28. As explained in paras. 19-21, the Anode of the Control Valve V3 is fed through Resistor R1, which is also the bias resistor for V2.

29. Under these conditions any small change in the output voltage of the power supply causes a change in the grid bias of the Control Valve V3 and thereby a corresponding but amplified change in the anode current of this valve.

30. Any change in the anode current of V3 causes a variation in the voltage drop across Resistor R1, and as this is also in the Grid Circuit of V2, this has the effect of regulating the amount of current passed by V2 and thereby effectively controlling the output voltage.

31. The time lag in the action of this system is negligible and the circuit constants have been so chosen that the output voltage can be held within a fraction of a volt over a wide range of supply voltages.

OUTPUT CONTROL.

32. The Output Control (R5) is used to adjust the bias on the Control Grid of the valve V3 (Control Valve). See paras. 26, 27, and 29.

33. The Output Control (R5) may also be used as an Output Voltage Control setting the value of the regulated voltage within the operating limits of the unit.

34. This control is located on the chassis (see Fig. 1 and 5) between the 5Y3G Rectifier Valve and the 6V6G Regulator Valve.

35. After the unit has been connected to the Service Frequency Meter Type SCR211 by means of the connecting cable supplied (see Fig. 4) the output voltage should be adjusted by means of the Output Control.

36. The voltage reading should be taken between the junction of R3 and R4 (see Fig. 5) and earth.

37. It will be necessary to remove the chassis from the cover before making this adjustment, but once this has been made no further adjustment will be required should the mains supply fluctuate around its mean voltage.

POWER SUPPLY.

38. As mentioned in para. 7, the 5Y3G Valve is used as a normal full wave rectifier.

39. The power transformer T1 is tapped at 115, 220, 240 and 260 volts to allow for operation on any of these input voltages.

40. Three heater windings are provided, viz., 5 volts for the 5Y3G, 6.3 volts for the 6V6G, and a 6.3 volt winding for the 6J7G. This latter filament winding also supplies both the Pilot Lamp and the external heater requirements.

41. A 2-amp. fuse is inserted in series with one side of the power transformer, and a spare fuse is clamped on the top of the chassis.

42. The filter is of the condenser input type, the Filter Condensers C1 and C2 being each of 8 mfd. capacity, the Filter Choke CH1 being rated at 15 Henries 50 Milliamps.

43. It is important to note that the 6V6G Cathode is 135 volts positive above earth and cannot have its heater earthed owing to the possibility of internal leakage occurring in the 6V6G. (See Fig. 3.) Such leakage, if it did occur, would prevent this unit functioning correctly and this is the reason a separate winding has been provided for the Control Valve, Pilot Lamp and external heater voltage.

CONTROLS.

44. The Output Control (R5) consists of a 5000 Ohm. semi-fixed potentiometer.

45. S1 is a D.P.S.T. toggle switch and is used to switch off the power supply. (See Fig. 1.)

CHAPTER 2

INSTALLATION, OPERATION AND SERVICING

Chapter 2.

INSTALLATION, OPERATION AND SERVICING.

INSTALLATION.

1. Remove the chassis from the case and check the valves. See that they are firmly mounted in their sockets and that the grid clip of the 6J7G is tight. Check that pilot lamp is tightly screwed home.

Check to see whether the 2—1.5V Batteries are mounted in "BATTERY" compartment. Should they not be in this compartment, remove cardboard cartons from batteries (if necessary), insert batteries in P.V.C. sleeving supplied, and then insert in battery compartment, observing correct polarity as marked on outside of lid.

2. Check main voltage and adjust the transformer to the appropriate tapping.

3. Connect the unit to the equipment by means of the cable supplied (See Fig. 4.) The larger plug (3 pin) is connected to socket provided on the front panel of this unit (see Fig. 2) and the knurled nut is screwed up firmly. This will securely lock the plug to the socket.

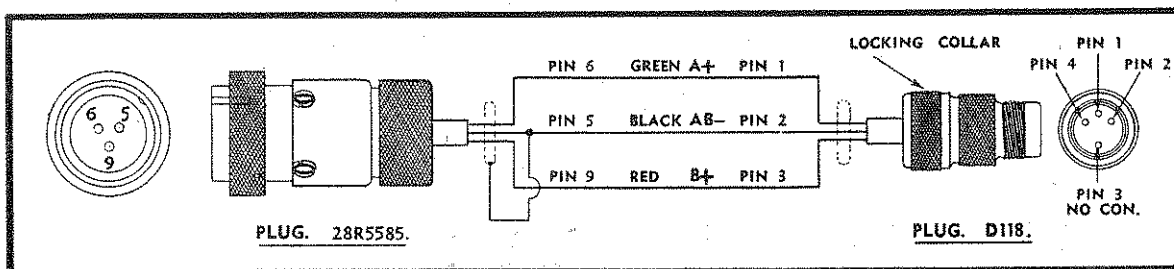


Fig. 4.—SHIELDED METAL BRAIDED OUTPUT CONNECTING CABLE AND PLUG CONNECTIONS.

4. The smaller plug (4 pin) is fitted to the socket provided on the Service Frequency Meter. It is important to note that the back collar on this plug **must be slacked off before** the plug is screwed into the socket provided as **failure to do this will cause the cable to revolve with the plug, thereby damaging the leads.** After screwing up the plug, firmly tighten up the back collar nut.

5. Connect to the power supply by means of the 3-pin plug and cable supplied.

INITIAL TESTS.

6. Depress power switch S1. This switch is marked "PWR" and is mounted on the front panel. (See Fig. 2.)

7. The pilot lamp on the bottom left hand corner of the front panel should light up and valve heaters should heat up.

8. If pilot lamp does not light up switch off the power and check fuse, replacing, if necessary, with spare fuse mounted on chassis.

OPERATING INSTRUCTIONS.

9. Having proceeded as set out above in paras. 1-8, the Frequency Meter should now be in an operative condition.

10. With the Frequency Meter switched on, the output voltage should now be adjusted to 135 volts. (See Chap. 1, Paras. 34-36.)

11. Connect the positive lead from a High Resistance Voltmeter to the junction of Resistors R3 and R4 (see Fig 5) and the negative lead to the earth.

12. Adjust the output control R5 (see Figs. 1 and 5) until the output voltage reads 135 volts, by inserting a screwdriver in the slotted control and turning either clockwise or anti-clockwise as required.

13. When this is satisfactorily adjusted, replace the unit in the case. It should not be necessary to make any further adjustment to this control.

SERVICING AND MAINTENANCE.

14. Under normal conditions of operation the unit should operate over long periods without requiring any service or maintenance. Should any trouble be experienced, this may be readily diagnosed by reference to the servicing notes below and to the voltage charts in Appendix A.

NO VOLTAGE.

15. Check power fuse on front panel to see that it is making good contact and is not open circuited. If the fuse is blown check to see that the transformer is connected to the correct voltage tapping, and then with S1 off, check C1 and C2, replacing if either of these show a zero or very low resistance reading. For this check, the positive lead of the ohmmeter should be connected to the Choke (CH1) terminals and the negative lead to earth.

16. Check voltages as set out in Appendix A. Check V1, V2 and V3, replacing if necessary.

HIGH VOLTAGE.

17. Should the output voltage exceed 135 volts after having carried out the instructions as set out in Chap. 2, paras. 10-13, this would indicate that the Control Valve is not functioning.

18. Check voltages on V3 as set out in Appendix A, replacing V3 if necessary.

19. Should the bias voltage on V3 be less than 2.5 volts, replace the bias batteries in the battery compartment, making certain that these are connected as marked on the cover.

20. When replacing these batteries, first of all remove the cardboard containers and then insert the batteries in the P.V.C. sleeving supplied with the unit. This sleeving MUST be used to prevent the batteries shorting to the chassis.

21. Should voltage still remain in excess of 135 volts, check R1, R5 and R4, in that order replacing any faulty resistors and then reset the output control.

LOW VOLTAGE.

22. If, after proceeding as set out in paras. 10-13, the voltage cannot be adjusted to 135 volts, this may indicate that either V1 or V2 have lost their emission.

23. Should the anode voltage on V2 agree with that shown in Appendix A replace V2.

24. Should the plate voltage on V2 be lower than that shown in Appendix A replace V1, and if this does not rectify the fault check C1 and C2, replacing if necessary.

25. Check voltages on V1 as in Appendix A. Check R1, R4, R5, and R2.

OUTPUT VOLTAGE FLUCTUATES.

26. Should the output voltage fluctuate this would tend to indicate that the Control Valve V3 has lost control.

27. Check voltages as set out in Appendix A, replacing V3 if necessary or bias batteries if these show less than 2.5 volts. (Refer Para. 20.)

28. Check R5, R1 and R4.

APPENDICES

APPENDIX A.

VOLTAGE TESTS.

1. The voltages taken below were taken when the primary input voltage was adjusted to 240 volts. D.C. measurements were taken with a Standard 1000 Ohms per volt meter.

2. Reference to the circuit diagram (Fig. 3) will show the numbered positions of all valve elements.

Circuit Ref.	Type No.	Purpose.	Element.	Pin	Meter Range.	D.C. Volts to Earth.	Remarks.
V1	5Y3G	Rectifier	Anode 1 Anode 2 Heater/Heater		750V (AC) 750V " 8V "		260AC to E. 260AC to E. 5.0V AC
V2	6V6G	Regulator Valve	Anode Cathode Heater/Heater		500V 250V 8V (AC)	325V DC 135V DC	6.3V AC
V3	6J7G	Control Valve	Anode SC Cathode Heater/Heater		250 250 10V 8V (AC)	27V DC 30V DC 3V	6.3V AC
Ext Fil					8V (AC)		6.2V AC
T1		Power Transformer	Secondary		750V (AC)	Anode 1 Anode 2	275V AC 275V AC
CHI		Filter Choke			10V		Voltage Drop across Choke 8V.

APPENDIX B.

Transformer Connections.

POWER TRANSFORMER.

Colour Code.

PRIMARY.	Common	White
	115 Volt	Green
	220 Volt	Yellow
	240 Volt	Orange
	260 Volt	Maroon
SECONDARY (H.T.).	275 Volt	Red
	Centre Tap	Earth
	275 Volt	Red
SECONDARY (HEATER).		
6V6G.	6.3V — 6.3V	Blue
6J7G.	6.3V — 6.3V	Black & Earth
5Y3G.	5.0V — 5.0V	Grey
STATIC SHIELD.		Earth

APPENDIX C.

Voltage Analysis Chart.

1. The following chart sets out the Controlled D.C. and A.C. Voltages obtained at various A.C. input voltages.

2. These readings were taken with the Power Supply Unit adjusted at 240 Volts A.C. input and with the mains connected to the 240V. Tapping.

3. Voltage readings were taken with the following types of meters which have all been checked against standard meters and proved to be accurate.

4. **A.C. INPUT VOLTAGES.**

These were checked with an O-500V. A.C. Dynamometer Type Meter (large scale).

5. **A.C. HEATER VOLTAGES.**

For these an O-10V. A.C. Dynamometer Type (large scale) meter was used.

6. **UNCONTROLLED AND CONTROLLED D.C. VOLTAGES.**

These readings were taken with a 1000 Ohms per volt meter.

VOLTAGE ANALYSIS CHART.

Primary.		D.C. Voltage.		Heater Voltages.				Remarks.
Volts.	Amps.	Uncon- trolled.	Con- trolled.	6J7G.	External 6.3V.	6V6G.	5Y3G.	
190	.150	240	131	4.95	4.85	4.8	4.0	Load Constant at 20 M.A. on all tests.
200	.155	260	133	5.2	5.1	5.05	4.15	
210	.160	275	135	5.4	5.4	5.3	4.4	
220	.165	290	135	5.8	5.7	5.6	4.75	
230	.170	310	135	6.0	5.95	5.8	4.95	
240	.175	325	135	6.3	6.2	6.1	5.1	
250	.180	340	135	6.5	6.4	6.3	5.4	
260	.185	360	135	6.8	6.7	6.5	5.6	
270	.192	380	135	7.05	7.0	6.9	5.8	
280	.198	395	135	7.4	7.3	7.15	6.0	
290	.203	410	133.5	7.6	7.5	7.3	6.25	
300	.210	435	133	8.0	7.85	7.65	6.55	

7. **TEST VOLTAGES.**

5Y3G.	Plate to Earth.	260V A.C.
	Plate to Earth.	260V A.C.
6J7G.	Screen to Earth.	30V D.C.
	Plate to Earth.	27V D.C.
	Cathode to Earth.	3V positive obtained from two 1.5V Batteries.

These readings were taken with a 1000 Ohm per volt meter, the A.C. readings being taken on the A.C. Scale through a rectifier.

N.B.—The load of the meter will cause variations in the output voltage of the unit.

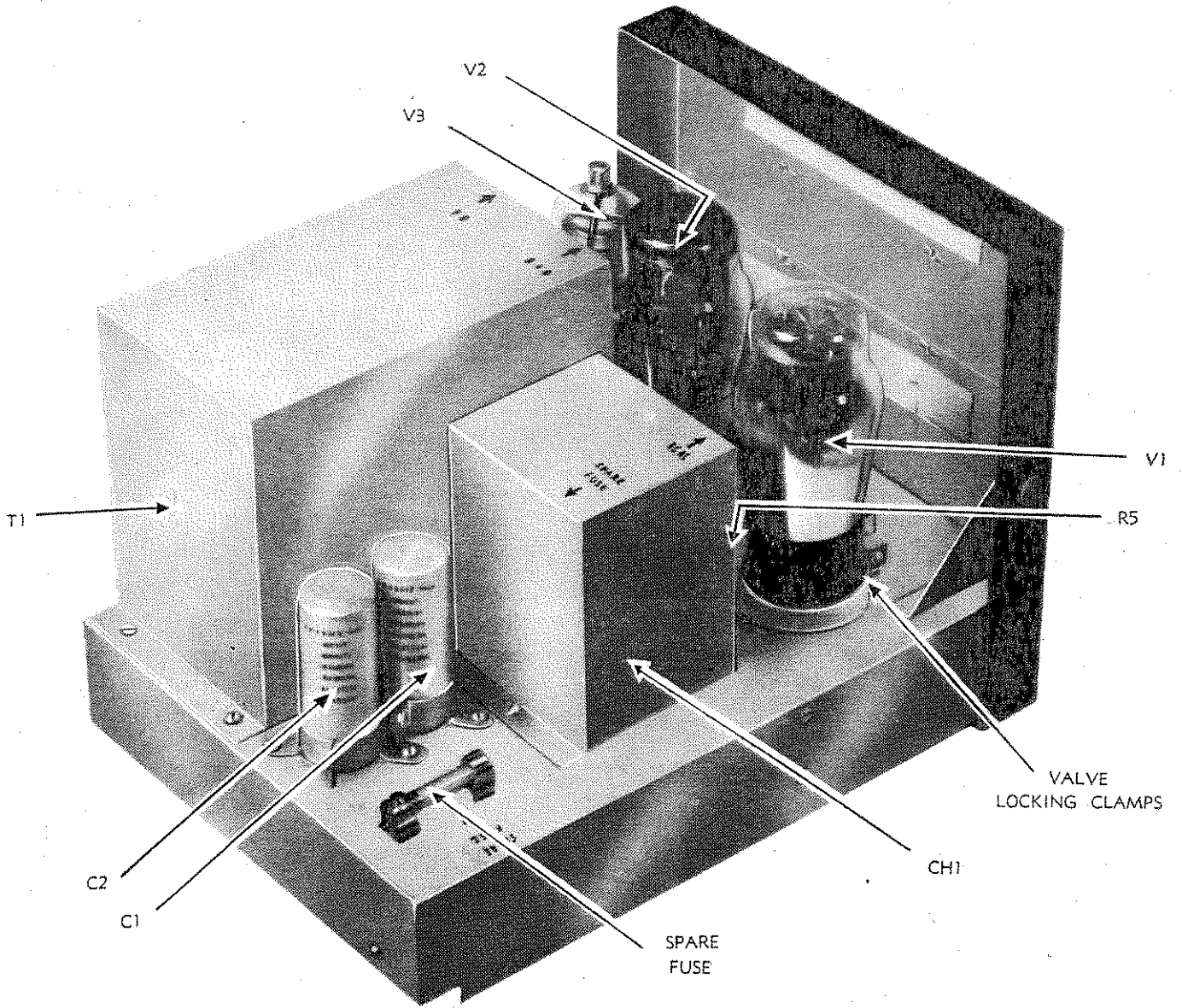
SCHEDULE OF COMPONENTS

FOR

UNIT POWER SUPPLY TYPE Y1 — IDENT. No. Y10D/70450.

**APPENDIX D.
Components.**

Drawing No.	Circuit No.	Description.	Circuit	Function.	Maker's Name.	Maker's Designation.	R.A.A.F. Ident No.
	R1	.25 Meg 1 Watt Carbon Resistor	V2-V3	Bias Resistor	Ducon	RV2541	Y10C/65235
	R2	.05 Meg 1 Watt Carbon Resistor	Output	Voltage Divider	Ducon	RV5031	Y10C/65158
	R3	.15 Meg 1 Watt Carbon Resistor	Output	Voltage Divider	Ducon	RV1541	Y10C/65758
	R4	.15 Meg 1 Watt Carbon Resistor	Output	Voltage Divider	Ducon	RV1541	Y10C/65758
	R5	5000 Ohm Semi Variable Pot	Output	Output Control	Aerostar		Y10C/67361
	C1	8 Mfd 525V Electrolytic Cond.	Power	Filter Condenser	Ducon	EE10774	Y10C/65895
	C2	8 Mfd 525V Electrolytic Cond.	Power	Filter Condenser	Ducon	EE10774	Y10C/65895
	S1	D.P.S.T. Toggle Switch	Power	Power Switch	Alpha	Type D	Y10F/83265
	T1	Power Transformer	Power	Power Transformer	Bland Radio	MRS 71/T1	Y10A/56523
	CH1	Power Choke	Filter	Filter Choke	Bland Radio	MRS 71/CHI	Y10C/67360
	V1	Type 5Y3G Valve	V1	Rectifier	Philips	5Y3G	Y10E/75086
	V2	Type 6V6G Valve	V2	Regulator	Philips	6V6G	Y10E/55248
	V3	Type 6J7G Valve	V3	Control Valve	A.W.A.	6J7G	Y10E/75023
	2 only	1½V Batteries	V3	Bias	Ever-Ready	950	G5A/25091
	3	Octal Amphenol Sockets	V1, V2, V3	Valve Sockets	Int. Rad.	Type S8	Y10H/90227
	1	Fuse Holder	Power		C/wealth Moulding	MFP1	Y10H/90253
	1	Fuse 2 Amps.			Yott Pty. Ltd.	Type 3AG	Y10H/90430
	1	Spare Fuse			Yott Pty. Ltd.	Type 3AG	Y10H/90430
	1	Pilot Lamp 6-8V. .3A			Mazda		G5A/25251
	1	Pilot Lamp Holder			Efco		Y10H/90552
	1	Pilot Lamp Bezel			R.C.A.	A102/551-1	Y10A/56132
	1	Valve Retainer Clamps			Gramophone Co.	Type 4839B	Y10A/56374
	3	Plug 3 Pin Chassis Mounting Cable, Connecting, consisting of 3-Core Shielded Cable 4ft. long terminated by 1 plug type D118 and 1 socket type 11R5585.			A.W.A.	12R5585	Y10H/90121
	1				Bland Radio	MRS71	Y10H/90519



TOP REAR VIEW

(WITH COVER REMOVED)

FIG. 1

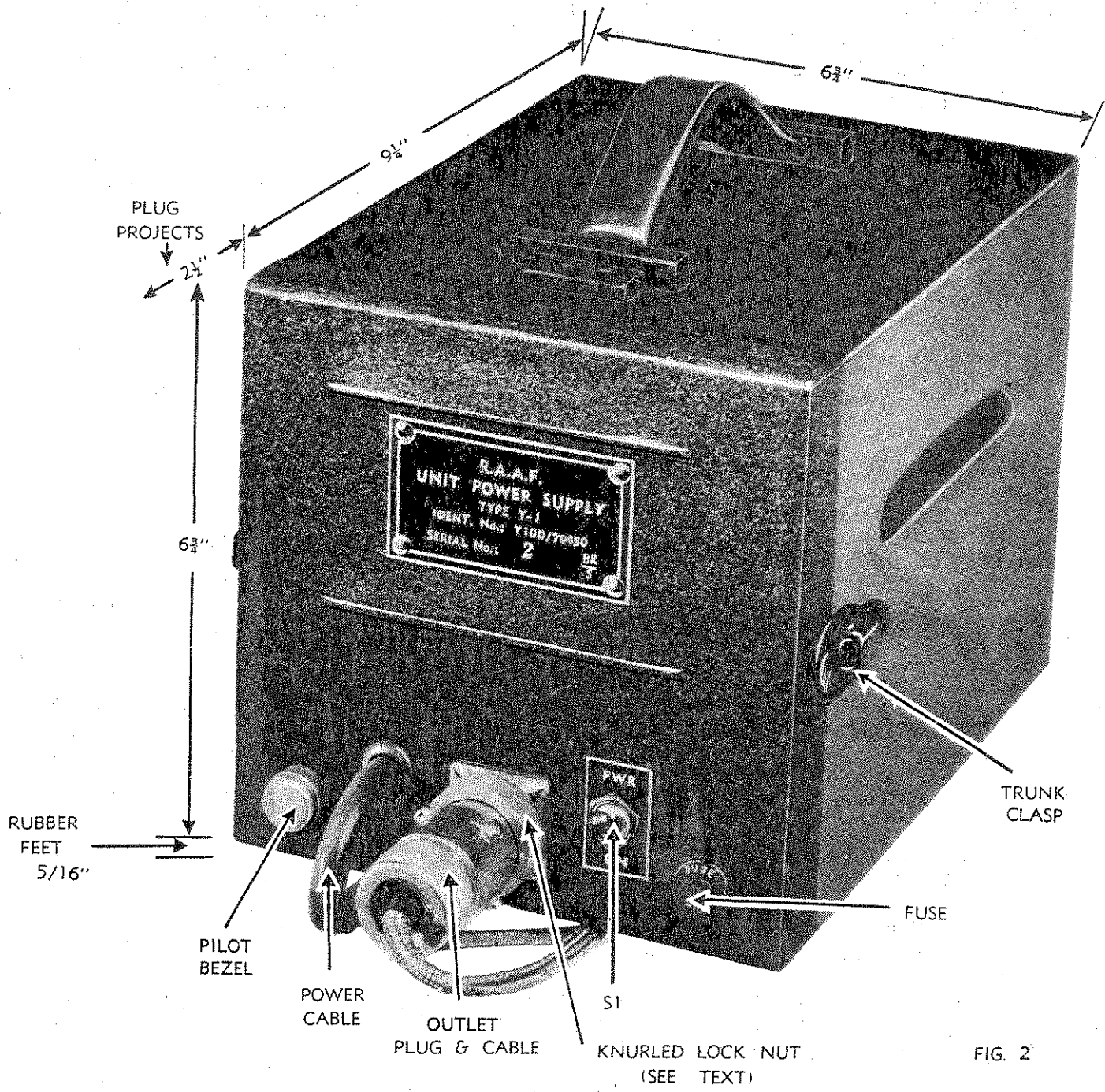
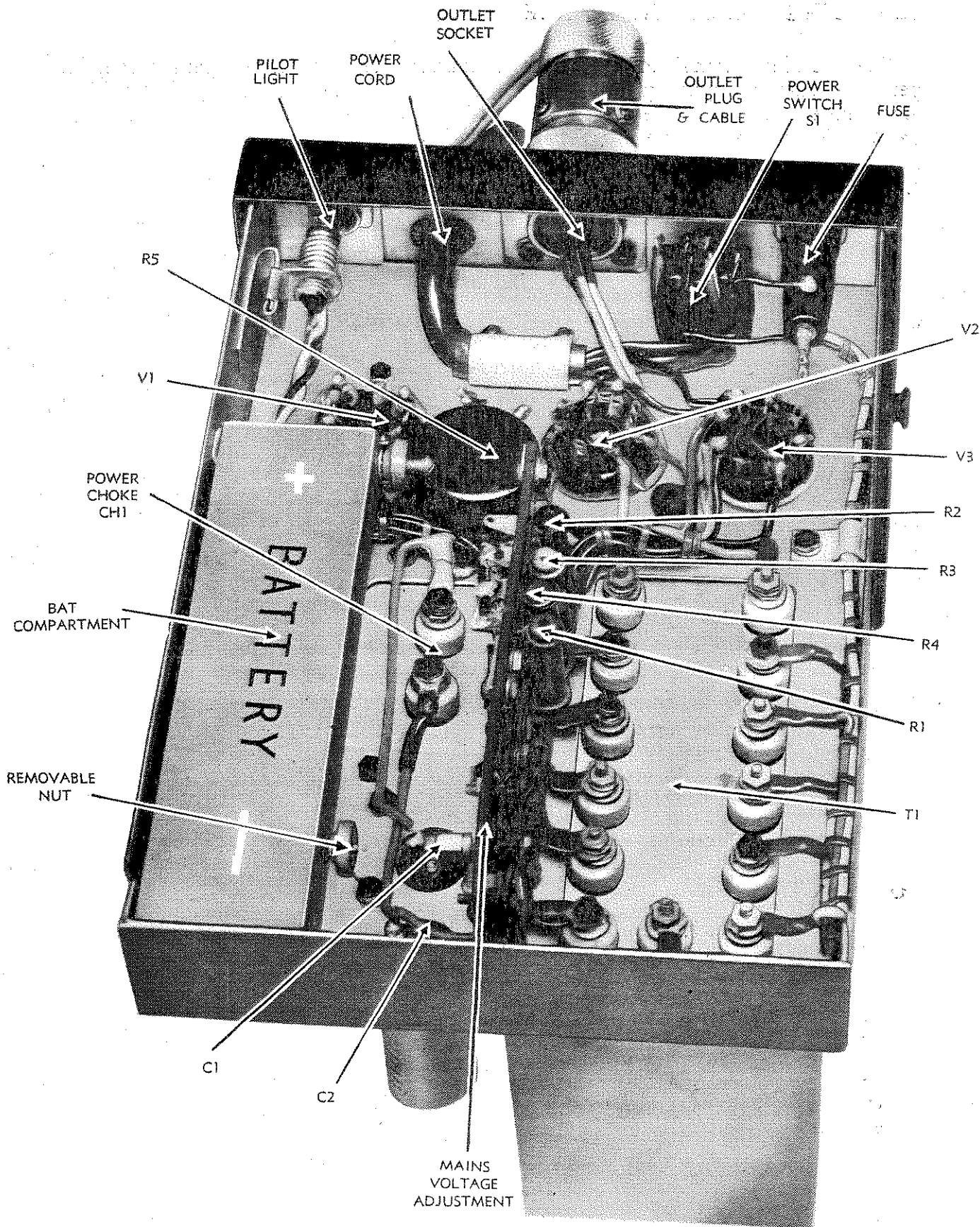


FIG. 2

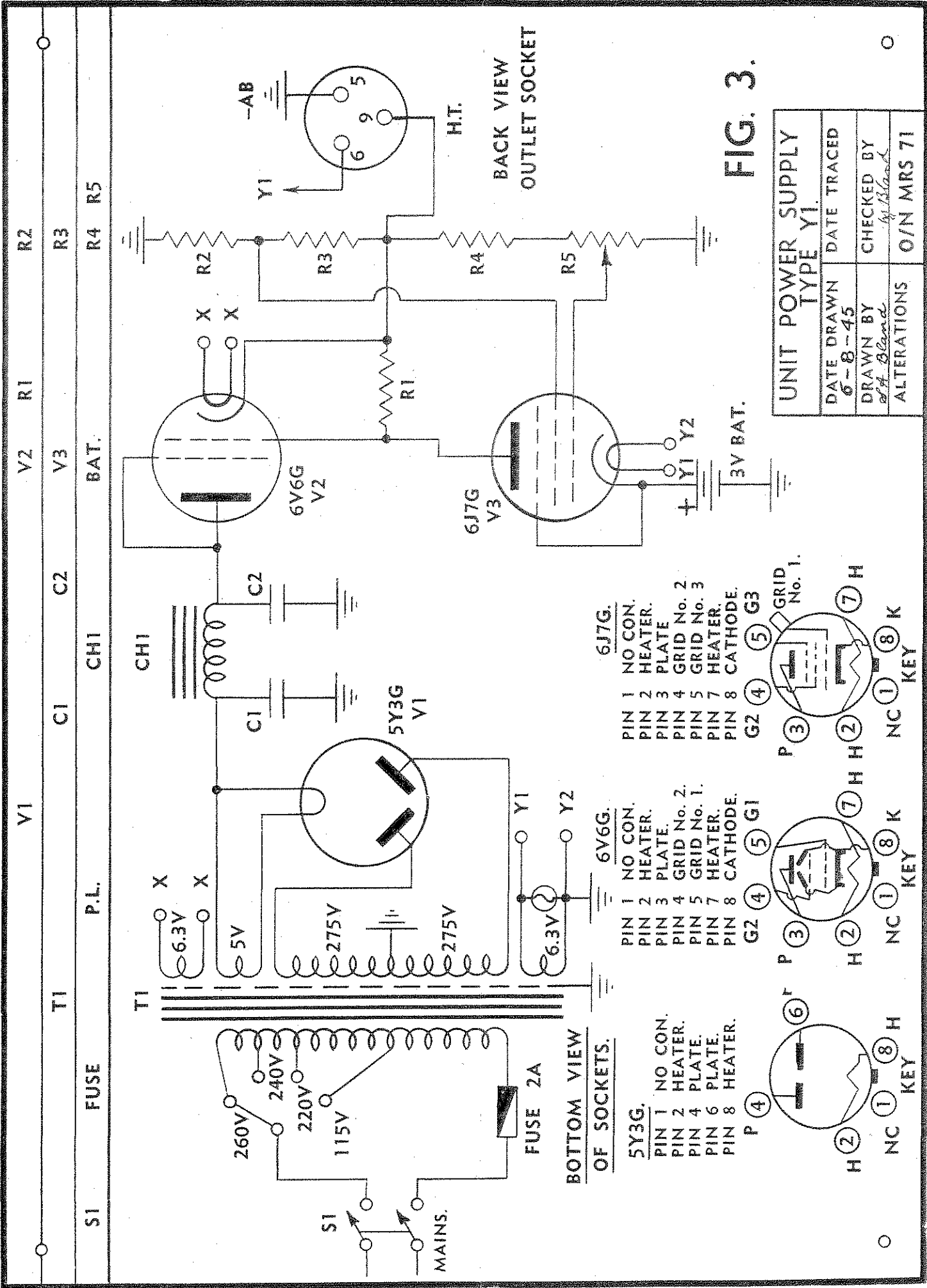
FRONT VIEW



REAR UNDERSIDE VIEW

WITH COVER REMOVED

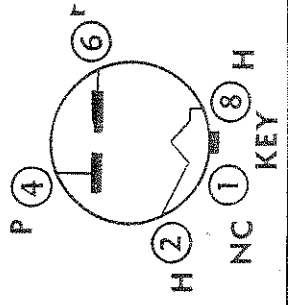
FIG. 5



S1 FUSE T1 P.L. V1 CH1 C1 CH1 C2 V2 R1 R2
 V3 BAT. R3 R4 R5

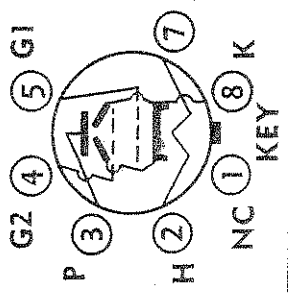
BOTTOM VIEW OF SOCKETS.

5Y3G.
 PIN 1 NO CON.
 PIN 2 HEATER.
 PIN 4 PLATE.
 PIN 6 PLATE.
 PIN 8 HEATER.



6V6G.

PIN 1 NO CON.
 PIN 2 HEATER.
 PIN 3 PLATE.
 PIN 4 GRID No. 1.
 PIN 5 GRID No. 2.
 PIN 7 HEATER.
 PIN 8 CATHODE.



6J7G.

PIN 1 NO CON.
 PIN 2 HEATER.
 PIN 3 PLATE.
 PIN 4 GRID No. 2.
 PIN 5 GRID No. 3.
 PIN 7 HEATER.
 PIN 8 CATHODE.

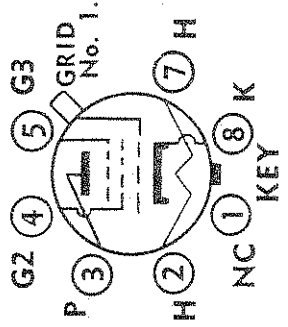


FIG. 3.

UNIT POWER SUPPLY TYPE Y1.	
DATE DRAWN 6-8-45	DATE TRACED
DRAWN BY A. Bland	CHECKED BY A. Bland
ALTERATIONS	O/N MRS 71

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Power Cord	—	—	2
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