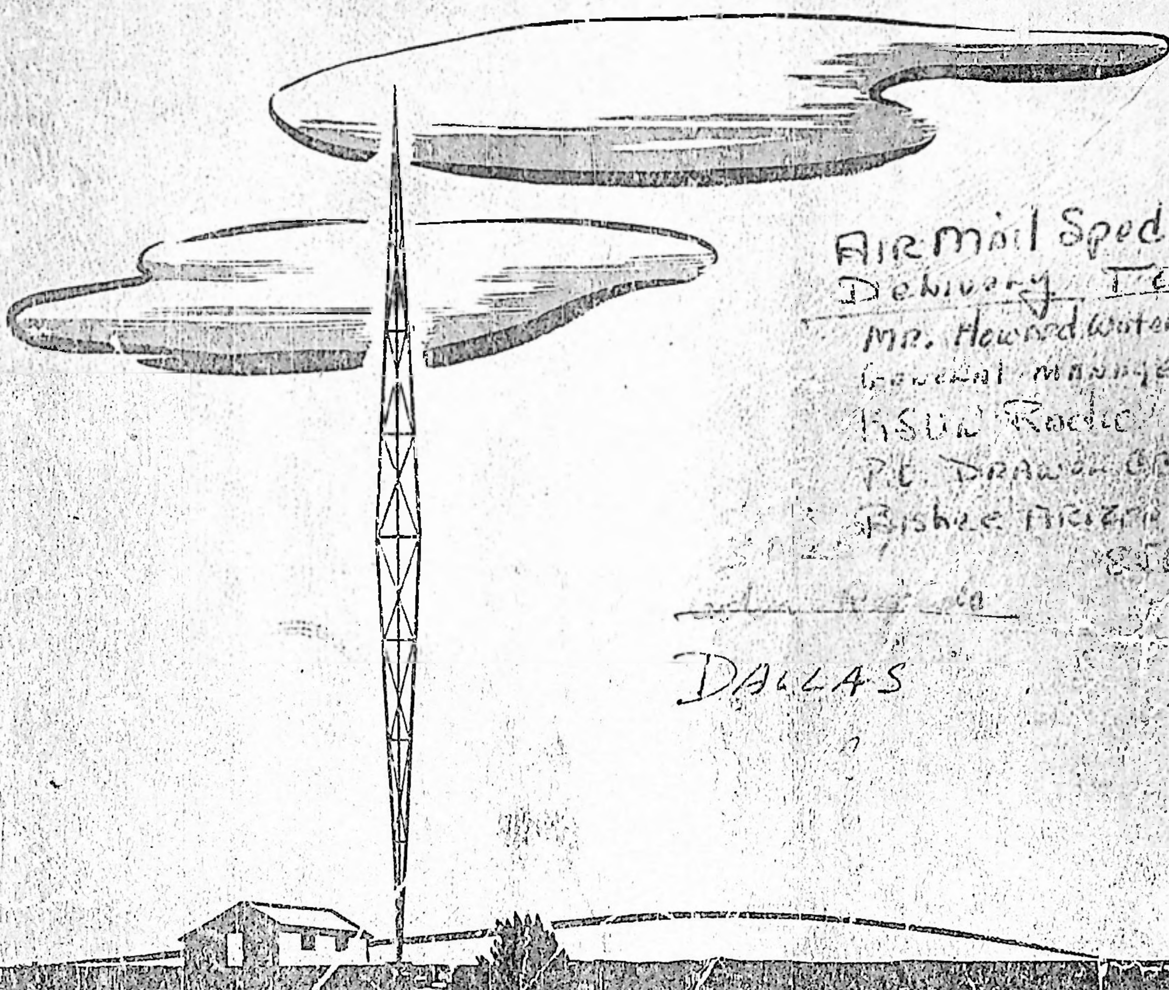
KTFN

INSTRUCTION BOOK



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DALLAS

20V AM BROADCAST TRANSMITTER

COLLINS

INSTRUCTION BOOK

FOR

20V 500/1000 WATT AM BROADCAST

TRANSMITTER

MANUFACTURED BY

COLLINS RADIO COMPANY

CEDAR RAPIDS, IOWA

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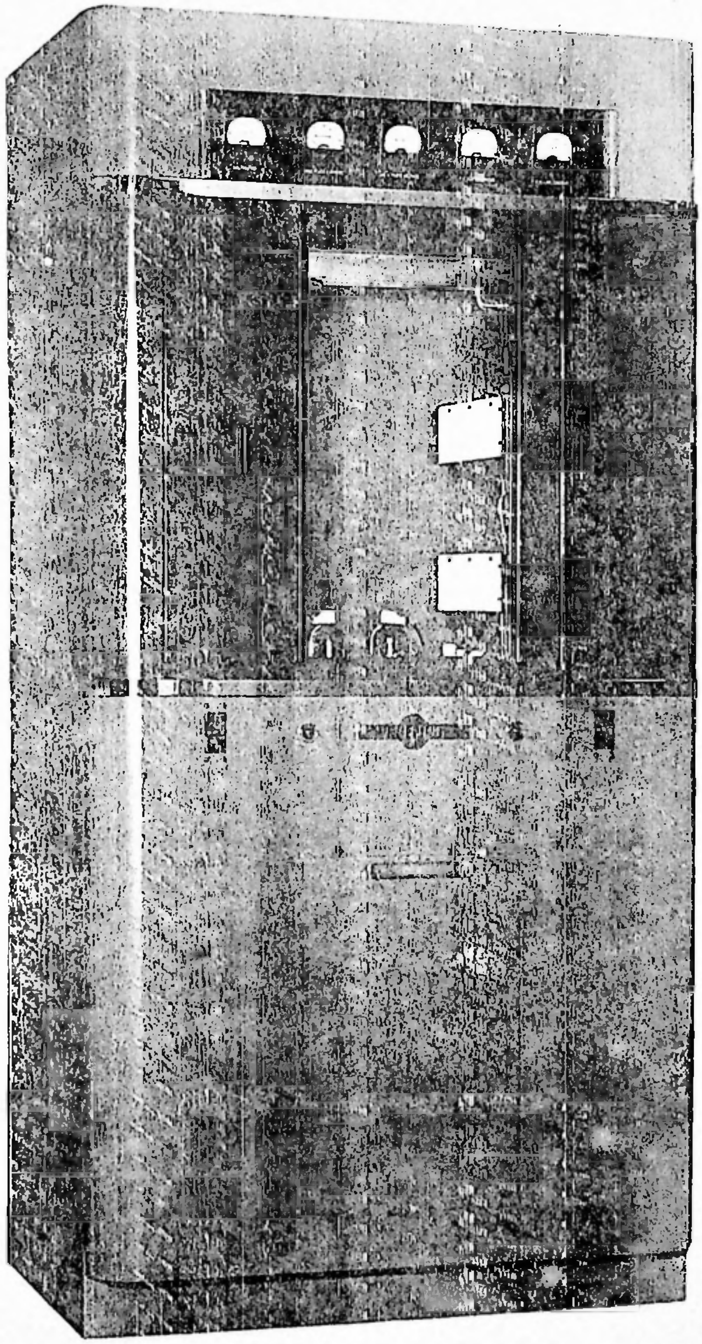

Figure 1-1. Collins 20V 1000 Watt AM Transmitter

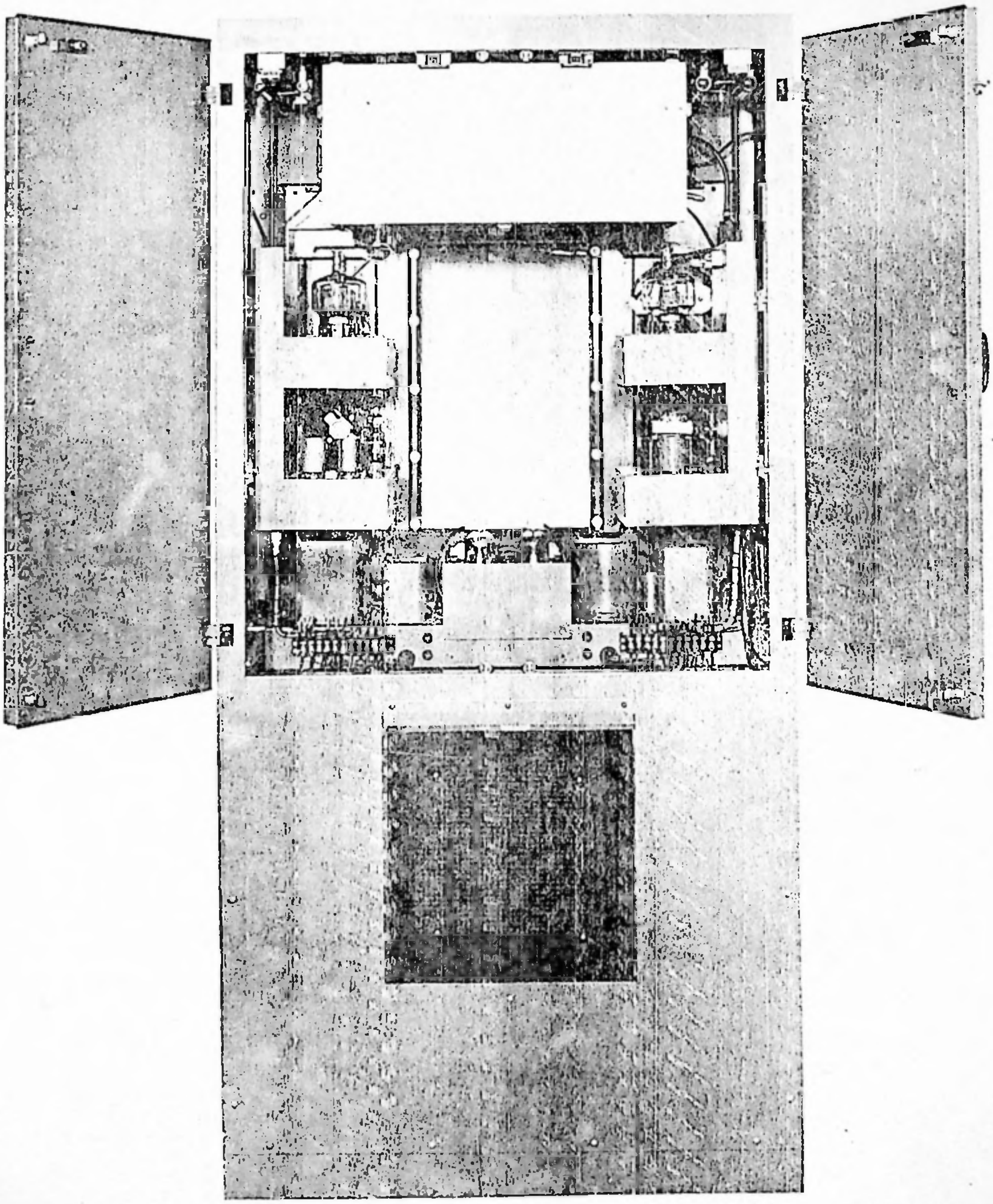

Figure 1-2. Collins 20V Transmitter Rear View

SECTION I

GENERAL DESCRIPTION

1.1. GENERAL

The Collins type 20V 500/1000 watt AM transmitter has been designed for high fidelity broadcast service. Advanced engineering techniques and new high quality components have combined to produce a transmitter that provides outstanding features designed to meet today's demand for better service from modern broadcast equipment.

One neatly-styled heavy-gauge sheet metal cabinet houses the entire transmitter. The complete equipment occupies a space 27" deep by 38" wide by 76" high. Its weight is approximately 1150 pounds. Transformers and other heavy units are mounted on the cabinet floor. RF and audio stages are housed in separate chassis that are designed for ease of servicing and maintenance. These two chassis are mounted on the right and left sides respectively, as viewed from the front of the cabinet. The power amplifier plate circuit and rf output network are housed in a single shielded compartment that is suspended from the roof of the transmitter cabinet. The entire back panel of this rf compartment is easily removable, providing ready access to the components within. A shelf extending the width of the cabinet holds the rectifier tubes and small transformers. All tubes are easily visible through the large window.

A small removable panel on the lower front of the transmitter allows access to power input terminals and control relays. The large doors at the rear of the cabinet allow access to the upper part of the transmitter for servicing and maintenance. The rear lower half of the transmitter is covered by a removable panel which contains the permanent type air filter.

All meters are mounted on a single illuminated panel. Their location allows operation of tuning controls while observing meter indications. The four bolts which secure the meter panel fit into slotted holes that allow the panel to be tilted to the desired angle.

Operating controls are conveniently located on the front of the cabinet. Toggle-type magnetically-operated circuit breakers that serve as filament and plate switches are mounted on the left and right sides of the cabinet below the front window. Other controls and switches are mounted behind small vertical access doors located on either side of the front window. As shown in figure 6-2, the right-hand door provides access to the crystal selector switch, the crystal frequency trimmers, the audio hum control, the pa drive control, the rf driver tank trimmers, the first buffer tank trimmers, the power amplifier tuning control, and the power amplifier loading control. The latter two controls position the tuning capacitor and loading capacitor by means of a flexible drive shaft assembly. Access to the multimeter switch, the power change switch, the modulator bias adjustments, and the audio balance control is provided through the left-hand door.

Ventilating air is drawn through a permanent bronze air filter by a low-speed, high volume blower. The air cools the entire transmitter and is exhausted through a shielded opening in the roof of the cabinet.

The description and function of each part is included in the parts list in section 5 of this book. Section 3, operation, lists the function of all controls.

1.2. GENERAL DESCRIPTION OF RF SECTION

As a result of major advances in crystal stability and oscillator design, the crystal oven and its associated thermostats, relays and other controls have been eliminated. A highly perfected oscillator design in conjunction with extremely stable, low-temperature coefficient crystals has resulted in exceptionally good frequency stability. There are provisions for mounting two crystals on the rf chassis, with one of the two always available in stand-by position. Crystals are easily selected by means of the crystal switch located behind the right-hand control panel.

All rf circuits of the 20V transmitter are extremely straight forward and trouble free. A 6AU6 oscillator and 6SJ7 buffer are followed by an 807 which drives the parallel 4-250A tubes in the power amplifier. The oscillator, buffer and rf driver plate circuits are contained within shielded plug-in units located behind the right front access door. For frequencies in the AM broadcast band, the oscillator employs a resistive load. As the 20V transmitter is also available for high frequency applications, provisions are included for replacing the resistor with a tuned tank circuit for frequency doubling. A frequency monitor connection is brought out from the grid circuit of the power amplifier. A resistor in the cathode circuit of the power amplifier acts as a low impedance source for feeding on audio monitor speaker or amplifier.

The rf output network consists of a pi section followed by an L section and is designed to feed into impedances between 50 and 72* ohms. Harmonics are greatly attenuated in this network. There is a minimum of fundamental frequency loss between the power ampliffier and transmission line. Coil L-110 acts as a static drain and as a voltage source for feeding the modulation monitor. This coil is connected from the output end of the L section to ground.

1.3 GENERAL DESCRIPTION OF AUDIO SECTION

The first audio stage and the audio driver employ triode-connected 6SJ7 tubes in push-pull class A amplifiers. The input to the sudio system consists of a terminating pad that feeds the primary of the audio input transformer. An audio balance control is connected in the cathode circuit of the audio driver. Type 4-250A tubes are used in the push-pull class AB_1 modulator. Approximately 12 db of feedback is provided from plates of the modulator tubes to grids of the first audio stage.

*Other impedances are available on special order.

1.4. GENERAL DESCRIPTION OF POWER SUPPLIES

There are separate power supplies for high voltage, low voltage and bias. The high voltage supply employs two type 872A halfwave mercury-vapor rectifiers in a single-phase, full-wave circuit. It supplies dc voltage for the plates of the modulators and the plates and screens of the power amplifier tubes. The low voltage supply uses two type 866A half-wave mercury vapor rectifiers in a single-phase full-wave circuit to provide dc voltage for plates and screens of the low power stages and screens of the modulator tubes. The bias supply employs a 5U4G high vacuum rectifier in a single-phase, full-wave circuit. It supplies bias to the rf driver, modulator, and power amplifier tubes.

Overload protection is provided by magnetically operated circuit breakers associated with the filament and plate switches, and by fuses in the primaries of the filament, low voltage, and bias transformers. Instantaneous power change is accomplished by rotating the power-change switch inside the left-hand access door.

A thermal time delay is included in the control circuit to prevent application of plate voltage before the filaments reach operating temperature. A unique feature of this circuit is its ability to automatically select the proper time delay interval after short power interruptions. Instantaneous interruptions cause no delay in returning to the air.

Dual interlocks, both electrical and mechanical, are incorporated on each of the rear doors to provide double protection to personnel. Electrical interlocks of the split V type open the primary circuits of the high and low voltage transformers whenever the rear doors are opened. The mechanical interlocks close after the electrical interlocks have opened the primary circuits.

Table 1-1. 20V Transmitter Specifications

Power Output	1000/500 watts
RF Output Impedance	50/72 ohms
Audio Input Impedance	600/150 ohms
Audio Input Level	+10 dbm ±2 db, pad input
Power Source	230/208 volts 50/60 cps single phase
Power Demand	Approximately 4.15 kw, 83% pf, at 100% modulation
Temperature Range	+15°C (59 F) to 45°C (113°F)
Altitude Range	Sea level to 6000 feet
Weight	Approximately 1150 pounds
Dimensions	38" wide, 76" high, 27" deep

Item Number	Tube Type	Function
V-101	6AU6	Oscillator
V-102	6S27	Buffer Amplifier
V-103	807	RF Driver
V-104	4-400A	Power Amplifier
V-105	4-400A	Power Amplifier
V-106	6SJ7	Audio Amplifier
V-107	6SJ7	Audio Amplifier
V-108	6SJ7	Audio Driver
V-109	6SJ7	Audio Driver
V-110	4-250A	Modulator
V-111	4-250A	Modulator
V-112	5U4G	Bias Rectifier
V-113	872A	HV Rectifier
V-114	872A	HV Rectifier
V-115	866A	LV Rectifier
V-116	866A	LV Rectifier

SECTION 2

INSTALLATION

2.1 UNPACKING

To avoid damaging the equipment, use caution when uncrating the transmitter and components. All units should be inspected carefully. Check for loose screws and bolts. Inspect all controls, such as switches, for proper operation as far as can be determined without application of power. Examine cables and wiring, and make sure that all connections are tight and clear of each other and of the chassis. Claims for damage should be filed promptly with the transportation company.

2.2 LOCATION OF THE TRANSMITTER

It is recommended that the transmitter be placed in its permanent location before the units that were removed for shipping are replaced. The comparatively simple arrangements to accommodate power input, audio input, frequency monitoring, modulation monitoring, and audio monitoring are illustrated in figures 7-4 and 7-5. The external wiring requirements may be met by laying necessary conduit in a concrete floor, or by installing a wiring trench of sufficient size. Another alternative would be to build a false floor under which the necessary wires and cables can be placed. The trench will have to accommodate a three-wire power cable, two shielded twisted pairs, and two RG-8/U coaxial cables. It is very desirable to have several ties from the transmitter cabinet to the building's ground system.

Adequate clearance should be allowed in front of the transmitter. There should also be a clearance of three and one-half to four feet behind the cabinet to provide sufficient room for service work.

2.3 REPLACEMENT OF UNITS REMOVED FOR SHIPPING

Several of the transmitter components have been removed and packed separately for safety in shipping. These include heavy units such as the high voltage transformer, modulation transformer, high voltage filter choke, large filter capacitors, and the small, fragile units such as tubes and crystals. The Channel Wiring Diagram, figure 7-4, the Inter-Unit Cabling Diagram, figure 7-6, and the typical Installation Diagram, figure 7-5, as well as the photographic illustrations will be of assistance in replacing and connecting these components in the transmitter.

Wires and cables that were removed from the units to which they connect were tagged before shipment. Should any of these tags become lost, refer to the Inter-Unit Cabling Diagram, figure 7-6, for assistance in identifying the leads.

The following installation procedure is recommended:

a. Set the tubes and crystals aside. They should not be placed in the transmitter until all other units have been installed and connected. Reference to figures 6-3, 6-4, 6-6, and 6-10 will aid in placing them in their proper positions.

CAUTION

EXTREME CARE SHOULD BE EXERCISED WHEN HANDLING THE CRYSTALS. THIS NEW TYPE OF CRYSTAL IS EXTREMELY FRAGILE. FOLLOWING ROUGH HANDLING THE CRYSTALS MAY STILL OSCILLATE, BUT MAY HAVE LOST THEIR HIGHLY IMPORTANT FREQUENCY vs TEMPERATURE CHARACTERISTICS

b. Note terminal numbers of the iron-core components before they are installed. Identification of these terminals is sometimes difficult after the components are in the transmitter.

c. Refer to figure 6-3 for the proper placement of the heavy iron-core components and install them in their proper locations in the lower part of the transmitter.

d. Check the station line voltage. Refer to figure 7-3 and make connections to the high voltage transformer primary terminals that most nearly correspond to this voltage. If the nominal station voltage is very low, the 208 volt taps on the 872A filament transformer, the main filament transformer, and the low voltage plate supply transformer should be used. These 208 volt taps are wire leads that have been cabled with the other transformer leads. The bias supply transformer primary is not tapped, but a correction may be made for a very low nominal line voltage by changing the value of the bias supply bleeder resistor, R-174, from 2000 to 2400 ohms.

e. Refer to figures 6-3, 7-4 and 7-6 as well as the tags on the cables in order to make all possible connections at this time.

f. Install and secure the large filter capacitors in their proper positions as shown in figure 6-3 and make all connections to these units.

g. Remove the rear cover from the rf output network and set the taps on tuning coil L-108 and loading coil L-109 to the positions shown in table 2-3 that correspond to the station operating frequency. The Collins test department data sheet included with the transmitter contains a record of the output network setup used for testing the transmitter at the factory. These conditions may not hold exactly under actual operating conditions, but on normally near enough to give a starting point for tuneup.

2.4. POWER INPUT CONNECTIONS

Refer to the Typical Installation Diagram, figure 7-5, for proper wire sizes and location of the power line accommodation hole in the bottom of the transmitter. Bring the neutral wire and the two hot wires in through the rubber grommet in this hole and run them forward to the front panel. Connect the two hot wires to the two outer terminals on terminal board E-100 illustrated in figure 6-1. The neutral wire should be connected to the center terminal of E-100.

2.5. AUDIO INPUT CONNECTIONS

The audio signal should be brought into the transmitter cabinet on a shielded twisted pair. Use the audio input hole illustrated in figure 7-5 for these wires. The audio input connections are made to terminal board E-103 located inside the lower shelf of the modulator chassis. The location of this terminal board can be seen in figure 7-4. Connect the two leads of the twisted pair to the two outer terminals of E-103. Connect the shield to the center terminal of E-103.

2.6. RF OUTPUT CONNECTIONS

A solder type coaxial end seal terminal for connecting to the rf output coaxial cable is located on top of the output network box and may be reached through a hole in the top of the cabinet. The coaxial cable leading to the antenna tuning house should be securely soldered to this terminal.

2.7. FREQUENCY MONITOR CONNECTIONS

Coaxial frequency monitor connector J-104 is located on the bottom of the rf chassis as shown in figure 7-4. The transmitter is shipped with a mating plug connected to J-104. Bring a piece of RG-8/U coaxial cable through the proper hole in the floor of the cabinet, as shown in figure 7-5, and connect it to this plug.

2.8. MODULATION MONITOR CONNECTIONS

Coaxial modulation monitor connector J-100 is supplied with the proper mating plug. Figure 7-4 shows this connector located on the top of the rf output network box. Thread a piece of RG-8/U coaxial cable through the proper hole in the floor of the cabinet as shown in figure 7-5. Connect the coax to the plug associated with connector J-100.

2.9. AUDIO MONITOR CONNECTIONS

A shielded twisted pair should be used for the audio monitor connections. Bring this wire through one of the monitoring lead holes in the bottom of the cabinet. These holes are indicated in figure 7-5. The audio monitor terminal board, E-104, is located inside the lower part of the rf chassis as shown in figure 7-4. Access to this terminal board can be gained only by removing the lower cover of the rf chassis. Connect one wire of the shielded twisted pair to one of the terminals on E-104. Connect the remaining wire and the grounded shield to the other terminal.

2.10. INTER-UNIT CABLING DIAGRAM

The Inter-Unit cabling Diagram, figure 7-6, shows the parts of the transmitter in their general locations as viewed from the rear. Each section of this diagram is enclosed by broken lines. These sections have been given section designation letters that appear in the upper right-hand corner of each dotted enclosure. Although wiring between transmitter units is not shown on the diagram, the destination of this wiring is indicated by numbers and letters that appear directly below the arrow heads as shown in figure 2-1. The numbers to the right of the lines above the arrow heads represent the types of wires used. The number directly to the right of each arrow head is the number of that point on the diagram and does not necessarily indicate that there is a terminal bearing that number at that point in the equipment. Where there are terminal boards with numbered terminals in the equipment, the terminals are represented on the diagram by small circles enclosing the number of the terminal. The terminal board is represented by a dotted line around all terminals on that board. Some sections of the diagram, such as section F, require that the terminal board in the diagram be broken to allow lines that do not terminate on that board to pass through the area on the diagram where the board is drawn.

A small portion of unit F from the Inter-Unit Cabling Diagram, figure 7-6, is shown in figure 2-1. The two KEO designations indicate that two type KEO wires leave this point. The K in KEO indicates the type of wire (high voltage insulated cable). E indicates size of wire (black). If a tracer were used on this wire an additional number would be added to indicate the color of the tracer. For example, if this wire was black with a red tracer, the designation would have been KEO2. If a shield were used, the wire would be called KESO2, the S indicating a shield. The color code used for wires and tracers is the same as that used for resistors and condensers.

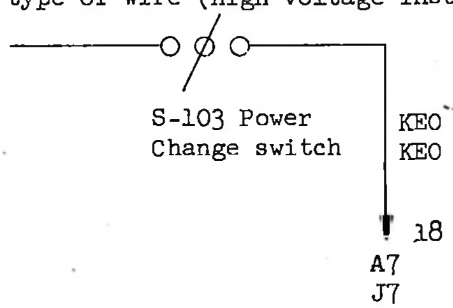

Figure 2-1. Inter Unit Cabling Example

The number 18 shown beside the arrow head indicates that this is point number 18 on the schematic.

A7 indicates that one of the wires leaving this point on the diagram goes to point 7 on unit A of the diagram. J7 indicates that one of the wires leaving this point on the diagram goes to point 7 on unit J of the diagram.

When coaxial cable, copper straps, and other types of connecting materials except wires are used, the "type of wire" code is not used. Instead of using a code, the connecting material is specified by name on the diagram, as in the case of the quarter inch copper tubing shown at point 1, unit C, of the Inter-Unit Cabling Diagram, figure 7-6.

Table 2-1. List of Wire Types

Letter	Type of Wire
A	AN-J-C-48
B	Busbar, Round Tinned Copper
C	JAN Type WL (600 volts)
D	Miniature JAN Wire
F	Extra-Flexible Varnished Cambric
G	General Electric Deltabeston
K	Neon Sign Cable (15,000 volts)
N	Single Conductor Stranded (Not Rubber)
P	Single Conductor Stranded (Rubber Covered)
R	JAN Type SRIR (1000 volts)
V	JAN Type SRHV (2500 volts)

Table 2-2. List of Wire Sizes and Color Codes

Letter	Size of Wire (AWG)
A	22
B	20
C	18
D	16
E	14
F	12
G	10
H	8
J	6
K	4
L	2
M	1
N	0
P	00
Q	000
R	0000

Number	Color of Wire or Tracer
0	Black
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Grey
9	White

Cable Identification Example:

A JAN Type WL, #22AWG, Shielded, White wire with Red Tracer would be labeled CAS92. A black #14AWG neon sign cable would be labeled KEO. A breakdown of these two descriptions is shown below.

C	A	S	9	2
Type of Wire	Size of Wire		Color of Body	Color of Tracer
Jan Type WL	#22AWG	Shielded	White	Red

K	E	O
Type of Wire	Size of Wire	Color of Body
Neon Sign Cable	#14AWG	Black

Table 2-3. Approximate Output Tank Tuning Data

FREQ.	L-108 mh	L-108 TURNS* FROM END	C-148 uuf	C-149 uuf	C-150 uuf	C-151 uuf	L-109 TAPS** USED
550	150	2	2000	800	800	800	1-8
600	150	3	2000	400	800	800	1-8
650	150	4	2000	400	800	800	1-8
700	150	0	2000	400	800	800	1-8
750	80	1	800	400	800	800	1-8
800	80	0	800	400	800	800	1-8
850	80	2	800	400	800	800	1-8
900	80	0	800	400	800	800	1-8
950	80	0	out	400	800	800	1-8
1000	80	1	out	400	800	800	1-8
1050	80	2	out	400	400	400	1-8
1100	80	4	out	400	400	400	1-8
1150	80	5	out	400	400	400	1-8
1200	80	5	out	400	400	400	1-8
1250	80	6	out	400	400	400	1-8
1300	80	7	out	400	400	400	2-7
1350	80	7	out	400	400	400	3-6
1400	80	8	out	400	400	400	4-6
1450	80	8	out	400	400	400	4-5
1500	80	9	out	400	400	400	4-5
1550	80	9	out	400	400	400	4-5
1600	80	10	out	400	400	400	4-5

NOTES:

*Approximate number of turns shorted at each end.

**Taps are numbered from top to bottom, 1 to 8.

C-145A is added for frequencies below 900 kc.

C-145B is added for frequencies below 750 kc.

C-142A is added for frequencies below 750 kc.

L 109 The tapped 4-5 - for 8-58
Check

SECTION 3

OPERATION

3.1 FILAMENT SWITCH

The filament switch, S-106, is a toggle-type magnetically operated circuit breaker. As shown in the Primary Control Circuit diagram, figure 7-1, operation of the filament switch energizes the meter lights, filaments, bias supply, and blower in addition to starting the thermal time delay relay on its cycle of operation.

3.2. THERMAL TIME DELAY RELAY

The thermal time delay relay contains a heating element, a bi-metallic strip, and a set of contacts. As shown in figure 7-1, the time delay relay contacts are in series with the door interlocks. The temperature within the relay affects the bi-metallic element and causes the contacts to open or close. Thermal inertia of the heating element and bi-metalic strip causes the time delay relay to automatically select the proper time delay interval after power interruptions. If the power is removed for an instant and then returned, there will be no delay period as the bi-metallic element will not have cooled sufficiently to open the contacts. Also , the filaments will not have cooled to the point where a warm-up period is necessary. This is a distinct advantage over the more common time delay systems which provide a set delay period regardless of the temperature of the tube filaments and therefore prevent operation of the transmitter until the standard time delay has passed, even though the power interruption was momentary and the filaments remain at operating temperature. The thermal time delay relay provides the quickest possible return to the air after a power interruption. When the relay contacts close, they place resistor R-172 in shunt with the relay heater element and relay adjustment R-171 to reduce the current through the heater while the transmitter is on the air.

Thermal time delay relay K-101 may be adjusted for any delay period between 10 and 45 seconds by means of variable resistor R-171. A delay of 30 seconds is recommended. To adjust this resistor, remove the lower front panel from the transmitter and use a screwdriver to turn the slotted shaft shown in figure 6-1. Turning this control clockwise will lengthen the time delay. If the delay period is to be timed, it is recommended that the check be made when the transmitter is first turned on in the morning as the thermal relay will operate more quickly if it is still warm from a previous run. If the two door interlocks are closed, the filament pilot light and the plate relay will be energized when the thermal time delay relay operates.

3.3. PLATE SWITCH AND PLATE RELAY

One set of contacts on the plate relay short the thermal time delay relay contacts as shown in figure 7-1. The remaining two sets of contacts on the plate relay are in series with the plate switch. These contacts cause the plate switch to be inoperative when the plate relay is open. Closure of the plate relay and plate switch energizes the low voltage and high voltage power supplies and the plate pilot light. If desired, the filament and plate switches may be turned on at the same time. If this is done, the filament pilot light, the plate pilot light, and the high voltage and low voltage power supplies will come on simultaneously at the end of the time delay period.

3.4. CRYSTAL SELECTOR SWITCH

Crystal selector switch S-101 is located in the center of the area behind the lower right inspection plate as indicated in figure 6-2. The switch shaft is slotted for screwdriver operation. When the switch is turned to the right, the crystal toward the right side of the chassis (as viewed from the front of the transmitter) is selected.

3.5. CRYSTAL FREQUENCY TRIMMER CONTROLS

Crystal frequency trimmer controls C-101 and C-102 are located behind the lower right inspection plate as indicated in figure 6-2. These two controls provide for small adjustments in the crystal frequency. C-101, the upper control, adjusts the frequency of Y-101, the left-hand crystal as seen from the front of the transmitter.

3.6 MULTIMETER SWITCH

Multimeter switch S-102 is a two-pole eight-position switch located behind the left door on the front of the transmitter cabinet as shown in figure 6-1. This switch inserts multimeter M-104 into any one of eight transmitter circuits. Table 4-1 lists the multimeter switch positions and typical readings for these circuits. The full scale reading of the multimeter is indicated for each switch position.

3.7 FIRST RF BUFFER TANK CIRCUIT TRIMMERS

The first buffer tank circuit trimmers, C-114 and C-115, are screwdriver adjustments located behind the lower right inspection plate. The location of these two trimmers is shown in figure 6-2. They should be adjusted for maximum grid drive to the 807 rf driver stage. The trimmers are connected in parallel as shown in figure 7-7. One of the trimmers should be adjusted to give a good tuning range with the second trimmer. The first trimmer adjustment opening should then be sealed with scotch tape and all adjustments made with the second trimmer.

3.8. RF DRIVER TANK TRIMMERS

C-125 and C-126, the rf driver tank circuit trimmers, are screwdriver adjustments located behind the upper right inspection plate. The location of these two trimmers is shown in figure 6-2. They should be adjusted for maximum grid drive to the power amplifier . The trimmers are connected in parallel as shown in figure 7-7. One of the trimmers should be adjusted to give a good tuning range with the second trimmer. The first trimmer adjustment opening should then be sealed with scotch tape and all adjustments made with the second trimmer.

3.9 POWER AMPLIFIER PLATE TUNING AND LOADING CONTROLS

The power amplifier plate circuit tuning and loading controls, C-146 and C-147 are located behind the right-hand door on the front of the transmitter cabinet as shown in figure 6-1. The PA tuning control is used to resonate the power amplifier plate circuit. An increase in loading is obtained by reducing the capacity of the power amplifier loading capacitor, C-147, while simultaneously retuning the power amplifier plate circuit to resonance by means of the PA tuning control. With a pi-L output network of the type used in the 20V transmiiter, any adjustment of the PA loading control will detune the output network and cause the plate current to soar. Care must be exercised to keep the PA tuning at resonance whenever the PA loading control is adjusted. The loading should be increased until the rf line current is slightly less than the desired value. The PA tuning control should then be adjusted slightly to the side of resonance that gives an increase in rf line current. The power amplifier plate current will also increase; however, the increase in power to the rf line constitutes a large proportion of the increase in power to the power amplifier circuit, thus yielding a higher plate efficiency. Adjust the PA tuning and PA loading controls to the point where the desired amount of rf line current is obtained with the highest operating efficiency. The highest efficiency will always be obtained with the power amplifier plate circuit slightly detuned.

3.10. POWER CHANGE SWITCH

Power change switch S-103 is located behind the left door on the front of the cabinet as shown in figure 6-1. A resistor is connected in series with the high voltage to the power amplifier plate circuit. The power change switch, S-103, is connected to short this resistor for high power watt operation and remove the short for low power operation. This switch may be operated regardless of whether the transmitter is on the air or not. Minor corrections in power output are made by the power amplifier tuning and loading controls.

3.11. AUDIO BALANCE ADJUSTMENT

Audio balance adjustment R-146 is the only control located behind the lower left inspection plate. The position of this screwdriver adjustment is indicated in figure 6-2. As shown in figure 7-7, the audio balance adjustment is a variable resistor used to shift the ground point of the audio driver stage cathode circuit in order to decrease the distortion caused by unbalance in the audio section of the transmitter. With the transmitter modulated 95%

by a 1000 cycle signal, adjust this control to obtain minimum distortion as indicated on a distortion analyzer.

3.12 PA DRIVE CONTROL

PA drive control R-182 is a screwdriver adjustment located behind the upper right-hand inspection plate as shown in figure 6-2. It is used to vary the rf driver screen voltage in order to regulate the grid drive applied to the power amplifier. PA drive control R-182 should be adjusted at the same time and in the same manner as audio hum control R-120, described in paragraph 3.13 below. When adjusted in this manner, optimum voltage will be applied to the rf driver screen circuit.

3.13 AUDIO HUM CONTROL

Audio hum control R-120 is a screwdriver adjustment located behind the upper right inspection plate as shown in figure 6-2. It is a variable resistor used to shift the ground point of the power amplifier filament circuit to a point which will minimize the hum caused by the ac filament voltage.

In order to adjust audio hum control R-120 and PA drive control R-182, inject a 1000 cycle audio signal of sufficient amplitude to modulate the carrier 100 percent. Califrate a noise meter, remove the modulation, and read the noise level. Adjust PA drive control R-182 for minimum noise. Adjust audio hum control R-120 to further reduce the noise level.

3.14 MODULATOR BIAS ADJUSTMENTS

Modulator bias adjustments R-162 and R-163 are located behind the upper left inspection plate as indicated in figure 6-2. These two screwdriver adjustments control the amount of negative bias applied to the grids of the individual modulator tubes. Turning R-162 clockwise increases the amount of bias applied to V-110, the modulator tube near the front of the cabinet. To adjust these two controls, inject a 1000 cycle signal of sufficient amplitude to modulate the carrier 95%. Vary R-162 and R-163 until minimum distortion is indicated on a distortion analyzer, but do not exceed the 120 milliampere static plate current recommended for the two modulator tubes.

3.15 STARTING THE EQUIPMENT

a. Close the rear doors of the transmitter.
b. Move the filament switch to the up (ON) position.
c. Turn the power change switch to the correct position for the desired output power.
d. Check to see that the desired crystal is in the circuit. The right-hand crystal is selected when the switch is thrown to the right.
e. Move the plate switch to the up (ON) position.
f. Check all meter readings including all of the circuits that can be read on the multimeter switch. Typical meter readings are listed in table 4-1.
g. Make all possible monitoring observations.

3.16. ADJUSTMENT OF RF SECTION

Rotate the multimeter switch to the 807 grid position. Adjust either of the 6SJ7 buffer plate circuit trimmers, C-114 or C-115, for maximum 807 grid current as indicated on the multimeter. The location of C-114 and C-115 behind the lower right inspection plate is shown in figure 6-2.

Rotate the multimeter switch to the PA grid position. Adjust either of the rf driver plate circuit capacitors, C-125 or C-126, for maximum grid drive to the power amplifier as indicated on the multimeter. The location of C-125 and C-126 is shown behind the upper right inspection plate in figure 6-2.

Adjust the loading of the power amplifier as outlined in paragraph 3.9.

3.17. ADJUSTMENT OF AUDIO SECTION

Inject a 1000 cycle signal of sufficient amplitude to modulate the rf carrier 95 percent. Adjust the audio driver cathode balance control, R-146, and the two modulator bias adjustments, R-162 and R-163, to obtain minimum distortion as indicated on a distortion analyzer. Do not exceed the 120 millampere static plate current recommended for the modulator tubes. The location of these controls is shown in figure 6-2.

Increase the level of the 1000 cycle modulating signal until 100% modulation is obtained. Calibrate a noise meter and remove the modulation. Read the noise level. Adjust PA drive control R-182 and audio hum control R-120 to reduce the amplitude of the noise level to a minimum value. The location of these controls is shown in figure 6-2.

3.18 STARTING THE EQUIPMENT IN A NEW INSTALLATION

a. Before starting the equipment for the first time, inspect it carefully for any obvious mechanical damage.

b. Remove the plate caps from the two 866A and two 872A mercury vapor rectifier tubes, V-113 through V-116. Make sure that the plate caps hang free and are not near any metal parts.

c. Inspect all door interlocks. Press on the contact block until the spring is completely compressed. Release the pressure. If the contact block does not spring out to its original position, check the interlock carefully and adjust it until it operates properly.

d. Using an ohmmeter, check for continuity between terminals 2 and 3 on terminal board E-101. The location of this terminal board on the rear of the low voltage power shelf is shown in figure 6-10. The two door interlocks, S-108 and S-109, are connected between these terminals. The meter should indicate an open circuit when one or both of the interlocks are open and a closed circuit when both interlocks are closed.

e. Refer to the primary control circuit diagram, figure 7-1.

f. Throw the filament switch to the ON position. The filament switch, S-106, and the thermal time delay relay, K-101, should operate as described in paragraphs 3-1 and 3-2.

g. Wait until the filament pilot light comes on; then throw the plate switch, S-107, to the ON position. The plate pilot lamp should glow immediately.

h. This completes the check of the power circuit. Throw the filament and plate switches to the off positions.

i. Remove the modulator tubes from the equipment.

j. Replace the plate caps on the 866A voltage rectifier tubes V-115 and V-116.

NOTE

OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. OPERATING PERSONNEL SHOULD AT ALL TIMES OBSERVE PROPER SAFETY PRECAUTIONS. DO NOT MAKE ADJUSTMENTS INSIDE OF THE EQUIPMENT WITH THE HIGH VOLTAGE APPLIED. DO NOT DEPEND UPON THE DOOR INTERLOCKS FOR PROTECTION. ALWAYS SHUT DOWN THE EQUIPMENT WHEN MAKING ADJUSTMENTS.

k. Rotate the crystal selector switch, S-101, to the desired position. The location of this switch is shown in figure 6-2.

l. Throw the filament switch to the on position and allow the transmitter to run for 20 minutes with only the filaments lighted. This operation is necessary in order to properly age the mercury vapor rectifier tubes. Aging is required for all new mercury vapor tubes and for old tubes that have been agitated or inverted.

m. Throw the plate switch to the on position.

n. Rotate the multimeter switch through the first four positions and check the readings with those given in table 4-1. The full-scale reading of the multimeter is indicated for each position of the multimeter switch.

o. Rotate the multimeter switch to the position designated 807 grid, 25 ma. It will be necessary to adjust C-114 and C-115, the first buffer tank circuit trimmers. The location of screwdriver adjustments for these two trimmers is shown in figure 6-2. They should be adjusted for maximum 807 grid current. These two trimmers are connected in parallel as shown in figure 7-7. One of the trimmers should be adjusted to give a good tuning range with the second trimmer. The first trimmer adjustment opening should then be sealed with scotch tape and all adjustments made with the second trimmer.

p. Rotate the multimeter switch to the first buffer cathode position and check the reading against table 4-1.

q. Rotate the multimeter switch to the PA grid position to check the adjustment of the 807 rf driver plate trimmer capacitors, C-125 and C-126. The screwdriver adjustments for these trimmers are shown in figure 6-2. They should be adjusted for maximum power amplifier grid current. These two trimmers are connected in parallel as shown in figure 7-7. One of the trimmers should be adjusted to give a good tuning range with the second trimmer. The first trimmer opening should then be sealed with scotch tape and all adjustments made with the second trimmer.

r. Turn off the plate and filament switches and replace the plate caps on the 872A high voltage rectifier tubes, V-113 and V-114.

s. Replace the two 4-125A modulator tubes, V-110 and V-111, in their sockets.

t. Turn the two bias adjustment controls, R-162 and R-163, to the maximum clockwise position. This adjustment results in maximum bias and minimum modulator tube plate current.

u. Adjust the clip on the modulation monitoring coil, L-110, located in the rf tank compartment and illustrated in figure 6-9, to a position near the ground end of the coil.

v. Turn the power change switch, S-103, to the low position.

w. Set the power amplifier loading to minimum by turning the PA loading control, C-147, to 100 on the dial.

x. Close the transmitter rear doors and turn on the filament and plate switches.

y. As soon as the plate pilot light comes on, adjust the power amplifier tuning control, C-146, for minimum power amplifier plate current.

z. Turn the multimeter switch to the power amplifier grid position and retune the 807 rf driver plate tank as outlined above for maximum power amplifier grid current as indicated on the multimeter.

aa. Adjust the modulator bias controls, R-162 and R-163, until 120 milliamperes of modulator plate current is drawn and the plates of the two tubes 4-250A modulator tubes, V-110 and V-111, appear to be dissipating equal amounts of power.

bb. Turn the power change switch, S-103, to the high position.

cc. Make certain that the power amplifier plate circuit is tuned to resonance. If it is not at resonance, immediately adjust the PA tuning control to obtain minimum plate current as indicated on the power amplifier plate current meter.

dd. Check the tuning of the 807 rf driver plate tank circuit and readjust it for maximum grid drive to the power amplifier, if necessary.

ee. Increase the loading of the power amplifier using the method described in paragraph 3.9.

ff. Readjust the modulation monitoring tap on L-110 to obtain the desired output to the monitoring equipment.

gg. Make the audio adjustments described in paragraph 3.17.

SECTION 4

MAINTENANCE

This Transmitter has been constructed of materials considered to be the best obtainable for the purpose and has been carefully inspected and adjusted at the factory in order to reduce maintenance to a minimum. To insure peak performance and prevent failure or impairment of operation, adhere to a definite schedule of periodic checks and maintenance procedures.

4.1. ROUTINE MAINTENANCE

a. CLEANING. The greatest enemies to uninterrupted service in equipment of this type are dirt and corrosion. Corrosion is accelerated by the presence of moisture and dust. In certain localities it is impossible to keep moisture out of the equipment, but dust can be periodically removed by means of a soft brush or a dry oilfree jet of air. There is always a slight accumulation of dust in the vicinity of high voltage circuits. Remove dust as often as a perceptible quantity accumulates at any point in the equipment. It is very important to keep the moving parts such as tap switches free of dust in order to prevent undue wear. In general, it will be found that tap switch contacts, tube prongs, and cable connectors are most affected by corrosion. When the equipment is operated near salt water or in other corrosive atmospheres, switches, cables, plugs, and other parts should be inspected and cleaned more frequently in order to keep the equipment in operating condition.

The air filter should be cleaned approximately every two weeks. A small vacuum cleaner is a satisfactory device for removing surface dirt. Whenever the element becomes clogged, it should be removed, washed in carbon tetrachloride, and rechanged by immersing in SAE 30 oil and allowing excess oil to drain off. If your transmitter is equipped with an aluminum air filter, follow cleaning instructions printed on side of filter.

Check all connections at least once each month. Tighten any nuts, bolts, or screws that may have become loose. The contacts of cable connectors should be checked to insure clean, firm mechanical and electrical connections. Interlock switches should be inspected and cleaned weekly. Moving parts such as tuning controls should be checked regularly for excessive wear.

b. LUBRICATION. The bearings and pulleys on each flexible condenser drive cable should be lubricated at two points with SAE 30 oil at least once each month.

The bearings of the blower motor should be lubricated monthly with SAE 10 oil. Use only a small amount of lubricant at one time since too much oil will shorten the motor's life.

c. ROUTINE TUBE MAINTENANCE. Do not abuse tubes by operating them above their rated conditions. Keep a record of the length of time the tubes are in use. A check on the emission of all tubes should be made at least every 1000 hours of service. Replace tubes that have been in service for a long time. Spare, pre-aged, mercury vapor rectifier tubes should be available for immediate replacement purposes. In order to have these tubes ready for emergency use they should be placed in the equipment during off-the-air hours and run for twenty minutes with only the filaments lighted. This will remove the mercury coating from the tube elements. The tubes should then be carefully removed from the equipment and stored in an upright position in a place where there is no possibility that they will be inverted or agitated. When pre-aged tubes are placed in the equipment they should be handled carefully in order to avoid the additional twenty minute waiting period that will be required if mercury is allowed to come in contact with the tube elements.

4.2. TROUBLE SHOOTING

The most frequent cause of trouble in equipment of this type is tube failure. Check the tubes by replacing them with tubes that are known to be good and noting any change of performance. Low emission tubes may be the cause of erratic or poor performance of the equipment. If there is any doubt concerning the emission of a tube, it should be checked. Tube failure may cause distortion of hum. A tube suspected of causing this difficulty may be checked by replacing it with a tube that is known to be in good condition.

If the transmitter fails to start, circuits should be checked in the order in which they are made operative. The Primary Control Circuit Diagram, figure 7-1, should be of assistance in locating trouble in the primary circuits. Table 4-1, Typical Meter Readings, and Table 4-2, Typical Voltages and Currents, are supplied as a reference of typical voltages and currents in an average 20V transmitter. A list of typical readings of all panel meters of the individual transmitter should be made as an aid to rapid trouble shooting.

4.3. ORDERING REPLACEMENT PARTS

The guarantee, on the inside front cover, contains information on ordering replacement parts.

WARNING

OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF VOLTAGES THAT ARE DANGEROUS TO LIFE. OPERATING PERSONNEL SHOULD AT ALL TIMES OBSERVE PROPER SAFETY PRECAUTIONS. DO NOT MAKE ADJUSTMENTS INSIDE THE CABINET WHILE ANY OF THE POWER SUPPLIES ARE OPERATING.

Table 4-1. Typical Meter Readings

Switch	Switch Position	Meter	Meter Reading
MULTIMETER SWITCH	1ST AUDIO CATH. 25 MA.	MULTIMETER	4 ma.
MULTIMETER SWITCH	2ND AUDIO CATH. 25 MA.	MULTIMETER	14 ma.
MULTIMETER SWITCH	OSC. CATH. 25 MA.	MULTIMETER	4 ma.
MULTIMETER SWITCH	1ST BUFF. GRID. 2.5 MA.	MULTIMETER	0.1 ma.
MULTIMETER SWITCH	1ST BUFF. CATH. 25 MA.	MULTIMETER	6.5 ma.
MULTIMETER SWITCH	807 GRID 25 MA.	MULTIMETER	1 ma.
MULTIMETER SWITCH	807 CATH. 250 MA.	MULTIMETER	55 ma.
MULTIMETER SWITCH	P.A. GRID 25 MA.	MULTIMETER	20 ma.
POWER CHANGE	LOW (550 w)	MOD. PLATE CURRENT	
		static	120 ma.
		100% mod.*	320 ma.
POWER CHANGE	LOW (550 w)	P.A. PLATE VOLTAGE	2200 volts
POWER CHANGE	LOW (550 w)	P.A. PLATE CURRENT	330 ma.
POWER CHANGE	LOW (550 w)	R.F. LINE CURRENT	
		70 ohm antenna	2.8 amps
		50 ohm antenna	3.3 amps
POWER CHANGE	HIGH (1100 w)	MOD. PLATE CURRENT	
		static	120 ma.
		100% mod.*	450 ma.
POWER CHANGE	HIGH (1100 w)	P.A. PLATE VOLTAGE	3100 volts
POWER CHANGE	HIGH (1100 w)	P.A. PLATE CURRENT	500 ma.
POWER CHANGE	HIGH (1100 w)	R.F. LINE CURRENT	
		70 ohm antenna	3.95
		50 ohm antenna	4.7

* With 1000 cycle sine wave.

Table 4-2

20V Typical Voltage and Currents

Tube	Tube Type	Function	Normal Operating Characteristics
V-101	6AU6	Oscillator, Pierce Circuit	Plate Voltage 270 volts Crystal Current 1.6 ma. Cathode Current 4.0 ma.
V-102	6SJ7	Buffer Amplifier	Plate Voltage 280 volts Screen Voltage 130 volts Grid Current 0.1 ma. Cathode Current 6.5 ma.
V-103	807	RF Driver Amplifier	Plate Voltage 550 volts Screen Voltage 260 volts Cathode Current 55 ma. Grid Current 1 ma.

Table 4-2

20V Typical Voltages and Currents (Cont)

Tube	Tube Type	Function	Normal Operating Characteristics		
V-104, V-105	4-400A	Power Amplifier	Output (watts)	1100	500 watts
			Plate Voltage	3100	2200 volts
			Plate Current	500	330 ma.
			Screen Voltage	470	330 volts
			Grid Current	20	20 ma.
			Plate Efficiency	73.5%	75.8 %
V-106, V-107	6SJ7	1st Audio Amplifier (Triode Connected)	Plate Voltage	265	volts
			Cathode Current	7	ma./tube
V-108 V-109	6SJ7	Audio Driver Amplifier	Plate Voltage	265	volts
			Cathode Current	7	ma./tube
V-110, V-111	4-250A	Modulator	Plate Voltage	3100	volts
			Cathode Current		
			No Signal	120	ma.
			100% Mod. 1100 w	450	ma.
			100% Mod. 550 w	320	ma.
V-112	5U4G	Bias Voltage Rectifier (Values are output from filter)	Voltage	-110	volts
			Current	100	ma.
V-113, V-114	872A	High Voltage Rectifier (Values are output from filter)	Voltage	3100	volts
			Current	1	amp.
V-115, V-116	866A	Low Voltage Rectifier (Values are output from filter)	Voltage	500	volts
			Current	250	ma.

Table 4-3

Primary Power Input

	KVA	KW	PF
Filament switch ON	.78	.66	85%
550 watts output, no modulation	3.28	2.45	75%
550 watts output, 100% modulation	4.0	3.2	80%
1100 watts output, no modulation	3.7	2.95	80%
1100 watts output, 100% modulation	4.82	4.0	83%

SECTION 5

PARTS LIST

20V-1 TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
B-101	Blower and Motor	BLOWER MOTOR: AC, 1/6 hp, 230 v, single phase, 1140 RPM Motor 60 cps Motor 50 cps	009 1207 00 230 0166 00 230 0170 00
C-101	Crystal frequency trimmer for Y-101	CAPACITOR: Variable, 7.5 mmf to 102.7 mmf	922 0028 00
C-102	Crystal frequency trimmer for Y-102	CAPACITOR: Variable, 7.5 mmf to 102.7 mmf	922 0028 00
C-103	Feedback capacitor for V-101	CAPACITOR: Mica, 1000 mmf p/m 20%, 3500 WVDC	914 0019 00
C-104	Cathode by-pass capacitor for V-101	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-105	Screen by-pass for V-101	CAPACITOR: Mica, 150 mmf p/m 20%, 500 WVDC	935 0114 00
C-106	Coupling capacitor V-101 to V-102	CAPACITOR: Mica, 5100 mmf p/m 5%, 500 WVDC	935 2105 00
C-107		Not Used	
C-108		Not Used	
C-109	Multimeter by-pass, Buffer grid, 2.5 ma position	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-110	Plate decoupling capacitor for V-101	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-111	Cathode by-pass capacitor for V-102	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-112	Screen by-pass capacitor for V-102	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-113	Plate tank padding capacitor for V-102	CAPACITOR: Mica, 100 mmf p/m 10%, 500 WVDC (p/o T-102)	912 0495 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-114 and C-115	Plate tank trimmer capacitor for V-102	CAPACITOR: Double, Variable, 5-10 mmf min to 100-105 mmf max (p/o T-102)	922 4800 00
C-116	Compensating capacitor grid to cathode of V-103	CAPACITOR: Ceramic, 20 mmf p/m 5%, 500 WV	916 4420 00
C-117		Not Used	
C-118		Not Used	
C-119	Coupling capacitor V-102 to V-103	CAPACITOR: Mica, 5100 mmf p/m 5%, 500 WVDC	935 2105 00
C-120	Plate decoupling capacitor for V-102	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-121	Multimeter by-pass capacitor for 807 Grid, 25 ma position	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-122	Cathode by-pass capacitor for V-103	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-123	Screen by-pass capacitor for V-103	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-124	Plate tank padding capacitor for V-103	CAPACITOR: Mica, 100 mmf p/m 10%, 500 WVDC (p/o T-103)	912 0495 00
C-125 and C-126	Plate tank trimmer capacitor for V-103	CAPACITOR: Double, Variable, 5-10 mmf min to 100-105 mmf max (p/o T-103)	922 4800 00
C-127		Not Used	
C-128		Not Used	
C-129	Plate decoupling capacitor for V-103	CAPACITOR: Mica, 1000 mmf p/m 20%, 3500 WVDC	914 0019 00
C-130	Decoupling capacitor for low voltage stages	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-131	Neutralizing condenser, for high frequency service only	CAPACITOR: Vacuum 10 mmf p/m 10%, 17,000 WV	919 0062 00
C-132	Coupling capacitor, V-103 to V-104 and V-105	CAPACITOR: Mica, 1000 mmf p/m 20%, 3500 WVDC	914 0019 00
C-133	Meter by-pass capacitor, PA Grid, 25 ma position	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-134	Filament by-pass capacitor for V-104	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-135	Filament by-pass capacitor for V-105	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-136	Filament by-pass capacitor for V-104	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-137	Filament by-pass capacitor for V-105	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-138	Screen by-pass capacitor for V-104	CAPACITOR: Ceramic, 67 mmf p/m 5%, 5000 WV	913 0090 00
C-139	Screen by-pass capacitor for V-105	CAPACITOR: Ceramic, 67 mmf p/m 5%, 5000 WV	913 0090 00
C-140	By-pass capacitor for PA plate current meter M-102	CAPACITOR: Mica, 5100 mmf p/m 5%, 500 WVDC	935 2105 00
C-141	Plate decoupling capacitor for V-104 and V-105	CAPACITOR: Ceramic, 500 mmf plus 50% minus 20%, 20,000 WVDC	913 1101 00
C-142	Plate blocking PA	Ceramic 200 mmf	

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
*C-142A	Additional Coupling capacitor 550 to 700 KC	CAPACITOR: Ceramic 200 mmf p/m 10%, 7500 WVDC	913 1441 00
C-143	Screen by-pass capacitor for V-104	CAPACITOR: Ceramic, 67 mmf p/m 5%, 5000 WV	913 0090 00
C-144	Screen by-pass capacitor for V-105	CAPACITOR: Ceramic, 67 mmf p/m 5%, 5000 WV	913 0090 00
C-145	Padder capacitor for PA plate tank	CAPACITOR: 200 mmf	924 1022 00
C-145A	Padder capacitor 550-890 KC	CAPACITOR: Ceramic, 200 mmf	913 1441 00
C-145B	Padder capacitor 550-700 KC	CAPACITOR: Ceramic, 200 mmf	913 1441 00
C-146	PA Plate tuning capacitor	CAPACITOR: Variable, 60 mmf min to 188 mmf max	920 0075 00
C-147	PA Plate loading capacitor	CAPACITOR: Variable 840 mmf maximum	920 0114 00
*C-148	Padder capacitor, PA output network, 550-700 KC	CAPACITOR: Mica, 2000 mmf, 6000 WV	906 2208 10
*C-148	Padder capacitor, PA output network, 710-890 KC	CAPACITOR: Mica, 800 mmf 6000 WV	906 3801 10
*C-149	Padder capacitor, PA output network, 550 KC	CAPACITOR: Mica, 800 mmf p/m 5%, 6000 TV	906 3801 10
*C-149	Padder capacitor, PA output network, 600-1600 KC	CAPACITOR: Mica, 400 mmf p/m 5%, 6000 TV	906 3401 10
*C-150	Padder capacitor, PA output network, 550-1040 KC	CAPACITOR: Mica, 800 mmf p/m 5%, 5000 WV	906 3801 10

*NOTE: Values Depend upon Frequency of Operation

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
*C-150	Padder capacitor, PA output network, 1050-1600 KC.	CAPACITOR: Mica, 400 mmf p/m 5%, 5000 WV	906 3401 10
*C-151	Padder capacitor, PA output network, 550-1040 KC.	CAPACITOR: Mica, 800 mmf p/m 5%, 5000 WV	906 3801 10
*C-151	Padder capacitor, PA output network, 1050-1600 KC.	CAPACITOR: Mica, 400 mmf p/m 5%, 5000 WV	906 3401 10
C-152	Plate decoupling capacitor for V-104 and V-105	CAPACITOR: Ceramic, 500 mmf plus 50%, minus 20%, 20,000 WVDC	913 1101 00
C-153	By-pass capacitor for multimeter, M-104	CAPACITOR: Mica, 5100 mmf p/m 5%, 500 WVDC	935 2105 00
C-154	Feedback insertion, V-106	CAPACITOR: Mica, 3300 mmf p/m 20%, 1200 WVDC	936 0283 00
C-155	Feedback insertion for V-107	CAPACITOR: Mica, 3300 mmf p/m 20%, 1200 WVDC	936 0283 00
C-156	Coupling capacitor, V-106 to V-108	CAPACITOR: Paper,.01 mf p/m 10%, 600 WVDC	961 5114 00
C-157	Coupling capacitor, V-107 to V-109	CAPACITOR: Paper,.01 mf p/m 10%, 600 WVDC	961 5114 00
C-158	Coupling capacitor, V-108 to V-110	CAPACITOR: Paper,.01 mf p/m 10%, 600 WVDC	961 5114 00
C-159	Coupling capacitor, V-109 to V-111	CAPACITOR: Paper,.01 mf p/m 10%, 600 WVDC	961 5114 00
C-160	Filament by-pass capacitor for V-110 and V-111	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10

* NOTE: Values Depend upon Frequency of Operation

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-161	Filament by-pass capacitor for V-110 and V-111	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-162	Plate decoupling capacitor for V-106 and V-107	CAPACITOR: Paper, 2 mf p/m 10%, 600 WVDC	930 0046 00
C-163	D-C blocking capacitor for T-105	CAPACITOR: Paper, 4 mf p/m 20%, 4000 WVDC	930 0045 00
C-164	By-pass capacitor PA plate voltage meter	CAPACITOR: Mica, 5100 mmf p/m 5%, 500 WVDC	935 2105 00
C-165	Filament by-pass capacitor for V-103	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-166	Filament by-pass capacitor for V-103	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-167	Filter capacitor, bias supply filter	CAPACITOR: Paper, 8 mf p/m 20%, 600 WVDC	956 2014 00
C-168	Filter capacitor, bias supply filter	CAPACITOR: Paper, 8 mf p/m 20%, 600 WVDC	956 2014 00
C-169	Tunes L-114 in H.V. filter to ripple frequency	CAPACITOR: Paper, .15 mf p/m 10%, 7500 WVDC	930 0329 00
C-170	Filter capacitor, high voltage supply filter	CAPACITOR: Paper, 4 mf p/m 20%, 4000 WVDC	930 0045 00
C-171	By-pass capacitor for modulator plate current meter, M-105	CAPACITOR: Mica, 5100 mmf p/m 5%, 500 WVDC	935 2105 00
C-172	Filter capacitor, low voltage supply filter	CAPACITOR: Paper, 8 mf p/m 20%, 600 WVDC	956 2014 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-173	Filter capacitor, low voltage supply filter	CAPACITOR: Paper, 8 mf p/m 20%, 600 WVDC	956 2014 00
C-174	Part of feedback network, plate of V-110 to grid of V-106	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162 00
C-175	Part of feedback network, plate of V-110 to grid of V-106	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162 00
C-176	Part of feedback network, plate of V-110 to grid of V-106	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162 00
C-177	Part of feedback network, plate of V-110 to grid of V-106	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162 00
C-178	Part of feedback network, plate of V-111 to grid of V-107	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162 00
C-179	Part of feedback network, plate of V-111 to grid of V-107	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162 00
C-180	Part of feedback network, plate of V-111 to grid of V-107	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162 00
C-181	Part of feedback network, plate of V-111 to grid of V-107	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-182		Not Used	
C-183		Not Used	
C-184	Filter capacitor, high voltage supply filter	CAPACITOR: Paper, 4 mf p/m 20%, 4000 WVDC	930 0045 00
C-185	Coupling capacitor to frequency monitor jack, J-104	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
E-100	Primary power input terminal board	BOARD: 3 terminals	306 0069 00
E-101	Terminal board connecting modulator chassis to power supplies	BOARD: 11 terminals	367 5110 00
E-102	Terminal board connecting r-f chassis to power supplies	BOARD: 11 terminals	367 5110 00
E-103	Audio input terminal board	BOARD: 3 terminals	367 4030 00
E-104	Audio monitoring output terminal board	BOARD: 2 terminals	367 4020 00
F-101	Fuse in primary of bias supply transformer T-106	FUSE: Cartridge, 1 amp. 250 v Slo Blow	264 4280 00
F-102	Fuse in primary of high voltage rectifier filament transformer, T-107	FUSE: Cartridge, 1 amp 250 v Slo Blow	264 4280 00
F-103	Fuse in primary of filament transformer, T-109	FUSE: Cartridge, 3 amp 250 v Slo Blow	264 0009 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
F-104	Fuse in primary of low voltage supply transformer	FUSE: Cartridge, 1 amp 250 v Slo Blow	264 4280 00
I-101	Filaments at operating temperature indicator	BULB: Candelabra base, 230-250 v, 10 w	262 0169 00
I-102	Lumiline meter panel lamp, illuminates meter panel	BULB: Lumiline, disc base, 110 VAC RMS, 40 w	262 0170 00
I-103	Lumiline meter panel lamp, illuminates meter panel	BULB: Lumiline, disc base, 110 VAC RMS, 40 w	262 0170 00
I-104	Plate ON lamp, indicates when high and low voltage is on	BULB: Candelabra base, 230-250 v, 10 w	262 0169 00
J-100	Jack for modulation monitor	RECEPTACLE: Chassis mtg	357 9005 00
J-101	Modulator unit connector	CONNECTOR: Four prong socket for chassis mtg.	364 2040 00
J-102	Modulator unit connector	CONNECTOR: Chassis mtg socket	366 2080 00
J-103	RF chassis connector	CONNECTOR: Chassis mtg socket	366 2080 00
J-104	Frequency monitor jack	RECEPTACLE: Chassis mtg	357 9005 00
J-105	Socket for F-101	HOLDER: Fuse	265 1002 00
J-106	Socket for F-102	HOLDER: Fuse	265 1002 00
J-107	Socket for F-103	HOLDER: Fuse	265 1002 00
J-108	Socket for F-104	HOLDER: Fuse	265 1002 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
K-101	Thermal time delay relay provides adequate filament warm-up period	RELAY: 3 amp 150 v DC, 3 amp 250 v AC contacts	402 0211 00
K-102	Plate relay, shunts thermal element in K-101 with resistor, shorts K-101 relay contacts, and completes circuit from S-107 to T-108 and T-110	RELAY: 25 amp 600 v contacts, 220 v coil	401 1201 00
L-101		Not used in broadcast band	
L-102		COIL: (p/o T-102)	
L-102A	Part of plate tank coil for V-102	Section of L-102	
L-102B	Part of plate tank coil for V-102	Section of L-102	
L-103		Not Used in broadcast band	
L-104		COIL: (p/o T-103)	
L-104A	Part of plate tank coil for V-103	Section of L-104	
L-104B	Part of plate tank coil for V-103	Section of L-104	
L-105		Not Used in broadcast band	
L-106	RF choke in B plus lead to V-103	COIL: RF 300 ma	240 5800 00
L-107	RF choke in B plus lead to V-104 and V-105	COIL: RF Choke, 200 turns #24 AWG DS wire	571 0460 10

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
*L-108	PA plate tuning coil, 550-700 KC.	INDUCTOR: RF fixed tank, 150 µh	980 0041 00
*L-108	PA plate tuning coil 710-1600 KC.	INDUCTOR: RF fixed tank, 81 µh	980 0040 00
L-109	L-section Inductor	COIL: R.F. - 30 turns #10 AWG wire	504 9624 003
L-110	Static drain choke, feeds modulation monitor	COIL: 56 turns, #22 copper wire	572 0700 30
L-111	Modulation reactor	REACTOR: 7500 TV RMS 50 Hy	678 0400 00
L-112	Filter choke, bias voltage supply filter	REACTOR: .080 amp DC 12 Hy, 2000 T.V.-dc resistance 375 ohm	668 0004 00
L-113	Filter choke, bias voltage supply filter	REACTOR: .080 amp DC 12 Hy, 2000 T. V. dc resistance 375 ohm	668 0004 00
L-114	Filter choke, high voltage supply filter	REACTOR: 9000 TV RMS 10 Hy, dc resistance 50 ohm	678 0386 00
L-115	Filter choke, high voltage supply filter	REACTOR: 9000 TV RMS 10 Hy dc resistance 50 ohm	678 0386 00
L-116	Filter choke, low voltage supply filter	REACTOR: 2500 TV RMS 8.0 Hy dc resistance 85 ohm	678 0384 00
L-117	Filter choke, low voltage supply filter	REACTOR: 2500 TV RMS 8.0 Hy dc resistance 85 ohm	678 0384 00

* NOTE: Values Depend upon Frequency of Operation.

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
M-101	Meters rf line current	METER: R. F. Ammeter 0-6 amps	451 0082 00
M-102	Meters PA plate current	METER: 0-800 ma dc	450 0095 00
M-103	Meters PA plate voltage	METER: 0-1 ma, 0-4000 v DC to be used with external multiplier R169	458 0196 00
M-104	Multimeter	METER: 0-1 ma DC, 250 div. scale	458 0170 00
M-105	Meters modulator plate current	METER: 0-800 ma DC	450 0095 00
P-100	Plug for modulation monitor	CONNECTOR: RF concentric cable	357 9014 00
P-101	Connects from J-102 to M-104 and M-105	CONNECTOR: Cable connector with cover	363 8042 00
P-102	Connects from J-103 to J-104	CONNECTOR: Cable connector with cover	365 8080 00
P-103	Connects from J-104 to J-103	CONNECTOR: Cable connector with cover	365 8080 00
P-104	Plug for frequency monitor	CONNECTOR: RF concentric cable	357 9014 00
R-101	Grid resistor for V-101	RESISTOR: .1 megohm p/m 10%, 1/2 w	745 1170 00
R-102	Cathode resistor for V-101	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-103	Plate load resistor, for V-101	RESISTOR: 10,000 ohm p/m 10%, 1 w (p/o T-101)	745 3128 00
R-104	Screen voltage dropping resistor for V-101	RESISTOR: 82,000 ohm p/m 10%, 1/2 w	745 1167 00
R-105	Voltage dropping resistor, V-101	RESISTOR: .12 megohm p/m 10%, 2 w	745 5174 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-106	Voltage dropping resistor, V-101	RESISTOR: .12 megohm p/m 10%, 2 w	745 5174 00
R-107	Grid resistor, V-102	RESISTOR: .1 megohm p/m 10%, 1/2 w	745 1170 00
R-108	Multimeter shunt resistor, 1st Buffer Grid, 2.5 ma position	RESISTOR: 3900 ohm p/m 10%, 1/2 w	745 1111 00
R-109	Voltage divider feeds frequency monitor	RESISTOR: 56 ohm p/m 10%, 2 w	745 5034 00
R-110	Cathode resistor for V-102	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-111	Voltage dividing resistor for V-102	RESISTOR: 39,000 ohm p/m 10%, 1 w	745 3153 00
R-112	Screen voltage dropping resistor, V-102	RESISTOR: 33,000 ohm p/m 10%, 1 w	745 3149 00
R-113	Voltage dropping resistor, V-102	RESISTOR: 25,000 ohm p/m 10%, 10 w	710 1254 20
R-114	Grid resistor, V-103	RESISTOR: 15,000 ohm p/m 10%, 1 w	745 3135 00
R-115	Cathode resistor, V-103	RESISTOR: 22 ohm p/m 10%, 2 w	745 5016 00
R-116	Stabilizing resistor, V-103	RESISTOR: 47 ohm p/m 10%, 1/2 w	745 1030 00
R-117	Screen voltage dividing resistor V-103	RESISTOR: 22,000 ohm p/m 10%, 2 w	745 5142 00
R-118		Not Used	
R-119	Grid resistor, V-104 and V-105	RESISTOR: 15 ohm p/m 20%, 25 w	710 3154 20

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-120	Audio hum control B	RESISTOR: 50 ohm p/m 10%, 25 w	504 9561 002
R-121	Audio voltage source for audio monitor	RESISTOR: 12.6 ohm p.m 20%, 20 w	710 0044 00
R-122	Screen dropping resistor, V-104 and V-105	RESISTOR: 2000 ohm p/m 5%, 25 w	710 3241 00
R-123	Voltage dividing resistor for bias supply	RESISTOR: 15,000 ohm p/m 10%, 1 w	745 3135 00
R-124	Part of 807 Grid resistance	RESISTOR: 4700 ohm p/m 10%, 1 w	745 3114 00
R-125	Shunt resistor for Multimeter, 807 Grid, 25 ma position	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-126	Shunt resistor for Multimeter, PA Grid 25 ma position	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-127	Multimeter series resistor	RESISTOR: 5100 ohm p/m 5%, 1/2 w	745 1116 00
R-128	Part of T-pad for audio input to T-104	RESISTOR: 150 ohm p/m 10%, 1/2 w	745 1051 00
R-129	Part of T-pad for audio input to T-104	RESISTOR: 150 ohm p/m 10%, 1/2 w	745 1051 00
R-130	Part of T-pad for audio input to T-104	RESISTOR: 150 ohm p/m 10%, 1/2 w	745 1051 00
R-131	Part of T-pad for audio input to T-104	RESISTOR: 150 ohm p/m 10%, 1/2 w	745 1051 00
R-132	Part of T-pad for audio input to T-104	RESISTOR: 430 ohm p/m 5%, 1/2 w	745 1070 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-133	Grid resistor for V-106	RESISTOR: 68,000 ohm p/m 10%, 1/2 w	745 1163 00
R-134	Grid resistor for V-107	RESISTOR: 68,000 ohm p/m 10%, 1/2 w	745 1163 00
R-135	Voltage divider for feedback network to V-106	RESISTOR: 10,000 ohm p/m 10%, 2 w	745 5128 00
R-136	Voltage divider for feedback network to V-107	RESISTOR: 10,000 ohm p/m 10%, 2 w	745 5128 00
R-137	Cathode resistor, V-106 and V-107	RESISTOR: 5600 ohm p/m 10%, 1/2 w	745 1118 00
R-138	Multimeter shunt resistor, Audio Cathode	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-139	Voltage dropping resistor, V-106 and V-107	RESISTOR: 22,000 ohm p/m 10%, 2 w	745 5142 00
R-140	Plate load resistor, V-106	RESISTOR: 47,000 ohm p/m 10%, 2 w	745 5156 00
R-141	Plate load resistor, V-107	RESISTOR: 47,000 ohm p/m 10%, 2 w	745 5156 00
R-142	Grid resistor, V-108	RESISTOR: 82,000 ohm p/m 10%, 1/2 w	745 1167 00
R-143	Grid resistor, V-109	RESISTOR: 82,000 ohm p/m 10%, 1/2 w	745 1167 00
R-144	Cathode resistor, V-108	RESISTOR: 820 ohm p/m 10%, 1/2 w	745 1083 00
R-145	Cathode resistor, V-109	RESISTOR: 820 ohm p/m 10%, 1/2 w	745 1083 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-146	Cathode resistor and audio balance control, V-108 and V-109	RESISTOR: Variable 400 ohm p/m 10%, 4 w	377 0006 00
R-147	Multimeter shunt resistor, 2nd Audio Cathode, 25 ma postion	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-148	Voltage dropping resistor, V-108 and V-109	RESISTOR: 4,700 ohm p/m 10%, 2 w	745 5114 00
R-149	Plate load resistor, V-108 and V-109	RESISTOR: 22,000 ohm p/m 10%, 2 w	745 5142 00
R-150	Plate load resistor, V-108 and V-109	RESISTOR: 22,000 ohm p/m 10%, 2 w	745 5142 00
R-151	Part of feedback network, from plate of V-110 to grid of V-106	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-152	Part of feedback network, from plate of V-110 to grid of V-106	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-153	Part of feedback network, from plate of V-110 to grid of V-106	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-154	Part of feedback network, from plate of V-110 to grid of V-106	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-155	Part of feedback network, from plate of V-111 to grid of V-107	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-156	Part of feedback network, from plate of V-111 to grid of V-107	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-157	Part of feedback network, from plate of V-111 to grid of V-107	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-158	Part of feedback network, from plate of V-111 to grid of V-107	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-159	Part of grid resistance of V-110 and V-111	RESISTOR: 47,000 ohm p/m 10%, 2 w	745 5156 00
R-160	Part of grid resistance of V-110 and V-111	RESISTOR: 82,000 ohm p/m 10%, 1 w	745 3167 00
R-161	Part of grid resistance of V-110 and V-111	RESISTOR: 82,000 ohm p/m 10%, 1 w	745 3167 00
R-162	Modulator bias adjustment	RESISTOR: Variable 25,000 ohm p/m 10%, 4 w	377 0011 00
R-163	Modulator bias adjustment	RESISTOR: Variable 25,000 ohm p/m 10%, 4 w	377 0011 00
R-164	Stabilizing resistor, V-110	RESISTOR: 10,000 ohm p/m 10%, 1/2 w	745 1128 00
R-165	Stabilizing resistor, V-111	RESISTOR: 10,000 ohm p/m 10%, 1/2 w	745 1128 00
R-166	Voltage dropping resistor for Power Change Switch	RESISTOR: 5000 ohm p/m 10%, 160 w	710 6542 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-167	Voltage dropping resistor for Power Change switch	RESISTOR: 5000 ohm p/m 10%, 160 w	710 6542 00
R-168	DC Plate Voltmeter, M-103, shunt resistor	RESISTOR: 10,000 ohm p/m 10%, 2 w	745 5128 00
R-169	Series resistor for DC Plate Voltmeter	RESISTOR: 4 megohm	505 5098 002
R-170		Not Used	
R-171	Varies length of filament time delay	RESISTOR: Variable 2000 ohm p/m 10%, 4 w	377 0008 00
R-172	Shunt resistor for K-101	RESISTOR: 5000 ohm p/m 10%, 10 w	710 1542 00
R-173	Voltage dropping resistor for K-101	RESISTOR: 2500 ohm p/m 10%, 10 w	710 0030 00
R-174	Bleeder resistor for bias supply	RESISTOR: 2000 ohm p/m 10%, 25 w	710 3242 00
R-175	Part of bleeder resistance for high voltage supply	RESISTOR: 20,000 ohm p/m 5%,100 w	710 2134 00
R-176	Part of bleeder resistance for high voltage supply	RESISTOR: 20,000 ohm p/m 5%, 100 w	710 2134 00
R-177	Part of bleeder resistance for high voltage supply	RESISTOR: 40,000 ohm p/m 10%, 100 w	710 5404 20
R-178	Bleeder resistor for low voltage supply	RESISTOR: 7500 ohm p/m 10%, 50 w	710 0099 00
R-179		Not Used	
R-180	Screen voltage dropping resistor, V-103	RESISTOR: 56,000 ohm p/m 10%, 2 w	745 5160 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-181	Screen voltage dropping resistor, V-103	RESISTOR: 56,000 ohm p/m 10%, 2 w	745 5160 00
R-182	Audio hum control A	RESISTOR: Variable 25,000 ohm 10%,4 watt	377 0011 00
R-183	Primary voltage dropping resistor (shorted out fo/20V in the circuit for 300)	RESISTOR: w.w. 15 ohms p/m 10% 25 watts	710 3152 00
S-101	Selects desired crystal, Crystal Selector switch	SWITCH: Rotary, 2 pole, 2 position	259 0362 00
S-102	Multimeter switch, selects circuit to be metered	SWITCH: Rotary, 2 pole, 8 position	259 0441 00
S-103	Power change switch, shorts out dropping resistors R-166 and R-167	SWITCH: High voltage rotary, SPST, special	504 9633 003
S-104	Mechanical door interlock, discharges high voltage filter capacitors	SHORTING BAR: Gravity operated	
S-105	Mechanical door interlock, discharges high voltage filter capacitors	SHORTING BAR: Gravity operated	
S-106	Filament ON-OFF switch and breaker, applies voltage to filaments, blower and bias supply	CIRCUIT BREAKER: Magnetic, 230 v AC 4 amp	260 0238 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
S-107	Plate ON-OFF switch and breaker, applies to T-108 and T-110	CIRCUIT BREAKER: Magnetic, 230 v AC 20 amp	260 0265 00
S-108	Electrical door interlock, removes the high and low voltage	CONTACT ASSEM: Male section of door interlock switch CONTACT ASSEM: Female section of door interlock switch	260 4040 00 260 4050 00
S-109	Electrical door interlock, removes the high and low voltage	CONTACT ASSEM: Male section of door interlock switch CONTACT ASSEM: Female section of door interlock switch	260 4040 00 260 4050 00
S-110	Blower interlock, removes high and low voltage if not closed	SWITCH: Micro. SPDT, 5 amp 250 v AC	260 0700 00
T-101	Plate tank rf can, V-101	OSCILLATOR PLATE TUNING ASSEM: (incl R-103)	504 9594 002
T-102	Plate tank rf can, V-102	INTERMEDIATE PLATE TUNING ASSEM: (inc C-113, C-114, C-115, L-102A, L-102B) 125.26 DAL 32133	504 9632 003 136.00 + Freight
T-103	Plate tank rf can, V-103	INTERMEDIATE PLATE TUNING ASSEM: (incl C-124, C-125, C-126, L-104A, L-104B)	504 9632 003
T-104	Audio input transformer feeds V-106 and V-107	TRANSFORMER: HF input audio, Pri: 600 ohm CT, Sec: 50,000 ohm CT	677 0114 00
T-105	Modulation transformer	TRANSFORMER: Modulation $804.00	~~677 0128 00~~ 667-0497-000
T-106	Bias supply transformer	TRANSFORMER: Power, Pri: 230 v, Sec #1: 360, 320, 280, 240 v CT, Sec #2: 5 v	672 0392 00
T-107	Filament transformer for high voltage rectifier tubes	TRANSFORMER: Filament, Pri: 230, 208 v, Sec: 5 v CT	672 0382 00 T107

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
T-108	High voltage transformer	TRANSFORMER: 208/230 v 50/60 cycle with taps for 3200 v dc out of power supply	672 0385 00
T-109	Filament transformer 866A rectifier tubes and all RF and audio tubes	TRANSFORMER: Filament, Pri: 230, 208 v, Sec #1; 5.3 v CT, Sec #2: 5.3 v CT, Sec #3: 6.3 v CT, Sec #4: 2.5 CT	672 0381 00
T-110	Low voltage supply transformer	TRANSFORMER: Plate, Pri: 230, 208 v, Sec: 550 v DC 280 ma dc	672 0383 00
V-101	Oscillator	Tube: Pentode 6AU6	255 0202 00
V-102	Buffer Amplifier	TUBE: Pentode 6SJ7	255 0030 00
V-103	RF Driver	TUBE: Beam 807	256 0033 00
V-104	Power Amplifier	TUBE: Tetrode 4-400A	256 0091 00
V-105	Power Amplifier	TUBE: Tetrode 4-400A	256 0091 00
V-106	1st Audio Amplifier	TUBE: Pentode 6SJ7	255 0030 00
V-107	1st Audio Amplifier	TUBE: Pentode 6SJ7	255 0030 00
V-108	Audio Driver Amplifier	TUBE: Pentode 6SJ7	255 0030 00
V-109	Audio Driver Amplifier	TUBE: Pentode 6SJ7	255 0030 00
V-110	Modulator	TUBE: Tetrode 4-250A	256 0089 00
V-111	Modulator	TUBE: Tetrode 4-250A	256 0089 00
V-112	Bias supply rectifier	TUBE: Rectifier 5U4G	255 0032 00
V-113	High voltage supply rectifier	TUBE: Rectifier 872A	256 0037 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
V-114	High voltage supply rectifier	TUBE: Rectifier 872A	256 0037 00
V-115	Low voltage supply rectifier	TUBE: Rectifier 866A	256 0049 00
V-116	Low voltage supply rectifier	TUBE: Rectifier 866A	256 0049 00
X-100	Socket for I-101	MTG: Pilot light, for candelabra base bulbs	262 0033 00
		DISC: Green	262 2370 00
X-101	Socket for I-104	MTG: Pilot light, for candelabra base bulbs	262 0255 00
		DISC: Red	262 0259 00
X-102	Socket for I-102	MTG: Socket, for lumiline lamp bulb	262 0177 00
X-103	Socket for I-102	MTG: Socket, for lumiline lamp bulb	262 0177 00
X-104	Socket for I-103	MTG: Socket, for lumiline lamp bulb	262 0177 00
X-105	Socket for I-103	MTG: Socket, for lumiline lamp bulb	262 0177 00
X-106		Adapter, for lumiline bulb	262 0175 00
X-107		Adapter, for lumiline bulb	262 0175 00
X-108		Adapter, for lumiline bulb	262 0175 00
X-109		Adapter, for lumiline bulb	262 0175 00
X-110	Socket for V-104	SOCKET: Tube, 5 prong	220 1016 00
X-111	Socket for V-105	SOCKET: Tube, 5 prong	220 1016 00
X-112	Socket for T-101	SOCKET: Tube, chassis mtg. 7 prong	220 1790 00
X-113	Socket for V-103	SOCKET: Tube, 5 contacts	220 5520 00

B0-3100

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
X-114	Socket for T-102	SOCKET: Tube, chassis mtg, 7 prong	220 1790 00
X-115	Socket for V-102	SOCKET: Tube, octal, 8 prong	220 1005 00
X-116	Socket for T-103	SOCKET: Tube, chassis mtg, 7 prong	220 1790 00
X-117	Socket for V-101	SOCKET: Tube, miniature, 7 pins	220 1034 00
X-118	Socket for Y-101	SOCKET: Tube, octal, 8 prong	220 1005 00
X-119	Socket for Y-102	SOCKET: Tube, octal, 8 prong	220 1005 00
X-120	Socket for V-110	SOCKET: Tube, 5 prong	220 1016 00
X-121	Socket for V-111	SOCKET: Tube, 5 prong	220 1016 00
X-122	Socket for V-106	SOCKET: Tube, octal, 8 prong	220 1005 00
X-123	Socket for V-107	SOCKET: Tube, octal, 8 prong	220 1005 00
X-124	Socket for V-108	SOCKET: Tube, octal, 8 prong	220 1005 00
X-125	Socket for V-109	SOCKET: Tube, octal, 8 prong	220 1005 00
X-126	Socket for K-101	SOCKET: Tube, octal, 8 prong	220 1005 00
X-127	Socket for V-112	SOCKET: Tube, octal, 8 prong	220 1005 00
X-128	Socket for V-115	SOCKET: Tube, 4 prong	220 5410 00
X-129	Socket for V-116	SOCKET: Tube, 4 prong	220 5410 00
X-130	Socket for V-113	SOCKET: Tube, 4 prong	220 5420 00
X-131	Socket for V-114	SOCKET: Tube, 4 prong	220 5420 00
Y-101	Quartz crystal	CRYSTAL	
Y-102	Quartz crystal	CRYSTAL	

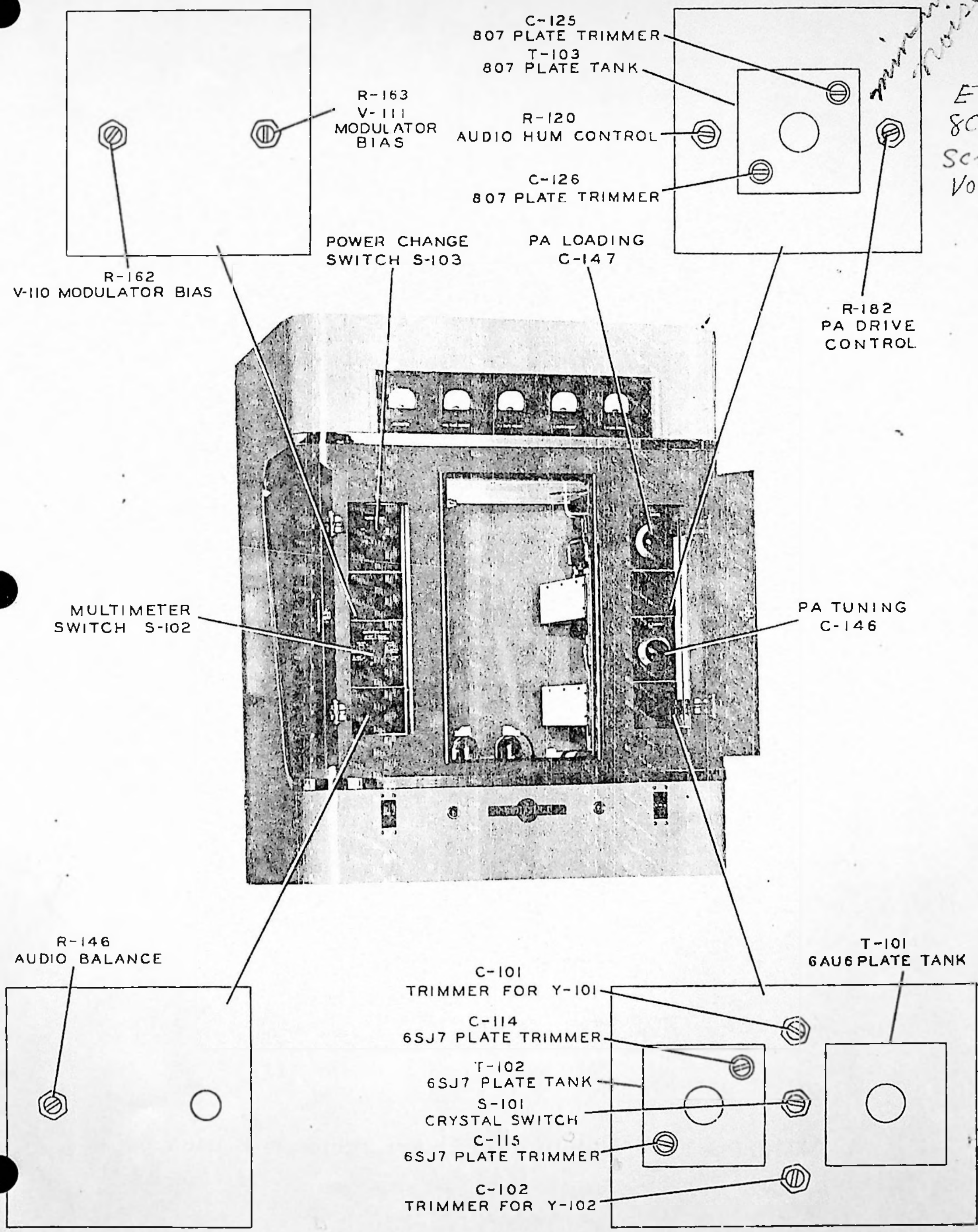


Figure 6-2. Location of Controls Behind Inspection Plates

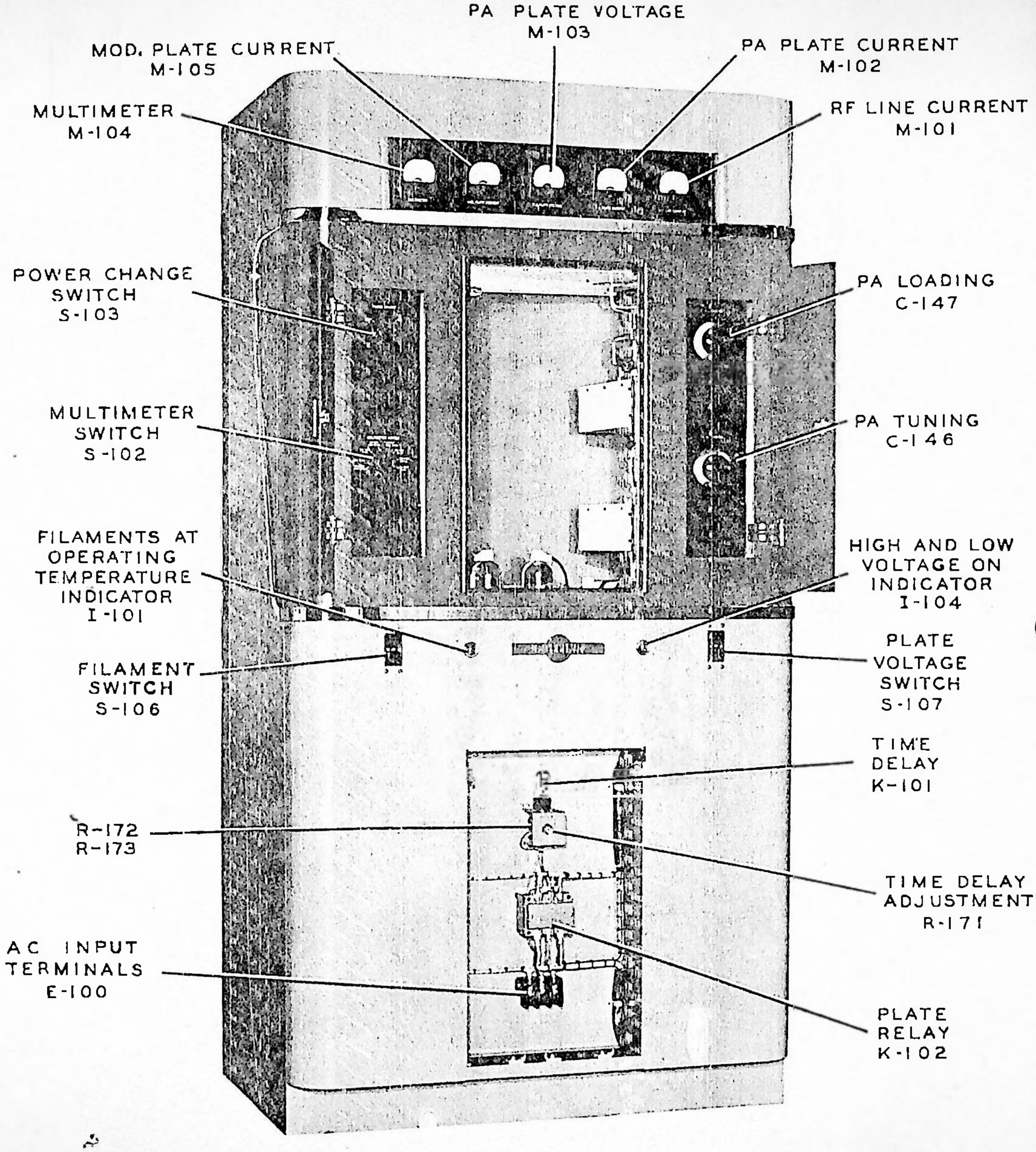


Figure 6-1. Transmitter Parts Arrangement, Front View

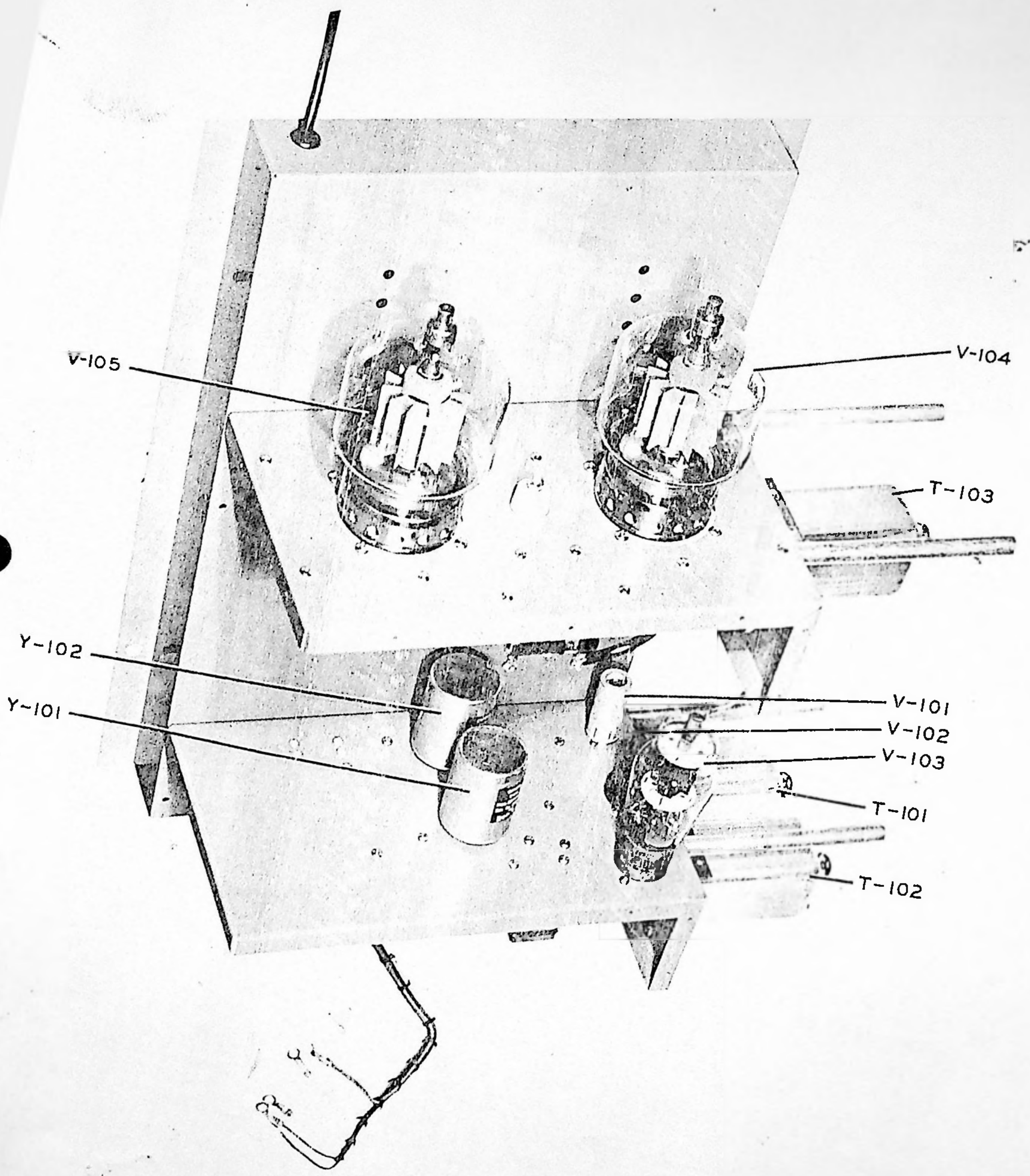


Figure 6-4. RF Chassis Parts Arrangement, Top View

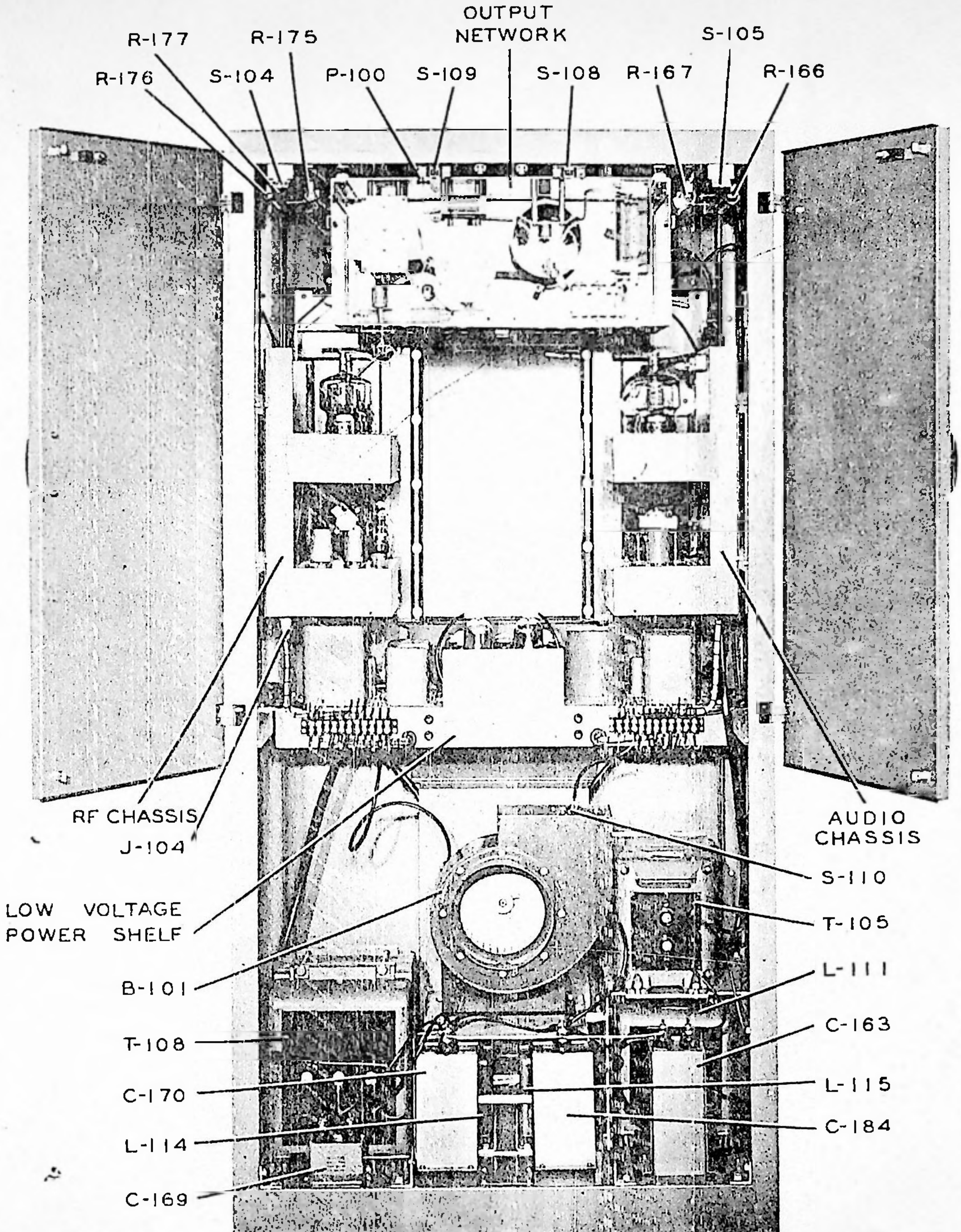


Figure 6-3. Transmitter Parts Arrangement, Rear View

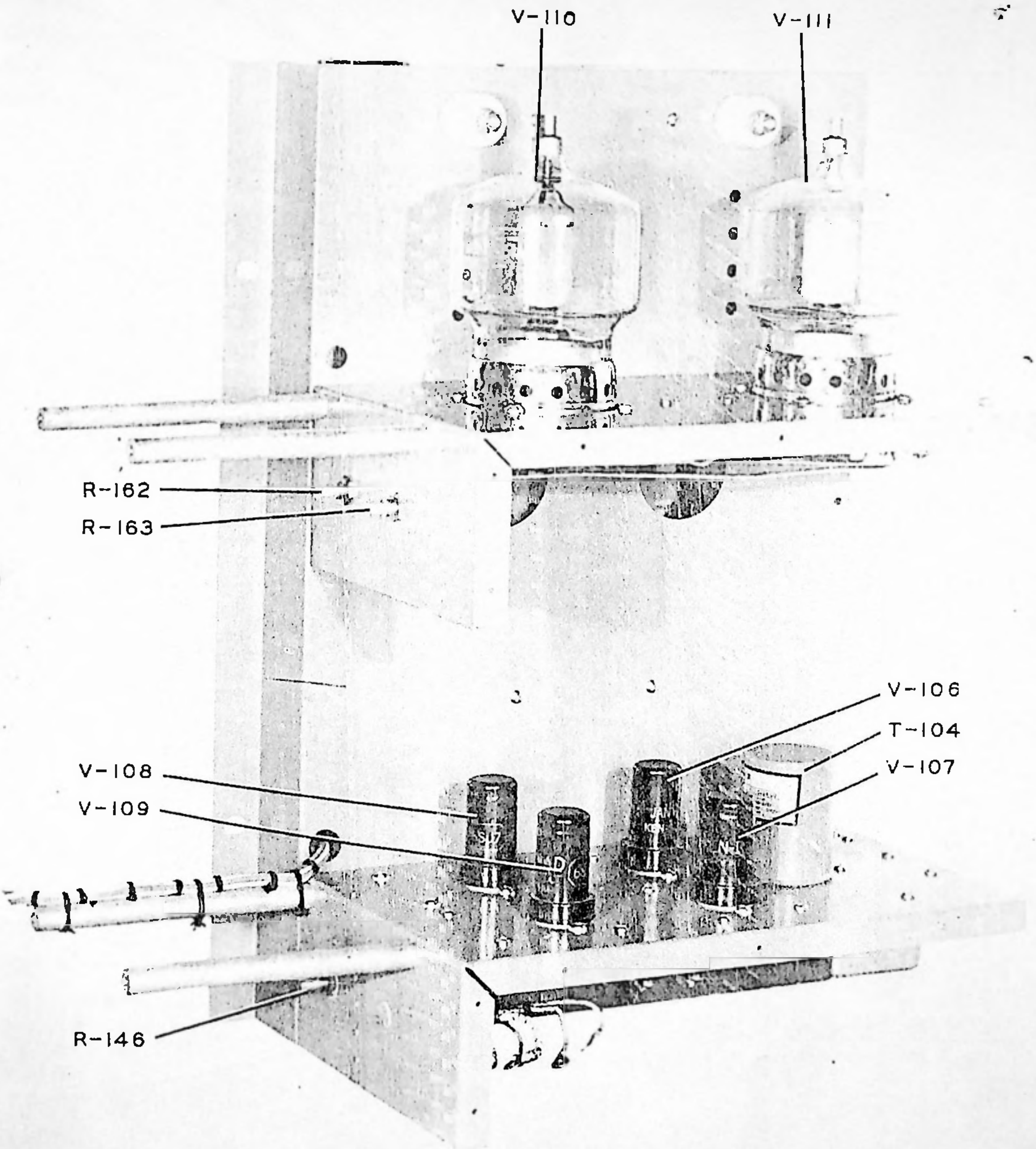


Figure 6-6. Audio Chassis Parts Arrangement, Top View

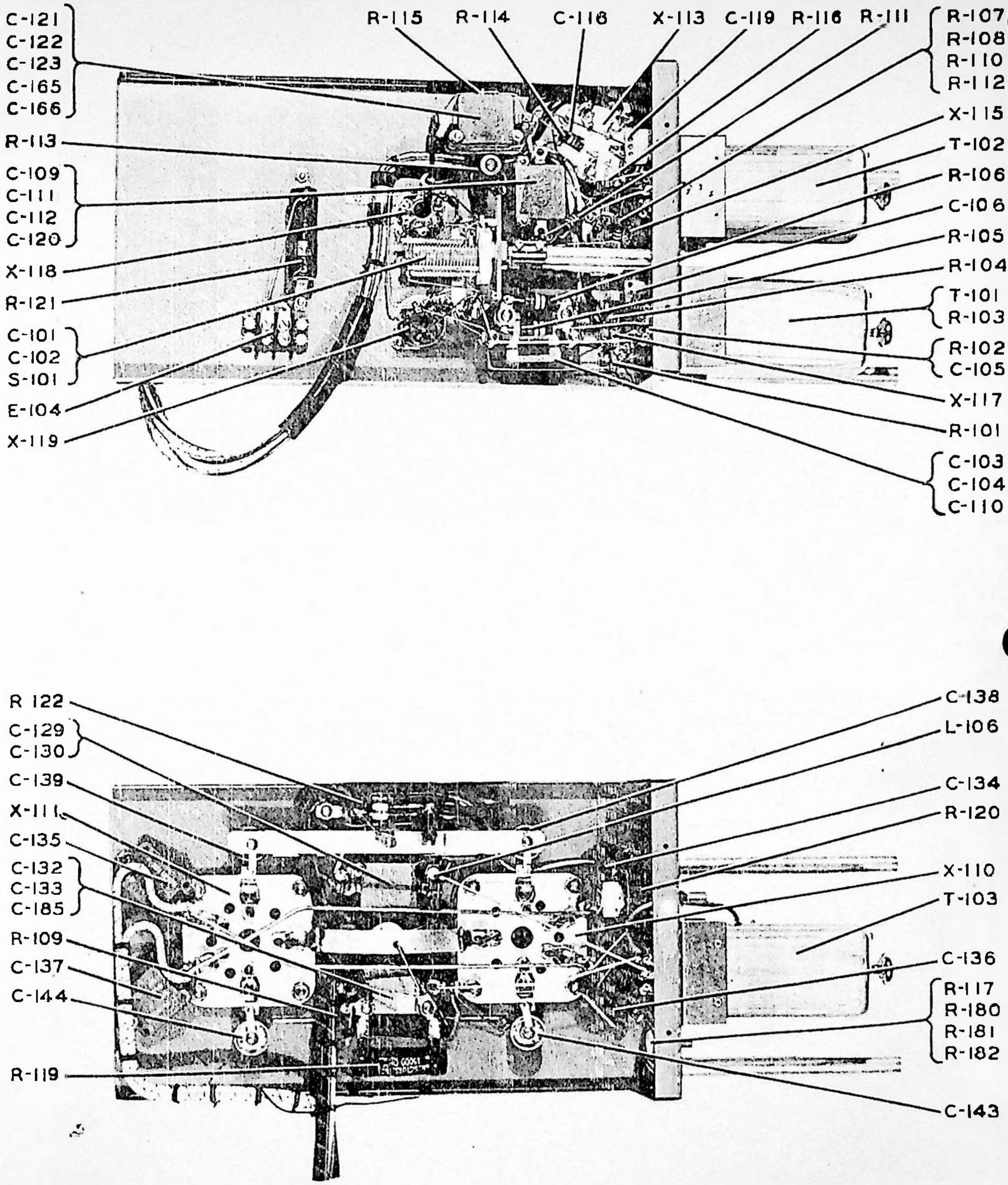
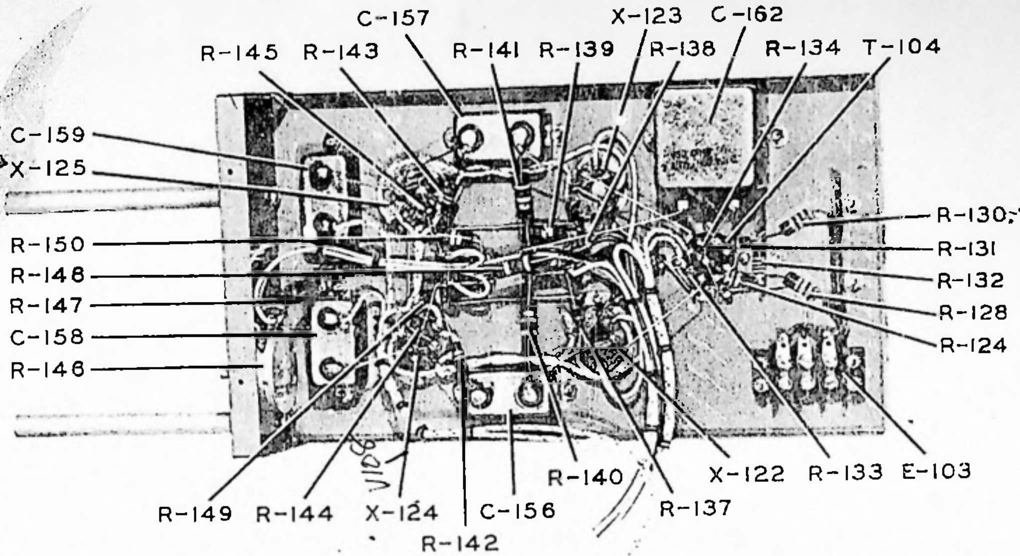


Figure 6-5. RF Chassis Parts Arrangement, Bottom View



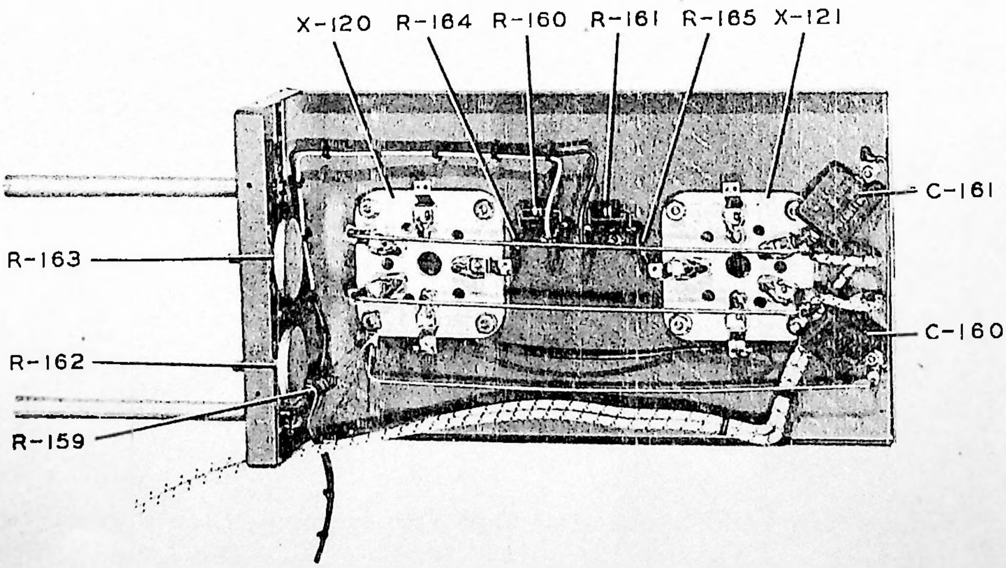


Figure 6-8. Audio Chassis Parts Arrangement, Bottom View

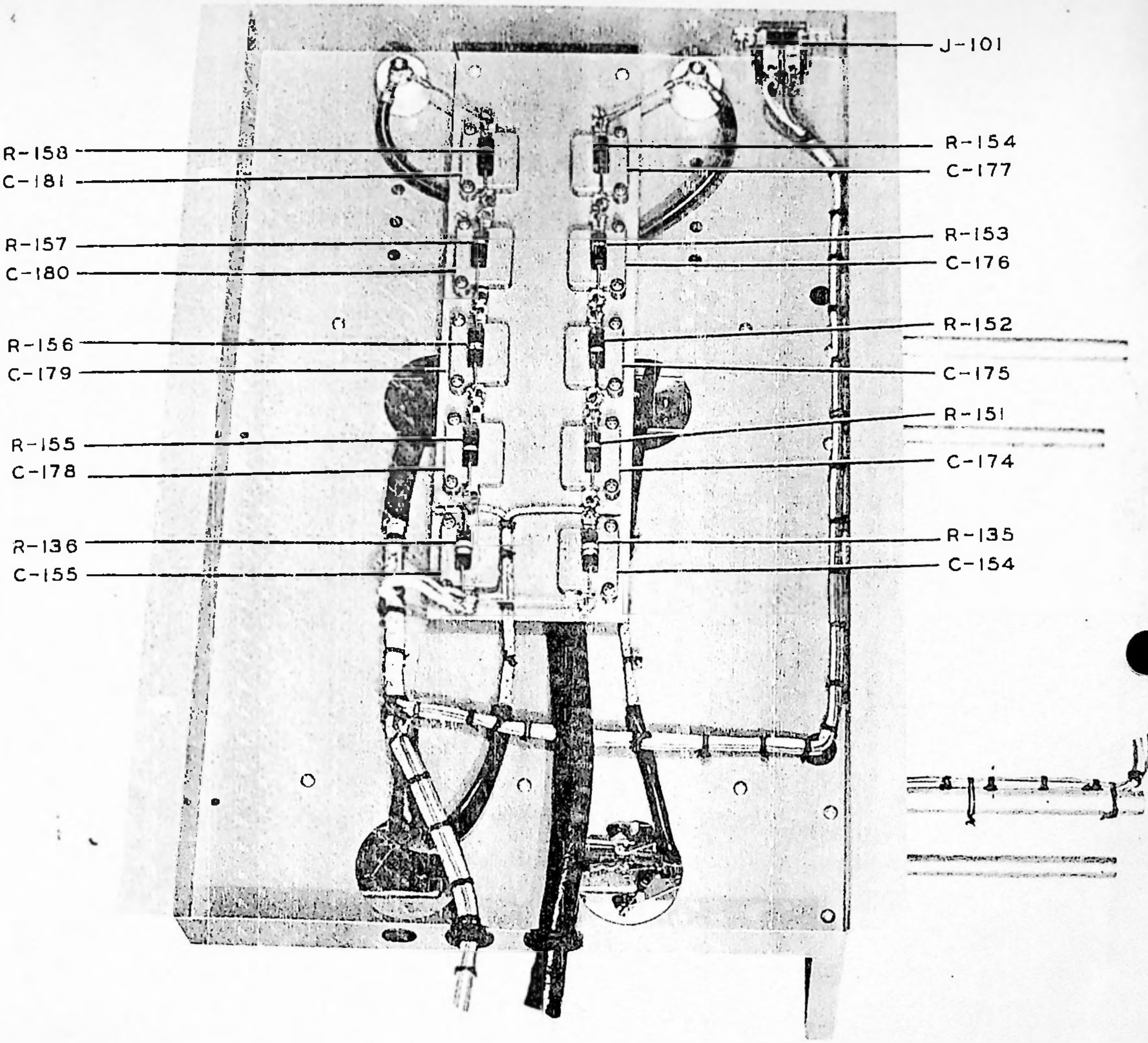


Figure 6-7. Audio Chassis Parts Arrangement, Side View

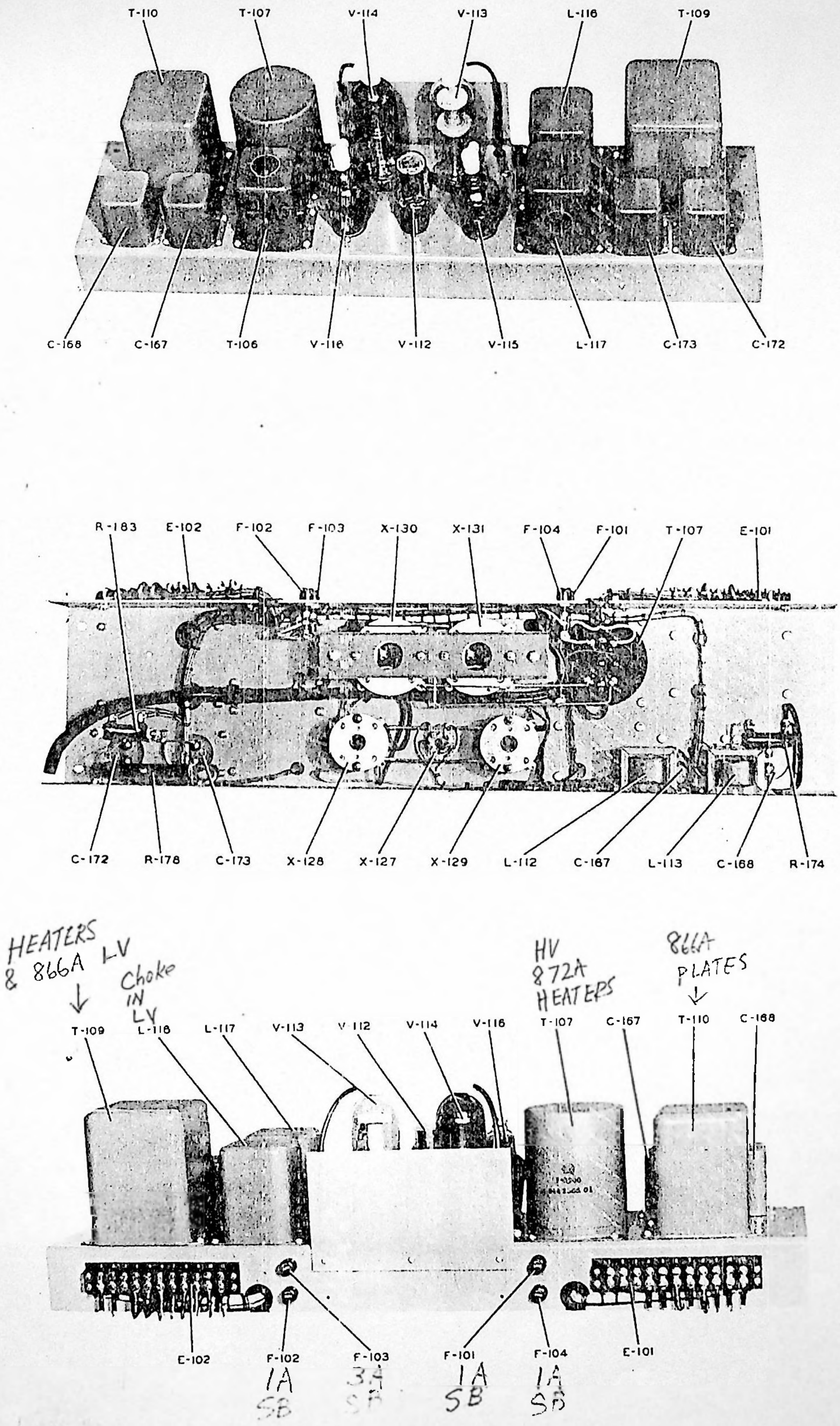


Figure 6-10. Low Voltage Power Shelf

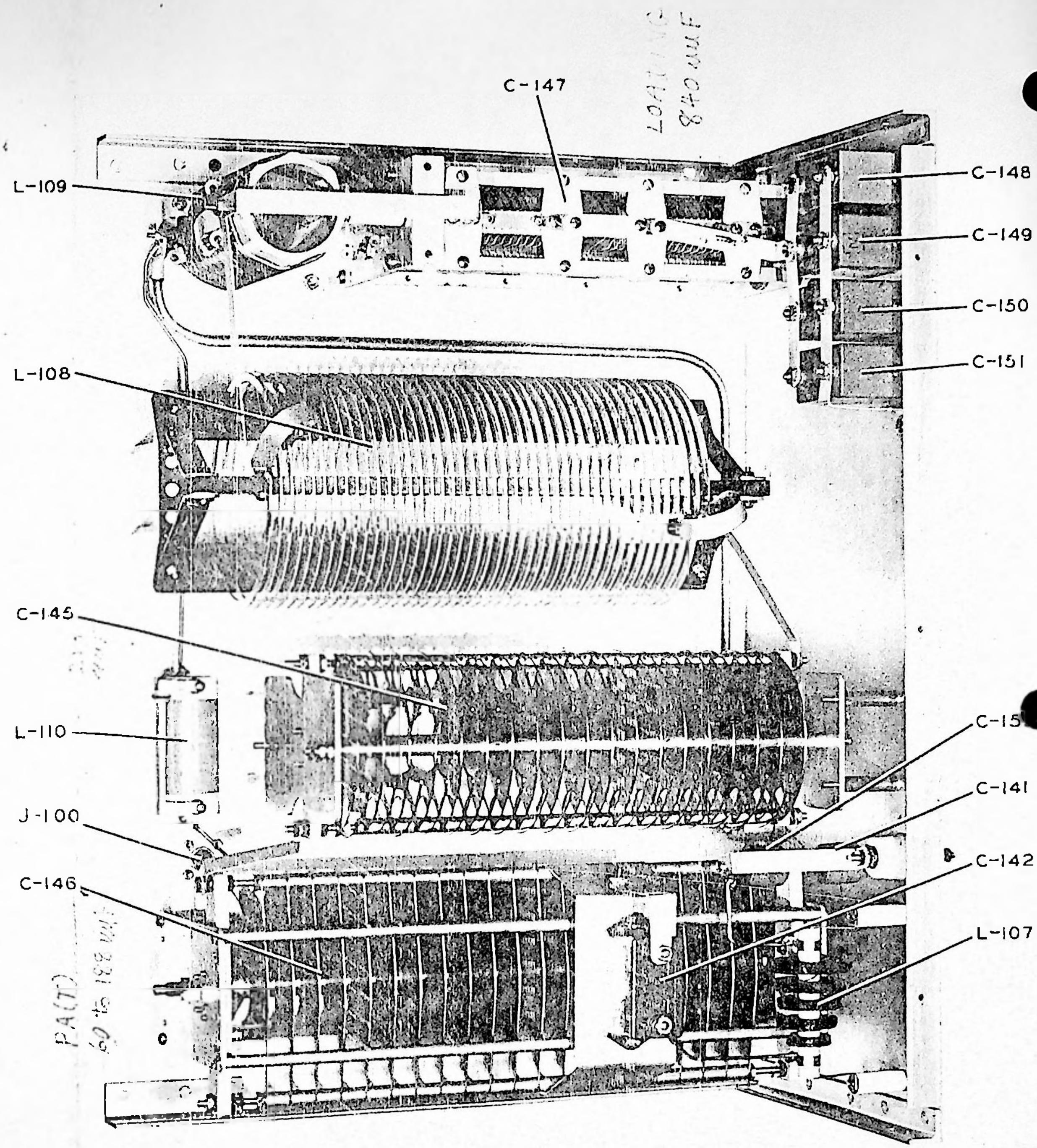


Figure 6-9. Output Network Parts Arrangement, Bottom View

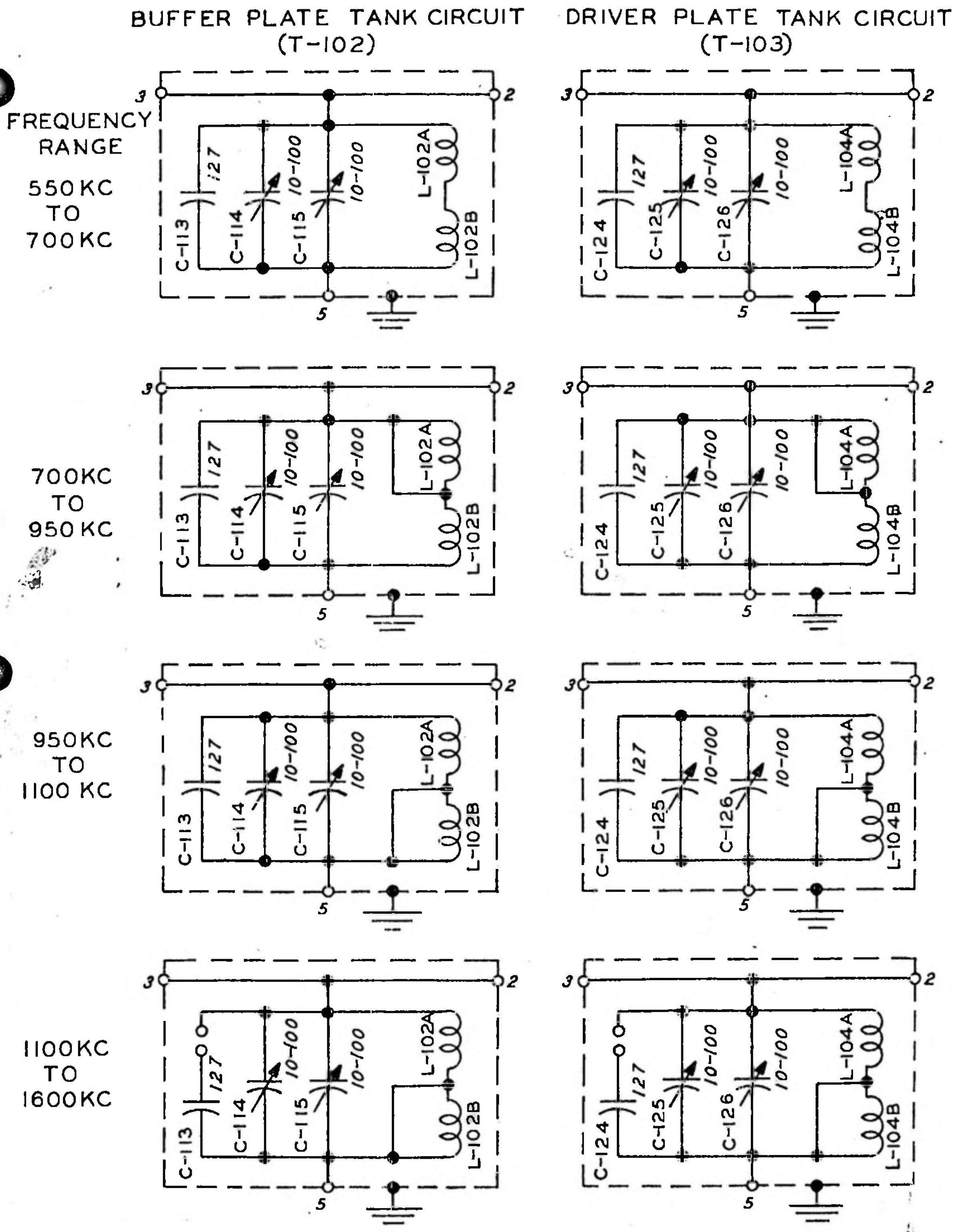


Figure 7-2. T-102 and T-103 Internal Connections

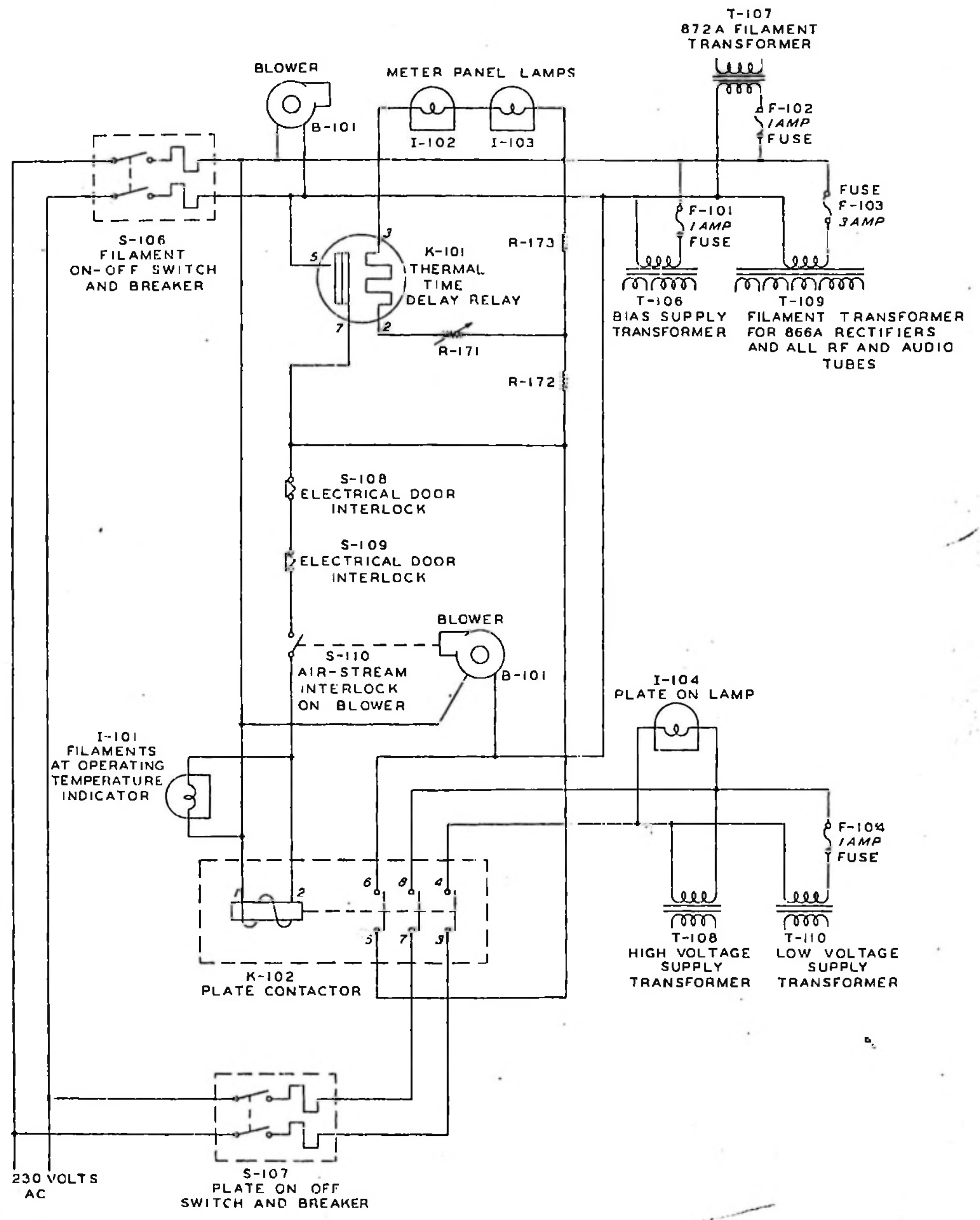


Figure 7-1. Primary Control Circuit Diagram

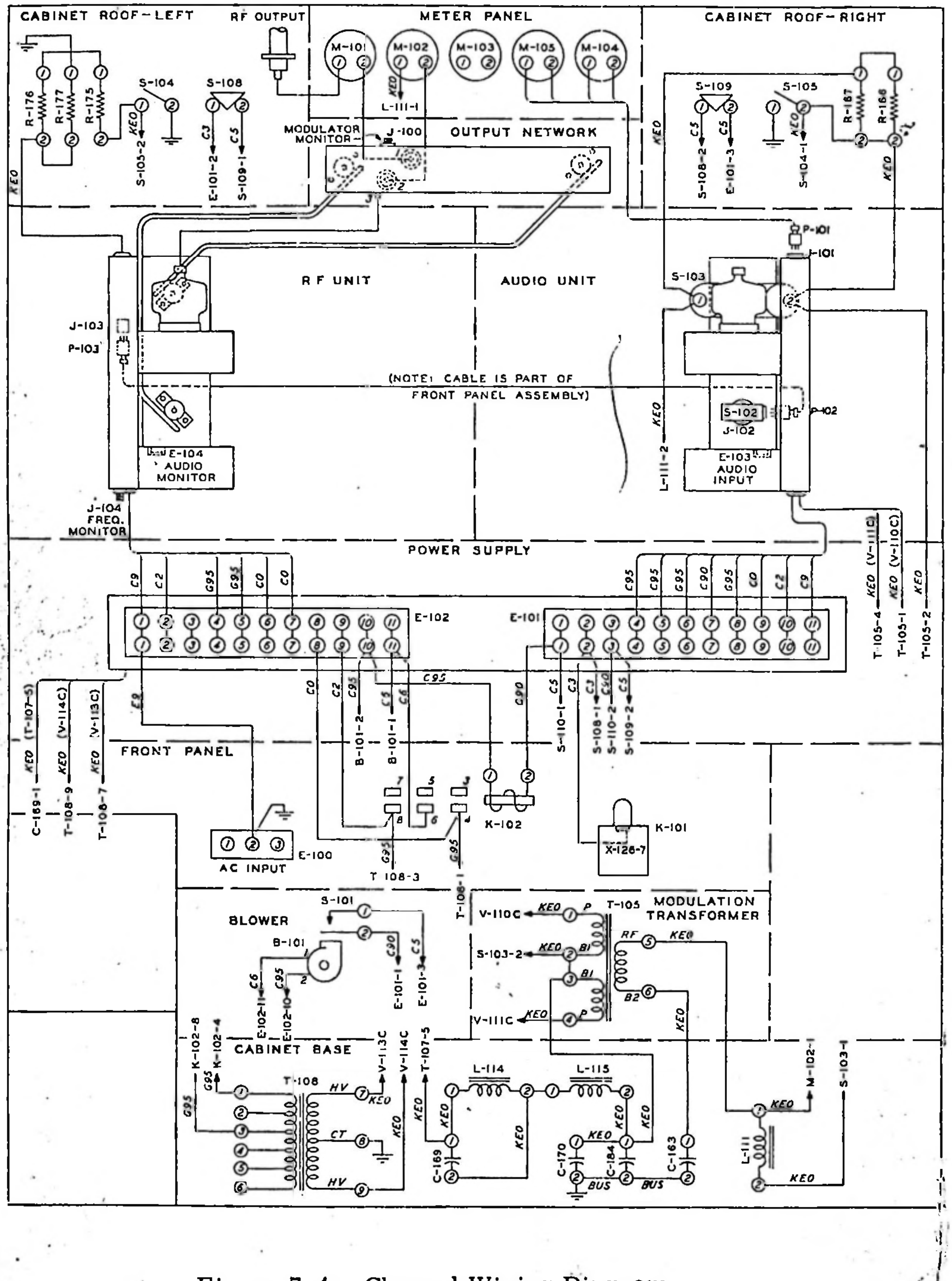
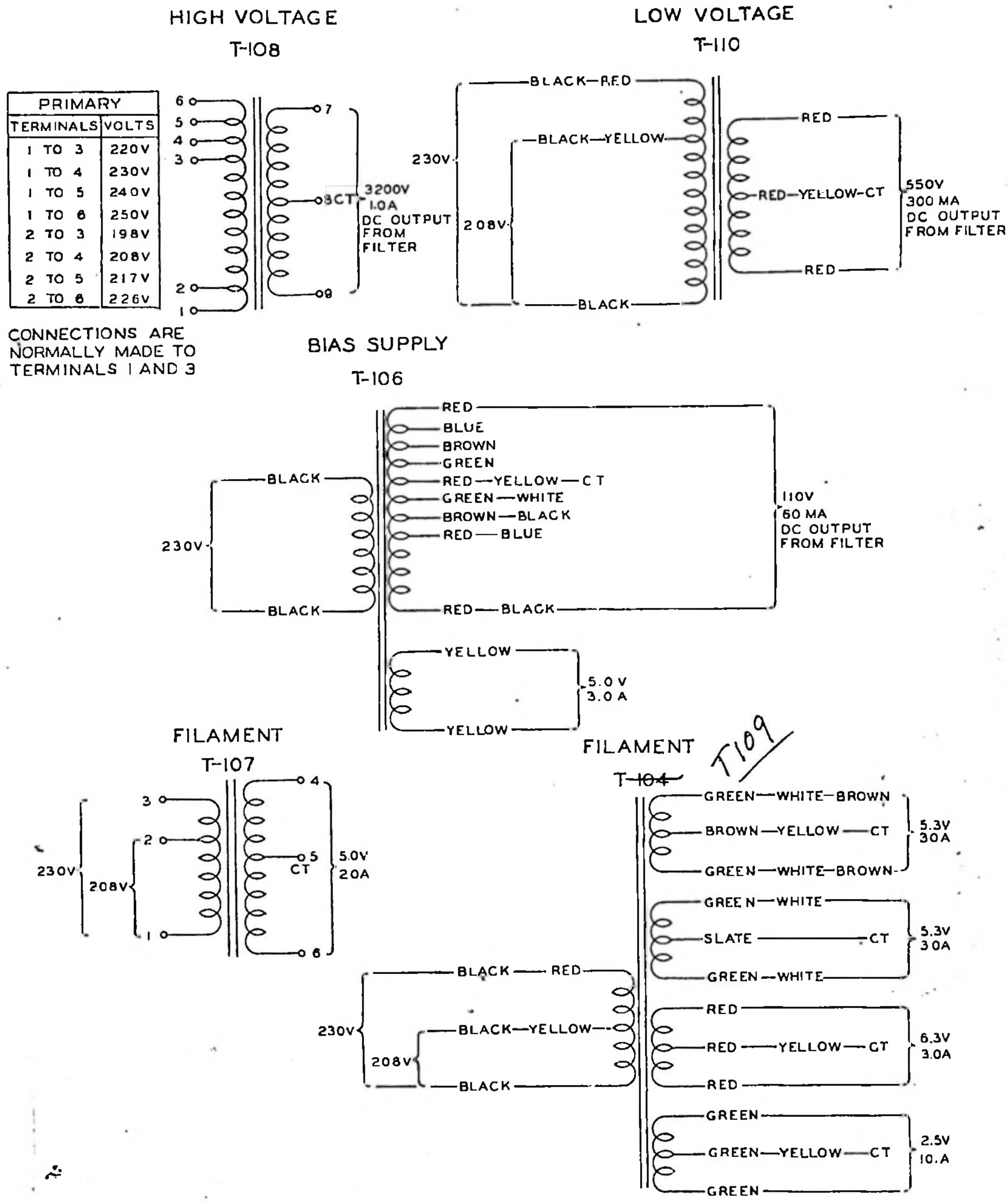


Figure 7-4. Channel Wiring Diagram



PRIMARY	
TERMINALS	VOLTS
1 TO 3	220V
1 TO 4	230V
1 TO 5	240V
1 TO 6	250V
2 TO 3	198V
2 TO 4	208V
2 TO 5	217V
2 TO 6	226V

Figure 7-3. Transformer Details

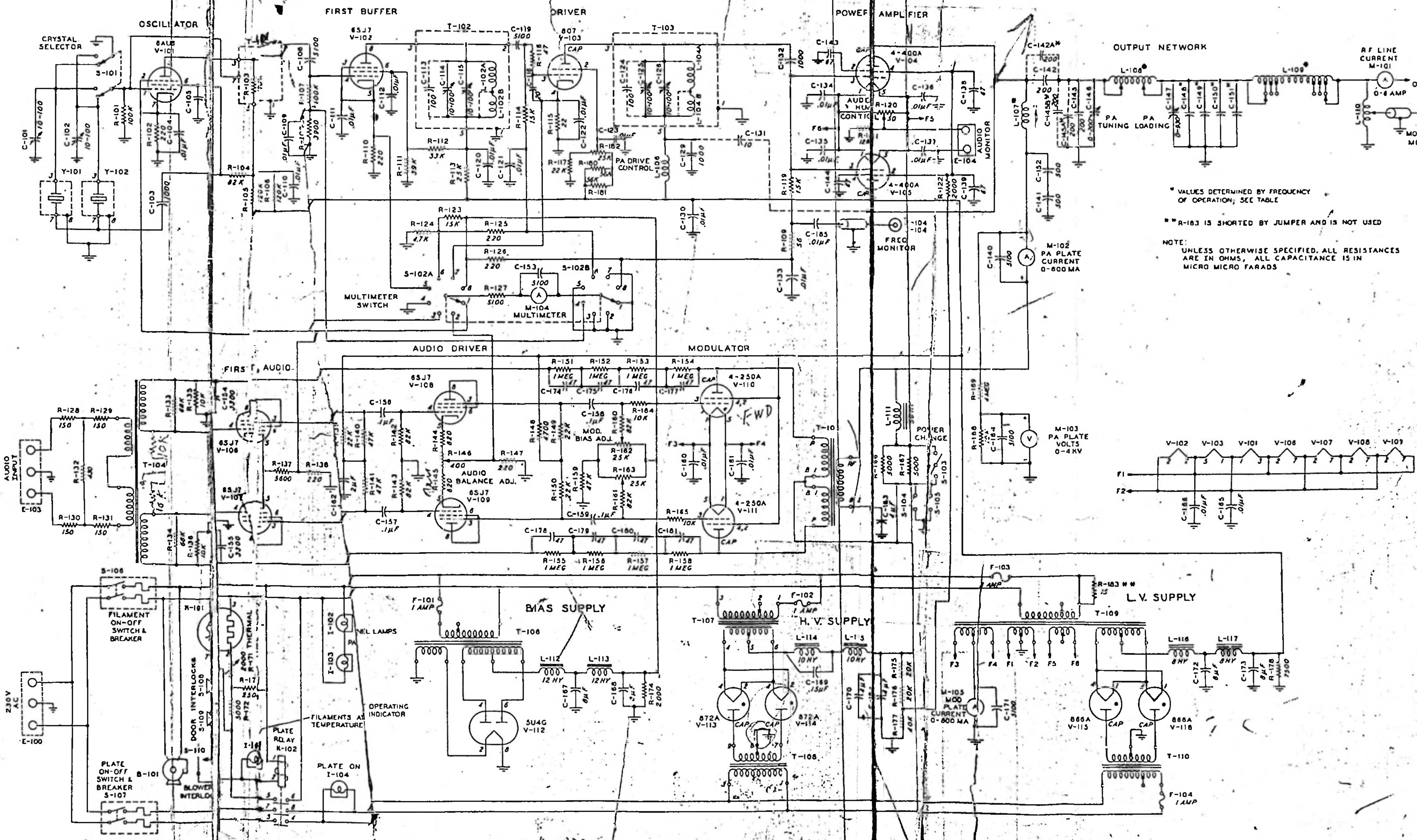


Figure 7-7. Main Schematic

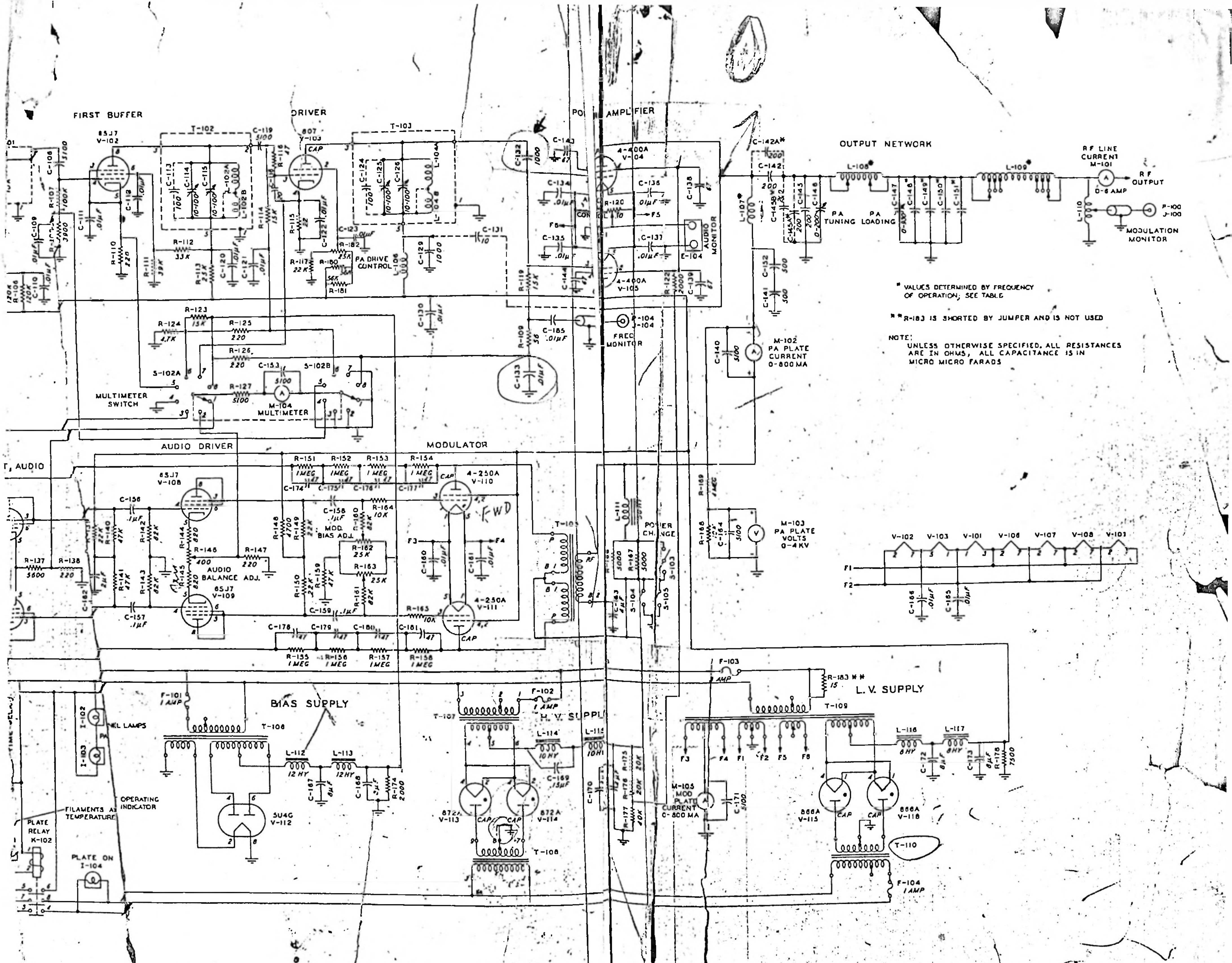


Figure 7-7. Main Schematic