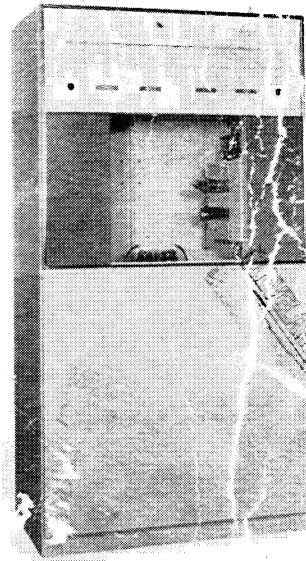
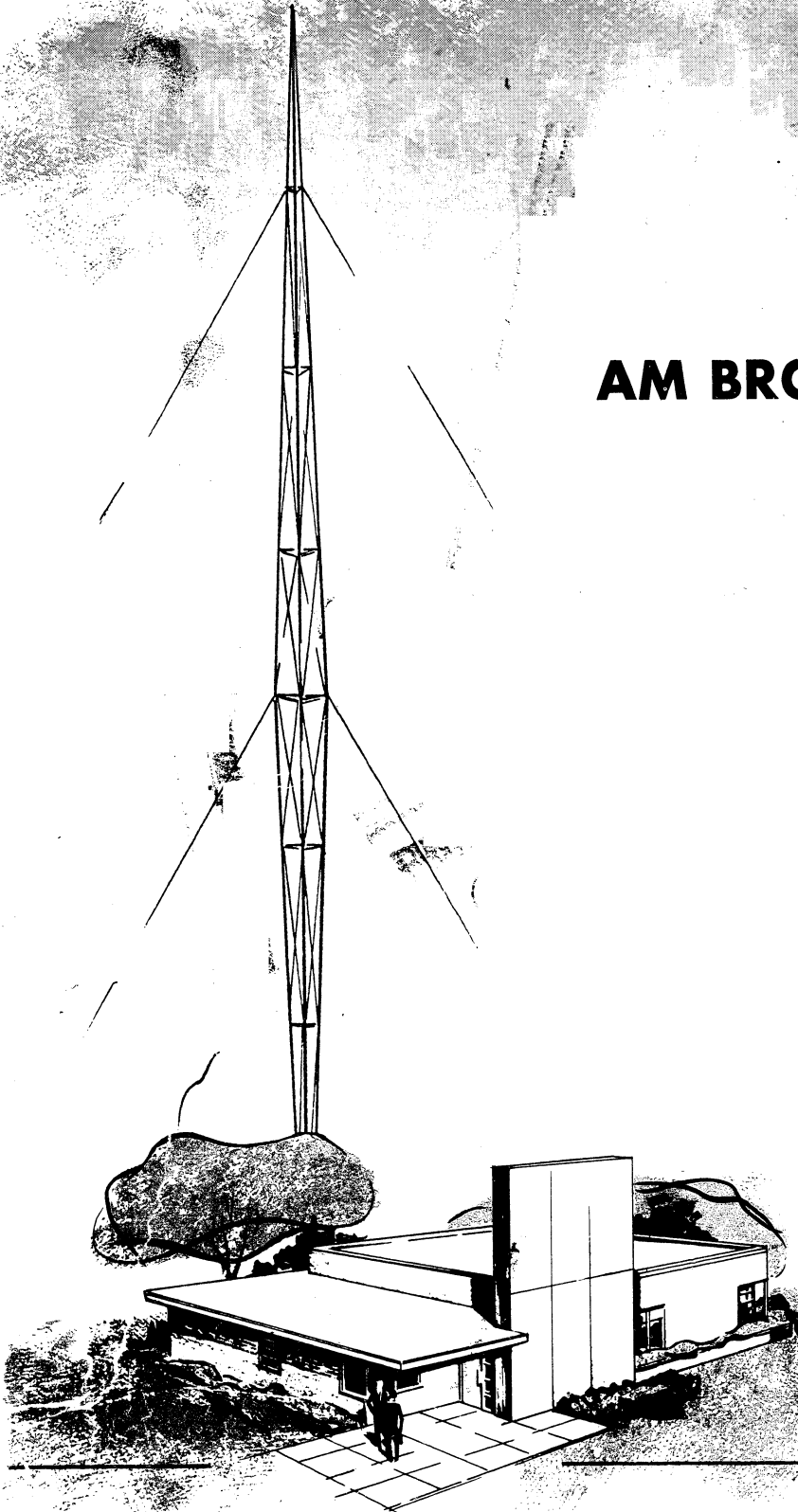


*Collins*

**INSTRUCTION BOOK**

**AM BROADCAST TRANSMITTER**

**20V-3**



**COLLINS RADIO COMPANY**

## GUARANTEE

The equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts, or accessories which are defective as to design, workmanship or material, and which are returned to Collins at its factory, transportation prepaid, provided

- (a) Notice of the claimed defect is given Collins within one (1) year from date of delivery and goods are returned in accordance with Collins instructions.
- (b) Equipment, accessories, tubes, and batteries not manufactured by Collins or from Collins designs are subject to only such adjustments as Collins may obtain from the supplier thereof.
- (c) No equipment or accessory shall be deemed to be defective if, due to exposure or excessive moisture in the atmosphere or otherwise after delivery, it shall fail to operate in a normal or proper manner.

Collins further guarantees that any radio transmitter described herein will deliver full radio frequency power output at the antenna lead when connected to a suitable load, but such guarantee shall not be construed as a guarantee of any definite coverage or range of said apparatus.

The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins or its authorized service center.

No other warranties, expressed or implied, shall be applicable to any equipment sold hereunder, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements in this paragraph contained. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause.

**HOW TO RETURN MATERIAL OR EQUIPMENT.** If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, insofar as applicable. If the item is thought to be defective, such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. (With respect to tubes we suggest that your adjustments can be speeded up if you give notice of defect directly to the tube manufacturer.) Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in the handling of your returned merchandise.

**ADDRESS:**

Collins Radio Company  
Service Division  
Cedar Rapids, Iowa

**INFORMATION NEEDED:**

- (A) Type number, name and serial number of equipment
- (B) Date of delivery of equipment
- (C) Date placed in service
- (D) Number of hours of service
- (E) Nature of trouble
- (F) Cause of trouble if known
- (G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
- (H) Item or symbol number of same obtained from parts list or schematic
- (I) Collins number (and name) of unit subassemblies involved in trouble
- (J) Remarks

**HOW TO ORDER REPLACEMENT PARTS.** When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable. To enable us to give you better replacement service, please be sure to give us complete information.

**ADDRESS:**

Collins Radio Company  
Service Division  
Cedar Rapids, Iowa

**INFORMATION NEEDED:**

- (A) Quantity required
- (B) Collins part number (9 or 10 digit number) and description
- (C) Item or symbol number obtained from parts list or schematic
- (D) Collins type number, name and serial number of principal equipment
- (E) Unit subassembly number (where applicable)

# **AM BROADCAST TRANSMITTER 20V-3**

**INSTRUCTION BOOK**

**1 SEPTEMBER 1961**

**523-0146-00**

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1961

**CEDAR RAPIDS, IOWA, U.S.A.**

PRINTED IN THE UNITED STATES OF AMERICA







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SECTION I  
General Description

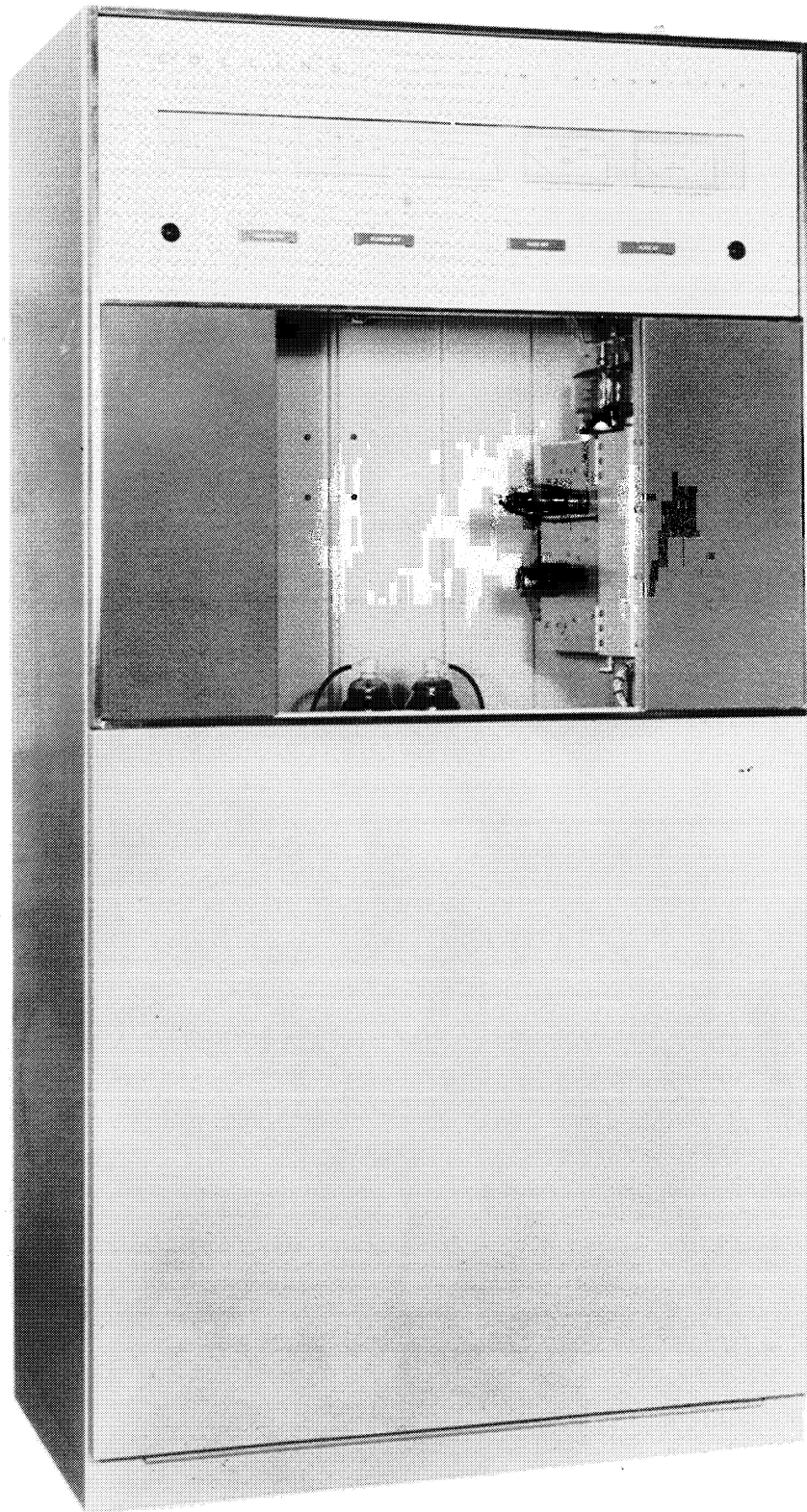


Figure 1-1. AM Broadcast Transmitter 20V-3

## SECTION I GENERAL DESCRIPTION

### 1.1 PURPOSE OF INSTRUCTION BOOK.

This instruction book is a guide for installing, operating, and maintaining Collins AM Broadcast Transmitter 20V-3.

### 1.2 PURPOSE OF EQUIPMENT.

Collins AM Broadcast Transmitter 20V-3 is used for standard or high-frequency AM broadcast service on a single frequency in the range from 550 kilocycles to 12 megacycles with an output power of 250, 500, or 1000 watts.

### 1.3 DESCRIPTION OF EQUIPMENT.

#### 1.3.1 PHYSICAL DESCRIPTION.

AM Broadcast Transmitter 20V-3, shown in figure 1-1, weighs about 1160 pounds and is 38 inches wide, 76 inches high, and 27-1/2 inches deep. It uses 14 tubes, all of which are visible through a large window in the front of the cabinet. All transmitter operating controls are located under two access doors, one on each side of the front window. The on-off controls and five monitoring meters are located near the top of the transmitter front panel. The meters may be observed easily while operating the tuning controls. The bottom front of the transmitter cabinet is removable to allow access to the power input terminals, power input circuit breakers, and control relays.

Two large doors at the upper rear of the cabinet (see figure 1-2) allow access to the upper part of the transmitter for servicing and maintenance. The lower half of the transmitter is covered by a removable panel that contains a ventilating fan and a permanent-type air filter. There are both electrical and mechanical interlocks on each of the rear doors to protect personnel. Electrical interlocks of the split V-type open the primary circuits of the high- and low-voltage transformers whenever the rear doors or lower rear panel are opened. The mechanical interlocks close, grounding the high-voltage circuits, after the electrical interlocks have opened the primary circuits.

Inside the transmitter cabinet, transformers and other heavy components are mounted at the bottom of the cabinet. Audio and r-f circuits are in separate chassis on opposite sides of the cabinet. These two chassis swing out toward the center of the cabinet so that all components in the chassis may be reached for easy maintenance. The power amplifier plate circuit and r-f output network are housed in a single, shielded compartment that is suspended from the top of the

cabinet. The entire back panel of this r-f compartment is removable, providing access to all components in the compartment.

The power supplies are mounted on a shelf that is about midway between the top and bottom of the cabinet. This entire shelf tilts forward to expose all components on the bottom of the power supply chassis.

Ventilating air for the transmitter is drawn through a cleanable air filter at the rear of the cabinet by a low-speed, high-volume fan. The cooling air is exhausted through a shielded opening in the top of the cabinet. Individual high-speed blowers supply cooling air directly to the power amplifier and modulator tubes.

#### 1.3.2 ELECTRICAL DESCRIPTION.

The power amplifier tubes in the 20V-3 are two 4-400A tetrodes connected in parallel. The transmitter uses high-level plate modulation of the power amplifier. The modulator tubes also are two 4-400A tetrodes connected in a push-pull class AB<sub>1</sub> modulator circuit.

The r-f carrier frequency is generated by a crystal oscillator that uses a low-temperature coefficient crystal. This type of crystal eliminates the need for a crystal oven and its associated thermostats and control relays. Two crystals may be mounted on the r-f chassis, so that one will always be available as a standby. Either of the two crystals may be selected by a switch on the front panel of the transmitter.

The r-f output network is a pi-section followed by an L-section. This network will feed into impedances between 50 and 72 ohms. (Other output impedance values are available on special order.) The tubes and r-f output circuit components are safeguarded against short circuits or flashover in the transmitter f-f output circuit by an arc-suppression circuit. This circuit interrupts all plate voltages in the event of arc-over in the output circuit, and returns the transmitter to the air when the arc is extinguished.

The transmitter output power may be switched from high to low level, or vice versa, while the transmitter is on the air by a power change switch under the front panel access doors.

Provisions are made in the transmitter for connection of remote on-off controls, on-off indicators, plate current and plate voltage indicators, and monitor meters. Outputs are provided also for frequency, modulation, and audio monitoring.

**SECTION I**  
**General Description**

There are three separate power supplies in AM Broadcast Transmitter 20V-3 for high voltage, low voltage, and bias. Overload protection is provided by magnetically operated circuit breakers, by fuses in the primaries of the filament, low-voltage, and bias transformers, and by individual overload relays in the cathode circuits of the power amplifier and modulator. A thermal time delay circuit in the transmitter prevents application of plate voltage before the filaments reach operating temperature.

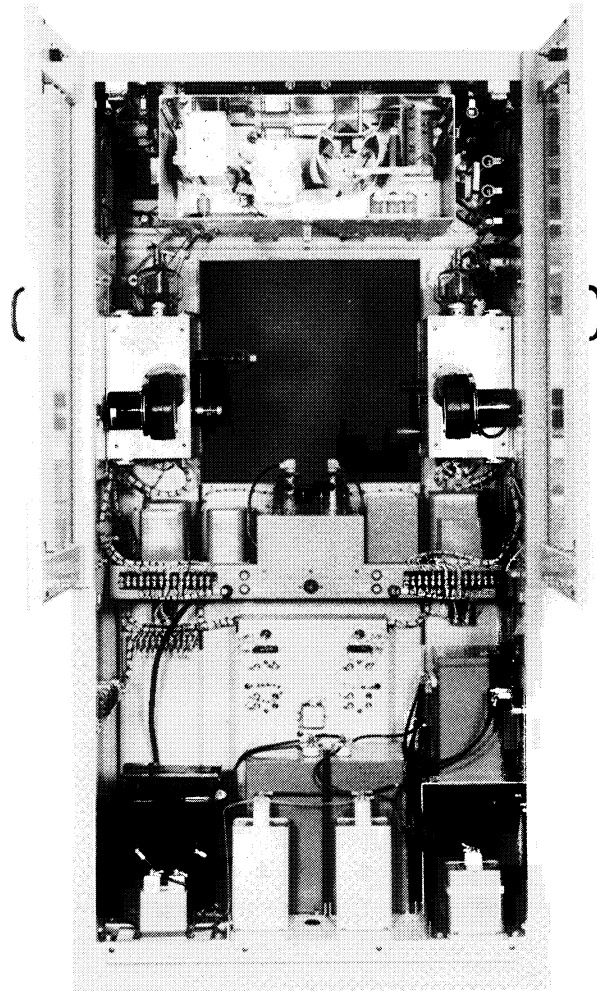
A more detailed description of the operation of the 20V-3 is contained in section IV of this instruction book.

**1.4 EQUIPMENT SUPPLIED.**

Table 1-1 lists equipment supplied as part of AM Broadcast Transmitter 20V-3. This basic transmitter is stocked with r-f output circuit components for operation in the frequency range from 1.05 to 1.5 megacycles. Transmitters that are to operate outside this range are specially reworked at the factory. Refer to section II for the Collins part numbers of circuit components for use at other frequencies in the standard broadcast band.

**TABLE 1-1**  
**EQUIPMENT SUPPLIED**

EQUIPMENT	COLLINS PART NUMBER
AM Broadcast Transmitter 20V-3	522-2480-00



**Figure 1-2.** AM Broadcast Transmitter 20V-3, Rear View with Lower Panel Removed

**1.5 EQUIPMENT REQUIRED BUT NOT SUPPLIED.**

Table 1-2 lists equipment required for the operation of AM Broadcast Transmitter 20V-3, but not supplied as part of the transmitter.

**TABLE 1-2**  
**EQUIPMENT REQUIRED BUT NOT SUPPLIED**

EQUIPMENT	COLLINS PART NUMBER
Tube kit	540-1215-001
Crystals	See table 2-2, section II.

**1.6 ACCESSORY EQUIPMENT.**

Table 1-3 lists accessory equipment that may be used with the 20V-3.

**TABLE 1-3**  
**ACCESSORY EQUIPMENT**

EQUIPMENT	COLLINS PART NUMBER
Type 512B-2 Impedance Matching Unit (For converting 50- or 75-ohm unbalanced output to 300- or 2600-ohm balanced output, 2 to 12 megacycles)	522-0113-005

**1.7 EQUIPMENT SPECIFICATIONS.**

1.7.1 MECHANICAL.

Weight . . . . . 1160 pounds maximum.

Size . . . . . 38 inches wide, 76 inches high, 27-1/2 inches deep.

Ventilation . . . . . One ventilating fan, two blowers.

Ambient temperature range. . . . . +15°C (59°F) to +45°C (113°F).

Ambient humidity range . . . . . 0- to 95-percent relative humidity.

Altitude . . . . . 0 to 6000 feet.

1.7.2 ELECTRICAL.

Power source . . . . . 200 to 250 volts, 50 to 60 cycle, single-phase.

Maximum power requirements . . . . . 4.15 kw at 83-percent power factor for 1000-watt output power with 100-percent modulation.

Power output . . . . . 250, 500, or 1000 watts.

Output impedance . . . . . 50 to 72 ohms, unbalanced. Other output impedances available on special order. Accessory units available for conversion to balanced output.

Frequency range . . . . . 0.55 to 12 megacycles.

Oscillator . . . . . Crystal-controlled, high-stability type using a plated, AT cut, nontemperature-controlled crystal.

Broadcast band (0.55 to 1.6 megacycles) frequency stability. . . . . Better than ±10 cps over an ambient temperature range from +15°C (59°F) to +45°C (113°F) and line-voltage variations of ±15 percent.

High-frequency band (1.6 to 12 megacycles) frequency stability. . . . . Better than ±0.005 percent over an ambient temperature range from +15°C (59°F) to +45°C (113°F) and line-voltage variations of ±15 percent.

Harmonic and spurious radiation . . . . . All harmonic and spurious frequencies at least 45 db below carrier level. Additional attenuation furnished by external antenna-matching network or harmonic filter.

Audio input impedance . . . . . 600 or 150 ohms, balanced.

Audio input level . . . . . +10 dbm ±2 db.

Audio frequency response . . . . . ±2 db from 50 to 10,000 cps, measured at 75-percent modulation.

Audio frequency distortion . . . . . Less than 3 percent over range from 50 to 7500 cps at any modulation level up to 95 percent.

Carrier shift . . . . . Less than 3 percent from 0- to 100-percent modulation.

Noise level . . . . . At least 60 db below 100-percent modulation at all frequencies to 30,000 cps.

SECTION I

General Description

**1.8 TUBE COMPLEMENT.**

Table 1-4 lists type and function of all tubes used in AM Broadcast Transmitter 20V-3.

TABLE 1-4  
TUBE COMPLEMENT

QUANTITY	TYPE	FUNCTION
1	6AU6	Crystal oscillator
1	6SJ7	Buffer amplifier

TABLE 1-4  
TUBE COMPLEMENT (Cont)

QUANTITY	TYPE	FUNCTION
1	807	R-f driver
2	4-400A	Power amplifier
2	6SJ7	Audio driver
2	4-400A	Modulator
1	5U4G	Bias rectifier
2	866A	Low-voltage rectifier
2	575A	High-voltage rectifier



## SECTION II INSTALLATION

### 2.1 UNPACKING.

Be careful when uncrating the transmitter and components to avoid damaging the equipment. Inspect all units carefully. Check for loose screws and bolts. Inspect all controls, such as switches, for proper operation as far as can be determined without power applied. Examine cables and wiring, making sure that all connections are tight, and clear each other and the chassis. File any damage claims promptly with the transportation company.

### 2.2 TRANSMITTER LOCATION.

Place the transmitter in its permanent location before replacing the units that were removed for shipping. Figure 2-1 shows arrangements that can be made before transmitter installation to accommodate power and audio inputs, and outputs for frequency, modulation, and audio monitoring. The external wiring requirements for these inputs and outputs may be met by laying a conduit in a concrete floor or by installing a wiring trench of sufficient size. Another alternative is to build a false floor under which the necessary wires and cables can be placed. The wiring trench must accommodate a three-wire power cable, two shielded twisted pairs, one RG-58/U coaxial cable, and one RG-8/U coaxial cable. The trench should also be large enough to contain several wires from the transmitter cabinet to the ground system of the building.

Allow adequate clearance both in front and in back of the transmitter. There should be a minimum clearance of 3-1/2 feet behind the transmitter to provide sufficient room for service work.

An air duct may be run from the exhaust-air opening in the top of the transmitter, if desired, to carry heat away from the transmitter.

### 2.3 REPLACEMENT OF UNITS REMOVED FOR SHIPPING.

Several of the transmitter components have been removed and packed separately for safety during 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. Refer to the photographs in section VI for assistance in replacing these components in the transmitter. Wires and cables that were disconnected before shipping have been tagged to facilitate reconnection. If any of these tags have been lost during shipment, refer to figure 2-2 for assistance in identifying and reconnecting these leads.

The following installation procedure should be performed:

a. Set the tubes and crystals aside where they will not be damaged. These components should not be placed in the transmitter until all other units have been installed and corrected.



Be very careful when handling the crystals. This type of crystal is extremely fragile. Rough handling may not cause the crystal to stop oscillating, but may cause it to lose its highly important frequency versus temperature characteristics.

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

c. Refer to figure 6-2 for proper placement of the heavy iron-core components. Install them in their proper locations in the lower part of the transmitter.

d. Measure the station line voltage. Refer to figure 2-3 and make connections to the high-voltage transformer (T107) primary terminals that most nearly correspond to this voltage. If the normal station voltage is low, use the low-voltage taps on the bias supply transformer (T105), the 575A filament transformer (T106), the main filament transformer (T108), and the low-voltage plate supply transformer (T109).



Dress all wires away from the high-voltage plate transformer (T107). Failure to do so may result in voltage breakdown between the wire and transformer.

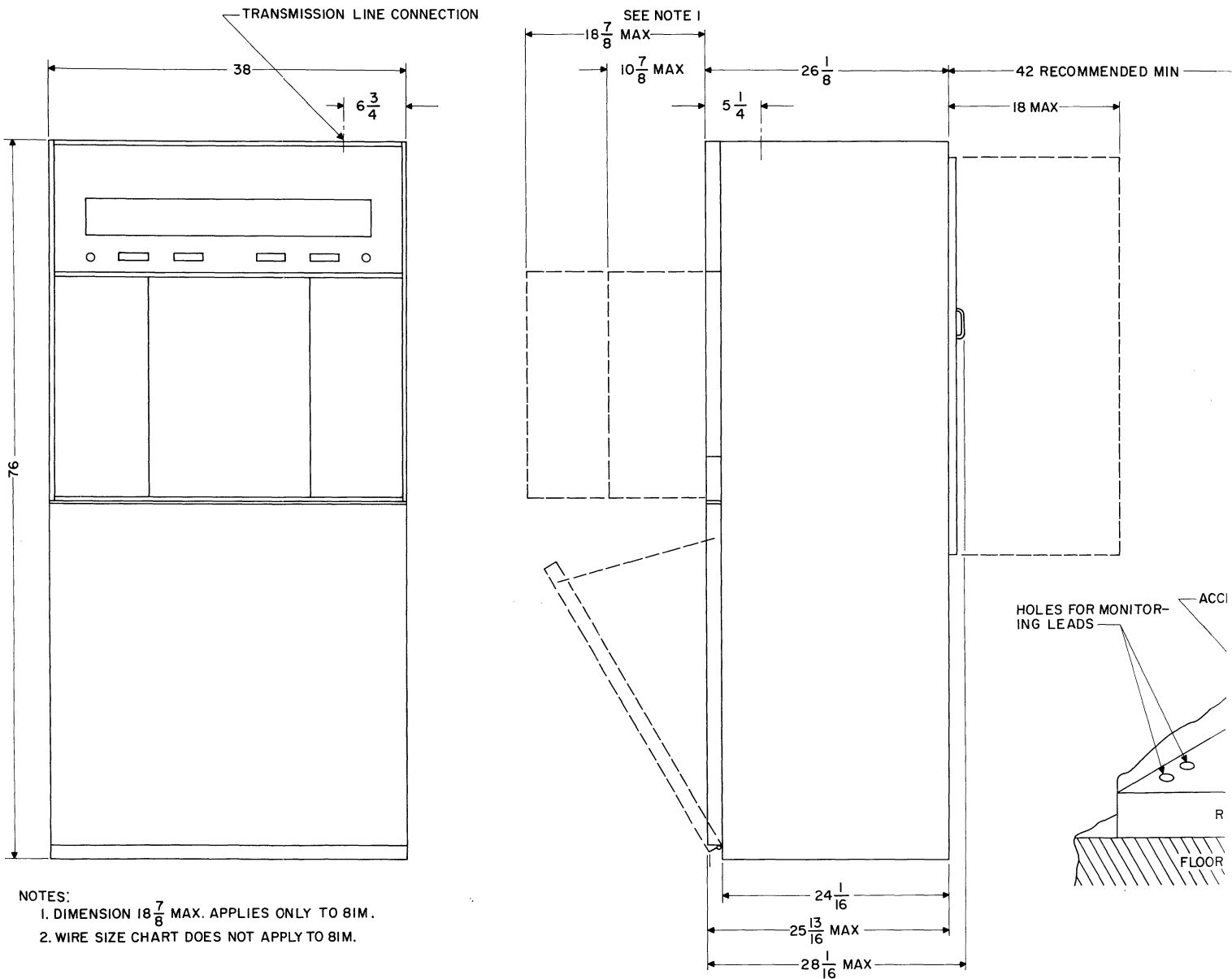
e. Refer to figure 2-2, the photographs in section VI, and the tags on the cables, and make all possible connections.

f. Install the large filter capacitors, C182 and C183, as shown in figure 6-2, and secure them in place. Make all connections to these units.

g. Remove the rear cover from the r-f output network compartment at the top of the cabinet, and check to be sure that the taps on tuning coil L108 and loading coil L109 are in the correct positions for the station

SECTION II  
Installation

CONNECTION	WIRE SIZES (SEE NOTE 2)	RECOMMENDED WIRE
STATION POWER LINE SWITCH TO TRANSMITTER INPUT (208/230 V SINGLE PHASE 50/60 CPS SOURCE FUSED AT WALL CUT OUT BOX FOR 30 AMPERES)		TWO NO. 6 WIRES
GROUND FEED (FURTHER BONDING OF CABINET TO BUILDING GROUND WOULD BE DESIRABLE)		ONE NO. 4 BARE WIRE
FREQUENCY MONITOR FEED		ONE RG-58/U COAXIAL CABLE
MODULATION MONITOR FEED		ONE RG-8/U COAXIAL CABLE
AUDIO MONITOR FEED		ONE 2 WIRE SHIELDED LEAD
AUDIO INPUT LEAD		ONE 2 WIRE SHIELDED LEAD
TRANSMISSION LINE		$\frac{7}{8}$ RIGID OR SOLID DIELECTRIC, $\frac{8}{8}$ 50 OR 70 OHM COAXIAL CABLE

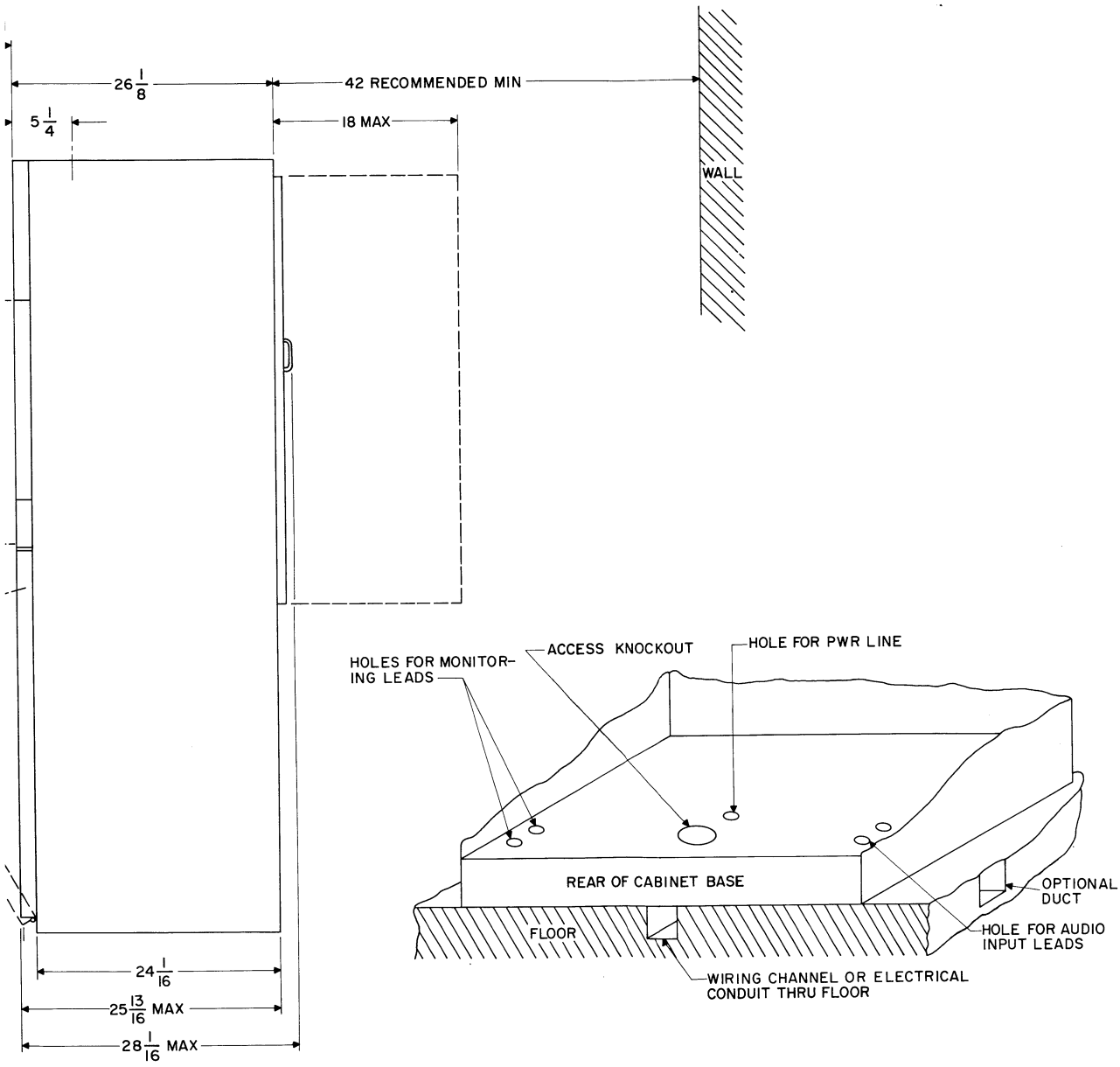


- NOTES:  
1. DIMENSION  $18\frac{7}{8}$  MAX. APPLIES ONLY TO 8IM.  
2. WIRE SIZE CHART DOES NOT APPLY TO 8IM.

Figure 2-1. AM Broadcast Transmitter 20V-3,  
Installation Diagram

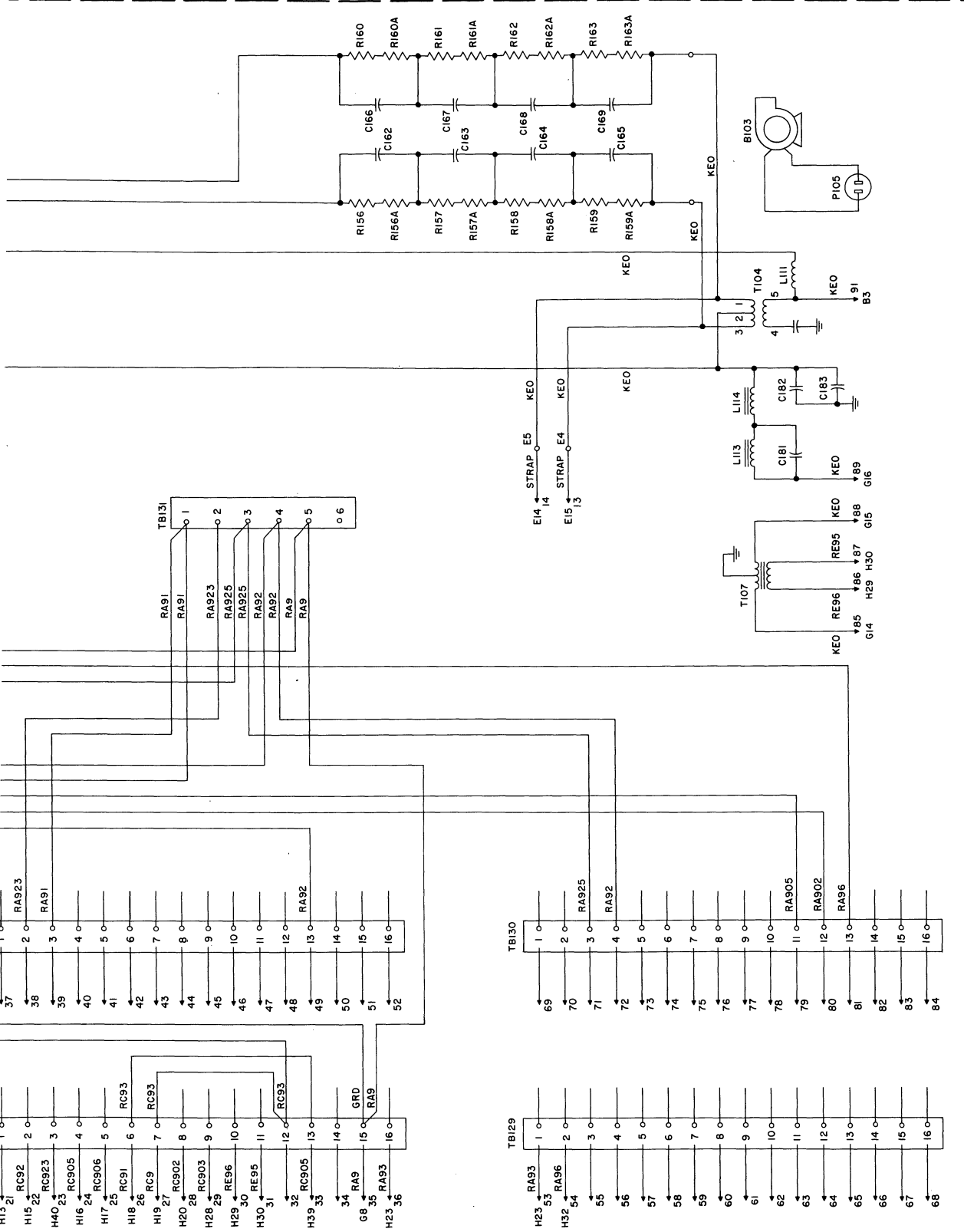
RECOMMENDED WIRE

- TWO NO. 6 WIRES
- ONE NO. 4 BARE WIRE
- ONE RG-58/U COAXIAL CABLE
- ONE RG-8/U COAXIAL CABLE
- ONE 2 WIRE SHIELDED LEAD
- ONE 2 WIRE SHIELDED LEAD
- $\frac{7}{8}$  RIGID OR SOLID DIELECTRIC,  
50 OR 70 OHM COAXIAL CABLE

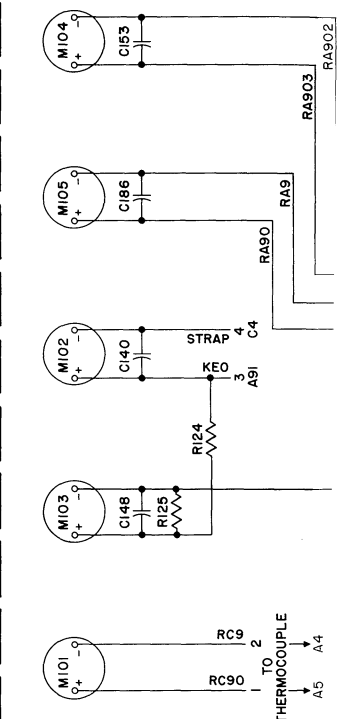








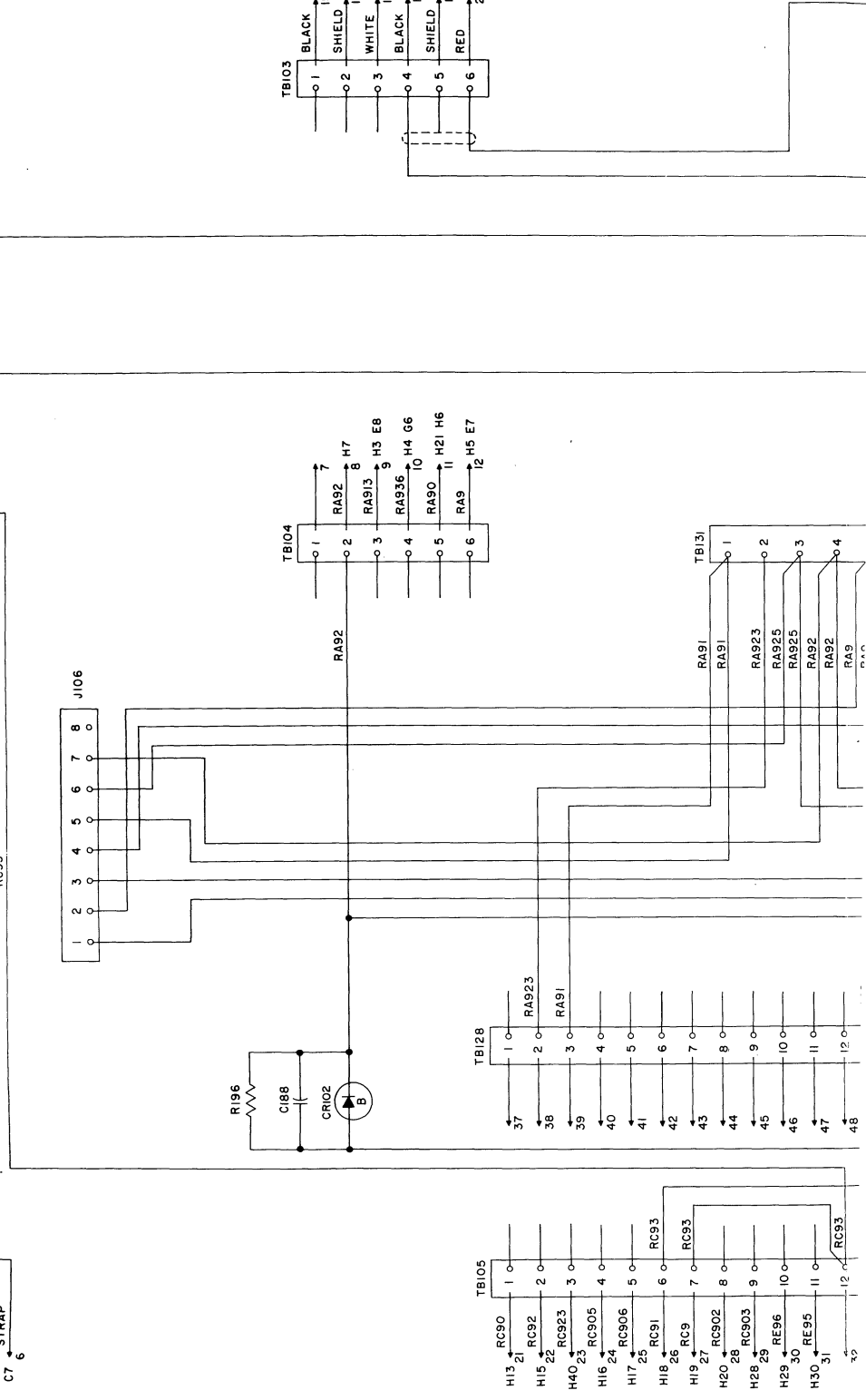
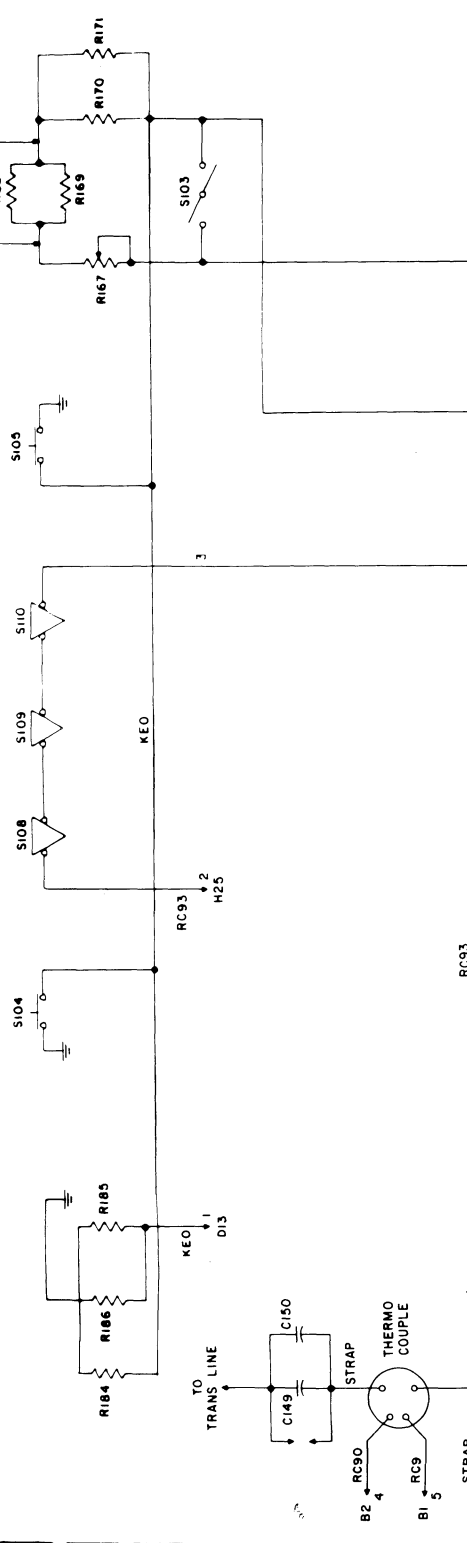
METER PANEL B



TO THERMOCOUPLE  
A5 A4

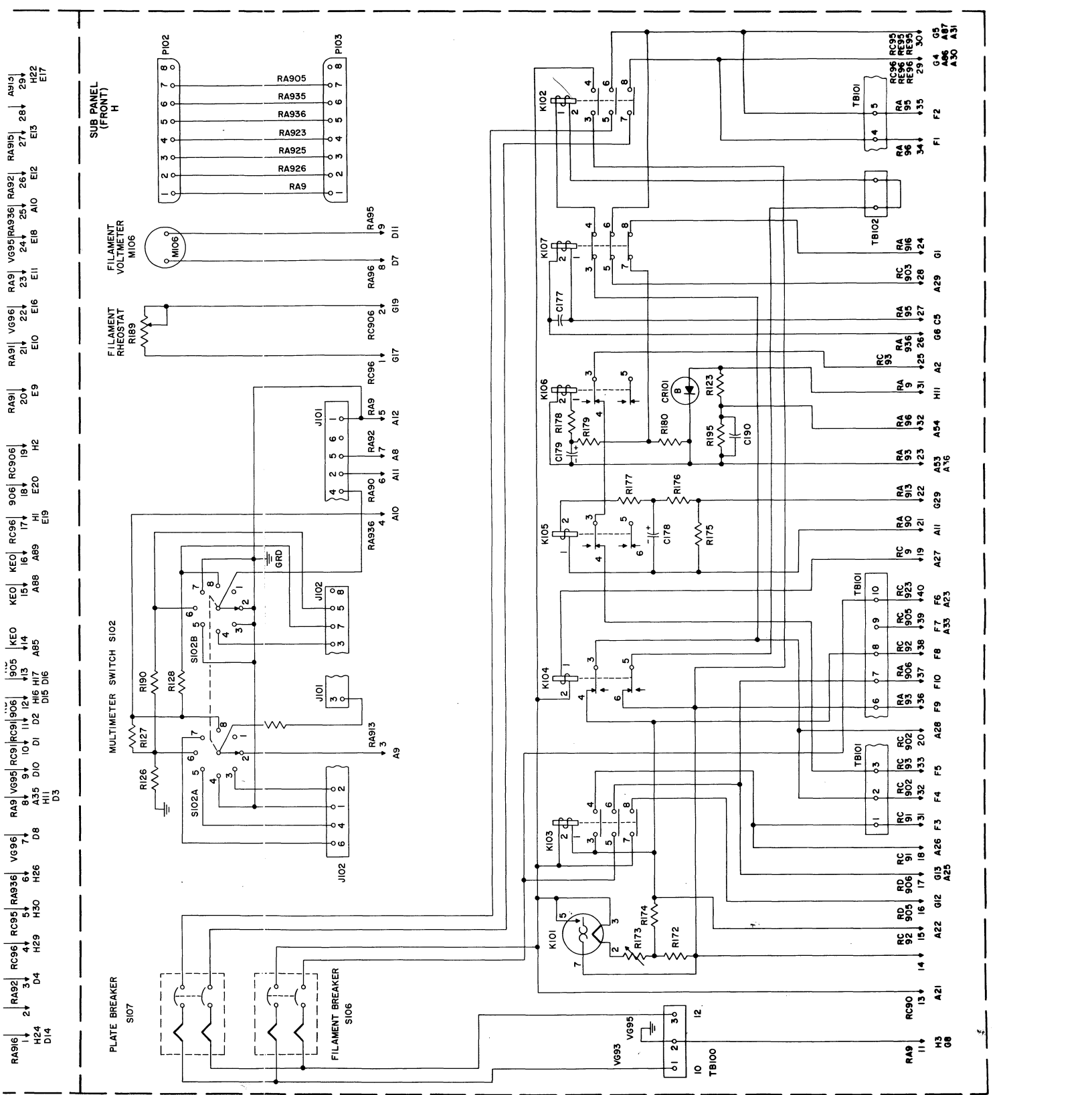


**CABINET A**



















operating frequency. Refer to the Collins Test Department data sheet for the correct tap positions. This data sheet, which is included with the transmitter, contains a record of the output network setup used for testing the transmitter at the factory. The setup may not be exactly correct for actual operating conditions at the station, but usually is near enough to permit preliminary tuning.

## 2.4 EXTERNAL CONNECTIONS.

Refer to figure 2-1 for assistance in making the following external connections.

a. Connect the power input cables to the transmitter. Use the proper wire size given in figure 2-1. Bring the two power wires and the neutral wire in through the rubber grommet in the power line hole in the bottom of the cabinet and run them forward to the front panel. Connect the two power wires to the two outer terminals on terminal board TB100, shown in figure 6-3. Connect the neutral wire to the center terminal on TB100.

b. Connect the audio input to the transmitter. Bring the audio signal into the cabinet on a shielded twisted pair. Connect the two audio leads to terminals 1 and 3 on terminal board TB103, shown in figure 6-2. Connect the shield to terminal 2 of TB103.

c. Bring the RG-58/U coaxial cable from the frequency monitor through the proper hole in the bottom of the cabinet and connect it to the mating plug that is connected to J104. Figure 6-5 shows the location of J104.

d. Bring the RG-8/U coaxial cable from the modulation monitor through the proper hole in the bottom of the cabinet and connect it to the mating plug that is connected to J100. Figure 6-4 shows the location of J100.

e. Bring the twisted shielded pair from the audio monitor through the proper hole in the bottom of the cabinet. Connect one wire of the pair to terminal 16 of terminal board TB105, shown in figure 6-2. Connect the other wire and the shield to terminal 15 of TB105.

f. Connect the coaxial cable leading to the antenna-tuning house to the r-f output. This connection is made to a feedthrough insulator located on the top of the transmitter. Connect the outer conductor of the coaxial cable to the ground stud next to the feedthrough insulator. Be sure that these connections are made well and are mechanically secure.

## 2.5 FINAL INSTALLATION PROCEDURE.

a. Again check all wiring and cable connections in the transmitter to be sure that each connection is electrically and mechanically firm. Refer to figure 2-1 and check to see that all connections are properly made. Paragraph 2.6 gives instructions for interpreting the cabling diagram.

b. Replace the rear panel on the transmitter. Insert the ventilating fan plug into the socket on the rear of the power supply chassis.

c. Place all tubes and crystals in their proper sockets. Refer to figures 6-5, 6-7, and 6-9 for correct tube placement.

d. If the transmitter is to be operated with an output power of 250 watts, remove the jumper strap that is across resistors R168 and R169. Refer to figure 6-2 for the location of this strap.

e. If the input power is 50 cycle instead of 60 cycle, replace C181 with a 0.11-microfarad capacitor. Refer to figure 6-2 for the location of C181.

f. Inspect the arc gaps listed below for proper adjustment. Set gaps as follows:

Plate tuning capacitor  
(C142) gap (E108) . . . 5/16 to 21/64 inch.

Loading capacitor  
(C143) gap (E109) . . . 1/16 to 5/64 inch.

Antenna coupling  
capacitor (C149)  
gap (E110). . . . . 1/32 to 3/64 inch.

Modulation trans-  
former (T104)  
gap (E111). . . . . 1/16 to 5/64 inch.

## 2.6 INTERUNIT CABLING DIAGRAM.

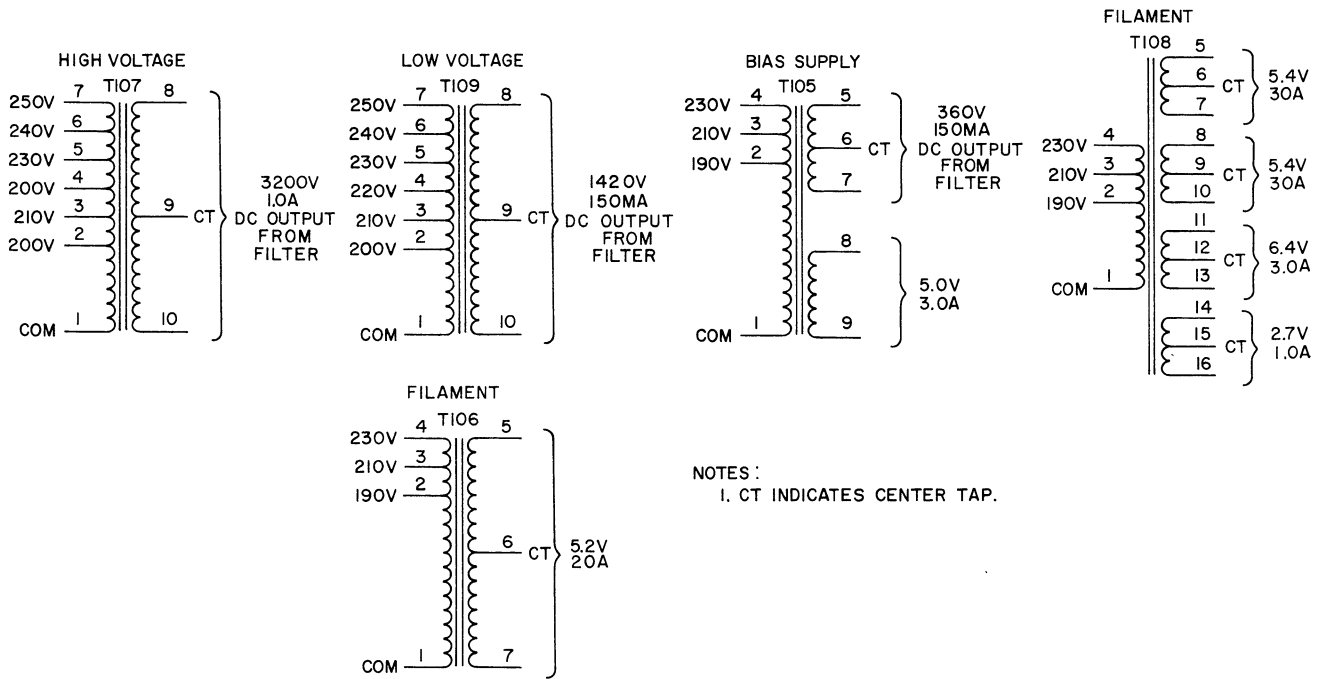
Figure 2-2 shows the wires and cables that connect components in the transmitter. Each section of the diagram is enclosed by broken lines. These sections have been given section designation letters that appear in the upper right corner of each dotted enclosure. Although wiring between transmitter units is not shown on the diagram, the destination of this wiring is indicated by letters and numbers that appear directly below the arrow heads as shown in figure 2-4. The numbers next to the lines above the arrow heads represent the type of wires used to make the connection. The number directly adjacent to each arrow head is the number of that point in the particular section of the diagram, and does not necessarily indicate that there is a terminal bearing that number at that point in the transmitter. Where there are terminal boards with numbered terminals in the transmitter, the terminals are enclosed by a rectangle on the diagram to indicate the terminal board.

A sample wire from the cabling diagram is shown in figure 2-4. Refer to the electrical wire code chart inside the back cover. The KE0 designation indicates that a KE0 wire leaves this point. The K in KE0 indicates that the type of wire used is high-voltage, insulated cable. E indicates that the wire size is #14 AWG, and the 0 indicates that the color of the wire used is black. If a tracer was used on this wire, an additional number would be added to indicate the color of the tracer. If, for example, this wire was black with a red tracer, the designation would have been KE02. If a shield was used, the wire would have been labeled KES02, the S indicating a shield. The color code used for wires and tracers is the same as that used for resistors and capacitors.

The number 13 beside the arrow-head in figure 2-4, indicates that this is point number 13 of a particular section on the diagram.



SECTION II  
Installation



NOTES:  
1. CT INDICATES CENTER TAP.

Figure 2-3. Transformer Details

A1 indicates that the wire leaving this point on the diagrams goes to point 1 in section A of the diagram.

When coaxial cable, copper straps, and other types of connecting materials except wires are used, the Electrical Wire Code is not used. Instead of using the code, the connecting material is specified by name on the diagram.

TABLE 2-1  
REMOTE CONTROL CONNECTIONS

FUNCTION	TB105 TERMINALS
FILAMENT ON	2 and 6
FILAMENT OFF	6 and 13 (remove jumper)
PLATE OFF	7 and 12 (remove jumper)
PLATE ON	6 and 8
Filament-at-operating-temperature indicator (green)	4 and 5
Plate voltage indicator (red)	10 and 11

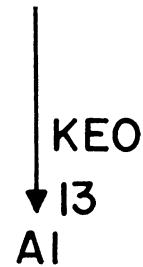


Figure 2-4. Cabling Example

2.7 REMOTE CONTROL CONNECTIONS.

Several 16-connection terminal boards, TB105, TB128, TB129, and TB131, are provided for remote control circuit connections. These terminals may be used to interlock AM Broadcast Transmitter 20V-3 with other equipment. Table 2-1 lists the numbers of terminals on TB105 that are used for remote on-off control and indication. The remote "on" switches should be of the normally-open momentary type. The "off" switches should be of the normally-closed momentary type. For simplified operation, the FILAMENT ON and PLATE OFF switches may be eliminated. When

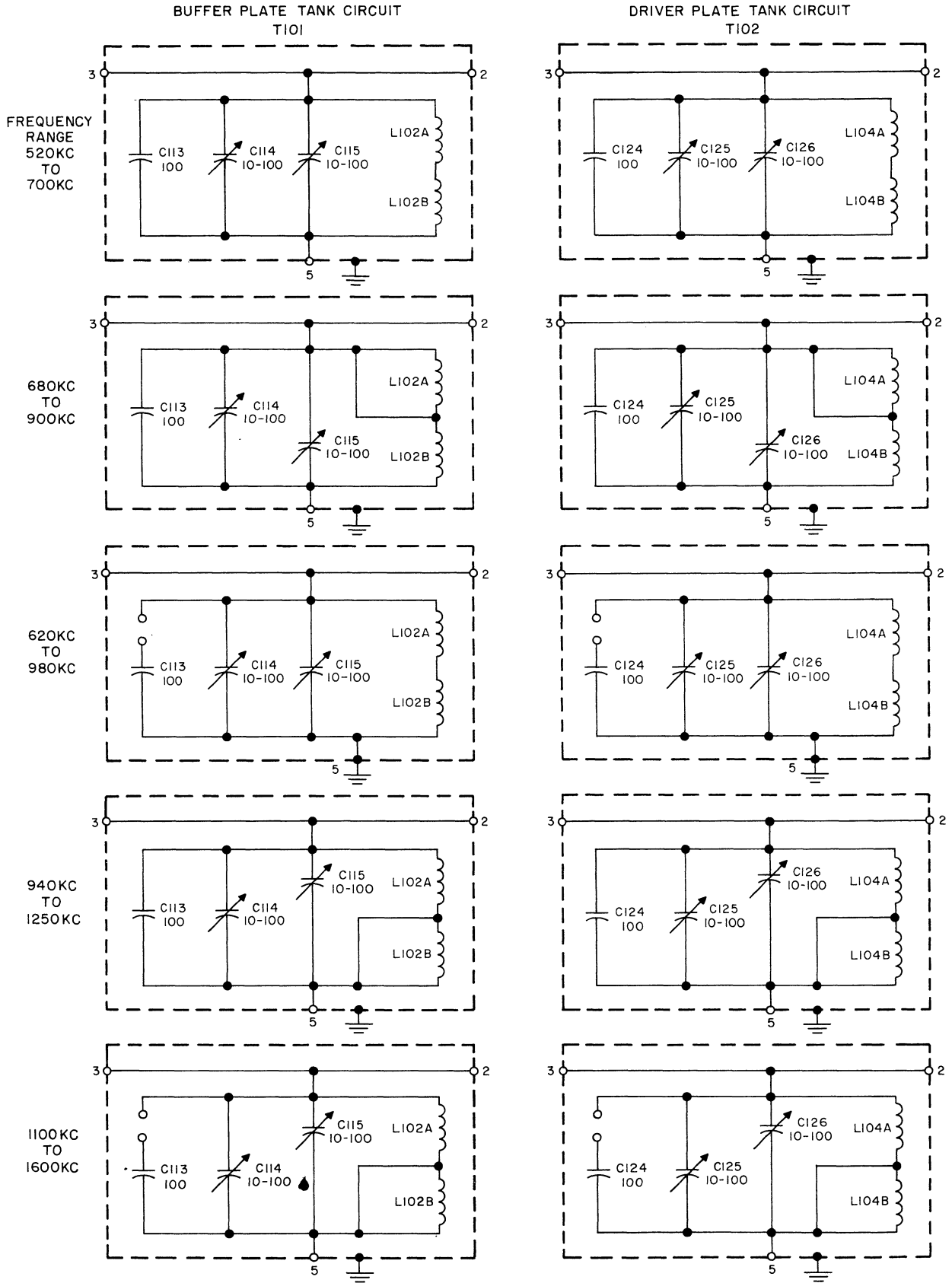


Figure 2-5. T101 and T102 Internal Connections

SECTION II  
Installation

the PLATE ON switch is operated, both filament and plate power will be automatically applied in proper sequence. Operating the FILAMENT OFF switch will shut down all filament and plate power that may be on. The indicator lamps should be the 230-volt a-c type.

Equipment is available that will completely control and monitor transmitter operation from a remote location through standard telephone pairs. When such remote control equipment is used, necessary installation and connection information will be supplied with the equipment.

**2.8 FREQUENCY CHANGE.**

If the transmitter operating frequency is changed, several transmitter components and component settings must be changed. These components are: (1) the crystal, (2) some components in the r-f output network, and (3) the buffer and r-f driver plate tank circuits, T1O1 and T1O2.

Table 2-2 lists the Collins part numbers for crystals of various frequencies. Table 2-3 lists the Collins part numbers of r-f output circuit components for various frequency ranges. Figure 2-5 shows connections of T1O1 and T1O2 for various frequency ranges.

TABLE 2-2. CRYSTAL PART NUMBERS

OPERATING FREQUENCY (KC)	COLLINS PART NUMBER	OPERATING FREQUENCY (KC)	COLLINS PART NUMBER	OPERATING FREQUENCY (KC)	COLLINS PART NUMBER
540	290-1088-00	900	291-9292-00	1260	290-0672-00
550	290-0627-00	910	290-0658-00	1270	290-0673-00
560	290-0635-00	920	291-9300-00	1280	291-9289-00
570	291-9296-00	930	291-9308-00	1290	291-9284-00
580	290-0636-00	940	290-0659-00	1300	291-9291-00
590	290-0637-00	950	291-9294-00	1310	291-9282-00
600	291-9311-00	960	291-9286-00	1320	291-9320-00
610	291-9306-00	970	291-9283-00	1330	291-9285-00
620	290-0638-00	980	291-9288-00	1340	291-9319-00
630	290-0639-00	990	291-9309-00	1350	291-9290-00
640	291-9314-00	1000	290-0660-00	1360	291-9303-00
650	290-0640-00	1010	290-0626-00	1370	290-0674-00
660	290-0641-00	1020	291-9316-00	1380	291-9321-00
670	290-0633-00	1030	291-9327-00	1390	291-9281-00
680	291-9298-00	1040	290-0661-00	1400	291-9297-00
690	290-0642-00	1050	291-9302-00	1410	291-9323-00
700	290-0643-00	1060	290-0662-00	1420	291-9310-00
710	291-9329-00	1070	290-0663-00	1430	291-9312-00
720	290-0644-00	1080	291-9322-00	1440	290-0631-00
730	290-0645-00	1090	290-0664-00	1450	291-9301-00
740	290-0646-00	1100	291-9293-00	1460	291-9280-00
750	291-9295-00	1110	290-0665-00	1470	290-0629-00
760	290-0647-00	1120	290-0666-00	1480	291-9304-00
770	290-0648-00	1130	290-0667-00	1490	291-9315-00
780	290-0649-00	1140	290-0668-00	1500	290-0675-00
790	290-0650-00	1150	291-9299-00	1510	290-1076-00
800	290-0651-00	1160	290-0669-00	1520	290-1077-00
810	290-0652-00	1170	290-0630-00	1530	290-1078-00
820	290-0653-00	1180	290-0634-00	1540	290-1079-00
830	290-0654-00	1190	290-0670-00	1550	290-1080-00
840	290-0655-00	1200	290-0671-00	1560	290-1081-00
850	291-9324-00	1210	291-9325-00	1570	291-9328-00
860	290-0628-00	1220	291-9318-00	1580	291-9307-00
870	291-9326-00	1230	291-9317-00	1590	290-1082-00
880	290-0656-00	1240	291-9313-00	1600	290-1083-00
890	290-0657-00	1250	291-9305-00		

TABLE 2-3. R-F OUTPUT NETWORK COMPONENTS

FREQ KC	L107	L108	C137	C141	C144	C145	C146	C147	C152	FREQ KC		
1600	571-0460-10	980-0040-00 (81 uh) or as alternate 980-0041-00 (150 uh) 930-0041-00 (150 uh) *	913-1789-00 (750 pf) C137A 913-1789-00 (750 pf)	924-1022-00 (200 pf) C141A 913-1441-00 (200 pf) C141B 913-1441-00 (200 pf)	938-2062-00 (820 pf) 938-2080-00 (2000 pf)	938-2048-00 (430 pf) 938-2062-00 (820 pf)	938-2048-00 (430 pf) 938-2062-00 (820 pf)	938-2048-00 (430 pf) 938-2062-00 (820 pf)	936-1149-00 (.022 uf)	1600		
1025										Out	Out	1025
1020										1020		
875										875		
865										865		
725										725		
715										715		
675										675		
665										665		
575										575		
565	565											
550	550											

SECTION III  
Operation

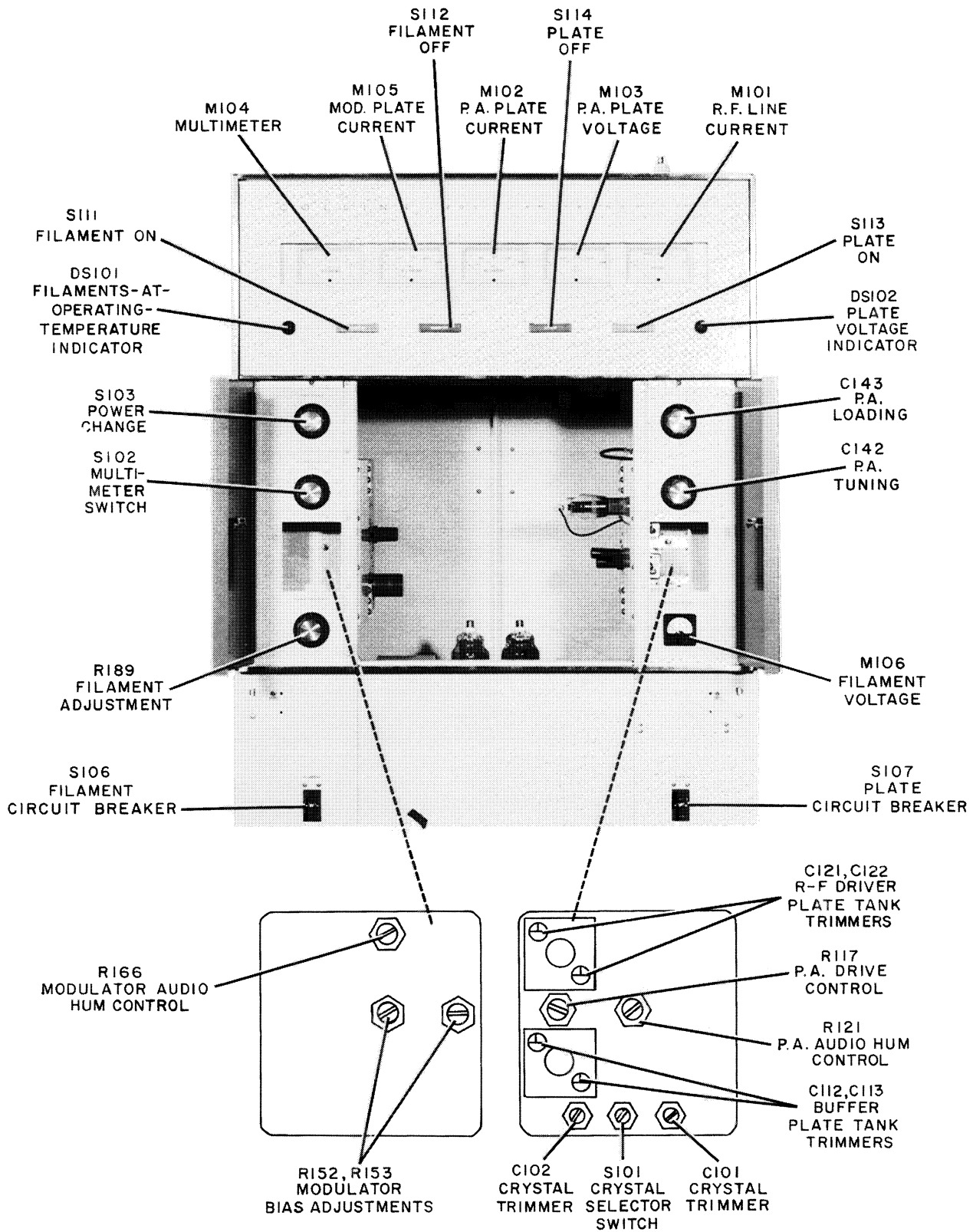


Figure 3-1. Operating Control Locations

## SECTION III OPERATION

### 3.1 CONTROL FUNCTIONS.

The following paragraphs describe the functions of all adjustable controls in AM Broadcast Transmitter 20V-3. Operating personnel should become thoroughly familiar with the location and function of each control before attempting to operate the transmitter. Refer to figures 3-1 and 3-2 for control location.

The following controls are located directly under the meters on the front panel. The FILAMENT ON switch, S111, energizes all transmitter tube filaments and the bias power supply. The FILAMENT OFF switch, S112, de-energizes all transmitter circuits. The PLATE OFF switch, S114, de-energizes the high- and low-voltage power supplies. The PLATE ON switch, S113, energizes the high- and low-voltage power supplies, supplying plate voltage to all transmitter tubes. The green indicator lamp at the left of the four on-off switches, DS101, lights whenever the tube filaments are at their proper operating temperature. This light also indicates that the plate-voltage interlock has been closed and that plate voltage may be applied to the tubes. The red indicator lamp at the right of the four on-off switches, DS102, lights whenever plate voltages are applied.

The following controls are located under the left access door on the front panel. The POWER CHANGE switch, S103, switches the transmitter output power from 250 or 500 watts when the switch is set at LOW, to 1000 watts when it is set at HIGH. This switch may be operated while the transmitter is on the air. The MULTIMETER SWITCH, S102, inserts the MULTIMETER, M104, into any one of seven transmitter circuits. Table 5-1 lists the MULTIMETER SWITCH positions and typical indications for each of the seven circuits. The full-scale MULTIMETER indication is given at each switch position.

The following screwdriver adjustments are located behind the panel plate between the MULTIMETER SWITCH and the FILAMENT ADJUSTMENT control. The modulator audio hum control, R166, is a variable resistor used to shift the ground point of the modulator filament circuit to a point that will minimize audio hum caused by the a-c filament voltage. The modulator bias adjustments, R152 and R153, vary the amount of negative bias applied to the grids of the modulator tubes. Another modulator bias adjustment, R182, located on the right top of the power supply chassis as viewed from the rear, performs the same function as the other two bias adjustments, and may be used as a coarse bias adjustment.

The following control is located at the bottom of the front panel. The FILAMENT ADJUSTMENT control,

R189, adjusts the current in the primary of filament transformers T106 and T108, and bias transformer T105, thus varying the filament voltage of the transmitter tubes. The FILAMENT VOLTAGE meter under the right front panel indicates the filament voltage of the power amplifier tubes.

The following controls are located under the right access door on the front panel. The P.A. LOADING control varies the transmitter output power by varying capacitor C143 in the r-f output network. The P.A. TUNING control tunes the power amplifier plate circuit by varying capacitor C142 in the r-f output network. Varying the P.A. LOADING control even slightly detunes the output network, causing excessive power amplifier plate current to flow. Therefore, the P.A. TUNING control must be readjusted at the same time the P.A. LOADING control setting is changed. This is done to retune the output network and keep the plate current at an allowable value.

The following screwdriver adjustments are located behind the panel plate between the P.A. TUNING control and the FILAMENT VOLTAGE meter. The r-f driver plate tank trimmers, C121 and C122, tune the plate circuit of the 807 r-f driver stage. These trimmers should be adjusted for maximum power amplifier grid current. The two trimmers are connected in parallel, so one should be adjusted to give a good tuning range for the other. The PA drive control, R117, adjusts the r-f driver screen voltage to vary the power amplifier grid current. The PA audio hum control, R121, performs the same function for the power amplifier that the modulator audio hum control does for the modulator. The buffer plate tank trimmers, C112 and C113, tune the plate circuit of the 6SJ7 buffer amplifier stage. These trimmers should be adjusted for maximum r-f driver grid current. Adjust in same manner as r-f driver plate tank trimmers. The crystal selector switch, S101, selects either of the two crystals that are mounted on the r-f chassis. When the switch is turned counterclockwise, the upper crystal is selected. The crystal trimmers, C101 and C102, are used to vary the crystal oscillator frequency slightly. The left trimmer is for the upper crystal.

The following adjustments are located under the lower front panel. The FILAMENT and PLATE circuit breakers, S106 and S107, are connected directly to the 230-volt a-c power input to limit current in the filament and plate circuits respectively.

Refer to figure 3-2. The operating current values of the modulator and power amplifier overload relays, K105 and K106, may be adjusted by turning the knurled

SECTION III  
Operation

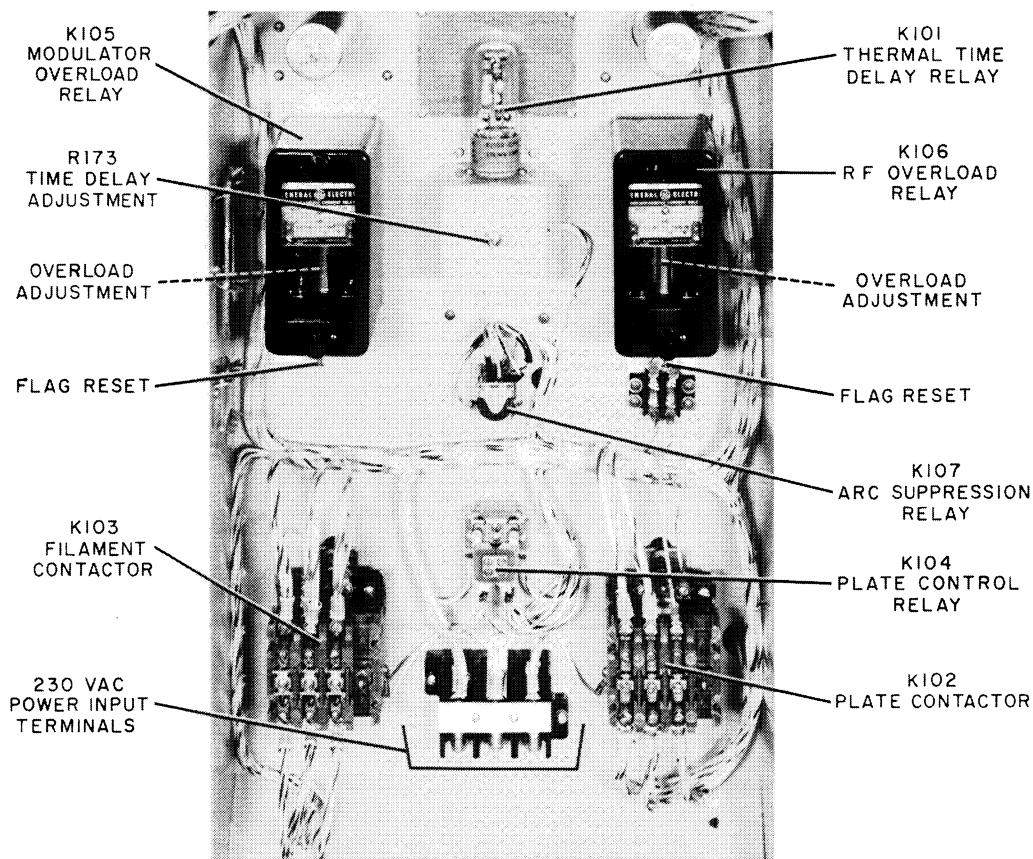


Figure 3-2. Relay Compartment

vertical shafts inside the relay cases. Turning the shafts clockwise increases the value of current needed to operate the relays. Both relays should be set so that they operate when the modulator or power amplifier plate current is 600 milliamperes.

The time delay of time delay relay K101 may be adjusted by varying R173, which is mounted on a small chassis under the relay. Turning this screwdriver adjustment clockwise increases the time delay. The delay should be set to 30 seconds from a cold start.

### 3.2 STARTING THE TRANSMITTER IN A NEW INSTALLATION.

- a. Before starting the transmitter for the first time, inspect it carefully for any mechanical damage.
- b. Carefully inspect all door interlocks. Press the contact block until the spring is completely compressed. Release the block. If it does not spring back to its original position, adjust it until it operates properly.
- c. Check to be sure that all tubes and crystals are in their proper sockets. Select the proper crystal, using the crystal selector switch, S101.

d. Remove the plate caps from V111, V112, V113, and V114, the high- and low-voltage power supply tubes. Be sure that the caps hang free and are not near any metal parts.

e. Close both rear cabinet doors. Check to see that the FILAMENT and PLATE circuit breakers under the lower front panel are set to ON.

f. Press the FILAMENT ON switch on the front panel. The filaments of all tubes should light and the blowers and ventilating fan should come on.

g. Adjust the FILAMENT ADJUSTMENT control for a 5-volt indication on the FILAMENT VOLTAGE meter.

h. When the green indicator lamp at the top left of the front panel lights, press the PLATE ON switch. The red indicator lamp at the top right of the front panel should light when this switch is pressed.

i. Press the FILAMENT OFF switch. The transmitter should shut down completely.

j. Remove the modulator tubes, V108 and V109, from the transmitter.

k. Replace the plate caps on V113 and V114, the 866A low-voltage rectifiers. Do not replace the caps on V111 and V112, the high-voltage rectifiers, until later.

**WARNING**

Voltages are present in this transmitter that are dangerous to life. Observe safety precautions when making any transmitter adjustments. Do not reach inside the transmitter cabinet whenever high voltage is applied. Do not depend on door interlocks. Always shut down the transmitter before doing any work inside the transmitter cabinet.

1. Press the FILAMENT ON switch. Allow the transmitter to run for 20 minutes with only the filaments lighted. This operation is necessary to properly age the mercury-vapor rectifier tubes. Aging is required for new tubes and for used tubes that have been inverted or agitated.

m. Press the PLATE ON switch.

n. Set the MULTIMETER SWITCH to its first four positions and check the MULTIMETER indications with those given in table 5-1 in the maintenance section. Slight deviations from the given limits are permissible.

o. Set the MULTIMETER SWITCH to 807 GRID 25MA. Adjust the buffer plate tank trimmers for a maximum indication on the MULTIMETER.

p. Refer to table 5-1, and recheck the MULTIMETER indication with the MULTIMETER SWITCH set to 807 CATH 250MA.

q. Set the MULTIMETER SWITCH to PA GRID 25MA. Adjust the r-f driver plate tank trimmers for a maximum indication on the MULTIMETER. Adjust these trimmers in the same way as those in step o.

r. Press the FILAMENT OFF switch.

s. Replace the modulator tubes, V108 and V109, and the plate caps on V111 and V112, the 575A high-voltage rectifiers.

t. Set the two front panel modulator bias adjustments, R152 and R153, fully counterclockwise. Set the modulator bias adjustment on the power supply chassis, R182, fully clockwise. These settings cause maximum bias and minimum modulator plate current.

u. Place the clip on modulation monitoring coil, L110, located in the r-f output network compartment, at a position near the ground (left) end of the coil.

v. Set the POWER CHANGE switch to LOW.

w. Set the P.A. LOADING control to 100. This setting is for minimum loading.

x. Close the rear cabinet doors. Press the FILAMENT ON switch.

y. When the green indicator lamp lights, press the PLATE ON switch. As soon as this switch is pressed, adjust the P.A. TUNING control for a minimum indication on the P.A. PLATE CURRENT meter.

z. Set the MULTIMETER SWITCH to PA GRID 25MA. Retune the r-f driver plate tank trimmers for a maximum MULTIMETER indication.

aa. Adjust the modulator bias adjustment, R182 on the power supply chassis, until modulator plate current just starts to flow, as indicated by the MOD. PLATE

CURRENT meter. Shut down the transmitter to make this adjustment. Recheck meter indication after power is reapplied. Readjust if necessary. Next, adjust one of the front panel modulator bias adjustments, R152 or R153, until the MOD. PLATE CURRENT meter indicates 60 milliamperes. Then adjust the other front panel modulator bias adjustment until the MOD. PLATE CURRENT meter indicates 120 milliamperes.

ab. Set the POWER CHANGE switch to HIGH. Readjust the P.A. TUNING control for a minimum indication on the P.A. PLATE CURRENT meter.

ac. Set the MULTIMETER SWITCH to PA GRID 25MA and readjust the r-f driver plate tank trimmers for a maximum MULTIMETER indication.

ad. Adjust the transmitter for proper output power as follows. Turn the P.A. LOADING control slowly counterclockwise to increase the output power. At the same time, keep readjusting the P.A. TUNING control for a minimum indication on the P.A. PLATE CURRENT meter. Continue this procedure until the R.F. LINE CURRENT meter indication is slightly below the desired value. Then adjust the P.A. TUNING control slightly to the side of resonance that causes an increase in the R.F. LINE CURRENT meter indication. This will also cause an increase in PA plate current, but the power increase in the r-f line will be a large proportion of the power increase in the power amplifier circuit, giving a higher PA plate efficiency. Adjust for maximum efficiency.

ae. Adjust the tap on L110 to obtain the desired output for modulation monitoring equipment.

af. Connect a distortion analyzer and noise meter, such as Hewlett-Packard 330D, to the modulation monitor output (J100).

ag. Apply a 1000-cps audio input to the transmitter. Make the input amplitude sufficient to modulate the r-f carrier 95 percent.

ah. Adjust the two front panel modulator bias adjustments, R152 and R153, for minimum distortion as indicated by the distortion analyzer. The other modulator bias adjustment, R182 on the power supply chassis, may be adjusted, if necessary, to bring the front panel adjustments into the proper adjustment range. The MOD. PLATE CURRENT meter indication should remain at about 120 milliamperes when the transmitter is not modulated.

ai. Increase the level of the 1000-cps modulating signal until the transmitter is modulated 100 percent. Calibrate the noise meter, then remove the modulation. Adjust the PA drive control, R117, and the modulator and power amplifier audio hum controls, R166 and R121, for minimum noise as indicated by the noise meter.

The transmitter is now ready for on-the-air operation.

**3.3 STARTING THE TRANSMITTER IN NORMAL OPERATION.**

- a. Close the rear cabinet doors.
- b. Press the FILAMENT ON switch.



### SECTION III

#### Operation

c. Set the POWER CHANGE switch to the correct position for desired output power.

d. When the green indicator lamp lights, press the PLATE ON switch.

e. If the output power is to be adjusted, adjust the P.A. LOADING and P.A. TUNING controls as instructed in paragraph 3.2.ad.

f. Check the meter and monitor indications. Typical meter indications are given in table 5-1 in the maintenance section.

g. An alternative method of starting the transmitter is to press only the PLATE ON switch. The plate voltage will be automatically applied when the tube filaments reach proper operating temperature.

## SECTION IV PRINCIPLES OF OPERATION

### 4.1 GENERAL

Refer to figure 4-1, a block diagram of AM Broadcast Transmitter 20V-3. The r-f carrier frequency is generated by a 6AU6 crystal oscillator, V101. The crystal used in this oscillator circuit is an extremely stable, low-temperature coefficient crystal that does not require a crystal oven. When the transmitter is operating in the AM broadcast band, the oscillator load is resistive. If the operating frequency is in the high-frequency band, the oscillator load resistor is replaced with a tank circuit that doubles the crystal frequency to the operating frequency. Two crystals may be mounted in the transmitter so that one will always be available as a standby. Either crystal may be selected by a switch on the front panel.

The oscillator output drives a 6SJ7 buffer amplifier, V102, which is coupled to an 807 r-f driver, V103. The buffer and driverplate circuits are contained in shielded, plug-in units located behind the right front access door. The driver output is coupled to the control grids of power amplifier tubes V104 and V105, two 4-400A tetrodes in parallel. An audio monitoring signal is fed from a resistor in the power amplifier cathode circuit. A frequency monitor connection is brought out from the power amplifier grid circuit.

The power amplifiers are plate modulated by two 4-400A tetrodes, V108 and V109, that are connected in a push-pull, class AB<sub>1</sub> modulator circuit. The modulator is driven by a 6SJ7 push-pull audio amplifier, V106 and V107. The transmitter audio input is fed through a terminating pad and audio input transformer, T103, to this amplifier. About 12 db of feedback is provided from the modulator plates to the audio amplifier input.

The r-f output network consists of a pi-section followed by an L-section. It is designed to feed into an unbalanced output with a resistive output impedance of from 50 to 72 ohms. This network greatly attenuates harmonics while passing the fundamental frequency with minimum loss. Coil L110, connected from the output end of the L-section to ground, acts as a static drain and is a voltage source that feeds the modulation monitor.

Output power change is accomplished as follows: Power-change switch S103 shunts resistors R167 through R171 in the power amplifier plate circuit during high-power (1000-watt) operation. During 500-watt operation, resistors R168 and R169 are shunted by a jumper strap. For 250-watt operation, this jumper is removed. Resistor R167 is tapped to allow coarse output-power adjustment around 500 or 250 watts.

Fine power adjustments are made with the P.A. LOADING and P.A. TUNING controls.

There are three separate power supplies in the 20V-3 for high voltage, low voltage, and bias. The high-voltage supply uses two 575A half-wave, mercury-vapor rectifiers in a full-wave circuit. It supplies d-c voltage to the modulator and power amplifier plates and the power amplifier screens. The low-voltage supply uses two 866A half-wave, mercury-vapor rectifiers in a full-wave circuit. This supply furnishes d-c voltage for plates and screens of the low-power stages and screens of the modulator tubes. The bias supply uses a 5U4G high-vacuum rectifier in a full-wave circuit. It supplies bias voltage to the r-f driver, modulator, and power amplifier.

Overload protection is provided by magnetically operated circuit breakers in the filament and plate circuits, fuses in the primaries of the filament, low-voltage, and bias transformers, and by individual overload relays in the power amplifier and modulator cathode circuits.

### 4.2 CONTROL CIRCUITS.

Refer to figure 4-2. When the FILAMENT circuit breaker, S106, is closed, pressing the FILAMENT ON switch, S111, will energize the filament contactor, K103. Contacts 3 and 4 of K103 shunt S111 to keep K103 energized after S111 is released.

The filament contactor, K103, connects the 230-volt a-c input to the three ventilating blowers, B101 through B103, the bias power supply, and filament transformers T106 and T108. K103 also connects the a-c input to the filament of time delay relay K101 through the normally-closed FILAMENT OFF switch, S112, contacts 4 and 3 of K103 and resistors R174 and R173. After about 30 seconds from a cold start, the filament in K101 has heated a bimetal strip in the relay sufficiently to close a pair of contacts which light the green lamp, DS101, on the front panel and close a plate-voltage interlock circuit. The green lamp indicates that the tube filaments have reached their proper operating temperature. The time delay is adjustable by varying R173, which is in series with the time delay relay filament.

This time delay relay filament cools at approximately the same rate as the tube filaments. Therefore, it will automatically select the minimum time delay needed to return the filaments to their proper operating temperature after a short power interruption. The transmitter will return to the air immediately after instantaneous interruptions.

SECTION IV  
Principles of Operation

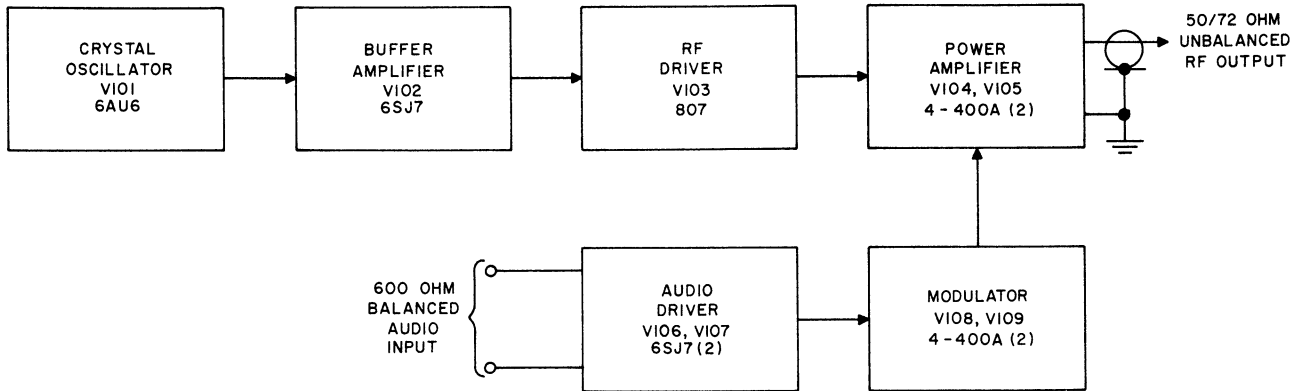


Figure 4-1. AM Broadcast Transmitter 20V-3, Block Diagram

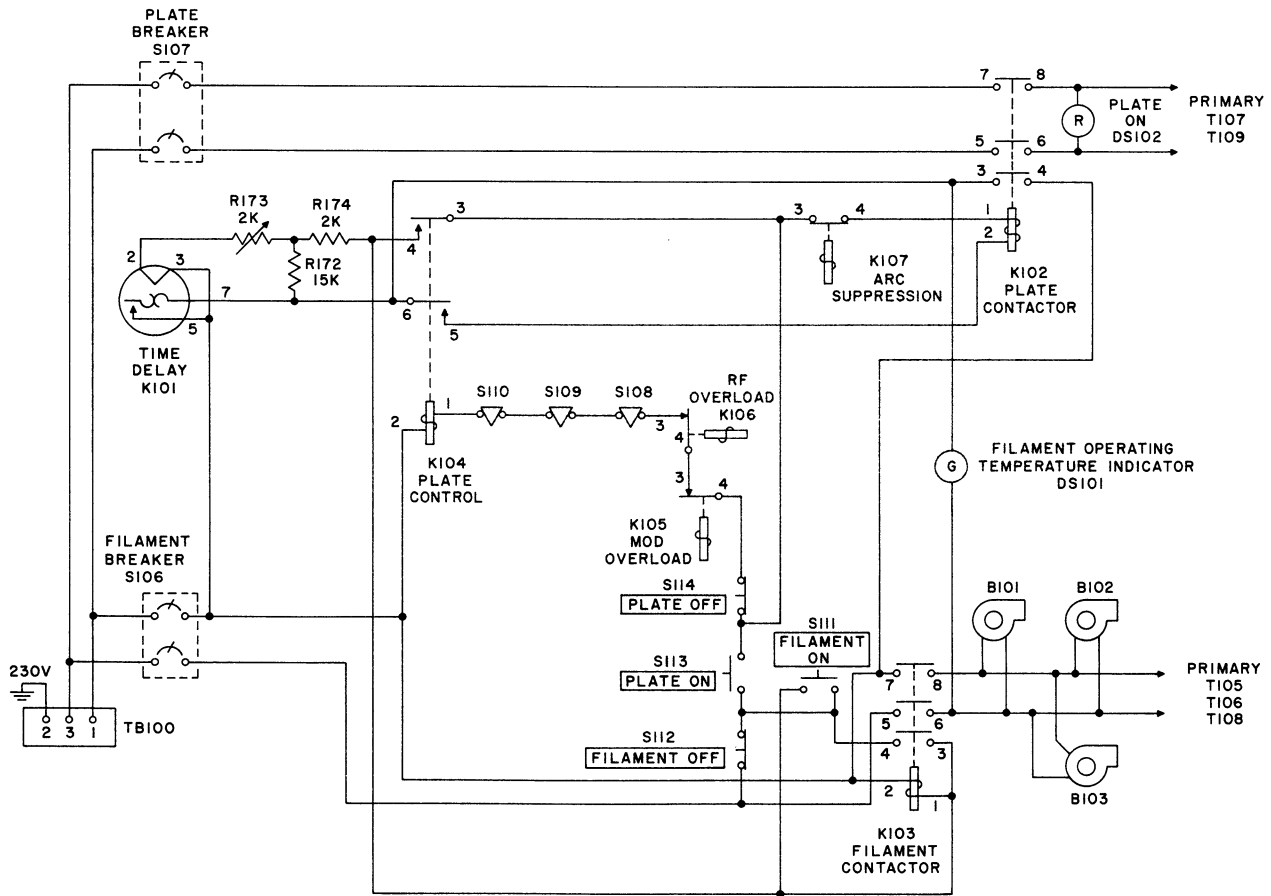


Figure 4-2. Control Circuits, Simplified Schematic Diagram

When the filaments have been energized and the time delay cycle has been completed, pressing the PLATE ON switch, S113, will energize the plate control relay, K104, through switches S112, S113, and S114; the modulator and r-f overload relays, K105 and K106; the three door interlocks, S108, S109, and S110; and the coil of K104. K104 remains energized after S113 is released by a circuit that shunts S113 through contacts 4 and 3 of K103, and contacts 4 and 3 of K104.

K104, in turn, energizes the plate contactor, K102, through contacts 3 and 4 of arc-suppression relay K107, the coil of K102, contacts 5 and 6 of K104, and contacts 7 and 5 of K101. When K102 is energized, contacts 3 and 4 of K102 connect R172 across the filament of K101 and R173 to decrease the current in the filament to a value that is just enough to keep contacts 5 and 7 of K101 closed.

When the plate contactor, K102, is energized, the 230-volt a-c input is connected through the closed PLATE circuit breaker, S107, to the plates of rectifier tubes in the high- and low-voltage power supplies. The red lamp, DS102, on the front panel lights whenever K102 is energized.

Pressing the FILAMENT OFF switch, S112, interrupts the coil circuits of K103 and K104, shutting the transmitter down completely. Pressing the PLATE OFF switch, S114, shuts down only the plate circuits, leaving the filament circuits energized.

Note that if the arc-suppression relay, K107, is energized by a fault in the r-f output network, only K102 will be de-energized. Since K104 remains closed, K102 will be re-energized immediately after K107 is de-energized. If one of the rear cabinet doors is opened while plate voltage is applied or if an overload

occurs in the modulator or power amplifier, K104 is de-energized, and the PLATE ON switch must be pressed to restart the transmitter.

If desired, the transmitter may be started from a cold start by pressing only the PLATE ON switch. Pressing this switch energizes K104, which, in turn, energizes the filament contactor and the time delay relay. At the end of the time delay interval, the closing of K101 will automatically energize K102, applying plate power to the transmitter. Pressing the FILAMENT OFF switch will again shunt down the entire transmitter.

### 4.3 ARC-SUPPRESSION CIRCUIT.

The arc-suppression circuit in AM Broadcast Transmitter 20V-3 will safeguard tubes and r-f output network components by interrupting the plate voltages in the event of a short circuit or flashover in the r-f output network. Refer to figure 7-1. The arc-suppression relay, K107, has normally-closed contacts in series with the plate contactor coil. The coil of K107 is connected in series with monitor coil L110. The end of the monitor coil that connects to the relay is bypassed to ground for r-f by capacitor C151. The bias power supply supplies current for the operation of K107. When an arc-over occurs in the r-f output network due to lightning or any other cause, the ionized path produced by the r-f voltage in the arc has a sufficiently low d-c resistance to complete the relay coil circuit and energize the relay. When the relay operates, its contacts open, disabling the high- and low-voltage plate supplies, removing the transmitter carrier from the air, and stopping the arc-over. When the arc is extinguished, there is no path to ground for the d-c relay-coil current, and the relay contacts close, returning the carrier to the air. Ordinarily, the program interruption will hardly be noticeable.



## SECTION V MAINTENANCE

### 5.1 GENERAL.

The following paragraphs contain information concerning the maintenance of AM Broadcast Transmitter 20V-3.

#### **WARNING**

Voltages are present in this transmitter that are dangerous to life. Observe safety precautions when performing any maintenance. Do not reach inside the transmitter cabinet whenever high voltage is applied. Do not depend on door interlocks. Always shut down the transmitter before doing any work inside the transmitter cabinet.

### 5.2 PREVENTIVE MAINTENANCE.

#### 5.2.1 CLEANING.

Most service interruptions in equipment of this type are caused by dirt and corrosion. Corrosion is accelerated by the presence of moisture and dust. In some localities it is impossible to keep moisture out of the transmitter, but dust should be removed periodically with a soft brush or a dry, oil-free air jet.

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 transmitter. It is very important to keep moving parts such as tap switches dust-free to prevent undue wear.

When the transmitter is operated near salt water or in other corrosive atmospheres, inspect and clean tap switch contacts, tube prongs, cable connectors, and other metal parts more frequently to keep the equipment in operating condition.

Once each month clean the air filter at the rear of the transmitter cabinet. Wash the filter in luke-warm water to which a detergent has been added. Before replacing the filter in the transmitter, dip it in SAE 30 oil and allow excess oil to drain off. Replacement filters are Collins part number 009-1069-00.

#### 5.2.2 INSPECTION.

Once each week check and clean the three interlock switches at the rear of the transmitter cabinet to be sure that they are in good working order.

Once each month check all connections in the transmitter. Tighten any nuts, bolts, or screws that may be loose. Check cable connections to see that they are clean and mechanically secure. Check moving parts such as tuning controls for excessive wear.

#### 5.2.3 LUBRICATION.

No lubrication is required in AM Broadcast Transmitter 20V-3. The fan and blower motors have sealed bearings that are lubricated for the life of the equipment.

### 5.3 TUBE MAINTENANCE.

Do not operate tubes above their rated capacity. Keep a record of how long each tube is in use. Check emission of all tubes, at least every 1000 hours of service. (Check 4-400A's by comparing with new tubes of known quality.) Refer to the tube manufacturer specifications for the rated filament life of each of the tubes. Replace tubes after they have been in service for about 75 percent of the rated filament life.

Spare, preaged mercury-vapor rectifier tubes should be available for immediate replacement. To ready these tubes for emergency use, place them in the transmitter during off-the-air hours and run them for twenty minutes with only the filaments lighted. This will remove the mercury coating from the tube elements. Then carefully remove the tubes from the transmitter and store them in an upright position where they will not be inverted or agitated. When these preaged tubes are placed in the transmitter, handle them carefully to avoid the twenty-minute warmup period that will be required if mercury comes in contact with the tube elements. Never apply plate voltage to mercury-vapor rectifier tubes that have not been aged long enough to remove all mercury from the tube elements.

### 5.4 TROUBLE SHOOTING.

The most frequent cause of trouble will probably be tube failure. If there is ever any doubt concerning the performance of a tube, check it in a tube checker or by replacing it with a tube that is known to be in good condition and noting any change in performance. Low-emission tubes may cause erratic or poor transmitter performance. Tube emission may be checked with a tube checker. Tube failure may also cause distortion or hum. If such difficulty occurs, replace the defective tube with one known to be in good operating condition.

The five front panel meters on the transmitter will be helpful in locating any trouble. Table 5-1 contains

SECTION V  
Maintenance

typical meter indications. The indications given in this table are averages obtained from several production transmitters operated in the frequency range from 550 to 1600 kilocycles. The indications on some operating units may vary slightly outside the given limits without affecting transmitter performance. Values for transmitters operating from 1.6 to 12 megacycles may vary appreciably from the given values. It is a good idea to prepare a list of panel meter indications for each individual transmitter when

it is operating properly in its particular installation. Any abnormal deviation from these values will then be apparent during a check of meter indications.

**5.5 ORDERING REPLACEMENT PARTS.**

Refer to the guarantee inside the front cover for information about ordering replacement parts. Collins part numbers for transmitter components may be found in the parts list, section VI.

TABLE 5-1. TYPICAL METER INDICATIONS

SWITCH	SWITCH POSITION	METER	METER INDICATION
MULTIMETER SWITCH	AUDIO CATH 25MA	MULTIMETER	7 to 11 milliamperes
MULTIMETER SWITCH	OSC CATH 25 MA	MULTIMETER	4.8 to 5.8 milliamperes
MULTIMETER SWITCH	1ST BUFF GRID 25 MA	MULTIMETER	0.2 to 0.5 milliamperes
MULTIMETER SWITCH	1ST BUFF CATH 25MA	MULTIMETER	6.7 to 8.3 milliamperes
MULTIMETER SWITCH	807 GRID 25MA	MULTIMETER	1.5 to 2.3 milliamperes
MULTIMETER SWITCH	807 CATH 250MA	MULTIMETER	36 to 54 milliamperes
MULTIMETER SWITCH	PA GRID 25MA	MULTIMETER	15 to 24 milliamperes
POWER CHANGE	LOW	P.A. PLATE CURRENT	245 milliamperes
POWER CHANGE	LOW	P.A. PLATE VOLTAGE	1560 volts d-c
POWER CHANGE	LOW	R.F. LINE CURRENT	
		70-ohm load	1.9 amperes
		50-ohm load	2.2 amperes
POWER CHANGE	LOW	P.A. PLATE CURRENT	300 milliamperes
POWER CHANGE	LOW	P.A. PLATE VOLTAGE	250 volts d-c
POWER CHANGE	LOW	R.F. LINE CURRENT	
		70-ohm load	2.8 amperes
		50-ohm load	3.3 amperes
POWER CHANGE	HIGH	P.A. PLATE CURRENT	500 milliamperes
POWER CHANGE	HIGH	P.A. PLATE VOLTAGE	3150 volts d-c
POWER CHANGE	HIGH	R.F. LINE CURRENT	
		70-ohm load	4.0 amperes
		50-ohm load	4.7 amperes
POWER CHANGE	LOW and HIGH	MOD. PLATE CURRENT	
		No modulation	120 milliamperes
		100-percent modulation, 1000 cps	Not more than 450 milliamperes.

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PARTS LIST

AM Broadcast Transmitter 20V-3

ITEM	DESCRIPTION	COLLINS PART NUMBER	ITEM	DESCRIPTION	COLLINS PART NUMBER
	AM BROADCAST TRANSMITTER 20V-3	522-2480-00	C130	CAPACITOR, FIXED, CERAMIC: same as C108	913-3522-00
B101	FAN, CENTRIFUGAL: direct connected; counterclockwise rotation; pole motor, 230 vac input, 60 cps single phase, 3200 rpm. ILG ventilation part no. BM8467	009-1562-00	C131	CAPACITOR, FIXED, CERAMIC: same as C108	913-3522-00
B102	FAN, CENTRIFUGAL: direct connected; clockwise rotation; pole motor, 230 vac input, 60 cps, single phase, 3200 rpm. ILG ventilation part no. BM8468	009-1559-00	C132	CAPACITOR, FIXED, CERAMIC: 67 uuf $\pm 5\%$ , 5000 vdcw; Centralab part no. 850-022	913-0090-00
B103	MOTOR, AC: 230 v, 50-60 cps, 1550 rpm, counterclockwise rotation, totally enclosed GE part no. 5KSP51CL17	230-0164-00	C133	CAPACITOR, FIXED, CERAMIC: same as C132	913-0090-00
C101	CAPACITOR, VARIABLE, AIR: single section, 7.5 uuf min to 102.7 uuf max, 35 plates	922-0028-00	C134	CAPACITOR, FIXED, CERAMIC: same as C132	913-0090-00
C102	CAPACITOR, VARIABLE, AIR: same as C101	922-0028-00	C135	CAPACITOR, FIXED, CERAMIC: same as C132	913-0090-00
C103	CAPACITOR, FIXED, MICA: 1000 uuf $\pm 10\%$ , 500 vdcw	935-4053-00	C136	CAPACITOR, FIXED, MICA: 10,000 uuf $\pm 20\%$ , 1200 vdcw	936-1127-00
C104	CAPACITOR, FIXED, CERAMIC: 10,000 uuf $\pm 20\%$ , 500 vdcw	913-1188-00	C137	CAPACITOR, FIXED, CERAMIC: 750 uuf $-0\%$ $+100\%$ at room temperature; 7500 vdcw	913-1789-00
C105	CAPACITOR, FIXED, MICA: 150 uuf $\pm 5\%$ , 500 vdcw; Electro Motive part no. DM15F151J01	912-2828-00	C138	CAPACITOR, FIXED, CERAMIC: 500 uuf $+5\%$ $-20\%$ , 20,000 vdcw	913-1101-00
C106	CAPACITOR, FIXED, MICA: 5600 uuf $\pm 2\%$ , 500 vdcw; Electro Motive part no. DM30F562J	912-2716-00	C139	CAPACITOR, FIXED, CERAMIC: same as C138	913-1101-00
C107	CAPACITOR, FIXED, CERAMIC: same as C104	913-1188-00	C140	CAPACITOR, FIXED, MICA: 5100 uuf $\pm 5\%$ , 500 vdcw	935-2105-00
C108	CAPACITOR, FIXED, CERAMIC: 0.01 uf $-0\%$ $+100\%$ at room temperature; 1600 vdcw; Centralab part no. DD16-103	913-3522-00	C141	CAPACITOR, FIXED, CERAMIC: 200 uuf $\pm 10\%$ , 7500 vdcw	913-1441-00
C109	CAPACITOR, FIXED, CERAMIC: same as C104	913-1188-00	C142	CAPACITOR, VARIABLE, AIR: single section, 58 uuf min, 185 uuf max, 33 plates; E. F. Johnson Co. part no. 152-27-2	920-0075-00
C110	CAPACITOR, FIXED, CERAMIC: same as C104	913-1188-00	C143	CAPACITOR, VARIABLE, AIR: 60 uuf min, 820 uuf max, 67 plates; E. F. Johnson Co. part no. 850D35	920-0114-00
C111	CAPACITOR, FIXED, MICA: 100 uuf $\pm 10\%$ , 500 vdcw	912-0495-00	C144	CAPACITOR, FIXED, MICA: transmitting; 0.002 uf $\pm 5\%$ , 6000 v test voltage; Cornell-Dubilier part no. PL-217-6L	906-2208-10
C112	CAPACITOR, VARIABLE, AIR: double midget, 10 uuf min, 100 uuf max; 1000 vdc voltage breakdown; 34 plates; Oak Mfg. Co. part no. 663-DAT	922-4800-00	C144A	CAPACITOR, FIXED, MICA: 820 uuf $\pm 5\%$ , 5000 vdcw	938-2062-00
C113	CAPACITOR, VARIABLE, AIR: same as C112	922-4800-00	C145	CAPACITOR, FIXED, MICA: transmitting; 0.0004 uf $\pm 5\%$ , 5000 vdcw	906-3401-10
C114	CAPACITOR, FIXED, CERAMIC: same as C108	913-3522-00	C145A	CAPACITOR, FIXED, MICA: same as C144A	938-2062-00
C115	CAPACITOR, FIXED, MICA: same as C106	912-2716-00	C146	CAPACITOR, FIXED, MICA: same as C144A	938-2062-00
C116	CAPACITOR, FIXED, CERAMIC: same as C104	913-1188-00	C146A	CAPACITOR, FIXED, MICA: same as C145	906-3401-10
C117	CAPACITOR, FIXED, MICA: 20 uuf $\pm 5\%$ , 500 vdcw; Electro Motive part no. DM15F200J01	912-2765-00	C147	CAPACITOR, FIXED, MICA: same as C144A	938-2062-00
C118	CAPACITOR, FIXED, CERAMIC: same as C104	913-1188-00	C147A	CAPACITOR, FIXED, MICA: same as C145	906-3401-10
C119	CAPACITOR, FIXED, CERAMIC: same as C108	913-3522-00	C148	CAPACITOR, FIXED, MICA: same as C140	935-2105-00
C120	CAPACITOR, FIXED, MICA: same as C111	912-0495-00	C149	CAPACITOR, FIXED, MICA: 10,000 uuf $\pm 10\%$ , 2500 vdcw	937-2025-00
C121	CAPACITOR, VARIABLE, AIR: same as C112	922-4800-00	C150	CAPACITOR, FIXED, MICA: same as C149	937-2025-00
C122	CAPACITOR, VARIABLE, AIR: same as C112	922-4800-00	C151	CAPACITOR, FIXED, MICA: 22,000 uuf $\pm 20\%$ , 600 vdcw	936-1149-00
C123	CAPACITOR, FIXED, MICA: 1000 uuf $\pm 20\%$ , 3500 vdcw	914-0019-00	C152	CAPACITOR, FIXED, MICA: same as C151	936-1149-00
C124	CAPACITOR, FIXED, CERAMIC: same as C108	913-3522-00	C153	CAPACITOR, FIXED, MICA: same as C140	935-2105-00
C125	CAPACITOR, FIXED, CERAMIC: same as C108	913-3522-00	C154	CAPACITOR, FIXED, MICA: 3300 uuf $\pm 20\%$ , 1200 vdcw	936-0283-00
C126	CAPACITOR, VACUUM, GLASS: 15 uuf $\pm 10\%$ , 17,000 v peak voltage	919-0063-00	C155	CAPACITOR, FIXED, MICA: same as C154	936-0283-00
C127	CAPACITOR, FIXED, MICA: same as C123	914-0019-00	C156	CAPACITOR, FIXED, PAPER: 0.1 uf $\pm 20\%$ , 600 vdcw; Sprague Electric Co. part no. 160P10406	931-5511-00
C128	CAPACITOR, FIXED, CERAMIC: same as C108	913-3522-00	C157	CAPACITOR, FIXED, PAPER: 2 uf $\pm 10\%$ , 600 vdcw	930-0046-00
C129	CAPACITOR, FIXED, CERAMIC: same as C108	913-3522-00	C158	CAPACITOR, FIXED, PAPER: same as C156	931-5511-00
			C159	CAPACITOR, FIXED, PAPER: same as C156	931-5511-00
			C160	CAPACITOR, FIXED, PAPER: 0.22 uf $\pm 20\%$ , 600 vdcw; Sprague Electric Co. part no. 160P22406	931-6846-00
			C161	CAPACITOR, FIXED, PAPER: same as C160	931-6846-00
			C162	CAPACITOR, FIXED, MICA: 51 uuf $\pm 20\%$ , 2500 vdcw	936-0162-00
			C163	CAPACITOR, FIXED, MICA: same as C162	936-0162-00
			C164	CAPACITOR, FIXED, MICA: same as C162	936-0162-00
			C165	CAPACITOR, FIXED, MICA: same as C162	936-0162-00
			C166	CAPACITOR, FIXED, MICA: same as C162	936-0162-00
			C167	CAPACITOR, FIXED, MICA: same as C162	936-0162-00
			C168	CAPACITOR, FIXED, MICA: same as C162	936-0162-00
			C169	CAPACITOR, FIXED, MICA: same as C162	936-0162-00



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Parts List

AM Broadcast Transmitter 20V-3

ITEM	DESCRIPTION	COLLINS PART NUMBER
C170	CAPACITOR, FIXED, CERAMIC: same as C108	913-3522-00
C171	CAPACITOR, FIXED, CERAMIC: same as C108	913-3522-00
C172	CAPACITOR, FIXED, CERAMIC: same as C108	913-3522-00
C173	CAPACITOR, FIXED, CERAMIC: same as C108	913-3522-00
C174	CAPACITOR, FIXED, PAPER: 2 uf ±20%, 5000 vdcw; Cornell-Dubilier part no. T-40020	930-0041-00
C175	CAPACITOR, FIXED, CERAMIC: same as C104	913-1188-00
C176	CAPACITOR, FIXED, CERAMIC: same as C104	913-1188-00
C177	CAPACITOR, FIXED, PAPER: same as C157	930-0046-00
C178	CAPACITOR, FIXED, ELECTROLYTIC: 1100 uf, min 90%, max 250% capacitance, 25 vdcw	184-2000-00
C179	CAPACITOR, FIXED, ELECTROLYTIC: same as C178	184-2000-00
C180	CAPACITOR, FIXED, PAPER: 8 uf ±10%, 600 vdcw	930-0048-00
C181	CAPACITOR, FIXED, PAPER: 0.08 uf ±5%, 2400 vdcw; Sprague Electric Co. part no. Sample #92460	930-0467-00
C182	CAPACITOR, FIXED, PAPER: 4.0 uf ±20%, 4000 vdcw	930-0045-00
C183	CAPACITOR, FIXED, PAPER: same as C182	930-0045-00
C184	CAPACITOR, FIXED, PAPER: 10 uf ±10%, 1000 vdcw; Cornell-Dubilier part no. T-10100	930-0038-00
C185	CAPACITOR, FIXED, PAPER: same as C184	930-0038-00
C186	CAPACITOR, FIXED, MICA: same as C140	935-2105-00
DS101	LAMP, INCANDESCENT: pilot light bulb w/ candelabra type base, 10 w, 230-250 v, C-7A filament, S-6 bulb; General Electric part no. 10S6/10-250	262-0169-00
DS102	LAMP, INCANDESCENT: same as DS101	262-0169-00
F101	FUSE, CARTRIDGE: 1.00 amp current rating, 250 v, glass body, ferrule terminals; Bussman part no. MDL 1	264-4280-00
F102	FUSE, CARTRIDGE: same as F101	264-4280-00
F103	FUSE, CARTRIDGE: 3 amp, 125 v, 0.066 ohms, ferrule terminals, glass body	264-0009-00
F104	FUSE, CARTRIDGE: same as F101	264-4280-00
J101	CONNECTOR, RECEPTACLE, ELECTRICAL: 4 female contacts, 10 amp max; phosphor bronze contacts; Howard B. Jones part no. S-304-AB	366-2040-00
J102	CONNECTOR, RECEPTACLE, ELECTRICAL: 8 contacts, 10 amp; Howard B. Jones, Div. Cinch Mfg. Co. part no. S-308-AB	366-2080-00
J103	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J102	366-2080-00
J104	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 female contact; Industrial Products Co. part no. 87075	357-9183-00
J105	CONNECTOR, RECEPTACLE, ELECTRICAL: 2 wire female contacts; 10 amp; Harvey Hubbell Inc. part no. 7526	368-0124-00
K101	RELAY, THERMAL: time delay, normally open contacts; 117 v ac nom; 3 amp, 150 v dc; 3 amp, 250 v dc; Thomas A. Edison part no. B-2103	402-0211-00
K102	RELAY, ARMATURE: 3 normally open contacts, 220 coil voltage; 25 amp; 50/60 cps; RBM part no. 109078-102	402-1201-00
K103	RELAY, ARMATURE: 3 normally open contacts, 220 coil voltage; 15 amp, 50/60 cps; RBM part no. 109092-102	401-1202-00
K104	RELAY, ARMATURE: 3 normally open contacts, 2 open contacts to carry 5 amp in 220 v ac circuit; 1 normally open contact for coil holding in 220 v ac circuit	405-0608-00
K105	RELAY, ARMATURE: current overload, self-reset ac or dc enclosed current; 0.225 amp continuous; 2 normally closed contacts; General Electric part no. 12PJC11A30TF-G-25	405-0186-00
K106	RELAY, ARMATURE: same as K105	405-0186-00
K107	RELAY, ARMATURE: 3 pole, normally closed contacts, 2.0 amp at 230 v ac, inductive load, 125 v dc; 4000 ohms ±10%	970-1727-00
L101	NOT USED	
L102	P/O T101	

ITEM	DESCRIPTION	COLLINS PART NUMBER
L103	NOT USED	
L104	P/O T102	
L105	NOT USED	
L106	COIL, RADIO FREQUENCY: 3 or 4 section; duolateral wound; 1.0 mh inductance, 300 ma max current; 10 ohm dc resistance; National Co., Inc. part no. R-300-S	240-5800-00
L107	COIL, RADIO FREQUENCY: isolantite coil form, 1/8 in. wall, 5-1/2 in.; quadruple bank #24 DSC wire; 7 in. lg overall	571-0460-10
*L108	COIL, RADIO FREQUENCY: 81 uh at 2.5 mc approx inductance; 42 turns 1/4 in. by 0.054 copper strip; E. F. Johnson Co. part no. 200-118-2	980-0040-00
*L108	COIL, RADIO FREQUENCY: 150 uh at 790 kc; 56 turns 1/4 in. by 0.054 copper strip; E. F. Johnson Co. part no. 200-117-2	980-0041-00
L109	TRANSFORMER, RADIO FREQUENCY: isolantite coil form; 30 turns #10 AWG wire right-hand wound; 2-1/2 in. dia by 6 in. lg overall; 9 taps	504-9624-003
L110	COIL ASSEMBLY: 60 uh inductance; isolantite coil form; 56 turns right-hand wound; both ends open; 1-1/2 in. dia by 3-1/4 in. lg overall & brass 56 turn coil rider, 3-1/8 in. lg overall	506-9995-003
L111	REACTOR: 50 hy 0.5 amp dc, 230 ohm max dc resistance; 60 cps; continuous duty cycle; Chicago Std. Trans. part no. 29955	678-0591-00
L112	REACTOR: 80 ma dc nom; 100 ma dc max; 375 ohm dc resistance; 2000 v rms; continuous duty cycle; Thordarson Meissner part no. T-20C53	668-0004-00
L113	REACTOR: 10 hy at 10 v rms, 60 cycles; 1 amp dc; 50 ohm max dc resistance; continuous duty cycle; Chicago Std. Trans. part no. 19069	678-0625-00
L114	REACTOR: same as L113	678-0625-00
L115	REACTOR: 6.5 hy at 10 v rms, 60 cps; 0.200 amp, 85 ohms dc resistance; 100/120 cps; continuous duty cycle; Chicago Std. Trans. part no. 30753	668-0002-00
L116	REACTOR: same as L115	668-0002-00
M101	AMMETER: thermocouple type; 0-6 scale, 60 scale divisions; 0.0074 ohm approx resistance; white dial background, black markings & pointer	451-0133-00
M102	AMMETER: permanent magnet moving coil type dc milliammeter; 0-800 milliamp meter range; 0.5 ohm meter resistance; flush panel mtg	458-0611-00
M103	AMMETER: permanent magnet moving type dc milliammeter; 0-1 milliamp; 50 ohms approx meter resistance	458-0610-00
M104	AMMETER: permanent magnet moving coil type dc milliammeter; 0-1 milliamp meter range; 50 ohms approx resistance; Assembly Products, Inc. part no. 80145	458-0612-00
M105	AMMETER: same as M102	458-0611-00
M106	VOLTMETER: moving iron vane type ac voltmeter; 0-10 v ac, 150 ±20% ohm meter resistance; white dial background, black markings & pointer	452-0058-00
O101	KNOB: screw-on type; chromium plated bronze body; 8-32 thd; 3/4 in. dia by 11/16 in. thk; N. B. Ives Co. part no. 54272-3/4 in.	015-0246-00
O102	KNOB: setscrew type; octagonal shape; black phenolic body w/ aluminum insert; 2.078 in. dia by 0.859 in. thk; excl skirt	544-0794-003
O103	KNOB: setscrew type; octagonal shape; black phenolic body w/ aluminum insert; incl skirt and disk; 2.078 in. dia by 0.859 in. thk knob	546-1291-003
O104	KNOB: same as O103	546-1291-003
O105	KNOB: same as O103	546-1291-003
O106	KNOB: same as O103	546-1291-003
O107	KNOB: same as O103	546-1291-003
P101	CONNECTOR, PLUG, ELECTRICAL: 4 male contacts; 10 amp max; 730 v rms max; Howard B. Jones part no. P-304-CCT	365-8040-00
P102	CONNECTOR, PLUG, ELECTRICAL: 8 male contacts; Howard B. Jones part no. P-308-CCT-W.I.	365-8080-00

\*Chosen per operational requirement.

## AM Broadcast Transmitter 20V-3

ITEM	DESCRIPTION	COLLINS PART NUMBER	ITEM	DESCRIPTION	COLLINS PART NUMBER
P103	CONNECTOR, PLUG, ELECTRICAL: same as P102	365-8080-00	R138	RESISTOR, FIXED, COMPOSITION: same as R137	745-5704-00
P104	CONNECTOR, PLUG, ELECTRICAL: 1 male contact; Automatic Metal part no. 100B 1000A	357-9292-00	R139	RESISTOR, FIXED, COMPOSITION: same as R102	745-1324-00
P105	CONNECTOR, PLUG, ELECTRICAL: 3 wire midget, twist-lock; 10 amp, 250 v; 15 amp, 125 v	368-0013-00	R140	RESISTOR, FIXED, COMPOSITION: 2200 ohms $\pm 10\%$ , 1/2 w	745-1366-00
R101	RESISTOR, FIXED, COMPOSITION: 0.10 megohms $\pm 10\%$ , 1/2 w	745-1436-00	R141	RESISTOR, FIXED, COMPOSITION: 82,000 ohms $\pm 10\%$ , 2 w	745-5733-00
R102	RESISTOR, FIXED, COMPOSITION: 220 ohms $\pm 10\%$ , 1/2 w	745-1324-00	R142	RESISTOR, FIXED, COMPOSITION: 0.15 megohms $\pm 10\%$ , 2 w	745-5743-00
R103	RESISTOR, FIXED, COMPOSITION: 10,000 ohms $\pm 10\%$ , 1/2 w	745-3394-00	R143	RESISTOR, FIXED, COMPOSITION: same as R142	745-5743-00
R104	RESISTOR, FIXED, COMPOSITION: 82,000 ohms $\pm 10\%$ , 1/2 w	745-1433-00	R144	RESISTOR, FIXED, COMPOSITION: same as R116	745-5708-00
R105	RESISTOR, FIXED, COMPOSITION: 0.12 megohms $\pm 10\%$ , 2 w	745-5740-00	R145	RESISTOR, FIXED, COMPOSITION: same as R116	745-5708-00
R106	RESISTOR, FIXED, COMPOSITION: same as R105	745-5740-00	R146	RESISTOR, FIXED, COMPOSITION: 8200 ohms $\pm 10\%$ , 2 w	745-5691-00
R107	RESISTOR, FIXED, COMPOSITION: same as R101	745-1436-00	R147	RESISTOR, FIXED, COMPOSITION: same as R141	745-5733-00
R108	RESISTOR, FIXED, COMPOSITION: 3900 ohms $\pm 10\%$ , 1/2 w	745-1377-00	R148	RESISTOR, FIXED, COMPOSITION: same as R141	745-5733-00
R109	RESISTOR, FIXED, COMPOSITION: same as R102	745-1324-00	R149	RESISTOR, FIXED, COMPOSITION: 47,000 ohms $\pm 10\%$ , 2 w	745-5722-00
R110	RESISTOR, FIXED, COMPOSITION: 39,000 ohms $\pm 10\%$ , 1 w	745-3419-00	R150	RESISTOR, FIXED, COMPOSITION: 82,000 ohms $\pm 10\%$ , 1 w	745-3433-00
R111	RESISTOR, FIXED, COMPOSITION: 33,000 ohms $\pm 10\%$ , 1 w	745-3415-00	R151	RESISTOR, FIXED, COMPOSITION: same as R142	745-5743-00
R112	RESISTOR, FIXED, WIREWOUND: 25,000 ohms $\pm 5\%$ , 10 w; Ohmite part no. 1-3/4-D-57-F2500	710-2918-00	R152	RESISTOR, VARIABLE: same as R117	377-0011-00
R113	RESISTOR, FIXED, COMPOSITION: 15,000 ohms $\pm 10\%$ , 1 w	745-3401-00	R153	RESISTOR, VARIABLE: same as R117	377-0011-00
R114	RESISTOR, FIXED, COMPOSITION: 47 ohms $\pm 10\%$ , 1/2 w	745-1296-00	R154	RESISTOR, FIXED, COMPOSITION: same as R142	745-5743-00
R115	RESISTOR, FIXED, COMPOSITION: 22 ohms $\pm 10\%$ , 2 w	745-5582-00	R155	RESISTOR, FIXED, COMPOSITION: same as R150	745-3433-00
R116	RESISTOR, FIXED, COMPOSITION: 22,000 ohms $\pm 10\%$ , 2 w	745-5708-00	R156	RESISTOR, FIXED, COMPOSITION: 0.47 megohms $\pm 10\%$ , 1 w	745-3464-00
R117	RESISTOR, VARIABLE: wirewound; 25,000 ohms $\pm 10\%$ , 0.013 amp; P. R. Mallory & Co. part no. M25MPX	377-0011-00	R156A	RESISTOR, FIXED, COMPOSITION: 0.56 megohm $\pm 10\%$ , 1 w	745-3468-00
R118	RESISTOR, FIXED, WIREWOUND: same as R112	710-2918-00	R157	RESISTOR, FIXED, COMPOSITION: same as R156	745-3464-00
R119	RESISTOR, FIXED, COMPOSITION: 56 ohms $\pm 10\%$ , 2 w	745-5600-00	R157A	RESISTOR, FIXED, COMPOSITION: same as R156A	745-3468-00
R120	RESISTOR, FIXED, COMPOSITION: 15 ohms $\pm 20\%$ , 25 w	710-3154-00	R158	RESISTOR, FIXED, COMPOSITION: same as R156	745-3464-00
R121	RESISTOR, VARIABLE: wirewound; 50 ohms $\pm 10\%$ , 25 w	735-0201-00	R158A	RESISTOR, FIXED, COMPOSITION: same as R156A	745-3468-00
R122	RESISTOR, FIXED, COMPOSITION: 2000 ohms $\pm 5\%$ , 25 w	710-3241-00	R159	RESISTOR, FIXED, COMPOSITION: same as R156	745-3464-00
R123	NOT USED		R159A	RESISTOR, FIXED, COMPOSITION: same as R156A	745-3468-00
R124	RESISTOR ASSEMBLY: c/o 4 resistors, 2 terminals and glass cloth epoxy board 1/16 in. thk; 2-7/8 in. w by 6 in. lg overall	548-3621-003	R160	RESISTOR, FIXED, COMPOSITION: same as R156	745-3464-00
R124A, B, C, D	RESISTOR, FIXED, FILM: 1,000,000 ohms $\pm 1\%$ , 2 w	705-4001-00	R160A	RESISTOR, FIXED, COMPOSITION: same as R156A	745-3468-00
R125	RESISTOR, FIXED, COMPOSITION: 10,000 ohms $\pm 10\%$ , 2 w	745-5694-00	R161	RESISTOR, FIXED, COMPOSITION: same as R156	745-3464-00
R126	RESISTOR, FIXED, COMPOSITION: 4700 ohms $\pm 10\%$ , 1 w	745-3380-00	R161A	RESISTOR, FIXED, COMPOSITION: same as R156A	745-3468-00
R127	RESISTOR, FIXED, COMPOSITION: same as R113	745-3401-00	R162	RESISTOR, FIXED, COMPOSITION: same as R156	745-3464-00
R128	RESISTOR, FIXED, COMPOSITION: 220 ohms $\pm 10\%$ , 1/2 w	745-1058-00	R162A	RESISTOR, FIXED, COMPOSITION: same as R156A	745-3468-00
R129	RESISTOR, FIXED, COMPOSITION: 5100 ohms $\pm 5\%$ , 1/2 w	745-1116-00	R163	RESISTOR, FIXED, COMPOSITION: same as R156	745-3464-00
R130	RESISTOR, FIXED, COMPOSITION: 100 ohms $\pm 10\%$ , 1/2 w	745-1310-00	R163A	RESISTOR, FIXED, COMPOSITION: same as R156A	745-3468-00
R131	RESISTOR, FIXED, COMPOSITION: same as R130	745-1310-00	R164	RESISTOR, FIXED, COMPOSITION: same as R103	745-3394-00
R132	RESISTOR, FIXED, COMPOSITION: same as R130	745-1310-00	R165	RESISTOR, FIXED, COMPOSITION: same as R103	745-3394-00
R133	RESISTOR, FIXED, COMPOSITION: same as R130	745-1310-00	R166	RESISTOR, VARIABLE: same as R121	735-0201-00
R134	RESISTOR, FIXED, COMPOSITION: 820 ohms $\pm 10\%$ , 1/2 w	745-1349-00	R167	RESISTOR, FIXED, WIREWOUND: 10 section; 1000 ohms total resistance $\pm 10\%$ , 150 w; Ohmite Mfg Co. part no 1603	717-0002-00
R135	RESISTOR, FIXED, COMPOSITION: 68,000 ohms $\pm 10\%$ , 1/2 w	745-1429-00	R168	RESISTOR, FIXED, COMPOSITION: 7500 ohms $\pm 10\%$ , 160 w; Ohmite Mfg Co. part no. 0715	710-0150-00
R136	RESISTOR, FIXED, COMPOSITION: same as R135	745-1429-00	R169	RESISTOR, FIXED, COMPOSITION: same as R168	710-0150-00
R137	RESISTOR, FIXED, COMPOSITION: 18,000 ohms $\pm 5\%$ , 2 w	745-5704-00	R170	RESISTOR, FIXED, COMPOSITION: 5000 ohms $\pm 10\%$ , 160 w; Ohmite Mfg Co. part no. 0714	710-6542-00
			R171	RESISTOR, FIXED, COMPOSITION: same as R170	710-6542-00

SECTION VI  
Parts List

AM Broadcast Transmitter 20V-3

ITEM	DESCRIPTION	COLLINS PART NUMBER
R172	RESISTOR, FIXED, WIREWOUND: 16,000 ohms ±5%, 10 w; Ohmite Mfg Co. part no. 1-3/4-D-57-F16000	710-2926-00
R173	RESISTOR, VARIABLE: wirewound; 2000 ohms ±10%, 0.045 amp; P. R. Mallory & Co. part no. M2MPX	377-0008-00
R174	RESISTOR, FIXED, COMPOSITION: 2500 ohms ±5%, 10 w; Ohmite Mfg Co. part no. 1-3/4-D-57-F2500	710-2910-00
R175	RESISTOR, FIXED, COMPOSITION: 25 ohms ±10%, 25 w; Ohmite Mfg Co. part no. 0200C	710-3252-00
R176	RESISTOR, FIXED, COMPOSITION: 25 ohms ±10%, 10 w	710-1252-00
R177	RESISTOR, FIXED, COMPOSITION: same as R176	710-1252-00
R178	RESISTOR, FIXED, COMPOSITION: same as R176	710-1252-00
R179	RESISTOR, FIXED, COMPOSITION: same as R176	710-1252-00
R180	RESISTOR, FIXED, COMPOSITION: same as R175	710-3252-00
R181	RESISTOR, FIXED, COMPOSITION: 2000 ohms ±10%, 25 w	710-3242-00
R182	RESISTOR, VARIABLE: wirewound; 4000 ohms, 4 w; 0.032 amp; P. R. Mallory & Co. part no. M4MPX	377-0040-00
R183	RESISTOR, FIXED, COMPOSITION: 1000 ohms ±10%, 2 w	745-5652-00
R184	RESISTOR, FIXED, WIREWOUND: 20,000 ohms ±5%, 100 w	710-2134-00
R185	RESISTOR, FIXED, WIREWOUND: same as R184	710-2134-00
R186	RESISTOR, FIXED, COMPOSITION: 40,000 ohms ±10%, 100 w	710-5404-00
R187	RESISTOR, FIXED, COMPOSITION: 15 ohms ±10%, 25 w	710-3152-00
R188	RESISTOR, FIXED, COMPOSITION: 7500 ohms ±10%, 100 w	710-0132-00
R189	RESISTOR, VARIABLE: 15 ohm, 150 w; power rheostat	739-0001-00
R190	RESISTOR, FIXED, COMPOSITION: same as R128	745-1058-00
R191	RESISTOR, FIXED COMPOSITION: 50 ohms ±10%, 22 w	712-4200-00
R192	RESISTOR, FIXED, COMPOSITION: 47 ohms ±10%, 2 w	745-5596-00
R193	RESISTOR, FIXED, COMPOSITION: same as R192	745-5596-00
R194	SUPPRESSOR, PARASITIC: c/o 47 ohm, 2 w resistor plus 5-1/2 turns #14 wire	549-1051-002
S101	SWITCH, ROTARY: 2 circuit, 2 pole, 2 position; 2 moving, 6 fixed contacts; Oak Mfg Co. part no. 139807-22	259-0362-00
S102	SWITCH, ROTARY: 2 circuit, 2 pole, 8 position, 2 section; 2 moving, 18 fixed contacts	259-0441-00
S103	SWITCH ASSEMBLY: c/o steel 2 position detent switch, phenolic contact post, copper leaf & steel panel 2-1/4 in. w by 5 in. lg overall	504-9633-003
S104	SWITCH ASSEMBLY: c/o ceramic standoff, brass washer & contact arm, steel bracket and hinge	504-9587-002 504-9582-002 504-9553-004 190 2520-00
S105	SWITCH ASSEMBLY: same as S104	
S106	CIRCUIT BREAKER: double pole, magnetic; back connected; 5.0 ac contact rating; 230 v ac, 125 v dc	260-0239-00
S107	CIRCUIT BREAKER: double pole, magnetic; back connected; 20.0 ac amp current rating; 230 v ac, 125 v dc	260-0225-00
S108	CONTACT ASSEMBLY: door interlock switch; female; Neptune Electronics part no. F7460330G4	260-4050-00
S109	CONTACT ASSEMBLY: same as S108	260-4050-00
S110	CONTACT ASSEMBLY: same as S108	260-4050-00
S111	SWITCH, PUSH: normally open and closed; bakelite; Arrow-Hart & Hegeman part no. B-2	260-2020-00
S112	SWITCH, PUSH: same as S111	260-2020-00
S113	SWITCH, PUSH: same as S111	260-2020-00
S114	SWITCH, PUSH: same as S111	260-2020-00
T101	TANK CIRCUIT, BUFFER PLATE: 2 windings; 550 to 1600 kc freq range 2 in. by 2 in. by 5.687 in. over-all dimensions; includes L102	504-9632-003

ITEM	DESCRIPTION	COLLINS PART NUMBER
T102	TANK CIRCUIT, BUFFER PLATE: same as T101; includes L104	504-9632-003
T103	TRANSFORMER, AUDIO FREQUENCY: two primaries 600 ohms, CT; two secondaries 50,000 ohms, CT; 30 to 15,000 cps; solder type terminals; Thordarson part no. T-50099	677-0114-00
T104	TRANSFORMER, AUDIO FREQUENCY: pri 19,000 ohms CT; sec, 37,000 ohms CT; 50 to 10,000 cps; screw-type terminals; continuous duty cycle; Electro Engr. Works part no. E-11585	667-0497-00
T105	TRANSFORMER, POWER, STEP-DOWN AND STEP-UP: pri 230 v, 208 v; sec. #1, 360 v, CT; sec. #2, 5 v; 50/60 cps; continuous duty cycle; Chicago Std. Trans. part no. 30754	662-0024-00
T106	TRANSFORMER, POWER, STEP-DOWN: pri 230 v, 208 v; sec. 5 v, CT; 50/60 cps; continuous duty cycle; Electro Engineering part no. E10306A	662-0209-00
T107	TRANSFORMER, POWER, STEP-UP: pri 220 v, 230 v, 240 v, 250 v, 198 v, 208 v, 217 v, 226 v; sec. 3200 v, CT; 50/60 cps; continuous duty cycle; Raytheon part no. F-2833	672-0385-00
T108	TRANSFORMER, POWER, STEP-DOWN: pri 230 v, 208 v; sec. #1 5.3 v CT; sec. #2, 5.3 v CT; sec. #3, 6.3 v CT; sec. #4, 2.5 v CT; 50/60 cps; continuous duty cycle; Raytheon part no. 292-5705G1	662-0040-00
T109	TRANSFORMER, POWER, STEP-UP: pri 230 v, 208 v; sec. 1420 v CT; 50/60 cps; continuous duty cycle; Raytheon part no. 292-5715G1	662-0013-00
TB100	TERMINAL BOARD: 3 solder-lug terminals; 50 amp; 600 v; 2-1/8 in. w by 3-19/32 in. lg; Square D Co. part no. 9080	306-0069-00
TB101	TERMINAL BOARD: mineral-filled phenolic barrier type w/ 10 screw terminals; 1-5/16 in. w by 6-13/64 in. lg	367-0645-00
TB102	TERMINAL BOARD: black bakelite, 2 terminals w/ 6-32 terminal screws; 1-1/8 in. w by 1-5/8 in. lg; Howard B. Jones part no. 2-141	367-4020-00
TB103	TERMINAL BOARD: phenolic, barrier type w/ 6 terminals; 7/8 in. w by 2-5/8 in. lg; Howard B. Jones part no. 353-11-06-001	367-0121-00
TB104	TERMINAL BOARD: same as TB103	367-0121-00
TB105	TERMINAL BOARD: black phenolic, 16 terminals; 1-5/16 in. w by 9-31/32 in. lg; Howard B. Jones part no. 16-142	367-5160-00
TB106	TERMINAL BOARD: bakelite, 2 terminal connector strips 2/ 5-40 terminal-screws; 7/8 in. w by 1-3/8 in. lg; Howard B. Jones part no. 353 11 02 001	367-0001-00
TB107	TERMINAL BOARD: same as TB106	367-0001-00
TB108	TERMINAL BOARD: bakelite; 13 terminals w/ 8-32 terminal screws; 1-5/16 in. w by 8-1/4 in. lg	367-5130-00
TB109	TERMINAL BOARD: same as TB108	367-5130-00
TB110	TERMINAL BOARD: phenolic w/ 3 solder-lug terminals; 11/16 in. w by 1-1/8 in. lg; Cinch Mfg Corp. part no. 1520-A	306-9033-00
TB111	TERMINAL BOARD: same as TB110	306-9033-00
TB112	TERMINAL BOARD: same as TB110	306-9033-00
TB113	TERMINAL BOARD: same as TB110	306-9033-00
TB114	TERMINAL BOARD: same as TB110	306-9033-00
TB115	TERMINAL BOARD: same as TB110	306-9033-00
TB116	TERMINAL BOARD: same as TB110	306-9033-00
TB117	TERMINAL BOARD: same as TB110	306-9033-00
TB118	TERMINAL BOARD: same as TB110	306-9033-00
TB119	TERMINAL BOARD: same as TB110	306-9033-00
TB120	TERMINAL BOARD: same as TB110	306-9033-00
TB121	TERMINAL BOARD: same as TB110	306-9033-00
TB122	TERMINAL BOARD: same as TB110	306-9033-00
TB123	TERMINAL BOARD: same as TB110	306-9033-00
TB124	TERMINAL BOARD: 2 solder-lug terminals, 19/32 in. w by 5/8 in. lg approx	306-0002-00
TB125	TERMINAL BOARD: same as TB110	306-9033-00
TB126	TERMINAL BOARD: same as TB110	306-9033-00
TB127	TERMINAL BOARD: same as TB110	306-9033-00
V101	ELECTRON TUBE: pentode; General Electric type 6AU6	255-0202-00
V102	ELECTRON TUBE: glass envelope; pentode; RCA type 6SJ7	255-0030-00
V103	ELECTRON TUBE: beam; RCA type 807	256-0033-00
V104	ELECTRON TUBE: tetrode; Eimac type 4-400A	256-0091-00

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ITEM	DESCRIPTION	COLLINS PART NUMBER
V105	ELECTRON TUBE: same as V104	256-0091-00
V106	ELECTRON TUBE: same as V102	255-0030-00
V107	ELECTRON TUBE: same as V102	255-0030-00
V108	ELECTRON TUBE: same as V104	256-0091-00
V109	ELECTRON TUBE: same as V104	256-0091-00
V110	ELECTRON TUBE: glass envelope; rectifier; General Electric type 5U4G	255-0032-00
V111	ELECTRON TUBE: rectifier; RCA type 575A	256-0080-00
V112	ELECTRON TUBE: same as V111	256-0080-00
V113	ELECTRON TUBE: rectifier; RCA type 866A/866	256-0049-00
V114	ELECTRON TUBE: same as V113	256-0049-00
XF101	FUSE HOLDER: w/ transparent knob for use w/ 3 AG fuses; 0-20 amp, 100-250 v rating; Bussman Mfg Co. part no. HKL-JRZ	265-1040-00
XF102	FUSE HOLDER: same as XF101	265-1040-00
XF103	FUSE HOLDER: same as XF101	265-1040-00
XF104	FUSE HOLDER: same as XF101	265-1040-00
XI101	LAMPHOLDER: panel mounting lampholder w/ candelabra screw base lamp	262-0255-00
XI102	LAMPHOLDER: same as XI101	262-0255-00
XK101	SOCKET, RELAY: 8 prong octal tube socket w/ steel mounting plate; American Phenolic part no. 88-8TM	220-1005-00
XT101	SOCKET, ELECTRON TUBE: 7 prong chassis mtg w/ ring and spacer; Amphenol part no. 49-SS7L	220-1770-00
XT102	SOCKET, ELECTRON TUBE: same as XT101	220-1770-00
XV101	SOCKET, ELECTRON TUBE: 7 contact top mtg, 1 miniature tube socket w/ shield base; 1 amp; phenolic insulation	220-1111-00
XV102	SOCKET, ELECTRON TUBE: 8 prong octal tube socket w/ steel mtg plate; American Phenolic part no. 88-8TM	220-1005-00
XV103	SOCKET, ELECTRON TUBE: 5 contact ceramic-tube socket; E. F. Johnson & Co. part no. 122-225-201	220-5520-00
XV104	SOCKET, ELECTRON TUBE: 5 prong tube socket, ceramic insulation; E. F. Johnson & Co. part no. 275	220-1016-00
XV105	SOCKET, ELECTRON TUBE: same as XV104	220-1016-00
XV106	SOCKET, ELECTRON TUBE: same as XV102	220-1005-00
XV107	SOCKET, ELECTRON TUBE: same as XV102	220-1005-00
XV108	SOCKET, ELECTRON TUBE: same as XV104	220-1016-00
XV109	SOCKET, ELECTRON TUBE: same as XV104	220-1016-00
XV110	SOCKET, ELECTRON TUBE: 8 prong octal tube socket w/ steel mtg plate	220-1059-00
XV111	SOCKET, ELECTRON TUBE: 4 prong socket w/ bayonet lock metal shell; E. F. Johnson & Co. part no. 123-211	220-5420-00
XV112	SOCKET, ELECTRON TUBE: same as XV111	220-5420-00
XV113	SOCKET, ELECTRON TUBE: 4 prong socket w/ bayonet lock metal shell; E. F. Johnson & Co. part no. 123-210-1	220-5410-00
XV114	SOCKET, ELECTRON TUBE: same as XV113	220-5410-00
XY101	SOCKET, CRYSTAL: 8 prong octal tube socket w/ steel mtg plate; American Phenolic part no. 88-8TM	220-1005-00
XY102	SOCKET, CRYSTAL: same as XY101	220-1005-00
COMMERCIAL HARDWARE		
	WASHER, NONMETALLIC: corprene; 0.032 in. thk, 0.147 in. id, 0.375 in. od	302-0026-00
	WASHER, NONMETALLIC: corprene; 0.032 in. thk, 0.172 in. id, 0.375 in. od	302-0028-00
	WASHER, NONMETALLIC: corprene; 0.032 in. thk, 0.172 in. id, 0.437 in. od	302-0029-00
	WASHER, NONMETALLIC: corprene; 0.032 in. thk, 0.172 in. id, 0.500 in. od	302-0030-00
	WASHER, NONMETALLIC: corprene; 0.032 in. thk, 0.203 in. id, 0.437 in. od	302-0031-00
	WASHER, NONMETALLIC: 0.032 in. thk; corprene; 0.203 in. id, 0.500 in. od	302-0032-00
	WASHER, NONMETALLIC: corprene; 0.032 in. thk, 0.203 in. id, 0.750 in. od	302-0034-00
	WASHER, NONMETALLIC: corprene; 0.016 in. thk, 0.265 in. id, 0.500 in. od	302-0037-00
	WASHER, NONMETALLIC: corprene; 0.016 in. thk, 0.265 in. id, 0.625 in. od	302-0038-00
	WASHER, NONMETALLIC: corprene; 0.016 in. thk, 0.265 in. id, 1.000 in. od	302-0040-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
	WASHER, NONMETALLIC: corprene; 0.016 in. thk, 0.265 in. id, 1.250 in. od	302-0041-00
	WASHER, NONMETALLIC: corprene; 0.016 in. thk, 0.515 in. id, 0.875 in. od	302-0047-00
	WASHER, NONMETALLIC: corprene; 0.016 in. thk, 0.765 in. id, 1.125 in. od	302-0049-00
	WASHER, NONMETALLIC: gray fiber, 0.063 in. thk, 0.170 in. id, 0.437 in. od	302-0050-00
	WASHER, NONMETALLIC: gray fiber, 0.063 in. thk, 0.250 in. id, 0.500 in. od	302-0051-00
	INSULATOR, WASHER: mica; 0.007 in. thk, 1/2 in. id, 1 in. od	302-0058-00
	WASHER, FLAT: corprene, 1-5/16 in. id, 1-3/4 in. od, 0.016 in. thk	302-0095-00
	WASHER, NONMETALLIC: mica w/ resin binder; 0.0312 in. thk, 0.187 in. id, 0.531 in. od	302-0347-00
	INSULATOR, WASHER: mica; 0.025 in. thk, 3/16 in. id, 7/16 in. od	302-2300-00
	WASHER, FLAT: bakelite natural, 0.255 in. id, 0.515 in. od, 0.062 in. thk	302-5100-00
	WASHER, NONMETALLIC: acetate; 0.015 in. thk, 1/8 in. id, 9/32 in. od	303-1000-00
	WASHER, FLAT: steel, cadmium plate; 0.035 in. thk, 5/32 in. id, 3/8 in. od	310-0001-00
	WASHER, FLAT: steel, 0.042 in. thk, 11/64 in. id, 7/16 in. od	310-0006-00
	WASHER, FLAT: steel; 0.045 in. thk, 13/64 in. id, 7/16 in. od	310-0007-00
	WASHER, FLAT: CRES; 0.027 in. thk, 0.125 in. id, 0.312 in. od	310-0045-00
	WASHER, FLAT: CRES; 0.032 in. thk, 0.147 in. id, 0.312 in. od	310-0046-00
	WASHER, FLAT: CRES; 0.036 in. thk, 0.172 in. id, 0.437 in. od	310-0048-00
	WASHER, FLAT: CRES; 0.060 in. thk, 0.203 in. id, 0.500 in. od	310-0049-00
	WASHER, FLAT: steel, 0.060 in. thk, 0.265 in. id, 0.625 in. od	310-0050-00
	WASHER, FLAT: brass, nickel plate; 0.093 in. id, 0.250 in. od, 0.028 in. thk	310-0053-00
	WASHER, FLAT: brass, 0.125 in. id, 0.312 in. od, 0.028 in. thk	310-0054-00
	WASHER, FLAT: brass, 0.147 in. id, 0.312 in. od, 0.032 in. thk	310-0055-00
	WASHER, FLAT: brass, 0.147 in. id, 0.375 in. od, 0.032 in. thk	310-0056-00
	WASHER, FLAT: nickel plated brass; 0.172 in. id, 0.375 in. od, 0.036 in. thk	310-0057-00
	WASHER, FLAT: brass, 0.172 in. id, 0.437 in. od, 0.036 in. thk	310-0058-00
	WASHER, FLAT: brass, 0.038 in. thk, 0.203 in. id, 0.437 in. od	310-0059-00
	WASHER, FLAT: brass, nickel plated; 0.203 in. id, 0.500 in. od, 0.038 in. thk	310-0060-00
	WASHER, FLAT: brass, 0.265 in. id, 0.625 in. od, 0.040 in. thk	310-0061-00
	WASHER, LOCK: steel, split helical ring locking; 0.025 in. thk, 0.141 in. id, 0.239 in. od	310-0071-00
	WASHER, LOCK: steel, split helical ring; 0.168 in. id, 0.296 in. od, 0.040 in. thk	310-0072-00
	WASHER, LOCK: steel, 0.194 in. id, 0.323 in. od, 0.040 in. thk	310-0073-00
	WASHER, LOCK: bronze; 0.115 in. id, 0.212 in. od, 0.025 in. thk	310-0076-00
	WASHER, LOCK: silicon bronze, split helical ring, 0.141 in. id, 0.253 in. od, 0.031 in. thk	310-0077-00
	WASHER, LOCK: bronze, split helical ring locking; 0.025 in. thk, 0.239 in. od	310-0078-00
	WASHER, LOCK: bronze, split helical ring; 0.168 in. id, 0.296 in. od, 0.040 in. thk	310-0079-00
	WASHER, LOCK: silicon bronze, 0.194 in. id, 0.062 in. thk, 0.337 in. od	310-0080-00
	WASHER, LOCK: bronze; split helical ring; 0.194 in. id, 0.323 in. od, 0.040 in. thk	310-0081-00
	WASHER, LOCK: bronze; split helical ring; 0.255 in. id, 0.493 in. od, 0.062 in. thk	310-0082-00
	WASHER, LOCK: CRES; split helical ring, 0.115 in. id, 0.212 in. od, 0.025 in. thk	310-0279-00
	WASHER, LOCK: CRES; split helical ring, 0.141 in. id, 0.253 in. od, 0.031 in. thk	310-0282-00
	WASHER, LOCK: steel, split helical ring, 0.194 in. id, 0.337 in. od, 0.047 in. thk	310-0284-00

SECTION VI  
Parts List

AM Broadcast Transmitter 20V-3

ITEM	DESCRIPTION	COLLINS PART NUMBER
	WASHER, LOCK: steel, 0.255 in. od, 0.493 in. od, 0.062 in. thk	310-0288-00
	WASHER, LOCK: bronze, split helical ring; 0.115 in. id, 0.202 in. od, 0.020 in. thk	310-0396-00
	WASHER, LOCK: bronze, split helical ring; 0.168 in. id, 0.280 in. od, 0.031 in. thk	310-0397-00
	WASHER, LOCK: bronze, split helical ring locking, 0.047 in. thk, 1/4 in. nom bolt size; 0.489 in. od	310-0400-00
	WASHER, FLAT: CRES; 0.147 in. id, 0.437 in. od, 0.031 in. thk	310-0447-00
	WASHER, LOCK: steel, split helical ring, 0.145 in. id, 0.239 in. od, 1/32 in. thk	310-3360-00
	WASHER, FLAT: steel; 0.147 in. id, 3/8 in. od, 0.031 in. thk	310-6360-00
	PIN, TAPERED, PLAIN: stainless steel; 6/0 taper pin 3/8 in. lg; 0.078 in. od	311-6003-00
	PIN, TAPERED, PLAIN: stainless steel; 6/0 taper pin 3/4 in. lg, 0.078 in. od	311-6033-00
	NUT, SELF-LOCKING, HEXAGON: steel, 5/16 in. across flats, 7/64 in. thk, tap 6-32	313-0002-00
	NUT, PLAIN, HEXAGON: stainless steel, thd 8-32, double chamfered; 0.3437 in. by 0.130 in.	313-0017-00
	NUT, PLAIN, HEXAGON: CRES; 10-32 thd; 3/8 in. hex, 1/8 in. thk	313-0019-00
	NUT, PLAIN, HEXAGON: CRES; 1/4 in. hex, 3/32 in. thk; 4-40 thd	313-0043-00
	NUT, PLAIN, HEXAGON: CRES; 6-32 thd; 1/4 in. hex; 3/32 in. thk	313-0045-00
	NUT, PLAIN, HEXAGON: steel, 8-32 thd, 1/4 in. hex by 3/32 in. thk	313-0046-00
	NUT, PLAIN, HEXAGON: brass, chamfered; 2-56 NC-2 thd, 0.1875 in. by 0.205 in. by 0.066 in. chamfered	313-0050-00
	NUT, PLAIN, HEXAGON: brass; chamfered; 4-40 NC-2 thd; 0.250 in. hex by 0.098 in. h	313-0051-00
	NUT, PLAIN, HEXAGON: brass, chamfered; 6-32 NC-2 thd; 0.3125 in. by 0.344 in. by 0.114 in.	313-0053-00
	NUT, PLAIN, HEXAGON: brass, chamfered; 8-32 NC-2 thd; 0.3437 in. , 0.378 in. by 0.130 in.	313-0054-00
	NUT, PLAIN, HEXAGON: brass, chamfered; 10-32 NF-2 thd; 0.3750 in. by 0.413 in. by 0.130 in.	313-0056-00
	NUT, PLAIN, HEXAGON: brass, single chamfered, 3/8-32 thd, 3/32 in. by 9/16 in.	313-0062-00
	NUT, PLAIN, HEXAGON: CRES; 1/4-20NC-2 thd; 7/16 in. hex by 3/16 in. h	313-0082-00
	NUT, PLAIN, HEXAGON: steel, cadmium plated; 6-32 NC-2 thd; 5/16 in. by 7/64 in.	313-0117-00
	NUT, PLAIN, HEXAGON: steel, cadmium plated; 8-32 NC-2 thd, 11/32 in. by 1/8 in.	313-0120-00
	NUT, PLAIN, HEXAGON: steel, cadmium plated; 10-32 NF-2 thd; 3/8 in. by 1/8 in.	313-0121-00
	NUT, PLAIN, HEXAGON: brass, nickel plated; 6-32 NC-2 thd, 1/4 in. by 3/32 in.	313-0140-00
	NUT, PLAIN, HEXAGON: brass, nickel plated; 1/4-20 NC-2 thd; 7/16 in. by 3/16 in.	313-0148-00
	NUT, PLAIN, HEXAGON: brass, nickel plated; 1/4-28 NF-2 thd, 3/8 in. by 1/8 in.	313-0149-00
	NUT, PLAIN, HEXAGON: brass, nickel plated; 4-40 NC-2 thd	313-0156-00
	SCREW, MACHINE: brass, cadmium plated; 4-36 NS-2 thd; fillister head, 0.112 in. by 5/16 in.	321-0047-00
	SCREW, MACHINE: brass, cadmium plated; 4-36-NS-2 thd; 0.112 in. by 5/16 in.	323-0037-00
	SCREW, MACHINE: brass, cadmium plated; 4-36-NS-2 thd; 0.112 in. by 1/2 in.	323-0040-00
	SCREW, MACHINE: stainless steel, trimmed head; 10-32 NF-2 thd; 0.190 in. by 1/2 in.	325-0051-00
	SET, SCREW: stainless steel passivate finish; 6-32 NC-3A by 1/8 in. lg	328-0018-00
	SET, SCREW: stainless steel w/ passivate finish; fluted socket, cup point; 8-32 NC-3A thd; 3/16 in. lg overall	328-0267-00
	SCREW TAPPING, THREAD FORMING: steel, Phillips binding head, 0.219 in. dia by 0.080 in. h; 4-40 thd, 3/8 in. lg	330-0733-00
	SCREW TAPPING, THREAD FORMING: steel, Phillips binding head, 0.270 in. dia by 0.097 in. h; 6-32 thd, 3/8 in. lg	330-0737-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
	SCREW TAPPING, THREAD FORMING: steel, Phillips binding head, 0.270 in. dia by 0.097 in. h; 6-32 thd, 3/4 in. lg	330-0740-00
	SCREW TAPPING, THREAD FORMING: steel, Phillips binding head, 0.321 in. dia by 0.115 in. h; 8-32 thd, 3/8 in. lg	330-0741-00
	SCREW TAPPING, THREAD FORMING: steel, hexagon head, 0.250 in. dia by 0.080 in. thk; 6-32 thd, 1/2 in. lg	330-0950-00
	SCREW TAPPING, THREAD FORMING: steel, hexagon head, 0.250 in. dia by 0.110 in. thk; 8-32 thd, 3/8 in. lg	330-0952-00
	SCREW TAPPING, THREAD FORMING: steel, hexagon head, 0.375 in. dia, 0.190 in. thk; 1/4-20 thd, 1/2 in. lg	330-0965-00
	SCREW TAPPING, THREAD FORMING: steel, hexagon head, 0.500 in. dia by 0.230 in. thk; 5/16-18 thd, 5/8 in. lg	330-0973-00
	SCREW TAPPING, THREAD FORMING: steel, Phillips stove truss head; 0.384 in. dia by 0.102 in. thk; screw size 8, 3/8 in. lg	330-1157-00
	SCREW TAPPING, THREAD FORMING: steel, Phillips stove truss head, 0.321 in. dia by 0.086 in. thk; screw size 6, 5/16 in. lg	330-1183-00
	SCREW TAPPING, THREAD FORMING: steel, Phillips stove truss head, 0.384 in. dia, by 0.102 in. thk; screw size 8, 3/8 in. lg	330-1185-00
	SCREW TAPPING, THREAD FORMING: steel, Phillips stove truss head, 0.384 in. dia by 0.102 in. thk; screw size 8, 5/8 in. lg	330-1187-00
	SCREW TAPPING, THREAD FORMING: steel, Phillips stove truss head, 0.448 in. dia, 0.118 in. thk; screw size 10, 3/8 in. lg	330-1188-00
	NUT, SELF-LOCKING, HEXAGON: dural; w/ nylon insert; 8(0.164) in. -32 NC-2 thd; 0.344 in. hex by 0.234 in. h overall; Elastic Stop Nut Corp. part no. 68NM-82	333-0381-00
	NUT, PLAIN, PLATE: aluminum; 6-32 thd; 7/16 in. by 15/32 in. by 0.859 in. ; Elastic Stop Nut Corp. of America part no. 68NA7-68-62	333-5620-00
	NUT, PLAIN, HEXAGON: brass; 3/8-32 NF thd; 9/16 in. hex by 3/16 in. h	334-0003-00
	NUT, PLAIN, WELDING: steel, 3/8 in. lg by 1/4 in. w, 7/64 in. thk, 6-32 thd	334-0300-00
	NUT, PLAIN, WELDING: steel, 10-32 thd, 7/16 in. by 5/8 in. by 1/8 in. ; Ohio Nut & Bolt Co. part no. SN 1710	334-0310-00
	NUT, PLAIN, WELDING: steel, 1/4-20 thd, 1/2 in. by 13/16 in. by 11/64 in.	334-0311-00
	NUT, PLAIN, WING: stainless steel, 8-32 thd; 13/16 in. by 13/32 in.	334-0310-00
	NUT, PLAIN, HEXAGON: stainless steel; 3/8-32 thd, 1/2 in. hex by 3/32 in. h overall	334-4120-00
	SETScrew: stainless steel; headless, multiple spline drive, oval point; 8-32 NC-2 thd, 1/4 in. lg overall	335-0025-00
	RING, RETAINING: spring steel, 0.225 in. by 0.025 in. by 0.45 in. ; Waldes Kohinoor, part no. 5100-25-MD	340-0025-00
	SCREW, MACHINE: stainless steel; Phillips recessed flat head; 6-32 NC-2A thd, 3/8 in. lg	342-0062-00
	SCREW, MACHINE: stainless steel; Phillips recessed flat head; 6-32 NC-2A thd, 1/2 in. lg	342-0064-00
	SCREW, MACHINE: stainless steel; Phillips recessed flat head, 8-32 NC-2A thd, 7/16 in. lg	342-0079-00
	SCREW, MACHINE: brass; Phillips recess flat head; 10-32 NF-2A, 5/8 in. lg	342-0206-00
	SCREW, MACHINE: stainless steel; Phillips recessed flat head; 1/4-20 UNC-2A, 3/4 in. lg	342-0260-00
	SCREW, MACHINE: CRES; Phillips pan head; 4-40 NC-2A thd, 1/4 in. lg	343-0133-00
	SCREW, MACHINE: CRES; Phillips pan head; 4-40 NC-2A thd, 5/16 in. lg	343-0134-00
	SCREW, MACHINE: CRES; Phillips pan head; 4-40 NC-2A, 3/8 in. lg	343-0135-00
	SCREW, MACHINE: CRES; Phillips pan head; 4-40 NC-2A thd, 3/4 in. lg	343-0139-00
	SCREW, MACHINE: CRES; Phillips pan head; 6-32 NC-2A thd, 1/4 in. lg	343-0167-00
	SCREW, MACHINE: CRES; pan head; 6-32 NC-2A thd; 5/16 in. lg	343-0168-00
	SCREW, MACHINE: CRES; Phillips pan head; 6-32 NC-2A thd, 3/8 in. lg	343-0169-00

## AM Broadcast Transmitter 20V-3

ITEM	DESCRIPTION	COLLINS PART NUMBER
	SCREW, MACHINE: CRES; Phillips recessed pan head; 6-32 NC-2A thd, 7/16 in. lg	343-0170-00
	SCREW, MACHINE: CRES; Phillips pan head, 6-32 NC-2A thd; 1/2 in. lg	343-0171-00
	SCREW, MACHINE: CRES; Phillips pan head; 6-32 NC-2A thd; 3/4 in. lg	343-0174-00
	SCREW, MACHINE: CRES; Phillips pan head; 6-32 NC-2A thd, 1-1/4 in. lg	343-0178-00
	SCREW, MACHINE: CRES; Phillips pan head; 8-32 NC-2A, 3/16 in. lg	343-0184-00
	SCREW, MACHINE: CRES; Phillips pan head; 8-32 NC-2A thd, 1/4 in. lg	343-0185-00
	SCREW, MACHINE: CRES; Phillips pan head; 8-32 NC-2A, 5/16 in. lg	343-0186-00
	SCREW, MACHINE: CRES; pan head; 8-32 NC-2A thd; 3/8 in. lg	343-0187-00
	SCREW, MACHINE: CRES; Phillips pan head; 8-32 NC-2A thd, 7/16 in. lg	343-0188-00
	SCREW, MACHINE: CRES; Phillips pan head; 8-32 NC-2A thd; 1/2 in. lg	343-0189-00
	SCREW, MACHINE: CRES; pan head; cross recess drive; 8-32 NC-2A thd; 5/8 in. lg	343-0190-00
	SCREW, MACHINE: CRES; Phillips pan head; 8-32 NC-2A thd; 3/4 in. lg	343-0191-00
	SCREW, MACHINE: steel; Phillips pan head; 8-32 NC-2A thd, 7/8 in. lg	343-0192-00
	SCREW, MACHINE: CRES; Phillips pan head; 8-32 NC-2A thd; 1 in. lg	343-0193-00
	SCREW, MACHINE: CRES; Phillips pan head; 8-32 NC-2A thd, 1-1/4 in. lg	343-0195-00
	SCREW, MACHINE: CRES; Phillips pan head; 8-32 NC-2A thd, 1-3/4 in. lg	343-0197-00
	SCREW, MACHINE: CRES; Phillips pan head; 8-32 NC-2A thd, 2-1/4 in. lg	343-0199-00
	SCREW, MACHINE: CRES; Phillips pan head; 10-32 NF-2A thd, 5/16 in. lg	343-0225-00
	SCREW, MACHINE: CRES; Phillips pan head; 10-32 NF-2A thd, 3/8 in. lg	343-0226-00
	SCREW, MACHINE: CRES; Phillips pan head; 10-32 NF-2A, 1/2 in. lg	343-0228-00
	SCREW, MACHINE: CRES; Phillips pan head; 10-32 NF-2A, 5/8 in. lg	343-0229-00
	SCREW, MACHINE: CRES; Phillips pan head; 10-32 NF-2A thd, 7/8 in. lg	343-0230-00
	SCREW, MACHINE: CRES; Phillips pan head; 10-32 NF-2A, 1-1/8 in. lg	343-0232-00
	SCREW, MACHINE: CRES; Phillips pan head; 1/4-20 UNC-2A, 5/8 in. lg	343-0266-00
	SCREW, MACHINE: brass; Phillips pan head; 4-40 NC-2A, 1/4 in. lg	343-0285-00
	SCREW, MACHINE: brass; Phillips pan head; 4-40 NC-2A thd, 5/16 in. lg	343-0286-00
	SCREW, MACHINE: brass; Phillips pan head; 4-40 NC-2A thd, 3/8 in. lg	343-0287-00
	SCREW, MACHINE: brass; Phillips pan head; 4-40 NC-2A, 7/8 in. lg	343-0292-00
	SCREW, MACHINE: brass; Phillips pan head; 4-40 NC-2A, 1 in. lg	343-0293-00
	SCREW, MACHINE: brass; Phillips pan head; 2-56 NC-2A, 3/16 in. lg	343-0298-00
	SCREW, MACHINE: brass; Phillips pan head; 2-56 NC-2A, 1/4 in. lg	343-0299-00
	SCREW, MACHINE: brass; Phillips pan head; 8-32 NC-2A thd, 5/16 in. lg	343-0308-00
	SCREW, MACHINE: brass; Phillips pan head; 8-32 NC-2A, 3/8 in. lg	343-0309-00
	SCREW, MACHINE: brass; Phillips pan head; 8-32 NC-2A; 1/2 in. lg	343-0311-00
	SCREW, MACHINE: brass; Phillips pan head; 8-32 NC-2A thd, 5/8 in. lg	343-0312-00
	SCREW, MACHINE: brass; Phillips pan head; 8-32 NC-2A, 3/4 in. lg	343-0313-00
	SCREW, MACHINE: brass; Phillips pan head; 8-32 NC-2A, 7/8 in. lg	343-0314-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
	SCREW, MACHINE: brass; Phillips pan head; 8-32 NC-2A, 1 in. lg	343-0315-00
	SCREW, MACHINE: brass; Phillips pan head; 8-32 NC-2A thd; 1-1/2 in. lg	343-0318-00
	SCREW, MACHINE: brass; Phillips pan head; 8-32 NC-2A thd, 2 in. lg	343-0320-00
	SCREW, MACHINE: brass; Phillips pan head; 6-32 NC-2A thd, 1/4 in. lg	343-0328-00
	SCREW, MACHINE: brass; Phillips pan head; 6-32 NC-2A thd, 5/16 in. lg	343-0329-00
	SCREW, MACHINE: brass; Phillips pan head; 6-32 NC-2A thd, 3/8 in. lg	343-0330-00
	SCREW, MACHINE: brass; Phillips pan head; 6-32 NC-2A, 7/16 in. lg	343-0331-00
	SCREW, MACHINE: brass; Phillips pan head; 6-32 NC-2A thd, 1/2 in. lg	343-0332-00
	SCREW, MACHINE: brass; Phillips pan head; 6-32 NC-2A thd, 5/8 in. lg	343-0333-00
	SCREW, MACHINE: brass; Phillips pan head; 6-32 NC-2A thd, 3/4 in. lg	343-0334-00
	SCREW, MACHINE: brass; Phillips pan head; 6-32 NC-2A thd, 7/8 in. lg	343-0335-00
	SCREW, MACHINE: brass; Phillips pan head; 6-32 NC-2A, 2 in. lg	343-0341-00
	SCREW, MACHINE: brass; Phillips pan head; 10-32 NF-2A, 1/4 in. lg	343-0343-00
	SCREW, MACHINE: brass; Phillips pan head; 10-32 NF-2A, 3/8 in. lg	343-0345-00
	SCREW, MACHINE: brass; Phillips pan head; 1/4-20 UNC-2A, 1/2 in. lg	343-0366-00
	SCREW, MACHINE: brass; Phillips pan head; 1/4-20 UNC-2A, 5/8 in. lg	343-0367-00
	SCREW, MACHINE: brass; Phillips pan head; 1/4-20 UNC-2A by 3/4 in. lg	343-0368-00
	SCREW, MACHINE: steel; Phillips recessed pan head; 8-32 NC-2A, 1/2 in. lg	343-0528-00
	SCREW, MACHINE: CRES; Phillips fillister head, 6-32 NC-2A thd, 7/16 in. lg	347-0036-00
	WASHER, LOCK: CRES; 3/8 screw size; 0.398 in. by 0.692 in. by 0.035 in.; Shakeproof, Inc. part no. 1720-00	373-0046-00
	WASHER, LOCK: CRES; 3/8 screw size; 0.391 in. by 0.507 in. by 0.022 in.; Shakeproof part no. 1720-02	373-0085-00
	WASHER, LOCK: phosphor bronze; to fit 3/8 in. dia machine screw; 0.398 in. by 0.692 in. by 0.035 in.; Shakeproof, Inc. part no. 1920-00	373-3070-00
	WASHER, LOCK: steel; to fit no. 8 machine screw; 0.176 in. by 0.381 in. by 0.020 in.; Shakeproof, Inc. part no. 1108-00	373-5030-00
	WASHER, LOCK: phosphor bronze; to fit no. 4 machine screw; 0.123 in. by 0.255 in. by 0.016 in.; Shakeproof part no. 1804-00	373-7010-00
	WASHER, LOCK: phosphor bronze; 0.317 in. od, 0.020 in. thk, no. 6 nom screw size; Shakeproof Inc. part no. 1806-00	373-7020-00
	WASHER, LOCK: phosphor bronze; 0.381 in. od, 0.020 in. thk, no. 8 nom screw size; Shakeproof Inc. part no. 1808-00	373-7030-00
	WASHER LOCK: phosphor bronze; 0.406 in. od, 0.204 in. id for no. 10 screw, 0.022 in. thk material; Shakeproof Inc. part no. 1810-00	373-7040-00
	WASHER, LOCK: phosphor bronze; 0.680 in. od, 0.398 in. id, 0.035 in. thk; Shakeproof, Inc. part no. 1820-00	373-7070-00
	WASHER, LOCK: steel; 0.225 in. od, 0.016 in. thk no. 4 machine screw; Shakeproof Inc. part no. 1604-00	373-8010-00
	WASHER, LOCK: stainless steel; 0.694 in. od, 0.398 in. id, 0.035 in. thk; Shakeproof Inc. part no. 1620-00	373-8070-00

SECTION VI  
Parts List

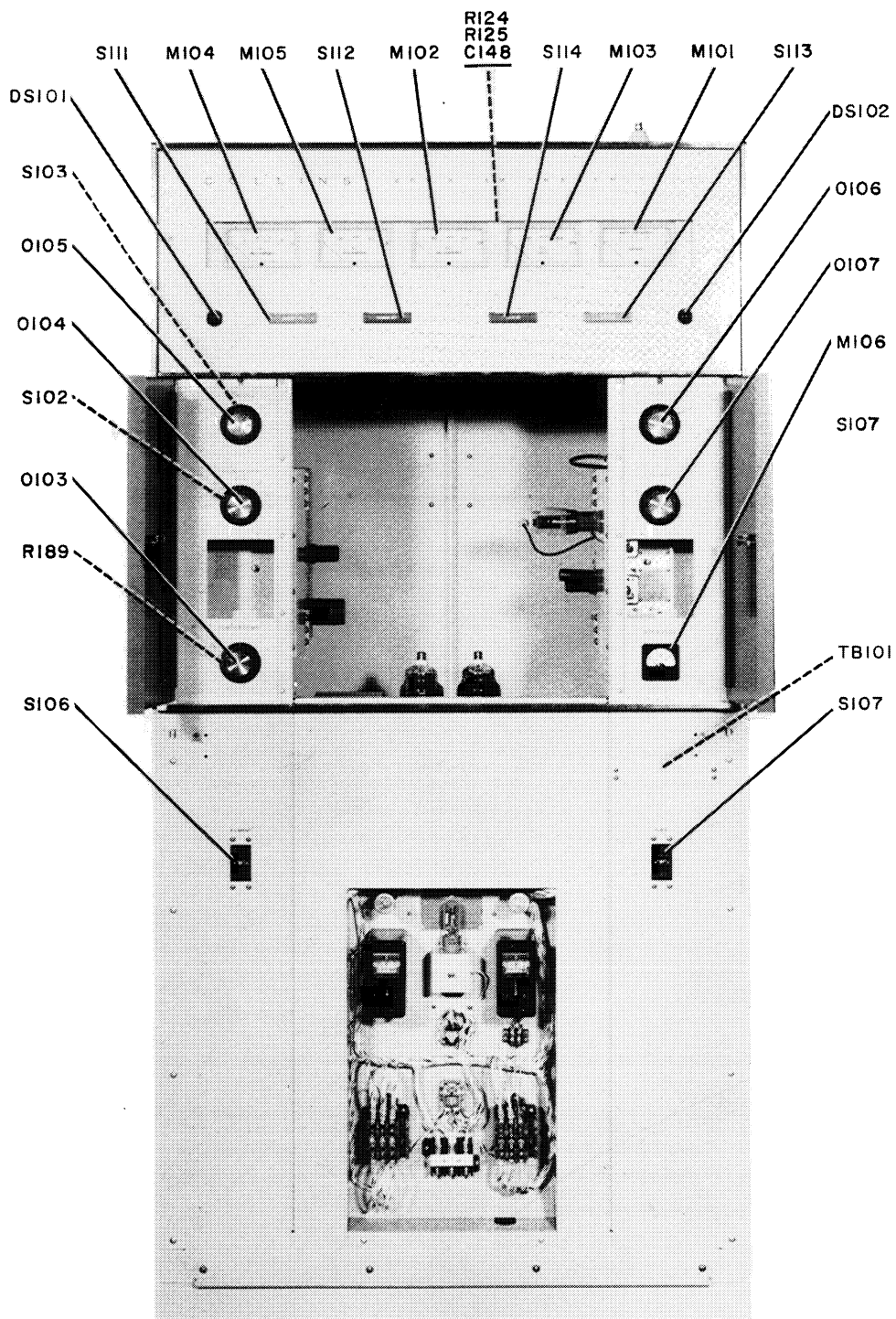


Figure 6-1. AM Broadcast Transmitter 20V-3, Front View



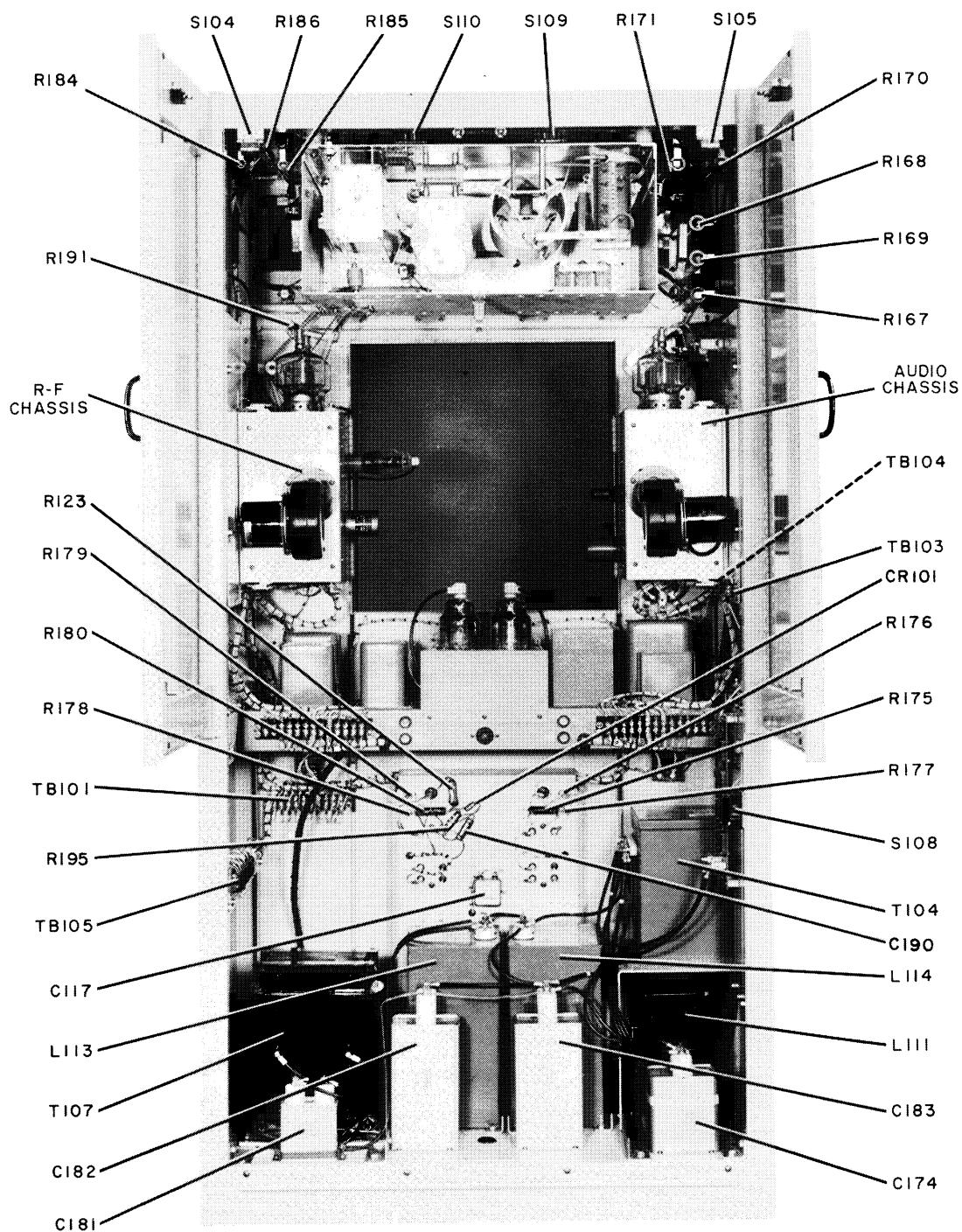


Figure 6-2. AM Broadcast Transmitter 20V-3, Rear View



SECTION VI  
Parts List

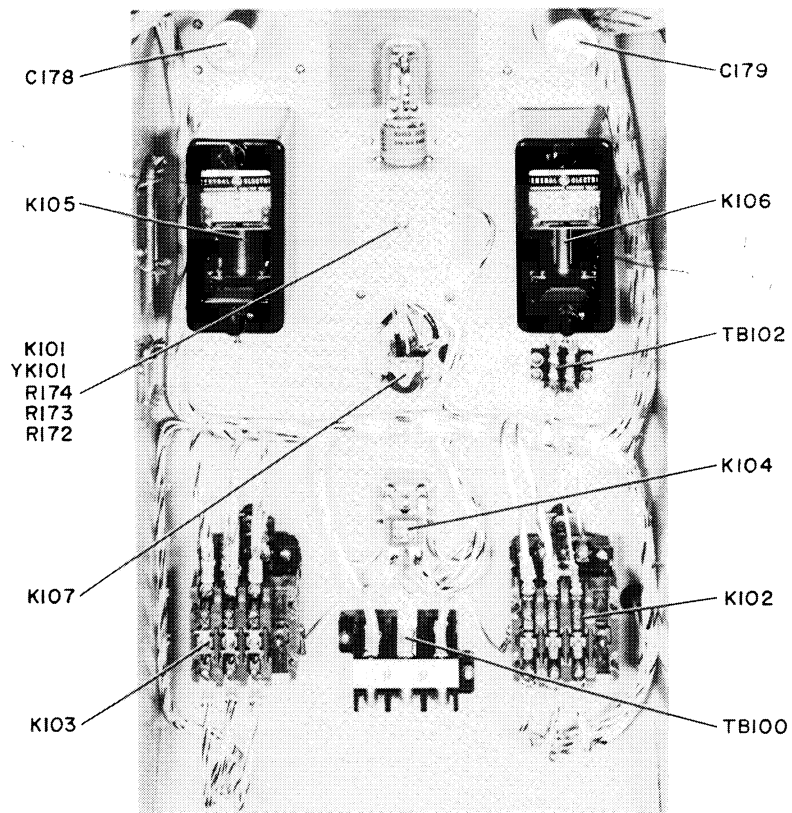


Figure 6-3. Relay Compartment

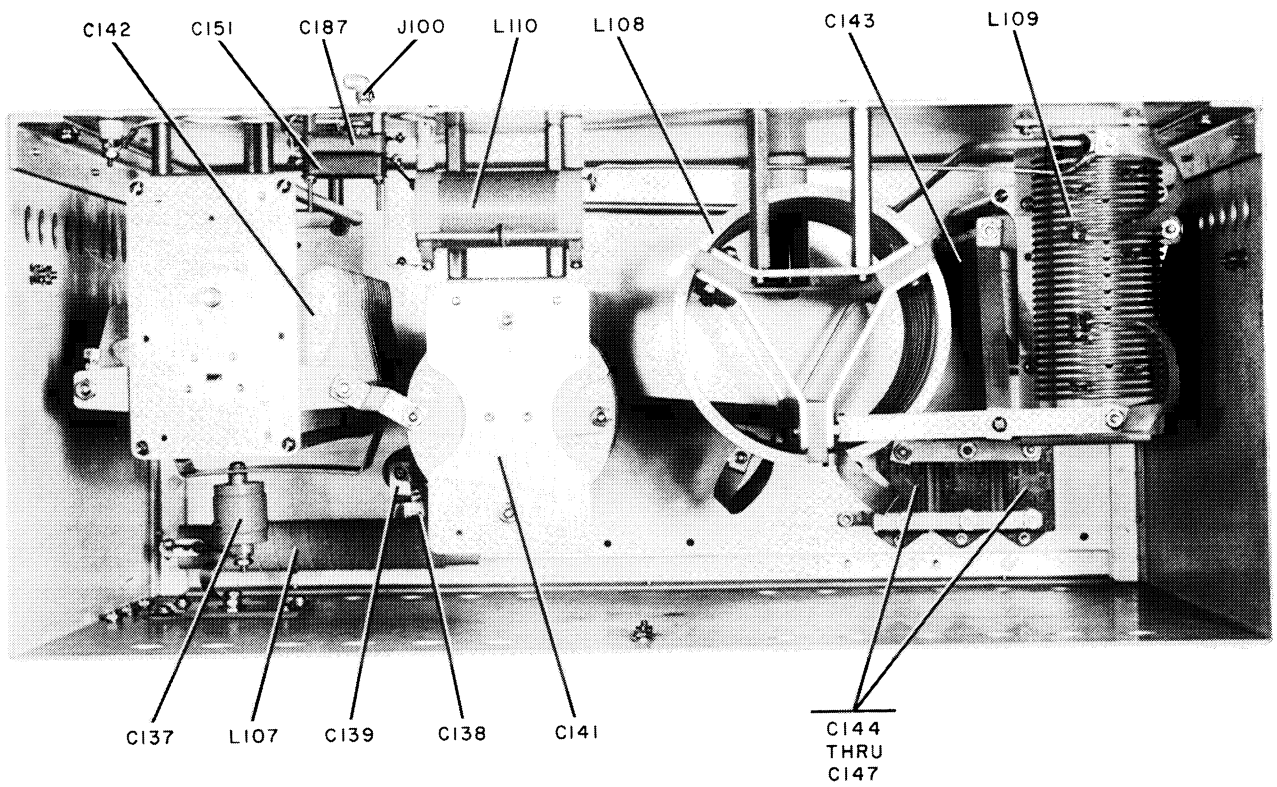


Figure 6-4. R-F Output Network Compartment

SECTION VI  
Parts List

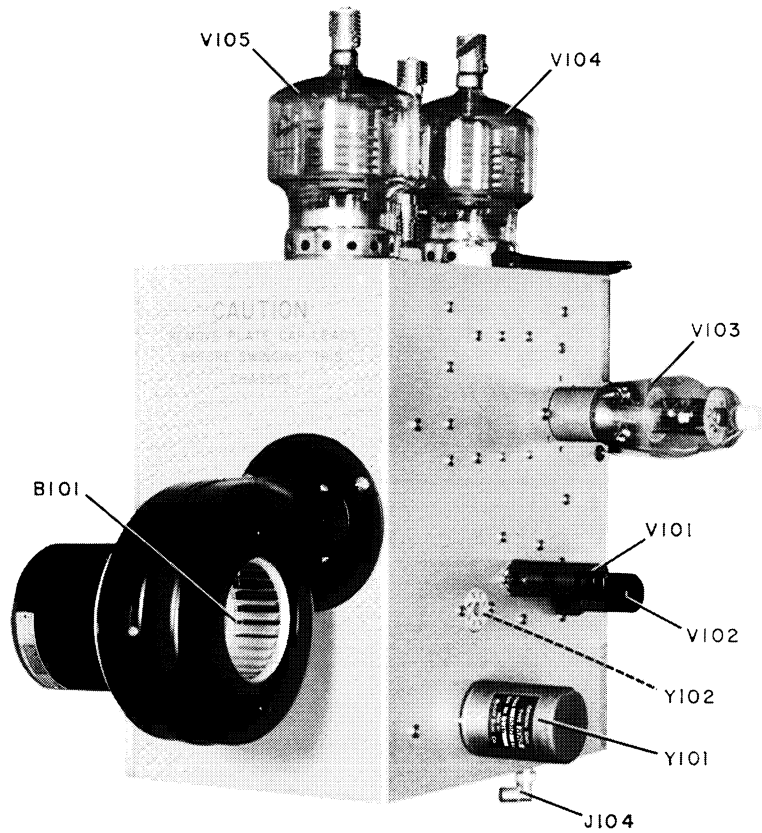


Figure 6-5. R-F Chassis, Outside View

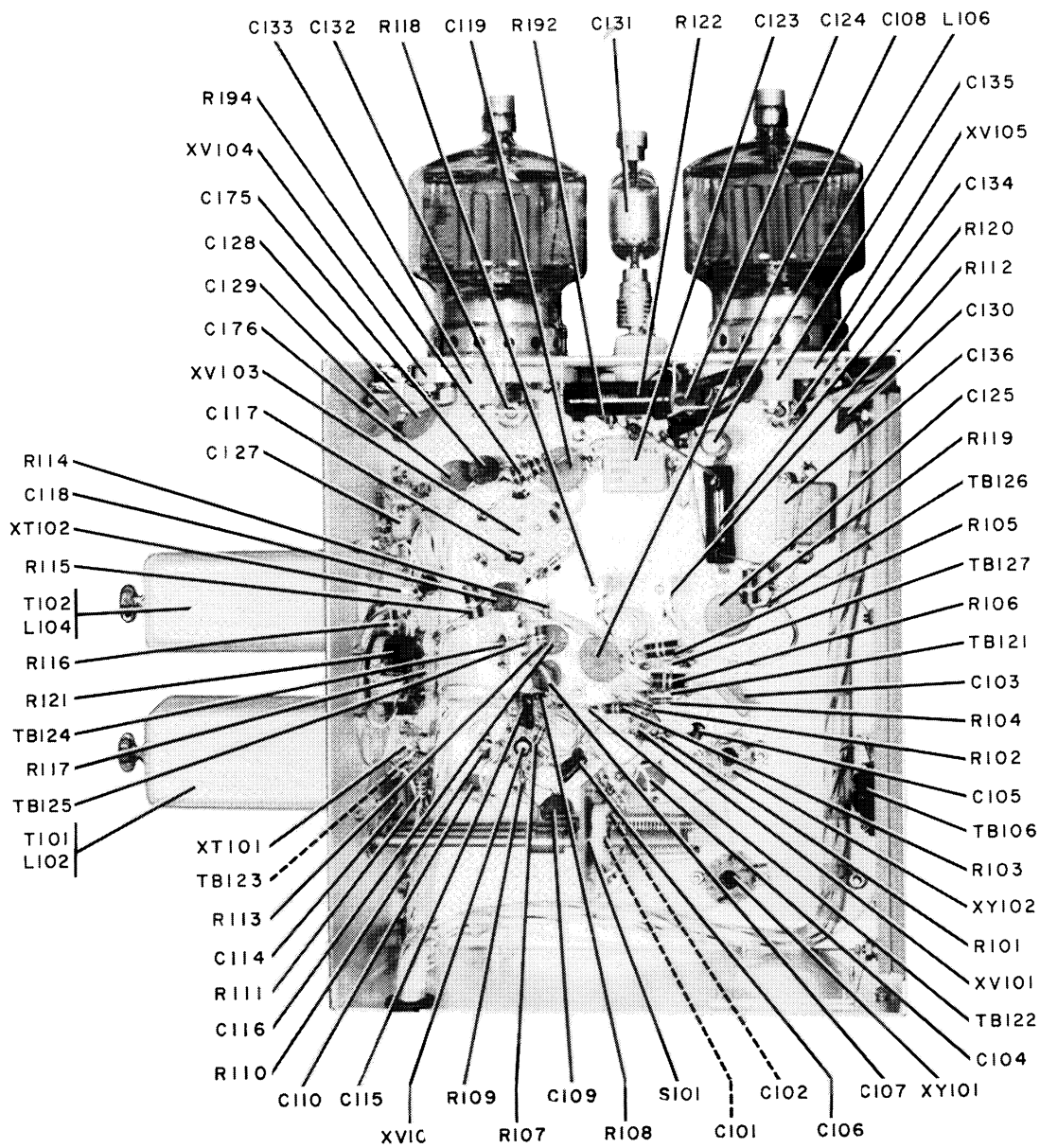


Figure 6-6. R-F Chassis, Inside View

SECTION VI  
Parts List

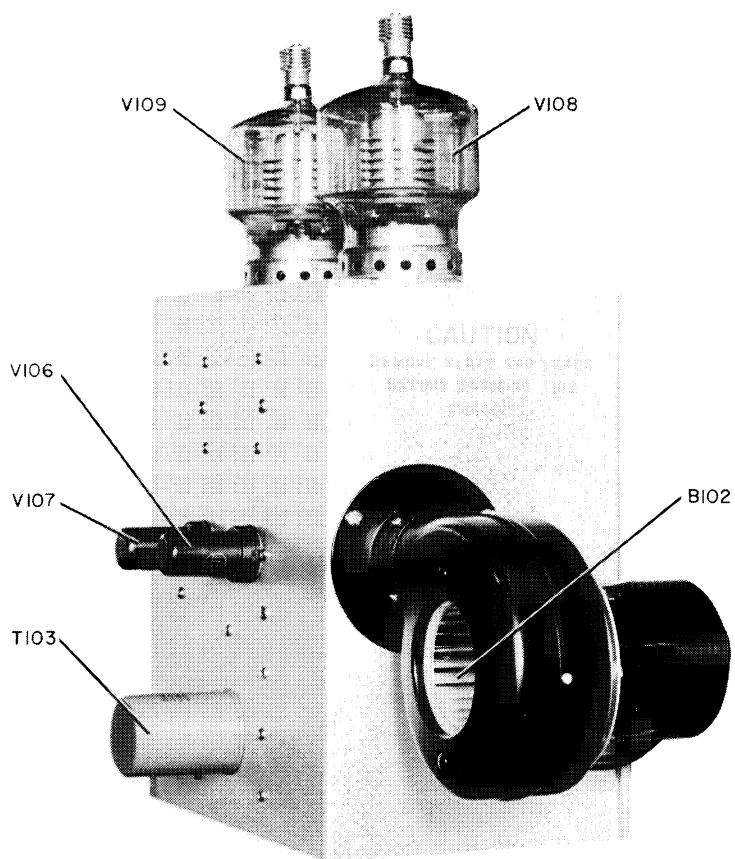


Figure 6-7. Audio Chassis, Outside View

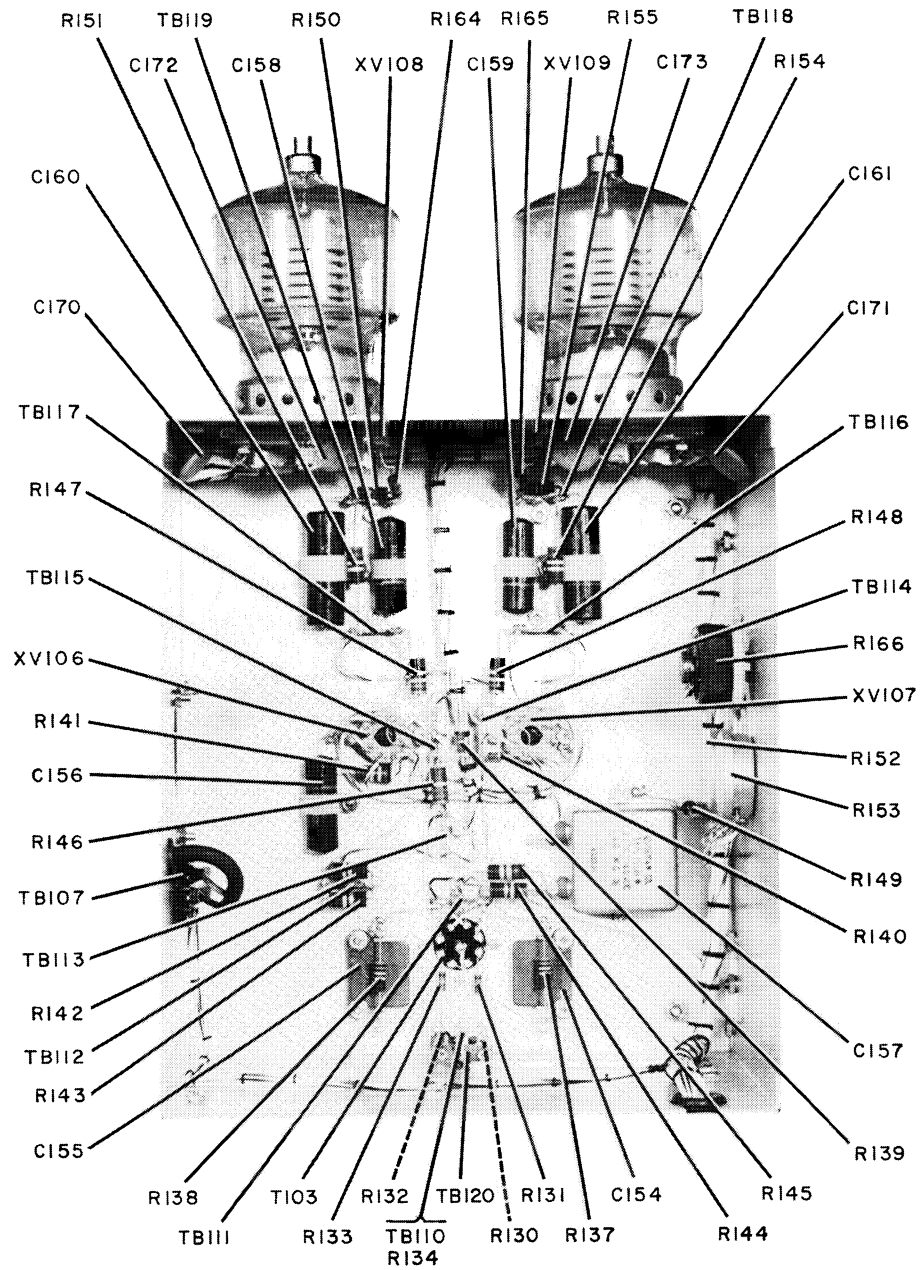


Figure 6-8. Audio Chassis, Inside View

SECTION VI  
Parts List

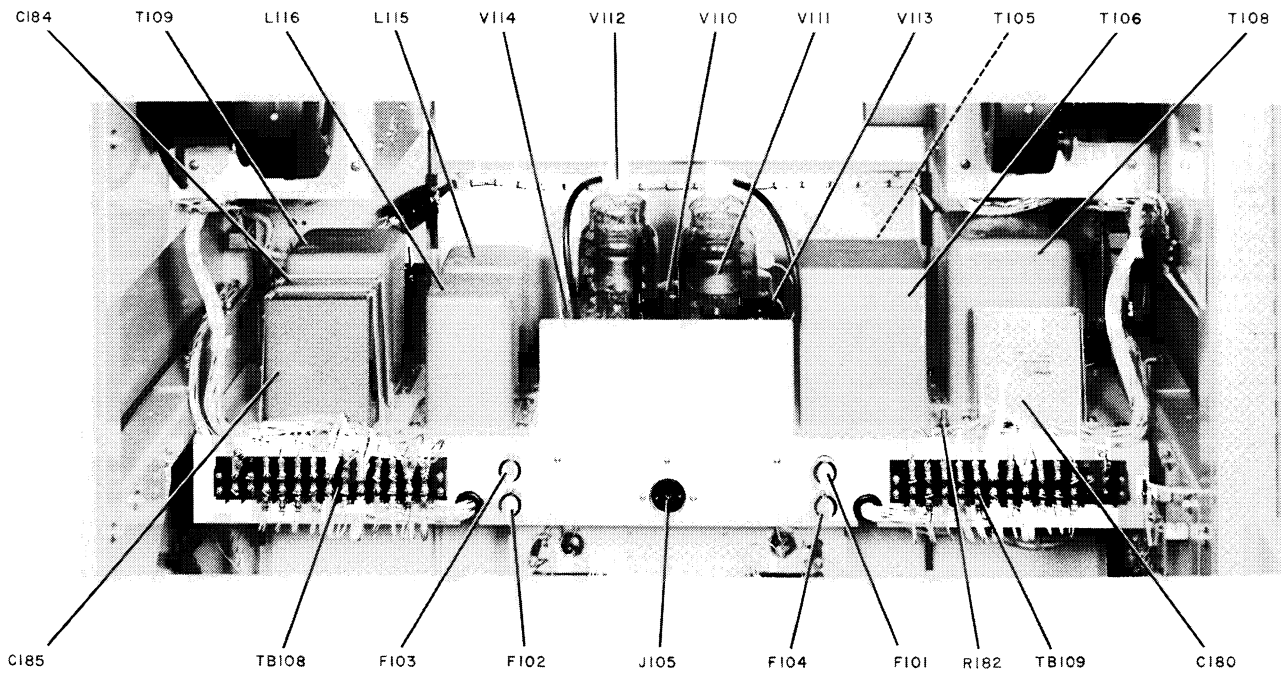


Figure 6-9. Power Supply Chassis, Top Rear View

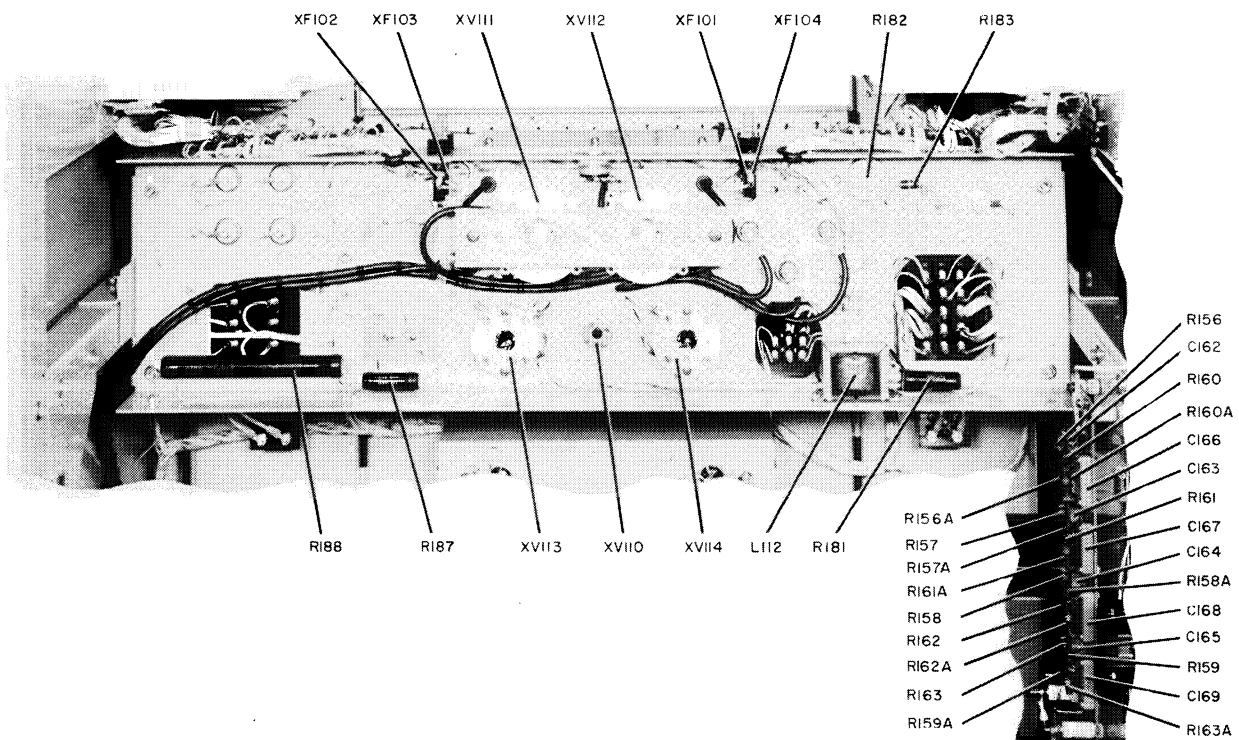
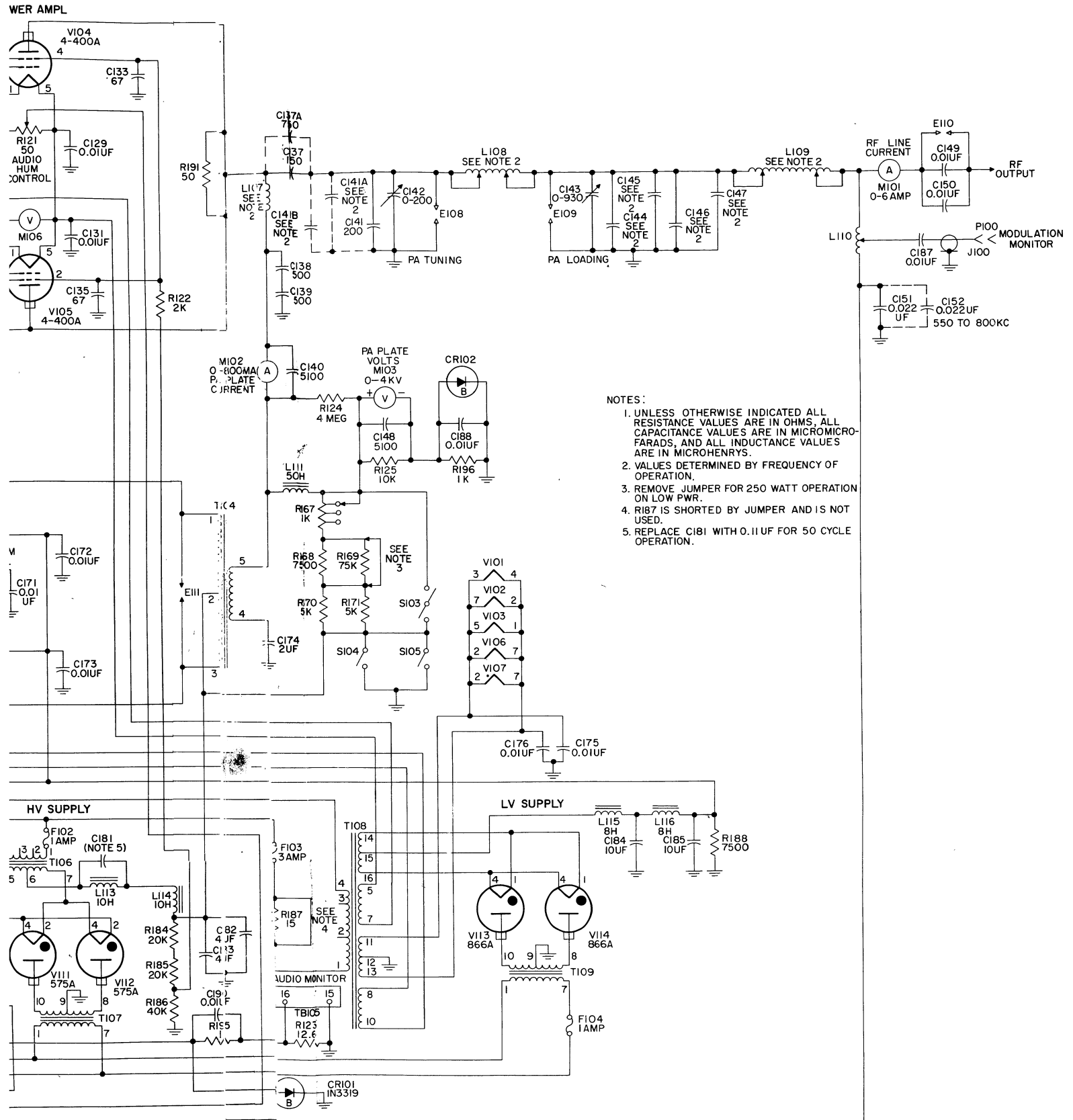


Figure 6-10. Power Supply Chassis, Bottom View

# SECTION VII ILLUSTRATIONS

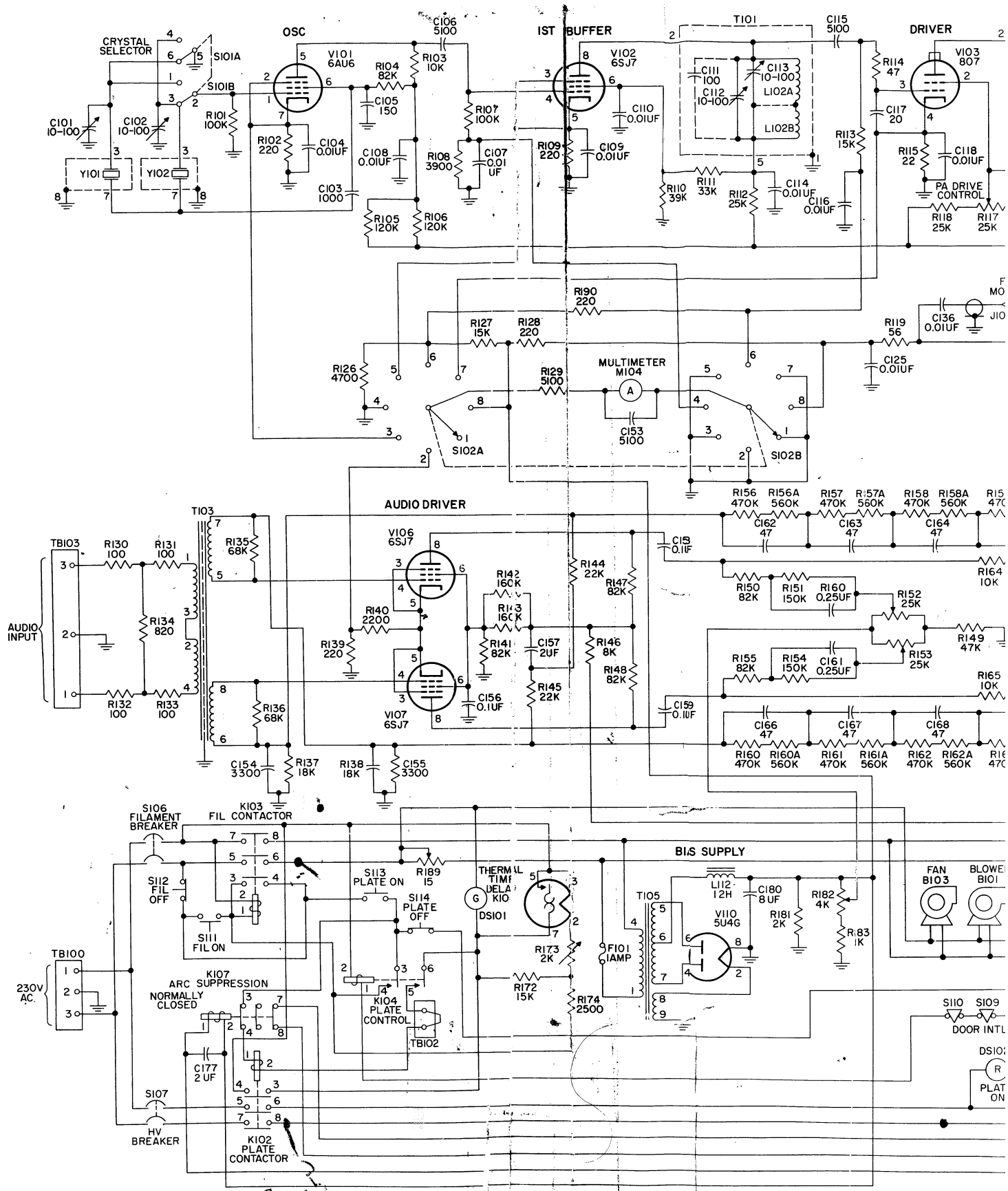


- NOTES:
1. UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRYS.
  2. VALUES DETERMINED BY FREQUENCY OF OPERATION.
  3. REMOVE JUMPER FOR 250 WATT OPERATION ON LOW PWR.
  4. R187 IS SHORTED BY JUMPER AND IS NOT USED.
  5. REPLACE C181 WITH 0.11 UF FOR 50 CYCLE OPERATION.

Figure 7-1. AM Broadcast Transmitter 20V-3, Schematic Diagram







# ELECTRICAL WIRE CODE

## EXAMPLES

UNSHIELDED WIRE, MIL TYPE B #22 AWG, WHITE WITH RED AND GREEN TRACERS:

  D    
Type of Wire
  A    
Size of Wire
  9    
Color of Body
 25   
Color of Tracers
—  4-1/4   
Length of Wire in Inches  
(Includes Stripping & Tinning)

SHEILED WIRE (SINGLE), MIL TYPE C, #15 AWG, WHITE WITH RED AND GREEN TRACERS:

  R    
Type of Wire
  D    
Size of Wire
  S    
Shielded
  9    
Color of Body
 25   
Color of Tracers
—  4-1/4   
Length of Wire in Inches  
(Includes Stripping & Tinning)

SHEILED WIRE (MULTIPLE), MIL TYPE B, #22 AWG, WHITE, AND WHITE WITH RED TRACER:

  D    
Type of Wire
  A    
Size of Wire
  S    
Shielded
  (9)    
First Conductor
  (92)    
Second Conductor
—  4-1/4   
Length of Wire in Inches  
(Includes Stripping & Tinning)

TYPE OF WIRE CODE		
LETTER	TYPE OF WIRE	FAMILY USUALLY FOUND IN
A	Cotton Braid Over Plastic (Formerly AN-J-C-48)	440 Plain 443 Shielded
B	Busbar, Round Tinned	421
C	MIL-W-16878 Type B (#20 and Larger) (600 Volts)	439
D	Miniature Wire, MIL-W-16878 Type B (#22 & Smaller)	439-7000 Series
E		
F	Extra Flexible Varnished Cambric	423
G		
H	Kel-F (Monochloro-trifluoroethylene)	422
J		
K	Neon Sign Cable (15,000 Volts)	423 0004 00
L	Silicone	425 0942 00
M		
N	Single Conductor Stranded (Not Rubber Covered)	422
P	Single Conductor Stranded (Rubber Covered)	423
Q		
R	MIL-W-16878 Type C (1000 Volts)	439 1000 Series
T	Teflon, MIL-W-16878 Type E (600 Volts)	439 4000 Series
V	MIL-W-16878 Type D (3000 Volts)	439 3000 Series
W	Teflon, MIL-W-16878 Type EE (1000 Volts)	439 0000 Series
X		
Y		
Z	Acetate Yarn Telephone Type	428

SIZE OF WIRE CODE	
LETTER	SIZE
A	#22 AWG
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
T	#28
V	#26
W	#24
X	#19
Y	#30
Z	

COLOR CODE	
NUMBER OR LETTER	COLOR
0	Black
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Gray (Slate)
9	White
a	Clear
b	Tan
c	Pink
d	Maroon
e	Light Green
f	Light Blue



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**COLLINS RADIO COMPANY**