COLLINS

30K 4

HIGH FREQUENCY TRANSMITTER

INSTRUCTION BOOK

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for

MODEL 30K-4 HIGH FREQUENCY TRANSMITTER

MANUFACTURED BY

COLLINS RADIO COMPANY, CEDAR RAPIDS, IOWA

520 9440 00

July 15, 1953

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 handling of your returned merchandise.

ADDRESS:

Collins Radio Company
Sales Service Department
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 sub-assemblies 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
Sales Service Department
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 sub-assembly number (where applicable)

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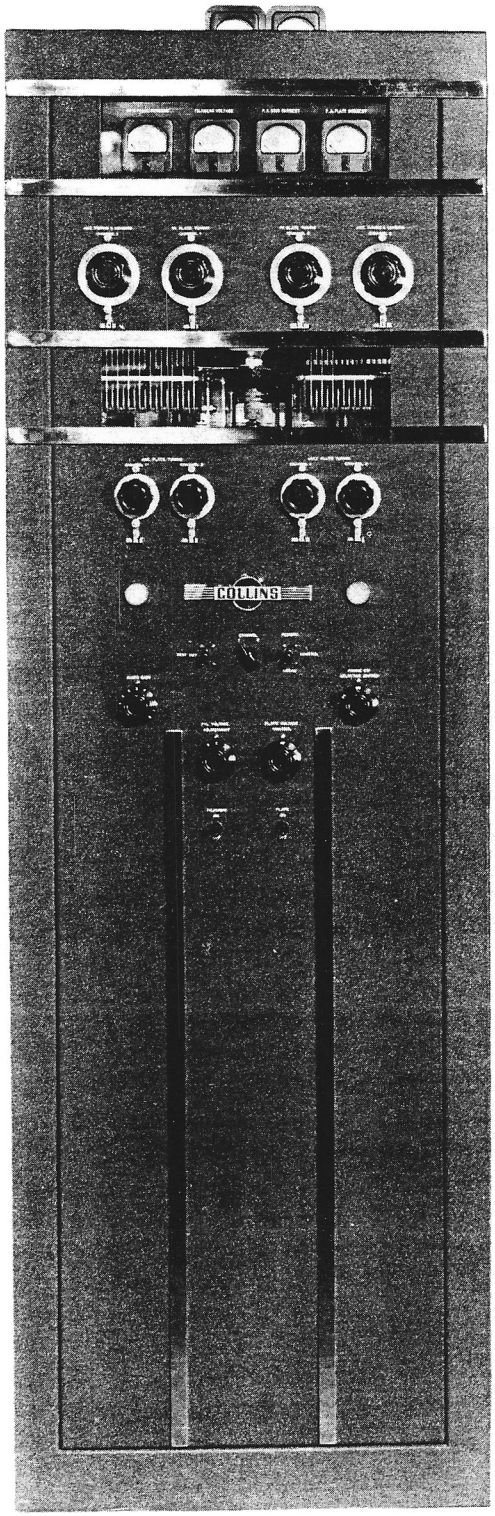
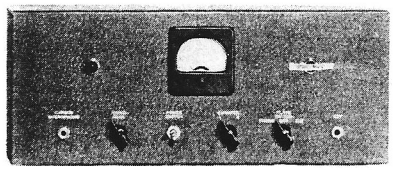




TYPE 177L-2 REMOTE
CONTROL UNIT

TYPE 30K-4
TRANSMITTER

FIGURE 1-1 TYPE 30K-4 TRANSMITTING EQUIPMENT

SECTION 1

GENERAL DESCRIPTION

1.1. GENERAL.

1.1.1. This instruction book is intended to serve as a guide to the proper installation, adjustment, operation and maintenance of the Collins Type 30K-4 ground station transmitter.

1.1.2. The Type 30K-4 is a dual channel transmitter designed for general applications such as police service, aeronautical ground stations or general point to point communication, where service is intermittent. The adaptability of the transmitter is attested to by the wide frequency range and the flexible pi network output circuit arrangement, which permits the use of a variety of antenna types.

1.1.3. EQUIPMENT DESCRIPTION.

(a) The transmitter is completely self-contained except for microphone and key. It is housed in an attractive cabinet designed in accordance with the best principles of advance styling. It is built of heavy gauge steel employing a welded stiffener type of construction. The full length rear door provides access to all units. The component parts of each sub-unit are mounted on a removable chassis. All power and control wires between the sub-units are laced together in a neatly formed cable. Connections are made at screw type, barrier, terminal strips at the rear of each unit.

The various chassis may be removed from the rear of the transmitter cabinet by first taking off the control knobs, removing the four bolts which secure the chassis to the mounting cleat, and disconnecting the cable from the terminal strip. A set of bristo wrenches is fastened to the rear door for loosening set screws in control knobs. A glass covered opening in the front panel allows a continuous check on the color of the plate of the power amplifier tube. The meter panel is also placed behind a glass covered opening in the interest of safety. The antenna current meters are located externally at the top rear edge of the transmitter cabinet. This feature allows shorter connecting leads, making possible more accurate current readings.

(b) ELECTRICAL - The stable oscillator circuit employs a type ~~6B6~~ 6V6 tube. An 807 follows the oscillator and serves as a buffer, doubler and driver. An Eimac 4-125A high efficiency tetrode is used in the output stage. All r-f stages have dual tank circuits, one for each of the two pre-tuned frequencies. Relays connect the desired tuning elements into the circuit. Dual pi networks in the output stage are used for tuning the final amplifier and loading into the antenna. Only two controls, designated TUNING and LOADING are required for each network. Plug in coils for r-f stages provide maximum efficiency at all frequencies, with a saving of space and operating controls.

The audio frequency response of 150-4000 cps is especially suited for voice communication. An audio peak clipping circuit is incorporated to improve the intelligibility when the atmospheric static level is high or when frequencies are congested. The clipper permits an unusually high level of modulation. The peak power of vowel sounds is held at a low level; at the same time the consonant sounds, which provide intelligibility, are allowed to produce maximum power. The r-f carrier sideband power is greatly increased as compared to normal operation. The peak clipper also prevents overmodulation. A low pass audio filter follows the peak clipper thus attenuating audio frequencies above 4000 cps.

Remote operation can be provided by using the type 177L-2 control unit. When the length of cable from the operating position to the transmitter is 50 feet or less, no additional equipment is required. However, for greater distances the type 177L-2 remote control unit provides filament and plate power controls, keying, microphone preamplifier and channel switching functions. The output of the remote line is fed to standard telephone line. 2-1/2 pairs plus ground return are required. A db meter is incorporated in the remote control unit so the operator can control the speech level. The loss in the telephone line cannot exceed 25 db or the resistance of any wire with the ground return should not exceed 200 ohms. This represents approximately 4-1/2 miles for #19 GA telephone cable, 2-1/2 miles for #22 GA and 1 mile for #26 GA. For remote selection of type of emission (Phone or CW) one extra telephone wire is required.

1.2. REFERENCE DATA.

1.2.1. The units which constitute the complete equipment with the over-all dimensions and weights are tabulated below:

Collins Type No.	Description	Over-all Dimensions	Weight
30K-4	Transmitter	22" w, 16-1/2" d, 66-1/2" h	420 lbs.
177L-2	Remote Control Unit Telegraph Key Microphone and Microphone Cable	17-1/4" w, 7-7/16" d, 7" h	
173V-2	Relay Unit		
504 4182 002	Rack Mounting Angles (2) for 177L-2		
520 4650 00	Cooling Fan Kit for Continuous Operation		
520 9416 00	Instruction Book		

This list does not necessarily designate equipment supplied with this order.

1.2.2. FREQUENCY RANGE: 2.0 - 30.0 mc

1.2.3. NUMBER OF CHANNELS: two

1.2.4. FREQUENCY CONTROL: quartz crystals

1.2.5. TYPES OF EMISSION: A1 and A3

1.2.6. NOMINAL CARRIER OUTPUT: 250 watts voice 300 watts cw from 2 mc to 15 mc
200 watts voice 250 watts cw from 15 mc to 30 mc

1.2.7. AUDIO FREQUENCY RESPONSE: within 3 db from 150 to 4000 cps.

1.2.8. AUDIO FREQUENCY DISTORTION: less than 10% at either 400 or 1000 cps at 100% modulation (with clipper and filter inoperative.)

1.2.9. INPUT IMPEDANCE (MICROPHONE) - High impedance dynamic or crystal

1.2.10. ALTITUDE FOR RATED VOLTAGE: 6000 feet

1.2.11. POWER REQUIREMENTS: standby - 160 watts on cw, 220 watts on phone
operating - 910 watts on cw, 1270 watts on phone

1.2.12. POWER SOURCE: 115 volts, 60 cps, single phase

1.3 VACUUM TUBE COMPLEMENT.

1.3.1. TYPE 30K-4 TRANSMITTER.

Symbol	Type	Function
V201	6V6GT	Oscillator
V202	807	Frequency multiplier
V203	4-125A	R-F Power amplifier
V301	6SJ7	Audio amplifier
V302	6SN7	Audio amplifier
V303	6H6	Clipper
V304	6B4G	Modulator driver
V305	75TH	Modulator
V306	75TH	Modulator
V401	5R4GY	Bias rectifier
V402	5R4GY	LV rectifier
V501	866A	HV rectifier
V502	866A	HV rectifier

1.3.2. TYPE 177L-2 REMOTE CONTROL UNIT.

V801	6SJ7	Preamplifier
V802	6SN7GT	Audio amplifier
V803	6X5GT	Rectifier

SECTION 2

INSTALLATION

2.1. INSTALLATION.

2.1.2. PRELIMINARY.

(a) UNPACKING - Refer to the table of equipment supplied in Section 1, paragraph 1.2.1. of this instruction book and to the packing slip for a list of all units supplied. If the crates are marked with arrows to indicate the upright position, remove crate cover only. Use a nail puller to remove nails, a bar or hammer may damage the equipment within. Remove all of the packing material and lift each unit out carefully. Search all of the packing material for small packages. Inspect each unit for loose screws or bolts. Be certain all controls such as knobs, switches, etc., work properly. All claims for damage should be filed promptly with the transportation company. It is necessary to preserve the original packing box and the packing if claim is to be made.

2.1.3. INSTALLATION PROCEDURE.

(a) PLACING THE CABINET - The transmitter cabinet may now be set in place. It may be located for convenience of operation, but at the same time consideration should be given to power connections, control cables (if required) antenna and ground connections and maintenance accessibility. The required clearances and base dimensions are shown in figure 2-1. Because all units are placed in the cabinet from the rear, clearance should be allowed for a workman between the cabinet and any obstruction. In addition, sufficient clearance should be provided to allow for the rear door to swing back fully out of the way.

(b) INSTALLATION OF UNITS - Reference to the photographic illustrations will assist in the assembly of the transmitter. See figure 2-3. Any cords designed to hold the cable in place for shipment should be untied and removed. Place the heavy plate power transformer in position at the bottom of the cabinet and make the connections indicated by the white tags tied to the cable lugs. After this, the power transformer may be placed over the mounting holes and bolted into place if desired. Proceed with the placement of units from the bottom to the top. The tabulation below lists the various units of the transmitter. For purposes of identification the unit letter designation which appears on the cabling schematic diagram, figure 5-16 is also shown.

Unit Letter Designation	Description
A	Meter Panel
B	R-F Exciter, Amplifier and Antenna Network
C	Speech Amplifier and Modulator
D	Low Voltage and Bias Power Supply

Unit Letter Designation	Description
E	Control Panel
F	High Voltage Rectifier
G	High Voltage Power Transformer
H	Type 175V-2 Relay Control Unit
J	Relay Voltage Supply and External Connection Strip

Each unit should be placed with protruding control shafts properly centered to prevent binding and then bolted in place with bolts provided for that purpose. A set of ~~brass~~ wrenches is attached to the rear door to be used for tightening the control knob set screws.

(c) INTERNAL CONNECTIONS - The connections between the units of the type 30K-4 transmitter are made by a pre-formed cable. The cable leads are formed and laced tightly so that they have a natural tendency to seek the proper terminal. Each wire is color coded and otherwise identified on the cabling schematic, figure 5-16, by means of the unit letter and terminal number to which each wire is terminated. Each cable connection in the transmitter is marked by a tag when the transmitter is dismantled for shipment. The cable connections can therefore be properly installed by following the markings on the tags.

The order of designation of inter-unit cabling is as follows: When a wire terminates on a single numbered terminal on a unit, the wire route is from the source to the terminal on the specified unit and is indicated by the unit letter designation followed by the terminal number. Thus, if a wire emanating from terminal number 2 on unit A is to be connected to terminal number 12 on unit C, an arrow at terminal number 2 on unit A would indicate C12 and a similar arrow on terminal 12 on unit C would indicate A2.

Color coiding of wires is used to facilitate connecting cables to terminal strips. The code is indicated by a letter such as A, B, etc., followed by a figure such as 1, 3, 5, etc. The letter designates the wire structure size, amount and kind of insulation and rating. The figures refer to RMA color code for resistors, etc. A class A wire with solid red covering would be an A2 while a class A tracer wire with a red body and a white tracer would be designated A29.

(d) FUSES - All fuses should be examined and their ratings checked. Refer to the MAINTENANCE section of this book paragraph 5.2.2. (b) for a table of fuses.

(e) EXTERNAL CONNECTIONS - Place all POWER switches in the OFF position before attempting to make any external connections. The external connections for the type 30K-4 transmitter consist of the following: AC power line, microphone, radiation system, remote control lines if used.

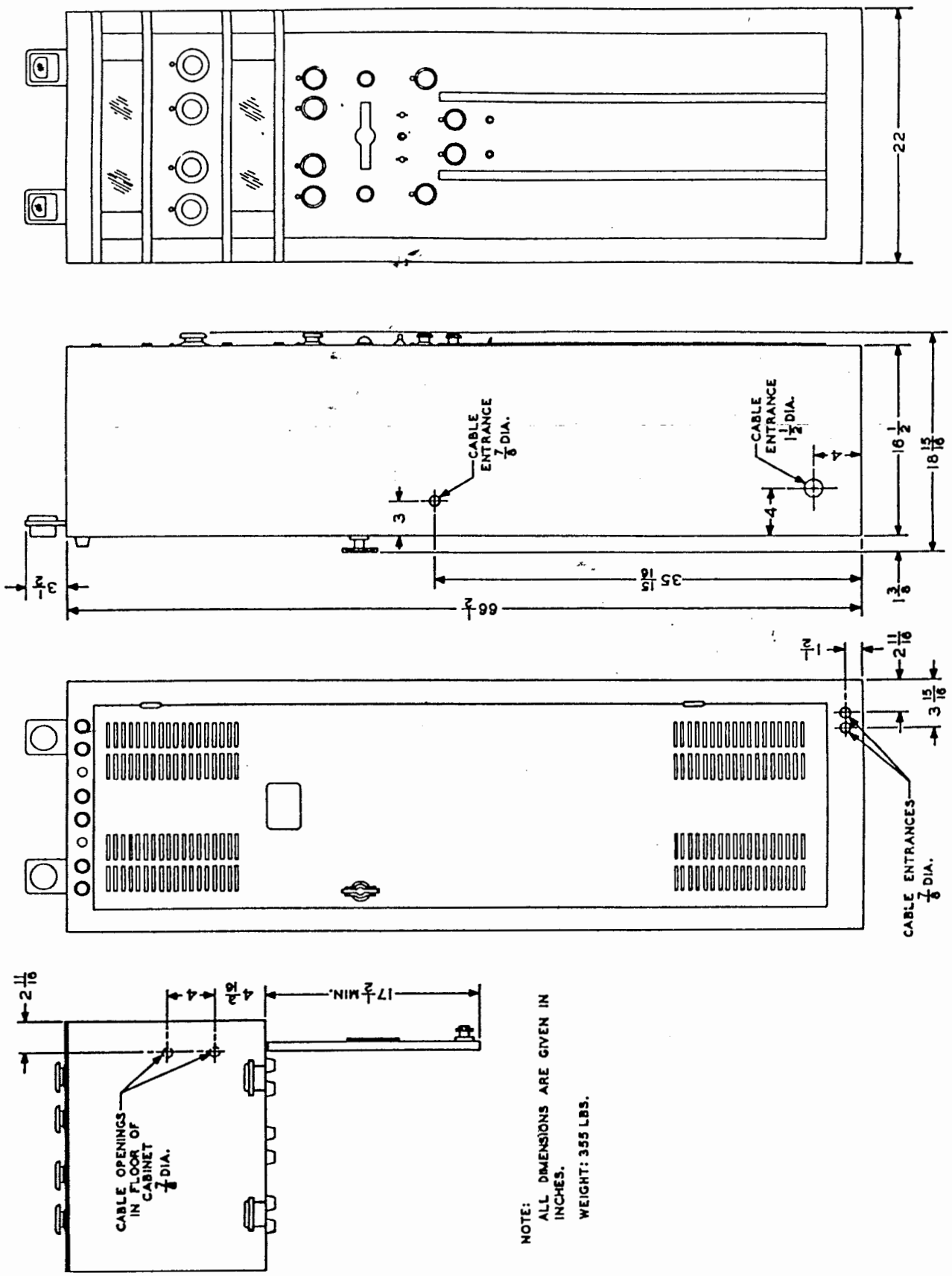
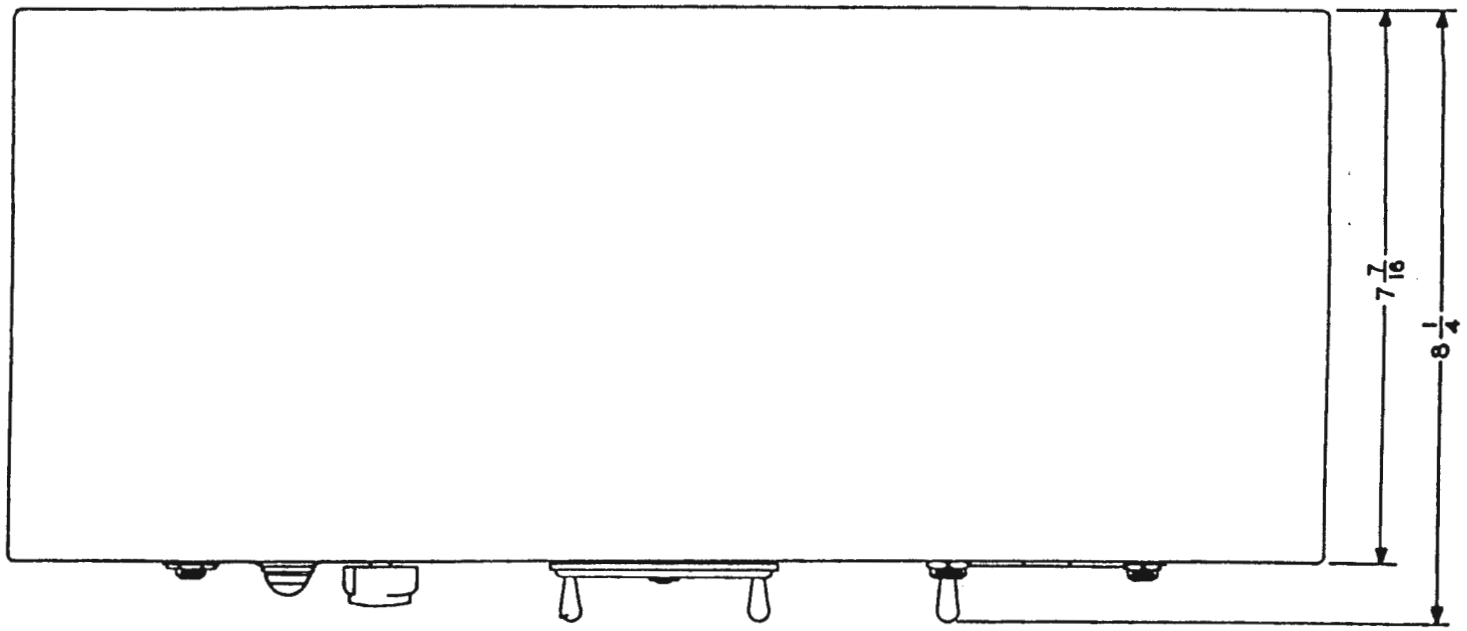


Figure 2-1 Type 30K Transmitter Outline and Mounting Dimensions



NOTE:
ALL DIMENSIONS ARE IN INCHES.
WEIGHT:

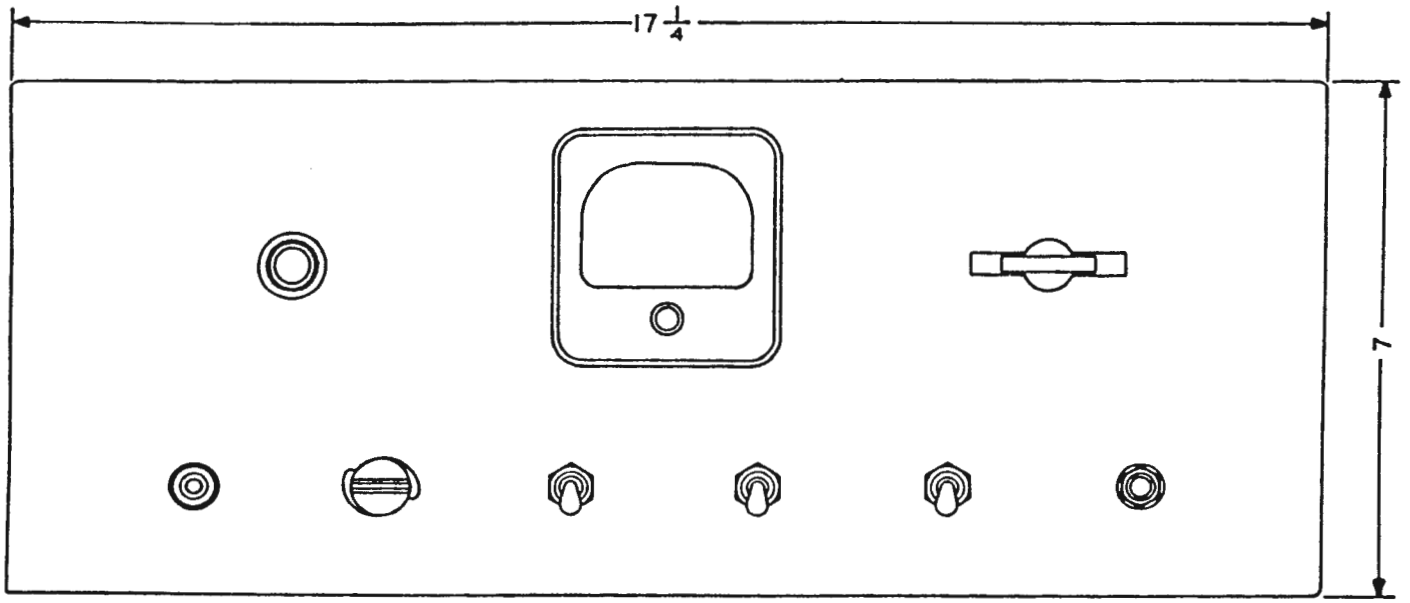


Figure 2-2 Type 177L Remote Control Unit Outline and Mounting Dimensions

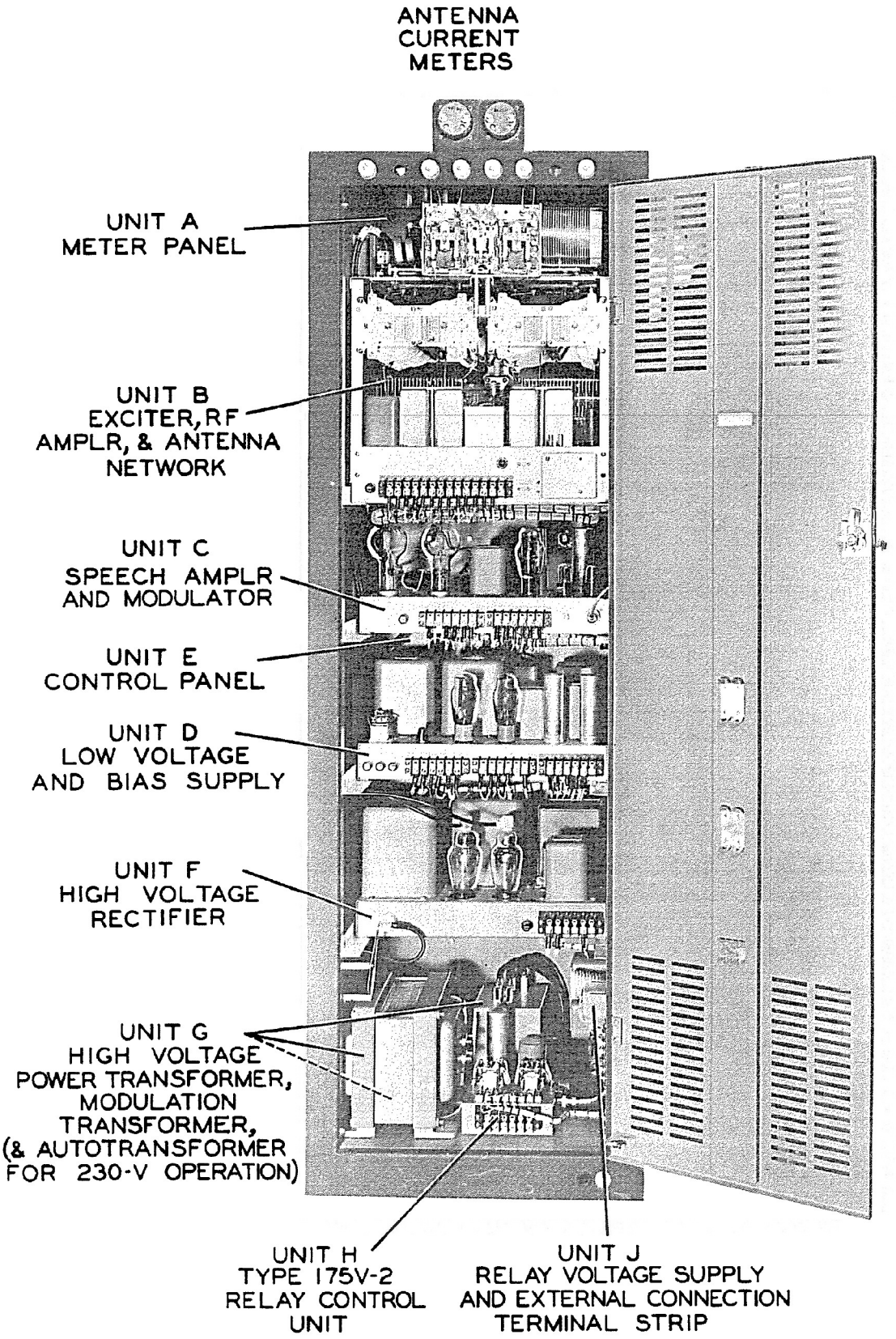


Figure 2-3. Unit Placement Photograph

(1) AC POWER LINE - The type 30K-4 is designed to operate from a 115 volt, single phase, 60 cycle power source. The supply line voltage and frequency should be checked before connections are made. The maximum load used by this equipment is 1250 watts. A power line of at least 2 k.v.a. capacity should be installed for each transmitter installation. Connect the power line directly to the bottom terminals of the line fuse block in the bottom of the cabinet. Number 10 A.W.G. or larger, suitably insulated wire should be used. The "high" side of the line should be connected to terminal No. 15, if possible. The "high" side of the line may be found by checking with a small 110 volt bulb from each side of the line to an external ground. It is recommended that an external wall mounting, two pole, disconnect switch be installed between the transmitter and the main line connections. If the line voltage is more than 5 volts too low or too high, the installation of an autotransformer is advisable. If 220 volts is available, a stepdown autotransformer may be used.

Two holes 7/8" in diameter are available in the base of the cabinet for power leads, if conduit type of wiring is used; otherwise, the power leads may enter the cabinet through holes in the base and thence through the above mentioned holes to the terminal board. Refer to figure 3-1 for location of the power entry holes. A 1-1/2" hole in the side of the cabinet at base level is also available for power lead entry.

(2) MICROPHONE - The push-to-talk and microphone connection are made by means of Amphenol type MC 4M four connector plug. The receptacle is located at the rear of the chassis and the microphone cable may enter the side of the cabinet, a 7/8" hole is provided. The ring on the microphone plug should be securely tightened. For LOCAL push-to-talk operation, place TEST KEY in the "locked" position and remove the jumper from terminals 5 and 6 on Unit C (speech amp and modulator).

(3) RADIATION SYSTEM - The output networks will match an extremely wide range of antenna impedances with excellent efficiency. At lower frequencies, and for antenna less than a quarter wave in length, provision is made for load coils which will assist in matching the antenna impedance. Unbalanced antenna and single wire or concentric transmission lines can be matched directly. See figure 2-5 for suggested antennas and circuits.

The details of the radiating system for any transmitter can best be determined at the time the installation is being made. Certain factors which will affect the operation of the equipment, however, should be considered before the installation is completed. With the 30K-4 transmitter a single antenna may be used for all frequencies provided space is available to install a suitable radiating system. When a single antenna is used for several operating frequencies, the antenna in general will not be resonant at all frequencies involved. For this type of operation it is recommended that a vertical radiating system be installed whenever possible. Such a vertical radiator would consist of either a self-supporting insulated tower or a guyed tower or mast supported on a base insulator. When several transmitters are being installed at the same location, it is sometimes desirable to erect two tall masts to which a messenger cable may be attached.

to erect two tall masts to which a messenger cable may be attached. By connecting large diameter conductors to the messenger cable supported by the masts, several vertical radiating systems each having different properties may thus be installed This arrangement in general will result in a satisfactory radiating system for the 30K-2 Transmitter, if the conductor diameter is 3/4" to 2". When limitations are placed on the height to which the radiating system may extend, a single end fed antenna of at least 3/8 inch outside diameter may be used.

In any case serious attention should be given to the installation of a suitable ground system. In the case of a vertical radiator, 60 radials of 8 to 10 gauge bare copper wire spaced 6 degrees apart and terminated at a common heavy conductor as near the base of the radiator as possible, should be used. The length of these radials should be at least a quarter wavelength referred to the lowest operating frequency. The connections from this ground mat to the transmitter ground ter at the roof of the r-f bay should be made by means of a heavy copper conductor copper bus. See figure 2-6.

For a single wire end fed horizontal antenna, the ground system should have the following configuration. A system of radial wires of 8 to 10 gauge bare copper spaced six degrees apart covering approximately 225 degrees and extending for approximately a quarter wavelength (referred to the lowest operating frequency) should be installed with their center directly below the vertical or feed line portion of the antenna. The area covered by the radials should be the portion opposite the open end of the horizontal part of the antenna. Attached to and emanating from the common junction or center of the radial system should be a group of wires spaced 5 or 6 feet apart and laid parallel with the horizontal portion of the antenna and extending for at least an eighth wavelength (referred to the lowest operating frequency) beyond the open end of the antenna and approximately an eighth wavelength on each side of the horizontal portion of the antenna.

The use of a suitable ground system such as outlined above will improve the radiating efficiency of the installation and will reduce excessive radio frequency voltages appearing in the control circuits, particularly the telephone line control equipment.

The height of the vertical radiator should be determined for the lowest frequency and should be at least one-quarter wavelength at this frequency.

For an end fed horizontal antenna, the ratio of the length of the vertical portion to the horizontal portion should be as large as possible. Whenever possible the height of the antenna should be at least one-quarter wavelength at the lowest frequency. The total length of the antenna including the vertical portion or lead-in should be adjusted to avoid the immediate vicinity of a half wavelength at any of the operating frequencies. Whenever this condition exists, regardless of the choice of total length, the end fed antenna should not be used.

At the building entrance for each antenna, a horn gap should be installed to reduce the danger of damage to the equipment due to electrical storms or disturbances. Refer to figure 2-7 for recommended installation details.

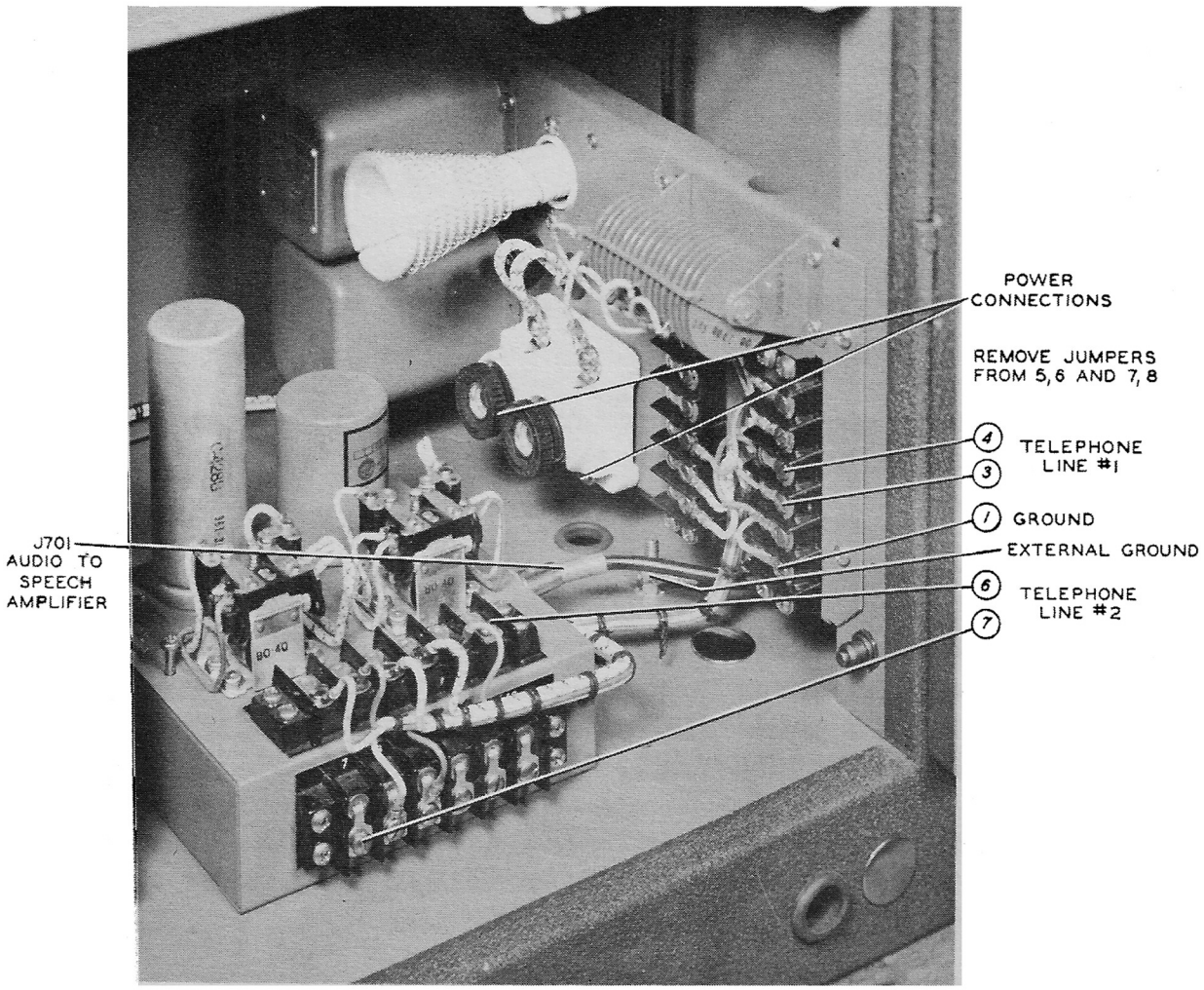


FIGURE 2-4 EXTERNAL CONNECTIONS

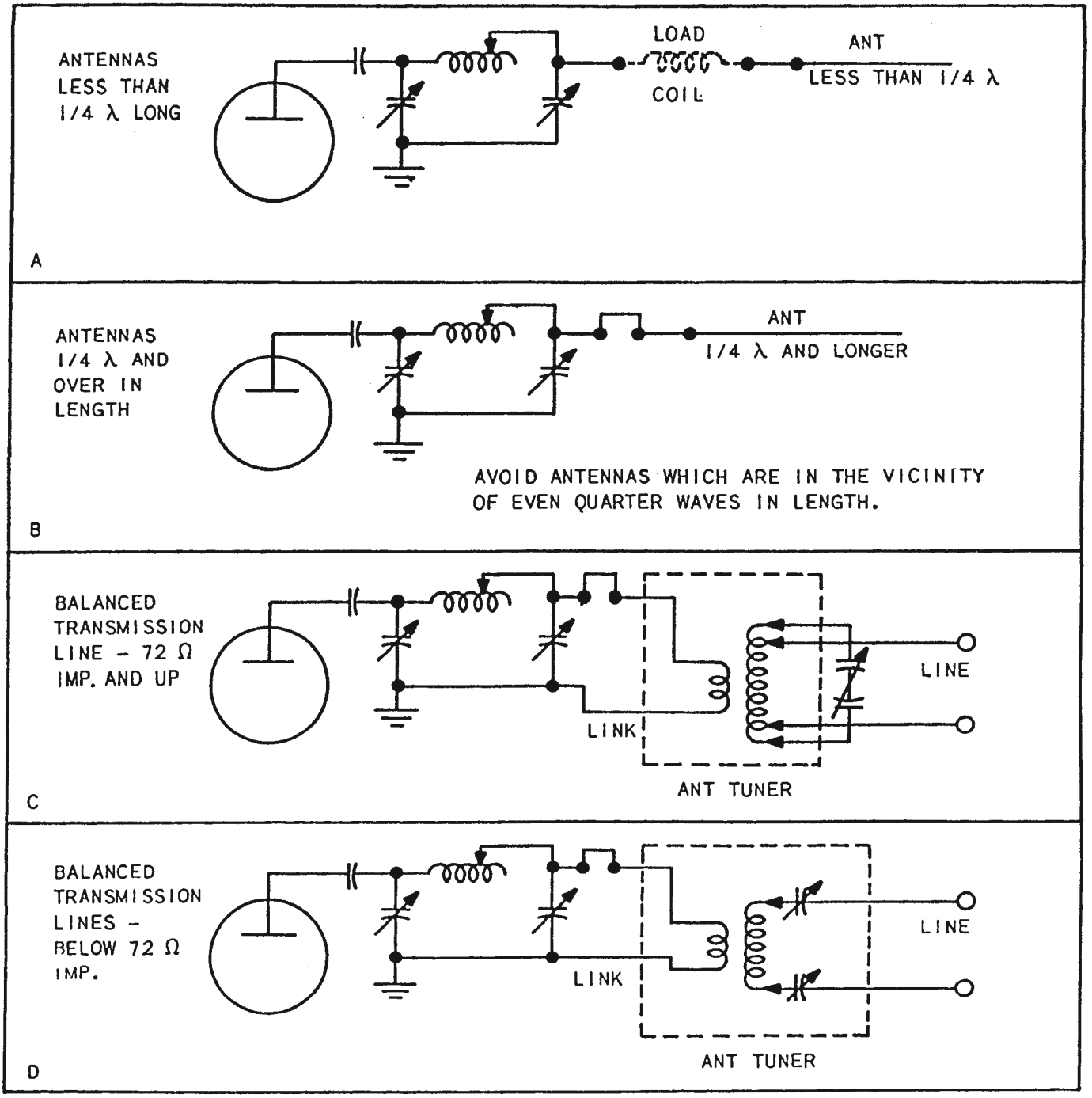


Figure 2-5 Applicable Antenna Circuits

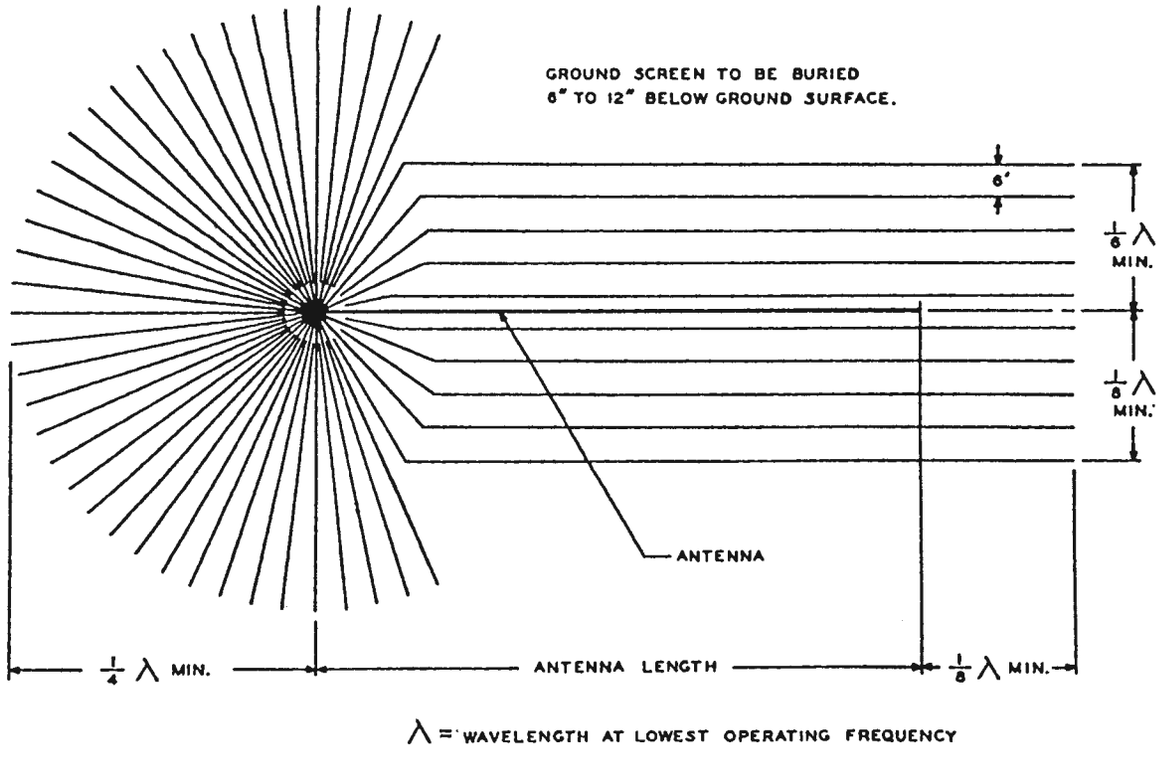


Figure 2-6 Suggested Ground System

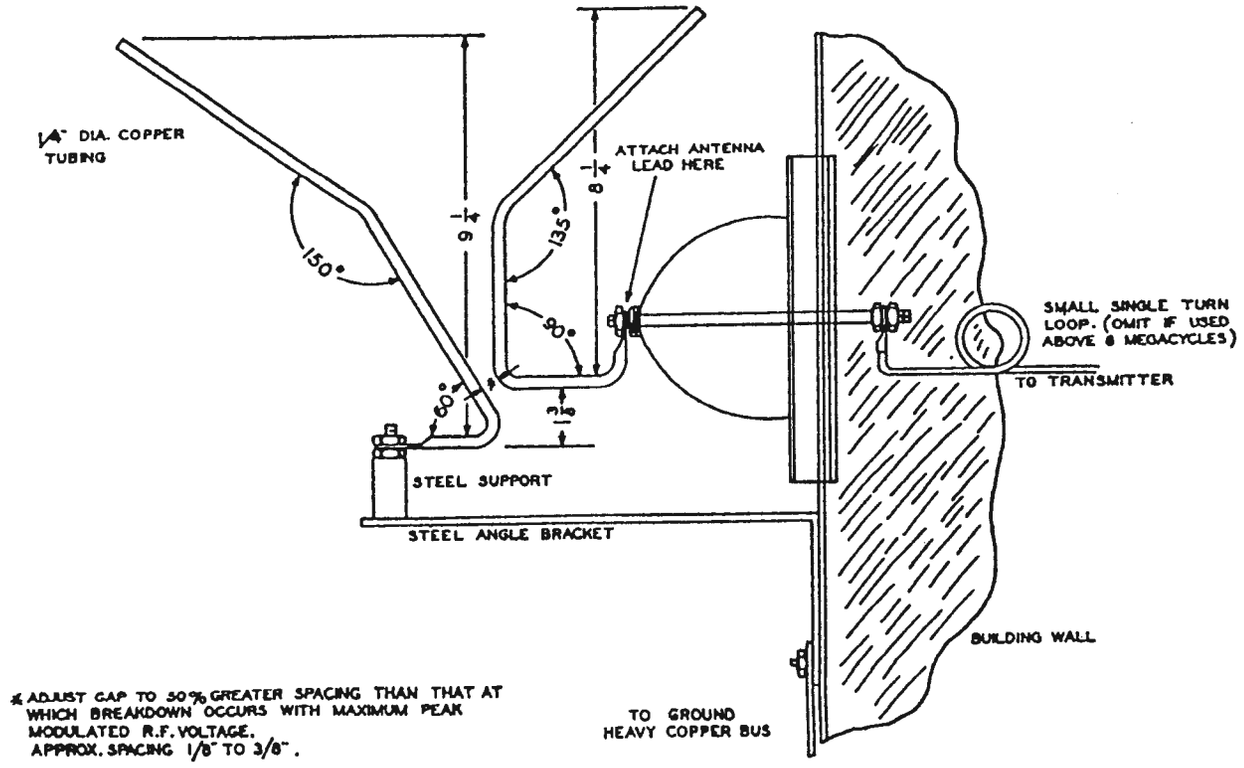
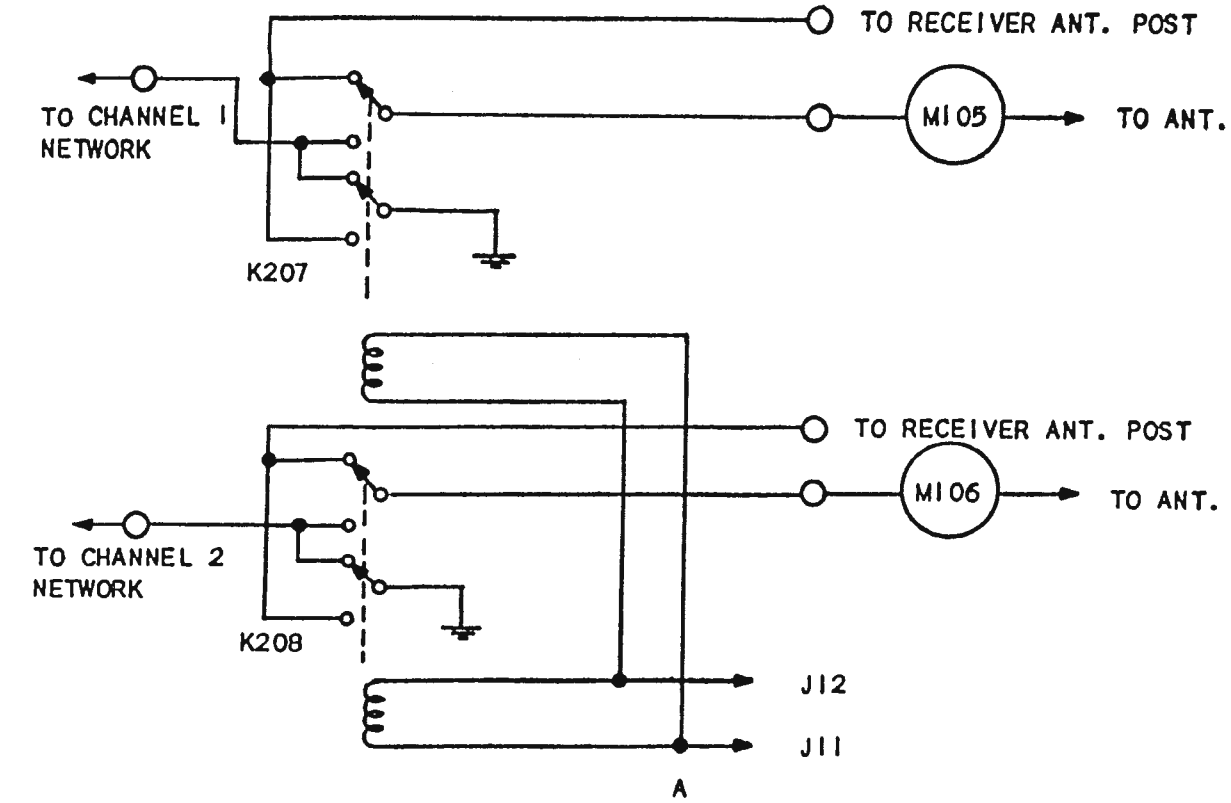


Figure 2-7 Antenna Horn Gap



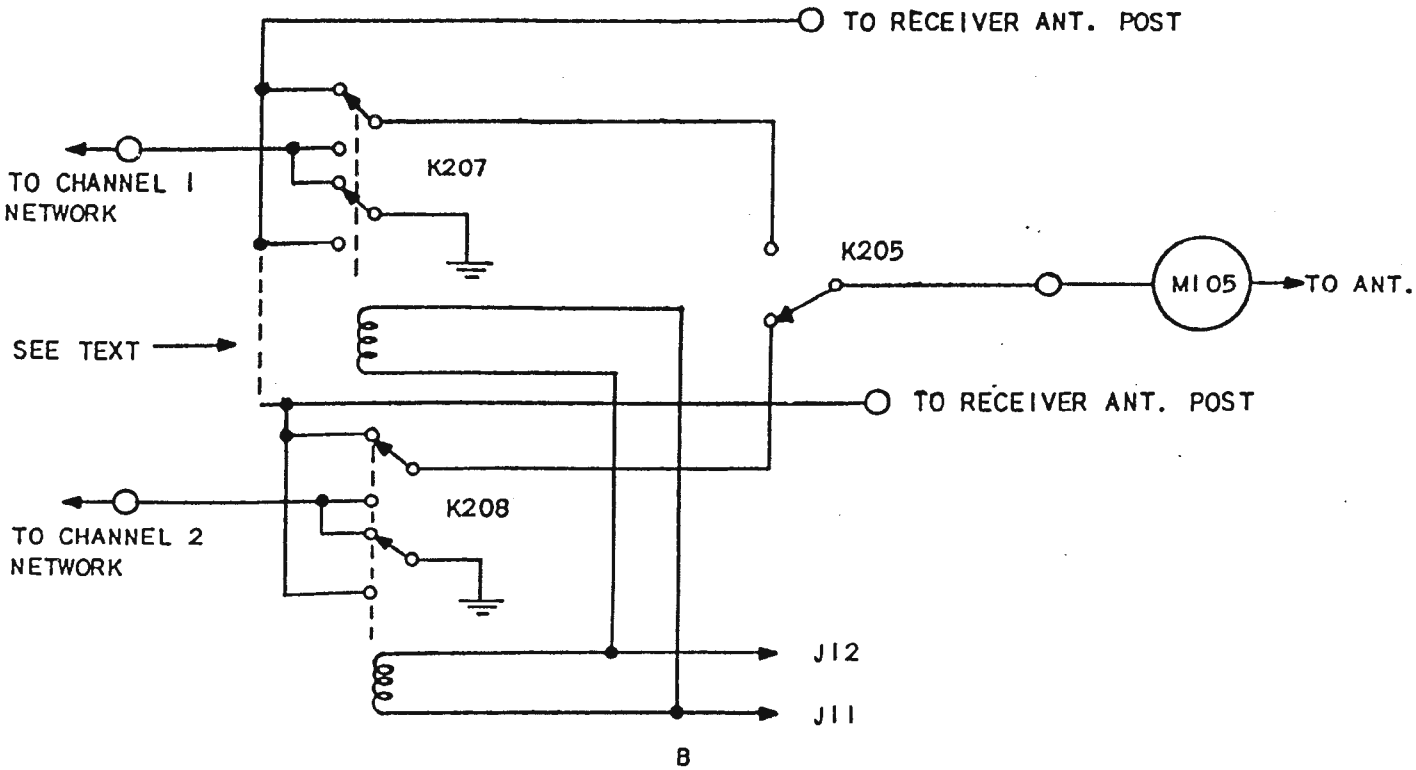


Figure 2-8 Antenna Change-Over Relay Circuits

The antenna connections are made to the terminals at the rear of the transmitter. The ground system should be connected to the terminal on the cabinet base.

(4) REMOTE CONTROL UNIT CONNECTIONS - A 7/8" diameter hole is provided at the cabinet base for entrance of remote control lines if used. Refer to figure 2-4.

In remote control operation using the 177L-2 Remote Control Unit, the distance from which the transmitter may be controlled is determined by the line loss. The loss in the line cannot exceed 25 db nor should the resistance of any wire plus ground return exceed 125 ohms. This represents 2.8 miles for #19 GA telephone cable, 1.4 miles for #22 GA and 0.56 mile for #26 GA. This distance from the transmitter can be extended considerably by using #12 open wire line which can be used up to 15 miles. For the longer distances using the smaller wire, the voltage adjustment tap on the relay supply transformer, T102, should be set on tap number 6. Also, low operating current telephone type relays can be installed in the 175V unit to operate the heavier relays therein.

The 177L Remote Control Unit is connected to the 30K-4 transmitter as shown in the following table:

177L-2 Terminal No.		175V-2 Terminal No.	30K-4 Terminal No. (On Sidewall of Cabinet)
7	Connect to	7	
8	"	6	
9	"		3
10	"		4
11	(to earth GND)		15 (to earth GND)
12	Connect to		10

NOTE

Be sure to remove the jumpers between J5 and 6 and J7 and 8 when using the 175V-2 Relay Unit.

Audio connection between the 175V-2 Relay Unit and the modulator unit is made by a short piece of microphone cable provided for this purpose. This cable is supplied with necessary connectors. Connection is made between J701 and J301.

Notice that terminals 10 and 11 on the 175V-2 Relay Unit connect to N.O. contacts on plate relay K702. These contacts may be used for operating auxilliary apparatus or for muting receivers.

If CW operation is employed when using the 177L Remote Control Unit, jumper terminals 1 and 2 on the rear of the 177L or lock the push-to-talk switch closed.

Carrier Freq. (MCS.)	Total Freq. Mult.	Y101 or Y102 Crystal Freq.	Oscillator Plate L203 or L204		807 Plate L207 or L208		PA Plate L212 or L213		RF Choke L210 or L211	
			Freq. Range	Part No.	Freq. Range	Part No.	Freq. Range	Part No.	Freq. Range	Part No.
2-2.6	1	2-2.6	None	Used	2.0-2.6	503 3828 003		503 3838 003 520 4271 00	2-10	503 3821 002
2.6-3.4	1	2.6-3.4	None	Used	2.6-3.4	503 3829 003		"		"
3.4-4.0	1	3.4-4.0	None	Used	3.4-4.5	503 3830 003		"		"
4.0-4.5	2	2.0-2.25	None	Used	3.4-4.5	503 3830 003		"		"
4.5-6.0	2	2.25-3.0	None	Used	4.5-6.0	503 3831 003		503 3839 003		"
6.0-6.8	4	1.5-1.7	2.6-3.4	503 3829 003	6.0-8.0	503 3832 003		"	6-18	503 3822 002
6.8-8.0	4	1.7-2.0	3.4-4.5	503 3830 003	6.0-8.0	503 3832 003		"		"
8.0-9.0	4	2.0-2.25	3.4-4.5	503 3830 003	8.0-10.5	503 3833 003		503 3840 003		"
9.0-10.5	4	2.25-2.625	4.5-6.0	503 3831 003	8.0-10.5	503 3833 003		"		"
10.5-12	4	2.625-3.0	4.5-6.0	503 3831 003	10.5-14	503 3834 003		"		"
12-14	4	3.0-3.5	6.0-8.0	503 3832 003	10.5-14	503 3834 003		"	10-30	503 3823 002
14-18	6	2.33-3.0	4.5-6.0	503 3831 003	14-18	503 3835 003		503 3841 003		"
18-24	6	3.0-4.0	6.0-8.0	503 3832 003	18-24	503 3836 003		"		"
24-30	6	4.0-5.0	8.0-10.5	503 3833 003	24-30	503 3837 003		503 3842 003		"

NOTE: On frequencies between 2 and 6 mc, a dummy can is plugged into L203 and L204 sockets to make the coil hold-down operative.

(5) TELEGRAPH KEY - For local keying, plug the key into Jack J101 in the base of the 30K-4 and place the LOCAL-REMOTE switch in the LOCAL position and the TEST Switch in the NORMAL position.

For remote keying, plug the key into the key jack on the front of the 177L unit.

(f) CRYSTALS AND INDUCTORS - The transmitter is shipped with crystals and inductors for the two frequency channels specified at the time of purchase. However if a change in operating frequency is contemplated the proper tank circuit inductors may be selected from the table.

NOTE

Before operation of the transmitter is attempted, be sure the flexible plate lead to the 4-125A PA tube does not touch the glass envelope of the tube.

If CW operation is used from the 177L-2 remote unit, terminals 1 and 2 on the rear of the unit should be jumpered, or in lieu of this, the microphone push-to-talk switch can be locked in the ON position.

(g) ANTENNA CHANGE-OVER - The 30K-4 transmitter is equipped with a pair of relays for changing the transmitting antenna from the transmitter output to a receiver input automatically so that the efficiency of the transmitting antenna may be utilized in receiving. These relays, K207 and K208, one for each channel, are a-c operated and are connected to be energized when the carrier is on. Thus energized, the receiver input is grounded and the transmitter output is connected through to the antenna. When the relays are unenergized, the antenna is connected through to the receiver input and the transmitter output circuit is grounded.

The relays may be connected in a number of ways. As shipped from the factory, the transmitter is connected for use with two separate antennas and with facilities for two receivers. In this case, the network switching contacts on K205 are not used and the output terminal of each network is connected through its respective antenna change-over relay to an antenna terminal. The inputs of both receivers will be grounded when transmitting on either channel and likewise, the outputs of each network will be connected to its respective antenna during transmission on either channel. During reception, each receiver input will be connected to its individual antenna.

The transmitter may be connected to supply one of two receivers at a time from one antenna by connecting as indicated in figure 2-8B. In this arrangement, the network output selector contacts on relay K205 are used to shift the antenna from one network to the other when changing channels. One receiver will be connected to the antenna during receiving while the other receiver will be disconnected from the antenna. It is possible to connect the relays together in such a fashion that both receivers are supplied from the same antenna at the same time, at a sacrifice in efficiency, however, by placing a jumper as indicated by the dotted line in figure 2-8B.

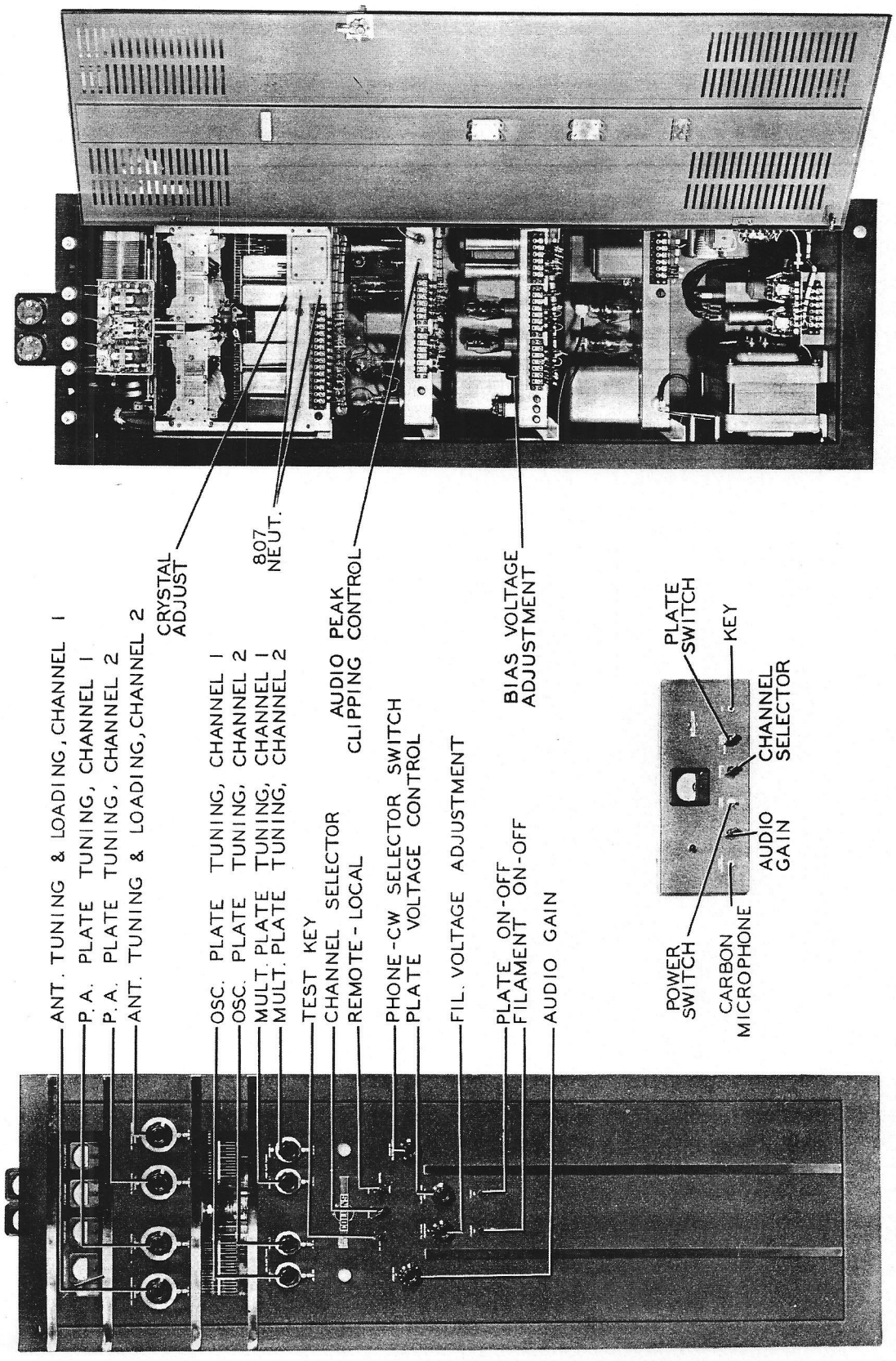


Figure 3-1. Control Functions

If desired, a muting relay with a 115 volt a-c coil can be connected to terminals 11 and 12 in the base of the transmitter cabinet (unit J) to mute the receivers during transmitting periods to prevent undesirable noises being produced by the receivers which sometimes happens when the transmitter and receiver are in close proximity to each other.

SECTION 3

ADJUSTMENT AND OPERATION

OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. OPERATING PERSONNEL SHOULD AT ALL TIMES OBSERVE ALL SAFETY PRECAUTIONS. DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE EQUIPMENT WITH SUPPLY VOLTAGE ON. DO NOT DEPEND UPON DOOR INTERLOCK SWITCH FOR PORTECTION BUT ALWAYS OPEN THE MAIN SWITCH IN SUPPLY LINE TO EQUIPMENT.

3.1. GENERAL. - After the installation wiring is complete and the tubes, fuses, crystals and inductors have been properly positioned in their respective sockets the equipment is ready for initial operational adjustment. All important operating controls are located on the front panel of the transmitter and each is clearly designated as to function. The following paragraphs list the control designations and circuit elements controlled by each. Refer to figure 3-1.

3.1.1. FILAMENT, ON-OFF switch. This switch, S105, energizes or de-energizes the primary windings of the following transformers: T102, T201, T303, T401, and T501.

3.1.2. PLATE ON-OFF switch. This switch, S106, will apply power to the primary winding of T402. If the plate voltage control is in the TUNE or OPERATE position, the primary winding of T101 will be energized, also.

3.1.3. FIL VOLTAGE ADJUSTMENT. This switch, S104, selects taps on the primary winding of the power amplifier and modulator filament transformer; T303, thereby giving a small range in the voltage applied to the tube filament.

3.1.4. PLATE VOLTAGE CONTROL. This switch, S107, has three positions; LV, TUNE and OPERATE. When placed in the LV position no plate voltage is applied to the r-f amplifier or modulator tubes, allowing tuning adjustments to be made on the exciter section of the transmitter and grid of P.A. In the TUNE position a resistor, R101 is connected in series with the primary of the transformer T101 resulting in a reduced voltage on the r-f amplifier and modulator tubes. When rotated to the OPERATE position full plate power is applied to these tubes.

3.1.5. PHONE CW SELECTOR switch. When this switch S109 is placed in the CW position the filament supply voltage to the modulator tubes is removed and the secondary windings of the modulation transformer T302 is short circuited. In the PHONE position the circuits are returned to normal operations.

3.1.6. TEST KEY. The test key, S101, serves to close the carrier control circuit during the time tuning adjustments are being made. If the switch is operated in one direction the key will immediately return to the normal position when released,; if operated in the opposite direction the key will lock to permit the making of tuning adjustments without the necessity of holding the telegraph key closed or the push-to-talk button on the microphone operated.

3.1.7. CHANNEL switch. Either one of the two predetermined frequency channels may be selected by operation of this switch, S102. In the CHANNEL 1 position relays K204 and K205 are energized and relays K202 and K203 are not energized. When S102 is in the CHANNEL 2 position relays K204 and K205 are not energized and relays K202 and K203 are energized.

3.1.8. LOCAL-REMOTE CONTROL switch. Operating this switch, S103, to the REMOTE position, allows the transmitter to be operated by remote control. A type 177L-2 remote control unit is necessary if the distance from the operating position is greater than fifty feet.

3.1.9. OSC PLATE TUNING. The CHANNEL 1 control operates capacitor C206, while CHANNEL 2 control operates C207.

3.1.10. MULT PLATE TUNING. The CHANNEL 1 control operates C212 and the CHANNEL 2 control operates C213.

3.1.11. ANT TUNING & LOADING. The CHANNEL 1 control operates capacitor C218 and the CHANNEL 2 control operates capacitor C223.

3.1.12. PA PLATE TUNING. The CHANNEL 1 control operates capacitor C219 and the CHANNEL 2 control operates capacitor C222.

3.1.13. AUDIO GAIN. The AUDIO GAIN control operates the potentiometer R306. The control permits adjusting of the input to the audio amplifier tube V302. The speech amplifier gain increases as the control is rotated from 0 toward 10.

3.2. ENERGIZING THE EQUIPMENT FOR THE FIRST TIME.

3.2.1. PRECAUTIONS - Before applying any voltage to the transmitter a thorough inspection of all connections should be made for tightness and clearance to structural parts which are at ground potential.

It is suggested the installation engineer read this complete section before beginning tuning adjustments. After this he will be able to make proper adjustments for the particular coil combinations which will be used.

3.3. ADJUSTMENT PROCEDURE.

3.3.1. RF ADJUSTMENTS.

(a) Place the FILAMENT power switch in the ON position. Make certain the PLATE power switch is in the OFF position.

(b) Adjust the filament voltage of the modulator and the r-f final amplifier tubes to 5 volts as indicated on the FILAMENT VOLTAGE meter using the FIL VOLTAGE ADJUSTMENT knob located directly above the filament switch on the front panel.

NOTE

On some units, the magnetic flux from K204 causes Filament Voltmeter M103 to fail to return to zero. Due to the construction of the AC voltmeter, the error will not exceed 0.1 to 0.2 volt at the measured voltage, and will generally cause the meter to read high by that amount. This should cause no difficulty since the accuracy is still within that required for control of the filament circuits. It will also be noted that during excitation of the relay K204 an even further error is introduced. It is suggested that all measurements of filament voltage be conducted with the channel selector on Channel 2. Permit the equipment to operate in this manner, with only the filament power only turned on, for a period of 15 minutes. This will allow the 866A rectifier tubes to attain proper operating conditions. Such a procedure is necessary only when new rectifier tubes are placed in service. The filament voltmeter, M-~~301~~ 103, has been set to zero properly when it was not adjacent to other meters nor relay K-204. It will normally read below zero when placed in the transmitter with no filament power applied, but this adjustment will give the most accurate reading with 5 volts.

(c) Operate the PHONE-CW switch to the CW position. Set the AUDIO GAIN at 0.

(d) Operate the REMOTE-LOCAL control switch to the LOCAL control position.

(e) Operate CHANNEL selector switch to either CHANNEL 1 or CHANNEL 2. The channel selected will depend upon the position of the frequency determining components such as crystals and inductors.

(f) Place the PLATE VOLTAGE control in the LV position.

(g) Operate the PLATE switch to the ON position.

(h) Operate the TEST switch.

(i) Adjust the OSC PLATE TUNING control, if OSC coil is used, until maximum grid current is indicated on meter, M201. If OSC coil is not used, (on output frequencies below 6 mc) set the control at 100 on the dial. If, after tuning the MULT PLATE TUNING, (see below) the 4-125A grid current is greater than 15 ma turn the OSC PLATE TUNING control in the direction of decreasing dial numbers thereby increasing capacity in the circuit which will decrease the drive to the 807 multiplier tube and reduce the 4-125A excitation.

(j) Adjust the MULT PLATE TUNING control, for the channel which is being used, until maximum grid current is indicated by the PA GRID CURRENT meter. A reading of 12 to 15 ma should be obtained. If the final grid drive is too great it may be adjusted by detuning the OSC PLATE TUNING control slightly in the direction of smaller numbers on the dial scale (only when the output frequency is less than 6 mc).

NOTE

12 to 15 ma grid current is best, but any grid current from 10 to 20 ma will give satisfactory operation. These grid current values should be obtained with plate power on and at full load since the grid current may drop slightly when the PA is loaded in the higher frequencies.

(k) Set the ANTENNA TUNING & LOADING control at half capacity and with the PLATE VOLTAGE control in the TUNE position and the LOCAL-REMOTE control switch in the LOCAL position, apply PLATE power.

NOTE

Maximum capacity on all tuning dials is at "0" on the dial.

(l) Operate the TEST switch and immediately attempt to resonate the power amplifier plate tank circuit by operating the PA PLATE TUNING. Resonance will be indicated by a sharp dip in current on the PA PLATE CURRENT meter, M101. If resonance cannot be established, change the position of the inductor tap and make another attempt to resonate the circuit.

NOTE

If the tap on the inductor happens to fall in a position which leaves more than 50% of the turns unused the unused portion should be shorted out. This is easily done by soldering a short piece of heavy bus between the cold end of the coil and the coil rider right at the lugs on the connecter pins.

(m) Operate the TEST KEY and using the ANTENNA TUNING & LOADING control, load the power amplifier stage until the PA PLATE CURRENT meter indicates 80 ma. While increasing the loading with the ANTENNA TUNING & LOADING control, keep the tank circuit in resonance with the PA PLATE TUNING control.

(n) Operate the PLATE VOLTAGE control to the OPERATE position and repeat step (m) until the PA PLATE CURRENT meter indicates 200 ma.

(o) Repeat the above tuning procedure for the other frequency channel.

NOTE

Do not operate the CHANNEL selector switch with the PLATE power ON.

3.3.2. VOICE OPERATION ADJUSTMENTS.

(a) TUNING ADJUSTMENTS - The tuning adjustments for type A3 emission are identical to those just outlined except that the r-f power amplifier should be loaded to 150 ma in step 3.3.1. (m). The PHONE-CW switch should be in the PHONE position.

CAUTION

Do not operate the PHONE-CW switch while the plate power is ON. Always turn the PLATE power switch to the OFF position before operating the PHONE-CW switch.

The modulator static plate current (no modulation) should be adjust to 45 ma by rotating the MODULATOR BIAS control at the rear of the speech amplifier and modulator unit with the transmitter fully operating. This will have to be done by steps since opening the rear door operates the interlock switch and turns the plate power off.

CAUTION

When applying plate power to the modulator tubes for the first time, immediately check the modulator static (resting) plate current. If over 45 ma, adjust before attempting further operation; otherwise, the modulators may become damaged.

(b) AUDIO ADJUSTMENTS.

(1) REMOTE CONTROL ADJUSTMENTS - This transmitter has been designed for remote operation from a type 177L-2 remote control unit. The distance from which the transmitter may be controlled is determined by the line loss. The loss in the line cannot exceed 25 db. The procedure outlined below should be followed in making preliminary adjustments.

(a) Apply filament and plate to the tubes in the 177L-2 unit by operating the ON-OFF switch to the ON position. (The transmitter FILAMENT and PLATE switches must be in the ON positions at all times REMOTE operation is desired.)

(b) When the tubes in the remote control unit have reached operating temperature, rotate the 177L-2 gain control in a clockwise direction until the AUDIO LEVEL meter, M801, indicates 0 db (zero level corresponds to 6 mw into 500 ohms) on peaks when talking in a normal tone into the microphone.

(c) With the transmitter AUDIO GAIN control set at 1/3 ON position, adjust the audio control R701 in the 175V-2 Relay Unit for desired modulation. (When speaking into the remote microphone.)

(2) TRANSMITTER ADJUSTMENTS.

(a) SPEECH CLIPPER OUT - The percentage of modulation at which speech clipping occurs has been chosen at 100% and the modulation control locked at the factory. If speech clipping is not desired, merely adjust the AUDIO GAIN control on the front panel until approximately 125 ma MODULATOR PLATE current is obtainable on heavy modulation peaks.

In the event speech clipping is dispenced with entirely, the 6H6 clipper tube can be removed from its socket in the modulator unit. This is not recommended however, since the clipper does prevent overmodulation.

(b) SPEECH CLIPPER IN - The clipper level adjustment on the rear of the speech unit was set at the factory using the following procedure. The transmitter was loaded for normal power input and a 400 cycle sine wave audio tone fed into the microphone input. The clipper level adjustment was then set at approximately 1/5 turn back from the full clockwise position. The audio gain control was then advanced until approximately 75% modulation was observed on an oscilloscope screen, after which the audio input was increased just 12 db and the clipper level control adjusted so that 100% modulation was reached. This procedure is repeated if necessary so that 12 db increase in audio level raises modulation to just under 100%.

The amount of speech clipping can be adjusted by the AUDIO GAIN control. With the control in an advanced position, a greater amount of sideband power is obtained because of the high modulation average. With the control set thus, however, a quiet operating position is desirable because of the higher overall audio gain with resulting higher room noise. Where the background noise is objectionable a noisecancelling microphone is recommended.

NOTE

Since clipping over 6 db results in less desirable quality, even though the intelligibility may be better for working through interference, the signal should be monitored and the audio gain adjusted to the point which produces a balance between more audio power and good quality.

3.4. TYPICAL METER READINGS.

3.4.1. PHONE EMISSION
PA PLATE CURRENT - 150 ma
PA GRID CURRENT - 12-15 ma
MULTIPLIER GRID CURRENT - 0-4 ma
MODULATOR PLATE CURRENT - STATIC - 45
100% MOD (Sine wave) - 150 ma

FILAMENT VOLTAGE - 5 v

3.4.2. CW EMISSION
PA PLATE CURRENT - 200 ma
PA GRID CURRENT - 12-15 ma
FILAMENT VOLTAGE - 5 v
MULTIPLIER GRID CURRENT - 0-4 ma

SECTION 4

CIRCUIT DESCRIPTION

4.1. GENERAL.

The Collins Type 30K-4 has two r-f channels, each of which may be pretuned to any frequency between 2.0 and 30.0 mc. Switching from one to the other is accomplished instantaneously by means of relays. A stable crystal controlled oscillator is followed by a stage employing an 807 tube which serves as a buffer, doubler and driver. A single high efficiency tetrode is used in the output stage. The audio circuit is designed especially for voice communication.

4.2. PRIMARY POWER CIRCUITS.

Refer to figure 4-1. The filament transformers T201, T303, T403, and T501, bias supply transformer T401 and relay voltage transformer T102 are energized when the FILAMENT switch, S105, is closed. The FILAMENT switch disconnects all power to the transmitter and must be on for REMOTE as well as LOCAL operation. Each of the above transformers is protected by a fuse. The filament voltage applied to the modulator and r-f power amplifier tubes may be adjusted by operation of S104. The low voltage transformer T402 and high voltage plate transformer T101 are energized by operation of plate relay K401 which is operated when the PLATE switch is closed. Because the relay coil energizing voltage is obtained from the bias supply, the possibility of applying plate power to modulator and r-f power amplifier with no fixed bias present is eliminated. A plate primary interlock switch, S108, is operated by the rear access door. When placed in the TUNE position the PLATE VOLTAGE CONTROL switch, S102, reduces the primary voltage on the high voltage plate transformer, T101, during the tuning procedure.

NOTE

The door interlock switch, S108, should not be made inoperative under any circumstances.

4.2.1. RECTIFIER POWER SYSTEM. - The type 30K-4 employs three separate d-c power circuits. These consist of a bias supply, a low voltage supply for the speech amplifier and low level r-f stages, and a high voltage supply for the modulator and r-f power amplifier stages. The bias supply employs a type 5R4GT tube, V401. The d-c output of the supply is approximately -145 volt. Provision is made for bias voltage adjustment on the modulator grids. The low voltage plate supply uses a 5R4GY tube, V402, in the rectifier circuit. The d-c output voltage is approximately 500 volts. The high voltage supply employs two type 866A tubes in a single phase full wave rectifier circuit. It supplies plate power to the r-f power amplifier and modulator tubes. The d-c output voltage of the high voltage supply is 2500 volts.

4.3. CARRIER CONTROL CIRCUITS

The carrier control circuits of the transmitter are outline in figure 4-2. The CHANNEL switch, S102 will function only when the LOCAL-REMOTE switch, S103 is in the LOCAL position. When S103 is in the REMOTE position the desired channel may be selected from the remote control unit. When S103 is in the LOCAL position the key circuit is made operative and the auxiliary plate relay, K702, contacts are shorted allowing the transmitter plate switch, S106, to have control, the filament relay, K701 circuit is closed so the transmitter FILAMENT switch, S105, will remove all filament power. The keying relay, K201, interrupts the crystal oscillator plate and the mult. screen circuits. The plate voltage relay, K401, receives its energizing voltage from the bias supply and will not operate until bias voltage is being applied to the modulator and r-f power amplifier tubes. 2-1/2 pair of telephone lines and ground return are used to connect the type 177L-2 remote control unit and the transmitter. The resistance of any wire and ground return should not exceed 200 ohms. If the operating controls (microphone, push-to-talk switch, key, relay control) are located at a distance no greater than 50 feet from the transmitter, a remote control unit will not be required.

4.4. RF CIRCUITS

4.4.1. OSCILLATOR. - A type 6V6GT tetrode, V201, is employed in a stable crystal controlled oscillator circuit. The proper crystal for operation on either channel one or channel two is selected by contacts on relay K202. Another group of contacts on ~~this relay~~ K202 connect the desired osc plate tank components in the circuit. Screen voltage for the oscillator is supplied through the dropping resistor, R203.

4.4.2. MULTIPLIER. - The multiplier stage uses a type 807 tube, V202. Grid current is indicated by M201. A voltage divider composed of resistors R209 and R210 supplies screen voltage for the exciter tube.

4.4.3. RF POWER AMPLIFIER. - The r-f amplifier uses a high efficiency tetrode. The proper grid circuit components are connected in the circuit by relay, K203. The desired output network is connected by relay, K204.

4.4.4. RF OUTPUT CIRCUIT. - The output circuit employed in the 30K-4 transmitter consists of a pi section plate tank circuit. It is designed to operate over the frequency ranges 2000 to 30,000 kc by means of plug-in coils. It is designed to operate into an unbalanced transmission line or antenna.

4.5. AUDIO CIRCUITS.

4.5.1. GENERAL. - A high gain preamplifier is followed by a two stage audio

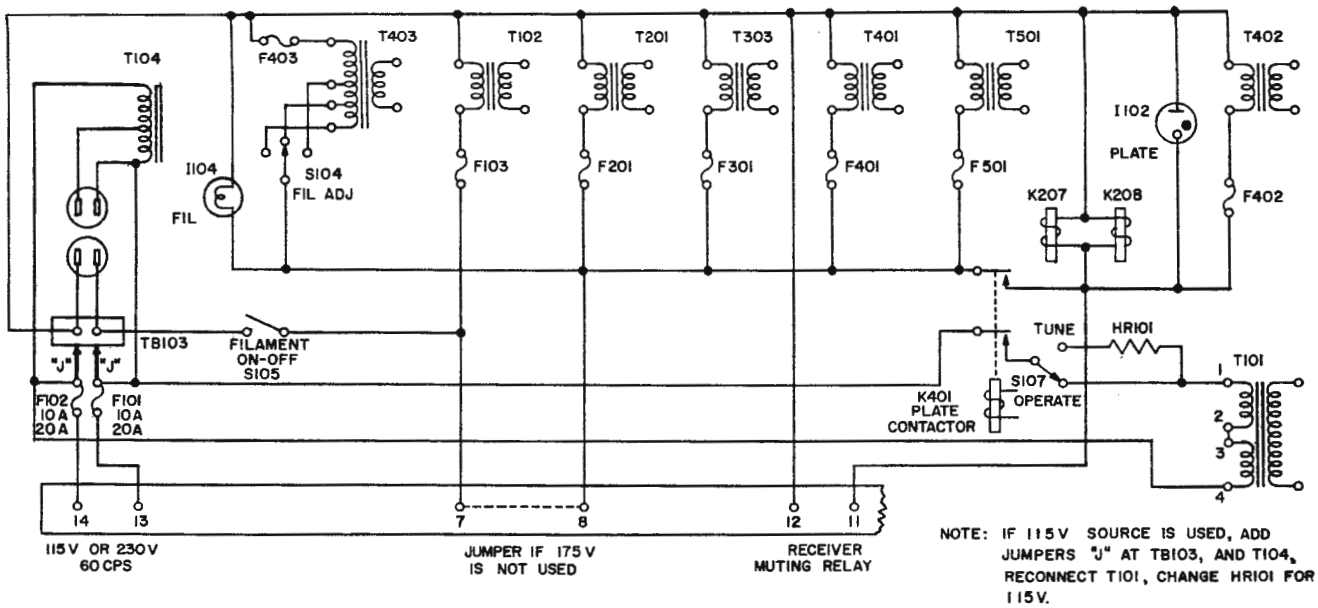


Figure 4-1. Primary Power Circuit

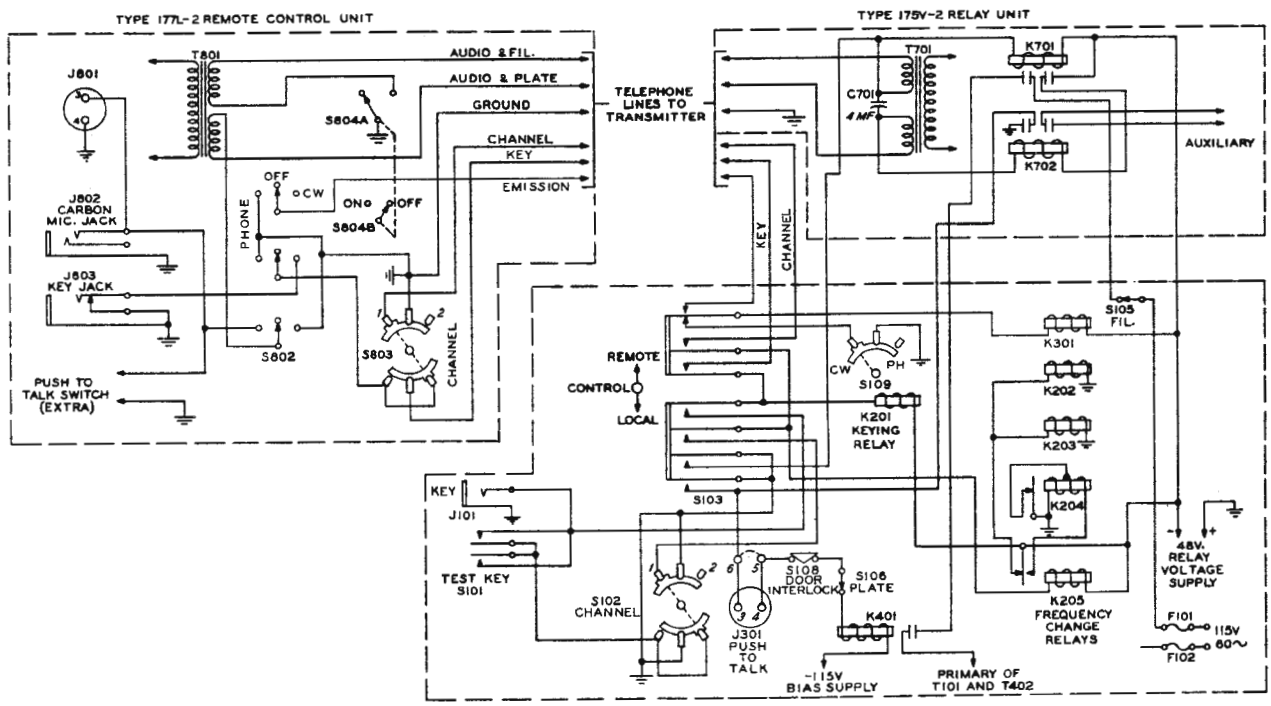


Figure 4-2. Carrier Control Circuits

amplifier which is shunted by a peak clipper tube. The output of the amplifier is followed by the modulator driver stage, which in turn is followed by the class B modulator. Full 100% modulation is attained with the use of any high impedance microphone such as a crystal or high impedance dynamic. The peak clipper limits or clips both the negative and the positive audio peaks, (if clipping is desired) thus preventing overmodulation while allowing a more powerful side band to be transmitted. A low-pass filter attenuates all speech frequencies over 4000 cps.

4.5.2. SPEECH AMPLIFIER CIRCUITS. A type 6SJ7 pentode, V301 is employed as a high gain voltage amplifier. Following the preamplifier is a type 6SN7 dual triode tube, the first section of which precedes the 6H6 clipper tube. Refer to figure 4 3. The type 6H6 clipper tube V303, is shunted across the audio input to the second section of the type 6SN7 audio amplifier tube. The cathode of one section of the type 6H6, pin number 4, is operated at a small fixed value of positive potential by virtue of being connected through reactor L301, resistor R310 to a tap on the cathode resistors R311, R312, and R313. This positive cathode potential biases the corresponding diode plate and no current flows through this section of the tube. However, when the magnitude of the negative audio peaks applied to the diode cathode become large enough to overcome the fixed positive potential, current flows through this section of the diode and the negative audio peak is limited or clipped by the short circuiting action of the diode. Likewise, the cathode of the second section of the clipper tube is returned to a tap on the type 6SN7 amplifier cathode resistor which is more positive than the tap where its corresponding plate is attached. Thus the plate of the second section of the type 6H6 is more negative than the cathode and no current flows. When a positive audio peak of sufficient magnitude reaches this diode plate the fixed negative bias is overcome and current flows through the second section of the diode and the positive audio peak is limited or clipped. Because of the above action the audio output of the second section of the audio amplifier tube cannot rise above the fixed level. Therefore, it is possible to set the degree of maximum modulation with the peak clipper control, R315, and to be assured that the percentage of modulation will not rise above the chosen amount.

4.5.3. MODULATOR DRIVER CIRCUITS. The output from the second section of the type 6SN7 dual triode tube is coupled to the grid of the driver tube, V304, through capacitor C310 and the clipper control R315. A type 6B4G power amplifier triode, drives the grids of the class B modulator tubes through transformer T301.

4.5.4. MODULATOR CIRCUIT. - A pair of type 75th triode power amplifier tubes are employed as modulators operating in class B service. Excitation for the modulator grids is obtained through the driver coupling transformer T301. Both the screen and the plate of the r-f power amplifier tube are modulated by individual secondary windings on the modulation transformer T302. When switching to CW emission, the modulator filaments are turned off and the power amplifier plate winding in the modulation transformer is short circuited. Plate voltage for the audio amplifier and driver stages is obtained from the low voltage supply while plate voltage for the modulator tubes is obtained from the high voltage supply. Screen voltage for the power amplifier tube is also taken from the low voltage supply. Grid bias for all audio tubes except the modulators is obtained from cathode resistors. The modulators are biased by voltage from the bias supply. A potentiometer, R401, located at the rear of the low voltage power supply unit is used for adjustment of the modulator bias.

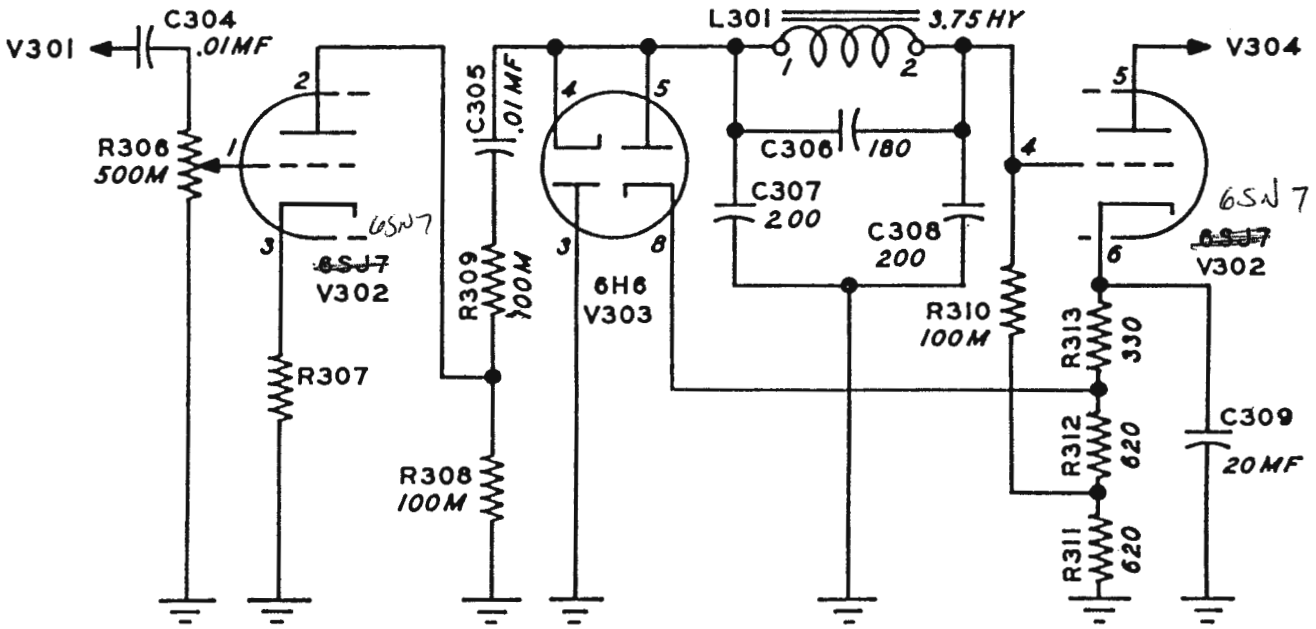


Figure 4-3 Audio Peak Clipper Circuit

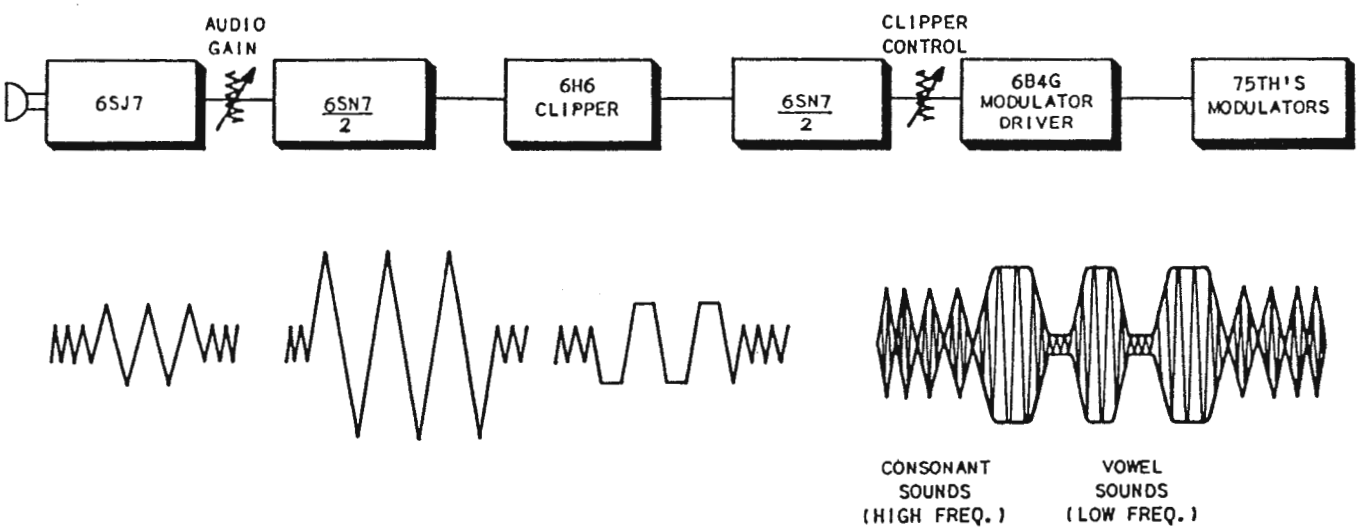


Figure 4-4 Clipper Waveform Illustration

SECTION 5

MAINTENANCE

This radio equipment is constructed of materials considered to be the best obtainable for the purpose, and has been carefully inspected and adjusted using accurate test equipment. No one but an authorized and competent service technician equipped with proper test facilities should be permitted to service the equipment.

5.1. ROUTING INSPECTION SCHEDULES.

Routine inspection schedules should be set up for periodic checks of the equipment. This inspection should include examination of the mechanical system for excessive wear or binding and of the electrical system for electrical defects. Make a check of the emission characteristics of all tubes. See that all tubes are replaced correctly and fully in their sockets, and that good electrical contact is made between the prongs of the tube and socket. Check all relays for proper operation and inspect relay contacts to make certain that the contact surfaces are clean and free from pits and projections. Make certain that contacts of all receptacles and plugs, such as microphone, key and cable connectors, are clean and make firm mechanical connections between one another. If the routine inspection of the equipment is carried out faithfully, the changes of improper operation of the equipment is greatly minimized. It is, therefore, important that this inspection be made at least once each month and it should be sufficiently thorough to include all major electrical circuits of the equipment.

5.1.1. CLEANING. - The greatest enemy to uninterrupted service in equipment of this type is corrosion and dirt. Corrosion itself is accelerated by the presence of dust and moisture on the component parts of the assembly. It is impossible to keep moisture out of the equipment in certain localities buth foreign particles and dust can be removed by means of a soft brush and dry, oilfree jet of air. Remove the dust as often as a perceptible quantity accumulates in any part of the equipment. It is very important that rotating equipment, such as variable condensers and tap switches, be kept free of dust to prevent undue wear. Likewise, variable condenser plates should be kept free from dirt to avoid flashover on modulation peaks.

One of the predominant sources of trouble in equipment located in a salt atmosphere is corrosion. Corrosion resulting from salt spray or salt laden atmosphere may cause failure of the equipment for no apparent reason. In general, it will be found that contacts such as tap switches, tube prongs, cable plug connectors and relay contacts are most affected by corrosion. When it is necessary to operate the equipment in localities subject to such corrosive atmosphere, inspection of wiping contacts, cable plugs, relays etc., should be made more frequently in order to keep the equipment in good condition.

5.1.2. VACUUM TUBES. - Make a check of emission characteristics of all tubes. After the emission check, examine the prongs on all tubes to make sure that they are free from corrosion. See that all tubes are replaced correctly and fully in their sockets, and a good electrical contact is made between the prong of the tube and socket. Use caution in removing and replacing grid or plate caps on tubes. Before a tube is discarded, make certain that the tube is at fault and the trouble is not a loose or broken connection within the equipment. A complete set of tested tubes of the same type specified should be kept on hand at all times. If faulty operation of the transmitter is observed and tube failure suspected, each tube may be checked by replacing it with a tube known to be in good condition. Defective tubes causing an overload in power circuits may usually be located by inspection. It will be found that excessive heating or sputtering within the vacuum tubes is a good indication of a fault in the tube circuit.

If tubes have been in use for a period of time equal to or exceeding the manufacturer's tube life rating, it is suggested that they be replaced. A marked improvement in the performance of the equipment is usually noticeable after the weak tubes have been replaced.

(a) PRECAUTIONS FOR SATISFACTORY TUBE LIFE.

(1) Before any tube is removed from the equipment, make certain the primary power is disconnected from the equipment.

(2) Operate all tubes within $\pm 5\%$ of rated filament voltage.

(3) Do not exceed the rated plate current of any tube during normal operation of the equipment.

(b) TUBE REPLACEMENT PRECAUTIONS.

(1) All tubes are removed by pulling straight up on them.

(2) Remove plate cap connectors with great care to prevent breaking the seal around the plate cap. Grid and plate cap adaptors are used on the modulator tubes. To prevent glass breakage when changing tubes, lay the tube on its side on a table, grasp the adaptor with a pair of pliers and loosen the set screws with a bristo wrench. When tightening the set screws on the new tube, be sure and hold the adaptor with the pliers.

(3) Before the tube is inserted, make certain that the type of tube is correct for the socket into which it is being placed.

5.1.3. RELAYS. - All relays should be inspected at regular intervals. Check the contacts for proper alignment, pitting and corrosion. Use a burnishing tool to clean contacts, never use sandpaper or emery cloth.

5.2. TROUBLE SHOOTING.

5.2.1. GENERAL. - If the section of the equipment in which the fault occurs can be isolated, the trouble may be located with a minimum of effort. Continuity checks and voltage measurements in circuits still operative may be helpful in isolating the trouble. For this purpose, an a-c, d-c voltmeter having an internal resistance of not less than 20,000 ohms per volt and equipped with a battery for continuity and resistance measurements is necessary. An oscilloscope is very useful in tracing faults in r-f and a-f circuits.

A frequent cause of trouble in equipment of this type is tube failure. If trouble occurs in the equipment, isolation of the circuit at fault is helpful in determining the location of the defective tube. Defective tubes which cause an overload in power circuits may usually be located by inspection. Low emission tubes may be the cause of erratic or poor performance of the equipment. If there is any doubt concerning the emission of any tube, it should be checked and immediately replaced if found defective. Tubes with electrical noises can cause excessive distortion or hum. This fault may be difficult to isolate to a particular tube. However, a tube suspected of faulty operation may be checked by replacing with a like tube known to be in good condition.

5.2.2. ISOLATING THE TROUBLE.

(a) Check the position of all controls to determine if they have been accidentally moved from the normal operation position.

(b) A check of all fuses should be made to determine the power circuit affected by the trouble. Fuse failure should be replaced only after the circuit in question has been carefully examined to make certain no permanent fault exists. Always replace a fuse with one having a rating specified in the following table.

FUSE TABLE

Symbol	Circuit Location	Type	Rating
F101	Primary power source line	Screw base	15 amp
F102	Primary power source line	Screw base	15 amp
F103	Relay voltage supply transformer primary	Cartridge Slo-Blo	1/2 amp
F201	Exciter filament transformer primary	Cartridge Slo-Blo	1/2 amp
F301	Speech amplifier filament transformer primary	Cartridge Slo-Blo	1/2 amp

Symbol	Circuit Location	Type	Rating
F401	Bias supply transformer primary	Cartridge (3AG)	1/2 amp
F402	LV power supply transformer primary	Cartridge (3AG)	3 amp
F501	HV rectifier filament transformer primary	Cartridge (3AG)	1 amp
F801	Type 177L-2 Remote Control Unit	Cartridge (3AG)	1/4 amp

(c) Check the circuits in the sequence by which they are made operative in starting the transmitter.

(d) Compare the transmitter meter readings with the typical readings given under operational data in Section 3.

(e) Make a visual inspection of all tubes, resistors and chokes. Tubes may be sputtering indicating shorts or their plates may show color indicating a heavy current drain. Resistors and chokes may be discolored by passing large amounts of current.

5.2.3. POWER SUPPLY TROUBLES. - The following chart lists troubles often encountered in power supply systems and causes and corrections of each:

(a) FAILURE OF FILAMENT SUPPLY VOLTAGE.

Symptoms	Possible Cause of Trouble	Remedy
1. No filament voltage applied to any one certain tube in the equipment.	1. a. Associated fuse in primary circuit is open.	1. a. Replace fuse.
	b. Defective filament transformer.	b. Replace transformer if found to be defective.
2. Filament pilot lamp does not light.	2. Filament pilot lamp defective.	2. Replace lamp.

(b) FAILURE OF PLATE VOLTAGE SUPPLY. - High voltage supply does not come on when PLATE supply switch is operated.

Symptoms	Possible Cause of Trouble	Remedy
1. Plate pilot lamp does not light and the meters indicate no plate current on modulators or power amplifiers.	1. a. Defective plate relay, K401. 2. Defective door switch. 3. Defective plate switch. 4. If 177L-2 used: Open telephone line or defective plate switch or push-to-talk button.	1. Replace component if found defective. 2. Same as above. 3. Same as above. 4. Same as above.

(c) LV OR BIAS VOLTAGE SUPPLY FAILURE.

Symptoms	Possible Cause of Trouble	Remedy
1. No indication of plate or screen voltages on oscillator, multiplier or audio amplifier tubes.	1. a. Fuse, F402, is open. b. Defective rectifier tube, V402. c. Open filter choke L402. d. Shorted filter capacitors.	1. In the event a defective component is isolated, it should be replaced with one known to be in good condition.
2. No bias voltage on modulators or r-f final amplifier tubes.	2. a. Fuse, F402, is open. b. Defective rectifier tube V401. c. Open filter choke L401. d. Shorted filter capacitors.	2. In the event a defective component is isolated, it should be replaced with one known to be in good condition.

5.2.4. RADIO FREQUENCY TROUBLE.

Symptoms	Possible Cause of Trouble	Remedy
1. No drive to PA	1. a. Defective crystal.	1. a. Replace crystal.
	b. Defective tube, open r-f coil.	b. Replace defective component.
	c. Channel change relay contacts dirty.	c. Burnish contacts.
2. PA does not resonate.	2. a. Antenna or transmission line characteristics changed.	

5.2.5. AUDIO SYSTEM TROUBLES.

(a) DISTORTION. - Very little distortion, except when clipping, is likely to occur with this equipment. However, if distortion is at all noticeable, the following checks should help to locate and correct it:

Check the static plate current on the modulators. This current should be approximately 45 ma for best operation. This value can be obtained by adjusting the bias on the modulators.

Replace the audio amplifier tubes with tubes known to be good.

Distortion may sometimes be difficult to locate. It may require a step by step method of testing with the oscilloscope until the point is reached where the distortion occurs.

5.3. REPLACEMENT OF PARTS.

The detailed tabular parts list which follows in the next section of this instruction book will aid in the choice of correct replacement parts.

5.4. CRYSTAL DATA.

a. Crystal frequency: In the range 1.5 mc to 5.0 mc as shown in the following table:

Channel Freq. in MC	Divide by	Crystal Freq. in MC
2.0 to 4.0	1	2.0 to 4.0
4.0 to 6.0	2	2.0 to 3.0
6.0 to 8.0	4	1.5 to 2.0
8.0 to 14.0	4	2.0 to 3.5
14.0 to 30.0	6	2.333 to 5.0

b. Temperature Coefficient: not exceeding 2 PPM/°C over the total range, nor exceeding 4 PPM/°C over any 10° increment.

c. Calibration ±.005% at 25°C in correlated test oscillator.

d. Activity: .5 ma minimum rectified grid current.

e. Crystal Cut: AT

f. Crystal Bland Size: 1" square.

g. Electrodes: Air gap type preferably monel.

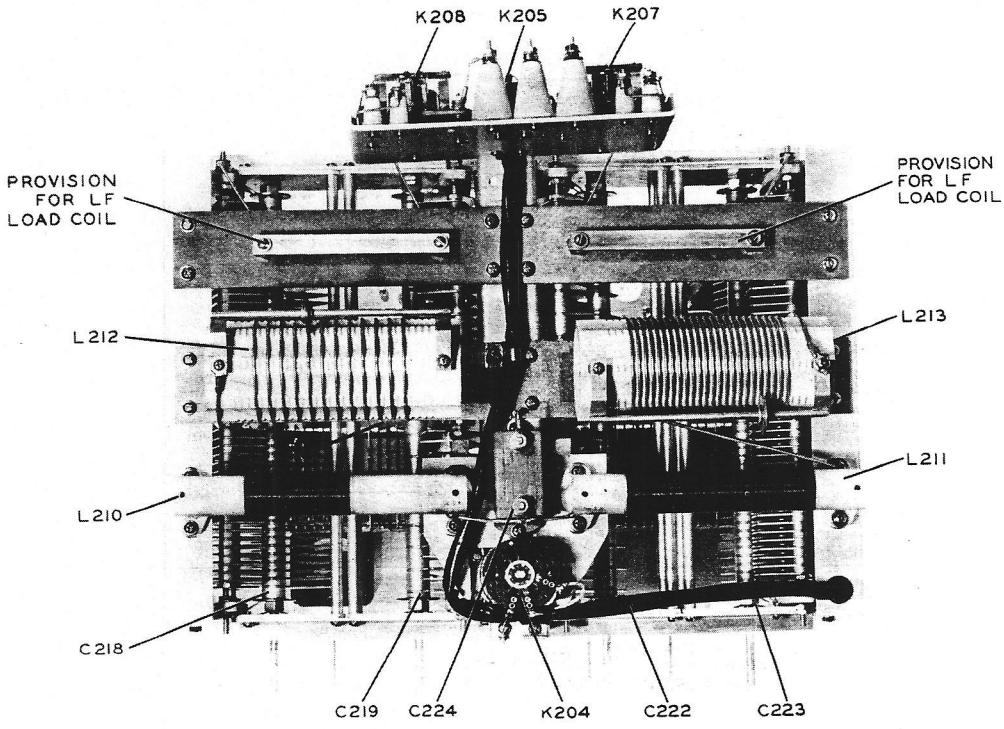


Figure 5-1. RF Output Network, Parts Arrangement - Top

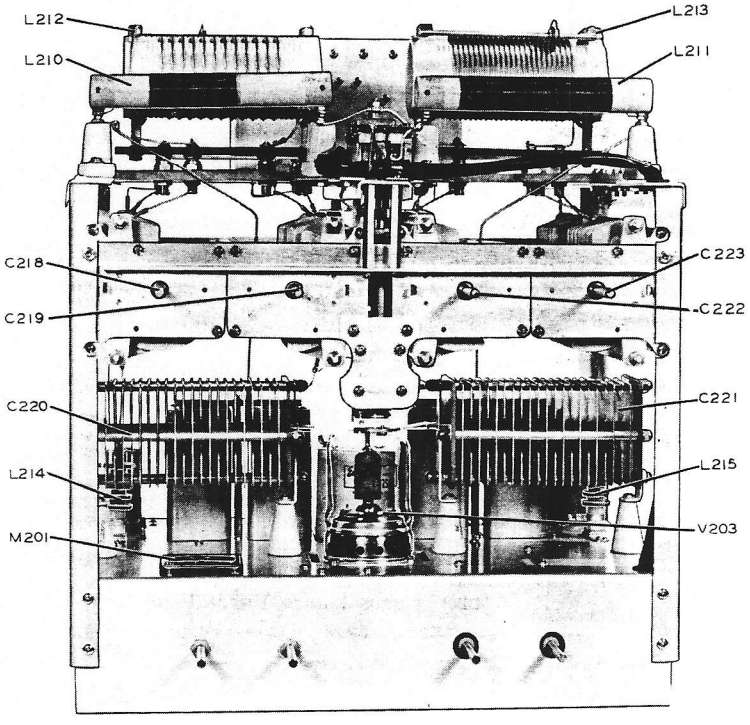


Figure 5-2. RF Exciter, Amplifier and Output Network, Parts Arrangement - Front

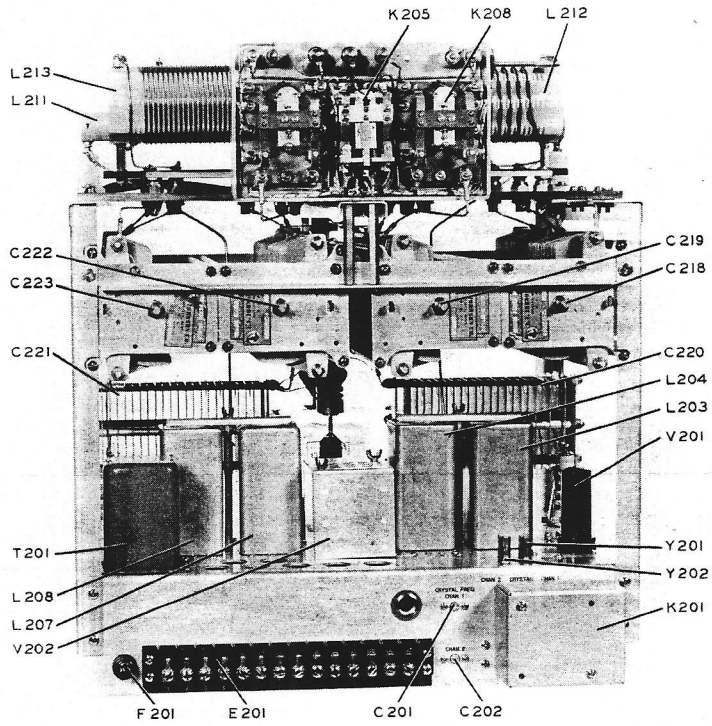


Figure 5-3. RF Exciter, Amplifier and Output Network, Parts Arrangement - Rear

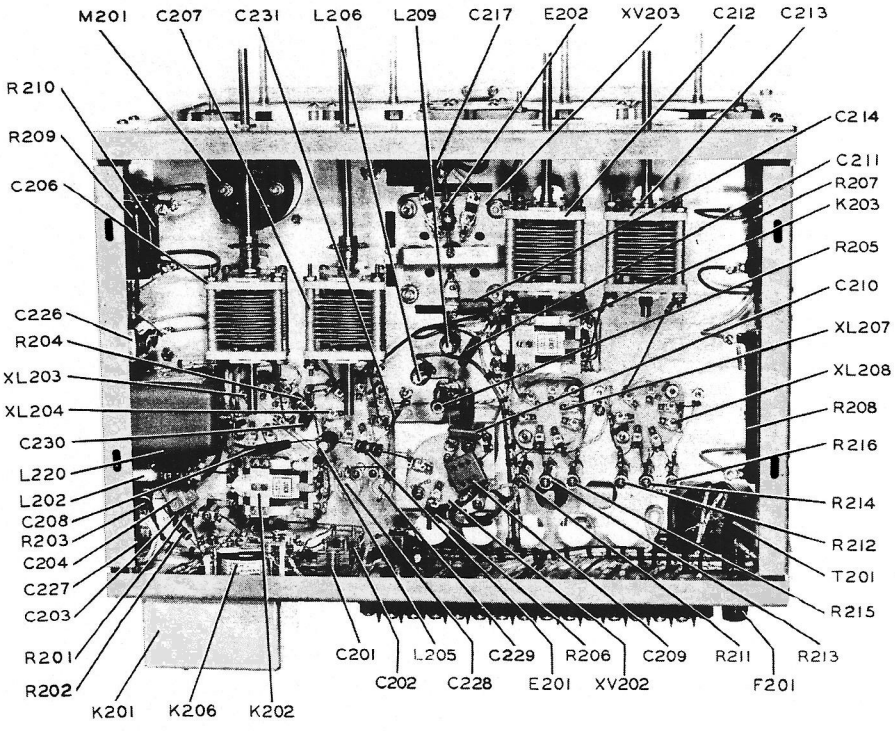


Figure 5-4. RF Exciter, Amplifier and Output Network, Parts Arrangement - Bottom

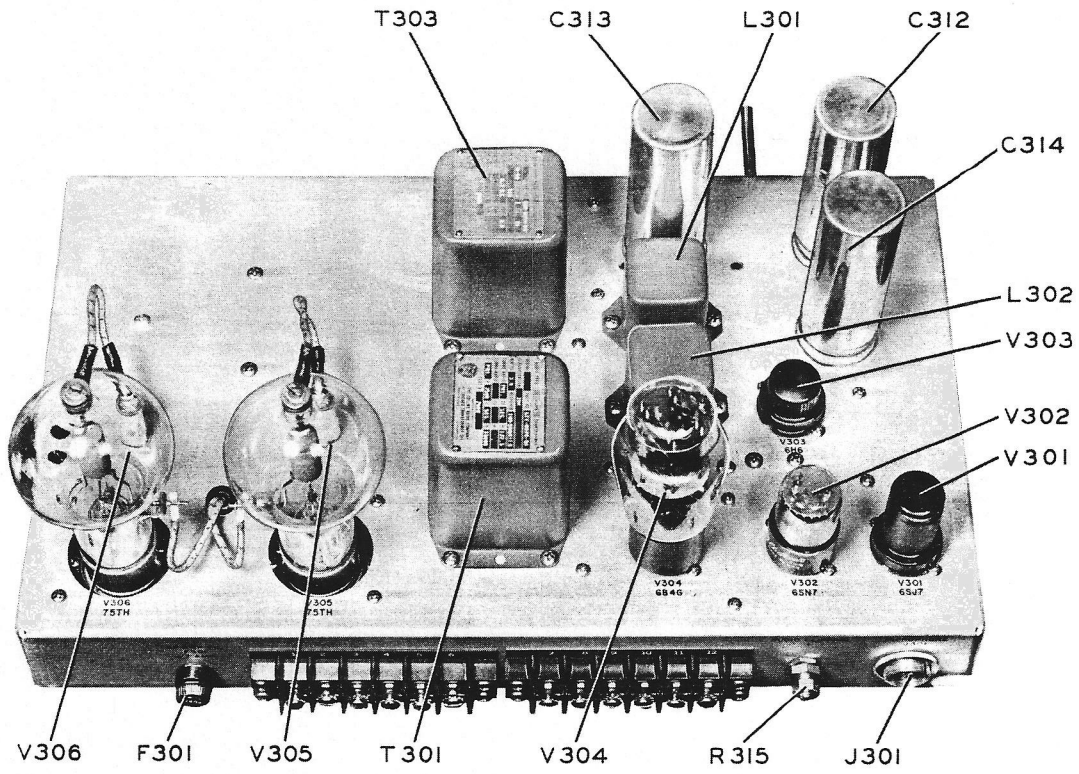


Figure 5-5. Speech Amplifier and Modulator, Parts Arrangement - Top

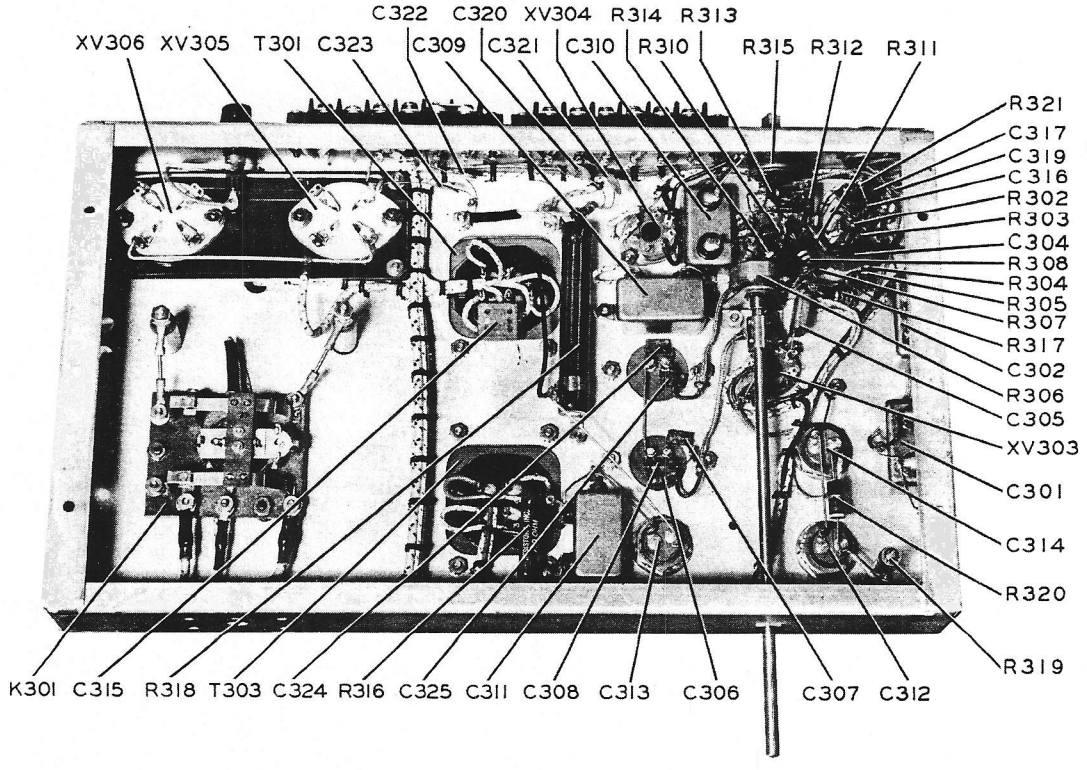


Figure 5-6. Speech Amplifier and Modulator, Parts Arrangement - Bottom

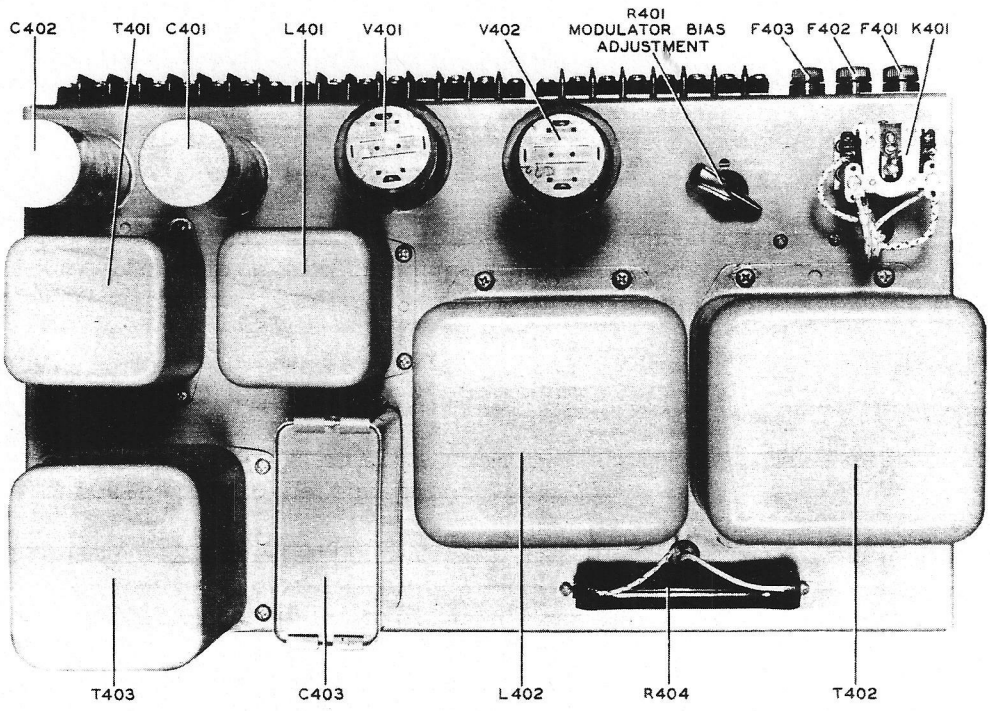


Figure 5-7. Low Voltage and Bias Power Supply, Parts Arrangement - Top

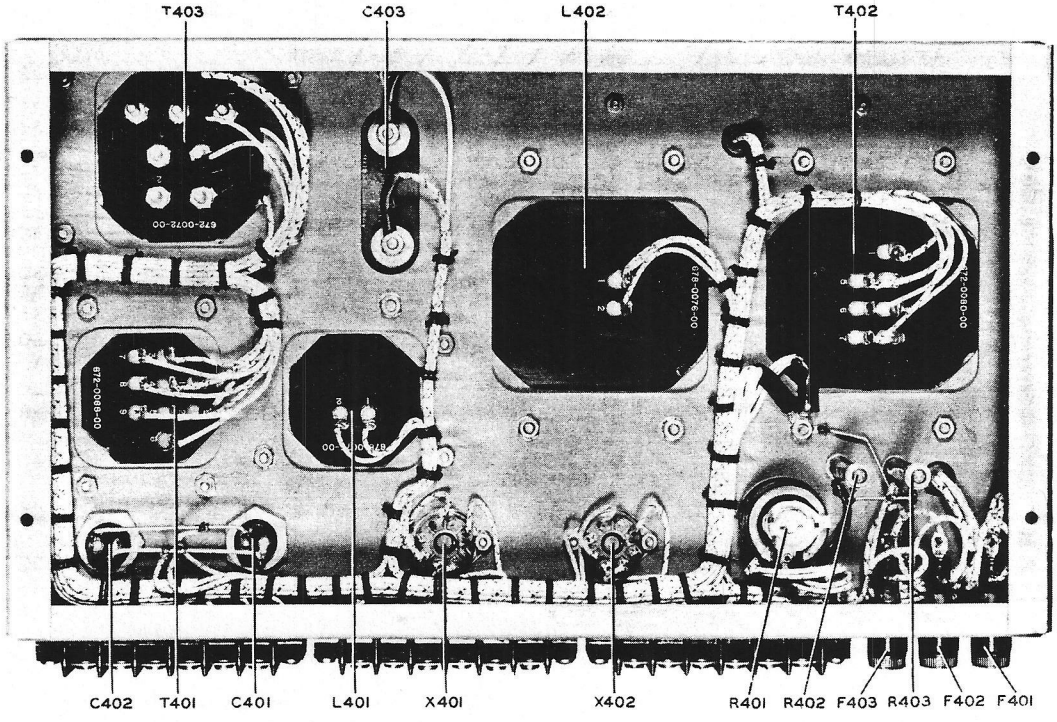


Figure 5-8. Low Voltage and Bias Power Supply, Parts Arrangement - Bottom

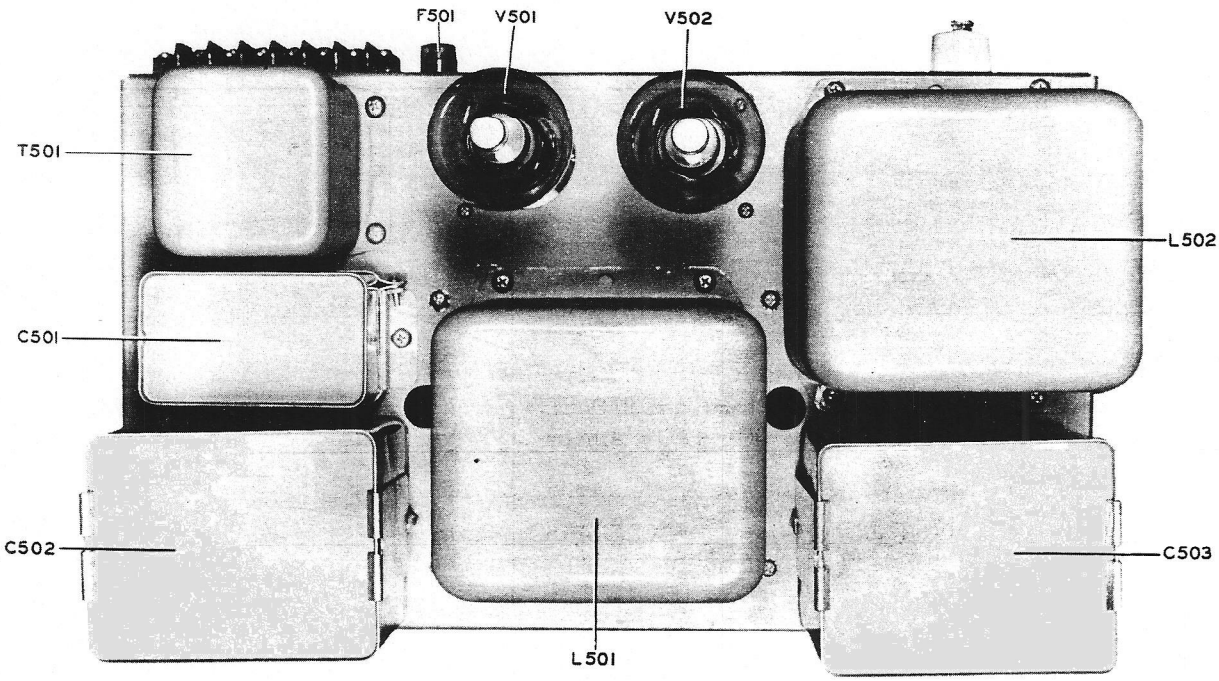


Figure 5-9. High Voltage Rectifier and Filter, Parts Arrangement - Top

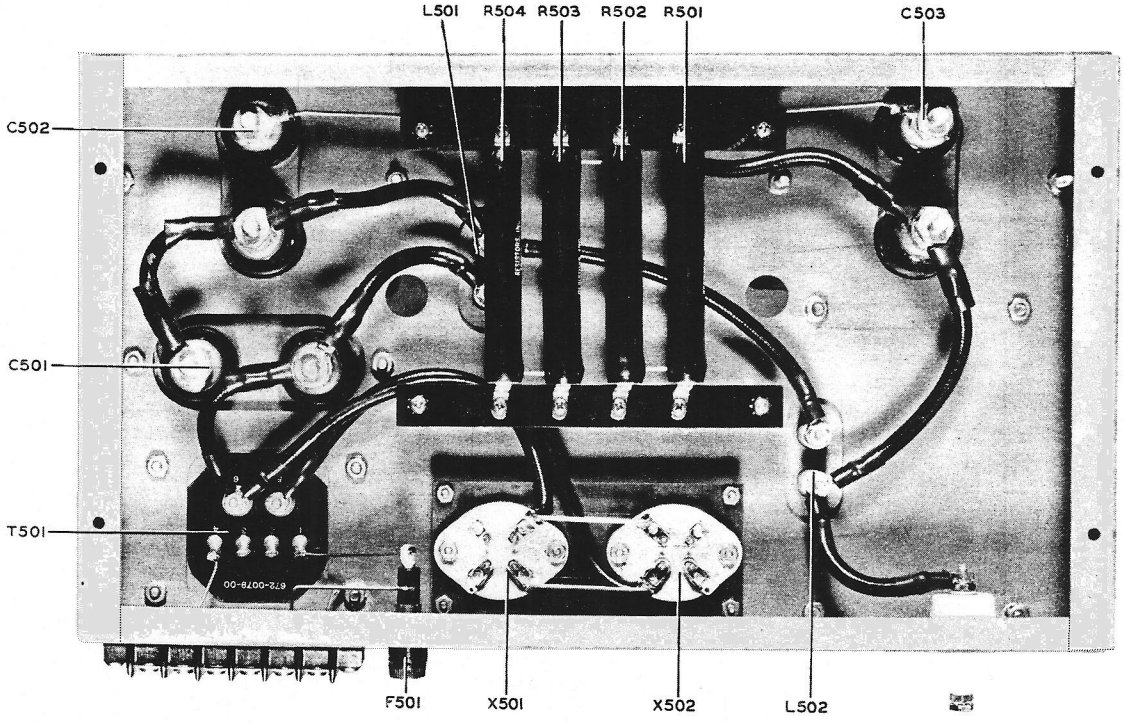


Figure 5-10. High Voltage Rectifier and Filter, Parts Arrangement - Bottom

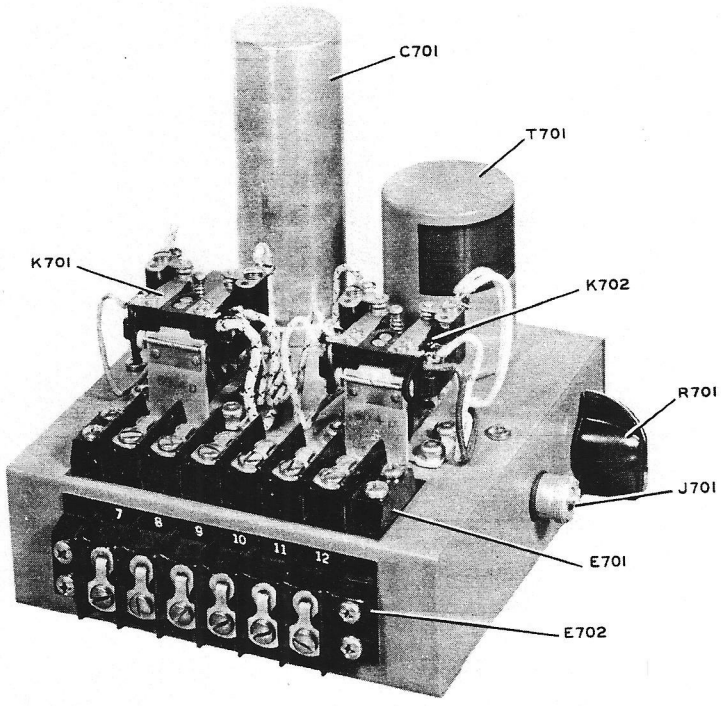


Figure 5-11. Type 175V-2 Relay Unit, Parts Arrangement - Top

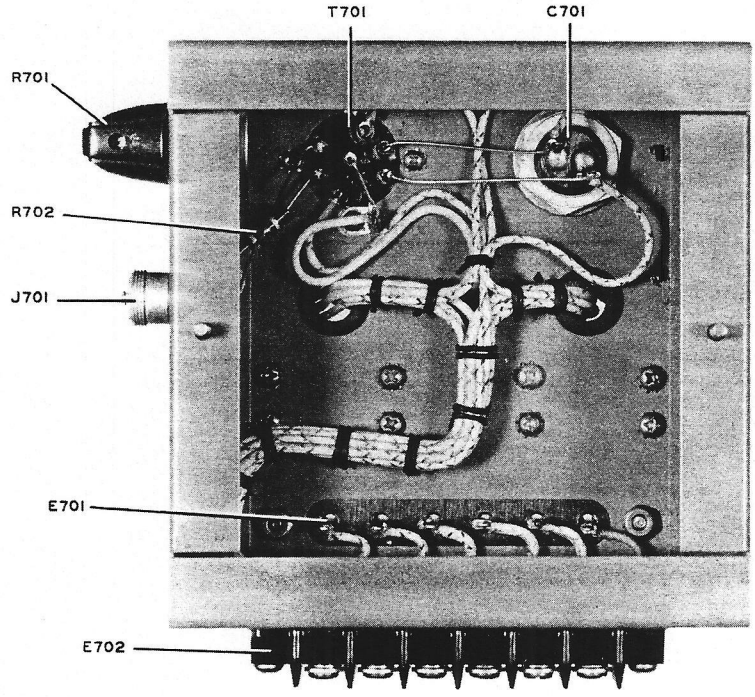


Figure 5-12. Type 175V-2 Relay Unit Parts Arrangement - Bottom

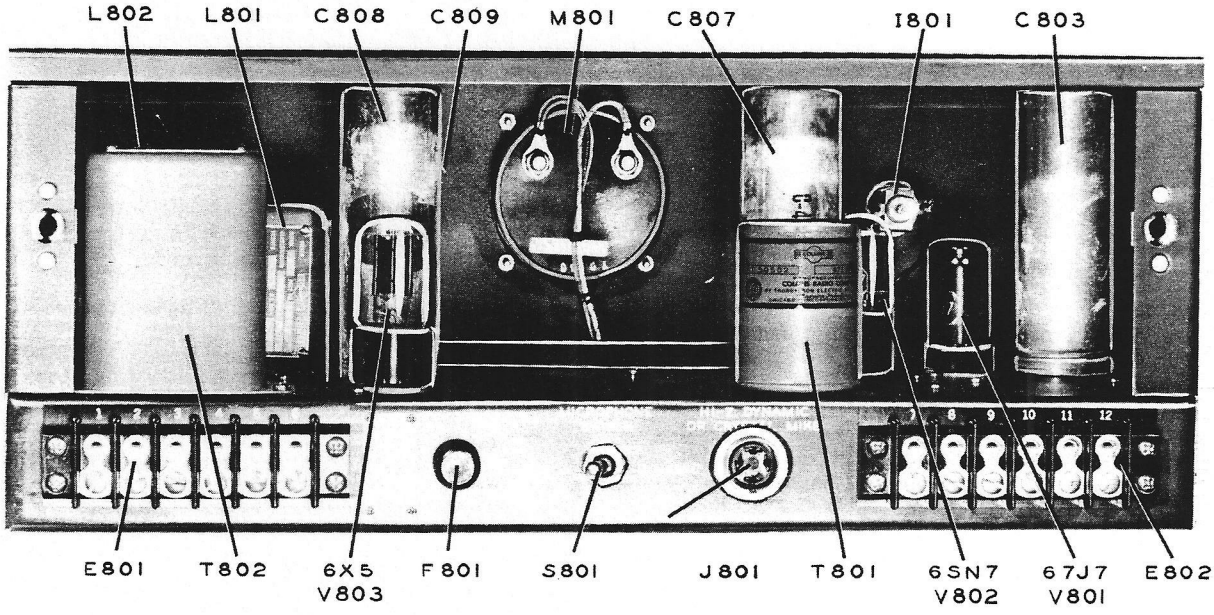


Figure 5-13. Type 177L-2 Remote Control Unit, Parts Arrangement - Top

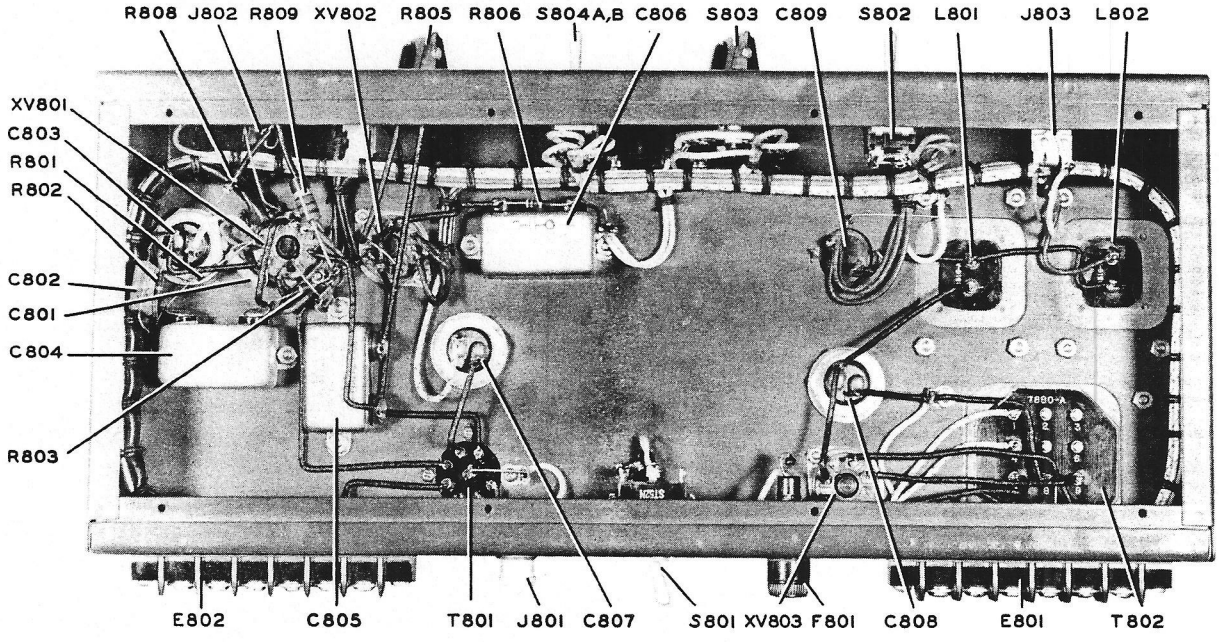


Figure 5-14. Type 177L-2 Remote Control Unit, Parts Arrangement - Bottom

COLLINS 30K-4, 2 CHANNEL TRANSMITTER

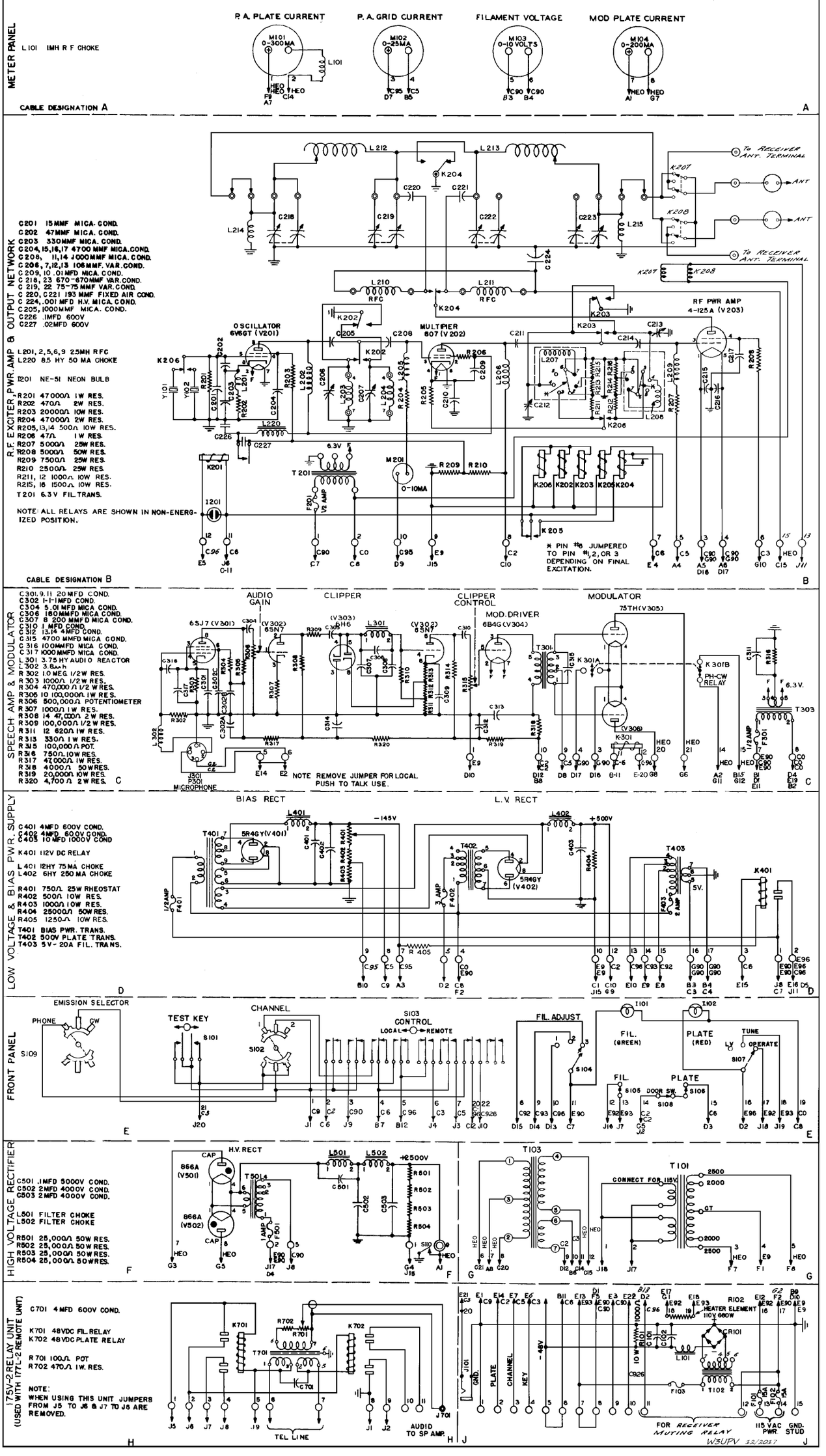


Figure 5-16 Type 30K-4 Transmitter Cabling Schematic

NOTE: LATER MODELS HAVE BEEN CHANGED AS FOLLOWS:

1. **C-315 CHANGED TO 2200 MMF.**
2. **C-217 CHANGED TO 1000 MMF.**
3. **ADD C-318 FROM PIN 4 OF J-301 TO GROUND.**
4. **ADD C-319 FROM PIN 3 OF J-301 TO GROUND.**
5. **ADD SUPPRESSOR E-201 AT PIN 3 OF V-202.**
6. **ADD SUPPRESSOR E-202 AT PIN 3 OF V-203.**

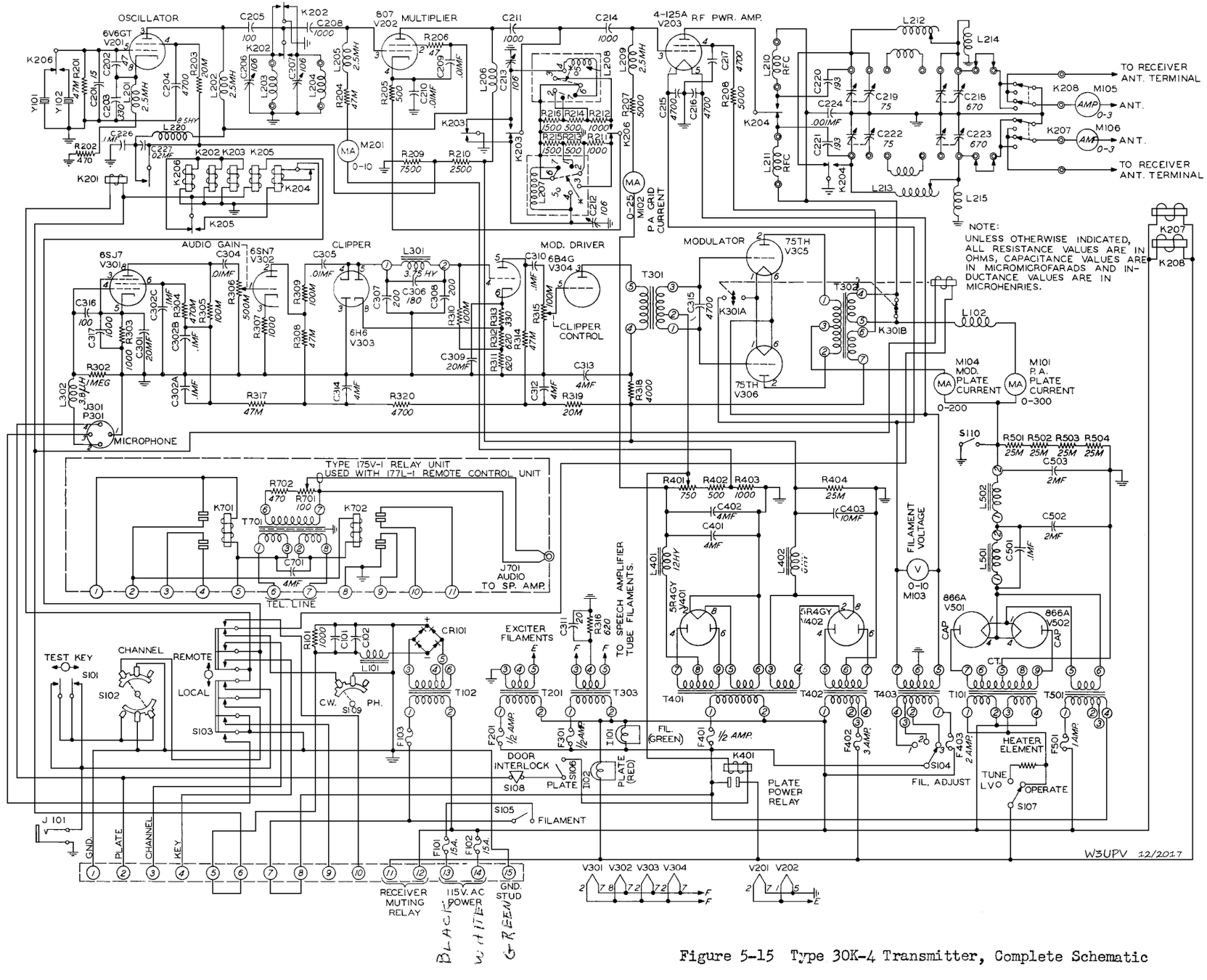


Figure 5-15 Type 30K-4 Transmitter, Complete Schematic

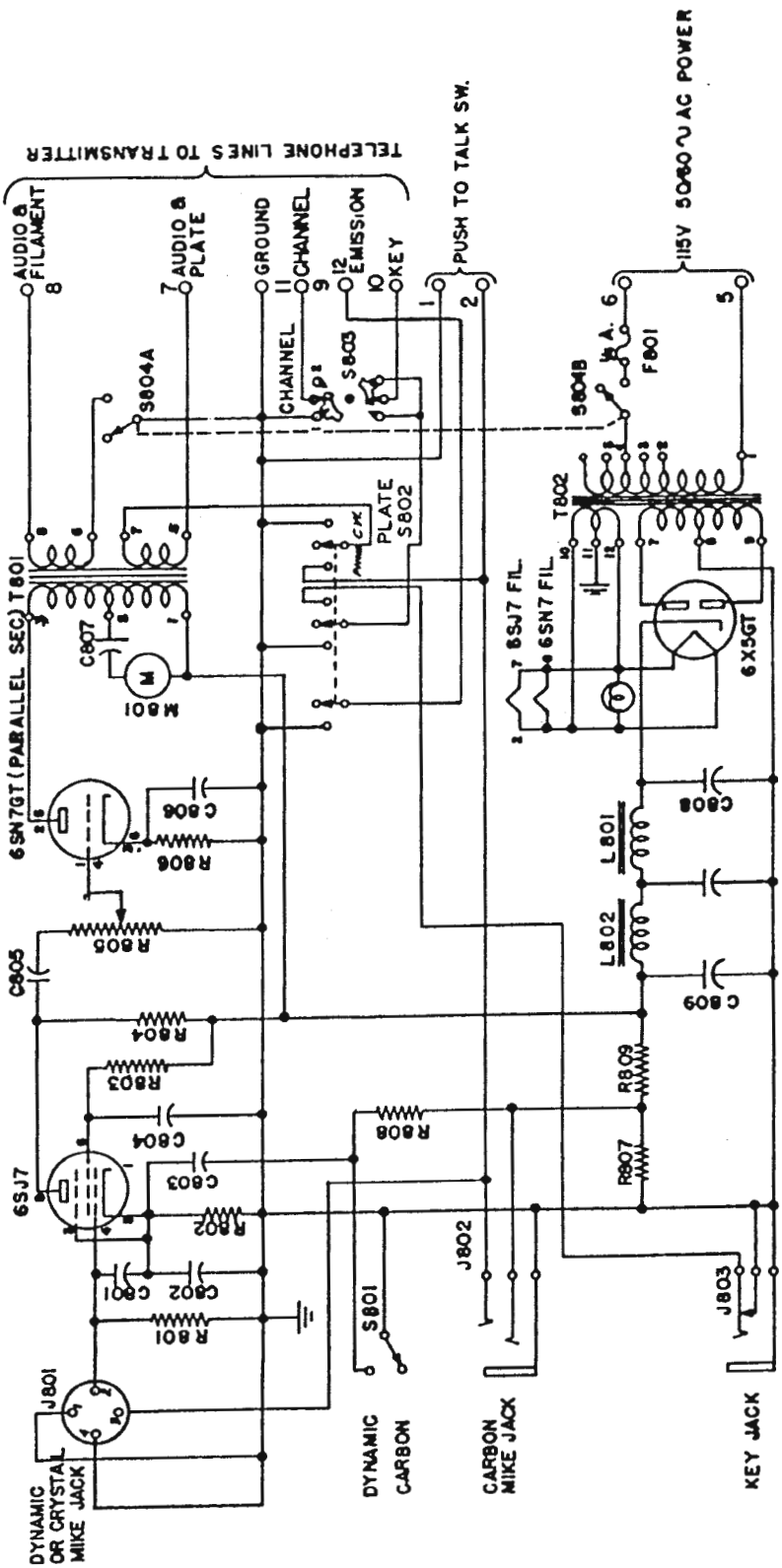


Figure 5-17 Type 177L-2 Remote Control Unit Schematic

SECTION 6

PARTS LIST

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C101	Relay supply voltage filter	CAPACITOR: 20 mf	184 6509 00
C102	Relay supply voltage filter	CAPACITOR: 20 mf	184 6509 00
C201	Oscillator, V201, grid circuit capacitor	CAPACITOR: 15 mmf ±10%; 500 WV	935 0073 00
C202	Oscillator, V201, grid cathode capacitor	CAPACITOR: 47 mmf ±5%; 500 WV	935 0091 00
C203	Oscillator, V201, cathode capacitor	CAPACITOR: 330 mmf ±10%; 500 WV	935 0127 00
C204	Oscillator, V201 screen bypass capacitor	CAPACITOR: 4700 mmf ±20%; 500 WV	935 2104 00
C205	R-F coupling capacitor	CAPACITOR: 1000 mmf ±20%; 500 WV	935 4101 00
C206	Oscillator, V201, plate tank capacitor	CAPACITOR: 100 mmf	920 1120 00
C207	Oscillator, V201, plate tank capacitor	CAPACITOR: 100 mmf	920 1120 00
C208	R-F coupling capacitor	CAPACITOR: 1000 mmf ±20%; 500 WV	935 4101 00
C209	Multiplier, V202, screen bypass	CAPACITOR: 10,000 mmf ±20%; 300 WV	935 2118 00
C210	Multiplier, V202, cathode bypass	CAPACITOR: 10,000 mmf ±20%; 300 WV	935 2118 00
C211	R-F coupling capacitor	CAPACITOR: 1000 mmf ±20%; 500 WV	935 4101 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C212	Multiplier plate tank capacitor	CAPACITOR: 100 mmf	920 1120 00
C213	Multiplier plate tank capacitor	CAPACITOR: 100 mmf	920 1120 00
C214	R-F coupling capacitor	CAPACITOR: 1000 mmf ±20%; 500 WV	935 4101 00
C215	R-F amplifier, V203, filament bypass capacitor	CAPACITOR: 4700 mmf ±20%; 2500 WV	936 1105 00
C216	R-F amplifier V203, filament bypass capacitor	CAPACITOR: 4700 mmf ±20%; 2500 WV	936 1105 00
C217	R-F amplifier, V203, screen bypass	CAPACITOR: 1000 mmf ±20%; 2500 WV	936 0250 00
C218	Channel 1 antenna tuning and loading capacitor	CAPACITOR: dual sect; 670 mmf per sect	920 0018 00
C219	Channel 1 plate tuning capacitor	CAPACITOR: dual sect; 75 mmf per sect	920 0016 00
C220	R-F coupling capacitor	CAPACITOR: 193 mmf	924 1005 00
C221	R-F coupling capacitor	CAPACITOR: 193 mmf	924 1005 00
C222	Channel 2 plate tuning capacitor	CAPACITOR: dual sect; 75 mmf per sect	
C223	Channel 2 antenna tuning and loading capacitor	CAPACITOR: dual sect; 670 mmf per sect	920 0018 00
C224	R-F coupling capacitor	CAPACITOR: 1000 mmf ±5%	938 2066 00
C226	Click filter	CAPACITOR: .1 mf + 40 - 15%, 1000 WV	961 5020 00
C227	Click filter	CAPACITOR: .02 mf ±20%, 600 WV	936 1149 00
C301	Audio amplifier V301, cathode bypass	CAPACITOR: 20 mf + 100 -10%; 100 WV	183 3310 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C302		CAPACITOR: 3 sect; 0.1 mf per sect +40 -15%; 600 WV	961 4059 00
C302A	Audio amplifier V301, screen bypass	Part of C302	
C302B	Audio amplifier, V301, plate bypass	Part of C302	
C302C	Plate decoupling	Part of C302	
C303		CAPACITOR: not used	
C304	Audio coupling capacitor	CAPACITOR: 10,000 mmf ±20%; 300 WV	935 2118 00
C305	Audio coupling capacitor	CAPACITOR: 10,000 mmf ±20%; 300 WV	935 2118 00
C306	Filter resonating capacitor	CAPACITOR: 180 mmf ±5%; 500 WV	935 0116 00
C307	Audio filter capacitor	CAPACITOR: 200 mmf ±5%; 500 WV	935 0118 00
C308	Audio filter capacitor	CAPACITOR: 200 mmf ±5%; 500 WV	935 0118 00
C309	Audio amplifier, V302, cathode bypass	CAPACITOR: 20 mf +100 -10%; 100 WV	183 3310 00
C310	Audio coupling capacitor	CAPACITOR: 0.1 mf +40 -15%; 600 WV	961 5116 00
C311	Mod. driver grid return bypass	CAPACITOR: 20 mf +100 -10%; 100 WV	183 3310 00
C312	Audio decoupling capacitor	CAPACITOR: 4 mf +40 -15%; 600 WV	961 3005 00
C313	Modulator driver plate decoupling capacitor	CAPACITOR: 4 mf +40 -15%; 600 WV	961 3005 00
C314	Audio decoupling capacitor	CAPACITOR: 4 mf +40 -15%; 600 WV	961 3005 00
C315	Modulator grid bypass capacitor	CAPACITOR: 2200 mmf ±10%; 500 WV	935 4067 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C316	Audio amplifier, V301, v-f bypass	CAPACITOR: 100 mmf ±20%; 500 WV	935 0107 00
C317	Audio amplifier, V301, cathode bypass	CAPACITOR: 1000 mmf ±20%; 500 WV	935 4101 00
C318	Push to talk RF filter	CAPACITOR: 5000 mmf 500 WV	913 1187 00
C319	Push to talk RF filter	CAPACITOR: 5000 mmf 500 WV	913 1187 00
C401	Bias voltage supply filter	CAPACITOR: 4 mf +40 -15%; 600 WV	961 3005 00
C402	Bias voltage supply filter	CAPACITOR: 4 mf +40 -15%; 600 WV	961 3005 00
C403	L.V. power supply filter	CAPACITOR: 10 mmf ±10%; 1000 WV	930 0038 00
C501	H.V. power supply filter	CAPACITOR: 0.1 mf ±10%; 5000 WV	930 0042 00
*C501		CAPACITOR: 0.15 mf ±10%; 500 WV	930 0035 00
C502	H.V. power supply filter	CAPACITOR: 2 mf ±10%; 4000 WV	930 0040 00
C503	H.V. power supply filter	CAPACITOR: 2 mf ±10%; 4000 WV	930 0040 00
C701	Audio bypass	CAPACITOR: 4 mf +40 -15%; 600 WV	961 3005 00
CR101	Relay Voltage supply rectifier	RECTIFIER: selenium; dry disc; single phase; full wave; input 72 v ac max; output 52 v dc max; 6 amp at 35°C; .4 amp at 45°C	353 0007 00
E101, E102, E201, E202, E301, E302, E401, E402, E403, E501	Inter unit Connector strips	TERMINAL STRIP: black phenolic; barrier type w/ lugs for back connections; 6 term	367 0037 00

* For equipments using 50 cps power source.

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
		INSULATOR: ceramic male bushing; .200" ID hole; 1-1/8" diam x 1-5/16" h o/a	190 0004 00
		INSULATOR: ceramic female bushing; .200" ID hole; 1-1/8" diam x 3/4" h o/a	190 0008 00
		JUMPER BAR: load coil; bar w/ banana plugs 4-3/8" c to c	502 3032 001
		CAP, TUBE PLATE: spring and connector assem for 4-125A tube cap	502 8808 002
		CAP, TUBE PLATE: ceramic; for 1/16" diam cap	301 1005 00
		CAP, TUBE PLATE: ceramic; for 3/8" diam cap	301 1002 00
	Plate voltage control knob	KNOB: control; black phenolic w/ skirt; for 1/4" diam shaft; engraved OP T LV	502 9002 002
	Fil. voltage adjustment knob	KNOB: control; black phenolic w/ skirt; for 1/4" diam shaft; engraved 3 2 1	502 9003 002
	Phone-CW Selector switch knob	KNOB: control; black phenolic w/ skirt; for 1/4" diam shaft; engraved PH CW	502 9004 002
	Audio gain control knob	KNOB: control; black phenolic w/ skirt; for 1/4" diam shaft; engraved 10 to 0	502 9005 002
	Exciter tuning knobs	KNOB: tuning; black bakelite w/ skirt; for 1/4" diam shaft; engraved 100 to 0	503 3041 002
	PA and Output network tuning knobs	KNOB: tuning; black phenolic w/ skirt; for 1/4" diam shaft; engraved 100 to 0	281 0039 00
		KNOB: pointer; black phenolic; for 1/4" diam shaft; engraved indicator line	281 1080 00
	Channel selector knob	KNOB: black phenolic; for 1/4" diam shaft;	281 0002 00
F101, F102	Supply line fuse Supply line fuse	FUSE: plug; 20 amp; 125 v	264 1200 00
F103	Relay Voltage Supply fuse	FUSE: cartridge; 2 amp; 250 v	264 4070 00
F201	Exciter filament Supply fuse	FUSE: slow blow; cartridge; 1/2 amp; 250 v	264 4260 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
F301	Mod. driver filament supply fuse	FUSE: slow blow; cartridge; 1/2 amp; 250 v	264 4260 00
F401	Bias voltage supply fuse	FUSE: slow blow; cartridge; 1/2 amp 250 v	264 4260 00
F402	L.V. supply fuse	FUSE: cartridge; 3 amp; 250 v	264 4080 00
F403	Modulator and R-F amplifier filament supply fuse	FUSE: cartridge; 2 amp; 250 v	264 4070 00
F501	H.V. rectifier	FUSE: slow blow; cartridge; 1 amp; 250 v	264 4280 00
I101	Filament power indicator	BULB: pilot light; 125 v; .040 amp; 6 w; candelabra base	262 3320 00
I102	Plate power indicator		
I201	Transient suppressor	BULB: Neon; min bayonet base, T-3-1/4, 1/25 w	262 0021 00
J101	Key jack	JACK: Phone, midget, 1 circuit	358 1040 00
J301	Microphone or audio connector	CONNECTOR: wall mtg; 4 contact	369 9000 00
K201	Keying control relay	RELAY: sensitive; 12-24 ma; 24-48 v	408 7000 00
K202	Exciter channel selector relay	RELAY: RF circ control; DPDT; 48 v dc coil	407 1005 00
K203	Exciter channel selector relay	RELAY: RF circ control; DPDT; 48 v dc coil	407 1005 00
K204	R-F power amplifier channel selector relay	RELAY: rotary; 2 pos; 30° wafer switch driving 48 v dc coil	410 0026 00
K205	Output network channel selector relay	RELAY: RF circ control: DPDT cont w/ SPDT aux; 48 v dc coil	407 1006 00
K206	Crystal select relay	RELAY: RF circ control; DPDT; 48 v dc coil	407 1005 00
K207	Antenna change over	RELAY: circuit control, 5 amp cont	407 1000 00
K208	Antenna change over	RELAY: circuit control, 5 amp cont	407 1000 00
K301	PH-CW phone	RELAY: circ control; DPDT; 48 v dc coil	407 6100 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
K401	Plate power relay	RELAY: circ control; SPNO double break; 15 amp cont; 112 v dc coil	405 0021 00
L101	Relay supply voltage filter	REACTOR: filter; 1 hy min at .050 amp, .25 hy min at .4 amp (at 25 v rms); 5 ohm max; 120 cps; 1000 TV rms;	678 0154 00
L102	Meter RF filter	CHOKE: RF, multiple pi, duo-lateral wound 1 mh ±10%, 600 ma, 6 ohm DC	240 0055 00
L201	Oscillator cathode choke	COIL: RF choke; 4 pi; duo-lateral wound; 2.5 mh; .125 amp; 50 ohm max;	240 5300 00
L202	Oscillator screen supply choke	COIL: RF choke; 4 pi; duo-lateral wound; 2.5 mh; .125 amp; 50 ohm max	240 5300 00
*L203 and *L204	Oscillator plate Tank inductor Oscillator plate Tank inductor	COIL: 34 turns #24 bus; 3.4-4.5 mc; shield can 2" sq x 4" h, med 7 pin base	503 3830 003
		COIL: 21 turns #24 bus; 4.5-6.0 mc; shield can 2" sq x 4" h; med 7 pin base	503 3831 003
		COIL: 14 turns #24 bus, 6.0-8.0 mc; shield can 2" sq x 4" h; med 7 pin base	503 3832 003
		COIL: 9-1/2 turns #24 bus; 8.0-10.5 mc; shield can 2" sq x 4" h; med 7 pin base	503 3833 003
L205	V202, multiplier grid choke	COIL: RF choke; 4 pi; duo-lateral wound; 2.5 mh; .125 amp; 50 ohm max	240 5300 00
L206	V202 multiplier, plate supply choke	COIL: RF choke; 4 pi; duo-lateral wound; 2.5 mh; .125 amp; 50 ohm max	240 5300 00
*L207 and *L208	Multiplier plate tank inductor	COIL: 54 turns #24 DSC; 2.0-2.6 mc; shield can 2" sq x 4" h; med 7 pin base	503 3828 003
		COIL: 36 turns #24 DSC; 2.6-3.4 mc; shield can 2" sq x 4" h; med 7 pin base	503 3829 003
		COIL: 34 turns #24 bus; 3.4-4.5 mc; shield can 2" sq x 4" h; med 7 pin base	503 3830 003
		COIL: 21 turns #24 bus; 4.5-6.0 mc; shield can 2" sq x 4" h; med 7 pin base	503 3831 003
		COIL: 14 turns #24 bus; 6.0 8.0 mc; shield can 2" sq x 4" h; med 7 pin base	503 3832 003

* Choose coils for frequency desired. (See coil chart in Installation Section)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
		COIL: 9-1/2 turns #24 bus; 8.0-10.5 mc; shield can 2" sq x 4" h; med 7 pin base	503 3833 003
		COIL: 8 turns #24 bus; 10.5-14.0 mc; shield can 2" sq x 4" h; med 7 pin base	503 3834 003
		COIL: 5 turns #24 bus; 14-18 mc; shield can 2" sq x 4" h; med 7 pin base	503 3835 003
		COIL: 5 turns #16 bus; 18-24 mc; shield can 2" sq x 4" h; med 7 pin base	503 3836 003
		COIL: 5 turns #16 bus; 24-30 mc; shield can 2" sq x 4" h; med 7 pin base	503 3837 003
209	V203, RF power amplifier grid choke	COIL: RF choke; 4 pi; duo-lateral wound; 2.5 mh; .125 amp; 50 ohm max	240 5300 00
*L210 and *L211	V203, RF power amplifier plate supply choke	COIL: RF choke; 2-10.5 mc; 300 uh; #24 DSC double band wound on ceramic form 1" diam x 7" lg. banana plugs 6-1/2" c to c	503 3821 002
		COIL: RF choke; 6-18 mc; 96 uh; #24 enam, single layer wound on ceramic form 1" diam x 7" lg; banana plugs 6-1/2" c to c	503 3822 002
		COIL: RF choke; 10-30 mc; 53 uh; #24 enam, single layer wound on ceramic form 1" diam x 6-1/2" c to c	503 3823 002
*L212 and *L213	RF power amplifier output tank inductor	COIL: tank; 46T #14 bus on ceramic form 2-1/2" diam x 6" lg; sliding coil rider; mycalex mtg plate w/ 4 banana plugs on st line 1-1/4"	503 3838 003
		COIL: tank, 24T #12 bus on ceramic form 2-1/2" diam x 6" lg; sliding coil rider; mycalex mtg plate w/ 4 banana plugs on st line 1-1/4"	503 3839 003
		COIL: tank; 12T #12 bus on ceramic form 2-1/2" diam x 6" lg; sliding coil rider; mycalex mtg plate w/ 3 banana plugs on st line	503 3840 003
		COIL: tank; 8T #10 bus on ceramic form 2-1/2" diam x 6" lg; sliding coil rider; mycalex mtg plate w/ 2 banana plugs	503 3841 003
		COIL: tank; 6T 1/2" wd copper ribbon, wound 2" diam x 5-1/2" lg; shorting bar on T #4; mycalex mtg plate w/ 2 banana plugs	503 3842 003

* Choose coils for frequency desired. (See coil chart in Installation Section)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
L214, L215	Static drain choke	COIL: RF choke; 1 mh ±10%; 0.6 amp	240 2600 00
**L216	Low frequency loading inductor	COIL: load; 46T #14 bus on ceramic form 2-1/2" diam x 6" lg; sliding coil rider; mycalex mtg plate w/ 2 banana plugs	503 3843 003
**L217	Low frequency loading inductor	COIL: load; 46T #14 bus on ceramic form 2-1/2" diam x 6" lg; sliding coil rider; mycalex mtg plate w/ 2 banana plugs	503 3843 003
L220	Click filter	REACTOR: filter, 8.5 hy 0.035 amp +20% - 0% 120 cps, 2500 TV	678 1531 00
L301	Audio filter reactor	REACTOR: audio; 3.75 hy; 1000 rms TV; 100-5000 cps; case 2-1/4" x 1-1/2" x 2" h; 2 mtg holes 1.880" c to c; 2 solder post term	678 0077 00
L302	Audio amplifier V301, grid choke	COIL: RF choke; 2.7 uh; 300 ma; form 0.170" diam x 5/8" lg; axial leads	240 0012 00
L401	Bias supply filter	REACTOR: filter; 12 hy; 75 ma; 2500 rms TV; 120 cps; 275 ohms	678 0075 00
L402	L.V. power supply filter	REACTOR: filter; 6 hy; 250 ma; 2500 rms TV; 120 cps; 62 ohms	678 0076 00
L501, L502	H.V. power supply filter	REACTOR: filter; 12 hy; 300 ma; 10,000 rms TV; resonates at 120 cps w/ .1 mf capacitor and 30 ma dc load;	678 0081 00
M101	Power amplifier plate current meter	METER: 0-300 ma dc; 30 scale div, 10 ma per div;	450 0031 00
M102	Power amplifier grid current meter	METER: 0-25 ma dc; 2% accuracy	450 0029 00
M103	Filament voltage meter	METER: 0-10 v ac; 2% accuracy	452 0006 00
M104	Modulator plate current meter	METER: 0-200 ma dc; 40 scale div, 5 ma per div	450 0030 00
M105	Antenna current	METER: 0-3 amp RF; 30 scale div, .1 amp per div; int thermocouple	451 0018 00
M106	Antenna current meter	METER: 0-3 amp RF; 30 scale div, .1 amp per div; int thermocouple	451 0018 00

** For low frequency operation

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
M201	Multiplier grid current meter	METER: 0-10 ma dc; 50 scale div, .2 ma per div	450 0049 00
P301	Microphone connector	CONNECTOR: cable; 4 contact	369 8100 00
101	Plate transformer series resistor for tuning	RESISTOR: heater; 660 w; 115 v; conical form med Edison base	711 0003 00
R102	Relay voltage supply bleeder resistor	RESISTOR: 1000 ohm ±10%; 10 w	710 1142 00
R201	Oscillator, V201, grid resistor	RESISTOR: 47,000 ohm ±10%; 1 w	745 3156 00
R202	Oscillator, V201, cathode resistor	RESISTOR: 470 ohm ±10%; 2 w	745 5072 00
R203	Oscillator, V201, screen resistor	RESISTOR: 20,000 ohm ±10%; 10 w	710 1204 20
R204	Multiplier, V202, grid resistor	RESISTOR: 47,000 ohm ±10%; 2 w	745 5156 00
R205	Multiplier, V202, cathode resistor	RESISTOR: 500 ohm ±10%, 10 w	710 1500 20
R206	Multiplier, V202, screen dropping resistor	RESISTOR: 47 ohm ±10%; 1 w	745 3030 00
R207	RF power amplifier V203, grid resistor	RESISTOR: 5000 ohm ±10%; 25 w	710 3542 00
R208	RF power amplifier V203, screen dropping resistor	RESISTOR: 5000 ohm ±10%; 50 w	710 4542 00
R209	Exciter screen voltage divider resistor	RESISTOR: 7500 ohm ±10%; 25 w	710 0069 00
R210	Exciter screen voltage divider resistor	RESISTOR: 2500 ohm ±10%; 25 w	710 0066 00
R211, R212	PA drive control	RESISTOR: 1000 ohm ±10%; 10 w	710 1142 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R213, R214	PA drive control	RESISTOR: 500 ohm ±10%; 10 w	710 1500 20
R215, R216	PA drive control	RESISTOR: 1500 ohm ±10%; 10 w	710 0027 00
R301		RESISTOR: not used	
R302	Audio amplifier, V301, grid resistor	RESISTOR: 1.0 megohm ±10%; 1/2 w	745 1212 00
R303	Audio amplifier, V301, cathode resistor	RESISTOR: 1000 ohm ±10%; 1/2 w	745 1086 00
R304	Audio amplifier, V301, screen resistor	RESISTOR: 47 megohm ±10%; 1/2 w	745 1198 00
R305	Audio amplifier, V301, plate resistor	RESISTOR: .10 megohm ±10%; 1 w	745 3170 00
R306	Audio gain control	RESISTOR: .50 megohm; 1/w; 350 v max	376 3027 00
R307	Audio amplifier, V302, cathode resistor	RESISTOR: 1000 ohm ±10%; 1 w	745 3086 00
R308	Audio amplifier, V302, plate resistor	RESISTOR: 47,000 ohm ±10%; 2 w	745 5156 00
R309	Audio equalizing resistor	RESISTOR: .10 megohm ±10%; 1/2 w	745 1170 00
R310	Audio amplifier, V302, grid resistor	RESISTOR: .10 megohm ±10%; 1 w	745 3170 00
R311	Audio amplifier, V302, cathode voltage divider	RESISTOR: 620 ohm ±5%; 1 w	745 3077 00
R312	Audio amplifier V302, cathode voltage divider	RESISTOR: 620 ohm ±5%; 1 w	745 3077 00
R313	Audio amplifier, V302, cathode voltage divider	RESISTOR: 330 ohm ±10%; 1 w	745 3065 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R314	Audio amplifier; V302, plate resistor	RESISTOR: 47,000 ohm ±10%; 2 w	745 5156 00
R315	Peak clipping control	RESISTOR: 100,000 ohm potentiometer; 1/2 w	376 0021 00
R316	Mod driver, V304, bias resistor	RESISTOR: 750 ohm ±10%; 10 w	710 1750 20
R317	Audio input amplifier, V301, decoupling resistor	RESISTOR: 47,000 ohm ±10%; 1 w	745 3156 00
318	Mod driver decoupling resistor	RESISTOR: 4000 ohm ±10%; 50 w	710 4442 00
R319	Plate decoupling resistor	RESISTOR: 20,000 ohm ±10%; 10 w	710 1204 20
R320	Plate decoupling resistor	RESISTOR: 4700 ohm ±10%; 2 w	745 5114 00
R401	Modulator bias control	RESISTOR: 750 ohm ±10%; 25 w	735 0002 00
R402	Bias supply voltage divider	RESISTOR: 500 ohm ±10%; 10 w	710 1500 20
R403	Bias supply voltage divider	RESISTOR: 1000 ohm ±10%; 10 w	710 1142 00
R404	L.V. power supply bleeder	RESISTOR: 25,000 ohm ±10%; 50 w	710 4254 20
R405		RESISTOR: 1250 ohm ±10%; 10 w	710 0024 00
R501	H.V. power supply bleeder resistor	RESISTOR: 25,000 ohm ±10%; 50 w	710 4254 20
R502	H.V. power supply bleeder resistor	RESISTOR: 25,000 ohm ±10%; 50 w	710 4254 20
R503	H.V. power supply bleeder resistor	RESISTOR: 25,000 ohm ±10%; 50 w	710 4254 20
R504	H.V. power supply bleeder resistor	RESISTOR: 25,000 ohm ±10%; 50 w	710 4254 20
S101	Test key switch	SWITCH: lever; contacts 1A 1A and 1A 1A; 110 v 60 cyc ac non-ind	375 0049 00
S102	Channel selector switch	SWITCH: tap; 2 circ; 2 pos	259 0239 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
S103	Local-Remote control switch	SWITCH: lever; contacts 2C 2C and 2C 2C; 110 v 60 cyc ac non-ind	375 0025 00
S104	Filament voltage control switch	SWITCH: tap; single circ; 30 pos	259 1180 00
S105	Filament power ON-OFF switch	SWITCH: toggle; SPST	266 3005 00
S106	Plate power ON-OFF switch	SWITCH: toggle; SPST	266 3005 00
S107	Plate voltage control switch	SWITCH: tap; single circ; 3 pos	259 1180 00
S108	Door interlock switch	SWITCH: push button, NO interlock	266 0003 00
S109	Emission selector	SWITCH: tap; 2 circ; 2 pos	259 0239 00
T101	H.V. power supply plate transformer	TRANSFORMER: plate; pri #1; 115 v; pri #2: 115 v; sec #1: 2365/2950 v; CT; sec #2: 2365/2950 v	662 0015 00
T102	Relay voltage supply transformer	TRANSFORMER: power; pri; 115 v; sec: 72/67/62 v; .58 amp	674 0153 00
T103	Modulation transformer	TRANSFORMER: mod; pri; 32,000 ohm CT, sec #1: 16,700 ohm, sec #2: 248 v RMS	677 0316 00
T201	Exciter filament transformer	TRANSFORMER: fil; pri: 115 v; sec: 6.3 v CT, 3 amp	672 0069 00
T301	Modulator driver transformer	TRANSFORMER: driver; pri: 2500 ohm; 60 ma bal; sec: 15,000 ohm CT: 100-5000 cps ±1-1/2 db	677 0074 00
T302		NOT used	
T303	Modulator driver filament transformer	TRANSFORMER: fil; pri: 115 v; sec: 6.3 v CT, 3 amp	672 0069 00
T401	Bias voltage supply transformer	TRANSFORMER: LV; 50/60 cps; pri: 115 v; sec #1: 5 v; 2 amp; sec #2; 5 v; 2 amp; sec #3: 420 v CT; 1 amp	672 0068 00
T402	L.V. power supply transformer	TRANSFORMER: LV; 50/60 cps; pri: 105/115/125 v sec: 1320 v CT; .177 amp	672 0080 00
T403	Modulator and R-F power amplifier filament transformer	TRANSFORMER: amp fil; 50/60 cps; pri: 105/110/115 v; sec: 5 v CT; 20 amp	672 0072 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
T501	H.V. rectifier filament transformer	TRANSFORMER: rect fil; 50/60 cps; pri: 105/110/115 v; sec: 2.5 v; 10 amp	672 0079 00
V201	Oscillator	TUBE: 6V6GT/G; beam power amplifier	255 0031 00
V202	Multiplier	TUBE: 807; transmitting beam pwr amplifier	256 0033 00
V203	R-F power amplifier	TUBE: 4-125A; power tetrode	256 0068 00
V301	Audio amplifier	TUBE: 6SJ7; triple-grid detector amplifier	255 0030 00
V302	Audio amplifier	TUBE: 6SN7GT; twin-triode amplifier	255 0033 00
V303	Audio peak clipper	TUBE: 6H6; twin-diode	255 0117 00
V304	Modulator driver	TUBE: 6B4G; power amplifier triode	255 0124 00
V305	Modulator	TUBE: 75th; medium-mutriode	256 0071 00
V306	Modulator	TUBE: 75th; medium-mutriode	256 0071 00
V401	Bias supply rectifier	TUBE: 5R4GY; full-wave high-vacuum rectifier	257 0020 00
V402	L.V. supply rectifier	TUBE: 5R4GY; full-wave high-vacuum rectifier	257 0020 00
V501	H.V. supply rectifier	TUBE: 866A; half-wave mercury-vapor rectifier	256 0049 00
V502	H.V. supply rectifier	TUBE: 866A; half-wave mercury-vapor rectifier	256 0049 00
XF101 XF102	Socket for F101 and F102	RECEPTACLE: fuse plug; 2 pole; 30 amp 125 v	265 1013 00
XF103 XF201 XF301 XF401 XF402 XF403 XF501	Holder for F103,F201 F301, F201 F401, F201 F402, F201 F403, F201 F501, F201	HOLDER: fuse cartridge; 1/2-24 thd mtg bushing; 11/16" diam x 2-7/16" lg o/a; lug terms	265 1002 00
XI101 XI102	Socket for I101, I102	HOLDER: pilot light mtg; for candelabra base bulbs; frosted jewel 1" diam; 1"-27 thd bushing 1/2" lg; 1-5/16" diam x 2-3/4" lg o/a	262 0033 00
	Disc for I101 Disc for I102	DISC: pilot light; green DISC: pilot light; red	262 2370 00 262 2360 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
XI201	Socket for I201	MOUNTING: Pilot light, min bayonet	262 1260 00
XL203 XL204 XL207 XL208	Socket for L203 Socket for L204 Socket for L207 Socket for L208	SOCKET: med 7 contact w/ clips; ceramic; 1-49/64" mtg/c	220 5730 00
XL209		SOCKET: not used	
XL210 XL211	Socket for L210 Socket for L211	JACK STANDOFF: 1-9/16" h ceramic stand-off w/ banana jack; 1-5/16" mtg/c (reg 2 per coil)	190 1132 00
XL212 XL213	Socket for L212 Socket for L213	JACK ASSEMBLY: PLATE: 1/4" thk mycalex; 2" wd x 8-3/8" lg w/ 2 jack mtg holes 4-3/8" c to c	503 3046 002
		JACK: jumbo banana; 9/32" ID; 9/16" hex x 7/8" lg o/a; 3/8-24 thd	360 2030 00
XL214	Socket for LOAD COIL	JACK ASSEMBLY:	
XL215	Socket for LOAD COIL	PLATE: 1/4" thk mycalex; 2" wd x 8-3/8" lg w/ 4 jack mtg holes 1-1/4", 3-1/2", 4-3/8" c to c on st line	503 3047 002
		JACK: jumbo banana; 9/32" ID; 9/16" hex x 7/8" lg o/a; 3/8-24 thd	
XR101	Socket for R101	SOCKET: screw type; 660 v; 660 w; porcelain 1-5/8" wd x 2-3/8" lg x 1-5/8" h; mtg holes 1-13/16" c to c	265 1010 00
XV201	Socket for V201	SOCKET: tube; std octal; bakelite w/ mtg plate; 1.312" mtg/c	220 1005 00
XV202	Socket for V202	SOCKET: tube; 5 prong w/ clips; ceramic; 2 mtg holes 1-49/64" c to c	220 5520 00
XV203	Socket for V203	SOCKET: tube; 5 prong w/ clips; ceramic; 2-1/4" x 2-1/4" mtg/c	220 1016 00
XV301 XV302 XV303 XV304	Socket for V301 Socket for V302 Socket for V303 Socket for V304	SOCKET: tube; std octal; bakelite w/ mtg plate; 1.312" mtg/c	220 1005 00
XV305 XV306	Socket for V305 Socket for V306	SOCKET: tube; 4 prong w/ clips; ceramic; 2 mtg holes 1-49/64" c to c	220 5450 00
XV401 XV402	Socket for V401 Socket for V402	SOCKET: tube; std octal; bakelite w/ mtg plate; 1.312" mtg/c	220 1005 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
XV501	Socket for V501	SOCKET: tube; 4 prong w/ clips; ceramic; 2 mtg holes 1-49/64" c to c	220 5450 00
XV502	Socket for V502		
XY201	Socket for Y201 and Y202	SOCKET: crystal; dual 3 pin w/ clips; ceramic; 1" x 4-1/8" mtg/c	220 8130 00
XY202			
Y201	Frequency control	CRYSTAL: frequency individually chosen within range 1.5 to 5 mc. See maintenance section 5.4	291 4149 00 thru 291 4648 00
Y202			
175V-2	RELAY CONTROL UNIT		
C701	Remote line capacitor	CAPACITOR: 4 mf +40 -15%; 600 WV	961 3005 00
E701, E702	Connector strip	TERMINAL STRIP: Black phenolic; barrier type with lugs for back connections; 6 term	367 0037 00
		KNOB: Pointer; black phenolic; for 1/4" diam shaft; engraved indicator line	281 1080 00
J701	Audio connector	CONNECTOR: Wall mtg; pressure type cont for single cond shielded cable	369 1008 00
K701	Auxiliary filament power control	RELAY: Circ control; DPST; NO; 50 v coil	407 1004 00
K702	Aux. pl pwr control	RELAY: Circ control; DPST; NO; 50 v coil	407 1004 00
P701	Audio connector	CONNECTOR: Plug; for single cond shielded cable 1/4" OD max	369 1006 00
R701	Audio input level adjustment	RESISTOR: 100 ohm potentiometer; .20 amp; 4 w	377 0036 00
R702	Audio pad	RESISTOR: 470 ohm ±10%; 1 w	745 3072 00
T701	Control lines transformer	TRANSFORMER: Audio; pri; 600 ohm CT; sec; 600 ohm 100-4000 cps ±1 db	677 0156 00
177L-2	REMOTE UNIT		
C801	Audio amplifier, V801, grid capacitor	CAPACITOR: 100 mmf ±20%; 500 WV	935 0107 00
C802	Audio amplifier V801, cathode bypass	CAPACITOR: 1000 mmf ±20%; 500 WV	935 4101 00
C803	Audio amplifier, V801, cathode bypass	CAPACITOR: 4 mf ±40 -15%; 600 WV	961 3005 00