(UNCLASSIFIED)

NAVSHIPS 92223(A)

INSTRUCTION BOOK

for

RADIO TRANSMITTING SET AN/FRT-24

COLLINS RADIO COMPANY
Cedar Rapids, Iowa

DEPARTMENT OF THE NAVY

BUREAU OF SHIPS

(UNCLASSIFIED)

Contract: NObsr-57357
NObsr-71341

Approved by BuShips: 13 July 1954
Change 1: 26 July 1955
Change 2: 10 May 1957

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Title page	Change 2	4-1 to 4-10	Original
A	Change 2	5-1 to 5-11	Original
B to C	Original	6-0 to 6-5	Original
i to iv	Original	7-0 to 7-15	Original
v	Change 2	7-16 to 7-17	Change 1
vi	Original	7-18 to 7-34	Original
vii	Change 2	7-35	Change 2
1-0	Change 1	7-36 to 7-38	Original
1-1	Change 2	7-39 to 7-40	Change 2
1-2 to 1-6	Original	7-41 to 7-61	Original
1-7	Change 2	7-62	Change 2
1-8 to 1-9	Original	7-63 to 7-80	Original
2-0 to 2-46	Original	7-81	Change 2
2-47	Change 2	7-82 to 7-86	Original
2-48 to 2-56	Original	7-87 to 7-92	Change 2
2-57	Change 2	7-93 to 7-100	Original
2-58 to 2-72	Original	8-0A to 8-0L	Change 2
3-1 to 3-31	Original	8-1 to 8-131	Change 1
4-0	Change 2	i-1 to i-11	Change 1

LIST OF ILLUSTRATIONS — C ntinu d

SECTION 7 — CORRECTIVE MAINTENANCE (Continued)

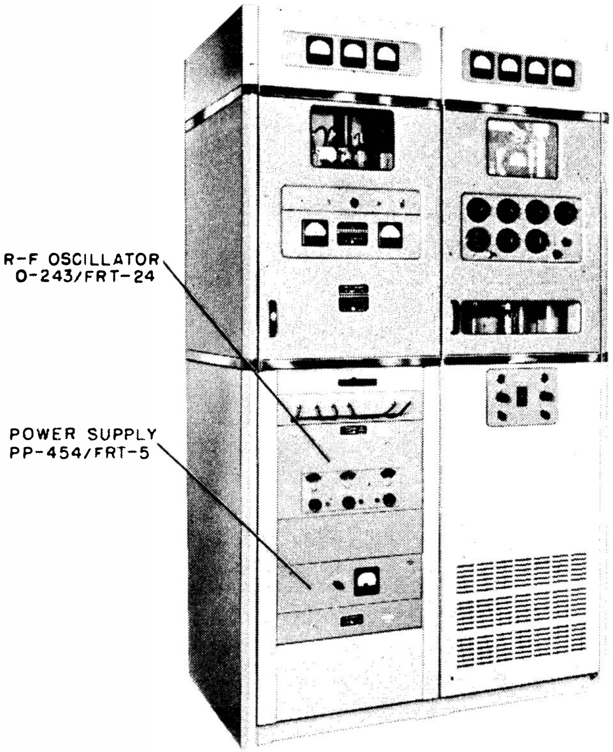
SECTION 7 — CORRECTIVE MAINTENANCE (Continued)

LIST OF ILLUSTRATIONS — C ntinued

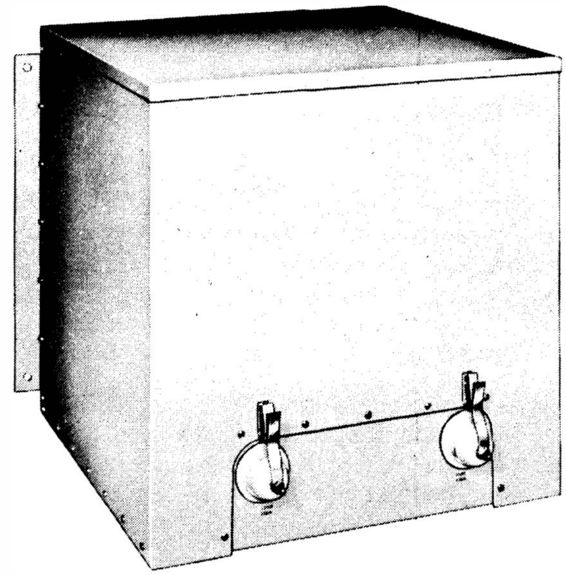
SECTION 7 — CORRECTIVE MAINTENANCE (Continued)

SECTION 7 — CORRECTIVE MAINTENANCE (Continued)

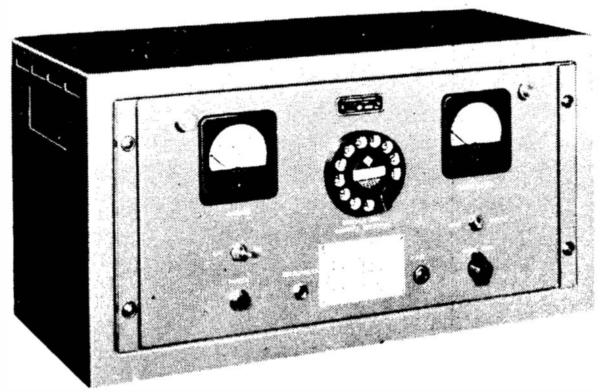
LIST OF TABLES



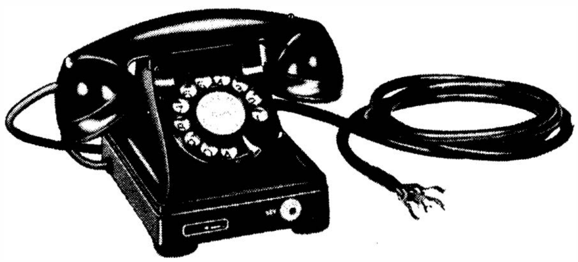
RADIO TRANSMITTER T-440/FRT-24



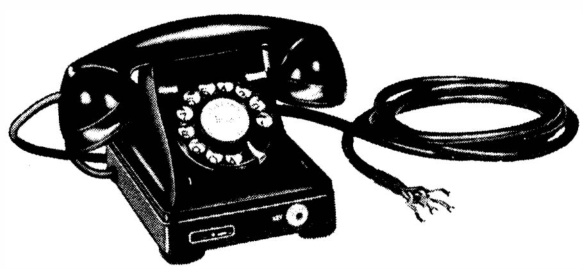
TRANSMISSION LINE COUPLER CU-390/FRT-24



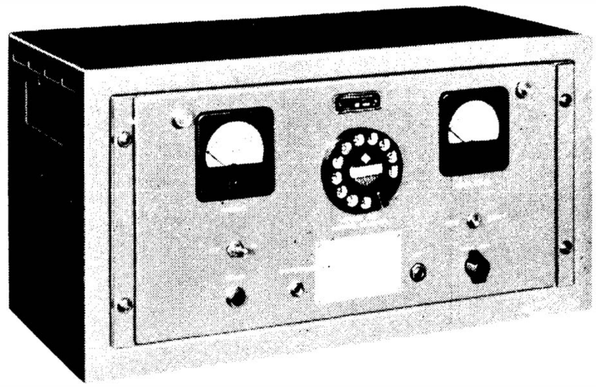
TRANSMITTER CONTROL C-1362/FRT-24



TELEPHONE SET TA-267/U



TELEPHONE SET TA-267/U



TRANSMITTER CONTROL C-1362/FRT-24

Figure 1-1. Radio Transmitting Set AN/FRT-24, Major Units

SECTION 1

GENERAL DESCRIPTION

1. PURPOSE

Radio Transmitting Set AN/FRT-24, figure 1-1, is designed for shore-to-ship, ground-to-aircraft, or point-to-point communication application. Radio Transmitting Set AN/FRT-24 provides a maximum output of 1 kilowatt when operating continuous wave radio telegraph (cw) or radiotelephone (mcw) on any frequency within the range of 2 to 30 megacycles. The equipment provides reliable communication for shore-station installations under wide variations in climatic conditions.

1A. INSTRUCTION BOOK COVERAGE

a. This instruction book covers Radio Transmitter T-440A/FRT-24 as well as Radio Transmitter T-440/FRT-24 which are supplied as part of Radio Transmitting Set AN/FRT-24. T-440A/FRT-24 differs from T-440/FRT-24 in that a different but interchangeable blower assembly is used. The new blower assembly does not differ in general appearance from the old blower assembly.

b. This instruction book also covers RF Oscillator O-243A/FRT-24 as well as RF Oscillator O-243/FRT-24 which are supplied as part of Radio Transmitting Set AN/FRT-24. O-243A/FRT-24 differs from O-243/FRT-24 in that a PWR OUTPUT potentiometer is added to the rear panel which permits varying the rf output voltage. However, for use with AN/FRT-24, this potentiometer is set for maximum output.

c. Reference throughout this instruction book to Radio Transmitter T-440/FRT-24 and RF Oscillator O-243/FRT-24 apply equally to T-440A/FRT-24 and O-243A/FRT-24, respectively, unless otherwise noted.

2. BASIC PRINCIPLES OF OPERATION

The operation of Radio Transmitting Set AN/FRT-24 is based upon the principle of generating submultiple of the desired output frequency, multiplying the frequency, and amplifying the power of this signal to produce the desired r-f carrier. This carrier is then interrupted or modulated with the intelligence to be transmitted and radiated from a suitable antenna.

A nine-channel crystal-controlled oscillator in the r-f assembly normally supplies the excitation. However, with modifications to the equipment, one to three frequency-shift oscillator assemblies may be incorporated in the r-f assembly to supply this excitation. The excitation signal may also be supplied from R-F Oscillator O-243/FRT-24, through a connector on a patch panel.

The r-f signal passes through a buffer stage, and then through one or two frequency multiplier stages where the crystal frequency is multiplied to produce the carrier frequency. The r-f signal is amplified by the driver amplifier which drives the power amplifier. The power amplifier provides an r-f power output of one-quarter, one-half, or one kilowatt on any frequency between 2 and 30 inc.

Intelligence may be superimposed on the carrier by on-off keying or amplitude modulation. On-off keying is accomplished by interrupting the carrier in the buffer stage. A high-level modulator is used for audio modulation. With modifications to the equipment, frequency-shift keying may be provided by frequency-shift oscillator assemblies (these are not furnished) in conjunction with a keyer circuit in the exciter assembly.

Circuits are provided in the transmitter for protection against equipment damage caused by overloads. The transmitter has interlock switches which remove all dangerous voltages when a cabinet door is opened. During normal operation, all high-voltage circuits are inaccessible from the outside of the transmitter.

3. GENERAL DESCRIPTION AND LIST OF MAJOR UNITS

a. GENERAL DESCRIPTION.—Radio Transmitting Set AN/FRT-24 is composed of eight major units (see table 1-1). Three major units, Radio Transmitter T-440/FRT-24, R-F Oscillator O-243/FRT-24, and Power Supply PP-454/FRT-5, are contained in two cabinets which bolt together to form a single unit. Transmission Line Coupler CU-390/FRT-24 and Transmitter Control C-1362/FRT-24 are each housed in an individual metal cabinet, and Telephone Set TA-267/U resembles an ordinary telephone.

The equipment is compact and readily serviceable. The frequency range and flexibility of operation of the equipment is made possible by the use of beam-power tetrodes and vacuum, tank capacitors. Beam-power tetrodes in the r-f assembly eliminates the necessity for high-power driver stages and unnecessarily large power supplies.

An Autotune system accomplishes band switching and tank tuning. The Autotune system provides positioning of all tuning controls to any one of nine preset frequencies. The maximum period of time required for positioning any one channel setting of the transmitter is eight seconds.

Glass windows in the front panel of the transmitter afford a continuous view of the modulator tubes, the r-f power amplifier tube, and the high-voltage rectifier tubes. A door on each cabinet of the transmitter opens to the right, thereby providing access to the individual assemblies.

A dual interlock affords protection to personnel. When either door is opened, the primary circuits of the low- and high-voltage power supplies are de-energized and the high voltage is short-circuited to ground. The door interlocks and the high-voltage shorting switches are provided with manually operated locks so that the transmitter can be operated with the doors open during tests and adjustments. These locks release automatically when the doors are closed.

Power control switches are conveniently located near the center of the front panel of the right-hand cabinet, and tuning knobs are grouped just beneath the upper window in the same cabinet.

Seven meters across the top front of the two cabinets and one meter behind the window of the r-f unit afford a continuous check of voltages and currents throughout the transmitter. Two hour counters, located in the left-hand cabinet, record cumulative filament-on and plate-on time.

b. LIST OF MAJOR UNITS.—Radio Transmitting Set AN/FRT-24 consists of the following major units and assemblies.

(1) Radio Transmitter T-440/FRT-24, which contains:

(*a*) R-F Assembly

(*b*) Low-Voltage Power Supply

(*c*) High-Voltage Power Supply

(*d*) Power Control Assembly

(*e*) Dial Control Assembly

(*f*) Modulator Assembly

(*g*) Power Change Assembly

(*h*) Service Power Supply

(*i*) Patch Panel Assembly

(*j*) Cabinet Accessories

(2) R-F Oscillator O-243/FRT-24

(3) Power Supply PP-454/FRT-5

(4) Transmitter Control C-1362/FRT-24

(5) Transmission Line Coupler CU-390/FRT-24

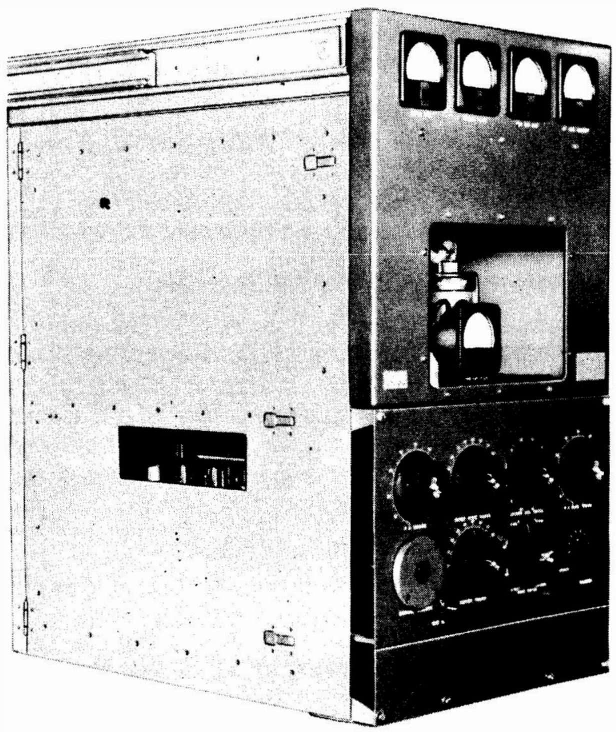
(6) Telephone Set TA-267/U

4. DETAILED DESCRIPTION OF MAJOR UNITS AND ASSEMBLIES

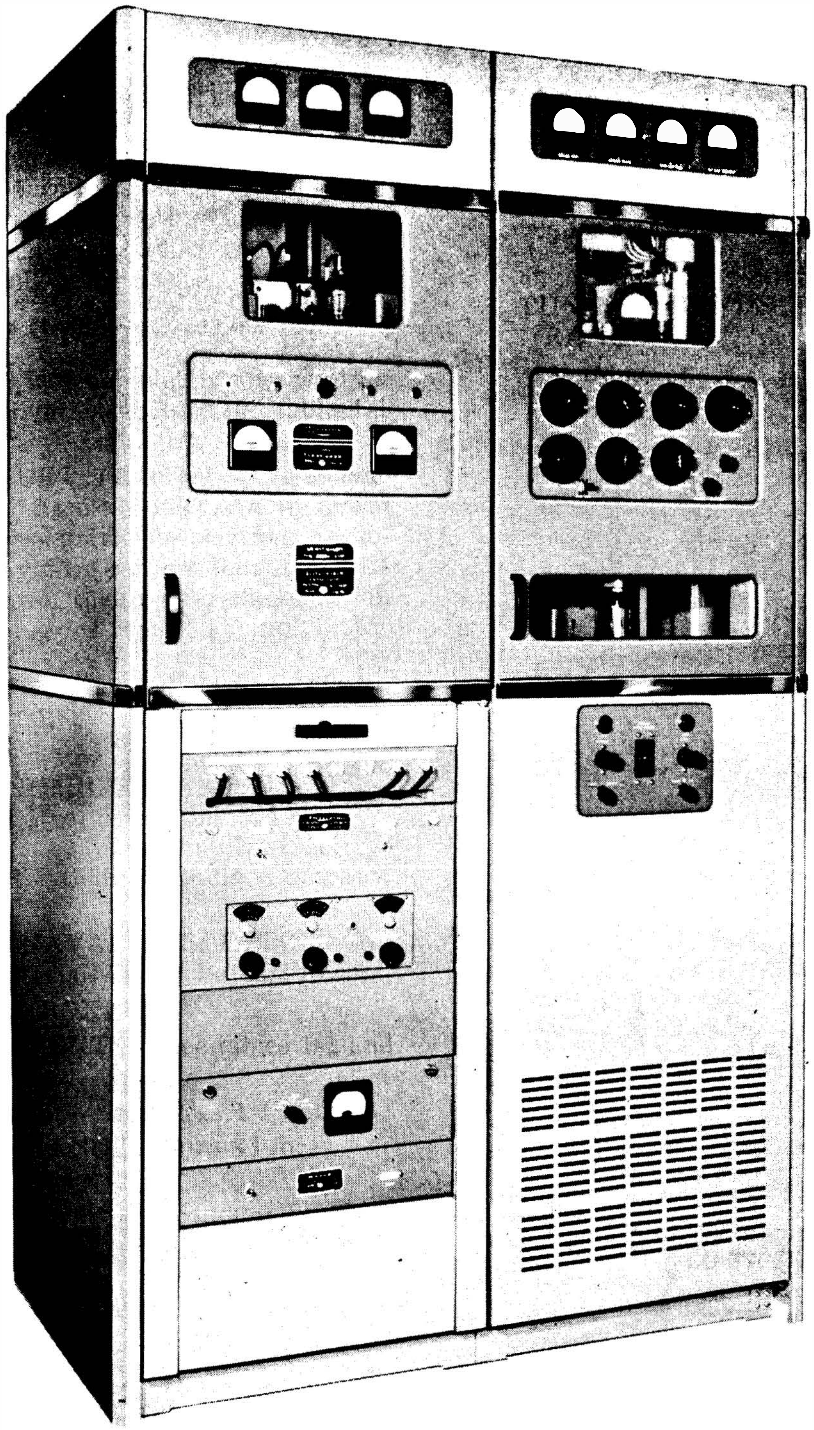
Detailed descriptions of the major units and assemblies which comprise Radio Transmitting Set AN/FRT-24 are given in the following subparagraphs:

a. RADIO TRANSMITTER T-440/FRT-24.—Radio Transmitter T-440/FRT-24 (see figure 1-2) operates from a 230-volt, single-phase, 50/60-cps power source. It has a maximum output of one kilowatt when operating within the frequency range of 2 to 30 mc. The transmitter is contained within two frame-type cabinets, which are bolted together, whose dimensions are given in table 1-1. A detailed description of each of the assemblies which comprise the transmitter are given in subparagraphs (1) through (10).

(1) R-F ASSEMBLY.—The R-F Assembly (see figure 1-3), located in the upper right-hand section of the transmitter, rests on telescoping roller slides. It is a self-contained assembly consisting of an r-f power amplifier, an exciter, an r-f bias supply, a keyer system, and an Autotune system. When the assembly is pulled forward, the high-voltage d-c power input and the r-f output connectors, mounted on the rear of the R-F Assembly, are disconnected from corresponding connectors mounted on the cabinet frame. Low-voltage input and control-circuit wiring enters the assembly through connectors located on the bottom of the assembly.



Figur 1-3. R-F Assembly



Figur 1-2. Radi Transmitter T-440/FRT-24

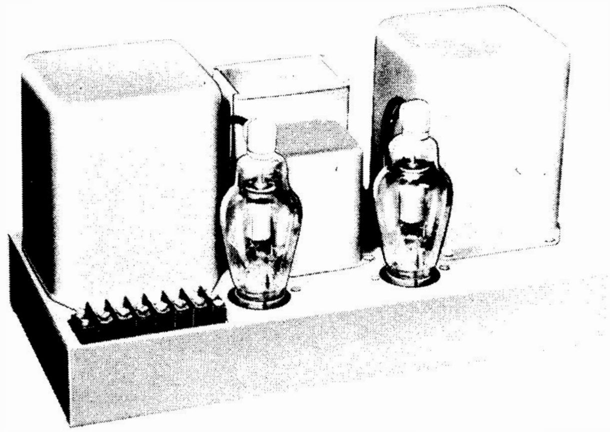


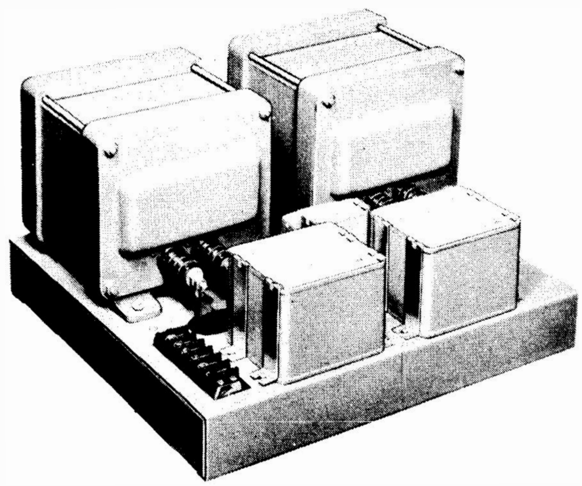
Figure 1-4. Low-Voltage Power Supply

(2) LOW-VOLTAGE POWER SUPPLY.— The Low-voltage Power Supply (see figure 1-4) furnishes 600 volts, dc, for the exciter, the power-amplifier screen grid, the speech amplifier, and the modulator screen grids. Connections are made to various units from a screw-type terminal strip mounted on the power supply chassis. The Low-voltage Power Supply is located in the center of the right-hand cabinet and is bolted to the channel on which it rests.

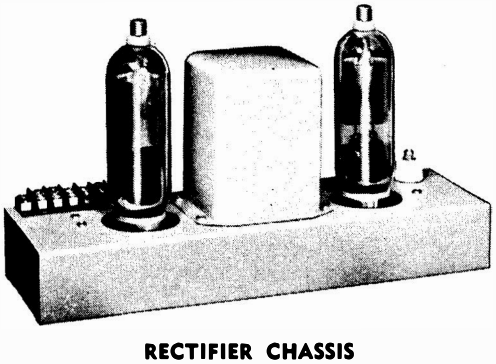
(3) HIGH-VOLTAGE POWER SUPPLY.— The High-voltage Power Supply (see figure 1-5) provides 3000 volts, dc, for the power amplifier plate and the modulator plates. It consists of three subassemblies: a plate transformer, located below the Low-voltage Power Supply in the right-hand cabinet; a rectifier chassis located above the Low-voltage Power Supply and behind the Power Control Assembly; and a filter chassis, located behind the rectifier chassis. The plate transformer rests on channels in the cabinet framework. The rectifier chassis and filter chassis bolt to channels in their section of the cabinet.

(4) POWER CONTROL ASSEMBLY. — The Power Control Assembly (see figure 1-6) controls the application of a-c power to all power supply primaries. In addition, it contains the local-remote and emission-selector switches. All connections from the Power Control Assembly are made by means of plug-in connectors. The Power Control Assembly is located in front of the low- and high-voltage power supplies and directly above the Blower Assembly.

(5) DIAL CONTROL ASSEMBLY. — The Dial Control Assembly (see figure 1-7) contains relays which control the Autotune system, actuate the emission selector, and turn the transmitter on or off, according to pulse information entering the circuit from Transmitter Control C-1362/FRT-24. The Dial Control Assembly is located under the modulator, near the center of the left-hand cabinet.



FILTER CHASSIS



RECTIFIER CHASSIS

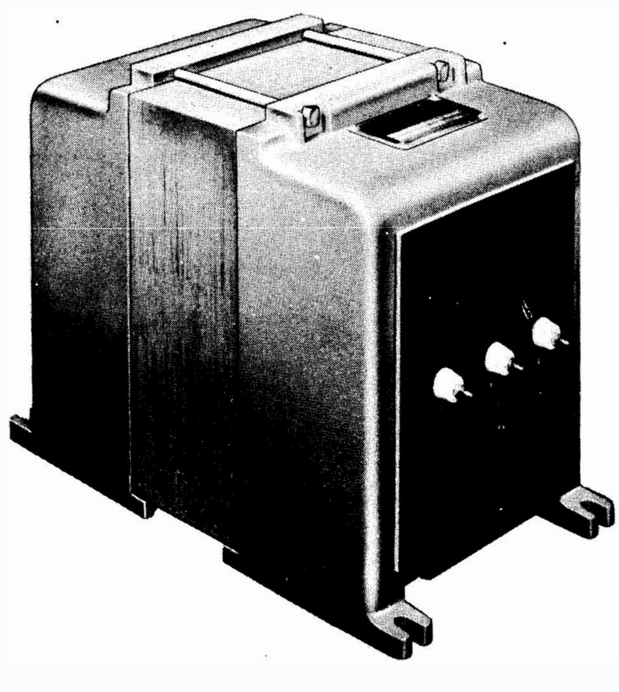


PLATE TRANSFORMER

Figure 1-5. High-V ltage Power Supply

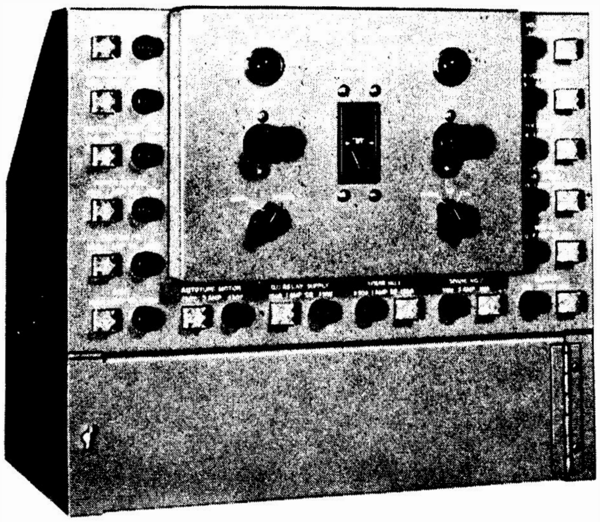


Figure 1-6. Power Control Assembly

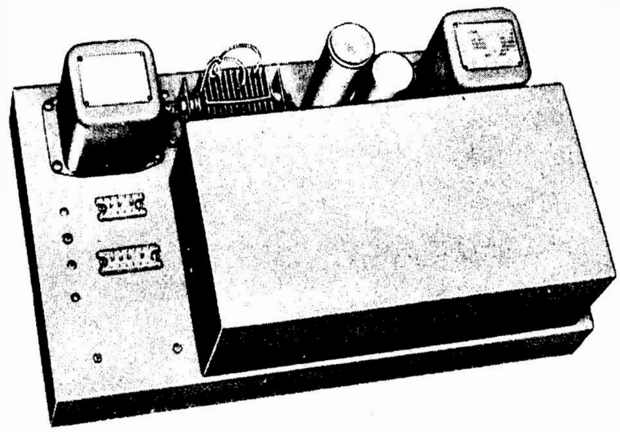
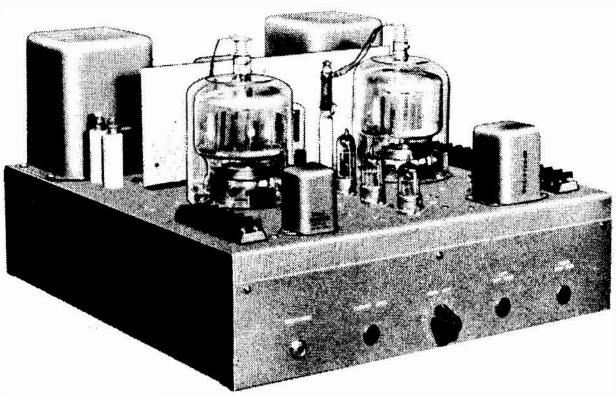


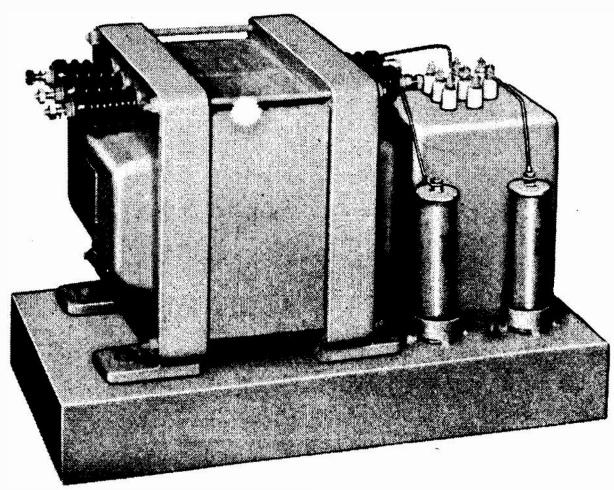
Figure 1-7. Dial Control Assembly

(6) MODULATOR ASSEMBLY.—The Modulator Assembly (see figure 1-8) supplies audio power to modulate the power amplifier in the R-F Assembly. It consists of two separate chassis: an audio chassis, which contains the speech amplifier, modulator tubes, and a bias supply, and is located in the upper section of the left-hand cabinet: and the modulation transformer and filter chassis, located directly behind the audio chassis. High-voltage connections between the two chassis are made from the two from standoff terminals on the audio chassis directly to terminals on the transformer and filter. Power-supply connections to the speech amplifier are made on screw-type terminal strips.

(7) POWER CHANGE ASSEMBLY.—The Power Change Assembly (see figure 1-9) selects the power output of Radio Transmitter T-440/FRT-24, either one-quarter kilowatt, one-half kilowatt, or one kilowatt. All connections from the Power Change Assembly are made by means of plug-in connectors and two binding posts. This assembly is located in the center of the left-hand cabinet, directly behind the Dial Control Assembly.



AUDIO CHASSIS



MODULATION TRANSFORMER AND
FILTER CHASSIS

Figure 1-8. Modulat r Ass mbly

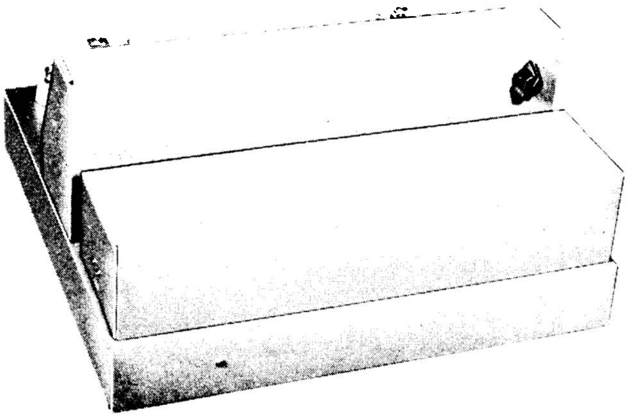


Figure 1-9. Power Change Assembly

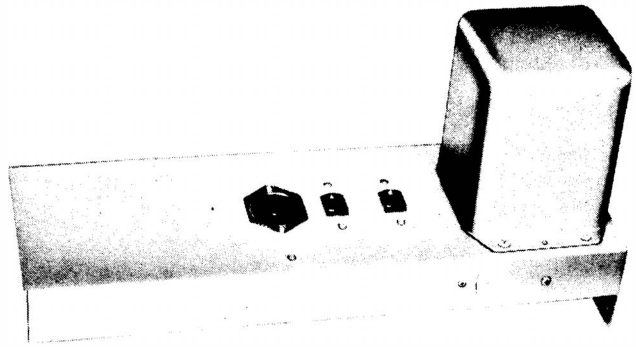


Figure 1-10. Service Power Supply

(8) SERVICE POWER SUPPLY. — The Service Power Supply (see figure 1-10) distributes power from the a-c line to Power Supply PP-454/FRT-5 and to R-F Oscillator O-243/FRT-24. It also supplies 115 volts, 60 cps, to an auxiliary outlet. The Service Power Supply is located in the left-hand cabinet, directly behind R-F Oscillator O-243/FRT-24.

(9) PATCH PANEL ASSEMBLY. — The Patch Panel Assembly (see figure 1-11) provides a means of connecting R-F Oscillator O-243/FRT-24 to the R-F Assembly. It is located near the center of the left-hand cabinet, directly above R-F Oscillator O-243/FRT-24.

(10) CABINET ACCESSORIES.—Cabinet accessories include all parts that are attached to the transmitter frame, such as meters and interlock switches. Also part of the cabinet accessories is the Blower Assembly (see figure 1-12), located in the bottom section of the right-hand cabinet, directly under the Power Control Assembly.

b. R-F OSCILLATOR O-243/FRT-24. — R-F Oscillator O-243/FRT-24 (see figure 1-13) is a stabilized, variable-frequency oscillator which derives its stability from a 100-kc crystal standard oscillator, and utilizes a permeability tuned oscillator which provides a frequency stabilized output in the range of 2 to 4.2 mc. It is mounted on telescoping slides in the left-hand cabinet in the relay rack, below the Patch Panel Assembly. Refer to table 1-1 for the dimensions of R-F Oscillator O-243/FRT-24.

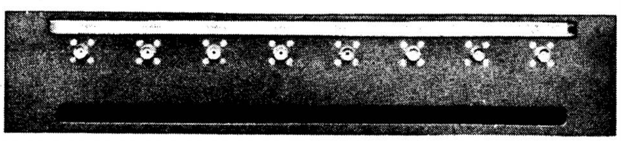
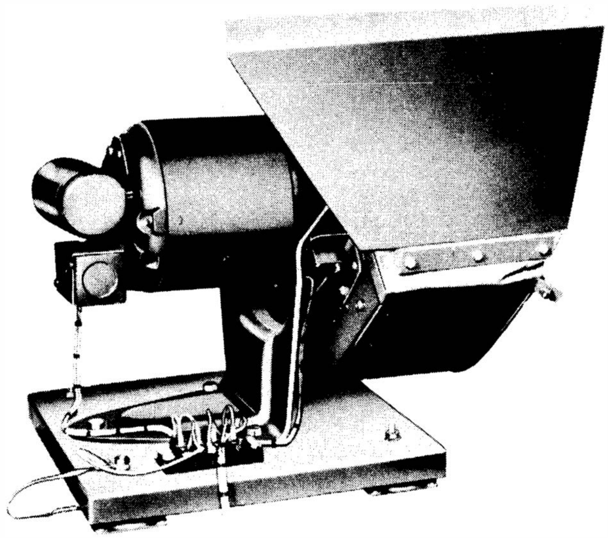


Figure 1-11. Patch Pan l Assembly

c. POWER SUPPLY PP-454/FRT-5.—Power Supply PP-454/FRT-5 (see figure 1-14) furnishes 250 volts, dc, unregulated; 150 volts, dc, regulated; and 6.3 volts, ac, filament voltage to R-F Oscillator O-243/FRT-24. It is mounted on telescoping slides in the left-hand cabinet in the relay rack, below R-F Oscillator O-243/FRT-24. Its dimensions are given in table 1-1.

d. TRANSMITTER CONTROL C-1362/FRT-24.—Transmitter Control C-1362/FRT-24 (see figure 1-15) functions as a remote control for Radio Transmitter T-440/FRT-24. Two transmitter control units are provided in Radio Transmitting Set AN/FRT-24. The dimensions are given in table 1-1.

e. TRANSMISSION LINE COUPLER CU-390/FRT-24.—Transmission Line Coupler CU-390/FRT-24 (see figure 1-16) matches the 52-ohm unbalanced output of the transmitter to a 600-ohm balanced antenna within the frequency



Figur 1-12. Blower Assembly

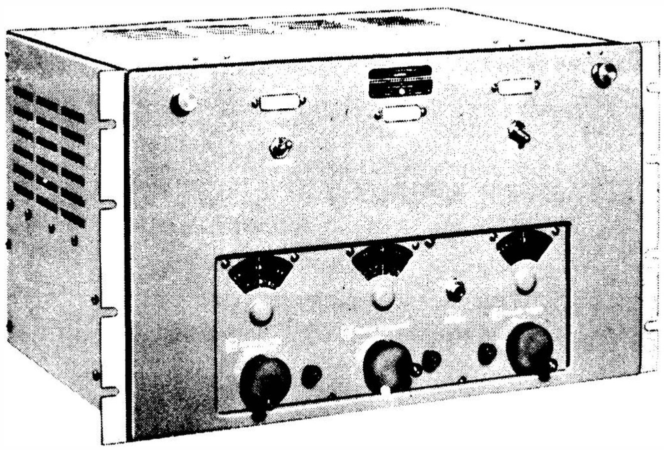


Figure 1-13. R-F Oscillator O-243/FRT-24

range of 2 to 30 mc. It is completely encased in a weatherproof aluminum case. Refer to table 1-1 for the dimensions.

f. TELEPHONE SET TA-267/U.—Telephone Set TA-267/U (see figure 1-17) is a modified hand telephone. It uses an eleven-position dial instead of the ordinary ten-position dial. A jack is provided on the front of the unit for the insertion of a telegraph-key plug for remote keying.

5. REFERENCE DATA

a. NOMENCLATURE. — Radio Transmitting Set AN/FRT-24.

b. CONTRACT NUMBERS AND DATES.—

NObsr 57357	dated May 9, 1952
NObsr 71341	dated July 18, 1956

c. CONTRACTOR.—Collins Radio Company, Cedar Rapids, Iowa.

d. COGNIZANT NAVAL INSPECTOR.—Inspector of Naval Material, Cedar Rapids, Iowa.

e. NUMBERS OF BOXES.

f. CUBICAL CONTENTS.—See tables 1-1 and 1-3.

g. TOTAL WEIGHT.—See tables 1-1 and 1-3.

h. FREQUENCY RANGE.—2 to 30 mc.

i. NUMBER OF CHANNELS.—9.

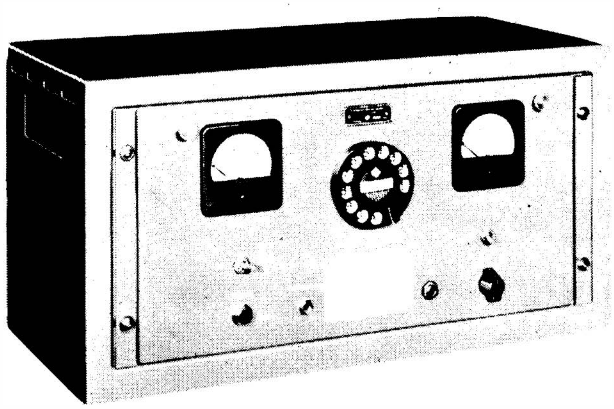


Figure 1-15. Transmitter Control C-1362/FRT-24

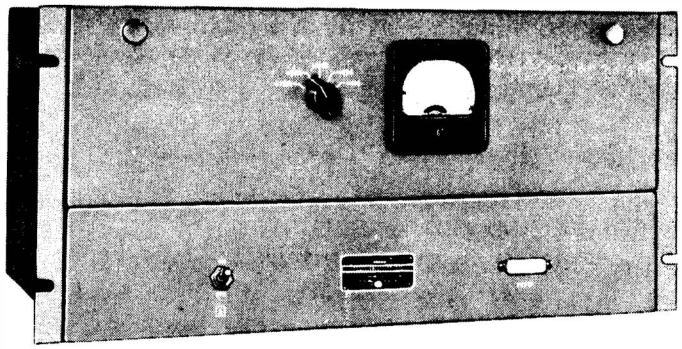


Figure 1-14. Power Supply PP-454/FRT-4

j. TUNING BANDS AND FREQUENCY RANGE.

Band	*Range (mc)*
1	2 to 3
2	3 to 4
3	4 to 6
4	6 to 8
5	8 to 12
6	12 to 16
7	16 to 24
8	24 to 30

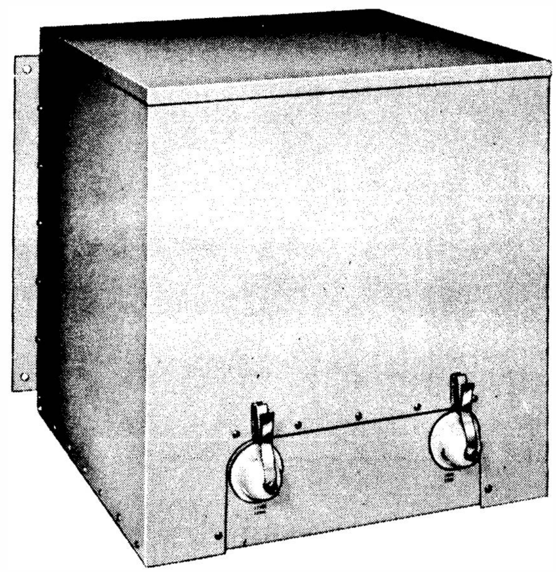


Figure 1-16. Transmission Line Coupler CU-390/FRT-24

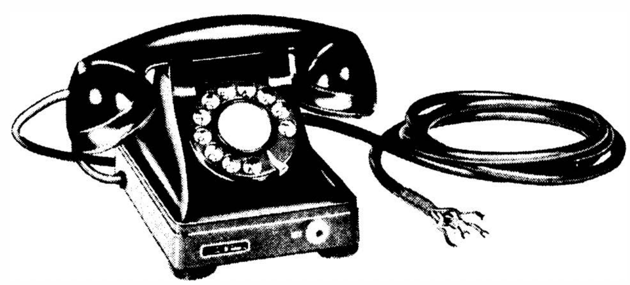


Figure 1-17. Telephone Set TA-267/U

k. TYPE OF FREQUENCY CONTROL.—Crystal or stabilized oscillator.

l. TYPE OF EMISSION AND MODULATION CAPABILITY.

(1) A-1 (carrier on-off)

(2) A-3 (phone) 100%

m. KEYING SPEED.—600 words per minute (240 dot cycles per second).

n. NOMINAL CARRIER OUTPUT.

(1) 250 watts, 500 watts, or 1000 watts for A-1 emission, into a 600-ohm load, with a maximum SWR of 2 to 1.

(2) 250 watts, 500 watts, or 1000 watts for A-3 emission, into a 600-ohm load, with a maximum SWR of 2 to 1.

o. FREQUENCY STABILITY.

(1) With crystal oscillator, .003%.

(2) With R-F Oscillator O-243/FRT-24, .004% ±240 cps.

p. CRYSTALS.—Type CR-18/U.

q. DISTORTION.—Less than 5% total harmonic distortion at 1000 cps and 90% modulation when clipping is not used.

r. NOISE.—At least 40 db below 100% modulation.

s. POWER FACTOR OF EQUIPMENT.

(1) Starting: (High voltage off).

	1 KW	½ KW	¼ KW
CW	.948	.948	.948
Phone	.941	.941	.941

(2) Standby: (Key open).

	1 KW	½ KW	¼ KW
CW	.797	.798	.798
Phone	.915	.899	.901

(3) Normal operation

	1 KW	½ KW	¼ KW
CW (key closed)	.895	.899	.880
Phone (100%)	.903	.905	.891

t. POWER SOURCE REQUIREMENTS.

(1) Voltage: 230/208 volts ±10%.

(2) Frequency: 50/60 cps ±5%.

(3) Number of phases: 1.

(4) Input power:

(*a*) Standby: 20 watts.

(*b*) Filaments on, cw: 900 watts.

(*c*) Filaments on, phone: 1000 watts.

(*d*) Carrier on, cw: 3100 watts.

(*e*) Carrier on, phone (no modulation): 3700 watts.

(*f*) Carrier on, phone (100% modulation): 4500 watts.

u. AMBIENT TEMPERATURE RANGE FOR SATISFACTORY OPERATION.—0°C (32°F) to 50°C (122°F).

v. MAXIMUM RELATIVE HUMIDITY.—Up to 95%.

w. MAXIMUM ELEVATION ABOVE SEA LEVEL.—10,000 feet.

Note

FOR 50-CPS OPERATION, CAPACITOR C404 IS CONNECTED INTO THE HIGH-VOLTAGE POWER SUPPLY CIRCUIT AS INDICATED IN THE SCHEMATIC (SEE FIGURE 7-64).

6. EQUIPMENT SUPPLIED

TABLE 1-1. EQUIPMENT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	OVER-ALL DIMENSIONS			VOLUME	WEIGHT
			HEIGHT	WIDTH	DEPTH		
1	Radio Transmitter	T-440/FRT-24	83	46 7/8	31 3/4		1500
1	R-F Oscillator	O-243/FRT-24	10 15/32	18 3/16	16 13/16		33
1	Power Supply	PP-454/FRT-5	8 3/4	19	15 1/8		88
2	Transmitter Control	C-1362/FRT-24	10 7/8	21 1/8	11		50
1	Transmission Line Coupler	CU-390/FRT-24	20 1/8	23	20 1/4		90
2	Telephone Set	TA-267/U	5 1/2	5 1/8	7 1/2		4

Unless otherwise stated, dimensions are in inches, volume in cubic feet and weight in pounds.

7. EQUIPMENT REQUIRED BUT NOT SUPPLIED

TABLE 1-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	REQUIRED USE	REQUIRED CHARACTERISTICS
1	Telegraph key		C-W operation	
1	Microphone		Radiotelephone operation	
	Crystal oven			
	Crystal units	CR-18/U	Frequency Control	

8. SHIPPING DATA

TABLE 1-3. SHIPPING DATA

SHIPPING BOX	CONTENTS		OVER-ALL DIMENSIONS			VOLUME	WEIGHT
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		

Unless otherwise stated, dimensions are in inches, volume in cubic feet, weight in pounds.

9. ELECTRON TUBE COMPLEMENT

TABLE 1-4. ELECTRON TUBE COMPLEMENT

UNIT	NUMBER OF TUBES OF TYPE INDICATED																				
	3B28*	4B32†	4-400A	4-1000A	5R4GYW	5Y3WGTA	6SJ7 or 5693	6X4W or 6X4WA	12AT7	12AU7	4-65A	5654	5654/6AK5W	5686	5726	5749	5750	5763	5814 or 5814A	OA2 or OA2WA	OB2 or OB2WA	Total No. of tubes
Radio Transmitter T-440/FRT-24	2	2	2	1		2		1		2	1		1					7	5	4	1	31
R-F Oscillator O-243/FRT-24							2					3		5	2	4	5		6			27
Power Supply PP-454/FRT-5					3			1												2		6
Transmitter Control C-1362/FRT-24						1			5													6
Total Number of Each Type	2	2	2	1	3	3	2	2	5	2	1	3	1	5	2	4	5	7	11	6	1	70

*Tube type 866/866A may be substituted.
†Tube type 872A/872 may be substituted.

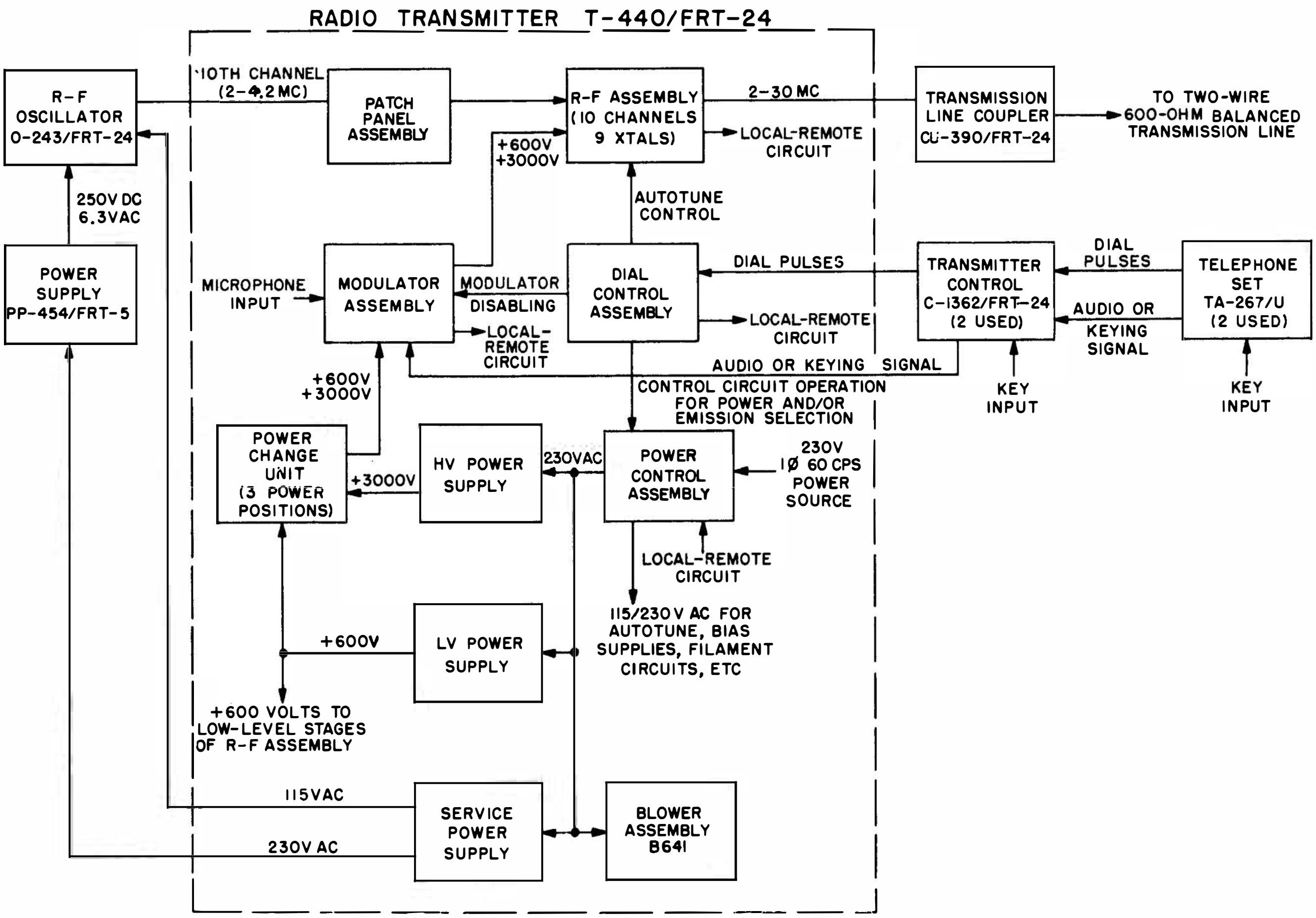
SECTION 2

THEORY OF OPERATION

1. INTRODUCTION

Figure 2-1 is a simplified block diagram of Radio Transmitting Set AN/FRT-24. The set consists of six basic units: Radio Transmitter T-440/FRT-24, Transmission Line Coupler CU-390/FRT-24, Transmitter Control C-1362/FRT-24 (two supplied), Telephone Set TA-267/U (two supplied), R-F Oscillator O-243/FRT-24, and Power Supply PP-454/FRT-5. discussed in paragraphs *a* through *f*, below. Detailed block diagrams will be included whenever the complexity of a particular unit requires such treatment. Radio Transmitter T-440/FRT-24 is a self-contained unit capable of generating an r-f carrier for c-w and phone operation within the 2 to 30-megacycle range. The transmitter can be made to provide frequency-shift operation (FSK) if certain circuit modifications and additional equipment are added. The output from the power stage in the R-F Assembly is fed through a shielded coaxial cable to Transmission Line Coupler CU-390/FRT-24, which can feed the antenna through a two-wire, 600-ohm balanced transmission line.

The transmitter can be operated locally by means of its own front-panel controls or remotely by means of Transmitter Control C-1362/FRT-24 and Telephone Set TA-267/U. Since two of each of the latter components are supplied, the transmitter is capable of being operated from two remote positions. Dial pulses as well as a keying or an audio input signal, depending upon the type service desired, can be originated from either the Transmitter Control or the Telephone Set. The



Figur 2-1. Radio Transmitting S t AN/FRT-24, Block Diagram

dial pulses set up relays in the Dial Control Assembly, which in turn select the proper circuits in the transmitter. In accordance with the number of pulses dialed, the Dial Control Assembly can do the following: operate the Autotune system to select one of 10 frequency channels in the R-F Assembly, operate the Power Control Assembly to turn off the power to filament circuits or the Low-Voltage and High-Voltage Power Supplies; operate to effect circuits in the R-F Assembly, Modulator Assembly, and Power Control Assembly for emission selection.

In phone operation, pressing the push-to-talk button in the Telephone Set or external microphone energizes the plate power supplies, putting the r-f carrier on the air. Speaking into the Telephone Set causes the Transmitter Control to feed an audio voltage to the Modulator Assembly. For local operation, a microphone can be connected directly into the input of the Modulator Assembly. This assembly modulates the +600-volt and +3000-volt, d-c voltages supplied from the Low-Voltage and High-Voltage Power Supplies, respectively, and then applies this modulated voltage through the Power Change Assembly to the screen grid and plate circuits of the power-amplifier stage in the R-F Assembly. The Power Change Assembly is a resistive network that is capable of dropping the input voltage of +600 and +3000 volts to a lower value for one-half or one-fourth the full rated output of the transmitter. If the full rated power is required, the Power Change Assembly shunts the d-c voltages around its resistive networks.

In c-w operation, the Modulator Assembly is disabled. Actuating or depressing an external telegraph key connected to the Transmitter Control or Telephone Set causes a keyer assembly to unblock the R-F Assembly circuits, and an r-f carrier is provided as long as the key is in the on position.

The R-F Assembly uses nine crystals to provide nine fixed frequencies (channels) lying in one of the eight bands that divide the operating-frequency range of 2 to 30 mc. The frequency of the tenth channel can be varied so that complete coverage for all eight bands is possible using an external vfo (variable-frequency oscillator). R-F Oscillator O-243/FRT-24 is an extremely accurate and stable oscillator which is capable of supplying an input frequency of 2 to 4.2 megacycles to the R-F Assembly through the Patch Panel Assembly when the R-F Assembly is set to channel 10. After the 10 channels are manually adjusted and positioned, they can be returned to these positions automatically by the operation of the Autotune system during local or remote operation. In local operation, the Dial Control Assembly, Transmitter Control, and Telephone Set are disabled, and these items are replaced by circuits in the transmitter which are energized by front-panel controls that accomplish identical functions.

a. RADIO TRANSMITTER T-440/FRT-24.—A simplified block diagram of Radio Transmitter T-440/FRT-24 is contained within the overall block diagram of the Radio Transmitting Set, shown in figure 2-1. The transmitter consists of 10 major items. One of these items is a Cabinet with accessories including blower assembly B641, which supplies air cooling to the high-power tubes in the Modulator and R-F Assemblies. The Cabinet not only houses the nine other items (R-F Assembly, Modulator Assembly, Dial Control Assembly, Power Control Assembly, three separate Power Supplies, Power Change Assembly, and Patch Panel Assembly), but also R-F Oscillator O-243/FRT-24 and Power Supply PP-454/FRT-5. Figure 2-2 is a detailed block diagram of the transmitter showing the tube functions of each major item discussed below:

The R-F Assembly is capable of generating up to one kilowatt of r-f energy into a 52-ohm load. The frequency range of 2 to 30 mc is developed at a lower frequency by crystal oscillator V101. The frequency is then stepped up to the correct operating frequency by means of frequency multiplication. Switch section S101D operated by the Autotune system can select any of nine different crystals (Y101 to Y109) for operation on a frequency lying in one of the eight frequency bands. These frequencies, which are also known as channels, must not be confused with the term "band". The operating frequency range of the transmitter is divided into eight portions, or bands; for example, Band 1 occupies the range of 2 to 3 mc, Band 2 occupies the range of 3 to 4 mc, etc, as shown in table 2-1. The tenth channel position on S101D is connected to an external signal source provided by R-F Oscillator O-243/FRT-24 through the Patch Panel Assembly connectors and cabling. In this position V101 acts as an additional buffer stage. Oscillator voltage regulator V107 maintains a constant +150-volt input to the plate and screen circuits of the crystal oscillator, to ensure maximum frequency stability. Buffer V102 acts as a decoupling device between V101 and the following r-f stages. Grid-blocking voltage is also supplied to V102 from keyer V201B for r-f carrier on-off keying during c-w operation.

The output signals from V101 pass through the untuned buffer (V102) to the input of the first frequency multiplier (V103). If the signal originates from the internal crystals (Y101 through Y109), V103 is used to double the signal frequency. In the tenth position when a signal of 2 to 4.2 mc is fed from the external oscillator, this stage can operate as a doubler, a tripler, or quadrupler depending upon the required band. For frequencies up to the sixth band (2—16 mc), the output of the first frequency multiplier is fed directly by switch sections S102B and S102C to the input of r-f driver V105. For carrier frequencies above 16 mc, the output is applied to the input of the second frequency multiplier (V104), which operates only as a frequency doubler to supply excitation to r-f driver V105. The output of V105 drives power amplifier V106. The driver and power-amplifier tubes are operated as Class-C amplifiers receiving their negative grid bias of —50 and —150 volts, respectively, from power-amplifier bias rectifier V113. During phone operation, the plate and screen voltages of V106 are modulated in order to produce linear 100 percent modulation of this stage, which uses a tetrode-type tube.

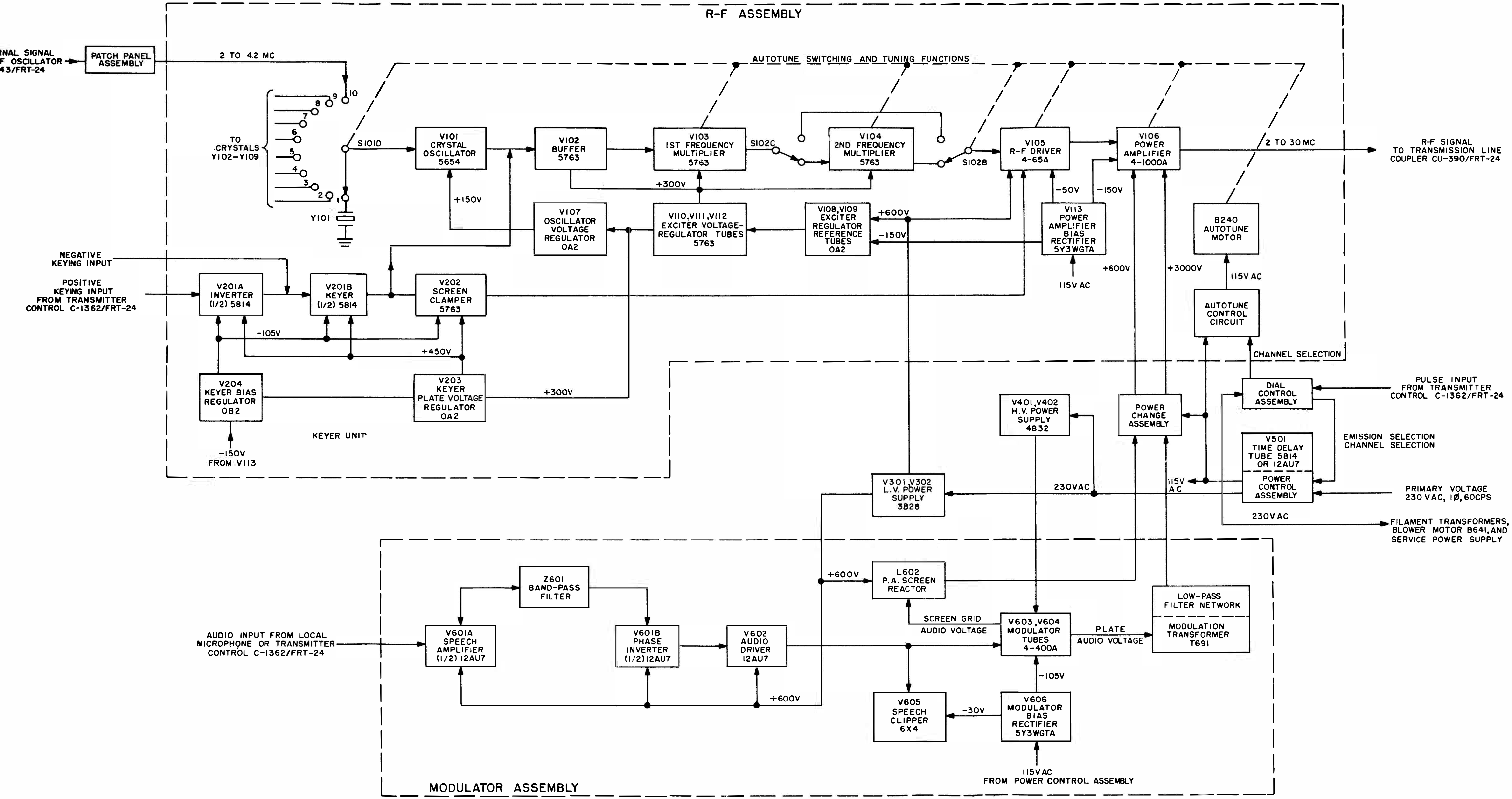
The keyer unit employs four tubes, V201 to V204. V201 is operated as a dual-purpose tube: section V201A functions as an inverter to convert positive or polar positive impulses for marking (key down), into negative impulses to feed to the other section, keyer V201B, during c-w operation. Negative or polar negative impulses are fed directly to the input of V201B. Keyer V201 feeds bias to buffer stage V102 and screen-clamper tube V202 during the spacing periods (key-up). The buffer stage ceases to operate, removing all signal drive to the following r-f stages, while V202 reduces the screen voltage of power amplifier V106 to a lower, safe value during the periods when there is no grid drive. V204 and V203 are voltage regulators which maintain at a constant level the —105 and +450 volts fed to the bias and plate circuits, respectively, of the keyer assembly.

All tuning controls (including the 10-position channel switch and the eight-position band switches used in the r-f stages of the transmitter) that are repositioned for a change in operating frequency are coupled to Autotune motor B240 through mechanical positioning heads. The control head is capable of positioning the channel-switch shaft to 10 positions corresponding to 10 frequency channels, whereas six single-turn heads can position their respective eight-position switches or tuning capacitor controls to a position in one of the eight bands corresponding to the frequency channel selected. The Autotune motor is actuated through a 10-position CHANNEL SELECTOR switch and a parallel-connected switching arrangement located on the control head. When a channel is selected either through the front panel selector switch or at a remote point through the Dial Control Assembly, the Autotune system automatically sets up the switches and tuning controls (seven in all) connected to the appropriate r-f stages.

The exciter voltage regulator employs two voltage reference tubes (V108 and V109) connected in series between the —150-volt and 600-volt power, and three parallel-connected voltage-regulator pentode tubes (V110, V111, and V112) maintain a constant 300-volt voltage for operation of the lower-level r-f stages excluding r-f driver V105. The d-c input for crystal oscillator V101 is dropped to 150 volts and is given additional regulation by V107.

The Modulator Assembly is capable of delivering sufficient audio power output to fully modulate the r-f carrier generated by V106. Designed primarily for voice communications, the modulator circuit includes a speech clipper (V605), a band-pass filter at low power level, and a low-pass filter at high power level. The clipper allows a high average modulation level without consequent overmodulation and splattering. The band-pass filter attenuates the audio signals below 350 cps and above 3500 cps, and thus allows a readable signal with minimum harmonic interference and usable sideband width. The audio input voltage from a microphone during local operation, or from a preamplifier in Transmitter Control C-1362/FRT-24 during remote operation, is amplified by speech amplifier V601A, and the output is fed through band-pass filter Z601 to phase inverter V601B. The phase inverter, employing a single-ended tube, provides two audio signals, 180 degrees out of phase with each other to the input of a push-pull Class-B amplifier, audio driver V602, which develops sufficient voltage swing to drive modulator tubes V603 and V604. The modulator tubes are connected as a push-pull amplifier, and are biased Class AB_1 by means of modulator bias supply V606. The speech clipper (V605) connected to the input of the modulator tubes receives a negative bias from V606. When the positive-going portion of the signal exceeds the established bias, V605 conducts, limiting the positive-going portion of the audio signal. Limiting this portion of the signal (known as positive peak extension to be discussed later in greater detail) increases the modulation capability of the transmitter without producing overmodulation in the negative direction, which is the principal cause of splattering and interference. The output of the modulator tube is coupled to the r-f power amplifier plate circuit through modulation transformer T691, the low-pass filter network, and the Power Change Assembly. The screen grid of the power amplifier tube is coupled to the 600-volt supply through reactor L602 and the Power Change Assembly. Reactor L602 allows the screen grid to be self-modulating. Combined plate and screen-grid modulation is provided in order to obtain linear modulation of the power-amplifier tube, which has a fairly high plate resistance.

The Power Change Assembly consists of two voltage-divider circuits in series with the +600-



Figur 2-2. Radio Transmitt r T-440/FRT-24, Block Diagram

volt and +3000-volt inputs to r-f power amplifier V106. By means of two relays operated by a switch, the voltage divider can be shorted out or placed into the circuit in part or entirely for full, one-half, or one-fourth of the transmitter rated power output of one kilowatt.

The Power Control Assembly consists of control branches and primary circuits for applying 115 volts, ac, or 230 volts, ac, as required to all circuits of the transmitter for operating the power, channel, and emission-selection systems. A local-remote switch in this unit sets up the transmitting set for operation locally or from one of the two remote stations. The assembly also contains an electronic time-delay circuit (V501) which delays application of primary power to the Low-Voltage and High-Voltage Power Supplies during the tube warm-up period.

The Dial Control Assembly contains relays actuated by pulses from Transmitter Control C-1362/FRT-24 or Telephone Set TA-267/U. During remote operation of the transmitter these relays are capable of actuating the control circuits in the Power Control Assembly to turn the transmitter on and off, to select the frequency channel by operating the Autotune system, and to select the desired type of emission.

The Low-Voltage Power Supply utilizes V301 and V302, connected as a full-wave rectifier, to deliver 600 volts, dc, to the R-F and Modulator Assemblies. The High-Voltage Power Supply employs V401 and V402, connected as a full-wave rectifier, to deliver 3000 volts, dc, to the plate circuits of the modulator tubes and r-f power amplifier. The Service Power Supply, consisting of an autotransformer, is connected to the primary power of the transmitter to supply power for Power Supply PP-454/FRT-5 and R-F Oscillator O-243/FRT-24.

b. TRANSMISSION LINE COUPLER CU-390/FRT-24.—The Transmission Line Coupler matches the unbalanced, 52-ohm coaxial cable attached to the output of Radio Transmitter T-440/FRT-24 to a two-wire, 600-ohm balanced transmission line. For convenience, shielding, appearance, and safety to personnel, coaxial cable is used to transmit r-f power within the transmitter shelter, whereas for outdoor transmission 600-ohm, two-wire lines are required to match the higher-impedance inputs of broad-band type antenna systems. The coupler first transforms the unbalanced, 52-ohm output to a balanced, 52-ohm output, and then steps up the impedance to approximately 600 ohms by means of artificial transmission lines and other circuit refinements.

c. TRANSMITTER CONTROL C-1362/FRT-24.—A block diagram of Transmitter Control C-1362/FRT-24 is shown in figure 2-3. An audio signal can be applied by either an external amplifier or microphone to input transformer T901. Telephone Set TA-267/U is also connected to T901. The input signal is amplified by trans-

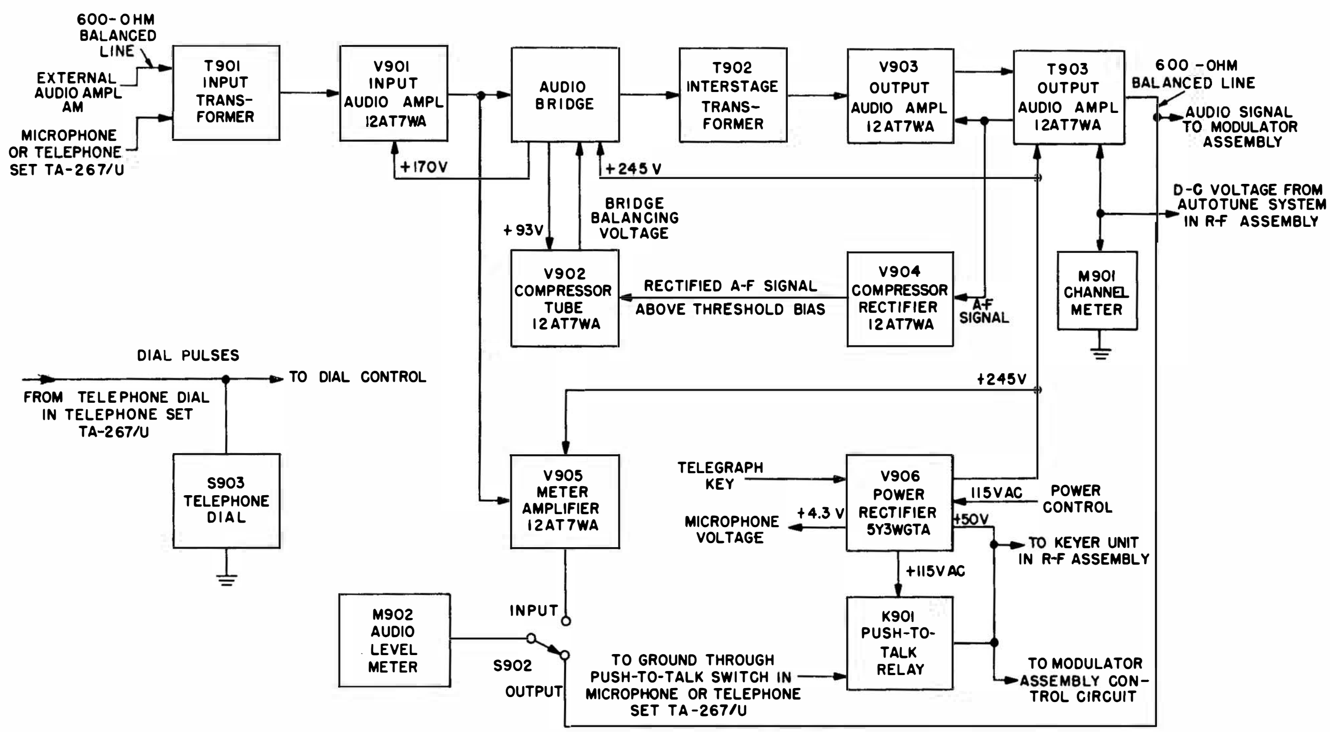


Figure 2-3. Transmitt r Contr l C-1362/FRT-24, Block Diagram

former-coupled stages V901 and V903, the input audio and output audio amplifiers, respectively, both of which are operated Class A push-pull. The advantages of using transformers T901, T902, and T903 are ease in matching balanced input and output lines, in driving the push-pull amplifiers, and in obtaining a pass band (100 to 5000 cps) for voice frequencies with optimum gain. An audio-level meter (M902) can be switched to measure the audio level at the output of V901 or the audio level at the output of transformer T903. The amplified signal taken from T903 is applied to the Modulator Assembly through a 600-ohm, balanced line.

A bridge-type compressor circuit reduces the gain of the amplifier whenever the audio level exceeds a preset value. This circuit includes compressor rectifier V904, compressor tube V902, interstage transformer T902, and an audio bridge. Whenever the audio signal from V903 exceeds the preset value of cut-off bias applied to V904, V904 conducts, and the resulting rectified voltage is applied to the input of V902. Tube V902 then conducts and brings the audio bridge more nearly into balance, so that the audio-signal voltage appearing across the primary winding of T902 is reduced, thereby lowering the over-all gain of the amplifier as long as a signal exceeding the preset value is maintained.

Telephone dial S903 of the Transmitter Control and the dial on Telephone Set TA-267/U are connected in parallel, so that either component can apply ground pulses to the Dial Control Assembly, which in turn selects the required transmitter function. The number of pulses transmitted corresponds to the number dialed. By dialing certain positions, an established group of pulses will actuate the Dial Control Assembly to set the transmitter to a different frequency channel or type of emission, or to turn off its plate or filament circuits. The new frequency channel to which the transmitter has been set will be indicated on CHANNEL meter M901, since a voltage proportional to the channel selected is fed to this meter from the Autotune system through the center tap of T903.

The voltage for all the circuits of the Transmitter Control is supplied by power rectifier V906. Voltage for the operation of a microphone, for push-to-talk relay K901, and for keying is obtained from taps on bleeder resistors connected across the output of V906. During phone operation, pressing the push-to-talk switch on the microphone or Telephone Set TA-267/U, energizes K901, which in turn applies 50 volts, dc, through its contacts to energize a similar relay in the Modulator Assembly so that plate voltage can be applied to the transmitter. During c-w operation, a telegraph key is shunted across the normally open contacts of K901, so that depressing the key applies the same 50 volts, dc, to the keyer assembly, which then turns on the r-f carrier for on-off type keying.

d. TELEPHONE SET TA-267/U.—Except for certain modifications the Telephone Set is similar in function to any ordinary commercial telephone. The circuits of the Telephone Set are connected in parallel with those in the Transmitter Control so that the operator can use the set to dial a new channel, turn filament or plate power on or off, or the type of emission, as well as to modulate or key the transmitter. The handset contains a standard mouth and earpiece so that the operator can modulate the transmitter after the switch on the hand grip is pressed. The mouthpiece, which is a carbon-type microphone, is connected to the audio-preamplifier circuits in the Transmitter Control, and the handset switch, when actuated, energizes the push-to-talk control circuits in the Transmitter Control and Modulator Assembly when the transmitter is set for PHONE operation. For two-way operation with another transmitting location, the earpiece can be connected to the receiver. For c-w operation, a telegraph key can be connected to a receptacle in the base of the Telephone Set to permit on-off keying of the transmitter.

e. R-F OSCILLATOR O-243/FRT-24.—A simplified block diagram of R-F Oscillator O-243/FRT-24 is shown in figure 2-4. The R-F Oscillator is a very stable automatic-frequency-controlled oscillator which covers a frequency range of 2 to 4.2 mc. It employs a master oscillator and amplifiers in conjunction with automatic-frequency-control circuits and a servo motor which maintain the output frequency from the master oscillator constant at any selected value within its range. The circuits that provide power to drive the transmitter are master oscillator V3131, first multiplier V3111, and final amplifier V3113. (These circuits are marked with an orange arrow on the chassis.) The remainder of the circuits, with the exception of the 450-kc mixer-amplifier (V3104), comprise the frequency-control circuits. The 450-kc mixer-amplifier (V3104) and the 100-kc amplifier (V3102B) are both provided with external jacks, so that the output of either may be fed to any external equipment requiring a frequency source of this type.

The stability of R-F Oscillator O-243/FRT-24 can be controlled by a 100-kc standard signal, either external or internal. The internal signal, when used, is generated by the 100-kc crystal oscillator (V3101). This 100-kc standard signal is subdivided by a frequency-divider circuit (V3103) to 25 kc and is then mixed, in harmonic mixer V3105 with the 100-kc signal from V3102B, to produce a signal range of 9.125 to 20.125 mc, which in turn is amplified by V3106.

The 9.125 to 20.125-mc signal from V3106 is mixed, in the first mixer (V3107), with the fifth harmonic (10—21 mc) produced by multipliers V3111 and V3112 from the generated frequency (1—1.5 mc) supplied by V3131, to produce an intermediate frequency (if.) in the range of 875—900 kc. This i-f signal is amplified by V3108 and combined in the second mixer (V3109) with a 75 to 100-kc signal, which is obtained by subdividing the 300 to 400-kc output of interpolation oscillator V3126 by means of dividers V3114 and V3115, to produce an 800-kc i-f signal in the output of V3109.

The 800-kc i-f signal is amplified by V3110 and is then subdivided to 100 kc by regenerative dividers V3124 and V3125. V3124 also provides bias to the first and second mixers and amplifiers, so that the amplitude of the 800-kc input from V3110 is maintained at a constant level at all times. Any error in the frequency of master oscillator V3131 will appear as a deviation from the 100-kc signal, which is used as one of the inputs to an error-correcting servo system. This input signal is combined, in a pair of diode mixers (V3122 and V3123), with a signal from the 100-kc standard (V3102B) to produce an output which, although in the audible range, still retains the original frequency-error deviation. In one of the diode mixers, the 100-kc standard input signal is shifted 90 electrical degrees, in order to provide a two-phase output. This two-phase output is fed to a pair of d-c amplifiers (V3120 and V3121), and thence to a pair of power amplifiers consisting of V3116, V3117, and V3118, V3119, respectively. The resultant two-phase output from the power amplifiers is fed to a-f-c motor V3101, which rotates a capacitor in the master-oscillator circuit, in the proper direction to correct the master-oscillator frequency. As soon as the master oscillator is set to the correct frequency, the 100-kc signal from V3124 matches the 100-kc signal from V3102B, and the motor ceases to rotate. The capacitor-centering relay (K3101) applies 115 volts, ac, to the a-f-c motor when the SET UP-OPERATE switch is thrown to SET UP. This sets the

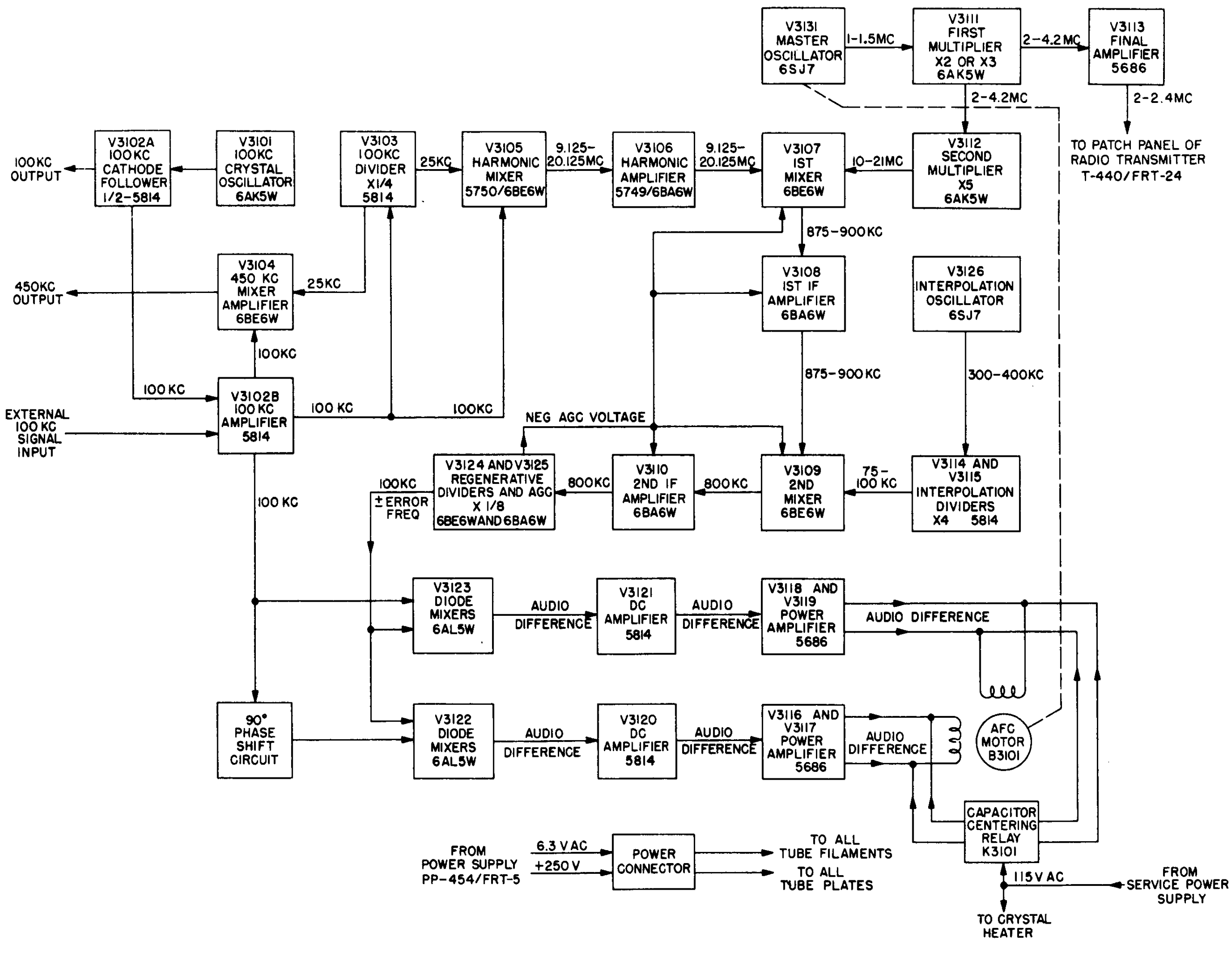


Figure 2-4. R-F Oscillator O-243/FRT-24, Block Diagram

capacitor in the master-oscillator circuit to the center of its range to permit adjustment of the R-F Oscillator controls.

f. POWER SUPPLY PP-454/FRT-5. — This Power Supply contains two similar power-supply sections, each capable of providing outputs of +250 volts unregulated, +150 volts regulated, and 6.3 volts, ac. One section of the component is used to supply +250 volts and 6.3 volts, ac, to the plate and filament circuits, respectively, of R-F Oscillator O-243/FRT-24. The section that supplies the d-c voltage is produced by two rectifier tubes (V1001 and V1002). The filament output is taken from a winding on rectifier transformer T1001. The +150 volts, which is regulated by a cold-cathode type regulator (V1005), is not required for the operation of the R-F Oscillator. The other section of the Power Supply, employing two rectifier tubes (V1003 and V1004) and voltage regulator V1006, can be used to supply plate and filament power to an external FSK oscillator when the FSK function (after certain circuit modifications are made) of the transmitter is to be enabled. The d-c output voltage from either supply can be measured by means of voltmeter M1001 and switch S1003. The input power of 230 volts, ac, from the Service Power Supply in Radio Transmitter T-440/FRT-24 is supplied to the primary windings of rectifier transformers T1001 and T1002 of the dual-section power supply. Operation from a 115-volt, a-c source is possible when switch S1002 is thrown to the 115V position.

2. CIRCUIT ANALYSIS

a. RADIO TRANSMITTER T-440/FRT-24.—Radio Transmitter T-440/FRT-24 consists of an R-F Assembly, Modulator Assembly, Dial Control Assembly, Power Control Assembly, three separate Power Supplies, Power Change Assembly, and Patch Panel Assembly, which are mounted in and interconnected within a cabinet. Each is discussed in the following paragraphs.

(1) R-F ASSEMBLY.—The R-F Assembly, shown in figure 1-3, is divided into a crystal oscillator and buffer, two multiplier stages, a driver and power-amplifier stage, a bias supply, an exciter voltage regulator, a keyer assembly, and an Autotune electromechanical system. Each is discussed in paragraphs (*a*) through (*h*), below.

(*a*) CRYSTAL OSCILLATOR AND BUFFER (*see figure 2-5*).—The crystal-oscillator stage, using a JAN 5654 pentode (V101), is essentially an electron-coupled, Colpitts-type circuit employing a highly selective crystal in place of a conventional tuned circuit for generating the transmitter frequency. The oscillator can be set to nine different channels within the frequency range of 1.0 mc to 8 mc by selecting crystals Y101 through Y109 with the 10-position channel switch (S101D). Each crystal has a trimmer capacitor (C171 through C179), which permits slight adjustment of the resonant frequency of the crystal to a more accurate setting. The oscillator portion of the tube consists of the cathode, control grid, and screen grid, the latter

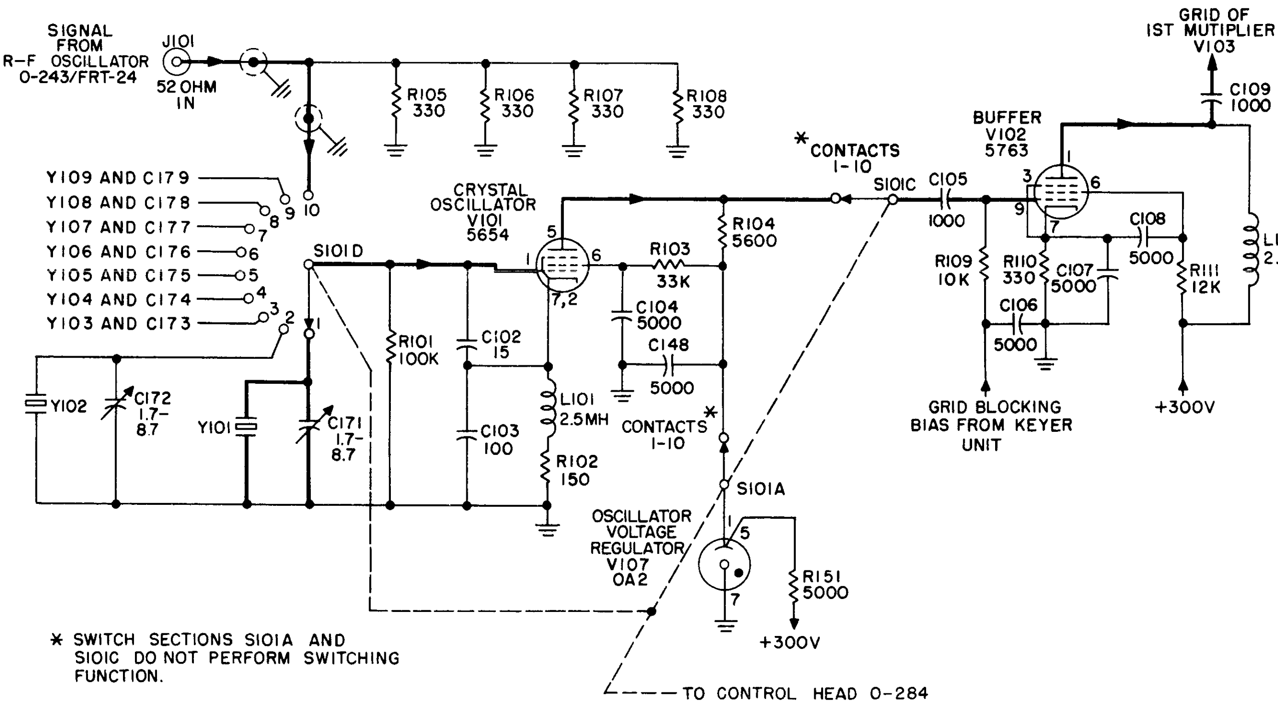


Figure 2-5. Crystal Oscillator and Buff r, Simplified Sch matic

element serving as the anode (held at r-f ground potential by means of bypass capacitor C104). Therefore, the crystal is actually connected between the control and screen grids; the ratio of signal voltage fed between the two grids to maintain oscillation is determined by the r-f potential established at the cathode by capacitors C102 and C103 acting as a voltage divider. R-F choke L101 isolates cathode bias resistor R102 by offering a high impedance to the signal, and thus prevents unnecessary loading that might prevent oscillation. The generated r-f is coupled to the plate by means of the electron stream within the tube. Since the plate is not part of the oscillator circuit, but is effectively isolated from the circuit by means of the grounded screen grid, variations in plate loading that might change the output frequency are avoided; therefore, frequency stability of the circuit is ensured.

Channel switch S101, which selects the various oscillator-frequency channels, is positioned by control head O-284 in the Autotune system, which is controlled in local operation by CHANNEL SELECTOR switch S243, as explained in paragraph 2.*a.*(1) (*h*) *3.*, or in remote operation by a telephone dial at the remote station, as explained in paragraph 2. *c.* (8) of this section. In channel positions 1 through 9, switch section S101D connects the appropriate crystal to the control grid of V101. In position 10, a signal is applied from R-F Oscillator O-243/FRT-24, through the r-f Patch Panel Assembly to the 52 OHM R-F INPUT receptacle (J101). J101 is connected by plug P731 and a 52-ohm, type RG-58/U cable to the TRANSMITTER INPUT connector (J721), which must be jumpered to the MASTER OSC. OUTPUT receptable (J722) by cable assembly W721 to obtain the output from R-F Oscillator O-243/FRT-24, a variable-frequency oscillator that can be set to any desired frequency over a 2.0 to 4.2-mc range. At position 10, the crystal oscillator (V101) is no longer self-excited, but operates as an r-f amplifier and untuned buffer stage for the incoming signal being applied from the external oscillator to J101 and impedance-matching and loading resistors R105 through R108.

Note

SWITCH WAFERS S101A, S101B, AND S101C HAVE BEEN REWIRED SO THAT THEY NO LONGER HAVE A FUNCTION SINCE THE FREQUENCY-SHIFT-KEYING OPERATION OF THE TRANSMITTER HAS BEEN DISABLED. THE OUTPUT FROM THE CRYSTAL OSCILLATOR IS SUPPLIED THROUGH THE CONTACTS OF SWITCH WAFER S101C AND COUPLING CAPACITOR C105 TO THE CONTROL GRID OF THE NEXT STAGE, BUFFER V102. REGULATED +150 VOLTS FROM VOLTAGE REGULATOR V107 IS APPLIED THROUGH THE CONTACTS OF SWITCH WAFER S101A TO THE PLATE AND SCREEN CIRCUITS OF V101.

D-C power is applied through load resistor R104 to the plate of V101, and through voltage-dropping resistor R103 to the screen grid of V101, which is by-passed for rf by capacitor C148; this power is supplied from the oscillator voltage regulator described in paragraph 2.*a.*(1) (*f*). The +300 volts from this regulator is fed directly to the next stage, V102, and is reduced to +150 volts by means of voltage-dropping resistor R151 in series with voltage regulator V107, a type JAN OA2 cold-cathode or glow-discharge tube.

The buffer stage uses a type JAN 5763 pentode tube as a broad-band amplifier which acts as an isolation device to permit continuous stable operation of the crystal oscillator, especially during keying, so that loading interaction on the oscillator from succeeding r-f stages is minimized. The control grid is resistance-coupled to the oscillator stage by means of capacitor C105 and grid-leak resistor R109. The control-grid bias is obtained across R109, which is connected to ground through contacts (3) of FSK-CW relay K201 of the keyer assembly (as explained in paragraph 2. *a.* (1) (*e*) of this section) when in the PHONE position. Hence, the buffer stage will operate continuously during phone operation. When relay K201 is energized during c-w operation, however, the bias applied to this stage from the keyer assembly through contacts (3) will vary in accordance with keying, and the stage will operate only during the key-down position. The output from V102 is impedance-coupled by means of r-f choke L102 and capacitor C109 to the input of the first frequency multiplier (V102).

(*b*) FREQUENCY MULTIPLICATION (*see figure 2-6*).—The first frequency multiplier, employing a JAN 5763 pentode, can double, triple, or quadruple the original oscillator frequency applied from the buffer stage, to produce an output frequency range of 2 to 16 mc. The multiplication factor provided is determined by the setting of the eight-position BAND SWITCH (S102), which sets up the conditions of operation not only for the first frequency multiplier, but also for the second frequency multiplier (V104). Table 2-1 indicates the function of various sections of S102 for each position of the switch, and the frequency scheme for the two stages. As shown in this table, each position of the switch corresponds to a particular range, or band, of transmitter frequencies.

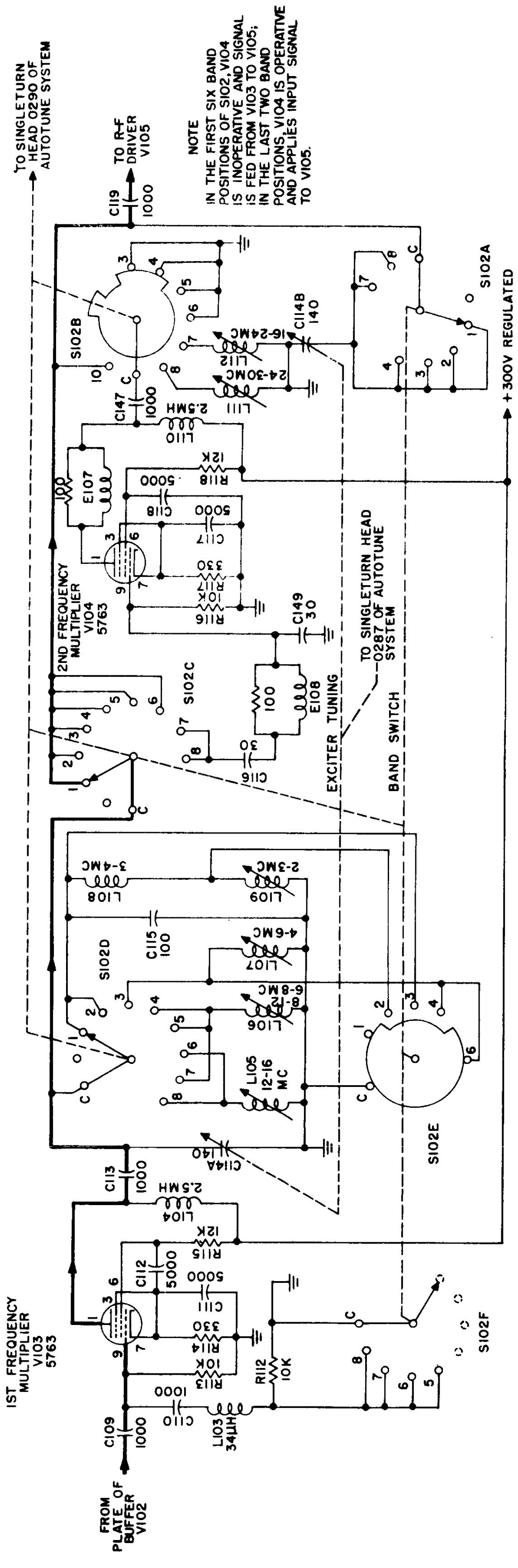


Figure 2-6. First and Second Frequency Multipliers, Simplified Schematic

TABLE 2-1. BAND-SWITCHING FUNCTIONS OF S102 IN MULTIPLIER PLATE TANK AND FREQUENCY SCHEME

SWITCH POSITION	BAND (mc)	FUNCTION OF S102				FREQUENCY SCHEME				
		SECTION OF SWITCH				V103			V104	
		S102D	S102E	S102B	S102A	IN*	IN**	OUT	IN	OUT
1	2—3	Selects L108, L109 in series (2—3 mc)	Shorts L107	Disables V104 plate circuit	Parallels C114B with C114A	Not used	1—1.5	2—3	Inoperative	Inoperative
2	3—4	Selects L108 (3—4 mc)	Shorts L107, L109	Disables V104 plate circuit	Parallels C114B with C114A	Not used	1.5—2	3—4	Inoperative	Inoperative
3	4—6	Selects L107 (4—6 mc)	Shorts L108, L109, C115	Disables V104 plate circuit	Parallels C114B with C114A	2—3	2—3	4—6	Inoperative	Inoperative
4	6—8	Selects L106 (6—12 mc)	Shorts L107, L108, L109	Disables V104 plate circuit	Parallels C114B with C114A	3—4	3—4	6—8	Inoperative	Inoperative
5	8—12	Selects L106 (6—12 mc)	Shorts L107, L108, L109	Disables V104 plate circuit	Removes C114B from circuit	2—4	4—6	8—12	Inoperative	Inoperative
6	12—16	Selects L105 (12—16 mc)	Shorts L107, L108, L109	Disables V104 plate circuit	Removes C114B from circuit	3—4	6—8	12—16	Inoperative	Inoperative
7	16—24	Selects L106 (8—12 mc)	Shorts L107, L108, L109	Connects L112 (16—24 mc) in V104 plate circuit	Connects C114B to tune L112	2—4	4—6	8—12	8—12	16—24
8	24—30	Selects L105 (12—16 mc)	Shorts L107, L108, L109	Connects L111 (24—30 mc) in V104 plate circuit	Connects C114B to tune L111	3—3.75	6—7.5	12—15	12—15	24—30

*Frequency supplied by R-F Oscillator O-243/FRT-24 when CHANNEL SELECTOR switch S243 and consequently S101D is in position 10.
**Frequency supplied by local crystals when CHANNEL SELECTOR switch S243 and consequently S101D is in any position from 1 to 10.

XTAL freq

The 2 to 30-mc frequency range of the transmitter is therefore divided into eight bands. For the first six bands, the output frequency of 16 mc, or less, from V103 is fed around V104 directly to the input of r-f driver stage V105, so that the signal from V103 determines the operating frequency of the transmitter. In the last two positions, the second frequency multiplier (V104), also a type JAN 5763 tube, operates as a frequency doubler of a signal within the 8 to 15-mc range supplied from the previous stage, to produce an output signal within the 16 to 30-mc range. This r-f signal, which is fed to V105, establishes the new operating frequency of the transmitter.

Note

THE BAND SWITCH CONTROL IS AN ASSEMBLY WHICH CONSISTS NOT ONLY OF S102 (WAFERS S102A TO S102F) BUT ALSO OF S103, S104, S105, AND S106 —ALL OF WHICH ARE POSITIONED BY A COMMON SHAFT ATTACHED TO SINGLE TURN HEAD, O-290 OF THE AUTOTUNE SYSTEM. THE AUTOTUNE SYSTEM IS CONTROLLED IN LOCAL OPERATION BY CHANNEL SELECTOR SWITCH S243 (REFER TO PARAGRAPH 2. *a.* (1) (*h*) 3. OF THIS SECTION), OR IN REMOTE OPERATION BY A TELEPHONE DIAL AT THE REMOTE LOCATION (REFER TO PARAGRAPH 2. *c.* (8) OF THIS SECTION).

The input to the control grid of the first frequency multiplier is a low-Q, parallel-resonant circuit, consisting of L103 in parallel with the stray circuit and tube-input capacitances. Capacitor C110 does not perform any tuning function in the circuit but is used as a blocking capacitor to prevent grounding of the d-c grid bias produced by R113 and R114. The parallel-resonant circuit has a higher impedance at the upper frequencies, because it is designed to peak in the 3 to 8-mc range; therefore, in this frequency range, its input impedance, and consequently the excitation fed to the control grid, will be greater than in the lower-frequency range of 1 to 3 mc. As a further aid to obtaining a more uniform excitation, and to equalize the greater signal input at the lower frequencies, switch wafer S102F inserts damping resistor R112 in series with L103 to decrease the Q of the circuit in the first four bands. The plate circuit of V103 is shunt-fed, the d-c voltage being applied through r-f choke L104 and the r-f output being coupled through capacitor C113 to a tuned circuit consisting of variable capacitor C114 and one of the five coils (L105 through L109) selected by switch wafers S102D and S102E. After the first four switch positions, variable capacitor C114 is taken out of the circuit by the action of S102A, in order to permit tuning the circuit to the higher frequencies. In band 1, coils L108 and L109, connected in series, are in parallel with C114 and padder capacitor C115, so that the output circuit can be tuned over a range of 2 to 3 mc, or twice the input signal of 1 to 1.5 mc. Switch wafer S102E shorts coil L107 to ground for bands 1 and 2, to prevent possible coupling of its inductance through the stray circuit and switch-contact capacitances. In position 2, S102E also shorts out coil L109, so that the plate circuit, which is now tunable over a 3 to 4-mc range, still operates as a doubler for 1.5 to 2-mc input signals. In position 3, the 4 to 6-mc band, L108, L109, and C115 are shorted to ground by S102E, and L107 is selected by S102D to form part of the tuned doubler circuit for 2 to 3-mc input signals. In the remaining positions, S102E shorts L107, L108, L109, and C115, to prevent detuning effects. Note that in positions 4, 5, and 7, S102D places L106 into the tuned plate circuit of V103, so that the tube can be made to function as a doubler, tripler, or quadrupler for any output signal in the 6 to 8-mc and 8 to 12-mc ranges. In order to prevent erratic operation, the multiplier is never operated as a straight-forward amplifier; that is, its output circuit is never tuned to the same frequency as the input circuit. For maximum efficiency, the plate circuit is always tuned to the lowest possible multiple of the input frequency. In positions 6 and 8, S102D places coil L105 into the plate tank circuit for tuning over the 12 to 16-mc range.

For positions 1 through 6, or band frequencies up to 16 megacycles, the output of the first multiplier is fed directly to the control grid of r-f driver V105, through the contacts of S102C and coupling capacitor C119. For positions 7 and 8, or transmitter frequencies from 16 to 30 mc, S102C applies excitation, within the range of 8 to 15 mc, from the tuned circuit of V103 to the input circuit of V104 consisting of voltage divider C116 and C149. The impedance of parasitic-suppressor circuit E108 is negligible in this circuit; its sole function, like that of E107 in the plate circuit, is to prevent spurious u-h-f oscillation. Coupling to the grid by means of a capacitor voltage divider not only permits a more efficient transfer of energy but also reduces the relative amplitude of the higher harmonics present in the r-f signal, because the impedance of the capacitors decreases with increasing frequency. The plate of V104 is shunt-fed by r-f coil L110, and it is coupled by capacitor C147 to a tuned circuit consisting of variable capacitor C114B, placed in the circuit by S102A in positions 7 and 8, and coil L112 (16 to 24 mc) or coil L111 (24 to 30 mc), placed in the circuit by S102B in positions 7 and 8, respectively.

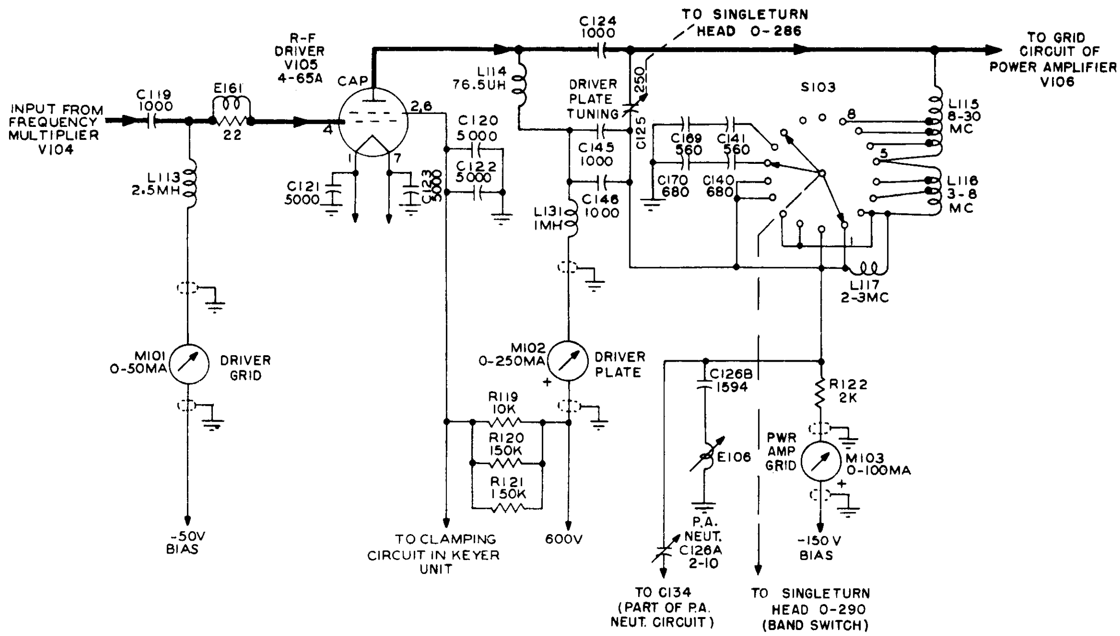


Figure 2-7. R-F Driver, Simplified Schematic

In positions 1 through 6, the output circuit of V104 is grounded by the contacts of S102B. With no input signal applied to the stage, protective cathode bias is supplied by R117 — a function identical to that provided by R114 in the previous stage.

The plate-tank circuits of the first and second frequency multipliers are tuned to the exact frequency by a two-section, ganged variable capacitor (C114). The manual positioning or presetting of capacitor C114 is controlled, from the front panel, by means of the EXCITER TUNING control. During channel selection the capacitor can be returned automatically to the preset position by means of singleturn head O-287 of the Autotune system. Since the two frequency-multiplier stages are gang-tuned, the second frequency multiplier is always operated as a doubler to ensure that the two stages will track properly.

Note

THE R-F TUNING COILS IN THE FIRST AND SECOND FREQUENCY MULTIPLIER PLATE-TANK CIRCUITS ARE FACTORY ADJUSTED, AND UNDER MOST CIRCUMSTANCES WILL NOT REQUIRE READJUSTMENT.

The power for the buffer and the two frequency-multiplier stages is obtained from the Low-Voltage Power Supply of the transmitter. The power supply delivers +600 volts to the exciter voltage-regulator circuit, which supplies regulated +300 volts to the plate and screen circuits of the tubes.

(c) R-F DRIVER *(see figure 2-7)*.—The r-f driver, employing a JAN 4-65A tetrode (V105), operates at the output frequency to provide sufficient excitation to drive power amplifier V106. The r-f driver tube is biased for Class-C operation from a separate bias supply, and amplifies the signal from either the first or second multiplier stage depending upon the output frequency selected.

The input frequency applied to the control grid of V105 through coupling capacitor C119 and u-h-f parasitic-suppressor circuit E161 is controlled by switch contacts of S102C for the first six bands (2 to 16 mc) from V103, and through switch contacts S102B for the last two bands (16 to 30 mc) from V104. The plate circuit is shunt-fed, the d-c voltage being applied through r-f choke L114, and the r-f output through capacitor C124 to a tuned circuit consisting of variable capacitor C125 and a tapped inductor consisting of L115, L116, and L117. Wafer switch S103 not only introduces a different portion of this inductor to change the resonant frequency of the tank circuit to conform to each new band, but also shorts out the unused portion of the tank inductor to avoid detuning effects. For operation in the 2 to 3-mc band, the three coils are in series. On progressively higher-frequency bands, L117 and additional turns on L116 and L115 are shorted to produce the correct inductance for the operating frequency. All the fixed capacitors that are connected to the switch are part of the neutralizing circuit of power amplifier V106, which will be discussed later. The plate tank circuit is tuned to the exact frequency by a variable air dielectric capacitor (C125). The manual positioning or presetting of C125 is controlled from the front panel by means of the DRIVER PLATE TUNING control. During channel selection, the capacitor can be returned automatically to the preset position by means of singleturn head O-286 of the Autotune system. S103 is part of the BAND SWITCH control, and is positioned together with S102, S105, and S106 as discussed in paragraph (*b*) above.

V105 is biased for class C operation with a combination of grid leak bias and fixed bias. —50 volts for protecting V105 is applied through meter M101 and r-f choke L113. DRIVER GRID meter M101 is a d-c milliammeter used for indicating the grid current of V105. The plate voltage for the stage, +600 volts, is applied to the plate load impedance (L114) through meter M102 and an r-f filter, consisting of L131, C145, and C146, for bypassing r-f currents around the meter and power supply. DRIVER PLATE meter M102 is a d-c milliammeter used for indicating the input plate current to V105. The voltage to the screen grid is dropped by the resistance composed of R119, R120, and R121. This tube element, which is kept at r-f ground potential by means of C120 and C122, acts as an interelectrode shield and thus eliminates the need to neutralize the stage. As a protective measure to prevent excessive screen current from damaging the tube when excitation is removed from the stage, such as during the spacing intervals of keying the screen voltage is reduced during these intervals by means of the screen clamper tube (V202) operated by the keyer unit (see paragraph 2.*a*. (1) (*e*) of this section). Capacitors C121 and C123 connected across the filament of V105 provide an electrical center for tube current, and thus eliminate a-c hum.

(*d*) POWER AMPLIFIER (*see figure 2-8*). —The power-amplifier stage, employing a JAN 4-1000A tetrode (V106) operates at the output frequency to supply up to one kilowatt of r-f power to the antenna system through Transmission Line Coupler CU-390/FRT-24. As explained in paragraph 2.*b*. of this section, this coupler matches the unbalanced, 52-ohm output from the transmitter to a 600-ohm balanced line. The power amplifier, as shown in figure 2-7, is biased for Class-C operation by a combination of fixed and grid-leak bias. Voltage for the fixed bias (—150 volts) is obtained from a separate bias supply, and the grid-leak bias voltage is developed across R122. In PHONE operation, the plate of the tube is fed audio power from the modulator (see paragraph 2.*a*. (2) of this section) to produce 100-percent modulation of the r-f carrier. The screen grid is self modulating because reactor L602 is in series with the d-c power supply.

The input frequency is applied through u-h-f parasitic-suppressor circuit E109 to the control grid of V106, directly from the plate tank of the r-f driver tube. The output signal from the plate is applied to the plate tuned circuit through parasitic-suppressor circuit E105 and capacitor C132. The plate is shunt-fed, the d-c voltage being applied through r-f chokes L119 and L120. Switch S106 shorts out L120 in all bands above the third (6 mc), in order to maintain suitable r-f choke characteristics over the entire frequency range of the transmitter. The power-amplifier tuned circuit is formed of a pi-type, impedance-matching network which greatly attenuates harmonics and provides an excellent match between the high-impedance plate circuit and a low-impedance load. The pi network consists of C134, a variable vacuum-type plate-tuning capacitor, a tapped inductor comprising coils L123 to L126, and sections of C135 and/or C136, plate load variable capacitors. Wafer switches S104 and S106 are operated together with S102 and S103 by means of the BAND SWITCH control discussed in paragraph 2.*a*. (1) (*h*) of this section. S104 is an eight-position switch which not only introduces a different amount of inductance to change the resonant frequency of the pi network to conform with each new band, but also shorts out the unused portion of the inductance to avoid detuning effects; another portion of this switch introduces one or more sections of C135 and/or C136, as shown in table 2-2. These capacitor sections are preset by

TABLE 2-2. BANDSWITCHING FUNCTIONS OF S104 IN POWER AMPLIFIER PLATE TANK

SWITCH POSITION	BAND (mc)	FUNCTIONS OF SWITCH	
		TUNING COILS CONNECTED	TUNING CAPACITORS CONNECTED
1	2—3	L123, L124, L125, and L126	C135 and C136
2	3—4	L123, L124, L125, and part of L126	C135 and C136
3	4—6	L123, L124, L125, and part of L126	C135 and C136
4	6—8	L123, L124, and L125	C135 and C136
5	8—12	L123, L124, and part of L125	C136
6	12—16	L123, L124, and part of L125	C136
7	16—24	L123, and L124	C136B only
8	24—30	L123	C136B only

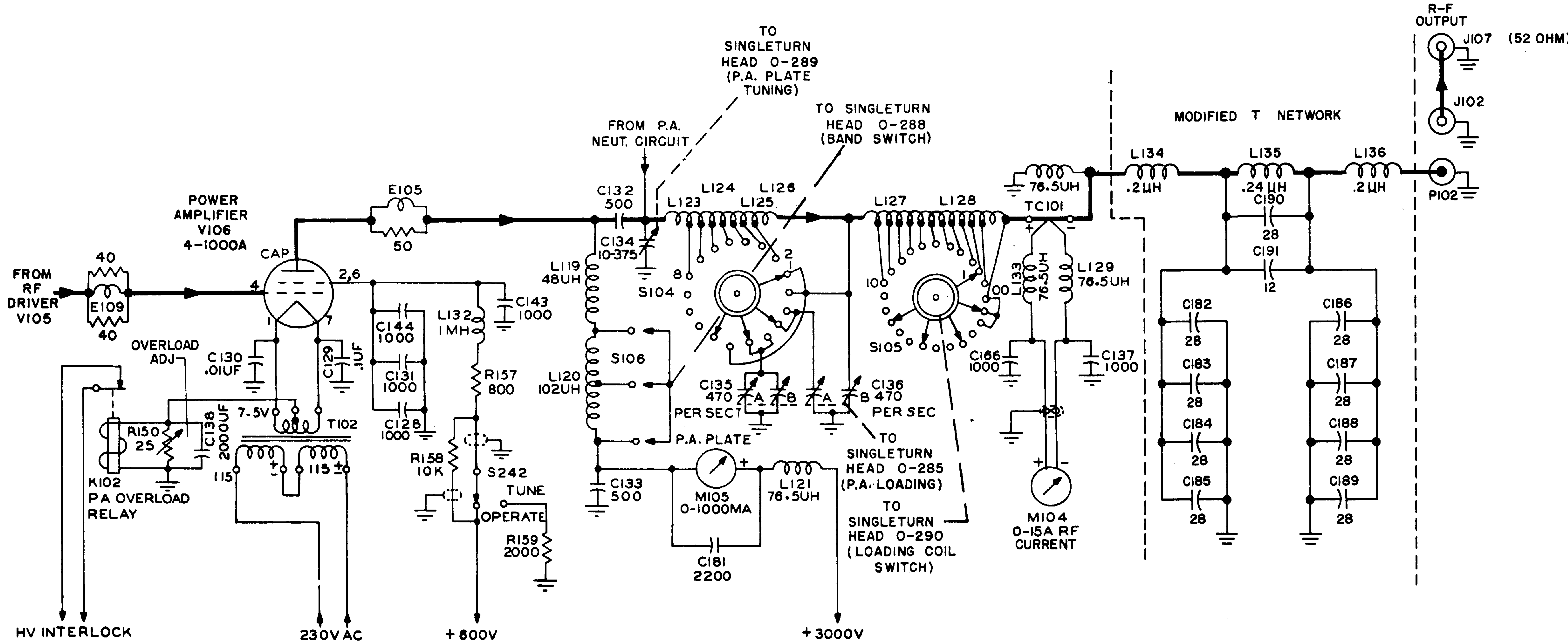


Figure 2-8. P wer Amplifier, Simplified Sch matic

the P.A. LOADING control to adjust the tank current, while C134, which resonates the plate circuit to the exact frequency is preset by the P.A. PLATE TUNING control. During channel selection, these controls can be returned automatically to their preset positions by means of singleturn heads O-285 and O-289, of the Autotune system.

The output or L-section of the network consists of coils L127, L128, and L122 joined to a modified T network which is mounted on a separate chassis and connected between L134 and L136 to supply additional harmonic-frequency suppression. These networks are used to match a 52-ohm load, and cancel the reactance of the load at the particular output frequency. Switch S105 adjusts the inductance of loading coils L127 and L128 for each frequency band. Normally, positions 1 through 8 of this switch correspond respectively with the eight bands previously selected by the BAND SWITCH. Since S105 is preset separately by means of the LOADING COIL SWITCH control (which can then be automatically returned to this position by singleturn head O-288 of the Autotune system during channel selection), the switch can be adjusted independently to compensate for variations in load impedance. The inductance is changed in a conventional manner, turns of L127 and L128 being shorted together as the switch arm is advanced from position 00 to position 10. The modified T network consists of coils L134, L135, and L136 as the arm of the T network and capacitors C182 through C191 forming the remainder of the T network. The output is taken off at receptacle P102 and fed through a cable assembly, consisting of a 52-ohm, RG-17/U coaxial cable and plugs J102 and J107, to Transmission Line Coupler CU-390/FRT-24. The r-f current at the output is measured by thermocouple TC101, which feeds a voltage proportional to the heating effect of this current to RF LINE CURRENT meter M104. Coils L129 and L133 and capacitors C137 and C166 are used for r-f blocking and bypassing, respectively.

Although the screen grid of the power amplifier is grounded by bypass capacitors C128, C131, C143, and C144, enough feedback exists between the plate and control grid, because of the high voltages used on these tube elements, to necessitate the use of capacitance-bridge neutralization, as shown in figure 2-9. The plate-grid capacitance (C_{pg}), through which feedback could cause the stage to oscillate, is neutralized by introducing by means of capacitor C126A (C_n) a voltage of equal phase and amplitude at the opposite or bottom end of the grid-tank inductance, formed of L115, L116, and/or L117. Since the voltage at one end of a coil is 180 degrees out of phase with that at the other end, C_{pg} is always neutralized. The power amplifier must be neutralized by presetting the P.A. neutralizing adjustments, C126A and E106,

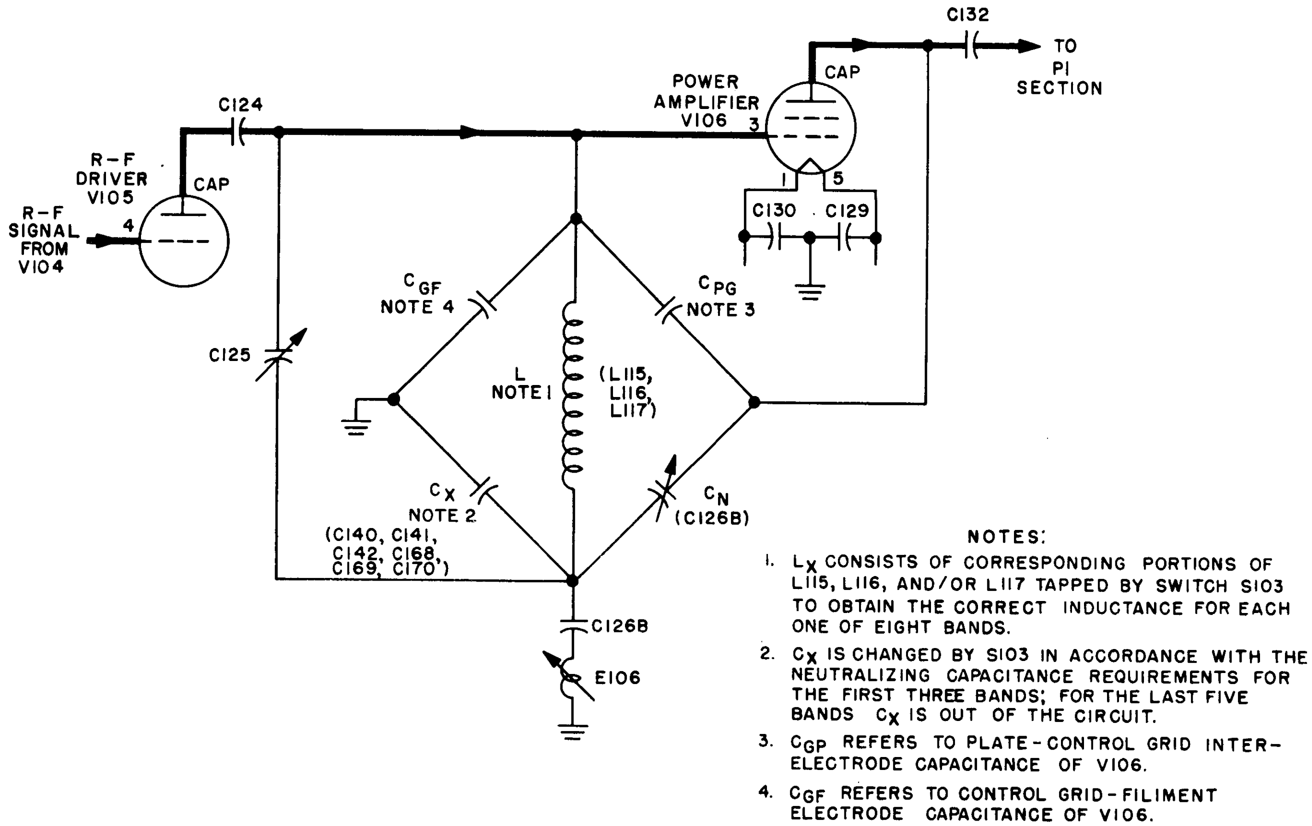
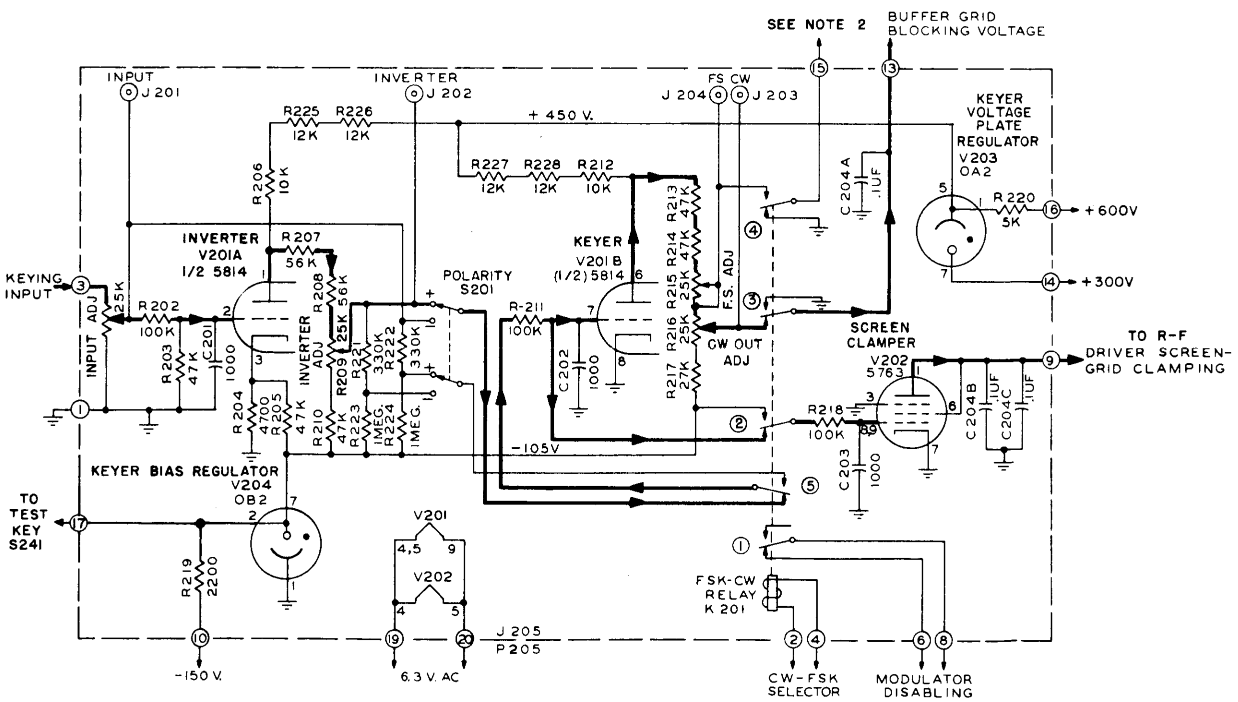


Figure 2-9. Power-Amplifier Neutralization Circuit, Simplified Schematic

as explained in Section 7, paragraph 6.*a.*(6). To insure that the tetrode is properly neutralized, the ratio of C_n to C_x (the grid-return bypass capacitance) must be approximately equal to C_{pg} and C_{gf} (grid-to-filament capacitance). C_x always includes fixed capacitor C126B and variable inductor E106, which is a bolt connecting to a strap at the bottom of the capacitor. Adjusting the length of the bolt above the chassis neutralizes the amplifier on band 8 (described in Section 7, paragraph 6.*a.*(6)) where the neutralization adjustment is very critical. Neutralization on bands 1, 2, and 3 requires several different values of capacitance across C126B, which are placed into the circuit by switch wafer S103. Figure 2-9 indicates the capacitors that are substituted for C_x to balance the bridge circuit for each of the three band positions. Capacitors C169 and C141 are connected in series, as are C170 and C140, to provide a greater safety factor.

The direct current drawn by the grid circuit is measured by PWR AMP GRID meter M103. The plate voltage for the power amplifier (+3000 volts) is applied through r-f choke L121 and meter M105. Capacitors C181 and C133 bypass r-f currents around the meter and the power supply. P.A. PLATE meter M105 is a d-c milliammeter used for indicating the input plate current to V106. The tube is protected from damage by P.A. overload relay K102, which operates when the tube current exceeds an allowable value (approximately 600 ma.). The manner in which this relay operates to disable the plate-voltage circuit is discussed more fully in paragraph 2.*a.*(4) (*a*) of this section. R150 is a sensitivity adjustment for controlling the current level at which the relay will be energized, while C138 prevents a-c chatter. C129 and C130 bypass r-f current from filament to ground. The screen voltage (+600 volts) is supplied through LV-TUNE-OPERATE switch S242A, voltage-dropping resistor R157, and r-f choke L132. When this switch is at the LV position for purposes of tuning and trouble-shooting, the high voltage is disabled, as explained in paragraph 2.*a.*(4) (*a*)*3.* of this section, and the screen voltage is disabled by K401. In the TUNE position, contacts of this switch allow the high-voltage circuit to be energized while the screen grid voltage is by the divider composed of R158 and R159. This limits the plate current of V106 to a safe value in tuning procedure. At the TUNE-OPERATE position, contacts of this switch energize the high-voltage circuit and short out R158 so that the full screen voltage can be applied. The plate and screen voltages fed from the High-Voltage and Low-Voltage Power Supplies, respectively,



NOTES:

1. RELAY K201 SHOWN IN ENERGIZED POSITION.
2. PIN 15 OF J205 SUPPLIES KEYING VOLTAGE FOR AN EXTERNAL FSK OSCILLATOR WHEN THE FSK FUNCTION IS ENABLED.

Figur 2-10. Keyer Unit, Simplifi d Sch matic through the Power Change Assembly can be changed in value for operation at one-fourth or one-half the full rated power, as described in paragraph 2.*a.*(7).

(*e*) KEYER ASSEMBLY (*see figure 2-10*).—The purpose of the keyer assembly is to set up the transmitter circuits for phone or c-w operation. Although the FSK function of the transmitter has been disabled, a brief explanation will be given to provide an understanding of the circuits that pertain to this function. When the transmitter is on c-w operation, as selected locally by the PHONE-CW-FSK switch (S505), or by a telephone dial at the remote station, the keyer assembly will accept positive, negative, polar-positive, or polar-negative impulses for marking during on-off keying.

The keyer assembly uses a JAN 5814 dual-triode tube (V201), section A being operated as an inverter and section B as a keyer, and a JAN 5763 pentode tube (V202) as a screen clamper. The keyer circuit requires two regulated d-c operating voltages, —105 and +450 volts. The former is derived from the r-f bias supply through a JAN OB2 voltage-regulator tube (V204). The latter is obtained between this bias supply and the Low-Voltage Power Supply. The +600-volt input from the Low-Voltage Power Supply is applied to R220, which is connected to the anode of a JAN OA2 voltage-regulator tube (V203), and the +300 volts from the exciter voltage regulator is connected to the cathode, producing a voltage output of +450 volts as measured to ground. The total d-c voltage from the two supplies is applied across voltage dividers: R227 to R217 (eight resistors in all) and R226 to R210 (seven resistors in all).

When the REMOTE-LOCAL switch (S504) is in the REMOTE position with the transmitter operating on c-w emission, and the POLARITY switch (S201) is in the positive position, positive voltage impulses from an external keying device such as Transmitter Control C-1362/FRT-24 can be fed to the control grid of inverter V201A through a voltage divider consisting of INPUT ADJ potentiometer R201 and resistors R202 and R203. R201 is adjusted to produce 30 volts during marking (key down), as measured at INPUT receptacle J201 (see paragraph 5.*d.*(6), Section 3). R202 and R203 further step down the input keying voltage to produce the correct voltage swing at the control grid. INVERTER ADJ potentiometer R209 in the plate circuit of this tube is adjusted (Section 3, paragraph 5.*d.*(6)) to produce zero volts as measured at INVERTER receptacle J202 during spacing (key up). A positive marking impulse on the inverter grid will cause the plate current to increase and the positive voltage at the junction of R206 and R207 to decrease, effectively causing the arm of R209 to feed a negative pulse to load resistors R221 and R223. Since the FSK-CW relay K201 is energized during c-w operation and since POLARITY switch S201 is in the positive position, the negative impulse taken from R221 and R222 is fed through contacts (2) and (5) of K201 and grid-current-limiting resistors R211 and R218, to the control grid of keyer V201B and screen clamper V202, respectively. The plate currents of these tubes decrease, causing their respective load circuits to increase in a positive direction with the result that the transmitter circuits are activated as described in the following paragraphs, and produce an r-f carrier for the duration of the pulse.

The CW OUT ADJ. potentiometer (R 215) in the plate circuit of keyer V201B is adjusted during marking (key-down) position to produce zero volts (ground) as measured at CW receptacle J203 (Section 3, paragraph 5.*d.*(6)). During spacing, the negative pulse on the control grid V201B disappears, the plate current increases, and since the voltage at the junction of R212 and R213 increases, the voltage at the arm of R215 becomes negative in relationship to ground. This negative pulse is then applied to the control grid of buffer V102, and the buffer plate current is cut off to produce the space in on-off keying. During key-down conditions the grid of keyer V201B becomes negative, causing its tube current to be cut off, with the result that the voltage on the arm of R216 is returned to zero potential, allowing the buffer to operate and produce the mark in on-off keying.

During the marking position, the negative keying impulse from the inverter circuit is also applied to the grid of screen clamper V202. The plate circuit of V202 is connected to the screen grid of r-f driver V105. Hence, the plate current flow through V202 is cut off, causing the normal amount of voltage to be applied to the screen of the r-f driver tube. However, during spaces in on-off keying, when the clamp-tube grid voltage is zero, the clamp-tube plate current flows. This plate current flow causes the voltage drop across the driver-screen dropping resistors to increase, so that the effective screen voltage is reduced. The tube is therefore protected from damage due to excessive grid current during the periods when there is no signal, because the buffer tube has been disabled to produce a space in on-off keying.

When negative voltage impulses from an external keying device are available for feeding to the keyer unit, inverter V201A is not used, and POLARITY switch S201 must be in the negative position. Negative impulses of the proper amplitude are then fed directly to INPUT receptacle J201 and load resistors R222 and R224 and are distributed to the input of V201B and V202 for keying the transmitter circuits for on-off operation, as explained in the previous paragraphs.

When the transmitter is set for phone or FSK operation by the PHONE-CW-FSK switch (S505) or by a telephone dial at a remote station, the FSK-CW relay (K201) is de-energized. Although the FSK function is not used, for purpose of clarifying certain circuits in the keyer unit, this function will be discussed in the following paragraphs. When relay K201 is de-energized, its contacts perform the following functions:

Contacts (1) open and enable the modulator to operate when emission-selector switch S505 is in the PHONE position and the press-to-talk button on the microphone is pressed as described in paragraph 2.*a.*(2). In the FSK position, this switch disables the modulator, whereas relay K201 is energized in the CW position, closing contacts (1) so that the transmitter can operate when the telegraph key is pressed.

Contacts (2) connect the grid of screen clamper V202 to the —105-volt source to cut off the tube and allow the driver screen grid to operate at its regular voltage, since an input signal to this stage is present whenever the plate voltage is on.

Contacts (3) place ground on the low side of grid-leak resistor R109 of buffer stage V102, so that this stage operates as long as plate voltage is being applied to the transmitter.

Contacts (4) connect the keying output from the arm of the FSK ADJ. potentiometer (R215) to CHANNEL switch wafer S101. This switch can be wired to the input of an FSK oscillator, which can then swing the operating frequency of the transmitter to conform with the keying. When such an oscillator is used, the output is adjusted by R215 and measured at FS receptacle J204, the proper voltage level at either the marking or spacing position depending upon the individual requirements of the FSK oscillator.

Contacts (5) connect the keyer grid to a point of lower voltage on one of the keyer dividers, since the keyer output-voltage swing need not be as large when keying an FSK oscillator as when keying the buffer stage during c-w operation. For a positive-polarity input keying signal, switch S201 is set to the +position, and the lower section of voltage divider R221 and R223 applies a signal to the keyer grid. For a negative-polarity input, the switch is set to the —position and the lower section of voltage divider R222 and R224 feeds a signal to the keyer.

TEST KEY S241 can be used for supplying local keying impulses for either testing the transmitter or adjusting the keyer unit, as described previously for FSK and c-w operation. S241 is a lever-action type switch; in the down position it acts as a momentary switch, whereas in the up position it locks in place to supply —105 volts from voltage regulator V204 to the control grids of keyer V201B and screen clamper V202. In FSK operation, buffer V103 is operating and V202 is continuously receiving this voltage through the contacts of de-energized relay K201; for this condition operating the TEST KEY will only shift the r-f carrier. However, in c-w operation, operating the TEST KEY between center and its up or down position, will turn the r-f carrier on and off to conform with the on-off operation of the buffer and screen-clamper tubes.

(*f*) EXCITER VOLTAGE REGULATOR (*see figure 2-11*).—The exciter voltage-regulator circuit consists of a voltage regulator made up of three JAN 5763 pentodes (V110, V111, and V112), connected in parallel to divide the +300-volt regulated current into three equal paths (to eliminate a bulky single tube), and a source of reference voltage made up of two JAN OA2 cold-cathode type reference tubes (V108 and V109). This circuit supplies regulated +300 volts to the crystal-oscillator voltage-regulator tube V107, to the screen-grid and plate circuits of buffer V102 and frequency multipliers V103 and V104, to the cathode of voltage-regulator tube V203, and to channel-indicating switch S240.

The +600 volts fed to the plates of the voltage regulator (V110, V111, and V112) is dropped to approximately 300 volts (as measured to ground) by load resistors R155 and R156 and the bucking voltage of the —150-volt supply. The sum of the voltage drops between the +600-volt input and the —150 volts from the bias supply produces a negative signal on the control grids. This signal will vary in accordance with power-input (+600

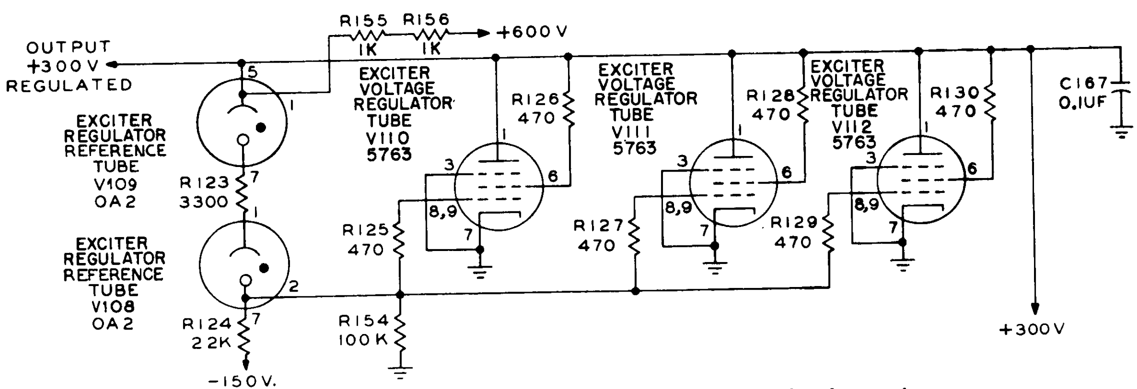


Figure 2-11. Exciter V ltag Regulat r, Simplified Schematic

volts) fluctuations by a certain amount above or below the mean voltage of +300 volts established by reference tubes V108 and V109, which are connected in a voltage-divider circuit. The plate currents through the voltage-regulator tubes will change causing these tubes to act as automatic variable resistors to maintain a constant output of +300 volts. This control voltage at the junction of R124 and R154 becomes less negative as the +600-volt input rises, because the voltage drop across V108 and V109 remains constant. When the exciter regulator grids become less negative, the plate current increases. The voltage drop across resistors R155 and R156 is therefore increased, so that the exciter-regulator reference voltage is reduced to the proper value. Consequently, if the exciter-regulator reference decreases, the control voltage to the grids of V110, V111, and V112 becomes more negative, the plate current decreases, and the plate voltage rises to its former value. Voltage-dropping resistor R123, connected in series with V108 and V109, drops the reference voltage slightly to impress the correct bias on the grids of the tubes. However, the voltage drop across this resistor does not change substantially with voltage variations, because V108 and R109 are connected in series with R124, a resistor of much higher value than R123; therefore, voltage variations between the negative voltage source and the regulated 300-volt output will appear for the most part across R124 and consequently R154. The resistors in the control-grid and screen-grid circuits of V110, V111, and V112 prevent oscillations at audio frequencies or higher. Capacitor C167 is a bypass capacitor for shunting audio and r-f currents around the voltage regulator.

(*g*) R-F BIAS SUPPLY (*see figure 2-12*). —The r-f bias supply uses a JAN 5Y3WGTA type tube connected as a full-wave rectifier with the positive side grounded, to supply a negative 150-volt output through a choke-input filter to the voltage-divider and bleeder network, R148 and R149. The full output voltage (—150 volts) supplies bias to power amplifier V106 and the exciter voltage-regulator voltage-divider circuit. This voltage is also supplied through voltage-dropping resistor R219 to voltage regulator V204, which applies —115 volts to the keyer unit and TEST KEY S241 for biasing and keying purposes. A negative 50 volts at the junction of R148 and R149 is used for biasing r-f driver V105. A 6.3-volt winding on bias transformer T103 supplies filament power for crystal oscillator V101 and buffer amplifier V102. Terminal E102 is provided for filament connections to an FSK oscillator or to other external equipment which may be incorporated into Radio Transmitting Set AN/FRT-24.

(*h*) AUTOTUNE SYSTEM.—The operating frequency within the 2 to 30-mc range for Radio Transmitter T-440/FRT-24 is determined by the position of the CHANNEL SELECTOR switch and the following controls (see figure 4-1): BAND SWITCH, EXCITER TUNING, DRIVER PLATE TUNING, P.A. PLATE TUNING, P.A. PLATE LOADING, LOADING COIL SWITCH. These tuning controls and switches can be automatically set to exact, predetermined positions by means of the Autotune system, which can be controlled locally at the transmitter or from a remote station using Transmitter Control C-1362/FRT-24 and/or Telephone Set TA-267/U. Refer to paragraph 2.*a.*(3) (*b*) of this section for a circuit description of the Autotune using a dial-type remote control system. The basic Autotune system shown in figure 7-24, consists of six singleturn positioning heads, a 10-position control head, and a two-phase a-c motor with associated chain drives and gearing to rotate the control and positioning heads. The electrical circuit for positioning the Autotune-driven elements by controlling the operation of motor B240 consists of the control-head circuitry, CHANNEL SELECTOR switch S243, motor-starting relay K240, and motor-reversing relay K241. The six front-panel controls shown in figure 4-1 are each connected to a singleturn head. Channel switch S101, which is used for selecting one of nine crystals or an external r-f signal, is connected to the shaft of the control head.

1. SINGLETURN HEADS.—Singleturn heads O-290 and O-288 position bandswitches S102, S103, S504, and S106 and the L-network shorting switch (S105), respectively; singleturn heads O-237, O-286, and O-289 position the tuning capacitors for the multiplier, driver, and power-amplifier plate tanks, respectively; and singleturn head O-285 positions the pi-network loading capacitors. All singleturn heads are identical except for a slight modification of O-286 and O-287; these two rotate their associated shafts through 180 degrees instead of 330 degrees. The singleturn heads can be preset to operate the previously mentioned switches and capacitors for 10 different frequency

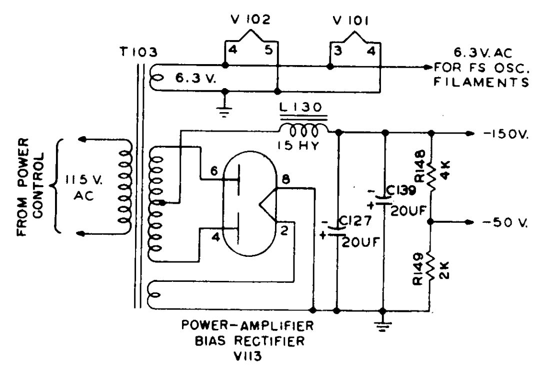


Figure 2-12. R-F Bias Supply, Simplifi d Schematic

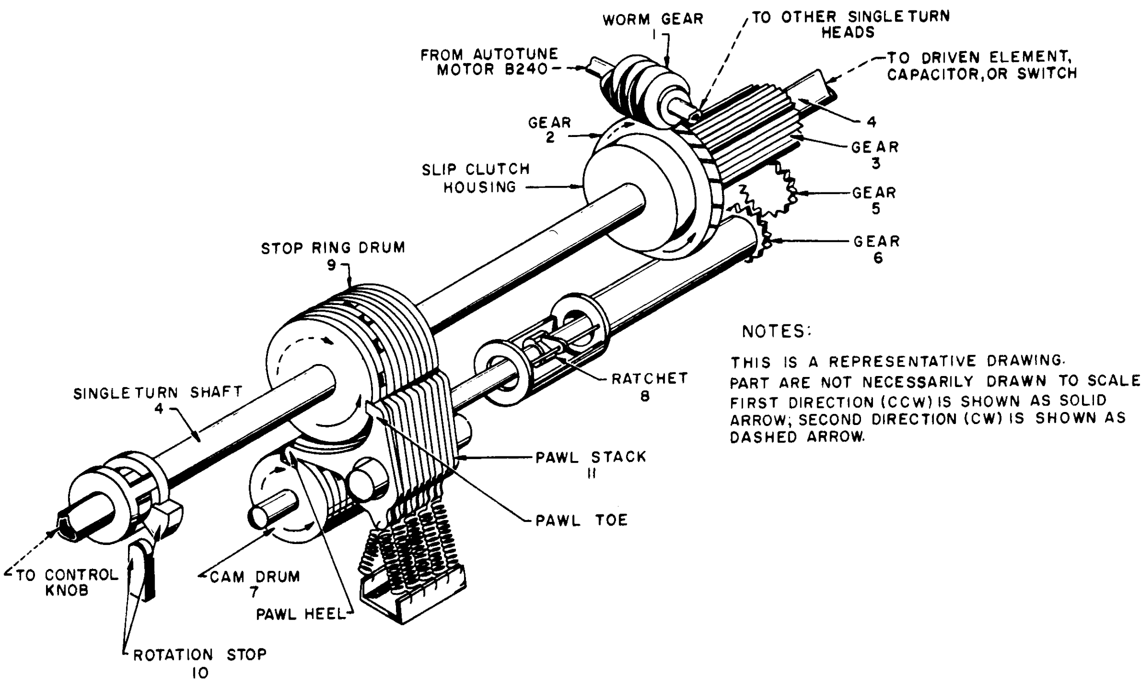


Figure 2-13. Singleturn Head, Mechanical Diagram

settings. For manual tuning or presetting, the thumb screws on the control knobs are loosened. The Autotune system must not be operated while the thumb screws are loose or all the channel settings may be lost. All locking keys must be secured before operating the transmitter. In order to position the singleturn heads, Autotune motor B240 drives them through chain belts and gears in the counterclockwise direction preparatory to the final adjustment, which occurs when the motor reverses rotation. (The counterclockwise direction will be known as the first direction, and the clockwise direction, as the second direction throughout the following discussion.) Figure 2-13 is a simplified diagram of typical singleturn head; it is not an exact mechanical representation, but is adequate for purposes of explanation. Figure 7-11 is an exploded view of a singleturn head.

The portion of shaft 4 extending from the back of the singleturn head is coupled to the circuit element (such as wafer switch or variable capacitor) being controlled, while the portion of the shaft extending from the front of the unit is attached to a knob used for manual tuning and channel setting. Autotune motor B240 drives worm gear 1 in the first direction so that gear 2 rotates in the direction indicated by the solid arrow, in figure 2-13. Gears 2 and 3 are fastened together, and rotation of gear 2 causes rotation of cam drum 7 through gears, 3, 5, and 6 and ratchet drive 8. A clutch action exists between shaft 4 and gear 2 (and 3). Stop-ring drum 9 rotates in the first direction until rotation step 10 halts the shaft rotation, and the clutch slips keeping the stop-ring drum stationary. This action insures that the stop-ring drum always starts from the home-stop (0-degree) position in preparation for its clockwise or second direction of rotation. Cam drum 7 continues to rotate until the Autotune motor reverses direction.

Cam drum 7 is composed of 10 slotted rings, the slots of which are evenly spaced around the drum, so that each slot corresponds to a position of seeking switch S251 in the Autotune control head circuits (paragraph *2a.*(1) (*h*)*4.* of this section); ring 1 is synchronized with the first position of S251, etc. Pawl stack 11 is composed of 10 pawls, each of which has a heel and a toe. The pawl heels ride on their corresponding cam-drum rings, which keep the pawl toes in a back position, and do not allow them to fall into the slots on stop-ring drum 9. The pawl heels are tapered, so that when the cam drum rotates in the first direction, the heels fall part way into their respective slots, but ride out of the slots as the drum continues to rotate. In the first direction, if a pawl toe falls into its slot, on the stop-ring drum, the cam drum rotation will cause the pawl heel to ride out of the cam-drum slot, thus raising the heel and disengaging the toe from the stop ring. At the beginning of the Autotune cycle, one of the pawl toes is engaged in its respective stop ring, so that during the first direction of Autotune operation, the stop ring becomes disengaged, or cleared, in preparation for the second-direction cycle. The position of S251 in the Autotune control circuit, when it causes Autotune motor B240 to reverse direction, determines which cam-drum ring is positioned so that its slot is directly beneath its respective pawl heel.

N t

THE ROTATION OF THE CAM DRUM IS IDENTICAL WITH THAT OF S251. THE CAM DRUM ROTATES CONTINUOUSLY IN THE FIRST DIRECTION ONLY, IN A MANNER SIMILAR TO THAT OF S251. WHEN B240 REVERSES, TO ROTATE IN THE SECOND DIRECTION, THE CAM DRUM REMAINS STATIONARY, BECAUSE RATCHET DRIVE 8 IN THIS DIRECTION TURNS WITHOUT COUPLING TO THE CAM DRUM.

Shaft 4 can rotate in the second direction, until rotation stop 10 is engaged, which limits the rotation of shaft 4 and stop-ring drum 9 to 180 or 330 degrees (depending upon the type head being used). The position of rotation stop 10, as adjusted during manufacture, determines the number of degrees of shaft travel. This means that when the stop-ring drum is rotated, a portion of its circumference will pass the pawl toes. The stop rings are preadjusted so that during rotation all of the stop-ring slots pass beneath the toes. When a stop-ring slot moves under the pawl toe which has been released by its corresponding pawl heel, the toe will fall into the slot, and the stop-ring drum and shaft 4 will be held stationary. Because the shaft of the circuit element being controlled is mechanically linked to shaft 4, it will be positioned according to the setting of the stop-ring slot which has engaged its pawl toe. Autotune motor B240 will continue to rotate (in the second direction), but the clutch will slip, and shaft 4 will not be moved.

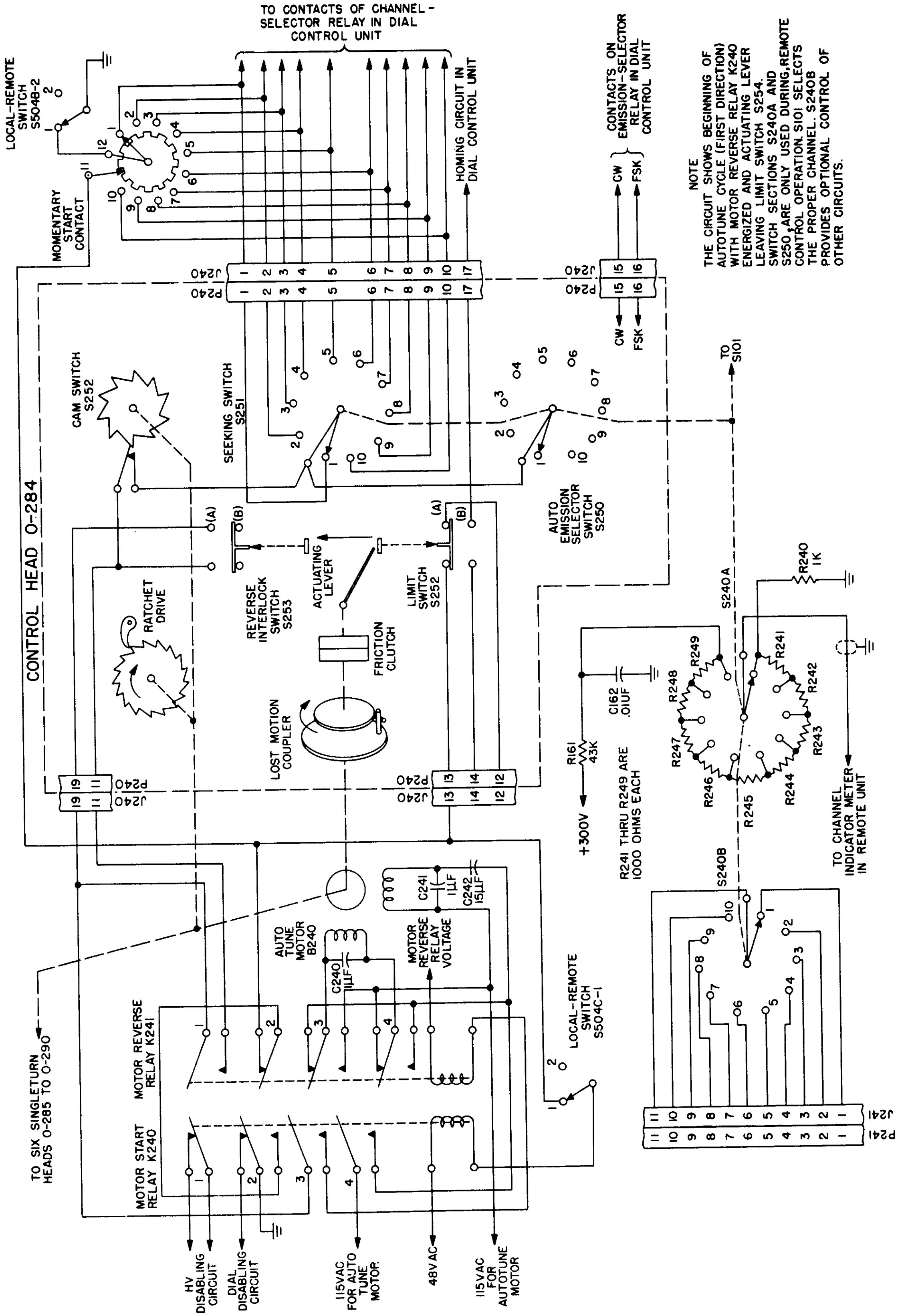
For the initial channel-frequency setting, a thumb screw on the control knob is loosened about two turns, to allow a stop ring engaged to a pawl to slip on shaft 4. The other nine stop rings, not retained by their pawls, maintain their relative position to each other and the shaft, so that when the circuit-element knob is rotated (manually), these stop rings, the shaft, and the circuit element are rotated. The engaged stop ring is held stationary, and the setting at which the control knob is positioned becomes the new band setting for that stop ring. When the thumb screw is tightened, all stop rings are fastened securely to each other and the shaft. Whenever this particular dial setting is again required, the CHANNEL SELECTOR switch is operated to the channel number corresponding to the ring on the cam drum. The Autotune motor starts and brings the cam drum into the proper position, so that the pawl is over the corresponding slot in the cam drum. The remaining pawl heels contact the smooth portion of the cam drum. When the Autotune control system causes the motor to reverse, the cam drum remains stationary, because of the action of ratchet 8, and the stop-ring drum rotates until the toe of the pawl falls into a corresponding slot in the stop-ring drum. When this occurs, the pawl grabs and holds shaft 4 stationary and thereby establishes a new capacitor or bandswitch setting for the associated transmitter circuit. The slip clutch takes up the mechanical motion from the motor, permitting gears 3 and 4 to turn without changing the position of the shaft, until the motor is turned off by the Autotune control circuit.

Note

IF THE THUMB SCREW ON ANY CONTROL KNOB IS NOT SECURED BEFORE AUTOTUNE CYCLING, ONE OF THE PAWL TOES MAY FALL INTO A STOP RING AS THE PAWL HEEL PASSES OVER ITS CAM-DRUM SLOT. IF THAT PARTICULAR CHANNEL HAS BEEN PRESET, THE SETTING WILL BE CHANGED AS THE RING IS ROTATED OUT OF POSITION.

2. AUTOTUNE ELECTRICAL SYSTEM.—The Autotune electrical system can be controlled locally or from a remote station, to properly position the control head and the six singleturn heads. These heads are initially adjusted to provide 10 frequency settings, each of which corresponds to one of the 10 positions on CHANNEL SELECTOR switch S243. The Autotune electrical system performs a complete cycle of operation each time that the Autotune cycle is initiated, regardless of the frequency channel selected. The following discussion covers only the local operation of the Autotune system. For operation of the system from a remote station using a dial-type assembly in conjunction with the dial control located in the transmitter, refer to paragraph 2.*a.*(3) (*b*) of this section. Although the control circuit for initiating Autotune operation from a remote position is more complex, the Autotune system proper functions in the same manner as in local operation. A schematic diagram of the Autotune electrical system is shown in figure 2-14, and two block diagrams showing the entire Autotune cycle for local operation are shown in figures 2-15 and 2-16. Control head O-284, together with its associated switches, is the heart of the Autotune electrical system in that it controls the operation and direction of rotation of Autotune motor B240 by energizing and de-energizing motor-starting relay K240 and motor-reversing relay K241 at the proper time and in the proper sequence. The electrical circuit of the control head is shown enclosed in dashed lines in figure 2-14. The sequence of operation of the electrical system is as follows:

3. STARTING AUTOTUNE SYSTEM.—When LOCAL-REMOTE switch S504 is placed in the LOCAL position, the Autotune system is readied for operation by the completion of the circuit between ground and the rotor of CHANNEL SELECTOR switch S243; momentary-start contact (11) of this switch is connected to the winding of motor-starting relay K240. When S243 is turned to a new channel, the blades of the grounded rotor



Figur 2-14. Aut tun El ctrical Syst m, Simplified Sch matic

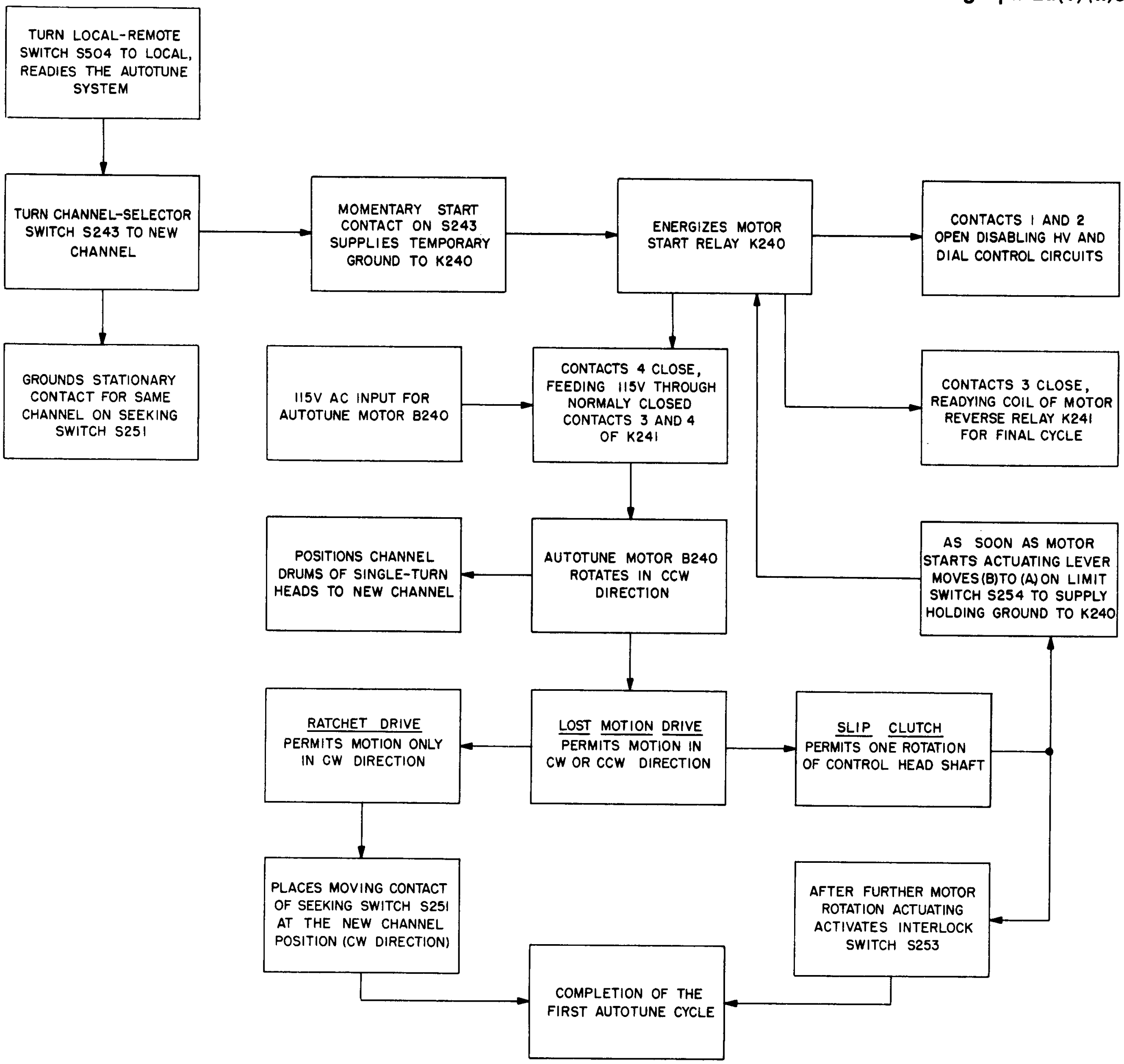


Figure 2-15. Autotune System Sequence of Operation for First Direction, Block Diagram

touch the momentary-start contact (in the new position, this contact lies between one of the slots), and K240 is energized. Contacts (2) of this relay close and supply a holding circuit to ground through the normally closed contacts (2) of motor-reversing relay K241. The normally-closed contacts (1) of K240 open the high-voltage disabling circuit (paragraph 2.*a.*(4) (*a*)*3.* of this section), so that transmitter operation is suspended during Autotune cycling. The connection to the dial disabling circuit on contacts (2) is made only when the LOCAL-REMOTE switch is in the REMOTE position, so that channel selection by another remote station is suspended during Autotune cycling. Contacts (3) close and connect the coil of K241 to reverse-interlock switch S253, in preparation for the motor-reversing operation (second direction). Contacts (4) close and complete the 115-volt, a-c input to Autotune motor B240. The motor then begins to run in a counterclockwise direction, driving the six singleturn heads and the control head.

4. CONTROL-HEAD OPERATION.—A simplified diagram of the control head is shown in figure 2-17. Before the motor begins to run, actuator lever 1 is pressed against actuator 2, so that the contacting bar of limit switch S254 is touching contacts (B). As soon as the motor begins to run, as described in the previous paragraph, worm drive 3 and worm gear 4 move control-head shaft 5 and seeking switch S251 (auto-emission selector switch is used only in remote Autotune operation with a dial-type unit; refer to paragraph 2.*a.*(3) (*b*) of this section) through ratchet drive (6) for one complete revolution before the lost-motion coupler is engaged. This is done in order to insure

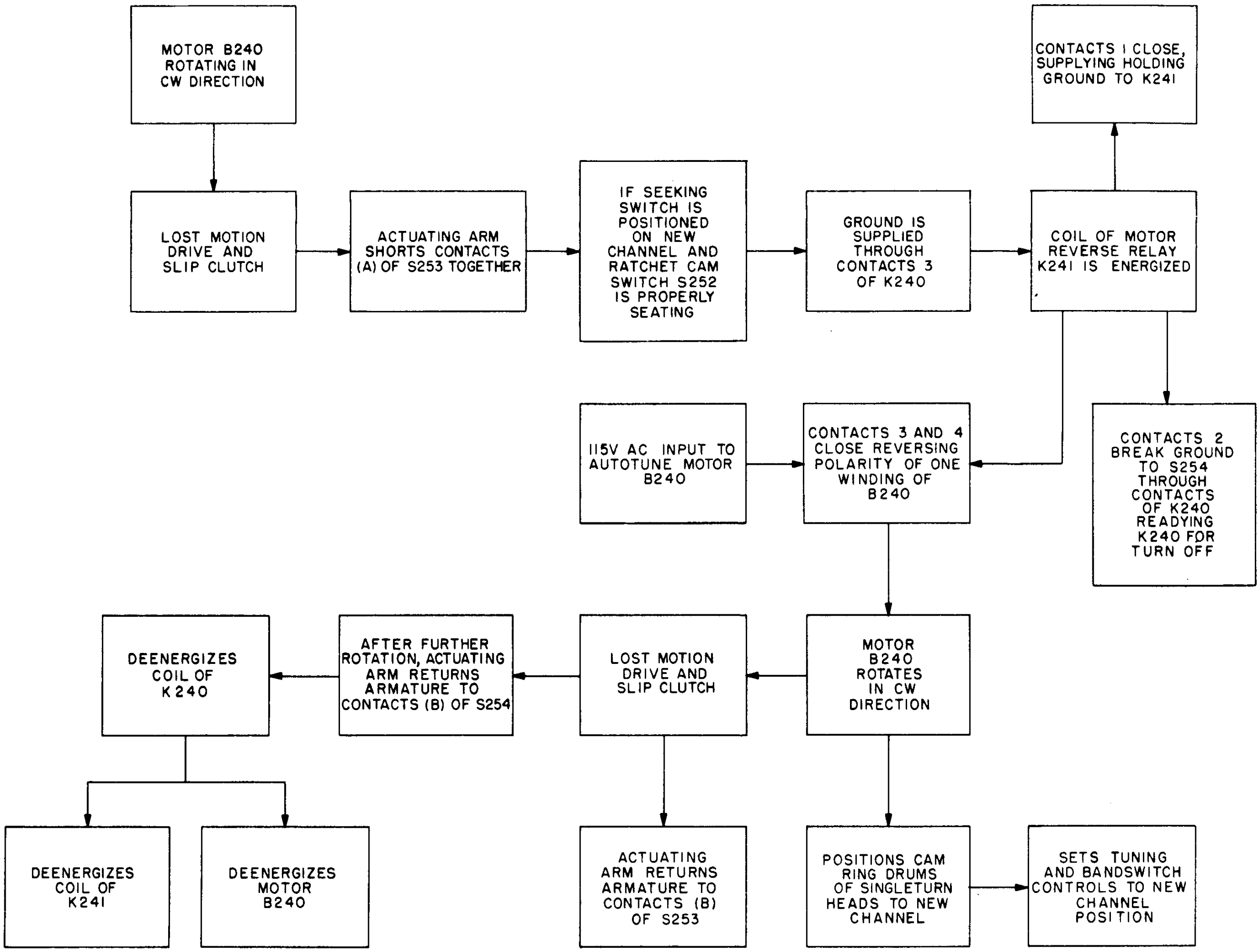


Figure 2-16. Autotune System, Sequence of Operation for Second Direction, Block Diagram

that the locating drums and shafts of the single-turn heads are all in the home-stop (0-degree) position.

When lost-motion coupler 7 is engaged, worm gear 4 drives actuating lever 1 by means of slip clutch 8. As soon as the lever pressure is removed, the shorting bar of S254 touches contacts (A) (because of a spring-return mechanism within the switch). Contacts (A) provide an alternate ground to the coil of K240, in readiness for the breaking of the holding circuit by the opening of contacts 2 of K240 at the time relay K240 is energized. The motor continues to drive in the first direction, moving the lever until it actuates switch S253. Contacts (A) of S253 are now connected together by the contacting bar inside the switch, readying the motor-reversing relay (K241); this relay will be energized as soon as seeking switch S251 and cam switch S252 are in the correct position. In the meantime, the friction clutch slips, keeping the lever against the spring-loaded mechanism of S253, as well as rotating the shaft with its associated switches S250, S251, and S252. This rotation continues until the wiper contact of S251 reaches the grounded stationary contact (which corresponds to the new channel). This ground is carried through the closed contacts of S252, S253, and K240 to the other side of the coil of relay K240, which then becomes energized.

Note

CAM SWITCH S252 IS SYNCHRONIZED WITH S251 SO THAT ITS CONTACTS CLOSE ONLY IN THE EXACT CENTER OF EACH CHANNEL CONTACT ON S251. THIS INSURES PRECISION CONTROL OF THE CHANNEL DRUMS IN THE SINGLETURN HEADS, WHICH IN TURN ARE SYNCHRONIZED WITH THE ROTATION AND POSITION OF SEEKING SWITCH S251.

5. COMPLETION OF AUTOTUNE CYCLE.—When motor-reversing relay K241 is energized, contacts (1) close, supplying an additional ground for holding purposes so that the relay will remain energized as soon as motor B240 reverses direction and opens S253. Contacts (3) and (4), in closing, reverse one phase of the 115-volt, a-c input to the motor so that the motor will reverse its direction of rotation. Contacts (2) open, leaving limit switch S254 as the only remaining ground to motor-starting relay K240. Operation of S254 at the end of the Autotune cycle will stop motor B240. When the motor rotates in a clockwise (second) direction, the worm drive begins to drive the worm gear in a counterclockwise direction. The ratchet drive prevents the control-head shaft from rotating in this direction, and the lost-motion coupler moves one complete turn before it begins to drive the lever back to its original position.

Note

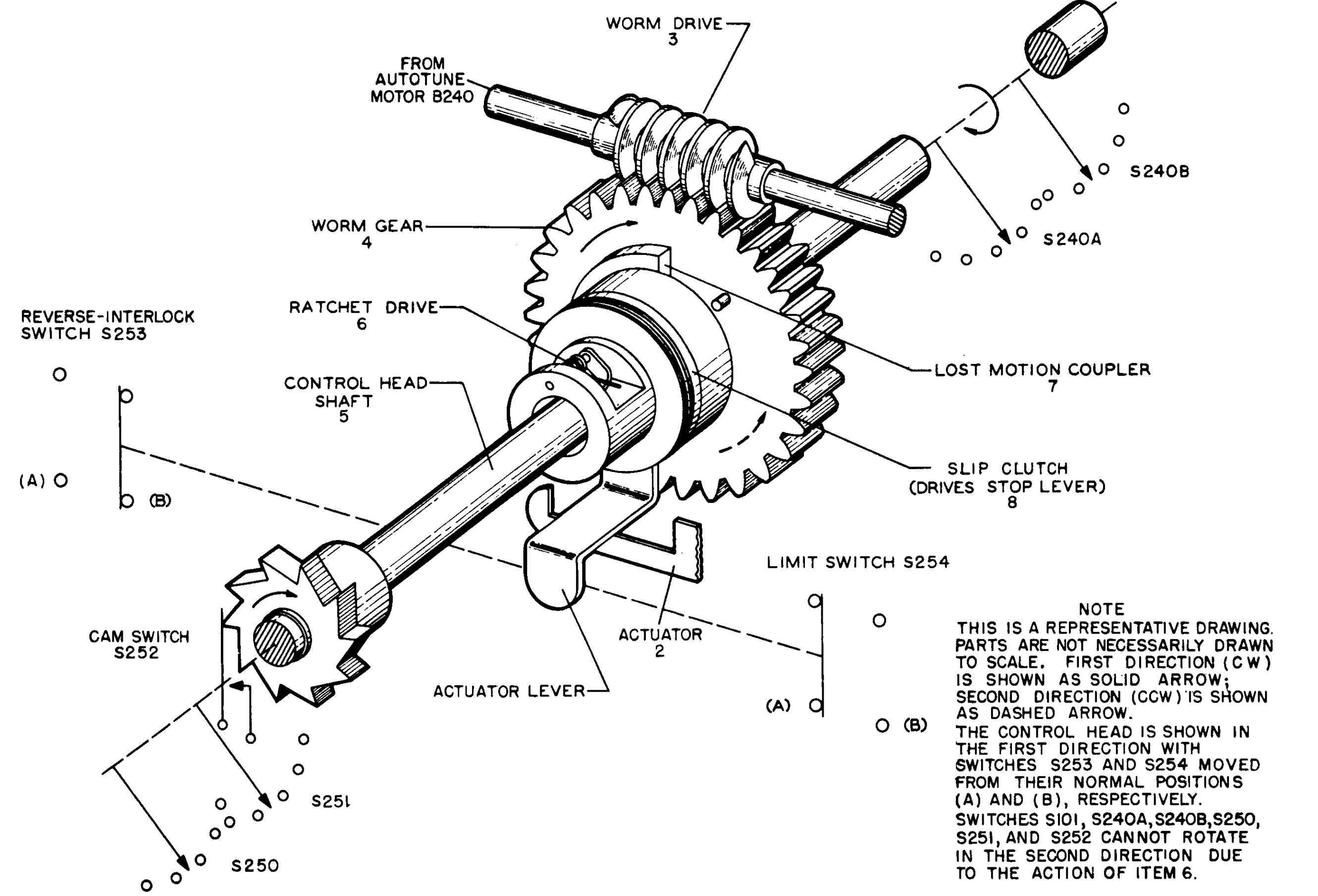
NOT ONLY S251 BUT ALSO SWITCHES S101, S240, AND S250 MAINTAIN THE SAME POSITION SINCE THEY ARE ALL MOUNTED IN COMMON ON THE CONTROL-HEAD SHAFT. S240 AND S250 ARE USED ONLY FOR CONTROL OF THE TRANSMITTER FUNCTION WITH A DIAL-TYPE UNIT, AS DISCUSSED IN PARAGRAPH 2.*a.*(3) OF THIS SECTION.

During this interval the locating drums of all the singleturn heads have sufficient time to start from their home or zero-degree position and rotate, if necessary, through their full range (180 or 330 degrees depending upon their design). Therefore, the circuit elements are properly positioned by the time the lost-motion coupler begins to drive the lever through the friction clutch. As soon as the lever position is changed, the contacting bar of S253 is returned to (B), keeping relay K240 energized by only the holding circuit of contacts 1. When the lever reaches limit switch S254, the contacting bar of this switch is forced over from contact (A) to (B). Relay K240 is de-energized, which in turn stops motor B240 and de-energizes relay K241. The high-voltage control circuit is completed, and the transmitter begins operation on the new channel that has been selected by the Autotune system.

Note

WAFER SWITCHES S101 AND S240 ARE IN THE SAME POSITION SINCE THEY ARE DRIVEN IN COMMON WITH WAFER SWITCHES S250 AND S251.

(2) MODULATOR ASSEMBLY (*see figure 2-18*).—The Modulator Assembly consists of the audio chassis and the modulation transformer and filter chassis shown in figure 1-8. The audio chassis uses six tubes, as follows: two JAN 5814 or 12AU7 duo-triodes, V601 as an audio amplifier and phase inverter, and V602 as an audio driver; two JAN 4-400 tetrodes (V603 and V604) as modulator tubes; and two duo-diode tubes, JAN 6X4W (V605) and JAN 5Y3WGTA (V606) as an audio-peak clipper and modulator bias rectifier, respectively. The modulation transformer (T601)



Figur 2-17. Control H ad, M chanical Diagram

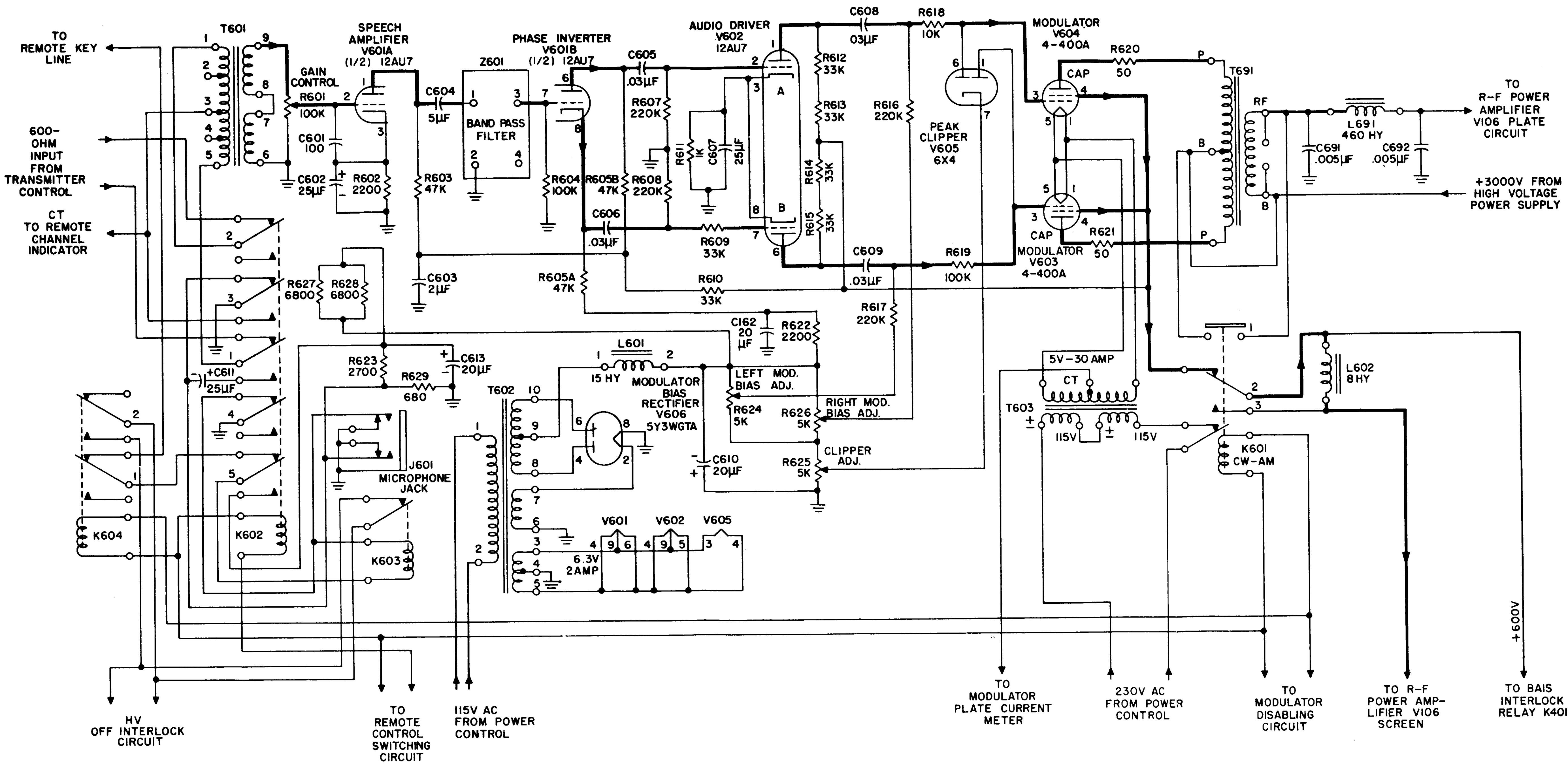
and the low-pass filter (L691, C691, and C692), which feed audio power to the power amplifier V106 during phone operation, are contained on a separate chassis; the low-pass filter isolates the power amplifier from any high-order harmonics that might be generated in the modulator itself.

When the transmitter is placed in phone operation locally by emission-selection switch S505 or by a telephone dial at a remote station, the modulator disabling relays (K601 and K604) are de-energized, so that the modulator circuits can operate properly. When LOCAL-REMOTE switch S505 (discussed in paragraph 2.*a.*(3) (*a*) of this section) is set to the LOCAL position, local-remote input switching relay K602 is energized. Contacts (1) and (2) of this relay connect the input signal from an external amplifier through a 600-ohm twin-conductor cable to the primary winding (terminals 1 and 5) of input transformer T601. Contacts (3) remove the ground on coupling capacitor C611 and place a ground on terminal (3) of T601 so that a carbon-type microphone connected to MICROPHONE JACK J601 can feed a signal through C611 and contacts (1) to one-half of the primary winding (terminals 3 and 5) of T601. Since the microphone input is less than that of an external audio amplifier, only half of the transformer winding is used in order to double the step-up ratio of T601, thereby doubling the input voltage to V601A. Contacts (3) also place a ground on the CT lead to channel-indicating switch S240 so that the portion of this circuit associated with Transmitter Control C-1362/FRT-24 is disabled, as described in paragraph 2.*c.*(8) of this section. Contacts (4) are in parallel with contacts (1) of J601 so that, in the LOCAL position, inserting a microphone plug into J601 de-energizes push-to-talk relay K603, and thereby disables the plate-voltage interlock circuit, as described in paragraph 2.*a.*(4) (*a*)*3.*, of this section. Operating the push-to-talk switch on the microphone energizes K603 and the plate interlock circuit so that plate voltage is applied to all the transmitter circuits. In the REMOTE position, the remote key line connected through normally closed contacts (4) and (1) of K602 and K604, respectively, can energize K603 when the push-to-talk switch of the microphone at a remote station is pressed. Note that contacts (4) and (5) can apply 50 volts to the coil of K603 from the modulator bias supply during local operation and from the voltage supply in Transmitter Control C-1362/FRT-24 during remote operation.

Voltages of 4.5 volts for the microphone and 50 volts for push-to-talk relay K603 are taken off a voltage-divider circuit consisting of resistors R627, R628, R623, and R629 connected to the modulator bias supply. Capacitor C613 shunts audio signals around this supply. The modulator bias supply consists of V606 connected as a full-wave rectifier with the positive side grounded to supply a negative voltage of —105 volts through a choke-input filter to the above mentioned voltage-divider circuit, and three adjustment potentiometers: CLIPPER ADJ R625, RIGHT MOD BIAS ADJ R624, and LEFT MOD BIAS ADJ R626. A positive bias of 9.5 volts is supplied to the cathode of inverter V601B through a decoupling circuit consisting of R622, C612, and bias resistor R605A. A 6.3-volt winding on bias transformer T602 supplies filament power for all the tubes in the assembly except V603 and V604, which receive filament power through the 5-volt winding of modulator filament transformer T603.

The audio voltage developed across the secondary winding of T601 is adjusted to the proper level by GAIN CONTROL R601 and is applied to the grid of input amplifier V601A. C601 is an r-f bypass capacitor; C602 connected across bias resistor R602 functions as an audio bypass to prevent attenuation of the audio signal (degenerative feedback) by R602. The plate circuit is resistance-coupled to the other section of the tube, inverter V601B, through band-pass filter Z601. Z601 attenuates input frequencies below 300 cps and above 3500 cps, to increase the effectiveness of the modulator tubes and at the same time to confine the carrier sidebands to the narrowest possible limits consistent with good speech intelligibility. V601B acts as a phase splitter in order that a single-ended tube may be used to operate into the push-pull audio driver (V602). The signal at the plate of V601, which is resistance-coupled to triode section V602A, is 180 degrees out of phase to the signal at the cathode of V601, which is resistance-coupled to triode section V602B. Resistor R609 is used as a voltage-dropping resistor in the grid circuit of V602B to equalize the voltage fed from the cathode so that this signal, although out of phase with the plate signal, will be of equal amplitude to maintain circuit balance. The triode sections of V602 are biased for Class-B operation by means of common cathode resistor R611; C607 is a bypass capacitor, which offers a low impedance to audio signals. The push-pull output of the r-f driver is resistance-coupled to the modulator, which uses two tubes (V603 and V604), also operated as a push-pull amplifier.

The modulator tubes are biased for Class-AB_1 operation by means of R624 and R626 so that practically no power is required from V602. Since modulation of an r-f carrier greater than 100 percent in the negative direction produces distortion and spurious sidebands, a speech clipper (V605) in the modulator grid circuit is used to provide extended positive-peak modulation. In voice waveforms, especially those of the male voice, the amplitude excursion in one direction from the average energy axis may be two or three times that in the other, although the average energy for both



Figur 2-18. Modulator Ass mbly, Simplifi d Sch matic

sides may be far from exceeding the modulation capability of the transmitter. Amplitude excursion causing overmodulation in the downward direction (when the r-f carrier generated by the power amplifier is sharply cut off by modulator output) is objectionable since it generates harmonics and splatter sidebands rather than overmodulation in the upward direction (the r-f carrier is increased by the addition of audio power). When a positive-going portion of the signal on the plates of V605 exceeds the negative bias established by CLIPPER ADJ R625 on the cathode, the tube conducts and effectively removes the excessive peak excursions. Note that it is the positive portion of the grid signal that produces the lowest positive output from the modulator plate current, which in turn is fed through the secondary of modulation transformer T691 to produce modulation in the downward direction for the r-f carrier. This clipping action generates high-frequency audio harmonics in the modulator grid circuit. A low-pass filter in the modulator, consisting of C691, L691, and C692, attenuates harmonics above 4000 cps that might otherwise be introduced into the r-f power-amplifier plate circuit and generate sidebands extending farther than 4 kc on either side of the transmitter operating frequency.

Since r-f power amplifier V106 is a tetrode, it is not only necessary to modulate the plate but the screen-grid circuit as well in order to obtain linear audio swing in the carrier as the audio-frequency output from the secondary of T691 causes the input voltage to the plate to vary between zero and twice (more than twice in the case of signals having extended positive-peak modulation) the +3000-volt input voltage. Choke L602, connected between the +600-volt input and the screen grids of the modulator tubes, modulates the power-amplifier screen grid connected to the other end of this choke at the same time that the power-amplifier plate circuit is being modulated. This +600-volt feed is also used to supply power to the plate and screen circuits of the lower-level stage (V601A and V601B), which is decoupled by capacitor C603 which shunts to ground the audio generated by the screen grid of the modulator. In the case of the plate circuits to r-f driver V602, decoupling is not necessary since the push-pull circuit balances out the audio component superimposed on the +600-volt feed line.

For CW or FSK operation, modulator disabling relay K601 is energized. Contacts (1) on the relay short-circuit the modulation-transformer secondary and feed +3000 volts through the low-pass filter to the r-f power-amplifier plate circuit. Contacts (2) disconnect the +600-volt input to the modulator low-level stages and the screen grids of the modulator tubes; choke L602 is short-circuited and the +600 volts is fed directly to the r-f power-amplifier screen grids. Contacts (3) disable the primary circuit of modulator filament transformer T603. Push-to-talk disabling relay K604 is also energized; contacts (1) of this relay maintain a short across contacts of push-to-talk relay K603 so that the plate-voltage interlock circuit can be enabled and plate voltage applied to all the transmitter circuits by a new set of conditions required for c-w and FSK operation. Although contacts (2) open the remote key line in this position, these contacts do not perform any real function except to insure that K603 will not be energized while the LOCAL-REMOTE switch is in the REMOTE position.

(3) DIAL CONTROL ASSEMBLY.—The Dial Control Assembly shown in figure 1-7, is used with Transmitter Control C-1362/FRT-24 and/or Telephone Set TA-267/U for remote control operation of the transmitter. When the telephone dial on one of these two components is operated to turn the transmitter on or off, or to select a new frequency or a different type of emission, the proper number of ground pulses for the action desired are transmitted to the Dial Control Assembly, which by a sequence of events discussed below, operates the Autotune system or the Power Control circuits to achieve the desired result. The Dial Control Assembly consists of a chassis upon which are mounted one stepping-type relay, eight telephone-type relays, and a d-c power supply for the relays. The LOCAL-REMOTE switch (S504) on the Power Control Assembly must be operated to the REMOTE position before the transmitter can be controlled from a remote station. In order to understand the operation of the Dial Control Assembly for automatic channel selection, it is essential that the theory of operation of the Autotune system discussed in paragraph 2.*a*.(1) (*h*) of this section be thoroughly understood. Figure 2-19 is a simplified schematic of the Dial Control Assembly and its associated circuits. Figures 2-20 and 2-21 are block diagrams showing the sequence of operation of the dial control during channel and power selection respectively.

(*a*) LOCAL-REMOTE SWITCHING.—The LOCAL-REMOTE switch (S504), located on the Power Control Assembly, connects the dial control to the Autotune and power control circuits when this switch is placed in the REMOTE position. Ground-pulse information from a dial input to stepping relay K801 in conjunction with pulsing relay K802 effects the operation of relays K803 through K809 for the control of these circuits. In the LOCAL position of the switch, the same circuits are disconnected from the dial control, so that the same operation can be initiated by means of the transmitter front-panel controls. However, before the transmitter can be handled exclusively from a remote station, the required frequency channel should be preset and the PRIMARY CIRCUIT BREAKER switch CB501 should be on.

S504 is a six-deck, wafer-type switch on a common shaft, the decks being numbered alphabetically S504A to S504F. S504A is the deck nearest the driver or knob end, as shown in figure 2-22. All decks except S504F consist of three single-pole, double-throw switch sections, each of which is designated with the suffix 1, 2, or 3. S504F consists of two double-pole, double-throw switch sections, each of which is designated with the suffix 1 or 2. Altogether the LOCAL-REMOTE switch contains 17 switch sections; the function of each switch section for either one of its two positions is given below.

Note

FOR FURTHER EXPLANATION OF THE FUNCTIONS OF S504 IN THE LOCAL POSITION, REFER TO PARAGRAPHS 2.*a*.(1)(*h*) AND 2.*a*.(4) OF THIS SECTION FOR LOCAL OPERATION OF THE AUTOTUNE SYSTEM AND POWER CONTROL CIRCUIT, RESPECTIVELY.

S504A-1: In the LOCAL position, this section readies PHONE-CW-FSK switch S505 so it can be used to select different types of emission. In the REMOTE position, it breaks this circuit and introduces an alternate circuit in which c-w and FSK relays K808 and K809 of the Dial Control Assembly can select the different types of emission.

S504A-2: In the LOCAL position, this section permits FILAMENT switch S503 to energize the filament circuits; in the REMOTE position, it breaks this circuit and introduces an alternate circuit in which filament relay K806 of the Dial Control Assembly can turn on the filament circuits.

S504A-3: In the LOCAL position, this section energizes local-remote switching relay K602, to permit local audio feed; in the REMOTE position, this relay is de-energized, to permit audio feed from the remote station.

S504B-1: In the LOCAL position, this section permits PLATE switch S503 to energize the plate circuits after a suitable time delay. In the REMOTE position, it breaks this circuit and introduces an alternate circuit in which plate delay relay K805 of the Dial Control Assembly can turn on the low-voltage and high-voltage plate circuits after a suitable time delay.

S504B-2: In the LOCAL position, this section supplies ground to the rotor of CHANNEL SELECTOR switch S243 so that the Autotune system can be cycled to a new frequency by changing the setting of this front-panel control. Also, in the LOCAL position, this switch section disables the functioning of the Dial Control Assembly by opening the holding circuit to the relays of that unit. In the REMOTE position, it ungrounds the rotor so that the Dial Control Assembly, when set into operation by a remote dial unit, can cycle the Autotune system to a new frequency.

S504B-3: This switch section performs no function but is wired to receptacle J502 to be used as a spare.

S504C-1: In the LOCAL position, this section connects coil of motor-starting relay K240 to the momentary start contact of S243 so that Autotune motor B240 may be energized as soon as CHANNEL SELECTOR switch S243 is turned. In the REMOTE position, it disables this circuit so that only the Dial Control Assembly can turn on the Autotune system.

S504C-2: In the LOCAL position, this section disconnects the dial-pulse input from pulsing relay K802 of the Dial Control Assembly. In the REMOTE position, this relay is reconnected to the dial input, in readiness for energization on the basis of ground-pulse information.

S504C-3: In the LOCAL position, this section disconnects the key line of the remote station from the keyer unit in the R-F Assembly. In the REMOTE position, it completes this circuit so that the transmitter can be turned on from a remote station.

S504D-1: This section has no function in the LOCAL position; in the REMOTE positions, it supplies 100 volts dc to terminal 3 of TB630 for use as an auxiliary for the test-keying circuit (refer to paragraph 2.*a*.(5) of this section).

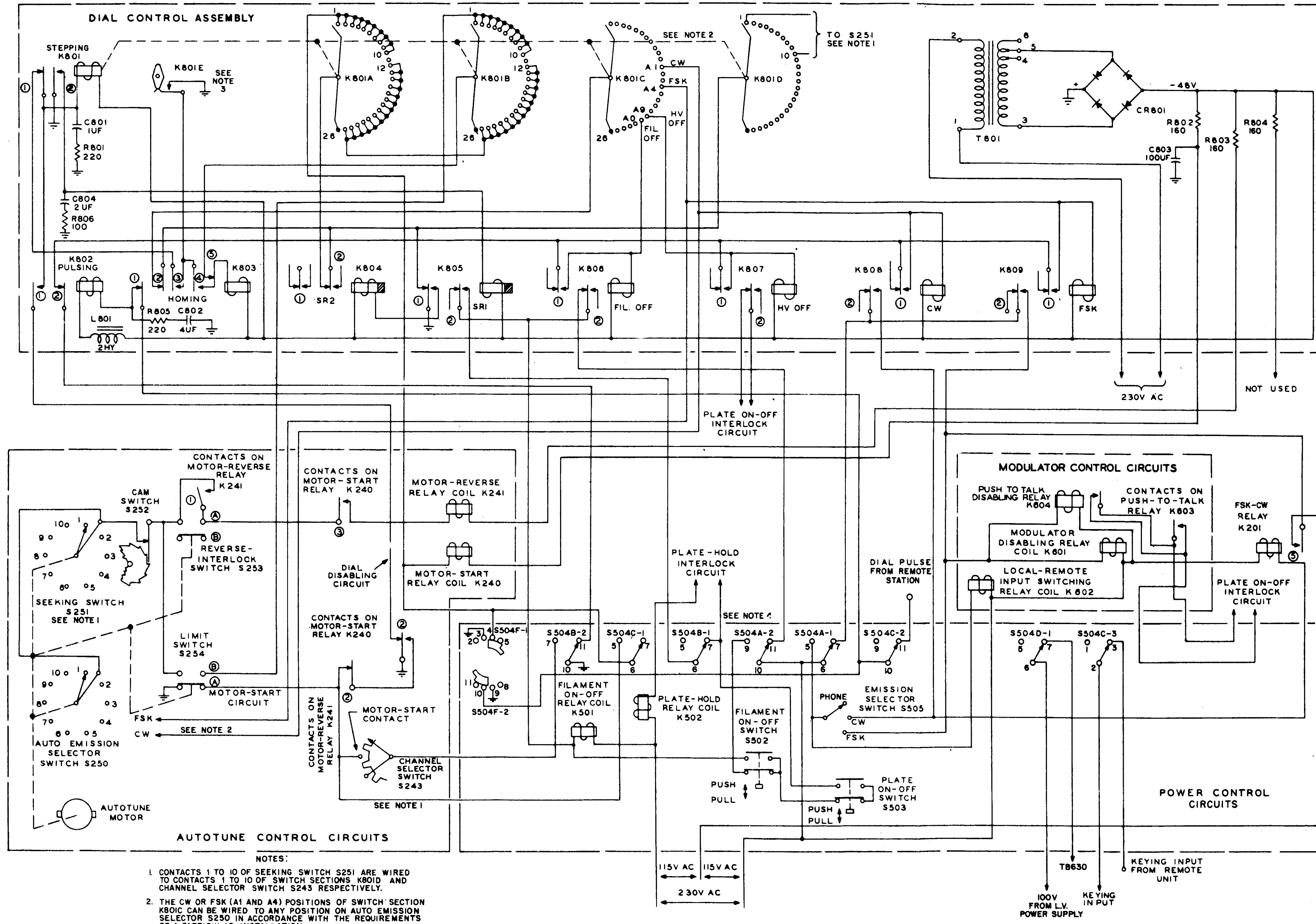
S504D-2: This switch section performs no function but is wired to receptacle J502 to be used as a spare.

S504D-3, S504E-1, S504E-2, S504E-3: These switch sections do not perform any function in either the LOCAL or REMOTE positions.

S504F-1: This section, when rotated from the REMOTE to the LOCAL position, momentarily energizes the coil of motor-starting relay K240 so that the Autotune system will cycle and set up on the channel indicated by the local CHANNEL SELECTOR switch, instead of remaining on the channel previously chosen by the telephone dial of a remote station.

S504F-2: When rotated from the REMOTE to the LOCAL position, this section momentarily energizes the coil of pulsing relay K802 so that contacts (2) of this relay open a holding circuit, deenergizing relays K806, K807, K808, and K809, which may have been actuated by the telephone dial of a remote station.

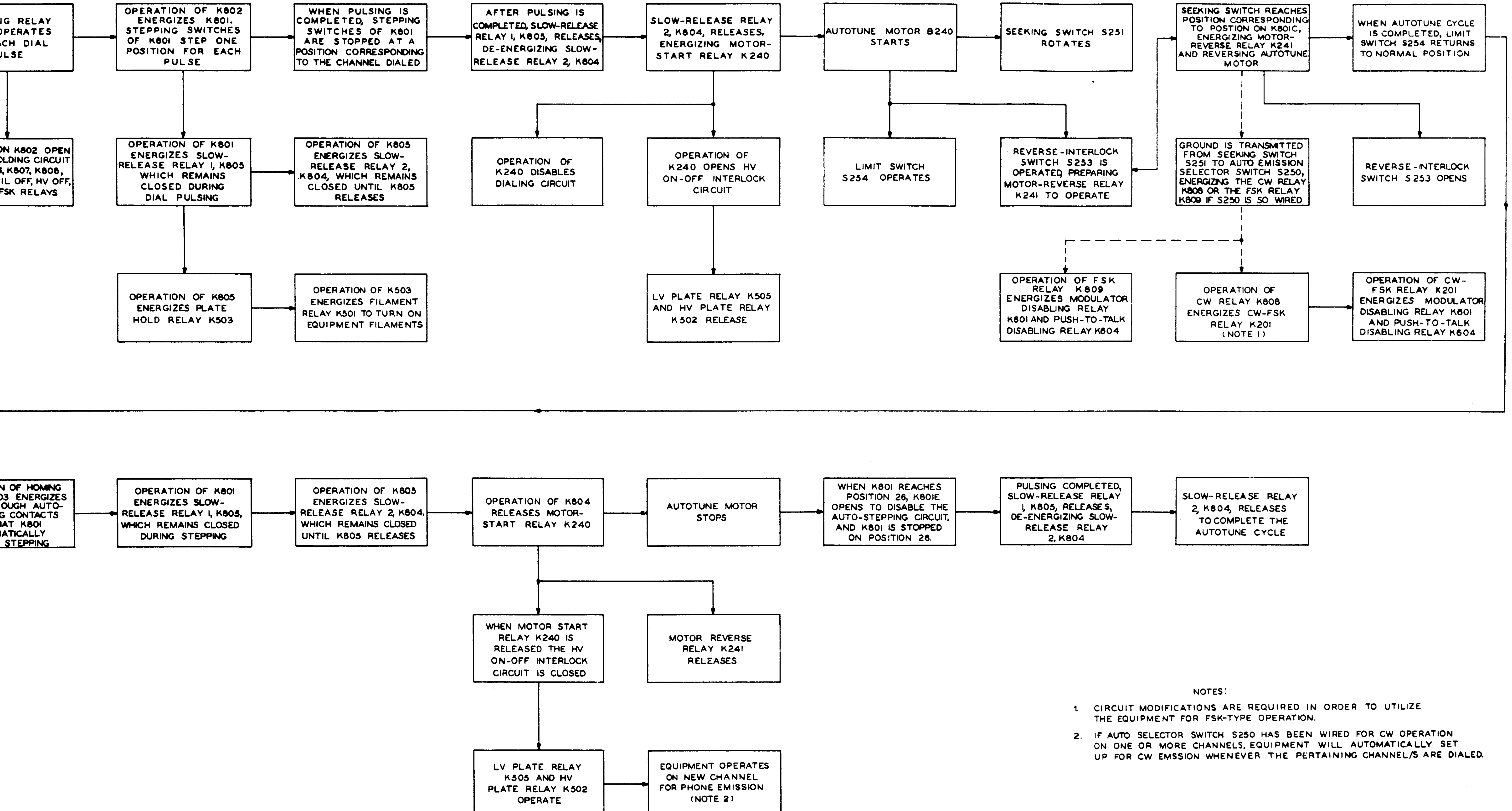
(*b*) CHANNEL SELECTION.—Figure 2-20 is a block diagram of the sequence of action for obtaining a new channel by means of the Dial Control Assembly and associated circuits; figure 2-19 is the schematic diagram for the same circuits.



NOTES:

1. CONTACTS 1 TO 10 OF SEEKING SWITCH S251 ARE WIRED TO CONTACTS 1 TO 10 OF SWITCH SECTIONS K801D AND CHANNEL SELECTOR SWITCH S243 RESPECTIVELY.
2. THE CW OR FSK (A1 AND A4) POSITIONS OF SWITCH SECTION K801C CAN BE WIRED TO ANY POSITION ON AUTO EMISSION SELECTOR S250 IN ACCORDANCE WITH THE REQUIREMENTS OF A PARTICULAR INSTALLATION.
3. THE CONTACTS OF CAM SWITCH K801E ARE CLOSED, IN ALL POSITIONS EXCEPT THE 26TH POSITION (REST OR HOME POSITION).
4. SWITCH SECTIONS OF THE LOCAL-REMOTE SWITCH S504 ARE SHOWN IN THE REMOTE POSITION.

Figur 2-19. Dial Contr l Assembly with Associated Circuits, Simplified Sch matic



NOTES:

1. CIRCUIT MODIFICATIONS ARE REQUIRED IN ORDER TO UTILIZE THE EQUIPMENT FOR FSK-TYPE OPERATION.
2. IF AUTO SELECTOR SWITCH S250 HAS BEEN WIRED FOR CW OPERATION ON ONE OR MORE CHANNELS, EQUIPMENT WILL AUTOMATICALLY SET UP FOR CW EMSSION WHENEVER THE PERTAINING CHANNEL/S ARE DIALED.

Figur 2-20. Dial C ntr l Assembly, S qu nce f Operation f r Chann l S lecti n, Bl ck Diagram

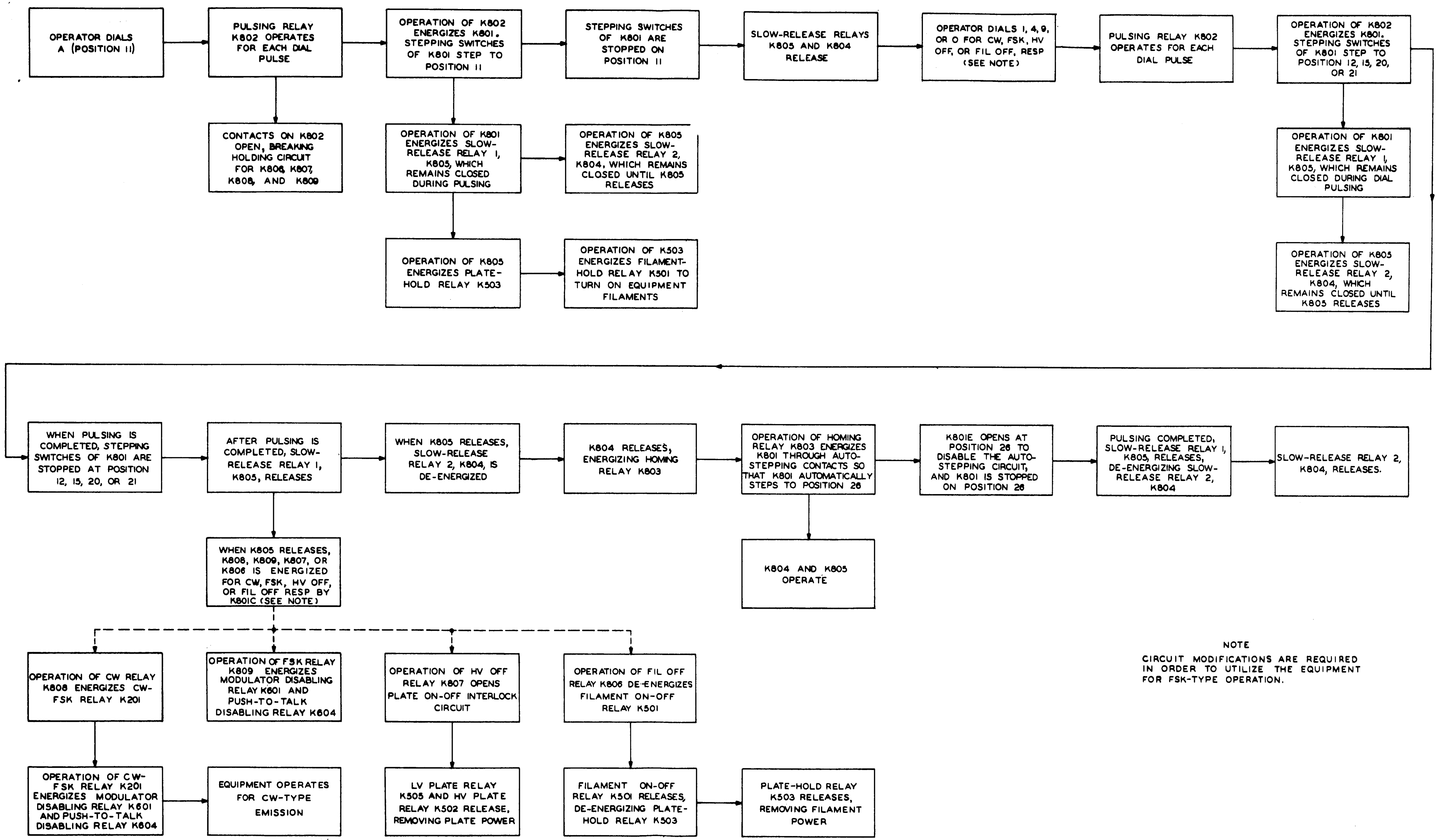


Figure 2-21. Dial Control Assembly, Sequence of Operation for Power or Emission Selection, Block Diagram

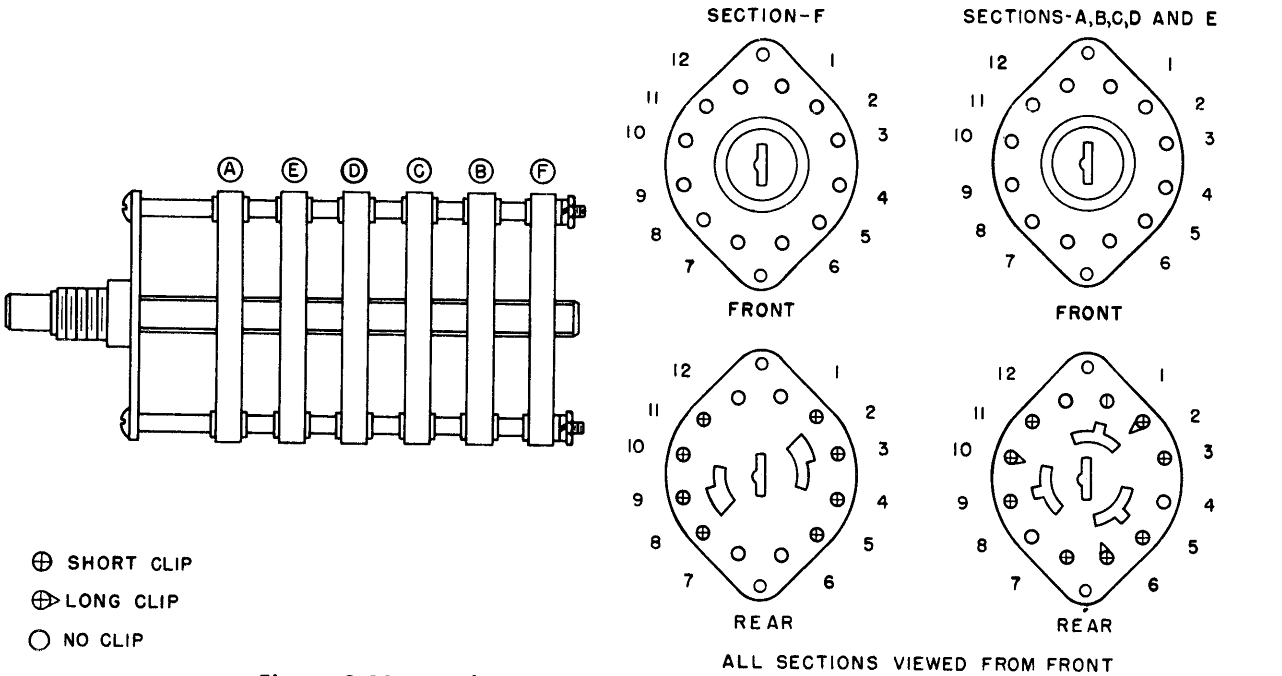


Figure 2-22. Local-Remote Switch S504, Mechanical Diagram

For convenience, the channel-selection function of the Dial Control Assembly is divided into stepping, control-circuit-cycling, and homing sequences.

1. STEPPING.—When the telephone dial on Transmitter Control C-1362/FRT-24 or Telephone Set TA-267/U is operated to select a new channel, a number of ground pulses corresponding to the channel number dialed are produced by the rotation of the special switching contacts in the dial assembly. For example, 10 pulses are produced for channel 10. These pulses are fed through switch section S504C-2 to the coil of pulsing relay K802. Power for this relay and for all other relays in the Dial Control Assembly is supplied through a bridge-type selenium-rectifier supply consisting of T801 and CR801. The positive side of this bridge circuit is grounded. A voltage of 48 volts, dc, is therefore placed on the coil of K802 each time this relay receives a ground dial pulse, and in the example, the pulsing relay will operate its contacts for 10 distinct intervals. Contacts (1) of K802, in supplying 10 ground pulses to the coil of stepping relay K801, cause the armatures of K801A, K801B, K801C, and K801D to move to the tenth position. Contacts (2), in opening (one pulse is sufficient), break the holding circuit from ground through switch section S504B-2 to relays K806, K807, K808, and K809, which are the filament off, high-voltage off, c-w, and FSK relays, respectively. By removing the holding circuits to these relays, these contacts stop the action of any relay which may have been energized previously; clearing this relay circuit is essential for setting up a transmitter function on the basis of new dial information. All transmitter functions are suspended except the filament circuits, which remain or become energized. For more details on the operation of these relays in the power control circuits, refer to paragraph 2.*a.*(4)(*b*) of this section.

2. CONTROL CIRCUIT TURN ON.—As soon as K801 is energized (one pulse is sufficient), contacts (1), in closing, energize SR1 relay K805, which remains closed a fraction of a second after each pulse since it is of the slow-release type. Contacts (2) of K805, in closing, apply 115 volts, ac, to plate-hold relay K503 and filament relay K501 through S504A-2, S504B-2, contacts (2) of K806, and the plate-hold interlock circuit. The radio set filament circuits are turned on. Contacts (1) of K805 energize Autotune control relay (SR 2), another slow-release type relay whose contacts remain open until a short time after K805 releases; this insures that the Autotune motor, which is energized through K801A and motor-starting relay K240, does not start its rotation until the last ground pulse is fed to pulsing relay K802. Contacts (2) of K804 lift ground from the armatures of K801A, K801C, and K801D so that the Autotune system will not cycle until the pulsing is completed. Switch section K801B is not affected at this time since it can energize homing relay K803 only after the Autotune system has undergone a complete cycle (ready to return limit switch S254 to its original position, as discussed in paragraph 2.*a.*(1)(*h*)*5.* of this section). As soon as K805 releases (assuming that channel 10 has been dialed, all armatures of the switch sections are now properly indexed at position 10), the armatures of K801C and K801D are returned to ground. In this position K801C does not have any effect, because its stationary contacts from positions 1 to 11 are unwired. However, stationary contacts 1 to 10 of K801D are wired in parallel with stationary contacts 1 to 10 of seeking switch S251 and CHANNEL SELECTOR switch S243. As soon as the armature of K801D is grounded, identically positioned contacts on S251 and S243 are placed at ground; this is equivalent to turning the CHANNEL SELECTOR switch to channel 10 when S504 is in the LOCAL position. As soon as relay K804 releases and grounds the armature of K801A, a ground is applied to the coil of motor-starting relay K240; this is equivalent to grounding the momentary-start contact while turning the rotor of the CHANNEL SELECTOR switch with S504 in the LOCAL position. The contacts of actuated relay K240 disable the control circuit to plate relays K502 and K505 so that plate voltage cannot be applied during Autotune cycling, and disable the dial input circuits so that turning the telephone dial of any of the remote units has no effect during Autotune cycling.

Note

IF AUTOTUNE EMISSION-SELECTOR SWITCH S250 IS WIRED TO THE COIL OF C-W RELAY K808, A GROUND WILL BE APPLIED TO THE RELAY DURING THE ROTATION OF SEEKING SWITCH S251 SO THAT THE EMISSION CONTROL CIRCUIT WILL AUTOMATICALLY BE SET UP FOR C-W EMISSION ON ANY ONE OF THE 10 CHANNELS DIALED. FSK RELAY K809 IS NOT USED, BUT IT CAN BE WIRED TO SWITCH S250 IF AUTOMATIC FSK SELECTION IS TO BE ENABLED. IF C-W RELAY K808 IS NOT WIRED TO S250, THE TRANSMITTER WILL SET UP FOR VOICE MODULATION UNLESS A REQUEST FOR C-W EMISSION IS DIALED AT A REMOTE UNIT, AS DISCUSSED IN PARAGRAPH (*c*), BELOW.

3. HOMING.—When the Autotune system cycles, it will set up the control head and the six singleturn heads on the new channel, as discussed in paragraph 2.*a*.(1) (*h*)*2*. of this section. When the Autotune cycle has been completed, limit switch S254 is returned to its original position. Ordinarily, the Autotune system is turned off at this point in LOCAL operation; however, in REMOTE operation, the system is still energized by the grounded contacts of K801A and K801D. When contacts (B) of S254 operate, they apply a ground through the first 10 stationary contacts and the armature of switch section K801B to closed contacts (5) of homing relay K803. Contacts (5) open, but ground is maintained to the coil by contacts (4) and K801E. Contacts (1) disable pulsing relay K802 so that there can be no new dial-pulse input during homing. Contacts (3) supply a ground through contacts (1) of K801, which begins automatically to step as a result of the make and break function of contacts (1) of K801. When the relay is energized, contacts (1) open, causing the relay to de-energize; contacts (1) then close, re-energizing the relay. Contacts (2) of K803 unground the armature of K801C so that during the homing process K806, K807, K808, and K809 cannot be energized as this armature is returned to its home on the 26th position. Contacts (2) of K801 supply a ground to slow-release relay K805, which in turn energizes K804. The contacts of K804, in opening, lift the ground from the armature of K801A, which in turn breaks the ground to relay K240. The contacts of K240 then de-energize the Autotune electrical system, and apply 115 volts, ac, to the control circuit to relays K502 and K505 so that high voltage may be applied to the transmitter circuits after a suitable time period has elapsed, allowing the transmitter to operate on the new channel setting. In the meantime, the armatures of K801 continue to step until they reach the 26th position, which is their normal position before receiving any new dial information from a remote station. Note that each armature has a wiper contact on either end so that a 26-position movement in effect returns the armature to its original place. At this time, cam switch K801E opens the ground to contacts (3) and (4) of homing relay K803 so that this relay and relay K801 are de-energized. Since contacts (2) of K801 are normally open, after a brief interval, relay K805 releases, in turn releasing K804.

(*c*) POWER OR EMISSION SELECTION.—At any time after the transmitter has been placed into normal operation, the Dial Control Assembly is ready to receive pulse information not only for changing channels, as discussed previously, but also for selecting different types of emission or turning off the plate or filament voltages. When a new channel is dialed, the dial control relays will cycle and cause the transmitter to go into operation on the new frequency with voice emission unless Autotune emission switch S250 has been wired to c-w relay K808; in the latter case, the transmitter will automatically set up for c-w emission. The FSK emission formerly selected by K809 is not used in this transmitter, and the circuits associated with this function will not be discussed. To set up the transmitter for voice operation if S250 is used will require a dialing operation. Figure 2-21 is a block diagram of the sequence of actions that occur for power or emission selection.

1. CONTROL-CIRCUIT RELAYS.—A detailed analysis of the power and emission control circuits are given in paragraph 2.*a*.(4) of this section. A thorough understanding of these control circuits will clarify the relationship of the dial control function with transmitter operation. Three telephone-type relays are used in the Dial Control Assembly to effect changes in the transmitter control circuits and subsequent operation. These relays are as follows:

K806, FIL OFF: The function of this relay is equivalent to that of FILAMENT switch S502, for which it is substituted during remote operation. Contacts (2) on this relay are connected in series with one side of the a-c input through contacts of S504A-2 to the other side of filament relay K501. When K806 is energized, contacts (2) open and turn the transmitter filaments off; the plate voltage circuits are also disabled simultaneously.

K807, HV OFF: The function of this relay is equivalent to that of PLATE switch S503, for which it is substituted during remote operation. Contacts (2) on this relay are connected in series with the plate interlock circuit so that when K807 is energized, contacts (2) open, de-energizing plate relays K502 and K505, turning the plate voltage off.

K808, CW: The function of this relay, when energized, is equivalent to that of EMISSION SELECTOR switch S505 when the switch is set at the CW position during remote operation. When the relay is not energized, the transmitter is set up for phone operation. Contacts (2) on this relay are connected in series with one side of the a-c input through contacts of S504A-1 to c-w relay K201. When K808 is energized, contacts (2) close and actuate K201 so that the modulator is disabled and the keyer is set up for c-w operation.

2. DIAL-CONTROL OPERATION.—The dial-control operation for power or emission selection is essentially the same as for channel selection except that the number of pulses required is greater. C-W selection requires 12 pulses, high-voltage off selection requires 20 pulses, and filament off selection requires 21 pulses to drive the armature of K801 to an equivalent position for accomplishing the required action. Dialing the letter A (11 pulses) steps K801 to position 11. Since contacts (11) on the stepping switches are blank, the armatures stop and do not function to operate the Autotune system. Now, dialing the number 1, 9, or 0 (1, 9, or 10 pulses) steps K801 so that the ungrounded armature of K801C stops at the c-w high-voltage off, or filament off position, in preparation for energizing K808, K807, or K806. When the pulsing stops, SR1 relay K805 is de-energized and releases SR2 relay K804. Contacts (1) of K805 apply a ground to the arm of K801C to energize the selected relay. The contacts of K804 apply a ground to homing relay K803 through the closed circuit of K801A and K801B. K801 steps to position 26 and stops. Each relay, K806, K807, and K808, is interlocked by means of self-holding contacts (1) so that once a relay has been energized by the stepping action of K801C, it will remain energized through the ground holding circuit consisting of its own contacts and closed contacts (2) of pulsing relay K802. The holding circuit to the relay will release only when K802 is again energized by the dial-pulse input. In the event the transmitter has been set up for c-w operation (either by means of switch S250 or by dialing A1), it can be returned to phone operation by dialing A3. Dialing the number A operates pulsing relay K802 so that contacts (2) on this relay break the holding circuit to the coil of K808. Contacts (2) of K808 then set up the transmitter for voice modulation. The armatures of K801 are stopped on position 11; dialing the number 3 steps the armatures to position 14, a position which permits K803 to home K801 to position 26.

(4) POWER CONTROL ASSEMBLY.—The Power Control Assembly, shown in figure 1-6, supplies primary power for application to the plate, filament, control, and blower circuits of Radio AN/FRT-24. On the front panel are mounted four controls, two panel lights, 16 fuses, and 16 blown-fuse indicator lights. PRIMARY CIRCUIT BREAKER CB501 is the main power (230 volts, ac) input switch, and FILAMENT control S502 and PLATE control S503 are used to turn power on or off in the filament and plate circuits. When these spring-loaded, momentary-contact switches are pulled toward the operator, the control circuit sequence will begin. FILAMENT lamp I501 will light immediately, and after a 30-second delay PLATE lamp I502 will go on, indicating that plate voltage is being applied. The filament circuit will automatically become energized in the event only the PLATE control is actuated.

Note

THE FOLLOWING DISCUSSION IS CONCERNED ONLY WITH APPLICATION OF POWER. THE COMPLETE FUNCTION OF LOCAL-REMOTE SWITCH S504 IS DISCUSSED IN GREATER DETAIL IN CONJUNCTION WITH THE DIAL CONTROL (PARAGRAPH 2.*a.*(3)(*a*) OF THIS SECTION). THE COMPLETE FUNCTION OF EMISSION-SELECTOR (PHONE-CW-FSK) SWITCH S505 IS DISCUSSED WHERE APPLICABLE IN THE PARAGRAPHS DEALING WITH THE DIAL CONTROL, KEYER, AND MODULATOR CIRCUITS.

Circuit breaker CB501 is a magnetic type switch affording overload protection for the primary input circuits; when this switch is opened as a result of an overload, it can be reset (after a 5-second delay) by manual operation of the toggle. The three control-circuit branches, the independent bias, filament, and plate power circuits as well as the blower, Autotune, and d-c relay supply circuits are individually protected by means of cartridge fuses (mainly of the slow-blow type). Table 5-2 of Section 5 gives the fuse symbol, the circuit it protects, and the rating of the fuse. As an aid in trouble-shooting, whenever a fuse opens because of an overload in a particular circuit, a neon-type lamp connected across the fuse will light, indicating a blown fuse. Whenever the lamps are used in circuits having voltages higher than their maximum rated voltage, a voltage-dropping resistor is used in series with the lamp to limit current (when a fuse opens) through the lamp to a safe value.

Beneath the front panel is an access door which covers five relays, four connectors, time-delay tube V501, and adjustment control R523, as shown in figure 7-32. On the bottom of the component are mounted two autotransformers, T501 and T502 (figure 7-33), for supplying stepped-down a-c voltages; these autotransformers are energized by means of the FILAMENT control. Figure 7-64 contains a schematic diagram of the Power Control Assembly. Figure 2-23 clarifies the relationship between the Power Control Assembly and its associated circuits. Figure 2-24 is a block diagram showing the sequence of actions of the Power Control Assembly for local operation.

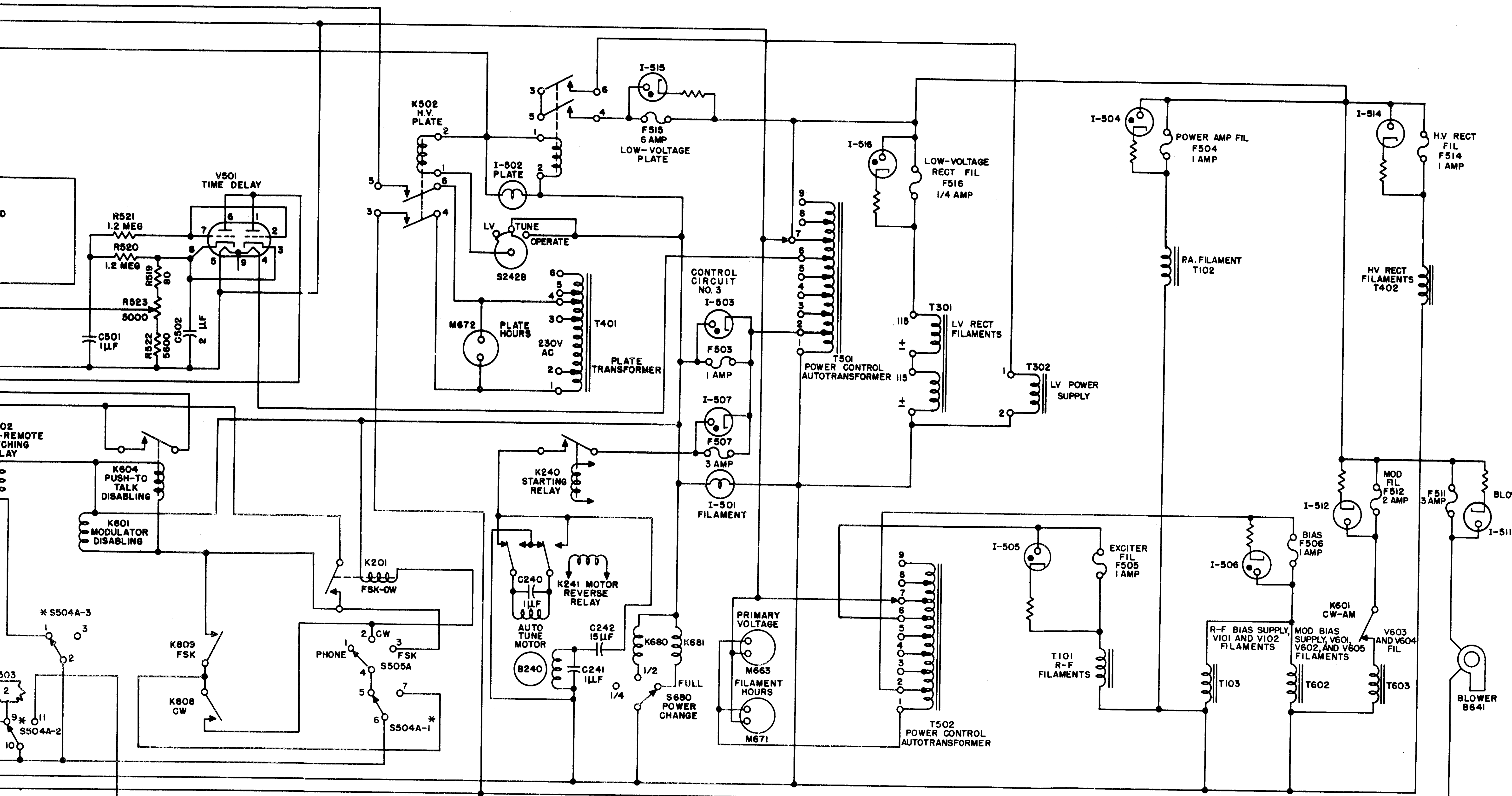
(*a*) LOCAL OPERATION.—When PRIMARY CIRCUIT BREAKER CB501 is turned ON, 230-volt, single-phase, 50—60-cps power is applied directly to the primary of d-c relay supply transformer T801 in the Dial Control Assembly, and to Service Power Supply autotransformer T701, which supplies 230 volts, ac, to Power Supply PP-454/FRT-5 and 115 volts, ac, to R-F Oscillator O-243/FRT-24.

1. FILAMENT-POWER APPLICATION.—Pulling the FILAMENT knob forward causes contacts (3 and 4) of S502 to momentarily complete the 230-volt circuit to filament relay K501 through its normally closed contacts (1) and (2) and switch section S504A-2. The controls of this relay perform the following functions:

Closed contacts (3 and 4) return the coil to closed contacts (1 and 2) of S502 so that when momentary switch S502 returns to its normal position, relay K501 will remain energized through this holding circuit.

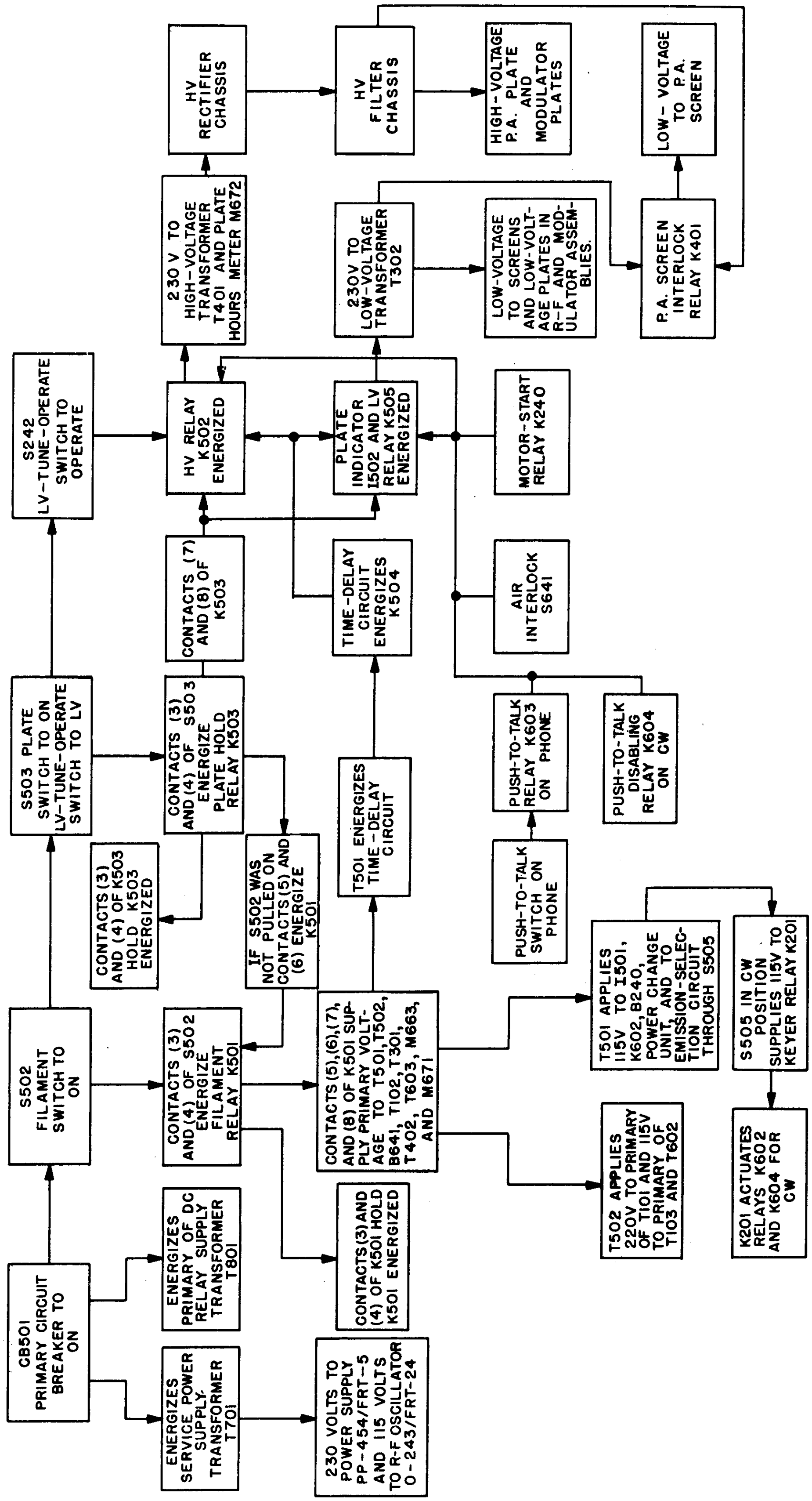
Closed contacts (5 and 6) and (7 and 8) apply 230 volts, ac, to terminals 1 and 7 of autotransformers T501 and T502, to blower B641, and to the primary windings of T102, T301, T402, and T603, which are the power-amplifier, low-voltage-rectifier, high-voltage-rectifier, and modulator filament transformers, respectively. Upon application of the voltage to these components, PRIMARY VOLTAGE meter M663, an a-c type voltmeter, will indicate the amplitude of the primary voltage, and FILAMENT HOURS meter M671, a synchronous self-starting electric clock, will begin to operate the direct-reading type dial. Autotune transformer T502 (between terminals 1 and 6) applies 220 volts, ac, to the primary winding of T101, the exciter filament transformer, and 115 volts, ac (between terminals 1 and 2), to the primary windings of T103 and T602, the r-f and modulator bias transformers, respectively. Autotransformer T501 applies 115 volts, ac (between terminals 1 and 2), to energize FILAMENT indicator lamp I501, the Power Change Assembly (paragraph 2.*a.*(7) of this section), and local-remote switching relay K602. These terminals also supply 115 volts, ac, for operation of Autotune motor B240 and the emission-selection circuit controlled by S505. Note that in the CW position of S505, 115 volts, ac, is supplied to keyer relay K201, which in turn actuates relays K602 and K604 to set up the keyer and disables the modulator circuits, respectively, for c-w operation; in the PHONE position, these relays are de-energized, as shown in figure 2-23.

2. TIME-DELAY CIRCUIT.—230 volts, as, is applied to a time-delay circuit using a JAN 5814 or a 12AU7, dual-triode tube (V501). Terminals 6 and 7 of T501 supply 10 volts, ac, to the cathode-heater circuit of time-delay tube V501. The plate circuit is returned to one side of the primary voltage, and the cathode circuit is returned to the other side through load resistors R522, R523, and R519 and contacts 7 and 8 of K501. Rectification of the a-c voltage by diode action causes a positive d-c voltage to be developed at the cathodes, and capacitor C501 is charged through resistor R520. The rising positive potential at C501 is fed through R521 to the control grids of V501, causing the plate current of this tube to increase. After approximately 30 seconds, the plate current becomes great enough to cause time-delay relay K504 to operate. Bringing up the tube to its required plate emission is delayed not only by the long-time-constant circuit consisting of C501 and R520, but also by the slow heating of the tube cathodes due to the fact that the heaters are operated at approximately 3 volts below their normal rating. Cathode bypass capacitor C502 filters the cathode voltage to prevent K504 from chattering with plate-current pulsations. The plate current will stabilize when the grid potential reaches the same potential as the cathode (zero bias). During the time that C501 is charging, the grid bias as measured with respect to the cathode, becomes increasingly less negative. Potentiometer R523 is used in adjusting the time-delay circuit so



NOTE:
* PART OF LOCAL-REMOTE SWITCH S504; SHOWN IN THE LOCAL POSITION.
ALL RELAYS ABOVE ARE IN DE-ENERGIZED POSITION.

Figure 2-23. P wer Contr l Assembly with Ass ciated Circuits, Simplified Schematic



Figur 2-24. P w r Control Ass mbly, S qu nc f r L cal Op rati n, Simplifi d Sch matic

that K504 will actuate after a 30-second delay. Changing this adjustment establishes a different current requirement for V501 at which sufficient voltage will be built up to energize the relay. If the primary input voltage should be momentarily removed, capacitors C501 and C502 will discharge through the coil of K504, and keep the contacts closed. However, when the contacts release, the relay will be re-energized quickly if during the interval of voltage removal the cathodes of V501 have nct completely cooled.

3. PLATE-POWER APPLICATION.—Plate hold relay K503 may be energized by means of switch S503, either before or after the time-delay circuit has operated. Pulling the PLATE knob forward causes contacts (3) and (4) of S503 to momentarily complete the 230-volt circuit through the closed contacts of S502, S504A-2, and the plate-hold interlock circuit consisting of normally closed contacts of P.A. overload relay K102 and door interlocks S621 and S651 (when the cubicle doors are shut). The contacts of plate-hold relay K503 perform the following functions:

Contacts (3) and (4) return the coil to closed contacts (1) and (2) of S502 and S503, so that when momentary switch S503 returns to its normal position, relay K503 will remain energized through this holding circuit.

Closed contacts (5) and (6) energize filament relay K501 in the event FILAMENT switch S502 has not been operated previously; these contacts are provided so that K501 and K503 may be energized simultanecusly in the event the PLATE control alone is actuated to the ON position. On the other hand, pressing this control breaks only the plate hold circuit to K503, whereas, if the FILAMENT control is pressed while K503 is energized, not only is the filament circuit to K501 broken but also the plate hold circuit to K503. Since plate hold relay K503 receives its energizing voltage through the normally closed contacts of S502, operating the FILAMENT control to off, disables all power applied to the radio set.

Closed contacts (7) and (8) ready the plate interlock circuit to complete the 115-volt, a-c circuit to the low-voltage and high-voltage plate relays, K505 and K502. The plate interlock circuit consists of the following relays whose pertaining contacts must be closed before K505 and K502 can operate: Time-delay relay K504 which actuates after 30 seconds, high-voltage off relay K807 (normally-closed), in the Dial Control Assembly, motor-starting relay K240 (contacts normally closed after the Autotune system has cycled), air interlock S641 (contacts normally closed if blower B641 is operating normally), and parallel contacts of microphone push-to-talk relay K603 and push-to-talk disabling relay K604. When S505 is in the PHONE position, the contacts of K603 can close only when the microphone button is pressed; when S505 is in the CW position, K604 is energized at all times, and the contacts remain closed, permitting the application of high voltage to the radio set. When the plate interlock circuit is completed, low-voltage plate relay K505 and PLATE indicator lamp I502 are energized. The closed contacts of K505 apply 230 volts, ac, to the primary winding of T302, the low-voltage rectifier plate transformer. If the LV-TUNE-OPERATE switch (S242) is in the TUNE-OPERATE position, high-voltage plate relay K502 is energized. The closed contacts of K502 apply 230 volts, ac, to the primary winding of high-voltage rectifier plate transformer T401 and PLATE HOURS meter M672 (identical in operation to M671).

(*b*) REMOTE OPERATION.—When PRIMARY CIRCUIT BREAKER CB501 is turned on and LOCAL-REMOTE switch S504 is at the REMOTE position, the radio set is readied for power application by operation from a remote station. As previously discussed in paragraph 2.*a.*(3) of this section, the Dial Control Assembly permits operation of the Power Control Assembly by means of a telephone dial. Switch sections S504A-2 and S504B-1 provide an alternate circuit for the energization of filament relay K501 and plate hold relay K503 by means of dial control relays K806 and K807 respectively. In remote operation, relays K806 and K807 perform the same functions as the FILAMENT and PLATE controls do in local operation. Switches S502 and S503, which are operated by the FILAMENT and PLATE controls respectively, are taken out of the circuit by the action of the LOCAL-REMOTE switch; all other circuits except the emission-selection circuit are the same as during local operation of the Power Control Assembly. Switch section S504A-1, in the REMOTE position, replaces PHONE-CW-FSK switch S505 with an alternate circuit using c-w relay K808 and FSK relay K809 of the Dial Control Assembly.

Note

THE FSK FUNCTION OF THE RADIO SET HAS BEEN DISABLED.

(5) LOW-VOLTAGE POWER SUPPLY (*see figure 2-25*).—The Low-Voltage Power Supply shown in figure 1-4 uses two rectifiers, type JAN 3B28 (V301 and V302), connected as a full-wave rectifier to rectifier plate transformer T302. The filaments of V301 and V302 receive power from rectifier filament transformer T301. The JAN 3B28 is a xenon-filled tube which operates satisfactorily over a wide ambient-temperature range. The rectified voltage is fed to a single-section choke-input filter consisting of choke L301 and capacitors C301. This type of filter not only gives better voltage regulation but also protects the rectifiers by preventing current surges, such as

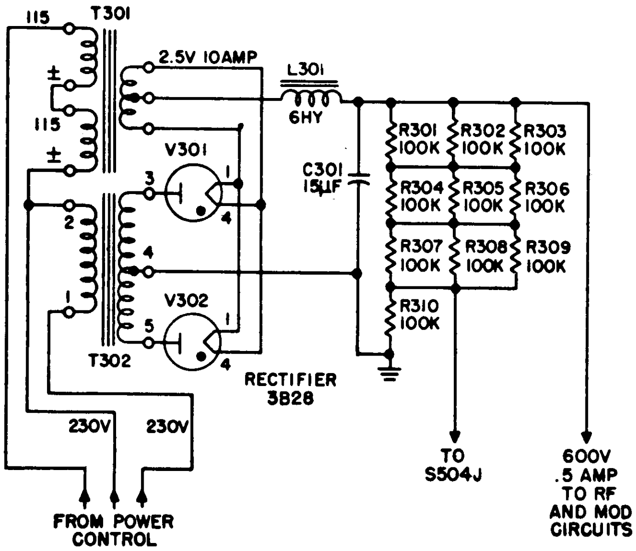


Figure 2-25. Low-Voltage Power Supply, Simplified Schematic

those that occur when power is first applied. Two d-c voltage outputs, 600 and 100 volts, are taken from a voltage divider and bleeder consisting of R301 through R309 (a series-parallel combination equivalent to a 100,000-ohm, 18-watt resistor) and R310. The 600-volt output supplies all the plate and screen circuits in the R-F Assembly and Modulator Assembly except the plates of power amplifier V106 and modulator tubes V603 and V604. The 100-volt

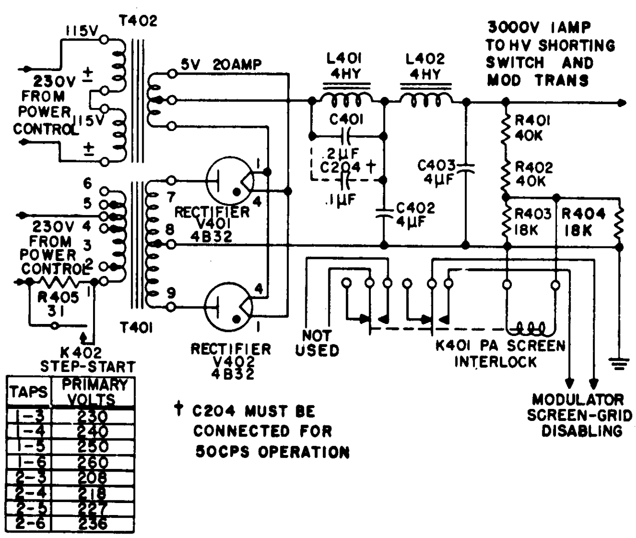
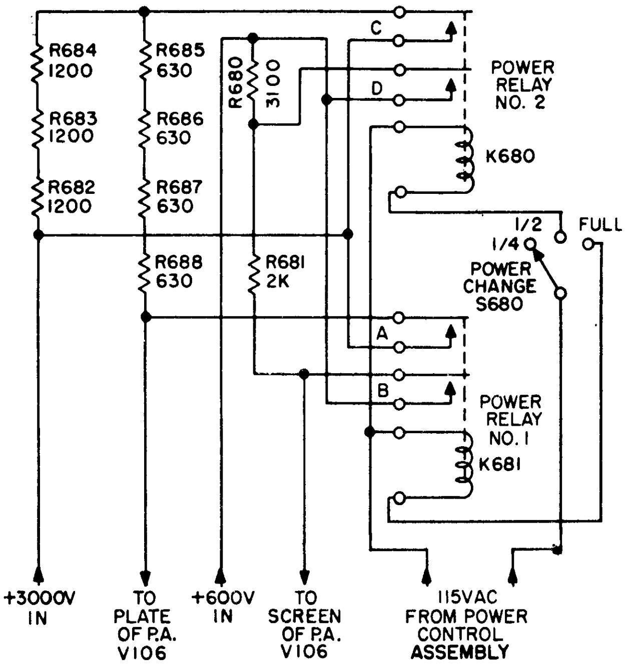


Figure 2-26. High-V ltage Pow r Supply, Simplifi d Schematic

output is for use as an auxiliary for operating the test-keying circuit in the keyer assembly when LOCAL-REMOTE switch S504 is in the REMOTE position.

(6) HIGH-VOLTAGE POWER SUPPLY (*see figure 2-26*).—The High-Voltage Power Supply consists of a rectifier chassis, a filter chassis, and rectifier plate transformer T401, shown in figure 1-5. This power supply uses two rectifiers, type JAN 4B32 (V401 and V402), connected as a full-wave rectifier to T401. The filaments receive power from rectifier filament transformer T402. The JAN 4B32 is a xenon-filled tube which operates satisfactorily over a wide ambient-temperature range. The rectified voltage is fed to a double-section choke-input filter consisting of chokes L401 and L402 and capacitors C402 and C403. This type of filter not only gives better voltage regulation but also protects the rectifiers by preventing current surges, such as those that occur when power is first applied. As an additional aid to better regulation, a series-resonant filter consisting of L401 and C401 maintains a high input to the rectifiers so that the power-supply output voltage does not rise excessively when the load is removed. Capacitor C404 is connected across C401 to lower the resonant frequency of the filter for 50-cps operation. The output voltage of 3000 volts, dc, at 1 ampere is applied to the plate circuits of power amplifier V106 and modulator tubes V603 and V604. A tap on the voltage divider and bleeder consisting of R401, R402, R403, and R404 energizes modulator screen interlock relay K401. Whenever the power supply is turned off, a set of contacts on this relay opens the screen-supply circuit (600 volts dc) to V603 and V604; this action protects these tubes from possible damage due to the excessive screen-grid current that would result when plate voltage is removed from these tubes. Another set of contacts of K401 can be used to control external warning lights, interlock circuits, etc., to meet the particular requirements of an individual transmitting location.

(6a) STEP-START CIRCUIT FOR HIGH VOLTAGE POWER SUPPLY (*see figure 7-64, section G*). — To prevent damage to the type 4B32 rectifier tubes V401 and V402, a step-start circuit in the primary winding of transformer T401 limits the initial surge current through the transformer. This circuit consists of time-delay switch S401, shorting relay K402, and surge resistor R405. Time-delay switch S401 is started at the same time 230 v ac is applied to the primary of transformer T401 which is initially in series with surge resistor R405. After the time delay, normally set for three seconds, S401 closes to energize shorting relay K402 which in turn shorts out resistor R405. The switch and relay remain energized until the transmitter is shut down.



Figur 2-27. Power Change Assembly, Simplified Schematic

(7) POWER CHANGE ASSEMBLY (*see figure 2-27*).—The Power Change Assembly, shown in figure 1-9, is used for operating the transmitter at full, one-half, or one-fourth its rated output. When POWER CHANGE switch S680 is at the FULL position, 115 volts, ac, is applied to power relay No. 1 (K681), causing contacts (A) and (B) to close. During phone operation, contacts (A) permit modulated voltage to be applied through choke L691 to the plate of power amplifier V106. During c-w operation, the same contacts apply an unmodulated voltage of 3000 volts, dc, to V106 since the secondary winding of modulator transformer T691 is shorted out by contacts of modulator disabling relay K601. Contacts (B) of K681 permit 600 volts, dc, to be applied to the screen grid of V106. Operating S680 to the ½ position de-energizes K681 and actuates power relay No. 2 (K680), causing contacts (C) and (D) to close. Contacts (C) short out part of the voltage-dropping branch consisting of R682 through R684, leaving the remaining four resistors (R685 through R688) in series with the plate feed to V106 so that this stage applies one half of its full power to the antenna system. Contacts (D) short out voltage-dropping resistor. R680, leaving R681 in series with the 600-volt, d-c feed to the screen-grid circuit of V106 so that the stage can operate properly with reduced plate voltage. Operating S680 to the ¼ position, de-energizes both relays K680 and K681, with the result that voltage-dropping branch R682 through R688 is in series with the plate circuit of V106, and R680 and R681 are in series with the screen-grid circuit of V106. For this condition the transmitter feeds

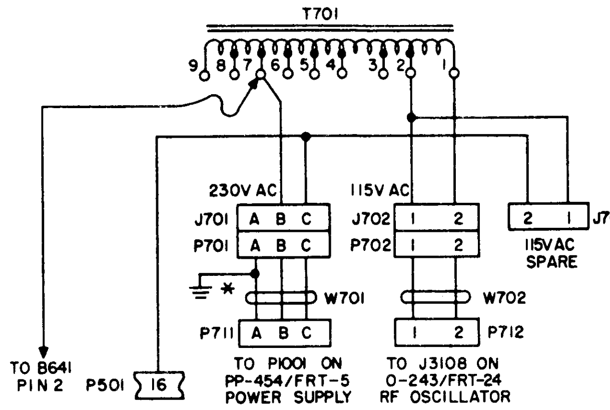


Figure 2-28. Service Power Supply, Simplified Schematic

about one fourth of its full rated power to the antenna system.

(8) SERVICE POWER SUPPLY (*see figure 2-28*).—Although the Service Power Supply (shown in figure 1-10) is part of Radio Transmitter T-440/FRT-24, it is used for supplying 230 volts, ac, to Power Supply PP-454/FRT-5 and 115 volts, ac, to R-F Oscillator O-243/FRT-24. The primary input power (230 volts, ac) across terminals 1 and 2 of autotransformer T701 is supplied to polarized receptacle J701 and thence through cable assembly W701 to Power Supply PP-454/FRT-5. The stepped-down voltage (115 volts, ac) at terminals 1 and 2 is supplied to receptable J701 and thence through Cable Assembly W702 to R-F Oscillator O-243/FRT-24. Receptacle J702 is used as a convenience outlet for supplying 115 volts, ac.

(9) PATCH-PANEL ASSEMBLY. — The Patch Panel Assembly, shown in figure 1-11, consists of eight UG-291/U type receptacles on a common front-panel mounting. MASTER OSC. receptacle J722 and TRANSMITTER INPUT receptacle J721 are wired to separate lengths of RG-58/U cable terminated with UG-88/U plugs, P732 and P731 respectively. Plug P732 mates with J3109, which connects to the signal output circuit of R-F Oscillator O-243/FRT-24. Plug P731 mates with the 52-OHM INPUT receptacle (J101), which connects to CHANNEL SELECTOR switch S101D of crystal-oscillator stage V101. When cable assembly W721 is connected between J721 and J722, and the CHANNEL SELECTOR switch is set to position 10, a selected signal from the R-F Oscillator will supply the operating frequency of the transmitter. In this position of the switch, crystal oscillator V101 operates as a buffer to amplify the signal fed from the external oscillator. EXTERNAL receptacle J723, which is wired to a length of RG-58/U cable and terminated with a UG-88/U connector, can be used (when necessary) for bringing an external signal to the patch

panel from either the radio set itself or some other equipment. Five receptacles (J724 to J728), marked SPARE, can be wired in any way to meet the specific requirements of an individual installation.

(10) CABINET AND ACCESSORIES.—The cabinet consisting of left and right hand sections, shown in figure 3-10 and 3-11 respectively, is part of Radio Transmitter T-440/FRT-24, but also houses R-F Oscillator O-243/FRT-24 and Power Supply PP-454/FRT-5, which are to be discussed later. The cabinet accessories, which are discussed where applicable in previous paragraphs, include the cabling and terminal boards for interconnecting the components of Radio Set AN/FRT-24; three meters for monitoring current and voltage (MODULATOR PLATE CURRENT M661, PLATE VOLTAGE M662, and PRIMARY VOLTAGE M663); and two meters for keeping record of the power consumption (FILAMENT HOURS M671 and PLATE HOURS M672). Blower Assembly B641 (shown in figure 1-12), which is also a part of the cabinet accessories, is used to supply air cooling for the final tubes in the R-F and Modulator Chassis. To prevent damage to these tubes in the event the blower fails to operate, air interlock switch S641, which is operated by the air stream within the blower, will keep the plate voltage disabled. To prevent shock hazard to personnel, if the left-hand or right-hand door is opened not only will the plate voltage be removed by the action of door interlock S621 or S652, respectively, but the output from the high-voltage power supply will be grounded by high-voltage shorting switch S622 or S652, respectively

b. TRANSMISSION LINE COUPLER CU-390/FRT-24 (*see figure 2-29*).—The Transmission Line Coupler is a device that provides both balancing and impedance transformation. It matches the unbalanced 52-ohm output from the pi-L coupler of the transmitter to a balanced 600-ohm, two-wire line feeding the antenna system Figure 2-30, A through C, illustrates the basic theory from which this coupler was derived.

Figure 2-30A shows an ideal long transmission line whose input impedance (Z_{in}) is equal to the terminating or output impedance (Z_o) and also shows an ideal matching transformer with a balanced input and a balanced output and an impedance-matching ratio of 1:1. If long, equally terminated transmission lines are connected in parallel at one end and in series at the other end, the output impedance (Z_o), as shown in figure 2-30B, the result is the same as putting lumped resistances in series at the Z_o end and in parallel at the Z_{in} end. The impedance transformation at the input end (looking from the coupler to the transmitter) is step down, and at the output (looking from the coupler to the actual antenna transmission line), step up; in either case, it varies as the square of the number of transmission lines used regardless of whether the circuit constants are lumped or distributed. Since three separate transmission lines are used, the output impedance (Z_o) will appear as nine times Z_{in}, or 450 ohms, for balanced impedance transformation.

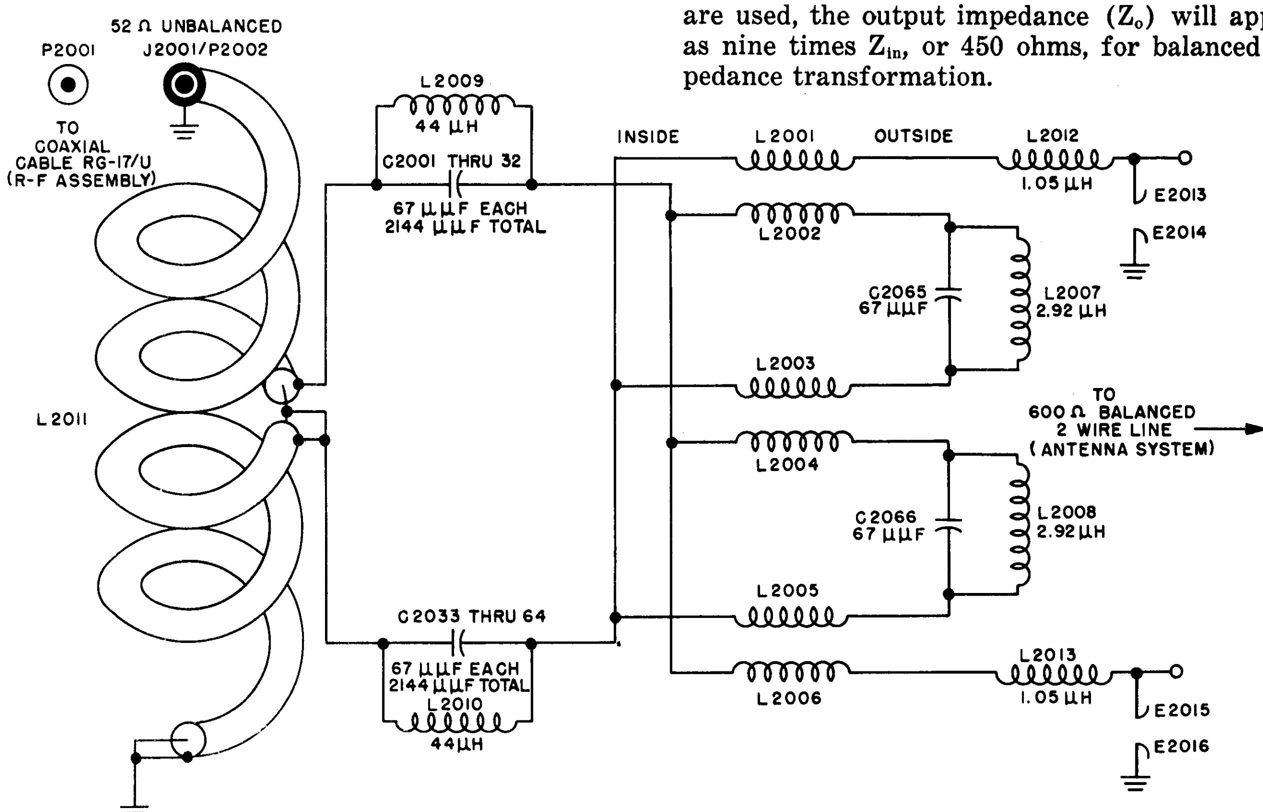


Figure 2-29. Transmission Line C upler CU-390/FRT-24, Sch matic Diagram

Figure 2-30C shows the equivalent circuit for the conditions represented in figure 2-30B except that an unbalanced input is fed through the coupler to a balanced output; the circuit also uses artificial transmission lines having lumped constants instead of long terminated lines. If a 600-ohm load is connected across the 450-ohm output of this device, a standing-wave ratio (SWR) of 1.33:1 $\left(\frac{600:1}{450}\right)$ will exist, assuming a balanced input and output condition. In practice, this is very difficult to achieve with antennas and transmission lines, particularly when they have to work over a wide frequency range such as 2 to 30 mc. Any unbalanced in the transmission line would cause a high standing-wave ratio, with subsequent distortion of the radiation pattern.

Lumped transmission lines L2001 and L2002, L2003 and L2004, and L2005 and L2006 are arranged so that their windings offer opposition to the flow of unbalanced currents (always in the same direction) and no opposition to the flow of balanced currents (always in opposite directions). Balance is obtained by the use of a coil Balun, L2011, to couple the matching unit to the unbalanced 52-ohm transmitter output jack (P2001). This Balun consists of a coaxial line wound as an inductance and connected as shown in the schematic in figure 2-28. As connected, the center conductor of the grounded half of this coil is not used, and the circuit operates as if it were comprised of two tank circuits balanced to ground. The unbalanced 52-ohm output, taken from Radio Transmitter T-440/FRT-24 through an RG-17/U coaxial cable and connector J107, is introduced to a 52-ohm balanced circuit, L2011, which converts this output to a balanced 52-ohm input. This input impedance is then stepped up in impedance by a device similar to the type discussed above. L2011 is made up of two sections of coiled r-f coaxial cable, which together with their distributed capacitances, act as two parallel resonant circuits equivalent to a center-tapped input over the entire operating range to maintain line balance. L2011 covers a 4:1 range in frequency; the use of capacitors C2001 through C2064 (64 capacitors in all) and coils L2009 and L2010 extends the low-frequency range and the over-all coverage to 15:1. An improvement in the standing-wave ratio is obtained by the use of tuned circuit C2065 and L2007, in series with the sections of artificial transmission line consisting of spiral windings L2002 and L2003; and by the use of tuned circuit C2006 and L2008, in series with the other sections of artificial transmission line consisting of spiral windings L2004 and L2005. Two loading coils (L2012 and L2013) are used to extend the frequency range of the coupler to 31.25 mc at the high-frequency end of the range, to prevent an

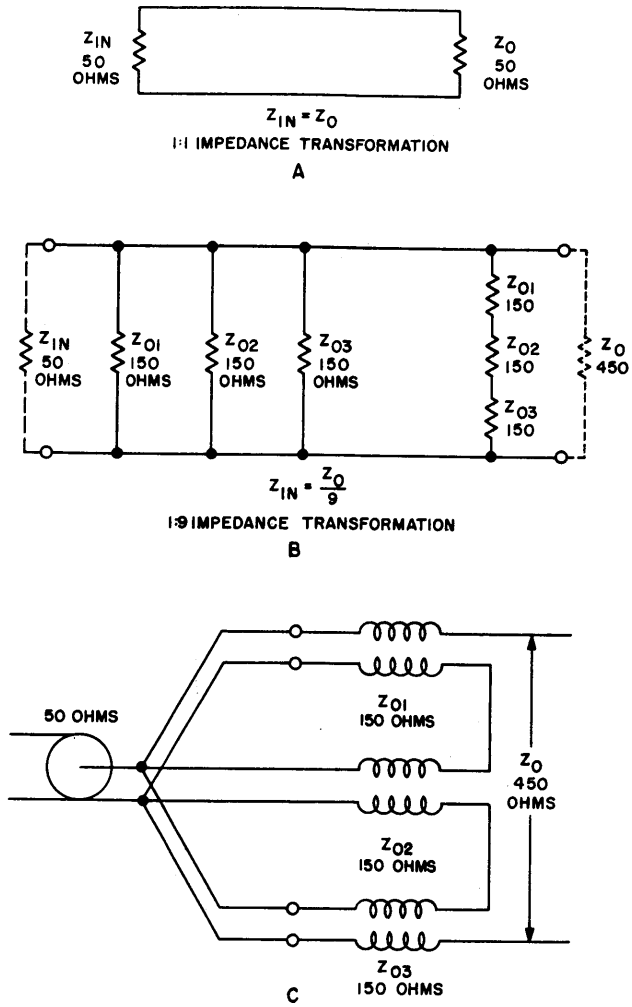


Figure 2-30. Derivation Diagrams for Transmission Line Coupler

otherwise rapidly rising SWR at 30 mc. These series loading coils, together with the feed-through *bowl* capacitance of 3.6 microfarads to ground (existing at E2003 and E2004, and E2005 and E2006, respectively), also form a small L-type network that matches the 450-ohm theoretical output impedance of the coupler to a 600-ohm load. A horn gap, E2013 and E2014, connected to one side of the balanced line, and E2015 and E2016 connected to the other, protect the equipment from damage due to extremely high voltage surges such as occur during lightning storms.

c. TRANSMITTER CONTROL C-1362/FRT-24.—For clarity in the following discussion, the circuits comprising the Transmitter Control will be considered in the following order: input audio amplifier, output audio amplifier, compressor rectifier, compressor and audio bridge, audio metering circuit, power supply, keying and push-to-talk circuits, and the telephone-dial and channel-indicator circuits. The Transmitter Control is shown in figure 1-15, and the over-all schematic diagram is shown in figure 7-67.

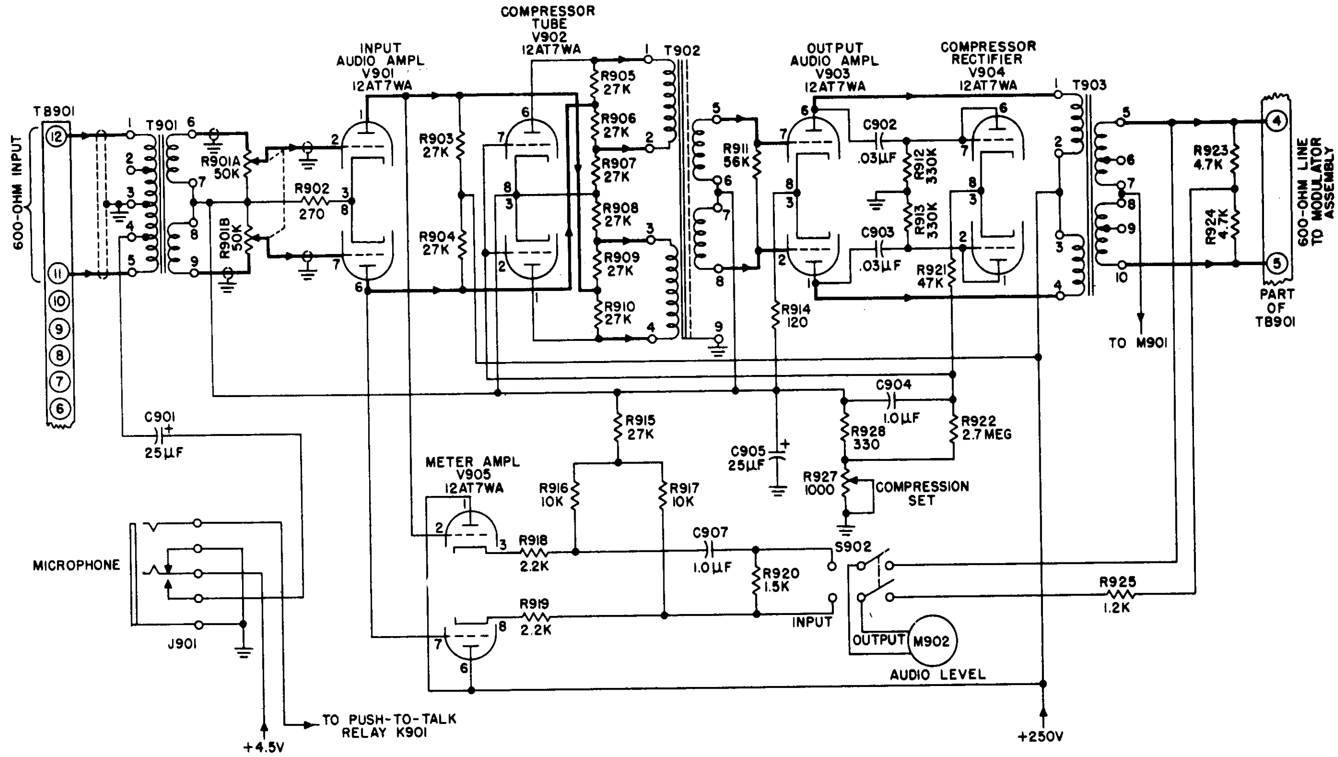


Figure 2-31. Transmitter Control Audio Circuits, Simplified Schematic

(1) INPUT AUDIO AMPLIFIER (*see figure 2-31*).—The input audio amplifier (V901) employs a JAN 12AT7WA miniature dual-triode tube, which is operated as a Class-A push-pull voltage amplifier using cathode bias. Two inputs are provided for this stage—a jack for a carbon microphone and terminals for a 600-ohm balanced input. The MICROPHONE jack (J901) is supplied with power from taps on the power-supply bleeder system (R929 through R937), and is coupled through capacitor C901 to a portion of the primary winding of input transformer T901. The complete primary winding of the transformer, representing a balanced 600-ohm input, is connected to terminals 11 and 12 of terminal board TB901, which is located on the rear of the chassis. A dual AUDIO GAIN control (R901A and R901B) is incorporated into the grid circuit of the input audio amplifier so that the input level to the amplifier may be adjusted. The plate circuits of V901 are connected in a balanced push-pull arrangement, by means of plate load resistors R903 and R904, and are connected directly to an audio bridge circuit contained in compressor stage V902.

(2) OUTPUT AUDIO AMPLIFIER (*see figure 2-31*).—The output audio amplifier (V903) employs a JAN 12AT7WA miniature dual-triode tube, which is operated as a Class-A push-pull voltage amplifier using cathode bias. The input signal for this stage is coupled from the output of the compressor stage by means of transformer T902. The primary winding of output transformer T903 comprises the plate load for the output audio amplifier. A balanced 600-ohm output to the transmitter is furnished by the secondary winding of T903, which is connected to terminals 4 and 5 of terminal board TB901, located on the rear of the chassis.

(3) COMPRESSOR RECTIFIER (*see figure 2-31*).—A JAN 12AT7WA miniature dual-triode tube is used in the compressor rectifier stage (V904) and is connected as a full-wave, biased rectifier. The value of positive bias applied to the cathodes of this stage is determined by the setting of COMPRESSION SET adjustment R927. Since the plates and grids of this rectifier are fed a signal from the plates of the output audio amplifier, the rectifier will conduct whenever the audio output signal exceeds the bias level, and the positive bias across resistor R922 will increase. The additional positive bias thus developed is used to control the action in compressor stage V902.

(4) COMPRESSOR AND AUDIO BRIDGE (*see figure 2-32*).—The compressor stage utilizes a JAN 12AT7WA miniature dual-triode tube (V902) to control the action in two separate audio bridge circuits. Since the two bridge circuits are

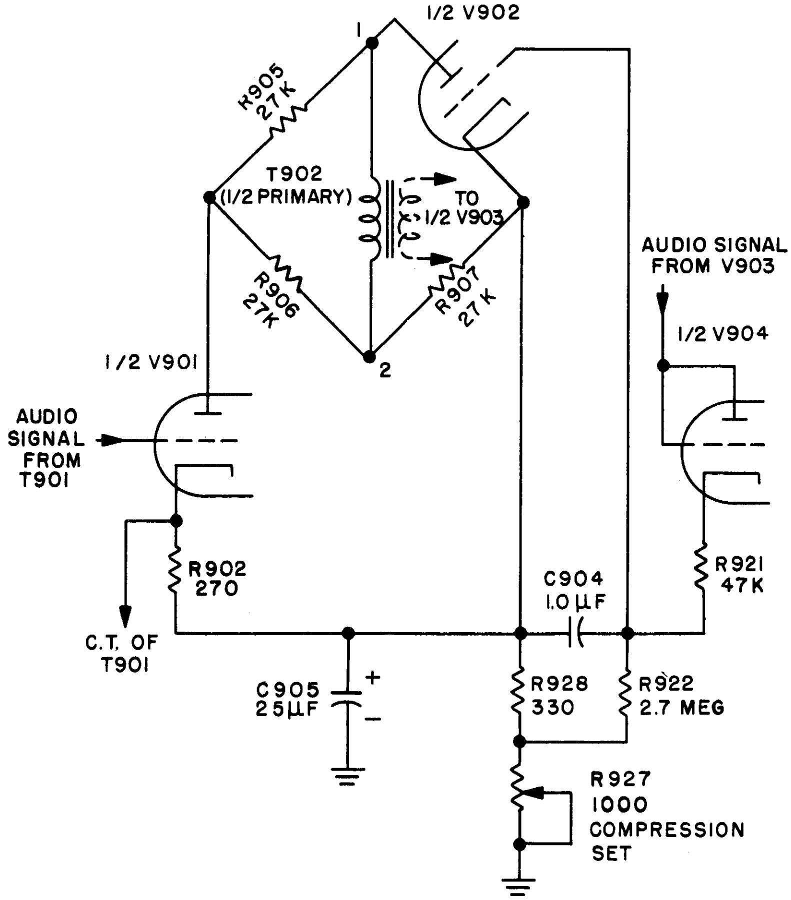


Figure 2-32. Compressor and Audio Bridge Circuit, Simplified Schematic

identical, only one will be described. For greater clarity in the following discussion, refer to the simplified diagram of figure 2-32, which shows one half of input audio amplifier V901, one half of compressor V902, and one of the audio bridges. Input audio amplifier V901 acts as the voltage source for the bridge, while compressor tube V902 comprises one arm of the bridge. The additional positive bias developed by compressor rectifier V904, as described above, is applied between grid and cathode of V902. Below the threshold of compression (before the compressor rectifier conducts), the plate-to-cathode resistance of V902 is greater than 27,000 ohms; therefore, the bridge circuit (R905, R906, R907, and V902) is unbalanced, and a large percentage of the audio-signal output voltage of V901 appears across one-half of the primary winding of transformer T902. However, when the audio level exceeds the threshold of compression, the compressor rectifier conducts and applies a greater positive bias to the grid of V902, which in turn conducts by a greater amount. As the conduction of V902 increases, its plate-to-cathode resistance decreases by a proportional amount (approaches 27,000 ohms), and the bridge is brought more nearly into balance. As the bridge is brought into balance, the audio-signal voltage across the primary winding of T902 is reduced. This proportionally reduces the output of amplifier (V903) to maintain a nearly constant output level.

(5) AUDIO METERING CIRCUIT (*see figure 2-31*).—The AUDIO LEVEL meter (M902) is a rectifier-type VU meter. This meter may be connected into either the input or output circuit of the amplifier by placing INPUT-OUTPUT switch S902 in the appropriate position. With the switch in the OUTPUT position, the meter is connected into the secondary-winding circuit of transformer T903. With the switch in the INPUT position, the meter is connected into the cathode circuit of a push-pull cathode follower, a JAN 12AT7WA miniature dual-triode tube (V905), which is direct-coupled to the plates of input audio amplifier V901.

(6) POWER SUPPLY (*see figure 2-33*).—The power supply utilizes a JAN 5Y3WGTA tube (V906) in a full-wave rectifier circuit with a choke-input filter, to furnish power for the various circuits contained in Transmitter Control C-1362/FRT-24. A bleeder network, composed of

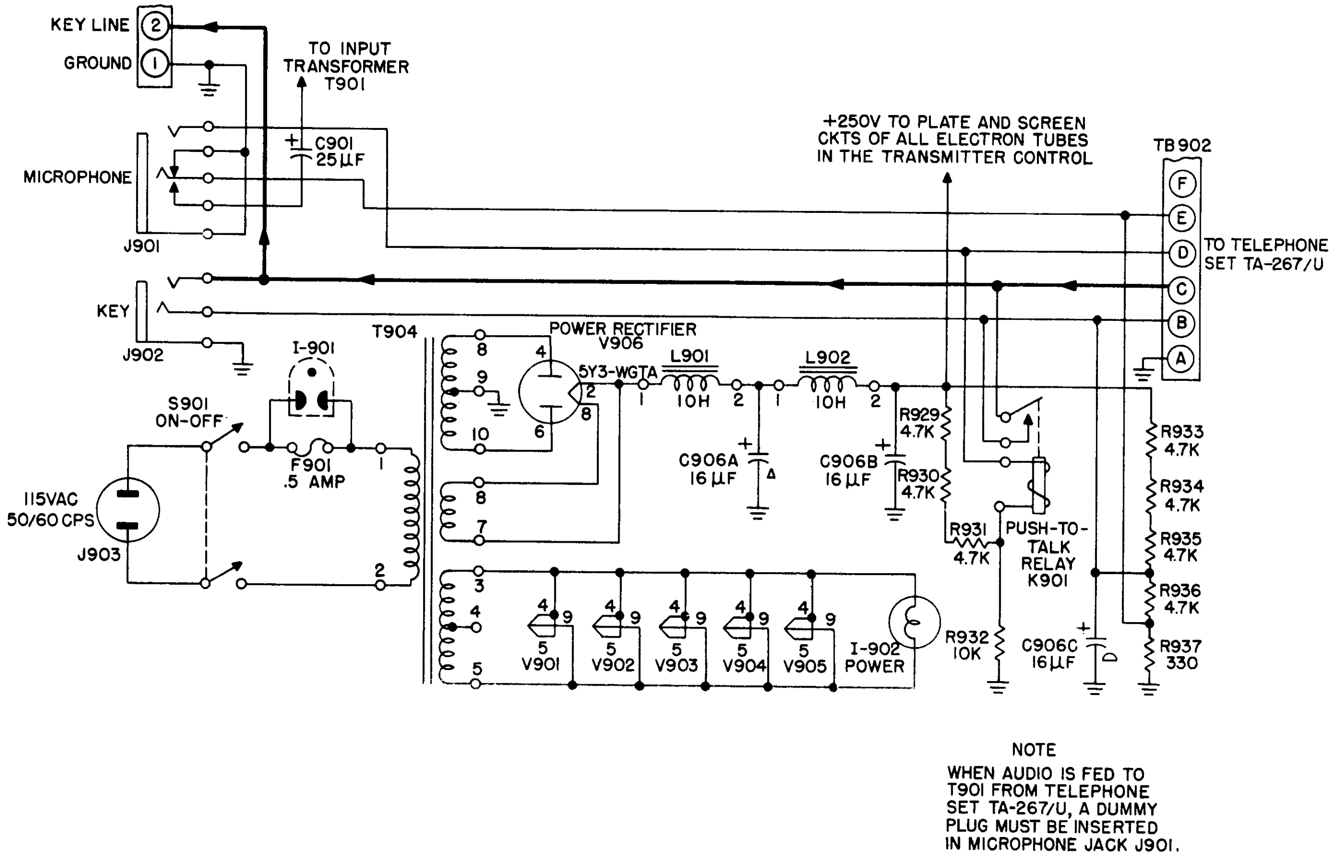


Figure 2-33. Transmitter Control Power Supply and Distribution Circuits, Simplified Schematic

resistors R929 through R937, is connected across the output of the power supply to provide the proper keying and microphone operating voltages. An indicator light (I-901), located on the top of the chassis, is connected in parallel with the primary circuit fuse, and will light whenever this fuse becomes blown.

(7) KEYING AND PUSH-TO-TALK CIRCUITS (*see figure 2-33*).—Voltages for keying and push-to-talk operations are furnished from taps on the bleeder system of the self-contained power supply. Closing the key delivers +50 volts, dc, to the keying line from a tap on the power-supply bleeder system. With the equipment set up for c-w operation, this keying voltage operates the keyer unit in the transmitter. The keying line also operates the push-to-talk circuits in the transmitter when the equipment is set up for phone operation. Closing the push-to-talk switch on the microphone operates relay K901 from voltage taps on the power-supply bleeder network. Contacts on relay K901 apply +50 volts, dc, to the keying line, which operates push-to-talk relay K603 in the modulator section of the transmitter.

(8) TELEPHONE-DIAL AND CHANNEL-INDICATOR CIRCUITS (*see figure 2-34*).—Telephone dial switch S903 is identical with dial switch S502 of Telephone Set TA-267/U. S903 is connected in parallel with S503 by means of terminal board TB902. These switches are similar to the conventional type used in ordinary commercial telephone dials, except that 11 dial positions instead of 10 are required to set up all the functions of the equipment. The dial circuit is normally open and is pulsed to ground, the number of pulses corresponding to the number dialed. Dialing A, for example, produces 11 pulses. Dialing a number from 1 to 10 sets up the Autotune system and consequently the transmitter circuits on the corresponding channel, and also turns on the filament and plate voltages if the transmitter was in standby operation as described in paragraph 2.*a.*(3)(*c*) of this section. The Autotune system operates switch S240A and positions its arm on one of the taps of the voltage divider consisting of R240 through R249, which is connected to the +300-volt output of the exciter voltage regulator through R161. These taps correspond to the 10 channel positions of the dial, so that a different voltage for each channel is applied to CHANNEL IND. meter M901, to make the meter indicate the number of the channel selected. This deflection voltage is transmitted through the line connected to the center tap on the primary winding of modulator input transformer T601 and the center tap

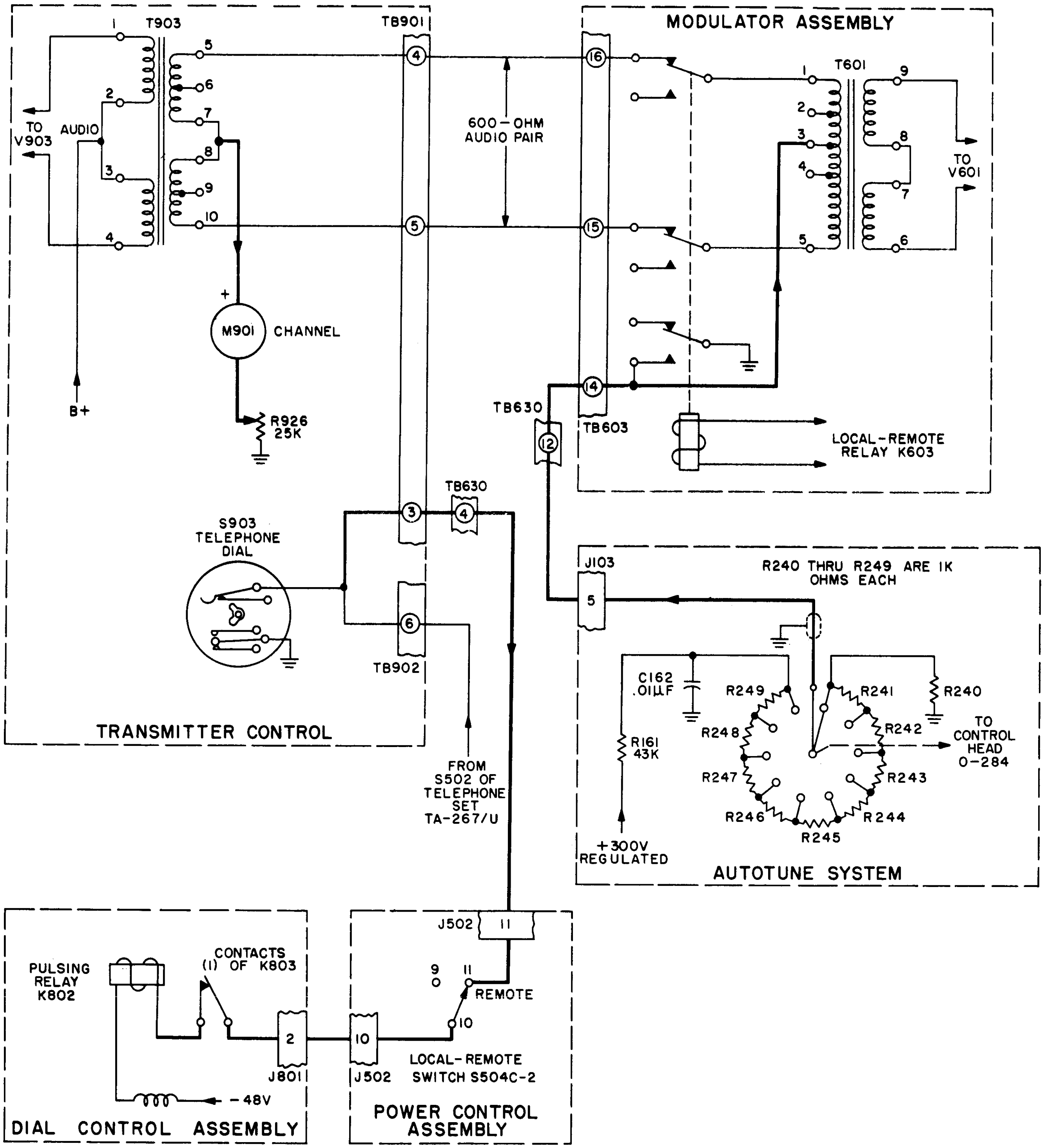


Figure 2-34. Telephone Dial and Channel Indicator Circuits, Simplified Schematic

on the secondary winding of output transformer T903.

Dialing A1, A3, or A4 selects c-w, phone, or FSK transmission, respectively, as described in paragraph 2.*a.*(3) (*c*) *2*. Note that the FSK function has been disabled, and that certain circuit modifications and additional equipment are required to make this function available. Dialing A9 turns off the high voltage, and dialing A0 shuts down the entire transmitter except for the Dial Control Assembly and the Service Power Supply that feeds primary power to Power Supply PP-454/FRT-5.

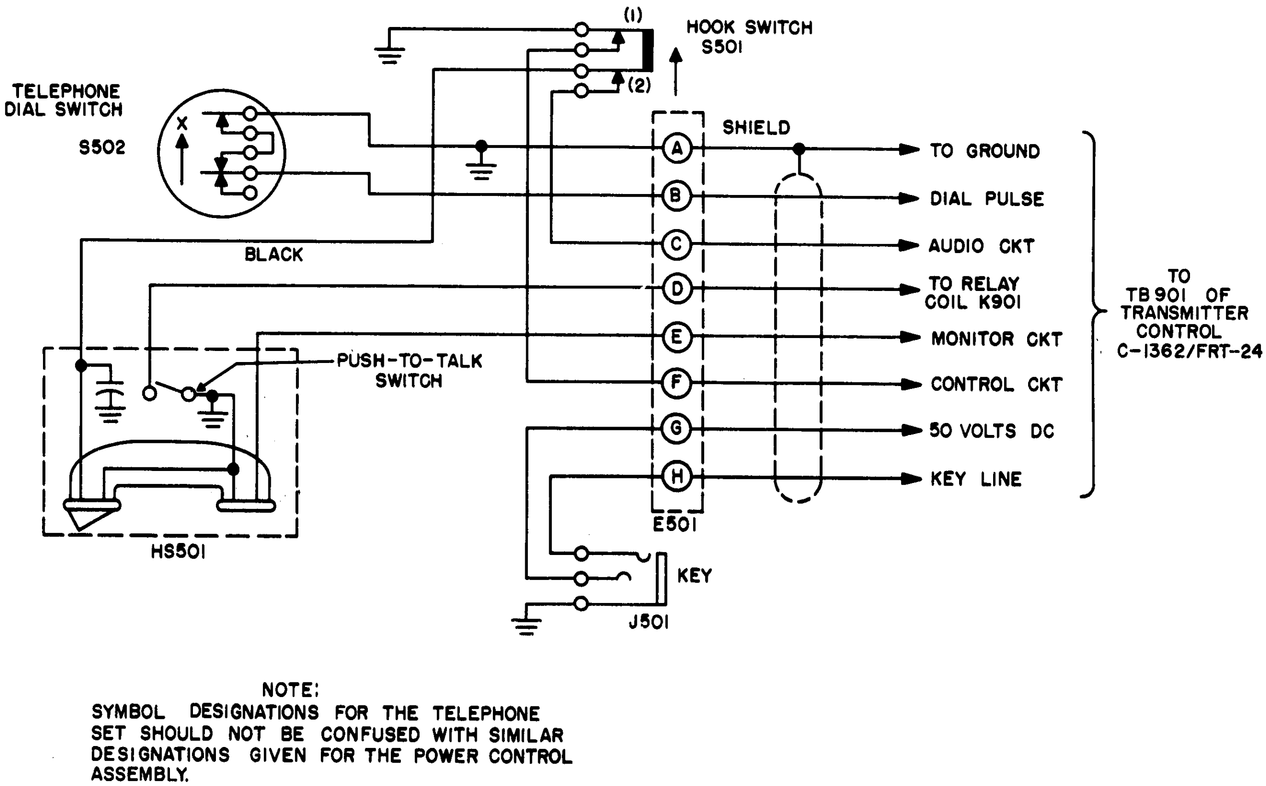


Figure 2-35. Telephone Set TA-267/U, Simplified Schematic

d. TELEPHONE SET TA-267/U (*see figure 2-35*).—Except for certain modifications, the Telephone Set (shown in figure 1-17) is similar in function to any ordinary commercial telephone. (Symbol designations for the Telephone Set should not be confused with similar designations given for the Power Control Assembly.) The base of the unit contains dial switch S502, which is connected in parallel with S903 and TB902 of Transmitter Control C-1362/FRT-24 by means of terminal board E501 and a seven-conductor shielded cable so that the function of this switch in channel, emission, and power selection is identical with that of the dial switch of the latter unit. The base also contains a KEY receptacle (J501) to provide a means of introducing a telegraph key, if the operator wishes to employ the transmitter for c-w operation. When handset HS501 is picked up from the base, microphone voltage is applied to the carbon-button type mouthpiece through closed contacts (2) of hook or enabling switch S501 (provided that an open-circuit or dummy plug has been inserted in MICROPHONE jack J901 so as to apply 4.5 volts, dc, to terminal E501, and to complete the input circuit through capacitor C901 to input transformer T901, as shown in figure 2-31). The capacitor across the microphone prevents carbon-granule packing due to loud noises or physical impact. The push-to-talk switch of HS501, when actuated, will energize relay K901 in the Transmitter Control and relay K603 in the Modulator Assembly so that the transmitter will provide phone operation, as explained in paragraph 2.*a.*(2) of this section. The permanent-magnet type earpiece of HS501 can be wired to the output circuit of a communications receiver for reception of signals from another transmitting location, or it may be used in any other way to meet the particular requirements of an individual installation. Contacts (1) of S501 can also be used for operating an external control circuit to meet the individual requirements of an installation. These contacts apply a ground whenever switch S501 is actuated by picking up HS501.

e. R-F OSCILLATOR O-243/FRT-24. — R-F Oscillator O-243/FRT-24, shown in figure 1-13, provides an extremely stable and accurate input signal within the frequency range of 2 to 4.2 mc. The over-all schematic diagram of the R-F Oscillator, as shown in figure 7-65, contains a master oscillator (V3131) feeding a multiplier (V3111) that acts as a doubler or tripler; the final amplifier (V3113) applies the signal at sufficient power level to drive the radio transmitter. These three stages are the basic components of the unit; the remainder of the circuits with the exception of the 450-kc mixer-amplifier (V3104) comprise the frequency control circuits, which serve to drive an a-f-c motor, B3101 (part of a servo system) whenever the frequency of master oscillator V3131 deviates in either direction. V3104 and V3102B provide a 450-kc output and a 100-kc output respectively to coaxial connectors J3104 and J3106 (located on the rear of the chassis), for use with any external equipment requiring frequency sources of this type. Whenever the tenth channel is selected, locally at the transmitter by CHANNEL SELECTOR switch S243 or remotely by a telephone dial of the remote station, a signal that has been previously set up in the R-F Oscillator is applied through the Patch Panel Assembly to the 52 OHM R-F INPUT receptacle (J101) of Radio Transmitter T-440/FRT-24. On this channel, crystal oscillator V101 of the transmitter will not be self-excited but will operate as an untuned r-f amplifier, as explained in paragraph 2.*a.*(1) (*a*) of this section.

(1) MASTER OSCILLATOR (*see figure 2-36*).—The oscillator assembly is a precision device which supplies an output signal of very stable frequency under conditions of extreme temperature and humidity changes. The circuit used is an electron-coupled type employing a 6SJ7 tube (V3131), and covering a frequency range of 1000 to 1500 kc. The output frequency of the oscillator is determined by the position of the tuning slug within grid inductor L3103, and the capacitance setting of C3170, which is across the grid inductor. The tuning-slug position is determined by the setting of MASTER OSCILLATOR dial A-1. The setting of C3170 is determined by the frequency control circuit, which operates the a-f-c motor that is mechanically linked to capacitor C3170.

(2) FIRST MULTIPLIER V3111 (*see figure 2-37*).—The first multiplier stage (V3111) employs a JAN 5654/6AK5W miniature pentode using cathode bias, and operating as either a frequency doubler or frequency tripler. The plate circuit of V3111 consists of a tuned circuit which is composed of slug-tuned inductor L3109, trimmer capacitor C3144, and one section of variable ganged capacitor C3120D. Capacitor C3166 is employed to block d-c plate voltage from the tuning gang, but its value is made sufficiently large so that tuning is not affected. The plate tank circuit may be tuned to twice the input frequency to produce an output frequency of 2 to 3 mc, or it may be tuned to three times the input frequency to produce an output frequency of 3 to 4.2 mc. Tuning is accomplished by OUTPUT TUNING dial C-1 (C3120D). The output of V3111 is capacitively coupled through C3171 to the second multiplier grid, and through C3167 to the final-amplifier grid.

(3) FINAL AMPLIFIER (*see figure 2-37*).—The final-amplifier stage (V3113) utilizes a

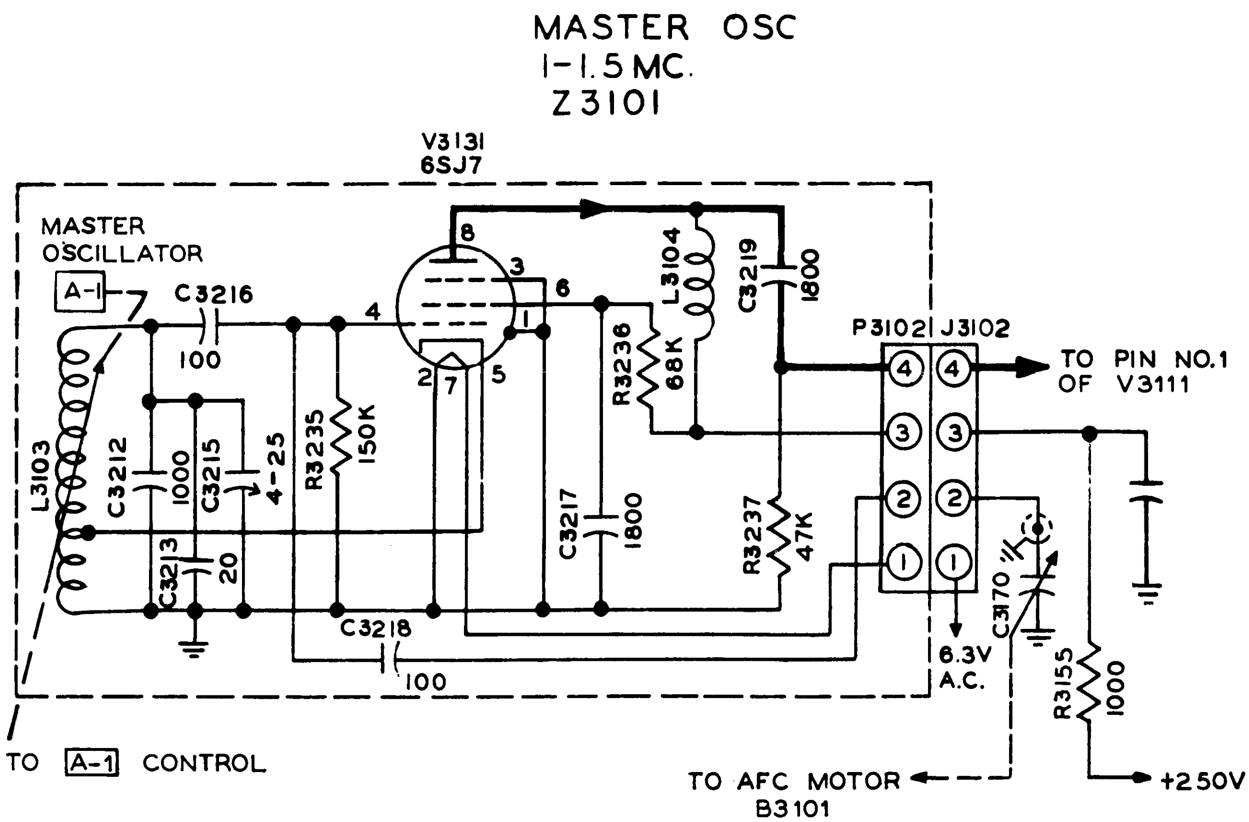


Figure 2-36. Master Oscillat r, Simplified Schematic

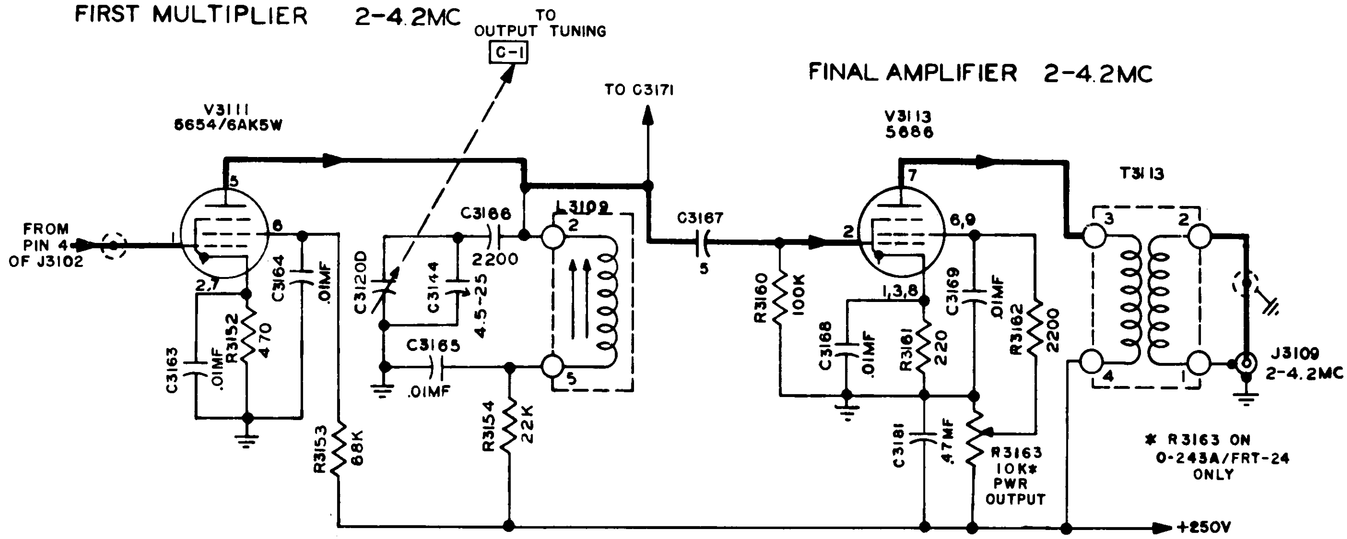


Figure 2-37. First Multiplier and Final Amplifier, Simplified Schematic

JAN 5686 pentode and operates as a straight Class-A amplifier using cathode bias. Input voltage is fed from the plate circuit of V3111 through capacitor C3167 to the control grid of V3113. The plate circuit of V3113 contains an untuned transformer, T3113, the output winding of which is coupled to the transmitter through a coaxial cable. O-243A/FRT-24 has PWR output potentiometer R3163 in the final amplifier V3113 screen grid circuit which is set for maximum output voltage for use in Radio Transmitting Set AN/FRT-24. In O-243/FRT-24 the screen dropping resistor R3162 connects directly to the +250 v supply.

Note

THE FREQUENCY CONTROL CIRCUITS CONSIST OF A 100-KC CRYSTAL OSCILLATOR, 100-KC AMPLIFIER, 100-KC DIVIDER, HARMONIC AMPLIFIERS, FIRST INTERMEDIATE-FREQUENCY AMPLIFIER (875—900 KC), SECOND INTERMEDIATE-FREQUENCY AMPLIFIER (800 KC), INTERPOLATION OSCILLATOR, BUFFER, INTERPOLATION DIVIDERS, REGENERATIVE DIVIDERS, DIODE MIXERS, D-C AMPLIFIERS, AND POWER AMPLIFIERS.

(4) 100-KC CRYSTAL OSCILLATOR (*see figure 2-38*).—The 100-kc crystal oscillator employs a JAN 5654/6AK5W miniature pentode (V3101), in an electron-coupled, Pierce-type of oscillator circuit. In this circuit, the screen grid of V3101 is used for the oscillator plate. Feedback takes place through a division of voltage between the screen-to-cathode capacitance and the grid-to-cathode capacitance of the tube, and the crystal acts as a resonant circuit. By means of the small variable capacitor, C3101, the circuit may be adjusted to oscillate at precisely 100 kc. The output is taken from the plate circuit of V3101 through capacitor C3104. The 100-kc crystal. Y3101, is contained in a temperature-controlled oven. When 115 volts, ac, is applied to the crystal oven, pilot light I-3101, designated as "CRYSTAL OVEN—HEAT ON", lights, indicating that the heater resistors are energized to raise the temperature of the oven. The temperature is thermostatically controlled between 59°C to 61°C (138.2°F to 141.8°F). When the temperature within the oven becomes stabilized, the heating cycle should be "heat on" for about 4 to 5 minutes and "heat off" for about 8 to 10 minutes with the room temperature constant. The required stability is reached within one hour after a-c power is applied. Capacitor C3114 is connected across the thermostat contacts to prevent arcing.

(5) 100-KC AMPLIFIER (*see figure 2-38*). — The 100-kc amplifier (V3102) uses a JAN 5814 miniature dual-triode tube. The input signal is taken from the plate circuit of the crystal oscillator and is applied through C3104 to the grid of section A of V3102, which is connected as a cathode follower. The output of the cathode follower is brought out to a coaxial connector on the rear of the chassis (J3105), so that a signal can be supplied to any external equipment that requires a 100-kc source. Section B of V3102 is operated as a Class-A amplifier with cathode bias, and its grid circuit is connected to a coaxial connector, (J3106), also located on the rear of the chassis. If an external 100-kc standard is used, its output may be fed into J3106. If use of the self-contained 100-kc standard is desired, a coaxial jumper is used to connect J3105 to J3106. The output from V3102B is fed through C3112 to the 450-kc amplifier stage, and through C3109 to the crystal-divider circuit.

(6) 100-KC DIVIDER (*see figure 2-38*).—the resistors cause the grid of tube B to be driven iature dual-triode tube, (V3103) in a synchronized, plate-coupled multivibrator circuit. The purpose of the circuit is to divide the input frequency (100 kc) by 4, in order to supply an output frequency of 25 kc. To understand the operation more thoroughly, consider V3103 as a free-running 25-kc multivibrator. When power is first applied, the full B-plus voltage will be applied to both plates of V3103, and capacitors C3110 and C3111 are charged almost to the B-plus value. As the tube begins to conduct, there will be a slight unbalance of plate currents between both sections of the tube, and one side will conduct slightly more than the other. For purposes of explanation, assume that tube A (V3103A) begins conducting more rapidly than tube B (V3103B). For this condition, the plate voltage of tube A will decrease more rapidly than the plate voltage of tube B, and capacitor C3111 will begin to discharge. The discharge path for C3111 is through R3115, R3113, and R3111, through the power supply, and back to the other side of the capacitor via R3116. The polarities of the resulting voltage drops across the resistors cause the grid of tube B to be driven in a negative direction toward cutoff. This causes the plate voltage on tube B to increase, as the plate current tapers off. As the charge on C3110 tends to follow this increase, a corresponding increase of voltage, in the positive direction, is transferred to the grid of tube A, causing its plate voltage to continue decreasing. The action is cumulative, and as a result, the grid of tube B is driven beyond cutoff for a period until the discharge of C3111 is nearly completed. During the time that tube B is cut off, tube A conducts strongly. The amount of time required for C3111 to discharge is determined by the time constant of the grid-circuit network associated with tube B.

When capacitor C3111 has discharged sufficiently, tube B comes out of cutoff and starts to conduct. Simultaneously, the plate voltage on tube B starts to decrease, causing capacitor C3110 to begin discharging. As a result, the whole cycle of events reverses, and tube A is then cut off while tube B is left conducting strongly. This condition marks the completion of one cycle of operation, after which the sequence of events is repeated indefinitely.

In order that this type of frequency divider may be synchronized, its free-running frequency is made slightly less than a submultiple of the synchronizing frequency (in this case, slightly lower than 25 kc). The 100-kc synchronizing signal is applied through capacitor C3109 and appears across the common grid resistor, R3111. Every other positive half-cycle of this signal causes each grid of the divider to be brought out of cutoff alternately, an instant sooner than it would be if the circuit were free running. To see this action more clearly, refer to figure 2-39. At the top of the figure is shown the 100-kc synchronizing waveform; directly beneath it is the waveform that would appear at the grid of tube A if the divider were free running. The third waveform from the top illustrates the combination of the two, the solid line representing the waveform at the grid of tube A when synchronized (locked in). The remaining two waveforms at the bottom illustrate the grid voltage of tube B for both free-running and synchronized conditions. It will be observed that tube A is brought out of cutoff, by the 100-kc voltage, at instants T_2 and T_4, while tube B is brought out of cutoff at instants T_1 and T_3. In this

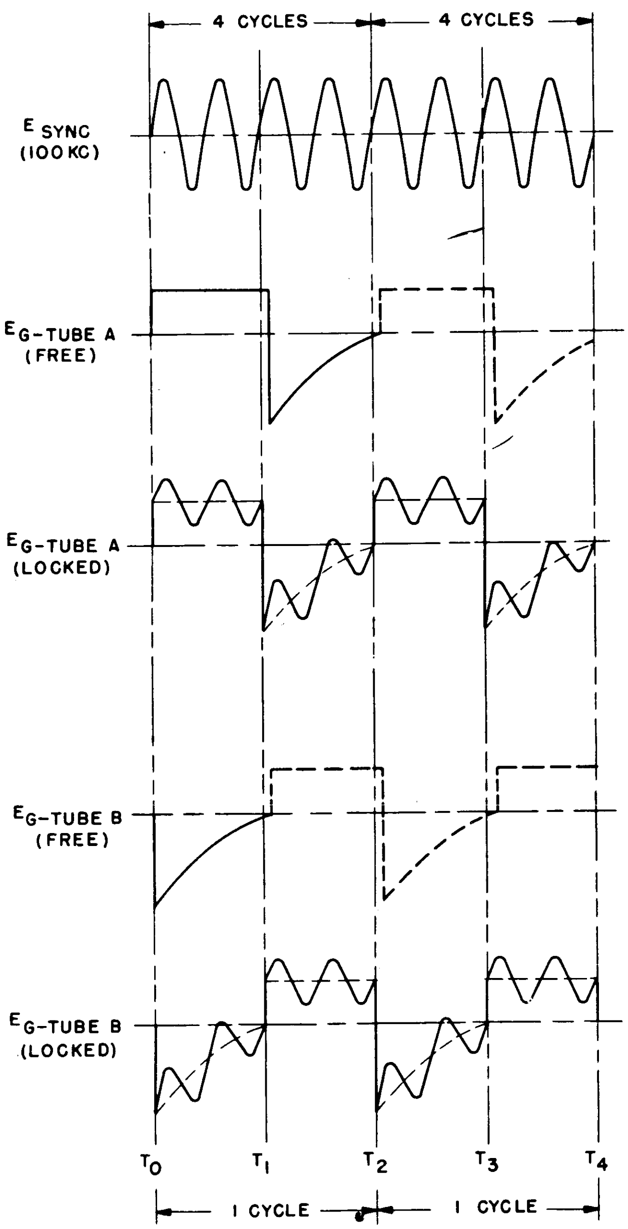


Figure 2-39. 100-KC Fr qu ncy Divid r Wav forms

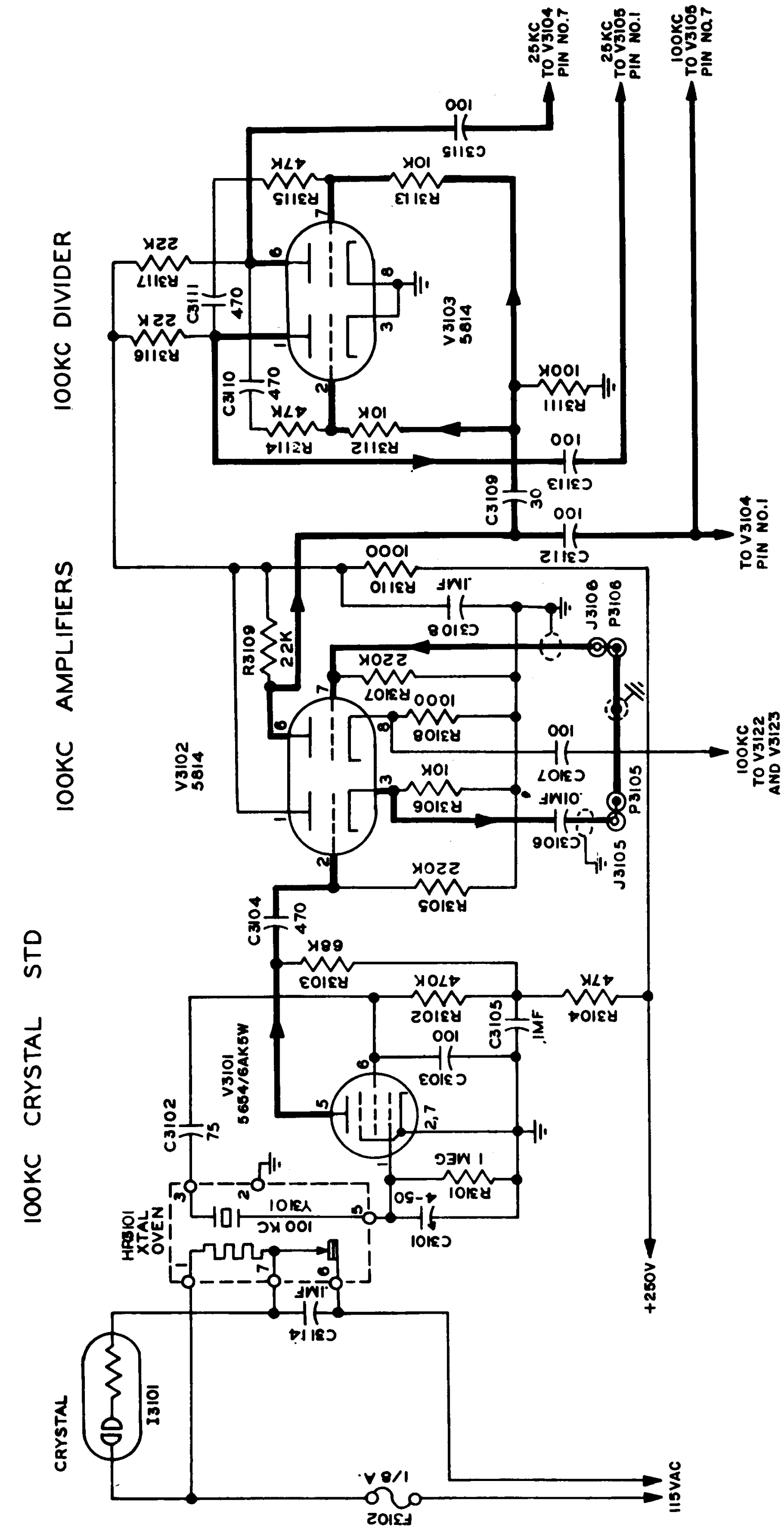


Figure 2-38. 100-KC Crystal Oscillat r, Amplifiers and Divider, Simplifi d Sch matic

manner the divider is synchronized twice per cycle of output by every other cycle of input, giving a frequency division of 4 to 1.

(7) HARMONIC AMPLIFIERS (*see figure 2-40*).

(*a*) HARMONIC MIXER V3105. — The harmonic mixer employs a JAN 5750/6BE6W miniature pentagrid converter tube (V3105). This stage combines a 25-kc signal taken from the crystal divider with a 100-kc signal taken from the 100-kc amplifier. The 25-kc signal is fed to grid number 1 of V3105 through capacitor C3113, and the 100-kc signal is fed to grid number 3 of V3105 through capacitor C3112. The two signals are mixed to produce a multitude of frequencies spaced 25 kc apart, starting with 25 kc and extending upward in frequency. The plate circuit of V3105 contains a parallel-resonant combination composed of slug-tuned inductor L3107, capacitor C3120B (part of the main tuning gang), and trimmer capacitor C3141. The circuit is tuned through the range of 9.125—20.125 mc by means of C3120B, which is controlled by OUTPUT TUNING dial C-1. Capacitor C3123 is inserted in the plate tank circuit to allow the rotor of C3120B to be grounded; in addition, it serves, in conjunction with R3126, to decouple the stage. The capacitance of C3123 is sufficiently large so that its effect on the tuned circuit is negligible. The signal appearing in the plate circuit of V3105 is applied to the grid of harmonic amplifier V3106 through capacitor C3124.

(*b*) HARMONIC AMPLIFIER V3106. — The harmonic amplifier employs a JAN 5749/6BA6W miniature pentode (V3106), operated as a Class-A amplifier with cathode bias. The parallel resonant combination used in the plate circuit of this stage is identical to that used in the preceding stage; it is tuned through the range of 9.125—20.125 mc by C3120A, which is controlled by OUTPUT TUNING dial C-1.

Note

THE OUTPUT SIGNAL FROM SECOND-HARMONIC AMPLIFIER V3106 IS FED TO THE INPUT OF THE FIRST I-F STRIP. SINCE THE FIRST STAGE OF THIS STRIP IS OPERATED AS A MIXER, ANOTHER SIGNAL, TAKEN FROM SECOND MULTIPLIER V3112, IS REQUIRED FOR ITS OPERATION.

(8) SECOND MULTIPLIER V3112 (*see figure 2-40*).—Multiplier stage V3112 employs a JAN 5654/6AK5W miniature pentode operating as a Class-C stage to multiply the input frequency five times. Bias for Class-C operation is obtained by a combination of cathode and grid-leak bias. Cathode bias is developed across R3157 and C3172, while grid-leak bias is developed across R3156 and C3239. The plate tank circuit is composed of slug-tuned inductor L3110, one section of main tuning gang C3120C, and trimmer capacitor C3145, and is tuned to the fifth harmonic (10—21 mc) of the input frequency. The setting of variable capacitor C3120C is controlled by OUTPUT TUNING dial C-1. The output is taken from the plate circuit and fed to the input of the first i-f strip.

(9) FIRST IF. (875—900 KC) (*see figure 2-40*).

(*a*) MIXER V3107. — The mixer stage (V3107) makes use of a JAN 5750/6BE6W miniature pentagrid converter tube, which is operated with agc and cathode bias. The signal from the harmonic amplifiers, which is somewhere in the range 9.125—20.125 mc depending upon the tuning, is applied to grid number 3 of mixer V3107, through capacitor C3129; grid number 3 is returned through resistor R3132 to the a-g-c system. The signal from the second multiplier, which is somewhere in the range 10—21 mc depending upon the tuning, is applied to grid number 1 of mixer V3107, through capacitor C3176. The two signals are mixed and would normally produce, in the output, several frequencies spaced 25 kc apart; however, the response in the plate circuit of the mixer is limited to a pass band of 875—900 kc by means of a double-tuned i-f transformer, T3106. Therefore, only one of these frequencies will predominate in the plate circuit of the mixer (the frequency that falls within the 875—900-kc pass band).

(*b*) I-F AMPLIFIER.—The first i-f amplifier (V3108) utilizes a JAN 5749/6BA6W miniature pentode. The input signal for this stage is supplied by the secondary winding of i-f transformer T3106. Negative grid bias taken from the a-g-c system through R3136, is also supplied through the secondary winding of T3106. The plate circuit of V3108 contains a double-tuned i-f transformer, T3107, which is identical to that used in the plate circuit of the preceding mixer stage.

Note

THE OUTPUT SIGNAL FROM THE FIRST I-F STRIP IS FED, BY MEANS OF THE SECONDARY WINDING OF T3107, TO THE INPUT OF THE SECOND I-F STRIP. SINCE THE FIRST STAGE OF THIS STRIP IS OPERATED AS A MIXER, ANOTHER SIGNAL, TAKEN FROM THE INTERPOLATION CIRCUITS, IS REQUIRED FOR ITS OPERATION.

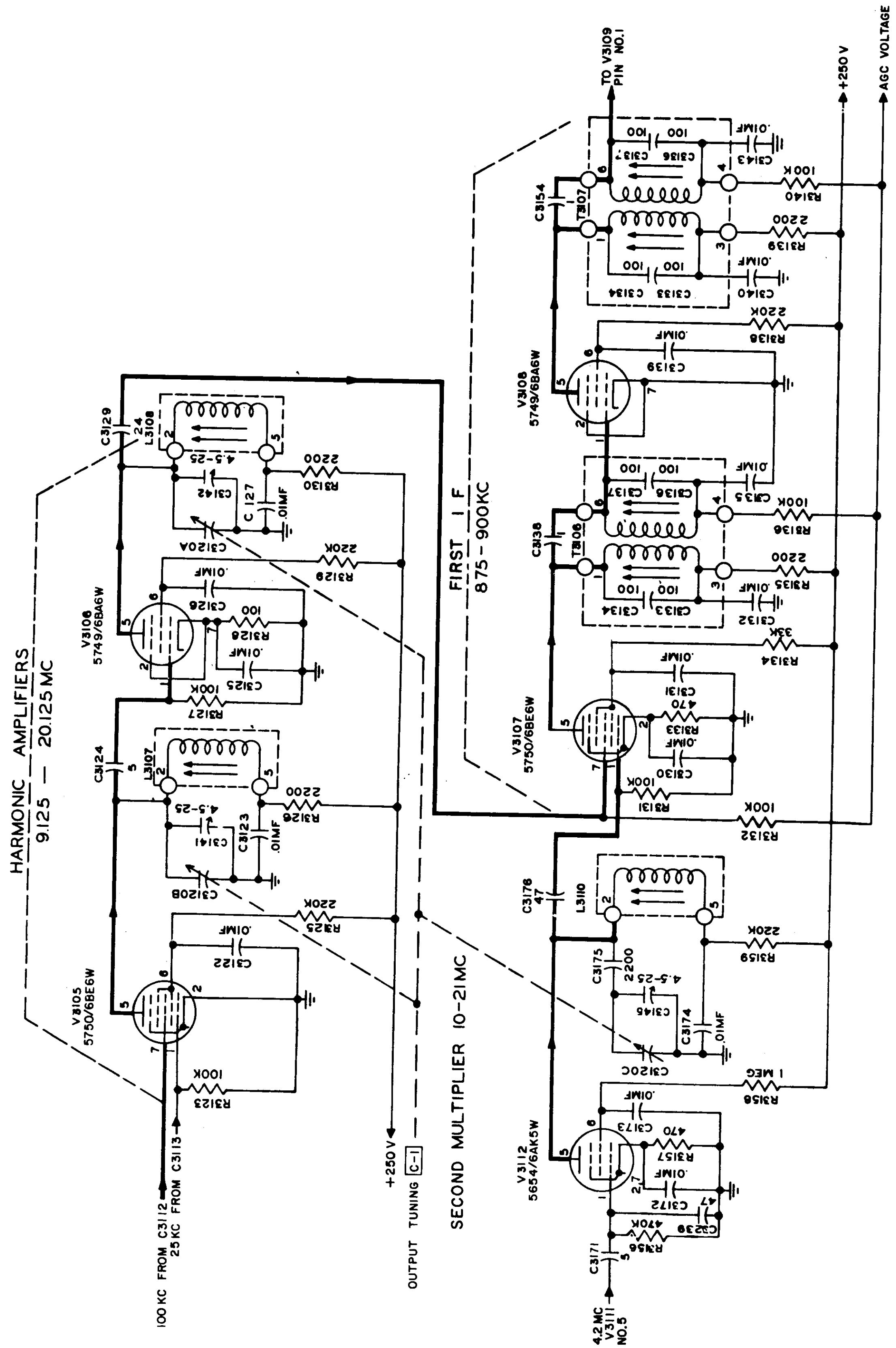


Figure 2-40. First I-F Strip, Simplified Schematic

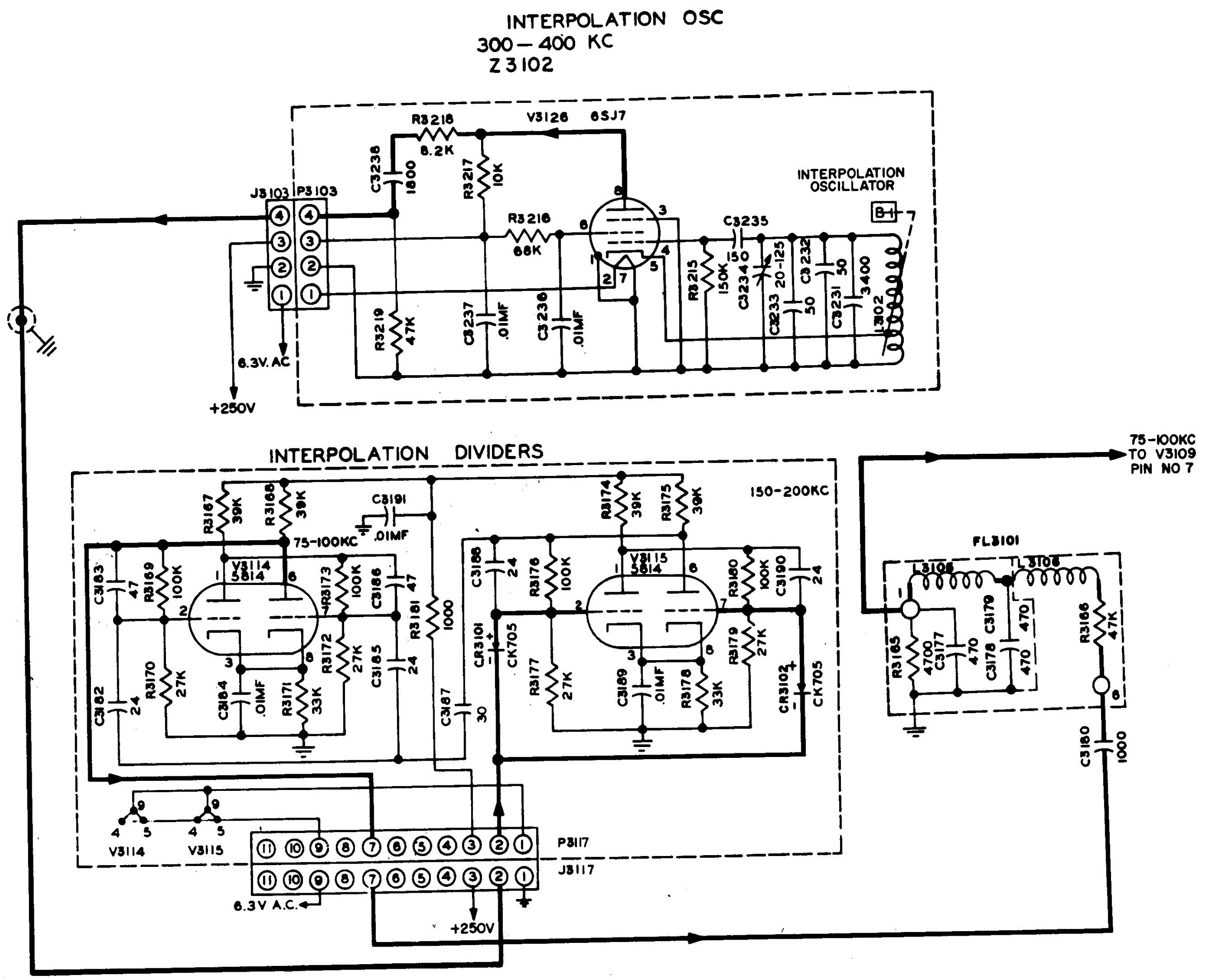


Figure 2-41. Interpolation Oscillator and Dividers, Simplified Schematic

(10) INTERPOLATION CIRCUITS (*see figure 2-41*).

(*a*) INTERPOLATION OSCILLATOR.—The interpolation-oscillator assembly is a precision device which supplies an output signal with a very stable frequency under conditions of extreme temperature and humidity changes. The circuit used is an electron-coupled type employing a 6SJ7 tube (V3126) and covering a frequency range of 300—400 kc. The output frequency of the oscillator is determined by the position of the tuning slug within grid inductor L3102, which in turn is determined by the setting of INTERPOLATION OSCILLATOR dial B-1.

(*b*) INTERPOLATION DIVIDERS (*see figure 2-41*).—The interpolation dividers (V3114 and V3115) each make use of a JAN 5814 miniature dual-triode tube in a triggered flip-flop multivibrator circuit. This type of circuit exhibits two stable states in which either section of the tube is left conducting while the other section is cut off, reversing only when a trigger is applied. Each divider stage functions to divide its input frequency by 2, giving a total frequency division through the interpolation divider circuits of 4 to 1 (dividing 300—400 kc down to 75—100 kc). To understand the operation more thoroughly, consider only the second-divider stage, V3114. When no excitation voltage is applied to the grids of this stage, one section of the tube (to be called A) conducts heavily and at the same time the other section of the tube (to be called B) is cut off. When a negative-going pulse is applied to the grids through capacitors C3182 and C3185, there will be no immediate effect on section B of the tube, but section A will be cut off. As a consequence, the plate voltage on section A will increase, and this increase will be transferred to the grid of the other section, through R3173 and

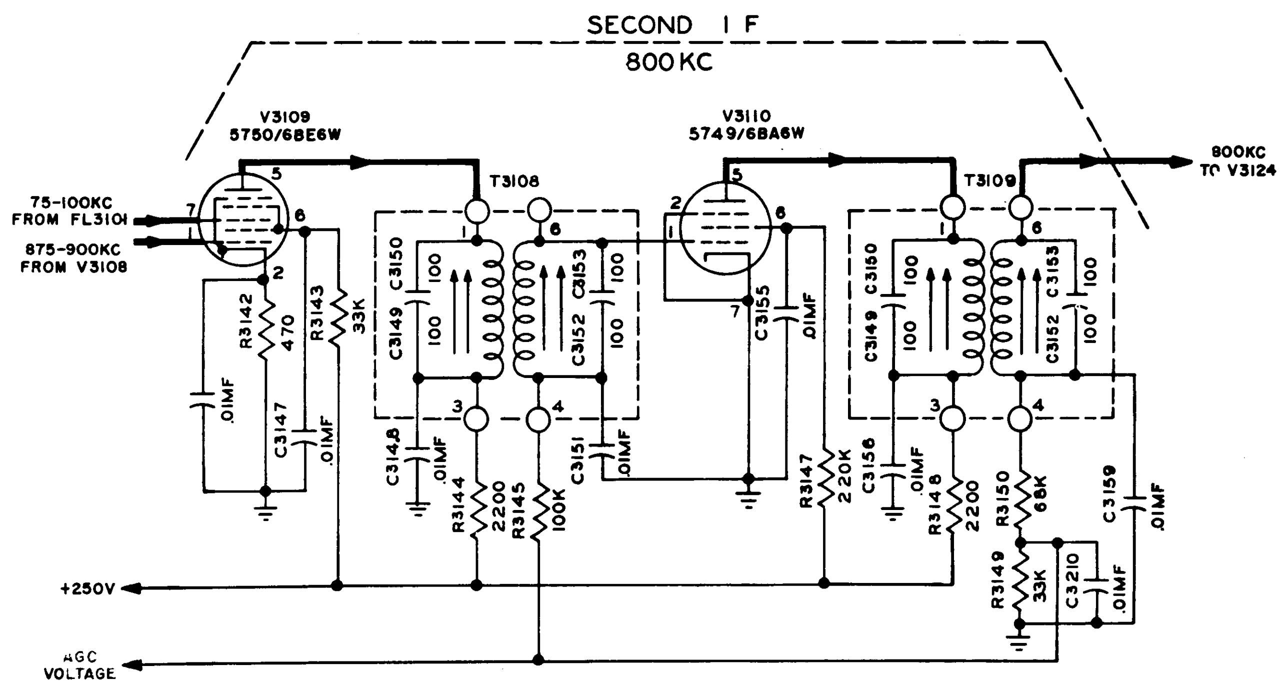
C3186, causing section B to be brought out of cutoff. Thus one-half cycle of output from the divider is produced, and nothing further happens until the next negative-going pulse is applied to the grids. When this occurs, section B of the tube is cut off by the trigger; the resulting sharp increase in plate voltage is transferred to the grid of section A through R3169 and C3183, bringing section A out of cutoff and completing one cycle of output from the divider.

Actually, the second divider is triggered by the negative half-cycle of the square-wave output from the first divider; the high negative bias used in the second divider makes the positive half-cycles of the triggering voltage ineffective.

The first-divider stage (V3115) operates in a similar manner to the second stage just described, the principal difference being that the triggering voltage is introduced into the circuit through a pair of crystal rectifiers, CR3101 and CR3102. The reason for this difference in design is twofold, both tending to make the divider operation more stable. First, it tends to make the triggering action more positive—a very desirable feature when the circuit is triggered from a sine-wave source; second, it reduces the loading effects of the interpolation oscillator upon the divider. It can be seen from the circuit arrangement that crystal rectifier CR3101 and CR3102 can conduct only on the negative portions of the triggering signal. (The grids of V3115, and therefore the anodes of CR3101 and CR3102, are prevented, by the flow of grid current, from going more than slightly positive at any time.) The triggering action in the first divider therefore is as follows: Assume that, initially, section A of V3115 is conducting and section B is cut off. The next negative half-cycle of the sine-wave triggering voltage will have no effect on section B because the anode of CR3102 is biased negatively. However, since the anode of CR3101 is positive with respect to the negative half-cycle of trigger voltage, CR3101 will conduct and cause section A of V3115 to be cut off, and this action in turn will cause section B to begin its period of conduction. On the next negative half-cycle of trigger voltage, CR3102 will conduct and cut off section B, which in turn will cause section A to begin its period of conduction. Thus, one cycle of output from the first divider is produced by two cycles of the triggering voltage.

(11) SECOND IF. (800 kc) (*see figure 2-42*).

(*a*) MIXER V-3109.—The mixer stage, V3109, makes use of a JAN 5750/6BE6W miniature pentagrid converter tube, which is operated with a-g-c and cathode bias. The signal from the first i-f strip, which is somewhere in the range 876—900 kc depending upon the tuning, is applied to grid number 1 of mixer V3109; the grid is returned through resistor R3140 to the a-g-c system. The signal from the interpolation divider, which is somewhere in the range 75—100 kc depending upon the tuning of the interpolation oscillator, is applied to grid number 3 of the mixer through a



Figur 2-42. Sec nd I-F Strip, Simplified Schematic

low-pass filter network (FL3101). This filter circuit passes all frequencies from zero up to 100 kc, and attenuates all frequencies above 100 kc (the upper harmonics of the 75—100-kc output signal from the interpolation divider). The two signals are mixed, and only the intermediate frequency is accepted by the plate circuit of V3109, which is tuned by means of double-tuned i-f transformer T3108. This transformer is tuned to pass only a narrow band of frequencies centered about 800 kc, and couples the output of the mixer to the input of the second i-f amplifier.

(*b*) I-F AMPLIFIER.—The second i-f amplifier (V3110) utilizes a JAN 5749/6BA6W miniature pentode. The input signal for this stage is supplied by the secondary winding of i-f transformer T3108. Negative grid bias, taken from the a-g-c system through R3145, is also supplied through the secondary winding of T3108. The plate circuit of V3110 contains a double-tuned i-f transformer (T3109), which is identical to that used in the plate circuit of the mixer stage.

(12) REGENERATIVE DIVIDERS AND AGC (*see figure 2-43*).—JAN 5750/6BE6W miniature pentagrid converter tube (V3124) is used in conjunction with a JAN 5749/6BA6W miniature pentode (V3125) in a regenerative divider circuit wherein the 800-kc output signal from the second i-f strip is effectively divided by 8. Essentially the circuit is composed of a mixer stage (V3124) and a frequency-multiplier stage (V3125). Both employ cathode bias and are coupled together in a manner that allows regeneration to take place over a small band of frequencies determined by resonance characteristics of the two tuned circuits contained in Z3104. Both tuned circuits, while located in a common container, are isolated from each other by means of shielding. The tuned circuit composed of L3113, C3227, and C3228 is resonant at 700 kc, while the tuned circuit composed of the primary winding of T3105 and capacitors C3225 and C3226 is resonant at 100 kc. When power is first applied, transient oscillations will be set up by shock excitation of the two resonant circuits. A portion of the 700-kc signal developed in the plate tank of frequency-multiplier stage V3125 is applied through capacitor C3221 to grid number 3 of mixer stage V3124. At the same time the 800-kc i-f signal from the secondary winding of the last second i-f transformer (T3109) is applied through resistor R3204 to grid number 1 of the mixer. The two signals are mixed, and the difference frequency (100 kc) is developed across tuned transformer T3105 in the plate circuit of the mixer stage. A portion of this 100-kc signal is fed to the grid of the frequency-multiplier stage through capacitor C3220, and is multiplied by 7 (producing 700 kc) in the plate tank circuit of that stage. As a point of general interest, the circuit is self-starting, that is, after regeneration has started in the above man-

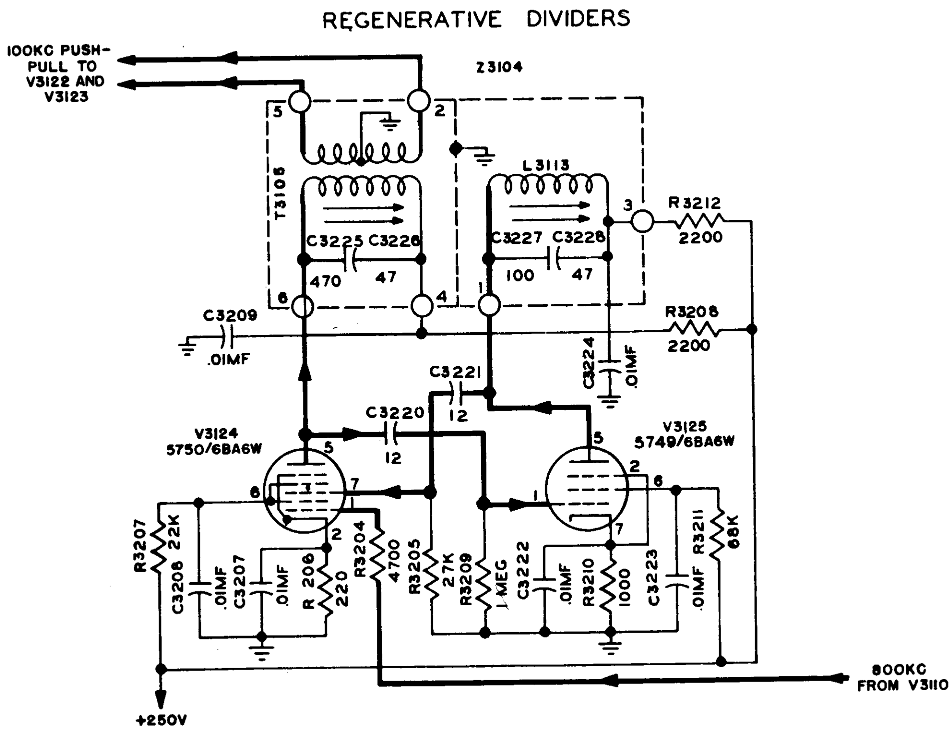


Figure 2-43. Regenerative Dividers, Simplified Schematic

ner, the process is continuous as long as the 800-kc signal is present at the input of the divider; if the 800-kc signal fails, regeneration can no longer be sustained, and the circuit ceases to operate and will not resume operation until the 800-kc signal is restored. A 100-kc push-pull output, balanced to ground, is taken from the divider by means of the secondary winding of transformer T3105.

A-G-C voltage is developed at grid number 1 of mixer stage V3124. The extreme positive excursions of the input signal (800 kc) to this grid overcome the cathode bias on V3124 and cause grid current to flow during these intervals. The grid-current flow through R3204, the secondary winding of i-f transformer T3109, R3150, and R3149 to ground, develops a voltage across a-g-c filter capacitors C3159 and C3210 which is negative with respect to ground. The negative voltage appearing across capacitor C3210 is used as bias for all stages in both the first i-f and second i-f strips, and is directly proportional to the amplitude of the 800-kc signal at grid number 1 of mixer V3124. Since an increase in signal amplitude at this point will cause increased negative bias on the i-f stages, the gain of these stages will be reduced, and the amplitude of the 800-kc input signal to the regenerative divider will be held essentially constant at all times.

(13) A-F-C MOTOR CONTROL CIRCUIT (*see figure 2-44*).—The a-f-c motor control circuit is made up of two identical channels, one of which is operated 90 electrical degrees out of phase with the other, and each containing a balanced diode mixer, a push-pull d-c amplifier, and a push-pull power amplifier. For greater clarity in the following discussion, one complete channel will be described, followed by a description of the method of obtaining quadrature operation in the other channel.

(*a*) DIODE MIXER. — The diode mixer stage (V3123), employing a JAN 5726/6AL5W miniature duo-diode tube, combines the output signal from the regenerative divider (100 kc ± error frequency) with a signal derived from the 100-kc standard, to produce an output signal whose frequency is the difference between the two combined signals. The circuit operation is as follows: The balanced output of the regenerative-divider circuit, taken from the secondary winding of transformer T3105, is fed push-pull through capacitors C3205 and C3206 to the cathodes of diode mixer V3123. The 100-kc standard signal, taken from the cathode circuit of the 100-kc amplifier (V3102B) through capacitor C3107, is applied to both plates of the diode mixer, and also appears across the parallel combination of L3111 and C3198, which is common to both diode sections and tuned somewhat below 100 kc. Mixing of the two applied signals takes place, and the mixer products appear across load resistors R3202 and R3203. The junction of the two load resistors and the resonant circuit is effectively held at a-c ground potential by means of bypass capacitor C3197, allowing a balanced push-pull output to be taken from the cathodes of mixer V3123. All mixer products except the audio difference frequency, are attenuated by the low-pass balanced filter network consisting of R3198, C3194, R3199, and C3195. This filter network terminates at the grids of d-c amplifier V3121.

(*b*) D-C AMPLIFIER.—A JAN 5814 miniature dual-triode tube (V3121) is connected as a balanced, push-pull, direct-coupled voltage amplifier. Cathode bias is employed, and the stage functions to amplify the filtered push-pull output from diode mixer V3123. One plate of this amplifier is connected directly to the grid of power amplifier V3119; the other plate is connected to the grid of power amplifier V3118 (connected in push-pull with V3119) through SET UP-OPERATE switch S3103, when the switch is in the OPERATE position. When the switch is in the SET UP position, the signal path from one plate of d-c amplifier V3121 is broken. PHONE jack J3110 is connected through capacitor C3200 to the d-c amplifier plate side of switch S3103. This jack is mounted on the front panel so that the audio difference frequency may be monitored.

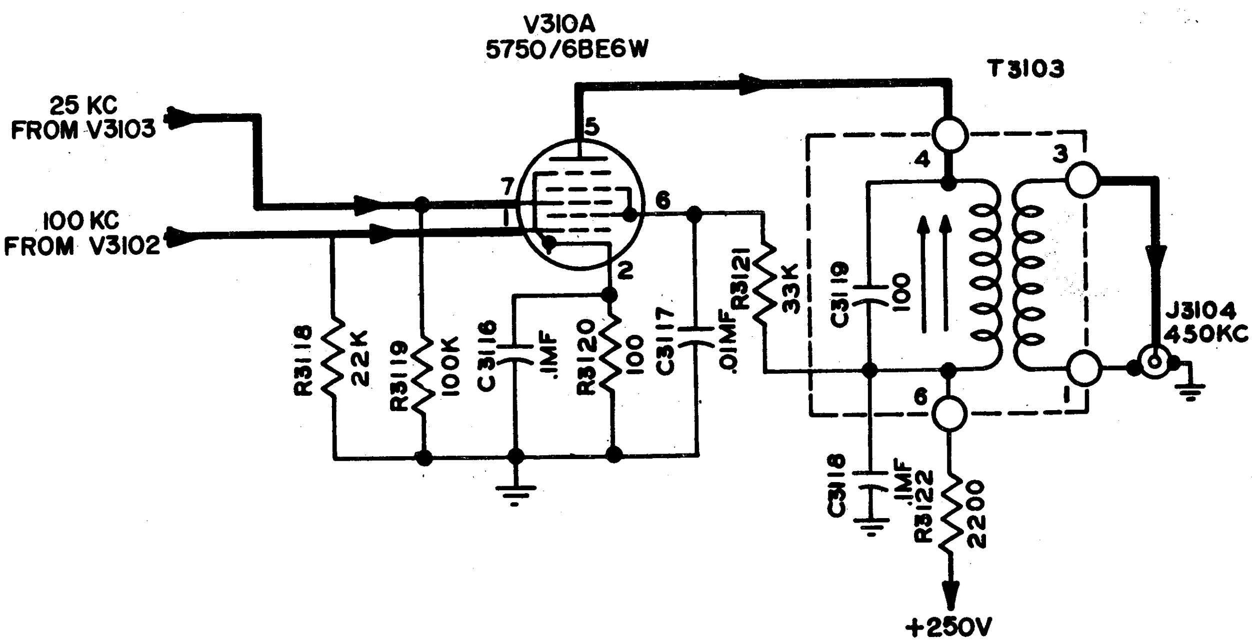
(*c*) POWER AMPLIFIER.—The power-amplifier stage makes use of two JAN 5686 miniature pentodes (V3118 and V3119), connected as a push-pull, direct-coupled power amplifier. The grids of V3118 and V3119 are connected to the plates of the preceding d-c voltage amplifier, V3121. Cathode bias for the power amplifier is developed across the common cathode resistor, R3183. B-plus voltage is applied, through a pair of normally closed contacts on capacitor-centering relay K3101, to the screen grids, and thence to the plates of the power amplifier through windings comprising one phase of the two-phase a-f-c motor, B3101.

Voltage for the other phase of the a-f-c motor is supplied from a second channel which, with the exception that there is no switch or phone connection in the plate circuit of the d-c amplifier, is identical to the channel just described but the output voltage is displaced 90 electrical degrees. The phase displacement is accomplished by means of the two tuned circuits contained in Z3103, in conjunction with capacitor C3202. The resonant circuit consisting of L3111 and C3198 is tuned somewhat below 100 kc, while the resonant circuit consisting of L3112 and C3199 is tuned somewhat above 100 kc. As a result, the former combination appears inductive to the 100-kc standard signal, while the latter appears capacitive. Since capacitor C3202 is effectively in series with tuned circuit L3112 and C3199, it causes this branch to appear even more capacitive. The tuning of the two branches, one below 100 kc and the other above, determines the exact amount of phase shift. Therefore, the two branches are adjusted apart in frequency by an amount that causes the 100-kc standard signal to be shifted exactly 90 degrees in phase between the plates of V3123 and the plates of V3122. For a 70-percent decrease, on one side of the response curve, of the maximum amplitude obtained at resonance, the detuned signal will be given a 45-degree phase shift in one direction; for a corresponding decrease on the other side of the response curve, the signal will be given a 45-degree phase shift in the opposite direction — making a total of 90 degrees. Since the phase-shifted 100-kc standard signal is a constituent of the mixer products, the audio difference frequency in both channels are therefore in quadrature with respect to each other.

(14) 450-KC MIXER-AMPLIFIER (*see figure 2-45*).—The 450-kc mixer-amplifier employs a JAN 5750/6BE6W miniature pentagrid converter tube (V3104), and is operated as a mixer-multiplier stage, using cathode bias. A 100-kc signal, taken from the plate circuit of the 100-kc amplifier (V3102B), is fed through capacitor C3112 to grid number 1 of V3104. At the same time a 25-kc signal, taken from the plate circuit of the crystal-divider stage (V3103), is fed through capacitor C3115 to grid number 3 of V3104. The plate circuit of the 450-kc amplifier is tuned to the sixth harmonic (450 kc) of the difference frequency (75 kc) by means of slug-tuned transformer T3103. The secondary winding of T3103 is brought out to a coaxial connector (J3104), on the rear of the chassis which permits supplying the signal to any external equipment that requires a 450-kc source.

(15) SET UP-OPERATE SWITCH (S3103) (*see figure 2-46*).—Placing the SET UP-OPERATE switch (S3103) in the SET UP position energizes capacitor-centering relay K3101. The operation of this relay removes B-plus voltage from the screen grids and plates of power amplifiers V3116, V3117, V3118, and V3119, and applies 115 volts, ac, to a-f-c motor B3101. The necessary phase shift between the voltages applied to the motor windings is provided by capacitors C3201A and C3201B, which are connected in series with one phase of the motor. The applied 115 volts, ac, causes the motor to rotate until S3104, a cam-operated switch, opens the a-c line to the motor. The cam is an integral part of a-f-c capacitor C3170, and is positioned in a manner that causes the switch (S3104) to open when C3170 is centered. Centering of the a-f-c capacitor is an important consideration in setting up the desired frequency. The AFC ON light (I-3104)

450KC AMPLIFIER



Figur 2-45. 450-KC Amplifi r, Simplified Sch matic

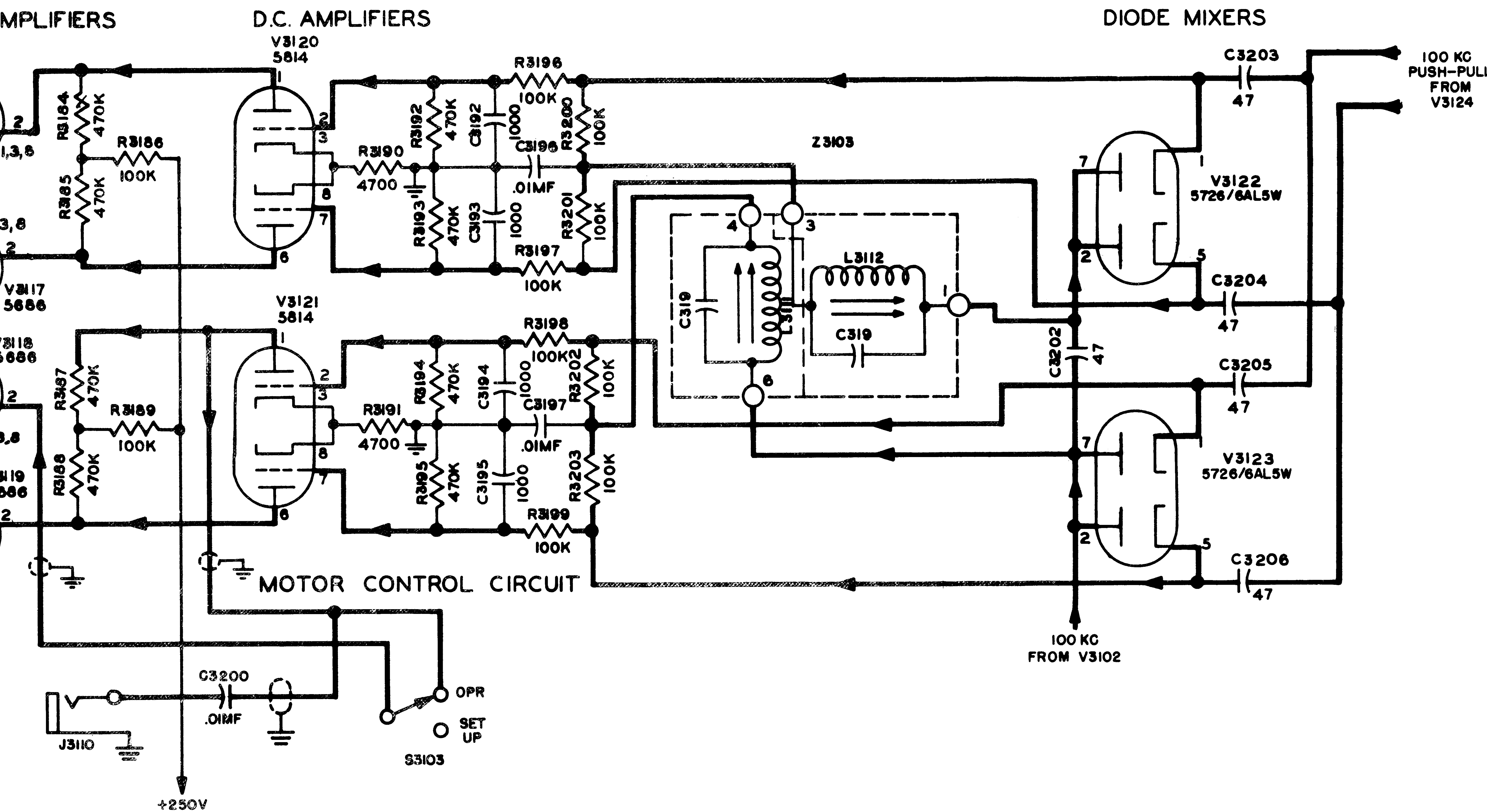


Figure 2-44. A-F-C Motor Control Circuit, Simplified Schematic

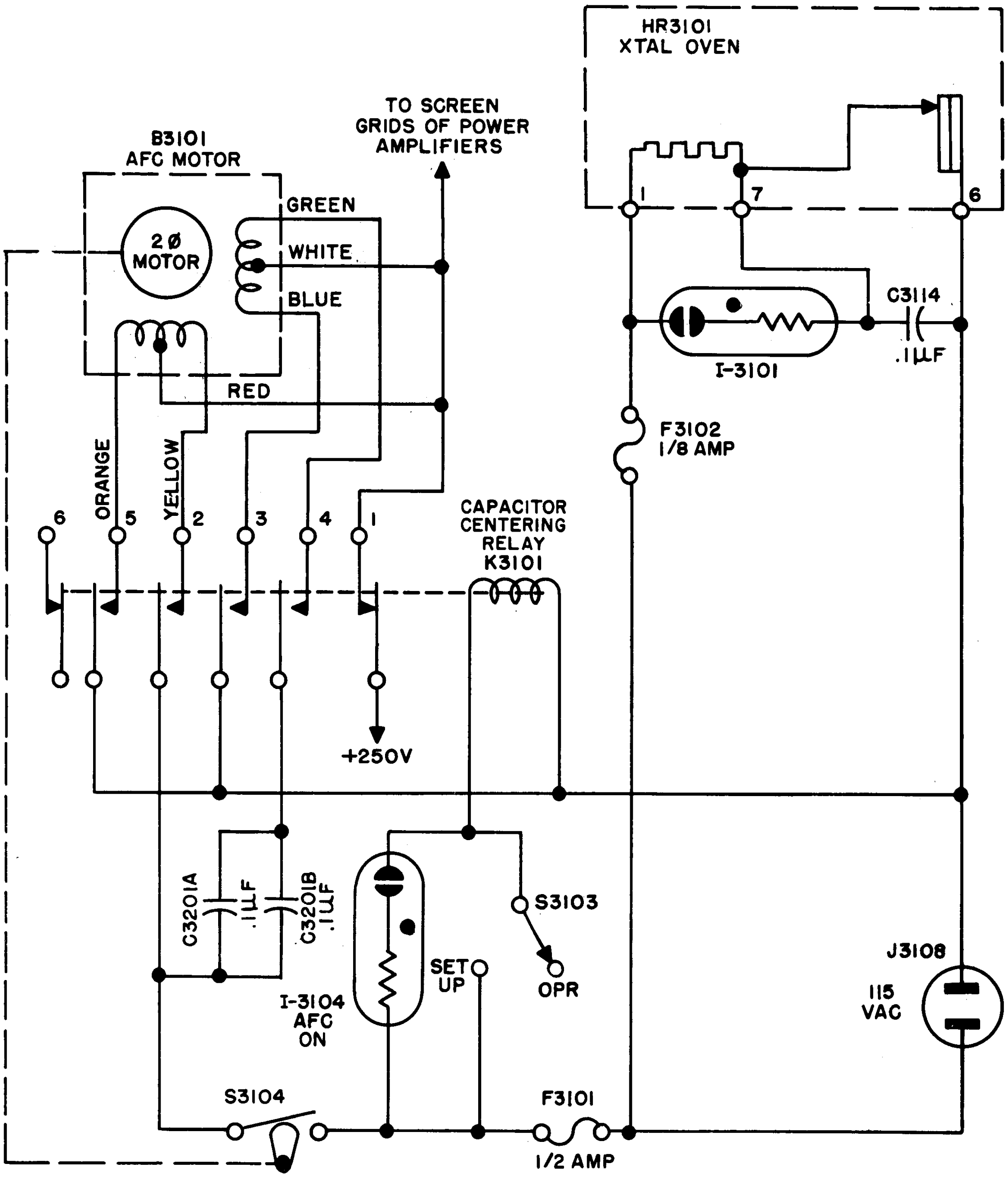


Figure 2-46. R-F Oscillator Control Circuit and A-C Distribution, Simplified Schematic

glows when the SET UP-OPERATE switch (S3103) is placed in the OPERATE position, indicating that the afc is in operation.

(16) TYPICAL FREQUENCIES DURING OPERATION. — Figures 2-47 and 2-48 are included to tie together, graphically, the foregoing discussion of the individual circuits. Both figures were prepared using the same output frequency (in this case, 3, 127.362 kc), but figure 2-48 assumes that the master oscillator is set up with some error.

Figure 2-47 assumes that the master oscillator is set up exactly on the desired frequency. The arrows indicating the direction of signal flow, and the numbers indicating the frequencies involved should be quite clear; however, a short explanation may be required in the case of the harmonic amplifier and the first mixer. As explained previously, a complete spectrum of frequencies, spaced 25 kc apart, is generated in the harmonic-amplifier circuit. For simplicity, however, only the frequency used in this example and

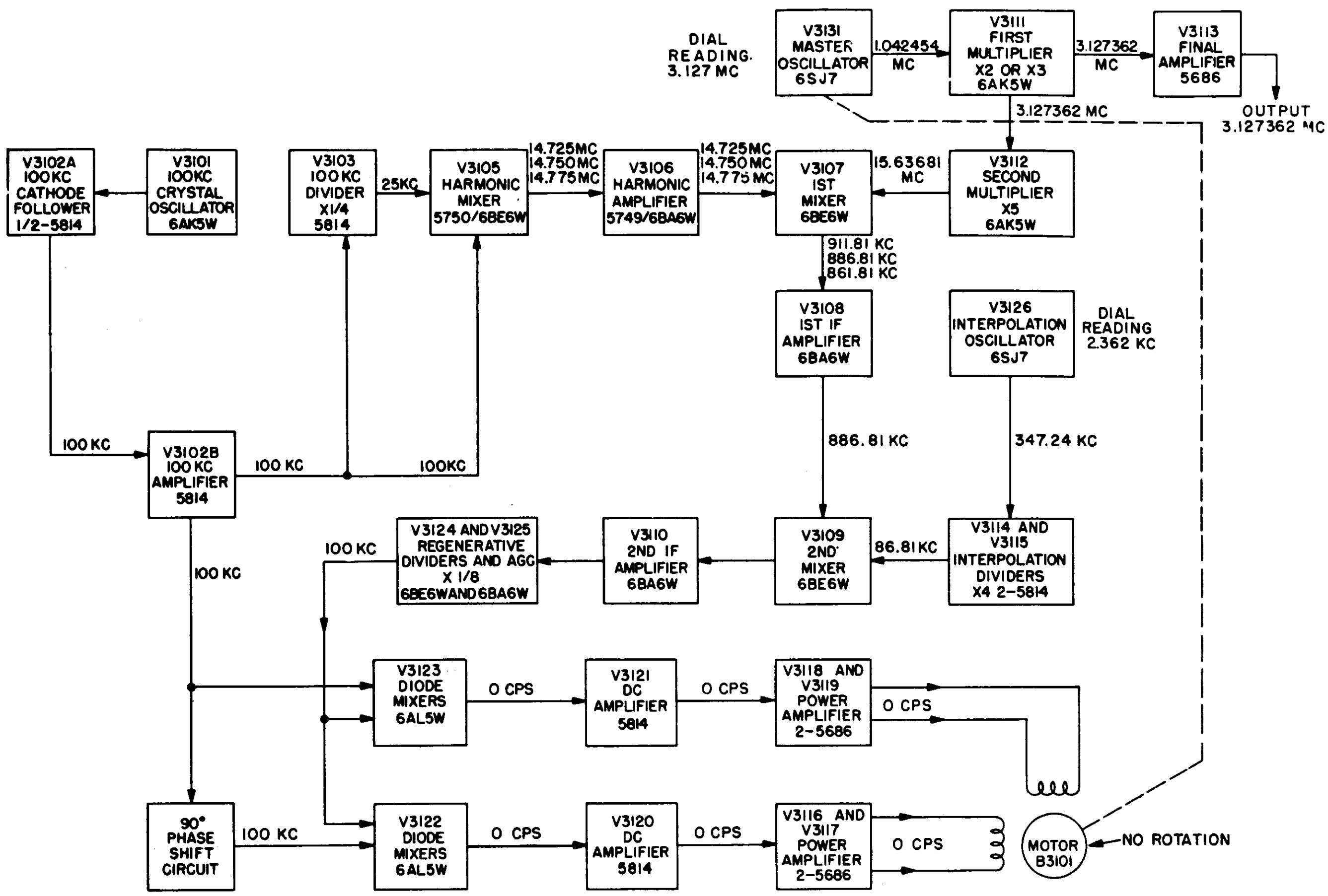


Figure 2-47. Typical Frequencies during Operation with No Error in Master Oscillator Setting, Block Diagam

the one on either side of it are shown. Likewise, only three frequencies are shown leaving the 1st mixer; the two outer frequencies, 911.81 kc and 861.81 kc, have suffered some attenuation in the plate circuit of the mixer. The first i-f amplifier, having a pass band of 875—900 kc, further attenuates the two side frequencies so that only the one frequency, 886.81 kc, appears in the output of the first if.

Some difficulty may be encountered with the apparent difference in the INTERPOLATION OSCILLATOR dial reading and the actual frequency of the oscillator. The dial is calibrated from 0—5 kc while the actual oscillator tuning range is from 300—400 kc. Therefore, with a reading of 0 on the dial, the oscillator is actually working at 300 kc, while with a dial reading of 5 kc, the oscillator frequency is 400 kc. The interpolation-oscillator frequency (in kc) for a given dial reading (in kc) may be found from the relation: Osc freq — 300 kc + $\frac{\text{Dial reading}}{.05}$. The dial reading (in kc) for a given interpolation-oscillator frequency (in kc), may be found from the relation: Dial reading = .05 (Osc freq—300 kc). In the case shown in figure 2-47, the dial reading is 2.362 kc; therefore, the oscillator frequency is found to be: Osc freq = 300 kc + $\frac{2.362}{.05}$ = 347.24 kc.

Another point which may raise questions is the case where the output frequency of the master oscillator is such as to cause the first i-f amplifier to receive frequencies of 875 kc and 900 kc at the same time. Since both of these frequencies lie within the pass band of the first i-f strip, they will appear at the second mixer with little or no attenuation. However, in a case of this sort, the output from the interpolation oscillator, and hence from the interpolation dividers, would be such that the output frequencies of the second mixer would be 800 kc and 825 kc, and since the second if. will pass only a narrow band of frequencies centered about 800 kc, the 825-kc signal would be greatly attenuated in the second i-f amplifier.

Figure 2-48 shows the frequencies which would result if the same output frequency (3, 127.362

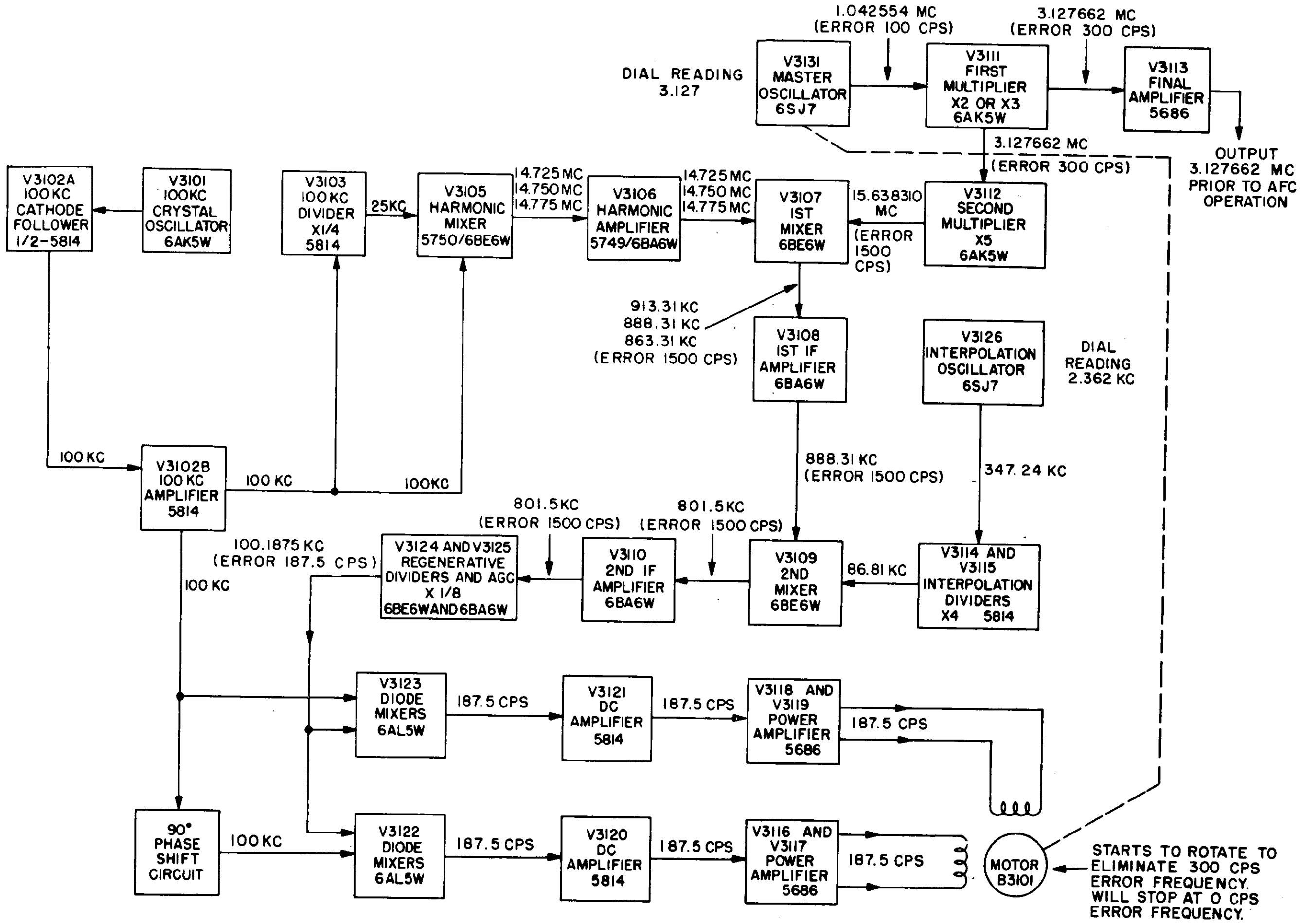


Figure 2-48. Typical Frequencies during Operation with 100-Cycle Error in Master Oscillator Setting, Block Diagram

kc) were desired but with the master-oscillator setting being in error by, say, 100 cycles. It is evident that an output frequency will be obtained from the power amplifiers (V3116, V3117, V3118, and V3119) which will cause the a-f-c motor to rotate and start correcting the master-oscillator frequency. As the master-oscillator frequency error becomes smaller, the output from the power amplifiers also decreases in frequency, until the master-oscillator frequency is corrected. When the output frequency error from the power amplifiers has decreased to 0 cps, the a-f-c motor will cease to rotate.

f. POWER SUPPLY PP-454/FRT-5. — One section of Power Supply PP-454/FRT-5, shown in figure 2-49, provides the filament and plate potentials necessary for the operation of R-F Oscillator O-243/FRT-24. Refer to the over-all schematic diagram in figure 7-66. A voltage of 230 volts, ac, is applied from the Service Power Supply to both sections of the primary winding of power transformer T1001, which are connected in parallel through switch S1002A located on the rear of the chassis. Switch S1002A permits operation from either a 115-volt or a 230-volt, a-c source; in the 115-volt position, the two primary

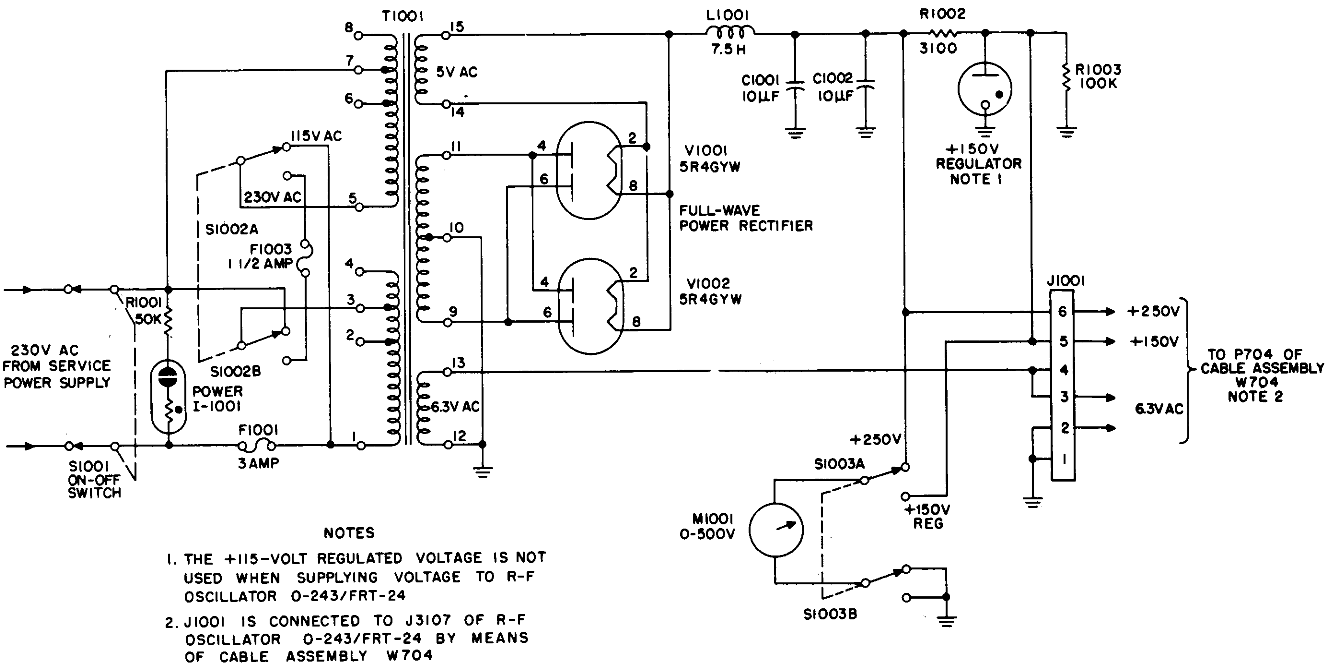


Figure 2-49. Operative Section of Power Supply PP-454/FRT-5, Simplified Schematic

windings are connected in parallel. To prevent damage to these windings, caution must be exercised not to connect a 230-volt source when the switch is in the 115-volt position. A voltage of 6.3 volts, ac, taken from a filament winding on T1001, is supplied to terminals 3 and 4 of output receptacle J1001. Terminals 1 and 2 of this receptacle act as a common ground return for both filament and plate power. A full-wave rectifier circuit employing two 5R4GYW tubes (V1001 and V1002) is used in conjunction with a choke-input filter (L1001 together with C1001 and C1002 in parallel) to supply +250 volts, dc, to terminal 6 of J1001. A d-c voltmeter (M1001) and a selector switch (S1003) are provided on the front panel to allow the d-c output voltage from this section of the Power Supply to be monitored by placing S1003 in the correct position. The POWER on light (I-1001) glows when the power ON-OFF switch A (S1001) is in the ON position.

SECTION 3

INSTALLATION

1. UNPACKING

The entire equipment, including spare parts, is packed in wooden crates. All major units and assemblies, except the Power Control Assembly and the Blower Assembly which remain in the transmitter cabinet, are individually crated. All components have been carefully braced in the crates to prevent damage due to shifting during shipment. One of two alternate methods may be followed in the unpacking of the components. The transmitter was crated by laying the cabinet on its side on top of one side of a crate and building the remainder of the crate around it. To uncrate the transmitter, the crating procedure may be reversed; that is, the crated unit may be placed on its side and the crating material removed from the sides and ends, or the unit may be placed on one end, being careful to stand it on its base and not the top of the cabinet, and the crating material removed from the sides and top. In either case, it will be necessary to use a hoist or considerable manpower to move the transmitter cabinet into position on the transmitting room floor. If the other units are crated while lying horizontal, they can be upended into position. If they are uncrated while standing upright, it will be necessary to lift each unit off the bottom of its crate and into position, or to move it into position and then lift the unit vertically while the bottom of the crate is removed. Whichever method is followed, the general procedure and precautions outlined below apply:

a. Place packing case near position in which equipment is to be installed.

b. Remove steel straps used to reinforce corners of packing case.

c. Remove nails from case using a nail puller.

d. Remove sides and top and/or bottom of packing case.

CAUTION

Prying off the sides may result in damage. Use care.

e. Remove bags of dessicant which are distributed throughout case for moisture absorption.

f. Some components have been blocked in place by means of wooden supports and in some cases padding has been used to protect the equipment from damage. Remove all of this excess material. Untie all components that have been bound with tape.

g. Move unit into position.

CAUTION

Use extreme care when moving the equipment to avoid damage.

h. Carefully remove units and assemblies from their packing cases, but do not install them until they have been thoroughly checked.

i. While inspecting equipment visually for damage, check all units and components received against master packing list.

Note

DO NOT ATTACH THE SIDE PANELS OF THE TRANSMITTER CABINET BEFORE THE INDIVIDUAL UNITS AND ASSEMBLIES HAVE BEEN INSTALLED.

2. WIRE SIZES

Table 3-1 lists the wire sizes used for external connections in Radio Transmitting Set AN/FRT-24.

3. INSTALLATION OF CABLES

Before starting to install the necessary cabling, refer to the latest Bureau of Ships' installation plans.

a. CABLING AND CONNECTORS FURNISHED.—No external cabling is furnished. However, all connectors needed for fabrication of cables to units of the equipment and for connections from remote control equipment are supplied. For details of coaxial-cable fabrication, refer to the following paragraphs:

b. ASSEMBLY OF TYPE 49551 PLUG CONNECTOR TO RG-17/U CABLE.—Assembly instructions for Type 49551 plug connectors and the RG-17/U cable used with them are given in figure 3-1.

c. CARE OF CABLES.—Run the cables so that they will be protected from damage, being careful to see that they are never pressed against sharp edges and never subjected to excessive pressure or bends. Each cable should be mechanically supported at frequent intervals throughout its entire length.

d. CABLE ASSEMBLIES. — To connect the cable assemblies that are supplied, refer to table 3-2.

TABLE 3-1. WIRE SIZES

CONNECTION	RECOMMENDED WIRE	NAVY TYPE DESIGNATION
Primary Power Source to Terminal Board TB651	#10, Underwriter's Code RH	DHF
Ground Connection to Terminal Board TB651	#10, Underwriter's Code RH	DHF
Transmitter Control C-1362/FRT-24 to Terminal Board TB630 and Terminal Board TB603	4 Conductor Cable, #16 GA with ground return	FHF
Transmission Line Coupler CU-390/FRT-24 to R-F Assembly	RG-17/U	
Transmitter Control C-1362/FRT-24 to Transmitter Control C-1362/FRT-24	4 Conductor Cable, #16 GA with ground return	FHF

TABLE 3-2. CABLE ASSEMBLY CONNECTIONS

REFERENCE DESIGNATION	STARTING LOCATION	CONNECT	TO	FUNCTION	TERMINATING LOCATION	CONNECT	TO
W101	Modulator Assembly	P242	J242	Interconnecting cable from movable assemblies to multiple-receptacle box.	Transmitter cabinet frame	P212	J212
		P103	J103			P113	J113
		P243	J243			P213	J213
		P241	J241			P211	J211
W701	Service Power Supply	P701	J701	Conducts 230 volts, ac.	Power Supply PP-454/FRT-5	P711	P1001
W702	Service Power Supply	P702	J702	Conducts 110 volts, ac.	R-F Oscillator O-243/FRT-24	P712	J3108
W704	Power Supply PP-454/FRT-5	P704	J1001	Conducts 250 volts, dc and 6.3 volts, ac.	R-F Oscillator O-243/FRT-24	P714	J3107
W721	Patch Panel Assembly	P721	J722	Patch cord for connecting output of R-F Oscillator O-243/FRT-24 to R-F Assembly.	Patch Panel Assembly	P722	J722

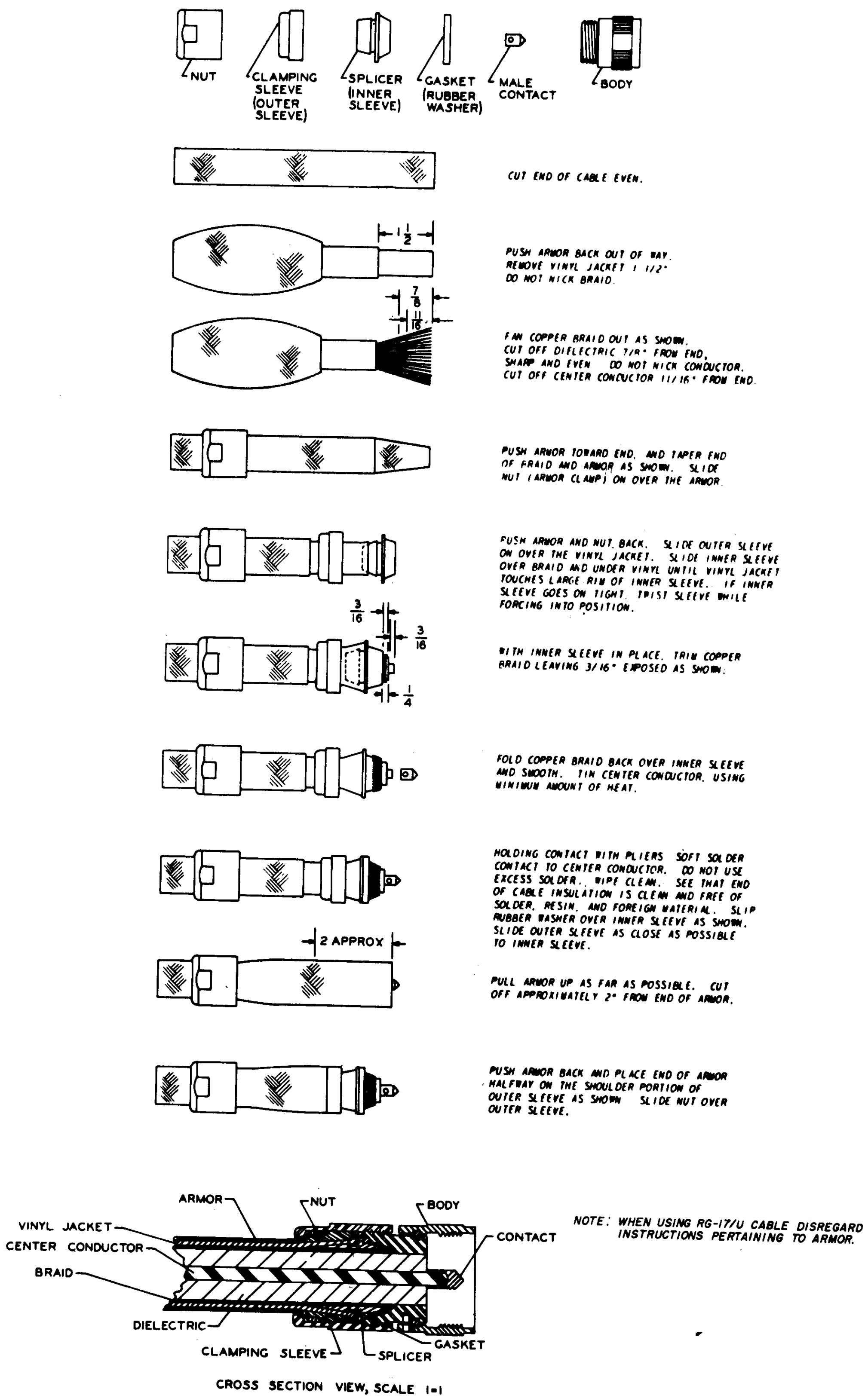


Figure 3-1. Ass mbly f R-F Output C nnect r t C axial F edlin

4. INSTALLATION

Before starting to install Radio Transmitting Set AN/FRT-24, refer to the latest Bureau of Ships' installation plans.

a. LOCATION.—The following is a suggested method of installation. Methods of installation vary between stations, depending upon the station location.

(1) RADIO TRANSMITTER T-440/FRT-24.—The following important factors should be taken into consideration when selecting a permanent location for the transmitter:

(*a*) When completely assembled, Radio Transmitter T-440/FRT-24 weighs approximately 1,500 pounds. Make certain that the floor construction is such that the added weight of the transmitter will not produce a strain on the floor.

(*b*) The room must be large enough so that sufficient space around the transmitter is available, in the event that repairs must be made.

(*c*) Adequate ventilation must be available.

(*d*) The transmitter should be placed in a level position, to ensure smooth-working control shafts, and must not be subjected to any vibration from external sources.

(*e*) Refer to figures 3-2 and 3-3 for a typical installation. Run in a trench the conduit and wires for connecting the remote control units to the transmitter. Conduit and wire for making the connections required for this installation are not supplied with the equipment.

(2) TRANSMITTER CONTROL C-1362/FRT-24.—The Transmitter Control (see figure 3-4) unit may be located wherever convenient, provided that the distance to the transmitter is not so great that the audio line presents a loss of more than 25 db or that the key-line loop resistance exceeds 1000 ohms. The connecting cables to the transmitter should not be placed near high-current-carrying power lines.

(3) TRANSMISSION LINE COUPLER CU-390/FRT-24.—The Transmission Line Coupler (see figure 3-5) may be located either near the transmitter or near the antenna, depending upon the installation.

b. EXTERNAL CONNECTION. — Refer to table 3-1 for wire size, and to figure 3-2 for location of connections for cables.

Note

ALL EXTERNAL CONNECTIONS TO THE TRANSMITTER ARE BROUGHT THROUGH THE BOTTOM OF THE CABINET TO TERMINAL BOARDS.

(1) PRIMARY POWER CONNECTIONS.—Connect a one-phase, two-wire, 230-volt, a-c line from the station distribution panel to terminal board TB651, which is mounted on the cabinet frame (see figure 3-2). This cable extends 3 feet into the transmitter.

(2) REMOTE CONTROL CABLES.—Connect a cable with four #16 conductors plus ground return, from terminal board TB901 on Transmitter Control C-1362/FRT-24 to terminal board TB630, located on the transmitter frame, and to terminal board TB603, located on the Modulator Assembly. This cable extends approximately 14 feet into the transmitter. The over-all length of this cable is dependent upon the location of the Transmitter Control unit.

Attach a connector on each end of the RG-17/U cable, which is of the 52-ohm coaxial type. One end is connected to Transmission Line Coupler CU-390/FRT-24, and the other end is connected to output receptacle P102 of the R-F Assembly. The portion of the cable that extends into the transmitter is approximately 7 feet.

Connect a cable with four #16 conductors plus ground return, between terminal board TB901 on both Transmitter Control units. The length of the cable is dependent upon the separation of the units. Telephone Set TA-267/U (see figure 3-6) is connected to terminal board TB902 on both Transmitter Control units.

(3) GROUND CONNECTIONS.—The transmitter enclosure should be connected to a good ground system which should consist of, at least, all the metal parts of the building in the vicinity of the transmitter. These metal areas should be well-bonded together and connected to the base of the transmitter at as many places as is practicable, using wide copper strap bonded to the station ground system or other suitable ground. Flexible copper braid shall not be used as a ground conductor under any circumstances.

c. INSTALLATION OF UNITS AND ASSEMBLIES REMOVED PRIOR TO SHIPMENT.—The following paragraphs describe the installation procedure of units and assemblies removed prior to shipment. See figures 3-7, 3-9, and 3-14.

(1) R-F ASSEMBLY.—To mount the R-F Assembly proceed as follows:

(*a*) REPLACING COMPONENTS REMOVED PRIOR TO SHIPMENT.—Replace all components removed prior to shipment as follows:

1. Return all tubes to their proper sockets, as indicated by type on chassis.

2. Return ferrule-type resistors. Refer to the parts list and use the symbol stamped on the chassis, the JAN number in the parts list, and the JAN number on the resistor to determine the correct location.

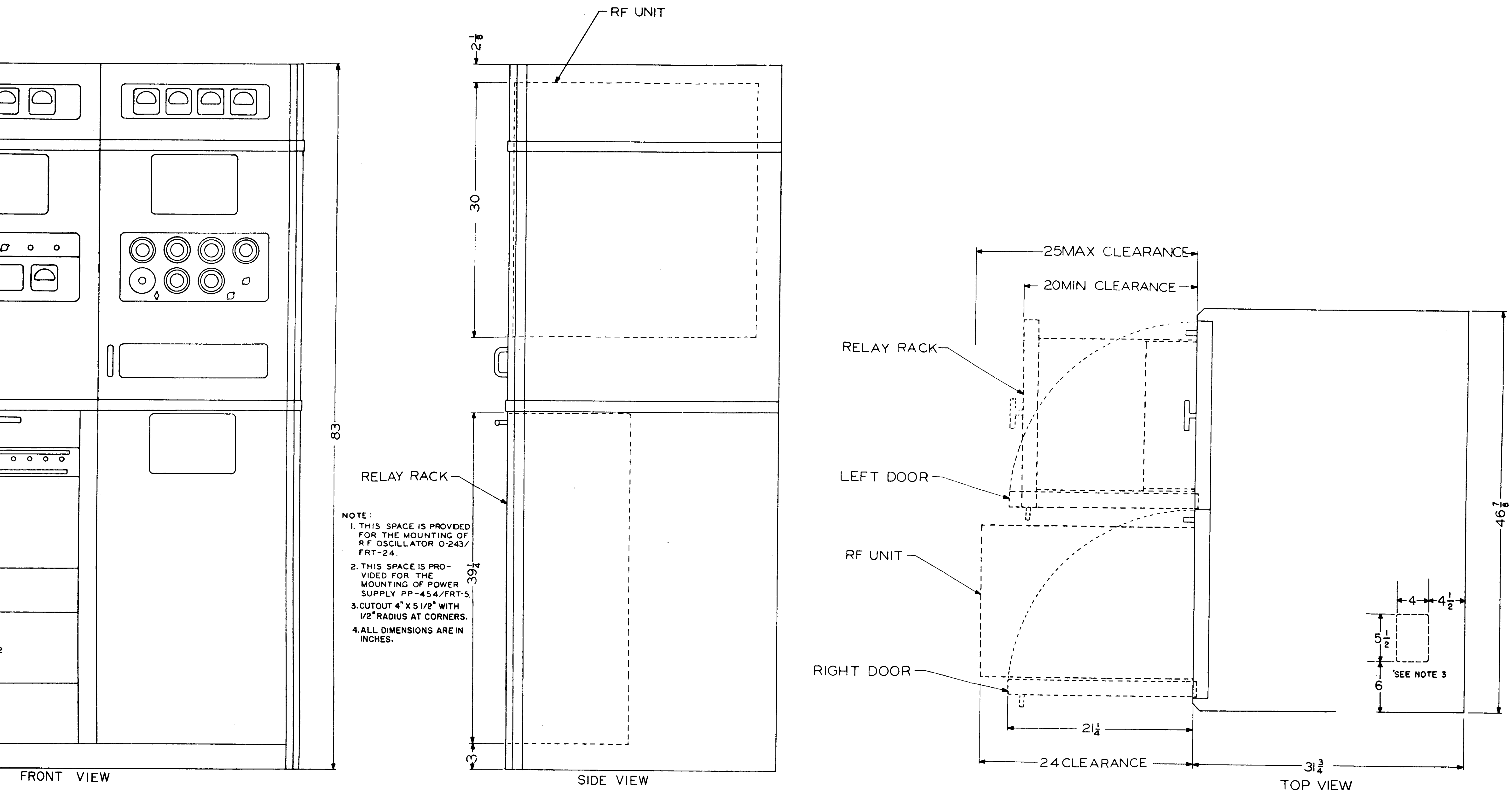


Figure 3-2. Radio Transmitter T-440/FRT-24, Dim nsional Drawing

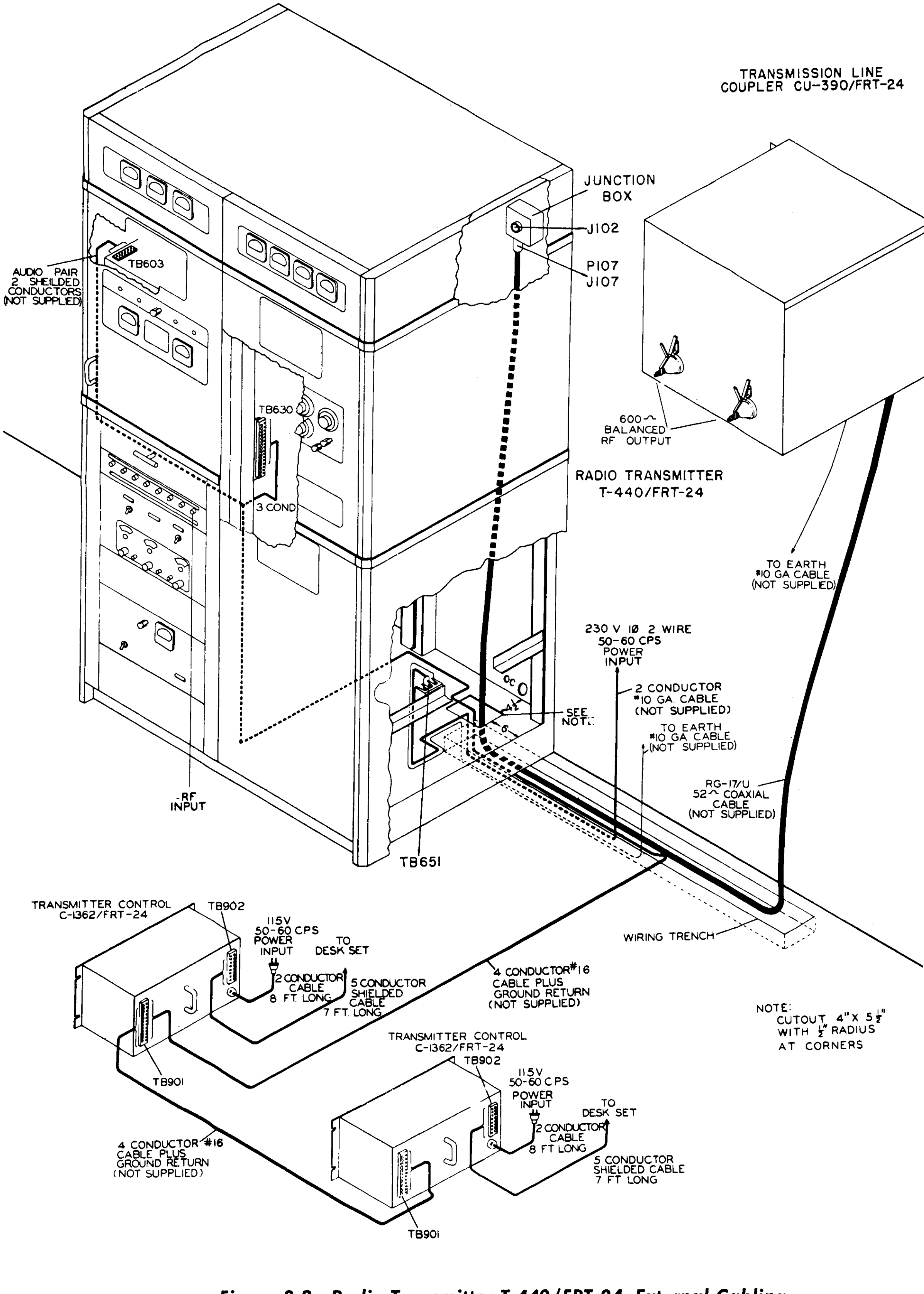


Figure 3-3. Radi Transmitter T-440/FRT-24, Ext rnal Cabling

3. Return vacuum-type capacitors. Refer to the parts list, using the symbol stamped on the chassis, the JAN number in the parts list, and the JAN number on the capacitor to determine the correct location.

(*b*) INSTALLATION. — To install the R-F Assembly (see figures 3-9 and 3-11), pull the telescoping slides part way out of the transmitter cabinet. Two or three persons will then be required to lift the R-F Assembly and insert it into place on the slides. Hold the OPEN-LOCK switch to OPEN and push the R-F Assembly back and into the transmitter cabinet until the connectors on the rear of the R-F Assembly engage the corresponding connectors mounted on the transmitter cabinet. Release the OPEN-LOCK switch. If the connectors on the R-F Assembly do not engage properly the connectors on the transmitter cabinet, and position the connectors to align with those on the R-F Assembly, then securely tighten the bolts. Refer to table 3-2 and to figures 3-9 and 3-12 to connect cable assembly W101 to the top of the R-F Assembly with a cable clamp.

(2) HIGH-VOLTAGE POWER SUPPLY.— The High-Voltage Power Supply is composed of three chassis: a plate transformer, a filter chassis, and a rectifier chassis. Each chassis is mounted separately. See figures 3-9 and 3-11 for their location.

(*a*) PLATE TRANSFORMER.—It will require two or three persons to mount the plate transformer. Mount the plate transformer in the rear of the right-hand cabinet, with terminals 7, 8, and 9 facing the right side panel. Bolt it to the cabinet frame with the hardware supplied.

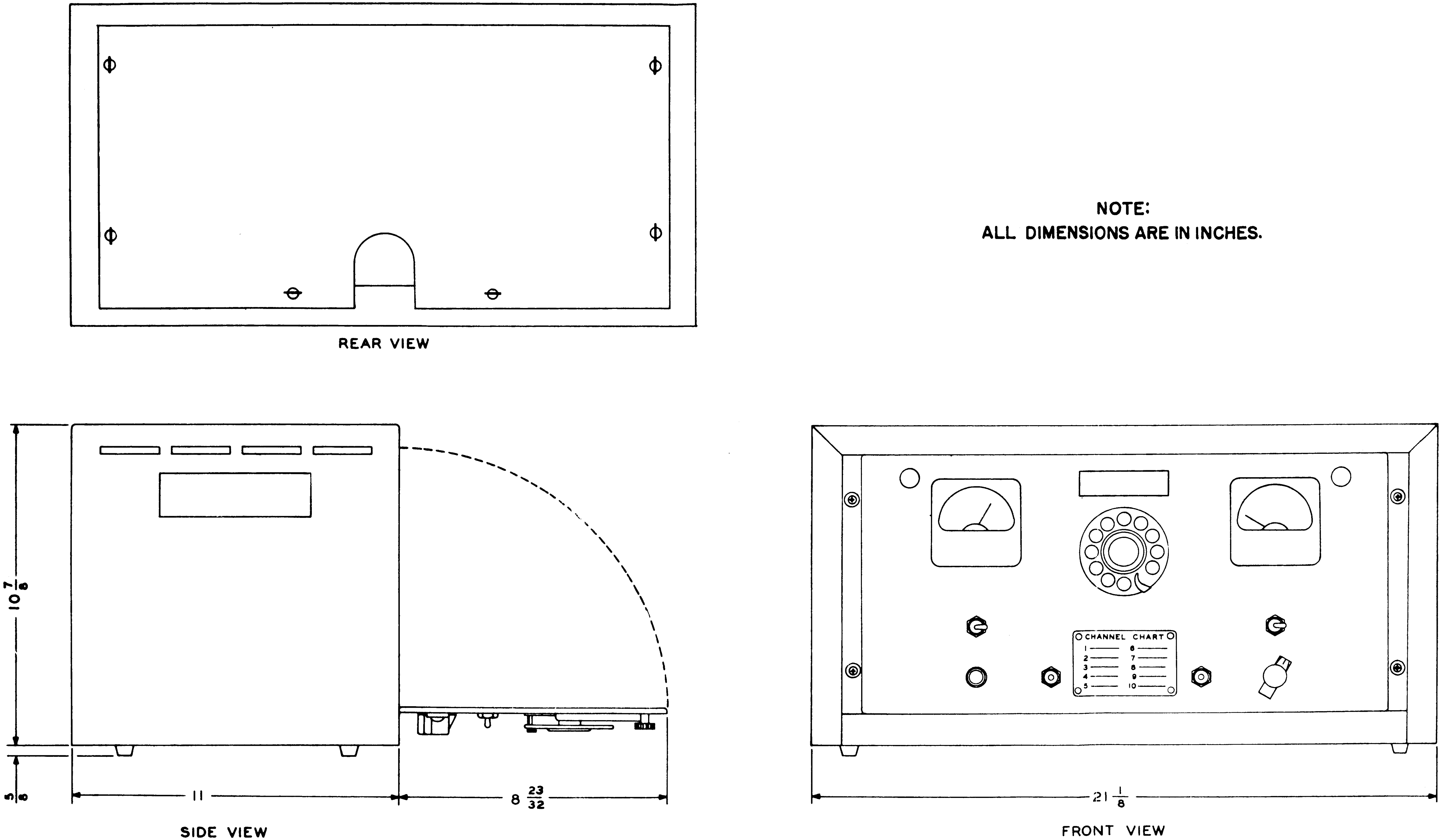
(*b*) FILTER CHASSIS.—Mount the filter chassis in the rear of the right-hand cabinet, directly under the R-F Assembly. Bolt it to the cabinet frame with the hardware supplied.

(*c*) RECTIFIER CHASSIS.—Return the electron tubes to their proper sockets as indicated by type designations on the chassis. Mount the rectifier chassis directly in front of the filter chassis. Bolt it to the cabinet frame with the hardware supplied.

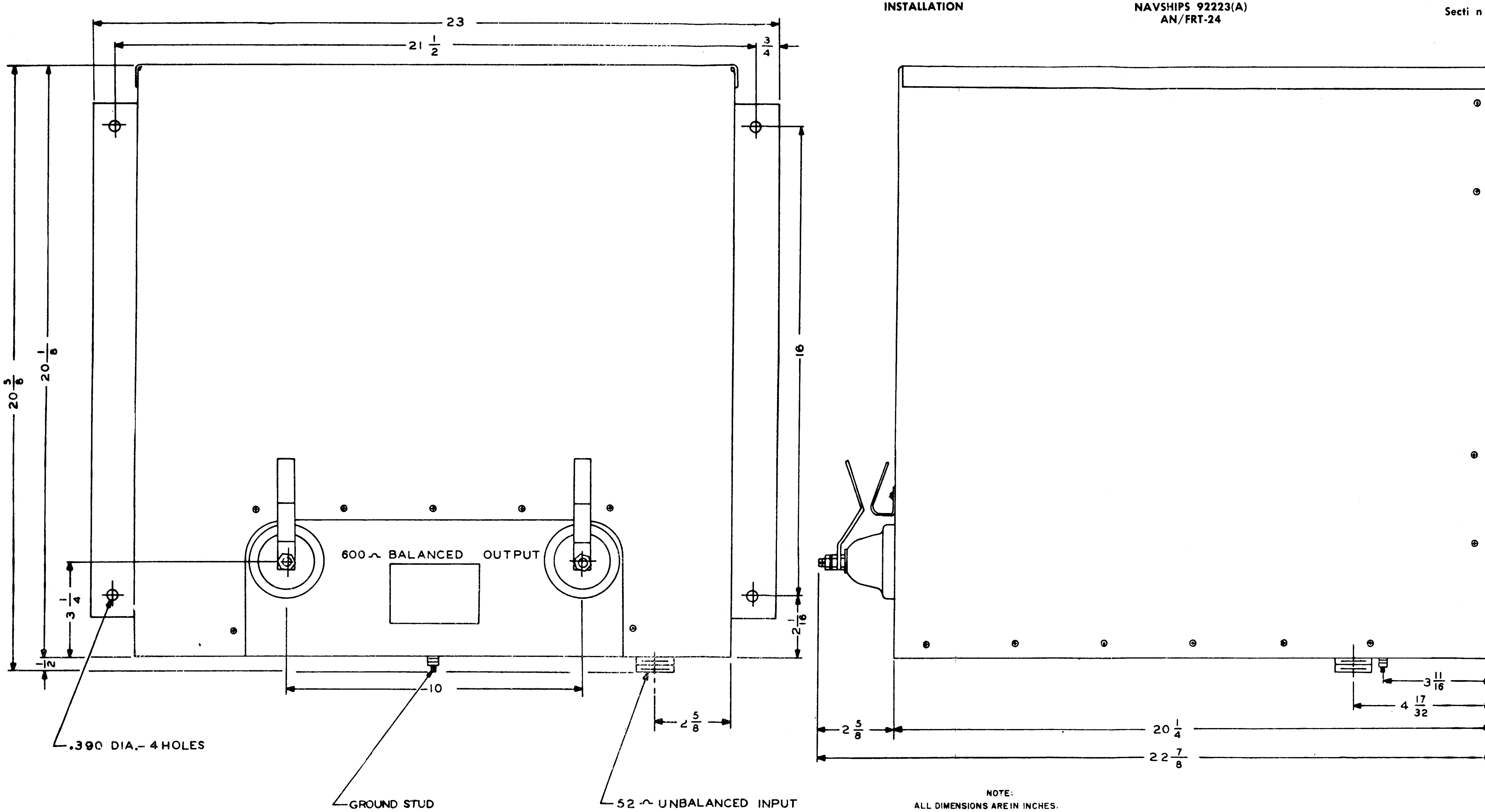
(*d*) HIGH-VOLTAGE POWER SUPPLY. —To connect the High-Voltage Power Supply, refer to table 3-3 and figure 3-12.

TABLE 3-3. HIGH-VOLTAGE POWER SUPPLY CONNECTIONS

STARTING LOCATION	CONNECT	TO	WITH	TERMINATING LOCATION
Plate Transformer T401	Terminal 1	Terminal E of P504	W103	Power Control Assembly
		Terminal 4 of PLATE HOURS meter M672		Cabinet Frame
	Terminal 4	Terminal F of P504	W103	Power Control Assembly
		Terminal 3 of PLATE HOURS meter M672		Cabinet Frame
	Terminal 7	Plate cap of V401	W103	Rectifier Chassis
	Terminal 8	Terminals 1 and 2 of TB402	W103	Filter Chassis
	Terminal 9	Plate cap of V402	W103	Rectifier Chassis
Rectifier Chassis Terminal Board TB401	Terminal 2	Terminal 4 of P501	W102	Power Control Assembly
	Terminal 1	Terminal 2 of TB301	W102	Low-Voltage Power Supply
	Terminal 5	Terminal 1 of TB402	W102	Filter Chassis
Filter Chassis Terminal Board TB402	Terminal 1	Terminal 5 of TB401	W102	Rectifier Chassis
		Terminal 4 of PLATE VOLTAGE meter M662		Cabinet Frame
	Terminal 2	Common ground	W102	Cabinet Frame
	Terminal 3	Terminal 6 of TB301	W102	Low-Voltage Power Supply
	Terminal 4	Terminal 4 of TB601	W102	Audio Chassis



Figur 3-4. Transmitter Control C-1362/FRT-24, Dimensional Drawing



NOTE:
ALL DIMENSIONS ARE IN INCHES.

Figur 3-5. Transmissi n Lin Coupler CU-390/FRT-24, Dimensi nal Drawing

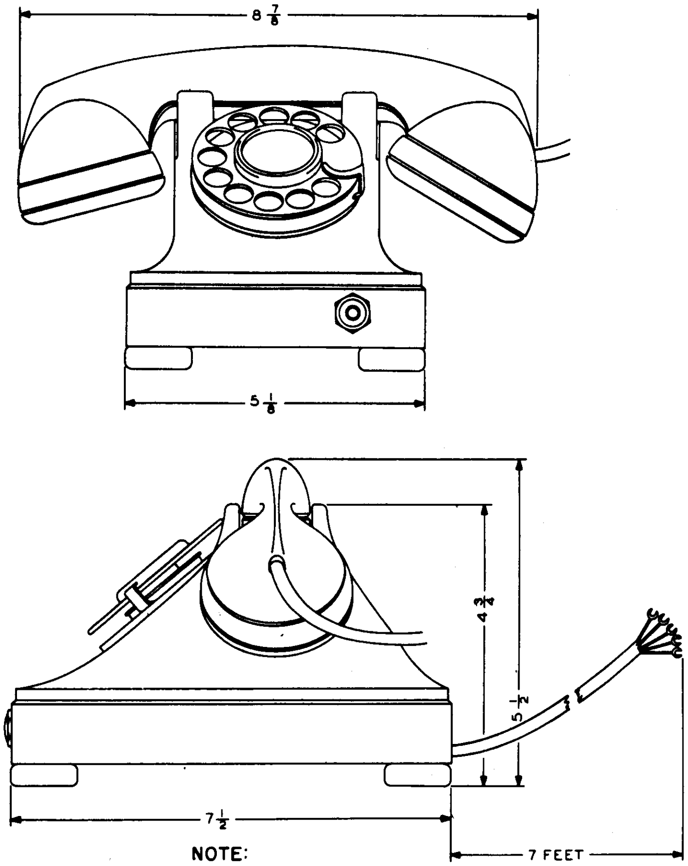


Figure 3-6. Telephone Set TA-267/U, Dimensional Drawing

(3) LOW-VOLTAGE POWER SUPPLY.—Return the electron tubes to their proper sockets as indicated by type designations on the chassis. Connect the plate caps to their respective tubes. Mount the Low-Voltage Power Supply directly above the plate transformer (see figures 3-9 and 3-11). For Low-Voltage Power Supply connections, refer to table 3-4 and figure 3-12.

TABLE 3-4. LOW-VOLTAGE POWER SUPPLY CONNECTIONS

STARTING LOCATION	CONNECT	TO	WITH	TERMINATING LOCATION
Terminal Board TB301	Terminal 1	Terminal 1 of P501	W102	Power Control Assembly
	Terminal 2	Terminal 10 of P501 Terminal 1 of TB401	W102	Power Control Assembly Filter Chassis
	Terminal 3	Terminal 2 of P501	W102	Power Control Assembly
	Terminal 4	Common ground	W102	Cabinet Frame
	Terminal 5	Terminal 16 of P502	W102	Power Control Assembly
	Terminal 6	Terminal 9 of P103 Terminal 3 of TB402	W102	R-F Assembly Filter Chassis

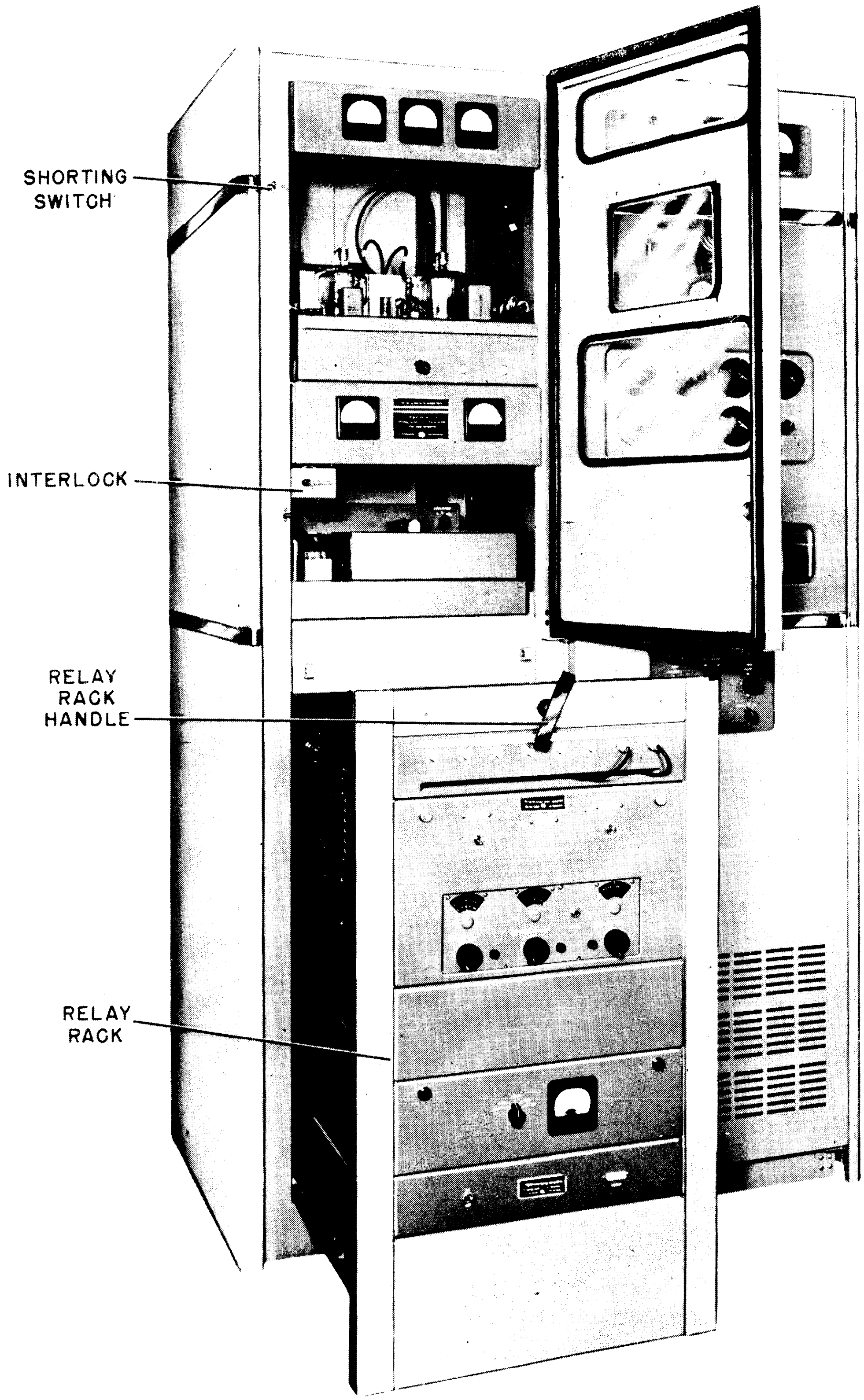


Figure 3-7. Radio Transmitter T-440/FRT-24, Left-Hand Cabinet Exposed

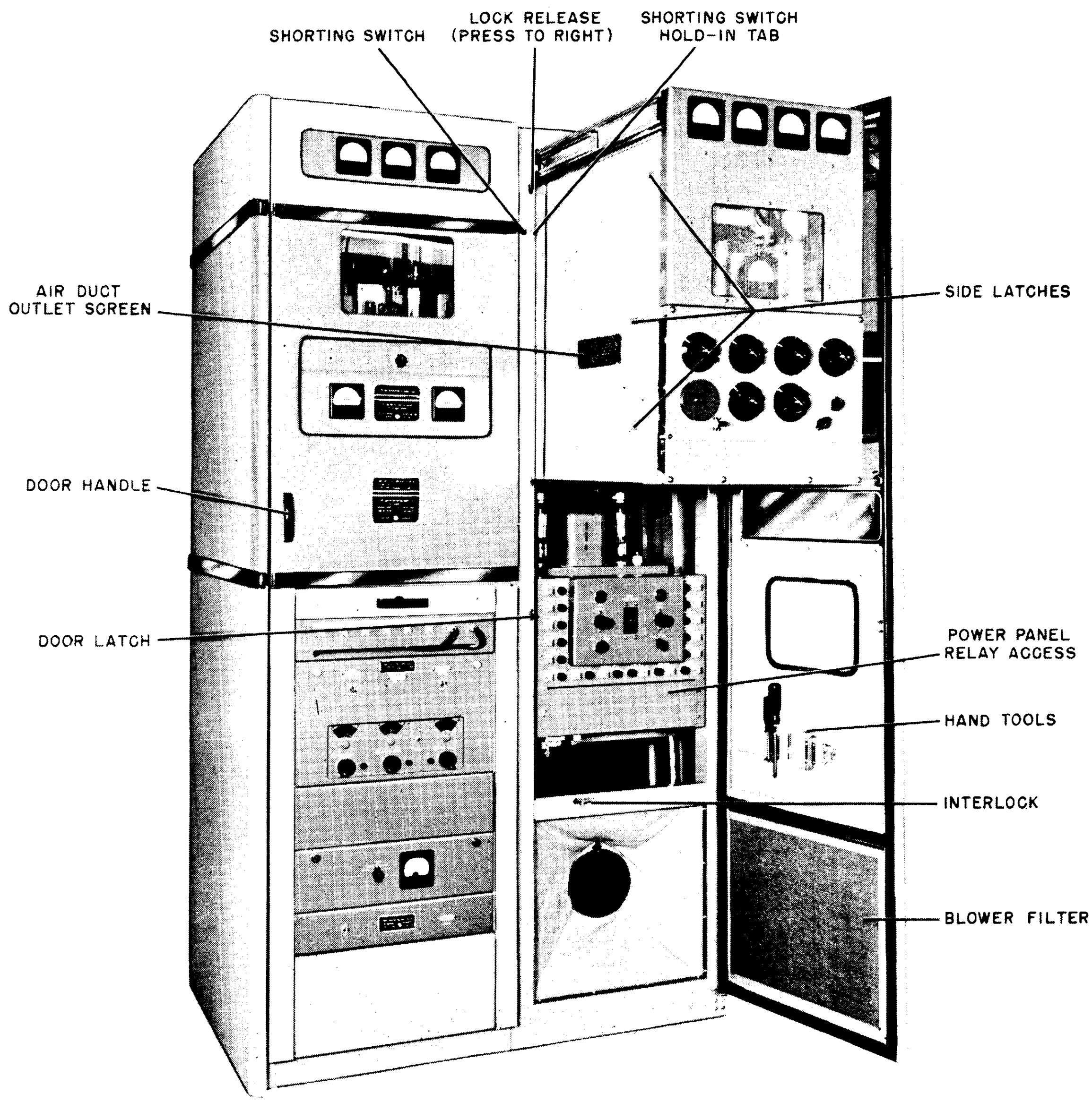


Figure 3-8. Radio Transmitter T-440/FRT-24, Right-Hand Cabinet Exposed

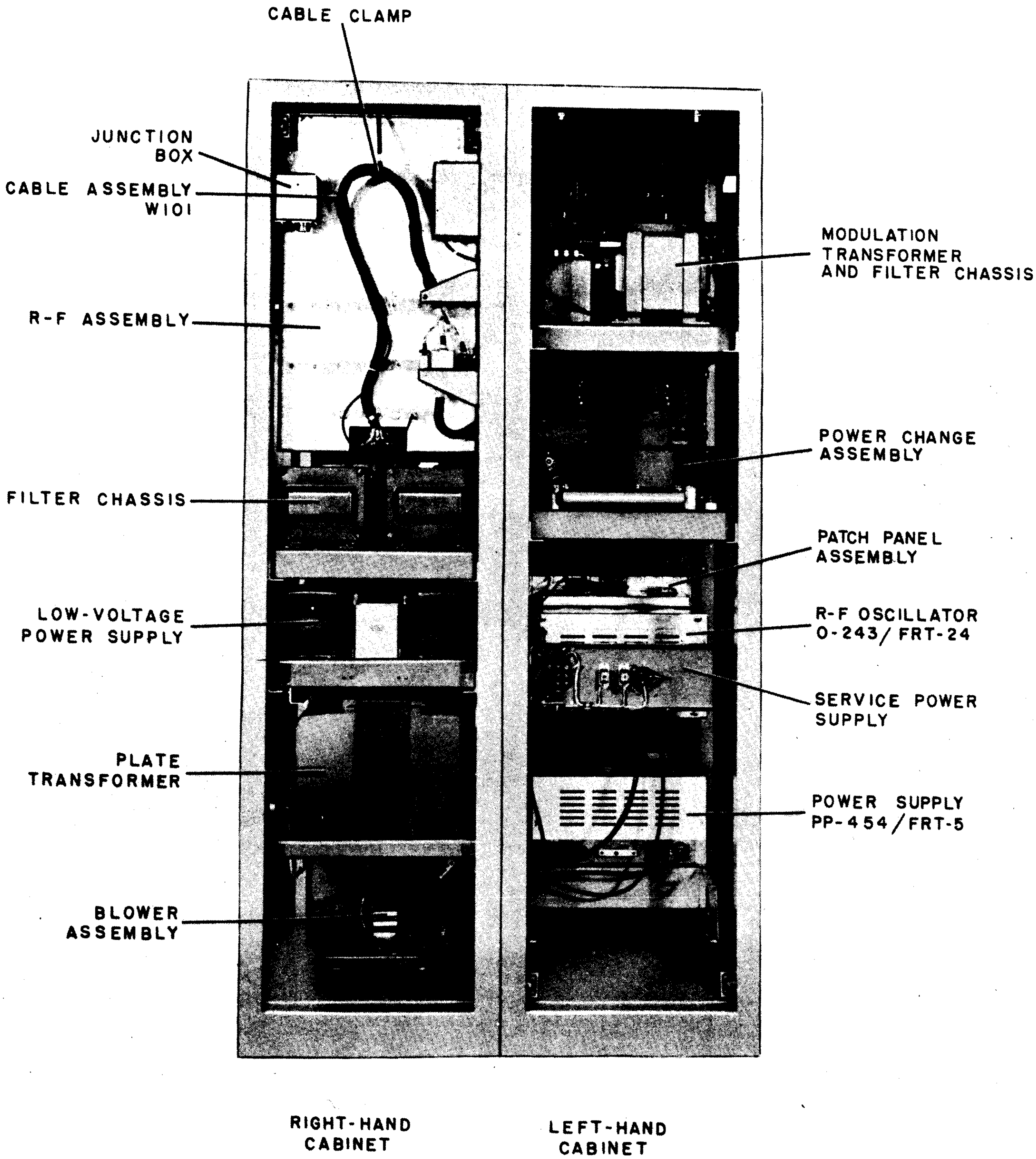


Figure 3-9. Radio Transmitter T-440/FRT-24, Rear Pan l Rem ved

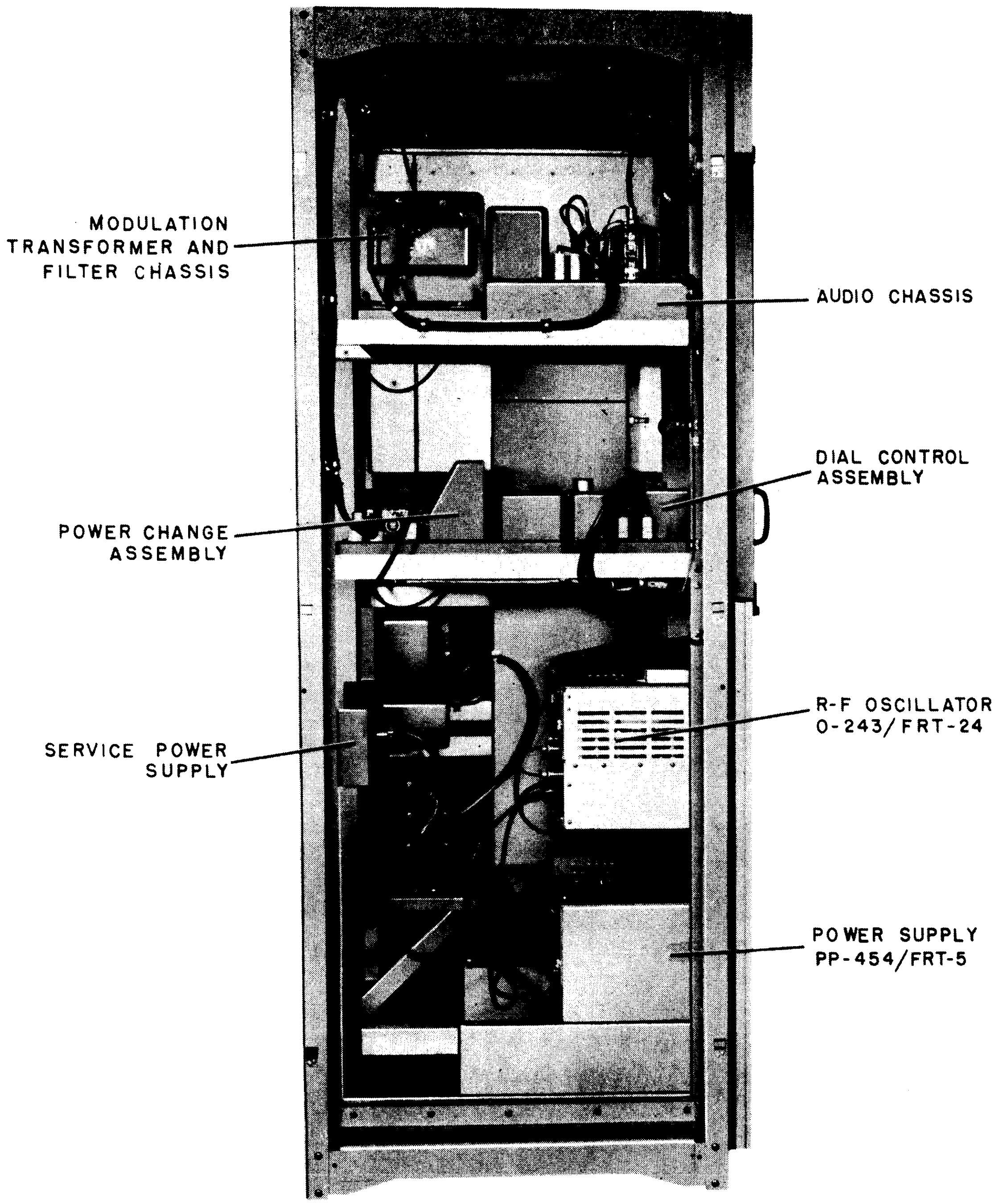


Figure 3-10. Radio Transmitter T-440/FRT-24, Side View of Left-Hand Cabinet, Side Panel Removed

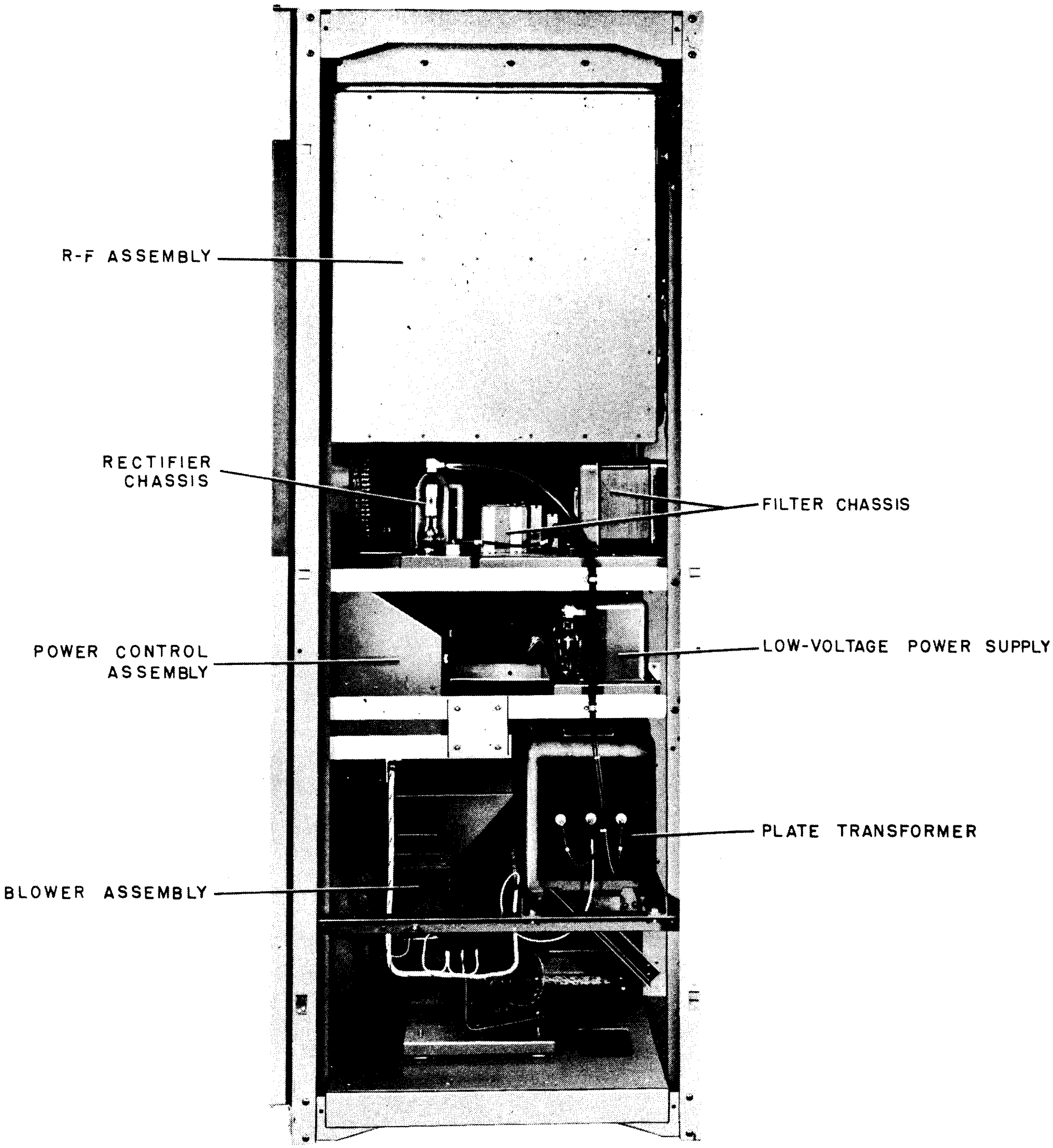


Figure 3-11. Radio Transmitter T-440/FRT-24, Side View of Right-Hand Cabinet, Side Panel Removed

(4) BLOWER ASSEMBLY.—The blower assembly has been mounted prior to shipment. For blower assembly connections, refer to table 3-5 and figure 3-12.

TABLE 3-5. BLOWER ASSEMBLY CONNECTIONS

STARTING LOCATION	CONNECT	TO	WITH	TERMINATING LOCATION
Terminal Board TB641	Terminal 1	Terminal 7 of P501	W102	Power Control Assembly
	Terminal 2	Terminal 14 of P503 Terminal 7 of T701	W102	Power Control Assembly Service Power Supply
	Terminal 3	Terminal 8 of P243	W102	R-F Assembly
	Terminal 4	Terminal 2 of TB601	W102	Audio Chassis
Blower Assembly Chassis	Common ground	Common ground	W102	Modulator Cabinet

(5) POWER CONTROL ASSEMBLY.—The Power Control Assembly has been mounted in the transmitter cabinet prior to shipment. Check this assembly to ensure that no damage has occurred during shipment. Check all fuses and indicator lamps. For Power Control Assembly connections, refer to table 3-6 and figure 3-12.

TABLE 3-6. POWER CONTROL ASSEMBLY CONNECTIONS

STARTING LOCATION	CONNECT	TO	WITH	TERMINATING LOCATION
Power Control Assembly	J504	P504	W102	Power Control Assembly
	J501	P501	W102	Power Control Assembly
	J503	P503	W102	Power Control Assembly
	J502	P502	W102	Power Control Assembly

(6) MODULATOR ASSEMBLY.—To mount the Modulator Assembly, proceed as described in the following paragraphs:

(*a*) REPLACING COMPONENTS REMOVED PRIOR TO SHIPMENT.—Replace all components removed prioı to shipment as follows:

1. Return all tubes to their proper sockets as indicated by type designations on chassis.

2. Return vacuum-type capacitors. Refer to parts list, using the symbol stamped on the chassis, the JAN number in the parts list, and the JAN number on the capacitor to determine the correct location.

(*b*) INSTALLATION. — The Modulator Assembly is comprised of two chassis—an audio chassis and a modulation transformer and filter chassis. To install the Modulator Assembly, proceed as described below (see figures 3-9 and 3-10).

1. MODULATION TRANSFORMER AND FILTER CHASSIS.—Mount the modulation transformer and filter chassis in the top, rear section of the left-hand cabinet. Bolt it to the cabinet frame with the hardware supplied.

2. AUDIO CHASSIS.—Mount the audio chassis directly in front of the modulation transformer and filter chassis. Bolt it to the cabinet frame with the hardware supplied.

(*c*) CONNECTIONS. — To connect the Modulator Assembly, refer to table 3-7 and figure 3-12.

TABLE 3-7. MODULATOR ASSEMBLY CONNECTIONS

STARTING LOCATION	CONNECT	TO	WITH	TERMINATING LOCATION
Audio Chassis Terminal Board TB603	Terminal 18	Terminal 2 of TB630	W102	R-F Assembly Cabinet
	Terminal 14	Terminal 12 of TB630	W102	R-F Assembly Cabinet
Audio Chassis Terminal Board TB601	Terminal 1	Terminal 3 of P503 Terminal 14 of P103	W102	Power Control Assembly R-F Assembly
	Terminal 2	Terminal 4 of TB641	W102	Blower Assembly
	Terminal 3	Terminal 17 of P801	W102	Dial Control Assembly
	Terminal 4	Terminal 4 of TB402	W102	Filter Chassis
	Terminal 5	Terminal 1 of P680	W102	Power Change Assembly
	Terminal 6	Modulator PLATE CURRENT meter M661	W102	Transmitter Cabinet
Terminal Board TB602	Terminal 7	Terminal 12 of P103 Terminal 11 of P801	W102 W102	R-F Assembly Dial Control Assembly
	Terminal 8	Terminal 8 of P103 Terminal 12 of P501	W102 W102	R-F Assembly Power Control Assembly
	Terminal 9	Terminal 11 of P503	W102	Power Control Assembly
	Terminal 10	Terminal 10 of P501	W102	Power Control Assembly
	Terminal 11	Terminal 19 of P501	W102	Power Control Assembly
	Terminal 12	Terminal 5 of P501	W102	Power Control Assembly

TABLE 3-7. MODULATOR ASSEMBLY CONNECTIONS—Continued

STARTING LOCATION	CONNECT	TO	WITH	TERMINATING LOCATION
Modulation Transformer and Filter Chassis Transformer T691	Terminal P	E601	W105	Audio Chassis
	Terminal B (center tap)	E603 Terminal B of T691	W105	Audio Chassis Modulation Transformer
	Terminal P	E602	W105	Audio Chassis
	Terminal RF	E604	W105	Audio Chassis
	Terminal B	Terminal B (center tap) Junction of R401 and L402	W105 W105	Modulation Transformer Filter Chassis
	Terminal 7 of L691	E680	W106	Power Change Assembly

(7) POWER CHANGE ASSEMBLY.—Mount the Power Change Assembly in the rear of the transmitter cabinet, below the modulation transformer and filter chassis. (See figures 3-9 and 3-10.) Bolt it to the cabinet frame. For Power Change Assembly connections, refer to table 3-8 and figure 3-12.

TABLE 3-8. POWER CHANGE ASSEMBLY CONNECTIONS

STARTING LOCATION	CONNECT	TO	WITH	TERMINATING LOCATION
Power Change Assembly	P680	J680	W106	
	E680	Terminal 7 of L691	W106	Filter Chassis
	E681	P106	W106	R-F Assembly

(8) DIAL CONTROL ASSEMBLY.—Mount the Dial Control Assembly directly in front of the Power Change Assembly. (See figures 3-9 and 3-10.) Bolt it to the cabinet frame. Connect P802 to J802 and P801 to J801. (See figure 3-12.)

(9) SERVICE POWER SUPPLY.—Mount the Service Power Supply in the rear of the transmitter cabinet, below the Power Change Assembly. (See figures 3-9 and 3-10.) Bolt it to the cabinet frame with the hardware supplied. For Service Power Supply connections, refer to table 3-9 and figure 3-12.

TABLE 3-9. SERVICE POWER SUPPLY CONNECTIONS

STARTING LOCATION	CONNECT	TO	WITH	TERMINATING LOCATION
Service Power Supply Transformer T701	Terminal 7	Terminal 2 of TB641	W102	Blower Assembly
	Terminal 1	Terminal 16 of P501	W102	Power Control Assembly
Service Power Supply	J701	P1001	W701	Power Supply PP-454/FRT-5
	J702	J3108	W702	R-F Oscillator O-243/FRT-24

(10) POWER SUPPLY PP-454/FRT-5.—Power Supply PP-454/FRT-5 is mounted in the relay rack, located in the left-hand cabinet. To mount the Power Supply, proceed as described below (see figures 3-9 and 3-10).

(*a*) Remove vertical style strips from relay rack on the transmitter cabinet.

(*b*) Mount the Power Supply at the bottom of the relay rack. Bolt it to the relay rack.

(*c*) For Power Supply PP-454/FRT-5 connections, refer to table 3-10 and figure 3-12.

TABLE 3-10. POWER SUPPLY PP-454/FRT-5 CONNECTIONS

STARTING LOCATION	CONNECT	TO	WITH	TERMINATING LOCATION
Power Supply PP-454/FRT-5	P1001	J701	W701	Service Power Supply
	J1001	J3107	W704	R-F Oscillator O-243/FRT-24

(11) R-F OSCILLATOR O-243/FRT-24.—R-F Oscillator O-243/FRT-24 is mounted in the relay rack, located in the left-hand cabinet. To mount the r-f oscillator, proceed as directed below (see figures 3-9 and 3-10).

(*a*) Mount the R-F Oscillator above Power Supply PP-454/FRT-5. Bolt it to the relay rack.

(*b*) For R-F Oscillator O-243/FRT-24 connections, refer to table 3-11 and figure 3-12.

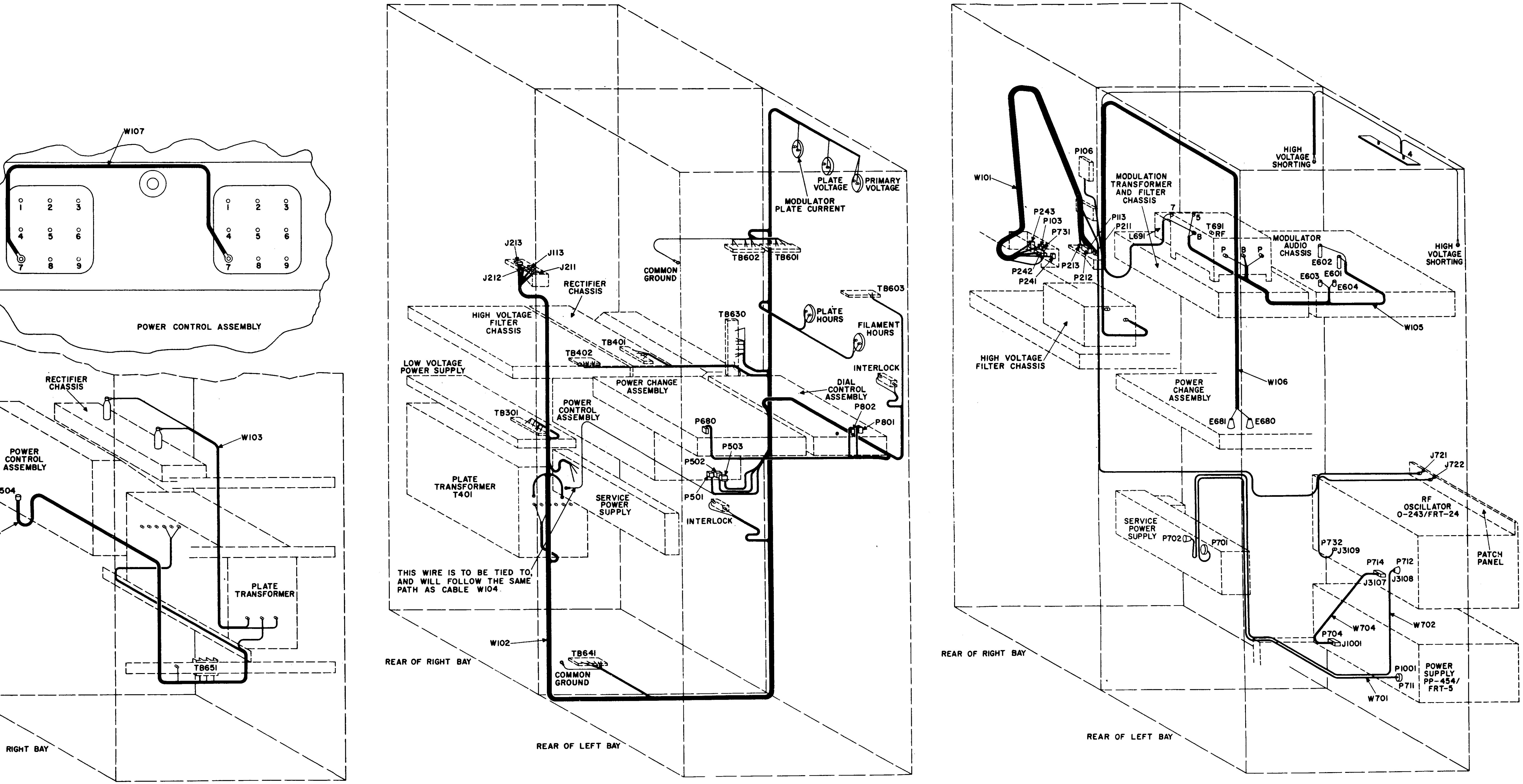
TABLE 3-11. R-F OSCILLATOR O-243/FRT-24 CONNECTIONS

STARTING LOCATION	CONNECT	TO	WITH	TERMINATING LOCATION
R-F Oscillator O-243/FRT-24	J3108	J702	W702	Service Power Supply
	J3107	J701	W701	Service Power Supply
	J3104			
	J3105			
	J3106			
	J3109	P732	J722	R-F Oscillator O-243/FRT-24

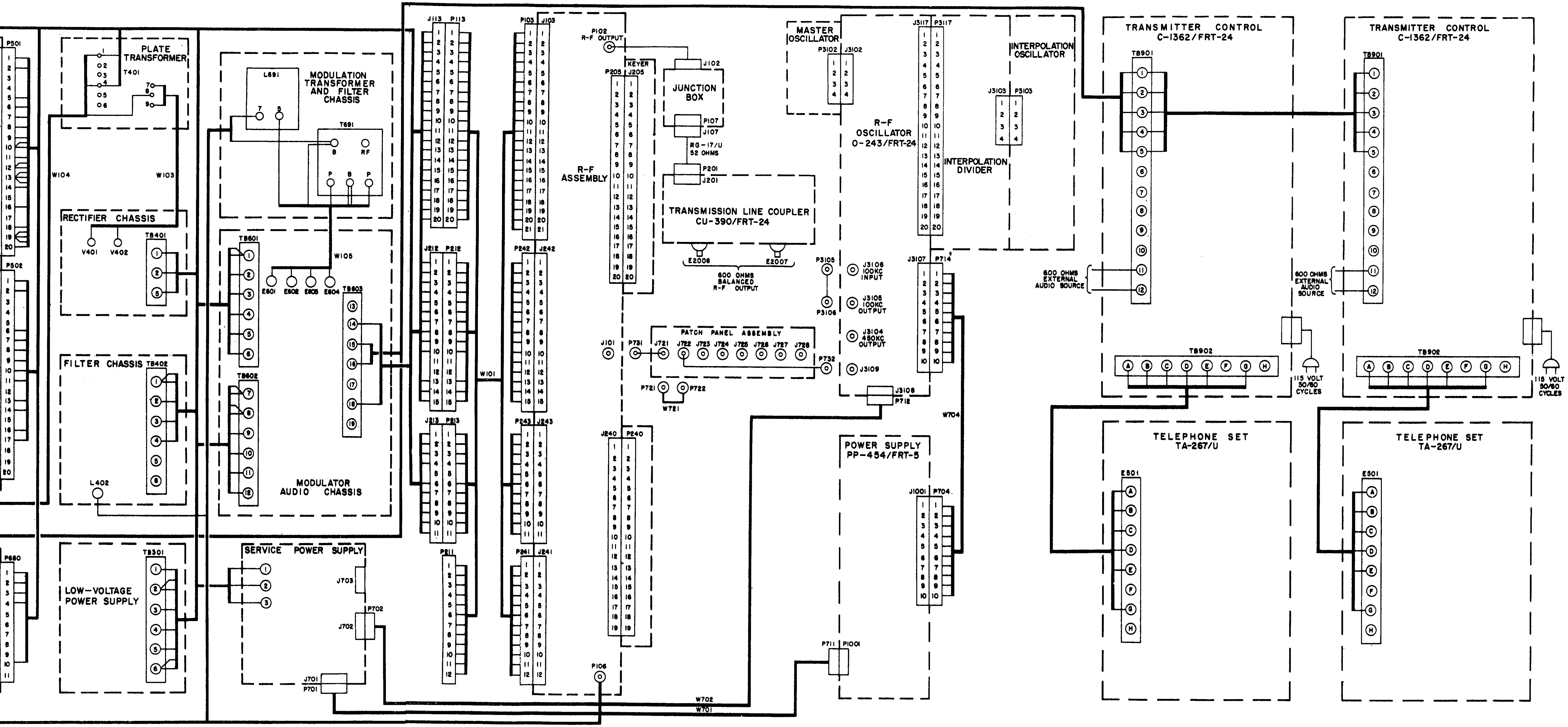
(12) PATCH PANEL ASSEMBLY.—Mount the Patch Panel Assembly in the relay rack, located in the left-hand cabinet, directly above R-F Oscillator O-243/FRT-24. (See figure 3-9.) For Patch Panel Assembly connections, refer to table 3-12 and figure 3-12.

TABLE 3-12. PATCH PANEL ASSEMBLY CONNECTIONS

STARTING LOCATION	CONNECT	TO	WITH	TERMINATING LOCATION
Patch Panel Assembly	J722	J721	W721	Patch Panel Assembly
	P732	J3109	RG-17/U	R-F Oscillator O-243/FRT-24
	P731	J101	RG-17/U	R-F Assembly



Figur 3-12. Transmitt r Cabin t Fram Cabling Diagram



Figur 3-13. Radi Transmitting S t AN/FRT-24, Intercabinet Cabling

WIRE ROUTING AND COLOR CODE DATA

DIAL CONTROL ASSEMBLY

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
J801-2	J502-10	Power Control	RB9125
J801-3	J243-9	R-F Assembly	RB902
J801-5	J503-1	Power Control	RB9023
J801-6	J243-1	R-F Assembly	RB936
J801-7	J503-9	Power Control	RB95
J801-8	J243-3	R-F Assembly	RB956
J801-9	J502-10	Power Control	RB9125
J801-10	J243-4	R-F Assembly	RB9256
J801-11	J503-8	Power Control	RB91
J801-11	TB602-7	Modulator A. C.	RB91
J801-12	J243-2	R-F Assembly	RB9235
J801-12	J502-7	Power Control	RB9235
J801-13	J503-6	Power Control	RB916
J801-15	J503-7	Power Control	RB9356
J801-16	J503-4	Power Control	RB9236
J801-17	TB601-3	Modulator A. C.	RB9
J801-17	C. G.-4	Mod. Cabinet	RB9
J801-19	J503-14	Power Control	RB915
J801-20	J501-6	Power Control	RB925
J802-1	J242-1	R-F Assembly	RB90
J802-2	J242-2	R-F Assembly	RB91
J802-3	J242-3	R-F Assembly	RB92
J802-4	J242-4	R-F Assembly	RB93
J802-5	J242-5	R-F Assembly	RB95
J802-6	J242-6	R-F Assembly	RB96
J802-7	J242-7	R-F Assembly	RB912
J802-8	J242-8	R-F Assembly	RB913
J802-9	J242-9	R-F Assembly	RB915
J802-10	J242-10	R-F Assembly	RB916
J802-12	J502-2	R-F Assembly	RB905
J802-13	J242-13	R-F Assembly	RB923
J802-14	J242-14	R-F Assembly	RB925
J802-15	J242-15	R-F Assembly	RB926

POWER CONTROL ASSEMBLY

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
J501-1	TB301-1	L. V. Pwr.	RB936
J501-2	TB301-3	L. V. Pwr.	RB936
J501-2	TB301-3	L. V. Pwr.	RE93
J501-5	TB602-12	Modulator A. C.	RB905
J501-6	J103-10	R-F Assembly	RB925
J501-7	TB641-1	Blower Cabinet	RC902
J501-8	J103-20	R-F Assembly	RB935
J501-9	J103-19	R-F Assembly	RB96
J501-10	TB602-10	Modulator A. C.	RB95
J501-10	J103-18	R-F Assembly	RB95
J501-11	J103-17	R-F Assembly	RB926
J501-12	J680-3	Power Change	RB9125
J501-12	TB602-8	Modulator A. C.	RB9125
J501-13	J243-11	R-F Assembly	RB91
J501-13	J243-1	R-F Assembly	RB91
J501-13	J680-4	Power Change	RB91
J501-14	TB401-2	Rectifier F. C.	RB912
J501-16	TB401-2	Rectifier F. C.	RB912
J501-18	F. H.-1	Trans. Cabinet	RB903
J501-19	J103-17	R-F Assembly	RB90
J501-19	TB301-2	L. V. Pwr.	RE90
J501-19	TB602-11	Modulator A. C.	RB90
J501-20	C. G.-7	R-F Cabinet	RB9
J502-1	C. G.-4	Mod. Cabinet	RB9
J502-2	J802-12	Dial Control	RB905
J502-6	J243-7	R-F Assembly	RB9126
J502-7	J801-12	Dial Control	RB9235
J502-8	J103-4	R-F Assembly	RB926
J502-9	J103-2	R-F Assembly	RB903
J502-10	J801-2	Dial Control	RB9125
J502-11	TB630-4	R-F Cabinet	RAS91
J502-13	J103-3	R-F Assembly	RAS96
J502-14	TB630-2	R-F Cabinet	RAS95
J502-16	TB301-5	L. V. Pwr.	RAS92
J502-17	TB630-3	R-F Cabinet	RAS93
J503-1	J801-5	Dial Control	RB9023
J503-3	TB601-1	Modulator A. C.	RB912
J503-4	J801-16	Dial Control	RB9236
J503-6	J801-13	Dial Control	RB9236

POWER CONTROL ASSEMBLY (Cont.)

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
J503-7	J801-15	Dial Control	RB9356
J503-7	J103-6	R-F Assembly	RB9356
J503-8	J801-11	Dial Control	RB91
P503-9	J801-7	Dial Control	RB95
J503-10	J801-9	Dial Control	RB9026
J503-11	TB602-9	Modulator A. C.	RB902
J503-12	D. I.-1	Mod. Cabinet	RB9256
J503-13	J103-15	R-F Assembly	RB906
J503-14	J103-11	R-F Assembly	RB913
J503-14	J801-19	Dial Control	RB915
J503-14	TB641-2	Blower Cabinet	RC903
J503-15	J103-16	R-F Assembly	RB9025
J504-A	TB651-1	R-F Cabinet	RG91
J504-B	TB651-2	R-F Cabinet	RG90
J504-E	T401-1	Plate Trans	RG95
J504-F	T401-4	Plate Trans	RG96

PLATE TRANSFORMER

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
T401-1	J504-E	Power Control	RG95
T401-1	P. H.-4	Trans. Cabinet	RB95
T401-4	J504-F	Power Control	RG96
T401-4	P. H.-3	Trans. Cabinet	RB96
T401-7	V401	Rectifier Chassis	KEO
T401-9	V402	Rectifier Chassis	KEO

RECTIFIER CHASSIS

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
TB401-1	TB301-2	L. V. Pwr.	RB90
TB401-2	J501-14	Power Control	RB912
TB401-5	TB402-1	Filter Chassis	RB9
V401	T401-7	Plate Trans.	KEO
V402	T401-9	Plate Trans.	KEO

FILTER CHASSIS

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
TB402-1	TB401-5		RB9
TB402-1	P. V.-4	Trans. Cabinet	RC9
TB402-2	C. G.-7	R-F Cabinet	RB9
TB402-3	TB301-6	L. V. Pwr.	RB92
TB402-4	TB601-4	Modulator A. C.	RB935
L402	T691-B	Modulator T. F.	KEO

POWER CHANGE ASSEMBLY

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
J680-1	TB601-5	Modulator A. C.	RB936
J680-2	J103-7	R-F Assembly	RB93
J680-3	J501-12	Power Control	RB9125
J680-4	J501-13	Power Control	RB91
J680-10	C. G.-4	Trans. Cabinet	RB9
E680	L691-7	Modulator T. F.	KEO
E681	P106	R-F Assembly	KEO

LOW VOLTAGE POWER SUPPLY

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
TB301-1	J501-1	Power Control	RB936
TB301-2	TB401-1	Rectifier Chassis	RB90
TB301-2	J501-19	Power Control	RE90
TB301-3	J501-2	Power Control	RE93
TB301-4	C. G.-4	Mod. Cabinet	RB9
TB301-5	J502-16	Power Control	RAS92
TB301-6	J103-9	R-F Assembly	RB92
TB301-6	TB402-3	Filter Chassis	RB92

MODULATOR TRANSFORMER AND FILTER CHASSIS

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
L691-5	E604	Modulator A. C.	KEO
L691-7	E680	Power Change	KEO
T691-B	T691-B	Modulator T. F.	KEO
T691-B	E603	Modulator A. C.	KEO
T691-P	E601	Modulator A. C.	KEO
T691-P	E602	Modulator A. C.	KEO
T691-B	L402	Filter Chassis	KEO

MODULATOR AUDIO CHASSIS

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
E601	T691-P	Modulator T. F.	KEO
E602	T691-P	Modulator T. F.	KEO
E603	T691-B	Modulator T. F.	KEO
E604	L691-5	Modulator T. F.	KEO
TB601-1	J503-3	Power Control	RB912
TB601-1	J103-14	R-F Assembly	RB912
TB601-2	TB641-4	Blower Cabinet	RB913
TB601-3	J801-17	Dial Control	RB9
TB601-4	TB402-4	Filter Chassis	RB935
TB601-5	J680-1	Power Change	RB936
TB601-6	Mod. Plt. Cur.-1	Trans. Cabinet	RB915
TB602-7	J801-11	Dial Control	RB91
TB602-7	J103-12	R-F Assembly	RB91
TB602-8	J501-12	Power Control	RB9125
TB602-8	J103-8	R-F Assembly	RB9125
TB602-9	J503-11	Power Control	RB902
TB602-10	J501-10	Power Control	RB905
TB602-11	J501-19	Power Control	RB90
TB602-12	J501-5	Power Control	RB905
TB603-14	TB630-12	R-F Cabinet	RAS9
TB603-15	TB901-	C-1362/FRT-24	not provided
TB603-16	TB901-	C-1362/FRT-24	not provided
TB603-18	TB630-2	R-F Cabinet	RAS95

SERVICE POWER SUPPLY

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
1	TB641-2	Blower Cabinet	RB903
2	J501-16	Power Control	RB906
3	C. G.-4	Mod. Cabinet	RB9
J701	J3108	O-243/FRT-24	uncoded
J702	P1001	PP-454/FRT-5	uncoded

R-F ASSEMBLY

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
P106	E681	Power Change	KEO
J103-1	C. G.-7	R-F Cabinet	RC9
J103-2	J502-9	Power Control	RB903
J103-3	J502-13	Power Control	RAS96
J103-4	J502-8	Power Control	RB9125
J103-5	TB630-12	R-F Cabinet	RAS9
J103-6	J503-7	Power Control	RB9356
J103-7	J680-2	Power Change	RB93
J103-8	TB602-8	Modulator A. C.	RB9125
J103-9	TB301-6	L. V. Pwr.	RB92
J103-10	J501-6	Power Control	RB925
J103-11	J503-14	Power Control	RB913
J103-12	TB602-7	Modulator A. C.	RB91
J103-13	D. I.-5	R-F Cabinet	RB905
J103-14	TB601-1	Modulator A. C.	RB912
J103-15	J503-13	Power Control	RB906
J103-16	J503-15	Power Control	RB9025
J103-17	J501-19	Power Control	RB90
J103-18	J501-10	Power Control	RB95
J103-19	J501-9	Power Control	RB96
J103-20	J501-8	Power Control	RB926
J241-1	P211-1	Cabinet Frame	RB9023
J241-2	P211-2	Cabinet Frame	RB9025
J241-3	P211-3	Cabinet Frame	RB9026
J241-4	P211-4	Cabinet Frame	RB9123
J241-5	P211-5	Cabinet Frame	RB9125
J241-6	P211-6	Cabinet Frame	RB9126
J241-7	P211-7	Cabinet Frame	RB9235
J241-8	P211-8	Cabinet Frame	RB9236
J241-9	P211-9	Cabinet Frame	RB9256
J241-10	P211-10	Cabinet Frame	RB9356
J241-11	P211-11	Cabinet Frame	RB903
J241-12	P211-12	Cabinet Frame	no con.
J242-1	J802-1	Dial Control	RB90
J242-2	J802-2	Dial Control	RB91
J242-3	J802-3	Dial Control	RB92
J242-4	J802-4	Dial Control	RB93
J242-5	J802-5	Dial Control	RB95

R-F ASSEMBLY (Cont.)

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
J242-6	J802-6	Dial Control	RB96
J242-7	J802-7	Dial Control	RB912
J242-8	J802-8	Dial Control	RB913
J242-9	J802-9	Dial Control	RB915
J242-10	J802-10	Dial Control	RB916
J242-13	J802-13	Dial Control	RB923
J242-14	J802-14	Dial Control	RB925
J242-15	J802-15	Dial Control	RB926
J243-1	J801-6	Dial Control	RB936
J243-2	J801-12	Dial Control	RB9235
J243-3	J801-8	Dial Control	RB956
J243-4	J801-10	Dial Control	RB9256
J243-6	C. G.-4	Mod. Cabinet	RB9
J243-7	J502-6	Power Control	RB9126
J243-8	TB641-3	Blower Cabinet	RB916
J243-9	J801-3	Dial Control	RB902
J243-10	J501-11	Power Control	RB926
J243-11	J501-13	Power Control	RB91

R-F OSCILLATOR O-243/FRT-24

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
J3108	J702	Svc. Pwr. Sup.	uncoded
J3107-1	J1001-1	PP-454/FRT-5	RE924
J3107-2	J1001-2	PP-454/FRT-5	RE924
J3107-3	J1001-3	PP-454/FRT-5	RE9124
J3107-4	J1001-4	PP-454/FRT-5	RE924
J3107-5	J1001-5	PP-454/FRT-5	RC9324
J3107-6	J1001-6	PP-454/FRT-5	RC9224
J3107-7	J1001-7	PP-454/FRT-5	RC9624
J3107-8	J1001-8	PP-454/FRT-5	no con.
J3107-9	J1001-	PP-454/FRT-5	no con.
J3107-10	J1001-	PP-454/FRT-5	no con.

POWER SUPPLY PP-454/FRT-5

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
J1001-1	J3107-1	O-243/FRT-24	RE924
J1001-2	J3107-2	O-243/FRT-24	RE924
J1001-3	J3107-3	O-243/FRT-24	RE9124
J1001-4	J3107-4	O-243/FRT-24	RE924
J1001-5	J3107-5	O-243/FRT-24	RC9324
J1001-6	J3107-6	O-243/FRT-24	RC9224
J1001-7	J3107-7	O-243/FRT-24	RC9624
J1001-8	J3107-8	O-243/FRT-24	no con.
J1001-9	J3107-	O-243/FRT-24	no con.
J1001-10	J3107-	O-243/FRT-24	no con.

TRANSMITTER CABINET

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
F. H.-1	PRI. V.-5	R-F Cabinet	RB903
F. H.-1	J501-18	Power Control	RB903
F. H.-2	PRI. V.-6	R-F Cabinet	RB91
F. H.-2	J501-13	Power Control	RB91
P. H.-3	T401-4	Plate Transf.	RB96
P. H.-4	T401-1	Plate Transf.	RB95

MODULATOR CABINET

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
D. I.-1	D. I.-4	R-F Cabinet	RB95
D. I.-2	J503-12	Power Control	RB9256
H. V. S.-3	P. V.-3	Trans. Cabinet	KEO
C. G.-4	C. G.-7	R-F Cabinet	RC9

R-F CABINET

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
TB630-1	C. G.-7	R-F Cabinet	RB9
TB630-1	TB901-1	C-1362/FRT-24	not supplied
TB630-2	TB901-2	C-1362/FRT-24	not supplied
TB630-2	TB603-18	Modulator A. C.	RAS95
TB630-2	J502-14	Power Control	RAS95
TB630-3	J502-17	Power Control	RAS93
TB630-4	J502-11	Power Control	RAS91
TB630-4	TB901-3	C-1362/FRT-24	not supplied
TB630-12	TB603-14	Modulator A. C.	RAS9

R-F CABINET (Cont.)

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
TB630-12	J103-5	R-F Assembly	RAS9
D. I.-4	D. I.-1	Mod. Cabinet	RB95
D. I.-5	J103-13	R-F Assembly	RB905
H.V.S.-6	P. V.-3	Trans. Cabinet	KEO
H.V.S.-6	T691B	Modulator T. F.	KEO
C. G.-7	C. G.-4	Mod. Cabinet	RC9
Ground 8	C. G.-7	R-F Cabinet	RC9
TB651-1	J504-A	Power Control	RG91
TB651-2	J504-B	Power Control	RG90
TB651-3	Ground 8	R-F Cabinet	RG9

BLOWER CABINET

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
TB641-1	J501-7	Power Control	RC902
TB641-2	1	Svc. Pwr. Sup.	RB903
TB641-2	J503-14	Power Control	RC903
TB641-3	J801-12	Dial Control	RB916
TB641-4	TB601-2	Modulator A. C.	RB913
Ground 5	C. G.-4	Mod. Cabinet	RB9

TRANSMITTER CONTROL C-1362/FRT-24

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
TB901-1	TB630-1	R-F Cabinet	not supplied
TB901-2	TB630-2	R-F Cabinet	not supplied
TB901-3	TB630-4	R-F Cabinet	not supplied
TB901-4	TB603-15	Modulator A. C.	not supplied
TB901-5	TB603-16	Modulator A. C.	not supplied
TB902-A	E501-A	TA-267/U	Shield
TB902-B	E501-B	TA-267/U	Black
TB902-C	E501-C	TA-267/U	Red
TB902-D	E501-D	TA-267/U	Green
TB902-E	E501-E	TA-267/U	Blue
TB902-G	E501-G	TA-267/U	Brown

TELEPHONE SET TA-267/U

FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
E501-A	TB902-A	C-1362/FRT-24	Shield
E501-B	TB902-B	C-1362/FRT-24	Black
E501-C	TB902-C	TA-267/U	Red
E501-D	TB902-D	TA-267/U	Green
E501-E	TB902-E	TA-267/U	Blue
E501-G	TB902-G	TA-267/U	Brown

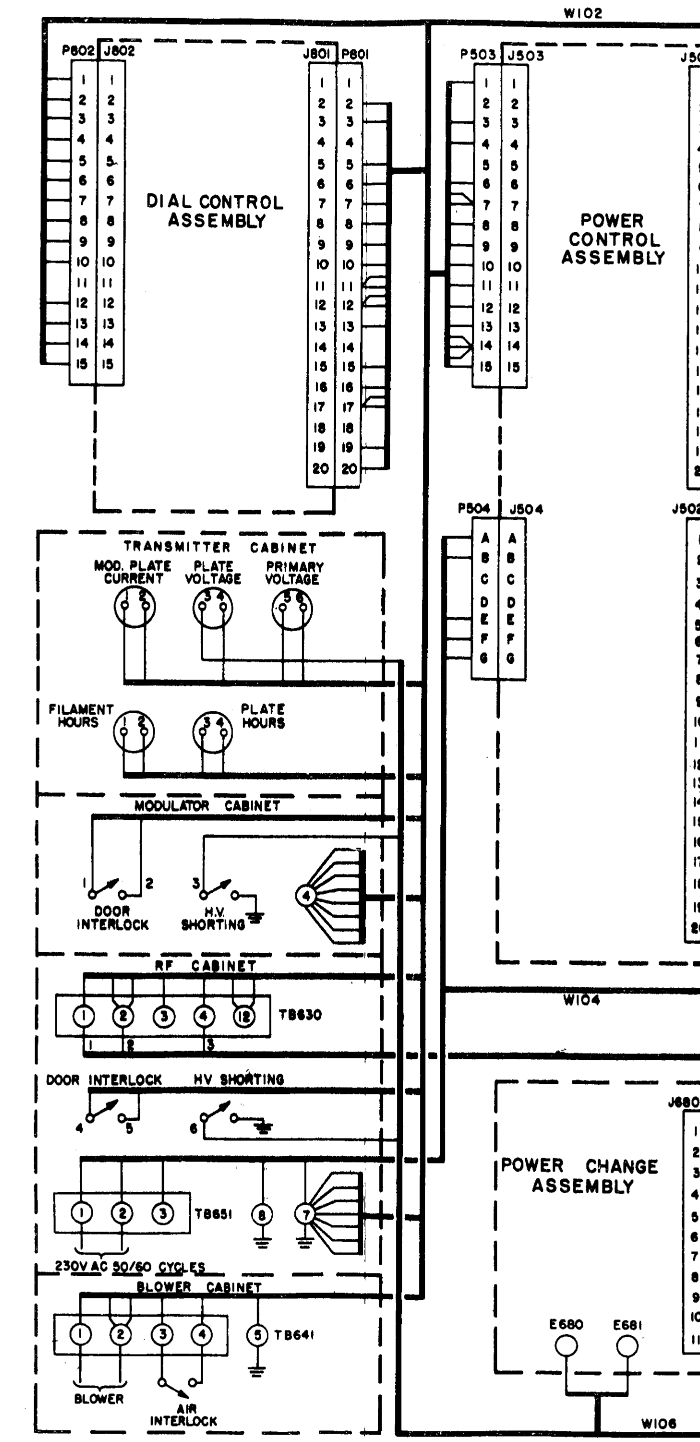
TRANSMITTER CABINET

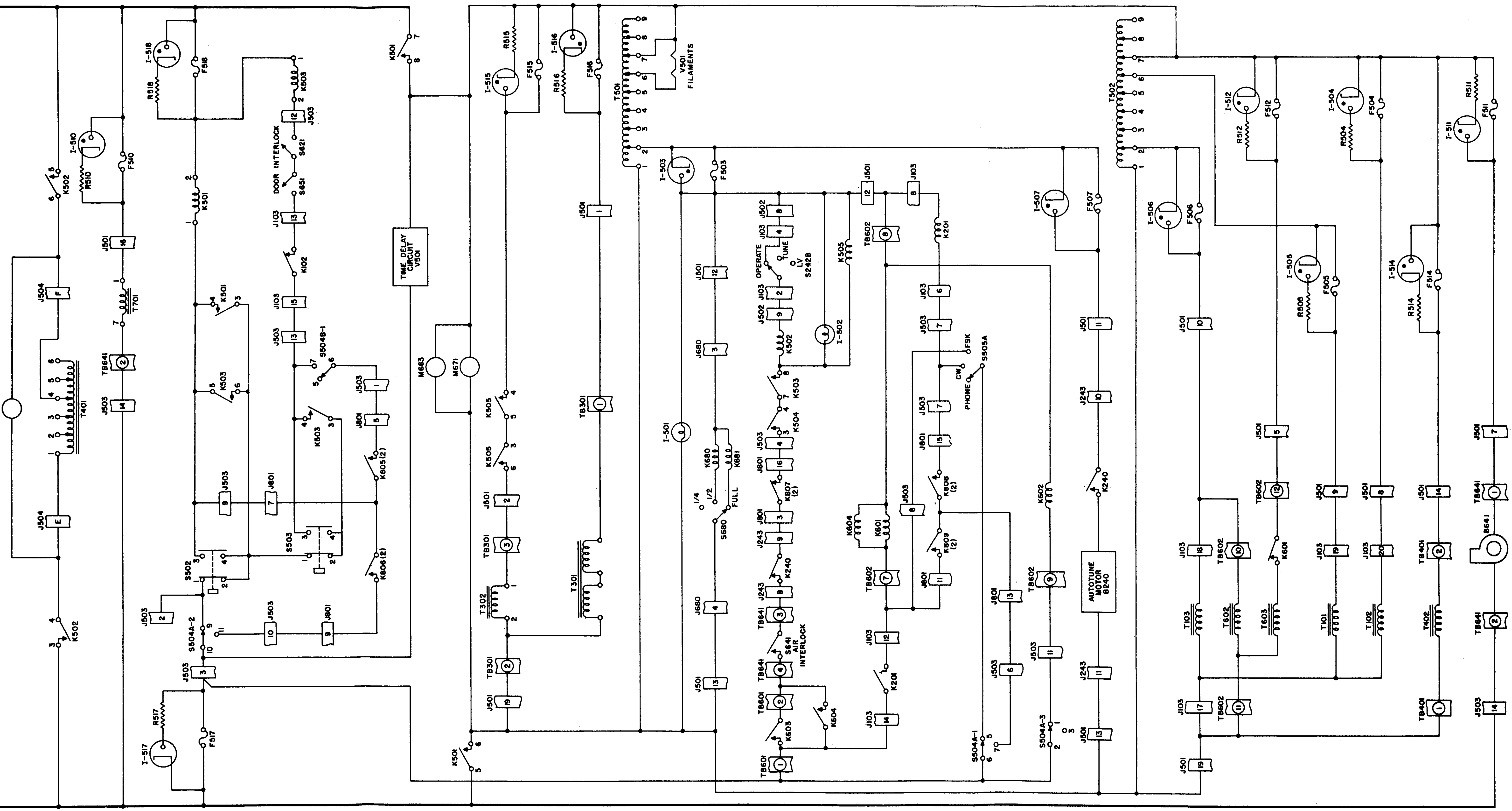
FROM TERMINAL	TO TERMINAL	TO UNIT	COLOR CODE
Mod P C-2	TB601-6	Modulator A. C.	RB915
Mod P C-1	P. V.-4	Trans. Cabinet	RC9
P. V.-3	H. V. S.-3	Mod. Cabinet	KEO
P. V.-3	H. V. S.-3	R-F Cabinet	KEO
P. V.-4	TB402-1	Filter Chassis	RC9
PRI. V.-5	F. H.-1	Trans. Cabinet	RB903
PRI. V.-6	F. H.-2	Trans. Cabinet	RB91

See figure 7-64 for interpretation of Color Code Data.

ABBREVIATIONS

F. H.-1 is Filament Hours 1
Modulator A. C. is Modulator Audio Chassis
L. V. Pwr. is Low Voltage Power Supply
Rectifier F. C. is Rectifier Filter Chassis
C. G.-7 is Channel Ground 7
D. I.-7 is Door Interlock 1
P. H.-4 is Plate Hours 4
Modulator T. F. is Modulator Transformer and Filter Chassis
PRI. V.-5 is Primary Voltage 5
H. V. S.-3 is High Voltage Shorting 3
P. V.-3 is Plate Voltage 3
Mod. P. C.-1 is Modulating Plate Current 1
Svc. Pwr. Sup. is Service Power Supply





Figur 3-14. P w r C ntrol Distributi n Ladder

5. INITIAL ADJUSTMENTS

a. GENERAL.—The following adjustments are to be made after the equipment is completely installed. It is assumed that the equipment has been properly connected with other units of the system. If difficulty is experienced in obtaining the results specified in these procedures, refer to the adjustments and corrective procedures included in the maintenance section, Section 7.

All tuning and operating controls necessary for local operation, except the POWER CHANGE switch, located on the Power Change Assembly, are located on the front panel of the transmitter. Power, emission selection, and local-remote switches are mounted on the front of the Power Control Assembly. Transmitter tuning controls are located on the front panel of the R-F Assembly. The modulator gain control is operated by means of a knob on the modulator front panel; the clipping level control and modulator bias controls are screwdriver-adjustable potentiometers accessible from the front panel.

A remote control unit (Transmitter Control CU-1362/FRT-24) can be used to select Autotune channels and the type of emission, and to control application of plate and filament voltages within the transmitter. The transmitter may be keyed at the remote unit, or for phone operation, a speech amplifier in the remote unit can be used to feed audio to the input of the transmitter modulator.

All switching functions necessary to transfer control between local and remote operation are performed by the LOCAL-REMOTE switch, located on the panel of the Power Control Assembly.

b. MECHANICAL INSPECTION.—After completing the setting up of the transmitter and the making of external connections, make a thorough inspection of the equipment and its associated wiring.

c. PRELIMINARY CHECKS AND CONTROL SETTINGS.—Before applying primary power to the equipment make the following checks and control settings.

(1) Check primary power connections and see that transmission line and antenna are connected properly.

(2) Check to see that all tubes, fuses, and indicator lamps are inserted in the proper receptacles.

(3) Check to see that all crystals are installed.

(4) Make certain that all protective grounding straps and devices are removed, and that all doors and interlock switches are closed.

(5) Set controls as follows:

(*a*) POWER CONTROL ASSEMBLY.

1. Set PRIMARY CIRCUIT BREAKER to OFF.

2. Push in PLATE on-off switch.

3. Push in FILAMENT on-off switch.

4. Set LOCAL REMOTE switch to LOCAL.

5. Set emission-selector switch to CW.

(*b*) POWER CHANGE ASSEMBLY.—Set POWER CHANGE switch to ¼.

(*c*) R-F ASSEMBLY.

1. Set CHANNEL SELECTOR to channel 1.

2. Set BAND SWITCH to 1.

3. Set LV-TUNE-OPERATE switch to TUNE.

4. Set TEST KEY to neutral (center) position.

5. Set EXCITER TUNING control to 15.

6. Set DRIVER PLATE TUNING control to 12.

7. Set P.A. PLATE TUNING control to 26.

8. Set P.A. LOADING control to 15.

9. Set LOADING COIL SWITCH to 11.

(*d*) MODULATOR ASSEMBLY.

1. Set LEFT MOD BIAS to midposition.

2. Set RIGHT MOD BIAS to midposition.

3. Set CLIPPING LEVEL to midposition.

4. Set AUDIO GAIN to 5.

(*e*) POWER SUPPLY PP-454/FRT-5.—Set ON-OFF switch to OFF.

(*f*) R-F OSCILLATOR O-243/FRT-24.

1. Set ON-OFF switch to OFF.

2. Set SET UP-OPERATE switch to SET UP.

(*g*) TRANSMITTER CONTROL C-1362/FRT-24.—Set ON-OFF switch to OFF.

d. LOCAL OPERATION.—Before making initial adjustments for local operation, check to see that the proper crystals are inserted in their respective crystal holders. Then proceed as directed below.

CAUTION

Before energizing the transmitter for the first time, make sure that the power line and antenna are connected properly.

(1) SPARK GAP CHECK.—With the power off, use a feeler gauge to check the spark gap across transformer T691, located on the modulation transformer and audio chassis. The correct spacing is 0.050 inch ±0.005.

(2) FILAMENT AND BLOWER CHECK.—To check the filament and blower circuits, proceed as follows:

(*a*) Set PRIMARY CIRCUIT BREAKER to ON.

(*b*) Pull out FILAMENT on-off switch. This will turn on the FILAMENT indicator lamp and all rectifier and tube filaments, and blower B641 will start. PRIMARY VOLTAGE meter M663 indicates the amplitude of the primary voltage.

(*c*) Set LOCAL-REMOTE switch to LOCAL.

(*d*) Set emission-selector switch S505 to CW; modulator filaments should light up. Set emission-selector switch to PHONE; modulator filaments should go off.

(3) TIME DELAY CHECK.—To check the time delay, proceed as follows:

(*a*) Pull out PLATE on-off switch. After a delay of 30 seconds, PLATE indicator lamp should light.

(*b*) If this delay is incorrect, it is necessary to adjust the TIME DELAY control. Refer to Section 7.

(4) R-F ASSEMBLY CHECK.—To check the R-F Assembly, proceed as follows:

(*a*) Set LV-TUNE-OPERATE switch to TUNE. Listen for contacts of high-voltage plate relay K502 to close.

(*b*) Turn BAND SWITCH to band to be used.

(*c*) Turn CHANNEL SELECTOR switch to channel to be used. The CHANNEL INDICATOR should register the correct channel.

WARNING

Do not allow the power amplifier or driver to operate off resonance longer than is necessary, as prolonged operation at excessive plate dissipation may damage a tube. Do not load the stage to more than 550 milliamperes as indicated on the P.A. plate current meter.

If the power amplifier cannot be properly loaded with the loading coil switch in a position corresponding to the setting of the band switch, the antenna system is not presenting the proper impedance to the transmitter output circuit. Inspect the antenna system and feed line for faults, or modify the antenna system as necessary to ensure the proper impedance match.

(*d*) Set TEST KEY in locked (up) position.

(*e*) Adjust EXCITER TUNING control for maximum indication on DRIVER GRID meter M101.

(*f*) Adjust DRIVER PLATE TUNING control for minimum indication on DRIVER PLATE meter M102.

(*g*) Adjust P.A. PLATE TUNING control for minimum indication on P.A. PLATE meter M105.

(*h*) Set LV-TUNE-OPERATE switch to OPERATE.

(*i*) Adjust P.A. LOADING control for an indication of 450 to 550 milliamperes on P.A. PLATE meter.

(*j*) Release TEST KEY.

(5) MODULATOR ASSEMBLY.—To check the Modulator Assembly, proceed as follows:

(*a*) Set emission-selector switch to PHONE.

(*b*) Insert a microphone into MICROPHONE jack J601.

(*c*) Rotate LEFT MOD BIAS and RIGHT MOD BIAS controls to extreme counterclockwise positions.

(*d*) Depress microphone key.

(*e*) Adjust LEFT MOD BIAS control clockwise for an indication of 60 milliamperes on MODULATOR PLATE CURRENT meter M661.

(*f*) Adjust RIGHT MOD BIAS control clockwise to obtain a total modulator plate current of 120 milliamperes on MODULATOR PLATE CURRENT meter.

(*g*) Release microphone key.

(*h*) Connect a pickup loop to the vertical input of an oscilloscope, such as Dumont Model 208B, and couple the pickup loop to the 600-ohm transmission line.

(*i*) Adjust the horizontal sweep frequency of the oscilloscope between 300 and 800 cps.

(*j*) Connect an audio oscillator, such as Hewlett-Packard 200B, between terminals 15 and 16 of TB603 and adjust its output to 1000 cps.

(*k*) Set the AUDIO GAIN and CLIPPING LEVEL controls to midposition.

(*l*) Adjust the oscilloscope sweep frequency for a stationary pattern.

(*m*) Overmodulation will be indicated by the narrowing of the envelope pattern to a thin, bright line. Excessive clipping will be indicated by extreme flattening of both upward and downward peaks of modulation, and inability to modulate the carrier completely. With the sweep frequency set between 300 and 800 cps and with no modulation, carrier alone should appear on the scope as a broad, filled-in horizontal band; applying modulation (turning on the audio oscillator) will produce an envelope pattern. With normal modulation the upward and downward peaks of the pattern should appear symmetrical about the unmodulated carrier peak lines, and no bright lines or spots should appear at the center line of the envelope. A bright line or bright portions at this line, accompanied by flattening of the downward peaks, shows overmodulation. Normal practice is to set the AUDIO GAIN at the point where slight overmodulation occurs on peaks without clipping, then set the CLIPPING LEVEL control just below the 100-per cent modulation point.

(6) KEYER ADJUSTMENTS.—To adjust the keyer, pull the R-F Assembly forward, and then proceed as follows:

(*a*) Set LOCAL-REMOTE switch to REMOTE.

(*b*) Set emission-selector switch to PHONE.

(*c*) Connect a voltmeter, such as Hewlett-Packard 410B, or equivalent, to INPUT jack J201.

(*d*) Set POLARITY switch to positive position, and depress TEST KEY.

(*e*) Adjust INPUT ADJ. control for an indication of +30 volts on voltmeter.

(*f*) Release TEST KEY.

(*g*) Connect voltmeter to INVERTER jack J202.

(*h*) Adjust INVERTER ADJ. control for 0 volts as indicated on voltmeter.

(*i*) Connect voltmeter to FS jack J204.

(*j*) Adjust FS OUT ADJ. control so that voltage, as indicated by voltmeter, varies between at least —20 volts to +20 volts as TEST KEY is operated.

(*k*) Connect voltmeter to CW jack J203.

(*l*) Set emission-selector switch to CW.

(*m*) Depress TEST KEY.

(*n*) Adjust CW OUT ADJ. control for an indication of 0 volts on voltmeter.

(7) AUTOTUNE SYNCHRONIZATION CHECK. — Set the CHANNEL SELECTOR switch to the desired channel. A deviation of five divisions is permissible. If the readings are incorrect, refer to Section 7.

(8) POWER SUPPLY PP-454/FRT-5 CHECK.—To check Power Supply PP-454/FRT-5, proceed as follows:

(*a*) Turn ON-OFF switch to ON position. The POWER lamp should light.

(*b*) Rotate voltage switch to each position and check meter readings against figures opposite pointer on switch. The actual readings should be a little high if the supply is not loaded.

(9) R-F OSCILLATOR O-243/FRT-24.—Perform the following checks carefully, keeping alert to any evidence of an irregularity which might provide an indication of possible trouble:

(*a*) With 115-volt power connected to oscillator, observe CRYSTAL OVEN-HEAT ON light. It should come on, indicating that oven heater is working.

(*b*) Operate plate ON-OFF switch to ON position. This should turn on the PLATE indicator lamp.

(*c*) Connect RG-17/U cable to J3105 and J3106, located on rear of unit.

(*d*) Determine frequency which is to be set up for check, for example, 2, 439, 224 cps. Throw SET UP-OPERATE switch to OPERATE, and insert a headphone connector into PHONE jack on front panel.

(*e*) Set MASTER OSCILLATOR dial to approximate frequency—in this case, 24 on outer dial and 39 on inner dial.

(*f*) Set INTERPOLATION OSCILLATOR to difference between MASTER OSCILLATOR reading, and the 5-kc check point immediately below it. In the case above, this would be 42 on the outer dial and 24 on the inner dial.

Note

A CHECK POINT IS PROVIDED EVERY 5000 CYCLES, AND THE INTERPOLATION-OSCILLATOR READING ADDS TO THE FIRST CHECK POINT IMMEDIATELY BELOW THE READING OF THE MASTER OSCILLATOR. IN THE CASE ABOVE, THE FIRST CHECK POINT BELOW THE MASTER-OSCILLATOR READING WOULD BE 2,435,000 CYCLES; THUS, THE INTERPOLATION OSCILLATOR WOULD BE SET TO 4224 CYCLES.

(*g*) Set OUTPUT TUNING control as close as possible to desired frequency. A steady tone should be heard in the headphones.

(*h*) Readjust MASTER OSCILLATOR for a low-pitched tone (50—100 cps); then readjust OUTPUT TUNING control for loudest and clearest tone.

(*i*) To determine whether a-f-c motor and associated circuits are working properly, remove headphone-connector plug. The a-f-c motor should be heard going into operation.

(*j*) For RF Oscillator O-243A/FRT-24, set the PWR OUTPUT potentiometer R3163 (on the rear panel) to produce maximum output, to the clockwise stop.

(10) POWER OUTPUT CHECK.—To check the power output, proceed as follows:

(*a*) Set POWER CHANGE switch on Power Change Assembly to FULL. Depress TEST KEY. The PWR AMP PLATE meter should indicate 500 milliamperes, and the RF LINE CURRENT meter should indicate 4.4 amperes. Release TEST KEY.

(*b*) Set POWER CHANGE switch to $\frac{1}{2}$. Depress TEST KEY. The PWR AMP PLATE meter should indicate 353 milliamperes, and the RF LINE CURRENT meter should indicate 3.1 amperes. Release TEST KEY.

(*c*) Set POWER CHANGE switch to $\frac{1}{4}$. Depress TEST KEY. The PWR AMP PLATE meter should indicate 250 milliamperes, and the RF LINE CURRENT meter should indicate 2.2 amperes. Release TEST KEY.

e. REMOTE OPERATION.—The checks and adjustments for remote operation are the same as for local operation except place LOCAL-REMOTE switch to REMOTE after completing the tests for local operation. In addition, the following checks are necessary:

(1) GENERAL.—Make sure that Transmitter Control C-1362/FRT-24 is connected properly.

(2) CONTROL CHECK.—To make a control check, proceed as follows:

(*a*) Set ON-OFF switch to ON. The POWER indicator lamp should light.

12/10 (*b*) Dial A0 on EMISSION AND CHANNEL SELECTOR switch. This turns off the filaments and places the transmitter in standby operation.

(*c*) Dial A9. This disables the high voltage in the transmitter.

(*d*) Dial A1. This sets up the transmitter for c-w operation.

(*e*) Dial A3. This sets up the transmitter for phone operation.

(*f*) Dial 2. This sets up the transmitter on the second channel, and the CHANNEL meter should indicate 2.

(*g*) Dialing any other number sets up the transmitter to the channel dialed.

f. NEUTRALIZATION.—For neutralization procedure, refer to Section 7.

SECTION 4
OPERATION

1. INTRODUCTION

a. DESCRIPTION.—Radio Transmitting Set AN/FRT-24 is a radio-telephone and c-w transmitter for operation over the frequency range of 2 mc to 30 mc. Nominal power output for either type of transmission is one kilowatt, with provisions for operation at $\frac{1}{2}$ or $\frac{1}{4}$ power. Tuning of the transmitter to any one of ten pre-set channels is accomplished by means of a motor-driven Autotune system.

Radio Transmitting Set AN/FRT-24 consists of the following:

(1) Radio Transmitter T-440/FRT-24
- (*a*) R-F Assembly
- (*b*) Low-Voltage Power Supply
- (*c*) High-Voltage Power Supply
- (*d*) Power Control Assembly
- (*e*) Dial Control Assembly
- (*f*) Modulator Assembly
- (*g*) Power Change Assembly
- (*h*) Service Power Supply
- (*i*) Patch Panel Assembly
- (*j*) Cabinet Accessories

(2) R-F Oscillator O-243/FRT-24

(3) Power Supply PP-454/FRT-5

(4) Transmitter Control C-1362/FRT-24

(5) Transmission Line Coupler CU-390/FRT-24

(6) Telephone Set TA-267/U

A nine channel crystal oscillator within the R-F Assembly supplies excitation for the transmitter. Excitation may also be supplied to a tenth channel in the R-F Assembly by R-F Oscillator O-243/FRT-24 or from an outside source through the Patch Panel Assembly.

Radio Transmitting Set AN/FRT-24 may be operated locally by means of the controls on its panel, or from a remote location by means of Transmitter Control C-1362/FRT-24. Table 4-1 shows the location and function of each control.

TABLE 4-1. CONTROL LOCATION AND FUNCTION

ILLUSTRATION REFERENCE NO.	FUNCTIONAL DESIGNATION	LOCATION	LETTER DESIGNATION	TYPE OF COMPONENT	SYMBOL	PURPOSE OF CONTROL
4-1	PRIMARY CIRCUIT BREAKER	Power Control Assembly (front panel)	1	Circuit breaker	S501	Controls application of 230-volt power to entire transmission.
4-1	FILAMENT	Power Control Assembly (front panel)	2	Momentary switch	S502	Pulling knob energizes transmitter filaments; pushing knob de-energizes filaments.
4-1	PLATE	Power Control Assembly (front panel)	3	Momentary switch	S503	Pulling knob energizes high-voltage and low-voltage plate transformers; pushing knob de-energizes plate transformers.
4-1	LOCAL-REMOTE	Power Control Assembly (front panel)	4	Switch	S504	Transfers control functions between local controls and remote control unit.
4-1	PHONE-CW-FSK	Power Control Assembly (front panel)	5	Switch	S505	Selects emission type.
4-1	LV-TUNE-OPERATE	R-F Assembly (front panel)	6	Switch	S242	In LV position energizes low-voltage power supply; in TUNE position limits plate current of power amplifier to a safe value by reducing screen-grid voltage and energizes HV Power Supply; in OPERATE position applies full voltage to all circuits.
4-1	BAND SWITCH	R-F Assembly (front panel)	7	Switch	S102, S103, and S104	Selects band on which transmitter is to operate.
4-1	LOADING COIL SWITCH	R-F Assembly	8	Switch	S105	Shorts sections of the L-network loading coil. Clockwise rotation of the switch increases loading; counterclockwise decreases loading.
4-1	TEST KEY	R-F Assembly (front panel)	9	Switch	S241	Operates keyer unit to control transmitter carrier. "Down" position momentary; "up" position locks.
4-1	EXCITER TUNING	R-F Assembly (front panel)	10	Capacitor	S114A and C114B	Tunes first and second multipliers.
4-1	DRIVER PLATE TUNING	R-F Assembly (front panel)	11	Capacitor	C125	Tunes driver plate tank circuit.
4-1	P. A. PLATE TUNING	R-F Assembly (front panel)	12	Capacitor	C134	Tunes power-amplifier plate tank circuit.

TABLE 4-1. CONTROL LOCATION AND FUNCTION—Continu d

ILLUSTRATION REFERENCE NO.	FUNCTIONAL DESIGNATION	LOCATION	LETTER DESIGNATION	TYPE OF COMPONENT	SYMBOL	PURPOSE OF CONTROL
4-1	P. A. LOADING	R-F Assembly (front panel)	13	Capacitor	C135 and C136	Tunes pi-network output circuit. Used for fine adjustment of loading after LOADING COIL SWITCH has been set to a number corresponding to, or close to, the setting of the BAND SWITCH. Clockwise rotation of P.A. LOADING control increases loading; counterclockwise rotation decreases loading.
4-1	CHANNEL SELECTOR	R-F Assembly (front panel)	14	Switch	S243	Starts Autotunes and selects channel on which Autotunes will set up.
4-1	AUDIO GAIN	Modulator Assembly (front panel)	15	Potentiometer	R601	Adjusts gain of modulator speech amplifier and amount of audio peak clipping.
4-1	MICROPHONE	Modulator Assembly (front panel)	16	Receptacle	J601	Receptacle for microphone.
4-2	INTERPOLATION OSCILLATOR	R-F Oscillator O-243/FRT-24 (front panel)	17	Coil	L3102	Provides signal used for automatic control of output frequency.
4-2	MASTER OSCILLATOR	R-F Oscillator O-243/FRT-24 (front panel)	18	Coil	L3103	Sets up oscillator for desired frequency.
4-2	OUTPUT TUNING	R-F Oscillator O-243/FRT-24 (front panel)	19	Capacitor	C3120	Tunes r-f oscillator for desired output frequency.
4-2	SET UP-OPERATE	R-F Oscillator O-243/FRT-24 (front panel)	20	Switch	S3103	In SET UP position disables a-f-c circuit for tuning of oscillator. In OPERATE position energizes a-f-c circuit for control of oscillator frequency.
4-2	ON-OFF	R-F Oscillator O-243/FRT-24 (front panel)	21	Switch	S3101	Controls application of power to R-F Oscillator.
4-3	OFF-ON	Power Supply PP-454/FRT-5 (front panel)	22	Switch	S1001	Applies primary power to the Power Supply.
4-3	Five-Position Selector Switch	Power Supply PP-454/FRT-5 (front panel)	23	Switch	S1003	
4-4	POWER CHANGE ¼ ½ FULL	Power Change Assembly (inside upper-left door below modulator)	24	Switch	S680	Controls transmitter power output.

TABLE 4-1. CONTROL LOCATION AND FUNCTION—Continued

ILLUSTRATION REFERENCE NO.	FUNCTIONAL DESIGNATION	LOCATION	LETTER DESIGNATION	TYPE OF COMPONENT	SYMBOL	PURPOSE OF CONTROL
4-5	OFF-ON	Transmitter Control C-1362/FRT-24 (front panel)	25	Switch	S901	Controls application of primary power to Transmitter Control.
4-5	Dial Selector	Transmitter Control C-1362/FRT-24 (front panel)	26	Telephone-type dial switch	S903	Controls transmitter functions.
4-5	INPUT-OUTPUT	Transmitter Control C-1362/FRT-24 (front panel)	27	Switch	S902	Switches AUDIO LEVEL meter to read input or output level.
4-5	AUDIO GAIN	Transmitter Control C-1362/FRT-24 (front panel)	28	Potentiometer	R901	Controls audio output level.
4-5	MICROPHONE	Transmitter Control C-1362/FRT-24 (front panel)	29	Receptacle	J901	Receptacle for microphone.
4-5	KEY	Transmitter Control C-1362/FRT-24 (front panel)	30	Receptacle	J902	Receptacle for telegraph key.
4-6	Dial Selector	Telephone Set TA-267/U	31	Telephone-type dial switch		Controls transmitter functions.
4-6	KEY	Telephone Set TA-267/U	32	Receptacle	J501	Receptacle for telegraph key.

b. OPERATING CONTROLS AND INDICATORS.—All operating controls and indicators to be used by operating personnel, except the POWER CHANGE switch, are located on the front panels of the equipment. The POWER CHANGE switch is located inside the upper-left door on the Power Change Assembly. No internal adjustments or settings should be attempted by the operator, other than those that may be indicated in Section 5. The various front-panel controls and indicators are shown in figures 4-1 through 4-6 and are as follows:

(1) POWER CONTROL ASSEMBLY.

(*a*) PRIMARY CIRCUIT BREAKER.—This is a toggle switch type, 25-ampere circuit breaker. This circuit breaker controls the application of 230-volt, 50/60 cycle power to the entire transmitter.

(*b*) FILAMENT KNOB.—This knob controls the application of power to the transmitter filaments. Pulling the knob energizes the filaments; pushing the knob de-energizes the filaments.

(*c*) FILAMENT INDICATOR.—This indicator will be illuminated when the transmitter filaments are energized.

(*d*) PLATE KNOB.—This knob controls the application of power to the high-voltage and low-voltage plate transformers. Pulling the knob energizes the transformers; pushing the knob de-energizes the transformers.

(*e*) PLATE INDICATOR.—This indicator will be illuminated when the high-voltage and low-voltage plate transformers are energized.

(*f*) LOCAL-REMOTE.—This is a two-position rotary switch. It transfers the control functions between the local controls, for local operation, or the controls on Transmitter Control

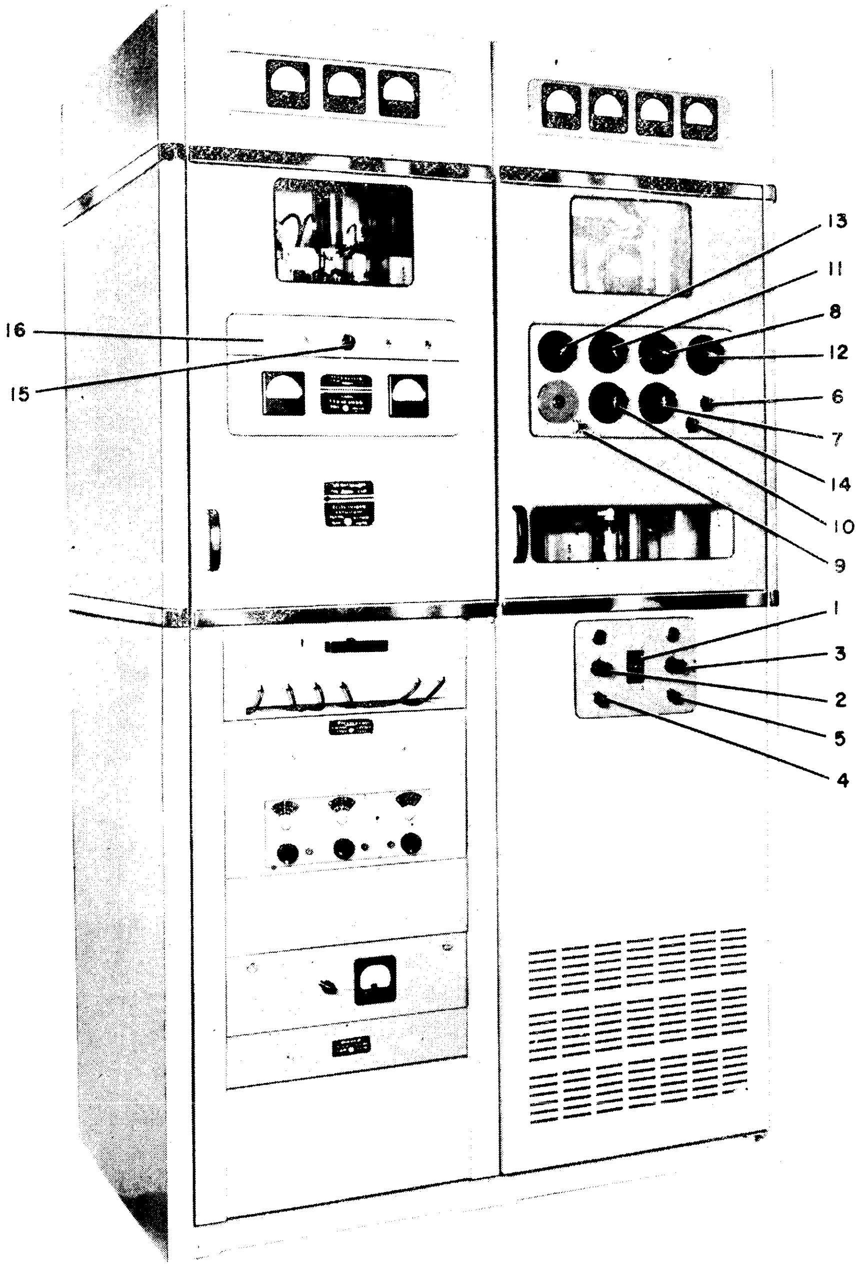


Figure 4-1. Radio Transmitter T-440/FRT-24, Location of Controls

C-1362/FRT-24, for remote operation.

(*g*) PHONE-CW-FSK.—This is a three-position rotary switch. It selects the emission type, either phone or cw. (The FSK position will not operate unless modifications are made in the equipment.)

(2) R-F ASSEMBLY.

(*a*) LV-TUNE-OPERATE. — This is a three-position rotary switch. In LV position this switch energizes the low-voltage power supply; in TUNE position it limits the plate current of the power amplifier to a safe value by reducing the screen-grid voltage; in OPERATE position it applies full operating voltage to all circuits.

(*b*) BAND SWITCH.—This is an eight-position rotary switch. It selects the frequency band on which the transmitter is to operate.

(*c*) LOADING COIL SWITCH.—This is a twelve-position rotary switch. It adjusts the loading circuit in steps. Operating the switch clockwise increases loading, and operating the switch counterclockwise decreases loading.

(*d*) TEST KEY.—This is a lever-action switch which operates the keyer unit to control the transmitter carrier. The "down" position is momentary; the "up" position locks.

(*e*) EXCITER TUNING.—This is a two-gang variable capacitor. It tunes the first and second frequency-multiplier stages.

(*f*) DRIVER PLATE TUNING.—This is a single-gang variable capacitor. It tunes the driver plate tank circuit.

(*g*) P.A. PLATE TUNING. — This is a variable vacuum capacitor. It tunes the power-amplifier plate tank circuit.

(*h*) P.A. LOADING.—This is a two-gang variable capacitor. It tunes the output circuit and it used as a fine adjustment of loading after the LOADING COIL SWITCH has been set to a number corresponding to, or close to, the setting of the BAND SWITCH.

(*i*) CHANNEL SELECTOR.—This is a ten-position rotary switch. It starts the Autotunes and selects the channel on which the Autotunes will set up.

(*j*) DRIVER GRID INDICATOR.—This meter indicates the driver grid current.

(*k*) DRIVER PLATE INDICATOR. — This meter indicates the driver plate current.

(*l*) PWR AMP GRID INDICATOR. — This meter indicates the power amplifier grid current.

(*m*) PWR AMP PLATE INDICATOR.— This meter indicates the power amplifier grid current.

(*n*) R.F. LINE CURRENT INDICATOR. —This meter indicates the current in the r-f line from the loading circuits.

(3) MODULATOR ASSEMBLY.

(*a*) AUDIO GAIN. — This is a rotary variable-resistance control. It adjusts the gain of the modulator speech amplifier and the amount of audio peak clipping.

(*b*) MICROPHONE. — Jack into which a microphone is inserted.

(4) CABINET.

(*a*) PRIMARY VOLTAGE INDICATOR. —This meter indicates the voltage of the primary power source.

(*b*) PLATE VOLTAGE INDICATOR. — This meter indicates the voltage output from the high-voltage power supply.

(*c*) MODULATOR PLATE CURRENT INDICATOR. — This meter indicates the plate current drawn by the modulators.

(5) R-F OSCILLATOR O-243/FRT-24.

(*a*) INTERPOLATION OSCILLATOR B-1.—This is a rotary control which, when properly adjusted, provides a signal used for automatic control of output frequency.

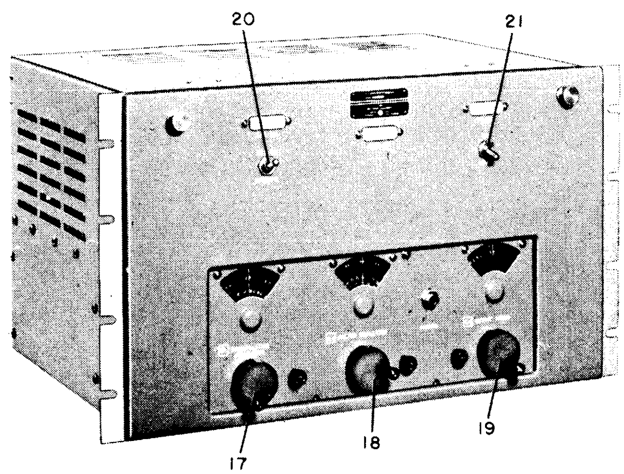
(*b*) MASTER OSCILLATOR A-1.—This is a rotary control which sets the oscillator for the desired frequency.

(*c*) OUTPUT TUNING C-1.—This is a rotary control which tunes the r-f oscillator for the desired output frequency.

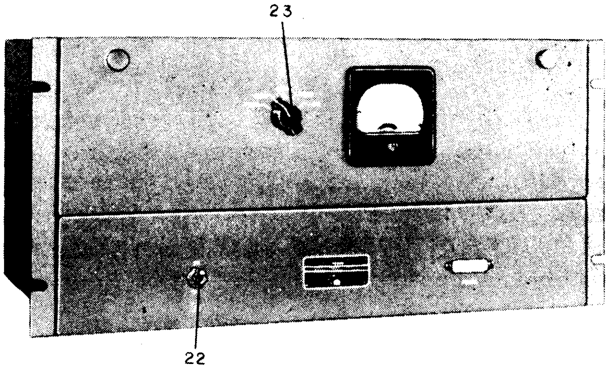
(*d*) SET UP-OPERATE.—This is a two-position toggle switch. In SET UP position it disables the a-f-c circuit to permit tuning of the oscillator. In OPERATE position it energizes the a-f-c circuit for control of the oscillator output frequency.

(*e*) ON-OFF. — This is a two-position toggle switch. It turns the unit on or off.

(*f*) AFC ON INDICATOR.—This indica-



Figur 4-2. R-F Oscillator O-243/FRT-24, Location f Contr ls



Figur 4-3. Power Supply PP-454/FRT-5, Location of Controls

tor lights when the a-f-c circuit is energized for automatic control of the output frequency.

(*g*) CRYSTAL OVEN HEAT ON INDICATOR.—This indicator lights when the crystal oven heater is energized.

(*h*) PLATE INDICATOR.—This indicator lights when the plates are energized.

(6) TRANSMITTER CONTROL C-1362/FRT-24.

(*a*) OFF-ON. — This is a two-position toggle switch. It controls the application of 115-volt primary power to Transmitter Control C-1362/FRT-24.

(*b*) INPUT-OUTPUT. — This is a two-position toggle switch. It switches the AUDIO LEVEL meter to read input level or output level.

(*c*) AUDIO LEVEL INDICATOR.—This meter may be used to indicate the level of audio input to Transmitter Control C-1362/FRT-24, or the output level from the unit.

(*d*) AUDIO GAIN. — This is a rotary variable-resistance control. It controls the audio output level of Transmitter Control C-1362/FRT-24.

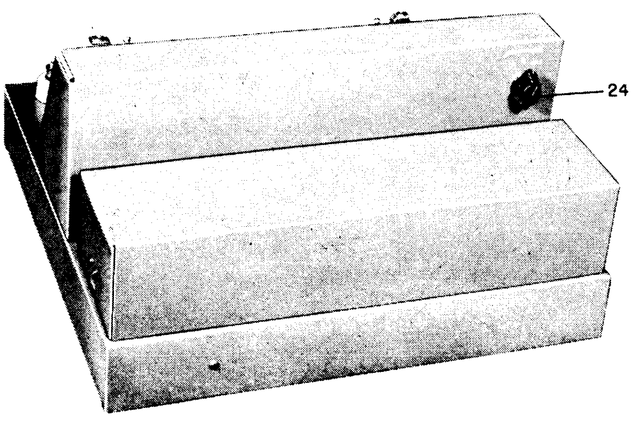


Figure 4-4. Pow r Chang Assembly, Location of Controls

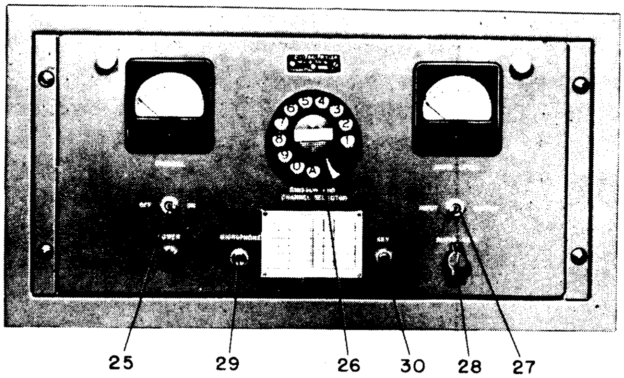


Figure 4-5. Transmitter Control C-1362/FRT-24, Location of Controls

(*e*) DIAL SELECTOR.—This is a rotary telephone-type dial switch. It controls the type of transmission (phone or cw), and selects the channel on which the Autotunes set up the transmitter.

(*f*) CHANNEL. — This meter indicates the channel to which the transmitter is set.

(7) POWER SUPPLY PP-454/FRT-5.

(*a*) OFF-ON. — This is a two-position toggle switch. It controls the application of primary power to Power Supply PP-454/FRT-5.

(*b*) POWER INDICATOR.—This indicator lights when primary power is applied to Power Supply PP-454/FRT-5.

(*c*) FIVE - POSITION SELECTOR SWITCH.—Selects one of five operating voltages.

(*d*) VOLTAGE INDICATOR.—This meter indicates the voltages present in the Power Supply.

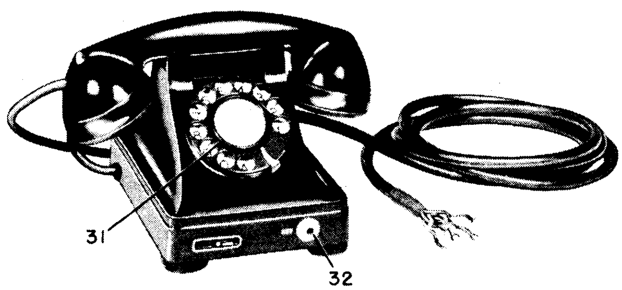
(8) POWER CHANGE ASSEMBLY.

(*a*) POWER CHANGE ¼, ½ FULL. — This is a three-position rotary switch. It controls the transmitter power output.

(9) TELEPHONE SET TA-267/U.

(*a*) DIAL SELECTOR.—This is a rotary telephone-type dial switch. It controls the type of transmission (phone or cw), and selects the channel on which the Autotunes set up the transmitter.

(*b*) KEY. — Jack into which a telegraph key is inserted.



Figur 4-6. T l ph n S t TA-267/U, Locati n of Controls

2. OPERATING PROCEDURE

a. OPERATING THE TRANSMITTER FROM LOCAL CONTROL. — Perform the following steps only when the transmitter has been properly tuned and adjusted in accordance with the tuning procedure outlined in steps *d*(1) through *d*(15).

(1) Set PRIMARY CIRCUIT BREAKER to ON position.

(2) Set LOCAL-REMOTE switch to LOCAL position.

(3) Pull FILAMENT switch to ON position. The FILAMENT indicator should light. Wait approximately thirty seconds for the time-delay circuit to operate.

(4) Pull PLATE switch to ON position. The PLATE indicator should light. If the PLATE switch is pulled to the ON position before the time-delay circuit has gone into operation, the PLATE indicator will not light until sufficient time has elapsed.

(5) Set CHANNEL SELECTOR switch to desired channel number. Allow approximately eight seconds for Autotunes to set up on channel selected. The CHANNEL indicator will indicate the channel on which the transmitter is set.

(6) Set PHONE-CW-FSK switch to PHONE for phone operation, or to CW for c-w operation. (The FSK position will not operate unless modifications are made to the transmitter.) For phone operation the press-to-talk switch on the local microphone turns the carrier signal on and off. For c-w operation the TEST KEY may be used to key the transmitter.

(7) To turn off transmitter, push in the FILAMENT switch. The plate and filament hold circuits will be broken, and the transmitter will not operate until the starting procedure (steps *a*(1) through *a*(5) above) is again performed.

b. OPERATING THE TRANSMITTER FROM REMOTE CONTROL. — Perform the following steps only when the transmitter has been properly tuned and adjusted in accordance with the tuning procedure outlined in steps *d*(1) through *d*(15).

(1) Set PRIMARY CIRCUIT BREAKER to ON position and LOCAL-REMOTE switch to REMOTE position. These two controls on the Power Control Assembly must be set as indicated, or the transmitter cannot be operated from the remote position.

(2) Turn OFF-ON switch on Transmitter Control C-1362/FRT-24 to ON position. The POWER indicator should light.

(3) Dial desired channel number on telephone-type dial switch. This energizes the filaments of the transmitter, sets up the Autotunes to the selected channel, and after approximately 30 seconds completes the plate supply circuits. When the transmitter is set up on the selected channel, the channel number should be indicated on the CHANNEL indicator.

(4) Dialing any channel will automatically set up the transmitter for phone operation if the auto-emission selector switch is wired normally. If c-w operation is desired, dial A1 (A corresponds to position 11 on the dial) after dialing the desired channel. If the auto-emission selector switch is wired for cw on the selected channel, the transmitter will set up for c-w operation when this channel is dialed. To set up for phone operation when the auto-emission selector switch is wired in this manner, dial A3 after selecting the channel.

(5) For phone operation the press-to-talk switch on the microphone turns the carrier on and off. For c-w operation the telegraph key is used to key the transmitter.

(6) When operating on phone the audio level must be monitored as follows:

(*a*) Set INPUT-OUTPUT switch to OUTPUT.

(*b*) Adjust AUDIO GAIN control to nominal level.

(7) To turn off transmitter plate power supplies, dial A9. To turn off all power supplies to transmitter, dial A0. To turn off Transmitter Control C-1362/FRT-24, set OFF-ON switch to OFF.

c. OPERATING THE TRANSMITTER WITH TELEPHONE SET TA-267/U. — Perform the following steps only when the transmitter has been properly tuned and adjusted in accordance with the tuning procedure outlined in steps *d*(1) through *d*(15). A dummy plug must be inserted into the PHONE jack on Transmitter Control C-1362/FRT-24 before the transmitter can be operated from Telephone Set TA-267/U.

(1) Set PRIMARY CIRCUIT BREAKER to ON position and LOCAL-REMOTE switch to REMOTE position. These two controls on the Power Control Assembly must be set as indicated, or the transmitter cannot be operated from the remote position.

(2) Turn OFF-ON switch on Transmitter Control C-1362/FRT-24 to ON position. The POWER indicator should light.

(3) Dial desired channel number of Telephone Set TA-267/U dial. This energizes the filaments of the transmitter, sets up the Autotunes to the selected channel, and after approximately 30 seconds completes the plate supply circuits.

(4) Dialing any channel will automatically set up the transmitter for phone operation if the

auto-emission selector switch is wired normally. If c-w operation is desired, dial A1 (A corresponds to position 11 on the dial) after dialing desired channel. If the auto-emission switch is wired for cw on the selected channel, the transmitter will set up for c-w operation when this channel is dialed. To set up for phone operation when auto-emission selector is wired in this manner, dial A3 after selecting channel.

(5) For phone operation the press-to-talk switch on the microphone turns the carrier on and off. For c-w operation the telegraph key is used to key the transmitter.

(6) When operating on phone the audio level is initially adjusted at the transmitter.

(7) To turn off transmitter plate power supplies, dial A9. To turn off Transmitter Control C-1362/FRT-24, set OFF-ON switch to OFF.

d. TUNING THE TRANSMITTER. — Perform the following steps only when the tuning of the transmitter has been disturbed or when the crystals (channels 1 through 9) or the frequency of R-F Oscillator O-243/FRT-24 (channel 10) are changed, or when setting up the transmitter for the first time. The following procedure must be performed for each channel to be tuned:

(1) Set PRIMARY CIRCUIT BREAKER to ON position.

(2) Set LOCAL-REMOTE switch to LOCAL position.

(3) Set PHONE-CW-FSK switch to CW position.

(4) Pull FILAMENT switch to ON position. The FILAMENT indicator should light.

(5) Tighten locking screws on all Autotune knobs, and then turn CHANNEL SELECTOR knob to channel for which settings are to be made. After the Autotune system has cycled, loosen locking screws.

(6) Set dials as shown in table 4-2. The settings indicated in the chart are approximate; the actual settings obtained after the transmitter is tuned may vary by ±10 dial divisions. If the antenna system presents a load deviating greatly from 52 ohms resistive, the settings given in table 4-2 for the LOADING COIL SWITCH and P.A. LOADING will not correspond to the actual settings obtained when the transmitter is tuned.

(7) Set LV-TUNE-OPERATE switch to TUNE.

(8) Pull PLATE switch to ON position. If sufficient time has elapsed for the time-delay circuit to operate, the PLATE indicator should light.

(9) Operate TEST KEY to turn on excitation, and adjust the controls as follows:

(*a*) EXCITER TUNING for maximum DRIVER GRID current.

(*b*) DRIVER PLATE TUNING for minimum DRIVER PLATE current.

TABLE 4-2. TUNING CHART

CHANNEL	FREQ. (mcs)	POSITION OF DIALS					BAND	METER READINGS				
		P.A. LOADING	DRIVER PLATE	LOADING COIL	P.A. PLATE	EXCITER TUNING		DRIVER GRID CURRENT	DRIVER PLATE (ma)	P.A. GRID	P.A. PLATE	R-F LINE
10	2	44.5	15	00	8.5	12	1	15	87	64	500	4.0
10	3	85.0	78	00	54.5	65	1	15	96	67	500	3.7
10	3	52.0	16	0	10.5	13	2	15	88	66	500	3.7
10	4	68.0	62	2	49.5	64	2	15	86	66	500	4.5
10	4	54.5	26	2	31.5	15	3	15	90	66	500	4.4
10	6	81.0	79	4	67.0	60	3	15	90	67	500	5.0
10	6	72.5	53	4	50.0	26	4	17	87	66	500	5.0
10	8	89.5	97	6	77.0	76	4	8	86	64	500	4.9
10	8	26.5	44	6	55.0	26	5	15	95	67	500	4.3
10	12	78.5	87	7	74.5	90	5	15	100	66	500	5.0
10	12	64.0	46	7	62.0	27	6	15	100	65	500	4.9
10	16	72.5	79	8	79.4	71	6	11	100	64	500	5.3
10	16	5.5	34	9	60.0	29	7	15	112	60	500	5.1
10	24	75.0	84	10	78.5	92	7	15	121	58	500	4.5
10	24	58.0	54	10	65.0	29	8	14.5	129	54	500	4.2
10	30	83.5	81	10	73.0	59	8	13	135	49	480	2.0

(*c*) P.A. PLATE TUNING for minimum PWR AMP PLATE current.

(*d*) Adjust the P.A. LOADING control to produce an indication of approximately 300 ma on the PWR AMP PLATE meter. While adjusting the P.A. LOADING control, readjust the P.A. PLATE TUNING control to maintain resonance in the power amplifier plate circuit. (Resonance is indicated by a minimum dip in the PWR AMP PLATE meter.)

(10) Set the LV-TUNE-OPERATE switch to OPERATE.

(11) Operate TEST KEY to turn on excitation, and adjust P.A. LOADING control to produce PWR AMP PLATE current of between 450 to 550 ma. While adjusting P.A. LOADING control, also readjust P.A. PLATE TUNING control to maintain resonance in power amplifier plate circuit. (Resonance is indicated by minimum dip in PWR AMP PLATE current.)

TABLE 4-3. TYPICAL METER READINGS

PRIMARY VOLTAGE	208 to 230 volts
PLATE VOLTAGE	Approx 3250 volts
MODULATOR PLATE CURRENT	140 to 160 ma (no modulation) 400 ma (100% sine-wave modulation) Approx 200 ma (on voice peaks)
DRIVER GRID	15 ma
DRIVER PLATE	50 to 150 ma
PWR AMP GRID	40 to 75 ma
R.F. LINE CURRENT (approx, with 52-ohm resistive load)	4.4 amp (full power) 3.1 amp (½ power) 2.2 amp (¼ power)
PWR AMP PLATE	500 ma (full power) 353 ma (½ power) 250 ma (¼ power)

(12) If P.A. LOADING control cannot be adjusted to produce PWR AMP PLATE current of 450 ma. to 550 ma., reset LOADING COIL SWITCH and repeat step (11).

(13) Readjust EXCITER TUNING control for DRIVER GRID current of 15 ma. Compare all meter readings with meter readings given in table 4-3. If meter readings obtained do not agree with those in table 4-3, repeat tuning procedure.

(14) When all tuning controls have been properly adjusted, tighten locking screws on the controls, and then set CHANNEL SELECTOR to an adjacent channel. After Autotunes have cycled, set CHANNEL SELECTOR back to channel for which tuning procedure has just been performed. The Autotunes should return all controls to the correct position for the tuned channel.

(15) If Autotunes do not return controls to the position, loosen locking screws and repeat steps *d*(6) through *d*(14).

e. TUNING PROCEDURE FOR R-F OSCILLATOR O-243/FRT-24.—If it is desired to use R-F Oscillator O-243/FRT-24 for excitation of the R-F Assembly it will first be necessary to first connect the output of the R-F Oscillator to the input of the transmitter. This is accomplished by use of the patch panel and one of the type RG-58/U jumper cables furnished with the equipment. One end of the jumper cable must be connected to the M.O. OUT jack, J722, on the patch panel, and the other end must be connected to the XMTR INPUT jack, J721, on the patch panel. Set PRIMARY CIRCUIT BREAKER on Power Control Assembly to ON position, and OFF-ON switch on Power Supply PP-454/FRT-5 to ON position; then perform the following procedure:

(1) SETTING UP ON A FREQUENCY NOT PREVIOUSLY RECORDED. — Proceed as follows:

(*a*) Insert headphones-cord plug into jack on front panel of R-F Oscillator.

(*b*) Set SET UP-OPERATE switch to SET UP position.

(*c*) Set PLATE switch to ON position.

(*d*) Choose an oscillator frequency lying between 2.0 and 4.2 mc. which when multiplied by 2, 4, or 6, will produce the exact output frequency. Figure 4-7 can be used as an aid in selecting this frequency, and the multiplying factor should be used to derive the exact oscillator frequency.

(*e*) Set OUTPUT TUNING control C-1, to frequency determined in step (*d*).

(*f*) The frequency control circuit provides a check point every 5 kc at the output frequency. Set INTERPOLATION OSCILLATOR control B-1, to indicate exact difference between desired

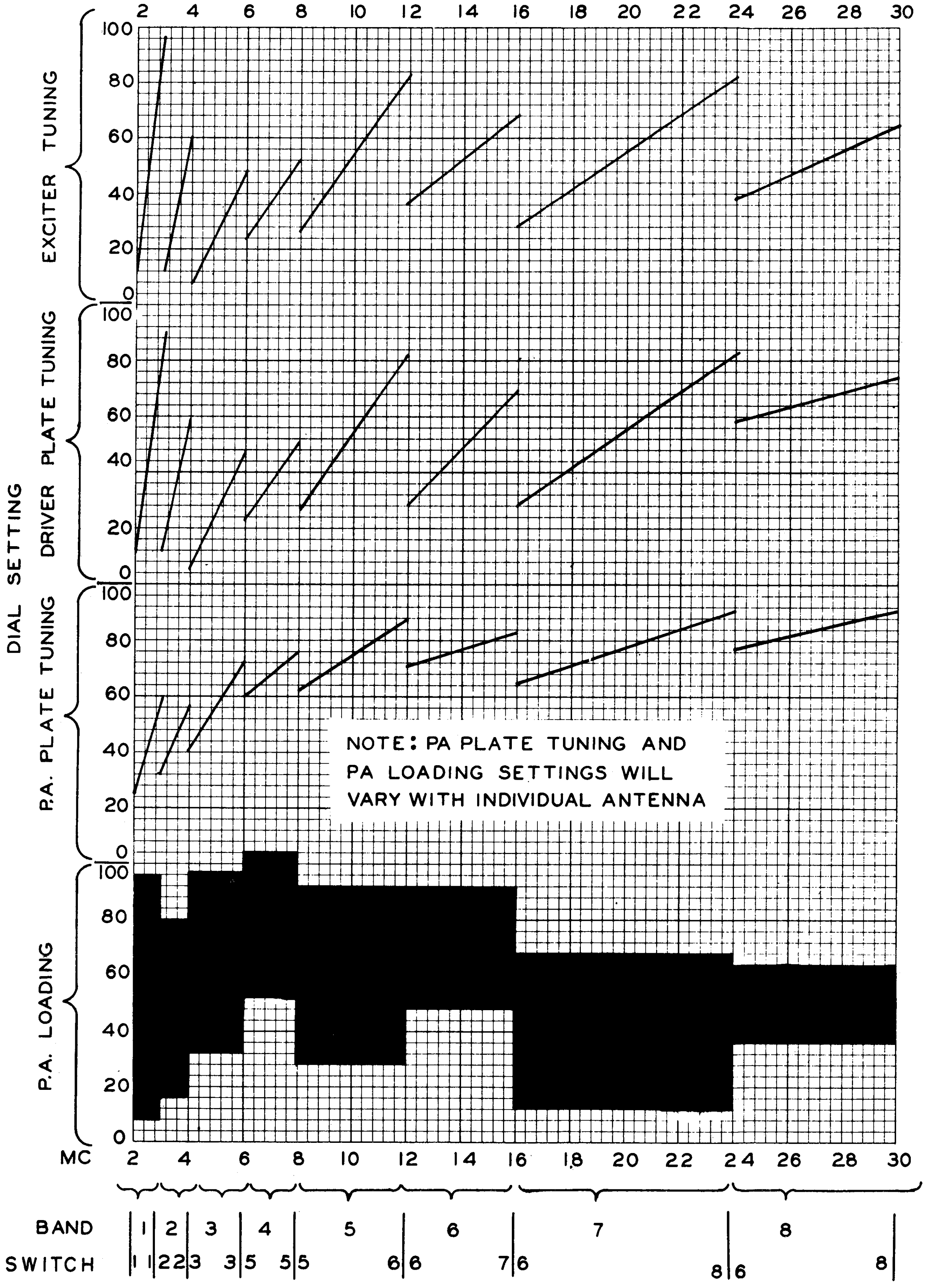


Figure 4-7. Typical Dial S ttings

frequency and check point just below it. For example, a required frequency of 2866.375 kc is 1375 cycles above the nearest check point, so the outer dial of the INTERPOLATION OSCILLATOR control should be set to 1.3, and the inner dial to 75.

(*g*) Set MASTER OSCILLATOR control A-1, as close as possible to required frequency. In the example given above, set outer dial to 2.8 and inner dial to 66.

(*h*) At this point a steady tone should be audible in the headphones.

(*i*) Readjust MASTER OSCILLATOR control A-1, until low-pitched tone (50 to 100 cps) is heard in headphones.

(*j*) This tone should be made as loud and clear as possible by slight readjustment of the OUTPUT TUNING control C-1.

(*k*) Remove headphones-cord plug.

(*l*) Record dial readings of each control at this frequency, for future reference.

(*m*) Set SET UP-OPERATE switch to OPERATE.

(*n*) Refer to the procedure for tuning the transmitter, paragraph *d*., and follow steps (2) through (15).

(2) SETTING UP ON A FREQUENCY PREVIOUSLY RECORDED ON TUNING CHARTS.

(*a*) Set SET UP-OPERATE switch to SET UP position.

(*b*) Set PLATE switch to ON position.

(*c*) Set MASTER OSCILLATOR control A-1, to setting previously recorded for that control.

(*d*) Set INTERPOLATION OSCILLATOR control B-1, to setting previously recorded for that control.

(*e*) Set OUTPUT TUNING control B-1 to setting previously recorded for that control.

(*f*) Set SET UP-OPERATE switch to OPERATE position.

(*g*) Refer to procedure for tuning the transmitter, paragraph *d*., and follow steps (2) through (15).

SECTION 5
OPERATOR'S MAINTENANCE

1. INTRODUCTION

To maintain peak performance of the equipment it will be necessary that the operator perform a routine check when coming on watch and during each period that he is responsible for the operation of the equipment. Minor defects may develop during operation which may be rectified without difficulty by the operator. Correction of these minor troubles will prevent the occurrence of major troubles at a later date. The operator should be sufficiently familiar with the technical details of the equipment to correct minor defects that may develop when trained technical aid is not available.

2. OPERATOR'S CHECK CHART

The following check chart and service information is offered for the guidance of the operator.

a. TRANSMITTER OPERATING. — Use the chart below when the transmitter is in operation.

TRANSMITTER OPERATING—EACH WATCH, HOURLY

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
Information from previous operator.	Review history in log-book. Receive verbal instructions.	Verify reported abnormal operation during your watch.
Transmitter tuning.	Observe meter readings. Make minor adjustments of tuning controls to verify proper tuning.	Be familiar with tuning procedure. Power amplifier and driver plate tuning must be correct to prevent tube damage.

TRANSMITTER OPERATING—EACH WATCH, HOURLY—Continued

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
All meters.	Observe and record meter readings. Observe and record temperature readings. Compare with normal readings.	Be alert for abnormal or subnormal readings. Be alert for erratic or jumpy meter readings.
Operating frequency of transmitter.	Use frequency meter or other stable frequency monitoring device.	Frequencies must not drift. Check position of CHANNEL SELECTOR switch. If frequency drift is excessive, check each channel; note whether all crystals are unstable, or only one is at fault.
Color of all tubes.	Visually inspect for normal color of 4-400A amplifier (dull red). Visually inspect for flash-over of rectifier tubes. Visually inspect modulator tubes (in phone position).	Prolonged operation with abnormal tube color will eventually ruin tube or circuit components. Abnormal color may be indicative of improper operation. If one tube appears to be unusually hotter than the others, turn off modulator and do not operate phone until repairs are made.
Indicator lamps on all major units.	Observe indicator lamp.	Unlighted plate or filament indicator lamps may be indicative of inoperative unit. All other indicator lamps are not lighted.
Keying characteristic.	Keying monitor or communication receiver.	Make certain that the keying monitor or receiver is adjusted properly. Make certain that the keying input level is properly set.

b. TRANSMITTER ON STANDBY.—Use the chart below when the transmitter is on standby.

TRANSMITTER ON STANDBY—EACH WATCH

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
Information from previous operator.	Review history in log-book. Receive verbal instructions.	Note whether transmitter is to go on the air during watch.
Over-all operation.	Tune transmitter completely as directed in Section 4. Check color and operation of tubes. Check meter readings.	Be alert for any inoperative or erratic stage or component.

TRANSMITTER ON STANDBY—EACH WATCH—Continued

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
Control circuits.	Operate plate and filament ON-OFF switches on transmitter to check primary power control. Set emission selector switch to CW. Modulator filaments should go off. Operate TEST KEY to check keyer. Set LOCAL-REMOTE switch to REMOTE. PLATE lamp should go off and exciter should operate.	Watch for erratic or abnormal operation. Report any inoperative circuit immediately. Be alert for slippage in switches.
Modulator.	With LOCAL-REMOTE switch set to LOCAL, voice-modulate transmitter. Check operation of AUDIO GAIN control.	Watch for abnormal meter readings and any other indication of improper operation.
Autotune.	Check several autotune channels by operating CHANNEL SELECTOR switch.	Perform this test with plate voltage off if any of the channels to be used in the test are being used.
Dial control of Transmitter Control C-1362/FRT-24.	Check remote control of autotune by operating EMISSION AND CHANNEL SELECTOR dial. Check the CW, high voltage off, and filament off functions by dialing A1, A9, and A0, respectively. Check modulation with microphone used at remote unit.	In this test, do not use channels occupied by other stations.
Filament voltages.	Visually check meters. Manually check operation of filament voltage controls.	If transmitter is to remain off the air for more than two hours, shut down completely.
Temperature of components and cabinets.	Immediately after shutdown, visually inspect all units for evidence of heating. Cautiously check components with your hand as a check for heating.	Normal operating temperatures of some components are high enough to produce severe burns. Be familiar with these components.
Operation of all tubes.	Observe rectifier tubes. Observe current readings for modulator, driver, and power amplifier on their respective meters.	Be alert for visible internal flashing. No visible glow should be observed under normal conditions. Check for abnormally low current. Refer to Section 4, table 4-3 for normal meter indications.
Operation of relays.	Remove relay covers and observe operation of relays.	Report any relays which have excessive sparking or which operate sluggishly.

TRANSMITTER ON STANDBY—EACH WATCH—Continued

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
Main circuit breaker.	Check to see whether main circuit breaker is working properly.	If inoperative or if slipping occurs, report it immediately.
Meter switch contacts.	Observe meter switch contacts and meter readings as the meters are switched into the various circuits.	Report any dirty contacts or intermittent operation immediately.
Sliding or moving coil contacts.	Visually or manually inspect all sliding or moving coil contacts.	Replace any contacts that are worn, dirty, bent, or broken.
Setscrews and other parts.	Inspect all setscrews and parts for looseness.	Tighten all loose parts, components, and setscrews.

3. REPLACEMENT OF FUSES AND RESETTING OF CIRCUIT BREAKERS.

The control panel of the Power Control Assembly contains all transmitter fuses and the primary power circuit breaker. The circuit breaker, which is in series with the 230-volt power-line input, will not open unless a short occurs in an unfused portion of the autotransformer circuit or in the high-voltage plate transformer circuit. Each of the circuits fed by the autotransformer is fused, and the power control circuits are adequately fused.

WARNING

Never replace a fuse or a circuit breaker with one of higher rating unless continued operation of the equipment is more important than probable damage. If a fuse burns out immediately after replacement, do not replace it a second time until the cause of the trouble has been corrected. If a circuit breaker trips after resetting, do not reset a second time until the cause of the trouble has been corrected.

All fuses are the slow-blow type except the LOW VOLTAGE PLATE, AUTOTUNE MOTOR, and CONTROL CIRCUIT NO. 1 fuses. Do not replace these three fuses with the slow-blow type.

If the transmitter fails and the trouble may be caused by a blown fuse, open the right-hand door and observe the blown-fuse indicators on the Power Control Assembly. A lighted indicator lamp indicates that the associated fuse is open. Refer to table 5-1 for symptoms of fuse failure, and table 5-2 for fuse location.

TABLE 5-1. SYMPTOMS OF FUSE FAILURE

SYMPTOM	FUSE (Fuse indicator light will glow when fuse is blown)
RADIO TRANSMITTER T-440/FRT-24	
Indicator light I-503 lights.	F503
Indicator light I-504 lights.	F504
Indicator light I-505 lights.	F505
Indicator light I-506 lights.	F506
Indicator light I-507 lights.	F507
Indicator light I-508 lights.	F508

TABLE 5-1. SYMPTOMS OF FUSE FAILURE—C ntinu d

SYMPTOM	FUSE (Fuse indicator light will glow when fuse is bl wn)
Indicator light I-509 lights.	F509
Indicator light I-510 lights.	F510
Indicator light I-511 lights.	F511
Indicator light I-512 lights.	F512
Indicator light I-513 lights.	F513
Indicator light I-514 lights.	F514
Indicator light I-515 lights.	F515
Indicator light I-517 lights.	F516
Indicator light I-517 lights.	F517
Indicator light I-518 lights.	F518
TRANSMITTER CONTROL C-1362/FRT-24	
Indicator light I-901 lights.	F901
POWER SUPPLY PP-454/FRT-5	
Rectifiers V1001 and V1002 do not light.	F1001—effective on 115 and 230 volts, ac.
Rectifiers V1003 and V1004 do not light.	F1002—effective on 115 and 230 volts, ac.
Rectifiers V1001 and V1002 do not light.	F1003—effective on 230 volts, ac only.
Rectifiers V1003 and V1004 do not light.	F1004—effective on 230 volts, ac only.
MASTER OSCILLATOR O-243/FRT-24	
Motor B3101 does not operate.	F3101
Indicator light I-3103 lights.	F3102

TABLE 5-2. FUSE LOCATION

SYMBOL	LOCATION	PROTECTS	AMPS	VOLTS	CONTRACTOR'S PART NUMBER
F503	Radio Transmitter T-440/FRT-24	Power distribution to control circuits	1	250	264 4280 00
F504	Radio Transmitter T-440/FRT-24	Power amplifier filaments	1	250	264 4280 00
F505	Radio Transmitter T-440/FRT-24	Exciter filaments	1	250	264 4280 00
F506	Radio Transmitter T-440/FRT-24	Bias rectifiers	1	250	264 4280 00
F507	Radio Transmitter T-440/FRT-24	Autotune motor B240	3	250	264 4080 00
F508	Radio Transmitter T-440/FRT-24	D-C relay supply	1	250	264 4280 00
F509	Radio Transmitter T-440/FRT-24	Spare	1	250	264 4280 00
F510	Radio Transmitter T-440/FRT-24	Spare	3	250	264 4080 00
F511	Radio Transmitter T-440/FRT-24	Blower B641	3	250	264 0008 00
F512	Radio Transmitter T-440/FRT-24	Modulator filament	2	250	264 4280 00
F513	Radio Transmitter T-440/FRT-24	Spare	1	250	264 4280 00
F514	Radio Transmitter T-440/FRT-24	High-voltage rectifier filament	1	250	264 4280 00
F515	Radio Transmitter T-440/FRT-24	Low-voltage plate circuit	6	250	264 4100 00
F516	Radio Transmitter T-440/FRT-24	Low-voltage rectifier filament	¼	250	264 4242 00
F517	Radio Transmitter T-440/FRT-24	Power distribution to control circuits	2	250	264 0008 00

TABLE 5-2. FUSE LOCATION — Continued

SYMBOL	LOCATION	PROTECTS	AMPS	VOLTS	CONTRACTOR'S PART NUMBER
F518	Radio Transmitter T-440/FRT-24	Power distribution to control circuits	1	250	264 4280 00
F901	Transmitter Control C-1362/FRT-24	115-volt a-c line	½	250	264 4260 00
F1001	Power Supply PP-454/FRT-5	A-C input supply	3	250	264 4080 00
F1002	Power Supply PP-454/FRT-5	A-C input supply	2	250	264 4070 00
F1003	Power Supply PP-454/FRT-5	230-volt a-c input supply	1½	250	264 4060 00
F1004	Power Supply PP-454/FRT-5	230-volt a-c input supply	1	250	264 4050 00
F3101	R-F Oscillator O-243/FRT-24	Motor B3101	½	250	264 4260 00
F3102	R-F Oscillator O-243/FRT-24	Crystal oven HR3101	⅛	250	264 4230 00

4. ELECTRON TUBE MAINTENANCE

For satisfactory tube operation and normal tube life, the filament voltage must be correct to within 5% of the rated value. Permitting the tubes to draw current for a longer period than a few seconds while the stage is out of resonance will shorten the life of the tubes.

The type 3B28 and 4B32 rectifier tubes are xenon-filled. They have the same current and voltage ratings as the type 866/866A and 872A/872 tubes, respectively, and are directly interchangeable with them. The 3B28 and 4B32 tubes are considerably more tolerant of ambient temperature, however, and therefore should not be replaced with 866/866A and 872A/872 tubes except in an emergency.

The following xenon-filled tubes are used in this equipment:

Quantity	Type	Location
2	3B28	Radio Transmitter T-440/FRT-24
2	4B32	Radio Transmitter T-440/FRT-24

5. ELECTRON TUBE REPLACEMENT

WARNING

Allow tubes to cool before handling. If immediate replacement is required, use an asbestos glove and handle carefully.

If it is necessary to examine tubes, open the transmitter doors, manually lock the interlock switches, and again operate the plate and filament ON-OFF switches. Do not handle exposed high-voltage contacts (terminal boards, plate caps, etc.) when the interlock switches are locked.

Before replacing an electron tube, note the proper location from table 5-3. When removing octal type electron tubes, use a gentle rocking motion. When inserting the replacement tube into the socket, align the tube guide and socket slot; use a steady pressure and push straight downward until the tube is seated properly. Do not force; otherwise, damage to the socket terminal clamp and wiring may result. Use the same procedure when removing any four or five-prong electron tube.

When removing tubes such as 3B28 or 4B32 type, or similarly constructed tubes, the tube should be grasped firmly and rotated counterclockwise until the tube guide pin is in line with the socket slot. The tube may then be lifted out of the socket without any difficulty. When inserting a new tube into a socket of this type, align the guide pin with the socket slot, push the tube straight down, and rotate clockwise until the guide pin is stopped.

TABLE 5-3. REPLACEMENT OF ELECTRON TUBES

SYMBOL DESIGNATION	TUBE TYPE NO.	REFER TO FIGURE NO.	FUNCTION
RADIO TRANSMITTER T-440/FRT-24			
V101	5654	7-19	Crystal oscillator
V102	5763	7-19	Buffer
V103	5763	7-19	First frequency multiplier
V104	5763	7-19	Second frequency multiplier
V105	4-65A	7-19	R-F Driver
V106	4-1000A	7-15	Power amplifier
V107	OA2	7-19	Oscillator voltage regulator
V108	OA2	7-19	Exciter regulator reference tube
V109	OA2	7-19	Exciter regulator reference tube
V110	5763	7-19	Exciter voltage regulator tube
V111	5763	7-19	Exciter voltage regulator tube
V112	5763	7-19	Exciter voltage regulator tube
V113	5Y3WGTA	7-19	Power-amplifier bias rectifier
V201	5814	7-22	Inverter-keyer
V202	5763	7-22	Screen clamper
V203	OA2	7-22	Keyer plate voltage regulator

TABLE 5-3. REPLACEMENT OF ELECTRON TUBES—C ntinued

SYMBOL DESIGNATION	TUBE TYPE NO.	REFER TO FIGURE NO.	FUNCTION
RADIO TRANSMITTER T-440/FRT-24—Continued			
V204	OB2	7-22	Keyer bias regulator
V301	3B28	7-26	Rectifier
V302	3B28	7-26	Rectifier
V401	4B32	7-28	Rectifier
V402	4B32	7-28	Rectifier
V501	12AU7 or 5814	7-32	Time-delay tube
V601	12AU7	7-36	Speech amplifier-phase inverter
V602	12AU7	7-36	Audio driver
V603	4-400A	7-36	Modulator
V604	4-400A	7-36	Modulator
V605	6X4	7-36	Speech clipper
V606	5Y3WGTA	7-36	Modulator bias rectifier
TRANSMITTER CONTROL C-1362/FRT-24			
V901	12AT7WA	7-60	Input audio amplifier
V902	12AT7WA	7-60	Compressor tube
V903	12AT7WA	7-60	Output audio amplifier
V904	12AT7WA	7-60	Compressor rectifier
V905	12AT7WA	7-60	Meter amplifier
V906	5Y3WGTA	7-60	Rectifier

TABLE 5-3. REPLACEMENT OF ELECTRON TUBES—Continued

SYMBOL DESIGNATION	TUBE TYPE NO.	REFER TO FIGURE NO.	FUNCTION
POWER SUPPLY PP-454/FRT-5			
V1001	5R4GYW	7-58	High-voltage rectifier
V1002	5R4GYW	7-58	High-voltage rectifier
V1003	6X4	7-58	Bias rectifier
V1004	5R4GYW	7-58	High-voltage rectifier
V1005	OA2	7-58	+ 150 volt regulator
V1006	OA2	7-58	+ 150 volt regulator
R-F OSCILLATOR O-243/FRT-24			
V3101	5654/6AK5W	7-45	100-kc crystal oscillator
V3102	5814	7-45	100-kc amplifier
V3103	5814	7-45	25-kc divider
V3104	5750/6BE6W	7-45	450-kc amplifier
V3105	5750/6BE6W	7-45	9.125 to 20.125-mc first harmonic amplifier
V3106	5749/6BA6W	7-45	9.125 to 20.125-mc second harmonic amplifier
V3107	5750/6BE6W	7-45	875 to 900-kc first mixer
V3108	5749/6BA6W	7-45	875 to 900-kc second mixer
V3109	5749/6BE6W	7-45	800-kc first mixer
V3110	5749/6BA6W	7-45	800-kc second amplifier
V3111	5654/6AK5W	7-45	2 to 4.2-mc multiplier

TABLE 5-3. REPLACEMENT OF ELECTRON TUBES—Continued

SYMBOL DESIGNATION	TUBE TYPE NO.	REFER TO FIGURE NO.	FUNCTION
R-F OSCILLATOR O-243/FRT-24—Continued			
V3112	5654/6AK5W	7-45	10 to 21-mc multiplier
V3113	5686	7-45	2 to 4.2-mc final amplifier
V3114	5814	7-45	75 to 100-kc interpolation divider
V3115	5814	7-45	150 to 200-kc interpolation divider
V3116	5686	7-45	Motor power amplifier
V3117	5687	7-45	Motor power amplifier
V3118	5686	7-45	Motor power amplifier
V3119	5686	7-45	Motor power amplifier
V3120	5814	7-45	D-C amplifier
V3121	5814	7-45	D-C amplifier
V3122	5726/6AL5W	7-45	Diode mixer
V3123	5726/6AL5W	7-45	Diode mixer
V3124	5750/6BE6W	7-45	Regenerative divider
V3125	5749/6BA6W	7-45	Regenerative divider
V3126	6SJ7	7-45	300 to 400-kc interpolation oscillator
V3131	6SJ7	7-45	1 to 1.5-mc master oscillator

SECTION 6
PREVENTIVE MAINTENANCE

1. INTRODUCTION

The maintenance of radio equipment does not begin when the equipment fails to operate in a normal manner. Maintenance must begin weeks, even months before, when the equipment is first placed into operation. Regular care and inspection, known as preventive maintenance, are just as important as corrective maintenance. Hence, if a regular schedule of preventive maintenance is adhered to, most of the common faults and breakdowns will never occur. Only a few minutes each day are needed to be sure that the equipment is kept entirely free from dirt, dust, sand, excessive moisture, vermin, and insects; that all cables and plugs of the equipment are clean and tight-fitting; and that no part of the equipment is being abused or neglected.

It is extremely important that personnel become very familiar with normal operating conditions so that abnormal conditions can be quickly detected. The equipment should be carefully studied during operation to locate all detectable symptoms of trouble. Valuable time can be saved by a careful analysis of the situation and formulation of several possible theories about the trouble. This approach is preferable to waiting for the trouble to become so serious that it causes a shut-down, even though the source of the difficulty may be, by then, quite obvious.

2. MAINTENANCE SCHEDULE

An outline of the important items to be inspected is given in table 6-1.

TABLE 6-1. MAINTENANCE SCHEDULE

	WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS AND REMEDIES
HOURLY	Crystal oven temperature.	Check CRYSTAL OVEN-HEAT ON indicator lamp and see whether it cycles.	Oven lamp should light for about two or three minutes, then go out for about 10 or 12 minutes.
	Transmitter tuning	Check meter readings. Make minor adjustments of tuning controls to verify proper tuning.	Be familiar with tuning procedure. Power amplifier and driver plate tuning must be correct to prevent possible tube damage.
	Meter readings.	Record in an appropriate chart and compare for irregularities.	Improper meter readings indicate trouble. Refer to corrective maintenance, Section 7.
	Color of tubes and tube operation.	Observe 4-400A tube for abnormal color (white or bright red).	To prevent circuit or tube damage, condition must be corrected immediately.
		Visually check for flash-over in rectifiers.	Abnormal color may be indicative of improperly tuned stages.
		Observe rectifier tubes.	Be alert for visible internal flashings. No visible glow should be observed under normal conditions.
		Observe current readings of power amplifier tube, modulator, and driver on their respective meters.	Check for abnormally low current. Refer to Section 4, table 4-3 for normal meter indications.
	Power Control Assembly.	Check indicator lamps.	If any of the indicator lamps listed in table 5-1 is on, a particular circuit is inoperative. Refer to corrective maintenance, Section 7.

TABLE 6-1. MAINTENANCE SCHEDULE—C ntinued

	WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS AND REMEDIES
DAILY	Transformers, chokes, capacitors, etc.	Visually and manually inspect all parts in transmitter for overheating and damage.	Remedy any signs of breakdown, overheating, or breakage by repairing or replacing the part.
	Sliding and moving coil contacts.	Visually and manually inspect all sliding and moving coil contacts.	Replace any contacts that are worn, bent, or broken.
	Zero-setting of all transmitter meters.	With transmitter completely shut down, all meters should read zero.	Erratic readings will result if meters are not zeroed. Small setscrew below glass allows adjustment.
	Autotune.	Check several Autotune channels by operating CHANNEL SELECTOR switch.	Perform this test with plate voltage off if any of the channels to be used are being used.
	Accumulation of dust and dirt.	Notice deposits of dust and dirt in the various compartments.	Remove by best means available. Take care not to strike tube envelopes with cleaning equipment.
	Blower motor.	Feel motor for overheating. Visually inspect rotating parts for wear.	Lubrication may be necessary. Refer to lubrication chart, table 6-2.
	Relay contacts.	Visually inspect contacts for pit marks, unevenness, and corrosion.	Use dry cleaning solvent 140-F SNSN G51-S-4718-10 (5 gal) and burnishing tool to remedy.
	All door interlocks.	Manually operate.	Repair if inoperative.
WEEKLY	Connectors, receptacles, etc.	Check connectors, receptacles, and cables for looseness, wear, and damage.	Tighten connector and repair cables where necessary.
	Rotary contacts and switch contacts.	Visually inspect switches and contacts for looseness, weak tensions, poor contacts, and pitting.	Clean, repair, or replace as necessary. Crocus cloth and dry cleaning solvent 140-F SNSN G51-S-4718-10 (5 gal) may be used for cleaning.

TABLE 6-1. MAINTENANCE SCHEDULE—Continued

	WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS AND REMEDIES
WEEKLY	Units enclosed in dust cover.	Remove dust cover from the particular unit, and inspect for dust, dirt, and possible failure.	Clean with equipment available. Use care when cleaning to prevent damage to units.
	Automatic shutdown, time delay, and safety devices.	Operate each one and verify that proper operation takes place.	If faulty operation is discovered, refer to corrective maintenance, Section 7.
	Operation of ciruit breaker.	Manually throw ON and OFF.	Be alert for faulty operation of switch.
	Air filters.	Inspect each filter for excessive accumulation of dust and dirt.	
MONTHLY	Main tuning shafts and gears.	Rotate each to maximum and minimum settings, and note any binding, looseness, or unevenness.	Apply lubricant when necessary. Refer to lubrication chart, table 6-2.
	Tube sockets and connections.	Remove plate connections from tubes. Examine socket connections and visually inspect sockets for cracks, breaks, etc. Visually examine tube pins and contact area for cleanliness and surface pitting.	Remove any coating or dullness with crocus cloth. Replace cracked or broken sockets or contacts.
	All nut and bolt connections.	Carefully look for signs of corrosion, dullness, or poor contacts.	Use crocus cloth or #0000 sandpaper for cleaning.
	Blower motor lubrication.	Examine shafts, motor bearings, etc., to see that they are properly lubricated.	Refer to lubrication chart, table 6-2.
	General lubrication.	Examine all moving parts for binding or dry surfaces.	Refer to lubrication chart, table 6-2.

TABLE 6-1. MAINTENANCE SCHEDULE—Continued

	WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS AND REMEDIES
QUARTERLY	Bearings.	Rotate bearings within their retainers and note any unevenness or binding.	Oil when necessary. Refer to lubrication chart, table 6-2.
	Tube life and time in use.	Review past and present tube time meter readings.	Replace as necessary.
	Autotune	Carefully inspect Autotune thoroughly, being alert for parts which need lubrication.	Lubricate necessary parts. Refer to lubrication chart, table 6-2.
ANNUALLY	Transmitter overhaul.	Disassemble and clean every component possible. Replace parts where necessary.	Experienced technician should be present for reassembly.

3. LUBRICATION

a. GENERAL.—Parts to be lubricated should be free of dirt and excessive lubricant. As much oil as the bearings will take should be applied to them, but any excess is undesirable. Grease is properly applied in an even, thin layer. For location of lubrication points, see figures 6-1 and 6-2.

b. LUBRICATION CHART.—Table 6-2 shows the parts to be lubricated, the lubricant used, and how often the part should be lubricated.

Note

IN ORDER TO LUBRICATE THE AUTOTUNE, IT IS NECESSARY TO REMOVE THE INDIVIDUAL AUTOTUNE ASSEMBLIES FROM THE R-F ASSEMBLY FRAME. IF THE AUTOTUNE COVER PLATES ARE REMOVED, THE AUTOTUNE ASSEMBLIES ARE EASILY ACCESSIBLE AND MAY BE LUBRICATED WITHOUT DISMANTLING THE ASSEMBLIES.

TABLE 6-2. LUBRICATION CHART

PART	LUBRICANT	INSTRUCTIONS
Porous bronze shaft bearings behind each of the Autotune assemblies and control assemblies.	MIL-L-7878	Apply one drop of lubricant. Check monthly.
Gear racks and associated gears.	MIL-G-3278	Apply small quantity of lubricant. Check and grease every six months.
Gear-driven chains and associated gears.	MIL-G-3278	Apply lubricant sparingly. Check and grease every six months.
All tap switch contacts.	Petroleum jelly	Apply lubricant sparingly. Check and grease every six months. Note: Do not get any petroleum-jelly on the ceramic parts of the switches.
Four collectors and two spring washers on output network tuning capacitors.	MIL-L-7870	Apply small quantity of lubricant. Check every six months.

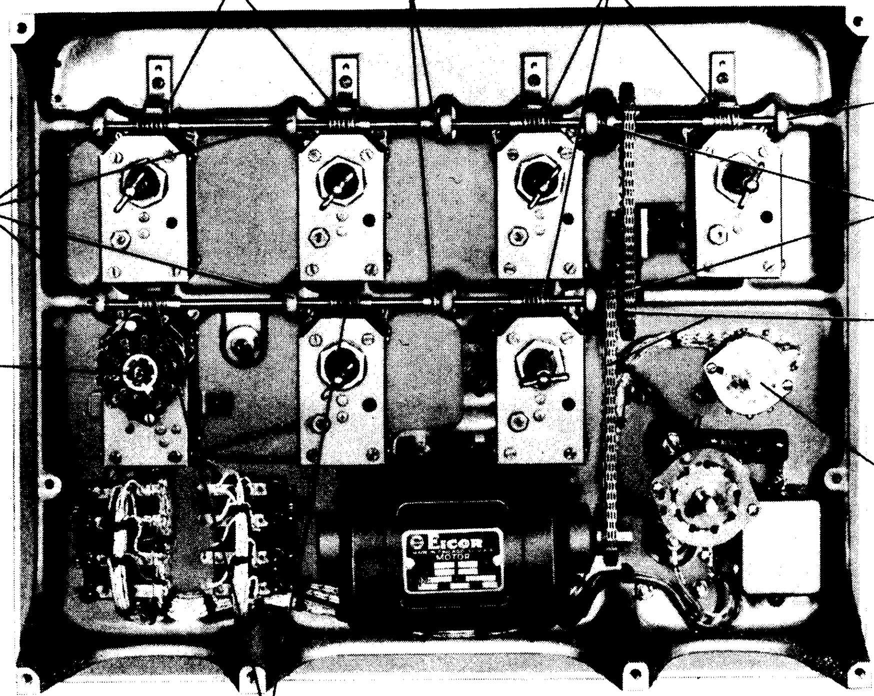


Figure 6-1. Autotune Casting Assembly, Lubrication Data

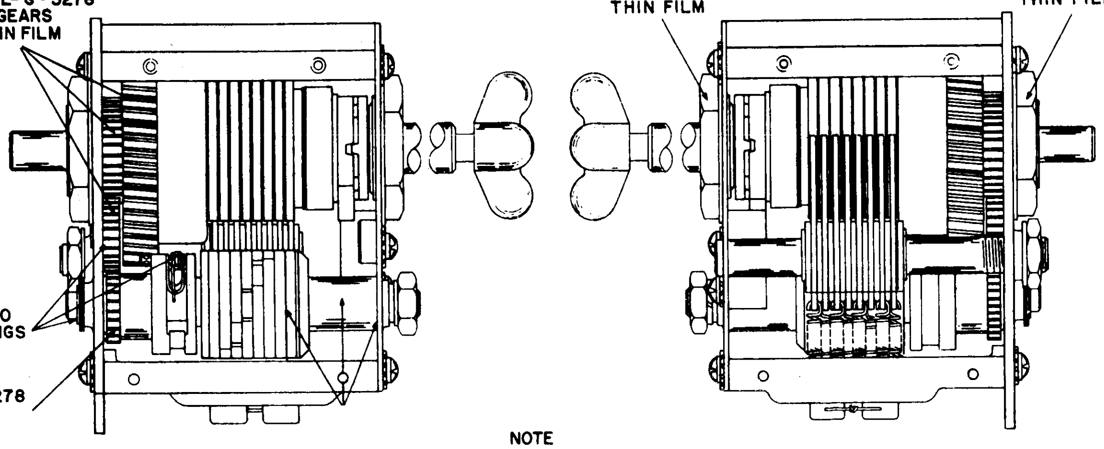


Figure 6-2. Singleturn Autotune, Lubrication Data

TABLE 6-2. LUBRICATION CHART—C ntinued

PART	LUBRICANT	INSTRUCTIONS
Collectors on exciter tuning and driver plate tuning capacitors.	MIL-L-7870	Apply small quantity of lubricant. Check every six months. **NOTE** DO NOT GET ANY OIL ON CAPACITOR PLATES OR ELSEWHERE OTHER THAN ON SURFACES SUBJECTED TO FRICTION.
Thrust bearings, line-shaft bearings, and idler-gear bearings.	MIL-L-7870	Apply small quantity of lubricant. Check every six months or every 10,000 Autotune cycles.
Disk clutch, lost-motion disk, porous bronze bearing, and ratchet within control assembly.	MIL-L-7870	Apply small quantity of lubricant. Check every six months or every 10,000 Autotune cycles.
Grease-impregnated wicks.		Annually replace the seven wicks with a complete new set.

c. LUBRICANT TYPE.—The following table lists the type of lubricant used in Radio Transmitting Set AN/FRT-24.

TABLE 6-3. LUBRICANT FEDERAL STANDARD STOCK NUMBERS

NAVY LUBRICANT		FEDERAL STANDARD STOCK CATALOG		
SPECIFICATIONS	TITLE	1 LB.	1 QT.	5 GAL.
MIL-G-3278				
MIL-L-7870				
MIL-L-7878				
	Petroleum jelly			

4. RE-TROPICALIZATION

A moisture-proofing and fungus-proofing treatment has been devised which, if properly applied, provides a reasonable degree of protection from fungi, insects, corrosion, salt spray, and moisture. The treatment involves the use of an approved lacquer or varnish coating material applied with a spray gun or brush.

When a component previously treated for climatic deterioration has been replaced, the new component and associated circuit wiring should be re-treated with an approved lacquer or varnish. Before applying the lacquer, clean all components thoroughly of dirt, dust, rust, and fungi. Carefully apply the lacquer to the area cleaned. Components such as air capacitors, relay contacts, or open switches, whose electrical function would be impaired if accidentally treated, should be masked. For more detailed instructions refer to the BuShips manual on treatment for prevention of climatic deterioration of communications equipment.

FAILURE REPORTS

A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form NAVGEN 1025, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS. Full instructions are to be found on each card.

Use great care in filling the card out to make certain it carries adequate information. For example under "Circuit Symbol" use the proper circuit identification taken from the schematic drawings, such as T-803, in the case of a transformer, or R-207, for a resistor. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause of failure and attach an extra piece of paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships, furnish a store of information permitting the Bureau to keep in touch with the performance of the equipment of your ship and all other ships of the Navy.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards and envelopes on board. They may be obtained from the nearest District Printing and Publication Office.

U. S. NAVY ELECTRONIC FAILURE REPORT
NAVSHIPS 383 (REV. 4-49)

NOTICE: 1. Read instructions interleaved in this pad prior to preparing report.
2. Report all failures (Electronic, electrical, and mechanical).
3. Use separate sheet to report each part failure.

REPORT—SHIPS-84

REPORT NO. ____________

DATE OF FAILURE ____________

EQUIPMENT INSTALLED IN (*Number and name of ship or station*)	REPAIRS MADE BY (*Number and name of ship, yard, tender, etc.*)	LEAVE BLANK	REPAIRED BY (*Name and rate of person*)

SERVICE USING EQUIPMENT (*Check one*)	TYPE ACTIVITY USING EQUIPMENT (*Check one*)	EQUIPMENT CATEGORY (*Check one*)
1 ☐ NAVY 2 ☐ USCG 3 ☐ USMC	1 ☐ SHIP 2 ☐ SHORE 3 ☐ AMPHIBIOUS	1 ☐ RADIO 2 ☐ RADAR 3 ☐ SONAR 4 ☐ TEST
4 ☐ ARMY 5 ☐ AIR FORCE	4 ☐ AIR-BORNE 5 ☐ OTHER ______ (*Specify*)	5 ☐ ORDNANCE 6 ☐ NANCY AND RADIAC 8 ☐ POWER 9 ______ OTHER (*Specify*)

NAME PLATE DATA					
EQUIPMENT	MODEL DESIGNATION	SERIAL NO.	NAME OF CONTRACTOR	MAJOR UNIT INVOLVED	TYPE NO. AND NAME
	LEAVE BLANK	CONTRACT NO.	DATE INSTALLED		SERIAL NO.

PART FAILURE DATA (*Check one*)						
☐ TUBE	COMPLETE TUBE TYPE, OR NAME AND NAVY TYPE NO. OF PART		STANDARD NAVY STOCK NO. (*See note 10*)	SYMBOL DESIGNATION (*V-101, R-201, etc.*)		FAILED IN (*Check one*) 1 ☐ OPERATION 2 ☐ FAULTY PACKAGING 3 ☐ HANDLING 4 ______ OTHER (*Specify*)
☐ OTHER	APPROXIMATE LIFE (*Hours*)	LEAVE BLANK	MANUFACTURER'S NAME	SERIAL NO. OF TUBE OR PART	ARMY STOCK NO. (*USMC only*)	MFRS' DATA (*See note 13*)

CHECK TYPE OF FAILURE

002 ☐ AIRLEAK	130 ☐ CHANGE OF VALUE	300 ☐ GROUNDED	360 ☐ INTERMITTENT OPERATION	225 ☐ MFR'S DEFECT	003 ☐ OPEN FILAMENT	540 ☐ PUNCTURED	620 ☐ SHORTED TO PRIMARY
007 ☐ ARCING	170 ☐ CORRODED	310 ☐ HANDLING IMPROPER	380 ☐ LEAKAGE	009 ☐ MICROPHONIC	460 ☐ OPEN PRIMARY	011 ☐ SCREEN DEFECTS	630 ☐ SHORTED TO SECONDARY
070 ☐ BROKEN	190 ☐ CRACKED	320 ☐ HIGH VOLTAGE BREAK-DOWN	013 ☐ LOOSE BASE	008 ☐ NOISY	470 ☐ OPEN SECONDARY	005 ☐ SHORTED INTERMITTENT	020 ☐ UNSTABLE OPERATION
014 ☐ BROKEN BASE	330 ☐ EXCESSIVE HUM	340 ☐ INSTALLED IMPROPERLY	012 ☐ LOOSE ELEMENTS	022 ☐ NO OSCIL-LATION	480 ☐ OVERHEATED	006 ☐ SHORTED PERMANENT	☐ OTHER (*Specify in remarks*)
015 ☐ BROKEN GLASS	001 ☐ GASSY	350 ☐ INSULATION BREAK-DOWN	004 ☐ LOW EMISSION	440 ☐ OLD AGE (*Specify in remarks*)	021 ☐ OVERLOADED	600 ☐ SHORTED TO CASE	
080 ☐ BURNED OUT	016 ☐ GLASS STRAIN		040 ☐ MECHANICAL BINDING	450 ☐ OPEN	010 ☐ POOR FOCUS	610 ☐ SHORTED TO FRAME	GPO 16—58703-1

REMARKS: INCLUDE CAUSE OF FAILURE AND SUGGESTED CHANGES (*Continue remarks on reverse side*)

LEAVE BLANK

Figure 7-1. Failure Report, Sample Form

SECTION 7

CORRECTIVE MAINTENANCE

WARNING

Operation of this equipment involves the use of high voltages (3000 volts) which are dangerous to life. Observe safety regulations at all times. Do not change tubes or make adjustments inside the equipment with high voltage on. Do not depend on door interlock switches for protection but always throw the primary circuit breaker to the off position. Under no circumstances should interlocks be short-circuited, removed, or tampered with, unless servicing is required for those particular parts. To avoid injury, always ground circuits before touching them. Do not service alone.

1. INTRODUCTION

In the normal service life of any piece of equipment, faults and breakdowns will develop. In order that the necessary repairs may be carried out in a reasonably short time, a logical testing routine must be followed. The two-fold purpose of any corrective maintenance procedure is first, the localization of the faulty unit or assembly, and second, the location of the faulty stage or component. The cause of the trouble must be determined as quickly and accurately as possible. The maintenance technician should familiarize himself with the operation and assembly make-up of the equipment prior to the occurrence of trouble. Reference to schematic diagrams, figures 7-64 through 7-69, should be made frequently as an aid to servicing.

When repairs are necessary it is recommended that this servicing be done, whenever possible, by competent radio techincians, supplied with suitable tools and equipment.

When working on the equipment remember that high voltage (3000 volts) may be exposed. Use extreme caution. Do not depend on interlocks. They may be the cause of the trouble.

Before proceeding with any extensive repairs, be reasonably sure that performance of this repair will eliminate the trouble. Do not waste time in needless probing or replacement of parts. When trouble is encountered, be logical.

In all repairs and replacements, every attempt should be made to duplicate the original condition of the equipment. Standard replacement parts, such as supplied in the spare parts accompaning this equipment or taken from stock, should be used. Particular care should be taken to run any replacement wiring in the same position and manner as the original wiring. Soldering should be done with rosin-core solder only. The smallest amount of solder necessary for a good mechanical and electrical joint should be used. Do not permit excess solder to drop on other components, or remain within the chassis.

In the event of emergency repairs, where it is impossible to make exact replacement of parts, the same care and workmanship must be taken. The temporarily repaired equipment should be conspicuously marked or tagged to indicate the temporary nature of the repair, and should be restored to its original condition at the first possible opportunity.

2. LOCALIZING OF TROUBLE

In servicing the equipment, defective components causing inoperation should be localized as quickly and efficiently as possible. Radio Transmitting Set AN/FRT-24 is divided into major units, and each unit is divided into several stages facilitating localization. It is suggested that the procedure used in shooting trouble be as follows: Observe all meters for abnormal indications; observe indicator lamps on the Power Control Assembly, to determine the affected circuit. Also, note any other visual or aural indications that may help to isolate the stage at fault. For example, assume that all indications are normal through the power-amplifier stage, that the transmitter is operating on a frequency of 18 mc, and that the power-amplifier plate meter reads 0. For these conditions, it can be assumed that the trouble lies somewhere in the power-amplifier stage or the power supply connected to it.

Check accessible components first, such as electron tubes, which are a major source of electronic troubles, before proceeding to any intricate servicing. If it is determined that the tubes are not at fault, the defective circuit and its associated components should be checked systematically for continuity, defective resistors, shorted capacitors, loose connections, etc. Test equipment such as an ohmmeter or a Voltohmyst should be used for these tests.

When performing continuity checks or resistance measurements, take into account other components which may be in shunt with the part under test. For accurate results, disconnect one lead of the part being checked before proceeding with measurements. Manually close contacts which are normally shut when the transmitter is operating. This will prevent errors occurring in continuity checks. Make full use of the schematic diagrams and trouble-shooting charts contained in Section 7.

3. SYSTEM TROUBLE-SHOOTING

WARNING

Read the safety notice at the front of the manual, and the high-voltage warning at the beginning of this section.

System trouble-shooting utilizes the meters, switches, controls, etc, of the transmitting set to isolate the fault to one of the units comprising the set. The unit trouble-shooting procedure given in paragraph 4 of this section is followed to isolate the fault within the unit to a particular circuit, stage, or component. In some cases, depending on circumstances, it may be quicker to replace the unit with one that is known to be in good working condition, if such a unit is available. The trouble-shooting chart for Radio Transmitting Set AN/FRT-24 given in figure 7-2 outlines a logical step-by-step method of isolating trouble by means of operational techniques. Each operational step or indication is included in a block drawn in heavy lines, and these steps are followed from the top of the page down until the faulty unit is discovered. The normal indication is placed under, and to the right of, the heavy lined block, and the abnormal condition is to the left. Contained within a lighter lined block are listed the possible faulty units and/or associated cables, connectors and other components. Once a faulty unit is discovered, all subsequent procedure is to be suspended until the faulty component is isolated as explained in the next paragraph.

4. UNIT TROUBLE-SHOOTING

Unit trouble-shooting requires detailed knowledge of the unit and may necessitate a review of the theory given in Section 2 for the particular unit. Some of the techniques used in isolating trouble in a unit are electron-tube testing, voltage and resistance measurements, signal tracing, waveform examination, and alignment or adjustment tests and checks. Certain units depend on mechanical or electromechanical devices for proper operation so that adjustments and repair to items such as motors, relays, Autotune mechanisms, etc, may be required to correct the trouble. A basic principle of trouble-shooting is to proceed first with the simple and obvious, and then by orderly steps to the more complex and unusual troubles. The trouble-shooting charts given in figures 7-3 through 7-10 present information in a logical step-by-step fashion for the more common defects that may be encountered in the following units of the radio set: Radio Transmitter T-440/FRT-24, Transmitter Control C-1362/FRT-24, Telephone Set TA-267/U, R-F Oscillator O-243/FRT-24, and Power Supply PP-454/FRT-5. No trouble-shooting chart is given for Transmission Line Coupler CU-390/FRT-24, if trouble in this unit is suspected, check by substituting an operating unit or perform the tests given in paragraph 6*d* of Section 7. If trouble is localized to one of the items in the radio transmitter by means of the system trouble-shooting chart, figure 7-2, the transmitter should then be checked using the four charts, figures 7-3 through 7-6, in the order given to avoid unnecessary and time-consuming delays in the trouble-shooting procedure. First, the a-c and d-c power distribution (figure 7-3) is checked out before proceeding with the emission (cw and phone) performance given in figure 7-4 and 7-5 for local operation. The final trouble-shooting procedure for the transmitter is a performance check of all its functions in remote operation.

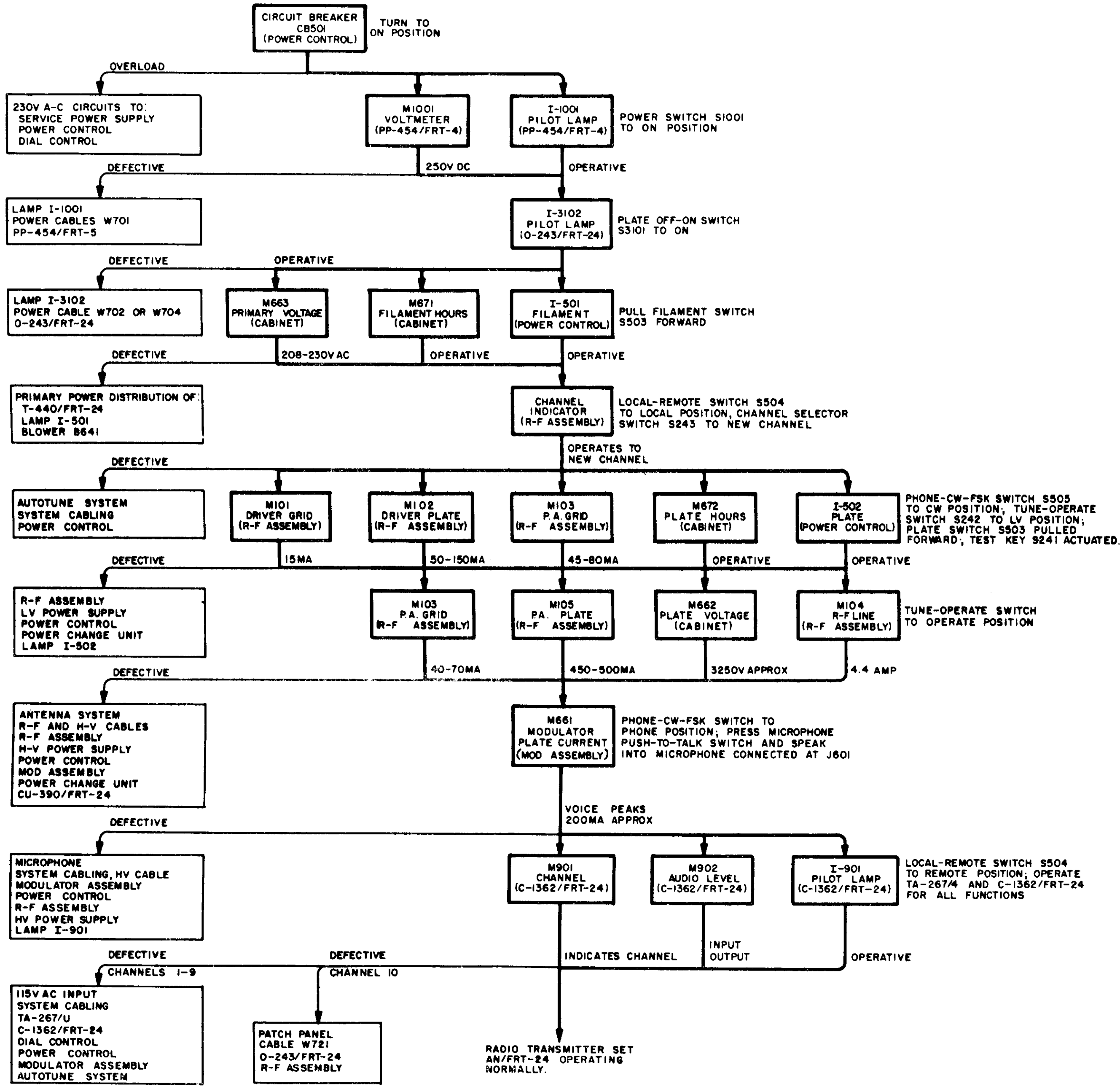


Figure 7-2. Radio Transmitting Set AN/FRT-24 System Trouble Shooting Chart

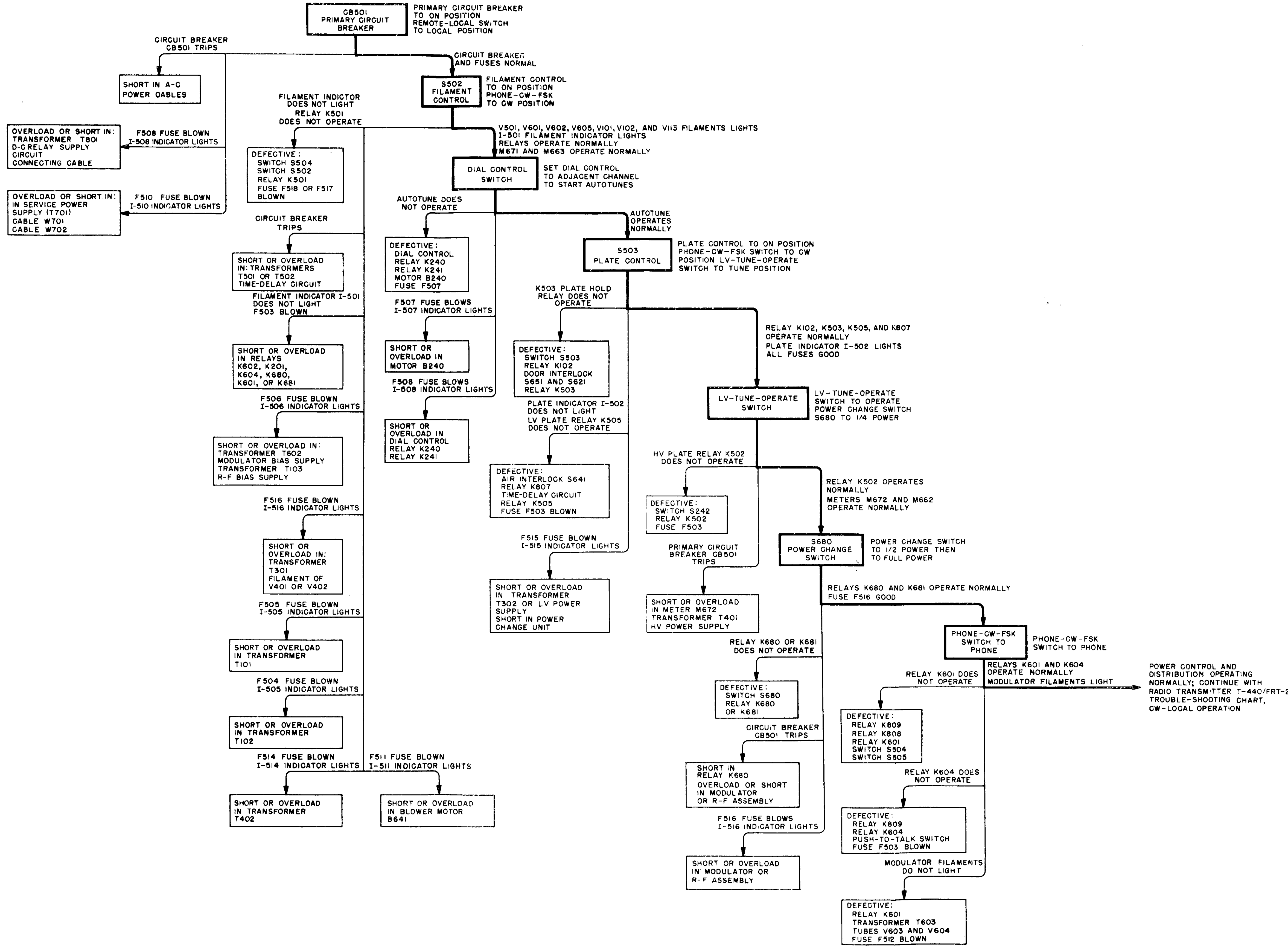


Figure 7-3. Radio Transmitter T-440/FRT-24, Trouble Shooting Chart A-C and D-C Distribution

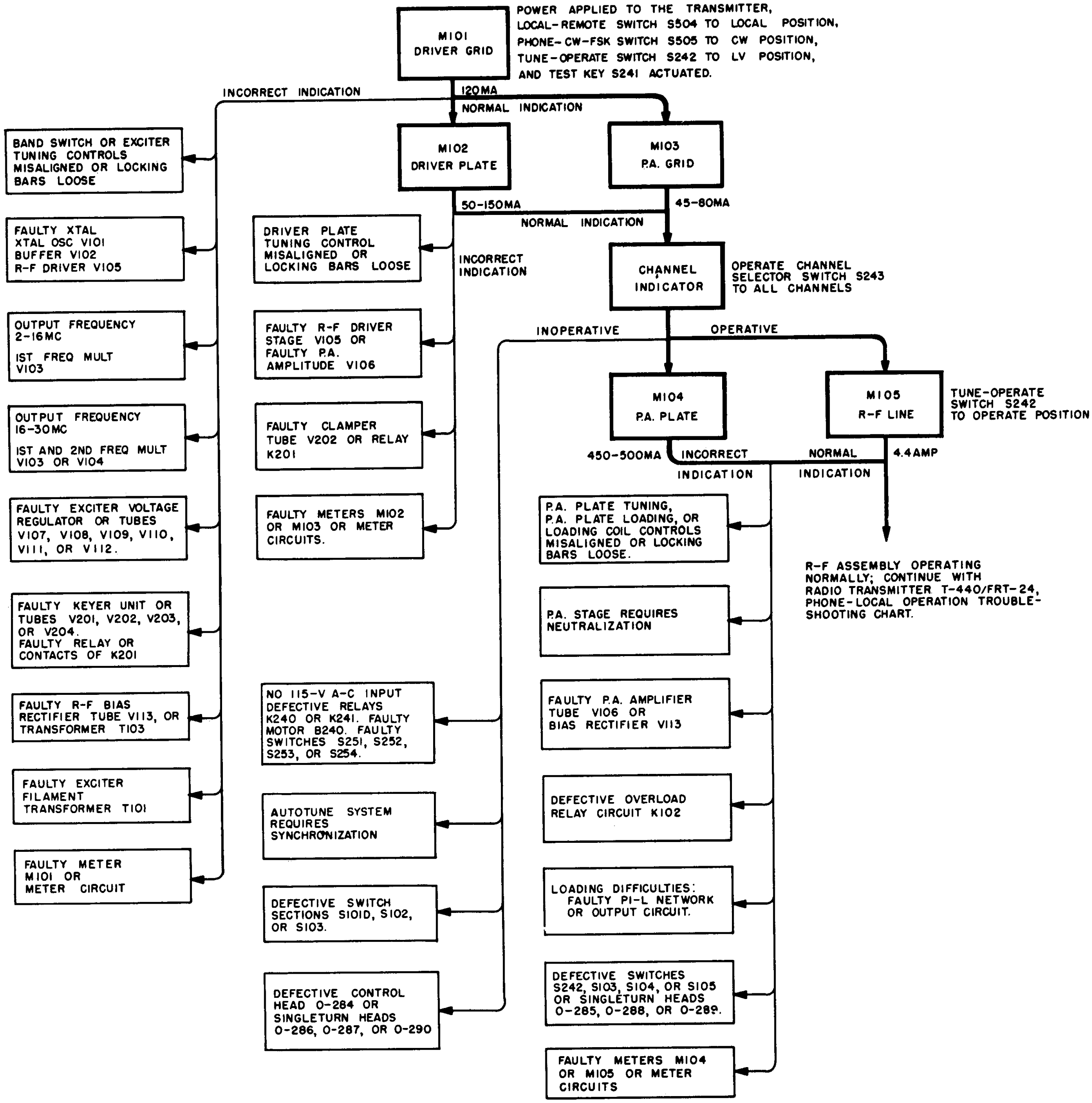
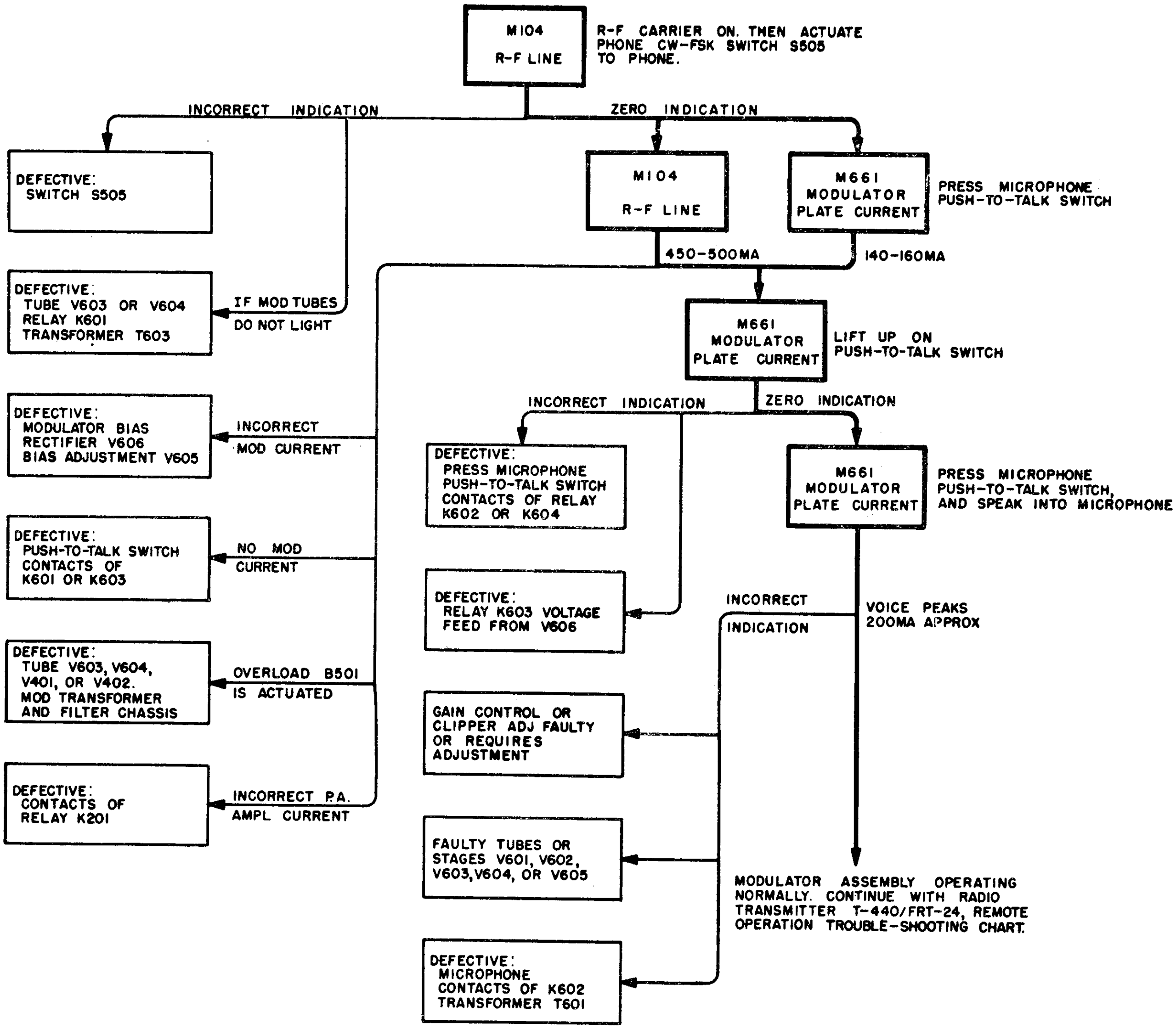


Figure 7-4. Radio Transmitter T-440/FRT-24, Trouble Shooting Chart, CW-Local Operati n



Figur 7-5. Radio Transmitter T-440/FRT-24, Trouble Shooting Chart, Phone-Local Operation

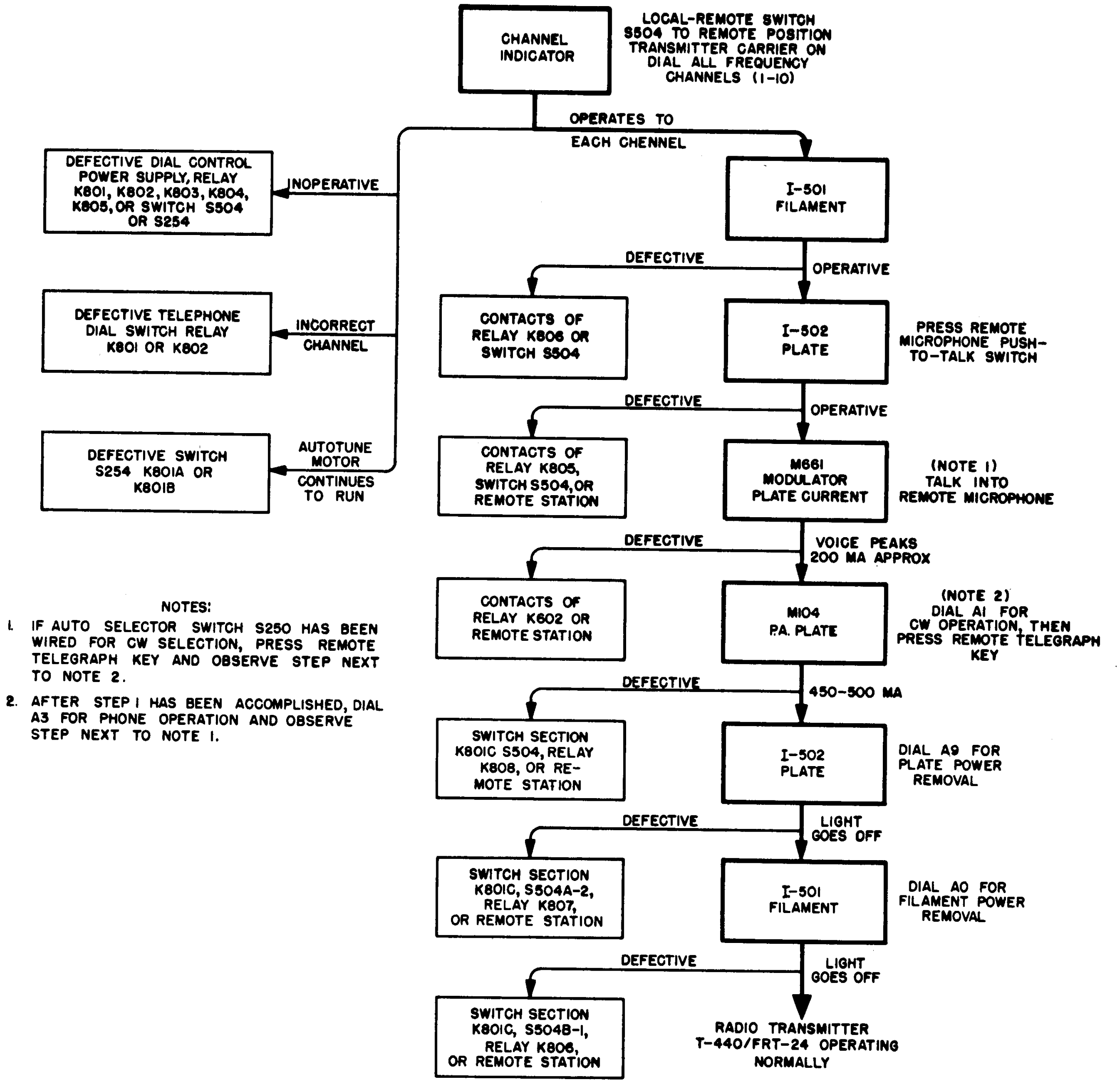


Figure 7-6. Radio Transmitter T-440/FRT-24, Trouble Shooting Chart, Remote Operation

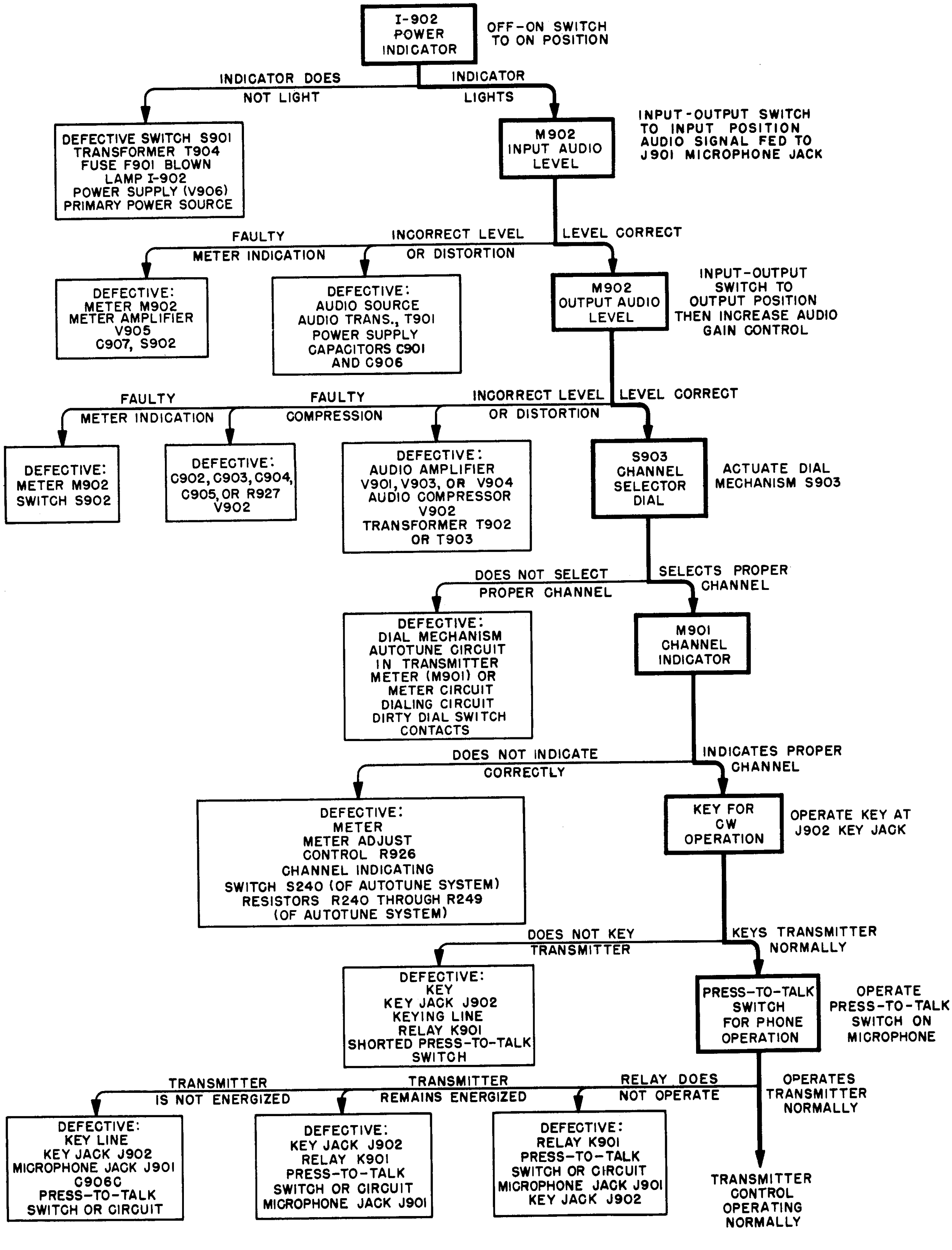


Figure 7-7. Transmitter C ntrol C-1362/FRT-24, Tr uble Sh oting Chart

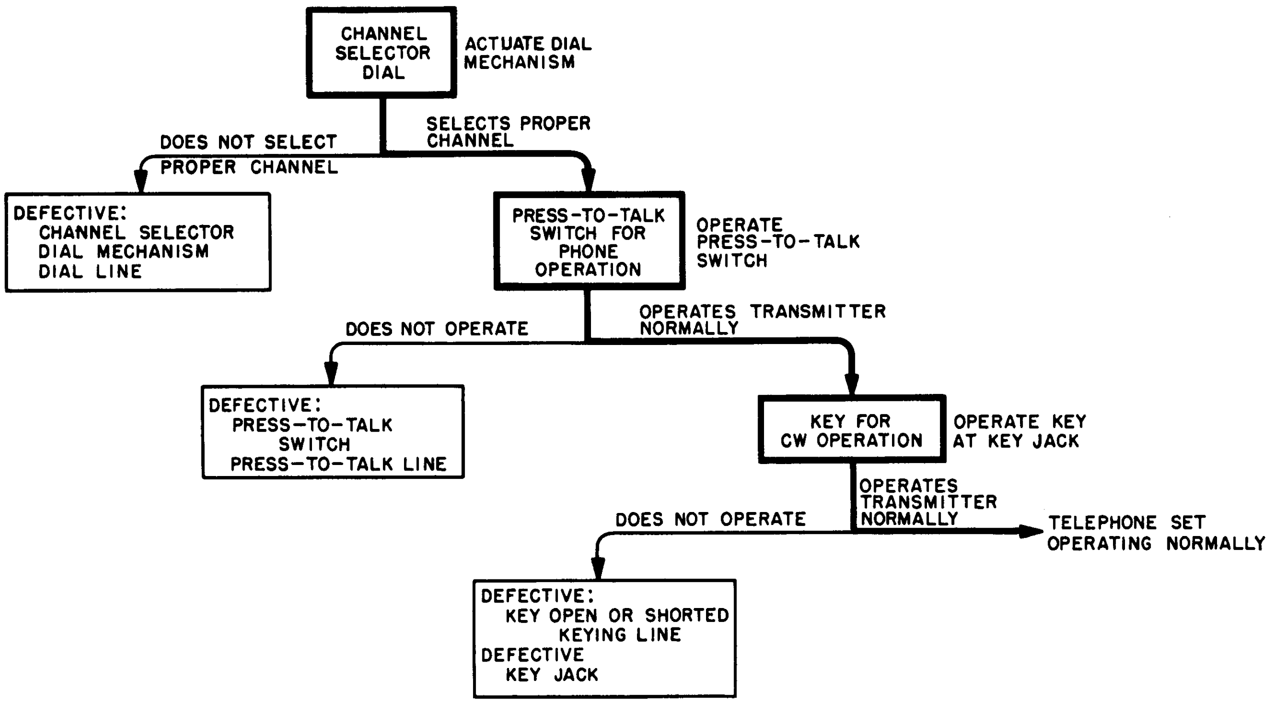
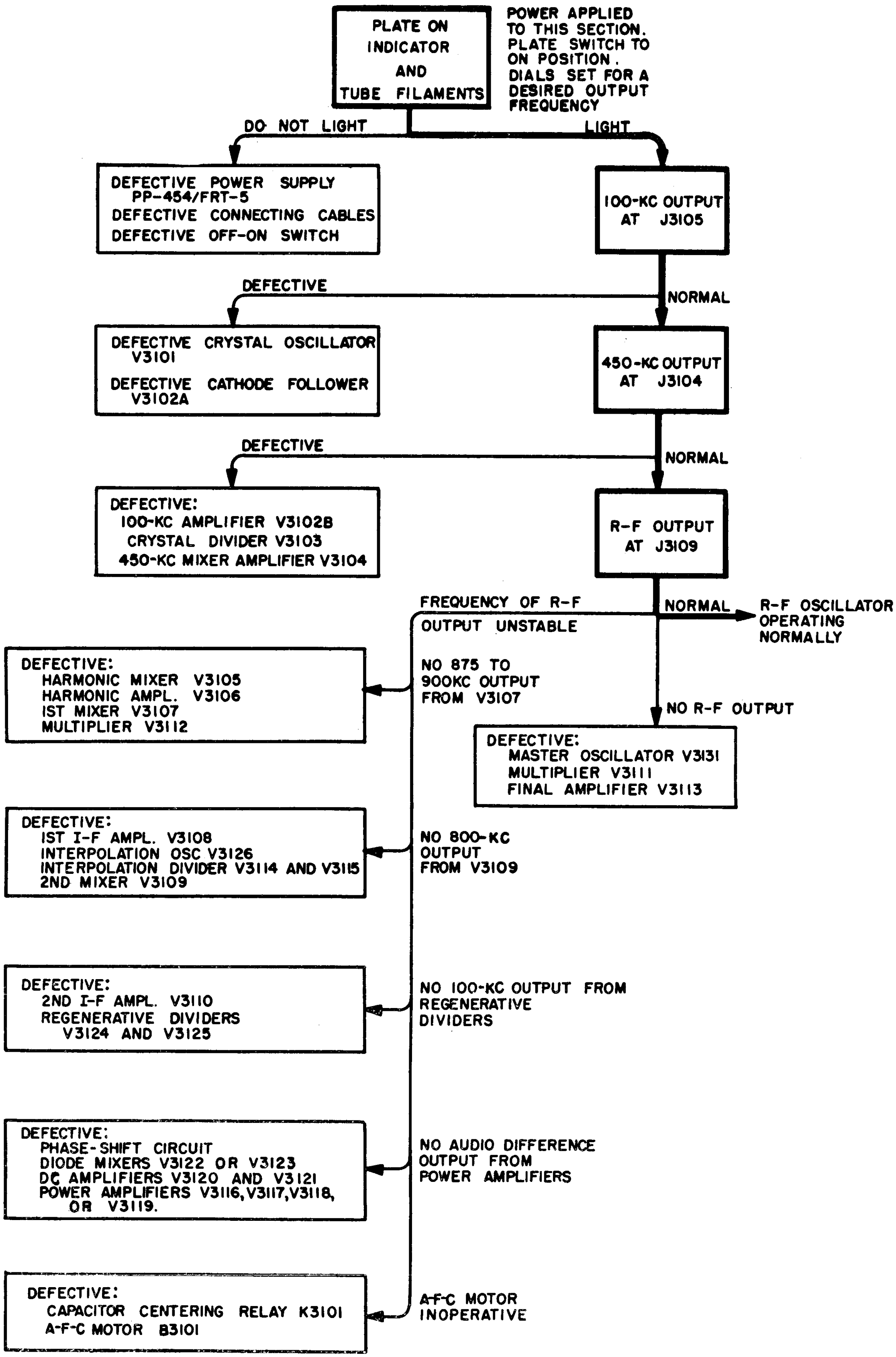


Figure 7-8. Telephone Set TA-267/U, Trouble Shooting Chart



Figur 7-9. R-F Oscillator O-243/FRT-24, Tr uble Shooting Chart

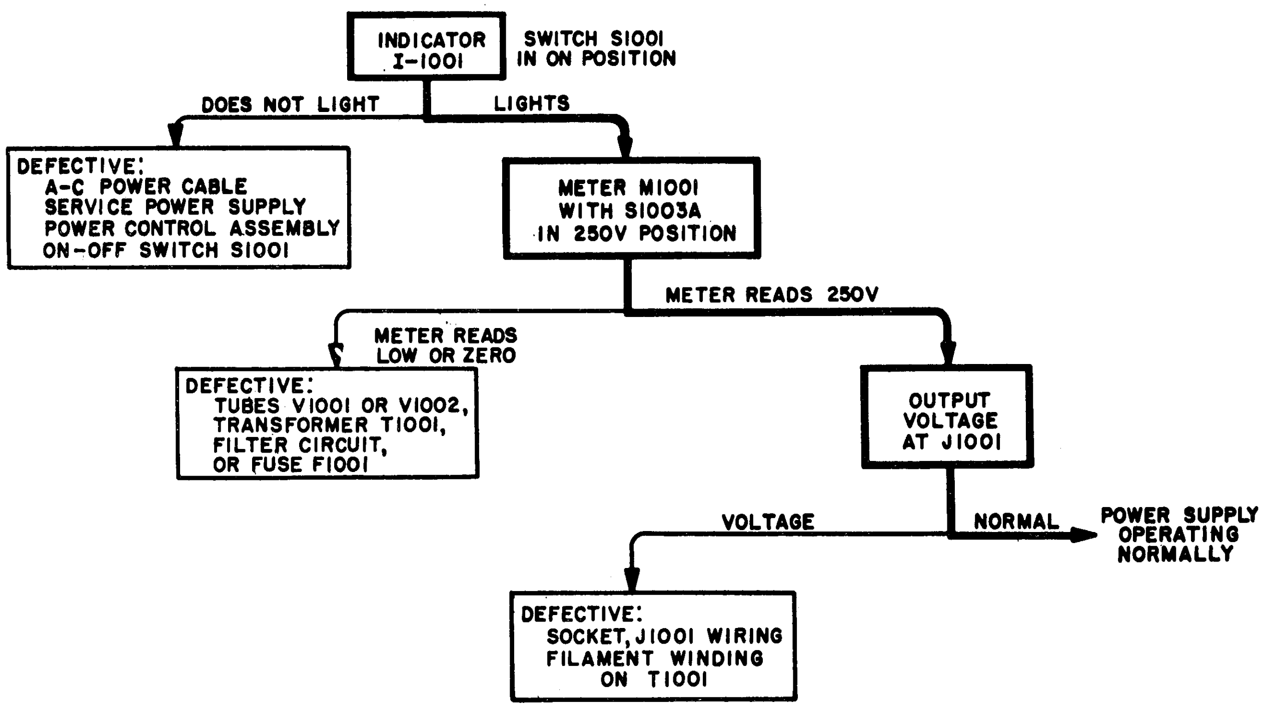


Figure 7-10. Power Supply PP-454/FRT-5, Trouble Shooting Chart

TABLE 7-1. TUBE RESISTANCE MEASUREMENTS

REFERENCE SYMBOL	TUBE TYPE	FUNCTION	PIN NUMBER 1	2	3	4	5	6	7	8	9	CAP
R-F ASSEMBLY*												
V101	5654/ 6AK5W	Crystal oscillator	90K	inf	H	0	40K	70K	200			
V102	5763	Buffer	30K	inf	320	H	0	45K	320	10K	10K	
V103	5763	First frequency multiplier	30K	inf	320	H	H	45K	320	10K	10K	
V104	5763	Second frequency multiplier	30K	inf	320	H	H	45K	320	10K	10K	
V105	4-65A	R-F driver	0	40K	inf	2000	inf	inf	0			30K
V106	4-1000A	Power amplifier	10	inf	8500	inf	10					inf
V107	OA2	Oscillator voltage regulator	25K	inf	inf	inf	35K	inf	0			

*Readings taken with vacuum-tube volt-ohmmeter from pins to ground. Values are in ohms.

TABLE 7-1. TUBE RESISTANCE MEASUREMENTS—C ntinued

REFERENCE SYMBOL	TUBE TYPE	FUNCTION	PIN NUMBER									
			1	2	3	4	5	6	7	8	9	CAP
R-F ASSEMBLY—Continued												
V108	OA2	Exciter regulator reference tube	inf	100K	inf	inf	inf	inf	30K			
V109	OA2	Exciter regulator reference tube	57K	inf	inf	inf	60K	inf	inf			
V110	5763	Exciter voltage regulator tube	35K	inf	0	H	H	35K	0	25K	25K	
V111	5763	Exciter voltage regulator tube	35K	inf	0	H	H	35K	0	25K	25K	
V112	5763	Exciter voltage regulator tube	35K	inf	0	H	H	35K	0	25K	25K	
V113	5Y3WGTA	Power-amplifier bias rectifier	inf	H	inf	6000	inf	6000	inf	0		
KEYER SUBASSEMBLY												
V201	5814	Inverter-keyer	50K	33K	4600	H	H	50K	340K	0	H	
V202	5763	Screen clamper	40K	inf	0	H	H	40K	0	100K	100K	
V203	OA2	Plate voltage regulator	30K	inf	inf	inf	32K	inf	30K			
V204	OB2	Keyer bias regulator	0	6500	inf	inf	inf	inf	6500			
LOW-VOLTAGE POWER SUPPLY												
V301	3B28	Rectifier	20K			20K						30
V302	3B28	Rectifier	20K			20K						30
HIGH-VOLTAGE POWER SUPPLY												
V401	4B32	Rectifier	120K			120K						30
V402	4B32	Rectifier	120K			120K						30
POWER CONTROL ASSEMBLY												
V501	5814	Time delay	0	1.5 MEG	10K	H	H	0	1 MEG	10K	H	

TABLE 7-1. TUBE RESISTANCE MEASUREMENTS—Continued

REFERENCE SYMBOL	TUBE TYPE	FUNCTION	PIN NUMBER									
			1	2	3	4	5	6	7	8	9	CAP
MODULATOR ASSEMBLY												
V601	5814	Speech amplifier-phase inverter	inf	2.0	2250	H	H	inf	1250	50K	H	
V602	5814	Audio driver	inf	220K	1000	H	H	inf	320K	1000	H	
V603	4-400A	Modulator	H	inf	220K	inf	H					85K
V604	4-400A	Modulator	H	inf	220K	inf	H					85K
V605	6X4W	Speech clipper	220K	inf	H	H	inf	220K	0.6			
V606	5Y3GTA	Modulator bias rectifier	inf	H	inf	4000	inf	4000	inf	0		
TRANSMITTER CONTROL C-1362/FRT-24												
V901	12AT7WA	Input audio amplifier	20K	2500	1600	H	H	20K	2500	1600	1600	
V902	12AT7WA	Compressor tube	18K	2.7 MEG	1300	H	H	18K	2.7 MEG	1300	1300	
V903	12AT7WA	Output audio amplifier	8700	3300	1450	H	H	8700	3300	1450	1450	
V904	12AT7WA	Compressor rectifier	330K	330K	2.7 MEG	H	H	330K	330K	2.7 MEG	2.7 MEG	
V905	12AT7WA	Meter amplifier	8300	20K	40K	H	H	8300	20K	40K	40K	
V906	5Y3WGTA	Rectifier		8700		180		200		8700	8700	
POWER SUPPLY PP-454/FRT-5												
V1001	5R4GYW	High-voltage rectifier	NC	90K	NC	18	NC	19	NC	90K		
V1002	5R4GYW	High-voltage rectifier	NC	90K	NC	18	NC	19	NC	90K		
V1003	6X4W	Bias rectifier	30K	NC	4	4	NC	30K	40			
V1004	5R4GYW	High-voltage rectifier	NC	110K	NC	40	NC	42	NC	110K		

TABLE 7-1. TUBE RESISTANCE MEASUREMENTS—Continued

REFERENCE SYMBOL	TUBE TYPE	FUNCTION	PIN NUMBER									
			1	2	3	4	5	6	7	8	9	CAP
POWER SUPPLY PP-454/FRT-5—Continued												
V1005	OA2	+150 volt regulator	NC	0	NC	NC	85K	NC	NC			
V1006	OA2	+150 volt regulator	NC	0	NC	NC	100K	NC	NC			
R-F OSCILLATOR O-243/FRT-24												
V3101	5654/ 6AK5W	100-kc crystal oscillator	1 MEG	0	inf 0	0	165K *	600K *	0			
V3102	5814	100-kc amplifier	68K *	220K	10K	0	0	68K *	220K	1000	0	
V3103	5814	25-kc divider	68K *	110K	0	0	0	68K *	110K	0	0	
V3104	5750/ 6BE6W	450-kc amplifier	22K	100	0	0	46K *	82K *	100K			
V3105	5750/ 6BE6W	9.125 to 20.125-mc first harmonic amplifier	100K	0	0	0	46K *	270K *	22K			
V3106	5749/ 6BA6W	9.125 to 20.125-mc second harmonic amplifier	100K	100	0	0	46K *	265K *	100			
V3107	5750/ 6BE6W	875 to 900-kc first mixer	100K	470	0	0	46K *	80K *	133K			
V3108	5749/ 6BA6W	875 to 900-kc second amplifier	133K	0	0	0	46K *	265K *	0			
V3109	5750/ 6BE6W	800-kc first mixer	133K	470	0	0	46K *	82K *	4700			
V3110	5749/ 6BA6W	800-kc second amplifier	133K	0	0	0	46K *	265K *	0			
V3111	5654/ 6AK5W	2 to 4.2-mc multiplier	47K	470	0	0	68K *	110K *	470			
V3112	5654/ 6AK5W	10 to 21-mc multiplier	470K	470	0	0	265K *	1 MEG *	470			
V3113	5686	2 to 4.2-mc final amplifier	220	27K	220	0	0	47K *	45K *	220	47K *	

*For R-F Oscillator O-243A/FRT-24 these values are approximately 36,000 ohms less than the values given for O-243/FRT-24.

TABLE 7-1. TUBE RESISTANCE MEASUREMENTS—Continued

REFERENCE SYMBOL	TUBE TYPE	FUNCTION	PIN NUMBER									
			1	2	3	4	5	6	7	8	9	CAP
R-F OSCILLATOR O-243/FRT-24—Continued												
V3114	5814	75 to 100-kc interpolation divider	56K *	23K	33K	0	0	75K *	23K	33K	0	
V3115	5814	150 to 200-kc interpolation divider	56K *	22K	33K	0	0	75K *	22K	33K	0	
V3116	5686	Motor power amplifier	1600	650K *	1600	0	0	45K *	45K *	1600	45K *	
V3117	5687	Motor power amplifier	1600	650K *	1600	0	0	45K *	45K *	1600	45K *	
V3118	5686	Motor power amplifier	1600	650K *	1600	0	0	45K *	45K *	1600	45K *	
V3119	5686	Motor power amplifier	1600	650K *	1600	0	0	45K *	45K *	1600	45K *	
V3120	5814	D-C amplifier	650K *	300K	4700	0	0	650K *	300K	4700	0	
V3121	5814	D-C amplifier	650K *	300K	4700	0	0	650K *	300K	4700	0	
V3122	5726/ 6AL5W	Diode mixer	310K	330K	0	0	310K	0	330K			
V3123	5726/ 6AL5W	Diode mixer	310K	330K	0	0	310K	0	330K			
V3124	5726/ 6AL5W	Regenerative divider	110K	220	0	0	47K *	68K *	27K			
V3125	5726/ 6AL5W	Regenerative divider	1 MEG	1000	0	0	47K *	110K *	1000			
V3126	6SJ7Y	300 to 400-kc interpolation oscillator	0	0	0	150K	0	115K *	0	55K *		
V3131	6SJ7Y	1 to 1.5-mc master oscillator	0	0	0	150K	0	115K *	0	46K *		

*For R-F Oscillator O-243A/FRT-24 these values are approximately 36,000 ohms less than the values given for O-243/FRT-24.

TABLE 7-2. TUBE OPERATING VOLTAGES

REFER-ENCE SYMBOL	TUBE TYPE	FUNCTION	PIN NUMBER									
			1	2	3	4	5	6	7	8	9	CAP
R-F ASSEMBLY *												
V101	5654/6AK5 Key open	Crystal oscillator	-14	1.0	6.3 ac	0	135	108	1.0			
	Key closed		-14	1.0	6.3 ac	0	135	108	1.0			
V102	5763 Key open	Buffer	300		0	6.3 ac	0	300	0	-54	-54	
	Key closed		290		9.6	6.3 ac	0	277	9.6	-4.2	-4.2	
V103	5763 Key open	First frequency multiplier	300		12	3.0 ac	3.0 ac	285	12	0	0	
	Key closed		280		16	3.0 ac	3.0 ac	230	16	-7.2	-7.2	
V104	5763 Key open	Second frequency multiplier	300		14.2	3.0 ac	3.0 ac	265	14	-1.7	-1.7	
	Key closed		285		19.8	3.0 ac	3.0 ac	235	18.5	-43	-43	
V105	4-65A Key open	R-F driver	3.0 ac	145		-50		145	3.0 ac			590
	Key closed		3.0 ac	220		86		220	3.0 ac			570
V106	4-1000A Key open	Power amplifier	3.6 ac	600	-145	600	3.6 ac					3400
	Key closed		3.6 ac	500	-320	500	3.6 ac					3000
V107	OA2 Key open	Oscillator voltage regulator	150				150		0			
	Key closed		150				150		0			
V108	OA2 Key open	Exciter regulator voltage tube	133	-21					-21			
	Key closed		113	-40					-40			
V109	OA2 Key open	Exciter regulator reference tube	300				300		148			
	Key closed		285				285		130			
V110	5763 Key open	Exciter voltage regulator tube	300		0	3.0 ac	3.0 ac	300	0	-20	-20	
	Key closed		285		0	3.0 ac	3.0 ac	285	0	-38	-38	

*Conditions of measurement: Approx. 1 kw output; band 8; 30 mc; cw.

TABLE 7-2. TUBE OPERATING VOLTAGES—C ntinued

REFERENCE SYMBOL	TUBE TYPE	FUNCTION	PIN NUMBER 1	2	3	4	5	6	7	8	9	CAP
R-F ASSEMBLY—Continued												
V111	5763 Key open	Exciter voltage regulator tube	300		0	3.0 ac	3.0 ac	300	0	−20	−20	
	Key closed		285		0	3.0 ac	3.0 ac	285	0	−38	−38	
V112	5763 Key open	Exciter voltage regulator tube	300		0	3.0 ac	3.0 ac	300	0	−20	−20	
	Key closed		285		0	3.0 ac	3.0 ac	285	0	−38	−38	
V113	5Y3WGTA Key open	Power-amplifier bias rectifier		5.0 ac		150 ac		150 ac		0		
	Key closed			5.0 ac		150 ac		150 ac		0		
KEYER SUBASSEMBLY												
V201	5814 Key open	Inverter-keyer	215	−0.4	12	3.0 ac	3.0 ac	92	0	0	3.0 ac	
	Key closed		170	11	18	3.0 ac	3.0 ac	280	0	0	3.0 ac	
V202	5763 Key open	Screen clamper	155		0	3.0 ac	3.0 ac	115	0	−1.4	−1.4	
	Key closed		235		0	3.0 ac	3.0 ac	235	0	−16.5	−16.5	
V203	OA2 Key open	Keyer plate voltage regulator	450	300			450		300			
	Key closed		440	290			440		290			
V204	OB2 Key open	Keyer bias regulator	0	−110					−110			
	Key closed		0	−110					−110			

LOW-VOLTAGE POWER SUPPLY

Terminal Board TB301			TERMINAL 5	6
	Key open	dc	78	600
		ripple	0.6	3.6
	Key closed	dc	47	600
		ripple	0.4	

TABLE 7-2. TUBE OPERATING VOLTAGES—C ntinued

REFERENCE SYMBOL	TUBE TYPE	FUNCTION	PIN NUMBER 1	2	3	4	5	6	7	8	9	CAP
HIGH-VOLTAGE POWER SUPPLY												
		Junction of L402 and R401	Key open	3400								
			Key closed	3000								
POWER CONTROL ASSEMBLY												
V501	5814 Key open	Time delay	180	0	8	3.0 ac	3.0 ac	180	0	8	3.0 ac	
	Key closed		180	0	8	3.0 ac	3.0 ac	180	0	8	3.0 ac	
MODULATOR ASSEMBLY												
V601	5814	Speech amplifier-phase inverter	180	0	8	3.0 ac	3.0 ac	200	0	9.5	3.0 ac	
V602	5814	Audio driver	230	0	9.8	3.0 ac	3.0 ac	230	0	9.8	3.0 ac	
V603	4-400A	Modulator	2.5 ac	590	−105	590	2.5 ac					2900
V604	4-400A	Modulator	2.5 ac	590	−105	590	2.5 ac					2900
V605	6X4W	Speech clipper	−105		3.0 ac	3.0 ac		−105	ADJ. −28			
V606	5Y3GTA	Modulator bias rectifier		5.0		225		225				
TRANSMITTER CONTROL C-1362/FRT-24												
V901	12AT7WA	Input audio amplifier	107	34	35	3.25 ac	3.25 ac	107	34	35	3.25 ac	
V902	12AT7WA	Compressor tube	93	25.5	104	3.25 ac	3.25 ac	93	25.5	104	3.25 ac	
V903	12AT7WA	Output audio amplifier	243	35	36.5	3.25 ac	3.25 ac	243	35	36.5	3.25 ac	
V904	12AT7WA	Compressor rectifier	0	0	25.5	3.25 ac	3.25 ac	0	0	25.5	3.25 ac	
V905	12AT7WA	Meter amplifier	245	107	110	3.25 ac	3.25 ac	245	107	110	3.25 ac	
V906	5Y3WGTA	Rectifier		270		350 ac	3.25 ac	350		270		

TABLE 7-2. TUBE OPERATING VOLTAGES—Continued

REFERENCE SYMBOL	TUBE TYPE	FUNCTION	PIN NUMBER									
			1	2	3	4	5	6	7	8	9	CAP
POWER SUPPLY PP-454/FRT-5												
V1001	5R4GYW	High-voltage rectifier		5		355 ac		355 ac		5		
V1002	5R4GYW	High-voltage rectifier		5		355 ac		355 ac		5		
V1003	6X4W	Bias rectifier	−465		6.3	6.3		−465	363 ac			
V1004	5R4GYW	High-voltage rectifier		5		363 ac		363 ac		5		
V1005	OA2	+150-volt regulator		160								
V1006	OA2	+150-volt regulator		160								
R-F OSCILLATOR O-243/FRT-24												
V3101	5654/ 6AK5W	100-kc crystal oscillator	−5	0	6.3 ac	6.3 ac	155	55	0			
V3102	5814	100-kc amplifier	163	1	6.3 ac	6.3 ac	6.3 ac	155	1	6.3 ac		
V3103	5814	25-kc divider	163	−10	0	6.3 ac	6.3 ac	155	−10.5	0	0	
V3104	5750/ 6BE6W	450-kc amplifier	−18.3	0.8	6.3 ac	0	246	51	−7.7			
V3105	5750/ 6BE6W	9.125 to 20.125-mc first harmonic amplifier	−24	0	6.3 ac	0	265	17	−17.5			
V3106	5749/ 6BA6W	9.125 to 20.125-mc second harmonic amplifier	0	0.2	6.3 ac	0	260	42	0.2			
V3107	5750/ 6BE6W	875 to 900-kc first mixer	0	2.7	6.3 ac	0	265	82	−1.5			
V3108	5749/ 6BA6W	875 to 900-kc second mixer	−2.0	0	6.3 ac	0	255	60	0			

TABLE 7-2. TUBE OPERATING VOLTAGES—C ntinued

REFERENCE SYMBOL	TUBE TYPE	FUNCTION	PIN NUMBER									
			1	2	3	4	5	6	7	8	9	CAP
R-F OSCILLATOR O-243/FRT-24—Continued												
V3109	5750/ 6BE6W	800-kc first mixer	−1.85	2.0	0	6.3 ac	260	118	0			
V3110	5749/ 6BA6W	800-kc second amplifier	−1.8	0	6.3 ac	0	260	67	0			
V3111	5654/ 6AK5W	2 to 4.2-mc multiplier	−17.5	3.7	6.3 ac	0	157	105	3.7			
V3112	5654/ 6AK5W	10 to 21-mc multiplier	−11	54	6.3 ac	0	90	48	0.54			
V3113	5686	75 to 100-kc interpolation divider	6.0	−71	6.0	6.3 ac	0	256	265	6.0	256	
V3114	5814	75 to 100-kc interpolation divider	175	32	45	6.3 ac	6.3 ac	174	34	45	0	
V3115	5814	150 to 200-kc interpolation divider	170	28	45	6.3 ac	6.3 ac	165	27	45	0	
V3116	5686	Motor power amplifier	71	50	71	6.3 ac	0	260	250	71	260	
V3117	5687	Motor power amplifier	71	50	71	6.3 ac	0	265	250	71	265	
V3118	5686	Motor power amplifier	71	50	71	6.3 ac	0	265	250	71	265	
V3119	5686	Motor power amplifier	71	50	71	6.3 ac	0	265	250	71	265	
V3120	5814	D-C amplifier	50	0	3.0	6.3 ac	6.3 ac	50	0	3.0	0	
V3121	5814	D-C amplifier	50	0	3.0	6.3 ac	6.3 ac	50	0	3.0	0	
V3122	5726/ 6AL6W	Diode mixer	0	−3.8	0	6.3 ac	0	0	−3.8			

TABLE 7-2. TUBE OPERATING VOLTAGES—Continued

REFERENCE SYMBOL	TUBE TYPE	FUNCTION	PIN NUMBER									
			1	2	3	4	5	6	7	8	9	CAP
R-F OSCILLATOR O-243/FRT-24—Continued												
V3123	5726/ 6AL5W	Diode mixer	0	−3.5	0	6.3 ac	0	0	−3.5			
V3124	5749/ 6BE6W	Regenerative divider	−6.0	1.8	6.3	0	265	114	−2.6			
V3125	5749/ 6BA6W	Regenerative divider	−40	6.8	0	6.3 ac	252	135	6.8			
V3126	6SJ7Y	300 to 400-kc interpolation oscillator		6.3 ac	0	−3	0	140	0	250		
V3131	6SJ7Y	1 to 1.5-mc master oscillator		0	0	−7	0	155	6.3 ac	250		

5. REMOVAL AND REPLACEMENT

a. GENERAL.—The removal of the majority of the units, assemblies, and components in this equipment requires no special treatment. The following paragraphs explain the removal and replacement procedures.

b. MAJOR UNITS.—Power Supply PP-454/FRT-5 and R-F Oscillator O-243/FRT-24 are the two major units located in Radio Transmitter T-440/FRT-24. These units are mounted on roller slides. The removal and replacement procedure of each is identical and is given below.

(1) REMOVAL. — To remove either unit, proceed as follows:

(*a*) Remove vertical style strips from relay rack.

(*b*) Slide out unit until it makes contact with the stops.

(*c*) Disconnect all associated cabling.

(*d*) Raise front of unit and slide out all the way, being careful not to drop it.

(*e*) Set unit out of the way.

(2) REPLACEMENT. — To replace either unit, proceed in the reverse order of its removal.

c. ASSEMBLIES.—All assemblies, except the R-F Assembly which is mounted on roller slides, are bolted to the transmitter cabinet frame. To remove the R-F Assembly, proceed with paragraph 5.*b.*(1)(*b*) through (*c*). To replace the R-F Assembly, proceed with paragraph 5.*b.*(2). The following assemblies are mounted on the transmitter cabinet frame:

(1) Rectifier chassis.
(2) Filter chassis.
(3) Low-Voltage Power Supply chassis.
(4) Power Control Assembly chassis.
(5) Blower Assembly chassis.
(6) Plate Transformer.
(7) Modulation Transformer and Filter chassis.
(8) Power Change Assembly chassis.
(9) Patch Panel Assembly chassis.
(10) Service Power Supply chassis.

To remove any of these assemblies, remove the bolts securing it to the cabinet frame and disconnect the associated cabling. To replace any of these assemblies, bolt it to the cabinet frame and reconnect the associated cabling. (Refer to Section 3.)

d. AUTOTUNE.—To remove and replace the components of the Autotune, proceed as follows:

(1) AUTOTUNE PANEL.—Proceed as follows:

(*a*) REMOVAL.—Remove the Autotune panel as follows:

1. Rotate all Autotune control knobs fully counterclockwise. Note position of channel indicator dial.

2. Remove Autotune locking screws, Autotune knobs, and all other knobs on control panel of R-F Assembly.

3. Remove locking nuts which hold LV-TUNE-OPERATE switch and CHANNEL SELECTOR switch to panel.

4. Remove channel indicator dial.

5. Remove bolts which hold TEST KEY to panel.

6. Remove bolts which hold panel to Autotune casting assembly and remove panel.

(*b*) REPLACEMENT. — To replace the Autotune panel, proceed in the reverse order of its removal.

(2) SINGLETURN HEAD.—To remove or replace a singleturn head, proceed as follows:

(*a*) REMOVAL.—To remove the singleturn head, first remove the Autotune panel as described in subparagraph (1), above, and then proceed as follows:

1. Loosen setscrew and free gear or coupler attached to driven end.

2. Remove the two slotted-head screws and the one Phillips screw which secure head to casting.

3. Remove singleturn head.

(*b*) REPLACEMENT. — To replace the singleturn head, proceed in the reverse order of removal.

(*c*) DISASSEMBLY (see figure 7-11).—The index numbers employed in the following procedure correspond with those assigned to the exploded view of the singleturn head. To disassemble the singleturn head proceed as follows:

1. Remove the eight Phillips screws (1) and free right dust cover (2) and left dust cover (3).

2. Remove locking key (4).

3. Remove wire from heads of the two spring anchor screws (5); loosen but do not remove these screws.

4. Remove camshaft nut (6) and the No. 10 lock washer (7).

5. Remove the four Phillips screws (8) and the four Shakeproof washers (9) from front-plate assembly (10), and remove items 10 and 5.

6. Remove the two Phillips screws (11), the two lock washers, (12), and lower plate standoff (13).

7. Remove the two Phillips screws (14), the two lock washers (15), and upper standoff assembly (16).

8. Remove retaining ring (17), retaining-ring washer (18), and shims (19) from camshaft (20).

9. Remove pawl-shaft nut (21) and Shakeproof washer (22) from spring-pawl assembly (23).

10. Remove camshaft (20), spring-pawl assembly (23), and stop-ring shaft assembly (24) the rear-plate assembly (25).

(*d*) REASSEMBLY.—The index numbers are the same as those employed in the disassembly procedure. To reassemble the singleturn head, proceed as follows:

1. Assemble upper standoff assembly (16), using the two Phillips screws (14) and lock washers (15).

2. Assemble lower plate standoff (13) to rear-plate assembly (25), using the two Phillips screws (11) and Shakeproof washers (12).

3. Lubricate rear ball-bearing assembly (located in item 24) and ball-bearing race (located in item 25) with grease, such as MIL-G-3278; then insert item 24 into item 25.

4. Screw spring-pawl assembly (23) into rear-plate assembly (25).

5. Insert the two spring anchor screws (5) through holes in lower-plate standoff (13), and rotate screws two turns into spring anchors.

6. Remove all parts from camshaft (20) and apply a thin film of grease, such as MIL-G-3278, to entire shaft. Replace all parts and insert camshaft into rear-plate assembly (25).

7. Lubricate front ball-bearing retainer assembly (located in item 24) and ball-bearing race (located in item 10) with grease, such as MIL-G-3278. Replace, and secure item 10 to lower plate standoff (13), using the four Phillips screws (8) and Shakeproof washers (9).

8. Put retaining-ring washer (18) and retaining ring (17) on camshaft (20). Put as many shims (19) as required under item 18 for 0.002 to 0.004-inch end play on camshaft (20).

9. Put a No. 10 lockwasher (7) and camshaft nut (6) on camshaft (20). Tighten camshaft nut with fingers only.

10. Rotate shaft of spring-pawl assembly (23) so that pawls align in approximate center of cams on camshaft (20).

11. Put Shakeproof washer (22) and pawl-shaft nut (21) on item 23. Do not tighten nut (21).

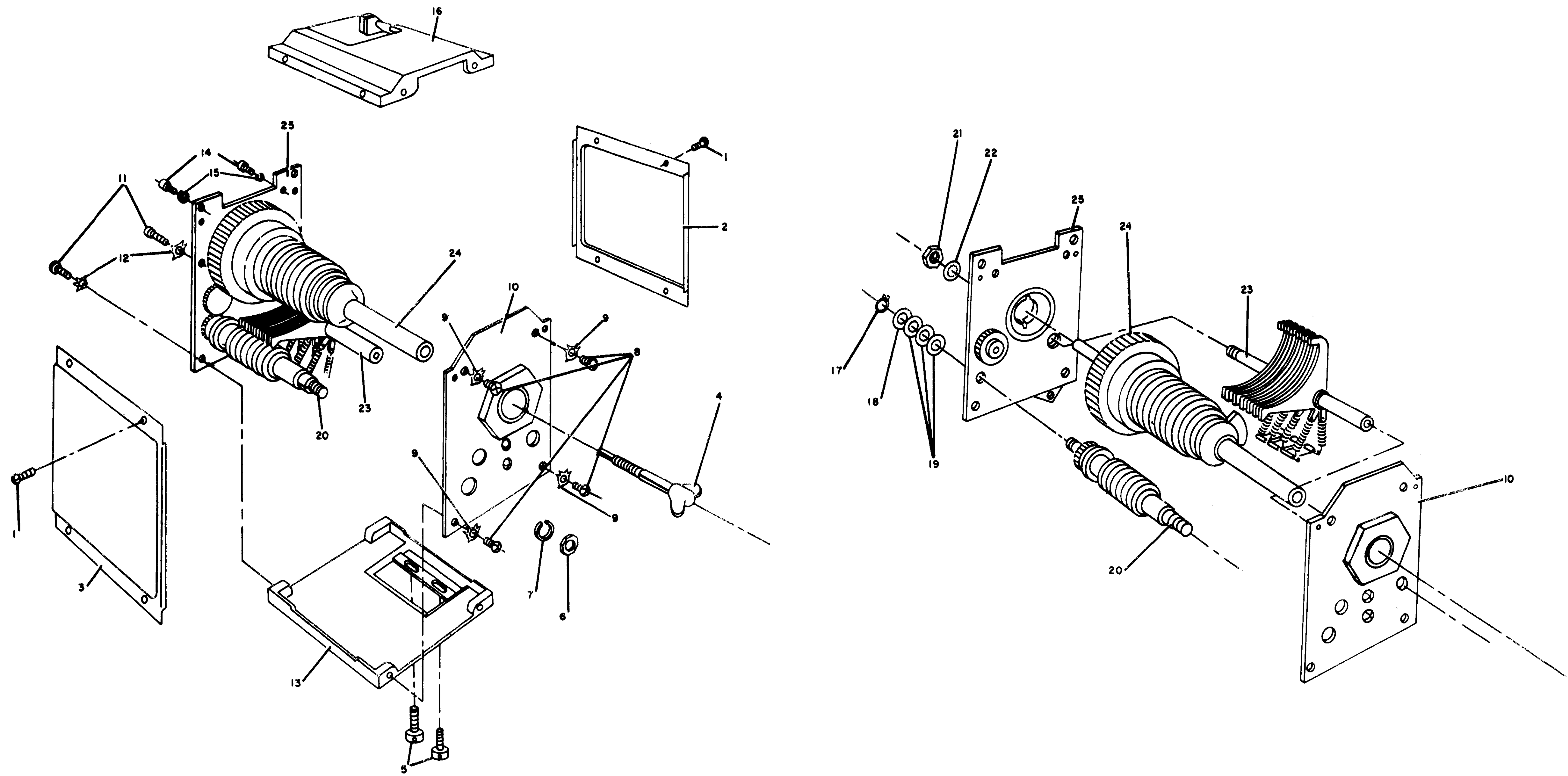
12. Tighten spring anchor screws (5), and secure them with safety wire.

13. Adjust singleturn head as directed in paragraph 6*a*(3).

14. Lubricate head in accordance with figure 6-1.

15. Coat threads of locking key (4) with grease, such as MIL-G-3278, and insert key in item 24.

16. Replace and secure left dust cover (3) and right dust cover (2), using the eight Phillips screws (1).



Figur 7-11. Disassembly of Single-Turn Head

(3) CONTROL HEAD.—Proceed as follows:

(*a*) REMOVAL.—To remove the control head, it is necessary to remove the front panel as described in subparagraph (1), above. When the front panel is removed, proceed as follows:

1. Note and disconnect color-coded wires on the control-head terminal board.

2. Remove the two slotted-head screws and one Phillips screw which secure head to casting.

3. Remove control head.

(*b*) REPLACEMENT. — To replace the control head, proceed in reverse order of removal.

(*c*) DISASSEMBLY.—After the control head has been removed, refer to figure 7-12 and accomplish the following disassembly procedure. The index numbers used in the following procedure correspond to those assigned to the parts in the figure.

1. Remove the eight Phillips screws (1); and then remove the right dust cover (2) and the left dust cover (3).

2. Loosen setscrew (4) and pull the channel indicator (5) off its shaft.

3. Remove the three Phillips screws (6), and separate terminal board (7) from control head.

4. Remove Phillips screw (8) and pull seeking switch (9) forward off its shaft. Do not unsolder any wires at this time unless it is necessary for repair.

5. Remove the two Phillips screws (10) and Shakeproof washers (11), and the two studs (12) and lock washers (13).

6. Carefully pull front plate (14) forward until it is disengaged from main shaft.

7. Unscrew nut (15) and then pull lug (16) off end of screw.

8. Unsolder and tag all wires connected to terminals of breaker switch (17), reverse switch (18), and limit switch (19).

Note

IT IS NOT RECOMMENDED THAT THE WIRES BE UNSOLDERED FROM THE SEEKING SWITCH OR THE TERMINAL BOARD UNLESS REPAIR ON THESE PARTICULAR ITEMS IS NECESSARY.

9. Remove the two Phillips screws (20) and the two lock washers (21), and separate breaker switch (17) from front plate (14).

10. Remove the two screws (22), and separate top casting (23) from rear plate (24).

11. Remove the two retaining rings (25 and 26) from end of main shaft (27) and bearing (28).

12. Disengage main shaft (27), with its attached parts, from rear plate (24).

13. Loosen setscrew (29) and slide cam (30) off main shaft (27).

14. Slide ratchet-and-gear assembly (31) off main shaft (27).

15. Slide bearing (28) out of rachet-and-gear assembly.

16. Remove retaining ring (32) from groove in main shaft (27).

17. Slide bushing (33), with its attached parts, off main shaft (27).

18. Remove retaining ring (34) from bushing (33).

19. Slide shims (35), spring washer (36), special washer (37), spacer (38), and actuator arm (39) off bushing (33).

20. Slide lost-motion washers (40) off main shaft (47).

21. Remove the two screws (41), and separate rear plate (24) from bottom casting (42).

22. Remove the two Phillips screws (43) and the Shakeproof washers (44), and separate bracket (45) from bottom casting.

23. Remove the four Phillips screws (46) and lock washers (47), and separate reverse switch (18) and limit switch (19) from bracket (45).

(*d*) REASSEMBLY.—After control head has been disassembled, repaired, and cleaned, refer to figure 7-13 to accomplish the following reassembly procedure. The index numbers assigned to the parts in the following procedure are identical with those used during the disassembly procedure, and also appear on the referenced figure.

1. Properly position reverse switch (18) and limit switch (19) on bracket (45). Secure these two switches to bracket, using the four Phillips screws (46) and the four lock washers (47).

2. Secure bracket (45) to bottom casting (42), using the two Phillips screws (43) and the two Shakeproof washers (44).

3. Attach rear plate (24) to bottom casting (42), using the two screws (41).

4. Slide lost-motion washers (40) onto main shaft (27).

5. Slide actuator arm (39), spacer (38), special washer (36), and shims (35) onto bushing (33).

6. Insert retaining ring (34) into its slot in bushing (33).

7. Slide bushing (33), with its attached parts, onto main shaft (27).

8. Insert retaining ring (32) into its slot in main shaft (27).

9. Slide bearing (28) into ratchet-and-gear assembly (31).

10. Slide ratchet-and-gear assembly (31) onto main shaft (27).

11. Slide cam (30) onto main shaft (27), and secure with setscrews (29).

12. Insert end of main shaft (27) and bearing (28) properly into their hole in the rear plate (24), and secure them in position with retaining rings (25 and 26).

13. Properly position top casting (23), and secure it to rear plate (24) with the two screws (22).

14. Properly position breaker switch (17) on front plate (14), and secure with the two Phillips screws (20) and the two lock washers (21).

15. Properly solder all removed wires to terminals of breaker switch (17), reverse switch (18), and limit switch (19). Make certain that as each wire is replaced, it corresponds to the terminal from which it was removed as tagged upon removal.

16. Replace lug (16) on end of screws, and secure with nut (15).

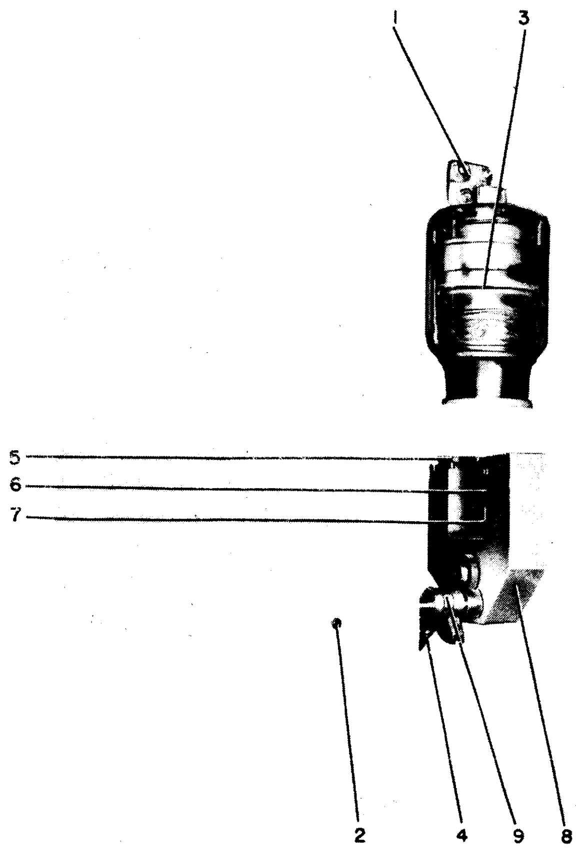
17. Replace front plate (14), engaging the bearing in the front plate with the main shaft (27), and secure with the two studs (12), the two Shakeproof washers (13), the two Phillips screws (10), and the two lock washers (11). Make certain that the rubber grommet (48) with the contained cabling is properly inserted into its slot in front plate.

18. Carefully slide seeking switch (9) onto main shaft (27), and secure it to front plate (14) with the Phillips screws (8).

19. Properly position terminal board (7), and secure in place with the three Phillips screws (6).

20. Slide channel indicator (5) onto main shaft (27), and secure with setscrew (4).

21. Rotate main shaft (27), using the gear of the ratchet assembly (31). All of the parts should rotate freely without binding, with the exception of the slip-clutch action of the actuator arm. While rotating the main shaft, check to make certain that the breaker switch (17) snaps open simultaneously with an open position on the seeking switch (9). It may be necessary to temporarily loosen the setscrews (29) and reposition the cam (30) on its shaft. Check to make certain that the lost-motion washers (40) become effective between limits of appromixately 2¼ revolutions of the spur gear.



Figur 7-13. Removal of Vacuum Type Capacit r

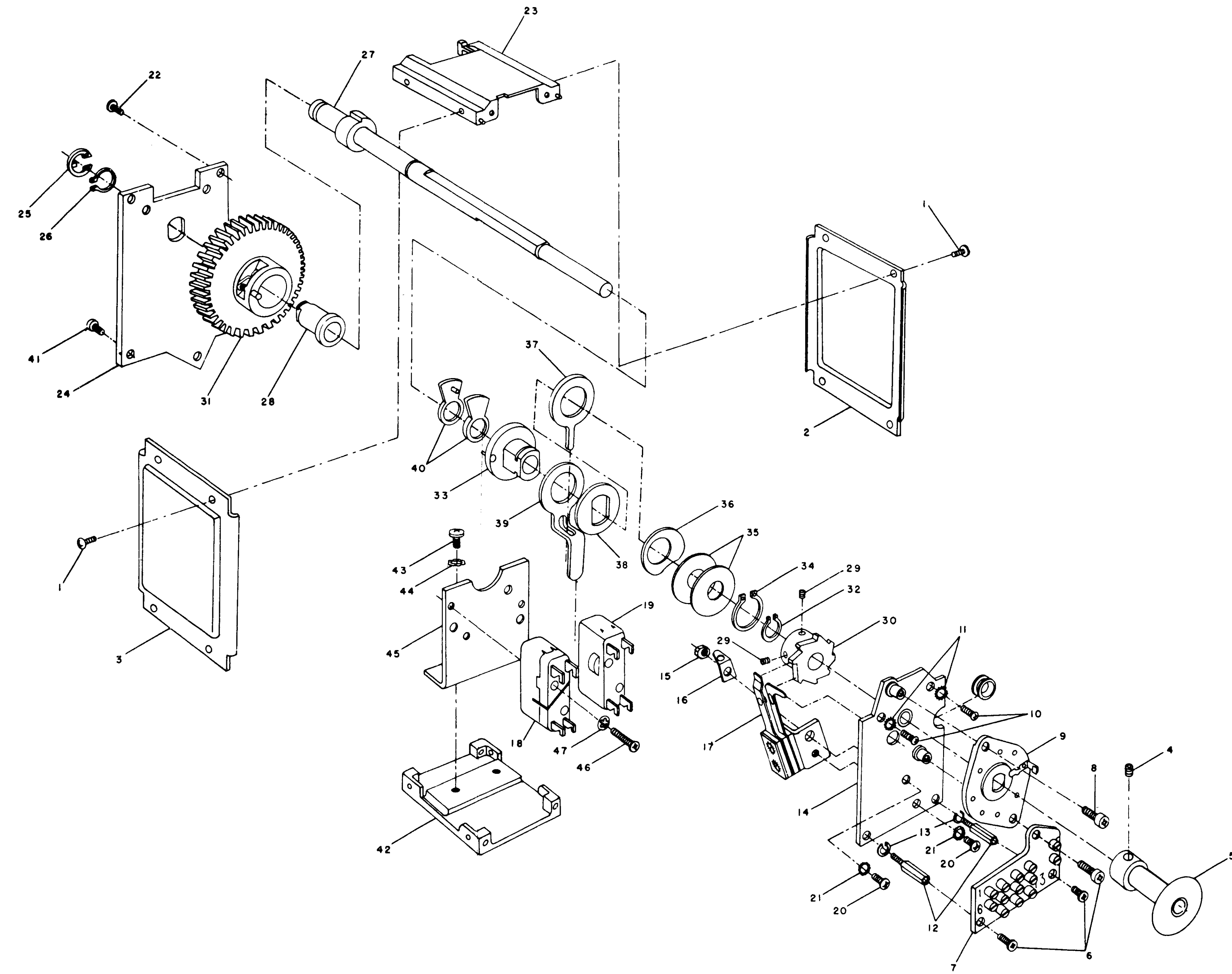


Figure 7-12. Disassembly of Control Head

22. Lubricate control head as directed in paragraph 3 section 6.

23. Replace left dust cover (3), and right dust cover (4), and secure with the eight Phillips screws (1).

e. VACUUM-TYPE CAPACITOR.—The vacuum-type capacitor is located in the R-F Assembly.

(1) REMOVAL.—Refer to figure 7-13 and accomplish the following removal procedure. The index numbers used in the following procedure correspond to those assigned to the parts in the figure.

(*a*) Remove the three bolts (1) on top of vacuum capacitor.

(*b*) Loosen innercoupler (2).

(*c*) Close vacuum capacitor so that plunger (3) is fully in capacitor.

(*d*) Disconnect tension spring (4).

(*e*) Loosen the four mounting bolts (5) which hold capacitor.

(*f*) Lift vacuum capacitor straight up.

(*g*) Unscrew rack assembly (6) out of capacitor.

(2) REPLACEMENT.—To replace the vacuum-type capacitor, proceed as follows. The index numbers assigned to the parts in the following procedure are identical with those used during the removal procedure, and also appear in the referenced figure.

(*a*) Screw rack assembly (6) eight turns into new capacitor.

(*b*) Rotate shaft (7) counterclockwise so that when rack assembly (6) is inserted into mount (8) a few teeth are engaged.

(*c*) Connect spring (4) which holds metal band (9).

(*d*) Make sure that no slack and not too great a tension exists on rack assembly (6). When assembled, there should be a slight tension on the rack assembly when the assembly is fully in the capacitor.

(*e*) Adjust spring tension so that rack assembly does not enter capacitor until P.A. PLATE TUNING control is rotated.

6. ALIGNMENT AND ADJUSTMENT

The alignment and adjustment procedures for Radio Transmitting Set AN/FRT-24 are given in the following paragraphs.

a. RADIO TRANSMITTER T-440/FRT-24.—To align and adjust Radio Transmitter T-440/-FRT-24, use the following procedure:

(1) TEST EQUIPMENT NEEDED FOR ALIGNMENT.—The following test equipment is needed for alignment:

(*a*) R-f load nonreactive, 2 kw minimum capacity, 52 ohms, with 10-ampere r-f meter.

(*b*) VTVM, such as Hewlett-Packard 410B or equivalent.

(*c*) Audio oscillator, such as Hewlett-Packard 200B or equivalent.

(*d*) Distortion and noise analyzer, such as General Radio 732B or equivalent.

(*e*) Oscilloscope, such as DuMont Model 208B or equivalent.

(*f*) Keyer, up to 600 wpm.

(*g*) Crystals (Type CR-18/U) for the following frequencies:

1 mc	4 mc
1.5 mc	6 mc
2 mc	7.5 mc
3 mc	8 mc

(*h*) Transmitter Control C-1362/FRT-24.

(*i*) Power Supply PP-454/FRT-5.

(*j*) Microphone.

(2) PRELIMINARY TESTS.—Before proceeding with the alignment, make the following tests:

(*a*) A-C LINE: Before connecting the 230-volt line, connect VTVM to terminal 1 and cabinet frame. Meter should indicate not less than 10 megohms. Connect VTVM to terminal 2 and cabinet frame. VTVM should indicate not less than 10 megohms.

(*b*) Connect VTVM between junction of resistor R401 and choke L402 (see figure 7-53) of the high-voltage power supply. VTVM should indicate 83,000 ohms ±10% with door closed and 100 ohms, maximum, with doors open.

(*c*) Connect VTVM to terminal 6 of TB301 and ground. VTVM should indicate 30,000 ohms ±10%.

(3) AUTOTUNE SYNCHRONIZATION.—To synchronize the Autotune system, proceed as follows:

(*a*) Remove the six positioning-head dial knobs, and drop front panel.

(*b*) Run Autotune forward until all positioning head cam shafts are turning counterclockwise. To do this with power on, turn CHANNEL SELECTOR knob to another channel and shut off power to drive motor just before it reverses. The same result can be accomplished by manually pulling the Autotune drive chain downward a number of times until all shafts are turning.

(*c*) With power removed, connect a continuity indicating device from the common terminal of S250 on Autotune control head to the lower-left normally open contact on motor-reversing relay K241. Run Autotune forward by pulling down on drive chain until the instant continuity is first indicated.

(*d*) Run the Autotune in a reverse direction by pulling upward on the drive chain until the Autotune line shaft completes 6⅝ revolutions.

(*e*) Synchronize each head by the following method: Insert No. 10 Bristo wrench in cam shaft and turn clockwise to stop. Hold shaft in place with the Bristo wrench, and turn the lock nut with an end wrench one-fourth to one-half turn counterclockwise to unlock cam drum. Rotate shaft clockwise to the stop. Turn nut clockwise to lock drum in new position. Do not tighten lock nut excessively.

(*f*) Replace front panel. Replace and index the dial knobs. Insert the locking keys.

(*g*) Turn on power to Autotune and select channel 1. Rotate each knob through its operating range, and then set it to desired dial reading. Lock knobs by turning the dial-locking keys clockwise. Try to turn knobs. They should not turn.

(*h*) Repeat (*g*) for the other nine channels.

Note

AN AUTOTUNE POSITIONING HEAD MAY REPEATEDLY FAIL TO SET UP ON A GIVEN CHANNEL, OR CHANNELS, EVEN WHEN PROPERLY SYNCHRONIZED. THIS IS BECAUSE THE STOP RINGS ASSOCIATED WITH THOSE PARTICULAR CHANNELS ARE IN A POSITION WHICH WILL NOT ALLOW THE PAWL TO DROP INTO THE NOTCH OF THE STOP RING. POSITIONING HEADS, WHICH HAVE ONLY 180 DEGREES OF OPERATING RANGE ARE MORE SUBJECT TO THIS DIFFICULTY THAN THE 330-DEGREE HEADS. THE REMEDY FOR THIS REQUIRES REMOVAL OF THE HEAD FROM THE AUTOTUNE CASTING. REMOVE EITHER OR BOTH SIDE COVERS AND THE DIAL-LOCKING KEYS. SLIP THE POSITIONING-HEAD STOP RINGS TO A POSITION SUCH THAT WHEN THE POSITIONING HEAD IS TURNED THROUGH ITS OPERATING RANGE, THE NOTCH IN EACH STOP RING MUST PASS UNDER ITS ASSOCIATED PAWL HEEL. REPLACE THE COVERS AND PUT THE HEAD BACK INTO THE AUTOTUNE ASSEMBLY. NOW REPEAT STEPS (*b*), (*c*), AND (*d*) OF THE SYNCHRONIZING PROCEDURE. REPEAT STEP (*e*) ONLY ON THE HEAD OR HEADS WHICH ARE REMOVED FOR ADJUSTMENT. THEN REPEAT STEPS (*f*), (*g*) AND (*h*).

(4) AUTOTUNE OPERATION, DIAL CONTROL.—Connect Transmitter Control C-1362/FRT-24, and set the LOCAL-REMOTE switch to REMOTE.

(*a*) Dial channel 1 and check the indicator on the seeking switch. Repeat for each of the remaining channels.

(*b*) Dial any channel twice. The second time the stepping switch should operate, then home. The Autotune motor should not run.

(*c*) Dial the next higher channel. The indicator dial should pass the correct number the first time it appears, and stop on the correct number the second time it appears.

(*d*) Dial A1, A4, A9, and A0 while watching the relays on the Dial Control Assembly.

A1 should operate the c-w relay.

A4 should operate the FSK relay.

A9 should operate the high-voltage-off relay.

A0 should operate the filament-off relay.

(5) EXCITER ALIGNMENT. — Exciter alignment is performed with the high-voltage rectifier tubes removed and the LV-TUNE-OPERATE switch in the LV position. Perform the alignment procedure shown in table 7-3, making sure that the tuned circuits are on the correct harmonic of the crystal. The indicated dial settings are desirable, but a variation of approximately five dial divisions is acceptable. Upon completion of the alignment procedure, return the high-voltage rectifier tubes to their sockets.

TABLE 7-3. EXCITER ALIGNMENT CHART

CRYSTAL FREQUENCY	ADJUST COIL NUMBER	TUNED TO	BAND SWITCH NUMBER	EXCITER DIAL SETTING	DRIVER GRID MA (not less than)	P. A. GRID MA (not less than)	DRIVER DIAL SETTING (approx)	DRIVER OUTPUT FREQUENCY
8 mc	L105	16 mc	8	80				
8 mc	L111	32 mc	8	79	12 ma	50 ma	92	32 mc

TABLE 7-3. EXCITER ALIGNMENT CHART—Continued

CRYSTAL FREQUENCY	ADJUST COIL NUMBER	TUNED TO	BAND SWITCH NUMBER	EXCITER DIAL SETTING	DRIVER GRID MA (not less than)	P. A. GRID MA (not less than)	DRIVER DIAL SETTING (approx)	DRIVER OUTPUT FREQUENCY
6 mc	Ck. Pt.	12 mc	8	32				
6 mc	Ck. Pt.	24 mc	8	37	12 ma	50 ma	59	24 mc
6 mc	L106	12 mc	7	86				
6 mc	L112	24 mc	7	82	12 ma	50 ma	84	24 mc
4 mc	Ck. Pt.	8 mc	7					
4 mc	Ck. Pt.	16 mc	7	28	12 ma	50 ma	36	16 mc
8 mc	Checking L105	16 mc	6	69	12 ma	50 ma	77	16 mc
6 mc	Checking L105	12 mc	6	28	12 ma	50 ma	42	12 mc
6 mc	Checking L106	12 mc	5	83	12 ma	50 ma	83	12 mc
4 mc	Checking L106	8 mc	5	26	12 ma	50 ma	39	8 mc
4 mc	Checking L106	8 mc	4	51	12 ma	50 ma	82	8 mc
3 mc	Checking L106	6 mc	4	23	12 ma	50 ma	53	6 mc
3 mc	L107	6 mc	3	48	12 ma	50 ma	78	6 mc
2 mc	Checking L107	4 mc	3	6	12 ma	50 ma	23	4 mc
2 mc	L108	4 mc	2	59	15 ma	55 ma	60	4 mc
1.5 mc	Checking L108	3 mc	2	12	15 ma	55 ma	13	3 mc
1.5 mc	L109	3 mc	1	90	15 ma	50 ma	73	3 mc
1 mc	Checking L109	2 mc	1	12	15 ma	50 ma	10	2 mc

(6) NEUTRALIZATION.—To insure stable operation, the power amplifier stage employs a capacity bridge neutralizing circuit whereby the feedback voltage due to the grid-to-plate capacity of V106 is balanced out by an equal voltage of opposite phase applied to the control grid of V106. The following procedure should be performed to neutralize the power amplifier stage:

(*a*) Set the PA NEUT. disc, C126A, spacing at approximately ½ inch.

(*b*) Set up for cw transmission, LOCAL control, band 5 with the PA PLATE current about 400 m.a.

(*c*) Starting with PA PLATE current at the exact minimum, detune the PA PLATE TUNING control clockwise (decreasing capacity) until the PA PLATE current rises to 600 m.a.; meanwhile noting the deviation of the PA GRID current. Do this briefly to avoid overheating of V106.

(*d*) Repeat step (*b*) in the counterclockwise (increasing capacity) direction.

(*e*) Pull the R-F assembly forward and turn the PA NEUT. disc, C126A clockwise (increasing capacity) if the PA GRID current rises in step (*c*) or counterclockwise (decreasing capacity) if the PA GRID current rises in step (*d*).

(*f*) Repeat steps (*c*), (*d*) and (*e*) until a setting of C126A is found at which maximum PA GRID current coincides with minimum PA PLATE current.

(*g*) Set up for transmission on band 8.

(*h*) Using the technique employed in step (*c*) check the PA GRID current deviation.

(*i*) Using the technique employed in step (*d*) check the PA GRID current deviation.

(*j*) Pull the R-F assembly forward and adjust the screw at E106 on the strap at the lower end of C126B. Turn the screw clockwise (shorter) if the PA GRID current rises in step (*h*) or counterclockwise (longer) if the PA GRID current rises in step (*i*).

(*k*) Repeat steps (*h*), (*i*) and (*j*) until a setting of E106 is found at which maximum PA GRID current coincides with minimum PA PLATE current.

(*l*) If much change was made at E106 repeat steps (*b*) through (*k*).

(7) FINAL AMPLIFIER.—Set P.A. overload relay to operate at 700 ma. Tune up the final amplifier in the sequence shown on table 7-4, with loading adjusted for 500-ma final-amplifier plate current. The dial settings shown are approximate. Lock the AUTOTUNE heads on the eight frequencies marked with an asterisk (*).

TABLE 7-4. TUNE-UP CHART FOR POWER AMPLIFIER

OUTPUT FREQ (mc)	PLATE TUNING	BAND SWITCH NO.	LOAD SWITCH NO.	P. A. LOADING	P. A. GRID CURRENT
2 mc	12	1	0	54	(NLT 40 mc)
*3	54	1	0	89	
3	23	2	2	42	
*4	53	2	2	74	
4	41	3	3	54	(NLT 40 mc)
*6	70	3	3	90	
6	57	4	4	78	
*8	73	4	4	95	
8	63	5	5	52	
*12	83	5	6	84	
12	69	6	6	66	
*16	82	6	7	86	
16	62	7	7	18	
*24	80	7	8	62	
24	70	8	8	35	
*32	83	8	10	58	(NLT 35 ma)

b. R-F OSCILLATOR O-243/FRT-24. — To align and adjust R-F Oscillator O-243/FRT-24, proceed as follows:

(1) TEST EQUIPMENT REQUIRED. — The following equipments or their equivalents are required to perform the specified tests:

(*a*) Signal generator, General Radio Co. Type 605-B, with a 470-$\mu\mu$f series blocking capacitor attached to the output lead.

(*b*) Receiver, range between 2 to 30 mc.

(*c*) Vacuum-tube voltmeter, Hewlett-Packard Model 410B.

(*d*) Oscilloscope, DuMont Model 208B.

(*e*) Power Supply PP-454/FRT-5.

(*f*) Unit interconnecting cable.

(*g*) Power cord with connector.

(*h*) R-F Load, 50 ohm noninductive with 5 feet of RG-58/U coaxial cable and male connector.

(*i*) High-impedance headphones.

(*j*) Frequency meter.

(2) PRELIMINARY TESTS. — Proceed as follows:

(*a*) Prior to making any power connections to R-F Oscillator O-243/FRT-24, make the following resistance measurements.

1. Measure resistance from pin 6 of J3107 to ground with the PLATE ON-OFF switch in the OFF position. Meter should indicate infinite resistance.

2. Measure resistance from pin 6 of J3107 to ground with the PLATE ON-OFF switch in the ON position. Meter should indicate 45,000 ohms. For R-F Oscillator O-243A/FRT-24 the meter should indicate 9000 ohms instead of 45,000 ohms.

3. Measure resistance from fuses F3101 and F3102 to ground. Meter should indicate infinite resistance.

(*b*) Apply 115 volts 50/60 cps to J3108. The following conditions should occur:

1. HEAT ON lamp should light.

2. With the SET UP-OPERATE switch (S3103) in the OPERATE position, the AFC ON lamp should light.

3. With the SET UP-OPERATE switch in the SET UP position, if the cam is not actuating S3104, the motor should run. When the cam reaches the actuate position, the motor should stop. If it does not stop, bend the actuator arm on S3104.

(*c*) Interconnect R-F Oscillator O-243/FRT-24 and Power Supply PP-454/FRT-5 using the test cable.

1. With the cable connected, the power supply turned on, and the PLATE ON-OFF switch in the OFF position, all the tube filaments should light.

2. When the PLATE ON-OFF switch is placed in the ON position, the PLATE ON lamp should light.

(3) TUNING MECHANISM ALIGNMENT. — Align the MASTER OSCILLATOR and INTERPOLATION OSCILLATOR dials to correlate the output frequencies of the oscillators with the dial settings. Set the OUTPUT TUNING dial to the white calibration mark (below 2.0) under the hairline when the tuning capacitor is fully engaged.

(4) INITIAL ADJUSTMENTS.—All tubes are to be in place, and the SET UP-OPERATE switch in the SET UP position, at the start of the alignment procedure.

(5) 800-KC SECOND I-F ALIGNMENT.—Proceed as follows:

(*a*) EQUIPMENT SETUP.—Set up the equipment as follows:

1. Remove tube V3108 and the interpolation-divider chassis.

2. Connect signal generator to pin 1 of V3110.

3. Connect d-c probe of vacuum-tube voltmeter to junction of R3149 and R3150 on a-v-c line.

4. Adjust signal generator to 800 kc ±500 cps. The signal generator output should be unmodulated.

(*b*) ALIGNMENT PROCEDURE. — Proceed as follows:

1. Turn plate power on.

2. Tune primary (top slug) and secondary (bottom slug) of T3109 for peak indication on VTVM.

3. Reduce signal-generator output as necessary to maintain a —2-volt d-c peak output while retuning primary and secondary of T3109.

4. Connect signal generator to pin 1 of V3109.

5. Tune primary (top slug) and secondary (bottom slug) of T3108 for peak indication on VTVM.

6. Reduce signal-generator output to approximately 50 mv, to obtain a —2-volt d-c peak output while retuning primary and secondary of T3108.

7. With a —2-volt d-c reading on VTVM, record on data sheet the signal-generator output. Increase signal-generator output to twice output obtained above, and check bandwidth at which a —2-volt d-c indication is obtained on VTVM.

(6) 875—900-KC I-F ALIGNMENT.—Proceed as follows:

(*a*) EQUIPMENT SET-UP.—Set up the equipment as follows:

1. Turn plate power off.

2. Insert tubes V3107, V3108, V3109, and V3110.

3. Remove tubes V3101, V3103, V3106, and V3112.

4. Replace interpolation-divider chassis and set INTERPOLATION OSCILLATOR dial to 2500 cps.

5. Connect signal generator to pin 1 of V3108.

6. Adjust signal generator to 887.5 kc ±500 cps. The signal-generator output should be unmodulated.

7. Connect a 470-$\mu\mu$f capacitor between pins 4 and 6 of T3107.

8. Connect d-c probe of vacuum-tube voltmeter to junction of R3149 and R3150 on a-v-c line.

(*b*) ALIGNMENT PROCEDURE.—Proceed as follows:

1. Turn plate power on.

2. Tune primary of T3107 for peak reading on VTVM by adjusting top slug.

3. Adjust signal-generator output for a —2-volt d-c reading and retouch top slug, if necessary.

4. Turn plate power off.

5. Transfer 470-$\mu\mu$f capacitor to pins 1 and 3 of T3107.

6. Turn plate power on.

7. Tune secondary of T3107 by adjusting bottom slug for peak reading on VTVM.

8. Adjust signal generator for a —2-volt d-c reading and retouch bottom slug, if necessary.

9. Turn plate power off.

10. Connect signal generator to pin 7 of V3107.

11. Repeat steps 1 through 9 for T3106.

12. Remove 470-$\mu\mu$f capacitor from T3106.

13. Turn plate power on.

14. With a —2-volt d-c reading on VTVM, record on data sheet the signal-generator output.

15. Set INTERPOLATION OSCILLATOR dial to 0, and adjust signal-generator output frequency to 875 kc.

16. Adjust signal-generator output to obtain a —2-volt d-c indication on VTVM. Record signal-generator output.

17. Set INTERPOLATION OSCILLATOR dial to 5.0, adjust signal-generator output frequency to 900 kc, and repeat step *16*.

18. Turn plate power off.

(7) REGENERATIVE-DIVIDER ALIGNMENT.—Proceed as follows:

(*a*) EQUIPMENT SETUP.—Set up the equipment as follows:

1. Remove tubes V3101, V3103, and V3108 and the interpolation-divider chassis.

2. Insert tubes V3124 and V3125.

3. Connect signal generator to pin 1 of V3124.

4. Adjust signal generator to 100 kc ±500 cps. The signal-generator output should be unmodulated.

5. Connect d-c probe of vacuum-tube voltmeter to pin 1 of V3125.

(*b*) ALIGNMENT PROCEDURE.—Proceed as follows:

1. Turn plate power on.

2. Adjust top slug of Z3104 for peak reading on VTVM.

3. Turn plate power off.

4. Connect signal-generator to pin 1 of V3125.

5. Adjust signal-generator frequency to 700 kc ±500 cps. The signal-generator output should be unmodulated.

6. Connect VTVM d-c probe to pin 7 of V3124.

7. Turn plate power on.

8. Adjust bottom slug of Z3104 until peak reading is indicated on VTVM.

9. Turn plate power off.

10. Connect signal-generator to pin 1 of V3109.

11. Adjust signal-generator frequency to 800 kc ±500 cps.

12. Connect VTVM d-c probe to junction of R3149 and R3150 on a-v-c line.

13. Replace tubes V3101, V3102, V3120, V3121, V3122, and V3123 in their respective sockets; and connect r-f cable between J3105 and J3106.

14. Turn plate power on.

15. Adjust signal-generator output to obtain a —2-volt d-c peak reading on VTVM.

16. Connect phones to phone jack J3110.

17. Vary signal-generator frequency from 750 to 850 kc. Record frequencies at which audible note from divider starts as frequency is varied toward 800 kc.

18. The divider should operate smoothly between 780 and 820 kc, or over an even greater range.

19. If divider does not start at 780 kc, set signal generator to 780 kc, and adjust bottom slug of Z3104 until a smooth, audible note is obtained.

20. If divider does not start at 820 kc, set signal generator to 820 kc, and adjust top slug of Z3104 until a smooth, audible note is obtained.

21. If necessary, repeat steps *19.* and *20.* to improve the divider alignment.

(8) 100-KC PHASE-SPLITTER ALIGNMENT.—Proceed as follows:

(*a*) EQUIPMENT SETUP.—Set up the equipment as follows:

1. Turn plate power off.

2. Insert tubes V3101, V3102, V3109, V3110, V3120, V3121, V3122, V3123, V3124, and V3125, and connect r-f cable between J3105 and J3106.

3. Remove tubes V3103, V3108, V3116, V3117, V3118, and V3119 and the interpolation-divider chassis.

4. Connect signal generator to pin 1 of V3109.

5. Adjust signal-generator frequency to 800 kc ±500 cps.

6. Connect d-c probe of VTVM to junction of R3149 and R3150 on a-v-c line.

7. Turn plate power on.

8. Adjust signal-generator output to obtain a —2-volt d-c reading on VTVM.

9. Turn plate power off.

10. Place SET UP-OPERATE switch in OPERATE position.

11. Connect vertical input of oscilloscope to pin 6 of V3120, and horizontal input to pin 6 of V3121.

12. Adjust oscilloscope for a-c operation on both vertical and horizontal inputs, and adjust oscilloscope gain controls for equal gain on both inputs.

13. Insert phones in phone jack J3110.

(*b*) ALIGNMENT PROCEDURE.—Proceed as follows:

1. Turn plate power on.

2. Adjust signal generator to obtain a low audio beat note in phones.

3. Adjust oscilloscope gain to keep elliptical pattern on screen. The gain of the vertical and horizontal inputs must be kept equal.

4. Remove phones from J3110.

5. Adjust top slug of Z3103 for largest elliptical pattern.

6. Adjust bottom slug of Z3103 for the most nearly circular pattern.

(9) MOTOR CONTROL CIRCUIT.—Proceed as follows:

(*a*) EQUIPMENT SETUP.—Set up the equipment as follows:

1. Turn plate power off.

2. Make certain that tubes V3101, V3102, V3109, V3110, V3116, V3117, V3118, V3119, V3120, V3121, V3122, V3123, V3124, and V3125 and the r-f cable between J3105 and J3106 are in place.

3. Remove tubes V3103 and V3108 and the interpolation-divider chassis.

4. Connect signal generator to pin 1 of V3109, and adjust output frequency to 800 kc ±500 cps.

5. Connect d-c probe of VTVM to junction of R3149 and R3150 on a-v-c line.

6. Remove cover from a-f-c capacitor C3170 to observe rotation.

7. Place SET UP-OPERATE switch in OPERATE position.

8. Insert phones in phone jack J3110.

(*b*) PROCEDURE.—Proceed as follows:

1. Turn plate power on.

2. Adjust signal-generator output to obtain a reading of —2-volts dc on VTVM.

3. Vary signal - generator frequency slowly through zero beat, as indicated by audible note in headphones. The motor should rotate at frequencies from 0 to 500 cps.

4. Turn plate power off.

(10) SPECTRUM GENERATOR ALIGNMENT.—Proceed as follows:

(*a*) EQUIPMENT SETUP.—Set up the equipment as follows:

1. Remove tubes V3101, V3103, V3108 and V3112 and r-f jumper from J3105 to J3106.

2. Make certain that tubes V3102, V3105, V3106, and V3107 are in place.

3. Connect signal generator to J3106.

4. Short pin 2 of V3107 to ground.

5. Connect d-c probe of VTVM to pin 7 of V3107.

(*b*) ALIGNMENT PROCEDURE.—Proceed as follows:

1. Turn plate power on.

2. Set OUTPUT TUNING DIAL to 2.2 mc.

3. Adjust signal-generator output to 10,112.5 kc ±5 kc.

4. Adjust top slugs of L3107 and L3108 for maximum indication on VTVM, and record this value on data sheet.

5. Set OUTPUT TUNING dial to 4.0 mc.

6. Adjust signal-generator output to 19,-112.5 kc ±5 kc.

7. Adjust C3142 and C3141 for maximum indication on VTVM, and record this value on the data sheet.

8. Repeat steps *2.* through *7.* until no further increase in VTVM reading is obtained.

(11) OSCILLATOR END POINTS.—Check the end points of the master oscillator and the interpolation oscillator for exact settings of 1.0 and 1.5 mc and 300 and 400 kc, respectively.

(12) MASTER OSCILLATOR MULTIPLIER TRACKING.—Proceed as follows:

(*a*) EQUIPMENT SETUP.—Set up the equipment as follows:

1. Turn plate power off.

2. Remove tubes V3101 and V3103.

3. Replace tubes V3107, V3111, V3112, and V3113.

4. Set MASTER OSCILLATOR dial to 2.2 mc.

5. Set OUTPUT TUNING dial to 2.2 mc.

6. Connect d-c probe of VTVM to pin 1 of V3112.

7. Place SET UP-OPERATE switch in SET UP position.

8. Connect 50-ohm load to J3109.

(*b*) ALIGNMENT PROCEDURE.—Proceed as follows:

1. Turn plate power on.

2. Tune L3109 for maximum indication on VTVM.

3. Set MASTER OSCILLATOR dial to 4.0 mc.

4. Set OUTPUT TUNING dial to 4.0 mc.

5. Tune C3144 for maximum indication on VTVM.

6. Return MASTER OSCILLATOR and OUTPUT TUNING dials to 2.2 mc, and repeat steps *2.* through *5.* until no further increase is indicated on VTVM.

7. Turn plate power off.

8. Remove V3111.

9. Connect d-c probe of VTVM to pin 1 of V3107.

10. Connect pin 2 of V3107 to ground.

11. Connect signal generator to pin 1 of V3112.

12. Adjust signal generator to 11 mc ±5 kc.

13. Set OUTPUT TUNING dial to 2.2 mc.

14. Turn plate power on.

15. Tune L3110 for maximum indication on VTVM.

16. Adjust signal generator to 20 mc ±5 kc.

17. Set OUTPUT TUNING dial to 4.0 mc.

18. Tune C3145 for maximum indication on VTVM.

19. Return signal generator to 11 mc, and OUTPUT TUNING dial to 2.2 mc and repeat steps *15.* through *18.* until no further increase is indicated on VTVM.

20. Turn plate power off.

(13) 100-KC CRYSTAL OSCILLATOR ALIGNMENT.—Proceed as follows:

(*a*) EQUIPMENT SETUP.—Set up the equipment as follows:

1. Insert tubes V3101, V3102, V3103, V3104, and V3105, and connect r-f cable between J3105 and J3106.

(*b*) PROCEDURE.—Proceed as follows:

1. Adjust crystal oscillator to 100 kc ±.05 cps by adjusting C101.

Note

THE CRYSTAL OSCILLATOR SHOULD NOT BE ADJUSTED UNTIL AFTER CRYSTAL OVEN HEAT HAS BEEN APPLIED FOR ONE HOUR.

2. Check for 100-kc spectrum and a-c output voltage across a 4000-ohm load at J3105.

3. Check for 25-kc spectrum at pin 7 of V3104, using a 1-μμf capacitor to provide coupling to the receiver.

4. Turn plate power off.

(14) 450-KC AMPLIFIER ALIGNMENT.—Proceed as follows:

(*a*) EQUIPMENT SETUP.—Set up the equipment as follows:

1. Remove V3101 and V3103.

2. Connect signal generator to pin 6 of V3103.

3. Adjust signal generator to 450 kc ±1 kc.

4. Connect J3104 to a 2200-ohm load.

5. Connect a-c probe of VTVM across 2200-ohm load.

(*b*) ALIGNMENT PROCEDURE.—Proceed as follows:

1. Turn plate power on.

2. Adjust T3103 for maximum indication on VTVM. The signal-generator output should be adjusted to give a maximum 2-volt d-c indication on the VTVM.

3. Turn plate power off.

4. Replace all tubes in their respective sockets, and connect r-f cable between J3105 and J3106 and interpolation-divider chassis.

5. Turn plate power on.

6. Measure a-c voltage across 2200-ohm load.

(15) CONTROL-CIRCUIT SENSITIVITY.—Proceed as follows:

1. Set up R-F Oscillator O-243/FRT-24 for 2.0-mc operation. Check output frequency against frequency meter. Note frequency error.

2. Detune R-F Oscillator slightly to high side afc in operation. The output should return to the same frequency ±3 cps. Repeat check on low side.

3. Throw SET UP-OPERATE switch to SET UP and back to OPERATE. The output should return to the same frequency ±3 cps.

4. Set up master oscillator for 4.2-mc operation and repeat steps *1.* through *3.*

(16) POWER OUTPUT AND CALIBRATION.—Connect the 50-ohm load to J3109. Check the power output over the range of the equipment. At least 9.0 volts should be obtained at all frequencies. For R-F Oscillator O-243A/FRT-24 the PWR output potentiometer R3163 (on the rear panel) must be set for full output, to the clockwise stop.

c. TRANSMITTER CONTROL C-1362/FRT-24.—To align Transmitter Control C-1362/FRT-24, proceed as follows:

(1) PRELIMINARY SETUP.—Proceed as follows:

(*a*) Check to see that Transmitter Control is connected properly to transmitter.

(*b*) Remove the two bolts on each of the vertical strips, and set vertical strips out of way.

(*c*) Insert a microphone in MICROPHONE jack.

(*d*) Loosen the two panel fasteners located at top of front panel. Lower the front panel.

(2) COMPRESSION LEVEL ADJUSTMENT.—Proceed as follows:

(*a*) Set ON-OFF switch to ON.

(*b*) Set INPUT-OUTPUT switch to OUTPUT.

(*c*) Set COMPRESSION LEVEL ADJUSTMENT fully clockwise.

(*d*) Talk into microphone and set AUDIO GAIN control to obtain an indication (approximately 2 db) on AUDIO LEVEL meter corresponding to desired threshold of compression.

Note

A METER INDICATION OF 0 DB CORRESPONDS TO AN AUDIO OUTPUT OF APPROXIMATELY +10 DBM.

(*e*) Slowly adjust COMPRESSION LEVEL ADJUSTMENT counterclockwise until meter indication begins to drop. Set threshold of compression 3 db below the required maximum, which is approximately 20 db.

(3) CHANNEL INDICATOR METER ADJUSTMENT.—Proceed as follows:

(*a*) Dial 5 on EMISSION AND CHANNEL SELECTOR dial.

(*b*) Adjust CHANNEL INDICATOR ADJUSTMENT until CHANNEL indicator meter indicates 5.

d. TRANSMISSION LINE COUPLER CU-390/FRT-24.—Measuring the standing-wave ratio (SWR) with the test setup shown in figure 7-14 provides a quick indication of the condition of Transmission Line Coupler CU-390/FRT-24. A typical resistance-bridge-type SWR meter is shown in figure 7-14 and construction data for the same is given in this paragraph, in the event a suitable measuring device is not available. The ratio of maximum to minimum current indication on milliammeter M determines the stand-

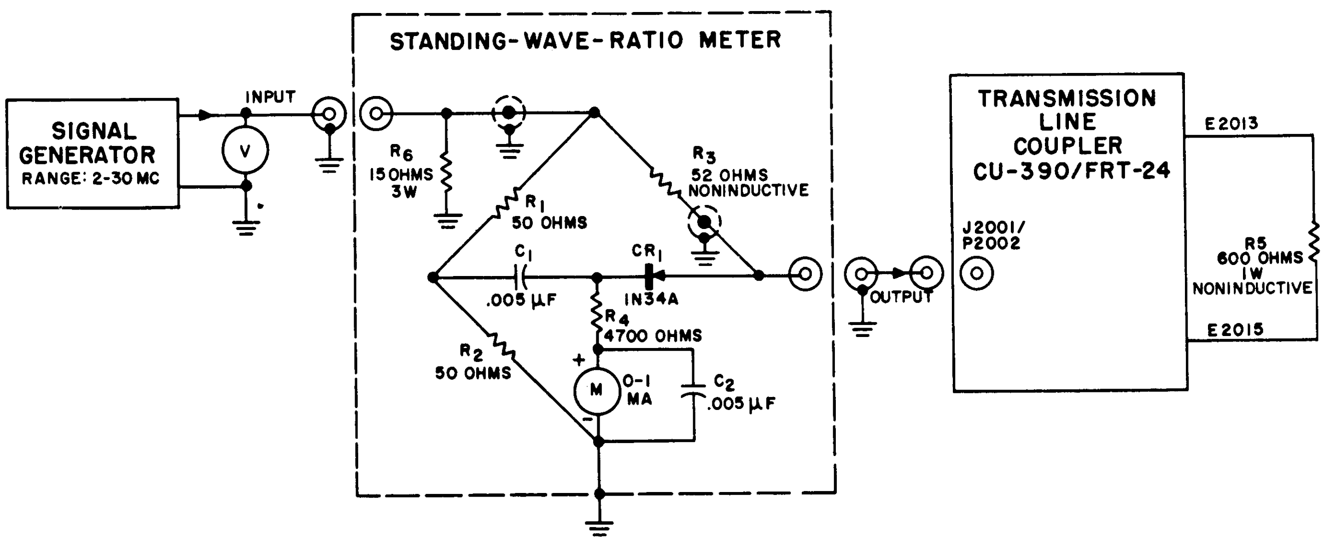


Figure 7-14. T st S tup f r Measuring SWR f Transmissi n Lin

ing-wave ratio of the coupler. Using a 52-ohm noninductive resistor as a standard, in place of the coupler, the deflection on the meter will represent a 1:1 indication for exact matching conditions. However, since the coupler operates over a wide frequency range (2 to 30 mc), it is considered to be operating normally when it has an SWR or mismatch no greater than 2:1. The full-scale deflection on meter M with no load connected to the output represents an SWR of 5:1 or greater. Because of the nonlinear characteristic of the meter circuit, the dial of the meter is calibrated to read SWR by using different values of noninductive resistors connected to the output side of the standing-wave ratio meter. Resistance values of either 6.5, 13, and 26 or 104, 156, and 208 ohms, noninductive, can be used for plotting SWR on the meter scale. The wiring within the standing-wave ratio meter should be as short as possible to minimize stray reactances, which may become appreciable at frequencies above 14 mc. In laying out or connecting parts together, avoid forming wiring loops through which the flow of r-f energy could induce an unwanted voltage in another part of a circuit. The ground connection between the signal generator, SWR meter, and the Transmission Line Coupler should also be as short as possible, and should be well bonded to one ground point.

With the Transmission Line Coupler disconnected from the SWR meter, sufficient voltage output should be applied from the signal generator to the input of the meter circuit to cause full-scale deflection on meter M. This voltage (usually about 2 volts) can be measured by the voltmeter of the signal generator or by an external vacuum-tube voltmeter represented by meter V. Connect the Transmission Line Coupler to the output side of the SWR meter, making sure that a 600-ohm, 1-watt, nonreactive load is across the output terminals of the coupler. The signal generator should not have to be readjusted to obtain the same reading on voltmeter V after the coupler is connected in place. If there is a change in voltmeter indication, either the construction of the SWR meter or the connection to the meter is faulty so as to introduce stray reactance to affect the readings. Measure the SWR on milliammeter M for 2-mc and 30-mc input signals from the signal generator. The SWR should not be greater than 2:1. Make other SWR checks at various check points between 2 mc and 30 mc, to make certain that the highest SWR for any observed frequency is not greater than 2:1.

7. MAINTENANCE AND ADJUSTMENTS

The following maintenance and adjustments should be performed when necessary.

a. RELAYS AND CAPACITORS. — Before servicing relay or capacitor contacts, clean the exterior with a dry or damp cloth. If it is very dirty, clean it with a cloth or brush dipped in dry cleaning solvent 140-F SNSN G51-S-4718-10. Then wipe the surface with a dry cloth to remove the white deposit left by the solvent when it dries. If loose connections are found, they should be inspected. If inspection shows them to be dirty or corroded, they should be removed and cleaned, and then carefully replaced.

Hard-alloy contacts are cleaned by drawing a strip of clear wrapping paper between them while holding them together. It may be necessary, in some cases, to moisten the paper or paper strips used for polishing. Corroded, burned, or pitted contacts should be dressed with a strip of crocus cloth or a burnishing tool.

Solid-silver contacts are cleaned with a cloth or brush dipped in dry cleaning solvent 140-F FSN W6850-274-5421. After being cleaned, the contacts are polished with a dry cloth. Dress corroded contacts first with crocus cloth, using either a stick or strip of the material. When all the corrosion has been removed, wipe with a clean cloth moistened with cleaning solvent and polish with a piece of folded cloth. Make certain that the shape of the contact has not been altered from the original. Dress burned or pitted contacts, if necessary, with #0000 sandpaper, making certain that the shape of the contacts is not changed. Then smooth the surface with crocus cloth. After a high polish is obtained, wipe thoroughly with clean cloth, using cleaning solvent when necessary.

Note

THE BROWN DISCOLORATION FOUND ON SILVER AND SILVER-PLATED CONTACTS IS SILVER OXIDE AND IS A GOOD CONDUCTOR. IT SHOULD BE LEFT ALONE UNLESS THE CONTACTS MUST BE CLEANED FOR SOME OTHER REASON. IT CAN BE REMOVED, AT ANY TIME, WITH A CLOTH MOISTENED WITH DRY CLEANING SOLVENT 140-F, FSN W6850-274-5421.

Clean silver-plated contacts with a cloth or brush dipped in cleaning solvent. After cleaning, polish the contacts with a dry cloth. Dress corroded contacts first with crocus cloth. The work must be done very carefully so as not to remove an excess amount of silver plating. When all the corrosion has been removed, polish with a cloth. Make certain that the shape of the contacts has not been changed. Dress contacts after burned or pitted spots have been removed. This may require an appreciable amount of time, but is preferable to the use of a file or sandpaper. If crocus cloth does not remove the burns or the pits, use a sandpaper tool very carefully. If sandpaper is used, follow with crocus cloth to polish the contacts, wipe thoroughly with a cloth moistened with cleaning solvent, and dry with a clean cloth.

CAUTION

Never use highly abrasive materials, such as emery cloth, coarse sandpaper, or carborundum paper for surfacing relay contacts. They will damage the contacts.

8. DISCARDING ELECTRON TUBES

In the course of trouble-shooting in the equipment, it may be necessary to replace a defective or inactive electron tube. It should be borne in mind, however, that the tube is the basis of the equipment and that no field substitute is available. Before discarding any electron tube, the technician should determine without question that replacement will remedy the trouble. The tube should be checked in a standard tube tester or in actual operation and should be discarded only if it shows one of the following faults:

Low emission—sufficient to prevent minimum efficient operation.

No filament continuity.

Microphonics (noise interference with operation).

Shorted element.

Intermittent shorts (tube cannot continue in use until transmission is completed).

When it is definitely ascertained that the tube is valueless in operation and requires replacement, observe the following rule: "All tubes of a given type supplied with the equipment shall be consumed prior to employment of tubes from general stock."

9. TUBE CHARACTERISTICS

The following table lists the characteristics of all tube types used in Radio Transmitting Set AN/FRT-24.

TABLE 7-5. TUBE CHARACTERISTICS

TUBE TYPE	NORMAL FILAMENT VOLTAGE (volts)	NORMAL FILAMENT CURRENT (amps)	PLATE VOLTAGE (volts)	GRID BIAS (volts)	SCREEN VOLTAGE (volts)	PLATE CURRENT (ma)	SCREEN CURRENT (ma)	A-C PLATE RESISTANCE (ohms)	VOLTAGE AMPLIFICATION FACTOR (mu)	TRANSCONDUCTANCE (micromhos)
3B28	2.5	5	5000			2000				
4B32	5.0	7.5	10,000			5000				
4-65A	6.0	3.3	3000	−48	400	150	0		6	
4-400A	5.0	14.5	4000	−500	600	350	45			4000
4-1000A	7.5	21.0	6000	−25	1000	700	+2		7.2	
5R4GYW	5.0	2	2800			650				
5Y3WGTA	5.0	2	1400			125				
6SJ7	6.3	.3	300	−3	125	3.	.8	1,000,000	167	1650
6X4	6.3	.6	1250			210				
12AT7WA	6.3	0.3	250	−2		10		10,900	55	5500
12AU7	6.3	0.3	250	−8.5		10.5		7700	17	2200

TABLE 7-5. TUBE CHARACTERISTICS—C ntinued

TUBE TYPE	NORMAL FILAMENT VOLTAGE (volts)	NORMAL FILAMENT CURRENT (amps)	PLATE VOLTAGE (volts)	GRID BIAS (volts)	SCREEN VOLTAGE (volts)	PLATE CURRENT (ma)	SCREEN CURRENT (ma)	A-C PLATE RESISTANCE (ohms)	VOLTAGE AMPLI-FICATION FACTOR (mu)	TRANSCON-DUCTANCE (micro-mhos)
5654/6AK5W	6.3	.175	200	−2	155	7.5	2.5			5000
5686	6.3	.35	250	−15	250	40	15			
5726/6AL5W	6.3	0.3	420			54				
5749/6BA6	6.3	0.3	250	−20	100	11	4.2	1,000,000		950
5750/6BE6W	6.3	0.3	250	−1.5	100	3	7.8	1,000,000		475
5763	6.0	.75	300	−125	250	50	15			7000
5814	6.3	.175	250	−8.5		10.5		7700	17	2200
OA2			150			30 (max)				
OB2			105			30				

10. CRYSTAL DATA

Listed below are data on the crystals used in Radio Transmitting Set AN/FRT-24.

a. RADIO TRANSMITTER T-440/FRT-24.—The following data are for crystals employed in the transmitter.

(1) OSCILLATOR CRYSTALS.—There are nine crystals (1 to 8 mc) in the transmitter and their characteristics, except for frequency, are identical.

(2) STABILITY.—The crystal frequency variation over a temperature range of —20°C (—4°F) to 60°C (140°F) will not exceed ±0.0003 percent.

b. R-F OSCILLATOR O-243/FRT-24. — The following data are for the crystal employed in R-F Oscillator O-243/FRT-24.

(1) 100-KC CRYSTAL.

(*a*) CIRCUIT RANGE.—The 100-kc crystal standard circuit is designed for operation at 100 kc only.

(*b*) STABILITY.—The crystal frequency variation over a temperature range of —20°C (—4°F) to 60°C (140°F) will not exceed ±0.0003 percent.

(*c*) OVEN TEMPERATURE.—The 100-kc crystal operates in an oven temperature of 60°C (140°F).

(2) 100-KC HOLDER AND OVEN.

(*a*) CRYSTAL MOUNTING. — The crystal is metal plated and suspended on wires in the holder. A conductive bonding material is applied at the point of contact of the suspension wire to the plating of the crystal plates.

(*b*) DIMENSIONS OF OVEN.

1. Diameter ....3.750 inches

2. Length less mounting pins ....4.625 inches

3. Length including mounting pins ....5.4375 inches

(*c*) NUMBER OF CONTACTS 7

(*d*) PIN CONNECTIONS.

Pin Number	*Connection*
1	Heater
2	Ground
3	Crystal
4	No connection
5	Crystal
6	Thermostat
7	Thermostat and heater junction

TABLE 7-6. WINDING DATA

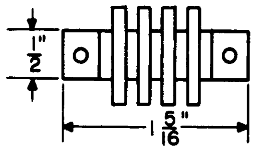
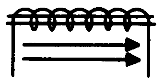
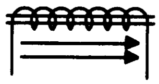
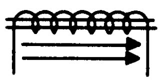
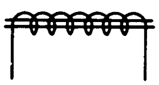
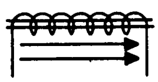
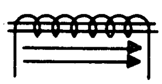
DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	REMARKS
L101, L104, L110, L113, L3105, L3106	National Co. R100S		Grouped single			50		Inductance: 2.5 mh, 0.125 amp.
L103	N16-C-73414-9937 (3C323-192Q)		Single	#35 AWG	145	4		Inductance: 34.0 mh. Fungus resistant.
L105	505 3255 003		Single	#18 AWG	15	Less than 1		Screw-driver adjustment through core.
L106	505 3256 003		Single	#24 AWG	20	Less than 1		Screw-driver adjustment through core.
L107	505 3257 003		Single	#24 AWG	27	Less than 1		Screw-driver adjustment through core.
L108	505 3258 003		Single	#26 AWG	36	Less than 1		
L109	505 3259 003		Single	#36 AWG	36	Less than 1		Screw-driver adjustment through core.
L111	505 3253 003		Single	#16 AWG	6	Less than 1		
L112	505 3254 003		Single	#18 AWG	9	Less than 1		Screw-driver adjustment through core.

TABLE 7-6. WINDING DATA—Continued

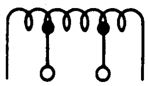
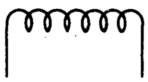
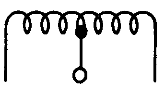
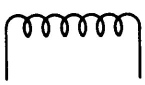
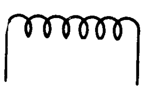
DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	REMARKS
L114, L122, L129, L133	505 3247 002		Single			Less than 1		Current rating: 500 ma.
L115	505 3640 002		Single	#12 AWG	16	Less than 1		
L116	505 3249 002		Single	#22 AWG	30	Less than 1		
L117	505 3248 002		Single	#22 AWG	48	Less than 1		
L118	Not used.							
L119	505 3244 002		Single	#22 DE	84	Less than 1		Inductance: 50 μh at 2 amp. 24 turns per inch.
L120	505 3245 002		Single C.T.	#24 AWG	150	Less than 1		Inductance: 120 μh at 1000 cycles.
L121	505 5335 002		Single			Less than 1		Current rating: 500 ma.
L123	505 3644 003		Single	Soft copper tubing, ⅜" OD x $\frac{1}{32}$" wall thk.	3	Less than 1		

TABLE 7-6. WINDING DATA—Continu d

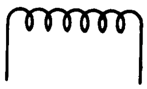
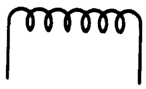
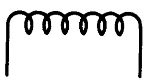
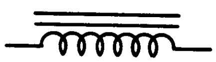
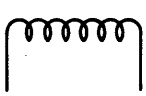
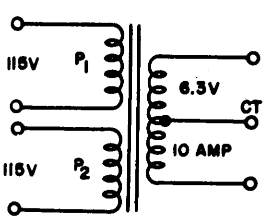
DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	REMARKS
L124	505 3645 003		Single	Soft copper tubing, ⅜" OD x 1/32" wall thk.	4	Less than 1		
L125	505 3646 003		Single	Soft copper tubing, ¼" OD x 1/32" wall thk.	16	Less than 1		
L126	505 3260 003		Single	#10 AWG	30	Less than 1		
L127	505 3650 003		Single	Soft copper tubing, 3/16" OD x 1/32" wall thk.	22¾	Less than 1		
L128	505 3252 003		Single	#12 AWG	22	Less than 1		
L130, L601	Chicago Transformer RS-1540		Single			475		Inductance: 10 h. Voltage ratings 25,000 v, rms test.
L102, L131, L132	Navy -47895		Duo-lateral, 3 section			10		Inductance: 1.0 mh. Current rating: 300 ma.
T101	Chicago Transformer F-610		Primary No. 1 Primary No. 2 Secondary			12 12 Less than 1		Two input windings to accommodate 115 volts or 230 volts.

TABLE 7-6. WINDING DATA—Continued

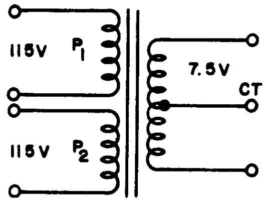
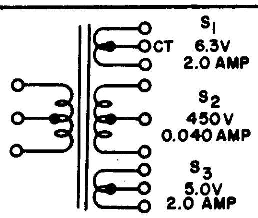
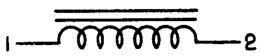
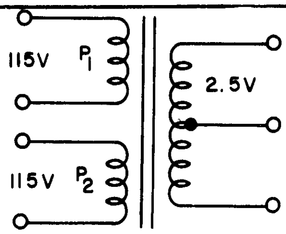
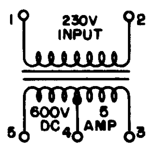
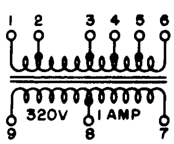
DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	REMARKS
T102	Chicago Transformer FT25		Primary No. 1 Primary No. 2 Secondary			2.5 2.5 Less than 1		Two input windings to accommodate 115 volts or 230 volts.
T103	Chicago Transformer PSC-40		Primary Secondary No. 1 Secondary No. 2 Secondary No. 3			2.5 Less than 1 500 Less than 1		
L301	678 0424 00		Single			42		Inductance: 6.5 h. Current rating: 500 ma. Voltage rating: 3000 v rms test.
T301	Chicago Transformer F-210		Primary No. 1 Primary No. 2 Secondary			4.5 4.5 Less than 1		Two input windings to accommodate 115 volts or 230 volts.
T302	672 0422 00		Primary Secondary			2 55		Voltage rating (input): 2500 v rms test.
L401, L402	Chicago Transformer 14984		Single			19		Inductance: 4.0 h. at 1.0 amp, 8.7 h. at 30 ma. Voltage rating: 7000 v rms test.
T401	UTC type F-2833		Primary Secondary			All windings less than 1 60		Voltage rating (input): 2500 v rms test.

TABLE 7-6. WINDING DATA—Continued

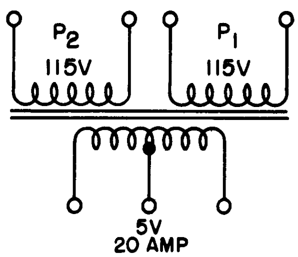
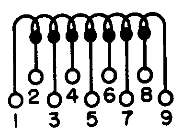
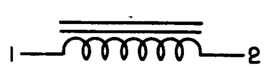
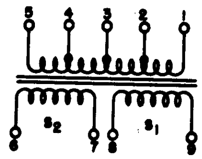
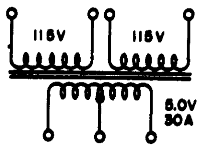
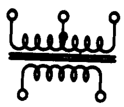
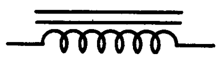
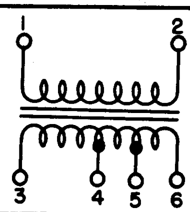
<table>
<tr><th>DESIGNATION SYMBOL</th><th>PART NO.</th><th>DIAGRAM</th><th>WINDING</th><th>WIRE SIZE</th><th>TURNS</th><th>D-C RESISTANCE IN OHMS</th><th>IMPEDANCE RATIO</th><th>REMARKS</th></tr>
<tr><td>T401</td><td></td><td><table><tr><th>TAPS</th><th>PRIMARY</th></tr><tr><td>1-3</td><td>230</td></tr><tr><td>1-4</td><td>240</td></tr><tr><td>1-5</td><td>250</td></tr><tr><td>1-6</td><td>260</td></tr><tr><td>2-3</td><td>208</td></tr><tr><td>2-4</td><td>218</td></tr><tr><td>2-5</td><td>227</td></tr><tr><td>2-6</td><td>236</td></tr><tr><td>7-9</td><td>9,000</td></tr></table></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>T402</td><td>Chicago Transformer F520HB</td><td></td><td></td><td></td><td>Primary No. 1
Primary No. 2
Secondary</td><td>6
6
Less than 1</td><td></td><td>Two input windings to accommodate 115 volts or 230 volts. Voltage rating (input): 2500 v rms test.</td></tr>
<tr><td>T501, T502, T701</td><td>Chicago Transformer 17745</td><td><table><tr><th>TAPS</th><th>INPUT VOLTS</th><th>OUTPUT VOLTS</th></tr><tr><td>1-2</td><td></td><td>115</td></tr><tr><td>1-3</td><td></td><td>120</td></tr><tr><td>1-4</td><td>200</td><td></td></tr><tr><td>1-5</td><td>210</td><td></td></tr><tr><td>1-6</td><td>220</td><td></td></tr><tr><td>1-7</td><td>230</td><td>230</td></tr><tr><td>1-8</td><td>240</td><td></td></tr><tr><td>1-9</td><td>250</td><td></td></tr><tr><td></td><td></td><td></td></tr></table></td><td>Single</td><td></td><td></td><td>3</td><td></td><td>Voltage rating (input): 750 v rms test.</td></tr>
<tr><td>L602</td><td>Chicago Transformer RS-8250</td><td></td><td>Single</td><td></td><td></td><td>90</td><td></td><td>Inductance: 8.0 h. Voltage rating: 2500 v rms test.</td></tr>
</table>

TABLE 7-6. WINDING DATA—C ntinued

DESIGNA-TI N SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPED-ANCE RATIO	REMARKS
L691	Chicago Trans-former SR-500		Single			31.7		Induc-tance: 0.02 to 1.5 h. tapped; 200 to 3500 cps. Voltage rating: 10,000 v rms test.
T601, T901	Chicago Trans-former CIs-1		Primary Secondary No. 1 Secondary No. 2			45 33 2,400		Response: 200 cps ± 1 db, 1000 cps ± O db, 3500 cps ±1 db.
T603	Chicago Trans-former F-530		Primary No. 1 Primary No. 2 Secondary			4 4 Less than 1		Input voltage: 115 volts or 230 volts. Voltage rating: 2500 v rms test.
T691	677 0073 00		Primary Secondary			90 35		Response: 100 to 5000 cps ± 1 db.
L801	Chicago Trans-former 6815		Single			50		Induc-tance: 2 h at 0.15 amp. Voltage rating: 2500 v rms test.
T801	Chicago Trans-former 17457-A		Primary Secondary			45 7.5		Voltage rating (input and output): 1000 v rms test.
L901, L902 (2 each)	Chicago Trans-former RS-1055 (modi-fied)		Single			230		Induc-tance: 10 h at 55 ma. Voltage rating: 2500 v rms test.

T801:

TAPS	INPUT VOLTS	OUTPUT VOLTS
1-2	230	
3-4		62
3-5		67
3-6		72

TABLE 7-6. WINDING DATA—C ntinu d

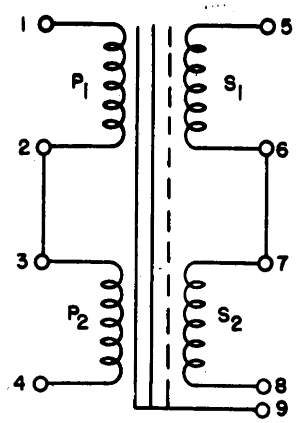
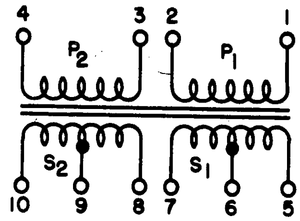
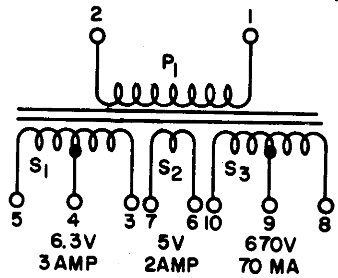
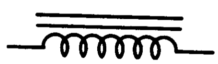
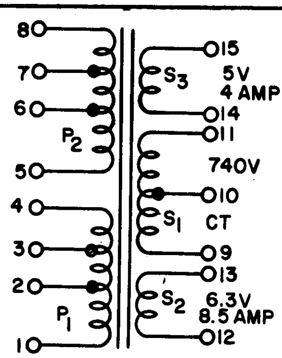
DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	REMARKS
T902 (2 used)	Chicago Transformer BI-6 (modified)		Primary Secondary No. 1			1,300 4,000	2.5 to 1	Voltage rating: 1500 v rms test. Response 30 cps to 20 kc ± 1.5 db. Electrostatic shield between primary and secondary.
T903 (2 used)	Chicago Transformer BO-2 (modified)		Primary No. 1 Primary No. 2 Secondary No. 1 Secondary No. 2			300 300 9 9		Response: 30 to 20 kc ± 1.5 db.
T904 (2 used)	Chicago Transformer 12152		Primary Secondary No. 1 Secondary No. 2 Secondary No. 3			6 Less than 1 Less than 1 3,400		Voltage rating: P_1-1000 v rms S_1-1000 v rms S_2-2000 v rms S_3-2000 v rms
L1001, L1002, L1003	Navy type 304883		Single			75		Inductance: 7.5 h at 280 ma. Voltage rating: 1500 v rms test.
T1001	Navy type 304884				Primary No. 1 Primary No. 2 Secondary No. 1 Secondary No. 2 Secondary No. 3	2.1 2 Less than 1 4 Less than 1		Voltage rating: 1500 v rms test. Primaries both rated at 125 v, tapped for 115 v and 105 v.

TABLE 7-6. WINDING DATA—C ntinu d

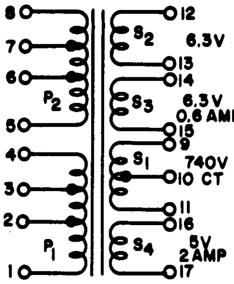
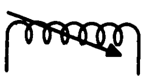
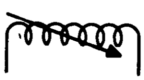
DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	REMARKS
T1002	Navy type 304885		Primary No. 1 Primary No. 2 Secondary No. 1 Secondary No. 2 Secondary No. 3 Secondary No. 4			3.3 3.5 80 Less than 1 Less than 1 Less than 1		Voltage rating: 1500 v rms test. Primaries both rated at 125 v, tapped for 115 v and 105 v.
L2001, L2003, L2005	540 1803 003		Single	Soft copper tubing, ¼" OD	9-⅓			
L2002, L2004, L2006	540 1804 003		Single	Soft copper tubing, ¼" OD	9-⅓			
L2007, L2008	540 1824 002		Single	#10 AWG copper wire	4			Inductance: 2.02 μh.
L2009 L2010	Ohmite type Z-14							Inductance: 44 μh ±10% at 2.5 mc. Current rating: 600 ma.
L2011	540 1847 003		Single	RG17U co-axial cable	7			Balances a 52-ohm unbalanced line.
L2012, L2013	540 1836 002		Single	#8 AWG	7			Inductance: 1.05 μh. Balun type.
L3102	506 8686 003		Single	#34 AWG	80	3.4		
L3103	N16-C-72590-8822		Single	#26 AWG	40	Less than 1		

TABLE 7-6. WINDING DATA—C ntinued

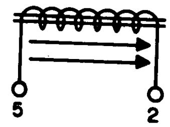
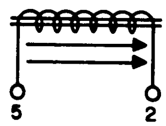
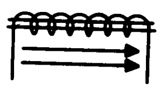
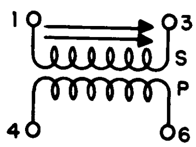
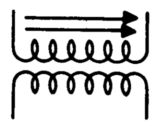
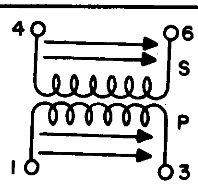
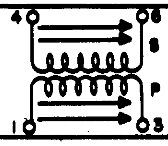
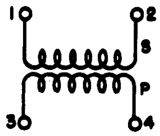
DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	REMARKS
L3104	N16-C-73926-8935		Single			2.5		Inductance: approx 180 μh at 1.66 to 1.69 mc with 50-$\mu\mu$f capacitor.
L3107, L3108, L3110	506 9164 003		Single	#26 AWG	11	Less than 1		Screwdriver adjustment through core.
L3109	N16-C-76635-4326		Single	#30 AWG	90	1		Screwdriver adjustment through core.
L3111, L3112	504 0579 002		Single	#36 SSE	500	30		
L3113	504 0576 002		Single	#36 SSE	150	7.5		
T3103	N17-T-81731-1167		Primary Secondary			7.5 7.5		Peak frequency: 450 kc.
T3105	504 0580 002		Primary Secondary					Frequency range: 9 to 20 mc.
T3106, T3107	N17-T-81716-1167		Primary Secondary			7.5 7.5		Frequency range: 875 to 900 kc.

TABLE 7-6. WINDING DATA—Continued

DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	REMARKS
T3108, T3109	N17-T-67710-8201		Primary Secondary			9 9		Peak frequency: 800 kc.
T3113	N17-T-81320-1103		Primary Secondary	#30 AWG #30 AWG	45 6	Less than 1 Less than 1		Frequency range: 2 to 4.2 mc.

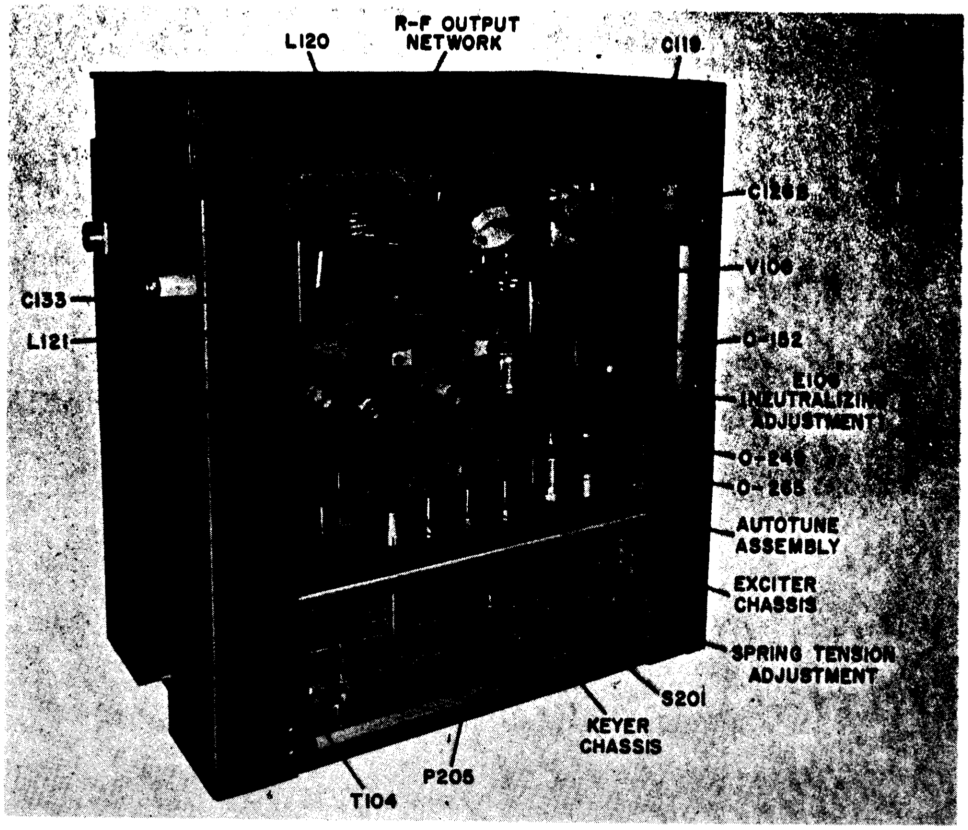


Figure 7-15. R-F Assembly, Left-Side View, Location of Parts

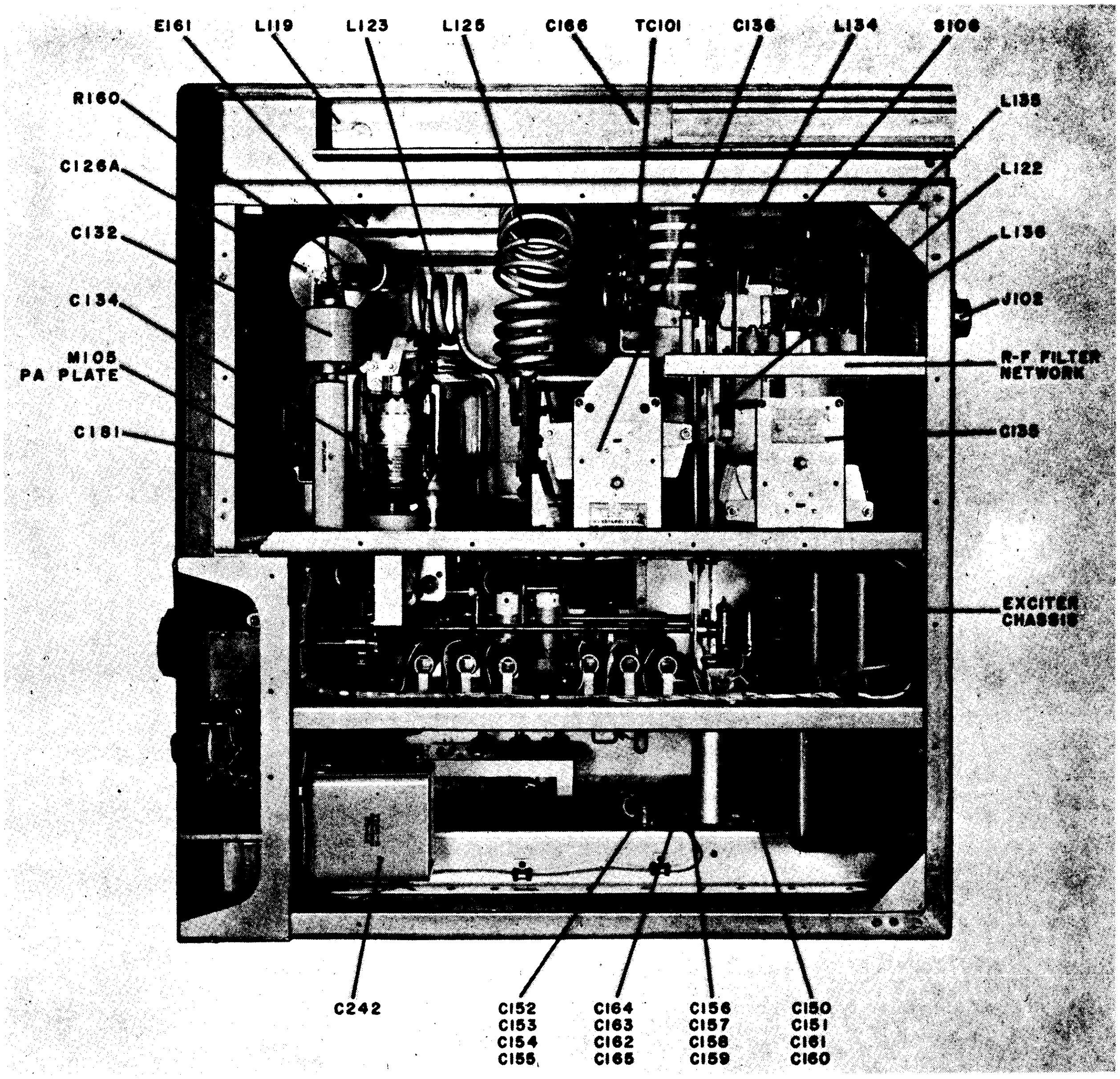


Figure 7-16. R-F Assembly, Right-Side View, Location of Parts

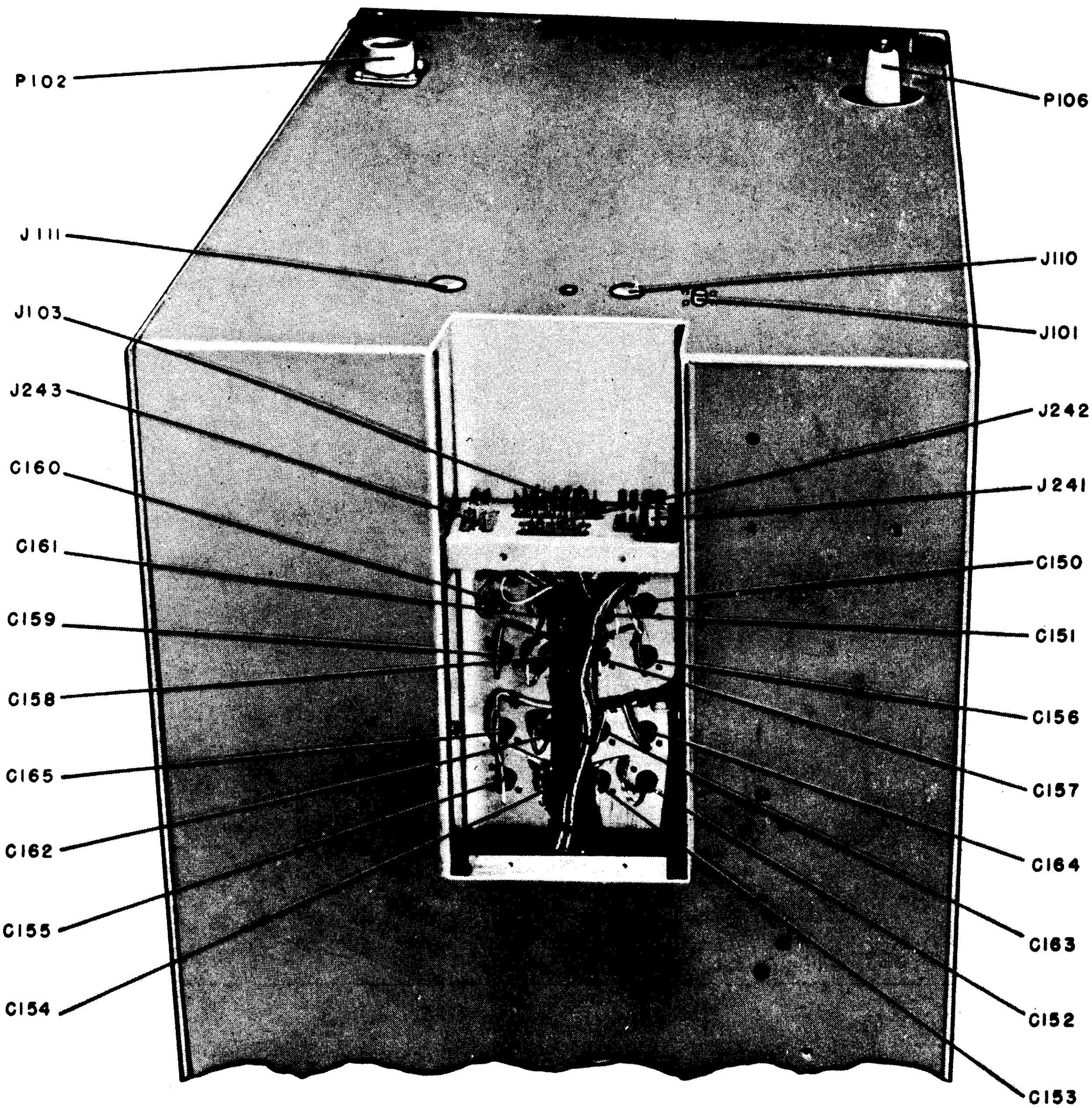


Figure 7-17. R-F Assembly, Rear View, Location of Parts

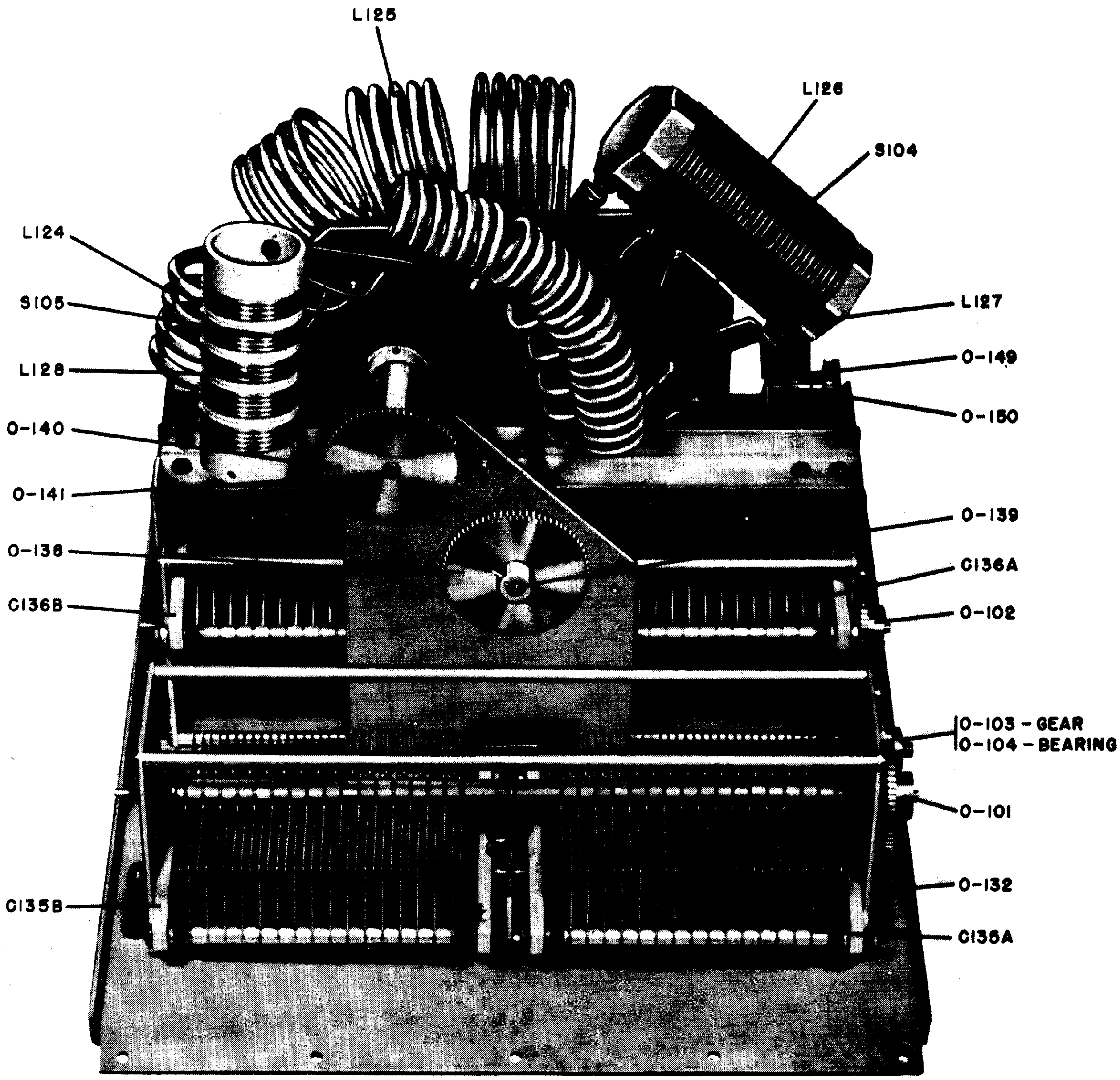


Figure 7-18. R-F Output Network, Location of Parts

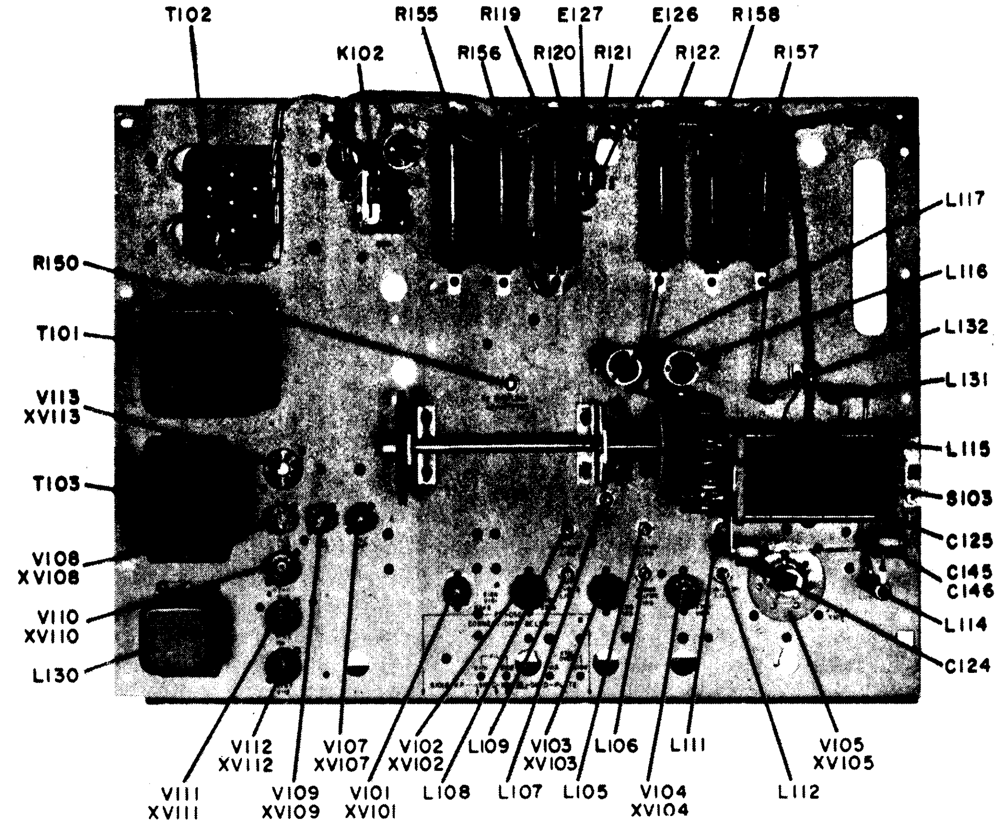


Figure 7-19. Exciter Chassis, Top View, Location of Parts

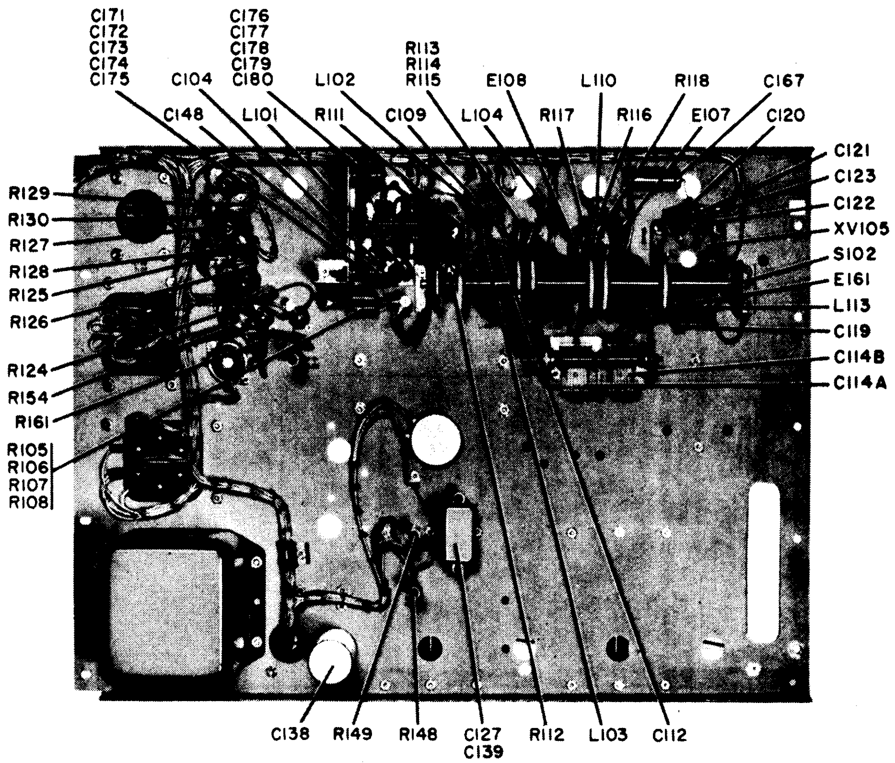


Figure 7-20. Exciter Chassis, Bottom View, Location of Parts

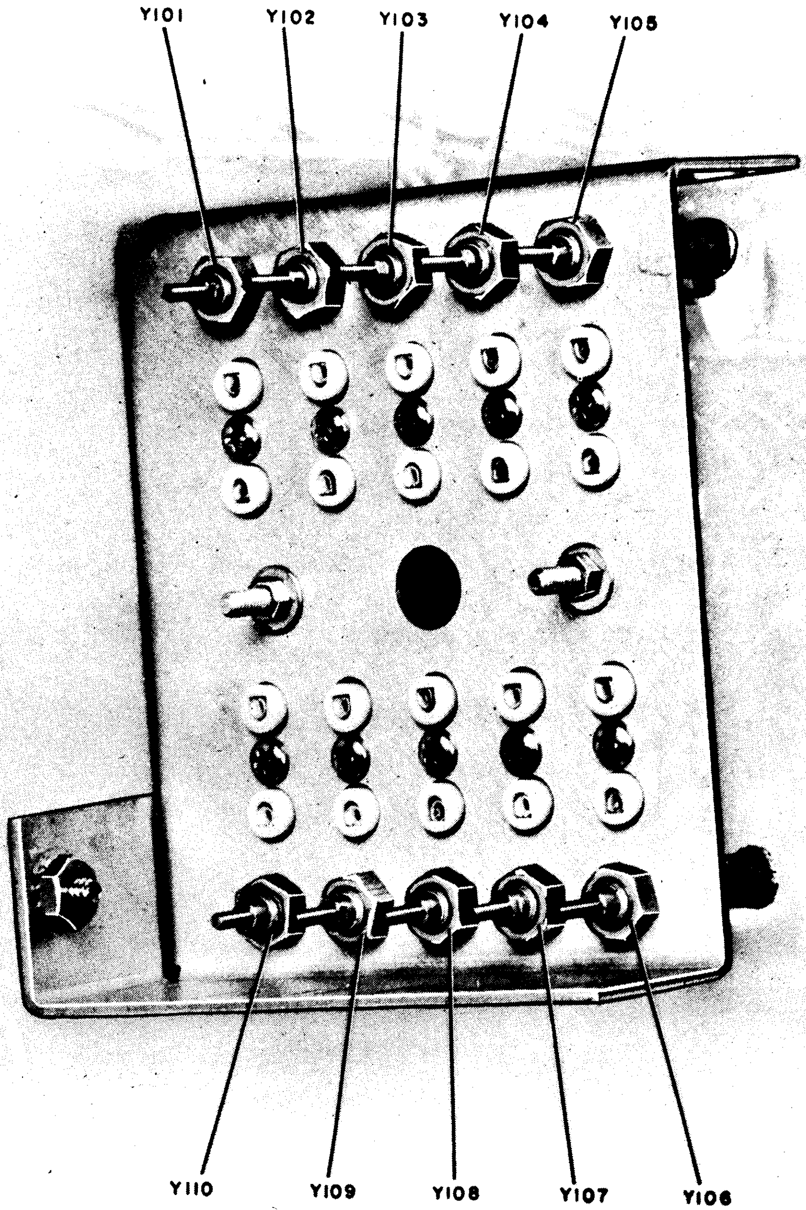


Figure 7-21. Crystal Chassis, Location of Crystals

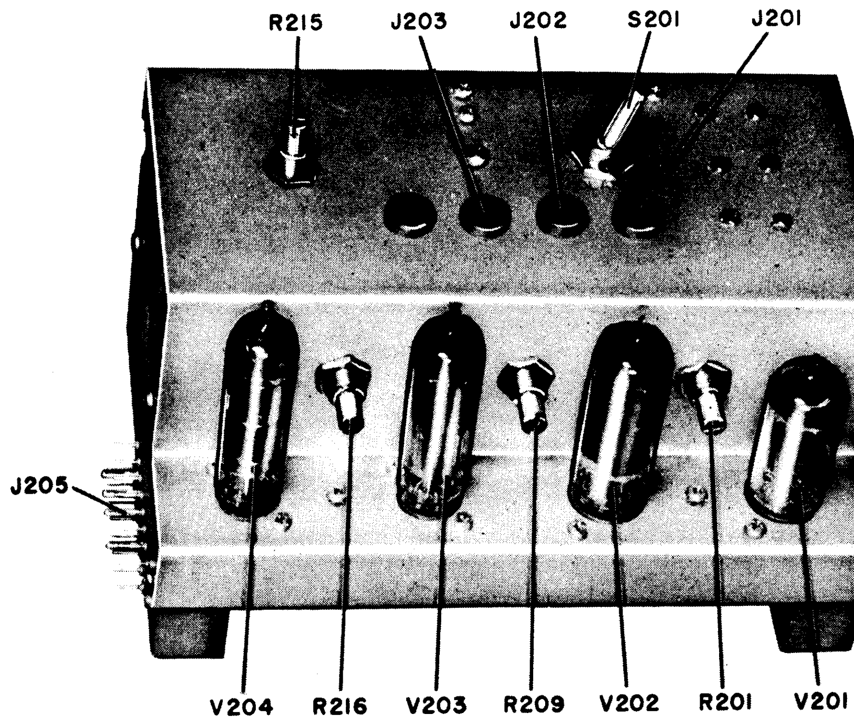
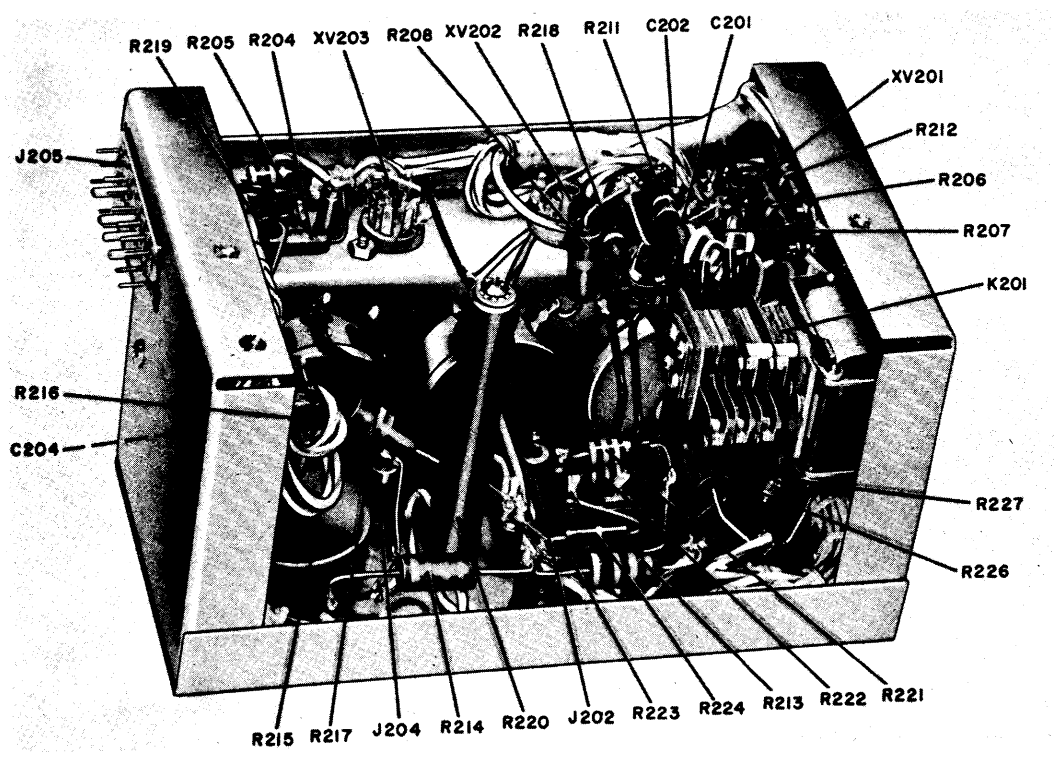


Figure 7-22. Keyer Chassis, Top View, Location of Parts



7-23. Keyer Chassis, B tt m View, L cation f Parts

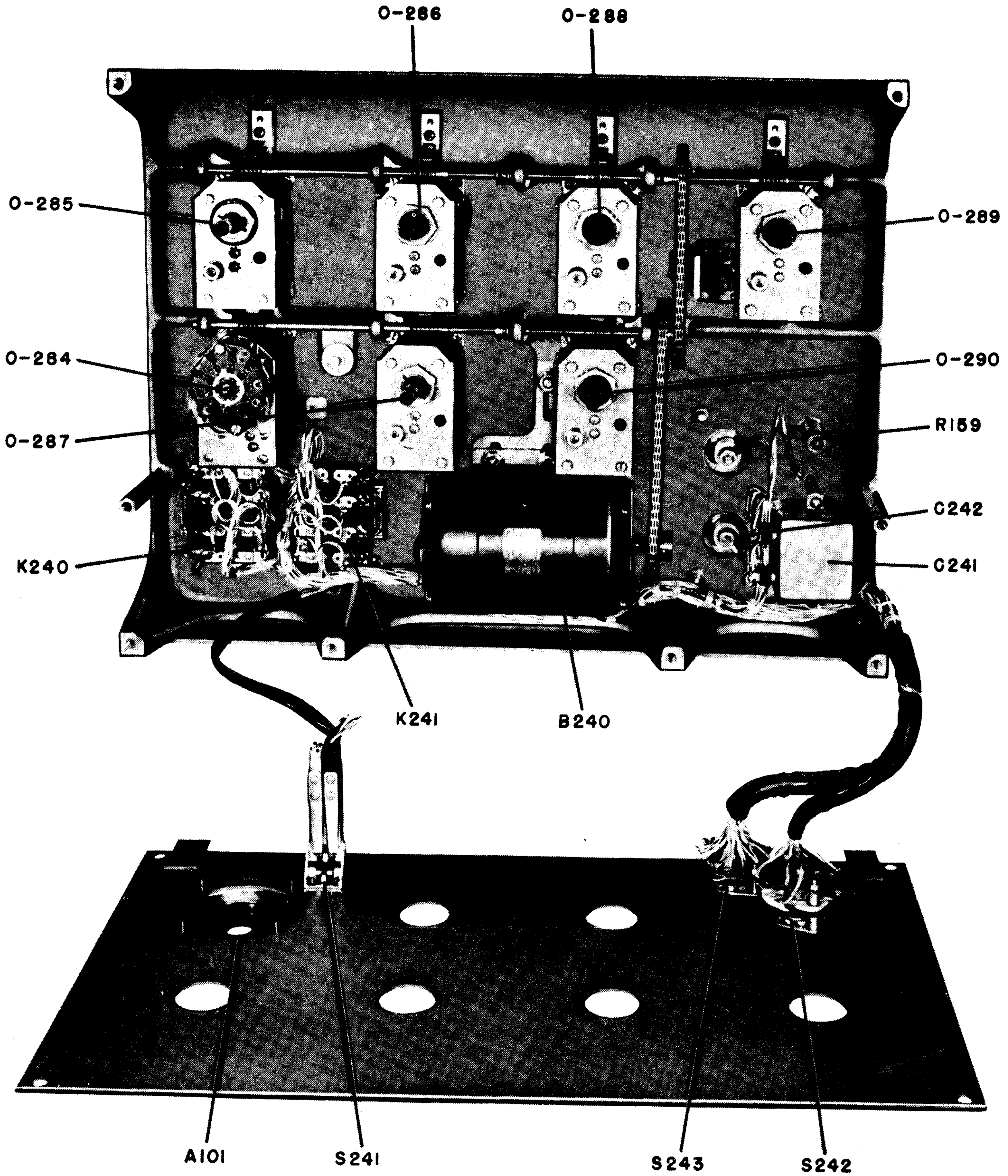


Figure 7-24. Autotune Assembly, Location of Parts

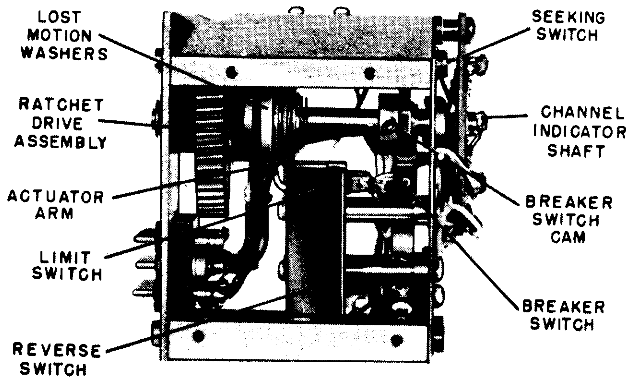


Figure 7-25. Autotune Control Head

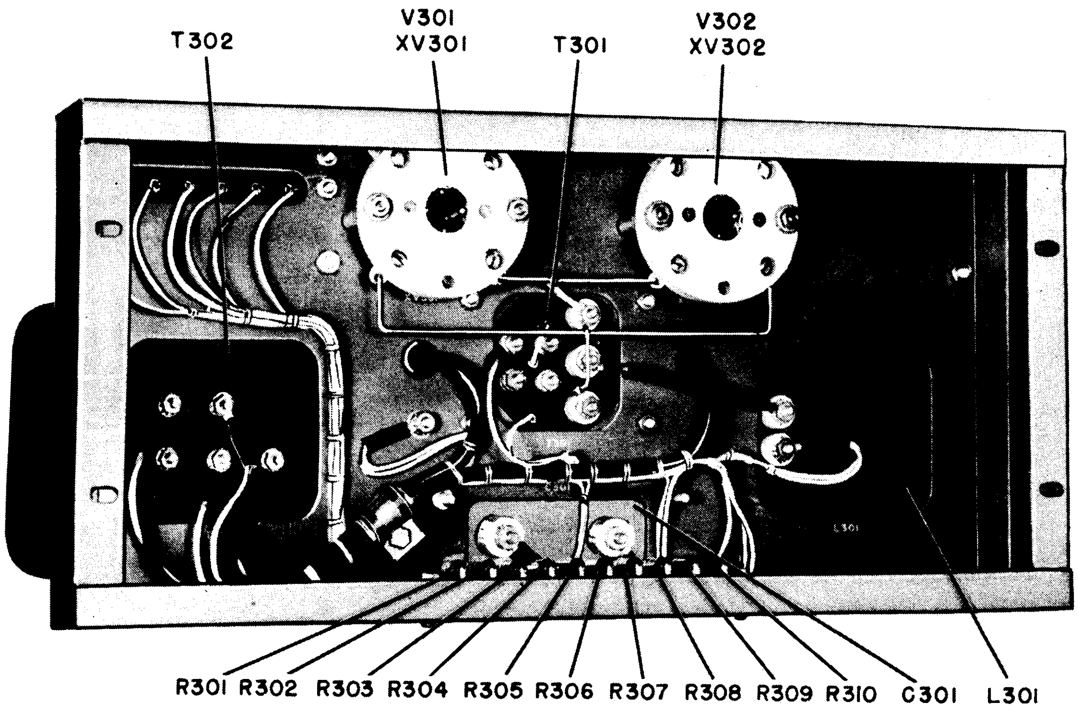


Figure 7-26. Low-Voltage Power Supply, Bottom View, Location of Parts

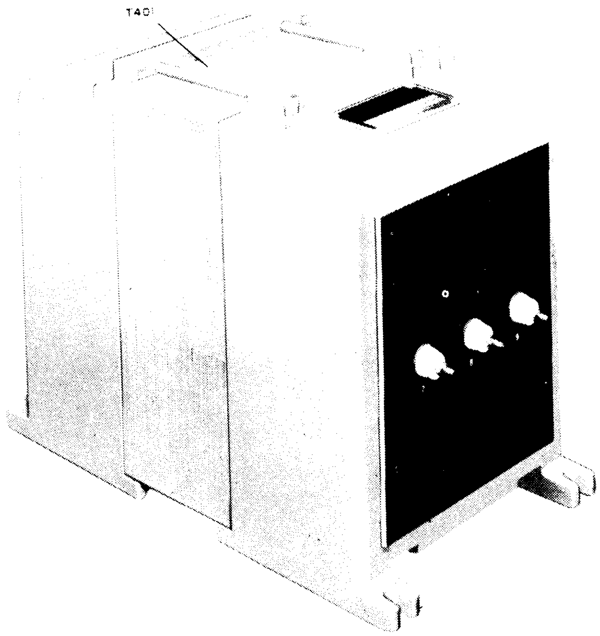


Figure 7-27. High-Voltage Power Supply, Plate Transformer

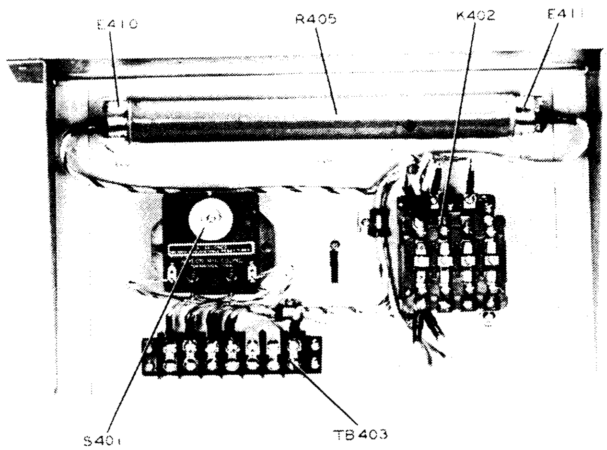
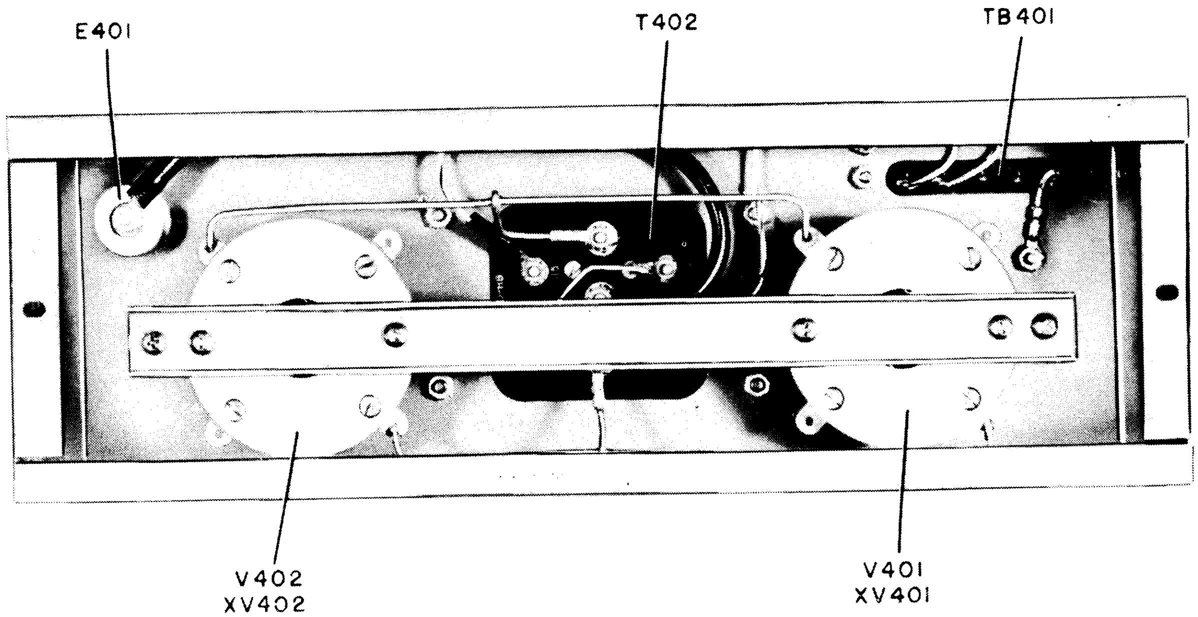


Figure 7-27A. Step-Start Assembly



Figur 7-28. High-Voltage Power Supply, Rectifi r Chassis, B ttom Vi w, Locati n of Parts

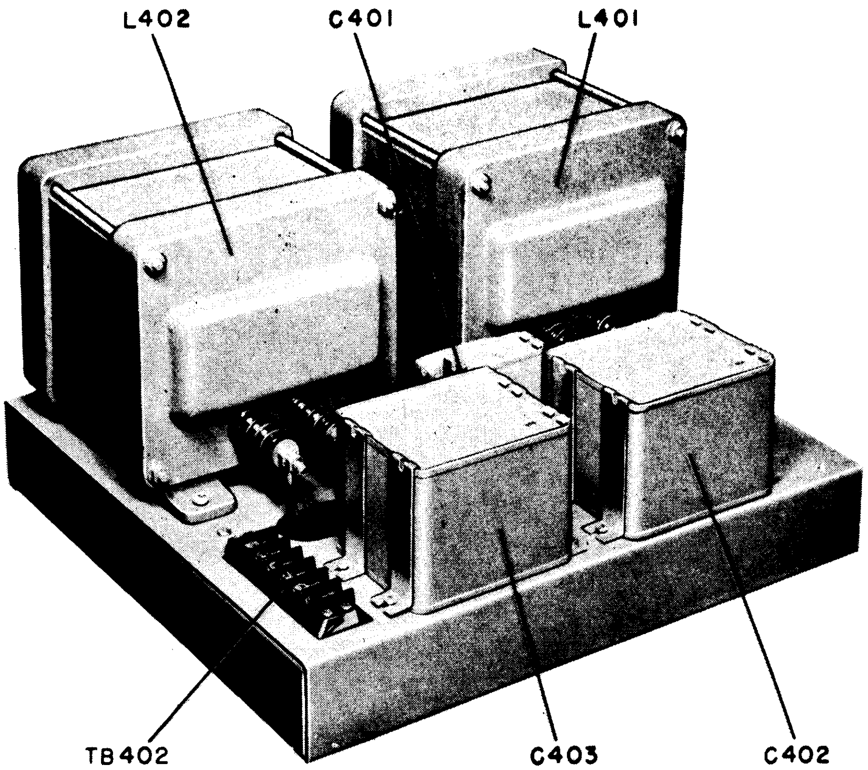


Figure 7-29. High-Voltage Power Supply, Filter Chassis, Top View, Location of Parts

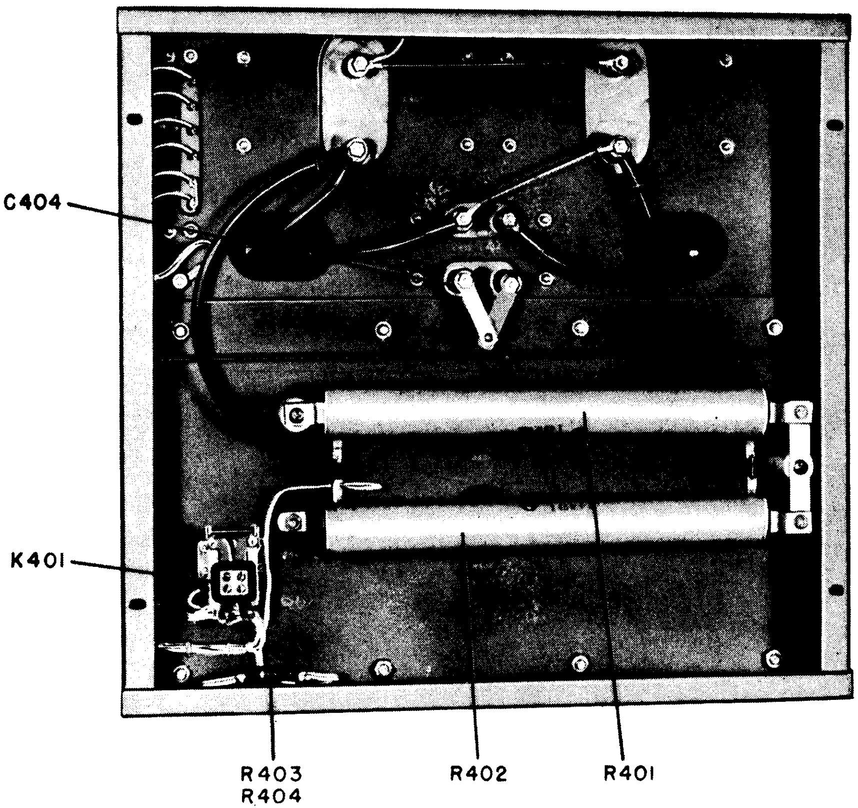


Figure 7-30. High-V ltage P w r Supply, Filter Chassis, B tt m View, L cati n of Parts

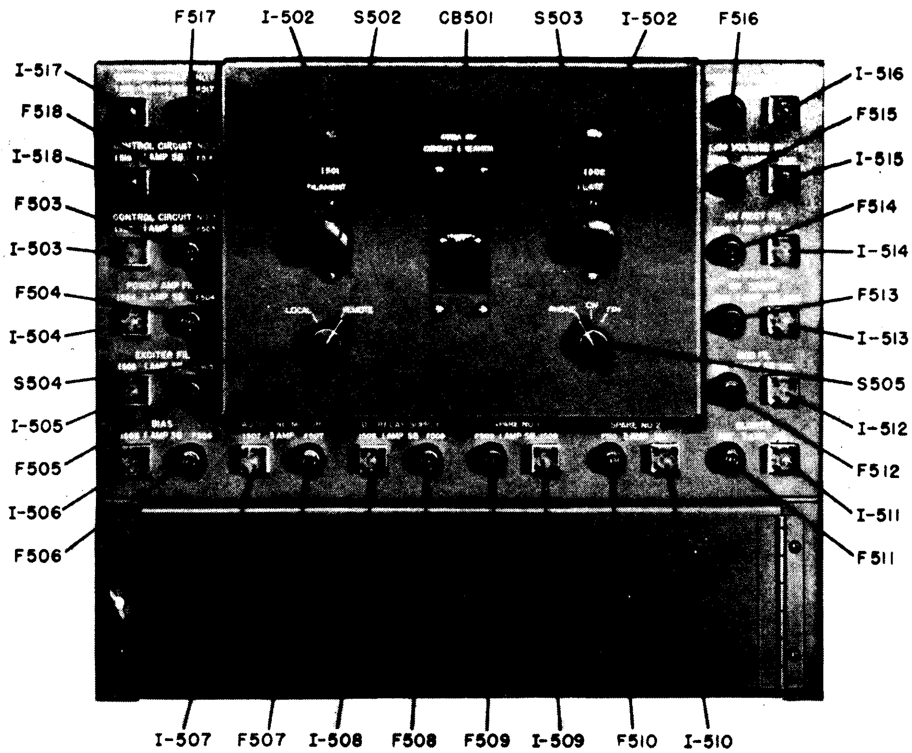


Figure 7-31. Power Control Assembly, Front Panel, Location of Parts

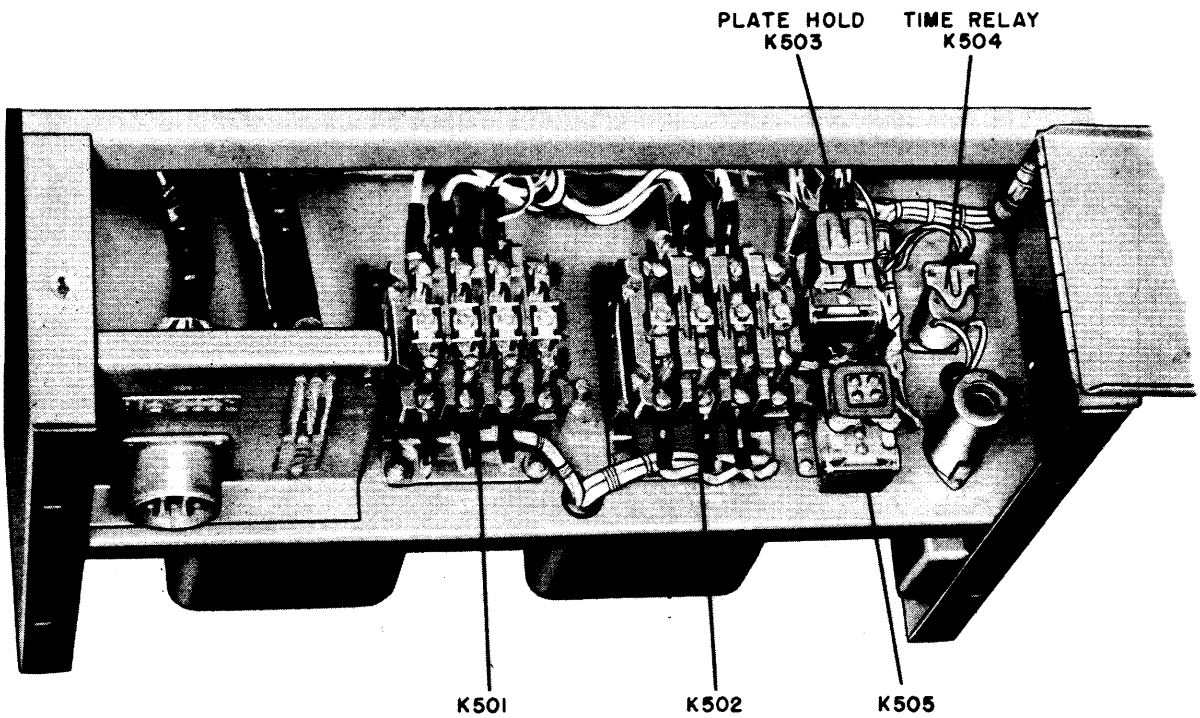


Figure 7-32. P wer C ntr l Ass mbly, Fr nt Vi w, L cati n f Parts

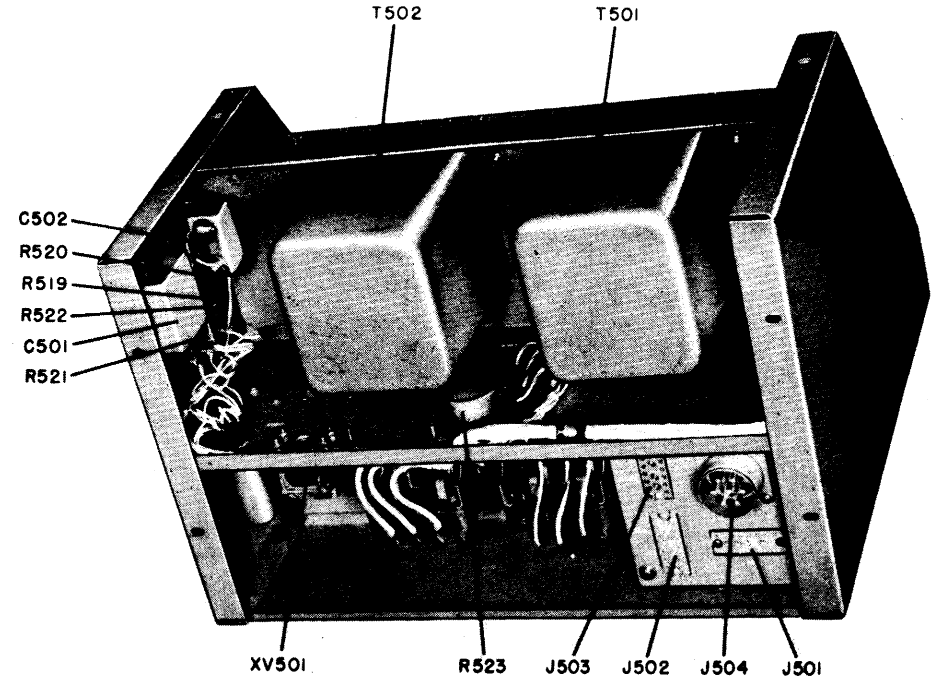


Figure 7-33. Power Control Assembly, Rear View, Location of Parts

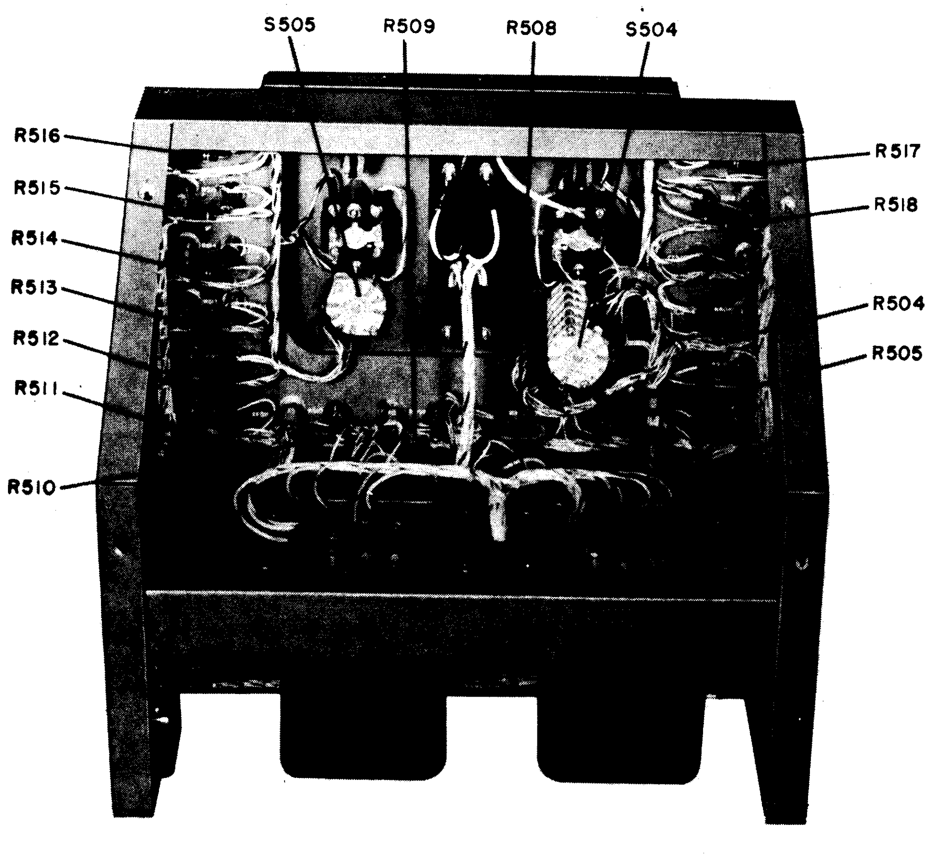


Figure 7-34. Pow r C ntrol Assembly, Bottom Vi w, Location of Parts

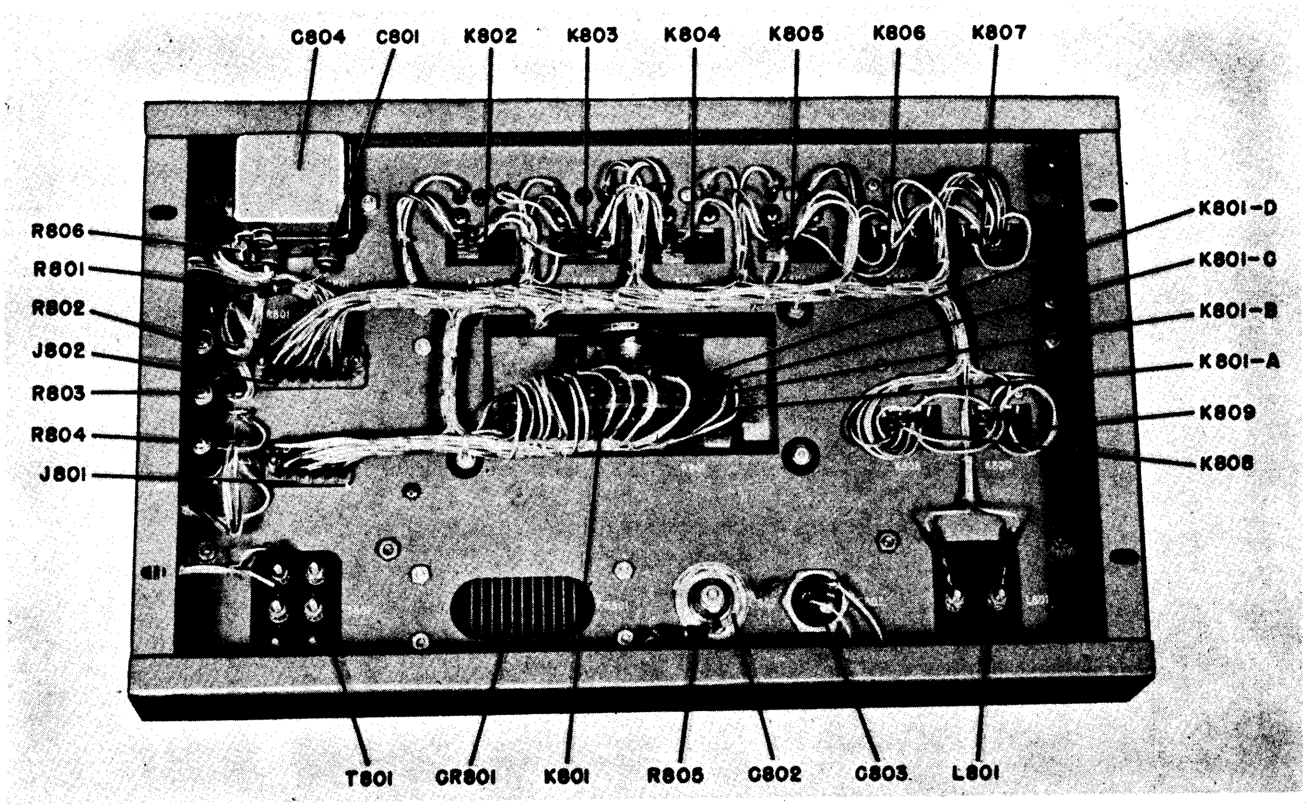


Figure 7-35. Dial Control Assembly, Bottom View, Location of Parts

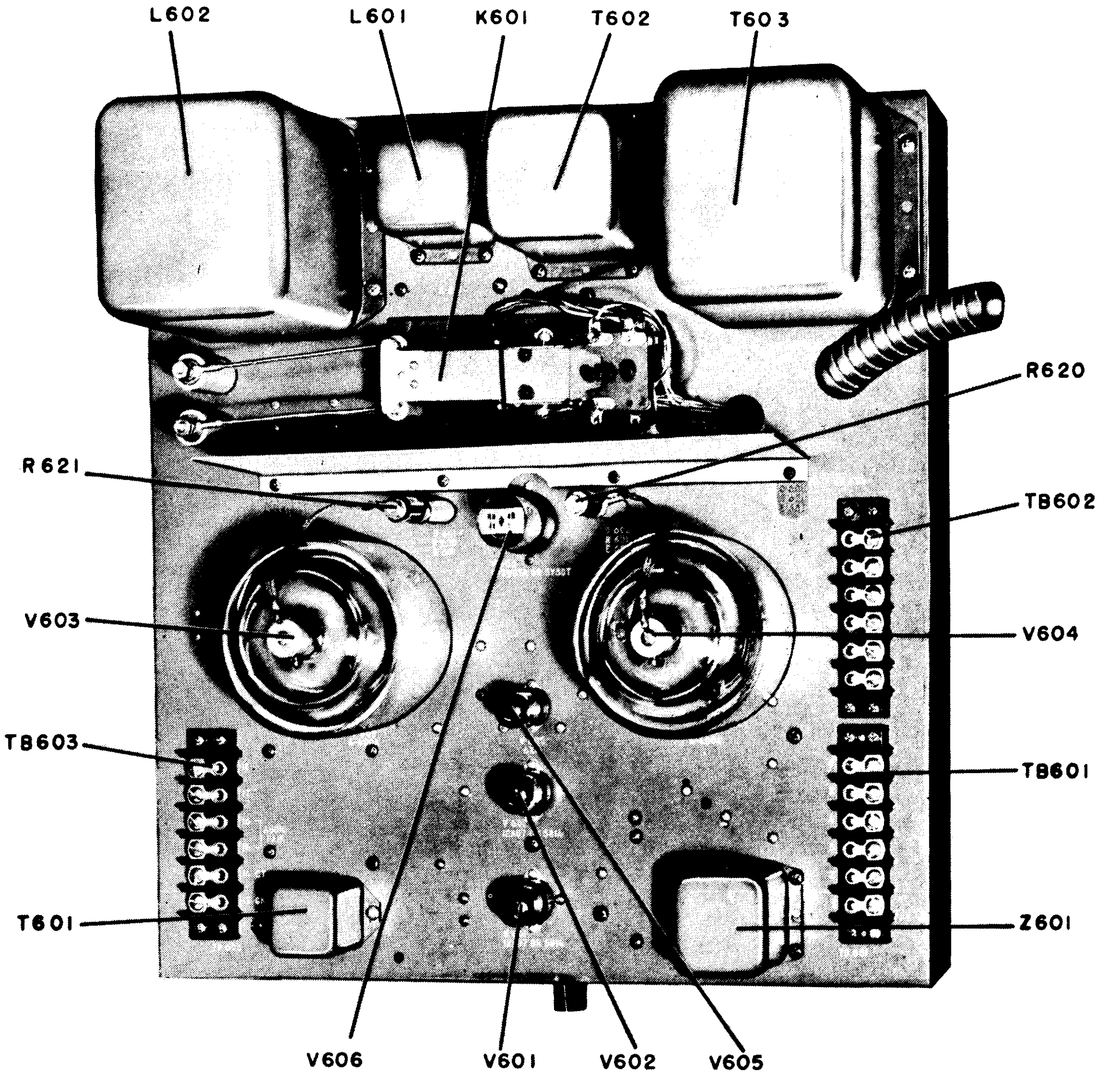


Figure 7-36. Modulator Assembly, Audio Chassis, Top View, Location of Parts

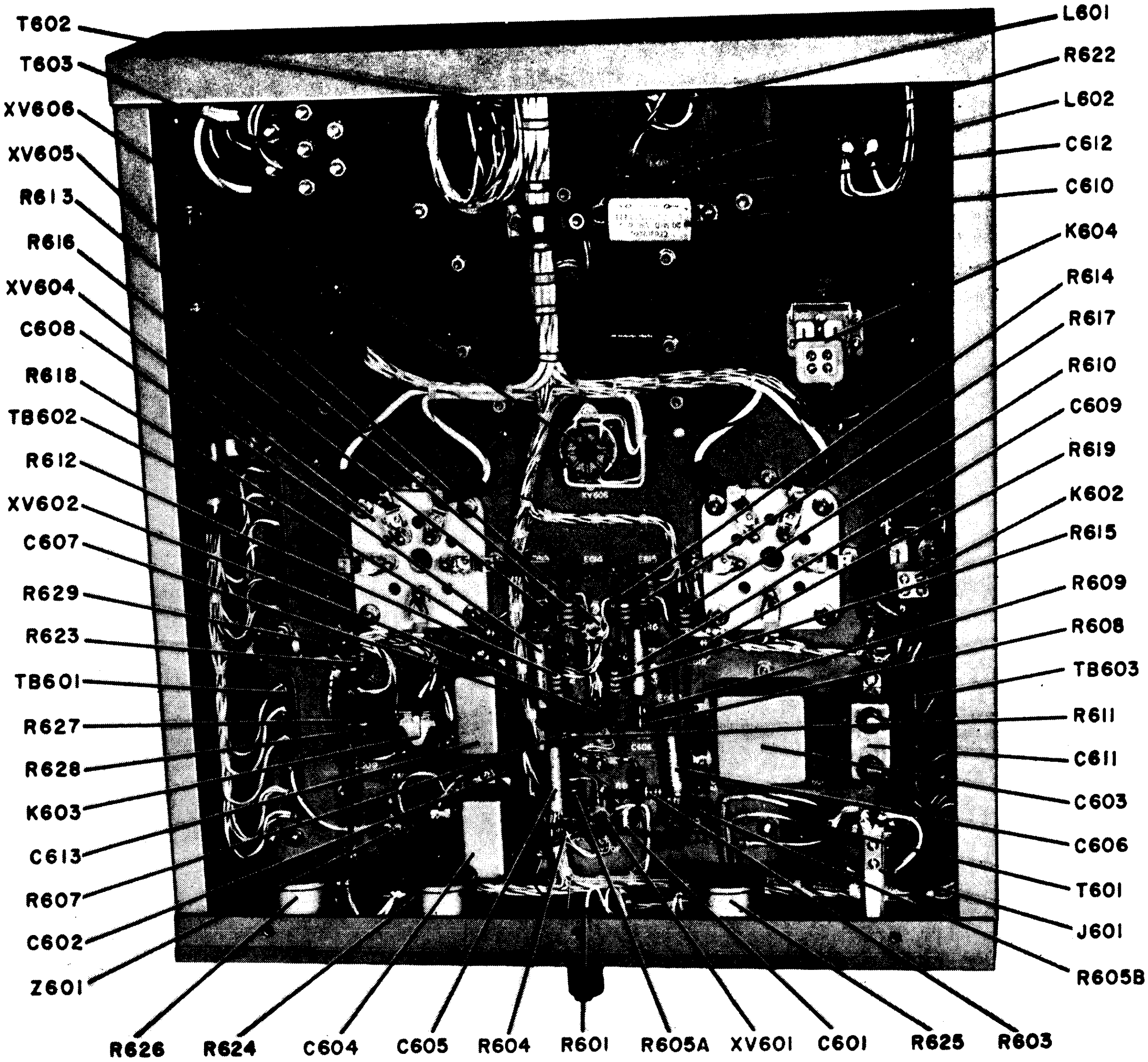


Figure 7-37. Modulator Assembly, Audio Chassis, Bottom View, Location of Parts

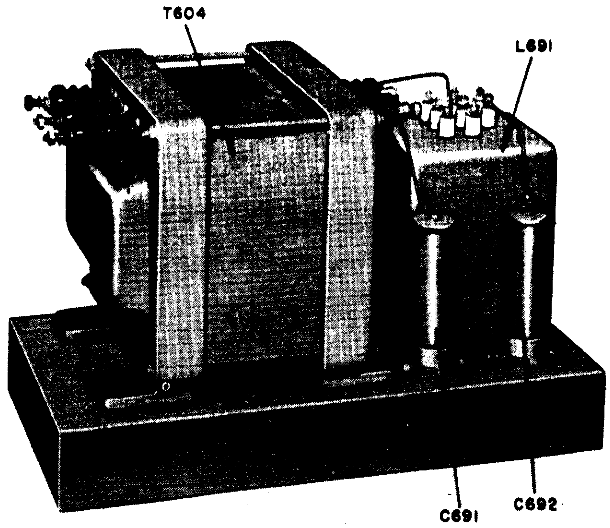
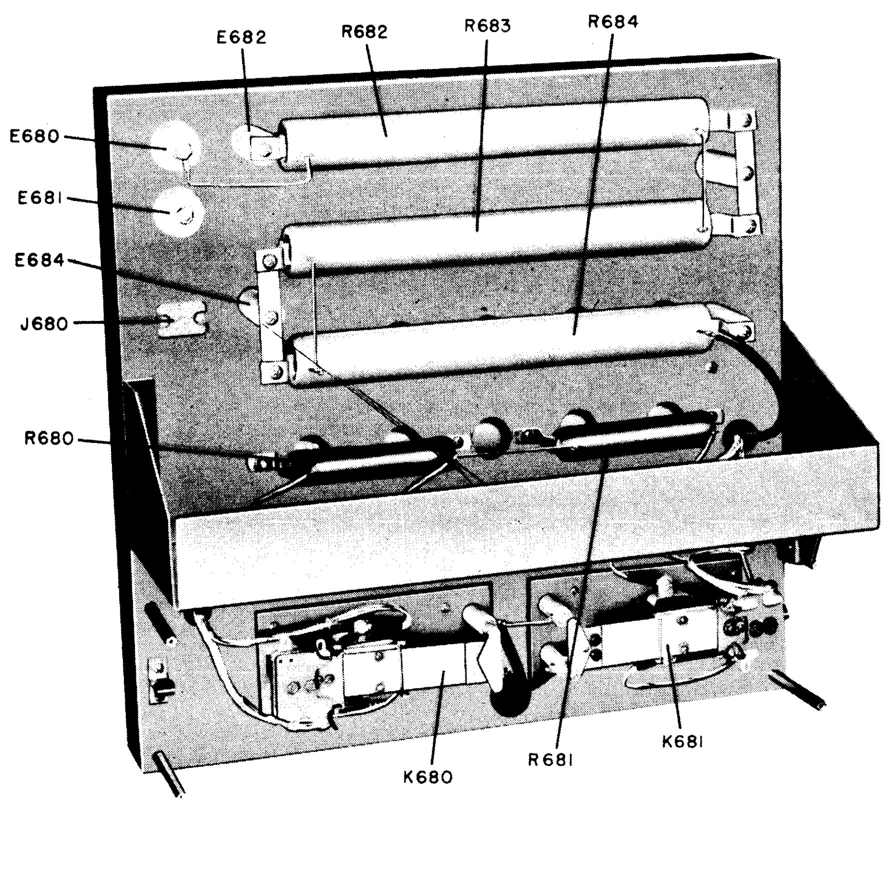


Figure 7-38. Modulator Assembly, Modulation Transformer and Filter Chassis, Location of Parts



Figur 7-39. P w r Change Ass mbly, T p Vi w, L cati n f Parts

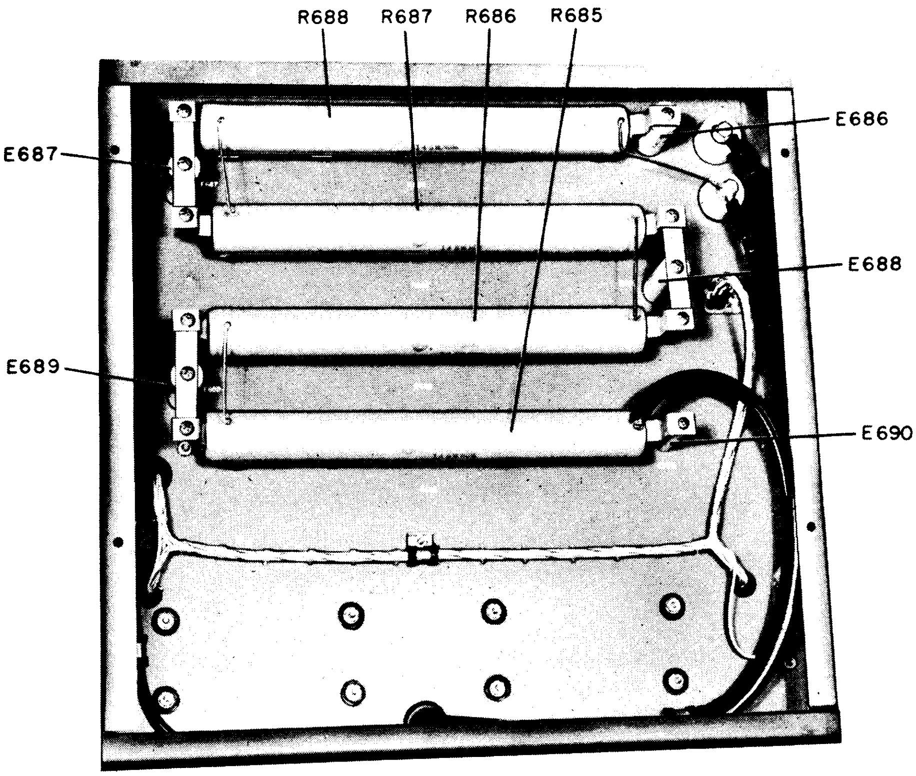


Figure 7-40. Power Change Assembly, Bottom View, Location of Parts

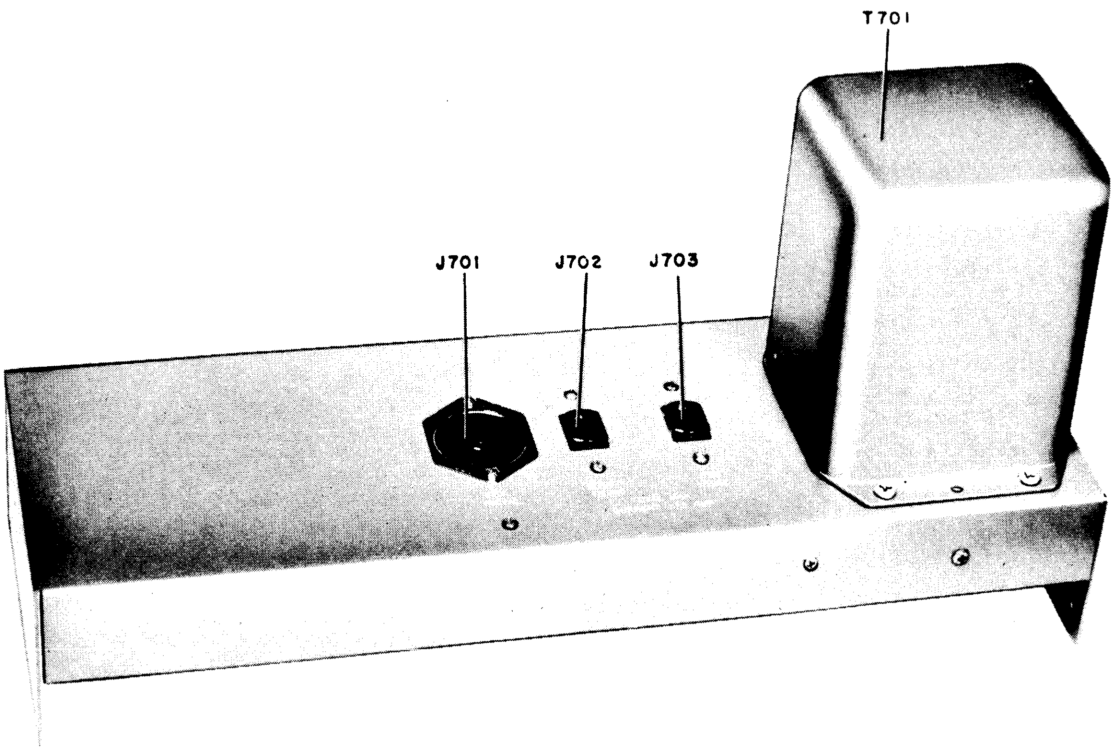


Figure 7-41. S rvice Pow r Supply, Top Vi w, Locati n of Parts

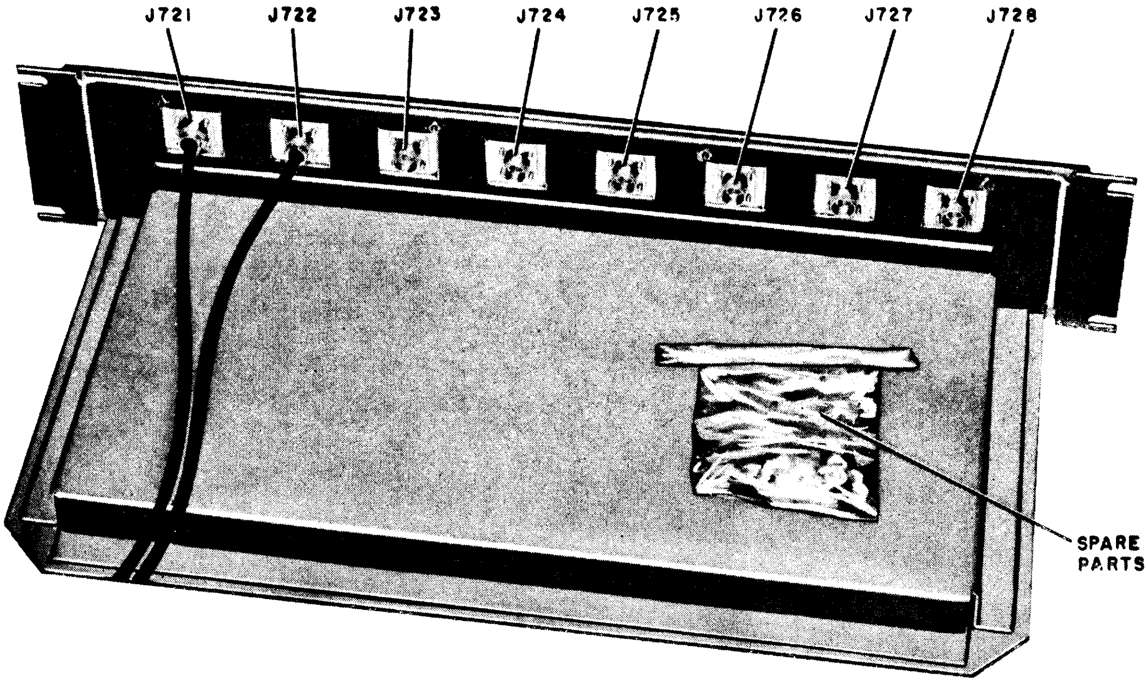


Figure 7-42. Patch Panel Assembly, Rear View, Location of Parts

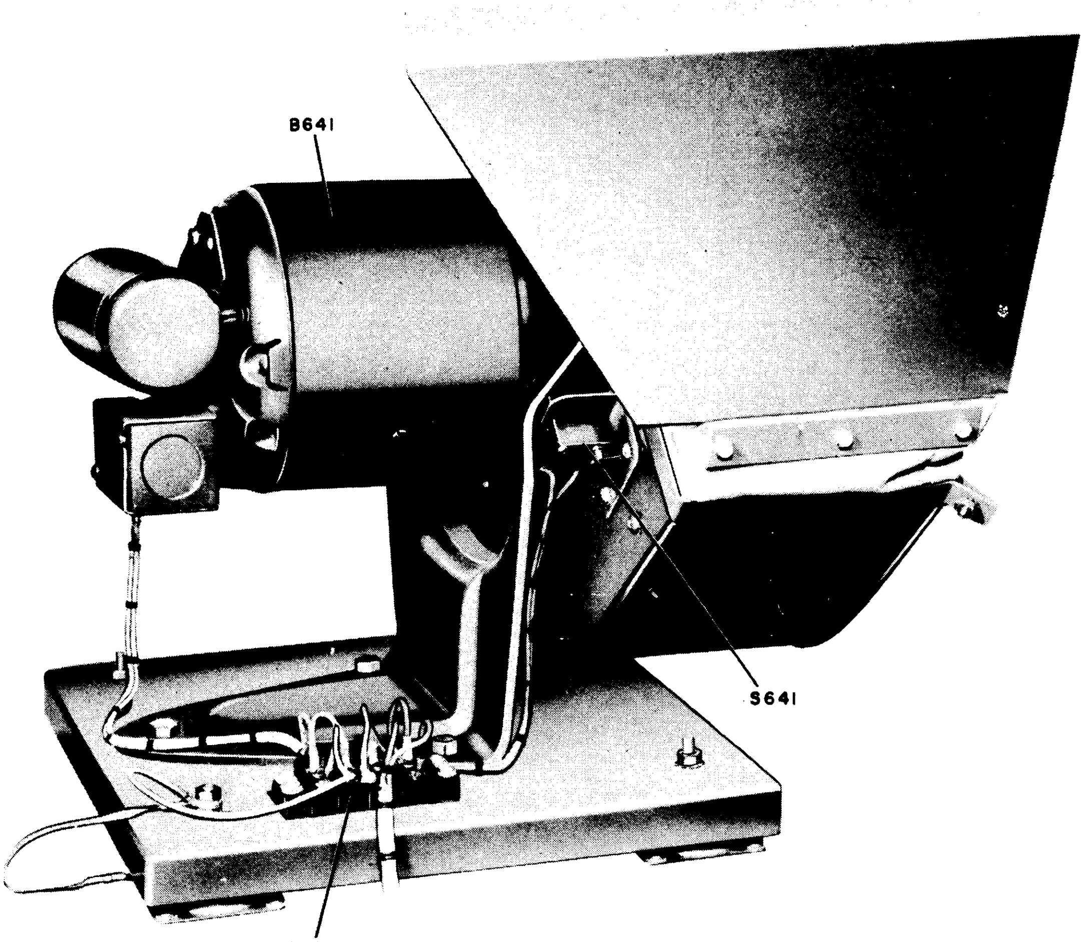


Figure 7-43. Blower Assembly, Location of Parts

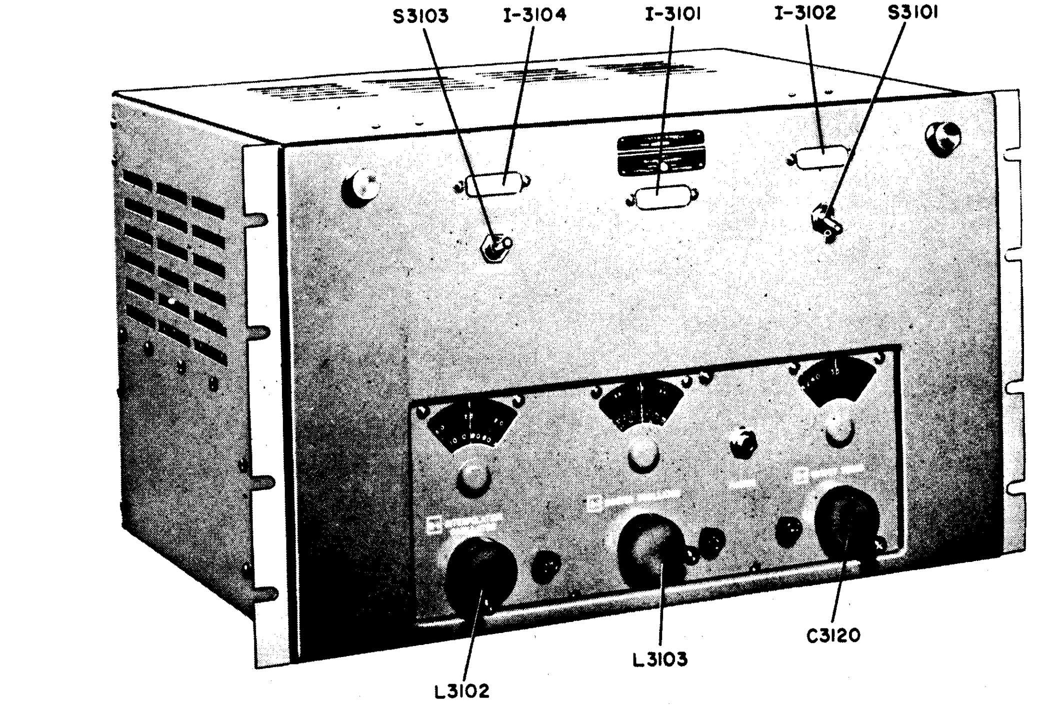
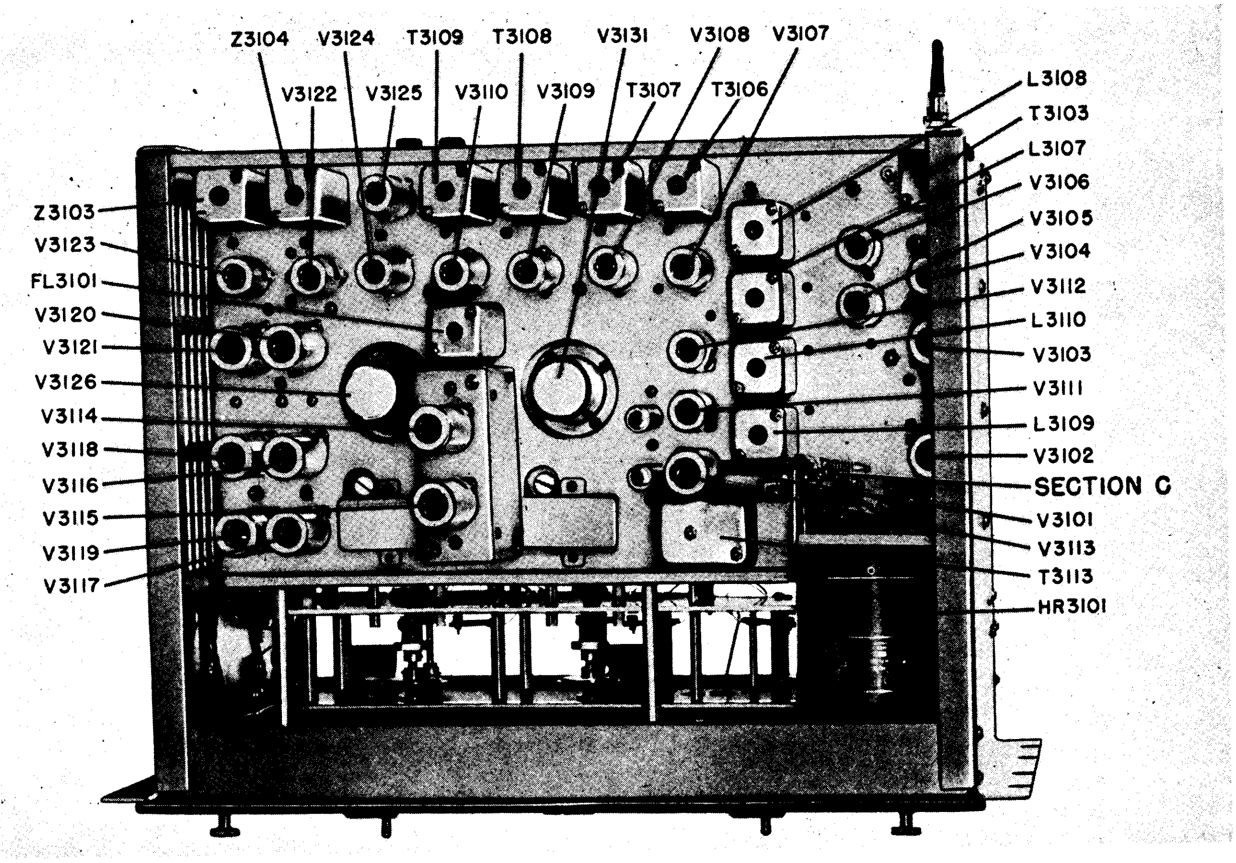


Figure 7-44. R-F Oscillator O-243/FRT-24, Front Oblique View, Location of Parts



Figur 7-45. R-F Oscillator O-243/FRT-24, Case Rem v d, T p Vi w, L cati n f Parts

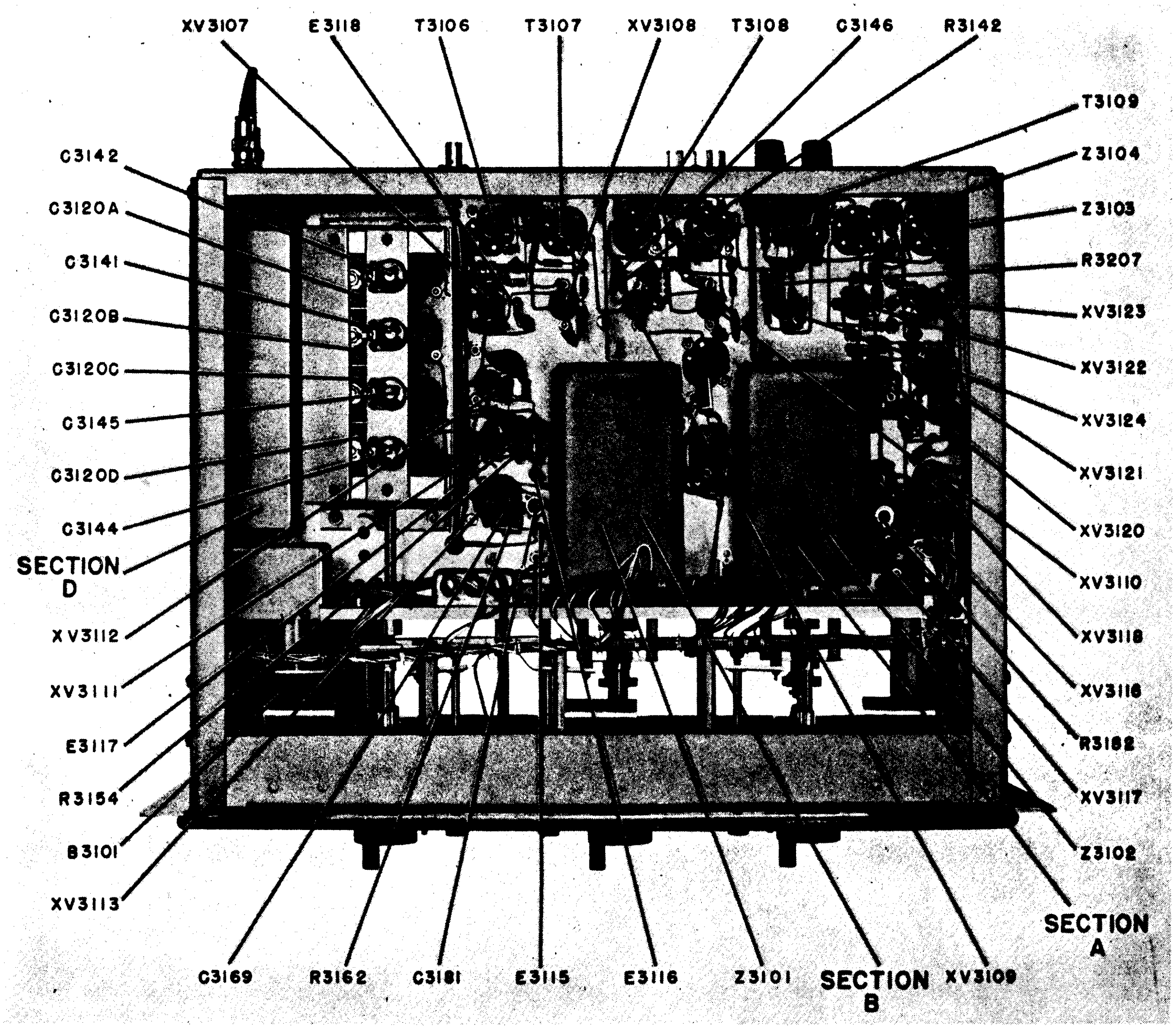


Figure 7-46. R-F Oscillator O-243/FRT-24, Case Removed, Bottom View, Location of Parts

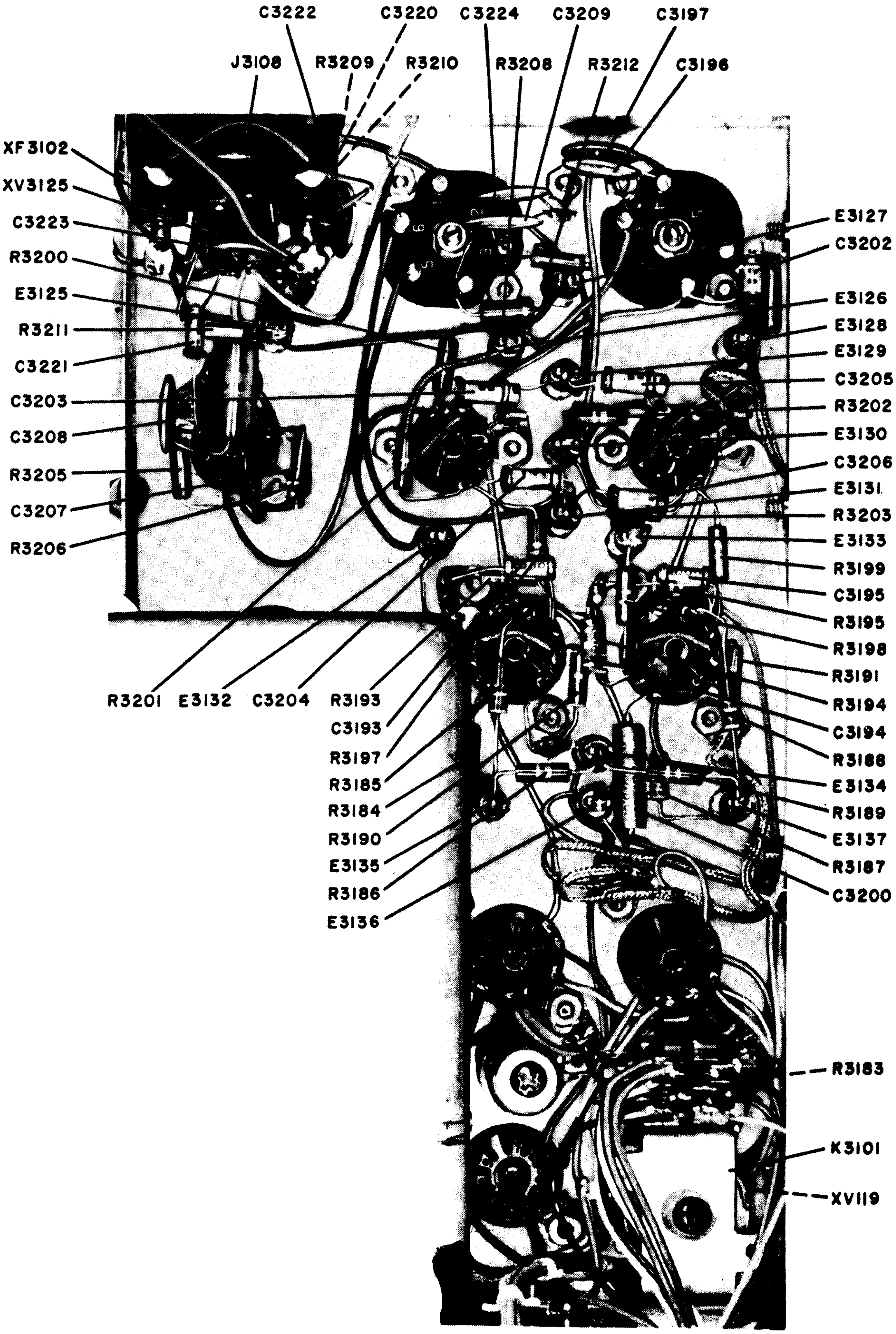


Figure 7-47. R-F scillat r O-243/FRT-24, Section A, Locati n f Parts

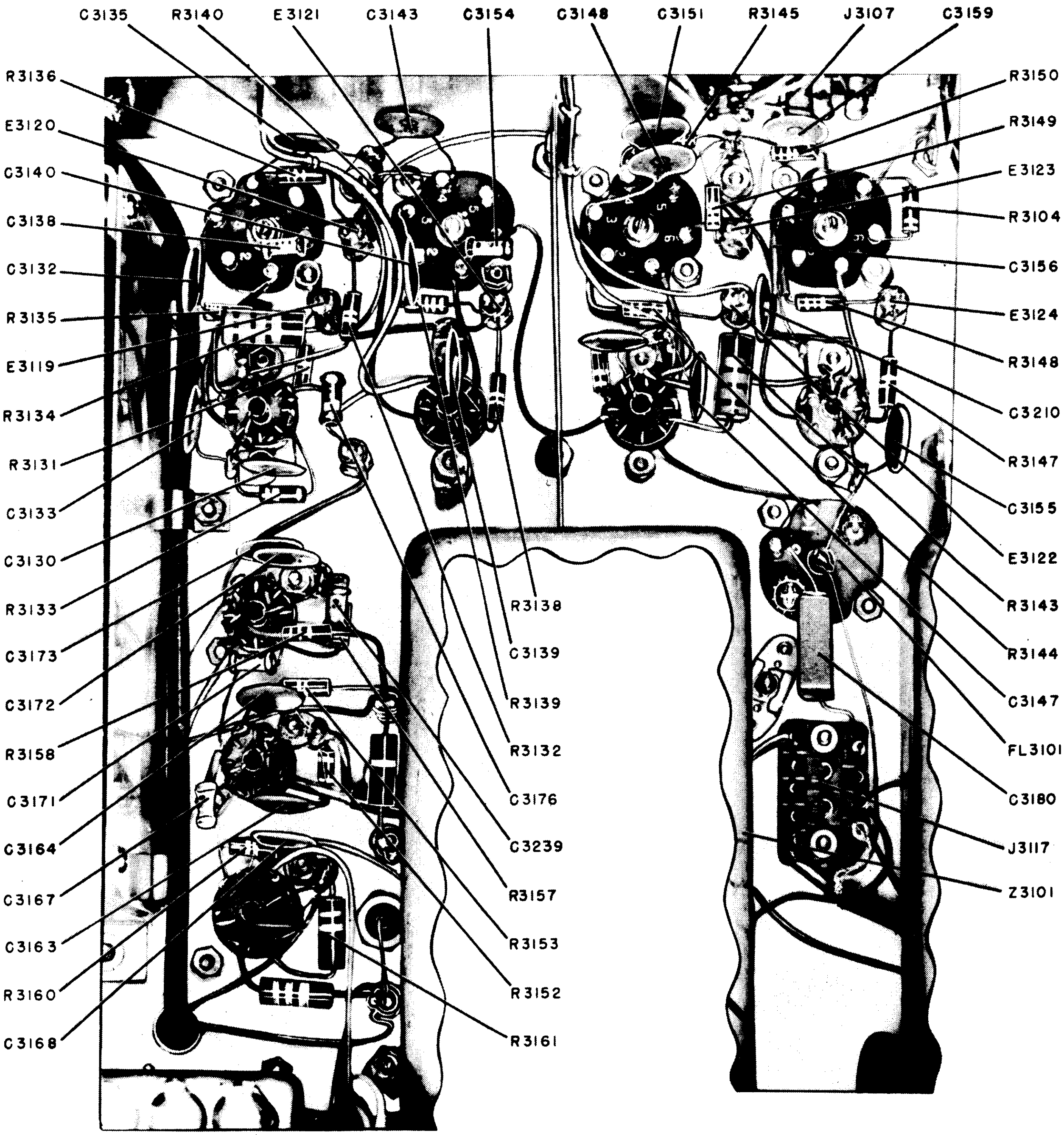


Figure 7-48. R-F Oscillator O-243/FRT-24, Section B, Location of Parts

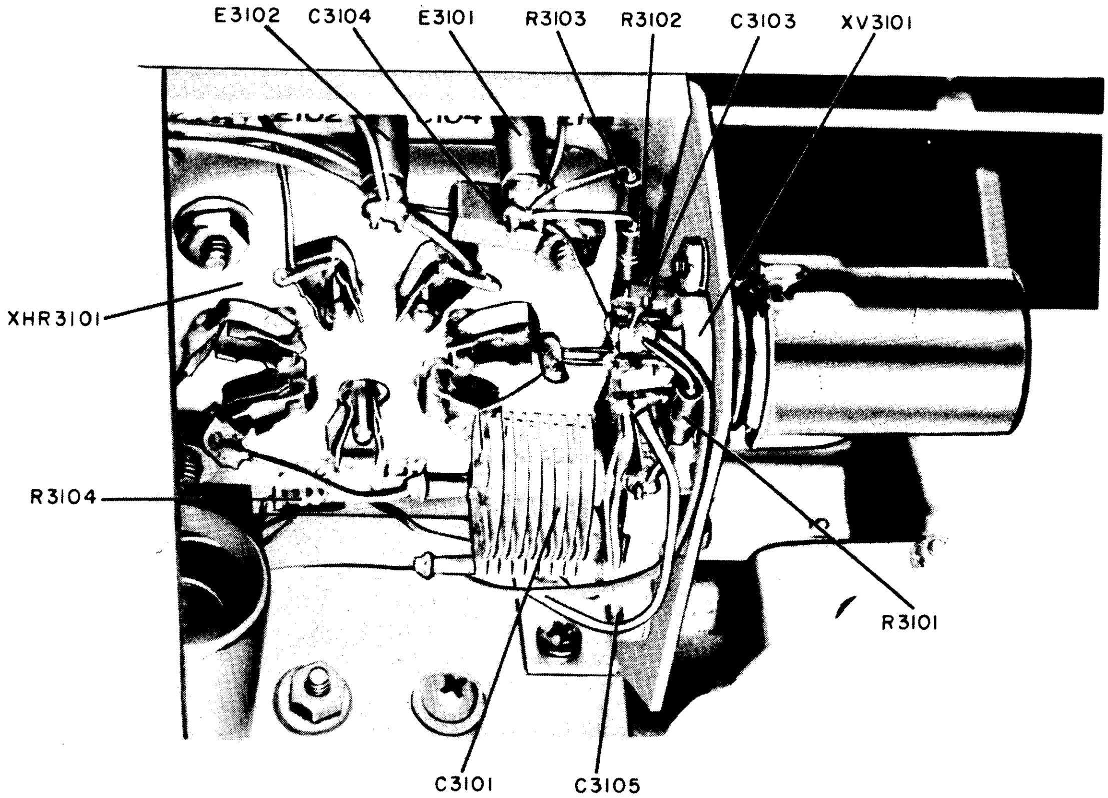


Figure 7-49. R-F Oscillator O-243/FRT-24, Section C, Location of Parts

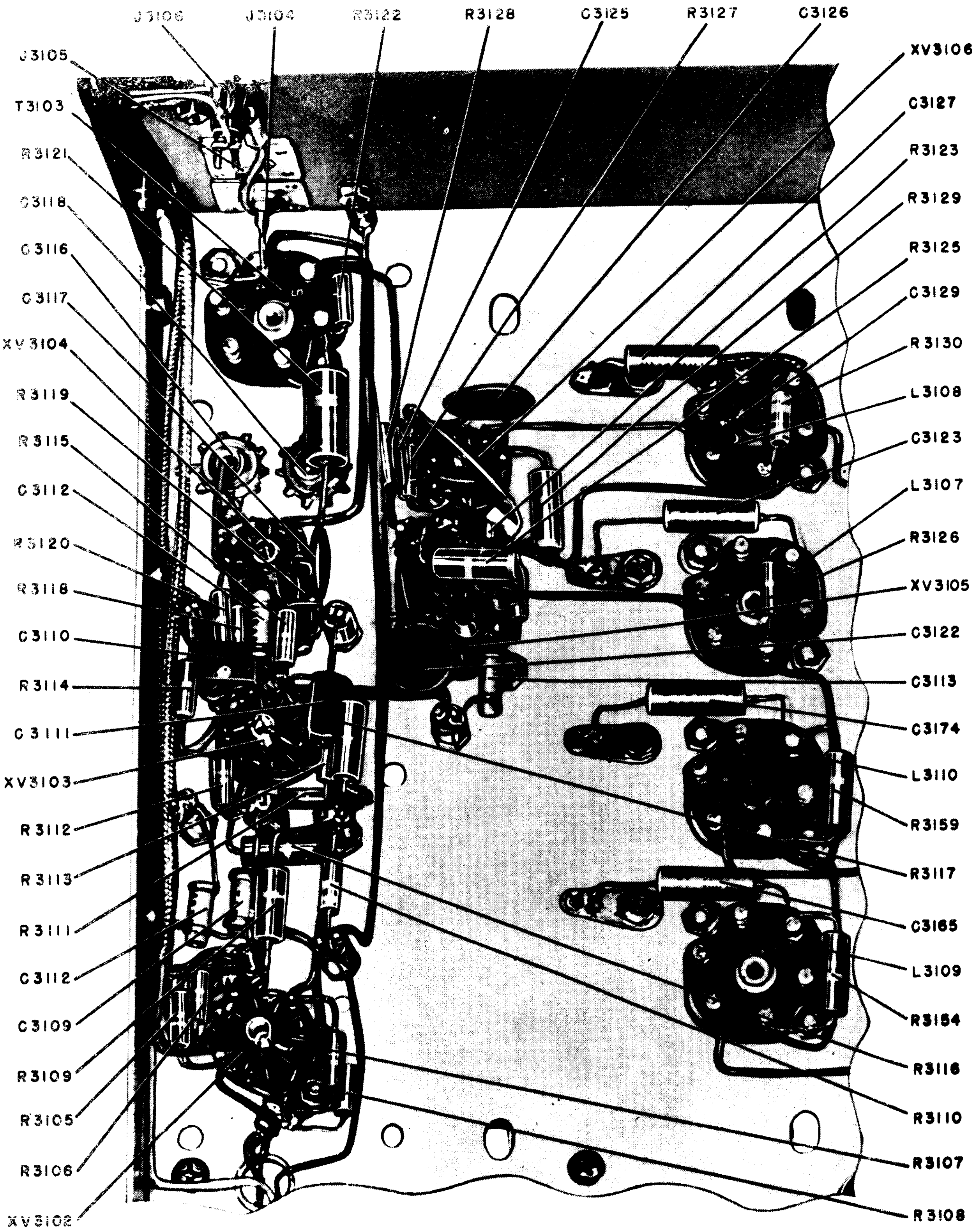


Figure 7-50. R-F Oscillator O-243/FRT-24, Section D, Location of Parts

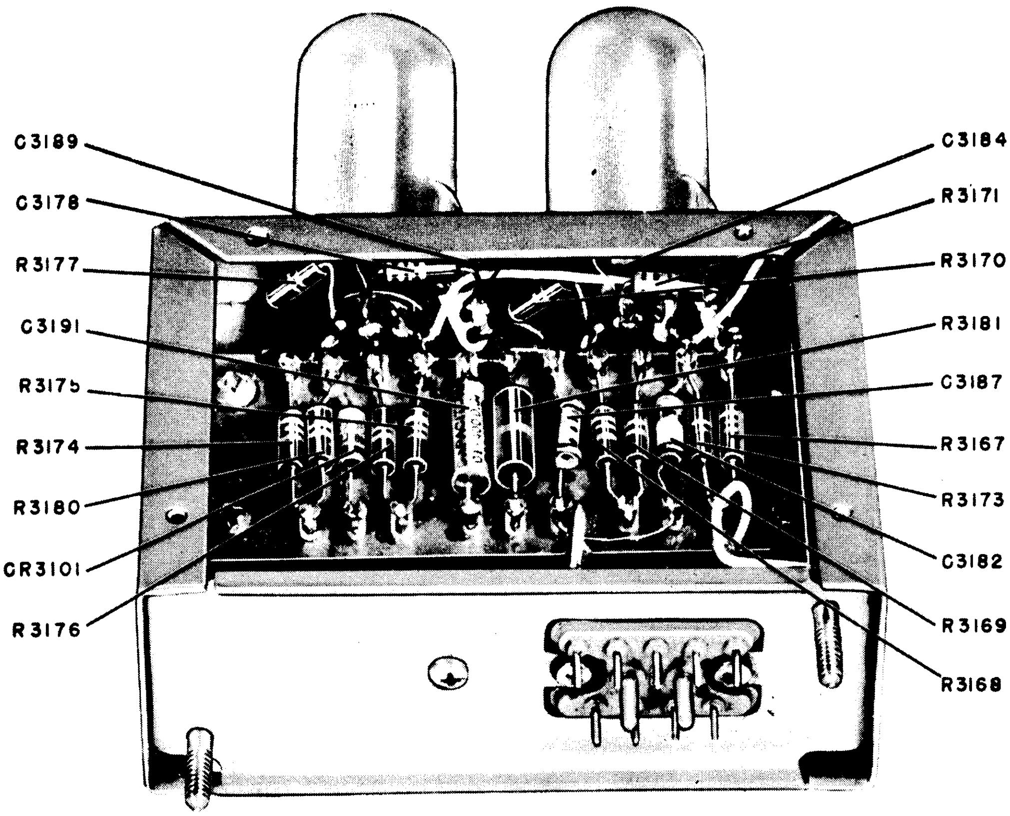


Figure 7-51. R-F Oscillator O-243/FRT-24, Interpolation Divider, Left-Side View, Location of Parts

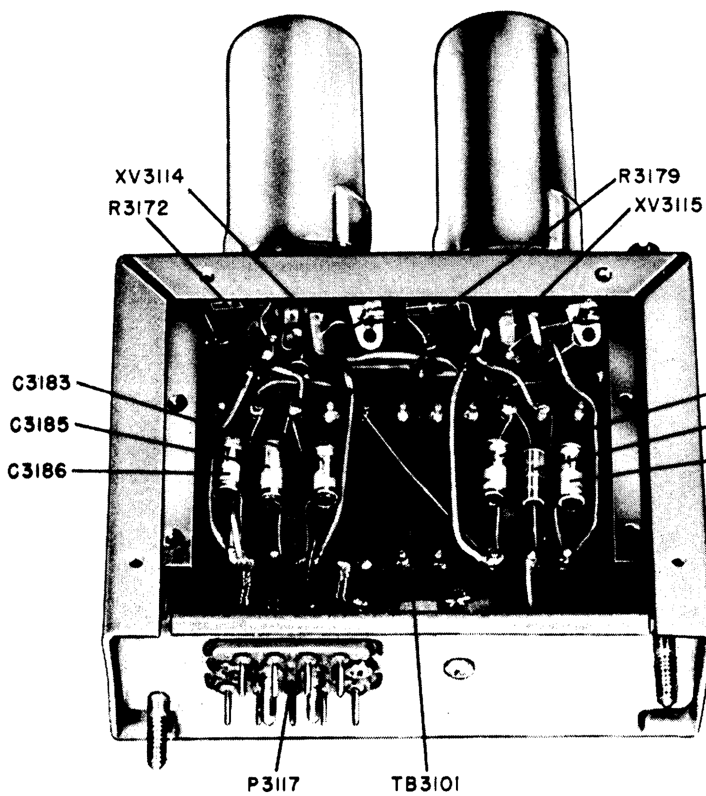


Figure 7-52. R-F Oscillat r O-243/FRT-24, Interp lati n Divider, Right-Side View, Locati n of Parts

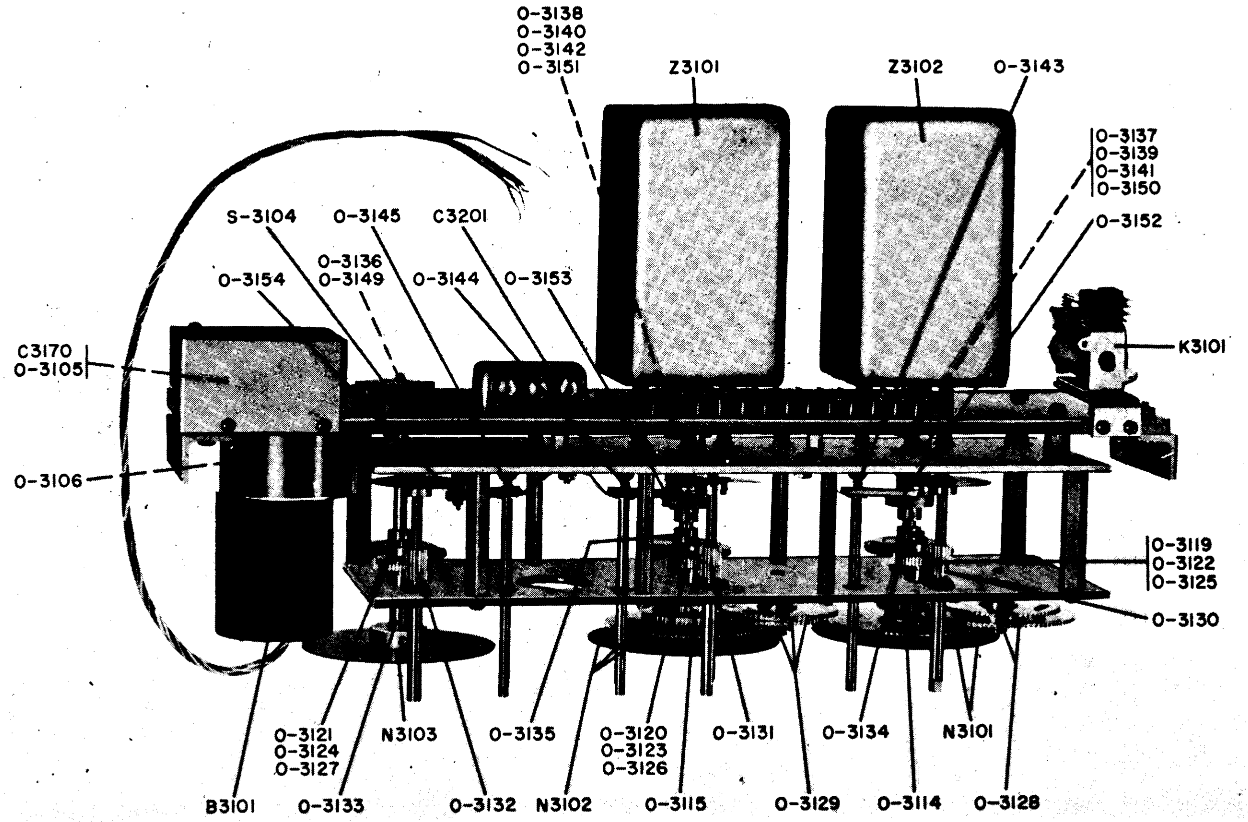
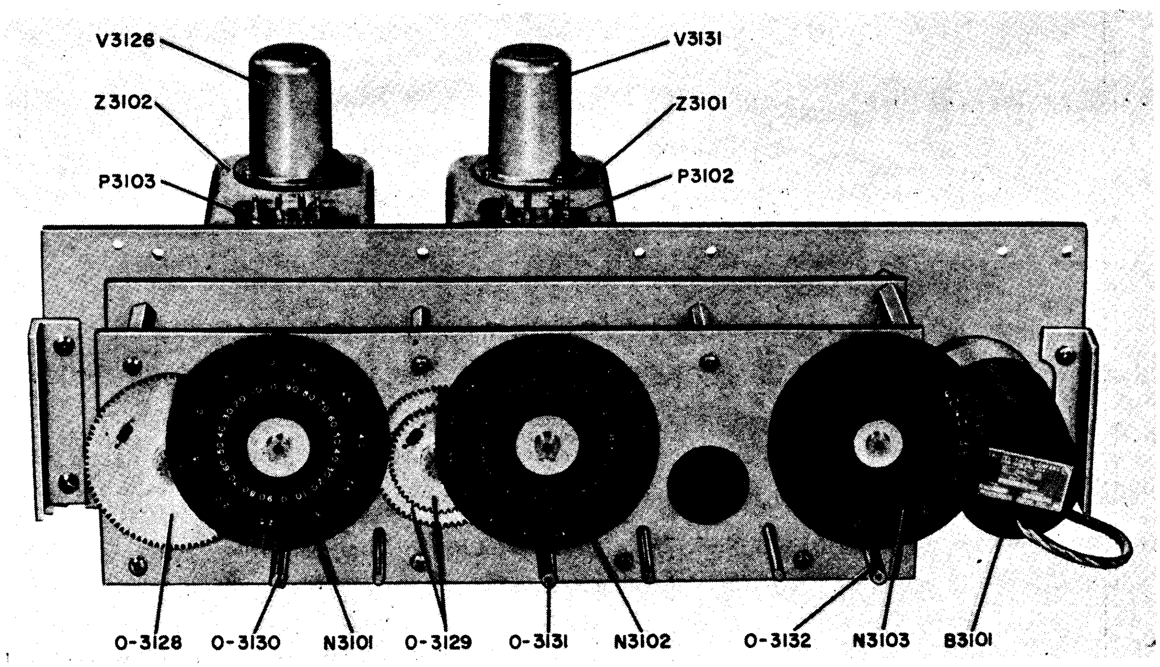


Figure 7-53. R-F Oscillator O-243/FRT-24, Top View of Dial Gears, Location of Parts



Figur 7-54. R-F Oscillat r O-243/FRT-24, Front Vi w f Dial G ars, L cation f Parts

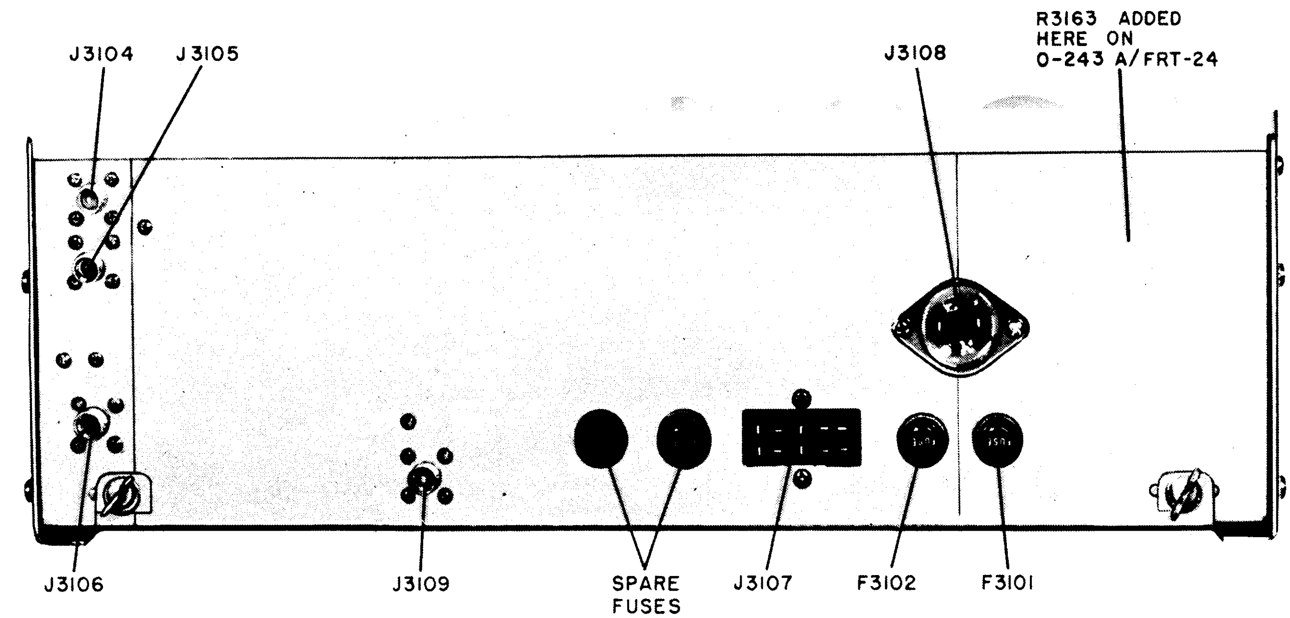


Figure 7-55. R-F Oscillator, O-243/FRT-24, Rear View, Location of Parts

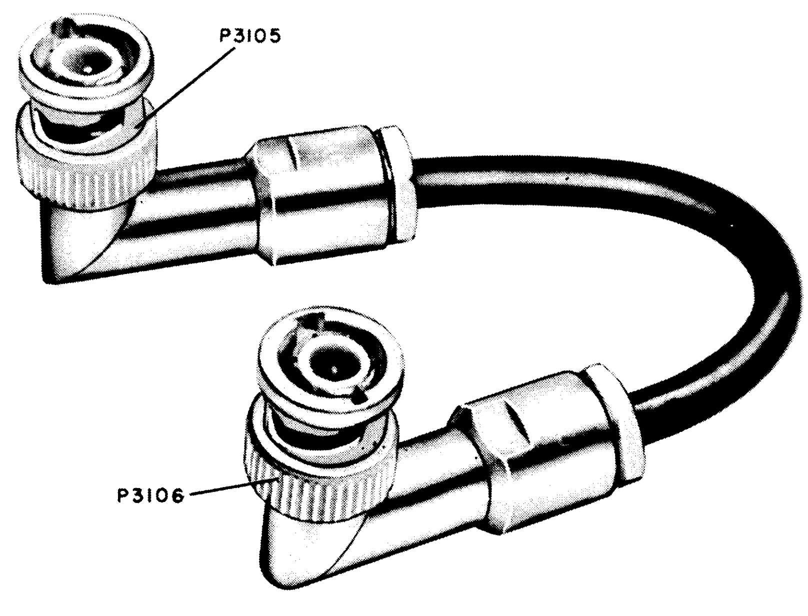


Figure 7-56. R-F Oscillator O-243/FRT-24, Coaxial Jumper Cable

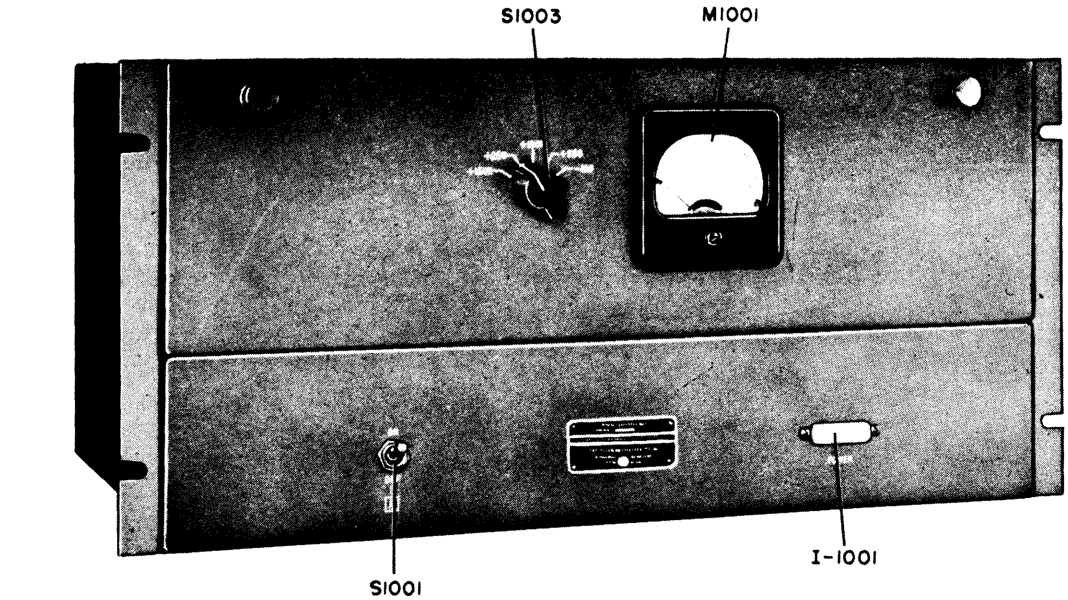


Figure 7-57. Power Supply PP-454/FRT-5, Front Oblique View, Location of Parts

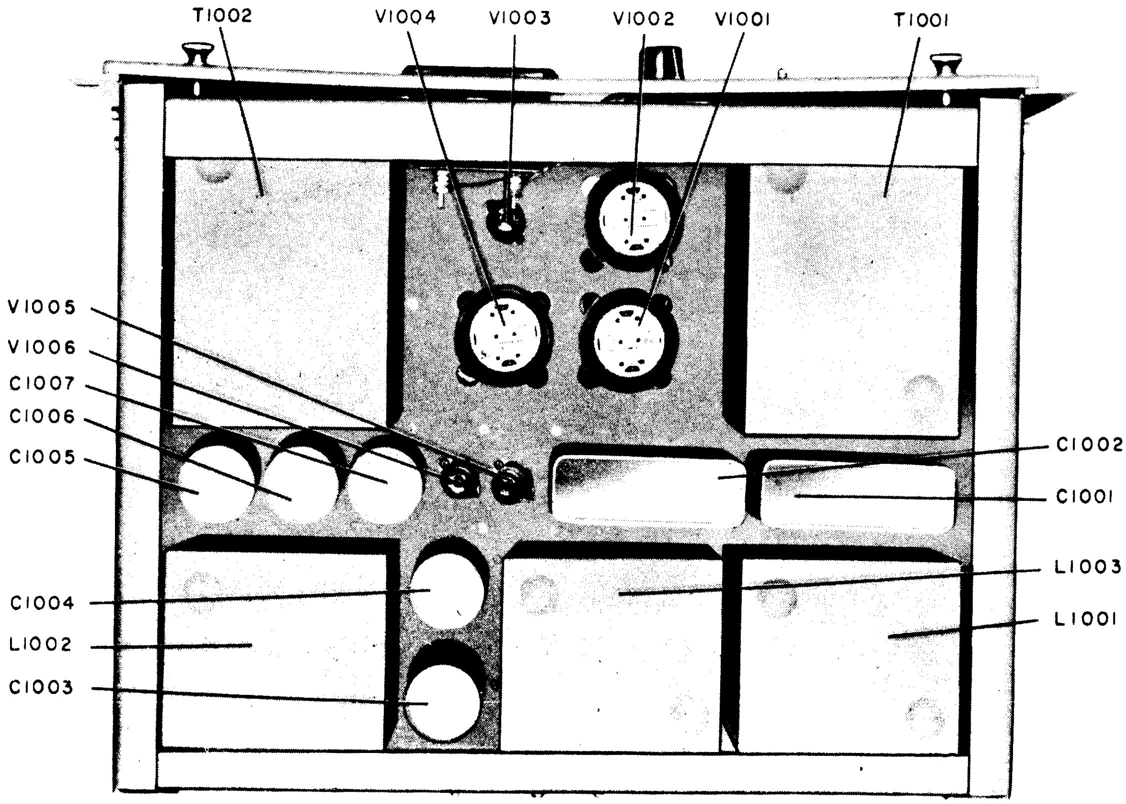


Figure 7-58. P wer Supply PP-454/FRT-5, Cas R moved, Top Vi w, L cati n of Parts

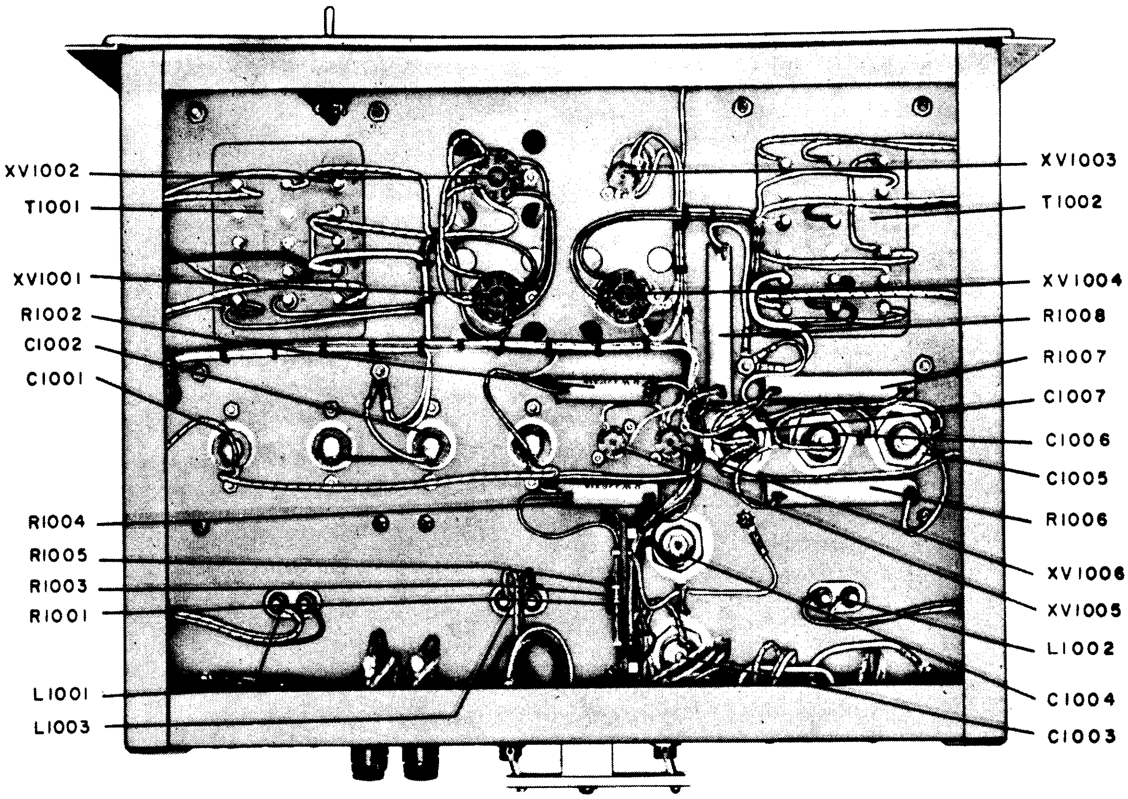
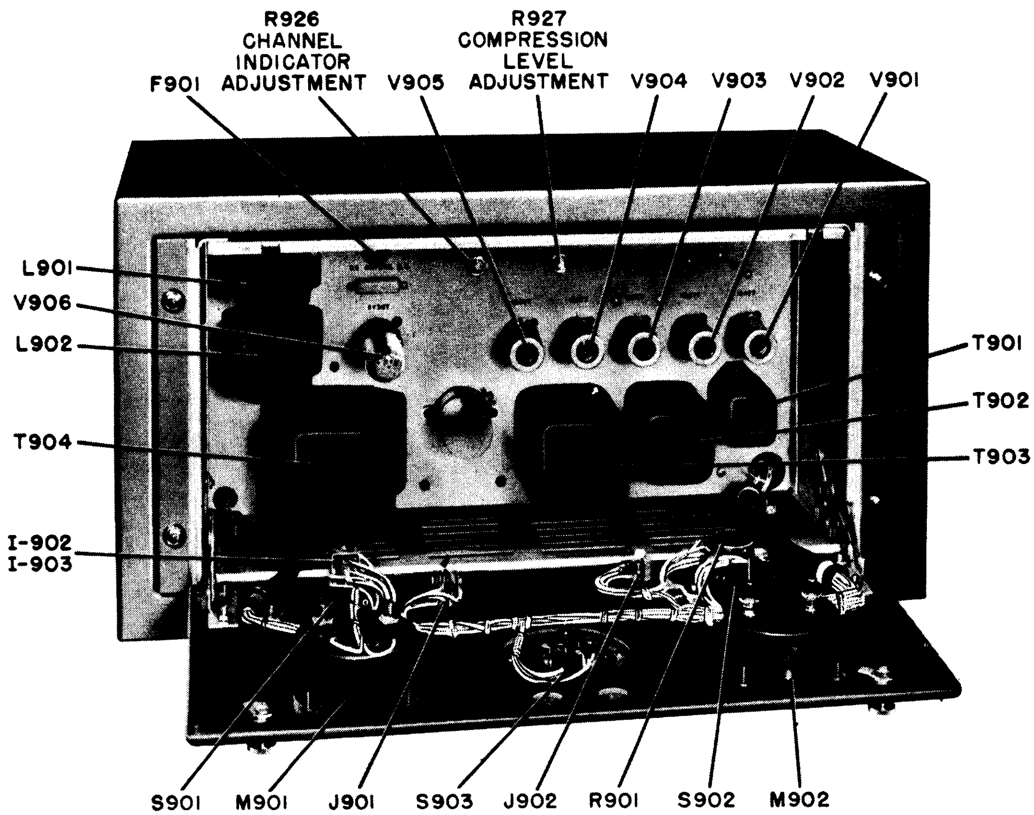


Figure 7-59. Power Supply PP-454/FRT-5, Case Removed, Bottom View, Location of Parts



Figur 7-60. Transmitt r Control C1362/FRT-24, Fr nt Pan l Lowered, Locati n f Parts

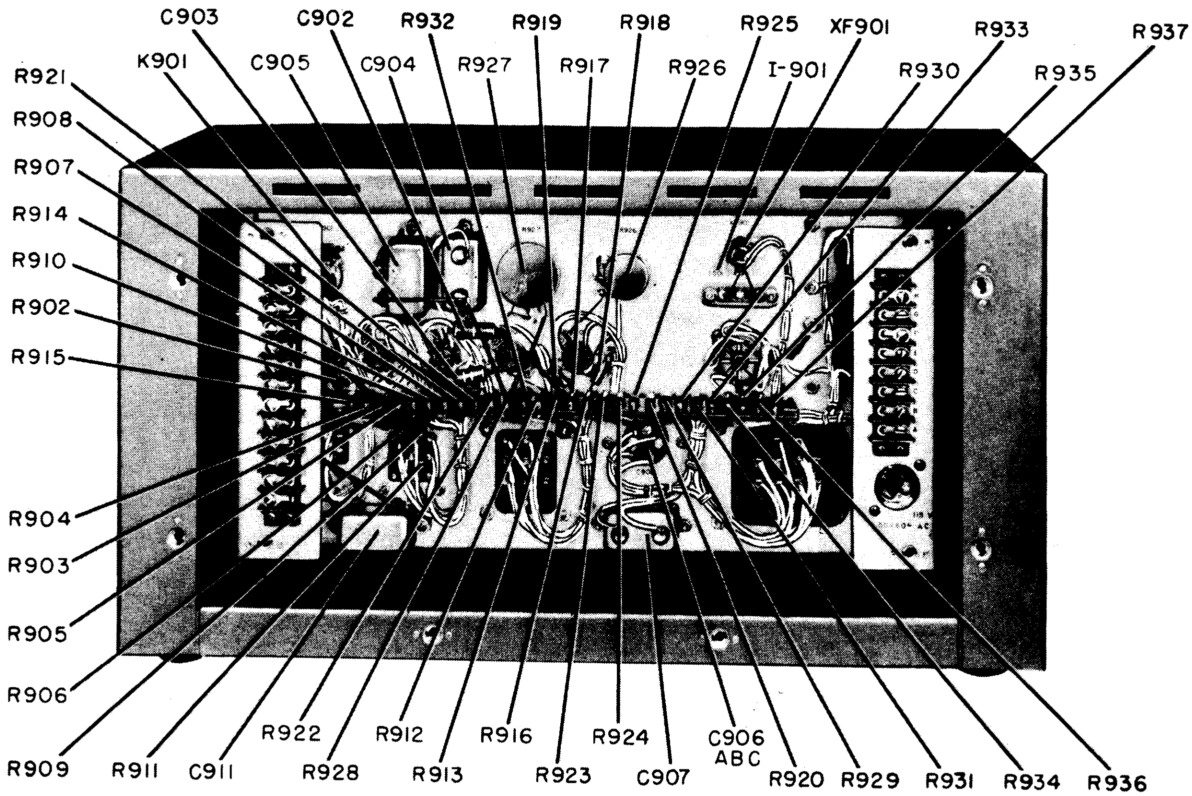


Figure 7-61. Transmitter Control C 1362/FRT-24, Rear View, Location of Parts

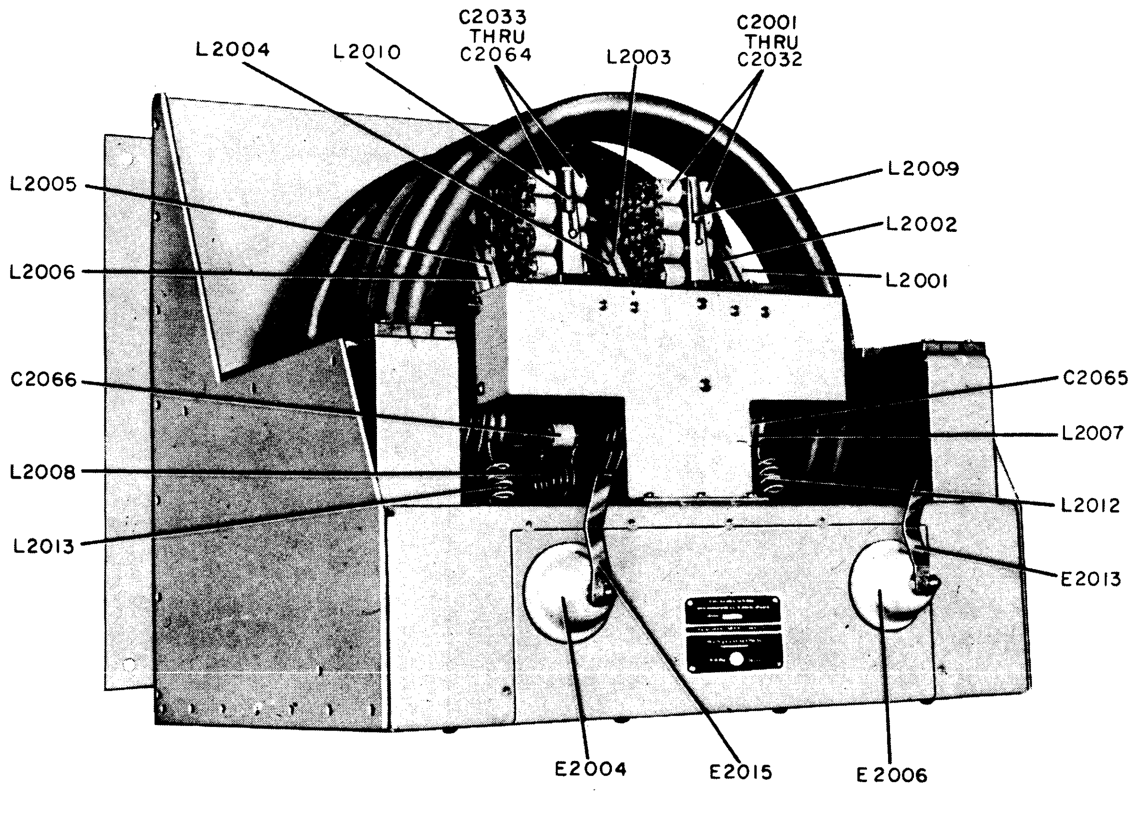


Figure 7-62. Transmission Line Coupler CU-390/FRT-24, Location of Parts

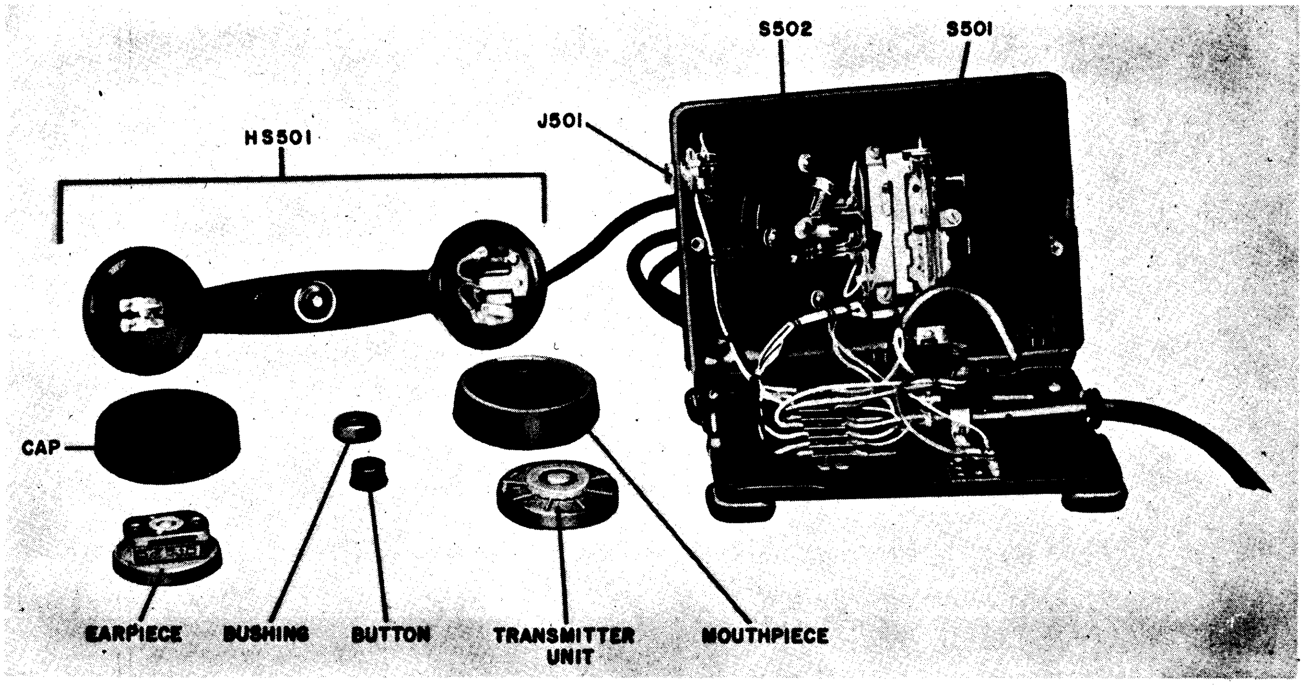
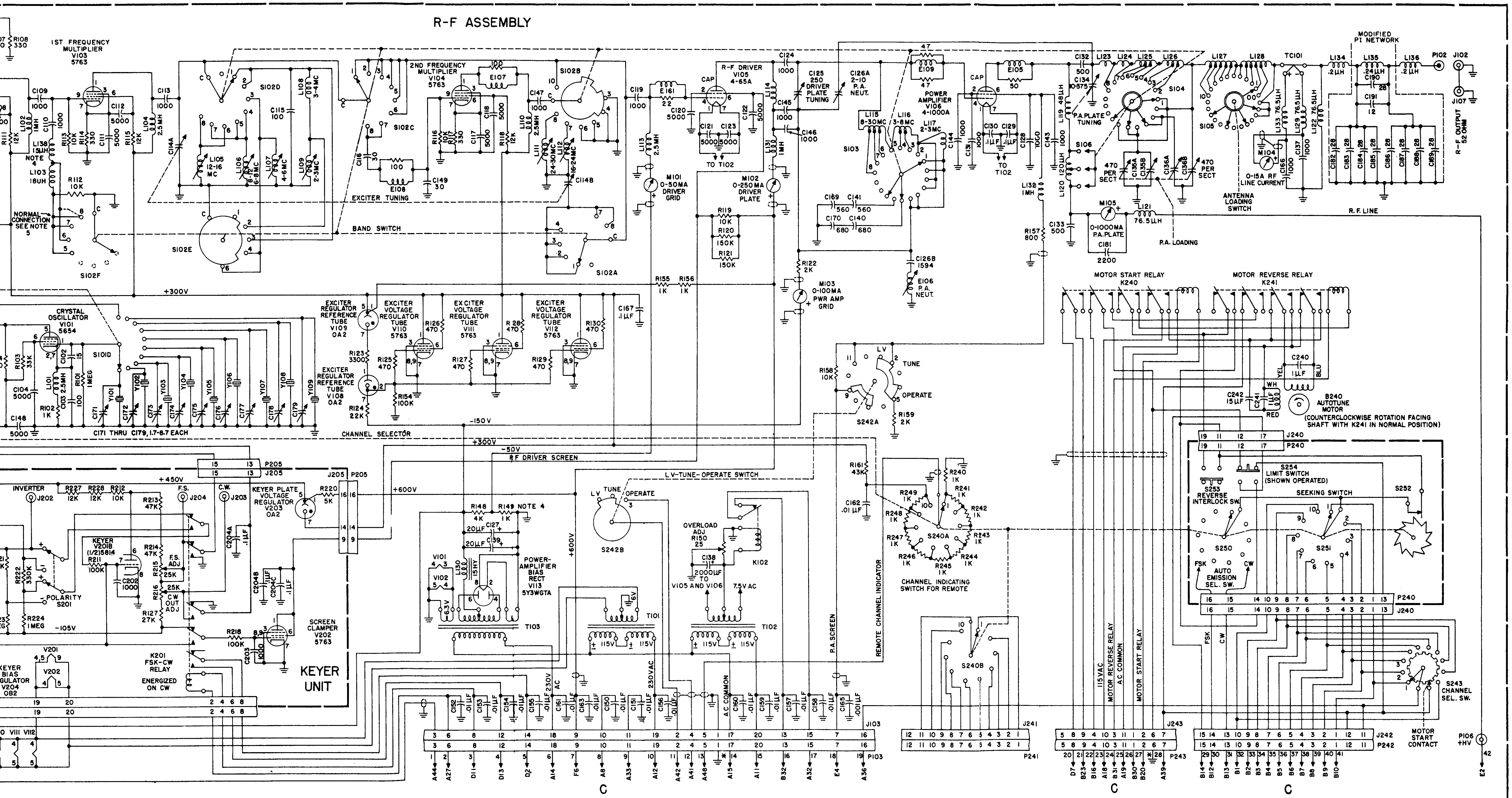
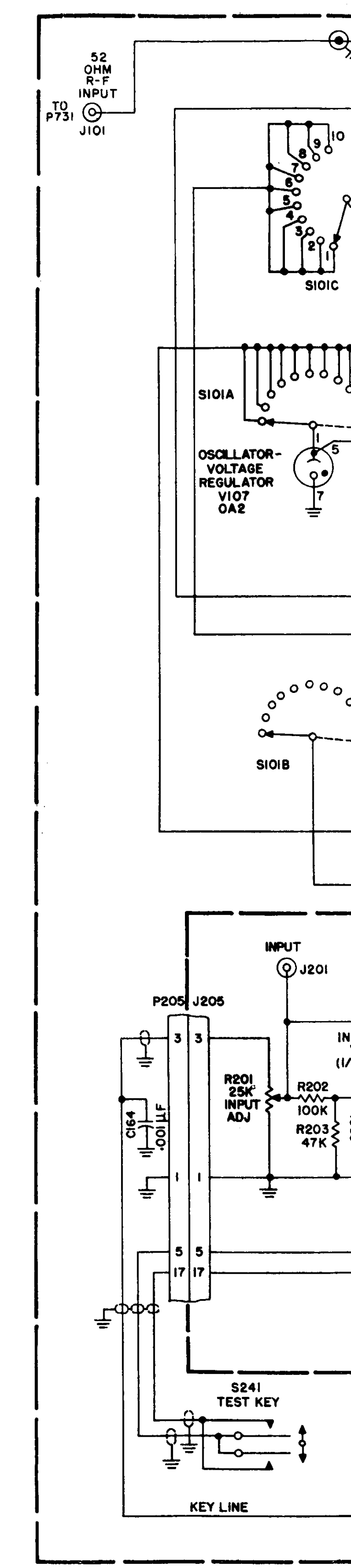


Figure 7-63. Telephone Set TA-267/U, Location of Parts



Figur 7-64. Radi Transmitter T-440/FRT-24, Overall Schematic (Sheet 1 f 2)



52
OHM
R-F
INPUT
TO
P731
J101
S101C
S101A
OSCILLATOR-
VOLTAGE
REGULATOR
V107
OA2
S101B
INPUT
J201
P205
J205
R201
25K
INPUT
ADJ
R202
100K
R203
47K
C164
.001 µF
S241
TEST KEY
KEY LINE

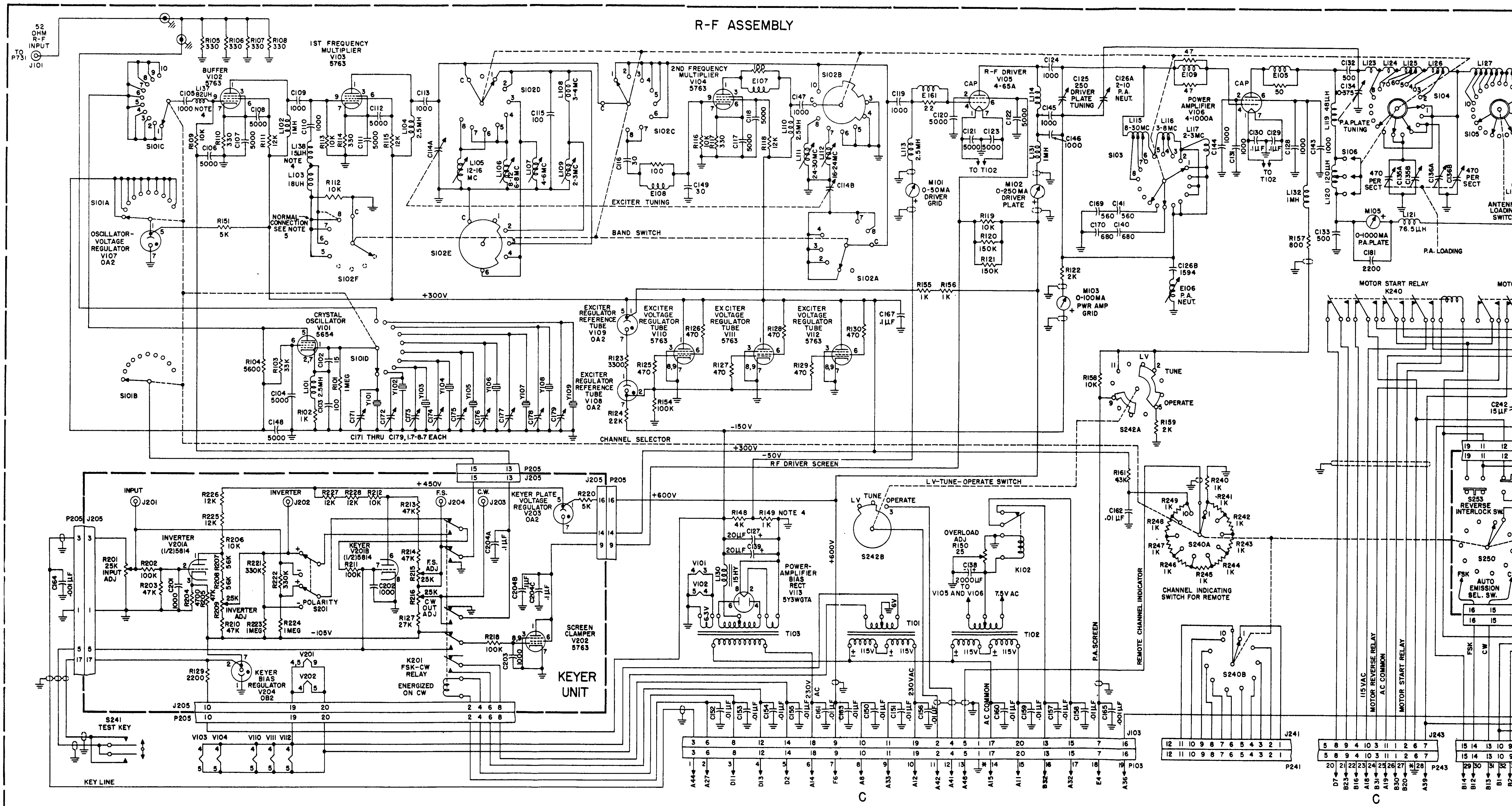


Figure 7-64. Radi Transmitter T-440/FRT-24, Overall Sch matic (Sh t 1 f 2)

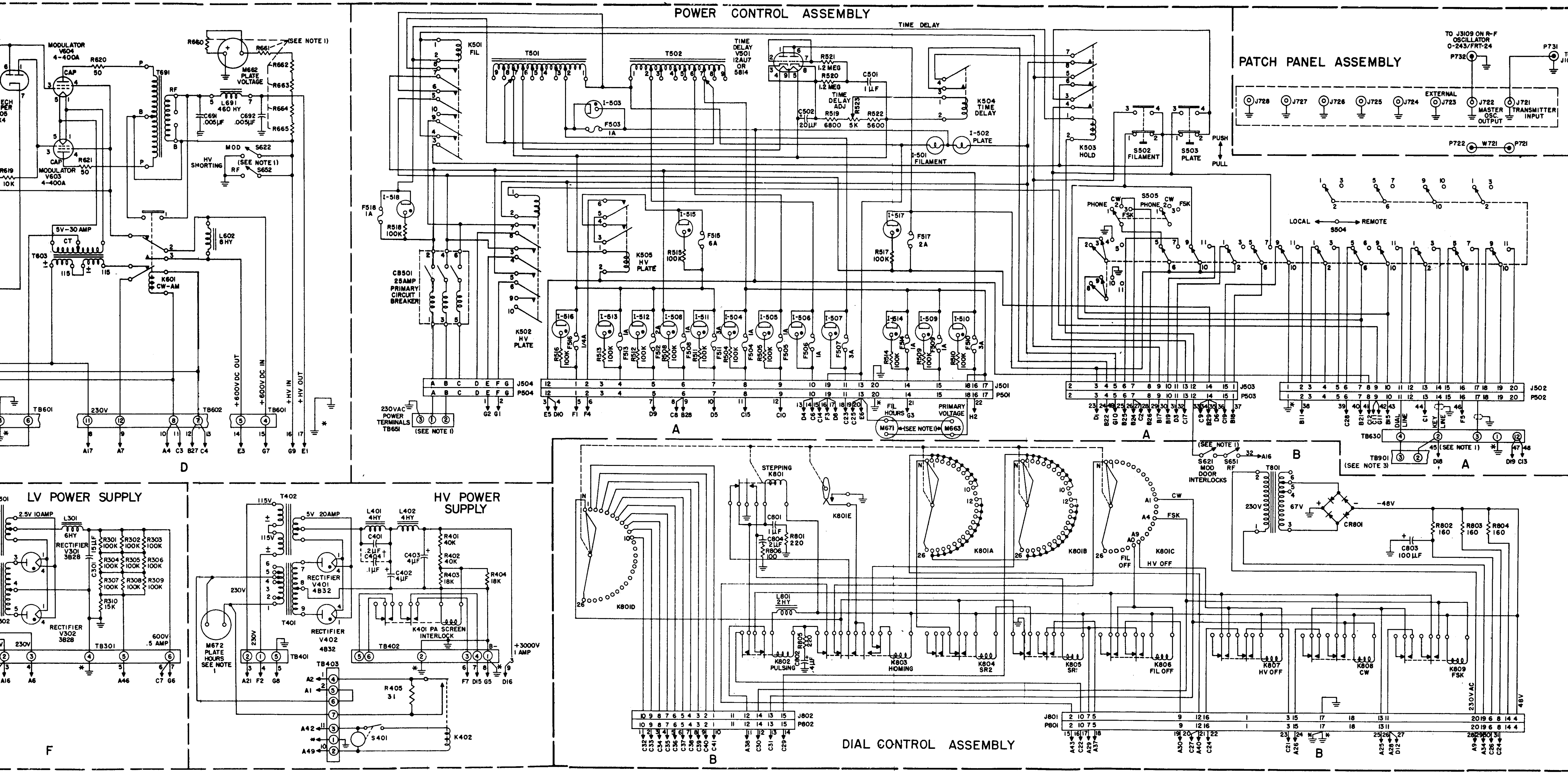


Figure 7-64. Radi Transmitt r T-440/FRT-24, Ov rall Sch matic (Sh t 2 of 2)

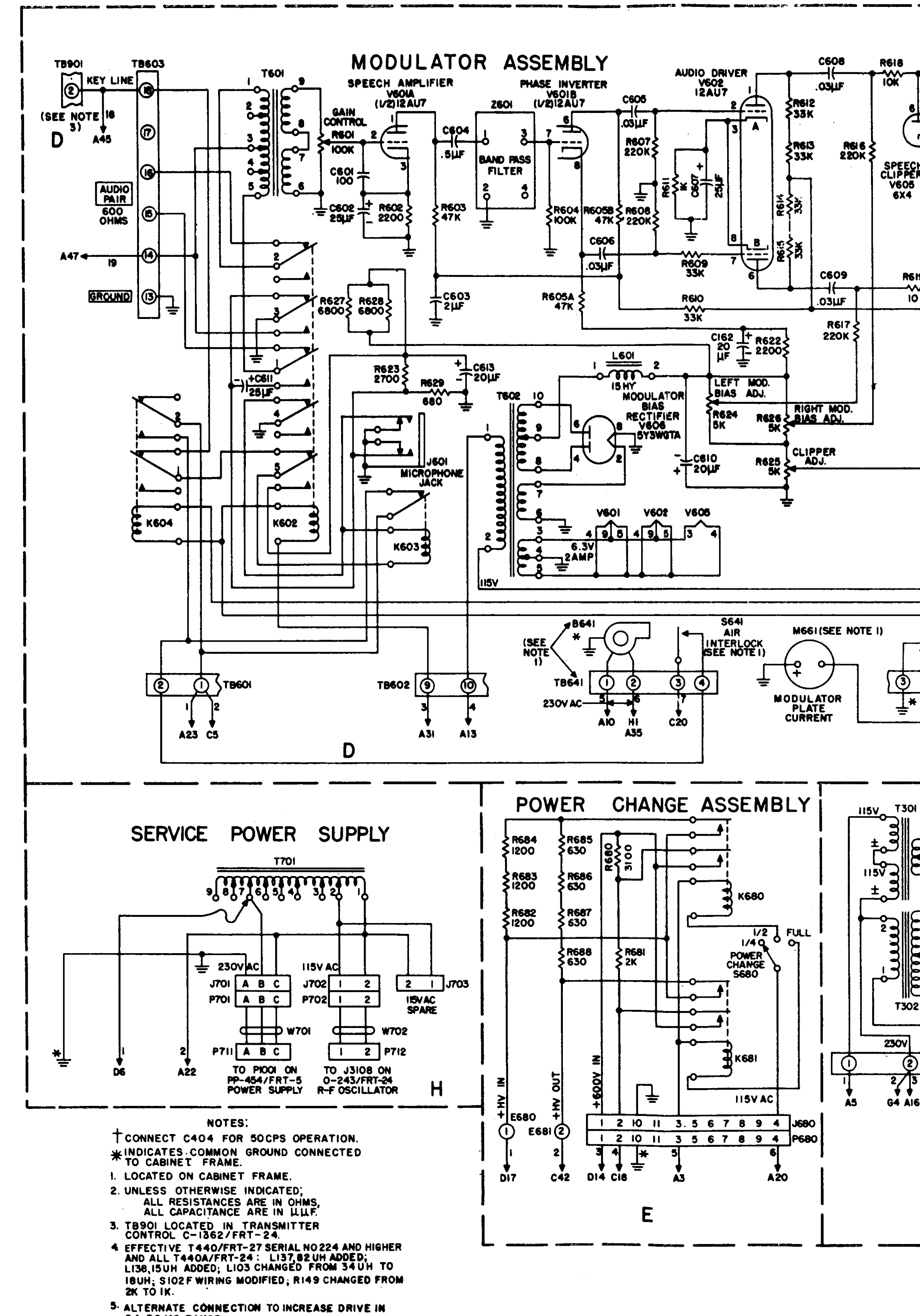
WIRING AND COLOR CODE DATA

FR M	TO	C LOR CODE	FROM	TO	COLOR C DE	FR M	T	COL R CODE
A1	G2	RG95	B3	C34	RB913	C22	B16	RB9256
A2	E5	RG96	B4	C35	RB912	C23	A18	RB926
A3	G1	RB9125	B5	C36	RB96	C24	B31	RB956
A4	D10	RB9125	B6	C37	RB95	C25	A19	RB91
A5	F1	RB936	B7	C38	RB93	C26	B30	RB936
A6	F4	RE93	B8	C39	RB92	C27	B20	RB9235
A7	D9	RB905	B9	C40	RB91	C28	A39	RB9126
A8	C8	RB925	B10	C41	RB90	C29	B14	RB926
A9	B28	RB925	B11	A38	RB905	C30	B12	RB925
A10	D5	RC902	B12	C30	RB925	C31	B13	RB923
A11	C15	RB935	B13	C31	RB923	C32	B1	RB916
A12	C10	RB96	B14	C29	RB926	C33	B2	RB915
A13	D4	RB95	B15	A43	RB9125	C34	B3	RB913
A14	C6	RB95	B16	C22	RB9256	C35	B4	RB912
A15	C14	RB90	B17	A29	RB95	C36	B5	RB96
A16	F3	RE90	B18	A37	RB9023	C37	B6	RB95
A17	D8	RB90	B19	A30	RB9125	C38	B7	RB93
A18	C23	RB926	B20	C27	RB9235	C39	B8	RB92
A19	C25	RB91	B21	A40	RB9235	C40	B9	RB91
A20	E6	RB91	B22	A24	RB9236	C41	B10	RB90
A21	G3	RB912	B23	C21	RB902	C42	E2	KEO
A22	H2	RB906	B24	A26	RB9356	D1	A23	RB912
A23	D1	RB912	B25	A25	RB916	D2	C5	RB912
A24	B22	RB9236	B26	A28	RB91	D3	A31	RB902
A25	B25	RB9236	B27	D12	RB91	D4	A13	RB905
A26	B24	RB9356	B28	A9	RB925	D5	A10	RC902
A27	C2	RB9356	B29	A34	RB915		A35	RC903
A28	B26	RB91	B30	C26	RB936	D6	H1	RB903
A29	B17	RB95	B31	C24	RB956	D7	C20	RB916
A30	B19	RB9026	C1	A44	RAS96	D8	A17	RB90
A31	D3	RB902	C2	A27	RB9356	D9	A7	RB905
A32	C17	RB906	C3	D11	RB9125	D10	A4	RB9125
A33	C9	RB913	C4	D13	RB91	D11	C3	RB9125
A34	B29	RB915	C5	D2	RB912	D12	B27	RB91
A35	D6	RC903	C6	A14	RB95	D13	C4	RB91
A36	C19	RB9025	C7	F6	RB92	D14	E3	RB936
A37	B18	RB9023	C8	A8	RB925	D15	G7	RB935
A38	B11	RB905	C9	A33	RB913	D16	G9	KEO
A39	C28	RB9126	C10	A12	RB96	D17	E1	KEO
A40	B21	RB9235	C11	A42	RB903	D18	A45	RAS95
A41	C12	RB926	C12	A41	RB926	D19	A47	RAS9
A42	C11	RB903	C13	A48	RAS9	E1	D17	KEO
A43	B15	RB9125	C14	A15	RB90	E2	C42	KEO
A44	C1	RAS96	C15	A11	RB935	E3	D14	RB936
A45	D18	RAS95	C16	B32	RB905	E4	C18	RB93
A46	F5	RAS92	C17	A32	RB906	E5	A3	RB9125
A47	D19	RAS9	C18	E4	RB93	E6	A20	RB91
A48	C13	RAS9	C19	A36	RB9025	F1	A5	RB936
B1	C32	RB916	C20	D7	RB916	F2	G4	RB90
B2	C33	RB915	C21	B23	RB902	F3	A16	RE90
F4	A6	RE93	G2	A1	RG95	G7	D15	RB935
F5	A46	RAS92	G3	A21	RB912	G8	G5	RB9
F6	C7	RB92	G4	F2	RB90	G9	D16	KEO
F7	G6	RB92	G5	G8	RB9	H1	D6	RB903
G1	A2	RG96	G6	F7	RB92	H2	A22	RB906

N t s for Schematic

† Connect C204 for 50 CPS operation
* Indicates common ground connected to cabinet frame

1—Located on cabinet frame
2—Unless otherwise indicated, all resistances are in ohms, all capacitances are in $\mu\mu$f
3—TB901 located in Transmitter Control, C-1362/FRT-24



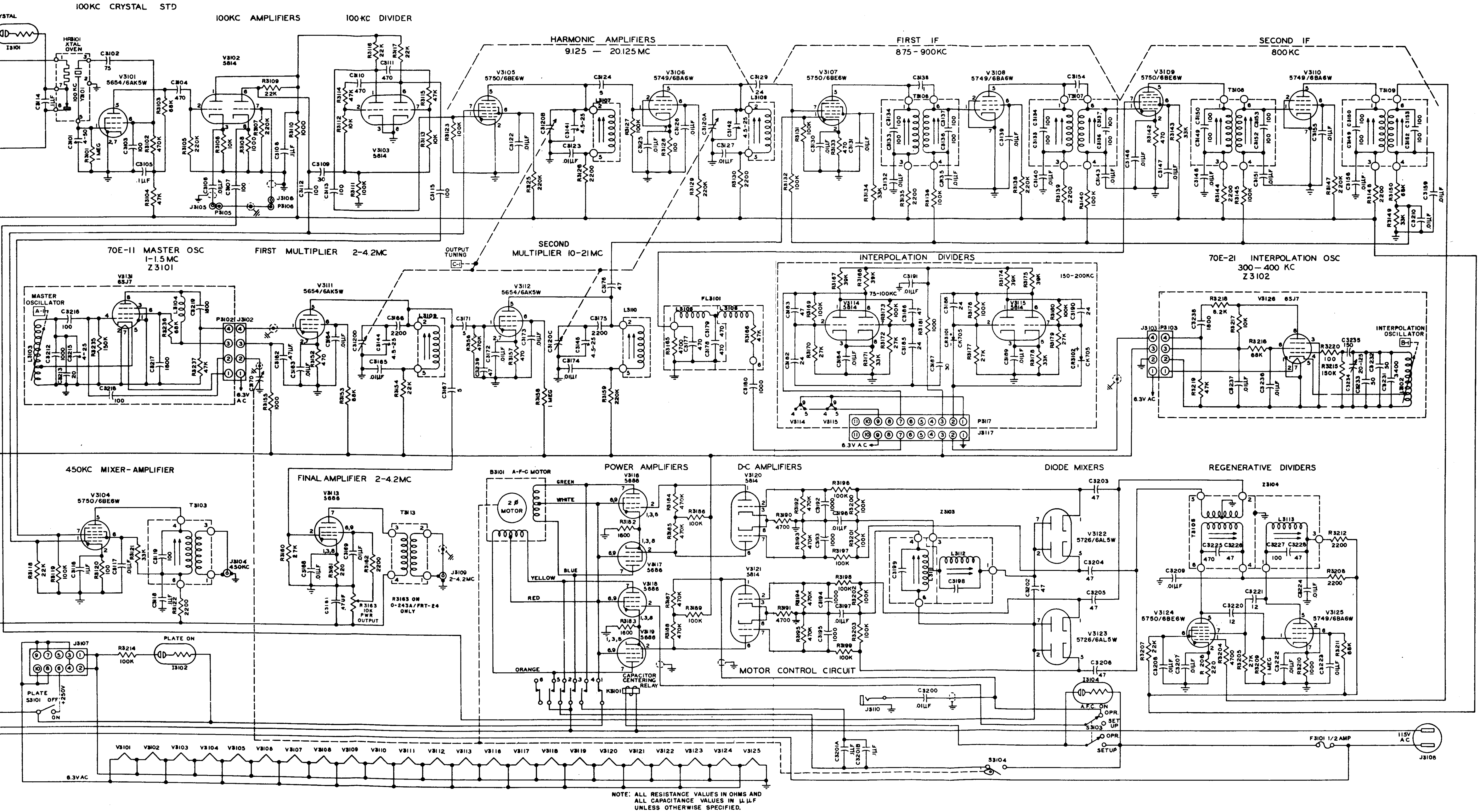
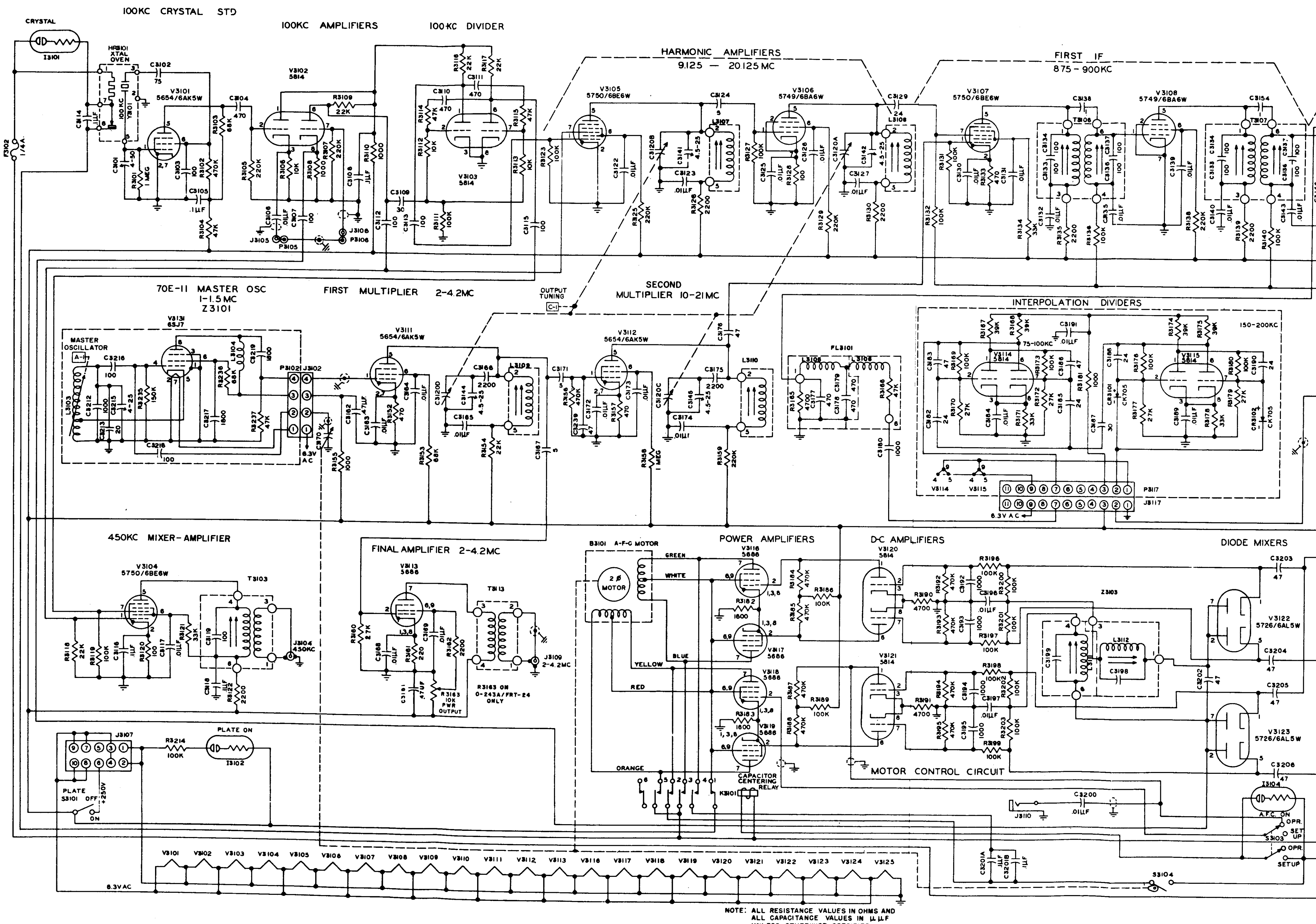
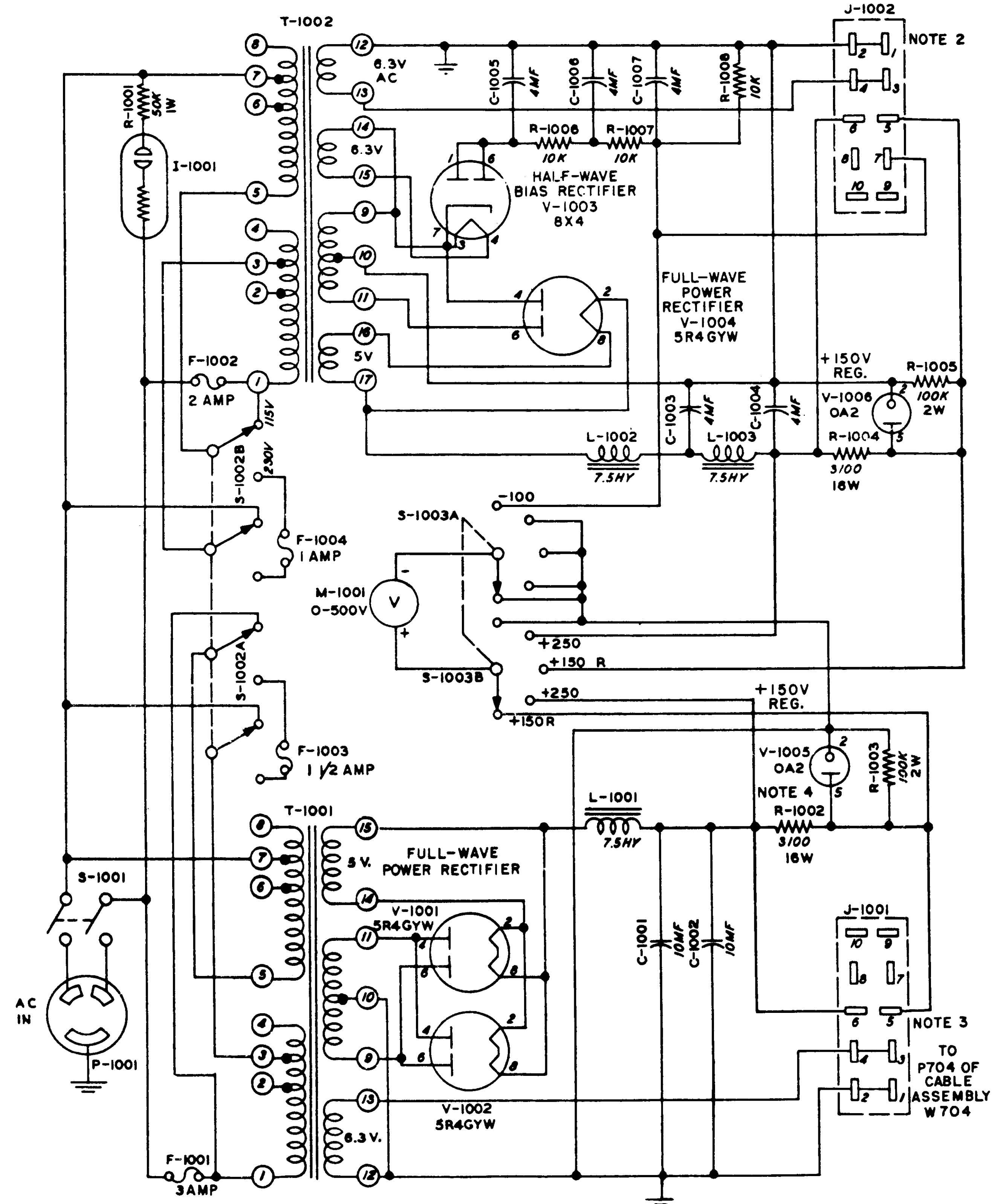


Figure 7-65. R-F Oscillat r O-243/FRT-24, Over-all Schematic



Figur 7-65. R-F Oscillat r O



NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTANCE ARE IN OHMS, ALL CAPACITANCE ARE IN MMF.
2. THE POWER-SUPPLY SECTION CONSISTING OF V1003, V1004, AND V1006 IS NOT NORMALLY USED IN RADIO TRANSMITTING SET AN/FRT-24; HOWEVER, IT MAY BE USED AS A POWER SUPPLY FOR AN EXTERNAL FSK OSCILLATOR, IF THE FSK FUNCTION OF THE RADIO SET IS ENABLED.
3. J1001 IS CONNECTED TO J3107 OF R-F OSCILLATOR O-243/FRT-24 BY MEANS OF CABLE ASSEMBLY W704.
4. THE +115 VOLT REGULATED VOLTAGE IS NOT USED WHEN SUPPLYING VOLTAGE TO R-F OSCILLATOR O-243/FRT-24.

Figur 7-66. Power Supply PP-454/FRT-5, Over-all Schematic

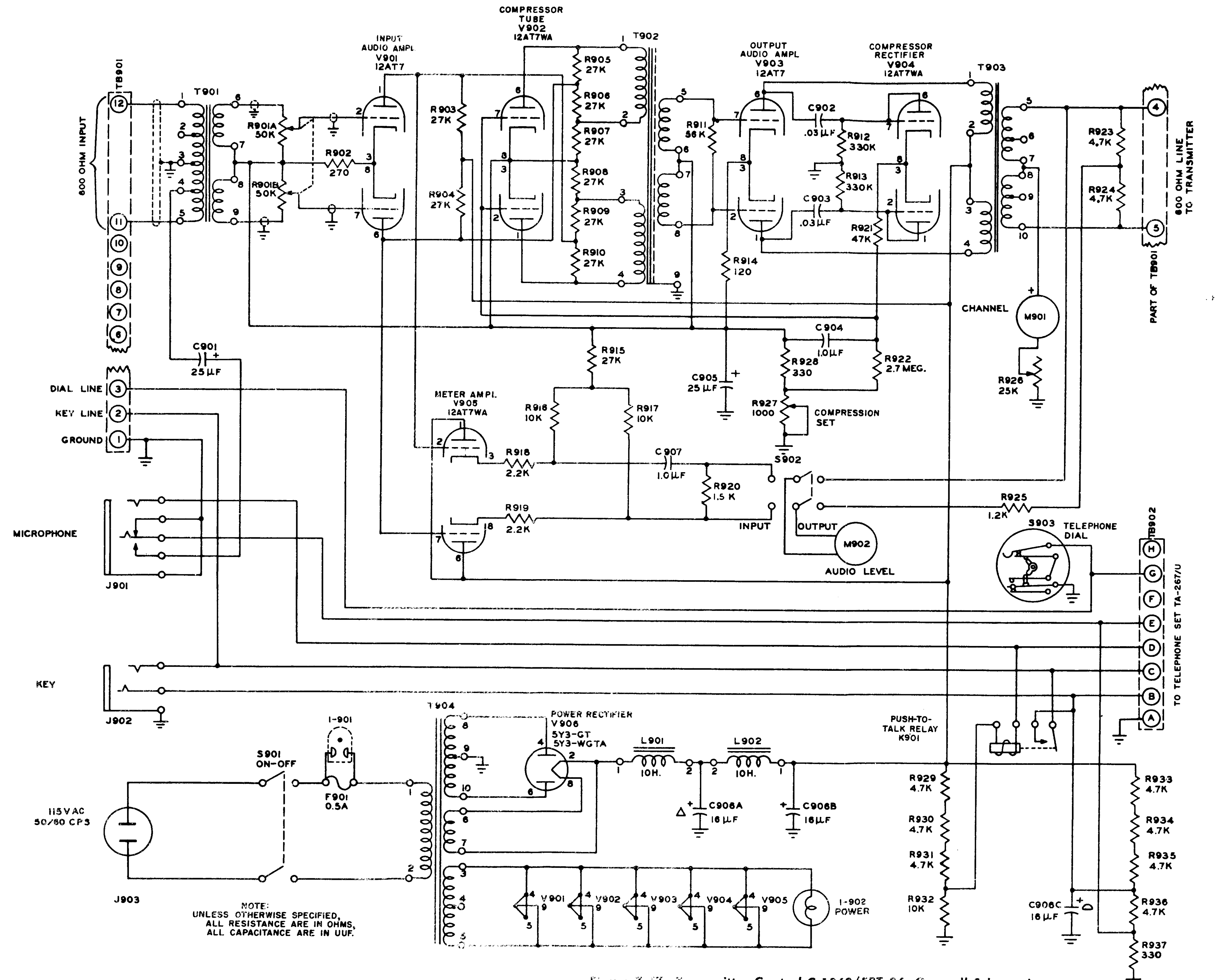


Figure 7-67. Transmitter Control C-1362/FRT-24, Over-all Schematic

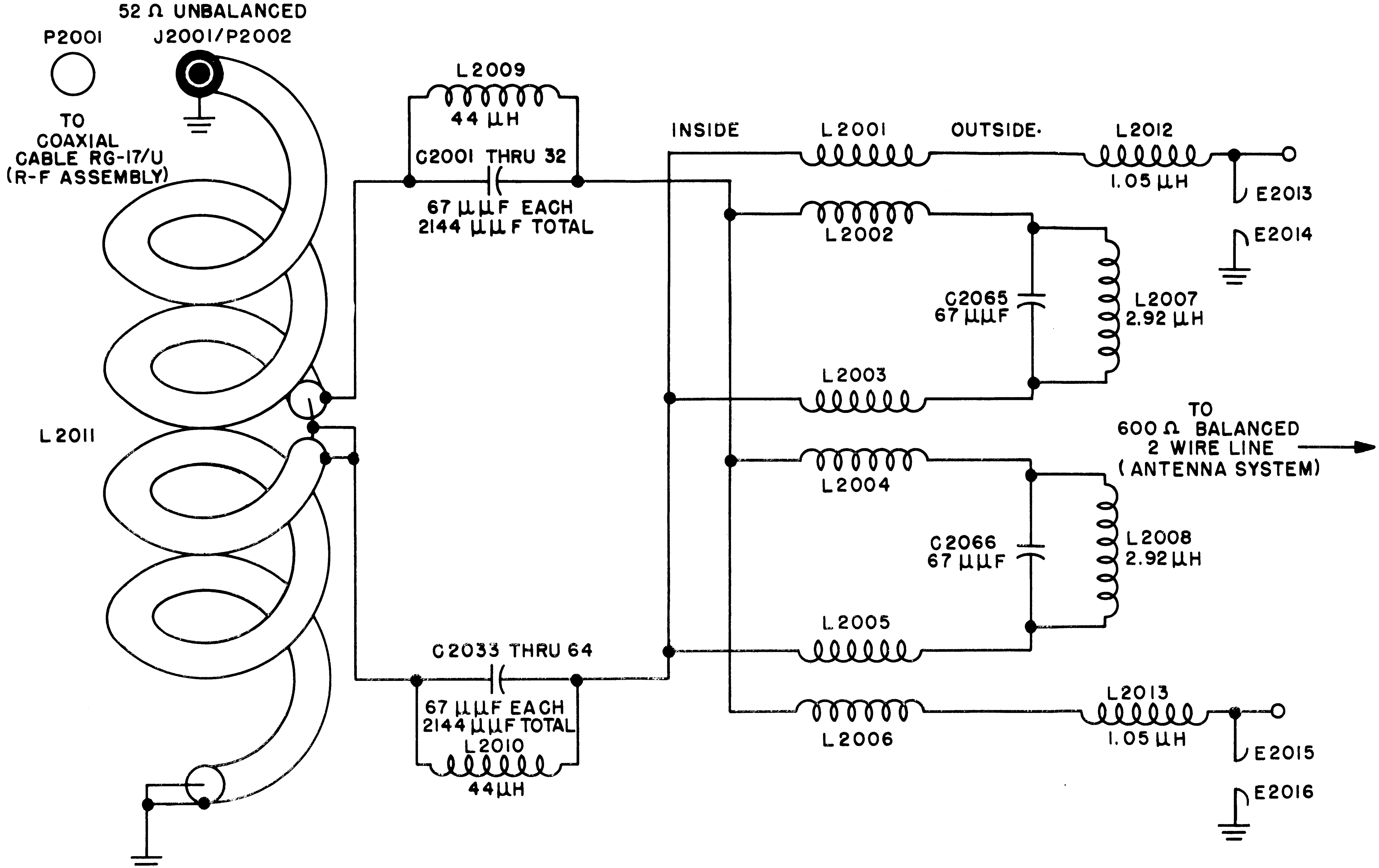
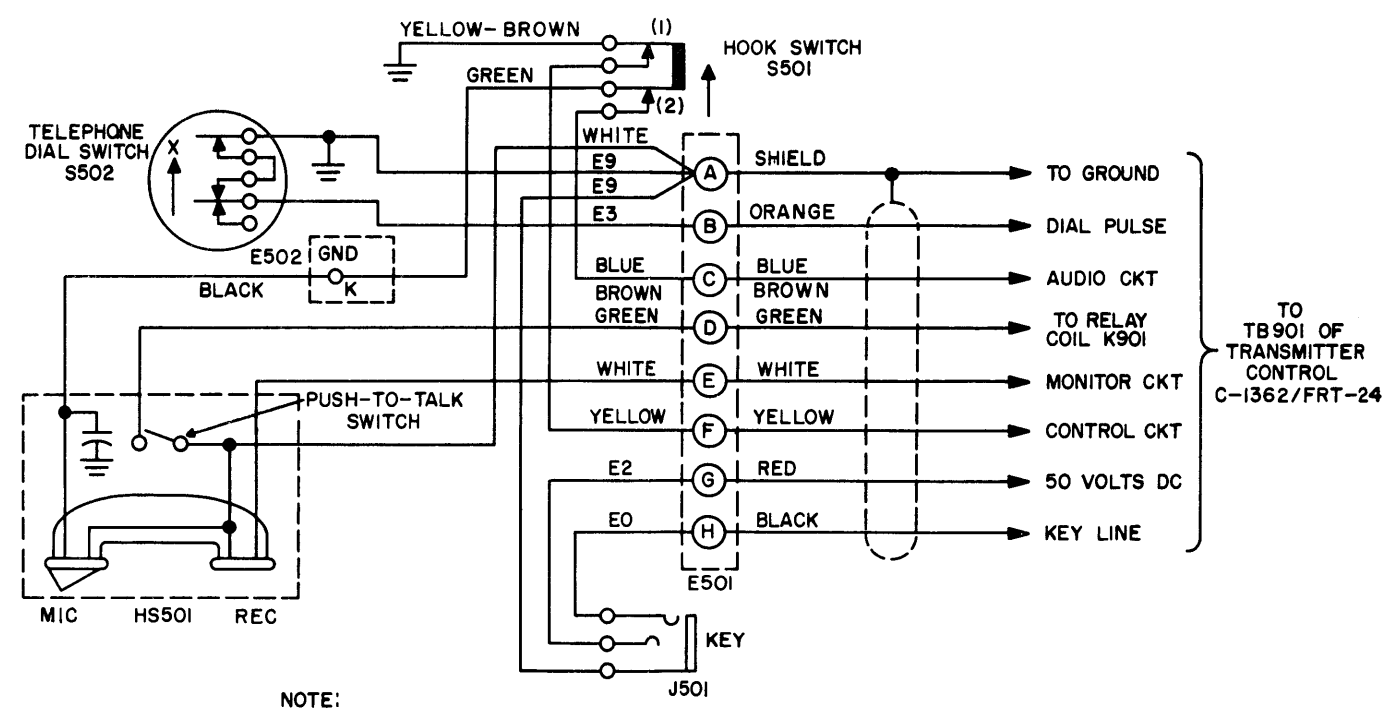


Figure 7-68. Transmission Line Coupler CU-390/FRT-24, Ov r-all Schematic



NOTE:
SYMBOL DESIGNATIONS FOR THE TELEPHONE SET SHOULD NOT BE CONFUSED WITH SIMILAR DESIGNATIONS GIVEN FOR THE POWER CONTROL ASSEMBLY.

Figure 7-69. Telephone Set TA-267/U, Over-all Schematic

TABLE 8-4A. SUPPLEMENTARY TABLE OF REPLACEABLE PARTS

The parts list, table 8-4, is corrected with this supplementary table, table 8-4A. Refer to this supplementary table before referring to the basic table as listings in the supplementary table supersede corresponding listings in the basic table. If no entry is given in this supplementary table for a given item, refer to the basic table for the required information. It will prevent possible errors if corresponding entries in the basic table are deleted and the note "See supplementary table 8-4A" is entered near the reference designation.)

Note

SEE SUPPLEMENTARY TABLE 8-6A, FOLLOWING, FOR CROSS REFERENCE PARTS LIST.

For Radio Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440( )/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) FEDERAL (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
C167	N5910-644-6248	CAPACITOR, FIXED: paper dielectric; 0.1 mf ±20%; 1000 vdcw; HS in tubular non-magnetic metal case; 1⅝" lg x 0.562" diam; 2 axial wire lead term; Sprague (SPR) 965596 Collins Rad (CR) part dwg # 931 2709 00.	Exciter low voltage bypass
L103	3C323-192Q N5950-228-2582	COIL, RF: choke; single-layer wnd; unshielded; 34.0 mh, 145 max turns # 35 AWG E copper wire; 1" lg x 0.270" diam o/a; phenolic form; two 1½" term mtg; 2 axial wire lead term; fungi resistant; Jeffers Electronics (JFE) # CF1-140/351/4; Collins Rad (CR) part dwg # 240 0010 00; (Effective Serials 1 thru 223 of NObsr-57357).	V103 grid
L103	N5950-647-9238	COIL, RADIO FREQUENCY: single layer wound; 18 uh ±10%; enamel, or formvar insulated copper wire; 19/32 in. lg by 7/32 in. od; powdered iron form; two 1½ in. lg axial wire lead terminal; terminal mounted; Jeffers Electronics (JFE) no. 10203-32; Collins Rad (CR) part dwg # 240 0167 00; (Effective Serial 224 of NObsr-57357 and Serial 1 of NObsr-71341).	V103 grid
L137	N5950-645-0282	COIL, RADIO FREQUENCY: single layer wound; 8.20 uh ±10%; enamel or formvar insulated copper wire; 19/32 in. lg by 7/32 in. od; powdered iron form; two 1½ in. lg axial wire leads terminal; terminal mounted; Jeffers Electronics (JFE) # 10203-24; Collins Rad (CR) part dwg # 240 0163 00; (Effective Serial 224 of NObsr-57357 and Serial 1 of NObsr-71341).	V102 grid
L138	N5950-647-5546	COIL, RADIO FREQUENCY: single layer wound; 15.0 uh ±10%; enamel or formvar insulated copper wire; 7/16 in. lg by 3/16 in. od; carbonyl C form; two 1½ in. lg axial wire lead terminals; terminal mounted; Jeffers Electronics (JFE) # 10102-36; Collins Rad (CR) part dwg # 240 0151 00; (Effective Serial 224 of NObsr-57357 and Serial 1 of NObsr-71341).	V103 grid
R149	For replacement use N5905-264-8746	RESISTOR, FIXED: JAN type RW31G202; WW; 2000 ohms ±5%; 10 w at 275° C max continuous oper temp; per spec JAN-R-26; (Effective Serial 1 thru 223 of NObsr-57357).	Bias supply bleeder
R149	3RW24320 N5905-112-6705	RESISTOR, FIXED: JAN type RW31G102; WW; 1000 ohm ±5%; 10 w at 275° C max continuous operating temp; per spec JAN-R-26A. (Effective Serial 224 of NObsr-57357 and Serial 1 of NObsr-71341).	Bias supply bleeder
R159		Same as R149. (RW31G202)	V106 screen grid voltage dropping
V107	N5960-262-0964	TUBE ELECTRON: JAN OA2WA; miniature voltage regulator; per spec MIL-E-1B. OR	Oscillator voltage regulator
V107	2JOA2 For replacement use N5960-262-0964	TUBE, ELECTRON: JAN OA2; voltage regulator; per spec MIL-E-1B.	Oscillator voltage regulator

TABLE 8-4A. SUPPLEMENTARY TABLE OF REPLACEABLE PARTS — C ntinued

F r Radi Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440( )/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) FEDERAL (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
V201	N5960-262-0210	TUBE, ELECTRON: JAN 5814A; current amplifier; per spec MIL-E-1B.	
		OR	
V201	2J5814 For replacement use N5960-262-0210	TUBE, ELECTRON: JAN 5814; miniature twin triode, per spec MIL-E-1B.	
V204	N5960-262-3763	TUBE, ELECTRON: JAN OB2WA; voltage regulator; per spec MIL-E-1B.	Bias regulator
		OR	
V204	2JOB2 For replacement use N5960-262-3763	TUBE, ELECTRON: JAN OB2; voltage regulator; per spec MIL-E-1B.	Bias regulator

TABLE 8-4A. SUPPLEMENTARY TABLE OF REPLACEABLE PARTS — C ntinu d

F r Radio Transmitting S t AN/FRT-24

Modulator (m)
Major Assembly: Power Chang Unit (p)
Cabinet Accessori s (c)
p/o Radio Transmitter T-440( )/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) FEDERAL (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
B641 (c)	For reference only	BLOWER: centrifugal vane; electric-motor operated; non-portable; guarded; 115/230 v, 50/60 cps; single phase, 1 amp load current air at 230 v and 2 amp at 115 v; 1/6 hp, 1750 rpm rotor speed; Collins Rad (CR) part/dwg # 542 1619 00; (Include B642 and O682) (Effective NObsr-71341).	Circulates cooling air
B641 (c)	For reference only	BLOWER: centrifugal vane; electric-motor operated; non-portable; guarded; 1/6 hp at 1750 rpm, 230 v AV 50/60 cps single ph; 14 3/8" lg x 12 3/4" wd x 12 1/2" h; 630 cfm max displacement; direct drive, counterclockwise bottom angular up blast; three 3/8" diam mtg holes spaced on 5" x 4 3/4" mtg/c; Ilg Elec (ILG) type B-12; Collins Rad (CR) part/dwg # 505 3371 002. (Incl. B-642, O-682) (Effective NObsr-57357).	Circulates cooling air
B642 (c)	N6105-505-9195	MOTOR, ALTERNATING CURRENT: squirrel cage induction type, capacitor start and run; 115/230 v, 50/60 cps, single phase, 1 amp load current at 230 v and 2 amp at 115 v; 1/6th hp, 1750 rpm rotor speed; single take-off, ccw rotation looking at load end; fully enclosed frame; 60° C max ambient temp, 40° C rise for continuous operation; flatted shaft, 1/2 in. dia.; 8 3/8 in. lg, 5 7/16 in. dia; 2 7/32 in. lg shaft; fixed base mounted; four 5/16 in.—18 UNC-2B thd mtg holes spaced 90° apart on a 3 1/2 in. dia circle; Ilg Elec (ILG); Collins Rad (CR) part/dwg # 230 0262 00; (part of B-641); (Effective NObsr-71341).	
B642 (c)	N6105-643-1397	MOTOR AC: wound-rotor induction type; 1/6 hp at 1750 rpm; 1750 rpm mom at 60 cps; semi open frame; ambient temp range 60 deg C max; w/o pulley; flatted shaft; 8 1/2" lg x 5 7/16" wd x 5 7/16" h, shaft extends 1 7/8"; 230/115 v AC, 50/60 cps; shaft mtd; four 5/16" —18 UNC-2B holes equally spaced on 3/12" diam base, incl 330 v AC, 5.0 uf capacitor; motor speed may be reduced to 5/6 of its cps value when operated at 50 cps; Ilg Elec (ILG) # 17-18-000A; Collins Rad (CR) part/dwg # 230 0216 00; (p/o B641); (Effective NObsr-57357).	
C603 (m)	3DB2-142 For replacement use N5910-112-7399	CAPACITOR, FIXED: Navy type CP53B1EF205M; paper dielectric; 2 uf ±20%; 600 v dc working; hermetically sealed metal case; 2 in. lg by 2 in. w by 1 1/8 in. deep; 3 solder lug terminal, located on side spaced 1/2 in. c to c; 2 mtg feet w/ 3/16" dia hole in each spaced 2 3/8" c to c; per spec MIL-C-25. OR	Plate circuit decoupling
C603 (m)	For replacement use N5910-112-7399	CAPACITOR, FIXED: Navy type CP53BIFF205X; paper dielectric; 2 mf +40% −15%; 600 vdcw; HS metal case; 2" lg x 2" wd x 1/18" d; Dykanol impr; 3 solderlug term, located on side spaced 1/2" c to c; no int gnd connections; 2 mtg feet w/ 0.187" diam hole in ea on 2 3/8" mtg/c; per spec JAN-C-25.	Plate-circuit decoupling
C605 (m)	For replacement use N5910-262-8387	CAPACITOR, FIXED: paper dielectric; 0.033 uf ±20%; 1000 vdcw; HS metal case; 1 3/8" lg x .0400" diam; 2 axial wire lead term; Sprague (SPR) part P65689; Collings Rad (CR) part/dwg # 931 2706 001.	Couples V601 to V602
O682 (c)	Procured on demand by nearest Naval Shore Supply Activity	IMPELLER, CENTRIFUGAL; used on blower Collins # 009 1357 00; steel, mfr's standard green, over suitable primer; rd; 6 3/8 in. dia by 3 5/8 in. thk; 0.5005 in. id for mtg; counterclockwise rotation; (p/o B641); Ilg Elec (ILG) # 1812-9009A; Collins Rad (CR) part/dwg # 234 0856 00; (Effective NObsr-71341).	
O682 (c)	N4450-279-0510	IMPELLER, CENTRIFUGAL: used on a blower, Collins # 009 1209 00; steel, mfr standard green finish over suitable primer, cad pl set screw; round; 6 3/8" OD x 3 5/8" thk o/a; 0.3755" ID for mtg; counterclockwise rotation; (p/o B641) Ilg Elec # 1812 9002A; Collins Rad (CR) part/dwg # 234 0578 00. (Effective NObsr-57357).	

TABLE 8-4A. SUPPLEMENTARY TABLE OF REPLACEABLE PARTS — C ntinu d

For Radio Transmitting Set AN/FRT-24

Major Assembly: Power Supply PP-454/FRT-5

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) FEDERAL (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
C1001	For replacement use N5910-235-0872	CAPACITOR, FIXED: JAN type CP70B1EF106M; paper dielectric; 10 uf ±20%; 600 v dc working; per spec MIL-C-25.	HV filter
		OR	
C1001	For replacement use N5910-235-0872	CAPACITOR, FIXED: JAN type CP70B1-DF106V; paper dielectric; 10 mf +20% −10%; 600 vdcw; per spec JAN-C-25.	High-voltage filter

TABLE 8-4A. SUPPLEMENTARY TABLE OF REPLACEABLE PARTS — Continued

F r Radio Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator O-243( )/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) FEDERAL (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
*3101-3299 Series	F5820-644-4738	MASTER-OSCILLATOR, RF (O-243): freq range 2.0 to 4.2 mc, 1 band; 1.5 w output; stabilized master oscillator; 250 v DC, 200 ma and 115 v, 50/60 cps, single ph, 8.2 amp required power input; external power supply; integral coils; 18 3/16" w x 16 13/16" d x 10 15/32" h; rack mtd; auxiliary 100-kc and 450-kc output available, oscillator freq-stabilized by servo-mechanical system in which freq compared with 100-kc spectrum-interpolation oscillator; p/o AN/FRT-24; Collins Rad (CR) part/dwg # 522 0079 005; Effective Serials 1 thru 151 of NObsr-57357).	Excitation for RF Unit 507A-2
*3101-3299 Series	F5820-644-4381	MASTER-OSCILLATOR, (O-243A) same as above except for addition of output level control R-3163; Collins Rad (CR) part/dwg # 522 0079 075; (Effective Serials 152 of NObsr-57357 and Serial 1 of NObsr-71341).	Excitation for RF Unit 507A-2
C3106	For replacement use N5910-666-6980	CAPACITOR, FIXED: paper dielectric; 10,000 mmf ±20%; 100 vdcw; HS metal case; 3/4" lg x 0.175" diam; oil impr; 2 axial wire leads; Sprague (SPR) # 96P22301S2 (Special); Collins Rad (CR) part/dwg # 931 0398 00.	Couples cathode of 1st section V3102 to grid of 2nd section V3102 through external cable
C3114	For replacement use N5910-644-0815	CAPACITOR, FIXED: paper dielectric; 100,000 mmf ±20%; 300 vdcw; HS metal case; 1 1/8" lg x 0.40" diam; oil-impr; 2 axial wire leads; Sprague (SPR) part/dwg # 96P10403S2; (Special); Collins Rad (CR) part/dwg # 931 0442 00.	HR3101 spark suppressor
C3162	For replacement use N5910-644-3492	CAPACITOR, FIXED; paper dielectric; 470,000 mmf ±20%; 300 vdcw; HS metallic case; 1 13/16" lg x 0.562" diam; impr with high-temp organic material; 1 axial wire lead; one end gnd; body mtd by 5/16—24 NF-2 thd extending 1/4"; Sprague (SPR) # P38500; Collins Rad (CR) part/dwg # 931 0630 00.	V3131 plate decoupler
C3167		Same as C3129 (Effective Serials 1 thru 151 of NObsr-57357).	Couples V3111 to V3113
C3167		Same as C3124; (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	Couples V3111 to V3113
C3192		Same as C105. (Effective Serial 1 thru 151 of NObsr-57357).	V3120 grid RF bypass
C3192	N5910-270-9068	CAPACITOR, FIXED: JAN type CK61Y102Z; ceramic dielectric; 1000 uuf +100% −20%; 500 vdc working; per spec MIL-C-11015A; (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	V3120 grid RF bypass
C3193		Same as C105. (Effective Serials 1 thru 151 of NObsr-57357).	V3120 grid RF bypass
C3193		Same as C3192. (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	V3120 grid RF bypass
C3194		Same as C105. (Effective Serial 1 thru 151 of NObsr-57357).	V3121 grid RF bypass
C3194		Same as C3192. (Effective Serial 152 of NObsr-57357 and serial 1 of NObsr-71341).	V3121 grid RF bypass
C3195		Same as C105. (Effective Serials 1 thru 151 of NObsr-57357).	V3121 grid RF bypass
C3195		Same as C3192. (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	V3121 grid RF bypass

*The significant difference between these oscillators is the added potentiometer ref. symbol R-3163 for the O-243A/FRT-24. Piece parts of these oscillators are identical except where serial number references are made in the parts list.

TABLE 8-4A. SUPPLEMENTARY TABLE OF REPLACEABLE PARTS — Continu d

For Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator O-243( )/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) FEDERAL (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
C3198	For replacement use N5910-101-4890	CAPACITOR, FIXED: JAN type CM20B471M; mica dielectric; 470 mmf ±20%; 500 vdcw; p/o Z3103; per spec JAN-C-5. (Effective Serial 1 thru 151 of NObsr-57357).	Resonates primary of Z3103
C3198	3D9430-5 For replacement use N5910-666-5719	CAPACITOR, FIXED: mica; 430 uuf ±2%; 300 v dc working; temp coef ltr D; ½" lg by 9/32" w by 11/64" deep; molded phenolic case; 2 axial wire leads; (p/o Z3103); Electro Motive (EMM) # CM15E431G; Collins Rad (CR) part/dwg # 912 0538 00; (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	Resonates primary of Z3103
C3199	For replacement use N5910-160-1158	CAPACITOR, FIXED: JAN type CM20B331M; mica dielectric; 330 mmf ±20%; 500 vdcw; p/o Z3103; per spec JAN-C-5. (Effective Serials 1 thru 151 of NObsr-57357).	Resonates secondary of Z3103
C3199	3D9330-27 For replacement use N5910-187-2793	CAPACITOR, FIXED: mica; 330 uuf ±2%; 500 v dc working; temp coef ltr D; ½" lg by 9/32" w by 11/64" deep; molded phenolic case; 2 axial wire leads (p/o Z3103); Electro Motive (EMM) # CM15E331G; Collins Rad (CR) part/dwg # 912 0529 00; (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	Resonates secondary of Z3103
C3200	3DA10-648 For replacement use N5910-666-6980	CAPACITOR, FIXED: paper dielectric; 10,000 ohms ±20%; 400 vdcw; HS metallic case; ¾" lg x 0.235" diam; high-temp organic impr; 2 axial wire leads; Sprague (SPR) part # P66309 Collins Rad (CR) part/dwg # 931 0455 00.	DC blocking for J3110
C3207		Same as C3117.	V3124 cathode bypass
C3208		Same as C3117.	V3124 screen-grid bypass
C3209		Same as C3117.	V3124 plate decoupler
C3210		Same as C3117.	Bypass for AVC line
*C3212	N5910-196-0556	CAPACITOR, FIXED: ceramic dielectric; 1000 mmf ±1%; neg temp coef 49.8 (tol ±10) mmf/mf/° C; 500 vdcw; 15/16" diam x 11/16" lg, solder-lug term; 6-32 stud mtg; p/o Z3101; Centralab (CN) # 950; Collins Rad (CR) part/dwg # 913 0077 00.	Resonates L3103
* # C3213	3D9010-186 N5910-195-5367	CAPACITOR, FIXED: ceramic dielectric; 10 uuf ±1.0 uuf; neg temp coef 0 (tolerance ±30) uuf/uf/° C; 500 v dc working; 0.520" lg by 0.395" by 3/32" thk; axial wire leads; uninsulated; p/o Z3101; Centralab (CN) part # DA933-011(X); Collins Rad (CR) part/dwg # 913 0043 00; (Effective all Serials, both O-243 and O-243A/FRT-24).	Temp compensator for C3212
* # C3213	3D9010-170 N5910-195-5384	CAPACITOR, FIXED: ceramic dielectric; 10 uuf ±1.0 uuf; neg temp coef 200 (tolerance ±15) uuf/uf/° C; 500 v dc working; 0.520" lg by 0.395" w by 3/32" thk; axial wire leads; insulated; p/o Z3101; Centralab (CN) part # DA933-009(X); Collins Rad (CR) part/dwg # 913 0044 00; (Effective all Serials, O-243 and O-243A/FRT-24).	
* # C3213	3D9010-187 N5910-275-6444	CAPACITOR, FIXED: ceramic dielectric; 10 uuf ±1.0 uuf; neg temp coef 400 (tolerance ±15) uuf/uf/° C; 500 v dc working; 0.520" lg x 0.203" w x 3/32" thk; axial wire leads; uninsulated; p/o Z3101; Centralab (CN) part # DA934-010(X); Collins Rad (CR) part/dwg # 913 0045 00; (Effective all Serials both O-243 and O-243A/FRT-24).	

*These items are used in sealed oscillator assembly Z3101; replace complete assembly.
Individually selected to fit the specific requirements of each oscillator.

TABLE 8-4A. SUPPLEMENTARY TABLE OF REPLACEABLE PARTS — Continued

For Radio Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator O-243( )/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) FEDERAL (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
* ※ C3213	3D9010-173 N5910-195-5392	CAPACITOR, FIXED: ceramic dielectric; 10 uuf ±1.0 uuf; neg temp coef 600 (tolerance ±15) uuf/uf/° C; 500 v dc working; 0.520″ lg x 0.203″ w by 3⁄32″ thk; axial wire leads; uninsulated; p/o Z3101; Centralab (CN) part ※ DA934-008; Collins Rad (CR) part/dwg ※ 913 0046 00; (Effective all Serials, both O-243 and O-243A/FRT-24).	
* ※ C3213	3D9010-172 N5910-195-2569	CAPACITOR, FIXED: ceramic dielectric; 10 uuf ±1.0 uuf; neg temp coef 800 tolerance ±15) uuf/uf/°C; 500 v dc working; 0.520″ lg x 0.203″ w by 3⁄32″ thk; axial wire leads; uninsulated; p/o Z3101; Centralab (CN) part ※ DA934-009(X); Collins Rad (CR) part/dwg ※ 913 0047 00; (Effective all Serials, both O-243 and O-243A/FRT-24).	
* ※ C3213	3D9010-217 N5910-195-2570	CAPACITOR, FIXED: ceramic dielectric; 10 uuf ±1.0 uuf; neg temp coef 1000 (tolerance ±15) uuf/uf/° C; 500 v dc working; 0.520″ lg x 0.203″ w x 3⁄32″ thk; axial wire leads; uninsulated; p/o Z3101; Centralab (CN) part ※ DA934-004(X); Collins Rad (CR) part/dwg ※ 913 0048 00; (Effective all Serials, both O-243 and O-243A/FRT-24).	
* ※ C3213	N5910-195-6513	CAPACITOR, FIXED: ceramic dielectric; 20 uuf ±1.0 uuf; neg temp coef (tolerance ±30) uuf/uuf/° C; 500 v dc working; 0.520″ lg x 0.395″ w x 3⁄32″ thk. axial wire leads; uninsulated; p/o Z3101; Centralab (CN) part ※ DA933-003(X); Collins Rad (CR) part/dwg ※ 913 0051 00; (Effective all Serials both O-243 and O-243A/FRT-24).	
* ※ C3213	N5910-195-6982	CAPACITOR, FIXED: ceramic dielectric; 20 uuf ±1.0 uuf; neg tem coef 200 (tolerance ±15) uuf/uf/° C; 500 v dc working; 0.520″ lg x 0.395″ x w 3⁄32″ thk; 2 axial wire lead terminal; p/o Z3101; Centralab (CN) part ※ DA933-004(X); Collins Rad (CR) part/dwg ※ 913 0052 00; (Effective all Serials both O-243 and O-243A/FRT-24).	
* ※ C3213	N5910-666-5317	CAPACITOR, FIXED: ceramic dielectric; 20 uuf ±1.0 uuf; neg temp coef 400 (tolerance ±60) uuf/uf/° C; 500 v dc working; 0.520″ lg x 0.395″ w x 3⁄32″ thk; axial wire leads; uninsulated; p/o Z3101; Centralab (CN) part ※ DA933-002(X) Collins Rad (CR) part/dwg ※ 913 0053 00; Effective all Serials, both O-243 and O-243A/FRT-24).	
* ※ C3213	N5910-195-6930	CAPACITOR, FIXED: ceramic dielectric; 20 uuf ±1.0 uuf; neg temp coef 600 (tolerance ±90) uuf/uf/° C; 500 v dc working; 0.520″ lg x 0.395″ w x 3⁄32″ thk; axial wire leads; uninsulated; p/o Z3101; Centralab (CN) part ※ DA933-006(X); Collins Rad (CR) part/dwg ※ 913 0054 00; (Effective all Serials, both O-243 and O-243A/FRT-24).	
* ※ C3213	N5910-666-5331	CAPACITOR, FIXED: ceramic dielectric; 20 uuf ±1.0 uuf; neg temp coef 800 (tolerance +120) uuf/uf/° C; 500 v dc working; 0.520″ lg x 0.395″ w x 3⁄32″ thk; axial wire leads; uninsulated; p/o Z3101; Centralab (CN) part ※ DA933-007(X); Collins Rad (CR) part/dwg ※ 913 0055 00; (Effective all Serials, both O-243 and O-243A/FRT-24).	
* ※ C3213	N5910-195-6964	CAPACITOR, FIXED: ceramic dielectric; 20 uuf ±1.0 uuf; neg temp coef 1000 (tolerance ±150) uuf/uf/° C; 500 v dc working; 0.520″ lg x 0.395″ w x 3⁄32″ thk; axial wire leads; uninsulated; p/o Z3101; Centralab (CN) part ※ DA933-008; Collins Rad (CR) part/dwg ※ 913 0056 00; (Effective all Serials, both O-243 and O-243A/FRT-24).	
C3225		Same as C3198 (Effective Serials 1 thru 151 of NObsr-57357).	Part of Z3104
C3225		Same as C3110 (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	Part of Z3104

*These items are used in sealed oscillator assembly Z3101; replace complete assembly.
※ Individually selected to fit the specific requirements of each oscillator.

TABLE 8-4A. SUPPLEMENTARY TABLE OF REPLACEABLE PARTS — Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: Master Oscillator O-243( )/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) FEDERAL (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
** ※C3232	N5910-192-2134	CAPACITOR, FIXED: ceramic dielectric; 50 mmf ±1.0 mmf; temp coef 0 (tol ±30) mmf/mf/° C; 500 vdcw; 1.020″ lg x 0.395″ wd x 3/32″ thk; 2 axial wire leads; uninsulated; p/o Z3102; Collins Rad (CR) part/dwg ※ 913 0059 00 (Effective Serials 1 thru 151 of NObsr-57357).	Temperature compensator for C3231
** ※C3232		Same as C103 (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
** ※C3232	N5910-192-2099	CAPACITOR, FIXED: ceramic dielectric; 100 uuf ±2.0 uuf; neg temp coef 200 (tol ±15%) uuf/uf/° C; 500 v dc working; 1.020″ lg x 0.520″ w x 3/32″ thk; axial wire lead terminal; uninsulated; p/o Z3102; Centralab (CN); Collins Rad (CR) part/dwg ※ 913 0068 00 (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
** ※C3233		Same as C3213 (913 0051 00) p/o Z3102 (Effective all Serials both O-243 and O-243A/FRT-24).	Temp compensator for C3231
** ※C3233		Same as C3213 (913 0052 00) p/o Z3102 (Effective all Serials, both O-243 and O-243A/FRT-24).	
** ※C3233	N5910-192-2134	CAPACITOR, FIXED: ceramic dielectric; 50 uuf ±1.0 uuf; neg temp coef (tolerance ±30) uuf/uf/° C; 500 v dc working; 1.020″ lg x 0.395″ w x 3/32″ thk; axial wire leads; uninsulated; p/o Z3102; Centralab (CN) part ※ DA931-001; Collins Rad (CR) part/dwg ※ 913 0059 00 (Effective all Serials, both O-243 and O-243A/FRT-24).	
** ※C3233	3D9050-159 N5910-192-2138	CAPACITOR, FIXED: ceramic dielectric; 50 uuf ±1.0 uuf; neg temp coef 200 (tolerance ±15) uuf/uf/° C; 500 v dc working; 1.020″ lg x 0.395″ w by 3/32″ thk; axial wire leads; uninsulated; p/o Z3102; Centralab (CN) part ※ DA931-004(X); Collins Rad (CR) part/dwg ※ 913 0060 00 (Effective all Serials, both O-243 and O-243A/FRT-4).	
** ※C3233	3D9050-160 N5910-192-2140	CAPACITOR, FIXED: ceramic dielectric; 50 uuf ±1.0 uuf; neg temp coef 400 (tolerance ±15) uuf/uf/° C; 500 v dc working; 1.020″ lg x 0.395″ w x 3/32″ thk; axial wire leads; uninsulated; p/o Z3102; Centralab (CN) part ※ DA931-003(X); Collins Rad (CR) part/dwg ※ 913 0061 00 (Effective all Serials, both O-243 and O-243A/FRT-24).	
** ※C3233	3D9050-161 N5910-275-6460	CAPACITOR, FIXED: ceramic dielectric; 50 uuf ±1.0 uuf; neg temp coef 600 tolerance ±15) uuf/uf/° C; 500 v dc working; 0.520″ lg x 0.520″ w x 3/32″ thk; axial wire leads; uninsulated; p/o Z3102; Centralab (CN) part ※ DA932-001; Collins Rad (CR) part/dwg ※ 913 0062 00 (Effective all Serials, both O-243 and O-243A/FRT-24).	
** ※C3233	3D9050-168 N5910-244-1619	CAPACITOR, FIXED: ceramic dielectric; 50 uuf ±1.0 uuf; neg temp coef 800 (tolerance ±15%) uuf/uf/° C; 500 v dc working; 0.520″ lg x 0.395″ w x 3/32″ thk axial wire leads; uninsulated; p/o Z3102; Centralab (CN) part ※ DA933-010(X); Collins Rad (CR) part/dwg ※ 913 0063 00 (Effective all Serials both O-243 and O-243A/FRT-24).	
** ※C3233	3D9050-169 N5910-244-1622	CAPACITOR, FIXED: ceramic dielectric; 50 uuf ±1.0 uuf; neg temp coef 1000 (tolerance ±15%) uuf/uf/° C; 500 v dc working; 0.520″ lg x 0.395″ w by 3/32″ thk; axial wire leads; uninsulated; p/o Z3102 Centralab (CN) part ※ DA933-011(X); Collins Rad (CR) part/dwg ※ 913 0064 00 (Effective all serials, both O-243 and O-243A/FRT-24).	

**These items are used in sealed oscillator assembly Z3102; replace complete assembly.
※ Individually selected to fit the specific requirements of each oscillator.

TABLE 8-4A. SUPPLEMENTARY TABLE OF REPLACEABLE PARTS — Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: Master Oscillator O-243( )/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) FEDERAL (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
** # C3233	3D9050-170 N5910-244-1621	CAPACITOR, FIXED: ceramic dielectric; 50 uuf ±1.0 uuf; neg temp coef 1200 (tolerance ±15%) uuf/uf° C; 500 v dc working; 0.520″ lg by 0.395″ w by 3/32″ thk; axial wire leads; uninsulated; p/o Z3102; Centralab (CN) part # DA933-012(X); Collins Rad (CR) part/dwg # 913 0065 00 (Effective all Serials both O-243 and O-243A/FRT-24).	
** # C3233	3D9050-171 N5910-244-1620	CAPACITOR, FIXED: ceramic dielectric; 50 mmf ±1.0 mmf; neg temp coef 1400 (tol ±15%) mmf/mf/° C; 500 vdcw; 0.520″ lg x .395″ wd x 3/32″ thk; 2 axial leads; uninsulated; p/o Z3102; Centralab (CN); Collins Rad (CR) part/dwg # 913 0066 00; (Effective all Serials, both O-243 and O-243A/FRT-24).	Temperature compensator for C3231
**C3234	For replacement use N5910-126-1621	CAPACITOR, VARIABLE: ceramic dielectric; rotary type single sect; 20—125 mmf; 500 vdcw; neg temp coef 500 mmf/mf/° C; 1¼″ lg x 1 5/16″ wd x 0.706″ h; solder-lug term; two 4-40 NC-2 x 3/16″ mtg hole in base on 0.656″ mtg/c; scdr slot adj; ceramic base; p/o Z3102; Centralab (CN) part # 823AN; Collins Rad (CR) part/dwg # 917 1004 00; (Effective Serials 1 thru 151 of NObsr-57357).	Trimmer for C3231
**C3234	3D9050V-115 N5910-197-6744	CAPACITOR, VARIABLE: ceramic dielectric; rotary type; single section; 10 uuf to 50 uuf; 500 v dc working; temp coef 0 (tol ±100) uuf/uf/° C; 1.087″ lg x 1 5/16″ w x 1.289″ high; solder lug terminal; two No. 4-40 NC-2 x 3/16″ deep mtg holes on front; screwdriver slot adjustment; ceramic base; Centralab (CN) part # 823-054; Collins Rad (CR) part/dwg # 917 1001 00; (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	Trimmer for C3231
**C3236	For replacement use N5910-192-8414	CAPACITOR, FIXED: paper dielectric; 100,000 mmf ±20%; 400 vdcw; HS metal case; ¾″ lg x 0.235″ diam; high-temp impr; 2 axial wire leads; per JAN-C-25; p/o Z3102; Sprague (SPR) part/dwg # P66889 Collins Rad (CR) part/dwg # 931 2529 00.	V3126 screen grid bypass
CR3101	2Z3565-12 For replacement use N5960-194-9408	CRYSTAL UNIT, RECTIFYING: germanium, metallic case w/ plastic ins; 60 peak inverse v, 50 to 150 ma avg; 0.40″ lg x 0.175″ diam; 2 axial wire leads; Raytheon (RAY) part # CK705; Collins Rad (CR) part/dwg # 353 0097 00. (Effective Serials 1 thru 151 of NObsr-57357).	Pulse-gating diode
CR3101	For replacement use N5960-284-6515	CRYSTAL UNIT, RECTIFYING: germanium crystal; 4.0 ma min. forward current at low voltage 5.0 ma max inverse current at −5 v; 50.0 ma max inverse current at −50 v; ambient temp range −78° C to +90° C; cylindrical body; 0.265″ lg x 0.105″ dia max 2 axial wire leads 1⅛″ lg by 0.020″ dia; Hughes Aircraft Co. (HUG) type # 1N67A; Collins Rad (CR) part/dwg # 353 0147 00; (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	Pluse-gating diode
F3102	3Z2585-5 N5920-665-0894	FUSE, CARTRIDGE: MIL type FO2GR125B; ⅛ amp, opens from 5-60 seconds at 200% load, 1 hr at 133% load, rated continuous at 110%; 250 v; per spec MIL-F-15160; (Effective Serials 1 thru 151 of NObsr-57357).	HR3103 crystal oven fuse
F3102	3Z2587-1 N5920-280-3529	FUSE, CARTRIDGE: MIL type FO2GR250B; ¼ amp; 250 v; per spec MIL-F-15160; (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	HR3101 crystal oven fuse
O3136	N5820-303-3947	OSCILLATOR SUBASSEMBLY: for tuning shaft; beryllium copper; C-clamp shape; 1¼″ lg x 9/32″ wd x 1 3/16″ h o/a; ¼″ hole for shaft mtg; one 4-40 tapped hole; special flat spring for shock absorption; Collins Rad (CR) part/dwg # 502 5410 002. (Effective Serials 1 thru 151 of NObsr-57357).	Couples C3120 with O3133 (mates with O3149)

**These items are used in sealed oscillator assembly Z3102; replace complete assembly.

Individually selected to fit the specific requirements of each oscillator.

TABLE 8-4A. SUPPLEMENTARY TABLE OF REPLACEABLE PARTS — C ntinu d

For Radio Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator O-243( )/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) FEDERAL (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
O3136	N3010-313-8034	HUB: coupling; stainless steel type 303; rd; ⅞" dia by 0.374" thk overall; # 4-40 NC-2 hole for set screw; ¼" center shaft hole; raised lip across one face; Collins Rad (CR) part/dwg # 504 5346 002; (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
O3137	N3010-313-8034	HUB, COUPLING: SS type 303 round; ⅞" diam x 0.374" thk o/a; 4-40 NC-2 hole for set screw; ¼" ctr shaft hole; raised lip across one face; Collins Rad (CR) part/dwg # 504 5346 002. (Effective Serials 1 thru 151 of NObsr-57357).	Part of coupling between O3134 and O3234
O3137		Same as O3136 (Effective Serial of 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
O3138		Same as O3137 (Effective Serials 1 thru 151 of NObsr-57357).	p/o coupling between O3135 and C3215
O3138		Same as O136 (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
O3139		Same as O3137 (Effective Serials 1 thru 151 of NObsr-57357).	p/o coupling between O3134 and C3238
O3139		NOT USED: (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
O3140		Same as O3137 (Effective Serials 1 thru 151 of NObsr-57357).	p/o coupling between O3135 and C3215
O3140		NOT USED: (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
O3149	2Z3295-204 N3040-294-6813	COUPLING, FLEXIBLE: for tuning shaft; brass; round; 1¼"; diam x 1$\frac{1}{16}$" lg o/a; 0.296" diam shaft hole on one end, 2 holes tapped 8-36 NC-2 spaced 90° on side; ⅛" diam x $\frac{5}{16}$" lg engaging pin on face; Collins Rad (CR) part/dwg # 504 5045 001. (Effective Serials 1 thru 151 of NObsr 57357)	Couples C3120 with O3133 (mates with O3136)
O3149		Same as O3136 (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
O3150	N3010-306-9987	SPIDER, ROTOR: coupler guide; SS type 303; ⅞" diam x 0.156" thk o/a; 0.156" wd x 0.078" d lip on each face milled at right angles; $\frac{9}{32}$" diam hole in ctr; Collins Rad (CR) part/dwg # 504 5345 001; (Effective Serials 1 thru 151 of NObsr-57357).	Couples O3137 with O3139
O3150		(No. of uses increased to 3, added O3157) (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
O3154		Same as O3152.	Locks N3103
O3155	Low failure item — if required requisition from ESO referencing Nav Ships 900, 180A	WASHER, FLAT: rd; stainless steel; 0.510" od x 0.0375" thk; $\frac{3}{16}$" lg x 0.093" w extrusion at 90°; Collins Rad (CR) part/dwg # 506 9145 002; (Added effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
O3156	N5310-637-4741	WASHER, FLAT: rd; stainless steel, type 302; 0.510" dia x 0.040" thk; w/ single 0.093" w x 0.050" lg extrusion at 90°; Collins RAD (CR) part/dwg # 503 0643 001; Added effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
O3157		Same as O3150 (Added effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
O3158		Same as O3136 (Added effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	

TABLE 8-4A. SUPPLEMENTARY TABLE OF REPLACEABLE PARTS — C ntinued

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator O-243( )/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) FEDERAL (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
O3159		Same as O3136 (Added effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
R3160		Same as R3111 (Effective Serials 1 thru 151 of NObsr-57357).	V3113 grid #3
R3160	3RC20GF273K For replacement use N5905-195-9482	RESISTOR, FIXED: JAN type RC20GF273K; Comp; 27,000 ohm ±10%; ½ w; per spec MIL-R-11. OR	V3113 grid No. 3
R3160	3RC20BF273K For replacement use N5905-195-9482	RESISTOR, FIXED: JAN type RC20BF273K; comp; 27,000 ohm ±10%; ½ w; per spec JAN-R-11; (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
R3163		NOT USED (Effective Serials 1 thru 151 of NObsr-57357).	
R3163	N5905-642-5012	RESISTOR, FIXED: wire wound; 10,000 ohm ±10%; 25 w, 1.410″ lg x 1.680″ dia; 3 solder lug terminals mounted x ⅜″ —32 NEF -2A x 0.375″ lg bushing; slotted shaft; Ohmite Mfg. Co. (OM) Collins Rad (CR) part/dwg # 749 4452 00; (Added effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	
R3204		Same as R3165.	V3124 grid #1
R3205	3RC20BF273K For replacement use N5905-195-9482	RESISTOR, FIXED: Jan type RC20BF273K; comp; 27,000 ohm 10%; ½ w per spec JAN-R-11. (Effective Serials 1 thru 151 of NObsr-57357). OR	V3124 grid # 3
R3205		Same as R3160 (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	V3124 grid # 3
R3220		NOT USED (Effective Serials 1 thru 151 of NObsr-57357).	
**R3220	3RC20GF101K For replacement use N5905-190-8889	RESISTOR, FIXED: JAN type RC20GF101K; comp; 100 ohm ±10%; ½ w; per spec MIL-R-11; (Effective Serial 152 of NObsr-57357 and Serial 1 of NObsr-71341).	Parasitic suppression
R3221 thru R3234		NOT USED.	
*R3235	3RC20GF154J For replacement use N5905-195-9483	RESISTOR, FIXED: JAN type RC20GF154J; comp; 150,000 ohm ±5%; ½ w; p/o Z3101; per spec MIL-R-11. OR	V3131 grid
R3235	3RC21BF154J For replacement use N5905-195-9483	RESISTOR, FIXED: JAN type RC21BF154J; comp; 150,000 ohms ±5%; ½ w; p/o Z3101; per spec JAN-R-11.	V3131 grid
*R3236	N5905-249-3661	RESISTOR, FIXED: JAN type RC20GF683J; comp; 68,000 ohm ±5%; ½ w; p/o Z3101; per spec MIL-R-11. OR	V3131 screen grid voltage dropping
*R3236	3RC21BF683J For replacement use N5905-249-3661	RESISTOR, FIXED: JAN type RC21BF683J; comp; 68,000 ohm ±5%; ½ w; p/o Z3101; per spec JAN-R-11.	V3131 screen grid voltage dropping
*R3237	N5905-254-9201	RESISTOR, FIXED: JAN type RC20GF473J; comp; 47,000 ohm ±5; ½ w; p/o Z3101; per spec MIL-R-11. OR	V3111 grid
*R3237	3RC21BF473J For replacement use N5905-254-9201	RESISTOR, FIXED: JAN type RC21BF473J; comp; 47,000 ohms ±5%; ½ w, p/o Z3101; per spec JAN-R-11.	V3111 grid

*These items are used in sealed oscillator assembly Z3101; replace complete assembly.
**These items are used in sealed oscillator assembly Z3102; replace complete assembly.

TABLE 8-6A. SUPPLEMENTARY CROSS REFERENCE PARTS LIST

The cross reference parts list, table 8-6, is corrected with this supplementary table, table 8-6A. This supplementary table is a cross reference of the Federal Stock Numbers and Signal Corps Stock Numbers listed in table 8-4A. Refer to table 8-6A before referring to the basic table as listings in the supplementary table supersede listings in the basic table. If a stock number is not given in the supplementary table, refer to the basic table for the required information.

FEDERAL STOCK NUMBER	KEY SYMBOL	FEDERAL STOCK NUMBER	KEY SYMBOL	FEDERAL STOCK NUMBER	KEY SYMBOL
F5820-644-4381	3101-3299 series	N5910-195-5384	C3213	N5960-262-0210	V201
F5820-644-4738	3101-3299 series	N5919-195-5392	C3213	N5960-262-0964	V107
N3010-306-9987	O3150	N5910-195-6513	C3213	N5960-262-3763	V204
N3010-313-8034	O3137	N5910-195-6930	C3213	N5960-284-6515	CR3101
N3040-294-6813	O3149	N5910-195-6964	C3213	N6105-505-9195	B642
N3101-313-8034	O3136	N5910-195-6982	C3213	N6105-643-1397	B642
N4450-279-0510	O682	N5910-196-0556	C3212		
N5310-637-4741	O3156	N5910-197-6744	C3234		
N5820-303-3947	O3136	N5910-235-0872	C1001	SIGNAL CORP STOCK NUMBER	KEY SYMBOL
N5905-112-6705	R149	N5910-244-1619	C3233		
N5905-190-8889	R3220	N5910-244-1620	C3233	3D9010-170	C3213
N5905-195-9482	R3160	N5910-244-1621	C3233	3D9010-172	C3213
N5905-195-9482	R3205	N5910-244-1622	C3233	3D9010-173	C3213
N5905-195-9483	R3235	N5910-262-8387	C605	3D9010-186	C3213
N5905-249-3661	R3236	N5910-270-9068	C3192	3D9010-187	C3213
N5905-254-9201	R3237	N5910-275-6444	C3213	3D9010-217	C3213
N5905-264-8746	R149	N5910-275-6460	C3233	3D9050-159	C3233
N5905-642-5012	R3163	N5910-644-0815	C3114	3D9050-160	C3233
N5910-101-4890	C3198	N5910-644-3492	C3162	3D9050-161	C3233
N5910-112-7399	C603	N5910-644-6284	C167	3D9050-168	C3233
N5910-126-1621	C3234	N5910-666-5317	C3213	3D9050-169	C3233
N5910-160-1158	C3199	N5910-666-5331	C3213	3D9050-170	C3233
N5910-187-2793	C3199	N5910-666-5719	C3198	3D9050V-115	C3234
N5910-192-2099	C3232	N5910-666-6980	C3106	3D9330-27	C3199
N5910-192-2134	C3232	N5910-666-6980	C3200	3D9430-5	C3198
N5910-192-2134	C3233	N5920-280-3529	F3102	3DB2-142	C603
N5910-192-2138	C3233	N5920-665-0894	F3102	3RC20BF273K	R3160
N5910-192-2140	C3233	N5950-228-2582	L103	3RC20GF101K	R3220
N5910-192-8414	C3236	N5950-645-0282	L137	3RC20GF154J	R3235
N5910-195-2569	C3213	N5950-647-5546	L138	3RC20GF273K	R3160
N5910-195-2570	C3213	N5950-647-9238	L103	3RW24320	R149
N5910-195-5367	C3213	N5960-194-9408	CR3101	3Z2587-1	F3102

SECTION 8

PARTS LISTS

Note

THE FOLLOWING SYMBOLS ARE USED IN THE STOCK NUMBERS COLUMN. OTHER SYMBOLS IN THE TABLE OF REPLACEABLE PARTS REFER TO PAGE FOOTNOTES.

SYMBOL	DESCRIPTION
†	Low Failure item—if required requisition from ESO referencing NavShips 900, 180A.
⊕⊕	Shop manufacture.
‡	Assemble from component parts.
⊕	Procured on demand by nearest Naval Shore Supply Activity.
∅	For reference only.

TABLE 8-1. WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES

EQUIPMENT SPARES						STOCK SPARES					
SPARE PARTS BOX	OVER-ALL DIMENSIONS			VOLUME	WEIGHT	SPARE PARTS BOX	OVER-ALL DIMENSIONS			VOLUME	WEIGHT
	HEIGHT	WIDTH	DEPTH				HEIGHT	WIDTH	DEPTH		

TABLE 8-2. SHIPPING WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES

EQUIPMENT SPARES						STOCK SPARES					
SPARE PARTS BOX	OVER-ALL DIMENSIONS			VOLUME	WEIGHT	SPARE PARTS BOX	OVER-ALL DIMENSIONS			VOLUME	WEIGHT
	HEIGHT	WIDTH	DEPTH				HEIGHT	WIDTH	DEPTH		

TABLE 8-3. LIST OF MAJOR UNITS

SYMBOL GROUP	QUANTITY	NAME OF MAJOR UNIT	NAVY TYPE DESIGNATION
101-899	1	RADIO TRANSMITTER	T-440/FRT-24
101-299	1	R-F ASSEMBLY	
301-399	1	LOW-VOLTAGE POWER SUPPLY	
401-499	1	HIGH VOLTAGE-POWER SUPPLY	
501-599	1	POWER CONTROL ASSEMBLY	
601-699	1	MODULATOR ASSEMBLY	
601-699	1	POWER CHANGE ASSEMBLY	
601-699	1	CABINET ACCESSORIES	
701-799	1	SERVICE POWER SUPPLY	
701-799	1	PATCH PANEL ASSEMBLY	
801-899	1	DIAL CONTROL ASSEMBLY	
901-999	2	TRANSMITTER CONTROL	C-1362/FRT-24
1001-1099	1	POWER SUPPLY	PP-454/FRT-5
2001-2099	1	TRANSMISSION LINE COUPLER	CU-390/FRT-24
3101-3299	1	R-F OSCILLATOR	O-243/FRT-24
	2	TELEPHONE SET	TA-267/U

TABLE 8-4. TABLE OF REPLACEABLE PARTS

F r Radi Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) ᐧIGNAL CORPS (2) S ANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
101-299 Series	∅	RF ASSEMBLY: AM, CW, and frequency shift keying; 2.0 to 30.0 mc freq range, 10 channels; crystal or master-oscillator controlled; 1000 w output; requires 115 v AC 60 cyc single ph 250 va, 230 v AC 60 cyc single ph 300 va, 3200 v DC at 500 ma, 600 v DC at 350 ma, 80 v DC at 5 ma; enclosed in aluminum case; 17⅜″ wd x 30⅞″ d x 29¾″ h o/a; rack cabinet mtd on pullout roller slides; requires forced air cooling; autotuned either locally or remotely; Collins Rad (CR) part # 507A-2A, dwg # 522 0065 003. P/O T-440/FRT-24.	Furnishes RF excitation and output
A101	†	COVER: used over control unit; aluminum, gray enamel; 3⅛″ diam x 13/32″ h o/a; four 0.140″ diam mtd holes on 2¾″ mtg/c; single white index mark; Collins Rad (CR) part/dwg # 505 3454 002.	Covers control unit 0284

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
B240	N17-M-54647-5151	MOTOR, AC: induction type; .038 hp at 1500 rpm; closed frame; ambient temp range, −15° to +50° C; fungus-treated; 5$\frac{5}{8}$" lg x 3$\frac{19}{32}$" wd x 3$\frac{5}{8}$" h; shaft $\frac{7}{8}$" lg, 2 flats $\frac{3}{4}$" lg, 90 deg ±2 deg apart; 102 to 127 v AC, $\frac{50}{60}$ cyc, single ph; fixed mtg base; four $\frac{1}{2}$" slots, 2 each end 1$\frac{1}{4}$" ctr ball bearing, SS shaft type 302 or 303; Ricor (EIC) part # ML1C 35-4RF; Collins Rad (CR) part/dwg # 230 0123 00.	Drives autotunes
C102	3D9015-85 For replacement use SNSN N16-C-15978-6001	CAPACITOR, FIXED: JAN type CC30CH150J; ceramic dielectric; 15 mmf ±5%; neg temp coef 0 (tol +60) mmf/mf/° C; 500 vdcw; per spec JAN-C-20A.	RF voltage divider
C103	309000.5-1 N16-C-17067-8295	CAPACITOR, FIXED: Ceramic dielectric; 100 mmf ±2.0 mmf; temp coef 0 (tol ±30) mmf/mf/° C; 500 vdcw; 1.020" lg x 0.395" wd x $\frac{9}{32}$" thk; axial wire leads; uninsulated; temp compensated; Collins Rad (CR) part/dwg # 913 0067 00.	RF voltage divider
C104	For replacement use SNSN N16-C-18983-1015	CAPACITOR, FIXED: ceramic dielectric; 0.005 mf min; 500 vdcw; $\frac{5}{32}$" thk x $\frac{9}{16}$" diam; wire leads; Centralab (CN) type BC; Collins Rad (CR) part/dwg # 913 1187 00.	V101 screen bypass
C105	For replacement use SNSN N16-C-18630-3689	CAPACITOR, FIXED: ceramic dielectric; 1000 mmf min; 500 vdcw; 0.40" lg x 0.20" diam; 2 radial wire leads; Centralab (CN); Collins Rad (CR) part/dwg # 913 0146 00.	Couples V101 to V102
C106		Same as C104.	Grid-return bypass
C107		Same as C104.	V102 cathode bypass
C108		Same as C104.	V102 screen bypass
C109		Same as C105	Coupling, buffer to 1st frequency multiplier
C110		Same as C105.	DC blocking
C111		Same as C104.	V103 cathode bypass
C112		Same as C104.	V103 screen bypass
C113		Same as C105.	Coupling, 1st frequency multiplier
C114	N16-C-62762-1050	CAPACITOR, VARIABLE: air dielectric; midget, dual section, plate meshing type; 140 mmf per sect max, 8.5 mmf per sect min; SLC; air gap 0.0245; 3" lg x 1$\frac{5}{8}$" wd x 1$\frac{15}{32}$" h, plates meshed; shaft 0.250" diam x $\frac{1}{2}$" lg, bushing $\frac{3}{8}$-32 thd x $\frac{3}{8}$" lg; extension shaft adj; 19 plates per sect; nickel pl soldered brass plates; 180 deg clockwise rotation; steatite ins; lug term; single hole mtg by $\frac{3}{8}$" diam mtg bushing; Hammarlund (HMM) part # MCD 140-M; Collins Rad (CR) part/dwg # 922 0041 00.	1st and 2nd multiplier plate
C115		Same as C103.	Tank capacitor for L108 and L109

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinued

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
C116	N16-C-16263-2801	CAPACITOR, FIXED: JAN type CC30CH300F; ceramic dielectric; 30 mmf ±1%; temp coef O; 500 vdcw; per spec JAN-C-20A.	RF voltage divider
C117		Same as C104.	V104 cathode bypass
C118		Same as C104.	V104 screen bypass
C119		Same as C105.	Coupling, frequency multiplier
C120		Same as C104.	V105 screen bypass
C121		Same as C104.	V105 filament bypass
C122		Same as C104.	V105 screen bypass
C123		Same as C104.	V105 filament bypass
C124	N16-C-18660-2453	CAPACITOR, FIXED: Navy type 484975-20; ceramic dielectric; 1000 mmf ±20%; 5000 vdcw; 2 5/32" diam x 7/8" lg case o/a; axial screw style term; uninsulated; Centralab (CN) part # 850A; Collins Rad (CR) part/dwg # 913 0101 00.	Couples V105 to V106
C125	N16-C-61611-5621	CAPACITOR, VARIABLE: air dielectric; single sect, plate meshing type; 250 mmf max, 19 mmf min; SLC; air gap 0.075"; 5 25/32" lg x 2 5/8" wd x 2 19/32 h, shaft 1 1/2" lg; extension shaft adj; 37 aluminum plates; 360 deg clockwise rotation; ceramic grade L-4 or better ins; lug term; two 0.140" diam mtg holes, one each end, spaced 5 3/8" on ctr; Johnson EF (JON) part # 250E30; Collins Rad (CR) part/dwg # 920 0003 00.	V105 plate tuning
C126	†	CAPACITOR ASSY: c/o var capacitor C126A and fixed capacitor C126B; air dielectric; neutralizing; disk type; C126A, 2 to 10 mmf; C126B, 1594 mmf ±5%; approx 6 11/32" lg x 4 1/16" wd x 12" h o/a; plates 3 1/2" diam x 1/4" thk; 2 polished aluminum plates; 2 stud type term; two 0.218" diam holes located in base for mtg; natural paper base phenolic; adj screw w/scdr slot; incl C126A, C126B, E106, E139, E140, E141; Collins Rad (CR) part/dwg # 506 8376 004.	Neutralizing and DC blocking
C126A		p/o C126.	
C126B		p/o C126.	
C127	3DB20-112 N16C-19713-8753	CAPACITOR, FIXED: JAN type CE63C200J; dry electrolytic; 20 mf −10% +150%; 150 vdcw; per spec JAN-C-62.	Filter capacitor
C128		Same as C124.	V106 screen bypass
C129	N16-C-45801-9592	CAPACITOR, FIXED: paper dielectric oil impregnated; 0.1 mfd +20% −10% 600 vdcw @ 20 amp; 1 1/16" diam 1 13/16" lg 3 term; feed through type; two 0.156 diam mtg holes 1 1/16" c to c; Sprague (SPR) type 80P; Collins Rad (CR) part/dwg # 241 0006 00.	V106 filament bypass

TABLE 8-4. TABLE OF REPLACEMENT PARTS—Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
C130		Same as C129.	V106 filament bypass
C131		Same as C124.	V106 filament bypass
C132	N16-C-99999-1146	CAPACITOR, FIXED: ceramic dielectric; 500 mmf ±20%; 15,000 vdcw; $2\frac{7}{8}$" lg x 2" diam; axial hole each end, $\frac{5}{8}$" deep, tap 10-32 NF-1, $\frac{7}{16}$" deep; for screw and lug-type term; Centralab (CN) type 859; Collins Rad (CR) part/dwg # 913 1717 00.	Couples V106 to output network
C133	N16-C-99999-1140	CAPACITOR, FIXED: ceramic dielectric; 500 mmf +50% −20%, 20,000 vdcw; axial stud type term; 2" lg x 1" diam; uninsulated; Centralab (CN) type DA-100; Collins Rad (CR) part/dwg # 913 1101 00.	V106 plate circuit bypass
C134	N16-C-65866-5658	CAPACITOR, VARIABLE: vacuum type; plate tuning; concentric cylinders; 10.0 mmf max min, 375 mmf min max; 12,000 v AC peak; $6\frac{9}{16}$" h x $3\frac{1}{8}$" diam; tubulation tip extends $\frac{7}{16}$" max on side; copper plates; 2 stud term 0.190" diam; 4 holes at 90 deg spacing; extension shaft adj; Jennings Rad (JRMC) type UCS; Collins Rad (CR) part/dwg # 919 0121 00.	V106 plate tuning
C135	N16-C-63049-9003	CAPACITOR, VARIABLE: air dielectric; dual sect, plate meshing type; 470 mmf per sect max, 38 mmf per sect min; SLC; air gap 0.125"; $14\frac{27}{32}$" lg x $5\frac{1}{2}$" wd x $5\frac{11}{32}$" h, shaft 1" lg; extension shaft adj; 33 aluminum plates per sect; 360 deg clockwise rotation; steatite ins; lug term; 2 mtg blt, two 0.200" holes in ea spaced 2" on ctr; torque, 40 in. — oz max, when counter-balanced; Johnson EF (JON) type CD special; Collins Rad (CR) part/dwg # 920 0084 00.	Output network loading
C136		Same as C135.	Output network loading
C137		Same as C124.	M104 RF bypass
C138	N16-C-21054-8542	CAPACITOR, FIXED: JAN type CE41C202E; dry electrolytic; 2000 mf; 15 vdcw; working temp range −40° C to +85° C; per spec JAN-C-62.	Power-amplifier overload delay
C139		Same as C127.	Filter capacitor
C140	3K3068121 N16-C-30536-4764	CAPACITOR, FIXED: JAN type CM30B681K; mica dielectric; 680 mmf ±10%; 500 vdcw; per spec JAN-C-5.	Power-amplifier neutralizing balance
C141	3K3056121 N16-C-30299-1164	CAPACITOR, FIXED: JAN type CM30B561K; mica dielectric; 560 mmf ±10%; 500 vdcw; per spec JAN-C-5.	Power-amplifier neutralizing balance
C143		Same as C124.	V103 screen bypass
C144		Same as C124.	V103 screen bypass
C145		Same as C124.	V105 plate circuit bypass
C146		Same as C124.	V105 plate circuit bypass

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
C147		Same as C105.	Coupling, multiplier to divider
C148		Same as C104.	Oscillator plate circuit bypass
C149		Same as C116.	RF voltage divider
C150	N16-C-42761-9592	CAPACITOR, FIXED: capacitor w/ paper dielectric and oil impregnant; 0.01 mf +20% −10%; 1¼″ lg x ⅝″ wd x 1⅛″ h; 20 amp, 600 v DC; uncased; two 0.156″ diam holes in flange 1³⁄₁₆″ on centers; 2 axial wire lead term; Sprague (SPR) type 79P; Collins Rad (CR) part/dwg # 241 0010 00.	T804 primary bypass
C151		Same as C150.	T804 primary bypass
C152		Same as C150.	K201 bypass
C153		Same as C150.	K201 bypass
C154		Same as C150.	K201 contact bypass
C155		Same as C150.	K201 contact bypass
C156		Same as C150.	T101 primary bypass
C157		Same as C150.	K201 contact bypass
C158		Same as C150.	K201 contact bypass
C159		Same as C150.	T102 primary bypass
C160		Same as C150.	T102 primary bypass
C161		Same as C150.	T103 primary bypass
C162		Same as C150.	Channel indicator circuit bypass
C163		Same as C150.	Exciter high-voltage by-pass
C164	N16-C-042760-8641	SUPPRESSOR, electrical noise: .001 mf "duct type feedthru" capacitor w/ paper dielectric and oil impr; 1⁹⁄₁₆″ lg x ⁷⁄₁₆″ diam excluding mtg fl; 15 amp, 1000 v DC; cylindrical metal case; fl mtd by two 0.156″ diam holes spaced 1³⁄₁₆″ c to c; three term, two 1¼″ lg axial wire leads, case other term; Sprague (SPR) type 79P duct; Collins Rad (CR) part/dwg # 241 0011 00.	Key-line bypass

TABLE 8-4. TABLE OF REPLACEMENT PARTS—Continu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
C165		Same as C164.	V103 screen bypass
C166		Same as C124.	M104 RF bypass
C167	N16-C-99999-1141	CAPACITOR, FIXED: paper dielectric; 0.1 mf ±20%; 1000 vdcw; HS in tubular, non-magnetic metal case; $1\frac{5}{8}$" lg x 0.562" diam; 2 axial wire lead term; Sprague (SPR) type 91P10401052; Collins Rad (CR) part/dwg # 931 2709 00.	Exciter low-voltage bypass
C169		Same as C141.	Power amplifier neutralizing balance
C170		Same as C140.	Power amplifier neutralizing balance
C171	N16-C-64452-1501	CAPACITOR, VARIABLE: air dielectric; ins adj core; 1.0 to 8.0 mmf; SLC; 500 vdcw; $1\frac{1}{4}$" lg x $\frac{11}{32}$" diam excluding shaft, 4-40 NC-2, $\frac{3}{4}$" lg shaft; ins slug; capacitance increased by turning adjusting bushing counterclockwise; glass ins; mtg bushing one term and radial solder strap other term; 12-12 NC-2 thd mtg bushing keyed by flat side; capacitance controlled by meshing ins slug w/ metal sleeve; Corning Glass (CGW) part # 682001; Collins Rad (CR) part/dwg # 922 0150 00.	Crystal trimmer
C172		Same as C171.	Crystal trimmer
C173		Same as C171.	Crystal trimmer
C174		Same as C171.	Crystal trimmer
C175		Same as C171.	Crystal trimmer
C176		Same as C171.	Crystal trimmer
C177		Same as C171.	Crystal trimmer
C178		Same as C171.	Crystal trimmer
C179		Same as C171.	Crystal trimmer
C180		Same as C171.	Crystal trimmer
C181	N16-C-31913-9493	CAPACITOR, FIXED: JAN type CM 45B222M; mica dielectric; 2200 mmf ±20%; 1200 vdcw; per spec JAN-C-5.	M105 RF bypass
C182	N16-C-16261-2001	CAPACITOR, FIXED: ceramic dielectric; 28 mmf ±5%; neg temp coef 750 (tol ±113) mmf/mf/° C; 5000 vdcw; $\frac{7}{8}$" lg x $\frac{51}{64}$" OD o/a; two axial hex nut term; both ends tapped # 6-32 NC-2 x $\frac{3}{16}$" d for mtg; uninsulated; Centralab (CN) type # 850A; Collins Rad (CR) part/dwg # 913 0824 00.	Harmonic filter
C183		CAPACITOR: Same as C182.	Harmonic filter
C184		CAPACITOR: Same as C182.	Harmonic filter
C185		CAPACITOR: Same as C182.	Harmonic filter

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

For Radio Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
C186		CAPACITOR: Same as C182.	Harmonic filter
C187		CAPACITOR: Same as C182.	Harmonic filter
C188		CAPACITOR: Same as C182.	Harmonic filter
C189		CAPACITOR: Same as C182.	Harmonic filter
C190		CAPACITOR: Same as C182.	Harmonic filter
C191	N16-C-15958-3301	CAPACITOR, FIXED: ceramic dielectric; 12 mmf ±5%; neg temp coef 750 (tol ±113) mmf/mf/°C; 5000 vdcw; 7/8" lg x 51/64" OD o/a; two axial hex nut term; both ends tapped # 6-32 NC-2 x 3/16" d for mtg; uninsulated; Centralab (CN) type # 850A; Collins Rad (CR) part/dwg # 913 0823 00.	Harmonic filter
C201		Same as C105.	V201 grid bypass
C202		Same as C105.	V201 grid bypass
C203		Same as C105.	V202 grid bypass
C204	N16-C-54467-1577	CAPACITOR, FIXED: JAN type CP54B5FF104X; paper dielectric; 3 sect; 100,000 mmf per sect +40% −15%; 600 vdcw; per spec JAN-C-25.	Wave shaping and V202 plate bypass
C240	N16-C-48817-3805	CAPACITOR, FIXED: JAN type CP53B1FF105K; paper dielectric; 1.0 mf ±10%; 600 vdcw; per spec JAN-C-25.	Motor field capacitor
C241		Same as C240.	Motor field capacitor
C242	For replacement use SNSN N16-C-52051-2332	CAPACITOR, FIXED: JAN type CP70E1DG156K; paper dielectric; 15 mf ±10%; 1000 vdcw; per spec JAN-C-25.	Motor field capacitor
E101	3Z12101-20.2 ⊕⊕	TERMINAL, STUD: melamine body, brass term tinned, brass base cad pl; hex; 0.788" lg, 1/4" across flats o/a; 4-40 NC-2, 5/32" d one end, two 0.212" lg x 0.052" wd slotted solder lug other end; Collins Rad (CR) part/dwg # 306 0233 00.	Tie point
E102		Same as E101.	Tie point
E103		Same as E101.	Tie point
E104		Same as E101.	Tie point
E105	†	SUPPRESSOR, PARASITIC: resistor and coil, 7 25/32" lg x 1 3/8" wd x 2 1/2" h o/a; one 7/8" turn silver pl 3/16" OD, 1/32" wall copper tubing; resistor 50 ohms, 20 w; uncased; mtd by tube cap connector one end, one 0.203" diam hole in strap on other end, term and mtg are common; Collins Rad (CR) part/dwg # 505 3238 002.	V106 plate suppressor parasitic
E106	⊕⊕	STRAP, CONNECTOR: adj to act as inductor at high frequencies; beryllium copper, bright alloy pl; 2 1/8" lg x 5/8" wd x 0.010" thk; one 0.218" diam mtg hole on one end, one 5/16" x 5/32" slotted hole on opposite end; Collins Rad (CR) part/dwg # 506 8369 002.	p/o C126 assembly

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
E107	‡	SUPPRESSOR, PARASITIC: resistor and coil; 7/8" lg x 13/32" diam excluding term; 5 turns #20 wire on 100-ohm 2-w resistor; uncased; 2 axial wire lead term; Collins Rad (CR) part/dwg # 540 1211 002.	V104 plate parasitic suppressor
E108	‡	SUPPRESSOR, PARASITIC: resistor and coil; 7/8" lg x 5/16" diam excluding term; 7 turns #20 wire on 100-ohm 1-w resistor; uncased; 2 axial wire lead term; Collins Rad (CR) part/dwg # 540 1212 002.	V104 grid parasitic suppressor
E109	‡	SUPPRESSOR, PARASITIC: resistor and coil; 2 13/16" lg x 1/2" wd x 3/4" h excluding term, 1 turn 3/8" ID tinned copper wire, two 47 ohm 2 w resistors; uncased; 2 axial wire lead term with solder lugs on ends; Collins Rad (CR) part/dwg # 505 3641 002.	V106 grid parasitic suppressor
E110		Same as E101.	Tie point
E111	3G350-79 N17-T-28228-3261	TERMINAL, STUD: molded melamine body, tinned brass term, cad pl brass insert; 23/32" lg x 1/4" hex o/a; 4-40 NC-2 x 5/32" d tapped insert; Collins Rad (CR) part/dwg # 306 0090 00.	Tie point
E112		Same as E111.	Tie point
E113		Same as E111.	Tie point
E114		Same as E101.	Tie point
E115		Same as E101.	Tie point
E116		Same as E101.	Tie point
E117		Same as E101.	Tie point
E118	3Z12101-9.3 N17-T-28228-3181	TERMINAL, STUD: molded melamine body, terminal, brass, tin dipped; insert, brass cad pl; round post shape; 9/16" lg o/a, 3/8" lg less term, 1/4" diam; #4-40 NC-2 tapped 5/32" d one end, slotted solder lug other end; Whitso, (WAEQ) # 103-A-2; Collins Rad (CR) part/dwg # 306 0091 00.	
E119		Same as E101.	Tie point
E120		Same as E101.	Tie point
E121		Same as E101.	Tie point
E122		Same as E101.	Tie point
E123	⊕⊕	POST, SUPPORTING: aluminum; 1 19/32" lg x 5/16" diam o/a; 6-32 NC-2 x 3/8" d hole on one end, 6-32 NC-2 x 1/4" d hole on opposite end; Collins Rad (CR) part/dwg # 506 6288 002.	Support for R149
E124	⊕⊕	POST, SUPPORTING: aluminum; 23/32" lg x 5/16" diam o/a; 6-32 NC-2 x 3/8" d hole on one end, 6-32 NC-2 x 1/4" d hole on opposite end; Collins Rad (CR) part/dwg # 506 6287 002.	Support for R148
E125	3G-350-149 N17-I-69158-6251	INSULATOR, STANDOFF: round post shape; L-4 ceramic, white, glazed sides; 3/4" lg x 3/8" diam, tapped 6-32 x 1/4" d at each end; Collins Rad (CR) part/dwg # 190 1143 00.	Tie point for resistor bank
E126		Same as E101.	Tie point

TABLE 8-4. TABLE OF REPLACEMENT PARTS—Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
E127		Same as E101.	Tie point
E128	N16-S-34520-3861	SHIELD TUBE: cad pl steel; cylindrical w/ 1/2" diam hole on top; bayonet mtg; 1 3/8" lg x 0.915" ID, 0.810" ID; SS spring inside; Johnson EF (JON) type 278A; Collins Rad (CR) # 141 0001 00.	Shields V101
E129	N16-C-301253-0832	CLAMP, VACUUM TUBE: 1 round female contact, straight; 7/8" lg x 3/4" diam; cylindrical aluminum body; locking screw for contact, bottom of connector tapped 6-32 NC-2 for cable or strap connection; tube plate heat-dissipating type connector; Eimac (ETM) type HR-6; Collins Rad (CR) part/dwg # 301 1013 00.	V105 plate cap connector
E130	⊕⊕	INSULATOR, STANDOFF: round post shape; xxx natural bakelite; 1 1/4" x 5/16" diam; tapped 6-32 NC-2 x 1/2" d ea end; Collins Rad (CR) part/dwg # 500 9034 001.	Support for C127 and C139
E131		Same as C130.	Support for C127 and C139
E132		Same as E118.	
E133	N16-C-301751-257	CLAMP, VACUUM TUBE: 1 round female contact; straight; 1 11/32" lg x 1 3/8" diam; cylindrical aluminum body; locking screw for contact, bottom of connector tapped 6-32 NC-2 for cable or strap connection; tube plate heat-dissipating type connector; Eimac (ETM) type HR-8; Collins Rad (CR) part/dwg # 301 1015 00.	V106 plate cap connector
E134	For replacement use SNSN N17-I-69256-9571	INSULATOR, STANDOFF: round post shape; L-4 ceramic, white glazed sides; 6" lg x 1 1/4" diam; tapped 1/4-20 x 5/8" d on ctr ea end, 2 holes 0.130 diam x 1/4" d on ea end 0.375" from ctr hole; Collins Rad (CR) part/dwg # 190 1192 00.	Support and tie point for C132
E135	3G3503-16.3 N17-I-69215-9481	INSULATOR, STANDOFF: JAN type NS4W0316; round post shape; L-4 ceramic, white glazed on sides; 2" lg x 3/4" diam o/a, tapped 10-32 x 3/8" d on ea end; per spec JAN-I-8.	Supports M105
E136		Same as E135.	Supports M105
E137		Not used.	
E138		Not used.	
E139	For replacement use SNSN N16-I-9817-199	INSULATOR, STANDOFF: round post shape; L-4 ceramic, white, glazed on sides; 3" lg x 1 1/4" diam; tapped 1/4"-20 x 5/8" d on ctr ea end, 2 holes 0.130" diam x 1/4" d on ea end 0.375" from ctr hole; Collins Rad (CR) part/dwg # 190 1189 00.	p/o C126 assembly
E140	N17-I-69175-7121	INSULATOR, STANDOFF: JAN type NS4W0206; round post shape; L-4 ceramic, white, glazed on sides, 3/4" lg x 1/2" diam, tapped 8-32 x 1/4" d at ea end; per spec JAN-I-8.	p/o C126 assembly
E141		Same as E140.	p/o C126 assembly
E142		Same as E135.	Tie point L121
E143		Same as E111.	Tie point

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinued

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
E144		Same as E111.	Tie point
E145	N17-I-69185-7111	INSULATOR, STANDOFF: JAN type NS4W0216; round post shape; L-4 ceramic, white, glazed on sides; 2" d x 1/2" diam, tapped 8-32 x 1/4" d at ea end; per spec JAN-I-8.	L119 coil support
E146		Same as E145.	L119 coil support
E147		Same as E145.	L120 coil support
E148		Same as E145.	L120 coil support
E149		Same as E145.	RF wire support
E150		Same as E135.	Support for L120 coil shorting switch
E151		Same as E135.	Support for L120 coil shorting switch
E152	⊕⊕	POST, SUPPORTING: Aluminum, 3 3/32" lg x 5/16" diam o/a; 6-32 NC-2 x 3/8" d hole on one end, 6-32 NC-2 x 1/4" d hole on opposite end; Collins Rad (CR) part/dwg # 506 6286 002.	Supports R151
E153	⊕	KNOB: round; black phenolic; for 11/32" diam shaft; 2 holes tapped 10-32 for setscrews; white indicator mark; 3" diam x 1 1/32" h o/a; brass insert removable skirt; Harry Davies Mold (DHM) part # 4109; Collins Rad (CR) part/dwg # 281 0075 00.	Power amplifier loading
E154		Same as E153.	Driver plate tuning
E155		Same as E153.	Loading coil switch
E156		Same as E153.	Power amplifier plate tuning
E157		Same as E153.	Band switch
E158		Same as E153.	Exciter tuning
E159	2Z5822-543 N16-K-700061-486	KNOB: bar; black bakelite; for 0.256" diam shaft; two 8-36 NF-2 tapped holes at 90 deg angle for shaft; one arrow marking; 1 1/8" lg x 0.750" wd x 11/16" d o/a; brass insert; 0.531" d shaft hole; Collins Rad (CR) part/dwg # 508 1103 20.	Low-voltage tune-operate
E160		Same as E159.	Channel selector
E161	‡	SUPPRESSOR, PARASITIC: resistor and coil; 3/4" lg x 0.4716" diam o/a; 5 turns # 16 AWG; resistor 22 ohms, 2 w; uncased; term mtd; 2 axial wire lead term; Collins Rad (CR) part/dwg # 505 5338 001.	V105 grid parasitic suppressor

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

For Radio Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
E162	N17-I-69167-6226	INSULATOR, STANDOFF: JAN type NS4W0116; cylindrical shape, L-4 ceramic, white, glazed on sides; 2" lg x 3/8" diam, tapped 6-32 x 3/8" d on ea end; per spec JAN-I-8.	Insulates 0120 from S106
E163	⊕⊕	INSULATOR, PLATE: flat, rectangular, glass-bonded mica; 6" lg x 2" wd x 1/4" thk; three 1/4" diam mtg holes on 2 5/8" mtg/c; Collins Rad (CR) part/dwg # 505 3272 002.	Support for J106
E164	N17-I-069180-7090	INSULATOR, STANDOFF: JAN NS4W0210 cylindrical pillar; grade L-4 ceramic white glaze on sides; 1.250" lg, 1/2" diam, tapped #8-32 x 3/8" d ea end; per spec JAN-I-8.	Harmonic filter
E165		INSULATOR: Same as E164.	Harmonic filter
E166 through E200		Not used.	
E201 through E213		Same as E101.	Tie point
E214		Same as E152.	Supports R220
E215 through E239		Not used.	
E240		Same as E123.	Supports R159
E241	⊕⊕	INSULATOR, PLATE: flat, rectangular; XXX natural phenolic; 2 1/4" lg x 2 1/4" wd x 1/8" thk; four 3/16" diam mtg holes spaced 1 3/4" c to c; one 5/16" diam shaft hole in ctr; Collins Rad (CR) part/dwg # 505 3436 002.	Insulator guide for C125 shaft
H240	⊕	POST, SPACING: aluminum; 1.5" lg x 5/16" hex; two 8-32 NC-2 x 3/8" d mtg holes on ea end; Collins Rad (CR) part/dwg # 500 6046 001.	Supports C240 and C241
H241		Same as H240.	Supports C240 and C241
H242	⊕	STUD: brass bright alloy pl; 2 1/2" lg x 1/4" diam o/a; one end threaded 2 5/32" lg w/ 10-32 thd; other end flattened 5/16" lg x 1/4" wd x 1/16" thk; Collins Rad (CR) part/dwg # 506 7995 002.	Adjusts tension on 0298
J101	2Z3062-167 N17-C-73108-1262	CONNECTOR, RECEPTACLE: JAN type UG 291/U; single round female cont; straight; 1 1/16" lg x 1 1/16" wd x 1 1/16" h o/a; cylindrical brass body threaded 3/8-32 NEF-2 for locking; teflon insert; cable opening 0.212" diam metal mtg fl w/ four 3-56 NF-2 tapped holes on .0500" x 0.500" mtg/c; per Navy dwg # RE49F246.	External signal input
*J102	‡	c/o J102A and J102B.	RF output connection of RF unit
J102A	N17-C-081523-4764	CONNECTOR, MALE: 1 round male cont; straight; brass, silver pl; 1 1/8" lg x 0.188" diam; thd one end 10-32 NF-2 x 11/16" lg; p/o J102; Collins Rad (CR) part/dwg # 505 3261 001.	

*Not replaceable as complete item, items J102A and J102B available.

TABLE 8-4. TABLE OF REPLACEMENT PARTS—Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
J102B	N17-C-084523-2429	CONTACT ASSEMBLY, COAXIAL: c/o one fl 2 5/8" OD x 1 5/8" ID x 5/8" h, 4 spring cont strips 15/16" lg x 5/8" wd x 0.016" thk w/ 3 fingers on each cont 3/16" wd x 5/16" lg silver pl brass; 2 5/8" diam x 5/8" h o/a; four 0.187" diam mtg holes spaced 90 deg on 1 3/32" rad; p/o J102; Collins Rad (CR) part/dwg # 505 3268 002.	
J103	2Z3072-7 N17-C-73615-4692	CONNECTOR, RECEPTACLE: 20 round male cont; straight; 1.937" lg x 0.750" wd x 0.406" thk less cont; 500 v AC RMS max at sea level; rectangular phenolic body; two 0.125" diam mtg holes spaced on 1.620" mtg/c; Amphenol (AMP) part # 26-806; Collins Rad (CR) part/dwg # 372 1069 00.	Wiring connections for RF unit
J104 J105		Not used.	
J106	N17-C-78537-7396	CONNECTOR, RECEPTACLE: one banana-type male cont; straight; nickel pl brass on copper; 1/2" hex head; 1 5/16" lg x 1/2" hex o/a; one 10-32 x 3/4" lg screw for mtg; Johnson EF (JON) type 77A; Collins Rad (CR) part/dwg # 361 2050 00.	Junction box high-voltage output
J107	N17-C-73115-8750	CONNECTOR, RECEPTACLE: Navy type 49551; one round female cont; straight; 2" lg x 2" wd x 1 1/2" d o/a; 52 ohm; 4 mtg holes 0.257" diam spaced 1.4375" on ctr; fits cables RG-17/U and RG-18/U; per Navy dwg # RE49F252; Collins Rad (CR) part/dwg # 357 9016 00.	RF output connection to antenna
J108 through J112		Not used.	
J113	2Z3081-10 N17-C-73323-3220	CONNECTOR, RECEPTACLE: 20 pol female cont; straight; 1 15/16" lg x 3/4" wd x 0.531" thk; 500 v AC RMS; 16 cont at 5 amp, 4 cont at 15 amp; rectangular phenolic body; phenolic insert; two 0.140" diam mtg holes spaced on 1.620" mtg/c; beryllium copper; silver pl term; Amphenol (AMP) part # 26-821; Collins Rad (CR) part/dwg # 372 1071 00.	Mates with P113 on cabinet frame
J114 through J200		Not used.	
J201	2Z3062-280 For replacement use SNSN N17-C-073108-2841	CONNECTOR, RECEPTACLE: 1 round female cont; straight; hex 1/2" across flats x 1 1/8" lg max; cylindrical Archoite body, nut and term brass, cad pl; body thd 3/8-32 NEF-1 for panel mtg; red head; Amer Rad Hdwe (ARH) type 711 (modified); Collins Rad (CR) part/ dwg # 360 0037 00.	Keyer unit input check point
J202		Same as J201.	Inverter check point
J203		Same as J201.	CW check point
J204		Same as J201.	FS check point
J205		Same as J103.	Keyer input connection
J206 through J210		Not used.	

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

For Radi Transmitting S t AN/FRT-24

Maj r Ass mbly: RF Ass mbly p/ Radio Transmitter T-440/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
J211	For replacement use SNSN N17-C-73291-4410	CONNECTOR, RECEPTACLE: 12 flat pol female cont; straight; $1\frac{9}{32}$" lg x $1\frac{1}{4}$" wd x $\frac{3}{4}$" d o/a; metal shell, black phenolic body; two 0.152" diam mtg holes on $1\frac{1}{4}$" mtg/c; Jones HB (JNS) part # S312AB-WI; Collins Rad (CR) part/dwg # 366 2120 00.	Mates with P211
J212	2Z3076-31 N17-C-73306-4215	CONNECTOR, RECEPTACLE: 15 pol female cont; straight; $1\frac{1}{2}$" lg x $\frac{3}{4}$" wd x 0.437" d less cont; 500 v AC; rectangular phenolic body; two 0.156" diam mtg holes on 1.188 mtg/c; Amphenol (AMP) part # 26-150; Collins Rad (CR) part/dwg # 372 1081 00.	Mates with P212
J213	N17-C-73288-1411	CONNECTOR, RECEPTACLE: 11 round pol female cont; straight; $1\frac{11}{64}$" lg x $\frac{3}{4}$" wd x 0.415" d less cont; 500 v AC, 2 large cont 15 amp, 9 small cont 5 amp; rectangular body and insert, two $\frac{1}{8}$" diam mtg holes on 0.864" mtg/c; Amphenol (AMP) part #26-820; Collins Rad (CR) part/dwg # 372 1076 00.	Mates with P213
J214 through J239		Not used.	
J240	N17-C-73323-2345	CONNECTOR, RECEPTACLE: 20 round female contacts; straight; $1\frac{11}{16}$" lg x $1\frac{3}{16}$" wd x 1" thk o/a; 7.5 amp current rotary, 750 v AC RMS voltage rating; rect black phenolic body, phosphor bronze, silver pl cont; Collins Rad part/dwg # 372 1089 00.	Connector on control head
J241	N17-C-73574-8919	CONNECTOR, RECEPTACLE: Navy type 49662; 12 rectangular male cont; straight; $1\frac{1}{4}$" lg x $1\frac{1}{2}$" wd x $1\frac{5}{32}$" thk o/a; 730 v RMS, rated voltage, 10 amp; 0.002 ohm avg cont resistance; rectangular molded bakelite body; 2 angle bkt mtd on sides, 2 holes $\frac{5}{32}$" diam; wax-impr cont retainer plate; Jones HB (JNS) part # P-312-AB; Collins Rad (CR) part/dwg # 365 2120 00.	Wiring connection to S240B
J242	2Z3035-31 N17-C-73593-5623	CONNECTOR, RECEPTACLE: 15 round male cont; straight; 1.500" lg x 0.750" wd x 0.320" thk less cont; 500 v AC RMS max at sea level; rectangular phenolic body; two 0.156" diam mtg holes on 1.188" mtg/c; Amphenol (AMP) part # 26-151; Collins Rad (CR) part/dwg # 372 1079 00.	Wiring connection to autotunes
J243	N17-C-73572-6454	CONNECTOR, RECEPTACLE: 11 round male cont; straight; 1.171" lg x 0.750" wd x 0.437" d o/a; 500 v AC RMS, large cont 15 amp, small cont 5 amp; rectangular phenolic body; two 0.156" diam mtg holes spaced 0.264" c to c; Amphenol (AMP) part # 26-804; Collins RAD (CR) part/dwg # 372 1074 00.	Wiring connection to motor relays
K101		Not used.	
K102	N17-R-64764-7313	RELAY, ARMATURE: silver cont; cont arr 1B (one normally closed contact); cont rating 230 v AC, max current 450 ma DC; 20 ohms nom coil resistance; approx $1\frac{7}{8}$" lg x $1\frac{5}{8}$" wd x 2" h o/a; 4-hole base mtg, 0.140" diam; fungus treated; manuf relay number and Collins part number stamped on; Auto Elec (AGX) type R83; Collins Rad (CR) part/dwg # 405 0606 00.	Power amplifier overload protection
K201	N17-R-64236-9805	RELAY, ARMATURE: silver cont; cont arr 5C (5 pole, double throw); cont rating 4C, 1 amp 115 v AC, 1C, 0.5 amp 230 v AC; 320 ohms nom coil resistance; approx $1\frac{3}{4}$" lg x $1\frac{5}{8}$" wd x $2\frac{1}{4}$" h o/a; fungus treated; manuf relay number and Collins part number stamped on; Auto Elec (AGX) type R83; Collins Rad (CR) part/dwg # 405 0612 00.	FSK-CW relay

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
K240	N17-R-99999-0814	RELAY, ARMATURE: silver cont, 7/32" min diam; cont arr 4C (4 pole, double throw), cont rating 10 amp 115 v AC resistive load; 2 3/8" lg x 2 1/8" wd x 1 15/16" h; base plate mtg tapped 6-32 NC-2, 4 holes; fungus treated; mfg number, Collins part number stamped on relay; Auto Elec (AGX) type R39; Collins Rad (CR) part/dwg # 405 0613 00.	Motor starting
K241		Same as K240.	Motor reversing
L101	N16-C-74714-8561	COIL, RF: choke; multiple sect duolateral wnd in 4 pies; unshielded; 2.5 mh, 0.125 amp, 50 ohms; 1 15/16" lg x 1/2" diam o/a; isolantite form; mtg hole 5/32" x 3/8" at one end; 2 brass cotter-pin term; Natl Co. (NAC) type R100S; Collins Rad (CR) part/dwg # 240 5300 00.	V101 cathode
L102	N16-C-74375-3813	COIL, RF: Navy type #47895; choke; 3 pie, duolateral wnd; unshielded; 1 mh, 300 ma, 10 ohms; 1 15/16" lg x 1/2" diam; ceramic form, air core; form 3/8" OD x 1 15/16" lg; single hole mtg, tapped 6-32 NC-2, 3/8" d; 2 cotter pin term; Natl Co. (NAC) type R300-S; Collins Rad (CR) part /dwg # 240 5800 00.	V102 plate
L103	3C323-192Q	COIL, RF: choke; single-layer wnd; unshielded; 34.0 mh, 145	V103 grid
	N16-C-73414-9937	max turns #35 AWG E copper wire; 1" lg x 0.270" diam o/a; phenolic form; two 1 1/2" term mtg; 2 axial wire lead term; fungi resistant; Jeffers Electronics (JFE) #CFI-140/351/4; Collins Rad (CR) part/dwg # 240 0010 00.	
L104		Same as L101.	V103 plate
L105	N16-C-075431-5021	COIL, RF: plate tank; single, single-layer wnd; unshielded; 15 turns # 18 AWG wire; approx 3 3/16" lg x 5/8" diam o/a; ceramic form, iron core; adj iron core; scdr adj through core; bushing mtg thd 3/8-32 NEF-2; 2 solder-lug term located on core; Collins Rad (CR) part/dwg # 505 3255 003.	V103 plate
L106	N16-C-75444-1755	COIL, RF; plate tank; single, single-layer wnd; unshielded; 20 turns #24 AWG wire; approx 3 3/16" lg x 5/8" diam o/a; ceramic form, iron core; adj iron core; scdr adj through core; bushing mtg thd 3/8-32 NEF-2; 2 solder-lug term located on core; Collins Rad (CR) part/dwg # 505 3256 003.	V103 plate
L107	N16-C-75398-1552	COIL, RF: plate tank; single, single-layer wnd; unshielded; 27 turns #24 AWG wire; approx 3 3/16" lg x 5/8" diam o/a; ceramic form, iron core; adj iron core; scdr adj through core; bushing mtg thd 3/8-32 NEF-2; 2 solder-lug term located on core; Collins Rad (CR) part/dwg # 505 3257 003.	V103 plate
L108	N16-C-75426-1653	COIL, RF: plate tank; single, single-layer wnd; unshielded; 36 turns #26 AWG wire; approx 3 3/16" lg x 5/8" diam o/a; ceramic form, iron core; adj iron core; bushing mtg thd 3/8-32 NEF-2; 2 solder-lug term located on core; Collins Rad (CR) part/dwg # 505 3258 003.	V103 plate
L109	N16-C-75364-8084	COIL, RF: plate tank; single, single-layer wnd; unshielded; 36 turns # 26 AWG wire; approx 3 3/16" lg x 5/8" diam o/a; ceramic form, iron core; adj iron core; scdr adj through core; bushing mtg thd 3/8-32 NEF-2; 2 solder-lug term located on core; Collins Rad (CR) part/dwg # 505 3259 003.	V103 plate
L110		Same as L101.	V104 plate

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

For Radi Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
L111	N16-C-075328-7931	COIL, RF: plate tank; single, single-layer wnd; unshielded; 6 turns #18 AWG wire; approx 3$\frac{3}{16}$" lg x $\frac{5}{8}$" diam o/a; ceramic form, iron core; adj iron core; scdr adj through core; bushing mtg thd $\frac{3}{8}$-32 NEF-2; 2 lug-type term located on core; Collins Rad (CR) part/dwg # 505 3253 003	V104 plate
L112	N16-C-075298-1147	COIL, RF: plate tank; single, single-layer wnd; unshielded; 9 turns # 18 AWG wire; approx 2$\frac{3}{8}$" lg x $\frac{5}{8}$" diam o/a; ceramic form, iron core; adj iron core; scdr adj through core; bushing mtg thd $\frac{3}{8}$-32 NEF-2; 2 solder-lug term located on core; Collins Rad (CR) part/dwg # 505 3254 003.	V104 plate
L113		Same as L101.	V105 grid
L114	N16-C-076507-3408	COIL, RF: choke; single, single-layer wnd; unshielded; 500 ma current rating; 0.22704 ohm DC resistance; approx 3$\frac{51}{64}$" lg x $\frac{1}{2}$" diam excluding term; ceramic form and core; form 2$\frac{1}{2}$" lg x $\frac{3}{8}$" diam; axial mtg hole one end tapped 8-32, $\frac{3}{8}$" d; 2 solder-lug term, one ea end of coil form, Collins Rad (CR) part/dwg # 505 3247 002.	V105 plate
L115	N16-C-075417-9100	COIL, RF: tank coil; single, single-layer wnd; unshielded; 16 turns # 12 AWG wire; approx 3" lg x 1.1616" diam excluding term; air core; mtd by 2 term, solder-lug type, one ea end; 2 solder-lug term, one ea end, 3 taps, at 2nd 4th, and 8th turn; Collins Rad (CR) part/dwg # 505 3640 002.	V105 plate
L116	N16-C-072369-4471	COIL, RF: plate tank; single, single-layer wnd; unshielded; approx 30 turns #22 AWG wire; approx 3" lg x 1" diam excluding term; ceramic form, air core; 2 mtg holes ea end tapped 6-32, $\frac{1}{2}$" d; 2 solder-lug term located on side spaced 2$\frac{1}{2}$" on ctr; Collins Rad (CR) part/dwg # 505 3249 002.	V105 plate
L117	N16-C-071795-2246	COIL, RF: plate tank; single, single-layer wnd; unshielded; 48 turns #22 AWG wire; approx 3" lg x 1" diam excluding term; ceramic form, air core; form 3" lg x 1" diam; 2 mtg holes ea end tapped 6-32, $\frac{1}{2}$" d; 2 solder-lug term located on side spaced 2$\frac{1}{2}$" on ctr; Collins Rad (CR) part/dwg # 505 3248 002.	V105 plate
L118		Not used.	
L119	N16-C-076598-8176	COIL, RF: single, single-layer wnd; 84 turns #22 DE wire; wnd at 24 turns per inch over a 1" OD ceramic coil form; approx 50μh at 2 amp DC; unshielded; o/a dimensions w/ standoff, 7$\frac{3}{4}$" lg x 3$\frac{1}{2}$" h x 1 OD; mtd by ceramic standoff 2" lg x $\frac{1}{2}$" diam; 2 solder-lug terms, one at each end of coil form; Collins Rad (CR) part/dwg # 505 3244 002.	V106 plate
L120	N16-C-73823-5960	REACTOR, RF: choke; 2 ceramic standoffs 2$\frac{1}{4}$" lg x $\frac{1}{2}$" diam; 2-sect solenoid, center tapped; #24 copper wire; unshielded; approx 150 turns; 120 μh at 1000 cps; 8" lg x 1" diam o/a incl supports and contacts which have o/a h of 4$\frac{1}{2}$"; steatite form; wnd covers 7" on the 1" diam form; 2 tapped holes 6$\frac{1}{2}$" c to c; one solder lug each end; 3 sw button cont, 1 ea end and 10 ctr; Collins Rad (CR) part/dwg # 505 3245 002.	V106 plate
L121	N16-C-071986-3584	COIL, RF: choke; single-layer wnd; unshielded; 500 ma current rating; 0.22704 ohm DC resistance; approx 2$\frac{23}{32}$" lg x $\frac{1}{2}$" OD excluding term; ceramic form and core; form 2$\frac{1}{2}$" lg x $\frac{1}{2}$" OD; 2 axial holes for mtg, tap $\frac{3}{8}$" d 8-32; 2 solder-lug term, one ea end; Collins Rad (CR) part/dwg # 505 5335 002.	V106 plate
L122	N16-C-071581-8820	COIL, RF: choke; single wnd, single layer wnd; unshielded; 161 turns of enamel covered copper #30 AWG wire; 3$\frac{5}{8}$" lg x $\frac{9}{16}$" OD o/a; ceramic form and core; mts by two $\frac{7}{8}$" lg, w/ $\frac{5}{64}$" diam hole solder lug term; 2 solder lug term; Collins Rad (CR) part/dwg # 540 2944 002.	Static drain

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radio Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
L123	N16-C-076350-2826	COIL, RF: plate tank; single, single-layer wnd; unshielded; 3 turns soft copper tubing, 3/8" OD x 1/32" wall thk; approx 4 5/16" lg x 2 3/4" wd x 4 7/32" h o/a; air core; term mtg by two 0.218" diam holes, one located ea end of copper tubing; Collins Rad (CR) part/dwg # 505 3644 003.	V106 plate
L124	N16-C-076478-2964	COIL, RF: plate tank; single, single-layer wnd; unshielded; 4 turns soft copper tubing, 3/8" OD x 1/32" wall thk; approx 3 5/32" lg x 2 3/4" wd x 4 27/32" h o/a; air core; term mtg by three 0.218" diam holes; Collins Rad (CR) part/dwg # 505 3645 003.	V106 plate
L125	N16-C-075351-9744	COIL, RF: plate tank; single, single-layer wnd; unshielded; 16 turns soft copper tubing 1/4" OD x 1/32" wall thk; approx 6 3/8" lg x 3 1/8" wd x 4 11/16" h o/a; air core; term mtg by 4 solder lugs, one ea end, one on 6th turn, and one on 11th turn; Collins Rad (CR) part/dwg # 505 3646 003.	V106 plate
L126	N16-C-072452-1374	COIL, RF: plate tank; single, single-layer wnd; unshielded; 30 turns # 10 AWG wire; 6" lg x 2 1/2" diam excluding term; isolantite form, air core; 2 large solder-lug type term for mtg, one ea end, 2 leads w/ lug term, one tapped at 6th turn, one tapped at 11th turn; Collins Rad (CR) part/dwg # 505 3260 003.	V106 plate
L127	N16-C-072834-8797	COIL, RF: plate tank; single, single-layer wnd; unshielded; 22 3/4 turns soft copper tubing 3/16" OD x 1/32" wall thk; approx 7 5/16" lg x 2 1/16" wd x 4 3/32" h o/a; air core; term mtg by 7 solder lugs; Collins Rad (CR) part/dwg # 505 3650 003.	L network
L128	N16-C-071936-8204	COIL, RF: plate tank; single, single-layer wnd; unshielded; 22 turns #12 AWG wire; approx 5" lg x 2 1/8" diam excluding term; isolantite form, air core; form 5" lg x 2" OD; 4 holes 3/16" d ea end for mtg, spaced 90 deg apart on ctr; 2 stud type term located on front side, 4 solder-lug taps; Collins Rad (CR) part/dwg # 505 3252 003.	L network
L129		Same as L114.	Thermocouple
L130	N17-R-99999-816	REACTOR, FILTER: 10 hy at 0.040 amp DC; 475 ohms nom resistance; 25,000 v RMS test; HS metal case; 2.370" lg x 2 1/8" wd x 2 11/16" h excluding term; six 0.190" diam mtg holes, 3 ea end, 0.500" on ctr; 2 solder-lug term on bottom; Chi Trans (CHT) part # RS-1540; Collins Rad (CR) part/dwg # 678 0410 00.	Filter
L131		Same as L102.	V105 plate
L132		Same as L102.	V106 screen
L133		Same as L114.	Thermocouple
L134	⊕⊕	COIL, RF: choke; single wnd; unshielded; 0.2 μh inductance, 3 RH or LH turns of copper #10 AWG wire; 1" OD x 3" lg o/a; air wound; 3/4" ID coil; mts by two 27/32" lg x 0.198" ID solder lug term; 2 solder lug term, one on ea end; Collins Rad (CR) part/dwg # 540 2943 002.	Harmonic filter
L135	⊕⊕	COIL, RF: choke; single wnd; unshielded; 0.24 μh inductance; four RH or LH turns of tinned copper #10 AWG wire; 1" OD x 3 1/2" free lg; air wound; 3/4" ID coil; mts by two 27/32" lg w/ 0.198" ID hole solder lug term; 2 solder lug term, one on ea end; Collins Rad (CR) part/dwg # 540 2941 002.	Harmonic filter

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
L136	⊕⊕	COIL, RF: choke; single wnd; unshielded; 0.2 μh inductance; three RH or LH turns of tinned copper #10 AWG wire; 1" OD x 2¾" free lg; air wound; ¾" ID coil; mts by two 27/32" lg w/ 0.198" ID hole solder lug term; 2 solder lug term, one on ea end; Collins Rad (CR) part/dwg # 540 2942 002.	Harmonic filter
M101	M17-M-19624-4251	METER, AMMETER: DC milliammeter; range 0 to 50 ma DC; rectangular phenolic, flush mtg case; 2¾" diam x 1⅜" d beyond fl, fl 3" wd x 3⅛" h x 13/64" thk; ±2% accuracy for full-scale reading; D'Arsonval movement; calibrated for non-magnetic panel; 50 scale divisions, black markings on white background; 4-36 NS-2, 4 studs; ¼-28 NF-2, 2 stud term; Simpson Elec (SIC) type 27B; Collins Rad (CR) part/dwg # 450 0084 00.	V105 grid circuit
M102	N17-M-19769-4326	METER, AMMETER: DC milliammeter; range 0 to 250 ma DC; rectangular phenolic flush mtg case; 2¾" diam x 1⅜" d beyond fl, fl 3" wd x 3⅛" h x 13/64" thk; ±2% accuracy for full-scale reading; D'Arsonval movement; calibrated for non-magnetic panel; 50 scale divisions, black markings on white background; 4-36 NS-2, 4 studs; ¼-28 NF-2, 2 stud term; Simpson Elec (SIC) type 27B; Collins Rad (CR) part/dwg # 450 0089 00.	V105 plate current
M103	N17-M-19682-4326	METER, AMMETER: DC milliammeter; range 0 to 100 ma DC; rectangular phenolic flush mtg case; 2¾" diam x 1⅜" d beyond fl, fl 3" wd x 3⅛" h x 13/64" thk; ±2% accuracy for full-scale reading; D'Arsonval movement, calibrated for non-magnetic panel; 50 scale divisions, black markings on white background; 4-36 NS-2, 4 studs; ¼-28 NF-2, 2 stud term; Simpson Elec (SIC) type 27B; Collins Rad (CR) part/dwg 450 0086 00.	V106 grid current
M104	N17-M-18291-1951	METER, AMMETER: RF; range 0 to 1 ma DC; rectangular bakelite flush mtg case; 2¾" diam x 1⅜" d beyond fl, fl 3" lg x 3⅛" wd x 13/64" thk; ±2% accuracy for full-scale reading; D'Arsonval movement; calibrated for non-magnetic panel; 15 scale divisions, black markings on white background; operates from 30 mv thermocouple w/ 0.25-ohm line; 4-36 NS-2, 4 studs; two ¼-28 NF-2 studs; expanded scale; Simpson Elec (SIC) type 37B; Collins Rad (CR) part/dwg # 457 0010 00.	Antenna current
M105	N17-M-19943-4351	METER, AMMETER: DC milliammeter; range 0 to 1000 ma DC; rectangular phenolic flush mtg case; 2¾" diam x 1⅜" d beyond fl, fl 3" wd x 3⅛" x 13/64" thk; ±2% accuracy for full-scale reading; D'Arsonval movement; calibrated for non-magnetic panel; 50 scale divisions, black markings on white background; 4-36 NS-2, 4 studs; ¼-28 NF-2, 2 stud term; Simpson Elec (SIC) type 27B; Collins Rad (CR) part/dwg # 450 0093 00.	V106 plate current
O101	†	GEAR, SPUR: brass, bright alloy pl; capacitor drive; straight teeth; 60 teeth; 24 pitch, 2½" pitch diam; 219/32" OD, ¼" bore, ⅝" thk o/a; straight face; hub 1" OD, extends 7/16" beyond face of gear; shaft mtd; Collins Rad (CR) part/dwg # 505 3615 002.	Drives C135A and C135B
O102		Same as O101.	Drives C136A and C136B
O103	†	GEAR, SPUR: brass, bright alloy pl; capacitor drive; straight teeth; 60 teeth; 24 pitch, 2½" pitch diam; 219/32" OD, ½" bore, ⅝" thk o/a; straight face; hub 1" OD, extends 7/16" beyond face of gear; shaft mtd; Collins Rad (CR) part/dwg # 505 3616 002.	Drives O101

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
O104	⊕	BEARING, SLEEVE: bearing for gear shaft; oilite bronze; 0.502" OD x 5/16" ID x 5/8" lg; Amplex (AXD) type A-504; Collins Rad (CR) part/dwg # 309 0033 00.	Bearing for O105
O105	⊕⊕	SHAFT: for gear bearing; passivated SS; 5/16" OD x 0.203" ID x 0.640" lg; Collins Rad (CR) part/dwg # 505 3514 001.	Mounting for O103
O106	⊕	NUT, SQUARE: SS; 10-24 NC-2 thd; 3/16" thk; 1" wd across flats; Collins Rad (CR) part/dwg # 505 3515 001.	Nut for O105
O107	⊕	BEARING, SLEEVE: bearing for shaft; oilite bronze; 0.440" OD x 5/16" ID x 1 1/64" lg; shoulder 9/16" OD x 3/64" thk; Amplex (AXD) type F-432; Collins Rad (CR) part/dwg # 309 0130 00.	Bearing for O122
O108	†	GEAR, SPUR: brass, bright alloy pl; sw drive; straight teeth; 32 teeth; 24 pitch, 1.333" pitch diam; 1 15/32" OD, 5/16" bore, 1/2" thk o/a; straight face; hub 5/8" OD, extends 5/16" beyond face of gear; shaft mtd; Collins Rad (CR) part/dwg # 505 3479 001.	Drives O137
O109	†	SLEEVE, RACK GUIDE: passivated SS; 0.445" lg x 0.312" OD x 0.250" ID; Collins Rad (CR) part/dwg # 505 3478 001.	Bearing for O110
O110	†	ROLLER, GUIDE: porous bronze; for guiding rack; pulley shape; 3/4" OD, 5/16" bore, 0.421" thk; outer edge of roller has groove 0.266" wd x 0.101" d; shaft mtd; Collins Rad (CR) part/dwg # 505 3613 002.	Support for O137
O111		Same as O107.	Bearing for O112
O112	⊕⊕	SHAFT: passivated SS; switch drive; 6 11/16" lg x 0.310" diam o/a; 1/16" wd x 0.075" d groove 1/4" from one end; Collins Rad (CR) part/dwg # 505 3905 001.	Drives O113
O113	N17-C-98378-3818	COUPLING, FLEXIBLE: ins type; nickel pl brass and bakelite; for 1/4" shaft mtg; 1 1/16" diam x 37/64" lg o/a; secured by set-screw each end; Natl Co. (NAC) type TX-10; Collins Rad (CR) part/dwg # 015 3000 00.	Drives S103
O114		Same as O107.	Bearing for O112
O115	†	GEAR, SPUR: brass, bright alloy pl; turns shaft; straight teeth; 72 teeth; 24 pitch, 3" pitch diam; 3 1/8" OD, 5/16" bore, 5/8" thk o/a; straight face; hub 3/4" OD, extends 7/16" beyond face of gear; shaft mtd; Collins Rad (CR) part/dwg # 505 2762 002.	Drives O112
O116		Same as O107.	Bearing for O122
O117		Same as O108.	Drives O120 rack
O118		Same as O109.	Bearing for O119
O119		Same as O110.	Supports O120.
O120	†	RACK, GEAR: brass, bright alloy; rectangular bar shape with gear teeth on each side at various positions; 18" x 3/8" wd x 1/4" thk; one 6-32 NC-2 hole at one end; Collins Rad (CR) part/dwg # 505 3451 002.	Drives O138 and O115 and operates S106

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
O121		Same as O113.	Drives O122
O122	⊕⊕	SHAFT: brass, bright alloy pl; for rotary sw; solid rod shape; 7⅜" lg x ¼" diam; Collins Rad (CR) part/dwg # 505 3911 002.	Drives O123
O123		Same as O113.	Drives O124.
O124	⊕⊕	SHAFT: switching; XXX natural phenolic; solid rod shape; 4" lg x ¼" diam o/a; 2 sides flatted 0.032" entire length of shaft; Collins Rad (CR) part/dwg # 504 1482 002.	Drives S101
O125		Same as O113.	Drives C114A and C114B
O126	⊕⊕	SPRING: flat type; for rack loading; 20 ga beryllium copper; 2⅞" lg x 1" wd x ⅜" h; two 0.171" diam mtg holes on ⅝" mtg/c; Collins Rad (CR) part/dwg # 505 3225 002.	Provides pressure against O128
O127	⊕⊕	SHAFT: gear rack guide; SS; 1⁵⁄₁₆" lg x ⁵⁄₁₆" diam o/a; one side flatted on each end ⁵⁄₃₂" lg x ¹⁄₁₆" d; Collins Rad (CR) part/dwg # 505 3614 002.	Mounting for O128
O128		Same as O110.	Supports O132
O129		Same as O126.	Provides pressure against O131.
O130		Same as O127.	Mounting for O131
O131		Same as O110.	Provides a tension support for O132
O132	†	RACK, GEAR: brass, bright alloy pl; rectangular bar shape with gear teeth on one side; 19¾" lg x ¼" wd x ¼" thk; Collins Rad (CR) part/dwg # 505 3617 002.	Drives O102 and O103
O133		Same as O110.	Supports O120
O134		Same as O109.	Bearing for O133
O135		Same as O110.	Supports O137
O136		Same as O109.	Bearing for O135
O137	†	RACK, GEAR: brass, bright alloy pl; rectangular bar shape with gear teeth on parts of both sides; 17" lg x ⅜" wd x ¼" thk; Collins Rad (CR) part/dwg # 505 3453 002.	Drives O140
O138		Same as O115; p/o S104.	Used with O139 to drive S104
O139	∅	SHAFT: passivated SS; coil switching; 8¼" lg x 0.3110" diam; p/o S104; Collins Rad (CR) part/dwg # 505 2767 002.	Drives S104 coil switch
O140	∅	GEAR, SPUR: brass, bright alloy pl; drives coil switch; 64 teeth; 24 pitch, 2.667" pitch diam; 2¹³⁄₁₆" OD, ⁵⁄₁₆" bore, ⅝" thk o/a; straight face; hub ¾" OD, extends ⁷⁄₁₆" beyond face of gear; shaft mtd; p/o S105; Collins Rad (CR) part/dwg # 505 2752 002.	Used with O141 to drive S105

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O141	∅	SHAFT: switching; passivated SS; 4⅝″ lg x 0.3110″ diam; p/o S105; Collins Rad (CR) part/dwg ⁎ 505 2753 002.	Drives S105
O142	†	GEAR, SPUR: passivated SS; capacitor drive; 80 teeth; 60 pitch, 0.833″ pitch diam; 13/16″ OD, 3/16″ bore, 11/32″ thk o/a; straight face; hub ½″ OD, extends 5/32″ beyond face of gear; shaft mtd; Collins Rad (CR) part/dwg ⁎ 505 3470 001.	Drives O144
O143	3H305-23 GM3110-155-9601	BEARING, BALL: single row axial; double shielded; extra light; ½″ OD, 3/16″ bore, 0.196″ wd; seven 3/32″ balls; WS-429 grease; std fit; ABEC-3 tol; ND (ND) type 77R3; Collins Rad (CR) part/dwg ⁎ 309 0002 00.	Bearing for O144
O144	†	GEAR, SPUR: passivated SS: capacitor drive; 30 teeth; 96 pitch, 5/16″ pitch diam; 11/32″ OD, 3/16″ thk; straight face; hub shaft 3/16″ OD, extends ½″ and 13/16″ beyond each gear face respectively; one end of shaft slotted 0.046″ wd x 3/32″ d; Collins Rad (CR) part/dwg ⁎ 505 3471 001.	Drives O156
O145		Same as O143.	Bearing for O238
O146		Same as O143.	Bearing for O144
O147	⊕	BEARING, SLEEVE: oilite bronze; for shaft; 0.381″ OD x ¼″ ID x 3/16″ lg, shoulder ½″ OD x 1/16″ thk; Amplex (AXD) type F310; Collins Rad (CR) part/dwg ⁎ 309 0083 00.	Bearing for O148
O148	⊕⊕	SHAFT: gear; passivated SS; 115/16″ lg x ¼″ diam; Collins Rad (CR) part/dwg ⁎ 505 3228 002.	Drives O150
O149	†	GEAR, SPUR: brass, bright alloy pl; drives gear rack; 32 teeth; 24 pitch, 1.333″ pitch diam; 115/32″ OD, ¼″ bore, ½″ thk o/a; straight face; hub ¾″ OD, extends 5/16″ beyond face of gear; shaft mtd; Collins Rad (CR) part/dwg ⁎ 505 3226 002.	Drives O148
O150		Same as O149.	Drives O132
O151		Same as O147.	Bearing for O148
O152		Same as O126.	Provides pressure against O154
O153	⊕⊕	SHAFT: rotary switch; cad pl steel; 97/8″ lg x ¼″ wd x 3/16″ thk o/a; Collins Rad (CR) part/dwg ⁎ 269 3403 00.	Mounting for O154
O154		Same as O110.	Supports O132
O155	†	RACK, GEAR: brass, bright alloy pl; rectangular bar shape with gear teeth on parts of both sides; 10½″ lg x ¼″ wd x ¼″ thk; Collins Rad (CR) part/dwg ⁎ 505 3452 002.	Drives O149
O156	†	DRIVE, CAPACITOR: c/o SS stud, rod, and gear rack; 6″ lg x ¼″ wd x 7/32″ d; thd 6-32 NC-2 x ¾″ lg on one end, gear rack on opposite end; Collins Rad (CR) part/dwg ⁎ 505 3381 001.	Varies C134
O157	N16-P-324000-101	DUCT, AIR: directs cooling air; glass; cylindrical shape; 73/8″ h x 6⅛″ diam with 3¼″ diam hole in top; mts in metal clips on chassis; Collins Rad (CR) part/dwg ⁎ 192 1023 00.	Air duct for V106

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O158	†	TAPE: for spring anchor; beryllium copper, bright alloy pl; 4½" lg x ¼" wd x 004." thk; 2 anchor holes 0.096" diam located on ends; Collins Rad (CR) part/dwg # 506 8377 002.	Anchor for O298
O159 through O161		Not used.	
O162	⊕	LATCH, FASTENER: flush mtg, trigger action; SS; 2.660" lg x 1.438" wd x ¾" thk; mts by four 0.098" diam holes spaced 1.062" x 1.125"; Hartwell Co. part # H-4600-125-250; Collins Rad (CR) part/dwg # 015 0296 00.	Access door fastener
O163		Same as O162.	Access door fastener
O164		Same as O162.	Access door fastener
O165	⊕	PIN, CHAIN COUPLING: SS; oval shaped body; ¼" lg x 3/32" wd x 1/16" thk; fl head; Collins Rad (CR) part/dwg # 233 3030 00.	Couples ends of O272 chain
O166		Same as O165.	Couples ends of O273 chain
O167		Same as O165.	Couples ends of 0274 chain
O168 O169		Not used.	
O170	∅	SHAFT ASSEMBLY, AUTOTUNE STOP-RING: c/o shaft, stop-rings, spacers, clutch, gear; SS and brass; 4½" lg x 1⅝" diam o/a; mtd by shaft bearings; p/o O286; Collins Rad (CR) part/dwg # 505 2370 003.	Driving member of autotune
O171	∅	PAWL ASSEMBLY, RACHET: drives cam drum; c/o gear, bearing, rachet; bronze and SS; 1 7/32" lg x 0.687" OD o/a; mtd on shaft; p/o O286; Collins Rad (CR) part/dwg # 503 7821 002.	Drives cam drum
O172	∅	PLATE ASSEMBLY, FRONT: c/o plate bearing, bearing race, locknut, stop-bar; SS; bronze, aluminum; 2⅞" lg x 1.740" wd x 1 1/32" thk o/a; mtd by four ¼" diam holes on 1.206" x 2¼" x 1.064" mtg/c; p/o O286; Collins Rad (CR) part dwg/# 503 7819 002.	Front mounting plate
O173	∅	PLATE ASSEMBLY, REAR: c/o plate, bearing race, locknut, cam idler; SS, bronze; 3.041" lg x 1.740" wd x 1 1/32" thk o/a; mtd by four ¼" diam holes on 1.064" x 2½" mtg/c; p/o O286; Collins Rad (CR) part/dwg # 503 7822 002.	Rear mounting plate
O174	∅	PAWL ASSEMBLY, SPRING: c/o shaft, 10 springs, spring anchor, 10 stop-ring pawls, spacers; SS; 2.556" lg x 1⅛" wd x 1.687" h o/a; mtd by shaft bearings; p/o 0286; Collins Rad (CR) part/dwg # 502 1959 002.	Stopping member of autotune
O175	∅	DRUM, CAM: pawl selector; bronze casting; 0.970" lg x ¾" diam; mtd on shaft; p/o O286; Collins Rad (CR) part/dwg # 503 1165 003.	Selects different pawls

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radio Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
O176	Ø	BEARING, BALL: single row radial; plain; 0.310″ ID, 0.485″ OD, 0.152″ wd; 6 balls, SS retainer; oil-dipped; std fit; ABEC-1 std tol; open-type construction; p/o O286; BCA (BCA) type 149; Collins Rad (CR) part/dwg # 309 0010 00.	Rear bearing for shaft assembly
O177	Ø	BEARING, BALL: single row radial; plain; 0.425″ ID, 0.600″ OD, 0.125″ wd; 9 balls, brass retainer; oil-dipped; std fit; ±0.00005″ diam tol; open-type construction; self-aligning; p/o O286; Nice (NI) part # 6288; Collins Rad (CR) part/dwg # 309 0011 00.	Front bearing for shaft assembly
O178	Ø	BAR ASSEMBLY, LOCKING: stop-ring stack lock; c/o locking screw, wing cap; 2⅛″ lg x 1″ wd x 5⁄16″ thk o/a; p/o O286; Collins Rad (CR) part/dwg # 502 1829 002.	Locks and unlocks stop-rings
O179	Ø	SHAFT ASSEMBLY, AUTOTUNE STOP-RING: c/o shaft, stop-rings, spacers, clutch, gear; SS, brass; 4½″ lg x 1⅝″ diam o/a; mtd by shaft bearings; p/o O285; Collins Rad (CR) part/dwg # 505 2371 003.	Driving member of autotune
O180		Same as O171; p/o O285.	Drives cam drum
O181		Same as O172; p/o O285.	Front mounting plate
O182		Same as O173; p/o O285.	Rear mounting plate
O183		Same as O174; p/o O285.	Stopping member of autotune
O184		Same as O175; p/o O285.	Selects different pawls
O185		Same as O176; p/o O285.	Rear bearing for shaft assembly
O186		Same as O177; p/o O285.	Front bearing for shaft assembly
O187		Same as O178; p/o O285.	Locks and unlocks stop-rings
O188 through O207		Not used.	
O208	†	COLLAR, SHAFT: for spacing; brass, bright alloy pl; ⅜″ OD, 3⁄16″ ID, 3⁄16″ thk; Collins Rad (CR) part/dwg # 505 3417 002.	Retainer for O210
O209		Same as O208.	Retainer for O211
O210	3H305-212 GM77-B-411-00301-0000	BEARING, BALL: single row axial; plain; light duty; 0.189″ bore, 0.437″ OD, 0.185″ wd; 9 balls; low temp grease; std fit; ABEC-1 std tol; separable, 1 bearing, 2 thrust rings; Boston Gear (BGW) type A-01; Collins Rad (CR) part/dwg # 500 2122 002.	Thrust bearing for O281

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O211		Same as O210.	Thrust bearing for O281
O212		Same as O210.	Thrust bearing for O280
O213		Same as O210.	Thrust bearing for O280
O214	†	WICK: lubricating; SAE F-1 felt, w/ out spring; ¾" lg x 15/32" wd x 11/32" thk; Collins Rad (CR) part/dwg # 502 6542 002.	Lubricates O249
O215		Same as O214.	Lubricates O250
O216		Same as O214.	Lubricates O251
O217		Same as O214.	Lubricates O252
O218		Same as O214.	Lubricates O253
O219		Same as O214.	Lubricates O254
O220		Same as O214.	Lubricates O255
O221	⊕⊕	SHAFT: for capacitor drive; passivated SS; 5 11/16" lg x ¼" diam; Collins Rad (CR) part/dwg # 505 3910 002.	Drives O125
O222		Same as O110.	Guides rack O155
O223		Same as O127.	Mounting for O222
O224	⊕⊕	CLAMP: shaft; brass, bright alloy pl; 1 Bristo screw employed; 1" lg x 21/32" wd x ¼" thk excluding special pin; accom ¼" shaft; special pin ⅜" lg x 0.095" diam mtd on one side; Collins Rad (CR) part/dwg # 505 3379 002.	O284 drive-shaft clamp
O225		Same as O224.	O287 drive-shaft clamp
O226		Same as O224.	O290 drive-shaft clamp
O227		Same as O224.	O289 drive-shaft clamp
O228		Same as O224.	O288 drive-shaft clamp
O229	⊕⊕	CLAMP: shaft; SS; 1 Bristo setscrew employed; 15/32" lg x 11/16" wd x ¼" thk o/a; accom ¼" shaft; one end slotted; Collins Rad (CR) part/dwg # 505 3432 001.	Couples with O224
O230		Same as O229.	Couples with O225
O231		Same as O229.	Couples with O226

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O232		Same as O229.	Couples with O227
O233		Same as O229.	Couples with O228
O234		Same as O229.	Couples with O234
O235		Same as O113.	Couples C114 to O221
O236	†	SPROCKET, CHAIN: passivated SS; 0.937" OD, 3/8" thk, 0.313" bore; hub 11/16" OD, extends 15/64" beyond side of teeth; shaft mtd; 16 teeth; Collins Rad (CR) part/dwg # 505 3413 002.	Drives chain O274
O237	†	COLLAR, SHAFT: for spacing; brass, bright alloy pl; 1/2" OD, 1/4" ID, 1/4" thk; two 8-36 NF-2 holes for setscrew mtg; Collins Rad (CR) part/dwg # 505 3455 002.	Spacing collar on O238
O238	†	GEAR ASSEMBLY: capacitor drive; c/o 1 Collins Rad part/dwg # 505 7997 002 gear, one part/dwg # 505 3472 001 shaft, and one part/dwg # 505 3475 003 cam; 3 3/4" lg x 1 1/4" wd x 1" h o/a; Collins Rad (CR) part/dwg # 505 3473 001.	Drives O142
O239	†	SHAFT: for gear drive; passivated SS; 16 3/8" lg x 5/16" diam; slot 1/16" wd x 1/64" d, cut 5/16" from one end; Collins Rad (CR) part/dwg # 505 3477 001.	Drives O117
O240	†	BEARING, SLEEVE: for autotune shaft; oilite bronze bearing encased in SS sleeve; 0.345" OD, 3/16" ID, 1/4" lg o/a; Collins Rad (CR) part/dwg # 502 0912 002.	1st bearing for O280
O241		Same as O240.	2nd bearing for O280
O242		Same as O240.	3rd bearing for O280
O243		Same as O240.	4th bearing for O280
O244		Same as O240.	5th bearing for O280
O245		Same as O240.	1st bearing for O281
O246		Same as O240.	2nd bearing for O281
O247		Same as O240.	3rd bearing for O281
O248		Same as O240.	4th bearing for O281
O249	†	GEAR, WORM: cad pl steel; autotune drive; helical teeth; RH; single lead; 32 pitch, 0.433" pitch diam; 1/2" OD, 3/16" bore, 7/8" lg; straight face; hub 0.290" OD, extends 1/4" beyond face of gear; shaft mtd; Collins Rad (CR) part/dwg # 502 6472 002.	Drives O285 autotune

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O250		Same as O249.	Drives O286 autotune
O251		Same as O249.	Drives O288 autotune
O252		Same as O249.	Drives O289 autotune
O253		Same as O249.	Drives O290 autotune
O254		Same as O249.	Drives O287 autotune
O255	†	GEAR, WORM: cad pl steel; control drive; helical teeth; LH; single lead; 32 pitch, 0.433" pitch diam; ½" OD, 3/16" bore, 7/8" lg; straight face; hub 0.290" OD, extends ¼" beyond face of gear; shaft mtd; Collins Rad (CR) part/dwg # 505 3443 002.	Drives O284 control
O256	†	HOLDER, WICK: aluminum; rectangular shape w/ angle bkt; 19/32" lg x 17/32" wd x 13/32" h o/a; one 5/32" mtg hole on bkt end; Collins Rad (CR) part/dwg # 502 6913 002.	Holder for O214
O257		Same as O256.	Holder for O215
O258		Same as O256.	Holder for O216
O259		Same as O256.	Holder for O217
O260		Same as O256.	Holder for O218
O261		Same as O256.	Holder for O219
O262		Same as O256.	Holder for O220
O263	† 34330-150	BEARING, SLEEVE: for autotune shaft; oilite bronze bearing encased in SS sleeve; 0.4392" OD x 0.251" ID x 3/16" lg o/a; Collins Rad (CR) part/dwg # 505 0596 002.	Bearing for O291 shaft
O264		Same as O263.	Bearing for O293
O265		Same as O263.	Bearing for O291 shaft
O266		Same as O263.	Bearing for O2983
O267	†	BEARING, SLEEVE: for autotune shaft; oilite bronze bearing encased in SS sleeve; 0.4392" OD x 0.251" ID x ¼" lg; Collins Rad (CR) part/dwg # 506 7988 002.	Bearing for O238
O268		Same as O267.	Bearing for O221
O269		Same as O267.	Bearing for O294

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
O270	†	BEARING, SLEEVE: for autotune shaft; oilite bronze bearing encased in SS sleeve; 0.502" OD x 5/16" ID x 3/8" lg o/a; Collins Rad (CR) part/dwg # 506 7990 002.	Bearing for O299
O271		Same as O270.	Bearing for O239
O272	†	CHAIN: side-flanged silent link; 5/16" lg x 7/32" cross section; SS; 38 links o/a lg; stamped construction; endless; Collins Rad (CR) part/dwg # 233 3020 00 (38 links).	Connecting chain from B240 to O276
O273	‡	CHAIN: side-flanged silent link; 5/16" lg x 7/32" cross section; SS; 32 links o/a lg; stamped construction; endless; Collins Rad (CR) part/dwg # 233 3020 00 (32 links).	Connecting chain from O276 to O277
O274	†	CHAIN: side-flanged silent link; 5/16" lg x 7/32" cross section; SS; 44 links o/a lg; stamped construction; endless; Collins Rad (CR) part/dwg # 233 3020 00 (44 links).	Drives O293
O275	†	SPROCKET, CHAIN: passivated SS; 1.418" OD, 1/2" thk, 0.313" bore; hub 11/16" OD, extends 0.359" beyond sprocket face; shaft mtd; 24 teeth; Collins Rad (CR) part/dwg # 506 7996 002.	Motor sprocket driving O272
O276	†	SPROCKET, CHAIN: double drive; passivated SS; 1.418" OD, 1/2" thk, 3/16" bore; hub 1" OD x 7/32" thk, located between the two sprocket faces; shaft mtd; 24 teeth on both sprockets; Collins Rad (CR) part/dwg # 505 3416 002.	Drives O280 and O273
O277	†	SPROCKET, CHAIN: passivated SS; 1.418" OD, 1/2" thk, 3/16" bore, hub 11/16" OD, extends 0.359" beyond sprocket face; shaft mtd; 24 teeth; Collins Rad (CR) part/dwg # 505 3414 002.	Drives shaft O281
O278	†	PULLEY: idler for chain; flat pulley; SS; 7/8" OD x 5/16" thk; bore 5/8" d; mts on sleeve bearing; u/w O282; Collins Rad (CR) part/dwg # 505 3412 002.	Idler for O273
O279		Same as O278; u/w O283.	Idler for O274
O280	⊕⊕	SHAFT: autotune line shaft; passivated SS; 14 3/4" lg x 0.186" diam; one slot, 0.046" wd x 3/32" d at one end; Collins Rad (CR) part/dwg # 505 3423 001.	1st autotune line shaft
O281	⊕⊕	SHAFT: autotune line shaft; passivated SS; 11 1/4" lg x 0.186" diam; one slot, 0.046" wd x 3/32" d at one end; Collins Rad (CR) part/dwg # 505 3422 001.	2nd autotune line shaft
O282	†	BEARING, SLEEVE: for chain idler pulley; porous bronze; 0.626" OD x 0.375" ID x 0.344" lg; u/w O278; Collins Rad (CR) part/dwg # 505 3299 001.	Bearing for O278
O283		Same as O282, u/w O279.	Bearing for O279
O284	N16-C-089881-4551	CONTROL, SELECTOR: selects frequencies; c/o rotary type sw assembly, racket, clutch, gears, bearings, dial; 3 15/16" lg x 1 7/8" wd x 3 3/16" h o/a; two 1/8" diam mtg holes on 1 1/16" mtg/c; Collins Rad (CR) part/dwg # 505 2374 004 (111D-5).	Controls all actuator (autotune) assemblies

TABLE 8-4. TABLE OF REPLACEMENT PARTS—Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O285	N16-A-700185-0102	ACTUATOR, MECHANICAL, ROTARY: (autotune), remote motor required; single drive shaft driven both clockwise and counterclockwise direction; 24 rpm, 4-5 in-lb torque, 330-deg travel; no gear reduction; w/o brake; with clutch; provision for manual setup; intermittent; 10 sec max on cycle; 10,000 ft max altitude; fixed mtg; 1 lb net wt; Collins Rad (CR) part/dwg # 505 2373 004 (96W-3).	Power amplifier loading
O286	N16-A-700185-0101	ACTUATOR, MECHANICAL, ROTARY: (autotune), remote motor required; single drive shaft driven both clockwise and counterclockwise direction; 24 rpm, 4-5 in-lb torque, 270-deg travel; no gear reduction; w/o brake; with clutch; provision for manual setup; intermittent; 10 sec max on cycle; 10,000 ft max altitude; fixed mtg; 1 lb net wt; Collins Rad (CR) part/dwg # 505 2372 004 (96W-2).	Driver plate tuning
O287		Same as O286.	Exciter tuning
O288		Same as O285.	Loading coil switch
O289		Same as O285.	Power amplifier plate tuning
O290		Same as O285.	Band switch
O291	†	GEAR ASSEMBLY: c/o Collins Rad part/dwg # 505 3226 002 gear, one part/dwg # 505 3427 001 shaft; 1⅜" lg x 1$\frac{15}{32}$" diam o/a; Collins Rad (CR) part/dwg # 505 3433 001.	Drives S240
O292		Same as O126.	Provides pressure against O222
O293	†	GEAR, ASSEMBLY: c/o Collins Rad part/dwg # 505 3415 002 sprocket, one part/dwg # 505 3428 001 shaft; 3$\frac{11}{16}$" lg x 1.418" diam o/a; Collins Rad (CR) part/dwg # 505 3429 001.	Drives S102
O294	⊕⊕	SHAFT: channel selector; passivated SS; 3$\frac{15}{16}$" lg x ¼" diam o/a; one end flatted on opposite sides; Collins Rad (CR) part/dwg # 505 3437 002.	Operates S240 and drives O121
O295	⊕⊕	CLAMP: shaft; brass, bright alloy pl; 1 Bristo setscrew employed; 1⅛" lg x ¾" wd x ¼" thk, excluding special pin; accommodates ¼" shaft; special pin $\frac{3}{32}$" diam extends $\frac{11}{32}$" beyond face of clamp and anchored in insulator insert; Collins Rad (CR) part/dwg # 505 3444 002.	O286 drive-shaft clamp
O296		Same as O229.	Couples with O297
O297		Same as O224.	O285 drive-shaft clamp
O298	⊕⊕	SPRING: helical extension type; for pull tension; 0.051" diam SS wire; 0.492" OD x 6½" lg o/a; 114 turns; parallel hook terminals; Collins Rad (CR) part/dwg # 505 3510 001.	Used with O158 to provide tension on O238
O299		Same as O239.	Drives O107
P101		Not used.	

TABLE 8-4. TABLE OF REPLACEMENT PARTS—Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATION FUNCTION
P102		Same as J107.	RF output
P103		Same as J113; p/o W101.	Mates with J103
P104 P105		Not used.	
P106	‡	c/o P106A and P106B.	High-voltage input
P106A	N17-I-69047-5501	INSULATOR, STANDOFF: conical shaped; white glazed porcelain; $1\frac{3}{4}$" lg x $1\frac{3}{4}$" wd x $3\frac{1}{8}$" h o/a; mtd by four 0.200" diam holes on $\frac{1}{3}$" mtg/c on aluminum base; Johnson EF (JON) part # 135-66J; Collins Rad (CR) part/dwg # 190 0074 00.	Part of P106
P106B	⊕⊕	POST-HV CONNECTOR: ½ hard hex free cutting yellow brass; ½" OD x $3\frac{5}{16}$" lg w/ ½" diam hex bottom $\frac{3}{16}$" h; tap 10-32 NF-2, ⅜" d; ½" diam round end has tap ⅜-24 NF-2, ⅜" d; p/o P106; Collins Rad (CR) part/dwg # 505 3459 002.	Part of P106
P107	N17-C-71419-4848	CONNECTOR, PLUG: 1 round male cont; straight type; $2\frac{3}{8}$" lg x $1\frac{3}{8}$" OD o/a; 50 ohm; cylindrical metal shell, phenolic insert; 0.895" diam cable opening; thd locking with receptacle; per Navy dwg # RE49F252; Collins Rad (CR) part/dwg # 357 9015 00.	Output from function box connection to antenna
P108 through P112		Not used.	
P113		Same as J103; p/o W101.	Mates with J113
P114 through P204		Not used.	
P205		Same as J113.	Key to transmitter connection
P206 through P210		Not used.	
P211	N17-C-71575-1008	CONNECTOR, PLUG: 12 flat pol male cont; straight; $1\frac{5}{8}$" lg x $1\frac{1}{4}$" wd x $1\frac{5}{16}$" thk less cont but incl cable clamp; rectangular shell; black phenolic insert; ½" diam hole for cable; incl cable clamp; p/o W101; Jones HB (JNS) part # P312-CCT-WI; Collins Rad (CR) part/dwg # 365 8120 00.	Mates with J211 on cabinet frame
P212		Same as J242; p/o W101.	Mates with J212 on cabinet frame
P213		Same as J243; p/o W101.	Mates with J213 on cabinet frame
P214 through P239		Not used.	

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Maj r Ass mbly: RF Ass mbly p/ Radi Transmitt r T-440/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
P240	N17-C-73605-7769	CONNECTOR, PLUG: 18 round male cont; straight; 1⅝" lg x ¾" wd x 5/16" thk less term; 18 cont 7.5 amp; rectangular phenolic body; 2 holes 0.125" diam one ea end spaced 1.312" c to c; silver pl brass cont; Collins Rad (CR) part/dwg # 505 2439 002.	Autotune connection
P241	For replacement use SNSN N17-C-71291-5118	CONNECTOR, PLUG: 12 flat pol female cont; straight; 1⅝" lg x 1¼" wd x 15/16" thk less cont but incl cable clamp; rectangular shell, black phenolic insert; ½" diam cable opening; incl cable clamp; p/o W101; Jones HB (JNS) part # S312-CCT-WI; Collins Rad (CR) part/dwg # 366 8120 00.	Mates with O241
P242		Same as J212; p/o W101.	Mates with J242
P243		Same as J213; p/o W101.	Mates with J243
R101	N16-R-50975-725	RESISTOR, fixed: JAN type RC20GF105K; comp; 1.0 megohm ±10%; ½ w; per spec MIL-R-11.	V101 grid
		OR	
R101	3RC20BF105K N16-R-50975-811	RESISTOR, FIXED: JAN type RC20BF105K; comp; 1.0 megohm ±10%; ½ w; per spec JAN-R-11.	V101 grid
R102	For replacement use SNSN N16-R-49921-715	RESISTOR, FIXED: JAN type RC32GF102K; comp; 1000 ohm ±10%; 1 w; per spec MIL-R-11.	V101 cathode
		OR	
R102	3RC30BF102K N16-R-49923-231	RESISTOR, FIXED: JAN type RC30BF102K; comp; 1000 ohm ±10%; 1 w; per spec JAN-R-11.	V101 cathode
R103	N16-R-50418-101	RESISTOR, FIXED: JAN type RC32GF333K; comp; 33,000 ohm ±10%; 1 w; per spec MIL-R-11.	V101 screen
		OR	
R103	3RC30BF333K N16-R-50418-231	RESISTOR, FIXED: JAN type RC30BF333K; comp: 33,000 ohm ±10%; 1 w; per spec JAN-R-11.	V101 screen
R104	N16-R-50166-167	RESISTOR, FIXED: JAN type RC32GF562K; comp; 5600 ohm ±10%; 1 w; per spec MIL-R-11.	V101 plate
		OR	
R104	3RC30BF562K N16-R-50166-231	RESISTOR, FIXED: JAN type RC30BF562K; comp; 5600 ohms ±10%; 1 w; per spec JAN-R-11.	V101 plate
R105	N16-R-49707-511	RESISTOR, FIXED: JAN type RC42GF331K; Comp; 330 ohm ±10%; 2 w; per spec MIL-R-11.	External signal loading
		OR	
R105	3RC42BE331K N16-R-49707-506	RESISTOR, FIXED: JAN type RC42BE331K; comp; 330 ohm ±10%; 2 w; per spec JAN-R-11.	External signal loading
R106		Same as R105.	External signal loading
R107		Same as R105.	External signal loading
R108		Same as R105.	External signal loading

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
R109	N16-R-50283-116	RESISTOR, FIXED: JAN type RC32GF103K; comp; 10,000 ohm ±10%; 1 w; per spec MIL-R-11.	V102 grid
		OR	
R109	3RC30BF103K N16-R-50283-231	RESISTOR, FIXED: JAN type RC30BF103K; comp; 10,000 ohm ±10%; 1 w; per spec JAN-R-11.	V102 grid
R110	For replacement use SNSN N16-R-49705-705	RESISTOR, FIXED: JAN type RC32GF331K; comp; 330 ohm ±10%; 1 w; per spec MIL-R-11.	V102 cathode
		OR	
R110	3RC30BF331K N16-R-49707-231	RESISTOR, FIXED: JAN type RC30BF331K; comp; 330 ohm ±10%; 1 w; per spec JAN-R-11.	V102 cathode
R111	N16-R-50310-101	RESISTOR, FIXED: JAN type RC32GF123K; comp; 12,000 ohm ±10%; 1 w; per spec MIL-R-11.	V102 screen
		OR	
R111	3RC30BF123K N16-R-50310-231	RESISTOR, FIXED: JAN type RC30BF123K; comp; 12,000 ohm ±10%; 1 w; per spec JAN-R-11.	V102 screen
R112		Same as R109.	L103 damping
R113		Same as R109.	V103 grid
R114		Same as R110.	V103 cathode
R115		Same as R111.	V103 screen
R116		Same as R109.	V104 grid
R117		Same as R110.	V104 cathode
R118		Same as R111.	V104 screen
R119	3RW30334 N16-R-66398-6471	RESISTOR, FIXED: JAN type RW35G103; WW; 10,000 ohms ±5%; 38 w; per spec JAN-R-26.	V105 screen
R120	N16-R-50679-522	RESISTOR, FIXED: JAN type RC42GF154K; comp; 0.15 megohm ±10%; 2 w; per spec MIL-R-11.	V105 screen
		OR	
R120	3RC42BE154K N16-R-50679-525	RESISTOR, FIXED: JAN type RC42BE154K; comp; 0.15 megohm ±10%; 2 w; per spec JAN-R-11.	V105 screen
R121		Same as R120.	V105 screen
R122	3RW26148 For replacement use SNSN N16-R-66105-1835	RESISTOR, FIXED: JAN type RW35G202; WW; 2000 ohms ±5%; 38 w; per spec JAN-R-26.	V106 grid
R123	N16-R-50067-505	RESISTOR, FIXED: JAN type RC42GF332K; comp; 3300 ohm ±10%; 2 w; per spec MIL-R-11.	Reference voltage dropping
		OR	
R123	3RC42BE332K N16-R-50067-515	RESISTOR, FIXED: JAN type RC42BE332K; comp; 3300 ohm ±10%; 2 w; per spec JAN-R-11.	Reference voltage dropping

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R124	N16-R-50373-423	RESISTOR, FIXED: JAN type RC42GF223K; comp; 22,000 ohm ±10%; 2 w; per spec MIL-R-11.	Regulator voltage dropping
		OR	
R124	3RC42BE223K N16-R-50373-426	RESISTOR, FIXED: JAN type RC42BE223K; comp; 22,000 ohm ±10%; 2 w; per spec JAN-R-11.	Regulator voltage dropping
R125	N16-R-49770-165	RESISTOR, FIXED: JAN type RC32GF471K; comp; 470 ohm ±10%; 1 w; per spec MIL-R-11.	V110 grid stabilizing
		OR	
R125	3RC30BF471K N16-R-49770-231	RESISTOR, FIXED: JAN type RC30BF471K; comp; 470 ohm ±10%; 1 w; per spec JAN-R-11.	V110 grid stabilizing
R126		Same as R125.	V110 screen stabilizing
R127		Same as R125.	V111 grid stabilizing
R128		Same as R125.	V111 screen stabilizing
R129		Same as R125.	V112 grid stabilizing
R130		Same as R125.	V112 screen stabilizing
R131 through R147		Not used.	
R148	N16-R-66214-5516	RESISTOR, FIXED: JAN type RW32G402; WW; 4000 ohms ±5%; 12 w at 275° C max continuous oper temp; per spec JAN-R-26.	Bias supply bleeder
R149	For replacement use SNSN N16-R-66103-7646	RESISTOR, FIXED: JAN type RW31G202; WW; 2000 ohms ±5%; 10 w at 275° C max continuous oper temp; per spec JAN-R-26.	Bias supply bleeder
R150	For replacement use SNSN N16-R-89794-3410	RESISTOR, VARIABLE: WW; 25 ohms ±10%; 0.40 amp cur carrying capacity; 3 solder-lug term; metal case 1.64" diam x 23/32" d, encl case; round slotted metal shaft 0.248" diam x 3/4" lg from mtg surface; lin taper; ins cont arm, scdr slot, 3/8-32 NF-2 thd x 3/8" lg; Mallory (MAL) part # M25PX; Collins Rad (CR) part/dwg # 377 0003 00.	Power amplifier overload adjustment
R151	For replacement use SNSN N16-R-66251-4116	RESISTOR, FIXED: JAN type RW33G502; WW; 5000 ohms ±5%; 18 w; per spec JAN-R-26A.	V107 voltage dropping
R152		Not used.	
R153		Not used.	
R154	N16-R-50634-187	RESISTOR, FIXED: JAN type RC32GF104K; comp; 0.10 megohm ±10%; 1 w; per spec MIL-R-11.	Voltage regulation grid circuit
		OR	
R154	3RG30BF104K N16-R-50634-231	RESISTOR, FIXED: JAN type RC30BF104K; comp; 0.10 megohm ±10%; 1 w; per spec JAN-R-11.	Voltage regulation grid circuit

TABLE 8-4. TABLE OF REPLACEMENT PARTS—Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R155	3RW24361 N16-R-66031-4366	RESISTOR, FIXED: JAN type RW35G102; WW; 1000 ohms ±5%; 38 w; per spec JAN-R-26.	V109 voltage dropping
R156		Same as R155.	V109 voltage dropping
R157	3RW23729 For replacement use SNSN N16-R-65976-1646	RESISTOR, FIXED: JAN type RW35G801; WW; 800 ohms ±5%; 38 w; per spec JAN-R-26.	V106 screen dropping
R158		Same as R119.	V106 screen grid voltage dropping
R159		Same as R149.	V106 screen grid voltage dropping
R160		Not used.	
R161	N16-R-50461-698	RESISTOR, FIXED: JAN type RC32GF433J; comp; 43,000 ohm ±5%; 1 w; per spce MIL-R-11.	Channel indicator voltage dropping
R162 through R200		Not used.	
R201	N16-R-91406-1127	RESISTOR, VARIABLE: WW; 25,000 ohms ±10%; 4 w, 0.013 amp cur carrying capacity; 3 solder-lug term; metal case $1\frac{41}{64}$" diam x $\frac{23}{32}$" d, encl case; round slotted metal shaft 0.248" diam x $\frac{3}{4}$" lg from mtg surface; lin taper; ins cont arm, w/o off position; normal torque; bushing $\frac{3}{8}$-32 x $\frac{3}{8}$" lg; non-turn device located on $\frac{17}{32}$" rad at 12 o'clock; Mallory (MAL) part # M25-MFX; Collins Rad (CR) part/dwg # 377 0011 00.	Input level adjustment
R202	N16-R-50632-713	RESISTOR, FIXED: JAN type RC32GF104J; comp; 0.10 megohm ±5%; 1 w; per spec MIL-R-11.	Keying voltage divider
R202	3RC30BF104J N16-R-50632-751	OR RESISTOR, FIXED: JAN type RC30BF104J; comp; 0.10 megohm ±5%; 1 w; per spec JAN-R-11.	Keying voltage divider
R203	N16-R-50479-713	RESISTOR, FIXED: JAN type RC32GF473J; comp; 47,000 ohm ±5%; 1 w; per spec MIL-R-11.	Keying voltage divider
R203	3RC30BF473J N16-R-50479-751	OR RESISTOR, FIXED: JAN type RC30BF473J; comp; 47,000 ohm ±5%; 1 w; per spec JAN-R-11.	Keying voltage divider
R204	N16-R-50128-715	RESISTOR, FIXED: JAN type RC32GF472J; comp; 4700 ohm ±5%; 1 w; per spec MIL-R-11.	V201 Cathode
R204	3RC30BF472J N16-R-50128-751	OR RESISTOR, FIXED: JAN type RC30BF472J; comp; 4700 ohm ±5%; 1 w; per spec JAN-R-11.	V201 Cathode
R205		Same as R203.	Bias dropping

TABLE 8-4. TABLE OF REPLACEMENT PARTS—Continu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
R206	N16-R-50282-131	RESISTOR, FIXED: JAN type RC42GF103J; comp; 10,000 ohm ±5%; 2 w; per spec MIL-R-11.	V201 plate voltage dividing
		OR	
R206	3RC42BE103J N16-R-50282-140	RESISTOR, FIXED: JAN type RC42BE103J; comp; 10,000 ohm ±5%; 2 w; per spec JAN-R-11.	V201 plate voltage dividing
R207	N16-R-50515-955	RESISTOR, FIXED: JAN type RC42GF563J; comp; 56,000 ohm ±5%; 2 w; per spec MIL-R-11.	V201 voltage dividing
		OR	
R207	3RC42BE563J N16-R-50515-950	RESISTOR, FIXED: JAN type RC42BE563J; comp; 56,000 ohm ±5%; 2 w; per spec JAN-R-11.	V201 voltage dividing
R208		Same as R207.	V201 plate voltage divider
R209		Same as R201.	Inverter output adjustment
R210	N16-R-50480-131	RESISTOR, FIXED: JAN type RC42GF473J; comp; 47,000 ohm ±5%; 2 w; per spec MIL-R-11.	V201 plate voltage dividing
		OR	
R210	3RC42BE473J N16-R-50479-950	RESISTOR, FIXED: JAN type RC42BE473J; comp; 47,000 ohm ±5%; 2 w; per spec JAN-R-11.	V201 plate voltage dividing
R211		Same as R202.	V201 grid limiting
R212		Same as R206.	V201 plate voltage dividing
R213		Same as R210.	V201 plate voltage dividing
R214		Same as R210.	V201 plate voltage dividing
R215		Same as R201.	FS output adjustment
R216		Same as R201.	CW output adjustment
R217	N16-R-50399-131	RESISTOR, FIXED: JAN type RC42GF273J; comp; 27,000 ohm ±5%; 2 w; per spec MIL-R-11.	V201 plate voltage dividing
		OR	
R217	3RC42BE273J N16-R-50398-950	RESISTOR, FIXED: JAN type RC42BE273J; comp; 27,000 ohm ±5%; 2 w; per spec JAN-R-11.	V201 plate voltage dividing
R218		Same as R202.	V202 grid limiting

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTI N
R219	N16-R-50012-146	RESISTOR, FIXED: JAN type RC42GF222J; comp; 2200 ohm ±5%; 2 w; per spec MIL-R-11.	V204 dropping
R219	3RC42BE222J N16-R-50012-141	OR RESISTOR, FIXED: JAN type RC42BE222J; comp; 2200 ohm ±5%; 2 w; per spec JAN-R-11.	V204 dropping
R220		Same as R151.	V203 dropping
R221	N16-R-50758-709	RESISTOR, FIXED: JAN type RC32GF334J; comp; 0.33 megohm ±5%; 1 w; per spec MIL-R-11.	Inverter output voltage divider
R221	3RC30BF334J N16-R-50758-751	OR RESISTOR, FIXED: JAN type RC30BF334J; comp; 0.33 megohm ±5%; 1 w; per spec JAN-R-11.	Inverter output voltage divider
R222		Same as R221.	Input voltage dividing
R223	N16-R-50974-718	RESISTOR, FIXED: JAN type RC32GF105J; comp; 1.0 megohm ± 5%; 1 w; per spec MIL-R-11.	Inverter output voltage
R223	3RC30BF105J N16-R-50974-751	OR RESISTOR, FIXED: JAN type RC30BF105J; comp; 1.0 megohm ±5%; 1 w; per spec JAN-R-11.	Inverter output voltage
R224		Same as R223.	Input voltage dividing
R225	N16-R-50308-945	RESISTOR, FIXED: JAN type RC42GF123J; comp; 12,000 ohm ±5%; 2 w; per spec MIL-R-11.	V201 plate voltage dividing
R225	3RC42BE123J N16-R-50308-950	OR RESISTOR, FIXED: JAN type RC42BE123J; comp; 12,000 ohm ±5%; 2 w; per spec JAN-R-11.	V201 plate voltage dividing
R226		Same as R225.	V201 plate voltage dividing
R227		Same as R225.	V201 plate voltage dividing
R228		Same as R225.	V201 plate voltage dividing
R229 through R239		Not used.	
R240	N16-R-49921-715	RESISTOR, FIXED: JAN type RC32GF102J; comp; 1000 ohm ±5%; 1 w; per spec MIL-R-11.	Connection to control head
R240	3RC30BF102J N16-R-49921-751	OR RESISTOR, FIXED: JAN type RC30BF102J; comp; 1000 ohm ±5%; 1 w; per spec JAN-R-11.	Connection to control head

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R241		Same as R240.	Channel indicator voltage divider
R242		Same as R240.	Channel indicator voltage divider
R243		Same as R240.	Channel indicator voltage divider
R244		Same as R240.	Channel indicator voltage divider
R245		Same as R240.	Channel indicator voltage divider
R246		Same as R240.	Channel indicator voltage divider
R247		Same as R240.	Channel indicator voltage divider
R248		Same as R240.	Channel indicator voltage divider
R249		Same as R240.	Channel indicator voltage divider
S101A		SWITCH, SECTION, ROTARY: phenolic stator, spring silver alloy clips, coin silver alloy rotor blades; single ckt, single pole, 10 positions; irregular shape; $1\frac{19}{32}$" wd x 2.124" h x $\frac{1}{16}$" thk o/a; 2 holes for mtg, 0.140" diam spaced 1.812" on ctr; Collins Rad (CR) part/dwg # 269 1344 00.	Crystal selector
S101B		Same as S101A.	Signal source selector
S101C		Same as S101A.	Key input selector
S101D		Same as S101A.	Oscillator plate voltage
S102	N17-S-091787-4999	SWITCH ASSEMBLY: 6 rotary wafers; steatite stators, spring silver alloy clips, coil silver alloy rotor blades; 6 circuits, 6 poles, 12 positions w/o detent; approx $9\frac{5}{16}$" lg x $1\frac{7}{8}$" wd x $1\frac{5}{8}$" d o/a; two shaft mtg spaced 1.562" on ctr; c/o S102A, S102B, S102C, S102D, S102E, S102F; Oak (OAK) type HC; Collins Rad (CR) part/dwg # 269 1348 00.	See below
*S102A		Part of S102.	C114B in-out
*S102B		Part of S102.	C147 grounding

* Not available as a separate unit. Purchase complete assembly S102.

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinued

F r Radio Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
*S102C		Part of S102.	Couples V103 to V105 via C113
*S102D		Part of S102.	V103 plate tank switch
*S102E		Part of S102.	V103 plate tank switch
*S102F		Part of S102.	L103 grounding
S103	N17-S-59391-1501	SWITCH SECTION, ROTARY: steatite stator, solid silver contacts, brass silver pl rotor; cur carrying cap 7½ amp at 115 v, 60 cyc; min breakdown voltage 3000 v RMS, 60 cyc; single ckt; single pole, 18 positions; oval; approx 2¹³⁄₁₆" lg x 2" wd x 1⁹⁄₃₂" thk o/a; 2 holes for mtg, 0.147" diam spaced 2⁷⁄₁₆" on ctr; Collins Rad (CR) part/dwg # 269 1347 00.	V105 plate band switch
S104	N17-S-59390-9996	SWITCH, ROTARY: 8 position RF tap; movable cont coin silver; fixed cont # 18 elkonium; ¼" thk glass-bonded mica; approx 9½" lg x 9½" h x 8¼" d o/a; non shorting; 18 stud type term thd ¾" lg 10-32 NF-2; incl O138 and O139; Collins Rad (CR) part/dwg # 505 2771 003.	V106 plate band switch
S105	N17-S-59348-2651	SWITCH, ROTARY: 12 position RF tap; movable cont coin silver, fixed cont # 18 elkonium; switch plate ³⁄₁₆" thk glass-bonded mica; approx 6½" lg x 5⁹⁄₁₆" h x 4²¹⁄₃₂" thk o/a; non-shorting type; 14 stud type term thd ¾" lg 10-32 NF-2; includes O140 and O141; Collins Rad (CR) part/dwg # 505 2759 003.	L network shorting
S106	‡	c/o S106A, S106B, S106C.	
S106A	N17-C-82011-1770	CONTACT, SWITCH: approx 3¹⁄₁₆" lg x ²³⁄₃₂" wd x ⁵⁄₃₂" h o/a; arm, beryllium copper silver pl contact, coin silver; two 0.140" diam holes for mtg spaced 0.375" on ctr; p/o S106; Collins Rad (CR) part/dwg # 505 2761 001.	L120 shorting switch
S106B		Same as S106A.	L120 shorting
S106C		Same as S106A.	L120 shorting
S107 through S200		Not used.	
S201	3Z9849.135 N17-S-74139-4844	SWITCH, TOGGLE: JAN type ST22N; DPDT; resistive load 5 amp at 125 v, 2 amp at 250 v, inductive load 3 amp at 125 v, 1.5 amp at 250 v; phenolic body; 1⁹⁄₃₂" lg x ²³⁄₃₂" wd x 2.125" h o/a; ¹¹⁄₁₆" lg bat-type handle; locking action; 6 lug term; ¹⁵⁄₃₂" lg sleeve x ¹⁵⁄₃₂"-32 NS-2 mtg bushing, incl 2 hex nuts; per spec JAN-S-23.	Polarity reversing
S202 through S239		Not used.	
S240		c/o S240A and S240B.	

* Not available as a separate unit. Purchase complete assembly S102.

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radio Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
S240A		Same as S101A.	Channel-indicator switch
S240B		Same as S101A.	Connects to J241
S241	N17-S-55433-4483	SWITCH, LEVER: 3 positions, normal, non-locking, and locking; 1A both sides; max rating, 110 v 60 cyc AC non-inductive, 3 amp 150 w; $4\frac{9}{16}$" lg x $\frac{7}{8}$" wd x $1\frac{9}{32}$" h o/a; black phenolic handle lever, $\frac{3}{8}$" diam; solder-lug term; mtg, 4 holes tapped 3-48 NC-2; Collins Rad (CR) part/dwg # 375 0049 00.	Test key
S242	N17-S-66588-9551	SWITCH, rotary: 3 ckt, 3 pole, 3 position; 2 sect; coin silver alloy rotor blades; phenolic stator, spring silver alloy clips; 2" lg x $1\frac{5}{8}$" wd x $1\frac{7}{8}$" h; non-shorting type; solder lug term; single mtg hole bushing $\frac{3}{8}$"-32 NEF-2 x $\frac{3}{8}$" lg, shaft $\frac{1}{4}$" diam x $\frac{3}{4}$" lg FMS, flush mtg; w/ 30 deg detent and stops limiting rotation to 3 position; Oak (OAK) type HC; Collins Rad (CR) part/dwg # 259 0643 00.	Tune operate
S243	N17-S-60523-1255	SWITCH, ROTARY: single ckt, single pole, 10 positions; hard brass silver pl rotor blades, spring brass silver pl clips; phenolic body; $1\frac{43}{64}$" lg x $1\frac{7}{8}$" wd x $1\frac{1}{2}$" d o/a; non-shocking type; solder-lug term; extension shaft mtg, bushing thd $\frac{3}{8}$-32 NEF-2; wafer sw w/ 30 deg detent and stops limiting rotation to 10 positions; Oak (OAK) type H; Collins Rad (CR) part/dwg # 259 0446 00.	Channel selector
S244 through S249		Not used.	
S250		Same as S101A.	Autotune seeking switch
S251		Same as S101A.	Autotune emmission selector switch
S252	N17-C-083557-1715	SWITCH, LEVER: single position, non-locking; SPST; 115 v AC at 0.3 amp; uncased, SS type #302 sw pl, phenolic sw spacer and ins, brass sw mount, 2 beryllium copper sw leaf w/ silver cont; $1\frac{15}{32}$" lg $2\frac{1}{32}$" wd x $\frac{5}{8}$" h o/a; two solder lug term; bkt mtd; Collins Rad (CR) part/dwg # 505 2432 002.	Stepping switch
S253	N17-S-58007-1001	SWITCH, SNAP: 2 circuits, one normally open and one normally closed; snap-action sw enclosed in molded case with molded actuating button; operating force 10 oz ±5%; cont pressure 75 gm min; 125—250 v 60 cps AC, 30 v DC inductive; two 0.101 diam mtg holes 0.520" c to c; Electro Snap Switch (EABN) type # S3-4; Collins Rad (CR) part/dwg # 266 0067 00.	Reverse interlocking switch
S254		Same as S253.	Limit switch
TC101	N17-T-038661-8051	THERMOCOUPLE: range, 0—15 amp RF; to operate a 30-mv, 1 ma movement through a 0.25-ohm line; rectangular bakelite case; $2\frac{1}{8}$" lg x 1" wd x 1" h o/a; ext RF thermocouple, 4 stud-type term; 2 holes for mtg 0.122" diam; Simpson Elec (SIC) type 0-006021; Collins Rad (CR) part/dwg # 457 0009 00.	Antenna current

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
T101	N17-T-70753-4170	TRANSFORMER, POWER: filament type; supply freq 50/60 cps; 2 input wnd to accom 115 v or 230 v; one CT output wnd; 6.3 v CT output; HS metal case; 4″ lg x 3″ wd x 4¼″ h excluding term; six ¾″ lg stud term, thd 10-32 NC-2, located on bottom, equally spaced on 1½″ diam circle; six 0.220″ diam holes for mtg, 3 ea end spaced 1⅛″ on ctr; Chi Trans (CHT) type F610; Collins Rad (CR) part/dwg # 662 0075 00.	Exciter filaments
T102	N17-T-70753-8043	TRANSFORMER, POWER: filament; 50/60 cps; 2 pri wnd to accom 115 v or 230 v; one CT output wnd; 7.5 v 25.0 amp CT; HS metal case; 5¼″ lg x 4⁹⁄₁₆″ wd x 5⁵⁄₁₆″ h excluding term; seven ¾′ lg stud term thd 10-32 NC-2 equally spaced on 1½″ diam circle; six 0.230″ diam mtg holes, 3 ea end spaced 1¼″ on ctr; Chi Trans (CHT) type F725; Collins Rad (CR) part/dwg # 672 0409 00.	Power-amplifier filament
T103	N17-T-75837-1047	TRANSFORMER, POWER: distribution; 117 v 50/60 cps; 3 output wnd, 2 wnd CT; 6.3 v 2.0 amp CT; 5.0 v 2.0 amp, 450 v 0.040 amp DC (for capacitor input filter), CT; HS metal case; 3½″ lg x 2.850″ wd x 3¾″ h excluding term; 10 solder-lug term ½″ lg on bottom; six 0.190″ diam holes for mtg, 3 each end spaced 1.000″ on ctr; Chi Trans (CHT) type PSC-40; Collins Rad (CR) part/dwg # 672 0405 00.	Basic supply power
V101	2J5654/6AK5W N16-T-75654	TUBE, ELECTRON: JAN 5654/6AK5W; pentode; per spec MIL-13.	Crystal oscillator
V102	2J5763 N16-T-75763	TUBE, ELECTRON: JAN 5763; pentode; per spec MIL-E-1B.	Buffer
V103		Same as V102.	1st frequency multiplier
V104		Same as V102.	2nd frequency multiplier
V105	2J4-65A N16-T-54048	TUBE, ELECTRON: JAN 4-65A; transmitting tetrode; per spec MIL-E-1B.	Drives V106
V106	N16-T-54075	TUBE, ELECTRON: JAN 4-1000A; transmitting tetrode; per spec MIL-E-1B.	Power amplifier
V107	2JOA2 For Replacement Use N16-T-52001-3	TUBE, ELECTRON: JAN OA2; voltage regulator; per spec MIL-E-1B.	Oscillator voltage regulator
V108		Same as V107.	Exciter regulator reference
V109		Same as V107.	Exciter regulator reference
V110		Same as V102.	Exciter regulator
V111		Same as V102.	Exciter regulator
V112		Same as V102.	Exciter regulator
V113	N16-T-55738-5	TUBE, ELECTRON: JAN 5Y3WGTA full-wave rect; per spec MIL-25.	Bias rectifier
V114 through V200		Not used.	

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
V201	2J5814 N16-T-75814	TUBE, ELECTRON: JAN 5814; miniature twin triode, per spec MIL-13.	
V202		Same as V102.	Screen clamper
V203		Same as V107.	Plate regulator
V204	2JOB2 N16-T-52001-5	TUBE, ELECTRON: JAN OB2; voltage regulator; per spec MIL-E-1B.	Bias regulator
W101	N16-C-12121-7786	CABLE ASSEMBLY, SPECIAL PURPOSE: 53 #20 AWG stranded cond, each cond c/o 19 strands #32 AWG copper with thermoplastic ins and nylon jacket color coded, 1000 v working; 2 #22 AWG stranded cond, each cond c/o 7 strands #30 AWG copper with thermoplastic ins and nylon jacket, color-coded and shielding o/a, 1000 v working; 1 #14 AWG stranded cond, c/o 19 strands #27 AWG copper with thermoplastic ins and nylon jacket, 1000 v working; ¾″ fiber-glass sleeving o/a cond, ¾″ diam; approx 51″ lg excl term; Collins Rad (CR) part/dwg # 540 1208 004.	Interconnecting cable from moveable units to multiple receptacle box
W102	‡	CABLE ASSEMBLY: This symbol was assigned to internal cabling within the transmitter cabinets; all breakouts do not terminate in connectors; Collins Rad (CR) part/dwg # 540 1927 006.	
W103	‡	CABLE ASSEMBLY: This symbol was assigned to internal cabling within the transmitter cabinets; all breakouts do not terminate in connectors; Collins Rad (CR) part/dwg # 540 1929 004.	
W104	‡	CABLE ASSEMBLY: This symbol was assigned to internal cabling within the transmitter cabinets; all breakouts do not terminate in connectors; Collins Rad (CR) part/dwg # 540 1931 005.	
W105	‡	CABLE ASSEMBLY: This symbol was assigned to internal cabling within the transmitter cabinets; all breakouts do not terminate in connectors; Collins Rad (CR) part/dwg # 540 1930 006.	
W106	‡	CABLE ASSEMBLY: This symbol was assigned to internal cabling within the transmitter cabinets; all breakouts do not terminate in connectors; Collins Rad (CR) part/dwg # 540 1928 006.	
W107	‡	CABLE ASSEMBLY: This symbol was assigned to internal cabling within the transmitter cabinets; all breakouts do not terminate in connectors; Collins Rad (CR) part/dwg # 540 1948 002.	
XV101	2Z8677-171 N16-S-62603-6702	SOCKET, TUBE: JAN type TS102P01; 7-cont miniature; one-piece saddle mtg; two ⅛″ diam mtg holes ⅞″ c to c; round plastic body; 0.800″ diam x 25/32″ lg less term and mtg; copper base, non-magnetic alloy; silver pl cont; w/metal shock shield and ctr shield 0.180″ ID; per spec JAN-S-28.	Holds V101
XV102	2Z8679.30 N16-S-64063-6713	SOCKET, TUBE: JAN type TS103P01; 9-pin miniature; above chassis base mtg; two 0.125″ diam mtg holes spaced on 1.125″ mtg/c; plastic body; brass nickel pl saddle tap, 0.940″ diam; ⅝″ h excluding term; copper cont silver pl; per spec JAN-S-28.	Holds V102
XV103		Same as XV102.	Holds V103
XV104		Same as XV102	Holds V104

TABLE 8-4. TABLE OF REPLACEMENT PARTS—Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: RF Assembly p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
XV105	2Z8677-189 N16-S-62821-4920	SOCKET, TUBE: 7 cont type 829; four $\frac{11}{64}$" diam mtg holes 1.875" mtg/c; square ceramic L-3 or better; $2\frac{3}{8}$" x $2\frac{3}{8}$" x $1\frac{7}{32}$" h excluding term; beryllium copper, silver pl cont; w/o metal shock shield; Johnson EF (JON) part # 122-248; Collins Rad (CR) part/dwg # 220 1072 00.	Holds V105
XV106	N16-S-61911-7121	SOCKET ASSEMBLY, tube: c/o single base tube socket, 5 receptacle sockets, 5 receptacle springs and attaching hdw; glass bonded mica tube socket, brass ternary pl (copper, tin and zinc) receptacle socket, SS wire spring; $3\frac{3}{4}$" lg x $3\frac{3}{4}$" wd x $1\frac{7}{8}$" thk o/a; four $\frac{3}{16}$" diam mtg holes spaced $2\frac{15}{16}$" x $2\frac{15}{16}$" c to c, located on tube socket base; six slots equally spaced on $\frac{1}{2}$" diam on one end of receptacle socket, other end thd $\frac{1}{4}$"-20 NC-2; Collins Rad (CR) part/dwg # 540 2684 002.	Holds V106
XV107		Same as XV101.	Holds V107
XV108		Same as XV101.	Holds V108
XV109		Same as XV101.	Holds V109
XV110		Same as XV102.	Holds V110
XV111		Same as XV102.	Holds V111
XV112		Same as XV102.	Holds V112
XV113	2Z8670.33 N16-S-63515-4151	SOCKET, TUBE: JAN type TS101P01; 8 cont medium; one-piece saddle mtg, below chassis mtg; 2 holes, 0.156" diam, 1.500" on ctr; round, mica-filled phenolic body, $1\frac{7}{64}$" diam x $\frac{5}{8}$" thk, less term; cont copper base non-magnetic alloy, silver pl; unmarked; per spec JAN-S-28A.	Holds V113
XV114 through XV200		Not used.	
XV201		Same as XV102.	Holds V201
XV202		Same as XV102.	Holds V202
XV203		Same as XV101.	Holds V203
XV204		Same as XV101.	Holds V204
XY101	2Z8761-22 N16-S-054287-5101	SOCKET, CRYSTAL: for CR-7 type crystal; steatite body, cad pl phosphor bronze cont; oval body; $\frac{7}{8}$" lg x $\frac{3}{8}$" wd x $1\frac{1}{16}$" h o/a; above chassis mtg, one $\frac{1}{8}$" diam mtg hole on ctr; Eby (EBY) type 8879; Collins Rad (CR) part/dwg # 292 0023 00.	Holds Y101
XY102		Same as XY101.	Holds Y102
XY103		Same as XY101.	Holds Y103
XY104		Same as XY101.	Holds Y104
XY105		Same as XY101.	Holds Y105
XY106		Same as XY101.	Holds Y106
XY107		Same as XY101.	Holds Y107
XY108		Same as XY101.	Holds Y108
XY109		Same as XY101.	Holds Y109
XY110		Same as XY101.	Holds Y110

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: LV Power Supply p/o Radio Transmitter T-440/FRT-24

REFERENCE DESI NATI N	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
301—399 Series	∅	POWER SUPPLY: LV; electronic type; JAN type 3B28 tubes; full-wave rectification; output, 600 v DC at 0.5 amp, 80 v DC at 5 ma, unregulated; input, 230 v AC 60 cyc single ph 420 va; 17" wd x 8" d x 8½" h o/a; filter incl; four 7/32" x 11/32" oval slots on 4" x 16¼" mtg/c; Collins Rad (CR) part # 506A-1, dwg # 505 2304 005.	Supplies low voltage and keying voltage to RF assembly
C301		Same as C242.	Filter capacitor
E301		Not used.	
E302	2Z2725.2 N17-C-800956-126	CLIP, ELECTRON TUBE: for connecting to tube term; 1½" lg x 13/16" wd x 25/32" thk o/a; ceramic ins; beryllium copper, tinned; solder lug connection; approx ¼" diam opening for cable in end; Natl Co. (NAC) part # SPP-9; Collins Rad (CR) dwg # 301 1005 00.	Tube cap for V301
E303		Same as E302.	Tube cap for V302
L301	N17-R-99999-815	REACTOR, FILTER: 6.5 hy; 500 ma; 42 ohms DC resistance; 3000 v RMS test; enclosed metal case, 6" h x 5.870" wd x 5.31" d; six 0.270" diam mtg holes spaced on 1.75" mtg/c ea side; two term studs 8-32 NC-2 x ¾" lg spaced on ¾" mtg/c; Collins Rad (CR) part/dwg # 678 0424 00.	Filter choke
R301	N16-R-50634-503	RESISTOR, FIXED: JAN type RC42GF104K; comp; 100,000 ohm ±10%; 2 w; per spec MIL-R-11.	High voltage bleeder
		OR	
R301	3RC42BE104K N16-R-50634-505	RESISTOR, FIXED: JAN type RC42BE104K; comp; 100,000 ohm ±10%; 2 w; per spec JAN-R-11.	High voltage bleeder
R302		Same as R301.	High-voltage bleeder
R303		Same as R301.	High-voltage bleeder
R304		Same as R301.	High-voltage bleeder
R305		Same as R301.	High-voltage bleeder
R306		Same as R301.	High-voltage bleeder
R307		Same as R301.	High-voltage bleeder
R308		Same as R301.	High-voltage bleeder
R309		Same as R301.	High-voltage bleeder
R310	N16-R-50337-119	RESISTOR, FIXED: JAN type RC32GF153K; comp; 15,000 ohm ±10%; 1 w; per spec MIL-R-11.	High voltage bleeder

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: LV Power Supply p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
		OR	
R310	3RC30BF153K N16-R-50337-231	RESISTOR, FIXED: JAN type RC30BF153K; comp; 15,000 ohm ±10%; 1 w; per spec JAN-R-11.	High voltage bleeder
TB301	⊕⊕	BOARD, TERMINAL: general-purpose terminal strip; 6 screw term w/solder lugs on bottom; term 9/16" between centers; molded phenolic board; 4.343" lg 1 5/16" wd x 15/32" thk o/a; four 0.209" diam mtg holes spaced on 3 15/16" x 1/2" mtg/c; Jones HB (JNS) part # 142-Y; Collins Rad (CR) part/dwg # 367 0037 00.	Connections for low-voltage power
T301	N17-T-70752-1939	TRANSFORMER, POWER: filament type; input 115 v or 230 v; single output wnd; output 2.5 v CT; input 2500 v RMS test; steel case; 3 1/2" lg x 2.85" wd x 3.73" h excluding term; four 8-32 NC-2 x 9/16" lg term studs spaced on 5/8" x 5/8" mtg/c, three 8-32 NC-2 x 7/8" lg terms studs spaced 3/4" c to c; six 0.190" diam mtg holes spaced on 1" x 1" x 3.120" mtg/c; Chi Trans (CHT) part # F-210; Collins Rad (CR) part/dwg # 672 0399 00.	Rectifier filament transformer
T302	N17-T-99999-406	TRANSFORMER, POWER: plate type, input 230 v; single output wnd; output 600 v DC at 500 ma CT; input 2500 v RMS test; stud case 5.870" lg x 5.310" wd x 6.050" h excluding term; 5 term stud on bottom spaced 7/8"; six 0.270" diam mtg holes spaced on 1.75" ea side x 5.370" mtg/c; Collins Rad (CR) part/dwg # 672 0422 00.	Rectifier plate transformer
V301	2J3B28 N16-T-53228	TUBE, ELECTRON: JAN 3B28 transmitting tube; rectifier; per spec MIL-E-1B.	Rectifier
V302		Same as V301.	Rectifier
XV301	2Z8759.4-1 N16-S-60856-2987	SOCKET, TUBE: Navy type 49345; 4-prong med; above chassis base mtg; four 0.210" mtg holes on 2 5/16" x 2 5/16" mtg/c; round ceramic body, 2 13/16" diam x 1 27/32" h excluding term; phosphor bronze cad pl cont; Collins Rad (CR) part/dwg # 220 1018 00.	Holds V301
XV302		Same as XV301.	Holds V302
401—499 Series	∅	POWER SUPPLY: HV; electronic type, two 4B32 type tubes, full-wave rectification; 3200 v DC at 1.0 amp output, unregulated; 230 v AC, 50/60 cps, single ph, 4000 va input; rectifier unit 17" wd x 5 1/2" d x 9 1/2" h, filter unit 17" wd x 15 1/2" d x 9 5/8" h, plate transformer unit 17 5/8" wd x 10" d x 13 1/4" h; filter incl; each unit mtd by four 7/32" x 11/32" oval slots on bottom; Collins Rad (CR) part # 508A-1, dwg # 505 2748 002.	Provides plate voltage to V106 of RF assembly
C401	N16-C-99999-1142	CAPACITOR, FIXED: plastic-film dielectric; 0.2 mf ±10%; 6000 vdcw; HS steel case; 2 1/2" lg x 1 3/16" wd x 4 1/4" h; mineral-oil impr; 2 glass pillar ins term studs, spaced on 1 1/8" mtg/c; 2 removable L mtg brackets (not/incl); Condenser Prod (COPC) # AOC6MO2; Collins Rad (CR) part/dwg # 933 0085 00.	Resonates L401
C402	N16-C-56018-3908	CAPACITOR, FIXED: plastic-film dielectric 4.0 mf ±10%; 400 vdcw; HS metal case; 4 9/16" lg x 3 3/4" wd x 4 3/4" h; mineral-oil impr and filled; 2 ins term studs spaced on 2" mtg/c; 2 removable L mtg brackets (not/incl); Condenser Prod (COPC) # AOC4M4; Collins Rad (CR) part/dwg # 933 0083 00.	Filter capacitor
C403		Same as C402.	Filter capacitor
*C404	N16-C-99999-1148	CAPACITOR, FIXED: plastic-film dielectric; 0.1 mf ±10%; 6000 vdcw; HS steel case; 2 1/2" lg x 1 3/16" wd x 5" h; mineral-oil impr; 2 glass pillar ins term studs spaced 1 1/8" mtg/c; Condenser Prod (COPC) # AOC6MO1; Collins Rad (CR) part/dwg # 933 0084 00.	Resonates L401 for 50-cycle operation

* This capacitor is present, but is connected in circuit for 50-cps operation only.

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radio Transmitting S t AN/FRT-24

Maj r Ass mbly: LV P w r Supply p/o Radi Transmitt r T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
**E401		Consists of E401A and E401B.	High-voltage connection
E401A	For replacement use SNSN N17-I-48719-7756	INSULATOR, BUSHING: conical shape; white, grade L-4 ceramic; 1 5/16" lg x 1 1/8" diam o/a; ctr mtg hole 0.200" diam; bottom 23/32" diam x 9/16" lg for mtg; p/o E104, per spec JAN-I-8; Collins Rad (CR) part/dwg # 190 1124 00.	See E401
E401B	N17-I-47388-7521	INSULATION, BUSHING: cup shape; white, grade L-4 ceramic; 3/4" lg x 1 1/8" diam o/a; 3/4" ID x 9/16" d; 0.200" diam ctr mtg hole; per spec JAN-I-8; p/o E401; Collins Rad (CR) part/dwg # 190 1128 00.	See E401
E402		Same as E135.	High-voltage connection
E403		Same as E135.	Connection to high-voltage filament
E404		Same as E135.	Connection to modulator screen
E405		Same as E101.	Tie point
E406		Same as E111.	Tie point
E407	⊕⊕	STRAP, CONNECTING: # 18 ga brass; 1 13/16" lg x 3/8" wd x 0.040" thk; both ends rounded 7/32" rad; two 0.203" diam holes spaced 1 3/8" c to c; Collins Rad (CR) part/dwg # 506 8336 002.	Connection to C404
E408		Same as E407.	Connection to
E409		Same as E135.	K401 tie point
E410	N17-I-069229-3261	INSULATOR, STANDOFF: JAN type NS4WO410; cylindrical; white, grade L-4B steatite; 1.250" lg o/a; 1" OD, two tapped 1/4"-20 x 7/16" d mtg holes, one ea end; per spec JAN-I-8.	
E-411		Same as E410.	
K401	N17-R-65578-1335	RELAY, ARMATURE; cont arr 2c; cont rating 600 v DC 250 ma; silver cont 3/16" diam; single wnd 115 v DC, 5000 ohms release 58 v DC; 6 solder-lug term; 2" lg x 1 5/8" wd x 2" h; four 0.140" diam mtg holes spaced on 1 5/16" x 1/2" mtg/c; Auto Elec (ASX) type # R83; Collins Rad (CR) part/dwg # 405 0610 00.	Modulator screen interlock
K402	N17-R-64206-1636	RELAY, POWER CONTACTOR: cont arr 4 No; cont rating 25 amp 115 v 50/60 cps; screw term on coil and contacts; 3 5/8" lg x 2 3/4" wd x 3 5/16" h; three 0.178" diam mtg holes spaced on 2.250" and 3.187 mtg/c; RBM Div # 109054-101; Collins Rad (CR) part/dwg # 401 1204 00.	
L401	N16-R-99999-818	REACTOR, FILTER: 4.0 hy at 1.0 amp, 8.7 hy at 30 ma; 7000 v RMS test; open frame; 8 1/2" lg x 7 1/2" wd x 7" h; four 3/8" mtg holes spaced on 4 3/4" x 7 5/8" mtg/c; 2 term studs 1/4-20 NC-2 thd spaced 1 5/8" c to c; Chi Trans (CHT) part # 14948; Collins Rad (CR) part/dwg # 668 0074 00.	Filter choke

** ITEM not available as complete unit, purchase E401A and E401B.

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radio Transmitting S t AN/FRT-24

Major Assembly: LV Power Supply p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
L402		Same as L401.	Filter choke
R401	For replacement use SNSN N16-R-66569-4081	RESISTOR, FIXED: JAN type RW47G403; WW; 40,000 ohms ±5%; 145 w; per spec JAN-R-26.	High-voltage bleeder
R402		Same as R401.	High-voltage bleeder
R403	N16-R-50355-498	RESISTOR, FIXED: JAN type RC42GF183K; comp; 18,000 ohm ±10%; 2 w; per spec MIL-R-11.	High voltage bleeder
R404		Same as R403.	High-voltage bleeder
R405	For replacement use SNSN N16-R-061318-5601	RESISTOR, FIXED: JAN type RW10G310; wire wound; 31 ohm ±5%; 140 w at 275° C max operating temp; 10$\frac{7}{16}$" lg x 1$\frac{5}{16}$" diam; vitreous coating; 2 ferrule terminal 1$\frac{1}{8}$" diam x $\frac{1}{2}$" lg; per spec JAN-R-26A.	
S401	For replacement use SNSN N17-T-045201-5901	RELAY, Thermal: SPDT 10 amp at 110V; multiple wnd, 115 v AC, 2 solder lug term on coil, 2 stud term on contacts; 3$\frac{13}{32}$" wd x 2$\frac{13}{16}$" x h 2$\frac{25}{32}$" d o/a; two 0.180" diam mtg holes spaced 2$\frac{7}{8}$" c to c; time delay range 0-14.25 seconds automatic upon opening power circuit to motor; Haydon Mfg (HAYD) type # 5901-1; Collins Rad (CR) part/dwg # 402 0124 00.	
	N17-T-045201-5901	OR RELAY THERMAL: SPDT 10 amp at 110 V; multiple wnd, 115 v AC, 2 solder lug term on coil, 2 stud term on contacts; 3$\frac{13}{32}$" wd x 2$\frac{13}{16}$" h x 2$\frac{25}{32}$" d o/a; two 0.180" diam mtg holes spaced 2$\frac{7}{8}$" c to c; time delay range 0-57 seconds; automatic upon opening power circuit to motor; Haydon Mfg (HAYD) type # 5901-2; Collins Rad (CR) part/dwg # 402 0126 00.	
TB401		Same as TB301.	Couples to tube filaments
TB402		Same as TB301.	Couples to tube filaments
TB403	N17-B-077793-3492	BOARD, TERMINAL: general purpose binding post strip; seven #8-32 x $\frac{5}{16}$" lg screw term; $\frac{9}{16}$" c to c, w/ barriers; black phenolic boards; 4$\frac{29}{32}$" lg x 1$\frac{5}{16}$" wd x $\frac{5}{8}$" thk o/a; four 0.209" diam ctb to 0.312" diam x $\frac{3}{8}$" d mtg holes spaced 4$\frac{1}{2}$" x $\frac{1}{2}$" mtg/c; Howard B Jones (JNS) #7-142; Collins Rad (CR) part/dwg #367 5070 00.	
T401	N17-T-78234-6805	TRANSFORMER, POWER: plate type; input taps from 198 v to 250 v; output as necessary to deliver 3200 v, 1.0 amp in a single-ph full-wave rect circuit; 50/60 cps; 2500 v RMS test; open metal case; 17$\frac{1}{2}$" lg x 10" wd x 13$\frac{3}{16}$" h; six $\frac{1}{4}$-20 NC-2 x $\frac{3}{4}$" lg term on side, 3 ceramic pillar term w/ 8-32 NC-2 stud term on opposite side; four mtg slots $\frac{1}{2}$" w spaced 8$\frac{1}{2}$" x 16$\frac{1}{2}$" mtg/c; UTC (UNT) part # F-2833; Collins Rad (CR) part/dwg # 672 0385 00.	High-voltage plate
T402	N17-T-70752-6670	TRANSFORMER, POWER: filament type; input 115 v or 230 v; single output wnd; output 5 v CT; input 2500 v RMS test; steel case; 5$\frac{1}{4}$" lg x 4$\frac{9}{16}$" wd x 5$\frac{5}{16}$" h excluding term; 7 term stud on bottom spaced on $\frac{7}{8}$" mtg/c; six 0.230" diam spaced on 1.250" x 4.750" mtg/c; Chi Trans (CHT) part # F520HB; Collins Rad (CR) part/dwg # 672 0406 00.	Rectifier filament

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting Set AN/FRT-24

Maj r Ass mbly: LV P w r Supply p/ Radi Transmitt r T-440/FRT-24

REFERENCE DESI NATI N	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
V401	2J4B32 N16-T-54232	TUBE, ELECTRON: JAN 4B32; rect; per spec MIL-E-1B.	Rectifier
V402		Same as V401.	Rectifier
XV401	2Z8759-3 N16-S-60935-9301	SOCKET, TUBE: 4 prong bayonet lock socket for use w/ 50 w base tubes; above chassis base mtg; two 7/32" diam mtg holes spaced 2 13/16" c to c; round ceramic body, 3 5/16" diam x 2 3/16" h excluding term; phosphor bronze cont; Johnson EF (JON) part # 211; Collins Rad (CR) part/dwg # 220 5420 00.	Holds V401
XV402		Same as XV401.	Holds V402

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinued

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Power Con.rol, p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	L CATIN FUNCTION
501—599 Series	∅	CONTROL, POWER: manual and automatic; 1 circuit breaker, 1 filament push-button switch, 1 plate push-button switch, 2 rotary switches for local-remote control and type of emission control; no integral rectifying supply; requires 230/208 v AC, 50/60 cyc, single ph, up to 6.9 kva input; welded steel cabinet; gray enamel finish; 17½" wd x 9¼" d x 18⅛" h o/a; 4 mtg holes 7/32" x 11/32" oval slots on 5¼" x 16" mtg/c; incl 2 time-delay circuits, 16 pilot-indicating devices; Collins Rad (CR) part # 505B-1, dwg # 522 0012 005. P/O T-440/FRT-24.	Provides power control, distribution, and protective functions to other units of T-440/FRT-24
C501		Same as C240.	V501 grid filtering
C502		Same as C127.	V501 cathode bypass
CB501	N17-C-51502-7713	CIRCUIT BREAKER: magnetic; 3 poles; 230 v AC; 25 amp; bakelite case; 5¼" lg x 2.984" wd x 321/32" h; timing by Heinemann Curve # 3; 5-sec reset; toggle-action manual reset; Heinemann (HCB) part # 3363S, Collins Rad (CR) part/dwg # 260 0431 00.	Main circuit breaker
E501	⊕⊕	INSULATOR: round post shape; natural, grade XXX phenolic; ½" h o/a; ⅜" diam, two 6-32 NC-2 tapped holes each end; Collins Rad (CR) part/dwg # 500 8921 001.	Insulating mounting
E502		Same as E501.	Insulating mounting
E503		Same as E501.	Insulating mounting
E504		Same as E501.	Insulating mounting
E505		Same as E101.	
E506		Same as E101.	
E507		Same as E159.	On shaft of S504
E508		Same as E159.	On shaft of S505
E509	2Z8304.137 N16-S-34576-6515	SHIELD, TUBE: CRS, cad pl; cylindrical w/ 19/32" diam hole in top; bayonet mtg; 0.950" ID x 115/16" lg inside; w/ spring; Cinch (CIN) part # 16G12627; Collins Rad (CR) part/dwg # 141 0103 00.	Electrical shield
F501		Not used.	
F502		Not used.	
F503	3Z2601.16 N17-F-14310-380	FUSE, CARTRIDGE: Navy type 28053-1; 1 amp; blowing time, 1 hr at 135%, 5 to 60 sec at 200% load; 125 v; one time; glass body; ferrule term, 1¼" lg x ¼" diam; term ¼" lg x ¼" diam at ea end; high time lag; Littelfuse (LTF), part # 313001; Collins Rad (CR) part/dwg # 264 4280 00.	Control circuit #3
F504		Same as F503.	Power amplifier filament
F505		Same as F503.	Exciter filament
F506		Same as F503.	Bias

TABLE 8-4. TABLE OF REPLACEMENT PARTS—Continued

F r Radio Transmitting Set AN/FRT-24

Major Assembly: Power Control, p/o Radio Transmitter T-440/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
F507	3Z2603.2 GM17-F-16302-120	FUSE, CARTRIDGE: Navy type 28032-3; 3 amp; blowing time, life at 110%, 1 hr at 135%, 5—60 sec at 200% load; 250 v; one time; glass body; ferrule term; 1¼" lg x ¼" diam; term ¼" lg x ¼" diam at ea end; Littelfuse (LTF), part # 312003; Collins Rad (CR) part/dwg # 264 4080 00.	Autotune
F508		Same as F503.	DC relay supply
F509		Same as F503.	Spare #1
F510		Same as F507.	Spare #2
F511		Same as F507.	Blower
F512	N17-F-14305-40	FUSE, CARTRIDGE: Navy type 28053-2; 2 amp; blowing time, life at 110%, 1 hr at 135%, 5—60 sec at 200% load; 125 v; one time; glass body; ferrule term; 1¼" lg x ¼" diam; term ¼" lg x ¼" diam at ea end; 0.11 ohm; Littelfuse (LTF) part # 313002; Collins Rad (CR) part/dwg # 264 0008 00.	Modulator filament
F513		Same as F503.	Spare
F514		Same as F503.	High-voltage rectifier filament
F515	N17-F-16302-150	FUSE, CARTRIDGE: Navy type 28032-6; 6 amp; blowing time, life at 110%, 1 hr at 135%, 5—60 sec at 200%; 250 v; one time; glass body; ferrule term; 1¼" lg x ¼" diam; term ¼" lg x ¼" diam at ea end; Littelfuse (LTF), part # 312006; Collins Rad (CR) part/dwg # 264 4100 00.	Low-voltage plate
F516	3Z2587 N17-F-14310-335	FUSE, CARTRIDGE: Navy type 28053-¼; ¼ amp; blowing time, life at 110%, 1 hr at 135%, 5—60 sec at 200% load; 250 v; one time; glass body, ferrule term; 1¼" lg x ¼" diam; term ¼" lg x ¼" diam at ea end; Littelfuse (LTF), part # 313250; Collins Rad (CR) part/dwg # 264 4240 00.	Low-voltage rectifier filament
F517		Same as F512.	Control circuit #1
F518		Same as F503.	Control circuit #2
I501	GF17-L-3918	LAMP, INCANDESCENT: 125 v, 6 w, 0.04 amp; clear; 1²⁵⁄₃₂" lg o/a; candelabra base; burn any position; GE (GE) part # NE-¼ W; Collins Rad (CR) part/dwg # 262 3320 00.	Filament on indicator
I502		Same as I501.	Plate on indicator
I503	N17-L-99999-124	LAMP, GLOW: 65 to 130 v AC or 90 to 130 v DC; special plastic bulb incl holder; 2⅓₂" lg o/a; base is thd shank ½-24 NS-2 for panel mtg; glow any position; Littelfuse (LTF) part # 201005; Collins Rad (CR) part/dwg # 262 0090 00.	Blown-fuse indicator
I504		Same as I503.	Blown-fuse indicator
I505		Same as I503.	Blown-fuse indicator
I506		Same as I503.	Blown-fuse indicator
I507		Same as I503.	Blown-fuse indicator

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Power Control, p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
I508		Same as I503.	Blown-fuse indicator
I509		Same as I503.	Blown-fuse indicator
I510		Same as I503.	Blown-fuse indicator
I511		Same as I503.	Blown-fuse indicator
I512		Same as I503.	Blown-fuse indicator
I513		Same as I503.	Blown-fuse indicator
I514		Same as I503.	Blown-fuse indicator
I515		Same as I503.	Blown-fuse indicator
I516		Same as I503.	Blown-fuse indicator
I517		Same as I503.	Blown-fuse indicator
I518		Same as I503.	Blown-fuse indicator
I519	N17-L-250709-101	LENS, INDICATOR LIGHT: red; slotted push-on shank type; 1″ diam smooth glass, frosted back lens; bezel 1⅛″ OD, 5⁄16″ lg shank, 25⁄32″ lg o/a; polished chrome; Drake Mfg (DMI) type 75A-SFB; Collins Rad (CR) part/dwg # 262 0259 00.	Plate ON
I520	N17-L-250952-238	LENS, INDICATOR LIGHT: green; slotted push-on shank type; 1″ diam smooth glass, frosted back lens; bezel 1⅛″ OD, x 25⁄32″ h including lens; polished chrome; Drake Mfg (DMI) type 75A-SFB; Collins Rad (CR) part/dwg # 262 0258 00.	Filament ON
J501		Same as J113.	Power connection
J502		Same as J103.	Local-remote connector
J503		Same as J212.	Power connection
J504	N17-C-72624-6583	CONNECTOR, RECEPTACLE: AN type 3102A-24-10P, 7 round male cont; straight; 1¾″ lg x 1¾″ wd x 1⅞″ d; 150 v AC RMS max at sea level; four 0.147″ diam mtg holes spaced on 1.375″ mtg/c; per spec MIL-C-5015.	High-voltage connection
K501	N17-R-64554-1101	RELAY, POWER CONTACTOR: Cont arr 4 No; cont rating 10 amp; 230 v 50/60 cps; screw term on coil and contacts; 3⅝″ lg x 2¾″ wd x 35⁄16″ h; three 0.178″ diam mtg holes spaced on 2.250″ and 3.187″ mtg/c; RBM Co part # 109042-102; Collins Rad (CR) part/dwg # 401 1205 00.	Filament
K502		Same as K402.	Plate hold
K503	N17-R-64554-3737	RELAY, ARMATURE: cont arr 2A left, 1A right; cont rating 0.5 amp, 230 v AC; 3⁄32″ diam silver cont; single wnd, 230 v AC, 1430 ohms; solder-lug term on coil and cont; 111⁄16″ lg x 1⅝″ wd x 2″ h; four 0.140″ diam mtg holes spaced on ½″ mtg/c; Auto Elec (AGX) type R83; Collins Rad (CR) part/dwg # 405 0611 00.	Low-voltage plate

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Power Control, p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
K504	N17-R-65212-8501	RELAY, ARMATURE: cont arr left 1A, normally open; cont rating 1 amp; 230 v AC inductive; 3/16" diam silver cont; single wnd; pull-in at 5.4 ma DC, 5000 ohms; lug term on coil and cont; 1 37/64" lg x 1 1/8" wd x 1 3/8" h; 2 mtg holes tapped 4-40 NC-2 spaced on 0.843" mtg/c; Auto Elec (AGX) type R45; Collins Rad (CR) part/dwg # 405 0614 00.	High-voltage plate
K505	N16-R-64206-5398	RELAY, ARMATURE: SPDT normally open; cont rating 230 v AC at 20 amp; 3/8" diam baker alloy 901 cont; single wnd; energized at 98 v AC, nominal 115 v AC; 320 ohms coil resistance; solder-lug term on coil and cont, 1 7/8" lg x 1 5/8" wd x 1 15/16" h; four 0.140" diam mtg holes spaced on 1/2" x 1 5/16" mtg/c; must also be able to operate on 48 v AC w/ 300-ohm resistor in series w/ coil; Auto Elec (AGX) type R83; Collins Rad (CR) part/dwg # 405 0609 00.	Time delay (V501)
P501		Same as J103.	Mates with J501
P502		Same as J113.	Mates with J502
P503		Same as J212.	Mates with J503
P504	N17-C-70348-6585	CONNECTOR, PLUG: AN type 3106A-24-10S, 7 round female cont; straight 2 5/16" lg x 1 23/32" diam; 150 v AC; cylindrical metal body; phenolic insert; uses cable clamp, not incl; per spec MIL-C-5015.	Mates with J504
R501		Not used.	
R502		Not used.	
R503		Not used.	
R504		Same as R154.	Time-delay adjustment
R505		Same as R154.	V501 cathode
R506		Not used.	
R507		Not used.	
R508		Same as R154.	I508 voltage dropping
R509		Same as R154.	I509 voltage dropping
R510		Same as R154.	I510 voltage dropping
R511		Same as R154.	I511 voltage dropping
R512		Same as R154.	I512 voltage dropping
R513		Same as R154.	I513 voltage dropping
R514		Same as R154.	I514 voltage dropping
R515		Same as R154.	I515 voltage dropping

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting Set AN/FRT-24

Major Assembly: Power Control, p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R516		Same as R154.	I516 voltage dropping
R517		Same as R154.	I517 voltage dropping
R518		Same as R154.	I518 voltage dropping
R519	N16-R-50202-516	RESISTOR, FIXED: JAN type RC42GF682K; comp; 6,800 ohm ±10%; 2 w; per spec MIL-R-11.	V501 cathode
		OR	
R519	3RC42BE682K N16-R-50202-521	RESISTOR, FIXED: JAN type RC42BE682K; comp; 6,800 ohm ±10%; 2 w; per spec JAN-R-11.	V501 cathode
R520	N16-R-055492-0377	RESISTOR, FIXED: JAN type RC32GF125J; comp; 1.2 megohm ±5%; 1 w; per spec MIL-R-11.	V501 grid filter
		OR	
R520	3RC30BF125J N16-R-50992-751	RESISTOR, FIXED: JAN type RC30BF125J; comp; 1.2 megohm ±5%; 1 w; per spec JAN-R-11.	V501 grid filter
R521		Same as R520.	V501 grid
R522		Same as R104.	V501 cathode
R523	2Z7280-16 N16-R-91028-1405	RESISTOR, VARIABLE: WW; 5000 ohms ±10%; 4 w, 0.028 amp; 3 solder-lug term; enclosed cad pl case 1.64" diam x $1\frac{15}{32}$" d; slotted round metal shaft $\frac{1}{4}$" diam; linear taper; ins cont arm, w/o off position; normal torque bushing $\frac{3}{8}$-32 x $\frac{3}{8}$" lg, non-turn device located on $\frac{17}{32}$" rad at 12 o'clock; Mallory (MAL) part # M5MPX; Collins Rad (CR) part/dwg # 377 0009 00.	V501 time-delay adjustment
S501		Not used.	
S502	N17-S-59180-8210	SWITCH, PUSH-PULL: DPDT; 600 v AC, 5 amp inductive, 15 amp non-inductive, 600 v DC, 0.1 amp; $3\frac{3}{16}$" lg x $1\frac{13}{16}$" wd x $2\frac{1}{8}$" h; one side normally closed; two $\frac{13}{64}$" diam mtg holes spaced on $1\frac{39}{64}$" mtg/c; AH&H type PP-18; Collins Rad (CR) part/dwg # 260 0028 00.	Filament ON
S503		Same as S502.	Plate ON
S504	N17-S-66877-5066	SWITCH, ROTARY: 17 poles, 2 positions, 6 sect, per spec JAN-I-10; clips spring brass silver pl rotor blades 30-deg shorting type, hard brass silver pl; steatite ins; $4\frac{1}{16}$" lg x $1\frac{5}{8}$" wd x $1\frac{7}{8}$" h incl mtg shaft; shorting type cont; 60-deg detent stops limiting rotation to 2 positions; $\frac{3}{8}$-32 NEF-2 thd bushing for mtg; Oak Mfg (OAK) type HC; Collins Rad (CR) part/dwg # 259 0453 00.	Local-remote switch
S505	N17-S-61164-5849	SWITCH, ROTARY: 2 poles, 3 positions, 1 sect; silver pl brass cont; steatite ins; $1\frac{5}{8}$" lg x $1\frac{21}{32}$" wd x $1\frac{5}{8}$" d; single-hole mtg; bushing $\frac{3}{8}$-32 NEF-2; Oak Mfg (OAK) type HC; Collins Rad (CR) part/dwg # 259 0452 00.	PH-CW-FSK switch

TABLE 8-4. TABLE OF REPLACEMENT PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Power Control, p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
T501	N17-T-076422-1577	TRANSFORMER, POWER: fixed autotransformer; input 200 to 250 v; output 6.7 amp at 230 v RMS, 1.75 amp at 115 v RMS; 750 v RMS test; enclosed metal case; case excluding term 4¾″ lg x 4⁹⁄₁₆″ wd x 5⁵⁄₁₆″ h; 9 term studs on bottom; six ¼″ diam mtg holes spaced on 4¾″ x 1¼″ mtg/c; Chi Trans (CHT) type 17745; Collins Rad (CR) part/dwg # 664 0109 00.	Supplies 230/110 volts
T502		Same as T501.	
V501		Same as V201.	Time delay
XF501		Not used.	
XF502		Not used.	F502 mounting
XF503	3Z3282-42.9 N17-F-74267-5075	HOLDER, FUSE: extractor post type; for single 3AG cartridge fuse; bakelite; 5 amp; 125 v; 2⁵⁄₁₆″ lg x 1³⁄₁₆″ diam o/a; ½-24 NS-2 thd body for panel hole mtg; 2 solder lug term; Buss (BUS) type HKP; Collins Rad (CR) part/dwg # 265 1002 00.	F503 mounting
XF504		Same as XF503.	F504 mounting
XF505		Same as XF503.	F505 mounting
XF506		Same as XF503.	F506 mounting
XF507		Same as XF503.	F507 mounting
XF508		Same as XF503.	F508 mounting
XF509		Same as XF503.	F509 mounting
XF510		Same as XF503.	F510 mounting
XF511		Same as XF503.	F511 mounting
XF512		Same as XF503.	F512 mounting
XF513		Same as XF503.	F513 mounting
XF514		Same as XF503.	F514 mounting
XF515		Same as XF503.	F515 mounting
XF516		Same as XF503.	F516 mounting
XF517		Same as XF503.	
XF518		Same as XF503.	
XI501	For replacement use SNSN N17-L-76752-7532	LAMPHOLDER: miniature screw base; brass shell cad pl; 2⅛″ lg x 1⅛″ diam; 1-27 thd body ⅝″ lg; one solderlug term; incl one ⅞″ hex mtg nut and one ⅞″ ID fiber washer; Drake Mfg (DMC) type 75; Collins Rad (CR) part/dwg # 262 0255 00.	Holds I501
XI502		Same as XI501.	Holds I502
XV501		Same as XV102.	Holds V501

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Maj r Ass mbly: M dulat r (M)
P w r Chang Unit (p)
Cabinet Acc ss ri s (c)

F r Radio Transmitting Set AN/FRT-24 p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
601-699 Series (m)	∅	MODULATOR, RADIO: A3 type of emission; 750 w audio output; 350 to 2700 cps ±3 db; input impedance 600 ohms, output 6000 ohms; self-contained bias and filament supply only, external power required 250 v AC 60 cyc single ph at 200 va, 600 v DC at 0.1 amp, 3200 v DC at 0.45 amp; provision for microphone; modulator 17" wd x 18" d x 10⅝" h o/a; transformer filter unit 17" wd x 9" d x 11" h o/a; incl speech clipper; Collins Rad (CR) part #509A-1 dwg # 505 2740 002. P/O T-440/FRT-24.	Provides audio power for modulating 507A-2A
680-690 Series (p)	N16-C-90488-1010	POWER CHANGE UNIT: changes HV supply; c/o 9 power resistors, 2 relays, and 1 sw; rated to dissipate up to 1100 w; 17" wd x 16" d x 9⅞" h o/a; four 7/32" diam mtg holes on 9" x 16¼" mtg/c; Collins Rad (CR) part/dwg # 506 4261 006.	Changes transmitter output by controlling high-voltage supply
663-672 Series (c)	∅	CABINET ACCESSORIES: See descriptions of separate items.	
A601 through A639		Not used.	
A640 (c)	N17-M-75014-9951	MOUNT, VIBRATION: square mtg, 12 lb max load rating; 2⅜" lg x 2⅜" wd x 1 1/16" h o/a; rubber cushion, 1½" diam x ⅝" thk; round cup mtd; steel center sleeve w/ 0.257" bolt hole; monel-metal shear-type holder; 4 mtg holes 0.196" diam on 1 15/16" x 1 15/16" mtg/c; Lord (LO) part # 150 PMH-8; Collins Rad (CR) part/dwg # 200 3098 00.	Supports B641
A641 (c)		Same as A640.	Supports B641
A642 (c)		Same as A640.	Supports B641
A643 (c)		Same as A640.	Supports B641
B601 through B640		Not used.	
B641 (c)	∅	BLOWER: centrifugal vane; electric-motor operated; non-portable; guarded; ⅙ hp at 1750 rpm, 230 v AC 50/60 cps single ph; 14⅜" lg x 12¾" wd x 12½" h; 630 cfm max displacement; direct drive, counterclockwise bottom angular up blast; three ⅜" diam mtg holes spaced on 5" x 4¾" mtg/c; Ilg Elec type B-12; Collins Rad (CR) part/dwg # 505 3371 002. (incl. B-642, O-682)	Circulates cooling air
B642 (c)	N17-M-58301-6452	MOTOR, AC: (p/o B-641) MOTOR, AC: wound-rotor induction type; ⅙ hp at 1750 rpm; 1750 rpm mom at 60 cps; semi open frame; ambient temp range 60 deg C max; w/o pulley; flatted shaft; 8½" lg x 5 7/16" wd x 5 7/16" h, shaft extends 1⅞"; 230/115 v AC, 50/60 cps; shaft mtd; four 5/16"—18 UNC-2B holes equally spaced on 3½" diam base, incl 330 v AC, 50 mmf capacitor; motor speed may be reduced to ⅚ of its cps value when operated at 50 cps; Ilg Elec # 17-18-000 A; Collins Rad (CR) part/dwg # 230 0216 00 (p/o B641).	

TABLE 8-4. TABLE OF REPLACEABLE PARTS—Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: **Modulator (M)**
Power Change Unit (p)
Cabinet Accessories (c)
p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
C601 (m)	3D9100-230 N16-C-17077-1226	CAPACITOR, FIXED: Navy type CC30UJ101J; ceramic dielectric; 100 $\mu\mu$f ±5%; negative temp coef 750 (tol plus 120) $\mu\mu$f/μf/° C; 500 vdcw; 0.460" lg x 0.240" wd; 2 radial wire leads; uninsulated; per spec JAN-C-20A.	V601 grid RF bypass
C602 (m)	N16-C-19781-5646	CAPACITOR, ELECTROLYTIC: Navy type CE64C250F; 25 μf minus 10% plus 150%; 25 vdcw; HS metal case; $2\frac{1}{2}$" lg x 1" wd x $1\frac{1}{4}$" h; 2 solder-lug term on top, spaced $1\frac{1}{16}$" c to c; 2 mtg ft w/ $\frac{3}{16}$" diam hole in ea on $2\frac{1}{8}$" mtg/c per spec JAN-C-62.	V601 cathode bypass
C603 (m)	For replacement use SNSN N16-C-49197-3879	CAPACITOR, FIXED: Navy type CP53BIFF205X; paper dielectric; 2 mf +40% −15%; 600 vdcw; HS metal case; 2" lg x 2" wd x $1\frac{1}{8}$" d; Dykanol impr; 3 solder-lug term, located on side spaced $\frac{1}{2}$" c to c; no int gnd connections; 2 mtg feet w/ 0.187" diam hole in ea on $2\frac{3}{8}$" mtg/c; per spec JAN-C-25.	Plate-circuit decoupling
C604 (m)	N16-C-47297-3100	CAPACITOR, FIXED: Navy type CP53BIFF504K; paper dielectric; 0.5 mf ±10%; 600 vdcw; HS metal case; $1\frac{3}{16}$" lg x 1" wd x $\frac{7}{8}$" d; Dykanol impr; 2 solder-lug term located on side spaced $1\frac{1}{16}$" c to c; no int gnd connections; 2 mtg feet w/ $\frac{3}{16}$" diam hole in ea on $2\frac{1}{8}$" mtg/c; uninsulated; per spec JAN-C-25.	Couples V601 to Z601
C605 (m)	For replacement use SNSN N16-C-43634-4751	CAPACITOR, FIXED: paper dielectric; 0.033 μf ±20%; 1000 vdcw; HS metal case; $1\frac{3}{8}$" lg x 0.400" diam; 2 axial wire lead term; Sprague (SPR) part # 91P333010S2; Collins Rad (CR) part/dwg # 931 2706 00.	Couples V601 to V602
C606 (m)		Same as C605.	Couples V601 to V602
C607 (m)		Same as C602.	V602 cathode bypass
C608 (m)		Same as C605.	Couples V602 to V603
C609 (m)		Same as C605.	Couples V602 to V603
C610 (m)		Same as C127	Bias-supply filter
C611 (m)		Same as C602.	Couples J601 to T601 through K602
C612 (m)		Same as C127.	Bias-supply filter
C613 (m)		Same as C127.	Bias bleeder network filter
C614 through C690		Not used.	

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Major Assembly: M dulat r (M) Power Chang Unit (p) Cabinet Acc ss ri s (c)

F r Radio Transmitting Set AN/FRT-24

p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
C691 (m)	N16-C-99999-1145	CAPACITOR, FIXED: plastic-film dielectric; 0.005 μf $\pm 10\%$; 10,000 vdcw; —60° +75° C temp range; 1 13/32" diam x 4½" lg excluding term; 2 term studs 3/8" lg ea end, tapped 8-32 NC-2; Condenser Prod (COPC) type LSG; Collins Rad (CR) part/dwg # 933 0064 00.	High-level low-pass filter
C692 (m)		Same as C691.	High-level low-pass filter
E601 (m)		INSULATOR, STANDOFF: round post shape; L-4 ceramic, white, glazed on heavy lined surfaces; 2" lg x ½" diam; tapped 8-32 x 3/8" d ea end; Collins Rad (CR) part/dwg # 190 1153 00.	Support for R620
E602 (m)		Same as E601.	Support for R621
E603 (m)		Same as E135.	Tie point
E604 (m)		Same as E135.	Tie point
E605 (m)		Not used.	Tie point
E606 (m)		Same as E101.	Tie point
E607 (m)		Same as E101.	Tie point
E608 (m)		Same as E101.	Tie point
E609 (m)		Same as E101.	Tie point
E610 (m)		Same as E101.	Tie point
E611 (m)		Same as E101.	Tie point
E612 (m)		Sarre as E101.	Tie point
E613 (m)		Same as E101.	Tie point
E614 (m)		Same as E101.	Tie point
E615 (m)		Same as E101.	Tie point
E616 (m)		Same as E101.	Tie point

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Maj r Assembly: M dulat r (M)
P w r Chang Unit (p)
Cabinet Accessories (c)

For Radio Transmitting Set AN/FRT-24 p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
E617 (m)		Same as E101.	Tie point
E618 (m)		Same as E101.	Tie point
E619 (m)		Same as E101.	Tie point
E620 (m)		Deleted.	Tie point
E621 (m)	⊕⊕	INSULATOR, STANDOFF: round post shape; natural bakelite; 1.5″ lg; 5/16″ OD; tapped 6-32 NC-2 x ½″ d ea end; Collins Rad (CR) part/dwg # 500 9035 001.	Insulator
E622 (m)		Same as E621.	Insulator
E623 (m)		Same as E621.	Insulator
E624 (m)		Same as E621.	Insulator
E625	⊕⊕	INSULATOR, STANDOFF: round post shape; xxx natural bakelite; 1¼″ x 5/16″ diam; tapped 6-32 NC-2 x ½″ d each end; Collins Rad (CR) part/dwg # 500 9034 001.	Insulator
E626 (m)		Same as E625.	Insulator
E627 (m)	3G350-119 N17-I-69158-6701	INSULATOR, STANDOFF: round post shape; natural bakelite; 0.750″ lg; 3/8″ OD, tapped 6-32 NC-2 x ½″ d ea end; Collins Rad (CR) part/dwg # 500 8923 001.	Insulator
E628 (m)		Same as E627.	Insulator
E629 (m)		Same as E159.	Gain control knob
E630 (m)		Same as E101.	Tie point
E631 (m)		Same as E101.	Tie point
E632 (m)		Same as E129.	Tie point
E633 (m)		Same as E129.	Tie point
E634 (m)		Same as E129.	Tie point
E635 through E650		Not used.	

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Maj r Ass mbly: M dulat r (M)
P w r Chang Unit (p)
Cabinet Acc ss ri s (c)

F r Radio Transmitting Set AN/FRT-24 — p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
E651 (c)		Same as E135.	Supports E653
E652	⊕⊕	BAR, SHORTING: for sw; cad pl steel; Z shape; $1\frac{15}{16}$" lg x $1\frac{11}{16}$" wd x $1\frac{3}{4}$" h; two 0.187" mtg holes spaced $1\frac{1}{16}$" c to c; p/o S622; Collins Rad (CR) part/dwg # 505 3284 002.	Makes contact with E653
E653 (c)	⊕⊕	CONTACT, SWITCH: flat plate type; straight; $1\frac{1}{2}$" lg x $\frac{7}{8}$" wd x 0.064" thk; one $\frac{7}{32}$" diam mtg hole; p/o S622; Collins Rad (CR) part/dwg # 505 3281 001.	Makes contact with E652
E654		Same as E135; p/o S652.	Supports E656
E655		Same as E652; p/o S652.	Makes contact with E656
E656		Same as E653; p/o S652.	Makes contact with E655
E657 through E659		Not used.	
E660 (c)		Same as E118.	Tie point
E661 (c)		Same as E118.	Tie point
E662 (c)		Same as E118.	Tie point
E663 (c)		Same as E118.	Tie point
E664		Same as E118.	
E665		Not used.	
E666		Not used.	
E667	For replacement use SNSN N17-I-69160-6215	INSULATOR, STANDOFF: round post shape; grade L-4 ceramic, white, glazed except ends; 1" lg; $\frac{3}{8}$" diam, tapped # 6-32 x $\frac{5}{32}$" d at ea end; Collins Rad (CR) part/dwg # 190 1144 00.	Supports resistor board
E668		Same as E667.	
E669 through E679		Not used.	
E680 (p)		c/o E680A and E680B.	High-voltage input termina
E680A (p)		Same as E401A.	See E680
E680B (p)		Same as E401B.	See E680

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Maj r Ass mbly: M dulat r (M) P wer Change Unit (p) Cabinet Accessories (c) p/o Radio Transmitter T-440/FRT-24

F r Radi Transmitting Set AN/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
E681 (p)		c/o E681A and E681B.	High-voltage output terminal
E681A (p)		Same as E401A.	See E681
E681B (p)		Same as E401B.	See E681
E682 (p)		Same as E135.	R682 support
E683 (p)		Same as E135.	R682 and R683 support
E684 (p)		Same as E135.	R683 and R684 support
E685 (p)		Same as E135.	R684 support
E686 (p)		Same as E135.	R688 support
E687 (p)		Same as E135.	R687 and R688 support
E688 (p)		Same as E135.	R686 and R687 support
E689 (p)		Same as E135	R685 and R686 support
E690 (p)		Same as E145.	R685 support
E691		Same as E159.	Turns S680
J601	N17-J-39409-8522	JACK, TELEPHONE: Navy type JJ-083; 3 ckt; for use with 3/16" diam plug (JAN PJ-068 type); 3 5/32" lg x 9/16" wd x 1 1/8" h; cont arr J 7; mts by 3/8-32 x 3/8" lg bushing; incl 1 hex nut and 1 washer; 3/8" mtg hole; per spec JAN-J-641.	Microphone input
J602 through J679		Not used.	
J680 (p)		Same as J243.	Power-change control connections
K601 (m)	N17-R-64209-4021	RELAY, ARMATURE: cont arrangement, main cont single pole double break, aux cont 1B1C; main cont rating 1.0 amp, 10 kv peak, 1B cont rated 5 amp, 230 v AC, 1C cont rated 200 ma, 600 v DC; single wnd coil, 115 v AC, 0.47 amp, 245 ohms, solder-lug term on coil and cont; 5 15/16" lg x 2 1/2" wd x 2 3/8" h; four 0.156" diam mtg holes on 1 3/4" x 4 3/8" mtg/c; fast-acting; fungus-treated; Auto Elec (AGX) type R68; Collins Rad (CR) part/dwg # 410 0081 00.	Modulator disabling

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Major Assembly: M dulat r (M) Power Chang Unit (p) Cabinet Acc ss ri s (c) p/o Radio Transmitter T-440/FRT-24

F r Radio Transmitting Set AN/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	L CATING FUNCTION
K602 (m)		Same as K201.	Local-remote input switching
K603 (m)		Same as K504.	Push-to-talk
K604 (m)	N17-R-99999-817	RELAY, ARMATURE: cont arr 1C left, 1C right, cont rating 1 amp 230 v AC, 3/32" diam silver cont; pull-in 97 v, drop-out 85 v AC; single wnd; 115 v 50/60 cps solder-lug term on coil and cont; 2" lg x 1 5/8" wd x 2" h; four 5/32" diam mtg holes spaced on 1/2" x 1 5/16" mtg/c; Collins Rad (CR) part/dwg # 405 0616 00.	Push-to-talk disabling
K605 through K679		Not used.	
K680 (p)		Same as K601.	Changes plate and screen voltages for half-power operation
K681 (p)		Same as K601.	Changes plate and screen voltages for full-power operation
L601 (m)		Same as L130.	Filter choke
L602 (m)	N16-R-99999-819	REACTOR: filter choke; 8.0 hy; 90 ohms DC resistance; 2500 v RMS test; enclosed metal case; 500 v DC output; 5 1/4" lg x 4 9/16" wd x 5 5/16" h; six 0.230 diam mtg holes spaced on 1.250" x 4.750" mtg/c; two solder-lug term on bottom; Chi Trans (CHT) type RS-8250; Collins Rad (CR) part/dwg # 678 0413 00.	Power amplifier screen audio choke
L603 through L690		Not used.	
L691 (m)	N16-R-99999-820	REACTOR, AUDIO: 0.46 hy; 200 to 3500 cps, 550 ma; 10,000 v RMS test; enclosed metal case; 5 15/16" lg x 5 21/64" wd x 6 5/64" h excluding term; six 17/64" diam mtg holes spaced on 1.750" x 5.375" mtg/c; 2 screw type ceramic bushings; Chicago STD transformer (CHT) type # 20820; Collins Rad (CR) part/dwg # 678 0685 00.	High-level low pass filter
M601 through M660		Not used.	
M661 (c)		Same as M105.	Modulator plate current
M662 (c)	N17-M-35866-6626	METER, VOLTMETER: DC; 0—5000 v; round phenolic case; 2 3/4" diam body, 1 3/8" d, w/ sq mtg fl 3" lg x 3 1/8" h x 13/64" thk; ±2% accuracy for full-scale reading; D'Arsonval movement; 46 ohms resistance; calibrated for non-magnetic panel; 50 scale divisions; black numerals, w/ white face, spade-type pointer; four 4-36 NS-2 x 17/32" lg mtg studs spaced on 2 1/4" x 2 1/4" mtg/c; stud term 1/4"-28 NF-2 x 11/16" lg spaced 1 1/2" c to c; Simpson Elec (SIC) type 27B; Collins Rad (CR) part/dwg # 458 0272 00.	Plate voltage

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Major Assembly: Modulator (M)
Power Change Unit (p)
Cabinet Accessories (c)

For Radi Transmitting Set AN/FRT-24 p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
M663 (c)	N17-M-34276-1801	METER, VOLTMETER: AC; 0—300 v; round phenolic case; 2¾" diam body; 1⅜" d; w/ sq mtg fl 3" lg x 3⅛" h x 13/64" thk; ±2% accuracy for full-scale reading; moving-iron movement; 50,000 ohms resistance; calibrated for non-magnetic panel; 60 scale divisions; black numerals, w/ white face, spade type pointer; four 4-36 NS-2 x 17/32" lg mtg studs spaced on 2¼" x 2¼" mtg/c; 2 stud term ¼"-28 NF-2 x 11/16" lg spaced 1½" c to c; Simpson Elec (SIC) type 57B; Collins Rad (CR) part/dwg # 452 0046 00.	Primary voltage
M664 through M670		Not used.	
M671 (c)	N17-M-32933-4742	TIMER, ELECTRIC: elapsed-time indicator; synchronous self-starting electric clock; direct reading; automatic start and stop; 2 29/32" lg x 3" wd x 3" h; 5 rotating-drum counters ea calibrated 0 to 9, w/window opening in face; indicates from 0 to 9999.9 elapsed hours; 230 v 60 cyc ac; two term studs spaced on 1¼" mtg/c; black phenolic case; four 6-32 NC-2 mtg holes spaced on 2¼" x 2¼" mtg/c; Collins Rad (CR) part/dwg # 458 0190 00.	Indicates total filament hours
M672 (c)		Same as M671.	Indicates total plate hours
O601 (m)	N16-P-324000-102	DUCT AIR: Directs cooling air; glass; cylindrical shape; 5" h x 4⅛" diam w/ 2 7/16" diam opening in top; mounts in metal clips on chassis; Eimac (ETM) part # 4-400A/4006; Collins Rad (CR) part/dwg # 192 1024 00.	Directs cooling air round 4-400A tube
O602 (m)		Same as O601.	Directs cooling air around 4-400A tube
O603 through O640		Not used.	
O641 (c)	⊕⊕	CLEANER, AIR: baffle-impingement type, galvanized steel wire mesh; enclosing steel frame; 15¾" lg x ⅞" wd x 19¾" h; element not replaceable; 640 ohm recommended capacity Air Maze Corp (AMA) type K-1; Collins Rad (CR) part/dwg # 009 1205 00	Cleans cooling air
O642 (m)	†	HOSE, AIR: flexible; cotton sheeting with spiral steel wire; neoprene coated on both sides; 1¾" ID, 1.822" OD, 8" lg; not pressure-rated; must withstand up to +200° F temp; Collins Rad (CR) part/dwg # 009 1280 00.	Air duct for modulator tubes
O643 (m)	⊕⊕	CLAMP HOSE: SS; one worm employed; approx 2" lg x 1 1/16" wd x ¾" h o/a; accomm hose 1 1/16" to 2 1/16" diam; Breeze (BC) part # QS200M24S; Collins Rad (CR) part/dwg # 013 0993 00.	Holds O642
O644 (m)		Same as O643.	Holds O642
O645 through O679		Not used.	

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Major Assembly: Modulat r (M) Power Chang Unit (p) Cabinet Acc ss ri s (c) p/o Radio Transmitter T-440/FRT-24

F r Radi• Transmitting Set AN/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
O680 (c)	†	CATCH, FASTENER: spring friction type; brass, zinc pl; "Y" shape; 1$\frac{5}{16}$" lg x 1" wd x ½" thk o/a; 2 mtg holes on ⅝" mtg/c; Amer Cabt Hdwe (ACH) part # 3687; Collins Rad (CR) part/dwg # 015 4090 00.	Holds relay cover
O681 (c)		Same as O680.	Holds relay cover
O682	N17-I-19006-4018	IMPELLER, CENTRIFUGAL: used on a blower, Collins # 009 1209 00; steel, mfr standard green finish over suitable primer, cad pl set screw; round; 6⅜" OD x 3⅝" thk o/a; 0.3755" ID for mtg; counter clockwise rotation; (p/o B641) Ilg Elec # 1812 9002A; Collins Rad (CR) part/dwg # 234 0578 00.	
P601 through P679		Not used.	
P680 (c)		Same as J213.	Mates with J680
R601 (m)	For replacement use SNSN N16-R-88009-4558	RESISTOR, VARIABLE: comp; 0.10 meg ±20%; ½w; 80° C max continuous oper temp; 3 solder-lug term; metal case 1$\frac{5}{32}$" diam x $\frac{19}{32}$" d less shaft, enclosed; shaft round metal 0.250" diam x 1" lg; lin taper; ins cont arm; non-turn device located on 0.531" rad at 9 o'clock; mtg bushing ⅜"-32 NEF-2 x 0.375" lg; Collins Rad (CR) part/dwg # 376 3025 00.	Modulator gain control
R602 (m)	N16-R-50013-171	RESISTOR, FIXED: JAN type RC32GF222K; comp; 2200 ohm ±10%; 1 w; per spec MIL-R-11.	V601 cathode bypass
		OR	
R602 (m)	3RC30BF222K N16-R-50013-231	RESISTOR, FIXED: JAN type RC30BF222K; comp; 2200 ohm ±10%; 1 w; per spec JAN-R-11.	V601 cathode bypass
R603 (m)	N16-R-50481-101	RESISTOR, FIXED: JAN type RC32GF473K; comp; 47,000 ohm ±10%; 1 w; per spec MIL-R-11.	V601 plate
		OR	
R603 (m)	3RC30BF473K N16-R-50481-231	RESISTOR, FIXED: JAN type RC30BF473K; comp; 47,000 ohm ±10%; 1 w; per spec JAN-R-11.	V601 plate
R604 (m)		Same as R154.	V601 grid
R605 (m)	For replacement use SNSN N16-R-50481-457	RESISTOR, FIXED: comp; balanced pair; 47,000 ohms ±10%; 1w; characteristic ltr BF; 0.750" lg x 0.032" diam; ins; 2 axial wire lead term per spec JAN-R-11; IRC (IRC) type BTS; Collins Rad (CR) part/dwg # 720 0053 00.	V601 phase-splitter cathode
R606		Not used.	
R607 (m)	N16-R-50715-102	RESISTOR, FIXED: JAN type RC32GF224K; comp; 0.22 megohm ±10%; 1 w; per spec MIL-R-11.	V602 grid
		OR	
R607 (m)	3RC30BF224K N16-R-50715-231	RESISTOR, FIXED: JAN type RC30BF224K; comp; 0.22 megohm ±10%; 1 w; per spec JAN-R-11.	V602 grid
R608 (m)		Same as R607.	V602 grid

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Maj r Ass mbly: M dulat r (M)
P w r Chang Unit (p)
Cabinet Accessories (c)
p/o Radio Transmitter T-440/FRT-24

F r Radi Transmitting Set AN/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R609 (m)		Same as R607.	V602 grid compensating
R610 (m)	N16-R-50418-483	RESISTOR, FIXED: JAN type RC42GF333K; comp; 33,000 ohm ±10%; 2 w; per spec MIL-R-11.	Voltage dropping
		OR	
R610 (m)	3RC42BE333K N16-R-50418-487	RESISTOR, FIXED: JAN type RC42BE333K; comp; 33,000 ohm ±10%; 2 w; per spec JAN-R-11.	Voltage dropping
R611 (m)		Same as R102.	V602 cathode
R612 (m)		Same as R610.	V602 plate
R613 (m)		Same as R610.	V602 plate
R614 (m)		Same as R610.	V602 plate
R615 (m)		Same as R610.	V602 plate
R616 (m)		Same as R607.	Isolation resistor
R617 (m)		Same as R607.	Isolation resistor
R618 (m)		Same as R109.	V604 grid limiting
R619 (m)		Same as R109.	V603 grid limiting
R620 (m)	For replacement use SNSN N16-R-65532-4386	RESISTOR, FIXED: JAN type RW31G500; WW; 50 ohms ±5%; 10 w; per spec JAN-R-26A.	V603 plate stabilizing
R621 (m)		Same as R620.	V604 plate stabilizing
R622 (m)		Same as R620.	Part of V601 cathode-bias network
R623 (m)	N16-R-50040-518	RESISTOR, FIXED: JAN type RC42GF272K; comp; 2700 ohm ±10%; 2 w; per spec MIL-R-11.	p/o bias supply voltage divider
		OR	
R623 (m)	3RC42BE272K N16-R-50040-521	RESISTOR, FIXED: JAN type RC42BE272K; comp; 2700 ohm ±10%; 2 w; per spec JAN-R-11.	p/o bias supply voltage divider
R624 (m)		Same as R523.	Right modulator bias adjustment

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Major Ass mbly: M dulat r (M)
P w r Chang Unit (p)
Cabinet Acc ss ries (c)

F r Radio Transmitting Set AN/FRT-24

p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R625 (m)		Same as R523.	Clipper adjustment
R626 (m)		Same as R523.	Left modulator bias adjustment
R627 (m)		Same as R519.	Part of bias-supply voltage divider
R628 (m)		Same as R519.	Part of bias-supply voltage divider
R629 (m)	For replacement use SNSN N16-R-49840-698	RESISTOR, FIXED: JAN type RC32GF681K; comp; 680 ohm ±10%; 1 w; per spec MIL-R-11.	p/o bias supply voltage divider
		OR	
R629 (m)	3RC30BF681K N16-R-49842-231	RESISTOR, FIXED: JAN type RC30BF681K; comp; 680 ohm ±10%; 1 w; per spec JAN-R-11.	p/o bias supply voltage divider
R630 through R659		Not used.	
R660 (c)	N16-R-50283-512	RESISTOR, FIXED: JAN type RC42GF103K; comp; 10,000 ohm ±10%; 2 w; per spec MIL-R-11.	M662 shunt
		OR	
R660 (c)	3RC42BE103K N16-R-50283-535	RESISTOR, fixed: JAN type RC42BF103K; comp; 10,000 ohm ±10%; 2 w; per spec JAN-R-11.	M662 shunt
R661 (c)	N16-R-73308-7405	RESISTOR, FIXED: deposited carbon on ceramic rod; 1 meg ±1%; 2 w; 2 1/32" lg x 9/32" diam; ins, humidity and RSW; 2 axial wire lead term; Collins Rad (CR) part/dwg # 705 4001 00.	Series resistor for M662
R662 (c)		Same as R661.	Series resistor for M662
R663 (c)		Same as R661.	Series resistor for M662
R664 (c)		Same as R661.	Series resistor for M662
R665 (c)		Same as R661.	Series resistor for M662
R666 through R679		Not used.	
R680 (p)	3RW27341 For replacement use SNSN N16-R-66168-2523	RESISTOR, FIXED: JAN type RW35G312; WW; 3100 ohms ±5%; 38 w at 275° C max continuous oper temp; per spec JAN-R-26.	Part of power-change high-voltage network

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Major Ass mbly: Modulator (M)
P w r Chang Unit (p)
Cabinet Accessories (c)
F r Radi Transmitting Set AN/FRT-24 p/o Radio Transmitter T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R681 (p)	3RW26148 For replacement use SNSN N16-R-66105-1835	RESISTOR, FIXED: JAN type RW35G202; WW; 2000 ohms ±5%; 38 w at 275° C max continuous oper temp; per spec JAN-R-26. Same as R-122.	Part of power-change high-voltage network
R682 (p)	For replacement use SNSN N16-R-66051-8246	RESISTOR, FIXED: JAN type RW47G122; WW; 1200 ohms ±5%; 145 w at 275° C max continuous oper temp; per spec JAN-R-26.	Part of power-change high-voltage network
R683 (p)		Same as R682.	Part of power-change high-voltage network
R684 (p)		Same as R682.	Part of power-change high-voltage network
R685 (p)	For replacement use SNSN N16-R-65935-4441	RESISTOR, FIXED: JAN type RW47G631; WW; 630 ohms ±5%; 145 w at 275° C max continuous oper temp; per spec JAN-R-26.	Part of power-change high-voltage network
R686 (p)		Same as R685.	Part of power-change high-voltage network
R687 (p)		Same as R685.	Part of power-change high-voltage network
R688 (p)		Same as R685.	Part of power-change high-voltage network
S601 through S620		Not used.	
S621 (c)	N17-S-57755-3701	SWITCH, LEVER: 2 position non-locking; SPST; 6 amp, 250 v; bakelite body; 1⅞" lg x 13/16" wd x 213/64" h; roller-arm attachment; screw term; four 4-36 NS-2 thd mtg holes spaced on 0.630" x 0.755" mtg/c; C-H (CUT) part # 8909K128; Collins Rad (CR) part/dwg # 260 0856 00.	Door interlock
S622 (c)		c/o E651, E652, and E653.	High-voltage shorting, door safety switch
S623 through S640		Not used.	
S641	3Z9823-25.2 N17-S-69556-6901	SWITCH, SENSITIVE: SPDT; 5 amp, 250 v AC; phenolic body; 11/16" lg x ¾" wd x 13/64" h; actuating shaft 3/16" lg x 0.125" diam; 4 in-gm operating torque; 0.35 in-gm release torque; 20 deg max pretravel; 20 deg min over-travel momentary; 3 solder-lug term; two 0.120" mtg holes spaced on 0.750" x 0.500" mtg/c; Micro Sw (MCS) type V4-14; Collins Rad (CR) part/dwg # 260 0700 00.	Air interlock switch

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Major Assembly: M dulat r (M) Power Chang Unit (p) Cabinet Acc ss ri s (c) p/o Radio Transmitter T-440/FRT-24

For Radio Transmitting Set AN/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
S642 through S650		Not used.	
S651 (c)		Same as S621.	Door interlock
*S652 (c)		Same as S622. c/o E654, E655, E656.	High-voltage shorting, door safety switch
S653 through S679		Not used.	
S680 (p)	N17-S-59931-7438	SWITCH, ROTARY: single pole, 3 positions; one section, clips spring brass, silver pl, rotor blades hard brass, silver pl, body phenolic; body 1⅝" wd x 1⅞" h x ⅝" thk excluding shaft and bushing; non-shorting; 4 solder lugs; bushing ¼" lg x ⅜-32 NEF-2, shaft ¾" lg x ¼" diam; surface mtg; 30 deg detent and stops limiting rotation to 3 positions; corrosion and moisture resistant; Oak (OAK) type H; Collins Rad (CR) part/dwg # 259 0645 00.	Power changing switch
T601 (m)	N17-T-61606-8701	TRANSFORMER, AF: input type; pri 150 and 600 ohms impedance CT; steel upright potted case; 2¼" lg x 1½" wd x 2⅛" h excluding term; freq response 200 cyc ±1 db, 1000 cyc ±0 db, 3500 cyc ±1 db; 9 solder lugs on bottom; two 0.190" diam mtg holes on 1⅞" mtg/c; Chi Trans (CHT) type CIs-1; Collins Rad (CR) part/dwg # 677 0415 00.	Audio input
T602 (m)		Same as T103.	Bias supply
T603 (m)	N17-T-70752-6950	TRANSFORMER, POWER: filament type; input 115 or 230 v AC; one output wnd; secd 5.0 v at 30.0 amp CT; 2500 v RMS test; enclosed metal case; 5¼" lg x 4⁹⁄₁₆" wd x 5⁵⁄₁₆" h excluding term; seven 10-32 NC-2 x ¾" lg term stud on bottom spaced equally on 1½" diam circle; six 0.230" diam mtg holes spaced on 1.250" x 4.750" mtg/c; Chi Trans (CHT) type F-530; Collins Rad (CR) part/dwg # 672 0414 00.	Bias supply, modulator filament
T604 through T690		Not used.	
T691	N17-T-63351-7895	TRANSFORMER, AF: modulation; input 115 v; pri 12,650 ohms impedance CT, secd 6000 ohms impedance; open frame; 9½" lg x 8½" wd x 8½" h; freq response 100 to 5000 cps at ±1 db; 5 pillar term on sides spaced on 1½" mtg/c; four ⅜" diam mtg holes spaced on 5½" x 7⅝" mtg/c; Chi Trans (CHT) # 14949; Collins Rad (CR) part/dwg # 667 0073 00.	Modulator transformer
TB601 (m)		Same as TB301.	Connection point of modulator to transmitter
TB602		Same as TB301.	

*Not replaceable as complete item.

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Major Assembly: M dulat r (M)
Power Change Uni. (p)
Cabinet Accessories (c)
p/o Radio Transmitter T-440/FRT-24

F r Radi Transmitting Set AN/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
TB603		Same as TB301.	
TB604 through TB629		Not used.	
TB630 (c)	N17-B-78086-8349	BOARD, TERMINAL: general-purpose; 16 brass nickel pl screw term on top, solder lugs on bottom; 3/8" between ctr; with barriers; molded bakelite board; 7 3/4" lg x 1 1/8" wd x 31/32" thk o/a; four 0.175" diam mtg holes on 0.421" x 7 7/16" mtg/c; Jones HB (JNS) part # 16-141Y; Collins Rad (CR) part/dwg # 367 0114 00.	Input connections for remote control C1362/FRT-24
TB631 through TB640		Not used.	
TB641 (c)	N17-B-77639-1548	BOARD, TERMINAL: 4 screw term; term 9/16" between ctr; molded black phenolic body, barrier type; 3 7/32" lg x 1 5/16" wd x 5/8" h; four 0.209" diam mtg holes spaced on 1/2" x 2 13/16" mtg/c; Jones HB (JNS) part # 4-142; Collins Rad (CR) part/dwg # 367 5040 00.	Connects blower power
TB642 through TB650		Not used.	
TB651 (c)	N17-B-77590-1085	BOARD, TERMINAL: 3 solder-lug term; term rating 50 amp; ins rating 600 v term to gnd; molded phenolic board; 3 19/32" lg x 2 1/8" wd x 1 5/8" h; two 3/16" diam mtg holes spaced on 3 1/4" x 1" mtg/c; Sq D (SQ) type T-31, class 9080; Collins Rad (CR) part/dwg # 306 0069 00.	230 v AC power terminals
V601 (m)		Same as V201.	Speech amplifier
V602 (m)		Same as V201.	Push-pull voltage amplifier
V603	N16-T-54067	TUBE ELECTRON: JAN 4-400A tube; tetrode, per spec MIL-E-1B.	Modulator
V604 (m)		Same as V603.	Modulator
V605 (m)	N16-T-56840-50	TUBE, ELECTRON: JAN 6X4W tube; rectifier, per spec MIL-E-1B.	Speech clipper
V606 (m)		Same as V113.	Bias rectifier
XV601 (m)		Same as XV102.	Holds V601
XV602 (m)		Same as XV102.	Holds V602
XV603 (m)	2Z8675.110 N16-S-61876-8870	SOCKET, TUBE: Navy type 491975; for 5-prong tube, ceramic body; 5 cad pl clip cont; four 0.190" diam mtg holes spaced on 2.250" x 2.250"; sq body 2 7/8" lg x 2 7/8" wd x 11/16" h o/a; Johnson EF (JON) part # 275; Collins Rad (CR) part/dwg # 220 1016 00.	Holds V603

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

Major Assembly: M dulat r (M)
Power Chang Unit (p)
Cabinet Acc ss ri s (c)
p/o Radio Transmitter T-440/FRT-24

F r Radio Transmitting Set AN/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
XV604 (m)		Same as XV603.	Holds V604
XV605 (m)	2Z8677.99 N16-S-62603-6700	SOCKET, TUBE: JAN type TS102C01; 7-cont miniature, one-piece saddle mtg; two 1/8" diam mtg holes spaced on 7/8" mtg/c; round ceramic body; silver pl cont; per spec JAN-S-28.	Holds V605
XV606 (m)		Same as XV113.	Holds V606
Z601	N16-F-32091-3714	FILTER, BAND PASS: 300 to 3500 cps; 2 23/32" lg x 2 1/4" wd x 2 29/32" h excluding term; input 10,000 ohms, output 100,000 ohms or 500 ohms impedance; HS rectangular steel case; six 0.190" diam mtg holes spaced on 0.750" mtg/c; 4 solder-lug term; Chi Trans (CHT) part # 18408; Collins Rad (CR) part/dwg # 673 0553 00.	Low-pass audio

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radio Transmitting S t AN/FRT-24
Maj r Ass mbly: S rvic P w r Supply Patch Pan l Ass mbly p/o T-440/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
701-720 Series	N16-P-067646-4874	SERVICE POWER SUPPLY: for power distribution; c/o one autotransformer and quantity of receptacle connectors; 17½" lg x 5⅞" h x 8¾" d o/a mtd by four ⅝" diam holes on 4½" x 17½" mtg/c (does not include external cable assemblies in 700 family); Collins Rad (CR) part/dwg # 540 1047 004.	Distribute power from AC line to power supply and to master oscillator
J701	N17-C-73174-8870	CONNECTOR, RECEPTACLE: 3 pol twist-lock type female cont; straight; 2$\frac{5}{16}$" lg x 1¾" wd x 1$\frac{11}{32}$" d; rated 10 amp at 250 v AC; cylindrical bakelite body with metal case; locking type; two $\frac{5}{32}$" diam mtg holes on 1$\frac{15}{16}$" mtg/c; Hubbell (HAW) part # 7557; Collins Rad (CR) part/dwg # 368 1500 00.	Mates with P701
J702	N17-C-73131-3185	CONNECTOR, RECEPTACLE: 2 standard AC type female cont; straight; 1$\frac{3}{32}$" lg x 2$\frac{7}{32}$" wd x $\frac{29}{32}$" h; rectangular phenolic body with metal fl; two 6-32 tapped mtg holes on 1$\frac{31}{32}$" mtg/c; Collins Rad (CR) part/dwg # 368 4500 00.	Mates with P702
J703		Same as J702.	Spare connector
P701	6Z7591-25 GM17-C-71460-4878	CONNECTOR, PLUG: 3 pol twist-lock type male cont; straight; 1$\frac{17}{32}$" OD x 1$\frac{11}{32}$" lg less prong term; rated 10 amp at 250 v AC; cylindrical rubber body; locking type; ½" cable opening; with cable clamp; p/o W701; Hubbell (HAW) part # 7567; Collins Rad (CR) part/dwg # 368 1600 00.	Mates with J701
P702		p/o W702 (not replaceable as separate unit).	Mates with J702
P703		Not used.	
P704	2Z7120.3 N17-C-71565-2109	CONNECTOR, PLUG: 10 flat pol male cont; straight type; 1$\frac{3}{16}$" lg x 1$\frac{9}{16}$" wd x $\frac{11}{16}$" thk excluding cable clamp and cont; rectangular metal shell; black phenolic insert; ½" diam cable hole; wax-impr cont retainer plate; (p/o W704); Jones HB (JNS) part # P310-CCT-WI; Collins Rad (CR) part/dwg # 365 8100 00.	Mates with J1001 on power supply
P705 through P710		Not used.	
P711	6Z7591-3.1 N17-C-71168-1306	CONNECTOR, PLUG: 3 pol twist-lock type female cont; straight; 1½" OD x 2$\frac{5}{32}$" o/a; rated 10 amp at 250 v AC; cylindrical bakelite body; locking type; ⅝" cable opening; with cable clamp; p/o W701; Hubbell (HAW) part # 7559: Collins Rad (CR) part/dwg # 368 1702 00.	Mates with J1003
P712		p/o W702 (not replaceable as a separate unit).	Mates with J3108
P713		Not used.	
P714	2Z8680-5 N17-C-71281-3423	CONNECTOR PLUG: 10 flat pol female cont; straight type; 1$\frac{3}{16}$" lg x 1$\frac{9}{16}$" wd x $\frac{11}{16}$" thk less cable clamp and cont; rectangular metal shell; black phenolic insert; ½" cable opening; wax-impr cont retainer ring; p/o W704; Jones HB (JNS) part # S310-CCT-WI; Collins Rad (CR) part/dwg # 366 8100 00.	Mates with J3107 in master osc
T701		Same as T501.	Supplies 220 and 110 v AC

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Service Power Supply Patch Panel Assembly p/o T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
W701	‡	CABLE ASSEMBLY, POWER: underwriters type SJ, uses three # 18 AWG stranded cond, rated 300 v at 7 amp; 81½″ lg excluding term terminated with one Hubbell # 7567 plug and one Hubbell # 7559 plug; c/o P701, P711, and cable; Collins Rad (CR) part/dwg # 540 1871 002.	Carries 230 v AC from service power supply to PP454/FRT-5 power supply
W702	N17-C-048403-8818	CABLE ASSEMBLY, POWER: SJ type; two # 18 AWG stranded cond, rated at 300 w, includes 3 cable markers and cable "W702"; 10⅝″ lg excluding term; terminated w/ 1 GE # 20 rubber plug and 1 GE # 80 female rubber connector; Collins Rad (CR) part/dwg # 540 2623 002.	Carries 110 v AC from service Power Supply to O-243/FRT-24 Master Oscillator.
W703		Not used.	
W704	‡	CABLE ASSEMBLY, OUTPUT: two # 14 AWG cond, three # 18 AWG cond, 24″ lg excluding term; 24″ lg; one # P-310-CCT-WI male connector, one # S-310-CCT-WI female connector; ½″ diam fiber-glass tubing ins; c/o P704, P714, and cable; Collins Rad (CR) part/dwg # 540 1872 003.	Connects power from power supply to master oscillator
721-799 Series	N17-P-023179-6438	PATCH PANEL ASSEMBLY: for cable assemblies; c/o panel, 11 connectors, 1 cable assembly; 19″ lg x 3½″ h x 7¾″ d; four ¼″ x ½″ mtg slots on 3″ x approx 18½ mtg/c; Collins Rad (CR) part/dwg # 506 8931 004.	RF patching panel
J721		Same as J101.	Transmitter input connection
J722		Same as J101.	Master osc output connection
J723		Same as J101.	Spare
J724		Same as J101.	Spare
J725		Same as J101.	Spare
J726		Same as J101.	Spare
J727		Same as J101.	Spare
J728		Same as J101.	Spare
P721	2Z7390-88 N17-C-71408-5333	CONNECTOR, PLUG: JAN type UG-88/U single round male cont; straight; 52 ohms; cylindrical silver pl brass body; teflon insert; 1$\frac{1}{32}$″ lg x 0.563″ diam; cable opening 0.212″ diam, incl gasket washer and cable clamp; per Navy dwg # RE49F246B.	Part of W721
P722		Same as P721.	Part of W721
P723 through P730		Not used.	

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24
Maj r Ass mbly: S rvic P w r Supply Patch Pan l Ass mbly p/ T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
P731		Same as P721.	Connects RF unit
P732		Same as P721	Connects to master oscillator thru J3109
W721	‡	LINE, RF TRANSMISSION: coaxial, nom impedance 53.5 ohm, inner cond # 20 AWG solid plain copper wire, outer cond, single braid of # 36 AWG tinned copper wire, coaxial cable, RG-58/U, 0.195" OD, type I synthetic resin jacket; $11\frac{3}{8}$" lg excluding terminations; $13\frac{3}{8}$" lg o/a; terminated both ends w/ UG-88/U male connectors; incl 3 cable markers (c/o P721, P722, and cable); Collins Rad (CR) part/dwg # 540 2694 002.	Patch card for connecting master oscilliator to RF unit
W721A	N15-C-12201-50	CABLE: RG-58/U, bulk material.	

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Dial Control, p/ T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
801-899 Series	∅	CONTROL, DIAL: transmitter tuning and control; c/o capacitors, relays, transformer, rect and resistors; 17" wd x 10" d x 7" h o/a; four 7/32" x 11/32" slots for mtg on 6" x 16¼" mtg/c; Collins Rad (CR) part/dwg # 505 4378 005. P/O T-440/FRT-24.	Provides automatic remote control of transmitter from telephone pulses
C801		Same as C240.	Spark suppressor
C802	3DB4-322 N16-C-49981-9980	CAPACITOR, FIXED: JAN type CP40C2FF405V; paper dielectric; 4 mf +20% −10%; 600 vdcw; per spec JAN-C-25.	Spark suppressor
C803	For replacement use SNSN N16-C-20188-9901	CAPACITOR, FIXED: JAN type CE41C221G; dry electrolytic; 100 mf −10% +150%; 150 vdcw; working temp range −40° C to +85° C; per spec JAN-C-62.	Supplies surge to K240
C804		Same as C603.	
CR801	N17-R-51181-8789	RECTIFIER, SELENIUM: input 72 v AC, single ph; output 52 v DC, 0.35 amp half wave; 1½" wd x 2 1/16" h x 4 1/32" lg; 4 solder-lug term; screw mtd, four 9/64" diam mtg holes; Int Rect Corp. (ITRC) part # D1709; Collins Rad (CR) part/dwg # 353 0007 00.	Rectifier for DC relay supply
E801		Same as E111.	
E802		Same as E123.	
E803		Same as E123.	
E804		Same as E123.	
J801		Same as J103.	Dial control connections
J802		Same as J242.	Dial control connections
K801	N17-S-69812-2003	SWITCH, TELEPHONE ROTARY STEPPING: 26 cont spring-driven; interrupter springs form 1B; non-bridging; cont rating 3 amp AC or DC; phosphor bronze cont; 48 v DC; wiper cont; 6 9/16" lg x 2 3/8" wd x 4 5/8" thk; fl mtd, two holes 0.173" diam on 5 15/16" mtg/c; Collins Rad (CR) part/dwg # 976 1266 00.	Dial control stepping switch
K802	N17-R-65342-4823	RELAY, TELEPHONE: cont are left none, right 1B1A; cont rating 3 amp, 150 w, AC non-inductive; palladium cont; single wnd, 48 v AC, 5.0 v release voltage; solder-lug term ½" lg; 4" lg x 1 15/32" w x 1 29/32" h; two 8-32 NC-2 mtg holes spaced on 0.750" mtg/c; quick-acting; Clare CP (CLA) type C; Collins Rad (CR) part/dwg # 972 1041 00.	Pulsing relay
K803	N17-R-65346-8543	RELAY, TELEPHONE: cont arr left 1B1A, right 1B1D; cont rating 3 amp, 150 w, AC non-inductive; palladium cont; single wnd, 48 v AC, 5.0 v release voltage; solder-lug term ½" lg; 4" lg x 1 15/32" wd x 1 29/32" h; two 8-32 NC-2 mtg holes spaced on 0.750" mtg/c; quick-acting; Clare CP (CLA) type C; Collins Rad (CR) part/dwg # 972 1042 00.	Homing relay
K804	N17-R-65355-7545	RELAY, TELEPHONE: cont arr 2C; cont rating 3 amp, 150 w, AC non-inductive; palladium cont; single wnd 48 v DC; 800 ohms resistance; solder-lug term ½" lg; 4" lg x 1 5/16" wd x 2" h; two 6-32 NC-2 mtg holes spaced on 0.625" mtg/c; two 8-32 NC-2 mtg holes on end spaced 0.750"; slow release; Clare CP (CLA) type E; Collins Rad (CR) part/dwg # 970 1022 00.	Slow-release motor starting relay

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

For Radi Transmitting S t AN/FRT-24

Major Assembly: Dial Control, p/o T-440/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
K805		Same as K804.	Slow release filament-starting
K806	N17-R-65355-7613	RELAY, TELEPHONE: cont arr left 1c, right 1c; cont rating 5 amp, 500 w; silver cont 5/32" diam; 48 v coil; 2¼" lg x 1 3/32" wd x 1¾" h; 2 mtg holes spaced on 0.843" mtg/c; quick-acting; Auto Elec (AGX) type R-45L; Collins Rad (CR) part/dwg # 970 1154 00.	Filament OFF relay
K807		Same as K806.	High-voltage OFF relay
K808		Same as K806.	CW relay
K809		Same as K806.	FSK relay
L801	N16-R-28990-8961	REACTOR, FILTER CHOKE: 2 hy, 0.15 amp; 50 ohms DC resistance; 2500 v RMS test; HS enclosed metal case; 3½" lg x 2⅝" wd x 3 15/32" h; four 0.190" diam mtg holes spaced on 3⅛" x 2" mtg/c; two 8-32 screw term; Chi Trans (CHT) type 6815; Collins Rad (CR) part/dwg # 678 1590 00.	Filter choke
O801		Same as O680.	
O802		Same as O680.	
P801		Same as J113.	Mates with J801
P802		Same as J212.	Mates with J802
R801	For replacement use SNSN N16-R-49660-716	RESISTOR, FIXED: JAN type RC32GF221K; comp; 220 ohm ±10%; 1 w; per spec MIL-R-11.	Spark Suppressor
		OR	
R801	3RC30BF221K N16-R-49662-231	RESISTOR, FIXED: JAN type RC30BF221K; comp; 220 ohm ±10%; 1 w; per spec JAN-R-11.	Spark Suppressor
R802	3RW19501 N16-R-65735-2126	RESISTOR, FIXED: JAN type RW31G161; comp; 160 ohms ±5%; 10 w at 275° C max continuous oper temp; per spec JAN-R-26A.	Current suppressor
R803		Same as R802.	Current suppressor
R804		Same as R802.	Current suppressor
R805		Same as R802.	Spark suppressor
R806	N16-R-49581-190	RESISTOR, FIXED: JAN type RC32GF101K; comp; 100 ohm ±10%; 1 w; per spec MIL-R-11.	Spark suppressor
		OR	
R806	3RC30BF101K N16-R-49581-231	RESISTOR, FIXED: JAN type RC30BF101K; comp; 100 ohm ±10%; 1 w; per spec JAN-R-11.	Spark suppressor
T801	N17-T-99999-407	TRANSFORMER, POWER: input 230 v; single output wnd; output secd 72 v (leads 3 and 6) 67 v (leads 3 and 5) 62 v (leads 3 and 4); input 1000 v RMS test, output 1000 v RMS test; HS metal case; 3½" lg x 2.850" wd x 3¾" h excluding term; 6 term studs on bottom; six 0.190" diam mtg holes spaced 1" x 3.120" mtg/c; Chi Trans (CHT) part # 17457-A; Collins Rad (CR) part/dwg # 674 0440 00.	DC relay supply

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Transmitter Control C-1362/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
901-999 Series	F16-C-089293-3558	CONTROL, TRANSMITTER: manual telephone dial control, control c/o on-off switch, audio-level meter switch, audio gain control, emission and channel selector telephone dial; AC, 110 v, 50/60 cyc, single ph, 40 w; steel case; smooth gray enamel on panel, rest of cabinet chromate-dipped; 19″ lg x $10\frac{7}{8}$″ wd x $8\frac{3}{4}$″ h; rack mtg; speech amplifier incorporates a compressor circuit; Collins Rad (CR) part/dwg # 506 4018 003 (177 M-1).	Provides dial control of transmitter-start, stop, emission, and channel selection, and provides speech amplifier
C901	N16-C-19781-5626	CAPACITOR, FIXED: JAN type CE63C250F; dry electrolytic; 25 mf +150% −10%; 25 vdcw; per spec JAN-C-62.	Couples J901 microphone input to T901
C902	N16-C-43633-2001	CAPACITOR, FIXED: paper dielectric; 0.033 mf ±10%; 300 vdcw; molded phenolic case; $1\frac{1}{16}$″ lg x 0.375″ diam; high temp imp; 2 axial wire leads; Sprague (SPR) part # 65P33393S1; Collins Rad (CR) part/dwg # 931 0374 00.	Couples plate of V903 to grid of V904
C903		Same as C902.	Couples plate of V903 to grid of V904
C904	N16-C-48808-9181	CAPACITOR, FIXED: JAN type CP54B1EB105K; paper dielectric; 1.0 mf ±10%; 100 vdcw; per spec JAN-C-25.	Part of compression network
C905		Same as C901.	Part of compression network
C906	N16-C-22598-2501	CAPACITOR, FIXED: JAN type CE33C160N; electrolytic; 3 sect; 16 mf per sect; 300 vdcw; per spec JAN-C-62.	
C906A		p/o C906.	B+ filter capacitor
C906B		p/o C906.	B+ filter capacitor
C906C		p/o C906.	Low DC voltage filter capacitor
C907		Same as C904.	DC blocking to M902
E901		Same as E509.	Shields V902
E902		Same as E509.	Shields V902
E903		Same as E509.	Shields V903
E904		Same as E509.	Shields V904
E905		Same as E509.	Shields V905
E906		Same as E501.	Standoff post for C901
E907		Same as E501.	Standoff post for C901

TABLE 8-4. TABLE OF REPLACEABLE PARTS—Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: Transmitter Control C-1362/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
E908		Same as E501.	Standoff post for 905
E909		Same as E501.	Standoff post for C905
E910		Same as E159.	Control knob for R901
F901	3Z2595.18 N17-F-16320-25	FUSE, CARTRIDGE: $\frac{1}{2}$ amp, opens from 5—60 sec at 200% load, 1 hr at 133% load, rated continuous at 110%; 125 v; one time; glass body; ferrule term; $1\frac{1}{4}$" lg x $\frac{1}{4}$" diam; Littelfuse (LTF) part # 313.500; Collins Rad (CR) part/dwg # 264 4260 00.	115 v AC line fuse
I901	2Z5889-27 N17-L-6806-460	LAMP, GLOW: 115 v AC or DC, $\frac{1}{10}$ w; striking voltage 65 v AC or 90 v DC; no bulb, enclosed in rectangular plastic body $1\frac{7}{8}$" lg x $\frac{9}{16}$" wd x $\frac{1}{2}$" h; mts by two $\frac{9}{64}$" diam mtg holes spaced $1\frac{1}{2}$"; aircraft type burn any position; Littelfuse (LTF) part # 201001; Collins Rad (CR) part/dwg # 262 0074 00.	Indicator blown fuse
I902	2Z5952 GM17-L-6297	LAMP, INCANDESCENT: 6.3 v, 0.15 amp; bulb T $3\frac{1}{4}$ clear; $1\frac{1}{8}$" lg o/a; miniature bayonet base; tungsten filament; burn any position; GE (GE) part # 47; Collins Rad (CR) part/dwg # 262 3240 00.	Power on indicator
I903	2Z6125-279 N17-L-250627-691	LENS, INDICATOR LIGHT: red; threaded type; $\frac{5}{8}$" diam smooth clear glass disk lens; bezel $\frac{21}{32}$" OD x $\frac{3}{16}$" wd; chrome finish; Drake Mfg (DMC) part # 25; Collins Rad (CR) part/dwg # 262 2160 00.	Colored lens for X1902
J901	N17-J-39449-4686	JACK, TELEPHONE: for 3- cond plug $\frac{3}{16}$" diam; $1\frac{29}{32}$" lg x $\frac{7}{8}$" h; J1 and J5 combination cont; includes one $\frac{3}{8}$-32 nut and one washer; $\frac{3}{8}$" mtg hole; per spec JAN-J-641; Switchcraft Inc (SWIN) part # XA-1350; Collins Rad (CR) part/dwg # 358 0003 00.	Panel microphone jack
J902	2Z5533A N17-J-39435-6234	JACK, TELEPHONE: JAN type JJ-033; for 3-cond plug $\frac{3}{16}$" diam; o/a cont J2; includes one $\frac{3}{8}$-32 nut and one washer; $\frac{3}{8}$" diam mtg hole; has positioning pin; per spec JAN-J-641.	Panel key jack
J903	6ZK7799-13 N17-C-73443-8438	CONNECTOR, RECEPTACLE: Navy type 49844; 2 flat male cont; straight; $1\frac{29}{32}$" lg x $1\frac{1}{4}$" wd x $\frac{61}{64}$" h; 10 amp at 250 v or 15 amp at 125 v; cylindrical nickel pl brass body; textalite insert; fl mtd by two $\frac{5}{32}$" diam holes on $1\frac{1}{2}$" mtg/c; GE (GE) part # 2711; Collins Rad (CR) part/dwg # 368 3700 00.	115 v AC input receptacle
K901		Same as K504.	Push-to-talk relay
L901	N16-R-99999-821	REACTOR, FILTER CHOKE: 10 hy, 55 ma; 230 ohms DC resistance; 2500 RMS test; enclosed metal case; $2\frac{11}{16}$" lg x $2\frac{1}{4}$" wd x $3\frac{1}{2}$" h o/a; 6 mtg holes 0.190" diam on bottom fl; 2 solder-lug term on bottom; Chi Trans (CHT) part # RS-1055 (mod); Collins Rad (CR) part/dwg # 668 0092 00.	B+ input filter choke
L902		Same as L901.	B + output filter choke
M901	N17-M-27132-6281	METER, AMMETER: DC; 0—500 microamperes; rectangular phenolic flush mtg case; barrel diam $2\frac{3}{4}$", depth behind fl $1\frac{3}{8}$", flange 3" x $3\frac{1}{8}$" x $\frac{13}{64}$" thk; accuracy ±2%; permanent magnet, moving coil; 88,000 ohms resistance incl self-contained series resistor; for non-magnetic panel; 10 scale divisions, black numerals on buff background; self-contained; four 4-36 NS-2 x $\frac{17}{32}$" mtg studs spaced $2\frac{1}{4}$" x $2\frac{1}{4}$" c to c on back of flange; 2 stud term $\frac{1}{4}$-28 NF-2 x $\frac{11}{16}$" spaced $1\frac{1}{2}$ c to c; Simpson Elec (SIC) type 27B; Collins Rad (CR) part/dwg # 458 0220 00.	Channel indicator

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Transmitter Control C-1362/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
M902	N17-M-27177-5781	METER, AUDIO LEVEL: AC; −20 to +3 db upper scale, 0—100% volts lower scale; rectangular phenolic flush mtg case; barrel diam 2¾", depth behind fl 1⅜", fl 3" x 3⅛" x 13/64" thk; 0 vu or 100 reading on scale shall indicate voltage of 1.228 RMS v sine wave impressed across meter and external series resistor of 3600 ohms, a reading of vu represents 4 dbm (1 mw) across 600-ohm line; for non-magnetic panels; 13 scale divisions upper scale, 9 scale divisions (ending at 0 indication of upper scale;) on lower scale; black numerals from 20 to 0, and red numerals from +1 to +3 on upper scale, black numerals on lower scale, buff background; requires external 3600-ohm series resistor; four 4-36 NS-2 x 17/32" mtg studs spaced 2¼" x 2¼" c to c on back of fl; 2 stud terminals ¼-28 NF-2 x 11/16" lg spaced 1½" c to c; Simpson Elect (SIC) type 47B; Collins Rad (CR) part/dwg # 455 0005 00.	Audio level indicator
N901	⊕⊕	CHART, CALIBRATION: opaque graphic Lami-coil, 3½" lg x 2¼" wd x 1/16" thk; black printing on opaque background; four 0.098" diam mtg holes on 3¼" x 2" mtg/c; Collins Rad (CR) part/dwg # 474 1000 00.	Frequency and emission chart
R901	N16-R-99999-822	RESISTOR, VARIABLE: dual section; comp; 50,000 ohms ±10%, each sect; 2 watts minimum at 70° C; 3 solder-lug term on each sect; enclosed metal case 15/32" diam x 1¼" d; flatted metal shaft ¼" diam x ¾" lg from mtg surface; JAN C taper; ins cont arm; normal torque; bushing mtd, ⅜-32 x ⅜" lg; non-turn device optional, locate on 17/32" rad at 9 o'clock; no switch; fungus treated; AB (AB type) JJ; Collins (CR) part/dwg # 380 0413 00.	
R901A		p/o R901.	Half of R901
R901B		p/o R901.	Half of R901
R902	For replacement use SNSN N16-R-49687-698	RESISTOR, FIXED: JAN type RC32GF271K; comp; 270 ohm ±10%; 1 w; per spec MIL-R-11.	V901 cathode bias
		OR	
R902	3RC30BF271K N16-R-49689-231	RESISTOR, FIXED: JAN type RC30BF271K; comp; 270 ohm ±10%; 1 w; per spec JAN-R-11.	V901 cathode bias
R903	N16-R-50398-696	RESISTOR, FIXED: JAN type RC32GF273J; comp; 27,000 ohm ±5%; 1 w; per spec MIL-R-11.	Plate load 1st section of V901
		OR	
R903	3RC30BF273J N16-R-50398-751	RESISTOR, FIXED: JAN type RC30BF273J; comp; 27,000 ohm ±5%; 1 w; per spec JAN-R-11.	Plate load 1st section of V901
R904		Same as R903.	Plate load, 2nd section of V901
R905		Same as R903.	Part of bridge compressor network
R906		Same as R903.	Part of bridge compressor network

TABLE 8-4. TABLE OF REPLACEABLE PARTS—Continu d

For Radi Transmitting S t AN/FRT-24

Maj r Assembly: Transmitter Contr l C-1362/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R907		Same as R903.	Part of bridge compressor network
R908		Same as R903.	Part of bridge compressor network
R909		Same as R903.	Part of bridge compressor network
R910		Same as R903.	Part of bridge compressor network
R911	For replacement use SNSN N16-R-50515-711	RESISTOR, FIXED: JAN type RC32GF563K; comp; 56,000 ohm ±10%; 1 w; per spec MIL-R-11.	V903 grid stabilizer
		OR	
R911	3RC30BF563K N16-R-50517-231	RESISTOR, FIXED: JAN type RC30BF563K; comp; 56,000 ohm ± 10%; 1 w; per spec JAN-R-11.	V903 grid stabilizer
R912	N16-R-50760-121	RESISTOR, FIXED: JAN type RC32GF334K; comp; 0.33 megohm ± 10%; 1 w; per spec MIL-R-11.	V904 2nd section grid
		OR	
R912	3RC30BF334K N16-R-50760-231	RESISTOR, FIXED; JAN type RC30BF334K; comp; 0.33 megohm ±10%; 1 w; per spec JAN-R-11.	V904 2nd section grid
R913		Same as R912.	V904 1st section grid
R914	N16-R-49599-181	RESISTOR, FIXED: JAN type RC32GF121K; comp; 120 ohm ±10%; 1 w; per spec MIL-R-11.	V903 cathode bias
		OR	
R914	3RC30BF121K N16-R-49599-231	RESISTOR, FIXED: JAN type RC30BF121K; comp; 120 ohm ±10%; 1 w; per spec JAN-R-11.	V903 cathode bias
R915		Same as R903.	Part of audio metering network
R916	N16-R-50281-711	RESISTOR, FIXED: JAN type RC32GF103J; comp; 10,000 ohm ±5%; 1 w; per spec MIL-R-11.	p/o audio metering network
		OR	
R916	3RC30BF103J N16-R-50281-751	RESISTOR, FIXED: JAN type RC30BF103J; comp; 10,000 ohm ±5%; 1 w; per spec JAN-R-11.	p/o audio metering network
R917		Same as R916.	Part of audio metering network
R918	N16-R-50011-701	RESISTOR, FIXED: JAN type RC32GF222J; comp; 2200 ohm ±5%; 1 w; per spec MIL-R-11.	p/o audio metering network
		OR	
R918	3RC30BF222J N16-R-50011-751	RESISTOR, FIXED: JAN type RC30BF222J; comp; 2200 ohm ±5%; 1 w; per spec JAN-R-11.	p/o audio metering network

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

For Radi Transmitting Set AN/FRT-24

Major Assembly: Transmitter Control C-1362/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R919		Same as R918.	Part of audio metering network
R920	N16-R-49903-698	RESISTOR, FIXED: JAN type RC32GF911J; comp; 910 ohm ±5%; 1 w; per spec MIL-R-11.	M902 input shunt
		OR	
R920	3RC30BF911J N16-R-49903-751	RESISTOR, FIXED: JAN type RC30BF911J; comp; 910 ohm ±5%; 1 w; per spec JAN-R-11·	M902 input shunt
R921		Same as R603.	Part of compressor network
R922	For replacement use SNSN N16-R-51091-698	RESISTOR, FIXED: JAN type RC32GF275K; comp; 2.7 megohm ±10%; 1 w; per spec MIL-R-11.	p/o compressor network
		OR	
R922	3RC30BF275K N16-R-51093-231	RESISTOR, FIXED: JAN type RC30BF275K; comp; 2.7 megohm ±10%; 1 w; per spec JAN-R-11.	p/o compressor network
R923		Same as R204.	Part of meter output network
R924		Same as R204.	Part of meter output network
R925	N16-R-49939-698	RESISTOR, FIXED: JAN type RC32GF122J; comp; 1200 ohm ±5%; 1 w; per spec MIL-R-11.	p/o meter output network
		OR	
R925	3RC30BF122J N16-R-49939-751	RESISTOR, FIXED: JAN type RC30BF122J; comp; 1200 ohm ±5%; 1 w; per spec JAN-R-11.	p/o meter output network
R926	N16-R-87751-8650	RESISTOR, VARIABLE: comp; 25,000 ohms ±20%; ½ w min at 40° C; 3 solder-lug term; enclosed metal case 1$\frac{5}{32}$" diam x $\frac{19}{32}$" d; slotted metal shaft ¼" diam x ½" lg from mtg surface; JAN A taper; ins cont arm; 6 in-oz min, 20 in-oz max torque; bushing mtd, ⅜-32 x ⅜" lg; non-turn device optional, locate on $\frac{17}{32}$" rad at 9 o'clock; no sw; fungus-treated; AB (AB) type J; Collins Rad (CR) part/dwg # 380 0235 00.	M901 channel indicator adjustment
R927	2Z7279-84 N16-R-90754-6975	RESISTOR, VARIABLE: WW; 1000 ohms ±10%; 4 w; 0.063 amp; 3 solder-lug term; enclosed metal case 1$\frac{41}{64}$" diam x $\frac{23}{32}$" d; slotted metal shaft ¼" diam x ¾" lg from mtg surface; lin taper; ins cont arm; normal torque; bushing ⅜-32 x ⅜" lg; no sw; Mallory (MAL) part MIMPX: Collins Rad (CR) part/dwg # 377 0007 00.	Compressor control
R928		Same as R110.	Part of compressor network
R929	N16-R-50130-511	RESISTOR, FIXED: JAN type RC42GF472K; comp; 4,700 ohm ±10%; 2 w; per spec MIL-R-11.	p/o B+ bleeder network
		OR	
R929	3RC42BE472K N16-R-50130-479	RESISTOR, FIXED: JAN type RC42BE472K; comp; 4,700 ohm ±10%; 2 w; per spec JAN-R-11.	p/o B+ bleeder Network

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinued

F r Radi Transmitting S t AN/FRT-24

Maj r Ass mbly: Transmitt r Contr l C-1362/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R930		Same as R929.	Part of B+ bleeder network
R931		Same as R929.	Part of B+ bleeder network
R932		Same as R660.	Part of B+ bleeder network
R933	N16-R-50129-113	RESISTOR, FIXED: JAN type RC42GF472J; comp; 4,700 ohm ±5%; 2 w; per spec MIL-R-11.	p/o B+ bleeder network
		OR	
R933	3RC42BE472J N16-R-50129-121	RESISTOR, FIXED: JAN type RC42BE472J; comp; 4,700 ohm ±5%; 2 w; per spec JAN-R-11.	p/o B+ bleeder network
R934		Same as R933.	Part of B+ bleeder network
R935		Same as R933.	Part of B+ bleeder network
R936		Same as R933.	Part of B+ bleeder network
R937	N16-R-49705-705	RESISTOR, FIXED: JAN type RC32GF331J; comp; 330 ohm ±5%; 1 w; per spec MIL-R-11.	p/o B+ bleeder network
		OR	
R937	3RC30BF331J N16-R-49705-751	RESISTOR, FIXED: JAN type RC30BF331J; comp; 330 ohm ±5%; 1 w; per spec JAN-R-11.	p/o B+ bleeder network
S901	3Z9863-52N N17-S-73959-1025	SWITCH, TOGGLE: JAN type ST52N; DPDT; 30 amp; phenolic body; 1 21/64" lg x 49/64" wd x 1 1/16" d; 11/16" lg bat handle; solder-lug term; single-hole mtg bushing 15/32-32, 15/32" lg; per spec JAN-S-23.	On-off power switch
S902		Same as S901.	Input and output meter switch
S903	N17-D-036861-7360	DIAL, TELEPHONE: delayed impulse, 10 ±2 pulses per sec; shunt spring cont arr 1B1C; metal number plate with black letters and numerals on white background; metal finger wheel dial, black enamel, 11 holes; 3" diam x 1 5/8" thk; three 4-36 mtg holes spaced on radius of 1 9/32" on RH rear half of case; exchange number card holder incl; splash-proof; Auto Elec (AGX) Part # H-70227; Collins Rad (CR) part/dwg # 978 1000 00.	Emission and channel selector
T901		Same as T601.	Line input to V901
T902	N17-T-65938-6755	TRANSFORMER, AF: plate coupling type; pri 20,000 ohms impedance, secd 50,000 ohms impedance both CT, test voltage 1500; steel upright pitted case; 2 1/4" lg x 2 1/8" wd x 3 1/2" h o/a; 22 milliwatts; freq response 30 to 50 cyc ±1.5 db, 50—10000 cyc ±0.5 db, 10—20 kc ±1.5 db; electrostatic shield between pri and secd; 9 solder-pin term on bottom; four 6-32, 1/2" mtg studs spaced 1 3/8" x 1 9/16" c to c; Chi Trans (CHT) part BI-6 (mod); Collins Rad (CR) part/dwg # 667 0095 00.	Compressor transformer

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Maj r Ass mbly: Transmitt r C ntr l C-1362/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
T903	N17-T-65953-4056	TRANSFORMER, AF: plate coupling type; pri 20,000 ohms impedance CT, secd 600 ohms and 150 ohms impedance CT; steel upright potted case; $2\frac{7}{8}$" lg x $2\frac{11}{16}$" wd x $4\frac{1}{16}$" h o/a; 1 w; freq response 30 to 50 cyc ±1.5 db, 50 to 10,000 cyc +0.5 db, 10 to 20 kc ±1.5 db; 10 solder-pin term on bottom; four 8-32, $\frac{1}{2}$" lg mtg studs spaced $1\frac{7}{8}$" x 2" c to c; Chi Trans (CHT) part # BO-2 (mod); Collins Rad (CR) part/dwg # 667 0093 00.	V903 output to line
T904	N17-T-75846-2306	TRANSFORMER, POWER: filament and plate type; 117 v, 50/60 cyc, single ph; 3 output wnd; secd # 1-6.3 v at 3 amps CT, secd # 2-5 v at 2 amps, secd # 3-670 v at 70 ma CT; 1000 v ins for pri and secd # 1, 2000 v ins for secd #2 and #3; potted metal case; 4" lg x 4" wd x 4" max excluding term; 10 solder-lug term on bottom of case; $6\frac{5}{64}$" diam mts holes spaced $1\frac{1}{8}$" +$1\frac{1}{8}$" x $3\frac{1}{2}$" c to c; Chi Trans (CHT) part # 12152; Collins Rad (CR) part/dwg # 662 0099 00.	Power transformer
TB901	For replacement use SNSN N17-B-77988-5581	BOARD, TERMINAL: general-purpose; 12 brass nickel pl screw term on top, solder type below; term $\frac{7}{16}$" between ctr with barriers; molded phenolic board; 6" lg x $1\frac{1}{8}$" wd x $\frac{31}{32}$" h o/a; four 0.175" diam mtg holes spaced $\frac{27}{64}$" x $5\frac{11}{16}$" c to c; Jones HB (JNS) part # 12-141-y; Collins Rad (CR) part/dwg # 367 0110 00.	177 M-1 termination for 4-wire remote line
TB902	N17-B-77841-6746	BOARD, TERMINAL: general-purpose; 8 brass nickel pl screw term on top, solder type below; term $\frac{7}{16}$" between ctr; w with barriers; molded phenolic board; $4\frac{1}{4}$" lg x $1\frac{1}{8}$" wd x $\frac{31}{32}$" h o/a; four 0.175" diam mtg holes spaced $\frac{27}{64}$" x $5\frac{11}{16}$" c to c; Jones HB (JNS) part #8-141-Y; Collins Rad (CR) part/dwg # 367 0106 00.	
V901	N16-T-58240-14	TUBE, ELECTRON: JAN 12AT7WA; double triode; per spec MIL-13 JAN 1953.	1st audio amplifier
V902		Same as V901.	Part of compressor bridge network
V903		Same as V901.	Output audio amplifier
V904		Same as V901.	Compressor bias rectifier
V905		Same as V901.	Part of audio indicator circuit
V906		Same as V113.	High-voltage rectifier
XF901		Same as XF503.	Holds F901
XI901		Not used.	
XI902	2Z5991-221 For replacement use SNSN N17-L-76854-3936	LIGHT, INDICATOR: without lens; for miniature bayonet base, T$3\frac{1}{4}$" bulb; open frame; cad pl steel shell; $1\frac{3}{8}$" lg x $\frac{15}{16}$" diam o/a; $\frac{11}{16}$" mtg hole required, $\frac{1}{8}$" panel thk; horizontally mtd, lamp replaceable from front; 2 solder-lug term on opposite sides of base; thd for jewel but not incl; Drake Mfg (CMC) type # 50; Collins Rad (CR) part/dwg # 262 1260 00.	Holds I902
XV901		Same as XV102.	Supports V902
XV902		Same as XV102.	Supports V902
XV903		Same as XV102.	Supports V903
XV904		Same as XV102.	Supports V904
XV905		Same as XV102.	Supports V905
XV906		Same as XV113.	Supports V906

TABLE 8-4: TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Maj r Ass mbly: P w r Supply PP-454/FRT-5

*REFERENCE DESI NATI N	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
1001-1099 Series	F16-P-66711-1001	POWER SUPPLY: electronic type; output 250 v DC, 450 ma, 150 v regulated, 6.3 v AC, 14 amp; input required 105/125 v, 50/60 cyc, single ph; 19″ wd x 15⅛″ d x 8¾″ h o/a; three 5R4WGA one 6X4W5R4 full wave; filter incl; four 3⁄16″ x 5⁄16″ mtg slots on 5¾″ x 18¼″ mtg/c; Collins Rad (CR) part/dwg # 522 0162 005.	Supplies power to master oscillator O-243/FRT-24
C1001	N16-C-51881-9090	CAPACITOR, FIXED: JAN type CP70B1-DF106V; paper dielectric; 10 mf +20% −10%; 600 vdcw; per spec JAN-C-25.	High-voltage filter
C1002		Same as C1001.	High-voltage filter
C1003		Same as C802.	High-voltage filter
C1004		Same as C802.	High-voltage filter
C1005		Same as C802.	Bias filter
C1006		Same as C802.	Bias filter
C1007		Same as C802.	Bias filter
E1001	2Z8304-296 N16-S-34607-8353	SHIELD, TUBE: cold-rolled steel, cad pl; cylindrical, 7⁄16″ dia hole in top; bayonet mtg; 0.915″ ID x 2¼″ lg inside; w/ spring inside; Cinch (CIN) part # 16G12564; Collins Rad (CR) part/dwg # 141 0105 00.	Shields V1005
E1002		Same as E1001.	Shields V1006
E1003		Same as E1001.	Shields V1003
F1001		Same as F507.	AC input supply
F1002	3Z2602.26 GM17-F-16302-100	FUSE, CARTRIDGE: Navy type 28032-2; 2 amp; blowing time, life at 110%, 1 hr at 135%, 5 to 60 sec at 200% load; 250 v; one time; glass body; ferrule term; ¼″ diam x 1¼″ lg o/a; term ¼″ diam x ¼″ lg; Littelfuse (LTF) type 3AG, part # 1042; Collins Rad (CR) part/dwg # 264 4070 00.	AC input supply
F1003	3Z2601.5 GM17-F-16302-90	FUSE, CARTRIDGE: Navy type 28032-IR5; 1½ amp; blowing time, life at 110%, 1 hr at 135%, 5 to 60 sec at 200% load; 250 v; one time; glass body; ferrule term; ¼″ diam x 1¼″ lg o/a; term ¼″ diam x ¼″ lg; Littelfuse (LFT) part # 1041; Collins Rad (CR) part/dwg # 264 4060 00.	230 v AC input supply
F1004	3Z1926 GM17-F-16302-80	FUSE, CARTRIDGE: Navy type 28032-1; 1 amp; 250 v; one time; glass body; ferrule term; 1¼″ lg x ¼″ diam; ¼″ lg x ¼″ diam; Buss (BUS) type 3AG; Collins Rad (CR) part/dwg # 264 4050 00.	230 v AC input supply
I1001		Same as I901.	Power on indicator
J1001	2Z8639-6 N17-C-73281-9536	CONNECTOR, RECEPTACLE: Navy type 491982; 10 rectangular female pol cont; straight 1 9⁄16″ lg x 11⁄16″ wd x ½″ d less cont and mtg bkt; rectangular bakelite body; 2 angle bkt, ea with 1 mtg hole 0.146″ diam 1″ c to c; Jones HB (JNS) part # S-310-AB1/16; Collins Rad (CR) part/dwg # 366 2100 00.	Power-output connections

TABLE 8-4. TABLE OF REPLACEABLE PARTS—Continu d

F r Radio Transmitting S t AN/FRT-24

Major Assembly: Power Supply PP-454/FRT-5

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
J1002		Same as J1001	Power-output connections
J1003	6Z7813-2 N17-C-73471-6407	CONNECTOR, RECEPTACLE: Navy type 49749-A; 3 curved rectangular male pol cont; straight; 2 5/16" lg x 1 3/4" wd x 1 1/4" d o/a; cont rating 10 amp 250 v, 15 amp 125 v; cylindrical brass body polished nickel finish twist lock; black bakelite insert; two 5/32" diam mtg holes spaced 1 15/16" c to c; Grounded. Hubbell (HAW) type # 7556G; Collins Rad (CR) part/dwg # 368 2201 00.	AC input connection
L1001	3C325-22 N16-R-29174-5623	REACTOR: Navy type 304883; filter choke; 7.5 hy, 280 ma; 100/120 cyc; 75 ohms DC resistance; 1500 v ins; HS metal case; 4 1/4" lg x 3 11/16" wd x 5 9/16" h case; four 8-32 x 3/8" mtg holes on bottom on 3" x 3 5/8" mtg/c; two 5/16" lg ins bushing; Aero (ADC) part # AG526; Collins Rad (CR) part/dwg # 678 0291 00.	High-voltage filter
L1002		Same as L1001.	High voltage-filter
L1003		Same as L1001.	High-voltage filter
M1001	3F8500-9 N17-M-35614-8251	METER, VOLTMETER; DC; range 0 to 500 v; rect flush, black bakelite case; 2.75" diam body; sub base 2 1/2" diam; 1.665" d, behind fl, 3" x 3.120" x 0.200"; 2% accuracy for full-scale reading; sensitivity 1000 ohms per v; calibrated for non-magnetic panel; 50 scale divisions, black divisions on white background; self-contained; 4 mtg studs on back of fl on 2.240" x 2.240" mtg/c; 2 screw-type term 1/4-28 NF-2 on bottom of case; scale marked 0 to 500 v; Weston (WS) type 301; Collins Rad (CR) part/dwg # 458 1454 00.	DC voltage indicator
P1001		CONNECTOR: Now identified as J1003.	
R1001	For replacement use SNSN N16-R-50479-713	RESISTOR, fixed; JAN type RC32GF473M; comp; 47,000 ohm ±20%; 1 w; per spec MIL-R-11. OR	Voltage dropping for I1001
R1001	3RC30BF473M N16-R-50482-611	RESISTOR, FIXED: JAN type RC30BF473M; comp; 47,000 ohm ±20%; 1 w; per spec JAN-R-11.	Voltage dropping for I1001
R1002	N16-R-66167-8970	RESISTOR, FIXED: JAN type RW32G312; WW; 3100 ohms ±5%; 12 w at max continuous oper temp 275° C; per spec JAN-R-26.	Voltage dropping
R1003	For replacement use SNSN N16-R-50634-503	RESISTOR, FIXED: JAN type RC42GF104M; comp; 0.10 megohm ±20%; 2 w; per spec MIL-R-11. OR	Parallels V1005
R1003	3RC42BE104M For replacement use SNSN N16-R-50634-505	RESISTOR, FIXED: JAN type RC42BE104M; comp; 0.10 megohm ±20%; 2 w; per spec JAN-R-11.	Parallels V1005
R1004		Same as R1002.	Voltage dropping
R1005		Same as R1003.	Parallels V1006
R1006	For replacement use SNSN N16-R-66397-6511	RESISTOR, FIXED: JAN type RW33G103; WW; 10,000 ohm ±5%; 18 w; per spec MIL-R-26.	p/o bias bleeder network

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinued

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Power Supply PP-454/FRT-5

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
R1007		Same as R1006.	Part of bias bleeder network
R1008		Same as R1006.	Part of bias bleeder network
S1001		Same as S901.	Power on-off
S1002A		Same as S901.	115—230 v switch
S1002B		Same as S901.	115—230 v switch
S1003	3Z9825-50.12 N17-S-61497-1459	SWITCH, ROTARY: 5 positions; 2 ckt; spring silver alloy term; ceramic body; $1\frac{7}{8}$" lg x $1\frac{21}{32}$" wd x 1" d; non-shorting; solder-lug term; $\frac{3}{8}$-32 NEF-2 x $\frac{3}{8}$" lg bushing, shaft $\frac{3}{8}$" lg x $\frac{1}{4}$" diam; Collins Rad (CR) part/dwg # 259 0361 00.	Meter switch
T1001	2Z9612.333 N17-T-73673-8517	TRANSFORMER, POWER: Navy type 304884; fil and plate; input 2 pri wnd both rated 125 v tapped to operate at 105 v, 115 v, 50/60 cps; single ph; 3 output wnd; sect # 1,720 v CT; secd #2, 6.3 v 8.5 amp, secd #3, 5 v 4 amp; 1500 v ins; vacuum varnish or wax impr, sealed o/a special non-hygroscopic potting compound; HS metal case; $5\frac{5}{8}$" lg x $4\frac{3}{16}$" wd x $5\frac{17}{32}$" h; 15 silver pl brass lug term; four 10-32 mtg studs on bottom on 5" x $3\frac{5}{8}$" mtg/c; Aero (ADC) type # A6522; Collins Rad (CR) part/dwg # 672 0290 00.	Power transformer
T1002	2Z9618-135 N17-T-73674-9077	TRANSFORMER, POWER: Navy type 304885; fil and plate; input 2 pri wnd, ea rated 125 v tapped to operate at 105 v and 115 v, 50/60 cps, single ph; 4 output wnd; secd #1,740 v CT, secd #2, 6.3 amp, secd #3, 6.3 v, 0.6 amp, secd #4, 5 v 2 amps; 1500 v ins; vacuum varnish or wax impr; sealed o/a special non-hygroscopic potting compound; HS metal case; $5\frac{5}{8}$" lg x $4\frac{3}{16}$" wd x $5\frac{17}{32}$" h case; 17 silver pl brass lug terms; four 10-32 mtg studs on bottom on 5" x $3\frac{5}{8}$" mtg/c; Aero (ADC) type # A6523; Collins Rad (CR) part/dwg # 672 0289 00.	Power transformer
TB1001	⊕⊕	BOARD, TERMINAL: for mtg resistors; 6 feed-through solder term staked on board; 3 term on ea side spaced on $1\frac{1}{16}$" x $\frac{5}{8}$" ctr; phenolic board; $2\frac{7}{8}$" lg x $1\frac{3}{4}$" wd x $\frac{7}{16}$" thk o/a; four $\frac{9}{64}$" diam mtg holes spaced on $2\frac{1}{2}$" x $1\frac{1}{4}$" mtg/c; marked R1001, R1003, R1005; Collins Rad (CR) part/dwg # 504 1459 00.	Resistor support
V1001	N16-T-055445	TUBE, ELECTRON: JAN 5R4WGA; rectifier; per spec MIL-30, April 52.	High-voltage rectifier
V1002		Same as V1001.	High-voltage rectifier
V1003		Same as V605.	Bias rectifier
V1004		Same as V1001.	High-voltage rectifier
V1005		Same as V107.	Voltage regulator
V1006		Same as V107.	Voltage regulator

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Power Supply PP-454/FRT-5

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
XF1001		Same as XF503.	Holds F1001
XF1002		Same as XF503.	Holds F1002
XF1003		Same as XF503.	Holds F1003
XF1004		Same as XF503.	Holds F1004
XV1001	2Z8654 N16-S-63511-6461	SOCKET, TUBE: octal; one-piece saddle mtg; two 0.156″ diam mtg holes 1.312″ c to c; round low-loss mica-filled bakelite 1⅝″ x 1³⁄₁₆″ wd x ½″ thk excluding term; phosphor bronze, silver pl cont; Amphenol (AMP) part # 88-8TM; Collins Rad (CR) part/dwg # 220 1005 00.	Holds V1001
XV1002		Same as XV1001.	Holds V1002
XV1003	2Z8677.94 N16-S-62603-6674	SOCKET, TUBE: JAN type S010M; miniature octal; above chassis base mtg; two ¼″ diam mtg holes ⅞″ c to c; round mica-filled phenolic body 0.800″ diam x 0.968″ lg excluding term; beryllium copper, silver pl cont; w/ ¾″ h metal shock shield, w/ 0.095″ ID ctr shield; per spec JAN-S-28.	Holds V1003
XV1004		Same as XV1001.	Holds V1004
XV1005		Same as XV1003.	Holds V1005
XV1006		Same as XV1003.	Holds V1006

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Telephone Desk Set TA-267/U

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
E1501	2ZK9408.25 N17-B-077840-1634	BOARD, TERMINAL: general purpose; eight 5-40 x 3/16" screw terms; terms 3/8" c to c, w/ barriers; bakelite board; 3 5/8" lg x 7/8" wd x 3/8" h o/a; mtg holes 3 3/8" x 5/16" c to c; Jones H. B. (JNS) Part # 8-140; Collins Rad (CR) part/dwg # 367 3080 00.	Connecting strip
E1502	φ	BOARD, TERMINAL: integral part of desk set base; see S1501.	Terminal block
HS1501	N17-H-020001-1022	HANDSET: black finish, rubber covered card; 8 7/8" lg x 3 5/16" h o/a; push button normally open; Western Electric Co. (WE) # F-3AW-3; Collins Rad (CR) # 977 1800 00.	Handset
J1501	N17-J-39420-5601	JACK, TELEPHONE: signal corps type # JK-43A, Navy type # 49909; for use w/ three cond plug w/ 3/16" diam barrel; 1 1/32" lg x 3/4" diam minus lugs and term; cont arrangement J2; incl 3/8"-32 NEF-2 mtg bushing 3/8" lg, one washer and one hex nut; 3/16" diam mtg hole; to be supplied w/ a 5/8" OD flat brass washer and a 1/2" across flats by 3/32" thk hex nut; Switchcraft (SWIN) Collins Rad (CR) part/dwg # 358 1100 00.	Key jack
S1501	φ	SWITCH: integral part of desk set base; see E1502.	Hook switch
E1503	N17-B-146461-0125	BASE, TELEPHONE: desk set fabrication; incl base and switch; plastic, black lacquer; 8" lg x 5 1/4" wd x 5" h; table mtd; engraved "KEY"; modified to accom jack, nameplate and term boards; incl E1502 and S1501; Collins Rad (CR) Part/dwg # 571 1595 30.	
S1502	N17-D-36861-7360	DIAL, TELEPHONE: delayed impulse, 10 pulses per sec p/m 2 pulses per sec; shunt spring cont arrangement 1B1C; metal number pl w/ black letters and numerals on white background; metal finger wheel dial, black enamel, 11 holes 3" diam x 1 5/8" thk; three 4-36 mtg holes spaced on radius of 1 9/32" on RH rear half of case; exchange number card holder incl; splash proof; Auto Elec (AGX) # H-70227; Collins Rad (CR) part/dwg # 978 1000 00. Same as S-903.	Dial

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Coupler Transmission Line CU-3.0/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
2001-2099 Series	F16-N-030826-1099	IMPEDANCE MATCHING UNIT: matches 52-ohm unbalanced input to 600-ohm balanced output; 3 term, input coax type, output ins feed through type; c/o 66 capacitors, 6 spiral-wnd coils, 2 RF coils, 2 RF chokes; 20⅝" h x 23" wd x 20³⁄₁₆" d o/a; four 0.390" diam mtg holes on 16" x 21½" mtg/c; weatherproof freq range 2 to 30 mc, rated at 2500 w; completely enclosed in alum case; Collins Rad (CR) part/dwg # 522 0113 005.	Matches transmitter impedance to antenna over entire frequency range
C2001	3D9067-2 N16-C-16774-7057	CAPACITOR, FIXED: ceramic dielectric; 67 mmf ±5%; temp coef 0 (tol ±100) mmf/mf/° C; 5000 vdcw; ⁵¹⁄₆₄" diam x ⅝" lg excluding term; 2 axial hex nut term tapped 6-32 x ³⁄₁₆"; ins; Centralab (CH) Part # 850-022; Collins Rad (CR) part/dwg # 913 0090 00.	Part of LC matching network
C2002 through C2066		Same as C2001.	Part of LC matching network
E2001		Not used.	
E2002		Not used.	
E2003	N17-I-47417-4211	INSULATOR, BUSHING: JAN type NS4W4601; grade 4 steatite, white glaze on outer sides; 1⁴³⁄₆₄" lg, 2½" OD, 1⁹⁄₁₆" ID, o/a; mtd as ½ of feed-through; per spec JAN-I-8.	Insulator support for 600-ohm line output
E2004		Same as E2003.	
E2005		Same as E2003.	
E2006		Same as E2003.	
E2007	†	INSULATOR, PLATE: rectangular shape; yellow, glass-bonded mica; 12¾" lg; 3" wd, ½" thk; four 0.228" diam mtg holes on 2¼" x 12" mtg/c; Collins Rad (CR) part/dwg # 540 1807 003.	Supports L2001
E2008		Same as E2007.	Supports L2002
E2009		Same as E2007.	Supports L2003
E2010		Same as E2007.	Supports L2004
E2011		Same as E2007.	Supports L2005
E2012		Same as E2007.	Supports L2006
E2013	†	CONTACT, SPARK GAP: brass, bright alloy pl; flattened S shape; 3¹¹⁄₃₂" lg x ½" wd x .032" thk; one 0.265" diam mtg hole on one end; Collins Rad (CR) part/dwg # 540 1830 002.	One-half of spark gap
E2014	†	CONTACT, SPARK GAP: brass, bright alloy pl; right-angle strap; 2⅜" lg x 1⁵⁄₁₆" h x ½" wd, 0.032" thk strap; two 0.173" diam mtg holes spaced ⅜" c to c; Collins Rad (CR) part/dwg # 540 1831 002.	One-half of spark gap
E2015		Same as E2013.	One-half of spark gap
E2016		Same as E2014.	One-half of spark gap

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting Set AN/FRT-24

Major Assembly: Coupler Transmission Line CU-390/FRT-2-

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
J2001	N17-C-67731-5697	CONNECTOR, ADAPTER: JAN type UG-287/U; double-ended female; round female cont; straight; joins 2 male coax plugs; 52 ohms; cylindrical silver pl brass body with ctr mtg fl; poly insert; 4 mtg holes on fl, 0.257" diam, spaced 1$\frac{1}{16}$" c to c; per spec MIL-C-3650, Navy spec RE49F344.	Joins P2001 and P2002
L2001	⊕⊕	COIL, RF: antenna coupler; single spiral wnd; unshielded individually; 9⅛ turns ¼" OD copper tubing; 9$\frac{11}{16}$" diam x ¼" thk o/a; 19 mtg holes 0.115" diam in straight line across face of coil on right side; Collins Rad (CR) part/dwg # 540 1803 003.	Part of LC matching network
L2002	⊕⊕	COIL, RF: antenna coupler; single spiral wnd; unshielded individually; 9⅛ turns ¼" OD copper tubing; 9$\frac{11}{16}$" diam x ¼" thk o/a; 19 mtg holes 0.115" diam in straight line across face of coil on left side; Collins Rad (CR) part/dwg # 540 1804 003.	Part of LC matching network
L2003		Same as L2001.	Part of LC matching network
L2004		Same as L2002.	Part of LC matching network
L2005		Same as L2001.	Part of LC matching network
L2006		Same as L2002.	Part of LC matching network
L2007	⊕⊕	COIL, RF: antenna coupler; single wnd unshielded; 4 turns # 10 AWG copper wire; ⅞" ID x 1" lg; air-core form; mtd by pigtail wire of the coil itself; Collins Rad (CR) part/dwg # 540 1824 002.	Part of LC matching network
L2008		Same as L2007.	Part of LC matching network
L2009	For replacement use SNSN N16-C-73509-2812	COIL, RF: choke; single-layer wound; unshielded; 44μh ±10% at 2.5 mc; 600 ma; 2" lg x $\frac{7}{16}$" OD; steatite form and core; 2 axial wire leads; 7-35 mc; moistureproofed; Ohmite (OM) type Z-14; Collins Rad (CR) part/dwg # 240 0137 00.	Static drain choke
L2010		Same as L2009.	Static drain choke
L2011	⊕⊕	COIL, RF: for converting 52-ohm unbalanced line to 52-ohm balanced line; single wnd, CT; unshielded; 7 turns RG17U coax cable spaced ¼" between turns; 15" coil diam; approx 29½ ft of coax used; air core, supported between bakelite sheets; 2 term, one coax plug on one end solder-lug ground conn other end; Collins Rad (CR) part/dwg # 540 1847 003.	To change 52-ohm unbalanced line to 52-ohm balanced line
L2012	⊕⊕	COIL, RF: output coil; single, single-layer wnd; unshielded; 7 turns # 8 AWG copper wire; 2½" lg x 1⅜" ID; air core; 2 axial wire leads; Collins Rad (CR) part/dwg # 540 1836 002.	Output coil
L2013		Same as L2012.	Output coil
P2001	2Z7390-154 N17-C-71422-3137	CONNECTOR, PLUG: # UG-154/U; designed for male contact, not incl; straight; 3$\frac{5}{16}$" lg x 1⅝" OD o/a; cylindrical, brass silver pl; cable opening 1" diam; 1½"-18 NS-2 thd; incl neoprene gasket; Navy dwg # RE49F284.	Mates with J2001
P2002		Same as P2001.	

TABLE 8-4. TABLE OF REPLACEABLE PARTS—Continu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Telephone S t TA-267/U

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
No symbol	F17-T-20623-1261	TELEPHONE SET: remote control supplies current; cradle desk-stand; self-contained indoor; handset and cradle black-lacquered phenolic, 8" lg x 9" wd x 6" h o/a; has built-in telegraph key jack, fireproof; Collins Rad (CR) part/dwg # 571 0839 40. TA-267/μ. See 1500 series for breakdown of this component.	Provides dial control of transmitter in conjunction with C-1362/FRT-24 (start, stop emission, and channel selection)

TABLE 8-4. TABLE OF REPLACEABLE PARTS—Continued

F r Radio Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
3101-3299 Series	F16-O-55295-1278	MASTER-OSCILLATOR, RF: freq range 2.0 to 4.2 mc, 1 band; 1.5 w output; stabilized master oscillator; 250 v DC, 200 ma and 115 v, 50/60 cps, single ph, 8.2 amp required power input; external power supply; integral coils; 18$\frac{3}{16}$" w x 16$\frac{13}{16}$" d x 10$\frac{15}{32}$" h; rack mtd; auxiliary 100-kc and 450-kc output available, oscillator freq-stabilized by servo-mechanical system in which freq compared with 100-kc spectrum-interpolation oscillator; p/o AN/FRT-24; Collins Rad (CR) part # 70843, dwg # 522 0079 005.	Excitation for RF Unit 507A-2
B3101	N17-M-57241-1939	MOTOR, AC: hysteresis type; 6—600 v AC, 0—1000 cyc, 2 ph, 0.2—10 va, 80% power factor, fractional hp rating, single takeoff, 0—3,000 rpm, both clockwise and counterclockwise rotation; closed frame; temp range 0—50° C; continuous duty cycle; 10,000 ft max operating altitude; incl SS gear, 17 teeth, $\frac{11}{32}$" OD, pitch 64, pitch diam 0.2656", $\frac{9}{32}$" thk, plain shaft, gear pinned on; motor 2$\frac{11}{32}$" lg excluding shaft x 1$\frac{15}{16}$" diam, 0.1562" diam shaft extends $\frac{5}{16}$" from frame, 6 wire lead term; four 4-40 mtg holes spaced $\frac{13}{16}$" c to c on shaft end of frame; motor is driven by change in plate current from 2 push-pull power amplifiers; Collins Rad (CR) part # 370-A-5, dwg # 522 9020 003.	Tunes or centers C3170
C3101	3D9050V-134 N16-C-59766-4781	CAPACITOR, VARIABLE: Navy type 483458; air dielectric; plate meshing type, single sect; 3.9 to 50 mmf; SLC characteristics; air gap .015" min; 1$\frac{9}{32}$" lg x 1$\frac{5}{16}$" wd x 1$\frac{7}{32}$" h excluding shaft, ¼" hex nut on $\frac{5}{16}$" lg shaft, locking, scdr adj; 17 silver pl brass plates 360 deg rotation; isolantite ins; solder-lug terminals; two mtg nuts on front tapped 4-40; RCC (RAD) type # 34; Collins Rad (CR) part/dwg # 922 4300 00.	Oscillator crystal fine tuning
C3102	N16-C-99999-1138	CAPACITOR, FIXED: mica dielectric; 75 mmf ±1%; 300 vdcw; temp coef 10 to 40; $\frac{33}{64}$" lg x $\frac{19}{64}$" wd x $\frac{7}{32}$" h max; molded bakelite case; 2 axial wire leads; Electro Motive (EMM) type # 605 (SPCL); Collins Rad (CR) part/dwg # 912 0987 00.	Couples oscillator crystal to screen grid of V3101
C3103	N16-C-99999-1147	CAPACITOR, FIXED: mica dielectric; 100 mmf ±1%; 300 vdcw; temp coef −5 to plus 30 mmf/mf/° C; $\frac{33}{64}$" lg x $\frac{19}{64}$" wd x $\frac{7}{32}$" h max; molded bakelite case; 2 axial wire leads; Electro Motive (EMM) type # 605 (SPCL); Collins Rad (CR) part/dwg # 912 0990 00.	Feed-back capacitor of V3101
C3104	3D9470-56 For replacement use SNSN N16-C-30103-2331	CAPACITOR, FIXED: mica dielectric; 470 mmf ±5%; 300 vdcw; temp coef ltr D; ½" lg x $\frac{9}{32}$" wd x $\frac{11}{64}$" h o/a; molded phenolic case; 2 axial wire leads; Electro Motive (EMM) type # 605; Collins Rad (CR) part/dwg # 912 0542 001.	Couples V3101 to V3102
C3105	N16-C-99999-276	CAPACITOR, FIXED: paper dielectric; 100,000 mmf ±20%; 300 vdcw; HS metal case; 0.40" diam x 1$\frac{1}{16}$" lg; high-temp impr; single 1½" lg axial wire lead; other lead int gnd; $\frac{5}{16}$" −24NF-2, ¼" lg bushing for mounting; Sprague (SPR) part # 86P10403S5; Collins Rad (CR) part/dwg # 931 0626 00.	V3101 plate decoupler
C3106	N16-C-99999-285	CAPACITOR, FIXED: paper dielectric; 10,000 mmf ±20%; 100 vdcw; HS metal case; ¾" lg x 0.175" diam; oil impr; 2 axial wire leads; Sprague (SPR) part # 96P10301S2; Collins Rad (CR) part/dwg # 931 0398 00.	Couples cathode of 1st section V3102 to grid of 2nd section V3102 through external cable
C3107	For replacement use SNSN N16-C-28547-8645	CAPACITOR, FIXED: mica dielectric; 100 mmf ±2%; 500 vdcw; temp coef ltr D; ½" lg x $\frac{9}{32}$" wd x $\frac{11}{64}$" d; molded phenolic case; 2 axial wire leads; Electro Motive (EMM) type # 605; Collins Rad (CR) part/dwg # 912 0493 00.	Couples 2nd cathode of V3102 to V3123 diode mixer

TABLE 8-4. TABLE OF REPLACEABLE PARTS—Continu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
C3108		Same as C3105.	V3102 plate decoupler
C3109	N16-C-16267-9144	CAPACITOR, FIXED: JAN type CC30CH300G; ceramic dielectric; 30 mmf ±2%; temp coef 0; 500 vdcw; per spec JAN-C-20A.	Couples V3102 to V3103
C3110	For replacement use SNSN N16-C-30103-8375	CAPACITOR, FIXED: mica dielectric; 470 mmf ±2%; 300 vdcw; temp coef ltr D; ½" lg x 9/32" wd x 11/64" h o/a; molded phenolic case; 2 axial wire leads; Electro Motive (EMM) type # 605; Collins Rad (CR) part/dwg # 912 0541 00.	V3103 1st feedback capacitor
C3111		Same as C3110.	V3103 2nd feedback capacitor
C3112		Same as C601.	Couples V3102 to V3104 and V3105
C3113		Same as C601.	Couples V3103 to V3105
C3114	For replacement use SNSN N16-C-99999-316	CAPACITOR, FIXED: paper dielectric; 100,000 mmf ±20%; 300 vdcw; HS metal case; 1⅛" lg x 0.40" diam; oil-impr; 2 axial wire leads; Sprague (SPR) part # 96P10403S2; Collins Rad (CR) part/dwg # 931 0442 00.	HR3101 spark suppressor
C3115		Same as C601.	Couples V3103 to V3104
C3116		Same as C3105.	V3104 cathode bypass
C3117	N16-C-99999-1139	CAPACITOR, FIXED: ceramic dielectric; 10,000 mmf min; 500 vdcw; 21/32" diam x 3/16" thk; 2 radial wire leads; Durez 9841 and wax ins; Centralab (CN) type BC; Collins Rad (CR) part/dwg # 913 1188 00.	V3104 screen-grid bypass
C3118		Same as C3105.	V3104 plate decoupler
C3119		Same as C601.	Resonates primary of T3103
C3120	N16-C-063507-3751	CAPACITOR, VARIABLE: air dielectric; plate-meshing type, 4 sect; 241.2 mmf max per sect; SLF characteristics; .0185" air gap; 5" lg x 33/16" wd x 17/8" h excluding shaft, shaft ¼" diam x 25/32" lg no bushing; ext shaft adj; 52 aluminum plates total; 180° counterclockwise rotation; ceramic ins; lug terminals; 3 mtg holes 0.136" diam in semicircular spacing 11/16" radius from shaft on front plate, 9 spare holes 0.144" diam irregular spaced around front plate edge; c/o C3120A, C3120B, C3120C, C3120D; Oak (OAK) type 50; Collins Rad (CR) part/dwg # 920 0057 00.	Tunes harmonic amplifiers and multipliers
C3120A		Part of C3120.	
C3120B		Part of C3120.	
C3120C		Part of C3120.	

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Ass mbly: Mast r Oscillat r, O-243/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
C3120D		Part of C3120.	
C3121	N16-C-027371-6210	CAPACITOR, FIXED: mica, 39 mmf ±10%; 500 vdcw; temp coef D; 33/64" lg x 19/64" wd x 3/16" thk excluding term; molded phenolic case; two 1¼" lg axial wire lead term; Collins Rad (CR) part/dwg # 912 0465 00.	Harmonic bypass
C3122		Same as C3117.	V3105 screen-grid bypass
C3123	3DA10-588 N16-C-42765-4140	CAPACITOR, FIXED: paper dielectric; 10,000 mmf ±20%; 400 vdcw; HS metal case; 11/16" lg x 0.235" diam; high-temp impr; 2 axial wire leads; one end gnd; Sprague (SPR) part # 86P10304S1; Collins Rad (CR) part/dwg # 931 0547 00.	V3105 plate decoupler
C3124	N16-C-15627-9001	CAPACITOR, FIXED: JAN type CC20CH050D; ceramic dielectric; 5 mmf ±½ mmf; temp coef 0 (tol +60 mmf/mf/° C); 500 vdcw; per spec JAN-C-20A.	Couples V3105 to V3106
C3125		Same as C3117.	V3106 cathode bypass
C3126		Same as C3117.	V3106 screen-grid bypass
C3127		Same as C3123.	V3106 plate decoupler
C3128		Not used.	
C3129	N16-C-16171-9144	CAPACITOR, FIXED; JAN type CC30CH240G; ceramic dielectric; 24 mmf ±2%; 0 temp coef (tol +60 mmf/mf/°C); 500 vdcw; per spec JAN-C-20A.	Couples V3106 to V3107
C3130		Same as C3117.	V3107 cathode bypass
C3131		Same as C3117.	V3107 screen-grid bypass
C3132		Same as C3117.	V3107 plate decoupler
C3133	For replacement use SNSN N16-C-17072-9275	CAPACITOR, FIXED: JAN type CC35CG101K; ceramic dielectric; 100 mmf ±10%; 0 temp coef (tol +30 mmf/mf/°C); 500 vdcw; per spec JAN-C-20A.	Resonates primary of T3106 and T3107
C3134		Same as C3133; p/o T3106 and T3107.	Resonates primary of T3106 and T3107
C3135		Same as C3117.	V3108 AVC decoupler
C3136		Same as C3133; p/o T3106 and T3107.	Resonates secondary of T3106 and T3107
C3137		Same as C3133.	Resonates secondary of T3106 and T3107

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
C3138	3D9001-15 N16-C-15368-5828	CAPACITOR, FIXED: JAN type CC20CK010C; ceramic dielectric; 1 mmf ±¼ mmf; 0 temp coef (tol +250) mmf/mf/° C; 500 vdcw; per spec JAN-C-20A.	T3106 top coupling capacitor
C3139		Same as C3117.	V3108 screen grid bypass
C3140		Same as C3117.	V3108 plate decoupler
C3141	N16-C-64036-4565	CAPACITOR, VARIABLE: ceramic dielectric; rotary type, single sect; 4.5 mmf max min to 25 mmf min max; 500 vdcw; 0 temp coef (tol ±100 mmf/mf/° C); 1 7/16" lg x 0.640" wd x 3/8" h o/a; 2 solder-lug term; two 0.120" diam mtg holes in base on 0.437" ctr; scdr slot adj; ceramic base; Centralab (CN) part # 822-AZ; Collins Rad (CR) part/dwg # 917 1005 00.	Trimmer for C3120B
C3142		Same as C3141.	Trimmer for C3120A
C3143		Same as C3117.	V3109 AVC decoupler
C3144		Same as C3141.	Trimmer for C3120D
C3145		Same as C3141.	Trimmer for C3120C
C3146		Same as C3117.	V3109 cathode bypass
C3147		Same as C3117.	V3109 screen-grid bypass
C3148		Same as C3117.	V3109 plate decoupler
C3149		Same as C3133; p/o T3108 and T3109.	Resonates primary of T3108 and T3109
C3150		Same as C3133; p/o T3108 and T3109.	Resonates primary of T3108 and T3109
C3151		Same as C3117.	T3110 AVC decoupler
C3152		Same as C3133; p/o T3108 and T3109.	Resonates secondary of T3108 and T3109
C3153		Same as C3133; p/o T3108 and T3109.	Resonates secondary of T3108 and T3109

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

For Radio Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
C3154		Same as C3138.	T3107 top coupling capacitor
C3155		Same as C3117.	V3110 screen-grid bypass
C3156		Same as C3117.	V3110 plate decoupler
C3157		Not used.	
C3158		Not used.	
C3159		Same as C3117.	V3124 AVC decoupler
C3160		Not used.	
C3161		Not used.	
C3162	For replacement use SNSN N16-C-47147-8960	CAPACITOR, FIXED: paper dielectric; 470,000 mmf ±20%; 300 vdcw; HS metallic case; 1 13/16" lg x 0.562" diam; impr with high-temp organic material; 1 axial wire lead; one end gnd; body mtd by 5/16-24 NF-2 thd extending 1/4"; Sprague (SPR) part # 86P47403S5; Collins Rad (CR) part/dwg # 931 0630 00.	V3131 plate decoupler
C3163		Same as C3117.	V3111 cathode bypass
C3164		Same as C3117.	V3111 screen-grid bypass
C3165		Same as C3123.	V3111 plate decoupler
C3166	3K3022221 N16-C-31908-1564	CAPACITOR, FIXED: JAN type CM30B222K; mica dielectric; 2200 mmf ±10%; 500 vdcw; per spec JAN-C-5.	Padder for C3120D
C3167		Same as C3129.	Couples V3111 to V3113
C3168		Same as C3117.	V3113 cathode bypass
C3169		Same as C3117.	V3113 screen-grid bypass
*C3170	∅	CAPACITOR, VARIABLE: air dielectric; plate meshing type, single sect; very low cap SLC characteristics; 0.093" air gap; 1 1/2" lg x 1" wd x 1 7/16" h o/a; no shaft, 0.171" diam hole in rotor for external shaft adj; 4 aluminum plates; 360° clockwise rotation; steatite ins; solder-lug terminal; rotor and stator mount separately, stator by two 0.140" diam holes spaced 3/4" on both plates, rotor by ext shaft; c/o C3170A and C3170B.	AFC of master oscillator Z3101
C3170A	†2Z8066-8	ROTOR, CAPACITOR: p/o C3170; Collins Rad (CR) part/dwg # 504 0648 002.	See C3170

*Not replaceable as complete item; see C3170A and C3170B.

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

For Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
C3170B	†	STATOR, CAPACITOR: p/o C3170; Collins Rad (CR) part/dwg # 504 0537 001.	See C3170
C3171		Same as C3124.	Couples V3111 to V3112
C3172		Same as C3117.	V3112 cathode bypass
C3173		Same as C3117.	V3112 screen-grid bypass
C3174		Same as C3123.	V3112 plate decoupler
C3175		Same as C3166.	C3120C padder
C3176	N16-C-16523-9101	CAPACITOR, FIXED: JAN type CC30CH470G; ceramic dielectric; 47 mmf ±2%; 0 temp coef (tol +60) mmf/mf/° C; 500 vdcw; per spec JAN-C-20A.	Couples V3112 to V3107
C3177		Same as C3104.	Part of FL3101, 100-kc filter
C3178		Same as C3104.	Part of FL3101, 100-kc filter
C3179		Same as C3104.	Part of FL3101, 100-kc filter
C3180	3K3010221 N16-C-31090-4164	CAPACITOR, FIXED: JAN type CM30B102K; mica dielectric; 1000 mmf ±10%; 500 vdcw; per spec JAN-C-25.	Couples V3114 to FL3110 filter
C3181		Same as C3162.	V3113 plate decoupler
C3182		Same as C3129.	Couples V3115 to 1st sec V3114
C3183		Same as C3176.	1st feed-back capacitor of V3114
C3184	N16-C-99999-307	CAPACITOR, FIXED: paper dielectric; 10,000 mmf ±20%; 100 vdcw; HS metallic case; 1 1/16" lg x 0.175" diam; high-temp impr; 2 axial wire leads; one end int gnd; Sprague (SPR) part # 86P10301S1; Collins Rad (CR) part/dwg # 931 0490 00.	V3114 cathode bypass
C3185		Same as C3129.	Couples V3115 to 2nd section to V3114
C3186		Same as C3176.	2nd feed-back capacitor of V3114
C3187		Same as C3109.	Couples V3115 to V3114

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
C3188		Same as C3129.	V3115 1st section feed-back capacitor
C3189		Same as C3184.	V3115 cathode bypass
C3190		Same as C3129.	V3115 2nd section feed-back capacitor
C3191		Same as C3123.	V3114 and V3115 plate decoupler
C3192		Same as C105.	V3120 grid RF bypass
C3193		Same as C105.	V3120 grid RF bypass
C3194		Same as C105.	V3121 grid RF bypass
C3195		Same as C105.	V3121 grid RF bypass
C3196		Same as C3117.	Z3103 RF bypass
C3197		Same as C3117.	Z3103 RF bypass
C3198	N16-C-30119-6756	CAPACITOR, FIXED: JAN type CM20B471M; mica dielectric; 470 mmf ±20%; 500 vdcw; p/o Z3103; per spec JAN-C-5.	Resonates primary of Z3103
C3199	For replacement use SNSN N16-C-029713-6806	CAPACITOR, FIXED: JAN type CM20B331M; mica dielectric; 330 mmf ±20%; 500 vdcw; p/o Z3103; per spec JAN-C-5.	Resonates secondary of Z3103
C3200	3DA10-648 N16-C-42765-4745	CAPACITOR, FIXED: paper dielectric; 10,000 ohms ±20%; 400 vdcw; HS metallic case; ¾" lg x 0.235" diam; high-temp organic impr; 2 axial wire leads; Sprague (SPR) part # 96P-10304S2; Collins Rad (CR) part/dwg # 931 0455 00.	DC blocking for J3110
C3201	3DA100-731 N16-C-53192-8190	CAPACITOR, FIXED: JAN type CP53B4EF104L; paper dielectric; 2 sect; 100,000 mmf per sect ±15%; 600 vdcw; per spec JAN-C-25.	60-cyc phase shift for B3101.
C3201A		P/O C3201.	
C3201B		P/O C3201.	
C3202		Same as C3176.	Phase shift for Z3103
C3203		Same as C3176.	Couples Z3104 to 1st section of V3122
C3204		Same as C3176.	Couples Z3104 to 2nd section of V3122

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinued

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
C3205		Same as C3176.	Couples Z3104 to 1st section of V3123
C3206		Same as C3176.	Couples Z3104 to 2nd section of V3123
C3207		Same as C3176.	V3124 cathode bypass
C3208		Same as C3176.	V3124 screen-grid bypass
C3209		Same as C3176.	V3124 plate decoupler
C3210		Same as C3176.	Bypass for AVC line
C3211		Not used.	
C3212	N16-C-18632-8164	CAPACITOR, FIXED: ceramic dielectric; 1000 mmf ±1%; neg temp coef 49.8 (tol ±10) mmf/mf/° C; 500 vdcw; $\frac{15}{16}$" diam x $\frac{11}{16}$" lg; solder-lug term; 6-32 stud mtg; p/o Z3101; Centralab (CN) type # 950; Collins Rad (CR) part/dwg # 913 0077 00.	Resonates L3103
C3213	N16-C-16083-4337	CAPACITOR, FIXED: ceramic dielectric; 20 mmf; neg temp coef 200 (tol ±15%) mmf/mf/° C; 500 vdcw; 0.520" lg x 0.395" wd x $\frac{3}{32}$" thk; 2 axial wire leads; p/o Z3101; Collins Rad (CR) part/dwg # 913 0052 00.	Temp compensator for C3212
C3214		Not used.	
*C3215	N16-C-59059-4601	CAPACITOR, VARIABLE: Navy type 483457; air dielectric; plate meshing type single sect; 4-25 mmf; $\frac{61}{64}$" lg x $\frac{15}{16}$" wd x $1\frac{7}{32}$" h; $\frac{1}{4}$" hex nut on $\frac{5}{16}$" lg shaft; locking; 180°; isolantite; solder-lug term; p/o Z3101; Radium Chem (RCC) type 34; Collins Rad (CR) part/dwg # 922 4500 00.	Trimmer for C3212
*C3216		Same as C103; p/o Z3101.	Couples L3103 to V3131 grid
*C3217	N16-C-31665-6528	CAPACITOR, FIXED: JAN type CM35B182J; mica dielectric; 1800 mmf ±5%; 500 vdcw; per spec JAN-C-5.	V3131 screen-grid bypass
*C3218		Same as C103; p/o Z3101.	Couples C3170 to V3131 grid
*C3219		Same as C3217; p/o Z3101.	Couples output of V3131 to V3111
C3220	N16-C-15953-2881	CAPACITOR, FIXED: JAN type CC20CH120J; ceramic dielectric; 12 mmf ±5%; 500 vdcw; per spec JAN-C-20A.	Couples V3124
C3221		Same as C3220.	Couples V3125 to V3124

*This item is used in sealed oscillator assembly Z3101; replace complete assembly.

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

For Radio Transmitting S t AN/FRT-24

Major Ass mbly: Mast r Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
C3222		Same as C3117.	V3125 cathode bypass
C3223		Same as C3117.	V3125 screen-grid bypass
C3224		Same as C3117.	V3125 plate decoupler
C3225		Same as C3198.	Part of Z3104
C3226	3D9047-43 For replacement use SNSN N16-C-16523-9101	CAPACITOR, FIXED: JAN type CC30CH470J; ceramic dielectric; 47 mmf ±5%; 500 vdcw; per spec JAN-C-20A.	Part of Z3104
C3227		Same as C601.	Part of Z3104
C3228		Same as C3226.	Part of Z3104
C3229		Not used.	
C3230		Not used.	
**C3231	N16-C-99999-1144	CAPACITOR, FIXED: ceramic dielectric; 3400 mmf ±1%; neg temp coef 45 (tol ±10) mmf/mf/° C; 500 vdcw; 1" diam x 3/4" lg; one solder-lug term; two 0.156" mtg hole on feet spaced on 1 3/8" ctr; metal case; p/o Z3102; Herlec Corp (HERC) type B20; Collins Rad (CR) part/dwg # 913 1787 00.	Resonates L3102
**C3232	N16-C-16555-8161	CAPACITOR, FIXED: ceramic dielectric; 50 mmf ±1.0 mmf; temp coef 0 (tol ±30) mmf/mf/° C; 500 vdcw; 1.020" lg x 0.395" wd x 3/32" thk; 2 axial wire leads; uninsulated; p/o Z3102; Collins Rad (CR) part/dwg # 913 0059 00.	Temperature compensator for C3231
**C3233	3D9050-171 N16-C-16557-2851	CAPACITOR, FIXED: ceramic dielectric; 50 mmf ±1.0 mmf; neg temp coef 1400 (tol ±15%) mmf/mf/° C; 500 vdcw; 0.520" lg x .395" wd x 3/32" thk; 2 axial wire leads; uninsulated; p/o Z3102; Collins Rad (CR) part/dwg # 913 0066 00.	Temperature compensator for C3231
**C3234	For replacement use SNSN N16-C-64232-8500	CAPACITOR, VARIABLE: ceramic dielectric; rotary type single sect; 20—125 mmf; 500 vdcw; neg temp coef 500 mmf/mf/° C; 1 1/4" lg x 15/16" wd x 0.706" h; solder-lug term; two 4-40 NC-2 x 3/16" mtg hole in base on 0.656" mtg/c; scdr slot adj; ceramic base; p/o Z3102; Centralab (CN) part # 823AN; Collins Rad (CR) part/dwg # 917 1004 00.	Trimmer for C3231
**C3235	3D9150-108 For replacement use SNSN N16-C-28969-7900	CAPACITOR, FIXED: mica dielectric; 150 mmf ±2%; 500 vdcw; temp coef D; 1/2" lg x 9/32" wd x 11/64" d; molded phenolic case; 2 axial wire leads; p/o Z3102; Electro Motive (EMM) type # 605; Collins Rad (CR) part/dwg # 912 0505 00.	Couples L3102 to V3126
**C3236	For replacement use SNSN N16-C-45773-5668	CAPACITOR, FIXED: paper dielectric; 100,000 mmf ±20%; 400 vdcw; HS metal case; 3/4" lg x 0.235" diam; high-temp impr; 2 axial wire leads, per JAN-C-25; p/o Z3102; Sprague (SPR) part/dwg # 96P10404S4; Collins Rad (CR) part/dwg # 931 2529 00.	V3126 screen-grid bypass
**C3237		Same as C3236; p/o Z3102.	V3126 plate decoupler

**This item is used in sealed oscillator assembly Z3101; replace complete assembly.

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

For Radio Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
**C3238	3DA1.800-18 N16-C-99999-1143	CAPACITOR, FIXED: mica dielectric; 1800 mmf ±5%; 500 vdcw; temp coef E; 51/64" lg x 15/32" wd x 7/32" d; molded phenolic case, 2 axial wire leads; p/o Z3102; Collins Rad (CR) part/dwg # 935 5071 00.	Couples V3126 to V3115
C3239		Same as C3176.	V3112 RF bypass
CR3101	2Z3565-12 For replacement use SNSN N16-T-051769	CRYSTAL UNIT, RECTIFYING: germanium, metallic case w/ plastic ins; 60 peak inverse v, 50 to 150 ma avg; 0.40" lg x 0.175" diam; 2 axial wire leads; Raytheon (RAY) part # CK705; Collins Rad (CR) part/dwg # 353 0097 00.	Pulse-gating diode
CR3102		Same as CR3101.	Pulse-gating diode
E3101		Same as E101.	Tie point
E3102		Same as E101.	Tie point
E3103		Same as E101.	Tie point
E3104		Same as E101.	Tie point
E3105		Same as E101.	Tie point
E3106		Same as E101.	Tie point
E3107		Same as E101.	Tie point
E3108		Same as E101.	Tie point
E3109		Same as E101.	Tie point
E3110		Same as E101.	Tie point
E3111		Same as E101.	Tie point
E3112	†	TERMINAL, STUD: round post shape; molded melamine body; 0.632" lg x 1/4" hex o/a; tapped 4-40 NC-2, 5/32" d one end, slotted solder lug other end; insert and terminal brass; Collins Rad (CR) part/dwg # 306 0234 00.	Tie point
E3113		Same as E3112.	Tie point
E3114		Same as E3112.	Tie point
E3115		Same as E101.	Tie point
E3116		Same as E101.	Tie point
E3117		Same as E101.	Tie point
E3118		Same as E3112.	Tie point
E3119		Same as E101.	Tie point

**This item is used in sealed oscillator assembly Z3102; replace complete assembly.

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radio Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
E3120		Same as E3112.	Tie point
E3121		Same as E101.	Tie point
E3122		Same as E101.	Tie point
E3123		Same as E3112.	Tie point
E3124		Same as E101.	Tie point
E3125		Same as E101.	Tie point
E3126		Same as E3112.	Tie point
E3127		Same as E101.	Tie point
E3128		Same as E101.	Tie point
E3129		Same as E101.	Tie point
E3130		Same as E3112.	Tie point
E3131		Same as E101.	Tie point
E3132		Same as E101.	Tie point
E3133		Same as E101.	Tie point
E3134		Same as E101.	Tie point
E3135		Same as E101.	Tie point
E3136		Same as E3112.	Tie point
E3137		Same as E101.	Tie point
E3138 through E3143		Not used.	
**E3144		Same as E118.	Tie point
**E3145	†	TERMINAL, STUD: solder connections; phosphor bronze term, silver pl, phenolic body, varnished; 1″ lg x ¾″ diam o/a; one 6-32 NC-2 x ⅜″ hole one end, 3 term made of wire clips mtd around form; Collins Rad (CR) part/dwg # 502 0931 001.	Tie point
E3146		Same as E118.	Tie point
E3147	2Z8304.57 N16-S-34520-3864	SHIELD, TUBE: JAN type TS102U01; nickel-pl copper or brass; cylindrical with ½″ diam hole in top; bayonet mtg; 1⅜″ lg x 0.810″ ID; with SS spring inside.	Holddown shield for V3101
E3148		Same as E3147.	Holddown shield for V3111
E3149		Same as E3147.	Holddown shield for V3112

**This item is used in sealed oscillator assembly Z3102; replace complete assembly.

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTI N
E3150		Same as E3147.	Holddown shield for V3122
E3151		Same as E3147.	Holddown shield for V3123
E3152	2Z8304.276 N16-S-34557-8351	SHIELD, TUBE: JAN type TS102U02; nickel pl copper or brass; cylindrical with ½" diam hole in top; bayonet mtg; 1¾" lg x 0.810" ID; with SS spring inside; per spec JAN-S-28A.	Holddown shield for V3104
E3153		Same as E3152.	Holddown shield for V3105
E3154		Same as E3152.	Holddown shield for V3106
E3155		Same as E3152.	Holddown shield for V3107
E3156		Same as E3152.	Holddown shield for V3108
E3157		Same as E3152.	Holddown shield for V3109
E3158		Same as E3152.	Holddown shield for V3110
E3159		Same as E3152.	Holddown shield for V3124
E3160		Same as E3152.	Holddown shield for V3125
E3161	2Z8304.275 N16-S-34576-6514	SHIELD ,TUBE: JAN type TS103U02; nickel pl copper or brass; cylindrical with 19⁄32" diam hole in top; bayonet mtg; 1 15⁄16" lg x 0.950" ID; with SS spring; per spec JAN-S-28A.	Holddown shield for V3102
E3162		Same as E3161.	Holddown shield for V3103
E3163		Same as E3161.	Holddown shield for V3113
E3164		Same as E3161.	Holddown shield for V3114
E3165		Same as E3161.	Holddown shield for V3115
E3166	N16-S-034753-1676	SHIELD, TUBE: copper or brass, nickel pl; cylindrical; bayonet mtg; 1 5⁄16" lg x 0.950" ID; matl non-magnetic w/ ventilating slots; Collins Rad (CR) part/dwg # 141 0141 00.	Holddown shield for V3116
E3167		Same as E3166.	Holddown shield for V3117
E3168		Same as E3166.	Holddown shield for V3118
E3169		Same as E3166.	Holddown shield for V3119

TABLE 8-4. TABLE OF REPLACEABLE PARTS—Continu d

For Radio Transmitting S t AN/FRT-24

Major Ass mbly: Mast r Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
E3170		Same as E3161.	Holddown shield for V3120
E3171		Same as E3161.	Holddown shield for V3121
E3172	2Z5822-291 N16-K-700248-886	KNOB, ROUND: black anodized aluminum; for 3/16" diam shaft; 6/32" set screw; marked lock with arrow; 0.437" diam x 0.343" h o/a; shaft hole 7/32" d; fine straight knurl; Collins Rad (CR) part/dwg # 503 8779 003.	Interpolation oscillator dial locking shaft knob
E3173		Same as E3172.	Master oscillator dial locking shaft knob
E3174		Same as E3172.	Output tuning dial locking shaft knob
E3175	†	KNOB, ROUND; black anodized aluminum; for 1/4" diam shaft; double 6/32" NC-2 set screw; 1 11/32" diam x 1 11/64" h o/a incl spinner knob; shaft hole 3/8" d; has spinner 39/64" lg x 3/8" diam mtd with one 6/32" NC-2 x 25/32" lg special screw; Collins Rad (CR) part/dwg # 505 9137 002.	Turns interpolation-oscillator dial
E3176		Same as E3175.	Turns master-oscillator dial
E3177		Same as E3175.	Turns ouput tuning dial
F3101		Same as F901.	B3101 motor fuse
F3102	3Z2585.5 N17-F-14310-315	FUSE, CARTRIDGE: 1/8 amp, open from 5—60 sec at 200% load 1 hr at 133% load, rated continuous at 110%; 250 v; one time; glass body; ferrule term; 1 1/4" lg x 1/4" diam; Littelfuse (LTF) part # 1263; Collins Rad (CR) part/dwg #264 4230 00.	HR3101 crystal-oven fuse
FL3101	N16-F-44278-4458	FILTER, BAND-PASS: 100-kc peak, 0-100KC band width; 2 11/16" h x 1 3/8" sq o/a, less term; high-impedance input and output; rectangular metal case; mtd by two 4-40 NC-2 x 15/64" lg studs on bottom on opposite corners; 2 solder-pin term; incl 2 capacitors and 2 resistors; c/o C177, C178, C179, L3105, L3106, R165, R166; Collins Rad (CR) part/dwg # 504 0662 003.	100-kc low-pass filter
HR3101	N16-C-95404-9633	OVEN, CRYSTAL: for one crystal unit in JAN-HC-15/U holder; 56° C to 64° C oven temp, 0° C to 50° C ambient temp, ±1.0° C tolerance; AC 115 v 0.104 amp; no indicating device incl; 7 term, pin type; located on std L 7-prong tube base; phenolic case; 3 3/4" diam x 4 5/8" h excluding term; term mtd; J Knights (KNJ) type JK07E; Collins Rad (CR) part/dwg # 292 0104 00.	Controls temperature of Y3101
I3101		Same as I901.	Crystal-oven indicator light
I3102		Same as I901.	Plate-circuit indicator light
I3103		Not used.	
I3104		Same as I901.	AFC indicator light

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
J3101		Not used.	
J3102	2Z3065-133 N17-C-71190-6437	CONNECTOR, RECEPTACLE: 4 round female cont; straight; 1⅝" lg x ⅜" wd x 3/32" less cont; rectangular phenolic body; mates with special banana plug connector adapter; Collins Rad (CR) part/dwg # 502 6686 002.	Connects Z3101 to multiplier
J3103		Same as J3102.	Connects Z3102 with divider through P3103
J3104	2Z7390-290 N17-C-73108-1267	CONNECTOR, RECEPTACLE: JAN type UG-290/U; 1 round female cont; straight; ⅞" lg x 11/16" sq less cont; 52 ohms; cylindrical body except sq mtg fl, silver pl brass, bayonet locking; molded teflon insert; mtd by four 3-56 NF-2 holes equally spaced on sq fl; per Navy dwg RE49F331.	450-kc outlet
J3105		Same as J3104.	V3102 cathode output connection
J3106		Same as J3104.	V3102 grid input connection
J3107	2Z7120.12 N17-C-73565-9015	CONNECTOR, RECEPTACLE: Navy type 491144; 10 flat male pol cont; straight; 19/16" lg x 1⅜" wd x ½" h; rectangular bakelite body; two 0.146" diam mtg holes on 1" mtg ctr; Jones HB (JNS) part # P310-AB; Collins Rad (CR) part/dwg # 365 2100 00.	Power-supply connector
J3108		Same as J903.	115 v AC inlet connection
J3109		Same as J3104.	
J3110	2Z5534 N17-J-39248-4418	JACK, TELEPHONE: JAN type JJ-034; for 2 cond ¼" diam plug; 1¼" lg x 15/16" wd x 49/64" h; J1 cont arr; incl one 25/64" brass washer and one hex nut; ⅜" mtg hole; per spec JAN-J-64.	Aural monitoring jack
J3111 through J3114		Not used.	
*J3115	N17-C-73197-7866	CONNECTOR, RECEPTACLE: 4 round female pol cont straight; 2⅛" lg x 9/16" wd x 9/16" h less term; rectangular phenolic body, two 0.128" diam mtg holes on 1⅞" mtg/c on mtg fl; p/o Z3101; Collins Rad (CR) part/dwg # 502 5037 002.	Connects Z3101 to multiplier through J3102
**J3116		Same as J3115; p/o Z3102.	Connects Z3102 with interpolation divider through J3103
J3117		Same as J213.	Input and output connections to interpolation divider

*This item is used on sealed oscillator assembly Z3101; replace complete assembly.
**This item is used on sealed oscillator assembly Z3102; replace complete assembly.

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

For Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
K3101	N17-R-64270-5641	RELAY, ARMATURE: cont arr 4A2B; cont rating 2 amp, 125 watt; $\frac{3}{32}$" diam silver cont; single wnd, 115 v AC; solder-lug terminal on coil and cont; $2\frac{1}{4}$" lg x $1\frac{3}{32}$" wd x $1\frac{1}{2}$" h; two 4-40 NC-2 mtg holes on 1.156" mtg/c; fast-acting; fungus and moisture-resistant; Auto Elec (AGX) type R45L; Collins Rad (CR) part/dwg # 972 1117 00.	C170 centering relay
L3101		Not used.	
**L3102	N16-C-75219-5298	COIL, RF: oscillator; single, single-layer wnd; unshielded; 80 turns # 34 copper wire; $1\frac{31}{32}$" lg x 1.062" diam excluding attached tuning mechanism; phenolic form powdered-iron core; adj iron core; shaft tuned from one end; 6 mtg holes 4-40 NC-2 on opposite end; 3 solder loops on wnd, special linear freq tuned; p/o Z3102; Collins Rad (CR) part/dwg # 506 8686 003.	Grid tank of V126
*L3103	N16-C-72590-8822	COIL, RF: oscillator; single, single-layer wnd; unshielded; 40 turns # 26 copper wire; $1\frac{15}{16}$" lg x $1\frac{3}{64}$" diam excluding attached tuning mechanism; phenolic form; powdered-iron core; adj iron core; shaft tuned from one end; 6 mtg holes 4-40 NC-2 on opposite end; 3 solder loops on wnd; special linear freq tuned; p/o Z3101; Collins Rad (CR) part/dwg # 502 7541 002.	Grid tank of V3131
*L3104	N16-C-73926-8935	COIL, RF: choke; single universal wnd; unshielded; inductance approx 180 µhy at 1.66 to 1.69 mc with 50 mmf capacitor; 1" lg x $1\frac{1}{16}$" diam o/a; phenolic form; air core; no adj; one 6-32 NC-2 x $\frac{3}{8}$" hole one end; 3 term made of wire clips mtd around form; p/o Z3101; Collins Rad (CR) part/dwg # 502 1207 001.	Plate choke V3131
L3105		Same as L101; p/o FL3101.	Part of FL3101
L3106		Same as L101; p/o FL3101.	Part of FL3101
L3107	N16-C-76385-4355	COIL, RF: harmonic amplifier; single, single-layer wnd; rectangular chromate-dipped aluminum shield can; 11 turns # 26 copper wire; $2\frac{11}{16}$" h x $1\frac{3}{8}$" sq o/a less term; phenolic form, powdered-iron core; form 1.859" lg x 0.409" diam; scdr adj of core through top of can; two 4-40 NC-2 x $\frac{15}{16}$" lg mtg studs on opposite corners 6 solder-pin term on bottom; coil doped; Collins Rad (CR) part/dwg # 506 9164 003.	V3105 plate tank
L3108		Same as L3107.	V3106 plate tank
L3109	N16-C-76635-4326	COIL, RF: multiplier amplifier; single, single-layer wnd; rectangular chromate-dipped aluminum shield can; 90 turns # 30 copper wire $2\frac{11}{16}$" h x $1\frac{3}{8}$" sq o/a less term; phenolic form, powdered-iron core; form 1.859" lg x 0.409" diam; scdr adj of core through top of can; two 4.40 NC-2 x $\frac{15}{64}$" lg mtg studs on opposite corners, 6 solder-pin term on bottom; coil doped; Collins Rad (CR) part/dwg # 504 0659 003.	V3111 plate tank
L3110		Same as L3107.	V3112 plate tank
L3111	N16-C-76138-8964	COIL, IF: 100-kc motor control; single winding single universal wnd; 500 turns # 36 SSE copper wire; phenolic form, powdered-iron core; form $\frac{29}{32}$" lg x 0.409" diam; mtd inside Z3103; Collins Rad (CR) part/dwg # 504 0579 002.	Part of Z3103

*This item is used in sealed oscillator assembly Z3101; replace complete assembly.
**This item is used on sealed oscillator assembly Z3102; replace complete assembly.

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
L3112		Same as L3111.	Part of Z3103
L3113	N16-C-74911-8480	COIL, IF: regenerative divider control; single winding single universal wnd; 150 turns # 36 SSE copper wire; phenolic form; powdered-iron core; form 29/32" lg x 0.409" diam; mtd inside Z3103; p/o Z3104; Collins Rad (CR) part/dwg # 504 0576 002.	Part of Z3104
N3101	†	DIAL: interpolation oscillator; brass hub and gear, aluminum dial plates with white figures on black anodize; 3 3/8" diam x 1/2" thk o/a; mounts on 0.342" diam shaft; one row of numerals silk-screened on each of 2 dial plates; inner dial is vernier; Collins Rad (CR) part/dwg # 506 9108 002.	Interpolation-oscillator frequency indicator
N3102	†	DIAL; master oscillator; brass hub and gears, aluminum dial plates with white figures on black anodize; 3 5/16" diam x 0.503" thk o/a; mounts on 0.342" diam shaft; 2 rows of numerals silk-screened on each of 2 dial plates; inner dial is vernier; Collins Rad (CR) part/dwg # 506 9110 002.	Master-oscillator frequency indicator
N3103	†	DIAL: output tuning; black anodized aluminum dial plate; chromate-dipped aluminum hub; 3 5/16" diam x 3/8" thk o/a; mounts on 0.342" diam shaft; one row silk-screened numerals; Collins Rad (CR) part/dwg # 506 9106 002.	Output-tuning frequency indicator
O3101	†	KNOB: round; aluminum; with 0.230" diam shaft; 7/8" lg x 5/8" diam o/a; fine diamond knurl; 0.028" slot around end of shaft, 6-32 NC-2 x 1/4" hole in end of shaft; Collins Rad (CR) part/dwg # 503 8653 001.	Turns left-hand panel latching fastener
O3102		Same as O3101.	Turns right-hand panel latching fastener
O3103	†	LATCH, FASTENER: cad pl steel; 55/64" lg x 25/64" wd x 1/16" thk; one 0.187" lg x 1/4" wd hole in one end for shaft mtg; Collins Rad (CR) part/dwg # 503 8654 001.	Used with O3101 for latching panel
O3104		Same as O3103.	Used with O3102 for latching panel
O3105	2Z379-5 N17-A-25801-1006	BAR, SWITCH ACTUATOR: c/o side mtg bkt; hinged roller leaf, two 2-56 x 3/4" screws and 4 nuts; cad pl steel bkt, cad pl phosphor bronze leaf; 1 31/32" lg x 1 15/32" h x 5/16" thk o/a; four 3/32" diam holes on 5/8" x 1" mtg/c; Collins Rad (CR) part/dwg # 260 0838 00.	Actuates S3104
O3106	†	GEAR ASSEMBLY: output gear and shaft assem; u/w Collins Rad part/dwg # 506 9166 003 AFC assem; c/o 1 gear and shaft Collins Rad part/dwg # 506 9119 002 and 2 gears Collins Rad part/dwg # 506 9118 002; 1 9/16" lg x 1 1/16" diam o/a; Collins Rad (CR) part/dwg # 506 9135 002.	Turns capacitor C3170
O3107	†	GEAR ASSEMBLY: capacitor shaft speed reduction; u/w Collins Rad part/dwg # 506 9135 002 gear assembly; c/o 1 gear Collins Rad part/dwg # 509 9117 002 and 1 pinion Collins Rad part/dwg # 506 9116 002; 1 1/16" OD x 1/4" thk o/a; mounts on 1/8" shaft; p/o O106 Collins Rad (CR) part/dwg # 506 9118 002.	Idler gear driving O3111
O3108		Same as O3107; p/o O106.	Idler gear driving O3112

TABLE 8-4. TABLE OF REPLACEABLE PARTS—Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O3109	†	GEAR, SPUR: brass; capacitor shaft driver; straight teeth; 64 teeth, 64 pitch, 0.10″ pitch diam; 1 1/16″ OD, 0.064″ thk; straight face; press fitted to steel shaft 5/16″ OD x 1 9/16″ lg o/a; no markings; p/o O106; Collins Rad (CR) part/dwg # 506 9119 002.	C3107 rotor driver
O3110	†	GEAR ASSEMBLY: idler gear and shaft assemb; u/w Collins Rad part/dwg # 506 9166 003 AFC assemb; c/o 1 shaft Collins Rad part/dwg # 506 9113 002 and 2 gears Collins Rad part/dwg # 506 9118 002; 0.914″ lg x 1 1/16″ o/a; Collins Rad (CR) part/dwg # 506 9136 002.	Part of gear reduction assembly driving C3170
O3111		Same as O3107; p/o O3110.	Idler gear driving O3108
O3112		Same as O3107; p/o O3110.	Idler gear driving O3109
O3113	⊕⊕	SHAFT: gear; u/w Collins Rad part/dwg # 506 9136 002 gear assem; SS; no dimension of this item is greater than 1 inch; p/o O3110; Collins Rad (CR) part/dwg # 506 9113 002.	Supports gears O3111 and O3112
O3114	†	GEAR, SPUR: corrosion resistant steel; dial driving; straight teeth; 34 teeth; 32 pitch 1.062″ pitch diam; 1 1/8″ OD, 11/32″ bore, 5/16″ thk; straight face; hub extends 3/16″ beyond face of gear; 11/16″ OD; two 6-32 NC-2 tap holes 45° apart, 7/64″ from end of hub; no markings; Collins Rad (CR) part/dwg # 506 9048 002.	Drives gear section of O3128
O3115		Same as O3114.	Drives gear section of O3129
O3116	⊕⊕	SPRING: loop type; retainer for gears; 0.041″ diam music wire; 15/16″ diam x 0.041″ thk; 3/4 turn; hook term indexed 90°; term bent on 1/16″ rad in same plane as coil; C-shaped; Collins Rad (CR) part/dwg # 506 9087 002.	Applies tension to gears on O3134 shaft assembly
O3117		Same as O3116.	Applies tension to gears on O3135 shaft assembly
O3118		Same as O3116.	Applies tension to gears on O3133 shaft assembly
O3119	†	GEAR ASSEMBLY: for driving dial mechanism; c/o 2 gears Collins Rad part/dwg # 506 9049 002 and # 506 9088 002; 1 1/32″ diam x 25/64″ thk; 3/16″ bore for shaft mtg; anchor pin on outer gear; Collins Rad (CR) part/dwg # 506 9089 002.	Idler gear driving O3134
O3120		Same as O3119.	Idler gear driving O3135
O3121		Same as O3119.	Idler gear driving O3133
O3122	†	GEAR, SPUR: brass idler for dial, straight teeth; 45 teeth; 48 pitch, 0.9375″ pitch diam; 0.1″ OD, 5/16″ bore, 0.032″ thk; straight face; mts on shaft″ p/o O3119; Collins Rad (CR) part/dwg # 506 9049 002.	Part of O3119

TABLE 8-4. TABLE OF REPLACEABLE PARTS—Continu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O3123		Same as O3122; p/o O3120.	Part of O3120
O3124		Same as O3122; p/o O3120.	Part of O3121
O3125	†	GEAR, SPUR: brass idler for dial, straight teeth; 45 teeth; 48 pitch, 0.9375" pitch diam; 0.1" OD, 3/16" bore, 25/64" thk; straight face; hub extends 11/64" beyond face of gear, 5/16" OD; mounts on shaft; anchor pin 0.093" diam x 0.382" lg mtd on hub side of gear face; Collins Rad (CR) part/dwg # 506 9088 002.	Part of O3119
O3126		Same as O3125; p/o O3120.	Part of O3120
O3127		Same as O3125; p/o O3121.	Part of O3121
O3128	†	GEAR ASSEMBLY: dial drive idler; c/o 4 gears Collins Rad part/dwg # 506 9046 002, # 506 9047 002, # 506 9082 002, and # 506 9083 002 mtd on hub; 2¾" diam x 31/64" thk o/a; mounts on 3/16" shaft; antibacklash type of gear assem; Collins Rad (CR) part/dwg # 506 9153 003.	Idler for driving N3101
O3129	†	GEAR ASSEMBLY: dial drive idler; c/o 4 gears Collins Rad part/dwg # 506 9046 002, # 506 9047 002, # 506 9084 002, and # 506 9085 002 mtd on hub; 1 11/16" diam x 31/64" thk o/a; mounts on 3/16" shaft; antibacklash type of gear assem; Collins Rad (CR) part/dwg # 506 9154 003.	Idler for driving N3102
O3130	†	SHAFT ASSEMBLY: gear driver; c/o 1 Collins Rad part/dwg # 506 9045 002 pinion shaft and 1 Collins Rad part/dwg # 506 9104 002 locking disk; 3 29/32" lg x 1⅝" diam o/a; mounts into one 3/16" and one ¼" diam shaft bearing; has special locking disk 1⅝" diam x ½" thk incl hub; Collins Rad (CR) part/dwg # 506 9162 003.	Main control shaft for tuning N3101
O3131		Same as O3130.	Main control shaft for tuning N3102
O3132		Same as O3130.	Main control shaft for tuning N3103
O3133	†	SHAFT ASSEMBLY: dial support; c/o 1 Collins Rad part/dwg # 506 9042 002 shaft, 1 Collins Rad part/dwg # 506 9081 002 gear, and 1 Collins Rad part/dwg # 506 9132 002 gear; 3 11/16" lg x 1⅝" diam o/a; mounts into one ¼" and one 0.342" diam shaft bearings; Collins Rad (CR) part/dwg # 506 9140 002.	Supports N3103 dial
O3134	†	SHAFT ASSEMBLY: dial support; c/o 1 Collins Rad part/dwg # 506 9042 002 shaft, 1 Collins Rad part/dwg # 506 9081 002 gear, 1 Collins Rad part/dwg # 506 9132 002 gear, 1 Collins Rad part/dwg # 506 9101 002 collar, 11 Collins Rad part/dwg # 503 0643 001 stop washers, and 11 Collins Rad part/dwg # 503 0644 001 washers; 3 49/64" lg x 1⅝" diam o/a; mounts into one ¼" diam and one 0.342" diam shaft bearings; Collins Rad (CR) part/dwg # 506 9173 003.	Supports N3101 dial
O3135		Same as O3134.	Supports N3102 dial
O3136	N16-O-65501-1010	OSCILLATOR SUBASSEMBLY: for tuning shaft; beryllium copper; C-clamp shape; 1¼" lg x 9/32" wd x 13/16" h o/a; ¼" hole for shaft mtg, one 4-40 tapped hole; special flat spring for shock absorption; Collins Rad (CR) part/dwg # 502 5410 002.	Couples C3120 with O3133 (mates with O3149)

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Ass mbly: Mast r Oscillat r, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O3137	N17-C-98611-1015	HUB, COUPLING: SS type 303; round; 7/8" diam x 0.374" thk o/a; 4-40 NC-2 hole for set screw; 1/4" ctr shaft hole; raised lip across one face; Collins Rad (CR) part/dwg # 504 5346 002.	Part of coupling between O3134 and O3234
O3138		Same as O3137.	Part of coupling between O3135 and C3215
O3139		Same as O3137.	Part of coupling between O3134 and C3234
O3140		Same as O3137.	Part of coupling between O3135 and C3215
O3141	⊕⊕	SLEEVE, COUPLING: brass 0.187" ID, 0.244" OD, 5/16" lg x 1/32" slot; Collins Rad (CR) part/dwg # 504 5379 001.	Used with O3139
O3142		Same as O3141.	Used with O3140
O3143	⊕⊕ 2Z8878-184	SPRING: helical compression type; releases disk lock; 0.028" diam SS wire; 7/16" free lg, 1/4" min working lg, 0.150" ID; 7 1/2 turns RH turns; flat ground ends; Collins Rad (CR) part/dwg # 504 0777 001.	Used with O3152
O3144		Same as O3143.	Used with O3153
O3145		Same as O3143.	Used with O3154
O3146	⊕⊕	SPRING: loop type; retainer for gears; 0.035" diam music wire; coil 15/32" diam x 0.035" thk; approx 4/5 turn; hook-type term; term bent on 3/64" radius in same plane as coil; C-shaped; Collins Rad (CR) part/dwg # 504 1116 001.	Applies tension to O3119 gear assembly
O3147		Same as O3146.	Applies tension to O3120 gear assembly
O3148		Same as O3146.	Applies tension to O3121 gear assembly
O3149	2Z3295-204 N17-C-98611-1019	COUPLING, FLEXIBLE: for tuning shaft; brass; round; 1 1/4" diam x 1 1/16" lg o/a; 0.296" diam shaft hole on one end, 2 holes tapped 8-36 NC-2 spaced 90° on side; 1/8" diam x 5/16" lg engaging pin on one face; Collins Rad (CR) part/dwg # 504 5045 001.	Couples C3120 with O3133 (mates with O3136)
O3150	N17-C-98611-1016	SPIDER, ROTOR: coupler guide; SS type 303; 7/8" diam x 0.156" thk o/a; 0.156" wd x 0.078" d lip on each face milled at right angles; 9/32" diam hole in ctr; Collins Rad (CR) part/dwg # 504 5345 001.	Couples O3137 with O3139
O3151		Same as O3150.	Couples O3138 with O3140

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Maj r Ass mbly: Mast r Oscillat r, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O3152	2Z379-4 N16-A-700001-193	ARM: actuator; SS type # 302; $2\frac{1}{8}''$ lg x $1\frac{3}{32}''$ h x 0.360" wd o/a; 0.093" diam hole $\frac{3}{16}''$ from one end, 0.171" diam hole $\frac{13}{16}''$ c to c from first hole, 0.140" diam hole $\frac{5}{32}''$ from other end; Collins Rad (CR) part/dwg # 504 0769 001.	Locks N3101
O3153		Same as O3152.	Locks N3102
O3154		Same as O3153.	Locks N3103
P3101		Not used.	
*P3102	N17-C-68293-3011	CONNECTOR, ADAPTER: double-ended male; 4 round male cont, 4 banana cont; straight; adapts receptacle to receptacle; $1\frac{5}{8}''$ lg x 1" wd x $\frac{1}{8}''$ thk less cont; rectangular phenolic body; four 0.136" diam mtg holes spaced on $\frac{7}{8}''$ x $\frac{3}{4}''$ mtg/c; p/o Z3101; Collins Rad (CR) part/dwg # 502 4287 002.	Adapter for J3102 and J3115
**P3103		Same as P3102, p/o Z3102.	Adapter for J3102 and J3116
P3104		Not used.	
P3105	N17-C-070950-2884	CONNECTOR, PLUG: JAN type UG-913/U; single round male cont; 90 deg right angle; $1\frac{1}{2}''$ x 1" (approx) wd x 0.563" h o/a; 52 ohms impedance; cylindrical body, bayonet locking; teflon insert; cable opening 0.212" diam incl cable clamping nut; per spec MIL-C-3608 and Sig C-SC-D-72255.	V3102 cathode output connection
P3106		Same as P3105.	V3102 grid input connection
P3107 through P3116		Not used.	
P3117		Same as J243.	Input and output connections to interpolation divider
R3101		Same as R101.	V3101 grid
R3102	N16-R-50822-761	RESISTOR, FIXED: JAN type RC20GF474K; comp; 470,000 ohm ±10%; ½ w; per spec MIL-R-11.	V3101 screen voltage dropping
		OR	
R3102	3RC20BF474K N16-R-50822-811	RESISTOR, FIXED: JAN type RC20BF474K; comp; 470,000 ohm ±10%; ½ w; per spec JAN-R-11.	V3101 screen voltage dropping
R3103	N16-R-50552-818	RESISTOR, FIXED: JAN type RC20GF683K; comp; 68,000 ohm ±10%; ½ w; per spec MIL-R-11.	V3101 plate leading
		OR	
R3103	3RC20BF683K N16-R-50552-811	RESISTOR, fixed: JAN type RC20BF683K; comp; 68,000 ohm ±10%; ½ w; per spec JAN-R-11.	V3101 plate leading

*This part is used in sealed oscillator assembly Z3101; replace complete assembly.
**This part is used in sealed oscillator assembly Z3102; replace complete assembly.

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Ass mbly: Mast r Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R3104	N16-R-50479-440	RESISTOR, FIXED: JAN type RC20GF473K; comp; 47,000 ohm ±10%; ½ w; per spec MIL-R-11.	V3101 plate voltage dropping
		OR	
R3104	3RC20BF473K N16-R-50480-811	RESISTOR, FIXED: JAN type RC20BF473K; comp; 47,000 ohm ±10%; ½ w; per spec JAN-R-11.	V3101 plate voltage dropping
R3105	3RC20GF224K N16-R-50714-818	RESISTOR, FIXED: JAN type RC20GF224K; comp; 220,000 ohm ±10%; ½ w; per spec MIL-R-11.	V3102 grid (1st section)
		OR	
R3105	3RC20BF224K N16-R-50714-811	RESISTOR, FIXED: JAN type RC20BF224K; comp; 220,000 ohm ±10%; ½ w; per spec JAN-R-11.	V3102 grid (1st section)
R3106	N16-R-50282-725	RESISTOR, FIXED: JAN type RC20GF103K; comp; 10,000 ohm ±10 %; ½ w; per spec MIL-R-11.	V3102 cathode bias (1st section)
		OR	
R3106	3RC20BF103K N16-R-50282-811	RESISTOR, FIXED: JAN type RC20BF103K; comp; 10,000 ohm ±10%; ½ w; per spec JAN-R-11.	V3102 cathode bias (1st section)
R3107		Same as R3105.	V3102 grid (2nd section)
R3108	N16-R-49922-730	RESISTOR, FIXED: JAN type RC20GF102K; comp 1000 ohm ±10%; ½ w; per spec MIL-R-11.	V3102 cathode bias (2nd section)
		OR	
R3108	3RC20BF102K N16-R-49922-811	RESISTOR, FIXED: JAN type RC20BF102K; comp; 1000 ohm ±10%; ½ w; per spec JAN-R-11.	V3102 cathode bias (2nd section)
R3109	N16-R-50373-101	RESISTOR, FIXED: JAN type RC32GF223K; comp; 22,000 ohm ±10%; 1 w; per spec MIL-R-11.	V3102 plate loading (2nd section)
		OR	
R3109	3RC30BF223K N16-R-50373-231	RESISTOR, FIXED: JAN type RC30BF223K; comp; 22,000 ohm ±10%; 1 w; per spec JAN-R-11.	V3102 plate loading (2nd section)
R3110		Same as R3108.	V3102 plate voltage dropping
R3111	3RC20GF104K N16-R-50633-785	RESISTOR, FIXED: JAN type RC20GF104K; comp; 0.10 megohm ±10%; ½ w; per spec MIL-R-11.	V3103 grid
		OR	
R3111	3RC20BF104K N16-R-50633-811	RESISTOR, FIXED: JAN type RC20BF104K; comp; 0.10 meghom ±10%; ½ w; per spec JAN-R-11.	V3103 grid
R3112	N16-R-050281-0438	RESISTOR, FIXED: JAN type RC20GF103J; comp; 10,000 ohm p/m 5%; ½ w; per spec MIL-R-11.	V3103 grid (1st section)
		OR	
R3112	3RC20BF103J N16-R-50281-431	RESISTOR, FIXED: JAN type RC20BF103J; comp; 10,000 ohm p/m 5%; ½ w; per spec JAN-R-11.	V3103 grid (1st section)

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting Set AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTI N
R3113		Same as R3112.	V3103 grid (2nd section)
R3114	N16-R-50479-435	RESISTOR, FIXED: JAN type RC20GF473J; comp; 47,000 ohm ±5%; ½ w; per spec MIL-R-11.	V3103 plate to grid (1st section)
R3114	3RC20BF473J N16-R-50479-431	OR RESISTOR, FIXED: JAN type RC20BF473J; comp; 47,000 ohm ±5%; ½ w; per spec JAN-R-11.	V3103 plate to grid (1st section)
R3115		Same as R3114.	V3103 plate to grid (2nd section)
R3116	N16-R-50371-711	RESISTOR, FIXED: JAN type RC32GF223J; comp; 22,000 ohm ±5%; 1 w; per spec MIL-R-11.	V3103 plate loading (1st section)
R3116	3RC30BF223J N16-R-50371-751	OR RESISTOR, FIXED: JAN type RC30BF223J; comp; 22,000 ohm ±5%; 1 w; per spec JAN-R-11.	V3103 plate loading (1st section)
R3117		Same as R3116.	V3103 plate loading (2nd section)
R3118	N16-R-50372-833	RESISTOR, FIXED: JAN type RC20GF223K, comp; 22,000 ohm ±10%; ½ w; per spec MIL-R-11.	V3104 Grid #1
R3118	3RC20BF223K N16-R-50372-811	OR RESISTOR, FIXED: JAN type RC20BF223K; comp; 22,000 ohm ±10%; ½ w; per spec JAN-R-11.	V3104 grid #1
R3119		Same as R3111.	V3104 grid #3
R3120	N16-R-49580-766	RESISTOR, FIXED: JAN type RC20GF101K; comp; 100 ohm ±10%; ½ w; per spec MIL-R-11.	V3104 cathode bias
R3120	3RC20BF101K N16-R-49580-811	OR RESISTOR, FIXED: JAN type RC20BF101K; comp; 100 ohm ±10%; ½ w; per spec JAN-R-11.	V3104 cathode bias
R3121	N16-R-50418-483	RESISTOR, FIXED: JAN type RC42GF333K; comp; 33,000 ohm ±10%; 2 w; per spec MIL-R-11. Same as R-610.	V3104 screen grid voltage dropping
R3121	3RC42BF333K N16-R-50418-457	OR RESISTOR, FIXED: JAN type RC42BF333K; comp; 33,000 ohm ±10%; 2 w; per spec JAN-R-11.	V3104 screen grid voltage dropping
R3122	N16-R-50012-816	RESISTOR, FIXED; JAN type RC20GF222K; comp; 2200 ohm ±10%; ½ w; per spec MIL-R-11.	V3104 B+ decoupler
R3122	3RC20BF222K N16-R-50012-811	OR RESISTOR, FIXED: JAN type RC20BF222K; comp; 2200 ohm ±10%; ½ w; per spec JAN-R-11.	V3104 B+ decoupler
R3123		Same as R3111.	V3105 grid #1
R3124		Not used.	

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Maj r Ass mbly: Mast r Oscillat r, O-243/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R3125		Same as R3105.	V3105 screen voltage dropping
R3126		Same as R3122.	V3105 plate decoupler
R3127		Same as R3111.	V3106 grid
R3128		Same as R3120.	V3106 cathode bias
R3129		Same as R3105.	V3106 screen voltage dropping
R3130		Same as R3122.	V3106 plate decoupler
R3131		Same as R3111.	V3107 grid #1
R3132		Same as R3111.	V3107 grid #3
R3133	N16-R-49769-799	RESISTOR, FIXED: JAN type RC20GF471K; comp; 470 ohm ±10%; ½ w; per spec MIL-R-11.	V3107 cathode bias
		OR	
R3133	3RC20BF471K N16-R-49769-811	RESISTOR, FIXED: JAN type RC20BF471K; comp; 470 ohm ±10%; ½ w; per spec JAN-R-11.	V3107 cathode bias
R3134		Same as R3121.	V3107 screen-grid voltage dropping
R3135		Same as R3122.	V3107 plate decoupler
R3136		Same as R3111.	V3108 AVC voltage
R3137		Not used.	
R3138		Same as R3105.	V3108 screen-grid voltage dropping
R3139		Same as R3122.	V3108 plate decoupler
R3140		Same as R3111.	V3109 AVC voltage
R3141		Not used.	
R3142		Same as R3133.	V3109 cathode bias
R3143		Same as R3121.	V3109 screen-grid voltage dropping

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

For Radi Transmitting S t AN/FRT-24

Maj r Ass mbly: Mast r Oscillat r, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
R3144		Same as R3122.	V3109 plate decoupler
R3145		Same as R3111.	V3110 AVC voltage
R3146		Not used.	
R3147		Same as R3105.	V3110 screen-grid voltage dropping
R3148		Same as R3122.	V3110 plate decoupler
R3149	N16-R-50417-823	RESISTOR, FIXED: JAN type RC20GF333K; comp; 33,000 ohm ±10%; ½ w; per spec MIL-R-11.	V3124 grid
		OR	
R3149	3RC20BF333K N16-R-50417-811	RESISTOR, FIXED: JAN type RC20BF333K; comp; 33,000 ohm ±10%; ½ w; per spec JAN-R-11.	V3124 grid
R3150		Same as R3103.	V3124 grid
R3151		Not used.	
R3152		Same as R3133.	V3111 cathode bias
R3153		Same as R3103.	V3111 screen-grid voltage dropping
R3154		Same as R3109.	V3111 plate decoupler
R3155		Same as R102.	V3131 plate decoupler
R3156		Same as R3102.	V3112 grid
R3157		Same as R3133.	V3112 cathode bias
R3158		Same as R101.	V3112 screen-grid voltage dropping
R3159		Same as R3105.	V3112 plate decoupler
R3160		Same as R3111.	V3113 grid
R3161		Same as R801.	V3113 cathode bias
R3162		Same as R602.	V3113 screen-grid voltage dropping

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Maj r Ass mbly: Mast r Oscillat r, O-243/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R3163		Not used.	
R3164		Not used.	
R3165	N16-R-50129-815	RESISTOR, FIXED: JAN type RC20GF472K; comp; 4700 ohm ±10%; ½ w; per spec MIL-R-11.	p/o FL3101
		OR	
R3165	3RC20BF472K N16-R-50129-811	RESISTOR, FIXED: JAN type RC20BF472K; comp; 4700 ohm ±10%; ½ w; per spec JAN-R-11.	p/o FL3101
R3166		Same as R3104.	Part of FL3101
R3167	N16-R-50443-438	RESISTOR, FIXED: JAN type RC20GF393J; comp; 39,000 ohm ±5%; ½ w; per spec MIL-R-11.	V3114 plate loading (1st section)
		OR	
R3167	3RC20BF393J N16-R-50443-431	RESISTOR, FIXED: JAN type RC20BF393J; comp; 39,000 ohm ±5%; ½ w; per spec JAN-R-11.	V3114 plate loading (1st section)
R3168		Same as R3167.	V3114 plate loading (2nd section)
R3169	N16-R-50632-416	RESISTOR, FIXED: JAN type RC20GF104J; comp; 0.10 megohm ±5%; ½ w; per spec MIL-R-11.	p/o time constant circuit for V3114
		OR	
R3169	3RC20BF104J N16-R-50632-431	RESISTOR, FIXED: JAN type RC20BF104J; comp; 0.10 megohm ±5%; ½ w; per spec JAN-R-11.	p/o time constant circuit for V3114
R3170	N16-R-50398-131	RESISTOR, FIXED: JAN type RC20GF273J; comp; 27,000 ohm ±5%; ½ w; per spec MIL-R-11.	V3114 grid (1st section)
		OR	
R3170	3RC20BF273J N16-R-50398-431	RESISTOR, FIXED: JAN type RC20BF273J; comp; 27,000 ohm ±5%; ½ w; per spec JAN-R-11.	V3114 grid (1st section)
R3171	N16-R-50416-435	RESISTOR, FIXED: JAN type RC20GF333J; comp; 33,000 ohm ±5%; ½ w; per spec MIL-R-11.	V3114 cathode bias
		OR	
R3171	3RC20BF333J N16-R-50416-431	RESISTOR, FIXED: JAN type RC20BF333J; comp; 33,000 ohm ± 5%; ½ w; per spec JAN-R-11.	V3114 cathode bias
R3172		Same as R3170.	V3114 grid (2nd section)
R3173		Same as R3169.	Part of time-constant circuit for V3114
R3174		Same as R3167.	V3114 plate load (1st section)

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

For Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R3175		Same as R3167.	V3114 plate load (2nd section)
R3176		Same as R3169.	p/o time constant circuit for V3115
R3177		Same as R3170.	V3115 grid (1st section)
R3178		Same as R3171.	V3115 cathode bias
R3179		Same as R3170.	V3115 grid (2nd section)
R3180		Same as R3169.	Part of time-constant circuit for V3115
R3181		Same as R102.	V3114 and V3115 plate decoupler
R3182	3RW25509 N16-R-66085-3846	RESISTOR, FIXED: JAN type RW31G162; WW; inductive; 1600 ohms ±5%; 10 w; per spec JAN-R-26A.	V3116 and V3117 cathode bias
R3183		Same as R3182.	V3118 and V3119 cathode bias
R3184		Same as R3102.	V3120 plate load (1st section)
R3185		Same as R3102.	V3120 plate load (2nd section)
R3186		Same as R3111.	V3120 plate voltage dropping
R3187		Same as R3102.	V3121 plate load (1st section)
R3188		Same as R3102.	V3121 plate load (2nd section)
R3189		Same as R3111.	V3121 plate voltage dropping
R3190		Same as R3165.	V3120 cathode bias
R3191		Same as R3165.	V3121 cathode bias
R3192		Same as R3102.	V3120 grid (1st section)

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
R3193		Same as R3102.	V3120 grid (2nd section)
R3194		Same as R3102.	V3121 grid (1st section)
R3195		Same as R3102.	V3121 grid (2nd section)
R3196		Same as R3111.	Part of low-pass filter
R3197		Same as R3111.	Part of low-pass filter
R3198		Same as R3111.	Part of low-pass filter
R3199		Same as R3111.	Part of low-pass filter
R3200		Same as R3111.	Part of low-pass filter
R3201		Same as R3111.	Part of low-pass filter
R3202		Same as R3111.	Part of low-pass filter
R3203		Same as R3111.	Part of low-pass filter
R3204		Same as R3111.	V3124 grid #1
R3205	N16-R-50399-813	RESISTOR, FIXED: JAN type RC20GF273K; comp; 27,000 ohm ±10%; ½ w; per spec MIL-R-11.	V3124 grid #3
		OR	
R3205	3RC20BF273K N16-R-50399-811	RESISTOR, FIXED: JAN type RC20BF273K; comp; 27,000 ohm ±10%; ½ w; per spec JAN-R-11.	V3124 grid #3
R3206	N16-R-49661-818	RESISTOR, FIXED: JAN type RC20GF221K; comp; 220 ohm ±10%; ½ w; per spec MIL-R-11.	V3124 cathode bias
		OR	
R3206	3RC20BF221K N16-R-49661-811	RESISTOR, FIXED: JAN type RC20BF221K; comp; 220 ohm ±10%; ½ w; per spec JAN-R-11.	V3124 cathode bias
R3207	N16-R-50373-423	RESISTOR, FIXED: JAN type RC42GF223K; comp; 22,000 ohm ±10%; 2 w; per spec MIL-R-11. Same as R-124.	V3124 screen grid voltage dropping
		OR	
R3207	3RC42BF223K N16-R-50373-421	RESISTOR, FIXED: JAN type RC42BF223K; comp; 22,000 ohm ±10%; 2 w; per spec JAN-R-11.	V3124 screen grid voltage dropping
R3208		Same as R3122.	V3124 plate decoupler

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATIN FUNCTION
R3209		Same as R101.	V3125 grid
R3210		Same as R3108.	V3125 cathode bias
R3211		Same as R3103.	V3125 screen-grid voltage dropping
R3212		Same as R3122.	V3125 plate decoupler
R3213		Not used.	
R3214		Same as R3111.	I3102 voltage dropping
R3215	N16-R-50678-818	RESISTOR, FIXED: JAN type RC20GF154K; comp; 0.15 megohm ±10%; ½ w; per spec MIL-R-11.	V3126 grid
		OR	
R3215	3RC20BF154K N16-R-50678-811	RESISTOR, FIXED: JAN type RC20BF154K; comp; 15,000 ohm ±10%; ½ w; per spec JAN-R-11.	V3126 grid
R3216	N16-R-50552-999	RESISTOR, FIXED: JAN type RC32GF683K; comp; 68,000 ohm ±10%; 1 w; per spec MIL-R-11.	V3126 screen grid voltage dropping
		OR	
R3216	3RC30BF683K N16-R-50553-231	RESISTOR, FIXED: JAN type RC30BF683K; comp; 68,000 ohm ±10%; 1 w; per spec JAN-R-11.	V3126 screen grid voltage dropping
R3217		Same as R109; p/o Z3102.	V3126 plate loading
R3218	N16-R-50237-815	RESISTOR, FIXED: JAN type RC20GF822K; comp; 8200 ohm ±10%; ½ w; per spec MIL-R-11.	V3126 grid filter
		OR	
R3218	3RC20BF822K N16-R-50237-811	RESISTOR, FIXED: JAN type RC20BF822K; comp; 8200 ohm ±10%; ½ w; per spec JAN-R-11.	V3126 grid filter
**R3219		Same as R3104; p/o Z3102.	V3115 grid
R3220 through R3234		Not used.	
*R3235	3RC21BF154J N16-R-50677-606	RESISTOR, FIXED: JAN type RC21BF154J; comp; 150,000 ohms ±5%; ½ w; p/o Z3101; per spec JAN-R-11.	V3131 grid
*R3236	3RC21BF683J N16-R-50551-591	RESISTOR, FIXED: JAN type RC21BF683J; comp; 68,000 ohms ±5%; ½ w; p/o Z3101; per spec JAN-R-11.	V3131 screen-grid voltage dropping
R3237	3RC21BF473J N16-R-50479-606	RESISTOR, FIXED: JAN type RC21BF473J; comp; 47,000 ohms ±5%; ½ w; p/o Z3101; per spec JAN-R-11.	V3111 grid

*This item is used in sealed oscillator assembly Z3101; replace complete assembly.
**This item is used in sealed oscillator assembly Z3102; replace complete assembly.

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
S3101	3Z9863-26N N17-S-74139-7130	SWITCH, TOGGLE: JAN type ST26N; DPDT; 6 amps, 125 v AC or DC; bat handle; per spec JAN-S-23.	Plate voltage on-off
S3102		Not used.	
S3103		Same as S3101.	
S3104	3Z9823-13 N17-S-69145-1898	SWITCH, TOGGLE: SPST; 3 amp, 250 v AC or DC; phenolic body metal case; 1¼″ lg x 35/64″ wd x 1¼″ d o/a; 17/32″ lg ball handle; position up closed, position down open; solder-lug terminal; single hole mtg bushing 15/32-32 NS-2, 5/8″ lg; Collins Rad (CR) part/dwg # 260 0839 00.	C3170 cam-actuated switch
T3101		Not used.	
T3102		Not used.	
T3103	2Z9626/87 N17-T-81731-1167	TRANSFORMER, IF: 450 kc peak freq; output; shielded; 2 11/16″ h x 1 3/8″ sq, less term; phenolic coil form, powdered-iron core; single tuned; adj iron-core tuning; mtd by two 4-40 NC-2 x 15/64″ lg studs in opposite corners at bottom; 6 solder-pin term; wnd coated with coil dope; Collins Rad (CR) part/dwg # 504 0663 003.	V3104 output transformer
T3104		Not used.	
T3105	N17-T-82121-8051	TRANSFORMER, IF; freq range 9 to 20 mc; regenerative divider control; shielded, 2 9/32″ lg x 2 1/32″ diam; phenolic form, powdered-iron core; tuned pri and secd; adj iron-core tuning; mtd inside Z3103; Collins Rad (CR) part/dwg # 504 0580 002.	Part of Z3104
T3106	N17-T-81716-1167	TRANSFORMER, IF: freq range 875 to 900 kc; interstage; shielded; 2 11/16″ h x 1 3/8″ sq, less term; phenolic coil form, 2 powdered-iron cores; double-tuned; adj iron-core tuning; mtd by two 4-40 NC-2 x 15/64″ lg studs on opposite corners at bottom; 6 solder-pin term; incl C3133, C3134, C3136, C3137; Collins Rad(CR) part/dwg # 504 0657 003.	900-kc IF transformer
T3107		Same as T3106.	900-kc IF transformer
T3108	N17-T-67710-8201	TRANSFORMER, IF: 800-kc peak freq; output; shielded; 2 11/16″ h x 1 3/8″ sq, less term; phenolic coil form, 2 powdered-iron cores; double-tuned; adj iron-core tuning; mtd by two 4-40 NC-2 x 15/64″ lg studs in opposite corners at bottom; 6 solder-pin term; incl C3149, C3150, C3152, C3153; Collins Rad (CR) part/dwg # 504 4310 003.	800-kc IF transformer
T3109		Same as T3108.	800-kc IF transformer
T3110 through T3112		Not used.	
T3113	2Z9626-89 N17-T-81320-1103	TRANSFORMER, RF: 2 single-layer wnd, single-layer wound secd on top of pri; pri 45 turns # 30 copper wire, secd 6 turns # 30 copper wire; ohms DC pri, ohms DC secd, 2—4.2 mc freq range; rectangular aluminum shield can; 2″ lg x 1 7/16″ wd x 2″ h o/a; phenolic coil form; air core; no adj; mtd by one 4-40 x ¼″ lg stud and one post hole tapped 4-40 NC-2; 4 solder rivet term; Collins Rad (CR) part/dwg # 504 1941 003.	2—4.2 mc output transformer

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

For Radio Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
TB3101	†	BOARD, TERMINAL: provides mtg and electrical connections for parts; 20 brass, silver pl solder-pin terminals; ¼" between term ctr; laminated phenolic board; 3½" lg x 1½" wd x ½" h o/a; four 0.144" diam mtg holes spaced 1⅛" x 3⅛"; silk-screened with symbols; Collins Rad (CR) part/dwg # 506 9098 002.	Resistor and capacitor mounting board in interpolation divider
TB3102	†	BOARD, TERMINAL: general purpose; 12 brass nickel pl screw term; ⅜" between terminal centers, barriers; molded bakelite board; 5⅛" lg x ⅞" wd x 13/32" thk, o/a; four 0.160" diam mtg holes on 5/16" x 4⅞" mtg ctr; Collins Rad (CR) part/dwg # 367 0124 00.	DC voltage distribution
V3101		Same as V101.	100-kc crystal oscillator
V3102		Same as V201.	100-kc amplifier
V3103		Same as V201.	25-kc divider
V3104	2J5750/6BE6W N16-T-75750	TUBE, ELECTRON: JAN 5750/6BE6W; rectifier; per spec MIL-13 JAN 1953.	450-kc amplifier
V3105		Same as V3104.	9.125 to 20.125 mc 1st harmonic amplifier
V3106	2J5749 N16-T-075749	TUBE, ELECTRON: JAN 5749/6BA6W; Pentode; per spec MIL-13 Jan 1953.	9.125 to 20.125 mc 2nd harmonic amplifier
V3107		Same as V3104.	875 to 900 kc 1st mixer
V3108		Same as V3106.	875 to 900 kc 2nd amplifier
V3109		Same as V3104.	800-kc 1st mixer
V3110		Same as V3106.	800-kc 2nd amplifier
V3111		Same as V101.	2 to 4.2 mc multipler
V3112		Same as V101.	10 to 21 mc multiplier
V3113	2J5686 N16-T-75686	TUBE, ELECTRON: JAN 5686; pentode; per spec MIL-13 Jan 1953.	2 to 4.2 mc final amplifier
V3114		Same as V201.	75 to 100 kc interpolation divider
V3115		Same as V201.	150 to 200 kc interpolation divider
V3116		Same as V3113.	Motor power amplifier

TABLE 8-4. TABLE OF REPLACEABLE PARTS—C ntinu d

F r Radi Transmitting S t AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESI NATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
V3117		Same as V3113.	Motor power amplifier
V3118		Same as V3113.	Motor power amplifier
V3119		Same as V3113.	Motor power amplifier
V3120		Same as V201.	DC amplifier
V3121		Same as V201.	DC amplifier
V3122	2J5726/6AL5W N16-T-75726	TUBE, ELECTRON: JAN 5726/6AL5W; twin triode; per spec MIL-13 Jan 1953.	Diode mixer
V3123		Same as V3122.	Diode mixer
V3124		Same as V3104.	Regenerative divider
V3125		Same as V3106.	Regenerative divider
V3126	2J6SJ7Y N16-T-056668	TUBE, ELECTRON: JAN 6SJ7Y; pentode; p/o Z3102; per spec MIL-E-1B.	300 to 400 kc interpolation oscillator
V3127 through V3130		Not used.	
V3131		Same as V3126; p/o Z3101.	1 to 1.5 mc master oscillator
XF3101		Same as XF503.	Holder for F3101 and spare
XF3102		Same as XF503.	Holder for F3102 and spare
XHR3101	2ZK8677-18 N16-S-62833-8849	SOCKET, TUBE: Navy type 49384; 7 cont jumbo; underchassis wafer mtg; four 11/64" diam mtg holes on 17/8" x 17/8" mtg/c; sq steatite body 25/8" sq x 5/16" thk excluding term; brass cad pl cont; Collins Rad (CR) part/dwg # 220 5711 00.	Holds HR3101 oven
XV3101		Same as XV101.	Holds V3101
XV3102		Same as VX102.	Holds V3102
XV3103		Same as XV102.	Holds V3103
XV3104		Same as XV101.	Holds V3104
XV3105		Same as XV101.	Holds V3105
XV3106		Same as XV101.	Holds V3106

TABLE 8-4. TABLE OF REPLACEABLE PARTS—Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
XV3107		Same as XV101.	Holds V3107
XV3108		Same as XV101.	Holds V3108
XV3109		Same as XV101.	Holds V3109
XV3110		Same as XV101.	Holds V3110
XV3111		Same as XV101.	Holds V3111
XV3112		Same as XV101.	Holds V3112
XV3113		Same as XV102.	Holds V3113
XV3114		Same as XV102.	Holds V3114
XV3115		Same as XV102.	Holds V3115
XV3116		Same as XV102.	Holds V3116
XV3117		Same as XV102.	Holds V3117
XV3118		Same as XV102.	Holds V3118
XV3119		Same as XV102.	Holds V3119
XV3120		Same as XV102.	Holds V3120
XV3121		Same as XV102.	Holds V3121
XV3122		Same as XV101.	Holds V3122
XV3123		Same as XV101.	Holds V3123
XV3124		Same as XV101.	Holds V3124
XV3125		Same as XV101.	Holds V3125
XV3126		Same as XV1001; p/o Z3102.	Holds V3126
XV3127 through XV3130		Not used.	
XV3131		Same as XV1001; p/o Z3101.	Holds XV131
Y3101	N16-C-99999-1137	CRYSTAL UNIT, QUARTZ: one plate in JAN HC-15/U holder; nom freq 100 kc; temp range 55 to 65° C; std octal tube base; xtal connected to pin 3 and 7, glass electron tube type body, 1$\frac{9}{32}$" diam x 2$\frac{7}{8}$" h o/a; no air gap adj, xtal is wire-mtd within evacuated glass bulb; J Knights (KNJ) type G-9; Collins Rad (CR) part/dwg # 291 9984 00.	100-kc crystal

TABLE 8-4. TABLE OF REPLACEABLE PARTS—Continued

For Radio Transmitting Set AN/FRT-24

Major Assembly: Master Oscillator, O-243/FRT-24

REFERENCE DESIGNATION	STOCK NUMBERS (1) SIGNAL CORPS (2) STANDARD NAVY (3) AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
*Z3101	2C2718-7 F16-O-55036-7755	OSCILLATOR, RF: freq range 1 to 1.5 mc; not crystal-controlled; approx .008 w output; 5″ lg x $2\frac{3}{4}$″ wd x $4\frac{13}{16}$″ h o/a; integral coils; receives power from rect unit of xmtr; incl 1 tube installed; mtd in sealed metal case; incl C3212, C3213, C3215, C3216, C3217, C3218, C3219, L3103, L3104, P3102, R3235, R3236, R3237, V3131, XV3131; Collins Rad (CR) part # 70E11, dwg # 503 9558 013.	Master oscillator
*Z3102	F16-O-52006-7751	OSCILLATOR, RF: freq range 300 to 400 kc; not crystal-controlled; approx .008 w output; $5\frac{1}{4}$″ lg x $2\frac{3}{4}$″ wd x $4\frac{13}{16}$″ h o/a; integral coils; receives power from rect unit for xmtr; incl 1 tube installed; mtd in sealed metal case; incl C3231, C3232, C3233, C3234, C3235, C3236, C3237, C3238, L3102, P5103, R3215, R3216, R3217, R3218, R3219, V3126, XV3126; Collins Rad (CR) part # 70E21, dwg # 522 0073 013.	Interpolation oscillator
Z3103	N17-T-81749-1011	COIL ASSEMBLY, IF: 2 coils; universal wnd, 500 turns # 36 SE copper wire ea coil; 6 solder-pin term; $2\frac{11}{16}$″ h x $1\frac{3}{8}$″ sq less term; adj iron core; mtd by two 4-40 NC-2 x $1\frac{5}{64}$″ lg studs on bottom; incl C3198, C3199, L3111, L3112; Collins Rad (CR) part/dwg # 504 0661 002.	Phase shifter for motor control
Z3104	N17-T-81731-1383	COIL ASSEMBLY, IF: 1 coil and 1 transformer; universal wnd, coil wnd with 150 turns # 36 SE copper wire, transformer coils wnd with 500 turns # 36 SE copper wire on pri, 300 turns # 36 SE copper wire on secd; 6 solder-pin term; adj iron core; mtd by two 4-40 NC-2 x $1\frac{5}{64}$″ lg studs on bottom; incl C3225, C3226, C3227, C3228, L3113, T3105; Collins Rad (CR) part/dwg # 504 0660 003.	Regenerative divider

*This item is sealed, and should be returned to Collins Rad for repair and recalibration.

TABLE 8-5. MAINTENANCE PARTS KIT

KEY DESIGNATION	BOX NO.	QUANTITY

KEY DESIGNATION	BOX NO.	QUANTITY

TABLE 8-6. CROSS REFERENCE PARTS LIST

STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL
F16-C-089293-3558	901-999 Series	N16-C-076507-3408	L114	N16-C-27371-6210	C3121
F16-N-030826-1099	2001-2099 Series	N16-C-076598-8176	L119	N16-C-28547-8645	C3107
F16-O-52006-7751	Z3102	N16-C-12121-7786	W101	N16-C-28969-7900	C3235
F16-O-55036-7755	Z3101	N16-C-15368-5828	C3138	N16-C-29713-6806	C3199
F16-O-55295-1278	3101 thru 3299 Series	N16-C-15627-9001	C3124	N16-C-301253-832	E129
GF17-L-3918	I501	N16-C-15953-2881	C3220	N16-C-30103-2331	C3104
GM17-C-71460-4878	P701	N16-C-15958-3301	C191	N16-C-30103-8375	C3110
GM17-F-16302-100	F1002	N16-C-15987-6001	C102	N16-C-30119-6756	C3198
GM17-F-16302-120	F507	N16-C-16083-4337	C3213	N16-C-301751-257	E133
GM17-F-16302-80	F1004	N16-C-16171-9144	C3129	N16-C-30299-1164	C141
GM17-F-16302-90	F1003	N16-C-16261-2001	C182	N16-C-30536-4764	C140
GM17-L-6297	I902	N16-C-16263-2801	C116	N16-C-31090-4164	C3180
GM77-B-411-00301-0000	O210	N16-C-16267-9144	C3109	N16-C-31665-6528	C3217
N17-M-19624-4251	M101	N16-C-16523-9101	C3176	N16-C-31908-1564	C3166
N15-C-12201-50	W721A	N16-C-16523-9101	C3226	N16-C-31913-9493	C181
N16-A-700001-193	O3152	N16-C-16555-8161	C3232	N16-C-42760-8641	C164
N16-A-700185-0101	O286	N16-C-16557-2851	C3233	N16-C-42761-9592	C150
N16-A-700185-0102	O285	N16-C-16774-7057	C2001	N16-C-42765-4140	C3123
N16-C-071795-2246	L117	N16-C-17067-8295	C103	N16-C-42765-4745	C3200
N16-C-071936-8204	L128	N16-C-17072-9275	C3133	N16-C-43633-2001	C902
N16-C-071986-3584	L121	N16-C-17077-1226	C601	N16-C-43634-4751	C605
N16-C-072369-4471	L116	N16-C-18632-8164	C3212	N16-C-45773-5668	C3236
N16-C-072452-1374	L126	N16-C-18630-3689	C105	N16-C-45801-9592	C129
N16-C-072834-8797	L127	N16-C-18660-2453	C124	N16-C-47147-8960	C3162
N16-C-075298-1147	L112	N16-C-18983-1015	C104	N16-C-47297-3100	C604
N16-C-075328-7931	L111	N16-C-19713-8753	C127	N16-C-48808-9181	C904
N16-C-075351-9744	L125	N16-C-19781-5626	C901	N16-C-48817-3805	C240
N16-C-075417-9100	L115	N16-C-19781-5646	C602	N16-C-49197-3879	C603
N16-C-075431-5021	L105	N16-C-20188-9901	C803	N16-C-49981-9980	C802
N16-C-076350-2826	L123	N16-C-21054-8542	C138	N16-C-51881-9090	C1001
N16-C-076478-2964	L124	N16-C-22598-2501	C906	N16-C-52051-2332	C242

TABLE 8-6. CROSS REFERENCE PARTS LIST—Continued

STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL
N16-C-53192-8190	C3201	N16-C-90488-1010	680-690 Series	N16-R-29174-5623	L1001
N16-C-54467-1577	C204	N16-C-95404-9633	HR-3101	N16-R-49580-766	R3120
N16-C-56018-3908	C402	N16-C-99999-276	C3105	N16-R-49580-811	R3120
N16-C-59059-4601	C3215	N16-C-99999-285	C3106	N16-R-49581-190	R806
N16-C-59766-4781	C3101	N16-C-99999-307	C3184	N16-R-49581-231	R806
N16-C-65866-5658	C134	N16-C-99999-316	C3114	N16-R-49599-181	R914
N16-C-61611-5621	C125	N16-C-99999-1137	Y3101	N16-R-49599-231	R914
N16-C-62762-1050	C114	N16-C-99999-1138	C3102	N16-R-49660-716	R801
N16-C-63049-9003	C185	N16-C-99999-1139	C3117	N16-R-49661-811	R3206
N16-C-63507-3751	C3120	N16-C-99999-1140	C133	N16-R-49661-818	R-3206
N16-C-64036-4565	C3141	N16-C-99999-1141	C167	N16-R-49662-231	R801
N16-C-64232-8500	C3234	N16-C-99999-1142	C401	N16-R-49687-698	R902
N16-C-64452-1501	C171	N16-C-99999-1143	C3238	N16-R-49689-231	R902
N16-C-71581-8820	L-122	N16-C-99999-1144	C3231	N16-R-49705-705	R110
N16-C-72590-8822	L3103	N16-C-99999-1145	C691	N16-R-49705-705	R937
N16-C-73414-9937	L103	N16-C-99999-1146	C132	N16-R-49705-751	R937
N16-C-73509-2812	L2009	N16-C-99999-1147	C3103	N16-R-49707-231	R110
N16-C-73823-5960	L120	N16-C-99999-1148	C404	N16-R-49707-506	R105
N16-C-73926-8935	L3104	N17-D-36861-7360	S903	N16-R-49707-511	R105
N16-C-74375-3813	L102	N17-D-36861-7360	S1502	N16-R-49769-799	R3133
N16-C-74714-8561	L101	N16-F-32091-3714	Z601	N16-R-49769-811	R3133
N16-C-74911-8480	L3113	N16-F-44278-4458	FL3101	N16-R-49770-165	R125
N16-C-75219-5298	L3102	N16-I-9817-199	E139	N16-R-49770-231	R125
N16-C-75364-8084	L109	N16-K-700248-886	E3172	N16-R-49840-698	R629
N16-C-75398-1552	L107	N16-K-700061-486	E159	N16-R-49842-231	R629
N16-C-75426-1653	L108	N16-O-65501-1010	03136	N16-R-49903-698	R920
N16-C-75444-1755	L106	N16-P-067646-4874	701-720 Series	N16-R-49903-751	R920
N16-C-76138-8964	L3111	N16-P-324000-101	0157	N16-R-49921-715	R102
N16-C-76385-4355	L3107	N16-P-324000-102	0601	N16-R-49921-715	R240
N16-C-76635-4326	L3109	F16-P-66711-1001	1001-1099 Series	N16-R-49921-751	R240
N16-C-89881-4551	O-284	N16-R-28990-8961	L801	N16-R-49922-730	R3108

TABLE 8-6. CROSS REFERENCE PARTS LIST—Continued

STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL
N16-R-49922-811	R3108	N16-R-50281-711	R916	N16-R-50398-950	R217
N16-R-49923-231	R102	N16-R-50281-751	R916	N16-R-50399-131	R217
N16-R-49939-698	R925	N16-R-50282-131	R206	N16-R-50399-811	R3205
N16-R-49939-751	R925	N16-R-50282-140	R206	N16-R-50399-813	R3205
N16-R-50011-701	R918	N16-R-50282-725	R3106	N16-R-50416-431	R3171
N16-R-50011-751	R918	N16-R-50282-811	R3106	N16-R-50416-435	R3171
N16-R-50012-141	R219	N16-R-50283-116	R109	N16-R-50417-811	R3149
N16-R-50012-146	R219	N16-R-50283-231	R109	N16-R-50417-823	R3149
N16-R-50012-811	R3122	N16-R-50283-512	R660	N16-R-50418-101	R103
N16-R-50012-816	R3122	N16-R-50283-535	R660	N16-R-50418-231	R103
N16-R-50013-171	R602	N16-R-50308-945	R225	N16-R-50418-457	R3121
N16-R-50013-231	R602	N16-R-50308-950	R225	N16-R-50418-483	R3121
N16-R-50040-518	R623	N16-R-50310-101	R111	N16-R-50418-483	R610
N16-R-50040-521	R623	N16-R-50310-231	R111	N16-R-50418-487	R610
N16-R-50067-515	R123	N16-R-50337-119	R310	N16-R-50443-438	R3167
N16-R-50128-715	R204	N16-R-50337-231	R310	N16-R-50443-431	R3167
N16-R-50128-751	R204	N16-R-50355-498	R403	N16-R-50461-698	R161
N16-R-50129-113	R933	N16-R-50371-711	R3116	N16-R-50479-431	R3114
N16-R-50129-121	R933	N16-R-50371-751	R3116	N16-R-50479-435	R3114
N16-R-50129-811	R3165	N16-R-50372-811	R3118	N16-R-50479-440	R3104
N16-R-50129-815	R3165	N16-R-50372-833	R3118	N16-R-50479-606	R3237
N16-R-50130-479	R929	N16-R-50373-101	R3109	N16-R-50479-713	R1001
N16-R-50130-511	R929	N16-R-50373-231	R3109	N16-R-50479-713	R203
N16-R-50166-167	R104	N16-R-50373-421	R3207	N16-R-50479-751	R203
N16-R-50166-231	R104	N16-R-50373-423	R124	N16-R-50479-950	R210
N16-R-50202-516	R519	N16-R-50373-423	R3207	N16-R-50480-131	R210
N16-R-50202-521	R519	N16-R-50373-426	R124	N16-R-50480-811	R3104
N16-R-50237-811	R3218	N16-R-50398-131	R3170	N16-R-50481-101	R603
N16-R-50237-815	R3218	N16-R-50398-431	R3170	N16-R-50481-231	R603
N16-R-50281-431	R3112	N16-R-50398-696	R903	N16-R-50481-457	R605
N16-R-50281-438	R3112	N16-R-50398-751	R903	N16-R-50482-611	R1001

TABLE 8-6. CROSS REFERENCE PARTS LIST—C ntinu d

STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL
N16-R-50515-711	R911	N16-R-50758-751	R221	N16-R-66569-4081	R401
N16-R-50515-950	R207	N16-R-50760-121	R912	N16-R-73308-7405	R661
N16-R-50515-955	R207	N16-R-50760-231	R912	N16-R-87751-8650	R926
N16-R-50517-231	R911	N16-R-50822-761	R3102	N16-R-88009-4558	R601
N16-R-50551-591	R3236	N16-R-50822-811	R3102	N16-R-89794-3410	R150
N16-R-50552-811	R3103	N16-R-50974-718	R223	N16-R-90754-6975	R927
N16-R-50552-818	R3103	N16-R-50974-751	R223	N16-R-91028-1405	R523
N16-R-50552-999	R3216	N16-R-50975-725	R101	N16-R-91406-1127	R201
N16-R-50553-231	R3216	N16-R-50975-811	R101	N16-R-99999-818	L401
N16-R-50632-416	R3169	N16-R-50992-751	R520	N16-R-99999-819	L602
N16-R-50632-431	R3169	N16-R-51091-698	R922	N16-R-99999-820	L691
N16-R-50632-713	R202	N16-R-55492-377	R520	N16-R-99999-821	L901
N16-R-50632-751	R202	N16-R-51093-231	R922	N16-R-99999-822	R901
N16-R-50633-785	R3111	N16-R-61318-5601	R405	N16-S-34520-3861	E128
N16-R-50633-811	R3111	N16-R-64206-5398	K505	N16-S-34520-3864	E3147
N16-R-50634-187	R154	N16-R-65532-4386	R620	N16-S-34557-8351	E3152
N16-R-50634-231	R154	N16-R-65735-2126	R802	N16-S-34576-6514	E3161
N16-R-50634-503	R1003	N16-R-65935-4441	R685	N16-S-34576-6515	E509
N16-R-50634-503	R301	N16-R-65976-1646	R157	N16-S-34753-1676	E3166
N16-R-50634-505	R1003	N16-R-66031-4366	R155	N16-S-34607-8353	E1001
N16-R-50634-505	R301	N16-R-66051-8246	R682	N16-S-54287-5101	XY101
N16-R-50677-606	R3235	N16-R-66085-3846	R3182	N16-S-60856-2987	XV301
N16-R-50678-811	R3215	N16-R-66103-7646	R149	N16-S-60935-9301	XV401
N16-R-50678-818	R3215	N16-R-66105-1835	R122	N16-S-61876-8870	XV603
N16-R-50679-522	R120	N16-R-66105-1835	R681	N16-S-61911-7121	XV106
N16-R-50679-525	R120	N16-R-66167-8970	R1002	N16-S-62603-6674	XV1003
N16-R-50714-811	R3105	N16-R-66168-2523	R680	N16-S-62603-6700	XV605
N16-R-50714-818	R3105	N16-R-66214-5516	R148	N16-S-62603-6702	XV101
N16-R-50715-102	R607	N16-R-66251-4116	R151	N16-S-62821-4920	XV105
N16-R-50715-231	R607	N16-R-66397-6511	R1006	N16-S-62833-8849	XHR3101
N16-R-50758-709	R221	N16-R-66398-6471	R119	N16-S-63511-6461	XV1001

TABLE 8-6. CROSS REFERENCE PARTS LIST—Continued

STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL
N16-S-63515-4151	XV113	N17-C-81523-4764	J102A	N17-C-73443-8438	J903
N16-S-64063-6713	XV102	N17-C-084523-2429	J102B	N17-C-73471-6707	J1003
N16-T-52001-3	V107	N17-C-48403-8818	W702	N17-C-73565-9015	J3107
N16-T-52001-5	V204	N17-C-51502-7713	CB501	N17-C-73572-6454	J243
N16-T-53228	V301	N17-C-67731-5697	J2001	N17-C-73574-8919	J241
N16-T-54048	V105	N17-C-68293-3011	P3102	N17-C-73593-5623	J242
N16-T-54067	V603	N17-C-70348-6585	P504	N17-C-73605-7769	P240
N16-T-54075	V106	N17-C-70950-2884	P3105	N17-C-73615-4692	J103
N16-T-54232	V401	N17-C-71168-1306	P711	N17-C-78537-7396	J106
N16-T-55445	V1001	N17-C-71190-6437	J3102	N17-C-800956-126	E302
N16-T-55738-5	V113	N17-C-71281-3423	P714	N17-C-82011-1770	S106A
N16-T-56668	V3126	N17-C-71291-5118	P241	N17-C-83557-1715	S-252
N16-T-56840-50	V605	N17-C-71408-5333	P721	N17-C-98378-3818	O113
N16-T-58240-14	V901	N17-C-71419-4848	P107	N17-C-98611-1015	O3137
N16-T-51769	CR3101	N17-C-71422-3137	P2001	N17-C-98611-1016	O3150
N16-T-75654	V-101	N17-C-71565-2109	P704	N17-C-98611-1019	O3149
N16-T-75686	V3113	N17-C-71575-1008	P211	N17-F-14305-40	F512
N16-T-75726	V3122	N17-C-72624-6583	J504	N17-F-14310-315	F3102
N16-T-75750	V3104	N17-C-73108-1262	J101	N17-F-14310-335	F516
N16-T-75749	V3106	N17-C-73108-1267	J3104	N17-F-14310-380	F503
N16-T-75763	V102	N17-C-73108-2841	J201	N17-F-16302-150	F515
N16-T-75814	V201	N17-C-73115-8750	J107	N17-F-16320-25	F901
N17-A-25801-1006	O3105	N17-C-73131-3185	J702	N17-F-74267-5075	XF503
N17-B-146461-0125	E1503	N17-C-73174-8870	J701	N17-H-20001-1022	HS-1501
N17-B-77590-1085	TB651	N17-C-73197-7866	J3115	N17-I-19006-4018	O682
N17-B-77639-1548	TB641	N17-C-73281-9536	J1001	N17-I-47388-7521	E401B
N17-B-77793-3492	TB403	N17-C-73288-1411	J213	N17-I-47417-4211	E2003
N17-B-77841-6746	TB902	N17-C-73291-4410	J211	N17-I-48719-7756	E401A
N17-B-77840-1634	E1501	N17-C-73306-4215	J212	N17-I-69047-5501	P106A
N17-B-77988-5581	TB901	N17-C-73323-2345	J240	N17-I-69158-6251	E125
N17-B-78086-8349	TB630	N17-C-73323-3220	J113	N17-I-69158-6701	E627

TABLE 8-6. CROSS REFERENCE PARTS LIST—C ntinu d

STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL
N17-I-69160-6215	E667	N17-M-35614-8251	M1001	N17-S-60523-1255	S243
N17-I-69167-6226	E162	N17-M-58301-6452	B642	N17-S-61164-5849	S505
N17-I-69175-7121	E140	N17-M-75014-9951	A640	N17-S-61497-1459	S1003
N17-I-69180-7090	E-164	N17-P-023179-6438	721-799 Series	N17-S-66588-9551	S242
N17-I-69185-7111	E145	N17-R-51181-8789	CR801	N17-S-66877-5066	S504
N17-I-69215-9481	E135	N17-R-64206-1636	K402	N17-S-69145-1898	S3104
N17-I-69229-3261	E-410	N17-R-64209-4021	K601	N17-S-69556-6901	S641
N17-I-69256-9571	E134	N17-R-64236-9805	K201	N17-S-69812-2003	K801
N17-J-39248-4418	J3110	N17-R-64270-5641	K3101	N17-S-73959-1025	S901
N17-J-39409-8522	J601	N17-R-64554-1101	K501	N17-S-74139-4844	S201
N17-J-39420-5601	J1501	N17-R-64554-3737	K503	N17-S-74139-7130	S3101
N17-J-39435-6234	J902	N17-R-64764-7313	K102	N17-T-038661-8051	TC101
N17-J-39449-4686	J901	N17-R-65212-8501	K504	F17-T-20623-1261	No Symbol
N17-L-250627-691	I903	N17-R-65342-4823	K802	N17-T-28228-3181	E118
N17-L-250709-101	I519	N17-R-65346-8543	K803	N17-T-28228-3261	E111
N17-L-250952-238	I520	N17-R-65355-7545	K804	N17-T-45201-5901	S-401
N17-L-6806-460	I901	N17-R-65355-7613	K806	N17-T-61606-8701	T601
N17-L-76752-7532	XI501	N17-R-65578-1335	K401	N17-T-63351-7895	T691
N17-L-76854-3936	XI902	N17-R-99999-0814	K240	N17-T-65938-6755	T902
N17-L-99999-124	I503	N17-R-99999-815	L301	N17-T-65953-4056	T903
N17-M-18291-1951	M104	N17-R-99999-816	L130	N17-T-67710-8201	T3108
N17-M-19682-4326	M103	N17-R-99999-817	K604	N17-T-70752-1939	T301
N17-M-19769-4326	M102	N17-S-091787-4999	S102	N17-T-70752-6670	T402
N17-M-19943-4351	M105	N17-S-55433-4483	S241	N17-T-70752-6950	T603
N17-M-27132-6281	M901	N17-S-57755-3701	S621	N17-T-70753-4170	T101
N17-M-27177-5781	M902	N17-S-58007-1001	S253	N17-T-70753-8043	T102
N17-M-32933-4742	M671	N17-S-59180-8210	S502	N17-T-73673-8517	T1001
N17-M-34276-1801	M663	N17-S-59348-2651	S105	N17-T-73674-9077	T1002
N17-M-35866-6626	M662	N17-S-59390-9996	S104	N17-T-75837-1047	T103
N17-M-54647-5151	B240	N17-S-59391-1501	S103	N17-T-75846-2306	T904
N17-M-57241-1939	B3101	N17-S-59931-7438	S680	N17-T-76422-1577	T501

TABLE 8-6. CROSS REFERENCE PARTS LIST—C ntinu d

STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL
N17-T-78234-6805	T401	2Z8304.275	E3161	3D9015-85	C102
N17-T-81320-1103	T3113	2Z8304.276	E3152	3D9047-43	C3226
N17-T-81716-1167	T3106	2Z8304-296	E1001	3D9050V-134	C3101
N17-T-81731-1167	T3103	2Z8304.57	E3147	3D9050-171	C3233
N17-T-81731-1383	Z3104	2Z8639-6	J1001	3D9067-2	C2001
N17-T-81749-1011	Z3103	2Z8654	XV1001	3D9100-230	C601
N17-T-82121-8051	T3105	2Z8670.33	VX113	3D9150-108	C3235
N17-T-99999-406	T302	2Z8675.110	XV603	3D9470-56	C3104
N17-T-99999-407	T801	2Z8677-171	XV101	3F8500-9	M1001
GM3110-155-9601	O143	2Z8677-189	XV105	3G350-119	E627
2Z3295-204	O3149	2Z8677.94	XV1003	3G-350-149	E125
2Z3565-12	CR3101	2Z8677.99	XV605	3G3503-16.3	E135
2Z379-4	O3152	2Z8679.30	XV102	3G350-79	E111
2Z379-5	O3105	2Z8680-5	P714	3H305-212	O210
2Z5533A	J902	2Z8759-3	XV401	3H305-23	O143
2Z5534	J3110	2Z8759.4-1	XV301	3K3010221	C3180
2Z5822-291	E3172	2Z8761-22	XY-101	3K3022221	C3166
2Z5822-543	E159	2Z8878-184	O3143	3K3056121	C141
2Z5889-27	I901	2Z9626-87	T3103	3K3068121	C140
2Z5952	I902	2Z9612.333	T1001	3RC20BF101K	R3120
2Z5991-221	X1902	2Z9618-135	T1002	3RC20BF102K	R3108
2Z6125-279	I903	2Z9626-89	T3113	3RC20BF103J	R3112
2Z7120.12	J3107	3C323-192Q	L103	3RC20BF103K	R3106
2Z7120.3	P704	3C325-22	L1001	3RC20BF104J	R3169
2Z7279-84	R927	3DA100-731	C3201	3RC20BF104K	R3111
2Z7280-16	R523	3DA10-588	C3123	2C2718-7	Z3101
2Z7390-154	P2001	3DA10-648	C3200	2J0A2	V107
2Z7390-290	J3104	3DA1.800-18	C3238	2J0B2	V204
2Z7390-88	P721	3DB20-112	C127	2J3B28	V301
2Z8066-8	C3170A	3DB4-322	C802	2J4B32	V401
2Z8304.137	E509	3D9001-15	C3138	2J4-65A	V105

TABLE 8-6. CROSS REFERENCE PARTS LIST—C ntinu d

STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL
2J5654/6AK5W	V101	3RC20BF473J	R3114	3RC30BF331J	R937
2J5686	V3113	3RC20BF473K	R3104	3RC30BF331K	R110
2J5726/6AL5W	V3122	3RC20BF474K	R3102	3RC30BF333K	R103
2J5750/6BE6W	V3104	3RC20BF683K	R3103	3RC30BF334J	R221
2J5749	V3106	3RC20BF822K	R3218	3RC30BF334K	R912
2J5763	V-102	3RC20GF104K	R3111	3RC30BF471K	R125
2J5814	V201	3RC20GF224K	R3105	3RC30BF472J	R204
2J6SJ7Y	V3126	3RC21BF154J	R3235	3RC30BF473J	R203
2ZK8677-18	XHR3101	3RC21BF473J	R3237	3RC30BF473K	R603
2ZK9408.25	E1501	3RC21BF683J	R3236	3RC30BF473M	R1001
2Z2725.2	E302	3RC30BF101K	R806	3RC30BF562K	R104
2Z3035-31	J242	3RC30BF102J	R240	3RC30BF563K	R911
2Z3062-167	J101	3RC30BF102K	R102	3RC30BF681K	R629
2Z3062-280	J201	3RC30BF103J	R916	3RC30BF683K	R3216
2Z3065-133	J3102	3RC30BF103K	R109	3RC30BF911J	R920
2Z3072-7	J103	3RC30BF104J	R202	3RC42BE103J	R206
2Z3076-31	J212	3RC30BF105J	R223	3RC42BE103K	R660
2Z3081-10	J113	3RC30BF121K	R914	3RC42BE104K	R301
3RC20BF105K	R101	3RC30BF122J	R925	3RC42BE104M	R1003
3RC20BF154K	R3215	3RC30BF123K	R111	3RC42BE123J	R225
3RC20BF221K	R3206	3RC30BF125J	R520	3RC42BE154K	R120
3RC20BF222K	R3122	3RC30BF153K	R310	3RC42BE222J	R219
3RC20BF224K	R3105	3RC30BF221K	R801	3RC42BE223K	R124
3RC20BF273J	R3170	3RC30BF222J	R918	3RC42BE272K	R623
3RC20BF223K	R3118	3RC30BF222K	R602	3RC42BE273J	R217
3RC20BF273K	R3205	3RC30BF223J	R3116	3RC42BE331K	R105
3RC20BF333J	R3171	3RC30BF223K	R3109	3RC42BE332K	R123
3RC20BF333K	R3149	3RC30BF224K	R607	3RC42BE333K	R610
3RC20BF393J	R3167	3RC30BF271K	R902	3RC42BE472J	R933
3RC20BF471K	R3133	3RC30BF273J	R903	3RC42BE472K	R929
3RC20BF472K	R3165	3RC30BF275K	R922	3RC42BE473J	R210

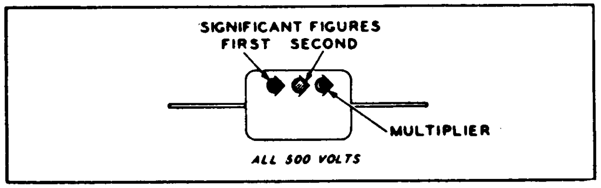
TABLE 8-6. CROSS REFERENCE PARTS LIST—C ntinu d

STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL	STANDARD NAVY STOCK NUMBER	KEY SYMBOL
3RC42BE563J	R207	3RW30334	R119	3Z9823-13	S3104
3RC42BE682K	R519	3Z12101-20.2	E101	3Z9823-25.2	S641
3RC42BF223K	R3207	3Z12101-9.3	E118	3Z9825-50.12	S1003
3RC42BF333K	R3121	3Z1926	F1004	3Z9849.135	S201
3RC30BF104K	R154	3Z2585.5	F3102	3Z9863-26N	S3101
3RW19501	R802	3Z2587	F516	3Z9863-52N	S901
3RW23729	R157	3Z2595.18	F901	309000.5-1	C103
3RW24361	R155	3Z2601.16	F503	34330-150	O263
3RW25509	R3182	3Z2601.5	F1003	6ZK7799-13	J903
3RW26148	R122	3Z2602.26	F1002	6Z7591-25	P701
3RW26148	R681	3Z2603.2	F507	6Z7591-3.1	P711
3RW27341	R680	3Z3282-42.9	XF503	6Z7813-2	J1003

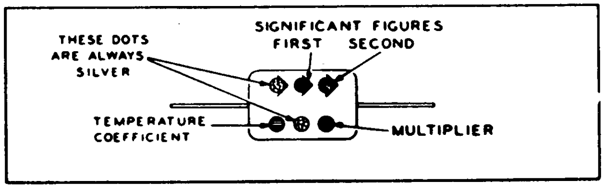
TABLE 8-7. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

CAPACITOR COLOR CODES

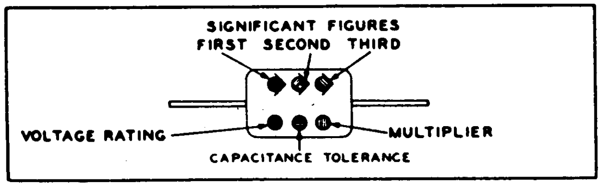
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



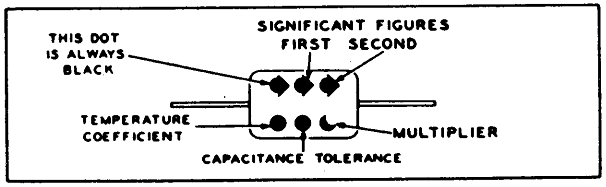
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



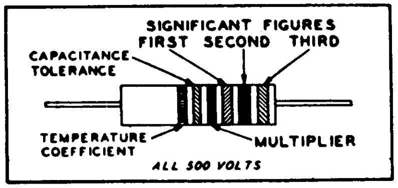
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

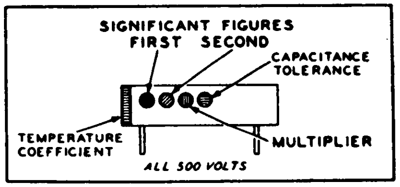


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

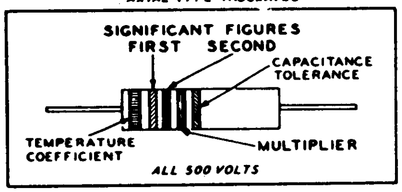


JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



AXIAL TYPE INSULATED



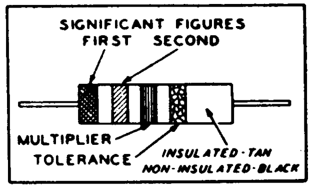
RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

RESISTORS				CAPACITORS				
				MULTIPLIER				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1,000	3	ORANGE	1,000	1000	1000	300	D
	10,000	4	YELLOW	10,000			400	E
	100,000	5	GREEN	100,000			500	F
	1,000,000	6	BLUE	1,000,000			600	G
	10,000,000	7	VIOLET	10,000,000			700	
	100,000,000	8	GRAY	100,000,000		0.01	800	
	1,000,000,000	9	WHITE	1,000,000,000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

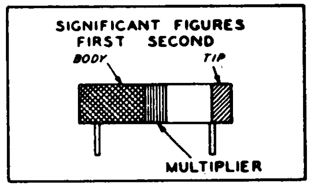
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

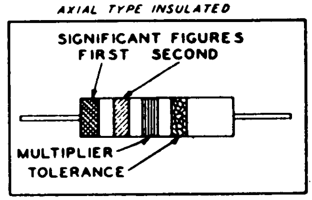


RADIAL TYPE



JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED

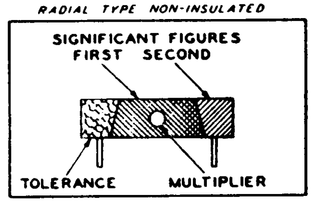


TABLE 8-8. LIST OF MANUFACTURERS

PREFIX AND/OR ABBREVIATION	NAME	ADDRESS	PREFIX AND/OR ABBREVIATION	NAME	ADDRESS
ADC	Aerodraulics Co.	Los Angeles, Calif.	ILG	Ilg Electric Ventilating Co.	Chicago, Ill.
AMA	Air-Maze Corp.	Cleveland 5, Ohio	ITRC	International Rectifier Co.	Los Angeles, Calif.
ACH	American Cabinet Hardware Corp.	Rockford, Ill.	IRC	International Resistance Co.	Philadelphia, Pa.
AMP	American Phenolic Corp.	Chicago 50, Ill.	JFE	Jeffers Electronics	St. Marys, Pa.
ARH	American Radio Hardware Co., Inc.	New York, N. Y.	JRMC	Jennings Radio Mfg. Co.	San Jose, Calif.
			JON	Johnson, E. F., Co.	Waseca, Minn.
AXD	Amplex Mfg. Co.	Detroit, Mich.	JNS	Jones, H. B., Co.	Chicago 18, Ill.
AGX	Automatic Electric Mfg. Co.	Chicago 7, Ill.	KNJ	Knights, James, Co.	Sandwich, Ill.
BCA	Bearing Co. of America	Lancaster, Pa.	LTF	Littelfuse Inc.	Chicago 40, Ill.
BGW	Boston Gear Wrks Div.	North Quincy, Mass.	LO	Lord Mfg. Co.	Erie, Pa.
BC	Breeze Corporations Inc.	Newark, N. J.	MAL	Mallory P. R. and Co. Inc.	Indianapolis 6, Ind.
BUS	Bussmann Mfg. Co.	St. Louis, Mo.	MCS	Micro Switch Corp.	Freeport, Ill.
CN	Centralab Div.	Milwaukee, Wis.	NAC	National Co. Inc.	
CHT	Chicago Transformer Div.	Chicago, Ill.	ND	New Departure Div. G. M. Corp.	Bristol, Conn.
CIN	Cinch Mfg. Corp.	Chicago 12, Ill.			
CLA	Clare C. P., Co.	Chicago 30, Ill.	NI	Nice Ball Bearing Co.	Philadelphia 40, Pa.
CR	Collins Radio Co.	Cedar Rapids, Ia.	OAK	Oak Mfg. Co.	Chicago 10, Ill.
COPC	Condenser Products Co.	Chicago, Ill.	OM	Ohmite Mfg. Co.	Chicago, Ill.
CGW	Corning Glass Works	Corning, N. Y.	PBF	Palmer Bros. Tool and Forging Co.	Meadville, Pa.
CUT	Cutler-Hammer Inc.	Milwaukee 1, Wis.			
DMC	Drake Mfg. Co.	Chicago 22, Ill.	RAD	Radio Condenser Co.	Camden, N. J.
EBY	Eby Hugh H Inc.	Philadelphia, Pa.	RCC	Radium Chemical Co. Inc.	New York, N. Y.
EIC	Eicor Inc.	Chicago 7, Ill.	RAY	Raytheon Mfg. Co.	Waltham, Mass.
ETM	Eitel-McCullough Inc.	San Bruno, Calif.	SIC	Simpson Electric Co. Div.	Chicago, Ill.
EMM	Electro-Motive Mfg. Co.	Willimantic, Conn.	SPR	Sprague Electric Co.	North Adams, Mass.
EABN	Electro-Snap Div. Exhibit Supply Co.	Chicago, Ill.	SQ	Square D Co.	Detroit, Mich.
			SWIN	Switchcraft Inc.	Chicago, Ill.
GE	General Electric Co.	Schenectady 5, N. Y.	UNT	United Transformer Co.	
HMM	Hammarlund Mfg. Co.	New York 1, N. Y.	WE	Western Electric Co.	New York, N. Y.
HAYD	Haydon Mfg. Co.	Forestville, Conn.	WL	Walworth Co.	New York, N. Y.
HCB	Heinemann Electric Co.	Trenton, N. J.	WS	Weston Electric Instrument Co.	New York, N. Y.
HERC	Hercules Co.	Marion, Ohio			
HAW	Hubbell, Harvey, Inc.	Bridgeport, Conn.	WAEQ	Whitso Inc.	Chicago, Ill.

INDEX