

NAVSHIPS 92211

*(Non-Registered)*

INSTRUCTION BOOK  
*for*  
RADIO RECEIVING SETS  
AN/FRR-21,  
AN/FRR-22, AN/FRR-23

RADIO CORPORATION OF AMERICA  
RCA VICTOR DIVISION  
CAMDEN, NEW JERSEY, U. S. A.

DEPARTMENT OF THE NAVY  
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NAVSHIPS 92211

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Chief of Bureau



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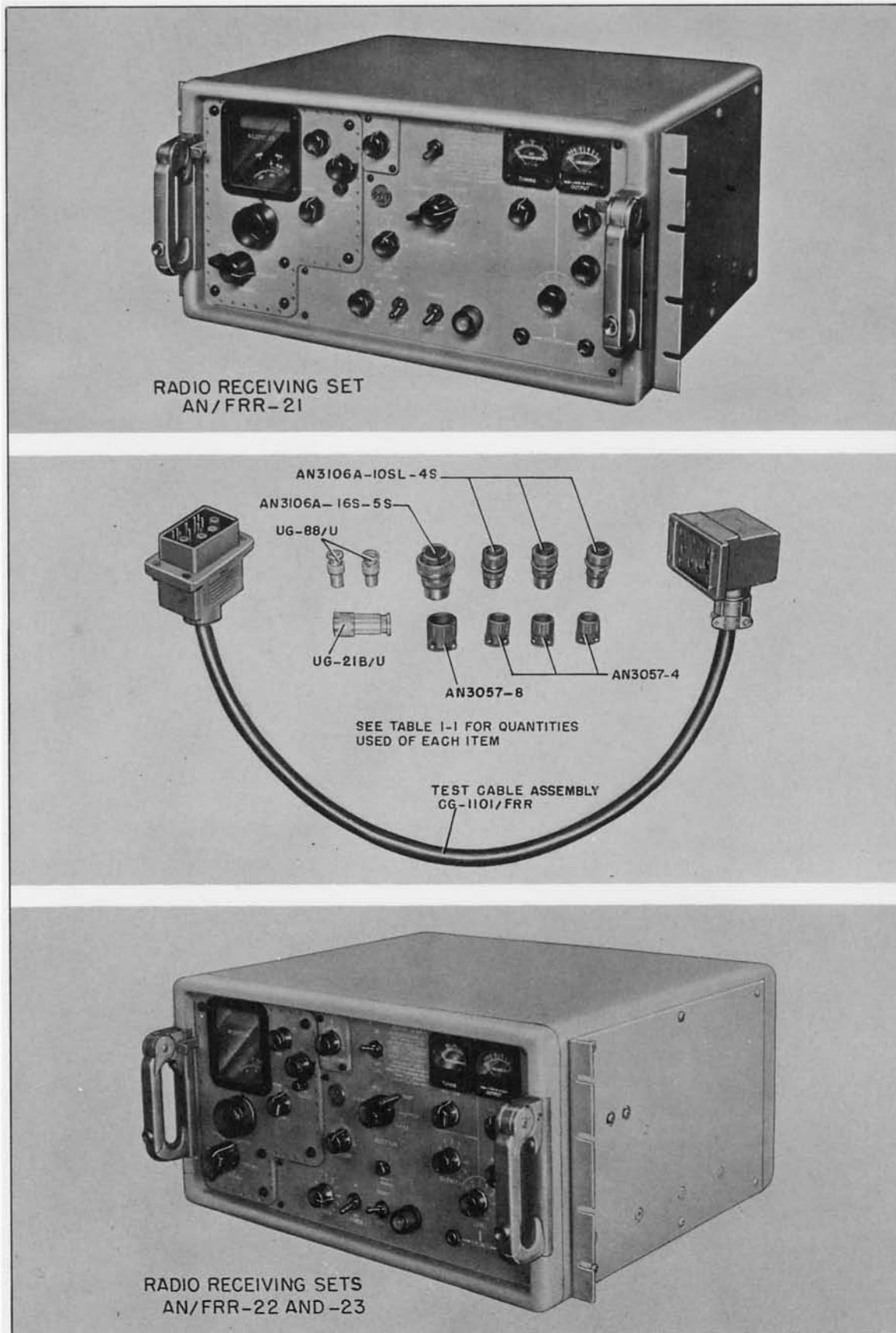


Figure 1-1. Radio Receiving Sets AN/FRR-21, -22, and -23

## SECTION 1

### GENERAL DESCRIPTION

#### 1. SCOPE OF THIS BOOK.

This instruction book covers fixed station Radio Receiving Sets AN/FRR-21, AN/FRR-22, and AN/FRR-23. Sections on theory, installation, operation, maintenance, and parts list are included.

#### 2. PURPOSE AND BASIC PRINCIPLES.

*a.* TYPE OF INSTALLATION.—Radio Receiving Sets AN/FRR-21, -22, and -23 are designed for fixed station operation. Provisions are made for rack mounting of these receivers.

*b.* FREQUENCY COVERAGE.—These radio receivers are divided into three frequency types which cover all frequencies from 14 kilocycles to 32 megacycles. The first or low-frequency type, AN/FRR-21, receives all signal frequencies from 14 to 600 kilocycles. The second or medium-frequency type, AN/FRR-22, receives all signal frequencies from 0.25 to 8.0 megacycles. The third or high-frequency type, AN/FRR-23, receives all signal frequencies from 2.0 to 32 megacycles. The frequency range in each receiver is divided into five bands with continuous tuning throughout each band.

The frequency range provided in each band is as follows:

BAND	LOW FREQ. TYPE AN/FRR-21	MEDIUM FREQ. TYPE AN/FRR-22	HIGH FREQ. TYPE AN/FRR-23
1	14 to 30 kc	0.25 to 0.5 mc	2.0 to 4.0 mc
2	30 to 63 kc	0.5 to 1.0 mc	4.0 to 8.0 mc
3	63 to 133 kc	1.0 to 2.0 mc	8.0 to 16 mc
4	133 to 283 kc	2.0 to 4.0 mc	16 to 24 mc
5	283 to 600 kc	4.0 to 8.0 mc	24 to 32 mc

*c.* CLASSES OF EMISSION RECEIVED.—The low-frequency type receiver, AN/FRR-21, has provisions for receiving three classes of emission (A1, A2, and Frequency Shift F1). The medium- and high-frequency type receivers, AN/FRR-22, AN/FRR-23, have provisions for receiving four types of emission (A1, A2, A3, and Frequency Shift F1).

*d.* CIRCUIT DESCRIPTION.—The basic receiver represented by the AN/FRR-21, -22, and -23 is a double

superheterodyne having two stages of r-f amplification ahead of the first mixer and local oscillator. The AN/FRR-22 and -23 have accommodations for an external oscillator, which can replace the local oscillator.

The output of the mixer is coupled to a first i-f amplifier (which is essentially a second converter). The first i-f amplifier converts the signal to a frequency of 200 kc.

This 200-kc signal is coupled to the input of a second i-f assembly, where it goes through three stages of amplification, and then is applied to a diode detector when the receiver is set to receive A2 or A3 signals, or to a mixer stage when the receiver is set to receive A1 or F1 signals. The mixer stage also receives a signal from a beat frequency oscillator, which heterodynes with the unmodulated 200-kc signal (A1 or F1) to produce an adjustable signal within the audio frequency range.

A manual adjustment, which controls the gain of the first two r-f amplifiers and of the first and second amplifiers of the second i-f assembly, is provided in each of these receivers. This adjustment is active when the receivers are set to receive A1 or A2 signals, and also F1 signals on the AN/FRR-21. A delayed AGC diode, located in the second i-f assembly, controls the gain of the same stages when the AN/FRR-22 and AN/FRR-23 receivers are set to receive A3 or F1 signals.

The output of the second i-f assembly (detector or mixer stage output) is coupled to the input of an audio assembly which provides three stages of amplification ahead of a beam power output stage. The beam power output stage feeds into an audio output transformer, which provides balanced line and unbalanced line (phone) outputs.

Two series limiters, located between the second and third audio amplifiers, limit positive and negative peaks. A silencer diode, located between the first and second audio amplifiers, eliminates background noises when the receiver is set to receive A3 signals. This circuit is inactive on the AN/FRR-21 receiver, since this has no provisions for A3 signal reception.

Two meters are provided in each of these receivers. The first meter is connected to the second i-f assembly to determine when the set is tuned properly to an incoming signal. The second meter is connected to the audio output transformer to indicate the power level (in db) of the audio output stage.

A tuning dial, included in each receiver, provides two readings. One indicates the frequency to which the set is tuned. This reading is displayed on a projection dial. The other is a numerical reading which is used for logging previously received stations. This reading is displayed on two movable scales.

A crystal calibrator is included in each receiver by which the projection dial may be aligned to an exact frequency. This is done to compensate for tracking error. The crystal calibrator on the low-frequency type receiver, AN/FRR-21, provides frequency check points at every 10-kc separation of tuned frequency input, as seen on the projection dial. The crystal calibrator for the medium-frequency type receiver, AN/FRR-22, provides frequency check points at every 50-kc separation of the tuned frequency input. The crystal calibrator for the high-frequency type receiver, AN/FRR-23, provides frequency check points at every 200-kc separation of the tuned frequency input.

An a-c operated power supply is included in each receiver to provide all of the filament and B+ operating voltages.

### 3. DESCRIPTION OF RECEIVERS.

(Refer to figure 1-1.)

#### a. GENERAL.

The AN/FRR-21, -22, and -23 receivers are housed in a gray enamel metal cabinet 17 $\frac{1}{4}$  inches wide, 8 $\frac{3}{4}$  inches high, 18 $\frac{1}{2}$  inches deep, and weighs approximately 75 pounds. The cabinet mounts in a standard rack, 19 inches wide, by means of the two metal flange plates on the sides of the receiver cabinet. All operating controls and switches, two meters (OUTPUT meter and TUNING meter), phone jack connectors, and a tuning dial assembly are mounted on the front panel.

b. INPUT AND OUTPUT CONNECTIONS.—All input and output connections to these receivers are made through either AN or coaxial receptacles mounted on a filter assembly at the back of the receiver cabinet or case. Mating plugs for these receptacles are supplied

as part of the Radio Receiving Set. Appropriate cable-to-plug connections must be fabricated in accordance with instructions given in Section 3 of this instruction book. Electrical connections between the filter assembly and the receiver chassis are made through a multi-connector plug mounted on the back of the filter assembly, and its corresponding socket mounted on the back of the receiver chassis. All connections are broken when the receiver is pulled out of the cabinet or case. Two sleeves on the back of the chassis engage guide pins on the back wall of the receiver cabinet or case to insure that the multi-connector plug and socket line up when the receiver chassis is pushed into the cabinet or case.

Some of the input and output connectors, located on the filter assembly, accommodate equipment external to these receivers. They are as tabulated below:

c. ASSEMBLIES AND SUB-ASSEMBLIES.—A feature of these receivers is that they are made up of assemblies and sub-assemblies, each of which is physically independent of the rest. In cases where time is a factor in repairing the receivers, a defective assembly can be replaced quickly by a spare one. The assemblies are held to their position in the chassis by captive screws, and interconnections between the assemblies and chassis wiring are made through multiple circuit connectors. Circuits to these assemblies are disconnected when the assembly is lifted from the chassis.

Individual sub-assemblies are mounted within each assembly. Some of these sub-assemblies contain a sub-miniature electron tube and circuitry for one stage. Others contain parts other than electron tubes, such as transformers, coils, filter networks, etc. All sub-assemblies are symbolized by Z-numbers.

Sub-assemblies containing a sub-miniature electron tube are of the plug-in type, permitting quick and easy replacement.

Sub-assemblies containing parts other than an electron tube, require unsoldering of a few connections to effect replacement.

CONNECTOR			ASSOCIATED EQUIPMENT	
QUAN.	NAME	USED ON RECEIVERS	NAME	TYPE OR EQUIV.
1	I.F.	All Receivers	Frequency Shift Con.	I-F type (200 kc)
1	PAN.	AN/FRR-22 and -23	Panoramic Adapter	I-F type (1600 kc) (See Note below)
1	EXT. OSC.	AN/FRR-22 and -23	External Osc.	
2	AUDIO	All Receivers	Frequency Shift Con.	Audio type (converter comparator group)
1	DET. AGC.	AN/FRR-22 and -23	Diversity Operation	Identical Receiver

NOTE: For Type AN/FRR-22, 1600 kc IF is available only on Bands 4 and 5 covering 2.0 to 8.0 mc.

*d.* CONTROLS.—All operating controls of these radio receivers are brought out to the front panel. The functional name of each, except for the band selector and tuning dial knob, is marked on the panel near the control. The band selector has frequency markings corresponding to the limits of the band at each of its settings. Refer to Section 4 for illustrations and functions of the front panel controls.

*e.* TUNING DIAL ASSEMBLY.—The tuning dial assembly tunes the r-f section of the receiver by turning a ganged variable capacitor when the tuning dial knob is turned. The band selector, also part of the tuning dial assembly, actuates switches in the r-f section of the receivers to select the appropriate tuned circuits for each band.

The frequency value to which the receiver is tuned is projected on a translucent dial screen located on the front panel of the dial assembly. A numerical indication of receiver tuning is displayed on a logging dial comprised of two movable scales, also located on the front panel of the dial assembly.

**4. REFERENCE DATA.**

*a.* EQUIPMENT DESIGNATIONS:

- (1) Radio Receiving Set AN/FRR-21. Shore station low-frequency receiver.
- (2) Radio Receiving Set AN/FRR-22. Shore station medium-frequency receiver.

(3) Radio Receiving Set AN/FRR-23. Shore station high-frequency receiver.

*b.* CONTRACT NUMBERS: NObsr-52623, NObsr-57135; dates: 29 June 1951 and 19 December 1951 (letter contract), respectively.

*c.* CONTRACTOR: Radio Corporation of America, RCA Victor Division, Camden, New Jersey, U.S.A.

*d.* COGNIZANT INSPECTOR: Inspector of Naval Material, Camden, New Jersey.

*e.* NUMBER OF PACKAGES PER COMPLETE SHIPMENT: 1.

*f.* TOTAL CUBIC CONTENT (approximate):

Model	Crated	Uncrated
AN/FRR-21	4.9 cu. ft.	1.5 cu. ft.
AN/FRR-22	4.9 cu. ft.	1.5 cu. ft.
AN/FRR-23	4.9 cu. ft.	1.5 cu. ft.

*g.* TOTAL WEIGHT (approximate):

AN/FRR-21	130 lbs.	75 lbs.
AN/FRR-22	130 lbs.	75 lbs.
AN/FRR-23	130 lbs.	75 lbs.

*b.* FREQUENCY RANGES:

AN/FRR-21	14 to 600 kilocycles
AN/FRR-22	0.25 to 8 megacycles
AN/FRR-23	2 to 32 megacycles

*i.* TUNING BANDS AND RANGE OF EACH BAND:

	LOW-FREQUENCY RECEIVERS	MEDIUM-FREQUENCY RECEIVERS	HIGH-FREQUENCY RECEIVERS
Band 1	14 to 30 kc	250 to 500 kc	2 to 4 mc
Band 2	30 to 63 kc	500 to 1000 kc	4 to 8 mc
Band 3	63 to 133 kc	1000 to 2000 kc	8 to 16 mc
Band 4	133 to 283 kc	2000 to 4000 kc	16 to 24 mc
Band 5	283 to 600 kc	4000 to 8000 kc	24 to 32 mc

*j.* TYPE OF FREQUENCY CONTROL: Continuous L-C oscillator tuning is employed in all receivers.

*k.* TYPE OF RECEIVER: Superheterodyne, employing double conversion.

*l.* TYPES OF RECEPTION: A1, A2, A3, and F1 (A3 emission is not received on the AN/FRR-21).

*m.* RECEIVER OUTPUT: 6 milliwatts into 600 ohms (0 db). Output through headphones and indicated on OUTPUT meter.

*n.* POWER SUPPLY: 105, 115, or 125 volts, 50 to 60 or 400 cycles, 0.85 ampere single phase a-c.

*o.* POWER FACTOR FOR A-C OPERATION: 90%.

*p.* INPUT IMPEDANCE TO ANTENNA PREAMPLIFIER: 73 ohms low impedance, 200 ohms high impedance.

*q.* FIRST INTERMEDIATE FREQUENCY: First i-f low-frequency receiver (AN/FRR-21) 60 kc on bands one and four; and 200 kc on bands one, two, three, and five. Medium-frequency receiver (AN/FRR-22) 200 kc on bands one, two, and three; and 1600 kc on bands four and five. High-frequency receiver (AN/FRR-23) 1600 kc on all five bands.



r. SECOND INTERMEDIATE FREQUENCY OF SECOND I-F ASSEMBLY: 200 kc for all three types of receivers.

s. SILENCER DIODE OPERATES ON A3 SIGNALS: Threshold control range covers 1- to 15,000-microvolt carrier level.

t. RECEIVER SENSITIVITY: (CW) (High-impedance Antenna).

- (1) 14-18 kc, 8 microvolts or better.
- (2) 18-100 kc, 5 microvolts or better.
- (3) 100-600 kc, 3.5 microvolts or better.
- (4) 600 kc-8 mc, 3 microvolts or better.
- (5) 8-24 mc, 4 microvolts
- (6) 24-32 mc, 5 microvolts or better.

**TABLE 1-1. EQUIPMENT SUPPLIED  
RADIO RECEIVING SET AN/FRR-21, -22, OR -23**

QUAN. PER EQUIP.	ITEM	DESCRIPTION	DESIGNATION	OVERALL DIMENSIONS (INCHES)			VOLUME (CU. FT.)	WEIGHT (LB.)
				HEIGHT	WIDTH	DEPTH		
1	1	Radio Receiving Set including tubes and crystals in place.	AN/FRR-21, AN/FRR-22, or AN/FRR-23	8 <sup>3</sup> / <sub>4</sub>	17 <sup>1</sup> / <sub>2</sub>	18 <sup>1</sup> / <sub>2</sub>	1.5	75
1	2	Set of connectors, clamps, and cable comprising:						
		(A) 1 connector	AN-3106A-16S-5S					
		(B) 3 connectors*	AN-3106A-10SL-4S					
		(C) 3 connectors§	UG-88/U					
		(D) 1 connector	UG-21B/U					
		(E) 3 clamps, cable*	AN-3057-4					
		(F) 1 clamp, cable	AN-3057-8					
		(G) 1 Test Cable Assembly	CG-1101/FRR					
2	3	Instruction Books	NAVSHIPS					

\* Quantity supplied in Radio Receiving Set AN/FRR-21 is one less than listed.

§ Only one supplied with Radio Receiving Set AN/FRR-21.

**TABLE 1-2. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED**

QUAN. PER EQUIP.	NAME OF UNIT	NAVY DESIGNATION	REQUIRED USE	REQUIRED CHARACTERISTIC
1 or 2 as required	Headset	49507 or equivalent		600 ohms (nominal)
1 or 2 as required	Loudspeaker Amplifier	AM-215/U or equivalent		600 ohms (nominal)
1	Frequency Shift Converter (Audio type)	CV-60/URR or equivalent	Teletype Frequency Shift	600 ohm input (nominal)
1	Frequency Shift Converter (I-F type)	CV-57/URR or equivalent	Teletype Frequency Shift	200 kc i-f input, 70 ohms

TABLE 1-3. SHIPPING DATA

SHIPPING BOX NO.	CONTENTS		OVERALL DIMENSIONS. (INCHES)			VOLUME (CU. FT.)	WEIGHT (LBS.)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Radio Receiving Set	AN/FRR-21, -22, or -23	13	24	30 $\frac{1}{4}$	4.9	130

TABLE 1-4. BASIC SIMILARITIES IN RADIO RECEIVING SETS  
AN/FRR, AN/MRR, AND AN/SRR

MODEL	FREQUENCY COVERED	TYPES OF EMISSION RECEIVED	POWER SOURCE	MECHANICAL DESIGN	REMARKS
AN/FRR-18	14 to 600 kc	A1, A2, F1	105, 115 or 125 volts, 50-60 or 400 cycles	Metal Case— Rack Mounted	Intended for shore station low-frequency frequency-shift service. Uses crystal local oscillator.
AN/FRR-19	2 to 32 mc	A1, A2, A3, A4, F1	105, 115 or 125 volts, 50-60 or 400 cycles	Metal Case— Rack Mounted	Intended for shore station high-frequency frequency-shift service. Uses crystal local oscillator.
AN/FRR-21	14 to 600 kc	A1, A2, A3, A4, F1	105, 115 or 125 volts, 50-60 or 400 cycles	Metal Case— Rack Mounted	Intended for low-frequency shore station communication service.
AN/FRR-22	0.25 to 8 mc	A1, A2, A3, A4, F1	105, 115 or 125 volts, 50-60 or 400 cycles	Metal Case— Rack Mounted	Intended for medium frequency shore station communication service.
AN/FRR-23	2 to 32 mc	A1, A2, A3, A4, F1	105, 115 or 125 volts, 50-60 or 400 cycles	Metal Case— Rack Mounted	Intended for high-frequency shore station communication service.
AN/MRR-1	14 to 600 kc	A1, A2, F1	105, 115 or 125 volts, 50-60 or 400 cycles	Waterproof Case, Portable	Intended for low-frequency mobile or transportable service.
AN/MRR-2	0.25 to 8 mc	A1, A2, A3, A4, F1	*24 volts d-c 105, 115 or 125 volts, 50-60 or 400 cycles	Waterproof Case, Portable	Intended for medium frequency mobile or transportable service.
AN/MRR-3	2 to 32 mc	A1, A2, A3, A4, F1	*24 volts d-c 105, 115 or 125 volts, 50-60 or 400 cycles	Waterproof Case, Portable	Intended for high-frequency mobile or transportable service.
AN/SRR-11	14 to 600 kc	A1, A2, F1	105, 115 or 125 volts, 50-60 or 400 cycles	Metal Case, Table-top Mounted	Intended for low-frequency shipboard communication service.
AN/SRR-12	0.25 to 8 mc	A1, A2, A3	105, 115 or 125 volts, 50-60 or 400 cycles	Metal Case, Table-top Mounted	Intended for medium-frequency shipboard communication service.
AN/SRR-13	2 to 32 mc	A1, A2, A3, F1	105, 115 or 125 volts, 50-60 or 400 cycles	Metal Case, Table-top Mounted	Intended for high-frequency shipboard communication service.

\* Separate power supply assembly supplied to accommodate 24 volts d-c source.

TABLE 1.5 ELECTRON TUBE COMPLEMENT AN/FRR-21

CIRCUIT	—5636	—5644	—5647	—5718	—5719	—5840	—5899	—5902	—6X4	IN69	TOTAL NO. OF TUBES
Antenna Preamplifier							1				1
R-F Amplifier							1				1
Mixer	1										1
Oscillator						1					1
First I-F	1										1
Second I-F	1		2	1			3			1	8
Audio Amplifier			4	2	2			1			9
Beat Frequency Oscillator						1					1
Crystal Controlled Calibrator	1			1							2
Power Supply		1							2		3
Total Number of each Type	4	1	6	4	2	2	5	1	2	1	28

TABLE 1-6. ELECTRON TUBE COMPLEMENT AN/FRR-22 AND -23

CIRCUIT	—5636	—5644	—5647	—5718	—5719	—5840	—5899	—5902	—6X4	IN69	TOTAL NO. OF TUBES
Antenna							1				1
R-F Amplifier							1				1
Mixer	1			1							2
Local Oscillator						1					1
First I-F	1										1
Second I-F	1		2	1			3			1	8
Audio Amplifier			4	2	2			1			9
Beat Frequency Oscillator						1					1
Crystal Controlled Calibrator				2							2
Power Supply		1							2		3
Total Number of each Type	3	1	6	6	2	2	5	1	2		29

## SECTION 2

### THEORY OF OPERATION

#### 1. GENERAL DESCRIPTION.

Radio Receiving Sets AN/FRR-21, AN/FRR-22, and AN/FRR-23 are discussed with reference to schematic diagrams, figures 7-20 through 7-22, and functional block diagrams, figures 2-8 through 2-10. Other diagrams will be referred to in the text, as required for an understanding of the functioning of the circuits.

This introductory paragraph describes the signal channels through the receiver, from the radio-frequency input to the final audio-frequency output. Individual stages thus will be shown in their mutual functional relationship within the system. A more detailed discussion of these individual stages is given in the subsequent paragraphs of this Section.

The general features and frequency coverage of these radio receiving sets were described in Section 1 of this instruction book and are not repeated here. Essentially, the sets are superheterodyne receivers employing dual conversion (on some frequency bands they operate with single conversion), which differ in their r-f and first i-f circuits. They are identical to each other in their second i-f and audio-frequency circuits. Referring to the above mentioned diagrams, the r-f signal is applied to the equipment through the ANT connector J1707 of the low-frequency type receiver AN/FRR-21 or J4007 of the medium and high-frequency receivers AN/FRR-22 and -23. From there the signal passes through the stages listed below (each stage listed is followed by a reference to a later paragraph, in which it is described in greater detail):

*a.* Antenna preamplifier, V101, V3001, or V3101 (see paragraph 2*b*), depending on the equipment considered, and r-f amplifier, V126, V3035, V3135, (see paragraph 2*c*).

*b.* The signal is now applied to a mixer, V151, V351, or V551 (see paragraph 2*d*), in which it is combined with the output of a local oscillator, V201, V401, or V4401 (see paragraph 2*e*).

(1) When the mixer output has a frequency of either 60 or 1600 kc (see paragraph 2*f*), it passes through a band-pass filter Z702, Z802, or Z902 and is applied to a first i-f stage where it is converted to a frequency of 200 kc. This is achieved in a dual-purpose

tube, V701, V801, V901, which operates both as a crystal-controlled heterodyning oscillator and as a mixer (see paragraph 2*g*).

(2) When the output of the mixer, V151 or V351, already has a frequency of 200 kc, the first i-f stage is bypassed.

*d.* The 200-kc signal output of either the mixer V151, V351, or the first i-f stage V701, V801, V901 is now passed through suitable filters (see paragraph 2*b*(1)) on the second i-f assembly (see paragraph 2*g*(2)) which includes three stages of 200-kc amplification, V1001, V1002, and V1003. The output of V1003 is handled differently, depending on the kind of signals being received.

(1) For A1 or F1 signal reception, the output of V1003 is applied to a mixer stage, V1004, which also receives a heterodyning signal from a beat-frequency oscillator, V1301 (see paragraphs 2*b*(4) and 2*i*). The difference-frequency output of the BFO mixer then goes to the audio amplifier assembly.

(2) For A2 or A3, signal reception, the output of V1003 is applied to a diode detector, V1005, on Radio Receiving Sets AN/FRR-22 and -23. This is associated with a delayed automatic gain control (AGC) circuit, V1006 (see paragraph 2*b*(5)). This AGC circuit serves to bias the r-f band and i-f stages when strong A3 and F1 signals are received. The diode detector feeds into the audio amplifier assembly. Associated with the diode detector is a tuning indicator (see paragraph 2*b*(3)).

*e.* Audio-frequency amplification of the signals (see paragraph 2*j*) is provided by tubes V1102, V1105, V1108, V1109, the latter tube feeding into the output transformer T1101. This transformer matches the output stage to a balanced or unbalanced line and phone connection.

Interference is reduced by a noise peak limiter V1101 (see paragraph 2*j*(1)). A silencer diode, V1103 (see paragraph 2*j*(2)) and d-c amplifier V1104, used on the AN/FRR-22 and -23 receivers only, permit the receiver to be made inactive on A3 reception when no signals are being received. Amplitude limiters, V1106 and V1107, tend to maintain uniform output level on A1 or A2 reception (see paragraph 2*j*(3)).

f. A crystal-controlled calibrator, V1401, V1501, or V1201 (see paragraph 2n), permits the calibration of the main tuning dial to be checked throughout the tuning range at points 10 kc, 50 kc and 200 kc apart on the low-, medium-, and high-frequency receivers, respectively.

g. Other features of the receivers are merely mentioned here, being described in detail in the paragraphs indicated:

- Output Meter, paragraph 2k.
- Power Supply, paragraph 2l.
- Filter Assembly, paragraph 2m.
- Band Selector, paragraph 2o.
- Reception Control, paragraph 2p.
- Tuning Dial Assembly, paragraph 2q.

b. Cathode-follower outputs are provided for operation of an external panoramic equipment (AN/FRR-22 and -23 only) and for an external i-f frequency shift converter. External detector and AGC line outputs are provided for diversity operation of Radio Receiving Sets AN/FRR-22 and -23.

## 2. CIRCUIT DESCRIPTION.

The radio receiving sets described by this instruction book are similar in design. However, modifications are made in each receiver type to conform with operating needs throughout the frequencies covered by each and the type installation for which each receiver is designed.

a. HOW TO READ THE SCHEMATICS.—The schematic diagrams (figures 7-20 through 7-22 of Section 7) are divided into two sheets for each receiver. Sheet 1 contains the antenna, r-f, mixer, oscillator, first i-f, and crystal calibrator. Sheet 2 contains the second i-f, audio, beat frequency oscillator, power supply, and filter assemblies. Front panel controls are also shown in sheet 2 of the schematic diagrams. Description of physical make-up of the assemblies and sub-assemblies is given in paragraph 3c of Section 1.

(1) ASSEMBLIES.—On the schematic diagrams each assembly is outlined by dashed lines; all parts contained within the dashed lines belong to that assembly.

(2) SUB-ASSEMBLIES.—The sub-assemblies contained in each assembly are outlined in dotted lines or in dot-dashed lines and are symbolized by Z numbers. All parts contained within these lines belong to that assembly. The dotted lines refer to plug-in units and the dot-dashed lines refer to plug-in boards.

(3) WAFER SWITCHES.

(a) BAND SELECTOR SWITCHES.—The band switch wafers are all shown on sheet 1 of the schematic diagrams. They are controlled by the five-position band

selector located on the front of the tuning dial. The wafers are all linked mechanically and this is shown by dotted lines on the schematic diagrams. These switches are shown in band I position of the band selector.

To circuit-trace the schematic in the band II position of the band switch, rotate each arrow representing a switch arm, in all the wafer switches shown on sheet 1 of the schematic diagrams, by one position in the direction of the arrow shown outside of each wafer switch. Proceed in the same way for any of five bands, rotating the switch by a number of positions corresponding to the desired band.

(b) RECEPTION CONTROL.—The RECEPTION control switch wafers are shown on sheet 2 of the schematic diagrams. They are controlled by the RECEPTION control located on the front panel of the receiver. The wafers are all linked mechanically. This is shown by dotted lines on the schematic diagram. This control is a four-position switch on the AN/FRR-21, and a six-position switch on the AN/FRR-22 and -23. The wafers are shown in the FSK position of the RECEPTION control on the AN/FRR-21 and in the A1 BROAD position of the RECEPTION control on the AN/FRR-22 and -23.

To circuit-trace the schematic in any of the other positions of the RECEPTION control, proceed as explained for the band switch in the preceding paragraph. A knob, labeled RECEPTION and shown with associated positions, is located on sheet 2 of the schematic diagrams. This knob is shown mechanically linked to the reception control wafers. Note that the second i-f, BFO, and audio assemblies are the same on all three types of receivers. The wafers of the RECEPTION control therefore have seven possible positions on the schematic diagrams (sheet 2). Only the first four of these positions are used in the AN/FRR-21 (corresponding to FSK, A1 BROAD, A1 SHARP, and A2 reception, respectively) while the last six of these positions are used in the AN/FRR-22 and -23 (corresponding to A1 BROAD, A1 SHARP, A2, A3 SHARP, A3 BROAD, and FSK reception, respectively). Note that in the seventh position, the switch arms of the wafers having three common segments make contact with the succeeding fixed segment.

(4) INPUT HI-LO, OUTPUT HI-LO.—In the antenna, r-f, and mixer stages, the leads designated as the OUTPUT HI connect the plate of that stage to the INPUT HI lead of the succeeding stage, whereas leads designated as OUTPUT LO connect the plate return of that stage to the INPUT LO lead of the succeeding stage. The leads designated as INPUT HI on the schematic diagram connect to the high side of the appropriate transformers as selected by the band selector

whereas the leads designated as INPUT LO connect to the low side of the appropriate transformer.

b. ANTENNA PREAMPLIFIER.—The antenna preamplifier stages for the three types of receivers are described separately.

(1) ANTENNA PREAMPLIFIER (AN/FRR-21).—Refer to sheet 1 of figure 7-20. The input circuit of the antenna preamplifier will accommodate antennas with a wide variation of capacity (from 30 to 5000 micromicrofarads with 200 micromicrofarads nominal). Links O101 and O102 (see figures 3-10, 3-12) are provided to match the antenna transformers (T101 through T105) to either high- or low-impedance input. The transformers are selected by the setting of switch S101 which is controlled by the band selector. The antenna is connected across the primary of one of the transformers when links O101 and O102 are set in the low-impedance position, also a 220-mmf capacitor, C106 is connected between a tap and the low side of the secondary to maintain tuning. When these links are set in the high-impedance position, the antenna is connected between a tap and the low side of the secondary of the appropriate transformer. Resistors R101 to R105 are provided to reduce the response at input circuit resonance. The high side of the secondary is connected to grid 1 of V101, through S101A.

The antenna section of the tuning-gang capacitor, C2001D at terminals E101 and E102, is shunted across the secondary of one of the five transformers, as determined by the setting of S101A. A section of switch S101B shorts certain unused coils to prevent absorption of signal in the band in use.

Inductance of the secondaries in transformers T101 through T105 is varied by means of powdered iron cores. The core of each circuit is brought to screwdriver adjustments at points shown in figures 7-14 and 7-15. Trimmer C103 compensates for changes in antenna capacity. This capacitor is adjusted by the ANT COMP control on the front panel.

Capacitor C102 is connected in series in the antenna input lead to accommodate high-capacity antennas. Microswitch S102, which is operated by a cam on the shaft of the ANT COMP control, is closed for 180 degrees of rotation of the control designated LOW, and C102 is out of the circuit. In this case the primary circuit capacity is that of the antenna. The switch is open for the second 180-degree rotation of the ANT COMP designated HIGH and C102 is in the circuit. In this case the primary circuit capacity is less than that of the antenna by virtue of the series capacitor.

R-f signals from the selected tuned circuit are amplified in V101. The r-f section of the GAIN control, R2001A (shown on sheet 2 of figure 7-20) is connected

in series with the filter coil L2001 (of filter board E2003) and the cathode bias resistor, R108, at terminal J101F. A filter capacitor C2003 (of filter board E2003) is connected across the gain control and the filter coil to form with these a smoothing filter to reduce r-f currents in the gain control circuit. The r-f section of the GAIN control potentiometer provides variable bias for controlling gain through V101 (and V126, r-f amplifier, as will be covered in a later paragraph). Output from V101 is fed to the r-f stage through terminals J101L and J101K.

(2) ANTENNA PREAMPLIFIER (AN/FRR-22).—Refer to sheet 1 of figure 7-21. The input circuit of the antenna preamplifier will accommodate a low- or a high-impedance antenna. When link O3001 (see figures 3-11 and 3-13) is set in the high-impedance position, the full primary of one of five transformers T3001 through T3005 is connected across the input circuit. A tap and one side of the primary on the appropriate transformer are connected across the circuit when link O3001 is set in the low-impedance position. The proper transformer primary and secondary windings are selected by S3001A and S3001B, which are controlled by the band selector. A section of S3001B also shunts out certain unused secondaries of the transformers to prevent absorption of the signal on the band in use.

The receiver should be isolated from a second receiver, if two receivers are to be operated from a common antenna, by the setting of link O4002 located in the filter assembly (see sheet 2 of the schematic diagram). In multiple operation, the antenna input circuits are decoupled by R4001 and C4001.

Fixed capacitors, connected across the secondary of each transformer, together with the antenna section of the r-f tuning capacitor C2101E and the ANT COMP capacitor C2106, resonate with the secondary coil to provide continuous tuning over the selected frequency band. The transformer secondaries can be adjusted by means of a screwdriver at points shown in figures 7-14 and 7-16. R-f voltages are taken off the high side of the appropriate secondary through a portion of S3001A and fed to the control grid (pin 1).

R-f signals from the selected tuned circuit are amplified in V3001. The r-f section of the GAIN control R2101A, (shown on sheet 2 of the schematic diagram) is connected in series with the filter coil L2101 (of the filter board E2103) and the cathode bias resistor, R3104, at terminal J3001F. A filter capacitor C2103 of the filter board is connected across the r-f section of the GAIN control R2101A and the filter coil to form with these a smoothing filter to reduce r-f currents in the GAIN control circuit. The r-f section of the GAIN control provides variable bias for controlling the gain through V3001 (and V3035, r-f amplifier, as will be covered in

a later paragraph). An alternate AGC bias voltage is applied to the control grid (pin 1) of V3001 through J3001D, to adjust the gain when the receiver is set to receive A3 or F1 signals.

(3) ANTENNA PREAMPLIFIER (AN/FRR-23).—Refer to sheet 1 of figure 7-22. The input circuit of the antenna preamplifier will accommodate a low- or high-impedance antenna. When link O3101 (see figures 3-11 and 3-13) is set in the high-impedance position, the full primary of one of five transformers T3101 through T3105 is connected across the input circuit. A tap and one side of the primary on the appropriate transformer are connected across the circuit when link O3101 is set in the low-impedance position. The proper transformer primary and secondary windings are selected by S3101A and S3101B, which are controlled by the band selector. A section of S3101B also shorts out unused secondaries of the transformers to prevent absorption of the signal on the band in use.

The receiver should be isolated from a second receiver, if two receivers are to be operated from a common antenna, by the setting of link O4002 located in the filter assembly (see sheet 2 of the schematic diagram).

Fixed capacitors, connected across the secondary of each transformer, together with the antenna section of the r-f tuning capacitor C2201E, and the ANT COMP capacitor C2206, resonate with the secondary coil to provide continuous tuning over the selected frequency band. The transformer secondaries can be adjusted by means of a screwdriver at points shown in figures 7-14 and 7-17. R-f voltages are taken off the high side of the appropriate secondary through a portion of S3101A and fed to the control grid (pin 1) through a capacitor C3110 and resistor R3103.

R-f signals from the selected tuned circuit are amplified in V3101. The r-f section of the GAIN control R2201A (shown on sheet 2 of the schematic diagram), is connected in series with the filter coil L2201 (of the filter board E2203) and the cathode bias resistor, R3104, at terminal J3101F. A filter capacitor C2203 of the filter board is connected across the r-f section (A section) of the GAIN control and the filter coil to form with these a smoothing filter to reduce r-f currents in the GAIN control circuit. The r-f section of the GAIN control provides variable bias for controlling the gain through V3101 (and V3135, r-f amplifier as will be covered in a later paragraph). An alternate AGC bias voltage is applied to the control grid (pin 1) of V3101 through J3101D, to adjust the gain when the receiver is set to receive A3 or F1 signals.

Output from the antenna preamplifier V3101 is taken from plate (pin 5) and screen grid (pin 7) and is coupled to the r-f amplifier, V3135, through terminals J3101L and K, and J3135B and C.

c. R-F AMPLIFIER.—Three different r-f amplifier circuits are used in the AN/FRR-21, -22, and -23, and they will be discussed separately.

(1) R-F AMPLIFIER (AN/FRR-21).—Refer to figure 7-20. Output from the antenna preamplifier V101 is applied across the primary winding of T126, T127, T128, T129, or T130 by the setting of a section of S126A, controlled by the band selector, through terminals J101K and L, and J126B and J126C. The r-f section of the gang-tuning capacitor C2001C is shunted across the secondary of the selected transformer to adjust the tuning of the transformer to the desired frequency.

Fixed capacitors and a trimmer connected across the secondary of each transformer, together with the r-f tuning capacitor, resonate with the secondary coil to provide continuous tuning over the frequency band. R-f voltages are taken off the tap on the appropriate secondary through a portion of S126A and fed to the control grid (pin 1) of the r-f amplifier tube V126. Switch S126B shorts certain unused primaries and secondaries to prevent absorption of the signal on the band in use.

The coils and trimmers can be adjusted by means of a screwdriver at points shown in figures 7-14 and 7-15

Signals are amplified in V126 and applied to the mixer stage V151 through terminals J126K and L and J151B and J151C. The r-f GAIN control R2001A, (see figure 7-20, sheet 2) is connected in series with the cathode (pin 2) of V126 to vary the bias and control the gain.

The r-f section of the GAIN control, as was described previously, is connected to the cathode circuits of the antenna preamplifier stage, V101, and the r-f stage, V126. Under conditions of strong r-f signals, when the GAIN control is set to reduce the gain appreciably, the antenna preamplifier may develop sufficient bias voltage across this control to cut off the r-f amplifier. For this reason a voltage divider network (R129 and R130) is provided to apply a portion of the cathode bias voltage developed across the GAIN control to the control grid (pin 1) circuit of the r-f amplifier (V126). This positive bias voltage applied to the control grid circuit of the r-f amplifier, V126, prevents its being cut off by the above described strong r-f signals.

Resistor R126 and capacitor C141 are decoupling network to shunt r-f signal components to ground.

(2) R-F AMPLIFIER (AN/FRR-22).—Refer to figure 7-21. Output from the antenna preamplifier, V3001, is applied across the primary of one of five transformers T3035, T3036, T3037, T3038, or T3039 by the setting of a section of S3036A which is controlled by the band selector.

Each of these transformers T3035 through T3039 has a primary and secondary winding which is coupled to an associated coil, L3035, L3036, L3037, L3038, or L3039. This arrangement provides for two parallel-resonant circuits at each band setting. The first of these circuits includes the secondary winding of one of five transformers T3035 through T3039, associated fixed and trimmer capacitors, and section D of the ganged tuning capacitor C2101D. The second tuned circuit consists of one of coils L3035 through L3039, associated fixed and trimmer capacitors, and section C of the ganged tuning capacitor C2101C. The inductance and capacity of the trimmers of the first and second tuned circuits can be adjusted by a screwdriver at points shown in figures 7-14 and 7-16. The capacitance of sections C and D of the tuning capacitor are varied by the tuning knob on the front panel of the dial assembly, and provide continuous tuning throughout each band.

Signal is coupled from the appropriate secondary (first tuned circuit as selected by S3036A) to the associated coil (second tuned circuit), and from there is coupled to the control grid pin 1 of V3035 through S3035. The use of double tuned circuits provides a greater selectivity.

Sections of S3036B and S3035 short unused secondaries and associated coils to prevent absorption of signal on the band in use.

Signals are amplified in V3035, which operates as a conventional pentode amplifier. The cathode resistor R3036 is connected to the r-f section of the GAIN control R2101A, which varies the bias to control the gain of the amplifier tube, V3035. As was described previously, this control also adjusts the gain of the antenna preamplifier, V3001. An AGC voltage, controlled by a diode V1006 in the second i-f, is applied to the control grid through resistor R3037 to control the gain of the amplifier V3035, when the reception control is set to receive A3 and F1 signals. The AGC system is discussed in paragraph 2b(5).

Output of the r-f amplifier, V3035, is taken from the plate, pin 5, and screen grid, pin 7, and coupled to the input of mixer, V351, through terminals J3035K and L to terminals J351B and C.

(3) R-F AMPLIFIER (AN/FRR-23).—Refer to figure 7-22. Output from the antenna preamplifier, V3101, is applied across the primary of one of five transformers T3135, T3136, T3137, T3138, or T3139 by the setting of a section of S3136A which is controlled by the band selector.

Each of these transformers T3135 through T3139 has a primary and secondary winding which is coupled to an associated coil, L3135, L3136, L3137, L3138, or L3139.

This arrangement provides for two parallel-resonant circuits at each band setting. The first of these circuits includes the secondary winding of one of five transformers T3135 through T3139, associated fixed and trimmer capacitors, and section D of the ganged tuning capacitor C2201D. The second tuned circuit consists of one of the coils L3135 thru L3139, associated fixed and trimmer capacitors, and section C of the ganged tuning capacitor C2201C. The inductance and capacity of the trimmers of the first and second tuned circuits can be adjusted by a screwdriver at points shown in figures 7-14 and 7-17. The capacitance of sections C and D of the tuning capacitor are varied by the tuning knob on the front panel of the dial assembly, and provide continuous tuning throughout each band.

Signal is coupled from the appropriate secondary (first tuned circuit as selected by S3136A) to the associated coil (second tuned circuit), and from there is coupled to the control grid pin 1 V3135 through S3135 and C3169. The use of two parallel resonant circuits provides a greater selectivity.

Sections of S3136B and S3135 short unused secondaries and associated coils to prevent absorption of signal on the band in use.

Signals are amplified in V3135, which operates as a conventional pentode amplifier. The cathode resistor, R3137, is connected to the r-f section of the GAIN control, R2201A (see figure 7-22, sheet 2), which varies the bias to control the gain of the amplifier tube, V3135. As was described previously, this control also adjusts the gain of the antenna preamplifier, V3101. An AGC voltage, controlled by a diode V1006 in the second i-f, is applied to the control grid through resistors R3135 and R3136 to control the gain of the amplifier, V3135, when the reception control is set to receive A3 and F1 signals. The AGC system is discussed in paragraph 2b(5).

Output of the r-f amplifier, V3135, is taken from the plate, pin 5, and screen grid, pin 7, and coupled to the input mixer, V551, through terminals J3135K and L to terminals J551B and C.

d. MIXER.—The mixer circuits used in the AN/FRR-21, -22, and -23 receivers differ and will be discussed separately.

(1) MIXER (AN/FRR-21).—Refer to figure 7-20. Input to the mixer, V151, is applied across the primary of one of the five transformers T151, T152, T153, T154, and T155, by the setting of a section of S151A, controlled by the band selector. The mixer section of the ganged tuning capacitor C2001B is shunted across the secondary of the selected transformer to tune the transformer to the desired frequency. Fixed capacitors and



a trimmer, together with the mixer tuning capacitor, resonate with the secondary coils to provide continuous tuning over the selected band. Switch S151B shorts the secondary of unused transformers to prevent absorption of signals on the band in use.

R-f signals are applied to the first grid, pin 1 of the mixer tube V151 from a tap on T151 through T155, as determined by the setting of a portion of S151A.

Signals from the oscillator V201 are applied to the third grid, pin 4, of the mixer V151, through terminal J151K. The oscillator and signal frequencies beat in the mixer stage to produce the intermediate frequency. The output frequency of the mixer V151 is 60 kilocycles on bands 1 and 4. Output frequency of mixer V151 on bands 2, 3, and 5 is 200 kilocycles. These output signals are taken from the plate, pin 5 of V151, and applied to the input of the first i-f assembly through terminals J151L and J701B.

Coils and trimmers in the mixer circuit are adjusted by means of a screwdriver at points shown in figures 7-14 and 7-15.

(2) MIXER (AN/FRR-22).—Refer to figure 7-21. Input to the mixer, V351, is applied to the primary of T351, T352, T353, T354, or T355 by the setting of a section of S351A, controlled by the band selector. Capacitors C352, C355, C358, C361, and C364 are shunted across the primary T351 through T355 to load the primary circuit. This arrangement provides a more constant input impedance throughout each band. The mixer section of the ganged tuning capacitor C2101B is shunted across the secondary of the desired transformer to tune the transformer to the desired frequency. Fixed capacitors and a trimmer together with the mixer tuning capacitor, resonate with the secondary coils to provide continuous tuning over the selected band. Coils and trimmers in the mixer circuits are adjustable by means of a screwdriver at points shown in figures 7-14 and 7-16. R-f signals are applied to the first grid, pin 1, of mixer tube V351 from one side of the selected tuned circuit by the setting of S351A. Switch S351B shorts the secondary of unused transformers to prevent absorption of signals on the band in use.

Signals from the oscillator V401 are applied to the third grid (pin 4) of V351, through terminal J351K. The oscillator and signal frequencies beat in the mixer to produce the intermediate frequency. The oscillator frequency is such that, when the receiver is set on band 1, 2, or 3, the output frequency of the mixer V351 is 200 kilocycles, and the output frequency on bands 4 and 5 is 1600 kilocycles. These output signals are taken from the plate, pin 5, of V351 and applied to the first i-f assembly through terminals J351L and J801B. These same outputs are also fed to the control grid (pin 1)

of the mixer cathode follower V352 which supplies an output between J351F and ground, to feed a panoramic adapter. The PAN receptacle J4006 at the back of the receiver accommodates the adapter. Because of the input selectivity characteristic of the second i-f filters, the use of this output is recommended on bands 4 and 5 only.

(3) MIXER (AN/FRR-23).—Refer to figure 7-22. Input to the mixer, V551, is applied to the primary of T551, T552, T553, T554, or T555 by a section of S551A, the setting of which is controlled by the band selector. Capacitors C557, C560, C563, and C570 are shunted across the primaries of T551, T552, T553, and T555 respectively, to load the primary circuit. This arrangement provides a constant input impedance throughout each band. No such capacitor is included in the primary of T554, as the stray capacitance in that circuit is sufficient to perform this function. The mixer section of the ganged tuning capacitor C2101B is shunted across the secondary of the selected transformer to adjust the transformer tuning to the desired frequency. Fixed capacitors and a trimmer, together with the mixer tuning capacitor, resonate with the secondary coils to provide continuous tuning over the selected band. Coils and trimmers in the mixer circuits are adjustable by means of a screwdriver at points shown in figures 7-14 and 7-17.

R-f signals are applied to the 1st grid, pin 1, of V551 from one side of the selected tuned circuit by the setting of S551A. Switch S551A shorts the secondary of unused transformers to prevent absorption of signals on the band in use.

Except for different frequencies, the mixer circuit, V551, of this receiver is similar to that for the AN/FRR-22 receiver, as described in paragraph 2d(2) of this Section. Because of the high frequency involved, the oscillator voltage is applied to grid 3 (pin 4) of V551 by way of link O4403, which is accessible directly beneath the cover of the oscillator and mixer boxes.

Output from the mixer pentode, V551, is applied to the first i-f assembly through J551L and J901B. This output has a frequency of 1600 kilocycles on all five bands. The pentode also feeds the mixer cathode follower, V552, which supplies a panoramic adapter on all bands. The PAN receptacle J4006 is at the back of the receiver.

e. LOCAL OSCILLATOR.—The oscillator in all three frequency-type receiving sets operate on similar principles, but each will be described separately to include any minor differences in the circuits.

(1) OSCILLATOR (AN/FRR-21).—Refer to figure 2-1. The oscillator used in the AN/FRR-21 receiving set is a Hartley circuit. The cathode and first

grid, pin 1, of the oscillator tube V201 are connected in the oscillatory circuit through contacts on S201A, which is controlled by the band selector. The tuned circuit consists of one of the coils L201, L202, L203, L204, or L205, appropriate fixed and trimmer capacitors, and the oscillator section of the ganged tuning capacitor C2001A. The tuning capacitor connects to the oscillator assembly through terminals E201 and E202.

Referring to the simplified schematic diagram, figure 2-1, the oscillator tuned circuit includes the oscillator section (section A) of the tuning capacitor and capacitors C217, C220, C219, C218, and coil L201. To provide proper oscillator feedback, this coil is connected respectively to the cathode, pin 2 (through R202), the control grid, pin 1 (through grid leak network R201, C223), and the second grid, pin 7, of V201 (through coupling capacitor C224). Resistor R202 is connected in series with the cathode to improve the stability of the circuit.

The oscillator signals are electron-coupled to the plate, pin 5, and are fed to the mixer V151 through terminals J201B and J151K. The plate and screen voltages of V201 are regulated B+ to insure stable output from the oscillator. Tube R1605, a ballast resistor located in the power supply regulates heater current.

The oscillator tracks on the high side of the signal frequency, so that it is 60 kilocycles higher than the signal frequency on band 1 or 4, and 200 kilocycles higher than the signal frequency on band 2, 3, or 5.

(2) OSCILLATOR (AN/FRR-22).—See figure 2-1 for similar circuit connections. The oscillator used in the AN/FRR-22 receiver is a Hartley circuit. The cathode and first grid, pin 1, of the oscillator tube V401 are connected in the oscillatory circuit through contacts on S401A, which is controlled by the band selector. The tuned circuit consists of one of the coils L401, L402, L403, L404, or L405, fixed and trimmer capacitors, and the oscillator section of the ganged tuning capacitor C2101A. The E tap of one of the coils L401 to L405, as selected by a section of S401A, is connected to the control grid (pin 1) through the grid leak network R405 and C421. Tap D of one of the coils, as selected by a portion of S401A, is connected to the cathode, pin 2. Resistors R401 to R404 are connected in the cathode circuit to improve the stability of the circuit. Switch S401B shorts unused coils to prevent absorption of signal on the band in use.

The screen grid, pin 7, is connected to the low side of the tuned circuit, through capacitor C422. This arrangement along with the cathode tap mentioned previously, provides proper feedback to sustain oscillation.

The oscillator signals are electron-coupled to the plate, pin 5, and from there are fed to the mixer V351

through terminals J401B and J351K. The plate and screen voltages of V401 are regulated B+ to insure stable output from the oscillator.

Tube R1605, a ballast resistor in the power supply, is in series with pin 6 of the filaments to regulate heater current. The oscillator tracks on the high side of the signal frequency by 200 kilocycles on bands 1, 2, and 3 or by 1600 kilocycles on bands 4 and 5.

The AN/FRR-22 receiver has two links (O2125 and O2126) to accommodate an external oscillator. These links are shown on sheet 1 of the schematic diagram. Link O2125 removes regulated B+ from the oscillator tube (V401) when set for external operation. Link O2126 connects the EXT. OSC. jack (J4008) to the suppressor grid (pin 4) of the mixer tube V351 through the appropriate connectors as shown on the schematic diagram. Both of these links are shown for normal receiver operation employing the oscillator signal provided by the receiver.

(3) OSCILLATOR (AN/FRR-23).—See figure 2-1 for similar circuit connections. The oscillator used in the AN/FRR-23 receiving set is a Hartley circuit. The cathode and first grid, pin 1, of the oscillator tube V4401 are connected in the oscillatory circuit through contacts on S4401A, which is controlled by the band selector. The tuned circuit consists of coils L4401, L4402, L4403, L4404, or L4405 fixed and trimmer capacitors, and the oscillator section of the ganged tuning capacitor C2201A.

A tap of one of the coils L4401 to L4405 is connected to the control grid, pin 1, as selected by a portion of S4401A, through the grid leak network C4422 and R4401. Another tap of one of the coils, as selected by a section of S4401A, is connected to the cathode, pin 2. A section of S4401B shorts unused coils to prevent absorption of signal on the band in use.

The plate and screen grids, pins 5 and 7, are connected to the low side (ground) of the tuned circuit, through capacitor C4424. This arrangement along with the cathode tap mentioned previously, provides proper feedback to sustain oscillations.

The plate and screen voltages of V4401 are regulated B+ to insure stable output from the oscillator. In order to get adequate injection voltage on the high-frequency bands, the oscillator is triode-connected, and the output to the mixer is taken from the cathode via link O4403. To reduce hum on band 5, one side of the heater is connected to the cathode through a section of S4401A. Choke L4406 and ballast resistor R1605, located in the power supply, are provided in the outer heater line to minimize heater current variations. The oscillator tracks 1600 kilocycles higher than the signal frequency on all five bands.

TABLE 2-1. INTERMEDIATE FREQUENCY RELATIONSHIPS

RECEIVER TYPE	BANDS	FIRST I-F INPUT FREQ.	FIRST I-F OSC. FREQ.
AN/FRR-21	1-4 2-3-5	60 kc 200 kc	140 kc INOPERATIVE
AN/FRR-22	1-2-3 4-5	200 kc 1600 kc	INOPERATIVE 1400 kc
AN/FRR-23	1-2-3-4-5	1600 kc	1400 kc

The AN/FRR-23 receiver has provisions to accommodate an external oscillator. In the AN/FRR-23 two links, O2225 (shown on sheet 2 of the schematic diagram) and O4401 (shown on sheet 1 of the schematic diagram) are provided in the oscillator assembly to accommodate an external oscillator. Link O2225 removes regulated B+ from the oscillator tube (V4401) and link O4403 connects the EXT. OSC. jack (J4008) to the suppressor grid (pin 4) of the mixer (V551) via the injection link O4403 and appropriate connectors as shown on the schematic diagram. Both of these links are shown in position for normal receiver operation employing the oscillator signal provided by the receiver.

f. INTERMEDIATE FREQUENCIES.—In addition to the local oscillator, a second conversion oscillator (V701, V801, V901 depending on the receiver considered) incorporated in the first i-f assembly, is used to convert the signal to 200 kilocycles when the output from the mixer stage V151, V351, V551 is either 60 or 1600 kilocycles. The intermediate frequency relationships are shown in Table 2-1.

g. FIRST I-F ASSEMBLY.—The first intermediate-frequency circuits used in the three receiver types differ slightly, and will be discussed separately.

(1) FIRST I-F (AN/FRR-21).—Refer to figure 2-2. As determined by the mixer output, V151, the first intermediate frequency input is 60 kilocycles on bands 1 and 4 and 200 kilocycles on bands 2, 3, and 5.

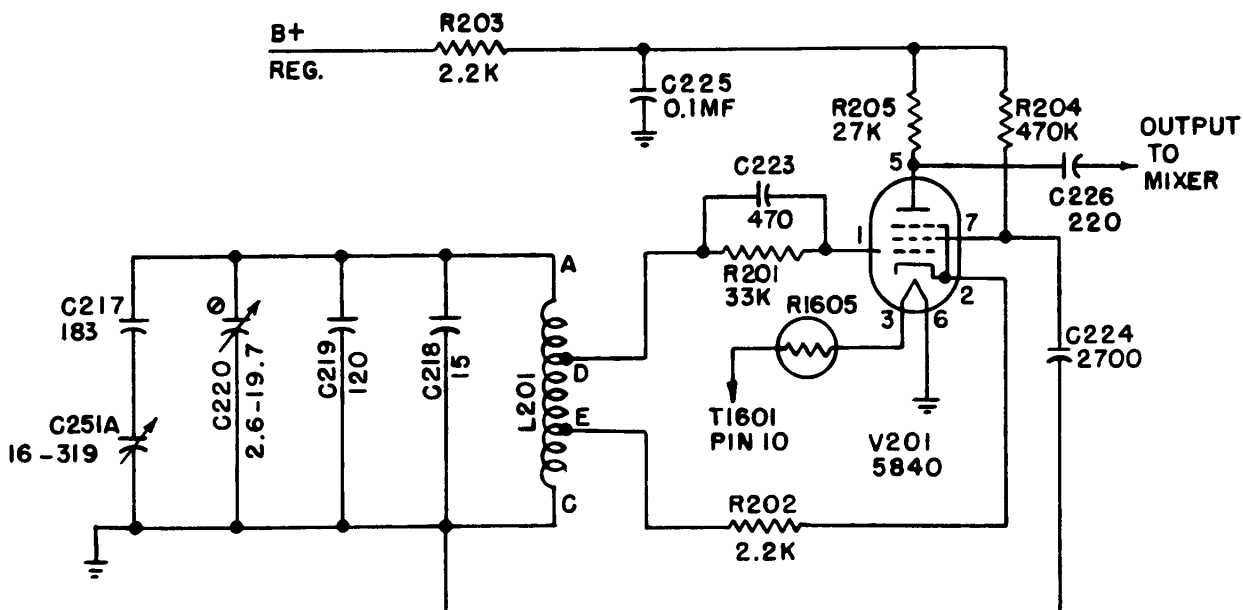
When the first i-f input is 60 kilocycles (band 1 or 4) the signal goes through S701, controlled by the band selector, to a band-pass filter Z702 which passes signal frequencies within a band wide enough for intelligibility, while suppressing extraneous frequency components. After passing through Z702 the 60-kilocycle signal is applied to the third grid (pin 4) of V701. This tube, V701 also operates as a 140-kilocycle crystal-controlled oscillator connected as a Pierce circuit, the tube elements involved being the cathode (pin 2), first grid (pin 1) and second grid (pin 7), and the feedback relations

being obtained through capacitors C716, C717 and the interelectrode capacitance of the tube elements. The 140-kc signal thus produced and the 60-kc signal applied to the grid (pin 4) combine to produce a 200-kc signal in the plate (pin 5) circuit of V701 which is then fed through S702 to the tuned primary circuit of T703. The signal from the secondary of T703 goes through J702B to the second i-f input J1001B.

When the first i-f input is 200 kilocycles (band 2, 3, or 5) the signal goes through S701 directly to S702 and is applied to the tuned primary circuit of T703. The secondary output of T703 is applied to the second i-f input through J702B and J1001B. Plate and screen voltages are removed from V701 by these settings of S702.

(2) FIRST I-F (AN/FRR-22).—See figure 2-2 for similarity of circuit connections. As determined by the mixer output, V351, the first intermediate frequency input is 1600 kilocycles on bands 4 and 5, and 200 kilocycles on bands 1, 2, and 3.

When the first i-f input is 1600 kilocycles (band 4 or 5) the signal goes through S801, controlled by the band selector, to a band-pass filter Z802 which passes signal frequencies within a band wide enough for intelligibility, while suppressing extraneous frequency components. After passing through Z802 the 1600-kilocycle signal is applied to the third grid (pin 4) of V801. This tube, V801 also operates as a 1400-kilocycle crystal-controlled oscillator connected as a Pierce-type circuit, the tube elements involved being the cathode (pin 2), first grid (pin 1) and second grid (pin 7), and the feedback relations being obtained through capacitors C-812, C-813 and the interelectrode capacitance of the tube elements. The 1400-kc signal thus produced and the 1600-kc signal applied to the grid (pin 4) combine to produce a 200-kc signal in the plate (pin 5) circuit of V801 which is then fed through S802 to the primary tuned circuit of T801. The signal from the secondary of T801 goes through J802B to the 2nd i-f input J1001B.



- NOTES: 1. SYMBOL NUMBERS AND COMPONENT VALUES ARE THOSE OF AN/FRR-21.  
2. FOR AN/FRR-22 USE 400 SYMBOL SERIES AND FOR AN/FRR-23 USE 4400 SYMBOL SERIES. COMPONENT VALUES GIVEN IN APPROPRIATE SCHEMATIC DIAGRAM.  
3. UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES GIVEN IN OHMS AND CAPACITANCE VALUES IN MMF.

Figure 2-1. Local Oscillator, Simplified Schematic

When the first i-f input is 200 kilocycles (band 1, 2, or 3) the signal goes through S801 directly to S802 where it is applied to the tuned primary circuit of T801. The secondary output of T801 is applied to the second i-f input through J802B and J1001B. Plate and screen voltages are removed from V801 by this setting of S802.

(3) FIRST I-F (AN/FRR-23).—See figure 2-2, for similarity of circuit connections. As determined by the mixer output, V151, the first intermediate frequency input is 1600 kilocycles on all bands.

The first i-f input signal goes through to a band-pass filter Z902 which passes signal frequencies within a band wide enough for intelligibility, while suppressing extraneous frequency components. After passing through Z902 the 1600-kilocycle signal is applied to the third grid (pin 4) of V901. This tube V901 also operates as a 1400-kilocycle crystal-controlled oscillator connected as a Pierce-type circuit, the tube elements involved being the cathode (pin 2), first grid (pin 1), and second grid (pin 7), and the feedback relations being obtained through capacitors C-912, C-913 and the interelectrode capacitance of the tube elements. The 1400-kc signal thus produced and the 1600-kc signal applied to the grid

(pin 4) combine to produce a 200-kc signal in the plate (pin 5) circuit of V901 which is then fed through S902 to the primary tuned circuit of T901. The signal from the secondary of T901 goes through J902B to the second i-f input J1001B.

b. SECOND I-F ASSEMBLY.—The second i-f assembly is identical for all receiver types. However, the connections between this assembly and associated parts and assemblies differ in the various receivers. These differences are mentioned where applicable throughout this paragraph. The second i-f assembly includes filter circuits Z1001, Z1002, Z1003, three stages of amplification V1001, V1002, V1003 at 200 kilocycles, a BFO mixer, V1004, diode detector, V1005, AGC delay diode, V1006, and a cathode follower, V1007, used to supply signals to a frequency shift converter or other accessory equipment. Link connections are also provided for connecting the AN/FRR-22 or -23 with a companion receiver in a dual diversity reception system.

(1) FILTERS AND INPUT CIRCUIT.—The 200-kilocycle input to the second i-f assembly, appearing at J1001B, is filtered before it is applied to the first amplifier, V1001. The filter selected depends on the position

of wafer switches S1001 and S1002 which are actuated by the RECEPTION control. When this control is set at FSK, A1 BROAD, or A1 SHARP, signals are fed through the "sharp" filter Z1001 which provides a pass-band of approximately 3.2 kc centered about 200 kc. When the RECEPTION control is set at A2 and A3 SHARP, the "medium" filter, Z1002, is used, which provides a pass-band of approximately 8 kc centered about 200 kc. Signals are fed through the "broadly" tuned transformer filter circuit, Z1003, when the RECEPTION control is set at A3 BROAD. Z1003 (together with Z1005, Z1007, Z1011, and T703, T801, or T901 of the first i-f) provides a pass-band of approximately 16 kc centered about 200 kc. Filter Z1003 is adjustable by means of a movable iron core in L1010.

(2) SECOND I-F AMPLIFIER STAGES.—The first two stages of amplification in the second i-f assembly, V1001 and V1002, are semi-remote cutoff pentodes which are coupled by the broadly tuned transformer circuit, Z1005. The alignment tuning of this circuit is adjusted by means of movable powdered iron cores in L1011 and T1011. The plate of V1002 is coupled through another broadly tuned transformer circuit, Z1007 (also provided with iron tuning slugs) to the third i-f amplifier, V1003. The B section of the GAIN control (R2001 on AN/FRR-21, R2101 on AN/FRR-22, and R2201 on AN/FRR-23) is connected to the cathode bias resistors R1006, R1010 of the first two amplifiers, V1001 and V1002, to control the gain through these stages. The GAIN BAL control (R2102 on AN/FRR-22 and R2202 on AN/FRR-23) variable by means of a screwdriver adjustment behind the hole in the front panel of these receivers, is also connected in series with cathode bias resistors of V1001 and V1002. This GAIN BAL control is used for matching the gain of the AN/FRR-22 or -23 receivers to the gain of a companion receiver when using diversity reception. This control is not on the AN/FRR-21.

Output from V1003, feeds four circuits: (1) the TUNING meter M2101 and M2201 of the AN/FRR-22 and -23 receivers, through T1014; (2) the BFO-mixer circuit which is active when the RECEPTION control is set to A1 BROAD, A1 SHARP, or FSK; (3) the diode detector V1005 whose output voltage is fed to the audio amplifier when the RECEPTION control is set at A2 or A3, and whose current operates the TUNING meter M2001 of the AN/FRR-21 receiver in all four positions of the RECEPTION control; (4) the cathode follower.

(3) TUNING METER.—In the AN/FRR-21 receiver the TUNING meter M2001 is connected to indicate the current in the diode detector, V1005. In the AN/FRR-22 and -23 receivers, the output of the third

amplifier, V1003, is applied to a 200-kilocycle tuned circuit in Z1009 and rectified by a crystal rectifier CR1001 to actuate the movement of the TUNING meter (M2101 on AN/FRR-22 and M2201 on AN/FRR-23), which is mounted on the front panel. When the desired signal is detuned, the rectified signal voltage applied to the TUNING meter is low, and the meter reads down scale. As the desired signal is tuned, the rectified voltage increases and the TUNING meter reads up scale. The HIGH-LOW switch (S2004 on AN/FRR-21, S2104 on AN/FRR-22, and S2204 on AN/FRR-23), mounted below the TUNING meter on the front panel, attenuates the meter reading when the switch is in the LOW position by connecting a shunt resistor R2003, across the meter for the AN/FRR-21 receiver or adding a series resistor R2103 or R2203 for the AN/FRR-22 or -23 receivers. This resistor is removed when the switch is in the HIGH position.

(4) BFO-MIXER.—Output from the third i-f amplifier, V1003, is fed to the first grid of the BFO-mixer, pin 1 of V1004. Signals from the beat frequency oscillator V1301 are applied to the third grid, pin 4, of V1004 through capacitor C1306. (See paragraph 2i of this Section for BFO circuit description.) The 200-kilocycle i-f signal and the signal from the BFO are heterodyned in V1004 to produce a difference frequency in the audio range. This difference frequency component is fed to the audio amplifier V1102 through S1003, J1002N, J1101D, and S1101A, when the RECEPTION control is set at A1 BROAD, A1 SHARP. When this control is set at FSK, the signal goes to V1102 through S1003, J1002N, the center arm of the OUTPUT control (R2007 on AN/FRR-21, R2107 on AN/FRR-22, and R2207 on AN/FRR-23), J1101J, and S1101A.

(5) DIODE DETECTOR AND DELAYED AGC.—See figure 2-3. Signals at 200 kc from the plate of V1003 are also applied across the diode detector V1005, through the broadly tuned transformer circuit Z1011. An audio voltage is developed across the diode load, R1027, and applied to the audio amplifier noise peak limiter V1101 through S1003, J1002K, J1101T, and R1102 when the RECEPTION control is in the A2 or A3 position. The noise peak limiter is discussed in paragraph 2j(1) of this Section.

The voltage developed by the diode detector V1105 across R1027 is applied, through R1028 and link O1003 to the AGC delay diode, V1006, when the RECEPTION control is in the FSK or A3 position (AN/FRR-22 or -23 receivers only). Capacitor C1053 in conjunction with R1028 serves to filter the modulation components of the detected signal so that only the d-c component is applied to the AGC diode. This diode is normally conducting by reason of a positive voltage applied to its

- NOTES: 1. SYMBOL NUMBERS AND COMPONENT VALUES ARE THOSE OF AN/FRR-21.  
2. FOR AN/FRR-22 USE 800 SYMBOL SERIES AND FOR AN/FRR-23 USE 900 SYMBOL SERIES. COMPONENT VALUES GIVEN IN APPROPRIATE SCHEMATIC DIAGRAM.

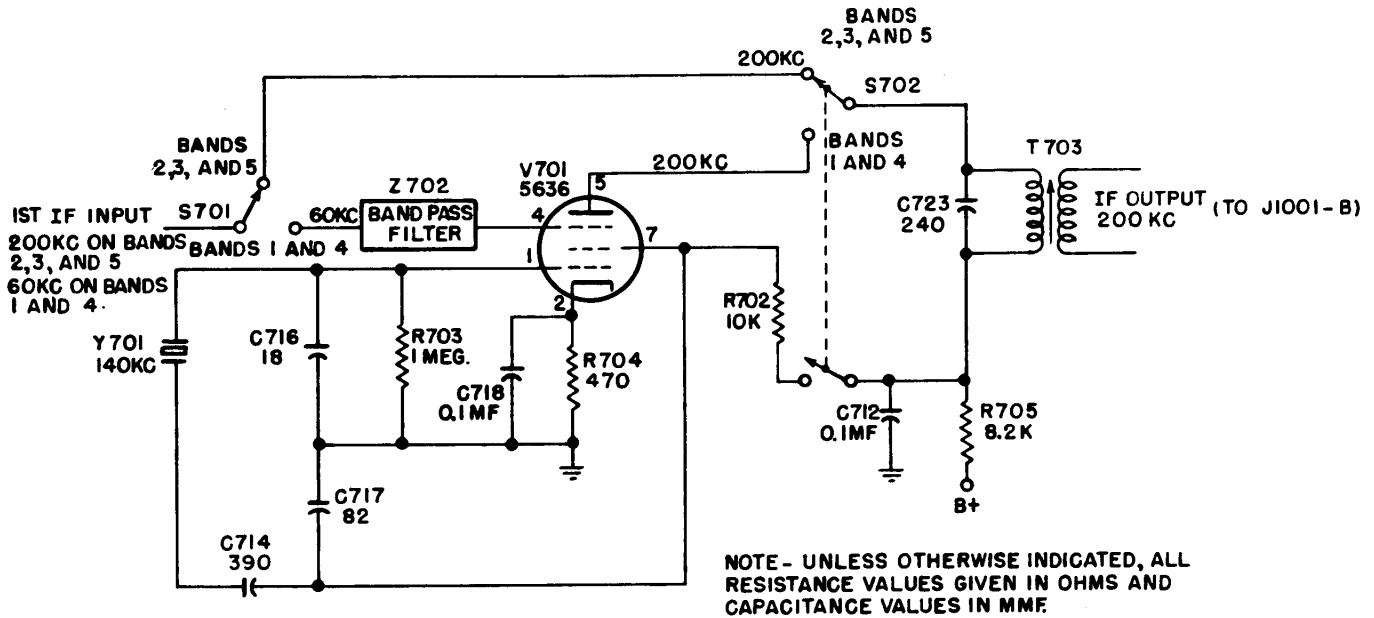


Figure 2-2. First I-F, Simplified Schematic

plate from the B+ regulated supply through R1029. Therefore, the AGC line to the r-f and second i-f amplifiers is held at a slightly positive potential until the d-c component of the signal developed across the diode load R1027, is sufficiently negative to stop V1006 from conducting. The voltage divider network R1027, R1028, and R1029 is so arranged that the point where the diode V1006 stops conducting corresponds to approximately 12 volts d-c at the detector V1005. For stronger signals the AGC line becomes negative by an amount necessary to bias the r-f and second i-f amplifiers and reduce the gain in these stages.

Delayed AGC is effective only for F1 and A3 reception in the AN/FRR-22 and -23 receivers. It is not used on the AN/FRR-21 receiver in which the delayed AGC output lead is grounded through J1002D. When the RECEPTION control is set at A1 BROAD, A1 SHARP, or A2 the delayed AGC line is grounded by S1003 and gain is controlled by the i-f section of the GAIN control (R2001B on AN/FRR-21, R2101B on AN/FRR-22, and R2201B on AN/FRR-23), on the front panel.

(6) DUAL DIVERSITY RECEPTION (AN/FRR-22 and -23 only).—Links are provided in the diode detector and AGC circuits for applying a rectified signal voltage and automatic gain control voltage to a second AN/FRR-22 or -23 designated as the companion re-

ceiver. With links O1001, O1002, and O1003 in positions as given in the table of figure 2-3 for diversity connection, the diode load resistor R1027 and the delayed AGC circuit of the local receiver are made common to the companion through the DET. AGC. receptacles J4003 and suitable cabling. When using a diversity system, gain of both receivers must be balanced. This is accomplished by regulating the amount of amplification in V1001 and V1002 of each receiver through adjustment of the DIVERSITY GAIN BAL control (R2102 on AN/FRR-22 and R2202 on AN/FRR-23) through a recessed screwdriver adjustment on the front panel.

(7) FREQUENCY SHIFT AND PANORAMIC OPERATION.—Intermediate-frequency outputs are supplied by each receiver to feed a frequency shift converter.

One output is provided by the second i-f cathode follower, V1007, which supplies signals at 200 kilocycles to a frequency shift converter through the coaxial receptacle, I.F. (J1705 on AN/FRR-21, J4005 on AN/FRR-22 and -23), on the back of the receiver. The output of the third amplifier, V1003 (pin 5), is coupled to the grid (pin 1) of V1007.

The second output, PAN receptacle J4006, incorporated in the AN/FRR-22 and -23 receivers only, is pro-

vided by the mixer cathode follower, V352 or V552, for use with a panoramic adapter. The mixer cathode follower circuits are further described in paragraph 2d(2) of this Section.

In addition to the i-f outputs, a frequency shift converter of the audio type can also be supplied from the balanced audio line. Mark and space frequencies may be correctly set by adjustment of the beat frequency oscillator in the receiver, after the receiver has been tuned to the desired carrier frequency.

*i.* BEAT FREQUENCY OSCILLATOR.—The BFO circuit provides a heterodyning signal to the BFO-mixer, V1004, for the second i-f to produce the desired beat note when the RECEPTION control is set for A1 and F1 reception. The beat frequency oscillator, V1301, is a Hartley circuit with adjustable capacitor, C1309, operated by the **FREQ. VERNIER** front panel control. This capacitor is paralleled by C1307 or C1308 which is a screwdriver trimmer adjustment (C1308 is active only in the FSK position of the RECEPTION control on the AN/FRR-22 and -23 receivers).

Output of the oscillator is electron-coupled to the plate, pin 5, of V1301. Beat frequency oscillator signals are fed, through J1301B, J1002A, to the third grid, pin 4, of the BFO-mixer, V1004, where they heterodyne with A1 or F1 received signals (coming from V1003) to produce a beat note in the audio range. Capacitor C1309, labeled as the **FREQ. VERNIER** on the front panel, changes the resonate frequency of Z1301 to provide a variation of 1500 cycles on either side of the center frequency which is zero cycle except in FSK position of the RECEPTION control on the AN/FRR-22 and -23 receivers. In this case, the beat note at the center (0) setting of the **FREQ. VERNIER** is 2550 cycles.

Plate and screen grid potentials to V1301 are removed through the setting of S1301 when the RECEPTION control is set at A2 or A3 or by the **CAL** switch (S2002 on AN/FRR-21, S2102 on AN/FRR-22, and S2202 on AN/FRR-23) when the crystal calibrator is turned on.

*j.* AUDIO AMPLIFIER.—The audio assembly is identical for all receivers. However the connections between this assembly, and associated assemblies and parts, differ in the three receiver types. These differences are mentioned where applicable throughout this paragraph.

(1) AUDIO INPUT CIRCUITS.—Input to the audio assembly is determined by the setting of S1101A which is controlled by the RECEPTION control. A simplified schematic of the audio input circuits is shown in figure 2-4. When the RECEPTION control is set at FSK, A1 BROAD, A1 SHARP, output from the BFO-mixer, V1004, is applied directly to the first audio amplifier, V1102. But when the RECEPTION control is

set at A2, A3 SHARP, or A3 BROAD (the A3 positions are used only on the AN/FRR-22 and -23 receivers), output from the diode detector, V1005, is applied to the first amplifier, V1102, through a noise peak limiter diode, V1101, which functions as follows:

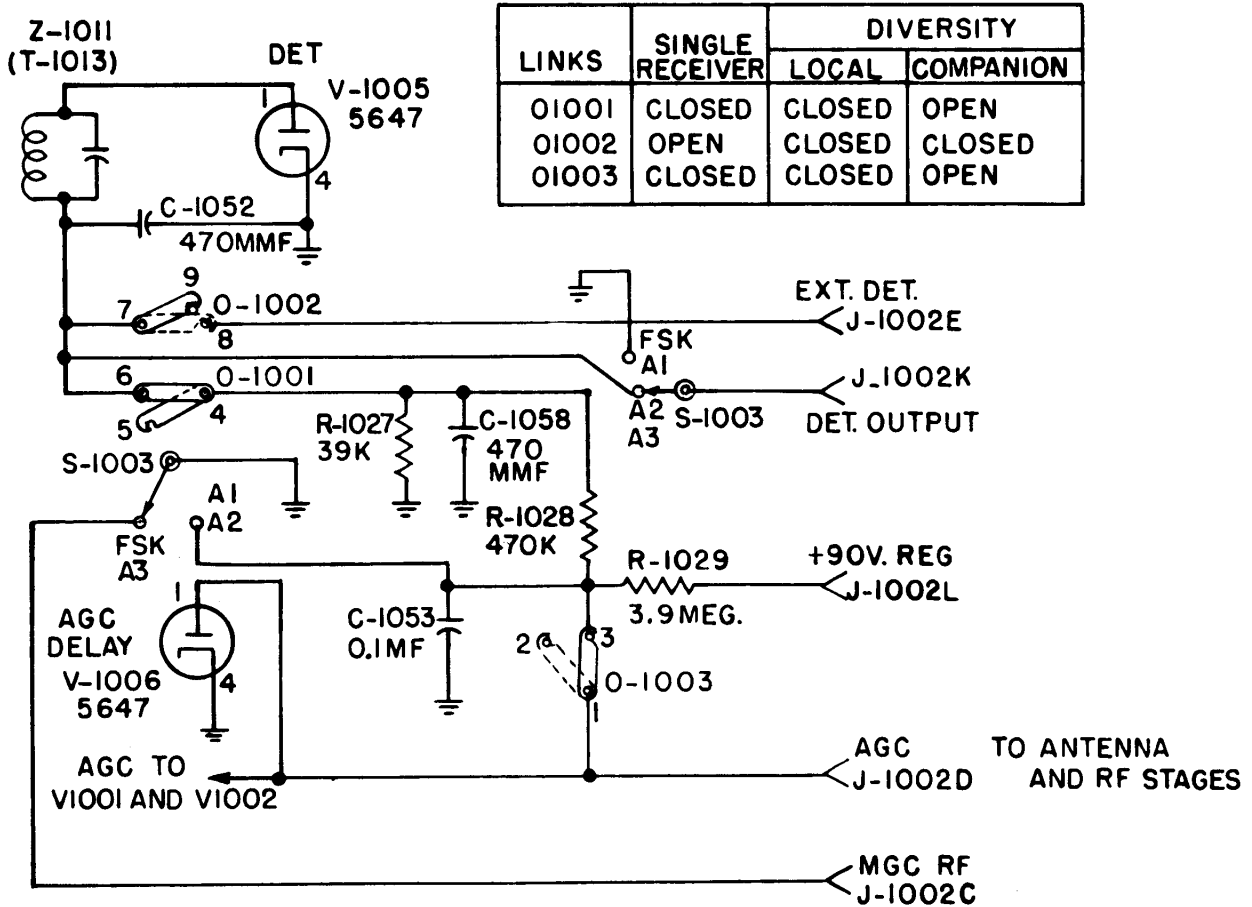
The d-c component of the rectified signal from the diode detector circuit developed across R1027 as described in paragraph 2g(5) is applied to the plate of the noise peak limiter, V1101, by means of voltage divider R1102 and R1103.

A portion of the rectified signal voltage is applied to the cathode of the noise peak limiter, V1101, through R1104, R1105, and C1101. Under conditions of normal signal, the diode V1101 conducts and feeds the first audio amplifier, V1102, but when a noise pulse which exceeds normal modulation percentage is detected, it causes an instantaneous decrease in potential on the plate of the noise limiter diode V1101. Voltage to the cathode, however, remains constant because of the filtering action of C1101 and R1104. Thus for a short time interval, the plate is more negative than the cathode, and during this time the diode acts as an open circuit. Therefore the output noise pulse is limited to a value corresponding to maximum normal modulation percentage as determined by the relative values of R1102 and R1103. In these receivers the noise limiter is set to limit impulses to a level corresponding to 40 per cent modulation.

The B section of OUTPUT control (R2007 on AN/FRR-21, R2107 on AN/FRR-22, and R2207 on AN/FRR-23) is shunted across the grid circuit of V1102, when S1101A is set at FSK and A3 SHARP or A3 BROAD to provide a means of adjusting the signal level before it is applied to the first audio amplifier, V1102. This control is inoperative when S1101A is set at A1 BROAD, A1 SHARP, or A2 (in these positions the signal input is applied across the entire resistor, and the output is taken from the same point).

The normal characteristic of the audio amplifier provides broad selectivity, but a narrow frequency response is obtained when the RECEPTION control is set at A1 SHARP. In this position, S1101B channels the output of the first audio amplifier through a band-pass filter, Z1110, before the signal is applied to succeeding stages of the audio assembly. Filter Z1110 is bypassed in all other positions of S1101B.

(2) SILENCER CIRCUIT (AN/FRR-22 and -23 RECEIVERS ONLY).—See figure 2-5. A silencer circuit, V1103 and V1104, is active in the audio assembly when the RECEPTION control is in the A3 SHARP or A3 BROAD position to prevent noise from being further amplified by succeeding stages in the absence of signals.



AGC IS ACTIVE ONLY ON AN/FRR-22 AND -23.  
J-1002D IS GROUND ON AN/FRR-21.

Figure 2-3. Detector and AGC, Simplified Schematic

The silencer diode, V1103, is connected in series between the first and second audio amplifiers, V1102 and V1105. Plate potential of the diode is determined by the amount of plate current flow through the d-c amplifier, V1104. The cathode potential is determined by voltage divider R1115 and R1116. Grid voltage of the d-c amplifier (pin 1 of V1104), supplied by B+, is determined by the setting of the SILENCER potentiometer (R2106 on AN/FRR-22 and R2206 on AN/FRR-23) which is mounted on the front panel of the receiver, and by the average d-c level of the detector output. This potentiometer is connected between B+ and ground, and thus provides an adjustable positive voltage.

When the grid voltage of the d-c amplifier V1104 is positive, the plate of V1103 becomes negative relative to the cathode, and V1103 cannot conduct. When the grid voltage of V1104 is reduced (as by the presence of a strong carrier) the plate of V1103 becomes positive relative to the cathode, thus causing V1103 to conduct.

When the RECEPTION control is set to any other

position but A3 SHARP or A3 BROAD, the SILENCER control is inoperative because switch S1101A returns the grid circuit of V1104 to ground instead of to the silencer control.

(3) SECOND AUDIO AMPLIFIER (V1105).—The output of the silencer diode, V1103, is taken from its cathode and coupled to the grid (pin 1) of the second audio amplifier, V1105, through C1105. The amplified output appears at the plate (pin 8) of V1105 and is applied to the cathode of the first diode limiter, V1106, through capacitor C1107.

(4) DIODE LIMITERS.—Two series diode limiters, V1106 and V1107, are combined to clip equally on positive and negative portions of the audio cycle, when S1101A on the RECEPTION control is set for A1 or A2. Plate potential on the limiters, and therefore, the level at which the tubes will become non-conductive, is set by the A section of the OUTPUT control (R2007 on AN/FRR-21, R2107 on AN/FRR-22, and R2207 on



AN/FRR-23). When the audio output from V1105 is applied to the limiter diodes (cathode of V1106), diode V1106 limits the positive portions of the input while V1107 limits the negative portions, and the OUTPUT control is adjustable to provide a range of 40 db. In those positions of the RECEPTION control where limiting is not used, A3 and FSK, the plate potential on the diodes is fixed by returning the plate to B+ through R1112 at such a value that the diodes remain conductive beyond the point that produces maximum power output from the output stage.

(5) AUDIO OUTPUT STAGES.—Signal voltages are taken from the cathode of the second limiter, V1107, and applied to the grid (pin 1) of the driver stage, V1108 through C1108. They are amplified and applied to the control grid (pin 1) of the beam power pentode, V1109, through C1109. A negative feedback voltage is applied from the plate (pin 5) of V1109 to the cathode (pin 5) of V1108 via resistor R1132 and R1134. The feedback is provided to maintain a nearly constant output voltage under changing load conditions, such as due to connecting two headphones in parallel or connecting various loads to the receiver audio output terminals.

The pentode, V1109, feeds the primary of output transformer T1101; and signals are taken from a balanced secondary winding to feed a 600-ohm line, and an unbalanced winding (with one side grounded) for phone jack connections.

The phone LEVEL control (R2008 on AN/FRR-21, R2108 on AN/FRR-22, and R2208 on AN/FRR-23) regulates the output which is applied to the two PHONE JACKS (J2015 and J2016 on AN/FRR-21, J2115 and J2216 on AN/FRR-22, and 2215 and J2216 on AN/FRR-23) connected in parallel. The same audio signal that feeds the PHONE jacks also goes to the OUTPUT meter (M2002 on AN/FRR-21, M2102 on AN/FRR-22, and M2202 on AN/FRR-23) through appropriate multiplier resistors as selected by the ADD DECIBEL switch (S2005 on AN/FRR-21, S2105 on AN/FRR-22, and S2205 on AN/FRR-23). The OUTPUT meter is connected directly to the output winding to prevent the LEVEL control and phones from affecting the meter readings.

k. OUTPUT METER.—The signal to the OUTPUT meter (M2002 on AN/FRR-21, M2102 on AN/FRR-22, and M2202 on AN/FRR-23), is attenuated in four steps to permit the meter to indicate, in decibel, a wide range of output levels. Zero db of the meter circuit corresponds to a power level of six milliwatts into a 600-ohm load. Multiplier resistors provide the appropriate amount of attenuation. These multipliers are se-

lected by the ADD DECIBEL switch (S2005 on AN/FRR-21, S2105 on AN/FRR-22, and S2205 on AN/FRR-23) for the +20 db, +10 db, 0 db, and -10 db positions. There is no attenuation provided when the switch is in the -10 db position in order that the low output levels can be read. The -10 db position of the ADD DECIBEL switch is spring-loaded, and the switch will fall back to the 0 db position if the switch arm is not held in the -10 db position.

l. POWER SUPPLY.—All voltages necessary for the operation of these receivers are provided by an a-c operated power supply. Taps on the primary of transformer T1601, selected by an appropriate position of link O1601 on link-board E1601, accommodate either a 105-, 115-, or 125-volt a-c source at frequencies of 50-60 cycles. Additionally, for operation at 400 cycles, the other side of the primary circuit, which is normally connected to terminal no. 1 of the power transformer T1601, must be reconnected to terminal no. 6 in which case the line voltage taps function as above. The two-section POWER switch (S2001 on AN/FRR-21, S2101 on AN/FRR-22, and S2201 on AN/FRR-23) which is mounted on the front panel, opens and closes both sides of the primary of T1601. Two fuses, F1601 and F1602, protect the circuit from overload.

Rectified current, developed by V1601 and V1602, is taken from the parallel connected cathodes and fed through a choke-input filter L1601A, L1601B, C1601, and C1602. Two outputs are supplied by the rectifier: 120 volts at terminal J1601C, and 95 volts regulated by V1603 at terminal J1601D. This is obtained by connecting V1603 to the midpoint of the filtering network by R1603. C1603 provides r-f filtering of the regulated output. A visual indication of the existence of B+ is given by the PILOT light (I2001 on AN/FRR-21, I2101 on AN/FRR-22, and I2201 on AN/FRR-23) which is located on the front panel and glows when d-c voltage is present in the circuit. This pilot light (a neon bulb) is connected in series with a 100,000-ohm resistor and this series combination is connected across B+.

Two heater windings are provided on the secondary of T1601. One winding (terminals 8, 9) supplies heater voltage for the noise limiter diode, V1101. This is supplied at a reduced level (5.2 volts) so as to reduce hum due to the heater-cathode leakage in V1101. Potentiometer R1601 (a chassis control) adjusts the balance of this winding to further reduce hum when a 400-cycle primary source is employed. The second heater winding (terminals 10, 11, 12, 13, 14) has several taps on each side of its ground connection. Most of the heater voltages for all other vacuum tubes in the equipment are supplied from terminals 11 and 13. Terminal 12 is con-

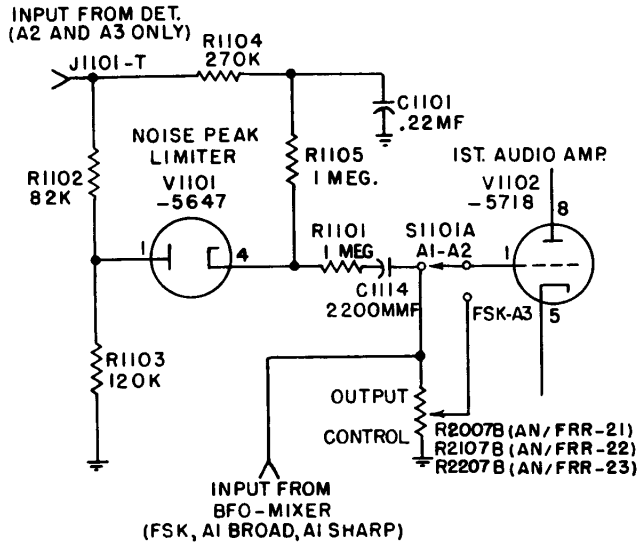


Figure 2-4. Noise Peak Limiter, Simplified Schematic

nected to ground. A ballast resistor, R1605, is connected in series between terminal 10 of the transformer and one of the oscillator-heater leads to regulate current to the oscillator-heater. (The other lead of the oscillator-heater is grounded.) A 6.3-volt a-c potential from terminal 14 of T1601 supplies the dial light and in the low-frequency receiver, additionally, the heaters of V101, V126, and V151.

m. FILTER ASSEMBLY.—Refer to figure 7-1. The filter assembly is located at the back of the receiver cabinet or case. It includes receptacles for input and output connections to the receiver, filters which reduce interference between the receiver and other equipment, and a relay which protects the receiver input stages. These receptacles, filters, and relay are described in the following sub-paragraphs.

(1) I-F CIRCUIT.—This circuit carries the cathode-follower 200-kc output from V1007 through J1002B and the A2 lead of the multiple jack (J1709 on AN/FRR-21, J4009 on AN/FRR-22 and -23), the i-f filter to the I.F. jack (J1705 on AN/FRR-21, J4005 on AN/FRR-22 and -23). This filter rejects a signal in the frequency range from 400 kc to 400 mc to prevent interference between the receiver and any external equipment connected to the I.F. jack.

(2) PAN CIRCUIT (AN/FRR-22 and -23 RECEIVERS ONLY).—This circuit carries the cathode-follower output (1600 kc) from V352 (or V552) through J351-I (or J551-L) to the A3 lead of the multiple jack and the pan filter, Z4004, to the PAN jack, J4006. This filter rejects signals in the frequency range

from 1700 kc to 400 mc to prevent interference between the receiver circuits and the external circuits.

(3) ANT. CIRCUIT.—This circuit carries r-f signals from the external antenna through the ANT jack (J1707 on AN/FRR-21, J4007 on AN/FRR-22 and -23), the ANT relay (K1701 on AN/FRR-21, K4001 on AN/FRR-22 and -23), and the A4 lead of the multiple jack (J1709 on AN/FRR-21, J4009 on AN/FRR-22 and -23) to jack J101B (or J3001B or J3101B) of the antenna assembly. The antenna relay is a current-operated thermal relay which opens the antenna lead to protect the receiver input circuits from overload, when a transmitter is operated in the immediate vicinity. Under overload conditions, the relay opens and closes rapidly to maintain an average current of 150 milliamperes.

(4) POWER CIRCUIT.—The circuit carries 115-volt (nominal) a-c current which powers the equipment, through the POWER jack (J1704 on AN/FRR-21, J4004 on AN/FRR-22 and -23), the power filter, leads

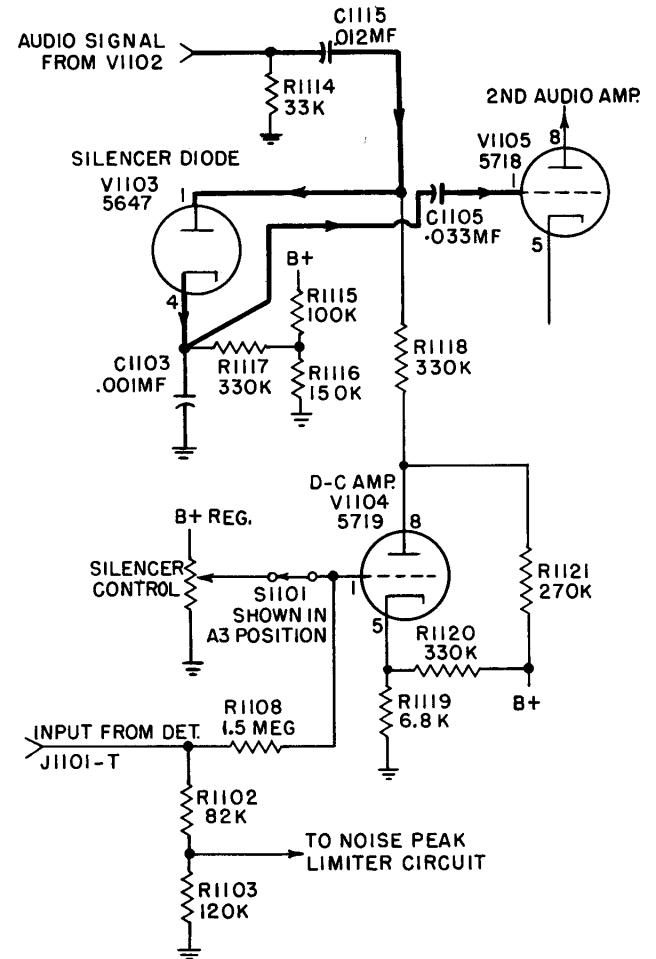


Figure 2-5. Silencer Circuit, Simplified Schematic

7, 8, and 10 of the multiple jack, the POWER switch (S2001 on AN/FRR-21, S2101 on AN/FRR-22, and S2201 on AN/FRR-23), fuses F1601, F1602, to the power transformer T1601. The power filter rejects frequencies from 14 kc to 400 mc to prevent interference between the receiver and other circuits connected to the power line.

(5) AUDIO CIRCUIT.—This circuit carries the receiver audio output from transformer T1101 terminals 5 and 7 through J1101-A, -E, leads 4 and 9 of the multiple jack (J1709 on AN/FRR-21, J4009 on AN/FRR-22 and -23), the audio filter, to the audio jack (J1701 and J1702 on AN/FRR-21, J4001 and J4002 on AN/FRR-22 and -23). The audio filter rejects frequencies from 100 kc to 400 mc.

(6) DET. AGC CIRCUIT (AN/FRR-22 and -23 ONLY).—This circuit includes no filter network. Terminal A of the DET. AGC jack J4003 carries the output of the detector tube V1005 through link O1002, jacks J1002-E and lead 2 of the multiple jack J4009. Terminal B of the DET. AGC jack J4003 receives an AGC voltage from the AGC diode V1006 through J1002-D, E453-2, and lead 6 of the multiple jack J4009.

(7) EXT. OSC. (AN/FRR-22 and -23 only).—An input receptacle on the rear of the receiver, labeled EXT. OSC. is provided to accommodate an external oscillator. Connect the plug-fabricated end of the oscillator cable to the EXT. OSC. receptacle (J4008) at the rear of the receiver cabinet. Connect the other end of the cable to the output of the external oscillator to be used. Refer to paragraph 1f(5) of Section 3 for further instructions on the connection of the external oscillator.

n. CRYSTAL CALIBRATOR.—The crystal calibrator circuit provides accurate frequency check points for calibrating the main tuning dial. These check points occur at every 10 kilocycles throughout the tuning range of the low frequency receivers, at every 50 kilocycles of the medium-frequency receivers and every 200 kilocycles of the high-frequency receivers. The calibrator circuits are described separately for the three frequency receiver types.

(1) 10-KC CRYSTAL CALIBRATOR (AN/FRR-21).—Refer to figure 2-6. The 10-kilocycle crystal calibrator consists of 10-kilocycle multivibrator V1402, which is synchronized to a 50-kilocycle Pierce oscillator, V1401. The Pierce oscillator circuit includes a triode V1401, the plate, pin 8, and grid, pin 1 are coupled to each other through capacitor C1406 and crystal Y1401, which is the frequency-determining element. Capacitors C1401, C1402, and C1403 comprise the voltage divider network to maintain proper voltage and phase relationship among the grid, cathode, and plate for oscillation

to occur. The grid circuit includes a screwdriver-adjusted capacitor C1401 which permits the frequency to be adjusted over a limited range. This adjustment is made at the factory and should not, normally require adjustment in the field. The circuit has two outputs:

(a) One output at the cathode, pin 5, which couples through capacitor C1408 to the grid, pin 1, of the multivibrator tube V1402.

(b) One output at the plate, pin 8, which couples through capacitors C1408 and C1064 to the grid, pin 1, of V1002 in the second i-f assembly.

The 50-kilocycle signal from the cathode of V1401 which is applied to the control grid (pin 1) of V1402 through C1408 synchronizes the 10-kc multivibrator. The pentode V1402 acts as two triodes to form a plate-coupled multivibrator. The cathode (pin 2-8), grid 1 (pin 1) and grid 2 (pin 7) act as one triode. (Grid 1 acts as a control grid, and grid 2 acts as a plate.) The second triode is composed of grid 3 (pin 4), the plate (pin 5), and the virtual cathode existing between grids 2 and 3. (Grid 3 acts as a control grid.) The first triode is plate-coupled to the control grid (pin 4) of the second triode through C1410, and R1410. The second triode is plate coupled to the control grid of the first triode (pin 1), through C1409 and R1405. The cathode resistor R1411 is adjustable to give approximately a 10-kc output. The 50-kc signal which is coupled from the cathode of V1401 to the control grid (pin 1) of V1402 through C1408, synchronizes V1402 to 10 kc.

The 10-kc multivibrator output is cathode-coupled to the r-f amplifier V126. This output is rich in harmonics. It is fed through V126 to V151 where it beats with the signal from the local oscillator V201. The beat signal goes through switches, S701, S702, S1001, S1002, and associated networks, through V1001, to the input circuit (grid pin 1) of V1002. In this same circuit, it combines with the fourth harmonic (200 kc) of the 50-kc output from V1401, applied by the path described above, giving a zero-beat at every 10-kc separation of the tuning dial setting.

The main tuning dial can thereby be calibrated independently of external signals by use of the CAL ADJUST control, if the CAL switch is turned to the ON position.

The CAL switch (S2002 on AN/FRR-21, S2102 on AN/FRR-22, and S2202 on AN/FRR-23), is connected so that in the OFF position B+ voltage is not applied to the crystal calibrator. In the ON position, B+ voltage is applied to the calibrator and is removed from the antenna preamplifier, V101, and BFO V1301. This prevents interference with the crystal calibrator from either externally applied signals or the BFO.

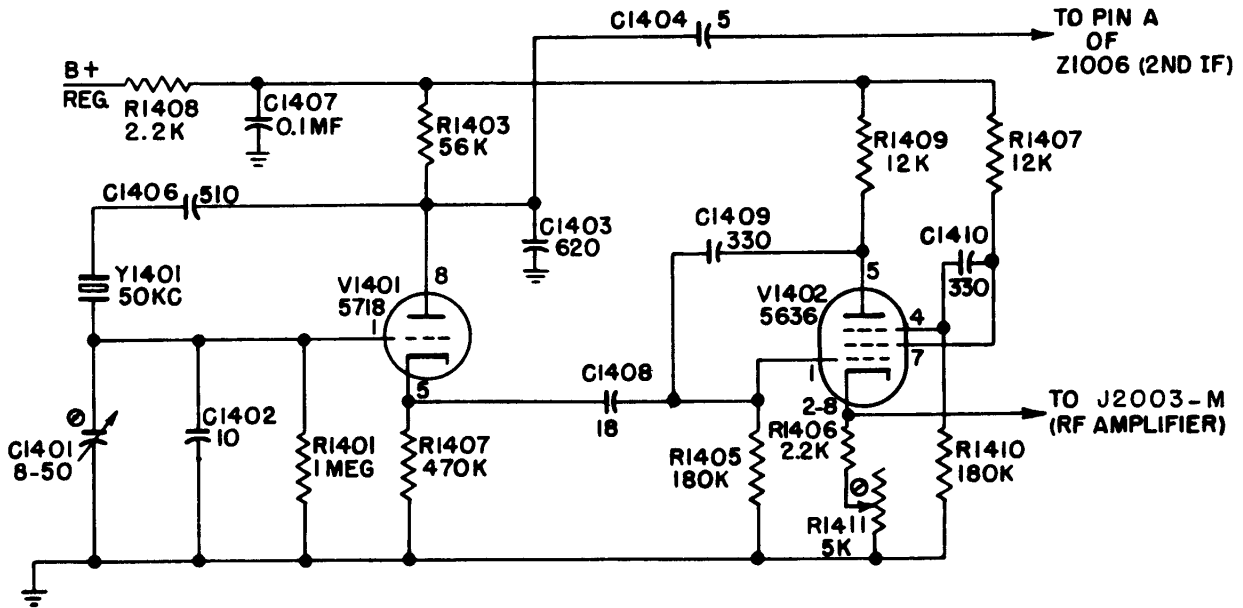


Figure 2-6. Crystal Calibrator, Simplified Schematic AN/FRR-21

(2) 50-KC CRYSTAL CALIBRATOR (AN/FRR-22 RECEIVER).—Refer to figure 2-7. The crystal calibrator circuit used in the AN/FRR-22 receiver is a cathode-coupled multivibrator, V1501 and V1502, which is locked to 50 kilocycles by Y1501. One output, rich in harmonics of 50 kc, is taken from the plate of V1502 and applied to the grid pin 1 of the r-f amplifier V3035, through C1505, J1501C, J3035M, C3060, and J3036K. After passing through V3035, the signal is combined in the mixer V351 with the signal from the local oscillator V401. The combination-frequency signal output of V351 then goes through switches S801, S802, S1001, S1002, and associated networks, through V1001, to the input circuit of V1002. In this last circuit, it combines with a second output from V1501/V1502.

The second output is taken from the common cathodes of V1501 and V1502 and its fourth harmonic is applied to V1002 of the second i-f assembly to produce a beat note as just mentioned. The combination of the two signals gives a beat note at every 50-kilocycle interval throughout the tuning range of the receiver. The main tuning dial can thereby be calibrated independently of external signals if the CAL switch is turned to the ON position. The CAL switch (S2002 on AN/FRR-21, S2102 on AN/FRR-22, and S2202 on AN/FRR-23) is connected so that in the OFF position B+ voltage is not applied to the crystal calibrator. In the ON position, B+ voltage is applied to the calibrator, and is removed from the antenna preamplifier, V3001, and BFO, V1301. This prevents interference with the crystal calibrator from either externally applied signals or the BFO.

(3) 200-KC CRYSTAL CALIBRATOR (AN/FRR-23 RECEIVER).—Refer to figure 2-7. The crystal calibrator circuit used in the AN/FRR-23 receiver is a cathode coupled multivibrator, V1201 and V1202, which is locked to 200 kilocycles by Y1201. One output, rich in harmonics of 200 kc, is taken from the plate of V1202 and applied to the grid pin 1 of the r-f amplifier V3135, through C1205, J1201C, J3135M, C3168, J3136K, and C3169. After passing through V3135 the signal is combined in the mixer, V551, with the signal from the local oscillator, V601 or V4401. The combination-frequency signal output of V551 then goes through switches S901, S902, S1001, S1002 and associated networks, through V1001, to the input circuit of V1002. In this last circuit, it combines with a second output from V1201/V1202 to be described presently.

The second output is taken from the common cathodes of V1201 and V1202, and is applied to V1002 of the second i-f assembly to produce a beat note as just mentioned. The combination of the two signals gives a beat note at every 200-kilocycle interval throughout the tuning range of the receiver. The main tuning dial can thereby be calibrated independently of external signals if the CAL switch is turned to the ON position.

The CAL switch (S2002 on AN/FRR-21, S2102 on AN/FRR-22, and S2202 on AN/FRR-23) is connected so that in the OFF position B+ voltage is not applied to the crystal calibrator. In the ON position, B+ voltage is applied to the calibrator, and is removed from the antenna preamplifier, V3101, and BFO, V1301. This prevents interference with the crystal calibrator from either externally applied signals or the BFO.

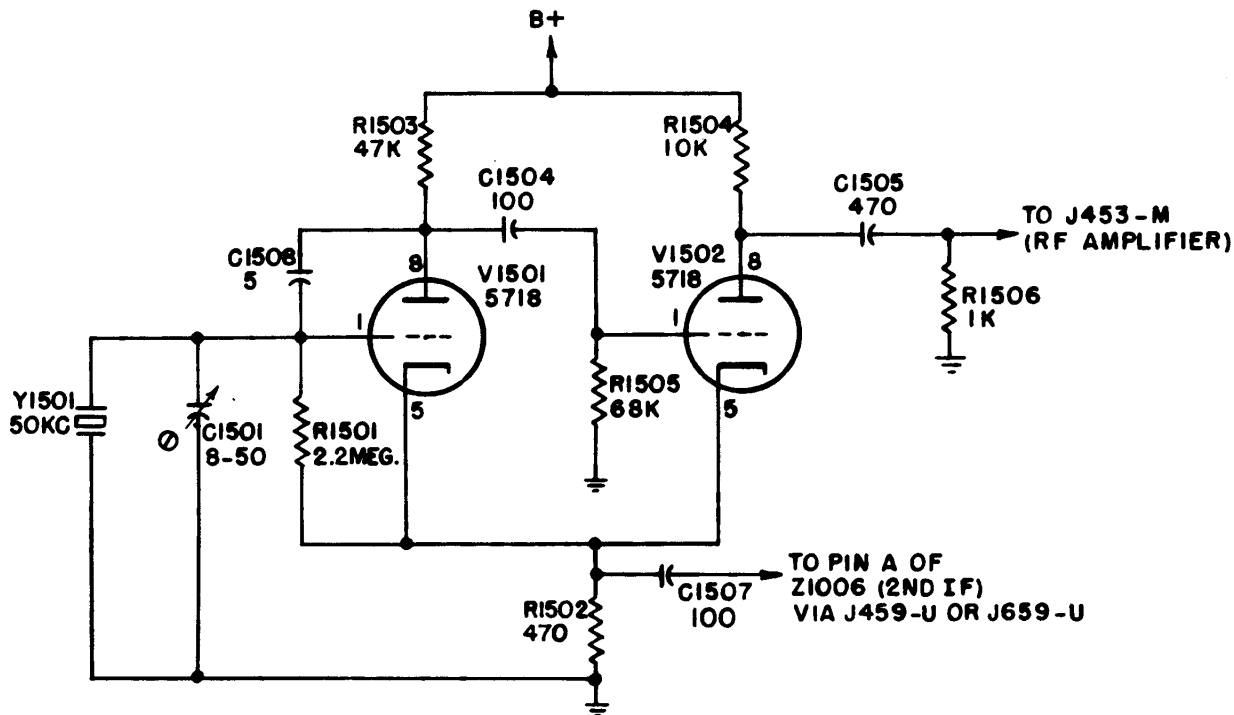
*o.* BAND SELECTOR FUNCTIONING.—The band selector assembly consists of a gear and sliding bar which moves the five-position wafer switches in the antenna, r-f, mixer, oscillator, and first i-f assemblies to connect appropriate circuits for the band of frequencies selected. The ranges of frequencies covered in each of the five bands are marked on the front panel around the band selector knob. The sliding bar, which extends along the ends of the antenna, r-f, mixer, oscillator, and first i-f assemblies, is made to move in and out by gears and a rack which are driven when the shaft on the band selector is turned. Crank arms connected to the extended ends of the wafer switch shafts in each assembly, have pins which fit into slots in the sliding rack. Stops on the linkage prevent the band switch assembly from moving through more than five positions. Each wafer switch assembly is provided with a detenting mechanism to assure accurate positioning of the switch.

*p.* RECEPTION CONTROL FUNCTIONING.—The RECEPTION control operates in a manner similar to the band selector to actuate wafer switches in the second i-f, audio, and BFO assemblies and select proper

circuits for optimum conditions of reception of one of three classes of emission in the low-frequency receivers, or one of four classes of emission in the medium- and high-frequency receivers. Four positions of the control are used in the low-frequency receivers, corresponding to settings of FSK, A1 BROAD, A1 SHARP, and A2. Six positions of the control are used in the medium- and high-frequency receivers corresponding to A1 BROAD, A1 SHARP, A2, A3 SHARP, A3 BROAD, and FSK. See Table 2-2 for circuits which are affected by the RECEPTION control, and how they are affected.

*q.* TUNING DIAL ASSEMBLY.—Refer to figures 7-10 through 7-13. The frequency to which the receiver is tuned appears projected on a translucent screen located at the upper left of the front panel. Calibration of the tuning dial is in kilocycles on the AN/FRR-21 receivers and in megacycles on the AN/FRR-22 and -23 receivers.

The projection system consists of a glass disk on which the tuning range of the receiver is calibrated in five scales. A light source is mounted in a housing behind the tuning dial. A portion of one of the optical scales is projected through a system of lenses and onto



- NOTES: 1. SYMBOL NUMBERS AND COMPONENT VALUES ARE THOSE OF AN/FRR-22.  
2. FOR AN/FRR-23 USE I200 SYMBOL SERIES, AND COMPONENT VALUES GIVEN IN APPROPRIATE SCHEMATIC DIAGRAM.  
3. UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES GIVEN IN OHMS AND CAPACITANCE VALUES IN MMF.

Figure 2-7. Crystal Calibrator, Simplified Schematic AN/FRR-22 and -23

TABLE 2-2. RECEPTION CONTROL FUNCTIONS

CONTROL POSITION	CONTROLLED CIRCUIT	FINAL CONTROLLED EFFECT		
		LOW-FREQ. RECEIVERS	MEDIUM-FREQ. RECEIVERS	HIGH-FREQ. RECEIVERS
A-1 BROAD	I-F selectivity A-F selectivity AGC Output limiter R-F gain control BFO Silencer circuit	Sharp Broad .... On Active On ....	Sharp Broad Off On Active On Inactive	Sharp Broad Off On Active On Inactive
A-1 SHARP	I-F selectivity A-F selectivity AGC Output limiter R-F gain control BFO Silencer circuit	Sharp Sharp .... On Active On ....	Sharp Sharp Off On Active On Inactive	Sharp Sharp Off On Active On Inactive
A-2	I-F selectivity A-F selectivity AGC Output limiter R-F gain control BFO Silencer circuit	Medium Broad .... On Active Off ....	Medium Broad Off On Active Off Inactive	Medium Broad Off On Active Off Inactive
A-3 SHARP	I-F selectivity A-F selectivity AGC Output limiter R-F gain control BFO Silencer circuit	.... .... .... .... .... .... ....	Medium Broad On Off Inactive Off Active	Medium Broad On Off Inactive Off Active
A-3 BROAD	I-F selectivity A-F selectivity AGC Output limiter R-F gain control BFO Silencer circuit	.... .... .... .... .... .... ....	Broad Broad On Off Inactive Off Active	Broad Broad On Off Inactive Off Active
FSK	I-F selectivity A-F selectivity AGC Output limiter R-F gain control BFO Silencer circuit	Sharp Broad .... Off Active On ....	Sharp Broad On Off Inactive On* Inactive	Sharp Broad On Off Inactive On* Inactive

\* The beat note with FREQ. VERNIER control centered, and input frequency tuned to the i-f (maximum reading on TUNING meter) 2550 cycles in these positions, 0 cycle in all others.

a mirror which reflects the image of the scales back upon the translucent screen. The glass disk is rotated by gears as the tuning knob is turned. When the setting of the band selector is changed, the dial light and lens housing is moved up or down by a cam driven from the band selector gears to align the lens system with the corresponding frequency scale on the glass disk. A CAL ADJUST KNOB and locking screw, located to the right of the tuning dial, provides a means of shifting the frequency scale on the translucent screen when recalibrating the receiver in conjunction with the crystal-controlled calibrator. This is done by a slight horizontal movement of the lens system.

The bayonet-base lamps (dial lamps I3601 and I3602 on AN/FRR-21, I3701 and I3702 on AN/FRR-22, and I3801 and I3802 on AN/FRR-23) are mounted in the dial light housing. Either lamp can be illuminated and moved into physical alignment with the lens system by the setting of the LAMP switch (S3601 on AN/FRR-21, S3701 on AN/FRR-22, and S3801 on AN/FRR-23), located on the front of the dial assembly. The bulbs are accessible from the top of the receiver after the cover plate to the dial light housing has been removed. A

lamp adjustment (O3626 on AN/FRR-21, O3726 on AN/FRR-22, and O3826 on AN/FRR-23) is provided to locate the lamp filament in the optimum position.

The dial lamp also illuminates the logging dial by the means of an aperture in the side of the dial light housing. Brilliance of the dial light is controlled, from maximum to extinguished, by the setting of the DIM control (R3601 on AN/FRR-21, R3701 on AN/FRR-22, and R3801 on AN/FRR-23). This control is located on the front of the dial assembly. The dial lamps are connected to the 6.3-volt winding of T1601 (terminal 14 to ground) through terminal 1 of the dial lights terminal board (E2001 on AN/FRR-21, E2101 on AN/FRR-22, and E2201 on AN/FRR-23) and J1601V.

The logging dial assembly comprises two movable scales located below the translucent screen. An index marker "0" is located between the two movable scales. The movable scales are driven through reduction gears by the tuning knob so that the top scale, calibrated in hundreds from zero to one thousand, moves between two one-hundred markers while the bottom scale makes a complete rotation, from zero to one hundred in steps of one.

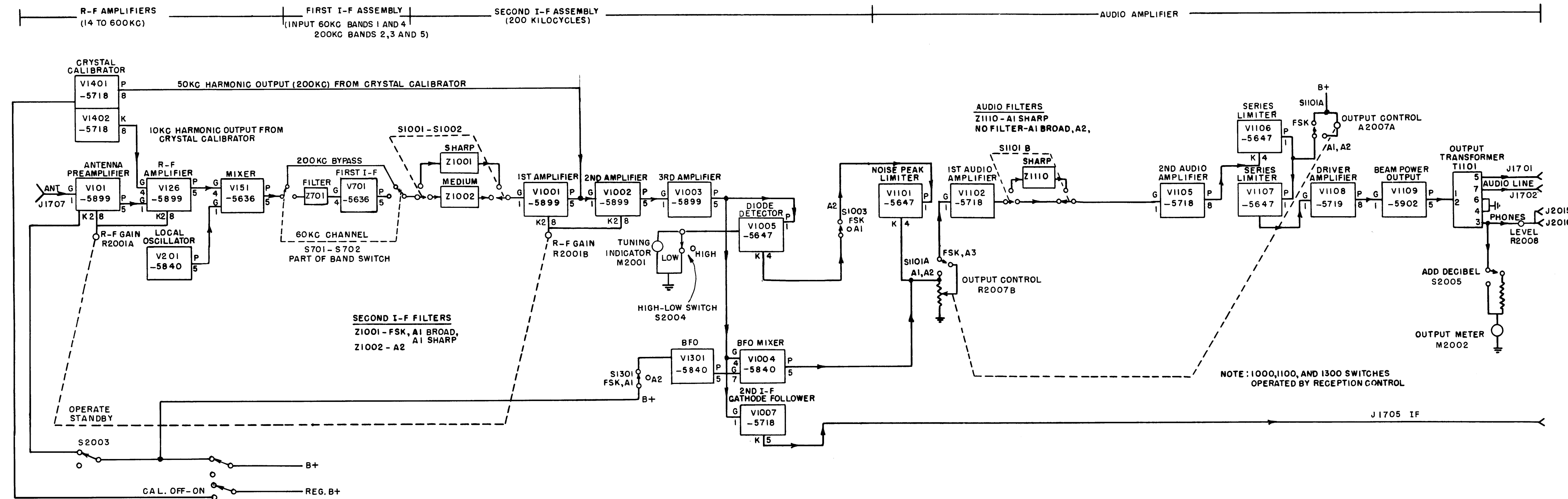


Figure 2-8. Functional Block Diagram, AN/FRR-21



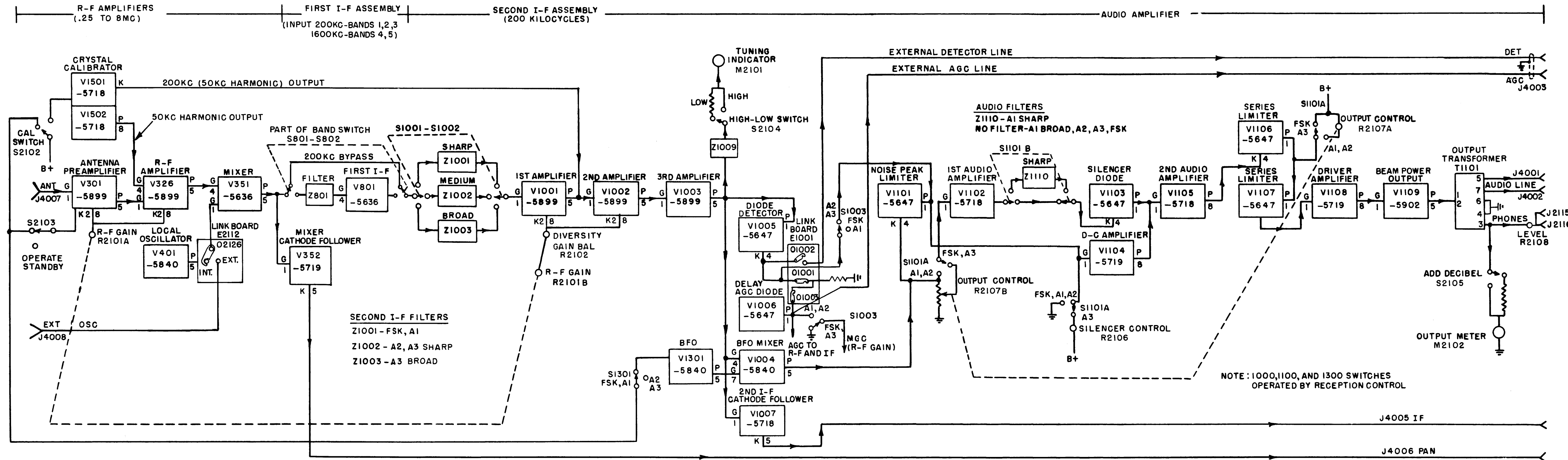


Figure 2-9. Functional Block Diagram, AN/FRR-22

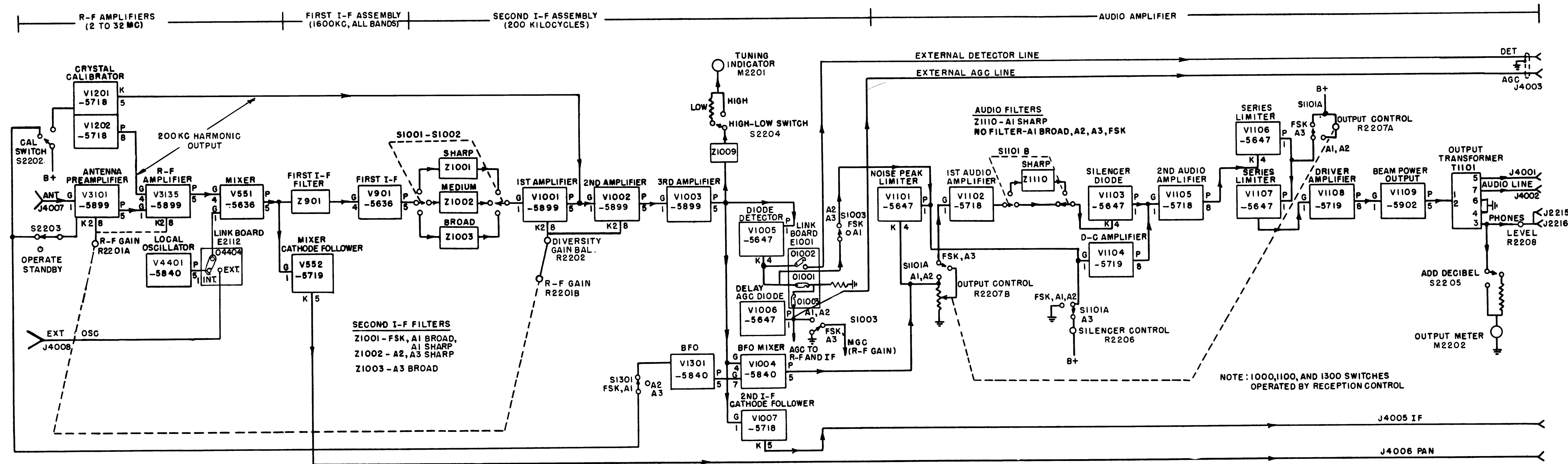


Figure 2-10. Functional Block Diagram, AN/FRR-23

## SECTION 3

# INSTALLATION

### 1. UNPACKING.

*a. GENERAL.*—Radio Receiving Sets AN/FRR-21, AN/FRR-22, or AN/FRR-23 include equipment shown in figure 1-1 and listed in Table 1-1. Shipping data is given in Table 1-3.

#### CAUTION

THE RECEIVERS ARE SHIPPED WITH THE CHASSIS MOUNTED IN THEIR CABINET AND THE ELECTRON TUBES IN PLACE. AVOID EXTREME SHOCKS WHEN UNPACKING AND INSTALLING THE EQUIPMENT IN ORDER NOT TO DAMAGE ANY PART.

*b. UNPACKING PROCEDURE.*—The tools required for unpacking include a pair of tin snips, a nail puller, a prying tool, and a penknife.

Set the crate containing the equipment in a position as shown in figure 3-1, step (1) and follow the procedure given below and illustrated in figure 3-1:

- (1) Clip the two metal bands that bind the wooden crate.
- (2) Pull out nails and remove the top cover and two sides.
- (3) Tear open the waterproof paper wrapping.
- (4) Remove the four corner supports and top corrugated pad.
- (5) Remove the corrugated box containing the receiver from the wooden crate.
- (6) Open the four flaps of the corrugated box and remove the corrugated container.
- (7) Tear open the moistureproof paper barrier.
- (8) Open the four flaps on the corrugated container and carefully remove the items of Radio Receiving Sets AN/FRR-21, -22, or -23.
- (9) Check the items removed against those listed in Table 1-1.

### 2. INSTALLATION.

Radio Receiving Sets AN/FRR-21, -22, and -23 are intended for fixed station operation. Powered from a

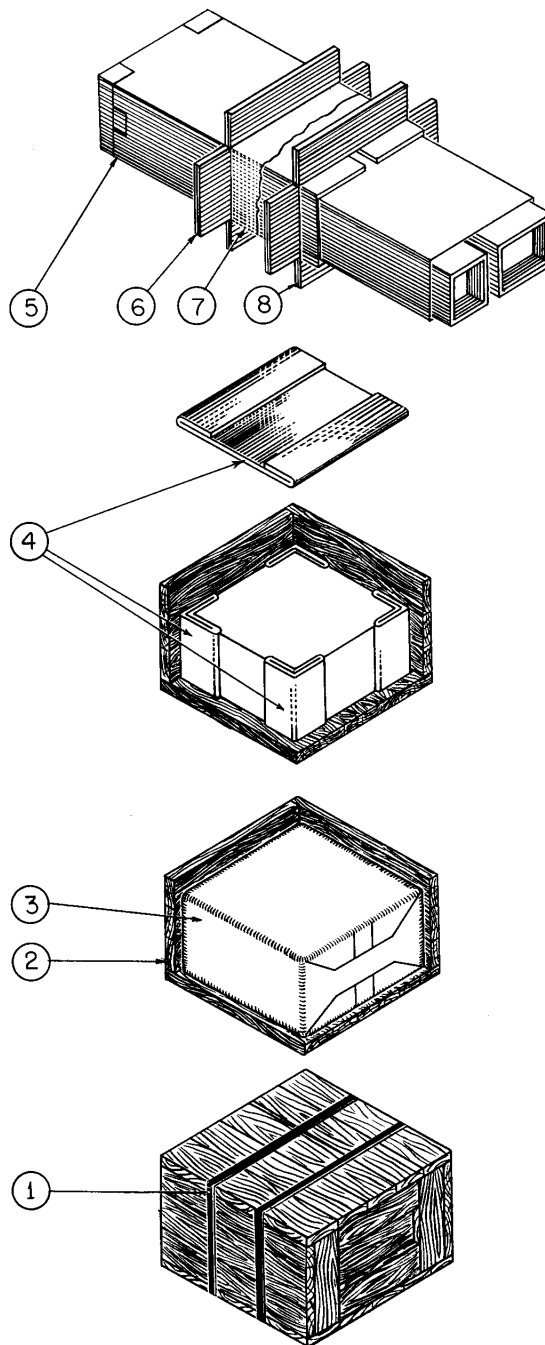


Figure 3-1. Unpacking

105, 115, or 125-volt, 50-60 or 400-cycle a-c supply, they are designed for rack mounting without the use of shock mounts. They may also be installed on a table or shelf, if desired.

**NOTE**

All installation should be made in accordance with approved Bureau of Ships drawings.

*a.* REMOVING THE CHASSIS.—Refer to figure 3-2. Lift the circular metal catches located toward the bottom of the two handles at the sides of the front panel and raise the two release bars astride the handles as far as they will go; then slide the chassis out. Depress the two chassis release levers located on the sides of the chassis, and pull the chassis off the slide assembly (support the chassis and the cabinet while removing chassis from slide assembly).

*b.* MOUNTING THE RECEIVER CABINET.

(1) RACK MOUNTING.—Mount the cabinet in a standard rack, 19 inches wide, by means of the mounting brackets at the sides of the receiver, shown in figure 3-13. Use eight 12-24 bolts and associated washers to fasten the receiver mounting brackets to the corresponding brackets on the rack.

(2) TABLE OR SHELF MOUNTING.—After the chassis has been removed from its cabinet as described in paragraph 2*a*, remove the four plug buttons in the bottom of the case. Allow at least three inches at the back of the cabinet for cable clearance, and drill four 7/16-inch clearance holes through the mounting surface in accordance with the drawing of the cabinet bottom view shown in figure 3-13. Determine length of the 3/8-24 bolts for mounting by adding 5/8 inch to the thickness of the mounting surface. Insert the bolts, lockwashers, and flatwashers as shown in Typical Mounting Section of figure 3-13. Connect a grounding braid to one of the mounting bolts as directed in particular installation plan (see paragraph 3*d*).

**NOTE**

If the receiver is to be mounted so that the back of the cabinet is close to a bulkhead, connect the power input and output cables to the receptacles at the back of the cabinet before securing receiver cabinet to the mounting surface. See paragraphs 2*d*, 2*e*, and 2*f* for cable information. Leave a minimum space of two inches around the equipment for ventilation.

*c.* REPLACING THE CHASSIS.—Extend the two tracks mounted on the inside walls of the receiver cabinet to their full length, then lift the chassis into position so the rails at the sides of the chassis engage the tracks in the cabinet. Push the chassis on the slide assembly; until the locking mechanism clicks into place. Then depress the two release levers at the sides of the chassis, and continue pushing the chassis into the cabinet as far as it will go. Push the release bars back in position on the handles. They will supply the leverage needed to secure the chassis in the cabinet. Make sure the two round metal catches on the release bars are down so the bars stay in place.

*d.* CABLING.—Cables must be run to appropriate receptacles at the back of the receiver to complete installation. See figures 3-3 and 3-13. In a standard installation, these cables will include the power line, antenna lead, and one or two audio cables. Receptacles have been provided for use with a panoramic adapter, a frequency shift converter of either the i-f or audio type, and additionally on the AN/FRR-22 and -23 receivers on External oscillator. A receptacle labeled DET AGC. has been provided on the AN/FRR-22 and -23 receivers for diversity application. Table 3-1 lists cable connectors and functions.

Fabricate those cables that are needed for the particular installation considered, following the cable fabrication instructions given below in paragraph 2*e*. Then connect these cables as described in paragraph 2*f*.

Run the cables as directly as possible from their external connections to the receiver, avoiding any sharp bends in the leads. Allow about six inches of slack in the cable at the receiver end so that the cable connectors can be attached to the receptacles without pulling or binding at the connection. On those cables which connect to external equipment, the plug which mates with the receptacle of the external equipment will have to be fabricated to the other end of the cable.

*e.* CABLE FABRICATION.—Receptacles are provided at the rear of the receiver and are labeled I.F., PAN, EXT. OSC., ANT., POWER, AUDIO, and DET. AGC. These are shown in figure 3-3 together with their external mating connectors and related cables. The connectors are provided in a paper container packed with the receiver. These connectors are shown in figure 1-1. The tools needed for fabrication of cables to these connectors are a pair of long nose pliers, a pair of diagonal pliers, a screwdriver (4-inch blade), a soldering iron, solder, and a small knife. Instructions for fabricating cable to plug are as follows:

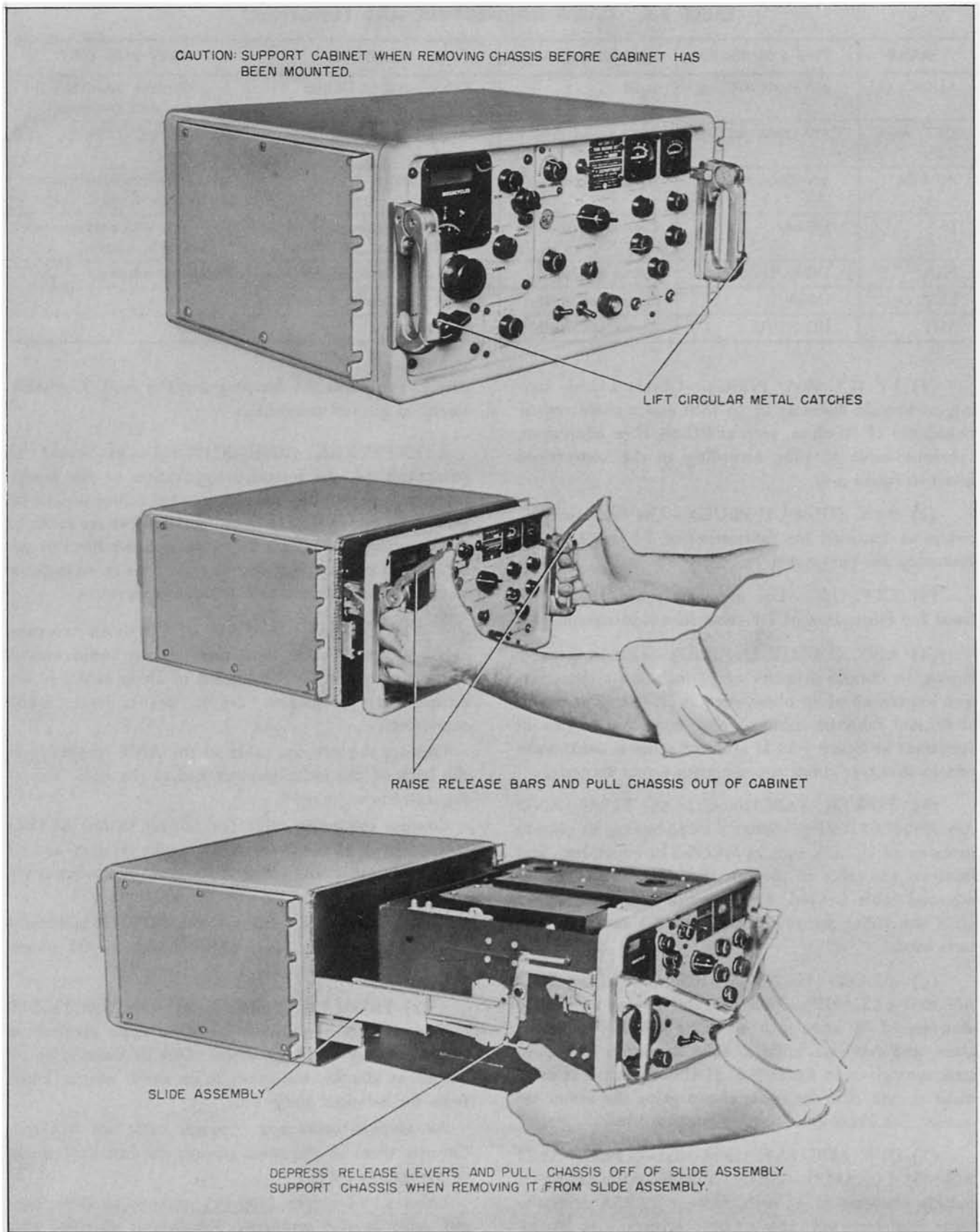


Figure 3-2. Removal of Chassis from Cabinet

TABLE 3-1. CABLE CONNECTORS AND FUNCTIONS

NAME	TYPE CONNECTOR	CONTACTS USED	FUNCTION	NAVY TYPE UNIT
AUDIO (2)	AN-3106A-10SL-4S	A, B	AUDIO and F1 Output	Loud-Speaker amplifier frequency shift converter
DET. AGC.	AN-3106A-10SL-4S	DET-A and ground AGC-B and ground	Output for external detector and AGC.	Receiver (AN/FRR-19, -22, c/ or -23)
POWER	AN-3106A-16S-5S	B, C, A-ground	Power cable	105-115 or 125 volt, 50-60 or 400 cycle supply
IF	UG-88/U	Center and shell	I-F output to frequency shift converter or pan adapter	Frequency shift converter and panoramic adapter
PAN	UG-88/U	Center and shell	Output to panoramic adapter	Panoramic adapter
EXT. OSC.	UG-88/U	Center and shell	Input from external oscillator	
ANT	UG-21B/U	Center and shell	Antenna input	Antenna

(1) I-F (UG-88/U PLUG).—Obtain a cable having an outside diameter of  $1/4$  inch and a characteristic impedance of 50 ohms, such as RG-58/U or equivalent. Fabricate cable to plug according to the instructions given in figure 3-4.

(2) PAN. (UG-88/U PLUG).—Use the same procedure as outlined for fabrication of I-F cable in the preceding sub-paragraph.

(3) EXT. OSC.—Use the same procedure as outlined for fabrication of I-F cable in sub-paragraph (1).

(4) ANT (UG-21B/U PLUG).—Obtain a cable having an outside diameter of  $3/8$  inch and a characteristic impedance of 70 ohms, such as RG-12/U or equivalent, and fabricate cable to plug according to the instructions in figure 3-5. If armored cable is used, make certain that rear connector nut grips armor securely.

(5) POWER (AN-3106A-16S-5S PLUG AND AN-3057-8 CLAMP).—Select a cable having an outside diameter of  $1/2$  inch, such as MCOS-2 or equivalent, and fabricate the cable to plug as shown in figure 3-6. If armored cable is used, make certain that cable clamp grips the armor securely. See Table 3-1 for plug contacts used.

(6) AUDIO (AN-3106A-10SL-4S PLUG AND AN-3057-4 CLAMP).—Select a cable having an outside diameter of  $3/8$  inch, such as TTHFWA 1 $1/2$  or equivalent, and fabricate cable to plug according to the instructions given in figure 3-6. If armored cable is used, make certain that the cable clamp grips the armor securely. See Table 3-1 for plug contacts used.

(7) DET. AGC. (AN-3106A-10SL-4S PLUG AND AN-3057-4 CLAMP).—Select a shielded cable having an outside diameter of  $3/8$  inch, such as TTRSA or equivalent, and fabricate cable to plug according to the instructions given in figure 3-6. If armored cable is used, make certain that the cable clamp grips the armor se-

curely. See Table 3-1 for plug contacts used. Use cable shield as ground connection.

f. EXTERNAL CONNECTIONS.—As stated in paragraph 2d, the intended application of the equipment will determine what particular cables are to be used. The cables having been fabricated as set forth in the preceding paragraph 2d or 2e, connect them as described below and as shown in figure 3-3 in accordance with the contemplated installation requirement.

(1) NORMAL INSTALLATION.—An antenna cable, a power cable, and one or two audio output cables are required. Fabrication of these cables is described in paragraphs 2e(4), 2e(5), and 2e(6) respectively.

Connect the antenna cable to the ANT receptacle at the back of the radio receiver and to the radio receiving antenna to be used.

Connect the audio cable (or cables) to the AUDIO receptacle(s) at the back of the radio receiver and to the loudspeaker or other associated audio-frequency equipment.

Connect the power cable to the POWER receptacle at the back of the radio receiver and to the power source used for energizing the receiver.

(2) FREQUENCY SHIFT (F1) CONNECTIONS.—Two outputs are provided on the radio receiver to feed frequency shift converters. One of these is an i-f output at 200 kc, the other is an audio output taken from the balanced audio line.

An antenna cable and a power cable are required. Connect these in the same manner as described above in paragraph 2f(1).

Either an i-f output (200 kc) cable or an audio output cable is also required. Fabrication of these two cables is described in paragraphs 2e(1) and 2e(6). Connect the desired cables as follows:

RECEIVER - RECEPTACLES

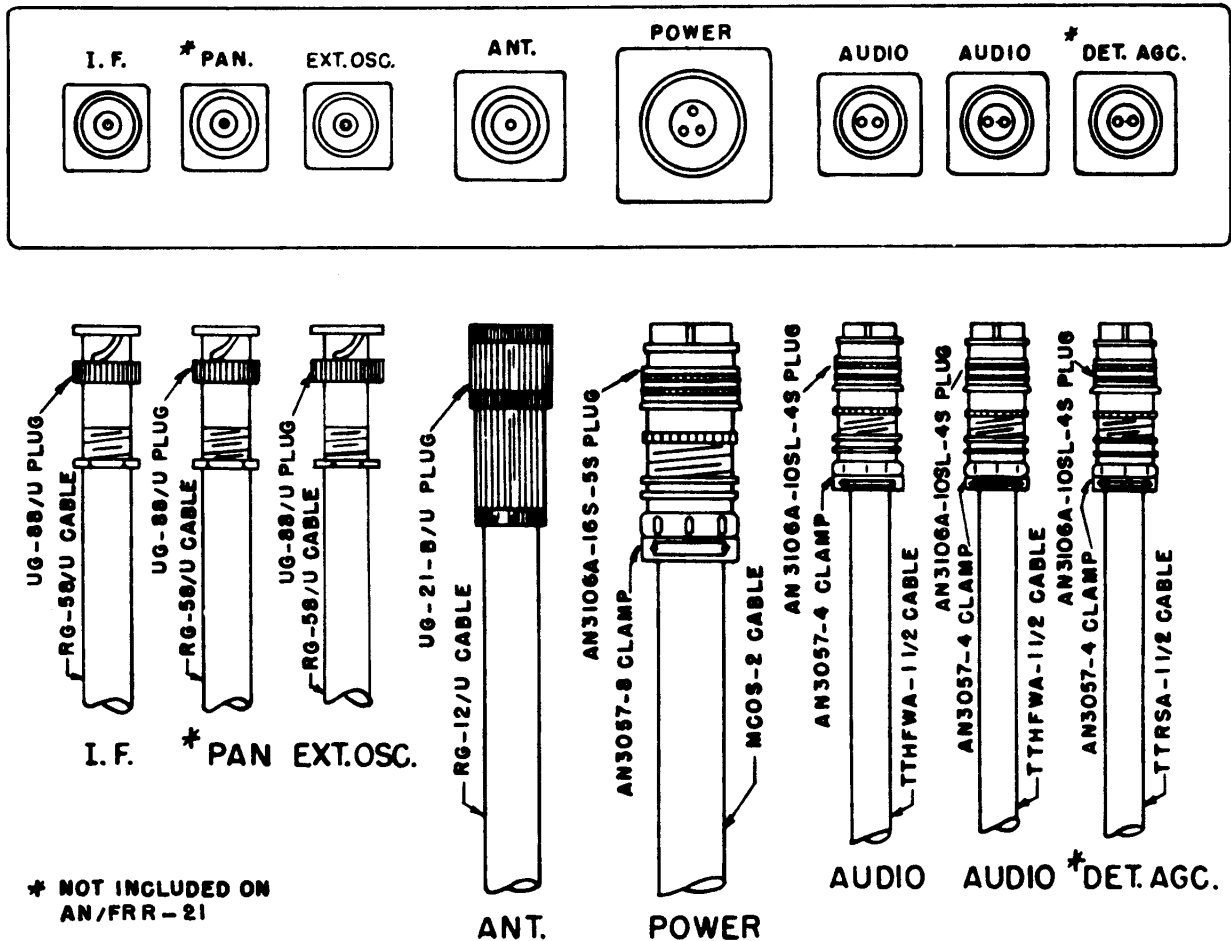


Figure 3-3. External Cabling Diagram

Connect the I-F CABLE to the I. F. connector at the back of the radio receiver and to the proper i-f input connection on a frequency shift converter or other apparatus having similar 200-kc signal input requirements.

Connect the AUDIO CABLE to the AUDIO connector at the back of the radio receiver and to the audio input connection of frequency shift converter of a converter-comparator group or to the input connection of a facsimile converter.

(3) PANORAMIC ADAPTER CONNECTION.—Radio Receivers AN/FRR-22 and -23 are provided with an output to feed a panoramic adapter. An ANTENNA CABLE, a POWER CABLE, and a PAN cable are required. Fabrication of these cables is described in paragraphs 2e(4), 2e(5), and 2e(2) respectively.

Connect the ANTENNA CABLE and POWER CABLE as described in paragraph 2f(1).

Connect the PAN CABLE to the PAN receptacle at the back of the radio receiver. Connect the other end of the cable to the appropriate input terminal on an appropriate panoramic adapter.

(4) DUAL DIVERSITY CONNECTION.—Two outputs are provided in Radio Receivers AN/FRR-22, and -23 to operate in a dual diversity system. One of these outputs is the detector voltage, and the other is automatic gain control voltage. They both come through a common receptacle labeled DET. AGC. at the back of the receiver cabinet. Two antenna cables, two power cables, and one DET. AGC. CABLE required. Fabrication of these cables is described in paragraphs 2e(4), 2e(5) and 2e(7) respectively.

Connect the antenna cables and the power cables as described in paragraph 2f(1). Use one antenna cable between each receiver and antenna, and one power cable between each receiver and power source. Do not connect



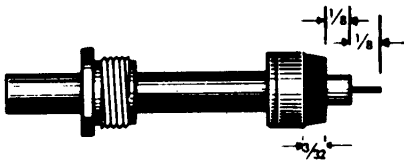
Trim jacket  $\frac{1}{4}$ " for RG-58/U,  $\frac{3}{16}$ " for RG-59/U or  $\frac{7}{16}$ " for RG-71/U.



Fray shield and strip inner dielectric  $\frac{1}{8}$ ". Tin center conductor.



Taper braid and slide nut, washer, gasket and clamp over braid. Clamp is inserted so that its inner shoulder fits squarely against end of cable jacket.



With clamp in place, comb out braid, fold back smooth as shown and trim  $\frac{3}{32}$ " from end.



Slip contact in place, butt against dielectric and solder. Remove excess solder from outside of contact. Be sure cable dielectric is not heated excessively and swollen so as to prevent dielectric from entering into connector body.



Push assembly into body as far as it will go. Slide nut into body and screw in place with wrench until tight. For this operation, hold cable and shell rigid and rotate nut.

**Figure 3-4. Cable Fabrication, UG-88/U Plug**

the antenna cables to the receiver until the adjustments described in paragraph 3g have been made.

Connect the DET. AGC. cable between the two receivers, using the DET. AGC. receptacle at the back of the receiver for this connection.

The antennas should be appropriately positioned for diversity operation.

(5) EXTERNAL OSCILLATOR CONNECTION.  
—An input receptacle on the rear of Radio Receivers AN/FRR-22 and -23, labeled EXT. OSC., is provided to accommodate an external oscillator. The cable connections needed for this type of installation are the same as those given in paragraph 2f(1) for a normal installation, plus one external oscillator cable. Fabrication of this cable is given in paragraph 2e(3). Connect the



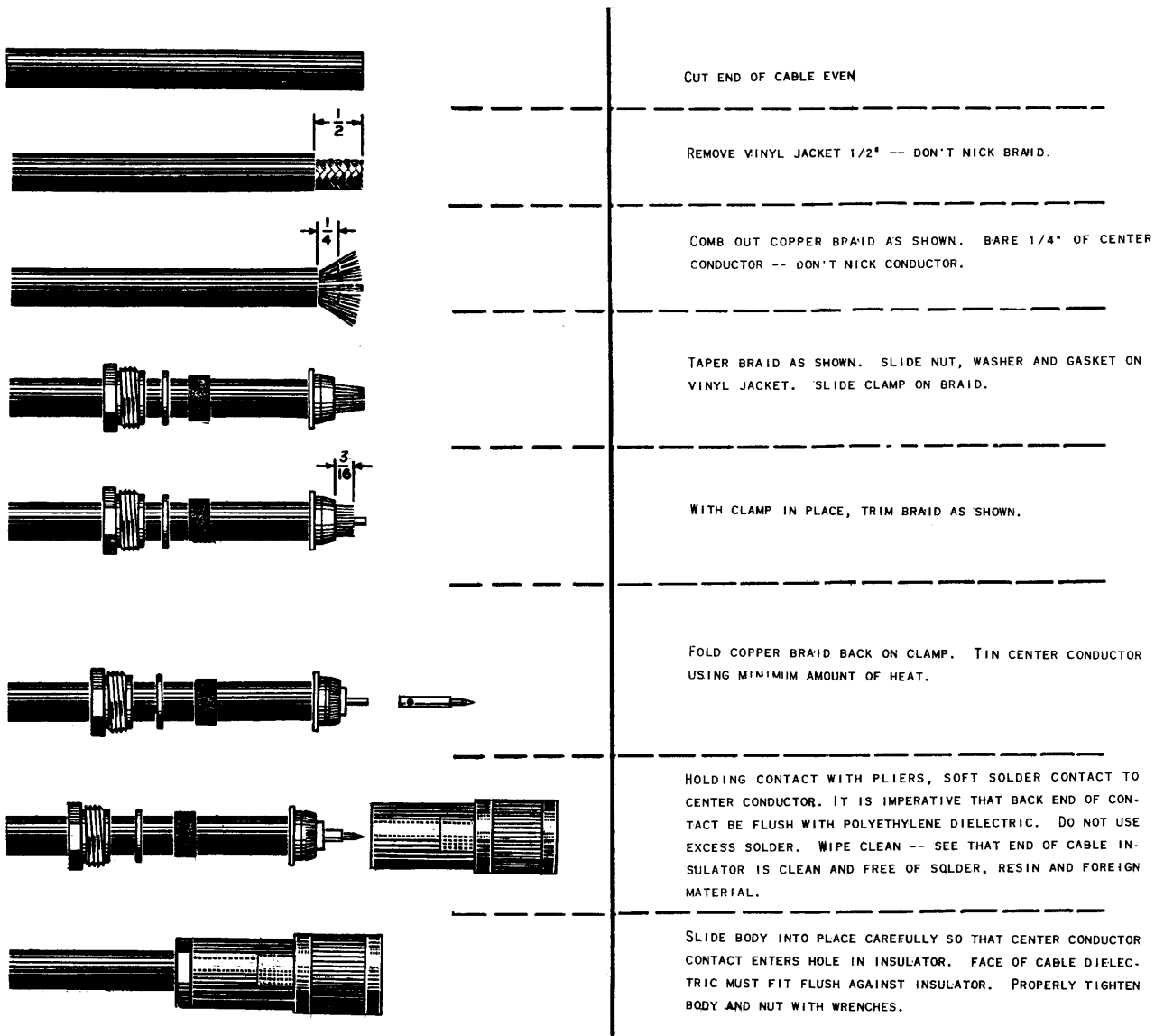


Figure 3-5. Cable Fabrication, UG-21B/U Plug

plug-fabricated end of the oscillator cable to the EXT. OSC. receptacle at the rear of the receiver cabinet. Connect the other end of the cable to the output of the external oscillator to be used.

To put Radio Receivers AN/FRR-22 and -23 into external oscillator operation, set the chassis in a position that gives access to the bottom of the receiver and proceed as follows:

(a) On Radio Receiver AN/FRR-22, set link O2126 in the number 6 position and link O2125 in the number 2 position on link board E2112.

(b) On Radio Receiver AN/FRR-23, set link O4404, in the position that connects to J4403E and set link O2225 in the number 2 position on link board E2212.

When an external oscillator is used with Radio Receivers AN/FRR-22 and -23, the correct frequency value must be set above the desired incoming signal frequency (as given in Table 3-2). The external oscillator must be capable of supplying at least 5 volts at the input to the receiver.

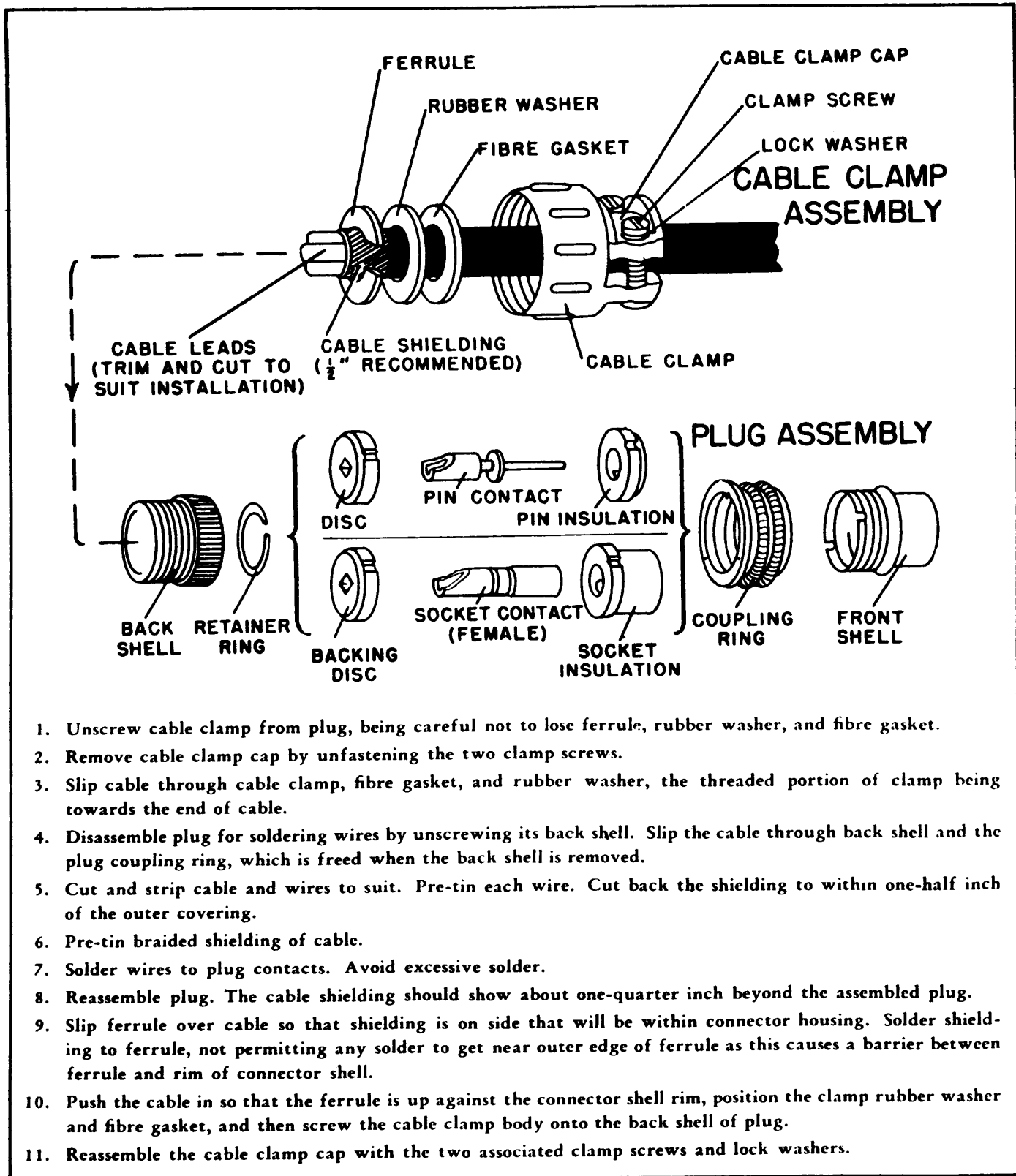


Figure 3-6. Cable Fabrication, AN-3106A Plugs

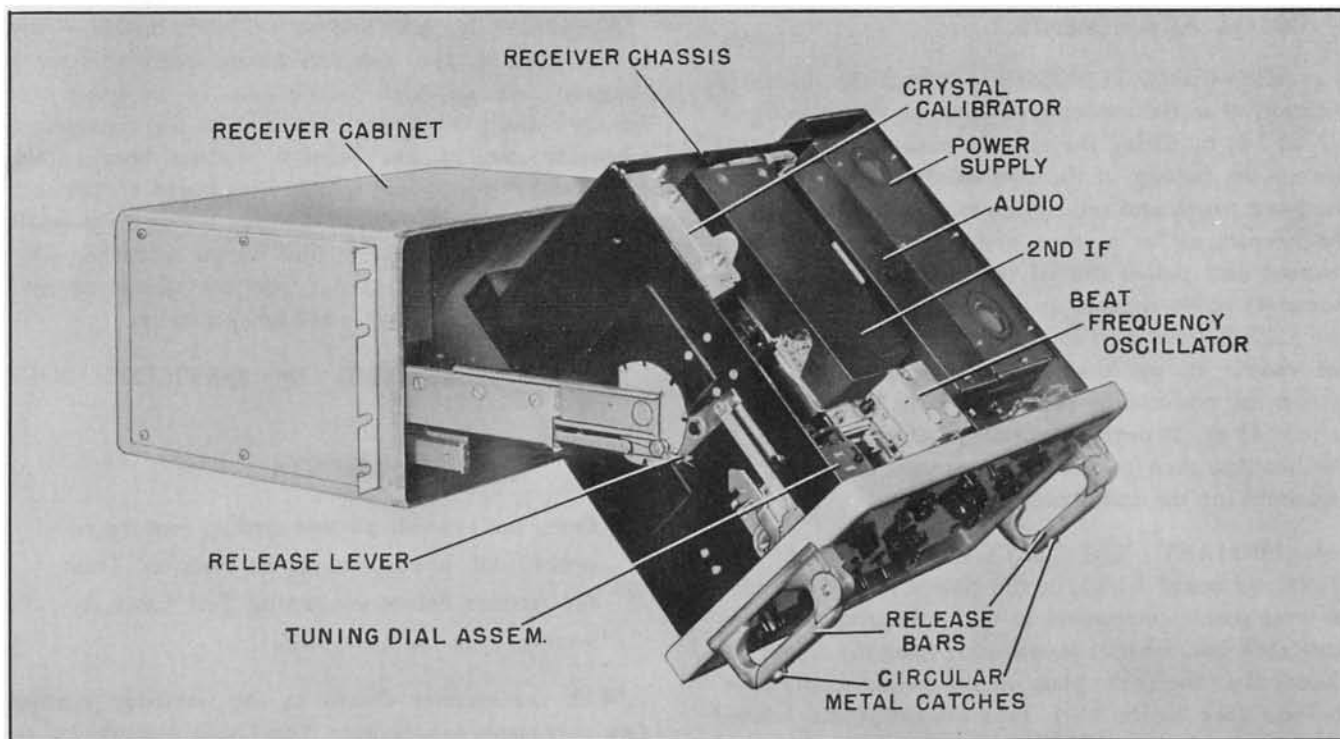


Figure 3-7. Chassis in Service Position, Top View

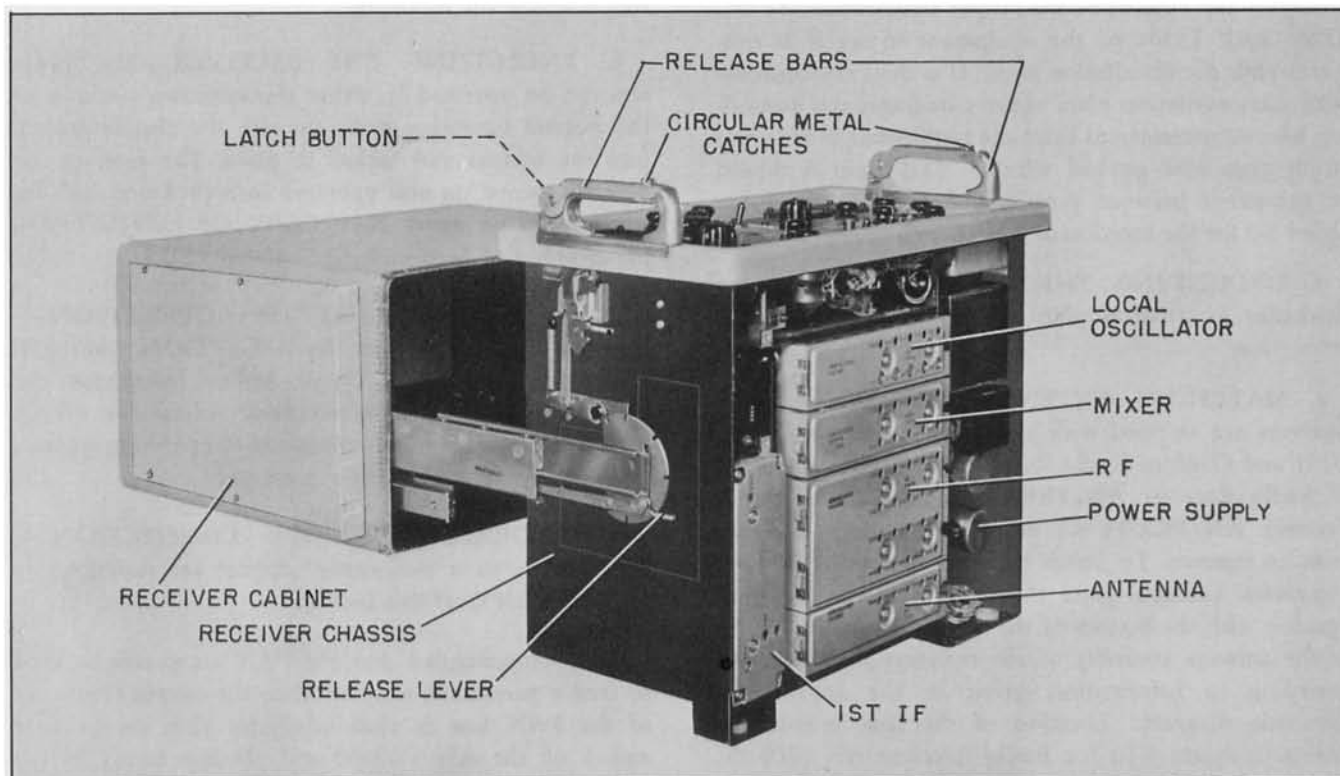


Figure 3-8. Chassis in Service Position, Bottom View

### 3. INITIAL ADJUSTMENTS.

*a.* SERVICING POSITION.—Extend the chassis of the receiver to the servicing position, as shown in figure 3-7 or 3-8, by lifting the circular metal catches located toward the bottom of the two handles at the sides of the front panel, and raising the two release bars astride the handles as far as they will go. The chassis, thus released and pulled out of the cabinet, may be positioned 45 or 90 degrees up or down by depressing the two latch buttons next to the handles, then positioning the chassis to the desired servicing position. Make certain the positioning mechanism locks in place (horizontal, 45 or 90 degree positions) before letting go of the handles, then proceed with paragraph 3*b* and the remainder of the installation procedure.

*b.* PRIMARY TAP SETTINGS.—Set the link O1601 on board E1601 in the power supply assembly to most nearly correspond to the anticipated line voltage. Link board E1601 is accessible from the top of the chassis after the cover plate on the power supply is removed. (See figure 3-9.) Taps on E1601 are labeled 105, 115, and 125. If the receiver is to be operated from a 400-cycle supply, unsolder and remove the lead connected to pin 1 of T1601 and connect it to pin 6.

*c.* OUTPUT TRANSFORMER TAP SETTINGS.—Refer to the particular installation plan in use, and check whether it calls for a grounded or ungrounded secondary tap (pin 6) of the output transformer, T1101. Then check T1101 of the equipment to see if it conforms with the installation plan. If it does not conform with the installation plan, remove or insert the grounding wire as necessary to meet the requirements of installation plan (the ground wire of T1101 pin 6 should be connected between pins 6 and 4 of T1101). See figure 3-9 for the location of T1101.

*d.* GROUNDING THE CABINET. Refer to the particular installation plan in use for details of this connection.

*e.* MATCHING ANTENNA IMPEDANCE.—The receivers are shipped with the antenna assembly links, O101 and O102 of Radio Receiver AN/FRR-21, O3001 of Radio Receiver AN/FRR-22, and O3101 of Radio Receiver AN/FRR-23 set to operate with a high-impedance antenna. To match the receiver input to a low-impedance antenna, place the receiver in the servicing position with the bottom of the chassis accessible. Links in the antenna assembly of the receivers should be set according to information given in the appropriate schematic diagram. Location of the link boards are shown in figure 3-10 for Radio Receiver AN/FRR-21, and in figure 3-11 for Radio Receivers AN/FRR-22 and -23.

*f.* COMMON ANTENNA CONNECTION.—Any combination of these receivers can be operated from a common antenna. Link O4002 must be set across terminals 1 and 3 as shown on sheet 2 of the appropriate schematic diagram for parallel antenna connections. Link O4002 is mounted in the filter board on the rear wall of the receiver cabinet or case. Remove the small black cover located on the filter board accessible after the chassis has been removed from the cabinet or case. The link is located directly behind this cover.

*g.* OPERATING TEST IN SERVICING POSITION.

#### CAUTION

Open the 115-volt a-c line feeding into the receiver. All power should be removed from the receiver before connecting Test Cable Assembly Type CG-1101/SRR.

With the receiver chassis in the servicing position (see paragraph 3*a*), connect Test Cable Assembly Type CG-1101/SRR to the receptacle at the back of the receiver chassis shown in figure 7-1. Then plug the connector at the other end of the test cable to the receptacle on the back wall of the receiver cabinet or case. With the test cable assembly connected as described, all circuits are connected and the receiver can be operated in this position for servicing.

*b.* ENERGIZING THE RECEIVER.—The radio sets can be operated in either the servicing position or the normal operating position with the chassis pushed into the cabinet and locked in place. The receiver can now be turned on and operated in accordance with instructions given under SUMMARY OF OPERATION, paragraph 4 of Section 4.

*i.* FREQUENCY SHIFT (F1) OPERATION.—Energize the receiver, set the RECEPTION control at FSK, and tune to an F1 signal. Follow instructions for the frequency shift converter used. Adjust the FREQ. VERNIER control in accordance with operating instructions for the frequency shift converter.

*j.* PANORAMIC ADAPTER CONNECTION.—Connections to a panoramic adapter are described in paragraph 2*f*(3) of this Section.

It is recommended that the PAN receptacle be used to feed a panoramic adapter when the output frequency of the PAN line is 1600 kilocycles (i.e., on bands 4 and 5 of the AN/FRR-22 and all five bands of the AN/FRR-23). Use the output from the I-F receptacle (200 kilocycles) when feeding a panoramic adapter

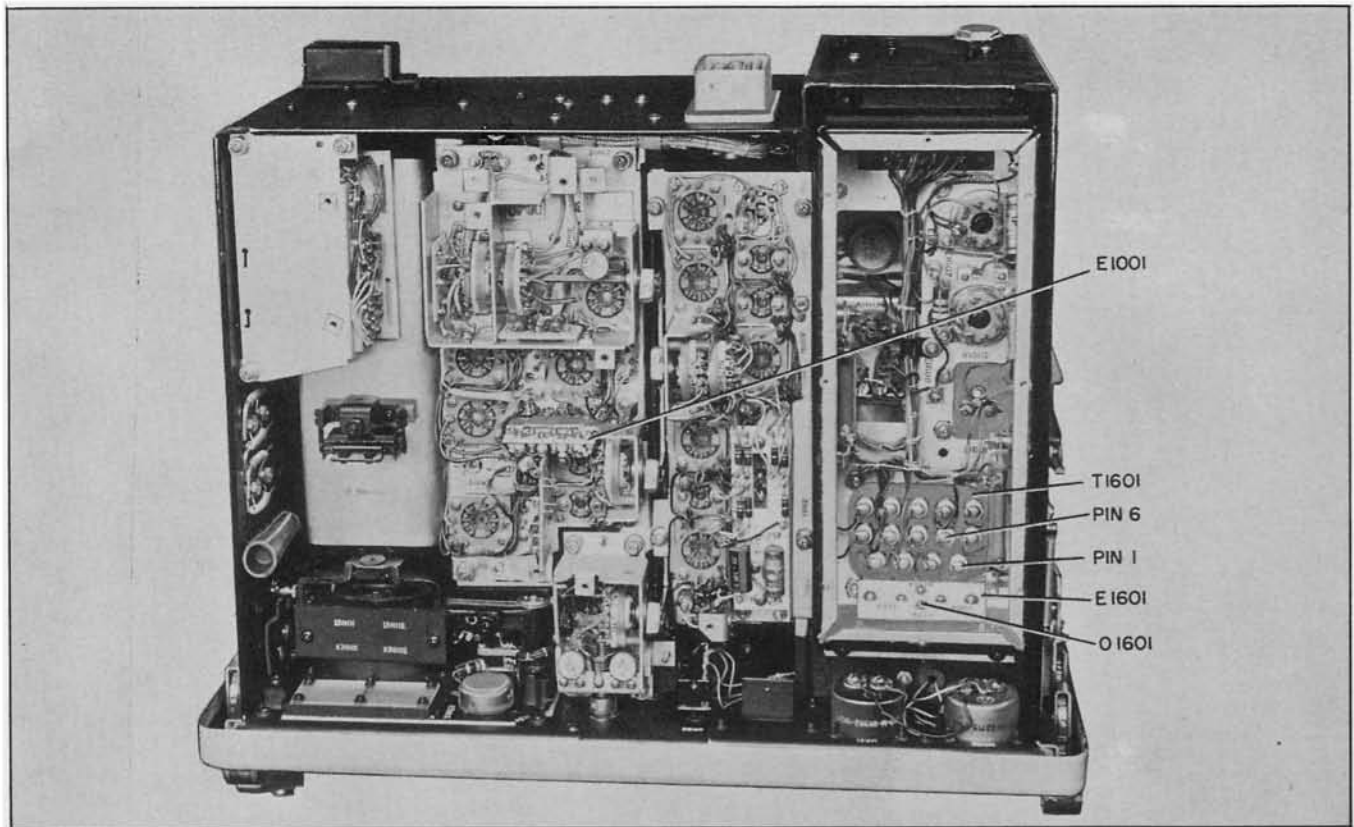


Figure 3-9. Initial Adjustment Component Locations, Top View

from the AN/FRR-21, and set the RECEPTION control at A2. The I-F receptacle should also be used to feed a panoramic adapter when the three lower bands of the AN/FRR-22 are active. The RECEPTION control for the last condition should be A3 BROAD.

k. DUAL DIVERSITY OPERATION.—In the description to follow, space diversity operation is considered, using two Radio Receivers AN/FRR-22 or -23. For additional reference, see literature on diversity equipment such as NAVSHIPS 900, 478 (RBP-1 and RCP). This does not apply to the audio-frequency type frequency shift converters, in which case refer to instruction books for the particular frequency shift converter involved.

The DET. AGC. receptacle at the back of Radio Receivers AN/FRR-22 or -23 accommodates two circuits: external detector between pin A and ground, and external AGC. between pin B and ground. See Table 3-1 for cable and connector information.

The three links on terminal board E1001 in the second i-f assembly of both local and companion receivers are to be changed as shown in figure 3-11 to achieve the combinations possible when operating two Radio Receivers AN/FRR-22 or -23 in a dual diversity system. Link positions for single receiver connections on E1001

are shown in figure 3-12. See figure 3-9 for link board locations.

After the links have been set for diversity operation and the connections described in paragraph 2f(4) have been made, it is necessary to balance the output of both receivers, using a known signal source from an r-f signal generator similar to Navy Type AN/URM-25 as follows:

(1) Set the RECEPTION control to A3 SHARP. Ground the antenna receptacle of the companion receiver, and connect the r-f signal generator to the antenna receptacle of the local receiver. Tune the signal generator to the desired working frequency, and modulate the signal with 1000 cycles at 30 percent.

(2) Tune the local receiver for maximum at this frequency, as determined by the TUNING indicator of the local receiver. With the audio controls of both receivers set for maximum output and the SILENCER turned fully counterclockwise (off), set the ADD DECIBELS switch to the 0 db position, and adjust the output of the signal generator for 0 db on the OUTPUT meter of the local receiver.

(3) Ground the antenna receptacle of the local receiver and connect the signal generator to the antenna

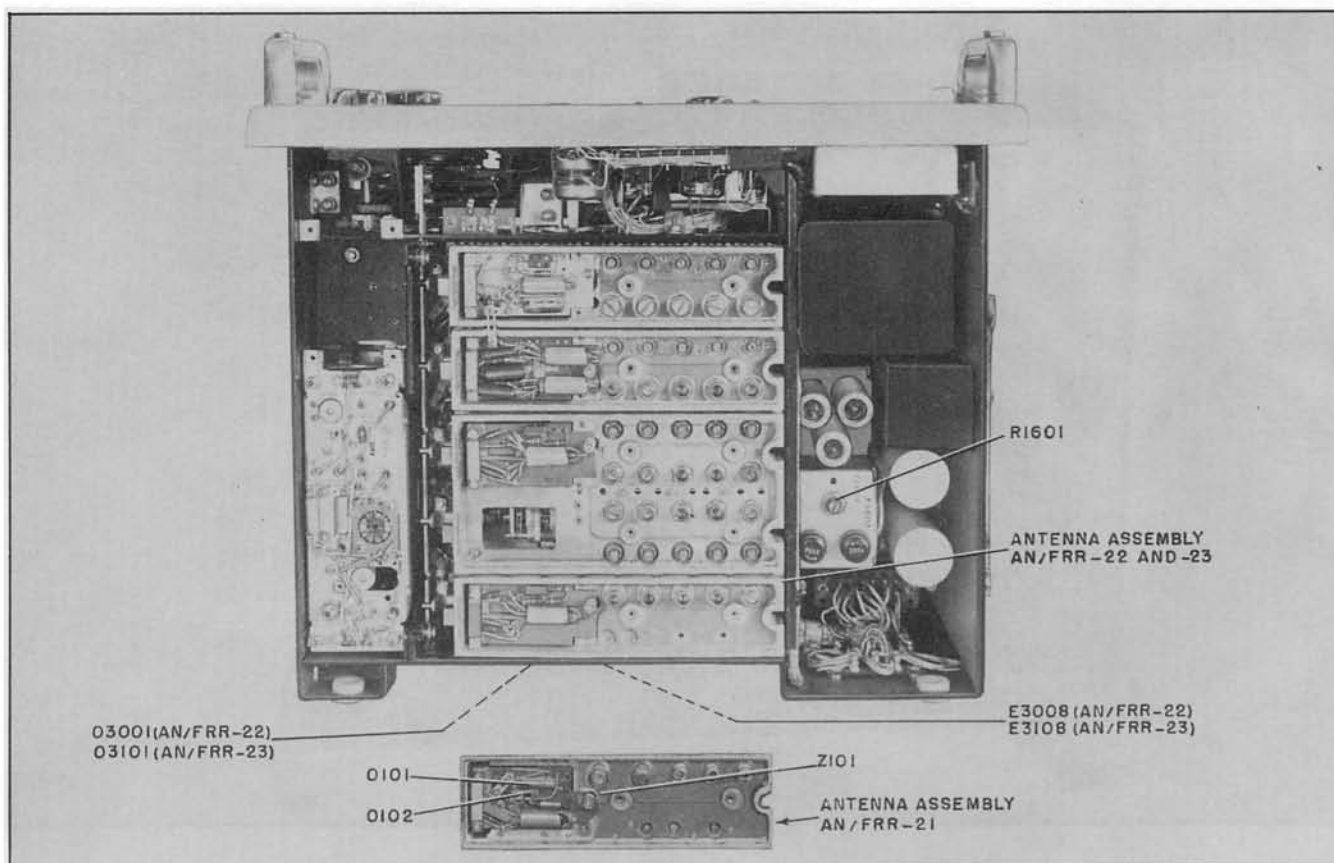


Figure 3-10. Initial Adjustment Component Locations, Bottom View

receptacle of the companion receiver. Do not change the setting of the signal generator. Tune the companion to maximum as read on its TUNING indicator.

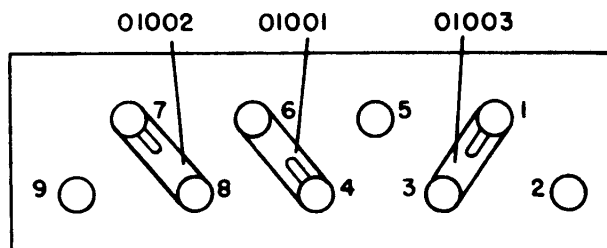
(4) If the OUTPUT meter of the companion receiver now reads more than 0 db, adjust GAIN BAL on the front panel of the companion receiver until 0 db is indicated on the OUTPUT meter of the local receiver. If the OUTPUT meter of the companion receiver reads less than 0 db, increase the output of the signal generator until 0 db is indicated.

(5) Interchange antenna connections (i.e., connect signal generator to antenna receptacle of the local receiver, and ground antenna receptacle of companion). If the OUTPUT meter of the local receiver reads more than 0 db, adjust the GAIN BAL in the local receiver until zero is indicated.

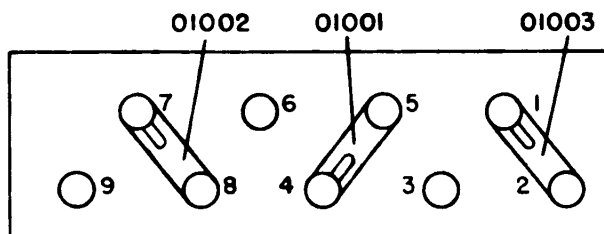
(6) Connect the antenna cables to each receiver. The RECEPTION control of both receivers should be set to A3 SHARP or A3 BROAD when operating in a diversity system.

TABLE 3-2. RELATION OF SIGNAL TO EXTERNAL LOCAL OSCILLATOR FREQUENCY  
(LOCAL OR EXTERNAL OSCILLATOR ABOVE SIGNAL FREQUENCY)

BAND	AN/FRR-21	AN/FRR-22	AN/FRR-23
1	60 kc	200 kc	1600 kc
2	200 kc	200 kc	1600 kc
3	200 kc	200 kc	1600 kc
4	60 kc	1600 kc	1600 kc
5	200 kc	1600 kc	1600 kc



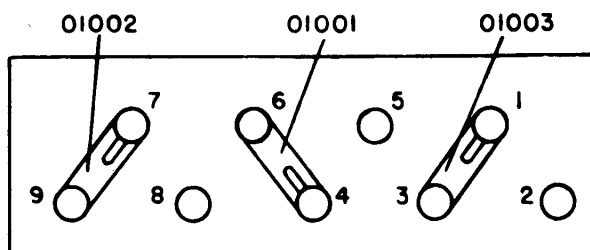
(A) LINK POSITIONS IN LOCAL RECEIVER



(B) LINK POSITIONS IN COMPANION RECEIVER

THE LINK BOARD IN THE AN/FRR-22 AND -23 IS LOCATED IN THE SECOND I-F ASSEMBLY. IT APPEARS AS SHOWN WHEN THE CHASSIS IS IN THE SERVICING POSITION SO THAT THE FRONT PANEL POINTS TOWARD THE DECK. THE COVER PLATE OVER THE ASSEMBLY MUST BE REMOVED.

Figure 3-11. Link Positions for Diversity Operation



THE LINK BOARD IN THE AN/FRR-22 AND -23 IS LOCATED IN THE SECOND I-F ASSEMBLY. IT APPEARS AS SHOWN WHEN THE CHASSIS IS IN THE SERVICING POSITION SO THAT THE FRONT PANEL POINTS TOWARD THE DECK. THE COVER PLATE OVER THE ASSEMBLY MUST BE REMOVED.

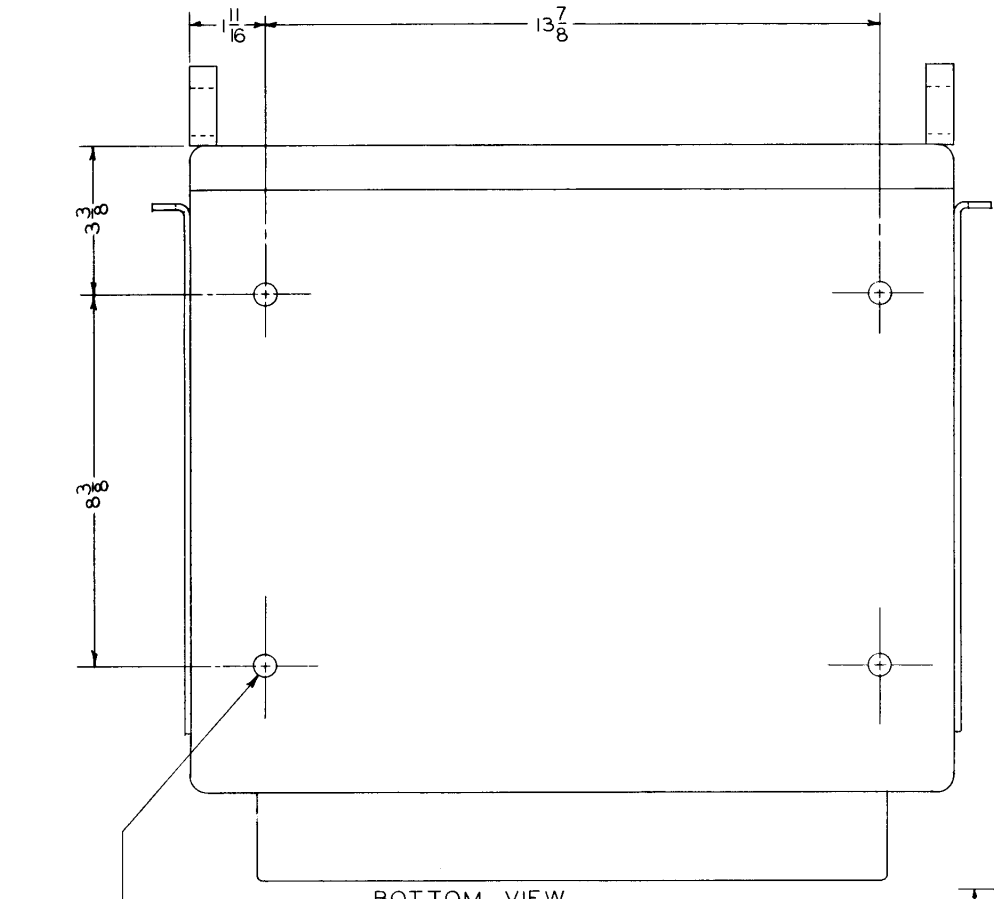
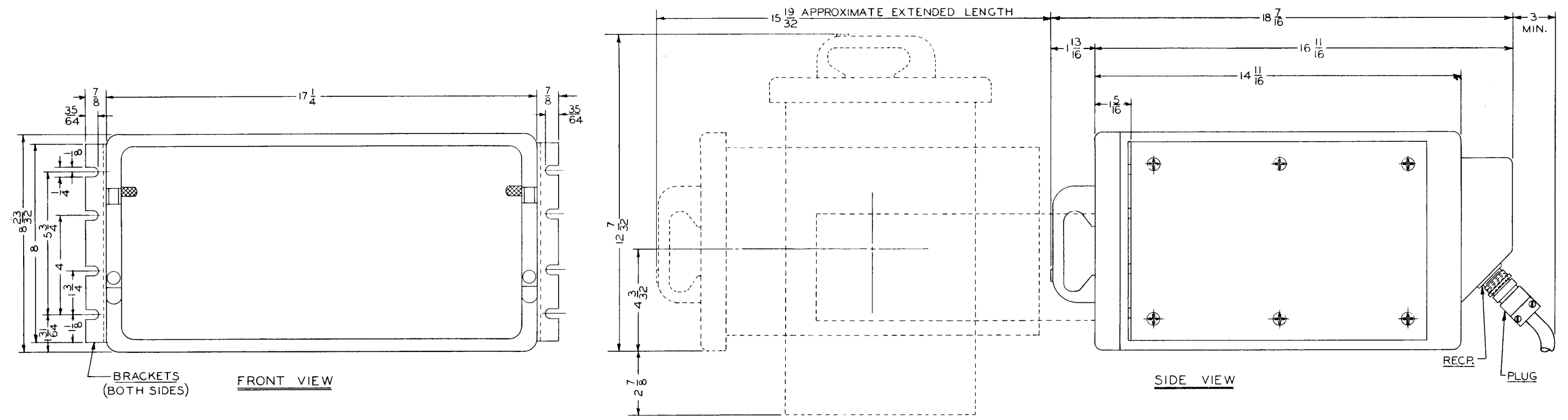
Figure 3-12. Link Positions for Single Receiver Operation

1. REDUCING HUM.—If objectional hum is heard when the receiver is operated from a 400-cycle power source, switch the RECEPTION control to A2 and turn the GAIN control to minimum (full counterclockwise). Adjust the OUTPUT and LEVEL controls to a listening level.

While monitoring the receiver with a headset plugged into the PHONES jack, adjust potentiometer R1601 in the power supply assembly for minimum hum. This potentiometer is located near the two FUSE cartridges. See figure 3-8.

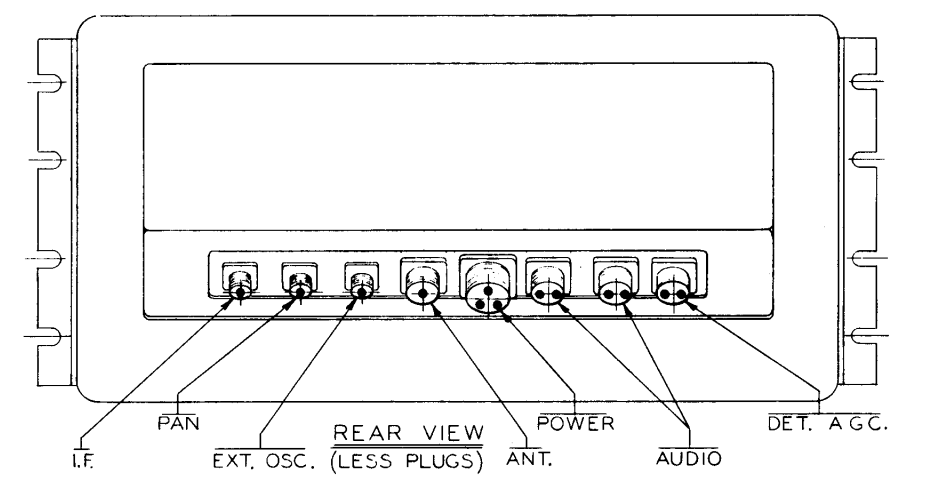




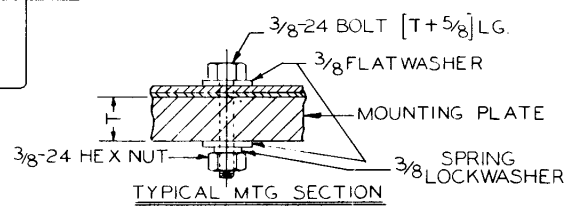


RACK OR BASE MOUNTING ASSEMBLY

RADIO REC. SET	MOUNTING BRACKETS	I.F.		PAN		ANT.		AUDIO		POWER		EX. OSC.		DET. A.G.C.	
		RECP.	PLUG	RECP.	PLUG	RECP.	PLUG	RECP.	PLUG	RECP.	PLUG	RECP.	PLUG	RECP.	PLUG
AN/FRR-21	AS SHOWN	A	W	*	*	B	X	C	Y	D	Z	*	*	*	*
AN/FRR-22	AS SHOWN	A	W	A	W	B	X	C	Y	D	Z	A	W	C	Y
AN/FRR-23	AS SHOWN	A	W	A	W	B	X	C	Y	D	Z	A	W	C	Y



\* INDICATES PART NOT USED



RECEPTACLE	
A	UG/290U
B	UG/58U
C	AN 3102A-10SL-4P
D	AN 3102A-16S-5P

PLUG	
W	UG/88U
X	UG/21BU
Y	AN 3106A-10SL-4S
Z	AN 3106A-16S-5S

APPROX. WEIGHT — 75 POUNDS

APPROX. POWER CONSUMPTION — 85 WATTS

CLEARANCE HOLE FOR 3/8 DIA. BOLT. 4-HOLES

ORIGINAL

Figure 3-13. Installation Outline  
3-15, 3-16

## SECTION 4 OPERATION

### 1. INTRODUCTION.

The radio receiving sets described in this instruction book are divided into three frequency types (low, medium, and high), each of which has five bands with continuous tuning throughout each band. The frequencies received by each receiver are as follows:

AN/FRR-21	(Low Frequency)	14 kc to 600 kc
AN/FRR-22	(Medium Frequency)	0.250 mc to 8 mc
AN/FRR-23	(High Frequency)	2 mc to 32 mc

Radio Receiver AN/FRR-21 is capable of receiving unmodulated CW (A1) signals, amplitude modulated (A2) signals, and frequency shift (F1) signals. Radio Receivers AN/FRR-22 and -23 are capable of receiving unmodulated CW (A1) signals, amplitude modulated (A2 and A3) signals and frequency shift (F1) signals.

Each receiver is designed to give maximum efficiency for the reception of those emissions encountered in a particular band of frequencies. Therefore, a few of the controls and switches found on some models will not be found on others.

### 2. OPERATING CONTROLS AND SWITCHES.

All operating controls and switches necessary for the operation of these receivers are mounted on the front panel of the receivers, together with two meters to be used when tuning and reading output level. The functional name of each control and meter with the exception of the band selector, is marked on the panel near the particular control. The band selector has five frequency-marked positions. See figure 4-1 or 4-2.

#### CAUTION

BEFORE OPERATING THE RECEIVING EQUIPMENT MAKE SURE THE CHASSIS IS FIRMLY IN THE RECEIVER CABINET OR CASE, OTHERWISE NO POWER WILL BE APPLIED TO THE RECEIVER.

### 3. TUNING ADJUSTMENTS.

Tuning of the receivers is accomplished by means of the controls on the front panel as shown in figures 4-1 and 4-2, and specified in the following list of control functions:

CONTROL	FUNCTION
POWER	Applies primary power when in ON position.
OPERATE-STANDBY	Plate potential is removed from the antenna preamplifier when the OPERATE-STANDBY switch is at STANDBY.
PILOT	Glowing, when high voltage is applied to the set.
GAIN	Controls r-f gain. Maximum volume when turned fully clockwise. GAIN is inactive when RECEPTION control on AN/FRR-22 or -23 is set at A3 SHARP, A3 BROAD, or FSK.
ANT COMP	Adjust tuning of antenna preamplifier to compensate for variations in antenna.
BAND SELECTOR	Selects tuning range of receiver in five bands.
TUNING KNOB	Adjusts receiver to desired frequency.
TUNING DIAL	Frequency setting is projected onto a translucent screen. Linear scale below projection dial is used for logging station settings.
DIM	Controls intensity of dial light. Fully clockwise, max. brilliance; fully counter-clockwise, dial light extinguished.
LAMPS switch	Connects spare dial light, should first one fail.
OUTPUT control	Controls volume of audio amplifier.
LEVEL control	Controls volume through headphones.

CONTROL	FUNCTION
PHONE jacks	Provide output to operate one or two sets of low-impedance headphones similar to Navy Type 49507.
RECEPTION control, Radio Receiver AN/FRR-21	<p>FSK—Selects circuits for reception of F1 signals when suitable converter is connected to receiver. A beat note is provided.</p> <p>A1 BROAD—Normal setting for unmodulated CW signals. A beat note is provided.</p> <p>A1 SHARP—Used to separate CW signals by frequency response. A beat note is provided.</p> <p>A2—Provides for reception of MCW signals.</p>
Radio Receivers AN/FRR-22 and -23	<p>A1 BROAD—Normal setting for unmodulated CW signals. A beat note is provided.</p> <p>A1 SHARP—Used to separate CW signals by narrowing frequency response. A beat note is provided.</p> <p>A2—Provides for reception of MCW signals.</p> <p>A3 SHARP—Provides for reception of voice modulated signals. (Medium selectivity.)</p> <p>A3 BROAD—Provides for reception of voice modulated signals.</p> <p>FSK—Selects circuits for reception of F1 signals when suitable converter is connected to receiver. A beat note is provided.</p>
SILENCER (AN/FRR-22 and -23)	Background noise may be reduced when the RECEPTION control is set at A3 SHARP or $\pm 3$ BROAD and desired station is not transmitting.
FREQ. VERNIER	Varies pitch of beat note when RECEPTION control is in A1 BROAD, A1 SHARP, FSK positions.
CAL switch	Provides frequency check points when CAL switch is in the ON position.
CAL ADJUST	Used to set projection dial after desired check point frequency has been zeroed.
DIVERSITY GAIN BAL. (AN/FRR-22 and -23)	Recessed screwdriver adjustment used to match receiver gain with companion receiver when employing diversity reception. CAUTION: This control is preset and does not require adjustment by the operator.
TUNING meter	Meter reads up scale (toward right) when desired signal is tuned to maximum. Meter reads down scale (toward left) when desired station is detuned. TUNING meter is used in conjunction with HIGH-LOW switch.
HIGH-LOW switch	Switch normally in LOW position. When TUNING indicator reads down scale in the LOW position of switch, use HIGH position and tune receiver slightly for an up scale reading on TUNING meter. HIGH positions of switch is spring-loaded and will return to LOW positions when released.
OUTPUT meter	Reads output power level between $-20$ db and $+25$ db when used in conjunction with ADD DECIBEL switch. OUTPUT meter should be turned to $+20$ db position when not reading signal strength.
ADD DECIBEL switch	Provides attenuation for OUTPUT meter circuit. $+10$ db position should be used to check strong output levels; $0$ db is used to measure weak levels. ADD DECIBEL switch should be in $+20$ position when not using OUTPUT meter.

**4. SUMMARY OF OPERATION.**

a. STARTING EQUIPMENT.—When applying power to the receivers follow this procedure:

- (1) Make sure the receiver chassis is firmly in cabinet.
- (2) Turn POWER switch to ON.
- (3) Adjust dial illumination by turning DIM con-

trol. Turn DIM control fully counterclockwise to extinguish dial light. Should dial light fail, switch LAMP knob to SPARE position and report the burned out light to a technician.

- (4) Turn ADD DECIBEL switch to the  $+20$  position.
- (5) Turn the OPERATE-STANDBY switch to OPERATE.

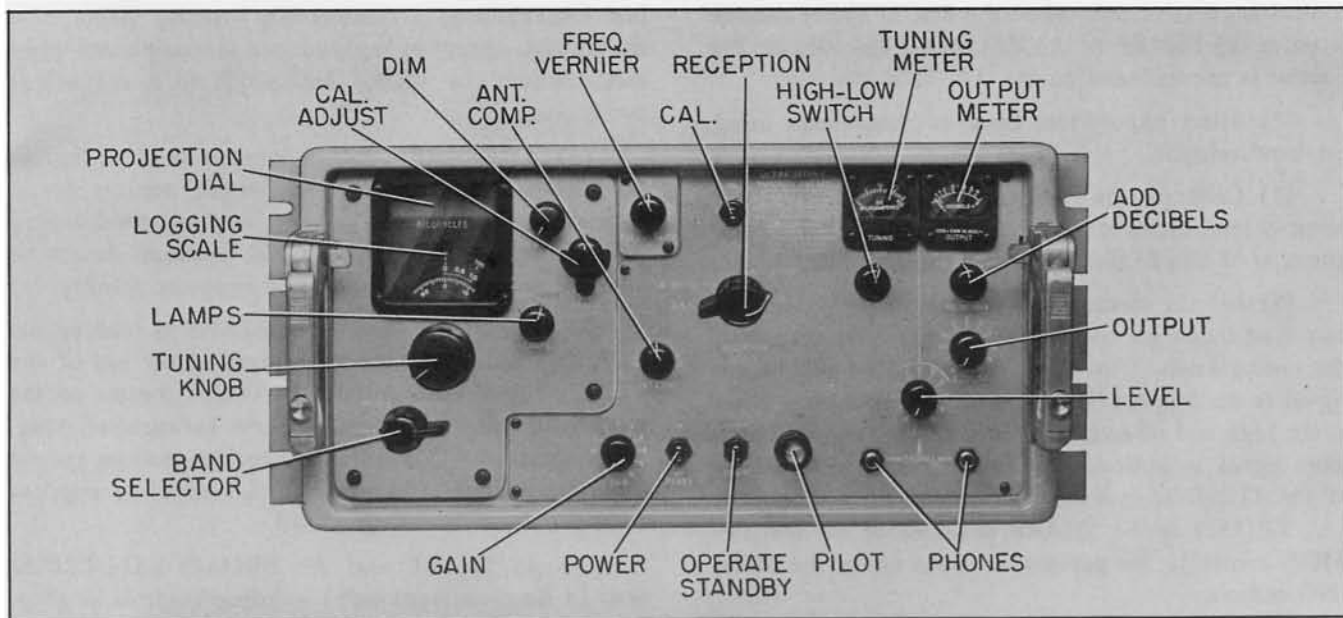


Figure 4-1. Front Panel Controls, AN/FRR-21

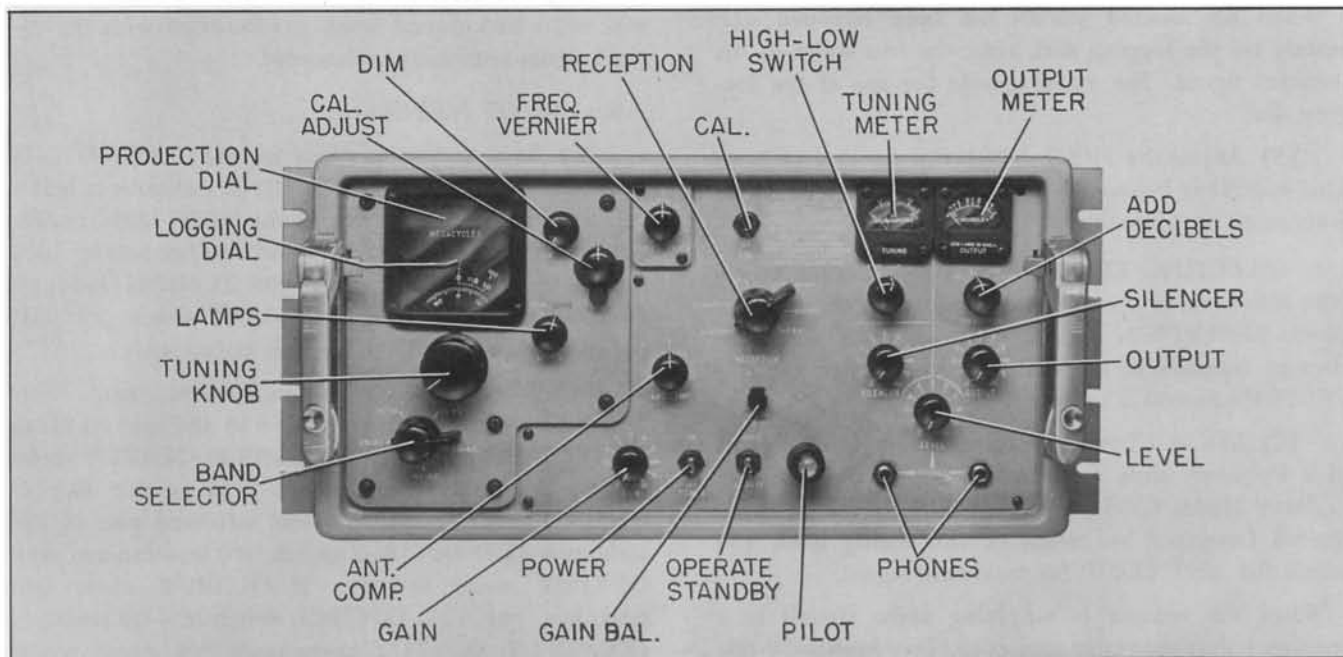


Figure 4-2. Front Panel Controls, AN/FRR-22 and AN/FRR-23

(6) Note that the PILOT light is glowing except when the knurled ring around the light is turned clockwise.

(7) Make sure the CAL switch is at the OFF position.

(8) Two pair of head sets can be operated from the receiver at the same time. Plug one or two pair of head sets into the jacks marked PHONES. It is recom-

mended that low-impedance (600 ohms nominal) head-sets be used similar to Navy Type 49507. The LEVEL control regulates gain through the headphones.

*b. TUNING A SIGNAL.*

(1) Turn the GAIN and OUTPUT controls up (clockwise) until background noise is heard. Turn SILENCER fully counterclockwise. NOTE: The SILENCER

control is effective only when the RECEPTION control is set at A3 SHARP or A3 BROAD. (The SILENCER control is not included on the AN/FRR-21).

(2) Select appropriate band of frequencies using the band selector.

(3) Calibrate the receiver at the frequency check point nearest to the desired signal frequency. See paragraph 4f of this Section for use of the crystal calibrator.

(4) Set the desired station's frequency under the hair line index on the projection screen by means of the tuning knob. Turn the ANT COMP control until signal is the loudest. This control will have most effect at the high end of each frequency band. Tune for maximum signal as indicated on the TUNING meter. Use of the TUNING indicator is optional for CW signals (A1 BROAD or A1 SHARP positions of the RECEPTION control). See paragraph 4d for use of the TUNING indicator.

NOTE: If station is not heard at this setting of the dial, rock the dial about this point a short distance to search for it.

When the desired station has been recorded previously on the logging dial, reset the two scales to the recorded figure. See paragraph 4e for use of the logging dial.

(5) Adjust the *FREQ. VERNIER* for desired beat. This control is inactive when the RECEPTION control is set at A2 or A3 positions.

c. **SELECTING EMISSION TYPES.**—Tuning procedure differs from this point depending on the position of the RECEPTION control which is set to match the class of emission of the desired signal. When the RECEPTION control is set at:

(1) **FSK.**—When the receiver is supplying signals to a frequency shift converter of the i-f type (similar to Navy Model CV-57/URR), tune the receiver to the desired frequency by means of the tuning knob and adjust the ANT COMP for maximum signal.

When the receiver is supplying audio signals to a frequency shift converter similar to Navy Model CV-60/URR, tune the receiver to the desired frequency, then adjust the OUTPUT, and *FREQ. VERNIER* controls as required for operation of the frequency shift converter.

When the receiver is applying audio frequency signals to a facsimile frequency shift converter similar to CV-172/U, tune the receiver to the desired frequency for maximum indication on the TUNING meter, then adjust the OUTPUT and *FREQ. VERNIER* controls as required for operation of the frequency shift converter.

(2) **A1 BROAD.**—Adjust the GAIN to the point of loudest signal and lowest background noise, then ad-

just OUTPUT to a comfortable listening point. Use the LEVEL control to regulate gain in headphones when used. Adjust the *FREQ. VERNIER* to a convenient audio note.

(3) **A1 SHARP.**—Adjust controls as given for the A1 BROAD position. The A1 SHARP setting should be used to eliminate adjacent signals that crowd desired station's signal. The A1 BROAD position should be used for reception of CW signals whenever possible.

(4) **A2.**—Tune signal to maximum as read on the TUNING indicator. See paragraph 4d for use of the TUNING indicator. Adjust the GAIN control to the point of loudest signal and lowest background noise. Then adjust the OUTPUT control to produce proper line output level. Use the LEVEL control to regulate volume in headphones when used.

(5) **A3 SHARP and A3 BROAD (AN/FRR-22 and -23 Receiver types only).**—Adjust controls as given for the A2 position with exception that the GAIN has no effect in this position of the RECEPTION control. To eliminate background noise set the SILENCER control fully counterclockwise; then turn the control clockwise until background noise is eliminated with the desired signal remaining undistorted.

d. **USE OF METERS.**

(1) As a station is tuned in, the TUNING indicator reads up scale. When TUNING indicator is below  $\frac{1}{4}$  scale on the LOW setting of the HIGH-LOW switch, hold switch in HIGH position and readjust tuning knob for an up scale indication of the TUNING indicator (CAUTION: never hold HIGH-LOW switch in HIGH position when TUNING meter is at full scale).

(2) When reading output power, turn ADD DECIBEL switch from +20 to +10 and add 10 db to OUTPUT meter reading. (EXAMPLE: OUTPUT meter reads -3, signal power = -3 +10 or +7 db.) If OUTPUT meter reads on lower left-hand part of the scale, put ADD DECIBEL switch in 0 position and read OUTPUT meter directly. If OUTPUT meter still reads low, put ADD DECIBEL switch in -10 position. (EXAMPLE: OUTPUT meter reads +5, signal power = +5 -10 or -5 db.) The -10 db position of the ADD DECIBEL switch is spring-loaded, and the switch will return to 0 position if not held in the -10 db position. CAUTION: Return ADD DECIBEL switch to the +20 db position except when measuring output level.

e. **USE OF LOGGING SCALES.**—Two movable scales and one fixed index immediately below the projection dial are used for logging the dial setting of received stations. There is no relationship between the projection dial and the logging dial. The logging dial

provides a quick means of resetting the receiver to the point where a station has previously been received. Note also that the logging dial is not affected by the CAL ADJUST knob.

To use the logging dial, calibrate the projection dial (see paragraph 4f), and then tune the receiver to the desired station. To record the settings of the scales, use the index mark on the middle segment of the logging dial. EXAMPLE:

- (1) The top scale reads between 200 and 300.
- (2) The bottom scale reads 63.
- (3) The setting of the logging dial 263.

By resetting this figure (263) on the logging dial, when the BAND selector is set as before, a previously received station can be retuned quickly. The logging dial should always be set approaching from the same direction—clockwise rotation of the tuning knob.

*f.* USE OF CRYSTAL CONTROLLED CALIBRATOR.—The crystal controlled calibrator provides frequency check points at regular intervals throughout the tuning ranges of these receivers so that the numerical setting of the projection dial can be adjusted to agree with the frequency of received signals. These check points occur at 10-kilocycle separations in Radio Receiver AN/FRR-21, at 50-kilocycle separations in Radio Receiver AN/FRR-22, and 200-kilocycle separations in Radio Receiver AN/FRR-23. Proceed as follows to calibrate the tuning dial:

- (1) Turn the CAL switch ON.
- (2) Set the tuning dial at the nearest calibration marker on the projection dial. The calibration points are

designated by an inverted V on the frequency scale. These markers are separated by 10 kc on Radio Receiver AN/FRR-21, 50 kc on Radio Receiver AN/FRR-22, and 200 kc on Radio Receiver AN/FRR-23.

(3) Rock the tuning dial slightly on both sides of the frequency chosen until a beat note is heard. Zero beat should occur at the calibration marker chosen. If zero beat does not occur at this marker, adjust the tuning knob until zero beat is heard.

(4) Loosen the thumbscrew holding the CAL ADJUST knob (turn counterclockwise), then turn CAL ADJUST knob until the nearest calibration marker is under the hair line on the projection screen. Tighten the thumbscrew over the CAL ADJUST knob. NOTE: If beat note is not located within 1/3 of the distance between the calibration markers, or if the beat note can not be brought to coincidence by use of the CAL ADJUST knob, report the condition to a technician.

*g.* USE OF EXTERNAL OSCILLATOR (AN/FRR-22 and -23).—Although there are no front panel controls that would indicate operation of these receivers with an external oscillator, the technician can adjust the receiver to operate with an external oscillator. Under such conditions the receiver is tuned in the same manner as for normal operation, except that the receiver will only be capable of picking up one signal, as determined by the external oscillator. To put Radio Receivers AN/FRR-22 and -23 into external oscillator operation, refer to paragraph 2f(5) in Section 3.

*b.* SHUTTING OFF THE EQUIPMENT.—To turn any of these receivers off, throw the POWER switch to the OFF position.

## SECTION 5

# OPERATOR'S MAINTENANCE

### 1. ROUTINE CHECK.

The routine checks given in Table 5-1, should be made by the operator to insure that receiver performance is maintained at a high standard. When trouble is indicated which cannot be cleared up by using procedures described under Emergency Maintenance (paragraph 2 of this Section), report the condition to the technician. These routine checks should be made each time the receiver is placed in operation, or daily if the receiver is in continuous service. See Section 3 paragraph 3a for placing the receiver in the servicing position.

### 2. EMERGENCY MAINTENANCE:

#### NOTICE TO OPERATORS

OPERATORS SHALL NOT PERFORM ANY OF THE FOLLOWING EMERGENCY MAINTENANCE PROCEDURES WITHOUT PROPER AUTHORIZATIONS.

#### a. REPLACING FUSES.

#### WARNING

NEVER REPLACE A FUSE WITH ONE OF A 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 HAS BEEN CORRECTED.

(1) SYMPTOMS OF FUSE FAILURE.—Dial light and PILOT light will be out. Receiver will be inoperative.

(2) FUSE LOCATION.—The two 0.8 slo-blow fuses used in the power supply are located on the power supply chassis toward the rear. This unit is accessible from the bottom of the main chassis (see figure 5-1).

**TABLE 5-1. ROUTINE CHECK CHART**

WHAT TO CHECK	HOW TO CHECK	REMARKS
Dial Light	With receiver ON, turn DIM control fully clockwise. If dial light does not light, turn LAMPS switch to SPARE position.	Check power input, replace fuses, replace lamp, if still does not light, report to technician.
PILOT	With receiver ON, open light shutter of PILOT by turning knurled knob around light in a counterclockwise position.	PILOT is out, and receiver is inoperative. Check fuses and tubes in power supply. See paragraph 2d this Section. Replace PILOT light if burned out.
TUNING meter	Tune a strong signal. TUNING meter should read up-scale on LOW position of HIGH-LOW switch. See paragraph 4d(1) of Section 4.	Failure of TUNING meter to read as described may indicate aging tubes in r-f and i-f stages. Report condition to technician.
OUTPUT meter	Read signal strength as indicated on the OUTPUT meter. See paragraph 4d(2) of Section 4.	Failure of meter to read on 0 db position of ADD DECIBEL switch may indicate aging tubes in audio amplifier, or trouble in OUTPUT meter circuit. Report condition to technician.
BFO	With RECEPTION control set at FSK, A1 BROAD, or A1 SHARP, CW signals should be heard.	If CW signals are not heard, report condition to technician.

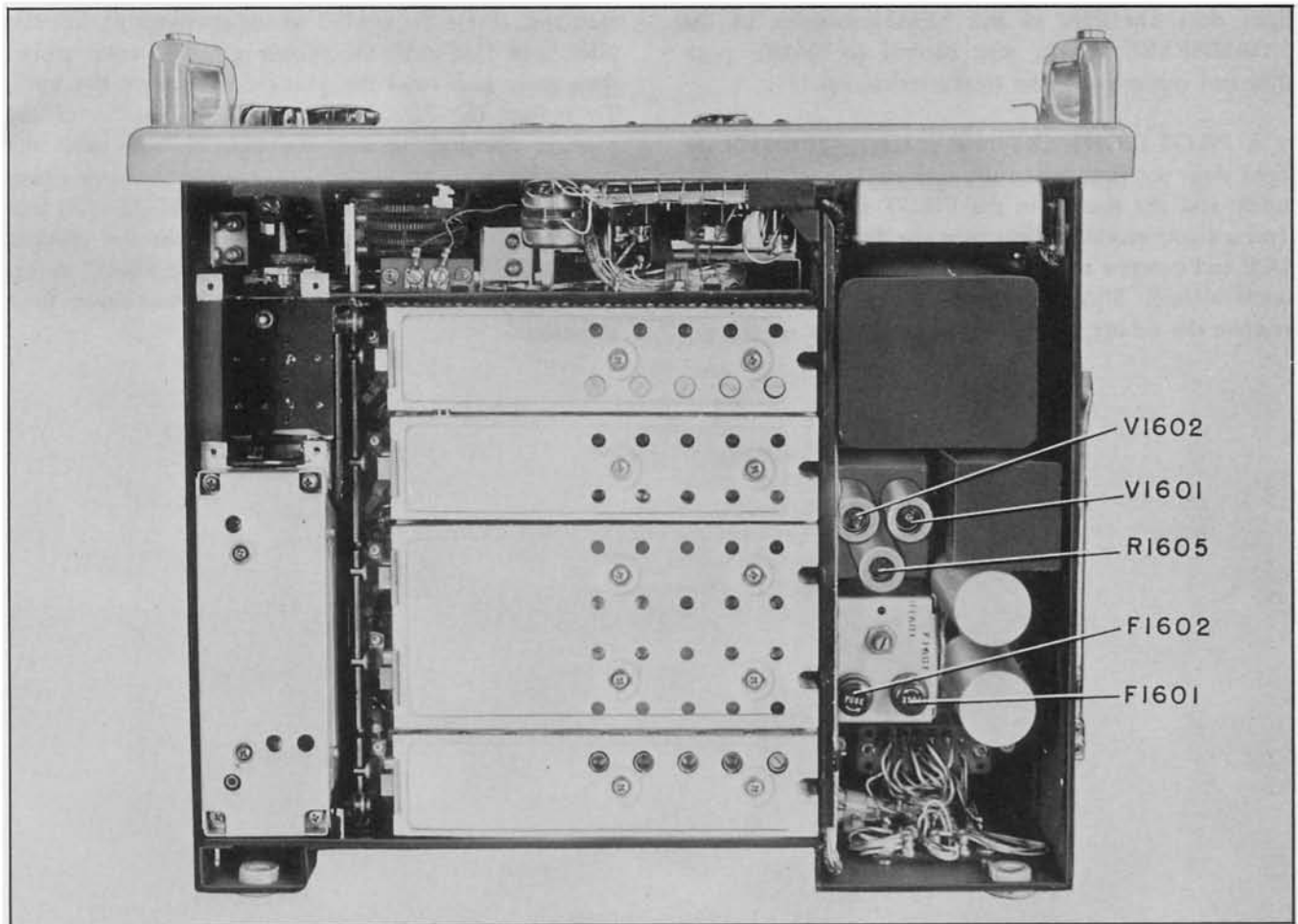


Figure 5-1. Tube and Fuse Locations

(3) FUSE REPLACEMENT.

(a) Slide the chassis out of the cabinet and tilt it so that the bottom is accessible.

(b) Turn one fuse holder cap at a time (counter-clockwise).

(c) Pull fuse from cap and replace with new one, if blown, and turn cap in a clockwise direction, back in the fuse holder.

(d) Replace chassis in the cabinet.

b. REPLACING ELECTRON TUBES.—The location of the sub-miniature electron tubes used in these receivers does not permit the operator to check tube performance. However, the two high voltage rectifier tubes and ballast resistor used in the power supply can be checked by the operator.

(1) SYMPTOMS OF TUBE FAILURE.—If rectifier tubes in the power supply are faulty, the dial light will be lit, but the PILOT light will be out, and the receiver inoperative.

(2) ELECTRON TUBE LOCATION.—The two high voltage rectifier tubes and ballast resistor are mounted on the power supply (see figure 5-1).

(3) LOCATING AND REPLACING RECTIFIER TUBES AND BALLAST RESISTOR.—Slide the chassis out of the cabinet or case and connect the test cable between the socket mounted at the rear of the chassis, and the socket on the filter assembly which is located on the back wall of the cabinet.

Turn the receiver to ON and allow about 30 seconds for the tubes to warm up. The rectifier tube or tubes (V1601 and V1602) in the power supply that fail to glow should be replaced, and the ballast resistor (R1605) should be replaced if it fails to glow with a dull red. TURN RECEIVER OFF BEFORE REPLACING ANY OF THESE TUBES (see figure 5-1).

After the tube or tubes in the power supply have been checked, turn receiver off, remove the jumper cable, and replace the chassis in the cabinet.



*c.* DIAL LIGHT EXTINGUISHED.—If the dial light does not light in the NORM position of the NORM-SPARE switch, turn control to SPARE position and report condition to the technician.

*d.* PILOT LIGHT EXTINGUISHED.—If the PILOT light does not light when the receiver is operating normally and the shutter in the PILOT indicator is open (turned counterclockwise), turn the POWER switch to OFF and unscrew the PILOT cover (keep turning counterclockwise). Slide the chassis out of its cabinet and remove the rubber plunger from its position on the top

left side of the chassis. The plunger has an opening on each end. Press the smaller of the openings against the pilot bulb face until the proper gripping takes place; then press and twist the plunger to remove the bulb. To replace the PILOT bulb, press the smaller of the plunger openings against the PILOT bulb until the proper gripping takes place; then grasp the large opening end of the plunger and insert the PILOT bulb into its proper receptacle, and press and twist the plunger to lock the bulb in position. Replace the PILOT cover. If it still does not light, report the condition to a technician.

## SECTION 6

# PREVENTIVE MAINTENANCE

THE ATTENTION OF MAINTENANCE PERSONNEL IS INVITED TO THE REQUIREMENTS OF CHAPTER 67 OF THE "BUREAU OF SHIPS MANUAL," OF THE LATEST ISSUE.

### 1. ROUTINE MAINTENANCE CHECK CHART.

When the procedure given in Table 6-1 is followed, potential mechanical and electrical failures can often be prevented by correcting the unit at fault before it causes interruption in receiver operation. Refer also to Table 5-1 of Section 5, which gives procedures for checking overall receiver performance during operation.

### 2. SLIDE ASSEMBLY ADJUSTMENTS.

If the chassis scrapes against the inside wall of the housing when it is pulled out to the service position, loosen the two retaining nuts that hold the tilting fulcrum (shown on figure 6-2) using a  $\frac{5}{8}$ -inch open-end wrench. These nuts are located on the inside walls of the chassis. Adjust the tilting fulcrum on both walls of the chassis, as required until the chassis no longer scrapes the housing. When the correct adjustment is found, tighten the two retaining nuts and stake by spreading glyptal or equivalent varnish over each tilting fulcrum and onto the chassis wall to prevent the adjustment from slipping.

### 3. CHECKING RECEIVER SENSITIVITY.

Refer to figure 6-1 and connect an r-f signal generator, Type AN/URM-25 or Model LP series, to the ANT receptacle (J1707 or J4007) located on the receptacle board at the rear of the receiver. Use the required accessories to simulate a standard RMA Dummy Antenna (such as supplied with RF Signal Generator Set AN/URM-25, use Impedance Adapter MX-1074/URM-25 and Antenna Simulator SM-35/URM-25. With the Model LP series, use Navy Type 66017 dummy antenna). After the signal generator is connected as described above, perform the following checks given in steps *a*, *b*, *c*, and *d* on all five receiver bands, and compare the results against those given in Table 6-2, 6-3, or 6-4. To perform these sensitivity checks the link O101 of the low-frequency receivers, link O3001 of the medium-

frequency receivers, or link O3101 of the high-frequency receivers should be set in the high impedance position.

#### NOTE

Sensitivity measurements should be made with the receivers placed in their cabinet or case. Do not use the Test Cable Assembly CG-1101/FRR, since the input capacity introduced by this cable will cause erroneous readings.

*a.* A1 BROAD AND A1 SHARP POSITIONS AND FSK POSITION ON AN/FRR-21.

(1) Set the RECEPTION control to A1 BROAD, the OUTPUT control to maximum, and the tuning dial to the frequency specified in Table 6-2, 6-3, or 6-4.

(2) Disconnect the standard dummy antenna from the signal generator and connect a short across the input of the dummy antenna.

(3) With the ADD DB switch in the -10 db position, adjust the GAIN control for a noise level of -10 db as read on the output meter. (This is a total of -20 db with respect to 6 milliwatts, or equivalent to an output level of 60 microwatts or 0.19 volt across 600 ohms.)

(4) Remove the short connected in step (2) and reconnect the dummy antenna to the signal generator.

(5) With the signal generator set for an unmodulated output, tune the signal generator for a maximum indication of the receiver TUNING meter.

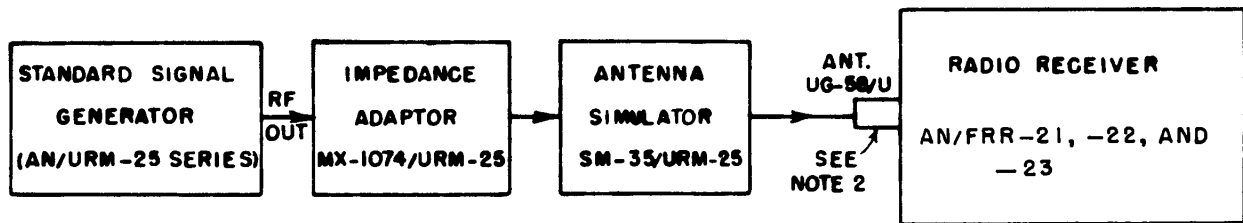
(6) Set the RECEPTION control to A1 SHARP, and adjust the receiver FREQ. VERNIER to produce a beat note of 1000 cycles per second. A 1000 cps beat note will occur at the FREQ. VERNIER setting which produces maximum reading on the OUTPUT meter.

(7) Set the RECEPTION control to A1 BROAD.

(8) With the ADD DECIBELS switch in the 0 position, adjust the signal generator for 0 db reading on the receiver OUTPUT meter. (This is equivalent

TABLE 6-1. ROUTINE MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	REMARKS
MONTHLY		
Mounting	Inspect that the mounting bolts or screws are tight.	Tighten mounting bolts, screws, and all external fasteners when loose.
Cables	Inspect cords and plugs for wear and broken parts.	Replace cords that cause clicking sounds when shaken during operation.
QUARTERLY		
Slide Assembly AN/FRR-series	Remove and replace the chassis in the housing.	If chassis binds on rails, adjust the chassis tilting fulcrum according to directions in Section 6, paragraph 2. Apply lubrication as described in Section 6, paragraph 6.
Plug-in Units	Check each plug-in unit for loose connections and appearance of component.	If components show signs of overheating, apply corrective maintenance given in Section 7.
Chassis	Inspect for loose interstage connectors (multi-sockets) on chassis.	Tighten as required.
Band Selector	Inspect for loose crank pins that connect to switch shafts.	If one crank arm is loose, turn band switch knob to band where receiver noise is loudest, then tighten crank pin, exercising care that it is centered in the slot. If more than one crank pin is loose, line the wafers up according to procedure given in paragraph 13b of Section 7.
RECEPTION Control	Inspect for loose crank pins that connect to switch shafts.	Line the wafer switches up according to procedure given in paragraph 13a of Section 7.
Cleaning	Remove dust from chassis and assemblies using small blower. Remove excess lubricant from band selector and RECEPTION control racks, miter gears, and dial gears.	After cleaning, lubricate according to instructions given in figures 6-2 through 6-5.
SEMI-ANNUALLY		
Receiver	Check receiver sensitivity according to instructions in paragraph 3 of Section 6.	Alignment may be required. See paragraph 14 of Section 7.
Spare Assemblies	Inspect for evidence of physical damage.	See paragraph 5 of Section 6.
Dial light adjust.	Check alignment of tuning dial and operation of dial light. Check the mirror assembly.	If alignment is required see paragraph 11 of Section 7. If mirror is dirty, clean it as per paragraph 8 of this Section.



NOTES: 1- CONNECT THE SIGNAL GENERATOR TO THE RECEIVER ANT. RECEPTACLE THROUGH THE IMPEDANCE ADAPTOR AND ANTENNA SIMULATOR THROUGH PROPER CONNECTOR AND CABLES AS PER THE INSTRUCTION BOOK (NAVSHIPS 91283 FOR THE RF SIGNAL GENERATOR SET (AN/URM-25)

2- THIS RECEPTACLE (J1707 ON AN/FRR-21; J4007 ON AN/FRR-22, AND -23) IS LOCATED AT THE BACK OF THE RECEIVER CABINET.

Figure 6-1. Test Set-up for Receiver Sensitivity Measurements

to an output level of 6 milliwatts or 1.9 volts across 600 ohms.)

(9) Under this condition, the signal generator output level is a measure of the receiver sensitivity. Check this sensitivity reading against the corresponding value given in Table 6-2, 6-3, or 6-4.

(10) Measure the sensitivity in the A1 SHARP and in the FSK positions of the RECEPTION control on the AN/FRR-21. Substitute the appropriate RECEPTION control position in steps (1) and (7) when performing the sensitivity checks for FSK and A1 SHARP.

*b.* A2 POSITION.

(1) Set the RECEPTION control to A2, the OUTPUT control to maximum, and the tuning dial to the frequency specified in Table 6-2, 6-3, or 6-4.

(2) Set the signal generator for 30 percent modulation at 1000 cps, and adjust the signal generator for a maximum reading on the receiver TUNING meter.

(3) Switch the signal generator to an unmodulated output (leaving signal generator carrier level unchanged) and adjust the GAIN control for a 0 db reading on the OUTPUT meter with the ADD DECIBELS switch in the -10 position. (This is equivalent to an output level of 600 microwatts or 0.6 volt across 600 ohms.)

(4) Switch the signal generator back to a modulated output and adjust the generator signal level for 0 db reading on the receiver OUTPUT meter with the ADD DECIBELS switch in the 0 position (this is equivalent to an output level of 6 milliwatts or 1.9 volts across 600 ohms).

(5) Repeat steps (2) and (3) until both conditions can be attained without further adjustment.

(6) With conditions of step (5) satisfied, the signal generator output level is a measure of the receiver sensitivity. Check this sensitivity reading against the corresponding value given in Table 6-2, 6-3, or 6-4.

*c.* A3 SHARP AND A3 BROAD POSITIONS (RADIO RECEIVERS AN/FRR-22 and -23 ONLY).

(1) Set the RECEPTION control to A3 SHARP, the SILENCER control to minimum, and the tuning dial to the frequency specified in Table 6-2, 6-3, or 6-4.

(2) Repeat steps (2) to (6) of the preceding paragraph *b*, substituting the OUTPUT control for the GAIN control.

(3) Set the RECEPTION control to A3 BROAD, and repeat steps (2) to (6) of the preceding paragraph *b*, substituting the OUTPUT control for the GAIN control.

*d.* FSK (RADIO RECEIVERS AN/FRR-22 and -23 ONLY).—This measurement cannot be made conveniently, because the AGC and BFO are both operating. The AGC prevents determining the signal-to-noise ratio by applying and removing the carrier, as is done for A1 measurements. The BFO prevents determining signal-to-noise ratio by applying and removing modulation, as is done for A3 measurements.

A check on the operation in this position of the RECEPTION control can be obtained by setting up a signal as for A1 BROAD sensitivity, sub-paragraph *a* steps (1) to (8), then:

(1) Set the RECEPTION control to FSK.

(2) Set the OUTPUT control to produce a 0 db reading on the OUTPUT meter.

(3) Set the FREQ. VERNIER control to minimum (fully counterclockwise).

**TABLE 6-2. SENSITIVITY DATA, RADIO RECEIVER AN/FRR-21  
(LOW-FREQUENCY TYPE RECEIVER)**

BAND	FREQ. KC	SENSITIVITY (microvolts)		
		A1 BROAD and FSK	A1 SHARP	A2
1	14	4.7	4.6	...
	22	3.0	3.0	...
	30	3.0	2.5	...
2	30	4.6	3.9	...
	46	3.2	2.2	...
	63	3.2	2.0	...
3	63	4.3	2.8	...
	97	2.4	1.7	...
	133	2.0	1.0	...
4	133	2.7	1.8	...
	206	1.8	1.0	3.9
	283	1.5	0.8	2.1
5	283	2.9	1.5	3.5
	438	2.0	0.8	2.0
	600	1.5	0.9	1.6

**TABLE 6-3. SENSITIVITY DATA RADIO RECEIVER AN/FRR-22  
(MEDIUM-FREQUENCY RECEIVER)**

BAND	FREQ. KC	SENSITIVITY (microvolts)				
		A1 BROAD	A1 SHARP	A2	A3 SHARP	A3 BROAD
1	250	1.7	1.2	3.4	4.0	4.3
	360	1.9	1.2	3.9	4.2	4.6
	500	2.0	1.0	3.2	3.4	3.9
2	500	1.5	1.2	3.2	3.4	3.8
	720	1.5	1.2	3.8	4.6	5.2
	1000	1.9	1.1	3.4	4.0	4.4
3	1000	1.6	1.15	4.0	5.8	6.1
	1440	1.5	1.0	3.2	3.5	4.2
	2000	1.5	0.9	2.8	3.8	4.4
4	2000	2.0	1.0	3.1	4.2	5.2
	2880	1.7	1.0	2.9	3.2	4.1
	4000	1.5	1.0	2.8	3.2	4.0
5	4000	2.0	1.1	3.5	4.0	5.2
	5750	2.0	1.1	3.1	3.5	4.4
	8000	1.9	1.1	2.9	3.2	4.3

**TABLE 6-4. SENSITIVITY DATA RADIO RECEIVER AN/FRR-23  
(HIGH-FREQUENCY RECEIVER)**

BAND KC	FREQ. MC	SENSITIVITY (microvolts)				
		A1 BROAD	A1 SHARP	A2	A3 SHARP	A3 BROAD
1	2.0	1.2	1.3	4.4	5.5	6.7
	2.8	1.2	1.5	5.2	6.1	7.0
	4.0	1.3	1.4	4.7	5.7	7.0
2	4.0	1.5	1.8	6.0	8.5	10.0
	5.6	1.5	1.9	6.8	8.6	9.6
	8.0	1.3	2.3	7.3	8.8	10.0
3	8.0	2.3	1.8	6.2	8.5	10.0
	11.3	1.8	1.8	6.5	8.8	11.0
	16.0	2.3	2.3	6.0	8.2	10.0
4	16.0	2.5	2.7	11.0	12.0	14.0
	19.5	2.4	2.5	9.5	12.0	14.0
	24.0	2.7	2.7	7.1	9.0	10.2
5	24.0	3.5	3.4	8.5	11.0	13.0
	27.7	3.7	3.9	8.0	10.0	12.0
	32.0	4.3	3.6	7.0	7.5	9.3

(4) Switch the reception control alternately to A1 BROAD and FSK while listening to the phones.

(5) If the receiver is operating properly to receive F1 signals, then except for shift in audio frequency, the signal-to-noise ratio in the FSK position of the RECEPTION control sounds only slightly inferior to that in A1 BROAD. This is a rough check but if there is anything wrong with receiver sensitivity in the FSK position of the reception control, a major change in output quality (signal almost lost in noise, no signal, etc.) will be noted.

#### 4. SENSITIVITY DATA.

The information given in Tables 6-2, 6-3, and 6-4 indicates typical sensitivity data for all of these receivers, as measured in the manner described in the preceding paragraph 3. Receivers that differ appreciably (by a factor of more than 2 or 3) from these values are probably out of alignment or have more serious difficulties.

On Radio Receiver AN/FRR-21, FSK sensitivity is the same as A1 BROAD; and A2 sensitivity data is shown only for frequencies above 200 kc, because selectivity of the equipment is too sharp to permit good A2 reception below this frequency. On Radio Receivers AN/FRR-22 and -23, FSK sensitivity is omitted because this measurement in the field is not recommended. The

FSK sensitivity will normally lie between the values given for A1 BROAD and those for A2.

#### 5. SPARE ASSEMBLIES.

Spare assemblies should be stored in a locker or box that is free of excess moisture. Never stock the spare units on top of each other when unpacked.

#### 6. LUBRICATION.

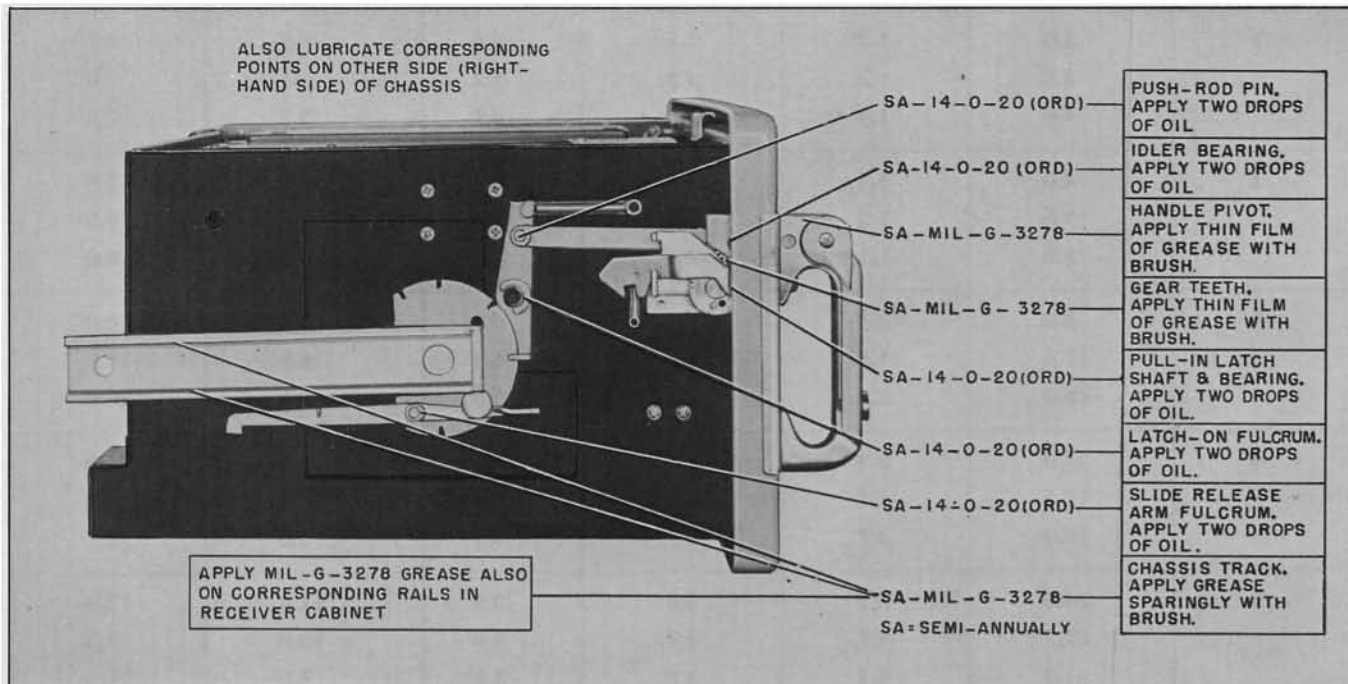
Lubricate the equipment at the time intervals and with the lubricants indicated in figures 6-2 to 6-5 inclusive. Caked or dirty lubricant should be removed with Dry Cleaning Fluid 140-F (5-gallon drum, stock number G51-S-9718-10).

#### 7. TUBE CHECKING.

Checking tubes in this equipment as a periodic maintenance is not recommended. When failure occurs in the equipment, trouble shooting procedure (Section 7) will determine which tube may have failed. As long as performance of the equipment is satisfactory the sub-miniature tubes should not be disturbed.

#### 8. CLEANING MIRROR.

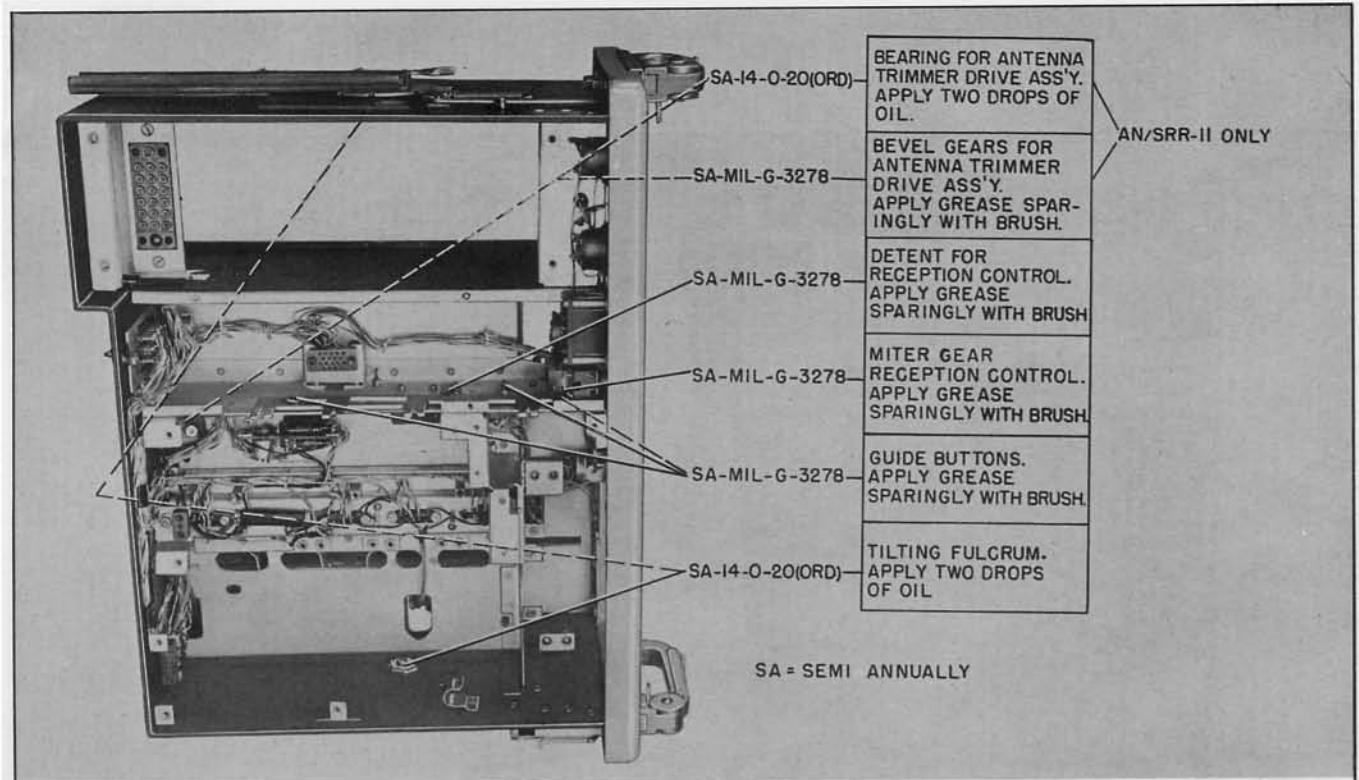
Use a soft cloth with soap solution or alcohol and wipe the mirror softly. Lens cleaning tissues are not recommended because of their oil content.



Specification Number & Table	STANDARD NAVY STOCK NUMBER				
	8 oz.	1 lb.	5 lb.	25 lb.	1 Pint
MIL-G-3278* Grease, Aircraft & Instruments	W14-G-611-5,	W14-G-611-10,	R14-G-984-520	R14-G-984-540	
	R14-G-984-500	R14-G-982-20			
14-O-20 Oil, Lubricating Instrument (Synthetic)					W14-O 975-25

\* Formerly AN-G-25.

Figure 6-2. Lubrication Chart, Chassis Positioning Mechanism

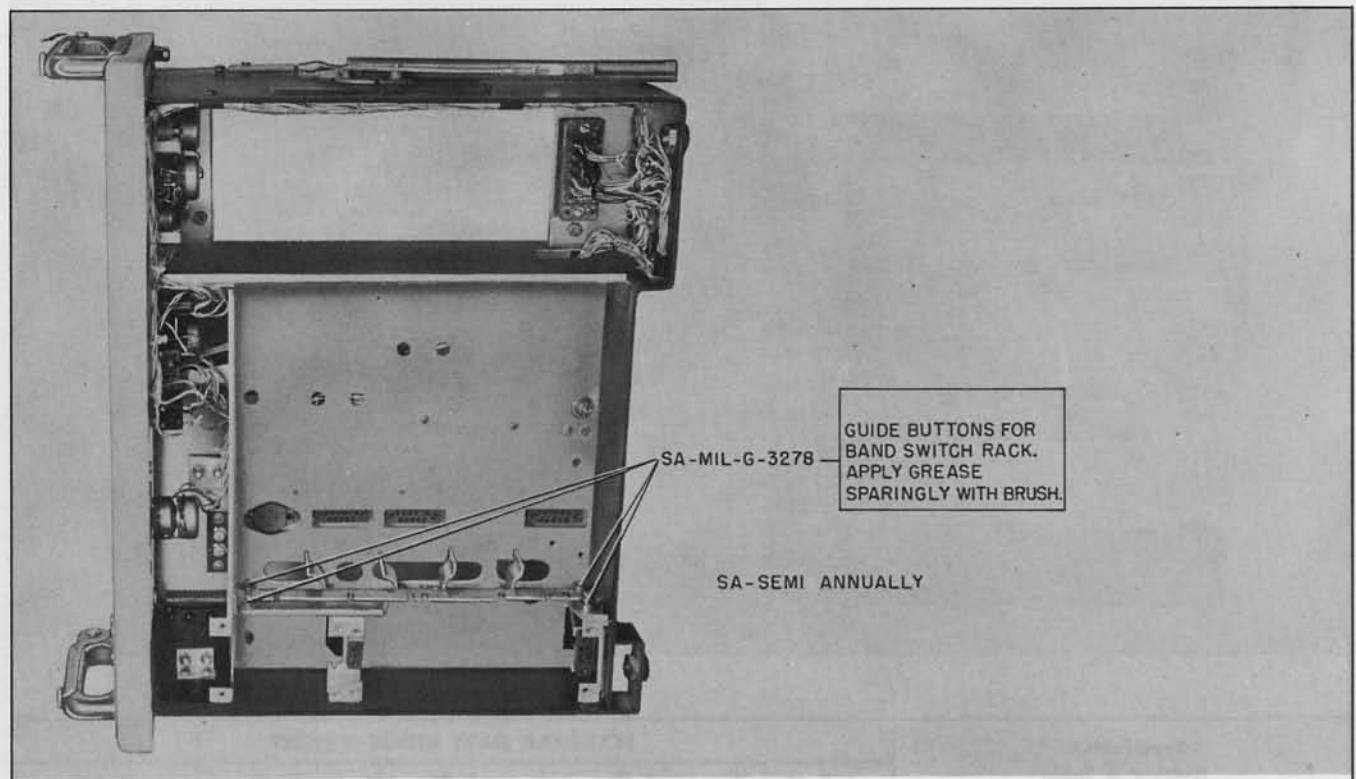


Specification Number & Table	STANDARD NAVY STOCK NUMBER				
	8 oz.	1 lb.	5 lb.	25 lb.	1 Pint
MIL-G-3278* Grease, Aircraft & Instruments	W14-G-611-5,	W14-G-611-10,	R14-G-984-520	R14-G-984-540	
	R14-G-984-500	R14-G-982-20			
14-O-20 Oil, Lubricating Instrument (Synthetic)					W14-O-975-25

\* Formerly AN-G-25.

Figure 6-3. Lubrication Chart, Chassis Top View

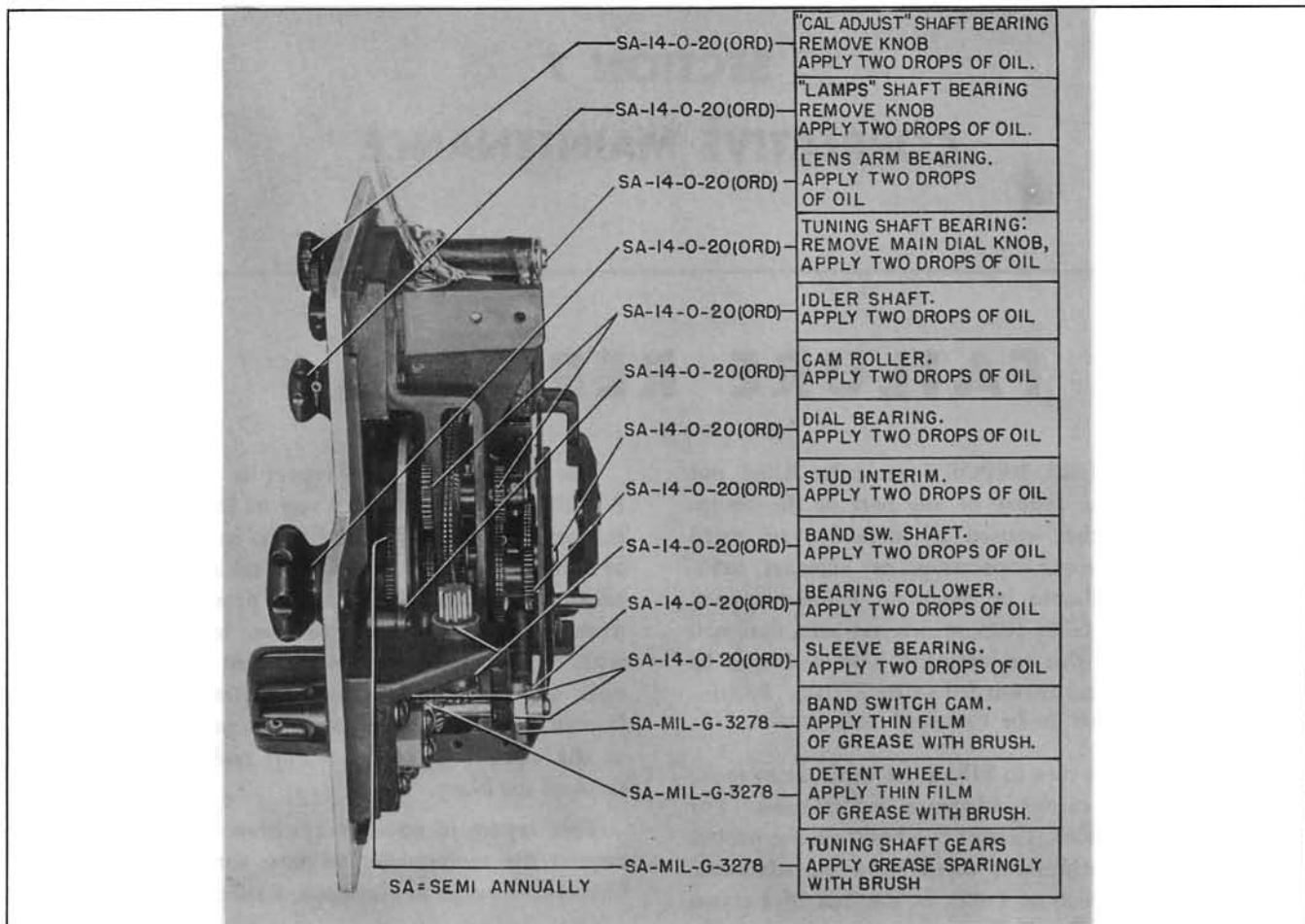




Specification Number & Table	STANDARD NAVY STOCK NUMBER				
	8 oz.	1 lb.	5 lb.	25 lb.	1 Pint
MIL-G-3278* Grease, Aircraft & Instruments	W14-G- 611-5,	W14-G- 611-10,	R14-G- 984-520	R14-G- 984-540	
	R14-G- 984-500	R14-G- 982-20			

\* Formerly AN-G-25.

Figure 6-4. Lubrication Chart, Chassis Bottom View



Specification Number & Table	STANDARD NAVY STOCK NUMBER				
	8 oz.	1 lb.	5 lb.	25 lb.	1 Pint
MIL-G-3278* Grease, Aircraft & Instruments	W14-G-611-5,	W14-G-611-10,	R14-G-984-520	R14-G-984-540	
	R14-G-984-500	R14-G-982-20			
14-O-20 Oil, Lubricating Instrument (Synthetic)					W14-O-975-25

\* Formerly AN-G-25.

Figure 6-5. Lubrication Chart, Tuning Dial Assembly

## SECTION 7

# CORRECTIVE MAINTENANCE

## 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.

### WARNING

Voltages over 300 volts shall be measured as follows:

- (1) Deenergize the equipment. Ground terminals to be measured to discharge any capacitors connected to these terminals. See Note (F).
- (2) Connect meter to terminals to be measured using a range higher than the expected voltage.
- (3) WITHOUT TOUCHING METER OR TEST LEADS, energize the equipment and read the meter.
- (4) Deenergize the equipment. Ground the terminals connected to the meter before disconnecting meter.

**NOTES:**

(A) MAKE SURE you are NOT GROUNDED whenever you are adjusting equipment or using measuring equipment.

(B) In general, USE ONE HAND only when servicing live equipment.

(C) If test meter must be held or adjusted while voltage is applied GROUND the case of the meter before starting measurement and DO NOT touch the live equipment or personnel working on live equipment while you are holding the meter. Some moving-vane type meters should not be grounded. These should not be held during measurements.

(D) DO NOT FORGET that high voltages MAY BE PRESENT across terminals that are normally low-voltage, due to equipment breakdown. Be careful even when measuring low voltages.

(E) DO NOT use test equipment known to be in poor condition.

(F) High-voltage high-capacity capacitors should be discharged with a grounding stick with approximately 10 ohms in series with the grounded line. Where neither terminal of a capacitor is grounded, short capacitor terminals to each other.

**WARNING**

THIS EQUIPMENT EMPLOYS VOLTAGES WHICH ARE DANGEROUS AND MAY BE FATAL IF CONTACTED. ALWAYS OBSERVE ALL SAFETY REGULATIONS AND PRECAUTIONS. REFER TO THE SAFETY PRECAUTIONS.

**1. INTRODUCTION.**

This section is written to help the technician in localizing trouble and in repairing and adjusting the equipment as necessary. It also contains reference data on electron tube characteristics, crystal characteristics, coil winding, and selectivity curves.

A list of test equipment required for trouble shooting and alignment of the Radio Receivers is given in Table 7-1.

Follow the instructions given in Section 3, paragraph 2a, for removal of the chassis from the cabinet, and in Section 3, paragraph 3a, for placing the receiver in the servicing positions. A Test Cable Assembly, CG-1101 FRR, is provided for operating the receiver in the servicing positions. See paragraph 3e for connecting of this cable.

**2. LOCALIZING TROUBLE.**

Radio Receivers AN/FRR-21, -22, and -23 are comprised of 12 assemblies, namely antenna, r-f, mixer, oscillator, first i-f, second i-f, audio, BFO, crystal cali-

brator, power supply, tuning dial assembly, and filter assembly. Each of these assemblies can be removed and replaced by loosening a few captive screws; some assemblies require slight additional procedures (see paragraph 4 for instructions on removal of assemblies).

When trouble occurs, the first step is to establish in which assembly the fault exists. The faulty assembly can then be replaced if a spare one is available, or repaired if there is no spare assembly.

Most of the assemblies are divided into sub-assemblies many of which plug into the assembly. Each plug-in sub-assembly contains a sub-miniature electron tube and associated parts.

Plug-in sub-assemblies are of two types, plug-in boards, and plug-in units. The plug-in boards are located in the antenna, r-f, mixer, and oscillator assemblies; and the plug-in units are in the first i-f, second i-f, audio, BFO, and crystal calibrator assemblies. The power supply assembly uses conventional type tubes and does not contain sub-assemblies. The tuning dial and filter assemblies do not contain electron tubes. The pro-

cedure given below quickly and systematically checks the functioning of the radio receiver by observation of the indicators that are built into the equipment. Two of these indicators (TUNING meter and OUTPUT meter) check the signal circuits, the two others (pilot light, dial light) are related to the power circuits. This procedure follows and describes steps outlined in the trouble shooting chart, Table 7-2. After localizing the trouble to an assembly or system, the procedure refers to a portion of paragraph 3, Detailed Trouble Shooting, where information is given for a more thorough check of the equipment. In some cases, where use of the equipment indicators isolates the trouble to a limited section of the receiver, details for localizing trouble are contained right within that paragraph without referring to paragraph 3.

When trouble occurs or when it is desired to make a systematic check of the receiver performance, visually inspect the chassis, check for charred insulation, discoloration of parts, leakage of potting compound or indications of abnormal operation. If the parts appear normal and odor of burned insulation is not detected, proceed as follows to localize the trouble or to check the receiver.

*a.* DIAL LIGHT AND FUSES.—Turn the POWER switch to ON and check the dial light. If the dial light is glowing, this indicates that the power input and power transformer T1601 primary circuits are operating. In this case follow with step *b* of this procedure. If the dial light is not glowing, switch the LAMPS control to the SPARE position; if the dial light still does not glow and the receiver is dead, then replace fuses F1601 and F1602 located on the bottom of the power supply assembly, as shown in figure 7-2. If this does not correct the trouble, then see paragraph 3 (*a*) of this Section.

*b.* PILOT LIGHT.—Check the pilot light: If the pilot light is glowing, this will indicate that the d-c power supply is operating. In this case, see step *c* of this procedure. If the pilot light is not glowing, replace it if it is burned out. If the light still fails to glow, replace tubes V1601 and V1602 located in the power supply assembly. If these measures fail to correct the trouble, then see paragraph 3*b*.

*c.* PHONES AND OUTPUT METER.—Check the OUTPUT meter and phones while attempting to tune in a signal. If the OUTPUT meter and phones both give an indication of signal, then the receiver is operating, but other associated devices such as the crystal calibrator or tuning meter may not be operating. For a more thorough check on the receiver, continue on with step *d*.

If just one of the two, either OUTPUT meter or

phones, gives an indication of signal then the trouble lies within the immediate circuits of the other. This trouble can be localized by taking resistance measurements of the faulty circuit. Refer to the appropriate schematic diagram.

If the OUTPUT meter and phones do not give an indication of signal then go on to step *d* of this procedure.

*d.* TUNING METER.—Check the TUNING meter while attempting to tune a signal. If the TUNING meter gives an indication of signal, the receiver is operating from the antenna input to the output of the third amplifier (V1003) of the second i-f. If such is the case and previously the OUTPUT meter and phones were found to be not indicating signal in step *c*, then the trouble is localized to the audio assembly and associated external components and inter-connecting lines. For further procedures in localizing this trouble see paragraph 3*c*.

If no known trouble exists and this procedure is used as a check of the functioning of the equipment go on to step *e*.

If the TUNING meter gives an indication but there is no signal output as indicated by phones or output meter in the CW positions of the reception control A1 BROAD, A1 SHARP, and FSK, then see step *i* of this procedure.

If the TUNING meter gives no indication of signal and the OUTPUT meter and phones give no indication of signal as determined in step *c*, then the trouble lies in the i-f or r-f systems (see paragraph 3*d* for further localization of trouble).

*e.* OUTPUT CONTROL.—Check the OUTPUT control. If the OUTPUT control is functioning properly it should vary the output level of signal on the OUTPUT meter. If the OUTPUT control does perform this function, then go to step *f*.

If the OUTPUT control does not perform this function on A1 and A2 positions of the RECEPTION control then check the A section of the OUTPUT control (R2007 on AN/FRR-21, R2107 on AN/FRR-22, and R2207 on AN/FRR-23) and its associated wiring.

If the OUTPUT control does not perform this function on A3 and FSK positions of the RECEPTION control then check the B section of the OUTPUT control (R2007 on AN/FRR-21, R2107 on AN/FRR-22, and R2207 on AN/FRR-23) and its associated interconnections.

*f.* SILENCER CONTROL.—Check the SILENCER control (AN/FRR-22 and -23 receivers only). This control is active only on the A3 position of the RECEPTION control. To check its functioning, turn the

**TABLE 7-1. LIST OF TEST EQUIPMENT REQUIRED FOR TROUBLE SHOOTING AND ALIGNMENT OF RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

ITEM No.	QUAN.	DESCRIPTION	NAVY DESIGNATION
1	1	Multimeter	AN/PSM-4 TS-352/U Series
2	1	Electronic Multimeter	ME-25/U Series
3	1	RF Signal Generator Set	AN/URM-25
	1	Impedance Adapter (Part of AN/URM-25)	MX-1074/URM-25
	1	Antenna Simulator (Part of AN/URM-25)	SM-35/URM-25
	1	Test Lead (Part of AN/URM-25)	CX-1363/U*
4	1	Audio Oscillator	TS-382A/U or higher, Navy Model LAJ Series
5	1	Heterodyne Frequency Meter	Navy Model LR Series
6	1	Oscilloscope	OS-8/U, Model OBL or OBT series
7	1	Tube Tester	TV-3/U Series

\* Contains an isolating capacitor.

control fully counterclockwise and tune in an A3 signal; then turn the silencer control clockwise and note if the control eliminates the background noises. If it does perform this function, go on to step *g* of this procedure. If it does not perform this function, then check the noise peak limiter diode (V1101) and its associated components, the SILENCER control (R2106 on AN/FRR-22 and R2206 on AN/FRR-23) and its interconnecting lines, and the portion of switch S1101-A associated with this control.

*g.* GAIN CONTROL.—Check the GAIN control (active on A1 and A2 positions of the RECEPTION control and FSK position of the low-frequency receivers). This control should vary the signal output, as indicated by the TUNING meter, OUTPUT meter, and phones. If the gain control does vary the signal output as described above, then proceed to step *b* of this procedure. If the gain control does not vary the output level to any degree, then the trouble is probably in the immediate circuits of the GAIN control (R2001 on AN/FRR-21, R2107 on AN/FRR-22, and R2207 on AN/FRR-23) itself. Check resistance and continuity of A and B sections of this control and its interconnections till the fault is found. Refer to the appropriate schematic diagram and figures 7-1 and 7-2 for location of interconnections. If the GAIN control (R2001 on AN/FRR-21, R2107 on AN/FRR-22, and R2207 on AN/FRR-23) varies the output to only a slight degree, then the trouble is probably in either the antenna and r-f section of the GAIN control (A section and associated circuit), or in the second i-f section of the GAIN

control (B section and associated circuit). To localize this trouble to any of the above mentioned sections check for a slight positive voltage, which should vary as the gain control is turned, on terminal 3 of both the A and B section of the GAIN control. Check this voltage on all the applicable points as given on the appropriate schematic diagram until the faulty connection or part is found.

*b.* CRYSTAL CALIBRATOR.—Turn the CAL switch to on. Turn the tuning knob until a zero beat is obtained on the phones. Check this on all five bands, and at several frequency check points throughout each band. Note the position of the tuning dial at zero beat. If the positions of the zero beat coincide with the frequency check points on the dial (inverted V on the frequency scale), or are capable of being brought to coincidence by the CAL ADJUST knob, then continue with step *i* of this procedure. If zero-beat indications are obtained, but their position does not correspond to the frequency dial check points, then misalignment of the oscillator crystal calibrator, or tuning dial is indicated.

The 95-volt regulated B+ supplies plate voltage to the oscillator. A changed value of this voltage could cause misalignment of the oscillator. Check regulated B+ voltage between J203F of the AN/FRR-21 receiver, J403F of the AN/FRR-22 receiver, or J4403F of the AN/FRR-23 receiver and ground. If it is not 95 volts d-c, then replace the regulator tube (V1603) in the power supply. If this fails to give the required 95 volts at the above mentioned jacks, then check the voltage at all the connectors through which the regulated

B+ passes until the fault is found. Refer to the appropriate schematic diagram and to figures 7-1 and 7-2 for location of these connectors. If this voltage is 95 volts d-c, then check the crystal calibrator frequency. See paragraph 14e for checking the crystal calibrator frequency. *Do not tamper with the crystal calibrator adjustments until it is made certain that this frequency is off.* If the crystal calibrator frequency is correct, then align the oscillator section on only the band or bands where calibration cannot be obtained. See paragraph 14f for oscillator and r-f alignment.

If beat notes are not obtained on any position of the band selector and the receiver is otherwise operative, then trouble in the crystal calibrator assembly and interconnections is indicated. See paragraph 3f for localizing this trouble.

i. **FREQ. VERNIER (BFO).**—Turn the RECEPTION control to A1 position, and tune in a signal. If a signal can be heard, and the audio note can be adjusted to 1000 cps (approx.) by the FREQ. VERNIER control, then proceed to step j.

If a beat note is heard but cannot be tuned properly then see paragraph 14d for alignment of the BFO.

If a beat note is not heard but a signal is indicated on the tuning meter, then the fault most likely lies in the BFO assembly or in the BFO mixer stage Z1010 of the second i-f. See paragraph 3g for further localization.

If a beat note is not heard on phones or indicated on the TUNING meter, then the fault lies in the second i-f assembly or BFO; see paragraph 3d or 3g for further localization.

j. **WEAK OUTPUT.**—If all of the above controls and meters function, but the receiver in general appears to have a weak output, check the receiver sensitivity as described in Section 6. If the sensitivity is normal the trouble lies in the antenna and its connecting line or the set is in an area of weak signal reception.

If the sensitivity is low, take stage gain measurements starting from the audio output Z1109 and working back to the receiver input. Nominal stage gain measurements are given in Table 7-3. If a stage gain is found to be low, replace the stage. If this fails to correct the trouble, then a fault in the interconnections between the stages is indicated. Check voltage and resistance as given in Tables 7-4 and 7-5 to further localize this trouble. A low stage gain measurement in the r-f section, first i-f or second i-f could indicate misalignment, see paragraph 11 for alignment of the receiver.

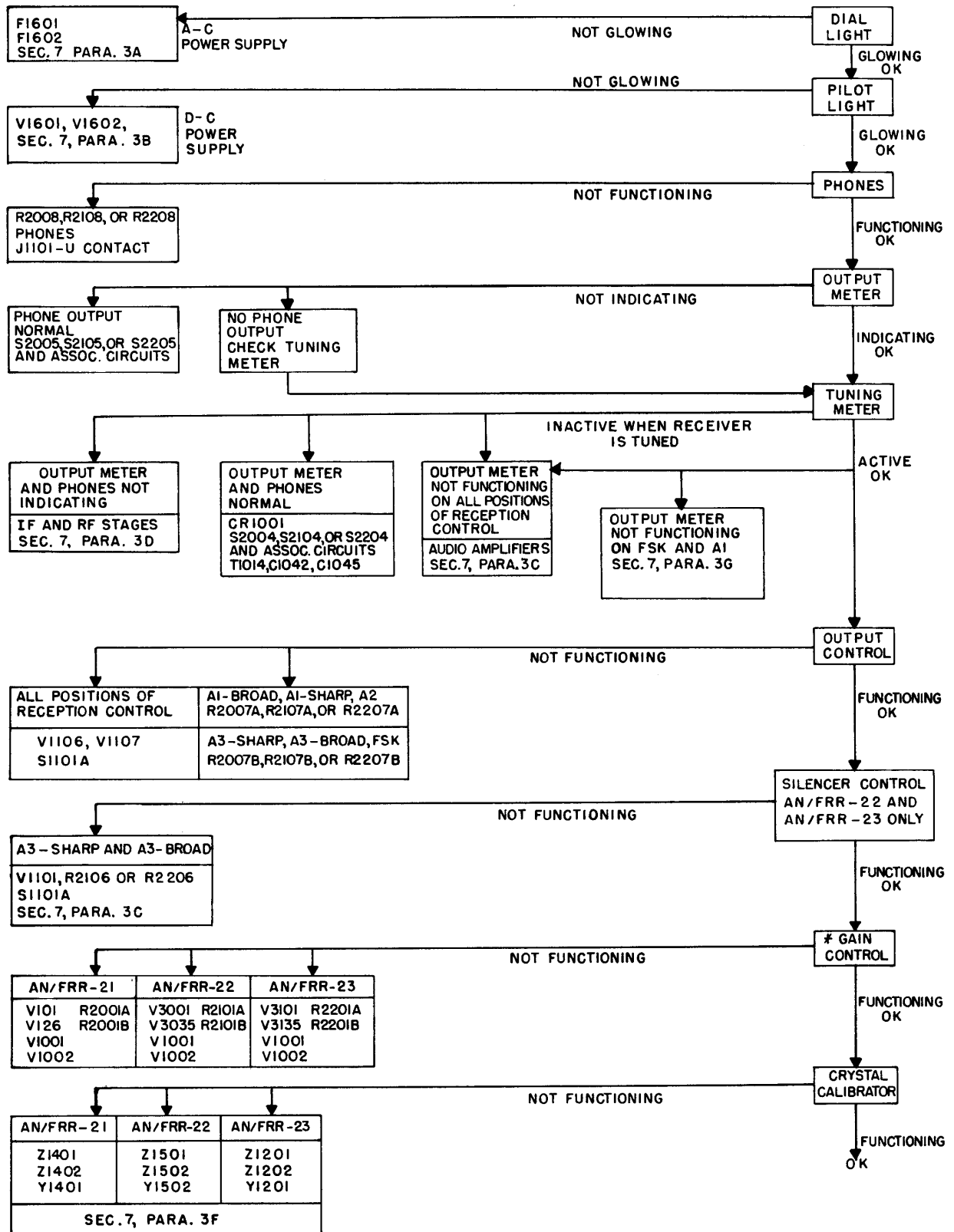
### 3. DETAILED TROUBLE SHOOTING.

The following procedures constitute a detailed, systematic, and complete check on the functioning of the equipment. These procedures should be used after trouble has been localized by the procedures described in paragraph 2, and as a complement to these procedures. Refer to appropriate schematic diagram figures 7-20 to 7-22, to the component location illustration figures 7-1 and 7-2, and the connection (wiring) diagrams. Table 7-1 is a list of test equipment required throughout this procedure. The block diagrams shown in figures 2-8 to 2-10 will often help in visualizing possible sources of trouble.

a. **A-C POWER SUPPLY.**—(Dial light not glowing, pilot light not glowing, as per paragraph 2a.) After fuses have been eliminated as a possible source of trouble, remove the test cable connector from the rear of the receiver chassis and check between pins 8 and 10 of the test cable connector for presence of a-c line voltage by use of a voltmeter similar to item 1 of Table 7-1. If a-c line voltage is present at these points, the trouble lies either in the chassis interconnections, power switch (S2001 of AN/FRR-21, S2101 of AN/FRR-22, and S2201 of AN/FRR-23), or the power transformer (T1601) primary (pins 1, 2, 3, 4, or 6) or secondary filament circuits (pins 10 to 14). See step (2) for further procedures. If a-c line voltage is not present at these points, the trouble lies either in the filter assembly, the test cable (CG-1101/FRR), or the power cable connecting the receiver to the source of a-c power. See step (1) for further procedures.

(1) Check to see if there is line voltage supplying the receiver. If such is the case, remove the receiver from the cabinet (as described in Section 3 paragraph 2a), and check for presence of line voltage at pins 8 and 10 of jack J2014 of the AN/FRR-21, J2114 of the AN/FRR-22, or J2214 of the AN/FRR-23, located at the back wall of the receiver cabinet, see figure 7-2. If line voltage is present at these points, then the trouble lies in the test cable assembly (CG-1101/FRR). Check the continuity of the cable to find which of the power leads (pin 8 or 10) is at fault, then correct trouble. If line voltage is not present at this point, then remove the plug from power input receptacle at the back of the receiver cabinet J1704 of the AN/FRR-21, J4004 of the AN/FRR-22 and -23, and check for presence of line voltage between pins B and C of the power cable. If line voltage is not present on the power cable, then the fault lies in the incoming line. Turn power off and check continuity of the power cable until trouble is found. If line voltage is present on the power cable, then the fault lies in the filter assembly. Remove the

TABLE 7-2. TROUBLE SHOOTING CHART



\*This control is active only on the A1 and A2 positions of the Reception Control



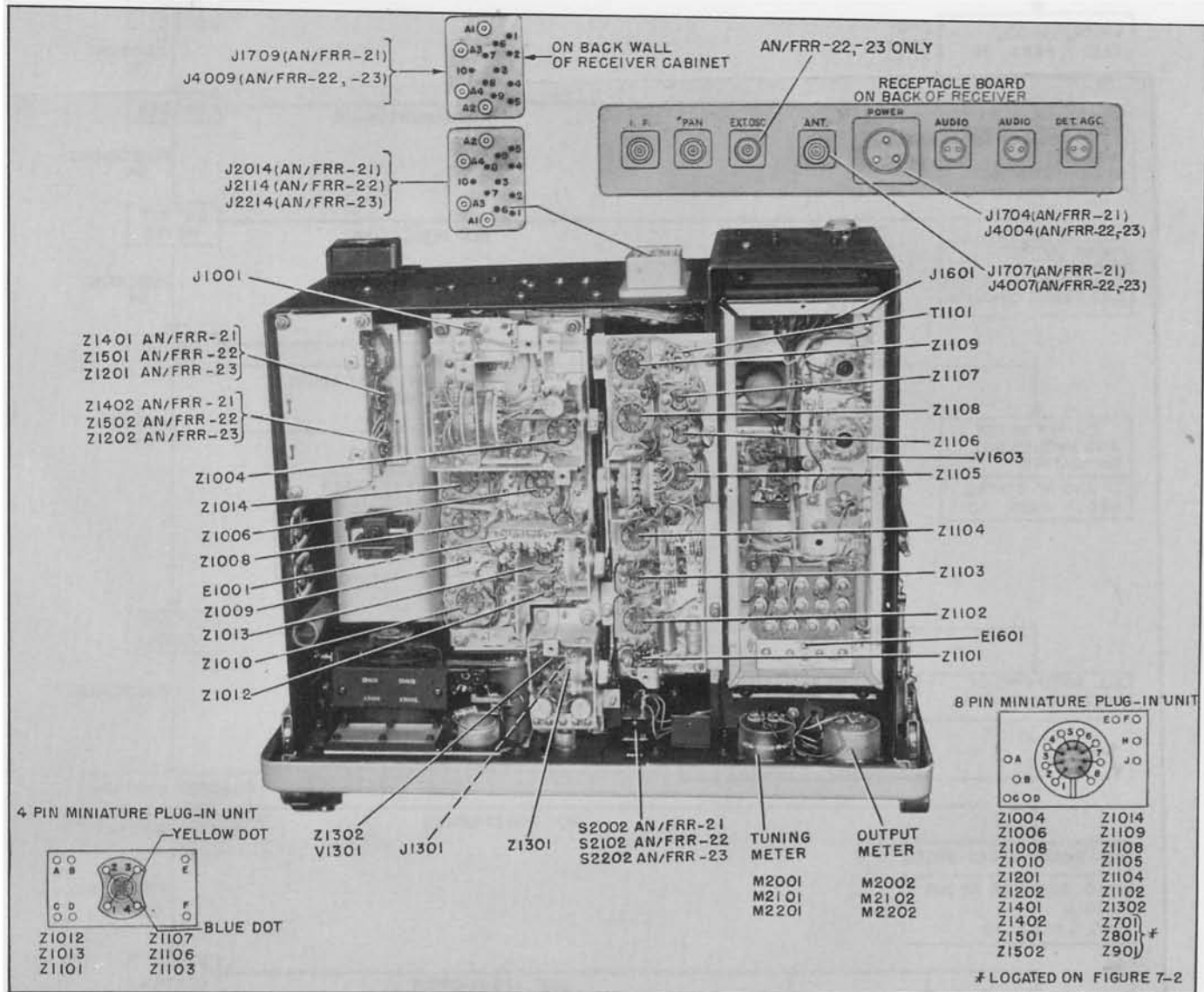


Figure 7-1. Stage Gain and Trouble Shooting Measurement Points, Top View

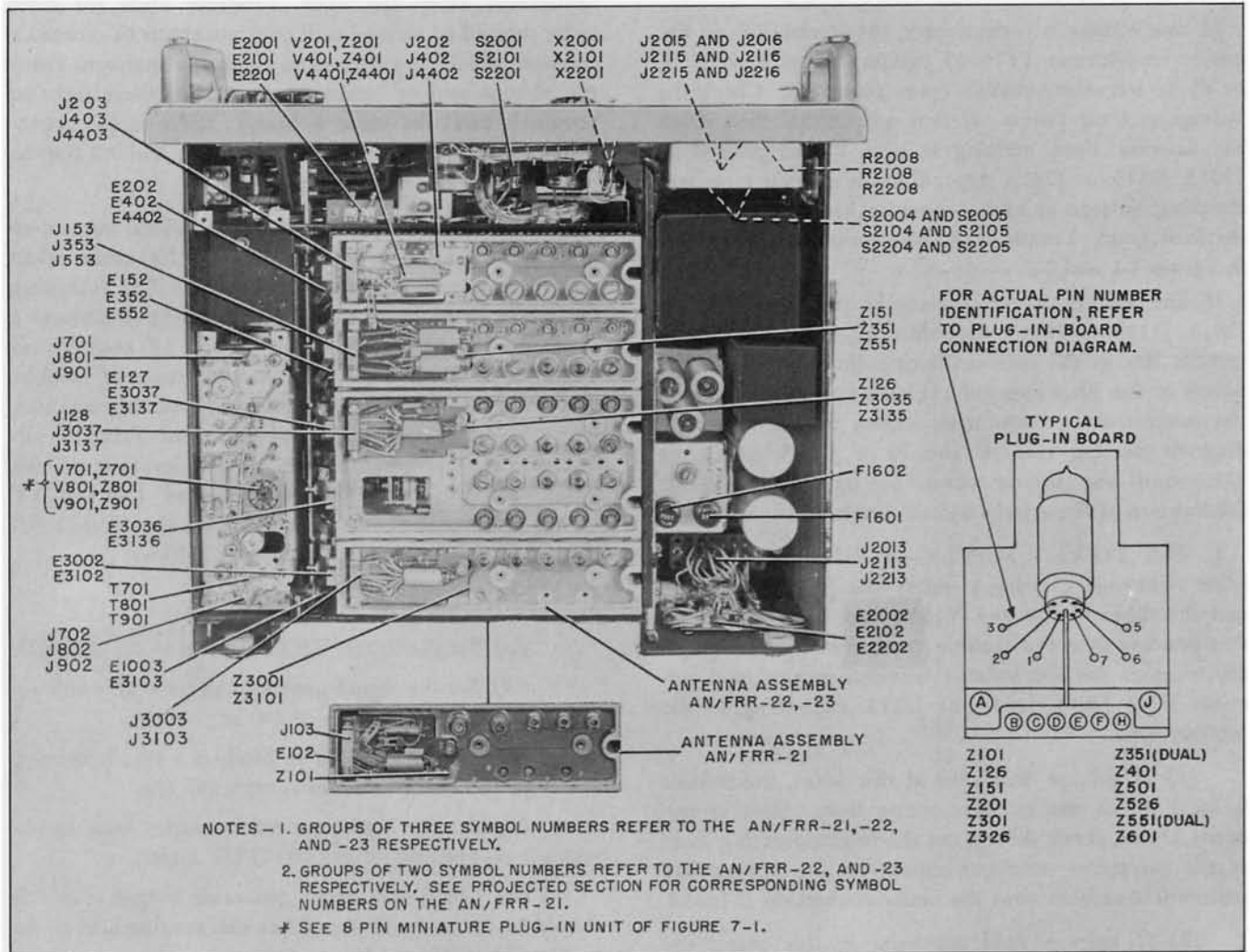


Figure 7-2. Stage Gain and Trouble Shooting Measurement Points, Bottom View

filter assembly and check continuity of Z1702 and associated leads of the AN/FRR-21, and Z4002 of the AN/FRR-22 or -23. If the filters Z1702 or Z4002 are not continuous, emergency operating conditions can be met by bypassing this filter with jumper leads, otherwise replace the filter. To bypass the power line filters Z1702 or Z4002, connect the proper jack as follows:

- (a) J1704B to J1709B and J1704C to J1709C.
- (b) or J4004B to J4009B and J4004C to J4009C.

(2) Check for presence of a-c line voltage between pins P and N of J2013 of the AN/FRR-21, J2113 of the AN/FRR-22, or J2213 of the AN/FRR-23.

If line voltage is present here, the trouble lies in the power transformer (T1601) primary (pins 1, 2, 3, 4, or 6) or secondary circuits (pins 10 to 14). Check the voltage at these points. If they are normal then check the filament lines, starting at pins V and ground of J2013, J2113, or J2213, depending on receiver type, and checking voltage at each connector listed on the schematic diagram. Locations of these connectors are shown in figures 7-1 and 7-2.

If line voltage is not present at pins P and N of J2013, J2113, or J2213, depending on receiver type, the trouble lies in the interconnecting lines between these points or the filter assembly. Check voltages at each of the connectors and terminals shown on the schematic diagram starting from P and N of J2013, J2113, or J2213 until the fault is found. See figures 7-1 and 7-2 for location of these jacks and terminals.

**b. D-C POWER SUPPLY.**—(Dial light glowing, pilot light not glowing.) After the pilot light lamp and the tubes V1601 and V1602 have been eliminated as a possible source of trouble as explained in paragraph 2b, measure the d-c voltage between ground and terminal D of J2013, J2113, or J2213, depending on the receiver type.

(1) If voltage does exist at this point, the trouble is localized to the interconnecting lines. Start at terminal D and check voltage on the interconnecting lines at the successive terminals shown on the appropriate schematic diagrams until the faulty connection is found.

(2) If voltage does not exist at this point, the trouble is in the power supply assembly. Check voltage and resistance of V1601 and V1602, the filter networks, and transformer T1601 (refer to Table 7-4).

**c. AUDIO.**—(No phone output, OUTPUT meter not indicating, TUNING meter indicating when receiver is tuned as per paragraph 2d.) Remove the cover from the audio assembly and take the stage gain measurements listed in Table 7-3. If the audio system is not operating properly on just one or a few positions of the RECEPTION control, take only the measurements cor-

responding to that or those particular positions. Once an abnormal reading is found replace the plug-in unit associated with that stage. If this does not correct the trouble then the fault lies in the interconnecting lines between the plug-in unit and its external associated parts. Check voltage and resistance at the tube socket in that particular stage (normal values are given in Table 7-4). If an abnormal voltage appears, check the assembly appropriate chassis interconnections which could logically cause the trouble. For example if no voltage appears at the plate of a tube and this voltage should be 80 volts d-c, it is obvious that the B+ lead is opened or shorted somewhere along the lines. Probable place for these to be shorted or opened is at any connectors or terminals through which they may pass. It then remains to check the voltage and or resistance at each of these jacks or terminals until the cause is found. Refer to the appropriate schematic diagram and figures 7-1 and 7-2 for the location of these jacks and terminals.

**d. I-F AND R-F SYSTEMS.**—(No phone output, no indication on OUTPUT meter or TUNING meter when receiver is tuned as per paragraph 2d.) The following procedure listed in paragraphs (1) to (5) constitutes a check on the operation of the second i-f assembly to eliminate or localize this as a possible cause of trouble. Remove the cover from the second i-f assembly and connect a signal generator such as item 3 of Table 7-1 directly to J1001B (see figure 7-1 for location of this jack.) Set the OUTPUT, GAIN, and DIVERSITY GAIN BAL controls to maximum and the SILENCER control to minimum and proceed as follows:

(1) A1 SIGNALS.

- (a) Set the RECEPTION control to A1 BROAD.
- (b) Set the signal generator to have an unmodulated output at a frequency of 200 kc.
- (c) Adjust the BFO to produce a 1-kc beat note. See steps (a) and (b) of paragraph 14f (2).
- (d) Set the signal generator output level to obtain a 0 db reading on the OUTPUT meter.
- (e) Check the signal generator output level. It should be 15 uv ( $\pm 30\%$ ). Note this reading and go on to step (f) of this procedure.
- (f) Set the RECEPTION control to A1 SHARP.
- (g) Set the signal generator output level to obtain a 0 db reading on the OUTPUT meter.
- (b) Check the signal generator output level. It should be 15 uv ( $\pm 30\%$ ). Note this reading and go on to paragraph (2) of these procedures.

(2) A2 SIGNALS.

- (a) Set the RECEPTION control to A2.

(b) Set the signal generator to have an output frequency of 200 kc at 30% modulation with 1000 cps.

(c) Set the signal generator output level to obtain a 0 db reading on the OUTPUT meter.

(d) Check the signal generator output level. It should be 25 uv ( $\pm 30\%$ ). Note this reading and proceed to paragraph (3) of these procedures.

(3) A3 SIGNALS (AN/FRR-22 and -23).

(a) Set the reception control to A3 SHARP.

(b) Leaving the signal generator frequency and modulation as set up in paragraph (2), set the signal generator output level to obtain a 0 db reading on the OUTPUT meter.

(c) Check the output level of the signal generator. It should be 25 uv ( $\pm 30\%$ ). Note this reading and proceed to step (d).

(d) Set the reception control to A3 BROAD.

(e) Set the signal generator output level to obtain a 0 db reading on the OUTPUT meter.

(f) Check the signal generator output level. It should be 38 uv ( $\pm 30\%$ ). Note this reading and proceed with paragraph (4) of these procedures.

(4) F1 SIGNALS.

(a) Set the RECEPTION control to FSK.

(b) Set the signal generator to have an unmodulated output at a frequency of 200 kc.

(c) Set the BFO to produce a 1-kc beat note. See steps (a) and (b) of paragraph 14f (2).

(d) Set the signal generator output level to obtain a 0 db reading on the OUTPUT meter.

(e) Check the signal generator output level. It should be 15 uv on the AN/FRR-21 receiver, 22 uv  $\pm 30\%$  on the AN/FRR-22 receiver, and on the AN/FRR-23 receiver. Note this reading then go on to paragraph (5) of these procedures.

(5) CONCLUSION.—If the readings obtained in all of the above steps are normal, the second i-f is then eliminated as a possible cause of trouble. The trouble is now localized to the antenna, r-f, mixer, local oscillator, or first i-f assemblies and their interconnections. Replace the cover on the second i-f assembly, and see paragraph e for further procedures.

If the readings obtained in the above steps (a) to (d) are abnormal, then take the stage gain measurements listed in Table 7-3 for the second i-f. If the readings are abnormal on one or a few positions of the RECEPTION control, take only the stage gain measurements pertaining to these particular positions. Once a faulty

reading is found, replace the plug-in unit associated with that stage. If this does not correct the trouble, then the fault lies in the interconnecting lines between that plug-in unit and its external associated components. Check voltage and resistance at the tube socket in that particular stage (normal values are given in Table 7-4). If an abnormal voltage appears, trace the assembly and chassis interconnections which could logically cause the trouble. For example, if no voltage appears at the plate of a tube and this voltage should be 80 volts d-c, it is obvious that the B+ lead is opened or shorted somewhere along the lines. Probable place for this to be shorted or opened is at jacks or terminals through which it may pass. It then remains to check the voltage and or resistance at each of these jacks or terminals until the cause is found. Refer to the appropriate schematic diagram and figures 7-1 and 7-2 for the location of these jacks and terminals.

e. R-F SYSTEM.—(No phone output, OUTPUT meter not indicating, TUNING meter not indicating when receiver is tuned on all positions of the RECEPTION control and the second i-f has been eliminated as the possible cause of trouble by procedures contained in paragraph 3d.) The procedure given in the following steps (1) to (7) is a method of localizing the trouble to the filter, antenna, r-f, mixer, oscillator, or first i-f assemblies and their interconnecting lines.

(1) Connect a signal generator, such as item 3 of Table 7-1, to the mixer terminal (E152 on AN/FRR-21, E352 on AN/FRR-22, and E552 on AN/FRR-23) of the mixer assembly. These terminals protrude from the bottom of the assembly and are connected to the tuning capacitor through metal straps. The assembly cover will not have to be removed, but make certain to connect to the right terminal. See figure 7-2 for location of this terminal.

(2) Set the RECEPTION control to A1 SHARP and adjust the BFO for a beat note of 1 kc. See paragraph 14f (2), steps (a) and (b) for adjusting the BFO.

(3) Set the signal generator to have an unmodulated output at a frequency of 30 kc on the AN/FRR-21 receiver, 0.5 mc on the AN/FRR-22 receiver, and 4.0 mc on the AN/FRR-23 receiver.

(4) Set the band selector to band 1. (The tuning dial to correspond to the signal generator frequency.)

(5) Set the signal generator output level to obtain a 0 db reading on the OUTPUT meter.

(6) Check the signal generator output level. This should be 120 uv. Note this reading and see step (7) for further procedures.

(7) If the signal generator output level required to produce 0 db on the output meter is within 30% of 120 uv, the trouble can then be assumed to lie in the filter, antenna, or r-f assembly, and the interconnections associated with these assemblies. If the signal generator output level required to produce 0 db on the output meter is not within 30% of 120 uv, the trouble can be assumed to lie in the mixer, oscillator, or first i-f assembly and the interconnections associated with these assemblies.

Measure the gain of the suspected stages. Once an abnormal stage gain measurement is found, replace the stage. If this does not correct the trouble then the fault lies in the interconnecting lines between that stage and its external associated components. Check voltage and resistance at the tube socket in that particular stage; normal values are given in Table 7-4. If an abnormal voltage appears, check the assembly and appropriate chassis interconnections which could logically cause the trouble. For example, if no voltage appears at the plate of a tube and this voltage should be 80 volts d-c, it is obvious that the B+ lead is opened or shorted somewhere along the lines. Probable places for these to be shorted or opened are at any connectors through which it may pass. It then remains to check the voltage at each of these connectors until the cause is found. Refer to the appropriate schematic diagram and figures 7-1 and 7-2 for the location of these jacks and terminals.

f. CRYSTAL CALIBRATOR.—(Receiver operates properly but crystal calibrator beat notes cannot be obtained when attempting to align the tuning dial as per paragraph 2b.) The trouble lies either in the crystal calibrator stages Z1401, Z1402 of the AN/FRR-21 receiver, Z1501, Z1502 of the AN/FRR-22 receiver, or Z1201, Z1202 of the AN/FRR-23 receiver, or in their associated interconnections and parts. Replace each of these stages. If this fails to correct the trouble, then the fault can be assumed to be in the interconnections and external parts associated with the stage. Replace the crystal (Y1401 for the AN/FRR-21 receiver, Y1501 for the AN/FRR-22 receiver, or Y1201 for the AN/FRR-23 receiver). If this fails to restore operation, check voltage and resistance at the tube socket of the crystal calibrator stages; normal values are given in Table 7-4. If an abnormal voltage appears, check the assembly and appropriate chassis interconnections which could logically cause the trouble. For example if no voltage appears at the plate of a tube and this voltage should be 80 volts d-c, it is obvious that the B+ lead is opened or shorted somewhere along the lines. Probable place for these to be shorted or opened is at any jacks or terminals through which it may pass. It then remains to check the voltage at each of these jacks or terminals until the cause is found. Refer to the appropriate sche-

matic diagram and figures 7-1 and 7-2 for the location of these jacks and terminals.

g. BFO.—(No phone output, OUTPUT meter not indicating, TUNING meter active when receiver is tuned on A1 BROAD, A1 SHARP, and FSK positions of the RECEPTION control as per paragraph 2i.) The first step is to localize the trouble to the BFO (V1301) or the BFO mixer (V1004) and their associated parts and interconnections. Follow the procedure given in steps (1) to (6) to accomplish this.

(1) Remove the BFO cover, and connect a signal generator similar to item 3 of Table 7-1, directly to J1301B.

(2) Set the signal generator to have a 1.0 v output level at 201 kc.

(3) Set the reception control to A1 SHARP.

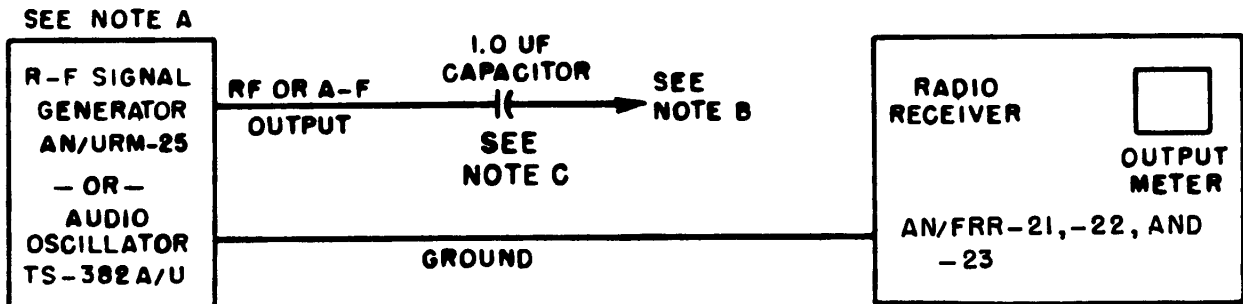
(4) Tune in a signal as would be indicated on the TUNING meter.

(5) Check the OUTPUT meter and phones for presence of a 1-kc beat note.

(6) If a 1-kc beat note is obtained and is of appreciable amplitude, then trouble can be assumed to lie within the BFO stage (Z1302) and associated interconnections and parts. If a 1-kc beat note is not obtained or is weak, then trouble can be assumed to lie in the BFO Mixer (Z1010) and its associated interconnections and parts.

Replace the plug-in unit associated with the suspected stage. If this does not correct the trouble, then the fault lies in the interconnecting lines between that stage and its external associated components. Check voltage and resistance at the tube socket in that particular stage; normal values are given in Table 7-4. If an abnormal voltage appears, check the assembly and appropriate chassis interconnections which could logically cause the trouble. For example, if no voltage appears at the plate of a tube and this voltage should be 80 volts d-c, it is obvious that the B+ lead is opened or shorted somewhere along the lines. Probable place for these to be shorted or opened is at any jacks or terminals through which it may pass. It then remains to check the voltage at each of these jacks or terminals until the cause is found. Refer to the appropriate schematic diagram and figures 7-1 and 7-2 for the location of these jacks and terminals.

b. NOISE PEAK LIMITER, DIODE DETECTOR, AND TUNING INDICATOR.—(No phone output, erratic phone output, TUNING indicator does not register.) With the RECEPTION control at A2, feed a 200-kilocycle signal from an r-f signal generator (sim-



**NOTE A:** USE AN/URM-25 FOR STAGE GAIN MEASUREMENTS ON R-F SYSTEM, I-F SYSTEM, CRYSTAL CALIBRATOR, AND B.F.O. USE TS-382A/U FOR STAGE GAIN MEASUREMENTS ON A-F SYSTEM.

**NOTE B:** CONNECT TO SPECIFIED LOCATION ON RECEIVER.

**NOTE C:** USE TEST LEAD CX-1363/U WITH AN/URM-25 AND DO NOT USE THE I.O UF CAPACITOR. WHEN USING TS-382A/U USE I.OUF CAPACITOR.

SEE NOTE B

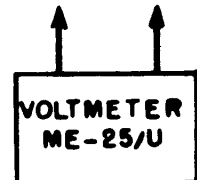


Figure 7-3. Test Set-Up for Stage Gain Measurements

ilar to item 3 of Table 7-1) through a 0.01-mf isolation capacitor (isolation accessory supplied with AN/URM-25) to V1003-5. Modulate the 200-kilocycle signal with a 1000-cycle tone at 30%, and adjust the signal generator output until the TUNING METER reads half scale on the HIGH position of the HIGH-LOW switch.

(1) If there is no other indication of output or if the output is erratic, check V1005 and V1101.

(2) When the TUNING indicator does not register, check voltage and resistance of V1003, and inspect Z1011 for a possible short. If Z1011 is replaced, the spare unit will have to be aligned at 200 kc. See paragraph 14b of this Section.

(3) If output is obtained but the TUNING meter does not register, check the TUNING indicator circuit, Z1009 in AN/FRR-22 and -23 and the HIGH-LOW switch circuit.

i. CHECKING AGC CIRCUITS AN/FRR-22 and -23 ONLY.)—Refer to figure 2-3. The AGC circuit is active when the RECEPTION control is at A3.

(1) Feed an r-f signal from a signal generator to the ANT receptacle of an AN/FRR-22 or -23 receiver. Modulate the r-f signal with a 1000-cycle tone at 30 percent.

(2) Tune the signal generator to any frequency within the tuning range of the receiver being checked, and resonate the receiver to this frequency. Set the RECEPTION control at A3 BROAD.

(3) Set the generator output to 10 uv, and adjust the OUTPUT control until the OUTPUT meter reads 0 db. The SILENCER must be off (fully counterclockwise).

(4) When the generator output is increased to 10,000 uv, the OUTPUT meter reading should not increase by more than 4 db.

**4. STAGE GAIN MEASUREMENTS.**

Stage gain measurements are listed in Table 7-3. The measurements should be taken as called for in paragraph 2 or 3 of this Section. If a measured stage gain does not agree to within approximately 30% of the value given in Table 7-3, then replace the stage. If this fails to correct the trouble, then take voltage and resistance measurements of the stage and associated components to locate the trouble. To measure stage gain, refer to the appropriate portion of Table 7-3 and to figure 7-3, which shows the test set-up, and proceed as follows:

*a.* Refer to figure 7-3 and connect a signal generator or audio oscillator as called for in Table 7-1 to the point designated as input location on that Table (location of points for test equipment connection or the receiver is shown in figures 7-1 and 7-2).

*b.* Set band selector tuning dial and RECEPTION CONTROL as specified in Table 7-3.

*c.* Unless otherwise stated in Table 7-3, set the OUTPUT GAIN, and DIVERSITY GAIN BAL controls to maximum, and the SILENCER control to minimum.

*d.* Set the signal generator to the frequency and output modulated or unmodulated as called for in Table 7-5.

**NOTE**

When Table 7-3 calls for an unmodulated signal generator output, with the BFO adjusted for a 1-kc beat note, refer to paragraph 14f (2), and use steps (a) and (b) of that paragraph to adjust the BFO for a 1-kc beat note.

*e.* If the OUTPUT LOCATION, as called for in Table 7-3, is designated by J-numbers, V-numbers, or Z-numbers connect a voltmeter, as called for in that table, to the specified location.

*f.* Set the signal generator output level to obtain the reading given as OUTPUT LEVEL in Table 7-3. This reading is indicated on either the OUTPUT meter (OM on Table 7-3) or on the voltmeter connected in step *e*.

*g.* Compare the signal generator r-f output level, as indicated on the signal generator, to the INPUT LEVEL value given in Table 7-3. If these two values do not agree to within 30% then consider the stage faulty and replace.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23**

A-F System.

Reception: A1 BROAD, FSK.

UNIT	FREQUENCY CPS	INPUT		OUTPUT		REMARKS
		LOCATION	LEVEL VOLTS	LEVEL	LOCATION	
A-F	1000	Z1109-A	1.5	(0 db) 6 mw	OM (M2002, M2102, or M2202)	
	1000	Z1108-A	0.6	(0 db) 6 mw	OM	
	1000	Z1107-E	0.6	(0 db) 6 mw	OM	
	1000	Z1106-E	0.6	(0 db) 6 mw	OM	
	1000	Z1105-A	0.05	(0 db) 6 mw	OM	
	1000	Z1103-F	0.05	(0 db) 6 mw	OM	
	1000	Z1104-H	0.055	(0 db) 6 mw	OM	
	1000	Z1102-J	0.25	(0 db) 6 mw	OM	
	1000	Z1102-A	0.017	(0 db) 6 mw	OM	

**NOTE:**

Use a 0.47-mf capacitor in series with an audio oscillator similar to item 4 of Table 7-1.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

A-F System.

Reception: A1 SHARP.

All stage measurements similar to A1 Broad Reception with the following exceptions:

UNIT	FREQUENCY CPS	INPUT		OUTPUT		REMARKS
		LOCATION	LEVEL VOLTS	LEVEL	LOCATION	
A-F	1000	Z-1102-J	0.2	(0 db) 6 mw	OM (M2002, M2102, or M2202)	
	1000	A	0.016	(0 db) 6 mw	OM	

**NOTES:**

1. The frequency of the oscillator must be very accurate to take the above measurements.
2. Use a 0.47-mf capacitor in series with an audio oscillator similar to item 4 of Table 7-1.

Reception: A2, A3.

All stage measurements similar to A1 BROAD reception except that following should also be checked.

A-F	100	Z1101-F	0.8	(0 db) 6 mw	OM (M2002, M2102, or M2202)	
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**NOTE:**

Use a 0.47-mf capacitor in series with an audio oscillator similar to item 4 of Table 7-1.

I-F System.

Reception: A1 BROAD, A1 SHARP, also FSK of AN/FRR-21.

Input Signal: 200 kc unmodulated with BFO<sup>o</sup> frequency adjusted for a 1-kc beat note.

UNIT	FREQUENCY KC	INPUT		OUTPUT		REMARKS
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION	
2nd I-F	1	Z1010-J	*0.4	(0 db) 6 mw	OM (M2002, M2102, or M2202)	Use audio oscil- lator (item 4 of Table 7-1).
	200	Z1014-A Z1010-A Z1008-J	*0.55	(0 db) 6 mw	OM	
	200	Z1008-A	43,000	(0 db) 6 mw	OM	
	200	Z1006-J	8,000	(0 db) 6 mw	OM	
	200	Z1006-A	650	(0 db) 6 mw	OM	
	200	Z1004-J	180	(0 db) 6 mw	OM	
	200	Z1004-A	20	(0 db) 6 mw	OM	
	200	J1001-B	15	(0 db) 6 mw	OM	

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For measurement at 1 kc, use 0.47-mf capacitor in series with audio oscillator.
2. For measurements at 200 kc, use a 0.1-mf capacitor connected in series with an r-f signal generator similar to item 3 of Table 7-1.



TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)

I-F System.

Reception: A2, A3 SHARP (AN/FRR-22, -23 only).

Input Signal: 200 kc, 30% modulated at 1000 cps.

UNIT	FREQUENCY KC	INPUT		OUTPUT		REMARKS
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION	
2nd I-F	1	Z1012-E	*0.80	(0 db) 6 mw	OM (M2002, M2102, or M2202)	Use audio oscil- lator (item 4 of Table 7-1).
	200	Z1012-F	*1.4	(0 db) 6 mw	OM	
	200	Z1012-F Z1009-2	*1.4	2 ua	TM (M2002, M2102, or M2202) H1 Sensitivity	
	200	Z1008-J Z1014-A Z1010-A	*1.2	(0 db) 6 mw	OM	
	200	Z1008-A	*0.10	(0 db) 6 mw	OM	
	200	Z1008-A	*0.1	2 v DC	Z1012-E	Use electronic multimeter similar to item 2 of Table 7-1.
	200	Z1006-J	20,000	(0 db) 6 <sup>*</sup> mw	OM	
	200	Z1006-A	1600	(0 db) 6 mw	OM	
	200	Z1004-J	500	(0 db) 6 mw	OM	
	200	Z1004-A	46	(0 db) 6 mw	OM	
	200	J1001-B	25	(0 db) 6 mw	OM	

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For measurement at a frequency of 1 kc use a 0.47-mf capacitor in series with the audio oscillator.
2. For measurements at a frequency of 200 kc use a 0.1-mf capacitor connected in series with an r-f signal generator similar to item 3 of Table 7-1.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

I-F System.

Reception: A3 BROAD (AN/FRR-22, -23 only).

Input Signal: 200 kc, 30% modulated at 1000 cps.

All stage measurements similar to A3 SHARP reception with the following exceptions:

UNIT	FREQUENCY KC	INPUT		OUTPUT		REMARKS
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION	
2nd I-F	200	J1001-B	38	(0 db) 6 mw	OM (M2202)	

**NOTE:**

Use a 0.1-mf capacitor connected in series with an r-f signal generator similar to item 3 of Table 7-1.

I-F System.

Reception: FSK (AN/FRR-22 and -23 only).

Input Signal: 200 kc, unmodulated, BFO adjusted to 1 kc. beat.

UNIT	FREQUENCY KC	INPUT		OUTPUT		REMARKS
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION	
2nd I-F	1	Z1012-E	*1.2	(0 db) 6 mw	OM (M2002, M2102, or M2202)	Use audio oscillator (item 4 of Table 7-1).
	200	Z1012-F	*2.1	(0 db) 6 mw	OM	
	200	Z1012-F Z1009-2	*2.1	20 ua	TM (M2002, M2102, or M2202) HI Sensitivity	
	200	Z1008-J Z1014-A Z1010-A	*1.8	(0 db) 6 mw	OM	
	200	Z1008-A	*0.15	(0 db) 6 mw	OM	
	200	Z1008-A	*0.15	2 v DC	Z1012-E	Use electronic multimeter similar to item 2 of Table 7-1.
	200	Z1006-J	30,000	(0 db) 6 mw	OM	
	200	Z1006-A	2400	(0 db) 6 mw	OM	
	200	Z1004-J	750	(0 db) 6 mw	OM	
	200	Z1004-A	46	(0 db) 6 mw	OM	
	200	J1001-B	25	(0 db) 6 mw	OM	

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For measurements at a frequency of 1 kc use a 0.47-mf capacitor in series with the audio oscillator.
2. For measurements at a frequency of 200 kc, use a 0.1-mf capacitor connected in series with an r-f signal generator similar to item 3 of Table 7-1.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

I-F System, AN/FRR-21.

Reception: A1 SHARP. Bands: 1 and 4.

Input Signal: Unmodulated with BFO frequency adjusted for a 1-kc beat note.

UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
1st I-F	200	Z701-A	2820	(0 db) 6 mw	OM (M2002)
	60	Z701-A	950	(0 db) 6 mw	OM
	60	J701-B	18,000	(0 db) 6 mw	OM
	60	V151-1 (mixer)	100	(0 db) 6 mw	OM

**NOTE:**

Use a 0.1-mf capacitor in series with an r-f signal generator similar to item 3 of Table 7-1.

I-F System, AN/FRR-22.

Reception: A1 SHARP. Bands: 4 and 5.

Input Signal: Unmodulated with BFO frequency adjusted for a 1-kc beat note.

UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
1st I-F	200	Z801-A		(0 db) 6 mw	OM (M2102)
	1600	Z801-A		(0 db) 6 mw	OM
	1600	J801-B		(0 db) 6 mw	OM
	1600	V351-1 (mixer)		(0 db) 6 mw	OM

I-F System, AN/FRR-23.

Reception: A1 SHARP.

Input Signal: Unmodulated with BFO frequency adjusted for a 1-kc beat note.

UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
1st I-F	200	Z901-A		6 mw	OM (M2202)
	1600	Z901-A		6 mw	OM
	1600	J901-B		(0 db) 6 mw	OM
	1600	V551-1 (mixer)		(0 db) 6 mw	OM

**NOTE:**

Use a 0.1-mf capacitor in series with an r-f signal generator similar to item 3 of Table 7-1.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-21.

Reception: A1 SHARP.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an A-F output of 1 kc.

BAND 1		DIAL SETTING 14 Kc			
UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	60	E152	65	(0 db) 6 mw	OM (M2002)
	14	E152	135	(0 db) 6 mw	OM
	..	....	...	*4.5	V151-4
R-F	14	E127	44	(0 db) 6 mw	OM
Antenna	14	E102 or V101-1	2.5	(0 db) 6 mw	OM
	14	J102-N	0.95	(0 db) 6 mw	OM
Filter	14	J1707	0.95	(0 db) 6 mw	OM
Oscillator	..	....	...	*7.5 *9.0 *6.0 *6.0 *9.0	E202 J202-K J202-L V201-5 V201-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.
5. Antenna links in high impedance position.

TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)

R-F System, AN/FRR-21.

Reception: A1 SHARP.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an A-F output of 1 kc.

BAND 1		DIAL SETTING 29 Kc			
UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	60	E152	145	(0 db) 6 mw	OM (M2002)
	29	E152	500	(0 db) 6 mw	OM
	..	....	...	*4.5	V151-4
R-F	29	E127	130	(0 db) 6 mw	OM
Antenna	29	E102	36	(0 db) 6 mw	OM
	29	J102-N	9.0	(0 db) 6 mw	OM
Filter	29	J1707	2.0	(0 db) 6 mw	OM
Oscillator	..	....	...	*10 *9.5 *9.5 *6.0 *9.0	E202 J202-K J202-L V201-5 V201-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-21.

Reception: A1 SHARP.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 2		DIAL SETTING 30 Kc			
UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	200	E152	380	(0 db) 6 mw	OM (M2002)
	30	E152	1100	(0 db) 6 mw	OM
R-F	...	....	....	*4.2	V151-4
	30	E127	240	(0 db) 6 mw	OM
Antenna	30	E102	16	(0 db) 6 mw	OM
	30	J102-N	3.4	(0 db) 6 mw	OM
Filter	30	J1707	1.5	(0 db) 6 mw	OM
Oscillator	...	....	....	*9.5 *10 *10 *4.8 *9.0	E202 J202-K J202-L V201-5 V201-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.

TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)

R-F System, AN/FRR-21.

Reception: A1 SHARP.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 2		DIAL SETTING 63 Kc			
UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	200	E152	300	(0 db) 6 mw	OM (M2002)
	63	E152	750	(0 db) 6 mw	OM
	...	....	...	*4.0	V151-4
R-F	63	E127	90	(0 db) 6 mw	OM
Antenna	63	E102	24	(0 db) 6 mw	OM
	63	J102-N	5.4	(0 db) 6 mw	OM
Filter	63	J1707	1.3	(0 db) 6 mw	OM
Oscillator	...	....	...	*30 *8.4 *10.5 *4.4 *9.0	E202 J202-K J202-L V201-5 V201-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-21.

Reception: A1 SHARP.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 2		DIAL SETTING 63 Kc			
UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	200	E152	300	(0 db) 6 mw	OM (M2002)
	63	E152	750	(0 db) 6 mw	OM
	...	....	...	*4.0	V151-4
R-F	63	E127	90	(0 db) 6 mw	OM
Antenna	63	E102	24	(0 db) 6 mw	OM
	63	J102-N	5.4	(0 db) 6 mw	OM
Filter	63	J1707	1.3	(0 db) 6 mw	OM
Oscillator	...	....	...	*30 *8.4 *10.5 *4.4 *9.0	E202 J202-K J202-L V201-5 V201-5

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use a 390-ohm resistor connected in series with signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.



**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-21.

Reception: A1 SHARP.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 3		DIAL SETTING 63 Kc			
UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	200	E152	135	(0 db) 6 mw	OM (M2002)
	63	E152	320	(0 db) 6 mw	OM
	...	....	...	*4.0	V151-4
R-F	63	E127	160	(0 db) 6 mw	OM
Antenna	63	E102	12.5	(0 db) 6 mw	OM
	63	J102-N	2.5	(0 db) 6 mw	OM
Filter	63	J1707	1.4	(0 db) 6 mw	OM
Oscillator	...	....	...	*15 *12 *11.5 *4.5 *9.5	E202 J202-K J202-L V201-5 V201-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Output level readings taken with ADD DECIBELS switch in the 0 position.
3. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with signal generator.
4. All measurements made with chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-21.

Reception: A1 SHARP.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 3		DIAL SETTING 133 Kc			
UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	200	E152	650	(0 db) 6 mw	OM (M2002)
	133	E152	420	(0 db) 6 mw	OM
	...	....	...	*4.0	V151-4
R-F	133	E127	120	(0 db) 6 mw	OM
Antenna	133	E102	24	(0 db) 6 mw	OM
	133	J102-N	4.4	(0 db) 6 mw	OM
Filter	133	J1707	0.32	(0 db) 6 mw	OM
Oscillator	...	....	...	*37 *12 *12.5 *4.0 *10	E202 J202-K J202-L V201-5 V201-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Output level readings taken with ADD DECIBELS switch in the 0 position.
3. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case Antenna Simulator SM-35/URM-25 connected in series with signal generator.
4. All measurements made with chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-21.

Reception: A1 SHARP.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for a-f output of 1 kc.

BAND 4		DIAL SETTING 133 Kc			
UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	60	E152	120	(0 db) 6 mw	OM (M2002)
	133	E152	340	(0 db) 6 mw	OM
	...	....	...	*4.5	V151-4
R-F	133	E127	80	(0 db) 6 mw	OM
Antenna	133	E102	13	(0 db) 6 mw	OM
	133	J102-N	3.0	(0 db) 6 mw	OM
Filter	133	J1707	1.05	(0 db) 6 mw	OM
Oscillator	...	....	...	*10 *10.5 *9.0 *5.0 *8.5	E203 J202-K J202-L V201-5 V201-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1)

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with signal generator.
3. Output level readings taken with ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-21.

Reception: A1 SHARP.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 4		DIAL SETTING 283 Kc			
UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	60	E152	70	(0 db) 6 mw	OM (M2002)
	283	E152	140	(0 db) 6 mw	OM
	...	....	...	*4.2	V151-4
R-F	283	E127	22	(0 db) 6 mw	OM
Antenna	283	E102	13	(0 db) 6 mw	OM
	283	J102-N	3.0	(0 db) 6 mw	OM
Filter	283	J1707	0.58	(0 db) 6 mw	OM
Oscillator	...	....	...	*20 *11 *10.5 *4.5 *9.5	E202 J202-K J202-L V201-5 V201-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with signal generator.
3. Output level readings taken with ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.

TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)

R-F System, AN/FRR-21.

Reception: A1 SHARP.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 5		DIAL SETTING 283 Kc			
UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	200	E152	240	(0 db) 6 mw	OM (M2002)
	283	E152	430	(0 db) 6 mw	OM
	...	....	...	*4.0	V151-4
R-F	283	E127	110	(0 db) 6 mw	OM across
Antenna	283	E102	16.0	(0 db) 6 mw	OM across
	283	J102-N	3.0	(0 db) 6 mw	OM
Filter	283	J1707	1.7	(0 db) 6 mw	OM
Oscillator	...	....	...	*16	E203
				*9.5	J202-K
				*6.0	J202-L
				*4.0	V201-5
				*7.0	V201-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with signal generator.
3. Output level readings taken with ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-21.

Reception: A1 SHARP.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 5		DIAL SETTING 600 Kc			
UNIT	FREQUENCY KC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	200	E152	75	(0 db) 6 mw	OM (M2002)
	600	E152	155	(0 db) 6 mw	OM
	...	....	...	*3.5	V151-4
R-F	600	E127	21	(0 db) 6 mw	OM
Antenna	600	E102	9.0	(0 db) 6 mw	OM
	600	J102-N	2.0	(0 db) 6 mw	OM
Filter	600	J1707	0.5	(0 db) 6 mw	OM
Oscillator	...	....	...	*30 *11 *10.5 *3.5 *9.0	E203 J202-K J202-L V201-5 V201-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with signal generator.
3. Output level readings taken with ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-22.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 1		DIAL SETTING 0.25 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	0.200	E352	160	6 mw	OM (M2102)
	0.250	E352	300	6 mw	OM
	...	....	...	*3.1	J353-B
R-F	0.250	E3038	81	6 mw	OM
	0.250	E3036	49	6 mw	OM
Antenna	0.250	E3002	19	6 mw	OM
Filter	0.250	J4007	1.6	6 mw	OM
Oscillator	...	....	...	*55 *44 *29 *31	E402 J402-K J402-L V401-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-22.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 1		DIAL SETTING 0.50 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	0.20	E352	270	6 mw	OM (M2102)
	0.50	E352	600	6 mw	OM
	...	....	...	*3	J353-B
R-F	0.50	E3038	430	6 mw	OM
	0.50	E3036	300	6 mw	OM
Antenna	0.50	E3002	48	6 mw	OM
Filter	0.50	J4007	2.8	6 mw	OM
Oscillator	...	....	...	*95 *54 *30 *41	E402 J402-K J402-L V401-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.



TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)

R-F System, AN/FRR-22.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 2		DIAL SETTING 0.50 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	0.20	E352	140	6 mw	OM (M2102)
	0.50	E352	270	6 mw	OM
	...	....	...	*3.8	J353-B
R-F	0.50	E3038	100	6 mw	OM
	0.50	E3036	40	6 mw	OM
Antenna	0.50	E3002	16	6 mw	OM
Filter	0.50	J4007	1.6	6 mw	OM
Oscillator	...	....	...	*61 *38 *24 *27	E402 J402-K J402-L V401-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-22.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 2		DIAL SETTING 1.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	0.20	E352	270	6 mw	OM (M2102)
	1.0	E352	520	6 mw	OM
	...	....	...	*3.7	J353-B
R-F	1.0	E3038	390	6 mw	OM
	1.0	E3036	190	6 mw	OM
Antenna	1.0	E3002	29	6 mw	OM
Filter	1.0	J4007	2.8	6 mw	OM
Oscillator	...	....	...	*85 *45 *24 *34	E402 J402-K J402-L V401-1

\* R-f volts, measured with electronics multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-22.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 3		DIAL SETTING 1.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	0.20	E352	95	6 mw	OM (M2102)
	1.0	E352	130	6 mw	OM
	...	....	...	*6	J353-B
R-F	1.0	E3038	28	6 mw	OM
	1.0	E3036	15	6 mw	OM
Antenna	1.0	E3002	10	6 mw	OM
Filter	1.0	J4007	1.2	6 mw	OM
Oscillator	...	....	...	*32	E402
				*18	J402-K
				*8	J402-L
				*15	V401-L

\* R-f volts, measured with electronics multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-22.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 3		DIAL SETTING 2.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	0.20	E352	120	6 mw	OM (M2102)
	2.0	E352	180	6 mw	OM
	...	....	...	*5.5	J353-B
R-F	2.0	E3038	72	6 mw	OM
	2.0	E3036	88	6 mw	OM
Antenna	2.0	E3002	16	6 mw	OM
Filter	2.0	J4007	1.6	6 mw	OM
Oscillator	...	....	...	*54 *26 *10 *20	E402 J402-K J402-L V401-1

\* R-f volts, measured with electronics multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-22.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 4		DIAL SETTING 2.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	1.6	E352	130	6 mw	OM (M2102)
	2.0	E352	210	6 mw	OM
	...	....	...	*4.2	J353-B
R-F	2.0	E3038	40	6 mw	OM
	2.0	E3036	32	6 mw	OM
Antenna	2.0	E3002	7.2	6 mw	OM
Filter	2.0	J4007	2.1	6 mw	OM
Oscillator	...	....	...	*11	E402
				*7.4	J402-K
				*4.3	J402-L
				*4.5	V401-1

\* R-f volts, measured with electronics multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-22.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 4		DIAL SETTING 4.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	1.6	E352	120	6 mw	OM (M2102)
	4.0	E352	250	6 mw	OM
	...	....	...	*3.2	J353-B
R-F	4.0	E3038	120	6 mw	OM
	4.0	E3036	105	6 mw	OM
Antenna	4.0	E3002	10	6 mw	OM
Filter	4.0	J4007	1.8	6 mw	OM
Oscillator	...	....	...	*26.5 *13 *6.5 *10	E402 J402-K J402-L V401-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-22.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 5		DIAL SETTING 4.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	1.6	E352	85	6 mw	OM (M2102)
	4.0	E352	150	6 mw	OM
	...	.....	...	*3.2	J353-B
R-F	4.0	E3038	35	6 mw	OM
	4.0	E3036	29	6 mw	OM
Antenna	4.0	E3002	5.6	6 mw	OM
Filter	4.0	J4007	2.2	6 mw	OM
Oscillator	...	.....	...	*11 *6.3 *2.6 *4.8	E402 J402-K J402-L V401-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-22.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 5		DIAL SETTING 8.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	1.6	E352	95	6 mw	OM (M2102)
	8.0	E352	300	6 mw	OM
	...	....	...	*2	J353-B
R-F	8.0	E3038	210	6 mw	OM
	8.0	E3036	140	6 mw	OM
Antenna	8.0	E3002	11	6 mw	OM
Filter	8.0	J4007	1.9	6 mw	OM
Oscillator	...	....	...	*21 *10 *4 *8	E402 J402-K J402-L V401-1

\* R-f volts, measured with electronic multimeter and r-f probe (item 2 of Table 7-1).

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use Antenna Simulator SM-35/URM-25 connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.



TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)

R-F System, AN/FRR-23.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 1		DIAL SETTING 2.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	1.6	E552		(0 db) 6 mw	OM (M2202)
	2.0	E552		(0 db) 6 mw	OM
	...	....	....		O4403 J551-4
R-F	2.0	E3137		(0 db) 6 mw	OM
	2.0	E3136		(0 db) 6 mw	OM
Antenna	2.0	E3102		(0 db) 6 mw	OM
	2.0	J2202-B		(0 db) 6 mw	OM
Filter	2.0	J4007		(0 db) 6 mw	OM
Oscillator	...	....	....		E4402 J4402-K J4402-L

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use a 390-ohm resistor connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-23.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 1		DIAL SETTING 4.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	1.6	E552		(0 db) 6 mw	OM (M2202)
	4.0	E552		(0 db) 6 mw	OM
	...	....	....		O4403 J551-4
R-F	4.0	E3137		(0 db) 6 mw	OM
	4.0	E3136		(0 db) 6 mw	OM
Antenna	4.0	E3102		(0 db) 6 mw	OM
	4.0	J2202-B		(0 db) 6 mw	OM
Filter	4.0	J4007		(0 db) 6 mw	OM
Oscillator	...	....	....		E4402 J4402-K J4402-L

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use a 390-ohm resistor connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)

R-F System, AN/FRR-23.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 2		DIAL SETTING 4.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	1.6	E552		(0 db) 6 mw	OM (M2202)
	4.0	E552		(0 db) 6 mw	OM
	...	....	....		O4403 J551-4
R-F	4.0	E3137		(0 db) 6 mw	OM
	4.0	E3136		(0 db) 6 mw	OM
Antenna	4.0	E3102		(0 db) 6 mw	OM
	4.0	J2202-B		(0 db) 6 mw	OM
Filter	4.0	J4007		(0 db) 6 mw	OM
Oscillator	...	....	....		E4402 J4402-K J4402-L

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use a 390-ohm resistor connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-23.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 2		DIAL SETTING 8.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	1.6	E552		(0 db) 6 mw	OM (M2202)
	8.0	E552		(0 db) 6 mw	OM
	...	....	....		O4403 J551-4
R-F	8.0	E3137		(0 db) 6 mw	OM
	8.0	E3136		(0 db) 6 mw	OM
Antenna	8.0	E3102		(0 db) 6 mw	OM
	8.0	J2202-B		(0 db) 6 mw	OM
Filter	8.0	J4007		(0 db) 6 mw	OM
Oscillator	...	....	....		E4402 J4402-K J4402-L J4401-1

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use a 390-ohm resistor connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)

R-F System, AN/FRR-23.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 3		DIAL SETTING 8.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	1.6	E552		(0 db) 6 mw	OM (M2202)
	8.0	E552		(0 db) 6 mw	OM
	...	....	....		O4403 J551-4
R-F	8.0	E3137		(0 db) 6 mw	OM
	8.0	E3136		(0 db) 6 mw	OM
Antenna	8.0	E3102		(0 db) 6 mw	OM
	8.0	J2202-B		(0 db) 6 mw	OM
Filter	8.0	J4007		(0 db) 6 mw	OM
Oscillator	...	....	....		E4402 J4402-K J4402-L J4401-1

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use a 390-ohm resistor connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-23.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 3		DIAL SETTING 16.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	1.6	E552		(0 db) 6 mw	OM (M2202)
	16.0	E552		(0 db) 6 mw	OM
	...	....	....		O4403 J551-4
R-F	16.0	E3137		(0 db) 6 mw	OM
	16.0	E3136		(0 db) 6 mw	OM
Antenna	16.0	E3102		(0 db) 6 mw	OM
	16.0	J2202-B		(0 db) 6 mw	OM
Filter	16.0	J4007		(0 db) 6 mw	OM
Oscillator	...	....	....		E4402 J4402-K J4402-L V4401-1

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use a 390-ohm resistor connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)

R-F System, AN/FRR-23.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 4		DIAL SETTING 16.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	1.6	E552		(0 db) 6 mw	OM (M2202)
	16.0	E552		(0 db) 6 mw	OM
	...	....	....		O4403 J551-4
R-F	16.0	E3137		(0 db) 6 mw	OM
	16.0	E3136		(0 db) 6 mw	OM
Antenna	16.0	E3102		(0 db) 6 mw	OM
	16.0	J2202-B		(0 db) 6 mw	OM
Filter	16.0	J4007		(0 db) 6 mw	OM
Oscillator	...	....	....		E4402 J4402-K J4402-L V4401-1

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use a 390-ohm resistor connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-23.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 4		DIAL SETTING 24.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	1.6	E552		(0 db) 6 mw	OM (M2202)
	24.0	E552		(0 db) 6 mw	OM
	...	....	....		O4403 J551-4
R-F	24.0	E3137		(0 db) 6 mw	OM
	24.0	E3136		(0 db) 6 mw	OM
Antenna	24.0	E3102		(0 db) 6 mw	OM
	24.0	J2202-B		(0 db) 6 mw	OM
Filter	24.0	J4007		(0 db) 6 mw	OM
Oscillator	...	....	....		E4402 J4402-K J4402-L V4401-1

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use a 390-ohm resistor connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.



TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)

R-F System, AN/FRR-23.

Reception: A1 BROAD.

Gain: With nc signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 5		DIAL SETTING 24.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL $\mu$ VOLTS	LEVEL	LOCATION
Mixer	1.6	E552		(0 db) 6 mw	OM (M2202)
	24.0	E552		(0 db) 6 mw	OM
	...	....	....		O4403 J551-4
R-F	24.0	E3137		(0 db) 6 mw	OM
	24.0	E3136		(0 db) 6 mw	OM
Antenna	24.0	E3102		(0 db) 6 mw	OM
	24.0	J2202-B		(0 db) 6 mw	OM
Filter	24.0	J4007		(0 db) 6 mw	OM
Oscillator	...	....	....		E4402 J4402-K J4402-L V4401-1

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use a 390-ohm resistor connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

**TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)**

R-F System, AN/FRR-23.

Reception: A1 BROAD.

Gain: With no signal input connected to the receiver, set the GAIN control to obtain a —10 db noise output level as indicated on the OUTPUT meter. Place the ADD DECIBELS switch in the —10 position to obtain this reading.

Input Signal: Unmodulated with the BFO frequency adjusted for an a-f output of 1 kc.

BAND 5		DIAL SETTING 32.0 Mc			
UNIT	FREQUENCY MC	INPUT		OUTPUT	
		LOCATION	LEVEL μ VOLTS	LEVEL	LOCATION
Mixer	1.6	E552		(0 db) 6 mw	OM (M2202)
	32.0	E552		(0 db) 6 mw	OM
	...	....	....		O4403 J551-4
R-F	32.0	E3137		(0 db) 6 mw	OM
	32.0	E3136		(0 db) 6 mw	OM
Antenna	32.0	E3102		(0 db) 6 mw	OM
	32.0	J2202-B		(0 db) 6 mw	OM
Filter	32.0	J4007		(0 db) 6 mw	OM
Oscillator	...	....	....		E4402 J4402-K J4402-L V4401-1

**NOTES:**

1. For all measurements, use an r-f signal generator similar to item 3 of Table 7-1.
2. Use a 0.1-mf capacitor connected in series with the signal generator on all measurements except "Filter," in which case use a 390-ohm resistor connected in series with the signal generator.
3. Output level readings taken with the ADD DECIBELS switch in the 0 position.
4. All measurements made with the chassis pulled out and test cable connected.

TABLE 7-3. STAGE GAIN MEASUREMENTS AN/FRR-21, -22, AND -23 (Continued)

## MISCELLANEOUS

	OUTPUT		REMARKS
	LOCATION	LEVEL R-F VOLTS	
Xtal. Cal. AN/FRR-23	Z1201-A Z1201-H Z1201-J V1201-8 Z1202-J V1202-8	1.2 3.2 8.0 17.0 8 20	Measured with electronic tube multimeter. (Item 2 of Table 7-1.)
Xtal. Cal. AN/FRR-22	Z1501-A Z1501-H Z1501-J V1501-8 Z1502-J V1502-8	1.2 9.0 1.1 25 4.2 24	
Xtal. Cal. AN/FRR-21	Z1401-A Z1401-J Z1401-H J1401-B J1401-E V1401-8 Z1401-C J1401-C Z1402-A	15 RMS 6.0 (Peak to Peak) 0.06 (Peak to Peak) 0.06 (Peak to Peak) 3.0 RMS 6.0 (Peak to Peak) 3.0 RMS 7.0 (Peak to Peak) 0.75 (Peak to Peak)	

## MISCELLANEOUS

UNIT	OUTPUT			REMARKS
	FREQUENCY KC	LOCATION	LEVEL R-F VOLTS	
BFO	200	Z1302-A Z1302-J J1301-B V1301-2 V1301-7 Z1302-E Z1301-1	9.0 4.5 3.5 5.0 17 17 8.5	Measured with electronic tube multimeter (Item 2 of Table 7-1).

## 5. VOLTAGE AND RESISTANCE MEASUREMENTS.

The following Table 7-4 shows voltage and resistance values under the following conditions:

- a. RECEPTION control set to A1 BROAD.
- b. SILENCER control set to minimum.
- c. All other controls set to maximum.
- d. All cables connected for normal single receiver operation, including the Test Cable Assembly, CG-1101/FRR.

## 6. REMOVING AND REPLACING ASSEMBLY COVERS AND ASSEMBLIES.

a. REMOVING ASSEMBLY COVERS. — Remove the captive screws which hold the cover to the assembly. These captive screws have Phillips heads and are set in the cover.

### CAUTION

When removing the cover from the first i-f assembly, first remove the assembly, then remove the cover.

b. REMOVING AND REPLACING ASSEMBLIES. —(Refer to figures 7-4 and 7-5.)

### (1) POWER SUPPLY AND CRYSTAL CALIBRATOR ASSEMBLIES.

Release the captive screws on the assembly and ease the assembly out of its socket.

When replacing the assembly, orient it to its position in the chassis. Use the connector on the assembly and corresponding socket on the chassis as guides. Seat the assembly, and tighten the captive screws.

### (2) AUDIO, SECOND I-F, AND BFO ASSEMBLIES.

Set the RECEPTION control to the A2 position, release the captive screws on the assembly, and lift the assembly out of the chassis.

When replacing the assembly, orient it to its position in the chassis. Use the connector on the assembly and corresponding socket on the chassis as guides. Set the RECEPTION control to the A2 position, and seat the assembly. Be sure that the crank arms in the assembly are set properly to engage the RECEPTION control bar. Tighten the captive screws.

### (3) ANTENNA, RF MIXER, OSC, AND FIRST I-F ASSEMBLIES.

Set the band switch to Band V, then place the chassis in the servicing position which will give access to the

bottom of the receiver. Disconnect the tuning capacitor strap leads of the box to be removed. Release the three captive screws holding the box in position, and ease the box out. (When removing the mixer or oscillator box from the AN/FRR-23 receiver, remove link O4403 before releasing the captive screws.) To replace the box, set the band switch to Band V and follow the removal procedure in reverse order.

## 7. REMOVING AND REPLACING PLUG-IN SUB-ASSEMBLIES.

Two types of plug-in sub-assemblies are used in Radio Receiving Sets AN/FRR-21, -22, and -23. The plug-in units as found in the BFO, crystal calibrator, first i-f, second i-f, and audio assemblies; and the plug-in boards as found in the antenna, r-f, mixer, and oscillator assemblies.

a. REMOVING A PLUG-IN UNIT.—First remove the assembly containing the plug-in unit; then depress the center of the release bar at the top of the unit, and twist the bar a quarter of a turn. Grip the center of the bar with thumb and index finger, and pull the unit out of its position. In some cases where it is difficult to remove the plug-in unit, it may be necessary to also push gently on the opposite (socketed) end while removing. See figures 7-6 to 7-9.

b. REPLACING A PLUG-IN UNIT.—Orient the plug-in unit so that the connecting pins on its base (labeled A, B, C, D, etc.) line up with the corresponding socket terminals on the chassis. This will occur when the arrow on the top cover of the plug-in unit points to the white dot at the side wall of the corresponding compartment in the chassis. Push the unit in place, and, while depressing the release bar, twist the bar a quarter of a turn. The ends of the bar will then fit into the slotted holes in the metal compartment.

c. REMOVING A PLUG-IN BOARD.—First remove the cover of the assembly, then pull the plug-in board from its position by gripping the metal bar and post at the ends of the board.

d. REPLACING A PLUG-IN BOARD.—Turn the board so the pins fit over the holes in the assembly, and carefully insert the board in place. Replace the cover plate.

## 8. CHANGING ELECTRON TUBES.

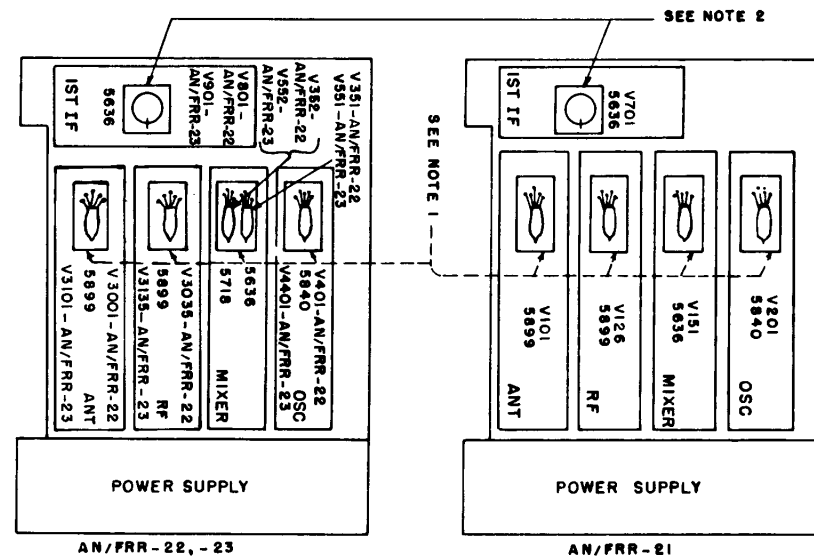
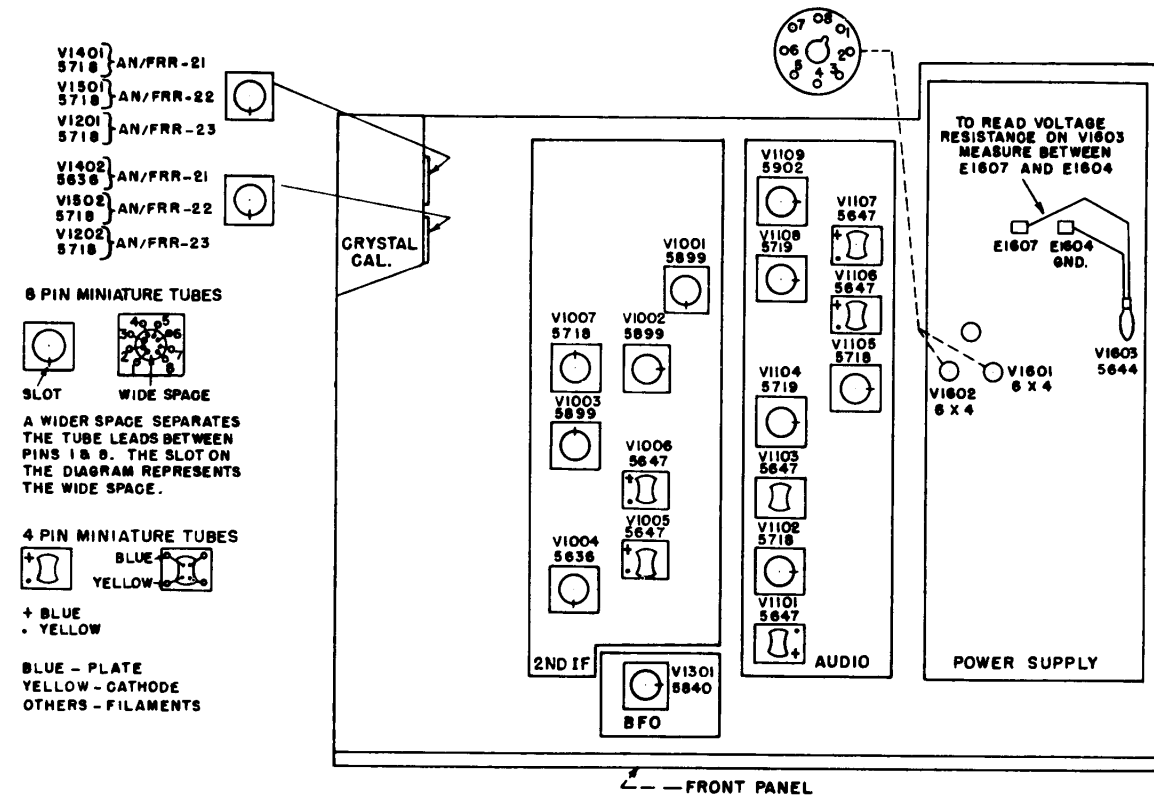
All electron tubes used in Radio Receiving Sets AN/FRR-21, -22, and -23 are of the subminiature type, with exception of those in the power supply. The subminiature tubes are soldered into the sub-assemblies and cannot be tested in the conventional manner. The

TABLE 7-4. VOLTAGE MEASUREMENTS TO CHASSIS GROUND AN/FRR-21, -22, AND -23

TUBE SYMBOLS	PIN NUMBERS								REMARKS
	1	2	3	4	5	6	7	8	
V101	0	2.0	6.3*	....	90	0	91	....	AN/FRR-21 only
V126	0.3	2.2	0	....	88	6.3*	89	....	AN/FRR-21 only
V151	0	2.4	0	-1.7	100	6.3*	110	....	AN/FRR-21 only
V201	....	2.0	6.3*	....	75	0	25	....	AN/FRR-21 only
V351	0	1.3	3.15*	-1.2	94	3.15*	95	....	AN/FRR-22 only
V352	0	....	3.15*	....	0.6	3.15*	....	96	AN/FRR-22 only
V401	8.2	0	0	0	87	6.3*	82	....	AN/FRR-22 only
V551	0	1.3	3.15*	-4	112	3.15*	107	....	AN/FRR-23 only
V552	0	....	3.15*	....	2.3	3.15*	....	108	AN/FRR-23 only
V701	-5.9	1.5	3.15*	0	100	3.15*	84	1.5	Bands I and IV AN/FRR-21 only
V801	-2.7	0.8	3.15*	0	90	3.15*	62	0	AN/FRR-22 only
V901	-0.66	1.5	3.15*	0	107	3.15*	72	....	AN/FRR-23 only
V1001	0	1.5	3.15*	1.5	87	3.15*	86	1.5	AN/FRR-23 only
V1002	0	1.5	3.15*	1.5	88	3.15*	88	1.6	AN/FRR-23 only
V1003	0	1.7	3.15*	1.7	88	3.15*	88	1.7	AN/FRR-23 only
V1004	-9.5	2.3	3.15*	-2.1	80	3.15*	82	2.3	AN/FRR-23 only
V1005	-23	2.9*	2.9*	0	....	....	....	....	AN/FRR-23 only
V1006	0	2.9*	2.9*	0	....	....	....	....	AN/FRR-23 only
V1007	0	0	3.15*	0	2.25	3.15*	3.6	100	AN/FRR-23 only
V1101	0	100	100	0.3	....	....	....	....	AN/FRR-23 only
V1102	0	0	3.15*	0	1.0	3.15*	0	37	AN/FRR-23 only
V1103	75	100	100	75	....	....	....	....	AN/FRR-23 only
V1104	0	0	3.15*	0	2.0	3.15*	0	90	AN/FRR-23 only
V1105	0	0	3.15*	0	0.8	3.15*	0	37	AN/FRR-23 only
V1106	11.0	3.15*	3.15*	11.0	....	....	....	....	AN/FRR-23 only
V1107	11.0	3.15*	3.15*	11.0	....	....	....	....	AN/FRR-23 only
V1108	0	0	3.15*	0	0.8	3.15*	1.5	70	AN/FRR-23 only
V1109	0.15	9.0	3.15*	9.0	90	3.15*	100	9.0	AN/FRR-23 only
V1201	1.5	....	3.15*	....	2.8	3.15*	....	70	Cal "ON" AN/FRR-23 only
V1202	-4.7	....	3.15*	....	2.8	3.15*	....	85	Cal "ON" AN/FRR-23 only
V1301	-2.5	2.5	3.15*	2.5	46	3.15*	74	2.5	
V1401	-28	0	3.15*	0	0.1	3.15*	0	37	Cal "ON" AN/FRR-21 only
V1402	0	3.6	3.15*	-1.0	87	3.15*	81	3.6	Cal "ON" AN/FRR-21 only
V1501	1.6	....	3.15*	....	3.1	3.15*	....	74	Cal "ON" AN/FRR-22 only
V1502	-5.3	....	3.15*	....	3.1	3.15*	....	96	Cal "ON" AN/FRR-22 only
V1601	210*	....	0	0	....	210*	165	....	
V1602	210*	....	0	0	....	210*	165	....	
V1603	86	....	....	0	....	....	....	....	
V3001									AN/FRR-22 only
V3035									AN/FRR-22 only
V3101									AN/FRR-23 only
V3135									AN/FRR-23 only
V4401	-10	0	0	....	90	6.3*	92	....	AN/FRR-23 only

\* a-c volts. Measurements given in volts.

TABLE 7-4. VOLTAGE AND RESISTANCE MEASUREMENTS TO CHASSIS GROUND



NOTE 1. - TAKE MEASUREMENTS ON NUMBERED PINS OF PLUG-IN BOARDS.  
 NOTE 2. - EIGHT-PIN MINIATURE TUBES; SEE CHASSIS TUBE LAYOUT TOP VIEW FOR INFORMATION ON PIN NUMBERS.

AN/FRR-21, -22, -23  
 CORRECTIVE MAINTENANCE

NAVSHIPS 92211

TABLE 7-4. RESISTANCE MEASUREMENTS TO CHASSIS GROUND AN/FRR-21, -22, AND -23 (Continued)

TUBE SYMBOLS	PIN NUMBERS								REMARKS
	1	2	3	4	5	6	7	8	
V101	130K	320	*	....	24K	*	34K	....	AN/FRR-21 only
V126	140K	350	0	....	33K	*	33K	....	AN/FRR-21 only
V151	4 to 190	470	0	27K	32K	*	32K	....	AN/FRR-21 only
V201	33K	2200	6.5	....	68K	*	500K	....	AN/FRR-21 only
V351	400K	180	*	22K	70K	*	70K	....	AN/FRR-22 only
V352	800K	....	*	....	450	*	....	70K	AN/FRR-22 only
V401	36K	2.2K	*	2.2K	47K	4	47K	....	AN/FRR-22 only
V551	450K	180	*	22K	70K	*	70K	....	AN/FRR-23 only
V552	450K	....	*	....	460	*	....	70K	AN/FRR-23 only
V701	100K	470	*	35	27K	*	39K	470	Bands I and IV AN/FRR-21 only
V801	9K	180	*	1.4	....	*	....	170	AN/FRR-22 only
V901	10K	180	*	1.6	70K	*	83K	180	AN/FRR-23 only
V1001	1 Meg	270	*	270	70K	*	70K	270	
V1002	1 Meg	270	*	270	70K	*	70K	270	
V1003	1 Meg	260	*	260	70K	*	70K	260	
V1004	4700	1000	*	4700	120K	*	120K	1050	
V1005	35K	*	*	*	....	....	....	....	
V1006	*	*	*	0	....	....	....	....	
V1007	70K	Inf	*	Inf	500	*	Inf	70K	
V1101	47K	39K	39K	1.4 Meg	....	....	....	....	
V1102	100K	Inf	*	Inf	900	*	Inf	120K	
V1103	600K	39K	39K	400K	....	....	....	....	
V1104	1 Meg	Inf	*	Inf	6200	*	Inf	300K	
V1105	1 Meg	Inf	*	Inf	750	*	Inf	130K	
V1106	500K	*	*	90K	....	....	....	....	
V1107	500K	*	*	90K	....	....	....	....	
V1108	1 Meg	Inf	*	Inf	12K	*	Inf	45K	
V1109	450K	300	*	300	70K	*	70K	300	
V1201	2200K	....	*	....	470	*	....	50K	Cal "ON" AN/FRR-23 only
V1202	33K	....	*	....	470	*	....	50K	Cal "ON" AN/FRR-23 only
V1301	85K	1000	*	1000	85K	*	90K	1000	
V1401	1 Meg	Inf	*	Inf	470	*	Inf	82	Cal "ON" AN/FRR-21 only
V1402	180K	2500 to 7500	*	180K	43K	*	43K	2500 to 7500	Cal "ON" AN/FRR-21 only
V1501	2 Meg	....	*	....	460	*	....	80K	Cal "ON" AN/FRR-22 only
V1502	30K	....	*	....	460	*	....	80K	Cal "ON" AN/FRR-22
V1601	60	....	0	0	....	60	36K	....	
V1602	60	....	0	0	....	60	36K	....	
V1603	40K	....	....	0	....	....	....	....	
V3001									AN/FRR-22 only
V3035									AN/FRR-22 only
V3101									AN/FRR-23 only
V3105									AN/FRR-23 only
V4401	12K	*	0	....	70K	6.5	70K	....	AN/FRR-23 only

\* Less than one ohm. Resistances in ohms. (K = 1000 ohms.)

TABLE 7-5. TUBE OPERATING VOLTAGES AND CURRENTS AN/FRR-21, -22, AND -23

Tube Symbols	Tube Type	Function	Plate Volts	Plate Ma	Screen Volts	Screen Ma	Sup-pressor Volts	Cathode Volts	Grid Volts	Heater Volts AC
V101	5899	Antenna Preamplifier	120	1.6	120	1.4	....	2.1	....	6.3
V126	5899	R-F Amplifier	120	1.6	120	1.7	....	2.1	....	6.3
V151	5636	Mixer	120	2.2	110	3.0	-1.7	2.4	....	6.3
V201	5840	Oscillator	95	0.7	22	0.15	....	2.4	-0.8	6.3
V351	5719	Mixer	120	7.2	120	....	0	1.3	....	6.3
V352	5636	Mixer Cathode Follower	95	1.6	....	....	0	0.6	....	6.3
V401	5840	Oscillator	90	9.3	90	3.5	0	....	....	6.3
V551	5636	Mixer	112	2.2	107	5.5	-4.4	1.3	0	6.3
V552	5719	Mixer Cathode Follower	108	5.0	....	....	....	2.3	0	6.3
V701	5636	I-F Amplifier	100	0.85	80	1.3	0	1.5	-6	6.3
V801	5636	I-F Amplifier	120	4.5	120	....	0	0.8	....	6.3
V901	5636	I-F Amplifier	107	3.6	72	3.1	0	1.5	-0.66	6.3
V1001	5899	2nd I-F Amplifier	120	5.5	120	....	0	1.6	....	6.3
V1002	5899	2nd I-F Amplifier	120	5.5	120	....	0	1.5	....	6.3
V1003	5899	2nd I-F Amplifier	120	6.3	120	....	0	1.7	....	6.3
V1004	5636	BFO Mixer	120	1.9	120	....	0	1.9	....	6.3
V1005	5647	Diode Detector	....	....	....	....	....	....	....	6.3
V1006	5647	Delay AGC	....	....	....	....	....	....	....	6.3
V1007	5718	2nd I-F Cathode Follower	120	4.8	....	....	....	2.2	....	6.3
V1101	5647	Noise Peak Limiter	....	....	....	....	....	....	....	6.3
V1102	5718	Audio Amplifier	120	1.2	....	....	....	1.0	....	6.3
V1103	5647	Silencer Diode	120	0.2	....	....	....	....	....	6.3
V1104	5719	D-C Amplifier	120	0.3	....	....	....	2.0	....	6.3
V1105	5718	Audio Amplifier	120	1.0	....	....	....	0.8	....	6.3
V1106	5647	Series Limiter	120	0.02	....	....	....	11.0	....	6.3
V1107	5647	Series Limiter	120	0.02	....	....	....	11.0	....	6.3
V1108	5719	Driver Amplifier	120	0.1	....	....	....	0.8	....	6.3
V1109	5902	Beam Power Output	120	29.7	120	2.0	0	9.0	....	6.3
V1201	5718	Crystal Calibrator	74	4.7	....	....	....	3.1	+1.6	6.3
V1202	5718	Crystal Calibrator	74	4.7	....	....	....	3.1	+1.6	6.3
V1301	5719	BFO	96	3.9	....	....	....	3.1	-5.3	6.3
V1401	5718	Crystal Calibrator	40	1.0	....	....	....	0.4	-28	6.3
V1402	5636	Crystal Calibrator	90	0.1	90	0.6	-1.0	3.6	0	6.3
V1501	5718	Crystal Calibrator	120	1.2	....	....	0	1.5	....	6.3
V1502	5718	Crystal Calibrator	120	2.0	....	....	0	1.5	....	6.3
V1601	6X4	Rectifier	220	....	....	....	....	....	....	6.3
V1602	6X4	Rectifier	220	....	....	....	....	....	....	6.3
V1603	5644	Voltage Regulator	120	5.0	....	....	....	....	....	....
V3001	5899	Antenna Preamplifier	120	7.2	120	....	0	1.3	....	6.3
V3035	5899	R-F Amplifier	120	7.2	120	....	0	1.3	....	6.3
V3101	5899	Antenna Preamplifier	101	7.0	100	1.6	....	1.4	0	6.3
V3135	5899	R-F Amplifier	106	4.7	106	2.0	....	1.9	0	6.3
V4401	5840	Oscillator	90	6.5	92	3.5	....	0	-10	6.3

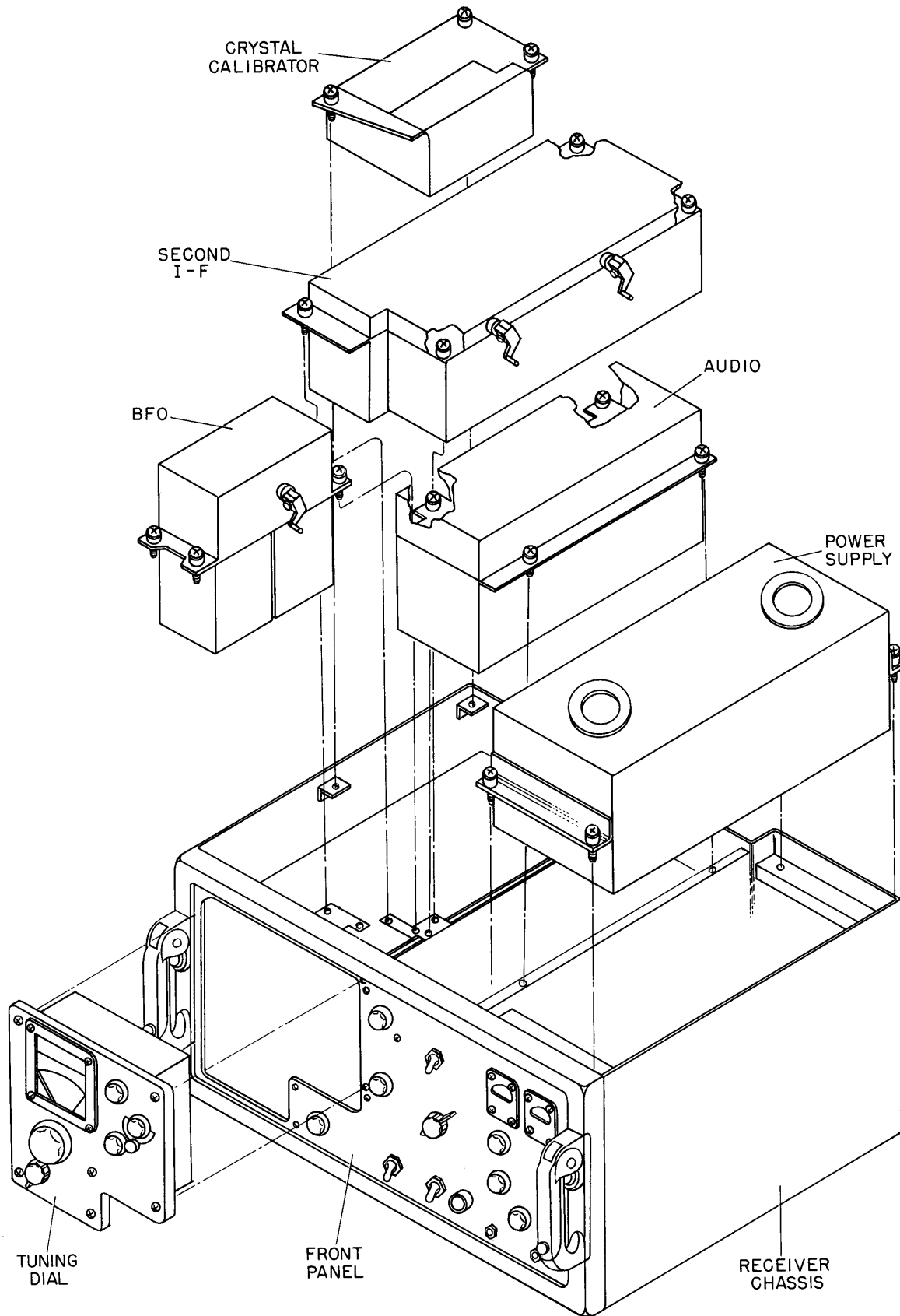


Figure 7-4. Removing and Replacing Assemblies on Top Side of Chassis



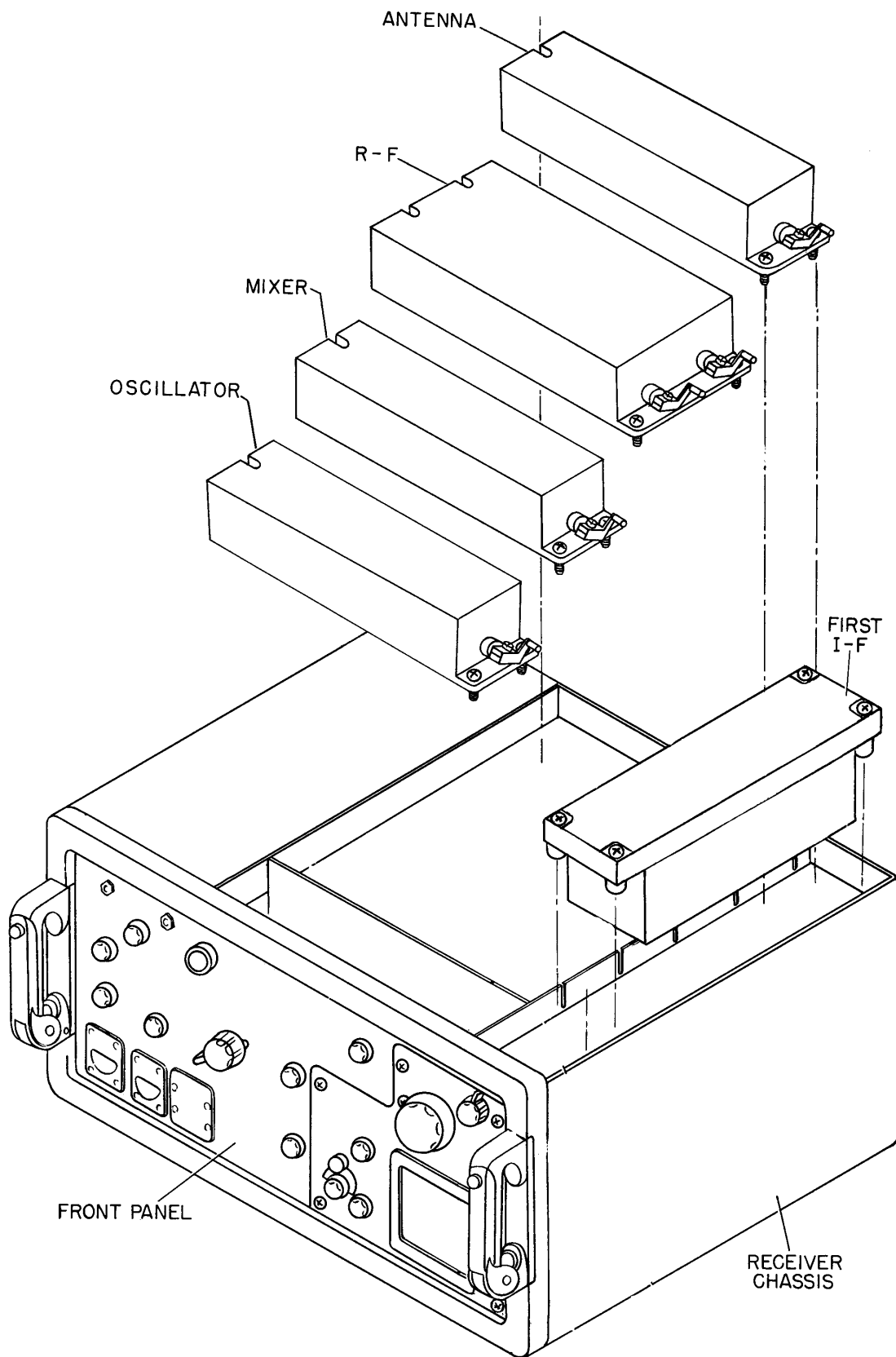


Figure 7-5. Removing and Replacing Assemblies on Bottom Side of Chassis

TABLE 7-6. RATED TUBE CHARACTERISTICS

Tube Type	Fila-ment Volt-age (V)	Fila-ment Cur-rent (A)	Plate Volt-age (V)	Grid Bias (V)	Screen Volt-age (V)	Plate Cur-rent (MA)	Screen Cur-rent (MA)	A-C Plate Resist-ance (Ohms)	Voltage Amplifi-cation Factor (MU)	Transcon-ductance (Micromhos)		Emission	
										Normal	Mini-mum	IS (MA)	Test Volt
6X4	6.3	0.6	450	...	...	70	...	...	...	...	...		
5636	6.3	0.15	100	-1	100	4	5.8	50K	...	3200	2700		
5644	...	...	95	...	...	5	...	...	...	...	...		
5647	6.3	0.15	150	...	...	9	...	...	...	...	...	45	6
5718	6.3	0.15	100	-1.2	...	8.5	...	4650	27	5800	4800		
5719	6.3	0.15	100	-2.5	...	0.73	...	41K	70	1700	1400		
5840	6.3	0.15	100	-1.5	100	7.5	2.4	280K	...	5000	4100		
5899	6.3	0.15	100	-1.1	100	7.2	2.2	260K	...	4500	3800		
5902	6.3	0.45	110	-8.7	110	30	2.2	15K	...	4200	3200		

stage gain measurements given in Table 7-3 are a good indication of the condition of the tubes.

It is recommended that a faulty stage be replaced with a spare (either a plug-in unit or a plug-in board) after trouble is isolated to a particular stage. However, procedure for changing these subminiature tubes is given below.

The electron tubes in the power supply are easily checked in a standard tube tester, and should be replaced with a spare of the same type when found to be faulty.

Two types of subminiature tubes are used in this equipment, the eight-pin base and four-pin base, shown in the inserts of the Tables of voltage and resistance measurements.

**NOTE**

ALL TUBES OF A GIVEN TYPE SUPPLIED WITH THE EQUIPMENT SHALL BE CONSUMED PRIOR TO EMPLOYMENT OF TUBES FROM GENERAL STOCK.

a. REPLACING EIGHT-PIN TUBES. — Procedure for changing the eight-pin tubes on the plug-in boards (antenna, r-f, mixer, and oscillator assemblies) is different from that for changing the eight-pin tubes mounted in the plug-in units (second i-f and audio assemblies, etc.). Each procedure is described separately.

(1) TUBES ON R-F BOARDS.—Refer to figures 7-7 to 7-9 and to the connection and schematic diagrams for the particular r-f board, then unsolder the tube leads at the terminals. Remove the subminiature tube from the metal shield, and replace it with a spare of the same type. Solder lead 1 to terminal 1, lead 2 to terminal 2, etc. The leads are numbered clockwise from the wide separation. Those leads that are not used should be cut off close to the bottom of the subminiature tube.

(2) TUBES IN PLUG-IN UNITS.—Refer to figures 7-7 to 7-9, and to the appropriate connection and schematic diagrams. Remove the plug-in unit from the major assembly and unsolder the eight leads at the terminals on the tube base. Pull the tube through the hole in the base of the plug-in unit, and replace with a spare of the same type. Orient the tube so that the widest space between the leads is opposite the raised key on the socket. Then solder lead 1 to terminal 1, lead 2 to terminal 2, etc. Leads are numbered clockwise starting from the left of the key. Replace the plug-in unit in its assembly. In the particular instance of Z1109, which utilizes a type 5902 electron tube, depress the locking pin at the top of the unit, then insert the tube until its tip just clears the end of the pin. All other tube types are inserted to the extent that the base is approximately flush with the shield.

b. REPLACING FOUR-PIN TUBES.—The four-pin tubes all are located in plug-in units. Refer to the appropriate connection and schematic diagrams, and to figures 7-7 to 7-9. Remove the plug-in unit from the assembly and unsolder the four leads at the terminals

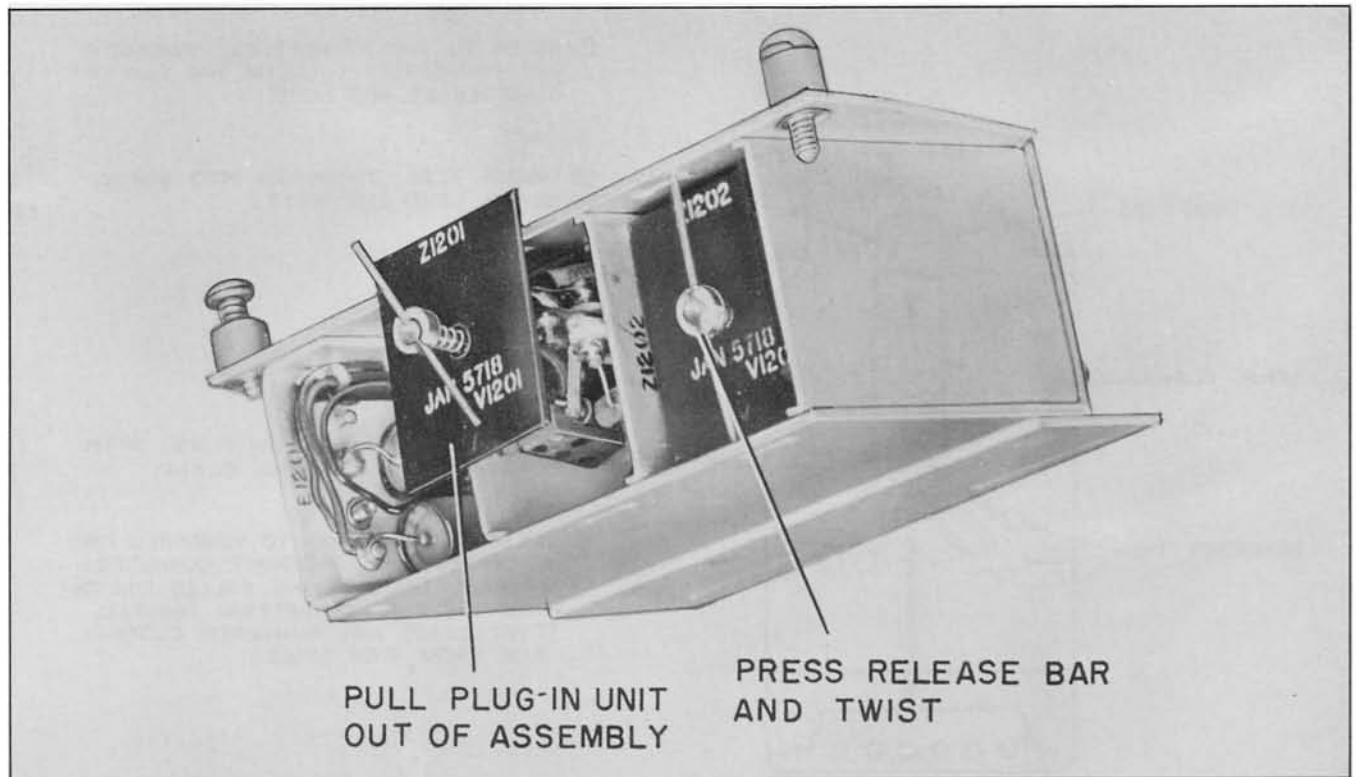


Figure 7-6. Removing a Plug-in Unit

on the tube base. Pull the tube through the hole in the base of the plug-in unit, and replace it with a spare of the same type. Orient the tube so that the blue lead is nearest the blue dot on the socket, and yellow lead is nearest the yellow dot on the socket. Then solder each of the four leads to the nearest terminal.

The leads of the four-pin type subminiature tubes are numbered consecutively beginning from the blue lead (terminal 1) and proceeding clockwise to the yellow lead (terminal 4).

## 9. REMOVING AND REPLACING PILOT LIGHT, DIAL LIGHTS, AND CRYSTALS.

*a.* PILOT LIGHT AND CRYSTALS.—First remove the pilot light cover or the cover of the assembly in which the crystal lies, then remove the bulb or crystal by use of the rubber plunger (H260, H460, or H660) located near the Allen wrenches on the left inner wall of the chassis (see figure 7-10). This plunger has an opening at each end. Place the end having the proper size opening over the crystal or bulb and press on the plunger until it grips the crystal or bulb. Then remove the bulb or crystal by pulling or twisting the plunger as necessary.

*b.* DIAL LIGHTS.—To change a dial light, proceed as follows:

(1) Pull the receiver chassis out to servicing position. Behind the tuning dial, accessible from the upper side of the chassis, is the cover of the dial light compartment (marked I3601, I3602, X3601, X3602, or I3701, I3702, X3701, X3702, or I3801, I3802, X3801, X3802, depending on the receiver type). This is shown in figure 7-10.

(2) Loosen the two captive screws (A and B of figure 7-10) which retain the dial light cover. Slide the cover forward so that its two keyhole-shaped openings clear the captive screws, then lift off the cover.

(3) Replace the bad bulb or bulbs by using the small plunger (H260, H460, or H660) as described for pilot light and crystal removal. Then perform the adjustments given in step (4).

(4) Refer to figure 7-11. Either one of the two lamps can be placed in operating position by means of the LAMPS switch (S3601 on AN/FRR-21, S3701 on AN/FRR-22, and S3801 on AN/FRR-23), a front panel control. There is one pair of red-headed screws C, D on each side of the lamp support frame. In each pair, the larger of the two screws (C) moves the corresponding

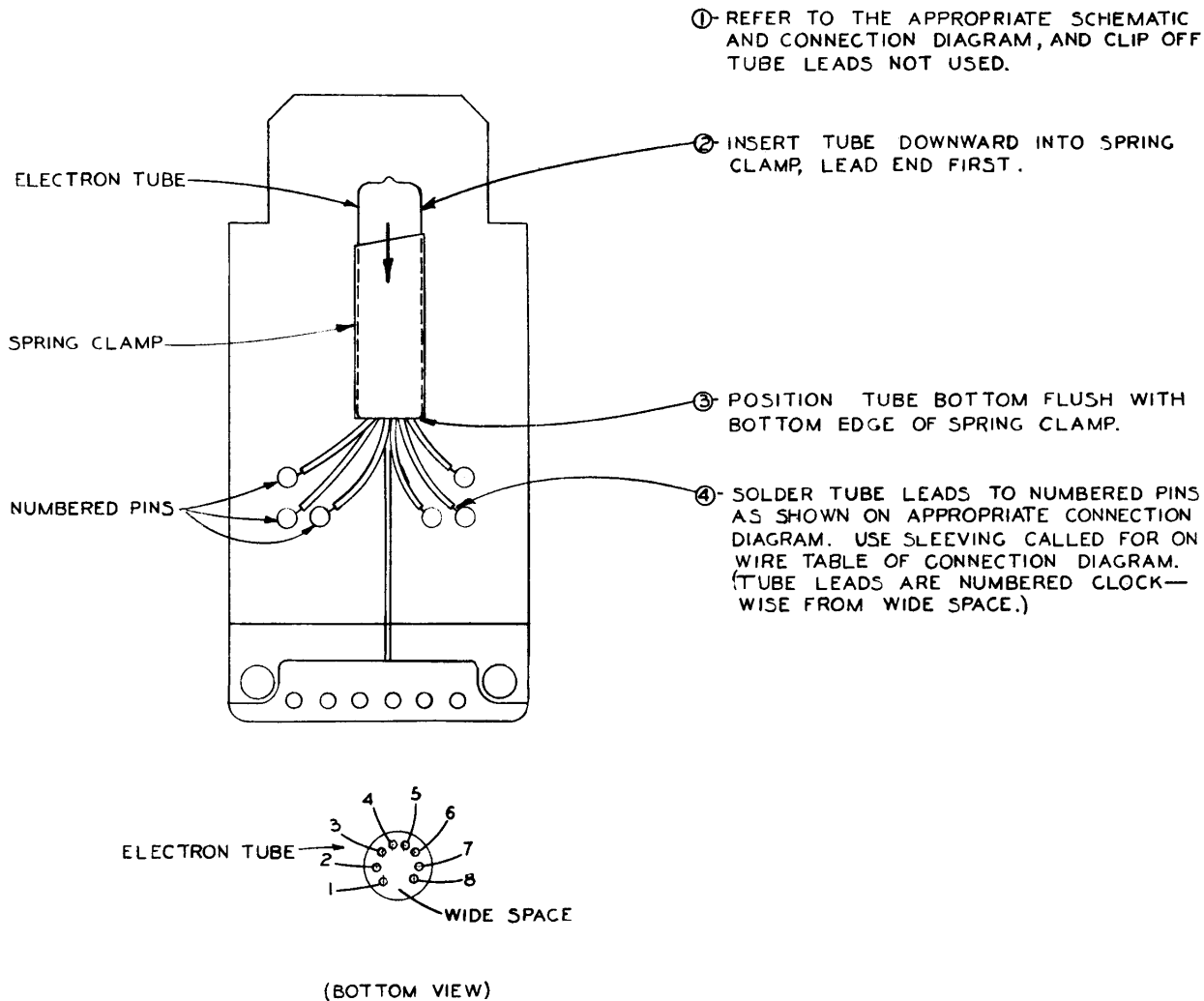


Figure 7-7. Eight-Pin Electron Tube Replacement Plug-in Board

lamp forward or backward, while the smaller screw (D) moves the lamp upward or downward. The lamp is centered properly when a paper held between the focusing lens and the mirror, perpendicularly to the light beam, will show a well-defined circular illuminated area.

## 10. REMOVING AND REPLACING THE TUNING DIAL.

(See figures 7-12 and 7-13).

When faulty operation of the mechanisms require replacement of the tuning dial, procure the following tools: A screwdriver (6-inch blade), a Phillips head screwdriver (6-inch blade), and two pieces of fine string respectively 6 inches long and 2 feet long; then proceed as follows:

a. Set the band switch to Band III, then slide the chassis out of its cabinet.

b. On the top side of the chassis, unhook the spring O3606, O3706, or O3806 (figure 7-10) from the left side of the lens arm assembly O3608, O3708, or O3808 and tie a 6-inch piece of string from the end of the spring to the bracket supporting the lens arm assembly, to prevent the spring from falling into the center of the chassis. Then swing the lens arm assembly open, and tie a piece of string from the end of the lens arm assembly to the right-hand front handle of the chassis.

c. Refer to figure 7-12. Using one of the Allen wrenches that is clipped to the side of the chassis, loosen the two set screws C, D on the coupling connector between the tuning dial output shaft and the tuning capacitor input shaft.

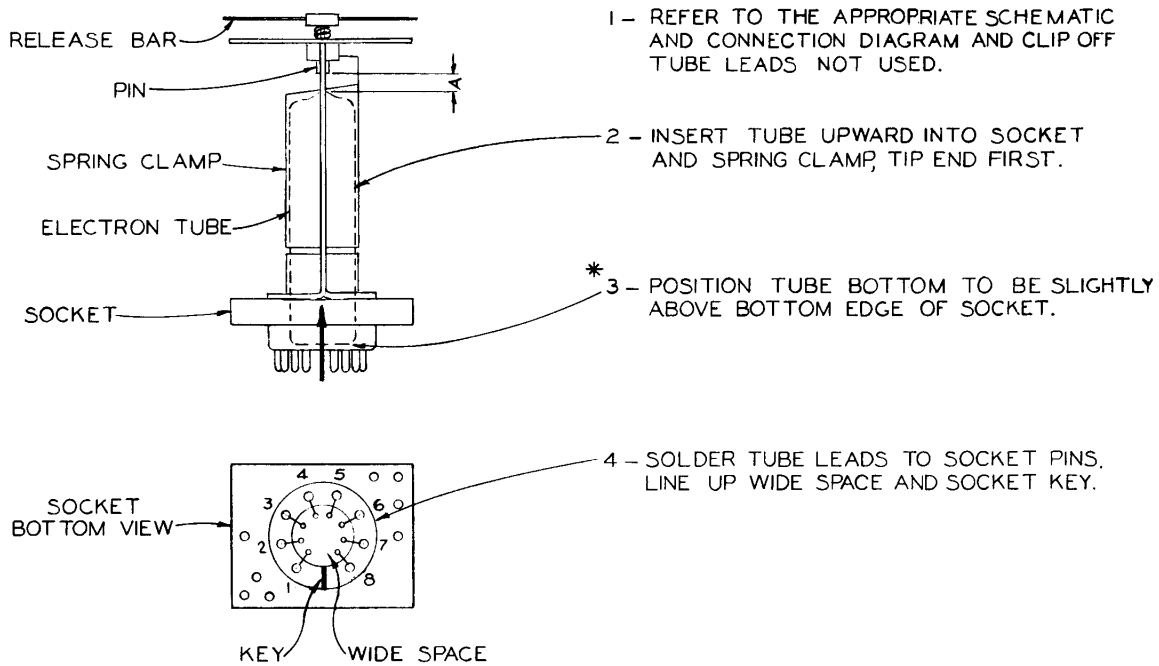


Figure 7-8. Eight-Pin Electron Tube Replacement Plug-in Unit

d. Remove the two strings connected in step b, and return the lens arm assembly to its original position.

e. Refer to figure 7-13. On the bottom side of the chassis, disconnect the two wires (spade connectors) on the dimmer terminal board.

f. Loosen the four captive screws (marked E, F, G, H in figure 7-2) on the mounting brackets which hold the tuning dial to the chassis.

g. Remove the rack from the operate bar by removing the two Allen head screws (K, L in figure 7-13).

h. Return the chassis to horizontal position and remove the six Phillips head screws from the front of the dial assembly.

i. Ease the tuning dial assembly out of the receiver. Be careful not to catch or tear any of the grounding springs, gears, or mechanism of the dial.

j. To replace the tuning dial, make certain that the band switch is set to Band III, and follow the reverse of the procedure just described, being careful that the tuning capacitor shaft and the dial coupling are aligned (extreme care must be exercised to insure that no strains are set up in the coupling). Check the gears and con-

trols on the dial assembly for free movement. When replacing the rack on the operate bar, be sure the teeth mesh properly with little or no play. Do not tighten the set screw in the coupling or the captive screw in the mounting brackets until the dial is aligned.

k. After the tuning dial has been installed, it will have to be aligned as outlined in paragraph 11 of this Section. Start with step c of the procedure outlined in paragraph 11.

## 11. ALIGNMENT OF THE TUNING DIAL.

(See figures 7-10 to 7-13.)

a. Set the band switch to Band III.

b. Loosen the Allen head set screws C, D on the coupling connector between the dial assembly output shaft and the tuning capacitor input shaft; also loosen the captive screws E, F, G, H in the mounting brackets.

c. Set the tuning capacitor to maximum capacitance by turning the arm on the capacitor input shaft to the extreme counterclockwise position.

d. Rotate the tuning knob of the dial assembly to the extreme counterclockwise position; then release the

stop by lifting the follower arm (see figure 7-13) and continue to rotate the knob counterclockwise until the linear scale (lowest scale) reads 83.

e. Tighten the coupling set screws and the captive screws in the bracket.

f. Refer to figure 7-11. Adjust the mirror assembly so that the vertical line of the projected dial coincides with the index line on the screen, and the upper one of the two short horizontal lines is about  $\frac{1}{32}$  inch below the top of the window (the end screws M, N that mount the mirror assembly will allow adjustment of the vertical line, and the screw O, directly behind the mirror will adjust the centering of the horizontal lines).

g. If the projected image is out of focus, adjust the projection lens to correct this by loosening the two set screws P, Q and moving the lens by hand until the image is in focus.

b. Tighten the two set screws P and Q.

i. Rotate the tuning knob until the zeroes of each scale on the tuning dial coincide.

**12. REMOVING AND REPLACING THE TUNING CAPACITORS.**

First remove the tuning dial as outlined in paragraph 10 of this Section, then remove the crystal calibrator assembly, and place the chassis in the servicing position so as to have access to the bottom of the receiver. Remove the tuning capacitor straps connected to the antenna, r-f, mixer, and oscillator. Remove the oscillator

and first i-f boxes. Remove the three nuts which are threaded to the capacitor mounting studs, while holding the tuning capacitor. Ease the tuning capacitor out, being careful not to catch its straps on any of the other components. To replace the tuning capacitor use the reverse of the procedure just described.

**13. ALIGNMENT OF WAFER SWITCHES.**

(See figure 7-14.)

a. RECEPTION CONTROL SWITCHES.—Three wafer switches in the second i-f assembly, two in the audio assembly, and one in the BFO are moved when the RECEPTION control is rotated. If these switches are not properly aligned mechanically, the controlled effect for a particular emission will not be obtained. Use one of the two following rules to line up the wafer switches.

(1) If the normal rotation of the wafer is counterclockwise when the RECEPTION control is switched through A1 BROAD, A1 SHARP, A2, etc., set the RECEPTION control at A1 BROAD. Loosen the Allen screw that holds the switch arm to the shaft, and turn the shaft until the red dot on the rotor is lined up with the red dot on the switch stator. Then move the switch shaft one position counterclockwise, and tighten the Allen screw.

(2) If the normal rotation of the wafer is clockwise when the RECEPTION control is switched through A1 BROAD, A1 SHARP, A2, etc., set the RECEPTION

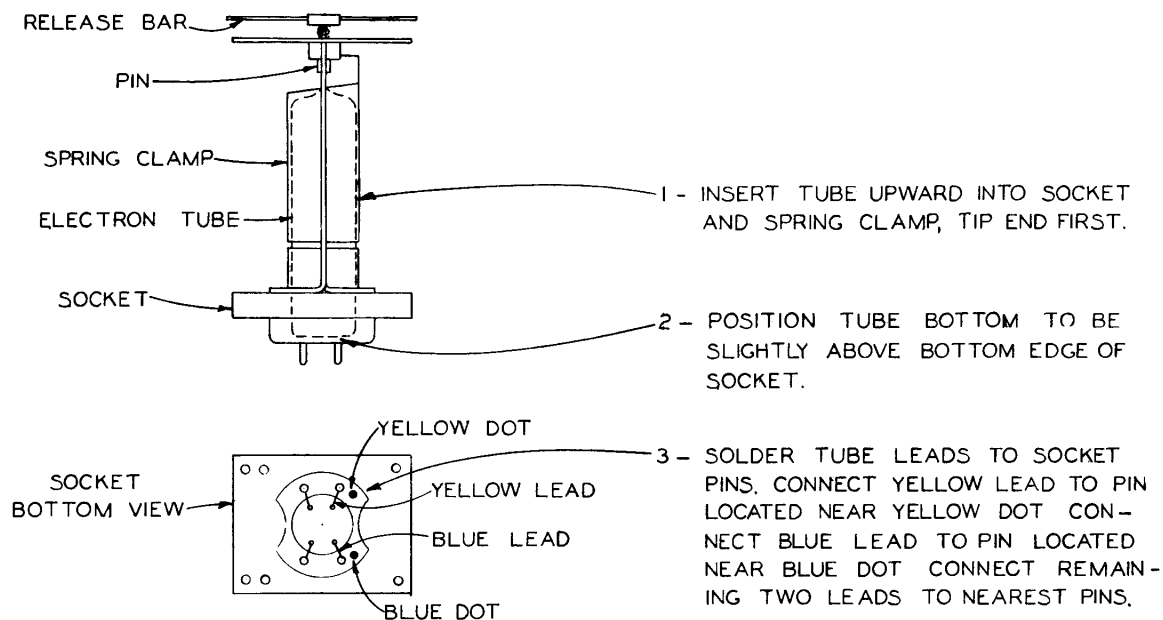


Figure 7-9. Four-Pin Electron Tube Replacement Plug-in Unit

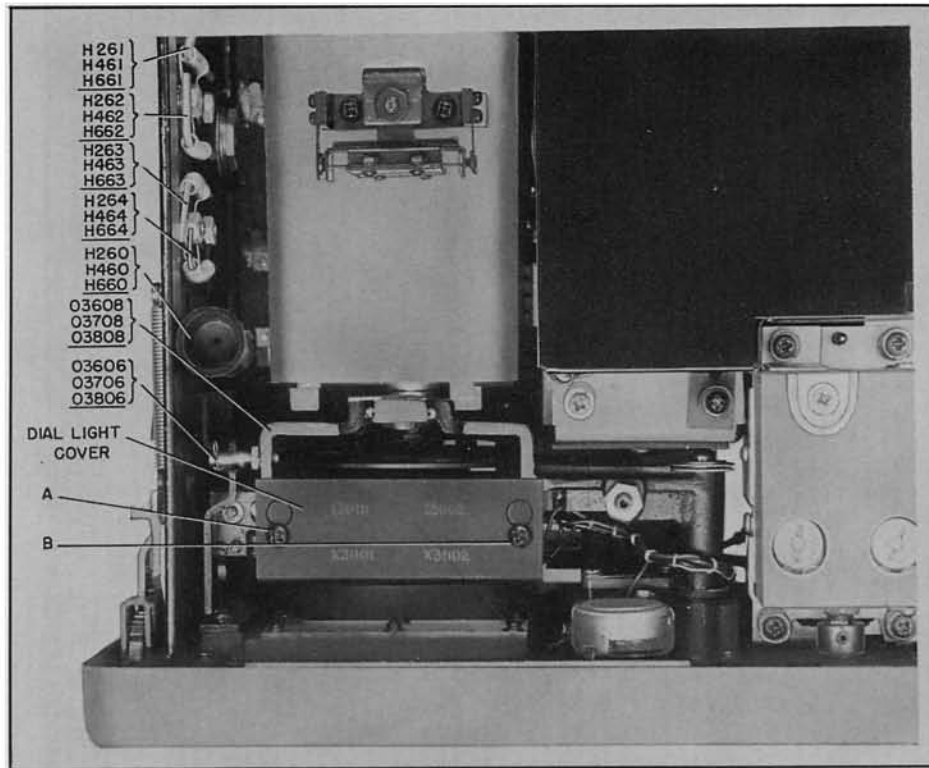


Figure 7-10. Lens-Arm Assembly and Dial Light Compartment, Top View

CONTROL at A1 BROAD and loosen the Allen screw that holds the switch arm to the shaft. Turn the shaft until the black dot on the rotor is lined up with the black dot on stator. Then move the switch shaft one position clockwise, and tighten the Allen screw.

*b.* BAND SELECTOR SWITCHES.—The band selector controls the wafer switches in the antenna, r-f, mixer, oscillator, and 1st i-f assemblies by mechanical movement of the operate bar, which in turn moves the switch arm of each assembly to obtain the desired switching. Each switch has six detent positions, only the last five of which are used on these receivers. If a switch goes out of alignment, re-align it by the following procedure:

(1) Remove the assembly or assemblies in which switch misalignment occurs.

(2) For the antenna, r-f mixer, and local oscillator assemblies, first set the switch to its extreme clockwise position; for the first i-f assembly, set the switch to its extreme counterclockwise position.

(3) Next, turn the switch back two positions. Loosen the Allen clamp screw on the switch arm, set the switch arm to a vertical position, and tighten the Allen clamp screw.

(4) Set the band switch to Band III, then insert

the assembly into its proper position in the chassis and engage the switch arm with the operate bar.

#### 14. RECEIVER ALIGNMENT.

When aligning the AN/FRR-21, -22, and -23 receivers, follow the procedure given in this paragraph in the order given. Since the second i-f and BFO circuits of all three types of receivers use the same frequencies, a common procedure is given, but separate procedures are given for alignment of the first i-f assemblies, crystal controlled calibrators, and r-f amplifiers. Refer to figures 7-1, 7-2, 7-14, 7-15, 7-16, and 7-17 for alignment points of the AN/FRR-21, -22, and -23. Refer also to the appropriate schematic diagrams.

##### *a.* LIST OF EQUIPMENT FOR RECEIVER ALIGNMENT.

(1) An electronic voltmeter (similar to item 2 of Table 7-1).

(2) An oscilloscope (similar to item 6 of Table 7-1).

(3) A signal generator (similar to item 3 of Table 7-1).

(4) An audio oscillator (similar to item 4 of Table 7-1).

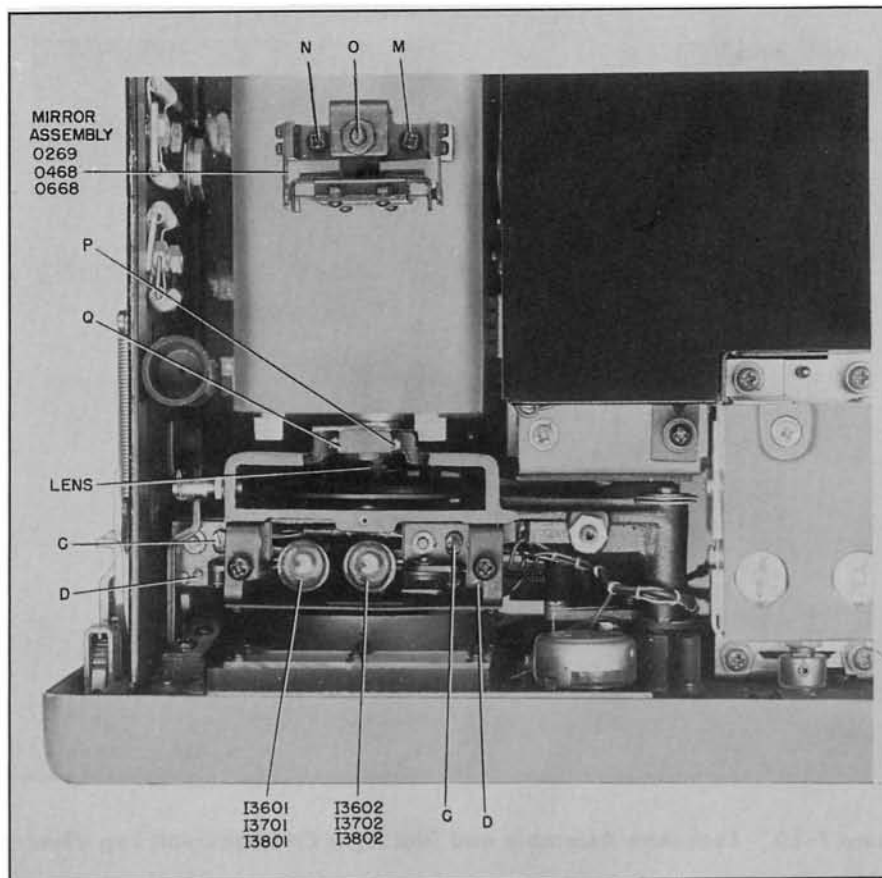


Figure 7-11. Lens-Arm Assembly and Dial Light Compartment, Cover Removed, Top View

(5) A frequency meter (similar to item 5 of Table 7-1).

(6) 2 capacitors (1.0 mf approximately).

(7) 1 capacitor (680 mmf approximately).

(8) 1 capacitor (39 mmf approximately).

(9) 1 jumper lead (6 inches of number 22 wire approximately).

**b. I-F ALIGNMENT.**

(1) Set the RECEPTION control to A2, and the band switch to III.

(2) Connect the electronic voltmeter as an output indicator measuring the d-c voltage at the detector output (Z1012-E and ground).

(3) Connect the output of the signal generator to Z1008-A. Use a 1.0-mf capacitor in series with this and all signal generator connections in this paragraph *b*. (Check the frequency with the frequency meter.)

(4) Set the signal generator to a fixed frequency of 200 kc and adjust the signal level to obtain a reading on the voltmeter which lies within the 0-to-10 volt range (at all times throughout this procedure the signal

generator level should be adjusted for a reading within the 0-to-10 volt range of the voltmeter).

(5) Connect a shunting capacitor of approximately 680 mmf from Z1012-F to ground.

(6) Tune L1013 for maximum detector output as indicated on the voltmeter.

(7) Remove the shunting capacitor from Z1012-F and tune T1013 for maximum detector output.

(8) Move the signal generator output to Z1006-A and connect the shunting capacitor to Z1008-A and ground.

(9) Tune L1012 for maximum detector output.

(10) Remove the shunting capacitor from Z1008-A and tune T1012 for maximum detector output.

(11) Move the signal generator output to Z1004-A and connect the shunting capacitor to Z1006-A and ground.

(12) Tune L1011 for maximum detector output.

(13) Remove the shunting capacitor from Z1006-A and tune T1011 for maximum detector output.



(14) Connect the shunting capacitor Z1003-1 and ground.

(15) (AN/FRR-21 and -22 Receivers only.) Move the signal generator output lead to the RF MIXER stage (mixer terminal; E152 on AN/FRR-21, E352 on AN/FRR-22, and E552 on AN/FRR-23), and tune the first i-f output transformer (T703 of the AN/FRR-21 receiver or T801 of the AN/FRR-22 receiver) for maximum detector output.

(16) (AN/FRR-23 Receiver only.) Move the signal generator output lead to terminal A of Z901, and tune T901 for maximum detector output.

(17) (AN/FRR-21 and -22 Receivers only.) Set the band switch to Band IV and move the signal generator output to the first i-f stage (Z701-A or Z801-A), then tune C721 of the AN/FRR-21 receiver, or C816 of the AN/FRR-22 receiver for maximum detector output.

(18) Remove the shunting capacitor from Z1003-1.

c. I-F FILTER ALIGNMENT.—This procedure describes the alignment of the sharp, medium, and broad filters (Z1001, Z1002, and Z1003) of the second i-f assembly, and the band-pass filter of the first i-f assembly. The sharp and medium filters of the second i-f are

sealed units but have a common tuning capacitor (C1029); therefore one adjustment is used for the alignment of both of these filters.

Connect an electronic voltmeter (item 2 of Table 7-1) to pin E of Z1012 and ground so as to read the output of the detector, then proceed as follows:

(1) SHARP, MEDIUM, AND BROAD FILTERS OF SECOND I-F ASSEMBLY.

(a) Set the RECEPTION control to A1 SHARP, and the band switch to Band IV.

(b) Connect a signal generator to the first i-f stage (Z701-A of the AN/FRR-21 receiver, Z801-A of the AN/FRR-22 receiver, or Z901-A of the AN/FRR-23 receiver). Place a 1.0-mf capacitor in series with this and all connections in this paragraph c.

(c) Set the signal generator to a fixed frequency of 200 kc and adjust the signal level to obtain a reading on the 0-to-10 volt range of the voltmeter.

(d) Adjust C1029 for a maximum output indication on the voltmeter.

(e) Set the RECEPTION control to the A3 BROAD position (steps (e) and (f) do not apply to

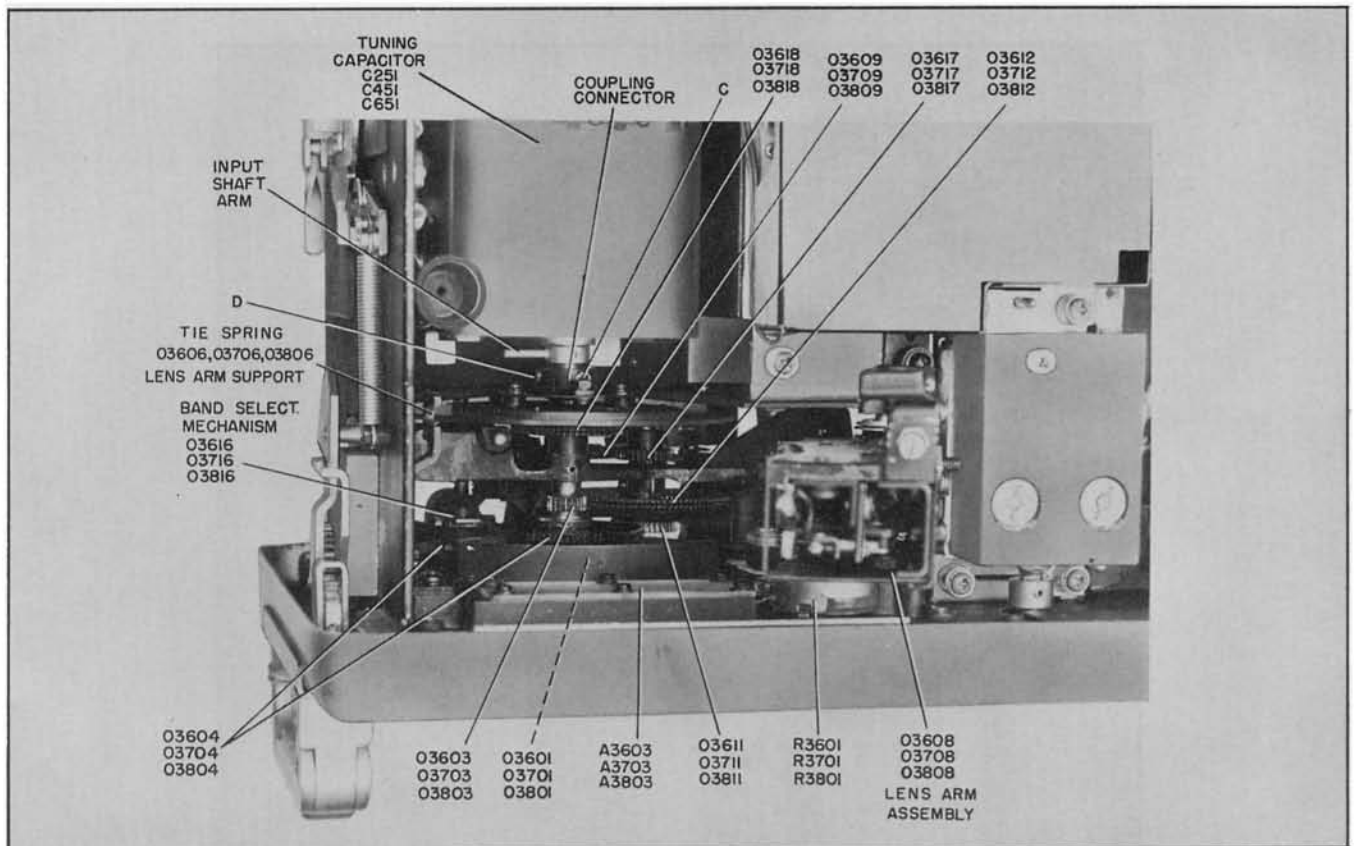


Figure 7-12. Dial Mechanism and Lens-Arm Assembly, Lifted, Top View

TABLE 7-7. CRYSTAL CALIBRATOR ALIGNMENT

EQUIPMENT	CRYSTAL OSCILLATOR FUNDAMENTAL FREQ.	FREQUENCY ADJUSTMENT	FREQUENCY METER CONNECTION
AN/FRR-21 Receiver	50 kc	C1401	J1401-B
AN/FRR-22 Receiver	50 kc	C1501	J1501-B
AN/FRR-23 Receiver	200 kc	C1201	J1201-B

the AN/FRR-21 receiver, as the broad filter of the second i-f is not used in this set).

(f) Adjust L1010 for a maximum output indication on the voltmeter.

(2) FIRST I-F BAND-PASS FILTER—Set the band switch to Band IV and connect the signal generator to the RF Mixer stage (J152-K of the AN/FRR-21 receiver, J352-K of the AN/FRR-22 receiver, or J552 of the AN/FRR-23 receiver), then proceed as follows:

(a) AN/FRR-21 RECEIVER.—Set the signal generator to a fixed frequency of 60 kc and adjust C710 and C715 for a maximum output reading on the voltmeter.

(b) AN/FRR-22 RECEIVER.—Set the signal generator to a fixed frequency of 1600 kc and adjust

C809 and C815 for a maximum output reading on the voltmeter.

(c) AN/FRR-23 RECEIVER.—Set the signal generator to a fixed frequency of 1600 kc and adjust C909 and C915 for a maximum output reading on the voltmeter.

d. BFO ALIGNMENT. (AN/FRR-21, -22, -23.)

(1) Set the RECEPTION control to A1 BROAD, and turn the FREQ VERNIER to its zero position.

(2) Apply a 2550-cycle signal from an audio oscillator (similar to item 4 of Table 7-1) to the horizontal input of an oscilloscope (similar to item 6 of Table 7-1). Turn the oscilloscope sync off.

(3) Connect the vertical input of the oscilloscope to pin J of Z1010, and apply a 200-kc signal to Z1004-A

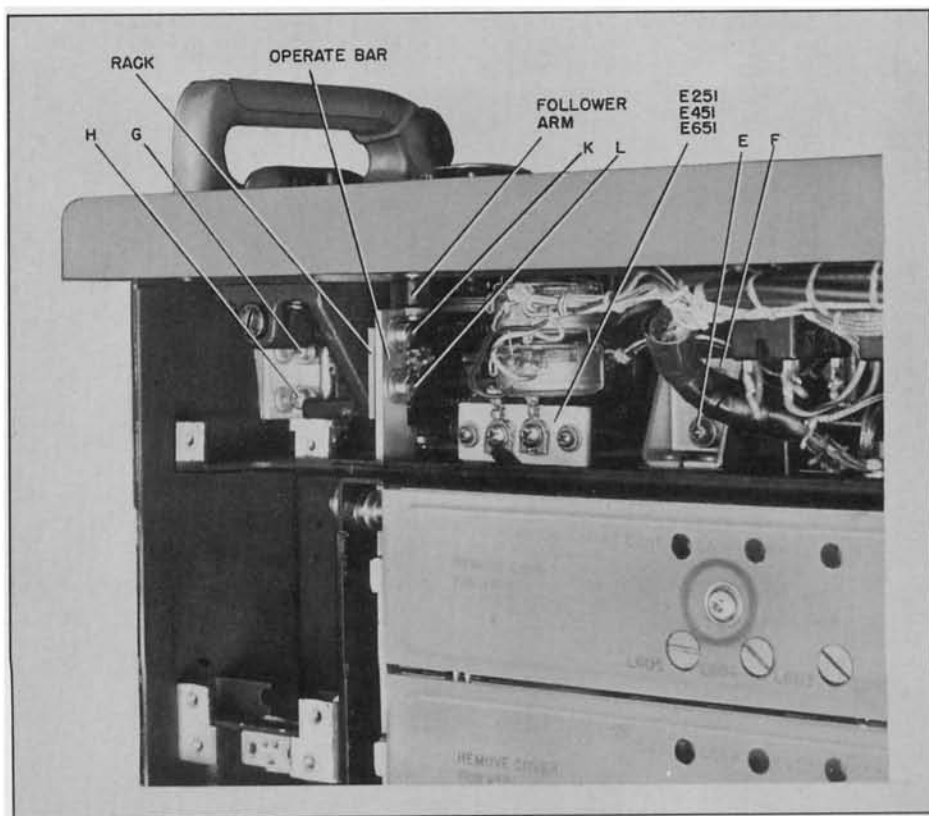
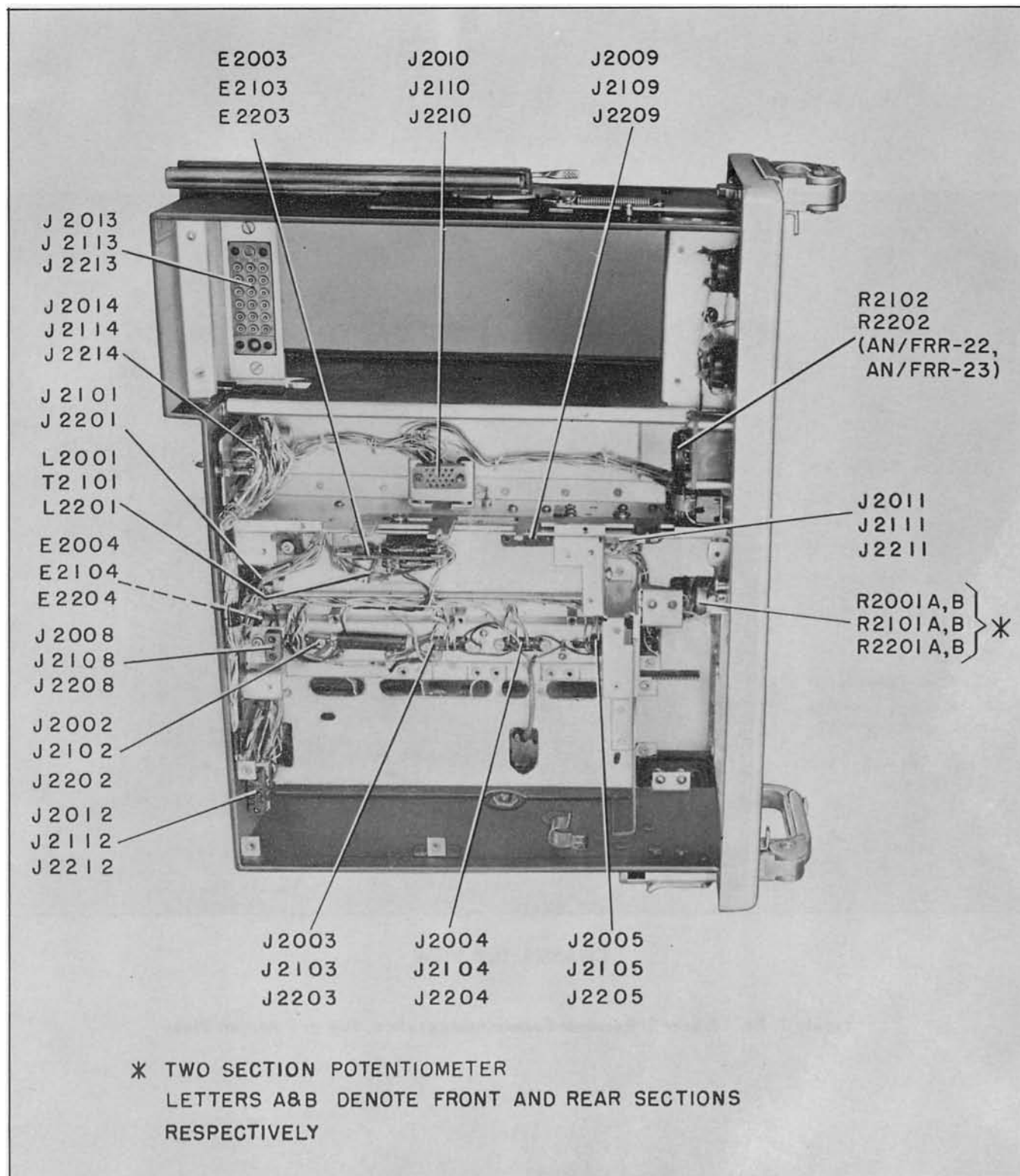
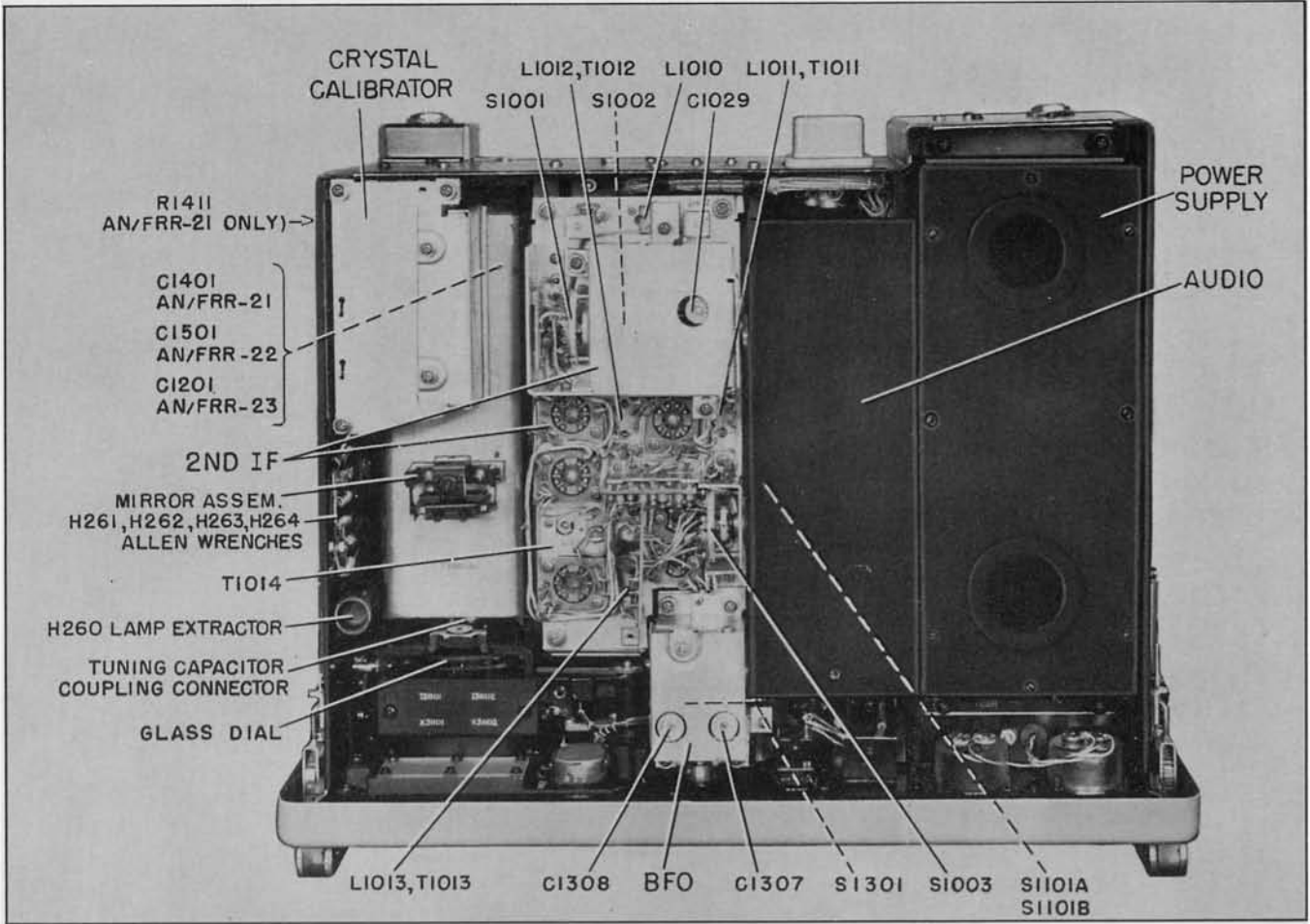


Figure 7-13. Dial Assembly, Bottom View



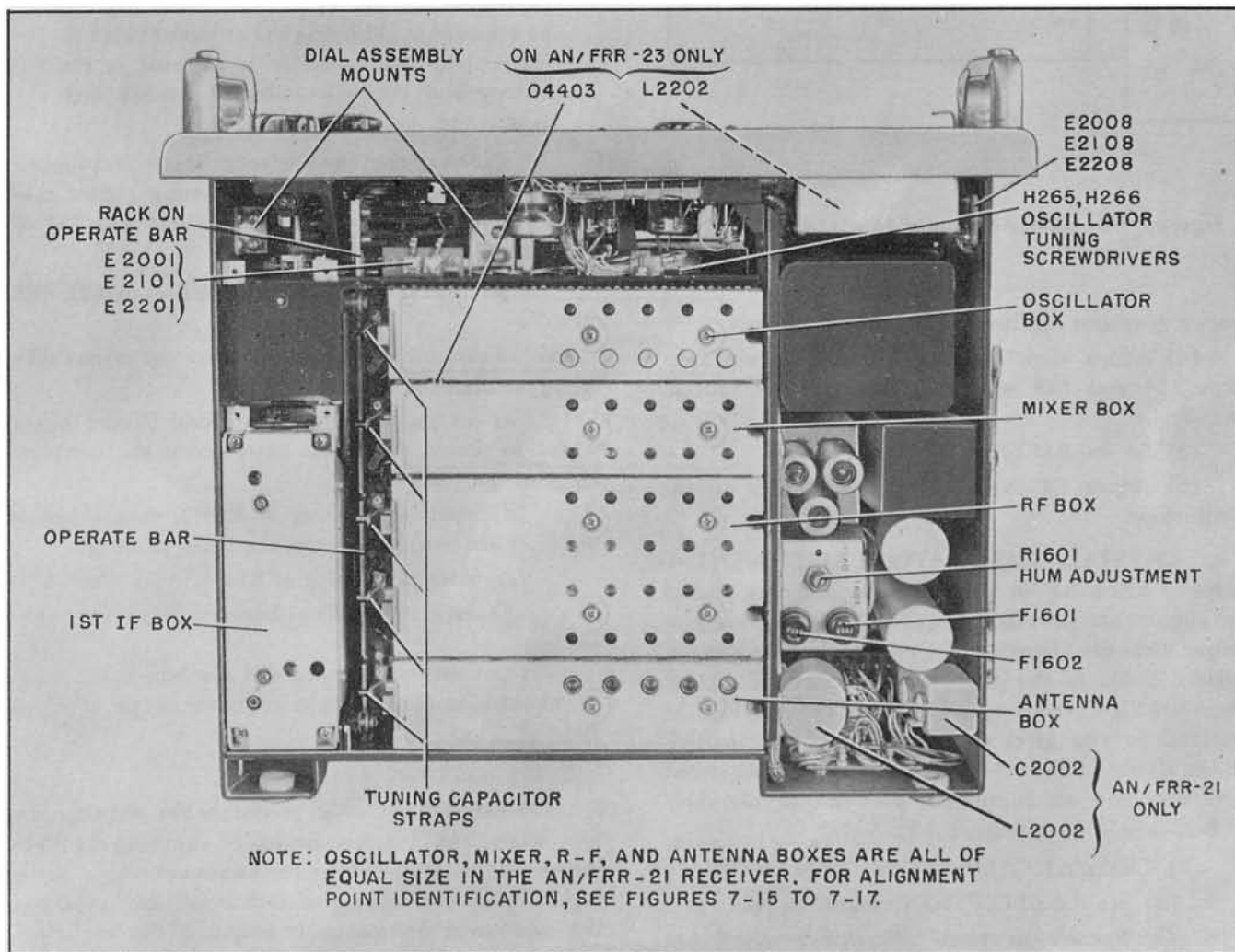
CHASSIS TOP VIEW, ASSEMBLIES REMOVED

Figure 7-14. (Sheet 1) Receiver Component Location, Top and Bottom View



CHASSIS TOP VIEW

Figure 7-14. (Sheet 2) Receiver Component Location, Top and Bottom View



CHASSIS BOTTOM VIEW

Figure 7-14. (Sheet 3) Receiver Component Location, Top and Bottom View

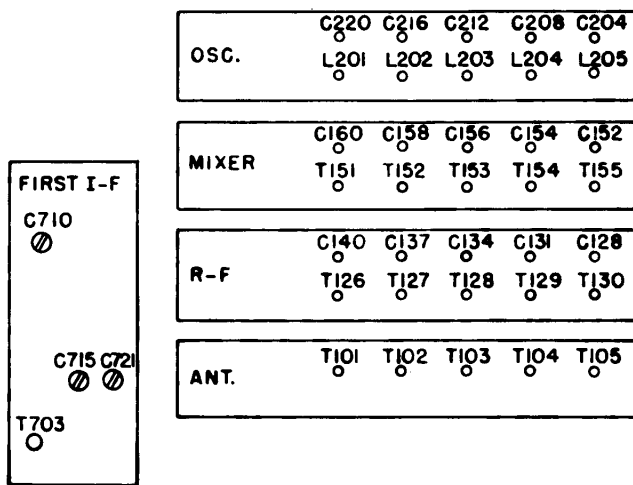


Figure 7-15. R-F Alignment Points, AN/FRR-21

from a generator similar to AN/URM-25 Series.

(4) Adjust C1307 for zero beat. Proceed with steps (5) and (6) when aligning the AN/FRR-22 and -23.

(5) Set the RECEPTION control to FSK.

(6) Adjust C1308 for a circular pattern on the oscilloscope.

*e.* CRYSTAL CALIBRATOR ALIGNMENT.—Refer to figure 7-1 for position of adjustments, also to the appropriate schematic diagram. The following procedure gives the alignment for the crystal calibrator oscillator Z1401 of the AN/FRR-21 receiver, Z1501 of the AN/FRR-22 receiver, and Z1201 of the AN/FRR-23 receiver. It also gives the alignment of the multivibrator Z1402 in the AN/FRR-21 receiver (this circuit does not have an adjustment provided in the AN/FRR-22 and -23 receivers).

(1) CRYSTAL CALIBRATOR OSCILLATOR.

(a) Set the RECEPTION control to A2.

(b) Remove the crystal calibrator cover and connect a frequency meter (similar to item 5 of Table 7-1), to the i-f output of the crystal calibrator (see Table 7-8 for the frequency meter connection).

(c) Obtain the frequency reading of this output. The output of the crystal oscillator is rich in harmonics, therefore, tune the frequency meter to have a reading of the fundamental if at all possible. If the fundamental frequency of the crystal does not lie within the band of the frequency meter, then tune the frequency meter to the closest obtainable harmonic of the crystal oscillator. The crystal oscillator frequency of all three types of receivers is listed in Table 7-7.

(d) If the frequency of the crystal calibrator is wrong, as determined in step (c), correct it by adjusting the capacitor listed in Table 7-7.

NOTE

The crystals employed in the calibrator are approximately 0.01 percent high in frequency at normal room temperature in order that they may maintain their frequencies within tolerance over a wide range of ambient temperatures. A slight variation in frequency can be achieved by adjusting the capacitor listed in Table 7-7. This capacitor is adjusted at the factory and normally will not require such adjustment.

(e) Disconnect the frequency meter and replace the crystal calibrator cover. If adjusting crystal calibrator of the low-frequency receivers, see step (2) of paragraph *e*.

(2) MULTIVIBRATOR, AN/FRR-21 RECEIVER ONLY.

This adjustment is to be made after the crystal calibrator oscillator is aligned.

(a) Set the band switch to Band III and adjust R1411 to obtain eight beat notes across the complete range of the band.

(b) Mark this setting of R1411, then adjust it to obtain six beat notes across the Band III range.

(c) Mark this setting of R1411.

(d) Set R1411 midway between the two previous settings.

(e) Check the tuning dial for beat notes at 10 kc separations (seven across complete range of Band III).

*f.* R-F SECTION ALIGNMENT.

(1) GENERAL.—The procedure for aligning the R-F, Mixer, and Antenna consists of adjusting the trimmer capacitors in each stage for maximum output at the high alignment frequency of each band, then adjusting the inductances for maximum output at the low alignment frequency end of each band. The alignment for the oscillator involves a similar procedure, but uses a zero beat instead of maximum output. R-f signals should be obtained from a signal generator set (similar to item 3 of Table 7-1) capable of supplying frequencies from 14 kc to 32 mc.

Locations of the trimmers and inductances are shown in figures 7-15 to 7-17. In addition, symbol numbers for the adjustments are marked on the equipment.

(2) R-F ALIGNMENT PROCEDURE.—Set the receiver and generator according to the following conditions, then adjust the trimmers and capacitors in the

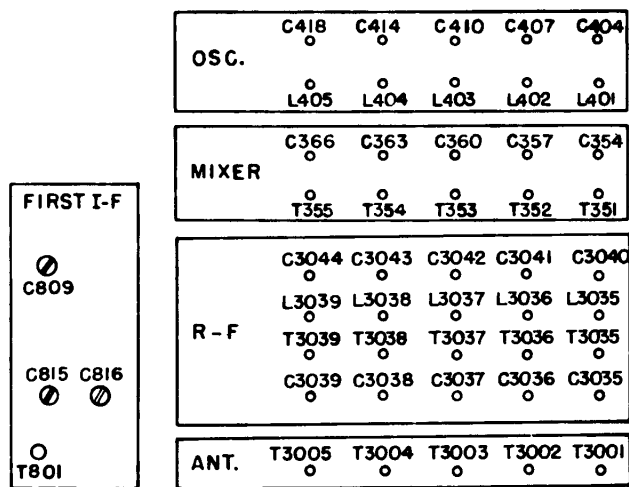


Figure 7-16. R-F Alignment Points, AN/FRR-22

oscillator, mixer, r-f, and antenna stages as directed in Tables 7-8 to 7-10.

If aligning the complete r-f section, first align the oscillator then align the antenna, r-f and mixer assemblies.

(a) Set the RECEPTION control at A1 BROAD, and connect a jumper wire between terminals 2 and 3 of the CAL switch (S2002 on AN/FRR-21, S2102 on AN/FRR-22, and S2202 on AN/FRR-23). Turn the CAL switch to ON. Tune the receiver away from a calibration frequency and adjust the FREQ VERNIER for zero beat. If an extraneous signal interferes with obtaining a beat note, detune the tuning dial to eliminate the signal. Remove the jumper wire.

(b) An alternate method of adjusting the BFO without the use of a jumper (to be used in place of step (a)) is as follows:

(1) Set the RECEPTION control to A1 BROAD and turn the CAL switch to ON. Tune the receiver away from a calibration frequency.

(2) Apply the output of the signal generator to ANT receptacle at the back of the receiver. Use an impedance adapter and an antenna simulator such as given under item 3 of Table 7-1, to make this connection.

(3) Apply a sufficiently high level of input at the r-f to obtain a beat note, and adjust the generator frequency to produce zero beat.

(4) Turn the CAL switch off. Adjust the FREQ VERNIER to produce zero beat.

(c) Set the link (O101 of AN/FRR-21 receiver, O3001 of the AN/FRR-22 receiver, or O3101 of the AN/FRR-23 receiver to a position so as not to connect

to any of the terminals. Then connect a 39-mmF capacitor to terminal 10 of Z101, terminal 3 of E3008, or terminal 3 of E3108, and ground.

(d) Apply the output of the signal generator directly to same terminal that the 39-mmF capacitor was connected to in step (c).

(e) Tune the generator and receiver to the alignment frequency specified in Tables 7-8 to 7-10 for the trimmer or inductance being adjusted. Check the frequency of the signal generator each time a new frequency is used. Use a frequency meter similar to item 5 of Table 7-1 to make this check.

(f) Set the ADD DECIBEL switch to -10 db position. Adjust the GAIN control in the receiver and output control of the generator for a reading of -10 db in the OUTPUT meter each time a new alignment frequency is used.

(g) Put the ADD DECIBEL switch at the 0 db position, then adjust the trimmers and inductances in the oscillator section to produce zero beat at the indicated frequencies of Tables 7-8 to 7-10. After the oscillator has been aligned, check the calibration check points as given in paragraph 14j.

(b) When aligning the inductances of the oscillator stages, first unscREW and remove the oscillator caps, then adjust the oscillator slug by using the special screwdriver which clips behind the front apron of the chassis (see figure 7-14). Use the outer blade of the screwdriver to hold the plastic slug support, then adjust the slug with the inner blade of the screwdriver for zero beat as described. DO NOT ADJUST THE PLASTIC SUPPORT, AS THIS WAS FACTORY SET FOR PROPER TEMPERATURE COEFFICIENT.

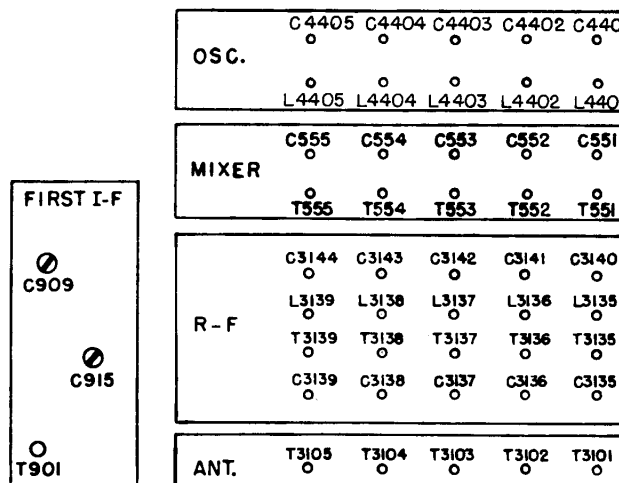


Figure 7-17. R-F Alignment Points, AN/FRR-23

(i) Adjust the mixer, r-f, and antenna stages for maximum on the OUTPUT meter in the order given in Tables 7-8 to 7-10. If the OUTPUT meter reads full scale, attenuate the signal generator output before adjusting the trimmer or inductance to maximum.

**NOTE**

The adjustments set forth in Tables 7-8 to 7-10 should be made in groups. The groups are determined by the particular band being aligned. For instance, the oscillator adjustments in Band I (1st group) are to be made and checked before going to the adjustments set forth for Band II, and the antenna, r-f, and mixer tuned circuits of Band I (1st group) are to be made and rechecked before going to the adjustments set forth for Band II. Two examples are given below.

Example 1 is for antenna, r-f, and mixer alignment, and Example 2 is for oscillator alignment. *When complete r-f section alignment is to be performed, align the oscillator first, then align the antenna, r-f, and mixer.*

**EXAMPLE 1:** Antenna, r-f, and mixer adjustments in Band I of the AN/FRR-21 receiver. (Refer to Table 7-8.)

(1) With the RECEPTION control at A1 BROAD and the adjustments described in paragraphs (2) (a) and (b) made, connect the signal generator output to the ANT receptacle of the receiver.

(2) Set the band selector to Band I, the CAL ADJUST knob to exact center position, and lock it.

(3) Turn the tuning dial knob till the reading on the frequency scale of the dial assembly is 28.65 kc.

(4) Tune the signal generator to 28.65 kc and check this frequency with the frequency meter.

(5) Set the ADD DECIBEL switch to the -10 db position and adjust the GAIN control for a -10 db reading.

(6) Set the ADD DECIBEL switch to the 0 db position and adjust trimmers ANT COMP, C140, and C160 to obtain a maximum output as indicated on the output meter and phones.

(7) Turn the tuning dial knob till the reading on the frequency scale of the dial assembly is 14.82 kc.

(8) Tune the signal generator to 14.82 kc and check this frequency with the frequency meter.

(9) Set the ADD DECIBEL switch to the -10 db position and adjust the gain control for a -10 db reading.

(10) Set the ADD DECIBEL switch to the 0 db position and adjust L201 for a maximum output as indicated on the output meter and phones.

(11) Repeat steps (2) through (9) until no further adjustment is necessary then go on to the next alignment step in Table 7-8 using this same procedure with the frequencies and adjustments given in that table.

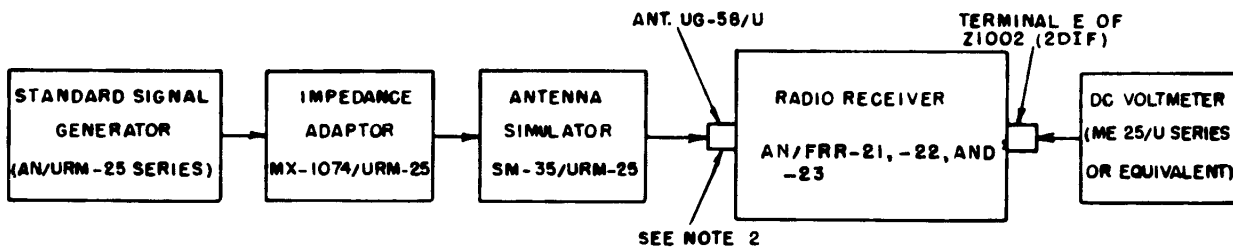
**EXAMPLE 2:** Oscillator alignment in Band I of the AN/FRR-21 receiver. (Refer to Table 7-8.)

(1) Follow the same procedure as given in example 1, and substitute oscillator alignment points and frequency as given in Table 7-8, as per example steps 1 and 2 of Table 7-8.

(2) After the complete oscillator adjustments have been made, recheck the adjustments for each band. They may require slight readjustment as there is a small amount of coupling between the tuned circuits of the oscillator.

(3) After the oscillator adjustments have been checked, perform the calibration checks given in paragraph (j).

(j) After the oscillator has been aligned or checked for alignment, turn the CAL switch to ON, and check each calibration check point on each band that has been aligned to make sure that the CAL ADJUST



**NOTES:** 1 - CONNECT THE SIGNAL GENERATOR TO THE RECEIVER ANT. RECEPTACLE THROUGH THE IMPEDANCE ADAPTOR AND ANTENNA SIMULATOR THROUGH PROPER CONNECTOR AND CABLES AS PER INSTRUCTION BOOK (NAVSHIPS 91283 FOR THE RF SIGNAL GENERATOR SET (AN/URM-25).

2 - THIS RECEPTACLE (J1707 ON AN/FRR-21; J4007 ON AN/FRR-22 AND -23) IS LOCATED AT THE BACK OF THE RECEIVER CABINET.

Figure 7-18. Test Set-Up for Receiver Selectivity Measurements



knob is capable of causing the calibrator frequency markings to coincide with the point of zero beat note. If such is not the case on any particular band, perform the following correction adjustments.

(1) Set the CAL ADJUST knob to its center position.

(2) Check all of the calibration points on the band, and the number of divisions on the linear scale by which the zero beat note is displaced from the point where the calibration marker appears. Attach a negative prefix to this number if the zero beat note occurs at a dial position which is lower than the dial marker, and a positive prefix if the zero beat note occurs at dial position which is higher than the dial marker.

(3) Record the positive and negative extremes of the number obtained in step (2).

(4) Compute the average of the two readings. This is equal to one-half the algebraic sum of these readings.

(5) Set the tuning dial to the calibration marker at the low end of the band and note the linear scale reading.

(6) Turn the tuning dial knob till the linear scale's position is displaced by the number of divisions computed in step (4). (Take into account the proper sign.)

(7) Set the CAL ADJUST knob so that the calibration marker at the low end of the band coincides with the linear scale reading obtained in step (6). Lock the CAL ADJUST knob.

(8) Align the oscillator as given in paragraph 4 with the CAL ADJUST knob set to the position determined in step (7), then recheck the calibration check points as described in the first paragraph.

(9) If the calibration check points still can not be brought to coincidence by use of the CAL ADJUST knob, then align the tuning dial as described in paragraph 11.

EXAMPLE: (AN/FRR-23 RECEIVER, BAND III.)

(1) With the CAL ADJUST knob set at its mid position, the 9.2-mc calibration marker appears at reading of 157 on the linear scale and the zero beat note occurs at a reading of 159 on the linear scale (a deviation of +2). In checking all the other check points, this is found to be the largest positive deviation.

(2) The 13.4-mc check point appears at a reading of 647 on the linear scale, and the zero beat note at 638 (a deviation of -9). In checking all other check points this is found to be the largest negative deviation.

(3) The average deviation of these two extremes is  $(+2-9)/2 = -2/2 = -3.5$ .

(4) Set the frequency dial to 8.0 mc (lowest check point of Band III). The linear scale reads 16.7.

(5) Rotate the tuning knob till the linear scale reads 13.2 ( $16.7-3.5=13.2$ ).

(6) Adjust the CAL ADJUST knob until the frequency dial reads 8.0 mc, and lock it at this position.

(7) Align the oscillator with the CAL ADJUST knob locked in the position given in step (6).

## 15. SELECTIVITY MEASUREMENT.

The curves shown in figures 7-19a through 7-19b are typical overall selectivity curves for the AN/FRR-21, -22, and -23. AN/FRR-21 selectivity is approximately the same for all settings of the RECEPTION control, being controlled primarily by the preselection selectivity (antenna preamplifier, r-f, mixer, and oscillator stages). In the case of the AN/FRR-22 and -23 receivers, typical curves are shown for each degree of selectivity for various frequencies. Overall selectivity above the highest frequency shown is effectively the i-f selectivity and will be the same as that at this frequency. These curves represent typical data; appreciable variation may occur from one set to another set without denoting trouble.

MEASUREMENT OF OVERALL SELECTIVITY.—Set up equipment as shown in the block diagram, figure 7-18.

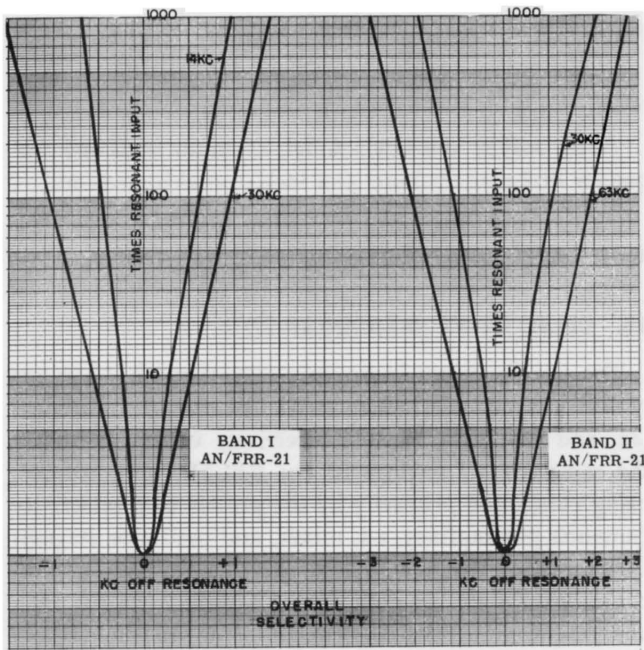
For A1 BROAD, A1 SHARP, or A2 setting of RECEPTION control, set the GAIN control to produce 60 microwatts of noise into a 600-ohm load (0.19V or -20 db), set output Level controls to maximum, SILENCER control to minimum. For A3 SHARP or BROAD, or FSK setting of RECEPTION control on the AN/FRR-22 and -23 receivers, turn DIVERSITY GAIN BALANCE control to minimum.

Before checking selectivity on any band, set the tuning dial to the high-frequency alignment point for the antenna stage (see Tables 7-8 to 7-10).

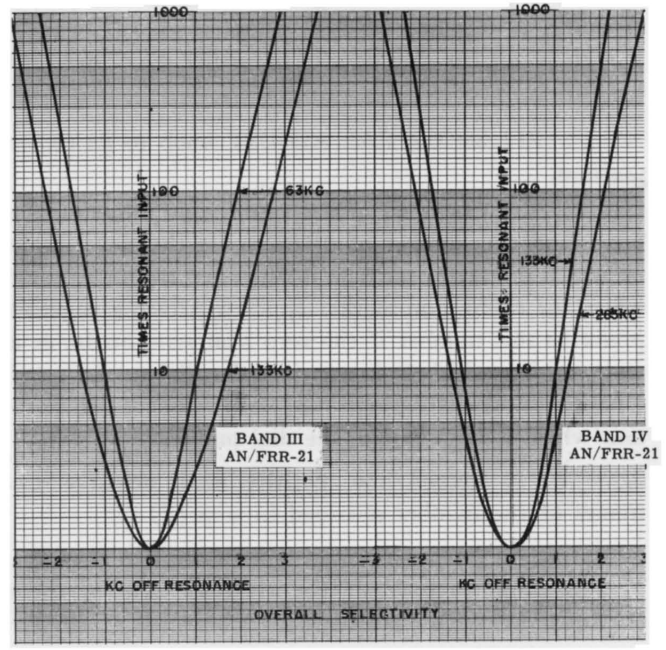
Set the RECEPTION control to A1 BROAD and GAIN control to produce 60 microwatts output. Set the Standard Signal Generator to produce peak output at this frequency; then adjust the antenna trimmer to produce maximum output. On the low bands of the low-frequency receivers it may be necessary to repeat these steps until the maximum is reached.

Then set the TUNING control to desired measurement frequency, and the RECEPTION control to desired condition.

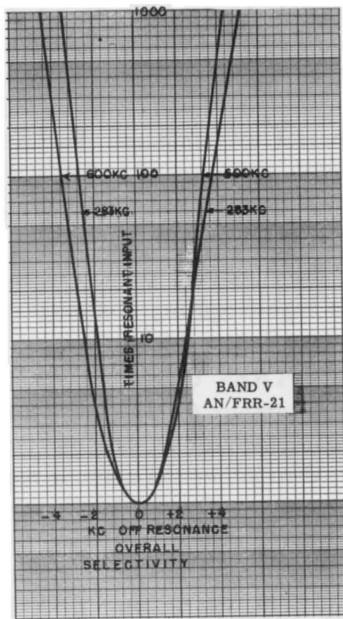
Set the Standard Signal Generator level to produce approximately 5 volts d-c on the voltmeter. Find the peak of the selectivity curve by turning the signal generator, and determine whether characteristic has a single or double peak. If there is a single peak, set signal gen-



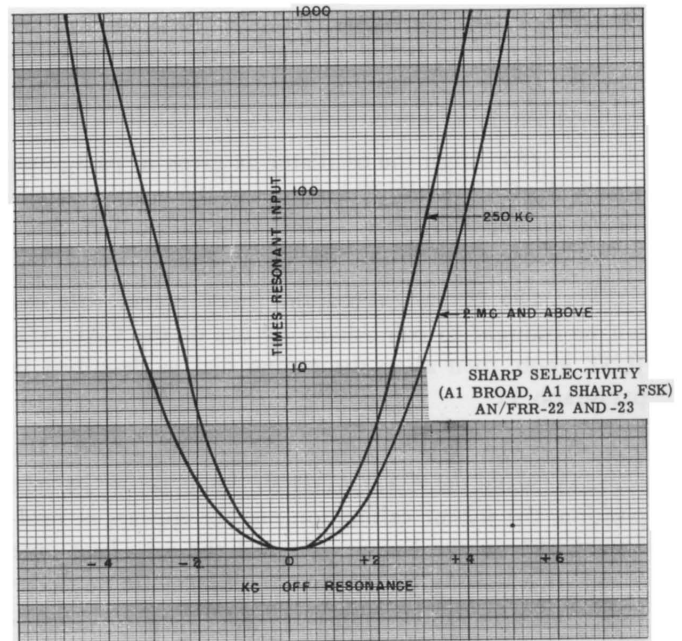
(A)



(B)

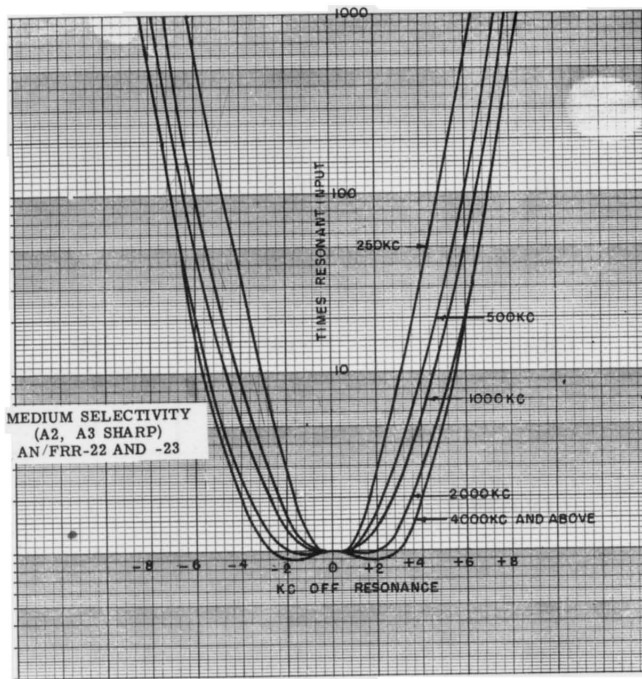


(C)

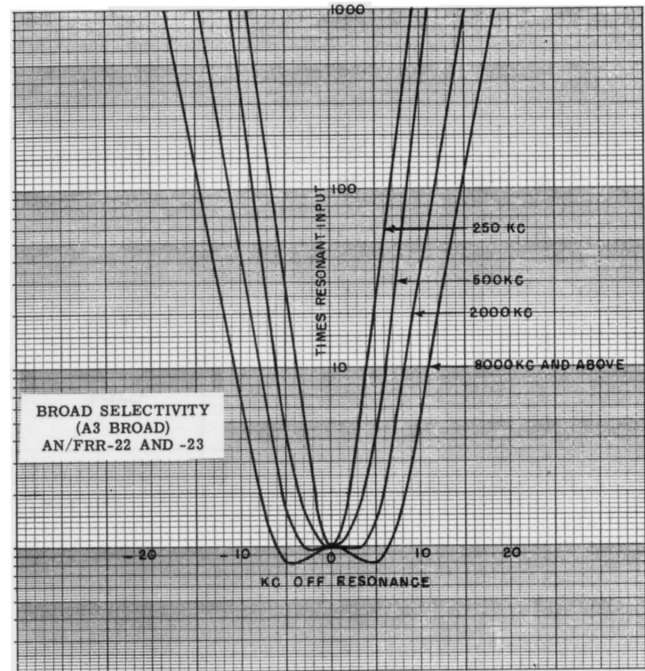


(D)

Figure 7-19. (A to D) Selectivity Curves



(E)



(F)

Figure 7-19. (E, F) Selectivity Curves

erator frequency to peak value and adjust level to produce 5 volts d-c output. Now increase input level in convenient steps (e.g. 2, 10, 100, and 1000 times resonant input). At each input level adjust frequency above and below resonance until the d-c voltmeter reads 5 volts. Record frequency. Selectivity curves are normally plotted in terms of the number of times resonant input (as set on the Standard Signal Generator) against the frequency deviation from resonance.

When the curve has a double peak, the minimum between the peaks should be employed as the resonant frequency. In this case, to plot a complete curve, two peaks should also be located. Often curves will be found to be asymmetrical. In this case it is convenient to choose a resonant frequency midway between the two frequencies which produces a standard output at two times the resonant input. Asymmetry does not necessarily indicate an incorrectly aligned set, since the tracking error normally present in the superheterodyne be-

tween oscillator and preselector can cause small asymmetries.

**16. CRYSTAL DATA.**

Crystals are used in the first i-f, and crystal-controlled calibrators in each receiver. They are mounted in plug-in holders which are held in place by spring clips. Table 7-11 lists the specification of each crystal, and their physical locations are shown in the appropriate connection diagram.

**17. WINDING DATA.**

Winding data for all coils and transformers indicated by symbol numbers on the schematic diagrams is given in Table 7-12. However, winding data for hermetically sealed filters, which are indicated by Z numbers on the schematic diagram, are not given. These filters are to be replaced as whole units.

TABLE 7-8. R-F ALIGNMENT PROCEDURE, AN/FRR-21

STEP	GENERATOR AND RECEIVER FREQUENCY (KC)	ADJUST TRIMMER FOR ZERO BEAT	ADJUST INDUCTANCE FOR ZERO BEAT	SECTION	BAND
1	30	C220		OSC	I
2	14		L201	OSC	I
3	63	C216		OSC	II
4	30		L202	OSC	II
5	133	C212		OSC	III
6	63		L203	OSC	III
7	283	C208		OSC	IV
8	133		L204	OSC	IV
9	600	C204		OSC	V
10	283		L205	OSC	V
		MAXIMUM OUTPUT	MAXIMUM OUTPUT		
11	28.65	ANT COMP		ANT	I
12	28.65	C140		RF	I
13	28.65	C160		MIX	I
14	14.82		T101	ANT	I
15	14.82		T126	RF	I
16	14.82		T151	MIX	I
17	60.1	ANT COMP		ANT	II
18	60.1	C137		RF	II
19	60.1	C158		MIX	II
20	31.78		T102	ANT	II
21	31.78		T127	RF	II
22	31.78		T152	MIX	II
23	128	ANT COMP		ANT	III
24	128	C134		RF	III
25	128	C156		MIX	III
26	66.6		T103	ANT	III
27	66.6		T128	RF	III
28	66.6		T153	MIX	III
29	269.4	ANT COMP		ANT	IV
30	269.4	C131		RF	IV
31	269.4	C154		MIX	IV
32	140		T104	ANT	IV
33	140		T129	RF	IV
34	140		T154	MIX	IV
35	570.8	ANT COMP		ANT	V
36	570.8	C128		RF	V
37	570.8	C152		MIX	V
38	298.8		T105	ANT	V
39	298.8		T130	RF	V
40	298.8		T155	MIX	V

TABLE 7-9. R-F ALIGNMENT PROCEDURE, AN/FRR-22

STEP	GENERATOR AND RECEIVER FREQUENCY (KC)	ADJUST TRIMMER FOR ZERO BEAT	ADJUST INDUCTANCE FOR ZERO BEAT	SECTION	BAND
1	500	C404		OSC	I
2	250		L401	OSC	I
3	1000	C407		OSC	II
4	500		L402	OSC	II
5	2000	C410		OSC	III
6	1000		L403	OSC	III
7	4000	C414		OSC	IV
8	2000		C404	OSC	IV
9	8000	C418		OSC	V
10	4000		L405	OSC	V
		MAXIMUM OUTPUT	MAXIMUM OUTPUT		
11	480	ANT COMP		ANT	I
12	480	C3035, C3040		RF	I
13	480	C354		MIX	I
14	260		T3001	ANT	I
15	260		L3035, T3035	RF	I
16	260		T351	MIX	I
17	960	ANT COMP		ANT	II
18	960	C3036, C3041		RF	II
19	960	C357		MIX	II
20	520		T3002	ANT	II
21	520		L3036, T3036	RF	II
22	520		T352	MIX	II
23	1920	ANT COMP		ANT	III
24	1920	C3037, C3042		RF	III
25	1920	C360		MIX	III
26	1040		T3003	ANT	III
27	1040		L3037, T3037	RF	III
28	1040		T353	MIX	III
29	3840	ANT COMP		ANT	IV
30	3840	C3038, C3043		RF	IV
31	3840	C363		MIX	IV
32	2080		T3004	ANT	IV
33	2080		L3038, T3038	RF	IV
34	2080		T354	MIX	IV
35	7680	ANT COMP		ANT	V
36	7680	C3039, C3044		RF	V
37	7680	C366		MIX	V
38	4160		T3005	ANT	V
39	4160		L3039, T3039	RF	V
40	4160		T355	MIX	V

TABLE 7-10. R-F ALIGNMENT PROCEDURE, AN/FRR-23

STEP	GENERATOR AND RECEIVER FREQUENCY (MC)	ADJUST TRIMMER FOR ZERO BEAT	ADJUST INDUCTANCE FOR ZERO BEAT	SECTION	BAND
1	4.0	C4401		OSC	I
2	2.0		L4401	OSC	I
3	8.0	C4402		OSC	II
4	4.0		L4402	OSC	II
5	16.0	C4403		OSC	III
6	8.0		L4403	OSC	III
7	24.0	C4404		OSC	IV
8	16.0		L4404	OSC	IV
9	32.0	C4405		OSC	V
10	24.0		L4405	OSC	V
		MAXIMUM OUTPUT	MAXIMUM OUTPUT		
11	3.88	ANT COMP		ANT	I
12	3.88	C3135, C3140		RF	I
13	3.88	C551		MIX	I
14	2.1		T3101	ANT	I
15	2.1		L3135, T3135	RF	I
16	2.1		T551	MIX	I
17	7.76	ANT COMP		ANT	II
18	7.76	C3136, C3141		RF	II
19	7.76	C552		MIX	II
20	4.28		T3102	ANT	II
21	4.28		L3136, T3136	RF	II
22	4.28		T552	MIX	II
23	15.49	ANT COMP		ANT	III
24	15.49	C3137, C3142		RF	III
25	15.49	C553		MIX	III
26	8.32		T3103	ANT	III
27	8.32		L3137, T3137	RF	III
28	8.32		T553	MIX	III
29	23.62	ANT COMP		ANT	IV
30	23.62	C3138, C3143		RF	IV
31	23.62	C554		MIX	IV
32	16.32		T3104	ANT	IV
33	16.32		L3138, T3138	RF	IV
34	16.32		T554	MIX	IV
35	31.7	ANT COMP		ANT	V
36	31.7	C3139, C3144		RF	V
37	31.7	C555		MIX	V
38	24.3		T3105	ANT	V
39	24.3		L3139, T3139	RF	V
40	24.3		T555	MIX	V

TABLE 7-11. CRYSTAL DATA\*

SYMBOL	FREQ.	TOLERANCE	TEMP. RANGE	CRYSTAL HOLDER TYPE
<b>FIRST I-F ASSEMBLY</b>				
Y701	140 kc	$\pm 0.016\%$	-40°C to +85°C	HC-6/U HC-6/U
Y801	1400 kc	$\pm 0.005\%$	-55°C to +90°C	
Y901	1400 kc	$\pm 0.005\%$	-55°C to +90°C	
<b>CRYSTAL CALIBRATOR</b>				
Y1201	200 kc	$\pm 0.012\%$	-40°C to +85°C	
Y1401	50 kc	$\pm 0.012\%$	-40°C to +85°C	
Y1501	50 kc	$\pm 0.012\%$	-40°C to +85°C	

\* Refer to MIL-C-3098 Specification.

TABLE 7-12. COIL WINDING DATA

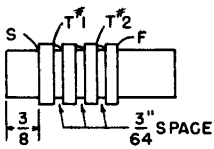
SYMBOL DESIGNATION	R. C. A. PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HI POT A-C VOLTS	REMARKS
L201	746105-6		Universal, 3 crosses per turn, 4 sections.	1 strand 0.004	257 per section, tap 1 at 257, tap 2 at 771.	106			0.455 in. dia. ceramic coil form. See notes 1, 2, 3, and 5. L = 18.1 mh.
L202	746105-7	Same as L201.	Universal, 4 crosses per turn, 4 sections.	8 strands 0.0022	94 per section, tap 1 at 94, tap 2 at 188.	13			0.312 in. dia. ceramic coil form. See notes 1, 2, and 3. L = 1440 mh.
L203	746105-8	Not available at time of printing.	Universal, 4 crosses per turn, 4 sections.	30 strands 0.0020	37 per section, tap 1 at 37, tap 2 at 74.	13.2			0.312 in. dia. ceramic coil form. See notes 1, 2, and 3. L = 1410 mh.
L204	746105-9	Same as L201.	Universal, 4 crosses per turn, 4 sections.	5 strands 0.0025	122 per section, tap 1 at 122, tap 2 at 244.	22.5			0.312 in. dia. ceramic coil form. See notes 1, 2, and 3. L = 2530 mh.
L205	746105-10	Same as L201.	Universal, 6 crosses per turn, 4 sections.	20 strands 0.0020	51 per section, tap 1 at 51, tap 2 at 102.	3.5			0.312 in. dia. ceramic coil form. See notes 1, 2, and 3. L = 445 mh.
L401	746105-1	Same as L201.	Universal, 6 crosses per turn, 4 sections.	20 strands 0.0020	60 per section, tap 1 at 57, tap 2 at 74.	4.0			0.312 in. dia. ceramic coil form. See notes 2 and 3. L = 693 mh.
L402	746105-2	Same as L201.	Universal, 6 crosses per turn, 6 sections.	30 strands 0.0020	37 per section, tap 1 at 37, tap 2 at 74.	1.8			0.312 in. dia. ceramic coil form. See notes 2 and 3. L = 243 mh.
L403	746105-3	Same as L201.	Universal, 6 crosses per turn, 6 sections.	30 strands 0.0020, tap 1 at 15, tap 2 at 46	sec turns 1 15½ 2 16 3 15¾ 4 16 5 16 6 15⅝	0.94			0.312 in. dia. ceramic coil form. See notes 2 and 3. L = 72.5 mh.

TABLE 7-12 (Continued)

SYMBOL DESIGNATION	R. C. A. PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
L404	746105-4		Flat, close wound.	1 strand 0.010	35 <sup>2</sup> / <sub>3</sub> , tap 1 at 9 <sup>1</sup> / <sub>2</sub> , tap 2 at 18 <sup>1</sup> / <sub>3</sub> .	0.38			0.312 in. dia. ceramic coil form. See notes 2 and 4. L = 9.6 mh.
L405	746105-5		Flat, close wound.	1 strand 0.0159	18 <sup>2</sup> / <sub>3</sub> , tap 1 at 9 <sup>1</sup> / <sub>2</sub> , tap 2 at 18 <sup>1</sup> / <sub>3</sub> .	0.095			0.312 in. dia. ceramic coil form. See notes 2 and 4. L = 3.6 mh.
L1010	746104-4		Random.	1 strand 0.004	319 <sup>1</sup> / <sub>2</sub>	14.1			0.118 in. dia. powdered iron coil form. See notes 2 and 3. L = 2.44 mh.
L1011, L1012	746104-31	Same as L1010.	Random.	1 strand 0.004	304 <sup>1</sup> / <sub>2</sub> , 162 <sup>1</sup> / <sub>4</sub> turns to tap.	13.6 6.5 to tap			0.118 in. dia. powdered iron coil form. See notes 2 and 3. L (Start to tap) = 0.382 mh. L (tap to finish) = 0.29 mh.
L1013	746104-32	Same as L1010.	Random.	1 strand 0.004	225 <sup>1</sup> / <sub>2</sub> , 121 <sup>1</sup> / <sub>3</sub> turns to tap.	9.8 4.7 to tap			0.118 in. dia. powdered iron coil form. See notes 2 and 3. L (Start to tap) = 1.22 mh. L (tap to finish) = 0.29 mh.
L1601	8896292-1		Single.	0.0071 E	1880	152			1 sheet of 0.001 in. paper between layer. 5 henries at 50 v AC 60 CPS.
L2001, L2101, L2201	746104-9		Universal, 1/2 cross per turn, 1 section.	1 strand 0.004	1045 <sup>1</sup> / <sub>2</sub>	50.2			0.125 in. dia. powdered iron slug. Wind coil over 1 layer of tape, extend leads 1 1/2 in. beyond core. L = 6.35 mh.
L2002	462575-1		Single.	0.0359 E	221	3.2			Wind over 245 dia. ferricore, use 0.005 paper between layers.



TABLE 7-12 (Continued)

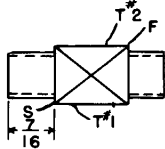
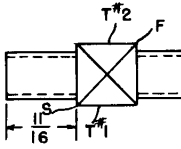
SYMBOL DESIGNATION	R. C. A. PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
L3035		Not available at time of printing.							
L3036		Not available at time of printing.							
L3037		Not available at time of printing.							
L3038		Not available at time of printing.							
L3039		Not available at time of printing.							
L3135		Not available at time of printing.							
L3136		Not available at time of printing.							
L3137		Not available at time of printing.							
L3138		Not available at time of printing.							
L3139		Not available at time of printing.							
L4401	746105-11		Flat, close wound.	30 strands 0.002	31 $\frac{2}{3}$ , tap 1 at 10.5, tap 2 at 18.4.	0.28			0.312 in. dia. ceramic coil form. See notes 2 and 4. L = 8.65 uh.
L4402	746105-12	Same as L4401.	Flat, close wound.	1 strand 0.0159	17 $\frac{1}{2}$ , tap 1 at 6 $\frac{1}{2}$ , tap 2 at 11 $\frac{1}{3}$ .	0.09			0.312 in. dia. ceramic coil form. See notes 2 and 4. L = 3.15 uh.
L4403	746105-13		Flat, 24 turns per in. in groove.	1 strand 0.020	6 $\frac{3}{4}$ , tap 1 at 2.9, tap 2 at 5 $\frac{1}{3}$ .	0.03			0.455 in. dia. ceramic coil form. See notes 1, 2, 4, and 5. L = 0.95 uh.

TABLE 7-12 (Continued)

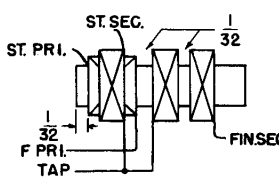
SYMBOL DESIGNATION	R. C. A. PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
L4404	746105-14	Same as L4403.	Flat, 13 turns per in. in groove.	0.015 x 0.045	4½, tap at 2.	0.013			0.455 in. dia. ceramic coil form. See notes 1, 2, 4, and 5. L = 0.372 uh.
L4405	746105-15	Same as L4403.	Flat, 13 turns per in. in groove.	0.015 x 0.045	3, tap at 1½.	0.01			0.455 in. dia. ceramic coil form. See notes 1, 2, 4, and 5. L = 0.255 uh.
L4406		Not available at time of printing.							
T101	746106-1		Primary flat, RH, 140 turns per in.  Secondary Universal, 1 cross per turn, 3 sections.	1 strand 0.004  1 strand 0.004	16  sec #1, 930 sec #2, 1180 sec #3, 1180 tap at 930	1.33  313			0.406 in. dia. glass base melamine coil form. See notes 2, 4.
T102	746106-2	Same as T101.	Primary flat, RH, 140 turns per in.  Secondary Universal, 1½ crosses per turn, 3 sections.	1 strand 0.0063  1 strand 0.0050	10  sec #1, 400 sec #2, 605 sec #3, 605 tap at 400	0.40  110			0.406 in. dia. glass base melamine coil form. See notes 2, 4.
T103	746106-3	Same as T101.	Primary flat, RH, 44 turns per in.  Secondary Universal, 1½ crosses per turn, 3 sections.	1 strand 0.005  1 strand 0.004	8  sec #1, 248 sec #2, 437 sec #3, 437	0.37  74.0			0.281 in. dia. glass base melamine coil form. See notes 2 and 4.  See notes 2 and 4.
T104	746106-4	Same as T101.	Primary flat, RH, close wound.  Secondary Universal, 1.35 crosses per turn, 3 sections.	1 strand 0.0050  1 strand 0.0050	8  sec #1, 118 sec #2, 187 sec #3, 187 118 turns to tap	0.26  22.1			0.281 in. dia. glass base melamine coil form. See notes 2 and 4.
T105	746106-5	Same as T101.	Primary flat, RH, 44 turns per in.  Secondary Universal, 2 crosses per turn, 3 sections.	3 strands 0.0028  3 strands 0.0028	4  sec #1, 52 sec #2, 58 sec #3, 88 tap at 52	0.24  11.3			0.281 in. dia. glass base melamine coil form. See notes 2 and 4.

TABLE 7-12 (Continued)

SYMBOL DESIGNATION	R. C. A. PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
T126	746106-6		Primary Universal, 4 crosses per turn, 1 section. Secondary Universal, 1 cross per turn, 2 sections.	1 strand 0.0035 1 strand 0.0035	253 sec #1, 1360 sec #2, 1360 tap at 1360	28 367			0.46 in. dia. paper base bakelite coil form. See notes 2 and 4.
T127	746106-7	Same as T126.	Primary Universal, 4 crosses per turn, 1 section. Secondary $1\frac{1}{2}$ crosses per turn, 2 sections.	1 strand 0.004 1 strand 0.005	190 sec #1, 743 sec #2, 743 743 turns to tap	20.6 107			0.46 in. dia. paper base bakelite coil form. See notes 2 and 3.
T128	746106-8	Same as T126.	Primary Universal, $1\frac{1}{3}$ crosses per turn, 1 section. Secondary Universal, $1\frac{1}{2}$ crosses per turn, 2 sections.	1 strand 0.0063 1 strand 0.004	166 sec #1, 437 sec #2, 437 437 turns to tap	4.92 63.5			0.281 in. dia. paper base bakelite coil form. See notes 2 and 3.
T129	746106-9	Same as T126.	Primary Universal, 2 crosses per turn, 1 section. Secondary Universal, $1\frac{1}{2}$ crosses per turn, 2 sections.	3 strands 0.0028 1 strand 0.005	109 sec #1, 207 sec #2, 207 207 turns to tap	5.5 19			0.281 in. dia. paper base bakelite coil form. See notes 2 and 3.
T130	746106-10	Same as T126.	Primary Universal, 2 crosses per turn, 1 section. Secondary Universal, 2 crosses per turn, 2 sections.	3 strands 0.0028 3 strands 0.0028	108 sec #1, 98 sec #2, 98 98 turns to tap	5.3 9.5			0.281 in. dia. paper base bakelite coil form. See notes 2 and 3.
T151	746106-11	Same as T126.	Same as T126.						0.406 in. dia. paper base bakelite coil form.
T152	746106-12	Same as T126.	Same as T126.						0.46 in. dia. paper base bakelite coil form.

TABLE 7-12 (Continued)

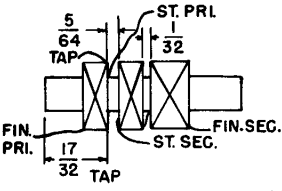
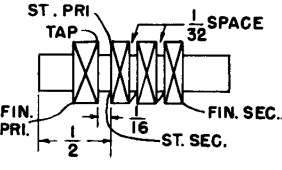
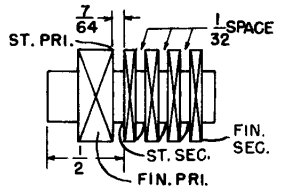
SYMBOL DESIGNATION	R. C. A. PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
T153	746106-13	Same as T126.	Primary Universal, 2 crosses per turn, 1 section. Secondary Universal, $1\frac{1}{8}$ crosses per turn, 2 sections.	3 strands 0.0028 1 strand 0.004	113 sec #1, 422 sec #2, 422 422 turns to tap	5.7 62.4			0.281 in. dia. paper base bakelite coil form. See notes 2 and 3.
T154	746106-14	Same as T126.	Primary 2 crosses per turn, 1 section. Secondary Universal, $1\frac{1}{8}$ crosses per turn, 2 sections.	3 strands 0.0028 1 strand 0.005	57 sec #1, 205 sec #2, 205 tap at 205	2.6 18.7			0.281 in. dia. paper base bakelite coil form. See notes 2 and 3.
T155	746106-15	Same as T126.	Primary Universal, 2 crosses per turn, 1 section. Secondary Universal, 2 crosses per turn, 2 sections.	3 strands 0.0028 3 strands 0.0028	56 sec #1, 95 sec #2, 95 tap at 95	2.6 9			0.281 in. dia. paper base bakelite coil form. See notes 2 and 3.
T351	746107-6		Primary Universal, $1\frac{1}{2}$ crosses per turn, 1 section. Secondary Universal, 1 cross per turn, 2 sections.	1 strand 0.004 10 strands 0.002	472 310 turns per section	25.1 15.4			0.188 in. dia. ceramic coil form. See notes 2 and 3.
T352	746107-7		Primary Universal, 1 cross per turn, 1 section. Secondary Universal, 4 crosses per turn, 3 sections.	1 strand 0.004 10 strands 0.002	487 92 turns per section	30.0 8.0			0.25 in. dia. ceramic coil form. See notes 2 and 3.
T353	746107-8		Primary Universal, 2 crosses per turn, 1 section. Secondary Universal, 4 crosses per turn, 4 sections.	1 strand 0.004 30 strands 0.002	392 24 turns per section	39.7 1.21			0.455 in. dia. ceramic coil form. See notes 2 and 3.

TABLE 7-12 (Continued)

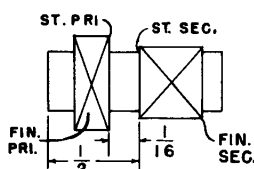
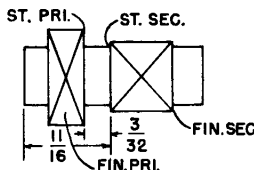
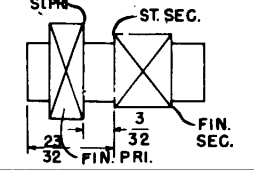
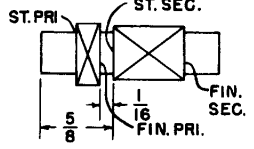
SYMBOL DESIGNATION	R. C. A. PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
T354	746107-9		Primary Universal, 2 crosses per turn, 1 section. Secondary flat, RH, 44 turns per in. in groove.	1 strand 0.004 1 strand 0.01	140 45 1/8	14.25 0.93			0.455 in. dia. coil form. See notes 2 and 4.
T355	746107-10		Primary Universal, 3 crosses per turn, 1 section. Secondary flat, RH, 44 turns per in. in groove.	3 strands 0.0025 1 strand 0.010	72 21 1/8	6.12 0.27			0.455 in. dia. ceramic coil form. See notes 2 and 4.
T551	746108-1		Primary Universal, 1 1/2 crosses per turn, 1 section. Secondary flat, RH, 64 turns per in.	1 strand 0.004 1 strand 0.01	328 45 1/8	28.2 0.6			0.455 in. dia. ceramic coil form. See notes 2 and 4.
T552	746108-2	Not available at time of printing.	Primary Universal, 3 crosses per turn, 1 section. Secondary flat, RH, 44 turns per in. in groove.	3 strands 0.0025 1 strand 0.01	96 1/2 20 1/8	8.77 0.3			0.455 in. dia. ceramic coil form. See notes 2 and 4.
T553	746108-3	Same as T355.	Primary Universal, 3 crosses per turn, 1 section. Secondary flat, RH, 24 turns per in. in groove.	3 strands 0.0025 1 strand 0.02	38 1/2 10 1/8	3.31 0.04			0.455 in. dia. ceramic coil form. See notes 2 and 4.
T554	746106-4		Primary flat, RH, close wound. Secondary flat, RH, 13 turns per in. in groove.	1 strand 0.0063 0.015 x 0.045 soft copper	15 1/2 6 1/8	0.622 0.016			0.455 in. dia. ceramic coil form. See notes 2 and 4.

TABLE 7-12 (Continued)

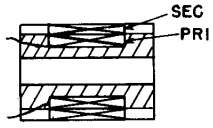
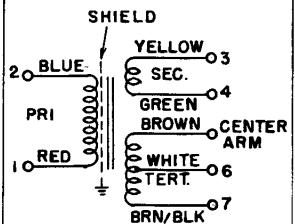
SYMBOL DESIGNATION	R. C. A. PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HI POT A-C VOLTS	REMARKS
T555	746108-5	Same as T554.	Primary Universal, 3 crosses per turn, 1 section. Secondary flat, RH, 24 turns per in. in groove.	3 strands 0.0025 1 strand 0.02	38½ 10½	0.313 0.013			0.455 in. dia. ceramic coil form. See notes 2 and 4.
T703, T801, T901	746104-25		Primary Random. Secondary Random.	1 strand 0.004 1 strand 0.004	300½ 22½	12.7 1.35			0.118 in. dia. powdered iron coil form. Wind secondary over primary, use tape between layers. See notes 2 and 3.
T1011, T1012	746104-30	Same as T703.	Primary Random. Secondary Random.	1 strand 0.004 1 strand 0.004	305½ 22½	12.6 1.35			0.118 in. dia. powdered iron coil form. Wind secondary over primary, use tape between layers. See notes 2 and 3.
T1013	746104-29	Same as T703.	Primary Random. Secondary Random.	1 strand 0.004 1 strand 0.004	254½ 15½	10.4 0.9			0.118 in. dia. powdered iron coil form. Wind secondary over primary, use tape between layers. See notes 2 and 3.
T1014	746106-16	Not available at time of printing.	Primary Random wound between pies of secondary. Secondary Universal, 1 cross per turn, 2 sections.	1 strand 0.004 30 strands 0.002	28 70 turns per section	1.7 1.13			0.247 in. dia. powdered iron coil form. See notes 2 and 4.
T1101	8842479-1		Primary. Secondary. Tertiary. Electrostatic Shield.	0.0035 Heavy Formex 0.0071 Heavy Formex 0.0071 Heavy Formex 0.002 Copper 0.4 x 3	90 210 246 tap at 123 1	327 7.62 7.14:1 10.8 6.1:1 1000			Insulate electrostatic shield with ¼-inch tape, then wind with exposed side of electrostatic shield out, then secure with 1 turn of 1½-inch tape.

TABLE 7-12 (Continued)

SYMBOL DESIGNATION	R. C. A. PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
T1601	8889252	<p>The diagram shows a transformer with a primary winding (PRI.) on the left and a secondary winding (SEC.) on the right. The primary has terminals 1, 2, 3, and 4. The secondary has terminals 5 through 14. A ground symbol is connected to terminal 5. The windings are arranged in a series-aiding configuration.</p>	<p>6-4</p> <p>5-7</p> <p>8-9</p> <p>10-11</p> <p>11-12-13</p> <p>13-14</p>	<p>#23 Formex</p> <p>#32 Formex</p> <p>#26 Formex</p> <p>#25 Formex</p> <p>#2 x 15 Formex</p> <p>#20 Formex</p>	<p>390 turns tap</p> <p>1 at 28</p> <p>2 at 330</p> <p>3 at 360</p> <p>1530 tap at 765</p> <p>16½</p> <p>33½</p> <p>20 tap at 10</p> <p>10</p>	<p>4.0</p> <p>4.0</p> <p>163.0</p> <p>0.49</p> <p>0.95</p>			<p>All windings are 700 V test except the H.V. secondary which is 2300 V test.</p>
T3035		Not available at time of printing.							
T3036		Not available at time of printing.							
T3037		Not available at time of printing.							
T3038		Not available at time of printing.							
T3039		Not available at time of printing.							
T3135		Not available at time of printing.							
T3136		Not available at time of printing.							
T3137		Not available at time of printing.							

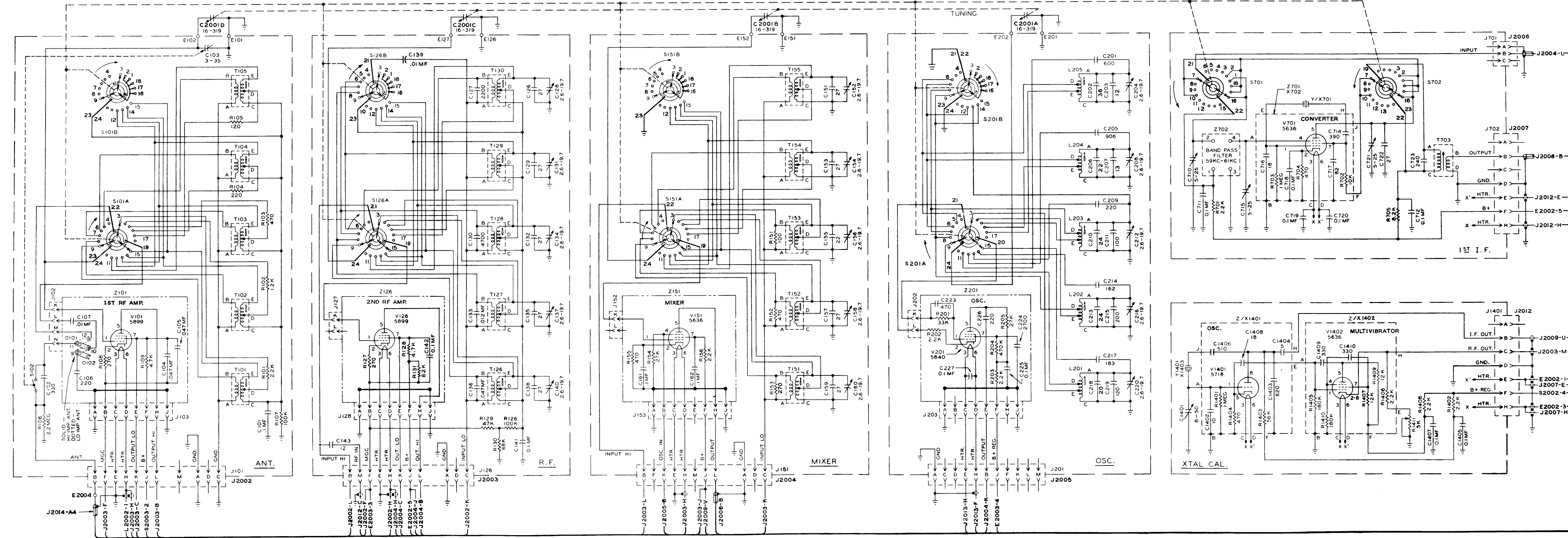
TABLE 7-12 (Continued)

SYMBOL DESIGNATION	R. C. A. PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
T3138		Not available at time of printing.							
T3139		Not available at time of printing.							

## NOTES:

- Note 1: Wind coil over 1 layer of tape, and make taps by raising a loop in the conductor.
- Note 2: Wind continuously without break or splice, extend all leads  $\frac{1}{2}$  inch beyond end of coil form, strip and tin  $\frac{5}{8}$  inch of lead ends. Apply cement to outside edges of the coils, keep ends of coil form free of cement.
- Note 3: Fasten finish of each winding with tape ( $\frac{1}{4}$  by  $\frac{3}{4}$ ) and moisten tape with acetone.
- Note 4: Fasten start and finish of each winding with tape ( $\frac{1}{4}$  by  $\frac{3}{4}$ ) and moisten tape with acetone.
- Note 5: Apply lacquer to outside edge of coil after winding.





- NOTES —
- SWITCHES SHOWN IN BAND 1.  
BAND 1 — 14 KC TO 30 KC  
BAND 2 — 30 KC TO 63 KC  
BAND 3 — 63 KC TO 133 KC  
BAND 4 — 133 KC TO 283 KC  
BAND 5 — 283 KC TO 600 KC  
RED DOT LOCATES TERMINAL 1. BLACK DOT LOCATES TERMINAL 9.
  - UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE GIVEN IN OHMS; ALL CAPACITANCE VALUES IN MMF.

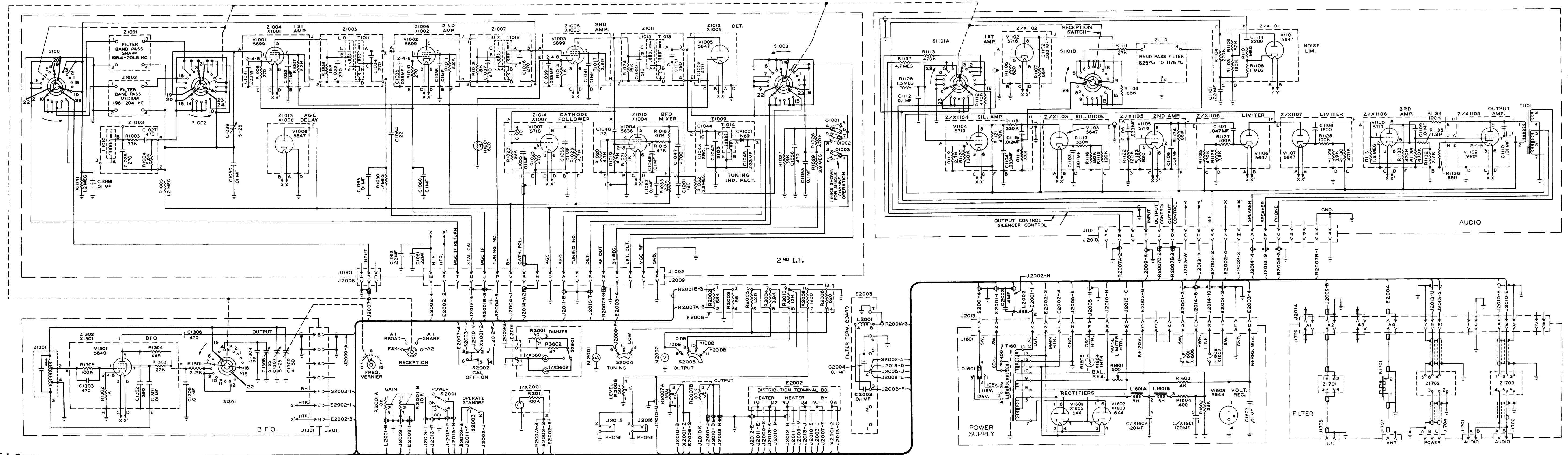
SEE SHEET 2

Figure 7-20. (Sheet 1) Schematic Diagram, AN/FRR-21

ORIGINAL

TRANSFORMER DATA FOR T1601

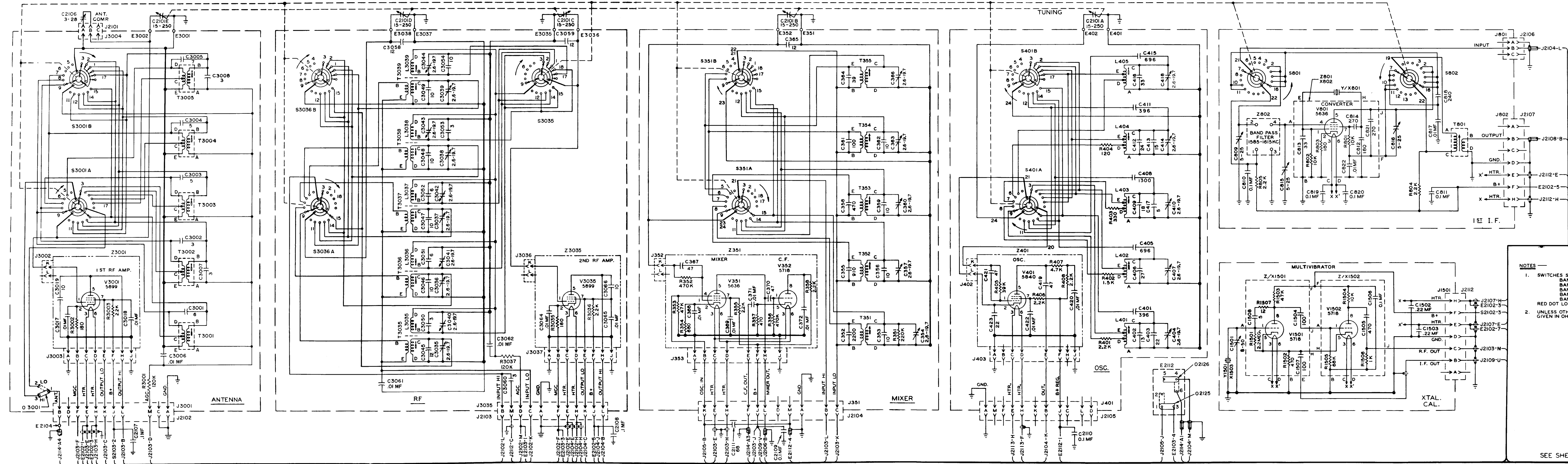
WINDING	TERMINALS	VOLTAGE 60 CPS	CURRENT AMPERES	RESISTANCE OHMS
Primary	1-2	105	0.37	
	1-3	115	0.405	
	1-4	125	0.44	284
Secondary	5-7	460	0.119	3870
	8-9	5.3	0.27	20
	10-12	14.4	0.15	96
	11-13	6.4	5	1.28
	12-14	6.4	0.9	7.15



- NOTES
- UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE GIVEN IN OHMS. ALL CAPACITANCE VALUES IN MMF.
  - ARROWS AT SWITCHES INDICATE DIRECTION OF ROTATION WHEN VIEWED FROM CONTROL END OF PRIMARY SUB-ASSEMBLY WITH FRONT PANEL CONTROL ROTATING CLOCKWISE.
  - ON SWITCHES S1001, S1002, S1003, S1101 & S1101 RED DOT LOCATES TERMINAL 1. BLACK DOT LOCATES TERMINAL 9.

SEE SHEET 1

Figure 7-20. (Sheet 2) Schematic Diagram, AN/FRR-21

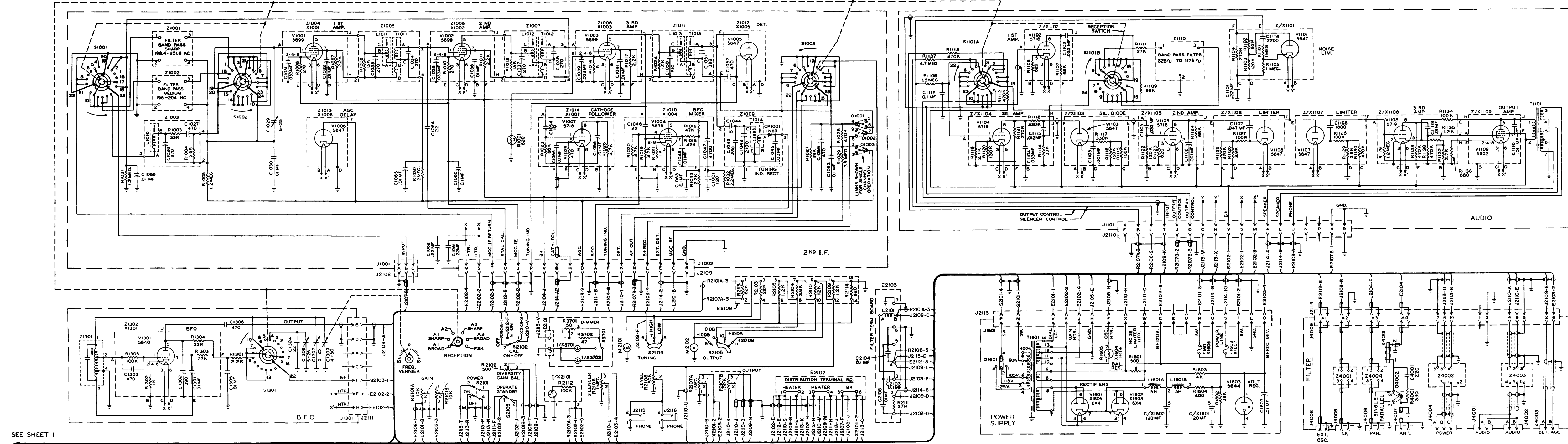


- NOTES —
- SWITCHES SHOWN IN BAND 1  
BAND 1 — 250 KC TO 500 KC  
BAND 2 — 500 KC TO 1 MC  
BAND 3 — 1 MC TO 2 MC  
BAND 4 — 2 MC TO 4 MC  
BAND 5 — 4 MC TO 8 MC
  - UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE GIVEN IN OHMS; ALL CAPACITANCE VALUES IN MMF.

SEE SHEET 2

TRANSFORMER DATA FOR T1601

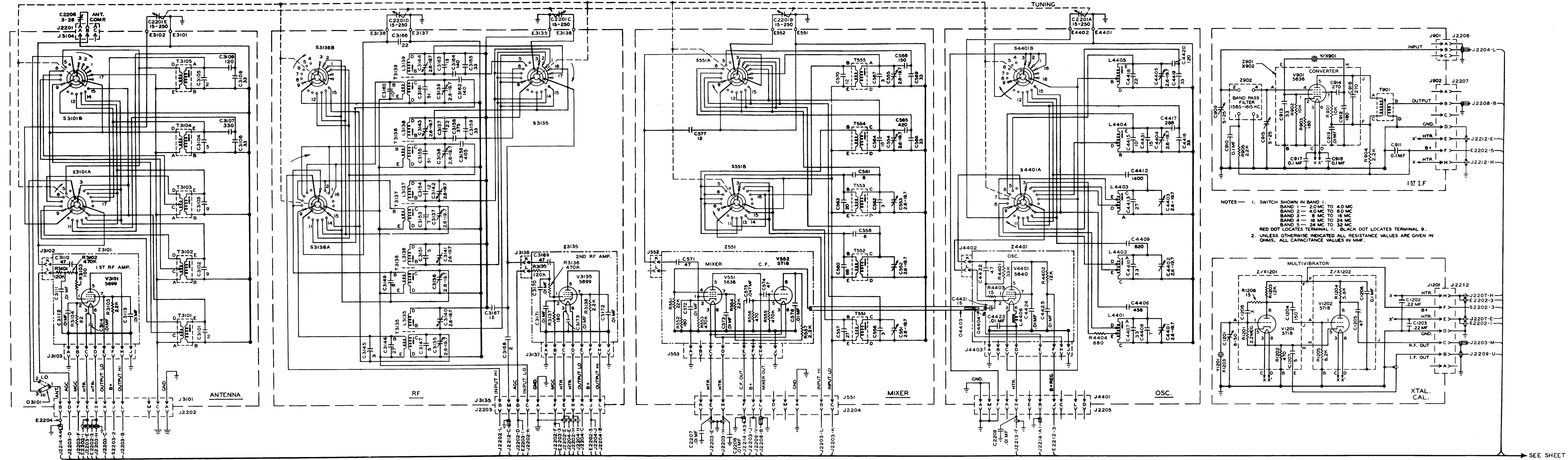
WINDING	TERMINALS	VOLTAGE 60 CPS	CURRENT AMPERES	RESISTANCE OHMS
Primary	1-2	105	0.37	284
	1-3	115	0.405	
	1-4	125	0.44	
Secondary	5-7	460	0.119	3870
	8-9	5.3	0.27	20
	10-12	14.4	0.15	96
	11-13	6.4	5	1.28
	12-14	6.4	0.9	7.15



- NOTES —
- UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE GIVEN IN OHMS. ALL CAPACITANCE VALUES IN MMF.
  - ARROWS AT SWITCHES INDICATE DIRECTION OF ROTATION WHEN VIEWED FROM CONTROL END OF PRIMARY SUB-ASSEMBLIES WITH FRONT PANEL CONTROL ROTATING CLOCKWISE
  - WHEN SWITCHING FROM A3 BROAD TO FSK ON THE 3 SEGMENT SWITCHES. THE SWITCH ARM WILL MOVE FROM ONE COMMON SWITCH SEGMENT TO THE FOLLOWING ONE AS SHOWN
- 
- RED DOT LOCATES TERMINAL I. BLACK DOT LOCATES TERMINAL 9.

SEE SHEET 1

Figure 7-21. (Sheet 2) Schematic Diagram, AN/FRR-22



NOTES — 1. SWITCH SHOWN IN BAND 1.  
 BAND 1 — 2.0 MC TO 4.0 MC  
 BAND 2 — 4.0 MC TO 6.0 MC  
 BAND 3 — 8 MC TO 16 MC  
 BAND 4 — 16 MC TO 24 MC  
 BAND 5 — 24 MC TO 32 MC

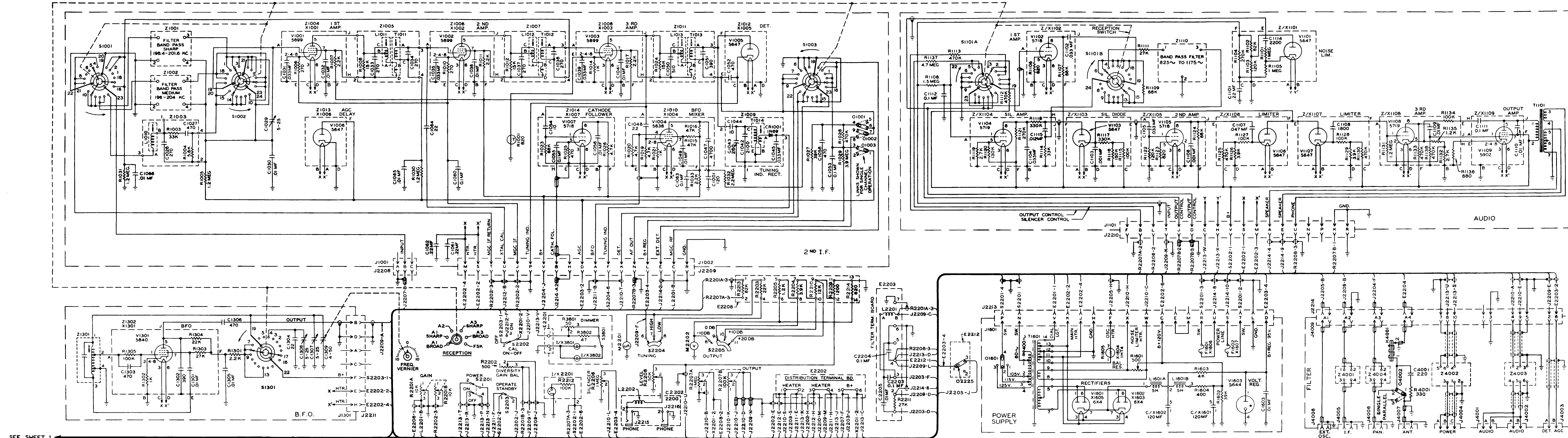
RED DOT LOCATES TERMINAL 1. BLACK DOT LOCATES TERMINAL 9.

2. UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE GIVEN IN OHMS, ALL CAPACITANCE VALUES IN MMF.

Figure 7-22. (Sheet 1) Schematic Diagram, AN/FRR-23

TRANSFORMER DATA FOR T1601

WINDING	TERMINALS	VOLTAGE 60 CPS	CURRENT AMPERES	RESISTANCE OHMS
Primary	1-2	105	0.37	284
	1-3	115	0.405	
	1-4	125	0.44	
Secondary	5-7	460	0.119	3870
	8-9	5.3	0.27	20
	10-12	14.4	0.15	96
	11-13	6.4	5	1.28
	12-14	6.4	0.9	7.15



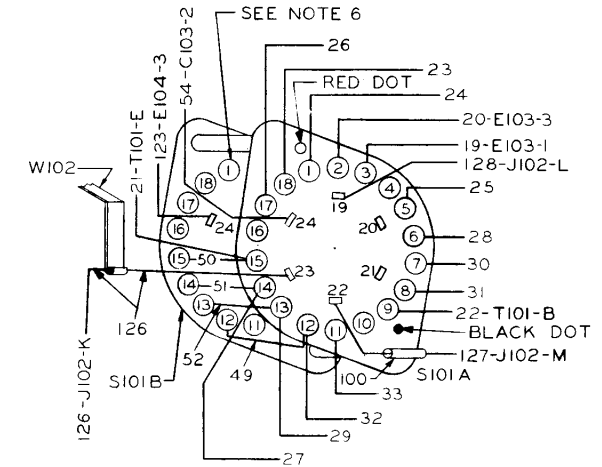
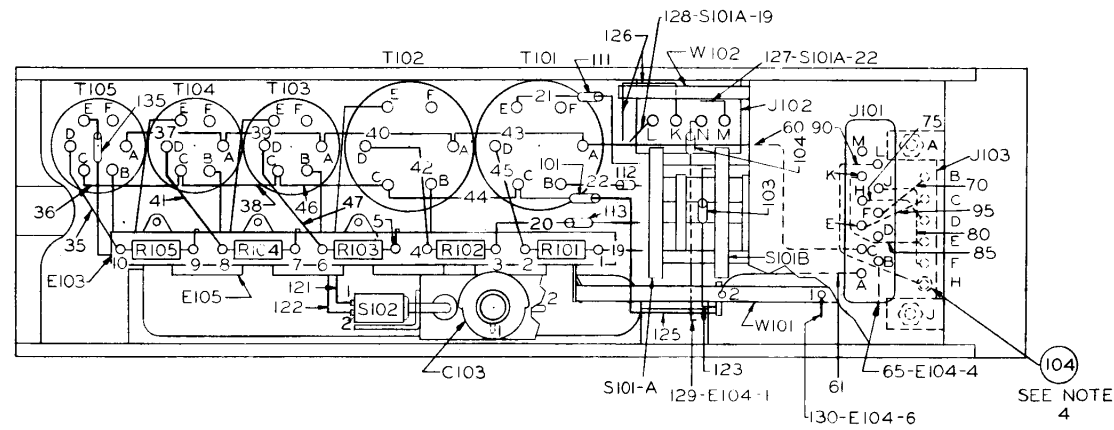
NOTES —

- UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE GIVEN IN OHMS. ALL CAPACITANCE VALUES IN MMF.
- ARROWS AT SWITCHES INDICATE DIRECTION OF ROTATION WHEN VIEWED FROM CONTROL END OF PRIMARY SUB-ASSEMBLIES WITH FRONT PANEL CONTROL ROTATING CLOCKWISE.
- WHEN SWITCHING FROM A3 BROAD TO FSK ON THE 3 SEGMENT SWITCHES, THE SWITCH ARM WILL MOVE FROM ONE COMMON SWITCH SEGMENT TO THE FOLLOWING ONE AS SHOWN.

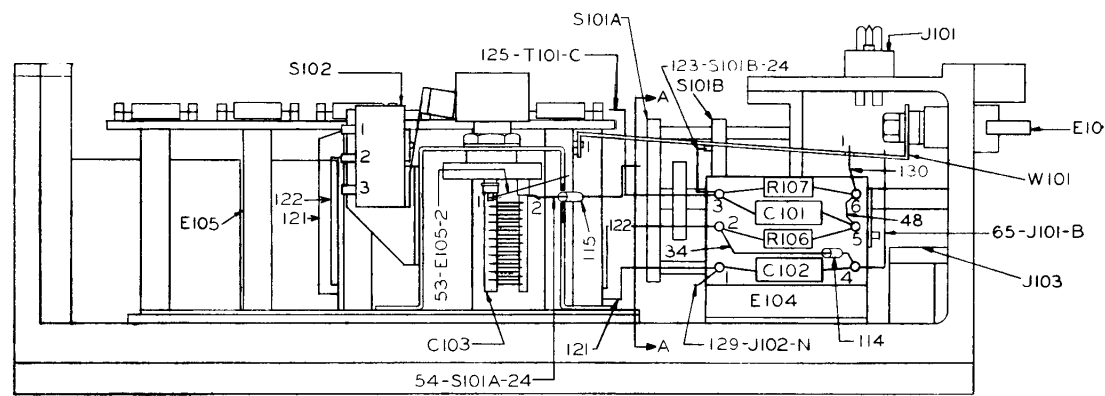
RED DOT LOCATES TERMINAL 1. BLACK DOT LOCATES TERMINAL 9.

SEE SHEET 1

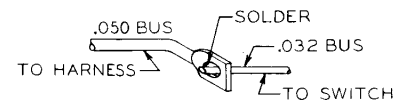
Figure 7-22. (Sheet 2) Schematic Diagram, AN/FRR-23



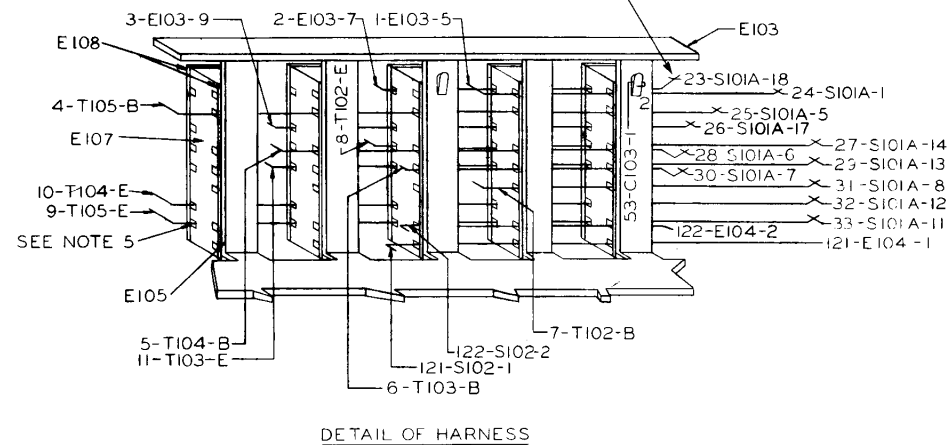
VIEW AT "A-A"  
USE IN CONJUNCTION  
WITH DETAIL OF HARNESS



WIRE NO.	DESCRIPTION
1-11	INCL WIRE TINNED COPPER .050 DIA.
19-54	INCL TINNED COPPER .032 DIA.
60-61	BLACK
65	GREEN
70	YELLOW
75	BROWN
80	RED
85	RED-BLACK TR.
90	BLUE
95	WIRE BROWN-BLACK TR.
100-104	INCL SLEEVING .042 I.D.
111-115	INCL SLEEVING .034 I.D.
121-130	INCL WIRE TINNED COPPER .040 DIA.
135	SLEEVING .053 I.D.



DETAIL OF CONNECTIONS

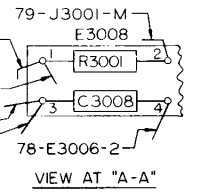
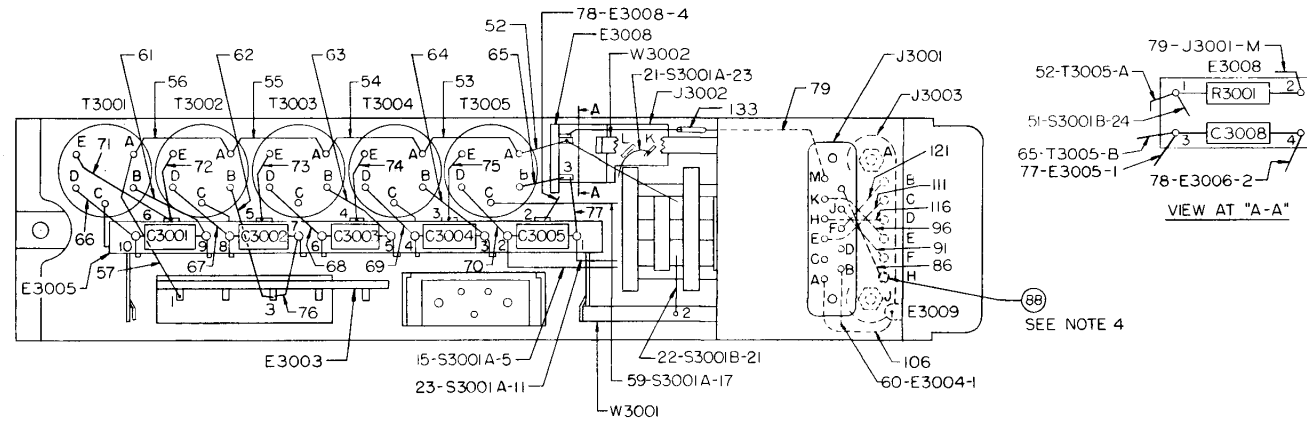


DETAIL OF HARNESS

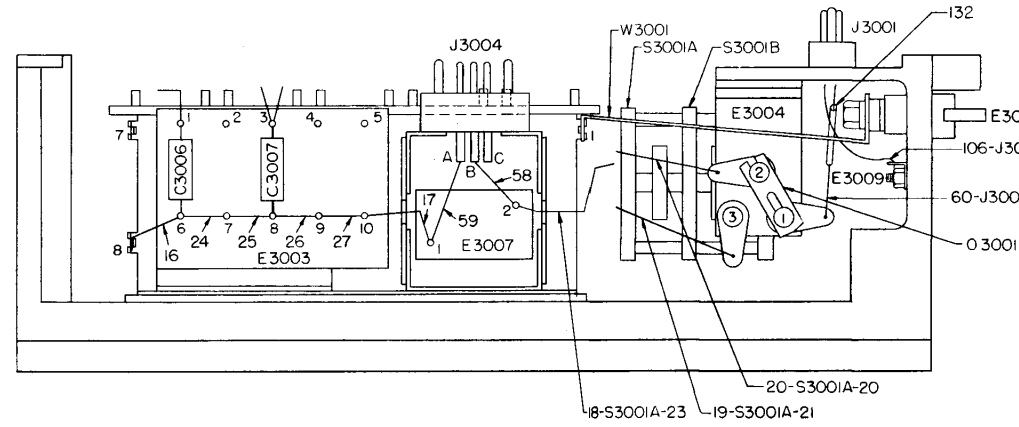
NOTES

- 2 NUMBERS IN WIRES REFER TO WIRE TABLE, CODING AT ENDS OF WIRES INDICATE WIRE NUMBERS AND DESTINATION OF WIRES. THUS: 3-E103-9, 3=WIRE NO., E103=TERMINAL BOARD E103, 9=TERMINAL 9 OF E103 AS INDICATED ON THIS DRAWING.
- 3 CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
- 4 ASSEMBLE ITEM 104 SLEEVING OVER ENDS OF WIRES & TERMINALS AT J103.
- 5 SECURE WIRES IN E107
- 6 BEND TERMINALS OF S101B WHICH INTERFERE WITH E104.

Figure 7-23. Antenna Box, Connection Diagram, AN/FRR-21



WIRE NO. INCL.	DESCRIPTION
1 TO 13	WIRE, TINNED COPPER .050 DIA.
15 TO 27	↑ ↑ ↑ .040 ↓
31 TO 79	↑ ↑ ↑ .032 ↓
81 TO 84	TINNED COPPER .020 DIA.
86	BLUE
91	RED
96	PUR.
106	BLK.
111	BRN.
116	↑ BRN.-BLK. TR. ↓
121	WIRE, YEL.
126 TO 129	SLEEVING .022 I.D.
131 TO 134	SLEEVING .034 I.D.



- NOTES —
- NOS. IN WIRES REFER TO WIRE TABLE, CODING AT ENDS OF WIRES INDICATE WIRE NO. & DESTINATION OF WIRE THUS - 106-J3001-A, 106 = WIRE NO., J3001 = ITEM J3001, A = TERMINAL A OF J3001 AS INDICATED ON THIS DRAWING.
  - CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
  - ASSEMBLE ITEM 88 SLEEVING OVER ENDS OF WIRES & TERMINALS AT J3003.
  - SECURE WIRES IN E3006

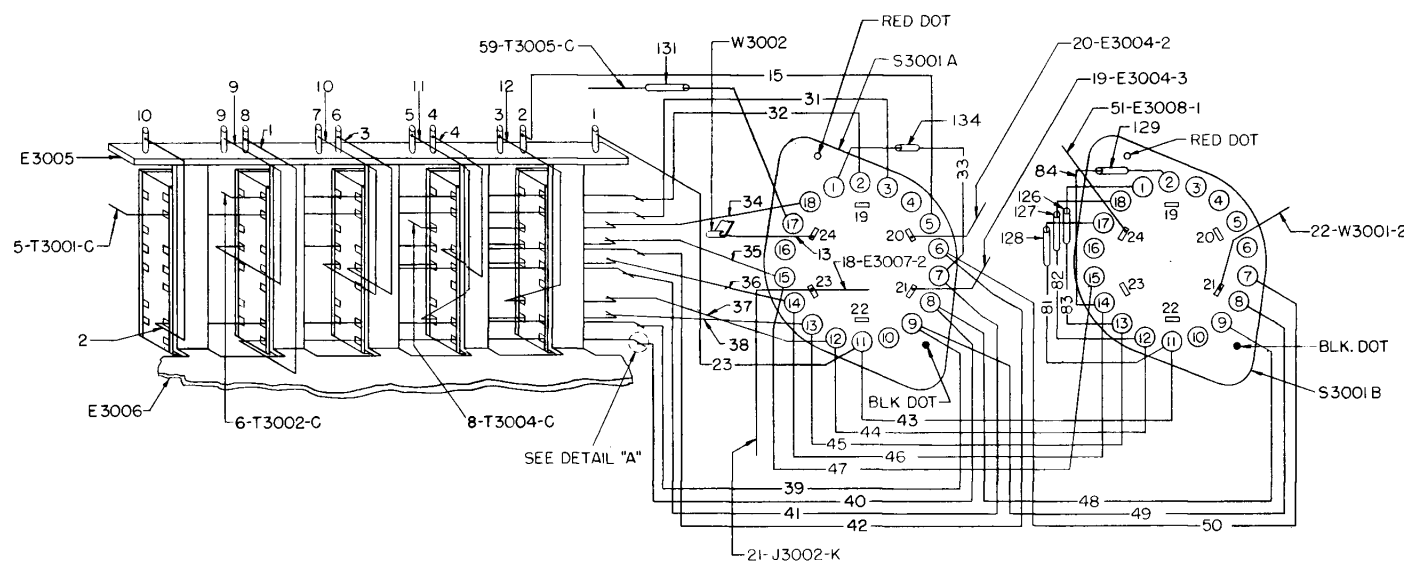
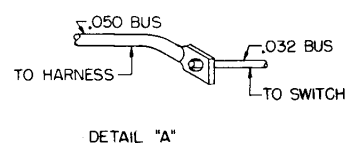


Figure 7-24. Antenna Box, Connection Diagram, AN/FRR-22



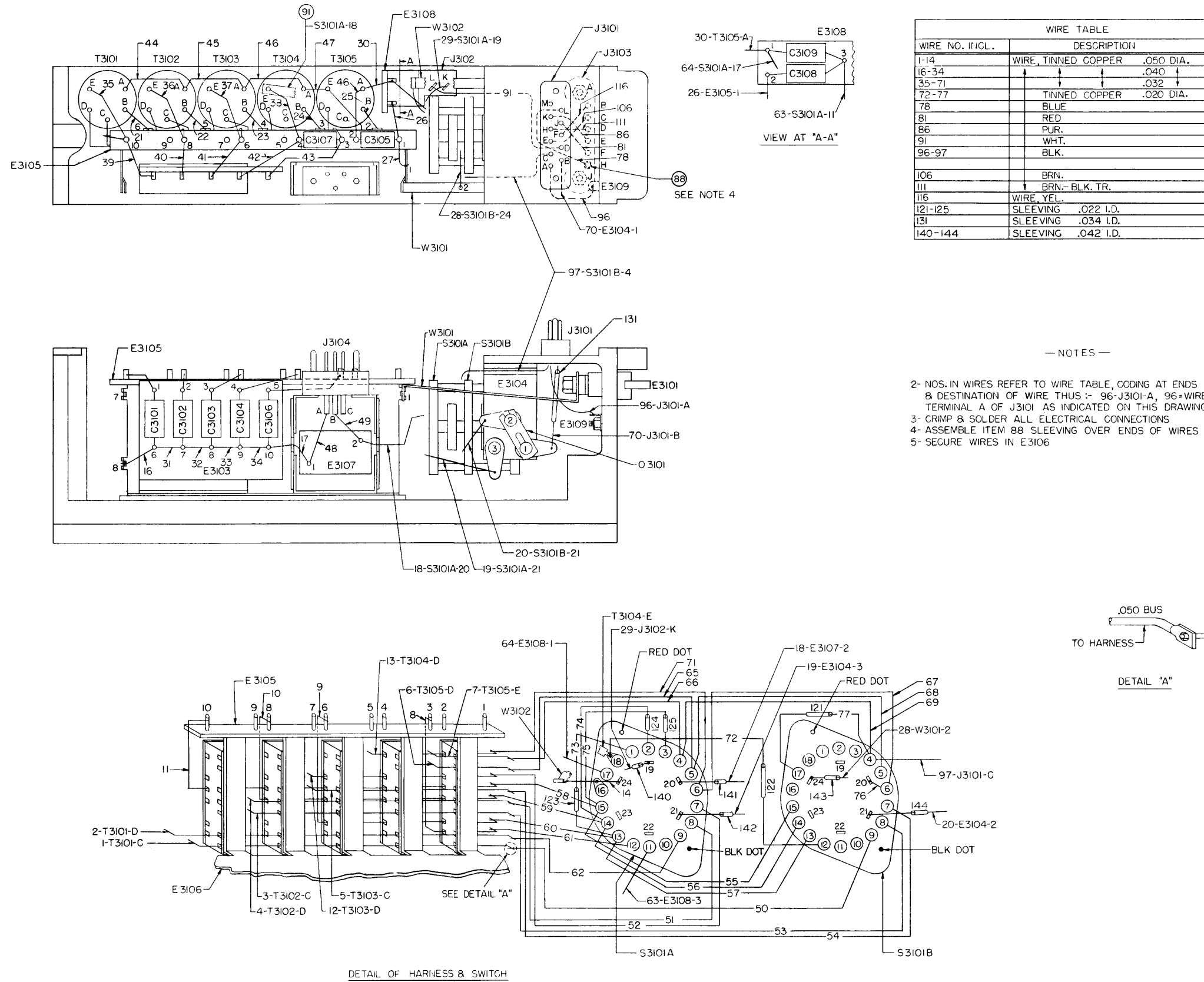
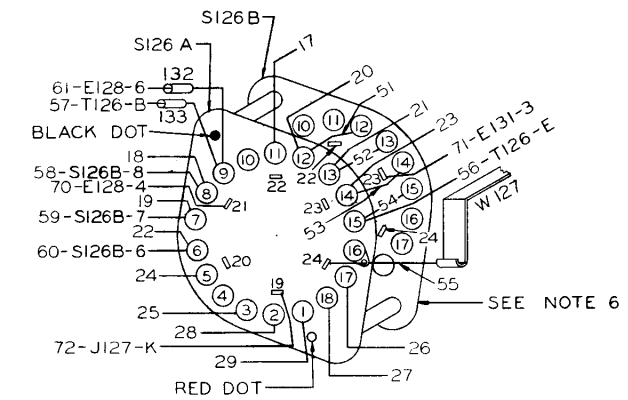
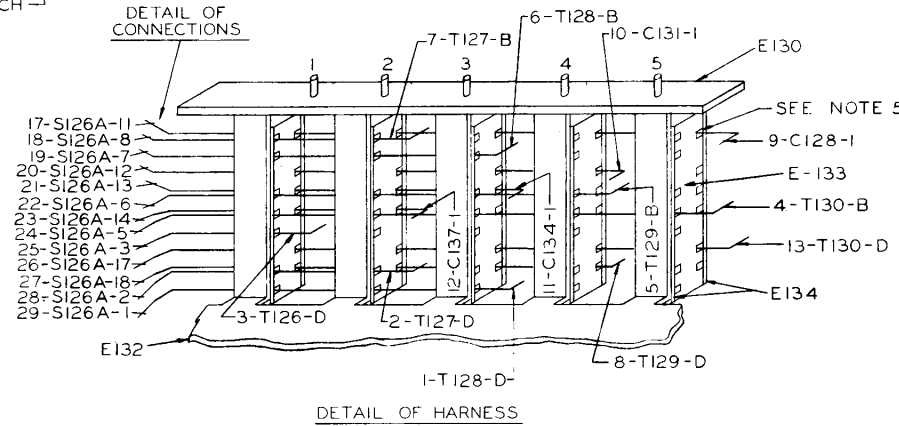
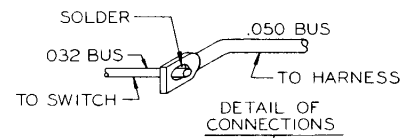
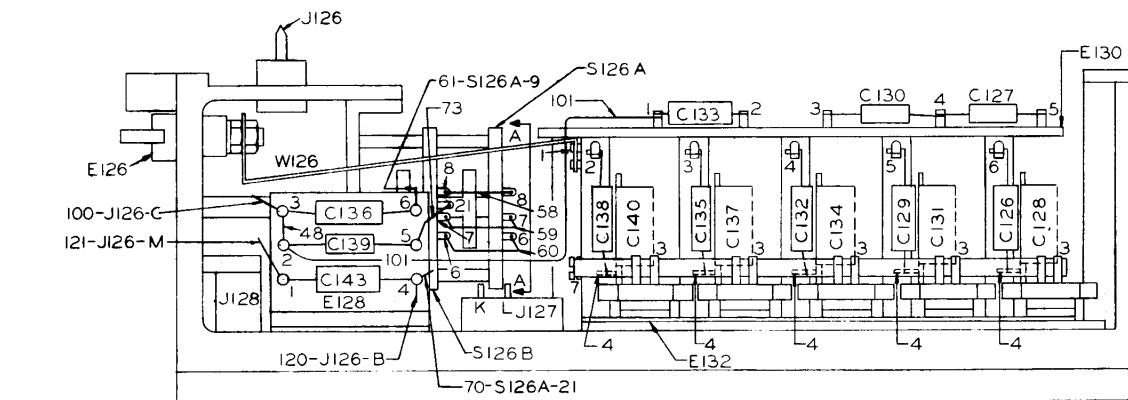
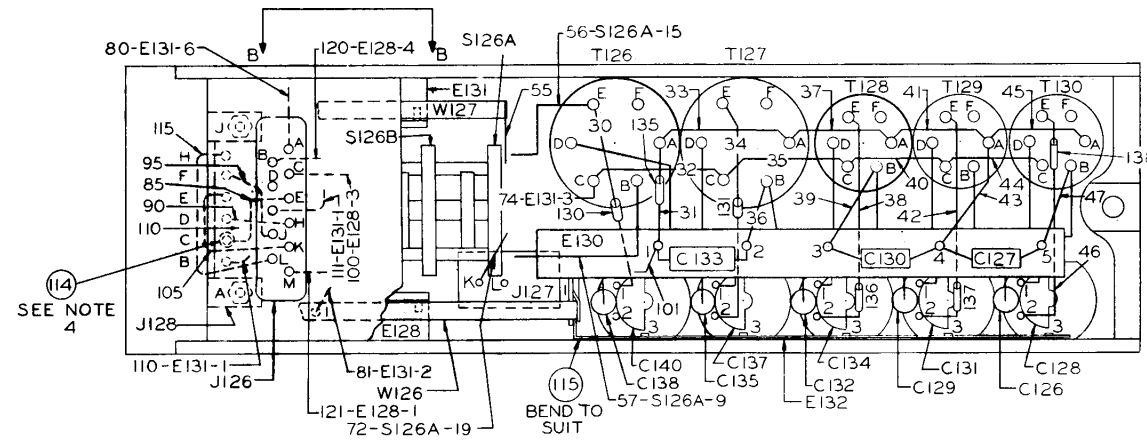
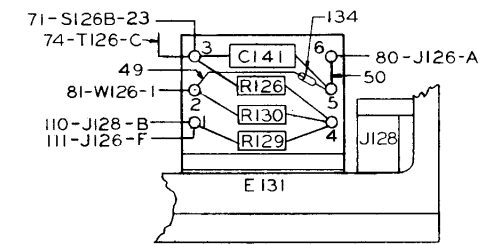


Figure 7-25. Antenna Box, Connection Diagram, AN/FRR-23



VIEW AT "A-A"  
USE IN CONJUNCTION WITH  
DETAIL OF HARNESS

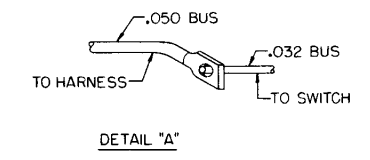
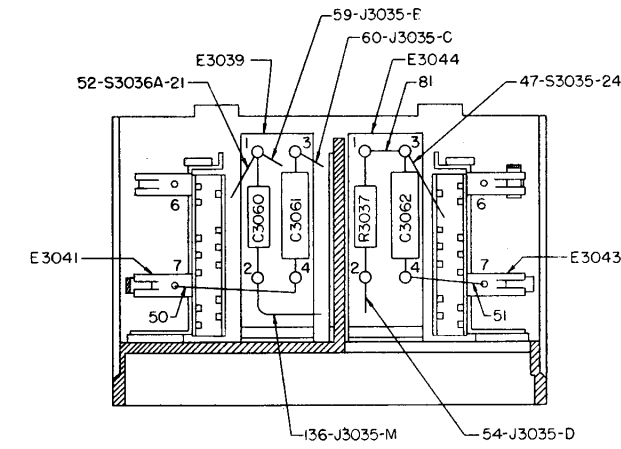
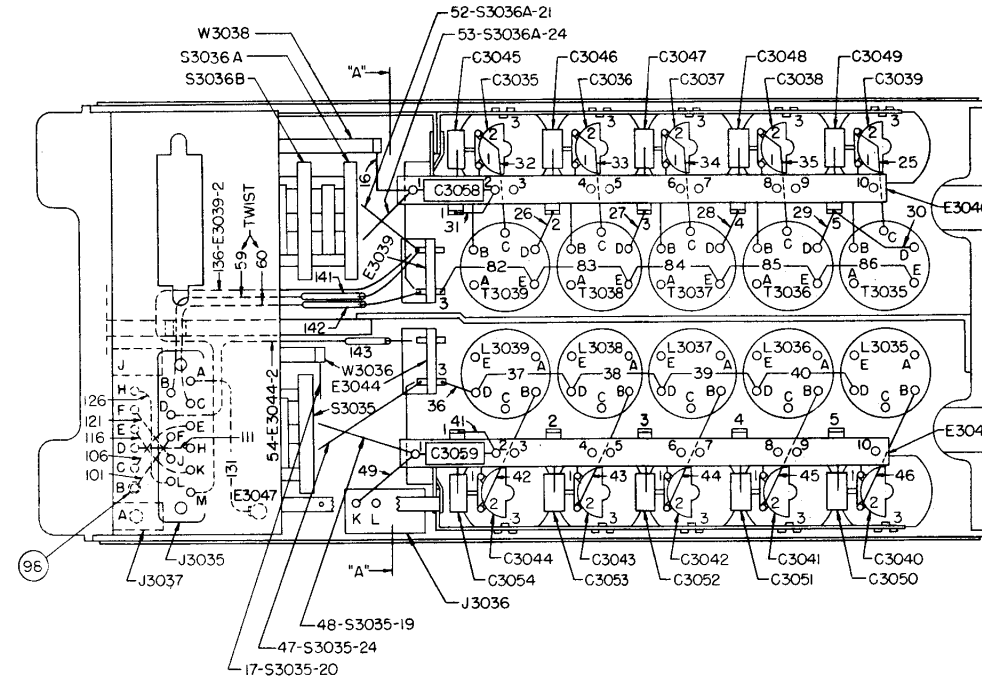


VIEW AT "B-B"  
ROTATED 180°

WIRE TABLE	
WIRE NO.	DESCRIPTION
1-13 INCL	WIRE TINNED COPPER .050 DIA.
17-61 INCL	TINNED COPPER .032 DIA.
70-74 INCL	TINNED COPPER .040 DIA.
80-81	BLACK
85	BROWN-BLACK TR.
90	BROWN
95	RED
100-101	RED-BLACK TR.
105	RED-BROWN TR.
110-111	YELLOW
115	BLUE
120-121	WIRE GREEN
130-138 INCL	SLEEVING .034 I.D.

NOTES

- NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATE WIRE NUMBERS AND DESTINATION OF WIRES. THUS: 74-T126-C, 74= WIRE NO., T126= TRANSFORMER T126, C= TERMINAL C OF T126 AS INDICATED ON THIS DRAWING.
- CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
- ASSEMBLE ITEM 114 SLEEVING OVER ENDS OF WIRES & TERMINALS AT J128.
- SECURE WIRES IN E133
- BEND TERMINALS OF SI26B THAT INTERFERE WITH E128 & E131.



WIRE TABLE	
WIRE NO.	DESCRIPTION
1-17 INCL.	WIRE, TINNED COPPER .050 DIA.
25-55 INCL.	WIRE, TINNED COPPER .040 DIA.
59-86 INCL.	WIRE, TINNED COPPER .032 DIA.
91-97 INCL.	TINNED COPPER .020 DIA.
101	YEL.
106	BRN.
111	BRN.-BLK. TR.
116	BLUE-RED TR.
121	RED
126	BLUE
131	BLK.
136	WIRE, RED-BRN. TR.
141-144 INCL.	SLEEVING .042 I.D.
151	SLEEVING .034 I.D.
161-167 INCL.	SLEEVING .022 I.D.

NOTES

- 2- NOS. IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATE WIRE NO.
- 3- DESTINATION OF WIRE THUS: 9-C3038-1, 9-WIRE NO., C3038-ITEM C3038, 1-TERMINAL 1 OF C3038 AS INDICATED ON THIS DRAWING.
- 4- CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS.
- 5- ASSEMBLE ITEM 98 SLEEVING OVER ENDS OF WIRES & TERMINALS AT J3035.
- 6- SECURE WIRES IN E3049

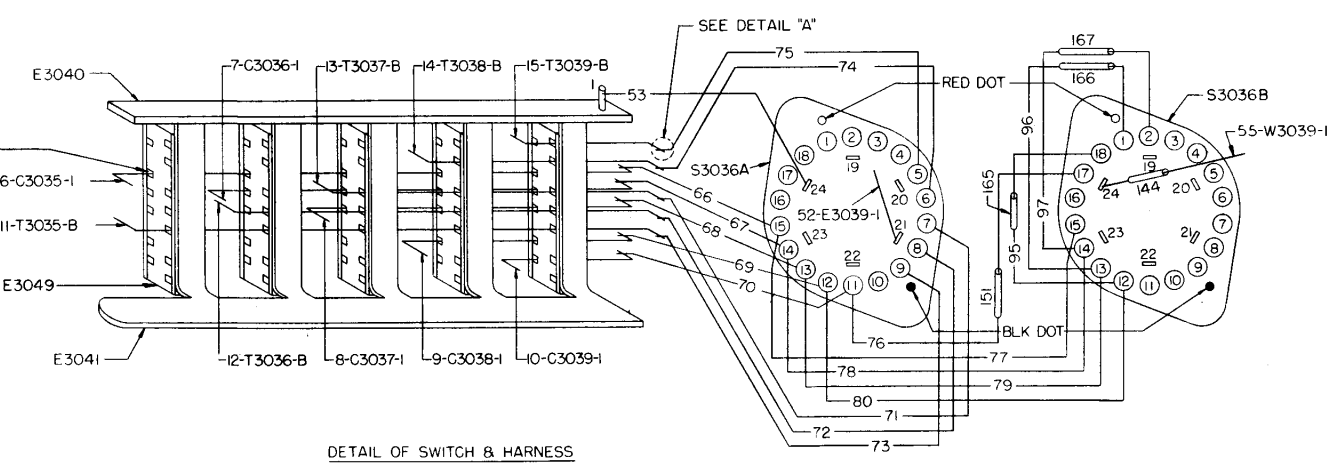
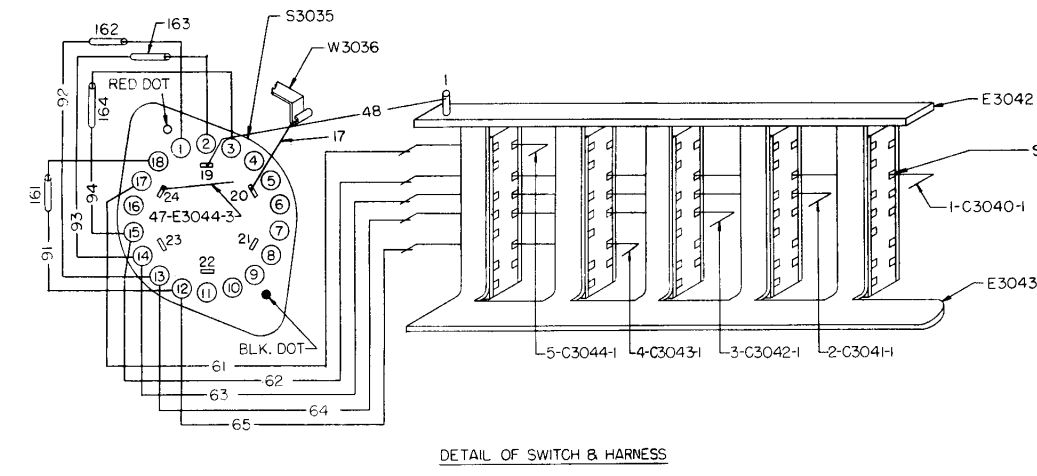
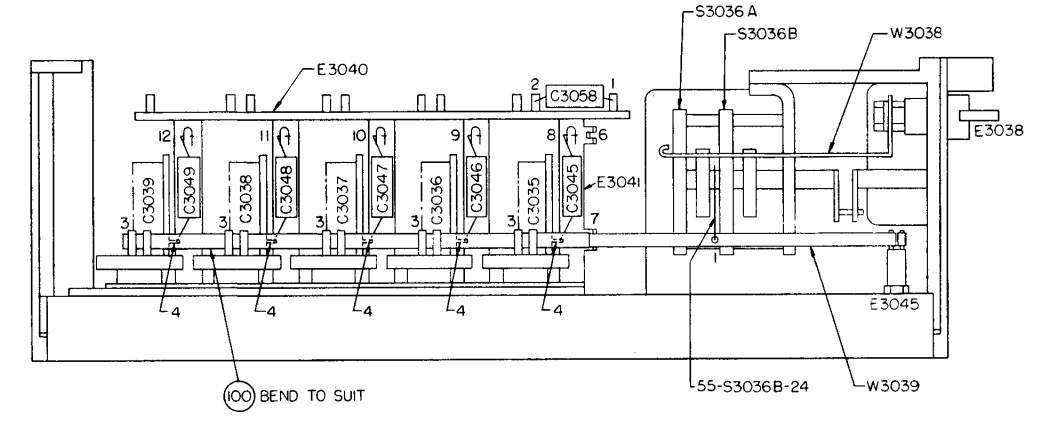
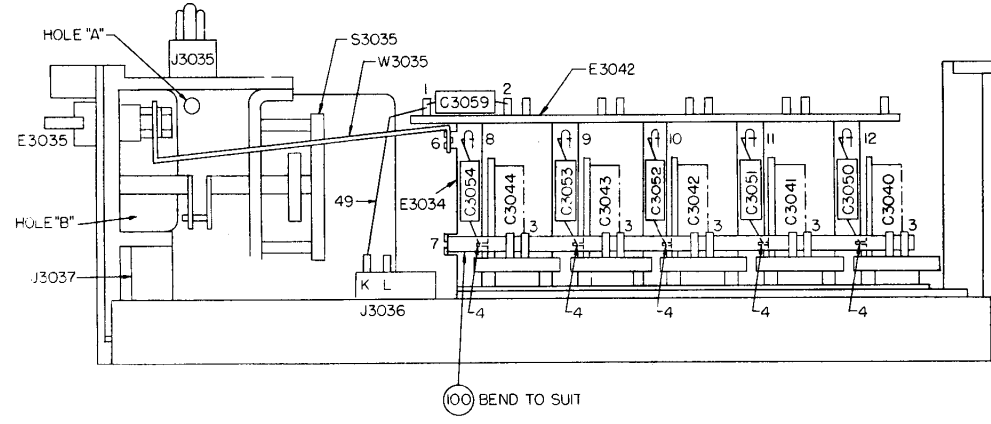
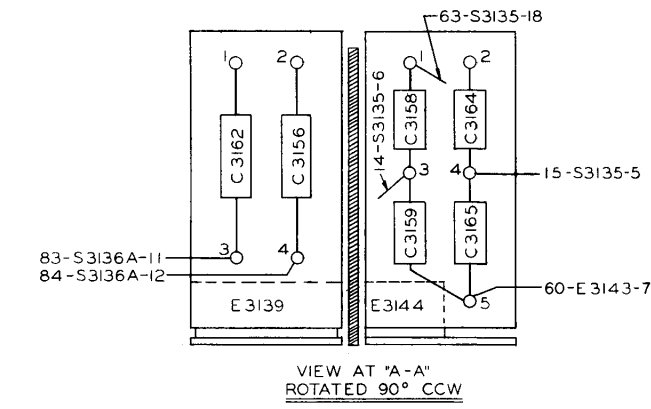
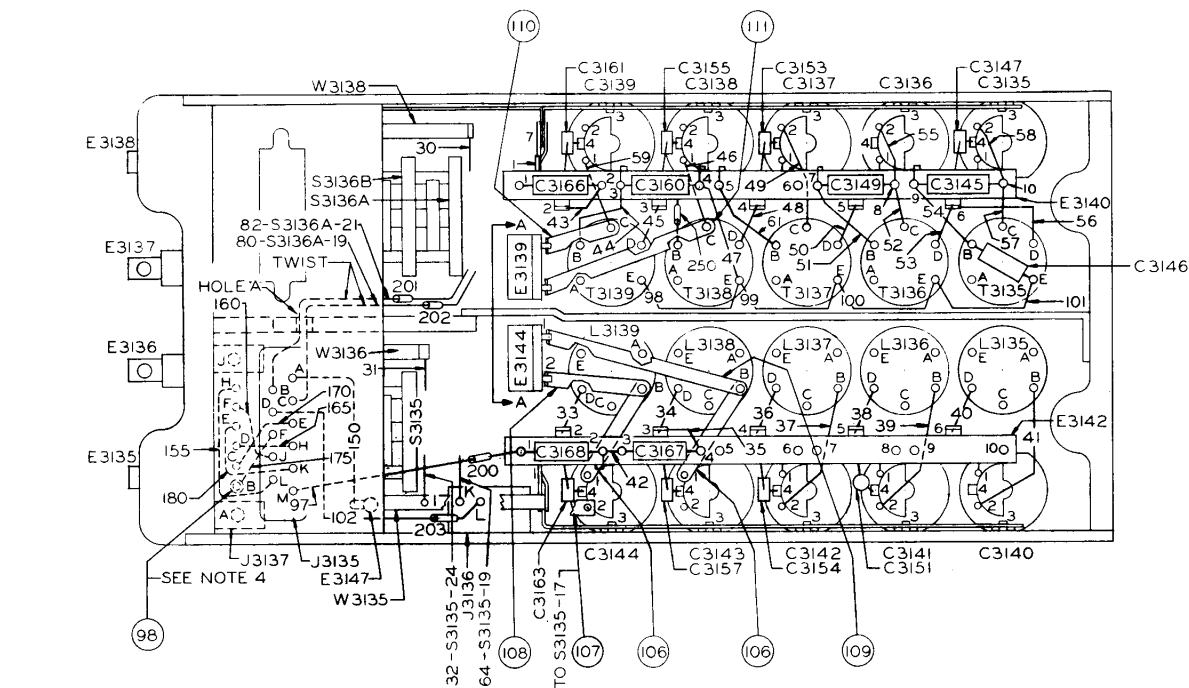


Figure 7-27. R-F Amplifier, Connection Diagram, AN/FRR-22



WIRE NO.	DESCRIPTION
1-15	INCL. WIRE TINNED COPPER .050 DIA.
30-65	INCL. TINNED COPPER .040 DIA.
80-106	INCL. TINNED COPPER .032 DIA.
120-133	INCL. TINNED COPPER .020 DIA.
150	BLACK
155	BLUE
160	RED
165	BROWN
170	BROWN-BLACK TR.
175	YELLOW
180	WIRE RED-BROWN TR.
200-203	INCL. SLEEVING .034 I.D.
220-233	INCL. SLEEVING .022 I.D.
240-243	INCL. SLEEVING .042 I.D.
250-251	SLEEVING .053 I.D.

NOTES

- NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATE WIRE NO. & DESTINATION OF WIRE THUS: 10-T3137-B  
10=WIRE NO T3137= TRANSFORMER T3137, B=TERMINAL B OF T3137 AS INDICATED ON THIS DRAWING.
- CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS USING ITEM 99 SOLDER
- ASSEMBLE ITEM 98 SLEEVING OVER ENDS OF WIRES & TERMINALS AT J3135.
- SECURE WIRES IN E3149 USING ITEM 81 CEMENT

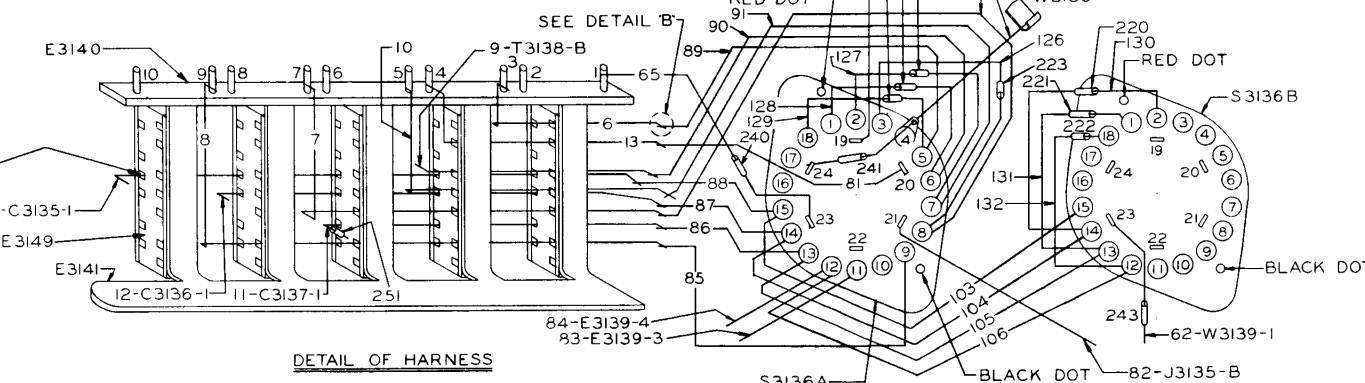
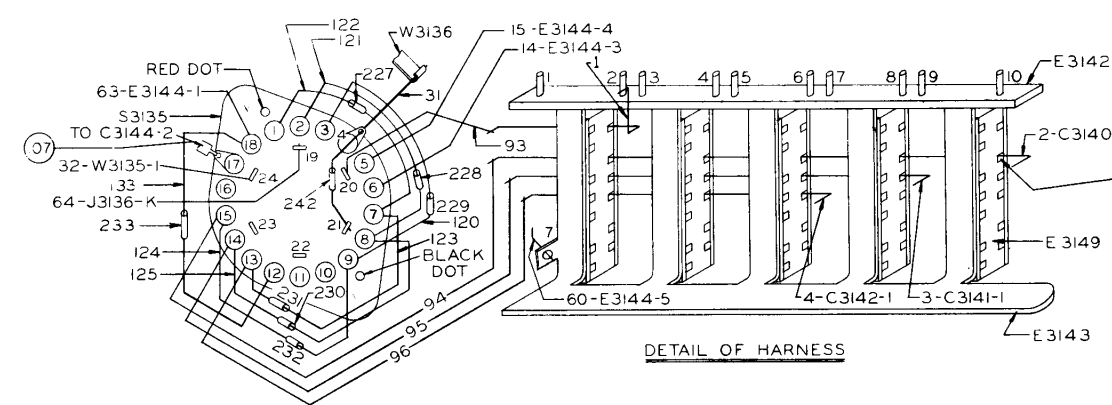
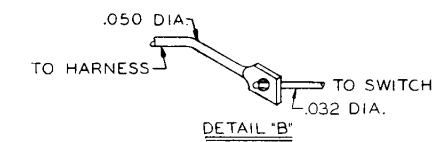
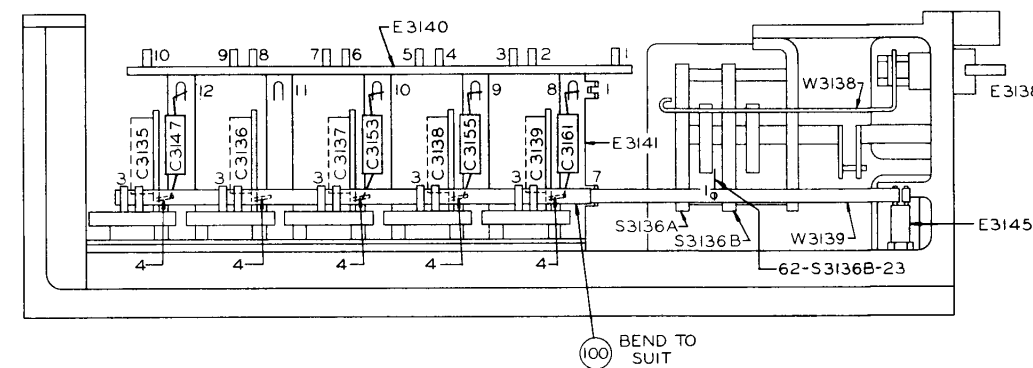
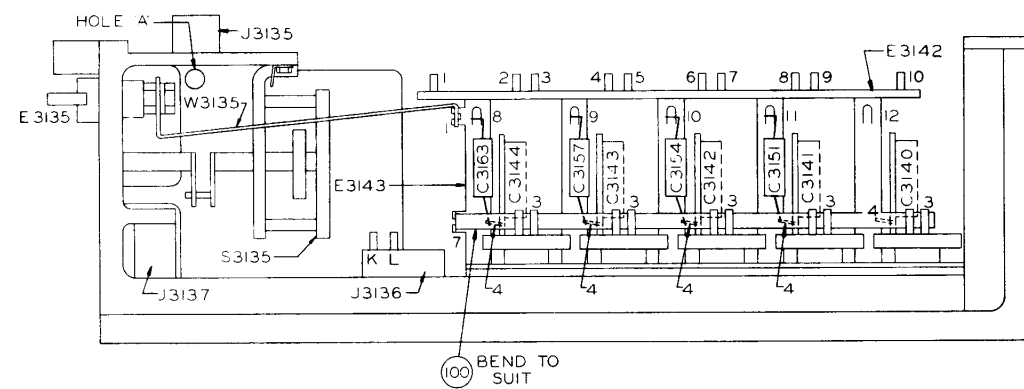
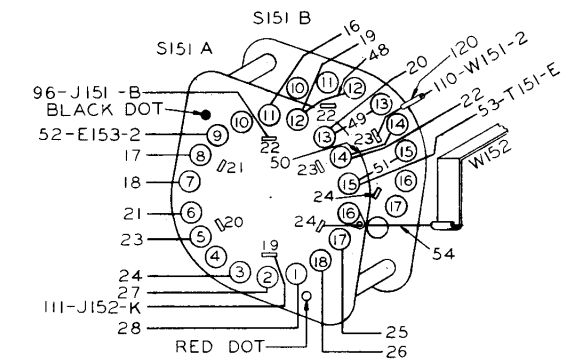
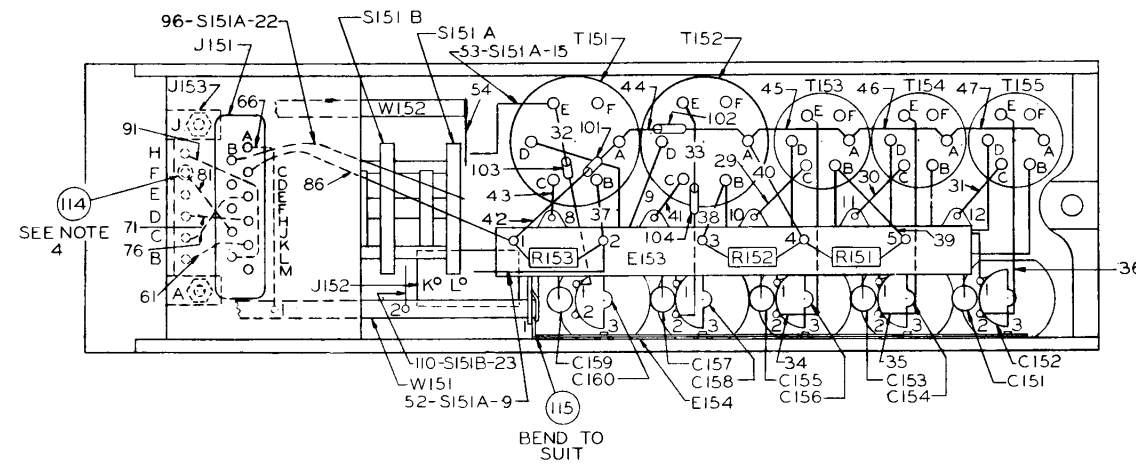
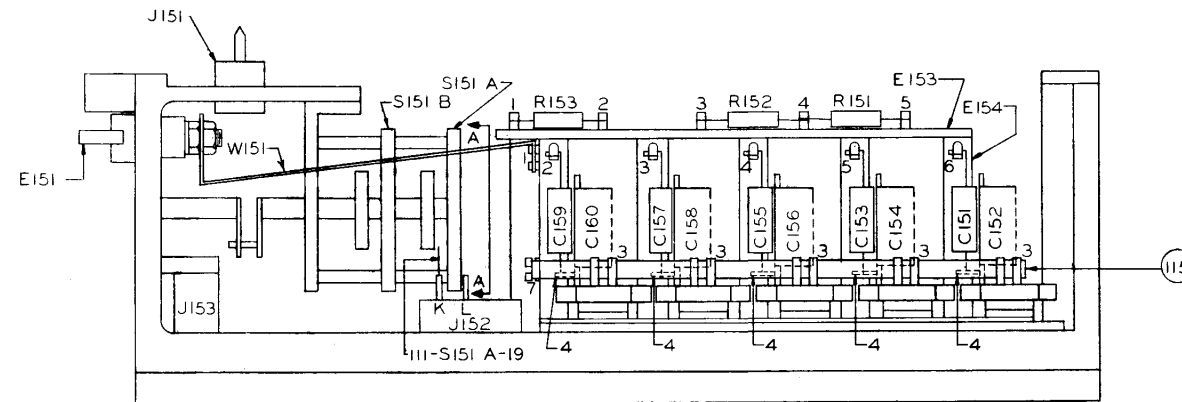


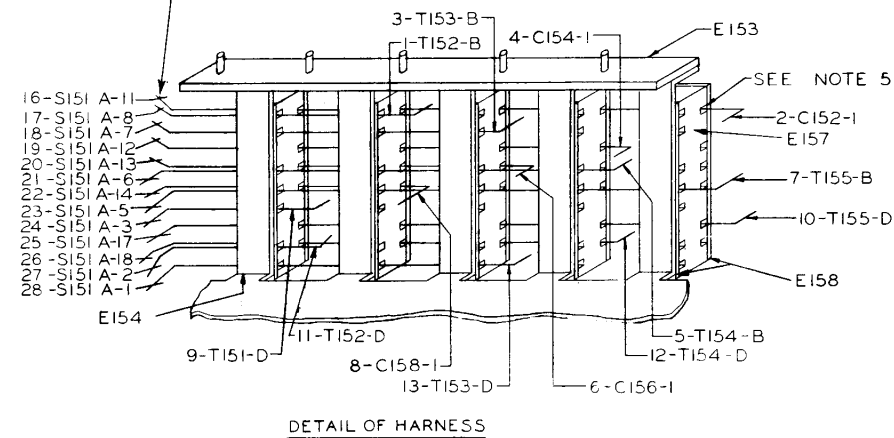
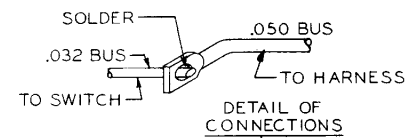
Figure 7-28. R-F Amplifier, Connection Diagram, AN/FRR-23



VIEW AT 'A-A'  
USE IN CONJUNCTION WITH  
DETAIL OF HARNESS.



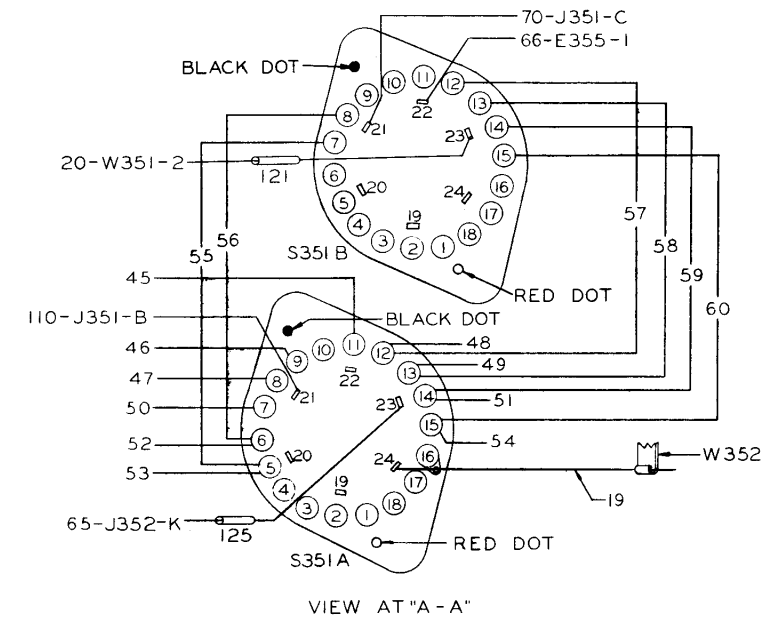
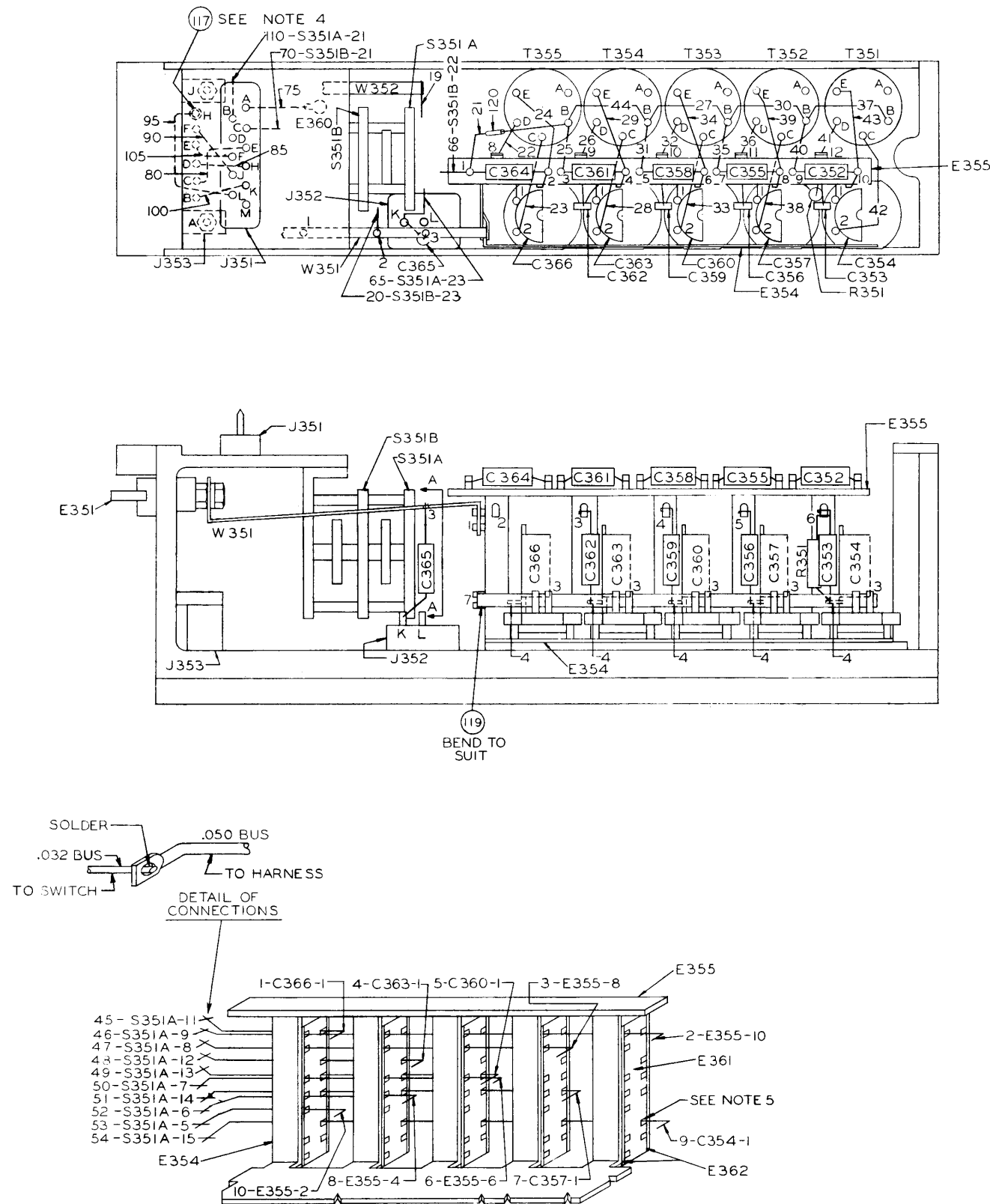
WIRE TABLE	
WIRE NO	DESCRIPTION
1-13 INCL.	WIRE TINNED COPPER .050 DIA.
16-54 INCL.	TINNED COPPER .032 DIA.
61-	PURPLE
66-	BLACK
71	BROWN
76	BROWN-BLACK TR.
81	RED
86	RED-BLACK TR.
91	BLUE-BLACK TR.
96	WIRE BLUE
101-104 INCL.	SLEEVING .034 I.D.
110-111	WIRE TINNED COPPER .040 DIA.
120	SLEEVING .042 I.D.



NOTES

- NUMBERS IN WIRES REFER TO WIRE TABLE, CODING AT ENDS OF WIRES INDICATE WIRE NUMBERS AND DESTINATION OF WIRES THUS: 13-T153-D 13=WIRE NO, T153=TRANSFORMER T153, D= TERMINAL D OF TRANSFORMER T153 AS INDICATED ON THIS DRAWING.
- CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
- ASSEMBLE ITEM 114 SLEEVING OVER ENDS OF WIRES & TERMINALS AT J153.
- SECURE WIRES IN E157

Figure 7-29. Mixer, Connection Diagram, AN/FRR-21



WIRE TABLE	
WIRE NO.	DESCRIPTION
1-10 INCL	WIRE TINNED COPPER .050 DIA.
19-60 INCL	WIRE TINNED COPPER .032 DIA.
65-66	WIRE TINNED COPPER .040 DIA.
70	RED-BLACK TR.
75	BLACK
80	BROWN
85	BROWN-BLACK TR.
90	RED
95	YELLOW
100	PURPLE
105	BLUE
110	WIRE BLUE-RED TR.
120-121	SLEEVING .034 I.D.
125	SLEEVING .042 I.D.

NOTES:

- NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATE WIRE NUMBERS AND DESTINATION OF WIRES THUS: 65-J352-K, 65=WIRE NO., J352=CONNECTOR J352, K=TERMINAL K OF J352 AS INDICATED ON THIS DRAWING.
- CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
- ASSEMBLE ITEM 117 SLEEVING OVER ENDS OF WIRES & TERMINALS AT J353.
- SECURE WIRES IN E361

Figure 7-30. Mixer, Connection Diagram, AN/FRR-22

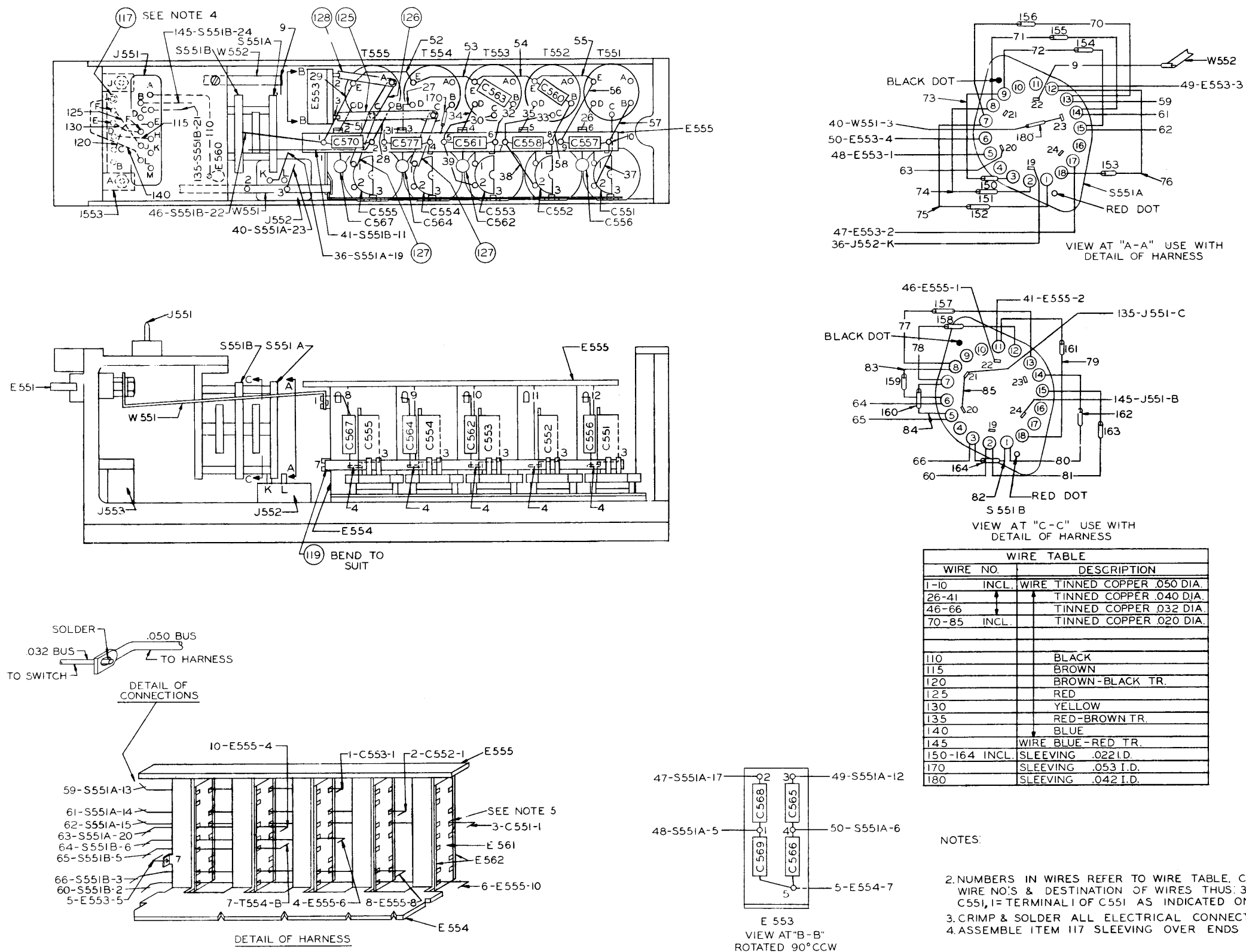
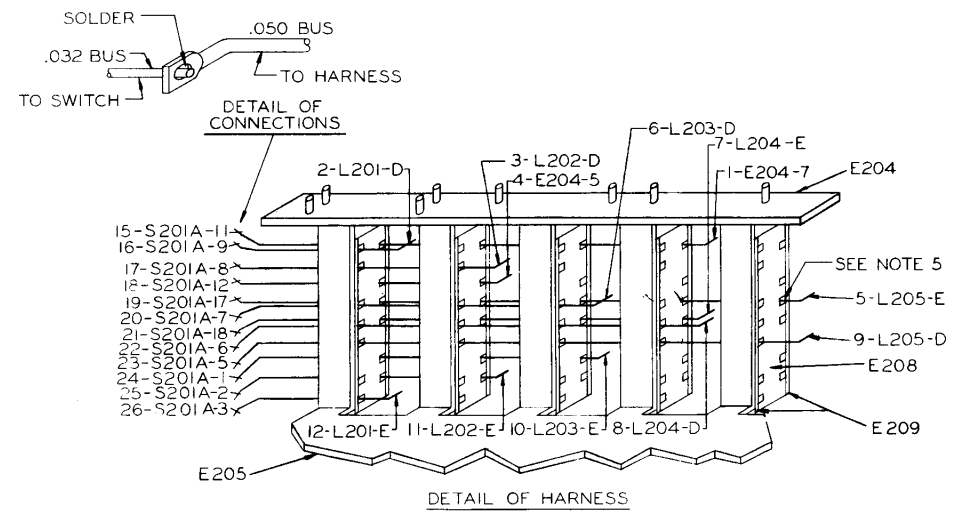
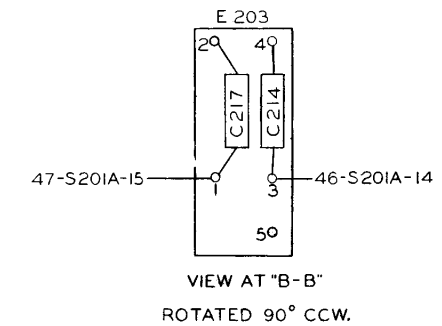
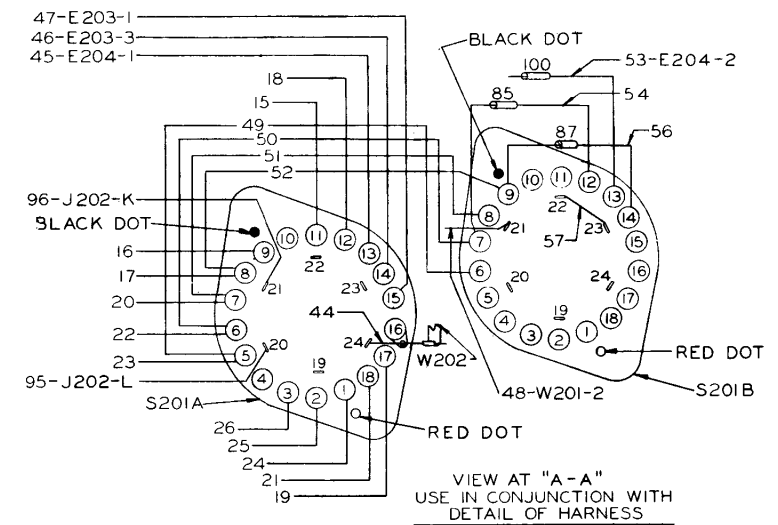
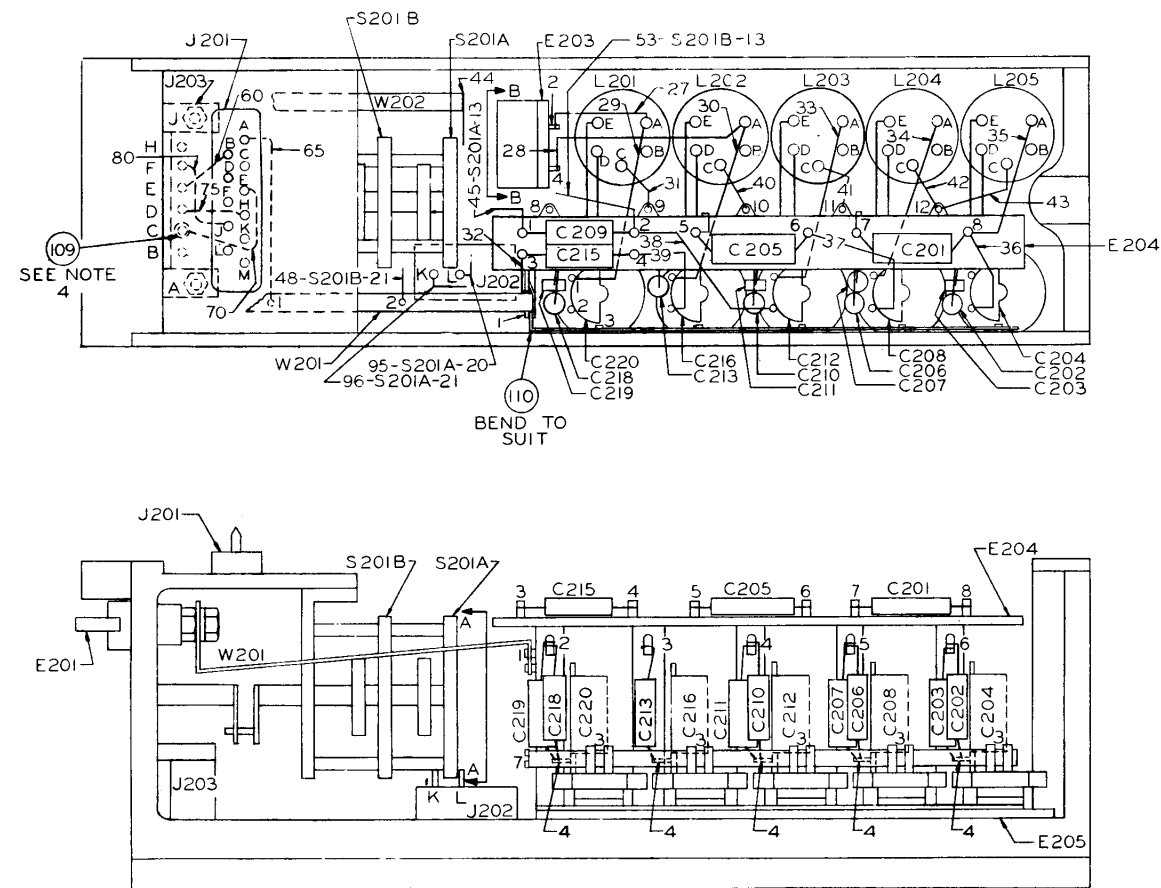


Figure 7-31. Mixer, Connection Diagram, AN/FRR-23



WIRE TABLE	
WIRE NO.	DESCRIPTION
1-12 INCL.	WIRE TINNED COPPER .050 DIA.
15-53 INCL.	TINNED COPPER .032 DIA.
54-57 INCL.	TINNED COPPER .020 DIA.
60	PURPLE
65	BLACK
70	BROWN-ORANGE TR.
75	BROWN-RED TR.
80	WIRE RED-ORANGE TR.
85-87 INCL.	SLEEVING .022 I.D.
95-96	WIRE TINNED COPPER .040 DIA.
100	SLEEVING .034 I.D.

NOTES

- NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATE WIRE NUMBERS AND DESTINATION OF WIRES. THUS: 47-E203-1, 47= WIRE NO., E203= TERMINAL BOARD E203, 1= TERMINAL 1 OF E203 AS INDICATED ON THIS DRAWING.
- CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
- ASSEMBLE ITEM 109 SLEEVING OVER ENDS OF WIRES & TERMINALS AT J203.
- SECURE WIRES IN E208



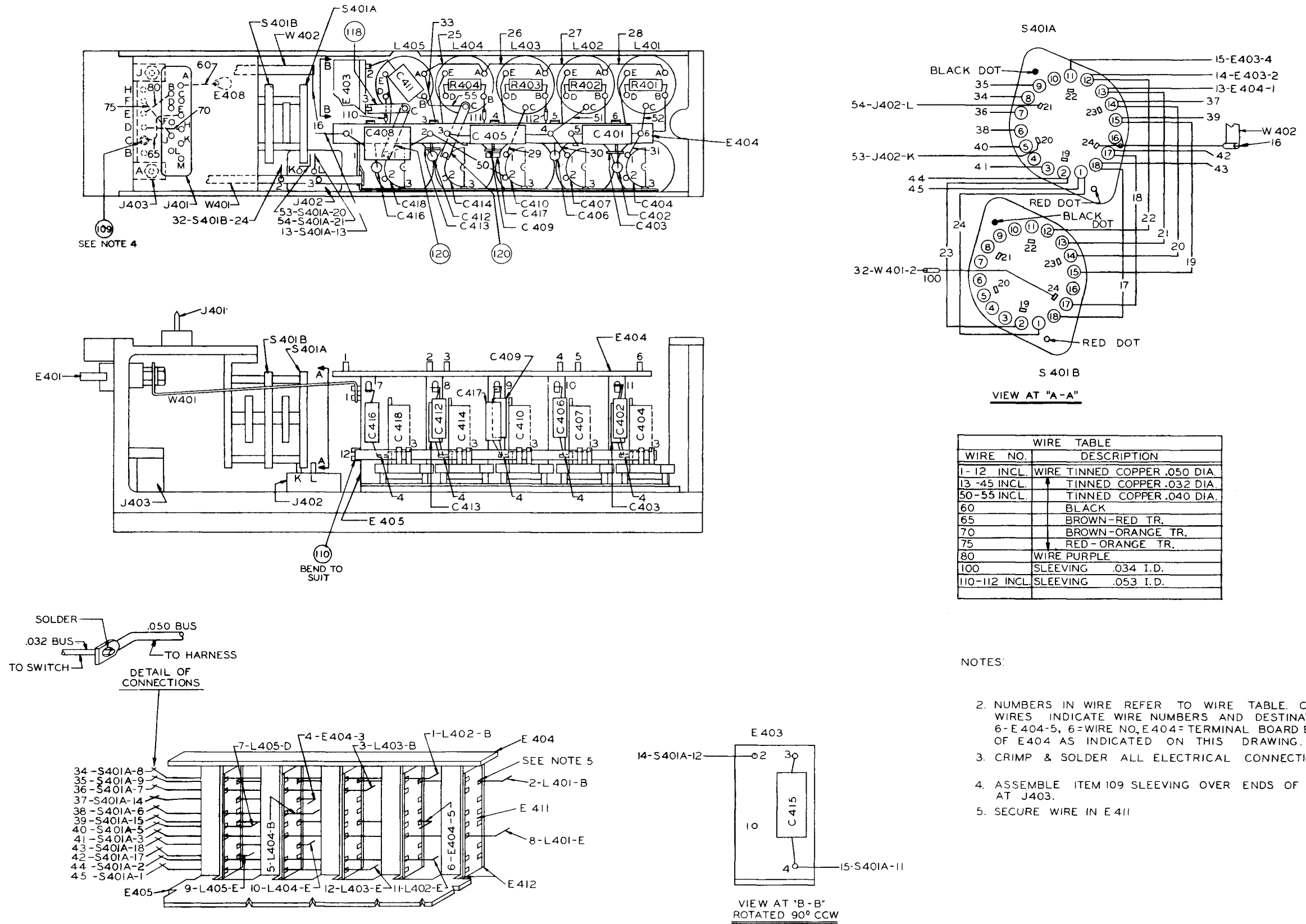
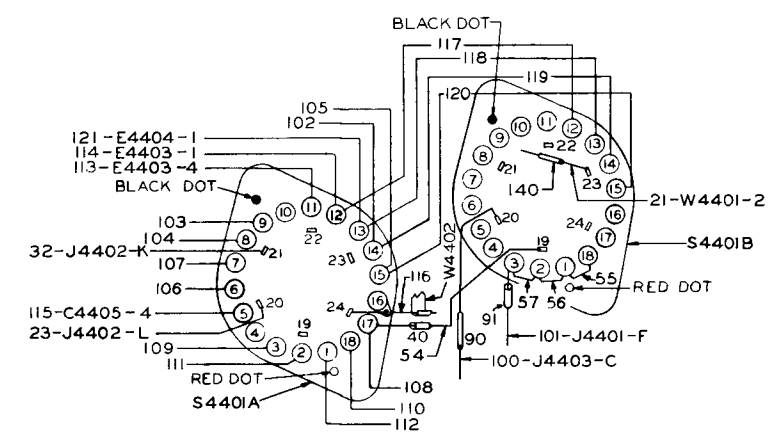
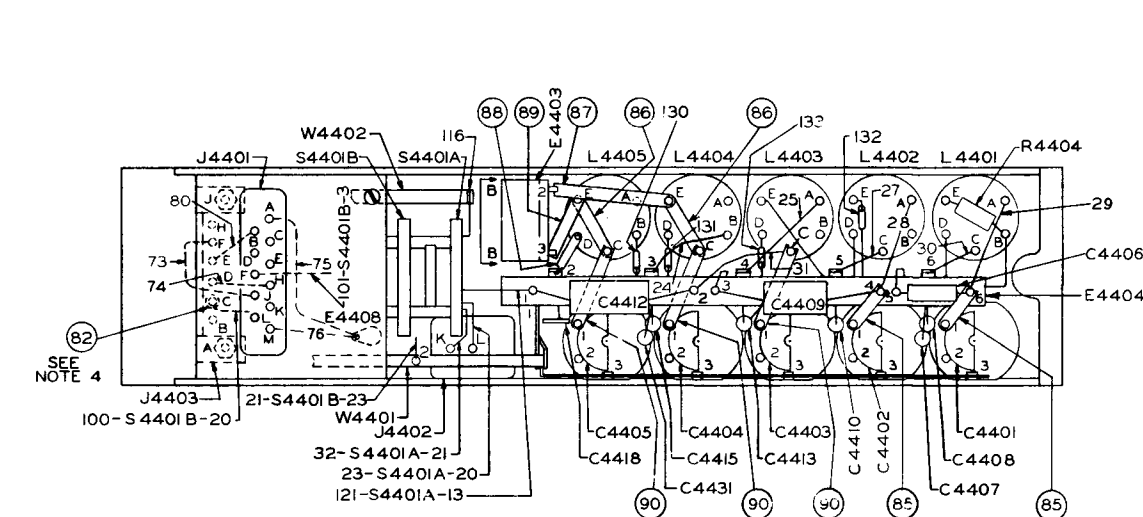
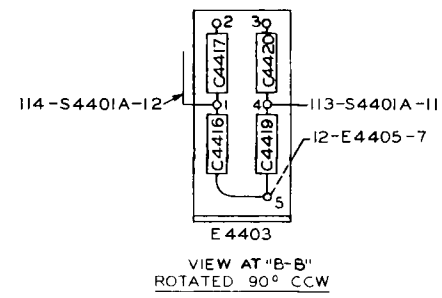
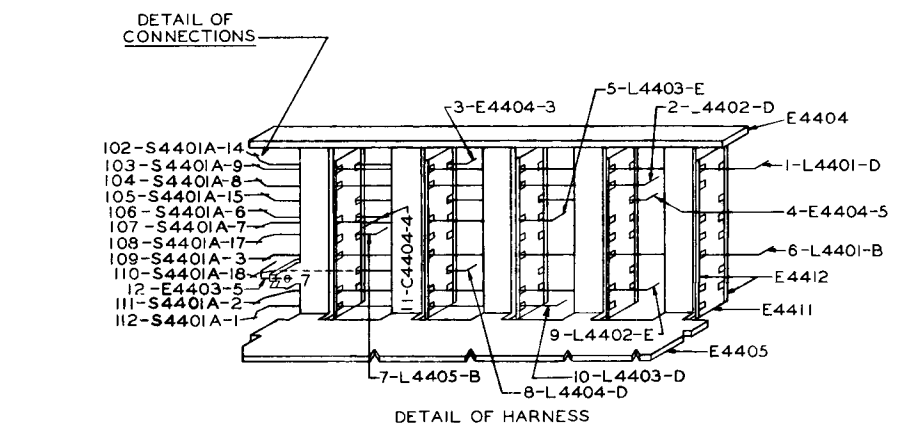
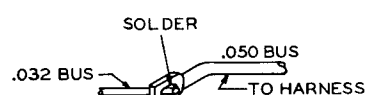
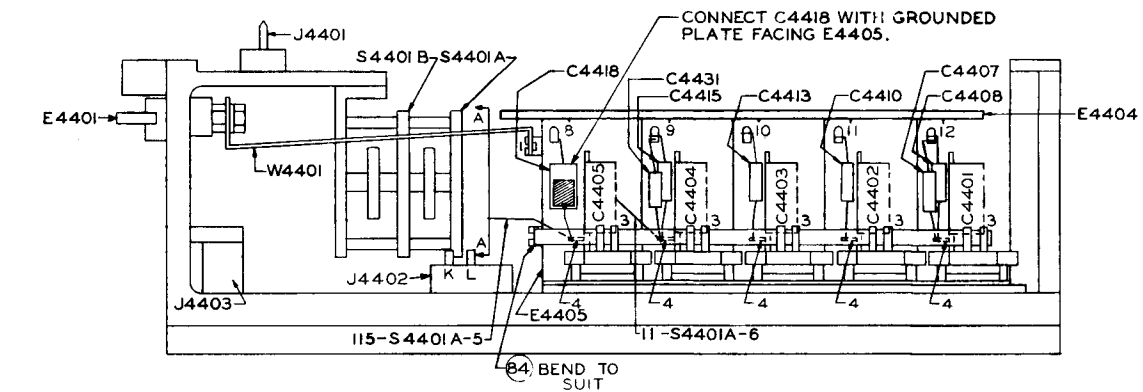


Figure 7-33. Oscillator, Connection Diagram, AN/FRR-22



VIEW AT "A-A"  
USE IN CONJUNCTION  
WITH DETAIL OF HARNESS

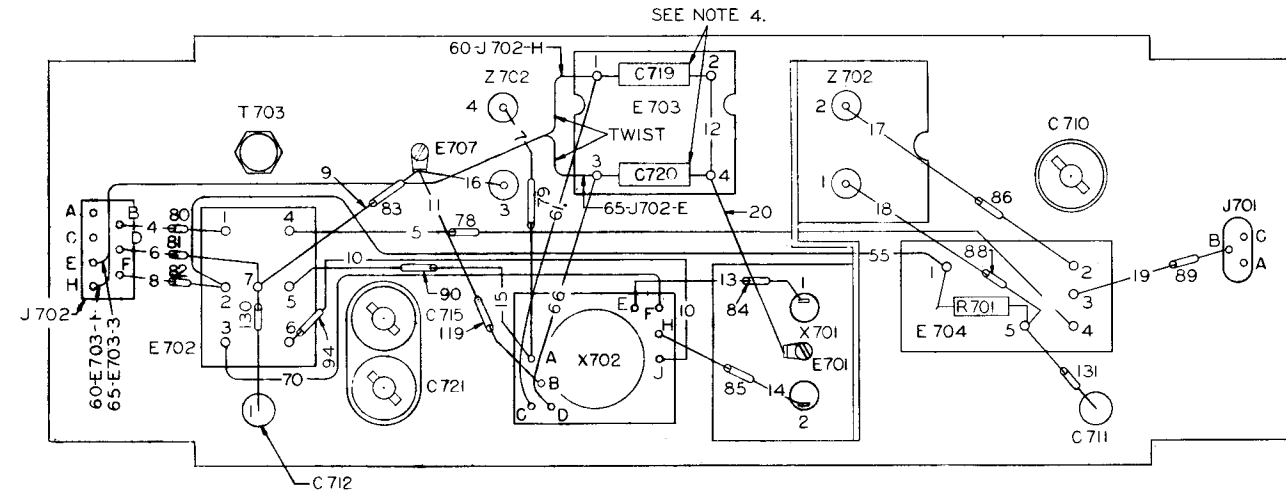


WIRE TABLE	
WIRE NO.	DESCRIPTION
1-12 INCL.	WIRE TINNED COPPER .050 DIA.
21-32 INCL.	WIRE TINNED COPPER .040 DIA.
40	SLEEVING .022 I.D.
54-57 INCL.	WIRE TINNED COPPER .020 DIA.
73	RED-ORN. TR.
74	BRN.-ORN. TR.
75-76	BLACK
80	WIRE RED
90-91	SLEEVING .034 I.D.
100-121 INCL.	WIRE TINNED COPPER .032 DIA.
130-133 INCL.	SLEEVING .053 I.D.
140	SLEEVING .042 I.D.

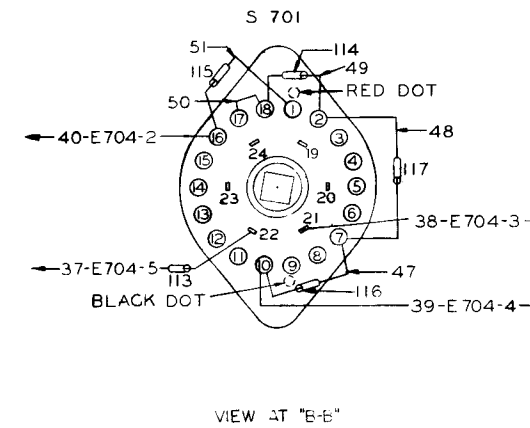
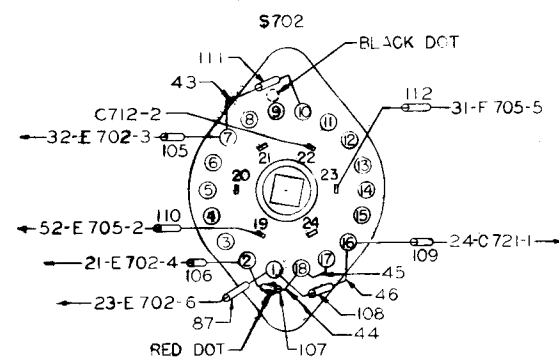
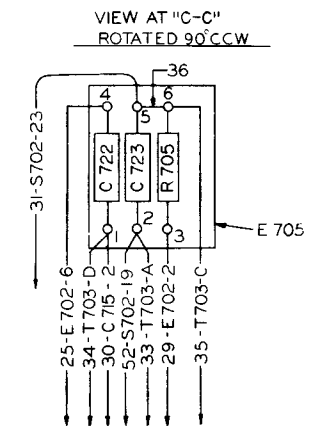
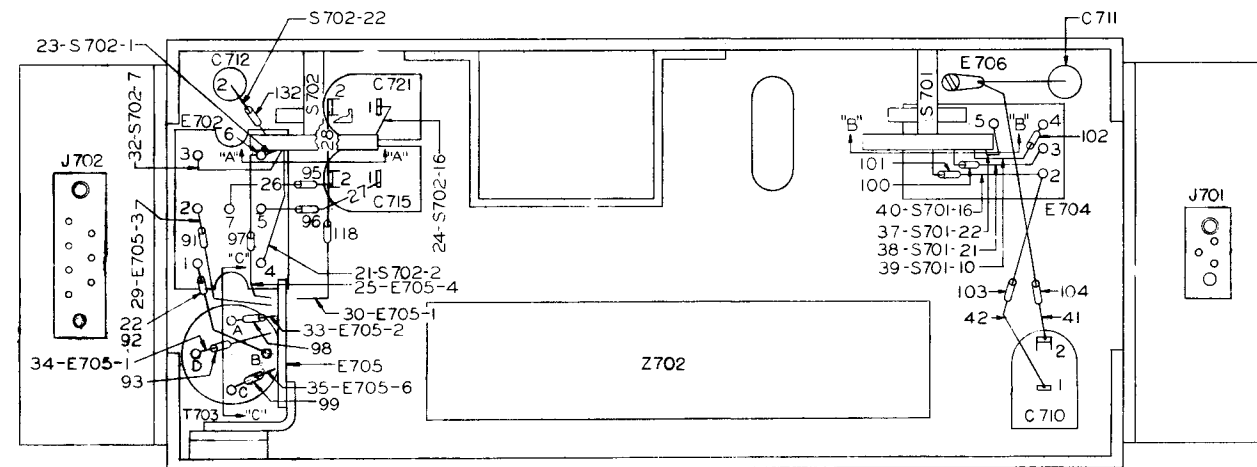
- 2- NOS. IN WIRES REFER TO WIRE TABLE, CODING AT ENDS OF WIRES INDICATE WIRE NO. & DESTINATION OF WIRE. THUS: 33-J4402-K, 33= WIRE NO., J4402= ITEM J4402, K=TERMINAL K OF J4402 AS INDICATED ON THIS DRAWING.
- 3- CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS USING ITEM 68
- 4- ASSEMBLE ITEM 82 SLEEVING OVER ENDS OF WIRES & TERMINALS AT J4403.
- 5- SECURE WIRES IN E4411

WIRE 80 TO BE CONNECTED FROM J4401-C TO J4403-H OTHERWISE SAME AS PT. 1.

Figure 7-34. Oscillator, Connection Diagram, AN/FRR-23

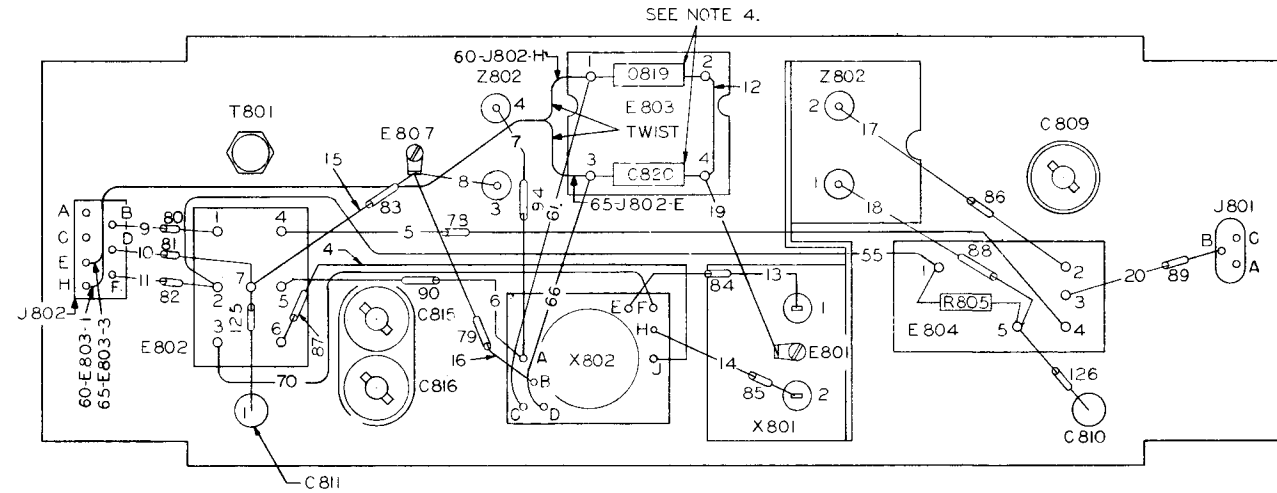


WIRE TABLE	
WIRE NO	DESCRIPTION
4-52 INCL	WIRE, TINNED COPPER .020 DIA.
55	WIRE, RED
60-61	WIRE, BRN.
65-66	WIRE, BRN.-BLK. TR
70	WIRE, ORN.
78-119 INCL	SLEEVING .022 I.D.
130-132 INCL	SLEEVING .034 I.D.

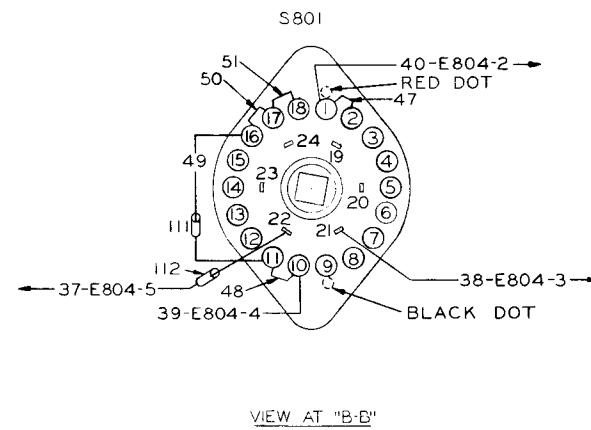
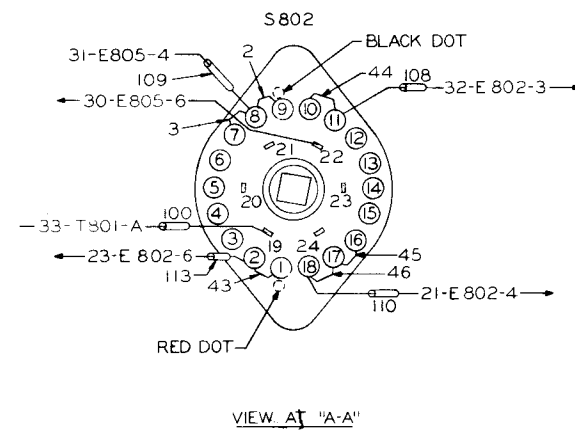
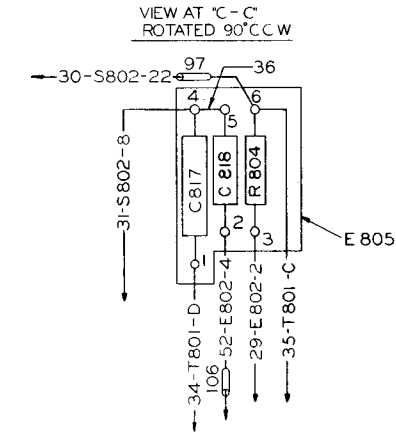
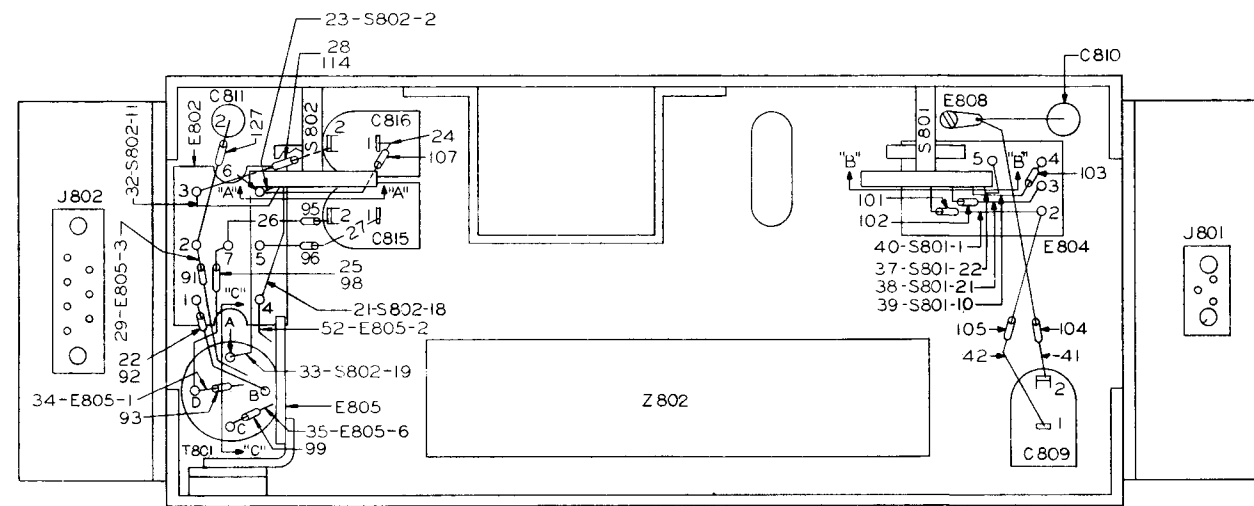


- NOTES-
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
  3. NUMBERS IN WIRES REFER TO WIRE TABLE.
  4. CASE OF CAPACITOR CONNECTED TO GROUND.

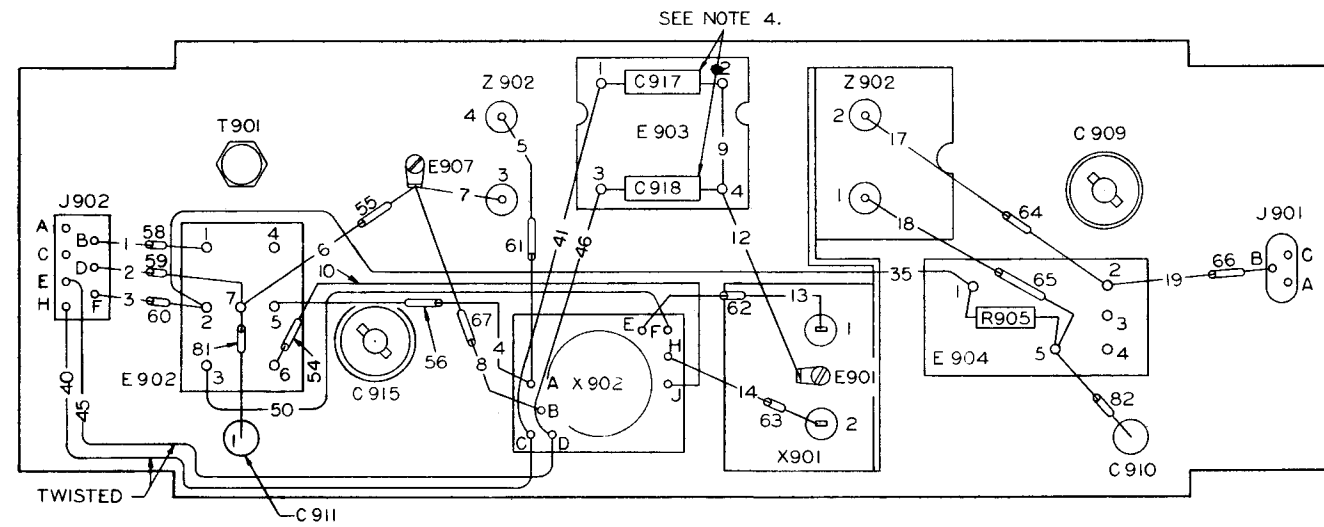
Figure 7-35. First I-F, Connection Diagram, AN/FRR-21



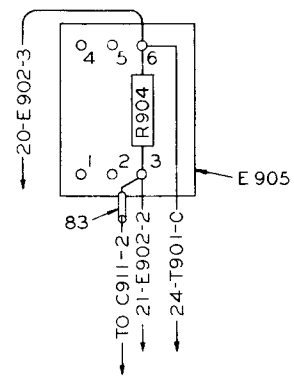
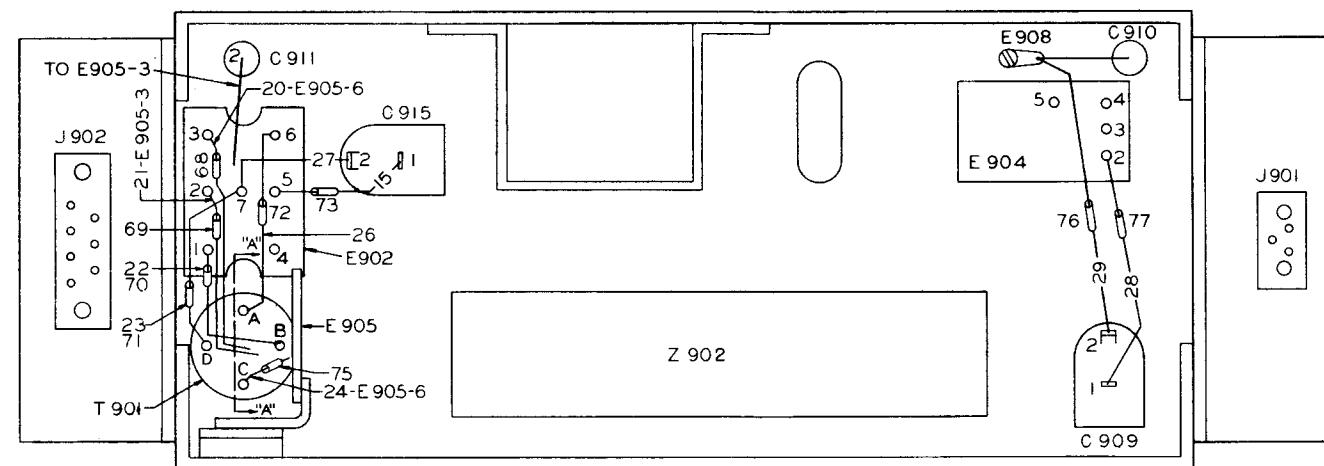
WIRE TABLE	
WIRE NO.	DESCRIPTION
2-52 INCL.	WIRE, TINNED COPPER .020 DIA.
55	RED
60-61	BRN.
65-66	BRN. BLK. TR
70	WIRE, ORN.
78-114 INCL.	SLEEVING .022 I.D.
125-127 INCL.	SLEEVING .034 I.D.



- NOTES-
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
  3. NUMBERS IN WIRES REFER TO WIRE TABLE.
  4. CASE OF CAPACITOR CONNECTED TO GROUND.



WIRE TABLE	
WIRE NO	DESCRIPTION
1-29 INCL	WIRE TINNED COPPER .020 DIA.
35	RED
40-41	BRN.
45-46	BRN.-BLK. TR
50	WIRE ORN.
54-77 INCL	SLEEVING .022 I.D.
81-83 INCL	SLEEVING .034 I.D.



VIEW AT "A-A"  
ROTATED 90° CCW

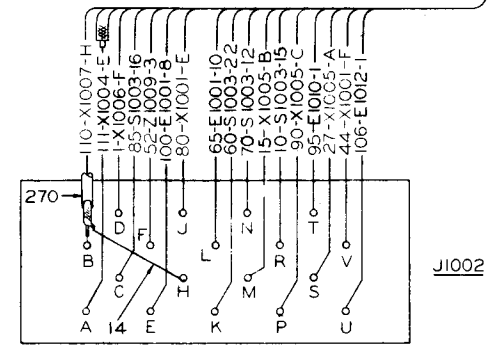
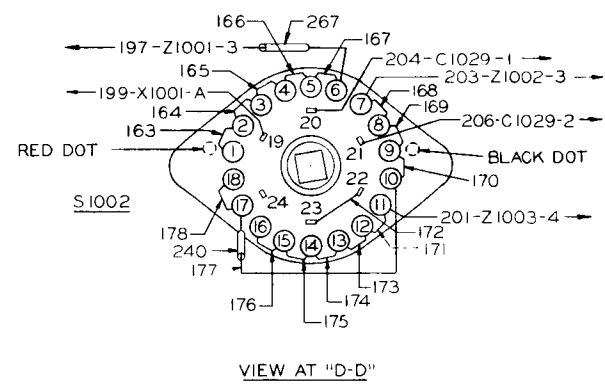
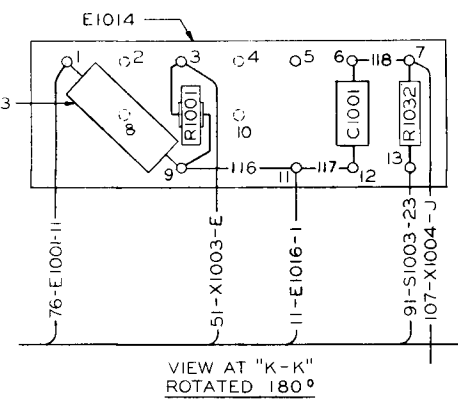
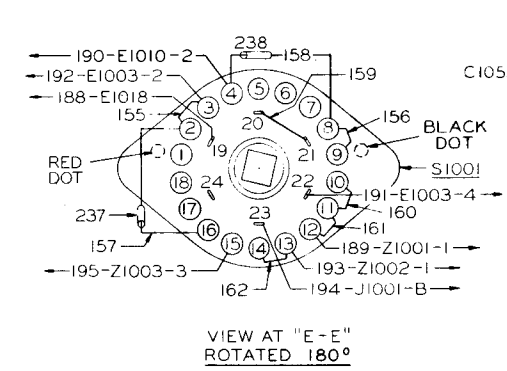
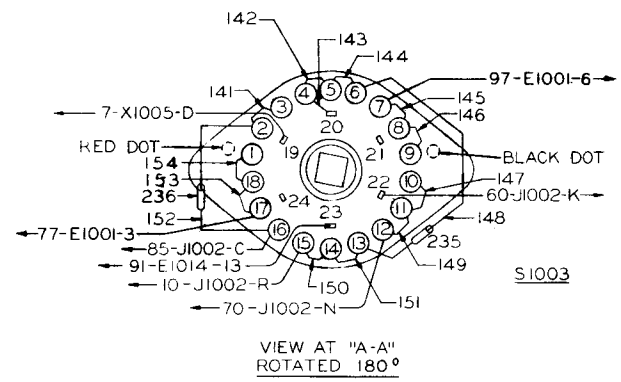
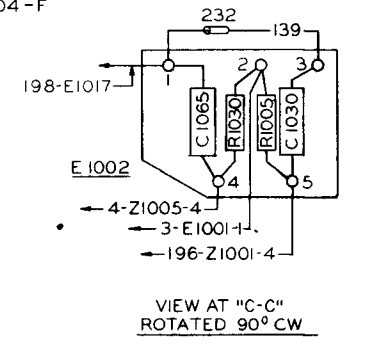
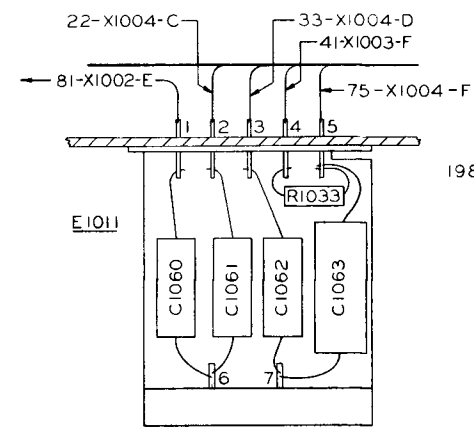
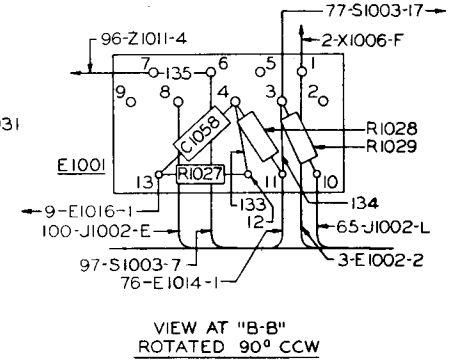
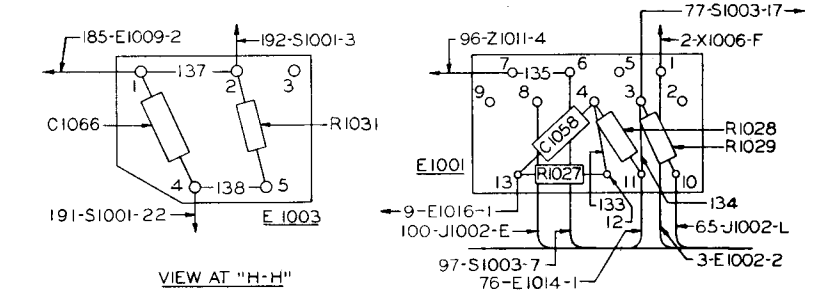
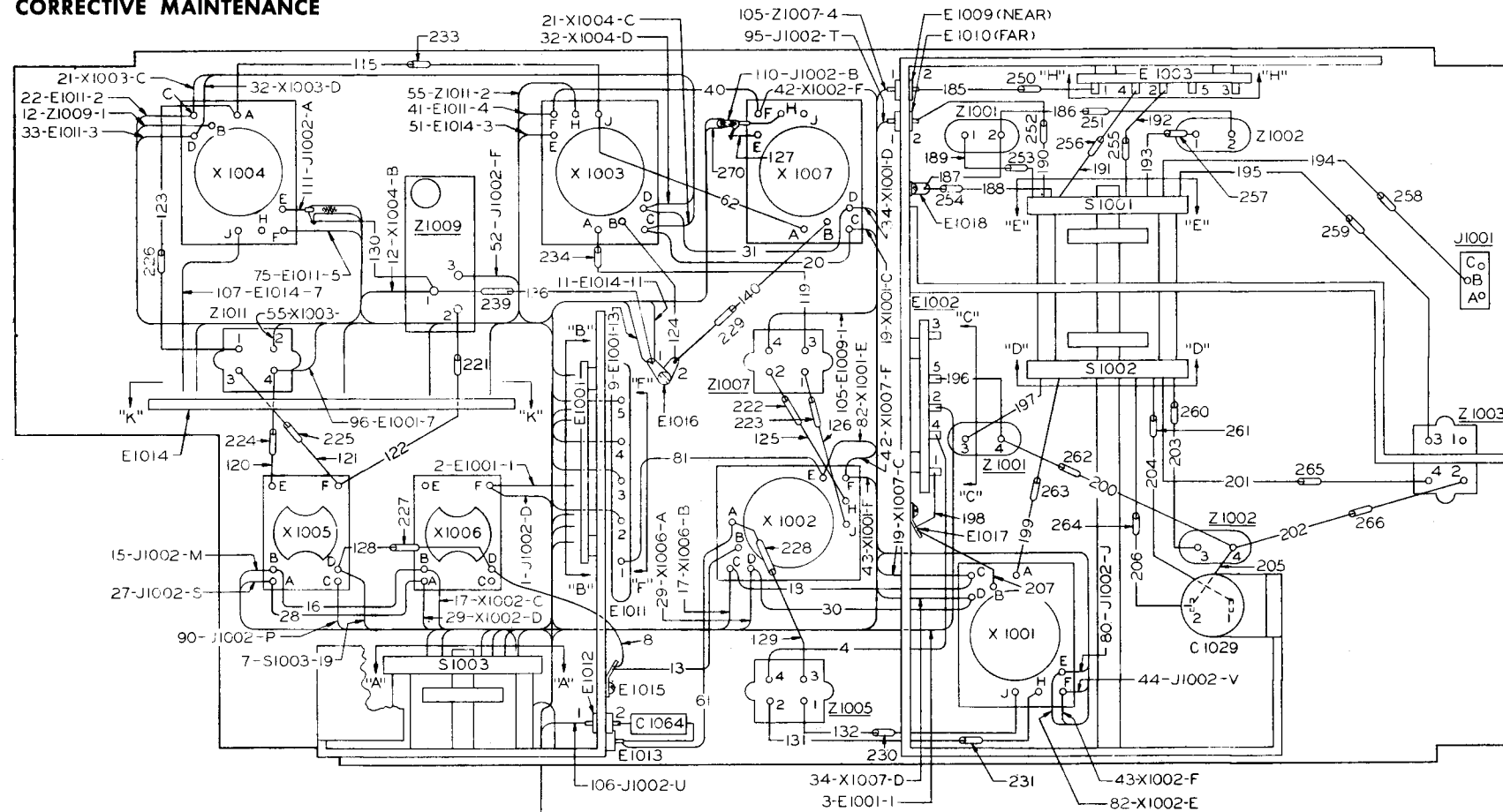
- NOTES-
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
  3. NUMBERS IN WIRES REFER TO WIRE TABLE.
  4. CASE OF CAPACITOR CONNECTED TO GROUND.

ORIGINAL

Figure 7-37. First I-F, Connection Diagram, AN/FRR-23

7-127, 7-128

**AN/FRR-21, -22, -23  
CORRECTIVE MAINTENANCE**

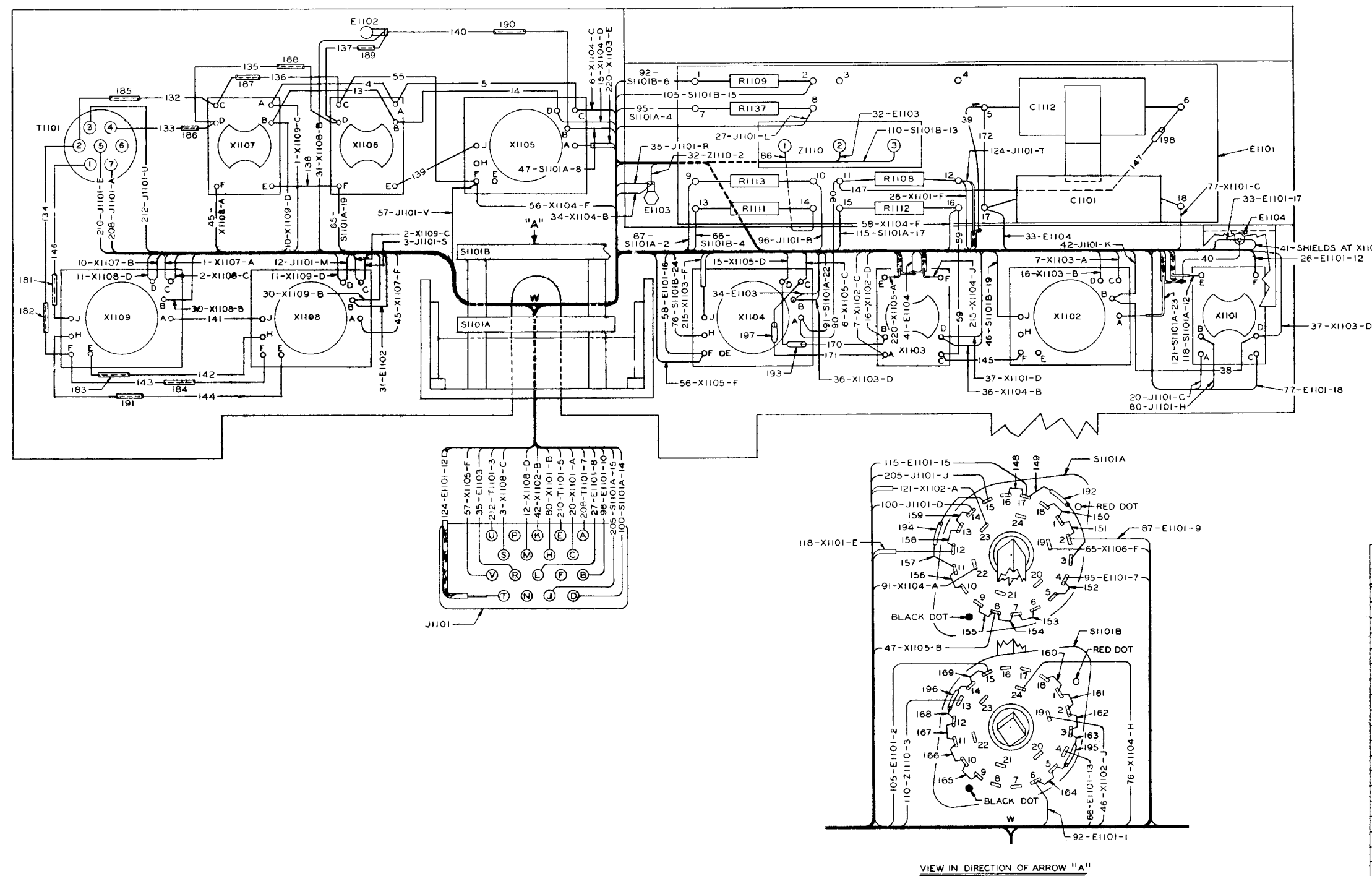


WIRE NO.	WIRE DESCRIPTION
1-4	WIRE WHITE
7-14	BLK.
15-22	BRN.-GRN. TR.
27-34	BRN.-YEL. TR.
40-44 INCL.	RED
51-52	YEL.
55	ORN.
60-62 INCL.	GRN.
65	RED-ORN. TR.
70	WHT.-BRN. TR.
75-77 INCL.	RED-BLUE TR.
80-82 INCL.	YEL.-BLK. TR.
85	YEL.-BRN. TR.
90-91	YEL.-GRN. TR.
95-97 INCL.	YEL.-RED TR.
100	YEL.-ORN. TR.
105-107 INCL.	WIRE GRN.-BLK. TR.
110	WIRE SHIELDED (YELLOW)
111	WIRE SHIELDED (PURPLE)
115-178 INCL.	WIRE TINNED COPPER .020 DIA.
185-207 INCL.	WIRE TINNED COPPER .032 DIA.
221-240 INCL.	SLEEVING .022 I.D.
250-267 INCL.	SLEEVING .034 I.D.
270	SLEEVING .095 I.D.

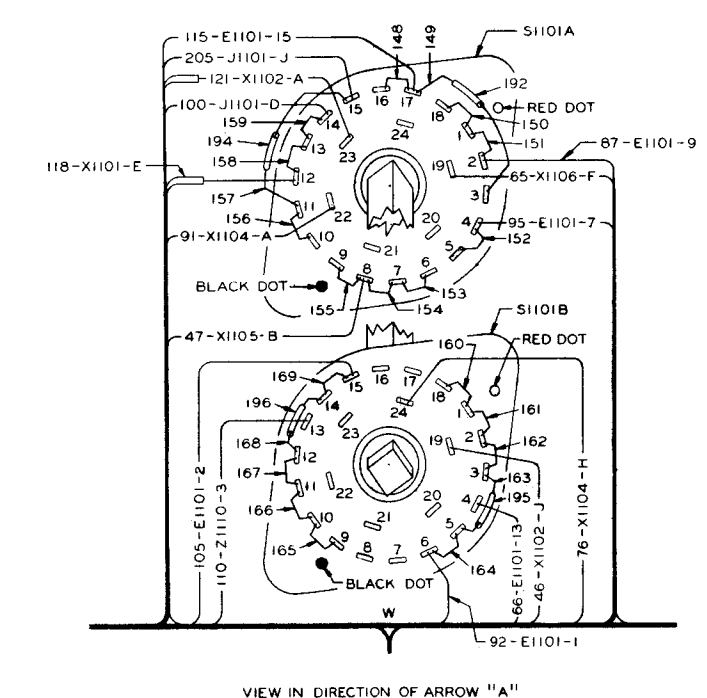
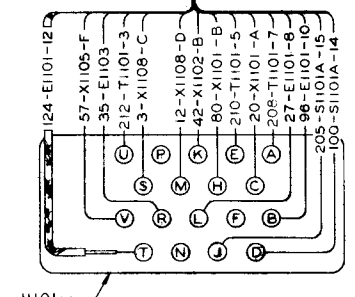
- NOTES -
- CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS USING ITEM 60 SOLDER.
  - USING ITEM 61 LACING CORD WHERE NECESSARY.

5. NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATE WIRE NUMBERS AND DESTINATION OF WIRES. THIS: 19-X1002-C, 19=WIRE NO., X1002=SOCKET X1002 C=TERMINAL OF SOCKET X1002 AS INDICATED ON THIS DRAWING.

Figure 7-38. Second I-F Amplifier, Connection Diagram

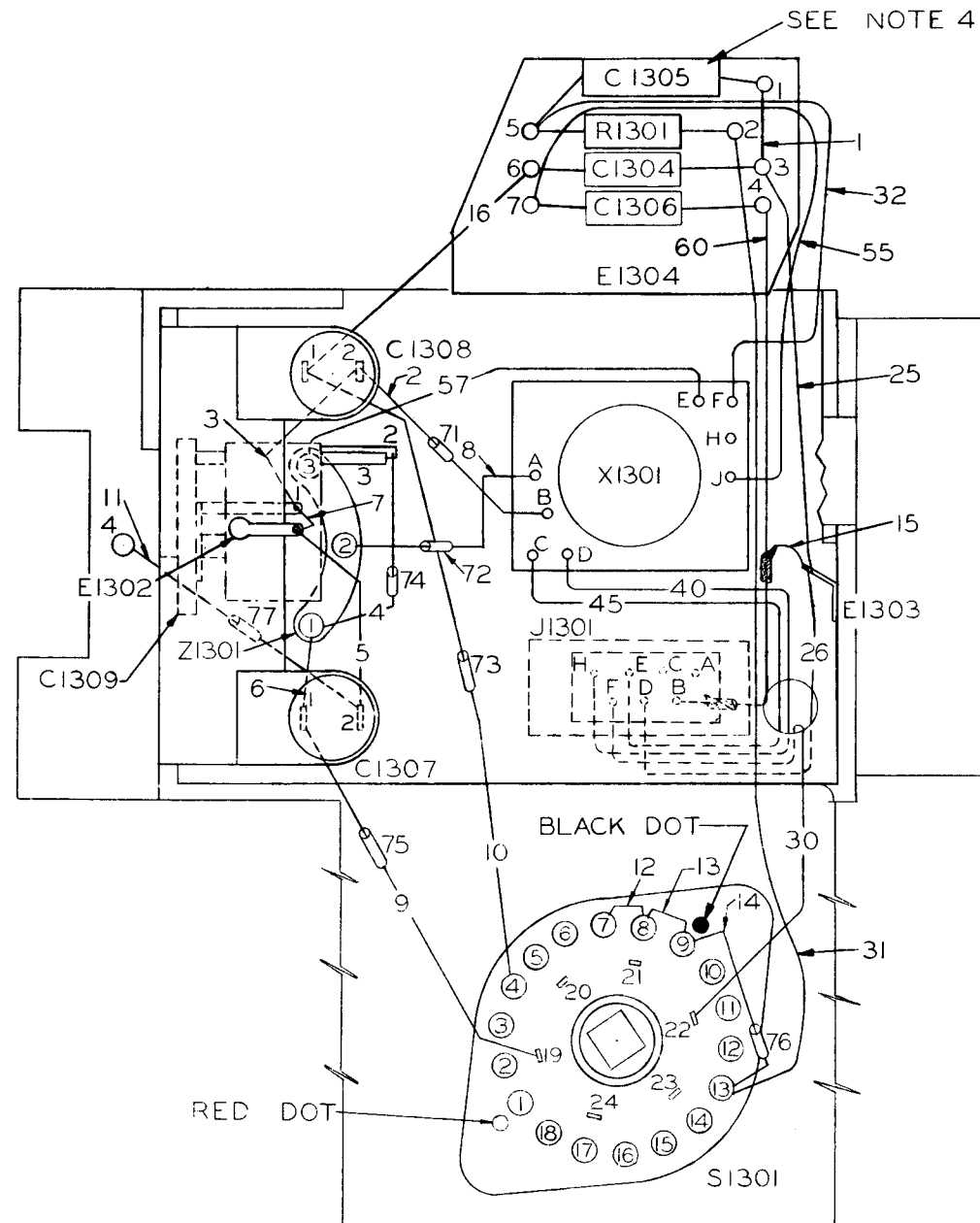


- NOTES
- CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS USING ITEM 60 SOLDER.
  - CABLE & LACE WIRES WHERE PRACTICAL USING ITEM 67 LACING CORD.
  - ITEM NUMBERS & SCHEMATIC SYMBOL NUMBERS REFER TO LIST OF PARTS A-8833205.
  - NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATES WIRE NUMBER AND DESTINATION OF WIRE. THUS: 58-E1101-16, 58= WIRE NUMBER, E1101= TERMINAL BOARD E1101, AND 16= TERMINAL 16 OF E1101 AS INDICATED ON THIS DRAWING.



WIRE TABLE	
WIRE NO.	DESCRIPTION
1 - 7 INCL.	BROWN - GREEN TR.
10 - 16 INCL.	BROWN - YEL. TR.
20	BRN. - PURPLE TR.
26 - 27	WHITE
30 - 42 INCL.	BLACK
45 - 47 INCL.	GREEN
55 - 59 INCL.	RED
65 - 66	BLUE
76 - 77	YELLOW
80	BRN. - BLUE TR.
86 - 87	BLUE - BRN. TR.
90 - 92 INCL.	RED - GRN. TR.
95 - 96	RED - BLK. TR.
100	GRN - BRN. TR.
105	YEL. - GRN. TR.
110	YEL. - BLK. TR.
115	BLUE - RED TR.
118	SHIELDED (WHITE)
121	SHIELDED (GRN. - YEL. TR.)
124	SHIELDED (GREEN)
132 - 172 INCL.	WIRE TINNED COPPER .020 DIA.
181 - 198 INCL.	SLEEVING .022 I.D.
205	WIRE GRN - BLK. TR.
208	WHITE - BLACK TR.
210	WHITE - BROWN TR.
212	WHITE - RED TR.
215	SHIELDED (BLUE)
220	WIRE SHIELDED (YEL.)

Figure 7-39. Audio Amplifier, Connection Diagram

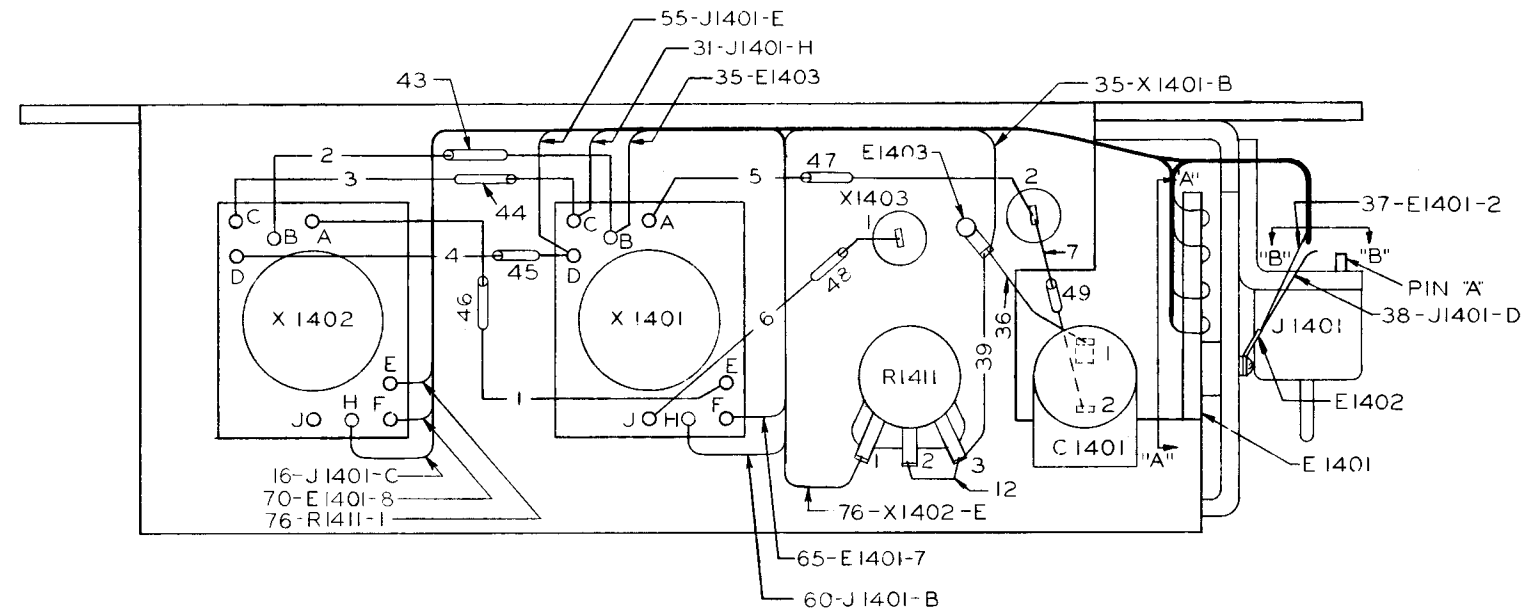


WIRE TABLE	
WIRE NO.	DESCRIPTION
1-16 INCL	WIRE - TINNED COPPER .020 DIA.
25-26	BLACK
30-32 INCL	RED
40	BROWN
45	BROWN-BLACK TR.
55	BLUE
57	ORANGE
60	WIRE - SHIELDED PURPLE
71-77 INCL	SLEEVING .022 I.D.

NOTES

1. NUMBERS IN WIRES REFER TO WIRE TABLE.
2. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
4. CASE OF CAPACITOR CONNECTED TO GROUND.

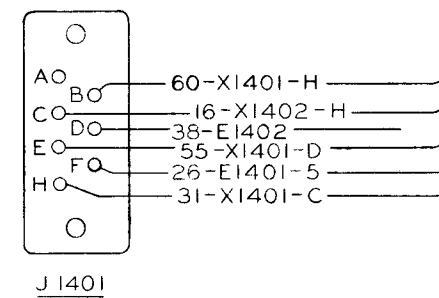
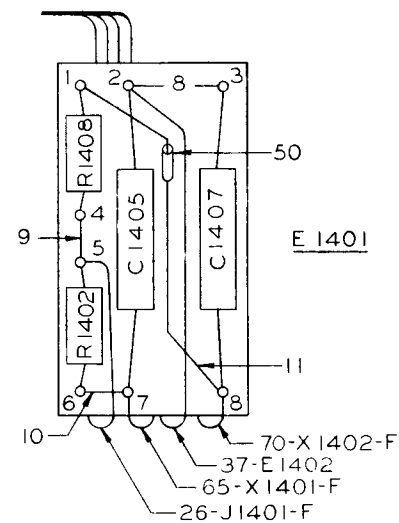




WIRE NO.	WIRE TABLE DESCRIPTION
1-12 INCL.	WIRE TINNED COPPER .020 DIA.
16	GREEN
26	RED-YEL. TR.
31	BRN.-GRN. TR.
35-39 INCL.	WIRE BLACK
43-50 INCL.	SLEEVING .022 I.D.
55	WIRE BRN.-YEL. TR.
60	GRN.-BLK. TR.
65	RED
70	RED-BLK. TR.
76	WIRE BLUE

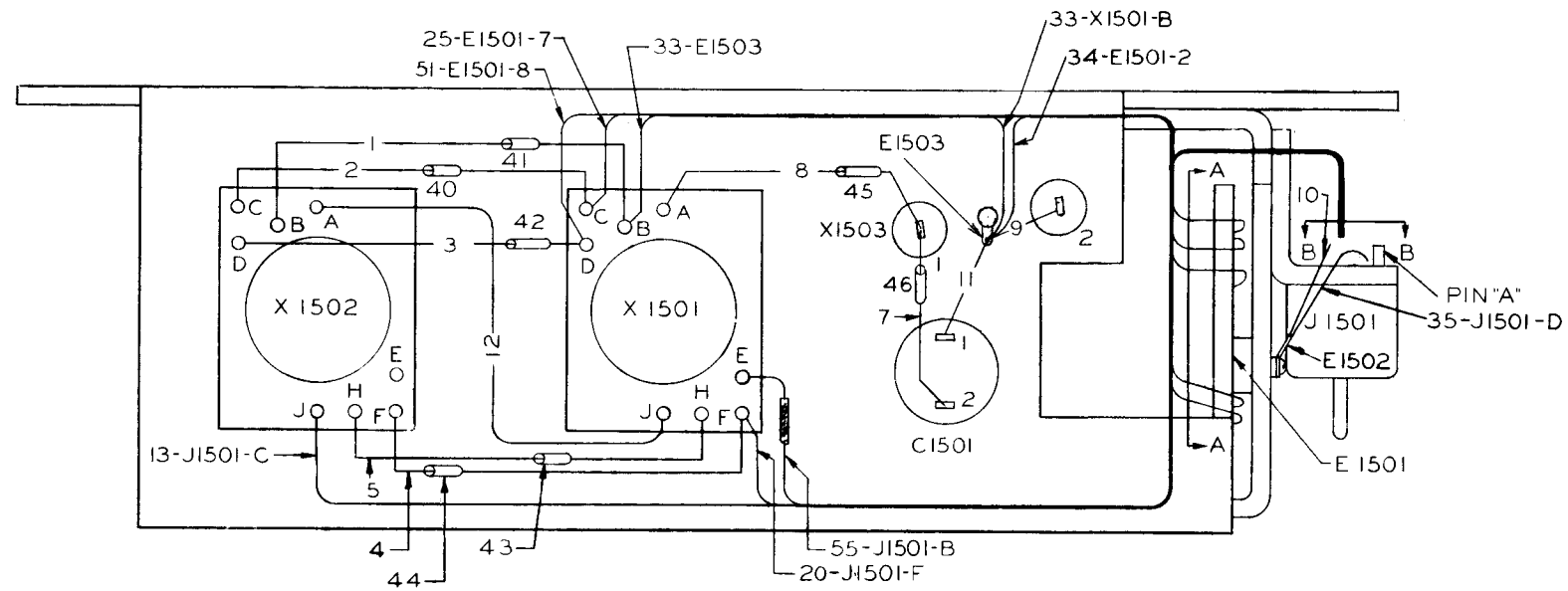
VIEW AT "A"- "A"  
ROTATED 90° CCW

VIEW AT "B"- "B"  
ROTATED 180°



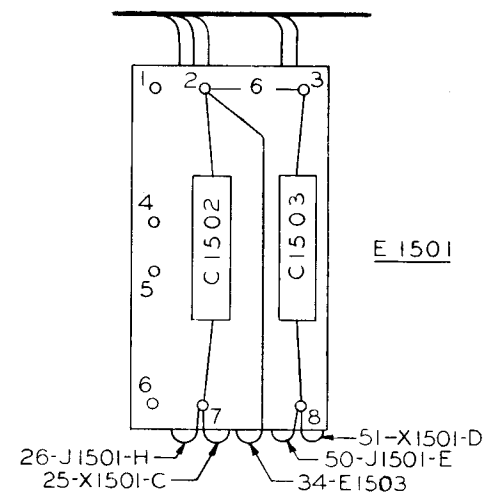
NOTES

2. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.
4. CABLE & LACE WIRES WHERE PRACTICAL

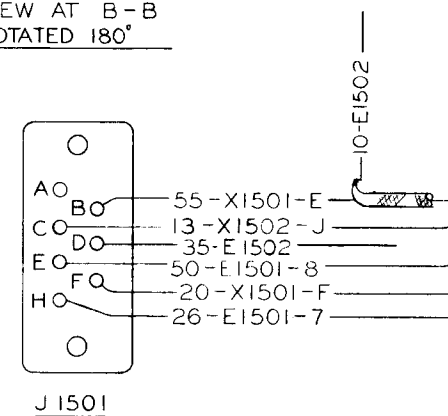


WIRE TABLE	
WIRE NO.	DESCRIPTION
1-11 INCL.	WIRE, TINNED COPPER, .020 DIA.
12-13 INCL.	GREEN
20	RED-YEL. TR.
25-26	BRN.-GRN. TR.
33-35 INCL.	WIRE, BLACK
40-46 INCL.	SLEEVING .022 I. D.
50-51	WIRE, BRN.-YEL. TR.
55	WIRE, SHIELDED, GRN-BLK. TR.

VIEW AT A-A  
ROTATED 90° C C W

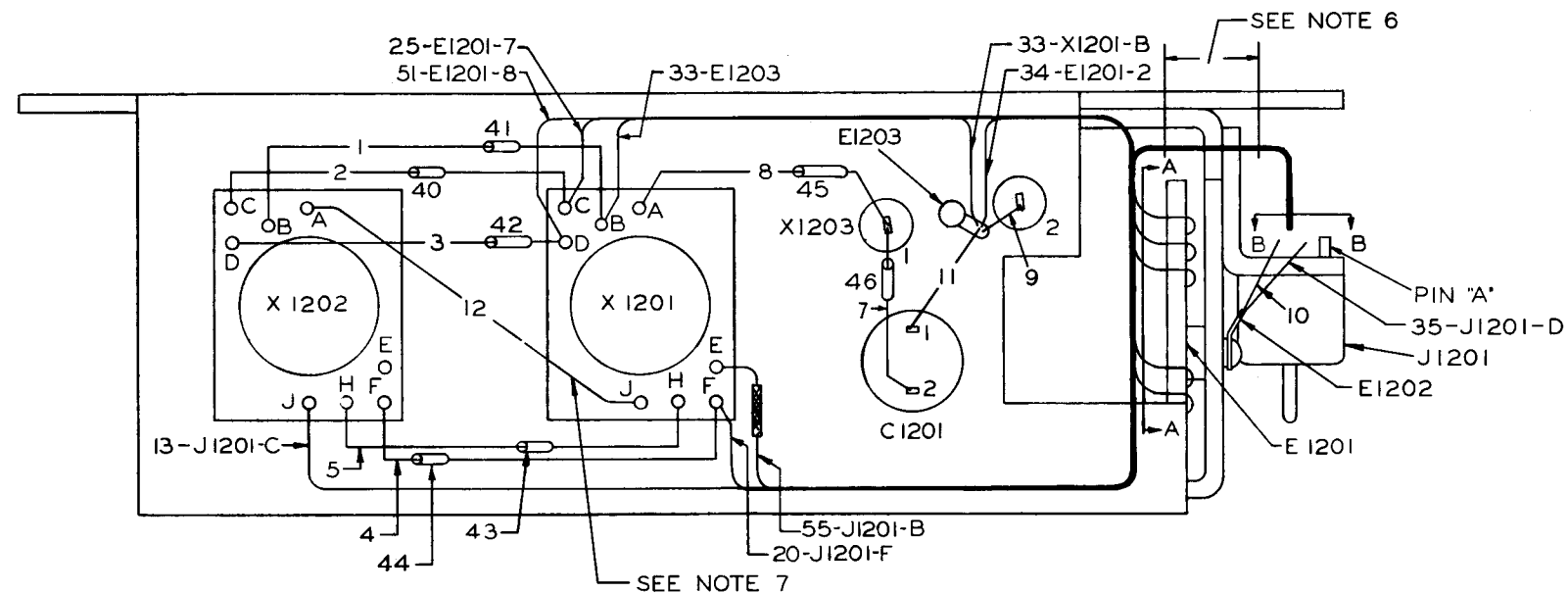


VIEW AT B-B  
ROTATED 180°

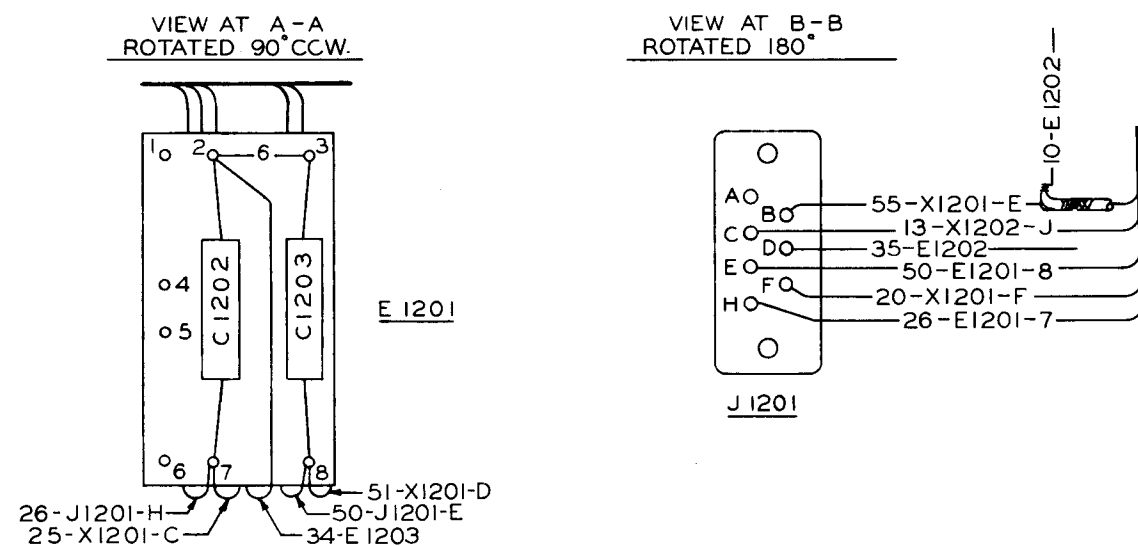


NOTES

2. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.
4. CABLE & LACE WIRES WHERE PRACTICAL



WIRE TABLE	
WIRE NO.	DESCRIPTION
1-11 INCL.	WIRE, TINNED COPPER .020 DIA.
12-13 INCL.	↑ GREEN
20	↑ RED-YEL. TR.
25-26	↓ BRN.-GRN. TR.
33-35 INCL.	WIRE BLACK
40-46 INCL.	SLEEVING .022 I.D.
50-51	WIRE, BRN.-YEL. TR.
55	WIRE, SHIELDED, GRN.-BLK. TR.



NOTES

2. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.
4. CABLE & LACE WIRES WHERE PRACTICAL
6. TAPE CABLE WHERE INDICATED
7. DRESS WIRE 12 IN DIRECT LINE BETWEEN TERMINALS A & J.

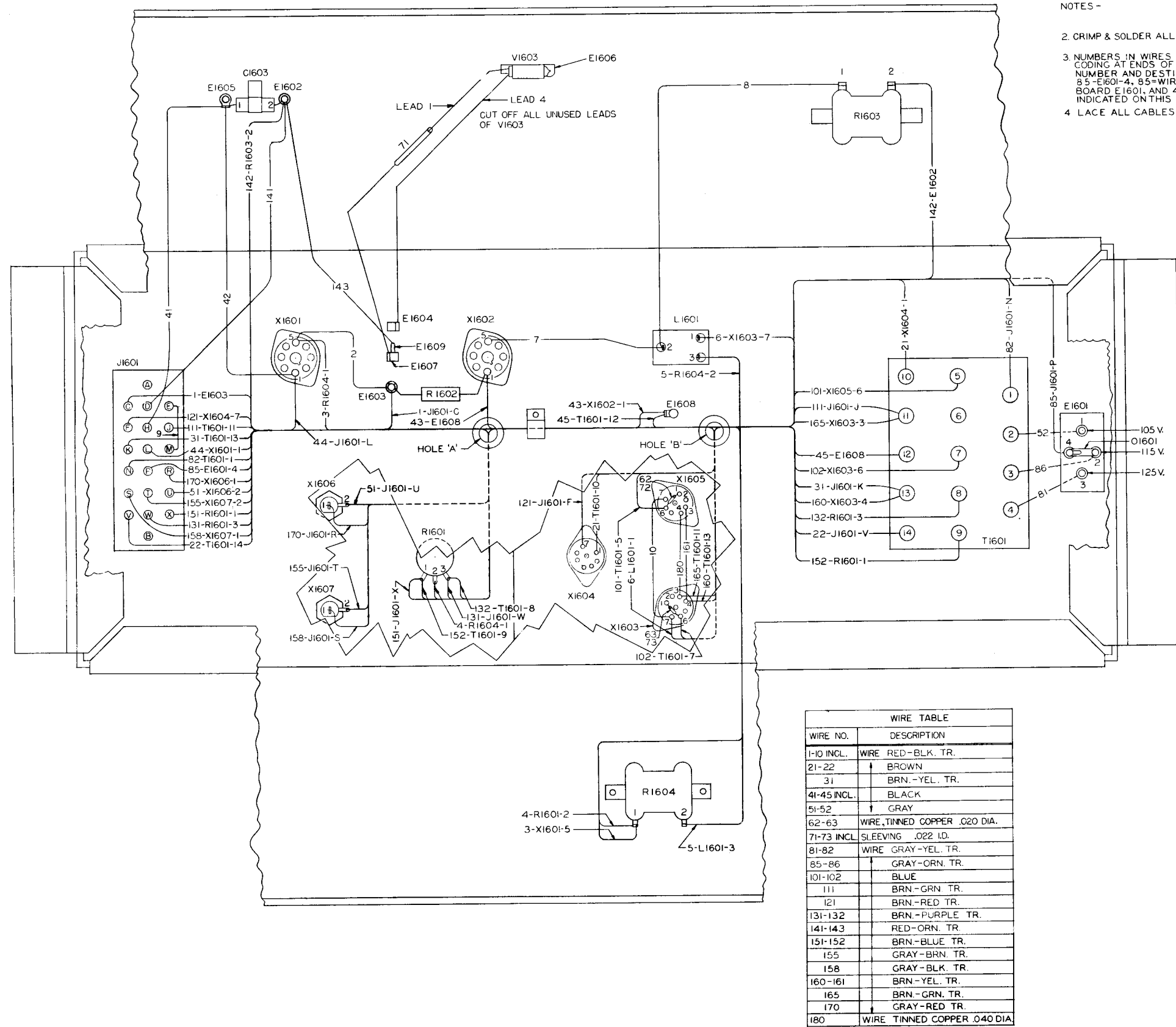
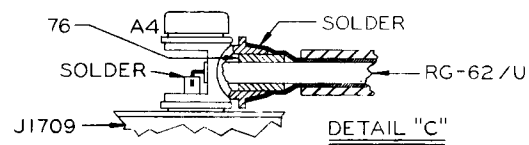
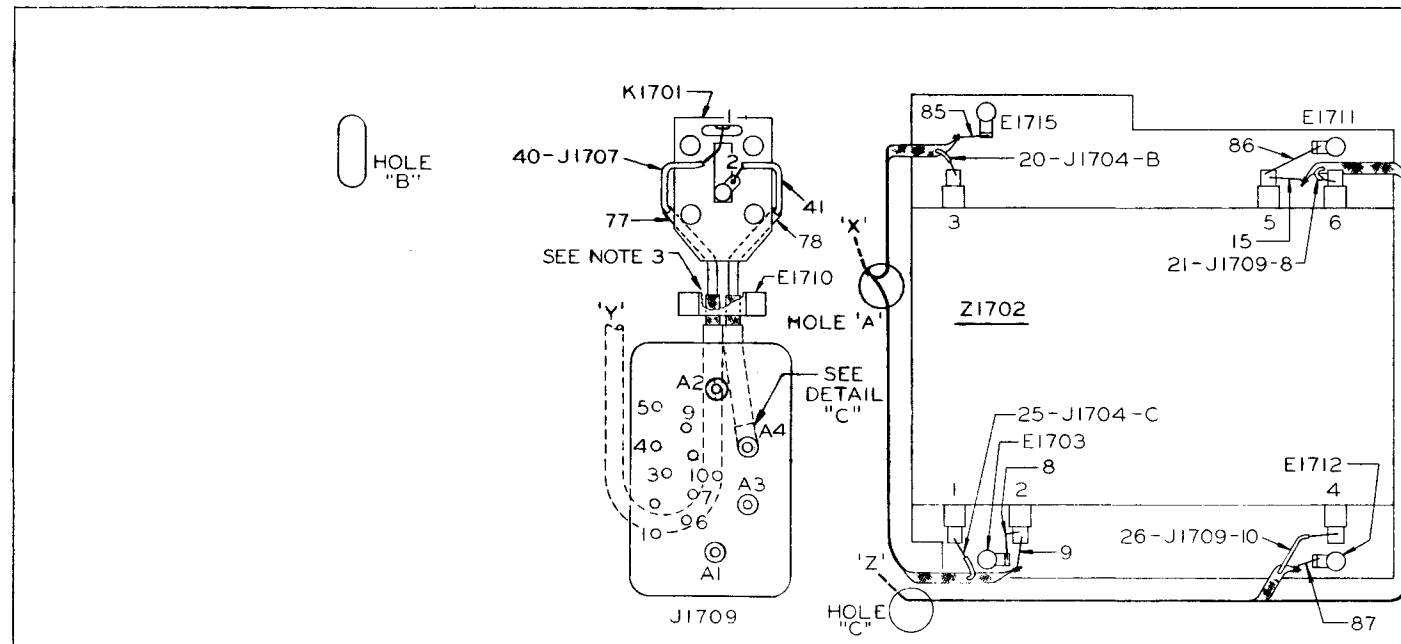
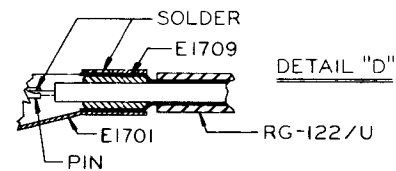
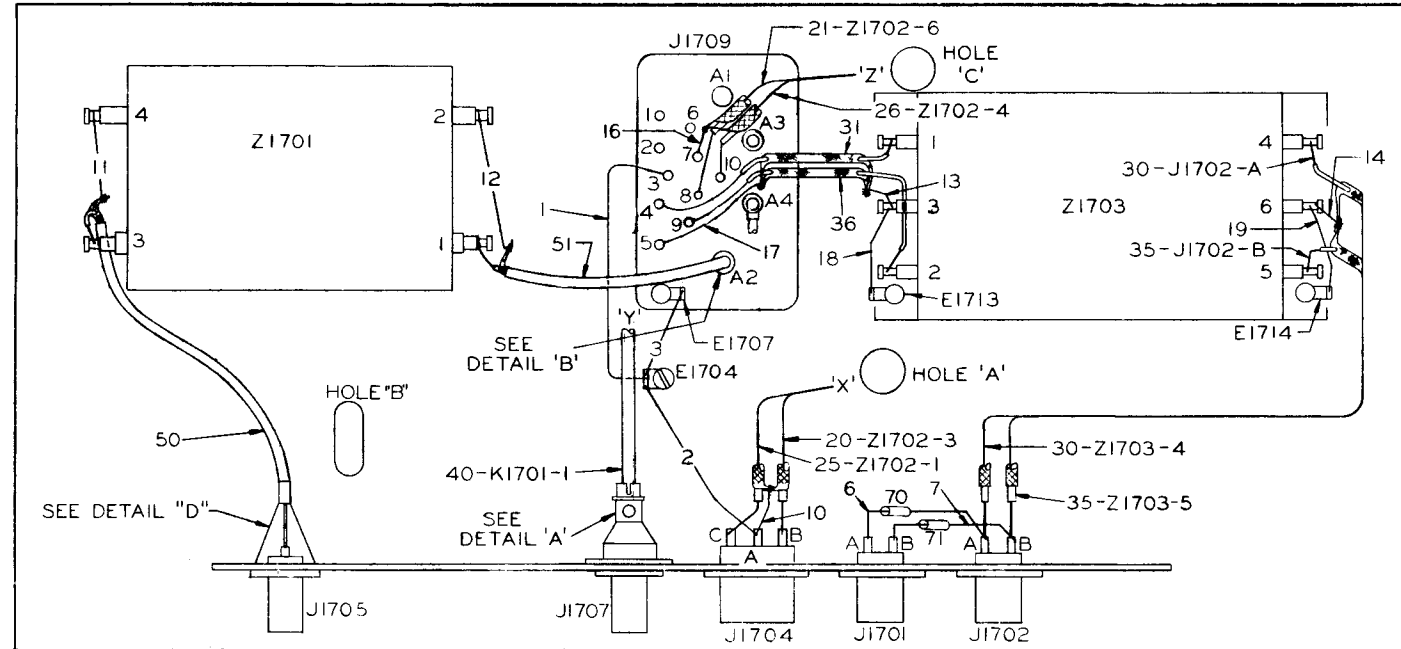


Figure 7-44. Power Supply, Connection Diagram



WIRE TABLE	
WIRE NO	DESCRIPTION
1-3 INCL.	WIRE BLACK
6-19 INCL.	TINNED COPPER .032 DIA.
20-21	SHIELDED GRAY
25-26	SHIELDED GRAY-BLACK TR.
30-31	SHIELDED WHITE-BLACK TR.
35-36	WIRE SHIELDED WHITE-BROWN TR.
40-41	CABLE COAX
50-51	CABLE COAX
70-71	SLEEVING .034 I.D.
75-78 INCL.	SLEEVING .148 I.D.
85-87 INCL.	WIRE TINNED COPPER .032 DIA.

NOTES:

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
2. NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT THE ENDS OF WIRES INDICATE WIRE NUMBERS AND DESTINATION OF WIRES. THIS: 21-J1709-8, 21 = WIRE NO., J1709 = CONNECTOR J1709, 8 = TERMINAL 8 OF J1709 AS INDICATED ON THIS DRAWING.
3. SOLDER SHIELDS OF CABLES 40 & 41 TO CLAMP E1710.

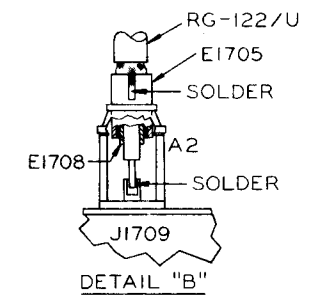
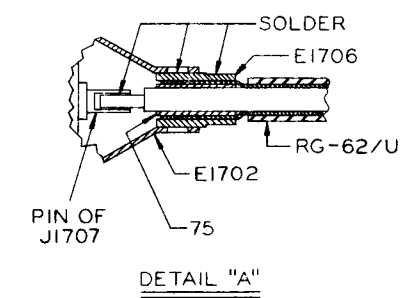
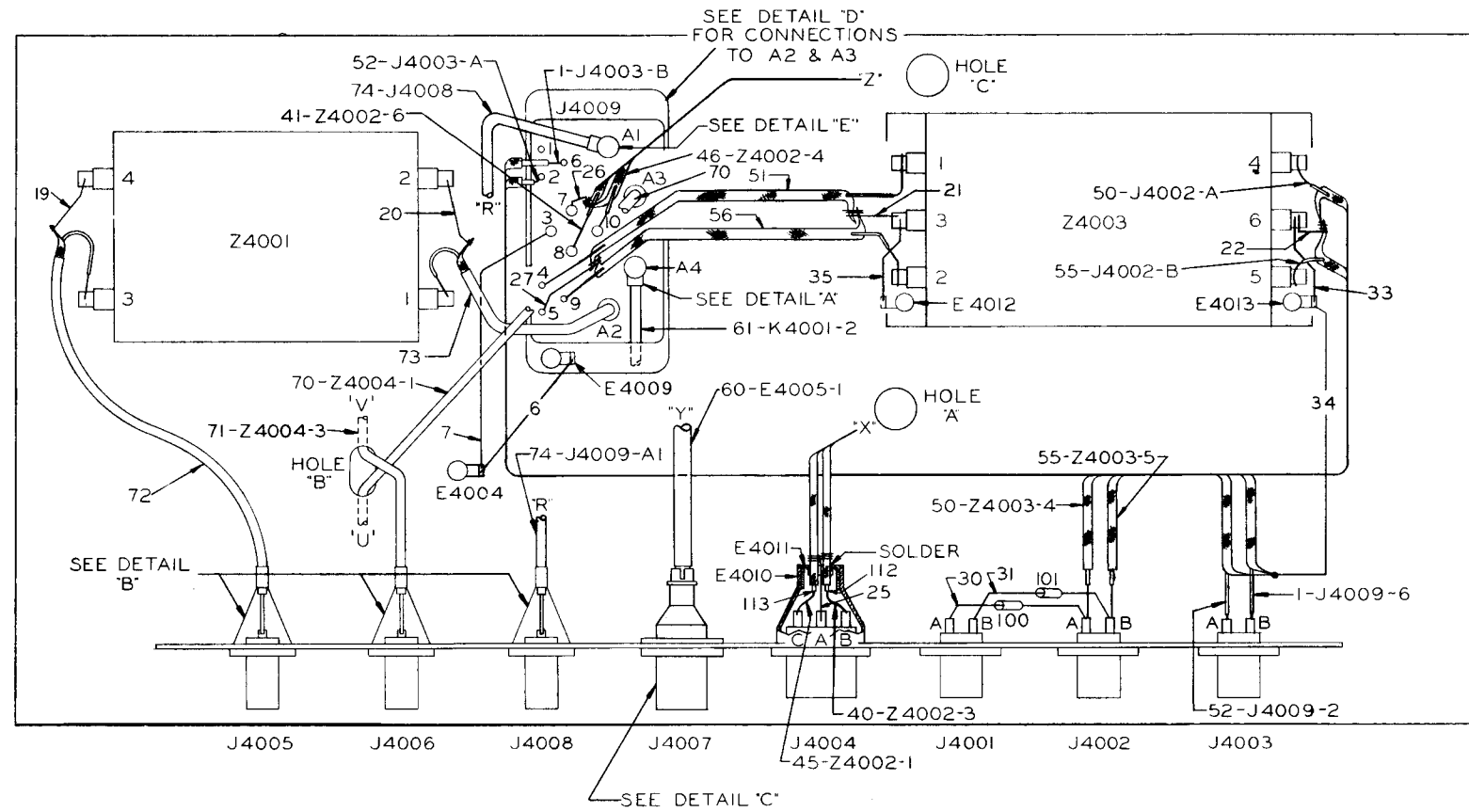


Figure 7-45. Filter Assembly, Connection Diagram, AN/FRR-21



WIRE TABLE	
WIRE NO.	DESCRIPTION
17	WIRE SHIELDED WHITE-RED TR.
6-7	BLACK
16-38 INCL	TINNED COPPER .032 DIA.
40-41	SHIELDED-GRAY
45-46	GRAY-BLACK TR.
50-52 INCL	WHITE-BLACK TR.
55-56	WIRE SHIELDED WHITE-BROWN TR.
60-61	CABLE COAX
70-74 INCL	CABLE COAX
100-103 INCL	SLEEVING .034 I.D.
105-108 INCL	SLEEVING .148 I.D.
112-113	SLEEVING .076 I.D.

NOTES:

- 1 CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
- 2 NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATE WIRE NUMBERS AND DESTINATION OF WIRES. THUS: 70-Z4004-1, 70=WIRE NO., Z4004= FILTER Z4004, 1= TERMINAL 1 OF Z4004 AS INDICATED ON THIS DRAWING.
- 3 SOLDER SHIELDS OF CABLES 60 & 61 TO CLAMP E4016.
- 6 CABLE & LACE WIRES WHERE PRACTICAL

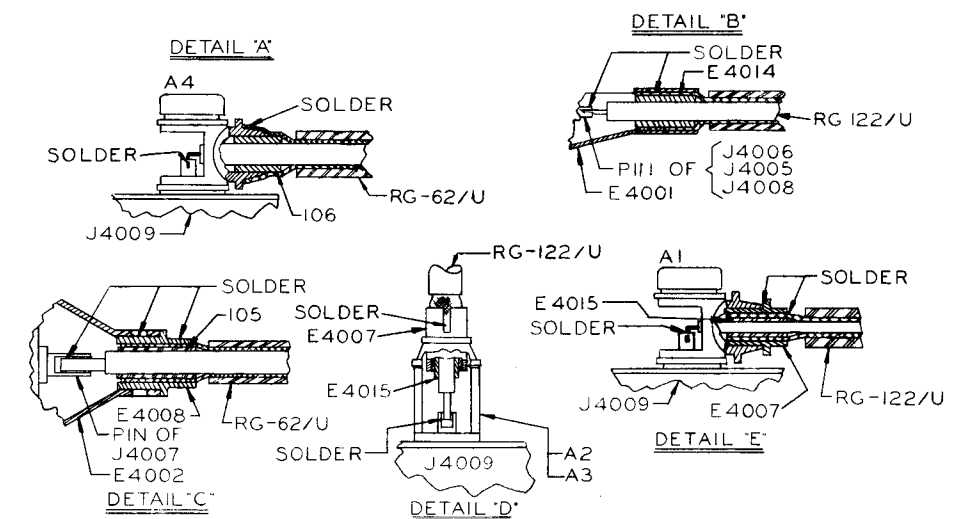
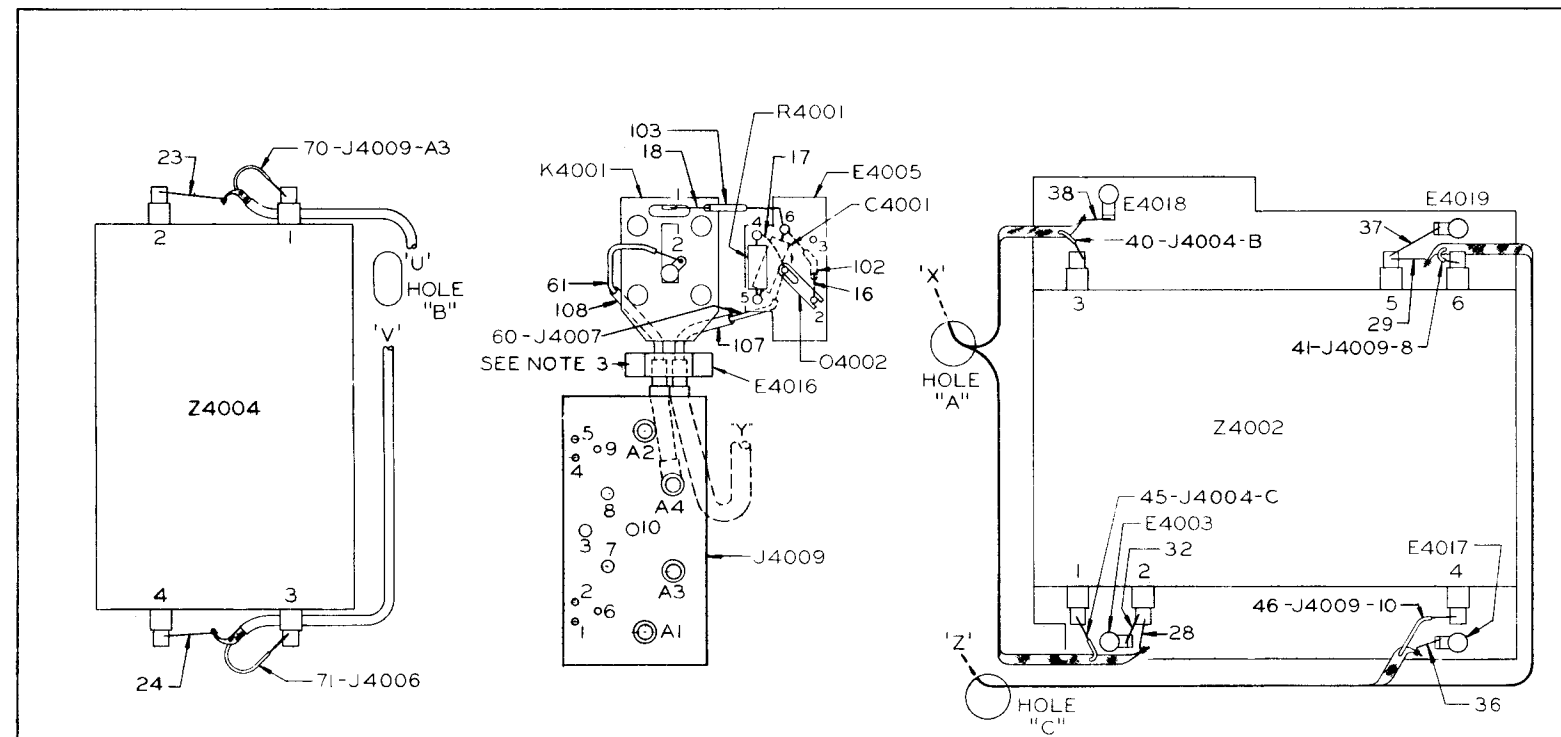
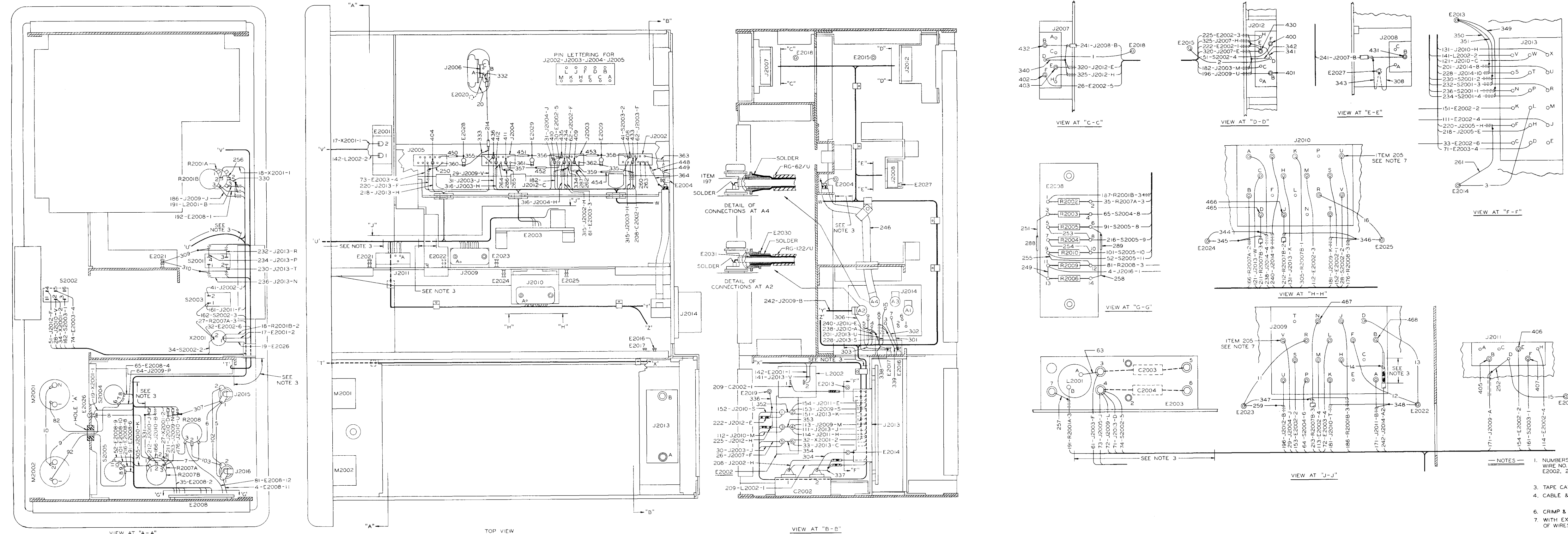


Figure 7-46. Filter Assembly, Connection Diagram, AN/FRR-22 and -23

AN/FRR-21, -22, -23  
CORRECTIVE MAINTENANCE



WIRE NO	DESCRIPTION
1 TO 20, 30 TO 310	WIRE BLACK
26 TO 35	RED
41	RED-BLK. TR.
51-52	RED-YEL. TR.
61 TO 65	YELLOW
71 TO 74	CABLE-GRN. TR.
81-82	YEL-BLK. TR.
91-92	WHITE
101 TO 103	BLUE
111 TO 114	BRN-GRN. TR.
121	BRN-PUR. TR.
131	BRN-BLUE TR.
141-142	BROWN
151 TO 154	BRN-YEL. TR.
161-162	RED-BRN. TR.
166	SHIELDED, RED-BLK. TR.
171	PURPLE
176	WHT-RED TR.
181-182	GREEN
186	YEL-BRN. TR.
191-192	YELLOW
196	GRN-BLK. TR.
201	GRAY
208-209	WIRE, SHIELDED, BROWN
211 TO 214	CABLE, COAXIAL
216	WIRE, WHT-BLK. TR.
218	SHIELDED, BRN-GRN. TR.
220	SHIELDED, BRN-YEL. TR.
222	BRN-RED TR.
225	BRN-GRN. TR.
228	GRAY-BLK. TR.
230	GRAY-BRN. TR.
232	GRAY-RED TR.
234	GRAY-GRN. TR.
236	GRAY-YEL. TR.
238	WHT-BLK. TR.
240	WIRE, SHIELDED, WHT-BRN. TR.
241-242	CABLE, COAXIAL
246	CABLE, COAXIAL
249 TO 265	WIRE, TINNED COPPER .020 DIA.
266 TO 289	SLEEVING .022 I.D.
315-316	WIRE, SHIELDED, BRN.
320	SHIELDED, BRN-YEL. TR.
325	SHIELDED, BRN-GRN. TR.
330 TO 364	WIRE, TINNED COPPER .032 DIA.
400 TO 412	SLEEVING .095 I.D.
430 TO 436	.133 I.D.
448 TO 454	.034 I.D.
465 TO 468	SLEEVING .106 I.D.

- NOTES
- NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATE WIRE NO. & DESTINATION OF WIRE THUS: 151-E2002-2, 151= WIRE NO., E2002= ITEM E2002, 2= TERMINAL 2 OF E2002 AS INDICATED ON THIS DRAWING.
  - TAPE CABLE WHERE INDICATED
  - CABLE & LACE WIRES AS INDICATED
  - CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS USING ITEM 148 SOLDER
  - WITH EXCEPTIONS AS INDICATED ASSEMBLE ITEM 205 SLEEVING OVER ENDS OF WIRES & TERMINALS AT J2009 & J2010.

Figure 7-47. Main Frame Connection Diagram, AN/FRR-21

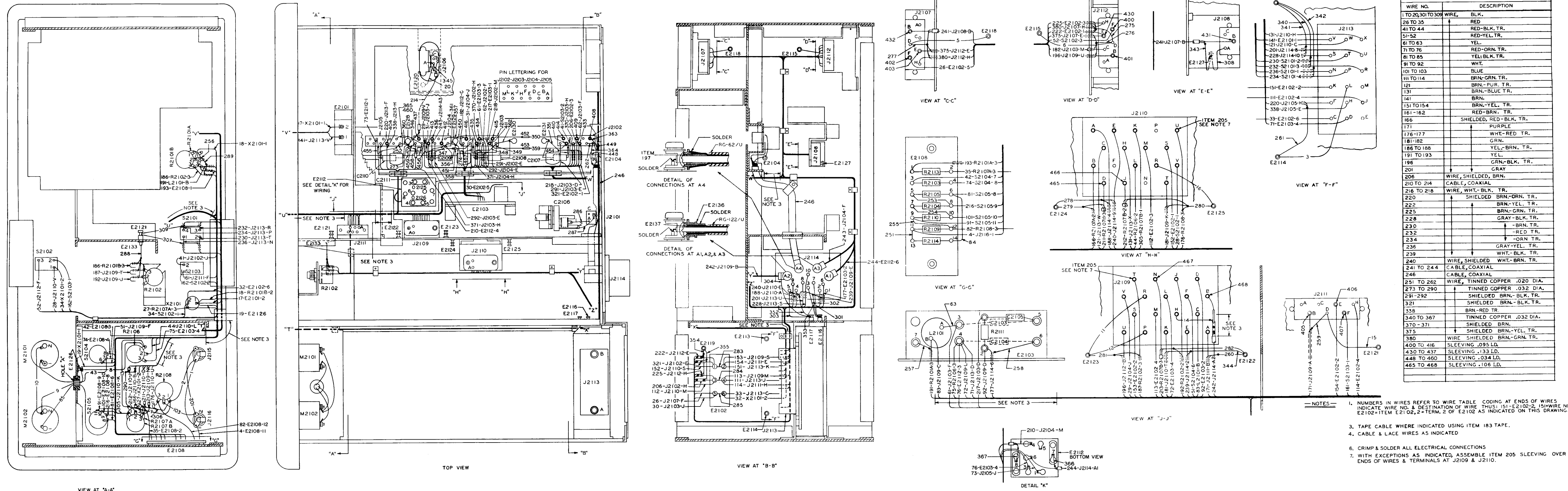
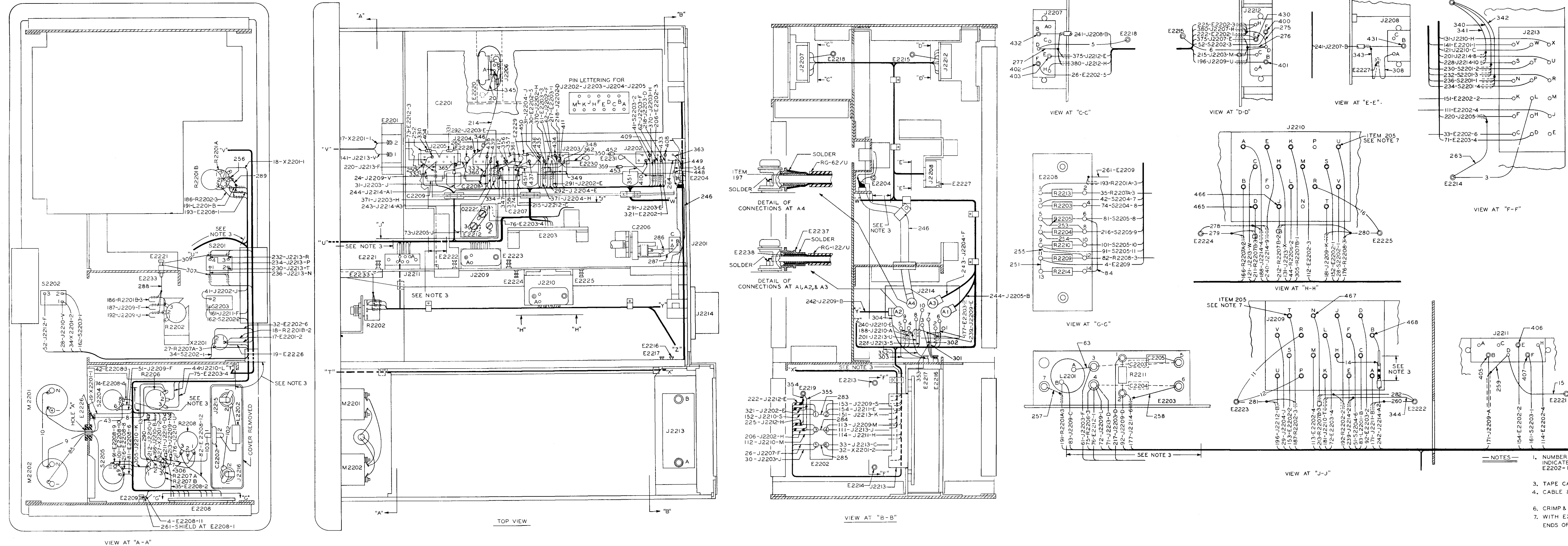


Figure 7-48. Main Frame Connection Diagram, AN/FRR-22

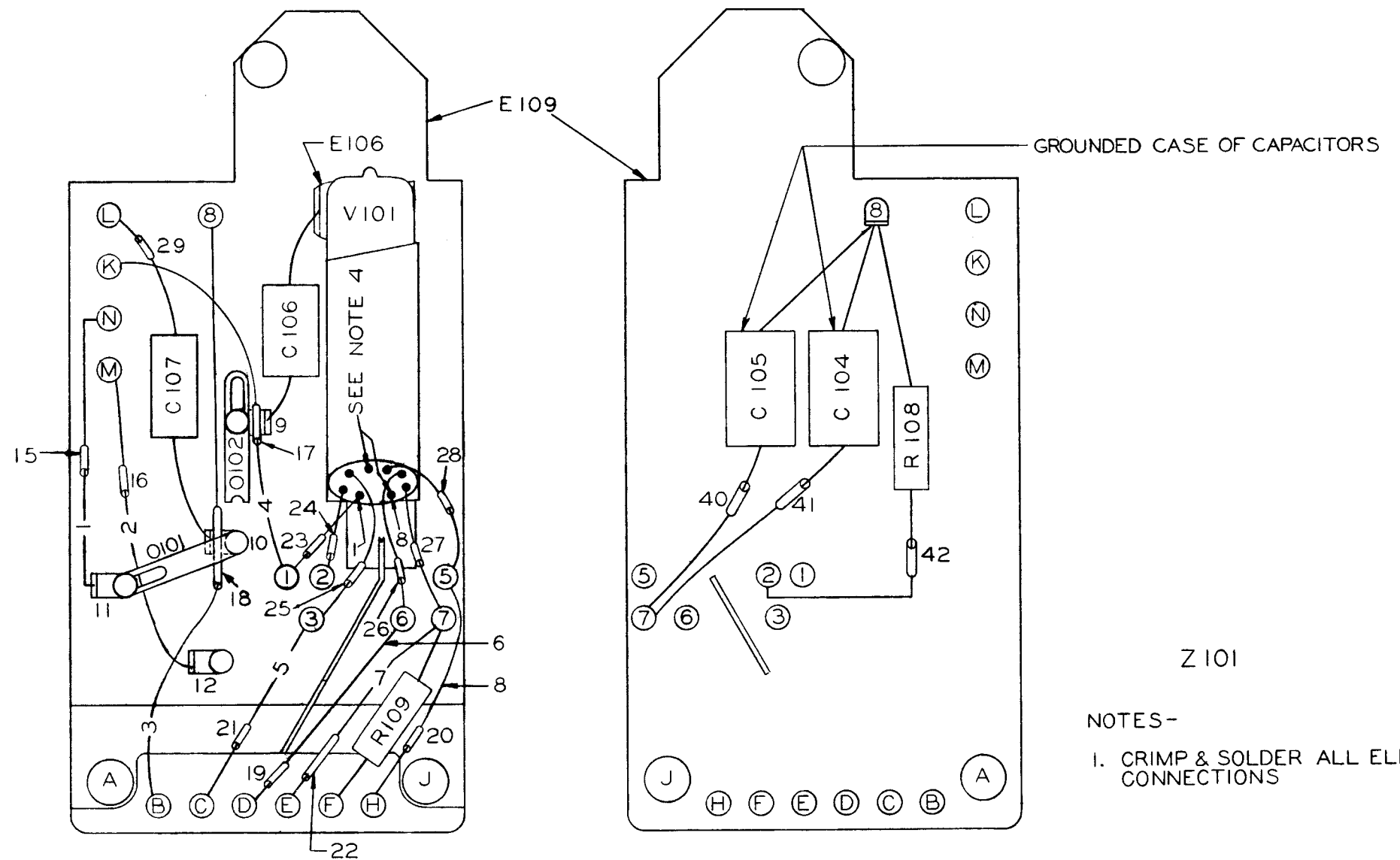




WIRE NO.	DESCRIPTION
3 TO 20, 30 TO 309	WIRE, BLK.
26 TO 35	RED
41 TO 44	RED-BLK. TR.
51-52	RED-YEL. TR.
61 TO 63	YEL.
71 TO 76	RED-ORN. TR.
81 TO 85	YEL-BLK. TR.
91 TO 92	WHT.
101 TO 103	BLUE
111 TO 114	BRN-GRN. TR.
121	BRN-PUR. TR.
131	BRN-BLUE TR.
141	BRN.
151 TO 154	BRN-YEL. TR.
161-162	RED-BRN. TR.
166	SHIELDED, RED-BLK. TR.
171	PURPLE
176-177	WHT-RED TR.
181	GRN.
186 TO 188	YEL-BRN. TR.
191 TO 193	YEL.
196	GRN-BLK. TR.
201	GRAY
206	WIRE, SHIELDED, BRN.
211 TO 215	CABLE, COAXIAL
216 TO 218	WIRE, WHT-BLK. TR.
220	SHIELDED BRN-ORN. TR.
222	BRN-YEL. TR.
225	BRN-GRN. TR.
228	GRAY-BLK. TR.
230	-BRN. TR.
232	-RED TR.
234	-ORN. TR.
236	GRAY-YEL. TR.
239	WHT-BLK. TR.
240	WIRE, SHIELDED WHT-BRN. TR.
241 TO 244	CABLE, COAXIAL
246	CABLE, COAXIAL
250 TO 264	WIRE, TINNED COPPER .020 DIA.
274 TO 290	TINNED COPPER .032 DIA.
291-292	SHIELDED BRN-BLK. TR.
321	WIRE, SHIELDED BRN-BLK. TR.
330 TO 334	SLEEVING .022 I.D.
340 TO 365	WIRE, TINNED COPPER .032 DIA.
370-371	SHIELDED BRN.
375	SHIELDED BRN-YEL. TR.
380	WIRE SHIELDED BRN-GRN. TR.
400 TO 412	SLEEVING .095 I.D.
430 TO 439	SLEEVING .133 I.D.
448 TO 453	SLEEVING .034 I.D.
465 TO 468	SLEEVING .106 I.D.

- NOTES
- NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATE WIRE NO. & DESTINATION OF WIRE. THUS: 151-E2202-2, 151=WIRE NO., E2202=ITEM E2202, 2=TERM. 2 OF E2202 AS INDICATED ON THIS DRAWING.
  - TAPE CABLE WHERE INDICATED
  - CABLE & LACE WIRES AS INDICATED
  - CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS USING ITEM 148 SOLDER.
  - WITH EXCEPTIONS AS INDICATED, ASSEMBLE ITEM 205 SLEEVING OVER ENDS OF WIRES & TERMINALS AT J2209 & J2210.

Figure 7-49. Main Frame Connection Diagram, AN/FRR-23



Z 101

NOTES-

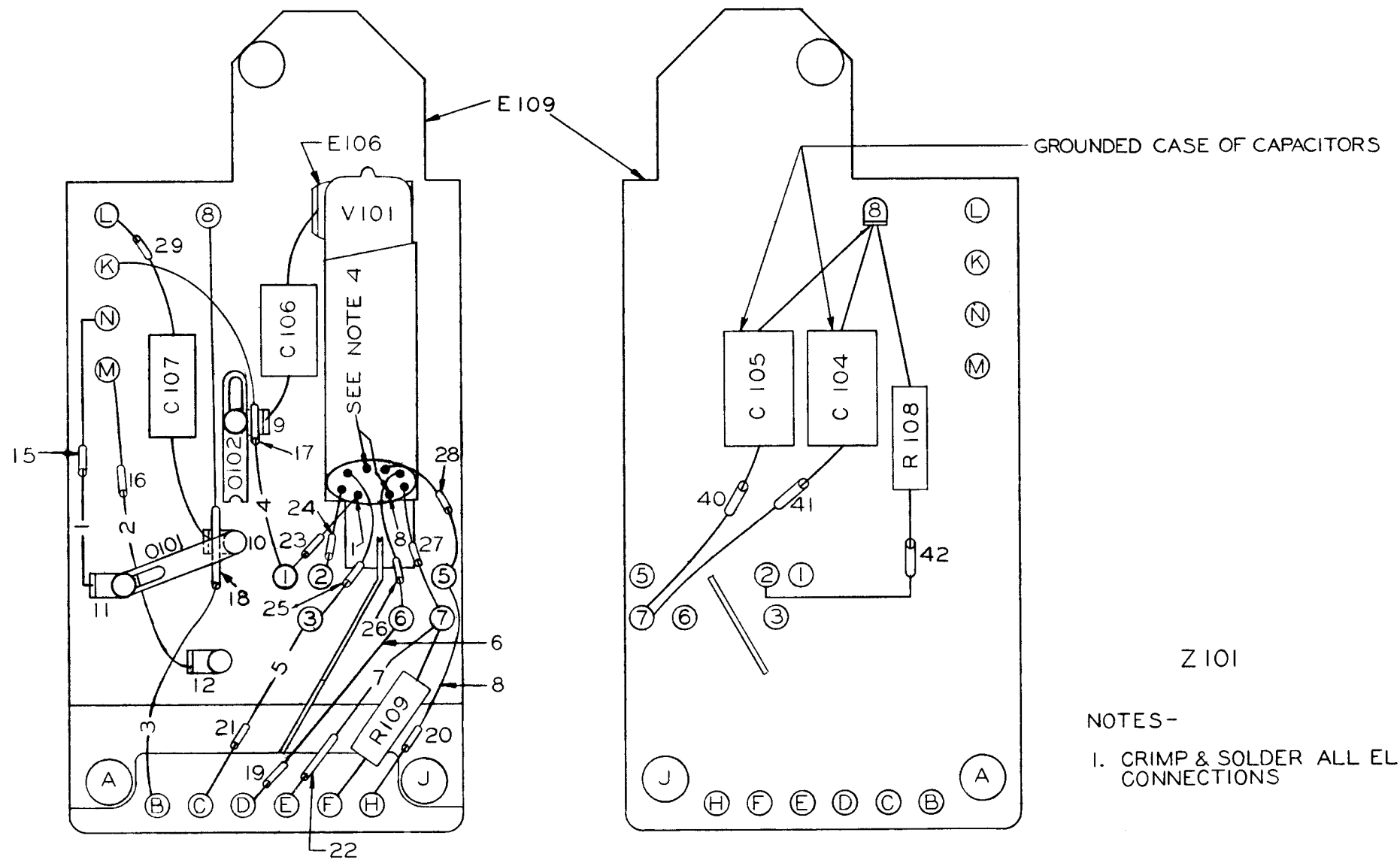
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.
4. LEAD NO'S. 4 & 8 OF V 101 CUT OFF CLOSE TO BASE.

WIRE TABLE	
WIRE NO	DESCRIPTION
1-8 INCL.	WIRE TINNED COPPER .020 DIA
15-29 INCL.	SLEEVING .022 I.D.
40-42 INCL.	SLEEVING .034 I.D.

ORIGINAL

Figure 7-50. Antenna Plug-in Board, Z101

7-153, 7-154



Z101

NOTES-

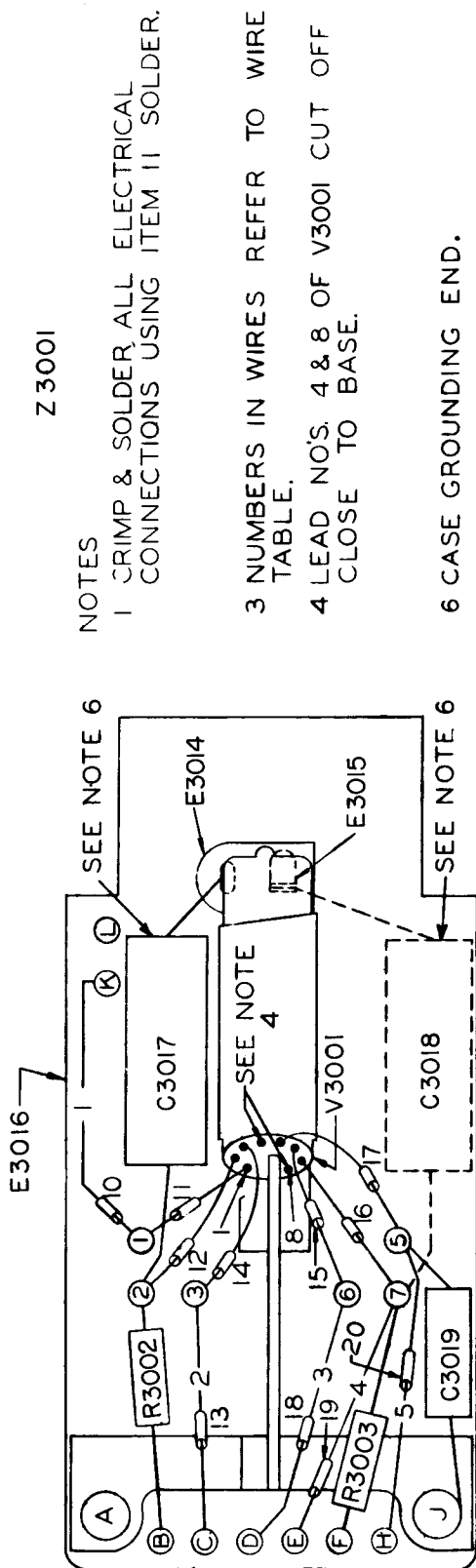
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.
4. LEAD NOS. 4 & 8 OF V101 CUT OFF CLOSE TO BASE.

WIRE TABLE	
WIRE NO	DESCRIPTION
1-8 INCL.	WIRE TINNED COPPER .020 DIA
15-29 INCL.	SLEEVING .022 I.D.
40-42 INCL.	SLEEVING .034 I.D.

ORIGINAL

Figure 7-50. Antenna Plug-in Board, Z101

7-153, 7-154



WIRE TABLE	
WIRE NO.	DESCRIPTION
1-5 INCL	WIRE TINNED COPPER .020 DIA.
10-20 INCL	SLEEVING .022 I.D.

Figure 7-51. Antenna Plug-in Board, Z3001

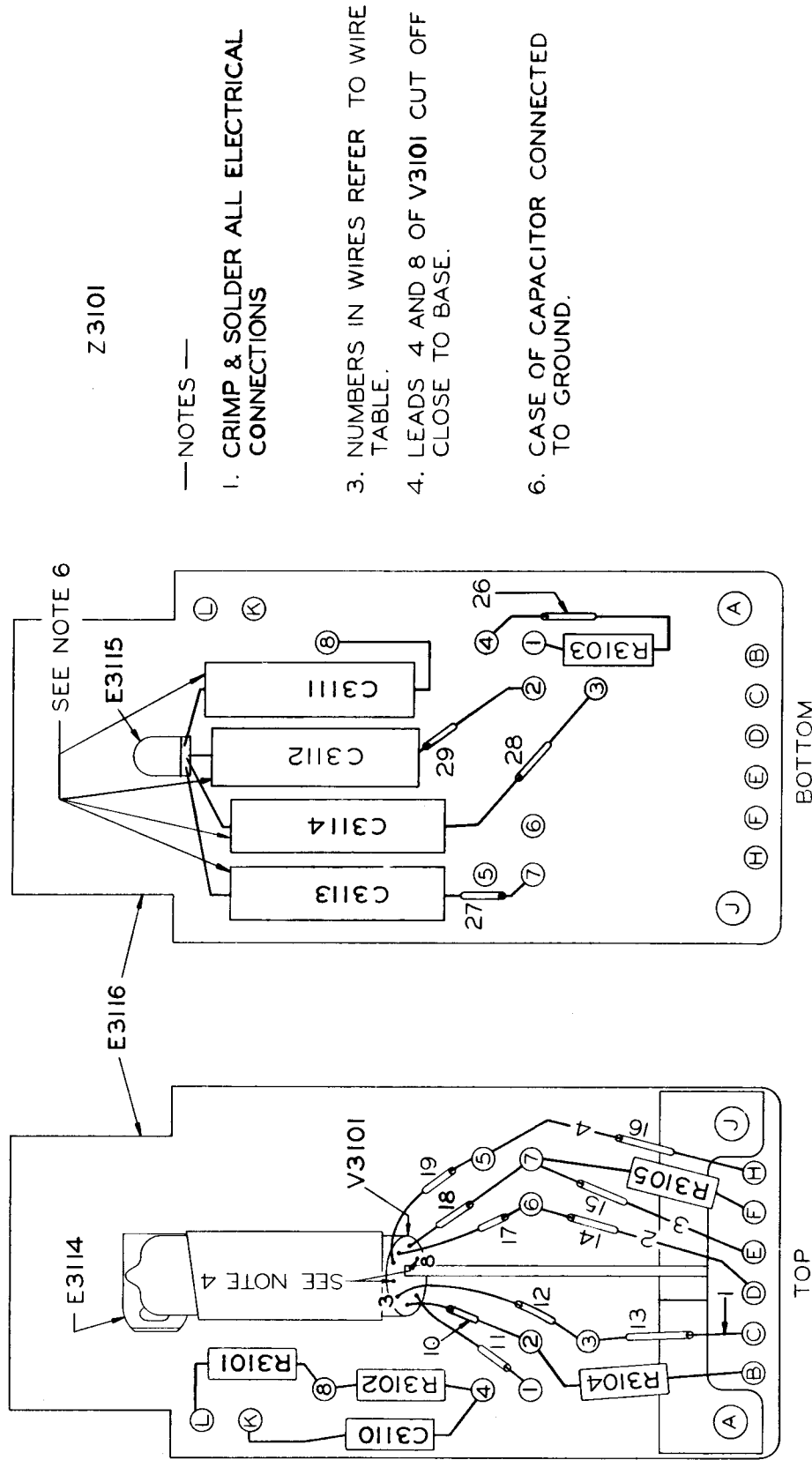
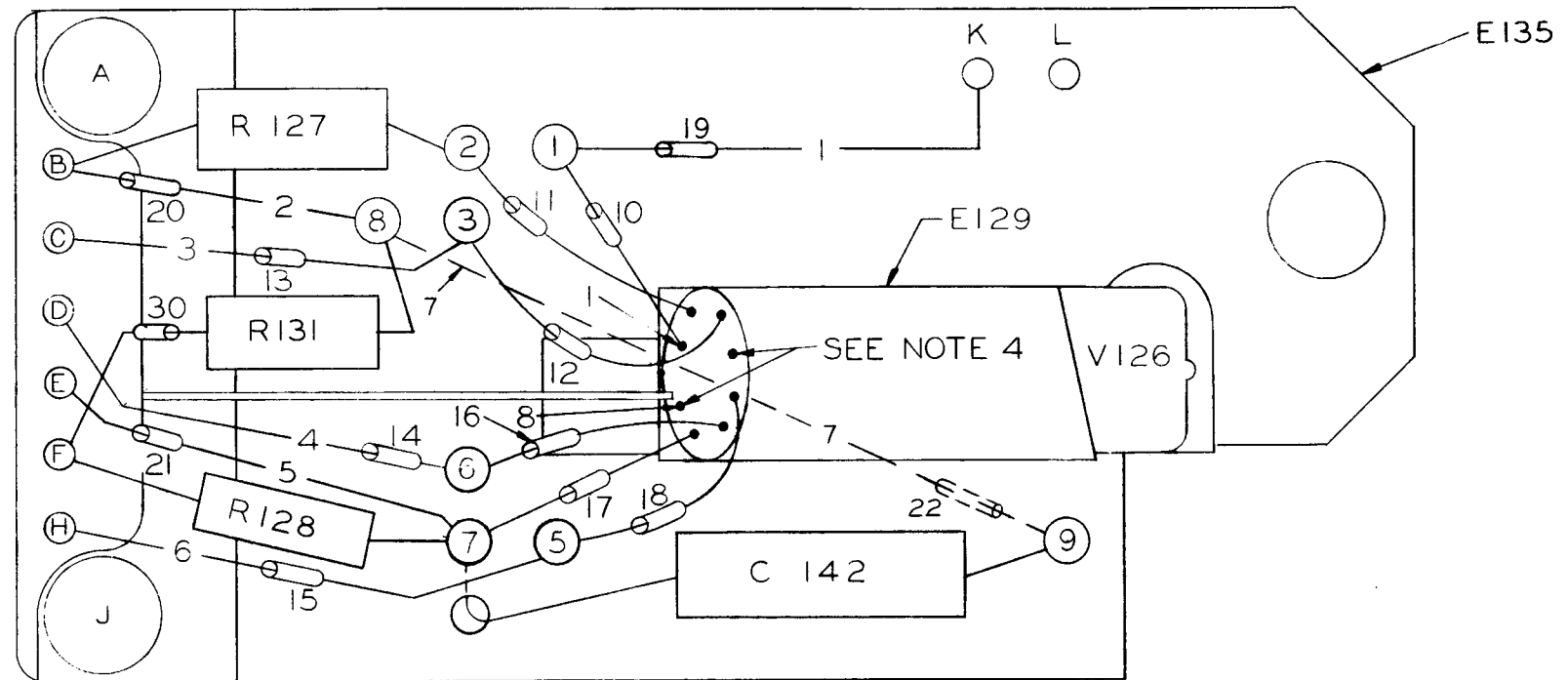


Figure 7-52. Antenna Plug-in Board, Z3101



Z126

NOTES-

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.
4. LEAD NOS. 4 & 8 OF V126 CUT OFF CLOSE TO BASE.

WIRE TABLE	
WIRE NO.	DESCRIPTION
1-7 INCL	WIRE TINNED COPPER .020 DIA.
10-22 INCL	SLEEVING .022 I.D.
30	SLEEVING .034 I.D.

ORIGINAL

Figure 7-53. R-F Plug-in Board, Z126

7-157, 7-158

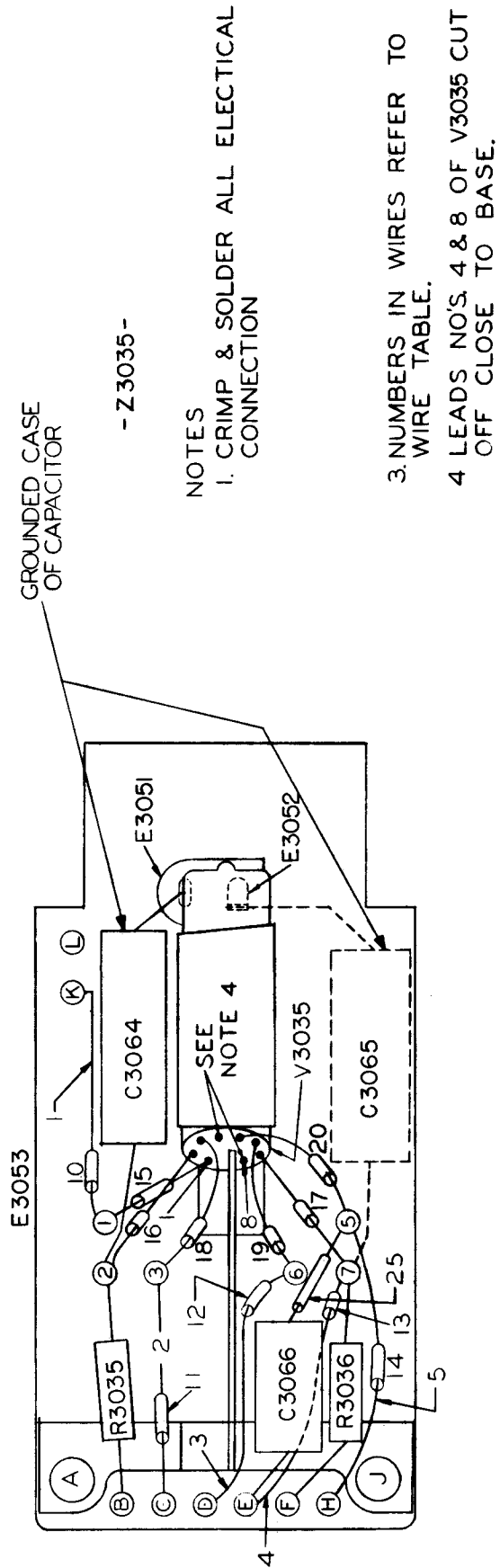


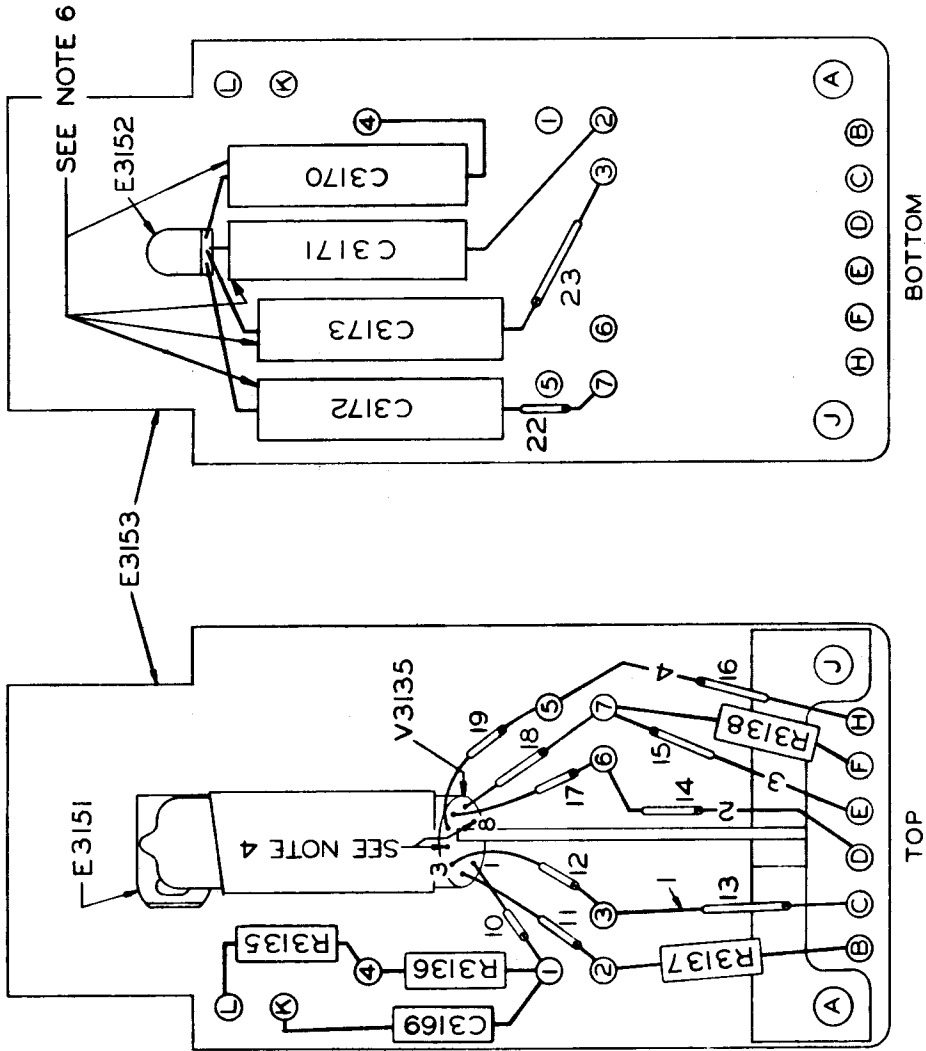
Figure 7-54. R-F Plug-in Board, Z3035

WIRE TABLE	
WIRE NO.	DESCRIPTION
1-5	INCL. WIRE TINNED COPPER .020 DIA.
10-20	INCL. SLEEVING .022 ID.
25	SLEEVING .034 ID.

Z 3135

—NOTES —

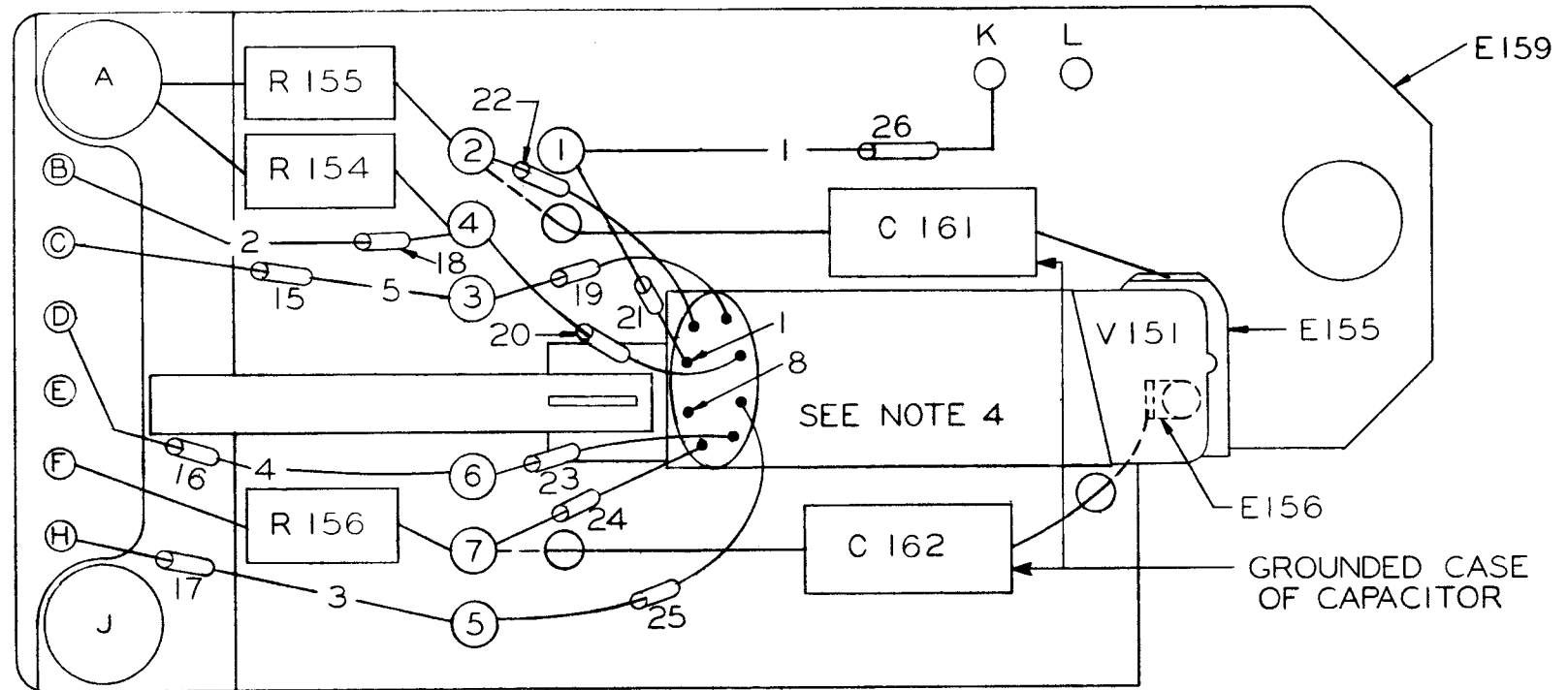
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.
4. LEADS 4 AND 8 OF V3135 CUT OFF CLOSE TO BASE.
6. CASE OF CAPACITOR CONNECTED TO GROUND.



WIRE TABLE	
WIRE NO.	DESCRIPTION
1-4	WIRE TINNED COPPER .020 DIA.
10-19	INCL. SLEEVING .022 I.D.
22-23	INCL. SLEEVING .034 I.D.

Figure 7-55. R-F Plug-in Board, Z3135





Z 151

NOTES-

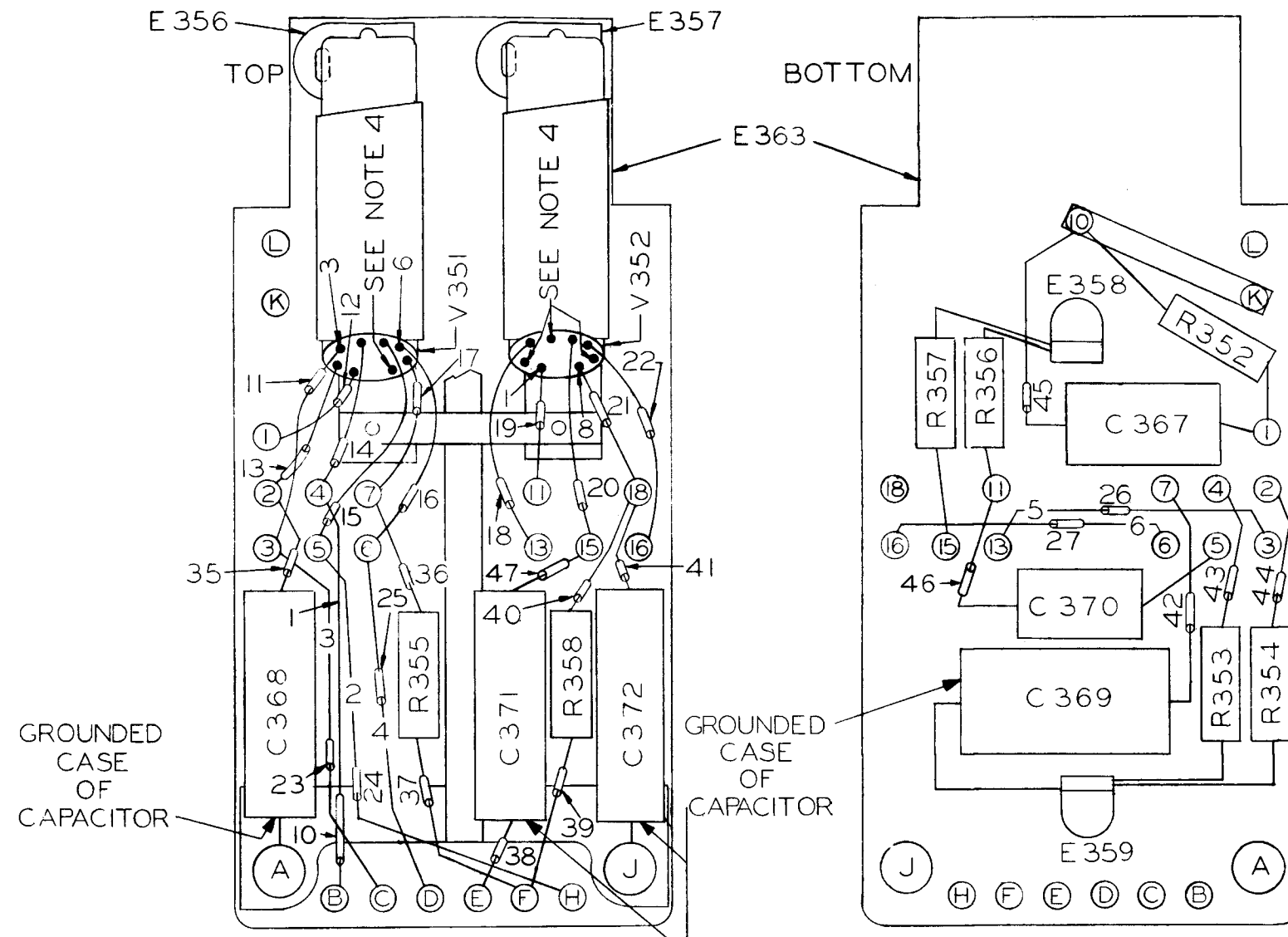
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.
4. LEAD NO. 8 OF V 151 CUT OFF CLOSE TO BASE.

WIRE TABLE	
WIRE NO.	DESCRIPTION
1-5 INCL.	WIRE TINNED COPPER .020 DIA. PS 105
15-26 INCL.	SLEEVING .022 I.D. PS753-B1

ORIGINAL

Figure 7-56. Mixer Plug-in Board, Z151

7-161, 7-162



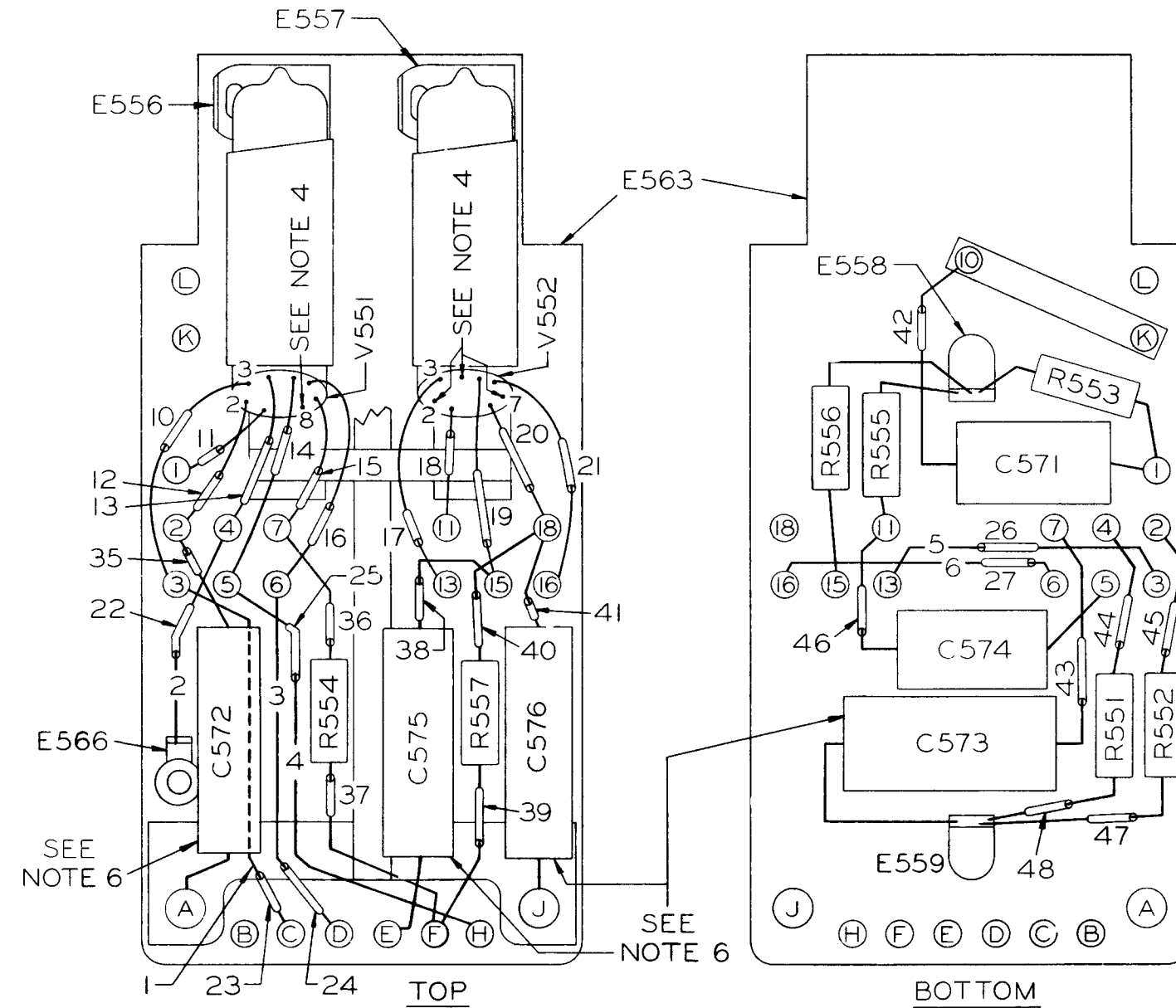
Z351

NOTES:

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.
4. LEAD NO 8 OF V351 & LEADS NOS. 2,4,&7 OF V352 CUT OFF CLOSE TO BASE.

WIRE TABLE	
WIRE NO.	DESCRIPTION
1-6 INCL.	WIRE TINNED COPPER .020 DIA.
10-27 INCL.	SLEEVING .022 I.D.
35-47 INCL.	SLEEVING .034 I.D.

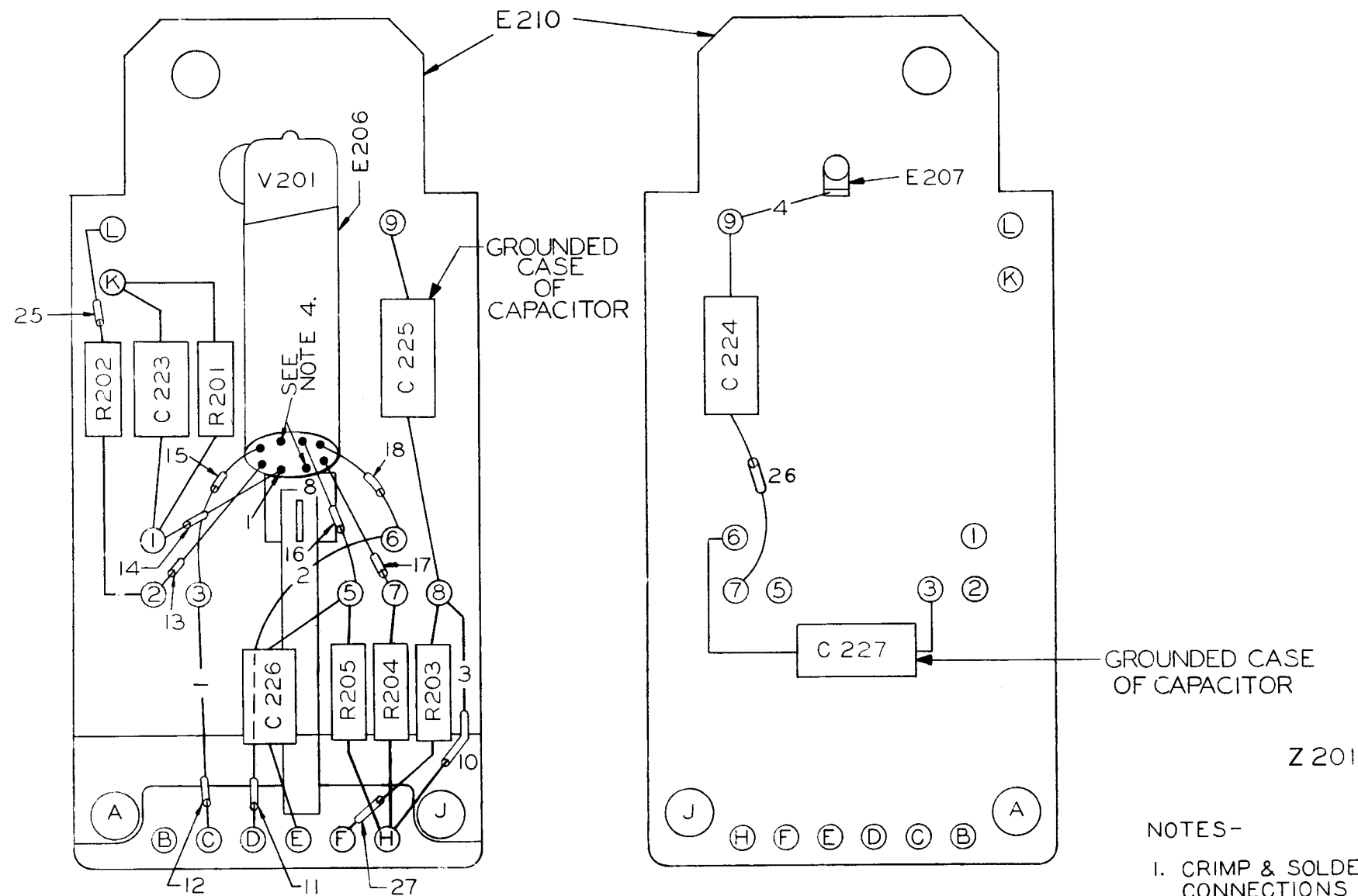
Figure 7-57. Mixer Plug-in Board, Z351



- Z551
- NOTES —
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
  3. NUMBERS IN WIRES REFER TO WIRE TABLE.
  4. LEAD 8 OF V551 AND LEADS 2, 4, & 7 OF V552 CUT OFF CLOSE TO BASE.
  6. CASE OF CAPACITOR CONNECTED TO GROUND.

WIRE TABLE		
WIRE NO.	DESCRIPTION	
1-6 INCL.	WIRE TINNED COPPER	.020 DIA.
10-27 INCL.	SLEEVING	.022 I.D.
35-48 INCL.	SLEEVING	.034 I.D.

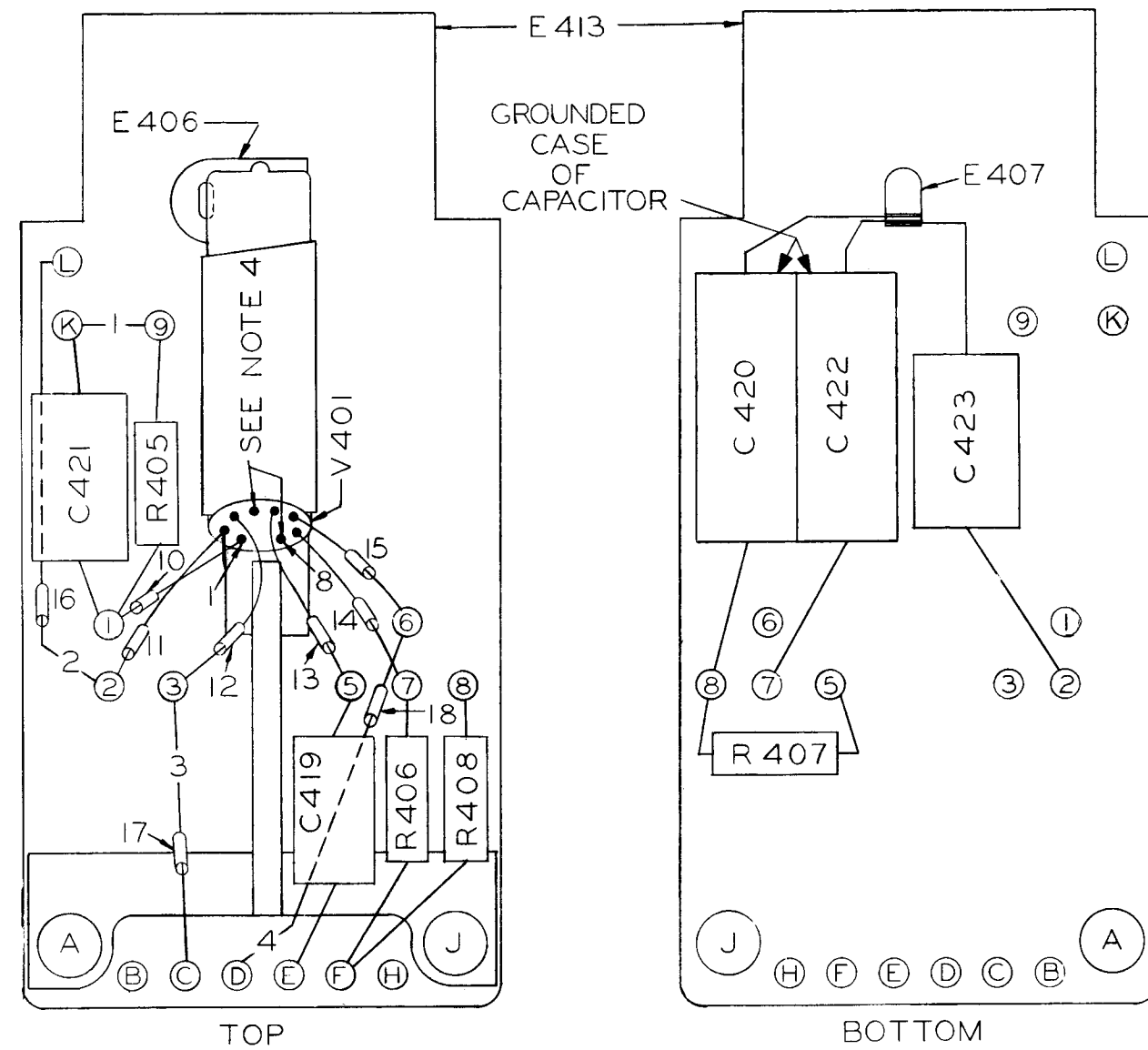
Figure 7-58. Mixer Plug-in Board, Z551



- NOTES-
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
  3. NUMBERS IN WIRES REFER TO WIRE TABLE.
  4. LEAD NOS. 4 & 8 OF V201 CUT OFF CLOSE TO BASE.

WIRE TABLE	
WIRE NO.	DESCRIPTION
1-4 INCL.	WIRE TINNED COPPER .020 DIA.
10-18 INCL.	SLEEVEING .022 I.D.
25-27 INCL.	SLEEVEING .034 I.D.

Figure 7-59. Oscillator Plug-in Board, Z201



— Z 401 —

NOTES

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

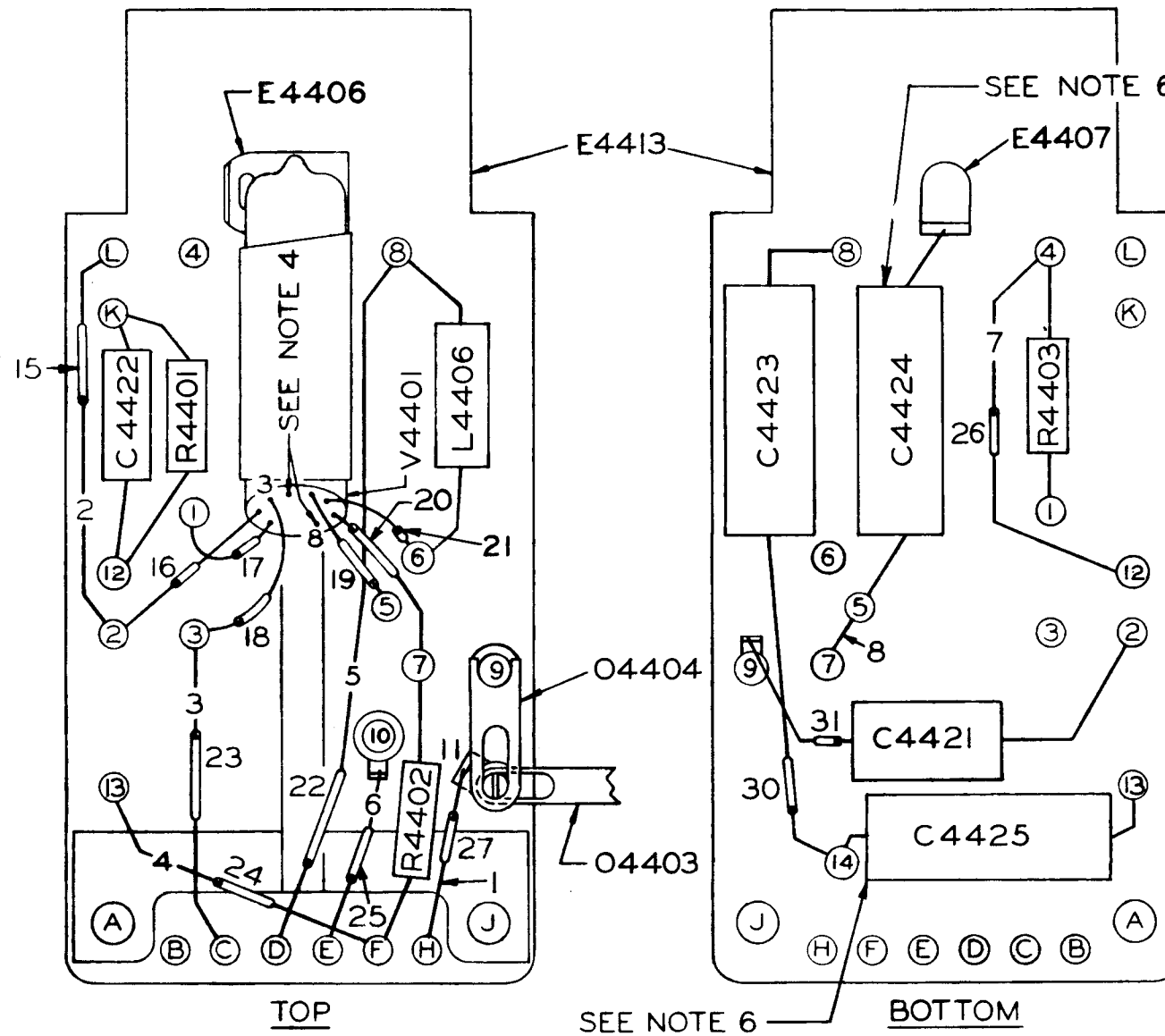
3. NUMBERS IN WIRES REFER TO WIRE TABLE.

4. LEADS NO'S. 4 & 8 OF V401 CUT OFF CLOSE TO BASE.

WIRE TABLE	
WIRE NO.	DESCRIPTION
1-4 INCL.	WIRE-TINNED COPPER .020 DIA.
10-18 INCL.	SLEEVING 022 I.D.

Figure 7-60. Oscillator Plug-in Board, Z401

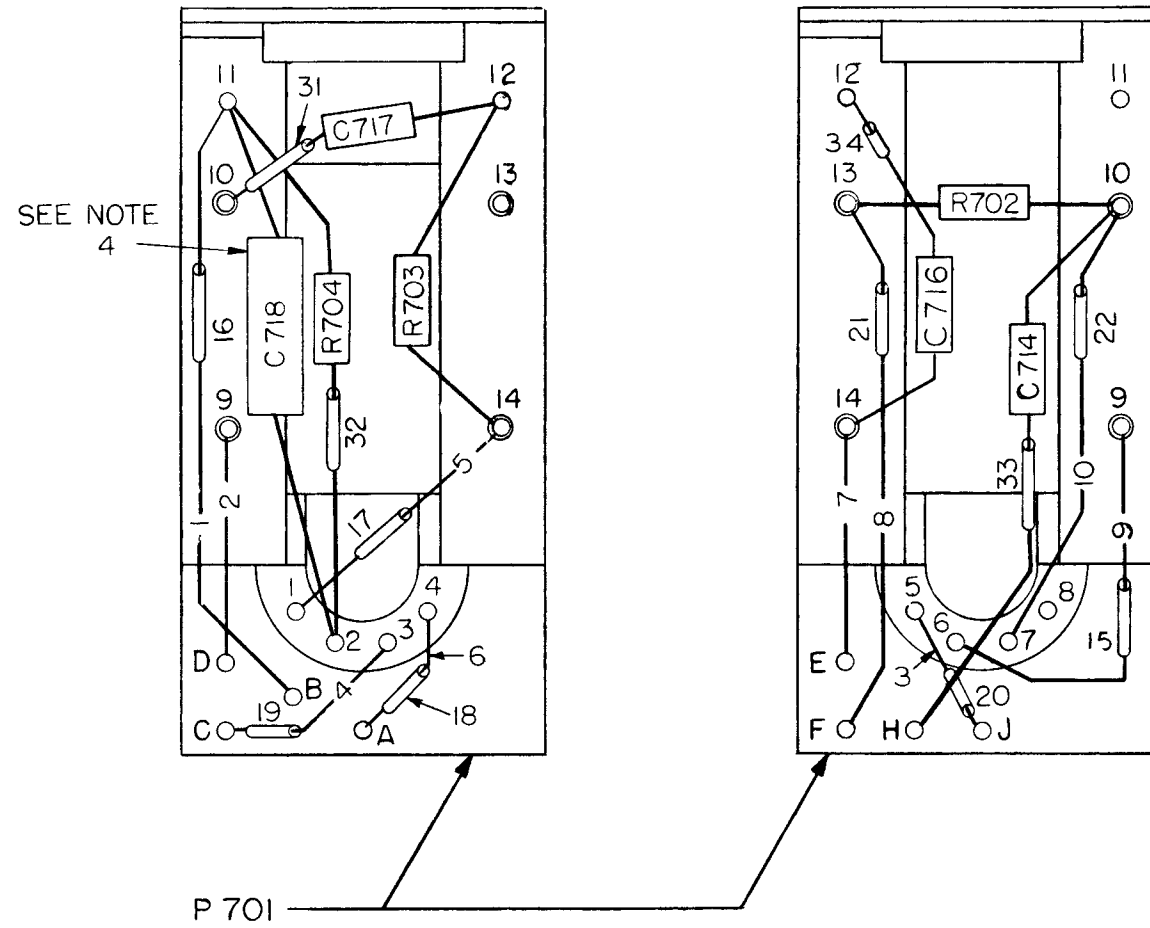
7-169, 7-170



- Z4401
- NOTES—
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
  3. NUMBERS IN WIRES REFER TO WIRE TABLE.
  4. LEADS 4 AND 8 OF V4401 CUT OFF CLOSE TO BASE.
  6. CASE OF CAPACITOR CONNECTED TO GROUND.

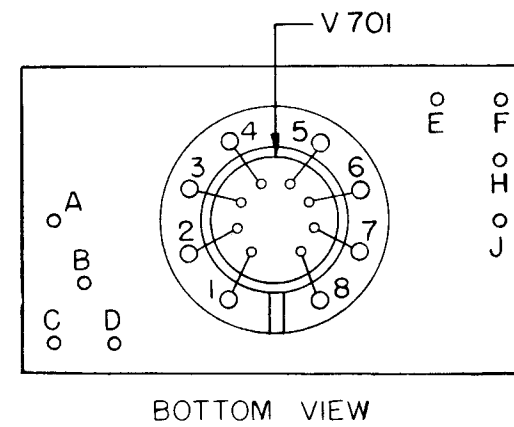
WIRE TABLE		
WIRE NO.	DESCRIPTION	
1-8 INCL.	WIRE TINNED COPPER	.020 DIA.
15-27 INCL.	SLEEVING	.022 I.D.
30-31	SLEEVING	.034 I.D.

Figure 7-61. Oscillator Plug-in Board, Z4401



WIRE TABLE	
WIRE NO.	DESCRIPTION
1-10 INCL.	WIRE, TINNED COPPER .020 DIA.
15-22 INCL.	SLEEVING .022 I.D.
31-34 INCL.	SLEEVING .034 I.D.

- NOTES
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
  3. NOS. IN WIRES REFER TO WIRE TABLE.
  4. CASE OF CAPACITOR CONNECTED TO TERMINAL 11.

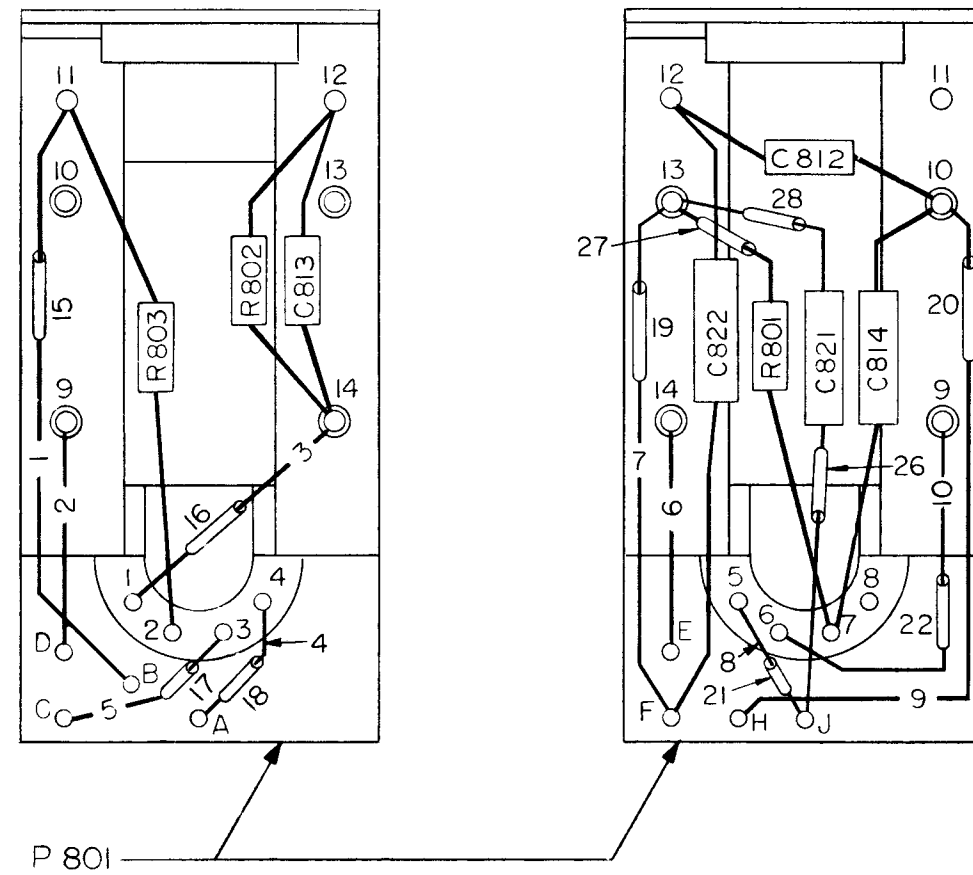


Z 701

ORIGINAL

Figure 7-62. First I-F Plug-in Unit, Z701

7-173, 7-174

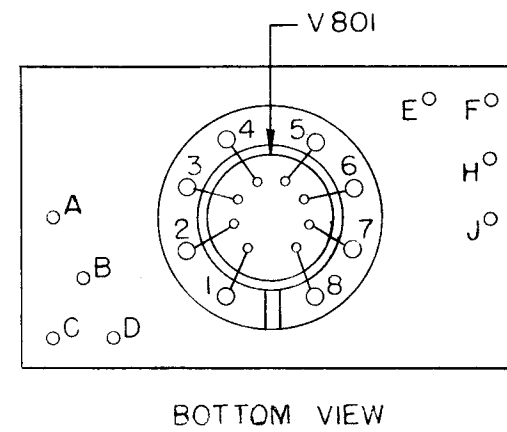


WIRE TABLE	
WIRE NO	DESCRIPTION
1-10 INCL	WIRE TINNED COPPER .020 DIA
15-22 INCL	SLEEVING .022 I D
26-28 INCL.	SLEEVING .034 I.D.

Z 801

NOTES

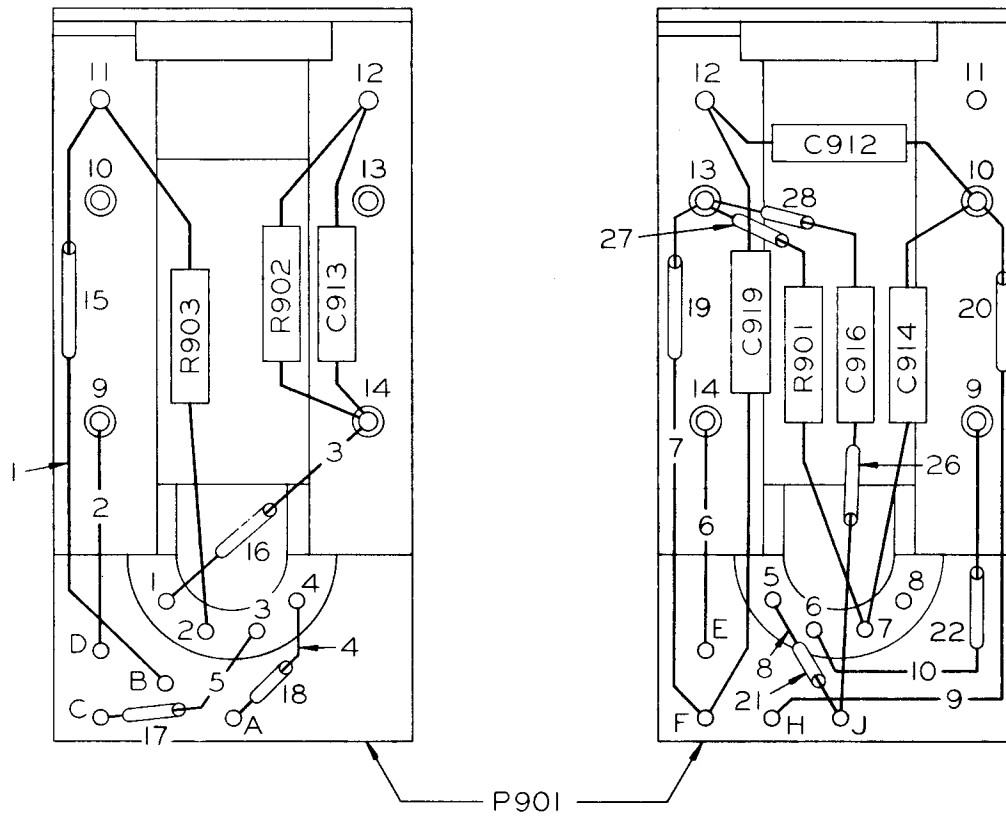
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS USING ITEM 15 SOLDER.
3. NOS. IN WIRES REFER TO WIRE TABLE.



BOTTOM VIEW

Figure 7-63. First I-F Plug-in Unit, Z801





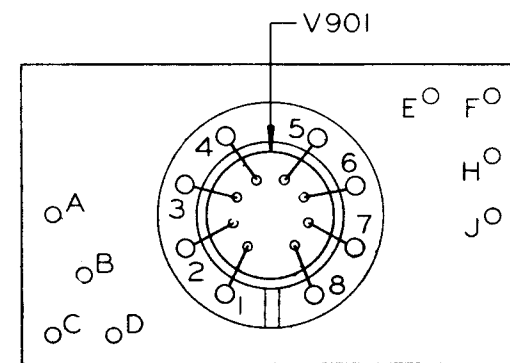
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-10 INCL.	WIRE, TINNED COPPER .020 DIA.
15-22 INCL.	SLEEVING .022 I.D.
26-28 INCL.	SLEEVING .034 I.D.

Z901

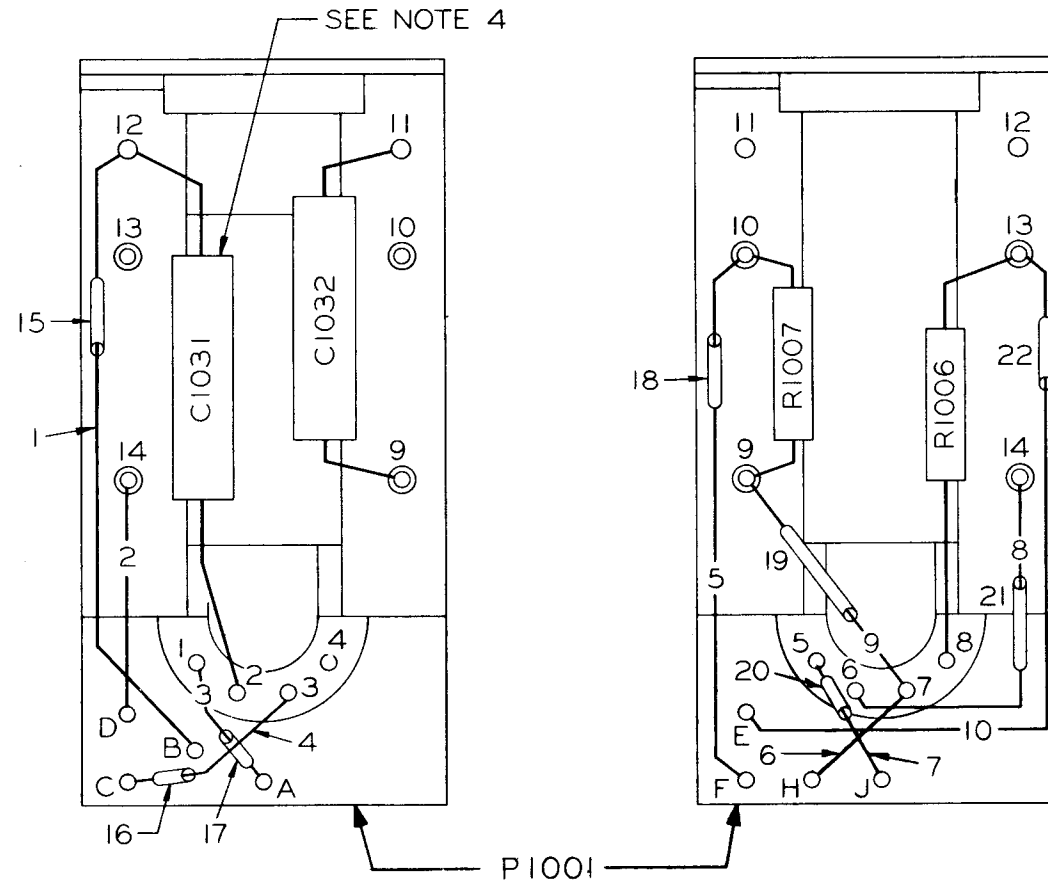
— NOTES —

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

3. NUMBERS IN WIRES REFER TO WIRE TABLE.



BOTTOM VIEW

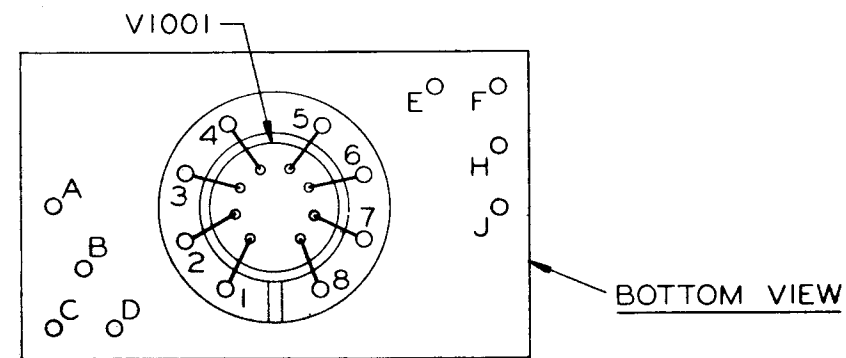


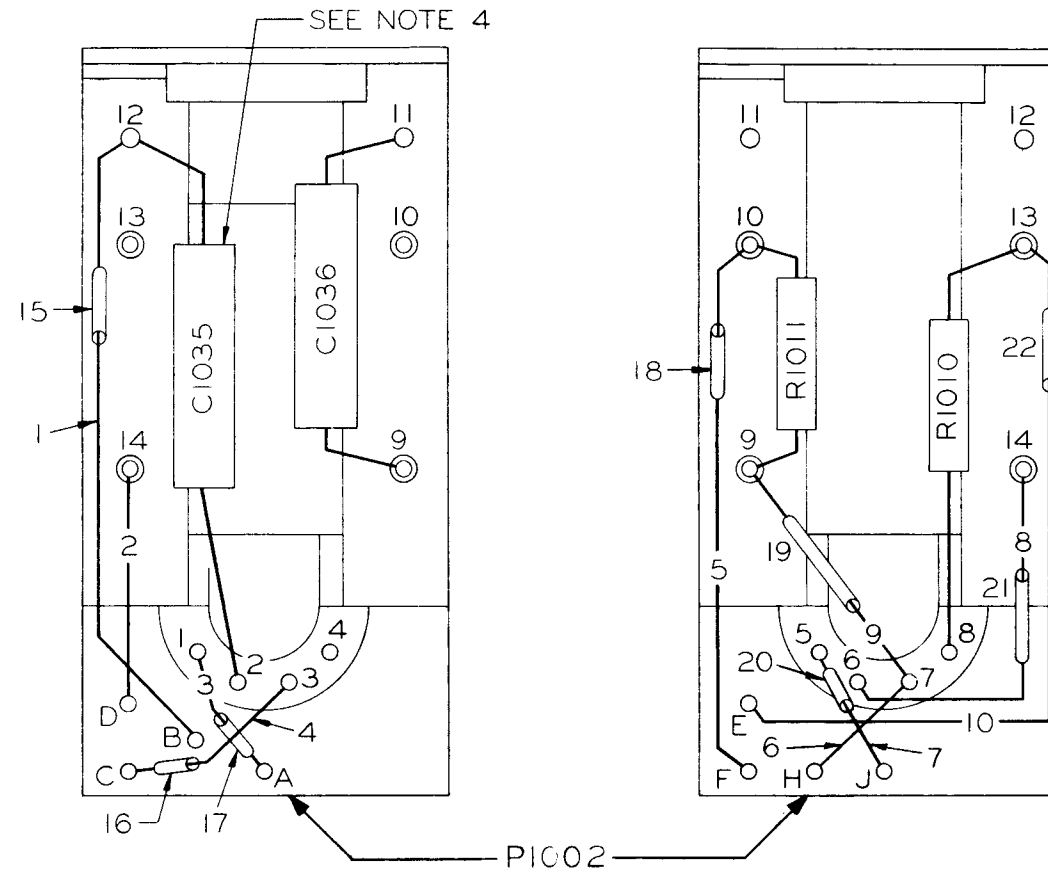
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-10 INCL.	WIRE, TINNED COPPER .020 DIA.
15-22 INCL.	SLEEVING .022 I.D.

Z 10 0 4

NOTES

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.
4. CASE OF CAPACITOR CONNECTED TO GROUND.



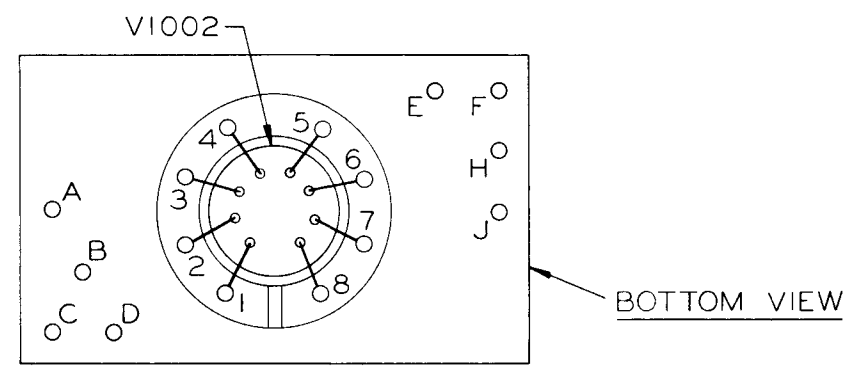


WIRE TABLE	
WIRE NO.	DESCRIPTION
1-10 INCL.	WIRE, TINNED COPPER .020 DIA.
15-22 INCL.	SLEEVING .022 I.D.

Z1006

NOTES

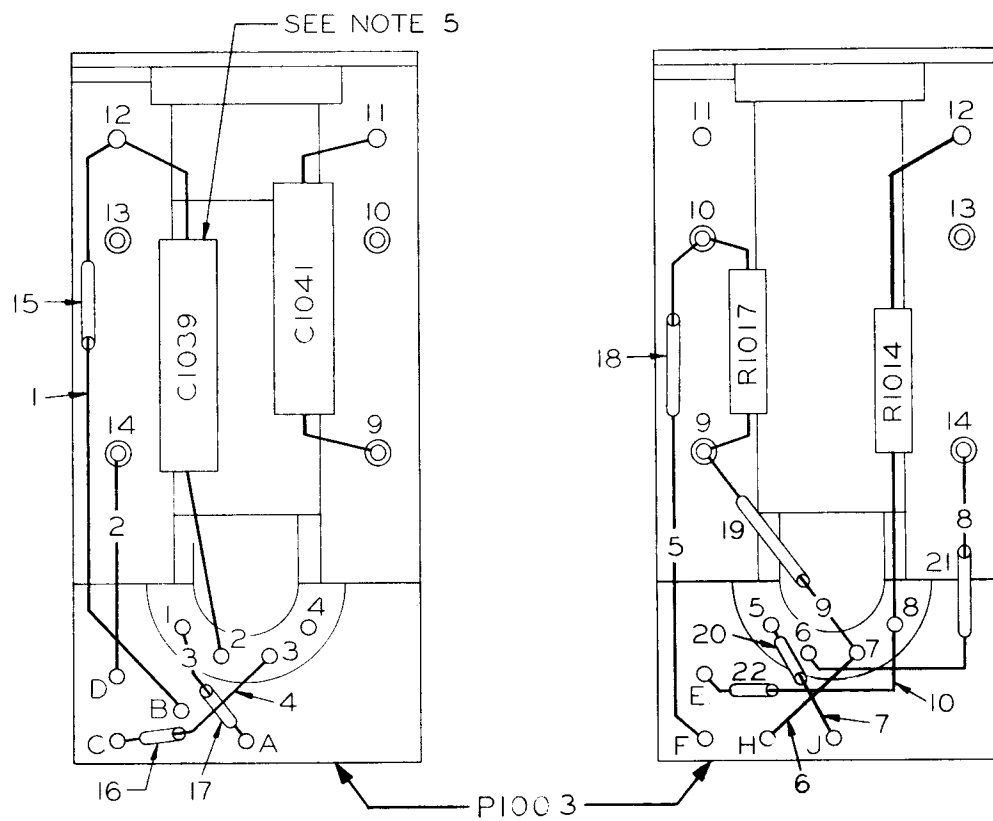
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.
4. CASE OF CAPACITOR CONNECTED TO GROUND.



ORIGINAL

Figure 7-66. Second I-F Plug-in Unit, Z1006

7-181, 7-182

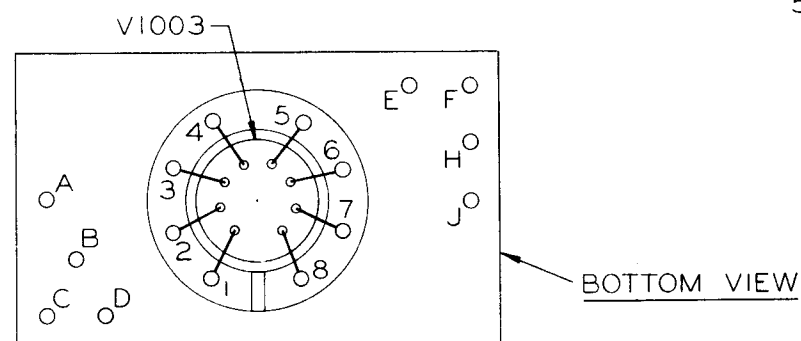


WIRE TABLE	
WIRE NO.	DESCRIPTION
1-10 INCL.	WIRE, TINNED COPPER .020 DIA.
15-22 INCL.	SLEEVING .022 I.D.

Z1008

NOTES

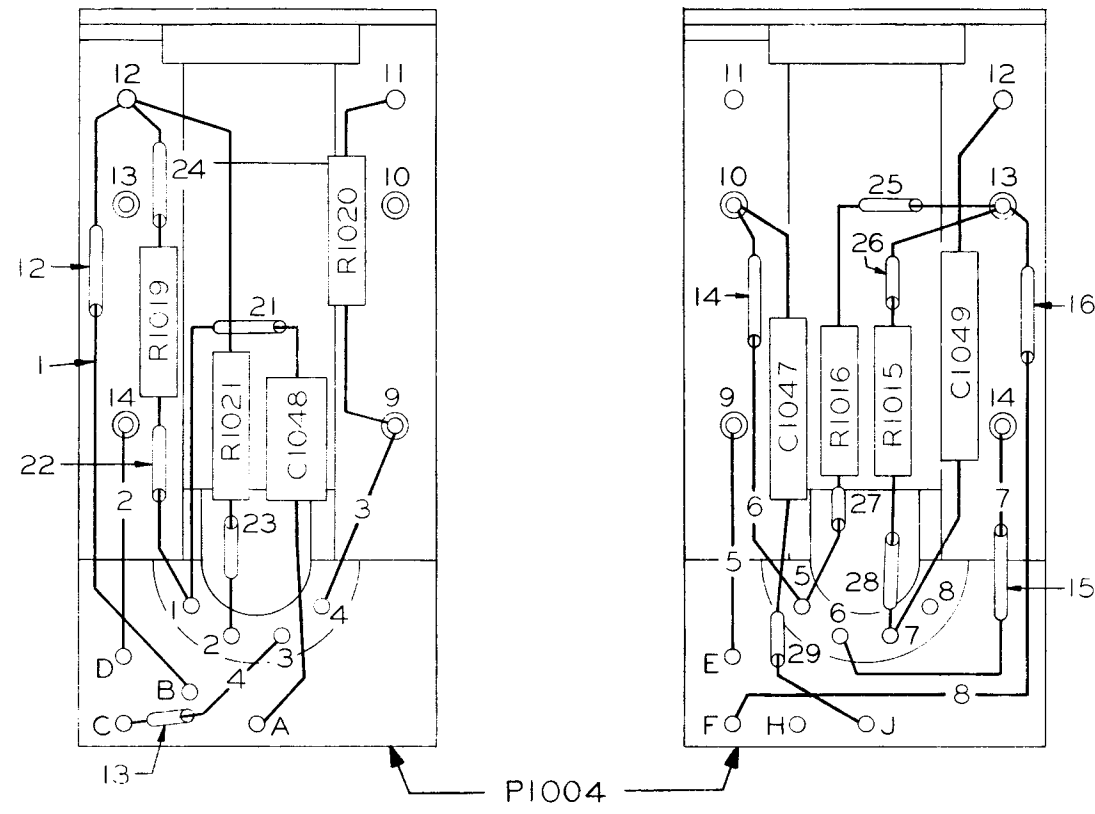
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS USING
3. NUMBERS IN WIRES REFER TO WIRE TABLE.
5. CASE OF CAPACITOR CONNECTED TO GROUND.



ORIGINAL

Figure 7-67. Second I-F Plug-in Unit, Z1008

7-183, 7-184

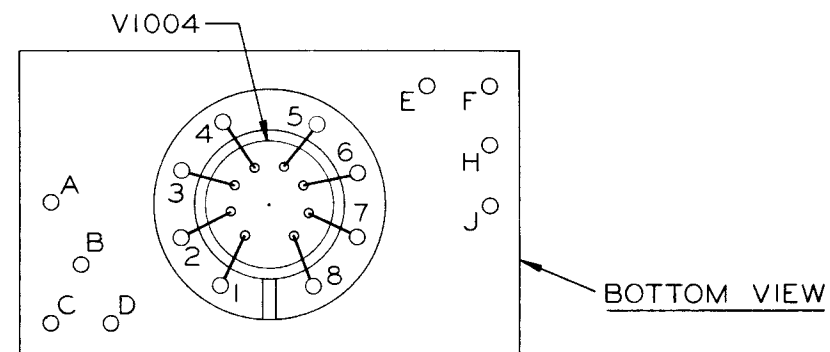


WIRE TABLE	
WIRE NO.	DESCRIPTION
1-8 INCL.	WIRE, TINNED COPPER .020 DIA.
12-16 INCL.	SLEEVING .022 I.D.
21-29 INCL.	SLEEVING .034 I.D.

Z1010

NOTES

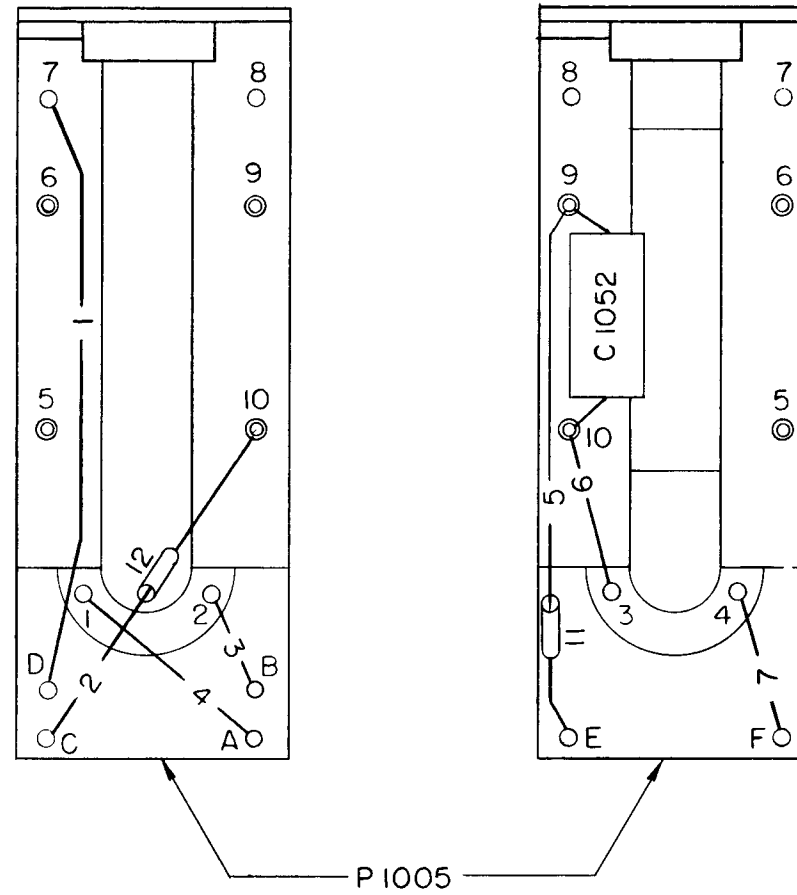
1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.



ORIGINAL

Figure 7-68. Second I-F Plug-in Unit, Z1010

7-185, 7-186



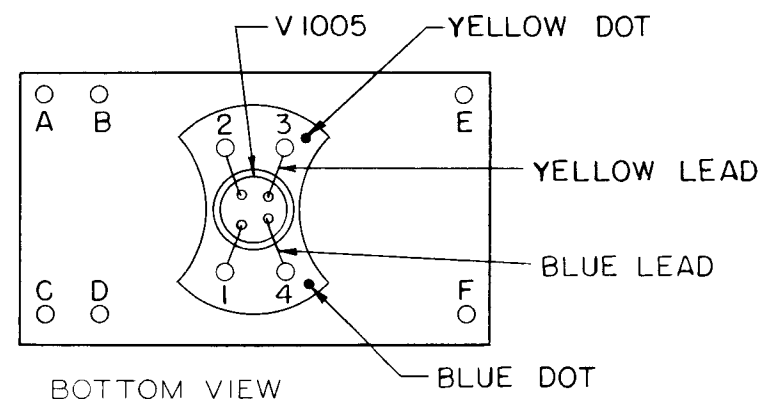
WIRE TABLE	
WIRE NO	DESCRIPTION
1-7 INCL	WIRE TINNED COPPER .020 DIA.
11-12	SLEEVING .022 I.D.

Z 1012

NOTES

1 CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

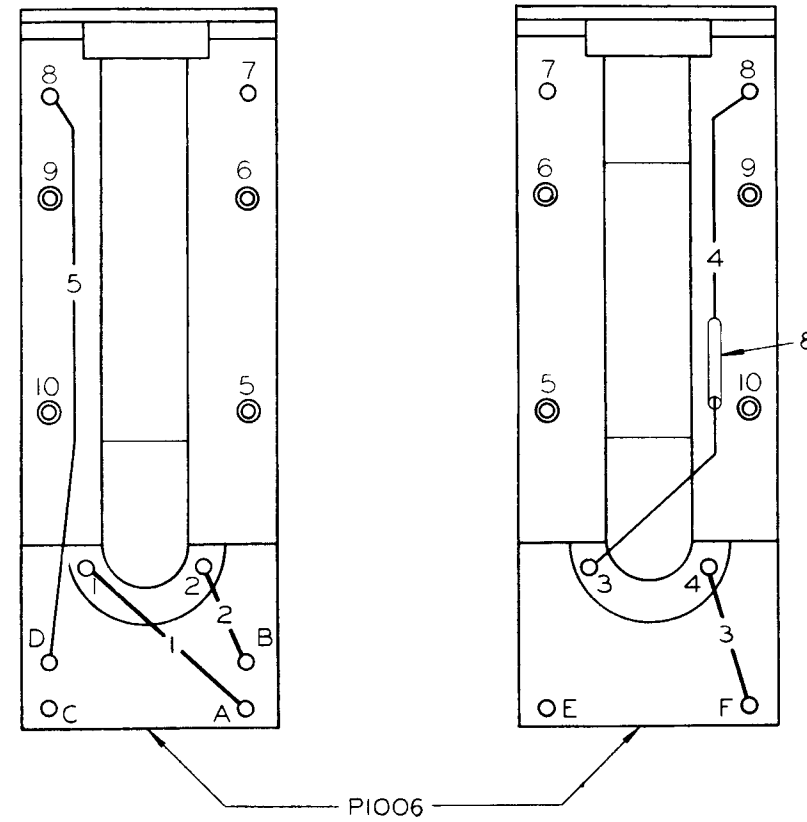
3 NOS.IN WIRES REFER TO WIRE TABLE.



ORIGINAL

Figure 7-69. Second I-F Plug-in Unit, Z1012

7-187, 7-188



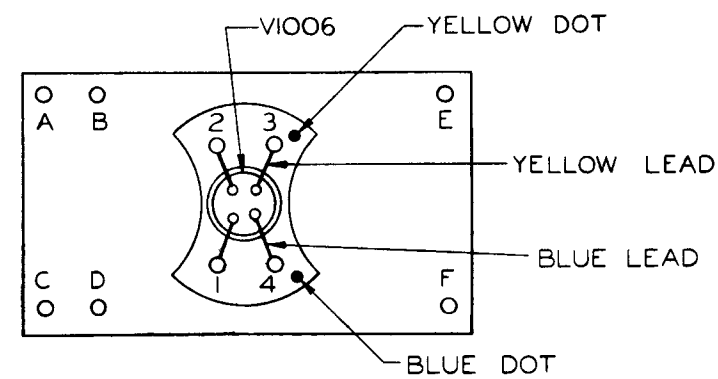
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-5 INCL.	WIRE TINNED COPPER .020 DIA.
8	SLEEVING .022 I. D.

Z1013

NOTES

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

3. NUMBERS IN WIRES REFER TO WIRE TABLE.

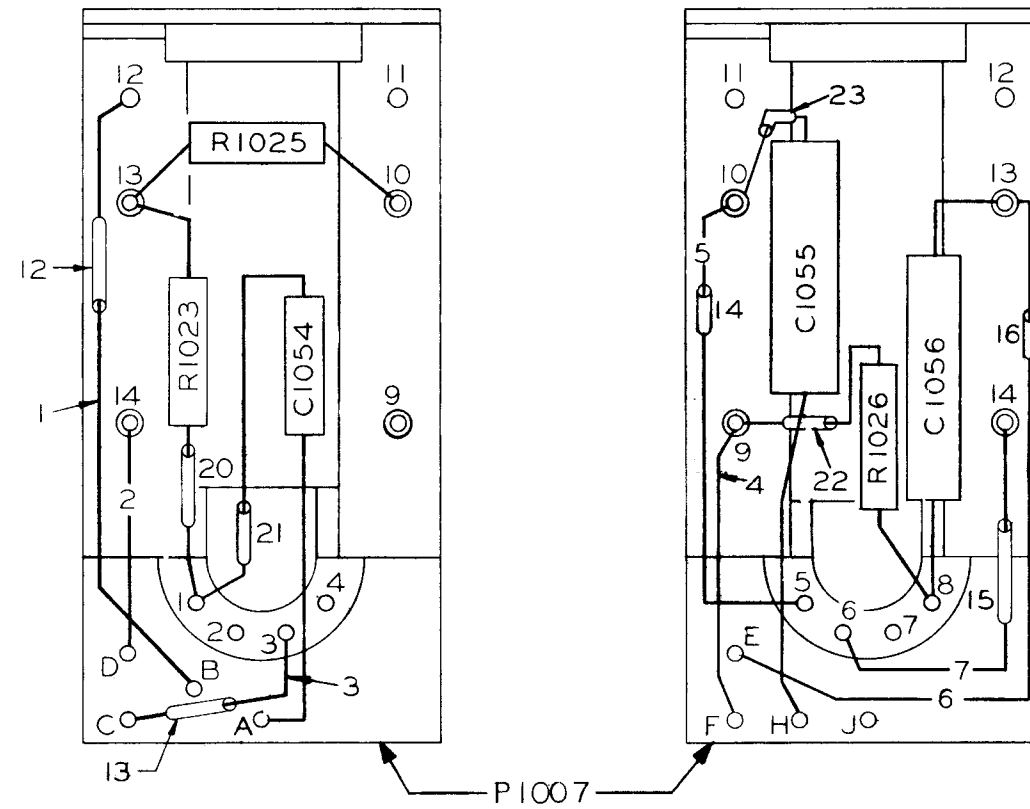


BOTTOM VIEW

ORIGINAL

Figure 7-70. Second I-F Plug-in Unit, Z1013

7-189, 7-190

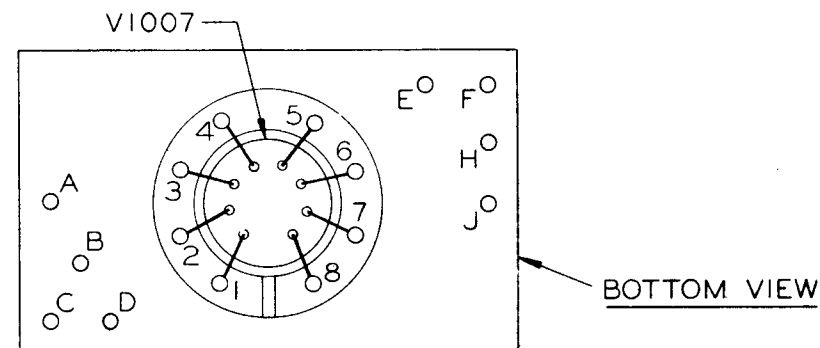


WIRE TABLE	
WIRE NO.	DESCRIPTION
1-7 INCL.	WIRE, TINNED COPPER .020 DIA.
12-16 INCL.	SLEEVING .022 I.D.
20-22 INCL.	SLEEVING .034 I.D.

Z1014

NOTES

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.

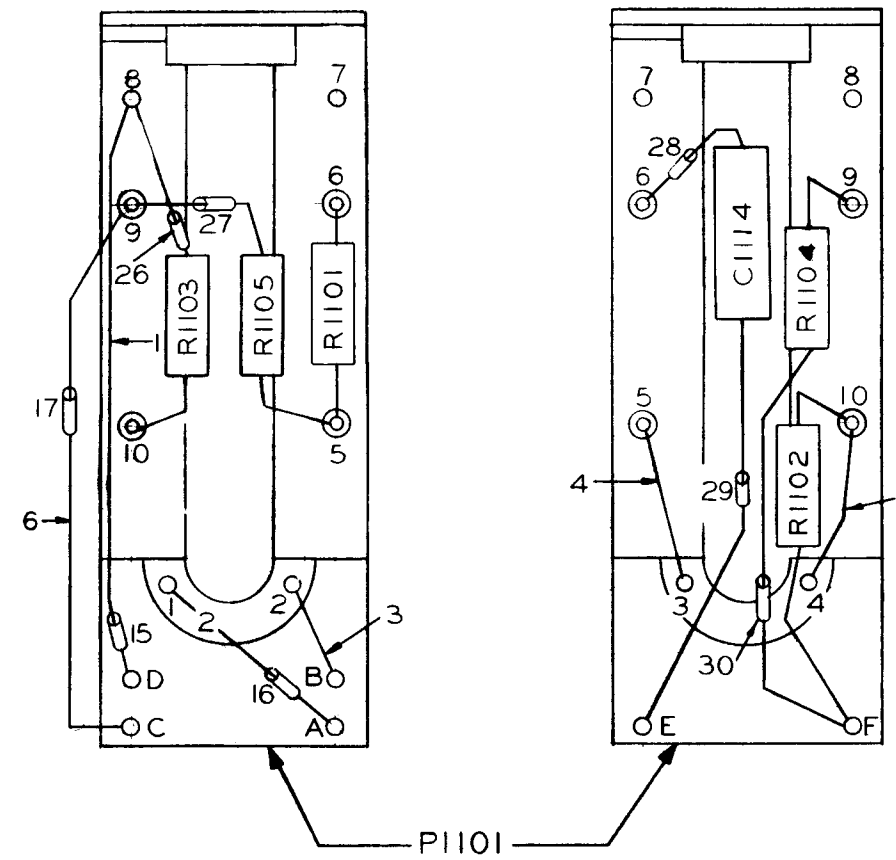


ORIGINAL

Figure 7-71. Second I-F Plug-in Unit, Z1014

7-191, 7-192





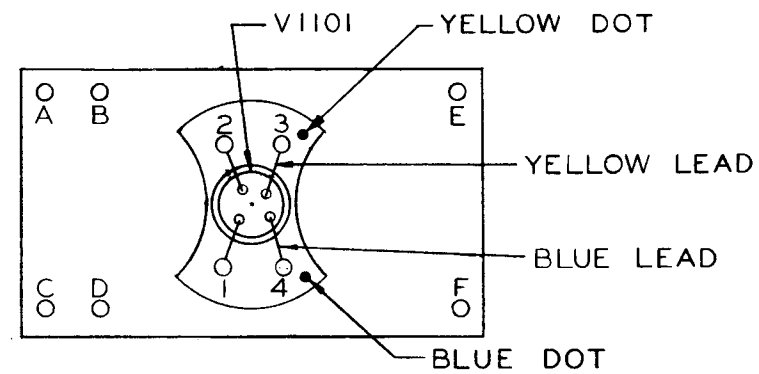
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-6 INCL.	WIRE-TINNED COPPER .020 DIA.
15-17 INCL.	SLEEVING .022 I.D.
26-30 INCL.	SLEEVING .034 I.D.

Z1101

NOTES:

1 CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

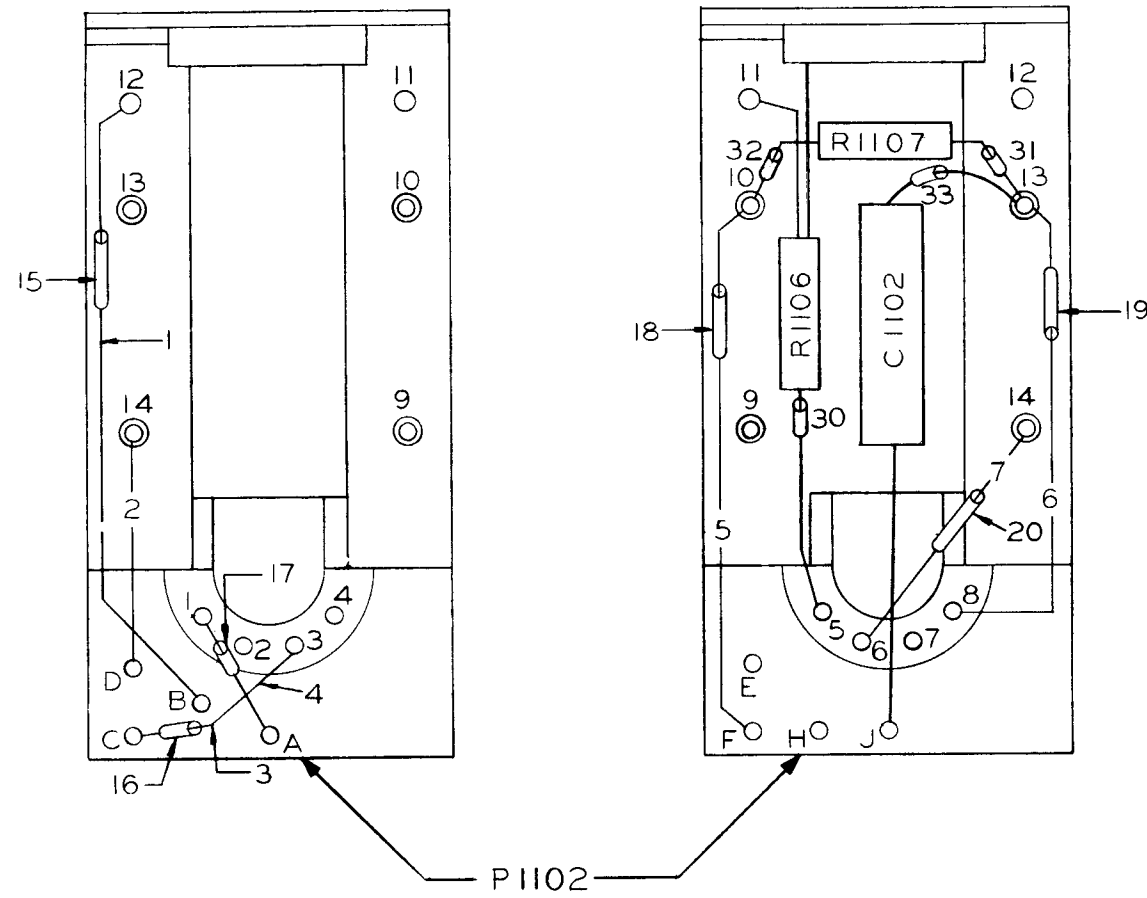
3 NUMBERS IN WIRES REFER TO WIRE TABLE.



ORIGINAL

Figure 7-72. A-F Plug-in Unit, Z1101

7-193, 7-194



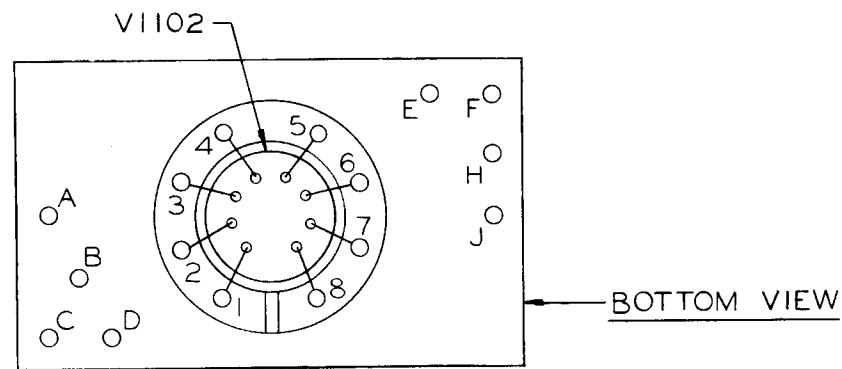
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-7 INCL.	WIRE-TINNED COPPER .020 DIA.
15-20 INCL.	SLEEVING 022I.D.
30-33 INCL.	SLEEVING 034I.D.

Z1102

NOTES:

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

3. NUMBERS IN WIRES REFER TO WIRE TABLE.

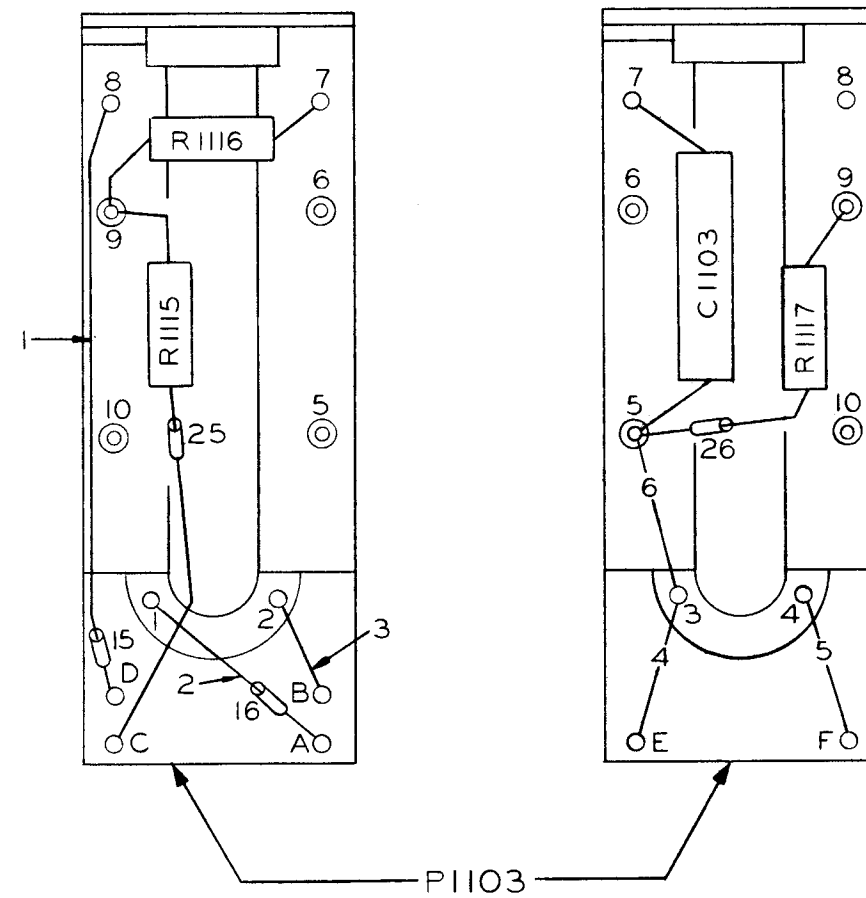


BOTTOM VIEW

ORIGINAL

Figure 7-73. A-F Plug-in Unit, Z1102

7-195, 7-196



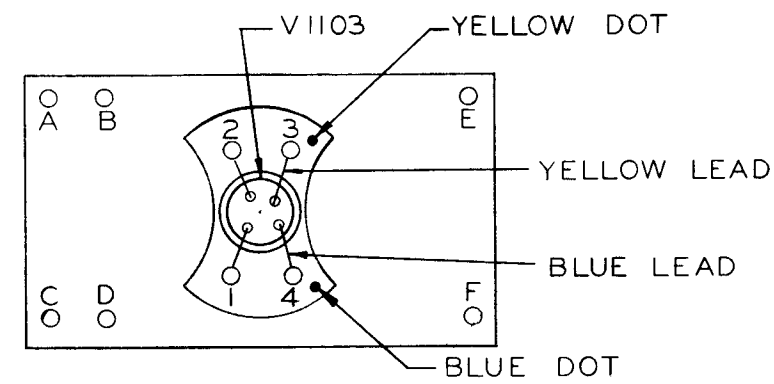
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-6 INCL	WIRE-TINNED COPPER .020 DIA.
15-16	SLEEVING .022 I.D.
25-26	SLEEVING .034 I.D.

Z1103

NOTES:

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

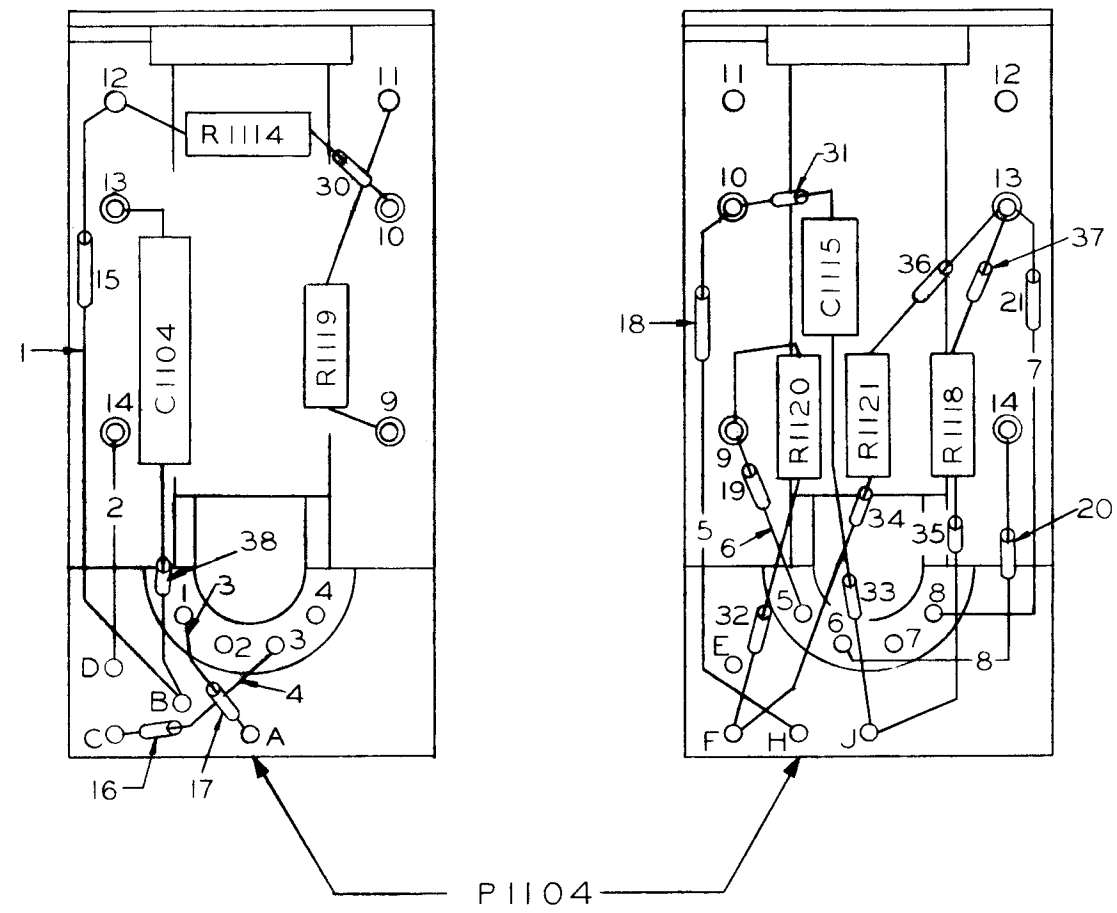
3 NUMBERS IN WIRES REFER TO WIRE TABLE.



ORIGINAL

Figure 7-74. A-F Plug-in Unit, Z1103

7-197, 7-198



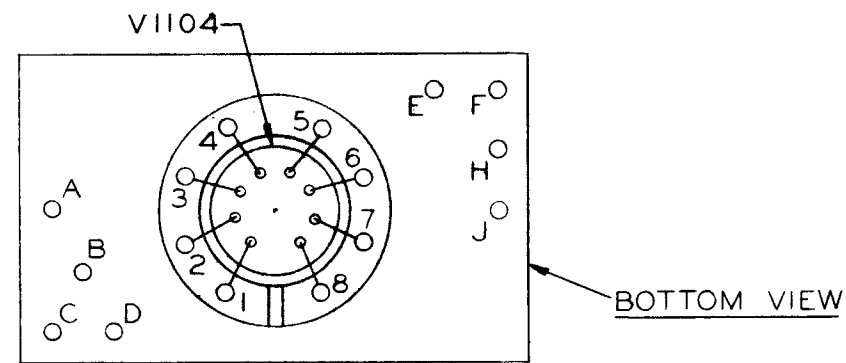
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-8 INCL.	WIRE - TINNED COPPER .020 DIA.
15-21 INCL.	SLEEVING .022 I.D.
30-38 INCL.	SLEEVING .034 I.D.

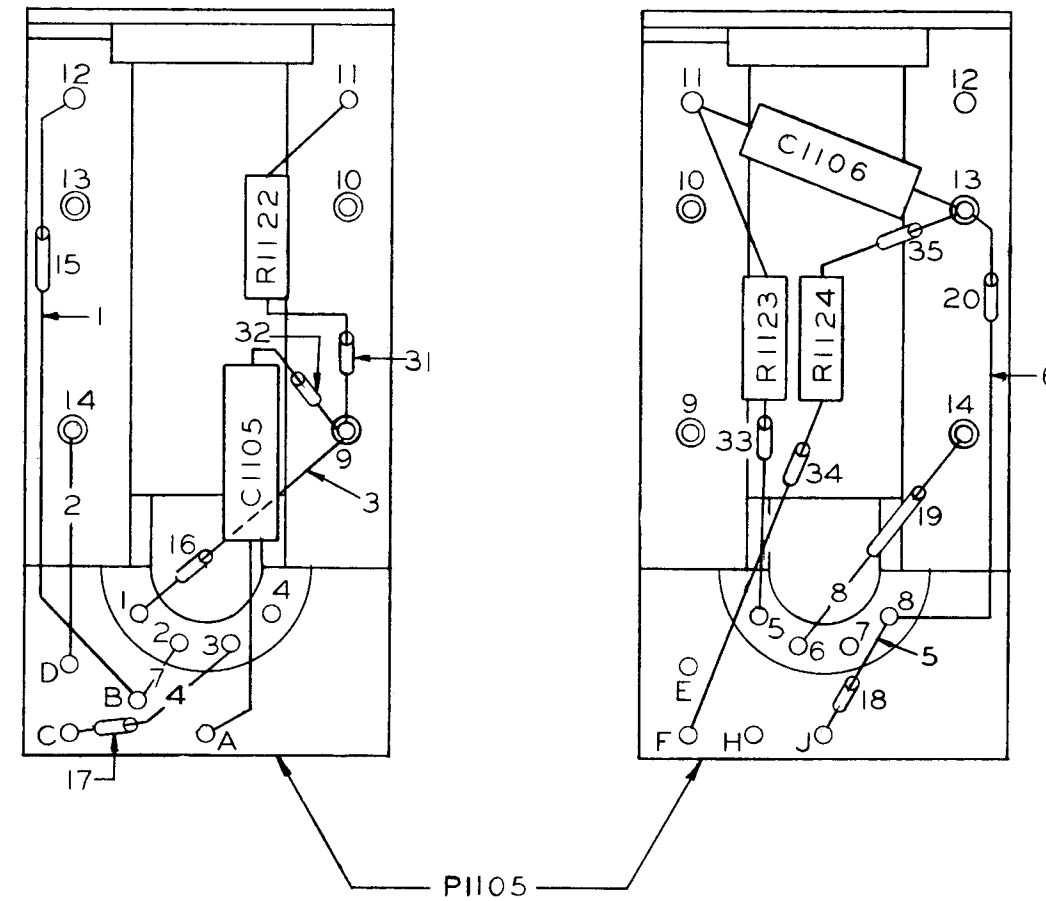
Z1104

NOTES:

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

3. NUMBERS IN WIRES REFER TO WIRE TABLE.





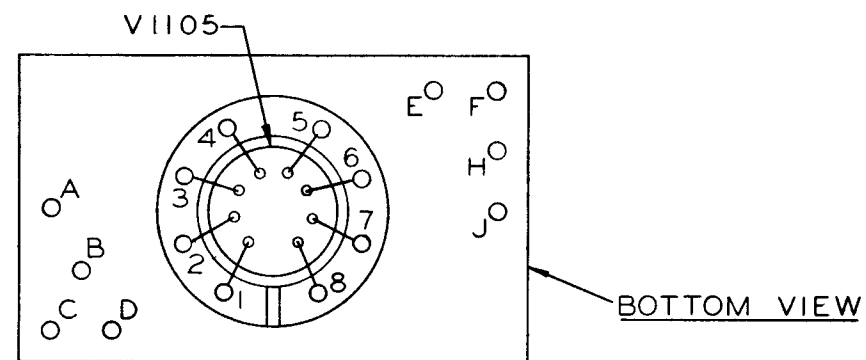
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-8 INCL.	WIRE - TINNED COPPER .020 DIA.
15-20 INCL.	SLEEVING .022 I.D.
31-35 INCL.	SLEEVING .034 I.D.

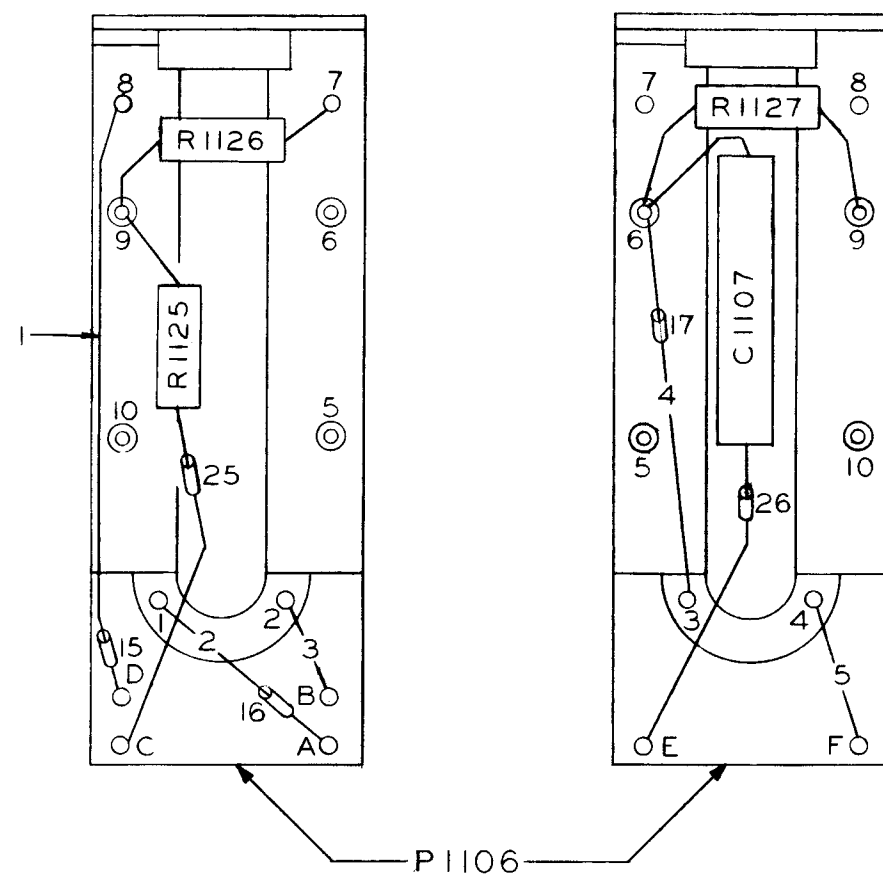
Z1105

NOTES:

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

3. NUMBERS IN WIRES REFER TO WIRE TABLE.





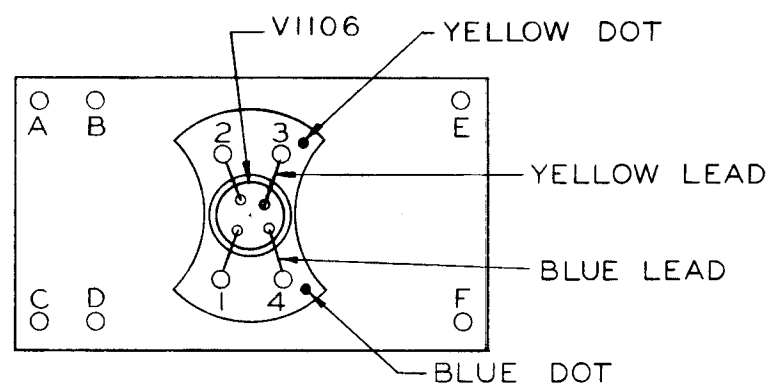
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-5 INCL.	WIRE-TINNED COPPER .020 DIA.
15-17 INCL.	SLEEVING .022 I.D.
25-26	SLEEVING .034 I.D.

Z1106

NOTES:

1 CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

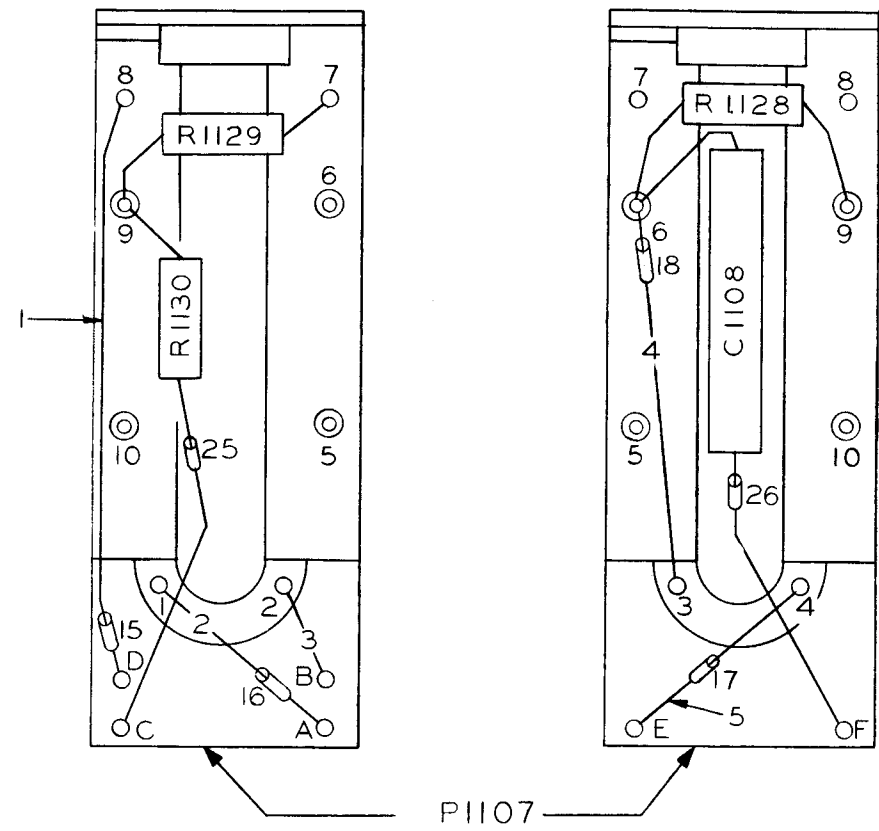
3. NUMBERS IN WIRES REFER TO WIRE TABLE.



ORIGINAL

Figure 7-77. A-F Plug-in Unit, Z1106

7-203, 7-204



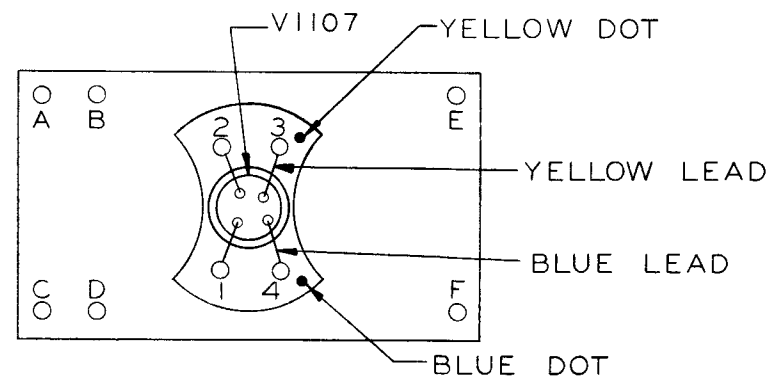
WIRE TABLE	
WIRE NO	DESCRIPTION
1-5 INCL	WIRE-TINNED COPPER .020 DIA.
15-18 INCL	SLEEVING 022 I.D.
25-26	SLEEVING 034 I.D.

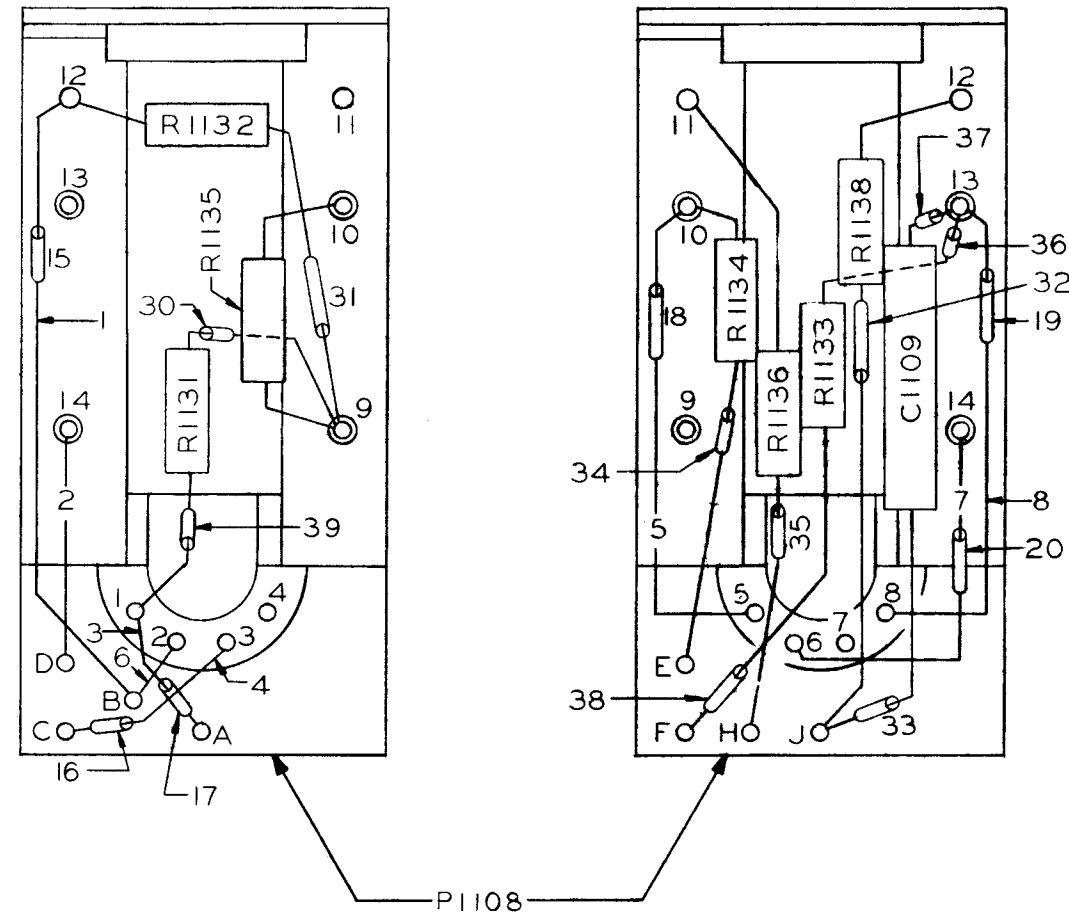
Z1107

NOTES

1 CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

3 NUMBERS IN WIRES REFER TO WIRE TABLE.





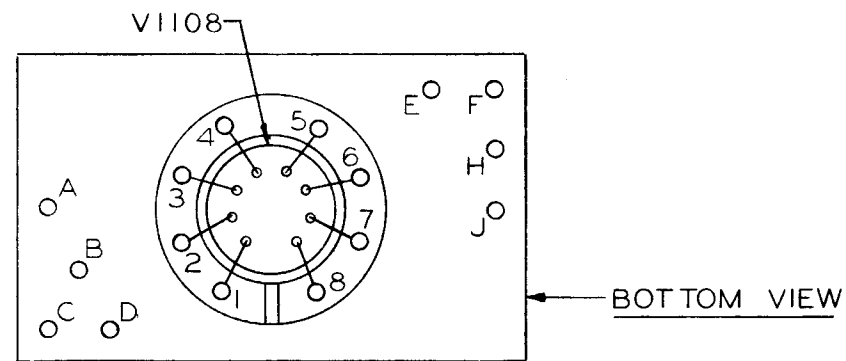
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-8 INCL	WIRE-TINNED COPPER .020 DIA.
15-20 INCL	SLEEVING .022 I.D.
30-39 INCL	SLEEVING .034 I.D.

Z1108

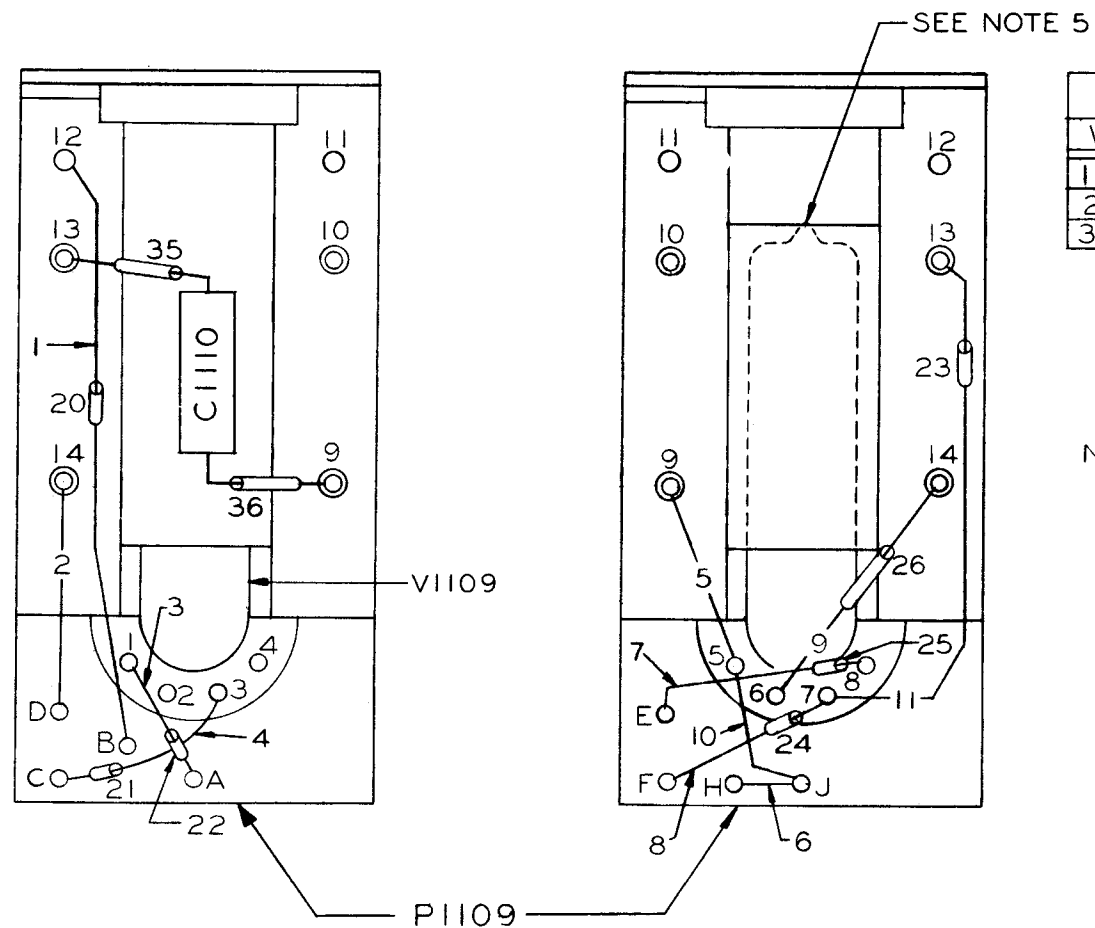
NOTES:

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

3 NUMBERS IN WIRES REFER TO WIRE TABLE.





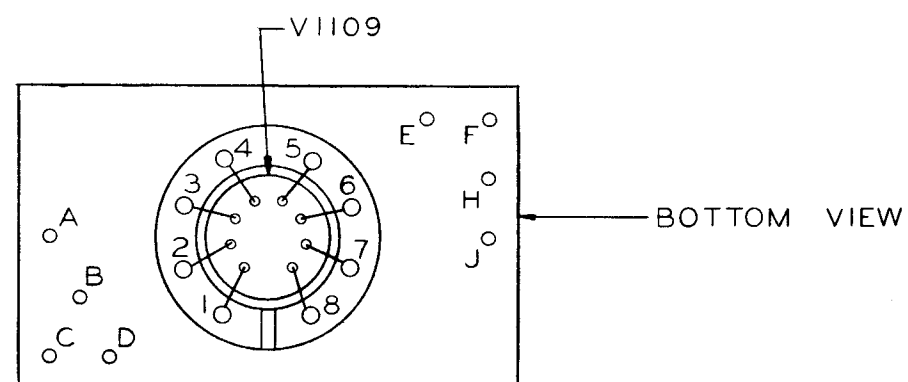


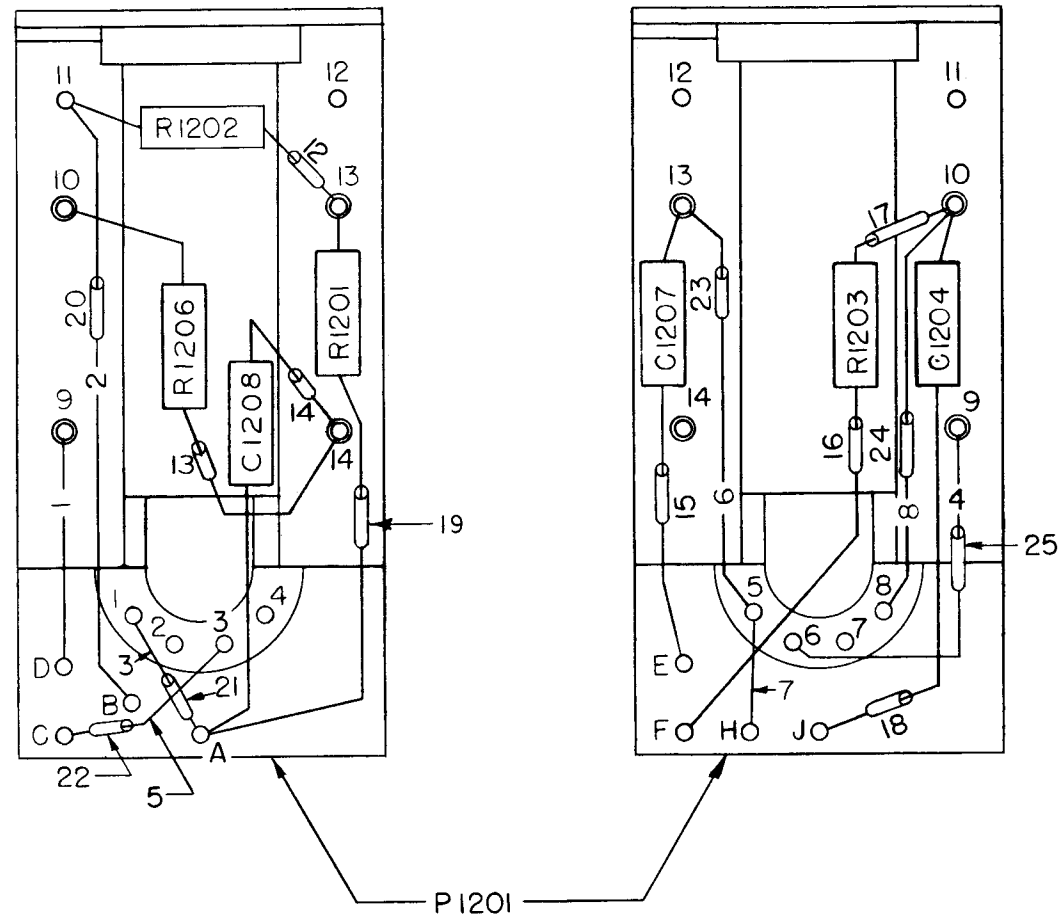
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-11 INCL.	WIRE TINNED COPPER .020 DIA.
20-26 INCL.	SLEEVING .022 I.D.
35-36	SLEEVING .034 I.D.

Z1109

NOTES:

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBER IN WIRES REFER TO WIRE TABLE.
5. INSERT TUBE TO APPROXIMATELY THE SAME HEIGHT AS FLEXIBLE TUBE SHIELD.





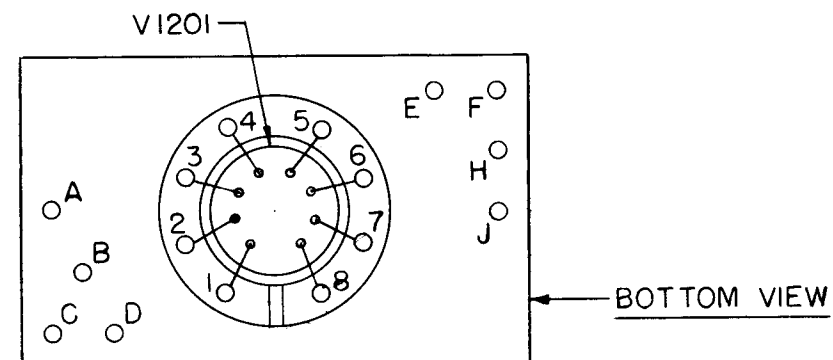
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-8 INCL.	WIRE TINNED COPPER .020 DIA.
12-19 INCL.	SLEEVING .034 I.D.
20-25 INCL.	SLEEVING .022 I.D.

Z 1201

NOTES

1 CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

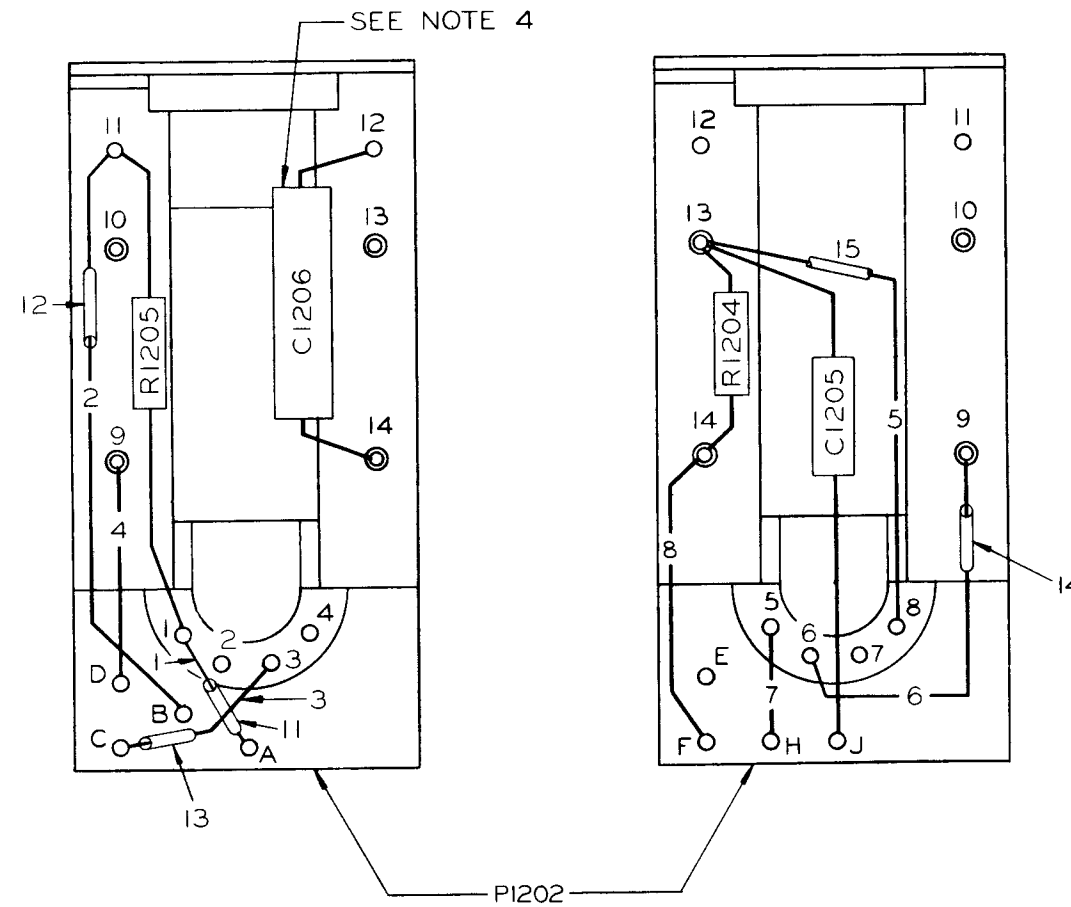
3 NOS. IN WIRES REFER TO WIRE TABLE.



ORIGINAL

Figure 7-81. Crystal Calibrator Plug-in Unit, Z1201

7-211, 7-212



WIRE TABLE	
WIRE NO.	DESCRIPTION
1-8 INCL.	WIRE TINNED COPPER .020 DIA.
11-15 INCL.	SLEEVING .022 I. D.

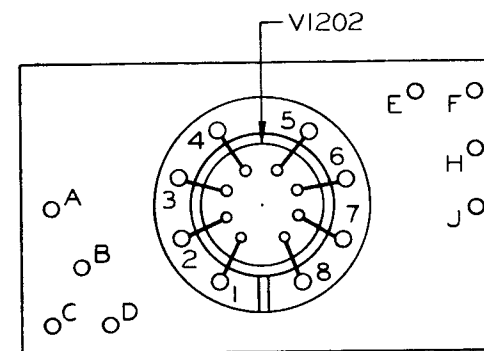
Z1202

NOTES

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

3. NUMBERS IN WIRES REFER TO WIRE TABLE.

4. CASE OF CAPACITOR CONNECTED TO GROUND.

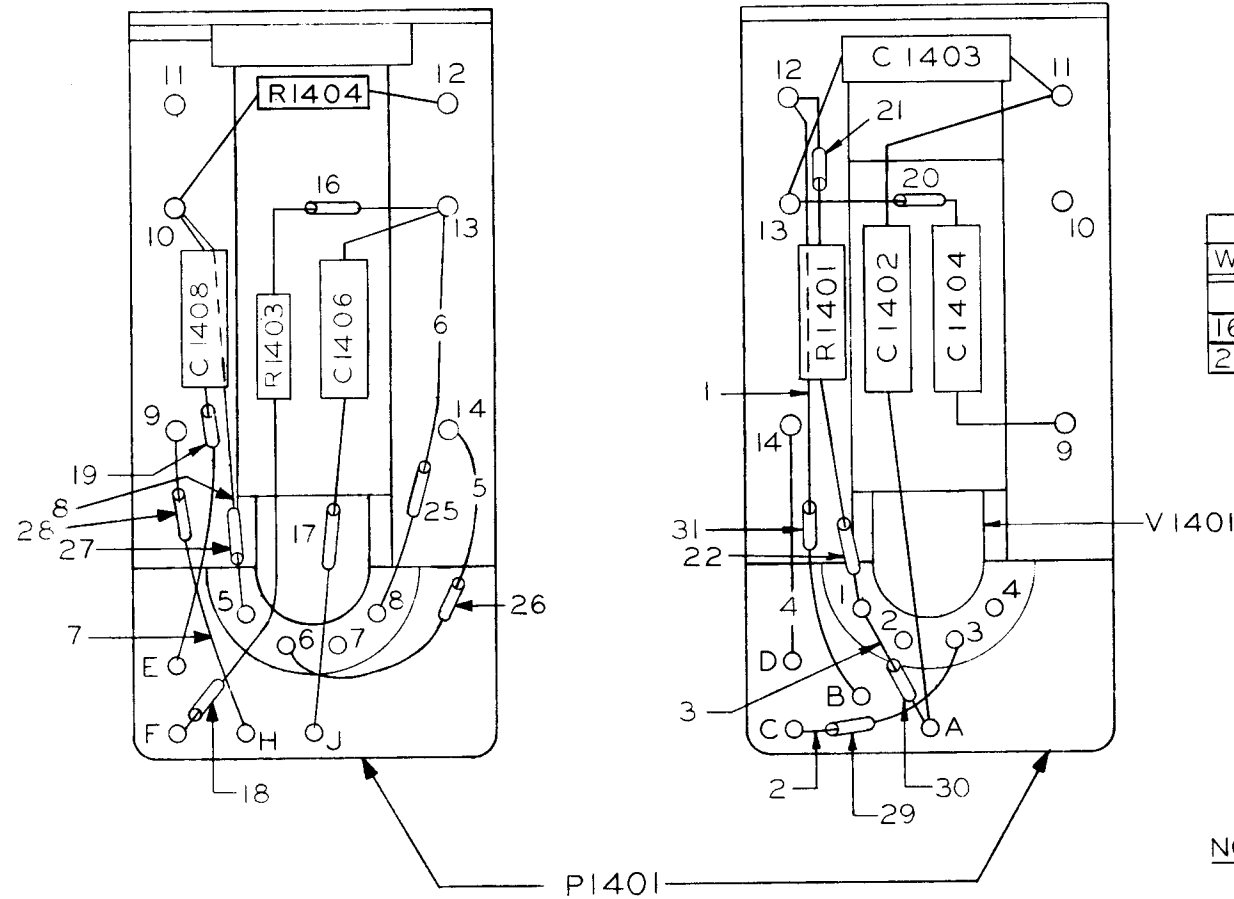


BOTTOM VIEW

ORIGINAL

Figure 7-82. Crystal Calibrator Plug-in Unit, Z1202

7-213, 7-214

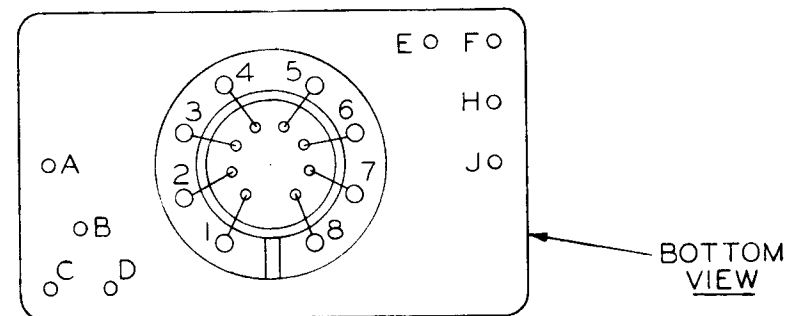


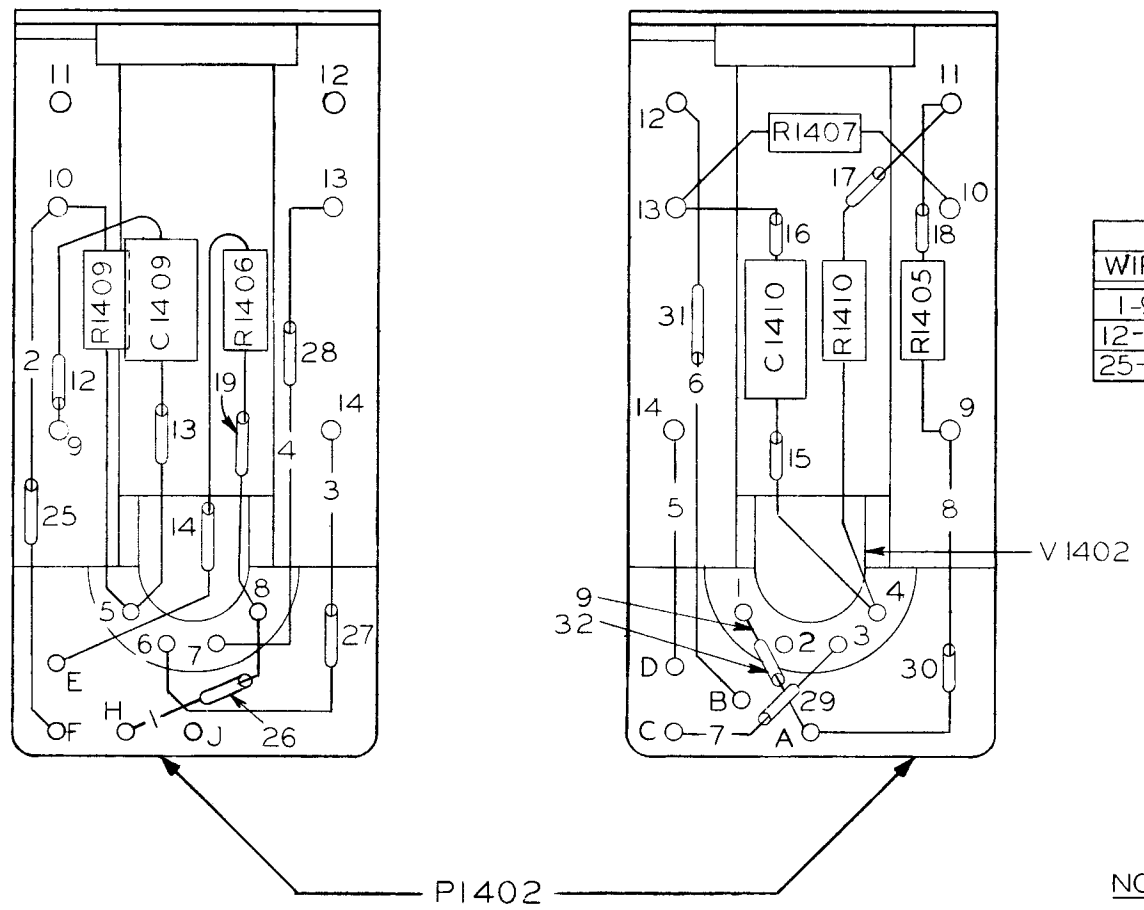
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-8 INCL.	WIRE TINNED COPPER .020 DIA.
16-22 INCL.	SLEEVING .034 I.D.
25-31 INCL.	SLEEVING .022 I.D.

Z1401

NOTES

2. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.



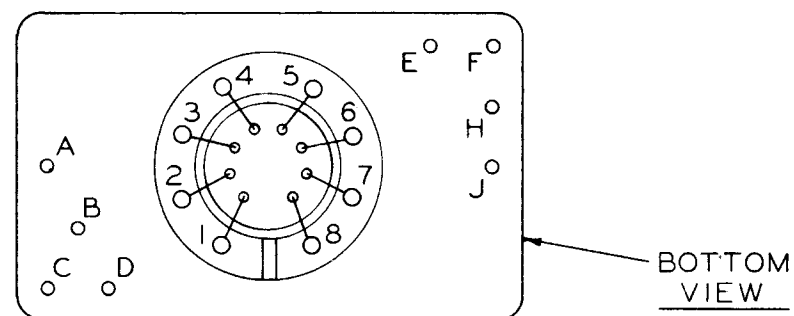


WIRE TABLE		
WIRE NO.	DESCRIPTION	
1-9 INCL.	WIRE TINNED COPPER .020 DIA.	PS 105
12-19 INCL.	SLEEVING .034 I.D.	PS 753-B-2
25-32 INCL.	SLEEVING .022 I.D.	PS 753-B-1

Z1402

NOTES

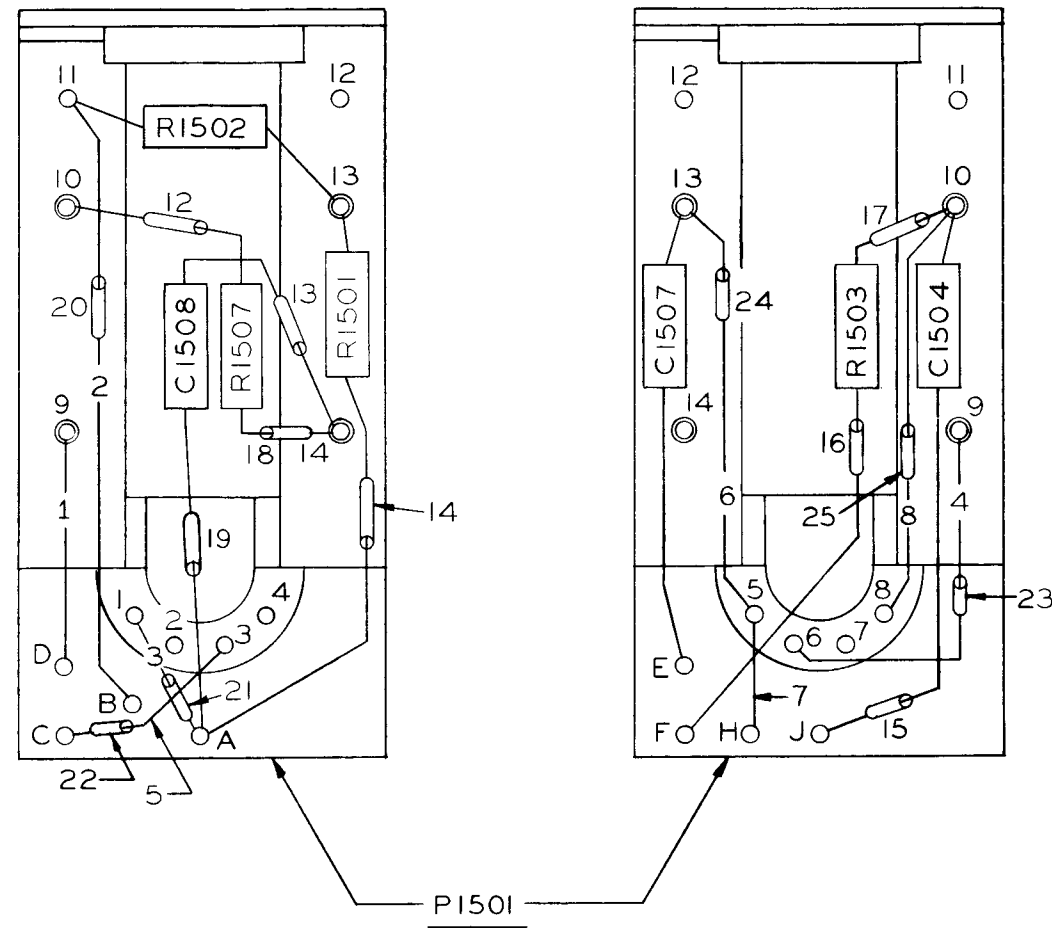
2. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS
3. NUMBERS IN WIRES REFER TO WIRE TABLE.



ORIGINAL

Figure 7-84. Crystal Calibrator Plug-in Unit, Z1402

7-217, 7-218



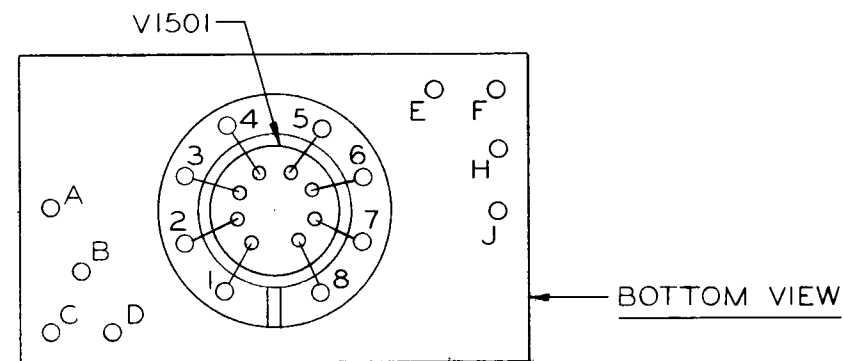
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-8	INCL WIRE TINNED COPPER .020 DIA.
12-19	INCL SLEEVING .034 I.D.
20-25	INCL SLEEVING .022 I.D.

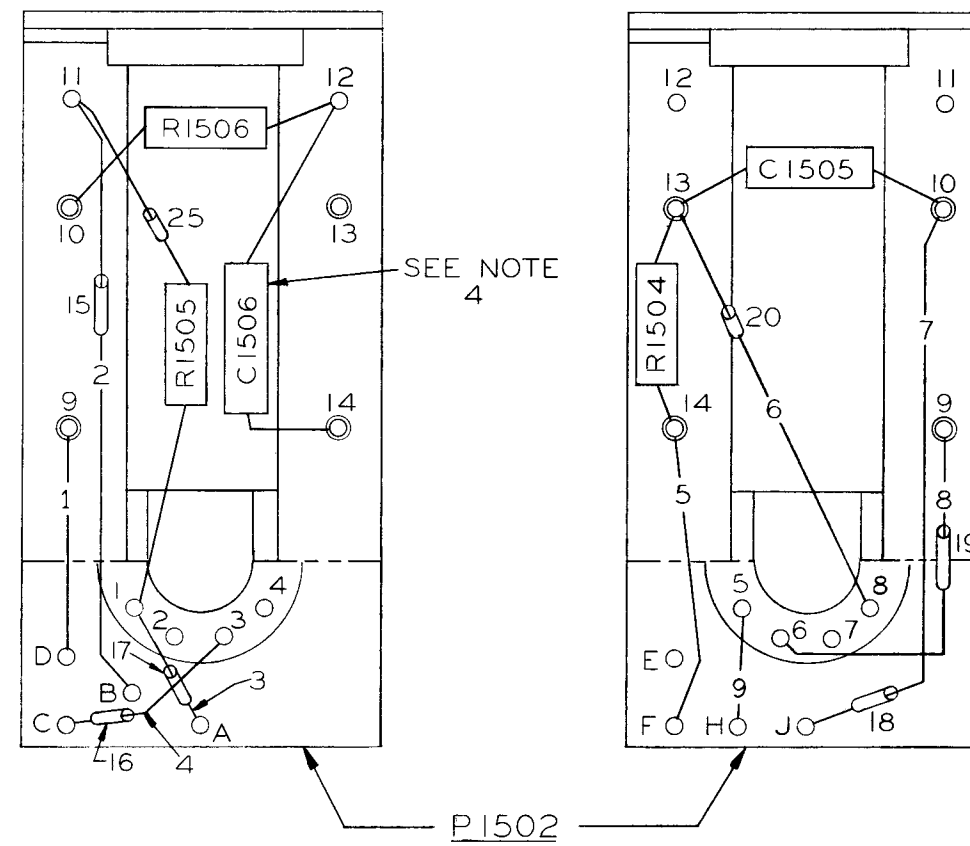
Z1501

NOTES:

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

3. NUMBERS IN WIRES REFER TO WIRE TABLE.





WIRE TABLE	
WIRE NO	DESCRIPTION
1-9 INCL	WIRE - TINNED COPPER .020 DIA.
15-20 INCL	SLEEVING .022 I.D.
25	SLEEVING .034 I.D.

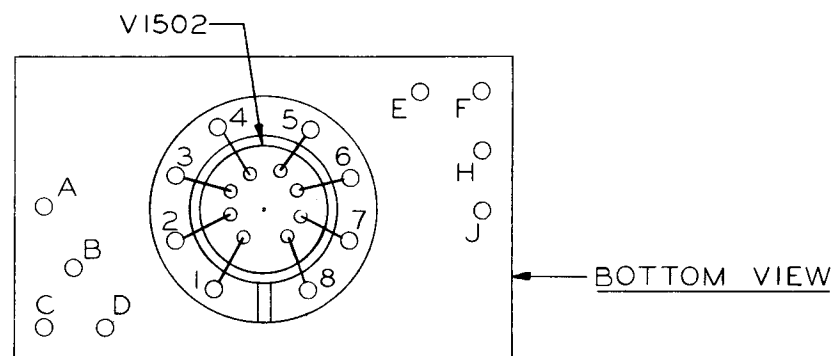
— Z1502 —

NOTES:

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

3. NUMBER IN WIRES REFER TO WIRE TABLE.

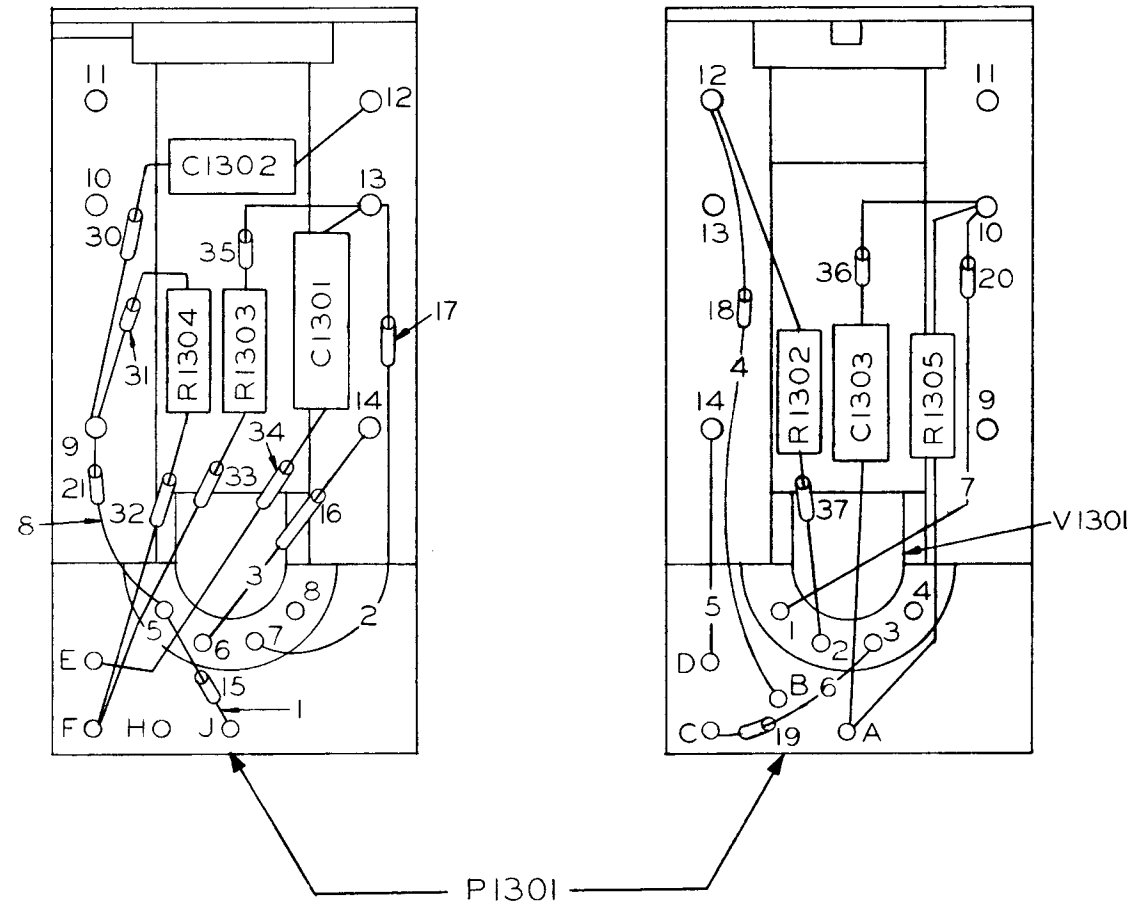
4. CASE OF CAPACITOR CONNECTED TO GROUND.



ORIGINAL

Figure 7-86. Crystal Calibrator Plug-in Unit, Z1502

7-221, 7-222



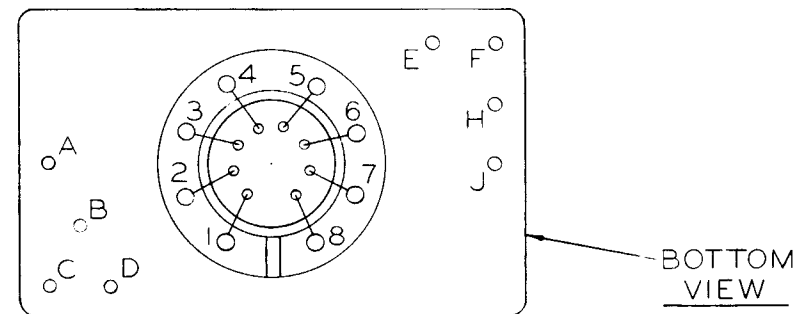
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-8 INCL.	WIRE TINNED COPPER 020 DIA.
15-21 INCL.	SLEEVING .022 I.D.
30-37 INCL.	SLEEVING .034 I.D.

Z1302

NOTES:

1. CRIMP & SOLDER ALL ELECTRICAL CONNECTIONS

3. NUMBERS IN WIRES REFER TO WIRE TABLE.



ORIGINAL

Figure 7-87. Beat Frequency Oscillator Plug-in Unit, Z1302

7-223, 7-224



## SECTION 8

### PARTS LISTS

#### 1. INTRODUCTION.

Reference designations (previously referred to as circuit symbol, reference symbol, etc.) have been assigned to identify all maintenance parts of the equipment. They are used for marking the equipment (adjacent to the part they identify) and are included on drawings, diagrams, and the parts list. *The letters* of a reference designation indicate the kind of part (generic group) such as resistor, amplifier, electron tube, etc. *The number* differentiates between parts of the same generic group. Parts of the AN/FRR-21 Radio Receiver are numbered from 101 to 299, 701 to 799, 1001 to 1199, 1301 to 1499, 1601 to 1799, 2001 to 2099, and 3601 to 3699; parts of the AN/FRR-22 Radio Receiver are numbered from 301 to 499, 801 to 899, 1001 to 1199, 1301 to 1399, 1501 to 1699, 2101 to 2199, 3001 to 3099, 3701 to 3799, and 4001 to 4099; and parts of the AN/FRR-23 Radio Receiver are numbered from 501 to 699, 901 to 1399, 1601 to 1699, 2201 to 2299, 3101 to 3199, 3801 to 3899, and 4401 to 4499. Sockets associated with a particular plug-in device, such as an electron tube or a fuse, are identified by a reference designation which includes the reference designation of the plug-in device. For example, the socket for electron tube V1601 is designated X1601.

#### 2. MAINTENANCE PARTS LIST.

Table 8-1 lists all major units and their maintenance parts. Each major unit's parts are grouped together.

Column 1 lists the reference series of each major unit followed by the reference designation of the various parts in alphabetical and numerical sequence.

Column 2 includes a reference to the explanatory notes that appear at the front of the table.

Column 3 includes the name and description of the various items. Information classified higher than the parts list has been omitted. Complete information is provided for all key parts (a part that differs from any part previously listed in the table) and sub-key parts (a

part that is identical to a key part, but appears for the first time for a given major unit). The name and description is omitted for other parts. However, reference is made to the key part or sub-key part for the data.

Column 4 indicates how the part is used and provides its functional location in the equipment.

#### 3. PARTS SUPPLIED WITH EQUIPMENT.

Table 8-2 gives a list of maintenance parts supplied as a permanent part of the equipment. The items should be replaced as soon as they are used.

#### 4. STOCK NUMBER IDENTIFICATION.

Table 8-3 gives stock numbers for the various items. Stock numbers preceded by an asterisk apply to replacement items which differ from the items supplied in the equipment.

#### 5. LIST OF MANUFACTURERS.

Table 8-4 lists manufacturers of parts used in the equipment. The prefix letters are those assigned by the Bureau of Ships to identify the manufacturers, on identification plates (nameplates) and on small parts.

#### 6. APPLICABLE COLOR CODES.

Table 8-5 lists and illustrates applicable color codes and miscellaneous data.

#### 7. NOTES.

2. Manufacture in Navy shop.
3. Will be procured on demand by the nearest Naval Shore Supply Activity.
4. Non-replaceable in this application. Listed for reference only.
6. Replace with the substitute part having the stock number listed in Table 8-3.

**TABLE 8-1. MAINTENANCE PARTS LISTS  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
101 to 299 701 to 799 1001 to 1199 1801 to 1499 1601 to 1799 2001 to 2099 3601 to 3699		RECEIVER, RADIO: (AN/FRR-21); AM (A-1, A-2) and FSK; 14 kc to 600 kc frequency range; five bands; input: 105, 115, 125 v AC, 50, 60, and 400 cycles single phase, 85 w nominal; side rack mounting; 18 <sup>7</sup> / <sub>16</sub> in. lg by 17 <sup>1</sup> / <sub>4</sub> in. wide, less mounting brackets; 8 <sup>23</sup> / <sub>32</sub> in. high overall; 27 electron tubes; double superheterodyne circuit; incl five connector plugs for external connections, five receptacles on back marked "IF," "ANT," "Power," "Audio," "Audio"; two handles on front for removing from cabinet, incl "BFO" int extal calibrator, 2 deg of RF and 2 deg of audio selectivity; MIL spec R-15132 (Ships) amendment no. 4, 27 July 53; RCA part/dwg A-8821498-501	
301 to 499 801 to 899 1001 to 1199 1301 to 1399 1501 to 1699 2101 to 2199 3001 to 3099 3701 to 3799 4001 to 4099		RECEIVER, RADIO: (AN/FRR-22); AM (A-1, A-2, A-3) and FSK; 0.25 mc to 8 mc frequency range; five bands; input: 105, 115, 125 v AC, 50, 60, and 400 cycles single phase, 85 w; side rack mounting; 18 <sup>7</sup> / <sub>16</sub> in. lg by 17 <sup>1</sup> / <sub>4</sub> in. wide less mounting brackets; 8 <sup>23</sup> / <sub>32</sub> in. high overall; 27 electron tubes; double superheterodyne circuit; incl eight connector plugs for external connections, eight receptacles on back marked external oscillator, "IF," "Pan," "Ant," "Power," "Audio," "Audio," "Det," "AGC"; two handles on front for removing from cabinet incl "BFO" int extal calibrator, 3 deg of RF and 2 deg of audio; MIL spec R-15132 (Ships) amendment no. 4, 27 July 53; RCA part/dwg A-8821498-502	
501 to 699 901 to 1399 1601 to 1699 2201 to 2299 3101 to 3199 3801 to 3899 4401 to 4499		RECEIVER, RADIO: (AN/FRR-23); AM (A-1, A-2, A-3) and FSK; 2 mc to 32 mc frequency range; five bands; input: 105, 115, 125 v AC, 50, 60, and 400 cycles single phase, 85 w; side rack mounting; 18 <sup>7</sup> / <sub>16</sub> in. lg by 17 <sup>1</sup> / <sub>4</sub> in. wide less mounting brackets; 8 <sup>23</sup> / <sub>32</sub> in. high overall; 27 electron tubes; double superheterodyne circuit incl eight connector plugs for external connections, eight receptacles on back marked external oscillator "IF," "Pan," "Ant," "Power," "Audio," "Audio," "Det," "AGC"; two handles on front for removing from cabinet, incl "BFO" int extal calibrator, 3 deg of RF and 2 deg of audio; spec MIL R-15132 (Ships) amendment no. 4, 27 July 53; RCA part/dwg A-8821498-503	
A-101 A-102		Not Used	
A-103	2	BRACKET: "U" shape with extension on one leg; aluminum alloy w/ steel nuts and brass eyelet; satin etch and chemical finish for spot welding; 1.973 in. lg by 1/2 in. wide by 1 <sup>7</sup> / <sub>32</sub> in. deep overall; 0.051 in. thick "U" stock and 0.032 in. thick extension stock; two self-clinching no. 6-32 nuts on flanged ends of "U," centers on longitudinal centerline 1.5 in. C to C, for mtg; angle piece 1 <sup>3</sup> / <sub>16</sub> in. lg by 5 <sup>1</sup> / <sub>16</sub> in. wide by 3 <sup>1</sup> / <sub>16</sub> in. deep, spot welded along one leg of "U" cut so that 1/16 in. strip extends 2 <sup>3</sup> / <sub>16</sub> in. at bottom of "U"; brass eyelet 0.198 in. dia by 3/16 in. lg riveted on other leg of "U" on centerline, center 1/16 in. from bottom of "U"; RCA part/dwg B-462561-501	Mounting for C-103
A-104 through A-1300		Not Used	

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
A-1301	2	COVER: chassis wiring shield; c/o one cover RCA part/dwg M-456847-2; one bushing RCA part/dwg A-8834792-2; rectangular shape; 2 $\frac{1}{32}$ in. lg by 1 $\frac{3}{16}$ in. wide by $\frac{1}{4}$ in. high overall approx; RCA part/dwg M-456847-501	Chassis Cover, BFO Unit
A-1601		SHIELD, ELECTRON TUBE: brass nickel plate finish; round; panel mounted; inside dia 0.760 in. by 1 $\frac{9}{32}$ in. lg excluding studs; mounted by two no. 4-40 threaded studs; to withstand 50-hr salt spray test; RCA part/dwg K-8888552-1	Secures X-1603, X-1604, X-1605
A-1602		SHIELD, ELECTRON TUBE: brass nickel plate finish; round; bayonet type spring mounted; inside dim 0.920 in. ID by 2 $\frac{5}{32}$ in. lg; bottom has two mounting slots $\frac{5}{32}$ in. high by $\frac{3}{4}$ in. greatest width by $\frac{5}{32}$ in. smallest width; for use w/ 6AQ5 vacuum tube; National Type JA3386; RCA part/dwg K-8888552-4	Shields and Secures V-1601, V-1602, R-1605
A-1603		Not Used	
A-1604	2	PLATE, RETAINER: retainer for connector receptacle; stainless steel, passivating dip finish; rectangular w/ 2.593 in. lg by 0.968 in. wide opening in center; 3 $\frac{3}{32}$ in. lg by $\frac{1}{4}$ in. wide by 0.093 in. thick; two 0.177 in. dia countersunk mounting holes 3.218 in. C to C; RCA part/dwg A-8848961-1	Secures J-1601
A-1605 through A-2000		Not Used	
A-2001	2	BRACKET: u/o radio receiving set; c/o one bracket RCA part/dwg A-8834733-2; two nuts RCA part/dwg A-8858336-3; two bushings RCA part/dwg A-8838908-8; "L" shape; 1 in. lg by 1 $\frac{1}{16}$ in. wide by $\frac{3}{16}$ in. high overall approx; two no. 6-32 self-clinching nuts on 0.562 in. mounting centers; nuts ring-staked to bracket, bushing riveted to bracket; RCA part/dwg A-8834733-501	Supports Type I Dial Assembly
A-2002		Same as A-1604	Supports J-2013
A-2003	2	BRACKET: to tie dial and frame together; bracket w/ bushings, screws, nuts, and washers; aluminum alloy satin etch and clear water dip finish, brass bushing white nickel finish, steel screw and nut bronze lockwasher; rectangular w/ triangular sides; 1 $\frac{1}{2}$ in. lg by 1 in. wide by $\frac{9}{16}$ in. deep, extending screw points; two stainless steel Phillips head no. 6-32 machine screws extend through bottom 0.5 in. C to C; two no. 6-32 self-clinching steel nuts 0.5 in. C to C press and ring stake in end bend-overs; two aluminum washers pressed into threads of two screws for assembly in bushing, screw must rotate freely after assembly; RCA part/dwg A-8834736-501	Supports Type I Dial Assembly
A-2004	2	PLATE, SPACER: used as stiffener for receptacle mounting; stainless steel, passivating dip finish; rectangular shape; 1 $\frac{3}{4}$ in. lg by $\frac{7}{16}$ in. wide by 0.093 in. thick; two 0.156 in. dia mounting holes on 1 in. mounting center; RCA part/dwg A-8838976-1	Supports J-2014
A-2005	2	SHIM: phosphor bronze, white nickel finish; rectangular shape; 1 in. lg by $\frac{3}{16}$ in. wide by 0.010 in. thick; mounts by two slots $\frac{3}{8}$ in. high by 0.187 in. wide; RCA part/dwg A-8829159-3	Spacer for Type I Dial Assembly. (As required)
A-2006	2	COVER: main frame channel cover; c/o one cover RCA part/dwg C-744574-3; one insulation strip RCA part/dwg A-8837464-1; phosphor bronze white nickel plated; "U" shape; 4 $\frac{1}{2}$ in. lg by 1 $\frac{1}{8}$ in. wide by $\frac{1}{8}$ in. high overall approx; two 0.173 in. dia mounting holes on 2 $\frac{3}{4}$ in. mounting center; three grounding and one mounting tab on one end; two "U" shape and one rectangular shape notches in one side, one "U" shape and three rectangular shape notches in other side; RCA part/dwg C-744574-501	Covers Chassis Wiring
A-2007	2	COVER: main frame channel cover; c/o one cover RCA part/dwg C-744574-4; one insulation strip RCA part/dwg A-8837463-1; phosphor bronze white nickel plated; "U" shape; 5 $\frac{3}{16}$ in. lg by 1 $\frac{1}{8}$ in. wide by $\frac{7}{8}$ in. high overall approx; two 0.173 in. dia mounting holes on 3 $\frac{3}{8}$ in. mounting center; one "U" shape and two rectangular shape notches in one side, one "U" shape and three rectangular notches in other side; RCA part/dwg C-744574-502	Covers Chassis Wiring
A-2008	2	BRACKET, MOUNTING: receptacle mounting bracket; wedge shape; aluminum alloy, satin etched; 1 $\frac{1}{2}$ in. lg by 1 $\frac{3}{16}$ in. wide by $\frac{3}{4}$ in. thick; two no. 6-32 integral mounting nuts on 1.031 in. mounting center; RCA part/dwg A-8849691-501	Supports J-2010
A-2009	2	SHIM: phosphor bronze, white nickel finish; rectangular shape; 1 in. lg by $\frac{3}{16}$ in. wide by 0.005 in. thick; mounts by two slots $\frac{3}{8}$ in. high by 0.187 in. wide; RCA part/dwg A-8829159-2	Spacer for Type I Dial Assembly. (As required)
A-2010	2	BRACKET: receptacle mounting bracket; "L" shape; aluminum alloy, satin etch and clear water dip; 1 $\frac{1}{2}$ in. lg by 2 $\frac{1}{32}$ in. wide by $\frac{5}{8}$ in. high; two no. 6-32 integral mounting nuts on 0.812 in. mounting center; two "U" shape notches $\frac{3}{16}$ in. wide by $\frac{3}{16}$ in. lg on 1 in. centers for mounting receptacles; RCA part/dwg A-8834748-501	Supports J-2009
A-2011	2	BRACKET: receptacle mounting bracket; "L" shape; aluminum alloy, satin etch and clear water dip; 1 $\frac{1}{4}$ in. lg by 3 $\frac{3}{4}$ in. wide by $\frac{5}{8}$ in. high; two no. 6-32 integral mounting nuts on 0.734 in. mounting center; two "U" shape notches $\frac{3}{16}$ in. wide by $\frac{3}{16}$ in. lg on 0.858 in. centers for mounting receptacle; RCA part/dwg A-8834749-501	Supports J-2011

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
A-2012 through A-2100		Not Used	
A-2101		Same as A-2001	Supports Type II Dial Assembly
A-2102		Same as A-1604	Supports J-2113
A-2103		Same as A-2003	Supports Type II Dial Assembly
A-2104		Same as A-2004	Supports J-2114
A-2105		Same as A-2005	Spacer for Type II Dial Assembly. (As required)
A-2106		Same as A-2006	Covers Chassis Wiring
A-2107		Same as A-2007	Covers Chassis Wiring
A-2108		Same as A-2008	Supports J-2110
A-2109	2	COVER, PANEL: aluminum; satin black, outside only; 1 $\frac{1}{16}$ in. lg by 1 $\frac{1}{4}$ in. wide by 2 $\frac{3}{32}$ in. deep; two mounting holes 0.147 in. dia through top toward ends 1.031 in. between center lines, one on center 4 $\frac{3}{64}$ in. from side, the other on center line 0.093 in. from former; one opening in ea end at bottom for wiring 3 $\frac{1}{16}$ in. deep, 3 $\frac{1}{16}$ in. wide at one end, 1 $\frac{1}{32}$ in. wide at other end, rounded tops; cover for link board in IF section; RCA part/dwg A-8829111-1	Covers E-2112
A-2110		Same as A-2010	Supports J-2109
A-2111		Same as A-2011	Supports J-2111
A-2112	2	BRACKET: u/o radio receiving set; c/o one plate RCA part/dwg A-8829113-2; one bracket RCA part/dwg A-8829113-3; "L" shape; 1 $\frac{5}{16}$ in. lg by 2 $\frac{1}{32}$ in. wide by 1 $\frac{1}{32}$ in. high overall approx; two mtg holes no. 4-40 on 0.500 in. mounting center; plate riveted to bracket, nuts pressed into bracket, one hole centrally located in plate; RCA part/dwg A-8829113-501	Supports O-2125
A-2113	2	COVER, CAPACITOR: cover for ant trimmer condenser; aluminum alloy; rectangular shape; 2 $\frac{1}{32}$ in. lg by 1 $\frac{3}{4}$ in. wide by 1 $\frac{11}{32}$ in. high overall; mounts by three mounting flanges, one mounting flange has two 0.166 in. dia holes spaced 1.437 in. C to C, a second mounting flange has two 0.166 in. dia holes spaced 0.687 in. C to C, the third mounting flange has one 0.166 in. dia hole centered on flange; 5/8 in. deep by 5/8 in. lg notch in one end; RCA part/dwg M-462173-501	Covers C-2106
A-2114		Same as A-2009	Spacer for Type II Dial Assembly. (As required)
A-2115 through A-2200		Not Used	
A-2201		Same as A-2001	Supports Type III Dial Assembly
A-2202		Same as A-1604	Supports J-2213
A-2203		Same as A-2003	Supports Type III Dial Assembly
A-2204		Same as A-2004	Supports J-2214
A-2205		Same as A-2005	Spacer for Type III Dial Assembly. (As required)
A-2206	2	COVER: main frame channel cover; c/o the following RCA part/dwg numbers: 1 cover C-744574-11; 1 plate C-744574-9; 1 insulation strip A-8837464-1; 1 spring A-8813763-1; "U" shape; 4 $\frac{1}{32}$ in. lg by 2 $\frac{3}{16}$ in. wide by 7/8 in. high; two 0.102 in. dia mounting holes on 2 $\frac{3}{4}$ in. mounting centers; three grounding and one mounting tab on one end; two "U" shape and one rectangular shape notches in one side, one "U" shape and three rectangular shape notches in other side, grounding spring mounted on one side of cover; RCA part/dwg C-744574-503	Covers Chassis Wiring
A-2207		Same as A-2007	Covers Chassis Wiring
A-2208		Same as A-2008	Supports J-2210
A-2209		Same as A-2109	Covers E-2212
A-2210		Same as A-2010	Supports J-2209
A-2211		Same as A-2011	Supports J-2211
A-2212		Same as A-2112	Supports O-2225
A-2213		Same as A-2113	Covers O-2225
A-2214		Same as A-2009	Spacer for Type III Dial Assembly. (As required)
A-2215 through A-3000		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
A-3001	2	BRACKET: cup shaped, rectangular; aluminum alloy $\frac{1}{4}$ hard, steel nuts, satin etch, and clear water dip finish; $1\frac{1}{16}$ in. lg by $1\frac{1}{16}$ in. wide by $\frac{1}{16}$ in. deep overall, 0.040 in. thick stock; mounts by two no. 4-40 self-clinching nuts in one side evenly spaced on longitudinal center line 0.500 in. C to C; $2\frac{3}{64}$ in. wide central opening in one side w/ "D" shaped notch at center of ea end; two pilot holes permissible $\frac{1}{8}$ in. dia in bottom or in one end; optional $\frac{3}{16}$ in. sq notch in ea end; double thickness at ends; RCA part/dwg M-462172-501	Supports J-3104
A-3002 through A-3100		Not Used	
A-3101		Same as A-3001	Supports J-3104
A-3102 through A-3600		Not Used	
A-3601	2	BEZEL: frame for dial window; aluminum alloy, black synthetic optical finish, 0.091 in. thick; rectangular; mounts by four 0.128 in. dia holes located on 2.875 in. by 2.484 in. mounting centers; RCA part/dwg A-8844629-1	Secures A-3602
A-3602	2	WINDOW: for dials; plastic, acrylic sheet, optical black synthetic finish on edges of window only; rectangular shape; 3.328 in. lg by 3.218 in. wide by 0.060 in. thick overall; four mounting holes 0.128 in. dia on 2.875 in. by 2.484 in. mounting centers; $\frac{1}{16}$ in. radius on four corners of window; RCA part/dwg A-8844281-1	Protects Dial Face
A-3603	2	WINDOW: window for dial assembly; plastic, acrylic sheet, steel blast finish; rectangular shape; $2\frac{23}{32}$ in. lg by $1\frac{1}{16}$ in. wide by 0.060 in. thick overall; six 0.113 in. dia mounting holes on $2\frac{1}{2}$ in. by $1\frac{1}{16}$ in. mounting centers; marked w/ white line 0.015 in. wide by 0.015 in. deep; RCA part/dwg A-8830110-1	Serves as Target for Dial Optical System
A-3604	2	MOUNTING, BRACKET: lens arm stabilizer; aluminum alloy, black alumilite finish; rectangular shape; $2\frac{1}{2}$ in. lg by $1\frac{27}{32}$ in. wide by $\frac{1}{16}$ in. high by 0.091 in. thick; mounts by two 0.156 in. dia holes on 1.406 in. mounting center; one end w/ flange $1\frac{1}{16}$ in. wide by $\frac{1}{2}$ in. lg w/ 0.187 in. wide slot by $\frac{5}{8}$ in. lg, $\frac{1}{4}$ in. from end to $\frac{3}{8}$ in. wide by $1\frac{1}{2}$ in. lg to 90 deg bend to $\frac{3}{8}$ in. wide by 2 in. lg to $2\frac{9}{32}$ in. wide by $1\frac{1}{32}$ in. lg to flange, 0.091 in. thick other end w/ flange $1\frac{27}{32}$ in. wide by $\frac{1}{16}$ in. high; RCA part/dwg B-456878-1	Stabilizes O-3608
A-3605	2	BRACE, REFLECTOR: reflector for dial assembly RCA part/dwg E-314436; aluminum, black synthetic and white lacquer; 4 in. ID by $2\frac{1}{64}$ in. wide by $\frac{3}{16}$ in. high by 0.032 in. thick; mounts by two 0.102 in. dia holes on $2\frac{3}{4}$ in. mounting center; RCA part/dwg A-8848190-1	Reflects Light to Logging Dial Scales
A-3606	2	BRACKET: support for lamp compartment cover (LH); c/o one bracket RCA part/dwg A-8821402-1; one machine screw RCA part/dwg A-8821405-655; brass, optical black finish; "U" shape approx; $5\frac{1}{64}$ in. lg by $\frac{5}{8}$ in. wide by 0.423 in. high min; mounts by no. 6-32 by $\frac{1}{4}$ in. lg machine screw; RCA part/dwg A-8821404-501	With A-3607, Mounts A-3608
A-3607	2	BRACKET: support for lamp compartment cover (RH); c/o one bracket RCA part/dwg A-8821402-2; one machine screw RCA part/dwg A-8821405-655; brass, optical black finish; "U" shape approx; $5\frac{1}{64}$ in. lg by $\frac{5}{8}$ in. wide by 0.423 in. high min; mounts by no. 6-32 by $\frac{1}{4}$ in. lg machine screw; RCA part/dwg A-8821404-502	With A-3606, Mounts A-3608
A-3608	2	COVER: cover for lamp compartment; aluminum alloy, optical black finish; rectangular shape; $3\frac{1}{8}$ in. lg by $1\frac{5}{64}$ in. wide by 0.110 in. thick; mounts by two key-shaped holes spaced 2.625 in. C to C; marked E-291, E-292, J-291 and J-292; RCA part/dwg A-8821403-1	Covers Top of Projection Lamp
A-3609	2	PLATE, APERTURE: for lamp compartment; aluminum alloy, 0.032 in. thick, optical black finish; "L" shape; 3 in. lg by $1\frac{17}{32}$ in. wide by $1\frac{3}{64}$ in. high overall approx; four mounting holes 0.120 in. dia on $2\frac{3}{4}$ in. and $2\frac{5}{8}$ in. mounting centers; one flange $1\frac{17}{32}$ in. lg by 3 in. wide w/ two holes 0.120 in. dia located $\frac{3}{8}$ in. from edge and $2\frac{3}{4}$ in. C to C and $\frac{5}{32}$ in. from top edge w/ one hole 1 in. lg by $\frac{1}{4}$ in. wide 1 in. from edge and $1\frac{1}{32}$ in. from bend, cutout $2\frac{1}{4}$ in. lg by $\frac{1}{4}$ in. deep from bend line, other flange w/ two tabs one on ea end $1\frac{3}{64}$ in. lg by $\frac{5}{8}$ in. wide w/ two holes 0.120 in. dia. $2\frac{5}{8}$ in. C to C and $6\frac{1}{64}$ in. from bend line; RCA part/dwg B-456248-1	Covers Side and Bottom of Projection Lamp
A-3610 through A-3700		Not Used	
A-3701		Same as A-3601	Secures A-3702
A-3702		Same as A-3602	Protects Dial Face
A-3703		Same as A-3603	Serves as Target for Optical Dial System
A-3704		Same as A-3604	Stabilizes O-3708
A-3705		Same as A-3605	Reflects Light to Logging Dial Scales

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
A-3706		Same as A-3606	With A-3707, Mounts A-3708
A-3707		Same as A-3607	With A-3706, Mounts A-3708
A-3708		Same as A-3608	Covers Top of Projection Lamp
A-3709		Same as A-3609	Covers Side and Bottom of Projection Lamp
A-3710 through A-3800		Not Used	
A-3801		Same as A-3601	Secures A-3802
A-3802		Same as A-3602	Protects Dial Face
A-3803		Same as A-3603	Serves as Target for Optical Dial System
A-3804		Same as A-3604	Stabilizes O-3808
A-3805		Same as A-3605	Reflects Light to Logging Dial Scales
A-3806		Same as A-3606	With A-3807, Mounts A-3808
A-3807		Same as A-3607	With A-3806, Mounts A-3808
A-3808		Same as A-3608	Covers Top of Projection Lamp
A-3809		Same as A-3609	Covers Side and Bottom of Projection Lamp
A-3810 through A-4000		Not Used	
A-4001	2	BRACKET: connector mtg; "U" shape; 1/4 hard steel cadmium plate and satin black synthetic finish; 3 1/2 in. lg by 2 13/16 in. wide by 1 9/32 in. high overall; 0.0897 in. thick sheet; four 0.173 in. dia mounting holes, one in ea corner, centers on 2.5 in. by 2.875 in. rectangle; 1 3/32 in. wide overhang along ea side; 2 5/8 in. by 1 7/8 in. cutout in center with four "D" shape extensions 0.280 in. by 0.280 in. two at ea end of cutout 1 in. C to C; RCA part/dwg B-462114-1	Supports J-4009
C-101		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 100,000 mmf ±20%; 100 v DC working; hermetically sealed metal case w/ plastic insulating sleeve; 1 3/16 in. lg by 0.374 in. dia; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range -55°C to +85°C; Sprague Type no. 81P10401S3; RCA part/dwg C-737816-353	Grid Bypass, V-101
C-102		CAPACITOR, FIXED, MICA: 330 mmf ±5%; 500 v DC working; characteristic E; 1/2 in. lg by 3/32 in. wide by 3/16 in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; RCA part/dwg C-737837-343	Fixed Antenna Trimmer
C-103		CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type, single section; 3 to 33 mmf; straight line characteristic; 600 v rms 60 cycle; 1 7/32 in. lg by 5/8 in. wide by 3/4 in. high less shaft; shaft 0.2183 in.; dia by 1 3/32 in. lg; extension shaft adjustable; 27 brass plates, nickel plated; 360 deg rotation either direction; ceramic insulation; solder lug terminals; single hole mounting by 3/16-32 thread by 1/4 in. bushing; RCA part/dwg A-8833296-2	Variable Antenna Trimmer
C-104		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 47,000 mmf ±20%; 200 v DC working; hermetically sealed metal case, w/ plastic insulating sleeve; 1 3/16 in. lg by 0.374 in. dia; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp -55°C to +85°C; Sprague Type no. 81P4732S3; RCA part/dwg C-737816-391	Screen Bypass, V-101
C-105		Same as C-104	Screen Bypass, V-101
C-106		CAPACITOR, FIXED, MICA: 220 mmf ±5%; 500 v DC working; characteristic E; 1/2 in. lg by 3/32 in. wide by 3/16 in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-339	Fixed Antenna Trimmer for LO Input Antenna
C-107		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 10,000 mmf ±20%; 100 v DC working; hermetically sealed metal case; 5/8 in. lg by 0.237 in. dia; vitamin Q impregnated; two axial wire leads; no internal ground, insulated; marked w/ capacity, tolerance, working v, and mfr name; operating temp range -55°C to +85°C; RCA part/dwg C-737816-27	Antenna Blocking
C-108 through C-125		Not Used	
C-126		CAPACITOR, FIXED, CERAMIC DIELECTRIC: single section; 27 mmf ±5%; 500 v DC working; neg temp coefficient; 1400 mmf per mf per deg C; (tolerance ±210) mmf per mf per deg C; insulated case; 0.230 in. max dia by 0.475 in. max lg; two uninsulated wire lead type terminals; mounting facilities not incl; RCA part/dwg A-8825430-20	Compensating Capacitor, T-130 Secondary

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-127		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 2200 mmf $\pm 10\%$ ; 300 v DC working max at 85°C; molded phenolic case; $\frac{3}{8}$ in. lg by 0.175 in. dia; POKAR impregnated; two axial wire lead terminals; not internally grounded; terminal mounted; operating temp range -55°C to +85°C; -8% capacity change at -55°C, +4.5% capacity change at +85°C; color coded; Sprague Type 75122293 2200 mmf; RCA part/dwg C-737845-189	Loading Capacitor, T-130 Primary
C-128		CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type; single section; 19.7 mmf max, 2.6 mmf min; straight line characteristic; 707 v AC peak voltage; $1\frac{5}{32}$ in. lg $\frac{3}{8}$ in. wide by $\frac{3}{4}$ in. high less shaft and bushing; bushing dim $\frac{1}{4}$ -32 threads, $\frac{1}{4}$ in. lg; shaft dim beyond bushing $\frac{1}{4}$ in. lg, 0.187 in. dia; screw driver adjustment; 360 deg rotation either direction; ceramic insulation between rotor and stator; two solder lug terminals; single hole mounted by $\frac{1}{4}$ in. dia bushing; 500 min "Q"; 21 plates, brass, silver plated; RCA part/dwg B-462181-1	Trimmer Capacitor, T-130 Secondary
C-129	Same as C-126		Compensating Capacitor, T-129 Secondary
C-130		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 4700 mmf $\pm 10\%$ ; 200 v DC working at 85°C, 150 v DC working at 125°C; molded phenolic case; $\frac{3}{8}$ in. lg by 0.175 in. dia; POKAR impregnated; two axial wire lead terminals; not internally grounded; terminals mounted; -55°C min operating temp; -8% capacity change at -55°C, +10% capacity change at +125°C; color coded; Sprague Type no. 75P47292; RCA part/dwg C-737845-163	Loading Capacitor, T-128 Primary
C-131	Same as C-128		Trimmer Capacitor, T-129 Secondary
C-132		CAPACITOR, FIXED, CERAMIC DIELECTRIC: JAN Type CC21UJ270J; 27 mmf $\pm 5\%$ ; neg temp coefficient 750 (tolerance +120 -350) mmf per mf per deg C; 500 v DC working; 0.562 in. lg by 0.25 in. dia; two axial wire lead terminals; terminals mounted; ceramic insulation; spec JAN-C-20A; RCA part/dwg P-722407-420	Compensating Capacitor, T-128 Secondary
C-133		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 12,000 mmf $\pm 10\%$ ; 200 v DC working at 85°C; 150 v DC working at 125°C; molded phenolic case; $\frac{3}{8}$ in. lg by 0.250 in. dia; POKAR impregnated; two axial wire lead terminals; not internally grounded; terminals mounted; -55°C min operating temp; -8% capacity change at -55°C, +10% capacity change at +125°C; color coded; Sprague, POKAR Type 75-P-12,000 mmf; RCA part/dwg C-737845-168	Loading Capacitor, T-127 Primary
C-134	Same as C-128		Trimmer Capacitor, T-128 Secondary
C-135	Same as C-132		Compensating Capacitor, T-127 Secondary
C-136		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 0.047 mf $\pm 10\%$ ; 100 v DC working; hermetically sealed metal case; $1\frac{5}{16}$ in. lg by 0.374 in. dia less terminals; vitamin Q impregnated; two axial wire lead terminals, $1\frac{1}{8}$ in. lg; not internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range -55°C to +85°C; Sprague Type no. 81P47391S3; RCA part/dwg C-737816-331	Loading Capacitor, T-126 Primary
C-137	Same as C-128		Trimmer Capacitor, T-127 Secondary
C-138	Same as C-132		Compensating Capacitor, T-126 Secondary
C-139		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 10,000 mmf $\pm 10\%$ ; 100 v DC working at 125°C; molded phenolic case; $\frac{3}{8}$ in. lg by 0.200 in. dia; POKAR impregnated; two axial wire lead terminals; not internally grounded; operating temp range -55°C to +125°C; -8% capacity change at -55°C, +10% capacity change at +125°C; color coded; Sprague Type no. 75P10391; RCA part/dwg C-737845-137	Loading Capacitor, T-127, T-128, T-129 Primary
C-140	Same as C-128		Trimmer Capacitor, T-126 Secondary
C-141	Same as C-101		Blocking Capacitor, T-126 through T-130 Secondaries
C-142		CAPACITOR, FIXED, PAPER DIELECTRIC: one section; 100,000 mmf $\pm 20\%$ ; 200 v DC working; hermetically sealed metal case; $\frac{7}{8}$ in. lg by 0.400 in. dia less terminals; two axial wire lead type terminals, on ea end; vitamin Q impregnated; no internal ground connections; terminal mounted; marked w/ capacity, tolerance, rated working v, and mfr name; operating temp -55°C to +85°C; Sprague Type no. 91P10402S2; RCA part/dwg C-737816-233	Screen Bypass, V-126
C-143		CAPACITOR, FIXED, CERAMIC: JAN Type CC21CH120J; 12 mmf $\pm 5\%$ ; temp coefficient 0 (tolerance $\pm 120$ ) mmf per mf per deg C; 500 v DC working; 0.562 in. lg by 0.25 in. dia; two axial wire leads; ceramic insulation; color coded; spec JAN-C-20A; RCA part/dwg C-722407-64	Coupling Capacitor, Calibrator Input
C-144 through C-150	Not Used		
C-151	Same as C-126		Compensating Capacitor, T-155 Secondary
C-152	Same as C-128		Trimmer Capacitor, T-155 Secondary

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-153		Same as C-132	Compensating Capacitor, T-154 Secondary
C-154		Same as C-128	Trimmer Capacitor, T-154 Secondary
C-155		CAPACITOR, FIXED, CERAMIC DIELECTRIC: single section; 22 mmf $\pm 5\%$ ; 500 v DC working; neg temp coefficient 1400 mmf per mf per deg C (tolerance $\pm 210$ ) mmf per mf per deg C; insulated case; 0.230 in. max dia by 0.475 in. max lg; two uninsulated wire lead type terminals; mounting facilities not included; RCA part/dwg A-8825430-18	Compensating Capacitor, T-153 Secondary
C-156		Same as C-128	Trimmer Capacitor, T-153 Secondary
C-157		Same as C-132	Compensating Capacitor, T-152 Secondary
C-158		Same as C-128	Trimmer Capacitor, T-152 Secondary
C-159		Same as C-132	Compensating Capacitor, T-151 Secondary
C-160		Same as C-128	Trimmer Capacitor, T-151 Secondary
C-161		Same as C-101; p/o Z-151	Cathode Resistor Bypass, V-151
C-162		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 100,000 mmf $\pm 20\%$ ; 200 v DC working; hermetically sealed metal case; $1\frac{3}{16}$ in. lg by 0.400 in. dia; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v. and mfr name; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; Sprague Type no. 81PI0402S1; RCA part/dwg C-737816-553	Screen Bypass, V-151
C-163 through C-200		Not Used	
C-201		CAPACITOR, FIXED, MICA DIELECTRIC: 600 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to $+50$ mmf per mf per deg C; molded, thermosetting material completely enclosing all elements; $5\frac{1}{4}$ in. max lg by $1\frac{3}{8}$ in. max wide by $\frac{1}{2}$ in. max deep; two solid wire lead terminals, $1\frac{1}{8}$ in. min lg ea; located axially one ea end; terminals mounted; RCA part/dwg B-465842-11	Series Padder for L-205/C-251A
C-202		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 36 mmf $\pm 2\%$ ; 0 temp coefficient $\pm 15\%$ ; 500 v DC working; 0.460 in. lg by 0.230 in. dia; two radial wire lead terminals; terminals mounted; un-insulated; polystyrene lacquer coated; color coded; RCA part/dwg C-748269-25	Compensating Capacitor, L-205
C-203		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 12 mmf $\pm 5\%$ ; neg temp coefficient 150 (tolerance $\pm 15$ ) mmf per mf per deg C; 500 v DC working; 0.520 in. lg by 0.395 in. wide by $\frac{3}{32}$ in. max thick; two axial wire lead terminals; terminals mounted; un-insulated; polystyrene lacquer coated; marked w/ capacity, temp coefficient and RCA part/dwg no.; RCA part/dwg C-748269-27	Tunes L-205
C-204		Same as C-128	Variable Trimmer, L-205
C-205		CAPACITOR, FIXED, MICA DIELECTRIC: 906 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to $+50$ mmf per mf per deg C; molded thermosetting material completely enclosing all elements; $5\frac{1}{4}$ in. max lg by $1\frac{3}{8}$ in. max wide by $\frac{1}{2}$ in. max deep; two solid wire lead terminals, $1\frac{1}{8}$ in. min lg ea; located axially one ea end; terminals mounted; RCA part/dwg B-465842-12	Series Padder for L-204/C-251
C-206		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 22 mmf $\pm 2\%$ ; neg temp coefficient 150 (tolerance $\pm 15$ ) mmf per mf per deg C; 500 v DC working; 0.520 in. lg by 0.395 in. wide by $\frac{3}{32}$ in. thick; two axial wire lead terminals; terminals mounted; un-insulated; marked w/ capacity, temp coefficient, RCA part/dwg no.; RCA part/dwg C-748269-21	Compensating Capacitor, L-204
C-207		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 13 mmf $\pm 2\%$ ; temp coefficient 0 (tolerance $\pm 15$ ) mmf per mf per deg C; 500 v DC working; 0.460 in. lg by 0.230 in. dia; two axial wire lead terminals; terminals mounted; un-insulated; color coded; RCA part/dwg C-748269-20	Compensating Capacitor, L-204
C-208		Same as C-128	Variable Trimmer, L-204
C-209		CAPACITOR, FIXED, MICA DIELECTRIC: 220 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to $+40$ mmf per mf per deg C; molded thermosetting material completely enclosing all elements; $3\frac{3}{4}$ in. max lg by $1\frac{3}{4}$ in. max wide by $\frac{1}{2}$ in. max deep; two solid wire lead terminals, $1\frac{1}{8}$ in. min lg ea; located axially one ea end; terminal mounted; RCA part/dwg B-465842-13	Series Padder, L-203/C-251A
C-210		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 24 mmf $\pm 2\%$ ; neg temp coefficient 220 (tolerance $\pm 33$ ) mmf per mf per deg C; 500 v DC working; 0.400 in. lg by 0.200 in. dia; two radial wire lead terminals; terminals mounted; un-insulated; polystyrene lacquer coated; color coded; RCA part/dwg C-748269-28	Compensating Capacitor, L-203
C-211		CAPACITOR, FIXED, MICA: 100 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to $+40$ mmf per mf per deg C; capacitance drift 0.05% max; $3\frac{3}{4}$ in. lg by $\frac{1}{2}$ in. wide by $1\frac{3}{4}$ in. high; phenolic; two axial wire leads one ea end in center, ea $1\frac{1}{8}$ in. lg min by 0.032 in. dia; terminals mounted; RCA part/dwg B-465842-1	Compensating Capacitor, L-203



TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-212		Same as C-128	Variable Trimmer, L-203
C-213		Same as C-210	Compensating Capacitor, L-202
C-214		CAPACITOR, FIXED, MICA DIELECTRIC: 162 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to +40 mmf per mf per deg C; molded thermosetting material completely enclosing all elements; $3\frac{3}{4}$ in. max lg by $1\frac{1}{4}$ in. max wide by $\frac{1}{2}$ in. max deep; two solid wire lead terminals, $1\frac{1}{8}$ in. min lg ea; located axially one ea end; terminals mounted; RCA part/dwg B-465842-8	Compensating Capacitor, L-202
C-215		CAPACITOR, FIXED, MICA DIELECTRIC: 200 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to +40 mmf per mf per deg C; molded thermosetting material completely enclosing all elements; $3\frac{3}{4}$ in. max lg by $1\frac{1}{4}$ in. max wide by $\frac{1}{2}$ in. max deep; two solid wire lead terminals, $1\frac{1}{8}$ in. min lg ea; located axially one ea end; terminals mounted; RCA part/dwg B-465842-10	Fixed Trimmer, L-202
C-216		Same as C-128	Variable Trimmer, L-202
C-217		CAPACITOR, FIXED, MICA DIELECTRIC: 183 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to +40 mmf per mf per deg C; molded thermosetting material completely enclosing all elements; $3\frac{3}{4}$ in. max lg by $1\frac{1}{4}$ in. max wide by $\frac{1}{2}$ in. max deep; two solid wire lead terminals, $1\frac{1}{8}$ in. min lg ea; located axially one ea end; terminals mounted; RCA part/dwg B-465842-9	With C-222, Series Padder, L-201/C-251A
C-218		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20 mmf $\pm 2\%$ ; neg temp coefficient 470 (tolerance $\pm 40$ ) mmf per mf per deg C; 500 v DC working; 0.400 in. lg by 0.200 in. dia; two radial wire lead terminals; terminals mounted; uninsulated; polystyrene lacquer coated; color coded; RCA part/dwg C-748269-26	Compensating Capacitor, L-201
C-219		CAPACITOR, FIXED, MICA DIELECTRIC: 120 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to +40 mmf per mf per deg C; molded thermosetting material completely enclosing all elements; $3\frac{3}{4}$ in. max lg by $1\frac{1}{4}$ in. max wide by $\frac{1}{2}$ in. max deep; two axial wire lead terminals, $1\frac{1}{8}$ in. min lg ea; located axially one ea end; terminals mounted; RCA part/dwg B-465842-7	Fixed Trimmer, L-201
C-220		Same as C-128	Variable Trimmer, L-201
C-221, C-222		Not Used	
C-223		CAPACITOR, FIXED, MICA: 470 mmf $\pm 5\%$ ; 300 v DC working; characteristic E; $\frac{1}{2}$ in. lg by $\frac{9}{32}$ in. wide by $\frac{3}{16}$ in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-347; p/o Z-201	Grid Bias, V-205
C-224		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 2700 mmf $\pm 10\%$ ; 300 v DC working max at 85°C; molded phenolic case; $\frac{3}{4}$ in. lg by 0.175 in. dia; POKAR impregnated; two axial wire lead terminals; not internally grounded; terminals mounted; operating temp range -55°C to +85°C; -8% capacity change at -55°C, +4.5% capacity change at +85°C; color coded; Sprague Type no. 75P27298; RCA part/dwg C-737845-190; p/o Z-201	Screen Bypass, V-201
C-225		Same as C-162; p/o Z-201	Plate Supply Bypass, V-201
C-226		Same as C-106; p/o Z-201	Output Coupling, V-201 Plate
C-227		Same as C-101; p/o Z-201	Heater Bypass, V-201
C-228 through C-351		Not Used	
C-352		Same as C-127	Loading, T-351 Primary
C-353		CAPACITOR, FIXED, MICA: 10 mmf $\pm 5\%$ ; 500 v DC working; temp coefficient -200 to +200 mmf per mf per deg C; $3\frac{3}{4}$ in. max lg by $1\frac{1}{4}$ in. max wide by $\frac{1}{2}$ in. max thick; molded low loss bakelite case; two axial wire lead terminals; terminal mounted; color coded; RCA part/dwg C-748252-310	Fixed Trimmer, T-351 Secondary
C-354		Same as C-128	Variable Trimmer, T-351 Secondary
C-355		CAPACITOR, FIXED, MICA: 910 mmf $\pm 2\%$ ; 500 v DC working; temp coefficient letter F; $5\frac{1}{4}$ in. max lg by $1\frac{1}{2}$ in. max wide by $\frac{1}{2}$ in. max thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; resistant to salt water; color coded; RCA part/dwg C-744584-354	Loading, T-352 Primary
C-356		Same as C-353	Fixed Trimmer, T-352 Secondary
C-357		Same as C-128	Variable Trimmer, T-352 Secondary
C-358		CAPACITOR, FIXED, MICA DIELECTRIC: 470 mmf $\pm 2\%$ ; 300 v DC working; temp characteristic letter F; case $3\frac{3}{4}$ in. max lg by $1\frac{1}{4}$ in. max wide by $\frac{1}{2}$ in. max thick less terminals; molded phenolic case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-744583-347	Loading, T-353 Primary
C-359		Same as C-353	Fixed Trimmer, T-353 Secondary
C-360		Same as C-128	Variable Trimmer, T-353 Secondary

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-361		CAPACITOR, FIXED, MICA: 100 mmf $\pm 2\%$ ; 500 v DC working; temp coefficient letter F; $3\frac{3}{64}$ in. lg by $1\frac{1}{64}$ in. wide by $\frac{1}{32}$ in. thick; molded bakelite case; two axial wire lead terminals; terminals mounted; resistant to salt water; color coded; RCA part/dwg C-744583-331	Loading, T-354 Primary
C-362	Same as C-353		Fixed Trimmer, T-354 Secondary
C-363	Same as C-128		Variable Trimmer, T-354 Secondary
C-364		CAPACITOR, FIXED, MICA DIELECTRIC: 82 mmf $\pm 2\%$ ; 500 v DC working; temp characteristic letter F; case $3\frac{3}{64}$ in. max lg by $1\frac{1}{32}$ in. max wide by $\frac{1}{32}$ in. max thick less terminals; molded phenolic case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-744583-329	Loading, T-355 Primary
C-365		CAPACITOR, FIXED, MICA: 12 mmf $\pm 2\%$ ; 500 v DC working; temp coefficient letter C; $3\frac{3}{64}$ in. max lg by $1\frac{1}{64}$ in. max wide by $\frac{1}{32}$ in. max thick; molded bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-748252-411	Fixed Trimmer, T-355 Secondary
C-366	Same as C-128		Variable Trimmer, T-355 Secondary
C-367		CAPACITOR, FIXED, MICA: 47 mmf $\pm 5\%$ ; 500 v DC working; characteristic E; $\frac{1}{2}$ in. lg by $\frac{9}{32}$ in. wide by $\frac{7}{16}$ in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-323; p/o Z-351	Grid Coupling, V-357
C-368		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 10,000 mmf $\pm 20\%$ ; 100 v DC working; hermetically sealed metal case; $1\frac{1}{16}$ in. lg by 0.237 in. dia w/ plastic insulating sleeve; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; Sprague Type no. 81P10301S3; RCA part/dwg C-737816-347; p/o Z-351	Cathode Resistor Bypass, V-351
C-369		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 10,000 mmf $\pm 20\%$ ; 400 v DC working; hermetically sealed metal case; $1\frac{1}{16}$ in. lg by 0.297 in. dia w/ insulating plastic sleeve; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; Sprague Type no. 81P10304S3; RCA part/dwg C-737816-427	Screen Bypass, V-351
C-370	Same as C-367; p/o Z-351		Grid Coupling, V-352
C-371	Same as C-368; p/o Z-351		Output Coupling from V-352 Cathode
C-372	Same as C-369; p/o Z-351		Plate Bypass, V-352
C-373 through C-400	Not Used		
C-401		CAPACITOR, FIXED, MICA: 396 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to $+40$ mmf per mf per deg C; capacitance drift $0.05\% \pm 0.1$ mmf max; $3\frac{3}{64}$ in. lg by $1\frac{1}{64}$ in. wide by $\frac{1}{32}$ in. thick max; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; marked w/ RCA part/dwg no.; color coded; RCA part/dwg B-465842-14	Series Pad for L-401
C-402	Same as C-207		With C-403 Compensates L-401
C-403	Same as C-206		With C-402 Compensates L-401
C-404	Same as C-128		Variable Trimmer, L-401
C-405		CAPACITOR, FIXED, MICA: 696 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to $+50$ mmf per mf per deg C; capacitance drift $0.05\% \pm 0.1$ mmf max; $5\frac{1}{64}$ in. lg by $1\frac{15}{32}$ in. wide by $\frac{1}{32}$ in. thick max; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; marked w/ RCA part/dwg no.; color coded; RCA part/dwg B-465842-15	Series Pad for L-402
C-406		CAPACITOR, FIXED, CERAMIC: 27 mmf $\pm 2\%$ ; temp coefficient 0.00 (tolerance $\pm 15$ ) mmf per mf per deg C; 300 v DC working; 0.460 in. lg by 0.230 in. dia; two radial wire leads 0.025 in. dia by $1\frac{1}{4}$ in. lg min; terminals mounted; ceramic insulated; capacitance drift $0.05\%$ or 0.02 mmf max; RCA part/dwg C-748269-7	Compensates L-402
C-407	Same as C-128		Variable Trimmer, L-402
C-408		CAPACITOR, FIXED, MICA: 1300 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to 50 mmf per mf per deg C; capacitance drift $0.05\% \pm 0.1$ mmf max; $5\frac{1}{64}$ in. lg by $1\frac{15}{32}$ in. wide by $\frac{1}{32}$ in. thick max; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; marked w/ RCA part/dwg no.; color coded; RCA part/dwg B-465842-16	Series Pad for L-403
C-409		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 18 mmf $\pm 0.25$ mmf; neg temp coefficient 150 (tolerance $\pm 15$ ) mmf per mf per deg C; 500 v DC working; 0.520 in. lg by 0.395 in. wide by $\frac{3}{32}$ in. thick; two axial wire lead terminals; terminals mounted; un-insulated; marked w/ capacity, temp coefficient, RCA part/dwg no.; RCA part/dwg C-748269-22	Compensates L-403
C-410	Same as C-128		Variable Trimmer, L-403

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-411		Same as C-401	Series Padder, L-404, C-451A
C-412		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 24 mmf $\pm 2\%$ ; temp coefficient 0 (tolerance $\pm 15$ ) mmf per mf per deg C; 500 v DC working; 0.460 in. lg by 0.230 in. dia; two radial wire lead terminals, terminals mounted; uninsulated; color coded; RCA part/dwg C-748269-23	With C-413 Compensates L-404
C-413		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 15 mmf $\pm 0.25$ mmf; pos temp coefficient 100 (tolerance $\pm 15$ ) mmf per mf per deg C; 500 v DC working; 0.520 in. lg by 0.395 in. wide by $\frac{3}{32}$ in. thick; two axial wire lead terminals; terminals mounted; uninsulated; marked w/ capacity, temp coefficient, RCA part/dwg no.; RCA part/dwg C-748269-24	With C-412 Compensates L-404
C-414		Same as C-128	Variable Trimmer, L-404
C-415		Same as C-405	Series Pad for L-405
C-416		CAPACITOR, FIXED, CERAMIC: 33 mmf $\pm 2\%$ ; temp coefficient 0.00 (tolerance $\pm 15$ ) mmf per mf per deg C; 300 v DC working; 0.460 in. lg by 0.230 in. dia; two radial wire leads 0.025 in. dia by $\frac{1}{4}$ in. lg min; terminals mounted; ceramic insulation; capacitance drift 0.05% or 0.02 mmf max; RCA part/dwg C-748269-9	Compensates L-405
C-417		CAPACITOR, FIXED, MICA: 5 mmf $\pm 5\%$ ; 500 v DC working; temp coefficient letter C; $\frac{3}{16}$ in. max lg by $\frac{1}{16}$ in. max wide by $\frac{1}{32}$ in. max thick; molded bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-748252-305	Top Coupling, T-302
C-418		Same as C-128	Variable Trimmer, L-405
C-419		Same as C-367; p/o Z-401	Output Coupling, V-401 Plate
C-420		Same as C-369; p/o Z-401	Plate Supply Decoupling, V-401
C-421		Same as C-367; p/o Z-401	Grid Coupling, V-401
C-422		Same as C-369; p/o Z-401	Screen Bypass, V-401
C-423		CAPACITOR, FIXED, MICA: 22 mmf $\pm 5\%$ ; 500 v DC working; characteristic E; $\frac{3}{16}$ in. lg by $\frac{1}{16}$ in. wide by $\frac{1}{32}$ in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-315; p/o Z-401	Cathode Resistor Bypass, V-401
C-424 through C-550		Not Used	
C-551		Same as C-128	Variable Trimmer, T-551 Secondary
C-552		Same as C-128	Variable Trimmer, T-552 Secondary
C-553		Same as C-128	Variable Trimmer, T-553 Secondary
C-554		Same as C-128	Variable Trimmer, T-554 Secondary
C-555		Same as C-128	Variable Trimmer, T-555 Secondary
C-556		CAPACITOR, FIXED, CERAMIC DIELECTRIC: JAN Type CC20CJ030C; 3 mmf $\pm 0.25$ mmf; 500 v DC working; temp coefficient 0 (tolerance $\pm 120$ ) mmf per mf per deg C; uninsulated; case dim, 0.400 in. lg by 0.200 in. dia; two radial wire lead type terminals, $\frac{1}{4}$ in. lg; terminals mounted; color coded; spec JAN-C-20A; RCA part/dwg P-722401-56	Fixed Trimmer, T-551 Secondary
C-557		CAPACITOR, FIXED, MICA: 27 mmf $\pm 5\%$ ; 500 v DC working; characteristic E; $\frac{3}{16}$ in. lg max by $\frac{1}{16}$ in. wide max by $\frac{1}{32}$ in. high max; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-317	Loading, T-551 Primary
C-558		CAPACITOR, FIXED, MICA: 6 mmf $\pm 5\%$ ; 500 v DC working; temp coefficient letter C; $\frac{3}{16}$ in. max lg by $\frac{1}{16}$ in. max wide by $\frac{1}{32}$ in. max thick; molded bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-748252-306	Top Coupling, T-552
C-559		Not Used	
C-560		CAPACITOR, FIXED, MICA: 68 mmf $\pm 5\%$ ; 500 v DC working; characteristic E; $\frac{1}{2}$ in. lg by $\frac{3}{16}$ in. wide by $\frac{3}{16}$ in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-327	Loading, T-552 Primary
C-561		Same as C-534	Top Coupling, T-553
C-562		Same as C-556	Fixed Trimmer, T-553 Secondary
C-563		CAPACITOR, FIXED, MICA: 20 mmf $\pm 5\%$ ; 500 v DC working; temp coefficient -200 to +200 mmf per mf per deg C; $\frac{3}{16}$ in. max lg by $\frac{1}{16}$ in. max wide by $\frac{1}{32}$ in. max thick; molded bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-748252-314	Loading, T-553 Primary

**TABLE 8-1. MAINTENANCE PARTS LISTS  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-564		CAPACITOR, FIXED, CERAMIC DIELECTRIC: JAN Type CC20CH180G; 18 mmf $\pm 2\%$ ; temp coefficient 0 (tolerance $\pm 60$ —112) mmf per mf per deg C; 500 v DC working; 0.400 in. lg by 0.200 in. dia; two radial wire lead terminals; terminals mounted; uninsulated; color coded; spec JAN-C-20A; RCA part/dwg P-722401-66	Fixed Trimmer, T-554 Secondary
C-565		CAPACITOR, FIXED, MICA: 420 mmf $\pm 1\%$ ; 300 v DC working; characteristic E; $3\frac{3}{64}$ in. max lg by $1\frac{1}{64}$ in. max wide by $\frac{7}{32}$ in. max high; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg A-8824194-6	With C-566, Bandsread Network for T-554 Secondary
C-566		CAPACITOR, FIXED, MICA: 33 mmf $\pm 2\%$ ; 500 v DC working; characteristic E; $3\frac{3}{64}$ in. lg by $1\frac{1}{64}$ in. wide by $\frac{7}{32}$ in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; spec JAN-C-5; RCA part/dwg C-737837-419	With C-565 Bandsread Network for T-554 Secondary
C-567	Same as C-556		Fixed Trimmer, T-555 Secondary
C-568		CAPACITOR, FIXED, MICA: 150 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient letter F; $3\frac{3}{64}$ in. lg by $1\frac{1}{64}$ in. wide by $\frac{7}{32}$ in. thick; molded bakelite case; two axial wire lead terminals; terminals mounted; resistant to salt water; color coded; RCA part/dwg C-744583-435	With C-569, Bandsread Network for T-555 Secondary
C-569	Same as C-566		With C-568, Bandsread Network for T-555 Secondary
C-570	Same as C-365		Loading, T-555 Primary
C-571	Same as C-367; p/o Z-551		Grid Coupling, V-551
C-572	Same as C-368; p/o Z-551		Cathode Resistor Bypass, V-551
C-573	Same as C-369; p/o Z-551		Screen Bypass, V-551
C-574	Same as C-367; p/o Z-551		Grid Coupling, V-552
C-575		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 47,000 mmf $\pm 20\%$ ; 100 v DC working; hermetically sealed case; $1\frac{1}{16}$ in. lg by 0.374 in. dia; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; RCA part/dwg C-737816-351; p/o Z-551	Output Coupling, V-552 Cathode
C-576	Same as C-369; p/o Z-551		Plate Bypass, V-552
C-577		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 12 mmf $\pm 5\%$ ; variable temp coefficient; 500 v DC working; 0.475 in. max lg by 0.230 in. max dia; two axial wire lead terminals; terminals mounted; ceramic insulation; RCA part/dwg A-8825430-14	Compensates Mixer Coils
C-578 through C-709	Not Used		
C-710		CAPACITOR, VARIABLE, CERAMIC: rotary type, single section; 5 to 25 mmf; 500 v DC working; temp coefficient 0; $\frac{3}{4}$ in. lg by $1\frac{1}{32}$ in. wide by $1\frac{1}{32}$ in. thick overall approx; solder lug terminals; two no. 2-56 tapped mounting holes on $\frac{1}{16}$ in. mounting center; screwdriver adjustment; ceramic base; fungus resistant; RCA part/dwg B-462179-2	Input Trimmer, Z-702
C-711		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 100,000 mmf $\pm 10\%$ ; 400 v DC working; hermetically sealed metal case; $1\frac{1}{4}$ in. lg by 0.400 in. dia; stabilized wax impregnated; two axial wire lead terminals; not internally grounded; terminals mounted; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; Sprague Catalog no. 88P10494S2; RCA part/dwg C-737818-253	Screen Supply Filtering, V-701
C-712	Same as C-711		Plate Supply Filter, V-701
C-713	Not Used		
C-714		CAPACITOR, FIXED, MICA: 390 mmf $\pm 5\%$ ; 500 v DC working; characteristic E; $\frac{1}{2}$ in. lg by $\frac{3}{32}$ in. wide by $\frac{3}{16}$ in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-345; p/o Z-701	Blocking Capacitor, V-701
C-715	Same as C-710		Output Trimmer, Z-702
C-716		CAPACITOR, FIXED, MICA: 18 mmf $\pm 5\%$ ; 500 v DC working; temp coefficient letter C; $3\frac{3}{64}$ in. max lg by $1\frac{1}{64}$ in. max wide by $\frac{7}{32}$ in. max thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-748252-313; p/o Z-701	Feedback Network, V-701 Grid No. 1
C-717		CAPACITOR, FIXED, MICA: 82 mmf $\pm 5\%$ ; 500 v DC working; characteristic E; $\frac{1}{2}$ in. lg by $\frac{3}{32}$ in. wide by $\frac{3}{16}$ in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-329; p/o Z-701	P/o Feedback Network, V-701 Grid No. 2

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-718		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 100,000 mmf $\pm 10\%$ ; 100 v DC working; hermetically sealed metal case; $1\frac{5}{16}$ in. lg by 0.374 in. dia w/ plastic insulating sleeve; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; RCA part/dwg C-737816-333; p/o Z-701	Cathode Resistor Bypass, V-701
C-719		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 100,000 mmf $\pm 10\%$ ; 100 v DC working; hermetically sealed metal case; $1\frac{3}{16}$ in. lg by 0.312 in. dia; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; Sprague Catalog no. 81P10491S1; RCA part/dwg C-737816-493	Heater Bypass, V-701
C-720	Same as C-719		Heater Bypass, V-701
C-721	Same as C-710		With C-722 and C-723, Tunes T-703 Primary
C-722	Same as C-557		With C-721 and C-723, Tunes T-703 Primary
C-723		CAPACITOR, FIXED, MICA: 240 mmf $\pm 5\%$ ; 500 v DC working; characteristic E; $\frac{3}{8}$ in. lg by $1\frac{1}{4}$ in. wide by $\frac{1}{32}$ in. thick; molded bakelite case; 2 axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-340	With C-721 and C-722, Tunes T-703 Primary
C-724 through C-808	Not Used		
C-809	Same as C-710		Input Trimmer, Z-802
C-810	Same as C-711		Screen Supply Filtering, V-801
C-811	Same as C-711		Plate Supply Filtering, V-801
C-812		CAPACITOR, FIXED, MICA DIELECTRIC: 180 mmf $\pm 5\%$ ; 500 v DC working; characteristic E; $\frac{3}{8}$ in. lg by $1\frac{1}{4}$ in. wide by $\frac{1}{32}$ in. thick; molded low loss bakelite case; two wire lead type terminals, located one on ea end; terminals mounted; color coded; RCA part/dwg C-737837-337; p/o Z-801	P/o Feedback Network, V-801 Grid No. 1
C-813		CAPACITOR, FIXED, MICA: 33 mmf $\pm 5\%$ ; 500 v DC working; characteristic E; $\frac{1}{2}$ in. lg by $\frac{3}{8}$ in. wide by $\frac{3}{16}$ in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-319; p/o Z-801	P/o Feedback Network, V-801 Grid No. 2
C-814		CAPACITOR, FIXED, MICA: 270 mmf $\pm 5\%$ ; 500 v DC working; characteristic E; $\frac{1}{2}$ in. lg by $\frac{3}{8}$ in. wide by $\frac{3}{16}$ in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-341; p/o Z-801	Blocking Capacitor, Y-801
C-815	Same as C-710		Output Trimmer, Z-802
C-816	Same as C-710		With C-818, Tunes T-801 Primary
C-817		CAPACITOR, FIXED, PAPER DIELECTRIC: one section; 10,000 mmf $\pm 10\%$ ; 400 v DC working; hermetically sealed metal case w/ plastic insulating sleeve; $\frac{1}{8}$ in. lg by 0.297 in. dia less terminals; two wire lead type terminals, located one ea end; vitamin Q impregnated; no internal ground connection; terminals mounted; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; marked w/ v, capacitance, tolerance, and vendor's name; insulated; Sprague Type no. 91P; RCA part/dwg C-737816-87	With C-816 and C-818, Tunes T-801 Primary
C-818	Same as C-723		With C-816, Tunes T-801 Primary
C-819	Same as C-719		Heater Bypass, V-801
C-820	Same as C-719		Heater Bypass, V-801
C-821	Same as C-814		With C-816, Tunes T-801 Primary
C-822	Same as C-817		With R-804 +B Plate Supply Filter
C-823 through C-908	Not Used		
C-909	Same as C-710		Input Trimmer, Z-902
C-910	Same as C-711		Screen Supply Filtering, V-551
C-911	Same as C-711		Plate Supply Filtering, V-901
C-912	Same as C-812; p/o Z-901		P/o Feedback Network, V-901 Grid No. 1
C-913	Same as C-813; p/o Z-901		P/o Feedback Network, V-901 Grid No. 2
C-914	Same as C-814; p/o Z-901		Blocking Capacitor to Y-901
C-915	Same as C-710		Output Trimmer, Z-902
C-916	Same as C-814; p/o Z-901		Tunes T-901 Primary
C-917	Same as C-719		Heater Bypass, V-901
C-918	Same as C-719		Heater Bypass, V-901

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-919		Same as C-817; p/o Z-901	With R-904, Plate Supply Decoupling, V-901
C-920 through C-1000		Not Used	
C-1001	6	CAPACITOR, FIXED, MICA DIELECTRIC: JAN Type CM20C121J; 120 mmf $\pm 5\%$ ; 500 v DC working; temp characteristic letter C; case $\frac{3}{4}$ in. lg by $\frac{1}{4}$ in. high by $\frac{1}{2}$ in. wide less leads; molded low loss phenolic case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-748252-333	With R-1032, Filters 200 Kc
C-1002 through C-1026		Not Used	
C-1027		Same as C-223; p/o Z-1003	Element of Z-1003
C-1028		Same as C-814; p/o Z-1003	Element of Z-1003
C-1029		CAPACITOR, VARIABLE, CERAMIC DIELECTRIC: rotary type; single section; zero temperature coefficient (NPO); 25 mmf max, 5 mmf min; 500 v DC test; $\frac{3}{4}$ in. lg by $\frac{1}{2}$ in. wide by $\frac{1}{2}$ in. thick; two solder lug type terminals, $\frac{2}{4}$ in. lg; back $\frac{3}{4}$ in. C to C at 90 deg to length; two 0.120 in. dia mounting holes spaced $\frac{1}{2}$ in. C to C; screwdriver adjustment; fungus resistant; RCA part/dwg B-462179-1	Output Trimmer, Z-1001, Z-1002, Z-1003
C-1030		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 10,000 mmf $\pm 10\%$ ; 200 v DC working at 85°C, 150 v DC working at 125°C; molded phenolic case; $\frac{3}{4}$ in. lg by 0.250 in. dia; POKAR impregnated; two axial wire lead terminals; not internally grounded; terminals mounted; -55°C min operating temp -8% capacity change at -55°C; +10% capacity change at 125°C; color coded; Sprague POKAR Type no. 75P10392; RCA part/dwg C-737845-167	Ground Return, Z-1001, Z-1002, Z-1003
C-1081		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 33,000 mmf $\pm 10\%$ ; 100 v DC working; hermetically sealed metal case; $\frac{1}{4}$ in. lg by 0.297 in. dia; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range -55°C to +85°C; RCA part/dwg C-737816-330; p/o Z-1004	Cathode Resistor Bypass, V-1001
C-1032		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 10,000 mmf $\pm 10\%$ ; 300 v DC working; molded phenolic case; $\frac{1}{4}$ in. lg by 0.195 in. diameter; POKAR impregnated; two axial wire lead terminals; not internally grounded; terminals mounted; operating temp range -55°C to +125°C, -8% capacity change at -55°C, +10% capacity change at +125°C; color coded; Sprague, POKAR Type 65P 10,000 mmf; RCA part/dwg C-737845-74; p/o Z-1004	Screen Bypass, V-1001
C-1033		Same as C-814	Tunes L-1011
C-1034		Same as C-814	Tunes L-1011
C-1035		Same as C-1031; p/o Z-1006	Cathode Resistor Bypass, V-1002
C-1036		Same as C-1032; p/o Z-1006	Screen Bypass, V-1002
C-1037		Same as C-814	Tunes L-1012
C-1038		Same as C-814	Tunes L-1012
C-1039		Same as C-1031; p/o Z-1008	Cathode Resistor Bypass, V-1003
C-1040		Not Used	
C-1041		Same as C-1032; p/o Z-1008	Screen Bypass, V-1003
C-1042		CAPACITOR, FIXED, MICA DIELECTRIC: 2100 mmf $\pm 2\%$ ; 500 v DC working; temp coefficient 0 to +40 mmf per mf per deg C; molded thermosetting material completely enclosing all elements; $\frac{5}{8}$ in. max lg by $\frac{5}{8}$ in. max wide by $\frac{3}{32}$ in. max deep; two axial wire lead terminals; $\frac{1}{8}$ in. min lg ea. located axially one ea end; terminals mounted; RCA part/dwg B-465842-6	With C-1043, Tunes T-1014 Primary
C-1043		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 280 mmf $\pm 1\%$ ; neg temp coefficient 1500 (tolerance $\pm 100$ ) mmf per mf per deg C; 500 v DC working; case 0.860 in. max lg by 0.230 in. max dia less terminals; two radial wire lead terminals bent 90 deg axially; terminals mounted; uninsulated; tolerance over range +25°C to -55°C not to exceed 1.3 times range from +25°C to +85°C; RCA part/dwg C-748269-13	With C-1042, Tunes T-1014 Primary
C-1044		CAPACITOR, FIXED, CERAMIC DIELECTRIC: JAN Type CC20CH100C; 10 mmf $\pm 0.25$ mmf; temp coefficient 0 (tolerance $\pm 60$ ) mmf per mf per deg C; 500 v DC working; 0.400 in. lg by 0.200 in. dia; two radial wire lead terminals; terminals mounted; uninsulated; color coded; RCA part/dwg P-722401-63	Coupling to T-1014
C-1045		Same as C-1031	Filters Rectified Output of CR-1001
C-1046		Not Used	

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-1047		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 4700 mmf $\pm 10\%$ ; 300 v DC working; molded bakelite case; $\frac{3}{4}$ in. lg by 0.200 in. dia; POKAR impregnated; two axial wire lead terminals; not internally grounded; terminals mounted; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ , $-8\%$ capacity change at $-55^{\circ}\text{C}$ , $+45\%$ capacity change at $+85^{\circ}\text{C}$ ; color coded; Sprague Type no. 75P47293; RCA part/dwg C-737845-193; p/o Z-1010	Output Coupling from V-1004 Plate
C-1048	6	CAPACITOR, FIXED, MICA: 22 mmf $\pm 10\%$ ; 500 v DC working; characteristic E; $\frac{3}{16}$ in. lg by $\frac{1}{16}$ in. wide by $\frac{1}{32}$ in. thick; molded bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-215; p/o Z-1010	Coupling to V-1004 Grid
C-1049		Same as C-1032; p/o Z-1010	Screen Bypass, V-1004
C-1050		CAPACITOR, FIXED, MICA: 510 mmf $\pm 5\%$ ; 300 v DC working; characteristic E; $\frac{3}{16}$ in. lg by $\frac{1}{16}$ in. wide by $\frac{1}{32}$ in. thick; molded bakelite case; two axial wire lead terminals; terminals mounted; color coded; spec JAN-C-5; RCA part/dwg C-737837-348	Tunes T-1013
C-1051		Same as C-714	Tunes T-1013
C-1052		CAPACITOR, FIXED, MICA: 470 mmf $\pm 10\%$ ; 300 v DC working; characteristic E; $\frac{1}{2}$ in. lg by $\frac{9}{32}$ in. wide by $\frac{1}{16}$ in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; spec JAN-C-5; RCA part/dwg C-737837-247; p/o Z-1012	Filters Rectified Output from V-1005
C-1053		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 100,000 mmf $\pm 10\%$ ; 200 v DC working; hermetically sealed metal case w/ plastic insulating sleeve; $\frac{15}{16}$ in. lg by 0.374 in. dia; stabilized wax impregnated; two axial wire lead terminals; not internally grounded; terminals mounted; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; Sprague Type no. 88P10492S4; RCA part/dwg C-737818-53	Coupling from V-1006 Cathode
C-1054		Same as C-325; p/o Z-1014	Coupling to V-1007 Grid
C-1055		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 100,000 mmf $\pm 10\%$ ; 200 v DC working; hermetically sealed metal case w/ plastic sleeve; 4 in. lg by 0.462 in. dia; vitamin Q impregnated; characteristic F per JAN-C-25; two axial wire lead terminals; not internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; RCA part/dwg C-737816-53; p/o Z-1014	Coupling from V-1007 Cathode
C-1056		Same as C-1032; p/o Z-1014	Plate Bypass, V-1007
C-1057		Not Used	
C-1058		Same as C-223	Filters Rectified Output from V-1005
C-1059		Not Used	
C-1060		Same as C-719	Filters Manual Gain Control Circuit
C-1061		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 220,000 mmf $\pm 10\%$ ; 100 v DC working; hermetically sealed metal case; $\frac{15}{16}$ in. lg by 0.400 in. dia; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; RCA part/dwg C-737816-495	Filters Second IF Heaters
C-1062		Same as C-1061	Filters Second IF Heaters
C-1063		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 100,000 mmf $\pm 10\%$ ; 400 v DC working; hermetically sealed metal case; $\frac{15}{16}$ in. lg by 0.400 in. dia; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; RCA part/dwg C-737816-573	Plate Supply Filtering, V-1004
C-1064		Same as C-1048	Coupling from Calibrator Unit to V-1002
C-1065		Same as C-1030	Automatic Gain Control Filter, V-1002 Grid Circuit
C-1066		Same as C-1030	With R-1031 Time Constant Determination, V-1003 Grid Circuit
C-1067 through C-1100		Not Used	
C-1101		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 220,000 mmf $\pm 10\%$ ; 100 v DC working; hermetically sealed metal case w/ plastic insulating sleeve; $\frac{15}{16}$ in. lg by 0.462 in. dia; stabilized wax impregnated; two axial wire lead terminals; internally grounded; terminals mounted; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; Sprague Type no. 78P22491S3; RCA part/dwg C-737818-335	Cathode Bias Filtering, V-1101

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-1102		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 33,000 mmf $\pm 10\%$ ; 400 v DC working; hermetically sealed metal case w/ plastic insulating sleeve; 1 in. lg by 0.374 in. dia; vitamin Q impregnated; two axial wire lead terminals; not internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; Sprague Type no. 91P; RCA part/dwg C-737816-90; p/o Z-1102	Coupling from V-1102 Plate
C-1103		CAPACITOR, PAPER DIELECTRIC: single section; 1000 mmf $\pm 10\%$ ; 400 v DC max at $85^{\circ}\text{C}$ ; molded phenolic case; $\frac{3}{4}$ in. lg by 0.175 in. dia; impregnated w/ high temp organic material; two axial wire lead terminals; not internally grounded; terminals mounted; color coded; Sprague Catalog no. 75P10294; RCA part/dwg C-737845-215; p/o Z-1103	Cathode Resistor Network Bypass, V-1103
C-1104		Same as C-1102; p/o Z-1104	Plate Bypass, V-1104
C-1105		Same as C-1102; p/o Z-1105	Coupling to V-1105 Grid
C-1106		Same as C-1103; p/o Z-1105	Plate Bypass, V-1105
C-1107		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 47,000 mmf $\pm 10\%$ ; 200 v DC working; hermetically sealed metal case w/ plastic insulating sleeve; $1\frac{3}{16}$ in. lg by 0.374 in. dia; vitamin Q impregnated; two axial wire lead terminals; not internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; Sprague Type no. 91P47392S4; RCA part/dwg C-737816-51; p/o Z-1106	Coupling to V-1106 Cathode
C-1108		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 1800 mmf $\pm 10\%$ ; 300 v DC max at $85^{\circ}\text{C}$ ; molded phenolic case; $\frac{3}{4}$ in. lg by 0.175 in. dia; impregnated w/ high temp organic material; two axial wire lead terminals, $1\frac{1}{8}$ in. + $\frac{3}{8}$ in. lg; not internally grounded; terminals mounted; color coded; Sprague POKAR Type no. 75P18293; RCA part/dwg C-737845-188; p/o Z-1107	Coupling from V-1107 Cathode
C-1109		Same as C-1032; p/o Z-1108	Coupling from V-1108 Plate
C-1110		Same as C-1030; p/o Z-1109	Screen Bypass, V-1109
C-1111		Not Used	
C-1112		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 100,000 mmf $\pm 10\%$ ; 200 v DC working; hermetically sealed metal can; $\frac{7}{8}$ in. lg by 0.400 in. dia; vitamin Q impregnated; two axial wire lead terminals; not internally grounded; single 0.144 in. diam mounting hole in integral tangential mounting bracket; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; marked w/ capacity, tolerance, working v, and mfr code and type; Sprague Catalog no. 91P10492S13; RCA part/dwg C-737860-125	Audio Input Filtering
C-1113		Not Used	
C-1114		Same as C-127; p/o Z-1101	Output Coupling from V-1101 Cathode
C-1115		Same as C-133; p/o Z-1004	Blocking Capacitor V-1104 Plate Circuit
C-1116 through C-1200		Not Used	
C-1201		CAPACITOR, VARIABLE, CERAMIC: rotary type, single section; 8 to 50 mmf; 500 v DC working; temp coefficient N750; $\frac{3}{4}$ in. lg by $1\frac{1}{32}$ in. wide by $1\frac{1}{32}$ in. thick overall approx; ( $1\frac{1}{64}$ in. thick less terminals); solder lug terminal at bottom; two 0.120 in. dia mounting holes on $\frac{5}{16}$ in. mounting center; screwdriver adjustment; ceramic base; fungus resistant; RCA part/dwg B-462179-3	Adjustment of Frequency of Y-120
C-1202		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 220,000 mmf $\pm 20\%$ ; 100 v DC working; hermetically sealed metal case; $1\frac{3}{16}$ in. lg by 0.462 in. dia; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; RCA part/dwg C-737816-355	Heater Bypass, V-1201, V-1202
C-1203		Same as C-1202	Heater Bypass, V-1201, V-1202
C-1204		CAPACITOR, FIXED, MICA: 150 mmf $\pm 5\%$ ; 500 v DC working; characteristic E; $3\frac{3}{64}$ in. lg by $1\frac{1}{64}$ in. wide by $\frac{1}{32}$ in. thick; low loss molded bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-335; p/o Z-1201	Output Coupling from V-1201 Plate
C-1205		CAPACITOR, FIXED, MICA: 47 mmf $\pm 20\%$ ; 500 v DC working; temp coefficient letter C; $3\frac{3}{64}$ in. lg by $1\frac{1}{64}$ in. wide by $\frac{1}{32}$ in. thick; molded bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-748252-123; p/o Z-1202	Output Coupling, V-1202 Plate
C-1206		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 100,000 mmf $\pm 20\%$ ; 200 v DC working; hermetically sealed metal case; $1\frac{5}{16}$ in. lg by 0.374 in. dia w/ plastic insulating sleeve; stabilized wax impregnated; two axial wire lead terminals; internally grounded; terminals mounted; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; Sprague Type no. 78P10402S3; RCA part/dwg C-737818-393; p/o Z-1202	Plate Supply Filtering, V-1201, 1202



TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-1207		CAPACITOR, FIXED, MICA: 5 mmf $\pm 20\%$ ; 500 v DC working; temp coefficient letter C; $3\frac{3}{4}$ in. lg by $1\frac{9}{16}$ in. wide by $\frac{7}{32}$ in. thick; molded bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-748252-105; p/o Z-1201	Output Coupling from V-1201 and V-1202 Cathodes
C-1208	6	CAPACITOR, FIXED, CERAMIC: JAN Type CC21CJ030C; 3 mmf $\pm 0.5$ mmf; 500 v DC working; temp coefficient 0 (tolerance $\pm 120$ ) mmf per mf per deg C; ceramic insulated; 0.562 in. lg by 0.250 in. dia; two axial wire lead terminals $1\frac{1}{4}$ in. lg; terminals mounted; color coded; spec JAN-C-20A; RCA part/dwg C-722407-56; p/o Z-1201	Feedback Coupling, V-1201
C-1209 through C-1300		Not Used	
C-1301		Same as C-817; p/o Z-1302	Screen Coupling, V-1301
C-1302		Same as C-714; p/o Z-1302	Plate Bypass, V-1301
C-1303		Same as C-223; p/o Z-1302	Grid Bias Charging, V-1301
C-1304		Same as C-423	With C-1308, Determines Frequency of Z-1301
C-1305		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 10,000 mmf $\pm 10\%$ ; 400 v DC working; hermetically sealed metal case w/ plastic insulating sleeve; $1\frac{3}{16}$ in. lg by 0.297 in. dia; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; Sprague Type no. 81; RCA part/dwg C-737816-407	Plate Supply Filtering, V-1301
C-1306		Same as C-223	Output Coupling from V-1301 Plate
C-1307		Same as C-1029	With C-1309, Determines Frequency of Z-1301
C-1308		Same as C-1029	With C-1304, Determines Frequency of Z-1301
C-1309		CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type, single section; 3.4 to 51 mmf; straight line characteristic; 500 v AC peak; $1\frac{5}{16}$ in. lg by $1\frac{5}{16}$ in. high by $2\frac{9}{32}$ in. wide less shaft, $\frac{1}{4}$ in. dia shaft flattened on two sides $1\frac{7}{32}$ in. lg w/ $\frac{9}{32}$ in. lg thread no. $\frac{5}{16}$ -32 bushing flat on one side; extension shaft adjustment; 19 brass plates, nickel plated; 390 deg rotation either direction; ceramic insulation; single hole mounting by $\frac{5}{16}$ -32 thread by $\frac{9}{32}$ in. lg bushing; moisture resistant; "Q" 500 min; RCA dwg B-462598-1	With C-1307, Determines Frequency of Z-1301
C-1310 through C-1400		Not Used	
C-1401		Same as C-1201	Adjustment of Y-1401 Frequency
C-1402		Same as C-353; p/o Z-1401	Assists in Feedback V-1401
C-1403		CAPACITOR, FIXED, MICA: 620 mmf $\pm 2\%$ ; 500 v DC working; temp coefficient letter F; $5\frac{1}{4}$ in. lg by $1\frac{9}{32}$ in. wide by $\frac{7}{32}$ in. thick; molded bakelite case; two axial wire lead terminals; terminals mounted; resistant to salt water; color coded; RCA part/dwg C-744584-350; p/o Z-1401	Plate Bypass, V-1401
C-1404		CAPACITOR, FIXED, CERAMIC: JAN Type CC21CH050D; 5 mmf $\pm 0.5$ mmf; neg temp coefficient 0 (tolerance $+60 -112$ ) mmf per mf per deg C; 500 v DC working; 0.562 in. lg by 0.25 in. dia; two axial wire lead terminals; terminals mounted; ceramic insulation; spec JAN-C-20A; RCA part/dwg P-722407-58; p/o Z-1401	Output Coupling from V-1401 Grid
C-1405		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 100,000 mmf $\pm 10\%$ ; 200 v DC working; hermetically sealed metal case w/ plastic insulating sleeve; $1\frac{5}{16}$ in. lg by 0.462 in. dia; vitamin Q impregnated; two axial wire lead terminals; internally grounded; marked w/ capacity, tolerance, working v, and mfr name; operating temp range $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; Sprague Catalog no. 81P10492S3; RCA part/dwg C-737816-373	Plate Supply Filtering, V-1401
C-1406		CAPACITOR, FIXED, MICA: 510 mmf $\pm 2\%$ ; 300 v DC working; characteristic E; $3\frac{3}{4}$ in. lg by $1\frac{9}{16}$ in. wide by $\frac{7}{32}$ in. thick; molded bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-448; p/o Z-1401	Screen Bypass, V-1402
C-1407		Same as C-1405	Plate Supply Filtering, V-1402
C-1408		Same as C-716; p/o Z-1401	Output Coupling Time Constant, V-1402 Plate
C-1409		Same as C-102; p/o Z-1402	Feedback Element, V-1402 Plate Grid
C-1410		Same as C-102; p/o Z-1402	Output Coupling from V-1402 Plate
C-1411 through C-1413		Not Used	
C-1414		Same as C-1406	Blocking Capacitor for Y-1401
C-1415 through C-1500		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-1501		Same as C-1201	Adjustment of Y-1501 Frequency
C-1502		Same as C-1202	Heater Bypass, V-1501, V-1502
C-1503		Same as C-1202	Heater Bypass, V-1501, V-1502
C-1504		CAPACITOR, FIXED, MICA: 100 mmf $\pm 5\%$ ; 500 v DC working; characteristic E; $\frac{1}{2}$ in. lg by $\frac{3}{32}$ in. wide by $\frac{3}{16}$ in. lg; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-331; p/o Z-1501	Output Coupling from V-1501 Plate
C-1505		Same as C-223; p/o Z-1502	Output Coupling from V-1502 Plate
C-1506		Same as C-1206; p/o Z-1502	Plate Supply Filtering, V-1501, V-1502
C-1507		Same as C-1504; p/o Z-1501	Output Coupling, V-1501, V-1502 Cathode
C-1508		Same as C-1404; p/o Z-1501	Feedback Coupling, V-1501
C-1509 through C-1600		Not Used	
C-1601		CAPACITOR, FIXED, DRY ELECTROLYTIC: polarized; JAN Type CE51C121P; single section; 120 mf; 350 v DC working; working temp range $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; $4\frac{1}{4}$ in. lg by 1 $\frac{3}{8}$ in. dia; hermetically sealed metal can; both terminals insulated from can, terminal in position no. 1 is neg; standard octal tube type base; even number pins omitted; plugs into 0.687 in. dia pin; spec JAN-C-62; RCA part/dwg P-735712-42	With L-1601, Filters Rectified Current
C-1602		Same as C-1601	With L-1601, Filters Rectified Current
C-1603		CAPACITOR, FIXED, PAPER DIELECTRIC: JAN Type CP29A1EF103M; single section; 10,000 mmf $\pm 20\%$ ; 600 v DC working; hermetically sealed metal case; 1 in. lg by $\frac{7}{16}$ in. dia; two axial wire lead terminals; not internally grounded; one tangential mounting bracket w/ single $\frac{3}{32}$ in. dia hole marked w/ mfr name or symbol, RCA part/dwg, capacity, and working v; spec JAN-C-25; RCA part/dwg K-984609-64	Filters Output from V-1603
C-1604 through C-2000		Not Used	
C-2001		CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type; four sections; 303 mmf max, 16 mmf min; straight line frequency tuning characteristic; 230 v rms test; 8 $\frac{3}{8}$ in. lg overall approx by 2.781 in. wide by 3 $\frac{3}{8}$ in. high overall approx; shaft dim beyond bushing $2\frac{1}{64}$ in. lg by $\frac{1}{4}$ in. dia; extension shaft, 187 deg clockwise rotation; ceramic insulation inside, metal cover; eight solder lug type terminals on bushing insulators; two no. 6-32 tapped mounting holes on 1 in. mounting center in block on top and three no. 10-32 mounting studs on 1.953 in. by 7.437 in. mounting center on bottom; ea section shielded from all other sections; all sections sealed against liquids and gases for a differential up to $\pm 3$ psi; resistant to 200-hr. salt spray test; 31 plates per section; front section steel, other section brass; RCA part/dwg C-744507-1	Gang Tuning Capacitor, Type I Receiver
C-2001A		Same as C-251; p/o C-2001	
C-2001B		Same as C-252; p/o C-2001	
C-2001C		Same as C-253; p/o C-2001	
C-2001D		Same as C-254; p/o C-2001	
C-2002		CAPACITOR, FIXED, METALIZED PAPER: single section; 4 mf $\pm 20\%$ ; 150 v DC working; hermetically sealed metal can; $1\frac{3}{16}$ in. lg by 1 in. wide by $\frac{1}{8}$ in. thick; wax impregnated; two solder lug terminals $\frac{3}{4}$ in. lg located on top spaced 1 in. C to C; not internally grounded; two integral mounting ears, one $\frac{3}{16}$ in. dia hole in ea ear on $2\frac{1}{8}$ in. mounting center; terminals hot solder dipped, marked w/ capacity, working v, and RCA part/dwg no.; RCA part/dwg C-737868-131	With L-252 Heater Circuit Filter
C-2003		Same as C-101	Manual Gain Control Bypass
C-2004		Same as C-1405	Plate Supply Bypass
C-2005 through C-2100		Not Used	
C-2101		CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type; five sections; 235 mmf max, 15 mmf min; straight line frequency tuning characteristics; 230 v rms test; 8 $\frac{3}{8}$ in. lg approx incl mountings overall by 2.781 in. wide by 3 $\frac{3}{8}$ in. high approx incl mountings and terminals overall; shaft dim beyond bushing $2\frac{1}{64}$ in. lg by $\frac{1}{4}$ in. dia; extension shaft, 187 deg clockwise rotation; ceramic insulation inside, metal cover; ten solder lug type terminals on bushing insulators; two no. 6-32 tapped mounting holes on 1 in. mounting center in block on top and three no. 10-32 mounting studs on 1.953 in. by 7.437 in. mounting center on bottom; ea section shielded from all other sections; all sections sealed against liquids and gases for a differential up to $\pm 3$ psi; resistant to 200-hr salt spray test; 25 plates per section; front section steel, other section brass; RCA part/dwg C-744506-1	Tuning Capacitor, Type II Receiver

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-2101A		P/o C-2101	
C-2101B		P/o C-2101	
C-2101C		P/o C-2101	
C-2101D		P/o C-2101	
C-2101E		P/o C-2101	
C-2102		Not Used	
C-2103		Same as C-101	Manual Gain Control Bypass
C-2104		Same as C-1405	Plate Supply Bypass
C-2105		Same as C-139	Automatic Gain Control Filtering and Time Constant
C-2106		CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type, single section; 3.0 to 28 mmf; straight line characteristics; 500 v 60 cyc rms; 3 $\frac{1}{2}$ in. lg by 2 $\frac{3}{32}$ in. wide by $\frac{1}{16}$ in. high less shaft, shaft 0.250 in. dia by 1 $\frac{1}{32}$ in. lg from mounting surface; extension shaft adjustable; 19 brass plates, nickel plated; 360 deg rotation either direction; ceramic insulation; single hole mounted by $\frac{9}{16}$ -32 by $\frac{1}{32}$ in. lg bushing; "Q" 500 min; RCA part/dwg B-462598-2	Antenna Trimmer
C-2107		CAPACITOR, FIXED, PAPER DIELECTRIC: single section; 100,000 mmf $\pm 10\%$ ; 200 v DC working; hermetically sealed metal case; 1 $\frac{1}{16}$ in. lg by 0.312 in. dia; stabilized wax impregnated; two axial wire lead terminals; internally grounded; terminals mounted; marked w/ capacity, tolerance, working v, and mfr name; operating temp range -40°C to +85°C; Sprague Type no. 78P10492S1; RCA part/dwg C-737818-533	Plate Supply Filtering, Antenna Unit
C-2108		Same as C-2107	Plate Supply Filtering, RF Unit
C-2109		Same as C-2107	Plate Supply Filtering, Mixer Unit
C-2110		Same as C-2107	Regulated Plate Supply Filtering, Oscillator Unit
C-2111 through C-2200		Not Used	
C-2201		Same as C-2101	Gang Tuning Capacitor, Type III Receiver
C-2201A		P/o C-2201	
C-2201B		P/o C-2201	
C-2201C		P/o C-2201	
C-2201D		P/o C-2201	
C-2201E		P/o C-2201	
C-2202		CAPACITOR, FIXED, MICA DIELECTRIC: 2200 mmf $\pm 10\%$ ; 500 v DC; temp coefficient letter E; 0.661 in. max dia by 0.117 in. max thickness; silver plated brass case and terminals; two solder lug terminals eccentrically located one on ea end; three mounting tabs $\frac{3}{32}$ in. lg spaced 120 deg apart on one end; 48-hr salt spray; terminals solder dipped; color coded; RCA part/dwg B-467255-1	Plate Supply Filtering
C-2203		Same as C-101	Manual Gain Control Bypass
C-2204		Same as C-1405	Plate Supply Bypass
C-2205		Same as C-139	Automatic Gain Control Filtering and Time Constant
C-2206		Same as C-2106	Antenna Trimmer
C-2207		Same as C-568	Heater Bypass, Mixer Unit
C-2208		Same as C-368	Heater Bypass, Mixer Unit
C-2209		Same as C-368	Heater Bypass, Oscillator Unit
C-2210 through C-3000		Not Used	
C-3001		Same as C-558	Top Coupling, T-3001
C-3002		Same as C-1208	Compensates Antenna Transformer
C-3003		CAPACITOR, FIXED, CERAMIC DIELECTRIC: JAN Type CC21CK020D; 2 mmf capacity $\pm 0.5$ mmf; 500 v DC working; temp coefficient 0 (tolerance $\pm 250$ ) mmf per mf per deg C; ceramic insulated; 0.562 in. lg by 0.250 in. dia; two axial wire lead type terminals, 1 $\frac{1}{4}$ in. lg; terminals mounted; color coded; spec JAN-C-20A; RCA part/dwg P-722407-55	Top Coupling, T-3003
C-3004		Same as C-3003	Top Coupling, T-3004

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-3005		CAPACITOR, FIXED, CERAMIC DIELECTRIC: JAN Type CC21CH040D; 4 mmf $\pm 0.5$ mmf; 500 v DC working; temp coefficient 0 (tolerance $\pm 60$ ) mmf per mf per deg C; ceramic insulated; 0.562 in. lg by 0.250 in. dia; two axial wire lead type terminals, $1\frac{1}{4}$ in. lg; terminals mounted; color coded; spec JAN-C-20A; RCA part/dwg P-722407-57	Top Coupling, T-3005
C-3006		Same as C-817	Automatic Gain Control Bypass
C-3007		Same as C-1208	Fixed Trimmer, T-3002 Secondary
C-3008		Same as C-1208	Fixed Trimmer, T-3005 Secondary
C-3009 through C-3016		Not Used	
C-3017		Same as C-2207	Plate Bypass, V-3001
C-3018		Same as C-369	Screen Bypass, V-3001
C-3019		Same as C-353	Cathode Resistor Bypass, V-3001
C-3020 through C-3034		Not Used	
C-3035		CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type; one section; 19.7 mmf max, 2.6 mmf min; straight line capacity tuning characteristics; 500 v, 60 cyc rms test; $1\frac{1}{32}$ in. lg by $\frac{3}{4}$ in. wide by $\frac{5}{8}$ in. deep less shaft and collar; bushing dim $\frac{1}{8}$ in. lg by $\frac{7}{16}$ in. dia by $\frac{1}{4}$ -32 thread; shaft $\frac{1}{2}$ in. lg extension, 0.187 in. dia; screwdriver adjustment; 360 deg rotation either direction; silicone treated steatite or equivalent; two solder lug type terminals, one lance 30 deg angle; single hole mounting in $\frac{1}{4}$ -32 bushing $\frac{5}{16}$ in. lg; 10,000 megohms insulation resistance, marked w/ dwg and part no.; to operate $-54^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; 10 stator and 11 rotor plates, brass, silver plated; circle segments $1\frac{1}{32}$ in. by $\frac{7}{32}$ in.; RCA part/dwg B-462181-2	Variable Trimmer, T-3035 Secondary
C-3036		Same as C-3035	Variable Trimmer, T-3036 Secondary
C-3037		Same as C-3035	Variable Trimmer, T-3037 Secondary
C-3038		Same as C-3035	Variable Trimmer, T-3038 Secondary
C-3039		Same as C-3035	Variable Trimmer, T-3039 Secondary
C-3040		Same as C-128	Variable Trimmer, L-3035
C-3041		Same as C-128	Variable Trimmer, L-3036
C-3042		Same as C-128	Variable Trimmer, L-3037
C-3043		Same as C-128	Variable Trimmer, L-3038
C-3044		Same as C-128	Variable Trimmer, L-3039
C-3045		CAPACITOR, FIXED, MICA: 12 mmf $\pm 5\%$ ; 500 v DC working; temp coefficient letter C; $3\frac{3}{64}$ in. max lg by $1\frac{1}{64}$ in. max wide by $\frac{3}{32}$ in. max thick; molded bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-748252-311	Fixed Trimmer, T-3035 Secondary
C-3046		Same as C-353	Fixed Trimmer, T-3036 Secondary
C-3047		Same as C-353	Fixed Trimmer, T-3037 Secondary
C-3048		Same as C-353	Fixed Trimmer, T-3038 Secondary
C-3049		Same as C-353	Fixed Trimmer, T-3037
C-3050		Same as C-1208	Fixed Trimmer, L-3035
C-3051		Same as C-558	Fixed Trimmer, L-3036
C-3052		Same as C-558	Fixed Trimmer, L-3037
C-3053		Same as C-1208	Fixed Trimmer, L-3038
C-3054		Same as C-353	Fixed Trimmer, L-3039
C-3055 through C-3057		Not Used	
C-3058		Same as C-577	Compensates RF Transformers
C-3059		Same as C-577	Compensates RF Transformers
C-3060		Same as C-1208	Input Coupling for Type II Calibrator
C-3061		Same as C-817	RF Ground Return for T-3035 through T-3039 Primaries
C-3062		Same as C-817	AGC Bypass
C-3063		Not Used	

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-3064		Same as C-368	Cathode Resistor Bypass, V-3035
C-3065		Same as C-369	Screen Bypass, V-3035
C-3066		CAPACITOR, FIXED, MICA DIELECTRIC: 10 mmf $\pm 10\%$ ; 500 v DC working; temp coefficient $-200$ to $+200$ mmf per mf per deg C; molded bakelite case; $\frac{3}{64}$ in. lg by $\frac{19}{64}$ in. wide by $\frac{1}{32}$ in. thick; two wire lead type terminals, $1\frac{1}{8}$ in. lg; located one on ea end; terminals mounted; color coded; RCA part/dwg C-748252-210	Plate Bypass, V-3035
C-3067 through C-3100		Not Used	
C-3101		CAPACITOR, FIXED, CERAMIC DIELECTRIC: JAN Type CC20CH050C; 5 mmf $\pm 0.25$ mmf; 500 v DC working; temp coefficient 0 (tolerance $\pm 60$ ) mmf per mf per deg C; unisulated; 0.400 in. lg by 0.200 in. dia; two radial wire lead type terminals, $1\frac{1}{4}$ in. lg; terminals mounted; color coded; spec JAN-C-20A; RCA part/dwg P-722401-58	Fixed Trimmer, T-3101
C-3102		Same as C-365	Fixed Trimmer, T-3102
C-3103		CAPACITOR, FIXED, CERAMIC DIELECTRIC: JAN Type CC20CH090C; 9 mmf $\pm 0.25$ mmf; 500 v DC working; temp coefficient 0 (tolerance $\pm 60$ ) mmf per mf per deg C; unisulated; 0.400 in. lg by 0.200 in. dia; two radial wire lead type terminals, $1\frac{1}{4}$ in. lg; terminals mounted; color coded; spec JAN-C-20A; RCA part/dwg P-722401-62	Fixed Trimmer, T-3103
C-3104		Same as C-1044	Fixed Trimmer, T-3104
C-3105		Same as C-3003	Fixed Trimmer, T-3105
C-3106		Same as C-566	With 3107, Bandsread Network for T-3104
C-3107		CAPACITOR, FIXED, MICA DIELECTRIC: 330 mmf $\pm 1\%$ ; 50 v DC working; temp coefficient 0 to $+40$ mmf per mf per deg C; capacitance drift 0.05% $\pm 0.1$ mmf max; molded low loss bakelite case; $\frac{3}{64}$ in. lg by $\frac{19}{64}$ in. wide by $\frac{1}{32}$ in. thick max; two axial wire lead terminals, $1\frac{1}{8}$ in. lg; centrally located one at ea end; terminals mounted; RCA part/dwg C-744583-443	With C-3106, Bandsread Network for T-3104
C-3108		Same as C-566	With C-3109, Bandsread Network for T-3105
C-3109		Same as C-219	With C-3108, Bandsread Network for T-3105
C-3110		Same as C-367	Grid Coupling, V-3101
C-3111		Same as C-368	Automatic Gain Control Filtering, V-3101
C-3112		Same as C-368	Cathode Resistor Bypass, V-3101
C-3113		Same as C-369	Screen Bypass, V-3101
C-3114		Same as C-368	Heater Bypass, V-3101
C-3115 through C-3134		Not Used	
C-3135		Same as C-3035	Variable Trimmer, T-3135 Secondary
C-3136		Same as C-3035	Variable Trimmer, T-3136 Secondary
C-3137		Same as C-3035	Variable Trimmer, T-3137 Secondary
C-3138		Same as C-3035	Variable Trimmer, T-3138 Secondary
C-3139		Same as C-3035	Variable Trimmer, T-3139 Secondary
C-3140		Same as C-128	Variable Trimmer, L-3135
C-3141		Same as C-128	Variable Trimmer, L-3136
C-3142		Same as C-128	Variable Trimmer, L-3137
C-3143		Same as C-128	Variable Trimmer, L-3138
C-3144		Same as C-128	Variable Trimmer, L-3139
C-3145		Same as C-1208	Top Coupling, T-3135
C-3146		Same as C-557	Loading, T-3135 Primary
C-3147		Same as C-3101	Fixed Trimmer, T-3135 Secondary
C-3148		Not Used	
C-3149		Same as C-3051	Top Coupling, T-3136
C-3150		Not Used	
C-3151		Same as C-1208	Fixed Trimmer, L-3136
C-3152		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-3153		CAPACITOR, FIXED, CERAMIC DIELECTRIC: JAN Type CC20CH070C; 7 mmf $\pm 0.25$ mmf; temp coefficient 0 (tolerance +60 -112) mmf/mf/deg C; 500 v DC working; 0.400 in. lg by 0.200 in. dia; two radial wire lead terminals; terminals mounted; ceramic insulation; color coded; spec JAN-C-20; RCA part/dwg P-722401-60	Fixed Trimmer, T-3135
C-3154		Same as C-365	Fixed Trimmer, L-3137
C-3155		CAPACITOR, FIXED, MICA DIELECTRIC: style no. 22, MBCA Ref. Dwg. Group 1; 51 mmf $\pm 2\%$ tolerance; 500 v DC working; -20 to +100 parts per million per deg C; molded low loss bakelite; $3\frac{3}{64}$ in. lg by $1\frac{9}{64}$ in. wide by $\frac{1}{32}$ in. high; two axial wire lead terminals, $1\frac{1}{8}$ in. lg by 0.032 in. dia; terminal mounted; color coded; RCA part/dwg 737837-424 Rev 3	Fixed Trimmer, T-3138, Secondary
C-3156		CAPACITOR, FIXED, MICA: 405 mmf $\pm 1\%$ ; 300 v DC working; characteristic E; $3\frac{3}{64}$ in. max lg by $1\frac{9}{64}$ in. max wide by $\frac{1}{32}$ in. max high; molded low loss bakelite case; two axial wire lead terminals, terminals mounted; color coded; RCA part/dwg A-8824194-5	Bandspread for T-3138
C-3157		CAPACITOR, FIXED, MICA: 22 mmf $\pm 2\%$ ; 500 v DC working; characteristic E; $3\frac{3}{64}$ in. lg by $1\frac{9}{64}$ in. wide by $\frac{1}{32}$ in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-737837-415	Fixed Trimmer, L-3138
C-3158		CAPACITOR, FIXED, MICA: 875 mmf $\pm 1\%$ ; 500 v DC working; characteristic E; $3\frac{3}{64}$ in. max lg by $1\frac{9}{64}$ in. max wide by $\frac{1}{32}$ in. max thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; RCA part/dwg A-8824194-4	With C-3159 Bandspread Network for L-3138
C-3159		Same as C-566	With C-3158 Bandspread Network for L-3138
C-3160		Same as C-353	Loading, T-3139 Primary
C-3161		Same as C-3155	Fixed Trimmer, T-3139 Secondary
C-3162		CAPACITOR, FIXED, MICA: 140 mmf $\pm 1\%$ ; 500 v DC working; characteristic E; $3\frac{3}{64}$ in. lg by $1\frac{9}{64}$ in. wide by $\frac{1}{32}$ in. max high; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg A-8824194-2	Bandspread for T-3139
C-3163		CAPACITOR, FIXED, MICA DIELECTRIC: Style no. 22, MBCA Ref. Dwg. Group 1; 15 mmf $\pm 2\%$ tolerance; 500 v DC working; -200 to +200 parts per million per deg C; molded low loss bakelite; $3\frac{3}{64}$ in. lg by $1\frac{9}{64}$ in. wide by $\frac{1}{32}$ in. deep; two axial wire lead terminals, located one each end; terminal mounted; color coded; RCA part/dwg 748252-412 Rev. 0	Fixed Trimmer, L-3139
C-3164		Same as C-3162	With C-3165 Bandspread Network for L-3139
C-3165		Same as C-566	With C-3164 Bandspread Network for L-3139
C-3166		CAPACITOR, FIXED, CERAMIC DIELECTRIC: JAN Type CC20UJ220G; Style no. 13, MBCA Ref. Dwg. Group 1, less mtg bkt; 22 mmf $\pm 2\%$ tolerance; 500 v DC working; -750 mmf per mf per deg C, variable, $\pm 30\%$ tolerance; uninsulated; 0.400 in. lg by 0.200 in. dia; two axial wire lead terminals, $1\frac{1}{4}$ in. lg by 0.025 in. dia; terminal mounted; JAN-C-20A; RCA part/dwg C722401-418 Rev 4	Compensates RF Transformers
C-3167		Same as C-577	Compensates RF Coils
C-3168		CAPACITOR, FIXED, CERAMIC DIELECTRIC: JAN Type CC20CK020C; 2 mmf $\pm 0.25$ mmf; zero temp coefficient (tol +250 -340) mmf/mf/deg C; 500 v DC working; case 0.400 in. max lg by 0.200 in. max dia less term; two axial wire lead term; term mtd; uninsulated; colored coded; JAN-C-20; RCA part/dwg P-722401-55 Rev. 2	Input Coupling for Type III Calibrator
C-3169		Same as C-367; p/o Z-3135	Grid Coupling, V-3135
C-3170		Same as C-368; p/o Z-3135	Automatic Gain Control Filtering, V-3135
C-3171		Same as C-368; p/o Z-3135	Cathode Resistor Bypass, V-3135
C-3172		Same as C-369; p/o Z-3135	Screen Bypass, V-3135
C-3173		Same as C-368; p/o Z-3135	Heater Bypass, V-3135
C-3174 through C-4000		Not Used	
C-4001		CAPACITOR, FIXED, MICA DIELECTRIC: 220 mmf $\pm 5\%$ ; 500 v DC working; temp coefficient -200 to +200 mmf per mf per deg C; molded low loss bakelite case; $3\frac{3}{64}$ in. lg max by $1\frac{9}{64}$ in. wide max by $\frac{1}{32}$ in. thick max; two axial wire lead type terminals, $1\frac{1}{4}$ in. lg 0.032 in. dia; located one on ea end; terminals mounted; color coded; RCA part/dwg C-748252-339	With R-4001 Antenna Isolation Network
C-4002 through C-4400		Not Used	
C-4401		Same as C-128	Variable Trimmer, L-4401
C-4402		Same as C-128	Variable Trimmer, L-4402

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C-4403		Same as C-128	Variable Trimmer, L-4403
C-4404		Same as C-128	Variable Trimmer, L-4404
C-4405		Same as C-128	Variable Trimmer, L-4405
C-4406		CAPACITOR, FIXED, MICA: 458 mmf $\pm 1\%$ ; 300 v DC working; temp coefficient 0 to +40 mmf per mf per deg C; capacitance drift 0.05% max; $3\frac{3}{64}$ in. lg by $\frac{1}{32}$ in. wide by $1\frac{1}{64}$ in. high; phenolic; one axial wire lead ea end in center 0.032 in. dia by $1\frac{1}{8}$ in. lg; terminals mounted; RCA part/dwg B-465842-3	Series Padder, L-4402, C-2201A
C-4407		Same as C-416	Compensating Capacitor, L-4402
C-4408		CAPACITOR, FIXED, CERAMIC DIELECTRIC; 7 mmf $\pm 0.25$ mmf; temp coefficient 0 (tolerance $\pm 15$ ) mmf per mf per deg C; 500 v DC working; 0.200 in. max dia by 0.400 in. lg; two radial wire lead terminals; terminals mounted; uninsulated; polystyrene lacquer coated; color coded marked w/ RCA part/dwg no.; RCA part/dwg C-748269-1	Compensating Capacitor, L-4401
C-4409		CAPACITOR, FIXED, MICA: 820 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to +50 mmf per mf per deg C; capacitance drift 0.05% max; $5\frac{1}{64}$ in. lg by $\frac{1}{32}$ in. wide by $1\frac{1}{32}$ in. high; phenolic; one axial wire lead ea end in center 0.032 in. dia by $1\frac{1}{8}$ in. lg; terminals mounted; RCA part/dwg B-465842-4	Series Padder, L-4402, C-2201A
C-4410		Same as C-416	Compensating Capacitor, L-4402
C-4411		Not Used	
C-4412		CAPACITOR, FIXED, MICA: 1400 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to +50 mmf per mf per deg C; capacitance drift 0.05% max; $5\frac{1}{64}$ in. lg by $\frac{1}{32}$ in. wide by $1\frac{1}{32}$ in. high; phenolic; one axial wire lead ea end in center 0.032 in. dia by $1\frac{1}{8}$ in. lg; terminals mounted; RCA part/dwg B-465842-5	Series Padder, L-4403, C-2201A
C-4413		Same as C-406	Compensating Capacitor, L-4403
C-4414		Not Used	
C-4415		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10 mmf $\pm 0.5$ mmf; temp coefficient 0 (tolerance $\pm 15$ ) mmf per mf per deg C; 500 v DC working; 0.200 in. max dia by 0.400 in. lg; two radial wire lead terminals; terminals mounted; uninsulated; polystyrene lacquer coated; color coded; marked w/ RCA part/dwg no.; RCA part/dwg C-748269-2	Compensating Capacitor, L-4404
C-4416		Same as C-416	With C-4417 Bandsread Network for L-4404
C-4417		CAPACITOR, FIXED, MICA: 288 mmf $\pm 1\%$ ; 500 v DC working; temp coefficient 0 to +40 mmf per mf per deg C; $3\frac{3}{64}$ in. lg by $1\frac{1}{64}$ in. wide by $\frac{1}{32}$ in. thick; molded low loss bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg B-465842-17	With C-4416 Bandsread Network for L-4404
C-4418		Same as C-206	Compensating Capacitor, L-4405
C-4419		Same as C-416	With C-4420 Bandsread Network for L-4405
C-4420		Same as C-219	With C-4419 Bandsread Network for L-4405
C-4421		CAPACITOR, FIXED, MICA: 15 mmf $\pm 5\%$ ; 500 v DC working; temp coefficient letter C; $3\frac{3}{64}$ in. max lg by $1\frac{1}{64}$ in. max wide by $\frac{1}{32}$ in. max thick; molded bakelite case; two axial wire lead terminals; terminals mounted; color coded; RCA part/dwg C-748252-312; p/o Z-601	Output Coupling, V-4401
C-4422		Same as C-367; p/o Z-601	Grid Coupling, V-4401
C-4423		Same as C-107; p/o Z-601	Heater Bypass, V-4401
C-4424		Same as C-369; p/o Z-601	Screen Bypass, V-4401
C-4425		Same as C-369; p/o Z-601	Plate Supply Filtering, V-4401
C-4426 through C-4430		Not Used	
C-4431		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 15 mmf $\pm 2\%$ ; temp coefficient NPO (tolerance $\pm 15\%$ ) mmf per mf per deg C; 500 v DC working; 0.460 in. lg by 0.230 in. dia max; two radial wire lead terminals; terminals mounted; uninsulated; color coded; RCA part/dwg C-748269-12	Compensating Capacitor, L-4404
CR-1001		TUBE, ELECTRON: JAN-1N69; germanium diode	Tuning Indicator, Rectifier
E-101	2	TERMINAL, STUD: feedthru, threaded; brass, silver plated; round post shape; $1\frac{1}{16}$ in. lg by $\frac{1}{32}$ in. dia max; mounts by single $2\frac{3}{32}$ in. lg by 0.112 in. dia stud w/ no. 4-40 by $1\frac{3}{32}$ in. lg thread portion; top end flattened on both sides to 0.125 in. thick by $1\frac{1}{32}$ in. lg by $\frac{1}{32}$ in. wide w/ no. 4-40 radial tapped hole, $\frac{1}{32}$ in. dia by 0.006 in. thick shoulder between flattened portion and mounting stud; RCA part/dwg A-8846044-1	Type I Antenna Unit Connection to C-251D
E-102		Same as E-101	Type I Antenna Unit Connection to C-251D

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-103		TERMINAL BOARD: general purpose; ten stud type solder lug terminals; hot solder dipped without barriers; spaced $\frac{5}{16}$ in., $\frac{5}{32}$ in., $\frac{5}{16}$ in., $\frac{5}{32}$ in., $\frac{5}{16}$ in., $\frac{5}{32}$ in., $\frac{5}{16}$ in. C to C; laminated glass cloth; silicone resin board $\frac{1}{16}$ in. thick; $4\frac{1}{4}$ in. lg by $\frac{1}{4}$ in. wide by 0.253 in. thick overall approx; five 0.073 in. dia mounting holes spaced 0.781 in. C to C; marked R-105, R-104, R-103, R-102, R-101; RCA part/dwg C-746176-501	Supports Resistors R-101 through R-105
E-104	2	TERMINAL BOARD: general purpose; six post type terminals; three terminals spaced $\frac{5}{16}$ in., $\frac{1}{4}$ in. C to C in ea of two rows, rows spaced $1\frac{1}{4}$ in. C to C; laminated glass cloth board; $1\frac{1}{2}$ in. lg by $1\frac{3}{32}$ in. wide by $\frac{1}{16}$ in. thick overall approx; two mounting holes 0.113 in. dia on 1.062 in. mounting center in "L" shape bracket; marked R-107, C-101, R-106, C-102; RCA part/dwg M-460867-504	Supports Resistors and Capacitors
E-105	2	SUPPORT, WIRING: brass, silver plated; irregular shape; $3\frac{19}{32}$ in. lg by $1\frac{7}{64}$ in. wide by $1\frac{15}{16}$ in. thick overall approx; mounts by four 0.166 in. dia holes irregularly spaced on $\frac{1}{16}$ in. wide plate; five "L" shaped fingers equally spaced extend at right angle from $\frac{1}{16}$ in. wide plate w/ two terminals extending $\frac{9}{16}$ in. at right angle from ea finger; RCA part/dwg B-464002-6	Supports Wiring
E-106	4	TERMINAL BOARD: 19 brass stud terminals silver plated, four tinned copper eye type terminals hot solder dipped; one row of six terminals at end 0.156 in. C to C, one row of four at side 0.187 in. C to C, one group of six at other side different spacings on center lines 0.171 in. apart, two in corners at end 1.156 in. C to C; laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; 3 in. lg by $1\frac{15}{16}$ in. wide by $1\frac{15}{16}$ in. deep overall; mounted by two terminal pins at one end in corners 0.093 in. dia 1.156 in. C to C, 0.328 in. lg projecting; assembled w/ shield, shieldmount, retainer stop, grounding strap, bracket, links, spacers, and springs; RCA part/dwg T-629844-502	Supports V-101. P/o E-109
E-107	2	INSULATOR, PLATE: rectangular shape; Cerex no. 250; $11\frac{1}{32}$ in. lg; $\frac{5}{16}$ in. wide by $\frac{3}{16}$ in. thick; two 0.073 in. dia mounting holes on $\frac{5}{32}$ in. by 0.578 in. mounting center; 13 slots 0.052 in. by 0.052 in. irregularly spaced; RCA part/dwg A-8834040-1	With E-105 Supports Wiring
E-108	2	INSULATOR, PLATE: rectangular shape; teflon; $11\frac{1}{32}$ in. lg; $\frac{5}{16}$ in. wide by $\frac{1}{32}$ in. thick, two 0.073 in. dia mounting holes on $\frac{5}{32}$ in. by 0.578 in. mounting center; RCA part/dwg A-8834041-3	With E-105 and E-107 Supports Wiring
E-109		Same as E-106	Foundation for Z-101. P/o Z-101
E-110	2	INSULATOR, PLATE: rectangular shape; laminated glass cloth, silicone resin; $4\frac{1}{4}$ in. lg overall; $\frac{9}{16}$ in. wide by 0.010 in. thick, four 0.166 in. dia mounting holes irregularly spaced; RCA part/dwg A-8829184-2	Insulates E-106 from Chassis
E-111 through E-125		Not Used	
E-126		Same as E-101	Type I RF Unit Connection to C-251C
E-127		Same as E-101	Type I RF Unit Connection to C-251C
E-128	2	TERMINAL BOARD: general purpose; six post type terminals; three terminals spaced $\frac{5}{16}$ in., $\frac{1}{4}$ in. C to C in ea of two rows; rows spaced $1\frac{1}{4}$ in. C to C; laminated glass cloth board; $1\frac{1}{2}$ in. lg by $1\frac{3}{32}$ in. wide by $\frac{1}{16}$ in. thick overall approx; two 0.113 in. dia mounting holes on 1.062 in. mounting center in integral "L" shape bracket; marked C-136, C-139, C-143; RCA part/dwg M-460867-502	Supports Resistors and Capacitors
E-129	4	TERMINAL BOARD: foundation for Z-126; 18 brass stud terminals silver plated, one brass lug eye terminal hot solder dipped; one row of six terminals at end 0.156 in. C to C, one group of four toward center 0.187 in. C to C rhomboid and one group of four 0.187 in. and 0.156 in. C to C triangle, two at side 0.187 in. C to C, two in corners at end 1.156 in. C to C; laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; 3 in. lg by $1\frac{15}{16}$ in. wide by $1\frac{15}{16}$ in. deep overall; mounted by two terminal pins at one end in corners 0.093 in. dia, 1.156 in. C to C, 0.328 in. lg projecting; assembled w/ shield, shieldmount, grounding strap, retainer stop, bracket, and springs; CRV and terminal number and letter markings to RCA part/dwg C-746181-2; RCA part/dwg T-629844-507	Supports V-126
E-130		TERMINAL BOARD: mounting board for resistors and capacitors; five brass rod short terminal lugs hot solder dip finish; stud type w/o barriers; first terminal centered 0.812 in. from end of board then C to C (1) to (2) 0.938 in. (3) 1.563 in. (4) 2.422 in. (5) 3.188 in.; laminated glass cloth, silicone resin board; $4\frac{1}{4}$ in. lg by $\frac{3}{4}$ in. wide by $\frac{3}{32}$ in. high overall; five mounting holes 0.073 in. dia, 0.781 in. C to C w/ $\frac{1}{2}$ in. at ea end; marked in three places as shown on dwg w/ $\frac{1}{16}$ in. high standard characters satin black synthetic C-133, C-130, C-127; rivet terminals in place; RCA part/dwg C-746176-502	Supports Capacitors
E-131	2	TERMINAL BOARD: general purpose; six post type terminals; three terminals spaced $\frac{5}{16}$ in., $\frac{1}{4}$ in. C to C in ea of two rows; rows spaced $1\frac{1}{4}$ in. C to C; laminated glass cloth board; $1\frac{1}{2}$ in. lg by $1\frac{3}{32}$ in. wide by $\frac{1}{16}$ in. thick overall approx; two 0.113 in. dia mounting holes on 1.062 in. mounting center in integral "L" shape bracket; marked C-141, R-126, R-130, R-129; RCA part/dwg M-460867-503	Supports Resistors and Capacitors



TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-132	2	PLATE, GROUNDING: u/o oscillator assem; brass, silver plated finish; "Z" shape; 3 <sup>31</sup> / <sub>32</sub> in. lg by 1 <sup>27</sup> / <sub>64</sub> in. wide by <sup>15</sup> / <sub>16</sub> in. high overall; mounts by two no. 0-80 tapped mounting holes on 0.578 in. mounting center; marked C-128, C-131, C-134, C-137, C-140, C-126, C-129, C-132, C-135, C-138; RCA part/dwg T-630899-1	Supports Wiring
E-133		Same as E-107	Supports Wiring
E-134		Same as E-108	With E-133 Supports Wiring
E-135		Same as E-129	Foundation for Z-126
E-136	2	INSULATOR, PLATE: rectangular shape; laminated glass cloth, silicone resin; 4 <sup>33</sup> / <sub>32</sub> in. lg; <sup>9</sup> / <sub>16</sub> in. wide by 0.010 in. thick, five 0.261 in. dia mounting holes spaced 0.781 in. C to C on 3.125 in. mounting center; two corners on one end chamfered <sup>3</sup> / <sub>16</sub> in. by 45 deg; RCA part/dwg A-8829184-1	Insulates E-132 from Chassis
E-137 through E-150		Not Used	
E-151		Same as E-101	Type I Mixer Unit Connection to C-251B
E-152		Same as E-101	Type I Mixer Unit Connection to C-251B
E-153		TERMINAL BOARD: mounting board for resistors; five brass rod short terminal lugs, hot solder dip finish; stud type w/o barriers; first terminal centered <sup>1</sup> / <sub>8</sub> in. from end of board then 0.781 in. C to C; laminated glass cloth, silicone resin board; 3 <sup>19</sup> / <sub>64</sub> in. lg by <sup>3</sup> / <sub>8</sub> in. wide by <sup>1</sup> / <sub>32</sub> in. high overall; five mounting holes 0.073 in. dia, 0.781 in. C to C, 0.515 in. from one end of board to first center; marked in three places as shown on dwg w/ <sup>1</sup> / <sub>16</sub> in. high standard characters satin black synthetic R-153, R-152, R-151; rivet terminals in place; RCA part/dwg C-746176-503	Supports Capacitors
E-154	2	PLATE, GROUNDING: supports wiring; u/o mixer A; brass, silver plated finish and clear water dip synthetic; "Z" shape; 3 <sup>31</sup> / <sub>32</sub> in. lg by 1 <sup>27</sup> / <sub>64</sub> in. wide by <sup>15</sup> / <sub>16</sub> in. high overall; mounts by two no. 0-80 tapped mounting holes on 0.578 in. mounting center; marked w/ C-152, C-154, C-156, C-158, C-160, C-151, C-153, C-155, C157, C-159; RCA part/dwg T-630899-2	Supports Wiring
E-155	2	TERMINAL BOARD: laminated glass cloth silicone resin board; 15 solder post feedthru type terminals; two solder post type, one solder lug type; w/o barriers; 17 stud and 1 lug eye; 3 in. lg by 1 <sup>7</sup> / <sub>16</sub> in. wide by 1 <sup>1</sup> / <sub>16</sub> in. thick less terminals mounted by two terminal pins spaced on 1.156 in. mounting center; principal accessories incl three springs, one retainer stop, one shieldmount, one bracket, one shield, and one grounding strap; RCA part/dwg P-629844-506	Supports V-151
E-156		Same as E-155	Supports Wiring
E-157		Same as E-107	Supports Wiring
E-158		Same as E-108	With E-157 Supports Wiring
E-159		Same as E-155	Foundation of Z-151
E-160		Same as E-136	Insulates E-154 from Chassis
E-161 through E-200		Not Used	
E-201		Same as E-101	Type I Oscillator Unit Connection to C-251A
E-202		Same as E-101	Type I Oscillator Unit Connection to C-251A
E-203	2	TERMINAL BOARD: general purpose; five post type brass hot solder dipped terminals; two brass, solder dipped solder lug terminals; five post type terminals irregularly spaced; two solder lug type terminals 1 <sup>3</sup> / <sub>32</sub> in. C to C; laminated glass, cloth silicone resin board; 1 <sup>3</sup> / <sub>16</sub> in. lg by 2 <sup>1</sup> / <sub>32</sub> in. wide by 1 <sup>3</sup> / <sub>32</sub> in. thick; mounted by two no. 4-40 self-clinching nuts on 0.375 in. mounting center w/ integral bracket; marked C-222, C-217, C-221; RCA part/dwg B-464024-501	Supports Capacitors
E-204	2	TERMINAL BOARD: mounting board for capacitors; eight brass rod short terminal lugs hot solder dip finish; stud type, w/o barriers; one row of terminals centers <sup>1</sup> / <sub>8</sub> in. from edge of board, first terminal centers <sup>1</sup> / <sub>8</sub> in. from end of board then C to C (1) to (2) 0.906 in. (3) 1.406 in. (4) 2.468 in. (5) 2.968 in. (6) 3.875 in., two other terminals w/ centers in line w/ (1) and (2) 0.281 in. from edge of board; laminated glass cloth, silicone resin board; 4 <sup>1</sup> / <sub>4</sub> in. lg by 1 <sup>3</sup> / <sub>32</sub> in. wide by <sup>1</sup> / <sub>32</sub> in. deep overall; five mounting holes 0.073 in. dia 0.781 in. C to C w/ <sup>1</sup> / <sub>2</sub> in. at ea end; first hole 0.130 in. dia 82 deg countersunk; marked in four places as shown on dwg w/ <sup>1</sup> / <sub>16</sub> in. high standard characters satin black synthetic C-209, C-215, C-205, C-201, rivet terminals in place; RCA part/dwg C-746176-504	Supports Capacitors
E-205	2	PLATE, GROUNDING: supports wiring, u/o oscillator A; brass, silver plated finish and clear water dip synthetic; 3 <sup>31</sup> / <sub>32</sub> in. lg by 1 <sup>27</sup> / <sub>64</sub> in. wide by <sup>15</sup> / <sub>16</sub> in. high overall approx; mounts by two no. 0-80 tapped holes on 0.578 in. mounting center; marked w/ C-204, C-208, C-212, C-216, C-220, C-202, C-206, C-210, C-214, C-218, C-203, C-207, C-211, C-213, and C-219; RCA part/dwg T-630899-3	Supports Wiring

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-206	2	TERMINAL BOARD: foundation for Z-201; 18 brass stud terminals silver plated, one brass lug eye terminal hot solder dipped; one row of six terminals at end of 0.156 in. C to C; one group of three and one group of four in center triangles 0.187 in. C to C right angle; two at side 0.187 in. C to C, two in corners at end 1.156 in. C to C; laminated glass cloth, silicone resin board, 1/16 in. thick; 3 in. lg by 1 7/16 in. wide by 1 1/16 in. deep overall; mounted by two terminal pins at one end in corners 0.093 in. dia. 1.156 in. C to C, 0.328 in. lg projecting; assembled w/ shield, shieldmount, grounding straps, retainer stop, bracket, and springs; CRV and terminal no. and letter markings to RCA part/dwg C-746181-4; RCA part/dwg T-629844-50;	Supports V-201
E-207		Same as E-206	Supports Wiring
E-208		Same as E-107	Supports Wiring. P/o E-210
E-209		Same as E-108	With E-208 Supports Wiring
E-210		Same as E-206	Foundation for Z-201
E-211		Same as E-136	Insulates E-205 from Chassis
E-212 through E-350		Not Used	
E-351		Same as E-101	Type II Mixer Unit Connection to C-451B
E-352		Same as E-101	Type II Mixer Unit Connection to C-451B
E-353		Not Used	
E-354	2	PLATE, GROUNDING: supports wiring, u/o mixer B; brass, silver plated and clear water dip synthetic finish; "Z" shape; 3 3/32 in. lg by 1 39/64 in. wide by 7/8 in. high overall approx; mounts by two no. 0-80 tapped mounting holes on 0.578 in. mounting center; marked w/ C-354, C-357, C-360, C-363, C-366, R-351, C-356, C-359, C-362, C-365, and C-353; RCA part/dwg T-630899-6	Supports Wiring
E-355		TERMINAL BOARD: mounting board for capacitors; ten post type solder lug terminals spaced 5/8 in., 5/32 in., 5/8 in., 5/32 in., 5/8 in., 5/32 in., 5/8 in., 5/32 in., 5/8 in. centers; laminated glass cloth, silicone resin board; 4 3/8 in. lg by 1/4 in. wide by 1/4 in. thick overall approx; five 0.078 in. dia mounting holes spaced 0.781 in. C to C; marked w/ C-364, C-361, C-358, C-355, C-352; RCA part/dwg C-746176-508	Supports Capacitors
E-356	2	TERMINAL BOARD: foundation for Z-303; 23 brass stud terminals silver plated, one brass lug eye terminal hot solder dipped; one row of terminals at end 0.156 in. C to C, one group of seven and one group of five in center section 0.171 in. by 0.171 in. C to C, two at side 0.187 in. C to C, two in corner at end 1.156 in. C to C; laminated glass cloth, silicone resin board, 1/16 in. thick; 3 in. lg by 1 7/16 in. wide by 1 1/16 in. deep overall; mounted by two terminal pins at one end in corners, 0.093 in. dia, 1.156 in. C to C, 0.328 in. lg projecting; assembled w/ shields, shieldmounts, retainer stop, grounding straps, brackets, and springs; CRV and terminal no., and letter markings to RCA part/dwg C-746182-3; RCA part/dwg T-629844-501	Supports V-356
E-357		Same as E-356	Supports V-357
E-358		Same as E-356	Supports Wiring
E-359		Same as E-356	Supports Wiring
E-360	2	TERMINAL, LUG: eye type; copper; hot solder dipped; no. 16 AWG wire accommodated; 1 3/64 in. lg by 1 3/32 in. wide by 1 3/64 in. high overall; soldered wire connection; 0.120 in. dia mounting hole in 5/32 in. dia end; made from 0.032 in. thick sheet, 1/16 in. wide wiring section; RCA part/dwg A-79534-10	Supports Wiring
E-361		Same as E-107	Supports Wiring
E-362		Same as E-108	With E-361 Supports Wiring
E-363		Same as E-356	Foundation for Z-351
E-364		Same as E-136	Insulates E-354 from Chassis
E-365 through E-400		Not Used	
E-401		Same as E-101	Type II Oscillator Connection to C-451A
E-402		Same as E-101	Type II Oscillator Connection to C-451A
E-403	2	TERMINAL BOARD: general purpose; four brass post type hot solder dipped terminals, two brass solder lug hot solder dipped terminals; four post type terminals irregularly spaced, two solder lug terminals on 1 3/32 in. C to C; laminated glass cloth, silicone resin board; 1 3/16 in. lg by 2 1/32 in. wide by 1 1/32 in. thick; mounted by two no. 4-40 self-clinching nuts on 0.375 in. mounting center of integral bracket; marked C-415; RCA part/dwg B-464024-504	Supports Capacitors and Wiring

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-404		TERMINAL BOARD: supports capacitors; six stud type terminals; irregularly spaced; laminated glass cloth, silicone resin board; $4\frac{1}{8}$ in. lg by $\frac{1}{4}$ in. wide by $\frac{1}{4}$ in. thick overall approx; five mounting holes 0.078 in. dia spaced 0.781 in. C to C; marked w/ C-408, C-405, C-401; RCA part/dwg C-746176-513	Supports Capacitors and Wiring
E-405	2	PLATE, GROUNDING: supports wiring u/o oscillator B; brass, silver plated and clear water dip synthetic finish; "Z" shape; $3\frac{31}{32}$ in. lg by $1\frac{39}{64}$ in. wide by $\frac{7}{8}$ in. high overall approx; mounts by two no. 0-80 tapped mounting holes on 0.578 in. mounting center; marked w/ C-404, C-407, C-410, C-414, C-418, C-403, C-406, C-409, C-412, C-416, C-402, C-418, and C-417; RCA part/dwg T-630899-7	Supports Wiring
E-406	2	TERMINAL BOARD: 18 brass stud terminals silver plated, one brass lug eye terminal hot solder dipped; one row of six terminals at end 0.156 in. C to C, one row of five and one row of two toward center different spacings on center lines 0.171 in. apart; two at side 0.187 in. C to C, two in corners at end 1.156 in. C to C; laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; 3 in. lg by $1\frac{1}{16}$ in. wide by $\frac{15}{16}$ in. deep overall; mounted by two terminal pins at one end in corners, 0.093 in. dia, 1.156 in. dia, 1.156 in. C to C, 0.328 in. lg projecting; assembled w/ shield, shieldmount, retainer stop, grounding straps, bracket, and springs; RCA part/dwg T-629844-503	Supports V-401
E-407		Same as E-406	Supports Wiring
E-408		Same as E-333	Wiring Connection to Chassis
E-409		Not Used	
E-410		Same as E-136	Insulates E-405 from Chassis
E-411		Same as E-107	Supports Wiring
E-412		Same as E-108	With E-411 Supports Wiring
E-413		Same as E-406	Foundation for Z-401
E-414 through E-550		Not Used	
E-551		Same as E-101	Type III Mixer Unit Connection to C-2201B
E-552		Same as E-101	Type III Mixer Unit Connection to C-2201B
E-553	2	TERMINAL BOARD: general purpose; five brass post type hot solder dipped terminals, two solder lug terminals hot solder dipped; five post type terminals irregularly spaced; two solder lug terminals on opposite side of board at $1\frac{33}{32}$ in. C to C; laminated glass cloth, silicone resin board; $1\frac{3}{32}$ in. lg by $2\frac{1}{32}$ in. wide by $1\frac{1}{32}$ in. thick; mounted by two no. 4-40 self-clinching nuts on 0.375 in. mounting centers of integral brackets; marked C-568, C-569, C-565, C-566; RCA part/dwg B-464024-506	Supports Capacitors and Wiring
E-554	2	PLATE, GROUNDING: supports wiring, used on Mixer C; brass, silver plated and clear water dip synthetic finish; "Z" shape; $3\frac{31}{32}$ in. lg by $1\frac{39}{64}$ in. wide by $\frac{7}{8}$ in. high overall approx; mounts by two no. 0-80 tapped mounting holes on 0.578 in. mounting center; marked w/ C-551, C-552, C-553, C-554, C-555, C-556, C-559, C-562, C-564, and C-567; RCA part/dwg T-630899-10	Supports Wiring
E-555		TERMINAL BOARD: supports capacitors; ten stud type terminals; spaced $\frac{7}{8}$ in., $\frac{5}{32}$ in., $\frac{5}{8}$ in., $\frac{5}{32}$ in., $\frac{5}{8}$ in., $\frac{5}{32}$ in., $\frac{5}{8}$ in., $\frac{5}{32}$ in., $\frac{5}{8}$ in. C to C; laminated glass cloth, silicone resin board; $4\frac{1}{8}$ in. lg by $\frac{1}{4}$ in. wide by $\frac{1}{4}$ in. thick overall approx; five 0.078 in. dia mounting holes spaced 0.781 in. C to C; marked w/ C-570, C-577, C-561, C-558, and C-557; RCA part/dwg C-746176-515	Supports Capacitors and Wiring
E-556	4	TERMINAL BOARD: foundation for Z-2503; 23 brass stud terminals silver plated, one brass lug eye terminal hot solder dipped; one row of six terminals at end 0.156 in. C to C, one group of seven and one group of five in center section 0.171 in. C to C, two at side 0.187 in. C to C, two in corners at end 1.166 in. C to C; laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; 3 in. lg by $1\frac{1}{16}$ in. wide by $\frac{15}{16}$ in. deep overall; mounted by two terminal pins at one end in corners, 0.093 in. dia, 1.156 in. C to C; 0.328 in. lg projecting; assembled w/ shields, shieldmounts, retainer stop, grounding straps, bracket, and springs; CRV and terminal number and letter markings to RCA part/dwg C-746183-3; RCA part/dwg T-629844-508	Supports V-551
E-557		Same as E-556	Supports V-552
E-558		Same as E-556	Supports Wiring
E-559		Same as E-556	Supports Wiring
E-560		Same as E-333	Wiring Connection to Chassis
E-561		Same as E-107	Supports Wiring
E-562		Same as E-108	With E-561 Supports Wiring
E-563		Same as E-556	Foundation for Z-551

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-564		Same as E-136	Insulates E-554 from Chassis
E-565	3	INSULATOR, STANDOFF: round post shape; Cerex no. 250; 1 <sup>5</sup> / <sub>32</sub> in. high; 1/4 in. OD w/ 1/4 in. deep tapped mounting hole no. 4-40 thread; one end undercut 3/64 in. deep by 0.140 in. dia; RCA part/dwg A-8810450-1	Supports Bus Wiring
E-566		Same as E-556	P/O E-563 Foundation for Z-551
E-567 through E-700		Not Used	
E-701	3	TERMINAL, LUG: eye type, body style no. 1; 1/64 in. thick copper, hot solder dip; for no. 16 AWG wire; 1 <sup>9</sup> / <sub>64</sub> in. lg by 1/4 in. high by 1/32 in. wide, w/ mounting hole 0.120 in. dia; solder connects to wire; bent at 90 deg 1 <sup>9</sup> / <sub>64</sub> in. from mounting end; RCA part/dwg K-79534-11	Wiring Connection to Chassis
E-702	2	TERMINAL BOARD: general purpose; six solder dipped brass stud type terminals; two rows 3/8 in. C to C, three terminals in ea row spaced 5/32 in. C to C; laminated phenolic board; 2 <sup>7</sup> / <sub>32</sub> in. lg by 3/8 in. wide by 3/16 in. thick; two mounting holes 0.147 in. dia, 5/32 in. C to C; RCA part/dwg A-8820937-501	Supports Wiring
E-703	2	TERMINAL BOARD: general purpose; six solder dipped brass stud type terminals; two rows of terminals 1 in. C to C, three terminals in ea row spaced 0.531 in. and 0.203 in. C to C; laminated phenolic board; 1 1/4 in. lg by 3 <sup>1</sup> / <sub>32</sub> in. wide by 3/16 in. thick; one 1 <sup>7</sup> / <sub>64</sub> in. lg by 1/4 in. wide mounting slot in ea end; RCA part/dwg A-8820931-501	Supports Capacitors
E-704	2	TERMINAL BOARD: general purpose; two single end and three feedthru solder dipped brass stud type terminals; irregularly spaced; laminated phenolic board; 1 <sup>15</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>16</sub> in. wide by 3/16 in. thick; two mounting holes 0.147 in. dia 1 <sup>7</sup> / <sub>32</sub> in. C to C; RCA part/dwg A-8820935-501	Supports R-701 and Wiring
E-705	2	TERMINAL BOARD: general purpose; six solder dipped brass stud type terminals; two rows 1 <sup>1</sup> / <sub>16</sub> in. C to C, three terminals in ea row spaced 5/32 in. C to C; laminated phenolic board; 2 <sup>5</sup> / <sub>16</sub> in. lg by 2 <sup>9</sup> / <sub>32</sub> in. wide by 7/16 in. thick; integral "L" shape mounting bracket w/ two no. 4-40 clinch nuts on 0.437 in. centers; RCA part/dwg A-8820950-501	Supports Resistors and Capacitors
E-706		Same as E-701	Wiring Connection to Chassis
E-707		Same as E-701	Wiring Connection to Chassis
E-708	2	CLIP: crystal holder; beryllium copper, white nickel plate finish; 7/16 in. lg by 2 <sup>3</sup> / <sub>32</sub> in. high by 3/32 in. wide overall; max inside length at base 1 <sup>3</sup> / <sub>32</sub> in. lg; heat treated spring temper; single mounting hole 0.120 in. dia in center of base; RCA part/dwg A-8837459-1	Secures Y-701
E-709 through E-800		Not Used	
E-801		Same as E-701	Wiring Connection to Chassis
E-802		Same as E-702	Supports Wiring
E-803	2	TERMINAL BOARD: general purpose; six solder dipped brass stud type terminals; two rows of terminals 1 in. C to C, three terminals in ea row spaced 0.531 in. and 0.203 in. C to C; laminated glass cloth, silicone resin board; 1 1/4 in. lg by 3 <sup>1</sup> / <sub>32</sub> in. wide by 3/16 in. thick; one 1 <sup>7</sup> / <sub>64</sub> in. lg by 1/4 in. wide mounting slot in ea end; marked C-819, C-820; RCA part/dwg A-8820931-502	Supports Capacitors
E-804	2	TERMINAL BOARD: general purpose; five solder post brass stud type terminals; irregularly spaced; laminated glass cloth, silicone resin board; 1 <sup>15</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>16</sub> in. wide by 3/16 in. thick; two mounting holes 0.147 in. dia, 1 <sup>7</sup> / <sub>32</sub> in. C to C; marked R-805; RCA part/dwg A-8820935-502	Supports R-805 and Wiring
E-805	2	TERMINAL BOARD: general purpose; six solder dipped brass stud type terminals; two rows 1 <sup>1</sup> / <sub>16</sub> in. C to C, three terminals in ea row spaced 5/32 in. C to C; laminated glass cloth, silicone resin board; 1 <sup>5</sup> / <sub>16</sub> in. lg by 2 <sup>3</sup> / <sub>32</sub> in. wide by 7/16 in. thick; one integral "L" shape mounting bracket w/ two no. 4-40 clinch nuts on 0.437 in. centers; marked C-817, C-818, R-804; RCA part/dwg A-8820950-502	Supports Resistors and Capacitors
E-806		Not Used	
E-807		Same as E-701	Wiring Connection to Chassis
E-808		Same as E-701	Wiring Connection to Chassis
E-809		Same as E-708	Secures Y-801 in Socket
E-810 through E-900		Not Used	
E-901		Same as E-701	Wiring Connection to Chassis
E-902		Same as E-702	Supports Wiring

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-903	2	TERMINAL BOARD: general purpose; six solder dipped brass stud type terminals; two rows of terminals 1 in. C to C, three terminals in ea row spaced 0.531 in. and 0.203 in. C to C; laminated glass cloth, silicone resin board; 1 1/4 in. lg by 3 1/2 in. wide by 3/16 in. thick; one 1 1/4 in. lg by 1/4 in. wide mounting slot in ea end; marked C-917, C-918; RCA part/dwg A-8820931-503	Supports Capacitors
E-904	2	TERMINAL BOARD: general purpose; five solder post brass stud type terminals; irregularly spaced; laminated glass cloth, silicone resin board; 1 15/32 in. lg by 1 1/16 in. wide by 5/16 in. thick; two mounting holes 0.147 in. dia, 1/32 in. C to C; marked R-905; RCA part/dwg A-8820935-503	Supports R-905 and Wiring
E-905	2	TERMINAL BOARD: general purpose; six solder dipped brass stud type terminals; two rows 1 1/16 in. C to C, three terminals in ea row spaced 5/32 in. C to C; laminated glass cloth, silicone resin board; 1 5/16 in. lg by 2 3/32 in. wide by 7/16 in. thick; one integral "L" shape mounting bracket w/ two no. 4-40 clinch nuts on 0.437 in. centers; marked C-916, R-904; RCA part/dwg A-8820950-503	Supports Resistors and Capacitors
E-906		Not Used	
E-907		Same as E-701	Wiring Connection to Chassis
E-908		Same as E-701	Wiring Connection to Chassis
E-909		Same as E-708	Secures Y-901 in Socket
E-910 through E-1000		Not Used	
E-1001	2	TERMINAL BOARD: general purpose; nine large stud type terminals, five small stud type terminals; three adjustable links on rear of large terminal; terminal irregularly spaced; laminated phenolic board, 1/16 in. thick; 1 25/32 in. lg by 1 1/32 in. wide by 7/16 in. thick overall approx; two 0.147 in. dia mounting holes, 1 3/8 in. C to C; RCA part/dwg A-8834048-501	Supports O-1001, O-1002, O-1003
E-1002	2	TERMINAL BOARD: general purpose; five solder stud type terminals; terminals irregularly spaced; laminated glass cloth, silicone resin board; 1 1/2 in. lg by 1 1/8 in. wide by 3/8 in. thick overall approx; mounts by two no. 4-40 Quintlock nuts on 1.25 in. mounting center; marked C-1065, R-1030, R-1005, C-1030; one corner beveled; RCA part/dwg A-8834049-502	Supports Resistors and Capacitors
E-1003	2	TERMINAL BOARD: general purpose; five solder stud type terminals; terminals irregularly spaced; laminated glass cloth, silicone resin board; 1 1/2 in. lg by 1 1/8 in. wide by 3/8 in. thick overall approx; mounts by two no. 4-40 Quintlock nuts on 1.25 in. mounting center; marked C-1066, R-1031; one corner beveled; RCA part/dwg A-8834049-503	Supports Resistors and Capacitors
E-1004	2	TERMINAL BOARD: general purpose; four solder dipped brass stud type terminals; terminals on 0.812 in. by 3/8 in. centers; laminated phenolic board; 1 3/32 in. lg by 5/8 in. wide by 1/32 in. thick overall; two no. 2-56 tapped mounting holes, 0.812 in. C to C; terminals identified by stenciled nos. 1 to 4; RCA part/dwg A-883243-501	Connections for Z-1005
E-1005		Same as E-1004	Connections for Z-1007
E-1006		Same as E-1004	Connections for Z-1011
E-1007	2	TERMINAL BOARD: general purpose; stud type terminals; two feed-thru and five single end solder dipped stud type terminals; terminals irregularly spaced; laminated glass cloth, silicone resin board; 1 25/32 in. lg by 3 1/32 in. wide by 5/16 in. thick overall; three mounting holes 0.136 in. dia irregularly spaced; rectangular shape; RCA part/dwg A-8848145-501	Connections for Z-1009
E-1008		Same as E-1004	Connections for Z-1003
E-1009	4	AMPLIFIER SUB-ASSEMBLY: chassis w/ partitions, mounting, and markings; 8 3/4 in. lg by 4 3/32 in. wide by 3 3/4 in. high overall; mounted by four Phillips head machine screws, steel no. 6-32 by 5/16 in. lg through bushing and washer in corners of chassis, two at one end 3.375 in. center to center, two at other end, one 7.062 in. from line of first two, the other 8.250 in. from same, 3.312 in. between lines of center; aluminum channel-shaped chassis w/ welded aluminum partitions and angle sections, machined, finished, and marked in accordance with RCA dwg; used for mounting tubes, switches, coils, resistors, capacitors, terminals, and other parts for the assembly of the 2nd IF Unit for the receiver; RCA part/dwg C-743452-501	Supports Wiring
E-1010		Same as E-1009	Supports Wiring
E-1011	2	TERMINAL BOARD: general purpose binding post strip; five feed-thru and two single end insulated solder lug post type terminals; feedthru terminals spaced 1 1/64 in. C to C, single end term 1 3/32 in. C to C; brass board; 2 3/8 in. lg by 1 3/8 in. wide by 1 3/32 in. high; two no. 2-56 tapped mounting holes on 1.625 in. mounting center; marked C-1060, C-1061, C-1062, C-1063; RCA part/dwg B-462142-501	Supports Wiring
E-1012		P/o A-1002	Supports Wiring

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-1013		P/o A-1002	Bracket, Supports Wiring
E-1014	2	TERMINAL BOARD: supports resistors and capacitors; 13 brass, hot solder dipped terminals; 1/4 in. between centers; laminated glass cloth, silicone resin board; 2 3/32 in. lg by 1 1/64 in. wide by 1 3/32 in. thick overall approx; two 0.147 in. dia mounting holes on 1.906 in. mounting center; marked w/ R-1082, R-1001, C-1001, C-1053; RCA part/dwg B-465816-501	Mounts Resistors and Capacitors in 2nd IF
E-1015		TERMINAL, LUG: eye type; 1/16 in. thick copper, hot solder dipped; for no. 9 AWG on one end and no. 15 AWG on other end; 1/2 in. lg by 3/32 in. wide by 1/64 in. thick; solder connects the wire; Zierick Catalog no. 75; RCA part/dwg K-79534-1	Wiring Connection to Chassis
E-1016		Same as E-1015	Wiring Connection to Chassis
E-1017		Same as E-1015	Wiring Connection to Chassis
E-1018		Same as E-1015	Wiring Connection to Chassis
E-1019	2	INSULATOR, PLATE: rectangular shape; coated glass fabric (Dupont tetrafluoroethylene no. 410); 1 3/32 in. lg; 3/4 in. wide by 0.010 in. thick overall; two 0.102 in. dia mounting holes spaced 3/16 in. C to C centrally located; RCA part/dwg A-8813771-1	Insulates Wiring in Z-1005
E-1020		Same as E-1019	Insulates Wiring in Z-1007
E-1021		Same as E-1019	Insulates Wiring in Z-1011
E-1022		Same as E-1019	Insulates Wiring in Z-1003
E-1023 through E-1100		Not Used	
E-1101	2	TERMINAL BOARD: general purpose; 18 brass, silver plated stud terminals; 18 terminals irregularly spaced; laminated phenolic board; 3 21/32 in. lg by 1 3/32 in. wide by 3/32 in. thick overall; two 0.156 in. dia mounting holes on 3 3/8 in. mounting centers; wax impregnated; RCA part/dwg A-8832397-501	Supports Resistors and Capacitors
E-1102	3	TERMINAL, LUG: eye type; 1/64 in. thick copper, hot solder dipped; no. 14 B and S max stranded wire accommodated; bent at 90 deg, 3/32 in. lg by 3/32 in. wide; solder connects the wire; 0.120 in. dia mounting hole; Zierick Catalog no. 75; RCA part/dwg K-79534-7	Wiring Connection to Chassis
E-1103	2	TERMINAL, LUG: ring type; copper, hot solder dipped; accommodates no. 15 AWG wire; 1/2 in. lg by 3/32 in. OD ring; 0.144 in. dia stud hole; solder connects to wire; RCA part/dwg K-79534-3	Wiring Connection to Chassis
E-1104		Same as E-1102	Wiring Connection to Chassis
E-1105	2	INSULATOR, PLATE: rectangular shape; laminated glass cloth, silicone resin; 3 21/32 in. lg by 1 3/32 in. wide by 0.015 in. thick; two 0.156 in. dia mounting holes 3 1/4 in. C to C; one rectangular shaped hole 1 1/8 in. lg by 5/16 in. wide centrally located 1 1/32 in. from one end, and one 0.406 in. dia hole w/ center 1/2 in. from other end and 1/4 in. off center line of mounting holes; RCA part/dwg A-8822081-1	Grounding Terminal
E-1106 through E-1200		Not Used	
E-1201	2	TERMINAL BOARD: general purpose; eight stud type terminals; irregularly spaced in lines 1/8 in. from edge at one side and both ends, three pairs 1/4 in. C to C, other two in corners; glass cloth, silicone resin board, 1/16 in. thick; 1 1/8 in. lg by 1 in. wide by 1 1/64 in. deep overall; two no. 4-40 swaged mounting nuts on 1 1/2 in. mounting center; marked in accordance w/ RCA part/dwg A-8827783-3; in 3/32 in. high black synthetic standard characters; RCA part/dwg A-8834702-503	Supports Resistors and Capacitors
E-1202		Same as E-1015	Wiring Connection to Chassis
E-1203		Same as E-1015	Wiring Connection to Chassis
E-1204 through E-1301		Not Used	
E-1302		TERMINAL LUG: ring type; brass, tin dipped; for no. 9 AWG on one end and no. 12 AWG on other end; 2 1/32 in. lg by 1/4 in. wide by 0.018 in. thick; solder connects to wire; Shakeproof Catalog no. 2522-4; RCA part/dwg K-67592-2	Wiring Connection to Chassis
E-1303		Same as E-333	Wiring Connection to Chassis
E-1304	2	TERMINAL BOARD: seven solder lug terminals; irregularly spaced; laminated glass cloth, silicone resin board; 1 11/16 in. lg by 1 3/16 in. wide by 1 9/64 in. thick overall approx; two no. 4-40 tapped mounting holes on 0.750 in. mounting center; marked w/ C-1305, R-1301, C-1304, C-1306; RCA part/dwg B-464087-501	Supports Resistors and Capacitors
E-1305 through E-1400		Not Used	

TABLE 9-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-1401	2	TERMINAL BOARD: eight stud terminals; irregularly spaced; laminated glass cloth, silicone resin board; 1 $\frac{7}{8}$ in. lg by 1 in. wide by 1 $\frac{1}{64}$ in. thick; two no. 4-40 swaged mounting nuts, 1 $\frac{1}{2}$ in. C to C; marked in accordance w/ RCA dwg A-8827783-1; $\frac{3}{32}$ in. characters in black R-1402, R-1408, C-1405, C-1407, natural color board; RCA part/dwg A-8834702-502	Supports Resistors and Capacitors
E-1402		Same as E-1015	Wiring Connection to Chassis
E-1403		Same as E-1015	Wiring Connection to Chassis
E-1404 through E-1500		Not Used	
E-1501	2	TERMINAL BOARD: general purpose; eight stud type terminals; irregularly spaced; laminated glass cloth, silicone resin board; 1 $\frac{7}{8}$ in. lg by 1 in. wide by 1 $\frac{1}{64}$ in. thick; two no. 4-40 swaged mounting nuts on 1 $\frac{1}{2}$ in. mounting center; RCA part/dwg A-8834702-501	Supports Resistors and Capacitors
E-1502		Same as E-1015	Wiring Connection to Chassis
E-1503		Same as E-1015	Wiring Connection to Chassis
E-1504 through E-1600		Not Used	
E-1601	2	TERMINAL BOARD: phenolic board, laminated; incl four solder stud type terminals: 2 $\frac{7}{16}$ in. lg by 1 $\frac{1}{16}$ in. wide by $\frac{1}{16}$ in. less terminals; two 0.147 in. dia mounting holes on 1 $\frac{15}{16}$ in. mounting centers; incl four 2-56 Phillips rd head screw and one adjustable link on reverse side; RCA part/dwg A-8835634-501	Supports Primary Top Connections from T-1601
E-1602	3	INSULATOR, STANDOFF: round post shape; ceramic, Type JAN-I-10, grade L-5 brass body, cadmium plated; $\frac{9}{16}$ in. lg less terminals; voltage breakdown at 60 cyc 4800 rms; $\frac{5}{16}$ in. OD, mounted by no. 6-32 stud on one end by $\frac{1}{4}$ in. lg; terminal finish suitable for soldering; Cambridge Thermionic Catalog no. X-1942-X; RCA part/dwg A-8831136-2	Supports Wiring
E-1603		Same as E-1602	Supports Wiring
E-1604	2	STUD: for wiring connection to chassis; c/o silver plated brass post, nickel-plated brass screw, silver plated brass bracket, and bronze lockwasher; rectangular shape; 0.8137 in. high by 0.291 in. wide by $\frac{1}{4}$ in. deep overall; one tapped mounting hole no. 6-32 thread by 0.281 in. lg; post has cutout 0.156 in. lg by 0.169 in. deep, 0.250 in. from top end; RCA part/dwg A-8812277-501	Wiring Connection to Chassis
E-1605	3	TERMINAL LUG: ring type; brass, tin dipped; for no. 14 AWG max stranded accommodates $\frac{1}{4}$ in. wire; bent at 90 deg angle; $\frac{3}{8}$ in. lg by 1 $\frac{1}{32}$ in. high by 0.18 in. thick overall; has one 0.150 in. dia hole in one end and one 0.078 in. dia hole for wire in other end; solder connects to wire; Shakeproof Catalog no. 2585; RCA part/dwg K-67592-21	Wiring Connection to Chassis
E-1606	2	CHASSIS: for AC power supply; aluminum chassis, synthetic satin black finish except top and inside; 11 $\frac{1}{4}$ in. lg by 4 $\frac{1}{4}$ in. wide by 2 $\frac{1}{16}$ in. high overall approx; four mounting screws no. 8-32 thread by $\frac{3}{4}$ in. lg on 10 $\frac{3}{4}$ in. by 3.0 in. mounting center retained in four bushings, two ea riveted to "L" shaped brackets welded to chassis; top exterior marked C-1601 and C-1602; top interior marked J-1601, X-1601, X-1602, L-1601, T-1601, E-1607, E-1603, E-1608, R-1602; one side interior marked E-1605, C-1603, E-1602, E-1604, E-5644, V-1603, R-1603; other side marked R-1604; one end interior marked E-1601; incl 56 holes of various dim.; two bracket assemblies welded to one end interior and one shieldmount riveted to one side interior; RCA part/dwg T-628796-501	Supports V-1603
E-1607		Same as E-1604	Binding Post for Connection to V-1603
E-1608		Same as E-1605	Wiring Connection to Chassis
E-1609		Same as E-1605	Wiring Connection to Chassis
E-1610 through E-1700		Not Used	
E-1701		COVER: AN Type MX-195/U; holds cable; brass, Army spec 57-160 annealed; silver plated; 0.875 in. lg by 0.687 in. sq flange, four 0.1094 in. dia mounting holes on 0.500 in. by 0.500 in. mounting center; holds cable up to 0.219 in. max dia; weather proof, non-constant impedance; American Phenolic Corp, Navy spec RE49F244; RCA part/dwg P-719230-3	Supports Cabling to J-1705, J-1708
E-1702		SHELL, ELECTRICAL CONNECTOR: Navy Type C-49193; brass, silver plated; cylindrical w/ sq flange; 1 in. lg by 1 in. wide by $\frac{3}{4}$ in. high overall; four mounting holes in flange 0.125 in. dia on 0.719 in. mounting center; marked w/ Navy Type no. prefixed by mfr's prefix letter; four 0.125 in. dia holes equally spaced in top of cover and solder dipped to $\frac{3}{16}$ in. min; 0.345 in. dia cable opening; RCA part/dwg P-255223-8	Supports Cabling to J-1707
E-1703		Same as E-1605	Wiring Connection to Chassis

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-1704		Same as E-1605	Wiring Connection to Chassis
E-1705	2	ADAPTER, SHAFT: for connecting 0.191 in. dia shaft to 1/4 in. OD hole; brass, hot solder finish; hollow tube shape w/ centrally located collar; 3/8 in. lg by 3/32 in. OD; has 0.191 in. ID hole, one end 0.240 in. OD w/ four equally spaced slots, has 3/32 in. OD by 1/32 in. wide center shoulder; other end 0.240 in. OD; RCA part/dwg A-8813758-1	Assists in Wiring J-1709
E-1706	2	ADAPTER, SHAFT: for connecting 0.234 in. dia shaft to 0.345 in. ID hole; brass, hot solder dip; hollow tube shape w/ centrally located collar; 15/32 in. lg by 1/4 in. OD overall; has 0.234 in. ID center hole, one end 0.281 in. OD w/ four equally spaced slots, has 3/8 in. OD by 1/32 in. lg shoulder spaced 3/16 in. from slotted end, other end 0.345 in. OD; RCA part/dwg A-8813758-2	Assists in Wiring J-1709
E-1707		Same as E-1605	Protects Cable from Heat While Soldering
E-1708	3	INSULATOR, BUSHING: tubular; laminated phenolic tubing; Fed. spec HH-256 Type 1 Grade XX; 3/8 in. lg; 0.156 in. OD by 0.105 in. ID; v not rated; end chamfered 45 deg; RCA part/dwg A-8817118-1	Adapts Coaxial Cable RG-122/U to J-1709
E-1709	3	INSULATOR, BUSHING: tubular; laminated phenolic tubing; Fed. spec HH-P-256 Type 1 Grade XX; 3/8 in. lg; v not rated; 0.187 in. OD by 0.105 in. ID; ends chamfered 45 deg; RCA part/dwg A-8817118-2	Adapts Coaxial Cable RG-122/U to J-1709
E-1710	2	CLAMP: coaxial lead hold down; brass strip 1/2 hard; hot solder dip finish; two bolts employed; 1 in. lg by 1/4 in. wide by 1/2 in. high overall approx; 0.032 in. thick strip; will hold 3/16 in. by 1/32 in. by 5/64 in. radius edge material; "U" shape; two 0.147 in. dia mounting holes 3/4 in. C to C; RCA part/dwg A-8824108-1	Supports Cabling to K-1701 and Grounds Shield of Coaxial Cable
E-1711		Same as E-1605	Wiring Connection to Chassis
E-1712		Same as E-1605	Wiring Connection to Chassis
E-1713		Same as E-1605	Wiring Connection to Chassis
E-1714		Same as E-1605	Wiring Connection to Chassis
E-1715		Same as E-1605	Wiring Connection to Chassis
E-1716 through E-2000		Not Used	
E-2001	2	TERMINAL BOARD: general purpose binding post strip; two combination screw and solder lug type terminals; 7/16 in. between centers; laminated glass cloth, silicone resin board; 1 1/16 in. lg by 3/8 in. wide by 1/16 in. thick overall approx; two 0.136 in. dia mounting holes on 1.312 in. mounting center; screws are swaged to prevent removal; RCA part/dwg B-458541-1	Connects Dial Lamp Wiring
E-2002	2	TERMINAL BOARD: general purpose; six post type terminals; terminals 1/2 in. between centers, two rows spaced 0.312 in. C to C; laminated phenolic board; 1/16 in. thick, Type ITS-K-4 in JAN-P-13; 2 5/16 in. lg by 3/4 in. wide by 7/16 in. thick overall approx; two 0.156 in. dia mounting holes, 1.875 C to C; terminals linked together in pairs; RCA part/dwg A-8836512-501	Supports Wiring
E-2003	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, 3/32 in. thick; eight stud type terminals; w/o barriers; 2 1/16 in. lg by 2 5/32 in. wide by 1 1/16 in. deep overall; mounts by means of two "L" shaped brackets attached under terminals, one ea end on same side of board, 0.156 in. dia hole in ea bracket, 2.312 in. between center lines; marked w/ C-2003, C-2004, L-2001; 0.261 in. dia hole, center 1 5/32 in. from end of board centrally placed for coil mounting, terminal at ea end soldered to bracket for grounding; RCA part/dwg B-459860-504	Supports Capacitors and Coil
E-2004		Same as E-1602	Supports Antenna Circuit Wiring
E-2005		KNOB: round; molded black phenolic; for 1/4 in. dia shaft; double no. 6-32 set screw; 1 1/32 in. wide groove filled w/ white lacquer pointer; 1 3/16 in. dia by 9/16 in. high; brass insert; 7/16 in. deep shaft hole; integral pointer 3/64 in. lg on periphery, eight equally spaced indents for finger grip; RCA part/dwg P-741622-501	Actuates Panel Controls
E-2006	3	KNOB: round w/ eight equally spaced indents around knob w/ bar extending 1/2 in. beyond periphery; black molded thermosetting plastic; for 1/4 in. dia shaft; double no. 8-32 set screw; marked w/ white line 1 1/32 in. wide; 1 3/8 in. lg by 1 1/16 in. dia by 7/8 in. high; brass insert; 3/4 in. deep shaft hole; counterbored 7/16 in. deep by 7/8 in. dia; RCA part/dwg M-446008-503	Actuates Reception Controls
E-2007	2	WASHER, FLAT: laminated glass; 1/2 in. OD by 0.010 in. thick overall; 0.196 in. ID hole; RCA part/dwg A-8812249-3	With E-2012 Insulates C-2001 from Chassis
E-2008	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, 1/16 in. thick; 16 stud type terminals, hot solder dipped; w/o barriers; 2 3/8 in. lg by 1 in. wide by 1 1/32 in. deep overall; mounts by two no. 6-32 tapped spacers located on center line 2 3/8 in. C to C; marked w/ R-2003, R-2005, R-2004, R-2010, R-2009, R-2002, and R-2006; two rows 3/4 in. C to C, seven terminals ea 1/32 in. C to C equally spaced; RCA part/dwg B-464035-504	Supports Resistors



**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-2009	2	TERMINAL, LUG: round tongue end type, bent; brass; hot solder dip finish; no. 11 AWG wire accommodated; $1\frac{3}{32}$ in. lg approx by 0.315 in. wide by 0.163 in. high approx overall; soldered wire connection; 0.145 in. dia mounting hole one end; 0.020 in. thick stock, bent to an angle of approx 60 deg $\frac{5}{16}$ in. from center of mounting hole; Shakeproof Inc. Catalog no. 2506-6 modified; RCA part/dwg K-880901-18	Wiring Connection to Chassis
E-2010	2	INSULATOR, PLATE: flat rectangular shape; glass fabric, tetrafluoroethylene coated; $2\frac{7}{16}$ in. lg; $\frac{5}{8}$ in. wide by 0.005 in. thick; four 0.128 in. dia mounting holes spaced on $\frac{5}{16}$ in. by 0.858 in. mounting centers; "I" shape slit on same center line as holes $3\frac{3}{64}$ in. lg by $\frac{5}{16}$ in. high; Dupont no. 405; RCA part/dwg A-8825747-4	Protects Wiring
E-2011	2	INSULATOR, PLATE: flat rectangular shape; glass fabric, tetrafluoroethylene coated; $1\frac{5}{16}$ in. lg; $\frac{5}{8}$ in. wide by 0.005 in. thick; four 0.128 in. dia mounting holes spaced on $\frac{5}{16}$ in., 0.858 in., $\frac{5}{16}$ in. centers; "I" shape slit on same center line holes $1\frac{7}{64}$ in. lg by $\frac{5}{16}$ in. high; Dupont no. 405; RCA part/dwg A-8825747-6	Protects Wiring
E-2012	2	INSULATOR, BUSHING: nylon; female; $\frac{5}{64}$ in. lg, 0.250 in. OD by 0.090 in. lg to $\frac{3}{8}$ in. OD by 0.030 in. lg other end, 0.196 in. ID hole; RCA part/dwg A-8812249-1	With E-2007 Insulates C-2001 from Chassis
E-2013	2	TERMINAL, STUD: post type; brass rod silver plate; $\frac{3}{8}$ in. lg by $\frac{3}{16}$ in. dia; mounts by no. 4-40 tap by $\frac{5}{32}$ in. dia; undercut $\frac{3}{32}$ in. lg by 0.093 in. dia w/ head 0.032 in. thick by 0.156 in. dia; tapped end has 35 pitch knurl approx 18 points; RCA part/dwg K-888927-1	Wiring Connection to Chassis
E-2014		Same as E-2013	Wiring Connection to Chassis
E-2015		Same as E-2013	Wiring Connection to Chassis
E-2016		Same as E-2013	Wiring Connection to Chassis
E-2017		Same as E-2013	Wiring Connection to Chassis
E-2018		Same as E-2013	Wiring Connection to Chassis
E-2019		Same as E-2013	Wiring Connection to Chassis
E-2020	2	TERMINAL, STUD: post type; brass rod, hot solder dip; $1\frac{1}{16}$ in. lg by $\frac{1}{4}$ in. wide across flats of hex head; mounts by no. 6-32 thread by $1\frac{1}{32}$ in. lg; stud portion $1\frac{1}{32}$ in. lg w/ head 0.156 in. dia by 0.032 in. wide; separated by undercut $\frac{3}{32}$ in. lg by 0.093 in. dia; second undercut is 0.140 in. lg by 0.093 in. dia extends to hex head 0.046 in. thick; RCA part/dwg K-891798-3	Wiring Connection to Chassis
E-2021		Same as E-2020	Wiring Connection to Chassis
E-2022		Same as E-2020	Wiring Connection to Chassis
E-2023		Same as E-2020	Wiring Connection to Chassis
E-2024		Same as E-2020	Wiring Connection to Chassis
E-2025		Same as E-2020	Wiring Connection to Chassis
E-2026		Same as E-2020	Wiring Connection to Chassis
E-2027		Same as E-2020	Wiring Connection to Chassis
E-2028		Same as E-2009	Wiring Connection to Chassis
E-2029		Same as E-2009	Wiring Connection to Chassis
E-2030		Same as E-1705	Assist in Wiring J-2014
E-2031		Same as E-1708	Adapts Coaxial Cable RG-122/U to J-2014
E-2032	3	KNOB: round; black phenolic; for $\frac{1}{4}$ in. dia shaft; double no. 6-32 set screw; $\frac{1}{32}$ in. wide groove filled w/ white lacquer on pointer; $\frac{13}{16}$ in. dia by $\frac{5}{16}$ in. high; brass insert; $\frac{7}{16}$ in. deep shaft hole; integral pointer $\frac{3}{64}$ in. lg on periphery; two sides flattened parallel to pointer; RCA part/dwg P-741622-504	Actuates Panel Controls
E-2033 through E-2100		Not Used	
E-2101		Same as E-2001	Connects Dial Lamp Wiring
E-2102		Same as E-2002	Supports Wiring
E-2103	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{3}{32}$ in. thick; eight stud type terminals; w/o barriers; $2\frac{1}{16}$ in. lg by $2\frac{3}{32}$ in. wide by $1\frac{1}{16}$ in. deep overall; mounts by means of two "L" shaped brackets attached under terminals one ea end on same side of board 0.156 in. dia hole in ea bracket, 2.312 in. between center lines; marked w/ C-2103, C-2104, C-2105, L-2101, R-2111; 0.261 in. dia hole, centered $1\frac{1}{32}$ in. from end of board centrally placed for coil mounting, terminal at ea end soldered to bracket for grounding; RCA part/dwg B-459860-505	Supports Capacitors and Coils
E-2104		Same as E-1602	Supports Antenna Circuit Wiring
E-2105		Same as E-2005	Actuates Panel Controls

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-2106		Same as E-2006	Actuates Reception Controls
E-2107	2	INSULATOR, BUSHING: nylon; male or female; 0.115 in. lg by ¼ in. dia overall; larger end 0.035 in. lg by ¼ in. dia cutback to 0.156 in. dia by 0.080 in. lg; 0.116 in. ID; RCA part/dwg A-8812249-2	With E-2012 Insulates C-2001 from Chassis
E-2108	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, ¼ in. thick; fourteen stud type terminals, hot solder dipped; w/o barriers; 2¾ in. lg by 1 in. wide by 1¼ in. deep overall; mounts by two no. 6-32 tapped spacers located on center line 2¼ in. C to C; marked w/ R-2103, R-2105, R-2104, R-2110, R-2109, R-2113, R-2114; two rows ¼ in. C to C, seven terminals ea ¼ in. C to C evenly spaced; RCA part/dwg B-464035-505	Supports Resistors
E-2109		Same as E-2007	Wiring Connection to Chassis
E-2110		Same as E-2010	Protects Wiring
E-2111		Same as E-2011	Protects Wiring
E-2112	2	TERMINAL BOARD: glass cloth, silicone resin board, ¼ in. thick; seven lug type terminals; w/o barriers; 1¼ in. lg by 1¼ in. wide by 1¼ in. deep overall; two mounting holes in opposite corners w/ eyelets 0.126 in. ID, centers 1.031 in. by 0.178 in.; marked w/ O-2125, O-2126, "1" "2" "3" "4" "5" "6"; terminals assembled on board w/ link and bushing using Phillips head no. 2-56 by ¼ in. lg sems lock screws; RCA part/dwg C-750148-501	Supports O-2225
E-2113		Same as E-2013	Wiring Connection to Chassis
E-2114		Same as E-2013	Wiring Connection to Chassis
E-2115		Same as E-2013	Wiring Connection to Chassis
E-2116		Same as E-2013	Wiring Connection to Chassis
E-2117		Same as E-2013	Wiring Connection to Chassis
E-2118		Same as E-2013	Wiring Connection to Chassis
E-2119		Same as E-2013	Wiring Connection to Chassis
E-2120		Same as E-2020	Wiring Connection to Chassis
E-2121		Same as E-2020	Wiring Connection to Chassis
E-2122		Same as E-2020	Wiring Connection to Chassis
E-2123		Same as E-2020	Wiring Connection to Chassis
E-2124		Same as E-2020	Wiring Connection to Chassis
E-2125		Same as E-2020	Wiring Connection to Chassis
E-2126		Same as E-2020	Wiring Connection to Chassis
E-2127		Same as E-2020	Wiring Connection to Chassis
E-2128		Same as E-2209	Wiring Connection to Chassis
E-2129		Same as E-2009	Wiring Connection to Chassis
E-2130		Same as E-2009	Wiring Connection to Chassis
E-2131		Same as E-2009	Wiring Connection to Chassis
E-2132		Not Used	
E-2133		Same as E-1015	Wiring Connection to Chassis
E-2134	2	INSULATOR, BUSHING: nylon rod; Polymer Co. Type no. FM-1001; male and female; ½ in. lg by ¾ in. OD w/ two flattened sides ¼ in. across flats; 0.375 in. ID thread side, other side has counterbore ¼ in. deep by 0.406 in. dia; ¼ in. lg shoulder ¼-32 thread, ¼ in. lg; shank unthreaded for ¼ in. at cap end; RCA part/dwg A-8829143-1	Insulates Chassis from Cabinet
E-2135		Same as E-2012	With E-2007 Insulates C-2001 from Chassis
E-2136		Same as E-1705	Assists in Wiring J-2114
E-2137		Same as E-1708	Adapts Coaxial Cable RG-122/U to J-2114
E-2138		Same as E-2032	Actuates Panel Controls
E-2139 through E-2200		Not Used	
E-2201		Same as E-2001	Connects Dial Lamp Wiring
E-2202		Same as E-2002	Supports Wiring

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-2203	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{3}{32}$ in. thick; eight stud type terminals; w/o barriers; $2\frac{1}{16}$ in. lg by $2\frac{3}{32}$ in. wide by $1\frac{1}{16}$ in. deep overall; mounts by means of two "L" shaped brackets attached under terminals one ea end on same side of board 0.156 in. dia hole in ea bracket, 2.312 in. between center lines; marked w/ C-2203, C-2204, C-2205, L-2201, and R-2211; 0.261 in. dia hole, centered $1\frac{3}{32}$ in. from end of board centrally placed for coil mounting; terminal at ea end soldered to bracket for grounding; RCA part/dwg B-469860-506	Supports Capacitors and Coil
E-2204		Same as E-1602	Supports Antenna Circuit Wiring
E-2205		Same as E-2005	Actuates Panel Controls
E-2206		Same as E-2006	Actuates Reception Controls
E-2207		Same as E-2107	With E-2012 Insulates C-2001 from Chassis
E-2208	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in thick; fourteen stud type terminals, hot solder dipped; w/o barriers; $2\frac{5}{8}$ in. lg by 1 in. wide by $1\frac{1}{32}$ in. deep overall; mounts by two no. 6-32 tapped spacers located on center line $2\frac{3}{16}$ in. C to C; marked w/ R-2203, R-2205, R-2204, R-2210, R-2209, R-2213, and R-2214; two rows $\frac{3}{4}$ in. C to C, seven terminals ea $\frac{3}{32}$ in. C to C evenly spaced; RCA part/dwg B-464035-506	Supports Resistors
E-2209		Same as E-2013	Wiring Connection to Chassis
E-2210		Same as E-2010	Protects Wiring
E-2211		Same as E-2011	Protects Wiring
E-2212	2	TERMINAL BOARD: glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; two lug type terminals; w/o barriers; $1\frac{5}{16}$ in. lg by $1\frac{1}{16}$ in. wide by $1\frac{1}{32}$ in. deep overall; two mounting holes in opposite corners 0.136 in. dia centers 1.03 in. by 0.718 in.; marked w/ O-2225, "1" "2" "3"; terminals assembled on board w/ link and bushing using Phillips head no. 2-56 by $\frac{5}{16}$ in. lg sems lock screws; RCA part/dwg C-750148-502	Supports O-2225
E-2213		Same as E-2013	Wiring Connection to Chassis
E-2214		Same as E-2013	Wiring Connection to Chassis
E-2215		Same as E-2013	Wiring Connection to Chassis
E-2216		Same as E-2013	Wiring Connection to Chassis
E-2217		Same as E-2013	Wiring Connection to Chassis
E-2218		Same as E-2013	Wiring Connection to Chassis
E-2219		Same as E-2013	Wiring Connection to Chassis
E-2220		Same as E-2020	Wiring Connection to Chassis
E-2221		Same as E-2020	Wiring Connection to Chassis
E-2222		Same as E-2020	Wiring Connection to Chassis
E-2223		Same as E-2020	Wiring Connection to Chassis
E-2224		Same as E-2020	Wiring Connection to Chassis
E-2225		Same as E-2020	Wiring Connection to Chassis
E-2226		Same as E-2020	Wiring Connection to Chassis
E-2227		Same as E-2020	Wiring Connection to Chassis
E-2228	2	TERMINAL, LUG: round tongue end type; brass; solder coat finish; no. 11 AWG wire accommodated; $\frac{11}{16}$ in. lg by $\frac{9}{32}$ in. wide by 0.016 in. thick overall; crimped and soldered wire connection; one 0.140 in. dia mounting hole at one end; Cinch Mfg. Co. Catalog no. 1430; RCA part/dwg A-8819429-1	Wiring Connection to Chassis
E-2229		Same as E-2009	Wiring Connection to Chassis
E-2230		Same as E-2009	Wiring Connection to Chassis
E-2231		Same as E-2009	Wiring Connector to Chassis
E-2232		Not Used	
E-2233		Same as E-1015	Wiring Connector to Chassis
E-2234		Same as E-2134	Insulates Chassis from Cabinet
E-2235		Same as E-2012	With E-2007 Insulates C-2001 from Chassis
E-2236		Same as E-2007	With E-2012 Insulates C-2001 from Chassis
E-2237		Same as E-1705	Assists in Wiring J-2214
E-2238		Same as E-1708	Adapts Coaxial Cable RG-122/U to J-2214
E-2239		Same as E-2032	Actuates Panel Controls

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-2240 through E-3000		Not Used	
E-3001		Same as E-101	Type I, Antenna Unit Connection to C-2101E
E-3002		Same as E-101	Type I, Antenna Unit Connection to C-2101E
E-3003	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; ten stud type terminals, hot solder dipped; w/o barriers; $1\frac{1}{8}$ in. lg by $1\frac{13}{32}$ in. wide by $1\frac{3}{32}$ in. deep overall; mounts by means of "L" shaped aluminum bracket riveted to board at one side w/ two holes w/ no. 4-40 self-clinching steel nut inserts on bent side 0.968 in. C to C; marked w/ C-3006, C-3007, C-3008, C-3009, C-3010; two rows $\frac{3}{4}$ in. C to C, five terminals in ea row $\frac{3}{8}$ in. C to C evenly spaced; RCA part/dwg B-464055-503	Supports Capacitors
E-3004	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; three terminals w/ one jumper link; hot tin dipped solder lug type; w/o barriers; $1\frac{1}{2}$ in. lg by 1 in. wide by $1\frac{1}{2}$ in. deep overall; mounts by means of "L" shaped bracket, aluminum, riveted to board at one end w/ two holes w/ no. 4-40 steel nut inserts on bent end 0.312 in. C to C; marked w/ "ANT," "HL," "LO" and "O-3001"; terminal lugs held by Phillips head brass screws no. 2-56 sems lock, peened and free to turn, in triangle form 0.406 in. C to C base, at opposite end to mounting; RCA part/dwg B-462513-501	Supports O-3001
E-3005	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; ten stud type terminals; w/o barriers; $4\frac{1}{8}$ in. lg by $\frac{1}{4}$ in. wide by 0.253 in. deep overall; five 0.078 in. dia mounting holes, 0.781 in. C to C w/ $\frac{1}{2}$ in. at ea end; marked w/ C-3001, C-3002, C-3003, C-3004, and C-3005; for mounting capacitors; RCA part/dwg C-746176-505	Supports Capacitors
E-3006	2	PLATE, ELECTRICAL GROUNDING: brass sheet, 0.0403 in. thick; silver plate and clear water dip finish; pronged "Z" shaped strip; $3\frac{7}{8}$ in. lg by $1\frac{27}{64}$ in. wide by $1\frac{1}{16}$ in. deep overall; mounts by means of four holes on center line of solid section of strip 0.166 in. dia, 0.968 in., 1.157 in., 0.500 in. C to C; marked w/ E-3006, J-3004; used for wiring, support, and grounding; RCA part/dwg T-630899-14	Supports Wiring
E-3007	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; two brass stud type terminals hot solder dipped; w/o barriers; $3\frac{1}{32}$ in. lg by $1\frac{9}{32}$ in. wide by $\frac{5}{16}$ in. deep overall; two 0.136 in. dia mounting holes at diagonal corners of rectangular board, centers 0.687 in. by 0.312 in.; marked w/ C-3011; terminals at diagonal corners, centers 0.687 in. by 0.312 in.; RCA part/dwg B-465843-502	Supports Wiring
E-3008	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; four stud type terminals, hot solder dipped; w/o barriers; $1\frac{1}{8}$ in. lg by $\frac{5}{16}$ in. wide by $\frac{1}{2}$ in. deep overall; mounts by means of "L" shaped aluminum bracket riveted to board at one end w/ two holes 0.102 in. dia, 0.218 in. C to C in bent section; marked w/ C-3012, R-3001; two terminals centered $\frac{3}{64}$ in. from end of board, $\frac{5}{16}$ in. C to C, two terminals centered $\frac{15}{16}$ in. from others, $\frac{5}{16}$ in. C to C; RCA part/dwg B-469478-501	Supports Resistors
E-3009	3	TERMINAL, LUG: eye type; copper; hot solder dipped; no. 16 AWG wire accommodated; $1\frac{3}{64}$ in. lg by $\frac{3}{32}$ in. wide by $1\frac{3}{64}$ in. high overall; soldered wire connection; 0.120 in. dia mounting hole in $\frac{1}{32}$ in. dia end; made from $\frac{1}{64}$ in. thick sheet, $\frac{1}{8}$ in. wide wiring section; F. R. Zierick Mfg Co. Catalog no. 75 modified; RCA part/dwg A-79534-6	Wire Connection to Chassis
E-3010		Not Used	
E-3011		Same as E-108	With E-3006 and E-3012 Supports Wiring
E-3012		Same as E-107	With E-3006 Supports Wiring
E-3013	2	INSULATOR, PLATE: laminated glass cloth, silicone resin; natural; flat rectangular strip or plate; $3\frac{3}{4}$ in. lg by 0.010 in. thick by $\frac{5}{16}$ in. wide; four mounting holes 0.166 in. dia on center line of strip w/ centers $\frac{1}{2}$ in., 1.468 in., 2.625 in. and 3.125 in. from end; RCA part/dwg A-8829184-4	Insulates E-3006 from Chassis
E-3014	2	SHIELD, ELECTRON TUBE: phosphor bronze, spring temper, 0.010 in. thick, silver plate; cylindrical shape w/ end tag extensions; $1\frac{1}{16}$ in. lg by $1\frac{13}{32}$ in. wide, 0.36375 in. OD by $\frac{3}{8}$ in. high overall; mounts by 0.086 in. dia hole in one end, tag for rivet; to withstand 48-hr salt spray test, riveted and soldered electrical connections at tags serves as tube mount; National Machine Shop, Inc. Type T3 (6873-3); RCA part/dwg A-8832370-2	Supports V-3001
E-3015	3	TERMINAL, LUG: round torque end type, bent; brass; hot solder dip finish; no. 14 AWG wire accommodated; $\frac{1}{32}$ in. lg by $\frac{5}{16}$ in. wide by $\frac{3}{32}$ in. high overall; soldered rivet or wire connection; 0.070 in. dia mounting and connection hole in one end; 0.015 in. thick stock "L" shaped right angle bend; RCA part/dwg A-8821462-1	Connects Wiring to E-3014
E-3016	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; 17 terminals; 16 stud and one "L" lug type; w/o barriers; 3 in. lg by $1\frac{1}{16}$ in. wide by 1 in. deep overall; mounts on two spring terminals and one spring pin; terminals at one end 1.156 in. C to C, pin at other end $2\frac{3}{4}$ in. from terminal center line and 1 in. from outer edge; marked w/ "1" to "7"; assem incl shieldmount, shield, and grounding strap, also bracket across mounting terminals; RCA part/dwg C-748787-503	Supports V-3001

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-3017 through E-3100		Not Used	
E-3101		Same as E-101	Type III, Antenna Unit Connection to C-2201E
E-3102		Same as E-101	Type III, Antenna Unit Connection to C-2201E
E-3103	2.	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; ten stud type terminals, hot solder dipped; w/o barriers; $1\frac{1}{8}$ in. lg by $1\frac{3}{32}$ in. wide by $1\frac{3}{32}$ in. deep overall; mounts by means of "L" shaped aluminum bracket riveted to board at one side w/ two holes w/ no. 4-40 self-clinching steel nut inserts on bent side 0.968 in. C to C; marked w/ C-3101, C-3102, C-3103, C-3104, C-3106; two rows $\frac{3}{4}$ in. C to C, five terminals in ea row $\frac{3}{8}$ in C to C evenly spaced; RCA part/dwg B-464055-504	Supports Capacitors
E-3104	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; three terminals w/ one jumper link, hot tin dipped solder lug type; w/o barriers; $1\frac{1}{2}$ in. lg by 1 in. wide by $1\frac{7}{32}$ in. deep overall; mounts by means of "L" shaped bracket, aluminum, riveted to board at one end w/ two holes w/ no. 4-40 steel nut inserts on bent end, 0.312 in. C to C; marked w/ "ANT," "HI," "LO" and "O-3101"; terminal lugs held by Phillips head brass screws no. 2-56 sems lock, peened and free to turn, in triangle form 0.406 in. C to C base, at opposite end to mounting; RCA part/dwg B-462513-502	Supports O-3101
E-3105	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; ten stud type terminals; w/o barriers; $4\frac{1}{8}$ in. lg by $\frac{1}{4}$ in. wide by 0.253 in. deep overall; five 0.078 in. dia mounting holes, 0.781 in. C to C w/ $\frac{1}{2}$ in. at ea end; marked w/ C-3107, C-3105; for mounting capacitors; RCA part/dwg C-746176-506	Supports Capacitors
E-3106	2	PLATE, ELECTRICAL GROUNDING: brass sheet, 0.0403 in. thick; silver plate and clear water dip finish; pronged "Z" shaped strip; $3\frac{7}{8}$ in. lg by $1\frac{27}{64}$ in. wide by $\frac{1}{16}$ in. deep overall; mounts by means of four holes on center line of solid section of strip 0.166 in. dia, 0.968 in., 1.157 in., 0.500 in. C to C; marked w/ Antenna Box Assem, E-3103, J-3104, E-3107; used for wiring, support and grounding; RCA part/dwg T-630899-15	Supports Wiring
E-3107		Same as E-3007	Supports Wiring
E-3108	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; three stud type terminals, hot solder dipped; w/o barriers; $1\frac{1}{8}$ in. lg by $\frac{9}{16}$ in. wide by $\frac{1}{2}$ in. deep overall; mounts by means of "L" shaped aluminum bracket riveted to board at one end w/ two holes 0.102 in. dia, 0.213 in. C to C in bent section; marked w/ C-3108, C-3109, two terminals centered $\frac{9}{64}$ in. from end of board, $\frac{7}{16}$ in. C to C, one terminal w/ center $\frac{15}{16}$ in. from other two and $1\frac{3}{64}$ in. from side; RCA part/dwg B-469478-502	Supports Capacitors
E-3109		Same as E-3009	Wire Connection to Chassis
E-3110		Not Used	
E-3111		Same as E-108	With E-3106 and E-3112 Supports Wiring
E-3112		Same as E-107	With E-3106 Supports Wiring
E-3113		Same as E-3013	Insulates E-1316 from Chassis
E-3114		Same as E-3014	Supports V-3101
E-3115		Same as E-3015	Connects Wiring to E-3114
E-3116	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; 19 terminals; 18 stud type and one "L" lug type terminals; w/o barriers; 3 in. lg by $1\frac{1}{16}$ in. wide by 1 in. deep overall; mounts by two spring terminals and one spring pin terminal at one end 1.156 in. C to C, pin at other end $2\frac{3}{4}$ in. from terminal center line and 1 in. from outer edge; marked w/ "1" to "7"; assem incl shieldmount and shield grounding strap; bracket across mounting terminals; RCA part/dwg C-748787-502	Supports V-3101
E-3117 through E-3134		Not Used	
E-3135		Same as E-101	Type III, RF Unit Connection to 2201-C-D
E-3136		Same as E-101	Type III, RF Unit Connection to 2201-C-D
E-3137		Same as E-101	Type III, RF Unit Connection to 2201-C-D
E-3138		Same as E-101	Type III, RF Unit Connection to 2201-C-D
E-3139	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; six terminals; four stud and two lug terminals, hot solder dipped; w/o barriers; $1\frac{3}{16}$ in. lg by $2\frac{1}{32}$ in. wide by $\frac{1}{16}$ in. deep overall; mounts by means of "L" shaped aluminum bracket riveted to board at one end w/ two holes w/ no. 4-40 self-clinching steel nut inserts on bent end $1\frac{1}{32}$ in. C to C; marked w/ C-3162, C-3156; four stud terminals evenly spaced $1\frac{1}{32}$ in., $1\frac{1}{32}$ in. centers, w/ two lug terminals at back of two end posts $1\frac{1}{32}$ in. C to C; RCA part/dwg B-464047-507	Supports Capacitors

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-3140	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, 1/16 in. thick; ten stud type terminals, brass hot solder dipped; w/o barriers; 4 1/8 in. lg by 1/4 in. wide by 1 7/64 in. deep overall; five 0.078 in. dia mounting holes, 0.781 in. C to C in line evenly spaced w/ reference to terminals; marked w/ C-3145, C-3149, C-3152, C-3160, C-3166; terminals placed one ea end 3.875 in. C to C and four pair evenly; between center spacings 0.687 in., 0.156 in., 0.625 in., 0.156 in., 0.625 in., 0.156 in.; RCA part/dwg B-469419-502	Supports Capacitors
E-3141	2	PLATE, ELECTRICAL GROUNDING: brass sheet 0.0403 in. thick; silver plate and clear water dip finish; pronged "Z" shaped strip; 3 31/32 in. lg by 1 27/64 in. wide by 15/16 in. deep overall; mounts by means of five holes on center line of solid section of strip 0.261 in. by 0.198 in. ea 0.781 in. C to C; marked w/ RF Box Assem, C-3135 to C-3139, C-3147, C-3150, C-3153, C-3155, C-3161; used for wiring, support, and grounding; RCA part/dwg T-630899-19	Supports Wiring
E-3142	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, 1/16 in. thick; ten stud type terminals, brass hot solder dipped; w/o barriers; 4 1/8 in. lg by 1/4 in. wide by 1 7/64 in. deep overall; five 0.078 in. dia mounting holes 0.781 in. C to C in line evenly spaced w/ reference to terminals; marked w/ C-3168, C-3167; terminals placed one ea end 3.875 in. C to C and four pair evenly, between center spacings 0.687 in., 0.156 in., 0.625 in., 0.156 in., 0.625 in., 0.156 in., 0.625 in., 0.156 in., 0.687 in.; RCA part/dwg B-469419-504	Supports Capacitors
E-3143	2	PLATE, ELECTRICAL GROUNDING: brass sheet, 0.0403 in. thick; silver plate and clear water dip finish; pronged "Z" shaped strip; 3 31/32 in. lg by 1 27/64 in. wide by 15/16 in. deep overall; mounts by means of five holes on center line of solid section of strip 0.261 in. by 0.198 in. ea, 0.781 in. C to C; marked w/ RF Box Assem, C-3140 to C-3144, C-3148, C-3151, C-3154, C-3157, C-3163; used for wiring, support and grounding; RCA part/dwg T-630899-17	Supports Wiring
E-3144	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, 1/16 in. thick; seven terminals; five stud, two lug terminals, hot solder dipped; w/o barriers; 1 3/8 in. lg by 2 1/32 in. wide by 1 9/32 in. deep overall; mounts by means of "L" shaped aluminum bracket riveted to board at one end w/ two holes w/ no. 4-40 self-clinching steel nut inserts on bent end 0.375 in. C to C; marked w/ C-3158, C-3159, C-3164, C-3165; four stud terminals evenly spaced 0.406 in. by 4 5/64 in. toward one end w/ "L" lugs on back of two end terminals, fifth stud terminal at corner opposite end; RCA part/dwg B-469475-502	Supports Capacitors and Resistors
E-3145		Same as E-3045	Supports W-3139
E-3146		Same as E-136	Insulates E-3141 from Chassis
E-3147		Same as E-333	Connects Wiring to Chassis
E-3148		Same as E-108	With E-3141 Supports Wiring
E-3149		Same as E-107	With E-3141 and E-3148 Supports Wiring
E-3150		Not Used	
E-3151		Same as E-3014	Supports V-3135
E-3152		Same as E-3015	Supports Wiring
E-3153	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, 1/16 in. thick; 18 terminals; 17 stud type and one "L" lug type terminals; w/o barriers; 3 in. lg by 1 1/16 in. wide by 1 in. deep overall; mounts by two spring terminals and one spring pin terminal at one end 1.156 in. C to C, pin at other end 2 3/8 in. from terminal center line and 1 in. from outer edge; marked w/ "1" to "7"; assem incl shieldmount and shield grounding strap; brackets are on mounting terminals; RCA part/dwg C-748787-504	Supports V-3135
E-3154 through E-3600		Not Used	
E-3601		Same as E-2005	Knobs for "Dim." "Cal. Adj." and "Lamps"
E-3602		Same as E-2006	Knob for Band Switch
E-3603		KNOB: round; black bakelite; for 1/4 in. dia shaft; two no. 8-32 Allen head set screws, 120 deg apart; 1 1/2 in. dia by 3/4 in. high overall; brass insert; 5/16 in. deep shaft hole; has eight finger indentations, counterbored 1 1/16 in. dia by 1/8 in. deep; RCA part/dwg P-737820-509	Knob for Tuning Control
E-3604	3	TERMINAL, LUG: spade type; brass, hot solder dipped; for no. 12 AWG wire; 3/4 in. lg by 1 1/32 in. wide by 7/32 in. high, 3/8 in. lg by 0.144 in. wide slot; solder connects to wire; w/ insulation clamping ears for 1/8 in. dia insulation; RCA part/dwg K-61580-1	Connects Dial Assembly to Frame
E-3605		Same as E-3604	Connects Dial Assembly to Frame
E-3606		Same as E-2032	Knob for Lamp Shift
E-3607 through E-3700		Not Used	

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-3701		Same as E-2005	Knobs for "Dim." "Cal. Adj." and "Lamps"
E-3702		Same as E-2006	Knob for Band Switch
E-3703		Same as E-3603	Knob for Tuning Control
E-3704		Same as E-3604	Connects Dial Assembly to Frame
E-3705		Same as E-3604	Connects Dial Assembly to Frame
E-3706		Same as E-2032	Knob for Lamp Shift
E-3707 through E-3800		Not Used	
E-3801		Same as E-2005	Knobs for "Dim." "Cal. Adj." and "Lamps"
E-3802		Same as E-2006	Knob for Band Switch
E-3803		Same as E-3603	Knob for Tuning Control
E-3804		Same as E-3604	Connects Dial Assembly to Frame
E-3805		Same as E-3604	Connects Dial Assembly to Frame
E-3806		Same as E-2032	Knob for Lamp Shift
E-3807 through E-4000		Not Used	
E-4001		Same as E-1701	Supports Cabling to J-4005, J-4006
E-4002		Same as E-1702	Supports Cabling to J-4007
E-4003		Same as E-1605	Wiring Connection to Chassis
E-4004		Same as E-1605	Wiring Connection to Chassis
E-4005	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; five terminals and one jumper link; three feed-thru stud and two "L" lug terminals, hot tin dipped; w/o barriers; $1\frac{3}{4}$ in. lg by $\frac{3}{4}$ in. wide by $3\frac{1}{4}$ in. deep overall, two 0.136 in. dia mounting holes, one toward ea end of board 1.25 in. C to C evenly spaced; mark three bushings forming central triangle "1," "2," "3" and O-4002, R-4001, on one side of board, also O-4001 on other side of board between studs; three brass silver plated bushings no. 2-56 tap, form triangle w/ base at edge $2\frac{1}{32}$ in. C to C w/ three brass pan head Phillips machine screws, link, and "L" terminals at "1" and "2," three feedthru terminals toward other edge of board; RCA part/dwg C-750160-501	Wiring Connection to Chassis
E-4006		Not Used	
E-4007		Same as E-1705	Assists in Wiring J-4009
E-4008		Same as E-1706	Assists in Wiring J-4009
E-4009		Same as E-1605	Wiring Connection to Chassis
E-4010	2	COVER: for connector Navy Type 49208; brass, silver plate; conical shaped w/ sq flange; $1\frac{3}{32}$ in. sq by $\frac{3}{8}$ in. high overall; four 0.120 in. dia mounting holes on $3\frac{1}{32}$ in. by $3\frac{1}{32}$ in. mounting centers; Amphenol 83-24; RCA part/dwg P-279000-3	Assists in Wiring J-4004
E-4011	2	ADAPTER, WIRE: adapts wire to hood; solder tinned brass; round shape; $\frac{5}{16}$ in. OD by $\frac{5}{16}$ in. lg overall; smaller end 0.3105 in. lg by 0.460 in. ID by 0.512 in. max OD enlarged to $\frac{5}{16}$ in. dia by 0.028 in. lg max; larger end, partially enclosed, has one shaped hole beveled to 0.300 in. lg by 0.156 in. wide and turned in flange 0.300 in. lg by 0.156 in. wide by 0.020 in. deep; RCA part/dwg A-8813756-1	Assists in Wiring J-4009
E-4012		Same as E-1605	Wiring Connection to Chassis
E-4013		Same as E-1605	Wiring Connection to Chassis
E-4014		Same as E-1709	Adapts Coaxial Cable RG-122/U to J-4009
E-4015		Same as E-1708	Adapts Coaxial Cable RG-122/U to E-4001
E-4016		Same as E-1710	Supports Cabling of K-4001 and Ground Shield of Coaxial Cable
E-4017		Same as E-1605	Wiring Connection to Chassis
E-4018		Same as E-1605	Wiring Connection to Chassis
E-4019		Same as E-1605	Wiring Connection to Chassis
E-4020 through E-4400		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E-4401		Same as E-101	Type III, Oscillator Connection to C-2201A
E-4402		Same as E-101	Type III, Oscillator Connection to C-2201A
E-4403	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; nine terminals; five stud, four lug terminals, hot solder dipped; w/o barriers; $1\frac{3}{16}$ in. lg by $2\frac{1}{2}$ in. wide by $1\frac{9}{32}$ in. deep overall; mounts by means of "L" shaped aluminum bracket riveted to board at one end w/ two holes w/ no. 4-40 self-clinching steel nut inserts on bent end 0.375 in. C to C; marked w/ C-4417, C-4418, C-4420, C-4419; four post terminals w/ "L" lugs on back, evenly spaced in one half of board, centers $\frac{3}{16}$ in. by 0.406 in.; one stud terminal in corner at mounting end in line; RCA part/dwg B-464024-508	Supports Capacitors and Wiring
E-4404	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; six stud type terminals; w/o barriers; $4\frac{1}{8}$ in. lg by $\frac{1}{4}$ in. wide by 0.253 in. deep overall; five 0.078 in. dia mounting holes, 0.781 in. C to C w/ $\frac{1}{2}$ in. at ea end; marked w/ C-4412, C-4409, C-4406; for mounting capacitors; RCA part/dwg C-746176-517	Supports Capacitors and Wiring
E-4405	2	PLATE, ELECTRICAL GROUNDING: brass sheet 0.0403 in. thick; silver plate and clear water dip finish; pronged "Z" shaped strip; $3\frac{3}{32}$ in. lg by $1\frac{3}{4}$ in. wide by $\frac{1}{16}$ in. deep overall; mounts by means of five holes on center line of solid section of strip 0.261 in. by 0.198 in. ea, 0.781 in. C to C; marked w/ Oscillator Box Assembly, C-4401 to C-4405 incl, C-4407, C-4410, C-4413, C-4415, C-4408, C-4431, C-4418; used for wiring, support, and grounding; RCA part/dwg T-630899-20	Supports Wiring
E-4406		Same as E-3014	Supports V-4401
E-4407		Same as E-3015	Wiring Connection
E-4408		Same as E-333	Wiring Connection to Chassis
E-4409		Same as E-565	Insulates E-4005 from Chassis
E-4410		Same as E-136	Insulates E-4405 from Chassis
E-4411		Same as E-107	Supports Wiring
E-4412		Same as E-108	With E-4411 Supports Wiring
E-4413	2	TERMINAL BOARD: laminated glass cloth, silicone resin board, $\frac{1}{16}$ in. thick; 24 terminals; 21 stud type and three "L" lug type terminals; w/o barriers; 3 in. lg by $1\frac{1}{16}$ in. wide by 1 in. deep overall; mounts by two spring terminals and one spring pin; terminals at one end 1.156 in. C to C, pin at other end $2\frac{3}{4}$ in. from terminal center line and 1 in. from outer edge; marked w/ "1" to "7"; assem incl two links and two grounding straps; bracket across mounting terminals; RCA part/dwg C-748787-501	Supports V-4401
F-1601		FUSE, CARTRIDGE: 0.8 amp, opens in 0 to 60 min max at 135% load and 60 sec max at 200% load; 125 v; one time; glass body; ferrule terminals; $1\frac{1}{4}$ in. lg by $\frac{1}{4}$ in. dia; Littelfuse Catalog no. 313,800; RCA part/dwg K-896698-9	Primary Power Fuse
F-1602		Same as F-1601	Primary Power Fuse
H-101	2	BUSHING: spacer; ceramic; $\frac{5}{32}$ in. lg by $\frac{9}{32}$ in. dia overall; 0.120 in. ID; $\frac{1}{16}$ in. thick by 0.189 in. dia hub; RCA part/dwg A-8834776-2	Spacer for E-102
H-102	2	BUSHING: plastic; Monsanto Chemical Cerex 250; male; $1\frac{5}{16}$ in. lg by $\frac{7}{16}$ in. OD; 0.120 in. ID; $\frac{5}{16}$ in. thick shoulder; 0.189 in. OD top; $\frac{1}{4}$ in. OD bottom; bottom undercut 0.140 in. wide by $\frac{1}{32}$ in. deep; RCA part/dwg A-8824106-1	Spacer for E-102
H-103	2	BUSHING: brass rod; both male and female; $\frac{7}{16}$ in. OD; one side flattened to 0.39875 in. across flats, $\frac{1}{4}$ in. thick, 0.120 in. dia of hole, $\frac{1}{16}$ in. lg by 0.189 in. dia shoulder one end; RCA part/dwg A-8822075-1	Spacer for E-101
H-104	2	BUSHING: spacer; brass $\frac{3}{16}$ in. lg by $\frac{9}{32}$ in. dia overall; 0.120 in. ID; $\frac{1}{16}$ in. thick by 0.189 in. dia hub; RCA part/dwg A-8834776-3	Spacer for E-101
H-105	2	PLATE, CLAMP: brass, white nickel finish; rectangular; $\frac{5}{8}$ in. lg by $\frac{3}{16}$ in. wide by 0.0641 in. thick; two no. 2-56 tapped holes, evenly spaced on longitudinal center line 0.375 in. C to C; RCA part/dwg K-90482-2	Mounting Plate for S-102
H-106 through H-125		Not Used	
H-126		Same as H-104	Spacer for E-126
H-127		Same as H-102	Spacer for E-127
H-128		Same as H-103	Spacer for E-126
H-129		Same as H-101	Spacer for E-127
H-130 through H-150		Not Used	



**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
H-151		Same as H-104	Spacer for E-151
H-152		Same as H-101	Spacer for E-152
H-153		Same as H-102	Spacer for E-151
H-154		Same as H-103	Spacer for E-152
H-155 through H-200		Not Used	
H-201		Same as H-101	Spacer for E-202
H-202		Same as H-102	Spacer for E-202
H-203		Same as H-103	Spacer for E-201
H-204		Same as H-104	Spacer for E-201
H-205 through H-350		Not Used	
H-351		Same as H-101	Spacers for E-351, E-352
H-352		Same as H-102	Spacers for E-351, E-352
H-353 through H-400		Not Used	
H-401		Same as H-101	Spacers for E-401, E-402
H-402		Same as H-102	Spacers for E-401, E-402
H-403 through H-550		Not Used	
H-551		Same as H-101	Spacers for E-551, E-552
H-552		Same as H-102	Spacers for E-551, E-552
H-553 through H-600		Not Used	
H-601		Same as H-101	Spacers for E-601, E-602
H-602 through H-1300		Not Used	
H-1301	3	GROMMET: black synthetic rubber; fits $\frac{5}{16}$ in. dia hole; $\frac{3}{16}$ in. dia center hole, $\frac{1}{16}$ in. wide groove, $\frac{1}{4}$ in. wide by $\frac{1}{2}$ in. dia overall; RCA part/dwg K-57421-25	Protects Wiring
H-2001		WRENCH: double end hex type; $\frac{5}{16}$ in. max wide across flats; $2\frac{3}{4}$ in. lg by $2\frac{3}{32}$ in. wide overall max; steel parkerized or cadmium plated; 90 deg offset; "L" shape handle hex rod; for no. 8 Allen set screw and no. 4 cap screw; Allen Mfg. Co. Code no. 564; RCA part/dwg K-828505-31	Repair and Maintenance Use
H-2002		WRENCH: double end hex, key type; $\frac{1}{16}$ in. max across flats; $12\frac{3}{32}$ in. lg by $2\frac{3}{32}$ in. wide by $\frac{1}{16}$ in deep overall; steel, cadmium plated; 90 deg offset; "L" shape handle hex rod; hex rod for no. 6 Allen set screw; Allen Mfg short series RCA part/dwg K-828505-32	Repair and Maintenance Use
H-2003		WRENCH: double end hex type; 0.050 in. max across flats; $12\frac{3}{32}$ in. lg by $2\frac{3}{32}$ in. wide by 0.050 in. thick overall; steel, cadmium plate finish; 90 deg offset; "L" shape handle hex rod; for no. 4 Allen set screw; RCA part/dwg K-828505-33	Repair and Maintenance Use
H-2004		TOOL, ALIGNMENT: fiber; 7 in. lg by $\frac{7}{32}$ in. dia overall; screwdriver on one end $\frac{7}{32}$ in. wide by 0.025 in. thick; screwdriver opposite end 0.125 in. wide by 0.015 in. thick; 0.198 in. by $\frac{7}{16}$ in. lg undercut located $5\frac{1}{32}$ in. from end; 2 in. by 0.198 in. undercut on one end; moisture and fungus resistance; RCA part/dwg A-8825713-1	Alignment and Adjustment
H-2005		TOOL, ALIGNMENT: laminated phenolic tubing; 1.296 in. lg by 0.218 in. dia overall; 0.046 in. high by 0.218 in. wide by 0.040 in. thick screwdriver one end; $\frac{7}{16}$ in. lg by 0.198 in. dia undercut located near one end; moisture and fungus resistant; RCA part/dwg A-8825734-1	Alignment and Adjustment
H-2006	3	WASHER, SPRING: phosphor bronze, spring temper, nickel plated; round 0.2607 in. ID by $\frac{7}{16}$ in. OD by $\frac{1}{16}$ in. thick; material 0.010 in. thick; RCA part/dwg K-69129-101	Grounding for C-2001
H-2007	3	RING, RETAINER: general purpose snap type retainer; SAE 1065 to 1090; steel, cadmium plated; open ring shape; groove dia 0.095 in., shaft dia 0.125 in.; 0.230 in. OD by 0.094 in. ID by 0.015 in. thick; mounts by application; Waldes-Kohinoor Co. Part no. 5133-12-S-MF; RCA part/dwg A-93605-103	Secures O-2023, O-2025

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)**  
**RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
H-2008		WRENCH: double end hex type; $\frac{3}{32}$ in. across flats; $2\frac{3}{16}$ in. lg by $2\frac{7}{32}$ in. wide overall; steel, cadmium plated; 90 deg offset; "L" shape handle, hex rod; for no. 10 and no. 12 set screws; Allen Mfg Code no. 332; RCA part/dwg K-828505-20	Repair and Maintenance Use
H-2009	3	WASHER, SPRING: phosphor bronze, spring temper, nickel plated; round 0.195 in. ID by $1\frac{1}{32}$ in. OD by 0.062 in. thick; material 0.0159 in. thick; RCA part/dwg K-99657-109	Stabilizes O-2013
H-2010	3	RING, RETAINER: general purpose snap type; SAE 1065 to 1090; steel, cadmium plated; open ring shape; groove dia 0.147 in., shaft dia 0.187 in.; 0.335 in. OD by 0.145 in. ID by 0.025 in. thick, mounts by application; Waldes-Kohinoor Co. Part no. 5133-18-S-MF; RCA part/dwg A-93605-106	Stabilizes O-2013
H-2011		Not Used	
H-2012	3	BOLT, MACHINE: steel; Navy spec 46S18e Class 7 Type A; 30,000 lb per sq in. min yield strength; B-85 to B-95 Rockwell hardness; passivating dip finish; eccentric stud type head; slot drive; $\frac{5}{16}$ in. dia shoulder; 0.093 in. thick, 0.102 in. thick shoulder; 0.060 in. width of slot, 0.053 in. depth of slot; eccentricity 0.032 in. between head and shank dia; $\frac{1}{4}$ -20 thread; 0.321 in. min length; 0.516 in. nominal length; paint sector red on top of head at edge at right angle to slot; RCA part/dwg A-8819444-1	Secures O-2014, O-2015
H-2013	2	EXTRACTOR, LAMP: for installing and extracting panel lamp; molded synthetic rubber; round tapered plug shape; $2\frac{1}{2}$ in. lg by $2\frac{3}{32}$ in. dia at one end, $1\frac{3}{32}$ in. dia at other end; $\frac{5}{16}$ in. max dia by $\frac{5}{16}$ in. lg tapered cup in large end, $\frac{3}{8}$ in. max dia by $\frac{1}{16}$ in. deep tapered cup in small end; RCA part/dwg A-8832396-1	Install and Remove Dial Lamps
H-2014	3	COLLAR, SPACING: general purpose; u/o AC power supply; brass; female; 0.140 in. lg by $1\frac{1}{32}$ in. OD by 0.144 in. ID; RCA part/dwg K-59294-146	With A-2002, Supports J-2013
H-2015	3	GROMMET: black synthetic rubber compound; fits $1\frac{1}{32}$ in. dia hole; hole $2\frac{1}{64}$ in. dia by $\frac{1}{16}$ in. wide groove, $2\frac{3}{32}$ in. dia by $\frac{5}{16}$ in. thick overall; RCA part/dwg K-57421-3	Protects Wiring
H-2016		Same as H-1301	Protects Wiring
H-2017	3	BUSHING: for mounting connectors; brass, nickel plated; 0.115 in. lg by $\frac{1}{4}$ in. dia max w/ 0.080 in. lg by 0.156 in. dia hub extending from one side 0.116 in. ID; RCA part/dwg K-835783-32	Assists in Mounting Connectors
H-2018	2	KEEPER: cold rolled steel cadmium plate finish; rectangular shape base w/ thimble type keeper; $1\frac{5}{16}$ in. lg by $\frac{3}{8}$ in. wide by 0.460 in. high overall; two no. 8-32 tapped mounting holes spaced 0.875 in. apart; RCA part/dwg A-8836509-501	Latching Chassis in Chassis
H-2019		SLIDE: provides means for supporting chassis when withdrawn from case; slide mechanism incl lock and reject slides, stops, latches, roller balls, and pivot index plate; steel mechanism; finish to withstand 48-hr Navy salt spray test; to withstand BuShips vibration test 40T9 in withdrawn position w/ 45 lb load on RH and LH slides assembled; rectangular strip type; $2\frac{1}{16}$ in. lg extended by $1\frac{1}{4}$ in. wide by $4\frac{61}{64}$ in. high overall; to mount on 0.091 in. thick RH panel w/ $\frac{5}{16}$ -32 thread stud, spacer, washer, lock washer, and hex nut at pivot index plate and three mounting holes in lower fixed section 0.281 in. dia w/ 0.385 in. dia countersunk and one hole 0.250 in. dia w/ 0.312 in. countersunk, 2.625 in. C to C; as per National Co. slide mechanism and RCA dwg. for RH side mounting, approx $12\frac{1}{2}$ in. lg in closed position; National Co. National Slide Mechanism; RCA part/dwg D-629837-1	Withdrawing Chassis from Cabinet
H-2020		SLIDE, DRAWER: provides means for supporting chassis when withdrawn from case; slide mechanism incl lock and reject slides, stops, latches, roller balls, and pivot index plate; steel mechanism; finish to withstand 48-hr Navy salt spray test; to withstand BuShips vibration test 40T9 in withdrawn position with 45 lb load on RH and LH slides assem; rectangular strip type; $2\frac{1}{16}$ in. lg extended by $1\frac{1}{4}$ in. wide by $4\frac{61}{64}$ in. high overall; to mount on 0.091 in. thick LH panel w/ $\frac{5}{16}$ -32 thread stud, spacer, washer, lock washer, and hex nut at pivot index plate and three mounting holes in lower fixed section 0.281 in. dia w/ 0.385 in. dia countersunk and one hole 0.250 in. dia w/ 0.312 in. dia countersunk, 2.625 in. C to C; as per National Co. Slide mechanism and RCA dwg. for LH side mounting, approx $12\frac{1}{2}$ in. lg in closed position; National Co. National Slide Mechanism; RCA part/dwg C-629837-2	Withdrawing Chassis from Cabinet
H-2021, H-2022		Not Used	
H-2023	2	POST, SPACING: brass rod, white nickel plate; cylindrical shape; $\frac{1}{16}$ in. lg by $\frac{1}{2}$ in. dia w/ 0.257 in. dia axial hole; mounts by 0.257 in. dia axial hole; RCA part/dwg K-99638-142	Bearing Washer for O-2010
H-2024 through H-2100		Not Used	
H-2101		Same as H-2001	Repair and Maintenance Use
H-2102		Same as H-2002	Repair and Maintenance Use
H-2103		Same as H-2003	Repair and Maintenance Use

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
H-2104		Same as H-2004	Alignment and Adjustment
H-2105		Same as H-2005	Alignment and Adjustment
H-2106		Same as H-2006	Grounding for C-2101
H-2107		Same as H-2007	Secures O-2123, O-2125
H-2108		Same as H-2008	Repair and Maintenance
H-2109		Same as H-2009	Stabilizes O-2113
H-2110		Same as H-2010	Stabilizes O-2113
H-2111		Same as H-2011	Insulates J-2101 from Chassis
H-2112		Same as H-2012	Secures O-2114, O-2115
H-2113		Same as H-2013	Install and Remove Dial Lamps
H-2114		Same as H-2014	With A-2102 Supports J-2113
H-2115		Same as H-2015	Protects Wiring
H-2116		Same as H-1301	Protects Wiring
H-2117		Same as H-2017	Assists in Mounting Connector
H-2118		Same as H-2018	Latching Chassis in Cabinet
H-2119		Same as H-2019	Withdrawing Chassis from Cabinet
H-2120		Same as H-2020	Withdrawing Chassis from Cabinet
H-2121, H-2122		Not Used	
H-2123		Same as H-2023	Bearing Washer for O-2110
H-2124 through H-2200		Not Used	
H-2201		Same as H-2001	Repair and Maintenance Use
H-2202		Same as H-2002	Repair and Maintenance Use
H-2203		Same as H-2003	Repair and Maintenance Use
H-2204		Same as H-2004	Alignment and Adjustment
H-2205		Same as H-2005	Alignment and Adjustment
H-2206		Same as H-2006	Grounding for C-2201
H-2207		Same as H-2007	Secures O-2223, O-2224
H-2208		Same as H-2008	Repair and Maintenance Use
H-2209		Same as H-2009	Stabilizes O-2213
H-2210		Same as H-2010	Stabilizes O-2213
H-2211		Same as H-2011	Insulates J-2201 from Chassis
H-2212		Same as H-2012	Secures O-2214, O-2215
H-2213		Same as H-2013	Install and Remove Dial Lamps
H-2214		Same as H-2014	With A-2202 Supports J-2213
H-2215		Same as H-2015	Protects Wiring
H-2216		Same as H-1301	Protects Wiring
H-2217		Same as H-2017	Assists in Mounting Connector
H-2218		Same as H-2018	Latching Chassis in Cabinet
H-2219		Same as H-2019	Withdrawing Chassis from Cabinet
H-2220		Same as H-2020	Withdrawing Chassis from Cabinet
H-2221, H-2222		Not Used	
H-2223		Same as H-2023	Bearing Washer for O-2210
H-2224 through H-3000		Not Used	
H-3001		Same as H-101	Spacer for E-3001, E-3002
H-3002		Same as H-102	Spacer for E-3001, E-3002
H-3003 through H-3034		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
H-3035		Same as H-102	Spacer for E-3035 through E-3038
H-3036		Same as H-101	Spacer for E-3035 through E-3038
H-3037 through H-3100		Not Used	
H-3101		Same as H-101	Spacer for E-3101 and E-3102
H-3102		Same as H-102	Spacer for E-3101 and E-3102
H-3103 through H-3134		Not Used	
H-3135		Same as H-102	Spacer for E-3135 through E-3138
H-3136		Same as H-101	Spacer for E-3135 through E-3138
H-3137 through H-3600		Not Used	
H-3601		RING, RETAINER: steel, SAE 1065 to 1090, cadmium plated; tensile strength, 238,000 to 280,000 pounds per sq in.; ring shape; 0.800 in. dia by 0.035 in. thick overall; mounts by shaft hole 0.461 in. inside dia; ring provided w/ apert lugs at free end for handling w/ pointed nose pliers; ring is sprung into groove on shaft; Waldes external ring NAS-5/Catalog no. 5100-50; RCA part/dwg M-142510-154	Secures O-3604
H-3602	3	WASHER, C: steel, cadmium plated; "E" shape; 0.207 in. ID by 0.527 in. OD by 0.025 in. thick; fits around 0.207 in. dia shaft; Waldes Kohinoor Part no. 5133-25-MF; RCA part/dwg A-93605-107	Secures O-3603, O-3614, O-3618
H-3603		Same as H-2010	Secures O-3605
H-3604	3	WASHER, SPRING: spring steel, cadmium plated finish; round; 0.251 in. ID by 1/2 in. OD by 0.006 in. thick; 1/2 in. OD by 5/64 in. high extrusion; RCA part/dwg K-886211-5	Stabilizes O-3614
H-3605	2	COLLAR, LOCKING: collar for dial assembly; brass, chemical black finish; cylindrical shape; 7/16 in. OD by 1/8 in. thick overall; mounted by 0.144 in. dia hole; one end w/ 7/16 in. OD by 0.070 in. lg to 0.200 in. OD by 0.055 in. lg, 0.144 in. dia hole through center; RCA part/dwg A-8849697-1	Locks O-3614 in Position
H-3606	2	SCREW, THUMB: knurled thumb head; brass, nickel plated; no. 6-32; 1/2 in. lg; 1/2 in. lg thread portion; cone point; 3/8 in. dia head; RCA part/dwg K-99017-201	Locking Screw for Calibration Adjustment
H-3607	3	SCREW, MACHINE: slot drive; flat head; brass, chemical black and oil finish; no. 8-32 thread; 3/8 in. lg overall; threaded portion 3/16 in. lg; 1/16 in. thick by 7/16 in. dia head; 0.249 in. dia by 0.125 in. lg shoulder; RCA part/dwg A-8849636-1	Secures O-3627
H-3608	2	WASHER, SPRING: phosphor bronze, chemical black lacquer; round; 0.257 in. ID, 7/16 in. OD, 0.010 in. thick; washer is dished shape; RCA part/dwg K-829937-19	Bearing Between H-3607 and H-3627
H-3609	3	WASHER, FLAT: brass, chemical black and black lacquer finish; round; 0.260 in. ±0.005 in. ID, 7/16 in. OD, 0.032 in. thick; RCA part/dwg K-55938-202	Stabilizes O-3627
H-3610	3	RING, RETAINING: for external use around shaft; beryllium copper, standard oil dipped; curved "E" shaped; mounts by 0.125 in. dia hole on shaft; RCA part/dwg B-449699-217 Rev. 1	To Assemble O-3627
H-3611	3	RING, RETAINER: retainer for dial assembly; carbon spring steel, cadmium plated; "C" shaped ring; 0.330 in. OD by 0.214 in. ID by 0.025 in. thick; spring mounting on 1/4 in. dia shaft in groove cut to 0.220 in. dia by 0.028 in. wide; Waldes Kohinoor, Inc. Ring no. 5103-25; RCA part/dwg B-449686-105	To Secure O-3601, O-3615
H-3612	3	WASHER, SPRING: phosphor bronze, white nickel plated; round; 7/16 in. OD by 0.260 in. ID by 1/16 in. thick overall; material 0.005 in. thick; extra spring temper, double curvature thickness; to withstand 50-hr salt spray test; RCA part/dwg K-69129-117	Grounds Shaft of O-3616
H-3613 through H-3700		Not Used	
H-3701		Same as H-3601	Secures O-3704
H-3702		Same as H-3602	To Secure O-3703, O-3718, O-3714
H-3703		Same as H-2010	To Secure O-3705
H-3704		Same as H-3604	To Stabilize O-3714
H-3705		Same as H-3605	Locks O-3714 in Position
H-3706		Same as H-3606	Locking Screw for Calibration Control
H-3707		Same as H-3607	To Secure O-3727
H-3708		Same as H-3608	Bearing Between H-3707 and O-3727

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
H-3709		Same as H-3609	To Stabilize O-3727
H-3710		Same as H-3610	To Assemble O-3727
H-3711		Same as H-3611	To Secure O-3701, O-3715
H-3712		Same as H-3612	Grounds Shaft of O-3716
H-3713 through H-3800		Not Used	
H-3801		Same as H-3601	To Secure O-3804
H-3802		Same as H-3602	To Secure O-3803, O-3818, O-3814
H-3803		Same as H-2010	To Secure O-3805
H-3804		Same as H-3604	To Stabilize O-3814
H-3805		Same as H-3605	Locks O-3814 in Position
H-3806		Same as H-3606	Locks Calibration Control
H-3807		Same as H-3607	To Secure O-3727
H-3808		Same as H-3608	Bearing Between H-3807 and O-3727
H-3809		Same as H-3609	To Stabilize O-3627
H-3810		Same as H-3610	To Assemble O-3727
H-3811		Same as H-3611	To Secure O-3801, O-3815
H-3812		Same as H-3612	Grounds Shaft of O-3816
H-3813 through H-4400		Not Used	
H-4401		Same as H-101	Spacer for E-3001
H-4402		Same as H-102	Spacer for E-3001
I-2001		LAMP, GLOW: 65 v AC or 90 v DC; bulb T3- $\frac{1}{4}$ clear; $1\frac{1}{16}$ in. max lg; miniature bayonet base; no fil, two anodes; burn in any position; neon gas atmosphere; Mazda no. NE-51; RCA part/dwg K-872291-9	Indicates "Power On"
I-2002 through I-2100		Not Used	
I-2101		Same as I-2001	Indicates "Power On"
I-2102 through I-2200		Not Used	
I-2201		Same as I-2001	Indicates "Power On"
I-2202 through I-3600		Not Used	
I-3601		LAMP, INCANDESCENT: 6 to 8 v, 2.6 w, 2 candle power; bulb C-4 $\frac{1}{2}$ clear; $1\frac{1}{16}$ in. lg overall; miniature bayonet base; C-2R fil, 500 hours average life; burn any position; Mazda Type 55 clear; RCA part/dwg K-61114-12	Projection Lamp "Norm"
I-3602		Same as I-3601	Projection Lamp "Spare"
I-3603 through I-3700		Not Used	
I-3701		Same as I-3601	Projection Lamp "Norm"
I-3702		Same as I-3601	Projection Lamp "Spare"
I-3703 through I-3800		Not Used	
I-3801		Same as I-3601	Projection Lamp "Norm"
I-3802		Same as I-3601	Projection Lamp "Spare"
J-101		CONNECTOR, RECEPTACLE: 11 round male contacts, polarized; straight type; $1\frac{2}{64}$ in. lg by $\frac{3}{8}$ in. wide by $\frac{5}{64}$ in. thick; 5 amp, 1000 v; rectangular, phenolic body; two no. 4-40 by $\frac{5}{16}$ in. lg mounting studs on 1.140 in. mounting centers; silver or gold plated contacts; terminals hot tin dipped; RCA part/dwg B-455061-11	Plug-in Connector for Type I Antenna Unit
J-102		CONNECTOR, RECEPTACLE: four round female contacts; straight type; 0.812 in. lg by $1\frac{1}{32}$ in. wide by 0.343 in. thick overall approx; rectangular teflon body; three 0.102 in. dia mounting holes spaced $\frac{1}{4}$ in. between centers; contact portion raised $\frac{3}{32}$ in. above mounting portion; RCA part/dwg A-8835626-1	Receptacle for Z-101

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
J-103		CONNECTOR, RECEPTACLE: six small round female contacts, two large round female contacts; straight type; $1\frac{13}{32}$ in. lg by $\frac{3}{8}$ in. wide by $\frac{7}{8}$ in. high overall approx; rectangular texolite body; two no. 4-40 by $\frac{3}{32}$ in. lg mounting studs on 1.156 in. mounting centers extend through body from two large contacts; one notch $\frac{5}{32}$ in. lg by $\frac{5}{32}$ in. wide by $\frac{3}{16}$ in. deep centrally located in top edge opposite contact; RCA part/dwg A-8834708-1	Receptacle for Z-101
J-104 through J-125		Not Used	
J-126		Same as J-101	Plug-in Connector for Type I IF Unit
J-127		CONNECTOR, RECEPTACLE: two round female contacts; straight type; $\frac{13}{16}$ in. lg by $1\frac{5}{32}$ in. wide by 0.343 in. thick overall approx; rectangular texolite body; two 0.102 in. dia mounting holes on $\frac{7}{32}$ in. mounting centers; contact portion raised $\frac{2}{64}$ in. lg by $\frac{2}{64}$ in. wide by $\frac{3}{32}$ in. thick; RCA part/dwg A-8834712-1	Receptacle for Z-126
J-128		Same as J-103	Receptacle for Z-126
J-129 through J-150		Not Used	
J-151		Same as J-101	Plug-in Connector for Type I Mixer Unit
J-152		Same as J-127	Receptacle for Z-151
J-153		Same as J-103	Receptacle for Z-151
J-154 through J-200		Not Used	
J-201		Same as J-101	Plug-in Connector for Type I Oscillator Unit
J-202		Same as J-127	Receptacle for Z-201
J-203		Same as J-103	Receptacle for Z-201
J-204 through J-350		Not Used	
J-351		Same as J-101	Plug-in Connector for Type II Mixer Unit
J-352		Same as J-127	Receptacle for Z-351
J-353		Same as J-103	Receptacle for Z-351
J-354 through J-400		Not Used	
J-401		Same as J-101	Plug-in Connector for Type II Oscillator Unit
J-402		Same as J-127	Receptacle for Z-401
J-403		Same as J-103	Receptacle for Z-401
J-404 through J-550		Not Used	
J-551		Same as J-101	Plug-in Connector for Type III Mixer Unit
J-552		Same as J-127	Receptacle for Z-551
J-553		Same as J-103	Receptacle for Z-551
J-554 through J-700		Not Used	
J-701		CONNECTOR, RECEPTACLE: three round male contacts, polarized; straight type; $\frac{5}{64}$ in. lg by $\frac{3}{8}$ in. wide by $\frac{5}{64}$ in. thick; 5 amp, 1000 v; rectangular phenolic body; two no. 4-40 by $\frac{5}{16}$ in. lg mounting studs on 0.578 in. mounting centers; contact silver or gold plated, terminal hot tinned dipped; RCA part/dwg B-455061-13	Plug-in Connector for Type I First IF Unit
J-702		CONNECTOR, RECEPTACLE: seven round male contacts, polarized; straight type; $1\frac{1}{64}$ in. lg by $\frac{3}{8}$ in. wide by $\frac{5}{64}$ in. thick overall; 5 amp, 1000 v; rectangular, phenolic body; two no. 4-40 by $\frac{5}{16}$ in. lg mounting studs on 0.858 in. mounting centers; contact silver or gold plated terminal hot tin dipped; RCA part/dwg B-455061-7	Plug-in Connector for Type I First IF Unit
J-703 through J-800		Not Used	
J-801		Same as J-701	Plug-in Connector for Type II First IF Unit
J-802		Same as J-702	Plug-in Connector for Type II First IF Unit
J-803 through J-900		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
J-901		Same as J-701	Plug-in Connector for Type III First IF Unit
J-902		Same as J-702	Plug-in Connector for Type III First IF Unit
J-903 through J-1000		Not Used	
J-1001		Same as J-701	Plug-in Connector for Second IF Unit
J-1002		CONNECTOR, RECEPTACLE: 18 round male contacts, polarized, straight type; 1 $\frac{1}{16}$ in. lg by $\frac{9}{16}$ in. wide by $2\frac{7}{32}$ in. deep overall; 3 amp; rectangular plastic body; two no. 4-40 by $\frac{1}{4}$ in. lg mounting studs on 1 in. mounting centers on terminal side; terminal and contacts identified by letters, contact silver plated; resistant to salt water; Winchester Electronics Co., Catalog no. MRE18P-G; RCA part/dwg B-449689-1	Plug-in Connector for Second IF Unit
J-1003 through J-1100		Not Used	
J-1101		Same as J-1002	Plug-in Connector for Audio Unit
J-1102 through J-1200		Not Used	
J-1201		Same as J-702	Plug-in Connector for Type III Calibrator Unit
J-1202 through J-1300		Not Used	
J-1301		Same as J-702	Plug-in Connector for BFO Unit
J-1302 through J-1400		Not Used	
J-1401		Same as J-702	Plug-in Connector for Type I Calibrator Unit
J-1402 through J-1500		Not Used	
J-1501		Same as J-702	Plug-in Connector for Type II Calibrator Unit
J-1502 through J-1600		Not Used	
J-1601		CONNECTOR, RECEPTACLE: 18 round male contacts, polarized; straight type; 2 $\frac{23}{32}$ in. lg by 1 $\frac{13}{32}$ in. wide by 1 $\frac{13}{32}$ in. thick overall; 10 amp; rectangular plastic body; two no. 6-32 by $\frac{3}{8}$ in. lg mounting studs on 2 $\frac{3}{32}$ in. mounting centers; terminal and contacts identified by letters; Winchester Electronics Co. Catalog no. QRE18P-2; RCA part/dwg M-146206-3	Plug-in Connector for Power Unit
J-1602 through J-1700		Not Used	
J-1701		CONNECTOR, RECEPTACLE: AN Type AN-3102A-10SL-4P; two round male contacts no. 20 AWG; straight type; 1 $\frac{1}{4}$ in. lg by 1 in. sq overall; cylindrical aluminum body w/ sq mounting flange; molded melamine insert; four 0.120 in. dia mounting holes on 2 $\frac{3}{32}$ in. mounting centers; solid shell, standard key position, polarized; spec MIL-C-5015; RCA part/dwg C-737841-97	Connection for Audio Output
J-1702		Same as J-1701	Connection for Audio Output
J-1703		Not Used	
J-1704		CONNECTOR, RECEPTACLE: AN Type 3102A-16S-5P; three round male contacts, no. 16 AWG; straight type; 1 $\frac{3}{8}$ in. lg by 1 $\frac{9}{32}$ in. sq overall; cylindrical aluminum body w/ sq mounting flange; molded melamine insert; four 0.120 in. dia mounting holes on 3 $\frac{1}{32}$ in. mounting centers; solid shell, polarized, standard key position; spec MIL-C-5015; RCA part/dwg C-737841-98	Connection to Primary Power Source
J-1705		CONNECTOR, RECEPTACLE: AN Type UG-290/U; one round female contact; straight type; 1 $\frac{1}{32}$ in. lg by 0.375 in. OD w/ $\frac{11}{16}$ in. sq mounting flange; 50 ohms nominal RF impedance; cylindrical brass silver plated body w/ sq mounting flange; thermosetting polymer insert; accommodates solid dielectric coaxial cable, 0.206 in. OD w/ no. 20 AWG inner conductor; four no. 3-56 tapped mounting holes on $\frac{1}{2}$ in. by $\frac{1}{2}$ in. mounting center; electrolytic protective coating on all silver surfaces; incl two studs for bayonet type connection to male connector; Amphenol Type UG-290/U Navy Dwg RE49F331; RCA part/dwg M-445813-1	Connection to FSK or Other Auxiliary Apparatus
J-1706		Not Used	
J-1707		CONNECTOR, RECEPTACLE: AN Type UG-58/U; one round female contact; straight type; 1 $\frac{3}{32}$ in. lg by $\frac{5}{8}$ in. dia w/ 1 in. sq mounting flange; 50 ohms impedance; cylindrical brass body; four $\frac{1}{8}$ in. dia mounting holes on 2 $\frac{3}{32}$ in. by 2 $\frac{3}{32}$ in. mounting centers; spec JAN-C-71; RCA part/dwg M-433647-1	Connection to Antenna

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
J-1708		Not Used	
J-1709		CONNECTOR, RECEPTACLE: 14 round female contacts; straight type; 3 $\frac{3}{8}$ in. lg by 1 $\frac{1}{16}$ in. wide by 1 $\frac{7}{8}$ in. thick; small contact 10 amp, medium contact 15 amp, large (coaxial) 10 amp; rectangular aluminum body; mica filled phenolic insert; four countersunk mounting holes 0.152 in. dia on 2 $\frac{7}{8}$ in. by 1 in. mounting centers; one coaxial contact has 90 deg offset for attaching to cable; RCA part/dwg C-744589-4	Plug-in Connection to Receiver Chassis
J-1710 through J-2001		Not Used	
J-2002		CONNECTOR, RECEPTACLE: 11 round female contacts, polarized; straight type; 1 $\frac{23}{64}$ in. lg by $\frac{3}{8}$ in. wide by $\frac{39}{64}$ in. thick overall; 5 amp, 1000 v peak; rectangular phenolic body; two no. 4-40 by $\frac{1}{4}$ in. lg mounting studs on 1.140 in. mounting centers; silver or gold plated contacts, terminals hot tin dipped; RCA part/dwg B-455061-12	Receptacle for Type I Antenna Unit
J-2003		Same as J-2002	Receptacle for Type I RF Unit
J-2004		Same as J-2002	Receptacle for Type I Mixer Unit
J-2005		Same as J-2002	Receptacle for Type I Oscillator Unit
J-2006		CONNECTOR, RECEPTACLE: three round female contacts, polarized; straight type; 5 $\frac{5}{64}$ in. lg by $\frac{3}{8}$ in. wide by $\frac{39}{64}$ in. high over mounting studs; contacts electrically rated; 5 amp, 1000 v peak; rectangular phenolic body; two mounting studs 0.112 in. dia; studs threaded w/ no. 4-40 thread; $\frac{1}{4}$ in. mounting studs 0.578 in. mounting center; silver or gold plated contacts, terminals hot tin dipped; RCA part/dwg B-455061-14	Receptacle for Type I First IF Unit (Input)
J-2007		CONNECTOR, RECEPTACLE: seven round female contacts, polarized; straight type; 1 $\frac{11}{64}$ in. lg by $\frac{3}{8}$ in. wide by $\frac{39}{64}$ in. thick overall; 5 amp, 1000 v peak; rectangular phenolic body; two no. 4-40 by $\frac{1}{4}$ in. lg mounting studs on 0.858 in. mounting centers; silver or gold plated contacts, terminal hot tin dipped; RCA part/dwg B-455061-8	Receptacle for Type I First IF Unit
J-2008		Same as J-2006	Receptacle for Type I Second IF Unit (Input)
J-2009		CONNECTOR, RECEPTACLE: 18 round female contacts, polarized; straight type; 1 $\frac{5}{16}$ in. lg by $\frac{9}{16}$ in. wide by 2 $\frac{7}{32}$ in. deep overall; 3 amp; rectangular plastic body; two no. 4-40 by $\frac{1}{4}$ in. lg mounting studs on 1 in. mounting center on terminal side; terminal and contact identified by letters; contact silver plated; resistant to salt water; Winchester Electronics Co., Catalog MRE18S-G; RCA part/dwg B-449689-2	Receptacle for Type I Second IF Unit
J-2010		Same as J-2009	Receptacle for Type I Audio Unit
J-2011		Same as J-2007	Receptacle for Type I BFO Unit
J-2012		Same as J-2007	Receptacle for Type I Calibrator Unit
J-2013		CONNECTOR, RECEPTACLE: 18 round female contacts, polarized; straight type; 2 $\frac{23}{32}$ in. lg by 1 $\frac{3}{32}$ in. wide by 1 $\frac{1}{4}$ in. deep; 10 amp; rectangular plastic body; two no. 6-32 by $\frac{3}{8}$ in. lg mounting studs on 2 $\frac{3}{32}$ in. mounting center; terminal and contact identified by letters; Winchester Electronics Co., Catalog QRE18S-2; RCA part/dwg M-146206-4	Receptacle for Type I Power Unit
J-2014		CONNECTOR, RECEPTACLE: 14 round male contacts; straight type; 3 $\frac{3}{8}$ in. lg by 1 $\frac{1}{16}$ in. wide by 1 $\frac{3}{4}$ in. thick; small contact 10 amp, medium contact 15 amp, large (coaxial) 10 amp; rectangular aluminum body; mica filled phenolic insert; four 0.152 in. dia countersunk mounting holes on 2 $\frac{7}{8}$ in. by 1 in. mounting centers; coaxial terminals are 90 deg angular type; RCA part/dwg C-744589-3	Receptacle for Type I Main Chassis
J-2015		JACK, TELEPHONE: two-conductor plug; 0.253 in. dia, 1 $\frac{9}{32}$ in. lg by $\frac{15}{16}$ in. wide by 4 $\frac{9}{64}$ in. high overall approx; J1 contact arrangement; $\frac{3}{8}$ in. dia mounting hole; mounting hardware not incl; RCA part/dwg A-8845654-2	Headphone Panel Jack
J-2016		Same as J-2015	Headphone Panel Jack
J-2017 through J-2100		Not Used	
J-2101		Same as J-2006	Plug-in Connector for Type II Antenna Trimmer Connection
J-2102		Same as J-2002	Receptacle for Type II Antenna Unit
J-2103		Same as J-2002	Receptacle for Type II RF Unit
J-2104		Same as J-2002	Receptacle for Type II Mixer Unit
J-2105		Same as J-2002	Receptacle for Type II Oscillator Unit
J-2106		Same as J-2006	Receptacle for Type II First IF Unit (Input)
J-2107		Same as J-2007	Receptacle for Type II First IF Unit (Input)



**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
J-2108		Same as J-2006	Receptacle for Type II Second IF Unit (Input)
J-2109		Same as J-2009	Receptacle for Type II Second IF Unit
J-2110		Same as J-2009	Receptacle for Type II Audio Unit
J-2111		Same as J-2007	Receptacle for Type II BFO Unit
J-2112		Same as J-2007	Receptacle for Type II Calibrator Unit
J-2113		Same as J-2013	Receptacle for Type II Power Unit
J-2114		Same as J-2014	Receptacle for Type II Main Chassis
J-2115		Same as J-2015	Headphone Panel Jack
J-2116		Same as J-2015	Headphone Panel Jack
J-2117 through J-2200		Not Used	
J-2201		Same as J-2006	Plug-in Connector for Type III Antenna Trimmer Connection
J-2202		Same as J-2002	Receptacle for Type III Antenna Unit
J-2203		Same as J-2002	Receptacle for Type III RF Unit
J-2204		Same as J-2002	Receptacle for Type III Mixer Unit
J-2205		Same as J-2002	Receptacle for Type III Oscillator Unit
J-2206		Same as J-2006	Receptacle for Type III First IF Unit (Input)
J-2207		Same as J-2007	Receptacle for Type III First IF Unit
J-2208		Same as J-2006	Receptacle for Type III Second IF Unit (Input)
J-2209		Same as J-2009	Receptacle for Type III Second IF Unit
J-2210		Same as J-2009	Receptacle for Type III Audio Unit
J-2211		Same as J-2007	Receptacle for Type III BFO Unit
J-2212		Same as J-2007	Receptacle for Type III Calibrator Unit
J-2213		Same as J-2013	Receptacle for Type III Power Unit
J-2214		Same as J-2014	Receptacle for Type III Main Chassis
J-2215		Same as J-2015	Headphone Panel Jack
J-2216		Same as J-2015	Headphone Panel Jack
J-2217 through J-3000		Not Used	
J-3001		Same as J-101	Plug-in Connector for Type I Antenna Unit
J-3002		Same as J-127	Receptacle for Z-3001
J-3003		Same as J-103	Receptacle for Z-3001
J-3004		Same as J-701	Antenna Trimmer Connection for Type I Antenna Unit
J-3005 through J-3034		Not Used	
J-3035		Same as J-101	Plug-in Connector, Type II RF Unit
J-3036		Same as J-127	Receptacle for Z-3035
J-3037		Same as J-101	Receptacle for Z-3035
J-3038 through J-3100		Not Used	
J-3101		Same as J-101	Plug-in Connector for Type II Antenna Unit
J-3102		Same as J-127	Receptacle for Z-3101
J-3103		Same as J-103	Receptacle for Z-3101
J-3104		Same as J-701	Antenna Trimmer Connection for Type II Antenna Unit
J-3105 through J-3134		Not Used	
J-3135		Same as J-101	Plug-in Connector for Type II RF Unit
J-3136		Same as J-127	Receptacle for Z-3135
J-3137		Same as J-103	Receptacle for Z-3135

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
J-3138 through J-4000		Not Used	
J-4001		Same as J-1701	Connection for Audio Output
J-4002		Same as J-1701	Connection for Audio Output
J-4003		Same as J-1701	Connection for Detector/Automatic Gain Control Output
J-4004		Same as J-1704	Connection to Primary Power Source
J-4005		Same as J-1705	Connection to FSK or Other Auxiliary Apparatus
J-4006		Same as J-1705	Connection to Panoramic Adapter or Other Auxiliary Apparatus
J-4007		Same as J-1707	Connection for Antenna
J-4008		Same as J-1705	Connection for External Oscillator
J-4009		Same as J-1709	Plug-in Connection to Receiver Chassis
J-4010 through J-4400		Not Used	
J-4401		Same as J-101	Plug-in Connector for Type III Oscillator Unit
J-4402		Same as J-127	Receptacle for Z-4401
J-4403		Same as J-103	Receptacle for Z-4401
K-1701		RELAY, THERMAL: contact arrangement 1B; 20 v 1 amp; contact material palladium or Fasaloy 35; 1 $\frac{3}{8}$ in. lg by 1 $\frac{1}{16}$ in. wide by 1 $\frac{13}{32}$ in. thick overall; mounts by four 0.140 in. dia holes on 0.687 in. by 0.812 in. mounting center; slow acting; shall open in one second or less for any current exceeding 150 ma and shall be continuously adjustable to a min operating current at 100 ma; RCA part/dwg C-748210-1	Protects Antenna Input Circuits
K-4001		Same as K-1701	Protects Antenna Input Circuits
L-201		COIL, RF: osc tunes 0.082 mc; single winding w/ two taps; 17.6 millihenries, 8.9 mmf distributed capacity, 100 ohms DC resistance; phenolic case; 1 $\frac{1}{2}$ in. lg less terminals, mounting, and adjustment screw by 0.750 in. dia; powdered iron core; screwdriver tuning adjustment at mounting end; $\frac{3}{8}$ -32 thread by $\frac{9}{32}$ in. lg mounting bushing at adjustment end; five solder post terminals at non-mounting end; operating temp range -54°C to +85°C; to withstand 48-hr salt spray corrosion test; in accordance w/ BuShips spec 16T36 (Ships); RCA part/dwg C-746105-6	Type I Oscillator Unit, Band 1
L-202		COIL, RF: osc tunes 0.250 mc; single winding w/ two taps; 1.57 millihenries, 4.0 mmf distributed capacity, 140 ohms DC resistance; phenolic case; 1 $\frac{1}{2}$ in. lg less terminals, mounting, and adjustment screw by 0.075 in. dia; powdered iron core; screwdriver tuning adjustment at mounting end; $\frac{3}{8}$ -32 thread by $\frac{9}{32}$ in. lg mounting bushing at adjustment end; five solder post terminals at non-mounting end; operating temp range -54°C to +85°C; to withstand 48-hr salt spray corrosion test; in accordance w/ BuShips spec 16T36 (Ships); RCA part/dwg C-746105-7	Type I Oscillator Unit, Band 2
L-203		COIL, RF: osc tunes 0.300 mc; single winding w/ two taps; 1.45 millihenries inductance; phenolic case; 1 $\frac{1}{2}$ in. lg less terminals, mounting, and adjustment screw by 0.750 in. dia; powdered iron core; screwdriver adjustment at mounting end; $\frac{3}{8}$ -32 thread by $\frac{9}{32}$ in. lg mounting bushing one end; four solder lug terminals at other end; operating temp range -54°C to +85°C; 48-hr salt spray test; in accordance w/ BuShips spec 16T36 Grade C; RCA part/dwg C-746105-8	Type I Oscillator Unit, Band 3
L-204		COIL, RF: osc tunes 0.270 mc; single winding w/ two taps; 2.54 millihenries inductance; phenolic case; 1 $\frac{1}{2}$ in. lg less terminals, mounting, and adjustment screw by 0.750 in. dia; powdered iron core; screwdriver adjustment at mounting end; $\frac{3}{8}$ -32 thread by $\frac{9}{32}$ in. lg mounting bushing one end; four solder lug terminals at other end; operating temp range -54°C to +85°C; 48-hr salt spray test; in accordance w/ BuShips spec 16T36 Grade C; RCA part/dwg C-746105-9	Type I Oscillator Unit, Band 4
L-205		COIL, RF: osc tunes 0.700 mc; single winding w/ two taps; 465 microhenries total inductance; phenolic case; 1 $\frac{1}{2}$ in. lg less terminals, mounting, and adjustment screw by 0.750 in. dia; powdered iron core; screwdriver adjustment at mounting end; $\frac{3}{8}$ -32 thread by $\frac{9}{32}$ in. lg mounting bushing one end; four solder lug terminals at other end; operating temp range -54°C to +85°C; 48-hr salt spray test; in accordance w/ BuShips spec 16T36 Grade C; RCA part/dwg C-746105-10	Type I Oscillator Unit, Band 5
L-206 through L-400		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
L-401		COIL, RF: osc tunes 0.700 mc; single winding w/ two taps; 655 microhenries tapped at 55.8, 170 microhenries from start to finish; 3.12 mmf distributed capacity, 3.56 ohms DC resistance; phenolic case; 1½ in. lg by 0.750 in. dia less terminals, mounting, and adjustment screw; powdered iron core; screwdriver adjustment at mounting end; ¼-32 thread by ½ in. lg mounting one end; five solder post terminals at other end; operating temp range -54°C to +85°C; 48-hr salt spray test; in accordance w/ BuShips spec 16T36 Grade C; RCA part/dwg C-746105-1	Type II Oscillator Unit, Band 1
L-402		COIL, RF: osc tunes 1.2 mc; single winding w/ two taps; 234 microhenries tapped at 15.2, 65.5 microhenries from start to finish; 2.88 mmf distributed capacity, 1.62 ohms DC resistance; phenolic case; 1½ in. lg by 0.750 in. dia less terminals, mounting, and adjustment screw; powdered iron core; screwdriver adjustment at mounting end; ¼-32 thread by ½ in. lg mounting bushing one end; five solder post terminals at other end; operating temp range -54°C to +85°C; 48-hr salt spray test; BuShips spec 16T36 Grade C; RCA part/dwg C-746105-2	Type II Oscillator Unit, Band 2
L-403		COIL, RF: osc tunes 2.200 mc; single winding w/ two taps; shielded can; 1½ in. lg by 0.750 in. dia less terminals, mounting, and adjustment screw; powdered iron core; screwdriver adjustment at mounting end; ¼-32 thread by ½ in. lg mounting bushing one end; five solder lug terminals at other end; operating temp range -54°C to +85°C; 48-hr salt spray test; BuShips spec 16T36 Grade C; RCA part/dwg C-746105-3	Type II Oscillator Unit, Band 3
L-404		COIL, RF: osc tunes 5.600 mc; single winding w/ two taps; 9.7 microhenries, tapped at 0.99, 2.5 microhenries from start to finish, 2.06 mmf distributed capacity, 0.295 ohm DC resistance; phenolic case; 1½ in. lg by 0.750 in. dia less terminals, mounting, and adjustment screw; powdered iron core; screwdriver adjustment at mounting end; ¼-32 thread by ½ in. lg mounting bushing one end; five solder post terminals at other end; operating temp range -54°C to +85°C; 48-hr salt spray test; BuShips spec 16T36 Grade C; RCA part/dwg C-746105-4	Type II Oscillator Unit, Band 4
L-405		COIL, RF: osc tunes 9.600 mc; single layer close wound w/ two taps; 3.3 microhenries tapped at 0.345 and 0.94 microhenries, distributed capacity 2.48 mmf, 0.093 ohm DC resistance; phenolic case; 1½ in. lg by 0.750 in. dia less terminals, mounting, and adjustment screw; powdered iron core; screwdriver adjustment at mounting end; ¼-32 thread by ½ in. lg mounting bushing one end; five solder post terminals at other end; operating temp range -54°C to +85°C; 48-hr salt spray test; BuShips spec 16T36 Grade C; RCA part/dwg C-746105-5	Type II Oscillator Unit, Band 5
L-1000 through L-1009		Not Used	
L-1010		COIL, RF: 2nd IF unit, IF coil; 200 kc peak frequency; single layer random wound; shielded; 0.601 in. lg by 0.572 in. dia less terminals, mounting, and tuning facilities; ceramic form, powdered iron core; adjustable iron core tuning; screwdriver adjustment one end; single mounting ¼-32 thread by 0.329 in. lg thread; two solder lug terminals on end opposite mounting flange; marked w/ symbol, RCA part/dwg, and Standard Navy Stock no.; operating temp range -54°C to +85°C; 48-hr salt spray test; coil sealed in potting compound; 2.44 millihenries; 14.1 ohms DC resistance; ±8% nominal inductance, rated at 50 v to ground; BuShips spec 16T36, Grade C; RCA part/dwg C-746104-4	Element of Z-1003
L-1011		COIL, RF: 200 kc peak frequency; primary inductance 2.34 millihenries ±8%; 13.6 ohms DC resistance; 2nd IF unit, IF transformer; one tap; 6.5 ohms to tap shielded; 0.769 "A" to "B" in. lg by 0.579 in. dia less terminals, mounting hardware, and tuning devices; powdered iron core; single tuned; adjustable iron core tuning; single mounting bushing ¼-32 thread by 0.2285 in. lg thread; four post type terminals; terminals marked A, B, C, D; temp range from -50°C to +85°C; RCA part/dwg C-746104-31	Element of Z-1005
L-1012		Same as L-1011	Element of Z-1007
L-1013		COIL, RF: 200 kc peak frequency; primary inductance 1.22 millihenries ±8%; 9.4 ohms DC resistance; 2nd IF unit, IF transformer; one tap; 4.7 ohms to tap shielded; 0.382 "A" to "B" in. lg by 0.291 "A" to "B" in. dia less terminals, mounting hardware, and tuning devices; powdered iron core; single tuned; adjustable iron core tuning; single mounting bushing ¼-32 thread by 0.2285 in. lg thread; four post type terminals; terminals marked A, B, C, D; temp range from -54°C to +85°C; RCA part/dwg C-746104-32	Element of Z-1011
L-1014 through L-1600		Not Used	
L-1601		REACTOR: filter choke; dual; terminals 1 and 2, 5 henries at 119 ma; terminals 2 and 3, 5 henries at 104 ma; 160 ohms DC resistance; 1300 v rms test; hermetically sealed metal case; 129/32 in. lg by 1 7/8 in. wide by 4 3/4 in. high; four no. 8-32 mounting studs 3/8 in. lg on 1 1/2 in. by 1 3/8 in. mounting center; three solder lug terminals on bottom; marked w/ Vendor's name, Govt. Stock no., and RCA part/dwg no.; operating temp range -55°C to +85°C, and pertinent electrical information; MIL spec T-27; RCA part/dwg A-8896292-1	With C-1601, C-1602, Filters Rectified Current

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
L-2001		COIL, RF: BFO choke: single pie, universal wound; shielded, aluminum alloy shield; 6.35 millihenries $\pm 10\%$ at 200 kc; 50.2 ohms DC resistance, 20 microhenries DC; 0.601 in. lg by 0.572 in. dia, less terminals, tuning and mounting facilities; powdered iron core; adjustable iron core; screwdriver adjustment through top of shield; single mounting bushing $\frac{1}{4}$ -32 thread; two stud type terminals on end opposite mounting; RCA part/dwg C-746104-9	Manual Gain Control Filter Circuit
L-2002		REACTOR: power inductor; one section; 0.001 henry min at 0.2 v AC; 0.41 ohm max DC resistance; 500 v rms test; hermetically sealed metal case; $1\frac{1}{32}$ in. lg max by $1\frac{1}{4}$ in. dia less terminals; two no. 6-32 by $\frac{3}{16}$ in. lg mounting studs on $\frac{1}{4}$ in. mounting center; two post type terminals $\frac{3}{8}$ in. lg on top of case; operating temp $-54^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; terminals hot solder dipped; air cooled; spec MIL T-27 Grade 1 Class A; RCA part/dwg B-462575-1	Heater Circuit
L-2003 through L-2100		Not Used	
L-2101		Same as L-2001	Manual Gain Control Filter Circuit
L-2201		Same as L-2001	Manual Gain Control Filter Circuit
L-2202		COIL, RF: single winding, single layer wound; unshielded; 30 microhenries $\pm 5\%$ inductance; resonant frequency 38 mc 50 ma approx; 3456 ohms DC resistance; 4 in. lg by 0.2616 in. dia overall; solid phenolic form; form 0.250 in. dia by 1 in. lg; mounts by wire lead terminals $1\frac{1}{2}$ in. lg; two wire lead type terminals, no. 20 AWG, $1\frac{1}{2}$ in. lg; coil marked w/ RCA part/dwg A-8813716-1; completed choke shall be protected by a suitable coating to completely cover and protect the inductance element; RCA part/dwg A-8813716-1	With C-2202 Headphone Filter
L-2203 through L-3034		Not Used	
L-3035		COIL, RF: one single layer winding; 628 turns total, no. 42 AWG nylon conductor; inductance 1520 microhenries, 15.2 ohms DC resistance; zero current rating; ceramic oil form; powdered iron core; adjusted core; screwdriver adjustment; $1\frac{1}{16}$ in. lg by 0.750 in. dia less terminals, mounting attachments, and tuning devices; two solder lug type terminals; mounts by single $\frac{3}{8}$ -32 by $\frac{3}{2}$ in. lg threaded bushing on bottom; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic; to withstand 48-hr salt spray test; RCA part/dwg C-746107-16	Type II RF Unit, Band 1
L-3036		COIL, RF: one single layer winding; 255 turns, Litz wire (10 strands 0.0020 in. dia); 500 to 1000 mc; ceramic coil form; powdered iron core; adjustable iron core; screwdriver adjustment; plastic case; $1\frac{1}{16}$ in. lg by 0.750 in. dia less terminals, mounting attachments, and tuning devices; two post type terminals; mounted vertically by single no. $\frac{3}{8}$ -32 bushing; RCA part/dwg C-746107-17	Type II RF Unit, Band 2
L-3037		COIL, RF: antenna, 1000/2000 mc; single winding; unshielded; $2\frac{7}{32}$ in. lg by 0.750 in. dia overall; ceramic form, powdered iron core; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; two post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic; to withstand 48-hr salt spray test; BuShips spec 16T36; RCA part/dwg C-746107-18	Type II RF Unit, Band 3
L-3038		COIL, RF: one single layer winding; 45 $\frac{3}{4}$ turns, 0.010 in. dia, enamel insulation; 23.1 microhenries at 100 cycles; ceramic coil form; powdered iron core; adjustable core; screwdriver adjustment; plastic case; 0.750 in. dia by $1\frac{1}{16}$ in. lg less terminals, mounting attachments, and tuning devices; two post type terminals; mounted vertically by single $\frac{3}{8}$ -32 bushing; RCA part/dwg C-746107-19	Type II RF Unit, Band 4
L-3039		COIL, RF: antenna, 4000/8000 mc; single winding; unshielded; $2\frac{7}{32}$ in. lg by 0.750 in. dia overall; ceramic form; powdered iron core; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; two post type terminals located on end opposite bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic; to withstand 48-hr salt spray test; BuShips spec 16T36; RCA part/dwg C-746107-20	Type II RF Unit, Band 5
L-3040 through L-3134		Not Used	
L-3135		COIL, RF: antenna, 3.0 mc; single winding; unshielded; $2\frac{7}{32}$ in. lg by 0.750 in. dia overall; ceramic form; powdered iron core; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; two post type terminals located on end opposite bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic; to withstand 48-hr salt spray test; BuShips spec 16T36; RCA part/dwg C-746108-16	Type III RF Unit, Band 1

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
L-3136		COIL, RF: antenna, 6.0 mc; single winding; unshielded; 2 $\frac{7}{32}$ in. lg by 0.750 in. dia overall; ceramic form; powdered iron core; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; two post type terminals located on end opposite bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic; to withstand 48-hr salt/spray test; BuShips spec 16T36; RCA part/dwg C-746108-17	Type III RF Unit, Band 2
L-3137		COIL, RF: antenna, 12.0 mc; single winding; unshielded; 2 $\frac{7}{32}$ in. lg by 0.750 in. dia overall; ceramic form; powdered iron core; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; two post type terminals located on end opposite bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic; to withstand 48-hr salt spray test; BuShips spec 16T36; RCA part/dwg C-746108-18	Type III RF Unit, Band 3
L-3138		COIL, RF: antenna, 20.0 mc; single winding; unshielded; 2 $\frac{7}{32}$ in. lg by 0.750 in. dia overall; ceramic form; powdered iron core; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; two post type terminals located on end opposite bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic; to withstand 48-hr salt spray test; BuShips spec 16T36; RCA part/dwg C-746108-19	Type III RF Unit, Band 4
L-3139		COIL, RF: antenna, 28.0 mc; single winding; unshielded; 2 $\frac{7}{32}$ in. lg by 0.750 in. dia overall; ceramic form; powdered iron core; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; two post type terminals located on end opposite bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic, to withstand 48-hr salt spray; BuShips spec 16T36; RCA part/dwg C-746108-20	Type III RF Unit, Band 5
L-3140 through L-4400		Not Used	
L-4401		COIL, RF: osc, 4.6 mc; single layer flat close wound; 8.7 microhenries, 3.3 mmf distributed capacity; phenolic case; 1 $\frac{1}{2}$ in. lg by 0.750 in. dia less terminals, mounting, and adjustment screw; powdered iron core; screwdriver adjustment at mounting end; $\frac{3}{8}$ -32 thread by $\frac{3}{32}$ in. lg mounting bushing one end; five solder post terminals at other end; 48-hr salt spray test; operating temp range -54°C to +85°C; BuShips spec 16T36 Grade C; RCA part/dwg C-746105-11	Type III Oscillator Unit, Band 1
L-4402		COIL, RF: osc, 7.6 mc; single layer close wound; 3.2 microhenries, 2.0 mmf distributed capacity; phenolic case; 1 $\frac{1}{2}$ in. lg by 0.750 in. dia less terminals, mounting, and adjustment screw; powdered iron core; screwdriver adjustment at mounting end; $\frac{3}{8}$ -32 thread by $\frac{3}{32}$ in. lg mounting bushing one end; five solder post terminals at other end; 48-hr salt spray test; operating temp range -54°C to +85°C; BuShips spec 16T36 Grade C; RCA part/dwg C-746105-12	Type III Oscillator Unit, Band 2
L-4403		COIL, RF: osc, 13.6 mc; single layer, flat wound; 98 microhenries, 1.2 mmf distributed capacity; phenolic case; 1 $\frac{1}{2}$ in. lg by 0.750 in. dia less terminals, mounting, and adjustment screw; powdered iron core; screwdriver adjustment at mounting end; $\frac{3}{8}$ -32 thread by $\frac{3}{32}$ in. lg mounting bushing one end; five solder post terminals at other end; 48-hr salt spray test; operating temp range -54°C to +85°C; BuShips spec 16T36 Grade C; RCA part/dwg C-746105-13	Type III Oscillator Unit, Band 3
L-4404		COIL, RF: osc, 21.6 mc; single layer flat wound; 0.390 microhenry; phenolic case; 1 $\frac{1}{2}$ in. lg by 0.750 in. dia less terminals, mounting, and adjustment screw; powdered iron core; screwdriver adjustment at mounting end; $\frac{3}{8}$ -32 thread by $\frac{3}{32}$ in. lg mounting bushing one end; five solder post terminals at other end; 48-hr salt spray test; operating temp range -54°C to +85°C; BuShips spec 16T36 Grade C; RCA part/dwg C-746105-14	Type III Oscillator Unit, Band 4
L-4405		COIL, RF: one single layer winding; 3 turns 0.015 in. by 0.045 in. rectangular wire; 0.13 microhenry nominal total inductance between terminals B and E, 0.13 microhenry nominal total inductance between terminals B and D, 0.255 microhenry nominal total inductance between terminals D and E; 0.01 ohm DC resistance; tapped at 1 $\frac{2}{3}$ turns; powdered iron core; adjustable core; screwdriver adjustment; phenolic case; $\frac{3}{4}$ in. dia by 1 $\frac{1}{2}$ in. lg less terminals, mounting attachments, and tuning devices; four solder lug type terminals; mounts by a bushing on one end, $\frac{3}{8}$ -32 thread by $\frac{3}{32}$ in. lg; RCA part/dwg C-746105-15	Type III Oscillator Unit, Band 5
L-4406		COIL, RF: single winding, single layer wound; unshielded; 25 microhenries $\pm 5\%$ inductance, resonant frequency 31 mc 4 amps 0.2161 ohm; 3 $\frac{7}{8}$ in. lg by 0.2641 in. dia; insulated iron core; form $\frac{7}{8}$ in. lg by 0.250 in. dia; mounts by wire lead terminals 1 $\frac{1}{2}$ in. lg; two wire lead type terminals no. 20 AWG, 1 $\frac{1}{2}$ in. lg; coil marked w/ RCA part/dwg A-8810453-501; completed choke shall be protected by a suitable coating to completely cover and protect the inductance element; RCA part/dwg A-8810453-501	Heater Choke, V-4401

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
M-2001		AMMETER, DC: range 0 to 100 microampere; sq, molded bakelite flush mounting case; 1.510 in. dia barrel; 1.000 in. deep behind flange less terminal; sq flange 1.770 in. lg by 1.770 in. wide by 0.406 in. thick (max dia); $\pm 3\%$ for full scale reading; resistance 1110 ohms across terminal; calibrated for use on non-magnetic panel; 20 scale divisions; white markings and pointer, black background; self-contained; four 0.140 in. dia mounting holes located on 1.312 in. by 1.312 in. mounting center; two solder lug terminals; RCA part/dwg B-462567-1	Tuning Meter
M-2002		METER, AUDIO LEVEL: AC type, 25 to 16,000 cycles; range $-10/0/+5$ db; sq, plastic flush mounting case; 1.770 in. sq flange by 1.150 in. dia body by 1.000 in. deep behind flange (max dia); $\pm 5\%$ accuracy for full scale reading; "O" on scale represents 0.6 v; 5000 to 5500 ohms resistance when indicating "O"; calibrated for use on non-magnetic panel; 10 scale divisions, white markings and pointer, black background; self-contained; four 0.140 in. dia mounting holes on 1.312 in. by 1.312 in. mounting center; two solder lug terminals; RCA part/dwg B-462566-1	Output Meter
M-2003 through M-2100		Not Used	
M-2101		Same as M-2001	Tuning Meter
M-2102		Same as M-2002	Output Meter
M-2103 through M-2200		Not Used	
M-2201		Same as M-2001	Tuning Meter
M-2202		Same as M-2002	Output Meter
O-101	2	LINK, CONNECTING: links two terminals; brass; silver plated; flat oblong; $2\frac{1}{32}$ in. lg by $\frac{7}{32}$ in. wide by 0.082 in. thick; one oval shaped mounting hole 0.312 in. lg by 0.093 in. wide and one spade end; RCA part/dwg A-8834059-1; p/o Z-101	Transfer Link, Antenna Circuit
O-102		Same as O-101	Transfer Link, Antenna Circuit
O-103		LEVER: switch actuating; c/o one coupling RCA part/dwg B-466861-3; one pin RCA part/dwg A-8848937-5; rectangular shape; 1 in. lg by $\frac{11}{16}$ in. wide by $\frac{3}{16}$ in. thick overall approx; RCA part/dwg A-8834099-501	Coupling for O-104
O-104	2	ACTUATOR, SWITCH: c/o one coupling RCA part/dwg A-8835608-2; one shaft RCA part/dwg A-8834081-1; rectangular shape; $1\frac{2}{4}$ in. lg by $1\frac{3}{32}$ in. wide by $\frac{3}{16}$ in. high overall approx; shaft w/ one end 0.124 in. dia by 0.253 in. lg to 0.186 in. dia by 0.849 in. lg to undercut $\frac{1}{16}$ in. wide by 0.010 in. deep to $\frac{3}{8}$ in. dia by $\frac{3}{16}$ in. lg to 0.249 in. dia by 0.102 in. lg. coupling riveted to 0.249 in. dia of shaft; RCA part/dwg A-8834082-502	Shaft Extension for S-101
O-105	2	CAM: operates O-104; stainless steel; off center round cylinder shape; 0.343 in. lg by $\frac{1}{16}$ in. wide by 0.527 in. high overall; mounts by 0.2187 in. dia axial hole; has $\frac{9}{16}$ in. OD for 160 deg approx, has 0.492 in. OD for approx 190 deg; two no. 4-40 tap radial set screw holes spaced 90 deg apart in center of greater OD and 0.093 in. from one side, other side of same OD has center cutout 0.094 in. wide by $\frac{3}{32}$ in. deep to mounting hole; RCA part/dwg A-8822110-1	Actuates O-106
O-106		LEVER: switch actuator; stainless steel; $1\frac{1}{4}$ in. lg by $\frac{9}{16}$ in. wide by $2\frac{3}{32}$ in. high overall approx; mounts by two no. 2-56 by $\frac{1}{2}$ in. lg r-und head machine screws spaced 0.375 in. C to C; oil impregnated bronze roller; operating force 10 oz max; release force 2 oz min; movement differential $\frac{1}{32}$ in. max; overtravel $\frac{1}{64}$ in. min; RCA part/dwg A-8835394-1	Actuates S-102
O-107 through O-125		Not Used	
O-126		Same as O-103	Coupling for O-127
O-127		Same as O-104	Shaft Extension for S-126
O-128 through O-150		Not Used	
O-151		Same as O-103	Coupling for O-152
O-152		Same as O-104	Shaft Extension for S-151
O-153 through O-200		Not Used	
O-201		Same as O-103	Coupling for O-202
O-202		Same as O-104	Shaft Extension for S-201
O-203 through O-350		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
O-351		Same as O-104	Shaft Extension for S-351
O-352		Same as O-103	Coupling for O-351
O-353 through O-400		Not Used	
O-401	2	SHAFT: switch actuator; c/o one coupling RCA part/dwg A-8835603-2; one shaft RCA part/dwg A-8834081-3; one spring RCA part/dwg A-8846790-1; rectangular shape; 1 $\frac{3}{4}$ in. lg by 1 $\frac{3}{32}$ in. wide by $\frac{3}{64}$ in. high overall approx; shaft w/ one end 0.124 in. dia by 0.253 in. lg to 0.186 in. dia by 0.849 in. lg to undercut $\frac{1}{16}$ in. wide by 0.010 in. deep to $\frac{3}{8}$ in. dia by $\frac{3}{16}$ in. lg to 0.249 in. dia by 0.102 in. lg; coupling riveted to 0.24 in. dia shaft end, spring attached to same end w/ drive pin; RCA part/dwg A-8834082-503	Shaft Extension for S-401
O-402	2	ARM: switch actuating; c/o one arm RCA part/dwg B-460861-4; one pin RCA part/dwg A-8848937-5; aluminum forging arm, satin etch finish; stainless steel pin, passivating dip finish; shaft end is rectangular w/ tongue projecting at 110 deg to form modified "L" shape; bearing end $\frac{7}{16}$ in. lg center line by $\frac{5}{16}$ in. wide by 0.250 in. thick; tongue $\frac{4}{16}$ in. lg center line by $\frac{9}{32}$ in. wide at end by 0.062 in. thick w/ pin projecting 0.233 in. from side, parallel to shaft hole; mounts by 0.128 in. dia hole in shaft end, end split for clamping action; one corner of shaft end beveled $\frac{3}{32}$ in. by $\frac{3}{32}$ in.; RCA part/dwg A-8834099-503	Coupling for O-401
O-403 through O-550		Not Used	
O-551		Same as O-104	Shaft Extension for S-551
O-552		Same as O-103	Coupling for O-551
O-553 through O-700		Not Used	
O-701		Same as O-103	Couplings for S-701, S-702
O-702 through O-800		Not Used	
O-801		Same as O-103	Couplings for S-801, S-802
O-802 through O-1003		Not Used	
O-1004	2	BUSHING: jack mounting; brass, white nickel finish; male; $\frac{3}{32}$ in. lg by 0.179 in. OD by 0.120 in. ID by 0.0345 in. thick by $\frac{9}{32}$ in. OD shoulder; RCA part/dwg K-835783-29	Assists in Mounting J-1001
O-1005	2	COLLAR, SPACING: brass, white nickel plate finish; round cylinder shape; 0.375 in. lg by $\frac{9}{64}$ in. dia overall; mounts by axial center hole 0.096 in. dia; ends are flat and parallel; RCA part/dwg K-817605-108	Assists in Mounting S-1001, S-1002, S-1003
O-1006	3	SPRING CLIP: spring temper steel wire; $\frac{9}{32}$ in. dia by $\frac{4}{16}$ in. lg; 0.032 in. dia wire; hair pin type; M. D. Hubbard Spring Co., Catalog no. HPC-121; RCA part/dwg M-140637-14	To Secure O-1007, O-1008
O-1007	2	COUPLING, RIGID: cam shaped forging and round pin; aluminum, chemical treatment finish, for forging, stainless steel pin passivating dip finish; for 4 inch-ounces torque; "L" shaped; 1.01 in. lg by $\frac{2}{32}$ in. wide by $\frac{2}{16}$ in. thick overall; mounts on switch shaft at 0.125 in. dia hole in split section of forging w/ 0.128 in. dia hole through split ends for pin to hold shaft secure by compression; pin to be riveted securely in forging at "cam" end; RCA part/dwg A-8816321-501	Shaft for S-1001, S-1002
O-1008		Same as O-1007	Shaft for S-1003
O-1009	2	STUD: brass, white nickel plate; 1 $\frac{3}{8}$ in. lg; no. 2-56 thread full length; chamfer both ends; RCA part/dwg K-8852764-169	Assembles S-1001, S-1002
O-1010 through O-1300		Not Used	
O-1301		Same as O-1007	Shaft Assembly for S-1301
O-1302 through O-1603		Not Used	
O-1604	3	GROMMET: black synthetic rubber composition; fits $\frac{15}{32}$ in. dia hole; $\frac{1}{16}$ in. dia hole, $\frac{1}{16}$ in. wide by $\frac{5}{16}$ in. deep groove $\frac{1}{16}$ in. wide by $\frac{9}{16}$ in. dia overall; RCA part/dwg K-57421-1	Protects Wiring
O-1605		Same as O-1604	Protects Wiring
O-1606 through O-1700		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
O-1701	2	BUSHING: jack mounting; steel; male; $\frac{5}{32}$ in. lg by 0.187 in. OD by 0.120 in. ID, $\frac{11}{32}$ in. OD overall; $\frac{9}{32}$ in. dia by 0.036 in. thick shoulder; RCA part/dwg K-835783-30	Assists in Mounting J-1709
O-2001	2	GUIDE, PULL BAR: guide for switch actuator bar; stainless steel; flat washer shape w/ hub on one side; $\frac{7}{16}$ in. OD max by 0.171 in. ID by $\frac{3}{32}$ in. thick; 0.342 in. OD hub extends 0.098 in. beyond face on one side; single 0.171 in. dia axial mounting hole; 0.281 in. dia by $\frac{3}{32}$ in. deep counterbored in side opposite hub; RCA part/dwg A-8834746-1	Retains O-2002
O-2002	2	BAR, ACTUATOR SWITCH: actuates reception switch; stainless steel; irregular shape; $8\frac{3}{4}$ in. lg by 1.781 in. wide by 0.093 in. thick; mounts by means of three irregularly space unattached guide pins permitting bar to slide longitudinally; has four teeth $\frac{1}{2}$ in. wide spaced 1.736 in., 2 in., 2.860 in. C to C; ea tooth has one $\frac{1}{8}$ in. wide by $\frac{13}{32}$ in. lg notch in end; 13 equally spaced teeth on edge at one end, four unequally spaced notches near center of same edge; one rectangular and one oval cutout through body; RCA part/dwg B-456851-1	Operates Band Switches
O-2003		GEAR ASSEMBLY: reception switch drive; c/o one bracket RCA part/dwg B-458182-1; one spur gear RCA part/dwg A-8834009-1; one shaft RCA part/dwg A-8834741-1; two miter gears RCA part/dwg B-460879-1; two set screws RCA part/dwg A-8888539-101; two taper pins RCA part/dwg K-845979-4; four washers RCA part/dwg K-73109-45; one washer RCA part/dwg K-889534-47; bronze; irregular shape; $2\frac{1}{4}$ in. lg by 1.967 in. wide by $1\frac{3}{8}$ in. thick; mounts by one no. 6-32 tapped hole $\frac{3}{8}$ in. deep w/ 0.219 in. dia by 82 deg countersunk, two 0.156 in. dia clearance holes w/ 0.219 in. dia by 82 deg countersunk, spaced 1.062 in. C to C; RCA part/dwg B-458183-501	Actuates O-2002
O-2004	2	GEAR: rack type; stainless steel; straight teeth; $14\frac{1}{2}$ deg pressure angle; 9 teeth; diametral pitch 32; $1\frac{1}{16}$ in. lg by $\frac{1}{2}$ in. max high by 0.093 in. wide overall; straight face; two mounting holes no. 6-32 tap thread spaced 0.562 in. C to C; pitch line parallel to mounting center line and spaced 0.312 in. away; mates w/ spur gear; RCA part/dwg A-8888927-1	Actuates O-2005
O-2005	2	BAR, SWITCH ACTUATOR: band switch drive; stainless steel; oblong shape; $11\frac{3}{32}$ in. lg by 0.593 in. wide by 0.093 in. thick; two mounting slots 0.281 in. lg by 0.156 in. wide on 0.562 in. mounting center; corner cutout on one end $1\frac{1}{4}$ in. lg by 0.156 in. wide; has five slots $1\frac{1}{32}$ in. lg by 0.156 in. wide spaced 0.468 in., 1.875 in., 1.500 in., 0.844 in., 2.344 in. C to C; RCA part/dwg B-456854-2	Operates Band Switches
O-2006	2	GUIDE, PULL BAR: guide for switch actuator bar; stainless steel, passivating dip; flat washer shape w/ hub on one side; $\frac{7}{16}$ in. OD max by 0.161 in. ID by $\frac{5}{32}$ in. thick; $\frac{1}{4}$ in. OD hub extends 0.098 in. beyond face on one side; single 0.161 in. dia axial mounting hole; RCA part/dwg A-8834747-1	Retains O-2005
O-2007	2	MOUNTING BLOCK: for reception switch detent; brass, white nickel plate finish; rectangular block shape; $\frac{11}{16}$ in. lg by $\frac{1}{2}$ in. high by $\frac{1}{4}$ in. wide overall; one larger side has two mounting holes no. 6-32 tap 0.375 in. C to C; one narrow end has single hole 0.152 in. dia by $\frac{3}{16}$ in. deep, front end is enlarged to 0.1568 in. +0.0006 in., -0.0000 in. dia by $\frac{5}{32}$ in. deep; RCA part/dwg A-8849603-1	Retains O-2020 and O-2021
O-2008		GEAR ASSEMBLY: antenna trimmer drive; c/o one bearing (casting assembly) RCA part/dwg A-8834042-1; one coupling RCA part/dwg B-462554-501; one shaft RCA part/dwg A-8834088-1; two gears RCA part/dwg B-462526-1; $1\frac{1}{16}$ in. lg by $1\frac{1}{8}$ in. wide by $1\frac{1}{16}$ in. high overall approx; two countersunk mounting holes 0.156 in. dia, 0.406 in. C to C; 0.156 in. lg crank pin $\frac{3}{16}$ in. off center in coupling; RCA part/dwg B-459835-501	Right Angle Drive for Type I Antenna Unit Trimmer
O-2009	2	SHAFT: antenna compensator drive; stainless steel; round rod shape; $10\frac{27}{32}$ in. lg by 0.250 in. +0.001 in. -0.002 in. dia overall; mounts by one end cut back to 0.125 in. $\pm 0.002$ in. dia by $\frac{5}{16}$ in. lg; other end has $\frac{1}{4}$ in. by 45 deg chamfer; RCA part/dwg A-8835688-1	Actuates O-2008
O-2010	2	SHAFT, ADAPTER: BFO extension shaft; brass, white nickel finish; round shaft 2 in. dia; $1\frac{1}{8}$ in. lg by $\frac{1}{2}$ in. dia overall; hole drilled axially in large dia end 0.251 in. dia by 0.218 in. deep w/ no. 6-32 tap radial hole in side and slot 0.055 in. wide, 0.145 in. deep from end 90 deg from radial hole center; small dia section 0.250 in. dia by $1\frac{1}{8}$ in. lg, $\frac{1}{8}$ in. by 45 deg chamfer end; RCA part/dwg A-8824188-1	Shaft Extension for Frequency Vernier Control
O-2011		HANDLE: used to operate catch fastener; zinc die casting handle; gears brass, slide lock brass, white nickel finish; $4\frac{7}{8}$ in. lg by $1\frac{1}{16}$ in. wide by 1 in. thick overall; zinc die casting grip $3\frac{1}{2}$ in. lg by $\frac{5}{16}$ in. wide, opens to 145 deg max; two mounting holes no. 10-32 tap by $\frac{1}{2}$ in. deep on 3.312 in. mounting center; to withstand 48-hr salt spray test; RCA part/dwg C-746147-501	Assists in Withdrawing Chassis from Cabinet
O-2012	2	BUSHING: brass, white nickel plate; $\frac{1}{2}$ in. hex head by $\frac{5}{16}$ in. lg overall; external $\frac{3}{8}$ -32 thread by $\frac{3}{16}$ in. lg thread portion; $\frac{1}{16}$ in. thick head has axial hole 0.252 in. +0.0015 in. -0.0000 in. dia; RCA part/dwg K-806568-113	Panel Bearing for O-2009



TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
O-2013	2	ROD, PUSH: manual release of O-267 and O-268; c/o one ea of push rod, RCA part/dwg A-8835643-1; spring, RCA part/dwg A-8813732-1; rivet, RCA part/dwg K-99105-154; stainless steel rod passivating dip, beryllium copper spring white nickel plate; 5½ in. lg by ⅜ in. wide by 2½ in. thick overall; material 0.062 in. thick; mounts through slot in panel and is secured to stud on inside by 0.191 in. dia hole in end; spring is riveted to rod near end w/ 90 deg offset; RCA part/dwg A-8813733-501	Manual Release for O-2014 and O-2015
O-2014	2	PAWL: dog assembly; c/o one dog stop RCA part/dwg A-8835699-1; one cable stud RCA part/dwg K-85494-19; one stud RCA part/dwg A-8835660-2; rectangular shape w/ one end turned on 0.030 in. radius extending up 0.218 in. on a ½ in. end; 3½ in. lg by 2¾ in. wide by 0.265 in. high; 1¾ in. by 1.203 in. mounting center; hole 0.3775 in. dia; 1¾ in. by 1.203 in. mounting center, right side; RCA part/dwg A-8835657-501	To Secure Chassis in Servicing Positions
O-2015	2	PAWL: dog assembly; c/o one dog stop RCA part/dwg A-8835699-2; one cable stud RCA part/dwg K-85494-19; one stud RCA part/dwg A-8835660-2; rectangular shape w/ one end turned on 0.030 in. radius extending up 0.218 in. on a ½ in. end; 3½ in. lg by 2¾ in. wide by 0.265 in. high; 1¾ in. by 1.203 in. mounting center; hole 0.3775 in. dia, 1¾ in. by 1.203 in. mounting center, left side; RCA part/dwg A-8835657-502	Secures Chassis in Servicing Positions
O-2016	2	CATCH FASTENER: w/ handle RCA part/dwg C-746147; c/o one block and guide assembly RCA part/dwg B-462551-501; one gear RCA part/dwg A-8835629-1; rectangular block welded to guide, gear riveted to guide; 1.655 in. lg by 1.358 in. wide by 0.6827 in. high overall; right-hand side; RCA part/dwg M-459844-501	Secures Chassis in Cabinet
O-2017	2	CATCH FASTENER: w/ handle RCA part/dwg C-746147; c/o one guide and block assembly RCA part/dwg B-462551-502; one gear RCA part/dwg A-8835629-2; rectangular block welded to guide, gear riveted to guide; 1.655 in. lg by 1.358 in. wide by 0.6827 in. high overall; left-hand side; RCA part/dwg M-459844-502	Secures Chassis in Cabinet
O-2018		MIRROR: reflects dial image upon ground glass viewing screen; c/o one mounting bracket RCA part/dwg A-8836518-1; one first surface mirror RCA part/dwg A-8836522-1; one spring assembly RCA part/dwg B-456863-6; two trunion RCA part/dwg A-8836513-1; one insulator RCA part/dwg A-8823220-1; one frame RCA part/dwg A-8823219-1; one holder RCA part/dwg B-459841-501; metal parts brass, black nickel plated; 2 in. lg by 1½ in. wide by 1½ in. high overall approx; two mounting holes 0.156 in. dia, 1 in. C to C; adjustment screw is provided for adjusting angle of mirror; RCA part/dwg C-744514-501	Reflector for Optical Dial System
O-2019	2	RECEIVER, SUB-ASSEMBLY: intermediate gear for latch mechanism; c/o one gear RCA part/dwg A-8836557-1; one hub RCA part/dwg A-8836563-1; one plate assembly RCA part/dwg M-459861-502; rectangular shape; 4¾ in. lg by 1¾ in. wide by ¾ in. thick overall approx; RCA part/dwg M-459861-501	Assists in Mounting O-2011
O-2020	2	SPRING: helical compression type; for bar movement, reception switch operation; 0.032 in. dia music wire, cadmium plate finish; ⅝ in. lg by 0.140 in. dia overall; ten right-hand turns; ends ground straight; mounts w/ ball at end in notch bar; RCA part/dwg B-470448-3	Spring Loading for O-2021
O-2021		BALL BEARING: stainless steel; round; ⅝ in. dia; mounts by insertion; RCA part/dwg K-76757-36	Detent Ball for Reception Switch
O-2022		SPRING: helical extension type; catch actuator; 0.029 in. dia music wire, cadmium plated; 1½ in. lg by 0.187 in. OD; 21 turns approx; direction of turns optional; parallel hook terminals; terminals bent on 0.129 in. radius on ⅝ in. center; RCA part/dwg B-453124-13	Spring Loading for O-2023 and O-2028
O-2023	2	PLATE, CATCH: locks chassis in case RH; c/o one catch RCA part/dwg M-459839-2; one stud RCA part/dwg A-8835660-3; one cable stud RCA part/dwg K-85494-20; irregular shape; 2¾ in. lg by 2¾ in. wide by 0.639 in. high overall approx; snap ring mounted at groove in studs; catch w/ ¾ in. radius bend 1½ in. from end by 0.140 in. high, notched 0.265 in. deep by 0.203 in. wide, 1.847 in. from center of stud at center line of 0.218 in. radius end; two studs riveted on same side of catch; RCA part/dwg M-459839-501	Secures Chassis in Cabinet
O-2024	2	SPRING: helical extension type; dog actuator; 0.035 in. dia music wire, cadmium plated; 1¾ in. lg by 0.250 in. OD; 35 turns approx; direction of turns optional; parallel hook terminals; terminals bent 0.180 in. radius on 1¾ in. center; RCA part/dwg B-453124-12	Spring Loading for O-2014 and O-2015
O-2025	2	PLATE, CATCH: locks chassis in case LH; c/o one catch RCA part/dwg M-459839-5; one stud RCA part/dwg A-8835660-3; one cable stud RCA part/dwg K-85494-20; irregular shape; 2¾ in. lg by 2¾ in. wide by 0.639 in. high overall approx; snap ring mounted at groove in studs; catch w/ ¾ in. radius bend 1½ in. from end by 0.140 in. high, notched 0.265 in. deep by 0.203 in. wide, 1.187 in. from center line of stud at center line of 0.218 in. radius end; two studs riveted on same side of catch; RCA part/dwg M-459839-502	Secures Chassis in Cabinet

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)**  
**RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
O-2026	2	RECEIVER, SUB-ASSEMBLY: intermediate gear for latch mechanism; c/o one gear RCA part/dwg A-8836557-1; one hub RCA part/dwg A-8836563-1; one plate RCA part/dwg M-459861-502; rectangular shape; 4 $\frac{1}{8}$ in. lg by 1 $\frac{3}{32}$ in. wide by $\frac{4}{16}$ in. thick overall approx; same as SNSN-16-R-33591-1334, except assembled w/ beveled side of gear on opposite side; RCA part/dwg M-459861-503	Assists in Mounting O-2011
O-2027		MIRROR: front surface mirror on polished plate glass; 1 $\frac{3}{8}$ in. lg by $\frac{13}{16}$ in. wide by $\frac{1}{8}$ in. thick; non-magnifying; temp range from -54°C to +85°C; RCA part/dwg A-8836522-1	Mirror Element of O-2018
O-2028 through O-2100		Not Used	
O-2101		Same as O-2001	Retains O-2102
O-2102	2	BAR, SWITCH ACTUATOR: actuates band switch; stainless steel; irregular shape; 8 $\frac{3}{64}$ in. lg by 1.781 in. wide by 0.093 in. thick; mounts by means of three irregularly spaced unattached guide pins permitting bar to slide longitudinally; has four teeth $\frac{1}{2}$ in. wide spaced 1.736 in., 2 in., 2.860 in. C to C; ea tooth has one $\frac{1}{8}$ in. wide by $\frac{13}{32}$ in. lg notch in end; 13 equally spaced teeth on edge at one end, six unequally spaced notches near center of same edge; one rectangular and one oval cutout through body; RCA part/dwg B-456851-2	Operates Reception Control Switches
O-2103		Same as O-2003	Actuates O-2102
O-2104		Same as O-2004	Actuates O-2105
O-2105	2	BAR, ACTUATOR, ELECTRICAL SWITCH: stainless steel; passivating dip finish, polish at seven slots; rectangular strip; 11 $\frac{3}{32}$ in. lg by 0.593 in. wide by 0.093 in. thick overall; mounts at one end, 1 $\frac{1}{4}$ in. lg cut down 0.156 in. w/ two oval holes 0.281 in. lg by 0.156 in. wide, 0.281 in. apart, centered on axis 0.187 in. from line of cut; seven slots along straight side 0.156 in. wide, 1 $\frac{1}{32}$ in. deep w/ rounded ends; center lines at right angles to axis, placed in accordance w/ RCA dwg; for band switch operation on radio receiver; RCA part/dwg B-462511-1	Operates Band Switches
O-2106		Same as O-2006	Retains O-2105
O-2107	2	CAP: screwdriver control cover; brass, dull black finish; $\frac{1}{2}$ in. OD by $\frac{1}{4}$ in. ID by 2 $\frac{3}{32}$ in. lg; mounts by $\frac{3}{8}$ -32 in. thread, $\frac{1}{32}$ in. lg; provided w/ closure spring; withstand 48-hr salt spray test; RCA part/dwg A-8824197-1	Cover for Gain Balance Control
O-2108	2	COUPLING, FLEXIBLE: coupling for antenna compensator capacitor; brass, nickel plated; round; $\frac{15}{16}$ in. lg by 2 $\frac{3}{32}$ in. sq; mounts by four no. 6-32 tapped holes, two located ea end; steatite insulated coupling; metal parts to withstand 48-hr spray test; RCA part/dwg A-8876114-1	Couples O-2109 to C-2106
O-2109	2	SHAFT: for knob adjustment and operation, antenna compensation drive shaft; stainless steel Navy spec no. 46S18E Class 7 Type A passivating dip finish; 30,000 lbs per sq in. wire yield strength; B-85 to B-95 Rockwell hardness; round rod, central section reduced dia; 9 $\frac{1}{8}$ in. lg overall; 0.25 in. dia at ends 0.156 in. dia reduced section; mounts in bushings at ends of shaft, one for coupling and one for knobs; RCA part/dwg A-8817156-1	Shaft Extension for C-2106
O-2110		Same as O-2010	Shaft Extension for Frequency Vernier Control
O-2111		Same as O-2011	Assists in Withdrawing Chassis from Cabinet
O-2112		Same as O-2012	Panel Bearing for O-2109
O-2113		Same as O-2013	Manual Release for O-2114 and O-2115
O-2114		Same as O-2014	To Secure Chassis in Servicing Conditions
O-2115		Same as O-2015	Secures Chassis in Servicing Positions
O-2116		Same as O-2016	Secures Chassis in Cabinet
O-2117		Same as O-2017	Secures Chassis in Cabinet
O-2118		Same as O-2018	Reflector for Optical Dial System
O-2119		Same as O-2019	Assists in Mounting O-2111
O-2120		Same as O-2020	Spring Loading for O-2121
O-2121		Same as O-2021	Secures Chassis in Cabinet
O-2122		Same as O-2022	Spring Loading for O-2123 and O-2124
O-2123		Same as O-2023	Secures Chassis in Cabinet
O-2124		Same as O-2024	Spring Loading for O-2014 and O-2015
O-2125	4	P/o E-2112	Transfer Link, B+ to Oscillator
O-2126	4	P/o E-2112	Transfer Link, Extension Oscillator
O-2127		Same as O-2007	Retains O-2121, O-2122

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
O-2128		Same as O-2025	Secures Chassis in Cabinet
O-2129		Same as O-2026	Assists in Mounting O-2111
O-2130		Same as O-2027	Mirror Element of O-2118
O-2131 through O-2200		Not Used	
O-2201		Same as O-2001	Retainer O-2202
O-2202		Same as O-2102	Operates Reception Control Switches
O-2203		Same as O-2003	Actuates O-2202
O-2204		Same as O-2004	Actuates O-2205
O-2205		Same as O-2105	Operates Band Switches
O-2206		Same as O-2006	Retains O-2205
O-2207		Same as O-2107	Cover for "Gain Balance" Control
O-2208		Same as O-2108	Couples O-2207 to C-2206
O-2209		Same as O-2109	Shaft Extension for C-2206
O-2210		Same as O-2010	Shaft Extension for Frequency Vernier Control
O-2211		Same as O-2011	Assists in Withdrawing Chassis from Cabinet
O-2212		Same as O-2012	Panel Bearing for O-2209
O-2213		Same as O-2013	Manual Release for O-2214 and O-2215
O-2214		Same as O-2014	To Secure Chassis in Service Positions
O-2215		Same as O-2015	Secures Chassis in Servicing Positions
O-2216		Same as O-2016	Secures Chassis in Cabinet
O-2217		Same as O-2017	Secures Chassis in Cabinet
O-2218		Same as O-2018	Reflector for Optical Dial System
O-2219		Same as O-2019	Assist in Mounting O-2211
O-2220		Same as O-2020	Spring Loading for O-2221
O-2221		Same as O-2021	Secures Chassis in Cabinet
O-2222		Same as O-2022	Spring Loading for O-2223, O-2224
O-2223		Same as O-2023	Secures Chassis in Cabinet
O-2224		Same as O-2024	Spring Loading for O-2214 and O-2215
O-2225	4	P/o E-2212	Transfer Link, Extension Oscillator Circuit
O-2226		Same as O-2007	Retains O-2221, O-2222
O-2227		Same as O-2025	Secures Chassis in Cabinet
O-2228		Same as O-2026	Assists in Mounting O-2211
O-2229		Same as O-2027	Mirror Element for O-2218
O-2230 through O-3000		Not Used	
O-3001	4	P/o E-3004	Transfer Link, Antenna Circuit
O-3002		Same as O-103	Coupling for O-3003
O-3003		Same as O-104	Shaft Extension for S-3001
O-3004 through O-3100		Not Used	
O-3101	4	P/o E-3004	Transfer Link, Antenna Circuit
O-3102		Same as O-103	Coupling for O-3103
O-3103		Same as O-104	Shaft Extension for S-3101
O-3104 through O-3134		Not Used	
O-3135		Same as O-104	Shaft Extension for S-3135
O-3136		Same as O-103	Coupling for O-3135
O-3137 through O-3600		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
O-3601	4	GEAR ASSEMBLY: p/o main tuning drive; scissor gear w/ shaft and stop; gear, brass and phosphor bronze chemical black and oil finish; shaft, stainless steel, passivating dip finish; circular gear on end of straight shaft; 1 $\frac{3}{32}$ in. lg by 0.8957 in. OD gear and 0.2496 in. dia shaft; shaft mounting w/ triangular projection on stop circumference to hold in place; taper pin all the way through stop, gear hub and shaft along dia; removable spring steel strip bent to hold movable gear in correct relation to fixed gear on hub in scissor gear assembly; 41 involute teeth 48 diametral pitch in gear; RCA part/dwg M-460862-501	Initial Dial Drive Gear
O-3602	4	SHAFT: for concentric bearings; stainless steel, passivating dip finish; cylindrical shape; 2 $\frac{7}{64}$ in. lg by $\frac{5}{16}$ in. dia overall approx; mounted in panel by 0.2511 in. dia; stud w/ one end 0.2511 in. dia by $\frac{3}{8}$ in. lg to undercut $\frac{1}{16}$ in. wide by 0.005 in. deep to $\frac{5}{16}$ in. dia by 0.062 in. lg to undercut $\frac{1}{16}$ in. wide by 0.005 in. deep to 0.2498 in. dia by $\frac{15}{16}$ in. lg to undercut, 0.210 in. dia by 0.028 in. lg to 0.2498 in. dia by 0.985 in. lg to undercut, 0.210 in. dia by 0.028 in. lg to 0.2498 in. dia by 0.066 in. lg w/ $\frac{1}{64}$ in. by 45 deg chamfer on end of stud, flat $\frac{3}{4}$ in. by $\frac{1}{32}$ in. deep located 1 $\frac{3}{64}$ in. from 0.2511 in. dia end; RCA part/dwg A-8842908-1	Shaft for O-3618
O-3603	4	INDICATOR SUB-ASSEMBLY, AZIMUTH AND RANGE: u/o dial assembly E-314436; c/o one dial RCA part/dwg A-46312-1; one gear RCA part/dwg P-741331-1; cylindrical shape; 2 in. dia by 1 in. lg overall; mounted by 0.250 in. dia hole in gear; marked w/ calibration marks and numbers from 0-100 in tenths; dial riveted to gear; RCA part/dwg A-8843836-501	Logging Dial, Fine Scale
O-3604	4	INDICATOR SUB-ASSEMBLY, AZIMUTH AND RANGE: u/o dial assembly E-314436; c/o one dial RCA part/dwg A-46310-1; one gear RCA part/dwg B-453888-1; one cam RCA part/dwg B-456231-1; one dial holder RCA part/dwg A-8820969-1; cylindrical shape; 1 $\frac{3}{32}$ in. lg by $3\frac{1}{16}$ in. dia overall; mounted by 0.500 in. dia hole in gear; marked w/ calibration lines and numbers from 0-1000 by hundredths; dial riveted to dial holder; RCA part/dwg A-8843837-501	Logging Dial, Coarse Scale
O-3605	4	FOLLOWER, DIAL: follower for dial assembly; c/o one arm, follower RCA part/dwg A-8841070-1; one bushing RCA part/dwg K-854313-12; one stud, roller RCA part/dwg A-8841071-1; one roller, follower RCA part/dwg A-8841072-1; rectangular shape; 1 $\frac{13}{16}$ in. lg by 1 $\frac{1}{2}$ in. wide by $3\frac{3}{64}$ in. high overall approx; mounts by 0.187 in. dia hole in bushing; RCA part/dwg A-8841073-501	Stops Dial at End of Scale
O-3606	2	SPRING, HELICAL EXTENSION TYPE: for dial assembly; 0.018 in. dia music wire, cadmium plate finish; $\frac{3}{16}$ in. OD by 1 $\frac{1}{16}$ in. free length; coil spring style 30 turns; RH wound; one end hook type terminal, other end eye type terminal indexed 90 degrees; RCA part/dwg B-456881-2	Secures Free End of O-3608
O-3607	4	SPRING, EXTENSION: helical extension type; for follower assembly; 0.015 in. dia music wire, cadmium plate finish; 0.7175 in. free length 0.171 in. OD; 23 terminals; parallel hook terminal; circular shaped loops at ends $\frac{5}{8}$ in. circumference of circle $\frac{5}{32}$ in. OD; mounts by end loops, center $\frac{1}{64}$ in. min from coil terminals; max load 0.6 lb min load 0.4 lb; RCA part/dwg B-458190-2	Secures Free End of O-3605
O-3608		ARM, LENS ASSEMBLY: u/o dial assembly E-314436; c/o one lens arm RCA part/dwg T-628730-1; one slide assembly RCA part/dwg A-8834737-501; one lens projection RCA part/dwg A-8832303-1; one lens assembly RCA part/dwg A-8832305-501; one bracket assembly RCA part/dwg A-8821404-501; one cover RCA part/dwg A-8821403-1; one cover RCA part/dwg B-456248-1; one bracket assembly RCA part/dwg A-8821404-502; two lamps RCA part/dwg K-61114-12; one lampholder RCA part/dwg M-458193-501; one lampholder RCA part/dwg M-458193-502; rectangular shape; 5 $\frac{1}{32}$ in. lg by 1 $\frac{1}{16}$ in. wide by 2 $\frac{1}{16}$ in. high overall approx; RCA part/dwg A-8848529-501	Light Source for Optical Dial System
O-3609	4	GEAR, ASSEMBLY: gear for dial assembly; c/o one spur gear 0.6666 in. OD; two spur gears 1.2916 in. OD; two springs; spur gear 0.6666 in. OD bronze; two spur gears 1.2916 in. OD brass, springs steel, chemical black and oil finish except 0.2500 in. dial hole; cylindrical shape; 1.2916 in. OD by 0.500 in. lg overall; mounts by 0.2500 in. dia hole in hub; one end w/ spur gear 0.6666 in. OD by 0.125 in. wide teeth, 48 pitch, 30 teeth, 0.6250 in. pitch dia, counterbored $\frac{7}{16}$ in. ID by 0.062 in. wide to 1 $\frac{1}{32}$ in. dia by $\frac{1}{32}$ in. wide to one spur gear 1.2916 in. OD by 0.0403 in. thick to 0.015 in. separation between gear sections to one spur gear 1.2916 in. OD by 0.0403 in. thick to 1 $\frac{1}{32}$ in. dia by $\frac{1}{32}$ in. lg to 0.312 in. dia by 0.059 in. lg; two spur gears 1.2916 in. OD, 48 pitch, 60 teeth, 1.2500 in. pitch dia; have scissor action provided by two springs and staked to body; 0.2500 in. dia hole full length of hub; RCA part/dwg C-742436-1	Reduction Gear Between O-3618 and O-3617
O-3610	4	SCREW, CAPTIVE: slot drive; flat head; stainless steel, passivating dip finish; no. 8-32 thread; 2 $\frac{5}{32}$ in. lg; threaded portion $\frac{5}{32}$ in. lg; $\frac{3}{8}$ in. dia head; shoulder next to head 0.2498 in. dia by 0.444 in. lg, next shoulder 0.1872 in. dia by 0.125 in. lg; 0.040 in. wide by $\frac{1}{32}$ in. deep slot in head; RCA part/dwg A-8849689-1	Mounts O-3609
O-3611	4	GEAR: spur type; stainless steel, passivating dip finish; shaft driving; straight teeth; 36 teeth; 48 pitch, 0.7500 in. pitch dia; 0.7916 in. outside dia, 0.125 in. thick; straight face; hub extends 0.015 in. beyond face of gear, $\frac{7}{16}$ in. dia; mounted by 0.2496 in. dia shaft, 1 $\frac{3}{32}$ in. lg; RCA part/dwg A-8899845-1	Drives O-3604

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
O-3612	4	GEAR ASSEMBLY: gear for dial assembly; c/o one hub, two spur gears, and two springs; gear and hub brass, spring steel; cylindrical shape; 2.1250 in. OD by 1 $\frac{1}{32}$ in. lg overall; mounts by 0.2500 in. dia hole in hub; one end w/ hub $\frac{1}{2}$ in. dia by 1 $\frac{1}{32}$ in. lg to one spur gear 2.1250 in. dia by 0.0403 in. thick to 0.015 in. separation between gear sections to one spur gear 2.1250 in. dia by 0.043 in. thick; gears are staked to hub; hub w/ 0.2500 in. dia hole full length of hub; two no. 8-32 tapped holes 90 deg apart $\frac{3}{32}$ in. from left-hand side of hub; gears have scissor action provided by two springs; two spur gears, 2.1250 in. OD, 100 teeth, 2.0833 in. pitch dia, straight teeth; RCA part/dwg B-463877-2	Reduces Back Lash Drive from O-3603 to O-3611 and O-3617
O-3613	2	FOLLOWER, CAM: follower for dial assembly; stainless steel; passivating dip finish; cylindrical shape; 2.519 in. lg by 0.1525 in. dia overall; mounts in 0.154 in. dia hole; $\frac{3}{32}$ in. spherical radius on both ends; RCA part/dwg A-8834066-1	Linkage Between O-3616 and O-3608
O-3614	2	ECCENTRIC: pivot for lens arm assembly; stainless steel w/ chemical black finish on plate and passivating dip on eccentric; 2.875 in. lg by 1.156 in. dia overall; mounts by insertion in 0.250 in. dia bushing; 0.093 in. wide by 120 deg arc slot in plate; RCA part/dwg A-8849696-502	Displaces O-3608 for Calibration Adjustment
O-3615	2	DIAL SUB-ASSEMBLY: u/o dial assembly; c/o one shaft RCA part/dwg A-8830100-1; one pointer RCA part/dwg A-8846798-1; one arm RCA part/dwg A-8848171-1; stainless steel, passivating dip finish; round shaft w/ projecting bent rectangular strip arm and straight triangular strip pointer; 2 in. lg shaft by $\frac{1}{16}$ in. dia (wide) by 1 $\frac{29}{64}$ in. high arm, overall; panel mounted; arm and pointer silver soldered to shaft at shoulders 0.828 in. apart; RCA part/dwg A-8849699-501	Shifts "Normal/Space" Lamp Positions
O-3616	4	DRIVE ASSEMBLY: to actuate lens arm assembly and band switches; c/o one housing RCA part/dwg C-748454-1; one pinion stem spur gear RCA part/dwg A-8849612-1; one gear RCA part/dwg B-460879-1; one cam RCA part/dwg B-456873-1; one detent and gear RCA part/dwg B-460880-501; one shaft RCA part/dwg A-8849644-1; rectangular shape; $3\frac{3}{32}$ in. lg by $1\frac{1}{8}$ in. wide by $1\frac{1}{4}$ in. high overall approx; mounts by four 0.312 in. dia holes spaced on 0.875 in. by 0.531 in. mounting center; RCA part/dwg A-8848531-501	Actuates O-3613 and Band System
O-3617	4	GEAR: spur type; phosphor bronze rod, chemical black finish; shaft driving; straight teeth; 30 teeth; 48 pitch, 0.6250 in. pitch dia; 0.6666 in. OD, 0.250 in. bore, 0.125 in. thick; straight face; hub 0.437 in. dia by $\frac{3}{32}$ in. lg; mounts by 0.250 in. dia hole; RCA part/dwg A-8848919-1	Drives O-3609
O-3618		SCALE: optical projection tuning scale; metal gear, glass scale; cylindrical shape; 3.812 in. dia by 0.656 in. wide by 0.250 in. ID overall approx; mounted by $\frac{1}{4}$ in. shaft hole through hub; marked w/ calibrations in tenths band no. 1—14.0 to 30.0; band no. 2—30.0 to 63.0; band no. 3—63 to 133; band no. 4—133 to 283; band no. 5—283 to 600; spring loaded scissor gear; RCA part/dwg B-455040-1	Provides Projection Dial Scale Markings
O-3619		BAR, SWITCH ACTUATOR: provides variations in mechanical characteristics for V3 switch; c/o one bracket, two screws, and two lockwashers; stainless steel; rectangular shape; $1\frac{1}{32}$ in. lg by $2\frac{3}{32}$ in. wide by $\frac{1}{16}$ in. by $\frac{1}{64}$ in. thick less screws; mounts by two no. 4-40 screws on 0.875 in. by 0.406 in. mounting center; one flange $1\frac{1}{32}$ in. lg by $2\frac{3}{32}$ in. wide w/ two screws on 0.875 in. by 0.406 in. mounting center to flange bent 90 deg $2\frac{3}{32}$ in. lg by $\frac{1}{16}$ in. wide; Micro Switch Catalog no. JV-1; RCA part/dwg A-8835610-1	Actuates S-3601
O-3620		COUPLING, RIGID: split sleeve; 0.252 in. ID ea end; set screw, hub, and plate mounting; $1\frac{1}{2}$ in. OD by $\frac{3}{8}$ in. lg approx overall; sleeve 0.312 in. OD; phosphor bronze sleeve and disk chemical black and oil finish; brass hub and plate; includes two rivets and washers for disks and plate assembly; hub drilled and tapped no. 6-32 centers $\frac{1}{4}$ in. from outer end; two radial holes 120 deg C to C for set screws; RCA part/dwg A-8824143-501	Couples O-3618 to C-251
O-3621		LENS, PROJECTION: still projector for translucent screen; f/lg 0.551 in.; lens speed diaphragmed to f/5; two set screws bearing on flats on outer circum of brass lens holder tangential at right angles on 0.234 in. radii, holds lens in place in dial screen projecting equipment; 0.312 in. lg by 0.4995 in. OD overall; Bausch and Lomb Optical Co. lens 12KB, mounted in RCA brass holder black nickel finish; lens approx $\frac{5}{32}$ in. dia diaphragmed to lens opening 0.109 in. dia in $\frac{3}{16}$ in. thick end wall of 0.375 in. ID holder, lens held by spin over extension round concave circum inside holder; RCA part/dwg A-8832303-1; p/o O-3608	Element of Optical Lens
O-3622		LENS, CONDENSING: 0.375 in. dia; f/lg 0.321 in.; brass barrel mounted; 0.233 in. lg by 0.4995 in. dia overall; c/o one barrel RCA part/dwg A-8832304-1; two lens RCA part/dwg A-8842926-1; one spacer RCA part/dwg A-8844600-1; Bausch and Lomb spectacle crown glass having index = 1.523, two spherical plano, convex lens are mounted in convex opposing positions; RCA part/dwg A-8832305-501; p/o O-3608	Element of Optical Lens System
O-3623		BALL BEARING: stainless steel; spherical; 0.187 in. dia; RCA part/dwg K-76757-39; p/o O-3608	Detent for O-3627
O-3624	2	SPRING: helical compression type; detent spring for slide assembly; 0.020 in. dia music wire, cadmium plated; $\frac{1}{16}$ in. lg by 0.171 in. OD; eight turns; squared ends; mounts by insertion; RH winding; RCA part/dwg B-470448-2; p/o 3608	Spring Loads, O-3623

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)**  
**RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
O-3625	2	ECCENTRIC: to stabilize lens arm assembly and provide mounting for spring; stainless steel, passivating dip finish; cylindrical shape; $\frac{3}{4}$ in. lg by 0.187 in. dia overall; mounted by no. 6-32 thread by $\frac{5}{16}$ in. lg; large end 0.187 in. dia by $\frac{1}{16}$ in. lg to undercut 0.120 in. dia by 0.40 in. wide to 0.187 in. dia by 0.273 in. lg to smaller end no. 6-32 thread by $\frac{3}{8}$ in. lg, smaller end center line parallel to larger end center line and 0.020 in. away; larger end has slot $\frac{1}{32}$ in. wide by $\frac{1}{32}$ in. deep and parallel to larger end center line; RCA part/dwg A-8848172-1; p/o 3608	Guide Pin for O-3608
O-3626	2	ECCENTRIC: to adjust location of lamp filaments; brass, chemical black and oil finish; cylindrical shape; 0.171 in. dia by $\frac{3}{32}$ in. lg; snag ring mounted in bushing; larger end 0.171 in. dia by $\frac{3}{32}$ in. lg to offset smaller end, smaller end center line parallel to larger end center line and 0.046 in. away, smaller end 0.124 in. dia by 0.025 in. lg to undercut 0.095 in. dia by 0.040 in. lg to 0.124 in. dia by 0.060 in. lg to back of large end; smaller end joined to larger end cutaway to larger dia by 0.010 in. lg; larger end has slot $\frac{1}{32}$ in. wide by $\frac{1}{32}$ in. deep on center line; RCA part/dwg A-8834046-1; p/o 3608	Assists in Adjustment of Projection Lamps
O-3627	2	BRACKET: provides means for shifting from normal to spare lamp; angle bar w/ pins; aluminum alloy angle w/ four brass and one steel pins; black aluminite finish angle, chemical black pins; right angle bar w/ projecting pins; $4\frac{3}{4}$ in. lg by $\frac{7}{16}$ in. wide by $\frac{3}{8}$ in. deep with pins extending $1\frac{1}{4}$ in. on top; two mounting holes in top 0.125 in. dia, 2.531 in. C to C; $1\frac{1}{16}$ in. lg opening in top $1\frac{3}{4}$ in. from end, two "V" slots and cutaway in $1\frac{1}{8}$ in. lg section at other end; two rounded end openings 1 in. lg in side; RCA part/dwg A-8834737-501; p/o 3608	Supports Projection Lamps
O-3628		RECEIVER, SUB-ASSEMBLY: principal parts c/o one panel; one master dial gear train (less all electrical parts, band change gearing, lens assemblies, all dials); aluminum alloy panel, navy green finish; frequency range 5 bands; band no. 1—14 to 30 kc; band no. 2—30 to 63 kc; band no. 3—63 to 133 kc; band no. 4—133 to 283 kc; band no. 5—283 to 600 kc; 6.437 in. lg by 7.437 in. high by $3\frac{3}{8}$ in. thick overall; six mounting holes 0.218 in. dia spaced $\frac{3}{4}$ in. from ea side and on $6\frac{1}{2}$ in. by $5\frac{1}{2}$ in. by 4 in. by 2 in. by 1.437 in. by 2.937 in. mounting center; RCA part/dwg A-8848521-504	Main Tuning Panel
O-3629 through O-3700		Not Used	
O-3701	Assemble from Component Parts	GEAR ASSEMBLY: p/o main tuning drive; spur gear w/ shaft and stop; phosphor bronze gear, chemical black and oil finish; stainless steel shaft, passivating dip finish; circular gear on end of straight shaft; $1\frac{5}{32}$ in. lg by 0.6041 in. OD gear and 0.2496 in. dia shaft; shaft mounting w/ triangular projection on stop circum to hold in place; taper pin all the way through stop, gear hub and shaft along dia; 27 involute teeth 48 diametral pitch on gear; RCA part/dwg M-460862-502	Initial Drive Gear
O-3702		Same as O-3602	Shaft for O-3718
O-3703	2	SCALE: u/o dial assembly E-314436; c/o one dial RCA part/dwg A-46312-1; one gear RCA part/dwg P-740389-2; cylindrical shape; 2 in. dia by 1 in. lg overall; mounts by 0.250 in. dia hole in gear; marked w/ calibration marks and numbers from 0-100 in tenths; dial riveted to gear; RCA part/dwg A-8843836-502	Logging Dial, Fine Scale
O-3704	2	SCALE: u/o dial assembly E-314436; c/o one dial RCA part/dwg A-46310-1; one gear RCA part/dwg B-453888-1; one cam RCA part/dwg B-456231-2; one dial holder RCA part/dwg A-8820969-1; cylindrical shape; $1\frac{3}{32}$ in. lg by $3\frac{7}{16}$ in. dia overall; mounts by 0.500 in. dia hole in gear; marked w/ calibration marks and numbers from 0-1000 by hundredths; dial riveted to dial holder; RCA part/dwg A-8843837-502	Logging Dial, Coarse Scale
O-3705		Same as O-3605	Stops Dial at End of Scale
O-3706		Same as O-3606	Secures Free End of O-3708
O-3707		Same as O-3607	Secures Free End of O-3705
O-3708	2	ARM, LENS ASSEMBLY: to adjust optical system; c/o one lens arm RCA part/dwg T-628730-1; one slide assembly RCA part/dwg A-8834737-501; one lens projection RCA part/dwg A-8832303-1; one bracket assembly RCA part/dwg A-8821404-501; one bracket assembly RCA part/dwg A-8821404-502; one cover RCA part/dwg B-456248-1; two lamps RCA part/dwg K-61114-12; one lamp holder RCA part/dwg M-458193-501; one lamp holder RCA part/dwg M-458193-502; rectangular shape; $5\frac{9}{32}$ in. lg by $1\frac{11}{16}$ in. wide by $2\frac{1}{16}$ in. high overall approx; RCA part/dwg A-8848529-502	Light Source for Optical Dial System
O-3709		Same as O-3609	Reduction Gear Between O-3718 and O-3717
O-3710		Same as O-3610	Mounts O-3709
O-3711		Same as O-3611	Drives O-3704
O-3712		Same as O-3612	Reduces Back Lash, Drive from O-3703 to O-3711 and O-3717
O-3713		Same as O-3613	Linkage Between O-3716 and O-3708
O-3714		Same as O-3614	Displaces O-3708 for Calibration Adjustment

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
O-3715		Same as O-3615	Shifts "Normal/Spare" Lamp Positions
O-3716		Same as O-3616	Actuates O-3713 and Band Switch Systems
O-3717		Same as O-3617	Drives O-3709
O-3718		SCALE: optical projection tuning scale; metal gear, glass scale; cylindrical shape; 3.812 in. dia by 0.656 in. wide by 0.250 in. ID overall approx; mounts $\frac{1}{4}$ in. shaft hole through hub; marked w/ calibrations in tenths; band no. 1—0.250 to 0.500; band no. 2—0.500 to 1.000; band no. 3—1.00 to 2.00; band no. 4—2.00 to 4.00; band no. 5—4.00 to 8.00; spring loaded scissor gear; RCA part/dwg B-455040-2	Provides Projection Dial Scale Markings
O-3719		Same as O-3619	Actuates S-3701
O-3720		Same as O-3620	Couples O-3718 to C-451
O-3721		Same as O-3621; p/o O-3708	Element of Optical Lens System
O-3722		Same as O-3622; p/o O-3708	Element of Optical Lens System
O-3723		Same as O-3623; p/o O-3708	Detent for O-3727
O-3724		Same as O-3624; p/o O-3708	Spring Loads, O-3723
O-3725		Same as O-3625; p/o O-3708	Guide Pin for O-3708
O-3726		Same as O-3626; p/o O-3708	Assists in Adjustment of Projection Lamps
O-3727		Same as O-3627; p/o O-3708	Supports Projection Lamps
O-3728		DIAL ASSEMBLY: c/o panel and master dial gear train (less all electrical parts, band change gearing, lens assembly, all dials); aluminum alloy panel, Navy grey enamel finish; frequency range 5 bands; band no. 1—0.25 mc to 0.5 mc; band no. 2—0.5 mc to 1.0 mc; band no. 3—1.0 mc to 2.0 mc; band no. 4—2.0 mc to 4.0 mc; band no. 5—4.0 mc to 8.0 mc; sq solid shape w/ one corner cut away; 6.437 in. lg by 7.437 in. high by $3\frac{3}{8}$ in. thick overall; six mounting holes 0.218 in. dia; holes are spaced $\frac{3}{4}$ in. from ea side and on $6\frac{1}{2}$ in., $5\frac{1}{2}$ in., 4 in., 2 in., 1.437 in., 2.937 in. mounting center; marked MEGACYCLES .25-50, .50-1.0, 1.0-2.0, 2.0-4.0, 4.0-8.0, DIM, LAMPS, CAL. ADJUST; ea band is subdivided by means of two scales into 1000 frequency divisions; large scale reads in hundredths, smaller scale has hundred subdivisions; has plastic window over scales for reading direct frequency (equipment for direct reading not supplied); RCA part/dwg A-8848521-505	Main Tuning Panel
O-3729 through O-3800		Not Used	
O-3801	4	GEAR ASSEMBLY: p/o main tuning drive; spur gear w/ shaft and stop; phosphor bronze gear, chemical black and oil finish; stainless steel shaft, passivating dip finish; circular gear on end of straight shaft; $1\frac{5}{32}$ in. lg by 0.4166 in. OD gear and 0.2496 in. dia shaft; shaft mounting w/ triangular projection on stop circum to hold in place; taper pin all the way through stop, gear hub and shaft along dia; 18 involute teeth, 48 diametral pitch on gear; RCA part/dwg M-460862-503	Initial Dial Drive Gear
O-3802		Same as O-3602	Shaft for O-3818
O-3803	4	SCALE: u/o dial assembly E-314436; c/o one dial RCA part/dwg A-46312-1; one gear RCA part/dwg P-740389-1; cylindrical shape; 2 in. dia by 1 in. lg overall; mounts by 0.250 in. dia hole in gear; marked w/ calibration marks and numbers from 0-100 in tenths; dial riveted to gear; RCA part/dwg A-8843836-503	Logging Dial, Fine Scale
O-3804	4	SCALE: u/o dial assembly E-314436; c/o one dial RCA part/dwg A-46310-1; one gear RCA part/dwg B-453888-1; one cam RCA part/dwg B-456231-3; one dial holder RCA part/dwg A-8820969-1; cylindrical shape; $1\frac{5}{32}$ in. lg by $3\frac{7}{16}$ in. dia overall; mounts by 0.500 in. dia hole in gear; marked w/ calibration marks and numbers from 0-1000 by hundredths; dial riveted to dial holder; RCA part/dwg A-8843837-503	Logging Dial, Coarse Scale
O-3805		Same as O-3605	Stops Dial at End of Scale
O-3806		Same as O-3606	Secures Free End of O-3808
O-3807		Same as O-3607	Secures Free End of O-3805
O-3808	4	ARM, LENS ASSEMBLY: to adjust optical system; c/o one lens arm RCA part/dwg T-628730-1; one slide assembly RCA part/dwg A-8834737-501; one lens projection RCA part/dwg A-8832303-1; one lens assembly RCA part/dwg A-8822305-501; one bracket assembly RCA part/dwg A-8821404-501; one bracket assembly RCA part/dwg A-8821404-502; one cover RCA part/dwg B-456248-1; two lamps RCA part/dwg K-61114-12; one lamp holder RCA part/dwg M-458193-501; one lamp holder RCA part/dwg M-458193-502; rectangular shape; $5\frac{1}{32}$ in. lg by $1\frac{1}{16}$ in. wide by $2\frac{1}{16}$ in. high overall approx; RCA part/dwg A-8848529-503	Light Source for Optical Dial System
O-3809		Same as O-3609	Reduction Gear Between O-3818 and O-3817
O-3810		Same as O-3610	Mounts O-3809

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
O-3811		Same as O-3611	Drives O-3804
O-3812		Same as O-3612	Reduces Back Lash, Drive from O-3803 to O-3811 and O-3817
O-3813		Same as O-3613	Linkage Between O-3816 and O-3808
O-3814		Same as O-3614	Displaces O-3808 for Calibration Adjustment
O-3815		Same as O-3615	Shifts "Normal/Spare" Lamp Positions
O-3816		Same as O-3616	Actuates O-3813 and Band Switch System
O-3817		Same as O-3617	Drives O-3809
O-3818		SCALE: optical projection tuning scale; metal gear, glass scale; cylindrical shape; 3.812 in dia by 0.656 in. wide by 0.250 in. ID overall approx; mounted by $\frac{1}{4}$ in. dia shaft hole through hub; marked w/ calibration in tenths; band no. 1—2.00 to 4.00; band no. 2—4.00 to 8.00; band no. 3—8.00 to 16.00; band no. 4—16.00 to 24.0; band no. 5—24.0 to 32.0; spring-loaded scissor gear; RCA part/dwg B-455040-3	Provides Projection Dial Scale Markings
O-3819		Same as O-3619	Actuates S-3801
O-3820		Same as O-3620	Couples O-3818 to C-651
O-3821		Same as O-3621	Element of Optical Lens System
O-3822		Same as O-3622	Element of Optical Lens System
O-3823		Same as O-3623	Detent for O-3827
O-3824		Same as O-3624	Spring Loads O-3823
O-3825		Same as O-3625	Guide Pin for O-3808
O-3826		Same as O-3626	Assists in Adjustment of Projection Lamps
O-3827		Same as O-3627	Supports Projection Lamps
O-3828		DIAL ASSEMBLY: c/o one panel and master dial gear train (less all electrical parts, band change gearing, lens assembly, all dials); aluminum alloy panel, Navy grey enamel finish; frequency range in 5 bands; band no. 1—2.0 mc to 4.0 mc; band no. 2—4.0 mc; band no. 3—8.0 mc to 16.0 mc; band no. 4—16.0 mc to 24.0 mc; band no. 5—25 mc to 32.0 mc; sq solid shape w/ one corner cut away; 6.437 in. lg by 7.437 in. high by $3\frac{3}{8}$ in. thick overall; six 0.281 in. dia mounting holes spaced $\frac{3}{4}$ in. from ea side and on $6\frac{1}{2}$ in., $5\frac{1}{2}$ in., 4 in., 2 in., 1.437 in., 2.937 in. mounting center; marked MEGACYCLES, 2.0-4.0, 4.0-8.0, 8.0-16.0, 16-24, 24-32, DIM, LAMPS, CAL. ADJUST; ea band is subdivided by means of two scales into 1000 frequency divisions; the large scale is divided into 10 parts of 100 ea, the smaller scale has 100 subdivisions; has plastic window over scales for direct frequency reading (direct reading equipment not supplied); RCA part/dwg A-8848521-506	Main Tuning Panel
O-3829 through O-4000		Not Used	
O-4001		Same as O-1701	Assists in Mounting J-4009
O-4002		P/o E-4005	Switching Link for Diversity Operation Isolation Network
O-4003 through O-4400		Not Used	
O-4401		Same as O-401	Shaft Extension for S-4401
O-4402		Same as O-402	Coupling for O-4401
O-4403	3	STRAP, CONNECTOR: for terminal link on oscillator box terminal board; brass w/ silver plate finish; straight strip, rounded ends, one forked; $3\frac{1}{32}$ in. lg by $\frac{3}{16}$ in. wide by 0.032 in. thick overall; mounted by slot w/ rounded ends $\frac{3}{16}$ in. lg, 0.093 in. wide toward one end and fork 0.093 in. wide, $\frac{3}{64}$ in. deep; rounded at other end; RCA part/dwg A-8834059-3; p/o Z-4401	Oscillator Output Link to Mixer
O-4404	3	STRAP, CONNECTOR: for terminal link on oscillator box terminal board; brass w/ silver plate finish; straight strip, rounded ends, one forked; $1\frac{1}{32}$ in. lg by $\frac{3}{16}$ in. wide by 0.032 in. thick overall; mounted by slot w/ rounded ends 0.203 in. lg, 0.093 in. wide toward one end and fork 0.093 in. wide, $\frac{3}{64}$ in. deep; rounded at other end; RCA part/dwg A-8834059-4; p/o Z-4401	Internal External Oscillator Switching
P-701	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; $2\frac{1}{2}$ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-701, JAN-5636, V-701, C-717, C-718, R-704, R-703, C-716, C-714, R-702; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-18	Foundation for Z-701



**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
P-702 through P-800		Not Used	
P-801	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-801, JAN-5636, V-801, R-803, R-802, R-801, C-813, C-814, C-812; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-19	Foundation for Z-801
P-802 through P-900		Not Used	
P-901	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-901, JAN-5636, V-901, R-903, R-902, C-913, R-901, C-914, C-912; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-20	Foundation for Z-901
P-902 through P-1000		Not Used	
P-1001	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle held in place by locking device on top; marked w/ Z-1004, JAN-5899, V-1001, C-1031, C-1032, R-1007, R-1006; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-8	Foundation for Z-1004
P-1002	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1006, JAN-5899, V-1002, C-1035, C-1036, R-1011, R-1010; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-9	Foundation for Z-1006
P-1003	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle held in place by locking device on top; marked w/ Z-1008, JAN-5899, V-1003, C-1039, C-1041, R-1017, R-1014; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-10	Foundation for Z-1008
P-1004	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1010, JAN-5636, V-1004, R-1020, R-1019, R-1021, C-1048, C-1047, R-1016, R-1015, C-1049; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-11	Foundation for Z-1010
P-1005	4	CHASSIS: brass hot tin dipped frame, top plate material brass, black lacquer finish, phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.109 in. wide by 0.781 in. thick overall approx; mounts by insertion in receptacle, held by locking device at top; marked w/ Z-1012, JAN-5647, V-1005 and C-1052; six terminals on sq end, four terminals on rounded section, four insulated terminals and two ground terminals; RCA part/dwg C-748227-1	Foundation for Z-1012
P-1006	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.109 in. wide by 0.781 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1013, JAN-5647, V-1006; six terminals on sq end, four terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748227-2	Foundation for Z-1013
P-1007	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1014, JAN-5718, V-1007, R-1025, R-1023, C-1054, C-1055, R-1026, C-1056; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-12	Foundation for Z-1014
P-1008 through P-1100		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
P-1101	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.109 in. wide by 0.781 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1101, JAN-5647, V-1101, C-1114, R-1104, R-1105, R-1102, R-1103, R-1101; six terminals on sq end, four terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748227-3	Foundation for Z-1101
P-1102	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1102, JAN-5718, V-1102, R-1107, R-1106, C-1102; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-13	Foundation for Z-1102
P-1103	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.109 in. wide by 0.781 in. thick overall approx; mounts by insertion in receptacle, held in position by locking device on top; marked w/ Z-1103, JAN-5647, V-1103, R-1116, C-1103, R-1117, R-1115; six terminals on sq end, four terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748227-4	Foundation for Z-1103
P-1104	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1104, JAN-5719, V-1104, R-1114, C-1104, R-1119, R-1120, R-1121, R-1118, C-1115; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-14	Foundation for Z-1104
P-1105	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1105, JAN-5718, V-1105, C-1105, R-1122, R-1123, R-1124, C-1106; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-15	Foundation for Z-1105
P-1106	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.109 in. wide by 0.781 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1106, JAN-5647, V-1106, R-1127, R-1126, C-1107, R-1125; six terminals on sq end, four terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748227-5	Foundation for Z-1106
P-1107	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.109 in. wide by 0.781 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1107, JAN-5647, V-1107, R-1128, R-1129, C-1108, R-1130; six terminals on sq end, four terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748227-6	Foundation for Z-1107
P-1108	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion into receptacle, held in place by locking device on top; marked w/ Z-1108, JAN-5719, V-1108, R-1132, R-1131, R-1135, R-1134, R-1136, C-1109, R-1133; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-16	Foundation for Z-1108
P-1109	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1109, JAN-5902, V-1109, C-1110, C-1111; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-17	Foundation for Z-1109
P-1110 through P-1200		Not Used	
P-1201	4	CHASSIS: brass hot tin dipped frame, top plate material brass, black lacquer finish, phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held by locking device at top; eight male pins marked w/ letters and standard characters Z-1201, JAN-5718, V-1201, R-1202, R-1201, R-1203, C-1207, C-1204; eight terminals on rounded section of base, eight male pins four ea on opposite corners of sq section of base, four insulated terminals and two ground terminals; RCA part/dwg C-748226-1	Foundation for Z-1201

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
P-1202	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1202, JAN-5718, V-1202, R-1205, C-1206, R-1204, C-1205; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-2	Foundation for Z-1202
P-1203 through P-1300		Not Used	
P-1301	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle held in place by locking device on top; marked w/ Z-1302, JAN-5840, V-1301, R-1302, C-1303, R-1305, R-1304, R-1303, C-1301, C-1302; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-7	Foundation for Z-1301
P-1401	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1401, JAN-5718, V-1401, C-1403, R-1404, R-1401, C-1402, C-1404, C-1408, C-1406, R-1403; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-3	Foundation for Z-1401
P-1402	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1402, JAN-5636, V-1402, R-1407, C-1410, R-1410, R-1405, R-1409, R-1406, C-1409; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-4	Foundation for Z-1402
P-1403 through P-1500		Not Used	
P-1501	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1501, JAN-5718, V-1501, R-1502, C-1508, R-1501, C-1507, C-1504, R-1503; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-5	Foundation for Z-1501
P-1502	4	CHASSIS: chassis and top plate brass sheet, satin black synthetic finish, mica-filled phenolic base, handle for plunger music wire; rectangular shape; 2½ in. lg by 1.281 in. wide by 1.109 in. thick overall approx; mounts by insertion in receptacle, held in place by locking device on top; marked w/ Z-1502, JAN-5718, V-1502, R-1506, R-1505, C-1506, R-1054, C-1505; eight terminals on sq end, eight terminals on rounded section, four insulated terminals, two ground terminals; RCA part/dwg C-748226-6	Foundation for Z-1502
R-101		RESISTOR, FIXED, COMPOSITION: 2200 ohms $\pm 10\%$ ; ½ w; characteristic F; 0.406 in. lg by 0.175 in. dia max; insulated, resistant to salt water; two axial wire lead terminals; color coded; Allen Bradley Type EB-2221; RCA part/dwg K-82283-66	Antenna Input Divider, T-101
R-102		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF122K; 1200 ohms $\pm 10\%$ ; ½ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-63	Antenna Input Divider, T-102
R-103		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF471K; 470 ohms $\pm 10\%$ ; ½ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-58	Antenna Input Divider, T-103
R-104		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF221K; 220 ohms $\pm 10\%$ ; ½ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-54	Antenna Input Divider, T-103
R-105		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF121K; 120 ohms $\pm 10\%$ ; ½ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-51	Antenna Input Divider, T-104
R-106		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF225K; 2.2 meg; ½ w; characteristic F; 0.375 in. max lg by 0.138 in. max dia less terminals; insulated, resistant to salt water, and humidity; two axial wire lead terminals no. 21 AWG 1½ in. lg; spec JAN-R-11; RCA part/dwg P-722318-102	Antenna Input Bleeder, Type I Antenna Unit
R-107		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF104K; 100,000 ohms $\pm 10\%$ ; ½ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-86	Grid Resistor, V-101

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R-108		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF271J; 270 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals, spec JAN-R-11; RCA part/dwg P-722318-145	Cathode Resistor, V-101
R-109	6	RESISTOR, FIXED, COMPOSITION: 4700 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia max; insulated, resistant to salt water; two axial wire lead terminals no. 21 AWG $1\frac{1}{2}$ in. lg min; color coded; Allen Bradley Type EB-4721; RCA part/dwg K-82283-70; p/o Z-101	Screen Decoupling Resistor, V-101
R-110 through R-125		Not Used	
R-126		Same as R-107; p/o Z-126	Grid Bias Resistor, V-126
R-127		Same as R-108; p/o Z-126	Cathode Resistor, V-126
R-128		Same as R-109	Screen Decoupling Resistor, V-126
R-129		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF473K; 47,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-82	Bias Network Resistor, V-126
R-130		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF683K; 68,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-84	Bias Return Resistor, V-126
R-131		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF823K; 82,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-85; p/o Z-126	Log of Voltage Switch to R-251A
R-132 through R-150		Not Used	
R-151		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF101K; 100 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals no. 21 AWG $1\frac{1}{2}$ in. lg; spec JAN-R-11; RCA part/dwg P-722318-50	Loading Resistor, T-153 Primary
R-152		Same as R-103	Loading Resistor, T-154 Primary
R-153		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF271K; 270 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia, less terminals; insulated, resistant to salt water, and humidity; two axial wire lead terminals; color coded; spec JAN-R-11; RCA part/dwg C-722318-55	Loading Resistor, T-155 Primary
R-154		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF273K; 27,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-79; p/o Z-151	No. 3 Grid Leak Resistor, V-151
R-155		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF471J; 470 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-151; p/o Z-151	Cathode Resistor, V-151
R-156		Same as R-101; p/o Z-151	Screen Decoupling Resistor, V-126
R-157 through R-200		Not Used	
R-201		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF333K; 33,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-80; p/o Z-201	Grid Resistor, V-204
R-202		Same as R-101; p/o Z-201	Cathode Resistor, V-201
R-203		Same as R-101; p/o Z-201	Plate Supply Decoupling, V-201
R-204		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF474K; 470,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-94; p/o Z-201	Screen Dropping Resistor, V-201
R-205		Same as R-154; p/o Z-201	Plate Load Resistor, V-201
R-206 through R-350		Not Used	

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R-351		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF224J; 220,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. max lg by 0.138 in. max dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-215	Secondary Loading Resistor, T-351
R-352	Same as R-204; p/o Z-201		No. 1 Grid Leak Resistor, V-351
R-353		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF473J; 47,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-199; p/o Z-201	No. 3 Grid Leak Resistor, V-351
R-354		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF681J; 680 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; color coded; MIL spec JAN-R-11A; RCA part/dwg C-722318-155; p/o Z-351	Cathode Resistor, V-351
R-355	Same as R-101; p/o Z-351		Screen Decoupling Resistor, V-351
R-356	Same as R-204; p/o Z-351		Grid Leak Resistor, V-352
R-357	Same as R-155; p/o Z-351		Cathode Load Resistor, V-352
R-358	Same as R-101; p/o Z-351		Plate Decoupling Resistor, V-352
R-359 through R-400	Not Used		
R-401		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF222J; 2200 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg C-722318-167	Cathode Resistor, V-401, Band 1
R-402		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF152J; 1500 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg C-722318-163	Cathode Resistor, V-401, Band 2
R-403		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF331J; 330 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg C-722318-147	Cathode Resistor, V-401, Band 3
R-404		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF121J; 120 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg C-722318-137	Cathode Resistor, V-401, Band 4
R-405		RESISTOR, FIXED, COMPOSITION: 39,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; derated from 100% of working v at 70°C to 0 v at 150°C; 0.375 in. lg by 0.140 in. dia; insulated, resistant to salt water; two axial wire lead terminals; color coded; Allen Bradley Type EB-3931; RCA part/dwg K-82283-81; p/o Z-401	Grid Leak Resistor, V-401
R-406	Same as R-101		Screen Decoupling Resistor, V-401
R-407		RESISTOR, FIXED, COMPOSITION: 4700 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.406 in. lg by 0.175 in. dia max; insulated, resistant to salt water; two axial wire lead terminals no. 21 AWG $1\frac{1}{2}$ in. lg min; color coded; Allen Bradley Type EB-4725; RCA part/dwg K-82283-175; p/o Z-401	Plate Load Resistor, V-401
R-408	Same as R-101; p/o Z-401		Plate Supply Decoupling Resistor, V-401
R-409 through R-550	Not Used		
R-551		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF223J; 22,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia less terminals; insulated, resistant to humidity, and salt water; two axial wire lead type terminals; 0.028 in. dia by 1.5 in. lg; color coded; spec JAN-R-11A; RCA part/dwg C-722318-191; p/o Z-551	No. 3 Grid Leak Resistor, V-551
R-552		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF181J; 180 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia less terminals; insulated, resistant to humidity, and salt water; two axial wire lead type terminals 0.028 in. dia by 1.5 in. lg; color coded; spec JAN-R-11A; RCA part/dwg C-722318-141; p/o Z-551	Cathode Resistor, V-551
R-553	Same as R-204; p/o Z-551		No. 1 Grid Leak Resistor, V-551
R-554	Same as R-101; p/o Z-551		Screen Decoupling Resistor, V-551
R-555	Same as R-204; p/o Z-551		Grid Leak Resistor, V-552
R-556	Same as R-155; p/o Z-551		Cathode Resistor, V-552
R-557	Same as R-101; p/o Z-551		Plate Decoupling Resistor, V-552
R-558 through R-700	Not Used		

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R-701		Same as R-101	Plate Decoupling Resistor, V-201
R-702		RESISTOR, FIXED, COMPOSITION: 10,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water; two axial wire lead terminals; color coded; Allen Bradley Type EB-1031; RCA part/dwg K-82283-74; p/o Z-701	No. 2 Grid Leak Resistor, V-701
R-703		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF105K; 1 meg $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-98; p/o Z-701	No. 1 Grid Leak Resistor, V-701
R-704		Same as R-103; p/o Z-701	Cathode Resistor, V-701
R-705		RESISTOR, FIXED, COMPOSITION: 8200 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; derated from 100% of working v at 70°C to 0 v at 150°C; 0.375 in. lg by 0.140 in. dia; insulated, resistant to salt water; two axial wire lead terminals; color coded; Allen Bradley Type EB-8221; RCA part/dwg K-82283-73	Plate Decoupling Resistor, V-701
R-706 through R-800		Not Used	
R-801		Same as R-702; p/o Z-801	No. 2 Grid Leak Resistor, V-801
R-802		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF103K; 10,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-74; p/o Z-801	No. 1 Grid Leak Resistor, V-801
R-803		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF181K; 180 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-53; p/o Z-801	Cathode Resistor, V-801
R-804		Same as R-101	Plate Decoupling Resistor, V-801
R-805		Same as R-101	Plate Decoupling Resistor, V-351
R-806 through R-900		Not Used	
R-901		Same as R-702; p/o Z-901	No. 3 Grid Leak Resistor, V-901
R-902		Same as R-802; p/o Z-901	No. 1 Grid Leak Resistor, V-901
R-903		Same as R-803; p/o Z-901	Cathode Resistor, V-901
R-904		Same as R-101	Plate Decoupling Resistor, V-901
R-905		Same as R-101	Plate Decoupling Resistor, V-551
R-906 through R-1000		Not Used	
R-1001		RESISTOR, THERMAL: temp compensating resistor; carbon composition w/ certain metallic oxides; disk type, $1\frac{1}{32}$ in. dia by $\frac{5}{32}$ in. thick; mounts by two radial wire leads 2 in. lg by 0.032 in. dia; RCA part/dwg B-465817-1	Gain Compensation Resistor, V-1003
R-1002		Not Used	
R-1003		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF333J; 33,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire leads no. 21 AWG $1\frac{1}{2}$ in. lg; spec JAN-R-11; RCA part/dwg P-722318-195; p/o Z-1003	Element of Z-1003
R-1004		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF562J; 5600 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-177; p/o Z-1003	Element of Z-1003
R-1005		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF125K; 1.2 meg $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-99	Automatic Gain Control Decoupling Resistor, V-1001
R-1006		Same as R-153	Cathode Resistor, V-1001
R-1007		Same as R-101	Screen Decoupling Resistor, V-1001
R-1008		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF153J; 15,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals no. 21 AWG $1\frac{1}{2}$ in. lg; spec JAN-R-11; RCA part/dwg P-722318-187; p/o Z-1005	Loads L-1011
R-1009		Not Used	
R-1010		Same as R-153	Cathode Resistor, V-1002

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R-1011		Same as R-101	Screen Decoupling Resistor, V-1002
R-1012		Same as R-1008; p/o Z-1007	Loads L-1012
R-1013		Not Used	
R-1014		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF102K; 1000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-62	With R-1001, Cathode Resistor, V-1003
R-1015		Same as R-129; p/o Z-1010	Screen Dropping Resistor, V-1004
R-1016		Same as R-129	Plate Load Resistor, V-1004
R-1017		Same as R-101	Screen Decoupling Resistor, V-1003
R-1018		Not Used	
R-1019		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF472K; 4700 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-70	No. 1 Grid Leak Resistor, V-1004
R-1020		Same as R-1019	No. 3 Grid Leak Resistor, V-1004
R-1021		Same as R-1014	Cathode Resistor, V-1004
R-1022		Not Used	
R-1023		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF683J; 68,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-203; p/o Z-7014	Grid Leak Resistor, V-1007
R-1024		Same as R-1008; p/o Z-1011	Loads L-1013
R-1025		Same as R-103; p/o Z-1024	Cathode Resistor, V-1007
R-1026		Same as R-109; p/o Z-1024	Plate Decoupling Resistor, V-1007
R-1027		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF393K; 39,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-81	Diode Load Resistor, V-1005
R-1028		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF474J; 470,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire leads, no. 21 AWG $1\frac{1}{2}$ in. lg; spec JAN-R-11; RCA part/dwg P-722318-223	With R-1029, Automatic Gain Control Delay Voltage Divider
R-1029		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF395J; 3.9 meg $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. max lg by 0.138 in. max dia; insulated, resistant to humidity, and salt water; two axial wire lead terminals, no. 21 AWG $1\frac{1}{2}$ in. lg; color coded; spec JAN-R-11; RCA part/dwg C-722318-245	With R-1028, Automatic Gain Control Delay Voltage Divider
R-1030		Same as R-1005	Automatic Gain Control Decoupling and Time Constant
R-1031		Same as R-1005	With C-1066, Time Constant Circuit, V-1003 Grid
R-1032		Same as R-106	Signal Reduction, V-1004 Plate
R-1033		Same as R-101	Plate Supply Decoupling Resistor, V-1004
R-1034 through R-1100		Not Used	
R-1101		Same as R-703; p/o Z-1101	Output Coupling, V-1101 Cathode
R-1102		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF823J; 82,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-205; p/o Z-1101	With R-1103, Dividing Network, V-1101 Plate
R-1103		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF124J; 120,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals no. 21 AWG $1\frac{1}{2}$ in. lg; spec JAN-R-11; RCA part/dwg P-722318-209; p/o Z-1101	With R-1102, Dividing Network, V-1101 Plate
R-1104		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF274K; 270,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia less terminals; insulated, resistant to salt water, and humidity; two axial wire lead type terminals 0.028 in. dia by 1.5 in. lg; color coded; Allen Bradley Type EB-2741; spec JAN-R-11; RCA part/dwg P-722318-91; p/o Z-1101	Detector Signal Filtering
R-1105		Same as R-703; p/o Z-1101	Cathode Return, V-1101
R-1106		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF821K; 820 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-61	Cathode Resistor, V-1102

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R-1107		Same as R-130	Plate Load Resistor, V-1102
R-1108		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF155J; 1.5 meg $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. max lg by 0.138 in. max dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals no. 21 AWG $\frac{1}{2}$ in. lg; color coded; spec JAN-R-11; RCA part/dwg C-722318-235	Audio Input Filtering
R-1109		Same as R-1023	Gain Compensation in "Broad" Audio Operation
R-1110		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF475K; 4.7 meg $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia less terminals; insulated, resistant to salt water, and humidity; two axial wire lead terminals 0.028 in. dia by 1.5 in. lg; color coded; spec MIL-R-11A; RCA part/dwg C-722318-106	Grid Leak Resistor, V-1104
R-1111		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF273J; 27,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-193	Driving Impedance to Z-1110
R-1112		Same as R-204	Grid Leak Resistor, V-1102
R-1113		Same as R-204	Part of "Limiter" Control Network
R-1114		Same as R-1003; p/o Z-1104	Output Load Resistor, V-1104 Plate
R-1115		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF104J; 100,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-207; p/o Z-1103	With R-1116 and R-1117 Cathode Bias Network, V-1103
R-1116		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF154J; 150,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-211; p/o Z-1103	With R-1115 and R-1117 Cathode Bias Network, V-1103
R-1117		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF334J; 330,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-213; p/o Z-1103	With R-1115 and R-1116 Cathode Bias Network, V-1103
R-1118		Same as R-1117; p/o Z-1104	Coupling V-1104 Plate to V-1103 Plate
R-1119		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF272J; 2700 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; color coded; spec JAN-R-11A; RCA part/dwg C-722318-169; p/o Z-1104	Cathode Resistor, V-1104
R-1120		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF134J; 130,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; color coded; spec JAN-R-11A; RCA part/dwg C-722318-210	With R-1119, Bias Network for V-1104 Cathode
R-1121		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF274J; 270,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-217	Plate Load Resistor, V-1104
R-1122		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF124K; 120,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-87; p/o Z-1105	Grid Leak Resistor, V-1105
R-1123		Same as R-1106; p/o Z-1105	Cathode Resistor, V-1105
R-1124		Same as R-130; p/o Z-1105	Plate Load Resistor, V-1105
R-1125		Same as R-204; p/o Z-1106	With R-1126 and R-1127 Cathode Bias Network, V-1106
R-1126		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF392K; 3900 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-69; p/o Z-1106	With R-1125 and R-1127 Cathode Bias Network, V-1106
R-1127		Same as R-107; p/o Z-1106	With R-1125 and R-1126 Cathode Bias Network, V-1106
R-1128		Same as R-107; p/o Z-1107	With R-1129 and R-1130 Cathode Bias Network, V-1107
R-1129		Same as R-1126; p/o Z-1107	With R-1128 and R-1130 Cathode Bias Network, V-1107
R-1130		Same as R-204; p/o Z-1107	With R-1128 and R-1129 Cathode Bias Network, V-1107
R-1131		Same as R-1005; p/o Z-1108	Grid Leak Resistor, V-1108
R-1132		Same as R-1119; p/o Z-1108	Cathode Resistor, V-1108



TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R-1133		Same as R-204; p/o Z-1108	Plate Load Resistor, V-1108
R-1134		Same as R-1115; p/o Z-1108	With R-1132, Feedback Network, V-1109 to V-1108
R-1135		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF122J; 1200 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-161; p/o Z-1108	Grid Leak Resistor, V-1109
R-1136		RESISTOR, FIXED, COMPOSITION: 680 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.140 in. dia; insulated, resistant to salt water; two axial wire lead terminals; color coded; Allen Bradley Type EB-6811; RCA part/dwg A-82283-60; p/o Z-1108	Cathode Resistor, V-1109
R-1137		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF475J; 4.7 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. max lg by 0.138 in. max dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals no. 21 AWG $1\frac{1}{2}$ in. lg; color coded; spec JAN-R-11; RCA part/dwg C-722318-247; p/o Z-1108	P/o "Silencer" Control Network
R-1138		Same as R-204	Grid Leak Resistor, V-1109
R-1139 through R-1200		Not Used	
R-1201		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF225J; 2.2 meg $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-239; p/o Z-1201	Grid Leak Resistor, V-1201
R-1202		Same as R-155; p/o Z-1201	Common Cathode Resistor, V-1201 and V-1202
R-1203		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF123J; 12,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals no. 21 AWG $1\frac{1}{2}$ in. lg; spec JAN-R-11; RCA part/dwg P-722318-185; p/o Z-1201	Plate Load Resistor, V-1201
R-1204		Same as R-1004; p/o Z-1202	Plate Load Resistor, V-1202
R-1205		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF822J; 8200 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-181; p/o Z-1202	Grid Leak Resistor, V-1202
R-1206		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF150K; 15 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia less terminals; insulated; resistant to moisture; two axial wire lead type terminals; $1\frac{1}{2}$ in. lg by 0.028 in. dia; color coded; spec JAN-R-11; RCA part/dwg C-722318-40; p/o Z-1201	Feedback Element, V-1201
R-1207 through R-1300		Not Used	
R-1301		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF222K; 2200 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-66; p/o Z-1302	Plate Supply Decoupling Resistor, V-1301
R-1302		Same as R-1014; p/o Z-1302	Cathode Resistor, V-1301
R-1303		Same as R-154	Screen Load Resistor, V-1301
R-1304		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF223K; 22,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-78; p/o Z-1302	Plate Load Resistor, V-1301
R-1305		Same as R-107; p/o Z-1302	Grid Leak Resistor, V-1301
R-1306 through R-1400		Not Used	
R-1401		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF105J; 1 meg $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-231; p/o Z-1401	Grid Leak Resistor, V-1401
R-1402		Same as R-101	Plate Supply Decoupling Resistor, V-1401
R-1403		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF563J; 56,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-201; p/o Z-1401	Plate Load Resistor, V-1401
R-1404		Same as R-155; p/o Z-1401	No. 3 Grid Leak, V-1402

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R-1405		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF184J; 180,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. max lg by 0.138 in. max dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-213; p/o Z-1402	Cathode Resistor, V-1402
R-1406		Same as R-401; p/o Z-1402	No. 1 Grid Leak, V-1402
R-1407		Same as R-1203; p/o Z-1402	Screen Decoupling Resistor, V-1402
R-1408		Same as R-101	Plate Supply Decoupling Resistor, V-1402
R-1409		Same as R-1203; p/o Z-1402	Plate Load Resistor, V-1402
R-1410		Same as R-1405; p/o Z-1402	P/o Multivibrator Time Constant Network, V-1402
R-1411		RESISTOR, VARIABLE, COMPOSITION: 5000 ohms $\pm 20\%$ ; 0.5 w; 40°C continuous operation; three solder lug terminals; metal case $\frac{3}{4}$ in. dia by $\frac{3}{8}$ in. deep, enclosed sliding-brush type; metal screwdriver slotted shaft $\frac{7}{16}$ in. lg by 0.125 in. dia; linear taper; insulated, no off position; normal torque; bushing mounted, $\frac{1}{4}$ in. lg by $\frac{1}{4}$ in. dia; non-turn device on $\frac{3}{8}$ in. radius at 9 o'clock; marked w/ C-746028-2, terminals hot solder dipped or gold plated; Chicago Tel. Supply Co., X-3534-5K-CPS-303; RCA part/dwg C-746028-2	Cathode Resistor, V-1401
R-1412 through R-1500		Not Used	
R-1501		Same as R-1201; p/o Z-1501	Grid Leak Resistor, V-1501
R-1502		Same as R-155; p/o Z-1501	Common Cathode Resistor, V-1501, V-1502
R-1503		Same as R-353; p/o Z-1501	Plate Load Resistor, V-1501
R-1504		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF103J; 10,000 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire leads no. 21 AWG $1\frac{1}{2}$ in. lg; spec JAN-R-11; RCA part/dwg P-722318-183; p/o Z-1502	Plate Load Resistor, V-1502
R-1505		Same as R-1023; p/o Z-1502	Grid Leak Resistor, V-1502
R-1506		Same as R-1014; p/o Z-1502	Output Loading, V-1502 Plate
R-1507		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF120J; 12 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; color coded; spec JAN-R-11A; RCA part/dwg C-722318-113	Parasitic Suppressor, V-1501
R-1508 through R-1600		Not Used	
R-1601		RESISTOR, VARIABLE, COMPOSITION: 500 ohms $\pm 20\%$ ; 2 w at 25°C; three solder lug terminals; enclosed metal case $1\frac{1}{16}$ in. dia by $\frac{3}{16}$ in. deep; slotted metal shaft $\frac{1}{4}$ in. dia by $\frac{1}{2}$ in. lg from mounting surface; linear taper; insulated contact arm, w/o off position; normal torque; $\frac{3}{8}$ -32 thread by $\frac{3}{8}$ in. lg mounting bushing; non-turn device located on $1\frac{1}{32}$ in. radius at 3 o'clock; operating temp range $-50^{\circ}\text{C}$ to $+100^{\circ}\text{C}$ ; will withstand 1000 v between terminal and mounting bushing for 1 min, and 100-hr salt spray; terminal hot tin dipped; marked w/ RCA part/dwg no.; will withstand acceleration of 8G Allen Bradley Type JU-5012, SD-3032; RCA part/dwg C-743461-26	Hum-bucking Adjustment V-1101 Heater Circuit
R-1602		RESISTOR, FIXED, COMPOSITION: JAN Type RC42BF393K; 39,000 ohms $\pm 10\%$ ; 2 w; characteristic BF; 0.750 in. lg by 0.370 in. dia; insulated, resistant to salt water; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722360-81	Bleeder Resistor, C-1602
R-1603	6	RESISTOR, FIXED, WIRE WOUND: JAN Type RW21J402; 4000 ohms $\pm 5\%$ ; 12.5 w at 200°C max continuous operating temp; 2 in. lg by $1\frac{3}{16}$ in. wide by $2\frac{1}{32}$ in. thick; resistant to humidity; coated per JAN-26A; two radial solder lug terminals 1 in. lg COT by $1\frac{1}{16}$ in. wide; stack mounted w/ two 0.196 in. dia mounting holes on $2\frac{3}{4}$ in. mounting center; spec JAN-R-26A; RCA part/dwg P-722463-647	Voltage Dropping Resistor, V-1603
R-1604		RESISTOR, FIXED, WIRE WOUND: JAN Type RW21J401; 400 ohms $\pm 5\%$ ; 12.5 w at 200°C; $3\frac{1}{4}$ in. lg by $1\frac{3}{16}$ in. wide by $2\frac{1}{32}$ in. high overall; resistant to humidity; two radial tab terminals 1 in. lg COT by $1\frac{1}{16}$ in. wide; stack mounted w/ two 0.196 in. dia mounting holes on $2\frac{3}{4}$ in. mounting center; RCA part/dwg P-722463-637	Voltage Dropping Resistor for Plate Supply Voltage
R-1605		TUBE, BALLAST: special current regulating tube; glass; 11.24 to 16.56 v, 0.140 to 0.160 amp; T-5 $\frac{1}{2}$ S bulb, $1\frac{1}{16}$ in. max lg less pins; seven pin base; Amperite Type 1HT4; RCA part/dwg B-464003-1	Regulates Local Oscillator Heater Current
R-1606 through R-2000		Not Used	

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R-2001		RESISTOR, VARIABLE, COMPOSITION: two sections, 10,000 ohms $\pm 20\%$ ea section; 2 w at 25°C; three solder lug terminals ea section; enclosed plastic case $1\frac{1}{16}$ in. dia by $1\frac{1}{16}$ in. lg; round metal shaft, $\frac{1}{4}$ in. dia by $\frac{3}{4}$ in. lg; panel unit, 26% resistance at 35% rotation, 10% resistance at 50% rotation, 3% resistance at 65% rotation; rear unit, 30% resistance at 35% rotation, 50% resistance at 50% rotation, 70% resistance at 65% rotation; insulated contact arm; w/o off position; normal torque; mounting bushing $\frac{3}{8}$ -32 by $\frac{3}{8}$ in. lg; non-turn device located on $1\frac{1}{32}$ in. radius at 3 o'clock; resistant to salt water; operating temp range -55°C to +85°C; marked w/ RCA part/dwg no.; 900 v test between terminal and mounting bushing; marked w/ RCA part/dwg no.; fungus proofed; Allen Bradley Type JJBU1032, P3048; RCA part/dwg P-737807-23	RF Gain (Manual) Control
R-2001A		P/o R-2001	
R-2001B		P/o R-2001	
R-2002		Same as R-130	Leg of Voltage Divider to R-2001B
R-2003		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF560J; 56 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. max lg by 0.138 in. max dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals no. 21 AWG $1\frac{1}{2}$ in. lg; color coded; spec JAN-R-11; RCA part/dwg C-722318-129	Multiplier for M-2001
R-2004		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF392J; 3900 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-173	"10 DB" Multiplier for M-2002
R-2005		Same as R-1135	"0 DB" Multiplier for M-2002
R-2006		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF621J; 620 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-154	Multiplier for M-2002
R-2007		RESISTOR, VARIABLE, COMPOSITION: two sections; panel unit, 1 meg $\pm 10\%$ ; rear unit, 100,000 ohms $\pm 20\%$ ; 2 w at 25°C; three solder lug terminals ea section; enclosed plastic case $1\frac{1}{16}$ in. dia by $1\frac{1}{16}$ in. lg; round metal shaft $\frac{1}{4}$ in. dia by $\frac{3}{4}$ in. lg; 2% resistance at 35% rotation, 10% resistance at 50% rotation, 26% resistance at 65% rotation; insulated contact arm; w/o off position; normal torque; mounting bushing $\frac{3}{8}$ -32 in. by $\frac{3}{8}$ in. lg; non-turn device located on $1\frac{1}{32}$ in. radius at 3 o'clock; resistant to salt water; operating temp range -55°C to +100°C; marked w/ RCA part/dwg no.; 900 v test between terminal and mounting bushing; marked w/ RCA part/dwg no.; fungus proofed; Allen Bradley Type JA-1051, 1042, P-3048; RCA part/dwg P-737807-22	"Output" Control
R-2007A		P/o R-2007	
R-2007B		P/o R-2007	
R-2008		RESISTOR, VARIABLE, COMPOSITION: 50,000 ohms $\pm 20\%$ ; 2 w at 25°C; three solder lug terminals; enclosed plastic w/ metal cover; $1\frac{1}{16}$ in. dia by $\frac{9}{16}$ in. deep; round metal shaft, $\frac{1}{4}$ in. dia by $\frac{3}{4}$ in. lg from mounting surface; counterclockwise Log "B," 35% resistance at 35% rotation, 10% resistance at 50% rotation, 3% resistance at 65% rotation; insulated contact arm; normal torque; $\frac{3}{8}$ -32 by $\frac{3}{8}$ in. lg mounting bushing; non-turn device located on $1\frac{1}{32}$ in. radius at 3 o'clock; operating temp range -50°C to +100°C; will withstand 1000 v between terminal and mounting bushing for 1 min and 100-hr salt spray; terminal hot tin dipped; marked w/ RCA part/dwg no.; will withstand acceleration of 8G; Allen Bradley Type JB-5032, P-3048; RCA part/dwg C-743461-29	Headphone Level Control
R-2009		Same as R-102	Headphone Circuit Termination
R-2010		Same as R-1203	"+20 DB" Multiplier for M-2002
R-2011		P/o X-2001	Neon Bulk Current Limiting
R-2012 through R-2100		Not Used	
R-2101		Same as R-2001	RF Gain (Manual) Control
R-2101A		P/o R-2101	
R-2101B		P/o R-2101	
R-2102		Same as R-1601	Diversity Gain Balance Control
R-2103		Same as R-551	Multiplier for M-2101
R-2104		Same as R-2004	"+10 DB" Multiplier for M-2102
R-2105		Same as R-1135	"0 DB" Multiplier for M-2102

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R-2106		RESISTOR, VARIABLE, COMPOSITION: 1 meg $\pm 20\%$ ; 2 w at 25°C; three solder lug terminals; enclosed plastic w/ metal cover; 1 $\frac{1}{16}$ in. dia by $\frac{1}{16}$ in. deep; round metal shaft, $\frac{1}{4}$ in. dia by $\frac{3}{4}$ in. lg from mounting surface; linear taper; insulated contact arm; w/o off position; normal torque; $\frac{3}{8}$ -32 by $\frac{3}{8}$ in. lg mounting bushing; non-turn device located on $1\frac{1}{32}$ in. radius at 3 o'clock; operating temp range -50°C to +100°C; will withstand 1000 v between terminal and mounting bushing for 1 min and 100-hr salt spray; terminal hot tin dipped; marked w/ RCA part/dwg no.; will withstand acceleration of 8G; Allen Bradley Type JU-1052, P-3048; RCA part/dwg C-743461-28	"Silencer" Control
R-2107	Same as R-2007		"Output" Control
R-2107A	P/o R-2107		
R-2107B	P/o R-2107		
R-2108	Same as R-2008		"Headphone Level" Control
R-2109	Same as R-102		Headphone Circuit Termination
R-2110	Same as R-1203		"+20 DB" Multiplier for M-2102
R-2111	Same as R-154		Automatic Gain Control Decoupling and Time Constant
R-2112	P/o X-2101		
R-2113	Same as R-131		Leg of Voltage Divider, R-2101
R-2114	Same as R-2006		Multiplier for M-2102
R-2115 through R-2200	Not Used		
R-2201	Same as R-2001		RF Gain (Manual) Control
R-2201A	P/o R-2201		
R-2201B	P/o R-2201		
R-2202	Same as R-1601		Diversity Gain Balance Control
R-2203	Same as R-551		Multiplier for M-2201
R-2204	Same as R-2004		"+10 DB" Multiplier for M-2202
R-2205	Same as R-1135		"0 DB" Multiplier for M-2202
R-2206	Same as R-2106		"Silencer" Control
R-2207	Same as R-2007		"Output" Control
R-2207A	P/o R-2207		
R-2207B	P/o R-2207		
R-2208	Same as R-2008		"Headphone Level" Control
R-2209	Same as R-102		Headphone Circuit Termination
R-2210	Same as R-1203		"+20 DB" Multiplier for M-2202
R-2211	Same as R-154		Automatic Gain Control Decoupling and Time Constant
R-2212	P/o X-2201		
R-2213	Same as R-131		Leg of Voltage Divider, R-2201
R-2214	Same as R-2006		Multiplier for M-2202
R-2215 through R-3000	Not Used		
R-3001	Same as R-1122		Automatic Gain Control Decoupling, V-3001
R-3002	Same as R-552		Cathode Resistor, V-3001
R-3003	RESISTOR, FIXED, COMPOSITION: JAN Type RC20GF222K; 2200 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic GF; 0.375 in. lg by 0.140 in. dia less terminals; insulated, resistant to salt water, and humidity; two axial wire lead type terminals; 0.033 in. dia by 1.5 in. lg; color coded; spec JAN-R-11A; Allen Bradley Type EB-0.5; RCA part/dwg K-8891491-66		Screen Decoupling
R-3004 through R-3034	Not Used		
R-3035	Same as R-552		Cathode Resistor, V-3035
R-3036	Same as R-3003		Screen Decoupling, V-3035
R-3037 through R-3100	Not Used		

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R-3101		Same as R-1122	With R-3102, Grid Leak for V-3101
R-3102		Same as R-204	With R-3101, Grid Leak for V-3101
R-3103		Same as R-151	Grid Decoupling, V-3101
R-3104		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF820J; 82 ohms $\pm 5\%$ ; $\frac{1}{2}$ w; characteristic BF; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals; spec JAN-R-11; RCA part/dwg P-722318-133	Cathode Resistor, V-3101
R-3105		Same as R-101	Screen Decoupling, V-3101
R-3106 through R-3134		Not Used	
R-3135		Same as R-1122	With R-3136, Grid Leak for V-3135
R-3136		Same as R-204	With R-3135, Grid Leak for V-3135
R-3137		Same as R-552	Cathode Resistor, V-3135
R-3138		Same as R-3003	Screen Decoupling, V-3135
R-3139 through R-3600		Not Used	
R-3601		RESISTOR, VARIABLE, COMPOSITION: 50 ohms $\pm 20\%$ ; 2 w at 25°C; three solder lug terminals; enclosed metal case $1\frac{1}{16}$ in. dia by $\frac{3}{16}$ in. deep; round metal shaft, $\frac{1}{4}$ in. dia by $\frac{3}{4}$ in. lg from mounting surface; linear taper; insulated contact arm; w/o off position; normal torque: $\frac{3}{8}$ -32 by $\frac{3}{8}$ in. lg mounting bushing; non-turn device located on $1\frac{1}{2}$ in. radius at 3 o'clock; operating temp range -50°C to +100°C; will withstand 1000 v between terminal and mounting bushing for 1 min, and 100-hr salt spray; terminal hot tin dipped; marked w/ RCA part/dwg no.; will withstand acceleration of 8G; Allen Bradley Type JU-5002, P-3048; RCA part/dwg C-743461-27	Regulates Intensity of Projection Lamps
R-3602	6	RESISTOR, FIXED, COMPOSITION: 47 ohms $\pm 10\%$ ; 1 w; characteristic F; 0.750 in. lg max by 0.280 in. dia max; insulated, resistant to salt water; two axial wire lead terminals; color coded; Allen Bradley Type GB-4701; RCA part/dwg K-90496-46	Supplements R-3601
R-3603 through R-3700		Not Used	
R-3701		Same as R-3601	Regulates Intensity of Projection Lamps
R-3702		Same as R-3602	Supplements R-3701
R-3703 through R-3800		Not Used	
R-3801		Same as R-3601	Regulates Intensity of Projection Lamps
R-3802		Same as R-3602	Supplements R-3801
R-3803 through R-4000		Not Used	
R-4001		RESISTOR, FIXED, COMPOSITION: JAN Type RC20BF331K; 330 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.138 in. dia; insulated, resistant to salt water, and humidity; two axial wire lead terminals no. 21 AWG $1\frac{1}{2}$ in. lg; spec JAN-R-11; RCA part/dwg P-722318-80	With C-2001, Antenna Isolation
R-4002		Not Used	
R-4003		Same as R-1206	
R-4004 through R-4400		Not Used	
R-4401		Same as R-201	Grid Leak Resistor, V-4401
R-4402		RESISTOR, FIXED, COMPOSITION: 12,000 ohms $\pm 10\%$ ; $\frac{1}{2}$ w; characteristic F; 0.375 in. lg by 0.140 in. dia less terminals; insulated, resistant to moisture; two axial wire lead type terminals, $1\frac{1}{2}$ in. lg by 0.033 in. dia; color coded; Allen Bradley Type EB-1231; RCA part/dwg A-82283-75	Plate Decoupling, V-4401
R-4403		Same as R-1206	Grid Decoupling, V-4401
R-4404		Same as R-354	Cathode Resistor, V-4401
S-101		SWITCH, ROTARY: 6 pole, 6 position, 6 throws; two sections; 2 amp, 500 v peak; silver contact; ceramic body; $12\frac{3}{64}$ in. high by 1 in. wide by $1\frac{1}{32}$ in. lg; shorting type contact; detent action; screw terminal on rotor, solder lug terminal on stator; two no. 6-32 tapped mounting holes in bracket on 0.468 in. mounting center; 0.0925 in. dia by $\frac{25}{64}$ in. lg crank type termination at end of shaft; crank has $\frac{5}{16}$ in. swing; shaft and crank extends $\frac{7}{8}$ in. beyond mounting bracket; RCA part/dwg C-743448-1	Band Switch, Type I Antenna Tuning Unit

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
S-101A		P/o S-101	
S-101B		P/o S-101	
S-102		SWITCH, SENSITIVE: SPDT; 125 to 250 v AC, 5 amp; plastic case; 2 <sup>3</sup> / <sub>32</sub> in. lg by 1/4 in. wide by 2 <sup>3</sup> / <sub>64</sub> in. high less terminals; plastic pin plunger type, 0.046 in. dia; 7 oz max operating pressure; 0.008 in. max differential in travel of actuating mechanism; 0.030 in. max pre-travel; 0.005 in. min over-travel; locking type one position, momentary other position; solder lug terminals; two mounting holes; one hole 0.096 in. lg by 0.088 in. wide, other hole 0.088 in. dia on 0.375 in. mounting center; Micro Switch Catalog no. ISMI; RCA part/dwg A-8835313-2	Switches C-102
S-103 through S-125		Not Used	
S-126		SWITCH, ROTARY: 6 pole, 6 position, 6 throws; two sections; 2 amp, 500 v peak; silver contact; ceramic body; 1 <sup>2</sup> / <sub>64</sub> in. high by 1 in. wide by 1 <sup>15</sup> / <sub>32</sub> in. lg; shorting type contact; detent action; screw terminal on rotor, solder lug terminal on stator; two no. 6-32 tapped mounting holes in bracket on 0.468 in. mounting center; 0.0925 in. dia by 2 <sup>5</sup> / <sub>64</sub> in. lg crank type termination at end of shaft; crank has 5/16 in. swing; shaft and crank extends 1/8 in. beyond mounting bracket; same as N17-S-65233-6617 except wafer contacts are 180 deg out of phase; RCA part/dwg C-743448-3	Band Switch, Type 1 RF Unit
S-126A		P/o S-126	
S-126B		P/o S-126	
S-127 through S-150		Not Used	
S-151		Same as S-126	Band Switch, Type I Mixer Unit
S-151A		P/o S-151	
S-151B		P/o S-151	
S-152 through S-200		Not Used	
S-201		Same as S-126	Band Switch, Type I Oscillator Unit
S-201A		P/o S-201	
S-201B		P/o S-201	
S-202 through S-350		Not Used	
S-351		Same as S-126	Band Switch, Type II Mixer Unit
S-351A		P/o S-351	
S-351B		P/o S-351	
S-352 through S-400		Not Used	
S-401		Same as S-126	Band Switch, Type II Oscillator Unit
S-401A		P/o S-401	
S-401B		P/o S-401	
S-402 through S-550		Not Used	
S-551		SWITCH, ROTARY: 6 pole, 6 position, 6 throws; two sections; 2 amp, 500 v peak; silver contact; ceramic body; 1 <sup>2</sup> / <sub>64</sub> in. high by 1 in. wide by 1 <sup>15</sup> / <sub>32</sub> in. lg; shorting type contact; detent action; screw terminal on rotor, solder lug terminal on stator; two no. 6-32 tapped mounting holes in bracket on 0.468 in. mounting center; 0.0925 in. dia by 2 <sup>5</sup> / <sub>64</sub> in. lg crank type termination at end of shaft; crank has 5/16 in. swing; shaft and crank extends 1/8 in. beyond mounting bracket; same as N17-S-65233-6567, except wafers are interchanged; RCA part/dwg C-743448-4	Band Switch, Type III Mixer Unit
S-551A		P/o S-551	
S-551B		P/o S-551	
S-552 through S-700		Not Used	
S-701		SWITCH, ROTARY: 2 pole, 6 position; single section; 2 amp, 500 v peak; silver contact; ceramic body; 1 <sup>7</sup> / <sub>16</sub> in. high by 1 in. wide by 0.843 in. lg; shorting type contact; detent action; screw type terminal on rotor, solder lug terminal on stator; two no. 2-56 by 3/16 in. deep tapped mounting holes on 1.187 in. mounting center; 1/8 in. dia shaft extends 1/32 in. beyond mounting surface w/ 1 <sup>15</sup> / <sub>32</sub> in. dia by 3/32 in. lg shoulder at switch end; RCA part/dwg M-458172-1	Band Switch, Type I First IF Unit

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
S-702		Same as S-701	Band Switch, Type I First IF Unit
S-703 through S-800		Not Used	
S-801		Same as S-701	Band Switch, Type II First IF Unit
S-802		Same as S-701	Band Switch, Type II First IF Unit
S-803 through S-1000		Not Used	
S-1001		SWITCH SECTION, ROTARY: 3 pole, 6 position; single section; 18 contacts; 2 amp, 500 v peak; silver contact; ceramic body; 1 $\frac{1}{16}$ in. lg by 1 in. wide by $\frac{1}{2}$ in. high overall; detent action; screw terminal on rotor, solder lug terminal on stator; two 0.086 in. dia mounting holes on 1.187 in. mounting center; 0.127 in. sq shaft hole centrally located in rotor; RCA part/dwg C-743426-2	Switches Inputs, Z-1001, Z-1002, Z-1003
S-1002		Same as S-1001	Switches Inputs, Z-1001, Z-1002, Z-1003
S-1003		Same as S-1001	Switches Output Circuits of Second IF Units
S-1004 through S-1100		Not Used	
S-1101		SWITCH, ROTARY: 5 poles, 6 positions; 36 contacts; 2 sections; 500 v peak, 2 amp; contacts, brass silver plated; ceramic wafers; 1 $\frac{1}{64}$ in. lg by 1 $\frac{1}{32}$ in. high by 1 $\frac{1}{2}$ in. wide incl shaft; used w/ external detent; solder lug terminals; one no. 4-40 self-clinching nut on ea side of bracket for mounting; shaft incl crank type coupling w/ 1 $\frac{1}{8}$ in. throw; Communication Products Type no. 55; RCA part/dwg C-748215-501	Mode Selection Audio Unit
S-1101A		P/o S-1101	
S-1101B		P/o S-1101	
S-1301		SWITCH SECTION, ROTARY: 2 pole, 9 position; single section; 18 contacts; 2 amp, 500 v peak; silver contact; ceramic body; 1 $\frac{1}{16}$ in. lg by 1 in. wide by $\frac{1}{2}$ in. high overall; detent action; screw type terminal on rotor, solder lug terminal on stator; two 0.086 in. dia mounting holes on 1.187 in. mounting center; 0.127 in. sq shaft hole centrally located in rotor; RCA part/dwg C-743426-3	Circuit Selection, BFO Unit
S-2001		SWITCH, TOGGLE: DPDT: JAN Type ST22K; 2 amp, 250 v; plastic case; 2 $\frac{1}{16}$ in. lg by 2 $\frac{3}{32}$ in. wide by 1 $\frac{1}{32}$ in. high; $\frac{1}{16}$ in. lg bat type handle; locking action normally closed in both positions; solder lug terminal; single hole mounting bushing 1 $\frac{5}{32}$ -32 in. by 1 $\frac{5}{32}$ in. lg; tropicalization treatment per JAN-T-152; RCA part/dwg B-426780-110	Main Power Switch
S-2002		SWITCH, TOGGLE: DPDT: JAN Type ST22N; 5 amps, 125 v AC or DC resistive load; phenolic body; 1 $\frac{9}{32}$ in. lg by 2 $\frac{3}{32}$ in. wide by 2 $\frac{3}{32}$ in. deep; $\frac{1}{16}$ in. lg bat type handle; locking action; solder lug terminal; single hole mounting bushing 1 $\frac{5}{32}$ -32 by $\frac{1}{4}$ in. lg; lever adaptable to luminous tip; spec JAN-S-23; RCA part/dwg B-426780-113	Turns Calibration "On/Off"
S-2003		SWITCH, TOGGLE: SPST: JAN Type ST12A; 6 amp continuous operating capacity; 5 amp 125 v, 2 amp 250 v resistive load; 3 amp 125 v, 1.5 amp 250 v inductive load, nominal ratings; black molded phenolic body; 1 $\frac{9}{32}$ in. lg by 2 $\frac{3}{32}$ in. wide by 2 $\frac{3}{32}$ in. deep body; bat type handle $\frac{1}{16}$ in. lg w/ 28 deg $\pm$ 4 deg throw; locking action, contact closed w/ lever up, contact open w/ lever down; solder lug terminal; one $\frac{3}{32}$ in. dia hole in ea terminal; single hole mounting bushing 1 $\frac{5}{32}$ -32 by 1 $\frac{5}{32}$ in. lg; flush mounting w/ non-turn keyway in bushing; incl two mounting nuts; spec JAN-S-23; RCA part/dwg M-426780-101	Standby Switch
S-2004		SWITCH, ROTARY: SPDT; 2 positions; single section; spring silver alloy contact on stator, solid silver contact on rotor; nylon fabric phenolic wafer, stainless steel or nickel plated brass body; 1 $\frac{1}{4}$ in. dia by $\frac{7}{8}$ in. lg approx; shorting type contact; momentary action in position no. 1, locking in position no. 2; solder lug terminal; single hole mounting bushing $\frac{3}{8}$ -32 by $\frac{3}{8}$ in. lg; $\frac{1}{4}$ in. dia by 2 $\frac{3}{32}$ in. lg stainless steel shaft; ambient operating temp range -54°C to +85°C; marked w/ RCA part/dwg no.; Oak Type F; RCA part/dwg M-458169-1	Controls Range of M-2001
S-2005		SWITCH, ROTARY: single pole, 4 position; three throws; single section; spring silver alloy contact on stator, solid silver contact on rotor; nylon fabric phenolic wafer, SS or nickel plated brass body; 1 $\frac{1}{4}$ in. dia by $\frac{7}{8}$ in. lg approx; shorting type contact; momentary action in position no. 1, other position locking action; solder lug terminal; single hole mounting bushing $\frac{3}{8}$ -32 by $\frac{3}{8}$ in. lg; $\frac{1}{4}$ in. dia by 2 $\frac{3}{32}$ in. lg stainless steel shaft; ambient operating temp range -45°C to +85°C; marked w/ RCA part/dwg no.; Oak Type F; RCA part/dwg M-458170-1	Controls Range of M-2002
S-2006 through S-2100		Not Used	
S-2101		Same as S-2001	Main Power Switch

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
S-2102		SWITCH, TOGGLE: DPDT; JAN Type ST12D; 6 amp continuous operating capacity, 5 amp 125 v, 2 amp 250 v resistive load, 3 amp 125 v, 1.5 amp 250 v inductive load, nominal rating; black molded phenolic body; 1 <sup>3</sup> / <sub>32</sub> in. lg by 2 <sup>3</sup> / <sub>32</sub> in. wide by 2 <sup>3</sup> / <sub>32</sub> in. deep body; bat type handle 1 <sup>1</sup> / <sub>16</sub> in. lg w/ 28 deg ±4 deg throw; locking action; solder lug terminal; one 3 <sup>3</sup> / <sub>32</sub> in. dia hole in ea terminal; single hole mounting bushing 1 <sup>5</sup> / <sub>32</sub> -32 by 1 <sup>5</sup> / <sub>32</sub> in. lg; flush mounting w/ non-turn keyway in bushing; spec JAN-S-23; incl two mounting nuts; RCA part/dwg M-426780-104	Turns Calibration "On/Off"
S-2103		Same as S-2003	Standby Switch
S-2104		Same as S-2004	Controls Range of M-2101
S-2105		Same as S-2005	Controls Range of M-2102
S-2106 through S-2200		Not Used	
S-2201		Same as S-2001	Main "Power" Switch
S-2202		Same as S-2102	Turns Calibrator "On/Off"
S-2203		Same as S-2003	Standby Switch
S-2204		Same as S-2004	Controls Range of M-2201
S-2205		Same as S-2005	Controls Range of M-2202
S-2206 through S-3000		Not Used	
S-3001		Same as S-101	Band Switch, Type II Antenna Tuning Unit
S-3001A		P/o S-3001	
S-3001B		P/o S-3001	
S-3002 through S-3034		Not Used	
S-3035		SWITCH, ROTARY: 3 pole, 6 position, 6 throw; single section; 2 amp, 500 v peak; silver contact; ceramic body; 1 <sup>2</sup> / <sub>64</sub> in. high by 1 in. wide by 2 <sup>3</sup> / <sub>32</sub> in. lg; shorting type contact; detent action; screw terminal on rotor, solder lug terminal on stator; two no. 6-32 tapped mounting holes in bracket on 0.468 in. mounting center; 0.0925 in. dia by 2 <sup>5</sup> / <sub>64</sub> in. lg crank type termination at end of shaft; crank has 5 <sup>1</sup> / <sub>16</sub> in. swing; shaft and crank extends 7 <sup>1</sup> / <sub>8</sub> in. beyond mounting bracket; RCA part/dwg C-743448-2	Band Switch RF Unit Coils
S-3036		Same as S-101	Band Switch Type II RF Unit Transformer
S-3037 through S-3100		Not Used	
S-3101		Same as S-101	Band Switch, Type III Antenna Tuning Unit
S-3101A		P/o S-3101	
S-3101B		P/o S-3101	
S-3102 through S-3134		Not Used	
S-3135		Same as S-3035	Band Switch, Type II RF Unit Coils
S-3136		Same as S-101	Band Switch, Type III RF Unit Transformers
S-3136A		P/o S-3136	
S-3136B		P/o S-3136	
S-3137 through S-3600		Not Used	
S-3601		SWITCH, SENSITIVE: SPDT; 10 amp, 115 v; plastic case; 1 <sup>3</sup> / <sub>32</sub> in. lg by 5 <sup>1</sup> / <sub>64</sub> in. wide by 1 <sup>3</sup> / <sub>32</sub> in. high overall; plunger actuated, 1 <sup>1</sup> / <sub>64</sub> in. lg by 7 <sup>1</sup> / <sub>64</sub> in. wide by 7 <sup>1</sup> / <sub>64</sub> in. high plunger; 6 to 14 oz operating pressure; 0.006 in. to 0.016 in. movement differential; 3 <sup>1</sup> / <sub>64</sub> in. max pre-travel; 1 <sup>1</sup> / <sub>32</sub> in. min over-travel; momentary; solder lug terminal, hot solder dipped; one 0.114 in. dia mounting hole and one 0.126 in. lg by 0.114 in. wide mounting hole on 0.875 in. by 0.406 in. mounting center; flat bosses around mounting holes for stack mounting; Micro Switch Type V3-1; RCA part/dwg K-8871821-2	Shifts "Normal/Spare" Lamp Connections
S-3701		Same as S-3601	Shifts "Normal/Spare" Lamp Connections
S-3801		Same as S-3601	Shifts "Normal/Spare" Lamp Connections
S-3802 through S-4400		Not Used	



TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
S-4401		Same as S-126	Band Switch, Type III Oscillator Unit Coils
T-101		COIL, RF: antenna transformer; 20 kc; two windings; round, aluminum can; 1.701 in. lg by 0.988 in. dia; melamine filled glass tubing, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{4}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-1	Type I Antenna Transformer, Band 1
T-102		COIL, RF: antenna transformer; 40 kc; two windings; round, aluminum can; 1.701 in. lg by 0.988 in. dia; melamine filled glass tubing, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{4}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-2	Type I Antenna Transformer, Band 2
T-103		COIL, RF: antenna transformer; 100 kc; two windings; round, aluminum can; 1.357 in. lg by 0.720 in. dia; melamine filled glass tubing, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{4}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-3	Type I Antenna Transformer, Band 3
T-104		COIL, RF: antenna transformer; 200 kc; two windings; round, aluminum can; 1.357 in. lg by 0.720 in. dia; melamine filled glass tubing, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{4}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-4	Type I Antenna Transformer, Band 4
T-105		COIL, RF: antenna transformer; 400 kc; two windings; round, aluminum can; 1.357 in. lg by 0.720 in. dia; melamine filled glass tubing, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{4}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-5	Type I Antenna Transformer, Band 5
T-106 through T-125		Not Used	
T-126		COIL, RF: RF transformer; 20 kc; two windings; round, aluminum can; 1.701 in. lg by 0.988 in. dia; bakelite coils, powdered iron core and shell; one coil form 0.406 in. OD by $\frac{1}{8}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; to withstand 48-hr salt spray test; spec MIL-T-16T36; RCA part/dwg C-746106-6	Type I RF Transformer, Band 1
T-127		COIL, RF: RF transformer; 40 kc; two windings; round, aluminum can; 1.701 in. lg by 0.988 in. dia; bakelite coils, powdered iron core and shell; one coil form 0.406 in. OD by $\frac{1}{8}$ in. lg, one coil form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-7	Type I RF Transformer, Band 2
T-128		COIL, RF: RF transformer; 100 kc; two windings; round, aluminum can; 1.357 in. lg by 0.720 in. dia; bakelite coils, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{8}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-8	Type I RF Transformer, Band 3

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
T-129		COIL, RF: RF transformer; 200 kc; two windings; round, aluminum can; 1.357 in. lg by 0.720 in. dia; bakelite coils, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{8}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-9	Type I RF Transformer, Band 4
T-130		COIL, RF: RF transformer; 400 kc; two windings; round, aluminum can; 1.357 in. lg by 0.720 in. dia; bakelite coils, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{8}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-10	Type I RF Transformer, Band 5
T-131 through T-150	Not Used		
T-151		COIL, RF: mixer transformer; 20 kc; two windings; round, aluminum can; 1.701 in. lg by 0.988 in. dia; bakelite coils, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{8}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-11	Type I Mixer Transformer, Band 1
T-152		COIL, RF: mixer transformer; 40 kc; two windings; round, aluminum can; 1.701 in. lg by 0.988 in. dia; bakelite coils, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{8}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-12	Type I Mixer Transformer, Band 2
T-153		COIL, RF: mixer transformer; 100 kc; two windings; round, aluminum can; 1.357 in. lg by 0.720 in. dia; bakelite coils, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{8}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-13	Type I Mixer Transformer, Band 3
T-154		COIL, RF: mixer transformer; 200 kc; two windings; round, aluminum can; 1.357 in. lg by 0.720 in. dia; bakelite coils, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{8}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded can; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-14	Type I Mixer Transformer, Band 4
T-155		COIL, RF: mixer transformer; 400 kc; two windings; round, aluminum can; 1.357 in. lg by 0.720 in. dia; bakelite coils, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{8}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; five post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-15	Type I Mixer Transformer, Band 5
T-156 through T-350	Not Used		
T-351		COIL, RF: mixer transformer; 250/500 mc; two windings; unshielded; $2\frac{3}{32}$ in. lg by 0.750 in. dia overall; ceramic form, powdered iron core; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; four post type terminals located on opposite end from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746107-6	Type II Mixer Transformer, Band 1

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
T-352		COIL, RF: mixer transformer; 500/1000 mc; two windings; unshielded; 2 $\frac{3}{32}$ in. lg by 0.750 in. dia overall; ceramic form, powdered iron core; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; four post type terminals located on opposite end from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746107-7	Type II Mixer Transformer, Band 2
T-353		COIL, RF: mixer transformer; 1000/2000 mc; two windings; unshielded; 2 $\frac{3}{32}$ in. lg by 0.750 in. dia overall; ceramic form, powdered iron core; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; four post type terminals located on opposite end from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746107-8	Type II Mixer Transformer, Band 3
T-354		COIL, RF: mixer transformer; 2000/4000 mc; two windings; unshielded; 2 $\frac{3}{32}$ in. lg by 0.750 in. dia overall; ceramic form, powdered iron core; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; four post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746107-9	Type II Mixer Transformer, Band 4
T-355		COIL, RF: mixer transformer; 4000/8000 mc; two windings; unshielded; 2 $\frac{3}{32}$ in. lg by 0.750 in. dia overall; ceramic form, powdered iron core; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; four post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil sealed in plastic; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746107-10	Type II Mixer Transformer, Band 5
T-356 through T-550		Not Used	
T-551		COIL, RF: RF transformer; frequency 3.0 mc; two windings; shielded, phenolic case; 1 $\frac{1}{16}$ in. lg by $\frac{3}{4}$ in. dia less terminals and mounting bushing; ceramic form, powdered iron core; adjustable iron core; screwdriver adjustment; mounted by $\frac{3}{32}$ in. lg thread $\frac{3}{8}$ -32 on 1 $\frac{1}{32}$ in. lg bushing on one end; five terminal posts located on bottom; marked w/ RCA part/dwg no., Govt. Stock no., nominal center frequency; potted; metal parts to withstand 48-hr salt spray test; temp range -54°C to +85°C; spec BuShips 16T36; RCA part/dwg C-746108-1	Type III Mixer Transformer, Band 1
T-552		TRANSFORMER, RF: frequency 6.0 mc; two windings; unshielded, phenolic case; 5.37 microhenries, 300 microhenries; 1 $\frac{1}{16}$ in. lg by $\frac{3}{4}$ in. dia less terminals, mounting bushing, and tuning device; ceramic form, powdered iron core; adjustable iron core; screwdriver adjustment; mounted by $\frac{3}{32}$ in. lg thread $\frac{3}{8}$ -32 on 1 $\frac{1}{32}$ in. lg bushing on one end; five terminal posts located on bottom; marked w/ RCA part/dwg no., Govt. Stock no., nominal center frequency; potted; metal parts to withstand 48-hr salt spray test; temp range -54°C to +85°C; spec BuShips 16T36; RCA part/dwg C-746108-2	Type III Mixer Transformer, Band 2
T-553		TRANSFORMER, RF: frequency 12.0 mc; two windings; unshielded, phenolic case; 1.29 microhenries, 53 microhenries; 1 $\frac{1}{16}$ in. lg by $\frac{3}{4}$ in. dia less terminals, mounting bushing, and tuning device; ceramic form, powdered iron core; adjustable iron core; screwdriver adjustment; mounted by $\frac{3}{32}$ in. lg thread $\frac{3}{8}$ -32 on 1 $\frac{1}{32}$ in. lg bushing on one end; five terminal posts located on bottom; marked w/ RCA part/dwg no., Govt. Stock no., nominal center frequency; potted; metal parts to withstand 48-hr salt spray test; temp range -54°C to +85°C; spec BuShips 16T36; RCA part/dwg C-746108-3	Type III Mixer Transformer, Band 3
T-554		TRANSFORMER, RF: frequency 20.0 mc; two windings; unshielded, phenolic case; 4.434 microhenries, 7.36 microhenries; 1 $\frac{1}{16}$ in. lg by $\frac{3}{4}$ in. dia less terminals, mounting bushing, and tuning device; ceramic form, powdered iron core; adjustable iron core; screwdriver adjustment; mounted by $\frac{3}{32}$ in. lg thread $\frac{3}{8}$ -32 on 1 $\frac{1}{32}$ in. lg bushing on one end; five terminal posts located on bottom; marked w/ RCA part/dwg no., Govt. Stock no., nominal center frequency; potted; metal parts to withstand 48-hr salt spray test; temp range -54°C to +85°C; spec BuShips 16T36; RCA part/dwg C-746108-4	Type III Mixer Transformer, Band 4
T-555		TRANSFORMER, RF: frequency 28.0 mc; two windings; unshielded, phenolic case, 0.336 microhenries, 2.2 microhenries; 1 $\frac{1}{16}$ in. lg by $\frac{3}{4}$ in. dia less terminals, mounting bushing, and tuning device; ceramic form, powdered iron core; adjustable iron core; screwdriver adjustment; mounted by $\frac{3}{32}$ in. lg thread $\frac{3}{8}$ -32 on 1 $\frac{1}{32}$ in. lg bushing on one end; five terminal posts located on bottom; marked w/ RCA part/dwg no., Govt. Stock no., nominal center frequency; potted; metal parts to withstand 48-hr salt spray test; temp range -54°C to +85°C; spec BuShips 16T36; RCA part/dwg C-746108-5	Type III Mixer Transformer, Band 5
T-556 through T-702		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
T-703		TRANSFORMER, RF: two random wound windings; inductance: primary, 2.18 mh at 200 kc $\pm 8\%$ , mutual, 0.173 mh at 200 kc $\pm 10\%$ ; primary, 300 $\frac{1}{2}$ turns no. 38 AWG copper wire, secondary, 22 $\frac{1}{2}$ turns no. 38 AWG copper wire; primary, 12.7 ohms DC, secondary, 1.35 ohms DC; tuned 200 kc peak; untapped; cylindrical shield can, aluminum alloy, satin finish; 0.601 in. lg less terminals, mounting attachments, and tuning devices, 0.572 in. dia; ceramic coil form, powdered iron core; coil form, 0.275 in. lg by 0.219 in. dia; adjustable iron core, screwdriver adjustment through end of shield can; single mounting bushing at end $\frac{1}{4}$ -32 thread $\frac{3}{8}$ in. lg; four stud type terminals on end of shield can; mark terminals "A," "B," "C," "D" on side of can, marked w/ symbol, RCA part/dwg no., Govt. Stock no.; sealed in container; to withstand 48-hr salt spray test; to operate $-54^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ , 120 v DC to ground nominal, 120 v between windings; spec MIL-T-15305; RCA part/dwg C-746104-25	Output Transformer, Type I, First IF Unit
T-704 through T-800	Not Used		
T-801	Same as T-703		Output Transformer, Type II, First IF Unit
T-901	Same as T-703		Output Transformer, Type III, First IF Unit
T-902 through T-1010	Not Used		
T-1011		TRANSFORMER, RF: two random wound windings; inductance: primary, 2.24 mh at 200 kc $\pm 8\%$ , mutual, 0.175 mh at 200 kc $\pm 10\%$ ; primary, 305 $\frac{1}{4}$ turns no. 38 AWG copper wire, secondary, 22 $\frac{1}{2}$ turns no. 38 AWG copper wire; primary, 12.6 ohms DC, secondary, 1.35 ohms DC; tuned 200 kc peak; untapped; cylindrical shield can, aluminum alloy, satin finish; 0.601 in. lg less terminals, mounting attachments, and tuning devices, 0.572 in. dia; ceramic coil form, powdered iron core; coil form 0.275 in. lg by 0.219 in. dia; adjustable iron core, screwdriver adjustment through end of shield can; single mounting bushing at end $\frac{1}{4}$ -32 thread $\frac{3}{8}$ in. lg; four stud type terminals on end of shield can; mark terminals "A," "B," "C," "D" on side of can, marked w/ symbol, RCA part/dwg no., Govt. Stock no.; sealed in container; to withstand 48-hr salt spray test; to operate $-54^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ , 120 v DC to ground nominal, 170 v between windings; spec MIL-T-15305; RCA part/dwg C-746104-30	Element of Z-1005
T-1012	Same as T-1011		Element of Z-1007
T-1013		TRANSFORMER, RF: two random wound windings; inductance: primary, 1.55 mh at 200 kc $\pm 8\%$ , mutual, 0.092 mh at 200 kc $\pm 10\%$ ; primary, 254 $\frac{1}{2}$ turns no. 38 AWG copper wire, secondary, 15 $\frac{1}{2}$ turns no. 38 AWG copper wire; primary, 10.4 ohms DC, secondary, 0.9 ohm DC; tuned 200 kc peak; untapped; cylindrical shield can, aluminum alloy, satin finish; 0.601 in. lg less terminals, mounting attachments, and tuning devices, 0.572 in. dia; ceramic coil form, powdered iron core; coil form 0.275 in. lg by 0.219 in. dia; adjustable iron core, screwdriver adjustment through end of shield can; single mounting bushing at end $\frac{1}{4}$ -32 thread, $\frac{3}{8}$ in. lg; four stud type terminals on end of shield can; mark terminals "A," "B," "C" on side of can marked w/ symbol, RCA part/dwg no., Govt. Stock no.; sealed in container; to withstand 48-hr salt spray test; to operate $-54^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ , 50 v DC to ground nominal, 170 v between windings; spec MIL-T-15305; RCA part/dwg C-746104-29	Element of Z-1011
T-1014		COIL, RF: 200 kc; two windings; round, aluminum can; 1.357 in. lg by 0.720 in. dia; bakelite coils, powdered iron core and shell; one form 0.406 in. OD by $\frac{1}{8}$ in. lg, one form 0.406 in. OD by $\frac{1}{2}$ in. lg; adjustable iron core; screwdriver adjustment; mounted vertically by single $\frac{3}{8}$ -32 bushing; four post type terminals located on end opposite from bushing; marked w/ RCA part/dwg no., Govt. Stock no., and nominal operating frequency; coil and core sealed within a shielded container; to withstand 48-hr salt spray test; spec BuShips 16T36; RCA part/dwg C-746106-16	Tuning Indicator Circuit Transformer
T-1015 through T-1100	Not Used		
T-1101		TRANSFORMER, AF: plate coupling type; primary, 2000 ohms min impedance, secondary, 150 ohms resistive load, tertiary, 200 ohms resistive load; center tapped; hermetically sealed metal case; 2 $\frac{3}{32}$ in. lg by 1 $\frac{1}{16}$ in. sq overall; $\frac{1}{2}$ w max audio operating level; turns ratio primary to secondary 7.14 to 1 $\pm 3\%$ , primary to tertiary 6 to 1 $\pm 3\%$ ; frequency response 200 cps to 8000 cps; secondary and tertiary windings shielded; seven solder lug terminals on bottom; four no. 6-32 by $\frac{1}{32}$ in. lg mounting studs on $\frac{3}{4}$ in. by $\frac{3}{4}$ in. mounting centers located on bottom; operating temp range $-54^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ; resistant to salt water immersion; marked in accordance w/ JAN-T-27; RCA part/dwg A-8842479-1	Couples V-1109 to Audio Output Circuits

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
T-1601		TRANSFORMER, POWER: filament and plate type; 125 v input, tapped for 115 v and 105 v, 50 to 400 cycle single phase; three output windings; secondary no. 1, 460 v at 86 ma rms center tapped; secondary no. 2, 20.8 v w/ taps for 6.4 v at 5 amp center tapped, 14.4 v at 150 ma and 6.4 v at 450 ma, secondary no. 3, 5.3 v at 270 ma; air coolant, impregnated in accordance w/ MIL-T-27 for Grade 1, Class A; hermetically sealed metal case; 4 $\frac{1}{16}$ in. lg by 3 $\frac{1}{32}$ in. wide by 3 $\frac{1}{32}$ in. thick; 14 solder lug terminals $\frac{7}{16}$ in. high on top of case; four no. 8-32 by $\frac{3}{8}$ in. lg mounting studs on 2 $\frac{1}{2}$ in. by 2 $\frac{1}{4}$ in. mounting centers; derated for 85°C ambient temp; family 03 electrostatic shield between primary and secondary; RCA part/dwg K-8889252-1	Supplies Plate and Heater Voltages
T-3001		TRANSFORMER, RF: two windings; single pie universal winding primary, 2 pie universal secondary; inductance: primary, 4655 microhenries at 150 kc, secondary, 1625 microhenries at 250 kc, primary open; primary, 745 turns single glass silicone no. 38 AWG wire, secondary, 620 turns single nylon enameled Litz 10 strand 44 gauge; primary, 41.1 ohms, secondary, 14.1 ohms DC resistance; 250 kc to 500 kc frequency range, tuned secondary; primary tapped at 170 turns; unshielded; 2 $\frac{3}{32}$ in. lg overall, 0.765 in. dia; ceramic coil form, powdered iron core; coil form, 1 $\frac{3}{8}$ in. lg 0.188 in. OD, 0.130 in. ID; adjustable iron core, screwdriver adjustment through core, nut and head assembly on end; mounts by $\frac{3}{8}$ -32 threaded bushing $\frac{1}{2}$ in. lg on head; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," and "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; spec MIL-T-15305; RCA part/dwg C-748767-1	Type II Antenna Transformer, Band 1
T-3002		TRANSFORMER, RF: two windings; single pie universal winding primary, 2 pie secondary; inductance: primary, 1048 microhenries at 260 kc, secondary, 415 microhenries at 500 kc, primary open; primary, 360 turns single glass silicone no. 38 AWG wire, secondary, 273 turns single nylon Litz wire 10 strands 44 gauge; primary, 25.1 ohms, secondary, 7.3 ohms DC resistance; 500 kc to 1000 kc frequency range, tuned secondary; primary tapped at 93 turns; unshielded; 2 $\frac{3}{32}$ in. lg overall, 0.765 in. dia; ceramic coil form, powdered iron core; coil form 1 $\frac{3}{8}$ in. lg 0.250 in. OD, 0.130 in. ID; adjustable iron core, screwdriver adjustment through core, nut and head assembly on end; mounts by $\frac{3}{8}$ -32 threaded bushing $\frac{1}{2}$ in. lg on head; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," and "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; spec MIL-T-15305; RCA part/dwg C-748767-2	Type II Antenna Transformer, Band 2
T-3003		TRANSFORMER, RF: two windings; single pie universal winding primary, 4 pie secondary; inductance: primary, 1343 microhenries at 250 kc, secondary, 97 microhenries at 1 mc, primary shorted; primary, 234 turns single glass silicone no. 38 AWG wire, secondary, 96 turns single nylon Litz wire 10 strands 44 gauge; primary, 23.8 ohms, secondary, 1.26 ohms DC resistance; 1000 to 2000 kc frequency range tuned secondary; primary tapped at 63 turns; unshielded; 2 $\frac{3}{32}$ in. lg overall, 0.765 in. dia; ceramic coil form, powdered iron core; coil form, 1 $\frac{3}{8}$ in. lg, 0.455 in. OD, 0.375 in. ID; adjustable iron core, screwdriver adjustment through core, nut and head assembly on end; mounts by $\frac{3}{8}$ -32 threaded bushing $\frac{1}{2}$ in. lg on head; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," and "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; spec MIL-T-15305; RCA part/dwg C-748767-3	Type II Antenna Transformer, Band 3
T-3004		TRANSFORMER, RF: two windings; universal primary and flat secondary single pie windings; inductance: primary, 576 microhenries at 350 kc, secondary, 23.9 microhenries at 2 mc, primary shorted; primary, 144 turns single glass silicone no. 38 AWG wire, secondary, 45 $\frac{1}{8}$ turns enameled no. 30 AWG wire; primary, 13.3 ohms, secondary, 0.61 ohm DC resistance; 2000 to 4000 kc frequency range tuned secondary; primary tapped at 58 turns; unshielded; 2 $\frac{3}{32}$ in. lg overall, 0.765 in. dia; ceramic coil form, powdered iron core; coil form, 1 $\frac{3}{8}$ in. lg, 0.455 in. OD, 0.375 in. ID; adjustable iron core, screwdriver adjustment through core, nut and head assembly on end; mounts by $\frac{3}{8}$ -32 threaded bushing $\frac{1}{2}$ in. lg on head; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," and "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; spec MIL-T-15305; RCA part/dwg C-748767-4	Type II Antenna Transformer, Band 4
T-3005		TRANSFORMER, RF: two windings; universal primary and flat secondary single pie windings; inductance: primary, 152 microhenries at 800 kc, secondary, 5.75 microhenries at 4 mc, primary shorted; primary, 75 turns single glass silicone no. 38 AWG wire; secondary, 20 $\frac{1}{8}$ turns tinned copper wire no. 30 AWG; primary, 6.83 ohms, secondary, 0.25 ohm DC resistance; 4000 to 8000 kc frequency range tuned secondary; primary tapped at 30 turns; unshielded; 2 $\frac{3}{32}$ in. lg overall, 0.765 in. dia; ceramic coil form, powdered iron core; coil form, 1 $\frac{3}{8}$ in. lg, 0.455 in. OD, 0.375 in. ID; adjustable iron core, screwdriver adjustment through core, nut, and head assembly on end; mounts by $\frac{3}{8}$ -32 bushing $\frac{1}{2}$ in. lg on head; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," and "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; spec MIL-T-15305; RCA part/dwg C-748767-5	Type II Antenna Transformer, Band 5

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
T-3006 through T-3034		Not Used	
T-3035		TRANSFORMER, RF: two windings; single pie flat close wound primary, 2 pie universal wound secondary; inductance: primary, 4.6 microhenries at 7 mc, secondary, 1.455 millihenries at 250 kc, primary open; primary, 20½ turns enameled single nylon no. 39 AWG wire, secondary, 620 turns single nylon enameled Litz wire 10 strand, 44 gauge; primary, 0.50 ohm, secondary, 14.7 ohms DC resistance; 250 kc to 500 kc frequency range tuned secondary; untapped; unshielded; 2½ in. lg overall, 0.765 in. dia; ceramic coil form, powdered iron core; coil form, 1¾ in. lg, 0.188 in. OD, 0.130 in. ID; adjustable iron core, screwdriver adjustment through core, nut and head assembly on end; mounts by ¾-32 bushing ½ in. lg; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," and "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; spec MIL-T-15305; RCA part/dwg C-748767-6	Type II, RF Transformer, Band 1
T-3036		TRANSFORMER, RF: two windings; single pie flat close wound primary, 3 pie universal wound secondary; inductance: primary, 7.3 microhenries at 5 mc, secondary, 360 microhenries at 500 kc, primary open; primary, 22½ turns enameled single nylon no. 38 AWG wire, secondary, 285 turns single nylon enameled Litz wire 10 strands, 44 gauge; primary, 0.64 ohm, secondary, 7.7 ohms DC resistance; 500 kc to 1000 kc frequency range tuned secondary; untapped; unshielded; 2½ in. lg overall, 0.765 in. dia; ceramic coil form, powdered iron core; coil form, 1¾ in. lg, 0.250 in. OD, 0.130 in. ID; adjustable iron core, screwdriver adjustment through core, nut and head assembly on end; mounts by ¾-32 bushing ½ in. lg on head; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," and "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; spec MIL-T-15305; RCA part/dwg C-748767-7	Type II, RF Transformer, Band 2
T-3037		TRANSFORMER, RF: two windings; single pie flat primary, 4 pie universal wound secondary; inductance: primary, 4.4 microhenries at 16 mc, secondary, 93.5 microhenries at 1000 kc, primary open; primary, 3½ turns enameled single nylon no. 34 AWG wire, secondary, 88 turns single nylon enameled Litz wire 10 strand, 44 gauge; primary, 0.16 ohm, secondary, 1.11 ohms DC resistance; 1000 kc to 2000 kc frequency range tuned secondary; untapped; unshielded; 2½ in. lg overall, 0.765 in. dia; ceramic coil form, powdered iron core; coil form 1¾ in. lg, 0.455 in. OD, 0.375 in. ID; adjustable iron core, screwdriver adjustment through core, nut, and head assembly on end; mounts by ¾-32 bushing ½ in. lg on head; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," and "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; spec MIL-T-15305; RCA part/dwg C-748767-8	Part II, RF Transformer, Band 3
T-3038		TRANSFORMER, RF: two windings; flat single pie windings; inductance: primary, 3.8 microhenries at 8 mc, secondary, 23.1 microhenries at 2 mc, primary open; primary, 10½ turns enameled single nylon no. 38 AWG wire; secondary, 45¼ single vinyl acetal coated wire no. 32 AWG; primary, 0.41 ohm, secondary, 0.58 ohm DC resistance; 2000 kc to 4000 kc frequency range tuned secondary; untapped; unshielded; 2½ in. lg overall, 0.765 in. dia; ceramic coil form, powdered iron core; coil form 1¾ in. lg, 0.455 in. OD; 0.375 in. ID; adjustable iron core, screwdriver adjustment through core, nut, and head assembly on end mounts by ¾-32 bushing ½ in. lg on head; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," and "E"; marked w/ RCA part/dwg no., hermetically sealed in bakelite container w/ cadmium plated brass head assembly; spec MIL-T-15305; RCA part/dwg C-748767-9	Type II, RF Transformer, Band 4
T-3039		TRANSFORMER, RF: two flat single pie windings; inductance: primary, 3.3 microhenries at 8 mc, secondary, 5.5 microhenries at 6 mc, primary open; primary, 8½ turns enameled single nylon no. 34 AWG wire, secondary, 20¼ turns tinned soft annealed no. 30 AWG wire; primary, 0.35 ohm, secondary, 0.26 ohm DC resistance; 4000 kc to 8000 kc frequency range tuned secondary; untapped; unshielded; 2½ in. lg overall, 0.765 in. dia; ceramic coil form, powdered iron core; coil form 1¾ in. lg, 0.455 in. OD, 0.375 in. ID; adjustable iron core, screwdriver adjustment through core, nut, and head assembly on end; mounts by ¾-32 bushing ½ in. lg on head; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," and "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; spec MIL-T-15305; RCA part/dwg C-748767-10	Type II, RF Transformer, Band 5
T-3040 through T-3100		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
T-3101		<p>TRANSFORMER, RF: two windings; single pie universal winding primary, 3 pie secondary; inductance: primary, 49.2 microhenries at 1.2 mc, secondary, 22.5 microhenries at 2 mc, primary shorted; primary, 87½ turns single glass silicone insulated 0.0040 in. bare dia, secondary, 36 turns, 10 strands 0.002 in. bare dia nylon insulated Litz; primary, 3.83 ohms, secondary, 1.35 ohms DC resistance; 2 to 4 mc frequency range; primary tapped at 39¼ turns; unshielded; 2½ in. lg overall, 0.750 in. dia; ceramic coil form, powdered iron core; coil form, 1¾ in. lg, 0.455 in. OD, 0.391 in. ID; adjustable iron core, screwdriver adjustment through core, nut, and head assembly on end; mounts by ⅜-32 threaded bushing ½ in. lg on head; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; to withstand salt spray test; spec MIL-T-15305; RCA part/dwg C-748768-1</p>	Type III, Antenna Transformer, Band 1
T-3102		<p>TRANSFORMER, RF: two windings; single pie universal winding primary, 1 pie secondary; inductance: primary, 14.7 microhenries at 200 kc, secondary, 5.2 microhenries at 4 mc, primary shorted; primary, 73 turns single glass silicone insulated 0.004 in. bare dia, secondary, 21½ turns tinned copper wire 0.010 in. bare dia; primary, 2.32 ohms, secondary, 0.27 ohm DC resistance; 4 to 8 mc frequency range; primary tapped at 29 turns; unshielded; 2½ in. lg overall, 0.750 in. dia; ceramic coil form, powdered iron core; coil form, 1¾ in. lg, 0.455 in. OD, 0.391 in. ID; adjustable iron core, screwdriver adjustment through core, nut, and head assembly on end; mounts by ⅜-32 threaded bushing ½ in. lg on head; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; to withstand salt spray test; secondary wound in groove thread on coil form; spec MIL-T-15305; RCA part/dwg C-748768-2</p>	Type III, Antenna Transformer, Band 2
T-3103		<p>TRANSFORMER, RF: two windings; single pie universal winding primary, 1 pie secondary; inductance: primary, 15.6 microhenries at 2 mc, secondary, 12.4 microhenries at 8 mc, primary shorted; primary, 36 turns single glass silicone insulated 0.004 in. bare dia, secondary, 9½ turns tinned copper wire 0.010 in. bare dia; primary, 2.20 ohms, secondary, 0.038 ohm DC resistance; 8 to 16 mc frequency range; primary tapped at 16¼ turns; unshielded; 2½ in. lg overall, 0.750 in. dia; ceramic coil form, powdered iron core; coil form, 1¾ in. lg, 0.455 in. OD, 0.391 in. ID; adjustable iron core, screwdriver adjustment through core, nut, and head assembly on end; mounts by ⅜-32 threaded bushing ½ in. lg on head; five stud type terminals located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; to withstand salt spray test; secondary wound in groove thread on coil form; spec MIL-T-15305; RCA part/dwg C-748768-3</p>	Type III, Antenna Transformer, Band 3
T-3104		<p>TRANSFORMER, RF: two windings; single pie flat close wound primary, 1 layer secondary; inductance: primary, 5.87 microhenries at 3.5 mc, secondary, 0.533 microhenry at 16 mc, primary open; primary, 21½ turns single glass silicone insulated 0.01 in. bare dia, secondary, 6½ turns tinned copper strip 0.015 in. by 0.045 in.; primary, 0.221 ohm, secondary, 0.016 ohm DC resistance; 16 to 24 mc frequency range; untapped; unshielded; 2½ in. lg overall, 0.750 in. dia; ceramic coil form, powdered iron core; coil form, 1¾ in. lg, 0.455 in. OD, 0.391 in. ID; adjustable iron core, screwdriver adjustment through core, nut and head assembly on end; mounts by ⅜-32 threaded bushing ½ in. lg on head; five stud type terminals, "C" not used, located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; to withstand salt spray test; secondary wound in groove threads on coil form; spec MIL-T-15305; RCA part/dwg C-748768-4</p>	Type III, Antenna Transformer, Band 4
T-3105		<p>TRANSFORMER, RF: two windings; single pie flat close wound primary, 1 layer secondary; inductance: primary, 5.5 microhenries at 4 mc, secondary, 0.40 microhenry at 24 mc, primary open; primary, 9½ turns single glass silicone insulated 0.01 in. bare dia, secondary, 4½ turns tinned copper strip 0.015 in. by 0.045 in.; primary, 0.219 ohm, secondary, 0.013 ohm DC resistance; 24 to 32 mc frequency range; untapped; unshielded; 2½ in. lg overall, 0.750 in. dia; ceramic coil form, powdered iron core; coil form, 1¾ in. lg, 0.455 in. OD, 0.391 in. ID; adjustable iron core, screwdriver adjustment through core, nut, and head assembly on end; mounts by ⅜-32 threaded bushing ½ in. lg on head; five stud type terminals, "C" not used, located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; to withstand salt spray test; secondary wound in groove threads on coil form; spec MIL-T-15305; RCA part/dwg C-748768-5</p>	Type III, Antenna Transformer, Band 5
T-3106 through T-3134		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
T-3135		TRANSFORMER, RF: two windings; single pie universal winding primary, 1 layer secondary; inductance: primary, 2700 microhenries at 0.190 mc, secondary, 21.6 microhenries at 2 mc, primary shorted; primary, 314½ turns 0.004 in. dia formax insulated, secondary, 45¼ turns 0.010 in. dia tinned copper wire; primary, 28.7 ohms, secondary, 0.602 ohm DC resistance; 2 to 4 mc frequency range; untapped; unshielded; 2½ in. lg overall, 0.750 in. dia; ceramic coil form, powdered iron core; coil form, 1¾ in. lg, 0.455 in. OD, 0.391 in. ID; adjustable iron core, screwdriver adjustment through core, nut, and head assembly on end; mounts by ⅜-32 threaded bushing ⅝ in. lg on head; five stud type terminals, "A" not used, located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; to withstand salt spray test; secondary wound in groove threads on coil form; spec MIL-T-15305; RCA part/dwg C-748768-6	Type III, RF Transformer, Band 1
T-3136		TRANSFORMER, RF: two windings; single pie universal winding primary, 1 layer secondary; inductance: primary, 865 microhenries at 0.5 mc, secondary, 5.3 microhenries at 4 mc, primary shorted; primary, 96¼ turns 0.0025 in. dia single nylon Litz wire, secondary, 20¼ turns 0.010 in. dia tinned copper wire; primary, 16.4 ohms, secondary, 0.266 ohm DC resistance; 4 to 8 mc frequency range; untapped; unshielded; 2½ in. lg overall, 0.750 in. dia; ceramic coil form, powdered iron core; coil form, 1¾ in. lg, 0.455 in. OD, 0.391 in. ID; adjustable iron core, screwdriver adjustment through core, nut, and head assembly on end; mounts by ⅜-32 threaded bushing ⅝ in. lg on head; five stud type terminals, "A" not used, located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; to withstand salt spray test; secondary wound in groove threads on coil form; spec MIL-T-15305; RCA part/dwg C-748768-7	Type III, RF Transformer, Band 2
T-3137		TRANSFORMER, RF: two windings; single pie universal winding primary, 1 layer secondary; inductance: primary, 53.2 microhenries at 1.2 mc, secondary, 1.24 microhenries at 8 mc, primary shorted; primary, 38½ turns 0.0025 in. dia single nylon Litz wire, secondary, 10¼ turns 0.010 in. dia tinned copper wire; primary, 3.22 ohms, secondary, 0.038 ohm DC resistance; 8 to 16 mc frequency range; untapped; unshielded; 2½ in. lg overall, 0.750 in. dia; ceramic coil form, powdered iron core; coil form, 1¾ in. lg, 0.455 in. OD, 0.391 in. ID; adjustable iron core, screwdriver adjustment through core, nut and head assembly on end; mounts by ⅜-32 threaded bushing ⅝ in. lg on head; five stud type terminals, "A" not used, located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; to withstand salt spray test; secondary wound in groove threads on coil form; spec MIL-T-15305; RCA part/dwg C-748768-8	Type III, RF Transformer, Band 3
T-3138		TRANSFORMER, RF: two windings; 1 flat close wound primary, 1 flat groove wound secondary; inductance: primary, 7.6 microhenries at 3 mc, secondary, 0.43 microhenry at 16 mc, primary open; primary, 15½ turns 0.0063 in. dia enameled nylon insulated, secondary, 6¼ turns 0.015 in. by 0.045 in. tinned copper strip; primary, 0.587 ohm, secondary, 0.017 ohm DC resistance; 16 to 24 mc frequency range; untapped; unshielded; 2½ in. lg overall, 0.750 in. dia; ceramic coil form, powdered iron core; coil form, 1¾ in. lg, 0.455 in. OD, 0.391 in. ID; adjustable iron core, screwdriver adjustment through core, nut and head assembly on end; mounts by ⅜-32 threaded bushing ⅝ in. lg on head; five stud type terminals, "A" not used, located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; to withstand salt spray test; secondary wound in groove threads on coil form; spec MIL-T-15305; RCA part/dwg C-748768-9	Type III, RF Transformer, Band 4
T-3139		TRANSFORMER, RF: two windings, 1 flat close wound primary, 1 flat groove wound secondary; inductance: primary, 2.17 microhenries at 6 mc, secondary, 0.27 microhenry at 24 mc, primary open; primary, 7½ turns 0.0063 in. dia enameled nylon, insulated, secondary, 4¼ turns 0.015 in. by 0.045 in. tinned copper strip; primary, 0.312 ohm, secondary, 0.013 ohm DC resistance; 24 to 32 mc frequency range; untapped; unshielded; 2½ in. lg overall, 0.750 in. dia; ceramic coil form, powdered iron core; coil form, 1¾ in. lg, 0.455 in. OD, 0.391 in. ID; adjustable iron core, screwdriver adjustment through core, nut and head assembly on end; mounts by ⅜-32 threaded bushing ⅝ in. lg on head; five stud type terminals, "A" not used, located on bakelite end enclosure cap; terminals marked "A," "B," "C," "D," "E"; marked w/ RCA part/dwg no.; hermetically sealed in bakelite container w/ cadmium plated brass head assembly; to withstand salt spray test; secondary wound in groove threads on coil form; spec MIL-T-15305; RCA part/dwg C-748768-10	Type III, RF Transformer, Band 5
V-101		TUBE, ELECTRON: JAN Type 5899; sub-miniature pentode	Antenna Unit Amplifier
V-102 through V-125		Not Used	
V-126		Same as V-101	Type I, RF Unit Amplifier



**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
V-127 through V-150		Not Used	
V-151		TUBE, ELECTRON: JAN 5636; sub-miniature pentode mixer	Type I, Mixer
V-152 through V-200		Not Used	
V-201		TUBE, ELECTRON: RMA 5840; sub-miniature pentode	Type I, Local Oscillator
V-202 through V-550		Not Used	
V-551		Same as V-151	Type III, Mixer
V-552		TUBE, ELECTRON: JAN 5718; sub-miniature pentode	Cathode Follower Output for Panoramic Output
V-553 through V-700		Not Used	
V-701		Same as V-151	Second Converter, Type I First IF Unit
V-702 through V-800		Not Used	
V-801		Same as V-151	Second Converter, Type II First IF Unit
V-802 through V-900		Not Used	
V-901		Same as V-151	Second Converter, Type III First IF Unit
V-902 through V-1000		Not Used	
V-1001		Same as V-101	First Amplifier, Second IF Unit
V-1002		Same as V-101	Second Amplifier, Second IF Unit
V-1003		Same as V-101	Final Amplifier, Second IF Unit
V-1004		Same as V-151	BFO-Mixer
V-1005		TUBE, ELECTRON: JAN 5647; sub-miniature single diode	Detector
V-1006		Same as V-1005	Automatic Gain Control Delay Diode
V-1007		Same as V-552	Cathode Follower Output Amplifier Frequency Shift IF Output
V-1008 through V-1100		Not Used	
V-1101		Same as V-1005	Audio Noise Limiting
V-1102		Same as V-552	First Audio Amplifier
V-1103		Same as V-1005	Silencer Diode
V-1104		TUBE, ELECTRON: JAN 5719; sub-miniature triode	Silencer Control Amplifier
V-1105		Same as V-552	Second Audio Amplifier
V-1106		Same as V-1005	Limiter Diode
V-1107		Not Used	
V-1108		Same as V-1104	Third Audio Amplifier
V-1109		TUBE, ELECTRON: RMA 5902; sub-miniature beam power pentode	Final Audio Amplifier
V-1110 through V-1200		Not Used	
V-1201		Same as V-552	Crystal Oscillator, Type III Calibrator
V-1202		Same as V-552	Antenna Type II Calibrator
V-1203 through V-1300		Not Used	
V-1301		Same as V-201	195-205 Kc Oscillator
V-1302 through V-1400		Not Used	
V-1401		Same as V-552	Crystal Oscillator, Type I Calibrator

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
V-1402		Same as V-151	Multivibrator, Type I Calibrator
V-1403 through V-1500		Not Used	
V-1501		Same as V-552	Crystal Oscillator, Type II Calibrator
V-1502		Same as V-552	Amplifier, Type II Calibrator
V-1503 through V-1600		Not Used	
V-1601		TUBE, ELECTRON: JAN 6X4; full-wave vacuum rectifier	With V-1602, Rectifies Plate Supply Voltage
V-1602		Same as V-1601	With V-1601, Rectifies Plate Supply Voltage
V-1603		TUBE, ELECTRON: RMA 5644; sub-miniature v regulator	Regulates Local Oscillator Plate Voltage
V-1604 through V-3000		Not Used	
V-3001		Same as V-101	Type II, Antenna Amplifier Unit
V-3002 through V-3034		Not Used	
V-3035		Same as V-101	Type II, RF Amplifier Unit
V-3036 through V-3100		Not Used	
V-3101		Same as V-101	Type III, Antenna Amplifier Unit
V-3102 through V-3134		Not Used	
V-3135		Same as V-101	Type III, RF Amplifier Unit
V-3136 through V-4400		Not Used	
V-4401		Same as V-201	Type III, Local Oscillator
W-101	2	BUS, BAR: copper strip, 2 $\frac{3}{16}$ in. lg by 1 $\frac{1}{32}$ in. wide by $\frac{9}{16}$ in. high by 0.0201 in. thick; LH; RCA part/dwg A-8825740-2	Connects E-101 to Circuit Wiring
W-102	2	BUS, BAR: 2 $\frac{1}{8}$ in. lg by $\frac{1}{2}$ in. wide by $\frac{5}{64}$ in. high by 0.0201 in. thick, LH; one hole 0.120 in. dia; RCA part/dwg A-8825741-2	Connects E-102 to Circuit Wiring
W-103 through W-125		Not Used	
W-126	2	BUS, BAR: copper strip, 2 $\frac{3}{16}$ in. lg by 1 $\frac{1}{32}$ in. wide by $\frac{9}{16}$ in. high by 0.0201 in. thick, RH; RCA part/dwg A-8825740-1	Connects E-126 to Circuit Wiring
W-127	2	BUS, BAR: 2 $\frac{1}{8}$ in. lg by $\frac{1}{2}$ in. wide by $\frac{5}{64}$ in. high by 0.0201 in. thick, RH; RCA part/dwg A-8825741-1	Connects E-127 to Circuit Wiring
W-128 through W-150		Not Used	
W-151		Same as W-126	Connects E-151 to Circuit Wiring
W-152		Same as W-127	Connects E-152 to Circuit Wiring
W-153 through W-200		Not Used	
W-201		Same as W-126	Connects E-201 to Circuit Wiring
W-202	2	BUS, BAR: 2 $\frac{3}{32}$ in. lg by $\frac{1}{2}$ in. wide by $\frac{5}{64}$ in. high by 0.0201 in. thick; RCA part/dwg A-8825741-3	Connects E-202 to Circuit Wiring
W-203 through W-350		Not Used	
W-351		Same as W-126	Connects E-351 to Circuit Wiring
W-352		Same as W-127	Connects E-352 to Circuit Wiring
W-353 through W-400		Not Used	
W-401		Same as W-126	Connects E-401 to Circuit Wiring
W-402		Same as W-202	Connects E-402 to Circuit Wiring

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
W-403 through W-550		Not Used	
W-551		Same as W-126	Connects E-551 to Circuit Wiring
W-552	2	BUS. BAR: copper; 2 $\frac{3}{32}$ in. lg by $\frac{1}{2}$ in. wide by 2 $\frac{5}{64}$ in. thick; RCA part/dwg A-8810449-1	Connects E-552 to Circuit Wiring
W-553 through W-3000		Not Used	
W-3001		Same as W-101	Connects E-3001 to Circuit Wiring
W-3002		Same as W-102	Connects E-3002 to Circuit Wiring
W-3003 through W-3100		Not Used	
W-3101		Same as W-101	Connects E-3035 to Circuit Wiring
W-3102 through W-3135		Not Used	
W-3136	2	BUS BAR: copper; rectangular cross section; $\frac{1}{8}$ in. wide w/ $\frac{1}{4}$ in. wide section at end, 0.0201 in. thick; solid; 1.502 in. lg overall, 2 $\frac{1}{64}$ in. deep; 0.120 in. dia hole at $\frac{1}{4}$ in. wide end for mounting; bent as shown in RCA dwg w/ hook at one end and mount at other; silver plate and gold plate finish; RCA part/dwg A-8827784-2	Connects E-3136 to Circuit Wiring
W-3137	2	BUS BAR: copper; rectangular cross section; $\frac{1}{8}$ in. wide w/ $\frac{1}{4}$ in. square at one end, 0.020 in. thick; solid; 1 $\frac{3}{32}$ in. lg overall; one 0.120 in. dia hole in center of square end for mounting; "L" shaped 1 $\frac{1}{16}$ in. lg side w/ square at end; silver and gold plate finish; RCA part/dwg A-8816319-2	Connects E-3137 to Circuit Wiring
W-3138	2	BUS BAR: copper; rectangular; solid; cross section $\frac{1}{8}$ in. wide by 0.020 in. thick; 2 $\frac{3}{32}$ in. lg; one 0.120 in. mounting hole in $\frac{1}{4}$ in. section at one end; right angle bend 1 $\frac{1}{32}$ in. lg at mounting end and hook at other end, silver plate and gold plate finish; RCA part/dwg A-8829176-3	Connects E-3138 to Circuit Wiring
W-3139	2	BUS BAR: copper; rectangular cross section; $\frac{1}{8}$ in. wide, 0.020 in. thick; solid; 2 $\frac{3}{16}$ in. lg; one 0.046 in. dia hole 1 $\frac{1}{2}$ in. from end, bent over ends in fork terminals; bent over $\frac{3}{16}$ in. at ea end $\frac{1}{32}$ in. inside radius; silver and gold plate finish; RCA part/dwg A-8816319-1	Connects E-3139 to Circuit Wiring
W-3140 through W-4400		Not Used	
W-4401		Same as W-126	Connects E-3101 to Circuit Wiring
W-4402		Same as W-202	Connects E-3102 to Circuit Wiring
X-701		SOCKET, CRYSTAL: Navy Type 491932; ceramic body, beryllium copper, silver plated contact; two contacts spaced 0.486 in. C to C; terminals hot tin dipped; oval shape; 5 $\frac{5}{64}$ in. lg by $\frac{3}{8}$ in. wide by $\frac{3}{8}$ in. thick less terminals; terminals extend 1 $\frac{9}{64}$ in. beyond body; single 0.125 in. dia mounting hole centrally located; Eby Catalog no. 9006; RCA part/dwg K-8893205-1	Socket for Y-701
X-702		CONNECTOR, RECEPTACLE: eight round female contacts; straight type; used as receptacle for first IF assembly; 1 $\frac{1}{4}$ in. lg by 1 in. wide by $\frac{1}{4}$ in. thick; 1000 v rms, 5 amp; rectangular phenolic body, single 0.765 in. dia hole in center; two 0.128 in. dia mounting holes on 0.687 in. by 0.937 in. center; RCA part/dwg C-744593-2	Socket for Z-701
X-703 through X-800		Not Used	
X-801		Same as X-701	Socket for Y-801. P/o E-801
X-802		Same as X-702	Socket for Z-801
X-803 through X-900		Not Used	
X-901		Same as X-701	Socket for Y-901. P/o E-901
X-902		Same as X-702	Socket for Z-901
X-903 through X-1000		Not Used	
X-1001		Same as X-702	Socket for Z-1004
X-1002		Same as X-702	Socket for Z-1006

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
X-1003		Same as X-702	Socket for Z-1008
X-1004		Same as X-702	Socket for Z-1010
X-1005		CONNECTOR, RECEPTACLE: six round female contacts; straight type; used as receptacle for second IF plug in unit; 1 in. lg by 3/4 in. wide by 1/4 in. thick; 1000 v rms, 5 amp; rectangular phenolic body, single butterfly shape hole in center; two 0.128 in. dia mounting holes on 0.687 in. mounting center; RCA part/dwg C-744591-2	Socket for Z-1012
X-1006		Same as X-1005	Socket for Z-1013
X-1007		Same as X-702	Socket for Z-1014
X-1008 through X-1100		Not Used	
X-1101		Same as X-1005	Socket for Z-1101
X-1102		Same as X-702	Socket for Z-1102
X-1103		Same as X-1005	Socket for Z-1103
X-1104		Same as X-702	Socket for Z-1104
X-1105		Same as X-702	Socket for Z-1105
X-1106		Same as X-1005	Socket for Z-1106
X-1107		Same as X-1005	Socket for Z-1107
X-1108		Same as X-702	Socket for Z-1108
X-1109		Same as X-702	Socket for Z-1109
X-1110 through X-1200		Not Used	
X-1201		Same as X-702	Socket for Z-1201
X-1202		Same as X-702	Socket for Z-1202
X-1203		Same as X-701	Socket for Y-1201
X-1204 through X-1300		Not Used	
X-1301		Same as X-702	Socket for Z-1302
X-1302 through X-1400		Not Used	
X-1401		Same as X-702	Socket for Z-1401
X-1402		Same as X-702	Socket for Z-1402
X-1403		Same as X-701	Socket for Y-1401
X-1404 through X-1500		Not Used	
X-1501		Same as X-702	Socket for Z-1501
X-1502		Same as X-702	Socket for Z-1502
X-1503		Same as X-701	Socket for Y-1501
X-1504 through X-1600		Not Used	
X-1601		SOCKET, ELECTRON TUBE: JAN Type TS101P01; eight beryllium silver plated contacts; medium size, octal; oval shape; 1 7/8 in. lg by 1 3/8 in. wide by 5/8 in. high overall less terminals; spec JAN 5-28 molded plastic body; RCA part/dwg A-99393-1	Socket for C-1601
X-1602		Same as X-1601	Socket for C-1602
X-1603		SOCKET, TUBE: Navy Type 491675; seven miniature contacts; one piece saddle mounting; two 0.125 in. dia mounting holes on 0.875 in. mounting center; oval mineral filled plastic body; 1 1/4 in. lg by 0.766 in. wide by 1 1/2 in. thick; beryllium copper silver plated contacts, terminal ends hot tin dipped; w/ center shield, 3/16 in. ID; RCA part/dwg K-8890605-1	Socket for V-1602
X-1604		Same as X-1603	Socket for R-1605
X-1605		Same as X-1603	Socket for V-1601
X-1606		FUSE HOLDER: extractor post type; for single 3 AG fuse, 1 1/4 in. lg by 1/4 in. dia; bakelite case; 2 3/4 in. lg by 1 1/8 in. dia; 1/2-24 thread by 1/2 in. lg mounting, mounts in hole 1/2 in. dia w/ flat on one side to 0.473 in; two solder lug terminals; screw cap marked w/ word fuse, mounting hardware, neoprene washer, and zinc plated nut; Bussman Type HKP; RCA part/dwg K-99086-2	Socket for F-1601

TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
X-1607		Same as X-1606	Socket for F-1602
X-1608 through X-2000		Not Used	
X-2001		LIGHT, INDICATOR: w/ lens; convex lens, clear on the outside and frosted on the inside; for miniature bayonet base, T-3¼ bulb; (½ in. effective dial); operating voltage 120 v DC nominal; enclosed shell; brass body, phenolic socket, lens holder and body black nickel finish; 2½ <sub>32</sub> in. lg by 1½ <sub>16</sub> in. dia overall approx; 1½ <sub>16</sub> in. dia mounting hole required, ¼ in. max panel thick; incl mounting hardware; horizontally mounted socket lamp, replaceable from front of panel; slotted jewel; two solder terminals located on bottom of base; dimmer cap to be total blackout type, incl 100,000-ohm built-in resistor; to withstand salt spray test for 100 hrs; operating temp -54°C to +85°C; spec JAN-P-14, Type MTS-E-1; RCA part/dwg B-460884-1	Socket and Lens for I-2001
X-2002 through X-2100		Not Used	
X-2101		Same as X-2001	Socket and Lens for I-2101
X-2102 through X-2200		Not Used	
X-2201		Same as X-2001	Socket and Lens for I-2201
X-2202 through X-3600		Not Used	
X-3601		LAMPHOLDER: accommodates miniature bayonet base lamp; 10 v, ½ amp; brass body; 1½ in. lg by ¾ in. wide by 1½ in. high overall; two terminals, one stud type and one spring type; two ½ in. wide by ¼ in. lg mounting holes spaced ⅝ in. C to C; mounting bracket located perpendicular to and beside socket; socket is on right side when mounted; socket position is adjustable by means of set screw; adjustment has spring return; RCA part/dwg M-458193-501	Socket for I-3601
X-3602		LAMPHOLDER: miniature bayonet type; brass body; 10 v, ½ amp; 1½ in. lg by ¾ in. wide by 1½ in. high overall approx; two mounting holes ½ in. wide by ¼ in. lg on ⅝ in. mounting center; socket is on left side when mounted; mounting bracket located perpendicular to and beside socket; socket position is adjustable by means of set screw; adjustment has spring return; RCA part/dwg M-458193-502	Socket for I-3602
X-3603 through X-3700		Not Used	
X-3701		Same as X-3601	Socket for I-3601
X-3702		Same as X-3602	Socket for I-3702
X-3703 through X-3800		Not Used	
X-3801		Same as X-3601	Socket for I-3801
X-3802		Same as X-3602	Socket for I-3802
Y-701		CRYSTAL UNIT, QUARTZ: one crystal plate; 140 kc; operable temp range 40°C to +85°C; two pins spaced on bottom 0.486 in. C to C, solid pins 0.050 in. dia by 0.243 in. lg; oval shape body 1.538 in. lg by 0.750 in. wide by 0.345 in. thick; RCA part/dwg A-8837466-3	Crystal for Second Local Oscillator, Type I First IF Unit
Y-702 through Y-800		Not Used	
Y-801		CRYSTAL UNIT, QUARTZ: c/o one crystal plate in HC-6/U holder; 1400 kc; frequency tolerance ±0.005% of nominal frequency, over temp range -50°C to +90°C; operable temp range -50°C to +90°C; two pins spaced on bottom 0.486 in. C to C; solid pins 0.050 in. dia by 0.243 in. lg; oval shape body 0.788 in. lg by 0.750 in. wide by 0.345 in. thick; operating temp +85°C ±5°C; marked type nominal frequency in kc; spec MIL-C-3098; RCA part/dwg K-8832372-3	Crystal for Second Local Oscillator, Type III First IF Unit
Y-802 through Y-900		Not Used	
Y-901		Same as Y-801	Crystal for Second Local Oscillator, Type III First IF Unit
Y-902 through Y-1200		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
Y-1201		CRYSTAL UNIT, QUARTZ: one crystal plate; 200 kc; —40°C to +85°C temp range; two pins spaced on bottom 0.486 in. C to C; solid pins 0.050 in. dia by 0.243 in. lg; oval shape body 0.788 in. lg by 0.750 in. wide by 0.345 in. thick; RCA part/dwg A-8837466-5	Crystal for Type III Calibrator
Y-1202 through Y-1400	Not Used		
Y-1401		CRYSTAL UNIT, QUARTZ: one crystal plate; 50 kc; operable temp range —40°C to +85°C; two pins spaced on bottom 0.486 in. C to C; solid pins 0.050 in. dia by 0.243 in. lg; oval shape body 1.538 in. lg by 0.750 in. wide by 0.345 in. thick; RCA part/dwg A-8837466-2	Crystal for Type I Calibrator
Y-1501		CRYSTAL UNIT, QUARTZ: one crystal plate; 50 kc; —40°C to +85°C operable temp range; two pins spaced on bottom 0.486 in. C to C; solid pins 0.050 in. dia by 0.243 in. lg; oval shaped body 1.538 in. lg by 0.750 in. wide by 0.345 in. thick; RCA part/dwg A-8837466-4	Crystal for Type II Calibrator
Z-101		AMPLIFIER, SUB-ASSEMBLY: antenna coupling stage fixed components; c/o one fixed capacitor C-104 RCA part/dwg C-737816-391; one fixed capacitor C-105 RCA part/dwg C-737816-391; one fixed capacitor C-106 RCA part/dwg C-737837-339; one fixed capacitor C-107 RCA part/dwg C-737816-27; one fixed resistor R-108 RCA part/dwg P-722316-145; one fixed resistor R-109 RCA part/dwg R-82283-70; one shield mount E-106; one terminal board assembly E-109; one vacuum tube V-101; rectangular shape; 3 in. lg by <sup>15</sup> / <sub>16</sub> in. high by 1½ in. wide overall; mounts by two pins 0.093 in. dia on 1.156 in. mounting center; marked w/ symbols; end opposite mounting pins has spring and cap arrangement to secure end using cover lid pressure on spring; RCA part/dwg A-8838476-501	Plug-in Sub-Assembly, Type I Antenna Unit
Z-102 through Z-125	Not Used		
Z-126		AMPLIFIER, SUB-ASSEMBLY: first RF stage fixed electrical components; c/o one fixed capacitor C-142 RCA part/dwg C-737816-553; one fixed resistor R-127 RCA part/dwg P-722318-145; one fixed resistor R-128 RCA part/dwg K-82283-70; one shield mount E-129; one terminal board assembly E-135; one vacuum tube V-126; rectangular shape; 3 in. lg by <sup>15</sup> / <sub>16</sub> in. high by 1½ in. wide overall; mounts by two pins 0.093 in. dia on 1.156 in. mounting center; marked w/ symbols; end opposite mounting pins has spring and cup arrangements to secure end using cover lid pressure on spring; RCA part/dwg A-8838476-502	Plug-in Sub-Assembly, Type I RF Unit
Z-127 through Z-150	Not Used		
Z-151		AMPLIFIER, SUB-ASSEMBLY: mixer stage fixed components; c/o one fixed capacitor C-161 RCA part/dwg C-737816-353; one fixed capacitor C-162 RCA part/dwg C-737816-553; one fixed resistor R-154 RCA part/dwg P-722318-79; one fixed resistor R-155 RCA part/dwg P-722318-151; one fixed resistor R-156 RCA part/dwg K-82283-66; one shield mount E-155; one terminal E-156; one terminal board assembly E-159; one vacuum tube V-151; rectangular shape; 3 in. lg by <sup>15</sup> / <sub>16</sub> in. high by 1½ in. wide overall; mounts by two pins 0.093 in. dia on 1.156 in. mounting center; marked w/ symbols; end opposite mounting pins has spring and cap arrangement to secure end using cover lid pressure on spring; RCA part/dwg A-8838476-503	Plug-in Sub-Assembly, Type I Mixer Unit
Z-152 through Z-200	Not Used		
Z-201		OSCILLATOR, SUB-ASSEMBLY: local oscillator stage fixed electrical components; c/o one fixed capacitor C-223 RCA part/dwg C-737837-347; one fixed capacitor C-224 RCA part/dwg C-737845-190; one fixed capacitor C-225 RCA part/dwg C-737816-553; one fixed capacitor C-226 RCA part/dwg C-737837-339; one fixed capacitor C-227 RCA part/dwg C-737816-353; one fixed resistor R-201 RCA part/dwg P-722318-80; one fixed resistor R-202 RCA part/dwg K-82283-66; one fixed resistor R-203 RCA part/dwg K-82283-66; one fixed resistor R-204 RCA part/dwg P-722318-94; one fixed resistor R-205 RCA part/dwg P-722318-79; one shield mount E-206; one terminal E-207; one terminal board assembly E-210; one vacuum tube V-201; rectangular shape; 3 in. lg by <sup>15</sup> / <sub>16</sub> in. high by 1½ in. wide overall; mounts by two pins 0.093 in. dia on 1.156 in. mounting center; marked w/ symbol; RCA part/dwg A-8838476-504	Plug-in Sub-Assembly, Type I Oscillator Unit
Z-202 through Z-350	Not Used		

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
Z-351		AMPLIFIER, SUB-ASSEMBLY: c/o one terminal board assembly E-363 RCA part/dwg T-629844-501; two capacitors silver mica C-367 RCA part/dwg C-737837-323, C-370 RCA part/dwg C-737837-323; four capacitors paper C-368 RCA part/dwg 737816-347, C-369 RCA part/dwg 737816-427, C-371 RCA part/dwg 737816-347, C-372 RCA part/dwg 737816-427; two vacuum tubes V-351 JAN 5636, V-352 JAN 5718; seven resistors R-352 RCA part/dwg 722318-94, R-353 RCA part/dwg 722318-199, R-354 RCA part/dwg 722318-155, R-356 RCA part/dwg 722318-94, R-357 RCA part/dwg 722318-151, R-358 RCA part/dwg 82283-66, R-355 RCA part/dwg 82283-66; 3 in. lg by 1 1/16 in. wide by 0.969 in. thick overall; RCA part/dwg 8838477-503	Plug-in Sub-Assembly, Type II Mixer Unit
Z-352 through Z-400		Not Used	
Z-401		AMPLIFIER, SUB-ASSEMBLY: c/o one terminal board E-413 RCA part/dwg T-629844-503; three capacitors silver mica C-419 RCA part/dwg 737837-323, C-421 RCA part/dwg 737837-323, C-423 RCA part/dwg 737837-315; two capacitors paper C-420 RCA part/dwg 737816-427, C-422 RCA part/dwg 737816-427; four resistors R-405, RCA part/dwg 82283-81, R-406 RCA part/dwg 82283-66, R-407 RCA part/dwg 82283-175, R-408 RCA part/dwg 82283-66; one vacuum tube V-401 JAN 5840; 3 in. lg by 1 1/16 in. wide by 0.969 in. thick overall; mounted by bracket on one end, RCA part/dwg 8838477-504 Rev. 9	Plug-in Sub-Assembly, Type II Oscillator
Z-402 through Z-550		Not Used	
Z-551		AMPLIFIER, SUB-ASSEMBLY: provides mounting for two tubes and associated components of frequency converter; c/o one terminal board assembly E-563 RCA part/dwg T-629844-501; two capacitors silver mica C-571 part/dwg 737837-323, C-574 RCA part/dwg 737837-323; four capacitors paper C-572 RCA part/dwg 737816-347, C-573 RCA part/dwg 737816-427, C-575 RCA part/dwg 737816-351, C-576 RCA part/dwg 737816-427; seven resistors R-551 RCA part/dwg 722318-191, R-552 RCA part/dwg 722318-141, R-553 RCA part/dwg 722318-94, R-554 RCA part/dwg 82283-66, R-555 RCA part/dwg 722318-94, R-556 RCA part/dwg 722318-151, R-557 RCA part/dwg 82283-66; two vacuum tubes V-551 JAN 5636, V-552 JAN 5718; 3 in. lg by 1 1/16 in. wide by 3/4 in. high overall; plug-in mounted; RCA part/dwg A-8838478-503	Plug-in Sub-Assembly, Type III Mixer Unit
Z-552 through Z-700		Not Used	
Z-701		AMPLIFIER, SUB-ASSEMBLY: converter for first i-f; c/o one chassis and plug assembly P-701 RCA part/dwg C-748226-18; three resistors R-702 RCA part/dwg K-82283-74, R-703 RCA part/dwg C-722318-98; R-704 RCA part/dwg C-772318-58; one vacuum tube V-701 JAN 5636; 2 1/2 in. lg by 1 in. wide by 1.250 in. high overall; plug-in mounted; RCA part/dwg A-8833233-50 Rev. 19	Plug-in Sub-Assembly, Type I First IF Unit
Z-702		FILTER, BANDPASS: middle frequency 60 kc; bandwidth 59 kc to 61 kc; 3 5/16 in. lg by 2 1/16 in. high by 2 3/32 in. wide; 150,000 ohms input and output impedance; rectangular metal case; mounts by two 0.156 in. dia mounting holes spaced 2.718 in. C to C; four stud type feedthru terminals; RCA part/dwg A-8833252-501	Selectivity Filter, Type I First IF Unit
Z-703 through Z-800		Not Used	
Z-801		CONVERTER, SUB-ASSEMBLY: provides mounting for tube and associated components of frequency converter; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831124-501; one capacitor C-812 RCA part/dwg C-737837-327; one capacitor C-813 RCA part/dwg C-737837-337; one capacitor C-814 RCA part/dwg C-737837-341; one resistor R-801 RCA part/dwg K-82283-74; one resistor R-802 RCA part/dwg C-722318-74; one resistor R-803 RCA part/dwg C-722318-53; one tube V-801 JAN-5636; 6.3 v 150 ma heater, 120 v DC power supply; input frequency 1600 kc, output frequency 200 kc; rectangular; 2 1 3/32 in. lg by 1 1/4 in. wide by 1 1/16 in. thick overall approx; mounts by plugging into socket, held in place by latch located on top; when used w/ external crystal provides oscillation at 1400 kc required for frequency conversion; RCA part/dwg A-8833233-502	Plug-in Sub-Assembly, Type II First IF Unit
Z-802		FILTER, BANDPASS: middle frequency 1600 kc, bandwidth 1588 kc to 1612 kc; 3 5/16 in. lg by 2 1/16 in. high by 2 3/32 in. wide; 100,000 ohms input and output impedance; rectangular metal case; mounts by two 0.156 in. dia holes spaced 2.718 in. C to C; four solder lug terminals; hermetically sealed case; RCA part/dwg A-8833252-506	Selectivity Filter, Type II First IF Unit
Z-803 through Z-900		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)**  
**RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
Z-901		CONVERTER, SUB-ASSEMBLY: mounts tube and associated components for use in frequency converter; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831284-501; one capacitor C-912 RCA part/dwg C-737837-327; one capacitor C-913 RCA part/dwg C-737837-337; one capacitor C-914 RCA part/dwg C-737837-341; one resistor R-901 RCA part/dwg K-82283-74; one resistor R-902 RCA part/dwg C-722318-74; one resistor R-903 RCA part/dwg C-722318-53; one tube V-901 JAN-5636; 6.3 v 150 ma heater, 120 v DC power supply; input frequency 1600 kc, output frequency 200 kc; rectangular; 2 <sup>13</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>4</sub> in. wide by 1 <sup>1</sup> / <sub>64</sub> in. thick overall approx; mounts by plugging into socket, held in place by latch located on top; when used w/ external crystal provides oscillation at 1400 kc required for frequency conversion; RCA part/dwg A-8833233-503	Plug-in Sub-Assembly, Type III First IF Unit
Z-902		Same as Z-802	Selectivity Filter, Type III First IF Unit
Z-903 through Z-1000		Not Used	
Z-1001		FILTER, BANDPASS: 200 kc band pass; 2.4 to 4 kc band width; 500 ohms input impedance; 250,000 ohms output impedance; 2 <sup>13</sup> / <sub>32</sub> in. lg by 1 <sup>13</sup> / <sub>32</sub> in. wide by 2 <sup>1</sup> / <sub>4</sub> in. high; rectangular metal case; mounts by four no. 4-40 integral nuts located in two rows spaced 1 <sup>13</sup> / <sub>32</sub> in. apart, two in one row are spaced 1.718 in. C to C, w/ two in the other row 0.718 in C to C; four solder lug terminals; hermetically sealed; RCA part/dwg A-8832387-501 Rev. 13	Sharp Selectivity Filter, Second IF Unit
Z-1002		FILTER, BANDPASS: 200 kc middle frequency; 196 kc to 204 kc bandwidth; 3 <sup>7</sup> / <sub>64</sub> in. lg by 2 <sup>3</sup> / <sub>64</sub> in. high by 1 <sup>1</sup> / <sub>4</sub> in. wide; 55,000 ohms input and output impedance; rectangular metal case; hermetically sealed; mounts by four 4-40 integral nuts located in two rows spaced 0.610 in. apart, two in one row are spaced 2.375 in. C to C, w/ two in the other row 1.375 in. C to C; four stud type feedthru terminals; RCA part/dwg A-8832387-502	Medium Selectivity Filter, Second IF Unit
Z-1003	Assemble from Component Parts	FILTER, BANDPASS: 200 kc operating freq; 16 kc band width; 500 ohms input impedance; 250,000 ohms output impedance; 2 <sup>1</sup> / <sub>16</sub> in. lg by 1 <sup>13</sup> / <sub>32</sub> in. wide by <sup>5</sup> / <sub>8</sub> in. high; metal rectangular case; mounts by two no. 2-56 tapped holes on <sup>7</sup> / <sub>8</sub> in. by <sup>3</sup> / <sub>8</sub> in. centers located in diagonally opposite corners of top; two post type terminals; RCA part/dwg A-8848510-504 Rev. 14	Broad Selectivity Filter, Second IF Unit
Z-1004		AMPLIFIER, SUB-ASSEMBLY: used as IF v amplifier; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831124-501; one capacitor C-1031 RCA part/dwg C-737816-330; one capacitor C-1032 RCA part/dwg C-737845-74; one resistor R-1006 RCA part/dwg C-722318-52; one tube V-1001 5899; 6.3 v 150 ma heater, 120 v DC; rectangular; 2 <sup>13</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>4</sub> in. wide by 1 <sup>1</sup> / <sub>64</sub> in. thick overall approx; mounts by plugging into socket, held in place by latch located on top; cathode connection provided for manual gain control, tube is semi-remote cutoff type to allow for automatic gain control; RCA part/dwg A-8848518-501	Plug-in Sub-Assembly, First Amplifier, Second IF Unit
Z-1005	Assemble from Component Parts	TRANSFORMER SET, IF: for coupling, first IF amplifier to second IF amplifier; c/o one frame assembly RCA part/dwg C-737837-341; one terminal board RCA part/dwg A-8833243-501; one coil assembly RCA part/dwg C-746104-4; one resistor RCA part/dwg C-722318-187; one coil assembly RCA part/dwg C-746104-25; 1 <sup>13</sup> / <sub>32</sub> in. lg by <sup>5</sup> / <sub>8</sub> in. wide by 2 <sup>1</sup> / <sub>16</sub> in. high overall; RCA part/dwg A-8848510-501	Couples V-1001 to V-1002
Z-1006		AMPLIFIER, SUB-ASSEMBLY: used as IF v amplifier; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831124-501; one capacitor C-1035 RCA part/dwg C-737816-330; one capacitor C-1036 RCA part/dwg C-737845-74; one resistor R-1010 RCA part/dwg C-722318-52; one resistor R-1011 RCA part/dwg K-82283-66; one tube V-1002 5899; 6.3 v 150 ma heater, 120 v DC; rectangular; 2 <sup>13</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>4</sub> in. wide by 1 <sup>1</sup> / <sub>64</sub> in. thick overall approx; mounts by plugging into socket, held in place by latch located on top; cathode connection provided for manual gain control, tube is semi-remote cutoff type to allow for automatic gain control; RCA part/dwg A-8848518-502	Plug-in Sub-Assembly, Second IF Amplifier, Second IF Unit
Z-1007	Assemble from Component Parts	TRANSFORMER SET, IF: for coupling second IF amplifier to third IF amplifier; c/o one frame assembly RCA part/dwg A-8833240-502; two capacitors RCA part/dwg C-737837-341; one terminal board RCA part/dwg A-8833243-501; one coil assembly RCA part/dwg C-746104-4; two resistors RCA part/dwg C-722318-199; one coil assembly RCA part/dwg C-746104-25; 1 <sup>13</sup> / <sub>32</sub> in. lg by <sup>5</sup> / <sub>8</sub> in. wide by 2 <sup>1</sup> / <sub>16</sub> in. high overall; RCA part/dwg A-8848510-502	Couples V-1002 to V-1003



**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
Z-1008		AMPLIFIER, SUB-ASSEMBLY: used as 1F v amplifier; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831124-501; one capacitor C-1039 RCA part/dwg C-737816-330; one capacitor C-1040 RCA part/dwg C-737837-347; one capacitor C-1041 RCA part/dwg C-737845-74; one resistor R-1014 RCA part/dwg C-722318-52; one resistor R-1015 RCA part/dwg C-722318-81; one resistor R-1016 RCA part/dwg C-722318-69; one resistor R-1017 RCA part/dwg K-82283-66; one tube V-1003 5899; 6.3 v 150 ma heater, 120 v DC; rectangular; 2 <sup>1</sup> / <sub>2</sub> in. lg by 1 <sup>1</sup> / <sub>4</sub> in. wide by 1 <sup>1</sup> / <sub>4</sub> in. thick overall approx; mounts by plugging into socket, held in place by latch located on top; cathode connection provided for manual gain control, two outputs provided at different levels of gain; RCA part/dwg A-8848518-503	Plug-in Sub-Assembly, Final Amplifier, Second IF Unit
Z-1009		TUNING INDICATOR, RECTIFIER: rectifier output of V-1003 to actuate tuning meter; c/o four capacitors RCA part/dwg B-465842-6, RCA part/dwg C-748269-13, RCA part/dwg P-722401-63, RCA part/dwg C-737816-330; one terminal board RCA part/dwg A-8848145-501; one transformer RCA part/dwg C-746106-16; one frame assembly RCA part/dwg A-8833239-501; operates on 200 kc single phase; 2 <sup>3</sup> / <sub>2</sub> in. lg by 1 <sup>6</sup> / <sub>4</sub> in. wide by 0.784 in. high; mounts by three 0.140 in. dia mounting holes on a 1.468 in. by 0.656 in. mounting center, 0.218 in. from edge of flange; RCA part/dwg A-8848509-501 Rev. 10	Tuning Indicator Rectifier
Z-1010		AMPLIFIER, SUB-ASSEMBLY: used as IF v amplifier and mixer; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831124-501; one capacitor C-1048 RCA part/dwg C-737837-235; one capacitor C-1049 RCA part/dwg C-737845-74; one capacitor C-1059; RCA part/dwg C-737816-330; one resistor R-1020 RCA part/dwg C-722318-97; one resistor R-1021 RCA part/dwg C-722318-53; one resistor R-1022 RCA part/dwg K-82283-66; one resistor R-1032 RCA part/dwg C-722318-85; one tube V-1004 JAN 5636; 6.3 v 150 ma heater, 120 v DC; rectangular; 2 <sup>1</sup> / <sub>2</sub> in. lg by 1 <sup>1</sup> / <sub>4</sub> in. wide by 1 <sup>1</sup> / <sub>4</sub> in. thick overall approx; mounts by plugging into socket, held in place by latch located on top; provision is made for mixing BFO signal w/ input signal; RCA part/dwg A-8848518-504	Plug-in Sub-Assembly, BFO Mixer
Z-1011	Assemble from Component Parts	TRANSFORMER SET, IF: for coupling third IF amplifier to detector; c/o one frame assembly RCA part/dwg A-8833240-503; one capacitor RCA part/dwg C-737837-348; one capacitor RCA part/dwg C-737837-345; one terminal board RCA part/dwg A-8833243-501; one coil assembly RCA part/dwg C-746104-5; one coil assembly RCA part/dwg C-746104-29; 1 <sup>3</sup> / <sub>2</sub> in. lg by <sup>3</sup> / <sub>8</sub> in. wide by 2 <sup>1</sup> / <sub>16</sub> in. high overall; RCA part/dwg A-8848510-503	Couples V-1003 to V-1005
Z-1012		AMPLIFIER, SUB-ASSEMBLY: used in detector circuit; c/o one chassis and one plug assembly RCA part/dwg C-748227-1; one capacitor RCA part/dwg C-737837-247; one vacuum tube JAN 5647; 2 <sup>1</sup> / <sub>2</sub> in. lg by 1.109 in. wide by 0.781 in. high overall; plug-in mounting; RCA part/dwg 8832360-505	Plug-in Sub-Assembly Detector
Z-1013		AMPLIFIER, SUB-ASSEMBLY: used in AGC delay; c/o one chassis and plug assembly RCA part/dwg C-748227-2; one capacitor C-1053 RCA part/dwg C-737818-413; one tube V-1006 JAN 5647; 6.3 v AC 150 ma heater, bias 10 v; rectangular shape; 2 <sup>1</sup> / <sub>2</sub> in. lg by 0.750 in. wide by 1 in. high; plug-in mounted; RCA part/dwg A-8832360-506	Plug-in Sub-Assembly, Automatic Gain Control Delay Diode
Z-1014		AMPLIFIER, SUB-ASSEMBLY: used as cathode follower; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831124-502; one capacitor C-1054 RCA part/dwg C-737837-347; one capacitor C-1055 RCA part/dwg C-737816-53; one capacitor C-1056 RCA part/dwg C-737845-74; one resistor R-1023 RCA part/dwg C-722318-97; one resistor R-1024 RCA part/dwg C-722318-49; one resistor R-1025 RCA part/dwg C-722318-74; one resistor R-1026 RCA part/dwg K-82283-66; one tube V-1007 5718; 6.3 v 150 ma heater, 120 v DC; nominal load reactance 70 ohms; rectangular; 2 <sup>1</sup> / <sub>2</sub> in. lg by 1 <sup>1</sup> / <sub>4</sub> in. wide by 1 <sup>1</sup> / <sub>4</sub> in. thick overall approx; mounts by plugging into socket, held in place by latch located on top; RCA part/dwg A-8848518-505	Plug-in Sub-Assembly, Cathode Follower Amplifier Frequency Shift, IF Output
Z-1015 through Z-1100		Not Used	
Z-1101		AMPLIFIER, SUB-ASSEMBLY: used in noise limiter circuit; c/o one chassis RCA part/dwg T-628798-507; one connector RCA part/dwg C-744591-1; one latch RCA part/dwg A-8831124-501; one capacitor C-1101 RCA part/dwg C-737818-335; one capacitor C-1114 RCA part/dwg C-737845-189; one resistor R-1101 RCA part/dwg C-722318-100; one resistor R-1102 RCA part/dwg C-722318-203; one resistor R-1103 RCA part/dwg C-722318-211; one resistor R-1104 RCA part/dwg C-722318-91; one resistor R-1105 RCA part/dwg C-722318-98; one tube V-1101 JAN 5647; 6.3 v heater at 150 ma; rectangular shape; 2 <sup>1</sup> / <sub>2</sub> in. lg by 1 <sup>3</sup> / <sub>2</sub> in. wide by 1 <sup>1</sup> / <sub>4</sub> in. high overall approx; mounts by plugging into socket, held in place by latch located on top; acts as series type limiter for AC voltage in excess of 30% of applied DC input v; RCA part/dwg A-8832360-501	Plug-in Sub-Assembly, Audio Noise Limiter

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
Z-1102		AMPLIFIER, SUB-ASSEMBLY: c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744598-1; one latch RCA part/dwg A-8831124-501; one capacitor C-1102 RCA part/dwg C-737816-90; one resistor R-1106 RCA part/dwg C-722318-61; one resistor R-1107 RCA part/dwg C-722318-84; one tube V-1102 5718; 6.3 v heater at 150 ma; 120 v DC; rectangular shape; 2 <sup>15</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>32</sub> in. wide by 1 <sup>3</sup> / <sub>4</sub> in. high overall approx; mounts by plugging into socket, held in place by latch located on top; RCA part/dwg A-883206-501	Plug-in Sub-Assembly, First Audio Amplifier
Z-1103		AMPLIFIER, SUB-ASSEMBLY: used in silencer circuit; c/o one chassis RCA part/dwg T-628798-507; one connector RCA part/dwg C-744591-1; one latch RCA part/dwg A-8831124-501; one capacitor C-1103 RCA part/dwg C-737845-215; one capacitor C-1115 RCA part/dwg C-737845-168; one resistor R-1114 RCA part/dwg C-722318-197; one resistor R-1115 RCA part/dwg C-722318-207; one resistor R-1116 RCA part/dwg C-722318-211; one resistor R-1117 RCA part/dwg C-722318-219; one tube V-1103 JAN 5647; 6.3 v heater at 150 ma, 120 v DC bias v; rectangular shape; 2 <sup>15</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>32</sub> in. wide by 1 <sup>3</sup> / <sub>4</sub> in. high overall approx; mounts by plugging into socket, held in place by latch located on top; acts as electronic switch when used in conjunction w/ Z-1104; RCA part/dwg A-8832360-502	Plug-in Sub-Assembly, Silencer Diode
Z-1104		AMPLIFIER, SUB-ASSEMBLY: used as DC amplifier in silencer circuit; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831124-501; one capacitor C-1104 RCA part/dwg C-737816-410; one resistor R-1118 RCA part/dwg C-722318-219; one resistor R-1119 RCA part/dwg C-722318-179; one resistor R-1120 RCA part/dwg C-722318-219; one resistor R-1121 RCA part/dwg D-722318-217; one tube V-1104 5719; 6.3 v heater at 150 ma, 120 v DC; rectangular shape; 2 <sup>15</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>32</sub> in. wide by 1 <sup>3</sup> / <sub>4</sub> in. high overall approx; mounts by plugging into socket, held in place by latch located on top; RCA part/dwg A-883206-502	Plug-in Sub-Assembly, Silencer Diode
Z-1105		AMPLIFIER, SUB-ASSEMBLY: used as v amplifier; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831124-501; one capacitor C-1105 RCA part/dwg C-737845-189; one capacitor C-1106 RCA part/dwg C-737845-215; one resistor R-1122 RCA part/dwg C-722318-98; one resistor R-1123 RCA part/dwg C-722318-61; one resistor R-1124 RCA part/dwg C-722318-84; one tube V-1105 5718; 6.3 v heater at 150 ma, 120 v DC; rectangular shape; 2 <sup>15</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>32</sub> in. wide by 1 <sup>3</sup> / <sub>4</sub> in. high overall approx; mounts by plugging into socket, held in place by latch located on top; RCA part/dwg A-883206-503	Plug-in Sub-Assembly, Second Audio Amplifier
Z-1'06		AMPLIFIER, SUB-ASSEMBLY: used in output limiter circuit; c/o one chassis RCA part/dwg T-628798-507; one connector RCA part/dwg C-744591-1; one latch RCA part/dwg A-8831124-501; one capacitor C-1107 RCA part/dwg C-737816-87; one resistor R-1125 RCA part/dwg C-722318-94; one resistor R-1126 RCA part/dwg C-722318-69; one resistor R-1127 RCA part/dwg C-722318-86; one tube V-1106 JAN 5647; 6.3 v heater at 150 ma, 120 v DC fixed bias, 0 to 120 v DC adjustable bias; rectangular shape; 2 <sup>15</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>32</sub> in. wide by 1 <sup>3</sup> / <sub>4</sub> in. high overall approx; mounts by plugging into socket, held in place by latch located on top; acts to limit positive peaks of applied audio v; RCA part/dwg A-8832360-503	Plug-in Sub-Assembly, Limiter Diode
Z-1107		AMPLIFIER, SUB-ASSEMBLY: used in output limiter circuit; c/o one chassis RCA part/dwg T-628798-507; one connector RCA part/dwg C-744591-1; one latch RCA part/dwg A-8831124-501; one capacitor C-1108 RCA part/dwg C-737845-188; one resistor R-1128 RCA part/dwg C-722318-96; one resistor R-1129 RCA part/dwg C-722318-69; one resistor R-1130 RCA part/dwg C-722318-94; one tube V-1107 JAN-5647; 6.3 v heater at 150 ma, 120 v DC fixed bias, 0 to 120 v DC adjustable bias; rectangular shape; 2 <sup>15</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>32</sub> in. wide by 1 <sup>3</sup> / <sub>4</sub> in. high overall approx; mounts by plugging into socket, held in place by latch located on top; acts to limit negative peaks of applied v; RCA part/dwg A-8832360-504	Plug-in Sub-Assembly, Limiter Diode
Z-1108		AMPLIFIER, SUB-ASSEMBLY: used as a voltage amplifier; c/o one capacitor RCA part/dwg C-737843-74; one chassis and plug assembly C-748226-16; four resistors RCA part/dwg C-722318-99; RCA part/dwg C-722318-169, RCA part/dwg C-722318-207, RCA part/dwg C-722318-161; two resistors RCA part/dwg C-722318-94; one resistor RCA part/dwg K-82283-60; one vacuum tube JAN 5719; 2 <sup>1</sup> / <sub>2</sub> in. lg by 1.109 in. wide by 1.281 in. high overall; plug-in mounting; RCA part/dwg A-883206	Plug-in Sub-Assembly, Third Audio Amplifier
Z-1109		AMPLIFIER, SUB-ASSEMBLY: used as a power output amplifier; c/o one capacitor RCA part/dwg C-737845-167; one chassis and plug assembly RCA part/dwg C-737226-17; one vacuum tube JAN 5719; 2 <sup>1</sup> / <sub>2</sub> in. lg by 1.109 in. wide by 1.281 in. high overall; plug-in mounting; RCA part/dwg A-883206-505	Plug-in Sub-Assembly, Final Audio Amplifier
Z-1110		FILTER, BANDPASS: 1000 cycle peak, 240 to 4800 cycle bandwidth; 3 <sup>1</sup> / <sub>2</sub> in. lg by 3 in. wide by 1 in. thick overall; 30.000 ohms impedance at band center; rectangular metal case; four no. 6-32 by <sup>3</sup> / <sub>32</sub> in. lg mounting studs on 2 <sup>5</sup> / <sub>16</sub> in. by <sup>1</sup> / <sub>4</sub> in. mounting center; three solder lug terminals; operating temp range -54°C to +85°C; resistant to salt water immersion, marked in accordance w/ JAN-T-27; reference signal, 1000 cps; RCA part/dwg K-8890585-2	Controls Response of Audio Unit

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
Z-1111 through Z-1200		Not Used	
Z-1201		OSCILLATOR, SUB-ASSEMBLY: oscillator for multivibrator assembly; c/o three capacitors RCA part/dwg 737837-335, RCA part/dwg 748252-105, RCA part/dwg 722407-56; one chassis and plug assembly RCA part/dwg 748226-1; four resistors RCA part/dwg 722318-239, RCA part/dwg 722318-151, RCA part/dwg 722318-185, RCA part/dwg 722318-40; one vacuum tube JAN 5718; 2½ in. lg by 1.109 in. wide by 1⅞ in. high overall; plug-in mounting; marked with ⅜ in. high standard characters; RCA part/dwg A-8820919-503	Plug-in Sub-Assembly, Type III Calibrator Oscillator
Z-1202		AMPLIFIER, SUB-ASSEMBLY: amplifier for multivibrator assembly; c/o two capacitors RCA part/dwg 748252-123, RCA part/dwg 737818-393; two resistors RCA part/dwg 722318-177, RCA part/dwg 722318-181; one chassis and plug assembly RCA part/dwg 748226-2; one vacuum tube JAN 5718; 2½ in. lg by 1.109 in. wide by 1⅞ in. high overall; plug-in mounted; marked with ⅜ in. high characters; RCA part/dwg A-8820919-504	Plug-in Sub-Assembly, Type III Calibrator Amplifier
Z-1203 through Z-1300		Not Used	
Z-1301		COIL, RF: BFO unit; one winding; round copper shield can, cadmium plated; inductance 2.34 millihenries; 2⅝ in. lg by 1⅞ in. dia less terminals; ceramic coil form, powdered iron core; 0.312 in. OD by 1⅝ in. lg; two 0.203 in. dia mounting holes on 1.375 in. mounting center; four solder lug terminals located on bottom; marked w/ RCA part/dwg no., Govt. Stock no., and nominal frequency; hermetically sealed; to withstand 48-hr salt spray test; tapped at 0.59, 1.17 millihenries from top of winding; incl two fixed capacitors, 270 mmf, mica and 5 mmf, ceramic; RCA part/dwg C-746103-1	Resonant Circuit for BFO Unit
Z-1302		OSCILLATOR, SUB-ASSEMBLY: provides mounting for tube and associated components of oscillator; c/o one chassis RCA part/dwg C-748226-7; one capacitor C-1301 RCA part/dwg C-737816-87; one capacitor C-1302 RCA part/dwg C-737837-345; one capacitor C-1303 RCA part/dwg C-737837-347; one resistor R-1302 RCA part/dwg C-722318-62; one resistor R-1303 RCA part/dwg C-722318-79; one resistor R-1304 RCA part/dwg C-722318-78; one resistor R-1305 RCA part/dwg C-722318-86; one tube V-1301 JAN 5840; 6.3 v 150 ma heater, fixed frequency 200 kc +3 kc -0 kc; rectangular; 2½ in. lg by 1.000 in. wide by 1.250 in. high overall; mounts by plugging into socket, held in place by latch located on top; RCA part/dwg A-8833227-502	Plug-in Sub-Assembly for BFO Unit
Z-1303 through Z-1400		Not Used	
Z-1401		FREQUENCY CALIBRATOR, SUB-ASSEMBLY: provides mounting for tube, and associated components of frequency calibrator; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831124-502; one capacitor C-1402 RCA part/dwg C-737837-415; one capacitor C-1403 RCA part/dwg P-722024-563; one capacitor C-1404 RCA part/dwg C-737837-313; one resistor R-1401 RCA part/dwg P-722318-231; one resistor R-1402 RCA part/dwg K-82283-66; one resistor R-1403 RCA part/dwg P-722318-201; one resistor R-1404 RCA part/dwg P-722318-183; one tube V-1401 5718; 6.3 v 150 ma heater, 120 v DC; rectangular; 2⅝ in. lg by 1¼ in. wide by 1⅞ in. thick overall approx; mounts by plugging into socket, held in place by latch located on top; when used w/ external crystal constitute 50 kc oscillation circuit; RCA part/dwg A-8820919-501	Plug-in Sub-Assembly, Type I Calibrator Oscillator
Z-1402		FREQUENCY CALIBRATOR, SUB-ASSEMBLY: provides mounting for tube, and associated components of frequency calibrator; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831124-502; one capacitor C-1406 RCA part/dwg C-737845-566; one capacitor C-1408 RCA part/dwg C-737837-423; one capacitor C-1409 RCA part/dwg C-737837-421; one capacitor C-1410 RCA part/dwg C-722407-58; one resistor R-1405 RCA part/dwg P-722318-151; one resistor R-1406 RCA part/dwg P-722318-223; one resistor R-1407 RCA part/dwg K-82283-175; one resistor R-1409 RCA part/dwg P-722318-201; one resistor R-1410 RCA part/dwg P-722318-225; one resistor R-1412 RCA part/dwg P-722318-225; one tube V-1402 JAN 5636; 6.3 v 150 ma heater, 120 v DC; rectangular; 2⅝ in. lg by 1¼ in. wide by 1⅞ in. thick overall approx; mounts by plugging into socket, held in place by latch located on top; when used w/ appropriate external elements constitutes 10 kc oscillation; provision is made for synchronizing w/ 50 kc oscillation; RCA part/dwg A-8820919-502	Plug-in Sub-Assembly, Type I Calibrator Multivibrator
Z-1403 through Z-1500		Not Used	

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
Z-1501		FREQUENCY CALIBRATOR, SUB-ASSEMBLY: provides mounting for tube, and associated components of frequency calibrator; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831124-502; one capacitor C-1502 RCA part/dwg C-737837-331; one resistor R-1501 RCA part/dwg C-722318-239; one resistor R-1502 RCA part/dwg C-722318-151; one resistor R-1503 RCA part/dwg C-722318-207; one tube V-1501 5718; 6.3 v 150 ma heater, 120 v DC; rectangular; 2 <sup>1</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>4</sub> in. wide by 1 <sup>1</sup> / <sub>64</sub> in. thick overall approx; mounts by plugging into socket, held in place by latch located on top; RCA part/dwg A-8832383-504	Plug-in Sub-Assembly, Type II Calibrator Oscillator
Z-1502		FREQUENCY CALIBRATOR, SUB-ASSEMBLY: provides mounting for tube, and associated components of frequency calibrator; c/o one chassis RCA part/dwg T-628798-508; one connector RCA part/dwg C-744593-1; one latch RCA part/dwg A-8831124-502; one capacitor C-1503 RCA part/dwg C-737816-393; one capacitor C-1504 RCA part/dwg C-737837-331; one capacitor C-1505 RCA part/dwg C-737837-347; one resistor R-1504 RCA part/dwg C-722318-183; one resistor R-1505 RCA part/dwg C-722318-207; one tube V-1502 5718; 6.3 v 150 ma heater, 120 v DC; rectangular; 2 <sup>1</sup> / <sub>32</sub> in. lg by 1 <sup>1</sup> / <sub>4</sub> in. wide by 1 <sup>1</sup> / <sub>64</sub> in. thick overall approx; mounts by plugging into socket, held in place by latch located on top; RCA part/dwg A-8832383-505	Plug-in Sub-Assembly, Type II Calibrator Amplifier
Z-1503 through Z-1700	Not Used		
Z-1701		FILTER, BANDPASS: passband between 175 and 225 kc; 3 <sup>3</sup> / <sub>4</sub> in. max lg by 3 <sup>5</sup> / <sub>8</sub> in. wide by 1 <sup>1</sup> / <sub>16</sub> in. max thick overall; 200 ohms input and 70 ohms output impedance; rectangular metal case; four mounting holes 0.173 in. dia on 3 <sup>1</sup> / <sub>8</sub> in. by 1 <sup>1</sup> / <sub>4</sub> in. mounting center; four solder lug terminals, 2 on ea end; marked w/ RCA part/dwg no., grade, class, schematic, and pertinent electrical information; unbalanced w/ respect to ground; capable of withstanding long periods of arctic and tropical service; RCA part/dwg A-8832380-1	Filters Output Circuit from Second IF
Z-1702		FILTER, LOW-PASS: passband from 0 to 400 cycle rejection band 14 kc to 400 meg; 5 <sup>1</sup> / <sub>2</sub> in. lg by 2 <sup>5</sup> / <sub>16</sub> in. wide by 1 <sup>1</sup> / <sub>16</sub> in. thick overall; power line filter; rectangular metal case; four mounting holes 0.173 in. dia on 4 <sup>3</sup> / <sub>8</sub> in. by 2 <sup>5</sup> / <sub>16</sub> in. mounting center; six solder lug terminals, two on ea side and one on ea end; marked w/ RCA part/dwg no., grade, class, schematic, and pertinent electrical information; the filter shall be balanced w/ respect to ground, the cap to ground shall be as small as practicable; capable of withstanding long periods of arctic and tropical service; RCA part/dwg A-8832381-1	Filters Power Line Circuit
Z-1703		FILTER, LOW-PASS: 8000 cycle cutoff; 5 <sup>1</sup> / <sub>16</sub> in. lg by 2 <sup>3</sup> / <sub>8</sub> in. wide by 1 <sup>1</sup> / <sub>16</sub> in. high; 50 ohms input and 50 ohms output impedance; rectangular metal case; four mounting holes 0.173 in. dia on 4 <sup>3</sup> / <sub>8</sub> in. by 1 <sup>1</sup> / <sub>4</sub> in. mounting center; six solder lug terminals, three on ea end, center terminals are grounded; operating temp range -54°C to +85°C; marked w/ RCA part/dwg no., grade, class, schematic, and pertinent electrical information; RCA part/dwg A-8832378-1	Filters Audio Output Circuit
Z-1704 through Z-3000	Not Used		
Z-3001		AMPLIFIER, SUB-ASSEMBLY: amplifier for antenna assembly; c/o three capacitors RCA part/dwg 737816-347, RCA part/dwg 737816-427, RCA part/dwg 748252-310; one terminal board assembly RCA part/dwg 748787-503; two resistors RCA part/dwg 722318-141, RCA part/dwg 722320-66; one vacuum tube JAN 5899; 3 in. lg by 1 <sup>1</sup> / <sub>16</sub> in. wide by 1 in. high overall; mounts by two spring terminals and one spring pin one end 1.156 in. C to C, and by pin at other end center 2 <sup>3</sup> / <sub>8</sub> in. from terminal C line and 2 <sup>3</sup> / <sub>32</sub> in. from base mounting line; RCA part/dwg A-8822020-501	Plug-in Sub-Assembly, Type II Antenna Unit
Z-3002 through Z-3034	Not Used		
Z-3035		AMPLIFIER, SUB-ASSEMBLY: RF amplifier in RF unit; c/o three capacitors RCA part/dwg 737816-347, RCA part/dwg 737816-427, RCA part/dwg 748252-210; one terminal board assembly 748787-505; two resistors RCA part/dwg 722318-141, RCA part/dwg 722320-66; one vacuum tube JAN 5899; 3 in. lg by 1 <sup>1</sup> / <sub>16</sub> in. wide by 1 in. high overall; mounts by two spring terminals and spring pin one end 1.156 in. C to C, and by one pin at other end center 2 <sup>3</sup> / <sub>8</sub> in. from terminal center line and 2 <sup>3</sup> / <sub>32</sub> in. from base mounting line; RCA part/dwg A-8822020-502	Plug-in Sub-Assembly, Type III RF Unit
Z-3036 through Z-3100	Not Used		
Z-3101		AMPLIFIER, SUB-ASSEMBLY: plug-in board in antenna box assembly; c/o one capacitor silver mica RCA part/dwg C-737837-323; four capacitors paper RCA part/dwg C-737816-347; one terminal board assembly RCA part/dwg C-748787-502; five resistors RCA part/dwg C-722318-87, RCA part/dwg C-722318-94, RCA part/dwg C-722318-50, RCA part/dwg C-722318-133, RCA part/dwg C-722320-66; 3 in. lg by 1 <sup>1</sup> / <sub>16</sub> in. wide by 1 in. deep overall; plug-in mounting; used as RCA part/dwg A-8822020-503	Plug-in Sub-Assembly, Type III RF Unit

**TABLE 8-1. MAINTENANCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
Z-3135		AMPLIFIER, SUB-ASSEMBLY: used as plug-in RF Box Assembly; c/o one capacitor silver mica RCA part/dwg C-737837-323; three capacitors paper RCA part/dwg C-737816-347; one capacitor paper RCA part/dwg C-737816-427; one terminal board assembly RCA part/dwg C-748787-504; four resistors RCA part/dwg C-722318-87, RCA part/dwg C-722318-94, RCA part/dwg C-722318-141, RCA part/dwg C-722320-66; one vacuum tube JAN 5899; 3 in. lg by 7/16 in. wide by 1 in. deep overall; plug-in mounting; RCA part/dwg A-8822020-504	Plug-in Sub-Assembly, Type III RF Unit
Z-3136 through Z-4000		Not Used	
Z-4001		Same as Z-1701	Filters Output Circuit from Second IF
Z-4002		Same as Z-1702	Filters Output Power Line Circuit
Z-4003		Same as Z-1703	Filters Audio Output Circuits
Z-4004		FILTER, BANDPASS: passband 100 kc to 1700 kc; 5 1/2 in. lg by 3 in. wide by 3/4 in. high overall approx; 200 ohms input 70 ohms output impedance; rectangular metal case; four mounting holes 0.173 in. dia on 5 in. by 2 1/4 in. mounting center; four solder lug terminals, hermetically sealed; RCA part/dwg A-8832379-1	Filters Output Circuit from First IF
Z-4005 through Z-4400		Not Used	
Z-4401		OSCILLATOR, SUB-ASSEMBLY: used as an oscillator plug-in board assembly in RF oscillator box; c/o two capacitors mica RCA part/dwg C-748252-312, RCA part/dwg C-737837-348; one capacitor silver mica RCA part/dwg C-737837-323; one capacitor paper RCA part/dwg C-737816-27; two capacitors paper RCA part/dwg C-737816-427; one terminal board assembly RCA part/dwg C-748787-501; one choke coil RCA part/dwg 8810453-501; three resistors RCA part/dwg C-722318-80, RCA part/dwg C-722318-40, RCA part/dwg 82283-75; 3 in. lg by 7/16 in. wide by 1 in. high overall; plug-in mounting; RCA part/dwg A-8815781-501	Plug-in Sub-Assembly, Type III Oscillator Unit

**TABLE 8-2. PARTS SUPPLIED WITH EQUIPMENT**

REF. DESIG.	BOX No.	QUANTITY	REF. DESIG.	BOX No.	QUANTITY

TABLE 8-3. STOCK NUMBER IDENTIFICATION

REF. DESIG.	STOCK NUMBER			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	AIR FORCE
**		F16-Q-112104-100		
		F16-Q-112104-200		
***		F16-Q-112106-100		
		F16-Q-112106-200		
A-1301		N16-C-650001-777		
A-1601		N16-B-151921-134		
A-1602		N16-S-34599-7750		
A-2113		N16-C-650001-784		
A-3001		N16-B-750001-875		
A-3601		N16-B-300001-183		
A-3604		N16-B-750001-885		
C-101		N16-C-45802-4768		
C-102		N16-C-29713-6603		
C-103		N16-C-59365-1938		
C-104		N16-C-44111-2371		
C-106		N16-C-29370-7461		
C-107		N16-C-42762-5397		
C-126		N16-C-16245-8001		
C-127		N16-C-40120-3671		
C-128		N16-C-58716-4907		
C-130		N16-C-41052-5601		
C-131		N16-C-58716-4907		
C-132		N16-C-16245-1248		
C-133		N16-C-42786-1080		
C-136		N16-C-44110-6585		
C-139		N16-C-42729-2001		
C-143	CC21CH120J	N16-C-15953-2999		
C-155		N16-C-16149-5001		
C-162		N16-C-45803-1984		
C-223		N16-C-30109-3330		
C-224		N16-C-40358-1930		
C-353		N16-C-26020-7691		
C-355		N16-C-30921-8710		
C-361		N16-C-28547-8665		
C-367		N16-C-27577-1231		
C-368		N16-C-42762-5397		
C-369		N16-C-42765-4822		
C-416		N16-C-16299-7701		
C-417		N16-C-99999-0037		
C-423		N16-C-26838-5145		
C-556	CC20CJ030C	N16-C-15528-5428		
C-557		N16-C-27075-8741		
C-558		N16-C-99999-0038		
C-560		N16-C-27999-1634		
C-563		N16-C-26732-9439		
C-564	CC20CH18CG	N16-C-16043-9128		
C-565		N16-C-29971-5410		
C-566		N16-C-27177-2063		
C-568		N16-C-28969-1660		
C-575		N16-C-44111-2270		
C-577		N16-C-15957-9125		
C-710		N16-C-64040-2005		
C-711		N16-C-45773-6723		
C-714		N16-C-29898-3409		
C-716		N16-C-99999-0041		
C-717		N16-C-28210-1404		
C-718		N16-C-45768-8214		
C-719		N16-C-45768-7992		
C-723		N16-C-29449-8642		
C-812		N16-C-29133-3841		
C-813		N16-C-27181-4341		
C-814		N16-C-29608-2009		
C-817		N16-C-42733-5956		
C-1001*	CM20C121J	N16-C-28737-7001		
C-1029		N16-C-64040-2000		
C-1030		N16-C-42729-8483		
C-1031		N16-C-43632-8786		
C-1032		N16-C-42732-6955		
C-1044		N16-C-15912-4628		
C-1047		N16-C-41064-1134		
C-1048*		N16-C-26838-5145		

\* Stock Number or Replacement Part.

\*\* Receiver, Radio: (AN/FRR-21)

\*\*\* Receiver, Radio: (AN/FRR-22)

TABLE 8-3. STOCK NUMBER IDENTIFICATION (Continued)

REF. DESIG.	STOCK NUMBER			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	AIR FORCE
C-1050		N16-C-30188-3727		
C-1052		N16-C-30114-3006		
C-1053		N16-C-45770-1671		
C-1055		N16-C-45770-1762		
C-1061		N16-C-46200-7165		
C-1063		N16-C-45773-7410		
C-1101		N16-C-46200-6410		
C-1102		N16-C-43633-4056		
C-1103		N16-C-39693-5927		
C-1107		N16-C-44111-1211		
C-1108		N16-C-40024-4700		
C-1111		N16-C-45770-1521		
C-1112		N16-C-45770-1522		
C-1201		N16-C-64175-6209		
C-1202		N16-C-46200-9903		
C-1204		N16-C-28975-1526		
C-1205		N16-C-99999-0034		
C-1206		N16-C-45813-3189		
C-1207		N16-C-99999-0033		
C-1208*	CC21CJ030C	N16-C-15528-5533		
C-1305		N16-C-42733-5793		
C-1309		N16-C-60027-1001		
C-1403		N16-C-30367-9395		
C-1404		N16-C-15627-9158		
C-1405		N16-C-45770-1713		
C-1406		N16-C-30183-1890		
C-1413		N16-C-26833-3226		
C-1504		N16-C-28553-1051		
C-1601		N16-C-20267-5896		
C-1603		N16-C-42767-5708		
C-2001		N16-C-63536-1001		
C-2002		N16-C-49983-2357		
C-2101		N16-C-63656-1001		
C-2106		N16-C-59261-4029		
C-2107		N16-C-45770-1435		
C-2202		N16-C-99999-0043		
C-3003	CC21CK020D	N16-C-15436-1367		
C-3005		N16-C-15563-9168		
C-3035		N16-C-58716-4907		
C-3045		N16-C-99999-0039		
C-3066		N16-C-99999-0036		
C-3101	CC20CH050C	N16-C-15624-4628		
C-3103	CC20CH090C	N16-C-15880-4628		
C-3107		N16-C-29707-7628		
C-4001		N16-C-99999-0042		
C-4406		N16-C-99999-0029		
C-4408		N16-C-15752-4501		
C-4409		N16-C-99999-0030		
C-4412		N16-C-99999-0031		
C-4415		N16-C-99999-0063		
C-4421		N16-C-26442-8169		
CR-1001		N16-T-51769		
E-103		N17-B-77963-2407		
E-104		N17-B-77734-7964		
E-128		N17-B-77734-7963		
E-130		N17-B-77691-3814		
E-131		N17-B-77734-7962		
E-153		N17-B-77690-4910		
E-203		N17-B-77685-5981		
E-355		N17-B-99999-0007		
E-403		N17-B-77635-5817		
E-404		N17-B-77741-3834		
E-553		N17-B-77685-5993		
E-555		N17-B-77936-2435		
E-1015		N16-T-26623-4296		
E-1302		N17-T-26653-4296		
E-1701		N17-C-945001-202		
E-1702		N17-S-250051-154		
E-2001		N17-B-77535-3065		
E-2005		N16-K-700284-190		
E-2006		N16-K-700026-102		
E-3603		N16-K-700349-674		
F-1601		N16-F-99999-0060		

\* Stock Number or Replacement Part.

TABLE 8-3. STOCK NUMBER IDENTIFICATION (Continued)

REF. DESIG.	STOCK NUMBER			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	AIR FORCE
H-2001		G41-W-2446-2		
H-2002		G41-W-2445-2		
H-2003		G41-W-2444-5		
H-2004		N16-T-750286-393		
H-2005		N16-T-751254-406		
H-2008		G41-W-2449-2		
H-2019		N16-S-470001-128		
H-2020		N16-S-470001-129		
H-3601		N17-R-651091-125		
H-3602		N17-R-651091-125		
I-2001		G17-L-6806-130		
I-3601		G17-L-5207		
J-101		N17-C-73572-8047		
J-102		N17-C-73185-2849		
J-103		N17-C-73257-3744		
J-127		N17-C-73126-3839		
J-701		N17-C-73459-9862		
J-702		N17-C-73531-3457		
J-1002		N17-C-73605-6389		
J-1601		N17-C-73606-7745		
J-1701		N17-C-72595-1800		
J-1704		N17-C-72604-4794		
J-1705		N17-C-73108-1267		
J-1707		N17-C-73108-5905		
J-1709		N17-C-73304-1318		
J-2002		N17-C-73288-1712		
J-2006		N17-C-73162-3774		
J-2007		N17-C-73242-6015		
J-2009		N17-C-73317-2189		
J-2013		N17-C-73317-6429		
J-2014		N17-C-73591-1360		
J-2015		N17-J-39650-1051		
K-1701		N17-R-99999-0038		
L-201		N16-C-76780-2846		
L-202		N16-C-76736-6086		
L-203		N17-C-76729-6401		
L-204		N16-C-76748-1800		
L-205		N17-C-74123-3251		
L-401		N16-C-76702-8966		
L-402		N16-C-76678-2203		
L-403		N16-C-99999-0046		
L-404		N16-C-76613-7351		
L-405		N16-C-76570-2942		
L-1010		N16-C-76743-1909		
L-1011		N16-C-76743-2212		
L-1013		N16-C-76727-7769		
L-1601		N16-R-29792-1061		
L-2001		N16-C-99999-0045		
L-2002		N16-R-28800-2904		
L-2202		N16-C-99999-0049		
L-3035		N16-C-76736-2445		
L-3036		N16-C-76683-9101		
L-3037		N16-C-76660-1901		
L-3038		N16-C-76635-3261		
L-3039		N16-C-76594-4421		
L-3135		N16-C-76635-4211		
L-3136		N16-C-76588-5403		
L-3137		N16-C-76533-2801		
L-3138		N16-C-76520-6575		
L-3139		N16-C-76520-4648		
L-4401		N16-C-76611-4201		
L-4402		N16-C-76569-8211		
L-4403		N16-C-76529-8501		
L-4404		N16-C-76520-7493		
L-4405		N16-C-99999-0050		
L-4406		N16-C-99999-0048		
M-2001		N17-M-18982-9120		
M-2002		N17-M-22713-3543		
O-103		N16-L-300001-168		
O-106		N16-L-99999-0046		
O-2003		N16-G-431136-114		
O-2005		N17-B-51951-1021		
O-2008		N16-R-33591-1335		



TABLE 8-3. STOCK NUMBER IDENTIFICATION (Continued)

REF. DESIG.	STOCK NUMBER			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	AIR FORCE
O-2011		N16-H-150001-337		
O-2016		N16-C-200001-138		
O-2017		N16-C-200001-138		
O-2018		N16-M-250606-646		
O-2019		N16-R-33591-1334		
O-2021		G778-999-75010-0100		
O-2022		N17-S-46733-2361		
O-2023		N16-P-401461-107		
O-2025		N16-P-401461-108		
O-2027		N16-M-250598-449		
O-2102		N17-A-25801-1049		
O-3606		N17-S-46746-8251		
O-3607		N17-S-46736-8476		
O-3608		N17-A-99999-0044		
O-3612		N16-G-500001-466		
O-3618		N16-S-117101-793		
O-3619		N17-A-25801-1048		
O-3620		N17-C-98611-1221		
O-3621		N16-L-288001-110		
O-3622		N17-L-240023-551		
O-3623		G778-999-75012-100		
O-3628		N16-R-33591-1378		
O-3718		N16-S-117101-794		
O-3818		N16-S-117101-795		
O-3828		N16-D-99999-0002		
R-101		N16-R-50012-816		
R-102		N16-R-49940-811		
R-103	RC20BF471K	N16-R-49769-811		
R-104	RC20BF221K	N16-R-49661-811		
R-105		N16-R-49598-811		
R-106		N16-R-51065-811		
R-107		N16-R-50633-811		
R-108		N16-R-49687-431		
R-109		N16-R-50129-815		
R-129		N16-R-50480-811		
R-130		N16-R-50552-811		
R-151		N16-R-49580-811		
R-153		N16-R-49688-811		
R-154		N16-R-50399-811		
R-155		N16-R-49768-431		
R-201		N16-R-50417-811		
R-204		N16-R-50822-811		
R-351		N16-R-50713-431		
R-353		N16-R-50479-431		
R-354	RC20BF681J	N16-R-49840-431		
R-401		N16-R-50011-431		
R-402	RC20BF152J	N16-R-49966-431		
R-403		N16-R-49705-431		
R-404	RC20BF121J	N16-R-49597-431		
R-405		N16-R-50444-233		
R-407		N16-R-50128-438		
R-551		N16-R-50371-431		
R-552		N16-R-49642-431		
R-702		N16-R-50282-725		
R-703		N16-R-50975-811		
R-705		N16-R-50237-815		
R-802		N16-R-50282-811		
R-803		N16-R-49643-811		
R-1001		N16-R-99999-0037		
R-1003		N16-R-50416-431		
R-1004		N16-R-50164-431		
R-1005		N16-R-50993-811		
R-1008		N16-R-50335-431		
R-1014		N16-R-49922-811		
R-1019		N16-R-50129-811		
R-1023		N16-R-50551-431		
R-1027		N16-R-50444-811		
R-1028		N16-R-50821-431		
R-1029		N16-R-51136-431		
R-1102		N16-R-50587-431		
R-1103		N16-R-50650-431		
R-1104		N16-R-50741-811		
R-1106		N16-R-49877-811		

TABLE 8-3. STOCK NUMBER IDENTIFICATION (Continued)

REF. DESIG.	STOCK NUMBER			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	AIR FORCE
R-1108		N16-R-51019-431		
R-1110		N16-R-51173-811		
R-1111		N16-R-50398-431		
R-1115		N16-R-50632-431		
R-1116		N16-R-50677-431		
R-1117		N16-R-50758-431		
R-1119		N16-R-50038-431		
R-1120	RC20BF134J	N16-R-50659-431		
R-1121		N16-R-50740-431		
R-1122		N16-R-50651-811		
R-1126		N16-R-50093-811		
R-1135		N16-R-49939-431		
R-1136		N16-R-49841-818		
R-1137		N16-R-51172-431		
R-1201		N16-R-51064-431		
R-1203		N16-R-50308-431		
R-1205		N16-R-50236-431		
R-1206	RC20BF150K	N16-R-49283-811		
R-1301		N16-R-50012-811		
R-1304		N16-R-50372-811		
R-1401		N16-R-50974-431		
R-1403		N16-R-50515-431		
R-1405	RC20BF184J	N16-R-50695-431		
R-1411		N16-R-87521-8010		
R-1412		N16-R-50857-431		
R-1504		N16-R-50281-431		
R-1507		N16-R-49255-431		
R-1601		N16-R-87192-5300		
R-1602		N16-R-50445-501		
R-1603*		N16-R-66214-8991		
R-1604		N16-R-65845-9776		
R-1605		N16-R-85002-6871		
R-2001		N16-R-88919-1361		
R-2003		N16-R-49462-431		
R-2004	RC20BF392J	N16-R-50092-431		
R-2006	RC20BF621J	N16-R-49822-431		
R-2007		N16-R-89219-1001		
R-2008		N16-R-87852-5365		
R-2106		N16-R-88342-5310		
R-2113		N16-R-50588-811		
R-3003		N16-R-50012-816		
R-3104		N16-R-49534-431		
R-3601		N16-R-89232-2988		
R-3602*		N16-R-49428-231		
R-4001		N16-R-49706-811		
R-4402		N16-R-50309-816		
S-101		N16-S-65233-6617		
S-102		N17-S-69074-4589		
S-126		N17-S-65233-6567		
S-701		N17-S-61615-1001		
S-1001		N17-S-91897-8968		
S-1101		N17-S-63719-3559		
S-1301		N17-S-91897-8969		
S-2001		N17-S-73082-9028		
S-2002		N17-S-74139-4844		
S-2003		N17-S-70777-8626		
S-2004		N17-S-59672-7885		
S-2005		N17-S-60080-3251		
S-2102		N17-S-72018-7719		
S-3035		N17-S-62311-2701		
S-3601		N17-S-69085-2701		
T-101		N17-C-99999-0070		
T-102		N17-T-81385-1532		
T-103		N17-T-81403-1422		
T-104		N17-T-81406-1515		
T-105		N17-T-81412-1526		
T-126		N16-C-99999-0051		
T-127		N17-T-81385-1535		
T-128		N17-T-81403-1420		
T-129		N17-T-81406-1517		
T-130		N17-T-81412-1536		
T-151		N17-T-81746-5804		
T-152		N17-T-81385-1537		

\* Stock Number or Replacement Part.

TABLE 8-3. STOCK NUMBER IDENTIFICATION (Continued)

REF. DESIG.	STOCK NUMBER			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	AIR FORCE
T-153		N17-T-81403-1501		
T-154		N17-T-81406-1527		
T-155		N16-C-99999-0047		
T-351		N17-T-82238-6207		
T-352		N17-T-82246-1707		
T-353		N17-T-82261-2301		
T-354		N17-T-82261-5651		
T-355		N17-T-82262-2751		
T-551		N17-T-82300-1979		
T-552		N17-T-82282-2701		
T-553		N17-T-82269-9061		
T-554		N17-T-82267-5237		
T-555		N17-T-82266-8723		
T-703		N17-T-67517-4424		
T-1011		N17-T-67517-4374		
T-1013		N17-T-67517-4469		
T-1014		N16-C-99999-0055		
T-1101		N17-T-64402-5501		
T-1601		N17-T-73701-5366		
V-101		N16-T-75899		
V-151		N16-T-75636		
V-201		N16-T-75840		
V-552		N16-T-75718		
V-1005		N16-T-75647		
V-1104		N16-T-75719		
V-1109		N16-T-75902		
V-1601		N16-T-56840		
V-1603		N16-T-75644		
X-701		N16-S-54287-5051		
X-702		N17-C-73255-1514		
X-1005		N17-C-73224-1698		
X-1601		N16-S-63515-4151		
X-1603		N16-S-62603-6446		
X-1606		N17-F-74267-5075		
X-2001		N17-I-76737-2765		
X-3601		N17-L-51629-1001		
X-3602		N17-L-51629-1003		
Y-701		N16-C-96205-1201		
Y-901		N16-C-96826-7063		
Y-1201		N16-C-96249-9999		
Y-1401		N16-C-96132-4201		
Z-101		N16-R-33591-1358		
Z-126		N16-R-33591-1357		
Z-151		N16-R-33591-1356		
Z-201		N16-R-33591-1359		
Z-351		N16-A-38801-1163		
Z-401		N16-A-38801-1152		
Z-551		N16-C-91201-1027		
Z-701		N16-C-91201-1019		
Z-702		N16-F-32602-4376		
Z-801		N16-C-91201-1017		
Z-802		N16-F-32681-1001		
Z-901		N16-C-91201-1018		
Z-1001		N16-F-32633-1157		
Z-1002		N16-F-99999-0056		
Z-1003		N17-C-76743-5913		
Z-1004		N16-A-38801-1127		
Z-1006		N16-A-38801-1102		
Z-1008		N16-A-38801-1128		
Z-1010		N16-A-38801-1104		
Z-1012		N16-A-38801-1158		
Z-1013		N16-R-33591-1379		
Z-1014		N16-A-38801-1103		
Z-1101		N16-A-38801-1108		
Z-1102		N16-A-38801-1113		
Z-1103		N16-A-38801-1111		
Z-1104		N16-A-38801-1114		
Z-1105		N16-A-38801-1112		
Z-1106		N16-A-38801-1107		
Z-1107		N16-A-38801-1106		
Z-1108		N16-A-38801-1110		
Z-1109		N16-A-38801-1109		
Z-1110		N16-F-32088-9827		

**TABLE 8-3. STOCK NUMBER IDENTIFICATION (Continued)**

REF. DESIG.	STOCK NUMBER			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	AIR FORCE
Z-1201		N16-C-99999-0007		
Z-1202		N16-C-14435-1030		
Z-1301		N16-C-74615-6431		
Z-1302		N16-C-66001-1015		
Z-1401		N16-C-14435-1001		
Z-1402		N16-C-14435-1002		
Z-1501		N16-F-92261-1001		
Z-1502		N16-F-92261-1002		
Z-1701		N16-F-32633-2649		
Z-1702		N16-F-99999-0091		
Z-1703		N16-F-44106-2081		
Z-4004		N16-F-32662-8001		

**TABLE 8-4. LIST OF MANUFACTURERS**

ABBREVIATION	PREFIX	NAME	ADDRESS
		Accurate Bushing Co.	3902 J St. Phila., Pa.
ACGE		Acme Gear & Machine Co.	330 N. 7th St. Phila., Pa.
		Advance Tool & Die Co.	15 W. Coulter Ave. Collingswood, N. J.
AEV		Aerovox Corp.	740 Belleville Ave. Attn. H. Sylvia New Bedford, Mass.
ALD		Allegheny Ludlum Steel Co.	Room 1360, Suburban Station Bldg. 1617 Pennsylvania Blvd. Phila., Pa.
AB		Allen Bradley Co.	3614 Walnut St. Phila., Pa.
		All Star Products, Inc.	Defiance, Ohio
ALR		Almo Radio Co.	509 Arch St. Phila., Pa.
		American Aluminum Co.	378 Jelliff Ave. Newark 8, N. J.
		American Cam Co.	Box 2106 Hartford, Conn.
AECI		American Emblem Co.	1338 Lincoln Liberty Bldg. Phila. 7, Pa.
AMP		American Phenolic Corp.	1830 S. 54th St. Chicago, Ill.
ATV		Amperite Co., Inc.	561 Broadway N. Y. C., N. Y.
ANCL		Ansonia Mfg. Co.	Ansonia, Conn.
AHH		Arrow Hart & Hegeman	103 Hawthorne St. Hartford, Conn.
		Arrow Tool & Die Co.	Erdrick and Van Kirk Sts. Phila., Pa.
SBAC		Semon, Bache & Co.	Greenwich and Morton Sts. New York 14, N. Y.
BAL		Ballantine Labs	Boonton, N. J.
BEAR		Bearings Inc.	1410 W. Hunting Park Ave. Phila., Pa.
		Berkeley Scientific Div.	2200 Wright Ave. Rochmond, Calif.
BHE		Birtcher Co.	4371 Valley Blvd. Los Angeles, Calif.
		Bogart Mfg. Co.	315 Siegel St. Brooklyn, N. Y.
		Boose Aluminum Foundry	Reamstown, Pa.
		Wm. Brand & Co., Inc.	North and Valley Sts. Willimantic, Conn.

TABLE 8-4. LIST OF MANUFACTURERS (Continued)

ABBREVIATION	PREFIX	NAME	ADDRESS
		H. Braun Tool and Instrument Co.	140 Fifth Ave. Hawthorne, N. J.
		Bridgeport Insulated Wire Co.	51 Brookfield Ave. Bridgeport, Conn.
		Brilhart Plastic Sales	Old Country Rd. Mineola, L. I., N. Y.
		Bristol Spring Mfg. Co.	165 W. Main St. Plainville, Conn.
		Buckbee Mears Co.	Lindeke Bldg. St. Paul, Minn.
BE		Burndy Engr. Co.	101 N. 33rd St. Phila., Pa.
BUS		Bussman Mfg. Co.	2538 University St. St. Louis, Mo.
CGT		Cambridge Thermionic Corp.	445 Concord Ave. Cambridge 38, Mass.
		Camcar Screw & Mfg. Co.	600 - 18th Ave. Rockford, Ill.
		Camden Tool & Supply Co.	129 York St. Camden, N. J.
		Campion Co., Inc.	34 S. 16th St. Phila., Pa.
		Cannon Elec. Co.	6th and Cooper St. Camden, N. J.
		E. R. Capewell Co.	Route 38 and Rudderow Ave. Maple Shade, N. J.
CAS		Casanave Supply Co.	2028 Sansom St. Phila., Pa.
CN		Centralab Div. of Globe	900 E. Keefe Ave. Milwaukee, Wisc.
CSNE		Central Screw & Mfg. Co.	Keene, N. H.
CPH		Chicago Telephone Supply Co.	Elkhart, Ind.
CHT		Chicago Transformer Co.	Addison and Elston Ave. Chicago, Ill.
CIN		Cinch Mfg. Co.	3701 N. Broad St. Phila., Pa.
		Clamart Company	401 Kossuth St. Riverside, N. J.
		Cleverly Elec. Wks.	17 N. 7th St. Phila., Pa.
		Communications Prod. Co.	Marlboro, N. J.
COSP		Connecticut Spring Corp.	1841 Broad St. Hartford, Conn.
		Continental Connector Corp.	Northern Blvd. at 45th St. Long Island City, N. Y.
		Continental Diamond Fibre Co.	Norristown, Pa. (Bridgeport, Pa.)
		Continental Machine Wks.	74-82 Slater St. Paterson, N. J.
COSC		Continental Screw Co.	New Bedford, Mass.
CLD		Cornell Dublier Elec. Co.	383 Hamilton Blvd. S. Plainfield, N. J.
		C. T. C. Corp.	544 Haddon Ave. Collingswood, N. J.
		Dage Electric Corp.	67 N. 2nd St. Beech Grove, Indiana
		Dalton Tool Co.	Cedar Ave. and White Horse Pike Berlin, N. J.
DJA		De Jur-Amsco Corp.	45-01 Northern Blvd. Long Island City, N. Y.
DLC		Dialight Corp.	60 Stewart Ave. Brooklyn, New York
		Dillon & Beck Mfg.	1227 Central Ave. Hillside, New Jersey
		Doehler Jarvis	Pottstown, Penna.
		Downs-Smith Brass & Copper Co.	120 N. 32nd St. Philadelphia, Penna.
		Drever Co.	220 W. Cambria St. Phila., Penna.

TABLE 8-4. LIST OF MANUFACTURERS (Continued)

ABBREVIATION	PREFIX	NAME	ADDRESS
		Durable Wire Co., c/o Rutan & Co.	1717 Sansom St. Phila., Penna.
		Eastern Screw & Supply Co.	374 Broad St. Newark, New Jersey
EAS		Eastern Spec.	3617 No. 8th St. Philadelphia, Penna.
EBY		H. H. Eby	18 W. Chelton Ave. Phila., Penna.
EBS		Edgcomb Steel	D St. and Erie Ave. Philadelphia, Penna.
		Edsam Screw Machine Co.	46 N. Forklanding Rd. Maple Shade, New Jersey
		Electro Motive Mfg.	Willimantic, Conn.
		Electronic Metalcraft Corp.	6700 Rudderow Ave. Merchantville, New Jersey
		Electronic Parts Specialty	Lumberton, New Jersey
		Emerson Plastics	567 Third Ave. New York, N. Y.
		Engar Machine Co.	Elmwood Rd. Marlton, New Jersey
ERC		Erie Resistor Corp.	Electronics Division Erie, Penna.
		Essex Wire Co.	Room 422, Center Bldg. Upper Darby, Penna.
		F. B. F. Tool	7260-68 Oakley St. Phila., Penna.
FSSU		Federal Screw & Supply	525 Broome St. New York, New York
		Fidelity Tool Supply Co.	309 Vine St. Camden, New Jersey
		The Filtron Co., c/o Massey Associates	529 Brookhurst Ave. Narberth, Penna.
		Fischer Casting Co.	700 South Ave. Dunnellen, New Jersey
FISM		Fischer Special Mfg. Co.	Morgan and Dover Sts. Cincinnati, Ohio
FXP		Föx Products	4720 North 18th St. Phila., Penna.
		Gadren Machine	P. O. Box 146 Audubon, New Jersey
		Garde Mfg.	588 Eddy St. Providence, Rhode Island
GGK		G. K. Garrett	D and Tioga Sts. Philadelphia, Penna.
		General Electric	1405 Locust St. Phila., Penna.
		General Radio	90 West St. New York, N. Y.
GER		General Radio	275 Massachusetts Ave. Cambridge, Mass.
		General Radio Supply Co.	6th and Penn Sts. Camden, New Jersey
		J. T. George	1815 Park St. Hartford, Conn.
		G. & F. Mfg.	1017 Frankford Ave. Philadelphia, Penna.
		Goodyear Supply Co.	1605 W. Hunting Park Ave. Philadelphia, Penna.
GRPH		Grant Pulley & Hardware	31-85 Whitestone Parkway Flushing, New York
GSY		Guarantee Spec. Mfg. Co.	E. 96th St. and N.Y.C.R.R. Cleveland, Ohio
GUC		The Gudeman Co.	361 W. Superior St. Chicago, Illinois
HTZ		T. B. Hagstoz & Son	709 Sansom St. Phila., Penna.
HMM		Hammarlund Mfg.	460 W. 34th St. New York 1, N. Y.

TABLE 8-4. LIST OF MANUFACTURERS (Continued)

ABBREVIATION	PREFIX	NAME	ADDRESS
HDH		Handy & Harman	82 Fulton St. New York, N. Y.
HWH		Hardwick Hindle Co.	40 Herman St. Newark, N. J.
		Hewlett Packard, c/o Burlingame Assoc.	103 Lafayette St. New York, N. Y.
HIH		Hill Chase & Co.	2223 E. Ontario St. Philadelphia, Penna.
		Hill Electronics Eng. & Mfg.	New Kingstown, Penna.
		Hinde & Dauch Paper Co.	5th and Walnut Sts. Gloucester, New Jersey
		Hi-Q Division, Aerovox Corp.	Olean, New York
		Hobby Bay Industries	P. O. Box 182 Berwyn, Illinois
HYK		Holyoke Wire & Cable Co.	720 Main St. Holyoke, Mass.
		Ludwig Honold Mfg.	Chester Pike and Folcroft Rd. Folcroft, Penna.
		Hunter Spring	1 Spring Ave. Lansdale, Penna.
HSG		C. G. Hussey Co.	1632 Fairmount Ave. Philadelphia, Penna.
		Independent Machine	1942 N. Hope St. Philadelphia, Penna.
		Independent Mfg. Co.	Land St. and Bellview Ave. E. Riverton, New Jersey
		Indiana Screw Machine Prod. Co.	35 Herman St. Worcester, Mass.
		Industrial Engraving Co.	101 N. 3rd St. Camden, New Jersey
		Industrial Packaging Prod.	1830 E. Hagert St. Phila., Penna.
ISCI		Instrument Spec. Co., Inc.	Little Falls, New Jersey
ININ		International Instrument Co.	P. O. Box 2954 New Haven 15, Conn.
		Jackson & Heit Machine Co.	7111 Keystone St. Phila., Penna.
JON		E. F. Johnson Co.	Waseca, Minnesota
		Kaiser Aluminum & Chemical Corp.	1616 Walnut St. Phila., Penna.
		Carl Link Mfg. Co.	913 Everett St. Camden, New Jersey
KMPC		Karp Metal Products Co.	211 - 63rd St. Brooklyn, New York
KAEL		Kay Electric Co.	14 Maple Ave. Pine Brook, New Jersey
		Kay Machine Co.	405 Fillmore St. Gloucester, New Jersey
KYC		Keystone Carbon Co.	St. Marys, Penna.
		Keys Tool Co.	Edgemont and Clementine Sts. Philadelphia 34, Penna.
KNU		The James Knights Co.	Sandwich, Illinois
KRW		William Kratt Co.	988 Johnson Place Union, New Jersey
		Landen Mfg. Co.	110 Beechwood Ave. Merchantville 10, New Jersey
		Lane Iron Works	83-85 Wythe Ave. Brooklyn, New York
		Lane Forging Co.	83-85 Wythe Ave. Brooklyn, New York
		Lanum Metal Prod.	4100 N. 16th St. Philadelphia, Penna.
		La Pointe Machine Tool Co.	Hudson, Mass.
		Larben Corp.	21 W. Cleveland St. Valley Stream, New York

TABLE 8-4. LIST OF MANUFACTURERS (Continued)

ABBREVIATION	PREFIX	NAME	ADDRESS
		Lariber Machine Co.	2 Main St. Camden, New Jersey
		Jack Leefson	5235 Whitby Ave. Philadelphia, Penna.
		Lewis Spring Mfg. Co.	2652 W. North Ave. Chicago, Illinois
		L. & S. Mfg. Co.	4346 North Gratz St. Phila., Penna.
MAD		Maddock & Co.	42 N. 6th St. Phila., Penna.
		P. R. Mallory & Co.	1343 Arch St. Philadelphia, Penna.
MKU		Manne Knowlton Insulation	416 W. 13th St. New York 14, New York
		L. Frank Markel & Sons	School Lane Norristown, Penna.
		Marlton Pike Precision Shop, Inc.	Marlton Pike and Union Ave. Merchantville 9, N. J.
MMSI		Mass. Machine Shop	817 Albany St. Boston, Mass.
		John Maxwell Co.	1322 Fairmount Ave. Philadelphia, Penna.
		Mead Specialties, c/o Jackson Walters	2027 Arch St. Phila., Penna.
MLG		Melrath Supply & Gasket Co.	Tioga and Memphis Ave. Phila., Penna.
MEVC		Merchant & Evans	2035 Washington Ave. Philadelphia, Penna.
MECT		Metal Etching Corp.	8300 Atlantic Ave. Ozone Park, L. I., New York
		Micro Switch, Div. Mpls. Honeywell	3345 W. Hunting Park Ave. Phila., Penna.
MIDC		Midland Mfg. Co.	3155 Fiberglass Rd. Kansas City 15, Kansas
MLL		James Millen Mfg.	150 Exchange St. Malden, Mass.
		Millivan Corp.	Post Office Box 997 Schenectady, New York
MODE		Model Engineering & Mfg.	Huntington, Indiana
MOFT		Moffatt Bearing Co.	1640 Fairmount Ave. Philadelphia, Penna.
		Mohawk Tool Co.	Hazel Park, Michigan
		Molded Insulation Co.	335 E. Price St. Philadelphia, Penna.
MOF		Moorlee Mfg. Co.	825 W. Eleventh St. Los Angeles, California
		D. Nast Machinery	2508-10 N. Broad St. Phila. 12, Penna.
NTA		National Ceramic Co.	400 Southard St. Trenton, New Jersey
NAC		National Co.	61 Sherman St. Malden, Mass.
NEMS		National Electrical Machine Shop	919 Jessup Blair Drive Silver Springs, Maryland
		National Tel-Tronics Corp.	35 St. Casimer Ave. Yonkers, New York
		National Vulcanized Fibre Co.	Girard Trust Bldg. Phila., Penna.
		Newark Screw Machine Prod.	76 Garden St. Newark, New Jersey
		New Jersey Gasket Co.	P. O. Box 827 Almonesson, New Jersey
		New Jersey Rivet Co.	10 So. Third St. Camden, New Jersey
		Norris Tool & Die	4815 N. 3rd St. Philadelphia, Penna.
OAK		Oak Mfg. Co.	1260 Clybourn St. Chicago, Illinois



TABLE 8-4. LIST OF MANUFACTURERS (Continued)

ABBREVIATION	PREFIX	NAME	ADDRESS
		W. L. Oppenheimer & Son	1307 - 68th Ave. Philadelphia, Penna.
		Packaging Materials Co.	15 Lombard St. Philadelphia, Penna.
		Penn. Eng. & Mfg. Co.	Doylestown, Penna.
		Penn Instrument Works, Inc.	838 Race St. Philadelphia, Penna.
PHE		Pheoll Mfg. Co.	5700 Roosevelt Rd. Chicago, Illinois
PHW		Phila. Insulated Wire Co.	200 N. Third St. Phila., Penna.
PMSC		Philadelphia Metal Stamping Co.	400 E. Rittenhouse St. Philadelphia, Penna.
PSA		Phila. Steel & Wire Co.	Penn and Belfield Philadelphia, Penna.
PRO		Pierce Roberts Rubber Co.	Trenton, New Jersey
		Pierce Template Co.	2646 N. Coral St. Philadelphia, Penna.
		Pine Machine Co.	435 N. 11th St. Philadelphia, Penna.
		Pioneer Machine & Tool Co.	830-32 New Market St. Phila. 23, Penna.
PLAS		Plastic Center, Inc.	228 N. 15th St. Philadelphia 3, Penna.
POH		H. T. Potts Co.	"D" St. and Erie Ave. Philadelphia, Penna.
		Harold H. Powell	2102 Market St. Philadelphia, Penna.
PRGE		Precision Gear & Machine	2001 North Tryon St. Charlotte, North Carolina
		Production Eng. & Machine Co.	4341 Orchard St. Philadelphia, Penna.
		Progressive Tool & Gauge Co.	46th and Crescent Blvd. Merchantville, New Jersey
		P. & W. Tool & Die Co.	545 Jackson St. Camden, New Jersey
PYEL		Pyramid Elec. Co.	1445 No. Hudson Blvd. No. Bergen, New Jersey
		Pyroferric Co.	621 E. 216th St. New York, New York
		Quaid Mfg. Co.	327 N. 3rd St. Philadelphia, Penna.
QCGW		Quaker City Gear	Red Lion and Philmont Rd. Bethayres, Penna.
		Quality Name Plate Co.	Fisher Hill Rd. E. Glastonbury, Conn.
		Quality Spec. Co.	28th and Lincoln Ave. Camden, New Jersey
RAD		Radio Condenser Co.	Copewood and Davis Sts. Camden, New Jersey
		Radio Corporation of America, RCA Victor Div.	415 S. 5th St. Harrison, New Jersey
RAE		Radio Electric Service	513 Cooper St. Camden, New Jersey
VD		RCA Victor Division Tube Dept. Camden Parts Plant, Bldg. 1-6	Camden, New Jersey
RVB		Revere Copper & Brass	Beury Building, 3701 N. Broad St. Philadelphia, Penna.
RYN		Reynolds Metal Co.	Plaza Hotel Bldg. Camden, New Jersey
RSM		Roller Smith Corp.	1776 W. Market St. Bethlehem, Penna.
ROSN		Rosan Incorp.	625 Coast Highway Newport Beach, California
		Roysen Engineering Co.	Jacksonville Rd. and Montgomery Ave. Hatboro, Penna.
		Ruoff & Sons, Inc.	9 Chestnut St. Bellmawr, New Jersey

TABLE 8-4. LIST OF MANUFACTURERS (Continued)

ABBREVIATION	PREFIX	NAME	ADDRESS
SWD		Sanson & Rowland	5050 Commerce St. Philadelphia, Penna.
		Scheidl Mfg. Co.	Great Neck Rd. Copiague, New York
		Screen Process Supply	316 Hepburn St. Williamsport, Penna.
SH		Shakeproof, Inc.	405 Lexington Ave. New York, New York
		Shawmut Tool & Die Co.	33 Lyman St. Springfield, Mass.
SKL		F. W. Sickles Div., General Instrument Corp.	P. O. Box 330 Chicopee, Mass.
SIC		Simpson Optical Co.	3200 W. Carroll Ave. Chicago, Illinois
		Sorenson & Co., c/o Burlingame Assoc.	103 Lafayette St. New York, New York
SPFA		Spec-Fab	1825 E. Boston Ave. Philadelphia 25, Penna.
		Specialty Screw Prod. Co.	Dillerville Rd. Lancaster, Penna.
		Speed Machine Prod.	275 Jefferson St. Newark, New Jersey
		Sperti-Faraday	1077 Celetial St. Cincinnati, Ohio
SAJ		Sprague Electric	North Adams, Mass.
		Star Stainless Screw	190 Union Ave. Paterson, New Jersey
SDU		Steel Distributors, Inc.	Cedar Ave. and Westmoreland St. Philadelphia, Penna.
STM		E. B. Stimpson Co.	70 Franklin Ave. Brooklyn, New York
		The Stites Tool Co.	1426 W. Third St. Cleveland 13, Ohio
STRC		Stockwell Rubber Co.	1117 Shackamaxon St. Philadelphia, Penna.
SAR		Stoddart Aircraft Radio Co.	6644 Santa Monica Blvd. Hollywood 38, California
SFN		Stupakoff Ceramic & Mfg.	Hillview Ave. Latrobe, Penna.
		Superior Tool & Die	2435 N. Second St. Philadelphia, Penna.
SUR		Surprenant Mfg. Co.	199 Washington St. Boston, Mass.
		H. E. Sweet Associates	120 Copley Rd. Upper Darby, Penna.
SLE		Sylvania Electric Prod.	1740 Broadway New York 19, N. Y.
SYNC		Synthane Corp.	Oaks, Penna.
TFI		Taylor Fibre	Norristown, Penna.
		Tektronix, Inc.	8118 Harford Rd. Baltimore, Md.
		Tele-Coil Co.	2733 Saunders St. Camden, New Jersey
		Teleradio Engineering Corp.	99 Wall St. New York 5, N. Y.
		Louis Toth	361 Hassemer Ave. Maple Shade, New Jersey
		Tru-Connector Co.	416 Union St. Lynn, Massachusetts
TBR		Tubular Rivet & Stud	Wallaston, Mass.
UCI		The Ucinite Co.	3701 N. Broad St. Philadelphia, Penna.
ULM		Theo. C. Ulmer	Richmond St. and E. Columbia Ave. Philadelphia, Penna.
		United Aero Prod.	Columbus Rd. Burlington, New Jersey
UC		United Carr Fastener	Cambridge 42, Mass.

TABLE 8-4. LIST OF MANUFACTURERS (Continued)

ABBREVIATION	PREFIX	NAME	ADDRESS
UNT		United Precision Gear	4937 Camden Ave. Indianapolis, Indiana
		United Screw & Ball Corp.	71 Murray St. New York 7, New York
		United Shoe Machine Co.	211-217 North 13th St. Philadelphia, Penna.
		United Transformer Co.	150 Varick St. New York, New York
UGA		U. S. Component, Inc.	454-462 E. 148th St. New York, New York
		U. S. Gasket Co.	602 N. 10th St. Camden, New Jersey
		Utility Metal Products	128 Baxter St. New York 13, New York
WSQ		Vibro Mfg. Co.	61-17 Roosevelt Ave. Woodside, Long Island, New York
		Waltham Screw Co.	80 Rumford Ave. Waltham, Mass.
		Weckesser Co.	4719 Longshore St. Philadelphia, Penna.
WEN		Wenco Mfg. Co.	1180-34 W. Hubbard St. Chicago, Illinois
WS		Weston Electric Instrument Co.	112 S. 16th St. Philadelphia, Penna.
		Whitehead Metal Prod.	1955 Hunting Park Ave. Phila., Penna.
		R. D. Williamson Co.	345 Bergen Ave. Kearney, New Jersey
WFSC		Wilmington Fibre Spec. Co.	P. O. Drawer 1028 Wilmington, Delaware
ZE		Zierick Mfg. Corp.	Beechwood and Rockdale New Rochelle, New York

TABLE 8-5. 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 8-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS**

**RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS**

**JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS**

### RESISTOR COLOR CODES

**RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS**

**JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS**

**RADIAL TYPE**

**RADIAL TYPE NON-INSULATED**

### CAPACITORS

RESISTORS	RESISTORS		CAPACITORS				TEMPERATURE COEFFICIENT
	TOLERANCE	MULTIPLIER	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND CERAMIC-DIELECTRIC	PAPER-DIELECTRIC	VOLTAGE RATING	
		1	1	1	1	1	A
		10	10	10	10	10	B
		100	100	100	100	100	C
		1000	1000	1000	1000	1000	D
		10000	10000	10000	10000	10000	E
		100000	100000	100000	100000	100000	F
		1000000	1000000	1000000	1000000	1000000	G
		10000000	10000000	10000000	10000000	10000000	
		100000000	100000000	100000000	100000000	100000000	
		0.1	0.1	0.1	0.1	0.1	1000
		0.01	0.01	0.01	0.01	0.01	2000
							500

RMA: RADIO MANUFACTURERS ASSOCIATION  
JAN: JOINT ARMY-NAVY

**TABLE 8-6. WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES**

EQUIPMENT SPARE PARTS					TENDER SPARE PARTS					STOCK SPARE PARTS							
SPARE PARTS BOX	OVERALL DIMENSIONS (INS.)			VOL-UME CU. FT.	WGT.	SPARE PARTS BOX	OVERALL DIMENSIONS (INS.)			VOL-UME CU. FT.	WGT.	SPARE PARTS BOX	OVERALL DIMENSIONS (INS.)			VOL-UME CU. FT.	WGT.
	Height	Width	Depth				Height	Width	Depth				Height	Width	Depth		

**TABLE 8-7. SHIPPING WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES**

EQUIPMENT SPARE PARTS					TENDER SPARE PARTS					STOCK SPARE PARTS							
SPARE PARTS BOX	OVERALL DIMENSIONS (INS.)			VOL-UME CU. FT.	WGT.	SPARE PARTS BOX	OVERALL DIMENSIONS (INS.)			VOL-UME CU. FT.	WGT.	SPARE PARTS BOX	OVERALL DIMENSIONS (INS.)			VOL-UME CU. FT.	WGT.
	Height	Width	Depth				Height	Width	Depth				Height	Width	Depth		

**TABLE 8-8. LIST OF MAJOR UNITS**

SYMBOL GROUP	NAME OF MAJOR UNIT	NAVY TYPE DESIGNATION
101-299, 701-799, 1001-1199, 1301-1499, 1601-1799, 2001-2099, 3601-3699	Radio Receiving Set	AN/FRR-21
301-499, 801-899, 1001-1199, 1301-1399, 1501-1699, 2101-2199, 3001-3099, 3701-3799, 4001-4099	Radio Receiving Set	AN/FRR-22
501-699, 901-1399, 1601-1699, 2201-2299, 3101-3199, 3801-3899, 4401-4499	Radio Receiving Set	AN/FRR-23

**TABLE 8-9. CROSS REFERENCE PARTS LISTS  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

JAN (OR AWS) DESIGNATION	KEY SYMBOL
IN69	CR-1001
6X4	V-1601
5636	V-151
5644	V-1603
5647	V-1005
5718	V-552
5719	V-1104
5840	V-201
5899	V-101
5902	V-1109
CC20CJ030C	C-556
CC20CH050C	C-3101
CC20CH090C	C-3103
CC20CH18CG	C-564
CC21CK020D	C-3003
CC21CJ030C	C-1208
CC21CH120J	C-143
CM20C121J	C-1001
RC20BF121J	R-404
RC20BF134J	R-1120
RC20BF150K	R-1206
RC20BF152J	R-402
RC20BF181J	R-552
RC20BF184J	R-1405
RC20BF221K	R-104
RC20BF392J	R-2004
RC20BF471K	R-103
RC20BF621J	R-2006
RC20BF681J	R-354

STANDARD NAVY STOCK NUMBER	KEY SYMBOL
N16-A-38801-1102	Z-1006
N16-A-38801-1103	Z-1014
N16-A-38801-1104	Z-1010
N16-A-38801-1106	Z-1107
N16-A-38801-1107	Z-1106
N16-A-38801-1108	Z-1101
N16-A-38801-1109	Z-1109
N16-A-38801-1110	Z-1108
N16-A-38801-1111	Z-1103
N16-A-38801-1112	Z-1105
N16-A-38801-1113	Z-1102
N16-A-38801-1114	Z-1104
N16-A-38801-1127	Z-1004
N16-A-38801-1128	Z-1008
N16-A-38801-1152	Z-401
N16-A-38801-1158	Z-1012
N16-A-38801-1163	Z-351
N16-B-151921-134	A-1601
N16-B-300001-183	A-3601
N16-B-750001-875	A-3001
N16-B-750001-885	A-3604
N16-C-14435-1001	Z-1401
N16-C-14435-1002	Z-1402
N16-C-14435-1030	Z-1202
N16-C-15436-1367	C-3003
N16-C-15528-5428	C-556
N16-C-15528-5533	C-1208
N16-C-15563-9168	C-3005
N16-C-15624-4628	C-3101
N16-C-15627-9158	C-1404
N16-C-15752-4501	C-4408
N16-C-15880-4628	C-3103
N16-C-15912-4628	C-1044
N16-C-15953-2999	C-143
N16-C-15957-9125	C-577
N16-C-16043-9128	C-564
N16-C-16149-5001	C-155

STANDARD NAVY STOCK NUMBER	KEY SYMBOL
N16-C-16229-7701	C-416
N16-C-16245-1248	C-132
N16-C-16245-8001	C-126
N16-C-200001-138	O-2016
N16-C-200001-138	O-2017
N16-C-20267-5896	C-1601
N16-C-26020-7691	C-353
N16-C-26442-8169	C-4421
N16-C-26732-9439	C-563
N16-C-26833-3226	C-1413
N16-C-26833-5145	C-423
N16-C-26833-5145	C-1048
N16-C-27075-8741	C-557
N16-C-27177-2063	C-566
N16-C-27181-4341	C-813
N16-C-27577-1231	C-367
N16-C-27999-1634	C-560
N16-C-28210-1404	C-717
N16-C-28547-8665	C-361
N16-C-28553-1051	C-1504
N16-C-28737-7001	C-1001
N16-C-28969-1660	C-568
N16-C-28975-1526	C-1204
N16-C-29133-3841	C-812
N16-C-29449-8642	C-723
N16-C-29608-2009	C-814
N16-C-29707-7628	C-3107
N16-C-29713-6603	C-102
N16-C-29898-3409	C-714
N16-C-29971-5410	C-565
N16-C-30109-3330	C-223
N16-C-30114-3006	C-1052
N16-C-30133-1890	C-1406
N16-C-30188-3727	C-1050
N16-C-30367-9395	C-1403
N16-C-30921-8710	C-355
N16-C-39370-7461	C-106
N16-C-39693-5927	C-1103
N16-C-40024-4700	C-1108
N16-C-40120-3671	C-127
N16-C-40358-1930	C-224
N16-C-41052-5601	C-130
N16-C-41064-1134	C-1047
N16-C-42729-2001	C-139
N16-C-42729-8483	C-1030
N16-C-42732-6955	C-1032
N16-C-42733-5793	C-1305
N16-C-42733-5956	C-817
N16-C-42762-5397	C-107
N16-C-42762-5397	C-368
N16-C-42765-4822	C-369
N16-C-42767-5708	C-1603
N16-C-42786-1080	C-133
N16-C-43632-8786	C-1031
N16-C-43633-4056	C-1102
N16-C-44110-6585	C-136
N16-C-44111-1211	C-1107
N16-C-44111-2270	C-575
N16-C-44111-2371	C-104
N16-C-45768-7992	C-719
N16-C-45768-8214	C-718
N16-C-45770-1435	C-2107
N16-C-45770-1521	C-1111
N16-C-45770-1522	C-1112
N16-C-45770-1671	C-1053
N16-C-45770-1713	C-1405
N16-C-45770-1762	C-1055
N16-C-45773-6723	C-711
N16-C-45773-7410	C-1063
N16-C-45802-4768	C-101
N16-C-45803-1984	C-162
N16-C-45803-3189	C-1206
N16-C-46200-6410	C-1101
N16-C-46200-7165	C-1061

TABLE 8-9. CROSS REFERENCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

STANDARD NAVY STOCK NUMBER	KEY SYMBOL
N16-C-46200-9903	C-1202
N16-C-49983-2357	C-2002
N16-C-58716-4907	C-131
N16-C-58716-4907	C-3035
N16-C-59261-4029	C-2106
N16-C-59365-1938	C-103
N16-C-60027-1001	C-1309
N16-C-63536-1001	C-2001
N16-C-63657-1001	C-2101
N16-C-64040-2000	C-1029
N16-C-64040-2005	C-710
N16-C-64175-6209	C-1201
N16-C-650001-777	A-1301
N16-C-650001-784	A-2113
N16-C-74123-3251	L-205
N16-C-74615-6431	Z-1301
N16-C-76520-4648	L-3139
N16-C-76520-6575	L-3138
N16-C-76520-7493	L-4404
N16-C-76529-8501	L-4403
N16-C-76533-2801	L-3137
N16-C-76569-8211	L-4402
N16-C-76570-2942	L-405
N16-C-76588-5403	L-3136
N16-C-76594-4421	L-3039
N16-C-76611-4201	L-4401
N16-C-76613-7351	L-404
N16-C-76635-3261	L-3038
N16-C-76635-4241	L-3135
N16-C-76660-1901	L-3037
N16-C-76678-2203	L-402
N16-C-76683-9101	L-3036
N16-C-76702-8966	L-401
N16-C-76727-7769	L-1013
N16-C-76729-6401	L-203
N16-C-76736-2445	L-3035
N16-C-76736-6086	L-202
N16-C-76743-1909	L-1010
N16-C-76743-2212	L-1011
N16-C-76748-1800	L-204
N16-C-76780-2846	L-201
N16-C-91201-1017	Z-801
N16-C-91201-1018	Z-901
N16-C-91201-1019	Z-701
N16-C-91201-1027	Z-551
N16-C-96132-4201	Y-1401
N16-C-96205-1201	Y-701
N16-C-96249-9999	Y-1201
N16-C-96826-7063	Y-901
N16-C-99999-0007	Z-1201
N16-C-99999-0029	C-4406
N16-C-99999-0030	C-4409
N16-C-99999-0031	C-4412
N16-C-99999-0033	C-1207
N16-C-99999-0034	C-1205
N16-C-99999-0036	C-3066
N16-C-99999-0037	C-417
N16-C-99999-0038	C-558
N16-C-99999-0039	C-3045
N16-C-99999-0041	C-716
N16-C-99999-0042	C-4001
N16-C-99999-0043	C-2202
N16-C-99999-0045	L-2001
N16-C-99999-0046	L-403
N16-C-99999-0047	T-155
N16-C-99999-0048	L-4406
N16-C-99999-0049	L-2202
N16-C-99999-0050	L-4405
N16-C-99999-0051	T-126
N16-C-99999-0055	T-1014
N16-C-99999-0063	C-4415
N16-D-99999-0002	O-3828
N16-F-32088-9827	Z-1110
N16-F-32602-4376	Z-702

STANDARD NAVY STOCK NUMBER	KEY SYMBOL
N16-F-32633-1157	Z-1001
N16-F-32633-2649	Z-1701
N16-F-32662-8001	Z-4004
N16-F-32681-1001	Z-802
N16-F-44106-2081	Z-1703
N16-F-92261-1001	Z-1501
N16-F-92261-1002	Z-1502
N16-F-99999-0056	Z-1002
N16-F-99999-0091	Z-1702
N16-G-431136-114	O-2003
N16-G-500001-466	O-3612
N16-G-500001-489	O-2008
N16-H-150001-337	O-2011
N16-K-700026-102	E-2006
N16-K-700284-190	E-2005
N16-K-700349-674	E-3603
N16-L-288001-110	O-3621
N16-L-99999-0046	O-106
N16-M-250598-449	O-2027
N16-M-250606-646	O-2018
N16-O-66001-1015	Z-1302
N16-P-401461-107	O-2023
N16-P-401461-108	O-2025
N16-R-28800-2904	L-2002
N16-R-29792-1061	L-1601
N16-R-33591-1334	O-2019
N16-R-33591-1335	O-2008
N16-R-33591-1356	Z-151
N16-R-33591-1357	Z-126
N16-R-33591-1358	Z-101
N16-R-33591-1359	Z-201
N16-R-33591-1378	O-3628
N16-R-33591-1379	Z-1013
N16-R-49255-431	R-1507
N16-R-49283-811	R-1206
N16-R-49428-231	R-3602
N16-R-49462-431	R-2003
N16-R-49534-431	R-3104
N16-R-49597-431	R-404
N16-R-49598-811	R-105
N16-R-49643-811	R-803
N16-R-49661-811	R-104
N16-R-49687-436	R-108
N16-R-49688-811	R-153
N16-R-49705-431	R-403
N16-R-49706-811	R-4001
N16-R-49768-431	R-155
N16-R-49769-811	R-103
N16-R-49822-431	R-2006
N16-R-49840-431	R-354
N16-R-49841-818	R-1136
N16-R-49850-811	R-151
N16-R-49877-811	R-1106
N16-R-49922-811	R-1014
N16-R-49939-431	R-1135
N16-R-49940-811	R-102
N16-R-49966-431	R-402
N16-R-50011-431	R-401
N16-R-50012-811	R-1301
N16-R-50012-816	R-101
N16-R-50012-816	R-3003
N16-R-50038-431	R-1119
N16-R-50092-431	R-2004
N16-R-50093-811	R-1126
N16-R-50128-438	R-407
N16-R-50129-811	R-1019
N16-R-50129-815	R-109
N16-R-50164-431	R-1004
N16-R-50236-431	R-1205
N16-R-50237-815	R-705
N16-R-50281-431	R-1504
N16-R-50282-725	R-702
N16-R-50282-811	R-802
N16-R-50308-431	R-1203

TABLE 8-9. CROSS REFERENCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23

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N16-R-50809-816	R-4402	N17-A-25801-1049	O-2102
N16-R-50335-431	R-1008	N17-A-25801-1050	O-2002
N16-R-50871-431	R-551	N17-A-99999-0044	O-3608
N16-R-50372-811	R-1304	N17-B-51951-1021	O-2005
N16-R-50398-431	R-1111	N17-B-77535-3065	E-2001
N16-R-50899-811	R-154	N17-B-77635-5817	E-403
N16-R-50416-431	R-1003	N17-B-77685-5981	E-203
N16-R-50417-811	R-201	N17-B-77685-5993	E-553
N16-R-50444-233	R-405	N17-B-77690-4910	E-153
N16-R-50444-811	R-1027	N17-B-77691-3814	E-130
N16-R-50445-501	R-1602	N17-B-77734-7962	E-131
N16-R-50479-431	R-353	N17-B-77734-7963	E-128
N16-R-50480-811	R-129	N17-B-77734-7964	E-104
N16-R-50515-431	R-1403	N17-B-77741-3834	E-404
N16-R-50551-431	R-1023	N17-B-77936-2407	E-103
N16-R-50552-811	R-130	N17-B-77936-2435	E-555
N16-R-50587-431	R-1102	N17-B-99999-0007	E-355
N16-R-50588-811	R-2113	N17-C-72595-1800	J-1701
N16-R-50632-431	R-1115	N17-C-72604-4794	J-1704
N16-R-50633-811	R-107	N17-C-73108-1267	J-1705
N16-R-50650-431	R-1103	N17-C-73108-5905	J-1707
N16-R-50651-811	R-1122	N17-C-73126-3829	J-127
N16-R-50659-431	R-1120	N17-C-73162-3774	J-2006
N16-R-50677-431	R-1116	N17-C-73185-2849	J-102
N16-R-50695-431	R-1405	N17-C-73224-1698	X-1005
N16-R-50713-431	R-351	N17-C-73242-6015	J-2007
N16-R-50740-431	R-1121	N17-C-73255-1514	X-702
N16-R-50741-811	R-1104	N17-C-73257-3744	J-103
N16-R-50758-431	R-1117	N17-C-73288-1712	J-2002
N16-R-50821-431	R-1028	N17-C-73304-1318	J-1709
N16-R-50822-811	R-204	N17-C-73317-2189	J-2009
N16-R-50857-431	R-1412	N17-C-73317-6429	J-2013
N16-R-50974-431	R-1401	N17-C-73459-9862	J-701
N16-R-50975-811	R-703	N17-C-73531-3457	J-702
N16-R-50993-811	R-1005	N17-C-73572-8047	J-101
N16-R-51019-431	R-1108	N17-C-73591-1360	J-2014
N16-R-51064-431	R-1201	N17-C-73605-6389	J-1002
N16-R-51065-811	R-106	N17-C-73606-7745	J-1601
N16-R-51136-431	R-1029	N17-C-945001-202	E-1701
N16-R-51172-431	R-1137	N17-C-98611-1221	O-3620
N16-R-51173-811	R-1110	N17-C-99999-0070	T-101
N16-R-65845-9776	R-1604	N17-F-74257-5075	X-1606
N16-R-66214-8991	R-1603	N17-F-99999-0060	F-1601
N16-R-85002-6871	R-1605	N17-I-76737-2765	X-2001
N16-R-87192-5300	R-1601	N17-J-39650-1051	J-2015
N16-R-87521-8010	R-1411	N17-L-240023-551	O-3622
N16-R-87852-5365	R-2008	N17-L-51629-1001	X-3601
N16-R-88342-5310	R-2106	N17-L-51629-1003	X-3602
N16-R-88919-1361	R-2001	N17-L-5207	I-3601
N16-R-89219-1001	R-2007	N17-M-18982-9120	M-2001
N16-R-89232-2988	R-3601	N17-M-22713-3543	M-2002
N16-R-99999-0037	R-1001	N17-R-651091-125	H-3601
N16-S-117101-793	O-3618	N17-R-99999-0038	K-1701
N16-S-117101-794	O-3718	N17-S-250051-154	E-1702
N16-S-117101-795	O-3818	N17-S-46733-2361	O-2022
N16-S-34599-7750	A-1602	N17-S-46736-8476	O-3607
N16-S-470001-128	H-2019	N17-S-46746-8251	O-3606
N16-S-470001-129	H-2020	N17-S-59672-7885	S-2004
N16-S-54287-5051	X-701	N17-S-60080-3251	S-2005
N16-S-62603-6446	X-1603	N17-S-61615-1001	S-701
N16-S-63515-4151	X-1601	N17-S-62311-2701	S-3035
N16-T-51769	CR-1001	N17-S-63719-3559	S-1101
N16-T-56840	V-1601	N17-S-65233-6567	S-126
N16-T-750286-393	H-2004	N17-S-65233-6617	S-101
N16-T-751254-406	H-2005	N17-S-69074-4589	S-102
N16-T-75636-5636	V-151	N17-S-69085-2701	S-3601
N16-T-75644-5644	V-1603	N17-S-70777-8626	S-2003
N16-T-75647-5647	V-1005	N17-S-72018-7719	S-2102
N16-T-75718-5718	V-552	N17-S-73082-9028	S-2001
N16-T-75719-5719	V-1104	N17-S-74139-4844	S-2002
N16-T-75840-5840	V-201	N17-S-91897-8968	S-1001
N16-T-75899-5899	V-101	N17-S-91897-8969	S-1301
N16-T-75902-5902	V-1109	N17-T-26623-4296	E-1015
N17-A-25801-1048	O-3619	N17-T-26653-4296	E-1302



**TABLE 8-9. CROSS REFERENCE PARTS LISTS (Continued)  
RADIO RECEIVING SETS AN/FRR-21, -22, AND -23**

STANDARD NAVY STOCK NUMBER	KEY SYMBOL
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N17-T-67517-4374	T-1011
N17-T-67517-4424	T-703
N17-T-67517-4469	T-1013
N17-T-73701-5366	T-1601
N17-T-81385-1533	T-102
N17-T-81385-1535	T-127
N17-T-81385-1537	T-152
N17-T-81403-1420	T-128
N17-T-81403-1422	T-103
N17-T-81403-1501	T-153
N17-T-81406-1515	T-104
N17-T-81406-1517	T-129
N17-T-81406-1527	T-154
N17-T-81412-1526	T-105
N17-T-81412-1536	T-130
N17-T-81746-5804	T-151

STANDARD NAVY STOCK NUMBER	KEY SYMBOL
N17-T-82238-6207	T-351
N17-T-82246-1707	T-352
N17-T-82261-2301	T-353
N17-T-82261-5651	T-354
N17-T-82262-2751	T-355
N17-T-82266-8723	T-555
N17-T-82267-5287	T-554
N17-T-82269-9061	T-553
N17-T-82282-2701	T-552
N17-T-82300-1979	T-551
G17-L-6605-120	I-2001
G-41-W-2444	H-2003
G-41-W-2445	H-2002
G-41-W-2446	H-2001
G-41-W-2449	H-2008
G-77-B-999-75010-0100	O-3623
G-77-B-999-75010-0100	O-2021



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