NAVSHIPS 91580

RESTRICTED
SECURITY INFORMATION
(*See Page B*)

INSTRUCTION BOOK

for

RADIO RECEIVING SET AN/FRR-24

NATIONAL COMPANY, INC.
MALDEN 48, MASSACHUSETTS

BUREAU OF SHIPS NAVY DEPARTMENT

Contract: NObsr-39402 *Approved by BuShips: 15 APRIL 1952*

July 15, 1952

TEMPORARY CORRECTION T-1 TO INSTRUCTION BOOK FOR AN/FRR-24 RADIO RECEIVING SET (NAVSHIPS 91580)

The following corrections are applicable to all AN/FRR-24 equipments.

Page	Correction
1-26	Delete from Box 54 the four trim panels.
2-11, 7-179, 7-180, 7-214 and 7-246	On Figure 2-7, 7-88, 7-108B and 7-130: add resistor R-156, 560 ohms, between junction of C-147 - R-136 and P-101 no. 9; add note that C-185 is used only on AM-450 and AM-451/FRR-24.
2-14	On Figure 2-10 add resistor R-338, 100 ohms, between terminal 1 of Z-301 and pin 1 of V-301.
2-[illegible], [illegible]-185, 7-186, 7-219, 7-220 and 7-259	On Figure 2-15, 7-91, 7-111 and 7-147: add capacitor C-515, 100 mmf, between V-401 cathode and chassis.
2-20, 7-[illegible] 7-186	On Figure 2-19 and 7-91: change the value of R-416 thru R-423 to 560,000 ohms
2-40, 7-199, 7-200, 7-233, 7-234 and 7-292	On Figure 2-43, 7-98, 7-119 and 7-187: change the value of R-1245 to 47,000 ohms; change the value of R-1246 to 100 ohms; add capacitor C-1257, 10,000 mmf, between pin 5 of V-1209 and chassis.
3-2	On Figure 3-1 add a sixth cabinet bolt clearance hole at the bottom left rear of the cabinet. Delete from Box 54 the four trim panels.
3-3	Para. 1. Step 11: Add the following: These screws are secured by nuts on the inside of the cabinet. The top three screws hold the warm air stop in position and they must be replaced to secure the air stop.
3-9	Para. 2. a. Step 1, add the following: A sixth hole is provided at the bottom left rear of each cabinet which is used to mount a grounding strap (packed in Box 51) between adjacent cabinets. Slip the bolt through a grounding strap then through the cabinet. The orher end of the strap is then slipped over the end of the bolt and the nut securely fastened. Para. 2. a. (2). Step 2, add the following: A ground strap is packed in Box 51 to be used to ground the equipment when a suitable ground source is available adjacent to the mounting surface of the equipment. The bond to ground is effected by slipping the ground strap over one of the mounting bolts before it is passed through the bottom of the cabinet and then soldering the other end of the strap to the ground connection. Para. 2. b. (1) Step 7. Change the first sentence to read: The comb-shaped air stop plates contain enough slots to accomodate all cables.
3-[illegible]	Para. c, Step 1, paragraphs 2 and 3: interchange units 4N and 4M.
3-[illegible]	If the antenna lead-in access holes mentioned in the second paragraph are not used the rubber grommets should be replaced by the plug buttons packed in Box 51.
3-[illegible]	Para. 2. b. (3). Delete Step 3.
7-183, 7-184, 7-217, 7-218 and 7-253	On Figure 7-90, 7-110 and 7-140: add resistor R-338, 100 ohms between terminal 1 of Z-301 and pin 1 of V-301; add resistor R-339, 100 ohms, between terminal 1 of Z-302 and pin 1 of V-302; add resistor R-340, 100 ohms, between terminal 1 of Z-303 and pin 1 of V-303; add resistor R-341, 100 ohms, between terminal 1 of Z-304 and pin 1 of V-304.
7-[illegible]85, 7-[illegible]86, 7-[illegible]219, 7-[illegible]20 and 7-[illegible]59	On Figure 7-91, 7-111 and 7-146: add resistor R-479, 1800 ohms, between P-401 no. 9 and C-492.
[illegible]	Change column 9 of C-101 to 84,

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Title Page	Original	4–0 to 4–38	Original
A to C	Original	5–1 to 5–22	Original
i to vi	Original	6–1 to 6–4	Original
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2–1 to 2–67	Original	8–0 to 8–430	Original
3–1 to 3–29	Original		

Page	Correction
8-14	Add to column 8 of C-183: C-515; change column 9 to 21.
8-15	Add to column 8 of C-302: C-1257; change column 9 to 128; delete 'from C-185 'part of Z-101[1] and Z-102[2]'.
8-32	Add: C-515 Same as C-183 V-401 cathode
8-61	Add: C-1257 Same as C-302 V-1209 grid
8-217	Delete from column 8 of R-101: R-1246 and add R-1245.
8-218	Add: R-479 Same as R-103 B minus filter
8-220	Add to column no. 8 of R-118: R-338, R-339, R-340 and R-341; change column 9 to read 120; delete from column 8 of R-118; R-1245 and add R-1246.
8-224	Add: symbol designation: R-156; description: Resistor, fixed: composition; 560 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec; function: V-107 plate decoupling; JAN type RC20BF561K; SNSN N16-R-49805-811; Mfr; 63; contractor dwg: M828-5; all symbol desig; R-156; total no. per equip: 12.
8-228	Delete from column 8 of R-405: R-416 thru R-423; change column 9 to read 24.
8-228	Add the following:

R-338	Same as R-118	parasitic suppressor
R-339	Same as R-118	parasitic suppressor
R-340	Same as R-118	parasitic suppressor
R-341	Same as R-118	parastiic suppressor

8-229	Change R-416 to: description: Resistor, fixed composition; 560,000 ohms ±10%, 1/2 watt; F characteristic; JAN-R-11 spec; JAN type RC20BF564K; SNSN: N16-R-50858-0811; mfr: 273; contractor dwg: M828-25: symbol desig: R-416 thru R-423; total no. per equip: 24.
8-229	Change R-417 thru R-423 to read same as R-416.
8-232	Add: R-479 Same as R-103 B minus filter.
8-252	Change: R-1245 to read Same as R-101; change R-1246 to read Same as R-118.
8-356	Delete from column 2 of Z-101[1]; C-185; delete fromcolumn 2 of Z-101[2] C-185.

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.

IN REPLY REFER TO
Code 993-100
15 April 1952

From: Chief, Bureau of Ships
To: All Activities Concerned with the Installation, Operation and Maintenance of the Subject Equipment

Subj: Instruction Book for Radio Receiving Set AN/FRR-24
NAVSHIPS 91580

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H. N. WALLIN
Chief of Bureau

RECORD OF CORRECTIONS MADE

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GUARANTEE

The equipment including all parts and spare parts, except vacumm tubes, batteries, rubber and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship or manufacture will be repaired or replaced, f.o.b. any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government, provided that such guarantee will not obligate the Contractor to make repair or replacement of any such defective items unless the defect appears within the aforementioned period and the Contractor is notified thereof in writing within a reasonable time and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above is of the Contractor's design or is of a design selected by the Contractor, it is also guaranteed, subject to the foregoing condition, against defects in design with the understanding that if ten percent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such items furnished under the contract, are found to be defective as to design such item will be conclusively presumed to be of defective design and subject to one hundred percent (100%) correction or replacement by a suitably redesigned item.

All such defective items will be subject to ultimate return to the Contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruptions of communications. In such cases the return of the defective items for examination by the Contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for affecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactorily due to any such defects, and any items repaired or replaced by the Contractor will be guaranteed anew under this provision.

SAFETY NOTICE

The attention of officers and operating personnel is directed to Chapter 67 of the Bureau of Ships Manual or superseding instructions on the subject of radio-safety precautions to be observed.

This equipment employs voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed.

KEEP AWAY FROM LIVE CIRCUITS:

Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside equipment with high voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors. To avoid casualties always remove power and discharge and ground circuits prior to touching them.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR, OR SONAR ENCLOSURE. POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY.

INSTALLATION RECORD

Contract NObsr-39402 — 30 June 1947

Serial Number of equipment .....

Date of acceptance by the Navy .....

Date of delivery to contract destination .....

Date of completion of installation .....

Date placed in service .....

Blank spaces on this page shall be filled in at time of installation.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire service life, shall be made to the Bureau of Ships in accordance with current regulations using form NAVSHIPS NBS 383 (revised). The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failures see Chapter 67 of the Bureau of Ships Manual or superseding instructions.

ORDERING PARTS

All requests or requisitions for replacement material should include the following data:

1. Standard Navy Stock Number or, when ordering from a Marine Corps or Signal Corps depot, the Signal Corps stock number.
2. Name and short description of part.

If the appropriate stock number is not available the following shall be specified:

1. Equipment model or type designation, circuit symbol, and item number.
2. Name of part and complete description.
3. Manufacturer's designation.
4. Contractor's drawing and part number.
5. JAN or Navy type number.

NAVSHIPS 91580

RESTRICTED
SECURITY INFORMATION

INSTRUCTION BOOK

for

RADIO RECEIVING SET AN/FRR-24

SECTION 1—GENERAL DESCRIPTION

NATIONAL COMPANY, INC.
MALDEN 48, MASSACHUSETTS

BUREAU OF SHIPS

NAVY DEPARTMENT

Contract: NObsr-39402

Approved by BuShips: 15 April 1952

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SECTION 1
GENERAL DESCRIPTION

1. PURPOSE AND BASIC PRINCIPLES.

Radio Receiving Set AN/FRR-24 is a double-conversion superheterodyne type diversity receiver contained in four rack cabinets for installation at Naval Radio Shore Stations. The complete receiving equipment consists of a group of three radio receivers together with the switching-combining circuits necessary to receive the following types of signals in single-channel, space or frequency dual or triple diversity operation:

a. Double-sideband radio-telephone.

b. On-off keyed radio-telegraph.

c. Frequency-shift keyed telegraph (to operate single-channel teletype at 24.5 dot-cycles and/or up to four-channel multiplex at 98 dot-cycles).

An I.F. frequency output circuit is available for connection to suitable auxiliary apparatus to permit reception of single-channel facsimile and telephoto signals employing frequency shift of the radio-frequency carrier. The receiver covers the tuning range of 2.0 to 32.0 megacycles in four tuning bands.

The space and frequency diversity systems of reception as employed in the AN/FRR-24 are based upon the fact that a high-frequency signal as used for long-distance communications does not always fade simultaneously at two locations separated by as little as several wavelengths. In the high-frequency ranges rapid fading conditions are brought about by multipath propagation. Under such conditions, the signal induced in a receiving antenna by a distant transmitter may be the resultant of two or three separate waves each propagated over a different path. If two waves arrive over paths differing in length by an odd number of half wavelengths the resulting 180^{o} phase difference causes maximum cancellation. On the other hand if the paths differ in length by an integral multiple of whole wavelengths the waves arrive in phase and maximum reinforcement results. The difference in path lengths may at times be as great as 500 to 1500 kilometers (delay time of 2 to 5 milliseconds) which in the high frequency region corresponds to thousands of wavelengths. Under these maximum conditions waves at one frequency may arrive in phase while waves at a frequency a few hundred cycles away may arrive in phase opposition. Since the path lengths are constantly changing, the transmission at a given frequency is subject to wide variations in amplitude and phase with time. When the difference in path lengths is not great enough to cause frequencies in one portion of a communication channel to fade differently from those in another portion, the term 'non-selective' or 'flat' fading is applied. When the difference in path lengths becomes great enough to cause considerable amplitude or phase distortion over the transmission band the term 'selective fading' is used. Since the propagation paths existing at a given moment vary for different antenna sites, the fading patterns obtained from two or three antennas separated by several wavelengths usually show a considerable phase difference so that a given frequency is not likely to fade into the noise level at all antennas simultaneously. By employing separate receivers for each antenna and suitably combining or selecting the demodulated outputs, a system is obtained which is much less susceptible to fading. Such a method is called space diversity reception. Inasmuch as fading over a given combination of paths is highly selective with respect to frequency much the same effect is obtained by frequency diversity reception. When this method is employed the intelligence is transmitted on two or more frequencies simultaneously and then received by separate receivers from a single antenna and the resulting demodulated signals combined or selected as for space diversity. Similarly it is also possible to use a different frequency for day, night and interim reception. This is valuable during the period when frequencies are being changed.

To obtain reliable operation in the high-frequency range it is common practice to employ space diversity reception. The use of frequency diversity, with the increase of transmitted power and greater frequency space required, is seldom justified if space diversity reception can be arranged. For A1, A2 and A3 reception, double or triple-space diversity arrangements are frequently used. Since a frequency-shift signal generally employs two separate frequencies, it is more likely to be effected by selective fading than an amplitude-modulated signal. However, a double-space diversity system of reception for frequency-shift signals gives sufficient diversity action provid-

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USE YOUR FRR-24 INSTRUCTION BOOK
AS A LAST RESORT —
USE IT FIRST!

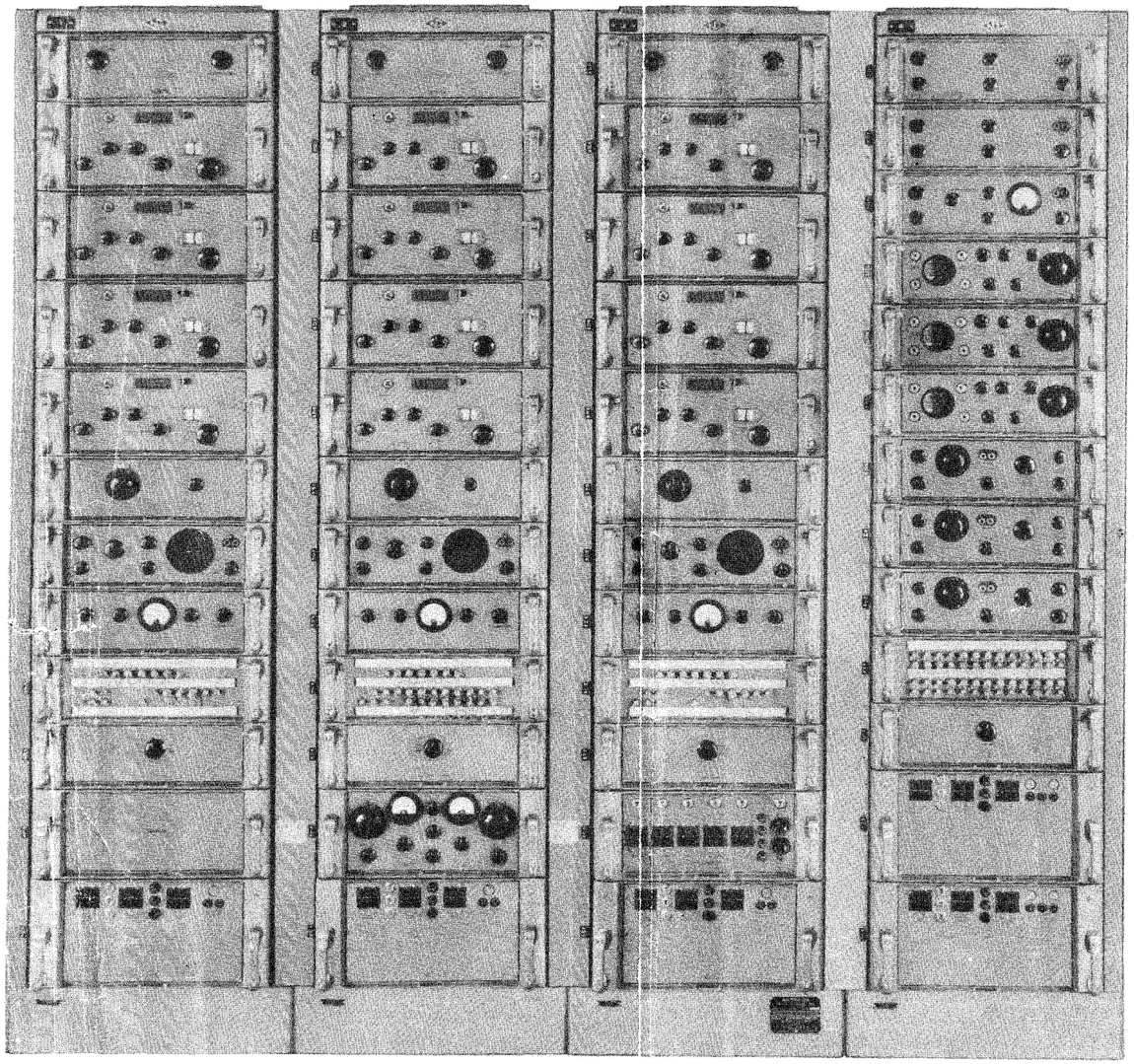

Figure 1-1. AN/FRR-24 Radio Receiving Set

IDENTIFICATION OF UNITS

1	2	3	4
CONTROL PANEL SB-142/FRR-24	CONTROL PANEL SB-142/FRR-24	CONTROL PANEL SB-142/FRR-24	AMPLIFIER-DETECTOR AM-440/FRR-24
AMPLIFIER-CONVERTER AM-450/FRR-24	AMPLIFIER-CONVERTER AM-450/FRR-24	AMPLIFIER-CONVERTER AM-450/FRR-24	AMPLIFIER-DETECTOR AM-440/FRR-24
AMPLIFIER-CONVERTER AM-451/FRR-24	AMPLIFIER-CONVERTER AM-451/FRR-24	AMPLIFIER-CONVERTER AM-451/FRR-24	AMPLIFIER-DETECTOR AM-438/FRR-24
AMPLIFIER-CONVERTER AM-453/FRR-24	AMPLIFIER-CONVERTER AM-453/FRR-24	AMPLIFIER-CONVERTER AM-453/FRR-24	FREQUENCY SHIFT CONVERTER CV-127/FRR-24
AMPLIFIER-CONVERTER AM-452/FRR-24	AMPLIFIER-CONVERTER AM-452/FRR-24	AMPLIFIER-CONVERTER AM-452/FRR-24	FREQUENCY SHIFT CONVERTER CV-127/FRR-24
FREQUENCY CONVERTER CV-126/FRR-24	FREQUENCY CONVERTER CV-126/FRR-24	FREQUENCY CONVERTER CV-126/FRR-24	FREQUENCY SHIFT CONVERTER CV-127/FRR-24
AMPLIFIER-DETECTOR AM-439/FRR-24	AMPLIFIER-DETECTOR AM-439/FRR-24	AMPLIFIER-DETECTOR AM-439/FRR-24	KEYER KY-62/FRR-24
R.F. AMPLIFIER AM-454/FRR-24	R.F. AMPLIFIER AM-454/FRR-24	R.F. AMPLIFIER AM-454/FRR-24	KEYER KY-62/FRR-24
PATCH PANEL SB-138/FRR-24	PATCH PANEL SB-140/FRR-24	PATCH PANEL SB-169/FRR-24	PATCH PANEL SB-143/FRR-24
FILTER ASSEMBLY F-99/FRR-24	FILTER ASSEMBLY F-99/FRR-24	FILTER ASSEMBLY F-99/FRR-24	COMPARATOR-KEYER CM-32/FRR-24
TOOL BOX	OSCILLATOR ASSEMBLY O-131/FRR-24	POWER DISTRIBUTION PANEL SB-141/FRR-24	POWER SUPPLY PP-649/FRR-24
POWER SUPPLY PP-590/FRR-24	POWER SUPPLY PP-590/FRR-24	POWER SUPPLY PP-590/FRR-24	POWER SUPPLY PP-648/FRR-24

ing it is of a type that permits switching between channels at signaling speed without causing appreciable distortion. This is necessary since it is a frequent occurence that the mark of one channel may fade, leaving a good space while the opposite may occur on a second channel. Since a frequency-shift system can accept rapid level changes, the main purpose of diversity methods is to insure that both the mark and space portion of the signal will be received above the noise level. In the case of AM telegraph, wherein rapid level changes cannot be accepted, diversity operation is important not only in keeping the signal above the noise but also in averaging out some of the rapid level changes. For this reason AM systems usually show considerable improvement in going from double to triple diversity.

The three individual antennas comprising a diversity antenna system may be of any type. Where available space is very limited, the use of one horizontal and one vertical doublet located quite close to each other will give a worth-while diversity effect. For best results, however, three horizontally polarized antennas of a type affording good directional characteristics should be employed. These are normally placed 1000 feet apart. Spacing much less than this would result in less improvement due to the lesser diversity of fading experienced at the less distantly spaced points. On the other hand spacing much greater than the nominal 1000 feet, while offering some improvement, is generally not warranted due to the increase in land area and the loss in the necessarily longer transmission lines.

Antennas ordinarily used in the diversity system are not sharply tuned and the so-called optimum frequency is therefore merely the approximate mid-frequency of the band over which the antenna will be used. Where several sizes of antennas are available for the desired direction, the one whose nominal frequency rating is nearest the frequency of the desired signal will give the best results.

Both the originating and terminating stations of a diversity communications system may be at a local or remote point from the transmitting or receiving station with interconnections by land lines of a communications system.

2. DESCRIPTION.

a. GENERAL.—The AN/FRR-24 is contained in four rack cabinets (bays). The four bays are permanently connected together by a system of interconnecting cables and plugs. Each bay contains its own power supply for distribution of plate and filament voltages to all units within the bay. R.F. or A.F. circuits emanating from different units are interconnected as necessary to condition the complete equipment for any one of the specified modes of reception through the use of patch cords which are inserted into connectors on the front of the patch panel. The removal of any basic unit is effected with a minimum of effort without the aid of hand tools or the removal of multiple mounting screws. All units except the Patch Panels and Power Supplys are fitted with runners and tilting mechanisms to permit the easy sliding of the unit out of its cabinet and its tilting to an angle of 45^{o}, 90^{o} or 135^{o} in either direction from a horizontal plane to provide access to the top, bottom or sides of the unit without the necessity of removing the unit from the rack. The Patch Panel and Power Supply units can be withdrawn from their cabinets but cannot be tilted. All permanent interconnections between the units and external equipment are made through a blister unit located at the rear of each cabinet. A single blower unit is mounted in each of the first three bays whereas a dual blower unit is incorporated in the fourth bay. The equipment is effectively shielded to permit its operation in strong fields of radiated radio-frequency energy. This shielding permits operation of the receiver in a field of at least three volts per meter without the output exceeding standard output level with the receiver adjusted for standard gain.

(1) BAYS 1, 2 AND 3.—Essentially each of the first three bays in the AN/FRR-24 is a radio receiver complete within itself and suitable for the reception of A1, A2, and A3 transmissions. Each receiver comprises the following basic units:

Four Amplifier-Converter units AM-450/FRR-24 through AM-453/FRR-24 contain the R.F. amplifier stages, converter and H.F. oscillator stages necessary to provide selectivity and amplification over a nominal tuning range of 2.0 to 32.0 megacycles. The Control Panel SB-142/FRR-24 provides a means of selecting which one of the four Amplifier-Converter units shall be placed in an operative condition and also selects the source of oscillator excitation i.e., local or remote. Tuning of the R.F. amplifiers, converters and H.F. oscillator is accomplished by a front-panel mounted control dial which drives a seven section ganged capacitor. The main tuning drive is geared to three individual dial scales. The large drum scale indicates frequencies in megacycles whereas the smaller scale has linear markings for logging purposes. The projection dial indicates frequencies in kilocycles. Two concentric tuning knobs are employed to obtain both fine and coarse tuning.

A Frequency Converter CV-126/FRR-24 provides an intermediate step in sharpening the broad selectivity and lowering the 1750 kc. intermediate frequency obtained from the Amplifier-Converter units to 50 kilo-

cycles. This unit contains four input I.F. amplifier channels to accomodate the 1750-kilocycle output from the Amplifier-Converter units. A crystal or variable oscillator operating at a frequency of 1700 kilocycles is used to provide oscillator injection voltage to the second converter.

A Filter Assembly F-99/FRR-24 consisting of several I.F. amplifier stages determines the final bandwidth and I.F. selectivity before demodulation.

An R.F. Amplifier AM-454/FRR-24 comprised of several I.F. Amplifiers, a meter rectifier circuit and a second I.F. Level meter provides the major portion of the receiver gain without adding appreciably to the selectivity.

An Amplifier-Detector AM-439/FRR-24 provides a means of aurally monitoring each bay. A heterodyne detector and tunable B.F. oscillator are contained within this unit for the reception of code telegraph signals. An A.G.C. circuit and a crystal oscillator are also incorporated in this unit. The crystal oscillator makes possible critical zero beat tuning.

A dual eight-channel crystal Oscillator Assembly O-131/FRR-24 located in bay 2 is utilized to provide outputs on two separate independent frequencies simultaneously. The two output frequencies are available in separate output circuits to permit crystal converter excitation of two channels operating in frequency diversity. In addition, each output circuit permits crystal controlled operation of three channels on the same frequency for space diversity reception.

Each bay contains its own electronically regulated power supply to provide all necessary operating voltages. Power Supplies type PP-590/FRR-24 located in bays 1, 2 and 3, are designed for operation from a 105/115/125 volt, 50/60 cycle, single phase A.C. source of supply. A.C. is distributed to the power supplies through the Power Distribution Panel SB-141/FRR-24 located in bay 3.

(2) BAY 4.—Bay 4 comprises the following basic units necessary to obtain single-channel reception of F4 signals and single or double or triple diversity reception of A1, A2, A3, F1 and F4 transmissions:

Amplifier-Detector AM-440/FRR-24 is a single detector unit utilized to amplify and detect the 50-kc. I.F. signal, provide a keyed D.C. output, an audio output and also provide a source of A.G.C. voltage.

Amplifier-Detector AM-438/FRR-24 is a triple detector unit which is designed to provide a means of combining or selecting one of the 50-kilocycle outputs of three receivers operating in diversity. The unit also provides a keyed D.C. output, an audio output and a source of A.G.C. voltage.

Frequency Shift Converter CV-127/FRR-24 is utilized to convert frequency-shift signals received from the R.F. Amplifier AM-454/FRR-24 to Mark and Space voltages for application to the Comparator Keyer CM-32/FRR-24.

Keyer KY-62/FRR-24 is provided to key an audio frequency tone on and off in accordance with the polarity of the input D.C. signal. The internal tone oscillator associated with the tone keyer is continuously variable over a frequency range of 400 to 5000 cycles. In addition an 8-position selector switch is provided to tune the oscillator by steps of 170 cycles from 595 to 1785 cycles. Provisions are also provided for using an external tone source up to 5000 cycles at an input level of 0.7 volts RMS. The keyer is capable of operating at a maximum speed of 500 words per-minute.

Comparator-Keyer CM-32/FRR-24 receives the keyed D.C. pulses from any or all of the Frequency Shift Converters CV-127/FRR-24 and combines and amplifies these pulses to a suitable level to key a teletypewriter loop and/or Keyer KY-62/FRR-24. The keyed D.C. pulses from one of the Frequency Shift Converters CV-127/FRR-24 may be switched to a second keyer in this unit to key a second teletypewriter loop and/or Keyer KY-62/FRR-24, when it is desired to operate dual diversity teletype on one circuit and single channel teletype on a second circuit.

Power Supplies PP-648/FRR-24 and PP-649/FRR-24 provide all the necessary operating voltages for bay 4. These Power Supplies are designed for operation from a 105/115/125 volt, 50/60 cycle, single phase A.C. source of supply. A.C. is connected into the power supplies through the Power Distribution Panel SB-141/FRR-24 located in bay 3.

b. DESCRIPTION OF UNITS.

(1) AMPLIFIER-CONVERTER UNITS AM-450/FRR-24, AM-451/FRR-24, AM-452/FRR-24, AM-453/FRR-24. *(See Figures 1–2 and 1–3).*—These units amplify the incoming R.F. signal and heterodyne this signal to an output intermediate frequency of 1750 kilocycles. The frequency range of these units is 2 to 32 megacycles.

Four separate nine-tube Amplifier-Converters each with a 2 to 1 frequency range are employed to cover the entire frequency band. Selection of the band to be employed is accomplished by means of the Band switch located in the associated Control Panel SB-142/FRR-24. All the units are identical except for frequency coverage and tuned circuit components. The following table lists the Amplifier-Converters and their frequency coverage.

Amplifier-Converter AM-450/FRR-24 -- 2–4 mcs.
Amplifier-Converter AM-451/FRR-24 -- 4–8 mcs.
Amplifier-Converter AM-453/FRR-24 -- 8–16 mcs.
Amplifier-Converter AM-452/FRR-24 -- 16–32 mcs.

The electrical circuits comprise three stages of R.F. amplification, a converter stage, H.F. oscillator

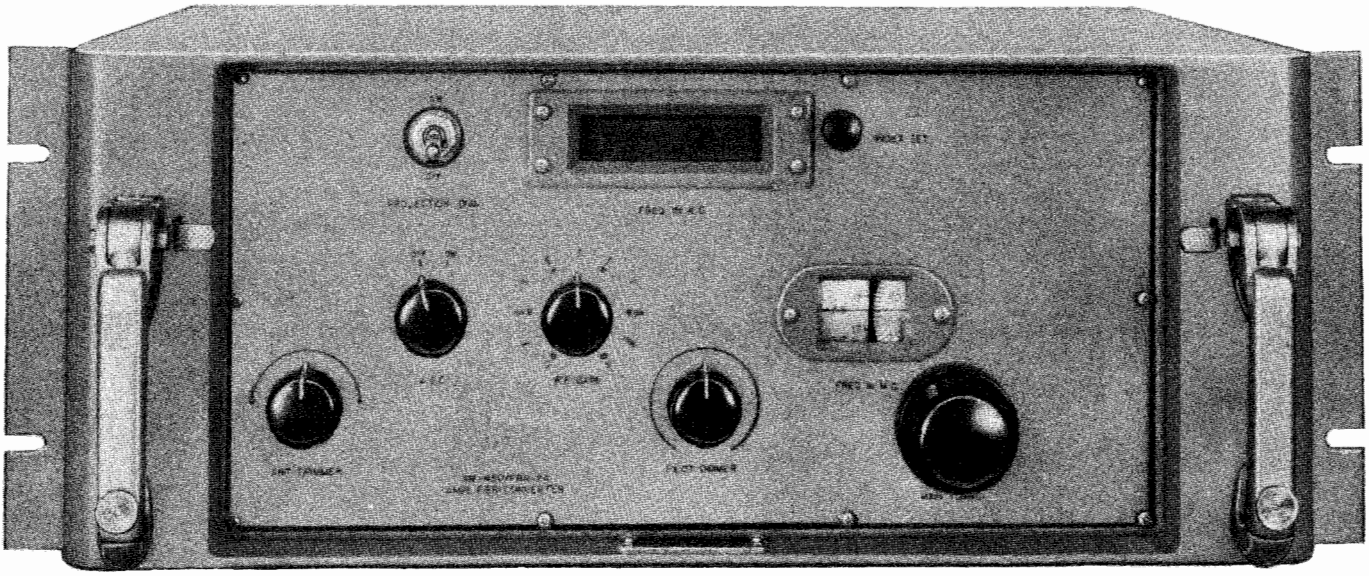

Figure 1–2. Amplifier-Converter Units AM-450/FRR-24, AM-451/FRR-24, AM-452/FRR-24, AM-453/FRR-24

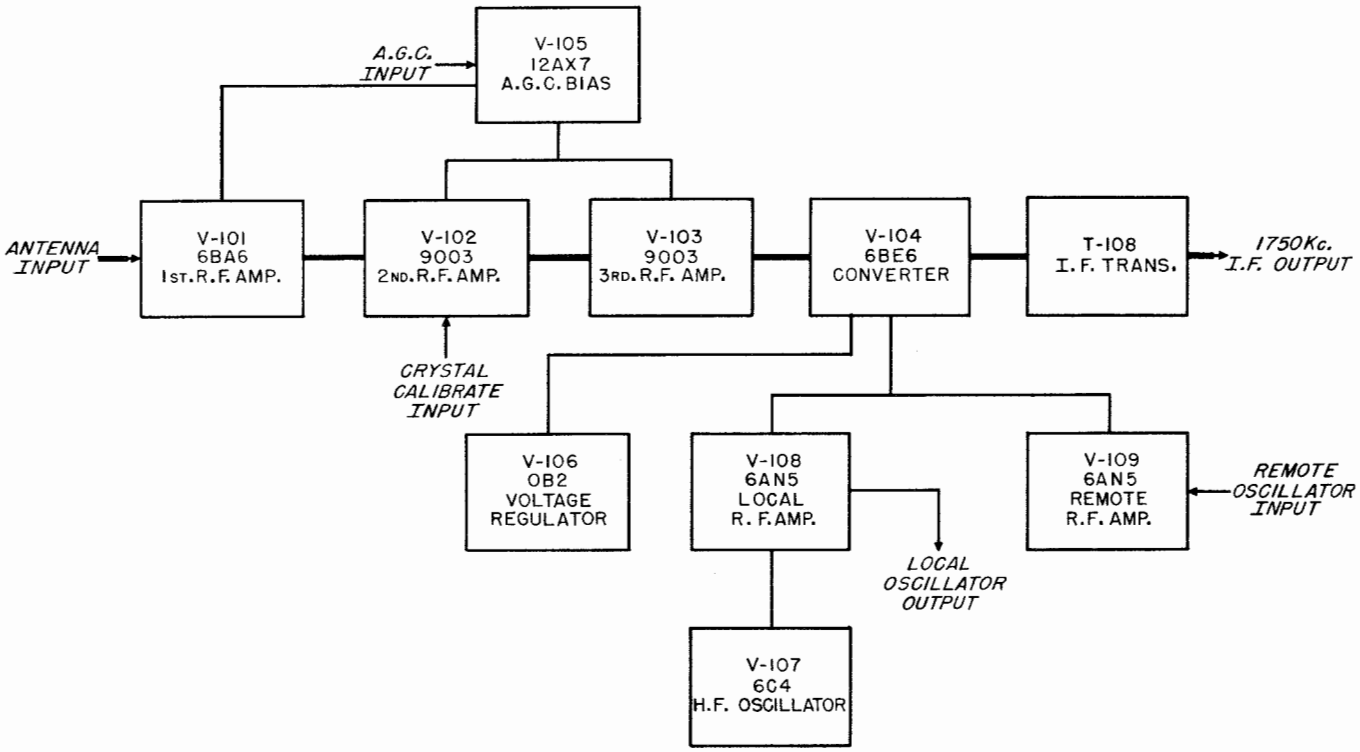

Figure 1–3. Amplifier-Converter Units AM-450/FRR-24, AM-451/FRR-24, AM-452/FRR-24, AM-453/FRR-24, Functional Block Diagram

stage, an A.G.C. bias tube, a local R.F. amplifier and a remote R.F. amplifier. Oscillator excitation may be obtained from either the local H.F. oscillator, the high-frequency oscillator from another Amplifier-Converter unit or a crystal oscillator in the Oscillator Assembly O-131/FRR-24. The local H.F. oscillator can also be connected into one or two other Amplifier-Converter units to provide oscillator excitation for these units for common oscillator space diversity reception. Automatic gain control voltage is connect-

ed into the unit from an associated unit. For calibration checking a crystal calibrator located in the Oscillator Assembly O-131/FRR-24 is connected into the unit and is used as a tuning marker. Tuning of the R.F., converter and H.F. oscillator stages is accomplished by a front-panel mounted control dial which drives a seven-section ganged capacitor. A linear potentiometer ganged to the main tuning capacitor is utilized to hold the gain flat within 6 db over the frequency range of any one band.

Components of the Amplifier-Converters are mounted on cast aluminum chassis to assure optimum mechanical stability. Adequate shielding of the H.F. oscillator and R.F. amplifier stages is obtained by mounting the tuned circuits in completely shielded compartments. Feedthru capacitors are used to maintain shielding integrity. A projection dial system is utilized to facilitate dial readings. The heater voltage of the H.F. oscillator and local amplifier tubes is regulated by the use of a current regulator.

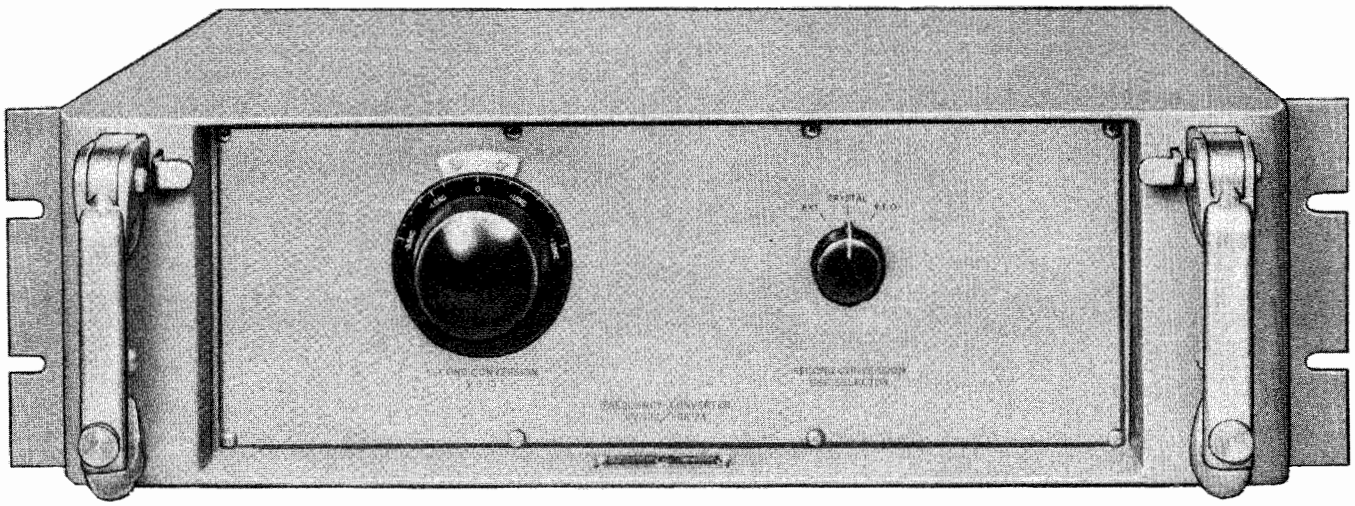

Figure 1–4. Frequency Converter CV-126/FRR-24

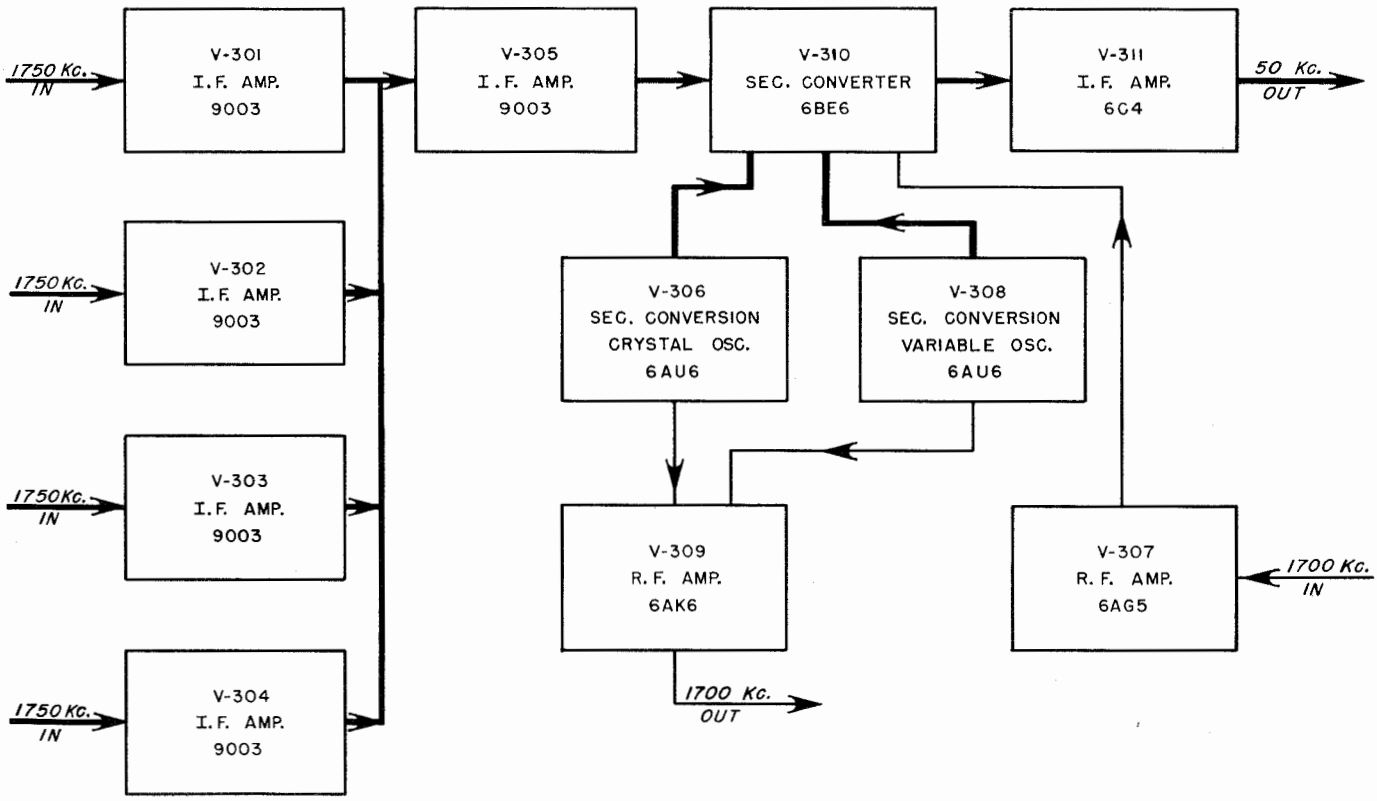

Figure 1–5. Frequency Converter CV-126/FRR-24, Functional Block Diagram

(2) FREQUENCY CONVERTER CV-126/FRR-24. *(See Figures 1–4 and 1–5).*—This unit provides an intermediate step in sharpening the broad selectivity and lowering the 1750-kc. intermediate frequency obtained from the Amplifier-Converter units preceding the CV-126/FRR-24 unit to the sharp selectivity and 50-kc. intermediate frequency of Filter Assembly F-99/FRR-24. The frequency changing function also provides a convenient point for vernier tuning or automatic frequency control tuning. If this intermediate unit were not employed, the undesired image response could not be attenuated sufficiently. If the frequency were not converted to some low frequency, the required selectivity could not be obtained in the Filter Assembly F-99/FRR-24. Even though two frequency conversions are employed, the undesired image response resulting at each conversion is attenuated many times more than would be possible with a single-frequency conversion circuit.

Four I.F. input channels are provided to accept the outputs of the four Amplifier-Converter units in the same bay. The channel in use corresponds to the Amplifier-Converter unit selected by means of the Band switch on the Control Panel SB-142/FRR-24.

Two I.F. amplifier stages employing five I.F. transformers tuned to a frequency of 1750 kilocycles are used with the output of the second stage being applied to the control grid of the second converter tube. The 1750-kilocycle I.F. input signal is converted to an output signal of 50 kc. through the use of a converter and 1700-kilocycle crystal oscillator or variable oscillator. One I.F. amplifier stage tuned to 50 kilocycles is used with its output applied to output connector J-305. An external source of 1700 kilocycles can be applied to this unit through connector J-306. A 1700-kilocycle crystal controlled oscillator or variable oscillator output is available for use in other bays at output connector J-306. The Second Conversion Oscillator Selector switch selects the oscillator to be placed into operation i.e., VFO, Crystal or External.

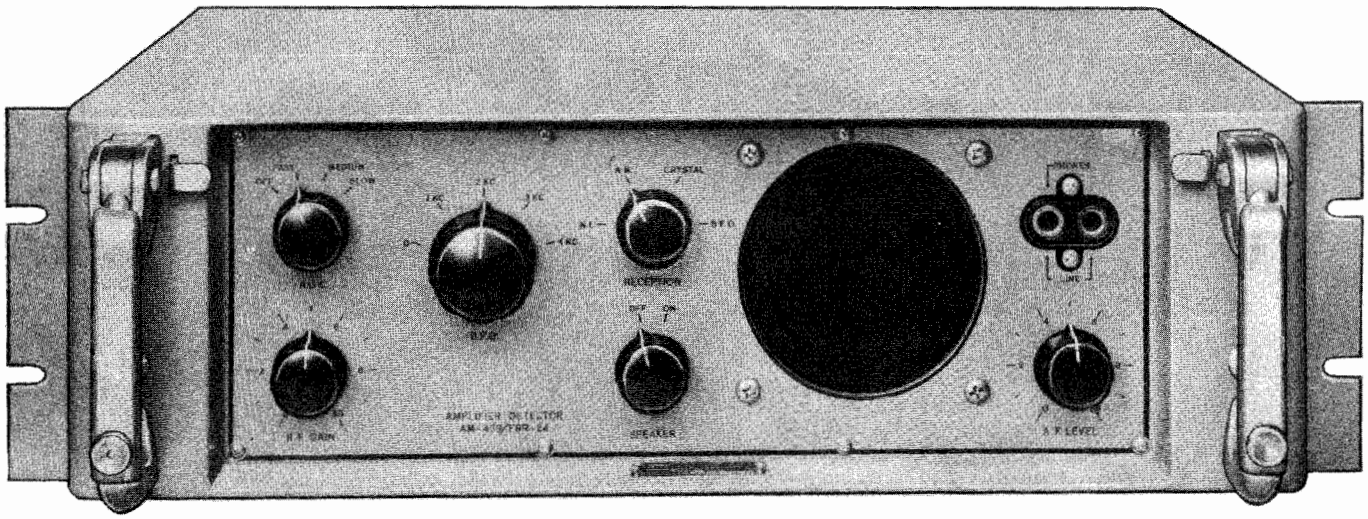

Figure 1–6. Amplifier-Detector AM-439/FRR-24

(3) AMPLIFIER-DETECTOR AM-439/FRR-24. *(See Figures 1–6 and 1–7).*—Amplifier-Detector AM-439/FRR-24 provides a means of aurally monitoring any A1, A2, A3, F1 or F4 signal of any single signal channel prior to subsequent combining etc. A heterodyne detector and tunable B.F. oscillator are used for the reception of code telegraph signals. The built-in monitor loudspeaker, headphones connected to the Phones Jack and/or a transmission line and suitable terminal apparatus connected to the Line jack or audio output connector may be used to monitor the audio intelligence at the output of this unit. The A.G.C. stage can be used to provide A.G.C. voltage for other units as required. The crystal oscillator makes possible critical zero-beat tuning.

A 50-kilocycle I.F. signal derived from the R.F. Amplifier AM-454/FRR-24 is applied to the input stage. In the case of A2 or A3 reception this input signal is amplified, detected and the detected audio is filtered and then amplified by a two-stage audio system. In the case of A1 reception the heterodyne detector and B.F. oscillator are used to provide an audible tone which is separately filtered and then applied to the common audio system. Accurate zero-beat tuning is made possible by use of the crystal oscillator and heterodyne detector.

A noise limiter is associated with the detector used for A2 and A3 reception. A.G.C. voltage is developed by this detector for application to other units as required. It will be required when this unit is used in

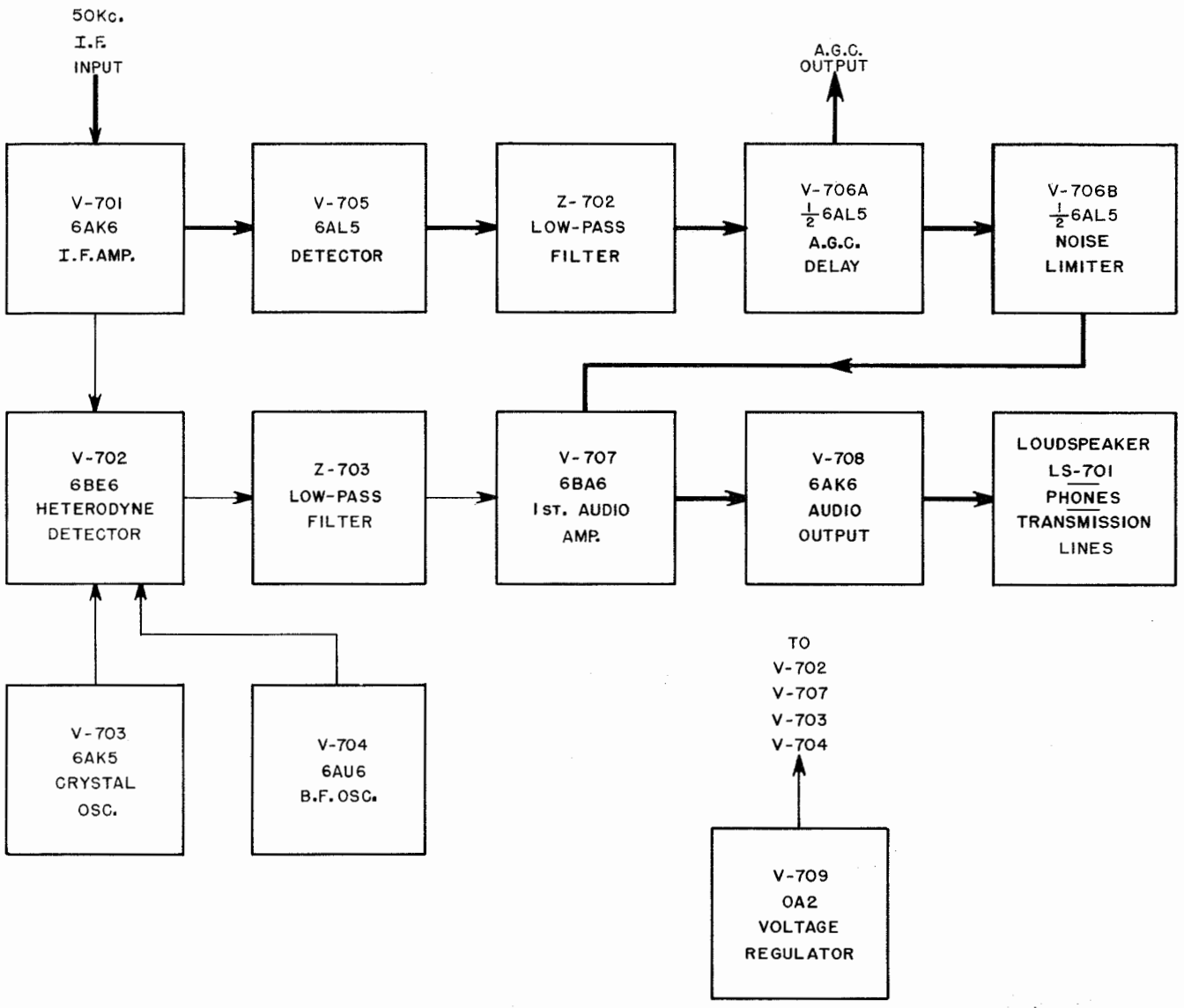

Figure 1–7. Amplifier-Detector AM-439/FRR-24, Functional Block Diagram

place of one of the Amplifier-Detector units AM-440/FRR-24.

The two-stage audio system provides an audio output of 60 milliwatts into each of from one to five 600-ohm loads (telephone transmission lines, headphones etc.) in parallel.

(4) FILTER ASSEMBLY F-99/FRR-24. *(See Figures 1–8 and 1–9).*–The Filter Assembly F-99/FRR-24 provides no gain to the receiver but affords a means of selecting one of eight bandwidths to cope with varying receiving conditions during A1, A2, A3, F1 or F4 reception. The purpose of this unit is to determine the final bandwidth and I.F. selectivity before demodulation.

The I.F. amplifier stages in this unit provide a choice of eight bandwidths as selected by the setting of the Selectivity switch S-401. A system of T-pad coupling networks is employed to maintain a constant overall gain of 1 to 1. The sharpest bandwidths are suitable for A1 reception. The medium bandwidths are suitable for A1, A2, A3, and F1 reception. The broadest bandwidths are suitable for A3 and F4 reception.

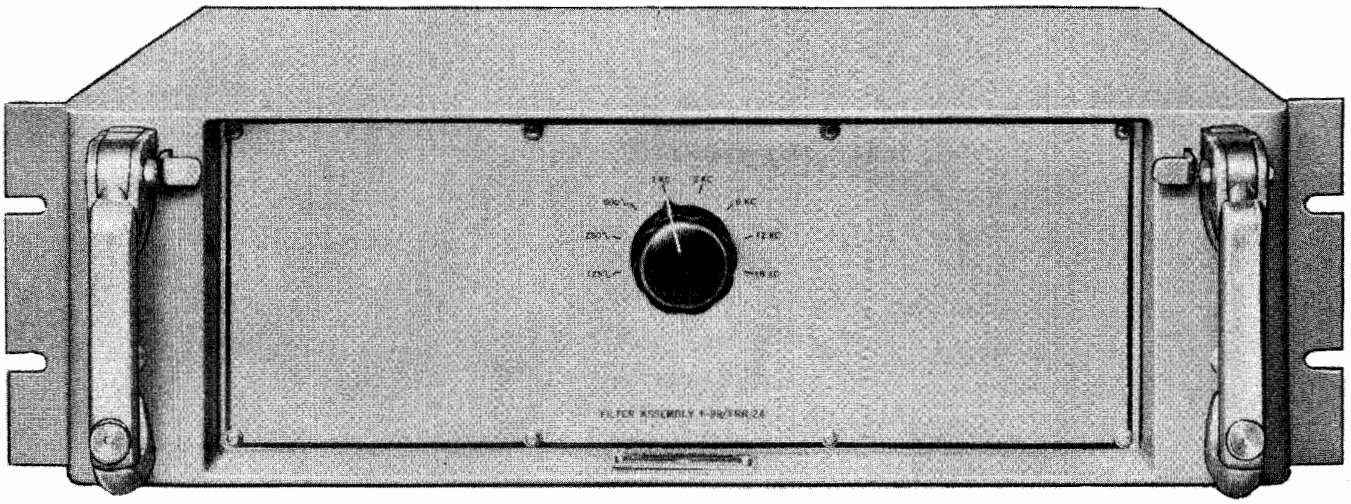

Figure 1–8. Filter Assembly F-99/FRR-24

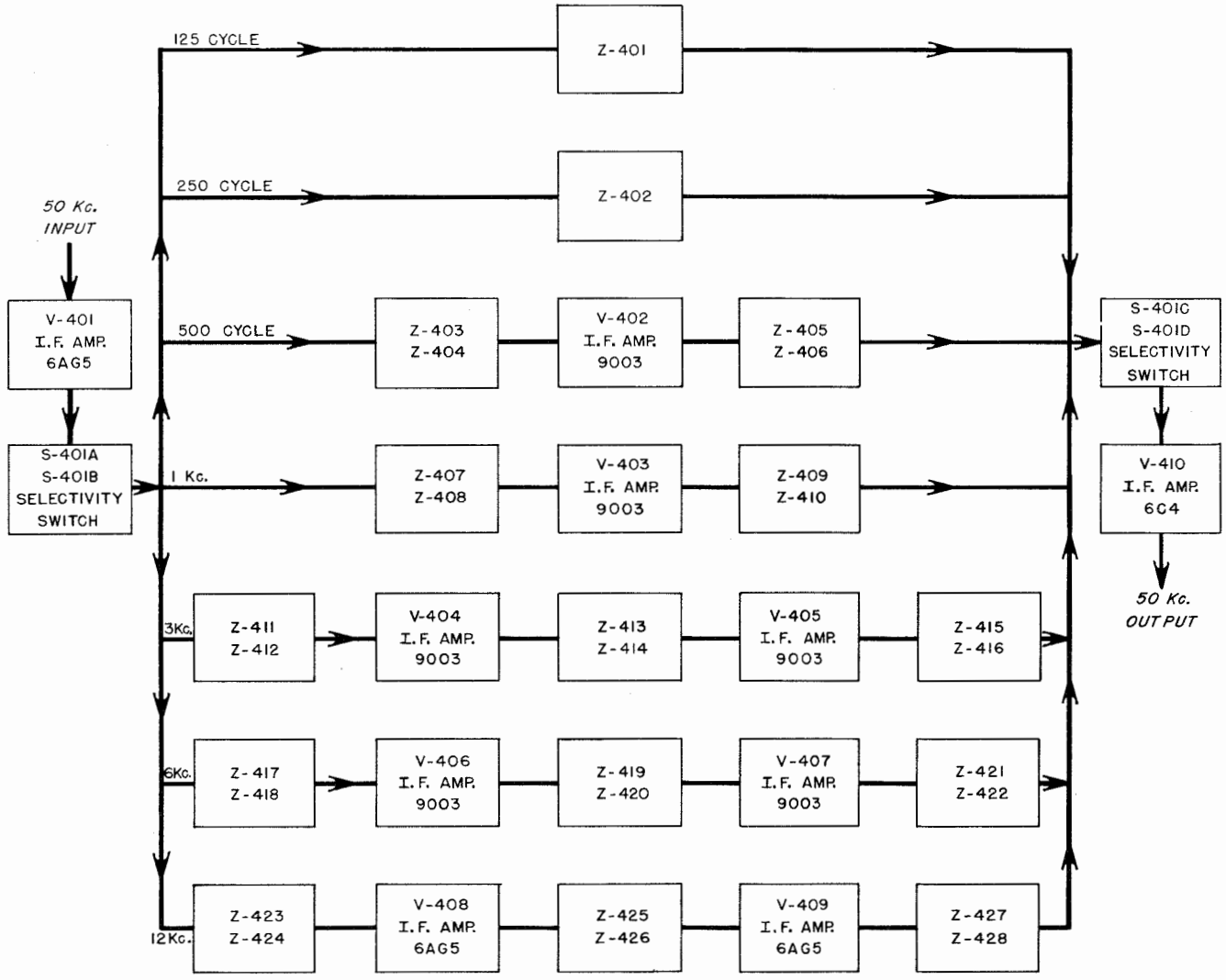

Figure 1–9. Filter Assembly F-99/FRR-24, Functional Block Diagram

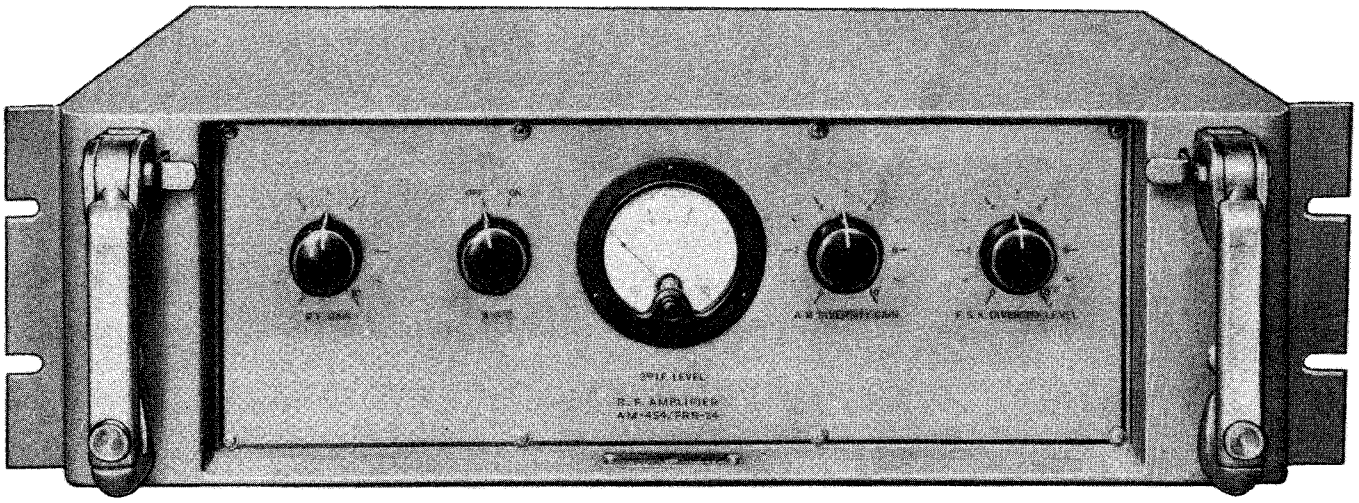

Figure 1–10. R.F. Amplifier AM-454/FRR-24

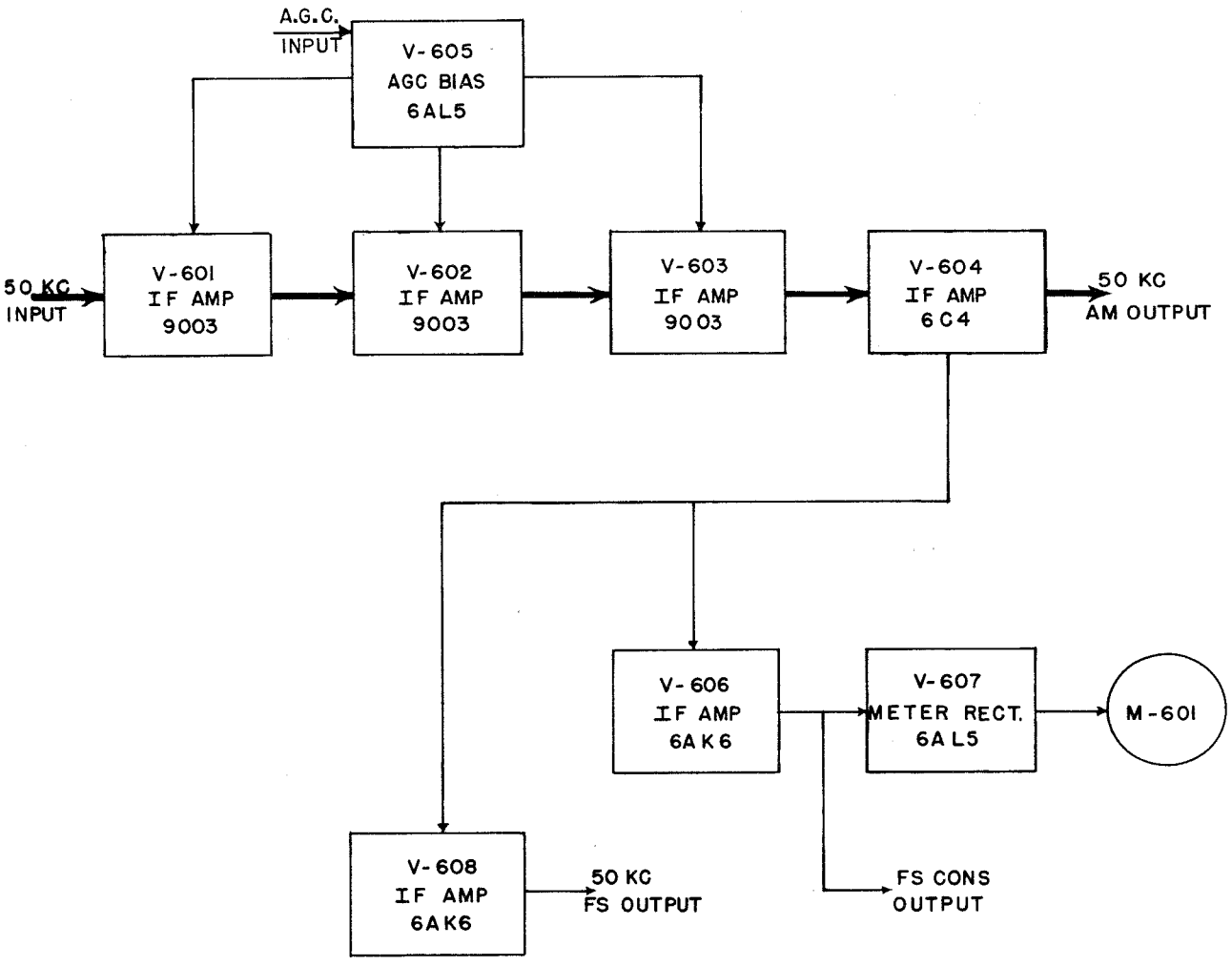

Figure 1–11. R.F. Amplifier AM-454/FRR-24, Functional Block Diagram

(5) R.F. AMPLIFIER AM-454/FRR-24. *(See Figures 1–10 and 1–11).*–The major portion of the receiver gain is provided by this unit without adding appreciably to the selectivity. This unit operates at 50 kilocycles and receives its input signal voltage from Filter Assembly F-99/FRR-24. The second intermediate frequency is produced at the output of the second heterodyne frequency converter stage located in the Frequency Converter CV-126/FRR-24. The desired 50-kilocycle selectivity characteristic is provided by the Filter Assembly F-99/FRR-24 which is located in the electrical circuit between the Frequency Converter CV-126/FRR-24 and R.F. Amplifier AM-454/FRR-24.

The R.F. Amplifier AM-454/FRR-24 provides outputs at two different levels. One output level is for A1, A2 and A3 signals. The second output is for F1 signals. The unit is designed to develop an overall gain of 77 db. from input to AM output. The overall gain is 76 db. from input to the plate of the F.S. output circuit . Matching transformers located in the output of the R.F. Amplifier AM-454/FRR-24 and in the input of the Frequency Shift Converter CV-127/FRR-24 maintain essentially the 76 db. gain between the input grids of the two units.

Three stages of I.F. amplification are used to produce the desired 50-kilocycle AM output level. A cathode follower is used to provide a low impedance to feed the output coaxial lines. Additional stages are used to produce the desired levels for the frequency shift output circuit and the frequency shift carrier-operated-noise-suppression (C.O.N.S.) circuit. The frequency shift C.O.N.S. circuit also includes a milliammeter arranged to indicate the level of the signals in the unit.

Provision is made in this unit to provide a protective bias for the tubes in case of failure of the incoming A.G.C. voltage or accidental removal of the patching cords.

(6) OSCILLATOR ASSEMBLY O-131/FRR-24. *(See Figures 1–12 and 1–13).*–This unit utilizes 16 crystals in the frequency range of 3.75 to 15 mcs. to provide heterodyne voltages for crystal-controlled operation of one or more Amplifier-Converter units. Two separate oscillators are used to provide these output voltages. Each oscillator has three parallel outputs with equal amplitude at an impedance of 23 ohms. A 200-kilocycle oscillator and harmonic generator are contained in this unit to provide marker frequencies for injection to the Amplifier-Converter unit for calibration checks. Two front-panel mounted crystal switches are used to select the crystals necessary to produce the heterodyne voltage required for reception of the chosen frequency channels. The above crystals are employed with a multiplication factor of 1, 2 or 3 times the crystal frequency to cover the tuning range of the Amplifier-Converter units. Two frequency charts are mounted opposite the oscillator unit to identify the frequency of the crystals associated with each crystal position and the signal frequency as read on the Amplifier-Converter unit.

Tuning meters are provided to indicate the magnitude of each oscillator output. Individual switches Osc. A and Osc. B, permit simultaneous operation of the oscillators.

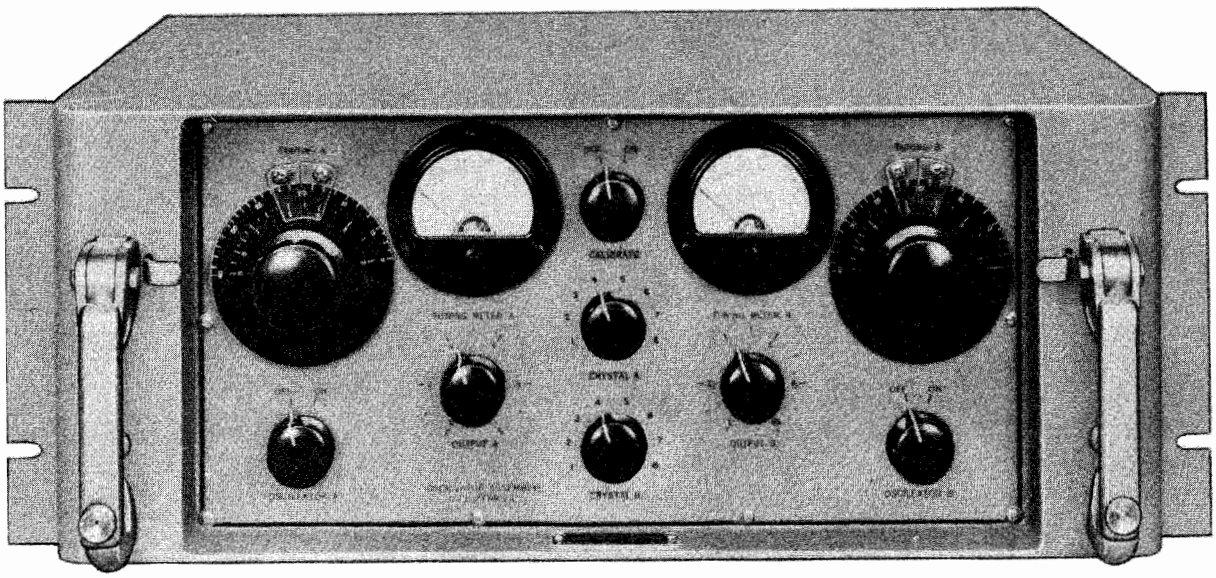

Figure 1–12. Oscillator Assembly O-131/FRR-24

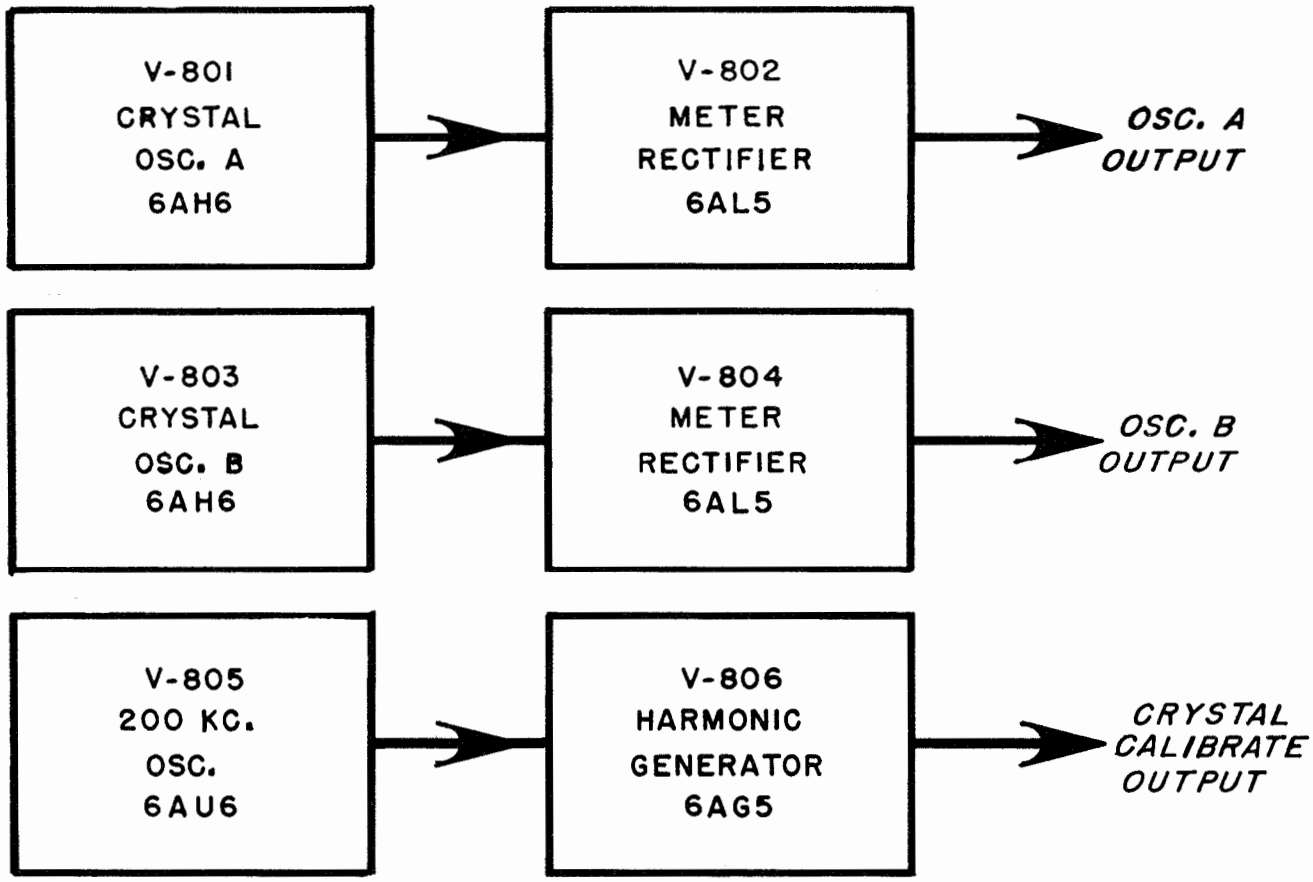

Figure 1–13. Oscillator Assembly O-131/FRR-24, Functional Block Diagram

(7) .CONTROL PANEL SB-142/FRR-24. *(See Figure 1–14).*–Control Panel SB-142/FRR-24 provides a means of selecting which one of the four Amplifier-Converter units shall be placed in an operative condition and also selects the source of oscillator excitation i.e., local or remote. In the local condition, the Control Panel makes oscillator voltage from the selected Amplifier-Converter available for patching into any other Amplifier-Converter unit of the same frequency range in another bay. In the remote condition, the Control Panel makes it possible for oscillator voltage from another source to be patched into the selected Amplifier-Converter unit. The Control Panel also serves as an intermediate step in the application of power from Power Supply PP-590/FRR-24 to the four Amplifier-Converters.

The unit contains a ganged seven-section Band switch, a ganged four-section Heterodyne Oscillator switch and a multiple arrangement of input and output connectors.

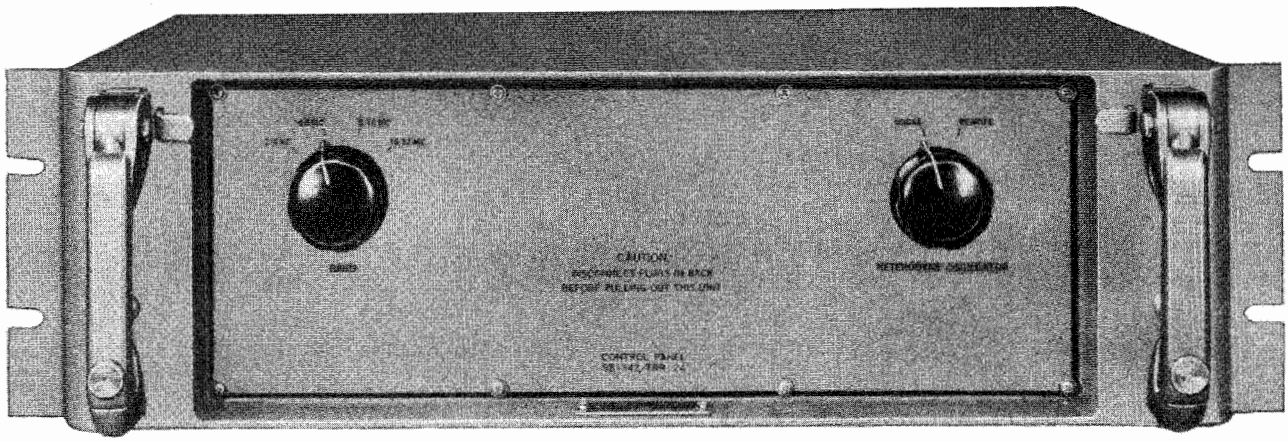

Figure 1–14. Control Panel SB-142/FRR-24

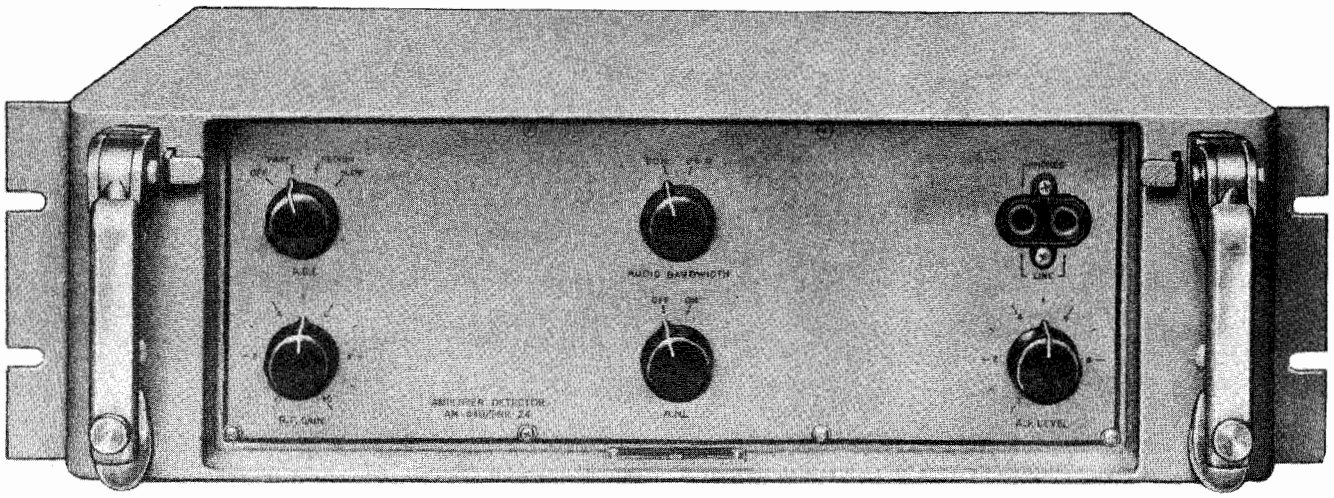

Figure 1–15. Amplifier-Detector AM-440/FRR-24

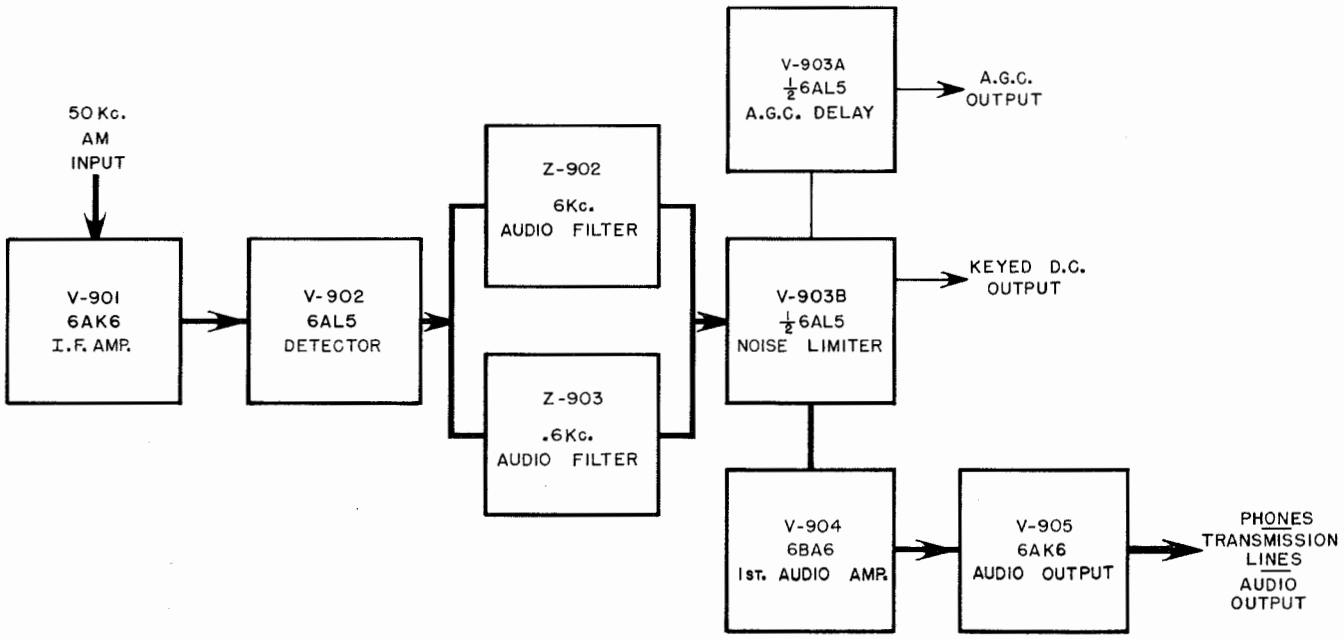

Figure 1–16. Amplifier-Detector AM-440/FRR-24, Functional Block Diagram

(8) AMPLIFIER-DETECTOR AM-440/FRR-24. *(See Figures 1–15 and 1–16).*—This is a five-tube single detector unit designed to amplify and detect the 50-kc. I.F. signal, provide a keyed D.C. output, an audio output and also provide a source of A.G.C. voltage.

The electrical circuits in the unit comprise one stage of I.F. amplification, a dual diode detector, two stages of audio amplification and a dual diode which utilizes one set of elements in an A.G.C. delay circuit and the other set of elements as a noise limiter. A front-panel mounted phones jack which is connected across the secondary winding of the output transformer provides a monitoring means.

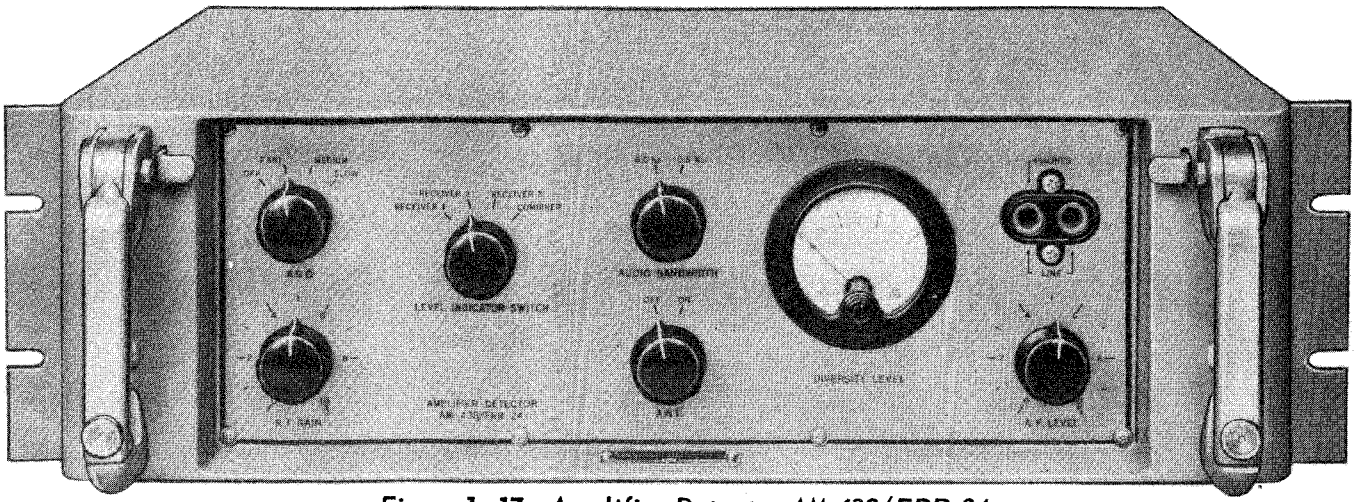

Figure 1–17. Amplifier-Detector AM-438/FRR-24

(9) AMPLIFIER-DETECTOR AM-438/FRR-24. *(See Figures 1–17 and 1–18).*–The Amplifier-Detector AM-438/FRR-24 is an eleven-tube triple detector unit designed to provide a means of combining or selecting one of the outputs of three receivers operating in diversity. The unit also provides a keyed D.C. output and a source of A.G.C. voltage. The electrical circuits consist of three separate 50-kilocycle input I.F. stages. Each I.F. stage has its own dual low-pass audio bandwidth filter and detector circuit. Combining or selecting of the diversity signal is accomplished by feeding the outputs of each of the three detectors through the three switching diodes into a common load resistor. A dual diode is employed which utilizes one set of elements in an A.G.C. delay circuit and the other set of elements as a noise limiter. Two stages of audio amplification are employed to provide an audio output of 60-milliwatts into each of from one to five 600-ohm loads in parallel.

A front-panel mounted phones jack which is connected across the secondary winding of the output transformer provides a monitoring means. A front-panel mounted milliameter is utilized to measure the individual diode currents or combined diode currents as selected by the setting of the Level Indicator switch.

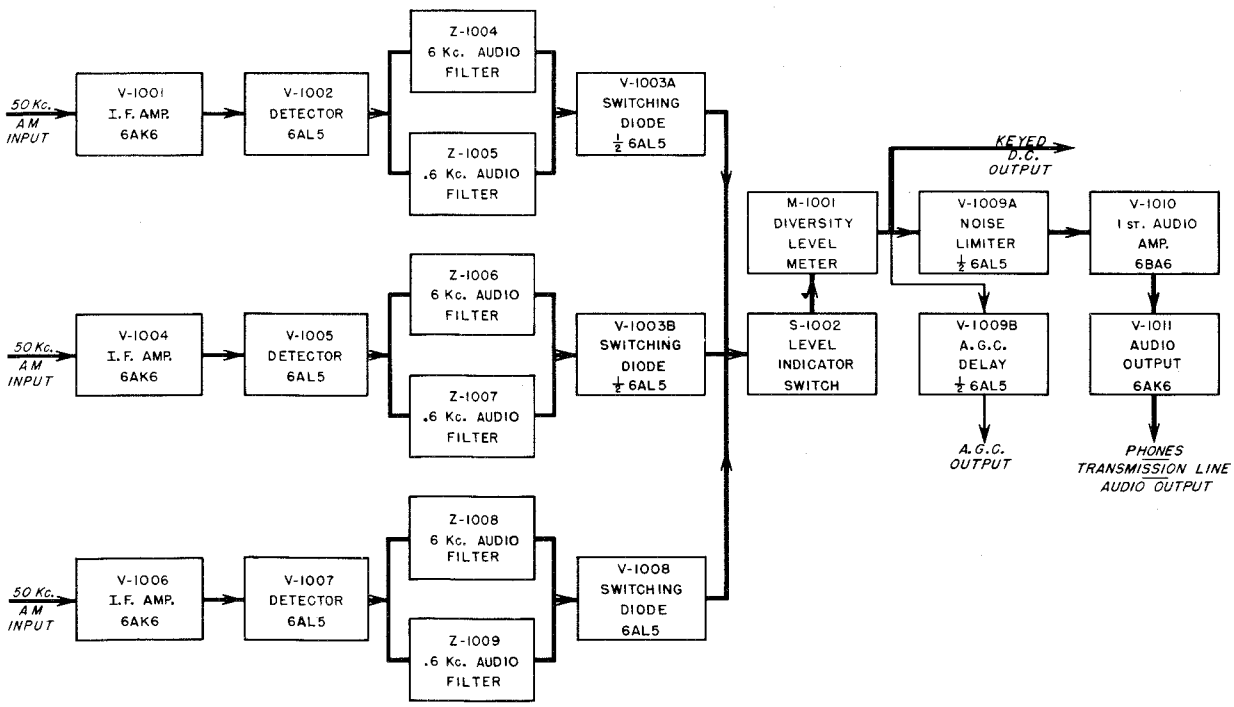

Figure 1–18. Amplifier-Detector AM-438/FRR-24, Functional Block Diagram

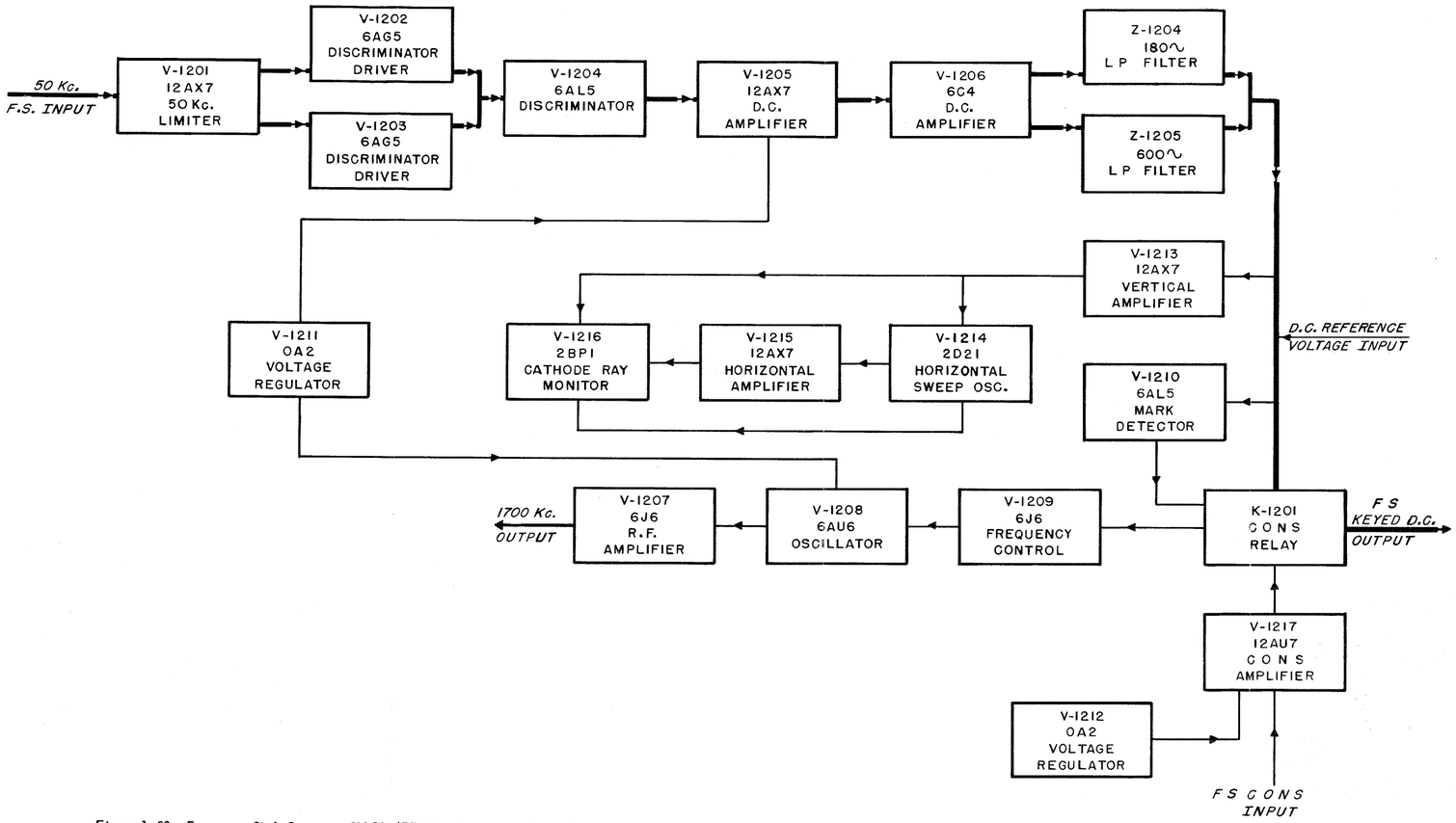

Figure 1–20. Frequency Shift Converter CV-127/FRR-24, Functional Block Diagram

RESTRICTED SECURITY INFORMATION

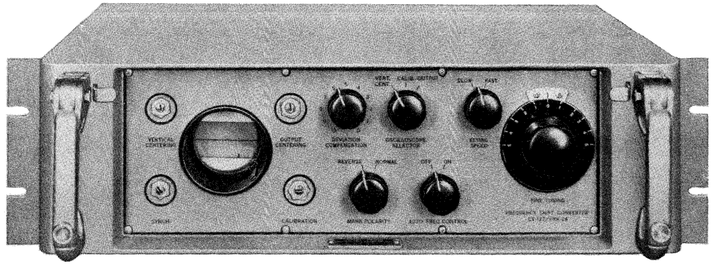

Figure 1–19. Frequency Shift Converter CV- 127/FRR-24

(10) FREQUENCY SHIFT CONVERTER CV-127/FRR-24. *(See Figures 1–19 and 1–20).*—The purpose of this unit is to convert frequency-shift signals received from the R.F. Amplifier AM-454/FRR-24 to Mark and Space voltages for application to the Comparator-Keyer CM-32/FRR-24. This latter unit is used to actuate a teletypewriter or other similar terminal equipment.

The signal circuits of the CV-127/FRR-24 comprise a 50-kc. limiter, two discriminator drivers, a discriminator and two D.C. amplifiers. The unit also contains a 1700 ±2.5 kc. oscillator whose output is fed back to the Frequency-Converter CV-126/FRR-24 to replace the oscillator in that unit during frequency-shift operation. The frequency of this oscillator is automatically varied over a ±2.5 kc. range by an A.F.C. circuit to hold constant the 50-kc. output frequency from the CV-126/FRR-24. Means of reversing the polarity of the signal input is provided. An oscilloscope with associated amplifiers and a horizontal sweep oscillator is provided to monitor the detected signal output. A Carrier-Off-Noise-Suppression circuit is included which opens the signal circuits in the absence of a usable signal and places the D.C. reference potential at the output connector J-1204, which causes the associated keyer to hold the teletypewriter on mark.

(11) KEYER KY-62/FRR-24. *(See Figures 1–21 and 1–22).*—The keyer is utilized to accept a D.C. input signal, amplify this signal and provide an audio tone at its output suitable for transmission over land lines to equipment capable of operating from a 600-ohm source. Three stages of D.C. amplification are employed to key the audio amplifier tubes in accordance with the incoming A1 or F1 radio-frequency signals. Audible monitoring of the output signal is made possible by insertion of headphones into the Phones jack. The input signal is derived from Amplifier-De-

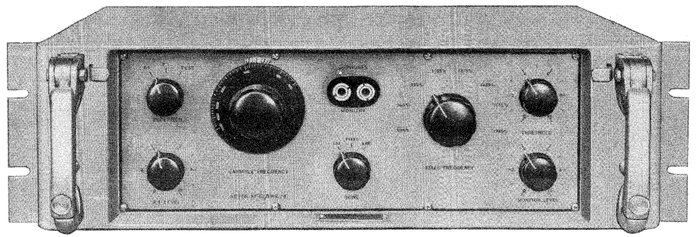

Figure 1–21. Keyer KY-62/FRR-24

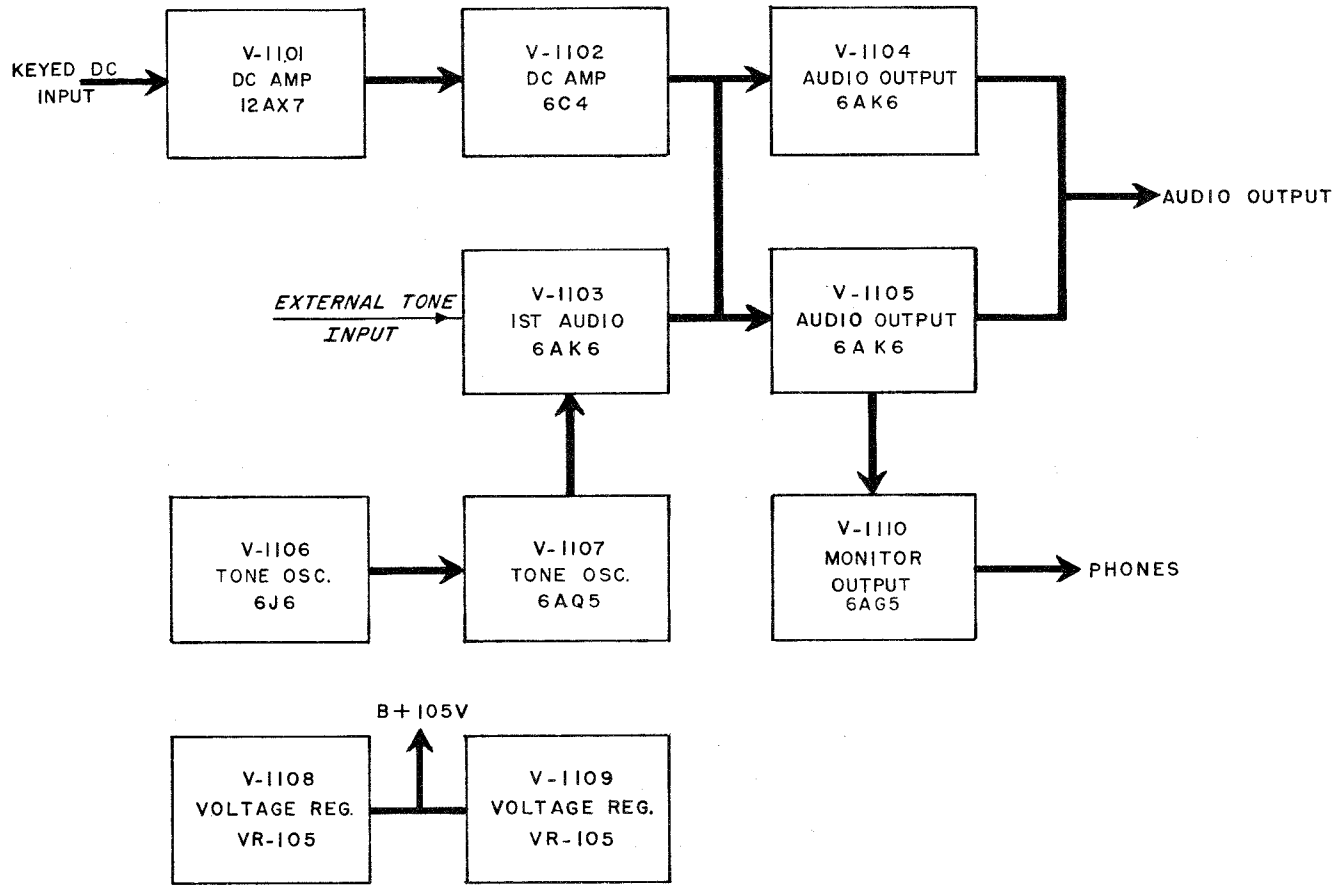

Figure 1–22. Keyer KY-62/FRR-24, Functional Block Diagram

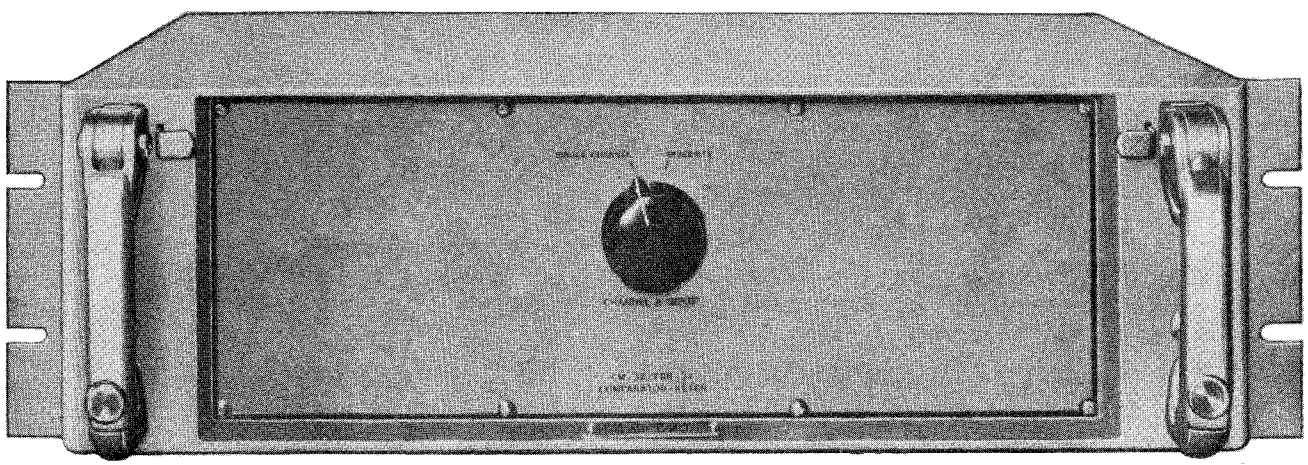

Figure 1–23. Comparator Keyer CM-32/FRR-24

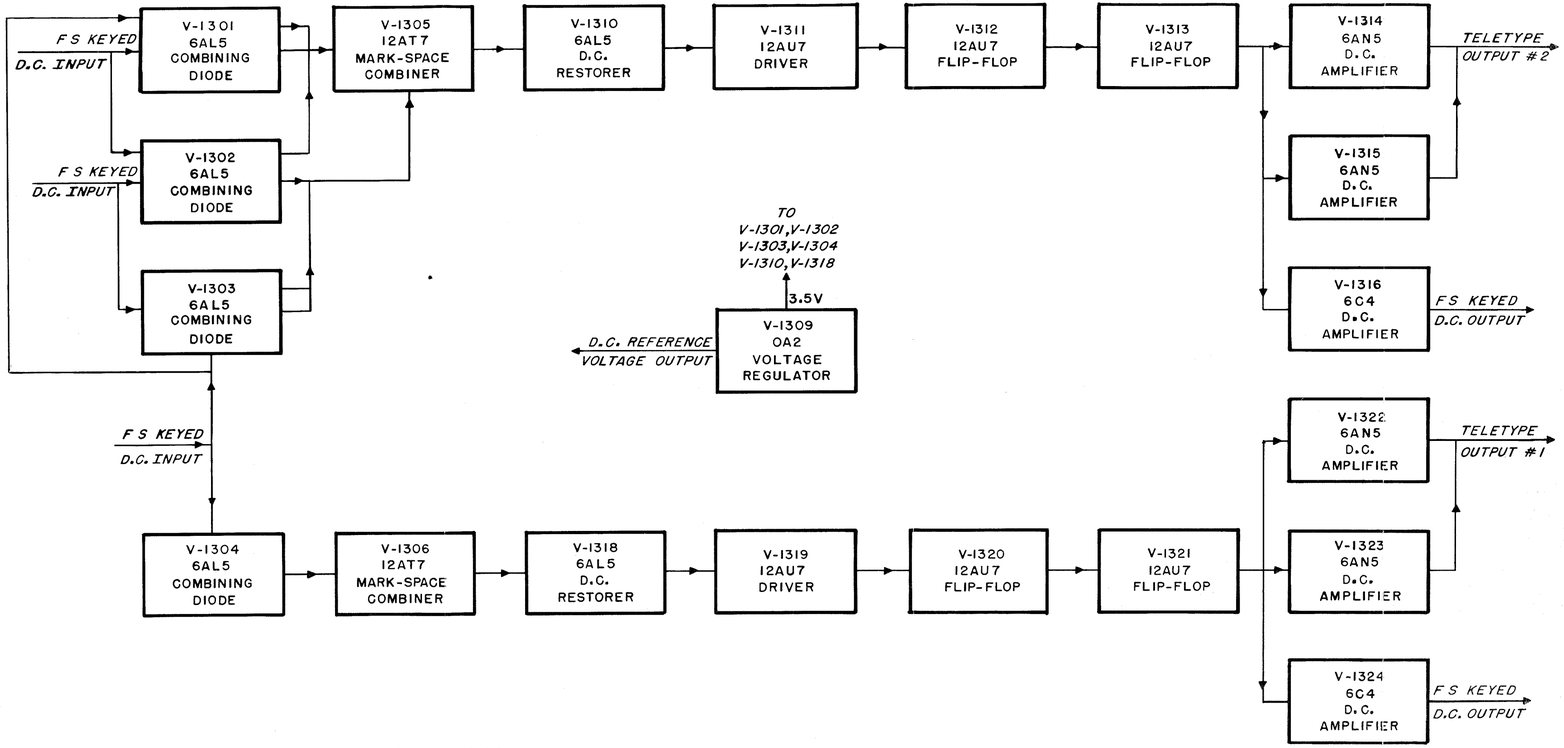

Figure 1–24. Comparator Keyer CM-32/FRR-24, Functional Block Diagram

tector AM-438/FRR-24, Amplifier-Detector AM-440/FRR-24 or the Comparator-Keyer CM-32/FRR-24. The front-panel mounted Tone switch selects the mode of operation i.e., Fixed Frequency, Variable Frequency or External Tone. The fixed frequency circuit is designed to vary the output tone in eight steps of 170 cycles each from 595 to 1785 cycles. The variable tone circuit is continuously variable over a frequency range of 400 to 5000 cycles. The unit will operate from an external tone source up to 5000 cycles with an input level of at least 0.7 volt R.M.S. The unit provides an output signal of 12 milliwatts. The keyer is capable of operating at a maximum speed of 500 words-per-minute.

(12) COMPARATOR KEYER CM-32/FRR-24. *(See Figures 1–23 and 1–24).*—The purpose of this unit is to receive the keyed D.C. pulses from any or all of the Frequency Shift Converters CV-127/FRR-24 and to combine and amplify these pulses to a suitable level to key a teletypewriter loop. This keyer has two channels, each channel capable of receiving separate transmissions. In addition, it can actuate one Keyer KY-62/FRR-24 for each channel. The Keyer KY-62/FRR-24 is used when it is necessary to transmit the F1 message over a telephone line from the receiving site to terminal equipment.

The two separate channels contained in the Comparator Keyer are identical electrically except for the input circuits. Three input signals may be fed into one channel for triple diversity operation or one input signal may be used for single channel operation leaving the remaining two inputs for dual diversity operation. Two different transmissions may be fed into the Comparator Keyer CM-32/FRR-24 when this unit is used in the latter mode of operation. When this unit is used for diversity operation, the Mark and Space elements of the frequency shift keyed information are applied to three combining diodes. The strongest signal is selected and delivered to the D.C. restorer where the Mark and Space voltages are restricted in amplitude and clamped with the negative peak at ground potential. Following the D.C. restorer is a driver tube which reproduces this Mark and Space voltage and couples it to the first flip-flop circuit. A second flip-flop circuit which is capacitively coupled is used to control the output tubes which key the D.C. loop circuit. A separate triode is used to provide a Mark and Space voltage which is capable of operating the Keyer KY-62/FRR-24.

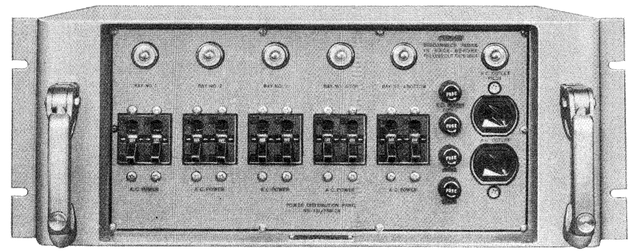

Figure 1–25. Power Distribution Panel SB-141/FRR-24

(13) POWER DISTRIBUTION PANEL SB-141/FRR-24. *(See Figure 1–25).*–The Power Distribution Panel SB-141/FRR-24 is located in bay 3 of the AN/FRR-24 Radio Receiving Set. A.C. power is distributed to the five power supplies through this unit. Separate switches with built-in ten-ampere circuit breakers are provided to connect A.C. into each of the five power supplies. A neon lamp is connected at each input to indicate the application of A.C. voltage to the selected power supply.

(14) POWER SUPPLY PP-590/FRR-24. *(See Figures 1–26 and 1–27).*–The Power Supplies are twelve-tube electronically regulated units utilized to provide all necessary voltages for bays 1, 2 or 3 of the AN/FRR-24. Two Primary Tap switches, one in the plate transformer and one in the filament transformer, are provided to permit operation from an A.C. supply of 105/115/ or 125 volts, 50/60 cps.

Two type 5R4GY full-wave connected rectifiers plus an associated capacitor-input filter network and voltage regulating circuit comprise the positive 210-volt regulated supply. The negative 210-volt supply consists of a 5R4GY full-wave connected rectifier plus an associated capacitor-input filter network and voltage regulating circuit. Both positive and negative rectifiers operate from the dual output windings of the plate transformer. Separate circuit breakers are connected in each leg of the plate transformer primary and the filament transformer 6.8-volt secondary windings. The filament circuit breakers operate to open the primary power circuit to both the filament transformer and the plate transformer. Both sides of the A.C. line to the blower are protected by one-ampere fuses. Three spare fuses, a failure indicator lamp, a heater primary lamp and a plate power lamp are provided on the front panel. A voltage test position is also provided to set the value of load voltage which the power supply should maintain.

The A.C. input is connected from the Power Distribution Panel SB-141/FRR-24 to the PP-590/FRR-24 via the A.C. input connector. Two overload protective devices and a failure indicator lamp are provided in the A.C. input circuit. An overheat thermostat is mounted inside the cabinet.

The negative power source is fixed at 210 volts by the use of two voltage regulator tubes. The negative 105 volts is fixed by the use of one voltage regulator tube.

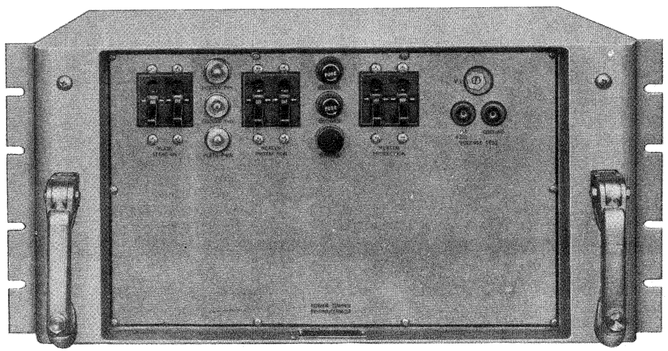

Figure 1–26. Power Supply PP-590/FRR-24

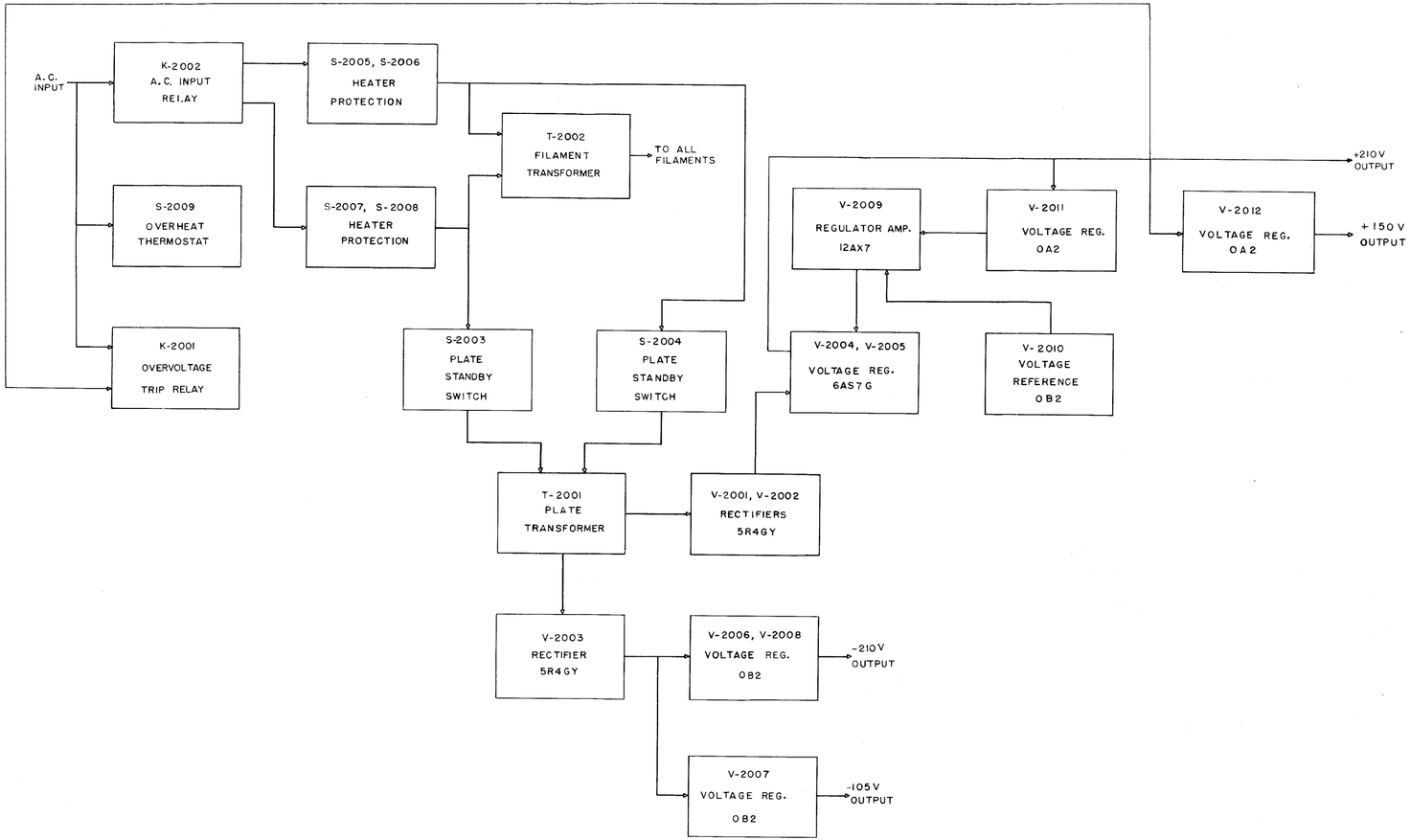

Figure 1–27. Power Supply PP-590/FRR-24, Functional Block Diagram

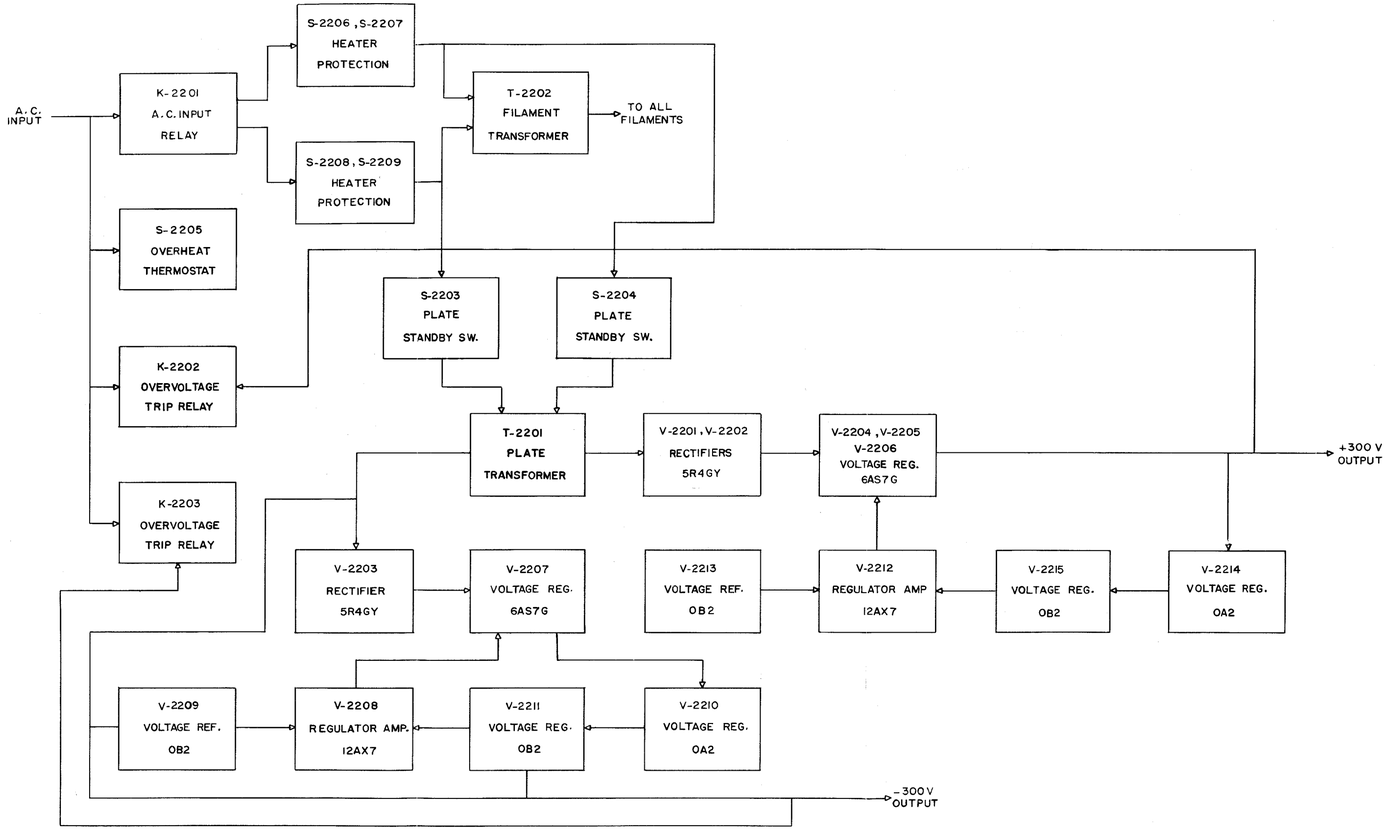

Figure 1–29. Power Supply PP-648/FRR-24, Functional Block Diagram

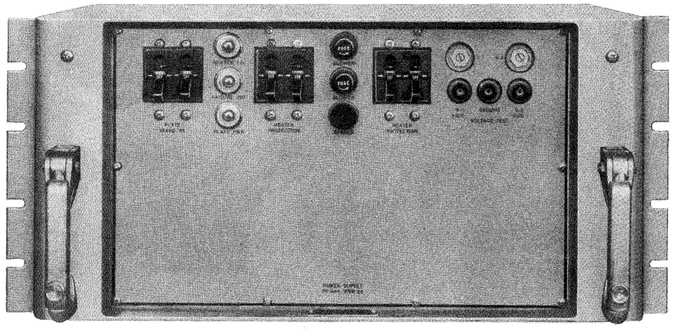

Figure 1–28. Power Supply PP-648/FRR-24

(15) POWER SUPPLY PP-648/FRR-24. *(See Figures 1–28 and 1–29).*–The PP-648/FRR-24 is a fifteen-tube electronically-regulated power supply located in bay 4 of the AN/FRR-24 Radio Receiving Set. The A.C. input circuit, filament transformer, plate transformer and rectifier circuits are similar to those in Power Supply PP-590/FRR-24 described in foregoing paragraph 2 b. (14). The A.C. input is connected from the Power Distribution Panel SB-141/FRR-24 to the PP-648/FRR-24 via the A.C. input connector J-2203. The A.C. control circuits are also similar to those in the PP-590/FRR-24 except that an additional overvoltage trip relay is provided in the negative 300-volt circuit.

The regulated positive 300-volt supply is obtained through three parallel connected dual-triode regulator tubes.

The regulated negative 300-volt supply is obtained through one regulator tube. Two voltage test positions are provided to set the value of the positive 300-volt and negative 300-volt outputs which the power supply should maintain.

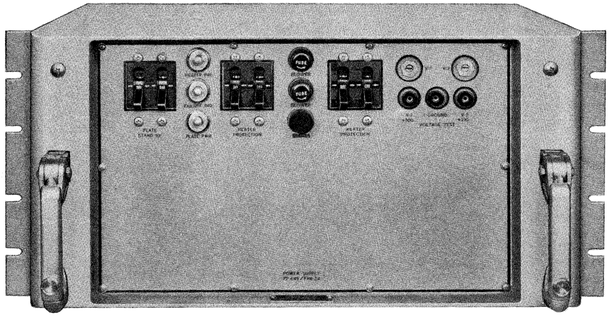

Figure 1–30. Power Supply PP-649/FRR-24

(16) POWER SUPPLY PP-649/FRR-24. *(See Figures 1–30 and 1–31).*—The PP-649/FRR-24 is a fifteen-tube electronically-regulated power supply located in bay 4 of the AN/FRR-24 Radio Receiving Set. The A.C. input circuit, filament transformer, plate transformer and rectifier circuits are similar to those in Power Supply PP-590/FRR-24 described in paragraph 2. b. (14). The A.C. input is connected from the Power Distribution Panel SB-141/FRR-24 to the PP-649/FRR-24 via the A.C. input connector J-2103. The A.C. control circuits are also similar to those in the PP-590/FRR-24 except that an additional Over-voltage Trip Relay K-2102 is provided in the positive 300-volt circuit.

The regulated positive 300-volt supply is obtained through three parallel connected dual triode regulator tubes. The regulated positive 210-volt supply is obtained from the regulated positive 300-volt source through one voltage regulator tube.

The negative 105 volts is fixed by the use of a voltage regulator tube. Two voltage test positions are provided to set the value of the positive 210-volt and 300-volt outputs which the power supply should maintain.

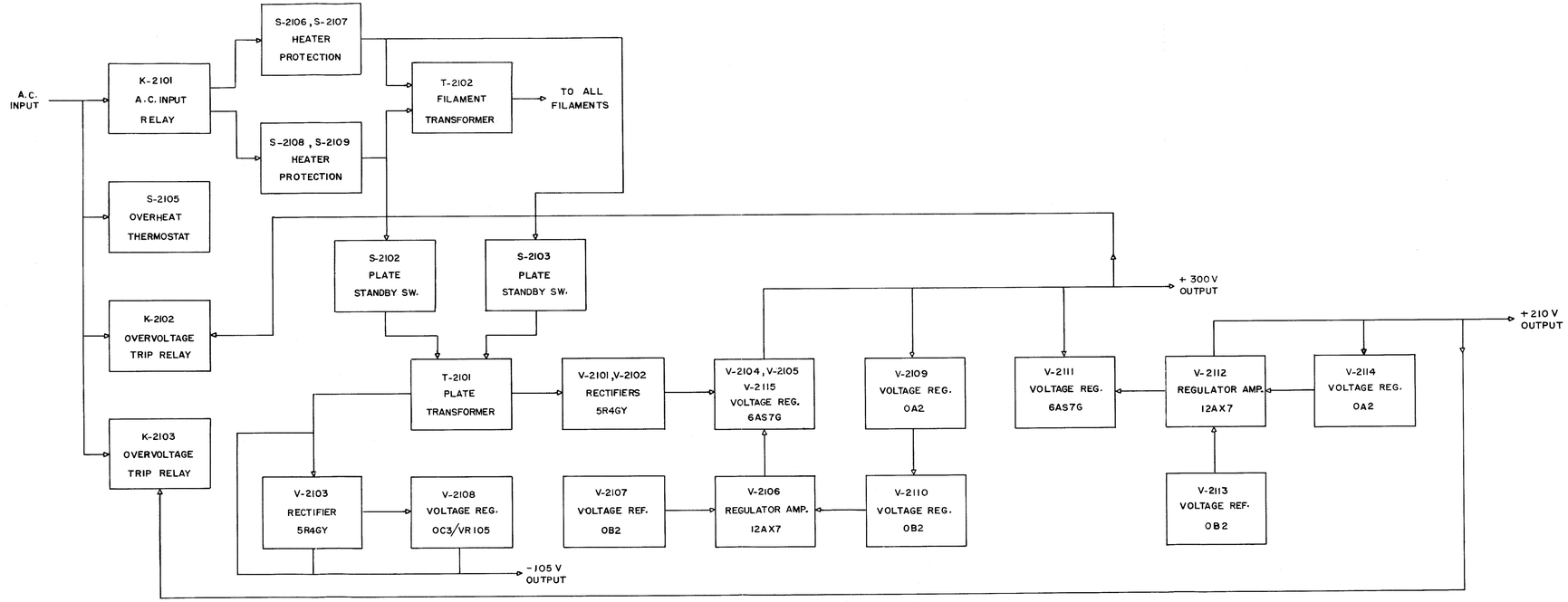

Figure 1–31. Power Supply PP-649/FRR-24, Functional Block Diagram

(17) PATCH PANELS. *(See Figures 1–32 thru 1–35).*–The patch panels are utilized to arrange the equipment for a particular mode of operation and to connect various circuits to circuits in other units. All of these types of connections are made by means of the patch cords associated with each patch panel. The four patch panels used in the AN/FRR-24 equipment are as follows:

Bay 1 -- SB-138/FRR-24
Bay 2 -- SB-140/FRR-24
Bay 3 -- SB-169/FRR-24
Bay 4 -- SB-143/FRR-24

Observation of the patch panel units will reveal that each connector has an identifying tab. A connector is provided for each of the inputs and outputs of the major units which may require changing when arranging the equipment for any mode of operation. To guard against unwanted signal pick-up and/or spurious radiation several connectors on the Patch Panel are fitted with covers and/or terminating plugs. These covering devices should be removed only when the connector is to be used and when its use is ended the cover must always be replaced.

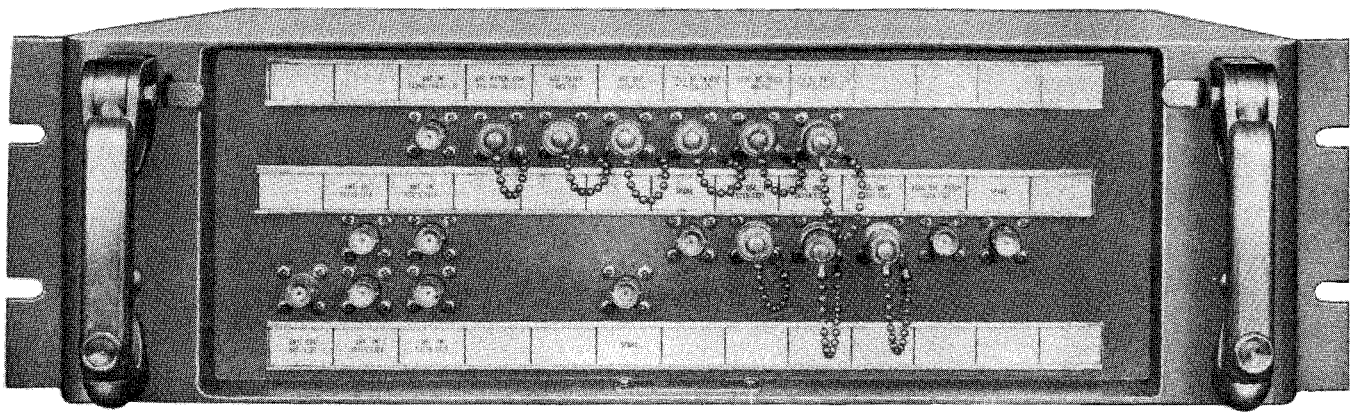

Figure 1–32. Patch Panel SB-138/FRR-24

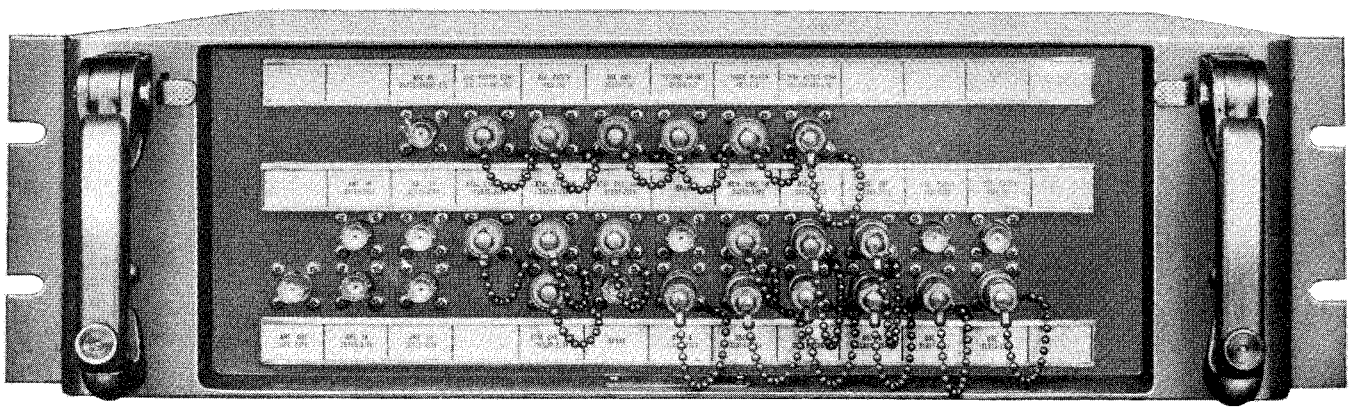

Figure 1–33. Patch Panel SB- 140/FRR-24

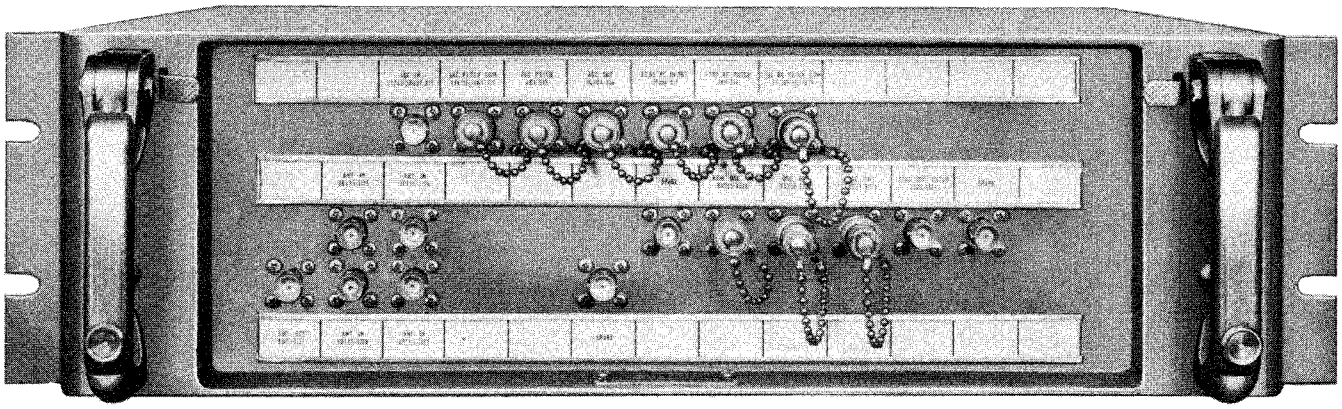

Figure 1–34. Patch Panel SB-169/FRR-24

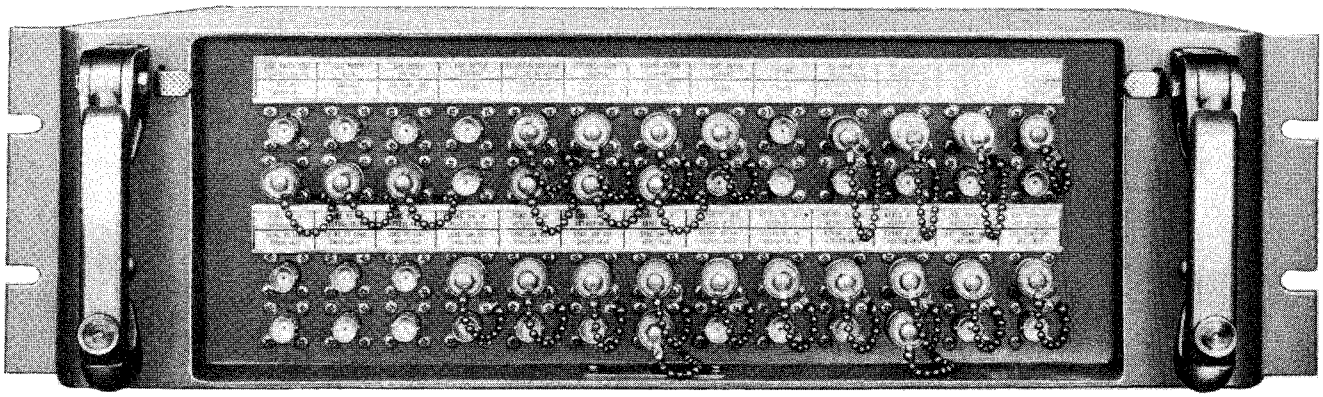

Figure 1–35. Patch Panel SB-143/FRR-24

3. REFERENCE DATA.

a. NOMENCLATURE.–Radio Receiving Set AN/FRR-24.

b. CONTRACT NUMBER AND DATE.–Contract NObsr-39402, dated 30 June 1947.

c. CONTRACTOR.–National Company, Inc., Malden, Massachusetts, U.S.A.

d. COGNIZANT NAVAL INSPECTOR.–Inspector of Naval Material, Boston 10, Massachusetts.

e. NUMBER OF PACKAGES INVOLVED PER COMPLETE SHIPMENT OF EQUIPMENT.–55 boxes (see table 1–3).

f. TOTAL CUBICAL CONTENTS.

(1) CRATED.– _____ Cu. ft. (see table 1–3)

(2) UNCRATED.– _____ Cu. ft. (see table 1–1)

g. TOTAL WEIGHT.

(1) CRATED.– _____ lbs. (see table 1–3)

(2) UNCRATED.– _____ lbs. (see table 1–1)

h. FREQUENCY RANGE.–2.0 to 32.0 megacycles.

i. TUNING BANDS.–Four.

(1) 2–4 megacycles.

(2) 4–8 megacycles.

(3) 8–16 megacycles.

(4) 16–32 megacycles.

j. NUMBER OF PRE-SET FREQUENCIES.–None.

k. TYPE OF FREQUENCY CONTROL.–Manual tuned with tuneable oscillator or crystal-controlled oscillator (16 crystals).

l. TYPES OF RECEPTION.

(1) A1 - Telegraph without the use of modulating audio frequency (On-Off keying).

(2) A2 - Telegraph by the keying of a modulating audio frequency or audio frequencies or by the keying of the modulated emission.

(3) A3 . Telephony, double sideband, full carrier.

(4) F1 - Telegraphy without the use of modulating audio frequency (frequency shift keying).

(5) F4 - Facsimile (I.F. output circuit for connection to suitable auxiliary apparatus).

m. TYPE OF RECEIVER.–Double superheterodyne.

n. INTERMEDIATE FREQUENCY.–First Conversion I.F. frequency of 1750 kcs., Second Conversion frequency of 50 kcs.

o. ANTENNA INPUT IMPEDANCE.–70 ohms nominal, unbalanced.

p. OUTPUT CIRCUITS.

(1) AUDIO.–60 milliwatts into each of from one to

five 600-ohm resistive loads in parallel.

(2) FREQUENCY SHIFT FACSIMILE.–50 kc. I.F. at 1-volt nominal.

(3) TELETYPE.

(a) CURRENT.–60 ma. (110 volts and 666 ohms in teletype; loop current must be supplied from external loop circuit).

(4) KEYED D.C. TONE.–12 milliwatts into 600 ohms.

q. CRYSTALS.

(1) 16 crystals type CR-18/U in Oscillator O-131/FRR-24. (See Section 3 par. 2. d. to determine required Xtal frequency for any desired signal frequency).

(2) One type CR-25/U, 200-kilocycle crystal in O-131/FRR-24 (crystal calibrator).

(3) One type CR-18/U, 1700-kc. crystal, in CV-126/FRR-24.

(4) One 50-kc. crystal, Western Electric Co. type 21NA (or equivalent) in AM-439/FRR-24 (BFO).

r. FREQUENCY STABILITY DATA.

(1) TEMPERATURE.–0.002% per ^{o}C frequency variation; 6 db. gain variation.

(2) HUMIDITY.–0.025% total frequency variation 6 db. total gain variation.

s. OSCILLATOR RADIATION.–less than 400 micromicrowatts.

t. INTERMEDIATE FREQUENCY REJECTION.–greater than 100 db.

u. IMAGE FREQUENCY REJECTION.–greater than 110 db.

v. RESONANT OVERLOAD.–60 milliwatts minimum into 600-ohm load or 300 milliwatts into a 120-ohm load.

w. MAXIMUM UNDISTORTED OUTPUT.–60 milliwatts minimum into a 600-ohm load or 300 milliwatts into a 120-ohm load.

x. AUTOMATIC GAIN CONTROL TIME CONSTANT.

(1) FAST.–0.01 second.

(2) MEDIUM.–0.1 second.

(3) SLOW.–1.0 second.

y. SENSITIVITY

(1) A2, A3.–2 microvolts or better.

(2) A1, A4, F1.–3 microvolts or better.

z. GAIN VARIATION.–Within 6 decibels over any one tuning band.

aa. RESERVE GAIN.–12 decibels.

bb. TUNING LINEARITY.–Using the average frequency variation per linear dial scale division, as determined for the limits of the working frequency range of any frequency band as a reference value, the variation in frequency per division for any 100-division dial scale increment in the working frequency range of any frequency band is not less than 80% nor more than 110% of the reference value.

cc. FREQUENCY OVERLAP.–Not less than 1% at each end of any frequency band.

dd. KEYING SPEED.–500 words-per-minute (A1 on-off keying).

ee. CHARACTERISTIC OF POWER SUPPLIES PROVIDED FOR OPERATION.

(1) TYPE.–Self-contained full wave rectifier.

(2) A.C. VOLTAGE.–105/115/125 volts.

(3) FREQUENCY.–50/60 cycles.

(4) NUMBER OF PHASES.–Single phase.

(5) POWER CONSUMPTION AND CURRENT DRAIN.

	Watts	V.A.	Drain (Amps.)
A.C. Line to Bay 1	345	368	3.2
A.C. Line to Bay 2	365	391	3.4
A.C. Line to Bay 3	345	368	3.2
A.C. Line to Bay 4 (A.M. units A, B, C, G, H, J, M)	510	552	4.8
A.C. Line to Bay 4 (F.S. units D, E, F, L, N)	480	506	4.4

ff. BASIC SIMILARITIES AND DIFFERENCES IN THE AN/FRR-24 RADIO RECEIVING SET AND THE MODEL RCP DIVERSITY RADIO RECEIVING EQUIPMENT.

(1) SIMILARITIES.–Basically the AN/FRR-24 Radio Receiving Set performs the same function as that of its predecessor the Model RCP Diversity Radio Receiver except that in addition it provides a means of receiving frequency shift telegraphy signals.

(2) DIFFERENCES.–The AN/FRR-24 is entirely different in its electrical design and mechanical construction from that of the previous unit. The AN/FRR-24 is intended for operation in the frequency range of 2.0 to 32.0 megacycles whereas the Model RCP operates in the frequency range of 3.0 to 24.0 megacycles.

gg. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

(1) A 70-ohm antenna.

(2) Headphones.

TABLE 1-1. EQUIPMENT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	AN OR NAVSHIPS DESIGNATION	OVERALL DIMENSIONS			VOLUME CU. FT.	WEIGHT LBS.
			HEIGHT	WIDTH	DEPTH		
3	Control Panel	SB-142/FRR-24	5 7/32"	19"	15 7/16"	0.89	33
3	Amplifier Converter	AM-450/FRR-24	6 31/32"	19"	16 15/16"	1.29	58
3	Amplifier Converter	AM-451/FRR-24	6 31/32"	19"	16 15/16"	1.29	58
3	Amplifier Converter	AM-452/FRR-24	6 31/32"	19"	16 15/16"	1.29	58
3	Amplifier Converter	AM-453/FRR-24	6 31/32"	19"	16 15/16"	1.29	58
3	Frequency Converter	CV-126/FRR-24	5 7/32"	19"	16 15/16"	0.97	33
3	Amplifier-Detector	AM-439/FRR-24	5 7/32"	19"	16 15/16"	0.97	36
3	R.F. Amplifier	AM-454/FRR-24	5 7/32"	19"	16 15/16"	0.97	32
1	Patch Panel	SB-138/FRR-24	5 7/32"	19"	15 5/16"	0.87	21
1	Patch Panel	SB-140/FRR-24	5 7/32"	19"	15 5/16"	0.87	21
1	Patch Panel	SB-143/FRR-24	5 7/32"	19"	15 5/16"	0.87	21
1	Patch Panel	SB-169/FRR-24	5 7/32"	19"	15 5/16"	0.87	21
3	Filter Assembly	F-99/FRR-24	5 7/32"	19"	16 15/16"	0.97	45
1	Tool Box		6 31/32"	19"	16 15/16"	1.29	41
1	Oscillator Assembly	O-131/FRR-24	6 31/32"	19"	16 15/16"	1.29	42
1	Power Distribution Panel	SB-141/FRR-24	6 31/32"	19"	15 5/16"	1.17	28
3	Power Supply	PP-590/FRR-24	8 23/32"	19"	15 5/16"	1.46	96
2	Amplifier-Detector	AM-440/FRR-24	5 7/32"	19"	16 15/16"	0.97	31
1	Amplifier-Detector	AM-438/FRR-24	5 7/32"	19"	16 15/16"	0.97	36
3	Frequency Shift Converter	CV-127/FRR-24	5 7/32"	19"	16 15/16"	0.97	35
3	Keyer	KY-62/FRR-24	5 7/32"	19"	16 15/16"	0.97	39
1	Comparator-Keyer	CM-32/FRR-24	5 7/32"	19"	16 15/16"	0.97	33
1	Power Supply	PP-648/FRR-24	8 23/32"	19"	15 5/16"	1.46	96
1	Power Supply	PP-649/FRR-24	8 23/32"	19"	15 5/16"	1.46	96
4	Cabinet	CY-860/FRR-24	84"	20 7/8"	14 3/4"	14.97	215

TABLE 1-2. TUBE COMPLEMENT

UNIT	NUMBER OF TUBES OF TYPE INDICATED																								
	6BA6	9003	6BE6	12AX7	OB2	6AN5	6C4	6AU6	6AG5	6AK6	OA2	6AL5	6AK5	6AH6	6J6	6AQ5	OC3 VR-105	2D21	2BP1	12AU7	12AT7	5R4GY	6AS7G	TOTAL
(3) AM-450/FRR-24	3	6	3	3	3	6	3																	27
(3) AM-451/FRR-24	3	6	3	3	3	6	3																	27
(3) AM-452/FRR-24	3	6	3	3	3	6	3																	27
(3) AM-453/FRR-24	3	6	3	3	3	6	3																	27
(3) CV-126/FRR-24		15	3				3	6	3	3	3													36
(3) AM-439/FRR-24	3		3					3		6	3	6	3											27
(3) AM-454/FRR-24		9					3			6		6												24
(3) F-99/FRR-24		18					3		9															30
O-131/FRR-24								1	1			2		2										6
(3) PP-590/FRR-24				3	12						6											9	6	36
(2) AM-440/FRR-24	2									4		4												10
AM-438/FRR-24	1									4		6												11
(3) CV-127/FRR-24				12	3		3	3	6		3	6			6			3	3	3				51
(3) KY-62/FRR-24				3			3		3	9					3	3	6							30
CM-32/FRR-24						4	2				1	6								6	2			21
PP-648/FRR-24				2	4						2											3	4	15
PP-649/FRR-24				2	3						2						1					3	4	15
Totals	18	66	18	34	34	28	29	13	22	32	20	36	3	2	9	3	7	3	3	9	2	15	14	420

TABLE 1-3. SHIPPING DATA

SHIPPING BOX NO.	CONTENTS		OVERALL DIMENSIONS (IN.)			VOLUME CU. FT.	WEIGHT LBS.
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Control Panel	SB-142/FRR-24	11 3/4	24 3/8	21 1/8	3.5	83
2	Control Panel	SB-142/FRR-24	11 3/4	24 3/8	21 1/8	3.5	83
3	Control Panel	SB-142/FRR-24	11 3/4	24 3/8	21 1/8	3.5	83
4	Amplifier-Converter	AM-450/FRR-24	13 1/2	24 3/8	21 1/8	4.1	108
5	Amplifier-Converter	AM-450/FRR-24	13 1/2	24 3/8	21 1/8	4.1	108
6	Amplifier-Converter	AM-450/FRR-24	13 1/2	24 3/8	21 1/8	4.1	108
7	Amplifier-Converter	AM-451/FRR-24	13 1/2	24 3/8	21 1/8	4.1	108
8	Amplifier-Converter	AM-451/FRR-24	13 1/2	24 3/8	21 1/8	4.1	108
9	Amplifier-Converter	AM-451/FRR-24	13 1/2	24 3/8	21 1/8	4.1	108
10	Amplifier-Converter	AM-452/FRR-24	13 1/2	24 3/8	21 1/8	4.1	108
11	Amplifier-Converter	AM-452/FRR-24	13 1/2	24 3/8	21 1/8	4.1	108
12	Amplifier-Converter	AM-452/FRR-24	13 1/2	24 3/8	21 1/8	4.1	108
13	Amplifier-Converter	AM-453/FRR-24	13 1/2	24 3/8	21 1/8	4.1	108
14	Amplifier-Converter	AM-453/FRR-24	13 1/2	24 3/8	21 1/8	4.1	108
15	Amplifier-Converter	AM-453/FRR-24	13 1/2	24 3/8	21 1/8	4.1	108
16	Frequency Converter	CV-126/FRR-24	11 3/4	24 3/8	21 1/8	3.5	83
17	Frequency Converter	CV-126/FRR-24	11 3/4	24 3/8	21 1/8	3.5	83
18	Frequency Converter	CV-126/FRR-24	11 3/4	24 3/8	21 1/8	3.5	83
19	Amplifier-Detector	AM-439/FRR-24	11 3/4	24 3/8	21 1/8	3.5	86
20	Amplifier-Detector	AM-439/FRR-24	11 3/4	24 3/8	21 1/8	3.5	86
21	Amplifier-Detector	AM-439/FRR-24	11 3/4	24 3/8	21 1/8	3.5	86
22	R.F. Amplifier	AM-454/FRR-24	11 3/4	24 3/8	21 1/8	3.5	82
23	R.F. Amplifier	AM-454/FRR-24	11 3/4	24 3/8	21 1/8	3.5	82
24	R.F. Amplifier	AM-454/FRR-24	11 3/4	24 3/8	21 1/8	3.5	82
25	Patch Panel	SB-138/FRR-24	11 3/4	24 3/8	21 1/8	3.5	71
26	Patch Panel	SB-140/FRR-24	11 3/4	24 3/8	21 1/8	3.5	71
27	Patch Panel	SB-169/FRR-24	11 3/4	24 3/8	21 1/8	3.5	71
28	Patch Panel	SB-143/FRR-24	11 3/4	24 3/8	21 1/8	3.5	71
29	Filter Assembly	F-99/FRR-24	11 3/4	24 3/8	21 1/8	3.5	95
30	Filter Assembly	F-99/FRR-24	11 3/4	24 3/8	21 1/8	3.5	95
31	Filter Assembly	F-99/FRR-24	11 3/4	24 3/8	21 1/8	3.5	95
32	Tool Box		13 1/2	24 3/8	21 1/8	4.1	91
33	Oscillator Assembly	O-131/FRR-24	13 1/2	24 3/8	21 1/8	4.1	92
34	Power Distribution Panel	SB-141/FRR-24	13 1/2	24 3/8	21 1/8	4.1	78
35	Power Supply	PP-590/FRR-24	15	24 3/8	21 1/8	4.45	146
36	Power Supply	PP-590/FRR-24	15	24 3/8	21 1/8	4.45	146
37	Power Supply	PP-590/FRR-24	15	24 3/8	21 1/8	4.45	146
38	Amplifier-Detector	AM-440/FRR-24	11 3/4	24 3/8	21 1/8	3.5	81
39	Amplifier-Detector	AM-440/FRR-24	11 3/4	24 3/8	21 1/8	3.5	81
40	Amplifier-Detector	AM-438/FRR-24	11 3/4	24 3/8	21 1/8	3.5	86
41	Frequency Shift Converter	CV-127/FRR-24	11 3/4	24 3/8	21 1/8	3.5	85
42	Frequency Shift Converter	CV-127/FRR-24	11 3/4	24 3/8	21 1/8	3.5	85
43	Frequency Shift Converter	CV-127/FRR-24	11 3/4	24 3/8	21 1/8	3.5	85
44	Keyer	KY-62/FRR-24	11 3/4	24 3/8	21 1/8	3.5	89
45	Keyer	KY-62/FRR-24	11 3/4	24 3/8	21 1/8	3.5	89
46	Keyer	KY-62/FRR-24	11 3/4	24 3/8	21 1/8	3.5	89

TABLE 1–3. SHIPPING DATA (CONT'D)

SHIPPING BOX NO.	CONTENTS		OVERALL DIMENSIONS (IN.)			VOLUME CU. FT.	WEIGHT LBS.
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
47	Comparator-Keyer	CM-32/FRR-24	11 3/4	24 3/8	21 1/8	3.5	83
48	Power Supply	PP-648/FRR-24	15	24 3/8	21 1/8	4.45	146
49	Power Supply	PP-649/FRR-24	15	24 3/8	21 1/8	4.45	146
50	Set of Eight Test Cables		16 7/8	33 5/8	13 7/8	4.55	90
51	Cabinet Mounting Hardware One Single blower Two Instruction Books Two Operator's Handbooks Two Maintenance Handbooks One Spare Parts Catalog	CY-860/FRR-24	87 1/2	25 1/4	19	24.4	465
52	Cabinet One single blower Five trim strips	CY-860/FRR-24	87 1/2	25 1/4	19	24.4	465
53	Cabinet One single blower Eleven Interconnecting Cables Forty-five patch cords Terminal box	CY-860/FRR-24	87 1/2	25 1/4	19	24.4	495
54	Cabinet One double blower Eight handles Interconnecting cable assembly Sixteen panel screws Four trim panels	CY-860/FRR-24	87 1/2	25 1/4	19	24.4	485
55	Equipment Repair Parts		16 7/8	33 5/8	13 7/8	4.55	145

NAVSHIPS 91580

RESTRICTED
SECURITY INFORMATION

INSTRUCTION BOOK

for

RADIO RECEIVING SET AN/FRR-24

SECTION 2—THEORY OF OPERATION

NATIONAL COMPANY, INC.
MALDEN 48, MASSACHUSETTS

BUREAU OF SHIPS NAVY DEPARTMENT

Contract: NObsr-39402

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SECTION 2
THEORY OF OPERATION

1. GENERAL DESCRIPTION OF CIRCUITS.

The AN/FRR-24 Radio Receiving Set is a double-conversion superheterodyne type diversity receiver contained in four rack cabinets. The complete receiving equipment consists of a group of three radio receivers together with the switching-combining circuits necessary to receive the following types of signals in single-channel, space or frequency, dual or triple diversity operation:

a. Double-sideband radio-telephone.

b. On-off keyed radio telegraph.

c. Frequency-shift keyed telegraph (to operate single-channel teletype and/or up to four-channel multiplex).

An I.F. output circuit is available for connection to suitable auxiliary apparatus to permit reception of single-channel facsimile and telephoto signals employing frequency-shift of the radio-frequency carrier.

The equipment is made up of several major units which function as follows:

Control Panel SB-142/FRR-24 -- provides a means for selecting the frequency range to be used and the method of first frequency converter excitation i.e., local or external oscillator.

Amplifier-Converters AM-450/FRR-24 through AM-453/FRR-24 -- amplify the incoming R.F. signal and heterodyne this signal to an output intermediate frequency of 1750 kilocycles.

Frequency Converter CV-126/FRR-24 -- provides an intermediate step in sharpening the broad selectivity and converts the 1750-kc. intermediate frequency obtained from the Ampl er-Converter units to the sharp selectivity and 50-kc. intermediate frequency of the Filter Assembly.

Filter Assembly F-99/FRR-24 -- determines the final bandwidth and I.F. selectivity before demodulation.

Amplifier-Detector AM-454/FRR-24 -- provides the major portion of the receiver gain without adding appreciably to the selectivity.

Amplifier-Detector AM-439/FRR-24 -- provides a means of aurally monitoring each bay. A crystal oscillator incorporated in this unit makes possible critical zero beat tuning.

Patch Panels SB-138/FRR-24, SB-140/FRR-24, SB-143/FRR-24 and SB-169/FRR-24 -- provide the means for interconnecting various circuits emanating from different units for a particular mode of operation. All these connections are made by means of patch cords associated with each Patch Panel.

Oscillator Assembly O-131/FRR-24 -- provides a means for crystal-controlled operation of one or more Amplifier-Converter units.

Power Distribution Panel SB-141/FRR-24 -- distributes AC power to the five Power Supplies.

Amplifier-Detector AM-440/FRR-24 -- amplifies and detects the 50-kc. I.F. signal from one receiver, provides a keyed D.C. output, and audio output and also provides a source of A.G.C. voltage.

Amplifier-Detector AM-438/FRR-24 -- provides a means of combining or selecting one of the outputs of three receivers operating in diversity. This unit also provides an audio output, a keyed D.C. output and a source of A.G.C. voltage.

Frequency Shift Converter CV-127/FRR-24 -- converts frequency-shift signals, received from the AM-454/FRR-24, to Mark and Space voltages for application to the CM-32/FRR-24.

Keyer KY-62/FRR-24 -- accepts a D.C. input signal, amplifies this signal and provides a keyed audio tone at its output suitable for transmission over land lines to equipment capable of operating from a 600-ohm source.

Comparator-Keyer CM-32/FRR-24 -- receives the keyed D.C. pulses from any or all of the Frequency Shift Converters CV-127/FRR-24, combines and amplifies these pulses to a suitable level to operate a teletypewriter or to be applied to Keyer KY-62/FRR-24.

Power Supplies PP-590/FRR-24, PP-648/FRR-24 and PP-649/FRR-24 -- electronically regulated units utilized to provide all necessary operating voltages for the AN/FRR-24 Radio Receiving Set.

2. MODES OF OPERATION.

The AN/FRR-24 Radio Receiving Set is a very flexible equipment in that it may be arranged in numerous ways to receive the type of signals outlined in preceding paragraph 1. The method of arranging the equipment in these various ways is accomplished entirely by means of front-panel controls and by suitable patching on the four Patch Panel units. Figures 2–1, 2–2 and 2–3 are overall functional block diagrams. Each dia-

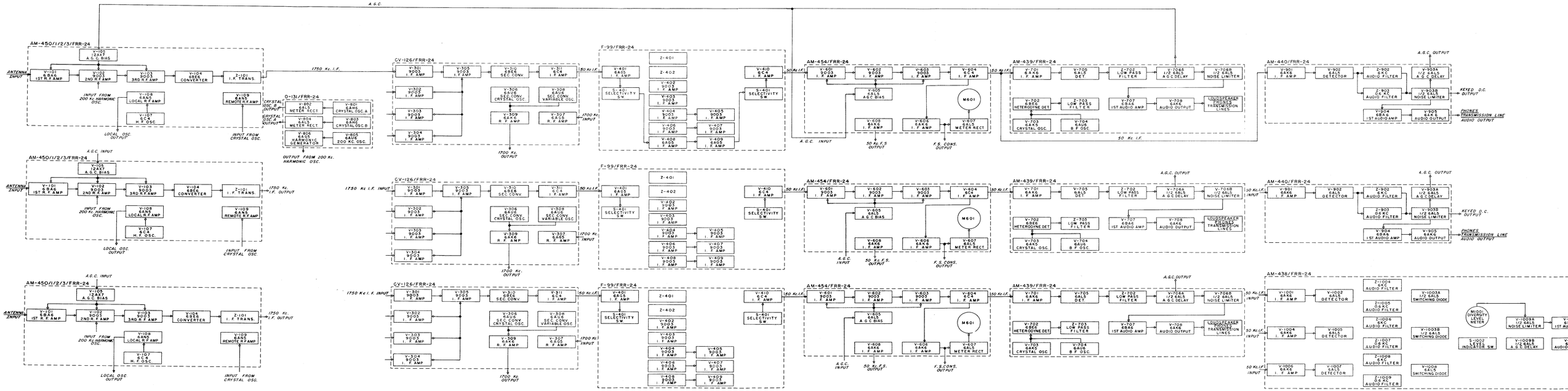
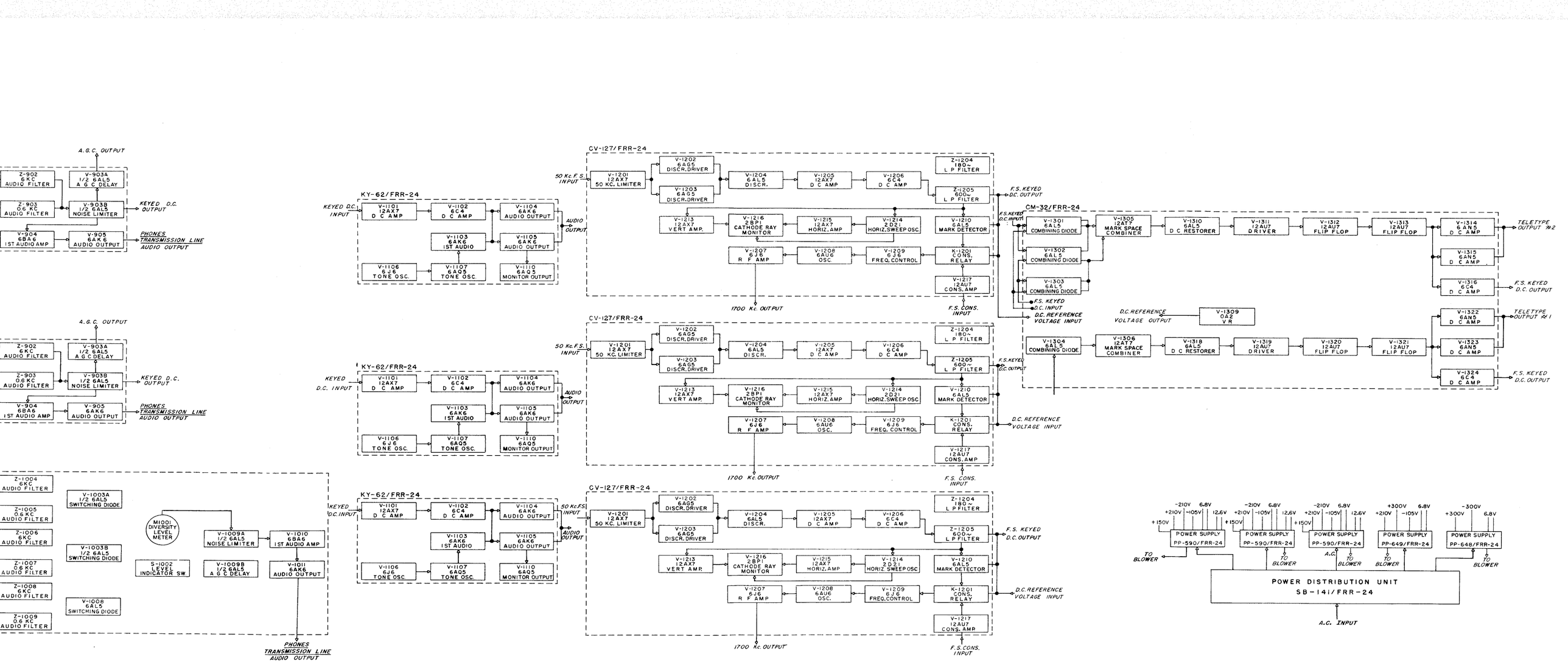


Figure 2–1. AN/FRR-24 Radio Receiving Set, Functional Block Diagram Illustrating a Typical Circuit Arrangement for A3 Single Channel Operation


A.G.C. OUTPUT
Z-902 6 KC AUDIO FILTER
V-903A 1/2 6AL5 A G C DELAY
Z-903 0.6 KC AUDIO FILTER
V-903B 1/2 6AL5 NOISE LIMITER
KEYED D.C. OUTPUT
V-904 6BA6 1ST AUDIO AMP
V-905 6AK6 AUDIO OUTPUT
PHONES TRANSMISSION LINE AUDIO OUTPUT
A.G.C. OUTPUT
Z-902 6 KC AUDIO FILTER
V-903A 1/2 6AL5 A G C DELAY
Z-903 0.6 KC AUDIO FILTER
V-903B 1/2 6AL5 NOISE LIMITER
KEYED D.C. OUTPUT
V-904 6BA6 1ST AUDIO AMP
V-905 6AK6 AUDIO OUTPUT
PHONES TRANSMISSION LINE AUDIO OUTPUT
Z-1004 6 KC AUDIO FILTER
Z-1005 0.6 KC AUDIO FILTER
Z-1006 6 KC AUDIO FILTER
Z-1007 0.6 KC AUDIO FILTER
Z-1008 6 KC AUDIO FILTER
Z-1009 0.6 KC AUDIO FILTER
V-1003A 1/2 6AL5 SWITCHING DIODE
V-1003B 1/2 6AL5 SWITCHING DIODE
V-1008 6AL5 SWITCHING DIODE
M1001 DIVERSITY LEVEL METER
S-1002 LEVEL INDICATOR SW.
V-1009A 1/2 6AL5 NOISE LIMITER
V-1009B 1/2 6AL5 A G C DELAY
V-1010 6BA6 1ST AUDIO AMP
V-1011 6AK6 AUDIO OUTPUT
PHONES TRANSMISSION LINE AUDIO OUTPUT
KY-62/FRR-24
KEYED D.C. INPUT
V-1101 12AX7 D C AMP
V-1102 6C4 D C AMP
V-1103 6AK6 1ST AUDIO
V-1104 6AK6 AUDIO OUTPUT
V-1105 6AK6 AUDIO OUTPUT
V-1106 6J6 TONE OSC.
V-1107 6AQ5 TONE OSC.
V-1110 6AQ5 MONITOR OUTPUT
AUDIO OUTPUT
KY-62/FRR-24
KEYED D.C. INPUT
V-1101 12AX7 D C AMP
V-1102 6C4 D C AMP
V-1103 6AK6 1ST AUDIO
V-1104 6AK6 AUDIO OUTPUT
V-1105 6AK6 AUDIO OUTPUT
V-1106 6J6 TONE OSC.
V-1107 6AQ5 TONE OSC.
V-1110 6AQ5 MONITOR OUTPUT
AUDIO OUTPUT
KY-62/FRR-24
KEYED D.C. INPUT
V-1101 12AX7 D C AMP
V-1102 6C4 D C AMP
V-1103 6AK6 1ST AUDIO
V-1104 6AK6 AUDIO OUTPUT
V-1105 6AK6 AUDIO OUTPUT
V-1106 6J6 TONE OSC.
V-1107 6AQ5 TONE OSC.
V-1110 6AQ5 MONITOR OUTPUT
50 Kc F.S. INPUT
AUDIO OUTPUT
CV-127/FRR-24
50 Kc F.S. INPUT
V-1201 12AX7 50 KC. LIMITER
V-1202 6AQ5 DISCR. DRIVER
V-1203 6AQ5 DISCR. DRIVER
V-1204 6AL5 DISCR.
V-1205 12AX7 D C AMP
V-1206 6C4 D C AMP
Z-1204 180~ L P FILTER
Z-1205 600~ L P FILTER
F.S. KEYED D.C. OUTPUT
V-1213 12AX7 VERT. AMP.
V-1216 2BP1 CATHODE RAY MONITOR
V-1215 12AX7 HORIZ. AMP.
V-1214 2D21 HORIZ. SWEEP OSC.
V-1210 6AL5 MARK DETECTOR
V-1207 6J6 R F AMP
V-1208 6AU6 OSC.
V-1209 6J6 FREQ. CONTROL
K-1201 CONS. RELAY
V-1217 12AU7 CONS. AMP
1700 Kc. OUTPUT
F.S. CONS. INPUT
CV-127/FRR-24
50 Kc F.S. INPUT
V-1201 12AX7 50 KC. LIMITER
V-1202 6AQ5 DISCR. DRIVER
V-1203 6AQ5 DISCR. DRIVER
V-1204 6AL5 DISCR.
V-1205 12AX7 D C AMP
V-1206 6C4 D C AMP
Z-1204 180~ L P FILTER
Z-1205 600~ L P FILTER
F.S. KEYED D.C. OUTPUT
V-1213 12AX7 VERT. AMP.
V-1216 2BP1 CATHODE RAY MONITOR
V-1215 12AX7 HORIZ. AMP.
V-1214 2D21 HORIZ. SWEEP OSC.
V-1210 6AL5 MARK DETECTOR
V-1207 6J6 R F AMP
V-1208 6AU6 OSC.
V-1209 6J6 FREQ. CONTROL
K-1201 CONS. RELAY
D.C. REFERENCE VOLTAGE INPUT
V-1217 12AU7 CONS. AMP
1700 Kc. OUTPUT
F.S. CONS. INPUT
CV-127/FRR-24
50 Kc F.S. INPUT
V-1201 12AX7 50 KC. LIMITER
V-1202 6AQ5 DISCR. DRIVER
V-1203 6AQ5 DISCR. DRIVER
V-1204 6AL5 DISCR.
V-1205 12AX7 D C AMP
V-1206 6C4 D C AMP
Z-1204 180~ L P FILTER
Z-1205 600~ L P FILTER
F.S. KEYED D.C. OUTPUT
V-1213 12AX7 VERT. AMP.
V-1216 2BP1 CATHODE RAY MONITOR
V-1215 12AX7 HORIZ. AMP.
V-1214 2D21 HORIZ. SWEEP OSC.
V-1210 6AL5 MARK DETECTOR
V-1207 6J6 R F AMP
V-1208 6AU6 OSC.
V-1209 6J6 FREQ. CONTROL
K-1201 CONS. RELAY
D.C. REFERENCE VOLTAGE INPUT
V-1217 12AU7 CONS. AMP
1700 Kc. OUTPUT
F.S. CONS. INPUT
CM-32/FRR-24
F.S. KEYED D.C. INPUT
V-1301 6AL5 COMBINING DIODE
V-1302 6AL5 COMBINING DIODE
V-1303 6AL5 COMBINING DIODE
F.S. KEYED D.C. INPUT
D.C. REFERENCE VOLTAGE INPUT
V-1305 12AT7 MARK SPACE COMBINER
V-1310 6AL5 D C RESTORER
V-1311 12AU7 DRIVER
V-1312 12AU7 FLIP FLOP
V-1313 12AU7 FLIP FLOP
V-1314 6AN5 D C AMP
V-1315 6AN5 D C AMP
V-1316 6C4 D C AMP
TELETYPE OUTPUT #2
F.S. KEYED D.C. OUTPUT
D.C. REFERENCE VOLTAGE OUTPUT
V-1309 0A2 V R
V-1304 6AL5 COMBINING DIODE
V-1306 12AT7 MARK SPACE COMBINER
V-1318 6AL5 D C RESTORER
V-1319 12AU7 DRIVER
V-1320 12AU7 FLIP FLOP
V-1321 12AU7 FLIP FLOP
V-1322 6AN5 D C AMP
V-1323 6AN5 D C AMP
V-1324 6C4 D C AMP
TELETYPE OUTPUT #1
F.S. KEYED D.C. OUTPUT
-210V 6.8V +210V -105V 12.6V +150V
POWER SUPPLY PP-590/FRR-24
TO BLOWER
-210V 6.8V +210V -105V 12.6V +150V
POWER SUPPLY PP-590/FRR-24
TO BLOWER
-210V 6.8V +210V -105V 12.6V +150V
POWER SUPPLY PP-590/FRR-24
A.C. TO BLOWER
+300V 6.8V +210V -105V
POWER SUPPLY PP-649/FRR-24
TO BLOWER
-300V +300V 6.8V
POWER SUPPLY PP-648/FRR-24
TO BLOWER
POWER DISTRIBUTION UNIT SB-141/FRR-24
A.C. INPUT

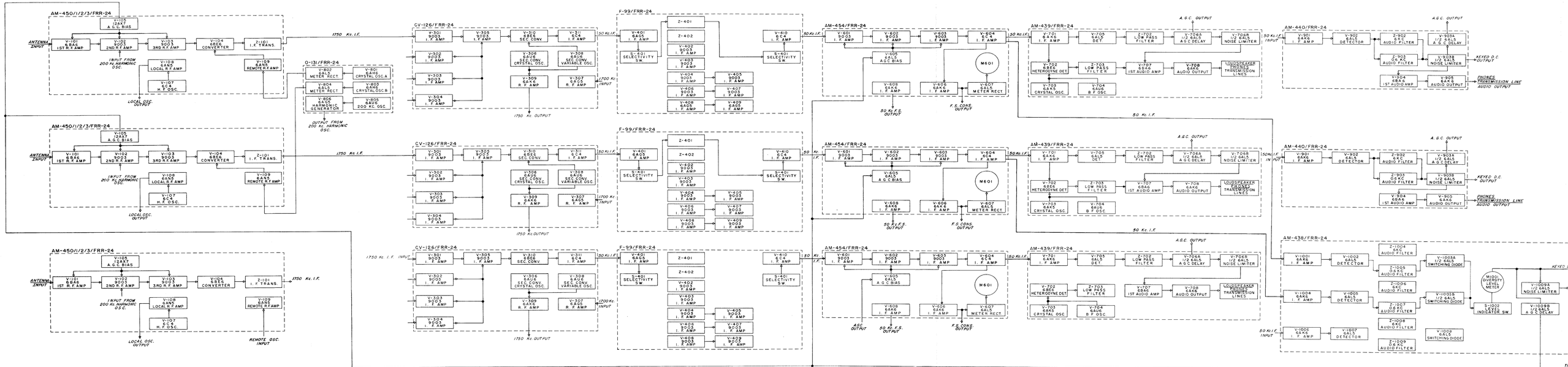
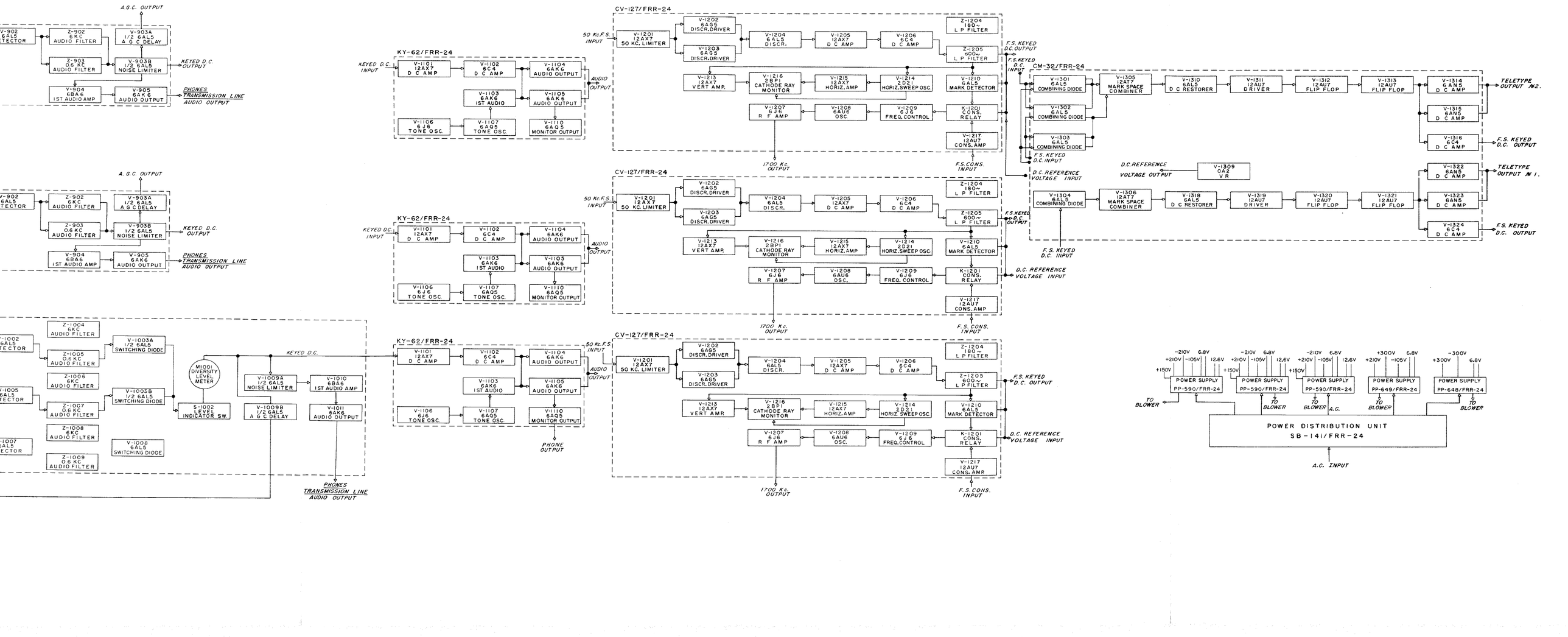


Figure 2–2. AN/FRR-24 Radio Receiving Set, Functional Block Diagram Illustrating a Typical Circuit Arrangement for A1 Dual Diversity Operation


A.G.C. OUTPUT
Z-902 6KC AUDIO FILTER
V-903A 1/2 6AL5 A.G.C. DELAY
Z-903 0.6 KC AUDIO FILTER
V-903B 1/2 6AL5 NOISE LIMITER
KEYED D.C. OUTPUT
V-904 6BA6 1ST AUDIO AMP
V-905 6AK6 AUDIO OUTPUT
PHONES TRANSMISSION LINE AUDIO OUTPUT
A.G.C. OUTPUT
Z-902 6KC AUDIO FILTER
V-903A 1/2 6AL5 A.G.C. DELAY
Z-903 0.6 KC AUDIO FILTER
V-903B 1/2 6AL5 NOISE LIMITER
KEYED D.C. OUTPUT
V-904 6BA6 1ST AUDIO AMP
V-905 6AK6 AUDIO OUTPUT
PHONES TRANSMISSION LINE AUDIO OUTPUT
Z-1004 6KC AUDIO FILTER
Z-1005 6KC AUDIO FILTER
Z-1006 6KC AUDIO FILTER
Z-1007 0.6 KC AUDIO FILTER
Z-1008 6KC AUDIO FILTER
Z-1009 0.6 KC AUDIO FILTER
V-1003A 1/2 6AL5 SWITCHING DIODE
V-1003B 1/2 6AL5 SWITCHING DIODE
V-1008 6AL5 SWITCHING DIODE
M1001 DIVERSITY LEVEL METER
S-1002 LEVEL INDICATOR SW.
KEYED D.C.
V-1009A 1/2 6AL5 NOISE LIMITER
V-1009B 1/2 6AL5 A.G.C. DELAY
V-1010 6BA6 1ST AUDIO AMP
V-1011 6AK6 AUDIO OUTPUT
PHONES TRANSMISSION LINE AUDIO OUTPUT
KY-62/FRR-24
KEYED D.C. INPUT
V-1101 12AX7 D.C. AMP
V-1102 6C4 D.C. AMP
V-1103 6AK6 1ST AUDIO
V-1104 6AK6 AUDIO OUTPUT
V-1105 6AK6 AUDIO OUTPUT
V-1106 6J6 TONE OSC.
V-1107 6AQ5 TONE OSC.
V-1110 6AQ5 MONITOR OUTPUT
AUDIO OUTPUT
PHONE OUTPUT
CV-127/FRR-24
50 Kc F.S. INPUT
V-1201 12AX7 50 KC. LIMITER
V-1202 6AQ5 DISCR. DRIVER
V-1203 6AQ5 DISCR. DRIVER
V-1204 6AL5 DISCR.
V-1205 12AX7 D.C. AMP
V-1206 6C4 D.C. AMP
Z-1204 180~ L.P. FILTER
Z-1205 600~ L.P. FILTER
V-1213 12AX7 VERT. AMP.
V-1216 2BP1 CATHODE RAY MONITOR
V-1215 12AX7 HORIZ. AMP
V-1214 2D21 HORIZ. SWEEP OSC.
V-1210 6AL5 MARK DETECTOR
V-1207 6J6 R.F. AMP
V-1208 6AU6 OSC.
V-1209 6J6 FREQ. CONTROL
K-1201 CONS. RELAY
V-1217 12AU7 CONS. AMP
1700 Kc. OUTPUT
F.S. CONS. INPUT
F.S. KEYED D.C. OUTPUT
F.S. KEYED D.C. INPUT
D.C. REFERENCE VOLTAGE INPUT
CM-32/FRR-24
V-1301 6AL5 COMBINING DIODE
V-1302 6AL5 COMBINING DIODE
V-1303 6AL5 COMBINING DIODE
V-1304 6AL5 COMBINING DIODE
V-1305 12AT7 MARK SPACE COMBINER
V-1306 12AT7 MARK SPACE COMBINER
V-1310 6AL5 D.C. RESTORER
V-1318 6AL5 D.C. RESTORER
V-1311 12AU7 DRIVER
V-1319 12AU7 DRIVER
V-1312 12AU7 FLIP FLOP
V-1320 12AU7 FLIP FLOP
V-1313 12AU7 FLIP FLOP
V-1321 12AU7 FLIP FLOP
V-1314 6AN5 D.C. AMP
V-1315 6AN5 D.C. AMP
V-1316 6C4 D.C. AMP
V-1322 6AN5 D.C. AMP
V-1323 6AN5 D.C. AMP
V-1324 6C4 D.C. AMP
TELETYPE OUTPUT #2.
F.S. KEYED D.C. OUTPUT
TELETYPE OUTPUT #1.
F.S. KEYED D.C. OUTPUT
D.C. REFERENCE VOLTAGE OUTPUT
V-1309 0A2 V.R.
-210V 6.8V +210V -105V 12.6V +150V
+300V -300V
POWER SUPPLY PP-590/FRR-24
POWER SUPPLY PP-649/FRR-24
POWER SUPPLY PP-648/FRR-24
TO BLOWER
A.C.
POWER DISTRIBUTION UNIT SB-141/FRR-24
A.C. INPUT

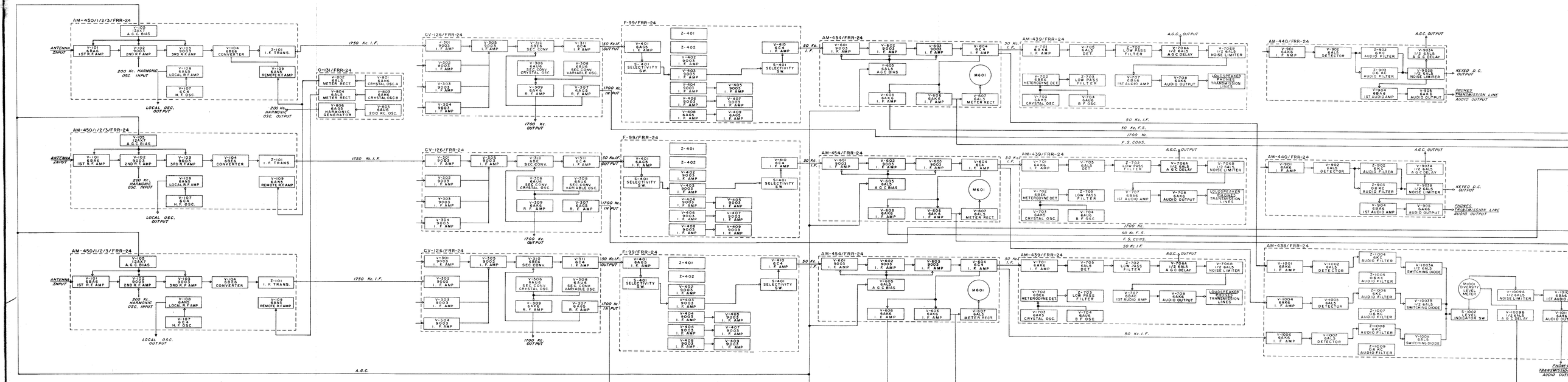
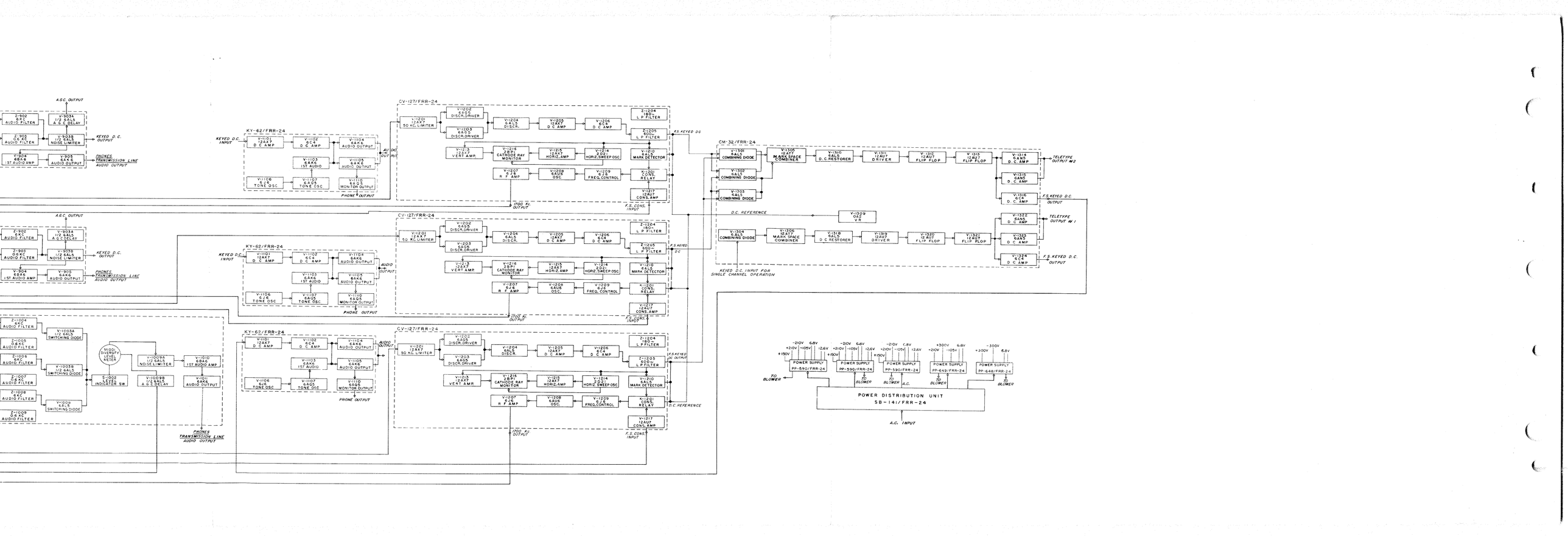


Figure 2–3. AN/FRR-24 Radio Receiving Set, Functional Block Diagram Illustrating a Typical Circuit Arrangement for F1 Triple Diversity Operation


A.G.C. OUTPUT
Z-902 0.6 KC AUDIO FILTER
V-9034 1/2 6AL5 A.G.C. RELAY
Z-903 0.6 KC AUDIO FILTER
V-9035 1/2 6AL5 NOISE LIMITER
KEYED D.C. OUTPUT
V-904 6BA6 1ST AUDIO AMP
V-905 6AK6 AUDIO OUTPUT
PHONES TRANSMISSION LINE AUDIO OUTPUT
KY-62/FRR-24
KEYED D.C. INPUT
V-1101 12AX7 D.C. AMP
V-1102 6C4 D.C. AMP
V-1103 1ST AUDIO
V-1104 6AK6 AUDIO OUTPUT
V-1105 6AK6 AUDIO OUTPUT
V-1106 6J6 TONE OSC
V-1107 6AQ5 TONE OSC
V-1110 6AQ5 MONITOR OUTPUT
PHONE OUTPUT
AUDIO OUTPUT
CV-127/FRR-24
V-1201 12AX7 50 KC LIMITER
V-1202 6AQ5 DISCR. DRIVER
V-1203 6AQ5 DISCR. DRIVER
V-1204 6AL5 DISCR.
V-1205 12AX7 D.C. AMP
V-1206 6C4 D.C. AMP
Z-1204 180~ L.P. FILTER
Z-1205 600~ L.P. FILTER
V-1210 6AL5 MARK DETECTOR
V-1213 12AX7 VERT. AMP.
V-1214 2D21 HORIZ. SWEEP OSC.
V-1215 12AX7 HORIZ. AMP.
V-1216 2BP1 CATHODE RAY MONITOR
V-1207 6J6 R. F. AMP.
V-1208 6AU6 OSC.
V-1209 6C4 FREQ. CONTROL
K-1201 CONS. RELAY
V-1217 12AU7 CONS. AMP.
F.S. KEYED D.C.
F.S. CONS. INPUT
1700 ~ OUTPUT
CM-32/FRR-24
V-1301 12AU7 MARK SPACE COMBINER
V-1302 6AL5 COMBINING DIODE
V-1303 6AL5 COMBINING DIODE
V-1304 COMBINING DIODE
V-1305 12AT7 MARK SPACE COMBINER
V-1306 6AT3 MARK SPACE COMBINER
V-1309 0A2 V.R.
D.C. REFERENCE
V-1310 6AL5 D.C. RESTORER
V-1311 12AU7 DRIVER
V-1312 12AU7 FLIP FLOP
V-1313 12AU7 FLIP FLOP
V-1314 6AN8 D.C. AMP
V-1315 6AN8 D.C. AMP
V-1316 6C4 D.C. AMP
V-1318 6AL5 D.C. RESTORER
V-1319 12AU7 DRIVER
V-1320 12AU7 FLIP FLOP
V-1321 12AU7 FLIP FLOP
V-1322 6AN8 D.C. AMP
V-1323 6AN8 D.C. AMP
V-1324 6C4 D.C. AMP
TELETYPE OUTPUT #2
F.S. KEYED D.C. OUTPUT
TELETYPE OUTPUT #1
KEYED D.C. INPUT FOR SINGLE CHANNEL OPERATION
Z-1004 0.6 KC AUDIO FILTER
Z-1005 0.6KC AUDIO FILTER
Z-1006 0.6KC AUDIO FILTER
Z-1007 0.6 KC AUDIO FILTER
Z-1008 0.6 KC AUDIO FILTER
Z-1009 0.6 KC AUDIO FILTER
V-1003A 1/2 6AL5 SWITCHING DIODE
V-1003B 1/2 6AL5 SWITCHING DIODE
V-1009 6AL5 SWITCHING DIODE
MODE DIVERSITY LEVEL METER
S-1002 6 POS. INDICATOR SW.
V-1009A 1/2 6AL5 NOISE LIMITER
V-1009B 1/2 6AL5 A.G.C. DELAY
V-1010 6BA6 1ST AUDIO AMP
V-1011 6AK6 AUDIO OUTPUT
PHONES TRANSMISSION LINE AUDIO OUTPUT
-210V 6.8V +210V -105V 12.6V +150V
-20V +210V -105V 12.6V +150V
-210V 6.8V -105V 12.6V +150V
+300V -210V 6.8V -105V
-300V +300V 6.8V
POWER SUPPLY PP-590/FRR-24
POWER SUPPLY PP-649/FRR-24
POWER SUPPLY PP-648/FRR-24
TO BLOWER
A.C.
POWER DISTRIBUTION UNIT SB-141/FRR-24
A.C. INPUT

gram illustrates a different mode of operation for a different type of input signal. Reference to these diagrams will reveal the circuits used and those circuits not used for the particular arrangement. The method of switching these circuits in and out is not shown because the diagrams are predicated on the fact that all the required switching has been accomplished.

The following discussion is a brief outline of the routing of those circuits which are patched to and from various destinations by means of the Patch Panels. A permanent connection is made in all cases from the point of origin of the circuit to a connector on a Patch Panel. By suitable patching this circuit is routed to its ultimate destination.

a. ANTENNA.–The antenna is routed into one or more of the Amplifier-Converter units encompassing the operating frequency by a patch on the Patch Panels in bays 1, 2 or 3.

b. TUNABLE LOCAL OSCILLATORS.–Tunable local oscillator injection voltage can originate in any one of the four Amplifier-Converter units AM-450/FRR-24, AM-451/FRR-24, AM-452/FRR-24 and AM-453/FRR-24 in bays 1, 2 and 3. This voltage can be applied to the corresponding Amplifier-Converter in the two bays other than the bay serving as the originating point. Manual switching on the Control Panel is required in addition to patch cord connections to achieve these results.

c. CRYSTAL-CONTROLLED LOCAL OSCILLATOR.–This local oscillator injection voltage originates in Oscillator Assembly O-131/FRR-24 in bay 2. Two oscillator output frequencies can be obtained from this unit simultaneously. A common output can be taken from this unit to be applied to bays 1, 2 and 3. Two separate outputs can be used to operate the three bays in any desired combination e.g., bays 1 and 2 on one frequency and bay 3 on the other. Here again manual switching on the Control Panel is required in addition to patching to achieve these results.

d. CRYSTAL CALIBRATE.–Marker frequencies for calibration purposes originate in Oscillator Assembly O-131/FRR-24. These markers can be patched into any Amplifier-Converter unit in bays 1, 2 and 3 through the Control Panel SB-142/FRR-24.

e. 1700-KC.–The 1700-kc. voltage for frequency conversion in Frequency Converter CV-126/FRR-24 in bays 1, 2 and 3 can originate from a crystal controlled oscillator or a tunable oscillator in each CV-126/FRR-24 or it can be obtained from the automatic frequency controlled 1700-kc. oscillator in each Frequency Shift Converter CV-127/FRR-24 in bay 4. Any one of these sources of 1700-kc. voltage can be used for injection to all three Frequency Converters CV-126/FRR-24, or each converter can obtain 1700-kc. voltage from a separate source.

f. 50-KC. AM.–This I.F. output originates in the R.F. Amplifiers AM-454/FRR-24 in bays 1. 2 and 3. Three separate outputs from three different originating units can be patched into two Amplifier-Detector units AM-440/FRR-24 and one Amplifier-Detector AM-438/FRR- or any suitable combination thereof. In diversity operation two or three separate outputs can be applied to Amplifier-Detector AM-438/FRR-24 to achieve the necessary combining action.

g. AGC.–Automatic gain control voltage can originate from Amplifier-Detectors AM-439/FRR-24 or AM-440/FRR-24 when single channel operation is required and from Amplifier-Detector AM-438/FRR-24 when dual or triple diversity operation is required.

h. KEYED D.C..–This D.C. output originates in the two Amplifier-Detector units AM-440/FRR-24 and the Amplifier-Detector AM-438/FRR-24. These three outputs can be patched singly into any one of the three Keyers KY-62/FRR-24 in any desired sequence.

i. F.S. KEYED D.C.–Two separate outputs of this type originate from Comparator-Keyer CM-32/FRR-24 in bay 4. These outputs can be patched into any two of the three keyers KY-62/FRR-24.

j. EXT. TONE.–Provision is made on the Patch Panel in bay 4 to accept three separate tone inputs from external apparatus. These input signals can be patched singly into the three Keyers KY-62/FRR-24.

k. 50-KC. F.S.–This frequency-shift I.F. output originates in R.F. Amplifiers AM-454/FRR-24 in bays 1, 2 and 3. The three available outputs can be patched singly into the three Frequency Shift Converters CV-127/FRR-24 in bay 4.

l. F.S. C.O.N.S.–This carrier-off-noise-suppression (CONS) voltage originates in R.F. Amplifiers AM-454/FRR-24 in bays 1, 2 and 3. This voltage can be patched singly into the Frequency Shift Converters CV-127/FRR-24 to actuate the C.O.N.S. relay.

3. CIRCUIT ANALYSIS.

The following subparagraphs discuss in detail the circuitry of the AN/FRR-24. In general, the discussion follows the outline presented on Figure 2–4.

a. TUNING.–Tuning of the R.F. amplifiers, converter and H. F. oscillator stages is accomplished by a front-panel mounted control dial which drives a seven section ganged capacitor C-103. Variable potentiometer R-127 is ganged with the main tuning capacitor and the circuit so arranged that as the tuning is changed the screen voltage of V-102 and V-103 is changed simultaneously to hold the gain flat within 6 DB over the frequency range of one band.

The main tuning drive is a two-speed drive mounted on anti-friction bearings. The use of anti-backlash springs eliminates the possibility of backlash in the drive. A rotary stop is provided to prevent the drive

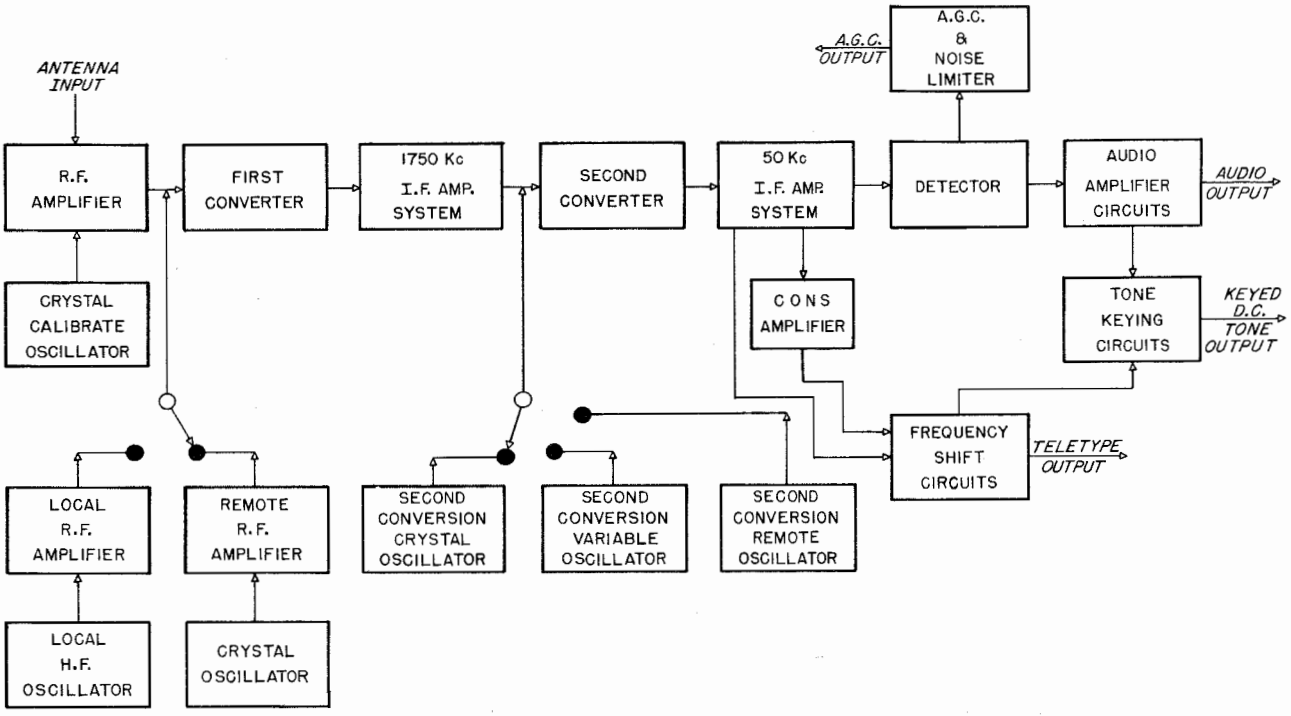


Figure 2–4. AN/FRR-24, Overall Simplified Functional Block Diagram

turning beyond minimum or maximum capacity of the main tuning capacitor. The main tuning drive is geared to three individual dial scales. The large drum scale indicates frequencies in megacycles whereas the smaller scale has linear markings for logging purposes. The projection dial indicates frequencies in kilocycles. Two concentric tuning knobs are employed to obtain both fine and coarse tuning. The outer knob, which has a gear ratio of 160 to 1, is utilized for fine tuning. The inner knob, which has a gear ratio of 20 to 1 is utilized for coarse tuning.

For clear presentation of the calibration points a magnified view of the projection dial is projected onto a screen (viewed on the front-panel) by a lamp I-101 and system of lenses and mirrors. The projection dial switch S-102 extinguishes the lamp if necessary. An index set is provided for adjustment of the projection dial pointer.

b. CALIBRATION.–For calibration checking a crystal calibrator located in the Oscillator Assembly O-131/FRR-24 is used as a tuning marker. Unmodulated marker frequencies in multiples of 200 kilocycles are fed into the Amplifier Converter units.

c. R.F. AMPLIFIER CIRCUIT DETAILS (AM-450/FRR-24, AM-451/FRR-24, AM-452/FRR-24, AM-453/FRR-24). *(See Figure 2–5.)*–The antenna input signal connected to the antenna input connector J-115 is coupled across the primary winding of T-101; the 70-ohm input transformer. The first R.F. amplifier tuned circuit consists of the secondary winding of T-101 and capacitor section C-103A. The iron-core tuning adjustment of T-101 and a variable Antenna Trimmer capacitor C-102 provide a means of accurately aligning the tuned circuit. Capacitor C-101 is a fixed parallel padder and C-174 a series padder. C-101 is not used in the AM-452/FRR-24. The R.F. signal appearing across transformer T-101 is coupled to the grid of the 1st. R.F. amplifier tube V-101, a type 6BA6, through coupling capacitor C-104. The D.C. grid return from the control grid of V-101 to the cathode follower triode section of the A.G.C. bias tube V-105 is completed through the grid load resistor R-101. Screen voltage is obtained through isolation resistors R-145 and R-103. C-106 is the screen bypass capacitor. Plate potential to V-101 is applied through transformer T-102.

The circuitry of the second and third R.F. stages is similar to that of the first except the control grids of V-102 and V-103, type 9003 tubes, are returned to the diode connected section of V-105, the A.G.C. bias tube, through their respective load resistors R-106 and R-111. Potentiometer R-127 is ganged with the main tuning capacitor C-103 to change the screen voltage of V-102 and V-103 with changes in tuning. Adjustable resistor R-125 is utilized to adjust the screen voltage of V-102 and V-103 at the high frequency end of the tuning range to maintain uniform gain over the band.

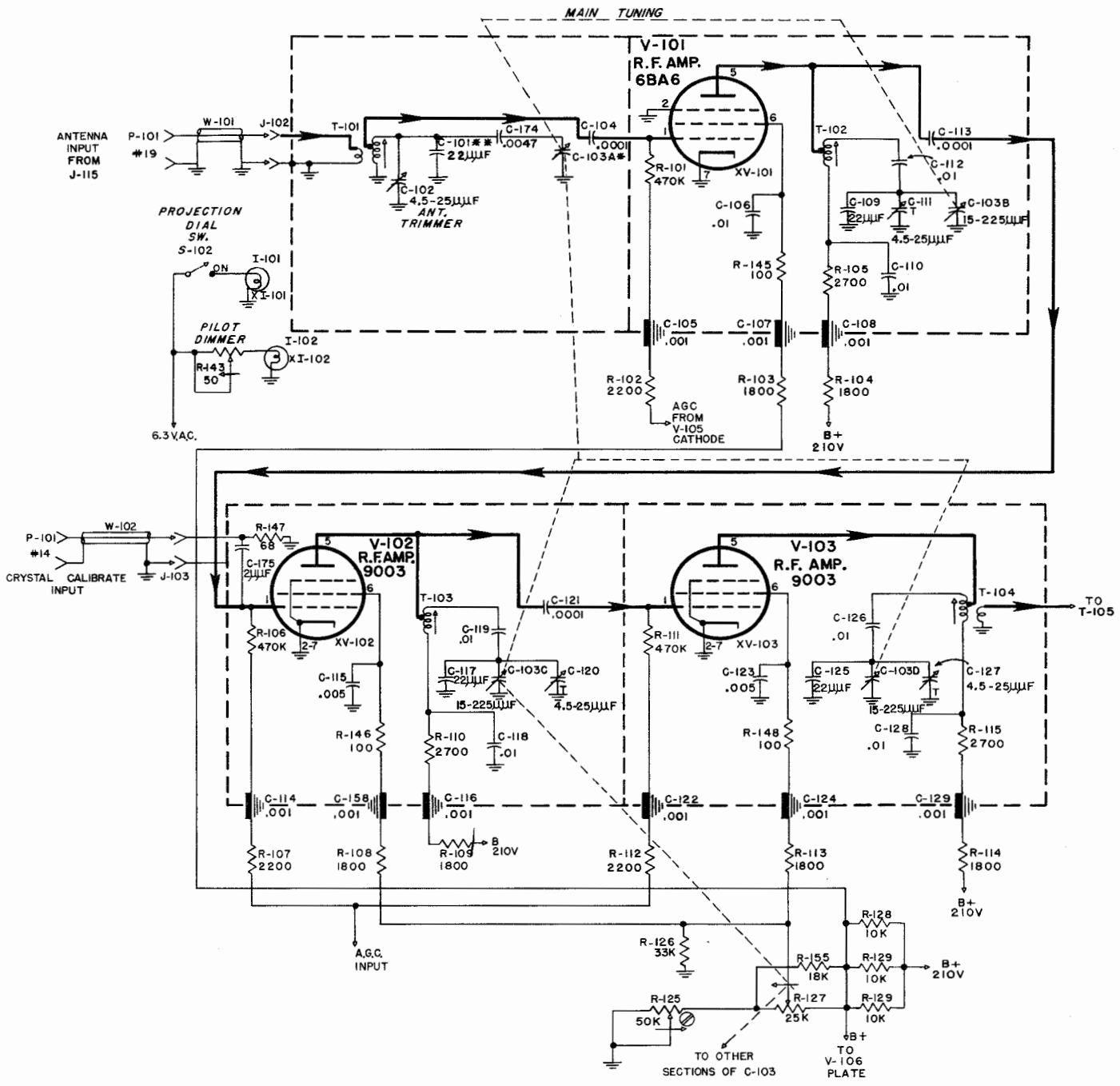


Figure 2–5. R.F. Amplifier Stages, Simplified Schematic Diagram

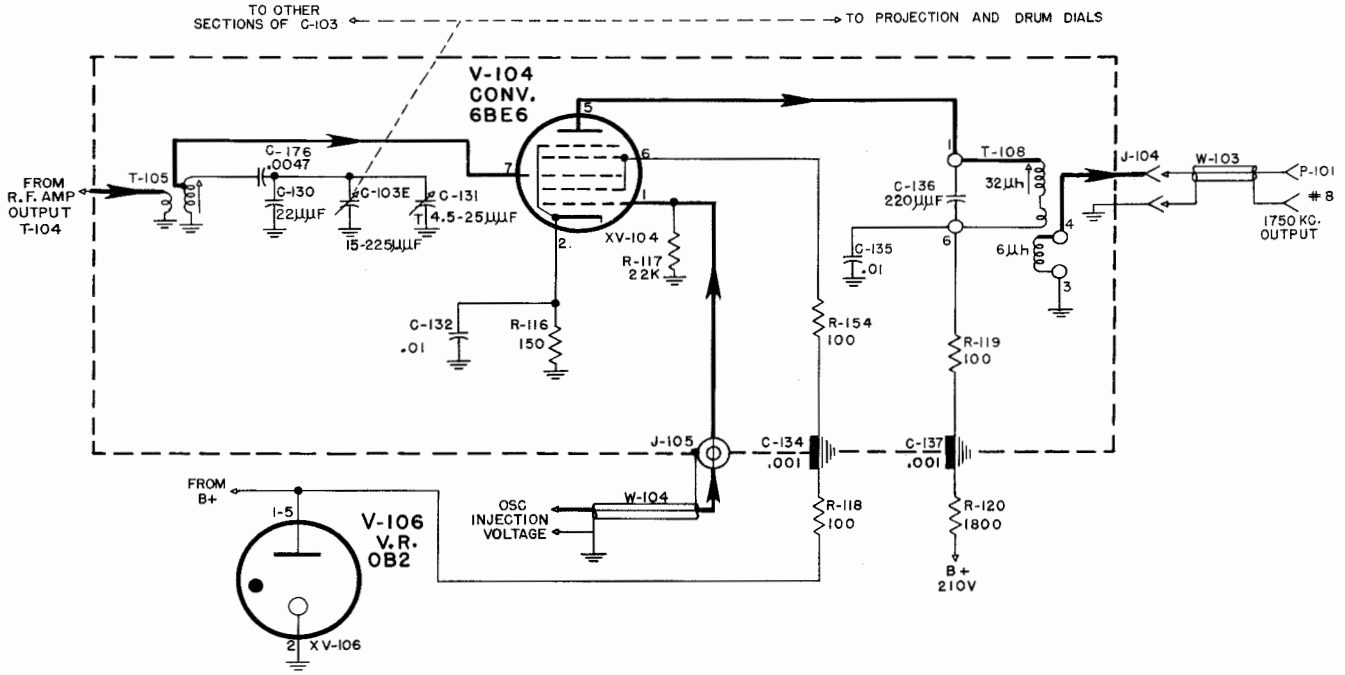


Figure 2–6. First Converter Stage, Simplified Schematic Diagram

d. FIRST CONVERTER CIRCUIT DETAILS (AM-450/FRR-24, AM-451/FRR-24, AM-453/FRR-24, AM-452/FRR-24). *(See Figure 2–6).*—Amplified signal voltages appearing across transformer T-104 are link coupled to transformer T-105. The converter tuned circuit is comprised of transformer T-105 and capacitor section C-103E. The iron-core tuning adjustment of T-105 and the variable trimmer capacitor C-131 provide a means of accurately aligning the tuned circuit. Capacitor C-130 is a fixed parallel padder and C-176 a series padder. Signal frequencies are connected to the signal grid of converter tube V-104, a type 6BE6, from a tap on T-105. The H.F. oscillator frequency is coupled to the injection grid of V-104 through capacitor C-150. The signal frequency and oscillator frequency are then heterodyned and the resultant difference frequency of 1750 kilocycles is obtained in the plate circuit of V-104. The output of V-104 is connected across the primary winding of transformer T-108. The output of transformer T-108 is applied to connector J-113 for application to the Frequency Converter CV-126/FRR-24 circuits. Screen potential for V-104 is obtained from voltage regulator V-106 through isolation resistors R-154 and R-118. Plate voltage is supplied through transformer T-108. Cathode bias is obtained through resistor R-116 which is bypassed by capacitor C-132.

e. LOCAL H.F. OSCILLATOR AND LOCAL-REMOTE R.F. AMPLIFIER CIRCUIT DETAILS (AM-450/FRR-24, AM-451/FRR-24, AM-453/FRR-24, AM-452/FRR-24). *(See Figure 2–7).*—A type 6C4 triode is used as the high frequency oscillator tube V-107 in a tuned plate grid tickler circuit. The oscillator tuned circuit consists of transformer T-107 and capacitor section C-103F. Adjustment of the oscillator tuning range is made possible by the iron-core tuning adjustment of T-107 and variable trimmer capacitors C-152A and C-152B. Capacitor C-151 is a series padder and capacitors C-153 and C-154 are temperature compensating capacitors. Resistor R-135 is the grid leak.

The action of the high frequency oscillator is dependent upon the setting of the Heterodyne Oscillator switch S-202 located on the Control Panel SB-142/FRR-24. With the switch set at Local, plate voltage is applied to the H.F. oscillator, screen voltage is applied to the local R.F. amplifier and screen voltage is removed from the remote R.F. amplifier V-109, a type 6AN5 tube. The H.F. oscillator output is then coupled through capacitor C-178 to the local R.F. amplifier V-108, a type 6AN5 tube. The output of V-108 is coupled through capacitor C-150 to the grid of converter tube V-104 and through transformer T-106 to connectors J-111 and J-116. The oscillator injection voltage appearing at connectors J-111 and J-116 can be used for other Amplifier-Converter units.

With the Heterodyne Oscillator switch set at Remote, the screen voltage of the remote R.F. amplifier V-109 is restored and the plate voltage of the H.F. oscillator V-107 and the screen voltage of the local R.F. amplifier V-108 is removed. In this manner the local H.F. oscillator V-107 is disabled and the oscillator injection voltage from either the Oscillator Assembly O-131/FRR-24 or a remote oscillator from another Amplifier-

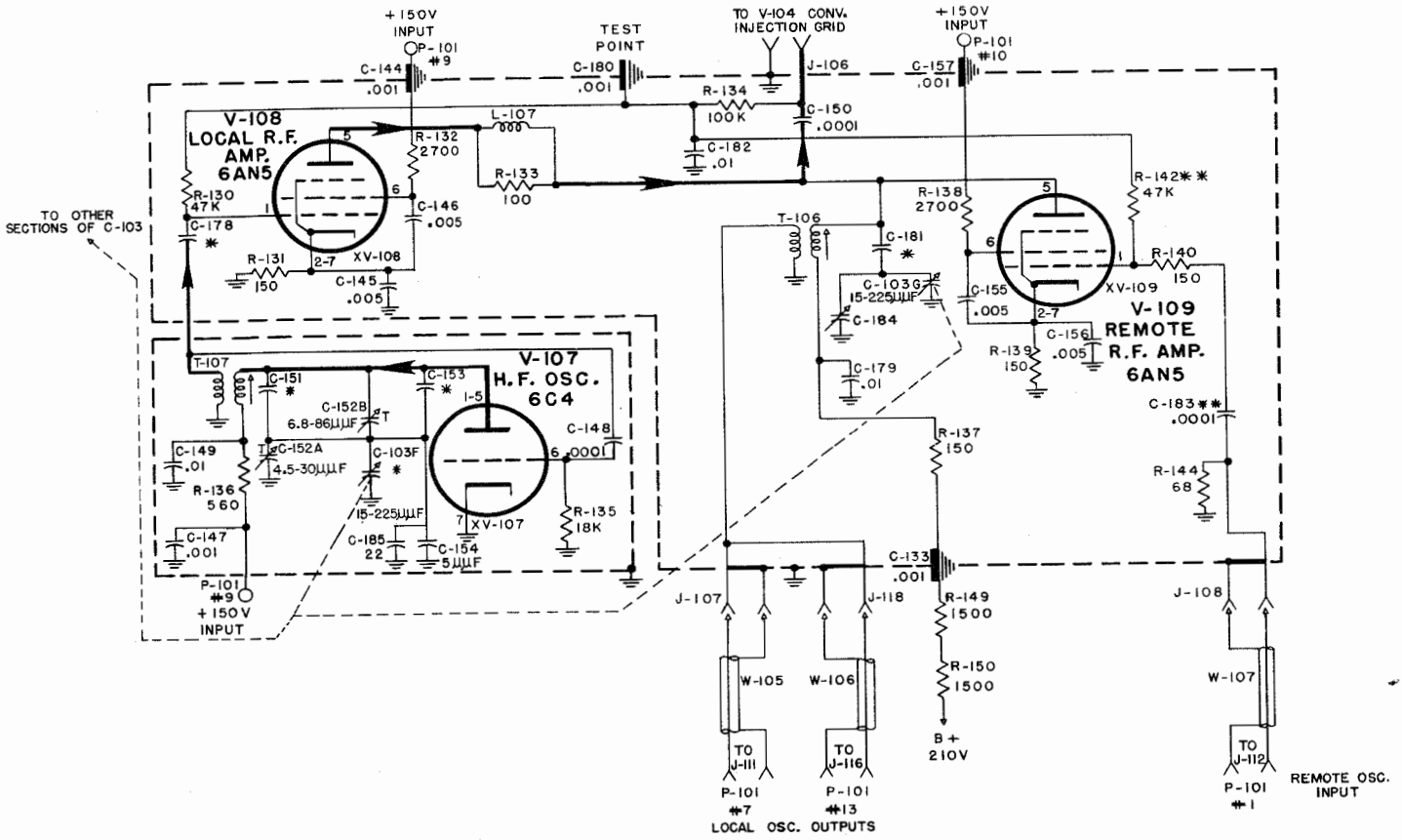


Figure 2–7. Local High Frequency Oscillator and Local-Remote R.F. Amplifier Stages, Simplified Schematic Diagram

Converter may be coupled to the remote R.F. amplifier V-109 via connector J-112. The local and remote R.F. amplifiers V-108 and V-109 have a common plate circuit from which the mixer injection voltage is taken. The tuned circuit of the local and remote amplifiers comprise capacitor section C-103G and transformer T-106. Trimmer capacitor C-184 is a variable parallel padder and C-181 is a fixed series padder. Inductor L-107 and resistor R-133 are utilized as parasitic suppressors. All of the bias voltage appearing across the converter grid resistor R-117 is fed back to the grids of V-108 and V-109 through resistors R-130, R-134 and R-142 to serve as an automatic excitation regulator. Feedthru capacitor C-180 is projected through the R.F. amplifier compartment to serve as a test point for measuring this voltage. Plate voltage for V-108 and V-109 is applied through transformer T-106. Screen voltage for V-108 is applied through screen dropping resistor R-132 which is bypassed by capacitor C-146. Cathode bias is obtained through resistor R-131 which is bypassed by capacitor C-145. Screen voltage for V-109 is applied through dropping resistor R-138 which is bypassed by capacitor C-155. Cathode bias is obtained through resistor R-139 which is bypassed by capacitor C-156.

f. CRYSTAL OSCILLATOR (O-131/FRR-24). *(See Figure 2–8).*—The crystal oscillator utilizes 16 crystals in the frequency range of 3.75 to 15 mcs. to provide heterodyne voltages for crystal-controlled operation of one or more Amplifier-Converter units. Two separate oscillators are used to provide these output voltages. Each oscillator has three paralleled outputs with equal amplitude at an impedance of 23 ohms. Two front-panel mounted crystal switches are used to select the crystals necessary to producethe heterodyne voltage required for reception of the chosen frequency channels. The above crystals are employed with a multiplication factor of 1, 2 or 3 times the crystal frequency to cover the tuning range of the Amplifier-Converter units. Two tuning meters are provided to indicate maximum output of the oscillators. Individual switches S-803 and S-804 permit simultaneous operation of the oscillators.

The crystal oscillators V-801 and V-803 are electron-coupled types of oscillators each using a type 6AH6 tube. Since both oscillator circuits are identical the following description is equally applicable to both except for the differences in symbol designations. A tuned circuit composed of inductor L-801 and capacitor C-818 is placed in the cathode circuit

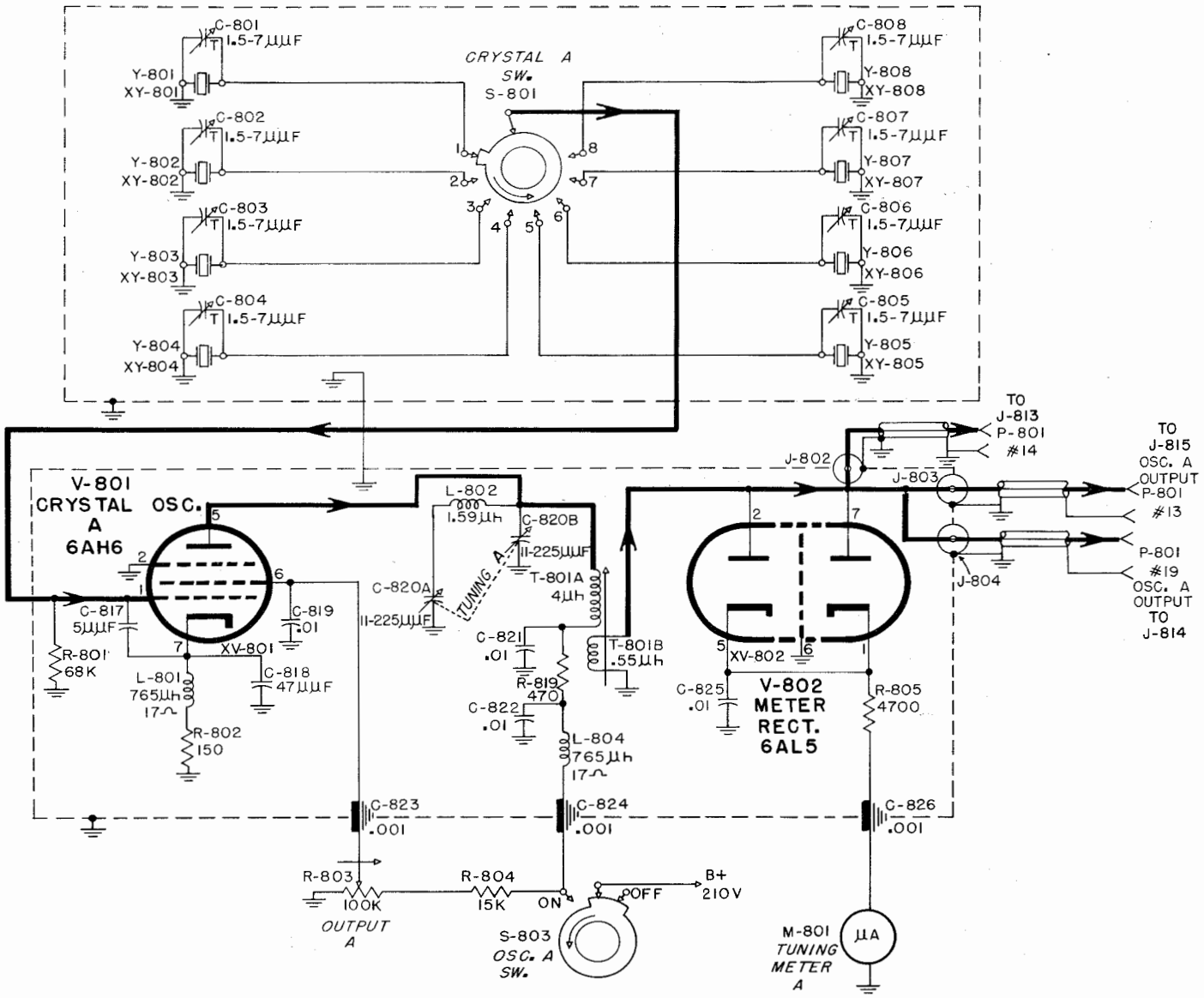


Figure 2–8. Crystal Oscillator Stages, Simplified Schematic Diagram

to obtain the proper R.F. potential in the cathode relative to the grid and screen grid to produce oscillation. The cathode potential is obtained in a voltage divider circuit composed of the tubes grid-to-cathode circuit capacity plus C-817 in series with the cathode-to-chassis tuned circuit capacitive reactance at the oscillating frequency. Each individual crystal Y-801 through Y-816 comprises the main tank circuit across which these impedances are shunted. Due to the fact that the resonant frequency of the cathode tuned circuit is lower than the crystal frequencies used, the cathode-to-chassis circuit presents a capacitive reactance at the crystal frequency, thus completing the capacity voltage divider across the crystal. Plate voltage is supplied through inductors L-804 and T-801 bypassed by capacitors C-822 and C-821. Screen voltage is supplied through R-804 and R-803 bypassed by capacitor C-819. Cathode voltage is developed across R-802 bypassed by capacitor C-818. The Output 'A' control R-803 is used in the screen circuit to control the amount of crystal oscillator 'A' output. The output circuit consists of a series-parallel LC tuned circuit which permits the fundamental frequency and harmonics of the fundamental frequency to be produced in the frequency range of 3.75 mc to 33.75 mc. Parallel tuning is employed in the frequency range of 3.75 to 12.75 mc. The tuned circuit consists of capacitors C-820A and C-820B in parallel with inductor T-801. Inductor L-802 appears as a short-circuit. Series tuning is employed in the fre-

quency range of 12.75 mc. to 33.75 mc. In this case, the tuned circuit consists of capacitors C-820A and C-820B in series with inductor L-802. Transformer T-801 provides a means of applying output voltage to output connectors J-813, J-814 and J-815. Iron-core tuning of inductor T-801 in oscillator 'A' is provided to set the low end of the frequency range. Simultaneously the output voltage is fed to a meter rectifier tube V-802, a type 6AL5. This rectified voltage is used to produce a reading on Tuning Meter 'A'. The normal reading on the meter is approximately 400 microamperes. Inductor L-804 and capacitor C-822 form an R.F. filter.

The Tuning 'A' control dial is divided into two frequency ranges; 2 mc. to 11 mc. and 11 mc. to 40 mc. to cover the entire range of the equipment. The Tuning 'A' control dial is calibrated identical to the main tuning dial of the Amplifier-Converter units. It should be noted that the dial actually reads the frequency of the signal to be received (oscillator output frequency less the 1750-kc. I.F. signal generated in the Amplifier-Converter units).

NOTE

For the reception of a 4 mc. signal using this oscillator as a means of obtaining heterodyne voltage the operator should proceed as follows:

Use the correct Amplifier-Converter unit for reception of a 4 mc. signal. Set the main tuning control dial of the above unit at 4 mc. Insert a crystal whose frequency is 1750 kcs. higher than 4 mc. (i.e. 5.75 mc.) into any one of the 16 crystal positions.

Set the Crystal 'A' or 'B' switch to the position corresponding to the crystal position in use. Set the corresponding Tuning control dial to 4 mc. as directly read on the inside scale. Adjust the Tuning control about this setting for maximum output. It must be understood the dial reads 4 mc. but the actual frequency of the oscillator voltage is 5.75 mc.

g. 200 KILOCYCLE OSCILLATOR AND HARMONIC GENERATOR (O-131/FRR-24). *(See Figure 2–9).*—A crystal calibrator comprised of a 6AU6 tube V-805 in a 200-kc. crystal oscillator circuit and a 6AG5 tube V-806 harmonic generator and amplifier provide tuning markers to check the accuracy of the frequency calibration of the R.F. amplifiers. Inductors L-810 and L-809 are connected in series, shunted by C-837 to form the oscillator tuned circuit. The inductors are fitted with variable iron cores and the capacitor is variable to resonate these components to the actual crystal frequency. Plate voltage to the oscillator is supplied through resistors R-816, R-817, R-812, R-813 and inductor L-809. Screen voltage is applied through resistors R-816 and R-817 bypassed by capacitor

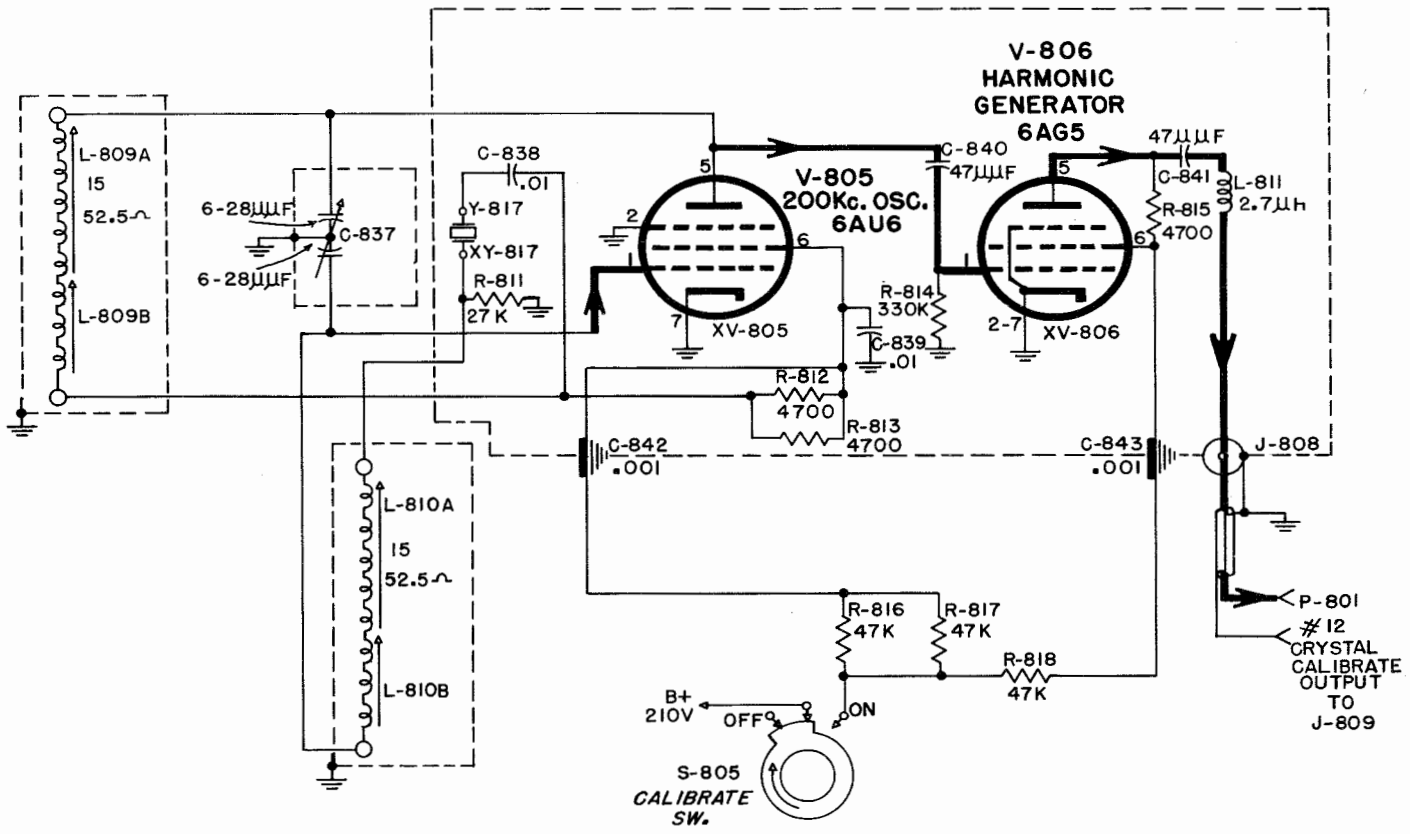


Figure 2–9. 200 kc. Oscillator and Harmonic Generator Stages, Simplified Schematic Diagram

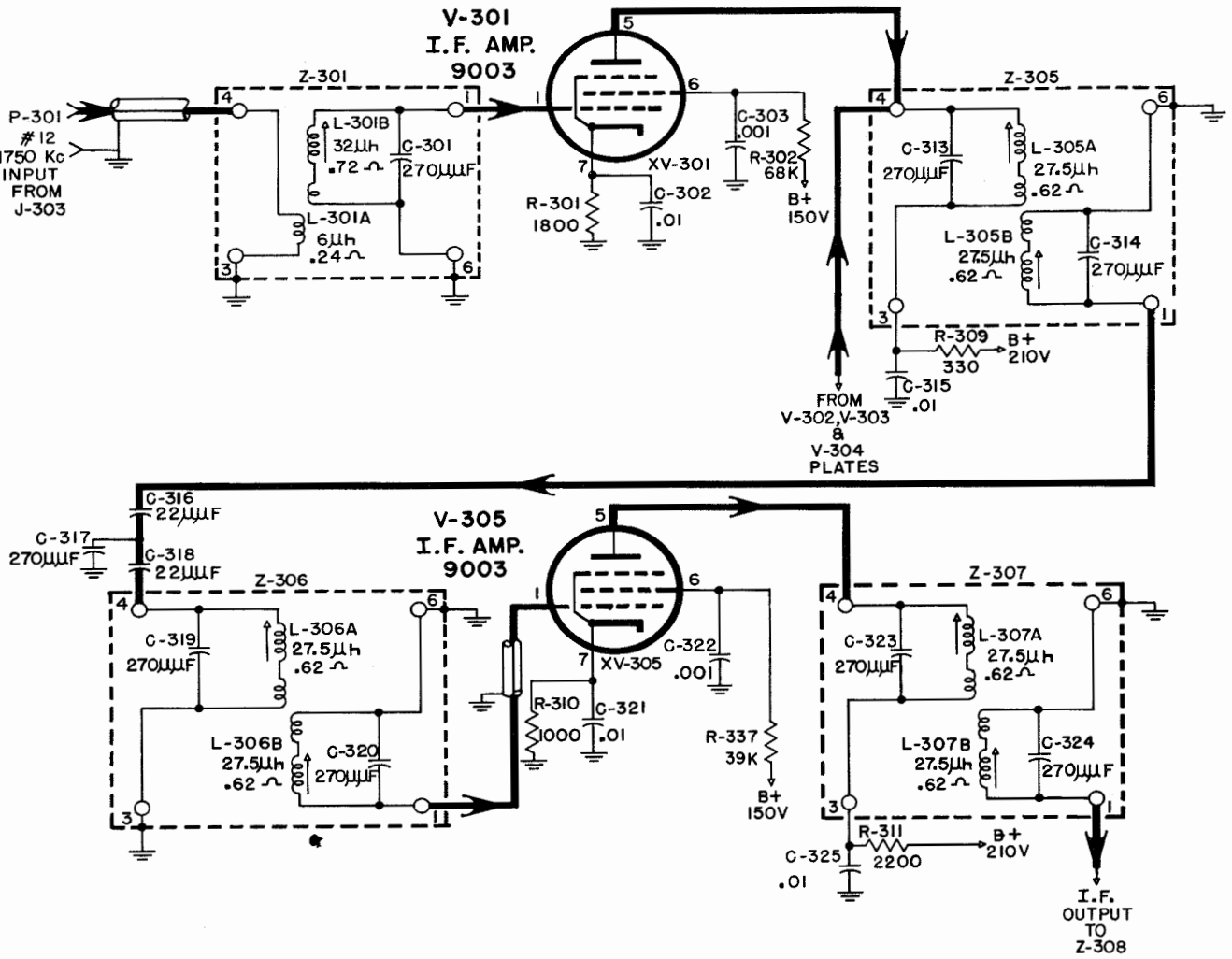


Figure 2–10. 1750-kc. I.F. Amplifier Stages, Simplified Schematic Diagram

C-839. The 200-kc. output of V-805 is capacitively coupled through capacitor C-840 to the grid of the 6AG5 tube, V-806. Screen voltage to the amplifier tube is supplied through resistor R-818. Plate voltage is supplied through resistors R-818 and R-815.

With the Calibrate switch S-805 in the On position the crystal calibrator feeds unmodulated frequencies at multiples of 200 kcs. to connector J-809 for application to the R.F. amplifiers. Capacitor C-841 and inductor L-811 form a series resonant circuit used to peak those harmonics of the crystal above 14 mc. The average amplitude of harmonics from the amplifier is 2000 microvolts.

b. 1750 KC. I.F. FREQUENCY AND SECOND CONVERSION CIRCUITS (CV-126/FRR-24).—The second frequency-conversion circuits provide an intermediate step in sharpening the broad selectivity and lowering the 1750-kc. intermediate frequency to the sharp selectivity and intermediate frequency of 50 kilocycles. The frequency changing function also provides a convenient point for vernier tuning or automatic frequency control tuning. If this intermediate step were not employed, the undesired image response could not be attenuated sufficiently. If the frequency were not converted to some low frequency, the required selectivity could not be obtained in the following I.F. amplifiers. Even though two frequency conversions are employed, the undesired image response resulting at each conversion is attenuated many times more than would be possible with a single frequency conversion circuit.

(1) 1750-KILOCYCLE I.F. AMPLIFIERS. *(See Figure 2–10.)*—The 1750-kilocycle output of the R.F. amplifiers is fed into the I.F. chain through input connectors J-302, J-303, J-304 or J-307. This signal is transformer coupled to the grid of the selected I.F. amplifier tube V-301, V-302, V-303 or V-304, all type 9003, through transformers Z-301, Z-302, Z-303 or Z-304. The I.F. stages operate with fixed cathode bias and have roughly unity gain. All 1750-kilocycle I.F. stages are tuned to a center frequency of 1750

kilocycles which is high enough to give the required image rejection. The center frequency is also low enough to provide sufficient selectivity for the required second image rejection. Selection of the desired R.F. amplifier results in the 1750 kilocycle I.F. signal being applied to the corresponding I.F. input transformer. Each input stage is identical in circuitry with a cathode bias resistor and bypass capacitor and a screen dropping resistor with its bypass capacitor. Plate voltage is fed through R-309 bypassed by capacitor C-315 and applied to the plate of all input stages through the primary winding of Z-305. Transformers Z-305 and Z-306 are common to all input stages and employ permeability tuning. The stages are coupled with T pad capacitor networks C-316, C-317 and C-318 to provide sufficient attenuation to reduce the gain to roughly unity.

The output of Z-306 is directly coupled to the grid of V-305, a type 9003 tube. Cathode bias is developed across R-310 bypassed by capacitor C-321. Screen voltage is supplied from V-312 a voltage regulator type OA2 tube through screen dropping resistor R-337 which is bypassed by capacitor C-322. Voltage is supplied through plate resistor R-311 bypassed by capacitor C-325 to the plate through the primary winding of Z-307. Coupling between the output of the second I.F. stage and the input transformer of the second converter stage is accomplished by the use of the T pad capacitor network C-326, C-327 and C-328. This network is used to provide sufficient attenuation to hold the gain at approximately unity.

(2) SECOND CONVERTER CIRCUIT, V-310 (CV-126/FRR-24). *(See Figure 2–11).*—The 1750 kc. output of Z-308 is directly coupled to the signal grid of the second converter tube V-310, a type 6BE6. Simultaneously the output from Z-309 is coupled through capacitor C-352 to the injection grid of V-310. The frequency of this signal is 1700 kilocycles. Cathode bias is obtained by the voltage drop across resistor R-330 which is bypassed by capacitor C-353A. Screen voltage is applied through screen dropping resistor R-331 bypassed by capacitor C-347C. Plate voltage is applied through plate resistor R-332 and transformer Z-311 bypassed by capacitor C-353B. Capacitor C-367 is used for parasitic suppression. Frequency conversion from 1750 kilocycles to 50 kilocycles is accomplished in this stage. The 1750-kilocycle signal is combined with the output of either one of the two 1700-kilocycle oscillators or from a remote oscillator. The resultant frequency of the output signal

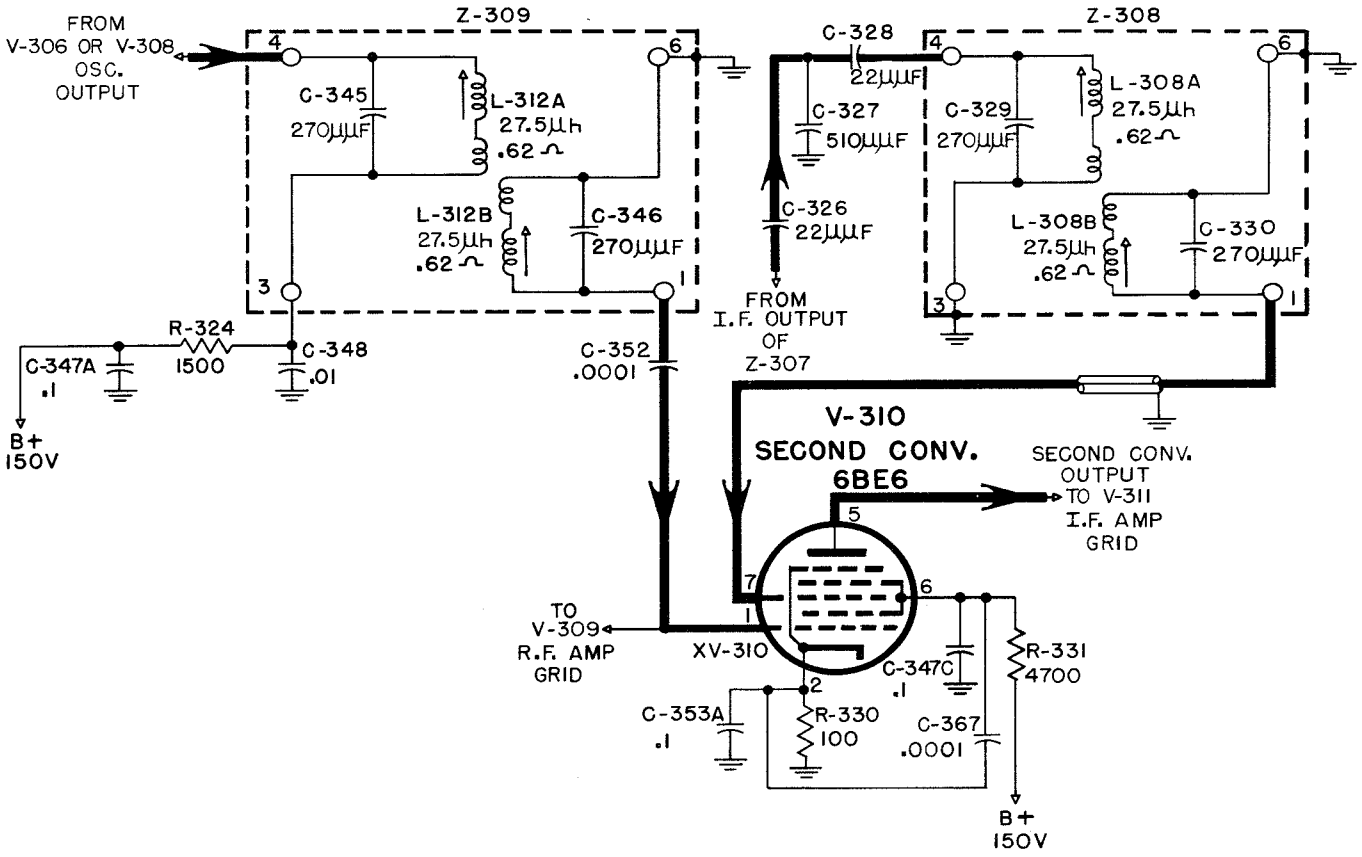


Figure 2–11. Second Converter Stage V-310, Simplified Schematic Diagram

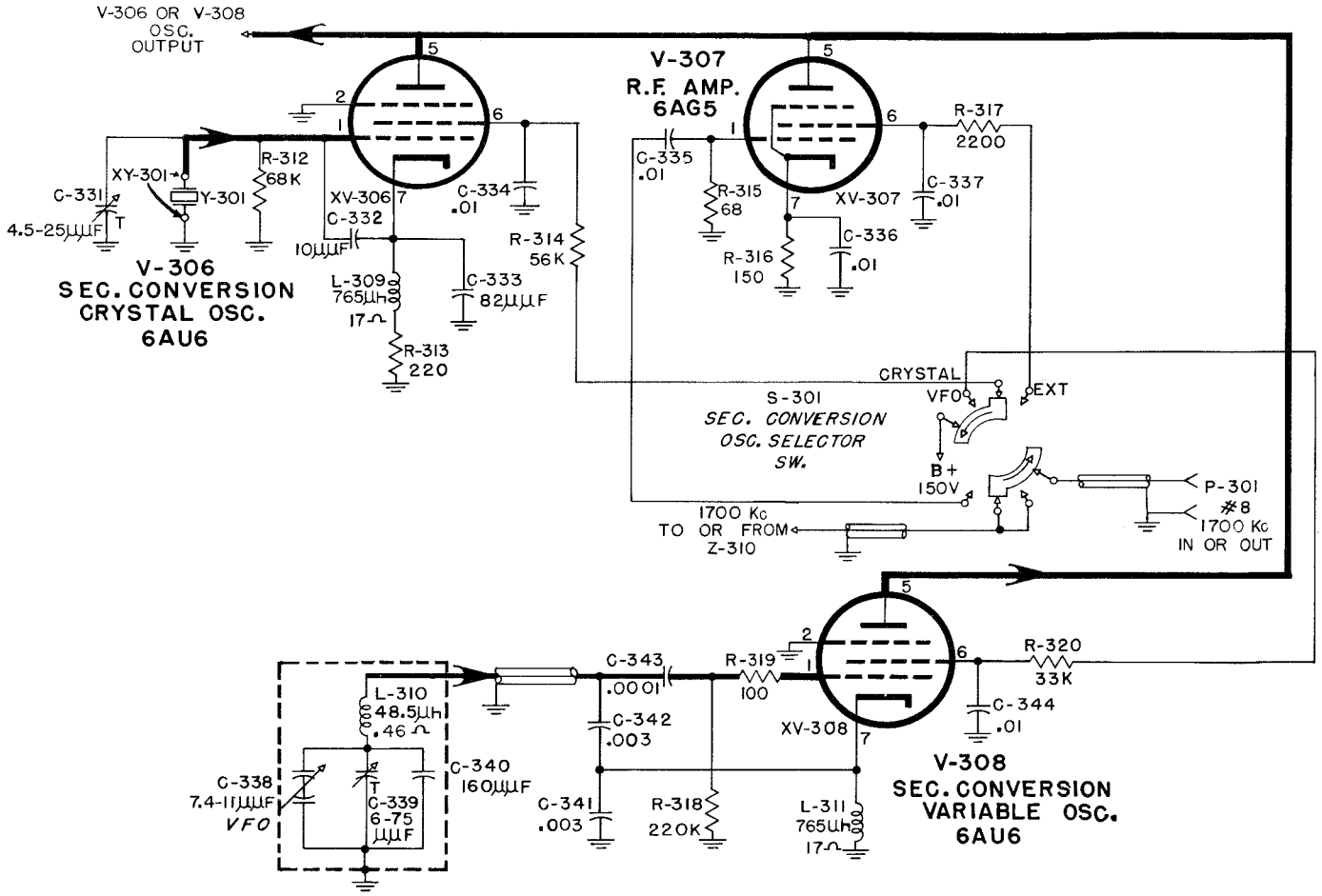


Figure 2–12. Second Conversion Crystal Oscillator Stage V-306, Variable Oscillator V-308 and R.F. Amplifier V-307, Simplified Schematic Diagram

becomes 50 kilocycles. Transformer Z-311 is broadly tuned due to heavy loading resulting in a low Q.

(3) SECOND CONVERSION CRYSTAL OSCILLATOR CIRCUIT (CV-126/FRR-24). (*See Figure 2–12*).– The second conversion crystal oscillator V-306, a type 6AU6 tube, is an electron-coupled type of circuit. A tuned circuit made up of inductor L-309 and capacitor C-333 is placed in the cathode to obtain the proper R.F. potential in the cathode relative to the grid and screen so that oscillation will result. The cathode potential is obtained in a voltage divider circuit composed of the tubes grid-to-cathode circuit capacity and C-332 in series with the cathode-to-chassis tuned circuit capacitive reactance at the oscillating frequency. The crystal Y-301 comprises the main tank circuit across which these impedances are shunted. Due to the fact that the resonant frequency of the cathode tuned circuit is lower than the crystal frequency of 1700 kilocycles the cathode-to-chassis circuit presents a capacitive reactance at the crystal frequency, thus completing the capacity voltage divider across the crystal. Plate voltage is applied from voltage regulator V-312 through resistor R-324 and the primary winding of Z-309. Screen voltage is also supplied from voltage regulator V-312 through screen dropping resistor R-314 bypassed by C-334. Cathode bias is developed across resistor R-313 bypassed by capacitor C-333. The frequency of the crystal oscillator is 1700 kilocycles which is 50-kc. below the 1750 kc. carrier frequency. This output is fed through Z-309 to the injection grid of the second converter stage.

(4) SECOND CONVERSION VARIABLE OSCILLATOR CIRCUIT (CV-126/FRR-24). (*See Figure 2–12*). –The second conversion variable oscillator V-308 employs a type 6AU6 tube in a highly stable oscillator circuit. The oscillator tuned circuit consists of C-338, C-339 and C-340 in series with L-310, C-342 and C-341. The voltage drop across C-342 and C-341 provide the feedback necessary for oscillation. Capacitors C-342 and C-341 are very large in comparison to C-338, C-339 and C-340 thereby causing very loose coupling between the tube and the tuned circuit and providing a very high 'Q' circuit. The

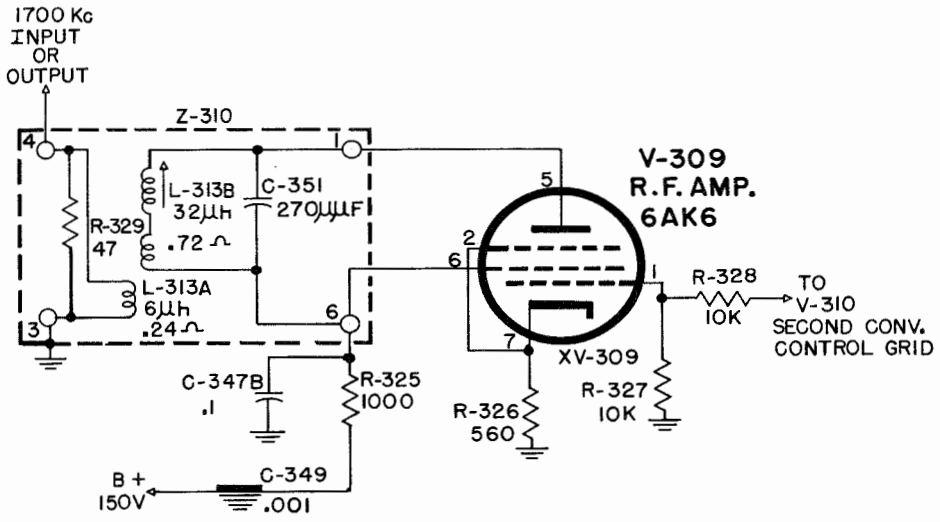


Figure 2–13. R.F. Amplifier V-309, Simplified Schematic Diagram

values of C-342 and C-341 are large in comparison with the grid-to-cathode and plate-to-cathode capacitance of the 6AU6 and as a result any changes in these capacitances due to voltage variations or heating effects become negligible. Capacitor C-343 is the grid blocking capacitor and resistor R-318 is the grid resistor. Plate voltage is applied from voltage regulator tube V-312 through resistor R-324 and the primary winding of Z-309. Screen voltage is applied through screen dropping resistor R-320 bypassed by capacitor C-344. Resistor R-319 is used to prevent parasitic oscillations. The oscillator tuned circuit is completely shielded and the frequency is controlled from the front panel by means of the VFO control. The nominal output frequency of this oscillator is 1700 kilocycles and is tunable over a seven kilocycle range.

(5) SECOND CONVERSION R.F. AMPLIFIERS (CV-126/FRR-24)--R.F. Amplifier V-307, a type 6AG5 tube, is used to amplify the incoming remote oscillator voltage before application to the second converter. See Figure 2–12. The external oscillator is capacitively coupled to the grid of V-307 through capacitor C-335. Resistor R-315 is employed as a load for the incoming oscillator signal. Cathode bias is developed across resistor R-316 bypassed by capacitor C-336. Plate and screen voltages are supplied from voltage regulator V-312, Plate voltage is applied through resistor R-324 and the primary winding of Z-309 bypassed by capacitors C-347A and C-348. Screen voltage is applied through resistor R-317 bypassed by capacitor C-337.

R.F. Amplifier V-309, a type 6AK6 tube, amplifies the 1700-kilocycle output of the second conversion oscillator for application to a remote circuit. (See Figure 2–13). The 1700-kilocycle output of Z-309 is capacitively coupled to the grid of V-309 through C-352. Resistors R-328 and R-327 are used as a voltage divider network to determine the amount of input signal to the grid of V-309. Cathode bias is developed across resistor R-326. Plate voltage is supplied from the voltage regulator through resistor R-325 bypassed by capacitor C-347B. Resistor R-329 is used as a terminating load across inductance L-313A. The 1700-kilocycle signal is link coupled through inductance L-313A to J-306 for external use.

(6) I.F. AMPLIFIER V-311 (CV-126/FRR-24).*(See Figure 2-14).*--The output of Z-311 is capacitively coupled through capacitor C-355 to the grid of V-311 a type 6C4 tube. Plate voltage is applied directly from the voltage regulator tube bypassed by capacitor C-356. Inductance L-315 offers a high impedance to

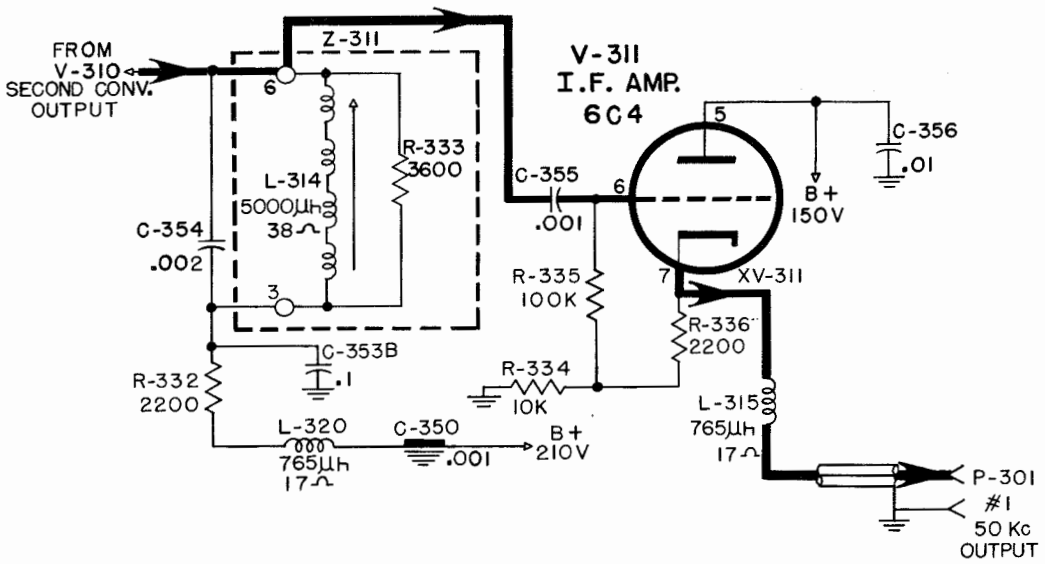


Figure 2–14. I.F. Amplifier V-311, Simplified Schematic Diagram

1700 kilocycles. The 50-kilocycle cathode follower output of V-311 is connected to J-305 for application to the filter circuits. See Figure 7–77 for the selectivity curve of the 1750-Kc. I.F. system.

i. FILTER CIRCUITS (Filter Assembly F-99/FRR-24).—The filter circuits contribute no gain to the receiver but determine the final bandwidth before demodulation. The filter stages provide a choice of eight bandwidths as selected by the Selectivity switch S-401.

(1) I.F. AMPLIFIER V-401 (F-99/FRR-24). *(See Figure 2–15).*—The output of the I.F. amplifier V-311 is applied through coupling capacitor C-401 across the grid load resistor R-401 of I.F. amplifier V-401, a type 6AG5. I.F. amplifier V-401 is a conventional amplifier circuit except that the plate and screen circuits are connected to chassis instead of being connected to a point that is positive with respect to the chassis. Cathode resistor R-402 is connected in the negative 210-volt circuit. Therefore the plate and screen circuits, which are at chassis potential, are positive with respect to the negative cathode. Screen dropping resistor R-403 is bypassed by capacitor C-403.

(2) FILTER CIRCUIT DETAILS (F-99/FRR-24).—The output of the I.F. amplifier V-401 is coupled to one of seven bandpass filters as selected by the setting of the Selectivity switch S-401. The bandwidths provided are as follows: 125 cycles, 250 cycles, 500 cycles, 1 kc., 3 kc., 6 kc. and 12 kc. at 6 db. attenuation. See Figures 7–78 through 7–81 for characteristic selectivity curves.

Two hermetically sealed units are provided to obtain the 'Q' necessary at the 125-cycle and 250-cycle bandwidths. The 125-cycle filter Z-401 (Figure 2–16) consists of two interstage transformers and a system

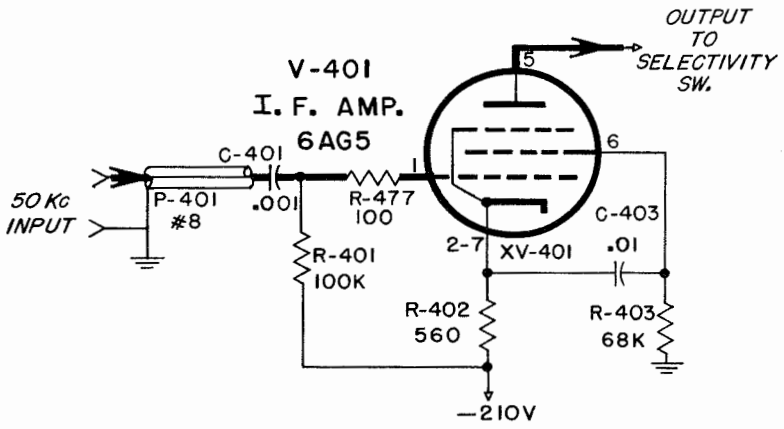


Figure 2–15. I.F. Amplifier V-401, Simplified Schematic Diagram

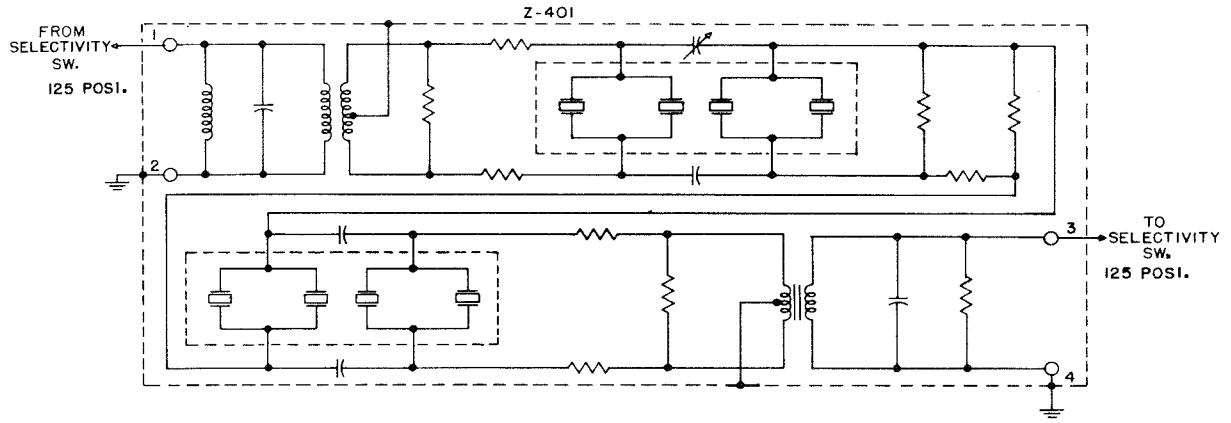


Figure 2–16. 125-Cycle Filter, Simplified Schematic Diagram

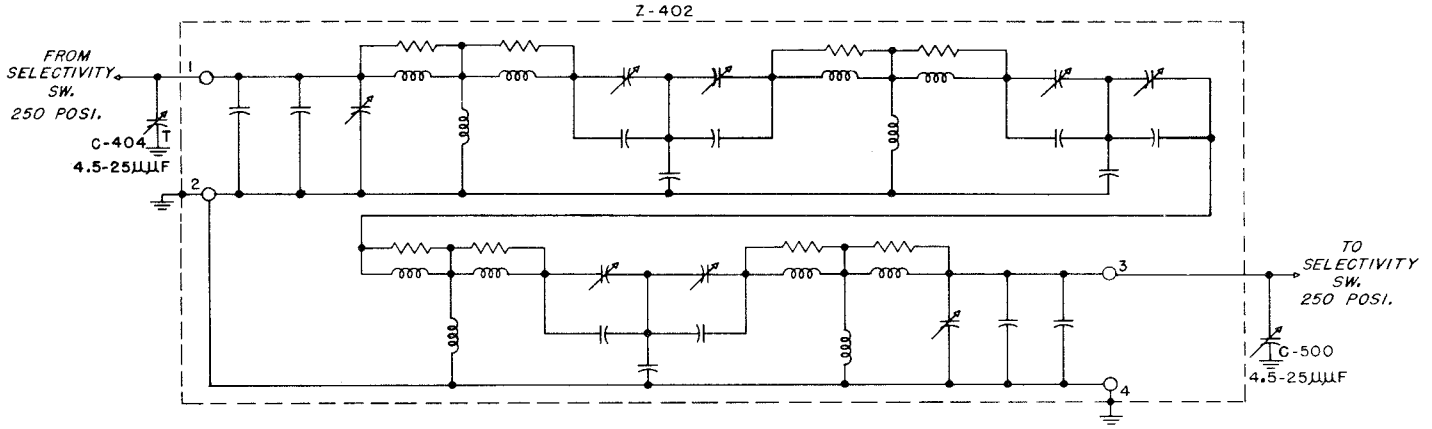


Figure 2–17. 250-Cycle Filter, Simplified Schematic Diagram

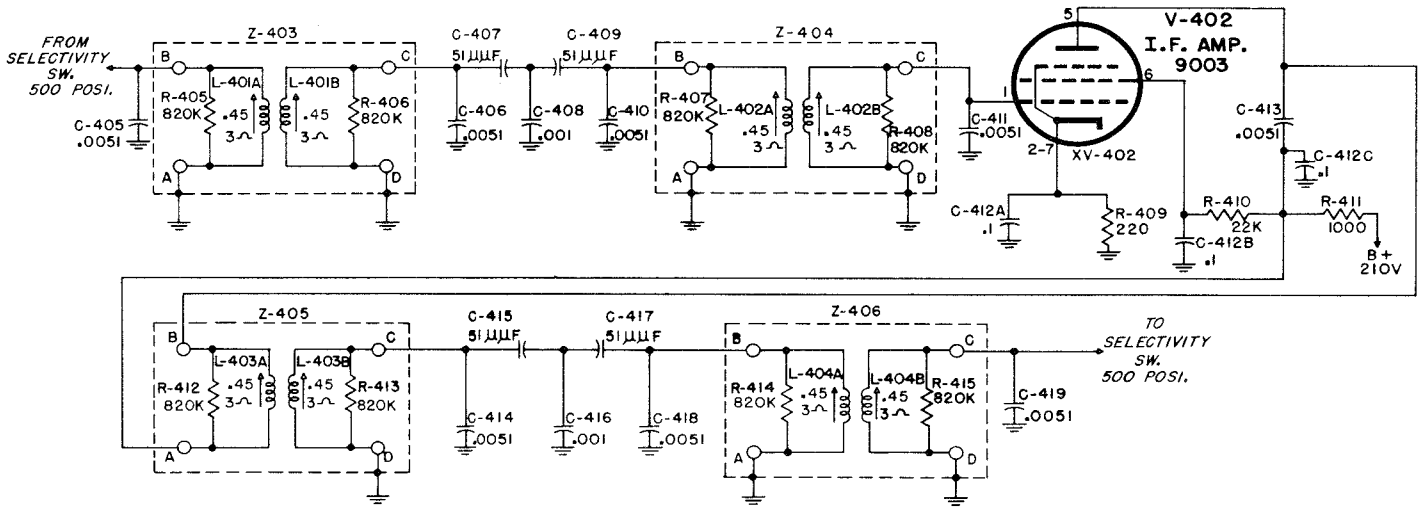


Figure 2–18. 500-Cycle Filter, Simplified Schematic Diagram

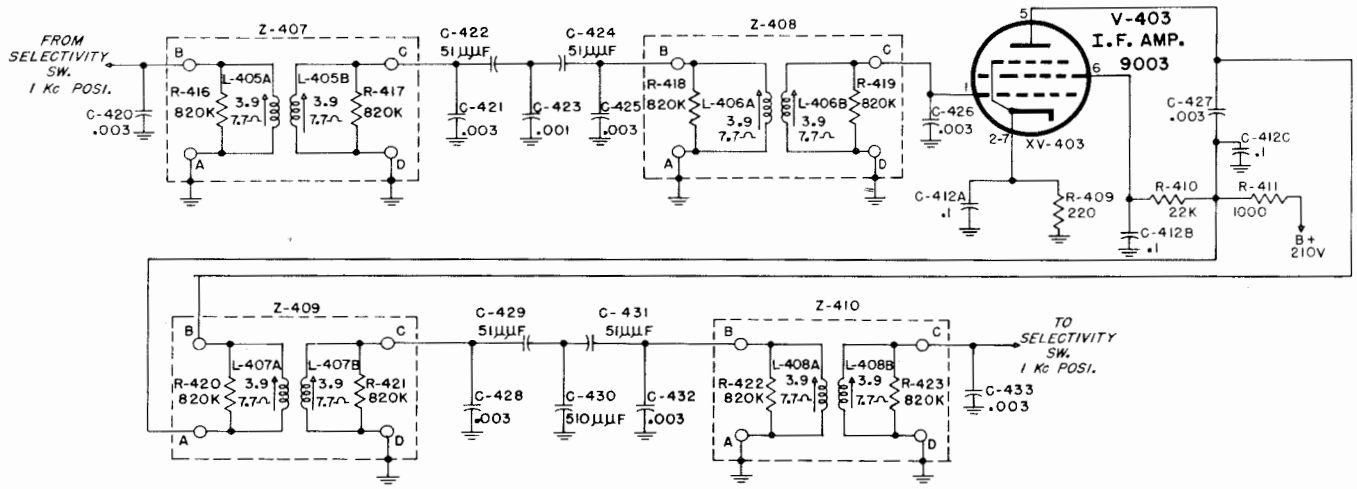


Figure 2–19. 1-kilocycle Filter, Simplified Schematic Diagram

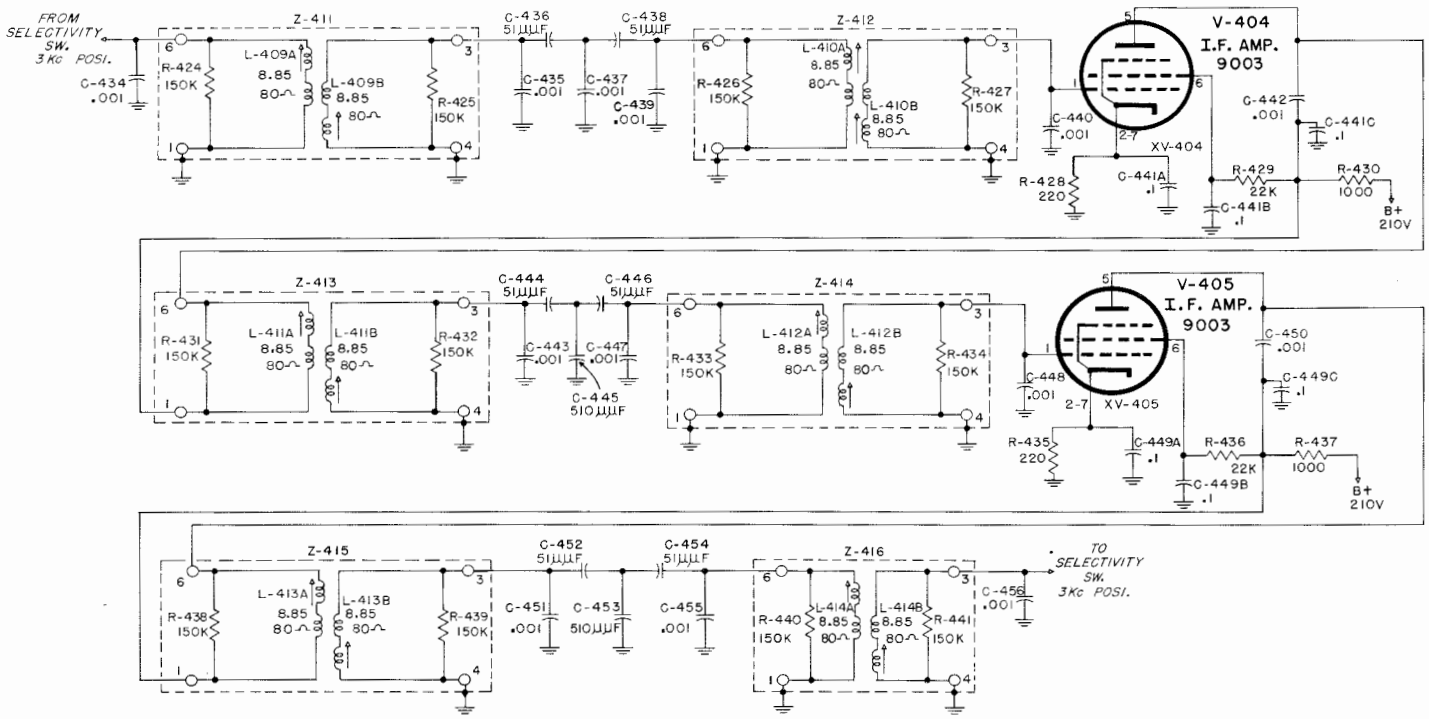


Figure 2–20. 3-kilocycle Filter, Simplified Schematic Diagram

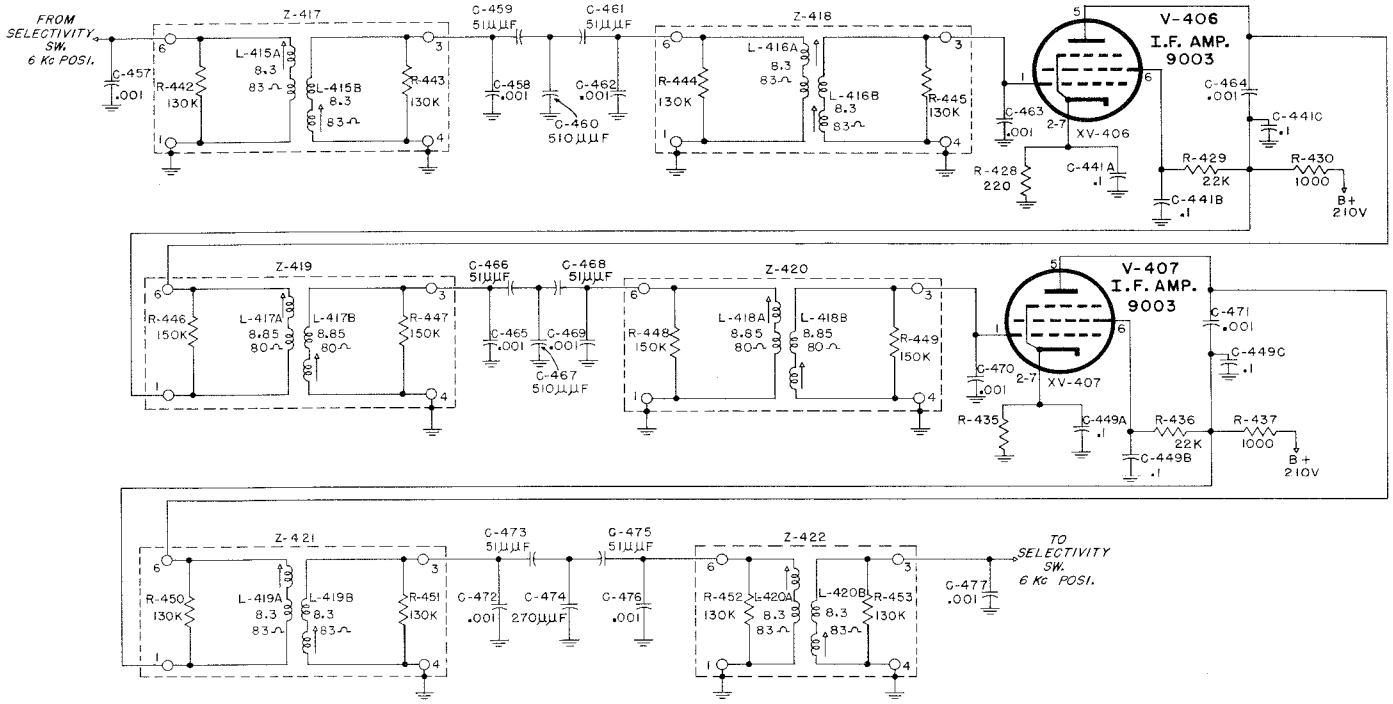


Figure 2–21. 6-kilocycle Filter, Simplified Schematic Diagram

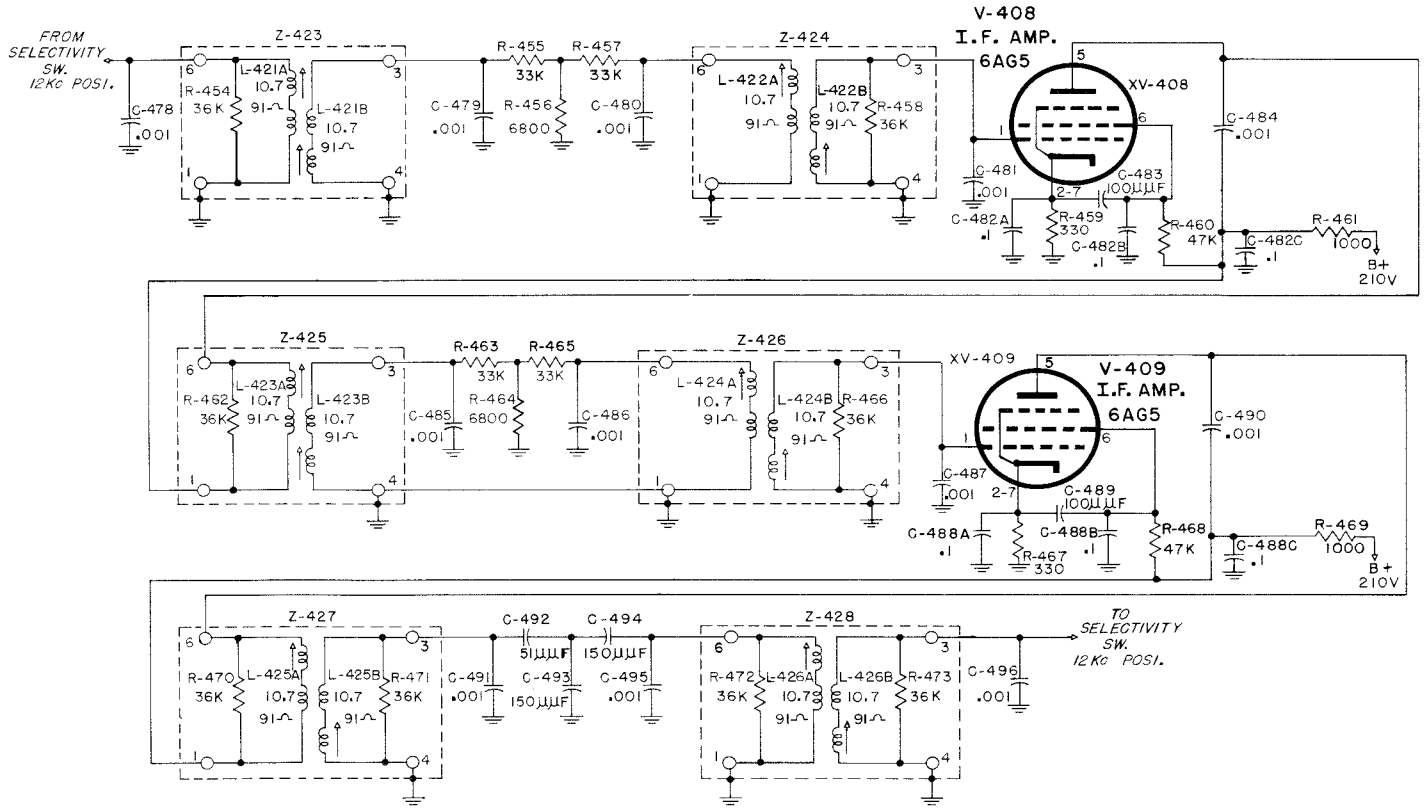


Figure 2–22. 12-kilocycle Filter, Simplified Schematic Diagram

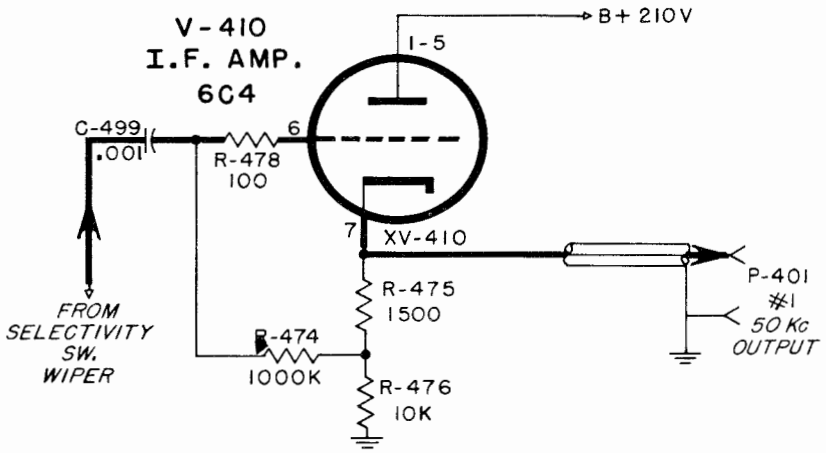


Figure 2–23. I.F. Amplifier V-410, Simplified Schematic Diagram

of crystals, resistors and capacitors. The 250-cycle filter Z-402 (Figure 2–17) comprises a system of resistors, capacitors and toroidal inductors. The 18-kc. selectivity is not filtered but is determined by the 50-kc. I.F. amplifier circuits. Resistor R-404 is provided as a plate load for I.F. amplifier V-401 when the Selectivity switch S-401 is in the 18-kc. position. Double tuned I.F. transformers are utilized in the remaining five channels to obtain the necessary bandwidth. See Figures 2–18 through 2–22. Type 9003 tubes are employed throughout except in the 12-kc. channel where it is necessary to use type 6AG5 tubes to obtain the necessary gain. The I.F. stages in the 500-cycle, 1-kc., 3-kc., 6-kc. and 12-kc. channels operate with fixed bias and have an overall voltage gain of 1 to 1. Their purpose is to provide selectivity without amplification. All the I.F. stages except the 12-kc. I.F. strip are coupled with T-pad capacitor networks to provide sufficient attenuation to hold the gain at unity throughout the system. In the 12-kc. I.F. strip a combination of resistor T-pad and capacitor T-pad coupling networks are utilized to obtain the proper attenuation. Plate and screen potentials of the I.F. amplifier tubes employed in the filter circuits are obtained from the positive 210-volt source through their respective load impedances.

(3) I.F. AMPLIFIER V-410 (F-99/FRR-24). *(See Figure 2–23).*—The output of the filter system is capacitively coupled through capacitor C-499 to the control grid of the I.F. amplifier V-410 a type 6C4, employed as a cathode follower. The output of V-410 is connected to coaxial connector J-402 for application to the 50-kc. I.F. amplifier circuits.

j. 50-KC. I.F. AMPLIFIERS (R.F. Amplifier AM-454/FRR-24).—The 50-kc. I.F. amplifier circuits provide a means of obtaining gain without appreciably sharpening the selectivity characteristic. An overall gain of approximately 97 db. and a nominal bandwidth of 18 kilocycles are obtained in this system. The overall gain can be manually adjusted to the desired level by either the AM Diversity Gain or R.F. Gain controls. A single 50-kc. input channel handles the input signal from the frequency conversion circuits. The system employs three stages of I.F. to obtain the desired gain and selectivity of the 50-kc. AM signal.

(1) 50 KC. AM I.F. AMPLIFIER AND CATHODE FOLLOWER CIRCUITS, V-601, V-602, V-603 AND V-604 (AM-454/FRR-24). *(See Figure 2–24).*—The output of the filter circuit is applied to input connector J-606 and then is capacitively coupled through capacitor C-601 to the control grid of V-601, a type 9003 tube. Plate voltage is supplied through resistor R-607 and band-pass filter Z-601. C-604 is the plate bypass capacitor. Screen voltage to this tube and V-602 and V-603 is supplied through resistors R-604 and R-603 which are bypassed by capacitor C-603. Filter Z-601 provides the major portion of the selectivity of the I.F. Amplifier. This amplifier stage has a bandwidth of 18 kilocycles and a voltage gain of 23 db. The output of Z-601 is capacitively coupled through capacitor C-606 to the control grid of the second I.F. stage tube V-602. Plate voltage is applied through resistor R-609 and inductor L-601 of filter Z-602. C-607 is the plate bypass capacitor. The voltage gain of this stage is 27 db. The output of filter Z-602 is capacitively coupled through C-610 to the control grid of the third I.F. stage tube V-603. Plate voltage is supplied through resistor R-612 and inductor L-602 of filter Z-603. Capacitor C-611 is the plate bypass. The gain of this third I.F. stage is 27 db. The I.F. amplifier is comprised of three stages with an overall gain of 77 db. Filters Z-602 and Z-603 are very broadly tuned compared with Z-601. The output of Z-603 is capacitively coupled through C-613 to the grid of the cathode follower stage V-604 which provides a low impedance method of coupling

the 50-Kc. AM output to associated circuits. A selectivity curve is shown in Figure 7–82. AGC voltage is supplied to input connector J-607 to be applied to the grids of the three I.F. stages. The gain of V-601, V-602 and V-603 can be adjusted by manually setting the front-panel mounted AM Diversity Gain control R-603, which varies the screen potential on the three tubes.

(2) 50 KC. F.S. I.F. AMPLIFIER CIRCUIT, V-608 (AM-454/FRR-24) .*(See Figure 2–25).*–The output of the cathode follower V-604 is capacitively coupled through capacitor C-625 to the grid of the I.F. amplifier V-608. The amount of input to this I.F. stage is manually controlled by the panel-mounted FSK Diversity Level control R-616. The gain of this stage is 20 db. Cathode bias is developed across resistor R-631 bypassed by capacitor C-626A. Screen voltage is applied through resistor R-632 bypassed by capacitor C-626B. Plate voltage is applied through resistor R-633 and the primary winding of transformer T-601. Capacitor C-626C is the plate bypass. The output of V-608 is applied across step-down matching transformer T-601 to connector J-605 for application to the Frequency-Shift Converters.

(3) 50 KC. F.S. C.O.N.S. CIRCUIT (AM-454/FRR-24). *(See Figure 2–26).*–The cathode follower output of V-604 is also coupled to the 50-kilocycle I.F. amplifier comprised of V-606 and Z-604 which provides further selectivity and voltage gain. Rectification of the 50-kilocycle intermediate frequency is accomplished by the use of a full-wave double-diode rectifier tube V-607. The rectified signal is fed through R-627 to connector J-602 for application to the frequency shift C.O.N.S. (carrier-off-noise-suppression) circuit. This voltage is used to actuate a relay in order to disable the FSK system during the absence of frequency-shift signals. Bias for V-606 is obtained across resistor R-623 bypassed by capacitor C-617A. Screen voltage is applied through resistor R-624 bypassed by capacitor C-617B. Plate voltage is sup-

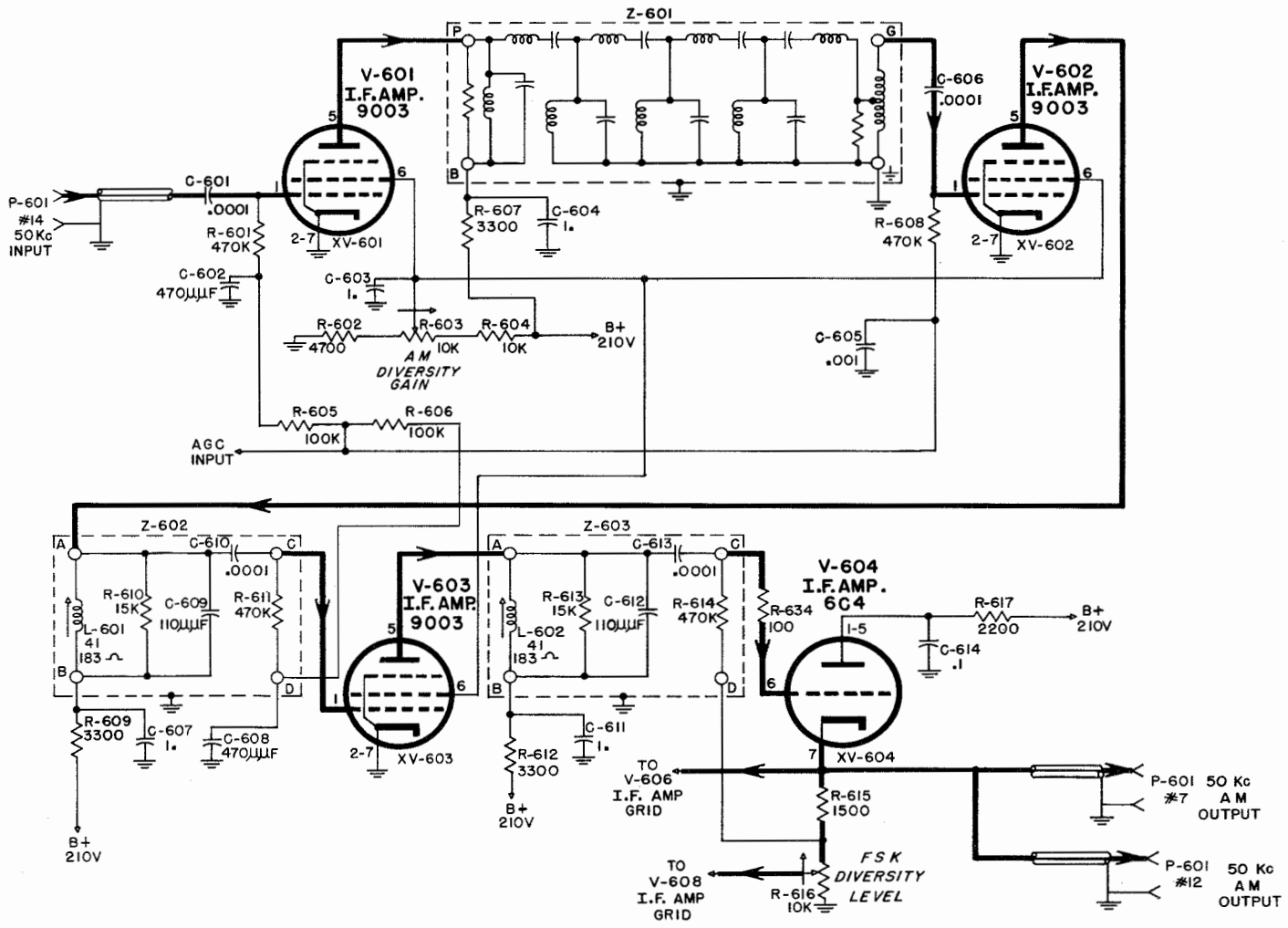


Figure 2–24. 50-kc. I.F. Amplifier Stages V-601, V-602, V-603 and V-604, Simplified Schematic Diagram

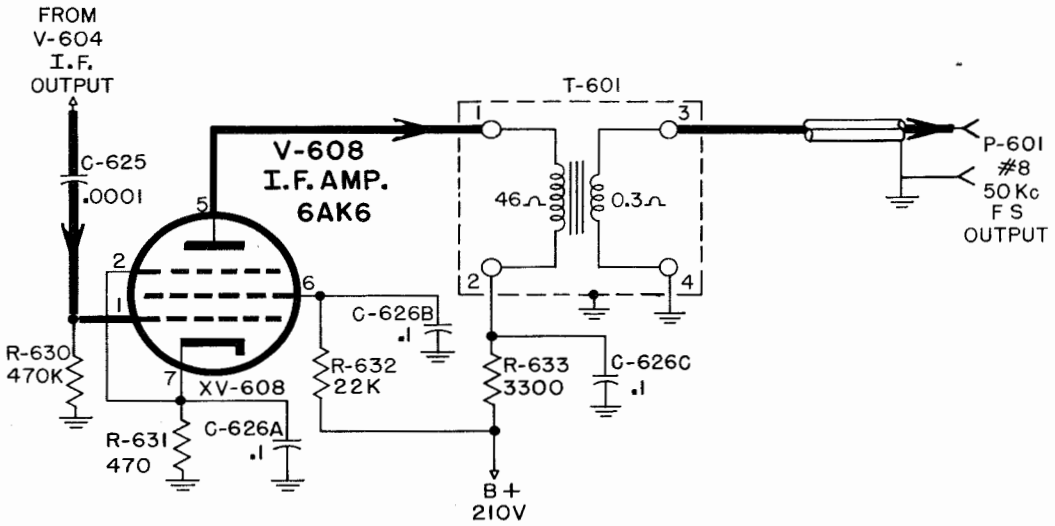


Figure 2–25. 50-kc. F.S. I.F. Amplifier Stage V-608, Simplified Schematic Diagram

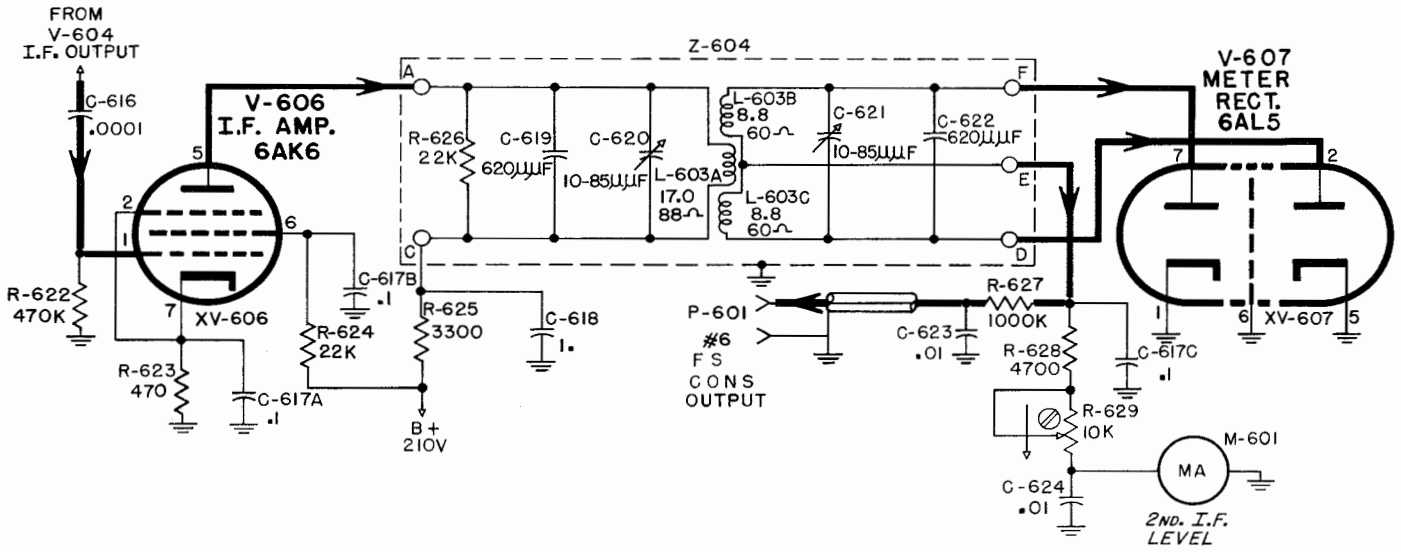


Figure 2–26. 50-kc. F.S. CONS Stages V-606 and V-607, Simplified Schematic Diagram

plied through resistor R-625 and the primary winding of Z-604. Capacitor C-618 is a plate bypass. Z-604 has the characteristics of a broadly tuned transformer. The second I.F. Level meter is utilized to measure the rectified output of V-607. The meter calibration is adjusted by use of potentiometer R-629.

k. DETECTORS.

(1) I.F. AMPLIFIER V-701 AND DETECTOR V-705 CIRCUIT DETAILS (Amplifier-Detector AM-439/FRR-24). *(See Figure 2–27).*—The output of the 50-kc. I.F. amplifier system is connected into the Amplifier-Detector AM-439/FRR-24 through input connector J-705. The signal is capacitively coupled to the grid of the I.F. Amplifier tube V-701, a type 6AK6, through coupling capacitor C-701. The I.F. stage has an approximate gain of 10, (i.e. a one-volt 50-kc. signal impressed on the grid of V-701 would be 11 volts D.C. as read across the diode load resistors R-722 and R-723). The 50-kilocycle I.F. signal from the cathode of V-701 is capacitively coupled to the signal grid of V-702 where it is used as a heterodyning signal for the reception of CW signals and zero beat tuning of the incoming signals. The output of the I.F. amplifier is fed to the primary winding of the I.F. transformer Z-701. Transformer Z-701 is a shielded double-tuned assembly employing air-dielectric variable capacitor adjustments C-704 and C-705. Plate and screen voltage is supplied through resistor R-704 which is bypassed by capacitor C-702B. Plate voltage is supplied through the primary winding L-701A of Z-701. Cathode bias is obtained from the voltage drop across resistors R-703 and

R-736. Resistor R-703 is bypassed by capacitor C-702A.

Transformer Z-701 is broadly tuned and has a low 'Q'. The output of the secondary is applied to the plates of a full-wave duo-diode type linear rectifier tube V-705, a type 6AL5, where detection of the 50-kilocycle I.F. signal is accomplished. The full-wave circuit produces a ripple frequency of 100 kilocycles which is more easily filtered than 50 kcs. Low distortion is another advantage obtained by the use of a double-diode type of rectifier. The mid-point of the secondary winding of Z-701 feeds the detected signal to the low-pass filter Z-702 which determines the audio bandwidth. Z-702 also attenuates the 100-kilocycle ripple frequency appearing at this point.

(2) HETERODYNE DETECTOR V-702, CRYSTAL AND BEAT FREQUENCY OSCILLATORS V-703 AND V-704 (AM-439/FRR-24). *(See Figure 2–28).*—The 50-kilocycle signal from the cathode of the I.F. amplifier tube V-701 is capacitively coupled through C-737 to the signal grid of the heterodyne detector V-702, a type 6BE6 tube. Plate voltage is obtained through plate load resistor R-709 and R-712 bypassed by capacitor C-710. Screen voltage is obtained through resistor R-708 bypassed by capacitor C-708B. Cathode voltage is developed across resistor R-707 bypassed by capacitor C-708A.

Heterodyning action is accomplished by either the conventional 50-kilocycle crystal controlled oscillator V-703, a type 6AK5, for zero beat tuning or a variable beat-frequency oscillator tube V-704, a type 6AU6. The output of the heterodyne detector V-702 is filtered by the low-pass filter Z-703. It is used to provide a suitable bandwidth and attenuate the 50-kilocycle carrier from the BFO and crystal oscillator. The filter output is capacitively coupled through

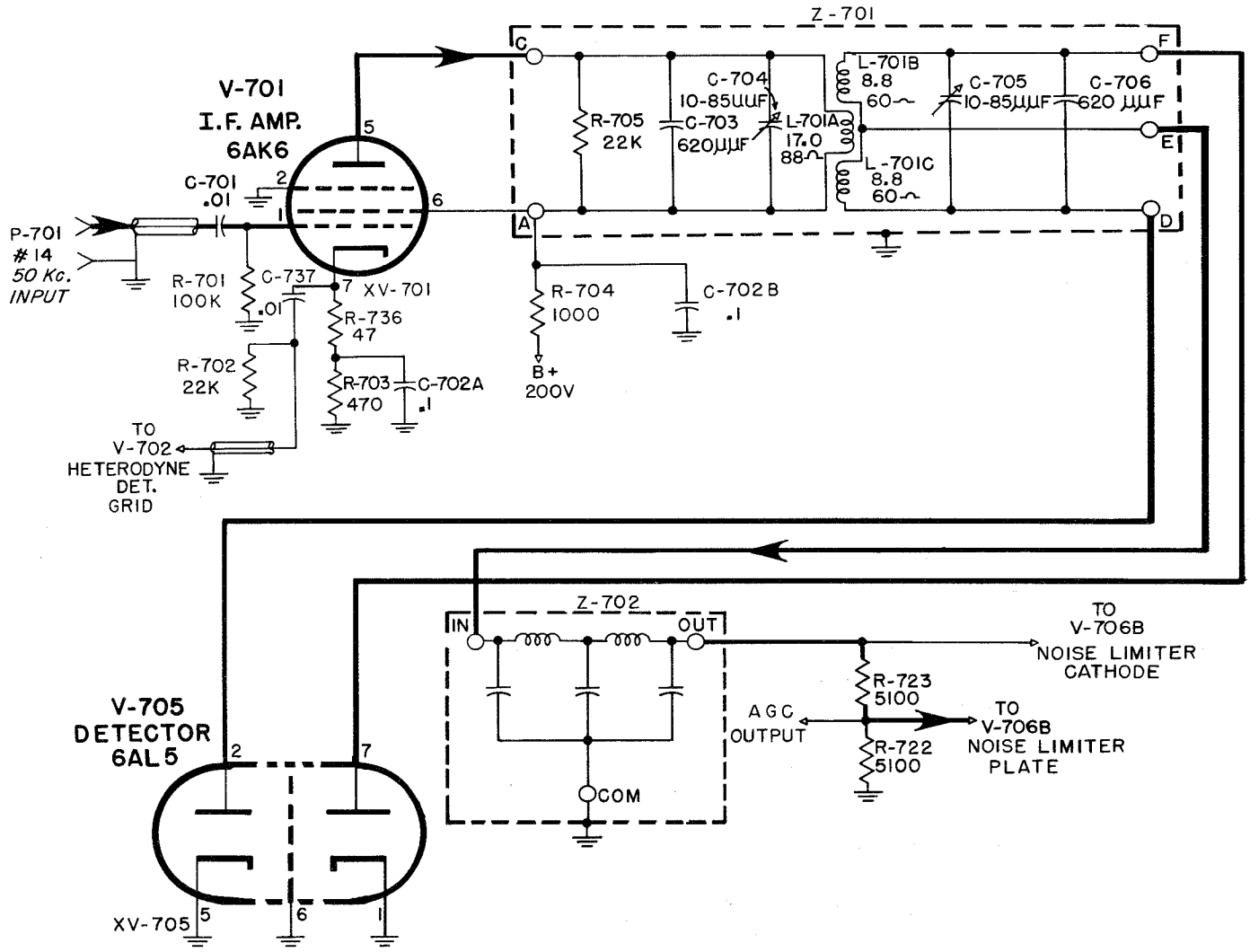


Figure 2–27. I.F. Amplifier V-701 and Detector V-705, Simplified Schematic Diagram

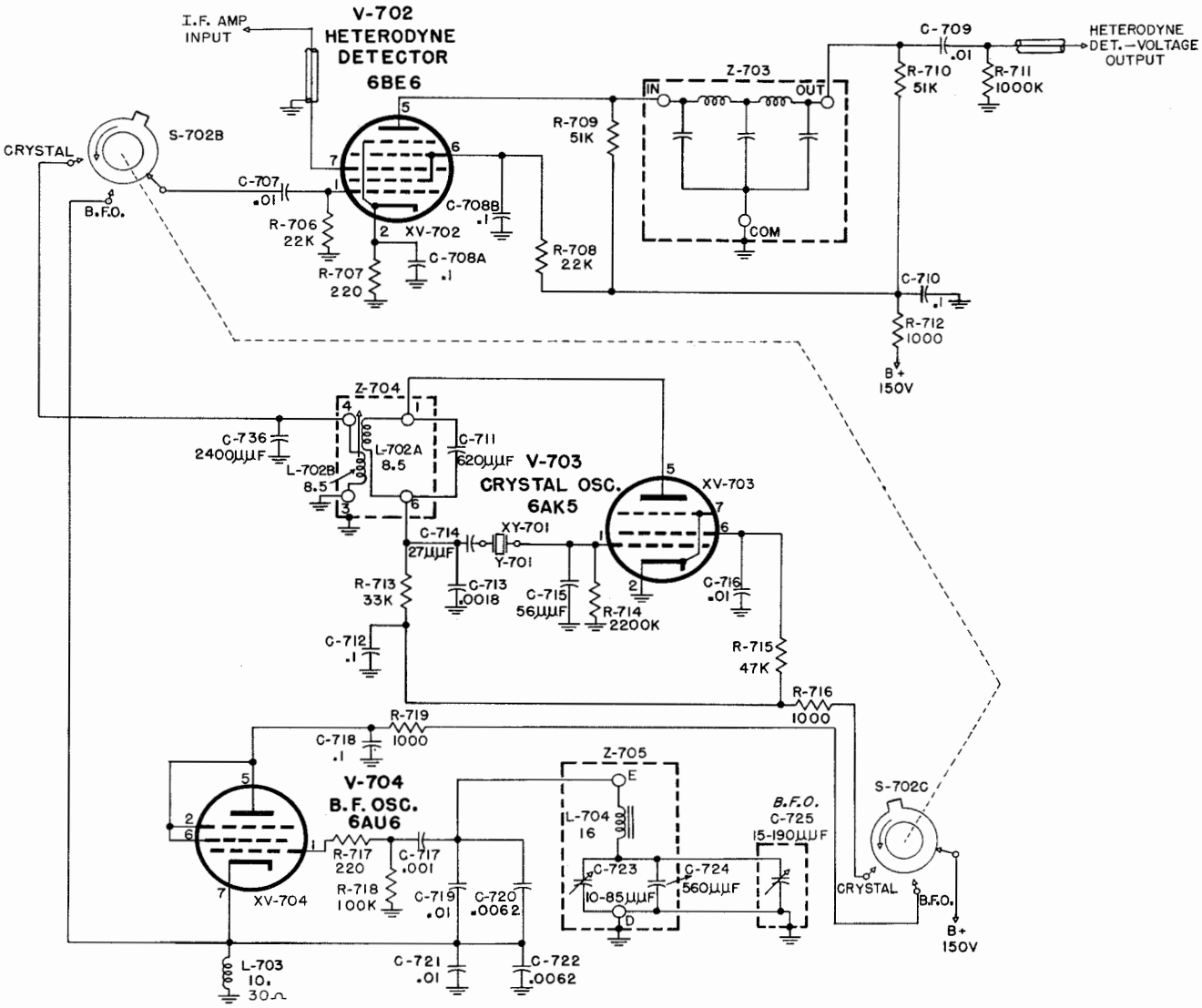


Figure 2–28. Heterodyne Detector V-702, Crystal and Beat Frequency Oscillator V-703 and V-704, Simplified Schematic Diagram

capacitors C-709 and C-748 to the grid of V-707.

The output of the crystal oscillator is applied to the injection grid of the heterodyne detector through Z-704 which is permeability tuned. The oscillator operates on a crystal-controlled frequency of 50 kilocycles. The oscillator is used for zero-beat tuning of the incoming signal. Plate voltage is supplied through section S-702C of the Reception switch, plate load resistor R-713 and filter resistor R-716 which is bypassed by C-712. Screen voltage is supplied through resistor R-715 which is bypassed by capacitor C-716.

The beat frequency oscillator V-704 is used for CW reception. The output is fed through switch section S-702B of the Reception switch to the injection grid of the heterodyne detector. Transformer Z-705 is a shielded RF oscillator coil tuned by variable capacitor C-723 and fixed capacitor C-724. The audio beat frequency is controlled by the BFO control C-725 which is completely shielded and has a beat frequency range of 0 to 4000 cycles. Plate voltage is applied through section S-702C of the Reception switch and plate filter resistor R-719 which is bypassed by capacitor C-718.

(3) I.F. AMPLIFIER V-901, DETECTOR V-902 AND AUDIO FILTER CIRCUIT DETAILS (Amplifier-Detector AM-440/FRR-24). *(See Figure 2–29).*—The 50-kilocycle cathode follower output of the I.F. amplifiers is fed into Amplifier-Detector AM-440/FRR-24 through input connector J-907. This signal input is capacitively coupled through capacitor C-901 and appears across grid load resistor R-901 of the I.F. amplifier stage. This single 50-kilocycle I.F. amplifier comprised of V-901, a type 6AK6 pentode, and Z-901

provides further selectivity and voltage gain. Z-901 is a shielded, double-tuned band-pass filter employing air-tuned variable capacitor adjustments C-904 and C-905. This filter is broadly tuned and has a low 'Q'. Screen voltage is supplied through resistor R-903 which is bypassed by capacitor C-902B. Plate voltage is supplied through primary winding L-901A of I.F. transformer Z-901. Cathode bias is supplied by the voltage drop across resistor R-902 which is bypassed by capacitor C-902A.

Detection of the single 50-kilocycle I.F. frequency is accomplished by the use of a double-diode type linear rectifier tube V-902, a type 6AL5 dual diode. Use of this rectifier circuit results in a ripple frequency with a fundamental twice that obtainable from a single diode (i.e. 100 kilocycles). The rectified D.C. signal is then fed through one of two low-pass filters (Z-902 or Z-903) to provide the proper audio bandwidth for the type of reception used. One of the two bandwidths (600 or 6000 cycles per second) is selected by the setting of the two-section Audio Bandwidth switch S-901. The 6-kilocycle passband is used for telephonic communications, the 600-cycle passband is used to pass C.W. keyed on/off signals with a dot repetition rate up to 200 dot cycles per second. The 6-kilocycle filter Z-902 is of the low-pass type providing a flat response within 1 db. from zero to 6 kilocycles with an attenuation of at least 46 db. above 40 kilocycles. The 600-cycle filter Z-903 is flat within 1 db. from zero to 600 cycles with an attenuation of at least 30 db. at 1000 cycles.

(4) I.F. AMPLIFIERS V-1001, V-1004, V-1006, DETECTORS V-1002, V-1005 AND V-1007 (Amplifier-Detector AM-438/FRR-24).—Each of the three separate 50-kilocycle input I.F. stages, dual diode detectors and the dual low-pass audio bandwidth filter circuits are designed and function in the same manner as described in preceding paragraph 3. k. (3) except for

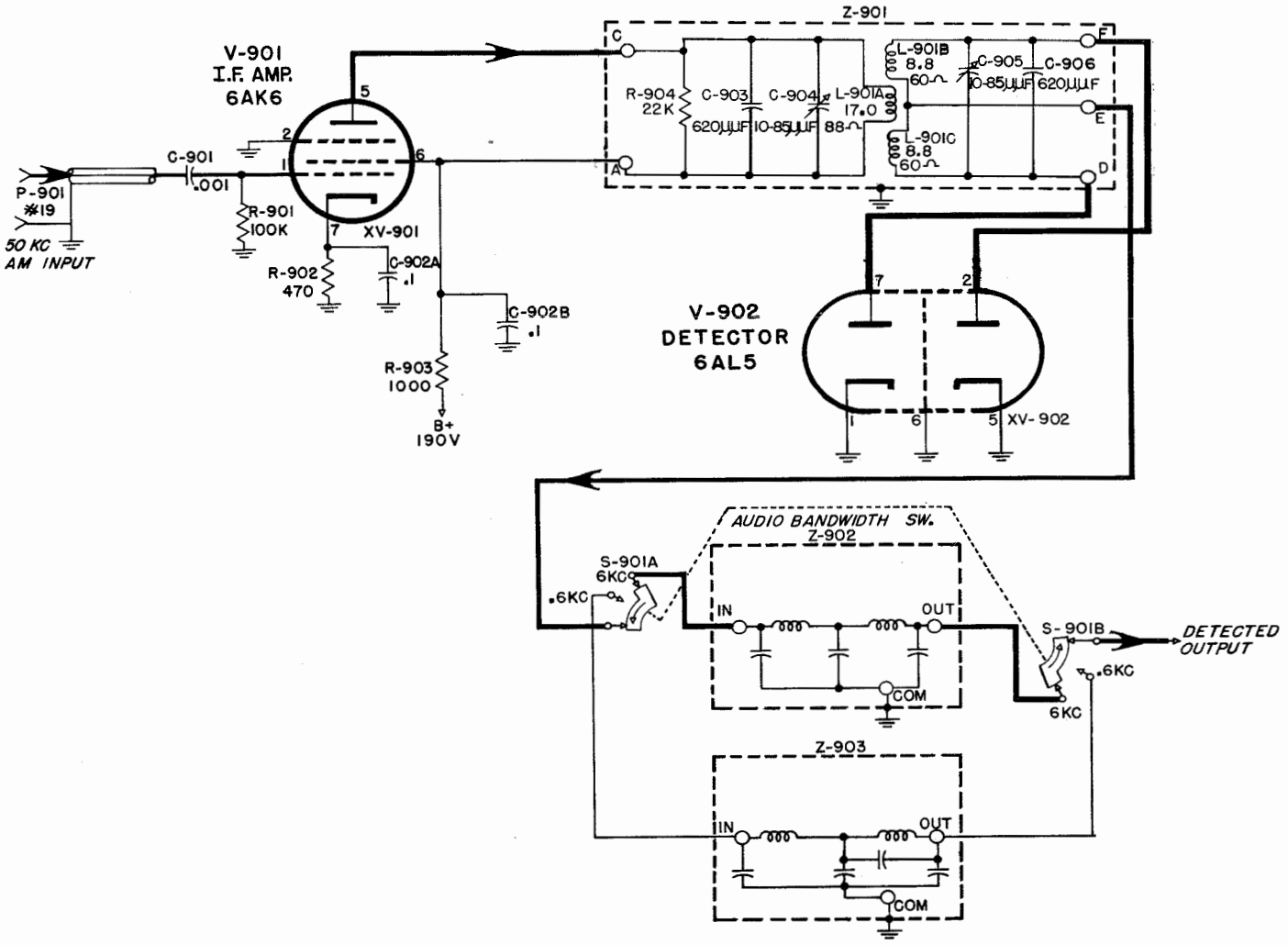


Figure 2–29. I.F. Amplifier V-901, Detector V-902 and Audio Filter Stages, Simplified Schematic Diagram

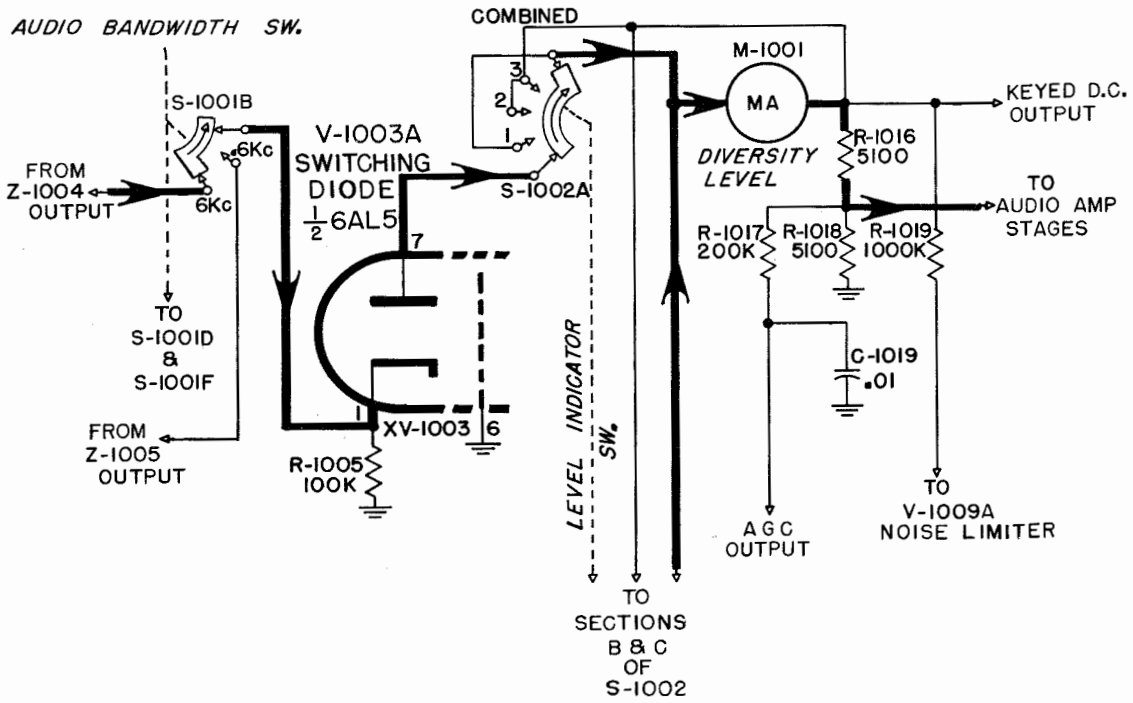


Figure 2–30. Switching Diode Stages, Simplified Schematic Diagram

symbol number designations. The 50-kilocycle I.F. output signal is connected into Amplifier-Detector AM-438/FRR-24 through input connectors J-1004, J-1008 and J-1009. The two-position three-section Audio Bandwidth switch S-1001 selects the proper bandwidth for the type of reception used.

(5) SWITCHING DIODE CIRCUIT DETAILS (AM-438/FRR-24). *(See Figure 2–30).*—Three switching diodes V-1003A, V-1003B and V-1008 are utilized in a resistive type circuit. The strongest signal will develop an equally strong D.C. signal voltage across the diode load resistors R-1016 and R-1018. A weaker input signal from either one or two of the channels in use will cause the associated switching diode tube or tubes to cease conducting as the stronger signal will place a higher negative voltage on the plate than on its cathode. In normal operating periods the Level Indicator switch S-1002 is left in the combined position. To monitor the signal level obtained from any one of the three signal input channels the Level Indicator switch can be set at the position corresponding to the channel to be monitored.

l. A.G.C. AND NOISE LIMITER CIRCUITS (AM-439/FRR-24).

(1) A.G.C. AND NOISE LIMITER CIRCUITS, V-706 *(See Figure 2–31).*—The rectified audio output from Z-702 is applied to the A.G.C. and noise limiter stages. The direct voltage present at the junction of the diode load resistors R-723 and R-722 is fed through filter resistor R-721 to the A.G.C. switch S-701 and in turn to the plate of the A.G.C. delay tube V-706A, one-half a type 6AL5. The delay or threshold voltage for this tube is controlled by the R.F. Gain control R-726. This voltage will not decrease below the lowest voltage obtained by the range of the R.F. Gain control (i.e. 3 volts). Due to the manner in which the R.F. Gain control is connected in the B-minus voltage divider network, a negative voltage within the range of approximately 3 to 15 volts may be applied to the cathode of V-706A. The R.F. Gain control functions as a threshold or carrier-off-noise-suppression (C.O.N.S.) control when the A.G.C. switch is at On. When the A.G.C. switch is at Fast, Medium or Slow retarding the R.F. Gain control toward zero reduces the receiver gain. The C.O.N.S. action is obtained by reducing the receiver gain manually to the minimum necessary to receive the desired signal. If the signal increases, A.G.C. action tends to hold the output constant. If the signal is turned off, the receiver gain can increase only to a value corresponding to the R.F. Gain control setting. If the R.F. Gain control has been retarded appreciably the gain will not be sufficient to bring noise up to an objectionable level. With conventional A.G.C. and no C.O.N.S. action, full receiver gain is applied to noise in the absence of a signal. Similarly for A1 reception the C.O.N.S. action provides cleaner keying by holding down the noise in the absence of a signal. The time constant of the A.G.C. action may be adjusted for slow, medium or fast (1, 0.1 or 0.01 second) by the setting of the A.G.C. switch S-701. In the A.G.C. Off position of this

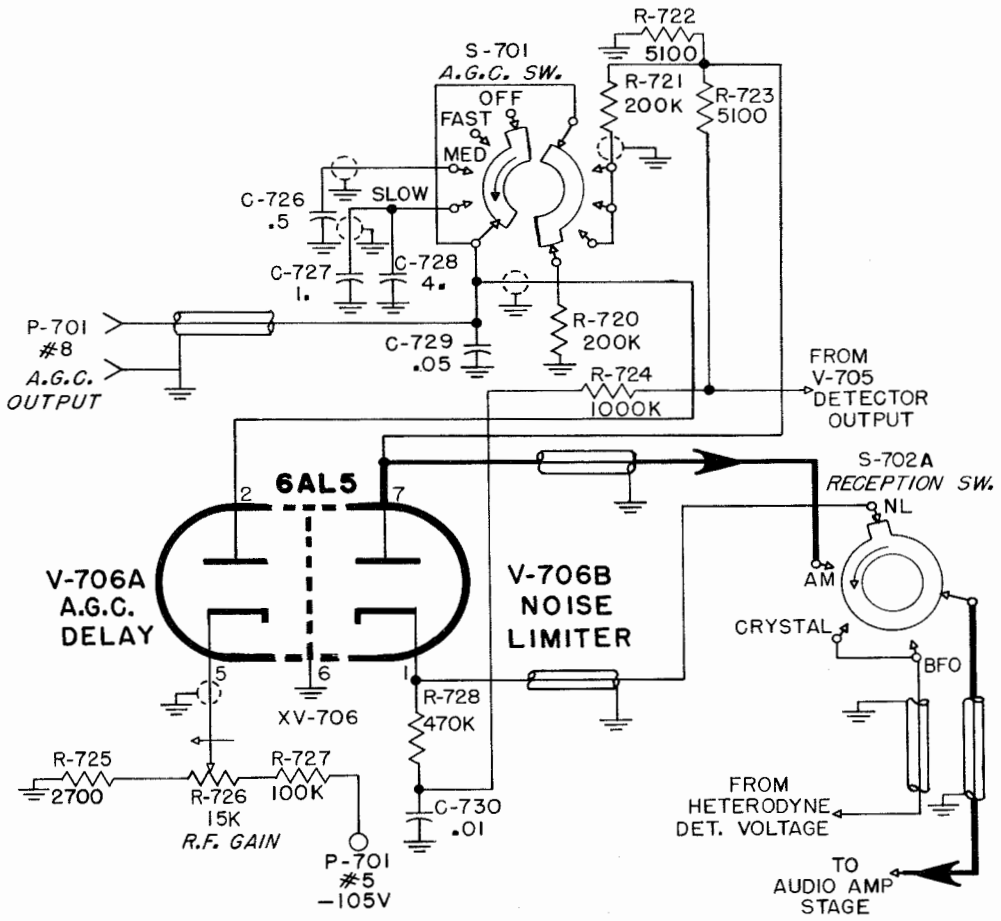


Figure 2–31. A.G.C. and Noise Limiter Stages V-706, Simplified Schematic Diagram

switch, a D.C. return to ground is furnished by R-720 for each of the stages normally receiving their A.G.C. voltage from this unit and control R-726 functions as an R.F. Gain control rather than a C.O.N.S. threshold control.

The Noise Limiter tube V-706B utilizes a conventional series-valve automatic threshold bias-type diode circuit that adjusts itself to the receiver carrier level. A front-panel mounted Reception switch is available for switching this circuit on or off. A negative voltage proportional to the carrier level is developed across capacitor C-730. This voltage cannot change rapidly due to the large values of resistor R-724 and capacitor C-730. The noise limiter diode acts as a conductor for the audio signal up to a point where its plate becomes negative with respect to its cathode. Noise peaks that exceed about 30% carrier-modulation level will drive the plate negative instantaneously and during this time the diode will not conduct. The large time constant of C-730 and R-724 prevents any rapid change in this reference voltage.

(2) A.G.C. DELAY AND NOISE LIMITER CIRCUIT DETAILS, V-903 (AM-440/FRR-24).—These circuits are identical in characteristics and operation to those described in preceding paragraph 3. 1. (1) except for symbol number designations.

(3) A.G.C. DELAY AND NOISE LIMITER CIRCUIT DETAILS, V-1009 (AM-438/FRR-24).—These circuits are identical in characteristics and operation to those described in paragraph 3. 1. (1) except for symbol number designations.

(4) A.G.C. BIAS CIRCUIT V-105 (Amplifier-Converter unit AM-450/FRR-24, AM-451/FRR-24, AM-453/FRR-24, AM-452/FRR-24). *(See Figure 2–32).*—Automatic gain control voltage is connected into the R.F. amplifiers through connector J-110. With the A.G.C. switch S-101 in the On position a negative automatic gain control voltage ranging from 3 to 15 volts is applied to the second and third R.F. stages. One-half of the A.G.C. bias tube V-105 is connected as a diode and provides a protective bias of minus 2.7 volts to the grids of the second and third R.F. stages in event the A.G.C. source is inadvertently removed. With the switch in the Off position a fixed bias is applied to V-102 and V-103 due to the manner in which the R.F. Gain control is connected in the B-minus voltage divider network. The bias voltage will range from a negative 3 volts to a negative 15 volts depend-

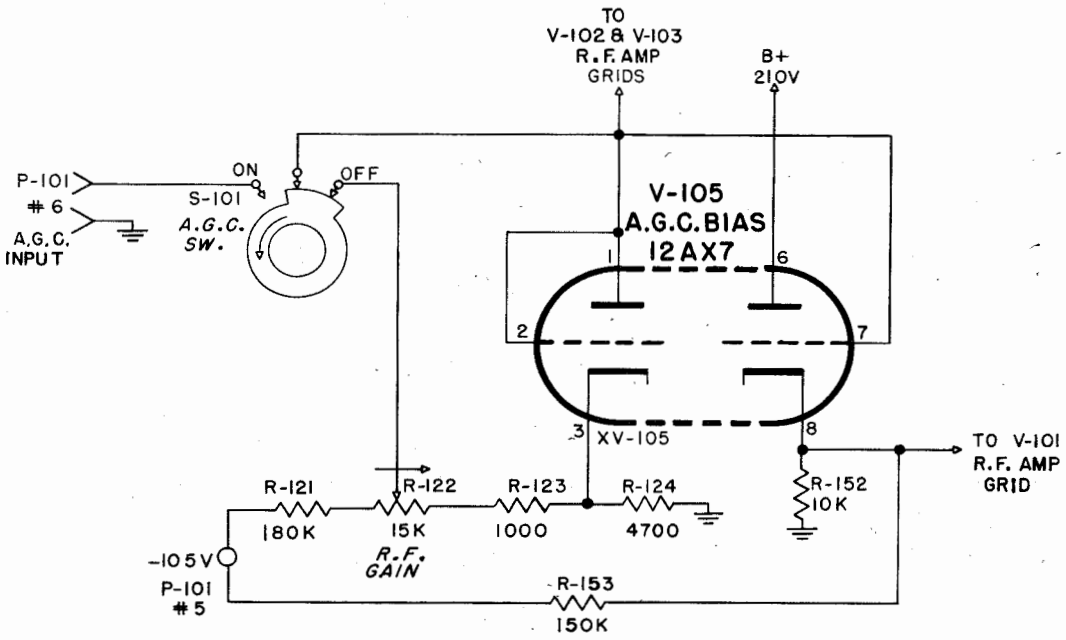


Figure 2–32. A.G.C. Bias Stage V-105, Simplified Schematic Diagram

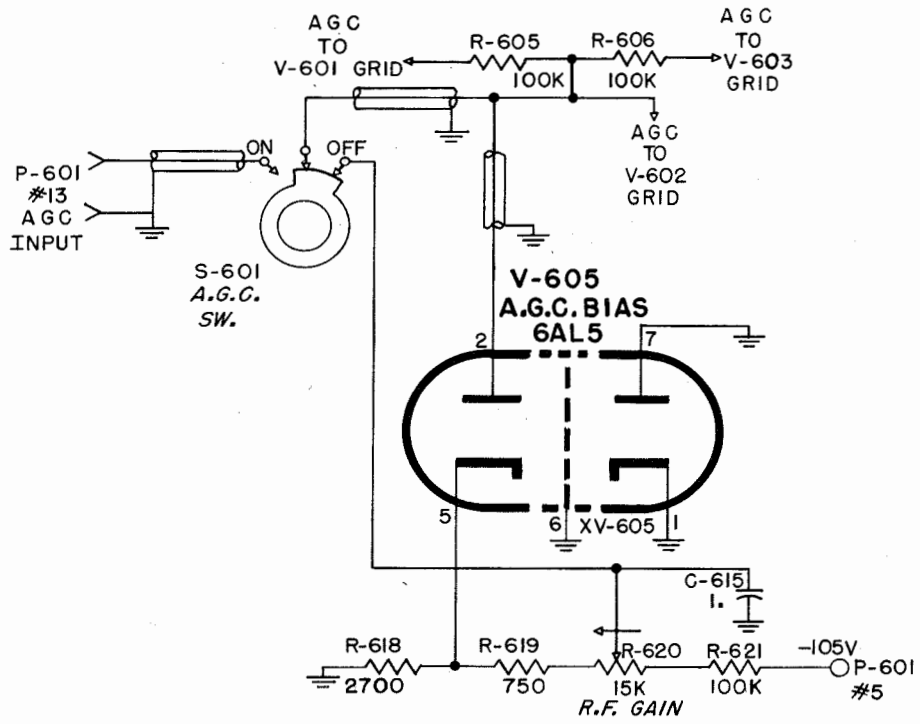


Figure 2–33. A.G.C. Bias Stage V-605, Simplified Schematic Diagram

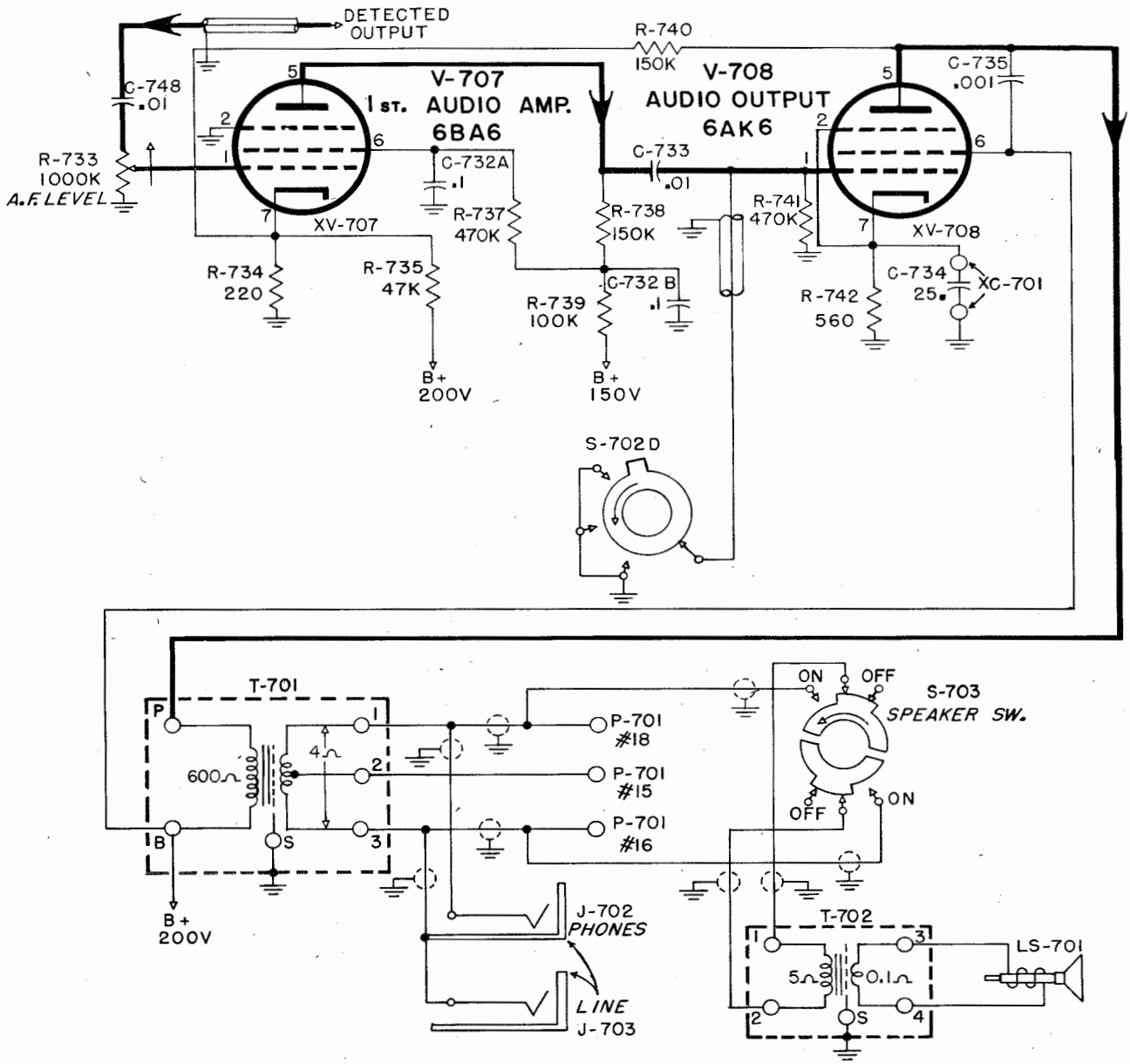


Figure 2–34. Audio Frequency Amplifier Stages V-707, V-708, Simplified Schematic Diagram

ing upon the setting of the R.F. Gain control R-122. The A.G.C. voltage is also connected to the grid of the other triode section of V-105. This triode section is connected as a cathode follower and is used to slide-back the A.G.C. voltage so that a minimum negative bias of 1 volt as required by V-101 is obtained instead of a negative 3 volts as required by V-102 and V-103.

(5) A.G.C. BIAS CIRCUIT, V-605 (AM-454/FRR-24). *(See Figure 2–33).*—Automatic gain control voltage is connected into the 50-kc. I.F. amplifiers through connector J-607. With the A.G.C. switch in the On position automatic gain control voltage is supplied to the grids of the I.F. tubes V-601, V-602 and V-603. With the switch in the Off position a fixed bias is applied to these stages from tube V-605 ranging from minus 3 to minus 15 volts depending on the setting of the R.F. Gain control R-620. With the switch in the On position a 2.8-volt protective bias is developed across R-618 and bias tube V-605 to prevent damage to the I.F. tubes in the event that the patching cable to the A.G.C. source is inadvertently removed.

m. AUDIO FREQUENCY AMPLIFIER CIRCUITS.

(1) AUDIO AMPLIFIER CIRCUITS, V-707 AND V-708 (AM-439/FRR-24). *(See Figure 2–34).*—The audio frequency amplifier consists of two stages of amplification using inverse feedback from the plate of

V-708, a type 6AK6, output amplifier tube to the cathode of V-707, a type 6BA6, first audio amplifier. The audio system serves to amplify the detected signal to a suitable level for the operation of phones, the built-in loudspeaker or transmission over telephone lines. The good fidelity and low distortion of the amplifier makes it suitable for its intended use. An output of 60 milliwatts into each of from one to five 600-ohm resistive loads in parallel is available. The output of the matching transformer T-701 is available from the front-panel mounted Phones or Line jack as well as through the three-pin Audio Output Connector J-707 located at the rear of the unit. For convenience in external line connections a center tap connection of T-701 is brought out through pin B of the Audio Output connector. An A.F. Level control R-733 is front-panel mounted to control the audio output. The cathode bias for the first audio amplifier is obtained through cathode resistor R-734. Additional positive bias is applied to the cathode through resistor R-735. Screen voltage is obtained through dropping resistor R-737 which is bypassed by capacitor C-732A. Plate voltage is obtained through plate load resistor R-738. The amplified audio voltage appearing across plate load resistor R-738 is applied through coupling capacitor C-733 across grid load resistor R-741 of the audio output tube V-708. Cathode bias of V-708 is obtained through cathode resistor R-742 which is bypassed by capacitor C-734. Plate voltage is obtained through the primary winding of transformer T-701. Switch S-703 turns the speaker on and off. Phones or line jacks can be used when the Speaker switch is in the On position.

Switch section S-702D is utilized as a click silencer by grounding the control grid of the audio output tube during those intervals of switch rotation when signal intelligence is not being applied to the audio system.

(2) AUDIO AMPLIFIER CIRCUITS, V-904 AND V-905 (AM-440/FRR-24).—These circuits are identical in characteristics and operation as those described in paragraph 3. m. (1) except for symbol number designations.

(3) AUDIO AMPLIFIER CIRCUITS, V-1010 AND V-1011 (AM-438/FRR-24).—These circuits are identical in characteristics and operation as those described in paragraph 3. m. (1) except for symbol number designations.

n. TONE KEYING CIRCUITS.

(1) D.C. AMPLIFIER CIRCUITS, V-1101 AND V-1102 (KY-62/FRR-24). *(See Figure 2–35).*—Three D.C. amplifier stages V-1101A, V-1101B, a duo-triode 12AX7 and V-1102, a type 6C4 triode, are employed to key the audio amplifier tubes V-1104 and V-1105 type 6AK6 pentodes in accordance with the incoming A1 or F1 radio-frequency signal. The maximum ampli-

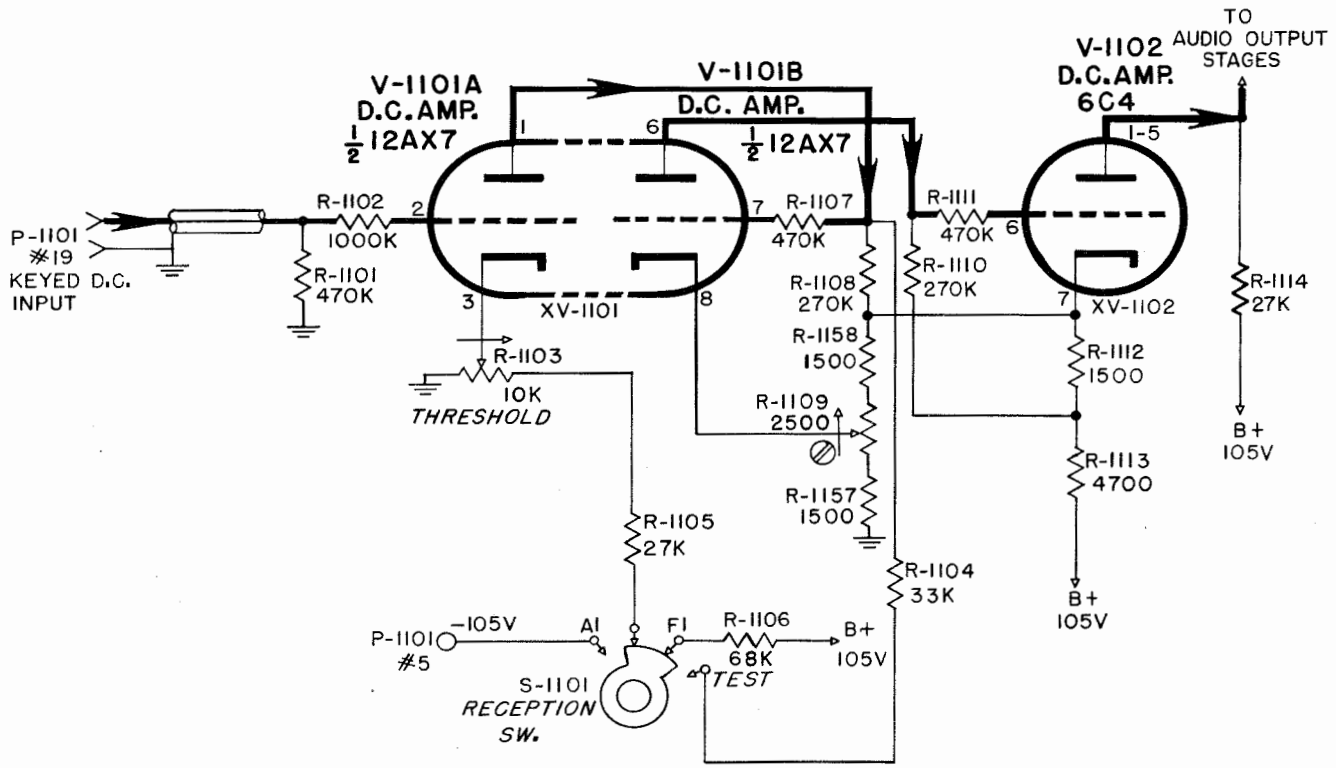


Figure 2–35. D.C. Amplifier Stages V-1101, V-1102, Simplified Schematic Diagram

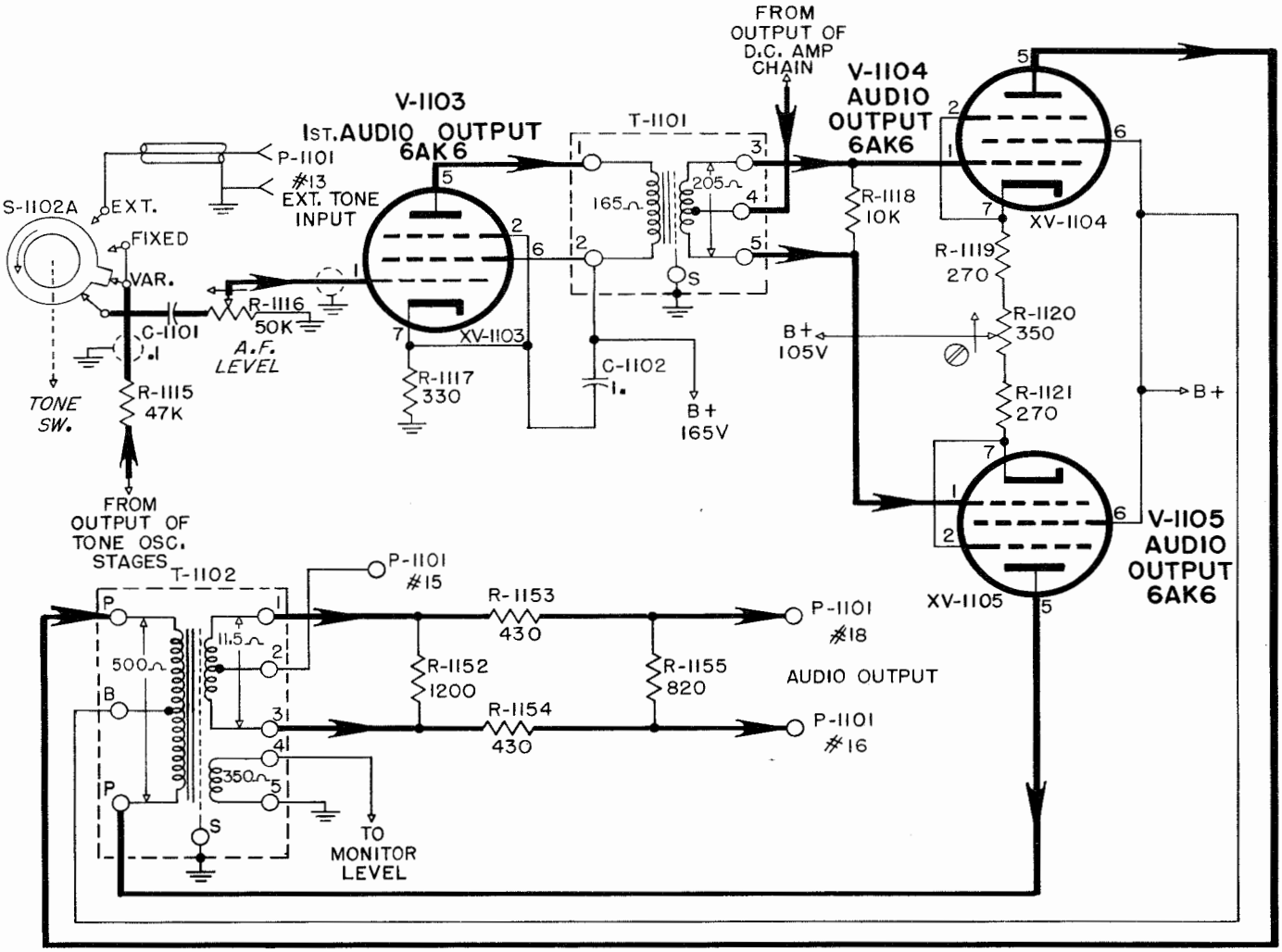


Figure 2–36. Audio Amplifier Stages V-1103, V-1104 and V-1105, Simplified Schematic Diagram

tude of the incoming A1 signals is approximately minus 6 volts on weak signals and minus 20 volts on strong signals. The maximum amplitude of F1 signals is plus 2.1 volts, ranging between plus 1.9 and plus 4 volts.

The incoming signal is directly coupled to the grid of the first D.C. amplifier tube V-1101A. The regulated plate voltage is applied through resistors R-1113, R-1112 and R-1108. Negative bias is obtained from an external source through resistors R-1105 and R-1103 for the reception of A1 signals. For the reception of F1 signals positive bias is obtained from an internal source through resistors R-1106, R-1105 and R-1103. The amount of bias voltage in each case is determined by the adjustment of the Threshold control R-1103. The setting of the Reception switch selects the correct bias polarity for the reception of the desired signals. In operation the Threshold control is adjusted to obtain the optimum in clean keying during varying conditions of fading. During initial adjustments adjustable resistor R-1109 is set to turn the tone off in the absence of an input signal. In F1 reception the same adjustment is made with the exception that fading is not considered. The output from the plate of V-1101A is directly coupled to the grid of V-1101B. Regulated plate voltage for this tube is applied through resistors R-1113 and R-1110. Bias voltage is developed across resistor R-1109. The output from the plate of V-1101B is directly coupled to the grid of V-1102 a type 6C4 tube. Regulated plate voltage for this tube is applied through resistor R-1114. Bias for V-1102 is applied through resistors R-1110 and R-1112. The output of V-1102 is fed to the center tap of the secondary winding of T-1101 the coupling transformer. The output of the coupling transformer is fed to the grids of a push-pull audio amplifier consisting of V-1104 and V-1105, type 6AK6 tubes. Cut-off bias for these tubes is developed across resistor R-1114; normal bias is developed across resistors R-1119,

R-1120 and R-1121.

During intervals when no signal is being received no bias voltage is developed across R-1110, hence the increased plate current of V-1102 flows through R-1114 across which the bias voltage for the output tubes is developed. This bias is sufficient to reduce the output of the audio tubes to zero. During intervals when a bias voltage appears on the input grid of V-1101 the plate current of V-1102 is reduced to zero, therefore the resulting bias applied to V-1104 and V-1105 is reduced to its normal value. Under this condition the audio output tubes function to amplify the output signal. Therefore, the keying of the audio tubes is accomplished by the conduction and non-conduction of these audio tubes.

With the Reception switch in the 'Test' position a positive voltage is applied to the grid of V-1101B which increases the plate current of this tube. The increase in V-1101B plate current causes a high negative potential to appear in the grid circuit of V-1102 resulting in the tube operating beyond its cutoff region. With V-1101B operating at cutoff, normal bias is applied to the output tubes V-1104 and V-1105 permitting them to function as amplifiers. The purpose of the 'Test' position is to set the internal or external tone level by adjusting the A.F. Level control R-1116.

(2) AUDIO AMPLIFIER STAGES V-1103, V-1104 AND V-1105 (KY-62/FRR-24). *(See Figure 2–36).*—The output of either the fixed or the variable tone oscillator or the external tone may be coupled through operation of the Tone switch S-1102 via coupling capacitor C-1101 and across the A.F. Level control R-1116 to the grid of the first audio output tube a type 6AK6. Cathode bias is developed across resister R-1117. Screen and plate voltages are obtained from the voltage divider network R-1144, R-1145 and R-1146 bypassed by capacitor C-1102. The plate voltage is applied through the primary winding of the coupling transformer T-1101. The output of T-1101 is fed directly to the grids of the audio output tubes. Cut-off bias for these tubes is developed across R-1114. Resistors R-1119 and R-1121 in conjunction with adjustable resistor R-1120 are used in a balancing circuit to reduce the amount of clicking caused during keying operation and provide normal bias. The output of the audio tubes is applied to the primary winding of output transformer T-1102. The secondary of T-1102 is fed into an attenuator composed of resistors R-1152, R-1153, R-1154 and R-1155 where the output power is reduced to 12 milliwatts. The output of the attenuator can be sent over land lines to equipment capable of operating from a 600-ohm source. The keyer is capable of operating at a maximum speed of 500-words-per-minute.

(3) MONITOR CIRCUIT, V-1110 (KY-62/FRR-24). *(See Figure 2–37).*—The monitoring stage utilizes a third winding of transformer T-1102 and a type 6AG5 pentode tube V-1110 connected as a triode. The purpose of this circuit is to permit monitoring of the output signals during operating periods. The third winding of T-1102 is connected to the grid of V-1110 through the Monitor Gain control R-1151. Cathode bias is developed across resistor R-1156. Plate voltage is obtained from a voltage divider network consisting of resistors R-1147, R-1148 and R-1149 and is connected into the plate circuit through the primary winding of output transformer T-1103. The voltage divider network is bypassed by capacitor C-1173B. The Phones jack is connected across the secondary winding of T-1103. The Monitor Gain control is used to set the output level at the Phones jack. The setting of this control does not affect the impedance matching or the amplitude of the output signal.

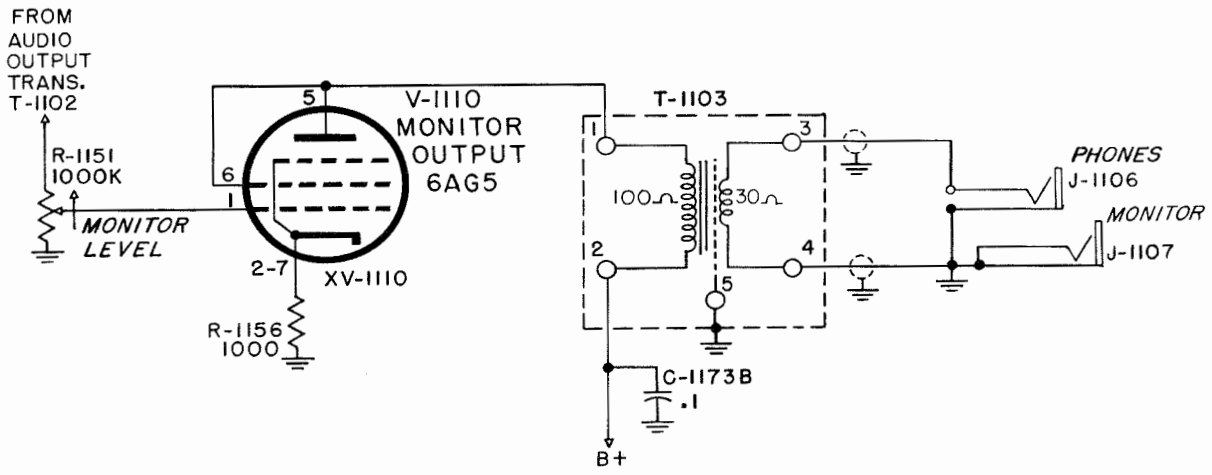


Figure 2–37. Monitor Circuit V-1110, Simplified Schematic Diagram

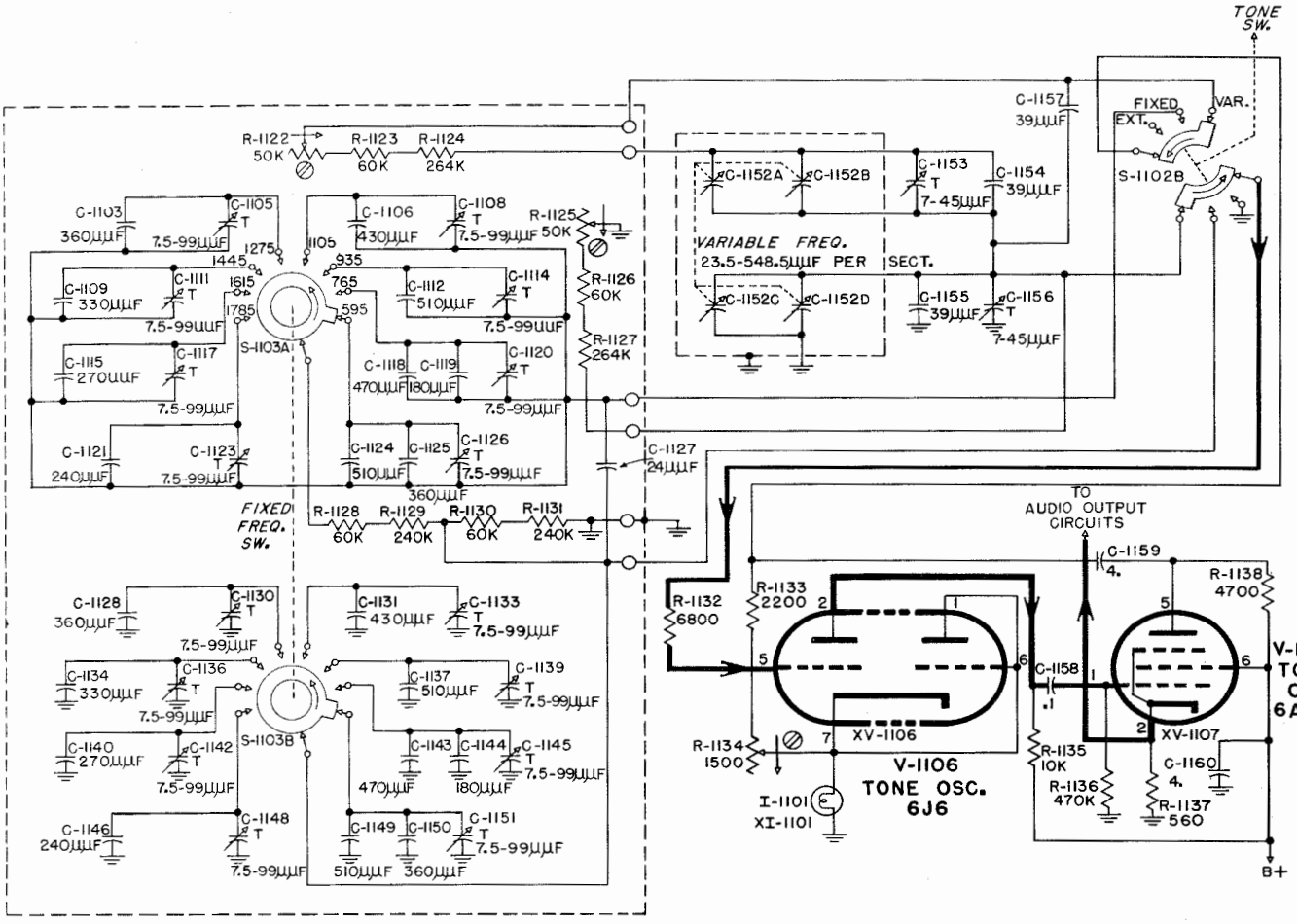


Figure 2–38. Tone Oscillator Circuits V-1106 and V-1107, Simplified Schematic Diagram

(4) TONE OSCILLATOR CIRCUITS, V-1106 AND V-1107 (KY-62/FRR-24). *(See Figure 2–38).*—The Tone oscillator consists of a two-stage feedback amplifier employing V-1106, a type 6J6 tube, and V-1107, a type 6AQ5 tube, in conjunction with a resistance-capacity network. A portion of the output of the tone oscillator V-1107 is fed back through potentiometer R-1134 to the cathode of V-1106. This degenerative network is not frequency sensitive but lamp I-1101 employed in the cathode is amplitude sensitive and acts to stabilize the oscillator at a particular voltage level. The phase-determining network in the grid circuit of V-1106, as selected by the front-panel mounted Tone switch and Fixed Frequency switch, fixes the frequency at which the oscillator will operate. In the variable position resistors R-1122, R-1123 and R-1124 are used in series with capacitors C-1152A, C-1152B, C-1153 and C-1154 to form a series resistor-capacity network. Capacitors C-1152C, C-1152D, C-1155 and C-1156 are used in parallel with resistors R-1127, R-1126 and R-1125 to form a parallel resistor-capacity network. The midpoint of these two networks is applied to the grid of the tone oscillator V-1106. The variable position allows tuning of the tone oscillator from 400 to 5000 cycles by adjustment of the Variable Frequency control C-1152. In the Fixed Frequency position resistors R-1128 and R-1129 are used in series with the capacitor network selected by the setting of the Fixed Frequency switch section S-1103A to form a series resistor-capacity network. Resistors R-1130 and R-1131 are used in parallel with the capacitor network selected by the setting of the Fixed Frequency switch S-1103B to form a parallel resistor-capacity network. The midpoint of these two networks is applied to the grid of the tone oscillator V-1106. Any one of eight fixed frequencies may be selected by the setting of the front-panel mounted Fixed Frequency switch. In the External position the internal tone oscillator is removed from the circuit and an external tone source up to 5000 cycles with an input level of at least 0.7 volt R.M.S. can be connected into the unit.

o. FREQUENCY SHIFT CIRCUITS.

(1) 50 KC. LIMITER V-1201 (CV-127/FRR-24). *(See Figure 2–39).*—A frequency-shift signal is fed in-

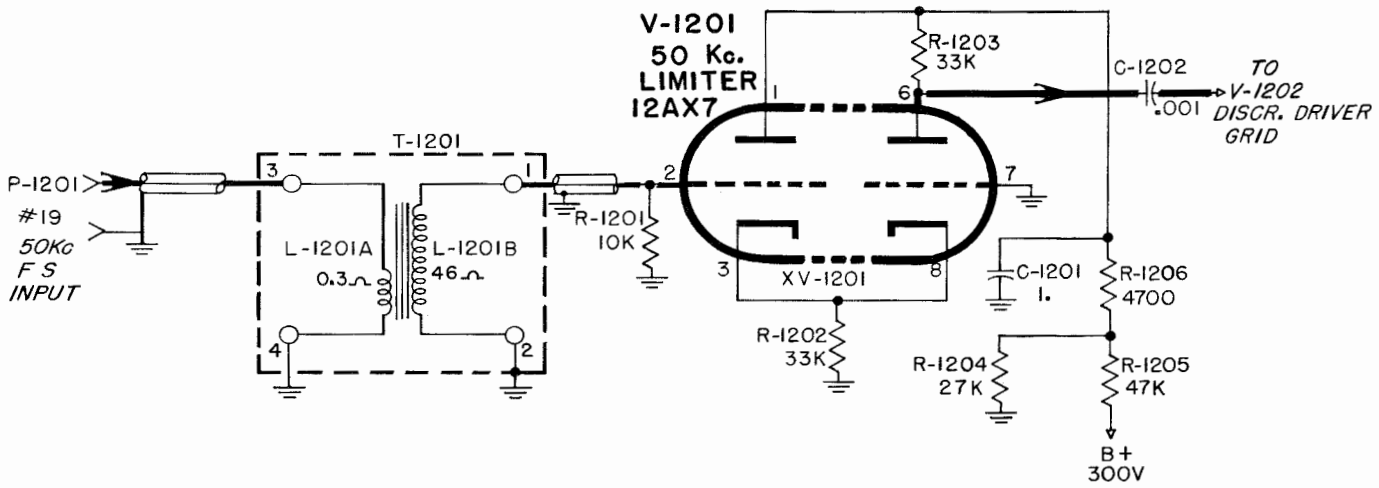


Figure 2–39. 50-kc. Limiter Stage V-1201, Simplified Schematic Diagram

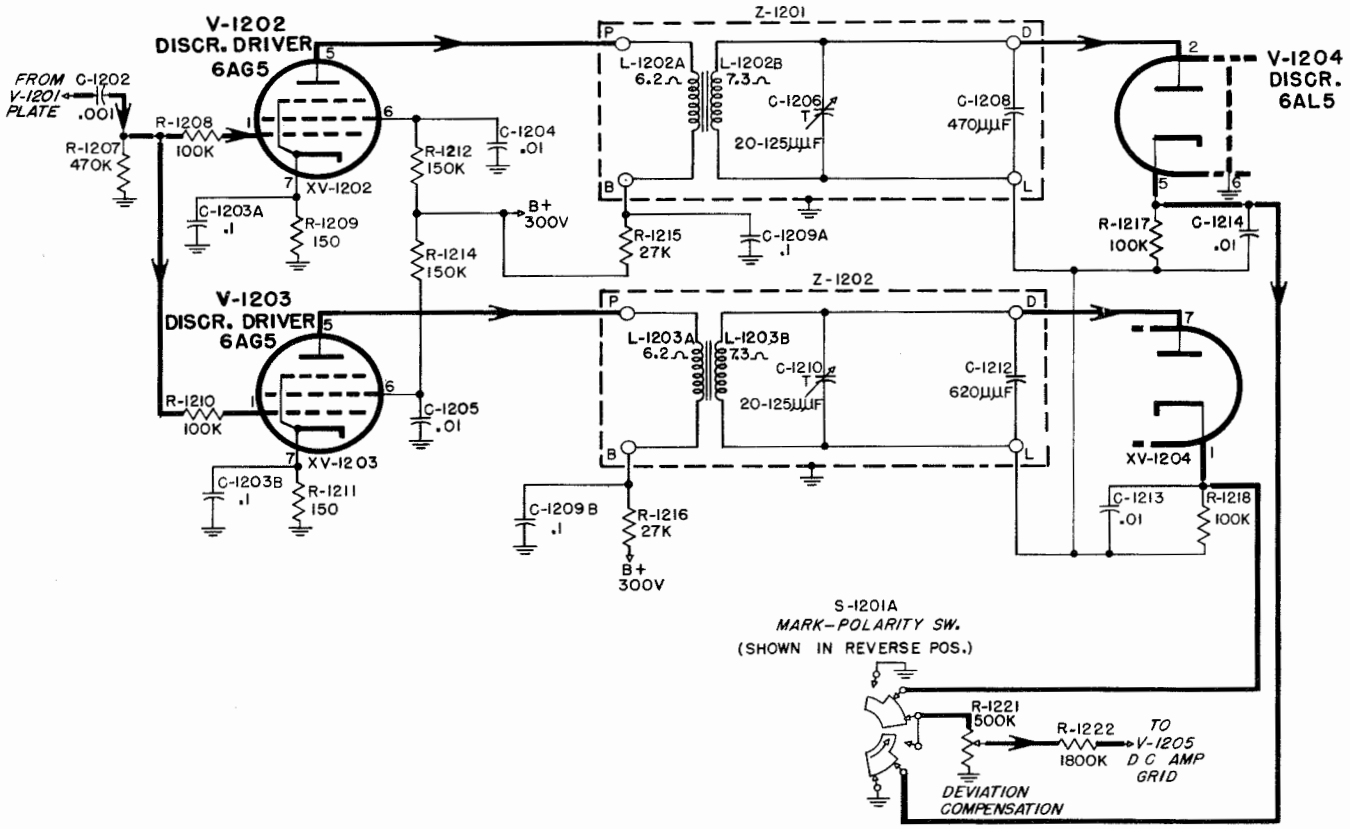


Figure 2–40. Discriminator Drivers V-1202, V-1203 and Discriminator V-1204, Simplified Schematic Diagram

to connector J-1206 of Frequency Shift Converter CV-127/FRR-24 from the 50-kc. I.F. amplifier circuits. From the input transformer T-1201 the signal passes through a transient-free limiter V-1201, a type 12AX7 dual triode tube. The limiter is utilized to remove amplitude modulation and noise from the input signal and to feed a constant amplitude signal to the grids of the discriminator drivers. The action of this limiter is similar to that of a diode limiter except that the input circuit does not draw power. The 50-kc. voltage is applied to the grid of the first triode section of V-1201. Due to cathode follower action of V-1201 the cathode of the first triode section follows the grid negative until the first section cuts off, thus clipping the negative swing of the applied voltage. The positive swing passes the first triode section unclipped but since it swings the combined cathodes of both tubes positive, it is clipped in the output triode section because the cathode of this section causes its grid to cut off the current beyond a maximum positive value of the cathode. Thus both excursions of the 50-kc. input voltage are limited to a constant amplitude. The output level of the output triode section is determined chiefly by the value of R-1203. By proper selection of the value of resistors R-1202 and R-1203, the limiting level is made the same for both positive and negative excursions of the input voltage. Plate voltage for V-1201 is obtained from the junction of bleeder resistors R-1205 and R-1204 through decoupling resistor R-1206 which is bypassed by C-1201.

(2) DISCRIMINATOR DRIVERS V-1202, V-1203 AND DISCRIMINATOR V-1204 (CV-127/FRR-24). *(See Figure 2–40).*—The constant amplitude output signal of limiter V-1201 is connected across grid load resistor R-1207 of the discriminator drivers V-1202 and V-1203 through coupling capacitor C-1202. Resistors R-1208 and R-1210 connected in the grid circuits of V-1202 and V-1203 are utilized as parasitic suppressors. Cathode bias for these two tubes is obtained through cathode resistors R-1209 and R-1211 which are bypassed by capacitors C-1203A and C-1203B. Screen voltage for V-1202 is provided through resistor R-1212 which is bypassed by capacitor C-1204. Screen voltage for V-1203 is provided through resistor R-1214 which is bypassed by capacitor C-1205. Each discriminator driver tube has a tuned circuit connected in its plate circuit whose secondary winding is connected to one of the diode sections of the discriminator tube V-1204, a type 6AL5 dual diode. Plate voltage for the discriminator driver tubes is obtained through the primary windings of these tuned circuits. The discriminator tuned circuits Z-1201 and Z-1202 are detuned approximately 3 kc. from the 50-kc. carrier frequency. One tuned circuit is tuned lower in frequency so that its diode load develops maximum output at a frequency lower than 50 kcs. The other tuned circuit is tuned higher in frequency so that its diode load develops maximum output at a frequency higher than 50 kcs. The two diode outputs are connected in series with their relative polarities so that their D.C. output voltages oppose. Also, the final adjustment of the tuned circuits is made so that the algebraic sum of their D.C. output voltages is zero at exactly 50 kcs. As the signal deviates from 50 kcs. the output voltage fed to the D.C. Amplifier V-1205 increases either positively or negatively depending on whether the frequency was increased or decreased. The direction of this polarity may be reversed by the Mark-Polarity switch S-1201. As explained later, the direction of the action of the frequency control tube V-1209 is reversed simultaneously. The polarity at this point is such that a negative voltage corresponds to Mark and a positive voltage to Space. This polarity is reversed before the output terminal is reached so that a positive voltage swing at the output connector J-1204 corresponds to Mark.

(3) D.C. AMPLIFIERS V-1205 AND V-1206 (CV-127/FRR-24). *(See Figure 2–41).*—The discriminator output voltage is connected through the Mark-Polarity switch section S-1201A to the grid of a D.C. Amplifier V-1205. The D.C. Amplifier V-1205 utilizes a type 12AX7 dual triode tube connected in a degenerative circuit that reduces the effect of heater voltage and tube characteristic changes to a minimum. A Deviation Compensation control R-1221 is provided as a means of regulating the discriminator output so that different frequency excursions of the signal frequency can be set to produce approximately plus or minus one-volt change in D.C. voltage on the arm of this control.

The amplified signal output of V-1205 is coupled through resistor R-1230 to the grid of the D.C. Amplifier V-1206, a type 6C4 triode connected as a cathode follower. The grid bias of V-1206 is adjusted by means of the Output Centering control R-1232. A positive voltage of approximately 13 volts at the cathode of V-1206 can be connected to either one of two low-pass filters as selected by the Keying Speed switch S-1202. Filter Z-1204 is utilized for single channel reception and has a cut-off frequency of approximately 180 cycles. Filter Z-1205 is utilized for quadruplex reception and has a cut-off frequency of approximately 600 cycles-per-second. At the output of the selected filter the no-signal voltage from the cathode bias of V-1206 has been reduced to approximately 5.8 volts positive which is equal to the D.C. Reference voltage appearing at the input connector J-1205. The gain of the D.C. amplifiers is such that the voltage at this point varies about plus

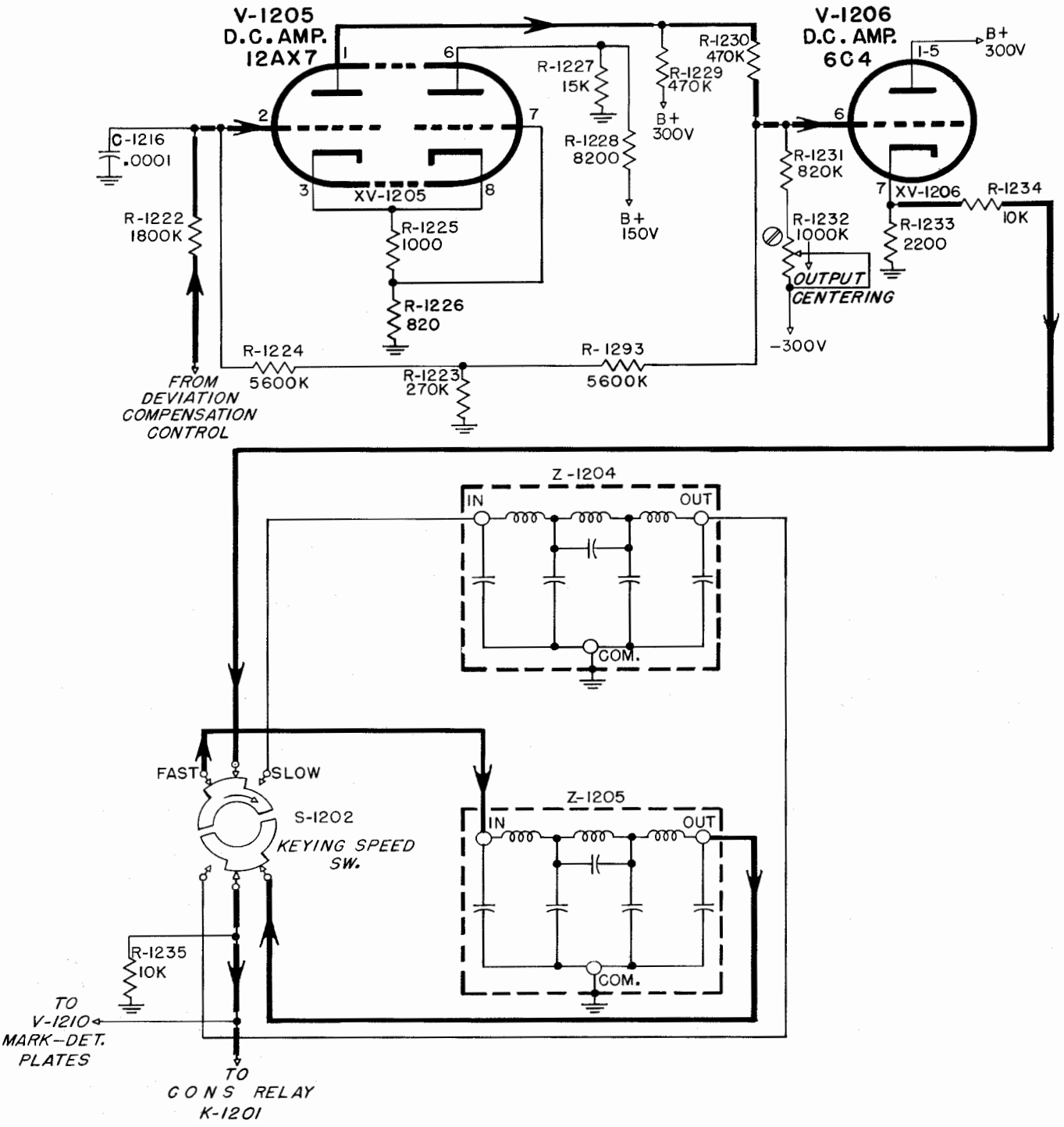


Figure 2–41. D.C. Amplifier Stages V-1205, V-1206, Simplified Schematic Diagram

and minus three volts from the D.C. reference of 5.8 volts when a signal is received. The output from the filter is connected to the output connector J-1204 through CONS relay K-1201. This output is also connected to the mark detector tube V-1210.

(4) MARK DETECTOR V-1210 (CV-127/FRR-24). *(See Figure 2–42).*—The mark detector tube V-1210, a type 6AL5 dual diode, in conjunction with the frequency control tube V-1209 are utilized to control the frequency of the oscillator V-1208. The no signal voltage at the input to V-1210 is 5.8 volts. When a signal is being received, the mark component increases this voltage approximately 3 volts to a maximum positive value of 8.8 volts charging the diode output capacitor C-1231 to this value plus the tubes contact potential of 0.4 volts. The value of

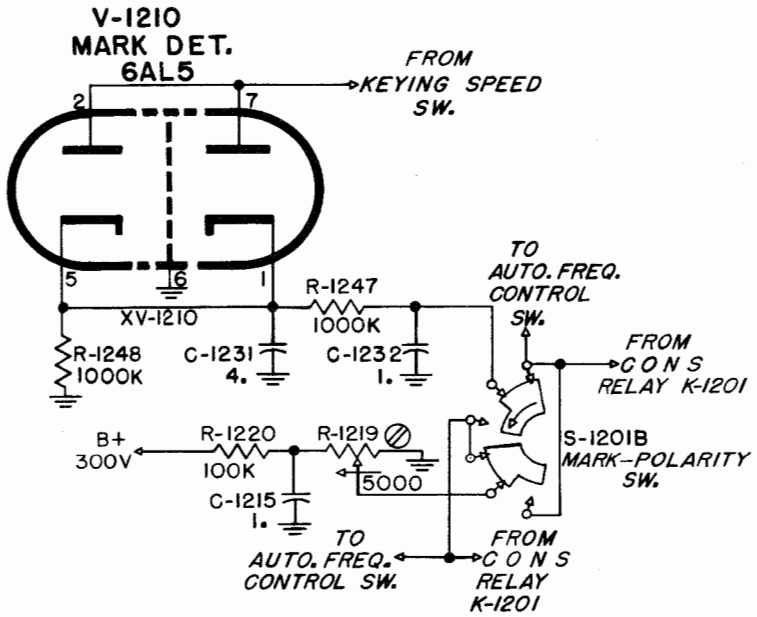


Figure 2–42. Mark Detector Stage V-1210, Simplified Schematic Diagram

9.2 volts is maintained during space reception by the long time constant of the diode output load circuit, i.e., resistors, R-1247, R-1248 and capacitor C-1232. This value is also maintained during periods of no transmission as the transmitter is then held on mark. If the input signal changes, the voltage applied to the mark detector plates moves upward or downward from the normal 8.8 value. The mark detector cathode follows this change and its 9.2 volt output is applied to the proper grid of the frequency control tube V-1209. The output of V-1209, which is connected in the grid circuit of V-1208, causes the 1700-kc. oscillator output frequency to change. The change in the 1700-kc. oscillator output frequency causes the 50-kc. signal output of the first I.F. amplifier stages to change thus bringing the output voltage back to its 8.8 value again.

(5) FREQUENCY CONTROL, V-1209 (CV-127/FRR-24). *(See Figure 2–43).*—The mark detector voltage is connected to the grid of one triode section of the frequency control tube V-1209, a type 6J6 dual triode, by way of the Mark Polarity switch section S-1201B. The grid of the other triode section of V-1209 is supplied a constant positive voltage through potentiometer R-1219. Potentiometer R-1219 is adjusted to 9.2 volts so that with a correct signal frequency the grids of both triode sections of V-1209 have equal positive potentials. These potentials applied to the two grids of V-1209 are reversed by the Mark Polarity switch S-1201 when that switch reverses the polarity of the discriminator voltages of V-1204. Reversing the polarity of both grid potentials keeps the action of the frequency control V-1209 in the proper direction regardless of the polarity of the mark and space signals. The frequency control tube can be disabled by setting the Automatic Frequency Control switch S-1203 at Off. With switch S-1203 set at Off, both grid circuits of V-1209 are connected together.

The frequency control tube V-1209 functions as a reactance modulator. It is connected across the tuned circuit of oscillator V-1208. The reactance modulator functions as an amplifier whose input capacity can be varied by changing the amplifier gain and consequently changes the 1700-kc. oscillator frequency accordingly. Section A of V-1209 (consisting of triode section 2, 5, and 7) is a cathode follower type of amplifier and section B of V-1209 (consisting of triode section 1, 6, and 7) functions to control the gain of section A in accordance with the voltage on the grid of section B. The input of the cathode follower amplifier is made to look capacitive by connecting capacitor C-1225 between the input (the grid) and the output (the cathode). If the amplifier had zero gain the cathode would be essentially at ground R.F. potential and the input capacity would appear to be C-1225. If the amplifier had unity gain the cathode and grid would be at the same R.F. voltage and phase. In this condition capacitor C-1225 would have no potential difference between its terminals and would appear as though it had been removed from the circuit. The amplifier input capacity would in this case appear to be that due to the tube capacities alone. Since the cathode follower gain always ranges

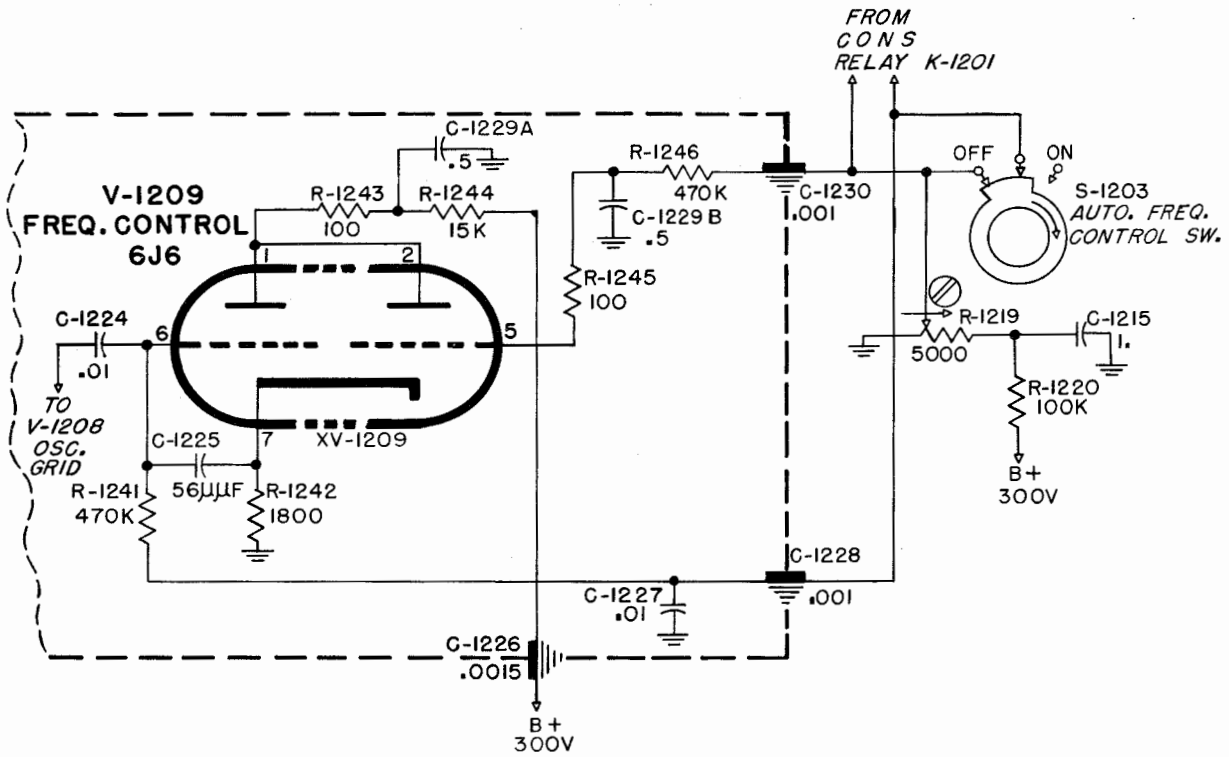


Figure 2–43. Frequency Control V-1209, Simplified Schematic Diagram

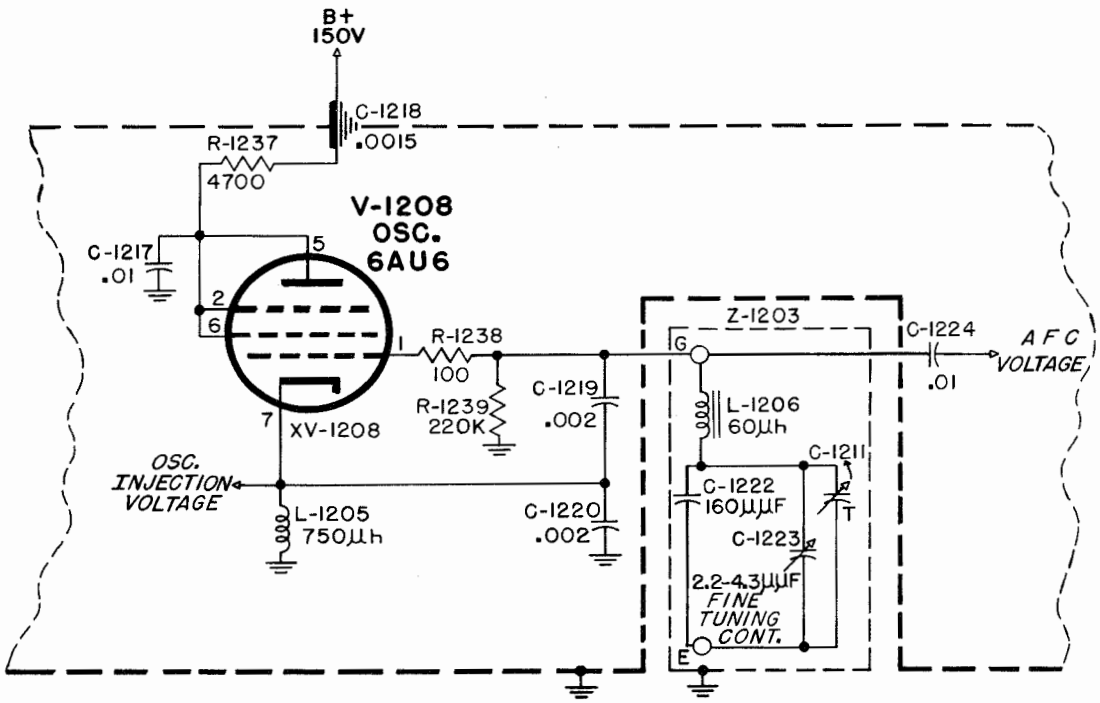


Figure 2–44. Oscillator V-1208, Simplified Schematic Diagram

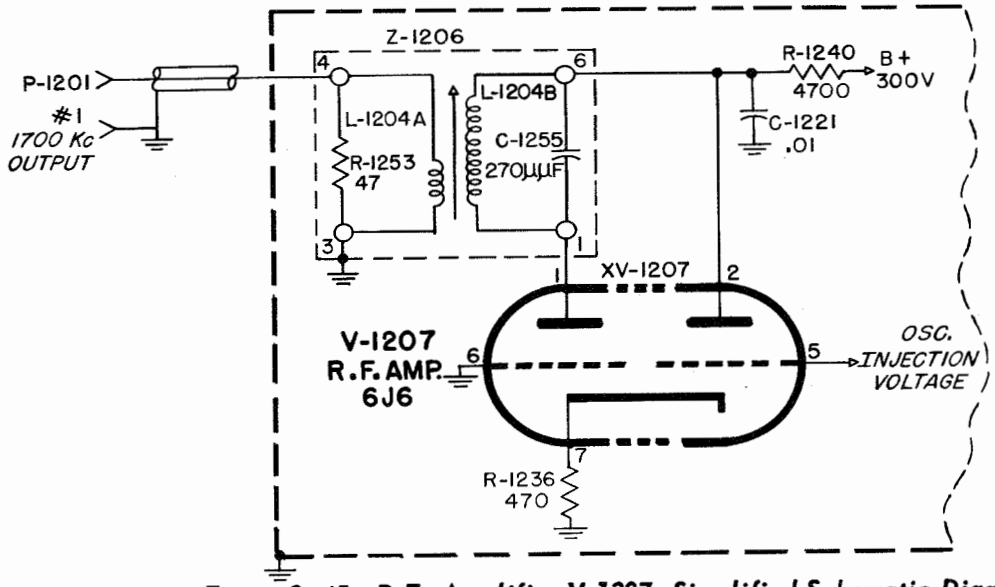


Figure 2–45. R.F. Amplifier V-1207, Simplified Schematic Diagram

between 0 and 1, corresponding percentages of C-1225 appear to be connected across the 1700-kc. oscillator circuit and consequently change its frequency accordingly. Actually the cathode follower gain is controlled by the bias on the grids of both triode sections.

(6) OSCILLATOR V-1208 (CV-127/FRR-24). *(See Figure 2–44).*—Oscillator V-1208, a type 6AU6 pentode, is connected in a highly stable series tuned circuit. The oscillator tuned circuit consists of C-1222, C-1223 and C-1211 in series with L-1206, C-1219 and C-1220. The voltage drop across C-1219 and C-1220 provide the feedback necessary for operation. Capacitors C-1219 and C-1220 are very large in comparison to C-1222, C-1223 and C-1211 thereby causing very loose coupling between the tube and the tuned circuit and providing a very high Q circuit. The values of C-1219 and C-1220 are large compared with the grid-to-cathode and plate-to-cathode capacitance of the 6AU6 and as a result any change in the capacitance of these capacitors due to voltage variations or heating effects become negligible. Resistor R-1239 is the grid resistor and R-1238 a parasitic suppressor. Plate and screen voltage is applied from voltage regulator tube V-1211 through resistor R-1237. The oscillator tuned circuit is completely shielded and its frequency can be adjusted from the front-panel by means of the Fine Tuning control C-1223. The nominal output frequency of the oscillator is 1700 kilocycles. The automatic frequency control circuit varies this frequency over a ±2.5 kc. range so that the I.F. output frequency is held constant at 50 kc.

(7) R.F. AMPLIFIER V-1207 (CV-127/FRR-24). *(See Figure 2–45).*—The output of oscillator V-1208 is connected to the R.F. amplifier V-1207, a type 6J6 dual triode. R.F. transformer Z-1206 is tuned to the oscillator frequency of 1700 kilocycles by means of an iron core tuning adjustment. The output of Z-1206 is connected to the output connector J-1203. It may then be used as the oscillator injection voltage to the mixer tube of the second frequency conversion circuit.

(8) OSCILLOSCOPE CIRCUIT DETAILS (CV-127/FRR-24). *(See Figure 2–46).*—An oscilloscope consisting of V-1216, a type 2BP1 cathode ray tube, and associated circuits is utilized to properly monitor the signal circuits. Included in this monitoring circuit are a vertical amplifier V-1213, a horizontal sweep oscillator V-1214 and a horizontal amplifier V-1215. An Oscilloscope Selector switch S-1204 provides a means of completing the circuit connections necessary for calibration adjustment and monitoring of the oscilloscope and signal circuits. A voltage divider between plus 300 volts and minus 300 volts supplies all necessary voltages for anodes no. 1 and no. 2. Focusing is accomplished by means of potentiometer R-1285.

(a) HORIZONTAL SWEEP OSCILLATOR V-1214 (CV-127/FRR-24).—The horizontal sweep oscillator V-1214 employs a type 2D21 gas-filled tetrode in a circuit which functions to generate a sawtooth sweep voltage for application to the horizontal amplifier V-1215.

During operation capacitor C-1235 gradually charges through resistor R-1275 until the capacitor charge reaches the potential required to fire the gas-filled sweep oscillator tube. The tube then conducts, discharging capacitor C-1235 through the current limiting resistor R-1274 and the low impedance path presented

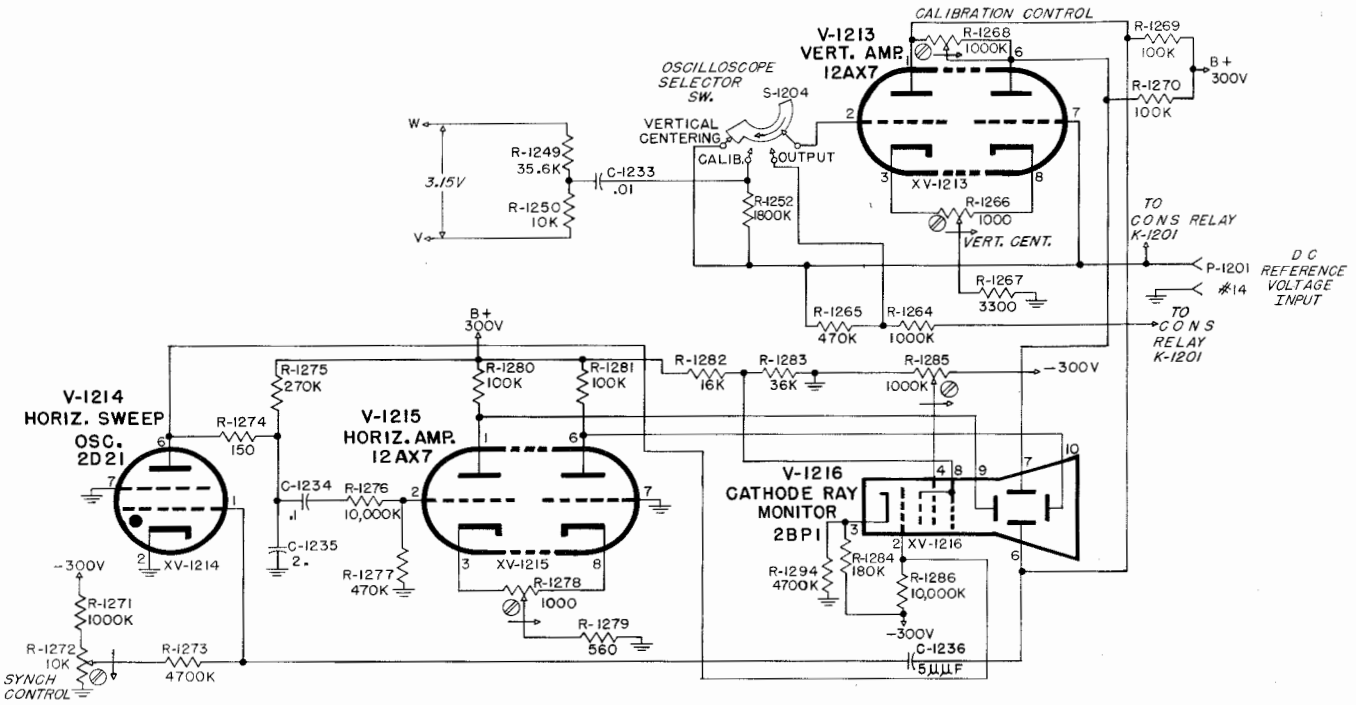


Figure 2–46. Oscilloscope Circuits, Simplified Schematic Diagram

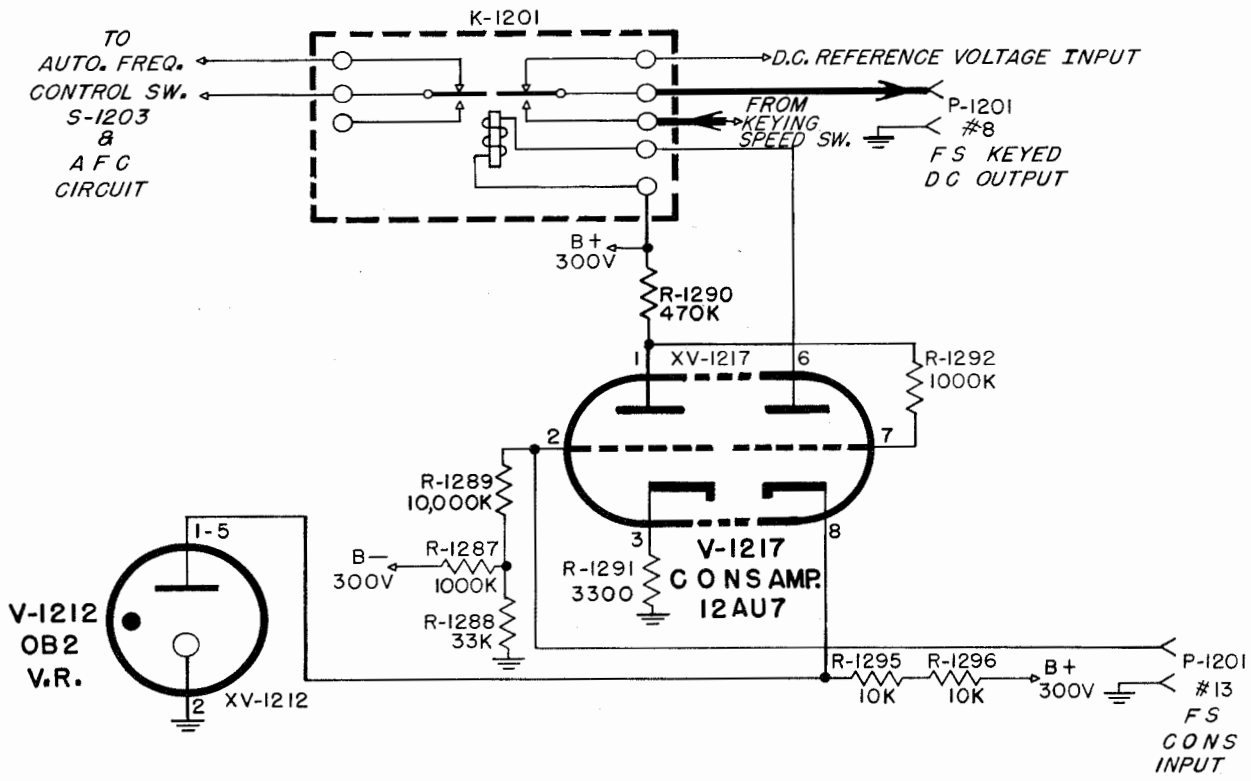


Figure 2–47. CONS Amplifier V-1217, Simplified Schematic Diagram

by the tube. When the capacitor charging potential drops below the firing potential of the tube, conduction ceases and the capacitor recharges. The RC time constant of C-1235 and R-1275 have been chosen so as to provide a sweep rate of approximately twelve cycles-per-second. Synchronizing voltage is connected into the grid of V-1214 from the vertical deflection plate of V-1216 to lock-in the oscillator at a submultiple of the vertical sweep frequency. The grid bias of V-1214 is adjusted by the Synch control R-1272.

(b) HORIZONTAL AMPLIFIER V-1215 (CV-127/FRR-24).–The saw-tooth voltage generated by V-1214 is coupled through capacitor C-1234 and resistor R-1276 to the control grid of the horizontal amplifier V-1215, a type 12AX7 dual triode. The use of a dual triode tube provides suitable amplification of the input voltage. A variable potentiometer R-1278 is connected in the cathode of the tube to regulate the cathode bias and change the relative plate potentials of V-1215 to control the horizontal position of the oscilloscope pattern.

(c) VERTICAL AMPLIFIER V-1213 (CV-127/FRR-24).–The vertical amplifier V-1213 utilizes a type 12AX7 dual triode tube in a circuit similar to the horizontal amplifier V-1215. In normal operation a part of the voltage output from filter Z-1204 or Z-1205 is connected through the Oscilloscope Selector switch S-1204 to the input grid of V-1213. Calibration control R-1268 is mounted on the front panel to permit gain adjustment of this stage. Also mounted on the front panel is the Vertical Centering control R-1266 which functions to position vertically the oscilloscope pattern by regulating the bias placed on the cathodes of both triode sections of V-1213. The amplified output of V-1213 is applied to the vertical plates of the cathode ray tube.

(d) CATHODE RAY MONITOR V-1216 (CV-127/FRR-24).–A type 2BP1 cathode ray tube, V-1216, is used to visually depict the signal for monitoring purposes. A ruled transparent screen is mounted in front of the cathode ray tube to provide a means of comparatively calibrating the magnitude of incoming signals. A variable potentiometer R-1285 is mounted on the chassis to provide a means of properly focusing the screen pattern.

Before the oscilloscope tube can be used for monitoring purposes it must first be properly adjusted. The D.C. reference voltage of 5.8 volts supplied at connector J-1205 is used as a reference level. Another reference voltage is supplied for calibrating purposes. One reference point is labeled 'W' on the schematic diagram and is taken from one side of the 6.3 volt heater voltage supplied to the unit at pin F of connector J-1208. The other reference point labeled 'V' is at ground potential but is not grounded directly in this unit to avoid undesired chassis current effects. The A.C. voltage between 'W' and 'V' appears across the voltage divider R-1249 and R-1250 which places a peak voltage of 1.0 volt on the Calibrate contact of S-1204 for calibrating purposes.

(9) CONS AMPLIFIER V-1217 (CV-127/FRR-24). *(See Figure 2–47).*–The CONS amplifier V-1217, a type 12AU7 dual triode, functions as a D.C. amplifier which operates relay K-1201. When a signal is being received a negative potential of approximately six volts appears at connector J-1207 due to a negative voltage developed by rectification of the signal carrier in the 50-kc. I.F. amplifiers. As a result, a good signal will lower the voltage on the grid of the first triode section of V-1217 causing it to draw less current. The grid of the second triode section will go positive causing this section of the dual triode to draw sufficient current to energize relay K-1201. When relay K-1201 becomes energized one set of contacts closes and removes the reference voltage from the output connector J-1204 and connects the filter output in its place. The other set of relay contacts also closes removing the short between the two grids of V-1209 thus permitting the tube to assume its normal function. If the signal fails the voltage supplied to the CONS amplifier V-1217 will be lowered to a point insufficient to energize the relay. With no signal output or with a signal of insufficient amplitude to cause the relay to become energized, the output of the filters is removed from connector J-1204 and the D.C. Reference voltage of 5.8 volts supplied at connector J-1205 will be connected in its place.

(10) COMBINING DIODE CIRCUIT, V-1301, V-1302, V-1303 AND V-1304 (CM-32/FRR-24). *(See Figure 2–48).*–The keyed output of three Frequency Shift Converters are applied to the combining diodes in Comparator-Keyer CM-32/FRR-24 through connectors J-1304, J-1306 and J-1307.

The setting of the Channel A Input switch determines the mode of operation i.e., for the reception of one or two separate messages. During single-channel operation combining diode V-1304 normally handles the signal. During diversity operation combining diodes V-1301, V-1302 and V-1303 operate in triple diversity depending on the number of channels fed into the unit.

The input signal is supplied from a resistance coupled cathode follower and its average (or DC) level is 5.8 volts. The keyed signal superimposed on this voltage is plus and minus 3 volts. All combining diode halves are arranged in two different polarities to compare separately the amount of positive (Mark) or negative (Space) swing on each signal. Each input is connected to a diode cathode and a diode plate.

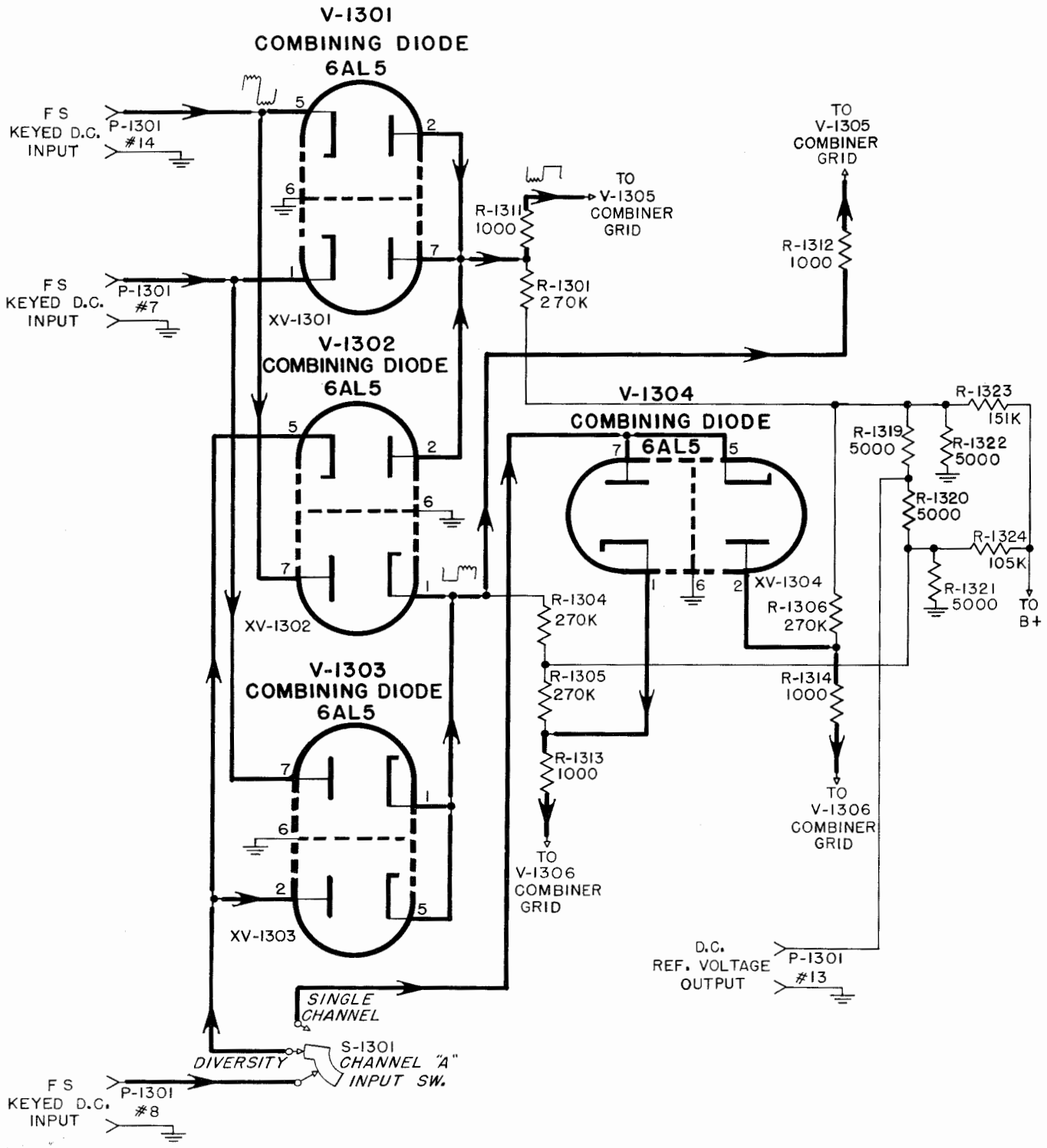


Figure 2–48. Combining Diode Stages V-1301, V-1302, V-1303, V-1304, Simplified Schematic Diagram

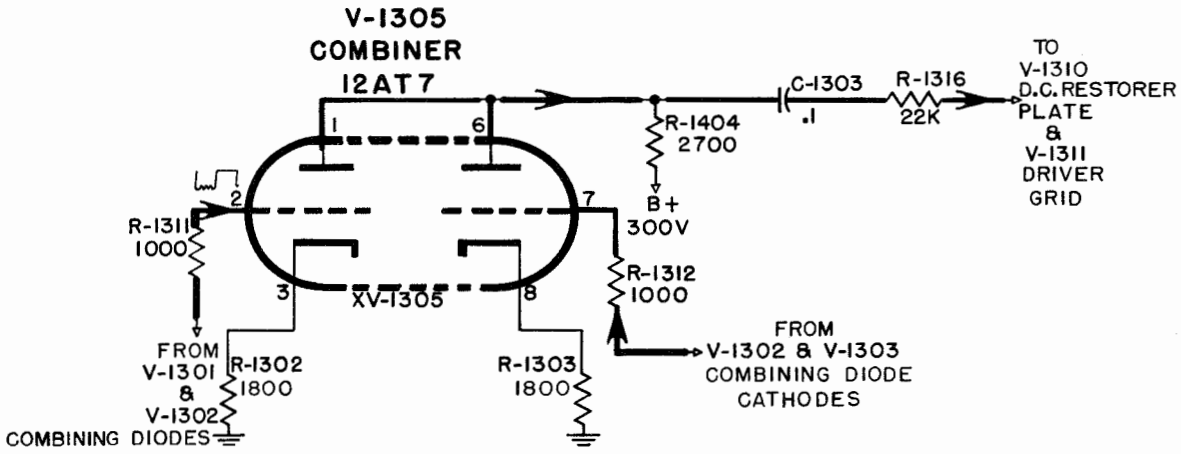


Figure 2–49. Mark-Space Combiner Stages V-1305, V-1306, Simplified Schematic Diagram

Referring to the input end of the diodes, the positive going signal will conduct plate to cathode while negative going signals will conduct from cathode to plate. The combining output plates are in parallel and utilize resistor R-1301 as their plate load while the output cathodes are also in parallel and their cathode load consists of resistor R-1304. A back bias is provided for the output circuit which consists of plus 0.6 volts for the cathode and minus 0.6 volts for the plates. The input signal must overcome this bias before conduction can take place. The strongest input signal will be the dominating signal. It should be noted that although these combining diodes do combine different channels, they separate the mark from the space since their diodes cannot conduct backwards. The reference voltage is derived from a regulated DC source with a resistance network which fixes the value of the mid-point bias at 5.8 volts which is the same value as the input circuit. This voltage is brought to connector J-1309 to be distributed to the Frequency Shift Converters as 'reference voltage'. The diode back bias of minus 0.6 volts is developed across R-1319 and plus 0.6 volts across R-1320.

(11) MARK-SPACE COMBINERS V-1305 AND V-1306 (CM-32/FRR-24). *(See Figure 2–49).*–Two separate combiners are provided, one for each channel. Each combiner operates in the same manner thus the following description of combiner V-1305 is also applicable to the other combiner V-1306.

The mark-space combiner consists of V-1305, a type 12AT7 dual triode, which is basically operated as a D.C. amplifier with its plates connected in parallel. Its function is to combine the positive and negative input signals applied to respective triode sections into one signal containing all the desirable information necessary to operate the driver stage that follows. The triode section composed of pins no. 1, 2 and 3 is designed to receive the negative or Space signal while the other triode section will receive the positive or Mark signal.

Each triode is individually biased. The combined Mark-Space signals appear across the plate load resistor R-1404. A signal capable of fully operating the combiner develops 6 volts change from Mark to Space at the plate of the combiner. There is a phase reversal in the combiner which interchanges the polarity of the Mark and Space at the output of the combiner.

(12) D.C. RESTORERS, V-1310 AND V-1318 (CM-32/FRR-24). *(See Figure 2–50).*–The following description of the D.C. restorer V-1310 is also applicable to the other D.C. Restorer V-1318. Up to this point the signal has been carried through with amplification not only of its swings but also of its average level. However, the output of a long string of D.C. amplifiers generally drifts considerably in D.C. level. The drift of the transmitter sending the message may shift the average D.C. level to approach the Mark side of the signal or the Space side of the signal depending upon the direction in which the drift occurs. The keying system would be very erratic and unstable resulting in errors if maintained under these conditions. To avoid this, the DC string is now broken by capacitor C-1303. A D.C. restorer V-1310 a type 6AL5 dual diode is inserted to maintain the correct average level. One diode section conducts in the negative direction to ground, the other conducts in the positive direction to a low impedance source, of plus 3.5 volts, which is the voltage developed across R-1342. The two diodes are then connected across the signal line. As long as the signal stays within this region of zero to 3.5 volts the diodes remain open and the average level can wander about at will.

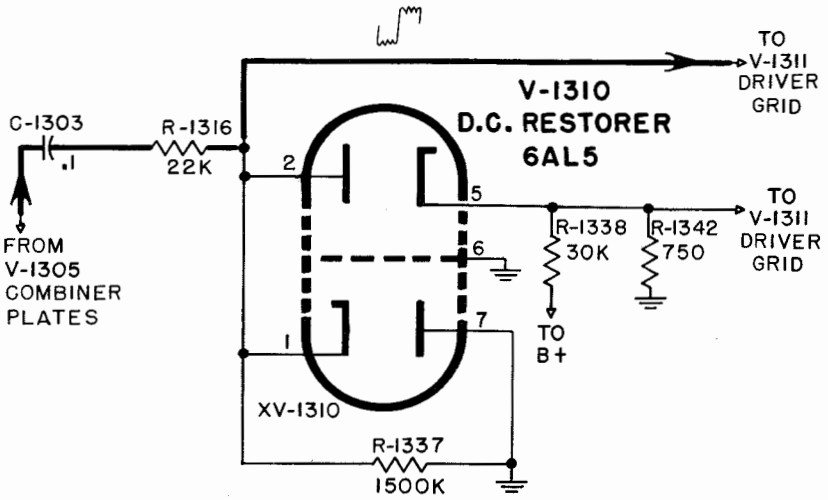


Figure 2–50. D.C. Restorers V-1310, V-1318, Simplified Schematic Diagram

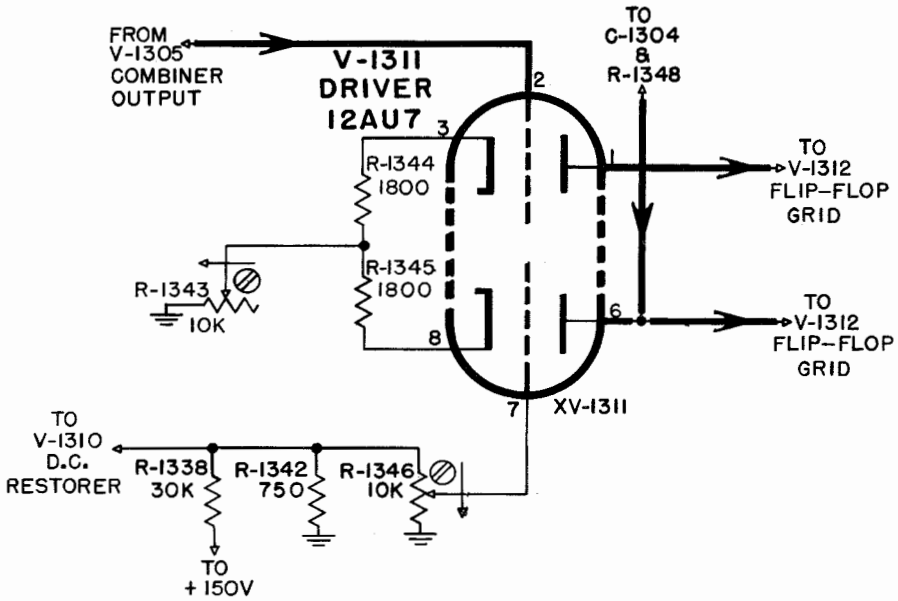


Figure 2–51. Drivers V-1311, V-1319, Simplified Schematic Diagram

However, it will be remembered that the combiner V-1305 furnished a swing of 6 volts (±3 volts) which exceeds the plus 3.5 volts required by the restorer. When the signal swings negative, one diode conducts and shorts the signal to ground; when the signal swings positive, the other diode conducts and clamps the signal to the plus 3.5 volt supply. This shorting and clamping action is made more effective by resistor R-1316 which raises the source impedance compared with the diodes but not compared with the grid impedance of the following stage V-1311. As a result of this action, the signal at this point is limited to swings of plus and minus 1.75 volts from zero to plus 3.5 and C-1303 takes on a charge which keeps the signal at this average or DC level of plus 1.75 volts.

Resistors R-1402 and R-1403 in one channel with resistors R-1400 and R-1401 in the other channel are used to lower the heater voltage and temperature of the diode cathodes in order to minimize contact potential and further limit the signal swing to ±1.5 volts in the range of 1.0 to 2.6 volts. Under these conditions, the restorer will select the middle portion of the signal which normally contains less noise.

At the start of a message the time constant associated with C-1303 acting through a suddenly conducting diode is fast enough to allow C-1303 to reach the proper charge in one-quarter of the half-length pulse

used in quadruplex work. On removal of the signal, with the diodes open, the charge will remain for the duration of several characters.

During quiet periods, interruption or at the completion of transmission, the unit comes to rest on Mark due to resistor R-1337 which discharges C-1303 and holds the grid of V-1311 (pin no. 2) at chassis potential corresponding to Mark. In the absence of sufficient signal the high resistance of R-1337 causes the diode to conduct and will slowly discharge C-1303 to ground. If the receiver missed the final shift to Mark, R-1337 will bring it to Mark so that receiver and transmitter will rest in phase, ready to start together. The holding of Mark during rest periods also has a quieting effect on the teletypewriter fed by this unit, which would hunt for something to do if left on Space.

(13) DRIVERS, V-1311 AND V-1319 (CM-32/FRR-24). *(See Figure 2–51).*—A separate driver is provided for each channel. Each driver operates in the same manner thus the following description and features of driver V-1311 is also applicable to the other driver V-1319.

The function of the driver tube, V-1311, a type 12AU7 dual triode, is to receive the Mark and Space voltages from the combiner V-1305 and the D.C. restorer V-1310 and couple them to the first flip-flop circuit that follows. One triode section will receive the signal voltages while the second triode section grid is set to a D.C. voltage point which is mid-way between the Mark and Space value. This is accomplished by the centering adjusting resistor R-1346. The grid driven by the signal will go positive and negative with respect to the second section grid. Each plate of the driver tube is connected directly to each flip-flop grid and as a result of the voltage changes occuring at the plate circuit, one flip-flop grid will be driven positive and the other negative. This voltage is double acting since it normally takes only a positive pulse to trigger the flip-flop circuit. In this unit, both flip-flop grids are triggered at the same time but in opposite polarity. Cathode bias for the tube is obtained from a resistive network made up of resistors R-1343, R-1344 and R-1345. R-1343 is adjustable to permit control of the sensitivity of the system.

(14) FLIP-FLOPS, V-1312 AND V-1320 (CM-32/FRR-24). *(See Figure 2–52).*—A separate flip-flop circuit is provided for each channel. Each flip-flop operates in the same manner thus the following description of flip-flop V-1312 is also applicable to the other flip-flop V-1320. The Mark-Space voltages are not true square wave shape, but have an appreciable rise time. The function of the flip-flop circuit V-1312, a type 12AU7 dual triode, is to produce a square wave with a shorter rise time. This voltage will be the approximate shape of the Mark and Space voltages appearing at the plate of V-1311. Coupling between V-1312 and V-1311 is made direct from plate to grid. This circuit operates differently from conventional flip-flop action in that a sustained pulse voltage is required to trigger the circuit.

The flip-flop circuit consists of two intercoupled triodes having direct resistance coupling between the plates of the first triode section (pins no. 1, 2 and 3) and the grid of the second triode section. The plate of the second triode section is coupled back to the grid of the first section. Both sections operate with a common cathode resistance R-1353. A small capa-

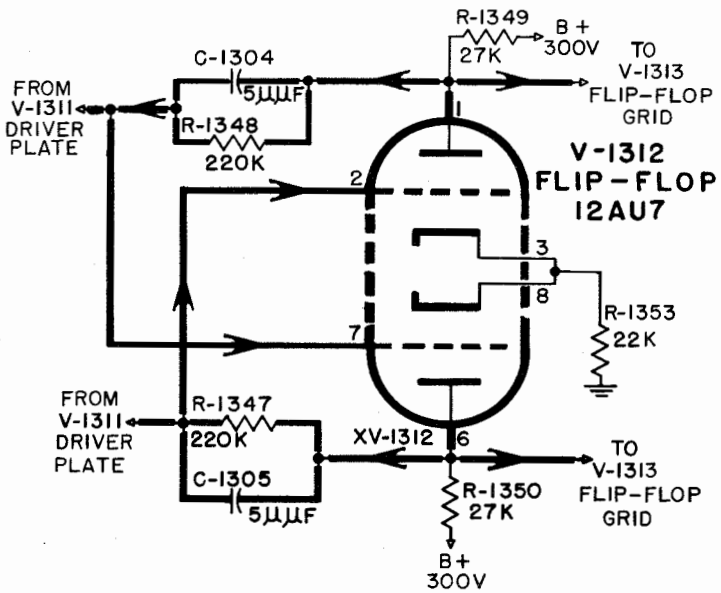


Figure 2–52. Flip Flops V-1312, V-1320, Simplified Schematic Diagram

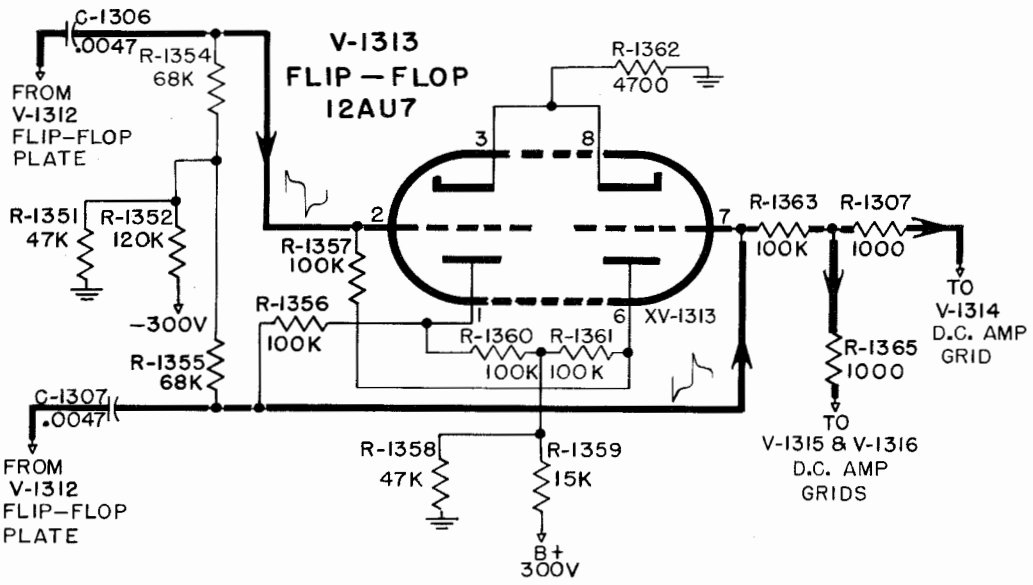


Figure 2–53. Flip Flops V-1313, V-1321, Simplified Schematic Diagram

citance of five mmf (C-1304 and C-1305) is shunted across the coupling resistors R-1348 and R-1347 to increase the velocity of the trigger action.

The action of the flip-flop is as follows: when the input signal applied to the grid of the first triode section is least positive (relative to chassis), maximum current flows in the second triode section, therefore the plate current of the first triode section is cut off by the voltage drop across the common cathode resistor. If the positive potential on the grid of the first triode section is increased by an amount which is sufficient to overcome the voltage drop across the common cathode resistor and to permit plate current to flow in the first section, the grid-cathode potential of the second section will become sufficiently negative to reduce the plate current of the second section considerably, thus reducing the voltage drop across the common cathode resistor which will, in turn, increase the grid potential on the first triode section. This constitutes one complete cycle of flip-flop action and it is repeated each time the signal changes from Mark to Space and back to Mark again.

(15) FLIP-FLOPS, V-1313 AND V-1321 (CM-32/FRR-24). *(See Figure 2–53).*—The following description of second flip-flop V-1313 is also applicable to the other second flip-flop V-1321.

The DC potential level of the flip-flop circuit V-1312 is higher than the DC amplifier V-1311 since V-1312 is directly coupled to V-1311. The output circuit, which is intended to operate a teletypewriter and/or tone keyer, consists of V-1314, V-1315 and V-1316 which are operated with their cathodes at ground potential. A second flip-flop circuit V-1313, a dual triode 12AU7, is capacitively coupled to V-1312 and is operated with its grids at or below ground potential to meet the potential level requirements of V-1314, V-1315 and V-1316.

This flip-flop circuit is fed through two short time constant differentiating circuits consisting of C-1306, R-1354 and C-1307, R-1355. This circuit operates in the same manner as that of flip-flop circuit V-1312 except that a pulse waveform is used to trigger it.

(16) D.C. AMPLIFIER OUTPUT CIRCUITS, V-1314, V-1315, V-1316, V-1322, V-1323 AND V-1324 (CM-32/FRR-24). *(See Figure 2–54).*—Two separate output circuits are provided, one for each channel. Each output circuit operates in the same manner thus the following description of output circuit V-1314, V-1315 and V-1316 is also applicable to the other circuit V-1322, V-1323 and V-1324.

The function of the output circuit of V-1314 and V-1315, two type 6AN5 pentodes, is to act as an instantaneous electronic on-off switch for the teletypewriter. These pentodes are connected as triodes. The keyed D.C. voltage from the second flip-flop will allow plate current to flow or bias them to cutoff depending on whether a Mark or Space signal is present at its control grids. Both tubes are operated in parallel. Resistor R-1363 functions to limit grid current in V-1314, V-1315 and V-1316. Resistors R-1307 and R-1365 are connected in series with the control grid of V-1314 and V-1315 respectively as parasitic suppressors. Plate voltage for V-1314 and V-1315 is supplied from the teletypewriter power supply. Signal output is connected to the Teletype Output connector J-1311.

The input signal voltage applied to V-1314 and V-1315 is also applied to V-1316, a type 6C4 triode.

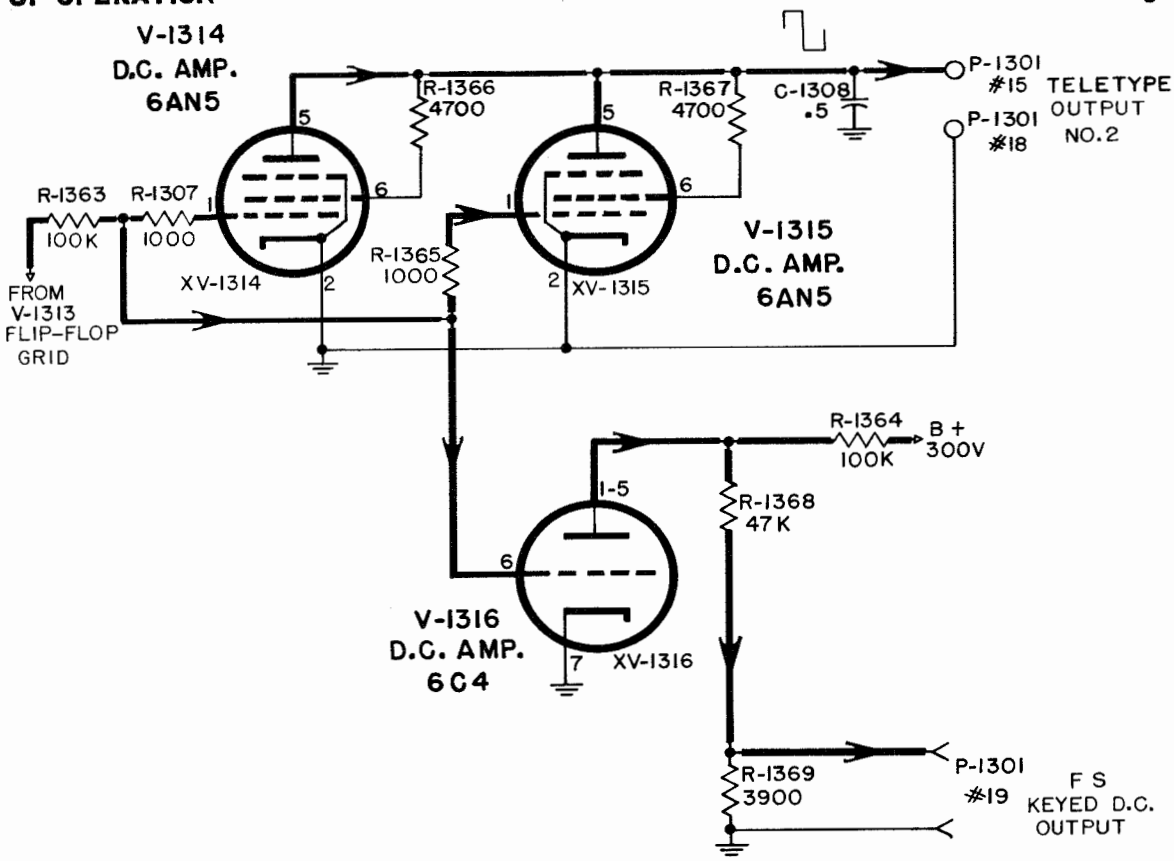


Figure 2–54. D.C. Amplifier Output Stages V-1314, V-1315, V-1316, V-1322, V-1323, V-1324, Simplified Schematic Diagram

Its function is to develop a keyed D.C. output voltage suitable to operate Keyer KY-62/FRR-24. When V-1316 receives a negative (Space) voltage on its control grid, plate current will decrease. The output voltage will be that caused by the bleeder current through R-1369 in combination with resistors R-1364 and R-1368. When a positive (Mark) signal is applied to the grid of V-1316, plate current will flow. This additional current must flow through resistor R-1364 and cause a further voltage drop across it. This lower voltage appears across the voltage divider composed of resistors R-1368 and R-1369 and in turn reduces the voltage across resistor R-1369 proportionally. Output voltage is applied to F.S. keyed D.C. output connector J-1308.

(17) VOLTAGE REGULATOR V-1309 (CM-32/FRR-24).–A type OA2 voltage regulator functions to stabilize the back bias voltage for the combining diodes and establish the reference level voltage of 5.8 volts as required by the Frequency Shift Converters.

p. POWER SUPPLIES.–Five power supplies are employed in the AN/FRR-24 Radio Receiving Set. Three type PP-590/FRR-24 provide all necessary operating voltages for bays 1, 2 and 3. The type PP-648/FRR-24 provides all necessary operating voltages for operation of the Comparator-Keyer CM-32/FRR-24 and the three Frequency Shift Converters CV-127/FRR-24. The PP-649/FRR-24 provides all necessary operating voltages for the three Keyers KY-62/FRR-24, the Amplifier-Detector AM-438/FRR-24 and the two Amplifier-Detectors AM-440/FRR-24.

(1) PP-590/FRR-24.–The PP-590/FRR-24 is a twelve-tube electronically regulated power supply. Two primary tap switches, S-2001 in the plate transformer and S-2002 in the filament transformer, are provided to permit operation from an A.C. supply of 105/115/125 volts 50/60 cps.

Two type 5R4GY full-wave connected rectifiers V-2001 and V-2002 plus an associated capacitor-input filter network and voltage regulating circuit comprise the positive 210-volt regulated supply. The negative 210-volt supply consists of a 5R4GY full-wave connected rectifier V-2003 plus an associated capacitor-input filter network and voltage regulating circuit. Both positive and negative rectifiers operate from the dual output windings of transformer T-2001.

The regulated positive 210-volt supply is obtained through two parallel connected dual triode regulator tubes V-2004 and V-2005 in an automatic series regu-

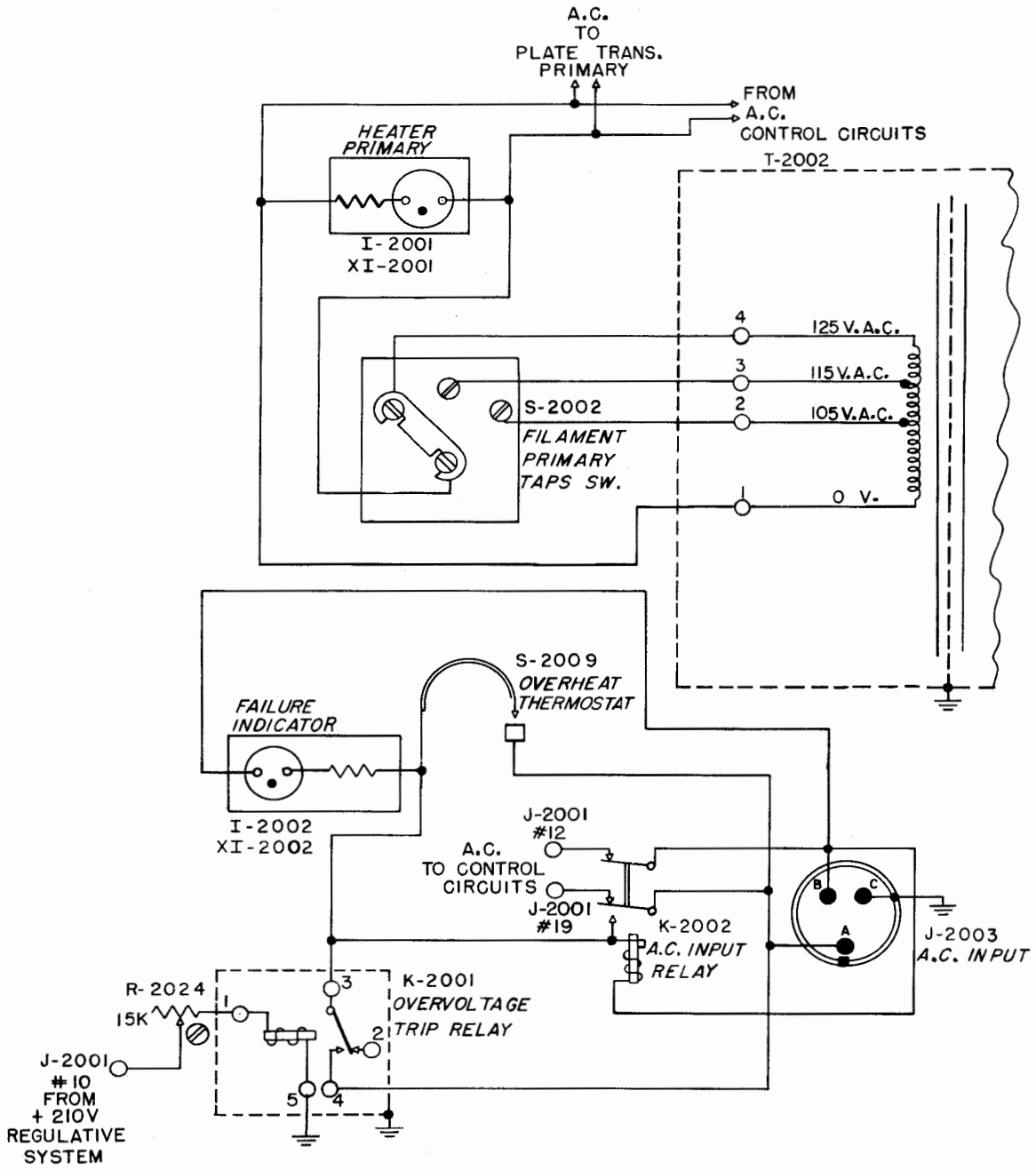


Figure 2–55. A.C. Circuits PP-590/FRR-24, Simplified Schematic Diagram

lator circuit.

The negative power source is fixed at 210 volts by the use of two voltage regulators V-2006 and V-2008. The negative 105 volts is regulated by the use of voltage regulator V-2007.

(a) A.C. CIRCUITS. *(See Figure 2–55).*—The A.C. input to the PP-590/FRR-24 is connected through the A.C. input connector J-2003 from the Power Distribution Panel SB-141/FRR-24. Separate switches with built-in circuit breakers are provided on the Distribution Panel to connect A.C. into each power supply. A neon lamp is connected at each input to indicate the application of A.C. voltage to the respective power units.

Two protective devices are provided in the A.C. input circuit and operate in the following manner; the coil of the overvoltage relay K-2001 is connected across the regulated B+ circuit and is adjusted to trip at 235 volts by variable potentiometer R-2024. Therefore, the coil becomes energized when the maximum B+ voltage reaches approximately 235 volts which will occur only on some failure in the regulated system. When relay coil K-2002 becomes energized the two sets of relay contacts open, thereby removing

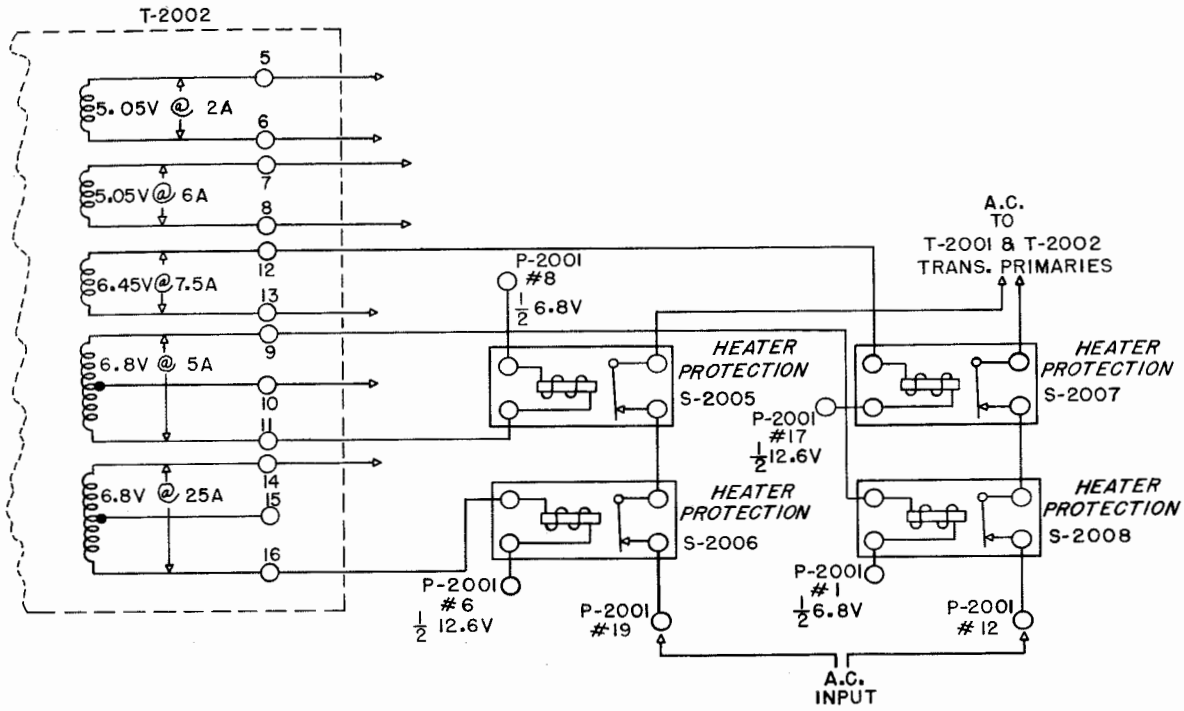


Figure 2–56. Filament Control Circuits PP-590/FRR-24, Simplified Schematic Diagram

the A.C. voltage from transformers T-2001 and T-2002. At the same instant that the contacts to the filament and plate supply are opened the contact to the Failure Indicator lamp I-2002 is closed, completing the A.C. circuit to the lamp resulting in its illumination. Relay K-2002 can only be reset after the failure has cleared by setting the A.C. Power switch located on the Power Distribution Panel at 'Off' and then to 'On' again.

Overheat thermostat S-2009 is mounted inside the chassis and its contact is normally open. The contact will close whenever the air temperature in the chassis reaches approximately 160° F and open when the temperature drops to approximately 140° F. When the contact of thermostat S-2009 closes completing the A.C. circuit to relay K-2002, the relay coil becomes energized. When the coil is energized the relay contacts open breaking the A.C. supply to transformers T-2001 and T-2002. At the same instant these contacts are opened the contacts to the Failure Indicator lamp are closed.

(b) FILAMENT CONTROL CIRCUIT (PP-590/FRR-24). *(See Figure 2–56).*—Two 10-ampere and two 30-ampere relay trip breakers S-2005, S-2008, S-2006 and S-2007 are connected in the filament transformer 6.3-volt output windings. These circuit breakers will open the A.C. line to transformers T-2001 and T-2002 when excessive filament current flows. Heater Primary lamp I-2001, when lighted, indicates the application of A.C. voltage to the primary of filament transformer T-2002.

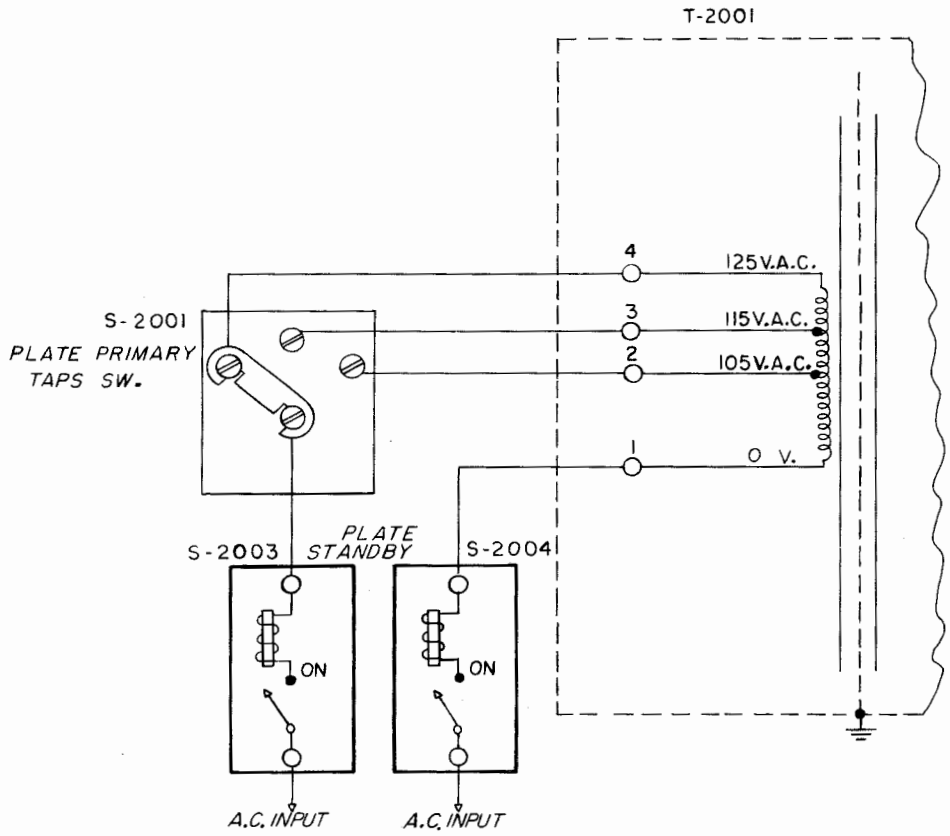


Figure 2–57. Plate Control Circuits PP-590/FRR-24, Simplified Schematic Diagram

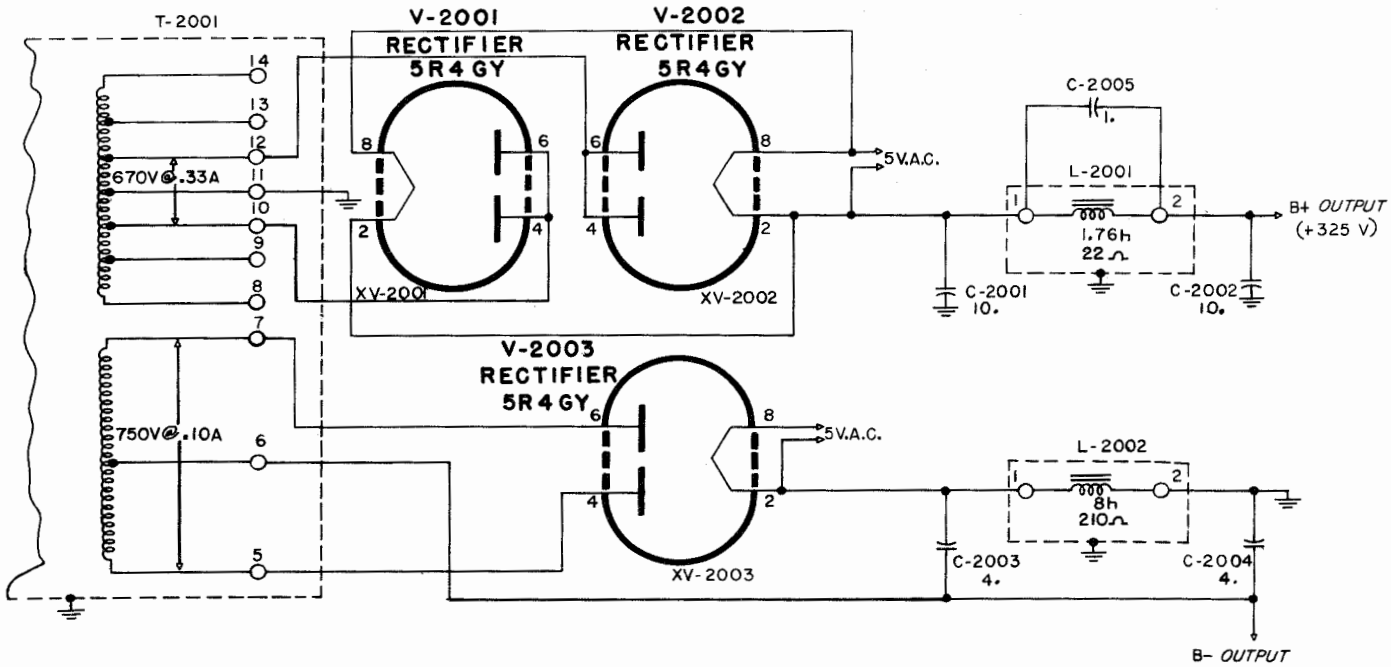


Figure 2–58. Rectifiers V-2001, V-2002, V-2003, Simplified Schematic Diagram

(c) PLATE CONTROL CIRCUIT (PP-590/FRR-24). *(See Figure 2–57).*–The Plate Standby switches S-2003 and S-2004 are connected in each side of the A.C. line and function to turn the A.C. input to the plate transformer T-2001 On and Off. A circuit breaker is incorporated in each switch. This circuit breaker will open the A.C. line to the plate transformer when current in excess of five amperes flows through the line. Plate Power lamp I-2003, when lighted, indicates the application of B+ voltage to the receiver circuits.

(d) BLOWER PROTECTION (PP-590/FRR-24).–Two one-ampere fuses are connected in the A.C. line to the blower, one in each side of the line. Three spare fuses are mounted on the front-panel.

(e) RECTIFIER V-2001, V-2002, V-2003 (PP-590/FRR-24). *(See Figure 2–58).*–Two type 5R4GY full-wave connected rectifiers V-2001 and V-2002 plus an associated capacitor-input filter network comprise the positive 210-volt supply source. The filter choke L-2001 in the positive supply is tuned by capacitor C-2005 to provide maximum attenuation of the 120 cycle A.C. ripple. The negative 210-volt supply source consists of a 5R4GY full-wave connected rectifier V-2003 plus an associated capacitor-input filter network. Both positive and negative rectifiers operate from the dual output windings of transformer T-2001.

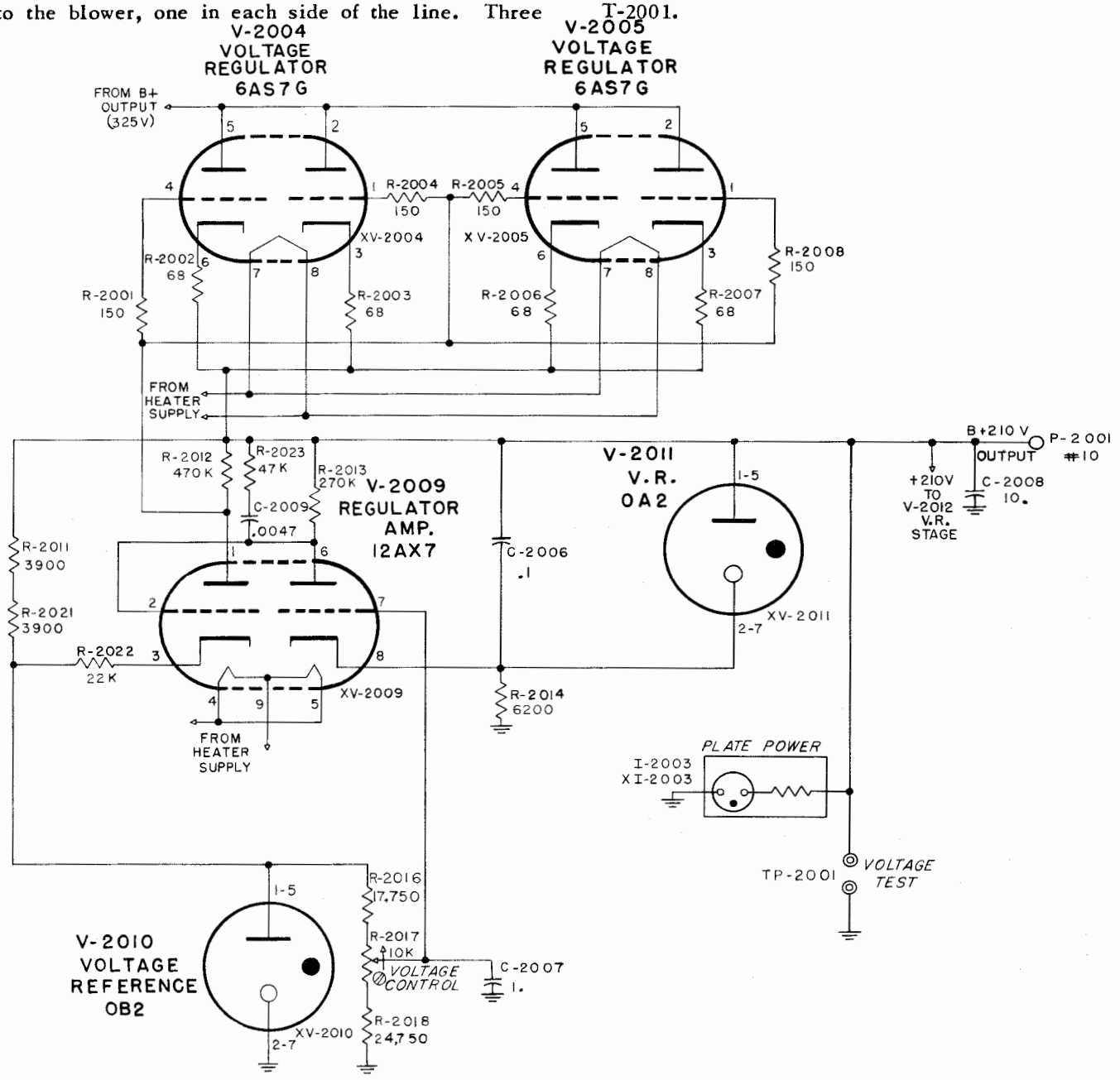


Figure 2–59. Positive 210-Volt Regulative Circuit V-2004, V-2005, V-2009, V-2010, V-2011, Simplified Schematic Diagram

(f) POSITIVE 210-VOLT REGULATIVE CIRCUIT V-2004, V-2005, V-2009, V-2010, V-2011 (PP-590/FRR-24). *(See Figure 2–59).*—The regulated positive 210-volt supply is obtained from the positive 320-volt output of L-2001 through two dual-triode regulator tubes V-2004 and V-2005, type 6AS7G tubes. Regulator tubes V-2004 and V-2005 are connected in parallel to afford greater current handling capabilities to the power supply. The combined plate resistance of V-2004 and V-2005 is connected in series with the external load, forming an automatically-variable voltage divider system. Variation of grid bias on these tubes will effectively change the plate resistance and thus change the proportions of the divider system allowing more or less of the input voltage to appear across the load. Voltage regulation is obtained by automatically adjusting the bias on V-2004 and V-2005 so as to stabilize the voltage across the load regardless of input voltage variations or load resistance variation.

The automatic bias adjustment is accomplished by regulator amplifier V-2009, a type 12AX7 dual triode, voltage reference V-2010, a type OB2, and voltage regulator V-2011, a type OA2. The control grid of the regulator amplifier V-2009 is connected to V-1 Voltage Control R-2017 which is part of a bleeder circuit including R-2016 and R-2018. The output voltage is adjusted to 210 volts by the setting of R-2017. When R-2017 is properly adjusted the grid of the input triode section of V-2009 is negatively biased with respect to its cathode. The resulting plate current causes a voltage drop across load resistor R-2013. Any change in potential across R-2013 changes the bias on the output triode section of V-2009 which causes a voltage drop across load resistor R-2012. Resistor R-2012 is connected between the grids and cathodes of voltage regulators V-2004 and V-2005, therefore any change in potential across R-2012 changes the bias potential applied to voltage regulators V-2004 and V-2005.

Voltage regulator V-2011, a type OA2 is utilized as a coupling device to the input triode section of V-2009. Regulator V-2011 in conjunction with resistor R-2014 are connected in series across the output voltage. Any variation in the output voltage will be coupled directly through V-2011 to appear as a voltage variation across R-2014.

Voltage regulator V-2010 is connected in the cathode (pin no. 3) of the output triode section of the regulator amplifier V-2009. Regulator V-2010 produces a constant positive potential across its terminals to be used for reference purposes. A part of this reference voltage is fixed at a specific value by Voltage Control R-2017 and applied to the output grid of V-2009. The value selected is one to provide an output voltage of 210 volts with normal bias on V-2009. The regulative system then functions to maintain this normal bias and thus stabilize the output voltage at 210 volts.

(g) VOLTAGE REGULATORS V-2006, V-2007, V-2008 (PP-590/FRR-24). *(See Figure 2–60).*—Voltage regulators V-2006, V-2007 and V-2008, type OB2 tubes, are utilized to regulate the negative 105 and 210-volt circuits. The regulated negative output voltages of minus 105 volts and minus 210 volts are obtained by returning the center tap of the high voltage

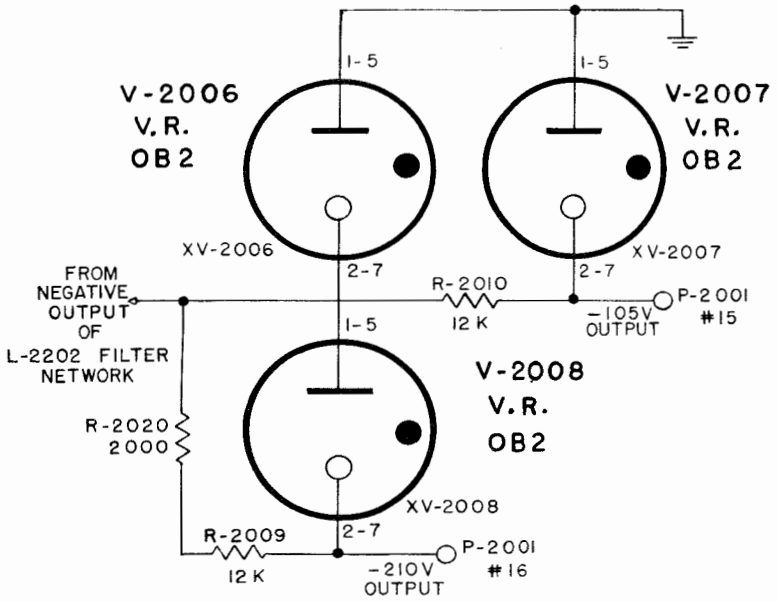


Figure 2–60. Voltage Regulators V-2006, V-2007, V-2008, Simplified Schematic Diagram

secondary winding of transformer T-2001 through voltage regulators V-2006, V-2007 and V-2008 via dropping resistors R-2010, R-2020 and R-2009. The total current of the rectifier tube V-2003 flows through these tubes and their respective loads developing negative voltages with respect to ground.

(b) VOLTAGE REGULATOR V-2012 (PP-590/FRR-24). *(See Figure 2–61).*—Voltage regulator V-2012, a type OA2, is utilized to provide a regulated positive 150-volt source to the H.F. oscillators in the Amplifier-Converters AM-450/FRR-24 through AM-453/FRR-24.

(2) PP-648/FRR-24.—The PP-648/FRR-24 is a fifteen tube electronically-regulated power supply located in bay 4 of the AN/FRR-24 Radio Receiving Set. The A.C. input circuit, filament transformer, plate transformer and rectifier circuits are similar to those described in the discussion on Power Supply type PP-590/FRR-24. The rectifier circuit is similar to the PP-590/FRR-24 circuit except that the power transformer T-2201 utilizes different taps on the secondary winding.

The regulated positive 300-volt supply is obtained through three parallel connected dual triode regulator tubes V-2204, V-2205 and V-2206.

The regulated negative 300-volt supply is obtained through voltage regulator V-2207.

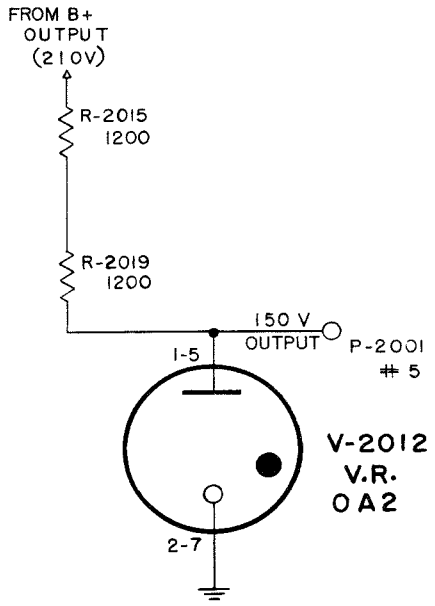


Figure 2–61. Voltage Regulators V-2012, Simplified Schematic Diagram

(a) A.C. CIRCUITS. *(See Figure 2–62).*—An additional Overvoltage Trip Relay K-2203 is provided in the PP-648/FRR-24. This relay is connected across

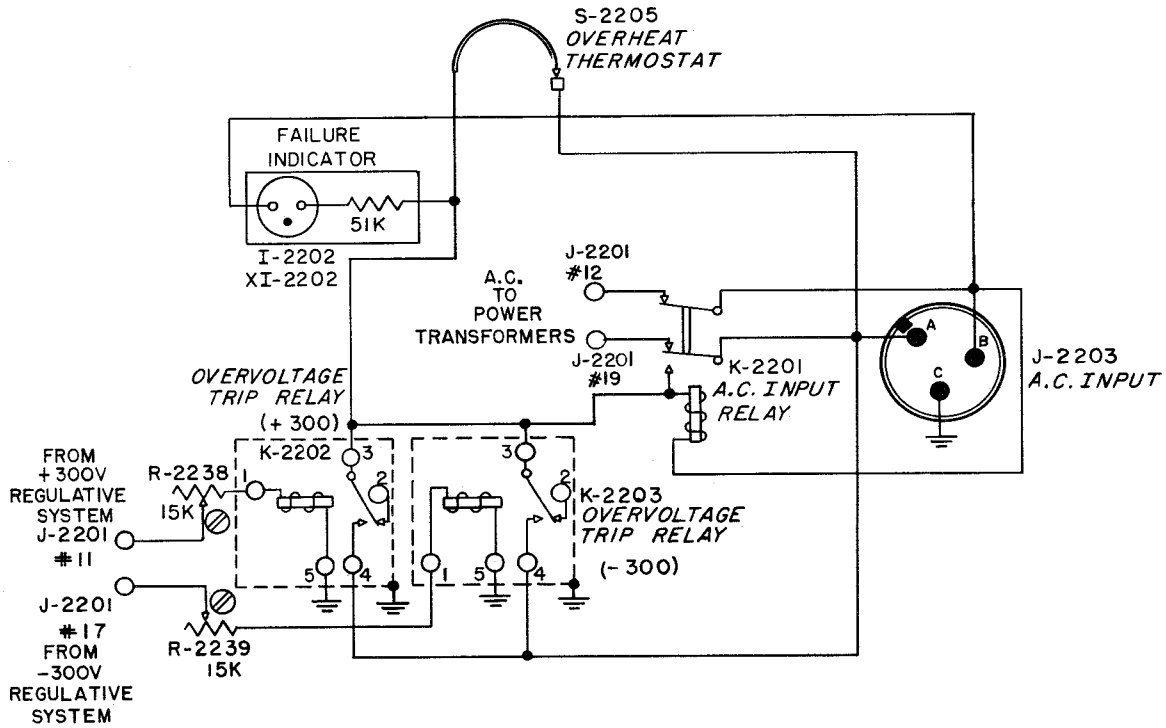


Figure 2–62. A.C. Circuits PP-648/FRR-24, Simplified Schematic Diagram

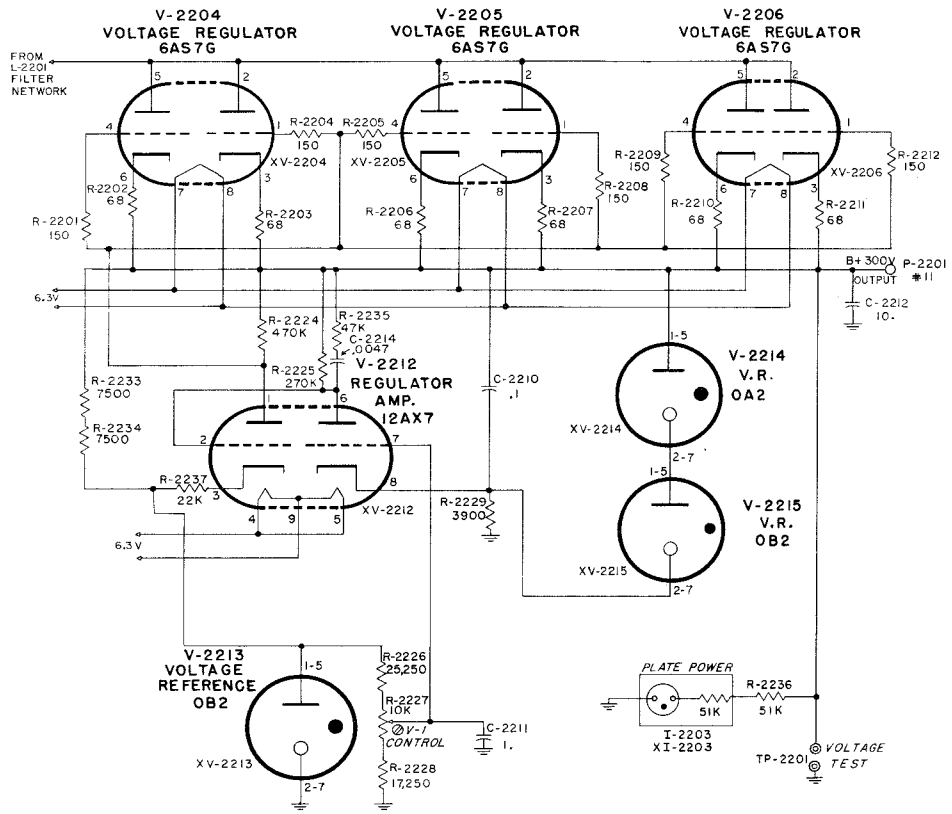


Figure 2–63. Positive 300-Volt Regulative Circuit V-2204, V-2205, V-2206, V-2212, V-2213, V-2214, V-2215, Simplified Schematic Diagram

the regulated negative 300-volt circuit. Relay K-2203 is adjusted to trip at 325 volts by variable potentiometer R-2239. Therefore, the coil becomes energized when the maximum B minus voltage reaches approximately 325 volts, which will occur only on some failure of the regulator system.

(b) POSITIVE 300-VOLT REGULATIVE CIRCUIT V-2204, V-2205, V-2206, V-2212, V-2213, V-2214 AND V-2215 (PP-648/FRR-24). *(See Figure 2–63).*—The regulated positive 300-volt supply is obtained from the positive 425-volt output at L-2201 through three dual triode regulator tubes V-2204, V-2205 and V-2206, type 6AS7G tubes connected in parallel. The automatic bias adjustment of V-2204, V-2205 and V-2206 is accomplished by regulator amplifier V-2212, voltage reference V-2213 and voltage regulators V-2214 and V-2215.

(c) NEGATIVE 300-VOLT REGULATIVE CIRCUIT V-2207, V-2208, V-2209, V-2210 AND V-2211 (PP-648/FRR-24). *(See Figure 2–64).*—The regulated negative 300-volt supply is obtained from the center tap of the high voltage secondary winding of transformer T-2201. Voltage regulation is accomplished by the use of voltage regulator V-2207. The automatic bias adjustment of V-2207 is accomplished by regulator amplifier V-2208, voltage reference V-2209 and voltage regulators V-2210 and V-2211.

(3) PP-649/FRR-24.—The PP-649/FRR-24 is a fifteen tube electronically regulated power supply located in bay 4. The A.C. input circuit, filament transformer, plate transformer and rectifier circuits are similar to those described in the discussion on Power Supply type PP-590/FRR-24. Although the rectifier circuit is similar to the PP-590/FRR-24 circuit, the power transformer T-2101 utilizes different taps on the secondary winding.

The regulated positive 300-volt supply is obtained through three parallel connected dual triode regulator tubes V-2115, V-2104 and V-2105.

The regulated positive 210-volt supply is obtained from the positive 300-volt regulated source through voltage regulator V-2111.

The negative output voltage of minus 105-volts is regulated by the use of voltage regulator V-2108.

(a) A.C. CIRCUITS (PP-649/FRR-24). *(See Figure 2–65).*—An additional Overvoltage Trip Relay K-2102 is provided in the PP-649/FRR-24. This relay is connected across the regulated positive 300-volt circuit. Relay K-2102 is adjusted to trip at 325-volts by variable potentiometer R-2139. Therefore, the coil becomes energized when the maximum B+ voltage reaches approximately 325 volts, which will

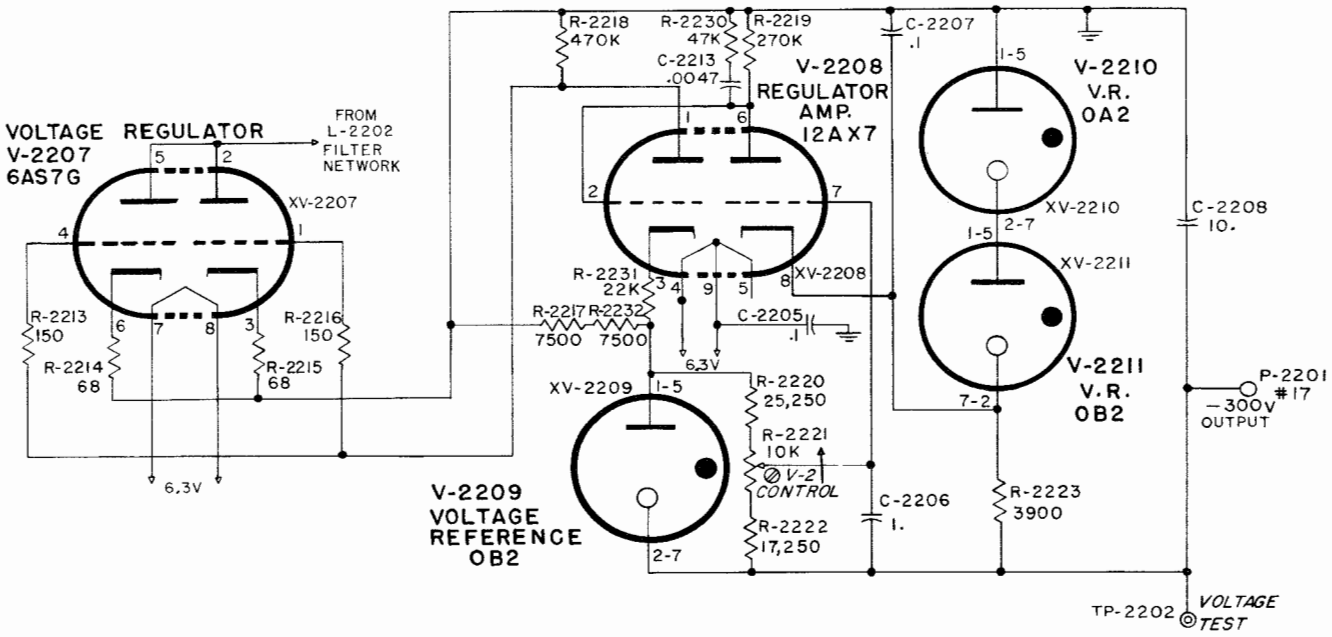


Figure 2–64. Negative 300-Volt Regulative Circuit V-2207, V-2208, V-2209, V-2210, V-2211, Simplified Schematic Diagram

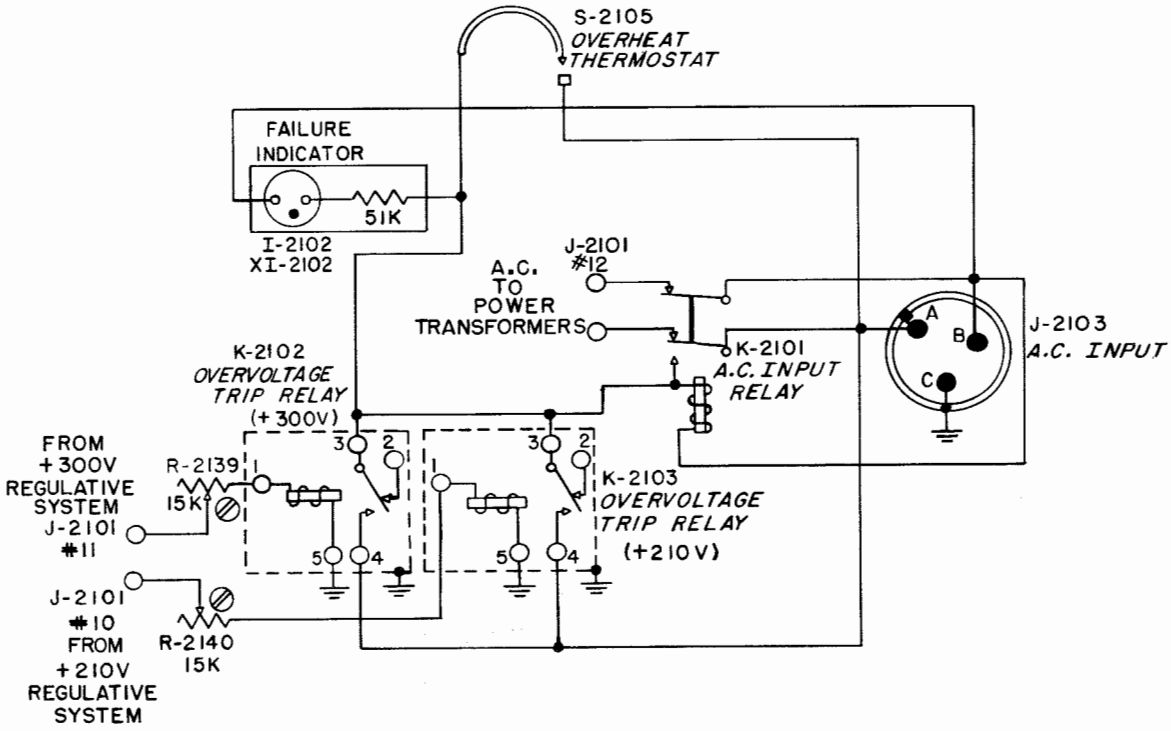


Figure 2–65. A.C. Circuits PP-649/FRR-24, Simplified Schematic Diagram

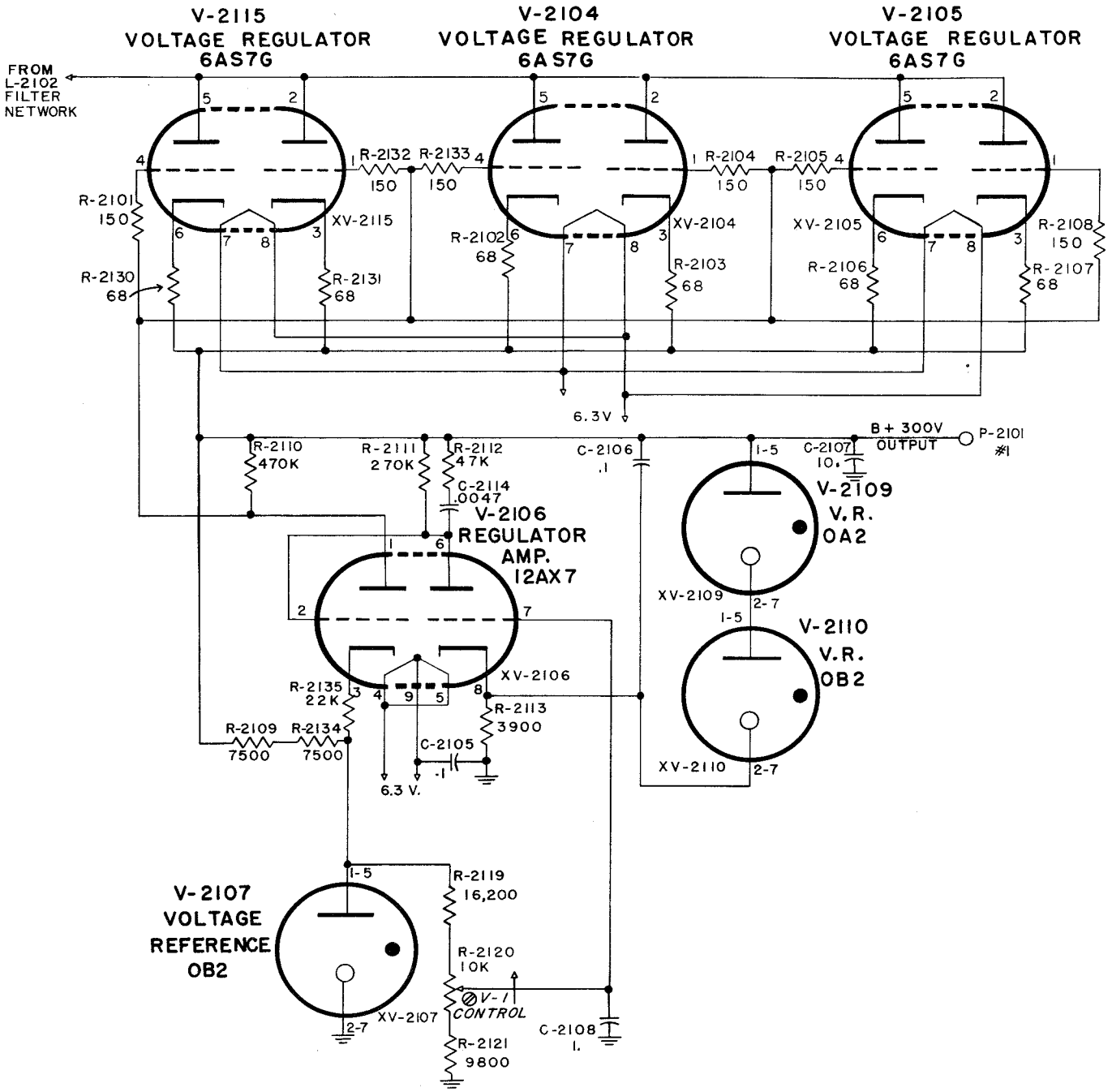


Figure 2–66. Positive 300-Volt Regulative Circuit V-2104, V-2105, V-2106, V-2107, V-2109, V-2110, V-2115, Simplified Schematic Diagram

occur only on some failure of the regulator system.

(b) POSITIVE 300-VOLT REGULATIVE CIRCUIT, V-2104, V-2105, V-2106, V-2107, V-2109, V-2110 AND V-2115 (PP-649/FRR-24). *(See Figure 2–66).*—The regulated positive 300-volt supply is obtained from the positive 400-volt output at L-2102 through three dual triode regulator tubes V-2115, V-2104 and V-2105, type 6AS7G tubes connected in parallel. The automatic bias adjustment of V-2115, V-2104 and V-2105 is accomplished by regulator amplifier V-2106, voltage reference V-2107 and voltage regulators V-2109 and V-2110.

(c) POSITIVE 210-VOLT REGULATIVE CIRCUIT V-2111, V-2112, V-2113 AND V-2114 (PP-649/FRR-24). *(See Figure 2–67).*—The regulated positive 210-volt supply is obtained from the regulated 300-volt supply through voltage regulator V-2111, a type 6AS7G. The automatic bias adjustment of V-2111 is

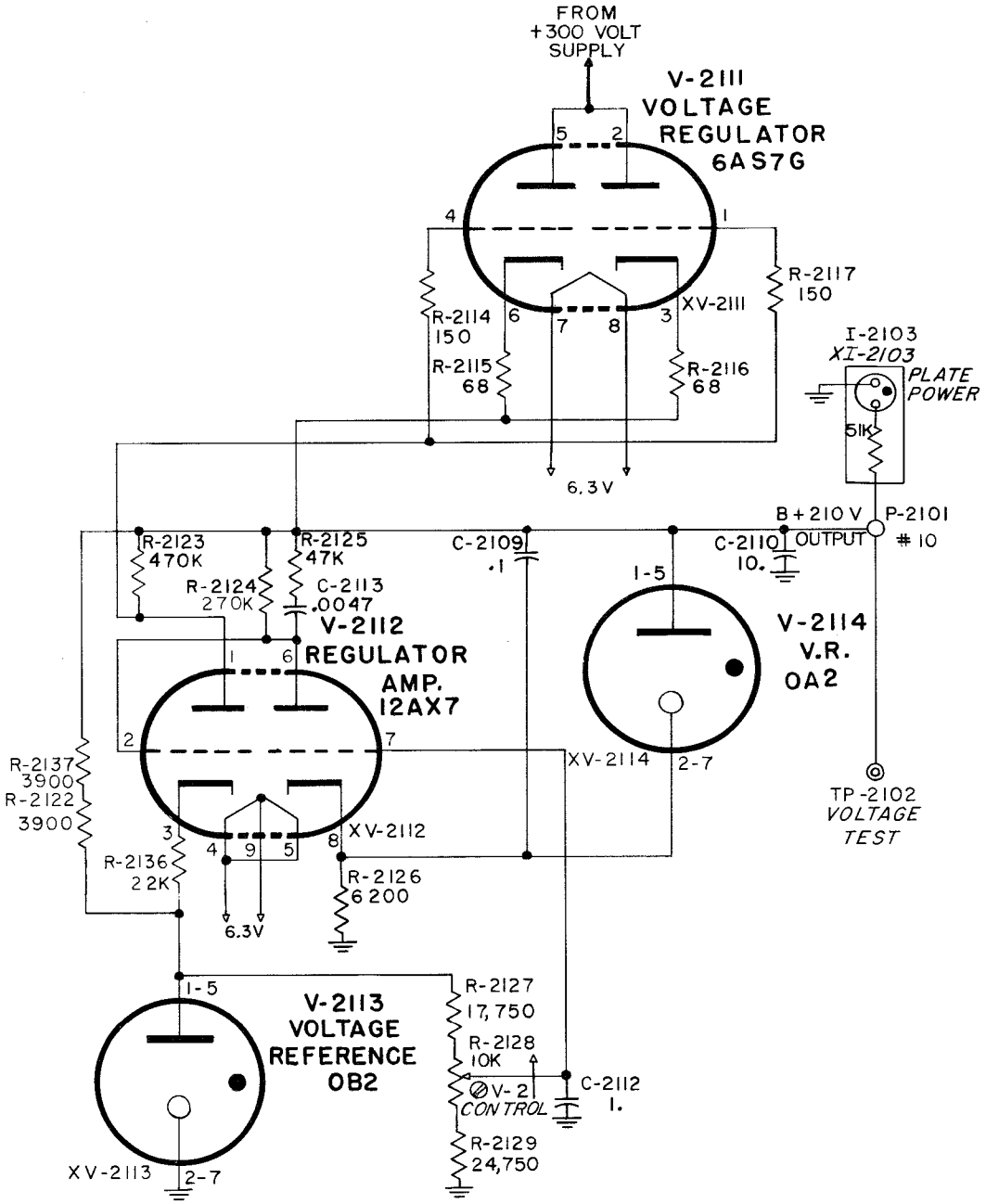


Figure 2–67. Positive 210-Volt Regulative Circuit V-2111, V-2112, V-2113, V-2114, Simplified Schematic Diagram

accomplished by regulator amplifier V-2112, voltage reference V-2113 and voltage regulator V-2114.

q. POWER DISTRIBUTION PANEL. *(See Figure 2–68).*—The Power Distribution Panel SB-141/FRR-24 is located in bay 3. A.C. power is distributed to the five power supplies through this unit. Separate switches with built-in circuit breakers are provided to connect A.C. into each power supply. A neon lamp is connected at each input to indicate the application of A.C. voltage to the selected power supply.

(1) CIRCUIT ANALYSIS.—The A.C. input to the power distribution panel is connected through five A.C. input connectors J-3401 through J-3405. The circuit description of all five channels is identical therefore the following analysis is applicable to all channels. Two switches are provided for each channel, S-3401 through S-3410, one in each side of the A.C. line. Incorporated in each switch is a circuit breaker. These circuit breakers will open the A.C. line when current in excess of 10 amperes flows through the line. A neon lamp (I-3401 through I-3405) lights when the A.C. switches for a particular bay is set at On. Five A.C. output connectors J-3406 through J-3410 are provided to connect A.C. supply

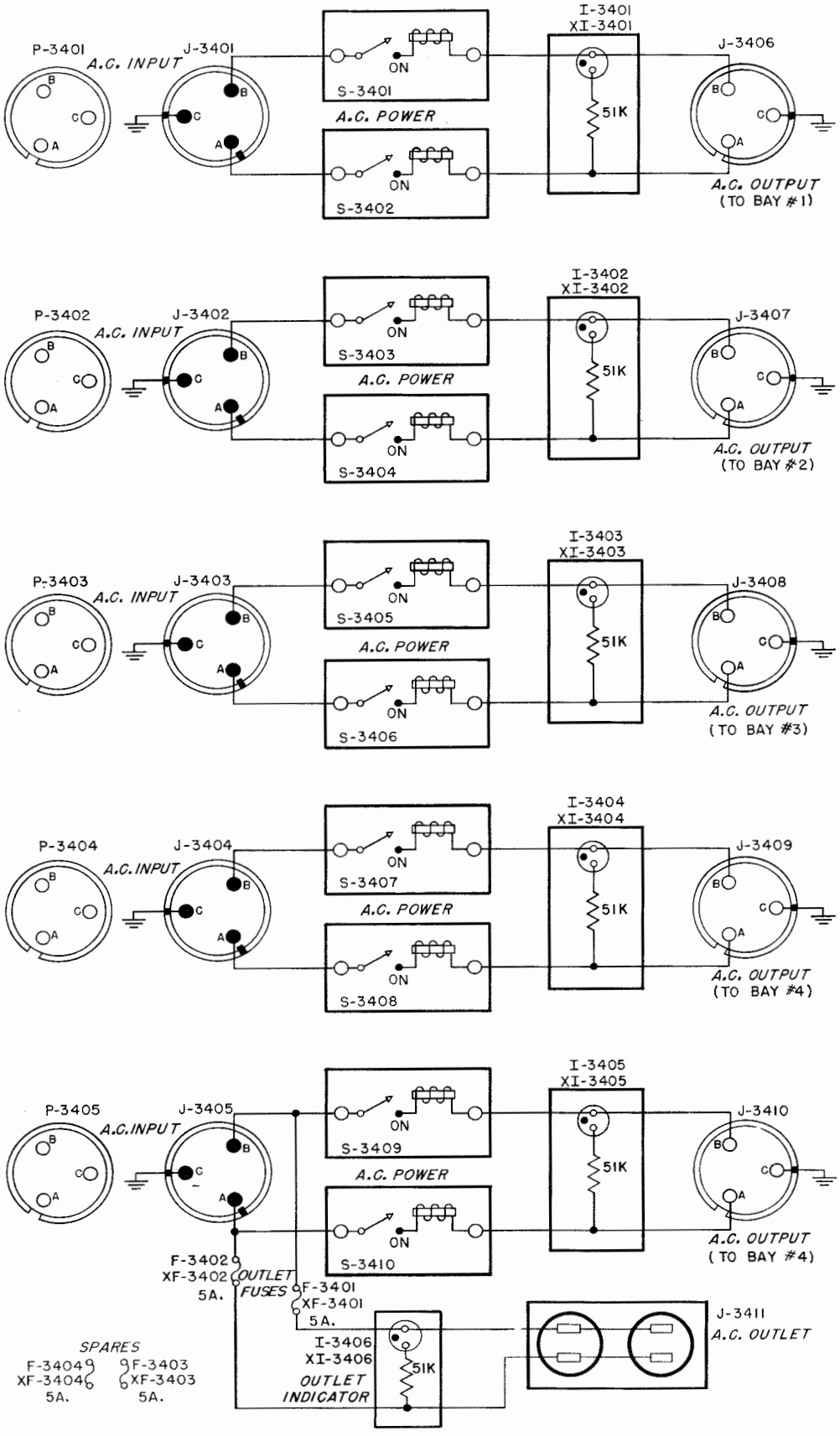


Figure 2–68. Power Distribution Panel SB-141/FRR-24, Schematic Diagram

voltage to each of the five power supplies in the equipment. An A.C. output receptacle J-3411 is supplied to provide A.C. power to any external equipment. The A.C. voltage to the A.C. outlet J-3411 is connected through two 5 ampere fuses (F-3401, F-3402), one in each side of the A.C. line, to prevent damage to the control panel due to failure of any external equipment. A neon lamp I-3406 is utilized to indicate the application of A.C. power to the A.C. outlet. Two spare fuses are mounted on the front-panel of the unit.

r. CONTROL PANEL. *(See Figure 2–69).*—The Control Panel SB-142/FRR-24 provides a means of selecting which of the four Amplifier-Converter units shall be placed in an operative condition and also selects the source of oscillator excitation i.e., local or remote. In the local condition, oscillator voltage from the selected Amplifier-Converter is made available for patching into any other Amplifier-Converter unit of the same frequency range in another bay. In the remote condition, oscillator voltage from another source may be patched into the selected Amplifier-Converter unit. It also serves as an intermediate step in the application of power from Power Supply PP-590/FRR-24 to the four Amplifier-Converters.

The unit consists of a ganged seven-section Band switch, a ganged four-section Heterodyne Oscillator switch and a multiple arrangement of input and output connectors.

(1) BAND SWITCH S-201 (SB-142/FRR-24).—The Amplifier-Converter unit corresponding to the desired frequency band is selected by the setting of this switch. This is a seven-section switch, each section having its own particular function as follows:

(a) LOCAL OSCILLATOR SWITCH S-201A.—The source of local oscillator voltage from all four Amplifier-Converter units is connected to this switch section via input connectors J-206 through J-209. By switch action the desired oscillator voltage can be selected and applied to output connector J-261 via switch section S-202D for application to another Amplifier-Converter of the same frequency.

(b) REMOTE OSCILLATOR SWITCH S-201B.—The source of remote oscillator voltage is connected to the wiper arm of this switch section via S-202B and input connector J-255. By switch action this oscillator voltage is applied to the desired Amplifier-Converter via one of four output connectors J-215 through J-218.

(c) LOCAL OSCILLATOR SWITCH S-201C.—The source of local oscillator voltage from all Amplifier-Converter units is connected to this switch section via input connectors J-224 through J-227. By switch action the desired oscillator voltage can be selected and applied to output connector J-258 via switch section S-202C for application to another Amplifier-Converter of the same frequency.

(d) CRYSTAL CALIBRATE SWITCH S-201D.—The crystal calibrate input voltage obtained from the crystal calibrate circuit located in the Oscillator Assembly O-131/FRR-24 is connected to this switch section via connector J-237. By switch action the crystal calibrate voltage can be applied to the selected Amplifier-Converter unit through one of the crystal calibrate output connectors J-233 to J-236.

(e) 210-VOLT PLATE SWITCH S-201E.—The 210-volt plate supply source at the power input connector J-242 is connected to the four power output connectors J-238, J-239, J-240 and J-241 via this switch. By switch action the 210-volt supply is connected to the power output connector that furnishes plate and filament voltages to the selected Amplifier-Converter unit.

(f) A.G.C. SWITCH S-201F.—The source of A.G.C. voltage is connected to this switch section via the A.G.C. input connector J-252. By switch action the A.G.C. voltage is applied to the selected Amplifier-Converter unit via one of four A.G.C. output connectors J-248 through J-251.

(g) 150-VOLT PLATE AND SCREEN SWITCH S-201G.—A positive 150-volt source is connected to this switch section via the power input connector J-242. During local operation the plate-screen switch section S-201G in conjunction with the local-remote switch section S-202A provides plate voltage to the local oscillator and screen voltage to the buffer amplifier in the selected Amplifier-Converter unit via the associated power output connector. During remote operation the two switches S-201G and S-202A remove the plate voltage from the local oscillator tube and supply screen voltage to the buffer amplifier of the selected Amplifier-Converter unit via power output connectors J-238 through J-241.

(2) HETERODYNE OSCILLATOR SWITCH S-202 (SB-142/FRR-24).—This is a four section switch which selects the source of oscillator excitation i.e., Local or Remote. Each switch section has its own particular function and operates in the following manner:

(a) LOCAL-REMOTE OSCILLATOR SWITCH S-202A.—This switch section is used in conjunction with the plate-screen switch section S-201G to provide plate and screen voltages to the selected Amplifier-Converter unit during local operation. During remote operation these two switches operate in unison to remove the plate voltage from the local oscillator and supply screen voltage to the buffer amplifier.

(b) REMOTE OSCILLATOR SWITCH S-202B.—The source of remote oscillator voltage is connected to the wiper of this switch section through the remote

oscillator input connector J-255. By switch action this voltage is connected to the wiper of the remote oscillator switch section S-201B for application to the remote oscillator output connectors. A 68-ohm resistor R-201 is provided to terminate the remote R.F. Amplifier during local operation.

(c) LOCAL OSCILLATOR SWITCH S-202C.—The source of local oscillator voltage is connected to the wiper of this switch section via switch section S-201C for application to the local oscillator output connector J-258. A 68-ohm resistor R-202 is provided in this switch section to terminate the local R.F. Amplifier during remote operation.

(d) LOCAL OSCILLATOR SWITCH S-202D.—The source of local oscillator voltage is connected to the wiper of this switch section via switch section S-201A for application to the local oscillator output connector J-261. A 68-ohm resistor R-203 is provided in this switch section to terminate the local R.F. Amplifier during remote operation.

(3) POWER CONNECTORS (SB-142/FRR-24).—All operating voltages necessary to operate the Amplifier-Converter units are obtained from the power supply PP-590/FRR-24. These voltages are connected to the control panel via the power input connector J-242 for application to the four power output connectors J-238 through J-241. The following voltages are obtainable at this connector: +150 V, +210 V, -105 V, 6.3 V.A.C. and 12.6 V.A.C.

s. PATCH PANELS.—The patch panels are utilized to arrange the equipment for a particular mode of operation and to connect various circuits to circuits in other units. All of these types of connections are made by means of the patch cords associated with each patch panel. The four patch panels used in the AN/FRR-24 equipment are as follows:

Bay 1 -- SB-138/FRR-24
Bay 2 -- SB-140/FRR-24
Bay 3 -- SB-169/FRR-24
Bay 4 -- SB-143/FRR-24

Reference to the schematic diagrams Figure 2–70 through 2–73 of the respective patch panels will show the contents of each unit. For convenience in identifying the circuits associated with the connectors on the patch panels, each of the major units in each rack has been lettered in alphabetical sequence starting at the top of the rack. This identifying letter appears on the trim strip along the left hand edge of each rack.

Observation of the patch panel units will reveal that each connector has an identifying tab. For example on unit 1J the connector in the upper left hand corner is labelled AGC IN 1A252. 1H607. 1J3. This means that AGC voltage is fed into this connector for application to rack 1, unit A, connector 252 and rack 1, unit H, connector 607 and this connector is in rack 1, unit J, connector J-1503. The numerals following the unit designations on the connector label are the symbol designations of the specific connectors on the units with the letter 'J' for connectors J-607 and J-252 deleted and with the letter 'J' plus the series symbol designations for connector J-1503 deleted. The same system of marking is used for each connector on each Patch Panel. That is, the circuit is specified, following this the point or points of origin and termination of the energy is named and the last marking identifies the connector on the patch panel itself. To guard against unwanted signal pick-up and/or spurious radiation several connectors on the Patch Panels are fitted with covers and/or terminating plugs. These covering devices should be removed only when the connector is to be used and when its use is ended the cover must always be replaced except in the case of the FS CONS connector (J-1810, J-1811 and J-1812) on Patch Panel SB-143/FRR-24 in bay 4 whose terminating plugs should always be removed during frequency shift operation. These connectors are capped only when it is desired to silence the Frequency Shift Converter CV-127/FRR-24 to simulate a no-signal condition as might be required during initial tuning procedures.

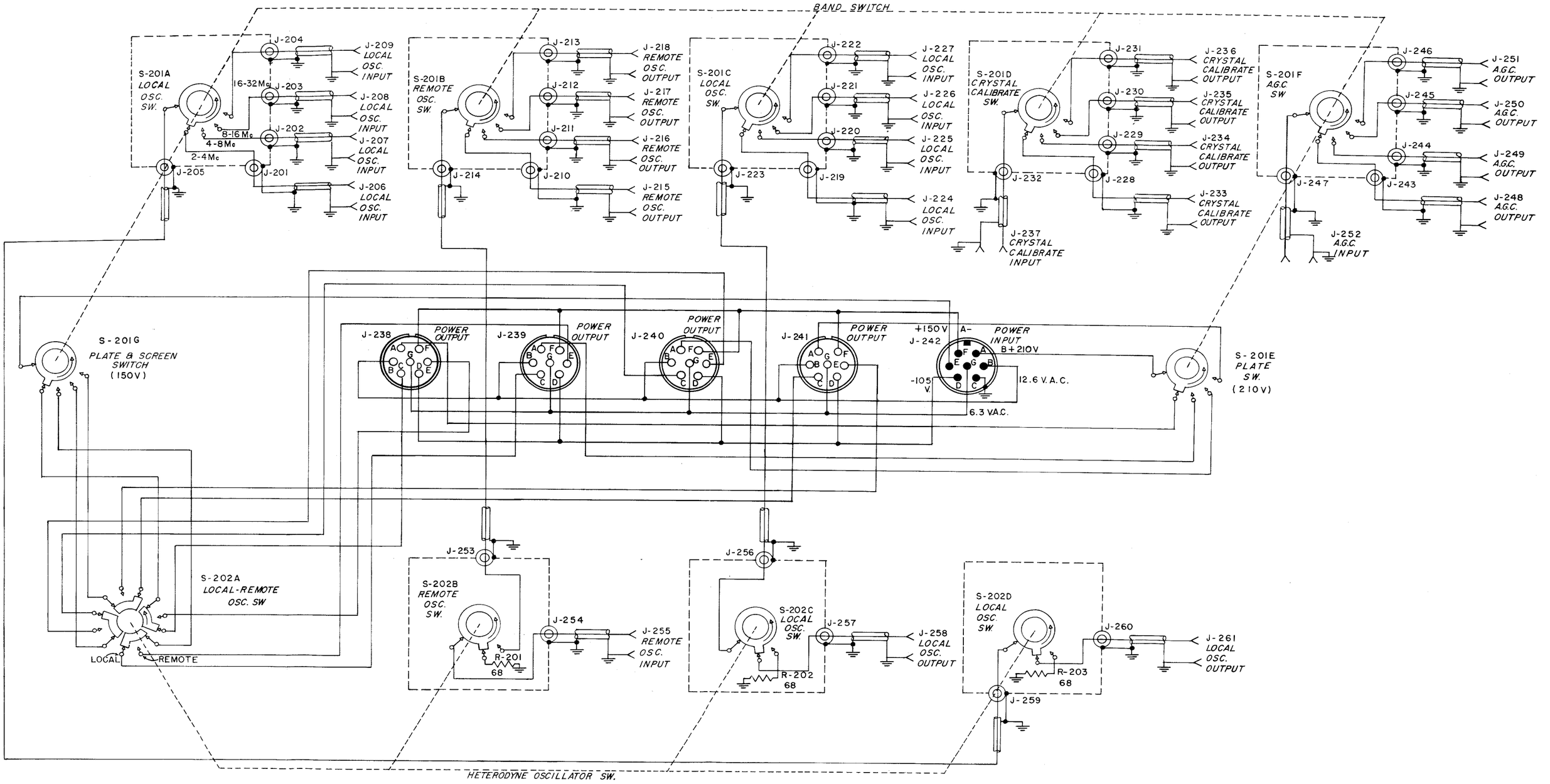


Figure 2–69. Control Panel SB-142/FRR-24, Schematic Diagram

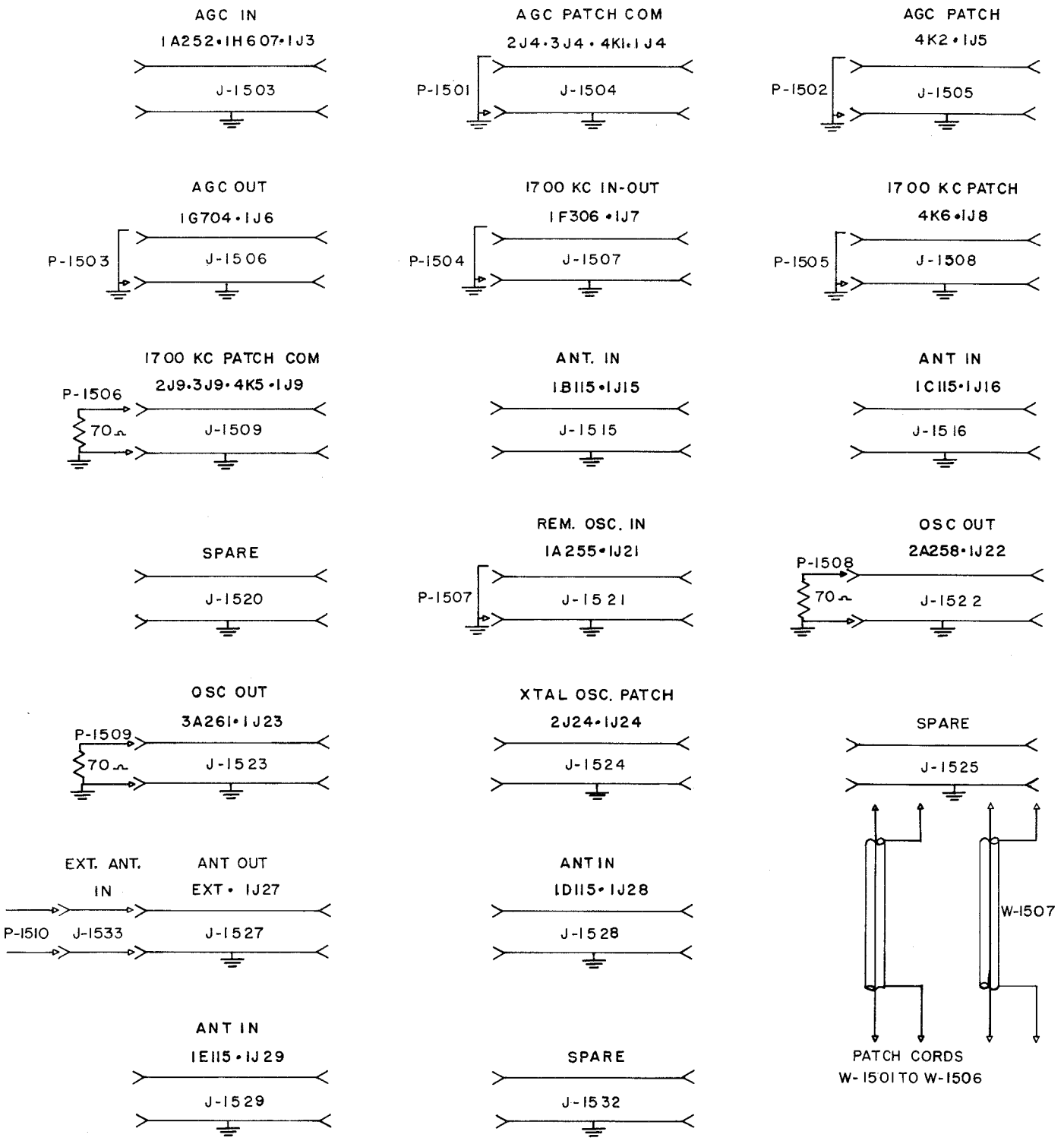


Figure 2–70. Patch Panel SB-138/FRR-24, Schematic Diagram

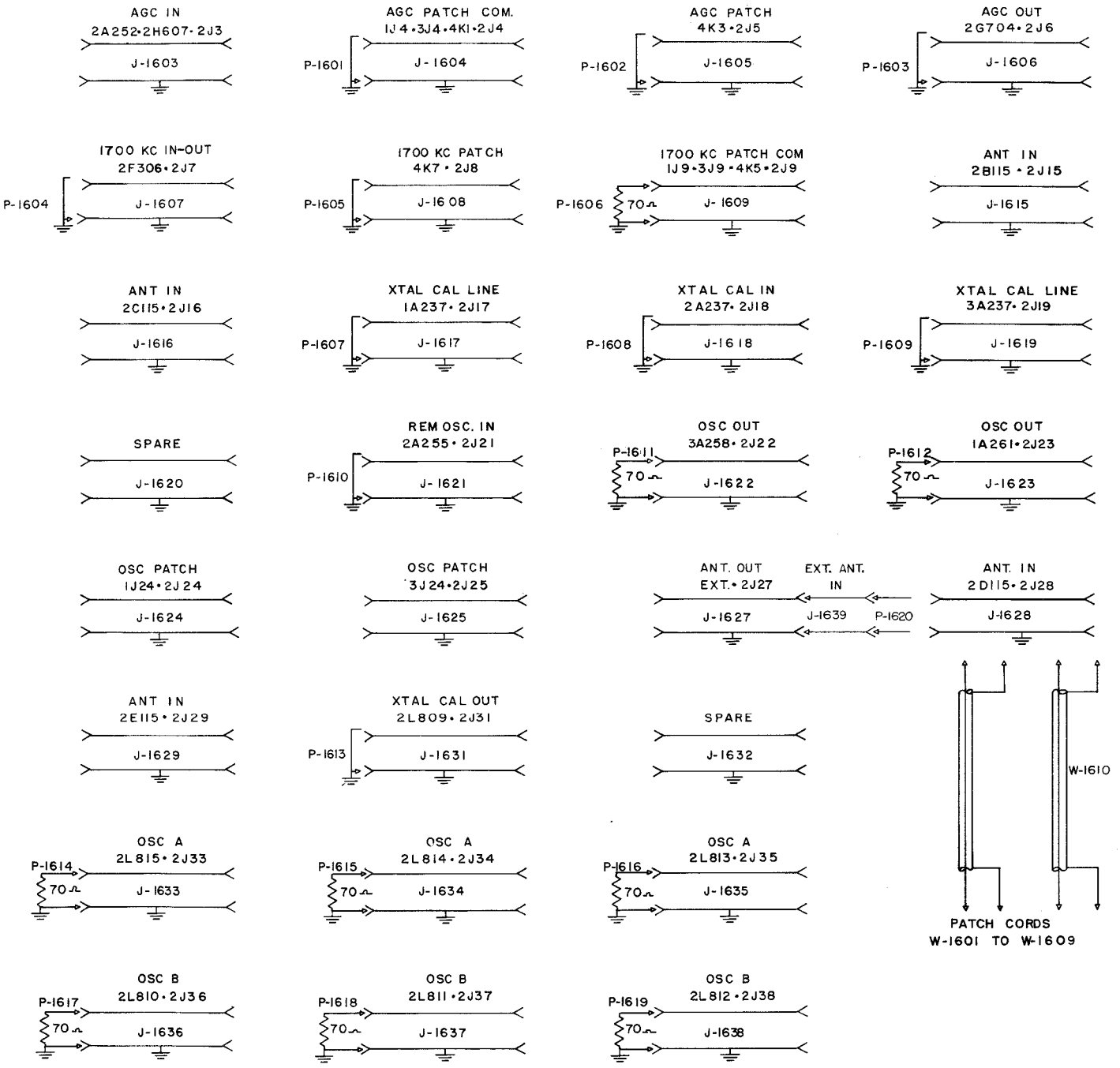


Figure 2-71. Patch Panel SB-140/FRR-24, Schematic Diagram

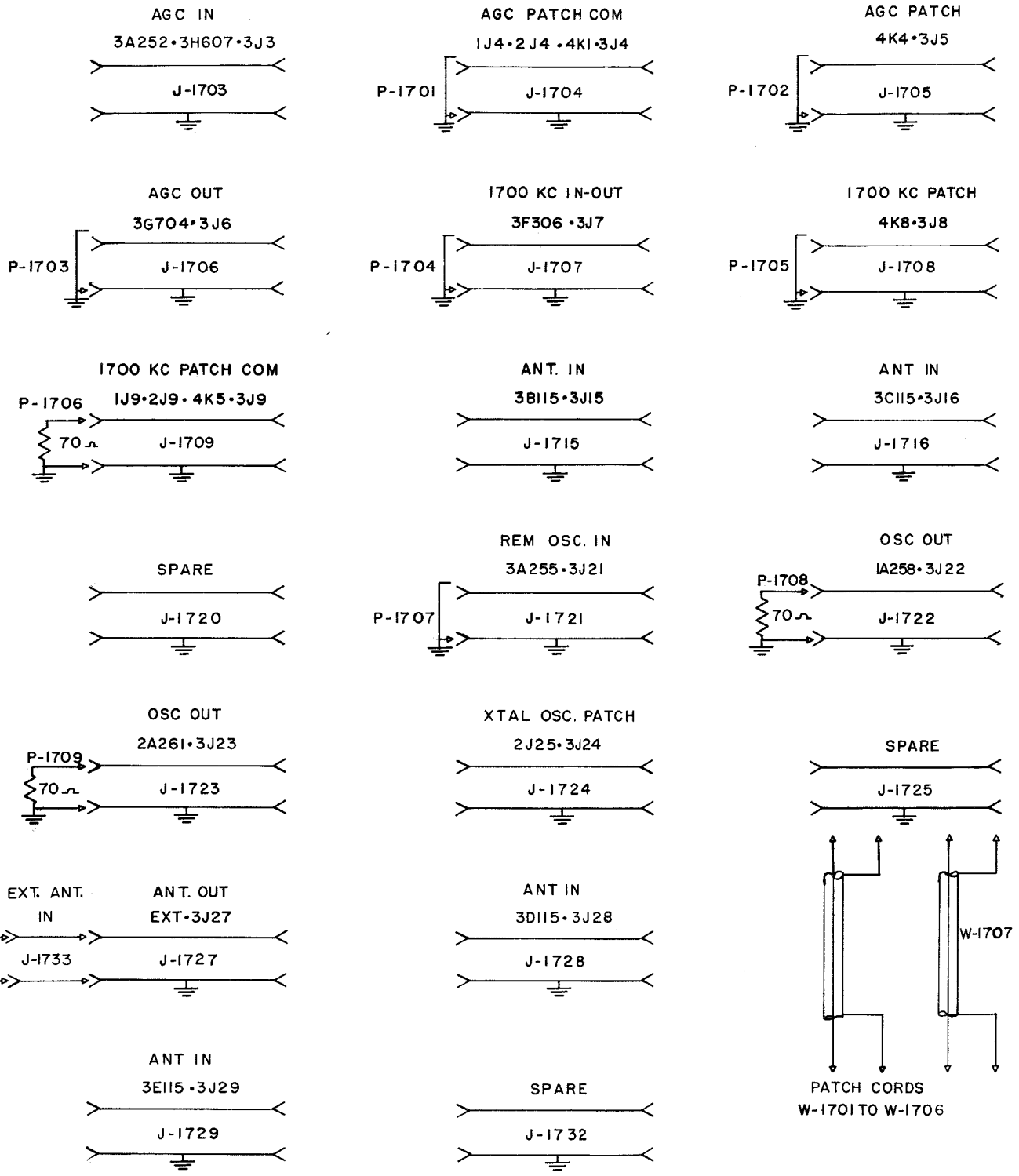


Figure 2–72. Patch Panel SB-169/FRR-24, Schematic Diagram

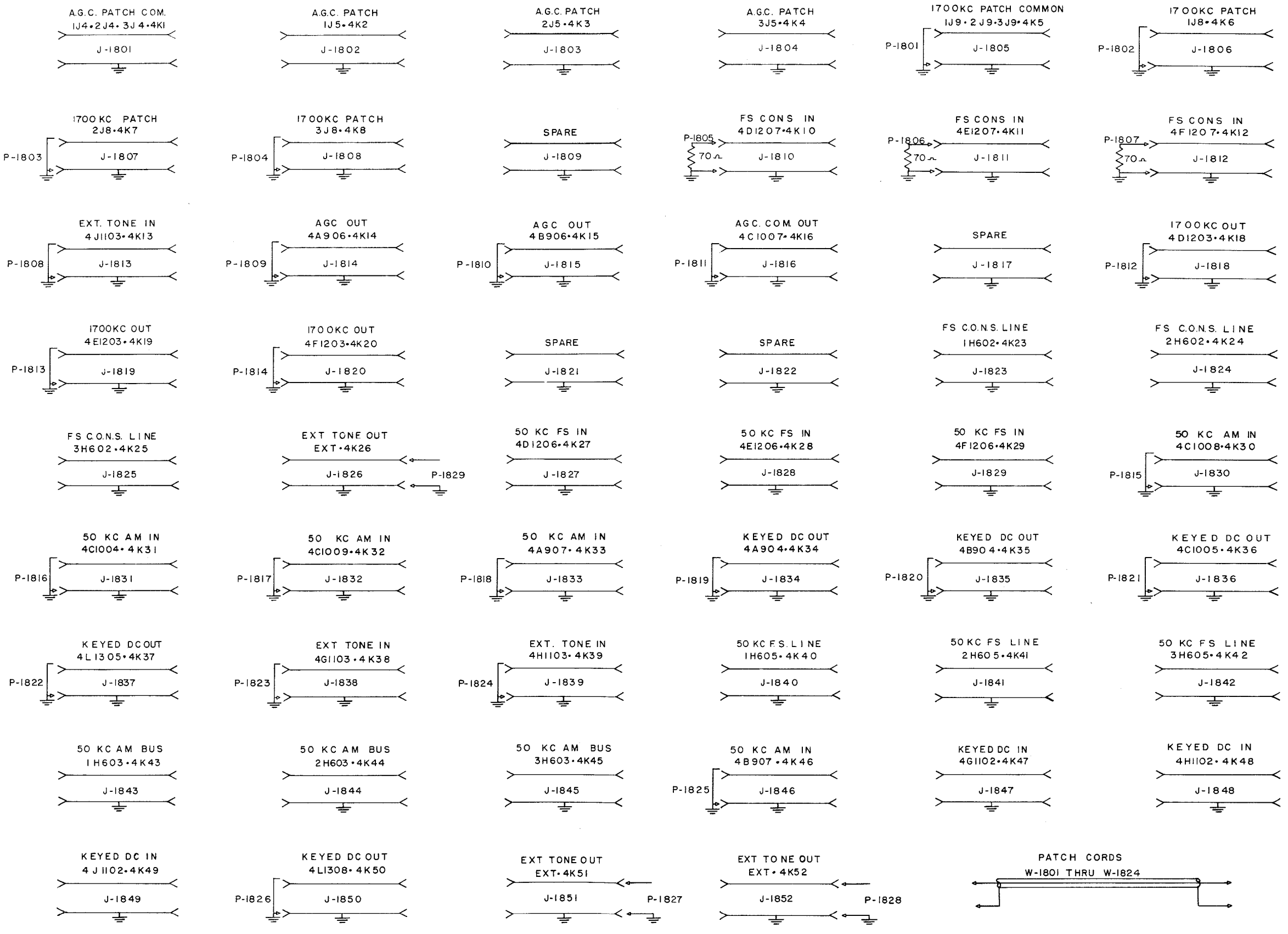


Figure 2–73. Patch Panel SB-143/FRR-24, Schematic Diagram

NAVSHIPS 91580

RESTRICTED
SECURITY INFORMATION

INSTRUCTION BOOK

for

RADIO RECEIVING SET AN/FRR-24

SECTION 3—INSTALLATION

NATIONAL COMPANY, INC.
MALDEN 48, MASSACHUSETTS

BUREAU OF SHIPS

NAVY DEPARTMENT

Contract: NObsr-39402

Approved by BuShips: 15 April 1952

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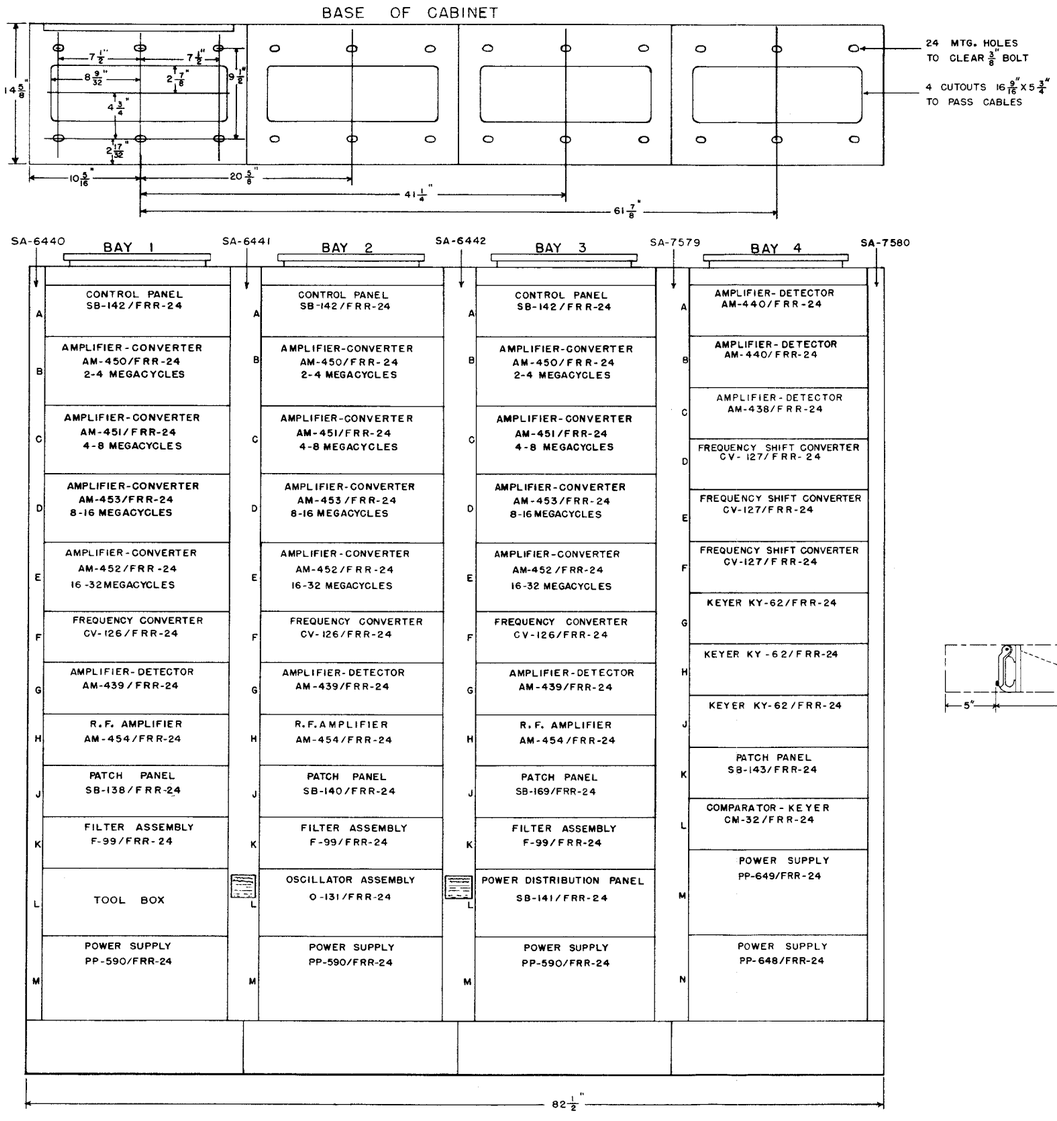
SECTION 3
INSTALLATION

1. UNPACKING.

The AN/FRR-24 is shipped from the factory with the rack cabinets, individual units and equipment repair parts packed in separate wooden boxes. The following table identifies the equipment to be found in each box.

SHIPPING BOX NO.	CONTENTS	
	NAME	DESIGNATION
1	Control Panel	SB-142/FRR-24
2	Control Panel	SB-142/FRR-24
3	Control Panel	SB-142/FRR-24
4	Amplifier-Converter	AM-450/FRR-24
5	Amplifier-Converter	AM-450/FRR-24
6	Amplifier-Converter	AM-450/FRR-24
7	Amplifier-Converter	AM-451/FRR-24
8	Amplifier-Converter	AM-451/FRR-24
9	Amplifier-Converter	AM-451/FRR-24
10	Amplifier-Converter	AM-452/FRR-24
11	Amplifier-Converter	AM-452/FRR-24
12	Amplifier-Converter	AM-452/FRR-24
13	Amplifier-Converter	AM-453/FRR-24
14	Amplifier-Converter	AM-453/FRR-24
15	Amplifier-Converter	AM-453/FRR-24
16	Frequency Converter	CV-126/FRR-24
17	Frequency Converter	CV-126/FRR-24
18	Frequency Converter	CV-126/FRR-24
19	Amplifier-Detector	AM-439/FRR-24
20	Amplifier-Detector	AM-439/FRR-24
21	Amplifier-Detector	AM-439/FRR-24
22	R.F. Amplifier	AM-454/FRR-24
23	R.F. Amplifier	AM-454/FRR-24
24	R.F. Amplifier	AM-454/FRR-24
25	Patch Panel	SB-138/FRR-24
26	Patch Panel	SB-140/FRR-24
27	Patch Panel	SB-169/FRR-24
28	Patch Panel	SB-143/FRR-24
29	Filter Assembly	F-99/FRR-24
30	Filter Assembly	F-99/FRR-24
31	Filter Assembly	F-99/FRR-24
32	Tool Box	
33	Oscillator Assembly	O-131/FRR-24
34	Power Distribution Panel	SB-141/FRR-24
35	Power Supply	PP-590/FRR-24
36	Power Supply	PP-590/FRR-24
37	Power Supply	PP-590/FRR-24
38	Amplifier-Detector	AM-440/FRR-24
39	Amplifier-Detector	AM-440/FRR-24
40	Amplifier-Detector	AM-438/FRR-24
41	Frequency Shift Converter	CV-127/FRR-24
42	Frequency Shift Converter	CV-127/FRR-24
43	Frequency Shift Converter	CV-127/FRR-24
44	Keyer	KY-62/FRR-24
45	Keyer	KY-62/FRR-24
46	Keyer	KY-62/FRR-24
47	Comparator-Keyer	CM-32/FRR-24
48	Power Supply	PP-648/FRR-24
49	Power Supply	PP-649/FRR-24
50	Set of Eight Test Cables	
51	Cabinet for Bay 1 Single Blower 24 Floor Mounting Screws 214 Cabinet Mounting Screws Two Instruction Books Operator's Handbook Maintenance Handbook Spare Parts Catalog	CY-860/FRR-24
52	Cabinet for Bay 2 Single Blower Five Trim Strips	CY-860/FRR-24
53	Cabinet for Bay 3 Single Blower Eleven Loose Interconnecting Cables Forty-Five Patch Cords Teletype Output Terminal Box	CY-860/FRR-24
54	Cabinet for Bay 4 Double Blower	CY-860/FRR-24



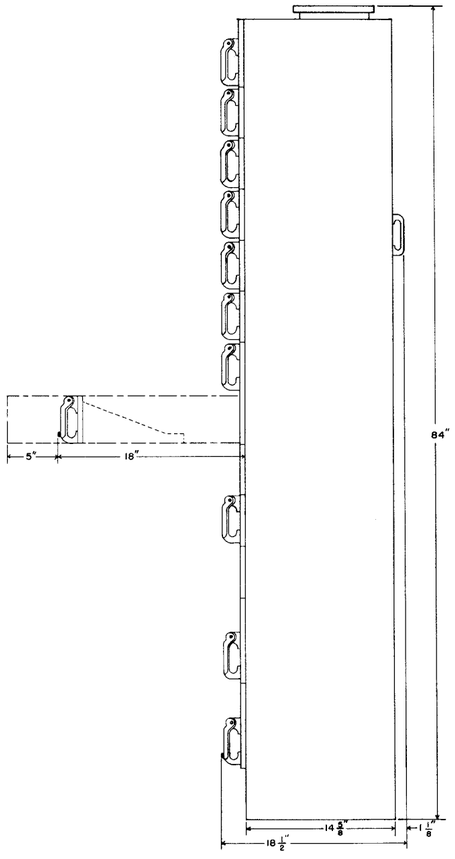


Figure 3–2. Outline Dimensional Drawing, AN/FRR-24 Radio Receiving Set

SHIPPING BOX NO.	CONTENTS	
	NAME	DESIGNATION
	Eight Handles with Screws Interconnecting Cable Harness Assembly Four Trim Panels with Screws	

SHIPPING BOX NO.	CONTENTS	
	NAME	DESIGNATION
55	Equipment Repair Parts	

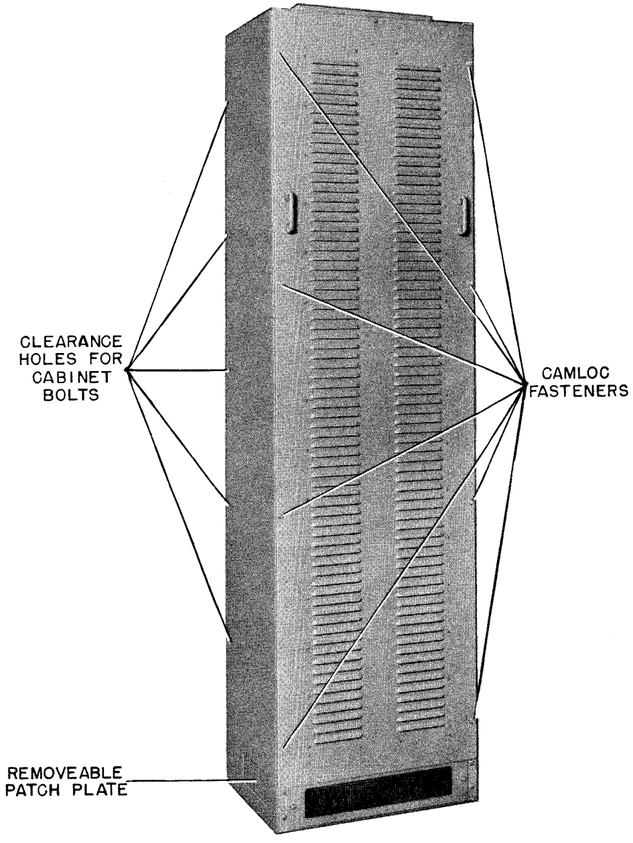


Figure 3–1. Cabinet CY-860/FRR-24, Rear View

The four rack cabinets and the individual units within their cabinets are separately crated and should be unpacked using the following procedure:

Step 1. One side of each box is marked 'This Side Up'. With the marked side uppermost cut the metal bands and with an ordinary nail puller remove the top of the box.

Step 2. To remove the rack cabinets from the boxes it is necessary to remove one side of the wooden crate as well as the top.

Step 3. Slide the cardboard cartons containing the rack cabinets from their wooden boxes.

Step 4. Stand the cartons on end and remove the cabinets from the cartons.

Step 5. Lift the cartons containing the individual units from their crates.

Step 6. Remove the individual units from their cartons.

Step 7. Release the eight Camloc fasteners (See Figure 3–1) on the cabinet backs and remove the backs.

Step 8. Cut the three straps which secure the small carton within the rack cabinet and remove the carton.

Step 9. Remove all traces of loose packing material from the interior of the cabinets.

Step 10. All the hardware needed for installing the AN/FRR-24 is contained in the small cartons in each cabinet. The different items may be located by referring to the table in paragraph 1 and may be removed from the cartons as needed.

Step 11. The side panels of each cabinet are equipped with removable patch plates. See Figure 3–1. All of these plates must be removed except the one on the left side of Bay 1 and the one on the right side of Bay 4. Take out the six flat Phillips-head screws and remove the patch plates.

2. INSTALLATION.

The following paragraphs provide detailed instructions for all installation procedures prior to energizing the equipment for the first time. These instructions MUST be strictly adhered to in order to insure that the equipment will function properly without incurring any unnecessary rechecking.

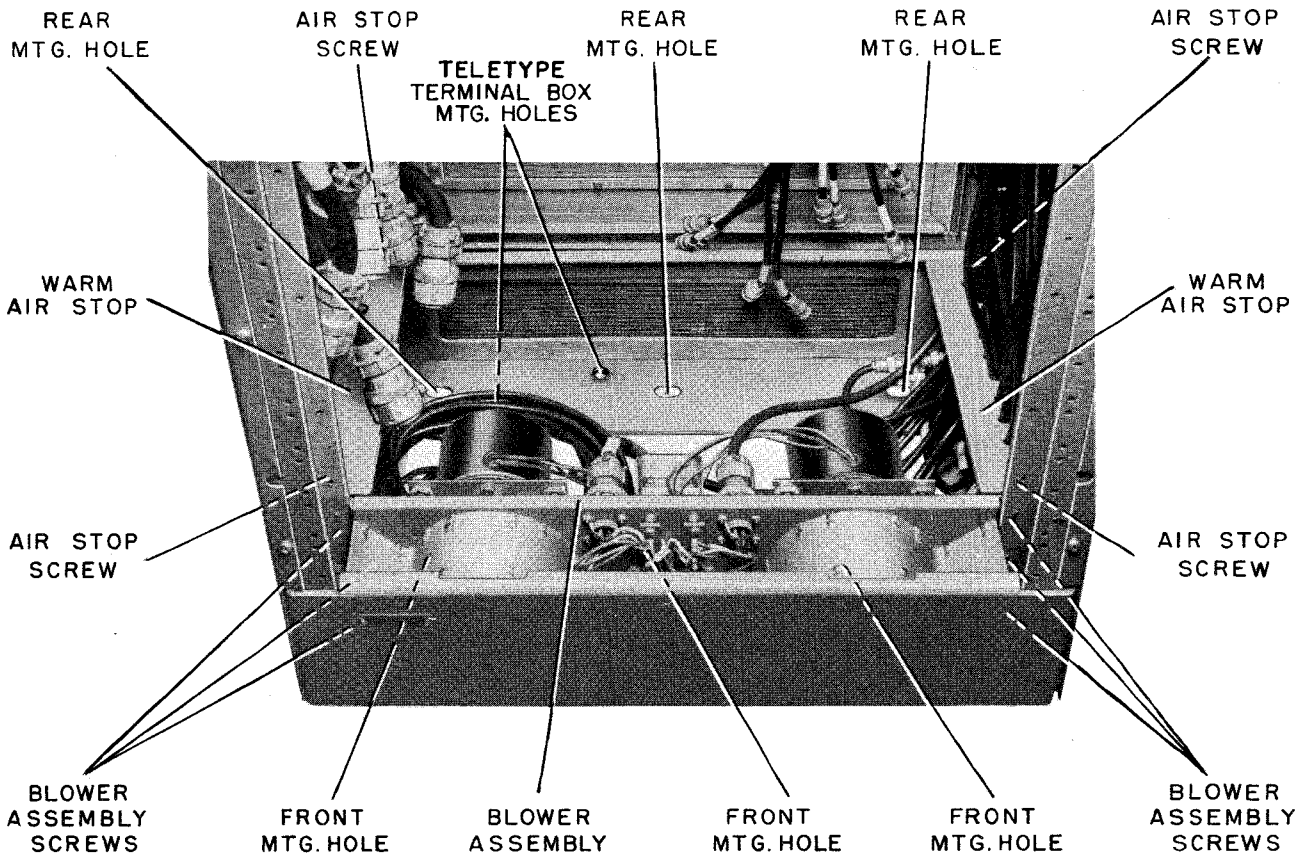


Figure 3–3. Mounting Details, Bottom of Cabinet CY-860/FRR-24

A—CUT BACK THE VINYLITE JACKET SQUARE AND EVEN AS SHOWN.

B—PUSH BACK BRAID AND CUT OFF 1/4 INCH OF CABLE DIELECTRIC.

C—PULL BRAID FORWARD AND TAPER TOWARD CENTER CONDUCTOR.

D—INSERT CABLE INTO CLAMPING NUT ①, THIN METAL WASHER ②, RUBBER WASHER ③, AND CLAMPING SLEEVE ④ IN ORDER AS INDICATED. BE SURE THAT CLAMPING SLEEVE ④ CLEARS ALL BRAID WIRES AND ITS INTERNAL SHOULDER RESTS SQUARELY AGAINST END OF VINYLITE JACKET.

E—UNBRAID SHIELD WIRES, SPREAD OPEN AND LAY BACK ON CLAMPING SLEEVE ④ WITHOUT WIRES CROSSING EACH OTHER. CUT OFF EXCESS BRAID WIRE LENGTH SO THAT EACH WIRE WILL END BEFORE TOUCHING SHOULDER OF CLAMPING SLEEVE ④. CUT OFF CABLE DIELECTRIC 5/32" FROM END OF BRAID WIRES. BE SURE TO CUT SQUARE AND EVEN AND DO NOT NICK CENTER CONDUCTOR. CUT CENTER CONDUCTOR 3/16" FROM END OF CABLE DIELECTRIC AND TIN. SOLDER MALE CONTACT CAREFULLY AND REMOVE EXCESS SOLDER. BE CAREFUL THAT SOLDER OR FLUX DOES NOT GET ON END OF CABLE DIELECTRIC.

F—INSERT CABLE INTO PLUG AS FAR AS IT WILL GO. PUSH RUBBER WASHER ③ AND THIN METAL WASHER ② INTO BODY AND TIGHTEN CLAMPING NUT ①. HOLD BODY WITH WRENCH AND TIGHTEN CLAMPING NUT ①. DO NOT ALLOW BODY OR CABLE TO ROTATE DURING THIS OPERATION.

G—WHEN ARMOR CABLE RG-12/U IS USED SUBSTITUTE ARMOR CLAMP MX-564/U CONSISTING OF PARTS ⑤ AND ⑥ FOR CLAMPING NUT ①. CUT ARMOR BACK 1 1/2 INCHES AND SLIDE ⑥ OVER ARMOR. PROCEED AS SHOWN IN A TO F, EXCEPT USE ⑤ IN PLACE OF ①. PULL ARMOR FORWARD OVER TAPERED PORTION OF ⑤ AND CUT OFF EXCESS ARMOR LENGTH. UNBRAID ARMOR WIRES FOR A SHORT DISTANCE AND BRING FORWARD ⑥. CLAMP ARMOR BETWEEN TWO TAPERED SURFACES. BE CAREFUL THAT LOOSE ARMOR ENDS DO NOT EXTEND INTO THREADS AND JAM.

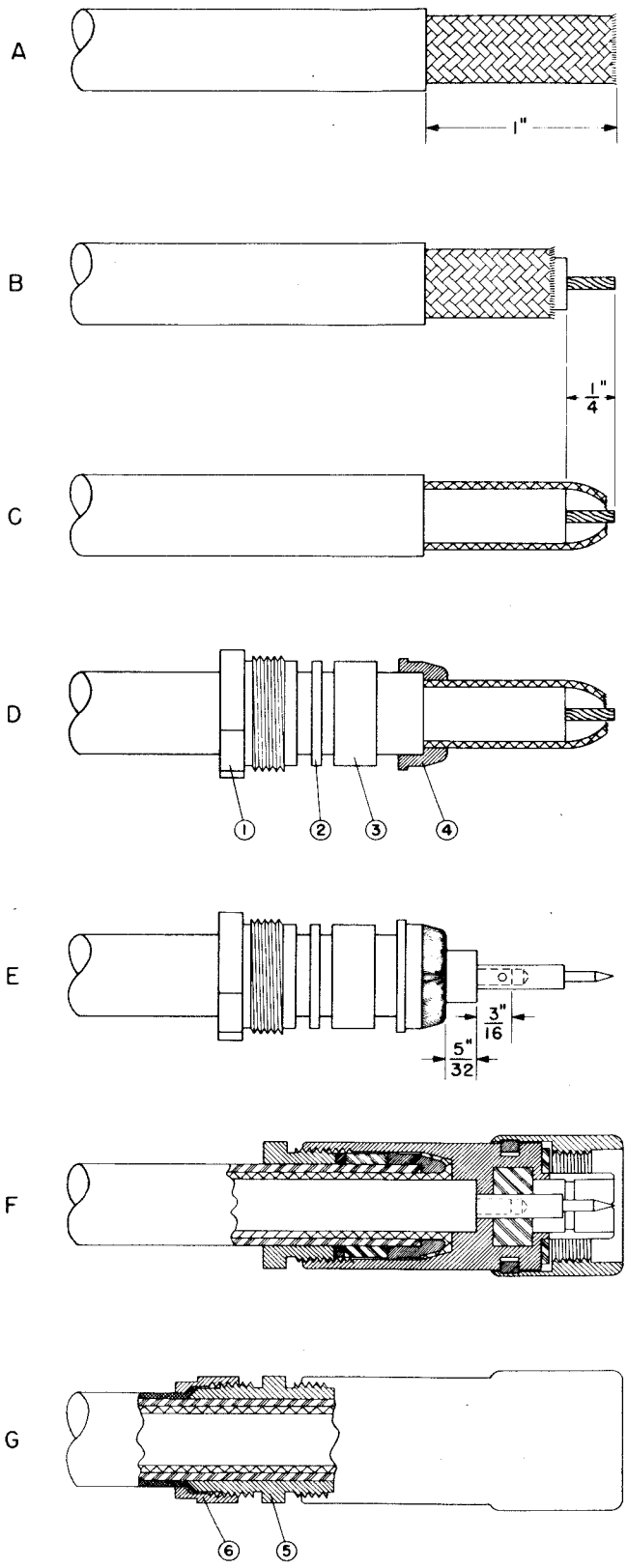
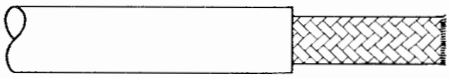
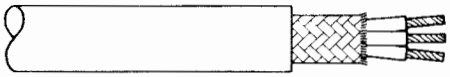


Figure 3–4. Assembly of UG-21B/U Plug and MX-564/U Clamp to RG-11/U or RG-12/U Cable for Antenna Input Connections

A—CUT BACK THE RUBBER JACKET SQUARE AND EVEN AS SHOWN.

A

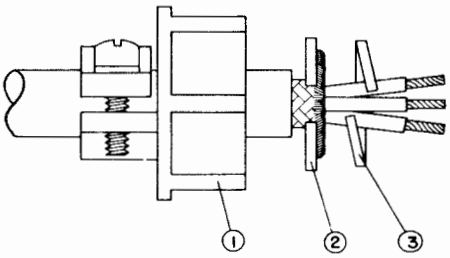




B

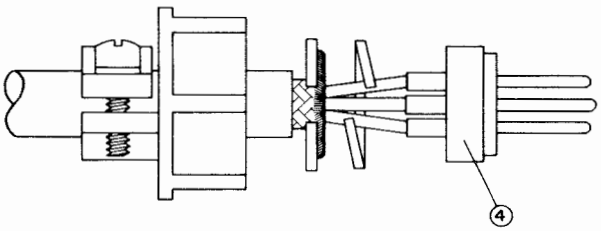
B—PUSH BACK SHIELD AND STRIP 1/4 INCH OF INSULATION OFF EACH CONDUCTOR.

C



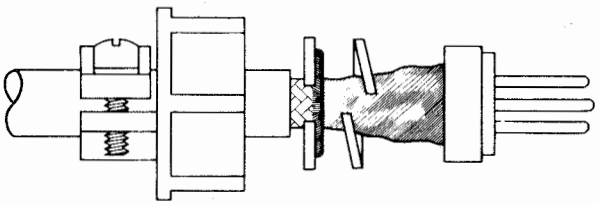
C—INSERT CABLE INTO CABLE CLAMP AN3057-6 ①. UNBRAID SHIELD WIRES AND FLARE OUT. SOLDER SLOTTED WASHER ② TO FLARED SHIELD AS SHOWN. INSERT WIRES INTO RETAINING RING ③.

D



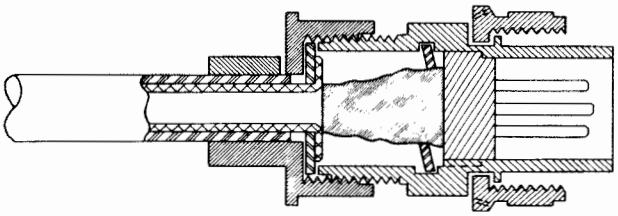
D—SOLDER EACH CONDUCTOR INTO CONTACT ON REAR OF INSERT ④.

E



E—TAPE EACH LEAD. PUT A LAYER OF TAPE AROUND ALL LEADS TO STRENGTHEN THE ASSEMBLY.

F



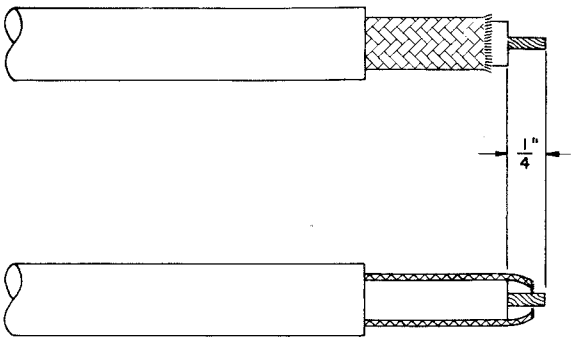
F—PUSH INSERT ④ INTO BARREL ASSEMBLY. MAKE SURE THE KEY IN BARREL ASSEMBLY FITS INTO KEYWAY ON INSERT ④. SLIDE RETAINER RING ③ INTO RETAINER RING GROOVE IN BARREL ASSEMBLY. INSERT ④ IS NOW LOCKED IN POSITION. PULL FORWARD CABLE CLAMP ① AND SCREW ON BARREL ASSEMBLY. TIGHTEN THE TWO PHILISTER HEAD SCREWS WHICH BIND CABLE CLAMP ① TO CABLE.

Figure 3–5. Assembly of Plug AN3106A-14S-12P to 3-wire Shielded Audio Cable for Audio Output and Teletype Connections

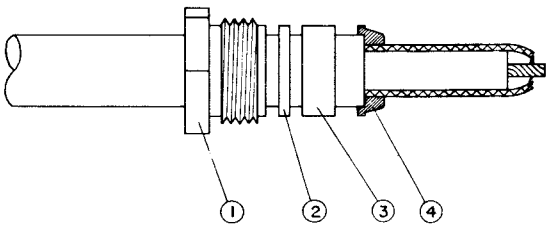
A—CUT BACK THE VINYLITE JACKET SQUARE AND EVEN AS SHOWN.

B—PUSH BACK BRAID AND CUT OFF 1/4 INCH OF CABLE DIELECTRIC.

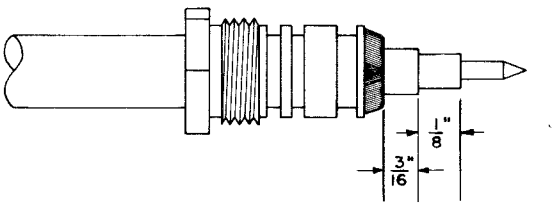
C—PULL BRAID FORWARD AND TAPER TOWARD CENTER CONDUCTOR.



D—INSERT CABLE INTO CLAMPING NUT ①, THIN METAL WASHER ②, RUBBER WASHER ③, AND CLAMPING SLEEVE ④ IN ORDER AS INDICATED. BE SURE THAT CLAMPING SLEEVE ④ CLEARS ALL BRAID WIRES AND ITS INTERNAL SHOULDER RESTS SQUARELY AGAINST END OF VINYLITE JACKET.



E—UNBRAID SHIELD WIRES, SPREAD OPEN AND LAY BACK ON CLAMPING SLEEVE ④ WITHOUT WIRES CROSSING EACH OTHER. CUT OFF EXCESS BRAID WIRE LENGTH SO THAT EACH WIRE WILL END BEFORE TOUCHING SHOULDER OF CLAMPING SLEEVE ④. CUT OFF CABLE DIELECTRIC 5/32" FROM END OF BRAID WIRES. BE SURE TO CUT SQUARE AND EVEN AND DO NOT NICK CENTER CONDUCTOR. CUT CENTER CONDUCTOR 3/16" FROM END OF CABLE DIELECTRIC AND TIN. SOLDER MALE CONTACT CAREFULLY AND REMOVE EXCESS SOLDER. BE CAREFUL THAT SOLDER OR FLUX DOES NOT GET ON END OF CABLE DIELECTRIC.



F—INSERT CABLE INTO PLUG AS FAR AS IT WILL GO. PUSH RUBBER WASHER ③ AND THIN METAL WASHER ② INTO BODY AND TIGHTEN CLAMPING NUT ①. HOLD BODY WITH WRENCH AND TIGHTEN CLAMPING NUT ①. DO NOT ALLOW BODY OR CABLE TO ROTATE DURING THIS OPERATION.

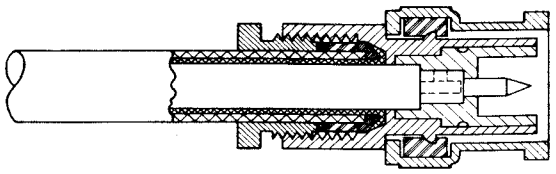
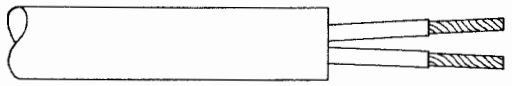


Figure 3–6. Assembly of Plug UG-260/U to RG-59/U Cable for External Tone Input Connections

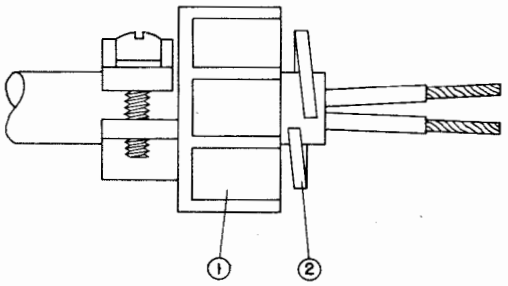
A—CUT BACK AND STRIP TO CONDUCTOR CABLE SQUARE AND EVEN AS SHOWN.

A



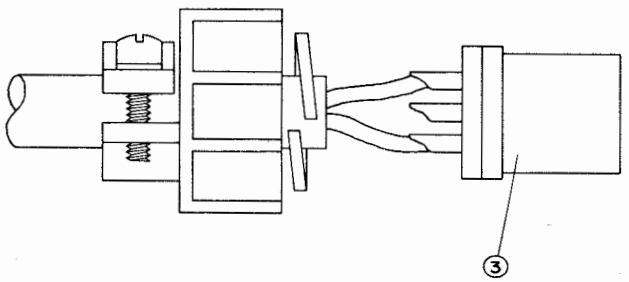
B—INSERT CABLE INTO CABLE CLAMP ① AND RETAINING RING ②.

B



C—SOLDER EACH CONDUCTOR INTO REAR OF CONTACT ASSEMBLY ③. CARE SHOULD BE EXERCISED NOT TO NICK CONDUCTORS.

C



D—PUSH CONTACT ASSEMBLY ③ INTO BARREL ASSEMBLY. MAKE SURE THE KEY IN BARREL ASSEMBLE FITS INTO KEYWAY OF CONTACT ASSEMBLY ③. SLIDE RETAINING RING ② INTO RETAINING RING GROOVE IN BARREL ASSEMBLY. SCREW CABLE CLAMP ① ONTO BARREL ASSEMBLY. TIGHTEN THE TWO PHILISTER HEAD SCREWS WHICH BIND CABLE CLAMP ① TO CABLE.

D

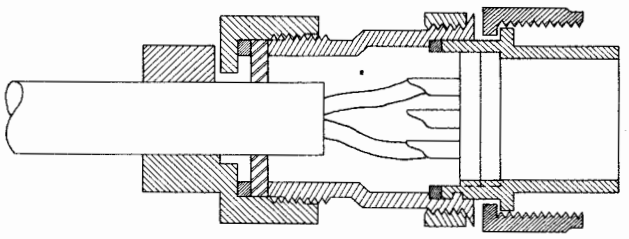


Figure 3–7. Assembly of Plug AN3106B-20-3S to Two Conductor no. 8 Rubber Covered Wire for A.C. Input Connections

BAY #1

CONTROL PANEL SB-142/FRR-24

A

W-3023 TO J-111(B) LOCAL OSC IN
W-3022 TO J-116(B) LOCAL OSC IN
W-3015 TO J-114(E) XTAL CAL OUT
W-3002 TO J-607(H)&J-1503(J) AGC IN
W-3052 TO J-1617(2J) XTAL CAL IN
W-3005 TO J-1623(2J) LOCAL OSC OUT
W-3003 TO J-1521(J) REMOTE OSC IN
W-3006 TO J-1722(3J) LOCAL OSC OUT
W-3014 TO J-114(D) XTAL CAL OUT
W-3029 TO J-114(C) XTAL CAL OUT
W-3027 TO J-114(B) XTAL CAL OUT
W-3024 TO J-110(B) AGC OUT
W-3025 TO J-110(C) AGC OUT
W-3010 TO J-110(D) AGC OUT
W-3011 TO J-110(E) AGC OUT
W-3026 TO J-112(B) REMOTE OSC OUT
W-3030 TO J-116(C) LOCAL OSC IN
W-3021 TO J-112(C) REMOTE OSC OUT
W-3028 TO J-111(C) LOCAL OSC IN
W-3008 TO J-116(D) LOCAL OSC IN
W-3016 TO J-112(D) REMOTE OSC OUT
W-3009 TO J-111(D) LOCAL OSC IN
W-3012 TO J-116(E) LOCAL OSC IN
W-3007 TO J-112(E) REMOTE OSC OUT
W-3013 TO J-111(E) LOCAL OSC IN

PWR IN TO J-2004(M) W-3001
PWR OUT TO J-117(B) W-3017
PWR OUT TO J-117(E) W-3020
PWR OUT TO J-117(C) W-3018
PWR OUT TO J-117(D) W-3019

J-255 J-237 J-258 J-261 J-252 J-238 J-239 J-242 J-241 J-240
J-233 J-234 J-235 J-236 J-224 J-206 J-216 J-226 J-208 J-216
J-248 J-249 J-250 J-251 J-215 J-225 J-207 J-217 J-227 J-209

W-3027 TO J-233(A) XTAL CAL IN
W-3031 TO J-302(F) 1750Kc OUT
W-3026 TO J-215(A) REMOTE OSC IN
W-3023 TO J-206(A) LOCAL OSC OUT
W-3022 TO J-224(A) LOCAL OSC OUT
W-3024 TO J-248(A) AGC IN

J-110 J-116 J-111 J-112 J-113 J-114 J-115 J-117

B
AMPLIFIER-CONVERTER AM-450/FRR-24

ANT IN TO J-1515(J) W-3039
PWR IN TO J-238(A) W-3017

W-3029 TO J-234(A) XTAL CAL IN
W-3032 TO J-303(F) 1750Kc OUT
W-3021 TO J-216(A) REMOTE OSC IN
W-3028 TO J-207(A) LOCAL OSC OUT
W-3030 TO J-225(A) LOCAL OSC OUT
W-3025 TO J-249(A) AGC IN

J-110 J-116 J-111 J-112 J-113 J-114 J-115 J-117

C
AMPLIFIER-CONVERTER AM-451/FRR-24

ANT IN TO J-1516(J) W-3040
PWR IN TO J-239(A) W-3018

W-3014 TO J-235(A) XTAL CAL IN
W-3033 TO J-307(F) 1750Kc OUT
W-3016 TO J-217(A) REMOTE OSC IN
W-3009 TO J-208(A) LOCAL OSC OUT
W-3008 TO J-226(A) LOCAL OSC OUT
W-3010 TO J-250(A) AGC IN

J-110 J-116 J-111 J-112 J-113 J-114 J-115 J-117

D
AMPLIFIER-CONVERTER AM-453/FRR-24

ANT IN TO J-1528(J) W-3061
PWR IN TO J-240(A) W-3019

W-3015 TO J-236(A) XTAL CAL IN
W-3034 TO J-304(F) 1750Kc OUT
W-3007 TO J-218(A) REMOTE OSC IN
W-3013 TO J-209(A) LOCAL OSC OUT
W-3012 TO J-227(A) LOCAL OSC OUT
W-3011 TO J-251(A) AGC IN

J-110 J-116 J-111 J-112 J-113 J-114 J-115 J-117

E
AMPLIFIER-CONVERTER AM-452/FRR-24

ANT IN TO J-1529(J) W-3062
PWR IN TO J-241(A) W-3020

W-3033 TO J-113(D) 1750Kc IN
W-3036 TO J-1507(J) 1700Kc IN-OUT
W-3035 TO J-403(K) 50Kc OUT
W-3034 TO J-113(E) 1750Kc IN
W-3032 TO J-113(C) 1750Kc IN
W-3031 TO J-113(B) 1750Kc IN

J-302 J-303 J-304 J-305 J-306 J-307 J-308

F
FREQUENCY CONVERTER CV-126/FRR-24

PWR IN TO J-2009(M) W-3037

W-3043 TO J-604(H) 50Kc IN
W-3038 TO J-1506(J) AGC OUT

J-704 J-705 J-707 P-702 AUDIO OUT J-706

G
AMPLIFIER-DETECTOR AM-439/FRR-24

PWR IN TO J-2008(M) W-3044

W-3002 TO J-252(A)&J-1503(J) AGC IN
W-3042 TO J-402(K) 50Kc IN
W-3050 TO J-1840(4K) 50Kc FS OUT
W-3043 TO J-705(G) 50Kc AM OUT
W-3051 TO J-1843(4K) 50K AM OUT
W-3049 TO J-1823(4K) FS CONS OUT

J-602 J-603 J-604 J-605 J-606 J-607 J-608

H
RF AMPLIFIER AM-454/FRR-24

PWR IN TO J-2007(M) W-3058

W-3002 TO J-252(A)&J-607(H) AGC IN
W-3045 TO J-1604(2J)&J-1704(3J)&J-1801(4K) AGC PATCH COM
W-3046 TO J-1802(4K) AGC PATCH
W-3038 TO J-704(G) AGC OUT
W-3036 TO J-306(F) 1700Kc IN-OUT
W-3047 TO J-1806(4K) 1700Kc PATCH
W-3048 TO J-1609(2J)&J-1709(3J)&J-1805(4K) 1700Kc PATCH COM

PATCH PANEL SB-138/FRR-24

J-1509 J-1508 J-1507 J-1506 J-1505 J-1504 J-1503
J-1525 J-1524 J-1523 J-1522 J-1521 J-1520 SPARE SPARE
J-1516 J-1515
J-1532 SPARE
J-1529 J-1528 J-1527

ANT OUT TO J-115(C) W-3040
ANT OUT TO J-115(B) W-3039
ANT IN
ANT OUT TO J-115(D) W-3061
ANT OUT TO J-115(E) W-3062

W-3548 TO J-1624(2J) XTAL OSC PATCH
W-3605 TO J-261(3A) OSC OUT
W-3506 TO J-258(2A) OSC OUT
W-3003 TO J-255(A) REMOTE OSC IN

J

W-3035 TO J-305(F) 50Kc IN
W-3042 TO J-606(H) 50Kc OUT

J-402 J-403 J-404

K
FILTER ASSEMBLY F-99/FRR-24

PWR IN TO J-2006(M) W-3055

L
TOOL BOX

PWR OUT TO J-242(A) W-3001
PWR OUT TO J-404(K) W-3055
PWR OUT TO J-608(H) W-3058
PWR OUT TO J-706(G) W-3044
PWR OUT TO J-308(F) W-3037

W-3057 TO J-3406(3L) AC IN
W-3056 TO FAN MOTOR AC OUT

W-3056 TO J-2002(M) FAN MOTOR

J-2002 J-2003 J-2004 J-2005 J-2006 J-2007 J-2008 J-2009

M
POWER SUPPLY PP-590/FRR-24

Figure 3-8. Interconnection Diagram, Bay no. 1

a. POSITIONING OF THE EQUIPMENT.–When locating the receiving equipment the following considerations must be taken into account:

(1) A minimum clearance of two feet and preferably three between the rear of the equipment and the nearest obstruction (walls, radiator etc) must be provided to allow access to all cable connections.

(2) Clearance must be provided at the front to permit the service and/or removal of the individual units. See Figure 3–2 for dimensions of equipment and required clearances.

Set the four rack cabinets over the access holes in the floor in numerical consecutive order with bay no. 1 cabinet at the left. Refer to the base of cabinet sketch on Figure 3–2 for the size and spacing of the floor mounting details required. The four cabinets are not interchangeable. Cabinet no. 1 is packed in box no. 51, cabinet no. 2 is packed in box no. 52, cabinet no. 3 is packed in box no. 53 and cabinet no. 4 is packed in box no. 54.

Proceed as follows:

Step 1. Using the 3/8-16 bolts and nuts provided in the mounting hardware package fasten adjacent cabinets together through the five holes provided in the sides of the cabinets. See Figure 3–1.

Step 2. Secure the entire assembly to the floor using the floor mounting screws provided. Six holes are provided for this purpose at the bottom of each cabinet. See Figure 3–3.

The blower assemblies are the f units to be mounted in the cabinets. The single blower units are used in the first three bays and the double blower unit mounts in bay no. 4. Each blower unit is mounted on three shock mounts, two of these mounts are shipped affixed to the cabinet, the third is mounted on the blower unit. Proceed to mount the blower assemblies as follows:

Step 1. Loosen the nuts on the two shock mounts at the sides of the cabinet and slide the slotted brackets down over the screws. This locates the blower assembly as shown in Figure 3–3. Sufficient clearance is provided between the rack and the warm air stops to allow the blower assembly mounting plate to slide through.

Step 2. Secure the shock mount on the blower to the front of the rack by passing the two flat head 6-32 screws through the rack and the mount and fasten with the lock washers and nuts provided. Tighten the nuts on the other two shock mounts.

Step 3. Fasten the handles to the backs of the cabinets.

Step 4. Secure the teletype output terminal box to the bottom of bay no. 4 cabinet using 10-32 screws. Refer to Figure 3–3 for location of the mounting holes.

b. CONNECTION DATA.–Installation of the AN/FRR-24 consists of tying-in and connecting all interconnecting cables and the fabrication of various other cable assemblies. Proceed as outlined in the following paragraphs.

(1) INTERCONNECTING CABLES.–All cables terminating within a bay are fastened within the cabinet during shipment. The terminations are taped to the cable supports with pressure-sensitive tape. Remove all the tape. The end of each cable carries a marker which contains the cable number and the number of the jack to which it must be connected. Figure 3–8 through 3–11 show the location of all the jacks and identify the cables.

The interconnecting cable harness assembly is packed in the inner carton in bay no. 4. The terminations are protected by wrappings sealed with pressure-sensitive tape. Remove the wrappings and lay the harness out at the rear of the cabinets. The cable harness must now be installed in the following manner:

Step 1. Starting in bay no. 3 feed the cables which terminated in bay no. 1 through the rectangular hole at the bottom right side of the cabinet (as viewed from the rear), through bay no. 2 and through the access hole in bay no. 2 into bay no. 1. Remove the comb shaped air stop, bring the cables past the air stop bracket and up behind the cable supports.

Step 2. Referring to Figure 3–8 tie the cables securely to the cable supports in such a manner that the connectors on the ends of the cables will reach their terminating connectors when the individual cabinets are installed.

Step 3. The cables terminating in bay no. 2 are brought up to their proper locations and tied in a similar manner.

Step 4. The bay no. 3 cables are fed directly up the sides of the cabinet behind the cable supports.

Step 5. The cables terminating in bay no. 4 must pass through the access hole at the left (facing the rear of the cabinets). They pass up to their terminating jacks in the same fashion.

Step 6. The eleven loose interconnecting cables are fed one at a time, from bay to bay through the access holes and fastened securely to the cable support nearest their termination. See Figures 3–8 through 3–11.

Step 7. The comb-shaped air stop plates contain enough slots to accomodate every cable individually. They vary in size, however, so the cable of largest diameter should be located first. Make certain that each cable passes through a slot in the comb and then secure the comb to the air stop bracket. See Figure 3–3.

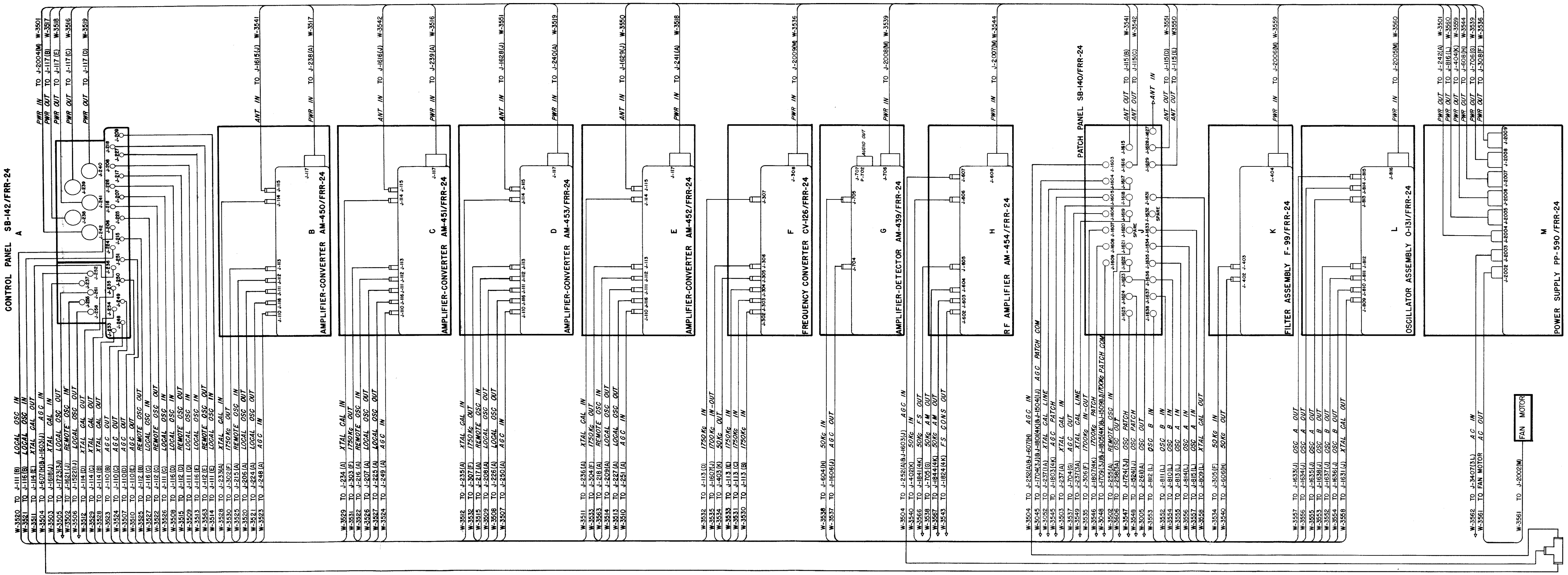


Figure 3–9. Interconnection Diagram, Bay no. 2

BAY #3

CONTROL PANEL SB-142/FRR-24

W-3621 TO J-111(B) LOCAL OSC IN
W-3622 TO J-116(B) LOCAL OSC IN
W-3612 TO J-114(E) XTAL CAL OUT
W-3601 TO J-607(H) & J-1703(J) AGC IN
W-3549 TO J-1619(2J) XTAL CAL IN
W-3605 TO J-1523(1J) LOCAL OSC OUT
W-3603 TO J-1721(J) REMOTE OSC IN
W-3606 TO J-1622(2J) LOCAL OSC OUT
W-3613 TO J-114 (D) XTAL CAL OUT
W-3630 TO J-114 (C) XTAL CAL OUT
W-3629 TO J-114 (B) XTAL CAL OUT
W-3624 TO J-110(B) AGC OUT
W-3625 TO J-110(C) AGC OUT
W-3608 TO J-110 (D) AGC OUT
W-3607 TO J-110(E) AGC OUT
W-3626 TO J-112 (B) REMOTE OSC OUT
W-3628 TO J-116 (C) LOCAL OSC IN
W-3623 TO J-112(C) REMOTE OSC OUT
W-3627 TO J-111(C) LOCAL OSC IN
W-3610 TO J-116(D) LOCAL OSC IN
W-3616 TO J-112(D) REMOTE OSC OUT
W-3611 TO J-111 (D) LOCAL OSC IN
W-3614 TO J-116 (E) LOCAL OSC IN
W-3609 TO J-112(E) REMOTE OSC OUT
W-3615 TO J-111 (E) LOCAL OSC IN
W-3629 TO J-233(A) XTAL CAL IN
W-3631 TO J-302(F) 1750Kc OUT
W-3626 TO J-215(A) REMOTE OSC IN
W-3621 TO J-206(A) LOCAL OSC OUT
W-3622 TO J-224(A) LOCAL OSC OUT
W-3624 TO J-248 (A) AGC IN

PWR IN TO J-2004(M) W-3602
PWR OUT TO J-117 (B) W-3618
PWR OUT TO J-117 (E) W-3619
PWR OUT TO J-117 (C) W-3617
PWR OUT TO J-117 (D) W-3620

J-255 J-237 J-238 J-239 J-258 J-261 J-252 J-242 J-241 J-240
J-233 J-234 J-235 J-236 J-224 J-206 J-216 J-226 J-208 J-218
J-248 J-249 J-250 J-251 J-215 J-225 J-207 J-217 J-227 J-209

J-110 J-116 J-111 J-112 J-113 J-114 J-115 J-117

B
AMPLIFIER-CONVERTER AM-450/FRR-24

ANT IN TO J-1715(J) W-3641
PWR IN TO J-238(A) W-3618

W-3630 TO J-234(A) XTAL CAL IN
W-3632 TO J-303(F) 1750Kc OUT
W-3623 TO J-216(A) REMOTE OSC IN
W-3627 TO J-207(A) LOCAL OSC OUT
W-3628 TO J-225(A) LOCAL OSC OUT
W-3625 TO J-249(A) AGC IN

J-110 J-116 J-111 J-112 J-113 J-114 J-115 J-117

C
AMPLIFIER-CONVERTER AM-451/FRR-24

ANT IN TO J-1716(J) W-3642
PWR IN TO J-239(A) W-3617

W-3613 TO J-235(A) XTAL CAL IN
W-3633 TO J-307(F) 1750Kc OUT
W-3616 TO J-217(A) REMOTE OSC IN
W-3611 TO J-208(A) LOCAL OSC OUT
W-3610 TO J-226(A) LOCAL OSC OUT
W-3608 TO J-250(A) AGC IN

J-110 J-116 J-111 J-112 J-113 J-114 J-115 J-117

D
AMPLIFIER-CONVERTER AM-453/FRR-24

ANT IN TO J-1728(J) W-3649
PWR IN TO J-240(A) W-3620

W-3612 TO J-236(A) XTAL CAL IN
W-3634 TO J-304(F) 1750Kc OUT
W-3609 TO J-218 (A) REMOTE OSC IN
W-3615 TO J-209(A) LOCAL OSC OUT
W-3614 TO J-227 (A) LOCAL OSC OUT
W-3607 TO J-251 (A) AGC IN

J-110 J-116 J-111 J-112 J-113 J-114 J-115 J-117

E
AMPLIFIER-CONVERTER AM-452/FRR-24

ANT IN TO J-1729(J) W-3650
PWR IN TO J-241(A) W-3619

W-3633 TO J-113(D) 1750Kc IN
W-3636 TO J-1707(J) 1700Kc IN-OUT
W-3635 TO J-403 (K) 50Kc OUT
W-3634 TO J-113 (E) 1750Kc IN
W-3632 TO J-113(C) 1750Kc IN
W-3631 TO J-113 (B) 1750Kc IN

J-302 J-303 J-304 J-305 J-306 J-307 J-308

F
FREQUENCY CONVERTER CV-126/FRR-24

PWR IN TO J-2009(M) W-3637

W-3639 TO J-604(H) 50Kc IN
W-3638 TO J-1706(J) AGC OUT

J-704 J-705 J-707 P-702 AUDIO OUT J-706

G
AMPLIFIER-DETECTOR AM-439/FRR-24

PWR IN TO J-2008(M) W-3640

W-3601 TO J-252(A) & J-1703(J) AGC IN
W-3644 TO J-402(K) 50Kc IN
W-3660 TO J-1842(4K) 50Kc FS OUT
W-3639 TO J-705 (G) 50Kc AM OUT
W-3661 TO J-1845(4K) 50Kc AM OUT
W-3643 TO J-1825 (4K) FS CONS OUT

J-602 J-603 J-604 J-605 J-606 J-607 J-608

H
RF AMPLIFIER AM-454/FRR-24

PWR IN TO J-2007(M) W-3645

W-3601 TO J-252 (A) & J-607 (H) AGC IN
W-3045 TO J-1604(2J) & J-1801(4K) & J-1504 (1J) AGC PATCH COM
W-3646 TO J-1804(4K) AGC PATCH
W-3638 TO J-704 (G) AGC OUT
W-3636 TO J-306 (F) 1700Kc IN-OUT
W-3648 TO J-1808 (4K) 1700Kc PATCH
W-3048 TO J-1509(1J) & J-1609(2J) & J-1805(4K) 1700Kc PATCH COM

J-1709 J-1708 J-1707 J-1706 J-1705 J-1704 J-1703
J-1725 J-1724 J-1723 J-1722 J-1721 J-1720 J-1716 J-1715 J-1729 J-1728 J-1727
SPARE SPARE J-1732 SPARE

PATCH PANEL SB-169/FRR-24

W-3547 TO J-1625(2J) XTAL OSC PATCH
W-3505 TO J-261 (2A) OSC OUT
W-3006 TO J-258 (1A) OSC OUT
W-3603 TO J-255 (A) REMOTE OSC IN

J

ANT OUT TO J-115(C) W-3642
ANT OUT TO J-115(B) W-3641
ANT IN
ANT OUT TO J-115(D) W-3649
ANT OUT TO J-115 (E) W-3650

W-3635 TO J-305 (F) 50Kc IN
W-3644 TO J-606 (H) 50Kc OUT

J-402 J-403 J-404

K
FILTER ASSEMBLY F-99/FRR-24

PWR IN TO J-2006(M) W-3651

J-3410 J-3409 J-3408 J-3407 J-3406
J-3405 AC IN J-3404 AC IN J-3403 AC IN J-3402 AC IN J-3401 AC IN

L
POWER DISTRIBUTION PANEL SB-141/FRR-24

AC OUT TO J-2203(4N) W-3653
AC OUT TO J-2103(4M) W-3656
AC OUT TO J-2003(M) W-3654
AC OUT TO J-2003(2M) W-3562
AC OUT TO J-2003(1M) W-3057

W-3657 TO FAN MOTOR AC OUT
W-3657 TO J-2002 (M) FAN MOTOR

J-2002 J-2003 J-2004 J-2005 J-2006 J-2007 J-2008 J-2009

M
POWER SUPPLY PP-590/FRR-24

AC IN TO J-3408(L) W-3654
PWR OUT TO J-242 (A) W-3602
PWR OUT TO J-404 (K) W-3651
PWR OUT TO J-608 (H) W-3645
PWR OUT TO J-706(G) W-3640
PWR OUT TO J-308(F) W-3637

Figure 3-10. Interconnection Diagram, Bay no. 3

BAY #4

W-3703 TO J-1833(K) 50Kc A M IN
W-3701 TO J-1814(K) A G C OUT
W-3702 TO J-1834(K) KEYED D C OUT

A
AMPLIFIER-DETECTOR AM-440/FRR-24
J-904 J-906 J-907 J-909 P-902 AUDIO OUT J-908
PWR IN TO J-2104(M) W-3704

W-3707 TO J-1846(K) 50Kc A M IN
W-3705 TO J-1815(K) A G C OUT
W-3706 TO J-1835(K) KEYED D C OUT

B
AMPLIFIER-DETECTOR AM-440/FRR-24
J-904 J-906 J-907 J-909 P-902 AUDIO OUT J-908
PWR IN TO J-2105(M) W-3708

W-3713 TO J-1832(K) 50Kc A M IN (REC 2)
W-3712 TO J-1830(K) 50Kc A M IN (REC 1)
W-3709 TO J-1816(K) A G C OUT
W-3711 TO J-1836(K) KEYED D C OUT
W-3710 TO J-1831(K) 50Kc A M IN (REC 3)

C
AMPLIFIER-DETECTOR AM-438/FRR-24
J-1004 J-1005 J-1007 J-1008 J-1009 J-1011 P-1002 AUDIO OUT J-1010
PWR IN TO J-2106(M) W-3714

W-3717 TO J-1810(K) F S C O N S IN
W-3716 TO J-1827(K) 50Kc F S IN
W-3718 TO J-1205(E) & J-1205(F) & J-1309(L) D C REF VOLTS OUT
W-3715 TO J-1306(L) F S KEYED D C OUT
W-3719 TO J-1818(K) 1700Kc OUT

D
CV-127/FRR-24
FREQUENCY SHIFT CONVERTER
J-1203 J-1204 J-1205 J-1206 J-1207 J-1208
PWR IN TO J-2204(N) W-3721

W-3722 TO J-1811(K) F S C O N S IN
W-3725 TO J-1828(K) 50Kc F S IN
W-3718 TO J-1205(D) & J-1205(F) & J-1309(L) D C REF VOLTS OUT
W-3724 TO J-1304(L) F S KEYED D C OUT
W-3723 TO J-1819(K) 1700Kc OUT

E
CV-127/FRR-24
FREQUENCY SHIFT CONVERTER
J-1203 J-1204 J-1205 J-1206 J-1207 J-1208
PWR IN TO J-2205(N) W-3726

W-3727 TO J-1812(K) F S C O N S IN
W-3731 TO J-1829(K) 50Kc F S IN
W-3718 TO J-1205(D) & J-1205(E) & J-1309(L) D C REF VOLTS OUT
W-3730 TO J-1307(L) F S KEYED D C OUT
W-3728 TO J-1820(K) 1700Kc OUT

F
CV-127/FRR-24
FREQUENCY SHIFT CONVERTER
J-1203 J-1204 J-1205 J-1206 J-1207 J-1208
PWR IN TO J-2206(N) W-3732

W-3734 TO J-1838(K) EXT TONE IN
W-3733 TO J-1847(K) KEYED D C IN

G
KEYER KY-62/FRR-24
J-1102 J-1103 J-1105 P-1102 AUDIO OUT J-1104
PWR IN TO J-2107(M) W-3735

W-3737 TO J-1839(K) EXT TONE IN
W-3736 TO J-1848(K) KEYED D C IN

H
KEYER KY-62/FRR-24
J-1102 J-1103 J-1105 P-1102 AUDIO OUT J-1104
PWR IN TO J-2108(M) W-3738

W-3740 TO J-1813(K) EXT TONE IN
W-3739 TO J-1849(K) KEYED D C IN

J
KEYER KY-62/FRR-24
J-1102 J-1103 J-1105 P-1102 AUDIO OUT J-1104
PWR IN TO J-2109(M) W-3741

W-3045 TO J-1504(1J) & J-1604(2J) & J-1704(3J) A G C PATCH COM
W-3046 TO J-1505(1J) A G C PATCH
W-3545 TO J-1605(2J) A G C PATCH
W-3646 TO J-1705(3J) A G C PATCH
W-3048 TO J-1509(1J) & J-1609(2J) & J-1709(3J) 1700Kc PATCH COM
W-3047 TO J-1508(1J) 1700Kc PATCH
W-3546 TO J-1608(2J) 1700Kc PATCH
W-3648 TO J-1708(3J) 1700Kc PATCH
W-3717 TO J-1207(D) F S C O N S IN
W-3722 TO J-1207(E) F S C O N S IN
W-3727 TO J-1207(F) F S C O N S IN
W-3740 TO J-1103(J) EXT TONE IN

W-3643 TO J-602(3H) F S C O N S LINE
W-3543 TO J-602(2H) F S C O N S LINE
W-3049 TO J-602(1H) F S C O N S LINE
W-3728 TO J-1203(F) 1700Kc OUT
W-3723 TO J-1203(E) 1700Kc OUT
W-3719 TO J-1203(D) 1700Kc OUT
W-3709 TO J-1007(C) A G C COM OUT
W-3705 TO J-906(B) A G C OUT
W-3701 TO J-906(A) A G C OUT

W-3713 TO J-1009(C) 50Kc A M IN
W-3703 TO J-907(A) 50Kc A M IN
W-3702 TO J-904(A) KEYED D C OUT
W-3706 TO J-904(B) KEYED D C OUT
W-3711 TO J-1005(C) KEYED D C OUT
W-3745 TO J-1305(L) KEYED D C OUT
W-3734 TO J-1103(G) EXT TONE IN
W-3737 TO J-1103(H) EXT TONE IN
EXT TONE OUT
W-3746 TO J-1308(L) KEYED D C OUT
W-3739 TO J-1102(J) KEYED D C IN
W-3736 TO J-1102(H) KEYED D C IN
W-3733 TO J-1102(G) KEYED D C IN
W-3707 TO J-907(B) 50Kc A M IN
W-3661 TO J-603(3H) 50Kc A M BUS
W-3710 TO J-1004(C) 50Kc A M IN
W-3567 TO J-603(2H) 50Kc A M BUS
W-3712 TO J-1008(C) 50Kc A M IN
W-3051 TO J-603(1H) 50Kc A M BUS
W-3731 TO J-1206(F) 50Kc F S IN
W-3660 TO J-605(3H) 50Kc F S LINE
W-3725 TO J-1206(E) 50Kc F S IN
W-3566 TO J-605(2H) 50Kc F S LINE
W-3716 TO J-1206(D) 50Kc F S IN
W-3050 TO J-605(1H) 50Kc F S LINE

K
PATCH PANEL
SB-143/FRR-24
SPARE SPARE SPARE SPARE
J-1813 J-1812 J-1811 J-1810 J-1809 J-1808 J-1807 J-1806 J-1805 J-1804 J-1803 J-1802 J-1801
J-1826 J-1825 J-1824 J-1823 J-1822 J-1821 J-1820 J-1819 J-1818 J-1817 J-1816 J-1815 J-1814
J-1839 J-1838 J-1837 J-1836 J-1835 J-1834 J-1833 J-1832 J-1831 J-1830 J-1829 J-1828 J-1827
J-1852 J-1851 J-1850 J-1849 J-1848 J-1847 J-1846 J-1845 J-1844 J-1843 J-1842 J-1841 J-1840

W-3718 TO J-1205(D) & J-1205(E) & J-1205(F) D C REF VOLTS OUT
W-3746 TO J-1850(K) F S KEYED D C OUT
W-3730 TO J-1204(F) F S KEYED D C IN
W-3715 TO J-1204(D) F S KEYED D C IN
W-3745 TO J-1837(K) F S KEYED D C OUT
W-3724 TO J-1204(E) F S KEYED D C IN

L
COMPARATOR-KEYER CM-32/FRR-24
J-1304 J-1305 J-1306 J-1307 J-1308 J-1309 J-1311 J-1310
TELETYPE OUT TO J-3903 W-3748
PWR IN TO J-2207(N) W-3747

W-3749 TO FAN MOTOR AC OUT

M
POWER SUPPLY PP-649/FRR-24
J-2102 J-2103 J-2104 J-2105 J-2106 J-2107 J-2108 J-2109
AC IN TO J-3409(3L) W-3656
PWR OUT TO J-908(A) W-3704
PWR OUT TO J-908(B) W-3708
PWR OUT TO J-1010(C) W-3714
PWR OUT TO J-1104(G) W-3735
PWR OUT TO J-1104(H) W-3738
PWR OUT TO J-1104(J) W-3741

W-3750 TO FAN MOTOR AC OUT
W-3749 TO J-2102(M) FAN MOTOR
W-3750 TO J-2202(N) FAN MOTOR

N
POWER SUPPLY PP-648/FRR-24
J-2202 J-2203 J-2204 J-2205 J-2206 J-2207
AC IN TO J-3410(3L) W-3653
PWR OUT TO J-1208(D) W-3721
PWR OUT TO J-1208(E) W-3726
PWR OUT TO J-1208(F) W-3732
PWR OUT TO J-1310(L) W-3747

TO TELETYPEWRITER
P-3901 J-3901 P-3902 J-3902 J-3903
W-3748

W-3718

Figure 3-11. Interconnection Diagram, Bay no. 4

(2) EXTERNAL CONNECTIONS.–All the external connection data is shown on the following table. To make these connections it is necessary to fabricate all the cable assemblies. Since all the plug connectors for these cables are attached to their mating receptacles the individual units must be unpacked. Follow the procedure outlined in paragraph 1 of this section to remove the units from their cartons. Refer to Figures 3–4 through 3–7 for the method of assembling the cables to the plugs.

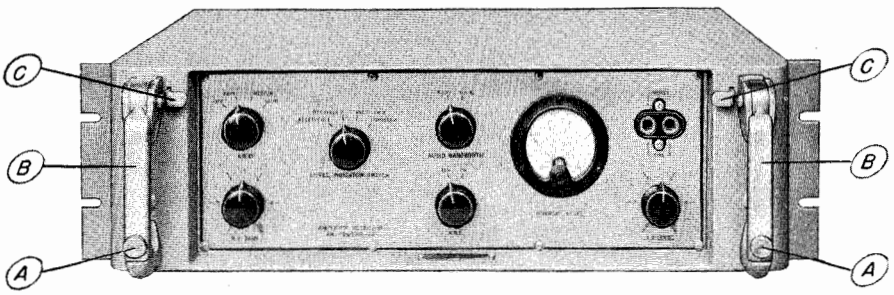
The antenna lead-ins may enter the cabinets either through the rubber grommeted holes in the top of the cabinets or through the access holes in the floor. All other cables pass through the access holes in the floor of the cabinets. The lengths of incoming and outgoing cables are not critical and should be determined by the installation requirements. It is intended that each power unit be connected to a separate 15 ampere circuit, however, input circuits may be paralleled if adequate current is available. Actual power and current drain for the entire equipment is 2045 watts and 19 amperes at 115 volts. These figures for each power unit are as follows:

POWER UNIT	WATTS	DRAIN (AMPS.)
PP-590/FRR-24 (Bay 1)	345	3.2
PP-590/FRR-24 (Bay 2)	365	3.4
PP-590/FRR-24 (Bay 3)	345	3.2
PP-649/FRR-24	510	4.8
PP-648/FRR-24	480	4.4

Before completing the A.C. connection make sure that all A.C. Power switches on Power Distribution Panel SB-141/FRR-24 are set at Off. The Outlet Indicator lamp on the foregoing will light regardless of the A.C. Power switch setting when the A.C. connection is completed.

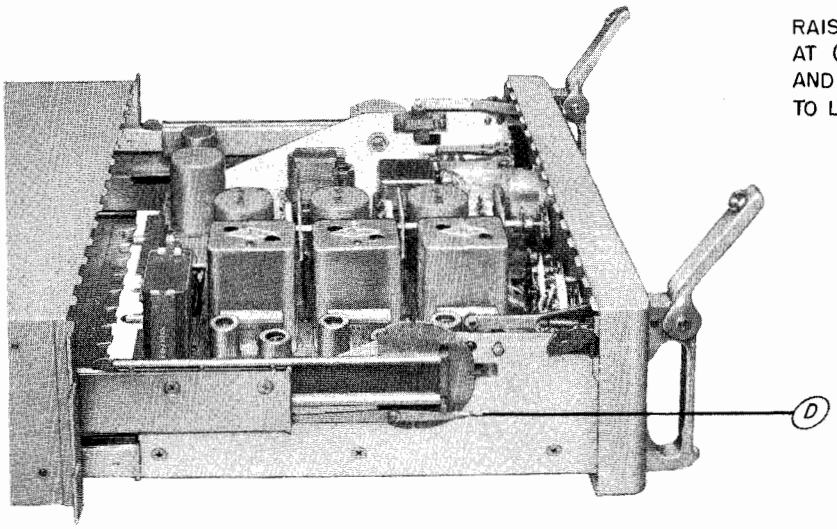
SYMBOL DESIG. OF PLUG	AN TYPE	LOCATED ON UNIT	CIRCUIT FUNCTION	RECOMMENDED CABLE
		Bay 1		
P-1510	UG-21B/U	J	Antenna Input	RG-11/U or RG-12/U*
P-702	AN-3106A-14S-12P	G	Audio Output	3 Wire Audio Cable
		Bay 2		
P-1620	UG-21B/U	J	Antenna Input	RG-11/U or RG-12/U*
P-702	AN-3106A-14S-12P	G	Audio Output	3 Wire Audio Cable
		Bay 3		
P-702	AN-3106A-14S-12P	G	Audio Output	3 Wire Audio Cable
P-1710	UG-21B/U	J	Antenna Input	RG-11/U or RG-12/U*
P-3401	AN-3106B-20-3S	L	A.C. Input	2 Cond. no. 8 Rubber Covered
P-3402	AN-3106B-20-3S	L	A.C. Input	2 Cond. no. 8 Rubber Covered
P-3403	AN-3106B-20-3S	L	A.C. Input	2 Cond. no. 8 Rubber Covered
P-3404	AN-3106B-20-3S	L	A.C. Input	2 Cond. no. 8 Rubber Covered
P-3405	AN-3106B-20-3S	L	A.C. Input	2 Cond. no. 8 Rubber Covered
		Bay 4		
P-902	AN-3106A-14S-12P	A	Audio Output	3 Wire Audio Cable
P-902	AN-3106A-14S-12P	B	Audio Output	3 Wire Audio Cable
P-1002	AN-3106A-14S-12P	C	Audio Output	3 Wire Audio Cable
P-1102	AN-3106A-14S-12P	G	Audio Output	3 Wire Audio Cable
P-1102	AN-3106A-14S-12P	H	Audio Output	3 Wire Audio Cable
P-1102	AN-3106A-14S-12P	J	Audio Output	3 Wire Audio Cable
P-1827	UG-260/U	K	Ext. Tone Input	RG-59/U
P-1828	UG-260/U	K	Ext. Tone Input	RG-59/U
P-1829	UG-260/U	K	Ext. Tone Input	RG-59/U
P-3901	AN-3106A-14S-12P	Terminal Box	Output For Teletype	3 Wire Audio Cable
P-3902	AN-3106A-14S-12P	Terminal Box	Output for Teletype	3 Wire Audio Cable

*Armored

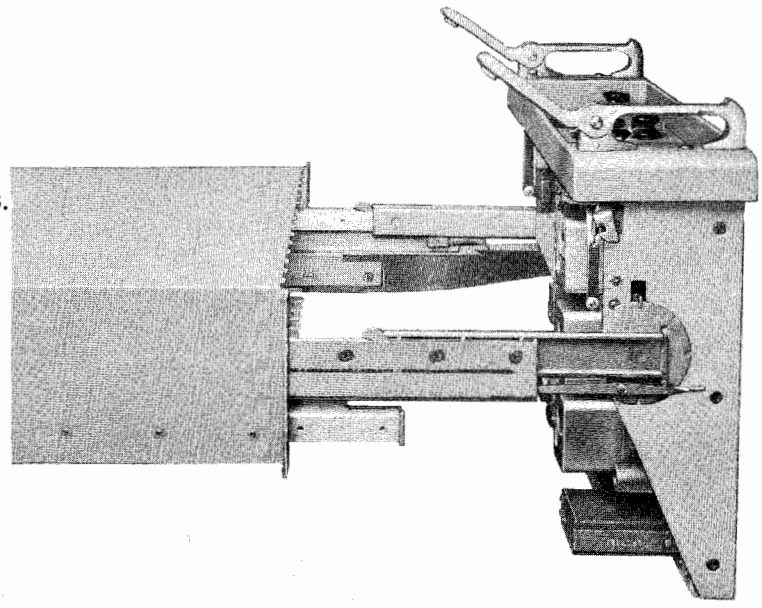


STEP ①
SLIDE LATCH HANDLE FASTENER BUTTONS AT Ⓐ UPWARD TO UNLOCK HANDLES.

STEP ②
RAISE LATCH HANDLES AT Ⓑ TO RELEASE AND WITHDRAW CHASSIS TO LOCKED POSITION.



STEP ③
PRESS TILT LEVERS AT Ⓒ TO UNLOCK PIVOT MECHANISM AND TILT CHASSIS TO ANY ONE OF THE SIX POSSIBLE LOCKED IN POSITIONS.



STEP ④
DEPRESS CHASSIS RELEASE LEVERS AT Ⓓ TO REMOVE CHASSIS FROM CABINET.

STEP ⑤
TO REPLACE CHASSIS IN CABINET FOLLOW THE ABOVE PROCEDURE IN REVERSE.

Figure 3–12. Instructions for Operation of Cabinet Slide-Tilt Mechanism

(3) CONNECTIONS FOR FACSIMILE OPERATION.–If the installation is to be used for the reception of facsimile signals an additional connection is required. This connection is made between the 50-Kc. AM output circuit of R.F. Amplifier AM-454/FRR-24 and suitable facsimile printing apparatus. Reference to Figure 3–6 will show the recommended plug and cable with their method of assembly. Connect the facsimile cable to one of the spare connectors on the Patch Panel in Bay 4. This connection is permanently made on the inside of the Patch Panel. The tab corresponding to the connector used can then be appropriately labeled. In operation a patch between the foregoing connector and either 4K43, 4K44 or 4K45 (depending on which bay is in use) will connect the 50-Kc. output circuit of the receiver to the I.F. type facsimile converter.

c. ARRANGEMENT OF UNITS.–The individual units of the AN/FRR-24 must be installed in the rack cabinets in their proper location. Proceed as follows:

Step 1. Referring to Figure 3–2 mount the units into the racks using the 12-24 Phillips head screws provided in the mounting hardware package. The Power Units 1M, 2M, 3M, 4M, 4N and the Frequency-Shift Converter unit 4D must now be withdrawn from their cabinets (Figure 3–12) to permit installation of their air stops and/or scoops. All the air stops and scoops together with their mounting hardware are packed in box number 51.

Units 1M, 2M, 3M and 4N (PP-590/FRR-24 and PP-648/FRR-24) require the Air Stop SA:9153. This is fastened into the cabinet at the cutout provided at the front left side. Use the 6-32 Phillips-head screws and lock washers provided.

Unit 4M requires the air scoop Q959-1 which must be fastened in the cutout at the right side of the cabinet using the hardware provided.

The Frequency-Converter CV-127/FRR-24 (unit 4D only) has a cabinet cutout on the right side to allow installation of an air stop SA:9155. Install the air stop with the 6-32 screws and lock washers.

NOTE

These air stops and air scoops must be removed in order to remove the above mentioned cabinets from the main rack cabinet.

Step 2. Remove the patch cords from box no. 53 and fasten one end of each cord to the open connectors on the Patch Panel units. Connect six cords to the Patch Panels in bays 1 and 3, nine cords to bay 2 and twenty-four cords to bay 4.

Step 3. The trim panels for the top of the cabinets are marked from 1 through 4. Fasten the panels to the cabinets with the 12-24 Phillips-head screws provided with the panels.

Step 4. The side trim strips are fastened to the cabinets by locating them over their mounting clips and sliding downward. The strips have designations on the reverse side and they must be located in accordance with Figure 3–2.

Step 5. Connect all the cables to their proper jacks at the backs of the units as indicated in Figures 3–8 through 3–11. To install the coaxial plugs push straight on to the mating fitting then secure by turning the knurled locking ring clockwise. The power and audio connectors are the multi-pin keyed type (type AN). Push the plugs firmly into their respective connecting jacks (the keyway insures proper polarization) and tighten the locking ring securely using the spanner wrenches provided in the Tool Box.

Step 6. Secure the backs to the cabinets by means of the eight Camloc fasteners.

d. CRYSTAL INSTALLATION.–Type CR-18/U crystals may now be installed in the Oscillator Assembly O-131/FRR-24. Crystals are not supplied with the equipment but are furnished by the Navy Department at the point of installation. To gain access to the crystal sockets slide this unit out of its cabinet. See Figure 3–12. Up to eight crystals may be mounted in both the A and B sections of the oscillator. Refer to Figure 3–13 for correlation between crystal sockets and switch positions. The crystal frequencies must be in the range of 3.75 to 15 megacycles to cover the 2 to 32 megacycle range of the equipment. The higher ranges are reached either by doubling or tripling the crystal frequency. It is recommended that the following chart be adhered to in determining the mode of crystal excitation i.e., operating the crystal on its fundamental frequency, doubling or tripling its frequency.

FREQUENCY RANGE OF AN/FRR-24	CRYSTAL MODE
2–15 mcs.	Fundamental
15–30 mcs.	Doubler
30–32 mcs.	Tripler

To determine the correct crystal frequency for any specific channel add 1750 kilocycles to the channel frequency. For example, if the channel frequency were 4 megacycles the correct crystal frequency would be 5.75 megacycles. If doubling or tripling is required add 1750 kilocycles to the channel frequency and divide by either 2 or 3. For example, if the channel frequency were 27 megacycles, add 1750 kilocyc-

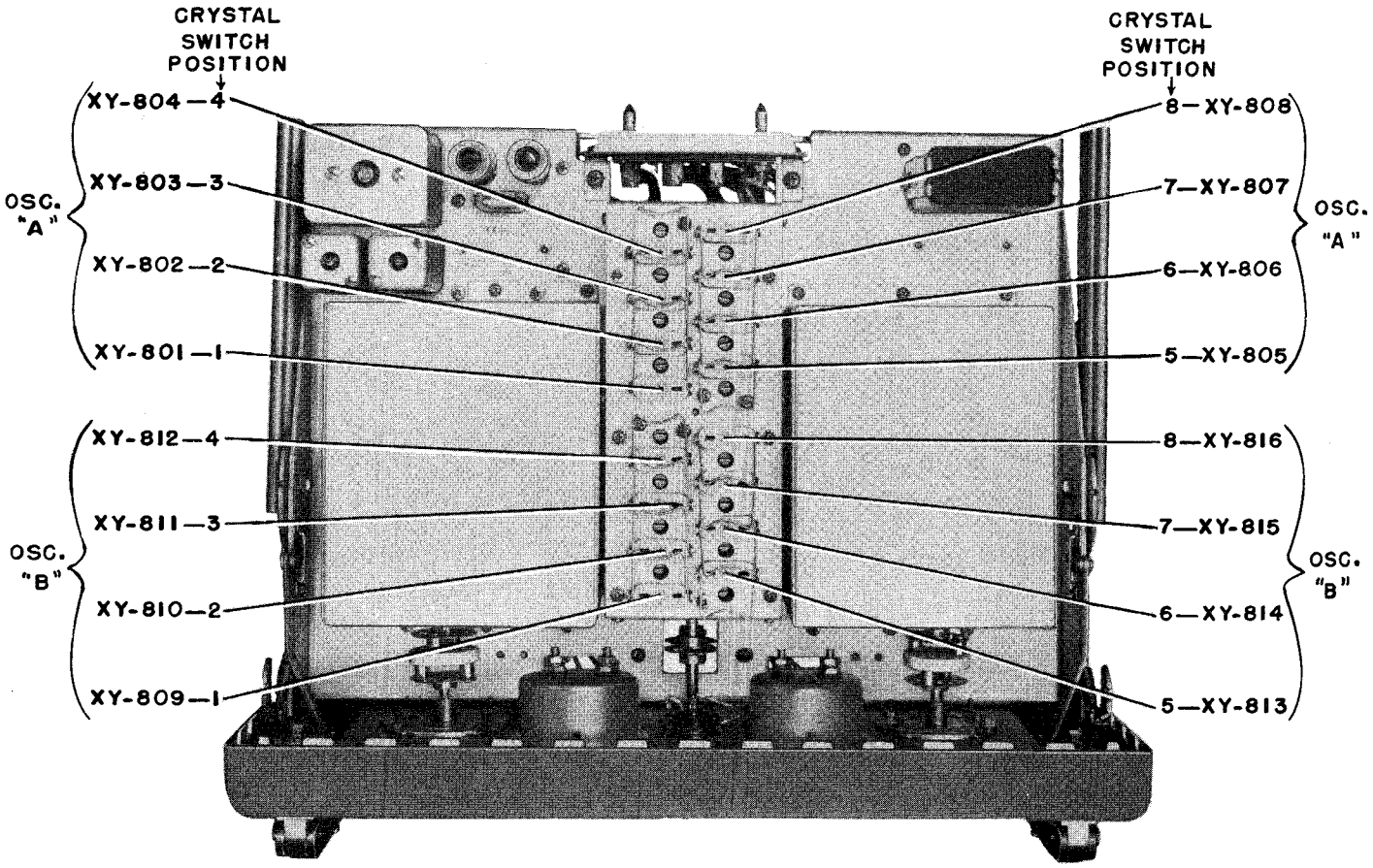


Figure 3–13. Crystal Socket Identification, Oscillator Assembly O-131/FRR-24

OSCILLATOR A

CRYSTAL NO.	SIGNAL(TUNING) FREQUENCY	CRYSTAL FREQUENCY
1		
2		
3		
4		
5		
6		
7		
8		

Figure 3–14. Oscillator Tuning Chart

paragraph 2 of this section, various tests and adjustments are required byfore the equipment can be turned over to operating personnel. These tests and adjustments serve a two-fold purpose. They provide a performance test plus a means of adjusting non-operating controls.

The checks made in this section require that various connections be set up on the Patch Panels of all four bays. An explanation of the method of identifying the connectors on each panel follows:

Observation of the patch panel units will reveal that each connector has an identifying tab. To explain the markings used on the tabs let us take a typical example and analyze it. For example on unit 1J the connector in the upper left hand corner is labelled AGC IN 1A252.1H607.1J3. This means that AGC voltage is fed into this connector for application to units 1A and 1H. The numerals following these unit designations are the symbol designations of the specific connectors on the units with the 'J' portion of the symbol designations deleted for the sake of simplicity. The last marking '1J3' identifies the connector on the Patch Panel itself. That is, the connector is located on unit 1J and its symbol designation ends with a 3. Here the letter 'J' plus the series symbol designations are deleted for simplicity. The symbol designation were it to be written out would be J-1503. The same system of marking is used for each connector on each Patch Panel. That is, the circuit is specified, following this the point or points of origin and termination of the energy is named and the last marking identifies the connector on the patch panel itself. The last digit of this identification has been chosen to coincide with the numerical order of the connector's location as counted from the left of the top row of connectors on the patch panel. However the order employed is not consecutive i.e., in the case above 1J3 is the first connector and 1J6 is the fourth. To guard against unwanted signal pick-up and/or spurious radiation several connectors on the Patch Panels are fitted with covers and/or terminating plugs. These covering devices should be removed only when the connector is to be used and if its use is ended the cover must always be replaced except in the case of the FS CONS connectors (J-1810, J-1811 and J-1812) on Patch Panel SB-143/FRR-24 in bay 4 whose terminating plugs should always be removed during frequency shift operation. These connectors are capped only when it is desired to silence the Frequency Shift Converter CV-127/FRR-24 to simulate a no-signal condition as might be required during initial tuning procedures.

Equipment required is a D.C. voltmeter with an accuracy of 2% such as Navy type -60046 or equivalent.

a. ENERGIZING THE EQUIPMENT FOR THE FIRST TIME.—Before applying power to the AN/FRR -24 determine the value of the A.C. line voltage. The equipment is set up at the factory for an input of 115 volts. In addition, taps are provided for 105 or 125 volt operation. If it is necessary to change the tap switches in the Power Supply units the first step is to remove the units from their cabinets. Follow the procedure outlined in Figure 3–12. The pivot mechanism of the Power Supplies is locked and the units do not tilt. There are two moveable-link type switches in each unit located on the bottom of the chassis. All switches in the Power Supply units must be set at the position which corresponds most closely to the A.C. line voltage. The correct tap is selected by loosening the securing screws, setting the two links correctly, then tightening the screws. Replace the units in their cabinets and proceed as follows:

Step 1. Set the Plate Stand-By switches on Power Supplies PP-590/FRR-24, PP-648/FRR-24 and PP-649/FRR-24 (units 1M, 2M, 3M, 4M and 4N) at Off and the Heater Protection switches on these units at On.

Step 2. Set all the A.C. Power switches on the Power Distribution Panel SB-141/FRR-24 (unit 3L) at On. All the bay indicator lamps on unit 3L and all Heater Pri. lamps on the Power Supplies should light.

Step 3. After waiting 30 seconds or more set the Plate Stand-By switches of unit 1M at On. The Plate Pwr. lamp should light.

Step 4. Connect a D.C. voltmeter between the Voltage Test pin jacks marked V1 and Ground (see Figure 4–19). A reading of +210 volts should be obtained. If not, adjust Voltage Control V1 (see Figure 4–19) until the reading is exactly +210 volts.

Step 5. Follow the procedure outlined in Steps 3 and 4 to set the voltages on units 2M and 3M (PP-590 /FRR-24).

Step 6. Repeat step 3 for unit 4M (PP-649/FRR-24) and adjust Voltage Control V1 for a voltmeter reading of +300 volts between Voltage Test pin jack marked V1 and Ground (see Figure 4–21). Adjust Voltage Control V2 for a voltmeter reading of +210 volts between Voltage Test pin jacks marked V2 and Ground.

Step 7. Repeat step 3 for unit4N (PP-648/FRR-24) and adjust Voltage Control V1 for a voltmeter reading of +300 volts between Voltage Test pin jack marked V1 and Ground (see Figure 4–20). Adjust Voltage Control V2 for a voltmeter reading of minus 300 volts between Voltage Test pin jacks marked V2 and Ground.

Step 8. Set all the Plate Stand-By switches at Off. The A.C. Power switches of unit 3L (SB-141/FRR-24) and all the Heater Protection switches should be left On until all initial adjustments are completed.

b. PERFORMANCE TEST OF THE UNITS IN BAY

1.—The following procedure will determine if the units in Bay No. 1 are ready for operation.

Step 1. Supply A.G.C. voltage from Amplifier-Detector AM-439/FRR-24 (unit 1G) to Conttol Panel SB-142/FRR-24 (unit 1A) and R.F. Amplifier AM-454/FRR-24 (unit 1H) by connecting a patch cord between connectors 1J3 and 1J6 on Patch Panel SB-138/FRR-24 (unit 1J).

Step 2. Set the controls on unit 1G (AM-439/FRR-24) as follows:

A.G.C. switch at Medium.

R.F. Gain control at 10.

Reception switch at A.M.

A.F. Level control at 3.

Speaker switch at On. Headphone operation may be checked by setting the switch at Off and inserting headphones into the Phones jack.

Step 3. Set the Band switch on unit 1A at the 2–4 Mc. band.

Step 4. Set the Heterodyne Osc. switch on unit 1A at Local.

Step 5. Set the A.G.C. and Projection Dial switches of Amplifier-Converter AM-450/FRR-24 (unit 1B) at On.

Step 6. Set the Second Conversion Osc. Selector switch on the Frequency Converter CV-126/FRR-24 (unit 1F) at Crystal.

Step 7. Set the A.G.C. switch on the R.F. Amplifier AM-454/FRR-24 (unit 1H) at On and set the A.M. Diversity Gain control at 10.

Step 8. Set the Selectivity switch on Filter Assembly F-99/FRR-24 (unit 1K) at 6 Kc.

Step 9. Connect the antenna to AM-450/FRR-24 (unit 1B). This is accomplished by connecting a patch cord between 1J27 and 1J15 on unit 1J.

Step 10. Set the Plate-Stand-By switch on unit 1M at On.

Step 11. It should now be possible to receive A.M. signals. Tune the Amplifier-Converter AM-450/FRR-24 (unit 1B) over its entire frequency range. Signals or noise should be heard over the complete dial range either at the loudspeaker or headphones whichever is being used. A signal will also be evidenced by a reading on the 2nd. I.F. Level meter on the panel of AM-454/FRR-24 (unit 1H). With a signal tuned in change the setting of the A.F. Level control on AM-439/FRR-24 (unit 1G). A change in audio output level should result.

Step 12. Set the Reception switch of unit 1G at Crystal. A heterodyne should be heard which will indicate that the crystal oscillator V-703 and the heterodyne detector of unit 1G are functioning properly.

Step 13. Set the Reception switch of unit 1G at B.F.O. The crystal oscillator V-703 has now been replaced by a variable frequency oscillator and the pitch of the beat note may be varied by means of the B.F.O. control. Vary the setting of the B.F.O. control and note the change in audio pitch as compared with the different settings of the control.

Step 14. With an A-1 (C.W.) signal being received check all the settings of the Selectivity switch of Filter Assembly F-99/FRR-24 (unit 1K). Make sure that reception is possible in all positions of the Selectivity switch.

NOTE

It is important that a C.W. signal be used and tuned very carefully for this check since the narrow band pass settings of Filter Assembly F-99/FRR-24 will not pass A.M. signals satisfactorily. Return the Reception switch to the A.M. position and the Selectivity switch at 6 Kc.

Step 15. Tune in an A.M. signal and observe the Second I.F. Level meter on AM-454/FRR-24 (unit 1H). Retard the R.F. Gain control on AM-439/FRR-24 (unit 1G) to the point where the 2nd I.F. Level meter reading noticeably decreases. Vary the Ant. Trimmer control on unit 1B. A setting should be found which will give an optimum meter reading.

Step 16. Vary the setting of the A.G.C. switch on AM-439/FRR-24 (unit 1G). Reception should be possible in all positions of the switch. It should be noted that in the Off position of the A.G.C. switch the background noise will be excessive unless the R.F. Gain control is backed off toward zero.

Step 17. Set the Second Conversion Osc. Selector switch on unit 1F at V.F.O. and the Reception switch of unit 1G at B.F.O. Vary the setting of the Second Conversion V.F.O. dial on CV-126/FRR-24 (unit 1F) and observe the audio pitch of the beat note. Changes in pitch of the audio note should be evidenced as the control is varied.

Step 18. Set the Projection Dial switch of unit 1B at Off and set the A.G.C. and Projection Dial switches of Amplifier-Converter AM-451/FRR-24 (unit 1C) at On.

Step 19. Move the antenna connection from unit 1B to 1C by changing the patch cord from 1J15 to 1J16 on unit 1J.

Step 20. Set the Band switch on unit 1A at 4–8 mc.

Step 21. Test the performance of unit 1C by following the procedure outlined in Steps 11 and 15 of this paragraph.

Step 22. Set the Projection Dial switch on unit 1C at Off and the A.G.C. and Projection Dial switches of Amplifier-Converter AM-453/FRR-24 (unit 1D) at On.

Step 23. Move the antenna connection from unit 1C to 1D by changing the patch cord from 1J16 to 1J28

on unit 1J.

Step 24. Set the Band switch of unit 1A at 8–16 Mc.

Step 25, Test the performance of unit 1D by following the procedure outlined in Steps 11 and 15 of this paragraph.

Step 26. Set the Projection Dial switch of unit 1D at Off and the A.G.C. and Projection Dial switches of Amplifier-Converter AM-452/FRR-24 (unit 1E) at On.

Step 27. Move the antenna connection from unit 1D to 1E by changing the patch cord from 1J28 to 1J29 on unit 1J.

Step 28, Set the Band switch on unit 1A at 16–32 Mc.

Step 29. Test the performance of unit 1E by following the procedure outlined in Steps 11 and 15 of this paragraph.

Step 30. Set the Plate Stand-By switch of unit 1M at Off. If trouble is encountered in any of the foregoing procedures refer to Section 7 for proper trouble shooting and corrective measures.

c. PERFORMANCE TEST OF THE UNITS IN BAY 2.–The following procedure will determine if the units in Bay no. 2 are ready for operation.

Following the exact procedure outlined in paragraph b, check the performance of the comparable units in the second bay. This bay has, in addition to these units, the Oscillator Assembly O-131/FRR-24 (unit 2L) which is checked in the following manner.

Step 1. Connect a patch cord between 2J33 and 2J21 on unit 2J. The output of oscillator A of unit 2L is now connected to unit 2A.

Step 2. Set the Heterodyne Osc. switch on unit 2A at Remote. This connects the oscillator A signal to the Amplifier-Converter selected by the Band switch.

Step 3. Set the Crystal A switch on O-131/FRR-24 (unit 2L) at a position corresponding to a signal channel in operation as determined by reference to the Oscillator A Tuning Chart located on the trim strip adjacent to unit 2L.

Step 4. Set the Band switch of SB-142/FRR-24 (unit 2A) to the frequency band which encompasses the channel selected in Step 3.

Step 5. Set the A.G.C. and Projection Dial switches of the Amplifier-Converter selected in Step 4 at On.

Step 6. Set the controls on unit 2G as follows:

A.G.C. switch at Medium.
R.F. Gain control at 10.
Reception switch at A.M.
A.F. Level control at 3.
Speaker switch at On.

Step 7. Set the Second Conversion Osc. Selector switch on unit 2F at V.F.O.

Step 8. Set the A.G.C. switch on unit 2H at On and the A.M. Diversity Gain control at 10.

Step 9. Set the Selectivity switch on unit 2K at 6 Kc.

Step 10. Connect the antenna to the Amplifier-Converter being used by connecting a patch cord between 2J27 and 2J15, 2J16, 2J28 or 2J29 whichever is applicable.

Step 11. Connect a patch cord from 2J3 to 2J6 for A.G.C. voltage.

Step 12. Set the Plate Stand-By switch of unit 2M at On.

Step 13. Set the Main Tuning control of the Amplifier-Converter selected in Step 4 to the channel frequency.

Step 14. On unit 2L set the Osc. A switch at On, the Osc. B switch at Off and the Tuning A control knob at the reception frequency.

Step 15. Rotate the Tuning A control slightly to give maximum deflection of Tuning Meter A, then adjust the Output A control for a meter reading of 200.

Step 16. Oscillator A of unit 2L is now functioning as the first conversion oscillator 1750 kilocycles above the reception frequency and it should be possible to tune the signal to optimum level by means of the Main Tuning control knob of the Amplifier-Converter. The optimum tuning point will be indicated aurally by the response from the loudspeaker and visually by a maximum reading on the 2nd. I.F. Level meter on unit 2H.

NOTE

To allow for very small variations in crystal frequency a trimmer is located adjacent to each crystal socket. To set the trimmers set the Reception switch of unit 2G at B.F.O. and set the trimmers for the best aural beat note.

Step 17. Set the Oscillator A switch at Off and the Oscillator B switch at On.

Step 18. Set the Crystal B switch a at position corresponding to a signal channel in operation as determined by reference to the Oscillator B Tuning Chart.

Step 19. Move the patch cord connected to 2J33 over to 2J36.

Step 20. Set the Band switch of unit 2A to the frequency band which encompasses the channel selected in Step 18.

Step 21. Set the A.G.C. and Projection Dial switches of the Amplifier-Converter selected in Step 19 at On.

Step 22. Connect the antenna to the Amplifier-Converter being used by connecting a patch cord between 2J27 and 2J15, 2J16, 2J28 or 2J29 whichever is applicable.

Step 23. Set the Main Tuning control of the Amplifier-Converter selected in Step 19 to the channel frequency.

Step 24. Rotate the Tuning B control on O-131/FRR -24 (unit 2L) slightly to give maximum deflection of Tuning Meter B, then adjust the Output B control for a meter reading of 200.

Step 25. Oscillator B of unit 2L is now functioning as the first conversion oscillator and the results obtained should duplicate those found in Step 16.

Step 26. Set the Oscillator B switch of unit 2L at Off and remove the patch cord between 2J36 and 2J21. Be sure to replace the caps over these connectors.

Step 27. Set the Heterodyne Osc. switch on unit 2A at Local. The Amplifier-Converter will now have its local oscillator as the source of first conversion oscillator voltage.

Step 28. Connect a patch cord between 2J31 and 2J18 on unit 2J. The crystal calibrator circuit of unit 2L is now connected through unit 2A to the Amplifier-Converter selected by the Band switch on unit 2A.

Step 29. Set the Calibrate switch on unit 2L at On and tune the Amplifier-Converter used in the previous check throughout its frequency range. A heterodyne should be heard every 200 kilocycles on the dial.

Step 30. Set the Calibrate switch at Off and remove the patch cord connected between 2J31 and 2J18.

Step 31. Set the Plate Stand-By switch of unit 2M at Off.

d. PERFORMANCE TEST OF THE UNITS IN BAY 3.—With the exception of the Power Distribution Panel SB-141/FRR-24 (unit 3L) bay no. 3 is composed of the same equipment as bay no. 1. In Step 2 of Paragraph 3. a. all the switches on unit 3L were set at On and will remain on until it is desired to shut down the complete equipment.

The remaining units in bay no. 3 may be checked following the procedure used to check bay no. 1. The various patches required may be set up on unit 3J in a manner identical to that used in checking bay no. 1.

After completing the performance test of bay no. 3 set the Plate Stand-By switch of unit 3M at Off.

e. PERFORMANCE TEST OF UNITS IN BAY 4.—The units in bay no. 4 operate in conjunction with certain units of the first three bays. In setting up the following tests specific units of the first three bays are used. It should be noted that, in some instances, other similar units may be used and the same performance obtained.

(1) PERFORMANCE TEST OF AMPLIFIER-DETECTOR AM-440/FRR-24 (UNIT 4A).—To check the operation of unit 4A proceed as follows:

Step 1. Supply A.G.C. voltage to bay no. 3 from unit 4A by connecting patch cords between 4K14 and 4K4 and between 3J3 and 3J5.

Step 2. Supply a 50-kc. signal from bay no. 3 to unit 4A by connecting a patch cord between 4K33 and 4K45.

Step 3. Set the controls on unit 4A as follows:
A.G.C. switch at Medium.
R.F. Gain control at 10.
Audio Bandwidth switch at 6 kc.
A.F. Level control at 3.
A.N.L. switch at Off.
Insert headphones into Phones jack.

Step 4. Set the controls on unit 3G as follows:
Reception switch at A.M.
A.F. Level control at 3.
Speaker switch at On.

Step 5. Set the Band switch of unit 3A at any frequency band that will give a usable A3 signal.

Step 6. Set the Heterodyne Osc. switch on unit 3A at Local.

Step 7. Set the A.G.C. and Projection Dial switches of the Amplifier-Converter selected in Step 5 at On.

Step 8. Set the Second Conversion Osc. Selector switch on unit 3F at Crystal.

Step 9. On unit 3H set the A.G.C. switch at On and the A.M. Diversity Gain control at 10.

Step 10. Set the Selectivity switch on unit 3K at 6 kc.

Step 11. Connect the antenna to the Amplifier-Converter selected in Step 5 by patching between 3J27 and either 3J15, 3J16, 3J28 or 3J29 whichever is applicable.

Step 12. Set the Plate Stand-By switches on units 3M and 4M at On.

Step 13. Tune in a suitable A.M. signal on the Amplifier-Converter selected in Step 5. The optimum tuning point will be indicated aurally by the response from the headphones and visually by a maximum reading on the 2nd I.F. Level meter on unit 3H. Adjust the A.F. Level control on unit 4A for the desired output.

Step 14. Listen for the signal in the headphones connected to the Phones jack of unit 4A while switching the A.G.C. switch of unit 4A to various positions. Reception should be obtained at all settings. It should be noted that, with the R.F. Gain controls at their present setting, extreme background noise will be heard at the A.G.C. Off position.

Step 15. While listening to the signal set the A.N.L. switch at On. Any noise pulses should be materially reduced in amplitude.

Step 16. It should still be possible to monitor the signal at unit 3G. The controls of unit 3G should

have no effect upon the output of unit 4A.

Step 17. To check the performance of the other Amplifier-Detector AM-440/FRR-24 (unit 4B) change the patch cord connected to 4K33 over to 4K46 and change the cord connected to 4K14 over to 4K15. Repeat steps 3 through 16 making adjustments on unit 4B instead of 4A.

Step 18. Set the Plate Stand-By switches of units 3M and 4M at Off.

(2) PERFORMANCE TEST OF KEYER KY-62/FRR-24 (UNIT 4G, 4H, 4J).–The following procedure is recommended for making the initial checks on Keyer KY-62/FRR-24 (unit 4G).

Step 1. Supply A.G.C. voltage to the Control Panel of bay no. 3 by connecting a patch cord between 3J3 and 3J5 on unit 3J and another cord between 4K14 and 4K4 on unit 4K.

Step 2. Connect the 50-kc. signal voltage from bay no. 3 to unit 4A by patching between 4K33 and 4K45 on unit 4K.

Step 3. Supply a keyed D.C. signal to the Keyer KY-62/FRR-24 (unit 4G) by connecting a patch cord between 4K34 and 4K47.

Step 4. Set the controls on unit 3G as follows:
Reception switch at B.F.O.
B.F.O. control at zero.
A.F. Level control at 3.
Speaker switch at On.

Step 5. Set the Band switch on unit 3A at a frequency band which encompasses A-1 signals suitable for checking purposes

Step 6. Set the Heterodyne Osc. switch on unit 3A at Local.

Step 7. On the Amplifier-Converter selected in Step 5 set the A.G.C. and Projection Dial switches at On. Adjust the Main Tuning control to the frequency of the desired signal as indicated on the two dials.

Step 8. Set the Second Conversion Osc. Selector switch on unit 3F at Crystal.

Step 9. On unit 3H set the A.G.C. switch at On and the A.M. Diversity Gain control at 10.

Step 10. Set the Selectivity switch on unit 3K at 6 kc.

Step 11. Set the controls on unit 4A as follows:
A.G.C. switch at Medium.
Audio Bandwidth switch at 0.6 kc.
A.F. Level control at 0.
A.N.L. switch at Off.
R.F. Gain control at 10.

Step 12. Set the controls on unit 4G as follows:
Reception switch at A-1.
A.F. Level control at 3.
Monitor Level control at 3.
Threshold control at 5.
Tone switch at Fixed.
Fixed Freq. switch at 1105 cycles.
Plug headphones into the Phones-Monitor jack.

Step 13. Connect the antenna to the Amplifier-Converter selected in Step 5 by connecting a patch cord between 3J27 and the applicable connector either 3J15, 3J16, 3J28 or 3J29 on unit 3J.

Step 14. Set the Plate Stand-By switches on units 1M and 4M at On. Plate Pwr. lamps on these units should light.

Step 15. Tune in the desired signal by adjustment of the Main Tuning control knob on the Amplifier-Converter unit selected in Step 5. Correct tuning is indicated when a zero beat condition is evidenced by a null at the loudspeaker of unit 3G. Readjust the B.F.O. control on unit 3G to 1 kc. and adjust the R.F. Gain control on AM-440/FRR-24 (unit 4A) for clean keying as evidenced by the aural response from the loudspeaker of unit 3G.

Step 16. An 1105-cycle tone should now be heard in the headphones connected to unit 4G and the A.F. Level and Threshold controls on this unit should be adjusted for clean keying as evidenced by optimum functioning of the terminal equipment.

Step 17. While listening to the tone in the headphones vary the setting of the Fixed Frequency switch to determine that all frequencies are operative.

Step 18. Set the Tone switch of unit 4G at Var.

Step 19. Rotate the Variable Frequency control and note the response in the headphones. The frequency of the audio tone should vary with the setting of the control.

Step 20. Place the Reception switch of unit 4G in the Test position. A steady tone should now be heard in the headphones regardless of whether or not a signal is being received.

Step 21. On unit 4K move the patch cord from connector 4K47 to 4K48.

Step 22. Check the performance of unit 4H setting the controls as listed in Step 12 and following the procedure outlined in Steps 16 through 20.

Step 23. Move the patch cord from 4K48 to 4K49 on unit 4K.

Step 24. Check the performance of unit 4J setting the controls as listed in Step 12 and following the procedure outlined in Steps 16 through 20.

Step 25. The Threshold controls of units 4G, 4H and 4J are used to provide the optimum in clean keying during varying conditions of fading.

Step 26. Set the Plate Stand-By switches on units 1M and 4M at Off.

(3) PERFORMANCE TEST OF COMPARATOR KEYER CM-32/FRR-24 AND FREQUENCY SHIFT CONVERTER CV-127/FRR-24.–For this test teletype printers should be connected to the CM-32/FRR-24

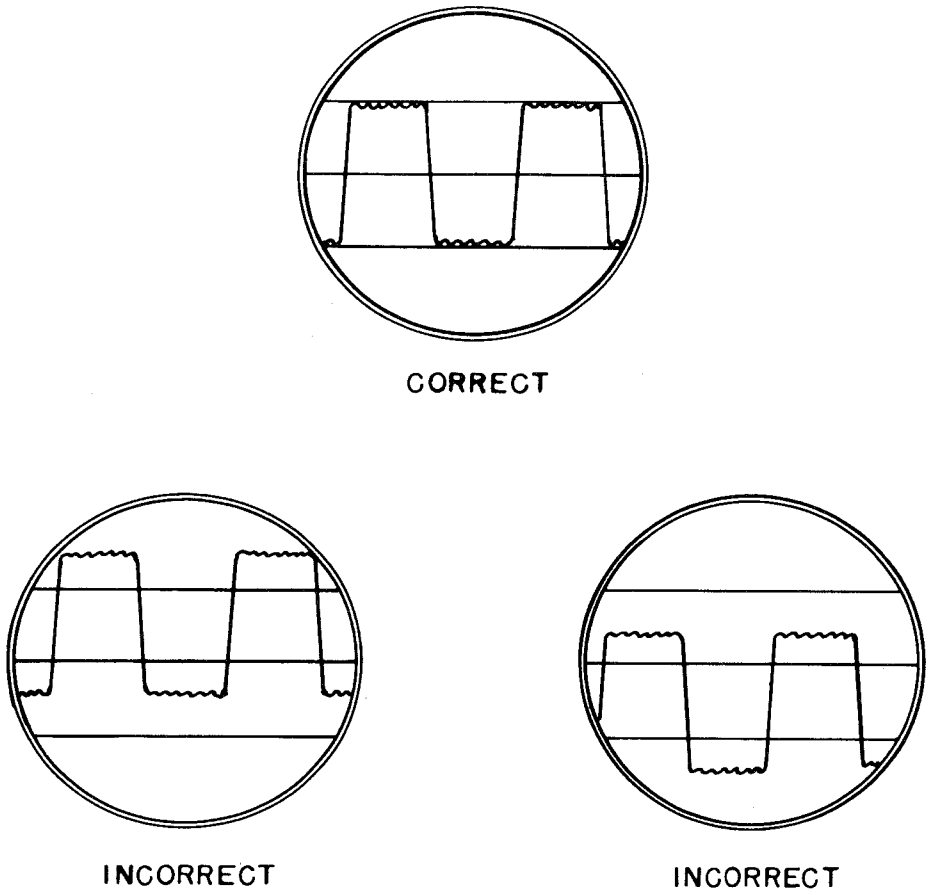


Figure 3–15. Oscillograph Patterns Illustrating Correct and Incorrect Tuning

single-channel output circuit.

The signal required to check the Comparator Keyer CM-32/FRR-24 (unit 4L) and the Frequency Shift Converter CV-127/FRR-24 (unit 4D) may be obtained from any of the first three bays. Bay no. 3 will be used in the following checks. Set up the equipment in the following manner:

Step 1. Supply A.G.C. voltage to the bay no. 3 Control Panel from unit 3G by connecting a patch cord from 3J6 to 3J3 on unit 3J.

Step 2. Connect the 1700-kc. second conversion oscillator voltage from unit 4D to unit 3F by connecting a patch cord between 4K8 and 4K18 on unit 4K and another cord between 3J7 and 3J8 on unit 3J.

Step 3. Carrier-off-noise-suppression (CONS) is made available by connecting a patch cord between 4K25 and 4K10 on unit 4K.

Step 4. Connect the 50-kc. signal from unit 3H to unit 4D by connecting a patch cord between 4K27 and 4K42.

Step 5. Set the Band switch on unit 3A at the frequency band which encompasses the reception frequency. If the reception frequency appears on two bands either may be used.

Step 6. Set the Heterodyne Osc. switch on unit 3A at Local.

Step 7. On the Amplifier-Converter selected in Step 4 set the A.G.C. and Projection Dial switches at On. Adjust the Main Tuning control knob to approximately the proper frequency as indicated on the two dials.

Step 8. Set the Second Conversion Osc. Selector switch on unit 3F at Crystal.

Step 9. Set the Selectivity switch on unit 3K at 6 kc.

Step 10. Set the Channel A input switch on unit 4L at Single Channel. (The other channel section of unit 4L will be checked during the performance test of diversity operation).

Step 11. Set the controls on unit 3G as follows:
Reception switch at Crystal.
A.F. Level control at 3.
R.F. Gain control at 10.
A.G.C. switch at Medium.
Speaker switch at On.

Step 12. Set the controls on unit 3H as follows:
F.S.K. Diversity Level control at 10.
R.F. Gain control at 0.

A.G.C. switch at On.
A.M. Diversity Gain control at 10.

Step 13. Set the controls on unit 4D as follows:
Auto. Freq. Control switch at Off.
Fine Tuning control at 0.
Deviation Compensation control at 10.
Mark-Polarity switch at Normal.
Oscilloscope Selector switch at Vert. Cent.

Step 14. Connect the antenna to the Amplifier-Converter selected in Step 4 by connecting a patch cord between 3J27 and either 3J15, 3J16, 3J28 or 3J29.

Step 15. Set the Plate Stand-By switches on units 3M and 4N at On. Plate Pri. lamps on these units should light.

Step 16. Tune in the desired signal by adjustment of the Main Tuning control knob on the Amplifier-Converter selected in Step 4 as follows:

Rotate the Main Tuning control knob slowly about its previous setting until both Mark and Space tones are heard in the audio output from unit 3G. Now rotate the Main Tuning knob slowly until the two separate tones that are on opposite sides of zero beat combine and a constant tone is audible at unit 3G. This setting assures that the Mark and Space signals are centered in the pass-band of unit 3K.

Step 17. Set the Second Conversion Osc. Selector switch on unit 3F at Ext.

Step 18. Make the following adjustments on unit 4D:

Set the Deviation Compensation control at 10 and the Oscilloscope Selector at Vert. Cent. and observe the pattern on the tube. The correct and incorrect patterns are shown on Figure 3–15. If necessary, adjust the Vertical Centering control to center the trace vertically.

Set the Oscilloscope Selector switch at Calib. Adjust the Synch control to produce 4 or 5 cycles of calibrating voltage.

Set the Oscilloscope Selector switch at Output and center the trace horizontally with the Output Centering control.

Adjust the Deviation Compensation and Fine Tuning controls simultaneously so that the amplitude of the trace visible on the oscilloscope is such that the peaks touch the top and bottom graph lines.

Set the Auto. Freq. Control switch at On and if the A.F.C. does not hold, i.e., if the trace moves upward or downward on the face of the scope, change the Mark-Polarity switch to the opposite position. The trace should recenter itself.

Step 19. On unit 3H adjust the FSK Diversity Level control as follows:

While observing the oscilloscope pattern on unit 4D retard the FSK Diversity Level control to the point where the amplitude of the signal just begins to decrease.

Then advance the control two divisions to overcome fading yet still allowing limiter action to limit strong noise pulses. The final setting of this control will depend upon the degree of fading on the signal versus the degree of interfering noise to be suppressed. A dial setting of 2.5 is normal.

Step 20. Adjust the Ant. Trimmer control on unit 3B, 3C, 3D or 3E (depending on which unit is in use) for maximum response on the 2nd. I.F. Level meter on unit 3H. To prevent incorrect adjustment retard the R.F. Gain control on unit 3G to the point where the 2nd. I.F. Level meter noticeably decreases.

Step 21. Disconnect the antenna by removing the patch cord connection at 3J27 and retard the R.F. Gain control on unit 3G. The teletypewriter should remain on Mark indicating that the C.O.N.S. is functioning. Return the R.F. Gain control to its previous setting and reconnect the antenna.

Step 22. Leave all control settings on bay no. 3 and unit 4L as they are and proceed to check the performance of units 4E and 4F following the procedure outlined in Steps 13, 18 and 19. To make these checks for unit 4E, make patch cord connections between 4K8 and 4K19, 4K25 and 4K11, and between 4K42 and 4K28. To make these checks for unit 4F, make patch cord connections between 4K8 and 4K20, 4K25 and 4K12, and between 4K42 and 4K29.

Step 23. To check the single channel section of CM-32/FRR-24 observe the functioning of the teletypewriter. If the printing is garbled, change the setting of the Mark-Polarity switch on the applicable unit 4D, 4E or 4F. The printer should now be functioning properly.

Step 24. Set the Plate Stand-By switches of units 3M and 4N at Off.

(4) PERFORMANCE TEST OF AMPLIFIER-DETECTOR AM-438/FRR-24.—The following instructions are given to check the operation of Amplifier-Detector AM-438/FRR-24 (unit 4C). The equipment is set up for triple space diversity operation so that the combining action of unit 4C may be observed. Bays 1, 2 and 3 are operated on the same frequency.

Step 1. In diversity operation it is first necessary to arrange bays 1, 2 and 3 for single-bay operation and to obtain A.G.C. voltage from units 1G, 2G and 3G. To accomplish this make patch cord connections from 1J3 to 1J6, from 2J3 to 2J6 and from 3J3 to 3J6. This will complete the A.G.C. voltage connections.

Step 2. Set controls on units 1G, 2G and 3G as follows:

A.G.C. switch at Medium
R.F. Gain control at 10.
Reception switch at A.M.
A.F. Level control at 3.
Speaker switch at On.

Step 3. Set the Band switches on units 1A, 2A and 3A at the frequency bands which encompass a suitable steady signal, preferably a high frequency broadcast signal or other telephone signal which will remain on long enough for the following performance check.

Step 4. Set the Heterodyne Osc. switch on units 1A, 2A and 3A at Local.

Step 5. Make the following control adjustments on the Amplifier-Converter unit selected in Step 3.

Set the A.G.C. switch at On.
Set the R.F. Gain control at 0.
Set the Projection Dial switch at On.
Set the Main Tuning control knob at approximately the reception frequency as indicated by the tuning dials.

Step 6. Set the Second Conversion Osc. Selector switch on units 1F, 2F and 3F at Crystal.

Step 7. Make the following adjustments on R.F. Amplifier units 1H, 2H and 3H.

Set the A.G.C. switch at On.
Set the A.M. Diversity Gain control at 10.
Set the R.F. Gain control at 0.

Step 8. Set the Selectivity switch on units 1K, 2K and 3K at 6 kc.

Step 9. Proper antennas must be selected and connected to the Amplifier-Converters selected in Step 3 by connecting a patch cord on unit 1J between connector 1J27 and either 1J15, 1J16, 1J28 or 1J29; a patch cord on unit 2J between connectors 2J27 and either 2J15, 2J16, 2J28 or 2J29; a patch cord on unit 3J between connectors 3J27 and either 3J15, 3J16, 3J28 or 3J29.

Step 10. Set the Plate Stand-By switches on units 1M, 2M, 3M and 4M at On. The Plate Pwr. lamps on these units should light.

Step 11. Tune in the desired signal by adjustment of the Main Tuning control knobs on the Amplifier-Converter units adjusted in Step 5. The optimum tuning point will be indicated aurally by the response from the loudspeaker and visually by a maximum reading on the 2nd I.F. Level meter on units 1H, 2H and 3H respectively. Adjust the A.F. Level controls on units 1G, 2G and 3G to obtain the desired audio output level and determine, by listening, that the same signal is being received on all three units.

Step 12. To insure that the signal has been correctly tuned in, set the Reception switch on units 1G, 2G and 3G at Crystal and adjust the Main Tuning control knobs on the Amplifier-Converters selected in Step 3 to obtain zero-beat in the audio output response from units 1G, 2G and 3G. After this adjustment is completed set the Reception switch back to A.M.

Step 13. To obtain an optimum match between the antenna and the antenna input circuit, adjust the Ant. Trimmer control on the Amplifier-Converters selected in Step 3 for maximum response on the 2nd. I.F. Level meter on units 1H, 2H and 3H. To insure a proper reading, the R.F. Gain control on units 1G, 2G and 3G should first be retarded until a noticeable decrease is obtained on the corresponding meter.

Step 14. Set the controls on unit 4C as follows:

A.G.C. switch at Medium.
R.F. Gain control at 10.
Audio Bandwidth switch at 6 kc.
A.F. Level control at 3.
A.N.L. switch at Off.
Level Indicator switch at Combined.
Insert headphones into Phones jack.

Step 15. The A.G.C. patch must now be changed for diversity operation. To prevent overload while the patch connections are open set the R.F. Gain controls at 0 and the A.G.C. switch at Off on units 1H, 2H and 3H.

Step 16. Change the A.G.C. patch connections made in Step 1 to connect 1J3 to1J4, 2J3 to 2J4 and 3J3 to 3J4.

Step 17. Connect a patch cord between 4K1 and 4K16.

Step 18. The 50-kc. signals from the first 3 bays are patched into unit 4C by making the following patch cord connections:

4K43 to 4K30
4K44 to 4K31
4K45 to 4K32

Step 19. Set the A.G.C. switch at On on units 1H, 2H and 3H.

Step 20. Set the A.F. Level control on unit 4C for the desired audio level and procede to check the diversity operation. To make this check properly it is necessary to adjust the gain of each channel to give equal output. In this manner each channel will have the same average output level and will deliver signal intelligence to the output circuit a proportional amount of time during periods of fading. The equalization of gain is accomplished in the following manner.

Step 21. Observe the readings on the 2nd. I.F. Level meters on units 1H, 2H and 3H for a sufficient period of time to determine the average reading. If one of the meters reads appreciably higher than the others, retard the A.M. Diversity Gain control on that unit so that each meter reading averages the same.

Step 22. In some cases one channel may have a definitely poorer average signal-to-noise ratio than the others in which case it may provide better overall performance if the A.M. Diversity Gain control in the weaker channel is retarded slightly so that it feeds

signal to the output only when both of the other channels have faded.

In any case at least one of the channels will have its A.M. Diversity Gain control set at 10 so that sufficient average receiver gain is used at all times.

Step 23. The performance check of the diversity function is now completed by setting the Level Indicator switch on unit 4C at Rec. 1, Rec. 2, Rec. 3 and Combined in turn. Note the readings on the Diversity Level meter for each switch setting. Proper diversity operation will be indicated if the individual channel meter readings fluctuate and the combined reading holds at a constant level.

Step 24. Set the Plate Stand-By switch of units 1M, 2M, 3M and 4M at off.

(5) PERFORMANCE TEST OF THE COMBINING FUNCTION OF COMPARATOR-KEYER CM-32/FRR-24 DURING DIVERSITY OPERATION.–For this test teletype printers should be connected to the CM-32/FRR-24 output circuits.

Step 1. Connect patch cords between 1J3 and 1J6, between 2J3 and 2J6 and between 3J3 and 3J6 for A.G.C. voltage supply.

Step 2. Set the Heterodyne Osc. switch on units 1A, 2A and 3A at Local.

Step 3. To make use of the heterodyne oscillators of units 4D, 4E and 4F connect patch cords between 4K6 and 4K18, 4K7 and 4K19 and 4K8 and 4K20 on unit 4K. On unit 1J connect a patch cord between 1J7 and 1J8. On unit 2J connect a patch cord between 2J7 and 2J8. On unit 3J connect a patch cord between 3J7 and 3J8.

Step 4. The 50-kc. frequency shift signal voltage from bay no. 1 is supplied to unit 4D by connecting a patch cord between 4K27 and 4K40. The signal from bay no. 2 reaches unit 4E by patching from 4K28 to 4K41. The signal from bay no. 3 is fed to unit 4F by connecting a patch cord between 4K29 and 4K42.

Step 5. Carrier-off-noise-suppression voltage is now connected to units 4D, 4E and 4F by connecting patch cords between 4K10 and 4K23, between 4K11 and 4K24 and between 4K12 and 4K25.

Step 6. Set the Auto. Freq. control switches on units 4D, 4E and 4F at Off, the Mark-Polarity switch at Normal, the Keying Speed switch at Slow, the Deviation Compensation control at 0, the Oscilloscope Selector switch at Output and the Fine Tuning control at 0.

Step 7. Set the Channel A Input switch of unit 4L at Diversity.

Step 8. Set the controls on units 1G, 2G and 3G as follows:

Reception switch at Crystal.
A.F. Level control at 3.
R.F. Gain control at 10.
A.G.C. switch at Medium.
Speaker switch at On.

Step 9. Set the controls on units 1H, 2H and 3H as follows:

F.S. K. Diversity Level control at 10.
R.F. Gain control at 0.
A.M. Diversity Gain control at 10.
A.G.C. switch at On.

Step 10. Set the Band switch on units 1A, 2A and 3A at the frequency band which will encompass frequency shift signal frequencies.

Step 11. On the Amplifier-Converters selected in Step 10 set the A.G.C. and Projection Dial switches at On and adjust the Main Tuning control knob to the proper frequency as indicated on the two dials.

Step 12. Set the Selectivity switch on units 1K, 2K and 3K at 6 kc.

Step 13. Connect the antenna to the Amplifier-Converters selected in Step 10 by connecting a patch cord between 1J27 and either 1J15, 1J16, 1J28 or 1J29; between 2J27 and either 2J15, 2J16, 2J28 or 2J29 and between 3J27 and either 3J15, 3J16, 3J28 or 3J29.

Step 14. Set the Plate Stand-By switches on units 1M, 2M, 3M and 4N at On. All the Plate Pri. lamps on these units should light.

Step 15. The Amplifier-Converter in bay no. 1 which was selected in Step 10 should be adjusted as follows:

Rotate the Main Tuning control knob slowly about its previous setting until both Mark and Space tones are heard in the audio output from unit 1G. Now rotate the Main Tuning knob slowly until the two separate tones that are on opposite sides of zero beat combine into a constant tone audible at unit 1G. This setting assures that the Mark and Space signals are centered in the pass-band of unit 1K.

Step 16. Repeat the above tuning process for the Amplifier-Converters in bays no. 2 and 3 and determine, by listening, that the same signal is being received on all three bays.

Step 17. Set the Second Conversion Osc. Selector switch at units 1F, 2F and 3F at Ext.

Step 18. Make the following adjustments on unit 4D:

Adjust the Deviation Compensation control so that the amplitude of the trace visible on the oscilloscope is such that the peaks touch the top and bottom graph lines.

Adjust the Fine Tuning control for proper centering of the oscilloscope pattern with the Auto. Freq. Control switch at Off.

Set the Auto. Freq. Control switch at On and, if the A.F.C. does not hold the trace steady on the scope, change the Mark-Polarity switch to the opposite position.

Step 19. Make the adjustments outlined in Step 18 on units 4E and 4F.

Step 20. On unit 1H adjust the FSK Diversity Level control as follows:

While observing the oscilloscope on unit 4D retard the FSK Diversity Level control to the point where the amplitude of the signal just begins to decrease.

Then advance the control two divisions to overcome fading yet still allowing limiter action to limit strong noise pulses. The final setting of this control will depend upon the degree of fading on the signal versus the degree of interfering noise to be suppressed. A dial setting of 2.5 is normal.

Step 21. Adjust the FSK Diversity Level control on unit 2H following the above procedure and observing the trace on the oscilloscope of unit 4E.

Step 22. Adjust the FSK Diversity Level control on unit 3H following the above procedure and observing the trace on the oscilloscope of unit 4F.

Step 23. Compare the oscilloscope patterns on units 4D, 4E and 4F. All three traces should conform to Figure 3–15. The teletype equipment should now be printing normally. If the printing is garbled, change the setting of the Mark-Polarity switches on units 4D, 4E and 4F to the opposite position.

Step 24. Set the Plate Stand-By switches on units 1M, 2M, 3M and 4N at Off.

(6) PERFORMANCE TEST OF KEYER KY-62/FRR-24 (UNITS 4G, 4H, 4J) OPERATING FROM COMPARATOR-KEYER CM-32/FRR-24 (UNIT 4L).– The following procedure is recommended for making the initial checks on Keyer KY-62/FRR-24 (unit 4G). Bay 3 is used in the following example as the origin of the test signal although either bay 1 or 2 may be used.

Step 1. Supply A.G.C. voltage to the Cotnrol Panel of bay no. 3 by connecting a patch cord between 3J3 and 3J6 on unit 3J.

Step 2. Connect the 50-kc. signal voltage from unit 3H to unit 4D by patching between 4K27 and 4K42 on unit 4K.

Step 3. Supply the 1700-kc. second conversion oscillator voltage from unit 4D to unit 3F by connecting a patch cord between 4K8 and 4K18 on unit 4K and another cord between 3J7 and 3J8 on unit 3J.

Step 4. Connect the F.S. keyed D.C. output signal from Comparator-Keyer CM-32/FRR-24 (unit 4L) to Keyer KY-62/FRR-24 (unit 4G) by patching between 4K50 and 4K47.

Step 5. Set the controls on unit 3G as follows:
R.F. Gain control at 10.
Reception switch at Crystal.
A.F. Level control at 3.
A.G.C. switch at Medium.
Speaker switch at On.

Step 6. Set the Band switch on unit 3A at a frequency band which encompasses F-1 signals suitable for checking purposes.

Step 7. Set the Heterodyne Osc. switch on unit 3A at Local.

Step 8. On the Amplifier-Converter selected in Step 6 set the A.G.C. and Projection Dial switches at On. Adjust the Main Tuning control to the frequency of the desired signal as indicated on the two dials.

Step 9. Set the Second Conversion Osc. Selector switch on unit 3F at Crystal.

Step 10. On unit 3H set controls as follows:
F.S.K. Diversity Level control at 10.
R.F. Gain control at 0.
A.G.C. switch at On.
A.M. Diversity Gain control at 10.

Step 11. Set the Selectivity switch on unit 3K at 6 kc.

Step 12. Set the Channel A input switch on unit 4L at Single Channel.

Step 13. Set the controls on unit 4D as follows:
Auto. Freq. Control switch at Off.
Fine Tuning control at 0.
Deviation Compensation control at 10.
Mark-Polarity switch at Normal.
Oscilloscope Selector switch at Vert. Cent.

Step 14. Set the controls on unit 4G as follows:
Reception switch at F-1.
A.F. Level control at 3.
Monitor Level control at 3.
Threshold control at 5.
Tone switch at Fixed.
Fixed Freq. switch at 1105 cycles.
Plug headphones into the Phones-Monitor jack.

Step 15. Connect the antenna to the Amplifier-Converter selected in Step 6 by connecting a patch cord between 3J27 and either 3J15, 3J16, 3J28 or 3J29.

Step 16. Set the Plate Stand-By switches on units 3M and 4N at On. Plate Pri. lamps on these units should light.

Step 17. Tune in the desired signal by adjustment of the Main Tuning control knob on the Amplifier-Converter selected in Step 6 as follows:

Rotate the Main Tuning control knob slowly about its previous setting until both Mark and Space tones are heard in the audio output from unit 3G. Now rotate the Main Tuning knob slowly until the two separate tones that are on opposite sides of zero beat combine and a constant tone is audible at unit 3G. This assures that the Mark and Space signals are centered in the pass-band of unit 3K.

Step 18. Set the Second Conversion Osc. Selector switch on unit 3F at Ext.

Step 19. Make the following adjustments on unit 4D. Set the Deviation Compensation control at 10 and the Oscilloscope Selector switch at Vert. Cent. and observe the pattern on the tube. The correct and incorrect patterns are shown on Figure 3–15. If necessary, adjust the Vertical Centering control to center the trace vertically.

Set the Oscilloscope Selector switch at Calib. Adjust the Synch control to produce 4 or 5 cycles of calibrating voltage and if necessary adjust the Calibration control to cause the pattern to just touch the two calibration marks. The calibrating voltages should appear as a sine wave on the scope.

Set the Oscilloscope Selector switch at Output and center the trace horizontally with the Output Centering control

Adjust the Deviation Compensation and Fine Tuning controls simultaneously so that the amplitude of the trace visible on the oscilloscope is such that the peaks touch the top and bottom graph lines.

Set the Auto. Freq.. Control switch at On and if the A.F.C. does not hold, i.e., if the trace moves upward or downward on the face of the scope, change the Mark-Polarity switch to the opposite position. The trace thould recenter itself.

Step 20. On unit 3H adjust the F.S.K. Diversity Level control as follows:

While observing the oscilloscope pattern on unit 4D retard the F.S.K. Diversity Level control to the point where the amplitude of the signal just begins to decrease.

Then advance the control two divisions to overcome fading yet still allowing limiter action to limit strong noise pulses. The final setting of this control will depend upon the degree of fading on the signal versus the degree of interfering noise to be suppressed. A dial setting of 2.5 is normal.

Step 21. Adjust the Ant. Trimmer control on unit 3B, 3C, 3D or 3E (depending on which unit is in use) for maximum response on the 2nd. I.F. Level meter on unit 3H. To prevent incorrect adjustment retard the R.F. Gain control on unit 3G to the point where the 2nd. I.F. Level meter noticeably decreases.

Step 22. An 1105-cycle tone should now be heard in the headphones connected to unit 4G and the A.F. Level and Threshold controls on this unit should be adjusted for clean keying as evidenced by optimum functioning of the terminal equipment.

Step 23. While listening to the tone in the headphones vary the setting of the Fixed Freq. switch to determine that all frequencies are operative.

Step 24. Set the Tone switch of unit 4G at Var.

Step 25. Rotate the Variable Frequency control and note the response in the headphones. The frequency of the audio tone should vary with the setting of the control.

Step 26. Place the Reception switch of unit 4G in the Test position. A steady tone should now be heard in the headphones regardless of whether or not a signal is being received.

Step 27. On unit 4K move the patch cord from connector 4K47 to 4K48.

Step 28. Check the performance of unit 4H setting the controls as listed in Step 14 and following the procedure outlined in Steps 22 through 26.

Step 29. Move the patch cord from 4K48 to 4K49 on unit 4K.

Step 30. Check the performance of unit 4J setting the controls as listed in Step 14 and following the procedure outlined in Steps 22 through 26.

Step 31. The Threshold controls of units 4G, 4H and 4J are used to provide the optimum in clean keying during varying conditions of fading.

Step 32. Set the Plate Stand-By switches on units 3M and 4N at Off.

Step 33. To shut down the equipment:

Set the Heater Protection switches on units 1M, 2M, 3M, 4M and 4N at Off.

Set the A.C. Power switches of unit 3L at Off.

Remove all patch cord connections and replace patch covers.

The equipment is now ready to be turned over to operating personnel.

NAVSHIPS 91580

RESTRICTED
SECURITY INFORMATION

INSTRUCTION BOOK

for

RADIO RECEIVING SET AN/FRR-24

SECTION 4—OPERATION

NATIONAL COMPANY, INC.
MALDEN 48, MASSACHUSETTS

BUREAU OF SHIPS

NAVY DEPARTMENT

Contract: NObsr-39402

Approved by BuShips: 15 April 1952

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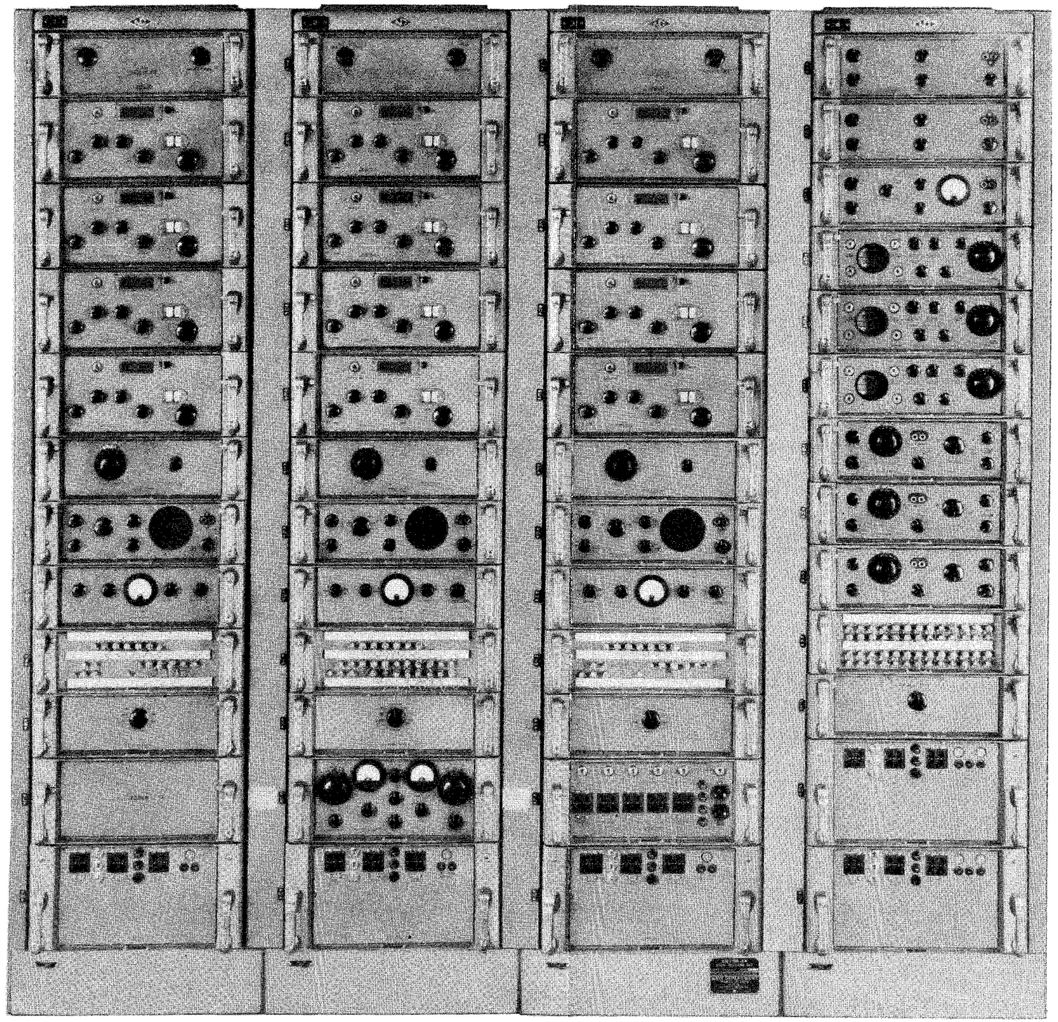

Figure 4–1. AN/FRR-24 Radio Receiving Set

IDENTIFICATION OF UNITS

	1	2	3	4
A	CONTROL PANEL SB-142/FRR-24	CONTROL PANEL SB-142/FRR-24	CONTROL PANEL SB-142/FRR-24	AMPLIFIER-DETECTOR AM-440/FRR-24
B	AMPLIFIER-CONVERTER AM-450/FRR-24	AMPLIFIER-CONVERTER AM-450/FRR-24	AMPLIFIER-CONVERTER AM-450/FRR-24	AMPLIFIER-DETECTOR AM-440/FRR-24
C	AMPLIFIER-CONVERTER AM-451/FRR-24	AMPLIFIER-CONVERTER AM-451/FRR-24	AMPLIFIER-CONVERTER AM-451/FRR-24	AMPLIFIER-DETECTOR AM-438/FRR-24
D	AMPLIFIER-CONVERTER AM-453/FRR-24	AMPLIFIER-CONVERTER AM-453/FRR-24	AMPLIFIER-CONVERTER AM-453/FRR-24	FREQUENCY SHIFT CONVERTER CV-127/FRR-24
E	AMPLIFIER-CONVERTER AM-452/FRR-24	AMPLIFIER-CONVERTER AM-452/FRR-24	AMPLIFIER-CONVERTER AM-452/FRR-24	FREQUENCY SHIFT CONVERTER CV-127/FRR-24
F	FREQUENCY CONVERTER CV-126/FRR-24	FREQUENCY CONVERTER CV-126/FRR-24	FREQUENCY CONVERTER CV-126/FRR-24	FREQUENCY SHIFT CONVERTER CV-127/FRR-24
G	AMPLIFIER-DETECTOR AM-439/FRR-24	AMPLIFIER-DETECTOR AM-439/FRR-24	AMPLIFIER-DETECTOR AM-439/FRR-24	KEYER KY-62/FRR-24
H	R.F. AMPLIFIER AM-454/FRR-24	R.F. AMPLIFIER AM-454/FRR-24	R.F. AMPLIFIER AM-454/FRR-24	KEYER KY-62/FRR-24
J	PATCH PANEL SB-138/FRR-24	PATCH PANEL SB-140/FRR-24	PATCH PANEL SB-169/FRR-24	KEYER KY-62/FRR-24
K	FILTER ASSEMBLY F-99/FRR-24	FILTER ASSEMBLY F-99/FRR-24	FILTER ASSEMBLY F-99/FRR-24	PATCH PANEL SB-143/FRR-24
L	TOOL BOX	OSCILLATOR ASSEMBLY O-131/FRR-24	POWER DISTRIBUTION PANEL SB-141/FRR-24	COMPARATOR-KEYER CM-32/FRR-24
M	POWER SUPPLY PP-590/FRR-24	POWER SUPPLY PP-590/FRR-24	POWER SUPPLY PP-590/FRR-24	POWER SUPPLY PP-649/FRR-24
N				POWER SUPPLY PP-648/FRR-24

SECTION 4
OPERATION

1. INTRODUCTION.

The AN/FRR-24 Radio Receiving Set is a double-conversion superheterodyne type diversity receiver contained in four rack cabinets as illustrated in Figure 4–1. The complete receiving equipment consists of a group of three radio receivers together with switching-combining circuits necessary to receive the following types of signals in single-channel operation and in space or frequency dual or triple diversity operation:

a. Double-sideband radio-telephone.

b. On-Off keyed radio-telegraph.

c. Frequency-shift keyed telegraph (to operate single-channel teletype and/or up to four-channel multiplex).

Essentially each of the first three bays is a radio receiver complete within itself except for its detector and suitable for reception of A1, A2 and A3 transmissions. However, each of these bays contains a monitor unit with a detector (Amplifier-Detector AM-439/FRR-24) so that preliminary tuning for each bay can be accomplished without departing from the bay being tuned. Each receiver also has an I.F. frequency output circuit for connection to suitable auxiliary apparatus to permit single-channel reception of facsimile and telephoto signals. The fourth bay contains the basic units necessary to obtain single, double or triple diversity reception of A1, A2, A3 and F1 transmissions within the frequency range of 2 to 32 megacycles.

A brief description of each unit and the function of their associated controls is contained in paragraph 2 of this section while the operating instructions are contained in paragraph 3 and are sub-divided so that a particular paragraph is applicable to one particular mode of reception.

2. CONTROLS.

The scope of this section is to familiarize the operator with the function of each control or device on the front panels of the AN/FRR-24 Radio Receiving Set. Normal operation is accomplished entirely by means of front panel-mounted controls together with proper patch-cord connections on the patch panel units. All front-panel controls for each of the different type units are located and identified in Figures 4–2 through 4–21.

a. CONTROL PANEL SB-142/FRR-24, UNITS 1A,

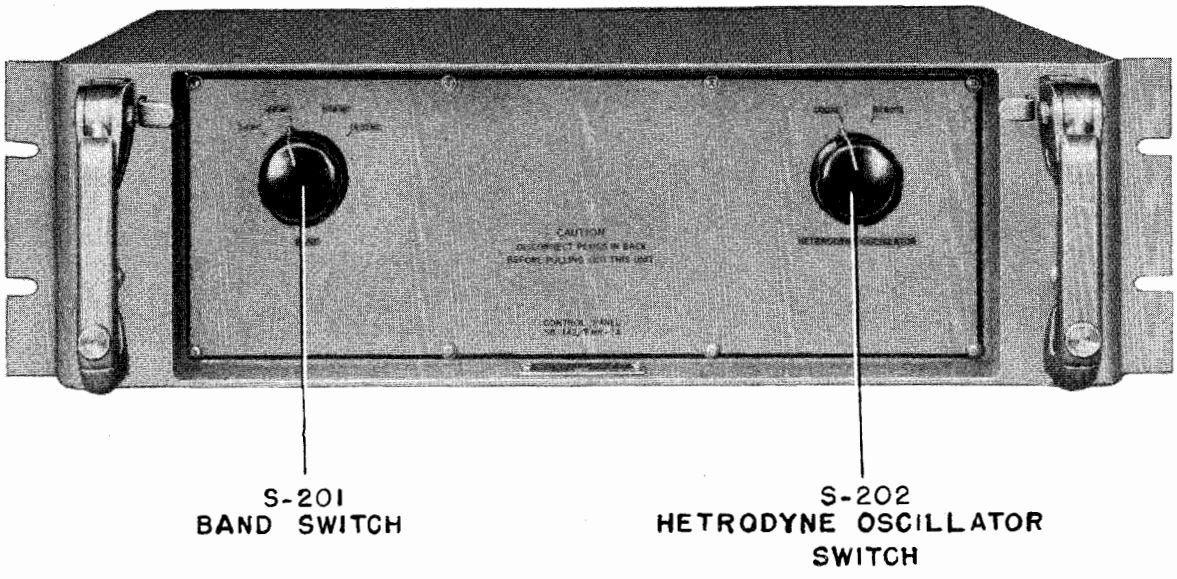

Figure 4–2. Control Panel SB-142/FRR-24 (units 1A, 2A, 3A), Front Panel Component Identification

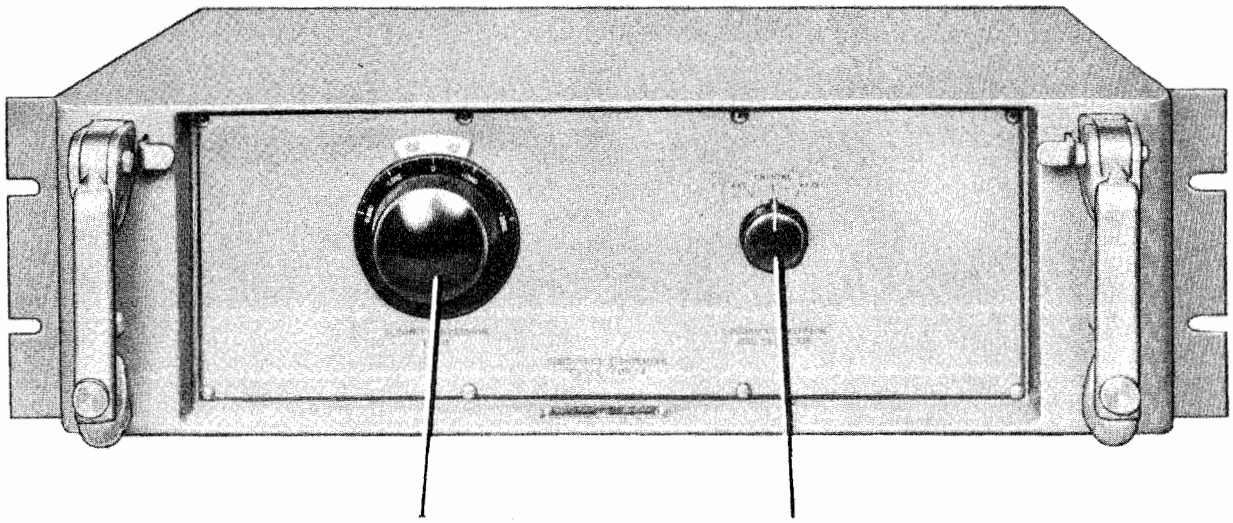

Figure 4–4. Frequency-Converter CV-126/FRR-24 (units 1F, 2F, 3F), Front Panel Component Identification

versity reception. Automatic gain control voltage must be connected into these units from an associated unit. Protective self-bias is provided in the event of A.G.C. bias failure. Since the four Amplifier-Converter units are identical in circuit design except for tuned circuit components, the operation of one unit is similar to all others. The following is a description of the controls on the Amplifier-Converter unit:

(1) MAIN TUNING CONTROL.–Tuning of the R.F. amplifiers, converters and H.F. oscillator stages is accomplished by this control. The main tuning drive is geared to three individual dial scales and drives a seven-section ganged capacitor. The large drum scale indicates frequencies in megacycles, whereas the smaller scale has linear markings for logging purposes and the projection dial indicates frequencies in kilocycles. Two concentric tuning knobs are employed to obtain both coarse and fine tuning. The outer knob, which has a gear ratio of 160 to 1, is utilized for fine tuning. The inner knob, which has a gear ratio of 20 to 1, is utilized for coarse tuning.

(2) R.F. GAIN CONTROL.–The function of this control is to manually adjust the overall gain of this unit to the desired level when the A.G.C. switch is at Off.

(3) ANTENNA TRIMMER CONTROL.–A variable trimmer capacitor, connected across the first R.F. amplifier main tuning capacitor section, is used to tune the first R.F. amplifier stage under varying antenna loading conditions.

(4) A.G.C. SWITCH.–The purpose of this switch is to turn the A.G.C. voltage On and Off.

(5) PILOT DIMMER CONTROL.–This control provides a means of raising or lowering the brilliance of the pilot lamp.

(6) PROJECTION DIAL SWITCH.–This switch turns on the projection dial lamp to project the kilocycle frequency dial numerals onto the front-panel window.

(7) INDEX SET CONTROL.–The Index Set control adjusts the position of the projection dial hair-line indicator.

c. FREQUENCY-CONVERTER CV-126/FRR-24, UNITS 1F, 2F, 3F. *(See Figure 4–4).*–The Frequency Converter CV-126/FRR-24 converts the 1750-kc. intermediate frequency obtained from the Amplifier-Converter units preceding it to the 50-kc. intermediate frequency of the following Filter Assembly F-99/FRR -24 unit. The frequency changing function also provides a convenient point for vernier tuning or automatic frequency control tuning. The 1750-kilocycle I.F. input signal is converted to an output signal of 50 kilocycles through the use of a converter and 1700 kilocycle crystal oscillator or variable oscillator. The following two controls are used to operate this unit:

(1) SECOND CONVERSION OSCILLATOR SELECTOR SWITCH.–This switch selects the oscillator circuit to be placed into operation i.e., Crystal, VFO or External. In the Crystal position, the fixed frequency oscillator generates a 1700-kc. injection voltage for internal or external application. Similarly

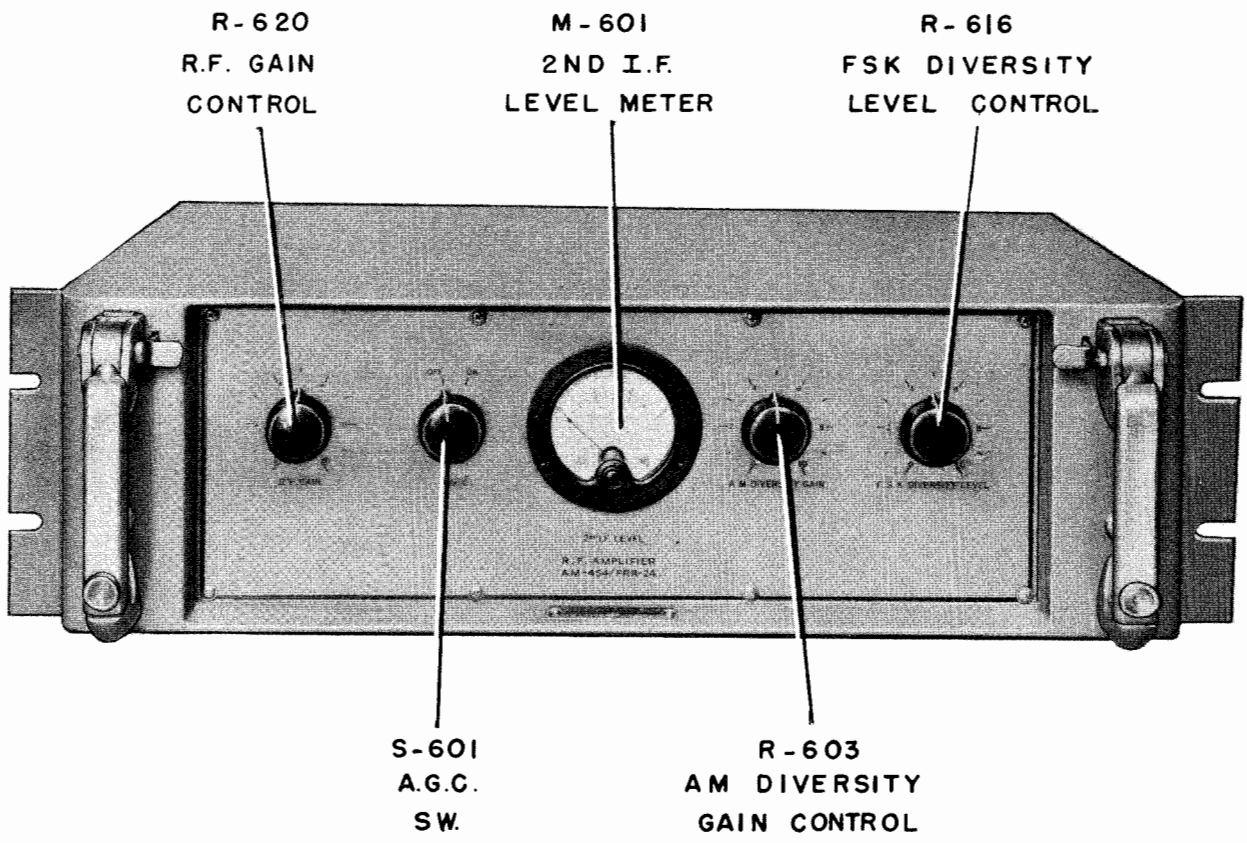

Figure 4–6. R.F. Amplifier AM-454/FRR-24 (units 1H, 2H, 3H), Front Panel Component Identification

ed mode of reception such as AM for radiotelephone, BFO for radiotelegraph or Crystal for accurate 'zero-beat' tuning is made with this switch which will also turn the noise limiter On or Off.

(6) LOUDSPEAKER.–A built-in loudspeaker permits audible monitoring of the audio intelligence.

(7) A.F. LEVEL CONTROL.–The audio output level of this unit is adjusted by this control.

(8) PHONES JACK.–This jack provides a means of connecting headphones to the unit to aurally monitor the received signal. It is wired for use with either a single phone plug or a twin plug such as is used on some audio frequency patch cords.

e. R.F. AMPLIFIER AM-454/FRR-24, UNITS 1H, 2H, 3H. *(See Figure 4–6).*–The major portion of the receiver gain is provided by the R.F. Amplifier AM-454/FRR-24 without adding appreciably to the selectivity. This unit provides outputs at two different levels: one output level is for A1, A2, A3 and F4 signals, the second output is for F1 signals. It is designed to develop a gain of 77 db from input to AM output and a gain of 76 db from input to FS output with a nominal bandwidth of 18 kilocycles in the system.

Operating at 50 kilocycles, it receives its input signal voltage from the Filter Assembly F-99/FRR-24.

The design thus provides selectivity and voltage gain for the 50 kilocycle AM and FS signals, the FS Carrier-Off-Noise Suppression (C.O.N.S.) voltage for application to another unit and protective self-bias in the case of A.G.C. bias failure. The front-panel controls for this unit are as follows:

(1) R.F. GAIN CONTROL.–The function of this control is to manually adjust the overall gain of this unit to the desired level when the A.G.C. switch is set at Off. This control is disconnected from the circuit when the A.G.C. switch is set at On.

(2) A.M. DIVERSITY GAIN CONTROL.–The overall gain can also be manually adjusted by the A.M. Diversity Gain control. This control can be used alone when the A.G.C. switch is set at On or in conjunction with the R.F. Gain control when the A.G.C. switch is set at Off.

(3) F.S.K. DIVERSITY LEVEL CONTROL.–The amount of FS output voltage being applied to the I.F. Amplifier is adjusted by the setting of this control.

(4) A.G.C. SWITCH.–The purpose of this switch is to turn the A.G.C. voltage On and Off.

(5) SECOND I.F. LEVEL METER.–This meter gives a visual indication of the output strength of the 50 kilocycle signal.

f. PATCH PANELS.–The following table lists the Patch Panel units and their illustrations:

SB-138/FRR-24 Unit 1J See Figure 4–7
SB-140/FRR-24 Unit 2J See Figure 4–8
SB-169/FRR-24 Unit 3J See Figure 4–9
SB-143/FRR-24 Unit 4K See Figure 4–10

The purpose of the patch panels is to arrange the equipment for a particular mode of operation and to connect various circuits in one unit to circuits in other units. All of these types of connections are made by means of patch cords associated with each patch panel.

Reference to illustrations Figures 4–7 to 4–10 will show the various connectors located on each patch panel and that each connector has an identifying tab. Before operation of this equipment is attempted a thorough understanding of the proper method of 'patching' on these panels should be attained. A complete explanation of patching is given in paragraph 3 of this section.

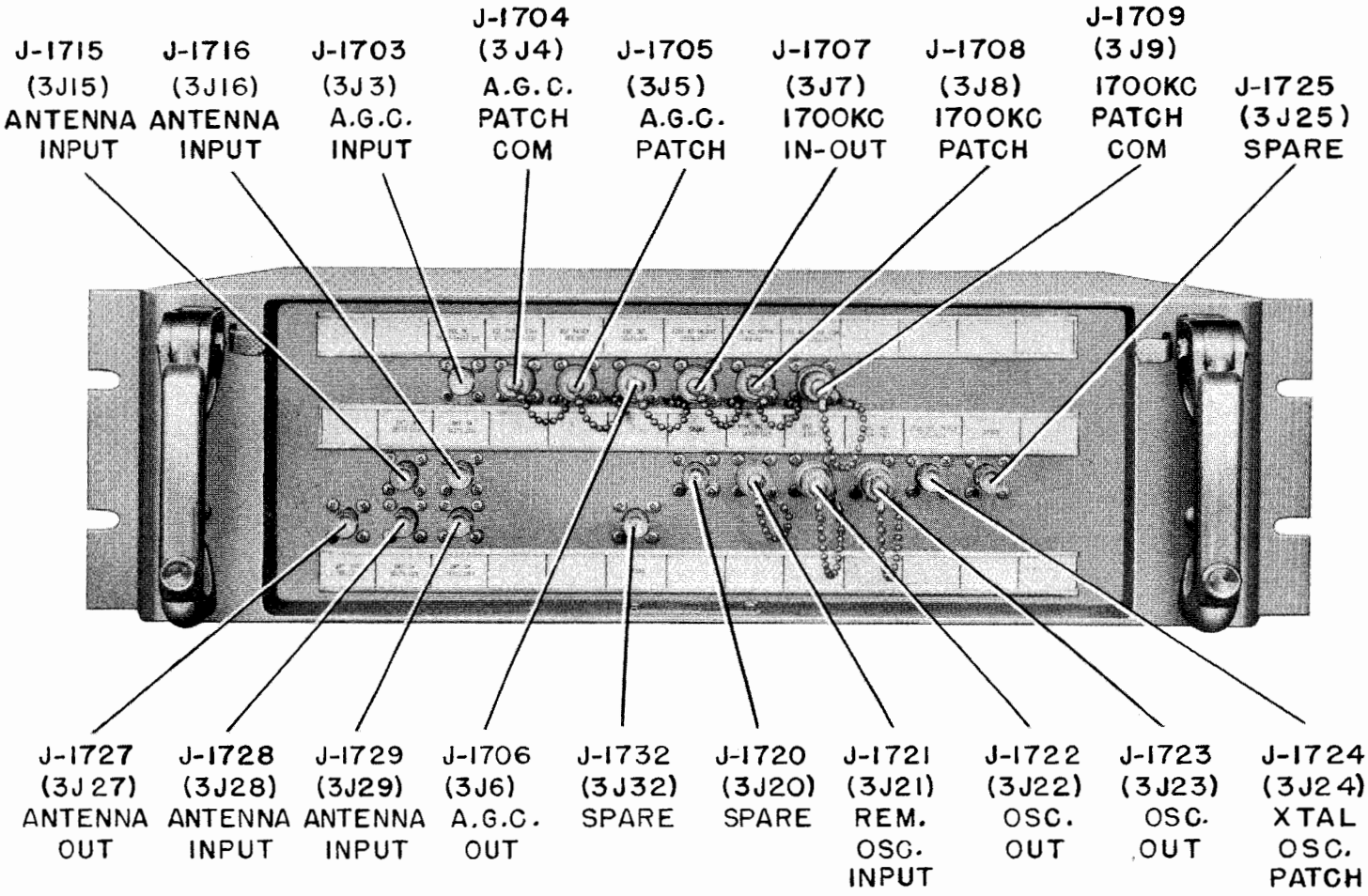

Figure 4–9. Patch Panel SB-169/FRR-24 (unit 3J), Front Panel Component Identification

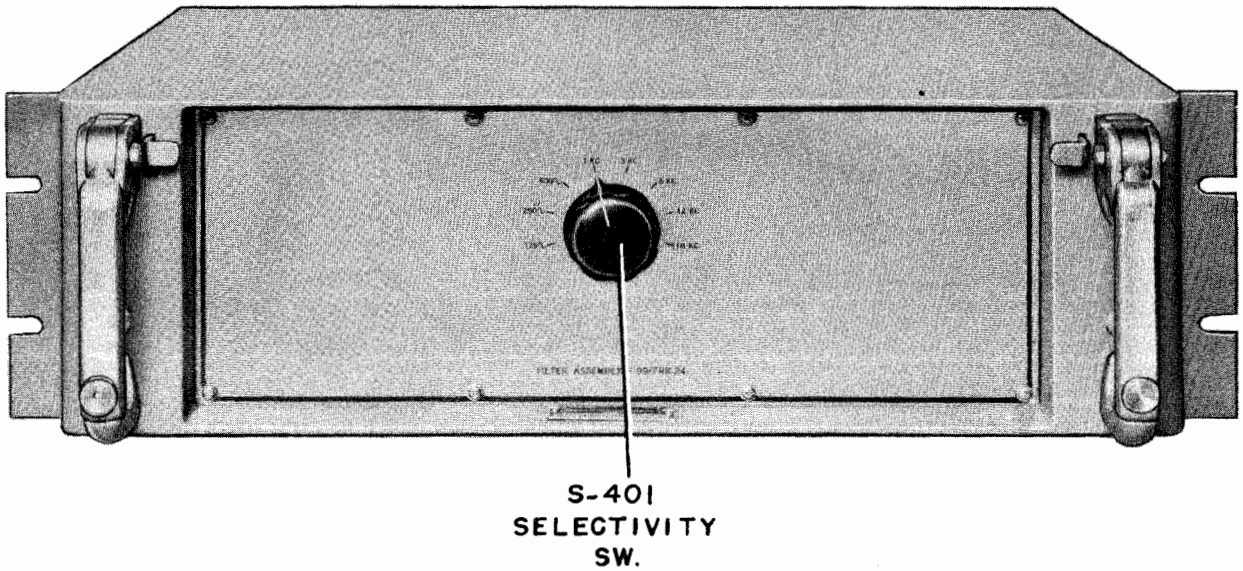

Figure 4–11. Filter Assembly F-99/FRR-24 (units 1K, 2K, 3K), Front Panel Component Identification

(1) SELECTIVITY SWITCH.–This is an eight position switch which selects one of eight bandwidths from a minimum of 125 cycles to a maximum of 18 kilocycles.

b. OSCILLATOR ASSEMBLY O-131/FRR-24, UNIT 2L. *(See Figure 4–12).*–Crystal controlled operation of one or more of the Amplifier-Converter units is made possible through use of the Oscillator Assembly O-131/FRR-24. This unit is composed of two separate crystal oscillators and one crystal calibrator. It is designed to develop oscillator output voltages between the frequencies 3.75 megacycles and 33.75

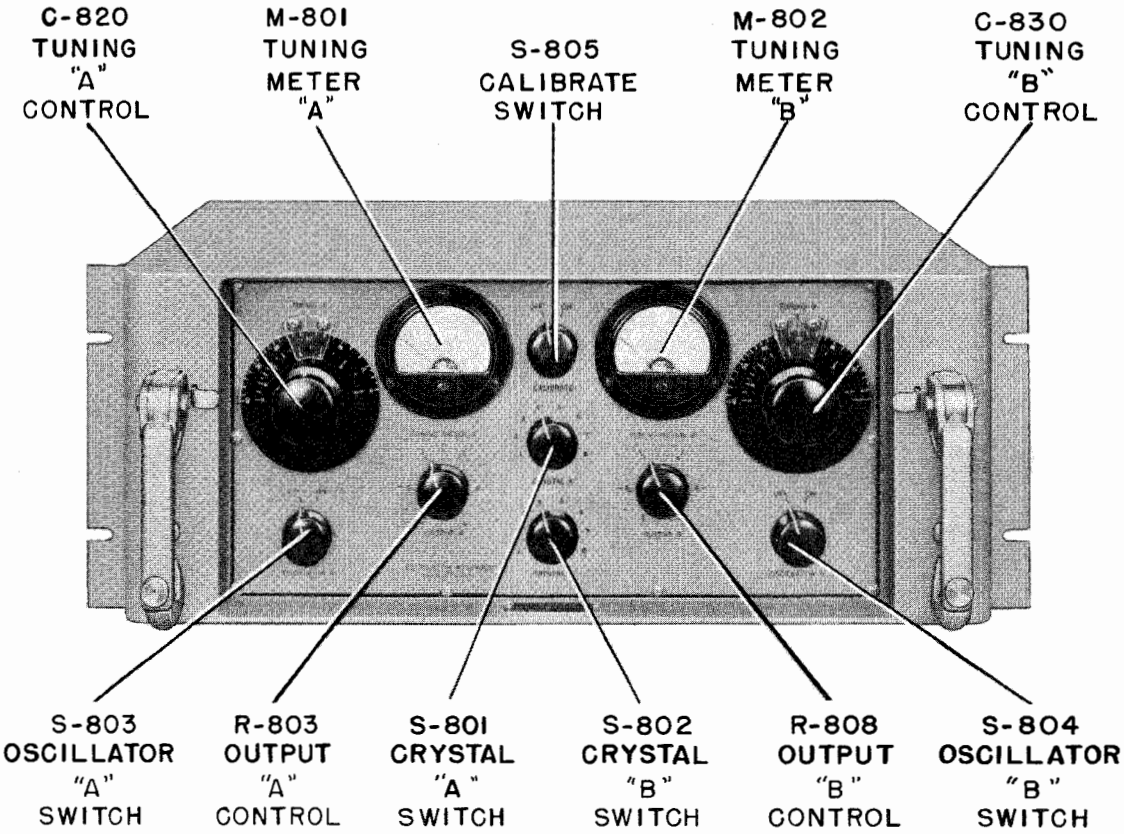

Figure 4–12. Oscillator Assembly O-131/FRR-24 (unit 2L), Front Panel Component Identification

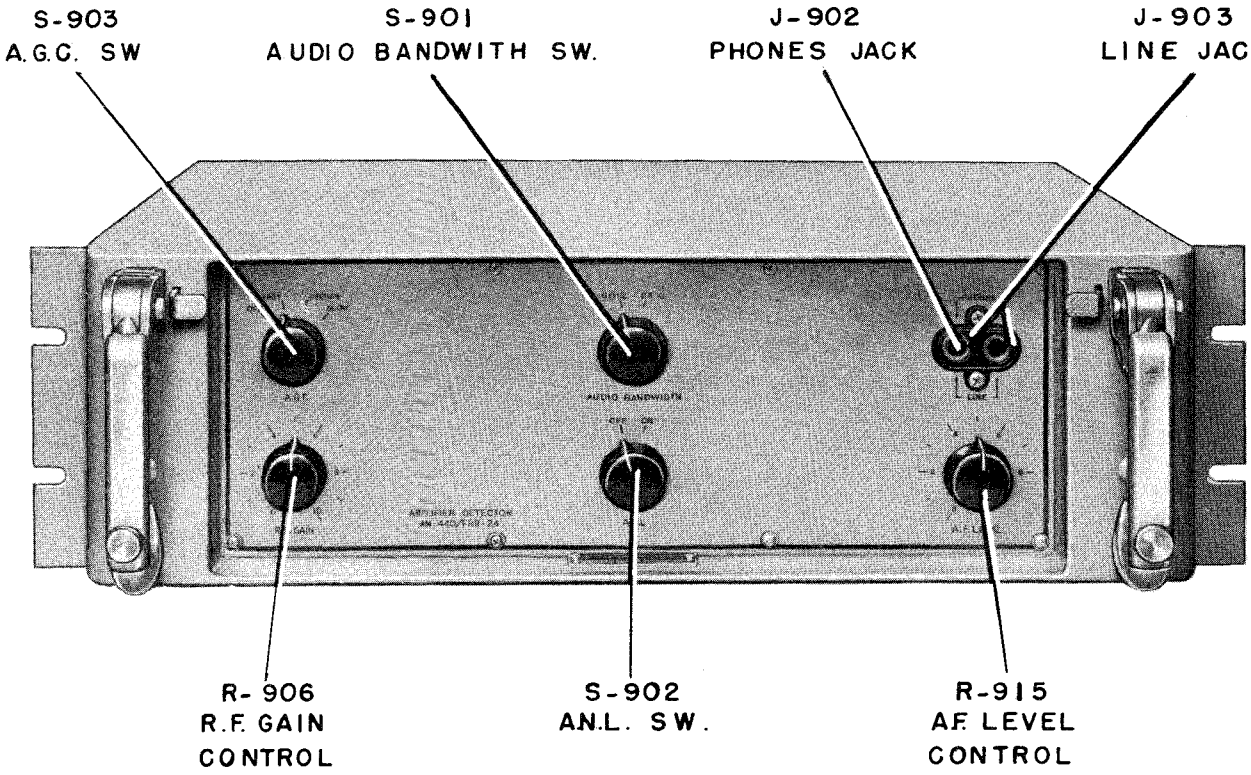

Figure 4–14. Amplifier-Detector AM-440/FRR-24 (units 4A, 4B), Front Panel Component Identification

(2) Bay No. 2 A.C. Power switch turns on the A.C. voltage to Power Supply PP-590/FRR-24 (unit 2M) in bay 2.

(3) Bay No. 3 A.C. Power switch turns on the A.C. voltage to Power Supply PP-590/FRR-24 (unit 3M) in bay 3.

(4) Bay No. 4-Top A.C. Power switch turns on the A.C. voltage to Power Supply PP-649/FRR-24 (unit 4M) in bay 4 which in turn supplies the heater and plate voltage to units 4A, 4B, 4C, 4G, 4H and 4J.

(5) Bay No. 4-Bottom A.C. Power switch turns on the A.C. voltage to Power Supply PP-648/FRR-24 (unit 4N) in bay 4 which in turn supplies the heater and plate voltages to units 4D, 4E, 4F and 4L.

j. AMPLIFIER-DETECTOR AM-440/FRR-24, UNITS 4A, 4B. *(See Figure 4–14).*—The Amplifier-Detector AM-440/FRR-24 is utilized to amplify and detect a single 50-Kc. I.F. amplifier input signal and to filter and amplify the detected audio output. A.G.C. voltage is developed in this unit for application to the Amplifier-Converter units in bays 1, 2 or 3. A keyed D.C. output is provided to actuate the Keyer KY-62/FRR-24 (units 4G, 4H, 4J) and an audio output signal is also made available. Normal operation is accomplished by means of the following front-panel mounted controls.

(1) A.G.C. SWITCH.—The setting of this switch changes the time constant of the Automatic Gain Control circuit to cope with varying conditions of signal fading. During periods of fast signal fading the switch should be set at Fast and during periods of slow signal fading the switch should be set at Slow. The Medium position effects a compromise between the Fast and Slow settings.

(2) R.F. GAIN CONTROL.—This potentiometer functions as an A.G.C. threshold or Carrier-Off-Noise-Suppression (C.O.N.S.) control when this unit is used as the source of A.G.C. voltage. When A.G.C. is at Off, the control functions to regulate the gain of the R.F. system. With clockwise rotation of the control the gain is increased and the A.G.C. threshold changed to permit the receiver to respond to weaker signals.

(3) AUDIO BANDWIDTH SWITCH.—One of two bandwidths (6 or 0.6 kcs.) is selected by the setting of this two-position switch. The 6-kc. position is used during telephonic communications; the 0.6-kc. position is used during C.W. operation.

(4) A.N.L. SWITCH.—During periods of adverse operating conditions the noise limiter can be connected into the circuit by setting the Automatic Noise Limiter switch to the On position.

(5) A.F. LEVEL CONTROL.—A means of adjusting the audio output level of the unit is provided by this control.

oscillator in that unit during frequency-shift operation. The frequency of this oscillator is automatically varied over a ±2.5-kc. range by an A.F.C. circuit to hold the 50-kc. output of the CV-126/FRR-24 constant.

An oscilloscope with associated amplifiers and a horizontal sweep oscillator is provided to monitor the detected signal output. A C.O.N.S. circuit is included which holds the associated teletype loop on Mark when the carrier is absent. Normal operation of this unit is accomplished by means of the following front-panel mounted controls.

NOTE

The semi-permanent, screwdriver-adjust controls (1) through (4), need not be adjusted by the operator in normal operation.

(1) VERTICAL CENTERING CONTROL.–The Vertical Centering control is utilized to position vertically the oscilloscope pattern when the Oscilloscope Selector switch is at the Vertical Centering position.

(2) SYNCH CONTROL.–The amplitude of the synchronizing voltage fed to the grid of the horizontal sweep oscillator is adjusted by this control.

(3) OUTPUT CENTERING CONTROL.–Centering of the trace on the face of the oscilloscope tube is accomplished by means of the Output Centering control when the Oscilloscope Selector switch is at Output and the Deviation Compensation control at 10.

(4) CALIBRATION CONTROL.–This control is adjusted to provide a vertical excursion of plus or minus one-half inch on the face of the oscilloscope tube corresponding to the upper and lower lines of the ruled transparent screen when the Oscilloscope Selector switch is set at Calib.

(5) DEVIATION COMPENSATION CONTROL.–Adjustment of this control from 0 to 10 varies the peak to peak amplitude of the signal on the oscilloscope tube when the Oscilloscope Selector switch is at Output.

(6) OSCILLOSCOPE SELECTOR SWITCH.–The Oscilloscope Selector is a three position switch (Vert. Cent., Calib., Output) which completes the circuit connections necessary for calibration, adjustment and monitoring of the oscilloscope and signal circuits.

(7) KEYING SPEED SWITCH.–For single printer operation the Keying Speed switch is set at the Slow position completing the connection to the low-pass

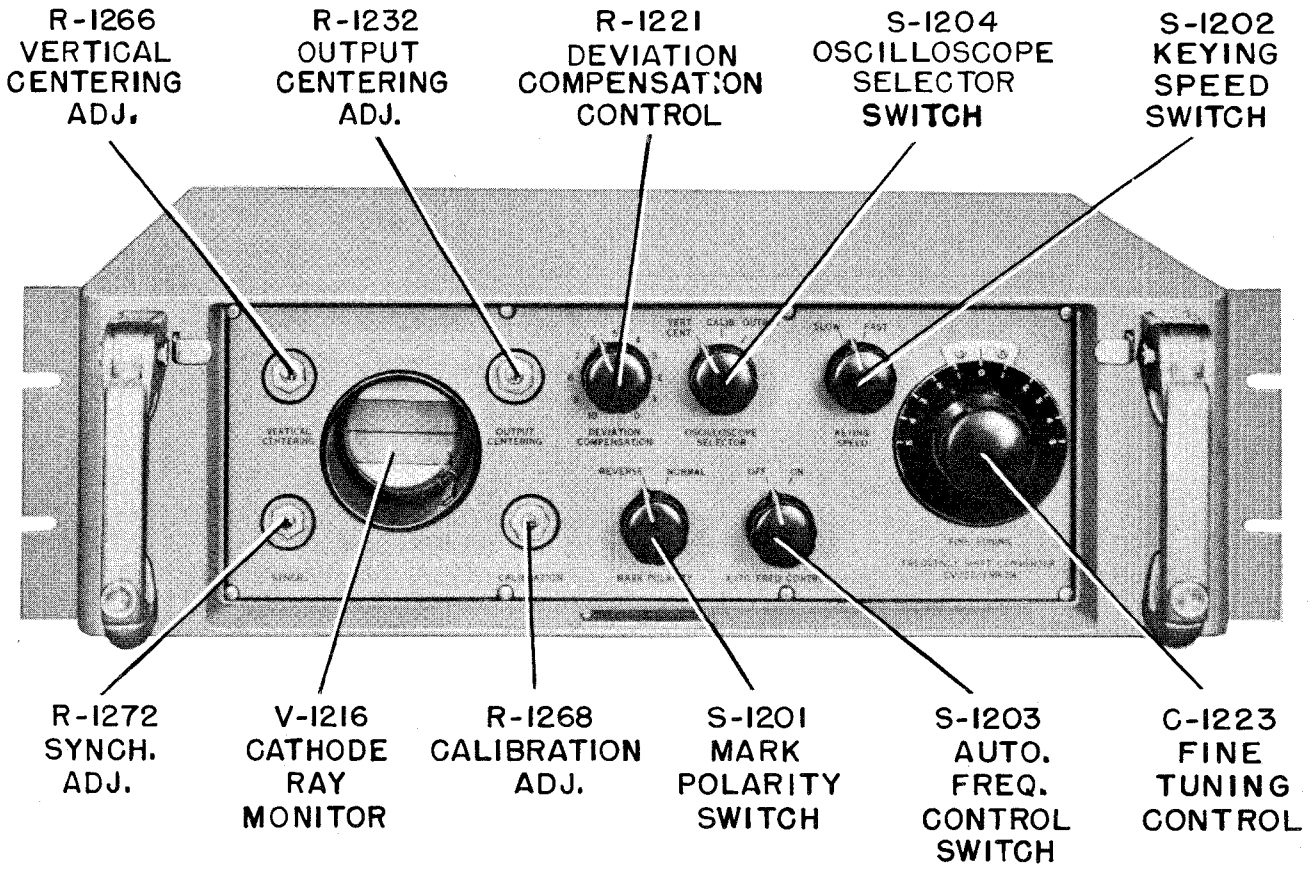

Figure 4–16. Frequency Shift Converter CV-127/FRR-24 (units 4D, 4E, 4F), Front Panel Component Identification

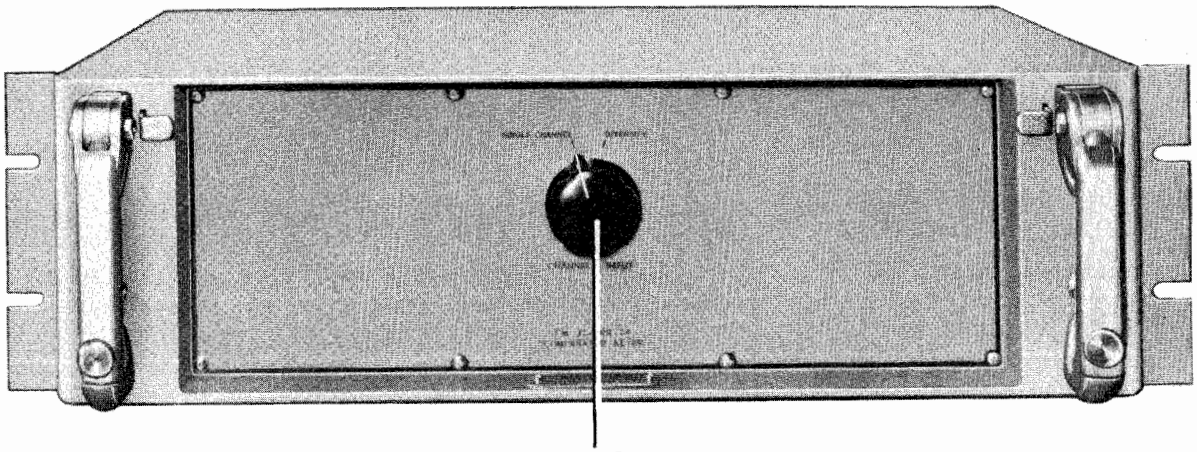

Figure 4–18. Comparator-Keyer CM-32/FRR-24 (unit 4L), Front Panel Component Identification

of audibly monitoring the output of this unit using headphones. It is wired for use with either a single phone plug or a twin plug such as is used on some audio frequency patch cords.

(5) TONE SWITCH.–Selection of one of three available modes of operation is made by this switch. The three modes of operation are External tone (Ext.), Fixed frequency (Fixed), or Variable frequency (Var.)

(6) FIXED FREQUENCY SWITCH.–Various tones in eight steps of 170 cycles each, from 595 cycles to 1785 cycles, may be selected by this switch.

(7) THRESHOLD CONTROL.–This control is utilized during reception of telegraphic signals to provide the necessary bias to suppress any noise from the receiver between transmissions or during a key-up condition.

(8) MONITOR LEVEL CONTROL.–The output of the monitor circuit is varied by this control.

n. COMPARATOR KEYER CM-32/FRR-24, UNIT 4L. *(See Figure 4–18).*–Keyed D.C. pulses from any or all of the Frequency Shift Converter CV-127/FRR-24 units are combined and amplified to a suitable level for operating a teletypewriter by the Comparator-Keyer CM-32/FRR-24. This Keyer is used to operate one or four teletypewriters (in quadruplex systems) on each of its two channels, each channel capable of receiving separate transmissions. In addition, it can actuate one Keyer KY-62/FRR-24 for each channel when it is necessary to transmit an F1 message over a telephone line from the receiving site to terminal equipment.

The two separate channels which are contained in in this unit are identical electrically except for the input circuits. Three input signals may be fed into one channel for triple diversity operation or one input signal may be used for single channel operation leaving the remaining two inputs for dual diversity operation. Two different transmissions may be fed into this unit when it is used in the latter mode of operation. This unit is operated by the following single control on its front panel.

(1) CHANNEL 'A' INPUT CONTROL.–The function of this control is to select the mode of operation to be used in bay 4. In the Diversity position, three inputs may be combined into one channel or two inputs combined in one channel and the other channel used for single channel operation; the Single Channel position is used for single channel operation.

o. POWER SUPPLY PP-590/FRR-24, UNITS 1M, 2M, 3M, PP-649/FRR-24, UNIT 4M, PP-648/FRR-24, UNIT 4N. *(See Figures 4–19, 4–20, 4–21).*–The three power supplies type PP-590/FRR-24 provide all necessary voltages for the operation of bays 1, 2 and 3. These power supplies produce regulated output voltages of plus 210-volts, plus 150-volts, minus 210-volts, minus 105-volts unregulated filament voltages of 6.8-volts and 12.6-volts A.C. and 115-volts A.C. for the blower.

Power Supply type PP-649/FRR-24 provides all necessary voltages for the operation of the two Amplifier-Detectors AM-440/FRR-24, the Amplifier-Detector AM-438/FRR-24 and the three Keyers KY-62/FRR-24 in bay 4. This power supply produces regulated output voltages of plus 300-volts, plus 210-volts and minus 105-volts and also an unregulated 115-volts A.C. source for the blower system as well as the unregulated filament voltage of 6.8 volts.

Power Supply type PP-648/FRR-24 provides all

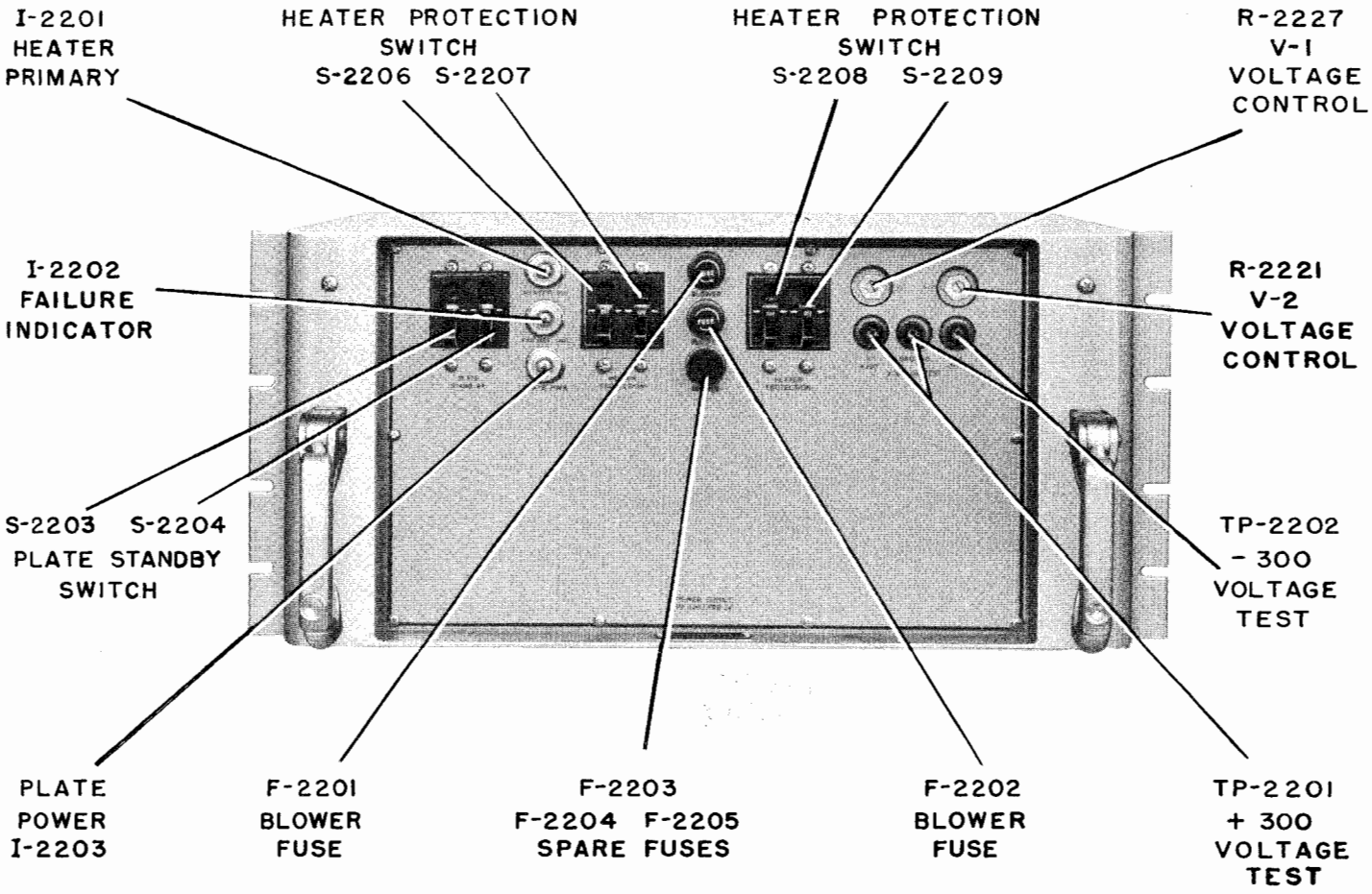

Figure 4–20. Power Supply PP-648/FRR-24 (unit 4N), Front Panel Component Identification

3. OPERATING INSTRUCTIONS.

Reference to units is made initially by AN type designation and then by code such as 1A, 2B, 4K etc. The digit in the foregoing designates the bay, the letter identifies the unit. For example, 1A means unit A in bay 1, 2B means unit B in bay 2 and 4K means unit K in bay 4. Bay and unit designations are shown on Figure 4–1.

To arrange the equipment for any particular mode of operation it is necessary to connect various circuits in one unit to circuits in other units. All of these types of connections are made by means of the patch cords associated with each patch panel. Observation of the Patch Panel units will reveal that each connector has an identifying tab with a name and a series of numbers to indicate where the circuit goes. The final number group identifies that connector. For example, on unit 1J the connector labelled AGC IN 1A252·1H607·1J3 will be specified as 1J3. This means that AGC voltage is fed into this connector for application to connector 252 in unit 1A and connector 607 in unit 1H.

CAUTION

Incorrect patching can result in damage to the equipment particularly in those cases where a patch is made between connectors carrying different circuit labels. For example, connecting '50 Kc AM' to an 'AGC' circuit may result in damage to the equipment.

To guard against unwanted signal pick up and/or spurious radiation, there are connectors on the Patch Panels which are fitted with covers and/or terminating plugs. Those connectors which are to be capped when not in use have a cover or terminating plug attached to one of its mounting screws by a chain. Unless otherwise specified in the detailed operating instructions these covering devices should be removed ONLY when the connector is to be used and if its use is ended the cover must always be replaced.

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A.F. Level - 3
PP-649/FRR-24 (Unit 4M)
Plate Stand-By - Off
Heater-Protection - On

Step 2. Install patch cord connections between
1J3 and 1J5
1J27 and either 1J15, 1J16, 1J28 or 1J29 (corresponding to the desired frequency range).
4K2 and 4K14
4K43 and 4K33

Step 3. On PP-590/FRR-24 (Unit 1M), set Plate Stand-By - On.

Step 4. On PP-649/FRR-24 (Unit 4M), set Plate Stand-By - On.

Step 5. On Amplifier-Converter (for the frequency range selected) set Main Tuning to the desired frequency. The optimum tuning point will be indicated aurally by the response from the headphones or loudspeaker which ever is used on unit 1G and visually by a maximum reading on the 2nd. I.F. Level meter on unit 1H. Adjust the A.F. Level controls on units 4A and 1G for the desired audio output level.

NOTE

Steps 1 through 5 complete the basic operating procedure. The following steps may be made to insure optimum performance when operating conditions indicate their requirement.

Step 6. If the signal is subject to rapid fading it may be desirable to set the A.G.C. switch on unit 4A at Fast.

Step 7. If heavy noise pulses are encountered set the A.N.L. switch on unit 4A at On.

Step 8. The bandwidth setting (on unit 1K) may be altered as operating conditions warrant. Bandwidth switch settings greater than 6 kc. may be used for improved fidelity if the signal is strong and free from interference. Bandwidth settings lower than 6 kc. may be used if the signal is weak and subject to interference.

Step 9. The signal can still be monitored at unit 1G. Any control settings on unit 1G will have no effect on the signal output of unit 4A.

Step 10. To insure that the signal has been correctly tuned in, set the Reception switch on unit 1G at Crystal and adjust the Main Tuning control knob to obtain 'zero-beat' in the audio output response from unit 1G. After this adjustment is completed set the Reception switch back to AM.

Step 11. To obtain an optimum match between the antenna and the antenna input circuit, adjust the Ant. Trimmer control on unit 1B, 1C, 1D or 1E (depending on which unit is in use) for maximum response on the 2nd. I.F. Level meter on unit 1H. This adjustment is best made by momentarily retarding the R.F. Gain control on unit 4A to the point where the 2nd. I.F. Level meter reading noticeably decreases.

c. SINGLE RECEIVER A-2 OR A-3 CRYSTAL CONTROLLED.—The following instructions are given for bay 1, unit 2L, and unit 4A although they are equally applicable to bay 2 or 3 and unit 4B and 4C.

Step 1. Set controls as follows:
SB-142/FRR-24 (Unit 1A)
Band - To desired frequency range
Heterodyne-Oscillator - Remote
Amplifier-Converter (Unit B, C, D or E as selected by Band switch)
Projection Dial - On
A.G.C. - On
CV-126/FRR-24 (Unit 1F)
Second Conversion Osc. Selector - V.F.O.
AM-439/FRR-24 (Unit 1G)
Reception - AM
A.F. Level - 3
Speaker - On
AM-454/FRR-24 (Unit 1H)
A.G.C. - On
A.M. Diversity Gain - 10
F-99/FRR-24 (Unit 1K) - 6 Kc.
PP-590/FRR-24 (Unit 1M)
Plate Stand-By - Off
Heater Protection - On
PP-590/FRR-24 (Unit 2M)
Plate Stand-By - Off
Heater Protection - On
SB-141/FRR-24 (Unit 3L)
A.C. Power - On
O-131/FRR-24 (Unit 2L)
Oscillator A - On
Oscillator B - Off
Crystal A - (Set to position corresponding to desired crystal freq.)
Tuning A - (Set to desired reception frequency).
AM-440/FRR-24 (Unit 4A)
A.G.C. - Medium
R.F. Gain - 10
Audio Bandwidth - 6 Kc.
A.N.L. - Off
A.F. Level - 3
PP-649/FRR-24 (Unit 4M)
Plate Stand-By - Off
Heater Protection - On

Step 2. Install patch cord connections between:
1J3 and 1J5
1J27 and either 1J15, 1J16, 1J28 or 1J29 (corresponding to the desired frequency range).
1J21 and 1J24
2J24 and 2J33
4K2 and 4K14

the 2nd. I.F. Level meter on unit 1H.

Step 5. Adjust the A.F. Level controls on units 4G and 1G for the desired output audio level and the Monitor Level control for the desired headphone level. Adjust the Threshold control on unit 4G to obtain the optimum in clean keying during varying conditions of fading.

Step 6. If the signal is subject to rapid fading it may be desirable to set the A.G.C. switch on unit 1G at Fast. If the sending speed is slow this will permit noise to come through between words. The setting of the switch should be determined by the actual operating conditions.

Step 7. When receiving slow-speed transmissions it may be desirable to use the A.G.C. delay circuit. To do so retard the R.F. Gain control on unit 4A toward zero until the signal level indication on the 2nd. I.F. Level meter on unit 1H just begins to decrease. This puts a delay voltage on the A.G.C. circuit to hold down receiver gain when the carrier is off (or key up) thereby reducing noise in the absence of a signal. It may be necessary to advance the R.F. Gain control slightly ahead of the point mentioned above to assure that the signal will not be lost due to excessive delay action during periods of fading.

Step 8. To insure that the signal has been correctly tuned in, set the Reception switch on unit 1G at Crystal and adjust the Main Tuning control knob to obtain 'zero-beat' in the audio output from unit 1G. After this adjustment is completed set the Reception switch back to B.F.O.

Step 9. To obtain an optimum match between the antenna and the antenna input circuit, adjust the Ant. Trimmer control on unit 1B, 1C, 1D or 1E (depending on which unit is in use) for maximum response on the 2nd. I.F. Level meter on unit 1H. This adjustment is best made by momentarily retarding the R.F. Gain control to the point where the 2nd. I.F. Level meter reading noticeably decreases.

Step 10. If heavy noise pulses are encountered careful setting of the Threshold control on unit 4G in conjunction with a reduced setting of the R.F. Gain control on unit 4A will result in improved noise reduction.

Step 11. The Fixed Freq. switch on unit 4G may be set at any position the operator desires. If an audible tone other than the ones provided by this switch is desired, set the Tone switch at Var. and adjust the Variable Freq. control to select the desired tone.

Step 12. The bandwidth setting on unit 1K may be altered as operating conditions warrant. If the signal is strong and free from interference a Selectivity switch setting greater than 6 kc. will assure reception during long periods of unattended operation. If the signal is weak or subject to interference, a narrow bandwidth is recommended. It must be borne in mind that the very narrow bandwidths, 125, 250 or 500 cycles will not pass high-speed telegraphy and in addition, when using the narrow bandwidths, the A.G.C. switch on unit 4A must be set at Slow.

e. TRIPLE DIVERSITY A-2 OR A-3.—These instructions are equally applicable to frequency-diversity and space-diversity operation except for the fact that in space-diversity operation all receivers are tuned to the same frequency and each receiver is connected to separate antennas spaced a calculated distance from each other.

Step 1. Set controls as follows:

SB-142/FRR-24 (Units 1A, 2A and 3A)
- Band - To desired frequency range
- Heterodyne Oscillator - Local

Amplifier-Converters (Bays 1, 2 and 3, Units B, C, D, or E as selected by the Band switch).
- A.G.C. - On
- R.F. Gain - Zero
- Projection Dial - On

CV-126/FRR-24 (Units 1F, 2F and 3F)
- Second Conversion Osc. Selector - Crystal

AM-439/FRR-24 (Units 1G, 2G and 3G)
- A.G.C. - Medium
- R.F. Gain - 10
- Reception - AM
- A.F. Level - 3
- Speaker - On

AM-454/FRR-24 (Units 1H, 2H and 3H)
- A.G.C. - On
- A.M. Diversity Gain - 10
- R.F. Gain - Zero

F-99/FRR-24 (Units 1K, 2K and 3K) - 6 Kc.

SB-141/FRR-24 (Unit 3L)
- A.C. Power - On

PP-590/FRR-24 (Units 1M, 2M and 3M)
- Plate Stand-By - Off
- Heater Protection - On

AM-438/FFR-24 (Unit 4C)
- A.G.C. - Medium
- R.F. Gain - 10
- Audio Bandwidth - 6 Kc.
- A.F. Level - 3
- A.N.L. - Off
- Level Indicator - Combined

PP-649/FRR-24 (Unit 4M)
- Plate Stand-By - Off
- Heater Protection - On

Step 2. Install patch cord connections between:

1J3 and 1J6

1J27 and either 1J15, 1J16, 1J28 or 1J29 (corresponding to the desired frequency range).

A.G.C. - On
Projection Dial - On
CV-126/FRR-24 (Units 1F, 2F and 3F)
Second Conversion Osc. Selector - V.F.O.
Second Conversion V.F.O. - 0
AM-439/FRR-24 (Units 1G, 2G and 3G)
A.G.C. - Medium
R.F. Gain - 10
Reception - AM
A.F. Level - 3
Speaker - On
AM-454/FRR-24 (Units 1H, 2H, and 3H)
A.G.C. - On
A.M. Diversity Gain - 10
R.F. Gain - Zero
F-99/FRR-24 (Units 1K, 2K and 3K) - 6 Kc.
O-131/FRR-24 (Unit 2L)
Tuning A - Set to desired reception frequency
Oscillator A - On
Output A - 4
Crystal A - Set to position corresponding to desired crystal freq.
SB-141/FRR-24 (Unit 3L)
A.C. Power - On
PP-590/FRR-24 (Units 1M, 2M and 3M)
Plate Stand-By - Off
Heater Protection - On
AM-438/FRR-24 (Unit 4C)
A.G.C. - Medium
R.F. Gain - 10
Audio Bandwidth - 6 Kc.
A.N.L. - Off
Level Indicator - Combined
PP-649/FRR-24 (Unit 4M)
Plate Stand-By - Off
Heater Protection - On

Step 2. Install patch cord connections between:
1J3 and 1J6
1J21 and 1J24
1J27 and either 1J15, 1J16, 1J28 or 1J29 (corresponding to the desired frequency range).
2J3 and 2J6
2J21 and 2J34
2J24 and 2J33
2J25 and 2J35
2J27 and either 2J15, 2J16, 2J28 or 2J29 (corresponding to the desired frequency range).
3J3 and 3J6
3J21 and 3J24
3J27 and either 3J15, 3J16, 3J28 or 3J29 (corresponding to the desired frequency range).
4K1 and 4K16
4K30 and 4K43
4K31 and 4K44
4K32 and 4K45

Step 3. On PP-590/FRR-24 (Units 1M, 2M and 3M) set the Plate Stand-By to On.

Step 4. On PP-649/FRR-24 (Unit 4M) set Plate Stand-By to On.

Step 5. On O-131/FRR-24 (Unit 2L) adjust Tuning A carefully to obtain maximum deflection on Tuning Meter A. Adjust Output A for a reading of 200 on Tuning Meter A.

Step 6. Tune in the desired signal by adjustment of the Main Tuning control knob on the Amplifier-Converter units in bays 1, 2 and 3 selected by the Band switch. The optimum tuning point will be indicated aurally by the response from the headphones or loudspeaker which ever is used and visually by a maximum reading on the 2nd. I.F. Level meter on units 1H, 2H and 3H. Adjust the A.F. Level controls on units 1G, 2G and 3G for the desired audio output level.

Step 7. Set the Reception switch on units 1G, 2G and 3G to Crystal and tune the Second Conversion V.F.O. on units 1F, 2F and 3F to obtain 'zero-beat' as heard in the audio outputs of units 1G, 2G and 3G. Return the Reception switch to AM.

Step 8. To obtain an optimum match between the antenna and the antenna input circuit, adjust the Ant. Trimmer control on Amplifier-Converter units selected by the Band switch for maximum response on the 2nd. I.F. Level meter on units 1H, 2H and 3H. This adjustment is best made by momentarily retarding the R.F. Gain control on units 1G, 2G and 3G to the point where the 2nd. I.F. Level meter reading noticeably decreases.

Step 9. The bandwidth setting may be altered as operating conditions warrant. Bandwidth switch settings greater than 6 kc. may be used for improved fidelity if the signal is strong and free from interference. Bandwidth switch settings lower than 6 kc. may be used if the signal is weak or subject to interference.

Step 10. If the signal is subject to rapid fading it may be desirable to set the A.G.C. switch on units 1G, 2G and 3G at Fast.

Step 11. If heavy noise pulses are encountered set the Reception switch on units 1G, 2G and 3G at N.L.

Step 12. Make the following control settings on the applicable Amplifier-Converter units and on units 1H, 2H and 3H.
Set the R.F. Gain controls at zero.
Set the A.G.C. switches at Off.

Step 13. Change the patch cord connection on unit 1J between 1J3 and 1J6 to connect between 1J3 and 1J4.

Step 14. On unit 1H set the A.G.C. switch at On.

Step 15. Change the patch cord connection on unit 2J between 2J3 and 2J6 to connect between 2J3 and

in Bay 3.

b. TRIPLE DIVERSITY A-1 (COMMON OSCILLATOR).—The following instructions are given for Space-Diversity operation. These instructions are equally applicable to Frequency-Diversity except for the fact that in Frequency-Diversity the receivers are tuned to different frequencies. The arrangement used herein has all receivers employing a common first conversion oscillator and a common second conversion oscillator with the receiver in bay 3 acting as the master. This common oscillator arrangement permits the use of sharp selectivity with a minimum of tuning control adjustments.

Step 1. Set controls as follows:

SB-142/FRR-24 (Unit 1A and 2A)
Band - To desired frequency range
Heterodyne Oscillator - Remote

SB-142/FRR-24 (Unit 3A)
Band - To desired frequency range
Heterodyne Oscillator - Local

Amplifier-Converter (Bays 1, 2 and 3, Units B, C, D or E as selected by the Band switches)
Projection Dial - On
A.G.C. - On
R.F. Gain - Zero

CV-126/FRR-24 (Units 1F and 2F)
Second Conversion Osc. Selector - Ext.

CV-126/FRR-24 (Units 3F)
Second Conversion Osc. Selector - Crystal

AM-439/FRR-24 (Units 1G, 2G and 3G)
A.G.C. - Medium
R.F. Gain - 10
B.F.O. - 1 Kc.
Reception - B.F.O.
Speaker - On
A.F. Level - 3

AM-454/FRR-24 (Units 1H, 2H and 3H)
R.F. Gain - Zero
A.G.C. - On
A.M. Diversity Gain - 10

F-99/FRR-24 (Units 1K, 2K and 3K) - 6 Kc.

SB-141/FRR-24 (Unit 3L)
A.C. Power - On

PP-590/FRR-24 (Units 1M, 2M and 3M)
Plate Stand-By - Off
Heater Protection - On

AM-438/FRR-24 (Unit 4C)
A.G.C. - Medium
R.F. Gain - 10
Level Indicator switch - Combined
Audio Bandwidth - 0.6 Kc.
A.N.L. - Off
A.F. Level - Zero

KY-62/FRR-24 (Unit 4G)
Reception - A1
A.F. Level - 3
Tone - Fixed
Fixed Frequency - 1105
Threshold - 5
Monitor Level - 3

PP-649/FRR-24 (Unit 4M)
Plate Stand-By - Off
Heater Protection - On

Step 2. Install patch cord connections between:
1J3 and 1J6
1J7 and 1J9
1J21 and 1J23
1J27 and either 1J15, 1J16, 1J28 or 1J29 (corresponding to the desired frequency range).
2J3 and 2J6
2J7 and 2J9
2J21 and 2J22
2J27 and either 2J15, 2J16, 2J28 or 2J29 (corresponding to the desired frequency range).
3J3 and 3J6
3J7 and 3J9
3J27 and either 3J15, 3J16, 3J28 or 3J29 (corresponding to the desired frequency range).
4K1 and 4K16
4K30 and 4K43
4K31 and 4K44
4K32 and 4K45
4K36 and 4K47
Place cap on 4K5.

Step 3. Set the Plate Stand-By switches on units 1M, 2M, 3M and 4M at On. The Plate Pwr. lamps on these units should light.

Step 4. Tune in the desired signal by adjustment of the Main Tuning control knobs on the Amplifier-Converter units selected by the Band switches, tuning the unit in bay 3 first. The optimum tuning points will be indicated aurally by the response from the respective headphones or loudspeaker of units 1G, 2G and 3G which ever is used and visually by a maximum reading on the 2nd. I.F. Level meter on units 1H, 2H and 3H respectively. Adjust the A.F. Level control on units 1G, 2G and 3G to obtain the desired audio output level.

Step 5. To insure that the signal has been correctly tuned in, set the Reception switch on unit 3G at Crystal and adjust the Main Tuning control knob on the Amplifier-Converter unit in bay 3 to obtain 'zero-beat' in the audio output response from unit 3G. After this adjustment is completed set the Reception switch back to B.F.O.

Step 6. To obtain an optimum match between the antenna and the antenna input circuit, adjust the Ant. Trimmer control on the Amplifier-Converter units selected by the Band switch for maximum response on the 2nd. I.F. Level meter on units 1H, 2H and 3H.

1, Rec. 2, Rec. 3,and Combined in turn. Note the reading on the Diversity Level meter for each switch setting. Proper diversity functioning will be indicated if the individual channel meter readings fluctuate and the combined reading holds at a constant level.

i. TRIPLE DIVERSITY A-1 (DAY-NIGHT TRANSITION).—The following instructions are given for changing from space diversity on one frequency to frequency diversity when the same signal is being transmitted on two frequencies at the same time, such as for diversity reception of both the day and the night frequencies during the transition periods. When the equipment is operating for triple diversity A-1 with common oscillators as described in paragraph h, proceed as follows:

Step 1. On unit 2H set the R.F. Gain control at zero and the A.G.C. switch at Off.

Step 2. On unit 2J change the patch cord connected between 2J3 and 2J4 to connect between 2J3 and 2J6. Remove the patch cord between 2J21 and 2J22 and replace the caps on these connections.

Step 3. On unit 4K remove the patch cord from connector 4K44.

Step 4. Set the Band switch on unit 2A at the desired new frequency range and the Heterodyne Osc. switch at Local.

Step 5. On unit 2J remove the patch cord from connector 2J7.

Step 6. On unit 2F set the Second Conversion Osc. Selector switch at Crystal.

Step 7. On unit 2H set the A.G.C. switch at On.

Step 8. Tune in the desired signal by adjustment of the Main Tuning control knob on the Amplifier-Converter unit in bay 2 selected by the Band switch. The optimum tuning point will be indicated aurally by the response from the headphones or loudspeaker and visually by a maximum reading on the 2nd. I.F. Level meter on unit 2H.

Step 9. To insure that the signal has been correctly tuned in, set the Reception switch on unit 2G at Crystal and adjust the Main Tuning control knob to obtain 'zero-beat' in the audio output response from unit 2G. After this adjustment is completed set the Reception switch back at B.F.O.

Step 10. To obtain an optimum match between the antenna and the antenna input circuit, adjust the Ant. Trimmer control on the Amplifier-Converter unit in bay 2 selected by the Band switch for maximum response on the 2nd. I.F. Level meter on unit 2H. This adjustment is best made by momentarily retarding the R.F. Gain control on unit 2G to the point where the 2nd. I.F. Level meter reading noticeably decreases.

Step 11. If the signal is subject to rapid fading it may be desirable to set the A.G.C. switch on unit 2G at Fast.

Step 12. On unit 2H set the R.F. Gain control at zero and the A.G.C. switch at Off.

Step 13. On unit 2J change the patch cord connected between 2J3 and 2J6 to connect between 2J3 and 2J4. Connect a patch cord between 4K31 and 4K44. On unit 2H set the A.G.C. switch at On.

Step 14. To make sure this channel is now functioning properly on the new frequency proceed as follows:

Set the Level Indicator switch on unit 4C at Rec. 2. The Diversity Level meter on unit 4C should read to indicate the new channel is operating. Adjust the A.M. Diversity Gain control on unit 2H using the procedure described in Steps 16 and 17 of paragraph h.

NOTE

When it appears that the new channel frequency is generally better than the old frequency the second and third receivers should be shifted to the new frequency. At this point bay 3 is operating on the old frequency with bay 1 as its slave, bay 2 is operating on the new frequency. The following instructions shift bay 1 over to the new frequency to operate as a slave to bay 2, bay 3 remains operative on the old frequency.

Step 15. On unit 1H set the R.F. Gain control at zero and the A.G.C. switch at Off.

Step 16. On unit 1J move the patch cord connected between 1J3 and 1J4 to connect between 1J3 and 1J6.

Stpe 17. On unit 4K remove the end of the patch cord from connector 4K43. Move the patch cord connected between 1J21 and 1J23 to connect between 1J21 and 1J22. Replace the cap on 1J23.

Step 18. Set the Band switch on unit 1A at the new desired frequency and the Heterodyne Osc. switch at Remote.

Step 19. Remove the patch cord between 3J7 and 3J9 and replace the cap on 3J9.

Step 20. Connect a patch cord between 2J7 and 2J9.

Step 21. On unit 1H set the A.G.C. switch at On.

Step 22. Tune in the desired signal by adjustment of the Main Tuning control knob on the Amplifier-Converter unit in bay 1 selected by the Band switch. The optimum tuning point will be indicated aurally by the response from the headphones or loudspeaker on unit 1G and visually by a maximum reading on the 2nd. I.F. Level meter on unit 1H.

Step 23. To obtain an optimum match between the antenna and antenna input circuit, adjust the Ant. Trimmer control for maximum response on the 2nd. I.F. Level meter on unit 1H. This adjustment is best made by momentarily retarding the R.F. Gain control on unit 1G to the point where the 2nd. I.F. Level meter reading noticeably decreases.

Set the Second Conversion Osc. Selector switch on unit 2F at V.F.O.

On unit 2F tune the Second Conversion V.F.O. control for 'zero-beat'. This centers the signal in the pass-band of units 1K, 2K and 3K to provide tuning of the three receivers with this one control.

On unit 2G set the Reception switch at B.F.O. for monitoring purposes or Crystal for tuning.

Step 46. At any time that it is desirable to check each channel output and their combined output proceed as follows:

Set the Level Indicator switch on unit 4C at Rec. 1, Rec. 2, Rec. 3 and Combined in turn. Note the reading on the Diversity Level meter for each switch setting. Proper diversity functioning will be indicated if the individual channel meter readings show evidence of fluctuation and the combined reading holds at a constant level.

j. SINGLE RECEIVER F-1 (FREQUENCY-SHIFT). –The following instructions are given for bay 1 although bay 2 or 3 can be employed.

Step 1. Set controls as follows:

SB-142/FRR-24 (Unit 1A)
- Band - To desired frequency range.
- Heterodyne Oscillator - Local

Amplifier-Converter (Unit B, C, D or E as selected by the Band switch)
- Projection Dial - On
- A.G.C. - On
- R.F. Gain - 0

CV-126/FRR-24 (Unit 1F)
- Second Conversion Osc. Selector - Crystal

AM-439/FRR-24 (Unit 1G)
- A.G.C. - Medium
- R.F. Gain - 10
- Reception - Crystal
- Speaker - On
- A.F. Level - 3

AM-454/FRR-24 (Unit 1H)
- R.F. Gain - Zero
- A.G.C. - On
- A.M. Diversity Gain - 10
- F.S.K. Diversity Level - 10

F-99/FRR-24 (Unit 1K) - 6 Kc.

PP-590/FRR-24 (Unit 1M)
- Plate Stand-By - Off
- Heater Protection - On

SB-141/FRR-24 (Unit 3L)
- A.C. Power - On

CV-127/FRR-24 (Unit 4D)
- Oscilloscope Selector - Output
- Keying Speed - Slow
- Mark-Polarity - Normal
- Auto. Freq. Control - Off
- Fine Tuning - 0

KY-62/FRR-24 (Unit 4G)
- Reception - F1
- A.F. Level - 3
- Tone Switch - Fixed
- Fixed Frequency - 1105
- Threshold - 4
- Monitor Level - 3

CM-32/FRR-24 (Unit 4L)
- Channel Input - Single Channel

PP-649/FRR-24 (Unit 4M)
- Plate Stand-By - Off
- Heater Protection - On

PP-648/FRR-24 (Unit 4N)
- Plate Stand-By - Off
- Heater Protection - On

Step 2. Install patch cord connections between:

1J3 and 1J6

1J7 and 1J8

1J27 and either 1J15, 1J16, 1J28 or 1J29 (corresponding to the desired frequency range).

4K6 and 4K18

4K10 and 4K23

4K27 and 4K40

4K37 and 4K47

Step 3. Set the Plate Stand-By switches on units 1M, 4M and 4N at On. Plate Pri. lamps on these units should light

Step 4. Tune in the desired signal by adjustment of the Main Tuning control knob on the Amplifier-Converter unit in bay 1 selected by the Band switch.

Rotate the Main Tuning control knob slowly about its frequency setting until both Mark and Space tones are heard in the audio output from unit 1G. Now rotate the Main Tuning knob carefully until the two separate tones that are on opposite sides of zero beat combine and a constant tone is audible at unit 1G. This setting assures that the Mark and Space signals are centered in the pass-band of unit 1K.

Step 5. Adjust the Ant. Trimmer control for maximum indication on the 2nd. I.F. Level meter on unit 1H.

Step 6. Set the Second Conversion Osc. Selector switch on unit 1F at Ext.

Step 7. Make the following adjustments on unit 4D.

Adjust the Deviation Compensation and the Fine Tuning controls so that the amplitude of the trace on the scope is such that the peaks touch the top and the bottom graph lines.

Set the Auto. Freq. Control switch at On and if the A.F.C. does not hold, i.e., if the trace moves upward or downward on the face of the scope, change the Mark-Polarity switch to the opposite position. Trace should recenter itself.

Step 8. On unit 1H adjust the F.S.K. Diversity Level control as follows:

3J7 and 3J8
3J21 and 3J23
3J27 and either 3J15, 3J16, 3J28 or 3J29 (corresponding to the desired frequency range).
4K1 and 4K16
4K7 and 4K19
4K8 and 4K20
4K31 and 4K44
4K32 and 4K45
4K41 and 4K28
4K42 and 4K29
4K50 and 4K48
Place terminating caps on 4K11 and 4K12

Step 3. Set the Plate Stand-By switches on units 2M, 3M, 4M and 4N at On. The Plate Pri. lamps on these units should light.

Step 4. Tune in the desired signal by adjustment of the Main Tuning control knobs on Amplifier-Converter units in bays 2 and 3, tuning bay 2 first. Now rotate the Main Tuning control knob slowly until the two separate tones that are on opposite sides of zero beat combine and a constant tone is audible at unit 2G. This setting assures that the Mark and Space signals are centered in the pass-band of unit 2K (unit 3K for bay 3). An indication of the correct setting of the Main Tuning control knob on the Amplifier-Converter in bay 3 can be had by adjusting the knob for maximum background noise as heard in the output from 3G.

Step 5. Adjust the Ant. Trimmer controls for maximum indication on units 2H and 3H.

Step 6. Make the following adjustments on units 4E and 4F.

Adjust the Deviation Compensation and the Fine Tuning controls so that the amplitude of the trace on the scope is such that the peaks touch the top and bottom graph lines.

Set the Auto. Freq. Control switch at On and if the A.F.C. does not hold i.e., if the trace moves upward or downward on the face of the scope change the Mark-Polarity switch to the opposite position. The trace should recenter itself.

Step 7. Change the patch cord connection between 2J3 and 2J6 to connect between 2J3 and 2J4 and change the patch cord connection between 3J3 and 3J6 to connect between 3J3 and 3J4.

Step 8. Observe the readings on the 2nd. I.F. Level meters on units 2H and 3H for a sufficient period of time to determine the average reading. If one of the meters reads appreciably higher than the other, retard the A.M. Diversity Gain control on that unit so that each meter reading averages the same.

In some cases one channel may have a definitely poorer average signal-to-noise ratio than the others in which case it may provide better overall performance if the A.M. Diversity Gain control in the weaker channel is retarded slightly so that it feeds signal to the A.G.C. output only when both of the other channels have faded.

In any case at least one of the channels will have its A.M. Diversity Gain control set at 10 so that sufficient average receiver gain is used at all times.

Step 9. Adjust the F.S.K. Diversity Level control on units 2H and 3H as follows:

While observing the oscilloscope pattern on unit 4E for bay 2 and 4F for bay 3, retard the F.S.K. Diversity Level control to the point where the amplitude of the signal just begins to decrease. Then advance the control approximately two divisions to overcome fading yet still allowing limiter action on strong noise pulses. The final setting of this control will depend upon actual operating conditions and the operator should make the setting taking into account the degree of interfering noise to be suppressed. A dial setting of approximately 2.5 is normal.

Step 10. If the signal is weak or subject to interference a narrow bandwidth of 1 kc. is recommended. To obtain this, set the Selectivity switch on units 2K and 3K at 1 kc. This 1-kc. setting is recommended for a frequency-shift signal deviating a total of approximately 850 cps. i.e., ±425 cps. If the deviation is other than this, the Selectivity switch should be set at a narrower bandwidth for a smaller deviation and a wider bandwidth for a greater deviation. Too narrow or too wide a bandwidth for the deviation used will result in more printing errors.

Step 11. Install patch cord connections between 4K11 and 4K24 and between 4K12 and 4K25.

Step 12. To realize in full the squelch action of the C.O.N.S. circuit (mark-hold), it is necessary to make careful adjustment of the R.F. Gain controls on unit 4C. Retard this control to the setting where the respective 2nd. I.F. Level meter readings decrease slightly and then advance the control so that during fading the meter reading does not drop to zero.

Step 13. To obtain clean keying from the output of unit 4H, adjust the Threshold control for best results.

Step 14. Reversal of Mark and Space signals at the transmitter will be evidenced by unreadable copy on the teletypewriter. To overcome this, change the setting of the Mark-Polarity switch.

Step 15. When it is desired to operate without the C.O.N.S. (mark-hold) circuit remove the patch cord connection between 4K11 and 4K24 and between 4K12 and 4K25. DO NOT connect the terminating plug in its place.

Step 16. If the signal is subject to rapid fading it may be desirable to set the A.G.C. switch on unit 4C at Fast. The setting of the switch should be deter-

the top and bottom graph lines.

Step 20. On unit 4E, set the Auto. Freq. Control at On. If the A.F.C. does not hold, i.e., if the trace moves upward or downward on the face of the oscilloscope, change the Mark-Polarity switch to the opposite position.

Step 21. Retard the F.S.K. Diversity Level on unit 2H to the point where the amplitude of the signal just begins to decrease as indicated on the oscilloscope. Then advance the control approximately two divisions to overcome fading yet still allowing limiter action on strong noise pulses. A setting of approximately 2.5 is normal.

Step 22. Change the patch cord connection between 2J3 and 2J6 to connect between 2J3 and 2J4.

Step 23. Install a patch cord between 4K31 and 4K44.

Step 24. Install a patch cord between 4K11 and 4K24.

Step 25. Adjust the A.M. Diversity Gain on units 2H and 3H as described in Step 8 of paragraph k.

Step 26. Readjust the Deviation Compensation on units 4E and 4F for equal indications on the oscilloscope.

m. TRIPLE DIVERSITY, FREQUENCY SHIFT, CRYSTAL CONTROLLED (SPACE DIVERSITY).

Step 1. Set controls as follows:

SB-142/FRR-24 (Units 1A, 2A and 3A)
- Band - To desired frequency range
- Heterodyne Oscillator - Remote

Amplifier-Converter Units (Units B, C, D or E as selected by the Band switch)
- Projection Dial - On
- A.G.C. - On
- R.F. Gain - 0

CV-126/FRR-24 (Units 1F, 2F and 3F)
- Second Conversion Osc. Selector - Ext.

AM-439/FRR-24 (Units 1G, 2G and 3G)
- A.G.C. - Medium
- R.F. Gain - 10
- Reception - Crystal
- Speaker - On
- A.F. Level - 3

AM-454/FRR-24 (Units 1H, 2H and 3H)
- R.F. Gain - 0
- A.G.C. - On
- A.M. Diversity Gain - 10
- F.S.K. Diversity Level - 10

F-99/FRR-24 (Units 1K, 2K and 3K) - 6 Kc.

SB-141/FRR-24 (Unit 3L)
- A.C. Power - On

O-131/FRR-24 (Unit 2L)
- Tuning A - Set to desired reception frequency
- Oscillator A - On
- Output A - 4
- Crystal A - Set to position corresponding to desired crystal frequency.

PP-590/FRR-24 (Units 1M, 2M and 3M)
- Plate Stand-By - Off
- Heater Protection - On

AM-438/FRR-24 (Unit 4C)
- A.G.C. - Medium
- R.F. Gain - 10
- Level Indicator Switch - Combined
- Audio Bandwidth - 6 Kc.
- A.F. Level - 0

CV-127/FRR-24 (Units 4D, 4E and 4F)
- Oscilloscope Selector - Output
- Keying Speed - Slow
- Mark-Polarity - Normal
- Auto. Freq. Control - Off
- Fine Tuning - 0

KY-62/FRR-24 (Unit 4G)
- Reception - F1
- A.F. Level - 3
- Tone - Fixed
- Fixed Frequency - 1105
- Threshold - 4
- Monitor Level - 3

CM-32/FRR-24 (Unit 4L)
- Channel A Input - Diversity

PP-649/FRR-24 (Unit 4M)
- Plate Stand-By - Off
- Heater Protection - On

PP-648/FRR-24 (Unit 4N)
- Plate Stand-By - Off
- Heater Protection - On

Step 2. Install patch cord connections between the following:

1J3 and 1J6
1J7 and 1J8
1J21 and 1J24
1J27 and either 1J15, 1J16, 1J28 or 1J29 (corresponding to the desired frequency range).
2J3 and 2J6
2J7 and 2J8
2J21 and 2J34
2J24 and 2J33
2J25 and 2J35
2J27 and either 2J15, 2J16, 2J28 or 2J29 (corresponding to the desired frequency range).
3J3 and 3J6
3J7 and 3J8
3J21 and 3J24
3J27 and either 3J15, 3J16, 3J28 or 3J29 (corresponding to the desired frequency range).
4K1 and 4K16
4K6 and 4K18
4K7 and 4K19
4K8 and 4K20

the teletypewriter. To overcome this, change the setting of the Mark-Polarity switch.

Step 17. When it is desired to operate without the C.O.N.S. (mark-hold) circuit remove the patch cord connection from 4K10, 4K11 and 4K12. DO NOT connect terminating plugs in their places.

Step 18. If the signal is subject to rapid fading it may be desirable to set the A.G.C. switch on unit 4C at Fast. The setting of the switch should be determined by actual operating conditions.

n. TRIPLE DIVERSITY, FREQUENCY SHIFT, CRYSTAL CONTROL (DAY-NIGHT TRANSITION).— The following instructions are for changing from triple space diversity crystal controlled to frequency diversity reception of frequency shift signals, when the same signal is being transmitted on two different frequencies such as during the day-night transition periods. To change bay 1 to the new frequency proceed as follows:

Step 1. Remove the patch cord connection from between 4K10 and 4K23 and place a terminating cap on 4K10.

Step 2. Remove the patch cord connection from between 4K30 and 4K43.

Step 3. Change the patch cord connection from between 1J3 and 1J4 to connect between 1J3 and 1J6.

Step 4. Change the patch cord connection from between 2J24 and 2J33 to connect between 2J24 and 2J36. Place terminating caps on 2J33, 2J37 and 2J38.

Step 5. Change the patch cord connection between 1J27 and either 1J15, 1J16, 1J28 or 1J29 corresponding to the new desired frequency

Step 6. On CV-127/FRR-24 (Unit 4D), set the Auto. Freq. control to Off, and set the Fine Tuning to 0.

Step 7. On O-131/FRR-24 (Unit 2L), set Crystal B to the position corresponding to the new desired frequency, set Oscillator B to On. Adjust Tuning B to desired new frequency and carefully rotate for maximum indication on Tuning Meter B. Set Output B to provide a reading of 200 on Tuning Meter B.

Step 8. On SB-142/FRR-24 (Unit 1A) set the Band switch to the desired new frequency range.

Step 9. On Amplifier-Converter in bay 1 selected by the Band switch, set A.G.C. - On, Projection Dial - On, Main Tuning to desired new frequency and carefully adjust the Main Tuning control knob for maximum indication on the 2nd. I.F. Level meter on unit 1H. Adjust the Ant. Trimmer for maximum response on the 2nd. I.F. Level meter on unit 1H.

Step 10. On CV-127/FRR-24 (Unit 4D) adjust the Fine Tuning and Deviation Compensation controls so that the peaks of the trace on the oscilloscope touch the top and bottom graph lines. Set the Auto. Freq. Control to On and if the trace moves upward or downward on the oscilloscope, change the Mark-Polarity switch to the opposite position.

Step 11. Change the patch cord connections from between 1J3 and 1J6 to connect between 1J3 and 1J4.

Step 12. Install a patch cord connection between 4K10 and 4K23.

Step 13. Install a patch cord connection between 4K30 and 4K43.

Step 14. Observe the readings on the 2nd. I.F. Level meters on units 1H, 2H and 3H. Adjust the A.M. Diversity Gain on these units for good diversity action.

When it becomes desirable to change bay 2 to the new frequency proceed as follows:

Step 15. Remove the patch cord connection from between 4K11 and 4K24 and place the terminating cap on 4K11.

Step 16. Remove the patch cord connection from between 4K31 and 4K44.

Step 17. Change the patch cord connection from between 2J3 and 2J4 to connect between 2J3 and 2J6.

Step 18. Change the patch cord connection from between 2J21 and 2J34 to connect between 2J21 and 2J37. Place the terminating cap on 2J34.

Step 19. Change the patch cord connection between 2J27 and either 2J15, 2J16, 2J28 or 2J29 (corresponding to the new desired frequency).

Step 20. On CV-127/FRR-24 (Unit 4E) set the Auto. Freq. Control to Off, and set the Fine Tuning to 0.

Step 21. On SB-142/FRR-24 (Unit 2A) set the Band switch to the desired new frequency range.

Step 22. On the Amplifier-Converter in bay 2 selected by the Band switch, set A.G.C. - On, Projection Dial - On. Set the Main Tuning to the desired new frequency and carefully adjust the Main Tuning for maximum indication on the 2nd. I.F. Level meter on Unit 2H. Adjust the Ant. Trimmer for maximum response on the 2nd. I.F. Level meter on unit 2H.

Step 23. On CV-127/FRR-24 (Unit 4E) adjust the Fine Tuning and Deviation Compensation controls so that the peaks of the trace on the oscilloscope touch the top and bottom graph lines. Set the Auto. Freq. Control to On and if the trace moves upward or downward on the oscilloscope, change the Mark-Polarity switch to the opposite position.

Step 24. Change the patch cord connection from between 2J3 and 2J6 to connect between 2J3 and 2J4.

Step 25. Install a patch cord connection between 4K11 and 4K24.

Step 26. Install a patch cord connection between 4K31 and 4K44.

Step 27. Observe the readings on the 2nd. I.F. Level meters on units 1H, 2H and 3H.

When it becomes desirable to change bay 3 to the new frequency proceed as follows:

Step 28. Remove the patch cord connection from be-

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RESTRICTED
SECURITY INFORMATION

INSTRUCTION BOOK

for

RADIO RECEIVING SET AN/FRR-24

SECTION 5—OPERATOR'S MAINTENANCE

NATIONAL COMPANY, INC.
MALDEN 48, MASSACHUSETTS

BUREAU OF SHIPS

NAVY DEPARTMENT

Contract: NObsr-39402

Approved by BuShips: 15 April 1952

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SECTION 5
OPERATOR'S MAINTENANCE

1. ROUTINE CHECKS..

The following routine checks of normal operation of the AN/FRR-24 Radio Receiving Set are to be made by the operating personnel at the beginning of each watch. The tests are to be made with the receiver operating under normal conditions. Careful routine check of the equipment very often prevents failure under conditions when maintenance personnel are not available. The following chart assumes that the five A.C. Power switches located on the Control Panel SB-142/FRR-24 are in the On position.

TABLE 5–1. ROUTINE CHECK CHART

EACH WATCH

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
A.C. outlet pilot lamp.	Observe that lamp is lighted.	No light indicates blown fuse F-3401, F-3402. Intermittent light indicates poor lamp, loose connections or short-circuit in external equipment.
A.C. Power lamps.	Observe that lamps are lighted	No light indicates open circuit breaker in A.C. Power switch.
Heater Primary lamps.	Observe that lamps are lighted.	No light indicates heater protection circuit breaker contacts open. Defective lamp.
Failure Indicator lamp.	Observe that lamps are not lighted.	Glowing lamps indicate failure in regulated power supply system or excessive temperature in cabinet.
Plate Power lamp.	Observe that lamps are lighted.	No light indicates open circuit breaker in Plate Stand-By switch. Defective rectifier or voltage regulator.
Projection dial system tuning indicator lamp.	Observe that scale screen is illuminated.	Intermittent or no light indicates loose connection or defective lamp.
Pilot lamp.	Observe that lamp is lighted. It may be necessary to adjust the Dimmer control to provide more illumination.	Intermittent or no light glow indicates poor contact in the dimmer, or loose connections.
Receiver Operation.	a. Make listening test for normal operation.	a. Insert headphones into the phones jack or set the speaker switch at On in the AM-439/FRR-24. b. Remove headphones from the AM-439/FRR-24 and insert them into the phones jack on the AM-440/FRR-24.

TABLE 5–1. ROUTINE CHECK CHART (CONT'D)

EACH WATCH

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
		c. Remove the headphones from the AM-440/FRR-24 and insert them into the phones jack in the AM-438/FRR-24. d. Remove the headphones from the AM-438/FRR-24 and insert them into the phones jack in the KY-62/FRR-24.
	b. Visual indication of normal receiver operation.	a. Observe the reading on the 2nd. I.F. Level meter. Note and record the reading obtained for future reference. b. Note the pattern obtained on the oscilloscope screen. The pattern should be centered between the two horizontal lines on the transparent screen.
Dial calibration (This check can only be made at an interval when no traffic is being handled)	Patch the Crystal Calibrator into the selected Amplifier-Converter unit by installing a patch cord connection between 2J31 and 2J17, 2J18 or 2J19. Set the calibrate switch located in the Oscillator Assembly O-131/FRR-24 at On.	a. Tune the Amplifier-Converter to zero beat at the nearest 200 Kc. harmonic in the portion of the dial to be checked. The index set can be used to obtain greater accuracy in determining the accuracy of the dial calibration. Although the Crystal Calibrator is accurate to within 0.01% the accuracy of the dial should be within 0.1%.

2. EMERGENCY MAINTENANCE.

Notice to Operators

Operators shall not perform any of the following emergency maintenance procedures without proper authorization.

The maintenance procedures listed in the following paragraphs are for the guidance of the operator personnel during an emergency when maintenance personnel are not available.

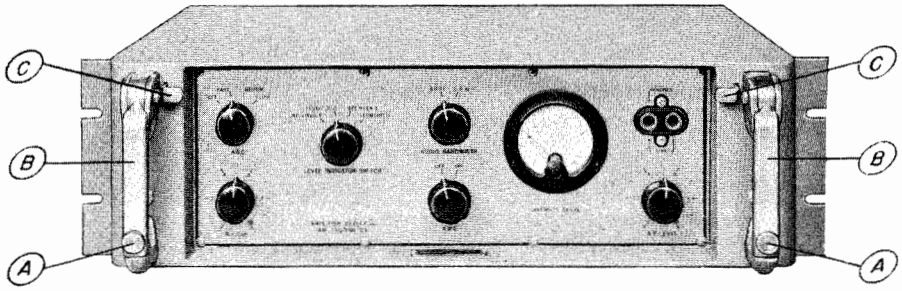
a. INOPERATIVE RECEIVER.–If the receiver is inoperative, the suspected unit should be withdrawn from its cabinet to determine if there is some obvious fault that can be corrected easily. To withdraw the unit from its cabinet proceed as shown on Figure 5–1.

WARNING

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

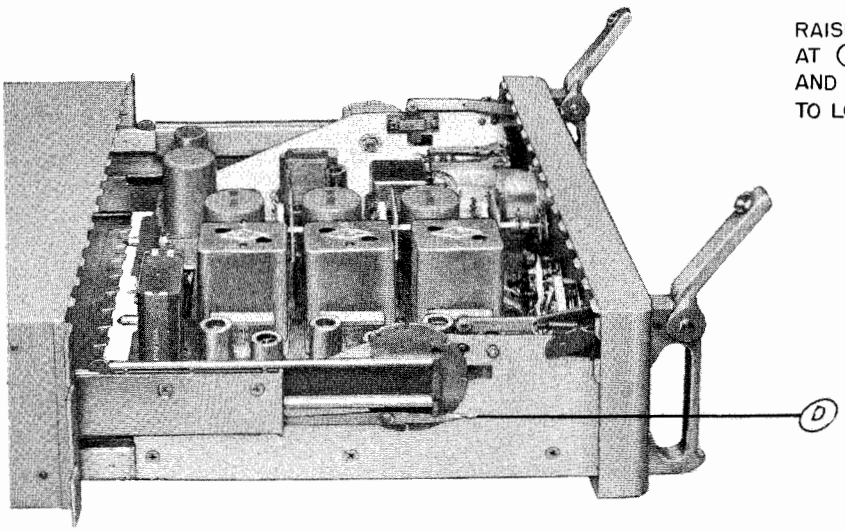
(1) FUSES. *(See Figures 5–2, 5–3, 5–4, 5–5).*– If a blower unit in a particular bay is inoperative check the blower fuses which are accessible at the front of the power supply associated with the defective blower. Two blower units are employed in bay 4, one is operated from the PP-648/FRR-24 and the other from the PP-649/FRR-24. Probable cause of fuse failure is a short-circuit in the blower motor or the A.C. line to the blower. A.C. is connected to the two A.C. output receptacles on the SB-141/FRR-24 through two five-ampere fuses. Probable cause of fuse failure in this circuit is a short circuit in the external equipment connected to the SB-141/FRR-24.

(2) ELECTRON TUBES.–All electron tubes employed in the AN/FRR-24 Radio Receiving Set are located and identified on Figures 5–6 through 5–19. If a particular tube is burned out, as observed visually by the absence of filament glow, or by feeling the tube to determine its temperature, the tube can be re-

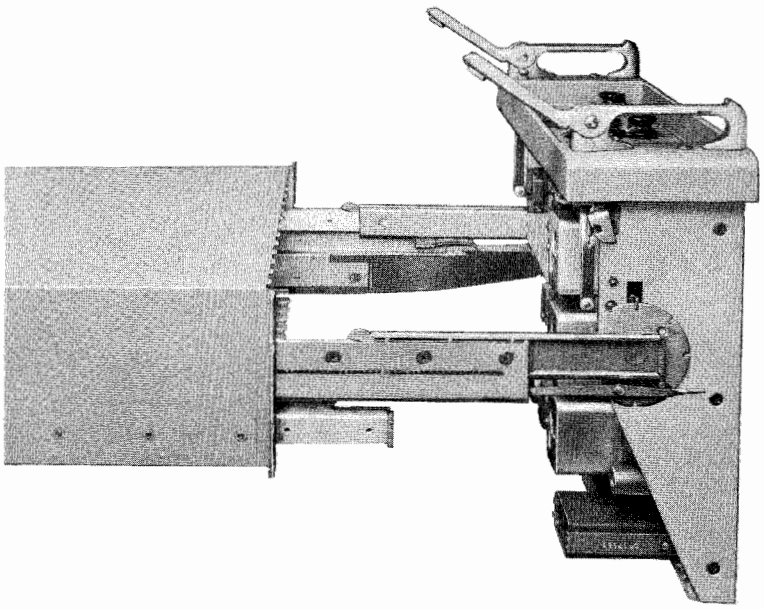


STEP ①
SLIDE LATCH HANDLE FASTENER BUTTONS AT Ⓐ UPWARD TO UNLOCK HANDLES.

STEP ②
RAISE LATCH HANDLES AT Ⓑ TO RELEASE AND WITHDRAW CHASSIS TO LOCKED POSITION.



STEP ③
PRESS TILT LEVERS AT Ⓒ TO UNLOCK PIVOT MECHANISM AND TILT CHASSIS TO ANY ONE OF THE SIX POSSIBLE LOCKED IN POSITIONS.



STEP ④
DEPRESS CHASSIS RELEASE LEVERS AT Ⓓ TO REMOVE CHASSIS FROM CABINET.

STEP ⑤
TO REPLACE CHASSIS IN CABINET FOLLOW THE ABOVE PROCEDURE IN REVERSE.

Figure 5–1. Instructions for Operation of Cabinet Slide-Tilt Mechanism

placed by the same type of tube of proven quality. All tubes in the equipment are of the miniature type except those in the power supply and the oscilloscope tube. Great care is to be exercised in the insertion of these tubes into their sockets to prevent bending of the tube pins. To replace the rectifier and voltage regulator tubes in the power supplies it is necessary to loosen the clamp about the base of the tube.

If replacement of the oscilloscope tube becomes necessary, proceed as follows:

Step 1. Remove the transparent screen at the face of the tube by prying up the two fingers holding the screen in place. The tips of these fingers are set in niches on the inside of the oscilloscope light shield.

Step 2. Remove the tube through the opening in the front panel by pressing the tube forward until it is released from its socket.

(3) PILOT LAMP.–To replace the pilot lamp that illuminates the dial scale proceed as follows:

Step 1. Remove the Amplifier-Converter from its cabinet.

Step 2. Remove the 6-32 phillips head screw holding the lamp socket in place.

Step 3. Remove the defective lamp and replace it with a new one.

Step 4. Replace the lamp socket and tighten in place. Move the chassis back into its cabinet.

(4) PROJECTION DIAL SYSTEM LAMP.–In the event of failure of the projection-dial-system lamp it can be replaced in the following manner:

Step 1. Remove the Amplifier-Converter from its cabinet.

Step 2. Loosen the 6-32 phillips head screw holding the lamp socket in place.

Step 3. Remove the defective lamp and replace it with a new one.

Step 4. Because of slight differences in the size and shape of lamps, it may be necessary to make an adjustment in the position of this new lamp in the optical system. This can be done by moving the lamp socket clockwise or counterclockwise for the brightest illumination.

Step 5. Tighten the lamp socket and move the chassis back into its cabinet.

(5) NEON LAMPS.–All neon lamps on the front of the equipment can be easily replaced without the removal of any chassis. Remove the lucite jewel covering the lamp. Remove the defective lamp and replace it with a new one. Replace the lucite jewel.

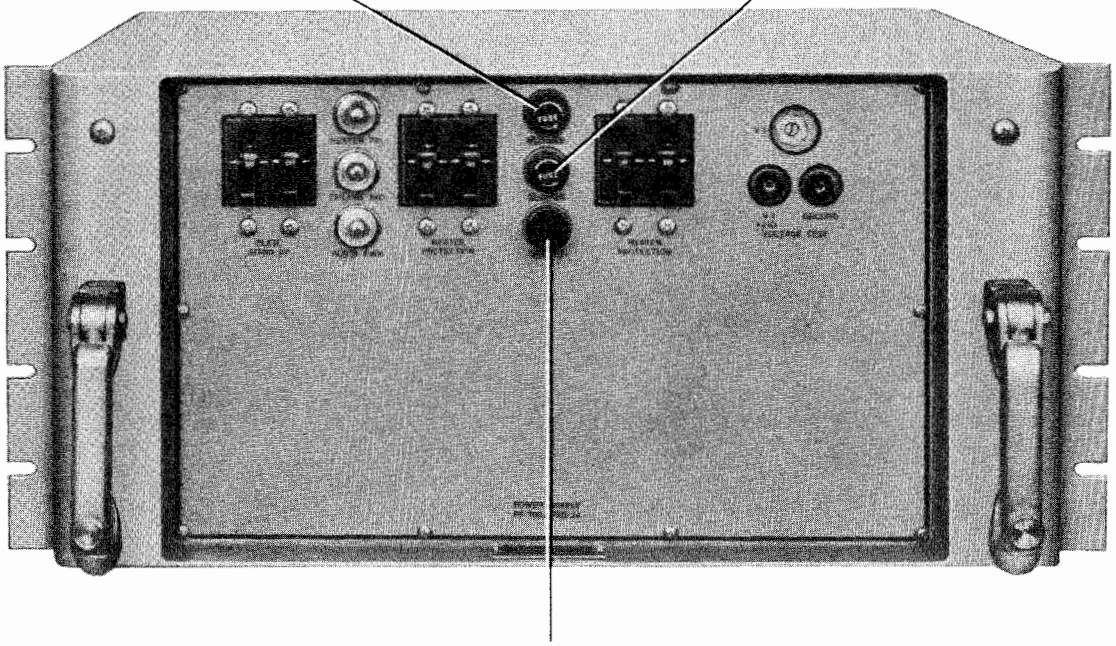


Figure 5–2. Fuse Locations, Power Supply PP-590/FRR-24

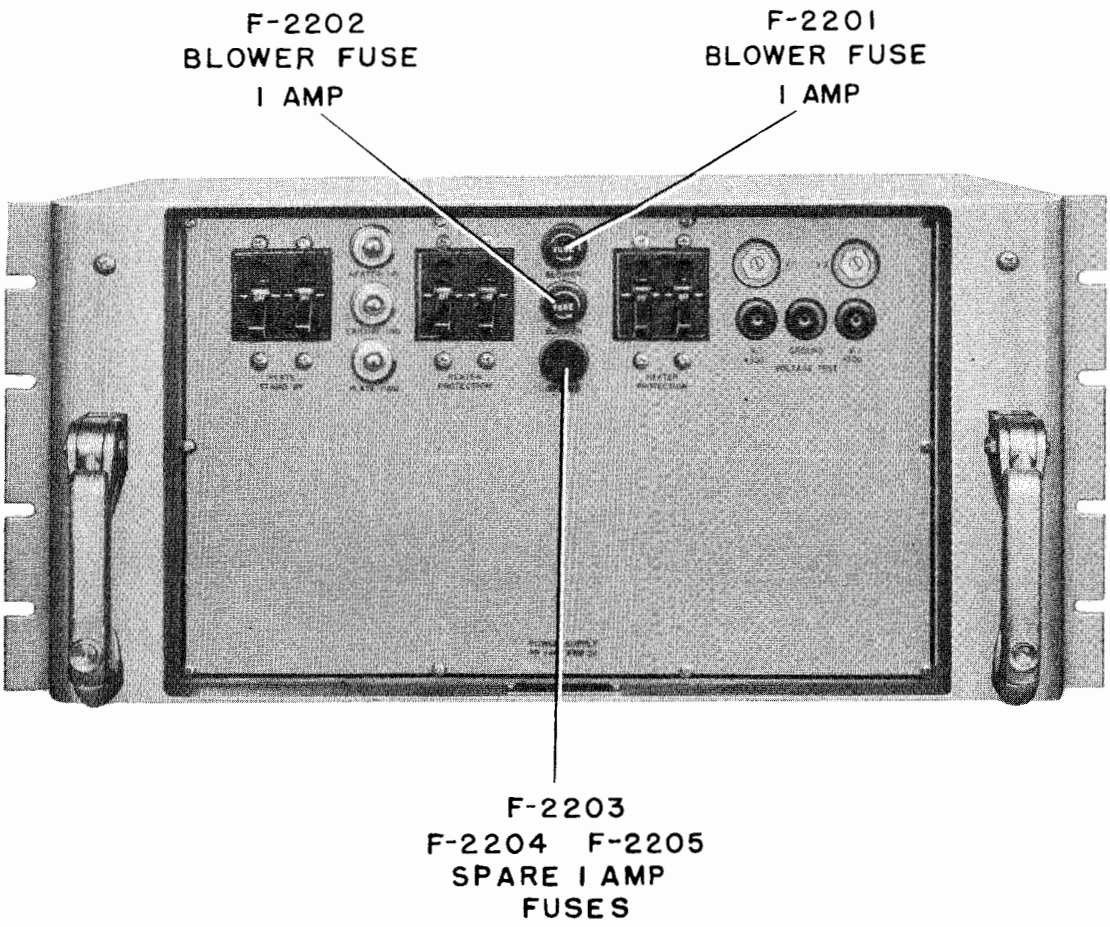


Figure 5–3. Fuse Locations, Power Supply PP-648/FRR-24

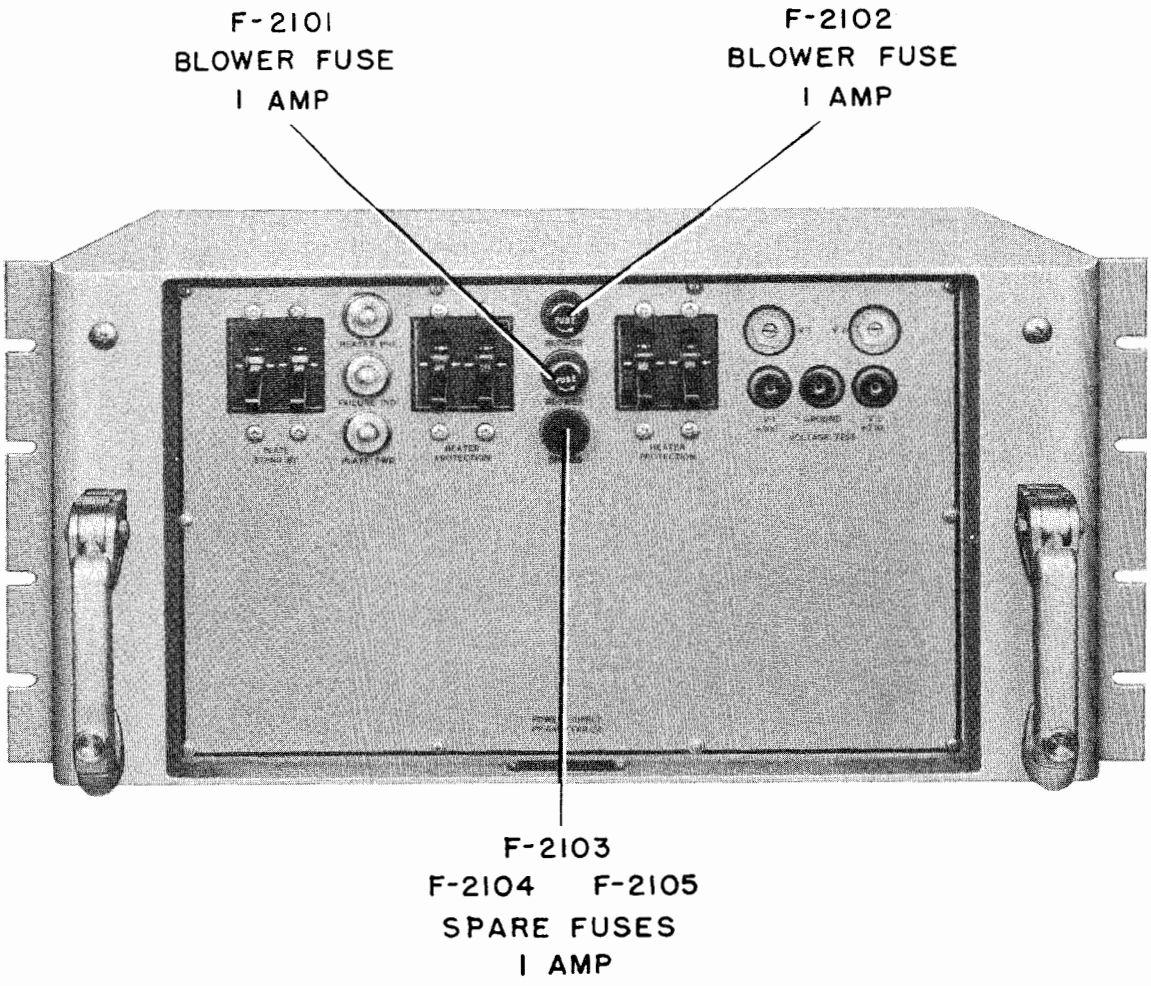


Figure 5–4. Fuse Locations, Power Supply PP-649/FRR-24

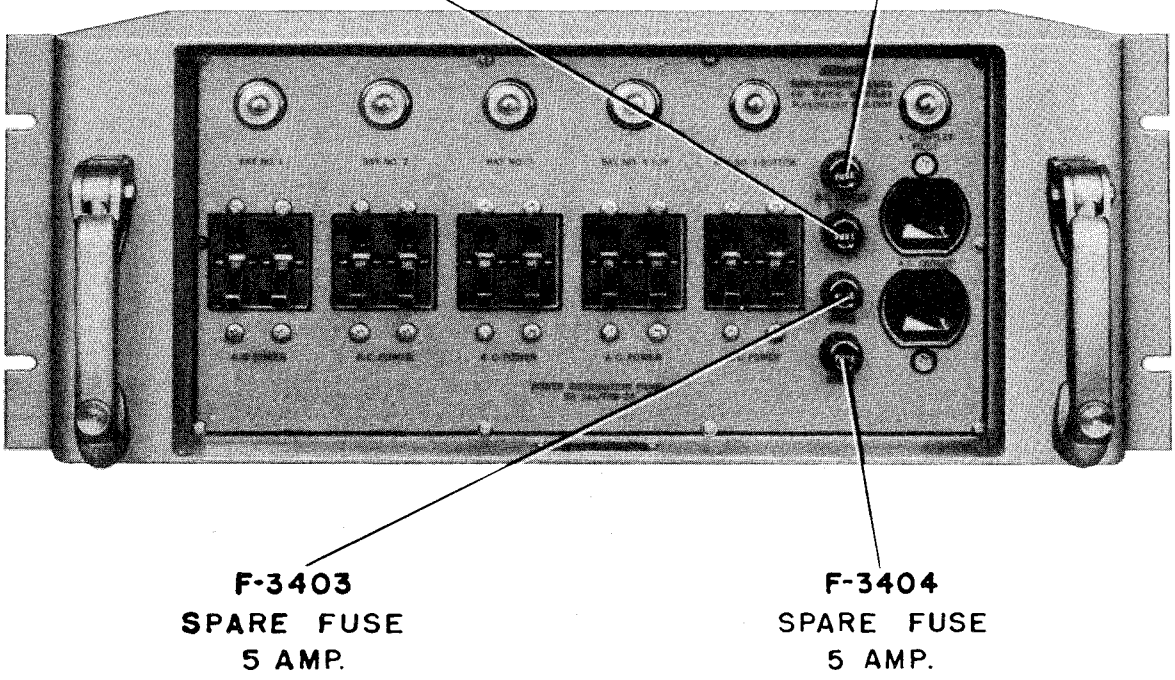


Figure 5–5. Fuse Locations, Power Distribution Panel SB-141/FRR-24

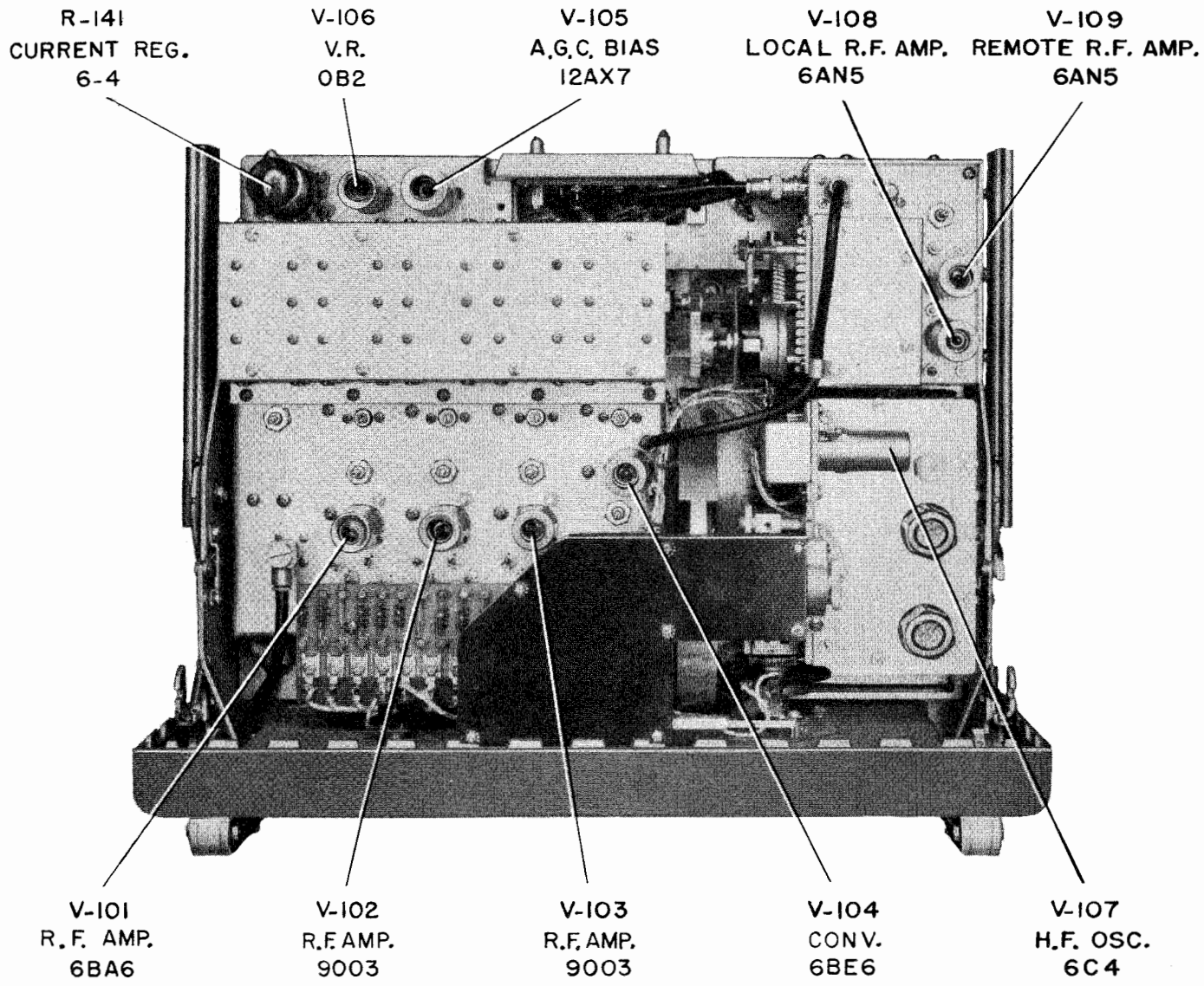


Figure 5–6. Tube Locations, Amplifier Converter AM-450, AM-451, AM-452, AM-453/FRR-24

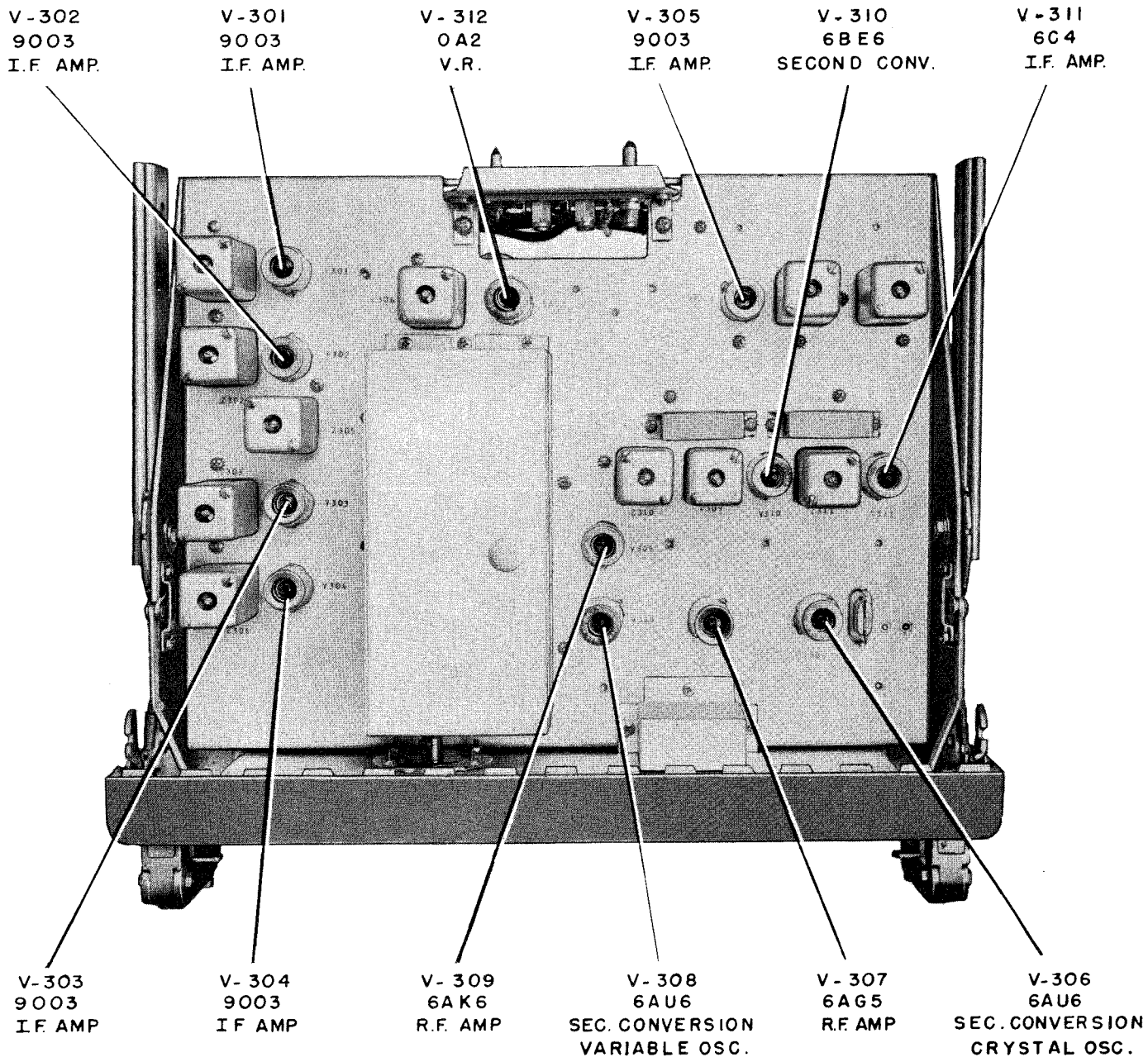


Figure 5–7. Tube Locations, Frequency Converter CV-126/FRR-24

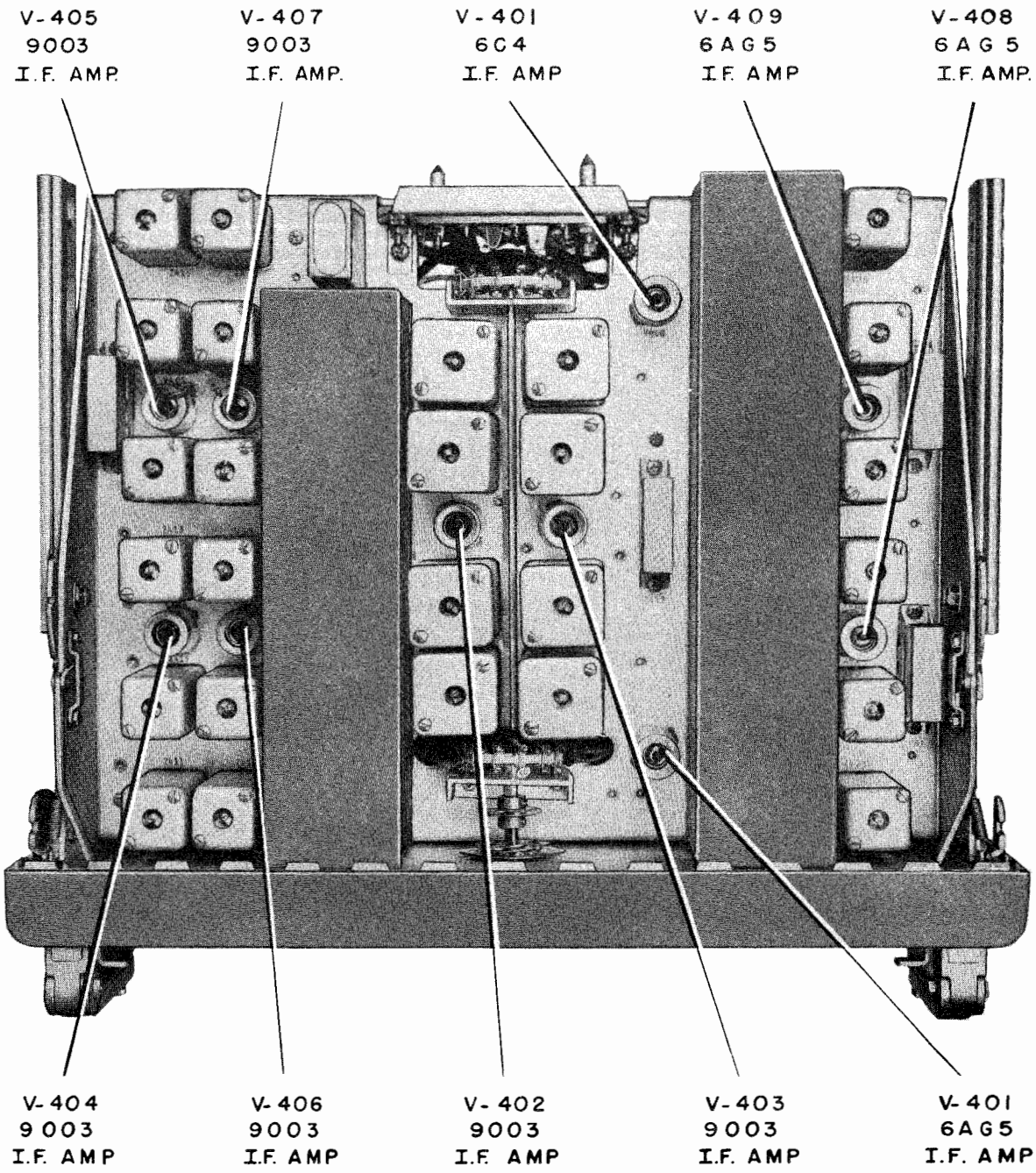


Figure 5–8. Tube Locations, Filter Assembly F-99/FRR-24

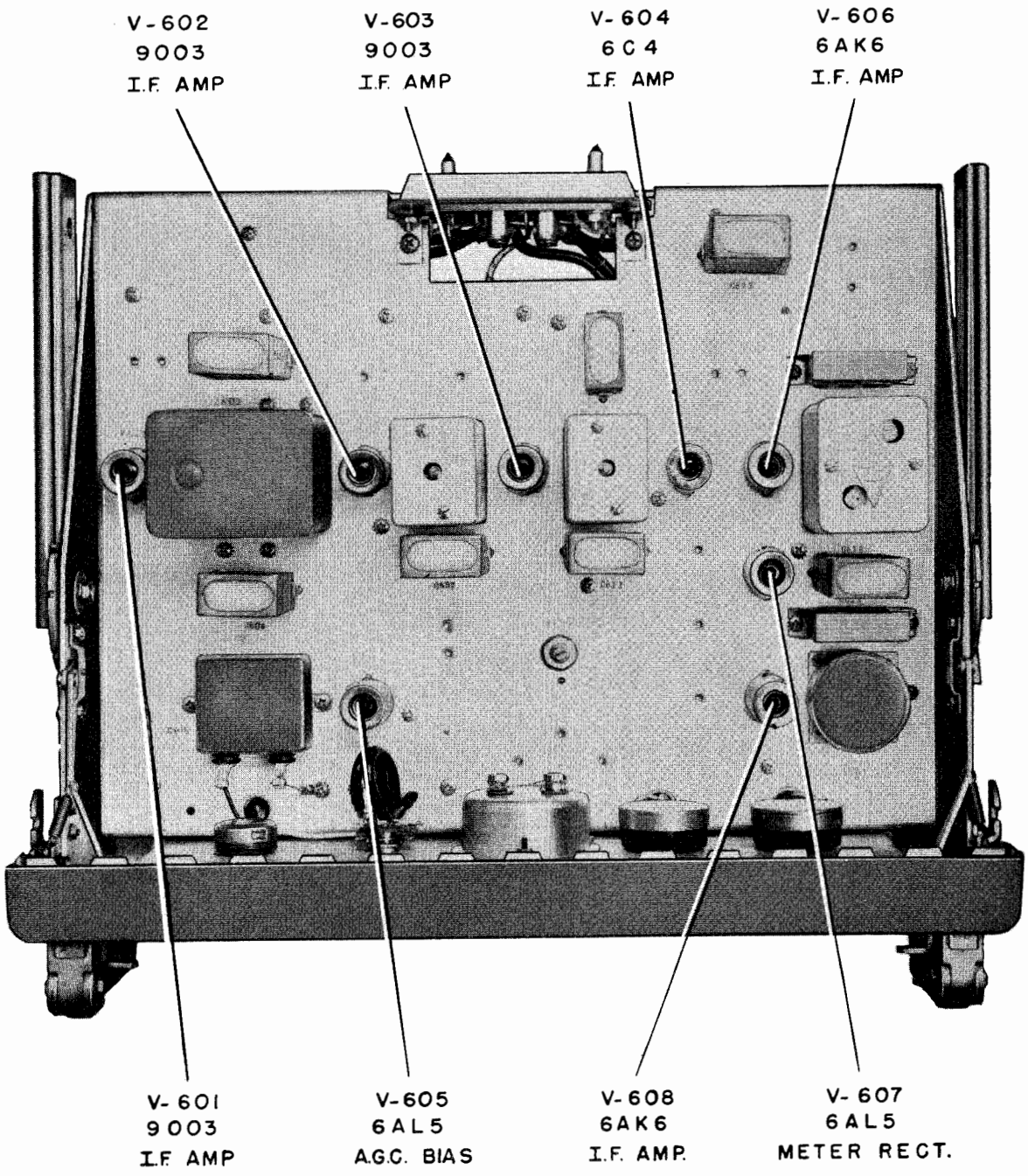


Figure 5–9. Tube Locations, R.F. Amplifier AM-454/FRR-24

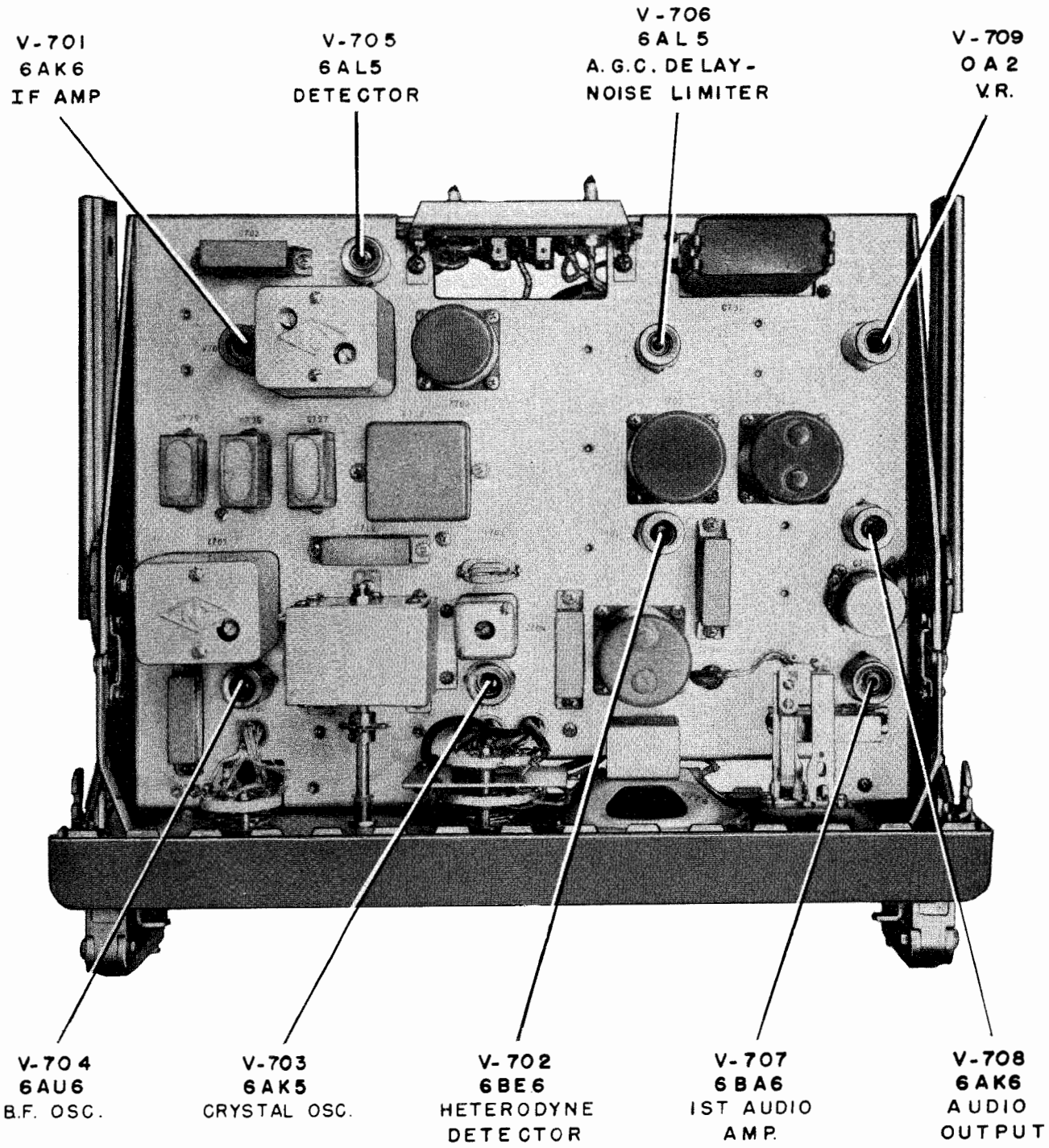


Figure 5–10. Tube Locations, Amplifier-Detector AM-439/FRR-24

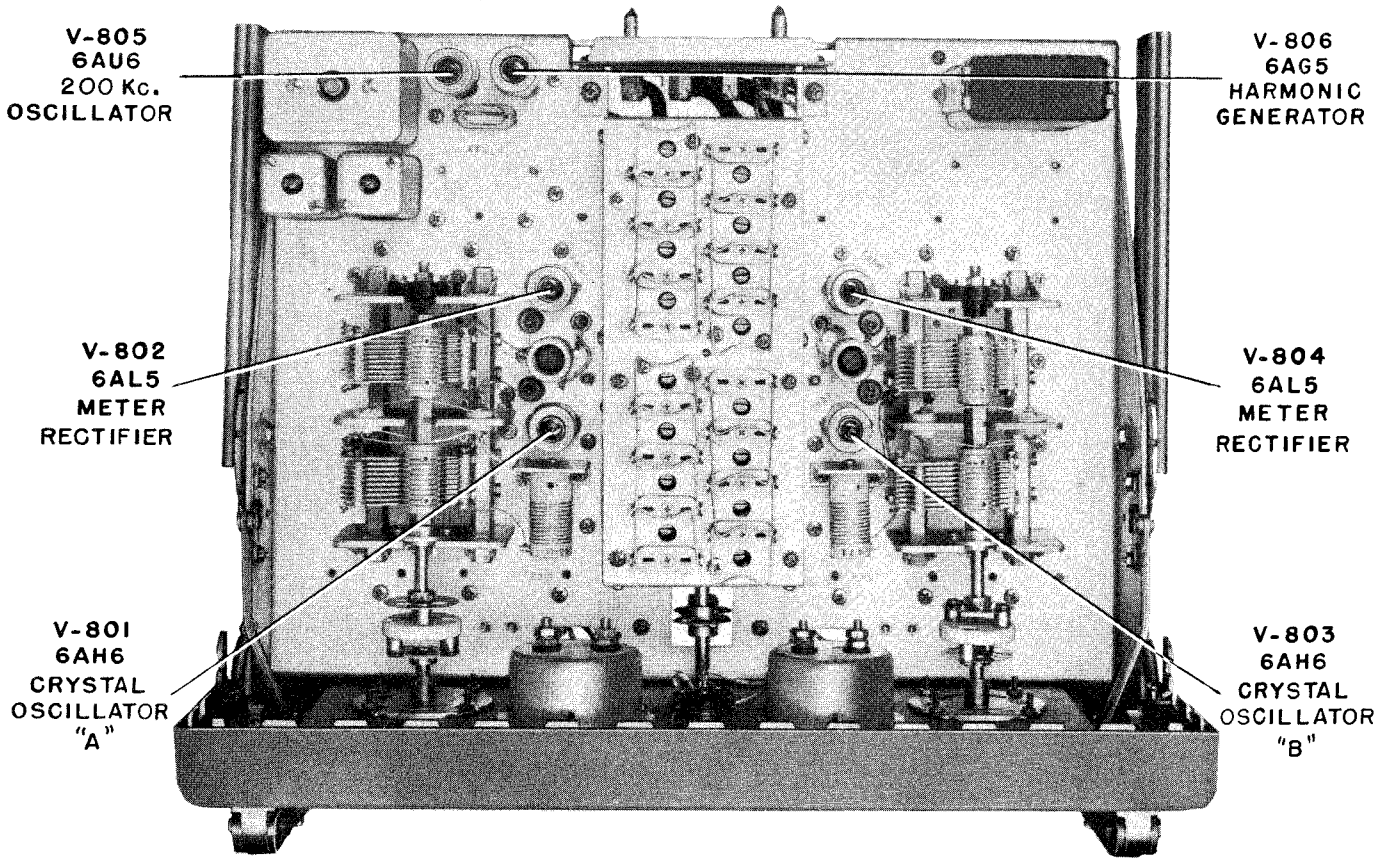


Figure 5–11. Tube Locations, Oscillator Assembly O-131/FRR-24

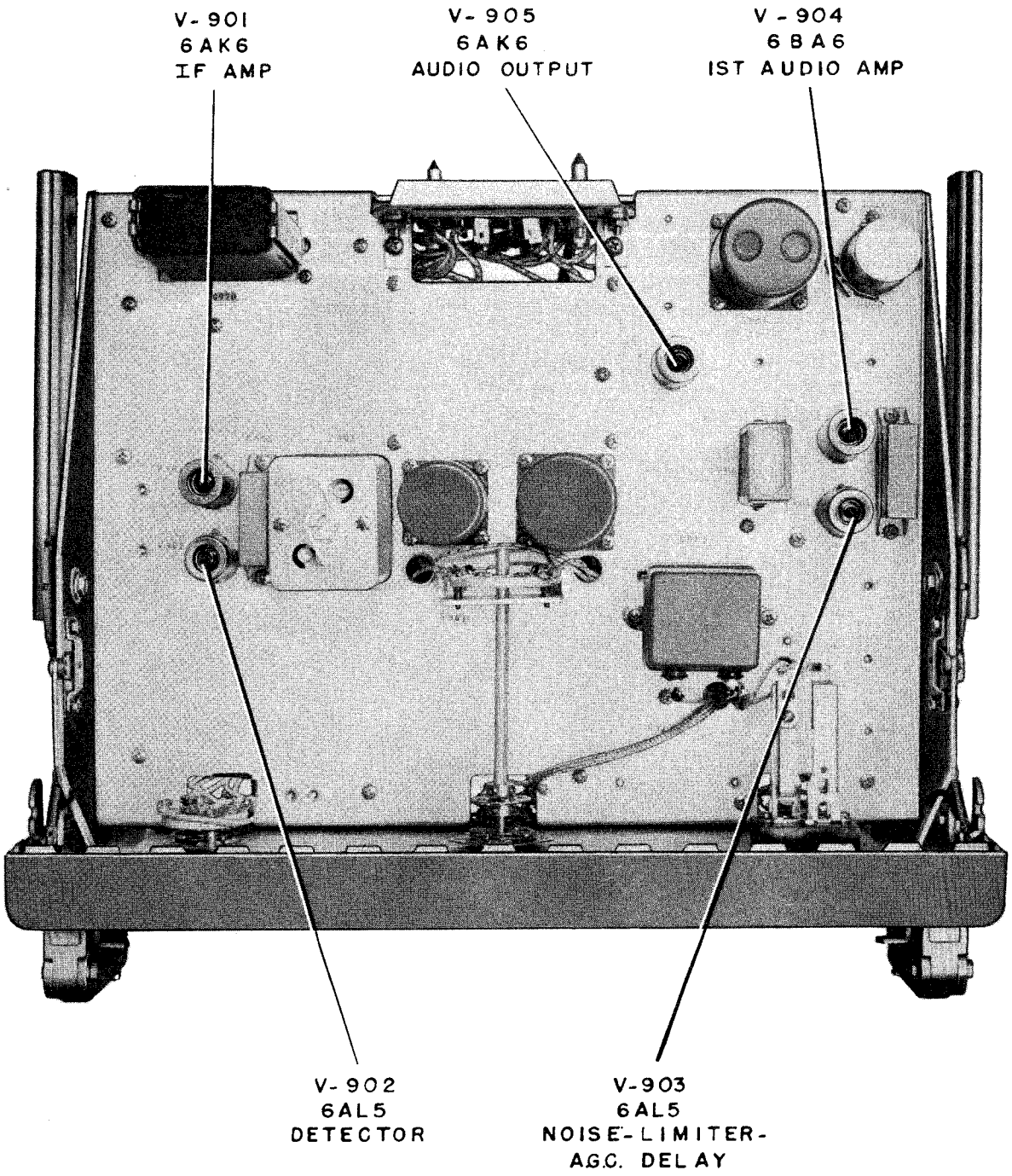


Figure 5–12. Tube Locations, Amplifier-Detector AM-440/FRR-24

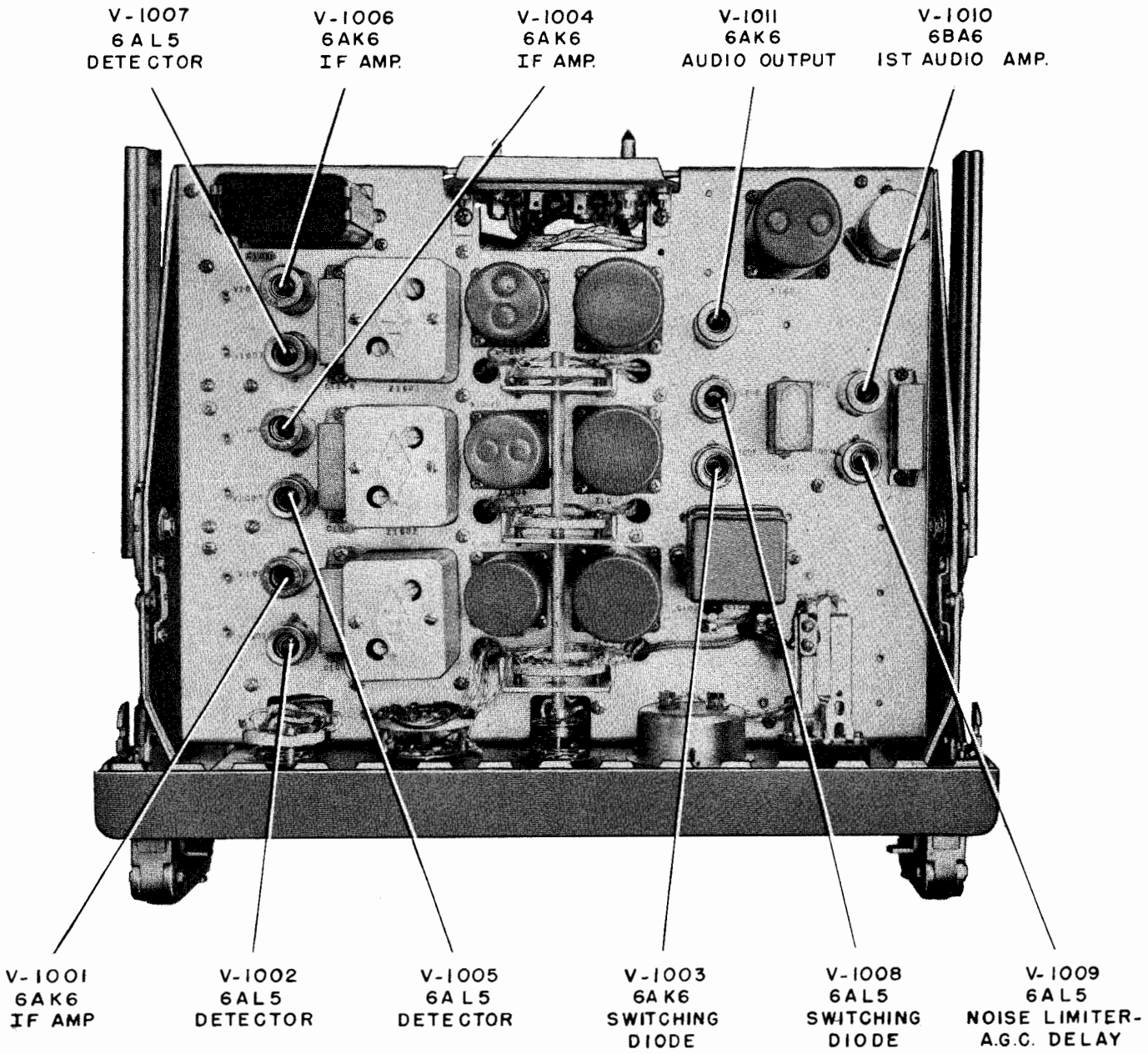


Figure 5–13. Tube Locations, Amplifier-Detector AM-438/FRR-24

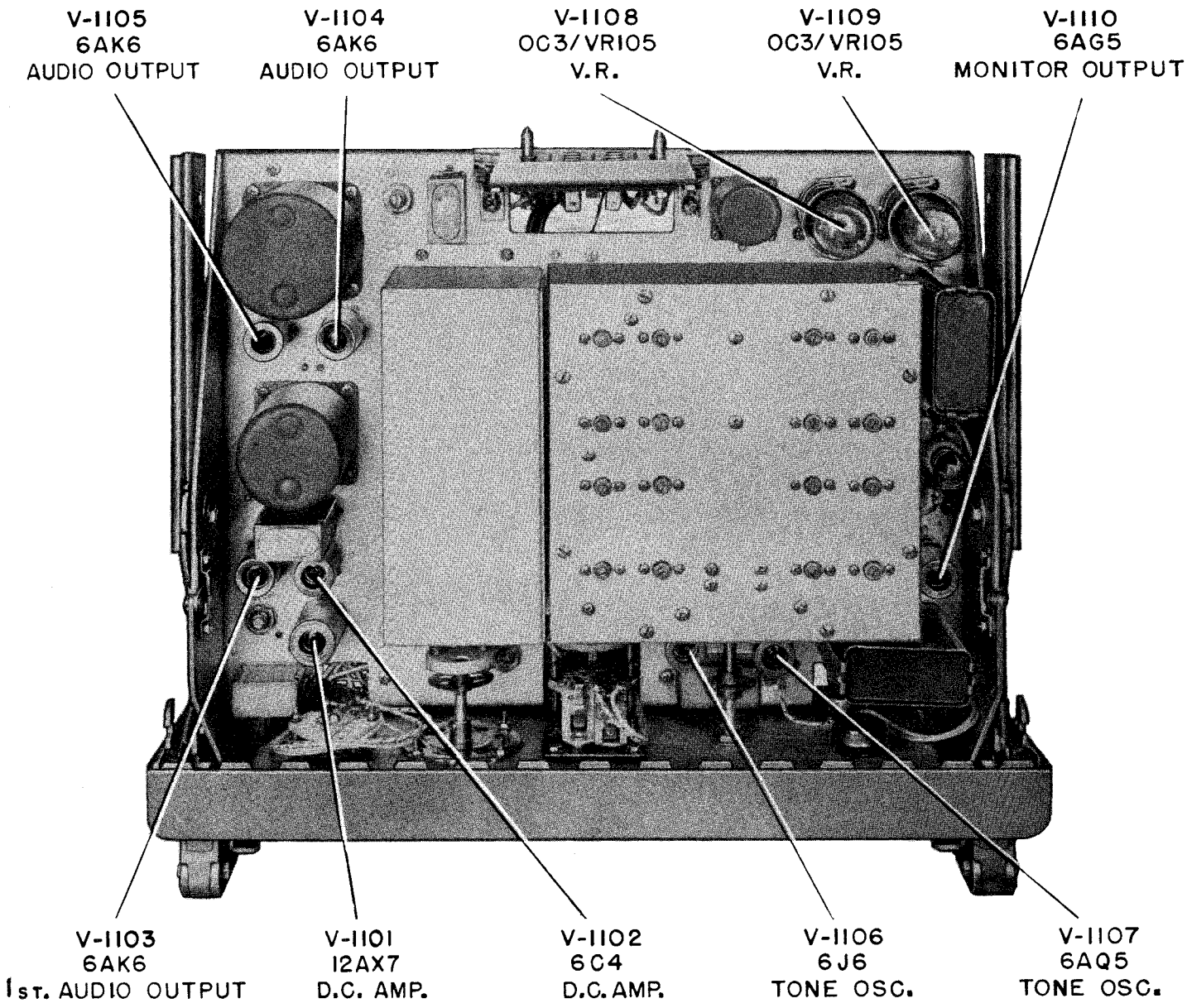


Figure 5–14. Tube Locations, Keyer KY-62/FRR-24

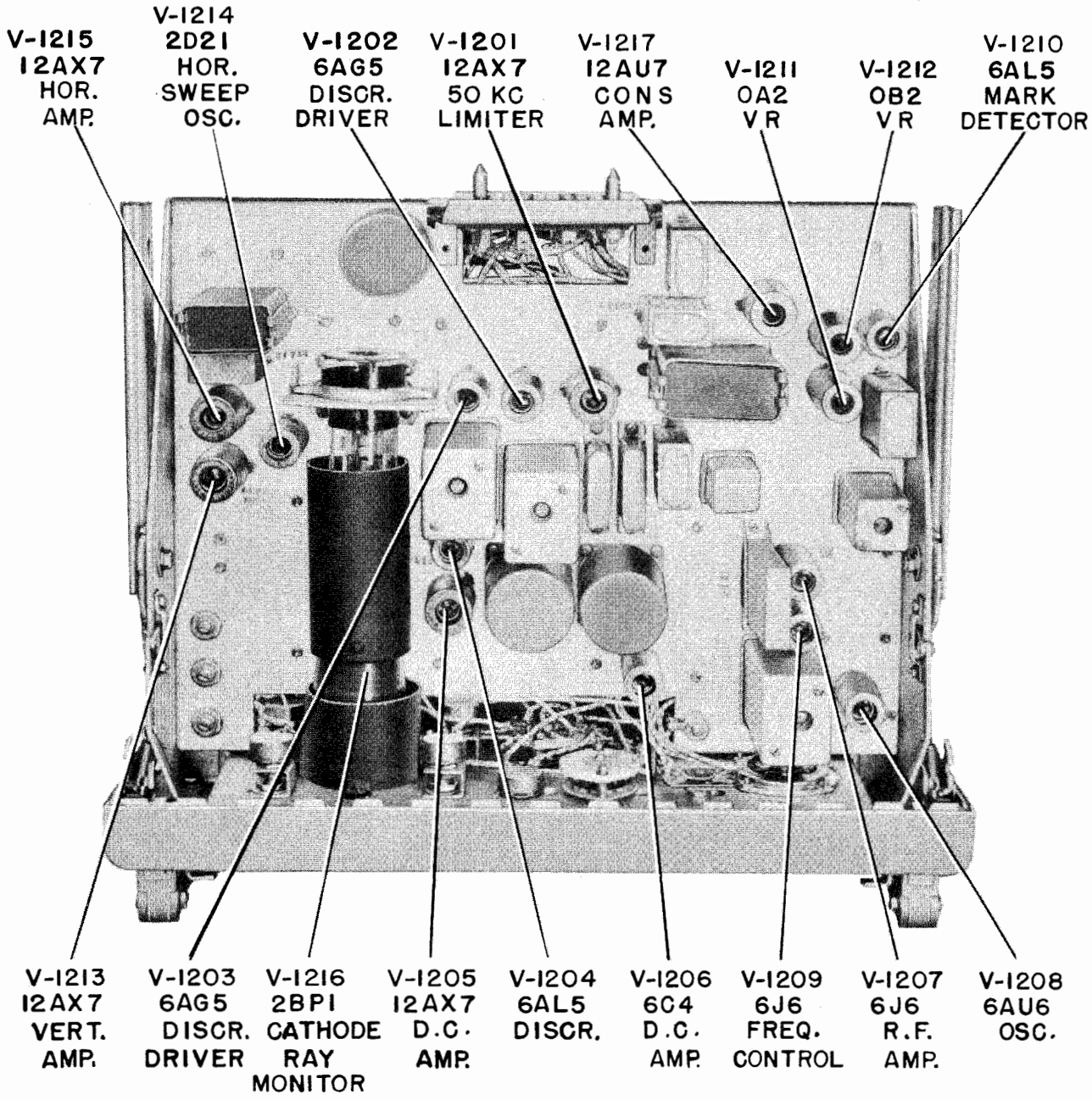


Figure 5–15. Tube Locations, F.S. Converter CV-127/FRR-24

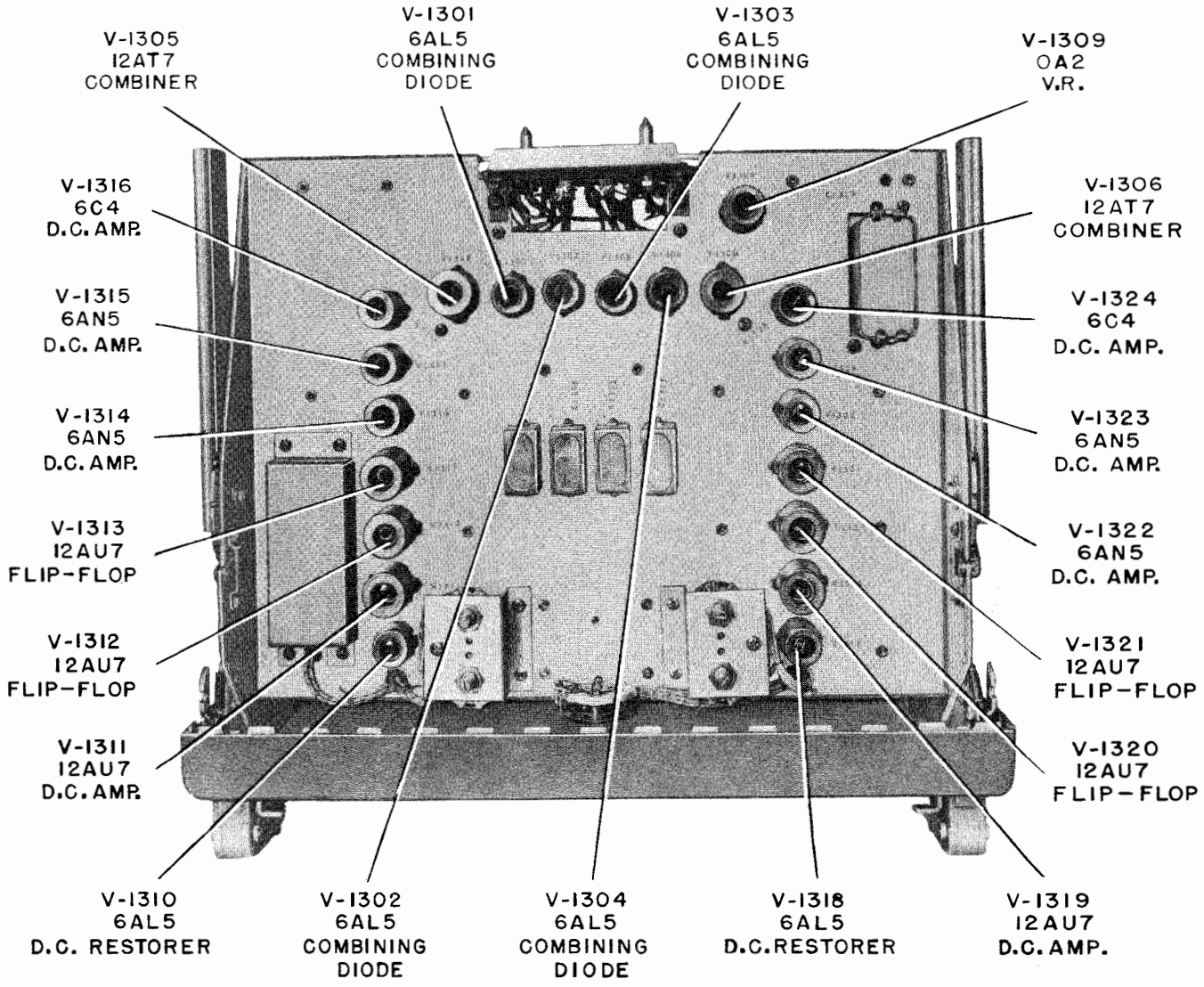


Figure 5–16. Tube Locations, Comparator Keyer CM-32/FRR-24

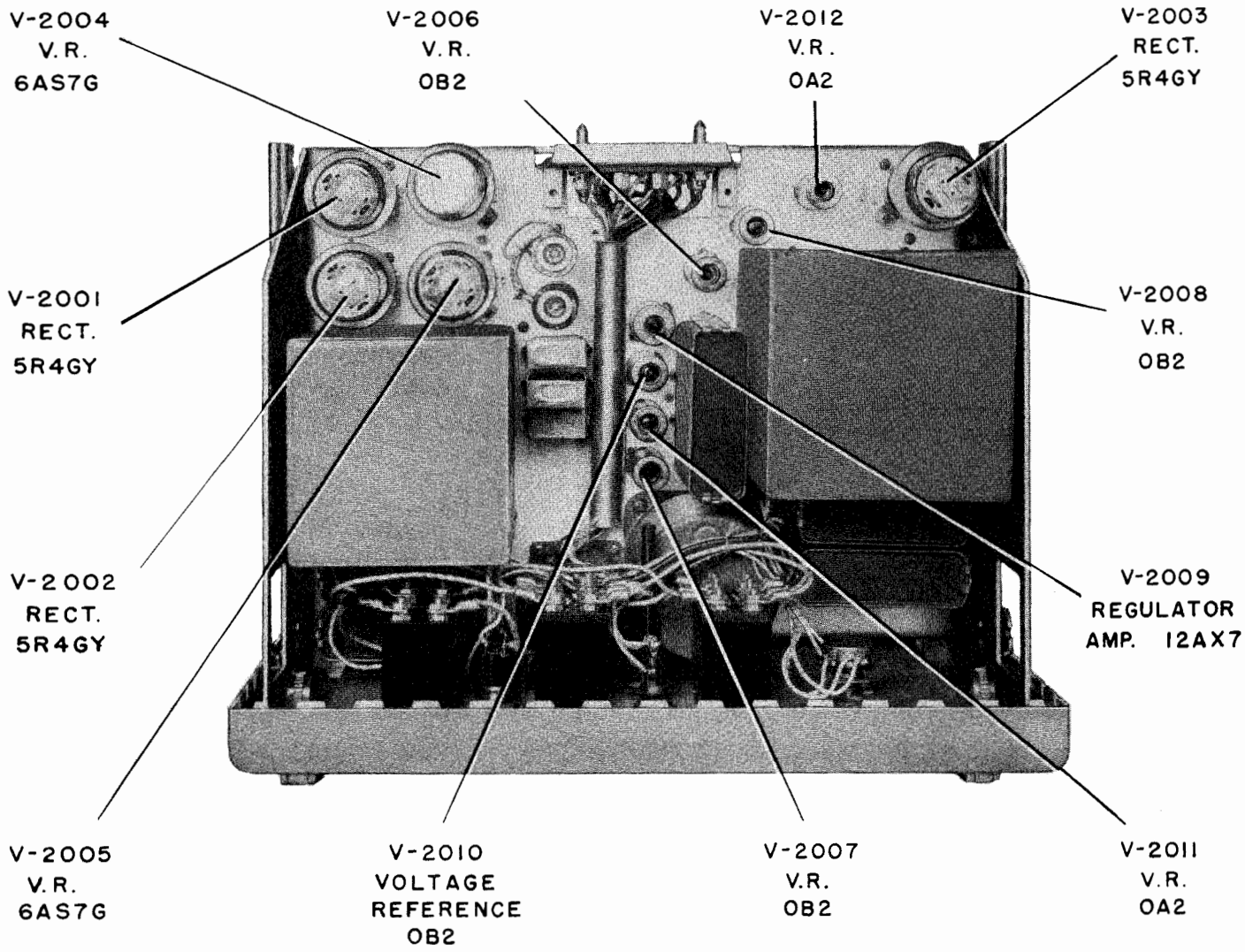


Figure 5–17. Tube Locations, Power Supply PP-590/FRR-24

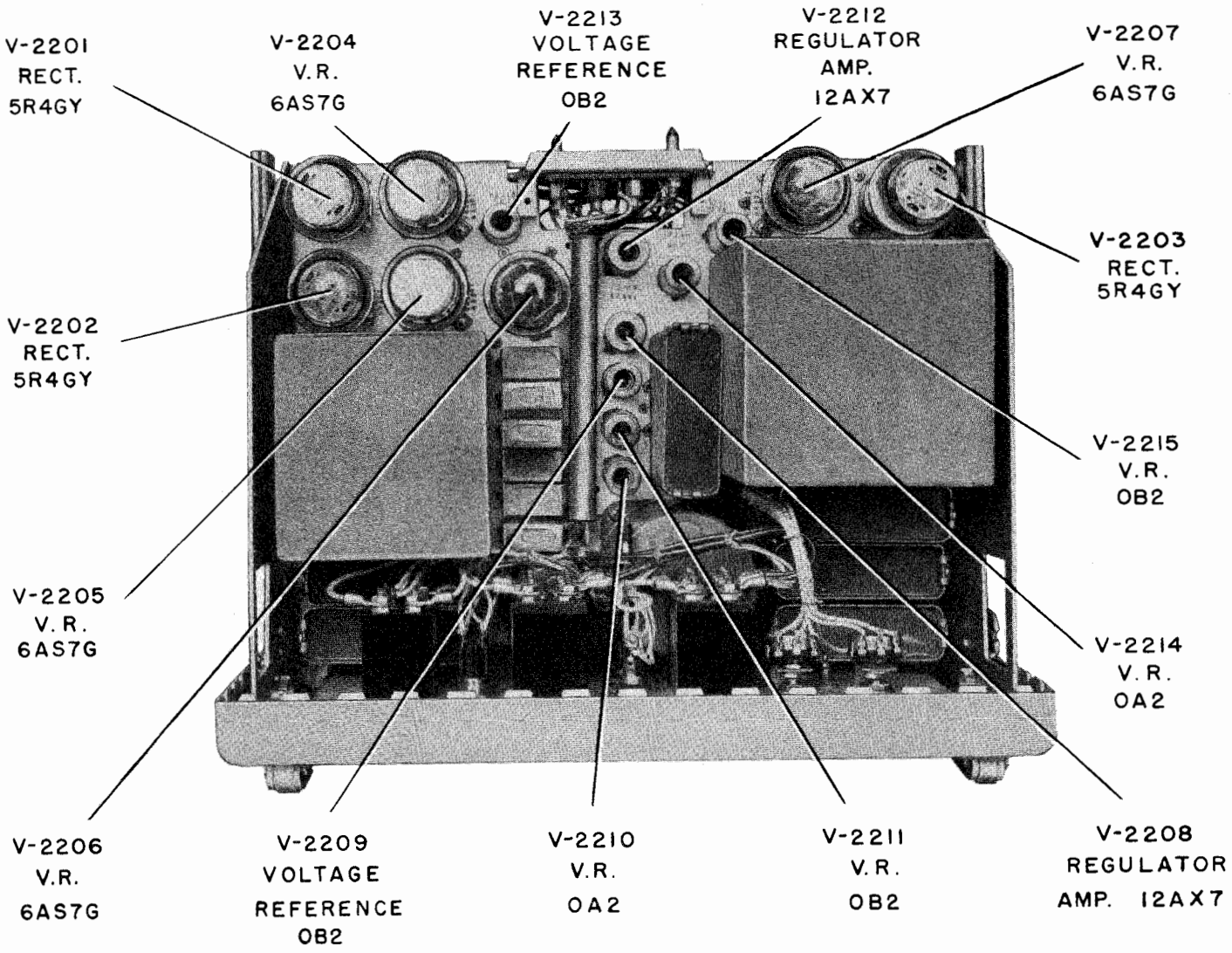


Figure 5–18. Tube Locations, Power Supply PP-648/FRR-24

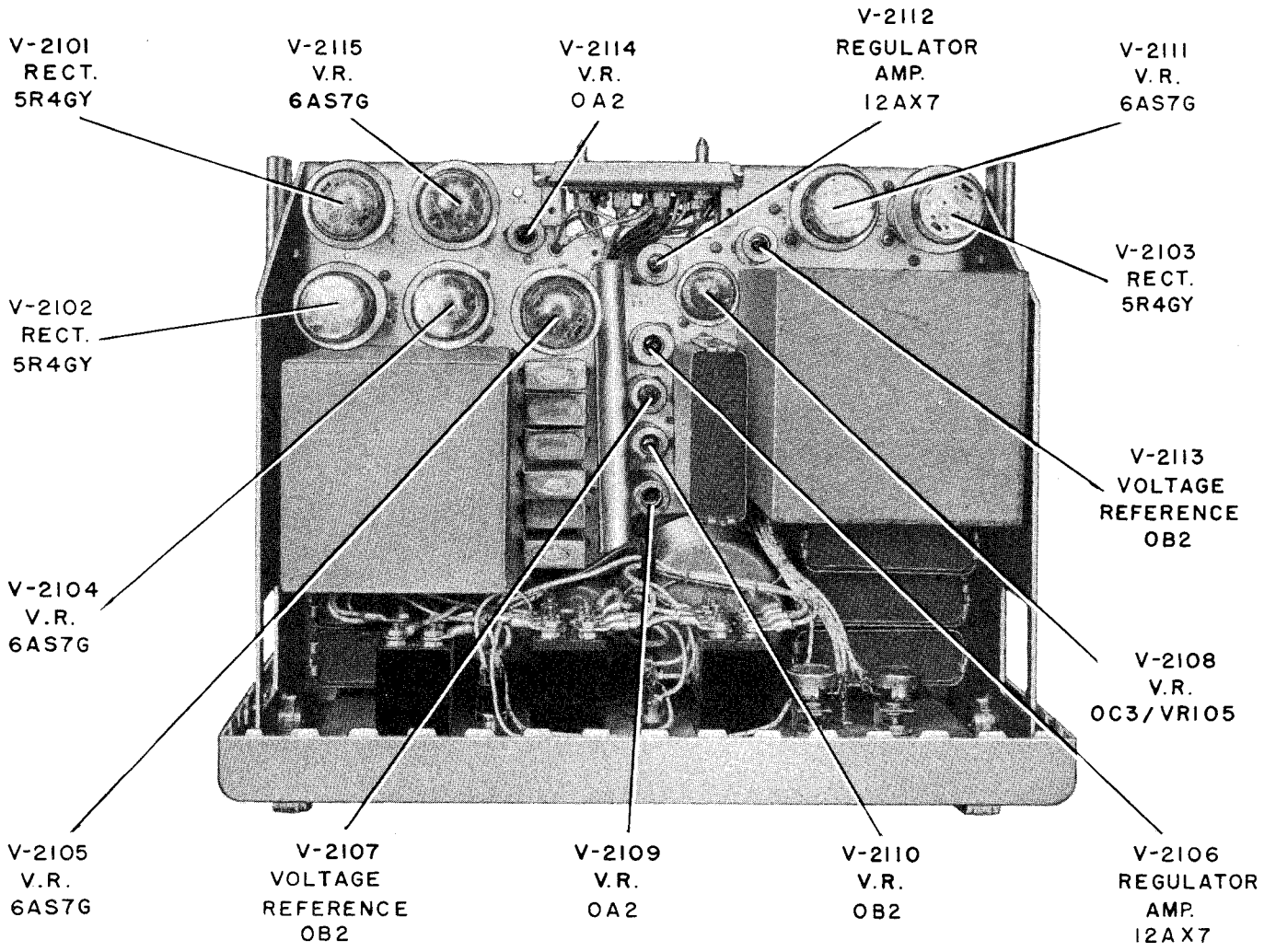


Figure 5–19. Tube Locations, Power Supply PP-649/FRR-24

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INSTRUCTION BOOK

for

RADIO RECEIVING SET AN/FRR-24

SECTION 6— PREVENTIVE MAINTENANCE

NATIONAL COMPANY, INC.
MALDEN 48, MASSACHUSETTS

BUREAU OF SHIPS

NAVY DEPARTMENT

Contract: NObsr-39402

Approved by BuShips: 15 April 1952

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SECTION 6
PREVENTIVE MAINTENANCE

1. ROUTINE CHECKS.

The following routine checks of normal operation of the AN/FRR-24 Radio Receiving Set are to be made by the operating personnel at the beginning of each watch. The tests are to be made with the receiver operating under normal conditions. Careful routine check of the equipment very often prevents failure under conditions when maintenance personnel are not not available. The following chart assumes that the five A.C. Power switches located on the Control Panel SB-142/FRR-24 are in the On position.

TABLE 6-1. ROUTINE CHECK CHART

EACH WATCH

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
A.C. outlet pilot.	Observe that lamp is lighted.	No light indicates blown fuse F-3401, F-3402. Intermittent light indicates poor lamp, loose connections or short-circuit in external equipment.
A.C. Power lamps.	Observe that lamps are lighted.	No light indicates open circuit breaker in A.C. Power switch.
Heater Primary Lamps.	Observe that lamps are lighted.	No light indicates heater protection circuit breaker contacts open. Defective lamp.
Failure Indicator lamp.	Observe that lamps are not lighted.	Glowing lamps indicate failure in regulated power supply system or excessive temperature in cabinet.
Plate Power lamp.	Observe that lamps are lighted.	No light indicates open circuit breaker in Plate Stand-By switch. Defective rectifier or voltage regulator.
Projection dial.	Observe that scale screen is illuminated.	Intermittent or no light indicates loose connection or defective lamp.
Pilot lamp.	Observe that lamp is lighted. It may be necessary to adjust the dimmer control to provide more illumination.	Intermittent or no light indicates poor contact in the dimmer, or loose connections.
Receiver Operation.	a. Make listening test for normal operation.	a. Insert headphones into the phones jack or set the speaker switch at On in the AM-439/FRR-24.

TABLE 6–1. ROUTINE CHECK CHART (CONT'D)

EACH WATCH

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
		b. Remove the headphones from the AM-439/FRR-24 and insert them into the phones jack on the AM-440/FRR-24. c. Remove the headphones from the AM-440/FRR-24 and insert them into the phones jack in the AM-438/FRR-24. d. Remove the headphones from the AM-438/FRR-24 and insert them into the phones jack in the KY-62/FRR-24
	b. Visual indication of normal receiver operation.	a. Observe the reading on the 2nd. I.F. Level meter. Note and record the reading obtained for future reference. b. Note the pattern obtained on the oscilloscope screen. The pattern should be centered between the two horizontal lines on the transparent screen.
Dial calibration (This check can only be made at an interval when no traffic is being handled).	Patch the Crystal Calibrator into the selected Amplifier-Converter unit by installing a patch cord connection between 2J31 and 2J17, 2J18 or 2J19. Set the Calibrate switch located in the Oscillator Assembly O-131/FRR-24 at On.	a. Tune the Amplifier-Converter to zero beat at the nearest 200 kc. harmonic in the portion of the dial to be checked. The index set can be used to obtain greater accuracy in determining the accuracy of the dial calibration. Although the Crystal Calibrator is accurate to within 0.01% the accuracy of the dial should be within 0.1%.

2. ROUTINE MAINTENANCE CHECKS.

Preventive maintenance is a systematic series of operations performed at regular intervals on equipment to eliminate major breakdowns and unwanted interruptions in service and to keep equipment operating at top efficiency.

The routine maintenance checks are listed in Table 6–2 and are arranged in groups according to the time intervals at which the respective checks are to be made. This routine maintenance test schedule should be modified if the equipment is used under adverse operating conditions, but in general, the test schedule as arranged should prove adequate.

NOTE

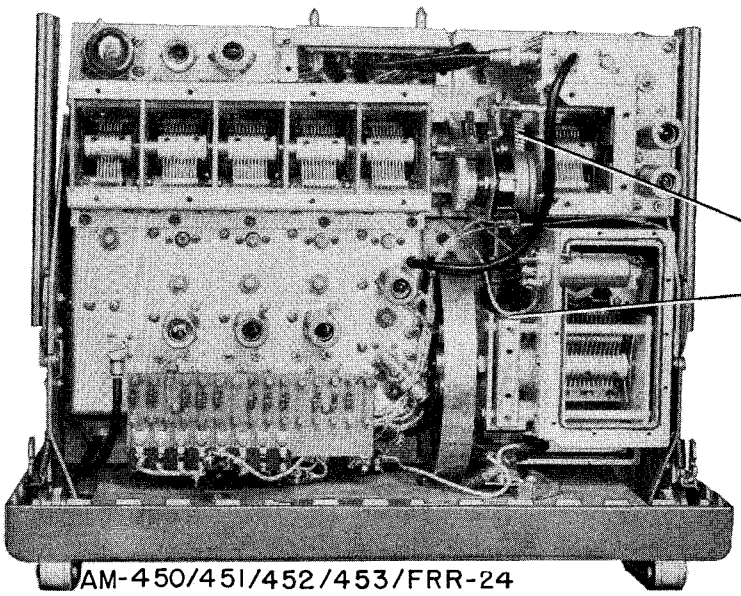
The attention of maintenance personnel is invited to the requirements of chapter 67 of the Bureau of Ships Manual, of the latest issue.

TABLE 6–2. ROUTINE MAINTENANCE CHECK CHART

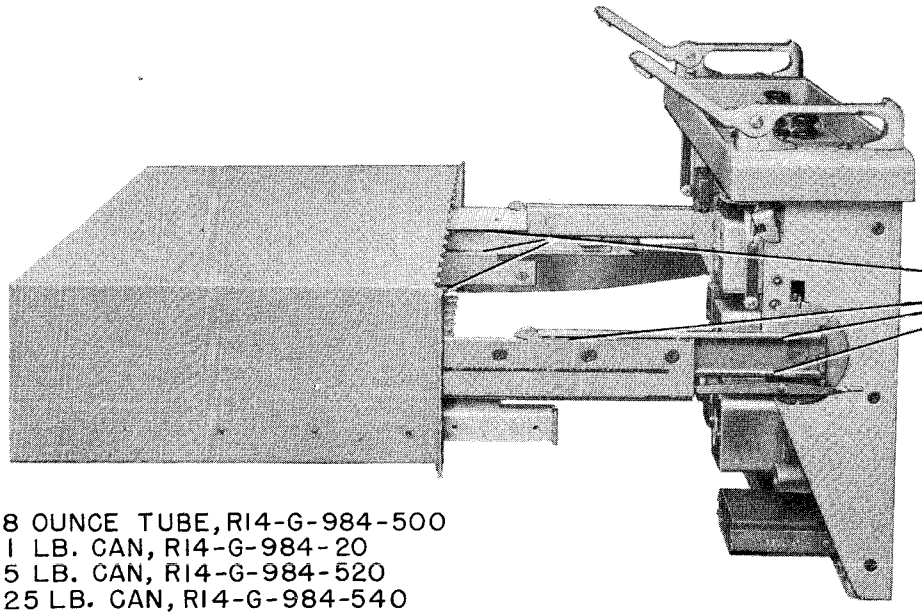
WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
EACH WATCH		
Refer to Table 6–1. Operator's Routine Check Chart.		
MONTHLY		
1. External connections and cables.	Inspect the firmness of all connections to the receiver. Check that cables have not been damaged.	Loose connections or damaged cables may result in faulty operation.
2. Air filters.	Inspect for dirt and dust particles.	Dirt and dust deposits accumulated on the filter will cause poor ventilating action.
QUARTERLY		
1. General Inspection.	Withdraw each unit from its cabinet. a. Make a careful visual inspection of the interior to detect symptons of trouble resulting from wear or overheating. b. Check for noisy components and/or connections.	To make this test withdraw the unit under test from its cabinet, connect a test cable between the multiconnector on the chassis and the multiconnector on the inside of the cabinet, then tap components and connections with a piece of insulating material while the equipment is adjusted for normal operation with an audible output.
2. Silica Gel driers on Amplifier-Converter units.	Observe color of silica gel. A brown color indicates the driers are saturated and require replacement or drying out.	To remove a drier turn the drier assembly in a counterclockwise direction. The drier can be replaced or its drying properties restored by heating or baking.
3. Sensitivity.	Check according to the procedure outlined in Section 7, Par. 5. c. (15 (a).	
4. Bandpass filter gain.	Check according to the procedure outlined in Section 7, Par. 5. c. (4).	
5. Frequency-shift performance.	Check according to the procedure outlined in Section 7, Par. 5. c. (9) and (11).	

3. LUBRICATION.

Instructions for the lubrication of the various moving elements of the mechanical assemblies and members that must be maintained free from corrosion for electrical reasons are indicated on Figure 6-1.



A MIL-G-3278. *
LARGE SPLIT GEARS (2)
APPLY THIN FILM WITH
BRUSH.



A MIL-G-3278. *
ALL MATING SURFACES.
APPLY THIN FILM
WITH BRUSH.

A = ANNUALLY

8 OUNCE TUBE, RI4-G-984-500
1 LB. CAN, RI4-G-984-20
5 LB. CAN, RI4-G-984-520
25 LB. CAN, RI4-G-984-540
35 LB. CAN, RI4-G-984-550
100 LB. CAN, RI4-G-984-560

* FORMERLY AN-G-25

Figure 6-1. Lubrication Chart

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for

RADIO RECEIVING SET AN/FRR-24

SECTION 7—CORRECTIVE MAINTENANCE

NATIONAL COMPANY, INC.
MALDEN 48, MASSACHUSETTS

BUREAU OF SHIPS

NAVY DEPARTMENT

Contract: NObsr-39402

Approved by BuShips: 15 April 1952

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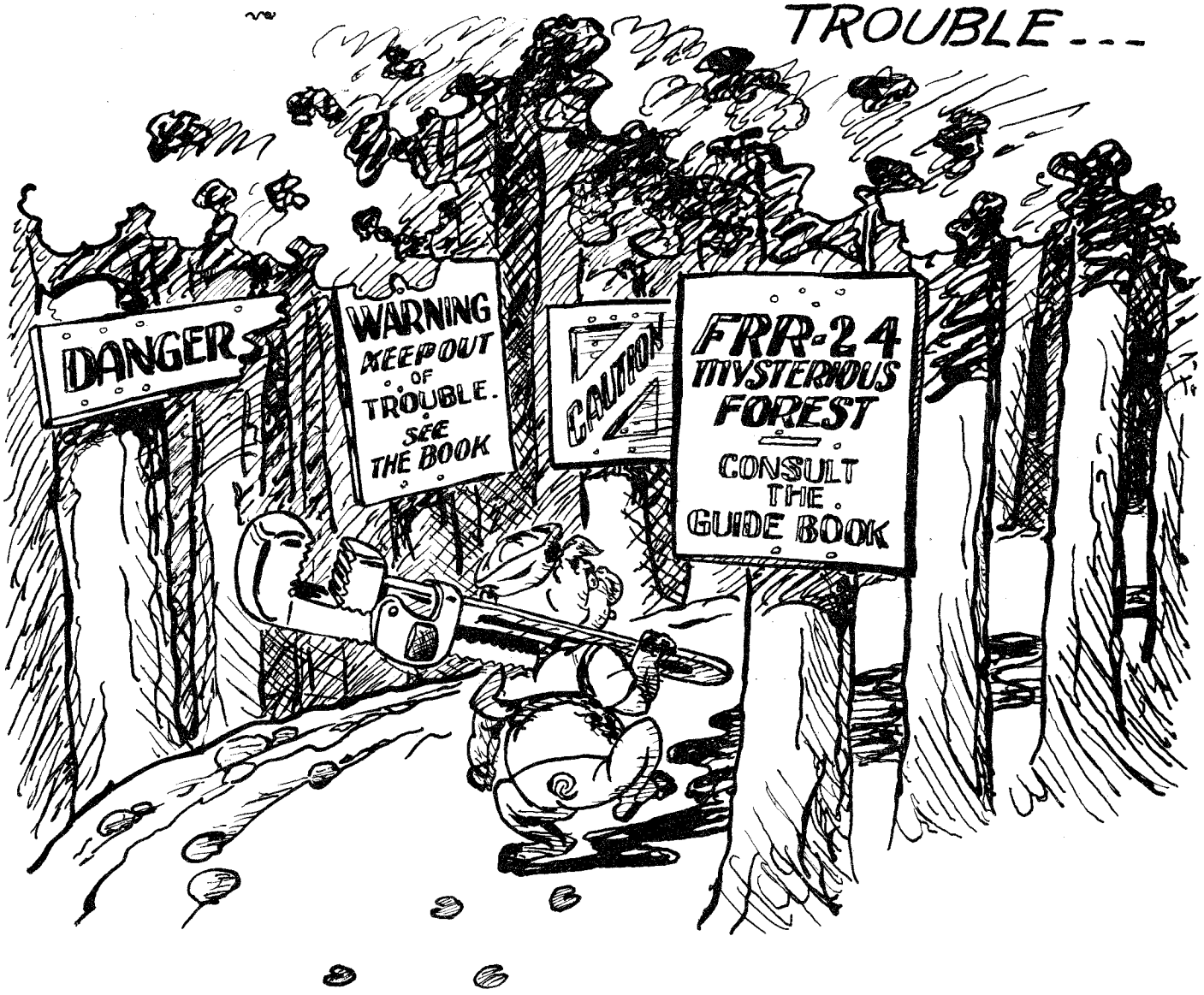
Do Not

OVERLOOK WARNINGS, CAUTIONS, AND NOTES —

THEY KEEP YOU OUT OF TROUBLE...



FAILURE REPORTS

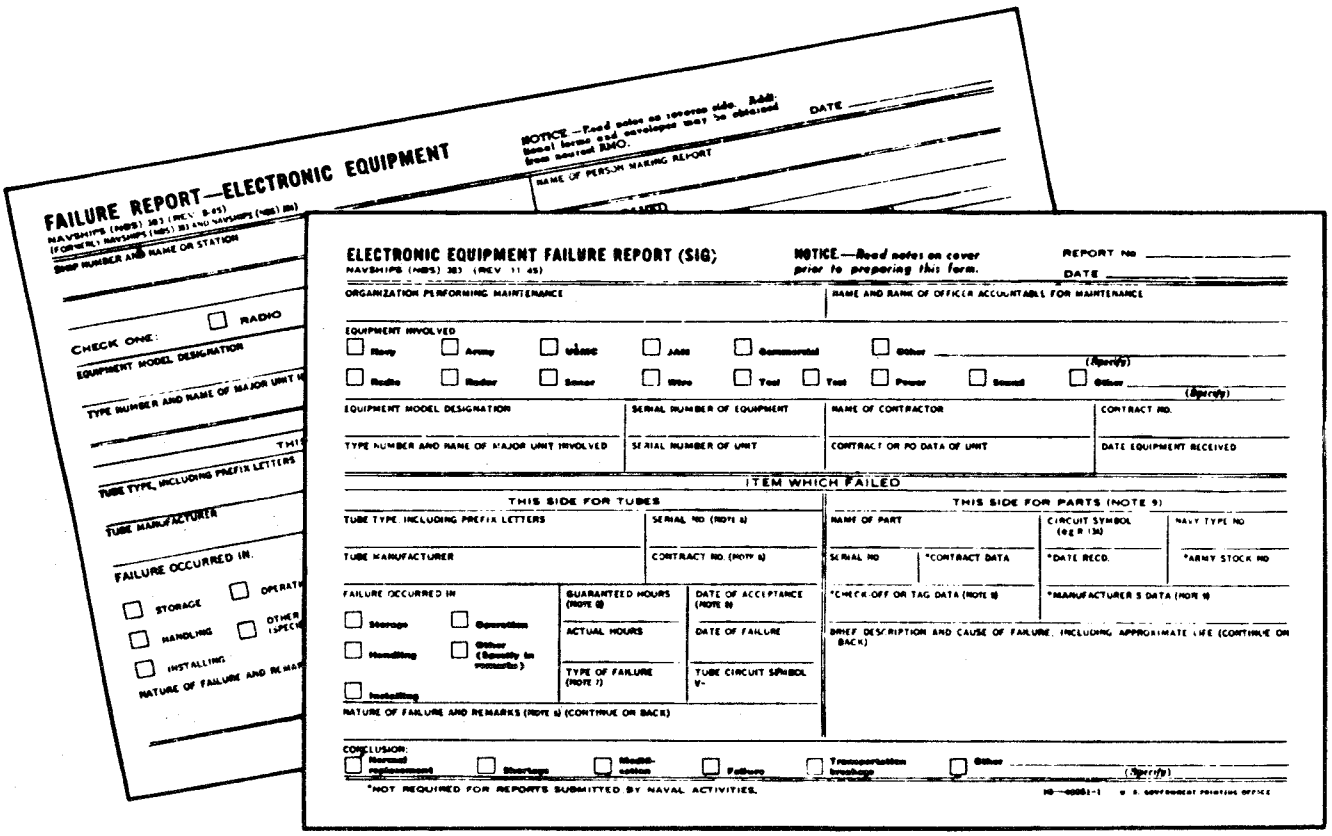
A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form NBS-383, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS in the franked envelope which is provided. 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 any Publications and Distribution Office.



FAILURE REPORT—ELECTRONIC EQUIPMENT

ELECTRONIC EQUIPMENT FAILURE REPORT (SIG)

NOTICE.—Read notes on cover prior to preparing this form.

REPORT No

DATE

ORGANIZATION PERFORMING MAINTENANCE

NAME AND RANK OF OFFICER ACCOUNTABLE FOR MAINTENANCE

EQUIPMENT INVOLVED

EQUIPMENT MODEL DESIGNATION | SERIAL NUMBER OF EQUIPMENT | NAME OF CONTRACTOR | CONTRACT NO.

TYPE NUMBER AND NAME OF MAJOR UNIT INVOLVED | SERIAL NUMBER OF UNIT | CONTRACT OR PO DATA OF UNIT | DATE EQUIPMENT RECEIVED

ITEM WHICH FAILED

THIS SIDE FOR TUBES

TUBE TYPE INCLUDING PREFIX LETTERS | SERIAL NO (NOTE 6)

TUBE MANUFACTURER | CONTRACT NO. (NOTE 6)

FAILURE OCCURRED IN: Storage, Operation, Handling, Other (Specify in remarks), Installing

GUARANTEED HOURS (NOTE 6) | DATE OF ACCEPTANCE (NOTE 6)

ACTUAL HOURS | DATE OF FAILURE

TYPE OF FAILURE (NOTE 7) | TUBE CIRCUIT SYMBOL V-

NATURE OF FAILURE AND REMARKS (NOTE 8) (CONTINUE ON BACK)

THIS SIDE FOR PARTS (NOTE 9)

NAME OF PART | CIRCUIT SYMBOL (eg R 134) | NAVY TYPE NO

SERIAL NO | *CONTRACT DATA | *DATE RECD. | *ARMY STOCK NO

*CHECK-OFF OR TAG DATA (NOTE 10) | *MANUFACTURER'S DATA (NOTE 9)

BRIEF DESCRIPTION AND CAUSE OF FAILURE, INCLUDING APPROXIMATE LIFE (CONTINUE ON BACK)

CONCLUSION: Normal replacement, Shortage, Modification, Failure, Transportation breakage, Other (Specify)

*NOT REQUIRED FOR REPORTS SUBMITTED BY NAVAL ACTIVITIES.

Figure 7–1. Failure Report

SECTION 7
CORRECTIVE MAINTENANCE

1. FAILURE REPORTS.

A failure report must be filled out for the failure of any part of the equipment. It is to be sent through the proper channels according to the instructions given in Figure 7–1.

2. INTRODUCTION.

This section contains all the information necessary for the repair and adjustment of a mal-functioning AN/FRR-24 Receiver. Maintenance personnel must be prepared to repair and adjust receivers that have failed in operation. The source of trouble must be located, the defect remedied and the equipment restored to an operating condition.

Contained in this section is a trouble-shooting paragraph to serve as a guide to maintenance personnel in locating the source of trouble and its possible cause. Following this is a paragraph giving detailed instructions for all electrical alignment procedures and adjustments. Finally, a paragraph is included for guidance when making mechanical repairs or adjustments.

To arrange the equipment for some maintenance procedures it is necessary to connect various circuits in one unit to circuits in other units. All of these types of connections are made by means of the patch cords associated with each patch panel. Observation of the Patch Panel units will reveal that each connector has an identifying tab. For example on unit 1J the connector in the upper left hand corner is labelled AGC IN 1A252.1H607.1J3. This means that AGC voltage is fed into this connector for application to rack 1, unit A, connector 252 and rack 1, unit H, connector 607 and this connector is in rack 1, unit J, connector J-1503. The numerals following the unit designations on the connector label are the symbol designations of the specific connectors on the units with the letter 'J' for connectors J-607 and J-252 deleted and with the letter 'J' plus the series symbol designations for connector J-1503 deleted. The same system of marking is used for each connector on each Patch Panel. That is, the circuit is specified, following this the point or points of origin and termination of the energy is named and the last marking identifies the connector on the patch panel itself.

Throughout this section the last marking on the tab is used to specify where the patch cord is to be connected. For example, were the instructions to read 'Connect a patch cord between connectors 1J3 and 1J6 on Patch Panel SB-138/FRR-24' the technician would then connect the cord between those connectors on unit J in bay 1 where the last markings are 1J3 and 1J6. The last digit of this identification has been chosen to coincide with the numerical order of the connector's location as counted from the left of the top row of connectors on the Patch Panel. However the order employed is not consecutive in that the order employed numbers the connector spaces and in some cases all spaces are not used. In the case above 1J3 is the first connector and 1J6 is the fourth. In summation, after the technician has completed a patch, he will know the point of origin and the termination point of the particular circuits he has connected together with the patch cord.

CAUTION

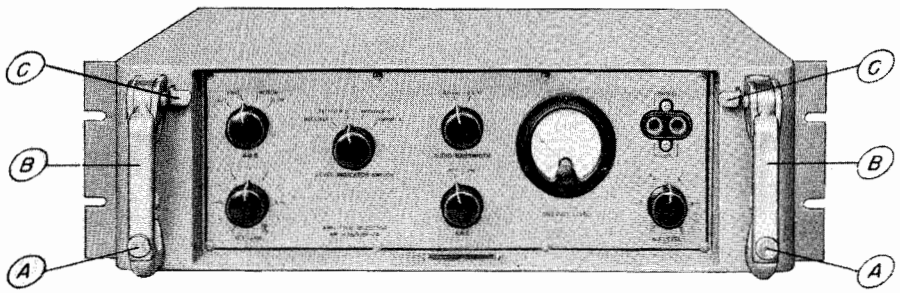
Incorrect patching can result in damage to the equipment particularly in those cases where a patch is made between connectors carrying different circuit labels. For example, connecting '50 Kc AM' to an 'AGC' circuit may result in damage to the equipment.

To guard against unwanted signal pick up and/or spurious radiation, there are connectors on the Patch Panels which are fitted with covers and/or terminating plugs. Those connectors which are to be capped when not in use have a cover or terminating plug attached to one of its mounting screws by a chain. These covering devices should be removed ONLY when the connector is to be used and if its use is ended the cover must always be replaced. The only exception to the foregoing rule is the case of connectors 4K10, 4K11 and 4K12 on Patch Panel SB-143/FRR-24. The terminating caps on these connectors MUST ALWAYS BE REMOVED when units 4D, 4E or 4F are used regardless of whether a patch cord connection is actually made to these connectors. Were the caps not removed the associated units would be conditioned for tuning purposes only and F1 signals would not reach the output circuit.

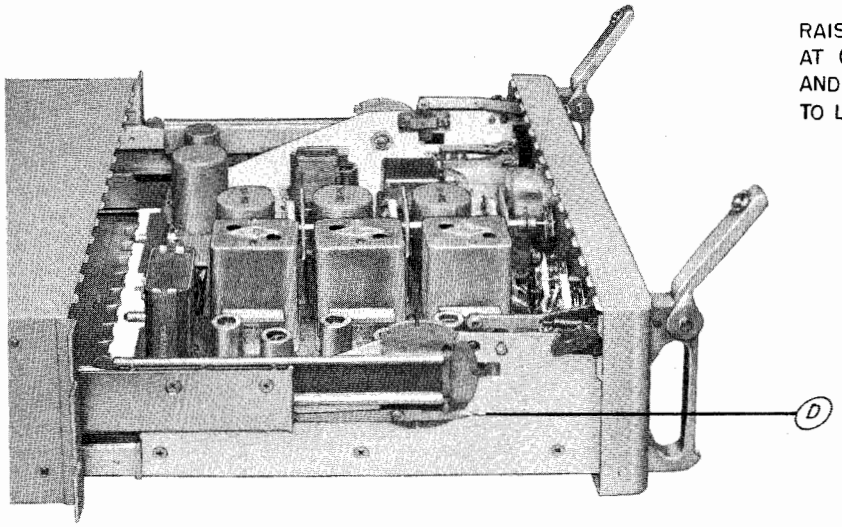
3. EMERGENCY MAINTENANCE.

Notice to Operators

Operators shall not perform any of the follow-

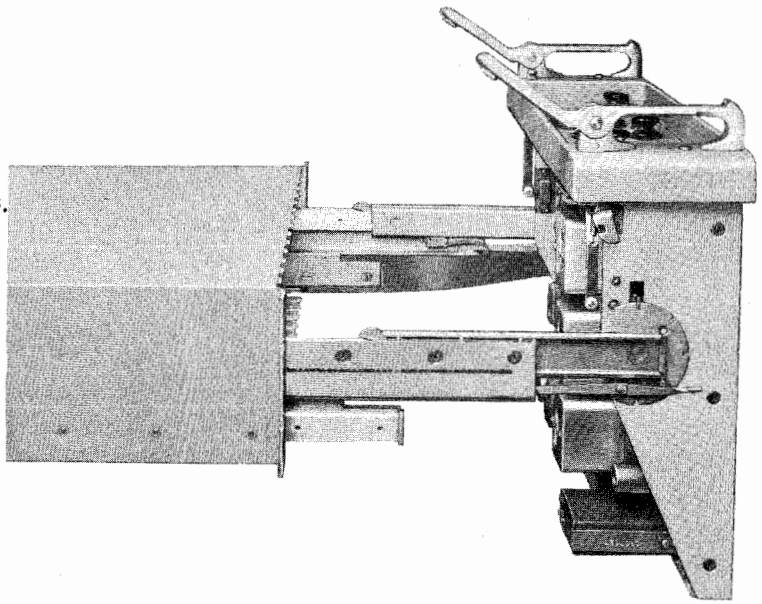


STEP ①
SLIDE LATCH HANDLE FASTENER BUTTONS AT Ⓐ UPWARD TO UNLOCK HANDLES.



STEP ②
RAISE LATCH HANDLES AT Ⓑ TO RELEASE AND WITHDRAW CHASSIS TO LOCKED POSITION.

STEP ③
PRESS TILT LEVERS AT Ⓒ TO UNLOCK PIVOT MECHANISM AND TILT CHASSIS TO ANY ONE OF THE SIX POSSIBLE LOCKED IN POSITIONS.



STEP ④
DEPRESS CHASSIS RELEASE LEVERS AT Ⓓ TO REMOVE CHASSIS FROM CABINET.

STEP ⑤
TO REPLACE CHASSIS IN CABINET FOLLOW THE ABOVE PROCEDURE IN REVERSE.

Figure 7–2. Instructions for Operation of Cabinet Slide-Tilt Mechanism

ing emergency maintenance procedures without proper authorization.

The maintenance procedures listed in the following paragraphs are for the guidance of the operator personnel during an emergency when maintenance personnel are not available.

a. INOPERATIVE RECEIVER.–If the receiver is inoperative, all patch cords associated with the particular mode of operation in use should be checked. After checking patch cords any suspected unit should be withdrawn from its cabinet to determine if there is some obvious fault that can be corrected easily. To withdraw the unit from its cabinet follow the directions outlined on Figure 7–2.

WARNING

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

(1) FUSES. *(See Figures 7–3, 7–4, 7–5 and 7–6).* –If a blower unit in a particular bay is inoperative check the blower fuses which are accessible at the front of the power supply associated with the defective blower. Two blower units are employed in bay 4, one is operated from the PP-648/FRR-24 and the other from the PP-649/FRR-24. Probable cause of fuse failure is a short circuit in the blower motor or the A.C. line to the blower. A.C. is connected to the two A.C. output receptacles on the SB-141/FRR-24 through two five-ampere fuses. Probable cause of fuse failure in this circuit is a short-circuit in the external equipment connected to the SB-141/FRR-24.

(2) ELECTRON TUBES.–All electron tubes employed in the AN/FRR-24 Radio Receiving Set are located and identified on Figures 7–7 through 7–20. If a particular tube is burned out, as observed visually by the absence of heater or filament glow or by feeling the tube to determine its temperature, the tube can be replaced by the same type of tube of proven quality. All tubes in the equipment are of the miniature-type except rectifiers, voltage regulators and oscilloscope tube. Great care is to be exercised in

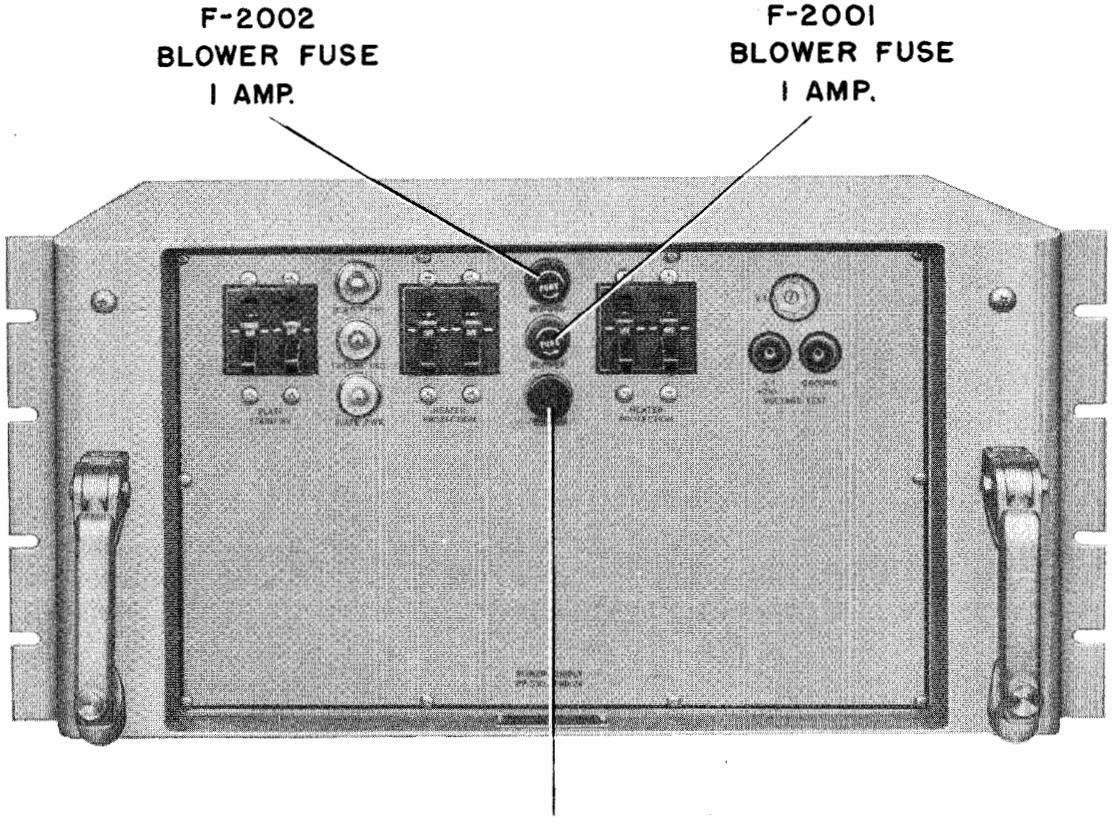


Figure 7–3. Fuse Locations, Power Supply PP-590/FRR-24

the insertion of these tubes into their sockets to prevent bending of the tube pins. To replace the rectifier and voltage regulator tubes in the power supplies it is necessary to loosen the clamp about the base of the tube.

If replacement of the oscilloscope tube becomes necessary, proceed as follows:

Step 1. Remove the transparent screen at the face of the tube by prying up the two fingers holding the screen in place. The tips of these fingers are set in niches on the inside of the oscilloscope light shield.

Step 2. Remove the tube through the opening in the front panel by pressing the tube forward until it is released from its socket.

(3) PILOT LAMP.—To replace the pilot lamp that illuminates the dial scale proceed as follows:

Step 1. Slide the Amplifier-Converter out of its cabinet.

Step 2. Loosen the 6-32 phillips head screw holding the lamp socket in place.

Step 3. Remove the defective lamp and replace it with a new one.

Step 4. Replace the lamp socket and tighten it in place. Move the chassis back into its cabinet.

(4) PROJECTION DIAL SYSTEM LAMP.—In the event of failure of the projection dial system lamp it can be replaced in the following manner:

Step 1. Slide the Amplifier-Converter out of its cabinet.

Step 2. Loosen the 6-32 phillips head screw holding the lamp socket in place.

Step 3. Remove the defective lamp and replace it with a new one.

Step 4. Because of slight differences in the size and shape of lamps, it may be necessary to make an adjustment in the position of this new lamp in the optical system. This can be done by moving the lamp socket clockwise or counterclockwise until the brightest illumination is obtained.

Step 5. Tighten the socket retaining screw and move the chassis back into its cabinet.

(5) NEON LAMPS.—All neon lamps on the front of the equipment can be easily replaced without the removal of any chassis. Unscrew the lucite jewel covering the lamp. Remove the defective lamp and replace it with a new one. Replace the lucite jewel.

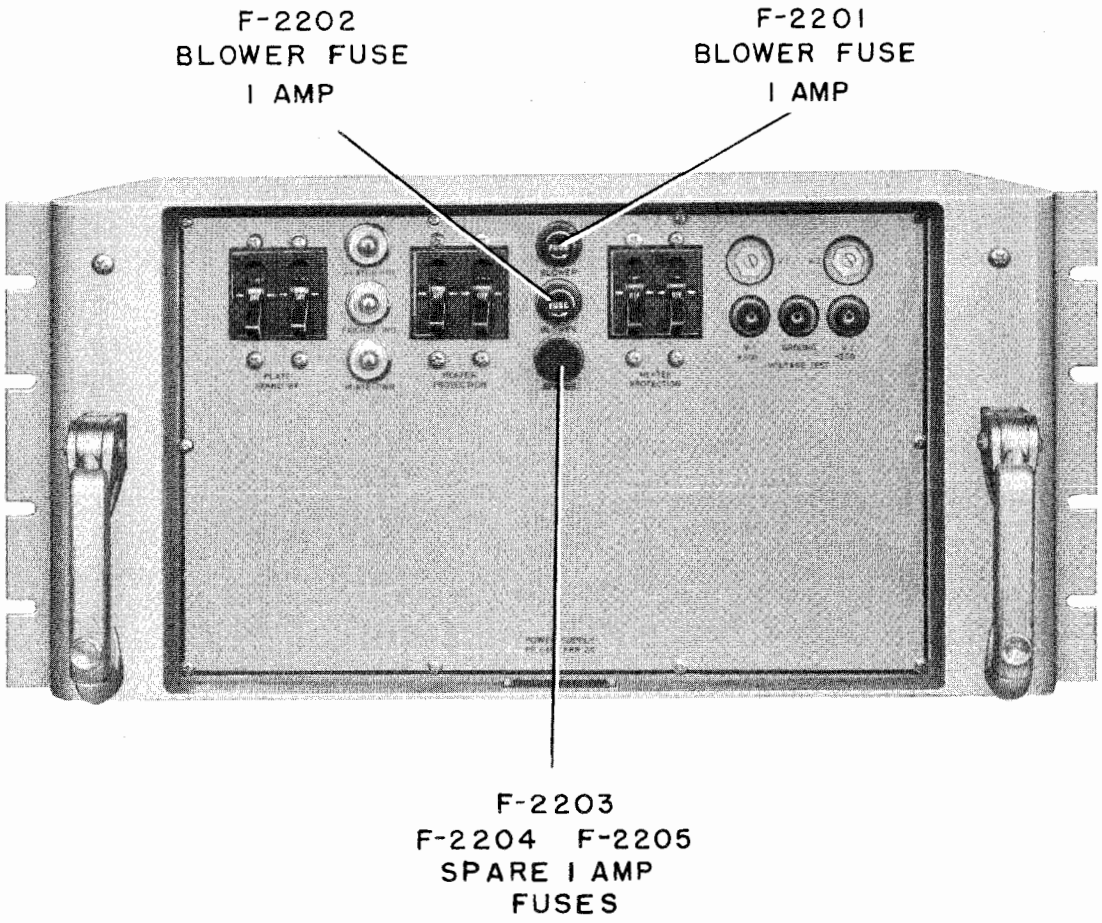


Figure 7–4. Fuse Locations, Power Supply PP-648/FRR-24

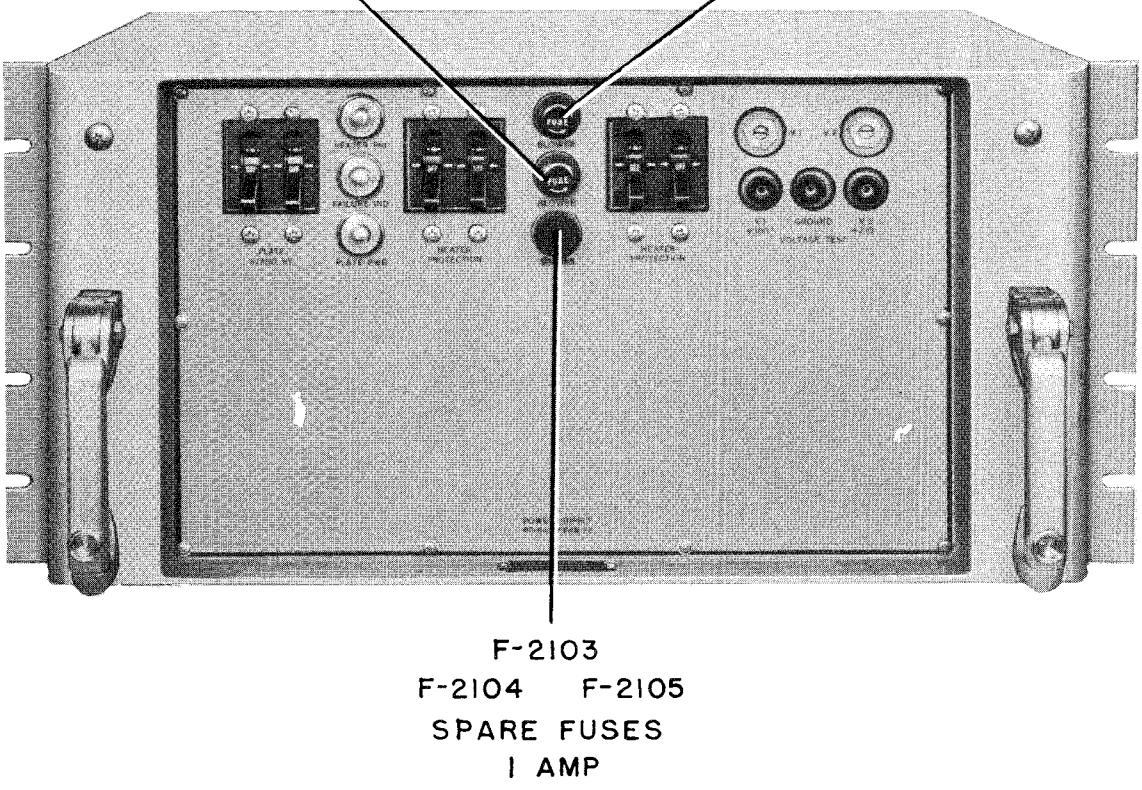


Figure 7–5. Fuse Locations, Power Supply PP-649/FRR-24

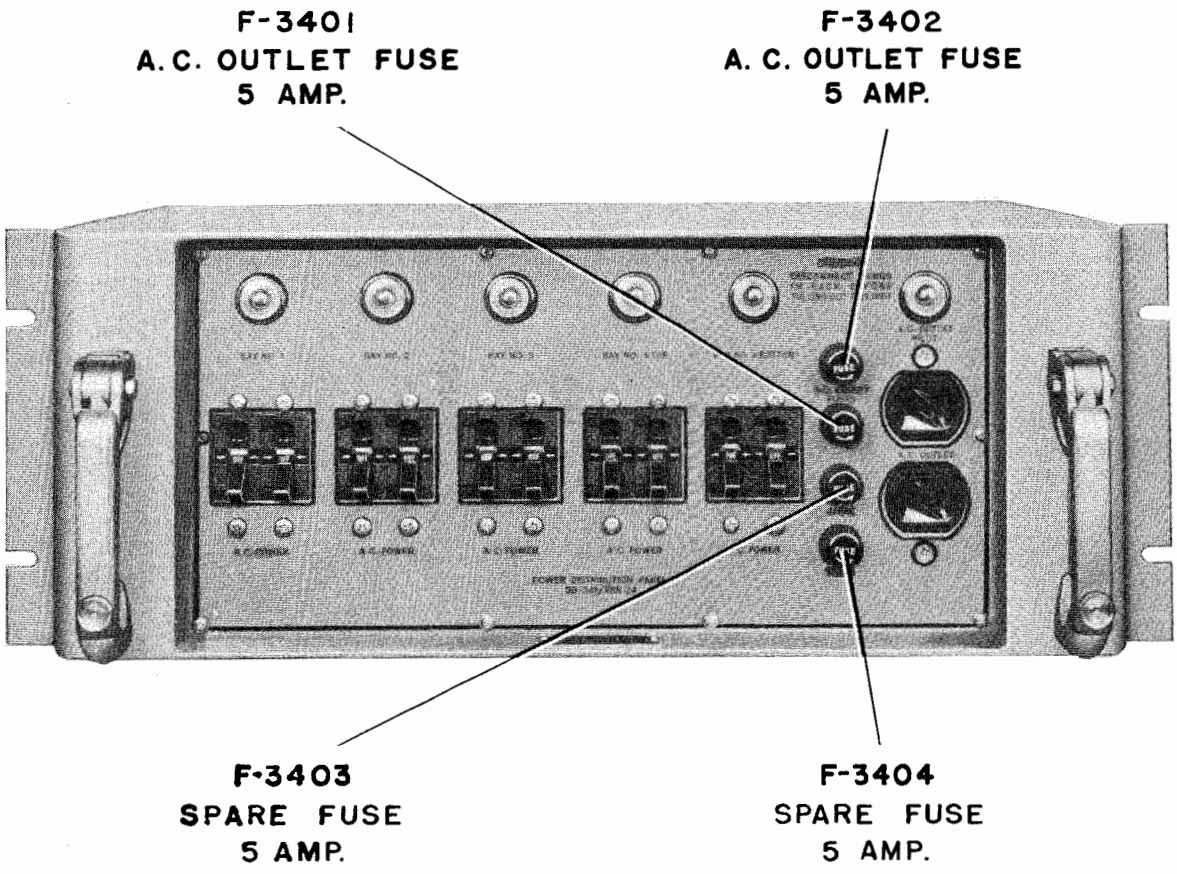


Figure 7–6. Fuse Locations, Power Distribution Panel SB-141/FRR-24

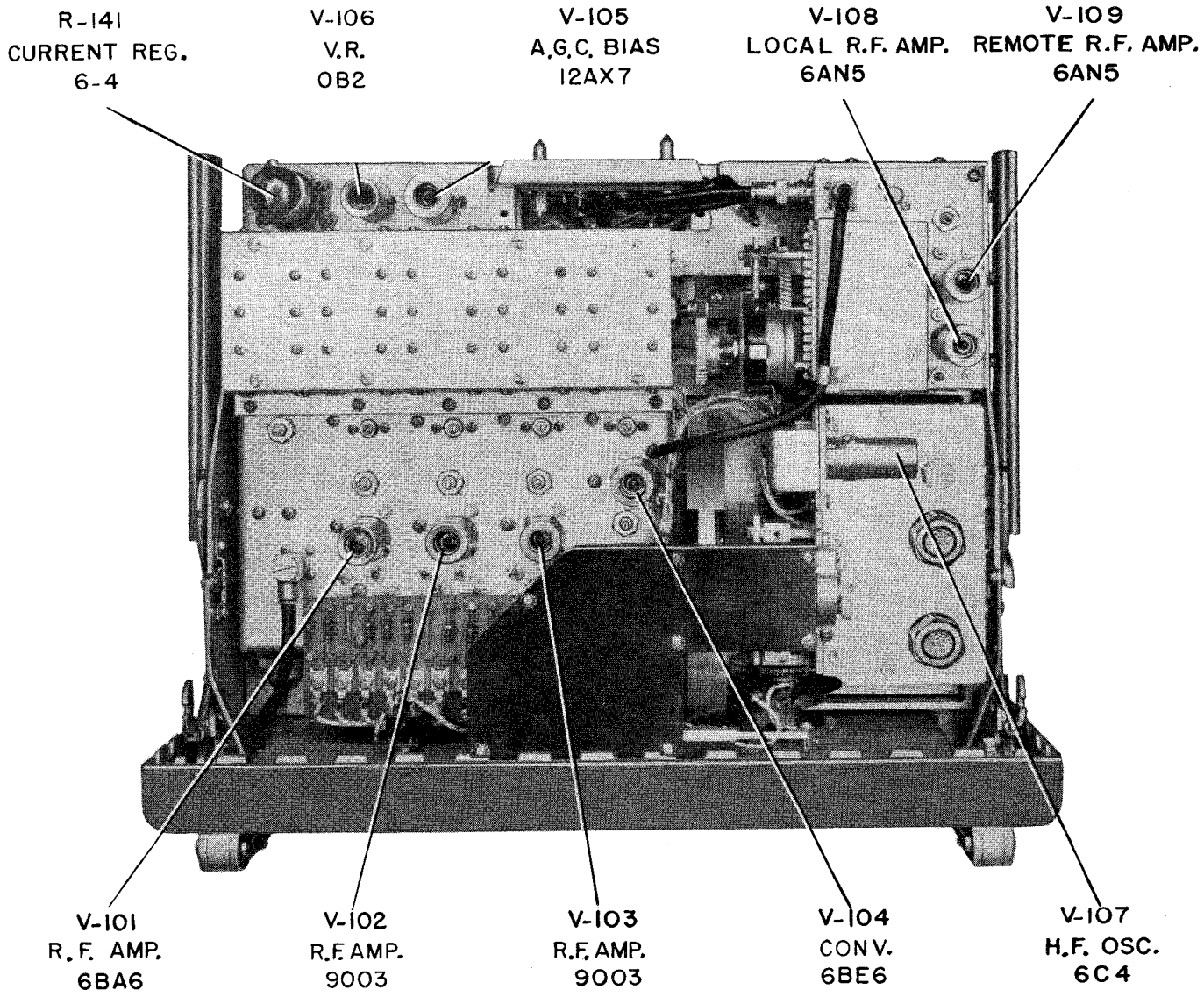


Figure 7–7. Tube Locations, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

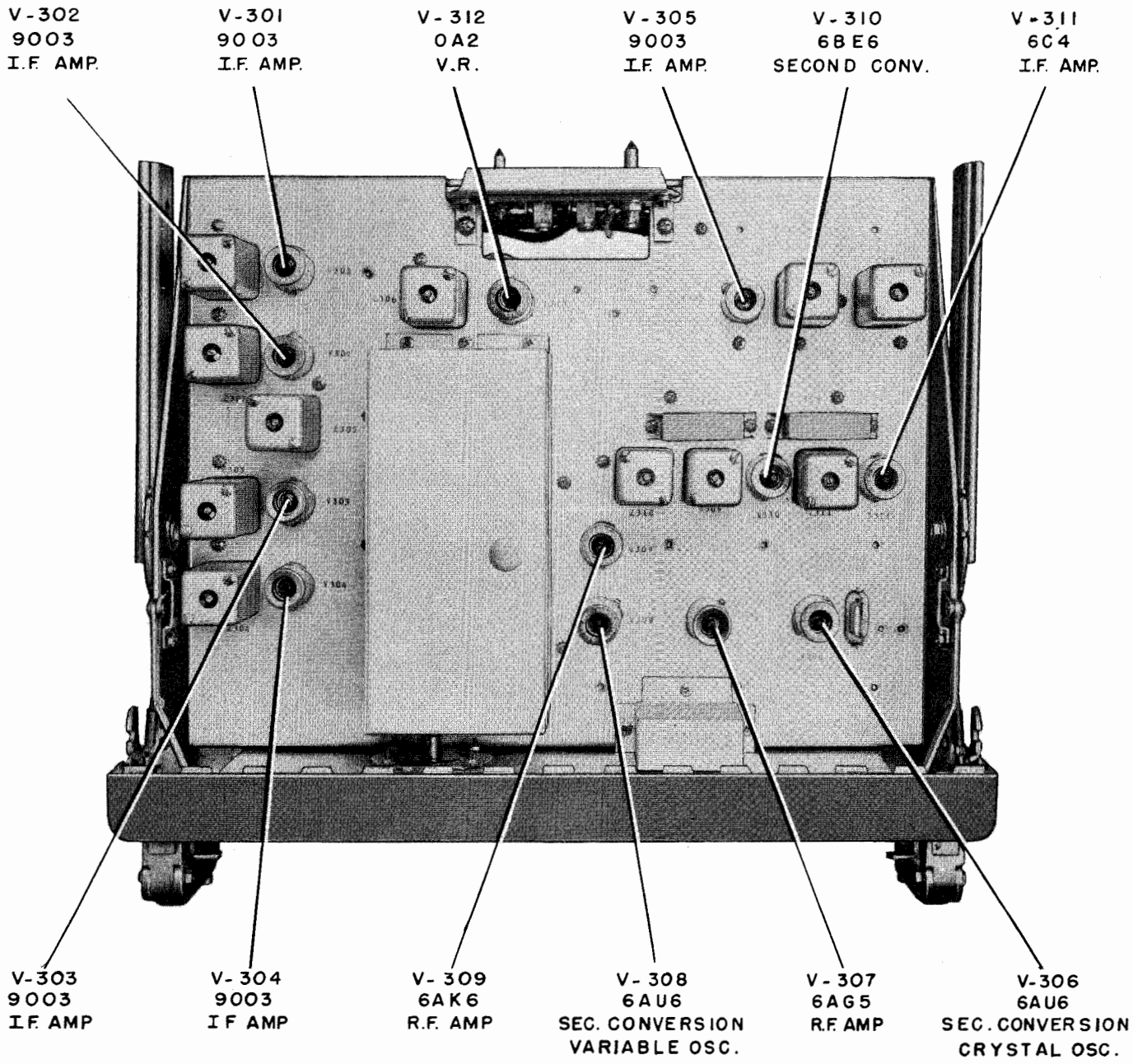


Figure 7–8. Tube Locations, Frequency-Converter CV-126/FRR-24

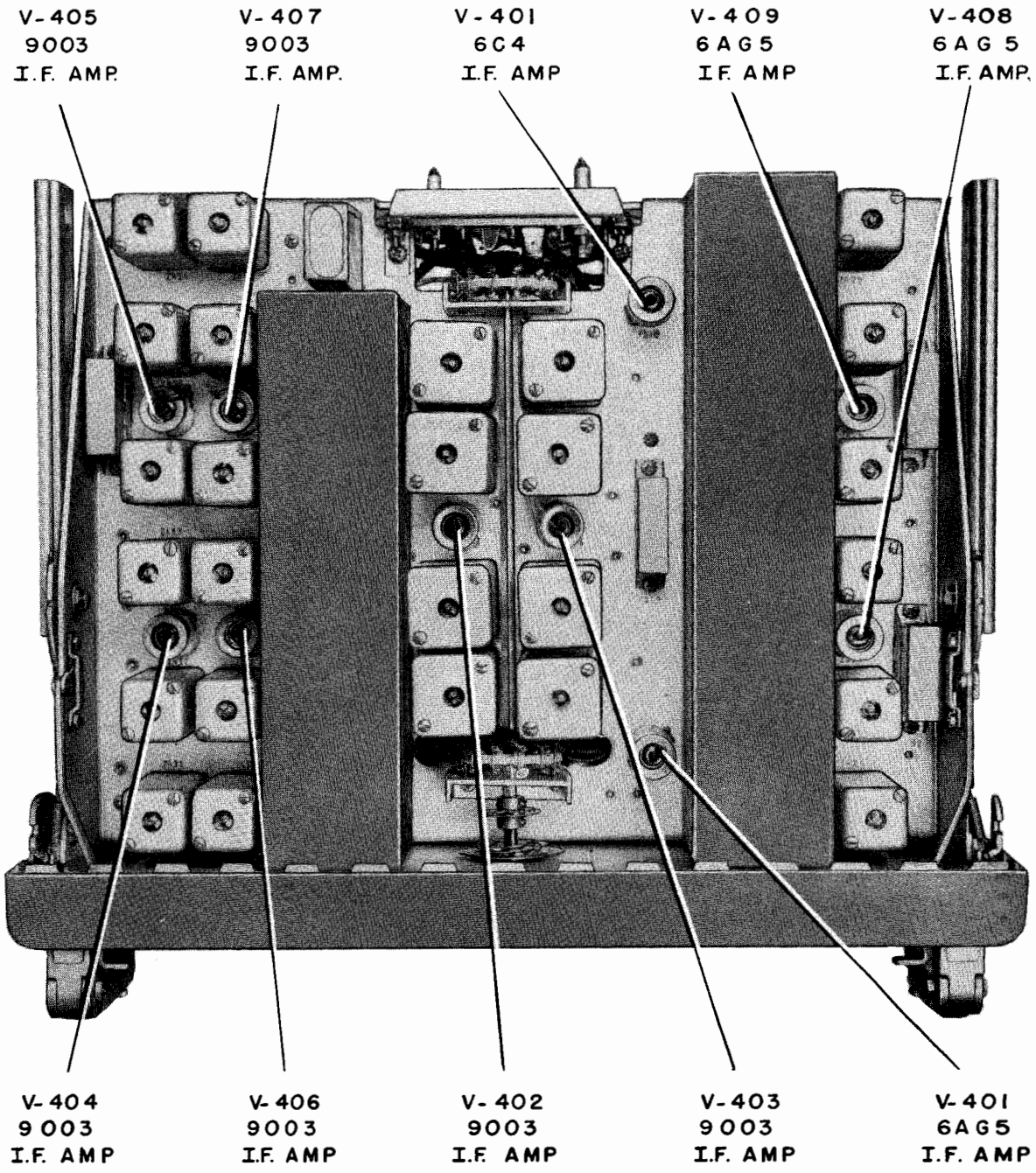


Figure 7–9. Tube Locations, Filter Assembly F-99/FRR-24

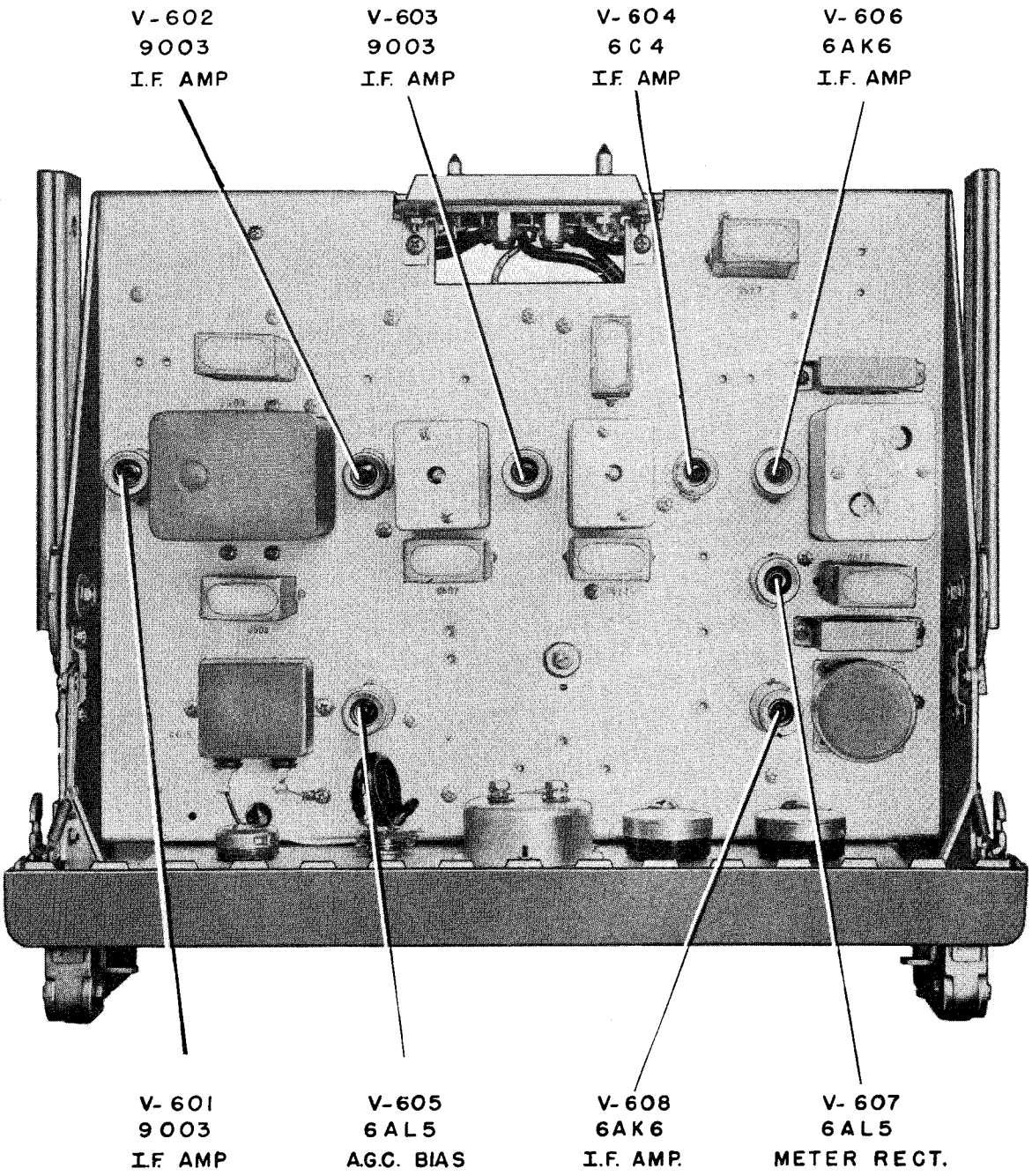


Figure 7–10. Tube Locations, R.F. Amplifier AM-454/FRR-24

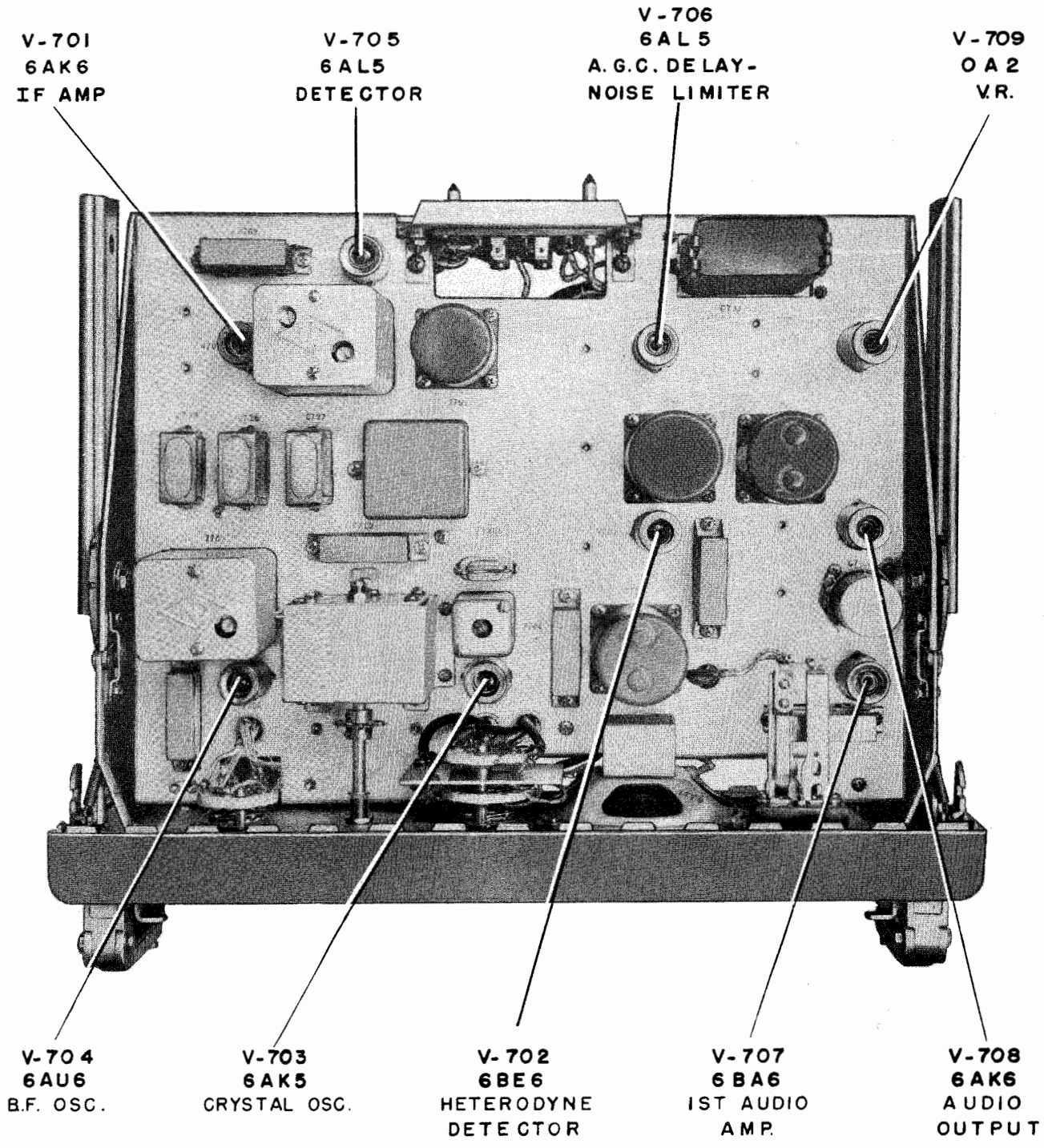


Figure 7–11. Tube Locations, Amplifier Detector AM-439/FRR-24

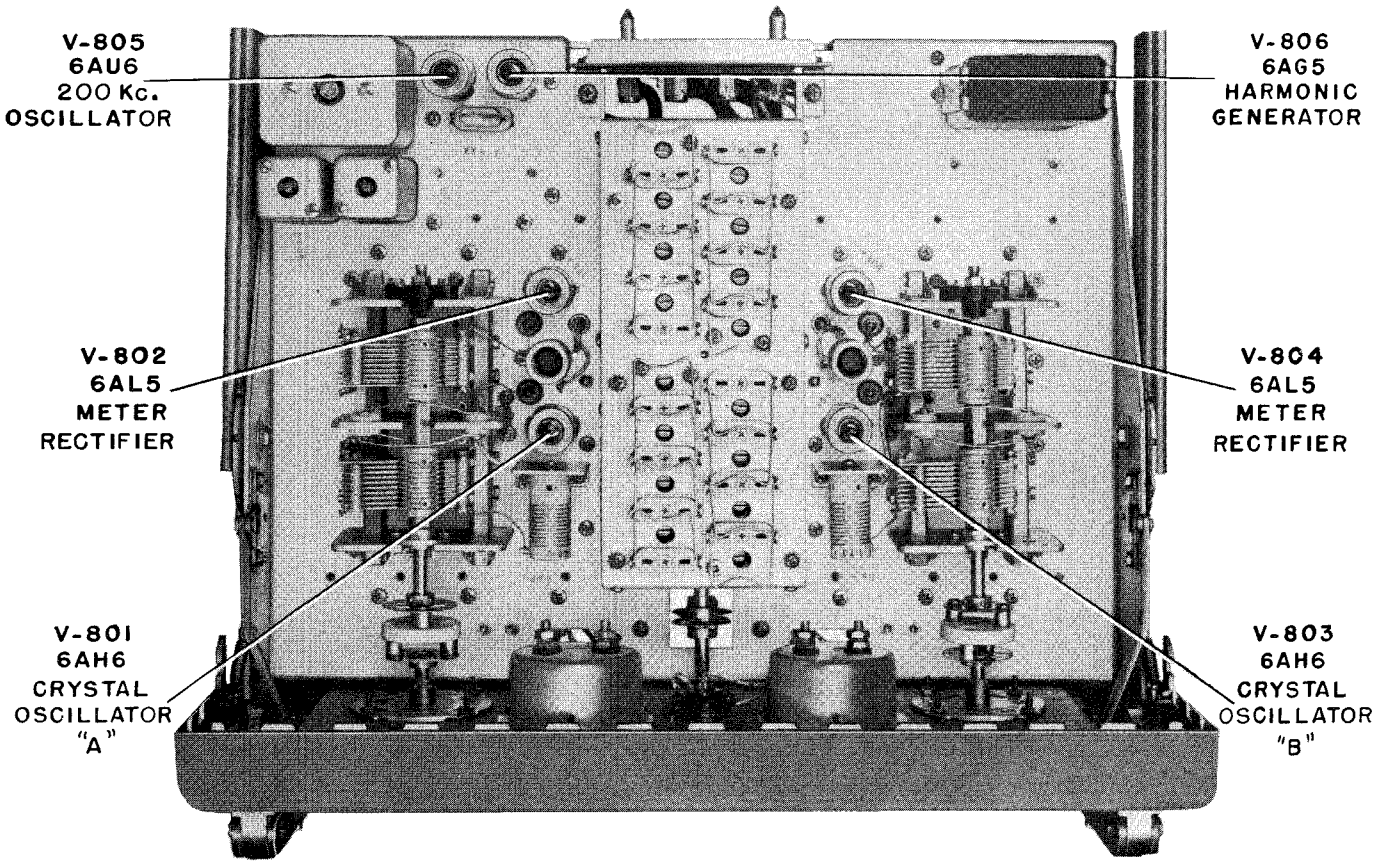


Figure 7–12. Tube Locations, Oscillator Assembly O-131/FRR-24

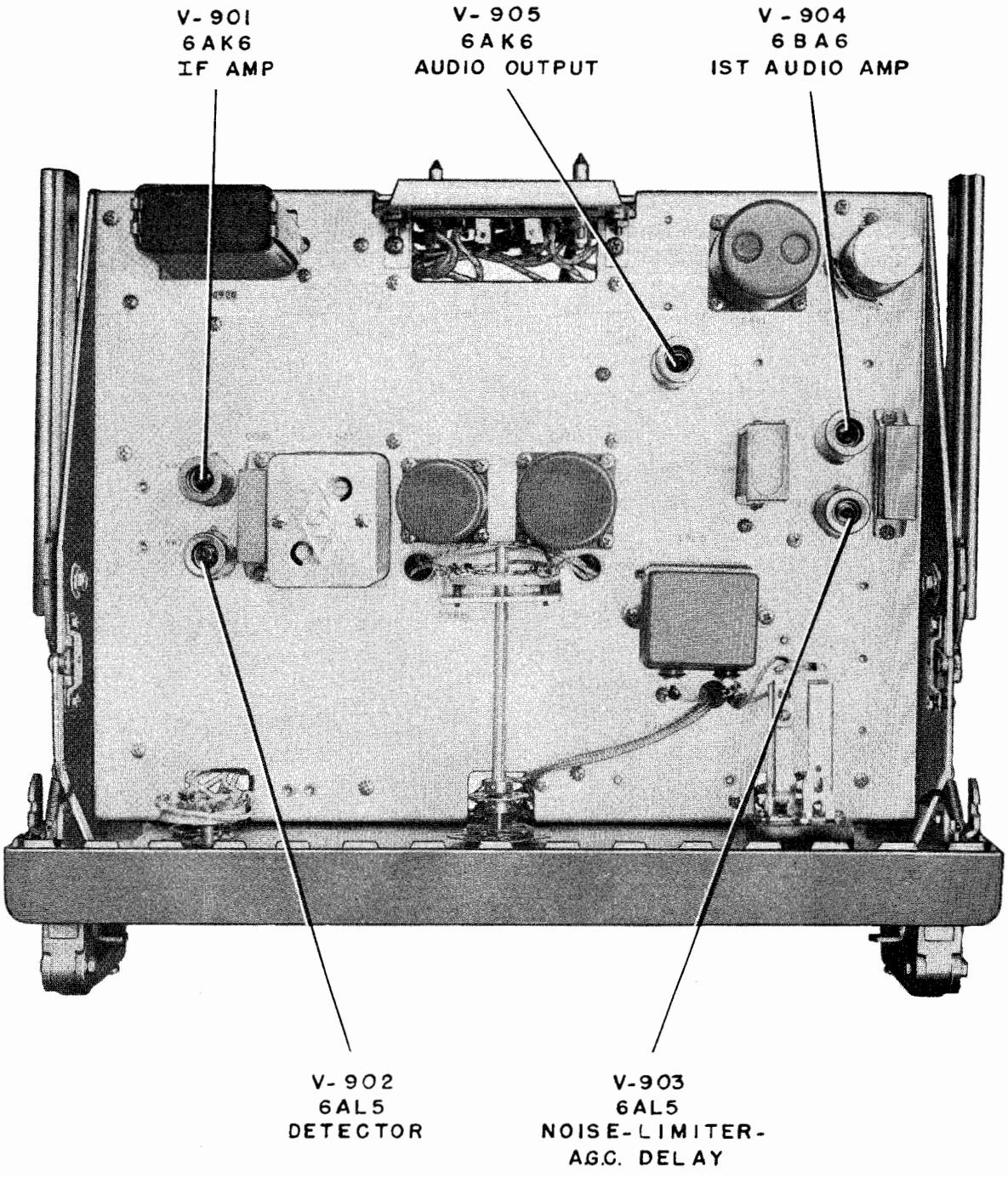


Figure 7–13. Tube Locations, Amplifier-Detector AM-440/FRR-24

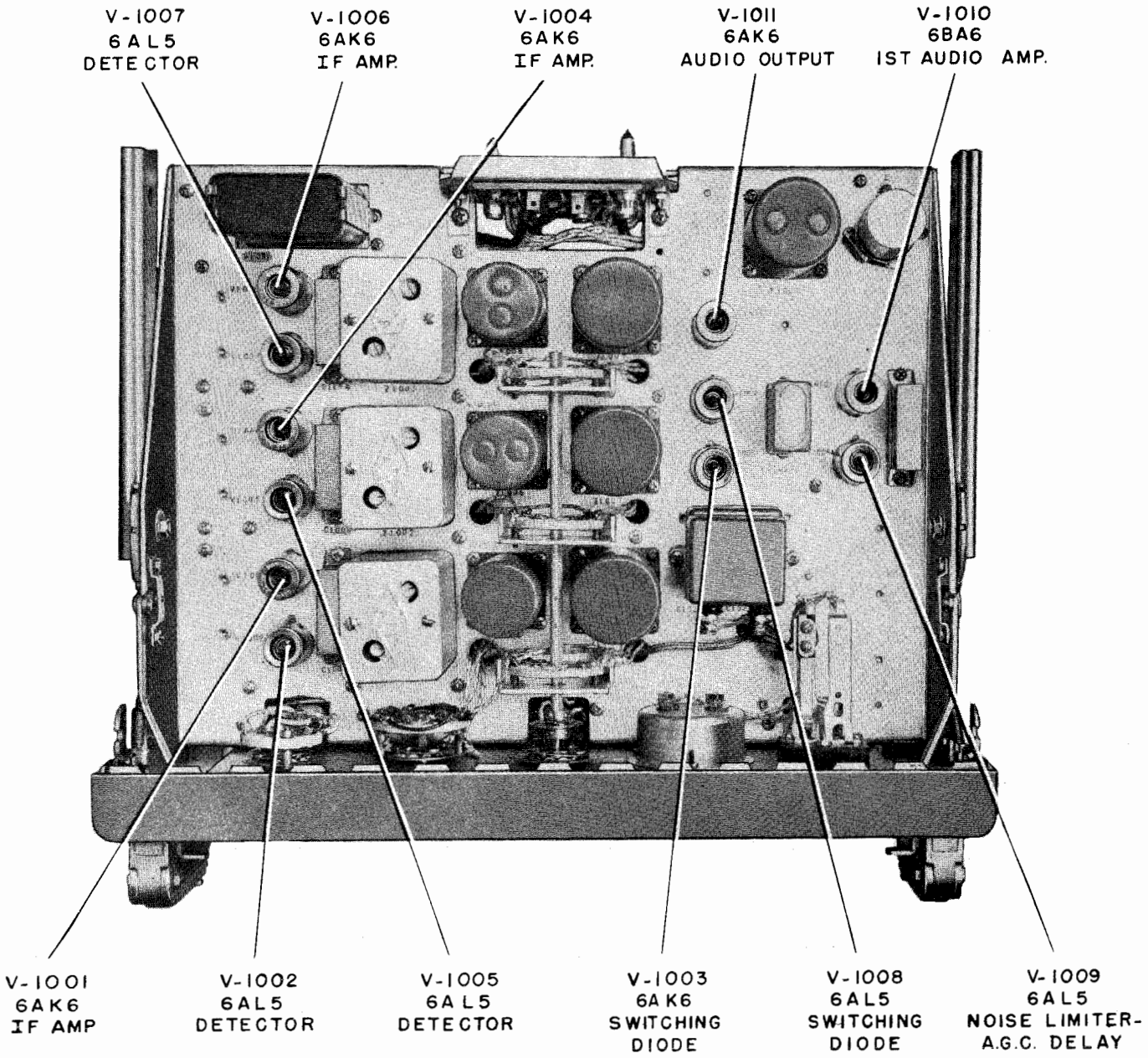


Figure 7–14. Tube Locations, Amplifier-Detector AM-438/FRR-24

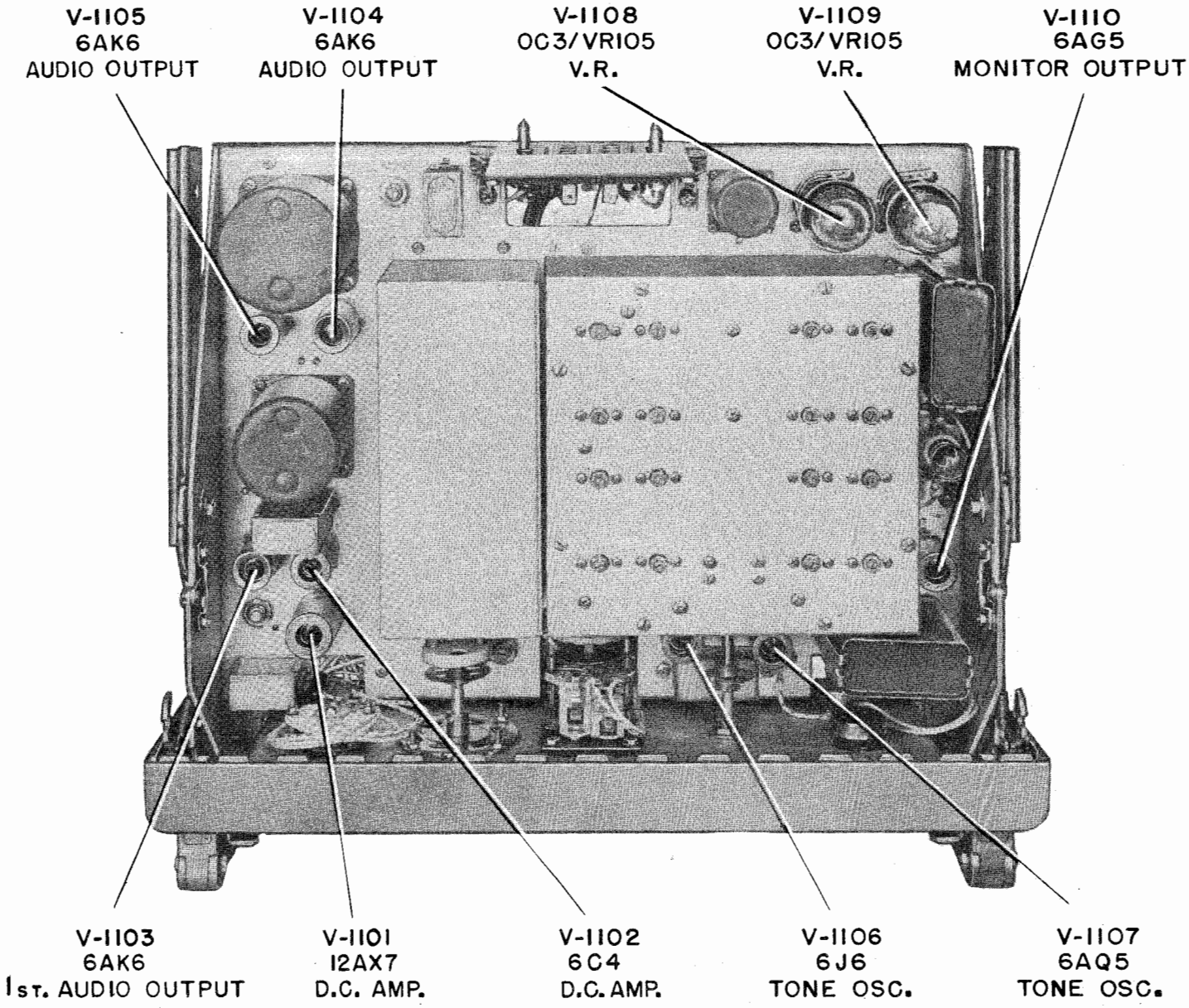


Figure 7–15. Tube Locations, Keyer KY-62/FRR-24

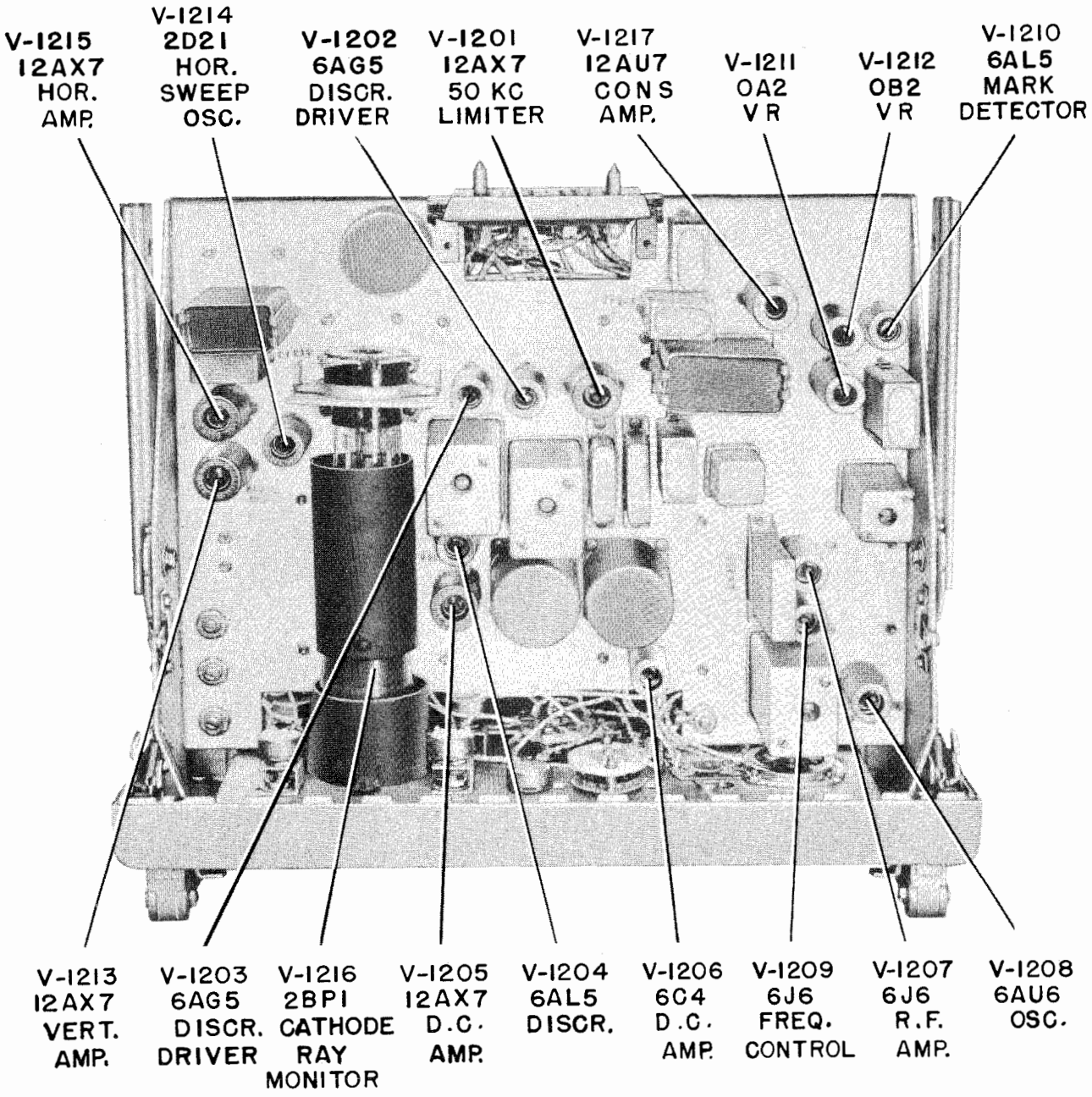


Figure 7–16. Tube Locations, F.S. Converter CV-127/FRR-24

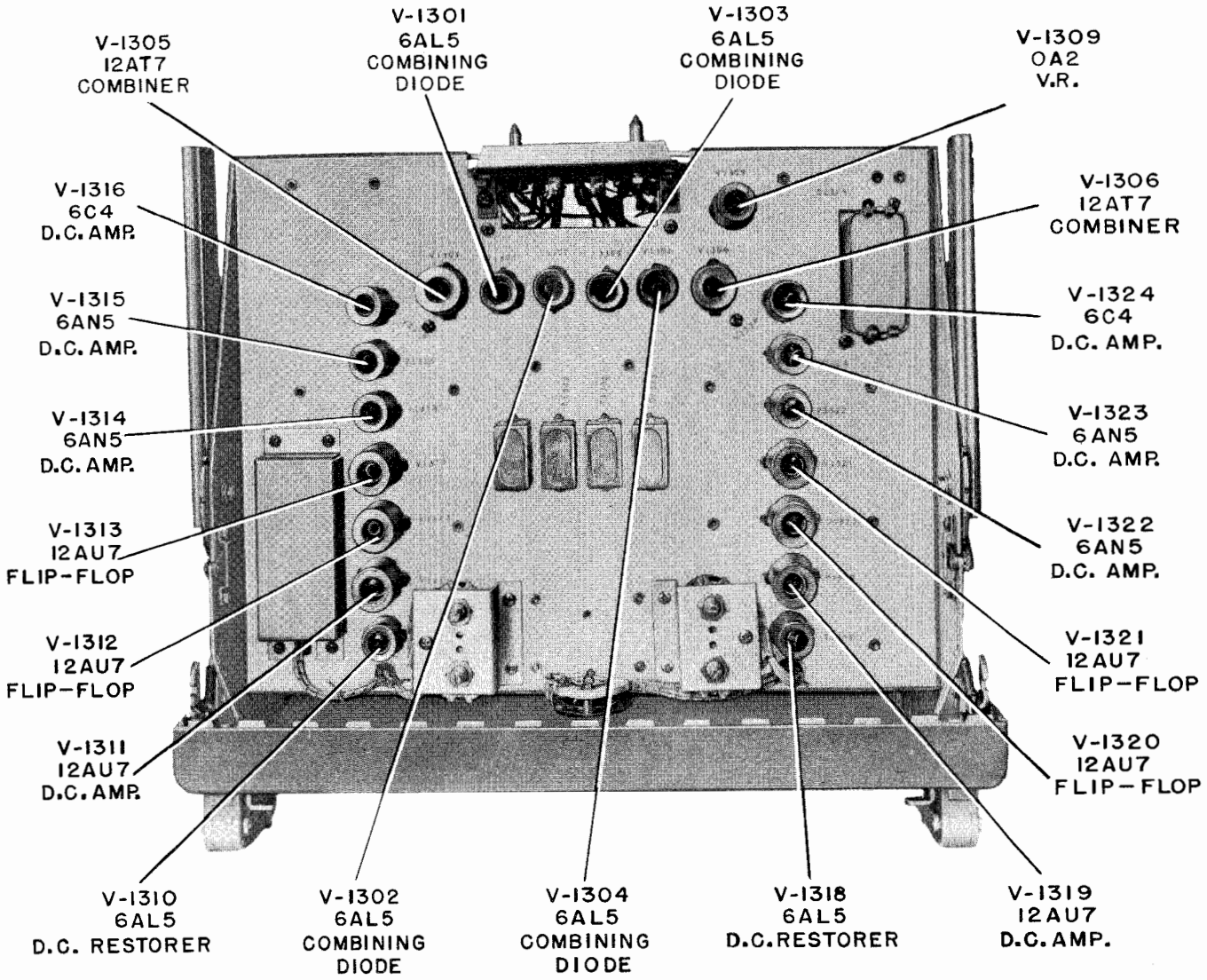


Figure 7–17. Tube Locations, Comparator Keyer CM-32/FRR-24

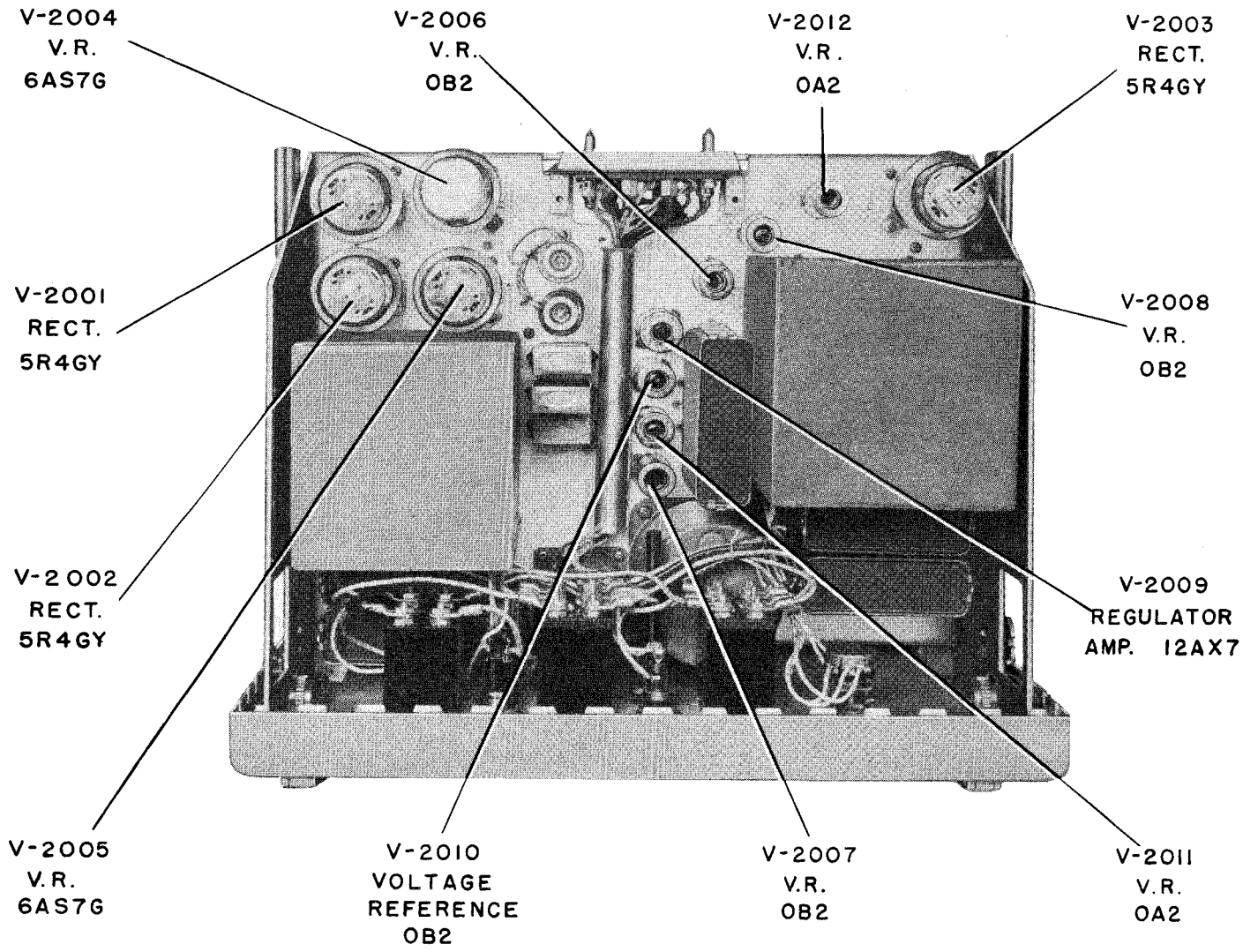


Figure 7–18. Tube Locations, Power Supply PP-590/FRR-24

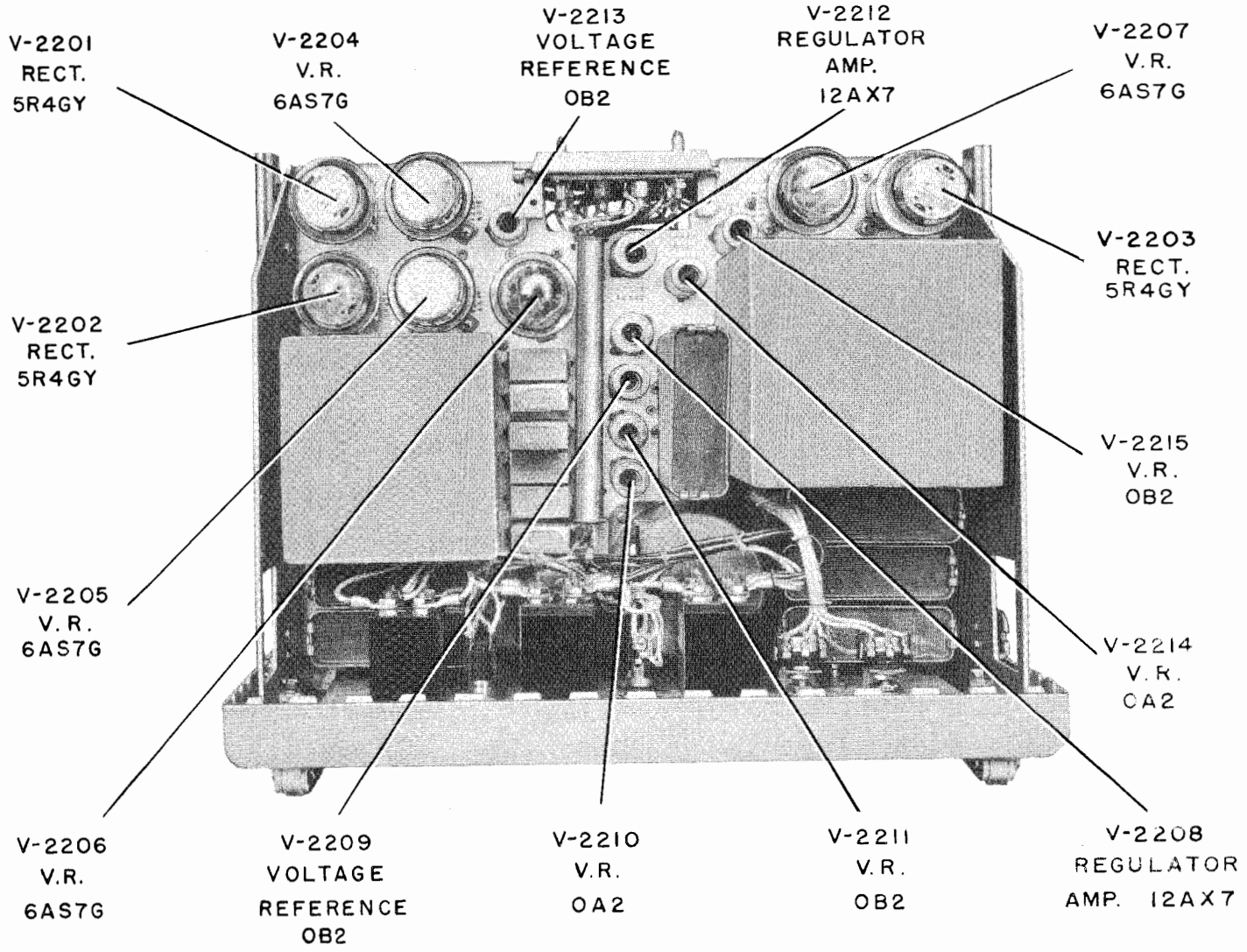


Figure 7–19. Tube Locations, Power Supply PP-648/FRR-24

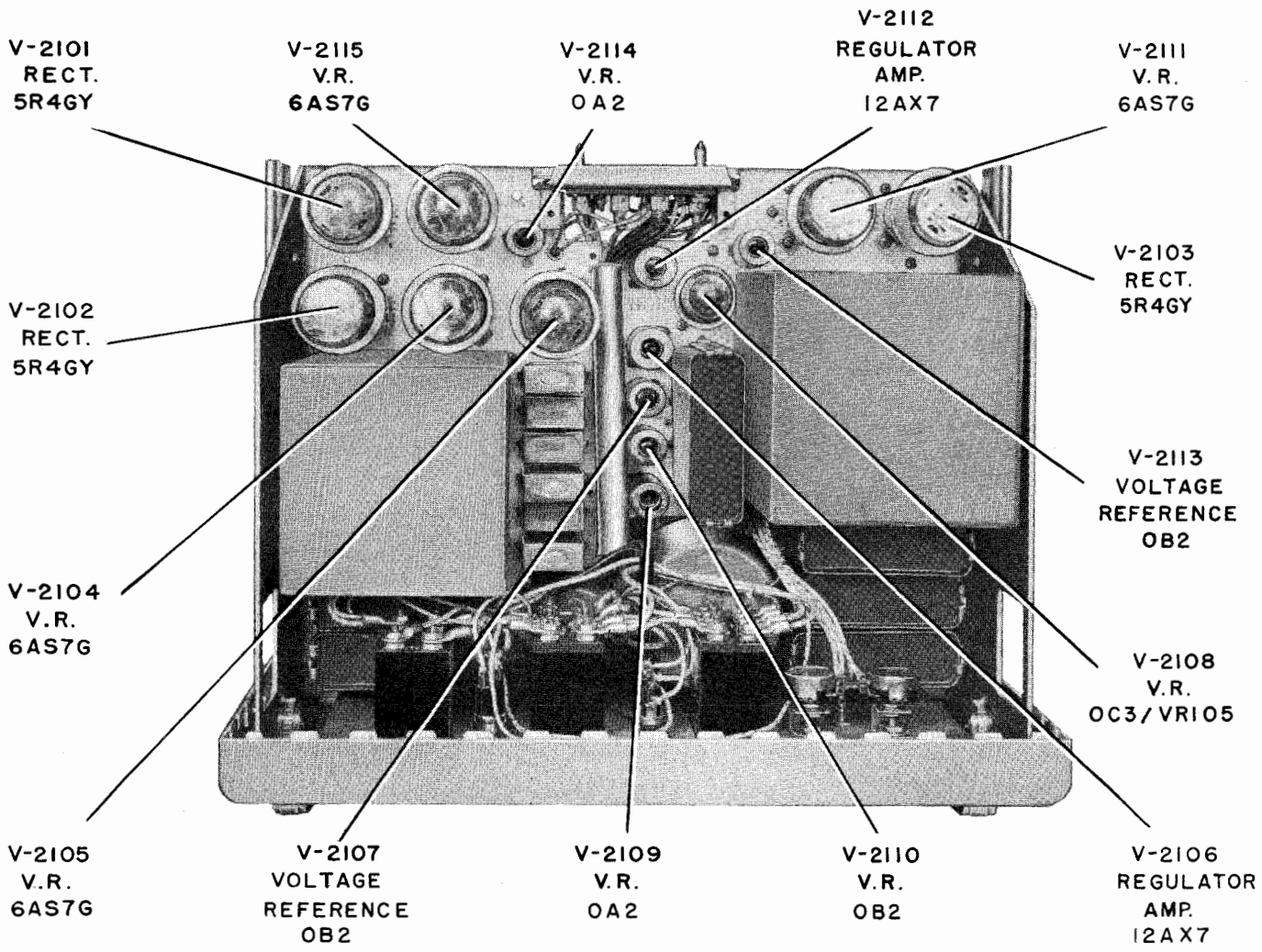


Figure 7–20. Tube Locations, Power Supply, PP-649/FRR-24

4. THEORY OF LOCALIZATION.

The manner in which the equipment operates, or fails to operate, often gives unmistakeable indications of the source of trouble. The equipment consists of several separate functional units mounted in four bays. The localization of faults should begin with a determination of the particular functional unit at fault. The unit at fault is determined by a series of tests based on the outline shown on Figure 7–21. As in most trouble shooting systems Figure 7–21 starts at the output of the AN/FRR-24 and proceeds to the antenna input circuit. Three modes of operation are depicted and it follows the technician will adhere to the chain corresponding to the mode in use. Each unit is shown either as a rectangle or circle. All units shown as circles are used as test points with the actual test points identified in the circle.

Initially the unit at fault can be localized to a specific unit or group of units by the use of the test points contained within the receiver and an R.F. signal input. If this first test confines the trouble to a group of units it will be necessary to employ signal generator AN/URM-25 in conjunction with the test points within the receiver to pin point the trouble to one specific unit.

The methods of connecting the AN/URM-25 are as follows:

METHOD A

R.F. Output X 20,000: Connect the R.F. Cable Assembly CG-409A/U (W-104) between J-101 and Test Lead CX-1363/U. R.F. Output X 20,000 is a 500 ohm, 2 volt open circuit R.F. Output.

METHOD B

R.F. Output X Mult. into load impedance of 500 ohms or more: Connect the R.F. Cable Assembly CG-409A/U (W-104) between J-102 and the Impedance Adapter MX-1074/URM-25. Connect the R.F. Cable Assembly CG-409A/U (W-105 or W-106) between the Impedance Adapter and Test Lead CX-1363/U.

METHOD C

R.F. Output X Mult. into load impedance of 70 ohms: Connect the R.F. Cable Assembly CG-409A/U (W-104) between J-102 and Test Lead CX-1363/U. Terminate the signal generator with a 180 ohm resistor (N16-R-49643-971). R.F. Output X Mult. is 53.5 ohm step attenuator output.

The procedure for localizing the trouble to a specific point is as follows:

Step 1. To check the five power supplies observe the condition of the Heater Pri. lamps, Plate Pri. lamps and Failure Indicator lamps on each unit. Proper operation is indicated by illumination of the Heater Pri. and Plate Pri. lamps and non-illumination of the Failure Indicator lamps. If improper operation is indicated on a particular power supply, that unit should be checked in accordance with the instructions in paragraph 5 of this section.

NOTE

For A3 operation proceed with Steps 2 and 5.
For A1 operation proceed with Steps 3 and 5.
For F1 operation proceed with Steps 4 and 5.

Step 2. Connect headphones to the Amplifier-Detector in use, AM-440/FRR-24 or AM-438/FRR-24. If the signal is not heard in the headphones and the 2nd.

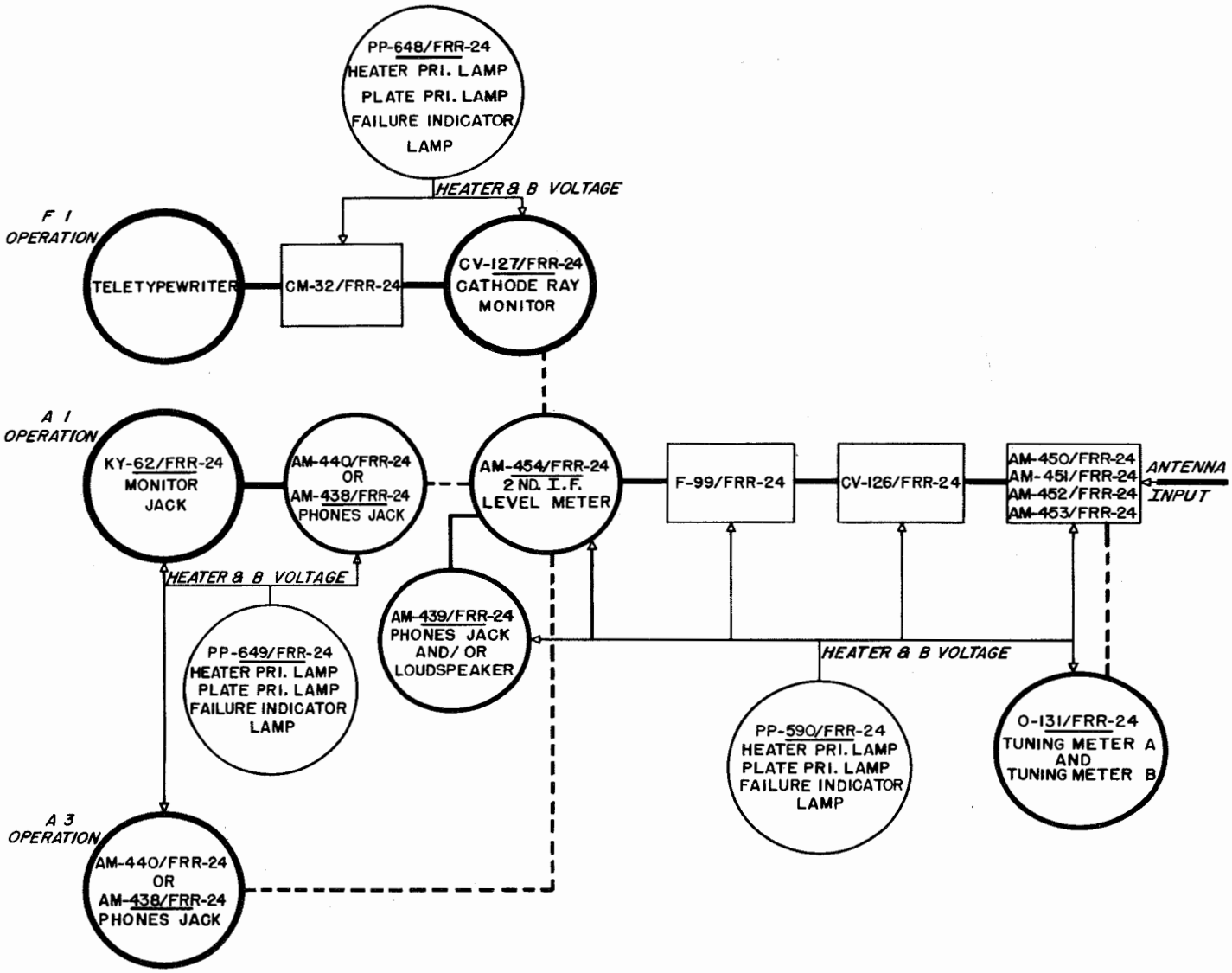


Figure 7-21. Overall Trouble Shooting Chart, AN/FRR-24 Radio Receiving Set

I.F. Level meter reading is normal (between 1-1 1/2 ma.), the defective unit is the Amplifier-Detector. If the 2nd. I.F. Level meter reading is not normal, the fault lies in the AM-454/FRR-24, F-99/FRR-24, CV-126/FRR-24 or the Amplifier-Converter unit. To localize the trouble to one of these units, see Step 5.

Step 3. Connect headphones to the Monitor jack on Keyer KY-62/FRR-24. If the signal is heard in the headphones the fault lies in the external transmission line system. Connect headphones to the Phones jack on the Amplifier-Detector in use, AM-440/FRR-24 or AM-438/FRR-24. If the signal is heard, the fault lies in Keyer KY-62/FRR-24. If the signal is not heard check the 2nd. I.F. Level meter reading. A normal meter reading (1-1 1/2) indicates the Amplifier-Detector is at fault. An abnormal meter reading indicates a faulty AM-454/FRR-24, F-99/FRR-24, CV-126/FRR-24 or the Amplifier-Converter unit. To localize the trouble to one of these units, see Step 5.

Step 4. Observe the oscillograph pattern on the CV-127/FRR-24. Compare this with the correct pattern shown on Figure 7–51. If the pattern observed is correct and the teletypewriter is not printing correctly, the fault lies in unit CM-32/FRR-24 or the terminal equipment. If this pattern is incorrect, check the reading on the 2nd. I.F. Level meter. A normal meter reading indicates unit CV-127/FRR-24 is at fault. An abnormal meter reading indicates a faulty AM-454/FRR-24, F-99/FRR-24, CV-126/FRR-24 or the Amplifier-Converter unit. To localize the trouble to one of these units, see Step 5.

NOTE

To connect the signal generator to each specific unit it is necessary to slide that unit out of its cabinet and to connect a test cable between the multiconnector on the chassis and the one on the inside of the cabinet.

Step 5. The following checks are made after Steps 2, 3 and 4 have localized the trouble to the following group of units: AM-454/FRR-24, F-99/FRR-24, CV-126/FRR-24 or the Amplifier-Converter. Disconnect the antenna and connect the signal generator AN/URM-25, in accordance with Method B, Par. 4. to the input of V-601 (TP-1, Figure 7–26) on unit AM-454/FRR-24. Set the Mod. Selector switch at off and adjust the Microvolt control on the generator to obtain a reading of one milliampere on the 2nd. I.F. Level meter. A generator output of between 35 and 75 microvolts is normal. An abnormal generator setting indicates unit AM-454/FRR-24 is at fault. If a normal generator setting is noted, disconnect the generator and connect it to the input of V-401 (TP-1, Figure 7–56) on F-99/FRR-24. Adjust the Microvolt control on the generator to obtain a reading of one milliampere on the 2nd. I.F. Level meter. A generator output of between 50 and 150 microvolts is normal. An abnormal generator setting indicates unit F-99/FRR-24 is at fault. If a normal generator setting is noted disconnect the generator and connect it to terminal 4 of Z-301 (TP-2, Figure 7–54) on unit CV-126/FRR-24. Adjust the Microvolt control on the generator to obtain a reading of one milliampere on the 2nd. I.F. Level meter. A generator output of between 5 and 15 microvolts is normal. An abnormal generator setting indicates unit CV-126/FRR-24 is at fault. If a normal generator setting is noted, the Amplifier-Converter unit is at fault. If Oscillator Assembly O-131/FRR-24 is in use its operation can be readily checked by noting the reading on Tuning Meter A or B (whichever is in use). A normal meter reading is between 300 and 400 microamperes.

5. •TROUBLE SHOOTING.

a. UNIT TROUBLE SHOOTING.–The instructions given in preceding para. 4 have localized the trouble in the receiver to a specific unit. This paragraph gives detailed instructions and data for the efficient trouble shooting of that unit. Given for each unit is is a trouble shooting chart, a voltage and resistance data chart and a tabular list of tube operating voltages and currents.

TABLE 7-1. TROUBLE SHOOTING CHART AM-450, AM-451, AM-452, AM-453/FRR-24

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
Oscillator and R.F. Amplifier Circuits V-107, V-108, V-109	Connect multimeter ME-25/U or Navy Model OBQ voltmeter between test point C-180 (See Figure 7-49) and chassis. Vary the Main Tuning capacitor over the entire tuning range. The oscillator injection voltage as measured on the voltmeter should range between 6.0 and 15.0 volts.	Tubes V-107, V-108, V-109. Oscillator circuit components. Check by voltage and resistance measurements. See Figure 7-23 and Table 7-2. Check alignment according to Par. 6. a. (4).
Converter V-104	In order to check the remaining circuits in the Amplifier-Converter units it will be necessary to calibrate the 2nd. I.F. Level meter. Connect the signal generator (in accordance with Method C, Par. 4.) between pin 4 of T-108 (TP-7, Figure 7-22) and chassis. Adjust the generator for an unmodulated output of 1000 uvs. at 1750 kc. Set the Second Conversion Osc. Selector switch on the CV-126/FRR-24 at Crystal. Set the A.G.C. switch on the R.F. Amplifier AM-454/FRR-24 at OFF and the A.M. Diversity Gain control at 10. Set the Selectivity switch on the F-99/FRR-24 at 18 kc. Adjust the R.F. Gain control on the AM-454/FRR-24 until the 2nd. I.F. Level meter reads 1.0 milliampere. Move the signal generator connection to the input of V-104 (TP-1, Figure 7-22) and chassis. Adjust the Microvolt control on the signal generator to 2800 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-104 and/or V-104 circuit components. Check by voltage and resistance measurements. See Figure 7-23and Table 7-2. Check alignment according to Par. 6. a. (4).
R.F. Amplifier V-103	Move the signal generator connection to the input of V-103 (TP-4, Figure7-22). Adjust the Microvolt control on the signal generator to 750 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-103 and/or V-103 circuit components. Check circuit components by voltage and resistance measurements. See Figure 7-23 and Table 7-2. Check alignment according to Par. 6. a. (4).
R.F. Amplifier V-102	Move the signal generator connection to the input of V-102 (TP-3, Figure 7-22). Adjust the Microvolt control on the signal generator to 350 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-102 and/or V-102 circuit components. Check circuit components by voltage and resistance measurements. See Figure 7-23 and Table 7-2.

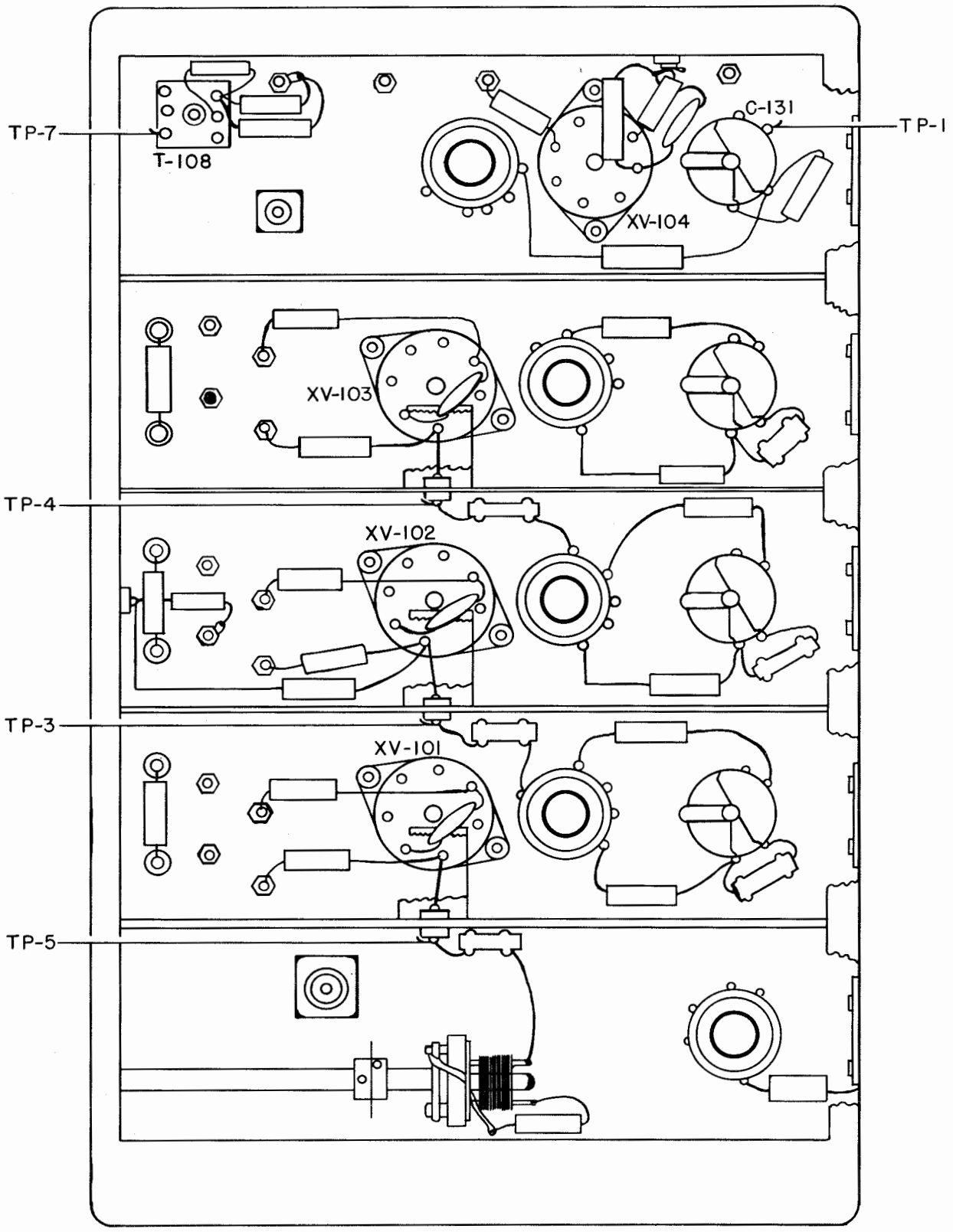


Figure 7–22. Test Point Locations Bottom of R.F. Amplifier Compartment, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

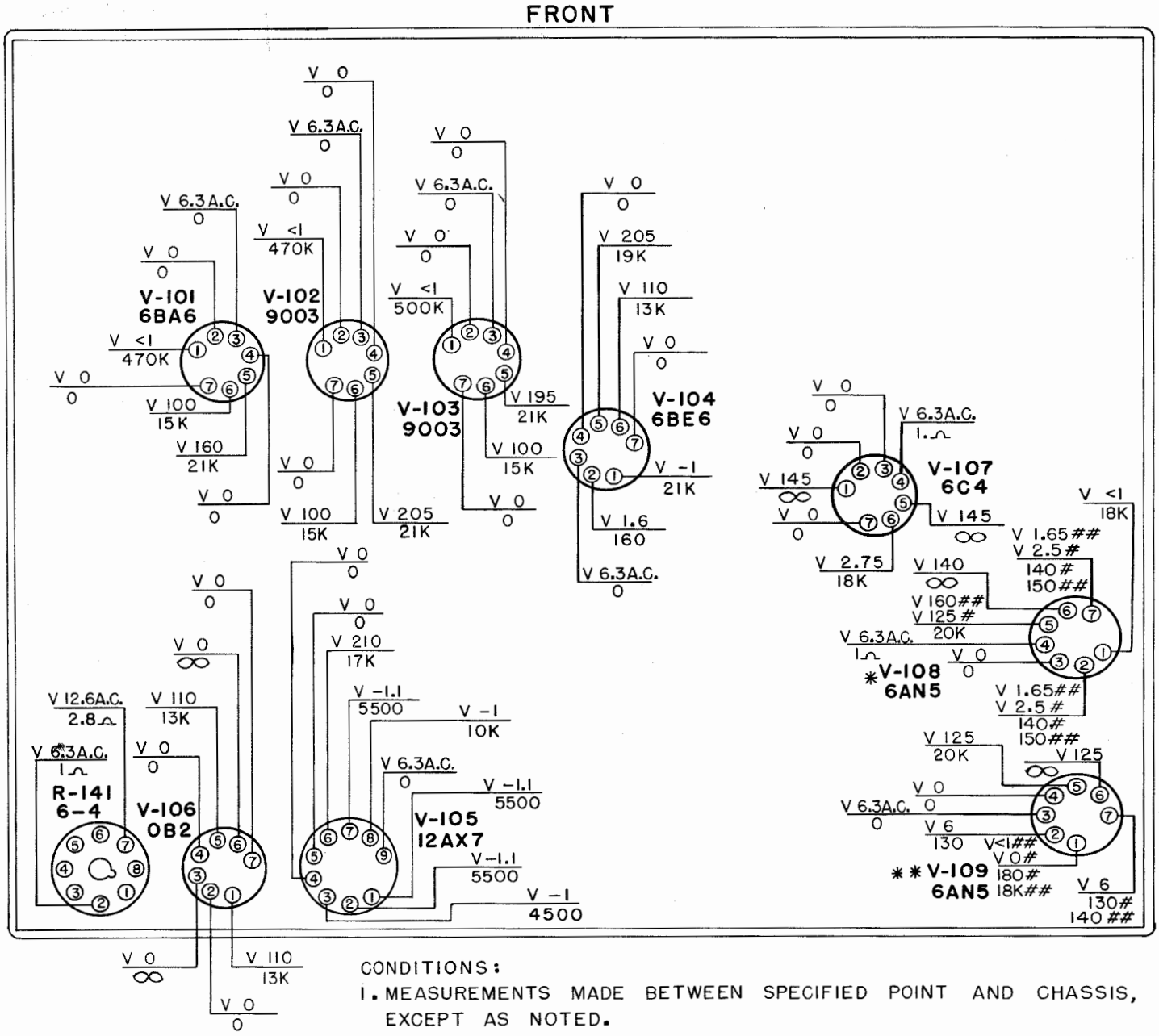
TABLE 7–1. TROUBLE SHOOTING CHART AM-450, AM-451, AM-452, AM-453/FRR-24 (CONT'D)

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
R.F. Amplifier V-102 (cont'd)		Check alignment according to Par. 6. a. (4).
R.F. Amplifier V-101	Move the signal generator connection to the input of V-101 (TP-5, Figure 7–22). Adjust the Microvolt control on the signal generator to 35 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-101 and/or V-101 circuit components. Check circuit components by voltage and resistance measurements. See Figure 7–23 and Table 7–2. Check alignment according to Par. 6. a. (4).
Antenna Input	Remove cable W-101 from J-102. Connect the signal generator to connector J-102 (TP-2, Figure 7–49). Adjust the Microvolt control on the signal generator to 6.5 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Antenna Trimmer C-102. Readjust. Check alignment according to Par. 6. a. (4).
Lamp I-102	Turn Dimmer Control in a clockwise direction. Brightness should increase.	Replace lamp if necessary.
Lamp I-101	Set Projection Dial switch at ON, pilot lamp should light.	Replace lamp if necessary.

TABLE 7-2. TUBE OPERATING VOLTAGES AND CURRENTS AM-450, 1, 2, 3/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	*SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
6BA6	R.F. Amp.	160	11.1	95	5.3	0	0	-1.3	6.3
9003	R.F. Amp.	185	4.2	97	2	0	0	-2.8	6.3
9003	R.F. Amp.	185	4.2	97	2	0	0	-2.8	6.3
6BE6	Converter	195	2.2	103	6	-6 to -20	1.5	0	6.3
1/2 12AX7**	A.G.C. Bias	210	0.5	--	--	--	1.3	-3	6.3
1/2 12AX7***	A.G.C. Bias	-3	--	--	--	--	-2.4	-3	--
6AN5#	Local R.F. Amp.	160	16	140	3.2	--	2.5	-6 to -20	6.3
6AN5##	Remote R.F. Amp.	160	16	140	3.2	--	2.5	-6 to -20	6.3
6C4	H.F. Oscillator	140	8.9	--	--	--	--	-10 to -25	6.3
OB2	Voltage Regulator	105	13	--	--	--	0	--	--

*Logging Dial set at 50.
**Pin nos. 6, 7, 8.
***Pin nos. 1, 2, 3.
#Heterodyne Osc. Switch set at Local.
##Heterodyne Osc. Switch set at Remote.



CONDITIONS:

1. MEASUREMENTS MADE BETWEEN SPECIFIED POINT AND CHASSIS, EXCEPT AS NOTED.
2. 1000 OHM/VOLT METER USED.
3. NO SIGNAL INPUT.
4. POWER ON FOR VOLTAGE MEASUREMENTS. UNIT DISCONNECTED FOR RESISTANCE MEASUREMENTS.
5. A.G.C. SWITCH "OFF."
6. R.F. GAIN CONTROL AT 10.
7. MAIN TUNING DIAL AT 0.
8. ALL VOLTAGES D.C. EXCEPT AS NOTED.

* HETERODYNE OSCILLATOR SWITCH AT LOCAL.
** HETERODYNE OSCILLATOR SWITCH AT REMOTE.
# AM-452/FRR-24
AM-450, AM-451, AM-453/FRR-24

Figure 7-23. Voltage and Resistance Data Chart, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

TABLE 7–3. TROUBLE SHOOTING CHART CV-126/FRR-24

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
Second Conversion Crystal Oscillator V-306	Connect voltmeter ME-25/U or OBQ between pin 1 of V-310 and chassis (TP-7, Figure 7–54). Set the Second Conversion Oscillator Selector switch S-301 at Crystal. A negative reading of 8.0 volts should be obtained on the meter.	Tube V-306 and/or V-306 circuit components. Check circuit components by voltage and resistance measurements. See Figure 7–24 and Table 7–4. Check oscillator alignment according to Par. 6. a. (6). (b). Check transformer Z-309 alignment according to Par. 6. a. (2). a.
Second Conversion Variable Oscillator V-308	Change the setting of switch S-301 to V.F.O. A negative reading of 5.0 volts should be obtained on the meter.	Tube V-308 and/or V-308 circuit components. Check circuit components by voltage and resistance measurements. See Figure 7–24 and Table 7–4. Check oscillator alignment according to Par. 6. a. (6). (b).
R.F. Amplifier V-307	Set the Second Conversion Oscillator Selector switch at Ext. Connect signal generator AN/URM-25 in accordance with Method C, Par. 4 to the input side of C-335 (TP-8, Figure 7–54). Adjust the generator output to 1700 kc. at 0.1 volt. A negative reading of between 0.6 and 2 volts should be obtained on the voltmeter.	Tube V-307 and/or V-307 circuit components. Check circuit components by voltage and resistance measurements. See Figure 7–24 and Table 7–4.
Second Converter V-310	Connect the multimeter ME-6/U between pin 7 of V-311 (TP-9, Figure 7–54) and chassis. Connect a .001 mfd capacitor (N16-C-31090) in series with the positive lead and a 100,000 ohm resistor (N16-R-50633-0971) across the meter to eliminate any possibility of hum pickup. Connect the signal generator AN/URM-25 between terminal 1 of Z-308 (TP-3, Figure 7–54) and chassis. Connect the generator according to Method B, Par. 4. Adjust the Microvolt control on the signal generator to 0.008 volt and set the output frequency at 1750 kc. Set the Mod. Selector switch at OFF. A reading of approximately 0.01 volt should be obtained on the ME-6/U.	Tube V-310 or V-311 and/or V-310 or V-311 circuit components. Check components by voltage and resistance measurements. See Figure 7–24 and Table 7–4. Check alignment according to Par. 6. a. (3). (a).

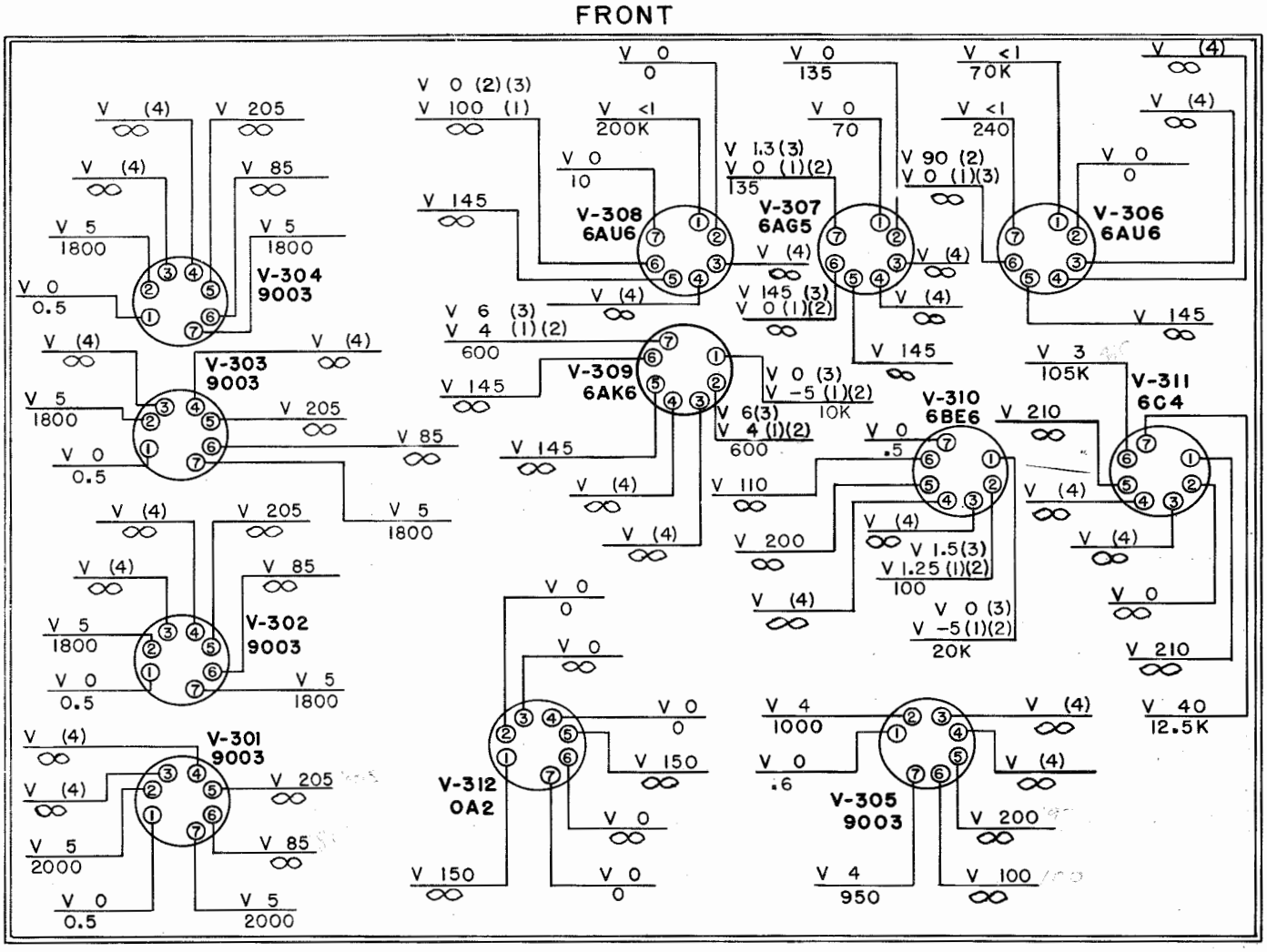
TABLE 7–3. TROUBLE SHOOTING CHART CV-126/FRR-24 (CONT'D)

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
I.F. Amplifier V-305	Adjust the signal generator R.F. output for 15,000 uvs. at a frequency of 1750 kc. and move the output lead to the input of V-305 (TP-10, Figure 7–54). A reading of 0.01 volt should be obtained on the ME-6/U.	Tube V-305 and/or V-305 circuit components. Check components by voltage and resistance measurements. See Figure 7–24 and Table 7–4.
I.F. Amplifiers V-301 through V-304	Change the signal generator connection in accordance with Method C, Par. 4. Adjust the generator for an unmodulated output of 0.025 volt at 1750 kc. Connect the ground lead of the generator to chassis and move the output lead alternately to terminal 4 of Z-301 (TP-2, Figure 7–54), to terminal 4 of Z-302 (TP-1, Figure 7–54), to terminal 4 of Z-303 (TP-4, Figure 7–54) and terminal 4 of Z-304 (TP-5, Figure 7–54). A reading of approximately 0.01 volt should be obtained on the ME-6/U at each position.	Tubes V-301, V-302, V-303, V-304 and/or V-301, V-302, V-303, V-304 circuit components. Check components by voltage and resistance measurements. See Figure 7–24 and Table 7–4. Check alignment according to Par. 6. a. (1). (b).

TABLE 7-4. TUBE OPERATING VOLTAGES AND CURRENTS CV-126/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
9003	I.F. Amp. (V-301)	210	1.97	89	0.88	4.6	4.6	0	6.3
9003	I.F. Amp. (V-305)	205	3.0	100	1.2	4.2	4.2	0	6.3
6AU6*	Crystal Osc.	145	3.1	98	0.9	0	0.9	-10.6	6.3
6AG5**	R.F. Amp.	146	3.0	148	0.96	0.9	0.9	0	6.3
6AU6***	V.F.O.	148	3.0	105	0.8	0	0.2	0	6.3
OA2	V.R.	150	20	--	--	--	0	--	--
6AK6***	R.F. Amp.	145	4.5	147	1	3.6	3.6	-6.4	6.3
6BE6***	Second Conv.	205	4.6	114	7.87	--	1.3	-13	6.3
6C4	I.F. Amp.	210	3.3	--	--	--	43	4	6.3
9003	I.F. Amp. (V-302)	210	1.98	94	0.88	5	5	0	6.3
9003	I.F. Amp. (V-303)	210	1.97	90	0.88	4.8	4.8	0	6.3
9003	I.F. Amp. (V-304)	210	1.96	94	0.88	4.8	4.8	0	6.3

*Second Conv. Osc. Selector switch at Crystal.
**Second Conv. Osc. Selector switch at External.
***Second Conv. Osc. Selector switch at V.F.O.



CONDITIONS:

1. MEASUREMENTS MADE BETWEEN SPECIFIED POINT AND CHASSIS EXCEPT AS NOTED.
2. 1000 OHM/VOLT METER USED.
3. NO SIGNAL INPUT.
4. POWER ON FOR VOLTAGE MEASUREMENTS.
   UNIT DISCONNECTED FOR RESISTANCE MEASUREMENTS.
5. ALL VOLTAGES D.C. EXCEPT AS NOTED.
6. SECOND CONVERSION OSC. SELECTOR SWITCH SET AT :
   (1) V.F.O.
   (2) CRYSTAL.
   (3) EXTERNAL.
7. (4) 6.3 V.A.C. ACROSS PINS 3 AND 4.

Figure 7–24. Voltage and Resistance Data Chart, Frequency-Converter CV-126/FRR-24

TABLE 7–5. TROUBLE SHOOTING CHART F-99/FRR-24

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
I.F. Amplifier V-410	Disconnect the cable connected to J-403 at the rear of the cabinet. Connect signal generator AN/URM-25 between the input of V-410 (TP-1, Figure 7–56) and chassis. Connect the generator in accordance with Method B, Par. 4. Adjust the Microvolt control on the signal generator to 1100 uvs. and set the Mod. Selector switch at OFF. Adjust the R.F. output frequency of the generator to 50 kc. Set the Selectivity switch at 18 kc. Set the A.G.C. switch located in the AM-454/FRR-24 at OFF. Adjustment of the R.F. Gain and A.M. Diversity Gain controls on the AM-454/FRR-24 should result in a reading of 1.0 ma. on the 2nd. I.F. Level meter.	Tube V-410 and/or V-410 circuit components. Check components by voltage and resistance measurements. See Figure 7–25 and Table 7–6.
I.F. Amplifier V-401	Move the output lead of the signal generator to the input of V-401 (TP-2, Figure 7–56). Set the Selectivity switch at 18 kc. Adjust the Microvolt control for an output of 1000 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-401 and/or V-401 circuit components. Check components by voltage and resistance measurements. See Figure 7–25 and Table 7–6.
I.F. Filter Z-401	Set the Selectivity switch at 125 cycles. Keep the signal generator connected to the input of V-401 and the Microvolt control adjusted for an output of 1000 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter. Because of the sharpness of filter Z-401, it may be necessary to rock the signal generator frequency setting slightly to obtain a 1.0 ma. reading.	Filter Z-401. Replace if necessary.
I.F. Filter Z-402	Set the Selectivity switch at 250 cycles. Keep the signal generator connected to the input of V-401 and the Microvolt control adjusted for an output of 1000 uvs. A reading of 1 ma. should be obtained on the 2nd. I.F. Level meter. Because of the sharpness of filter Z-402, it may be necessary to rock the signal generator frequency setting slightly to obtain a 1.0 ma. reading.	Filter Z-401. Replace if necessary. Check trimmer capacitors C-404 and C-500 adjustment according to Par. 6. a. (3). (b).
I.F. Amplifier V-402	Set the Selectivity switch at 500 cycles. Move the output lead of the signal generator to the input of V-402 (TP-3, Figure 7–56). Adjust the Microvolt control for an output of 900 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter	Tube V-402 and/or V-402 circuit components. Check components by voltage and resistance measurements. See Figure 7–25 and Table 7–6.

TABLE 7–5. TROUBLE SHOOTING CHART F-99/FRR-24 (CONT'D)

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
I.F. Amplifier V-402 (cont'd)		Check alignment according to Par. 6. a. (3). (b).
I.F. Transformers Z-403 and Z-404	Move the output lead of the signal generator to the input of V-401. Adjust the Microvolt control for an output of 1000 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Check alignment according to Par. 6. a. (3). (b). Check Z-403 and Z-404. Replace if defective.
I.F. Amplifier V-403	Set the Selectivity switch at 1 kc. Move the output lead of the signal generator to the input of V-403 (TP-4, Figure 7–56). Adjust the Microvolt control for an output of 670 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-402 and/or V-402 circuit components. Check components by voltage and resistance measurements. See Figure 7–25 and Table 7–6. Check alignment according to Par. 6. a. (3). (b).
I.F. Transformers Z-407 and Z-408	Move the output lead of the signal generator to the input of V-401. Adjust the Microvolt control for an output of 900 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Check alignment according to Par. 6. a. (3). (b). Check Z-407 and Z-408. Replace if necessary.
I.F. Amplifier V-405	Set the Selectivity switch at 3 kc. Move the output lead of the signal generator to the input of V-405 (TP-5, Figure 7–56). Adjust the Microvolt control for an output of 900 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-405 and/or V-405 circuit components . Check components by voltage and resistance measurements. See Figure 7–25 and Table 7–6. Check alignment according to Par. 6. a. (3). (b).
I.F. Amplifier V-404	Move the output lead of the signal generator to the input of V-404 (TP-6, Figure 7–56). Adjust the Microvolt control for an output of 600 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-404 and/or V-404 circuit components. Check components by voltage and resistance measurements. See Figure 7–25 and Table 7–6. Check alignment according to Par. 6. a. (3). (b).
I.F. Transformers Z-411 and Z-412	Move the output lead of the signal generator to the input of V-401. Adjust the Microvolt control for an output of 1000 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Check alignment according to Par. 6. a. (3). (b).

TABLE 7-5. TROUBLE SHOOTING CHART F-99/FRR-24 (CONT'D)

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
I.F. Transformers Z-411 and Z-412 (cont'd)		Check Z-411 and Z-412. Replace if defective.
I.F. Amplifier V-407	Set the Selectivity switch at 6 kc. Move the output lead of the signal generator to the input of V-407 (TP-7, Figure 7-56). Adjust the Microvolt control for an output of 700 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-407 and/or V-407 circuit components. Check components by voltage and resistance measurements. See Figure 7-25 and Table 7-6. Check alignment according to Par. 6. a. (3). (b).
I.F. Amplifier V-406	Move the output lead of the signal generator to the input of V-406 (TP-8, Figure 7-56). Adjust the Microvolt control for an output of 600 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-406 and/or V-406 circuit components. Check components by voltage and resistance measurements. See Figure 7-25 and Table 7-6. Check alignment according to Par. 6. a. (3). (b).
I.F. Transformers Z-417 and Z-418	Move the output lead of the signal generator to the input of V-401. Adjust the Microvolt control for an output of 1000 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Check alignment according to Par. 6. a. (3). (b). Check Z-417 and Z-418. Replace if defective.
I.F. Amplifier V-409	Set the Selectivity switch at 12 kc. Move the output lead of the signal generator to the input of V-409 (TP-9, Figure 7-56). Adjust the Microvolt control for an output of 1300 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-409 and/or V-409 circuit components. Check components by voltage and resistance measurements. See Figure 7-25 and Table 7-6. Check alignment according to Par. 6. a. (3). (b).
I.F. Amplifier V-408	Move the output lead of the signal generator to the input of V-408 (TP-10, Figure 7-56). Adjust the Microvolt control for an output of 430 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter	Tube V-408 and/or V-408 circuit components. Check components by voltage and resistance measurements. See Figure 7-25 and Table 7-6 Check alignment according to Par. 6. a. (3). (b).

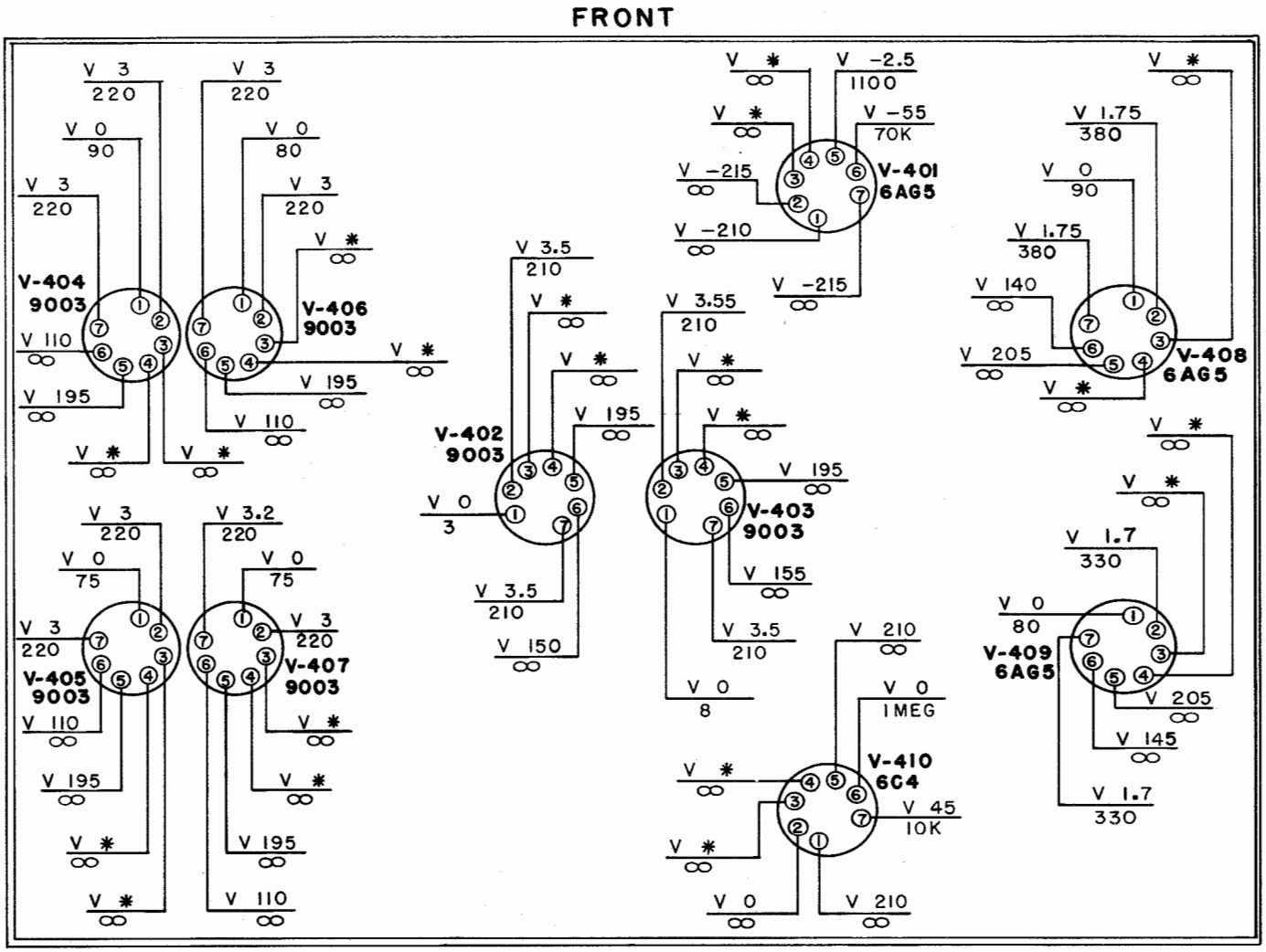
TABLE 7–5. TROUBLE SHOOTING CHART F-99/FRR-24 (CONT'D)

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
I.F. Transformers Z-423 and Z-424	Move the output lead of the signal generator to the input of V-401. Adjust the Microvolt control for an output of 1000 uvs. A reading of 1.0 ma. should be obtained on the 2nd. I.F. Level meter.	Check alignment according to Par. 6. a. (3). (b). Check Z-423 and Z-424. Replace if defective.

TABLE 7-6. TUBE OPERATING VOLTAGES AND CURRENTS F-99/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
6AG5	I.F. Amp.	205*	3.4	148*	0.8	2.4*	2.4*	0	6.3
9003	I.F. Amp.	195	8.6	155	0.9	4.2	4.2	0	6.3
9003	I.F. Amp.	195	8.6	155	0.9	4.2	4.2	0	6.3
9003	I.F. Amp.	200	6.1	115	1.9	3.5	3.5	0	6.3
9003	I.F. Amp.	200	5.6	115	1.9	3.4	3.4	0	6.3
9003	I.F. Amp.	200	6.1	115	1.9	3.5	3.5	0	6.3
9003	I.F. Amp.	200	5.6	115	1.9	3.4	3.4	0	6.3
6AG5	I.F. Amp.	205	4.9	150	1.2	2	2	0	6.3
6AG5	I.F. Amp.	205	4.5	160	1	1.8	1.8	0	6.3
6C4	I.F. Amp.	210	2.7	--	--	--	43	27	6.3

*Measured to B minus.



CONDITIONS:

1. MEASUREMENTS MADE BETWEEN SPECIFIED POINT AND CHASSIS EXCEPT AS NOTED.
2. 1000 OHM/VOLT METER USED.
3. NO SIGNAL INPUT.
4. POWER ON FOR VOLTAGE MEASUREMENTS.
   UNIT DISCONNECTED FOR RESISTANCE MEASUREMENTS.
5. SELECTIVITY SWITCH SET AT 18 Kc.
6. ALL VOLTAGES D.C. EXCEPT AS NOTED

* 6.3 V.A.C. ACROSS PINS 3 AND 4.

Figure 7–25. Voltage and Resistance Data Chart, Filter Assembly F-99/FRR-24

TABLE 7–7. TROUBLE SHOOTING CHART AM-454/FRR-24

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
I.F. Amplifier V-606 and Meter Rectifier V-607	Remove tube V-604 to prevent loading generator. Connect signal generator AN/URM-25 to the input of V-606 (TP-8, Figure 7–26) in accordance with Method A, Par. 4. Adjust Microvolt control on signal generator to 0.6 volt. A reading of between 0.5 to 0.7 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-606, V-607 and/or V-606, V-607 circuit components. Check components by voltage and resistance measurements. See Figure 7–27 and Table 7–8. Check R-629 adjustment.
I.F. Amplifier V-603	Set the A.G.C. switch at OFF and the R.F. Gain and A.M. Diversity Gain controls at 10. Connect signal generator AN/URM-25 between the input of V-603 (TP-7, Figure 7–26) and chassis. Connect the generator in accordance with method B, Par. 4. Adjust the generator output to a frequency of 50 kc. at 30,000 uvs., unmodulated. A reading of between 0.5 and 0.7 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-603 and/or V-603 circuit components. Check components by voltage and resistance measurements. See Figure 7–27 and Table 7–8. Check alignment according to Par. 6. a. (3). (c).
I.F. Amplifier V-602	Move the output lead of the signal generator to the input of V-602 (TP-6, Figure 7–26). Adjust the Microvolt control to 2000 uvs. A reading of between 0.5 and 0.7 ma. should be obtained on the 2nd. I,F. Level meter.	Tube V-602 and/or V-602 circuit components. Check components by voltage and resistance measurements. See Figure 7–27 and Table 7–8. Check alignment according to Par. 6. a. (3). (c).
I.F. Amplifier V-601	Move the output lead of the signal generator to the input of V-601 (TP-1, Figure 7–26). Adjust the Microvolt control to 100 uvs. A reading of between 0.5 and 0.7 ma. should be obtained on the 2nd. I.F. Level meter.	Tube V-601 and/or V-601 circuit components. Check components by voltage and resistance measurements. See Figure 7–27 and Table 7–8. Check alignment according to Par. 6. a. (3). (c).
I.F. Amplifier V-608	Keep the signal generator connected and adjusted in the same manner as outlined under V-601 test. Connect the ME-6/U between terminal 3 of transformer T-601 (TP-3, Figure 7–26) and chassis. Set the F.S.K. Diversity Level control at 10. A reading of between 0.65 to 0.8 volts on the ME-6/U indicates proper functioning of this stage.	Tube V-608 and/or V-608 circuit components. Check components by voltage and resistance measurements. See Figure 7–27 and Table 7–8.

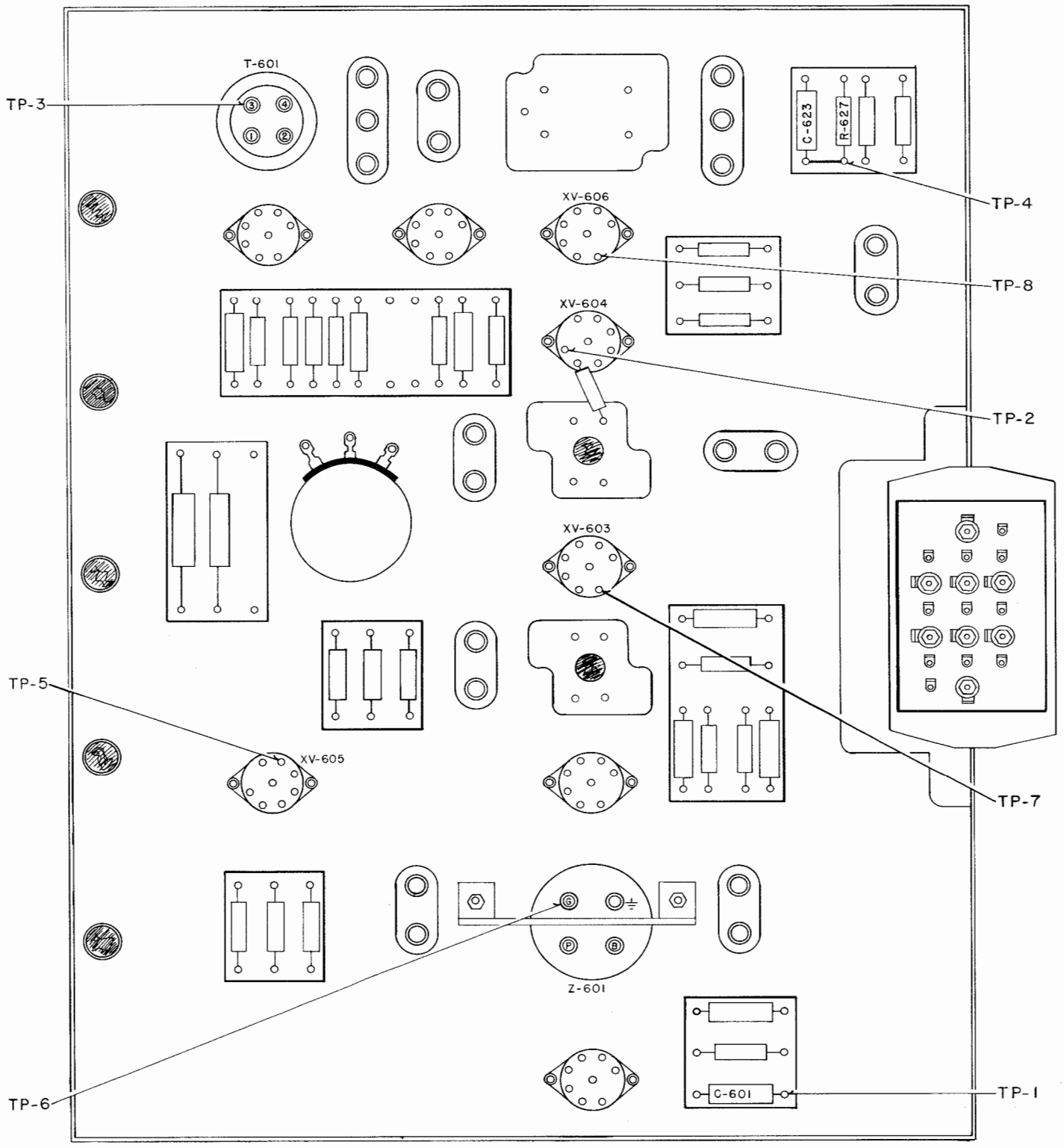
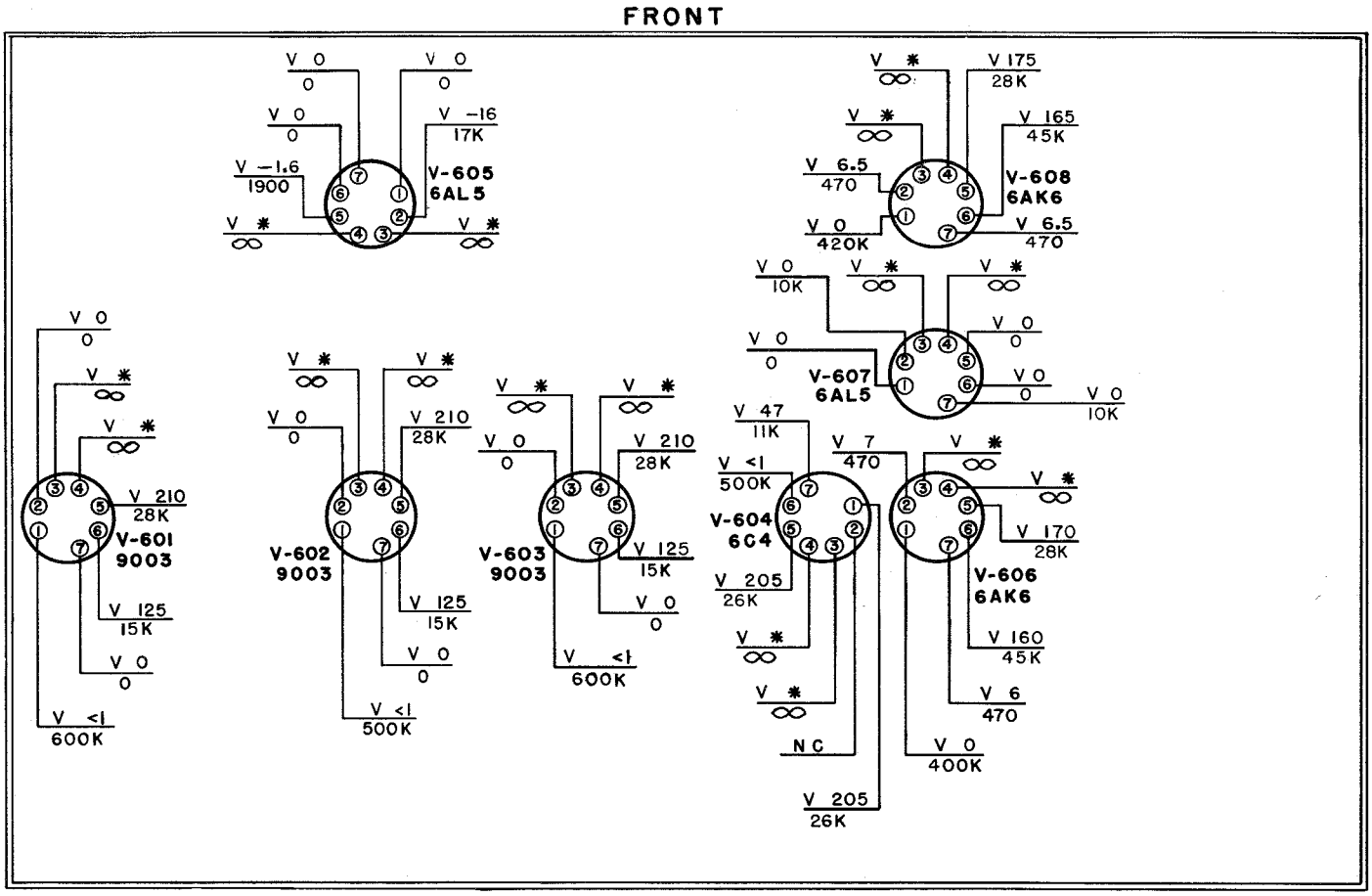


Figure 7–26. Test Point Locations Bottom of Chassis, R.F. Amplifier AM-454/FRR-24

TABLE 7-8. TUBE OPERATING VOLTAGES AND CURRENTS R.F. AMPLIFIER AM-454/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
9003	I.F. Amp.	195	4.6	100	1	0	0	-2.6	6.3
9003	I.F. Amp.	197	4.0	100	1	0	0	-2.7	6.3
9003	I.F. Amp.	200	3	100	1	0	0	-2.8	6.3
6C4	I.F. Amp.	200	3.9	--	--	--	45	33	6.3
6AL5*	A.G.C. Bias	-2.8	1.4	--	--	--	-2.5	--	6.3
6AL5**	A.G.C. Bias	0	0	--	--	--	0	--	--
6AK6	I.F. Amp.	165	13.6	165	2.0	--	7	--	6.3
6AL5	Meter Rectifier	0	0	--	--	--	0	--	6.3
6AK6	I.F. Amp.	175	10.6	170	1.8	--	6.3	--	6.3

*Pins 2 and 5.
**Pins 7 and 1.
AM Gain control at 10.
FSK Div. Level control at 0.
R.F. Gain control at 10.
A.G.C. switch at Off.



CONDITIONS:

1. MEASUREMENTS MADE BETWEEN SPECIFIED POINT AND CHASSIS EXCEPT AS NOTED.
2. 1000 OHM/VOLT METER USED.
3. NO SIGNAL INPUT.
4. POWER ON FOR VOLTAGE MEASUREMENTS.
   UNIT DISCONNECTED FOR RESISTANCE MEASUREMENTS.
5. A.M. DIVERSITY GAIN CONTROL AT 10.
   F S K DIVERSITY LEVEL CONTROL AT 0.
   R.F. GAIN CONTROL AT 0.
   A.G.C. SWITCH OFF.
6. * 6.3V.A.C. ACROSS PINS 3 AND 4.
   ALL VOLTAGES D.C. EXCEPT AS NOTED.

Figure 7–27. Voltage and Resistance Data Chart, R.F. Amplifier AM-454/FRR-24

TABLE 7–9. TROUBLE SHOOTING CHART AM-439/FRR-24

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
I.F. Amplifier V-701 and Detector V-705	Disconnect the cable connected to J-705 at the rear of the cabinet. Connect the signal generator AN/URM-25 between the input of V-701 (TP-1,, Figure 7–28) and chassis. Connect the generator in accordance with Method A, Par. 4. Connect multimeter ME-25/U set on the 30-volt scale across the diode load (TP-2, Figure 7–28). Set the R.F. Gain control at 10. Adjust the generator for a 1.0 volt 50 kc. A.M. output. A D.C. voltage between 9 and 11 volts should be obtained on the multimeter.	Tube V-701 or V-705 and/or V-701 or V-705 circuit components. Check components by voltage and resistance measurements. See Figure 7–29 and Table 7–10. Check alignment according to Par. 6. a. (3). (d).
Audio Amplifiers V-707 and V-708	Connect the signal generator between the input of V-701 (TP-1, Figure 7–28) and chassis in accordance with Method B, Par. 4. Connect audio level meter AN/URM-38 across the Phones jack (TP-3, Figure 7–58). Set the signal generator output frequency at 50 kc., modulated 30% at 1000 cps. Set the Microvolt control of the generator at 0.1 volts, set the A.F. Level control at 10 and the Reception switch at AM. A reading of at least 10 DB (10 milliwatts) should be obtained on the AN/URM-38.	Tube V-707, V-708 and/or V-707, V-708 circuit components. Check components by voltage and resistance measurements. See Figure 7–29 and Table 7–10. Check setting of the A.F. Level control Check setting of the Reception switch.
A.G.C. Delay V-706A	Connect the signal generator in the same manner as outlined under I.F. Amplifier V-701. Connect the model OBQ or ME-25/U D.C. voltmeter between pin 2 of V-706A (TP-4, Figure 7–28) and chassis. Set the A.G.C. switch at Fast or Medium and the R.F. Gain control at 10. Set the voltmeter on the 30-volt scale and adjust the Microvolt control on the generator for an output of 1.0 volt. A negative reading between 4.5 and 5.5 volts should be obtained on the voltmeter	Tube V-706A and/or V-706A circuit components. Check components by voltage and resistance measurements. See Figure 7–29 and Table 7–10. Check the setting of the A.G.C. switch. Check the setting of the R.F. Gain control.
Noise Limiter V-706B	Keep the signal generator connected in the same manner as outlined under I.F. Amplifier V-701. Connect an oscilloscope model OS-8/U across the Phones jack J-702 (TP-3, Figure 7–58). Adjust the Microvolt control on the generator for a 1.0 volt output modulated 30% at 1000 cps. Set the Reception switch at NL. Note the pattern obtained on the oscilloscope. One modulation peak should be clipped between 25% and 35%.	Tube V-706B and/or V-706B circuit components. Check components by voltage and resistance measurements. See Figure 7–29 and Table 7–10. Check the setting of the Reception switch.

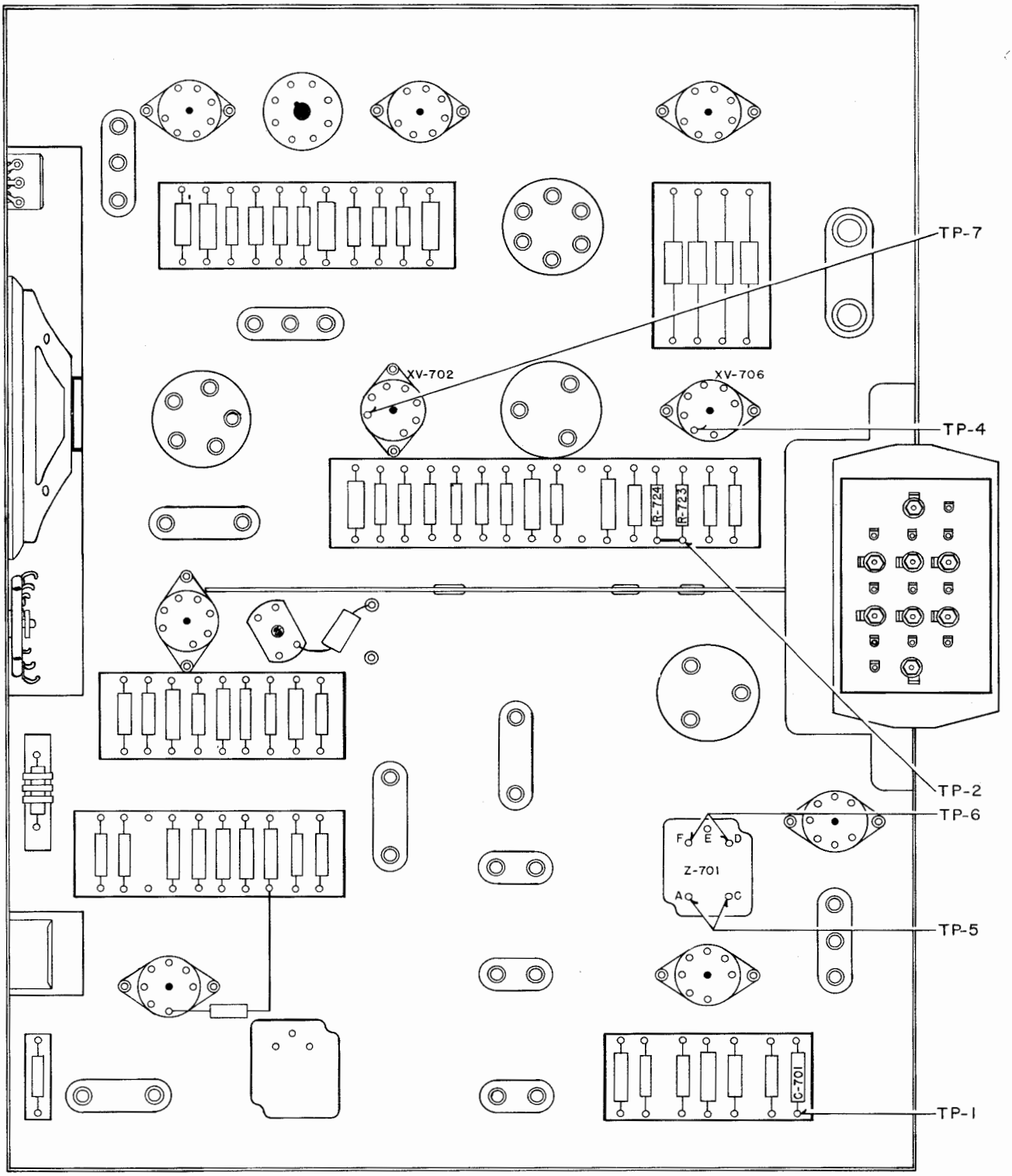


Figure 7–28. Test Point Locations Bottom of Chassis, Amplifier-Detector AM-439/FRR-24

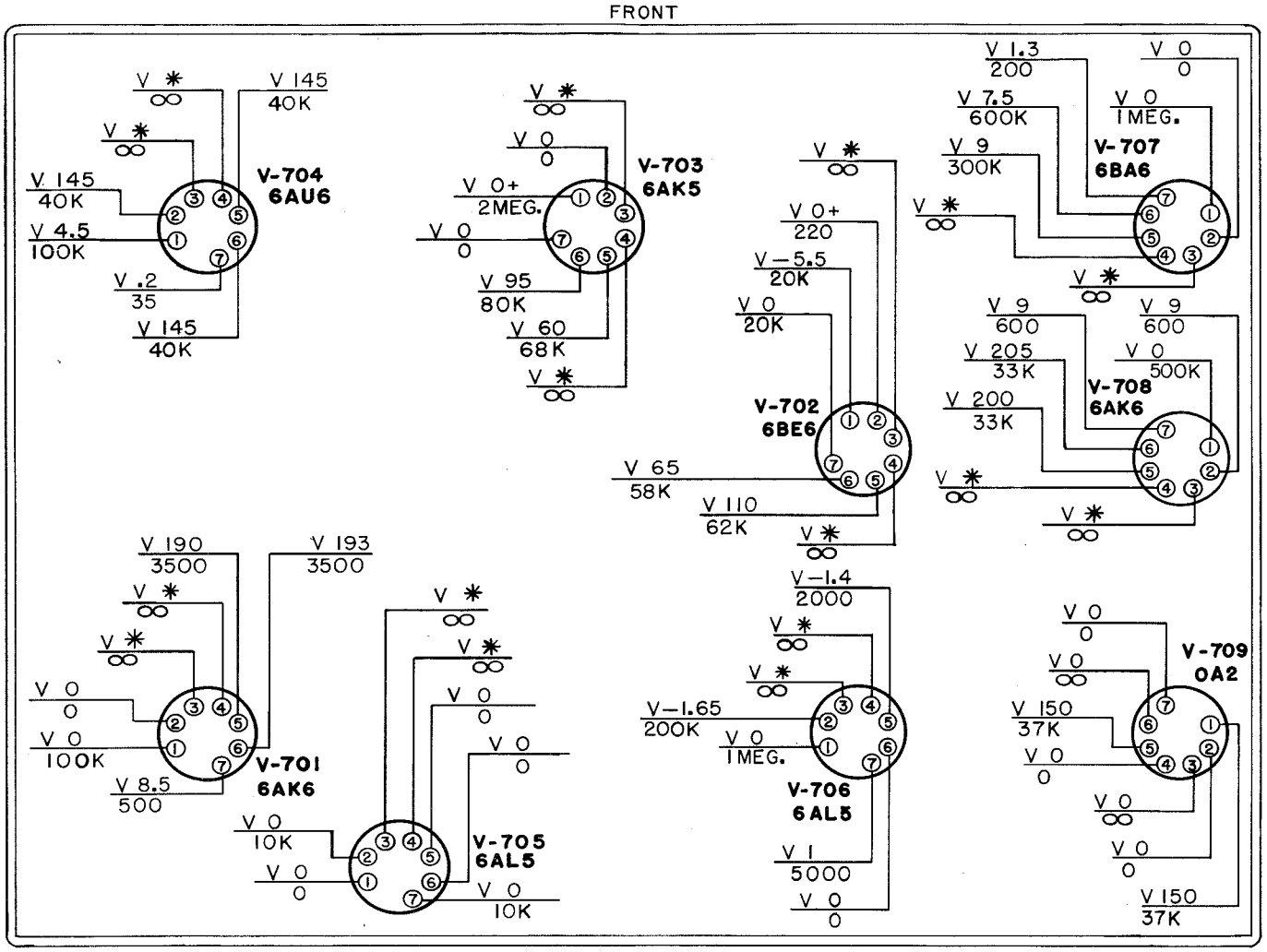
TABLE 7–9. TROUBLE SHOOTING CHART AM-439/FRR-24 (CONT'D)

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
Crystal Oscillator V-703 and B.F. Oscillator V-704	Connect voltmeter OBQ or ME-25/U to the input of V-702 (TP-1, Figure 7–28). Set the voltmeter on the 25 volt scale. To check the crystal oscillator set the Reception switch at Crystal, to check the B.F.O. set the Reception switch at BFO. A negative reading between 5 and 10 volts should be obtained.	Tubes V-703, V-704 and/or V-703, V-704 circuit components. Check components by voltage and resistance measurements. See Figure 7–29 and Table 7–10. Check the setting of the Reception switch. Check alignment according to Par. 6. a. (6). (c).
Heterodyne Detector V-702	Connect the signal generator in the same manner as outlined under Audio Amplifiers V-707 and V-708. Connect audio level meter AN/URM-38 across the Phones jack (TP-3, Figure 7–58). Set the Reception switch at Crystal and the A.F. Gain control at maximum. Adjust the generator for an unmodulated output of 0.1 volt at 51 kc. A reading of at least 12 DB (16 milliwatts) should be obtained on the audio level meter	Tube V-702 and/or V-702 circuit components. Check components by voltage and resistance measurements. See Figure 7–29 and Table 7–10. Check the setting of the Reception switch. Check alignment according to Par. 6. a. (6). (c).

TABLE 7–10. TUBE OPERATING VOLTAGES AND CURRENTS AM-439/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	SUPP (E)	GRID (E)	HEATER A.C. (E)
6AK6	I.F. Amp.	195	11	198	4	0	7.5	0	6.3
6BE6	Heterodyne Det.	114	1.2	56	3.7	--	1.3	5.4	6.3
6AK5*	Crystal Osc.	65	1.5	108	1.2	0	0	4.6	6.3
6AU6**	B.F. Osc.	140	4.6	140	1.4	140	0.25	6	6.3
6AL5***	Detector	0	0	0	0	0	0	0	6.3
1/2 6AL5	A.G.C. Delay	-2.9	0	--	--	--	-2.9	0	6.3
1/2 6AL5	Noise Limiter	0	0	--	--	--	0.4	0	--
6BA6	1st. Audio Amp.	35	neg.	24	neg.	0	1.3	0	6.3
6AK6	Audio Output	189	1.5	200	3	--	9.8	0	6.3
OA2	Voltage Regulator	150	--	--	--	--	0	--	--

*Reception switch at xtal.
**Reception switch at BFO.
***R.F. Gain control at 10.



CONDITIONS

1. MEASUREMENTS MADE BETWEEN SPECIFIED POINT AND CHASSIS EXCEPT AS NOTED.
2. 1000 OHM/VOLT METER USED.
3. NO SIGNAL INPUT.
4. POWER ON FOR VOLTAGE MEASUREMENTS.
   UNIT DISCONNECTED FOR RESISTANCE MEASUREMENTS.
5. A.G.C. SWITCH AT OFF, R.F. GAIN CONTROL AT 10.
   RECEPTION SWITCH AT B F O EXCEPT WHEN MEASURING V-703 WHEN IT IS AT CRYSTAL.
   SPEAKER SWITCH AT OFF, A.F. LEVEL CONTROL AT 10, HEADPHONES DISCONNECTED.
6. ALL VOLTAGES D.C. EXCEPT AS NOTED.

* 6.3 VOLTS A.C. ACROSS PINS 3 AND 4.

Figure 7–29. Voltage and Resistance Data Chart, Amplifier-Detector AM-439/FRR-24

TABLE 7–11. TROUBLE SHOOTING CHART O-131/FRR-24

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
Crystal Oscillator A V-801	Insert a crystal between the range of 3.75 mc. to 15.0 mc. in any one of the crystal holders associated with oscillator 'A'. See Figure 7–50. Set the Crystal 'A' switch at the position corresponding to the crystal socket employed. Connect electronic voltmeter OBQ or ME-25/U between pin 1 (TP-1, Figure 7–64) of V-802 and chassis. Turn the Oscillator 'A' switch On and set the Output 'A' control between 4 and 6 on the dial. Rotate Tuning 'A' control for maximum output on the voltmeter at the dial frequency reading corresponding to the reception frequency. Normal voltmeter reading is 2.0 volts D.C. Tuning meter 'A' should read between 300 and 400 microamperes which corresponds to 2.0 volts.	Tubes V-801, V-802 and/or V-801, V-802 circuit components. Check components by voltage and resistance measurements. See Figure 7–30 and Table 7–12. Check alignment according to Par. 6. a. (6). (e). Check tuning. Check Crystal A switch.
Crystal Oscillator B V-803	Insert a crystal into one of the oscillator 'B' sockets. See Figure 7–50. Connect electronic voltmeter OBQ or ME-25/U between pin 1 of V-804 (TP-2, Figure 7–64) and chassis. Repeat the test procedure outlined under crystal oscillator A.	Tubes V-803, V-804 and/or V-803, V-804 circuit components. Check components by voltage and resistance measurements. See Figure 7–30 and Table 7–12. Check alignment according to Par. 6. a. (6). (e). Check tuning. Check Crystal B switch.
200 Kc. Oscillator V-805 and Harmonic Generator V-806	To check the performance of the harmonic oscillator a harmonic frequency of 30.0 mc. will be used as a Test signal. Set the Calibrate switch on O-131/FRR-24 at ON and set the Bandswitch on Control Panel SB-142/FRR-24 at 16–32. Set the A.G.C. switch at OFF and reduce the R.F. Gain control setting on the selected Amplifier-Converter unit. Make the necessary patch cord connection to permit injection of the 200 kc. harmonics into the Amplifier-Converter for calibration. To do so connect a patch cord between 2J31 and 2J17, 2J18, or 2J19. Tune in the 30 mc. signal by adjustment of the selected Amplifier-Converter for maximum reading on the 2nd. I.F. Level meter located in unit AM-454/FRR-24. Note reading. Remove the patch cords previously connected to 2J31 and 2J17, 2J18 or 2J19 and set the Calibrate switch at OFF. Connect the signal generator AN/URM-25 in	Tubes V-805, V-806 and/or V-805, V-806 circuit components. Check circuit components by voltage and resistance measurements. See Fgiure 7–30 and Table 7–12. Check alignment according to Par. 6. a. (6). (f). Check tuning. Check Calibrate switch.

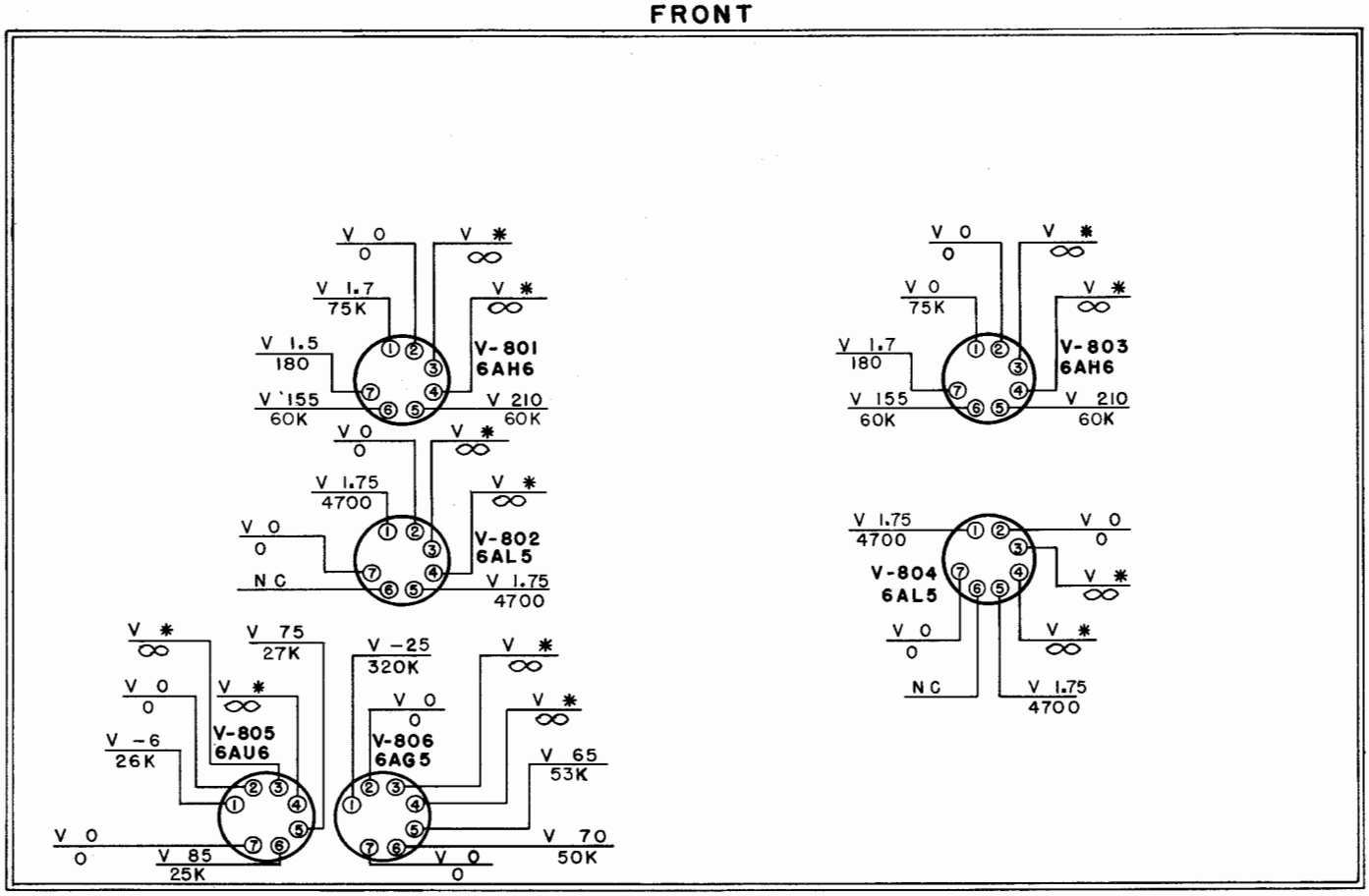
TABLE 7–11. TROUBLE SHOOTING CHART O-131/FRR-24 (CONT'D)

	CK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
ion. ont'd)	cor V-805 and nerator V-806	accordance with Method B, Par. 4, except that test lead CX-1363/U is omitted, to jack 2J17, 2J18 or 2J19 on the Patch Panel. Adjust the generator to an output frequency of 30 mc. Adjust the Microvolt control on the generator until the 2nd. I.F. Level meter reads identical with the reading previously obtained when the output of the harmonic oscillator was injected into the Amplifier-Converter unit. The output of the signal generator should read between 1500 and 2500 uvs.	

TABLE 7-12. TUBE OPERATING VOLTAGES AND CURRENTS O-131/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
6AH6	Crystal Oscillator A	195	8.5	150	2.5	0	1.5	-25	6.3
6AL5	Meter Rectifier	0	neg.	--	--	--	2	--	6.3
6AH6	Crystal Oscillator B	195	8.5	150	2.5	0	1.5	-24	6.3
6AL5	Meter Rectifier	0	neg.	--	--	--	2	--	6.3
6AU6	200 Kc. Oscillator	80	2	85	3	0	0	-9	6.3
6AG5	Harmonic Generator	66	1.5	73	1.4	0	--	-75	6.3

FRONT



CONDITIONS:

1. MEASUREMENTS MADE BETWEEN SPECIFIED POINT AND CHASSIS EXCEPT AS NOTED.
2. 1000 OHM/VOLT METER USED.
3. POWER ON FOR VOLTAGE MEASUREMENTS.
   UNIT DISCONNECTED FOR RESISTANCE MEASUREMENTS.
4. ALL VOLTAGES D.C. EXCEPT AS NOTED.
5. OSCILLATOR A AND B SWITCHES ON.
   CALIBRATE SWITCH ON.
   OUTPUT A AND B CONTROLS AT 10.
   CRYSTALS PLUGGED IN.
6. * 6.3 V.A.C. ACROSS PINS 3 AND 4.

Figure 7–30. Voltage and Resistance Data Chart, Oscillator Assembly O-131/FRR-24

TABLE 7–13. TROUBLE SHOOTING CHART AM-440/FRR-24

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
I.F. Amplifier V-901	Connect signal generator AN/URM-25 between the input of V-901 (TP-1, Figure 7–31) and chassis in accordance with Method A, Par. 4. Connect the D.C. voltmeter, Model OBQ or ME-25/U between the diode load (TP-2, Figure 7–31) and chassis. Adjust the output of the signal generator to 1.0 volt at 50 kc. with modulation OFF. Set the Audio Bandwidth switch S-901 alternately at 600 cycles and 6 kc. A reading of between 9 and 11 volts should be obtained on the voltmeter at both positions of the Audio Bandwidth switch.	Tube V-901 or V-902 and/or V-901 or V-902 circuit components. Check components by voltage and resistance measurements. See Figure 7–32 and Table 7–14. Check alignment according to Par. 6. a. (3) (e).
Audio Amplifiers V-904 and V-905	Connect the generator in accordance with Method B, Par. 4 between the input of V-901 (TP-1, Figure 7–31) and chassis. Connect audio level meter AN/URM-38 across the Phones jack J-902 (TP-3, Figure 7–59). Adjust the generator for an output signal of 0.1 volt at 50 kc., modulated 30% at 1000 cps. Set the A.F. Level control at 10. A reading of at least 11.75 DB (15 milliwatts) should be obtained on the audio level meter.	Tubes V-904, V-905 and/or V-904, V-905 circuit components. Check components by voltage and resistance measurements. See Figure 7–32 and Table 7–14. Check setting of the A.F. Level control
A.G.C. Delay V-903A	Connect the signal generator as outlined under I.F. amplifier V-901. Connect D.C. voltmeter Model OBQ or ME-25/U between pin 7 of V-903 (TP-4, Figure 7–31) and chassis. Adjust the Microvolt control on the generator for an output of 1.0 volt. Set the R.F. Gain control at 10. A negative reading between 4.5 and 5.5 volts should be obtained on the voltmeter.	Tube V-903A and/or V-903A circuit components. Check components by voltage and resistance measurements. See Figure 7–32 and Table 7–14. Check setting of the R.F. Gain control.
Noise Limiter V-903B	Keep the signal generator connected as outlined under audio amplifiers V-904 and V-905. Connect oscilloscope Model OS-8/U across the Phones jack (TP-3, Figure 7–59). Adjust the generator for a 0.1 volt output at 50 kc. modulated 30% at 1000 cps. Set the A.N.L. switch at ON. Note the pattern obtained on the oscilloscope. One modulation peak should be clipped between 25% and 35%.	Tube V-903B and/or V-903B circuit components. Check components by voltage and resistance measurements. See Figure 7–32 and Table 7–14. Check setting of A.N.L. switch.

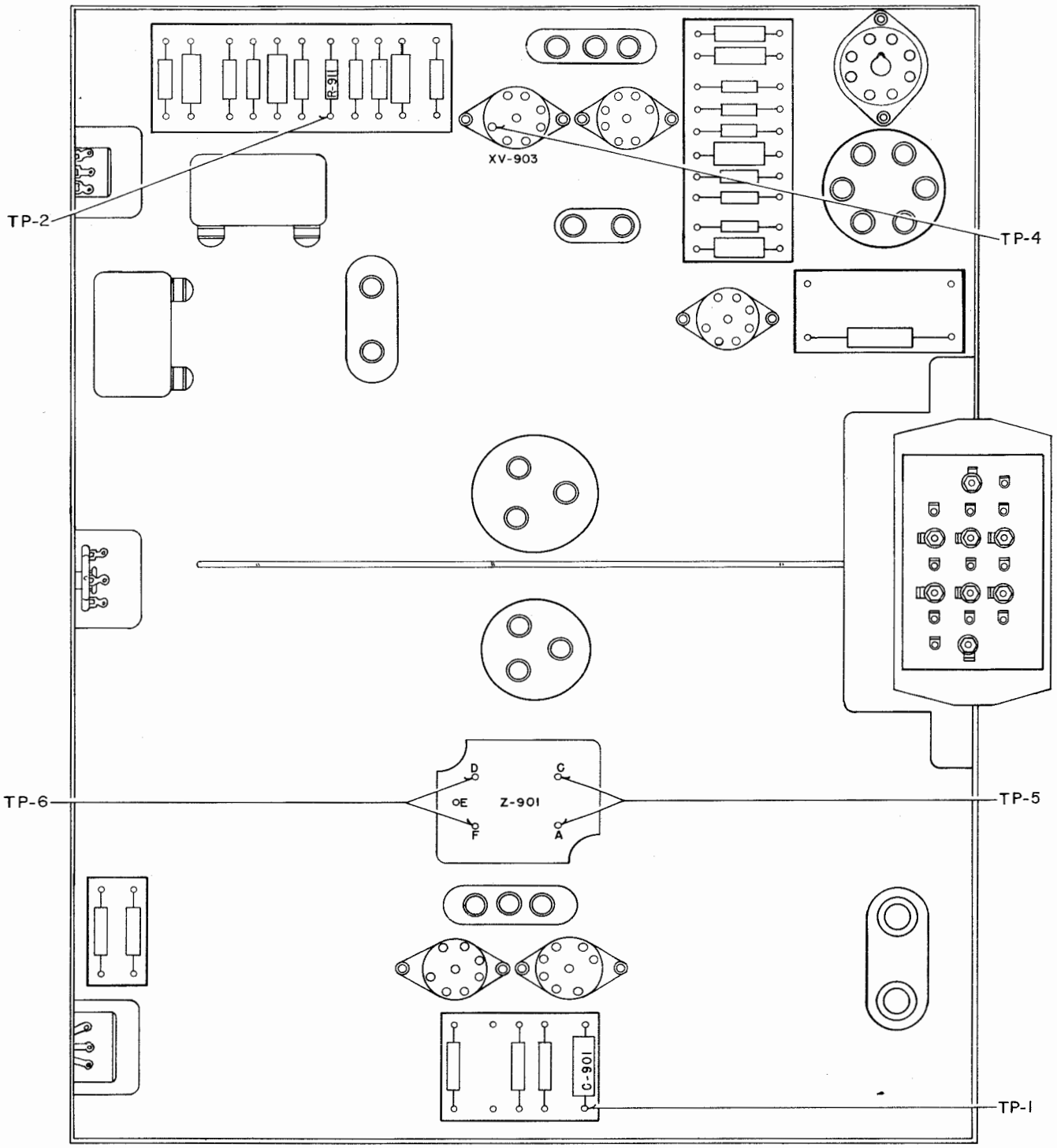
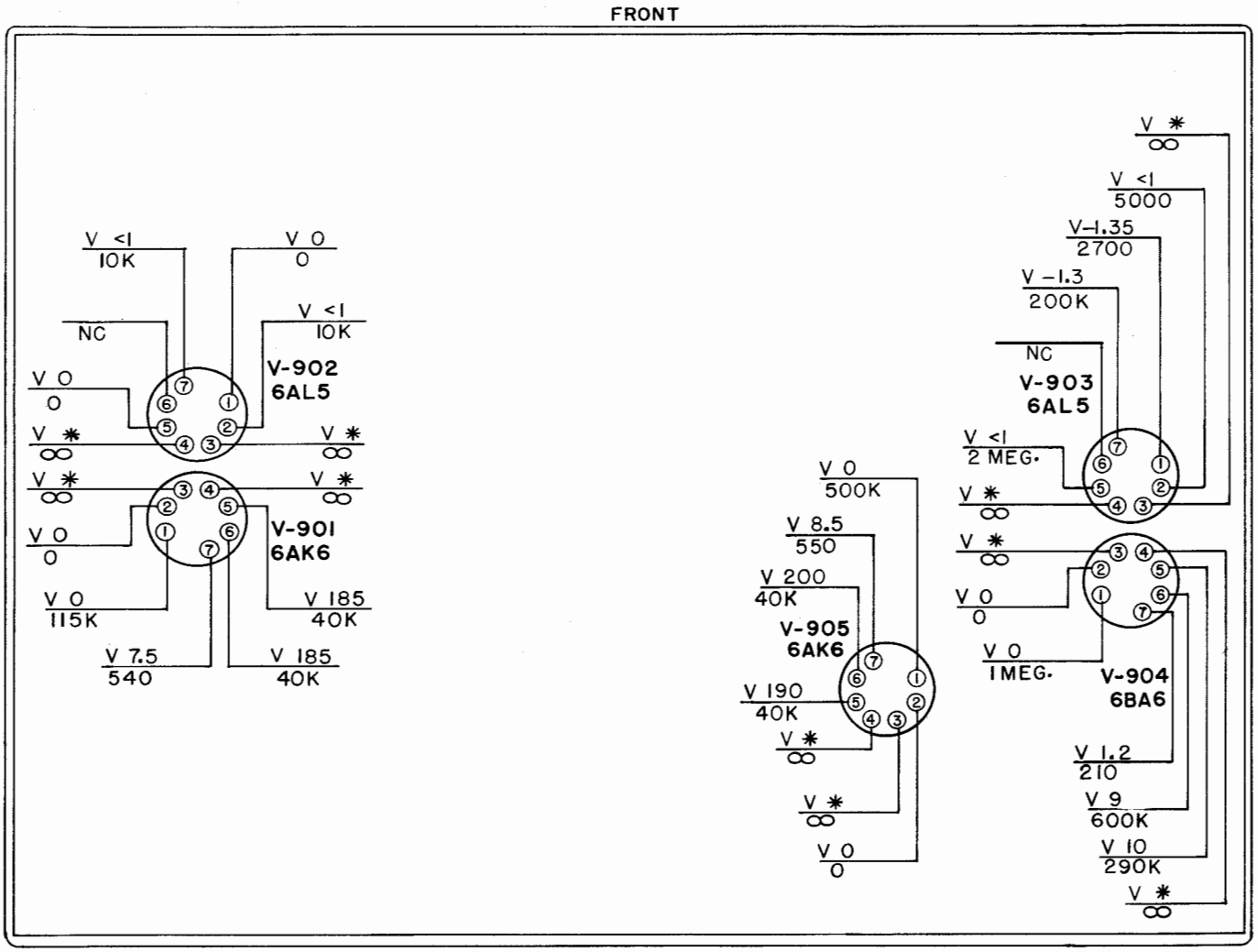


Figure 7–31. Test Point Locations Bottom of Chassis, Amplifier-Detector AM-440/FRR-24

TABLE 7-14. TUBE OPERATING VOLTAGES AND CURRENTS AM-440/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
6AK6	I.F. Amp.	175	11	178	4	0	7.0	0	6.3
1/2 6AL5	Detector	-.3	0	--	--	--	0	--	6.3
1/2 6AL5	Detector	-.3	0	--	--	--	0	--	--
1/2 6AL5	A.G.C. Delay	2.5	0	--	--	--	2.7*	--	6.3
1/2 6AL5	Noise Limiter	-.3	0	--	--	--	--	--	--
6BA6	1st. Audio Amp.	45.0	neg.	24	neg.	0	1.2	0	6.3
6AK6	Audio Output	180	13	188	2	0	8.2	0	6.3

*R.F. Gain at 10.



CONDITIONS

1. MEASUREMENTS MADE BETWEEN SPECIFIED POINT AND CHASSIS EXCEPT AS NOTED.
2. 1000 OHM/VOLT METER USED.
3. NO SIGNAL INPUT.
4. POWER ON FOR VOLTAGE MEASUREMENTS.
   UNIT DISCONNECTED FOR RESISTANCE MEASUREMENTS.
5. A.G.C. SWITCH AT OFF, R.F. GAIN CONTROL AT 10.
   A.F. LEVEL CONTROL AT 10, A.N.L. SWITCH AT OFF.
6. ALL VOLTAGES D.C. EXCEPT AS NOTED.

*6.3 VOLTS A.C. ACROSS PINS 3 AND 4.

Figure 7–32. Voltage and Resistance Data Chart, Amplifier-Detector AM-440/FRR-24

TABLE 7–15. TROUBLE SHOOTING CHART AM-438/FRR-24

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
I.F. Amplifier V-1001, Detector V-1002 and Switching Diode V-1003A	Connect signal generator AN/URM-25 between the input of V-1001 (TP-1, Figure 7–33) and chassis. Connect the generator in accordance with Method A, Par. 4. Adjust the output of the signal generator to 1.0 volt at 50 kc. with modulation OFF. Set the Level Indicator switch at 1 and set the Audio Bandwidth switch alternately at 600 cycles and 6 kc. A reading between 0.9 and 1.1 ma. should be obtained on the Diversity Level meter at both positions of the Audio Bandwidth switch	Tube V-1001, V-1002 or V-1003A and/or V-1001, V-1002 or V-1003A circuit components. Check components by voltage and resistance measurements. See Figure 7–34 and Table 7–16. Check alignment according to Par. 6. a. (3). (f).
I.F. Amplifier V-1004, Detector V-1005 and Switching Diode V-1003B	Connect signal generator AN/URM-25 between the input of V-1004 (TP-2, Figure 7–33) and chassis. Adjust the output of the signal generator to 1.0 volt at 50 kc. with the modulation OFF. Set the Level Indicator switch at 2 and set the Audio Bandwidth switch alternately at 600 cycles and 6 kc. A reading between 0.9 and 1.1 ma should be obtained on the Diversity Level meter at both positions of the Audio Bandwidth switch.	Tube V-1004, V-1005 or V-1003B and/or V-1004, V-1005 or V-1003B circuit components. Check components by voltage and resistance measurements. See Figure 7–34 and Table 7–16. Check alignment according to Par. 6. a. (3). (f).
I.F. Amplifier V-1006, Detector V-1007 and Switching Diode V-1008	Connect signal generator AN/URM-25 between the input of V-1006 (TP-3, Figure 7–33) and chassis. Adjust the output of the signal generator to 1.0 volt at 50 kc. with the modulation OFF. Set the Level Indicator switch at 3 and set the Audio Bandwidth switch alternately at 600 cycles and 6 kc. A reading between 0.9 and 1.1 ma. should be obtained on the Diversity Level meter at both positions of the Audio Bandwidth switch.	Tube V-1006, V-1007 or V-1008 and/or V-1006, V-1007 or V-1008 circuit components. Check components by voltage and resistance measurements. See Figure 7–34 and Table 7–16. Check alignment according to par. 6. a. (3). (f).
Audio Amplifiers V-1010 and V-1011	Connect the signal generator in accordance with Method B, Par. 4. between the input of V-1006 (TP-3, Figure 7–33) and chassis. Connect audio level meter AN/URM-38 across the Phones jack J-1002 (TP-4, Figure 7–60). Adjust the generator for an output signal of 0.1 volt at 50 kc., modulated 30% at 1000 cps. Set the A.F. Level control at 10. A reading of at least 11.75 DB (15 milliwatts) should be obtained on the audio level meter.	Tubes V-1010, V-1011 and/or V-1010, V-1011 circuit components. Check components by voltage and resistance measurements. See Figure 7–34 and Table 7–16.
A.G.C. Delay V-1009B	Connect the signal generator as outlined under I.F. amplifier V-1006. Connect D.C. voltmeter Model OBQ or ME-25/U between pin 7 of V-1009 (TP-11, Figure 7–33) and chassis. Adjust the Microvolt control on the generator for	Tube V-1009B and/or V-1009B circuit components. Check components by voltage and resistance measurements. See Figure 7–34

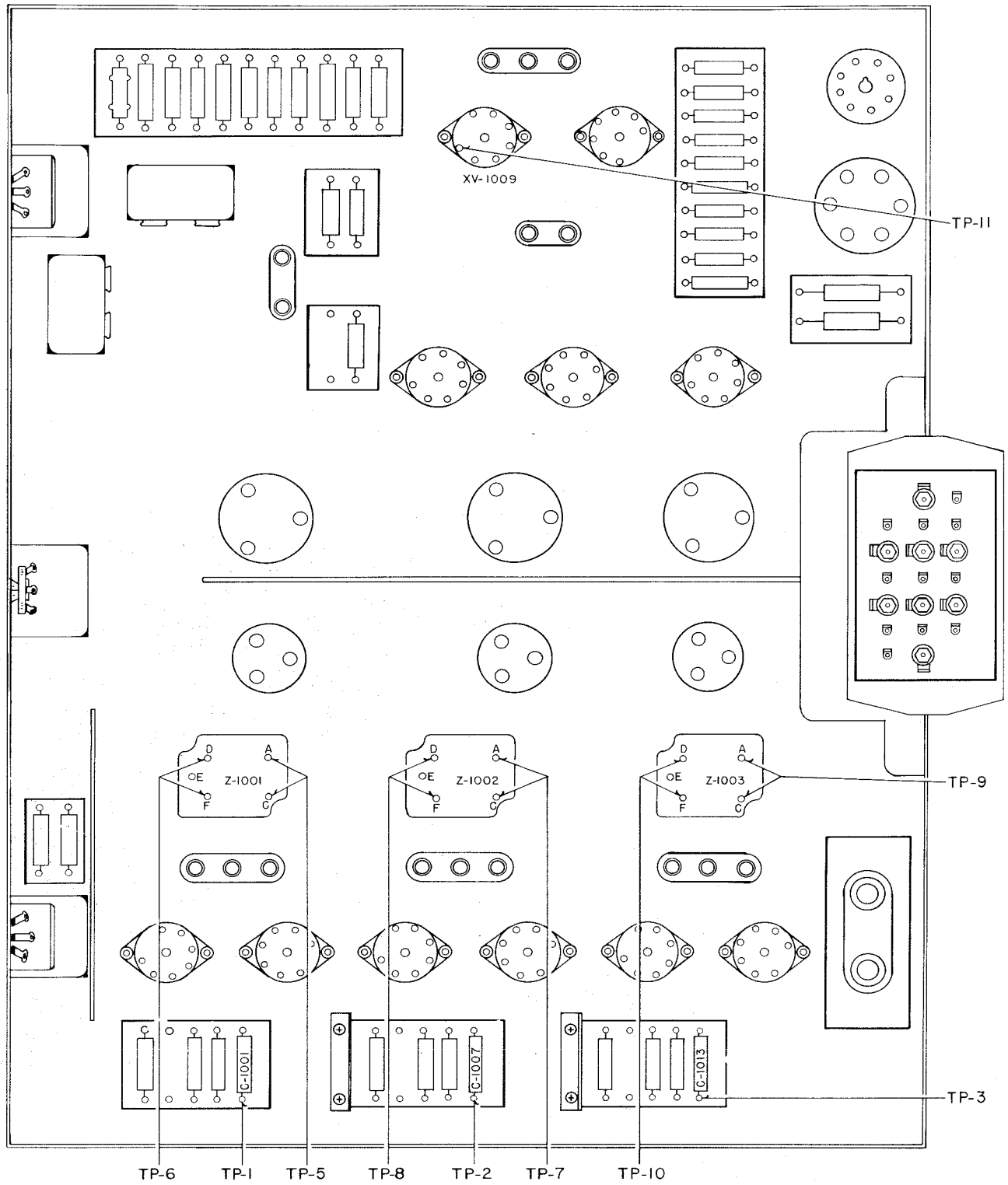


Figure 7–33. Test Point Locations Bottom of Chassis, Amplifier-Detector AM-438/FRR-24

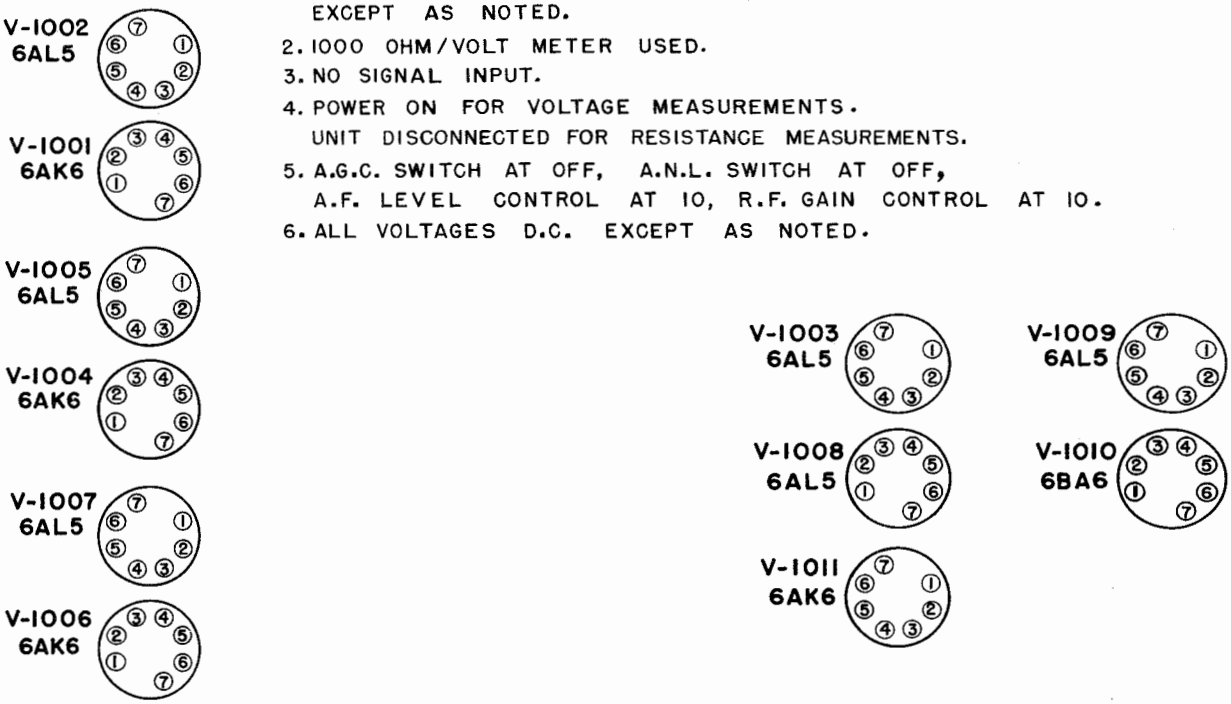
TABLE 7–15. TROUBLE SHOOTING CHART AM-438/FRR-24 (CONT'D)

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
A.G.C. Delay V-1009B (cont'd)	an output of 1.0 volt. Set the R.F. Gain control at 10. A negative reading between 4.5 and 5.5 volts should be obtained on the voltmeter.	and Table 7–16.
Noise Limiter V-1009A	Connect the signal generator as outlined under audio amplifiers V-1010 and V-1011. Connect oscilloscope, Model OS-8/U, across the Phones jack J-1002.(TP-4, Figure 7–60). Adjust the generator for a 0.1 volt output modulated 30% at 1000 cps. Set the A.N.L. switch at ON. Note the pattern obtained on the oscilloscope. One modulation peak should be clipped between 25% and 35%	Tube V-1009A and/or V-1009A circuit components. Check components by voltage and resistance measurements. See Figure 7–34 and Table 7–16. Check setting of A.N.L. switch.

TABLE 7-16. TUBE OPERATING VOLTAGES AND CURRENTS AM-438/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
6AK6	I.F. Amp.	175	12	176	5	0	8.2	0	6.3
1/2 6AL5	Detector	0	neg.	--	--	--	neg.	0	6.3
1/2 6AL5	Detector	0	neg.	--	--	--	neg.	0	--
1/2 6AL5	Switching Diode	neg.	neg.	--	--	--	neg.	0	6.3
1/2 6AL 5	Switching Diode	neg.	neg.	--	--	--	neg.	0	--
6AK6	I.F. Amp.	175	12	175	5	0	8.0	0	6.3
1/2 6AL5	Detector	0	neg.	--	--	--	neg.	0	6.3
1/2 6AL 5	Detector	0	neg.	--	--	--	neg.	0	--
6AK6	I.F. Amp.	165	12	165	4.5	0	7.8	0	6.3
1/2 6AL5	Detector	0	neg.	--	--	--	neg.	0	6.3
1/2 6AL5	Detector	0	neg.	--	--	--	neg.	0	--
1/2 6AL5	Switching Diode	neg.	neg.	--	--	--	neg.	0	6.3
1/2 6AL5	Noise Limiter	neg.	neg.	--	--	--	neg.	0	6.3
1/2 6AL5	A.G.C. Delay	-3.2	neg.	--	--	--	-2.8	0	--
6BA6	1st. Audio	41	neg.	21	neg.	0	1.2	0	6.3
6AK6	Audio Output	175	13.5	180	2.5	0	9	0	6.3

FRONT



TUBE	PIN NO.	1	2	3	4	5	6	7
V-1001	VOLTS	0	0	*	*	190	190	8.5
	OHMS	100K	0	∞	∞	40K	40K	500
V-1002	VOLTS	0	−.2	*	*	0	0	−.2
	OHMS	0	110K	∞	∞	0	0	110K
V-1003	VOLTS	−.2	−.2	*	*	−.1	0	−.2
	OHMS	110K	10K	∞	∞	110K	0	10K
V-1004	VOLTS	0	0	*	*	185	185	8.5
	OHMS	100K	0	∞	∞	40K	40K	500
V-1005	VOLTS	0	−.1	*	*	0	0	−.1
	OHMS	0	110K	∞	∞	0	0	110K
V-1006	VOLTS	0	0	*	*	185	185	8.5
	OHMS	100K	0	∞	∞	40K	40K	500
V-1007	VOLTS	0	−.15	*	*	0	0	−.15
	OHMS	0	110K	∞	∞	0	0	110K
V-1008	VOLTS	0	−.2	*	*	−.2	0	0
	OHMS	0	10K	∞	∞	100K	0	0
V-1009	VOLTS	−1.7	0	*	*	0	0	−1.7
	OHMS	2000	5000	∞	∞	2MEG	0	200K
V-1010	VOLTS	0	0	*	*	9.5	8.5	1.2
	OHMS	1MEG	0	∞	∞	300K	600K	240
V-1011	VOLTS	0	0	*	*	185	195	9
	OHMS	470K	0	∞	∞	40K	40K	600

* 6.3 V.A.C. ACROSS PINS 3 & 4

Figure 7–34. Voltage and Resistance Data Chart, Amplifier-Detector AM-438/FRR-24

TABLE 7–17. TROUBLE SHOOTING CHART KY-62/FRR-24

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
Audio Output V-1103, V-1104, V-1105	Connect audio level meter AN/URM-38 across resistor R-1155 (TP-1, Figure 7–66). Set the Reception switch at Ext. Connect audio oscillator LAJ or TS-382A/U to the input side of C-1101 (TP-4, Figure 7–66). Increase the A.F. Level control to maximum. A reading of 10.8 DB (12 milliwatts) should be obtained on the meter with an input of 0.35 volts or less. Connect a pair of headphones to the Phones jack J-1106. An audio tone should be heard in the headphones. Vary the Monitor Level control and note that the audio tone varies as the control is moved from minimum to maximum.	Tubes V-1103, V-1104, V-1105 and/or V-1103, V-1104, V-1105 circuit components. Check components by voltage and resistance measurements. See Figure 7–35 and Table 7–18. Check A.F. Level control. Check setting of Tone switch. Check setting of Reception switch. Check setting of Monitor Level control.
Tone Oscillators V-1106, V-1107	Remove the cables from connectors J-1102, J-1103 and J-1105 at the rear of the cabinet. Connect audio level meter AN/URM-38 across resistor R-1155 (TP-1, Figure 7–66). Connect Multimeter ME-6/U between pin 2 of V-1107 (TP-2, Figure 7–66) and chassis. Set the Reception switch at Test and the Threshold control at 0. Set the Tone switch at Var. and adjust the A.F. Level control to obtain a reading of 10.8 DB (12 milliwatts) on the Audio Level meter. Set the Variable Frequency dial at 5000 cycles. A voltmeter reading of 1.9 volts should be obtained. Set the Variable Frequency dial at 400 cycles. A voltmeter reading of 1.9 volts should be obtained. Set the Tone switch at Fixed. Vary the Fixed Frequency switch from 595 cycles through 1785 cycles. A voltmeter reading of 1.9 volts should be obtained at each setting of the Fixed Frequency switch.	Tubes V-1106, V-1107 and/or V-1106, V-1107 circuit components. Check components by voltage and resistance measurements. See Figure 7–35 and Table 7–18. Check alignment according to Par. 6. a. (6). (g). Check Tone switch S-1102.
D.C. Amplifiers V-1101, V-1102	Connect the vertical amplifier input of the oscilloscope across resistor R-1155 (TP-1, Figure 7–66). Connect variable audio oscillator TS-382A/U through a 0.01 mf. capacitor between the input of V-1101A (TP-3, Figure 7–66) and chassis. Adjust the input from the audio oscillator to approximately 6 volts RMS. Connect a pair of headphones to the Phones jack. Set the Tone switch at Ext. and adjust the Threshold control R-1103 until an audio tone is heard in the headphones. Set the tuning dial of the audio oscillator at 500 cycles. An unbroken line should be observed on the oscilloscope screen.	Tubes V-1101, V-1102 and/or V-1101, V-1102 circuit components. Check components by voltage and resistance measurements. See Figure 7–35 and Table 7–18. Check Threshold control. Check Reception switch.

TABLE 7-18. TUBE OPERATING VOLTAGES AND CURRENTS KY-62/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
1/2 12AX7	D.C. Amp.	44	neg.	--	--	--	10	0	6.3
1/2 12AX7	D.C. Amp.	40	neg.	--	--	--	34	34	--
6C4	D.C. Amp.	105	neg.	--	--	--	50	39	6.3
6AK6	Audio Output	170	17	170	3	--	6.7	0	6.3
6AK6	Audio Output	205	20	205	3	--	110	106	6.3
6AK6	Audio Output	205	20	205	3	--	110	106	6.3
6AG5	Monitor Output	225	4*	225	--	--	4	0	6.3
6J6	Tone Osc.	97	2.2	--	--	--	2	0	6.3
6AQ5	Tone Osc.	68	11	120	2	--	7	0	6.3
OC3/VR105	Voltage Regulator	210	12	--	--	--	105	--	--
OC3/VR105	Voltage Regulator	105	22	--	--	--	0	--	--

*Total Current for plate and screen.

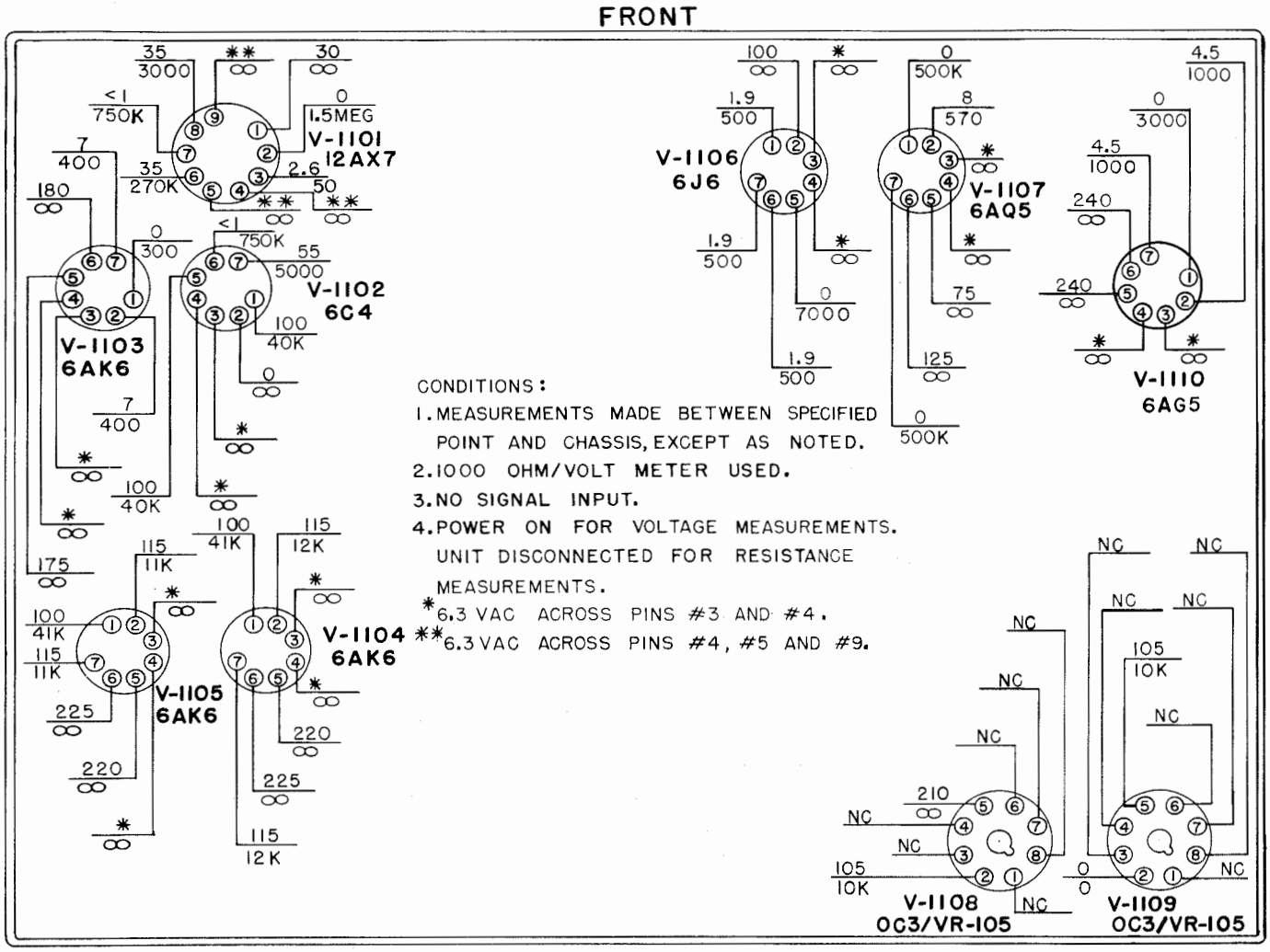


Figure 7–35. Voltage and Resistance Data Chart, Keyer KY-62/FRR-24

TABLE 7–19. TROUBLE SHOOTING CHART CV-127/FRR-24

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
50 Kc. Limiter V-1201	It is essential when the electrical circuits of the CV-127/FRR-24 are being checked that this unit shall be connected to the R.F. Amplifier AM-454/FRR-24. Make the following connections on the AM-454/FRR-24: Connect signal generator AN/URM-25 between pin 1 of V-603 (TP-7, Figure 7–26) and chassis. Connect the generator in accordance with Method A, Par. 4. Connect the multimeter ME-6/U between terminal 3 of T-601 (TP-3, Figure 7–26) and chassis. Set the F.S.K. Diversity Level control at 10. Make the following connection on the CV-127/FRR-24. Connect D.C. voltmeter Model OBQ or ME-25/U across diode load resistor R-1217 (TP-5, Figure 7–36). Adjust the output frequency of the signal generator to 50 kc. modulated 30% at 1000 cps. Vary the Microvolt control on the signal generator until a voltage range of from 0 to 1.5 volts is obtained on the ME-6/U. Limiting action should start at approximately 0.05 volt and remain nearly constant to 1.5 volts. Corresponding readings on the D.C. voltmeter should read between 75 and 80 volts.	Tube V-1201 and/or V-1201 circuit components. Check circuit components by voltage and resistance measurements. See Figure 7–37 and Table 7–20.
Discriminator V-1204	Keep the signal generator connected as outlined under limiter V-1201. Connect the D.C. voltmeter OBQ or ME-25/U between the Deviation Compensation control R-1221 (TP-2, Figure 7–61) and chassis. Set the voltmeter on the 100-volt scale. Adjust the R.F. output of the signal generator to 50 kc. Vary the output frequency of the generator 3 kc. higher and then 3 kc. lower from the center frequency of 50 kc. The voltmeter reading should be approximately 70 volts positive on one frequency and conversely, 70 volts negative on the other frequency setting.	Tubes V-1202, V-1203, V-1204 and/or V-1202, V-1203, V-1204 circuit components. Check components by voltage and resistance measurements. See Figure 7–37 and Table 7–20. Check alignment according to Par. 6. a. (3). (g).
1700 Kc. Oscillator V-1208	Remove the cable from the 1700 kc. output connector J-1203 at the rear of the cabinet and remove the bottom cover of the oscillator compartment. Connect the ME-6/U between terminal 4 of Z-1206 (TP-3, Figure 7–36) and chassis. A reading of approximately 0.5 volt should be obtained on the voltmeter.	Tubes V-1208, V-1207 and/or V-1207, V-1208 circuit components. Check components by voltage and resistance measurements. See Figure 7–37 and Table 7–20. Check alignment according to Par. 6. a. (6). (h).
D.C. Amplifiers V-1205 and V-1206	Connect the signal generator AN/URM-25 as outlined under limiter V-1201. Connect voltmeter ME-25/U or OBQ between pin 7 of V-1206	Tubes V-1205, V-1206 and/or V-1205, V-1206 circuit components. Check components

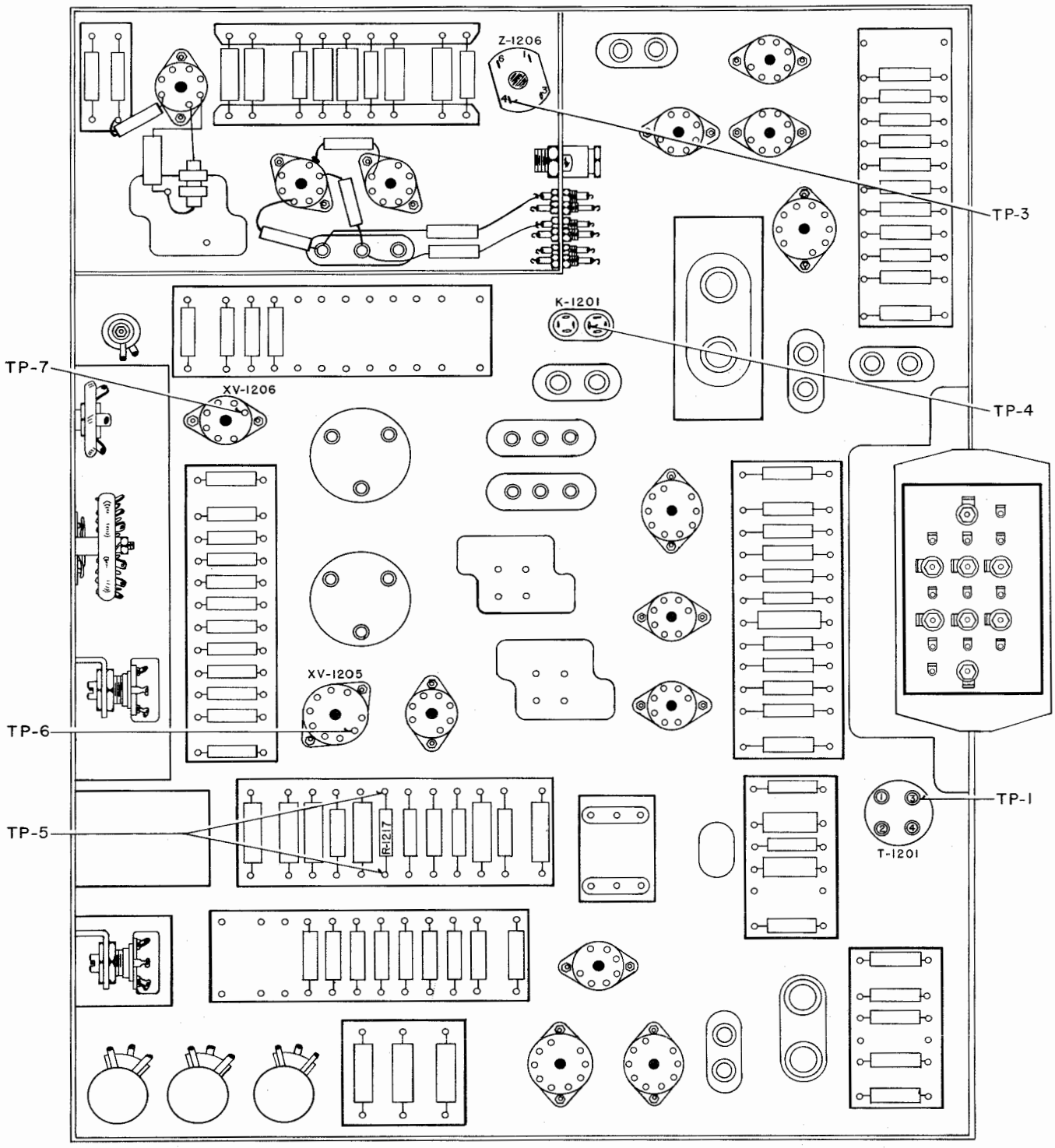


Figure 7–36. Test Point Locations Bottom of Chassis, F.S. Converter CV-127/FRR-24

TABLE 7-19. TROUBLE SHOOTING CHART CV-127/FRR-24 (CONT'D)

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
D.C. Amplifiers V-1205 and V-1206 (cont'd)	(TP-7, Figure 7-36) and chassis. Set the Deviation Compensation control at zero. A reading of 5.8 volts should be obtained on the voltmeter. Connect the voltmeter Model OBQ or ME-25/U between pin 2 of V-1205 (TP-6, Figure 7-36) and chassis. Set the Mark-Polarity switch at Normal. Tune the signal generator 500 cycles higher than the center frequency of 50 kc. and advance the Deviation Compensation control until the voltmeter connected to TP-6 reads plus 2.5 volts. The meter connected between TP-7 and chassis should now read 9.3 volts. Tune the signal generator lower in frequency until the meter connected to TP-6 reads minus 2.5 volts. The meter connected to TP-7 should now read plus 2.3 volts.	by voltage and resistance measurements. See Figure 7-37 and Table 7-20. Check setting of Deviation Compensation control. Check setting of Output Centering control.
Cathode Ray Monitor V-1216	Note the pattern obtained on the oscilloscope screen. All controls associated with the oscilloscope should perform their prescribed functions.	Tube V-1213 and/or vertical amplifier circuit components. Tube V-1214 and/or horizontal sweep oscillator circuit components. Tube V-1215 and/or horizontal amplifier circuit components. Tube V-1216 and/or oscilloscope circuit details. Check components by voltage and resistance measurements. See Figure 7-37 and Table 7-20.
A.F.C. and C.O.N.S. Amplifier V-1217	Refer to Par. 5. c. (9). (d). A.F.C. check and Par. 5, c. (9). (e). C.O.N.S. amplifier check.	Tubes V-1209, V-1210, V-1217, V-1212 and/or V-1209, V-1210, V-1217, V-1212 circuit components. Check components by voltage and resistance measurements. See Figure 7-37 and Table 7-20. Check contacts of relay K-1201.

TABLE 7-20. TUBE OPERATING VOLTAGES AND CURRENTS CV-127/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
1/2 12AX7*	D.C. Limiter	111	neg.	--	--	--	1.5	0	6.3
1/2 12AX7**	D.C. Limiter	110	neg.	--	--	--	1.5	0	--
6AG5	Discr. Driver	180	4.5	95	1.3	--	1	0	6.3
6AG5	Discr. Driver	170	4.5	95	1.3	--	1.2	0	6.3
1/2 6AL5&	Discriminator	0	0	--	--	--	0	--	6.3
1/2 6AL5&&	Discriminator	0	0	--	--	--	0	--	--
1/2 12AX7*	D.C. Amp.	115	neg.	--	--	--	1.3	.75	6.3
1/2 12AX7**	D.C. Amp.	95	neg.	--	--	--	1.3	.75	--
6C4	D.C. Amp.	300	6.1	--	--	--	13.4	3	6.3
1/2 6AL5&	Mark Detector	5.6	neg.	--	--	--	5.2	--	6.3
1/2 6AL5&&	Mark Detector	5.6	neg.	--	--	--	5.2	--	--
1/2 6J6#	Freq. Control	128	5	--	--	--	19	19	6.3
1/2 6J6##	Freq. Control	128	5	--	--	--	19	8.5	--
6AU6	Oscillator	126	5***	126	--	126	neg.	-3.1	6.3
1/2 6J6#	R.F. Amp.	240	6	--	--	--	5.6	0	6.3

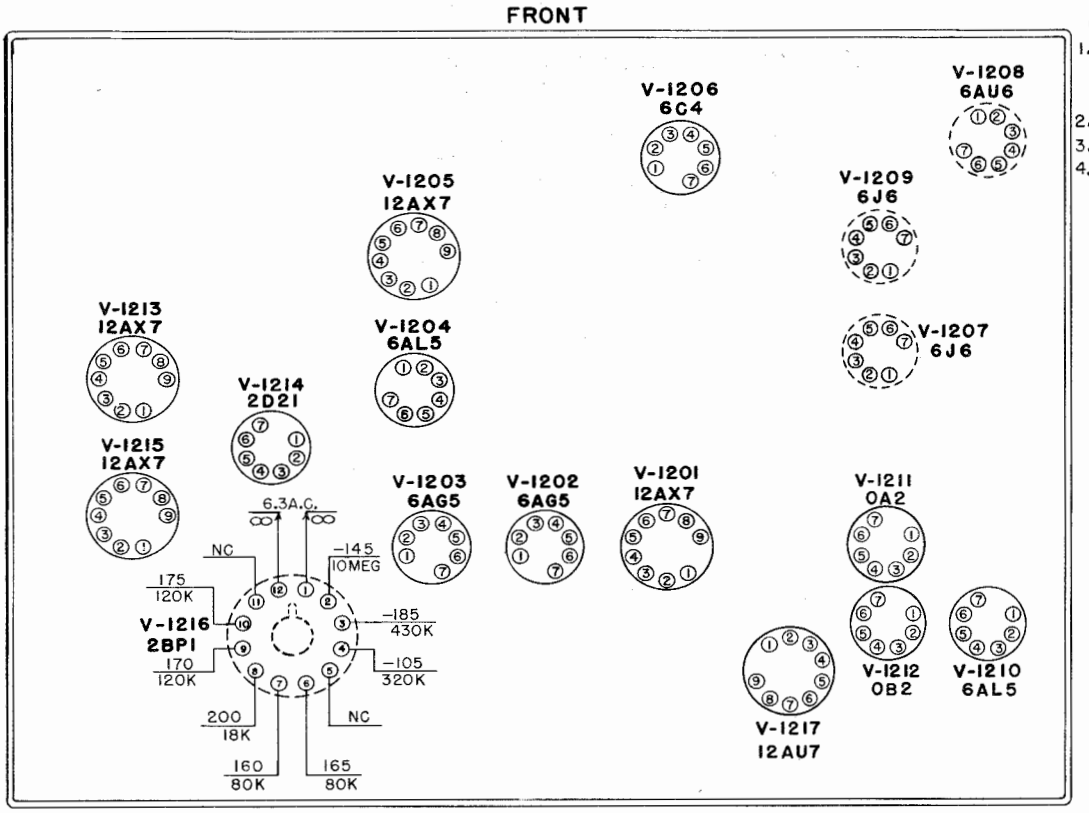
*Pins 1, 2 and 3.
**Pins 6, 7 and 8.
***Total Current for plate, screen and suppressor.
#Pins 1, 6 and 7.
##Pins 2, 5 and 7.
&Pins 2 and 5.
&&Pins 7 and 1.

TABLE 7-20. TUBE OPERATING VOLTAGES AND CURRENTS CV-127/FRR-24 (CONT'D)

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
1/2 6J6##	R.F. Amp.	240	6	--	--	--	5.6	0	--
1/2 12AX7*	Vertical Amp.	190	1.1	--	--	--	7.2	5	6.3
1/2 12AX7**	Vertical Amp.	190	1.1	--	--	--	7.2	5.8	--
2D21	Horiz. Sweep Osc.	31	1	0	0	--	0	.4	6.3
1/2 12AX7*	Horiz. Amp.	175	1.25	--	--	--	1.4	0	6.3
1/2 12AX7**	Horiz. Amp.	200	1.	--	--	--	1.7	0	--
1/2 12AU7*	CONS Amp.	150	neg.	--	--	--	1	-5.4	6.3
1/2 12AU7**	CONS Amp.	225	9	--	--	--	105	138	--
OA2	Voltage Regulator (V-1211)	150	15	--	--	--	0	--	--
OB2	Voltage Regulator (V-1212)	105	17	--	--	--	0	--	--

		CATH (E)	GRID (E)	FOCUSING GRID (E)	ANODE (E)	ANODE (MA)	DEF PLATE (E)		
2BP1	Cathode Ray Monitor	-275	-200	-170	200	neg.	pin 6-190 pin 7-190 pin 9-195 pin 10-200		

*Pins 1, 2 and 3.
**Pins 6, 7 and 8.
##Pins 2, 5 and 7.



CONDITIONS:
1. MEASUREMENTS MADE BETWEEN SPECIFIED POINT AND CHASSIS, EXCEPT AS NOTED.
2. 1000 OHM/VOLT METER USED.
3. NO SIGNAL INPUT.
4. POWER ON FOR VOLTAGE MEASUREMENTS. UNIT DISCONNECTED FOR RESISTANCE MEASUREMENTS.

TUBE	PIN NO.	1	2	3	4	5	6	7	8	9
V-1201	VOLTS	110	0	1	**	**	100	0	1	**
	OHMS	22K	45	30K	∞	∞	53K	0	30K	∞
V-1202	VOLTS	0	.8	*	*	185	90	.8	—	—
	OHMS	560K	150	∞	∞	40K	170K	150	—	—
V-1203	VOLTS	0	1	*	*	170	90	—	—	—
	OHMS	560K	150	∞	∞	38K	150K	150	—	—
V-1204	VOLTS	0	0	*	*	0	0	0	—	—
	OHMS	#150K	89K	∞	∞	#140K	0	85K	—	—
V-1205	VOLTS	85	0	1	**	**	95	.4	1	**
	OHMS	350K	1.3MEG	1800	∞	∞	10K	800	1800	∞
V-1206	VOLTS	300	0	*	*	300	0	13	—	—
	OHMS	13K	∞	∞	∞	13K	500K	2200	—	—
V-1207	VOLTS	250	250	*	*	0	0	6	—	—
	OHMS	17K	17K	∞	∞	14	0	470	—	—
V-1208	VOLTS	-2.5	130	*	*	130	130	0	—	—
	OHMS	220K	16K	∞	∞	17K	17K	14	—	—
V-1209	VOLTS	180	180	*	*	0	0	14.5	—	—
	OHMS	27K	27K	∞	∞	2MEG	450K	1700	—	—
V-1210	VOLTS	5	5	*	*	5	0	5	—	—
	OHMS	1MEG	5700	∞	∞	1MEG	0	5700	—	—
V-1211	VOLTS	150	0	—	0	150	—	0	—	—
	OHMS	12K	0	0	0	12K	0	0	—	—
V-1212	VOLTS	105	0	—	0	105	—	0	—	—
	OHMS	33K	0	0	0	33K	0	0	—	—
V-1213	VOLTS	165	0	7.5	**	**	160	5.8	7.5	**
	OHMS	80K	1MEG	3700	∞	∞	80K	1.4MEG	3700	∞
V-1214	VOLTS	0	0	*	*	0	290	0	—	—
	OHMS	6MEG	0	∞	∞	0	300K	0	—	—
V-1215	VOLTS	170	0	1.3	**	**	175	0	1.4	**
	OHMS	12K	430K	900	∞	∞	120K	0	1200	∞
V-1216	VOLTS	"SEE DRAWING ABOVE"								
	OHMS									
V-1217	VOLTS	120	0	.5	*	*	235	4.5	105	*
	OHMS	470K	10MEG	3300	∞	∞	21K	1.5MEG	33K	∞

* 6.3 V.A.C. ACROSS PINS #3 AND #4.
** 6.3 V.A.C. ACROSS PINS #4-#5 AND #9.
# WHEN NOT SHORTED BY MARK POLARITY SWITCH.

Figure 7-37. Voltage and Resistance Data Chart, F.S. Converter CV-127/FRR-24

TABLE 7-21. TROUBLE SHOOTING CHART CM-32/FRR-24

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
Flip-Flops V-1312, V-1313, Driver V-1311 and D.C. Amplifiers V-1314, V-1315, and V-1316	Remove all cable connections from J-1304 through J-1309 at the rear of the cabinet. Connect the negative lead of voltmeter OBQ or ME-25/U to the parallel plates of V-1314 and V-1315 (TP-2, Figure 7-38). Set the voltmeter on the 300 volt scale and connect the positive lead to a plus 300 volt source (TP-3, Figure 7-38). This meter is used to indicate whether the keying tubes are in a conducting or non-conducting state and any voltmeter with a 300-volt scale may be used. Connect the ends of a 10,000-ohm potentiometer (SNSN N16-R-91291-4928) across a 4.5-volt battery. Connect the negative end of the battery. to chassis and connect the arm of the potentiometer to the control grid (pin 2) of V-1311 (TP-4, Figure 7-38). Turn the arm of the potentiometer to the negative end of its range. Connect meter OBQ or ME-25/U to the grid (pin 2) of V-1311 (TP-4, Figure 7-38). Adjust the potentiometer until the meter connected in the output circuit indicates 300 volts. Rotate the potentiometer slowly to produce an increase in voltage on the meter connected in the grid of V-1311. Note the reading on this meter when the meter in the output circuit indicates cutoff (approximately 160 volts on OBQ or ME-25/U). The reading should be between 2.2 to 3 volts. Adjust the potentiometer to reduce the voltage on the grid of V-1311. Note the reading on the meter connected in the grid circuit when the meter at the output indicates approximately 300 volts. The reading should be between 0.7 to 1 volt. To check V-1316 connect an OBQ or ME-25/U to the junction of resistors R-1368 and R-1369 (TP-5, Figure 7-38). The voltage at TP-5 should be 1.9 volts when the output tubes are conducting and 4 volts when cut off.	Tubes V-1311, V-1312, V-1313, V-1314, V-1315, V-1316 and/or V-1311, V-1312, V-1313, V-1314, V-1315, V-1316 circuit components. Check components by voltage and resistance measurements. See Figure 7-39 and Table 7-22. Check settings of potentiometers R-1343 and R-1346 in accordance with Par. 6. a. (7). (a).
Flip-Flops V-1320, V-1321, Driver V-1319 and D.C. Amplifiers V-1322, V-1323 and V-1324	The procedure for testing the Flip-Flop circuits in this channel is identical with that outlined under Flip-Flops V-1312, V-1313 and Driver V-1311 except for the following test point locations: negative lead of output indicator connected to TP-7, Figure 7-38, positive lead to 300-volt source TP-3, Figure 7-38, potentiometer connection to pin 2 of V-1319 is TP-8, Figure 7-38, grid meter connection to pin 2 of V-1319 is TP-8, Figure 7-38. For the check of V-1324 the voltmeter is connected to the junction of R-1398 and and R-1399 (TP-9, Figure 7-38).	Tubes V-1320, V-1321, V-1319, V-1322, V-1323, V-1324 and/or V-1320, V-1321, V-1319, V-1322, V-1323, V-1324 circuit components. Check components by voltage and resistance measurements. See Figure 7-39 and Table 7-22. Check setting of potentiometers R-1372 and R-1376 in

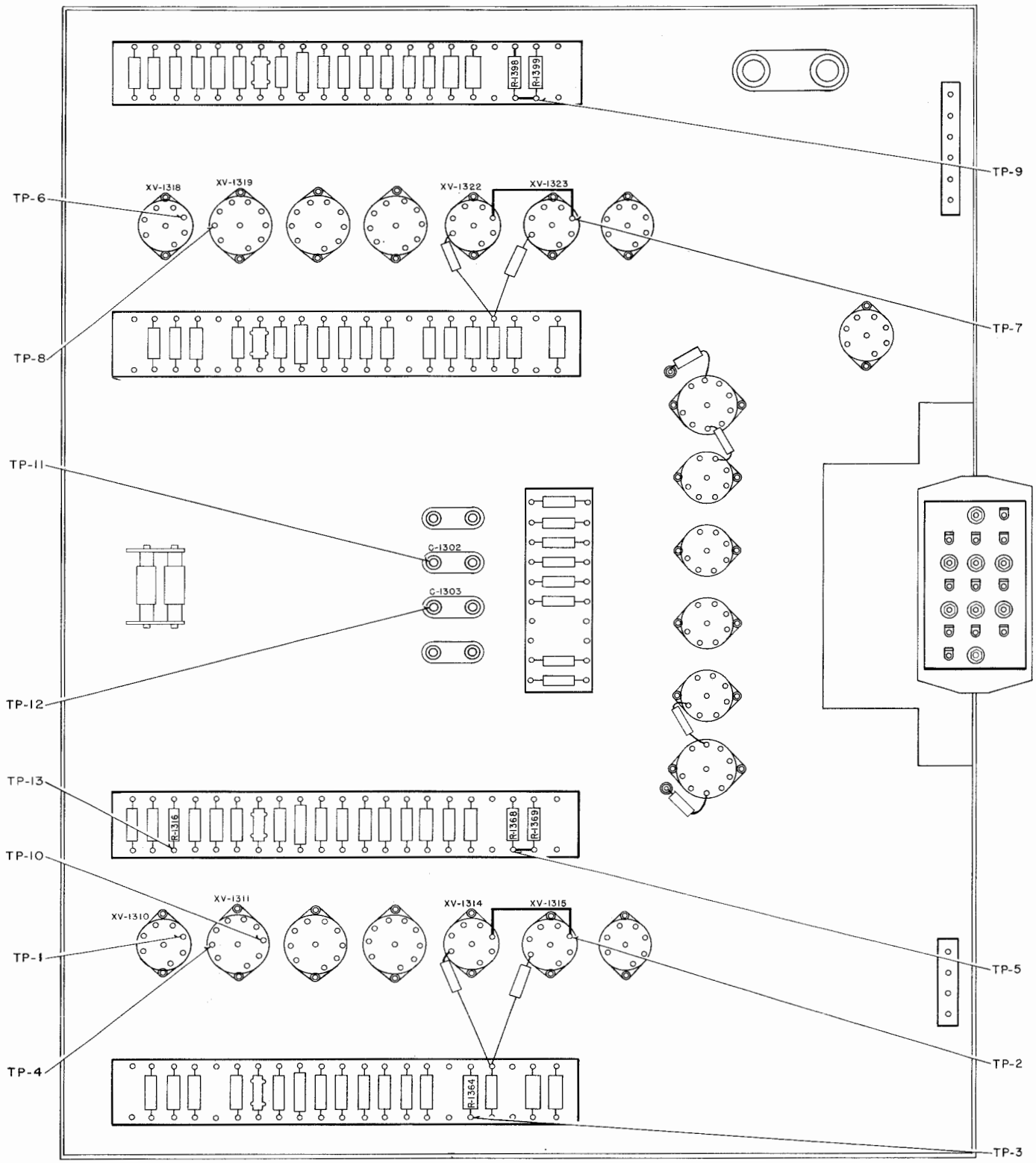


Figure 7–38. Test Point Locations Bottom of Chassis, Comparator Keyer CM-32/FRR-24

TABLE 7–21. TROUBLE SHOOTING CHART CM-32/FRR-24 (CONT'D)

WHAT TO CHECK	HOW TO CHECK	POSSIBLE DEFECTS AND REMEDIES
Flip-Flops V-1320, V-1321, Driver V-1319 and D.C. Amplifiers V-1322, V-1323 and V-1324 (cont'd)		accordance with Par. 6. a. (7). (a).
Combining Diodes V-1301, V-1302, V-1303	It is essential when the combining diodes are checked that this unit shall be connected to Frequency Shift Converter CV-127/FRR-24 (unit 4D). Remove the cables from connectors J-1304 and J-1307 at the rear of the cabinet. Make the following connections and adjustments on the CV-127/FRR-24. Connect a variable audio oscillator, Model LAJ or TS-382A/U between the Deviation Compensation control (TP-2, Figure 7–61) and chassis. Set the Keying Speed switch at Fast and the Oscilloscope Selector switch at Calib. Adjust the Calibration control for a one inch internal sweep. Reset the Oscilloscope Selector switch to Output. Adjust the audio oscillator and Deviation Compensation control simultaneously for a one-inch deflection on the cathode ray monitor V-1216. Make the following connections and adjustments on the CM-32/FRR-24. Connect oscilloscope OS-8/U between the junction of R-1336, C-1302 (TP-11, Figure 7–38) and chassis. Set the Channel A Input switch at Single Channel. A sine wave pattern with an amplitude of between 5 and 7 volts peak to peak should be obtained on the oscilloscope. Move the oscilloscope connections to the junction of C-1303, R-1316 (TP-12, Figure 7–38) and chassis. Change the setting of the Channel A Input switch to Diversity, the same output should be obtained. Remove the cable from connector J-1306 and connect it to connector J-1304. A sine wave pattern with an amplitude of between 5 and 7 volts peak to peak should be obtained on the oscilloscope. Remove the cable from connector J-1304 and connect it to connector J-1307. A sine wave pattern with an amplitude of between 5 and 7 volts peak to peak should be obtained on the oscilloscope. Move the oscilloscope to the opposite end of R-1316 (TP-13, Figure 7–38). A clipped wave with an amplitude of 3 to 4 volts should be obtained on the oscilloscope.	Tubes V-1301, V-1302, V-1303 and/or V-1301, V-1302, V-1303 circuit components. Check components by voltage and resistance measurements. See Figure 7–39 and Table 7–22.

TABLE 7-22. TUBE OPERATING VOLTAGES AND CURRENTS CM-32/FRR-24 (CONT'D)

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
1/2 12AT7##	Combiner (V-1306)	272	5.1	--	--	--	9.2	6.2	--
1/2 6AL5*	D.C. Restorer (V-1310)	0.28	0	--	--	--	3.2	--	6.3
1/2 6AL5**	D.C. Restorer (V-1310)	0	0	--	--	--	0.28	--	--
1/2 6AL5*	D.C. Restorer (V-1318)	0.28	0	--	--	--	3.2	--	6.3
1/2 6AL5**	D.C. Restorer (V-1318)	0	0	--	--	--	0.28	--	--
1/2 12AU7#	Driver (V-1311)	110	.95	--	--	--	6.3	neg.	6.3
1/2 12AU7##	Driver (V-1311)	70	.4	--	--	--	5.8	1.85	--
1/2 12AU7#	Driver (V-1319)	110	.95	--	--	--	6.3	neg	6.3
1/2 12AU7##	Driver (V-1319)	70	.4	--	--	--	5.8	1.85	--
1/2 12AU7#	Flip-Flop (V-1312)	155	4.9	--	--	--	110	110	6.3
1/2 12AU7##	Flip-Flop (V-1312)	280	0	--	--	--	110	70	--
1/2 12AU7#	Flip-Flop (V-1320)	155	4.9	--	--	--	110	110	6.3
1/2 12AU7##	Flip-Flop (V-1320)	280	0	--	--	--	110	70	--
1/2 12AU7#	Flip-Flop (V-1313)	15	1.5	--	--	--	6.8	7.4	6.3
1/2 12AU7##	Flip-Flop (V-1313)	102	0	--	--	--	6.8	-18	--
1/2 12AU7#	Flip-Flop (V-1321)	102	0	--	--	--	6.8	-18	6.3

*Pins 2 and 5.
**Pins 7 and 1.
#Pins 1, 2 and 3.
##Pins 6, 7 and 8.

TABLE 7–22. TUBE OPERATING VOLTAGES AND CURRENTS CM-32/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
1/2 6AL5*	Combining Diode (V-1301)	4.6	0	--	--	--	5.1	--	6.3
1/2 6AL5**	Combining Diode (V-1301)	4.6	0	--	--	--	5.1	--	--
1/2 6AL5*	Combining Diode (V-1302)	4.6	0	--	--	--	5.1	--	6.3
1/2 6AL5**	Combining Diode (V-1302)	5.1	0	--	--	--	5.7	--	--
1/2 6AL5*	Combining Diode (V-1303)	5.1	0	--	--	--	5.7	--	6.3
1/2 6AL5**	Combining Diode (V-1303)	5.1	0	--	--	--	5.7	--	--
1/2 6AL5*	Combining Diode (V-1304)	4.6	0	--	--	--	4.9	--	6.3
1/2 6AL5**	Combining Diode (V-1304)	4.9	0	--	--	--	5.6	--	--
1/2 12AT7#	Combiner (V-1305)	272	4.7	--	--	--	8.5	5.0	6.3
1/2 12AT7##	Combiner (V-1305)	272	5.1	--	--	--	9.2	6.2	--
1/2 12AT7#	Combiner (V-1306)	272	4.7	--	--	--	8.5	5.0	6.3

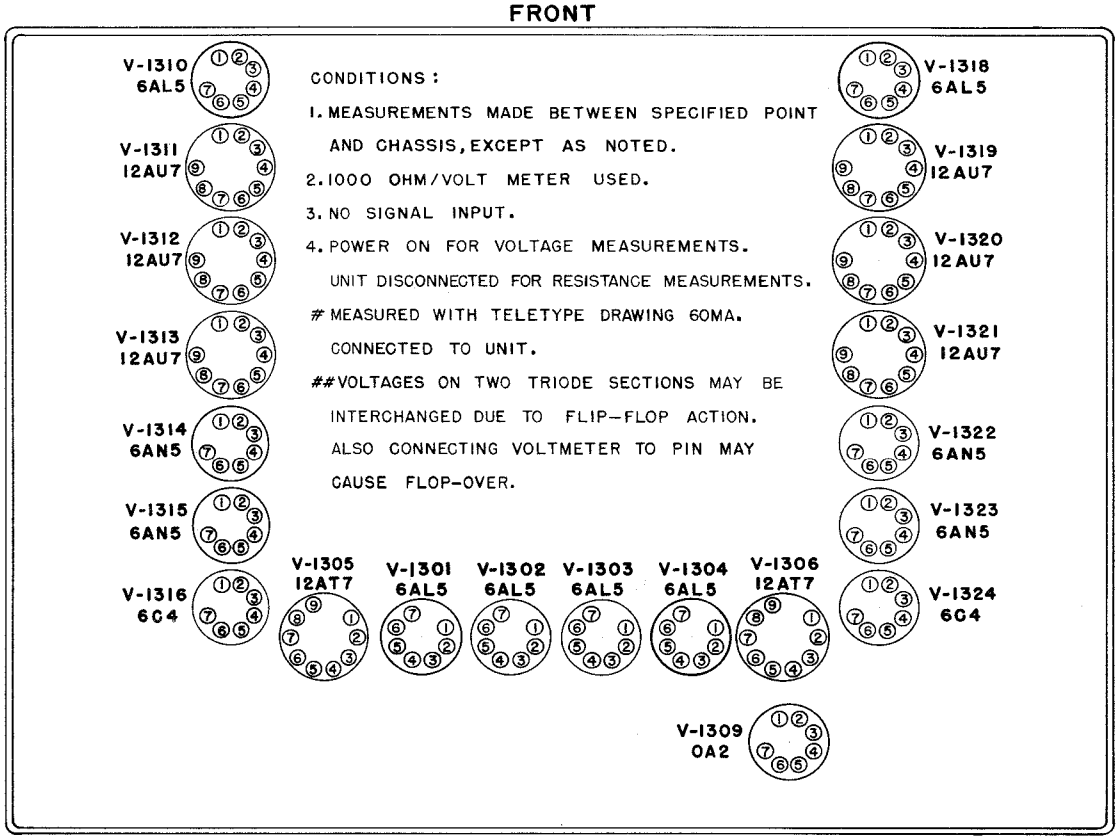
*Pins 2 and 5.
**Pins 7 and 1.
#Pins 1, 2 and 3.
##Pins 6, 7 and 8.

TABLE 7-22. TUBE OPERATING VOLTAGES AND CURRENTS CM-32/FRR-24 (CONT'D)

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
1/2 12AU7##	Flip-Flop (V-1321)	24	1.5	--	--	--	6.8	7.1	--
6AN5	D.C. Amp. (V-1314)	70	25	50	6	--	0	-.7	6.3
6AN5	D.C. Amp. (V-1322)	70	25	50	6	--	0	-.7	6.3
6AN5	D.C. Amp. (V-1315)	70	25	50	6	--	0	-.7	6.3
6AN5	D.C. Amp. (V-1323)	70	25	50	6	--	0	-.7	6.3
6C4	D.C. Amp. (V-1316)	55	.5	--	--	--	0	-17.5	6.3
6C4	D.C. Amp. (V-1324)	36	.5	--	--	--	0	-.9	6.3
OA2	Voltage Regulator	150	--	--	--	--	--	--	--

##Pins 6, 7 and 8.

FRONT



TUBE	PIN NO.	1	2	3	4	5	6	7	8	9
V-1301	VOLTS	0	0	*	*	0	0	0	—	—
	OHMS	∞	260K	∞	∞	∞	0	260K	—	—
V-1302	VOLTS	0	0	*	*	0	0	0	—	—
	OHMS	270K	260K	∞	∞	∞	0	∞	—	—
V-1303	VOLTS	0	0	*	*	0	0	0	—	—
	OHMS	270K	∞	∞	∞	270K	0	∞	—	—
V-1304	VOLTS	0	0	*	*	0	0	0	—	—
	OHMS	280K	280K	∞	∞	∞	0	∞	—	—
V-1305	VOLTS	270	0.5	8.5	**	**	270	4.5	9.5	**
	OHMS	14K	260K	1800	∞	∞	14K	270K	1800	∞
V-1306	VOLTS	270	0.5	8.5	**	**	270	4.5	9.5	**
	OHMS	14K	280K	1800	∞	∞	14K	280K	1800	∞
V-1307	VOLTS			NOT	USED					
	OHMS									
V-1308	VOLTS			NOT	USED					
	OHMS									
V-1309	VOLTS	150	—	—	—	150	—	—	—	—
	OHMS	8200	0	∞	0	8200	∞	0	—	—
V-1310	VOLTS	0	0	*	*	2.8	0	0	—	—
	OHMS	1.4MEG	1.4MEG	∞	∞	680	∞	0	—	—
V-1311	VOLTS	95	0	6	**	**	58	1.0	5.5	**
	OHMS	260K	1.4MEG	6300	∞	∞	260K	2300	6400	∞
V-1312	VOLTS	155	95	107	**	**	260	58	107	**
	OHMS	36K	260K	23K	∞	∞	36K	260K	23K	∞
V-1313	VOLTS	85	−8.5	6.5	**	**	12	6.5	6.5	**
	OHMS	78K	72K	4700	∞	∞	80K	72K	4500	∞
V-1314	VOLTS	0	0	*	*	70	50	0	—	—
	OHMS	180K	0	∞	∞	∞	∞	0	—	—
V-1315	VOLTS	0	0	*	*	70	50	0	—	—
	OHMS	180K	0	∞	∞	∞	∞	0	—	—
V-1316	VOLTS	21	0	*	*	21	<1	0	—	—
	OHMS	34K	∞	∞	∞	34K	180K	0	—	—
V-1318	VOLTS	0	0	*	*	2.8	0	0	—	—
	OHMS	1.4MEG	1.4MEG	∞	∞	680	0	0	—	—
V-1319	VOLTS	95	0	5.5	**	**	58	1.0	5.5	**
	OHMS	260K	1.4MEG	6300	∞	∞	260K	2600	6200	∞
V-1320	VOLTS	155	95	107	**	**	260	58	107	**
	OHMS	37K	260K	26K	∞	∞	36K	260K	26K	∞
V-1321	VOLTS	90	−7.5	7	**	**	17	4.5	7	**
	OHMS	78K	70K	4500	∞	∞	72K	70K	4600	∞
V-1322	VOLTS	0	0	*	*	70	50	0	—	—
	OHMS	180K	0	∞	∞	∞	∞	0	—	—
V-1323	VOLTS	0	0	*	*	70	50	0	—	—
	OHMS	180K	0	∞	∞	∞	∞	0	—	—
V-1324	VOLTS	22	0	*	*	22	<1	0	—	—
	OHMS	34K	∞	∞	∞	34K	18K	0	—	—

* 6.3 V.A.C. ACROSS PINS #3 AND #4.
** 6.3 V.A.C. ACROSS PINS #4 – #5 AND #9.

Figure 7–39. Voltage and Resistance Data Chart, Comparator Keyer CM-32/FRR-24

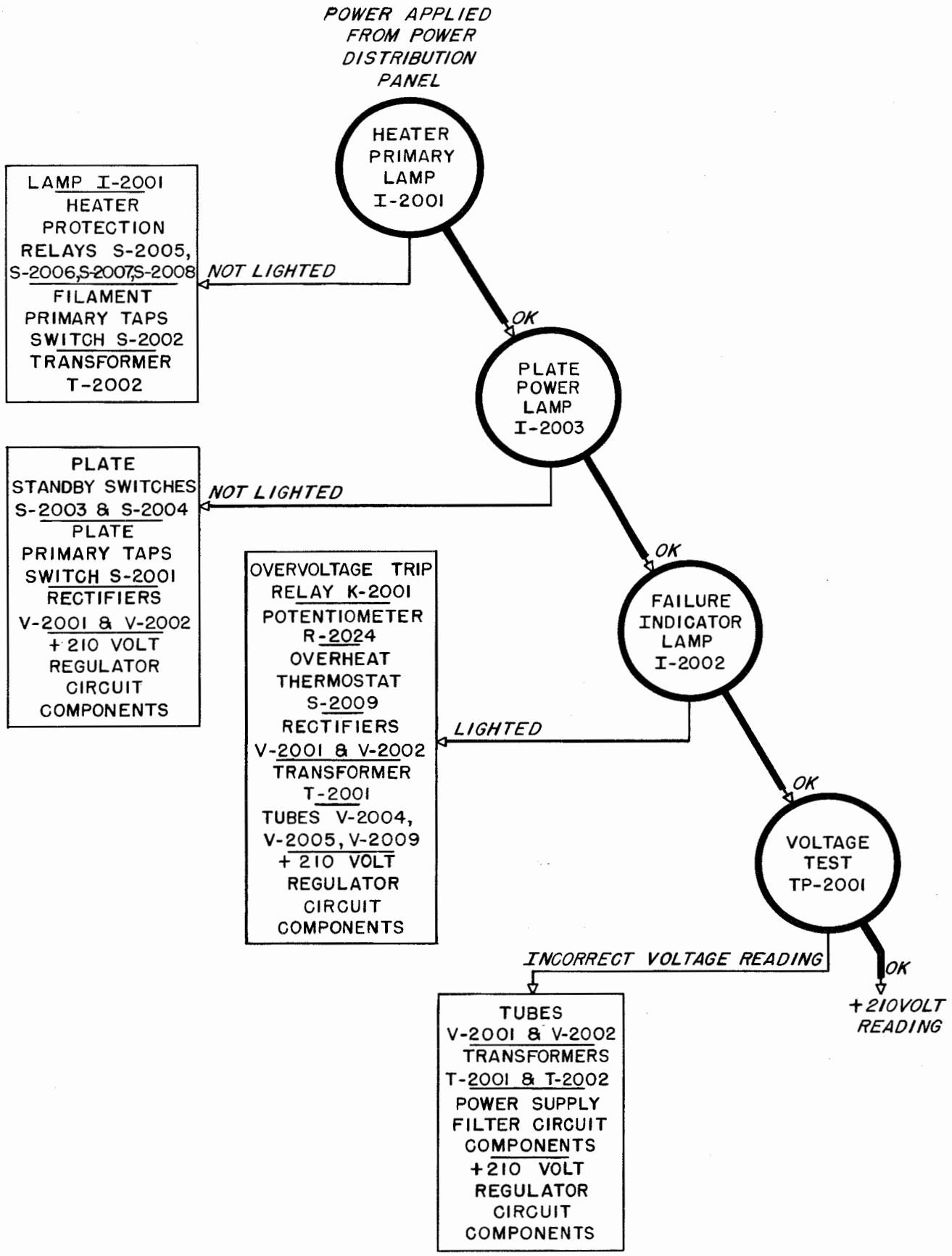


Figure 7–40. Trouble Shooting Chart, Power Supply PP-590/FRR-24

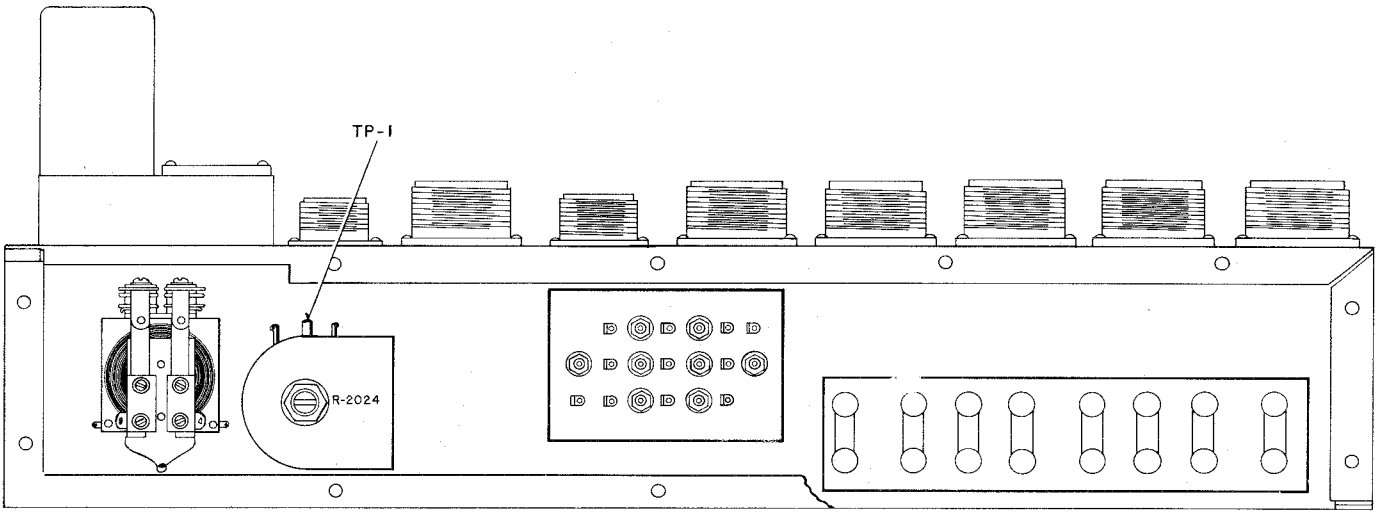


Figure 7–41. Test Point Locations Inside of R.F. Filter Compartment, Power Supply PP-590/FRR-24

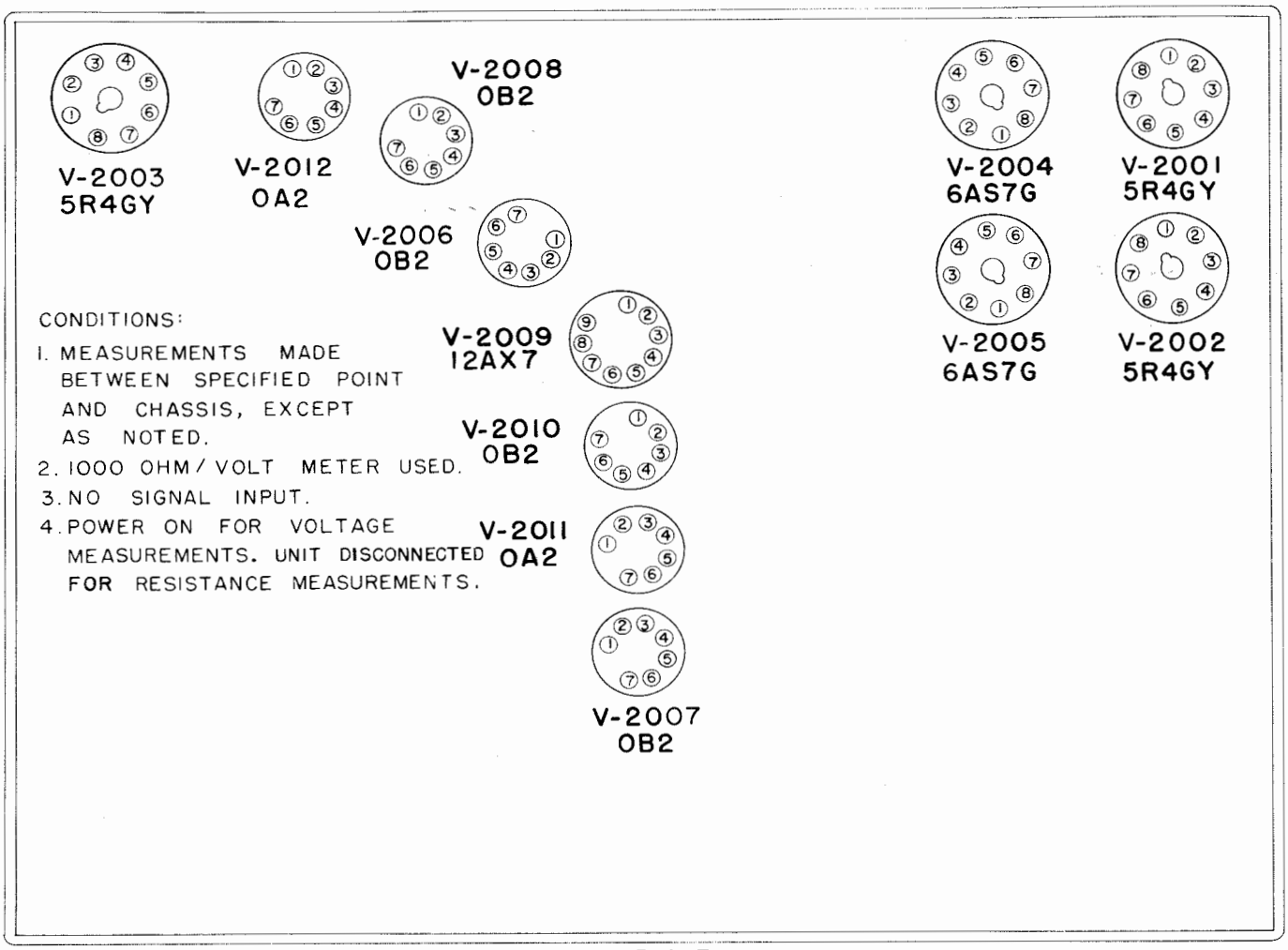
TABLE 7-23. TUBE OPERATING VOLTAGES AND CURRENTS PP-590/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
5R4GY	Rectifier (V-2001)	300 RMS	180	--	--	--	279	--	5
5R4GY	Rectifier (V-2002)	300 RMS	180	--	--	--	279	--	5
5R4GY	Rectifier (V-2003)	355 RMS	21	--	--	--	8.9	--	5
1/2 6AS7G*	Voltage Regulator (V-2004)	270	89	--	--	--	208	190	6.3
1/2 6AS7G**	Voltage Regulator (V-2004)	270	90	--	--	--	208	190	--
1/2 6AS7G*	Voltage Regulator (V-2005)	270	92	--	--	--	208	190	6.3
1/2 6AS7G**	Voltage Regulator (V-2005)	270	90	--	--	--	208	190	--
1/2 12AX7#	Regulator Amp. (V-2009)	189	neg.	--	--	--	106	104	6.3
1/2 12AX7##	Regulator Amp. (V-2009)	104	.37	--	--	--	168	163	--
OB2	Voltage Regulator (V-2006)	0	21	--	--	--	-107	--	--
OB2	Voltage Regulator (V-2007)	0	20	--	--	--	-109	--	--
OB2	Voltage Regulator (V-2008)	-107	21	--	--	--	-208	--	--
OB2	Voltage Regulator (V-2010)	106	13	--	--	--	0	--	--

*Pins 1, 2 and 3.
**Pins 4, 5 and 6.
#Pins 1, 2 and 3.
##Pins 6, 7 and 8.

TABLE 7–23. TUBE OPERATING VOLTAGES AND CURRENTS PP-590/FRR-24 (CONT'D)

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
OA2	Voltage Regulator (V-2011)	208	10	--	--	--	167	--	--
OA2	Voltage Regulator	150	20	--	--	--	0	--	--



FRONT

TUBE		PIN # 1	PIN # 2	PIN # 3	PIN # 4	PIN # 5	PIN # 6	PIN # 7	PIN # 8	PIN # 9
V-2001	VOLTS	NC	300	NC	300RMS	NC	300RMS	NC	300	—
	OHMS	∞	∞	∞	9.6	∞	9.6	∞	∞	—
V-2002	VOLTS	NC	300	NC	300RMS	NC	300RMS	NC	300	—
	OHMS	∞	∞	∞	10.5	∞	10.5	∞	∞	—
V-2003	VOLTS	NC	10	NC	23RMS	NC	23RMS	NC	10	—
	OHMS	∞	220	∞	∞	∞	∞	∞	220	—
V-2004	VOLTS	80	290	210	75	290	210	6.3A.C.	12.6A.C.	—
	OHMS	530K	∞	60K	530K	∞	60K	0	0	—
V-2005	VOLTS	80	290	210	75	290	210	6.3A.C.	12.6A.C.	—
	OHMS	530K	∞	60K	530K	∞	60K	0	0	—
V-2006	VOLTS	0	-110	0	-110	0	0	-110	—	—
	OHMS	0	∞	∞	∞	0	∞	∞	—	—
V-2007	VOLTS	0	-110	0	-110	0	0	-110	—	—
	OHMS	0	∞	∞	∞	0	∞	∞	—	—
V-2008	VOLTS	-110	-220	-110	-220	-110	-110	-220	—	—
	OHMS	∞	∞	∞	∞	∞	∞	∞	—	—
V-2009	VOLTS	75	110	102	0	0	110	50	54	6.3RMS
	OHMS	500K	340K	80K	0	0	340K	240K	6400	0
V-2010	VOLTS	110	0	0	0	110	0	0	—	—
	OHMS	52K	0	∞	0	52K	∞	0	—	—
V-2011	VOLTS	215	60	0	60	215	0	60	—	—
	OHMS	59K	6200	∞	6200	59K	∞	6200	—	—
V-2012	VOLTS	150	0	0	0	150	0	0	—	—
	OHMS	6200	0	∞	0	6200	∞	0	—	—

Figure 7-42. Voltage and Resistance Data Chart, Power Supply PP-590/FRR-24

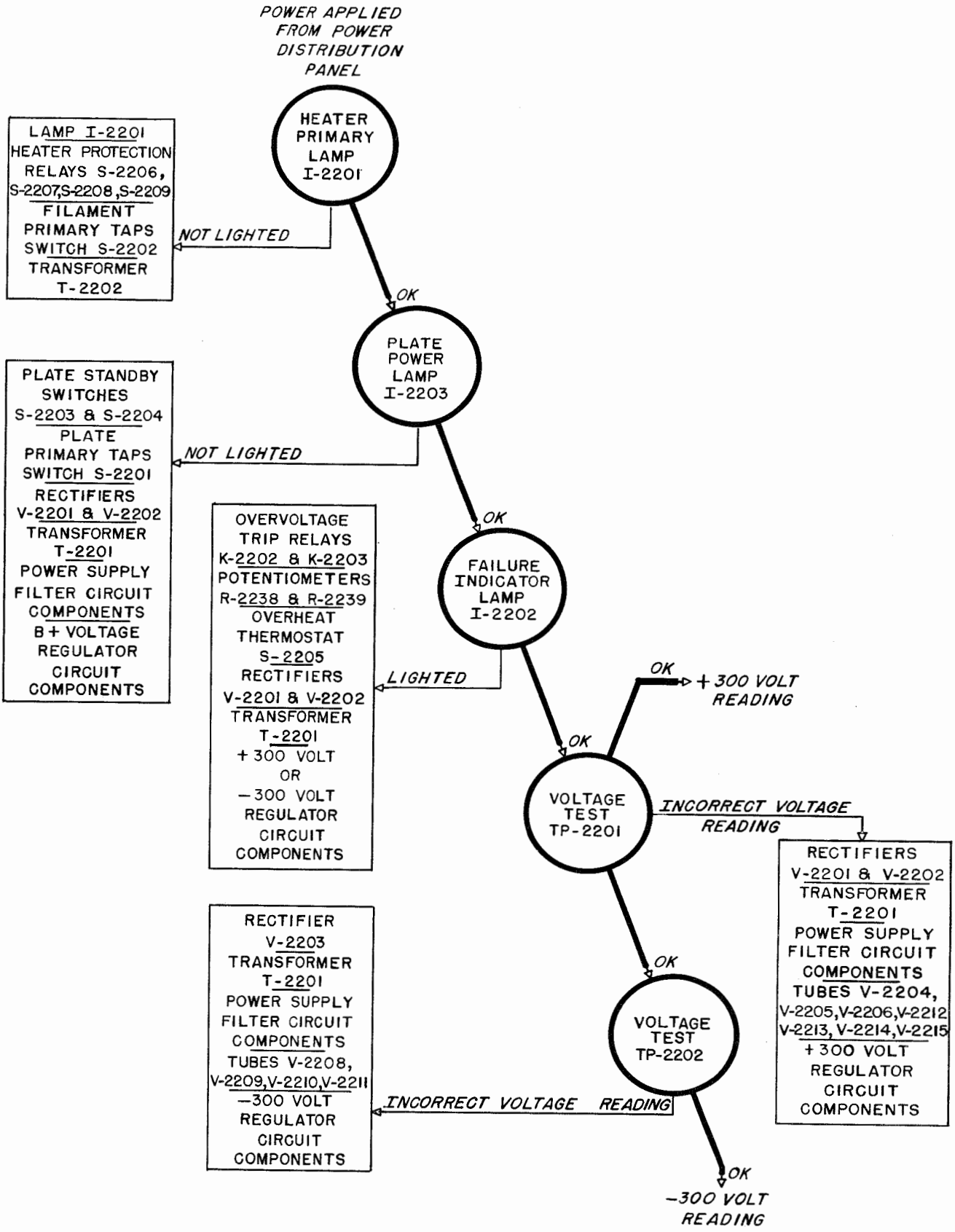


Figure 7–43. Trouble Shooting Chart, Power Supply PP-648/FRR-24

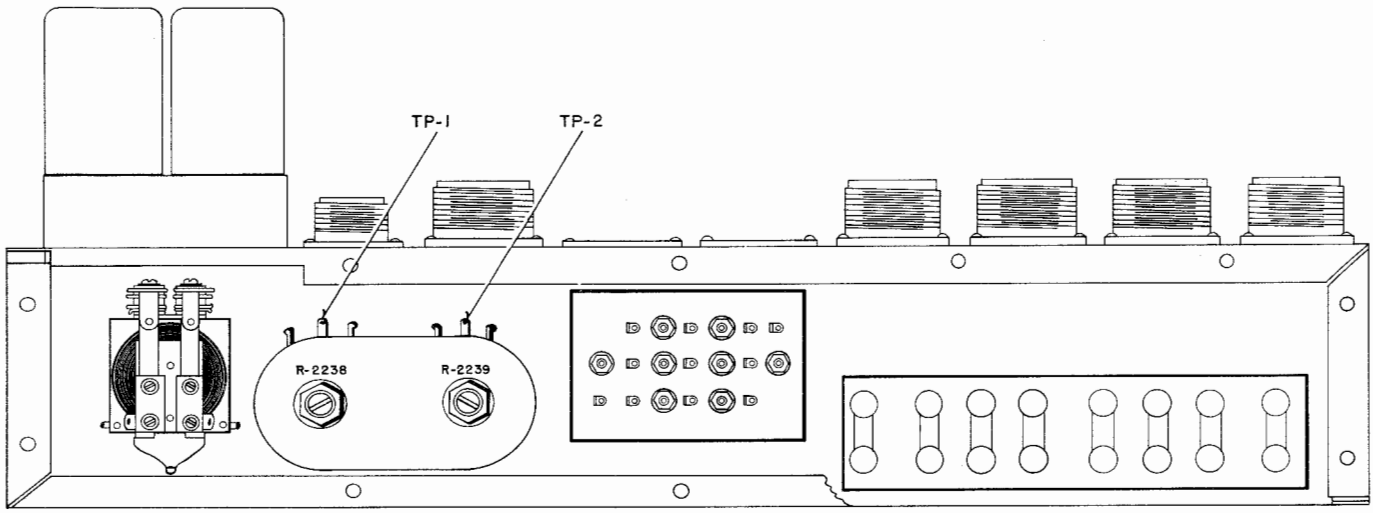


Figure 7–44. Test Point Locations Inside of R.F. Filter Compartment, Power Supply PP-648/FRR-24

TABLE 7–24. TUBE OPERATING VOLTAGES AND CURRENTS PP-648/FRR-24

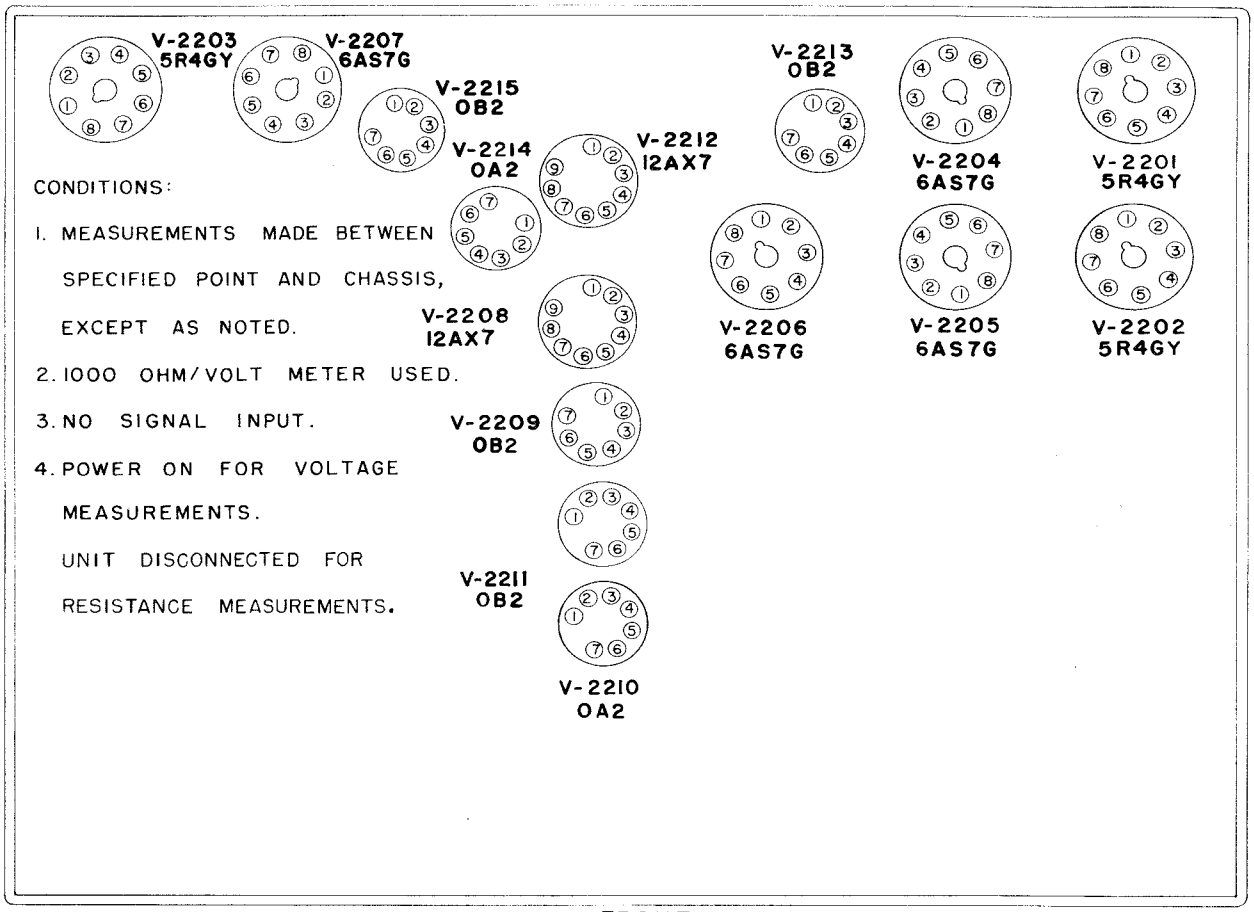
TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
5R4GY	Rectifier (V-2201)	460 RMS	90	--	--	--	480	--	5
5R4GY	Rectifier (V-2202)	460 RMS	90	--	--	--	480	--	5
5R4GY	Rectifier (V-2203)	360 RMS	15	--	--	--	165	--	5
1/2 6AS7G*	Voltage Regulator (V-2204)	460	60	--	--	--	300	225	6.3
1/2 6AS7G**	Voltage Regulator (V-2204)	460	60	--	--	--	300	225	--
1/2 6AS7G*	Voltage Regulator (V-2205)	460	60	--	--	--	300	225	6.3
1/2 6AS7G**	Voltage Regulator (V-2205)	460	60	--	--	--	300	225	--
1/2 6AS7G*	Voltage Regulator (V-2206)	460	60	--	--	--	300	225	6.3
1/2 6AS7G**	Voltage Regulator (V-2206)	460	60	--	--	--	300	225	--
1/2 6AS7G*	Voltage Regulator (V-2207)	160	15	--	--	--	neg.	-90	6.3
1/2 6AS7G**	Voltage Regulator (V-2207)	160	15	--	--	--	neg.	-90	--
1/2 12AX7#	Regulator Amp. (V-2208)	-90	neg.	--	--	--	-175	-180	6.3

*Pins 1, 2 and 3.
**Pins 4, 5 and 6.
#Pins 1, 2 and 3.

TABLE 7-24. TUBE OPERATING VOLTAGES AND CURRENTS PP-648/FRR-24 (CONT'D)

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
1/2 12AX7##	Regulator Amp. (V-2208)	-180	neg.	--	--	--	-250	-250	--
1/2 12AX7#	Regulator Amp. (V-2212)	215	neg.	--	--	--	108	108	6.3
1/2 12AX7##	Regulator Amp. (V-2212)	105	neg.	--	--	--	35	34	--
OB2	Voltage Reference (V-2209)	-190	12	--	--	--	-300	--	--
OA2	Voltage Regulator (V-2210)	0	11	--	--	--	-150	--	--
OB2	Voltage Regulator (V-2211)	-150	11	--	--	--	-260	--	--
OB2	Voltage Reference (V-2213)	105	12	--	--	--	0	--	--
OA2	Voltage Regulator (V-2214)	300	11	--	--	--	150	--	--
OB2	Voltage Regulator (V-2215)	150	11	--	--	--	35	--	--

#Pins 1, 2 and 3.
##Pins 5, 6 and 7.



FRONT

TUBE		PIN # 1	PIN # 2	PIN # 3	PIN # 4	PIN # 5	PIN # 6	PIN # 7	PIN # 8	PIN # 9
V-2201	VOLTS	NC	490	NC	460RMS	NC	460RMS	NC	490	—
	OHMS	—	∞	—	15	—	15	—	∞	—
V-2202	VOLTS	NC	490	NC	460RMS	NC	460RMS	NC	490	—
	OHMS	—	∞	—	15	—	15	—	∞	—
V-2203	VOLTS	NC	185	NC	360RMS	NC	360RMS	NC	185	—
	OHMS	—	∞	—	54K	—	54K	—	∞	—
V-2204	VOLTS	90	500	300	90	500	300	#	#	—
	OHMS	700K	∞	75K	660K	∞	75K	—	—	—
V-2205	VOLTS	90	500	300	90	500	300	#	#	—
	OHMS	650K	∞	75K	600K	∞	75K	—	—	—
V-2206	VOLTS	90	500	300	90	500	300	#	#	—
	OHMS	600K	∞	75K	600K	∞	75K	—	—	—
V-2207	VOLTS	-100	175	<1	-100	175	<1	#	#	—
	OHMS	450K	∞	68	450K	∞	68	—	—	—
V-2208	VOLTS	-100	-185	-175	*	*	-185	-265	-265	*
	OHMS	450K	260K	35K	∞	∞	270K	46K	65K	—
V-2209	VOLTS	-190	-300	0	-300	-190	0	-300	—	—
	OHMS	15K	61K	—	61K	15K	—	61K	—	—
V-2210	VOLTS	0	-150	0	-150	0	0	-150	—	—
	OHMS	0	∞	—	∞	0	—	∞	—	—
V-2211	VOLTS	-150	-265	0	-265	-150	0	-265	—	—
	OHMS	∞	66K	—	66K	∞	—	66K	—	—
V-2212	VOLTS	90	110	106	*	*	110	26	36	*
	OHMS	550K	340K	75K	0	0	340K	17K	4000	—
V-2213	VOLTS	110	0	0	0	110	0	0	—	—
	OHMS	50K	0	—	0	50K	—	0	—	—
V-2214	VOLTS	300	150	0	150	300	0	150	—	—
	OHMS	70K	∞	—	∞	70K	—	∞	—	—
V-2215	VOLTS	150	35	0	35	150	0	35	—	—
	OHMS	∞	4000	—	4000	∞	—	4000	—	—

* 6.3 RMS BETWEEN #9 AND #4, #5.

6.3 RMS BETWEEN #7 AND # 8.

Figure 7–45. Voltage and Resistance Data Chart, Power Supply PP-648/FRR-24

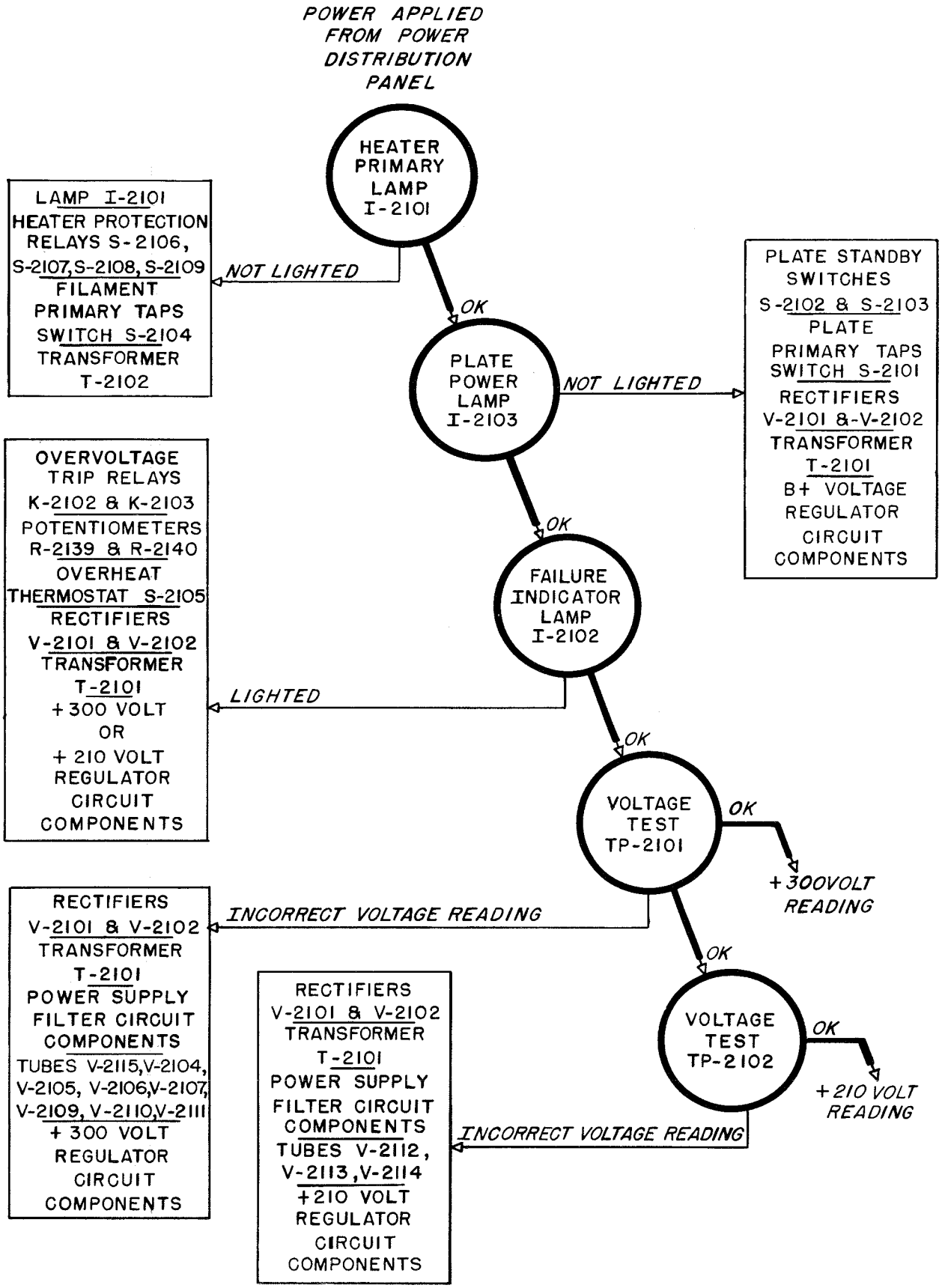


Figure 7–46. Trouble Shooting Chart, Power Supply PP-649/FRR-24

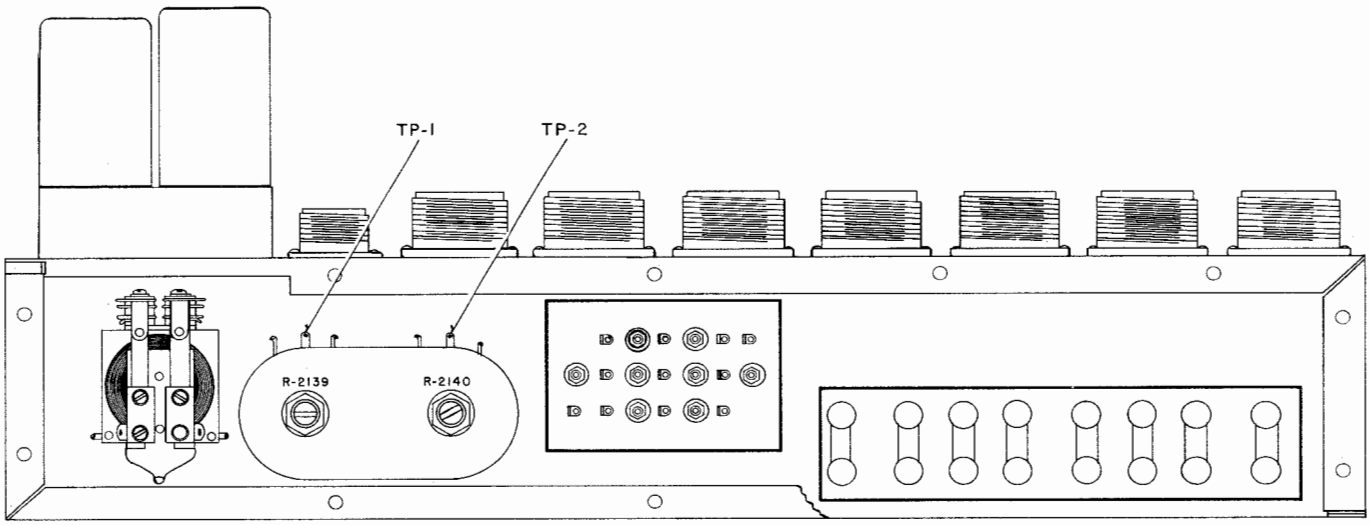


Figure 7–47. Test Point Locations Inside of R.F. Filter Compartment, Power Supply PP-649/FRR-24

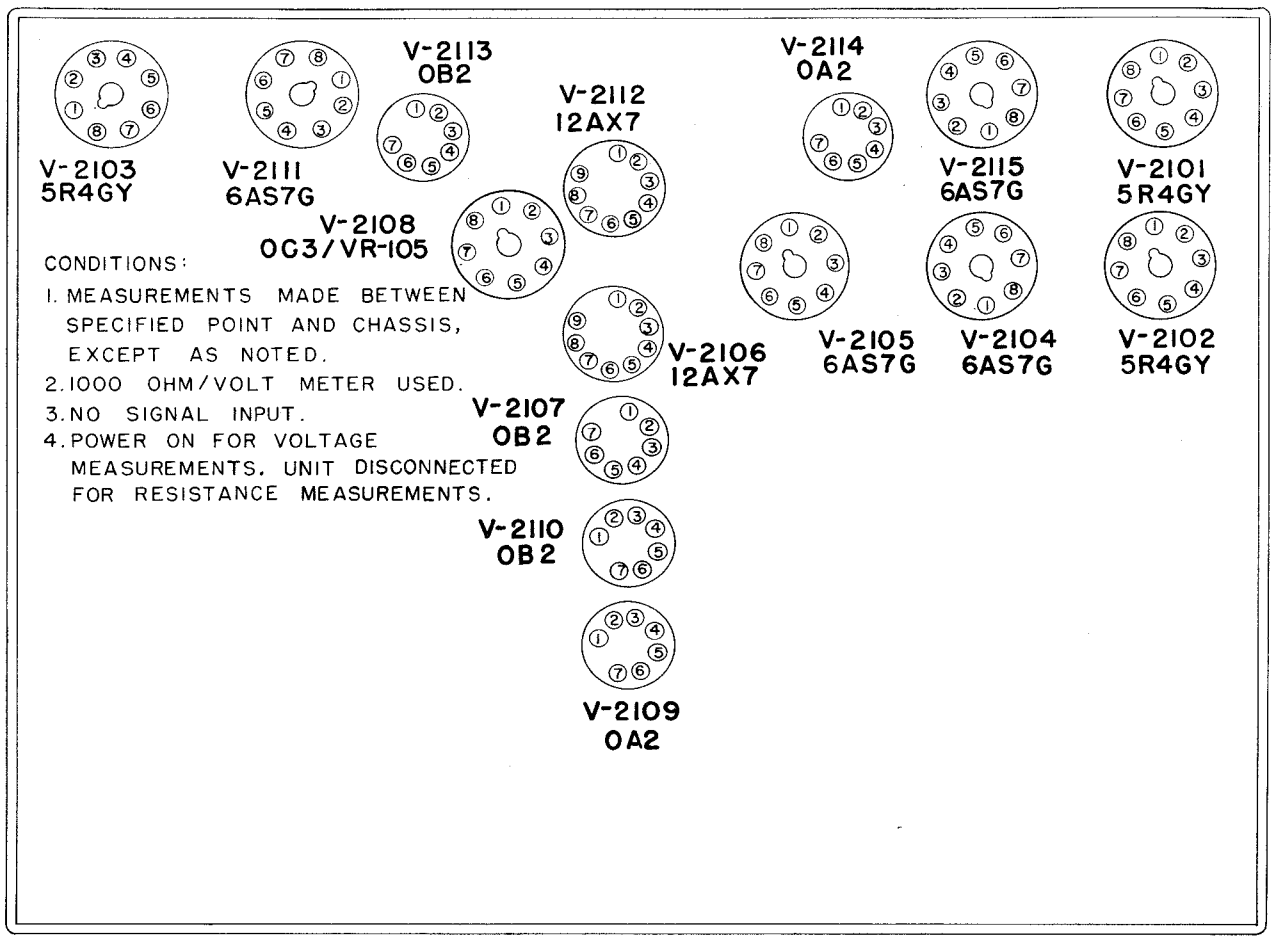
TABLE 7-25. TUBE OPERATING VOLTAGES AND CURRENTS PP-649/FRR-24

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
5R4GY	Rectifier (V-2101)	500 RMS	94	--	--	--	470	--	5
5R4GY	Rectifier (V-2102)	500 RMS	94	--	--	--	470	--	5
5R4GY	Rectifier (V-2103)	470 RMS	16	--	--	--	7	--	5
1/2 6AS7G*	Voltage Regulator (V-2115)	465	60	--	--	--	300	200	6.3
1/2 6AS7G**	Voltage Regulator (V-2115)	465	60	--	--	--	300	200	--
1/2 6AS7G*	Voltage Regulator (V-2104)	465	60	--	--	--	300	200	6.3
1/2 6AS7G**	Voltage Regulator (V-2104)	465	60	--	--	--	300	200	--
1/2 6AS7G*	Voltage Regulator (V-2105)	465	60	--	--	--	300	200	6.3
1/2 6AS7G**	Voltage Regulator (V-2105)	465	60	--	--	--	300	200	--
1/2 12AX7 #	Regulator Amp (V-2106)	210	.17	--	--	--	105	105	6.3
1/2 12AX7 ##	Regulator Amp. (V-2106)	105	.65	--	--	--	37	37	--
1/2 12AX7 #	Regulator Amp. (V-2112)	175	.05	--	--	--	107	105	6.3
1/2 12AX7 ##	Regulator Amp. (V-2112)	105	.35	--	--	--	55	55	--
1/2 6AS7G*	Voltage Regulator (V-2111)	300	70	--	--	--	210	175	6.3
1/2 6AS7G**	Voltage Regulator (V-2111)	300	70	--	--	--	210	175	--
OC3/VR105	Voltage Regulator (V-2108)	0	8	--	--	--	-105	--	--
OB2	Voltage Reference (V-2107)	102	8.8	--	--	--	0	--	--

*Pins 1, 2 and 3.
**Pins 4, 5 and 6
#Pins 1, 2 and 3.
##Pins 6, 7 and 8.

TABLE 7-25. TUBE OPERATING VOLTAGES AND CURRENTS PP-649/FRR-24 (CONT'D)

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
OB2	Voltage Reference (V-2113)	105	12	--	--	--	0	--	--
OA2	Voltage Regulator (V-2114)	210	9	--	--	--	55	--	--
OB2	Voltage Regulator (V-2109)	300	9	--	--	--	140	--	--
OB2	Voltage Regulator (V-2110)	140	9	--	--	--	37	--	--



FRONT

TUBE		PIN # 1	PIN # 2	PIN # 3	PIN # 4	PIN # 5	PIN # 6	PIN # 7	PIN # 8	PIN # 9
V-2101	VOLTS	NC	500	NC	500 AC	NC	500 AC	NC	500	—
	OHMS	∞	∞	∞	20	∞	20	∞	∞	—
V-2102	VOLTS	NC	500	NC	500 AC	NC	500 AC	NC	500	—
	OHMS	∞	∞	∞	20	∞	20	∞	∞	—
V-2103	VOLTS	NC	8	NC	20 AC	NC	20 AC	NC	8	—
	OHMS	∞	250	∞	∞	∞	∞	∞	250	—
V-2104	VOLTS	100	500	300	100	500	300	6.3 AC	6.3 AC	—
	OHMS	620K	∞	60K	620K	∞	60K	∞	∞	—
V-2105	VOLTS	100	500	300	100	500	300	6.3 AC	6.3 AC	—
	OHMS	620K	∞	60K	620K	∞	60K	∞	∞	—
V-2106	VOLTS	100	120	110	6.3 AC	6.3 AC	120	50	50	6.3 AC
	OHMS	620K	390K	60K	0	0	390K	12 K	4000	0
V-2107	VOLTS	120	NC	NC	NC	120	NC	0	—	—
	OHMS	39K	0	∞	39K	39K	∞	0	—	—
V-2108	VOLTS	NC	120	NC	NC	0	NC	120	NC	—
	OHMS	∞	∞	∞	∞	0	∞	∞	∞	—
V-2109	VOLTS	300	150	NC	NC	300	NC	150	—	—
	OHMS	56K	∞	∞	∞	56K	∞	∞	—	—
V-2110	VOLTS	150	50	NC	NC	150	NC	50	—	—
	OHMS	∞	3900	∞	3900	∞	∞	3900	—	—
V-2111	VOLTS	50	300	225	50	300	225	6.3 AC	6.3 AC	—
	OHMS	600K	56K	62K	600K	56K	62K	0	0	—
V-2112	VOLTS	50	120	110	6.3 AC	6.3 AC	120	50	50	6.3 AC
	OHMS	600K	390K	100K	0	0	390K	30K	7000	0
V-2113	VOLTS	120	0	NC	NC	120	NC	0	—	—
	OHMS	56K	0	∞	0	56K	∞	0	—	—
V-2114	VOLTS	225	50	NC	NC	225	NC	50	—	—
	OHMS	62K	6200	∞	6200	62K	∞	6200	—	—
V-2115	VOLTS	100	500	300	100	500	300	6.3 AC	6.3 AC	—
	OHMS	620K	∞	60K	620K	∞	60K	∞	∞	—

Figure 7–48. Voltage and Resistance Data Chart, Power Supply PP-649/FRR-24

b. CIRCUIT CONSTANTS.–The value of all circuit components are indicated on the Parts List, Table 8–4 and on the schematic diagrams, Figures 7–88 through 7–107. Their actual connections and approximate locations are shown on the practical wiring diagrams Figures 7–108 through 7–125. Their actual locations are shown on Figures 7–126 through 7–226.

c. PERFORMANCE TESTS.–The following tests are used to check operation of the receiver section by section and finally by means of an overall sensitivity check. The tests should be made following any readjustments or repairs to assure proper functioning of the receiver prior to its return to operational duty. The tests must be made in the order shown for each major unit since the test of any specific section of that unit is predicated on the fact that sections prior to the section under test have been checked and found to be functioning properly.

Units of test equipment required to perform these tests are as follows:

An electronic voltmeter such as Navy Model OBQ Vacuum Tube Volt-Ohm Milliammeter, Multimeter ME-25/U or equivalent.

An electronic voltmeter such as Electronic Multimeter ME-6/U.

A variable audio oscillator Navy Model LAJ, AN type TS-382A/U or equivalent.

An oscilloscope Navy Model OBL, AN type OS-8/U or equivalent.

A signal generator such as R.F. Signal Generator Set AN/URM-25 or equivalent.

An output meter such as Audio Level Meter AN/URM-38 or equivalent.

A 4.5-volt dry cell battery.

A linear-taper potentiometer with a resistance of approximately 10,000 ohms (Standard Navy Stock No. N16-R-91291-4928).

Before any adjustments are made allow the equipment to run for a suitable length of time with all voltages applied to bring the components up to a steady temperature. It will also be necessary to slide the unit being tested out of its cabinet and to connect a test cable between the multiconnector on the chassis and the multiconnector on the cabinet. After the unit has been tested remove the test cable and slide the chassis back into its cabinet.

The methods of connecting the AN/URM-25 are as follows:

METHOD A

R.F. Output X 20,000: Connect the R.F. Cable Assembly CG-409A/U (W-104) between J-101 and Test Lead CX-1363/U. R.F. Output X 20,000 is 500-ohm, 2-volt open circuit R.F. Output.

METHOD B

R.F. Output X Mult. into load impedance of 500 ohms or more: Connect the R.F. Cable Assembly CG-409A/U (W-104) between J-102 and the Impedance Adapter MX-1074/URM-25. Connect the R.F. Cable Assembly CG-409A/U (W-105 or W-106) between the Impedance Adapter and Test Lead CX-1363/U.

METHOD C

R.F. Output X Mult. into load impedance of 70 ohms: Connect the R.F. Cable Assembly CG-409A/U (W-104) between J-102 and Test Lead CX-1363/U. Terminate the signal generator with a 180 ohm resistor (N16-R-49643-971). R.F. Output X Mult. is 53.5 ohm step attenuator output.

(1) AMPLIFIER-CONVERTER AM-450/FRR-24 THROUGH AM-453/FRR-24.

(a) TRANSFORMER T-108.

Step 1. Remove the antenna patch cord from the applicable connector 1J27, 2J27 or 3J27. Remove the cable connected to J-307 on the rear of Frequency-Converter CV-126/FRR-24.

Before proceding further it will be necessary to calibrate the 2nd. I.F. Level meter. This is done by connecting the R.F. signal generator AN/URM-25 between terminal 4 of Z-302 (TP-1, see Figure 7–54) located on the Frequency Converter CV-126/FRR-24 and chassis. Connect the generator in accordance with Method C, Par. 5. c. Set the Frequency Band switch at E and adjust Main tuning dial to 1750 kc. The procedure is as follows:

Step 2. Set the Second Conversion Osc. Selector switch on the CV-126/FRR-24 at Crystal.

Step 3. Set the A.G.C. switch on the R.F. Amplifier AM-454/FRR-24 at Off and the A.M. Diversity Gain control at 10. Set the Selectivity switch on the F-99/FRR-24 at 18 kc. Adjust the signal generator Microvolt control for an output of 100 microvolts.

Step 4. Adjust the R.F. Gain control on the AM-454/FRR-24 until the 2nd. I.F. Level meter reads 1 milliampere.

The 2nd. I.F. Level meter is now calibrated to read 1 milliampere with an input R.F. signal of 100 microvolts. Do not disturb the control settings of the AM-454/FRR-24 and CV-126/FRR-24 until the performance test has been completed. Remove the signal generator from Frequency Converter CV-126/FRR-24, replace the cable removed from J-307 and slide the CV-126/FRR-24 back into its cabinet.

Step 5. Loosen the ten captivated screws around the edges of the coil compartment bottom and remove the bottom cover plate of the Amplifier-Converter under test. Connect the signal generator between the stator of trimmer capacitor C-131 (TP-1, see Figure 7–22) and the chassis of the Amplifier-Converter. Set the

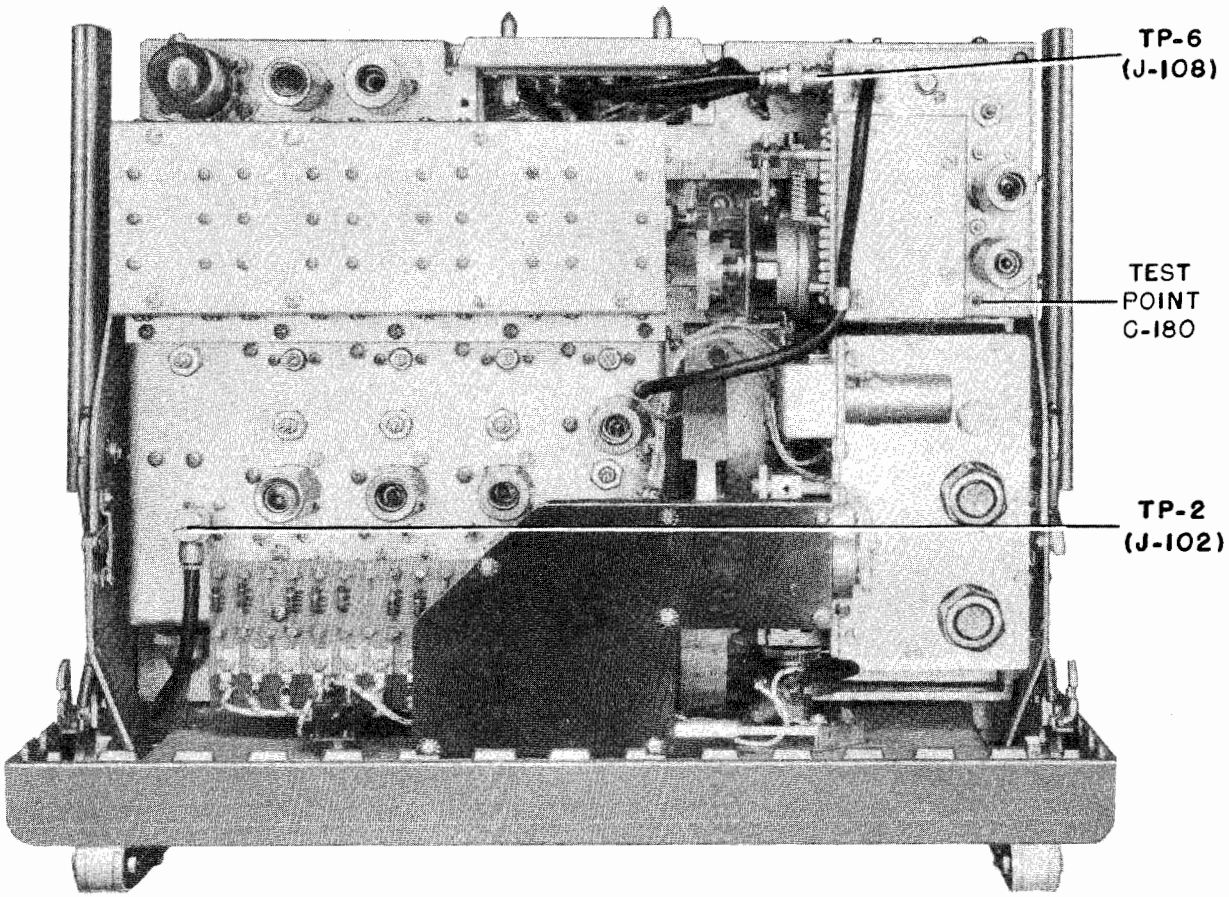


Figure 7–49. Location of Test Points, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

Band switch on the Control Panel SB-142/FRR-24 at the desired frequency range corresponding to the Amplifier-Converter under test.

Step 6. Adjust the signal generator Microvolt control until a reading of 1 milliampere is obtained on the 2nd. I.F. Level meter. Note the reading of the meter on the signal generator. The readings obtained should not vary more than 20% from those in the following table as each Amplifier-Converter is checked.

Amplifier-Converter	AM-450/FRR-24	850 uvs.
Amplifier-Converter	AM-451/FRR-24	850 uvs.
Amplifier-Converter	AM-453/FRR-24	850 uvs.
Amplifier-Converter	AM-452/FRR-24	1700 uvs.

Step 7. Remove the signal generator and replace the bottom cover of the coil compartment. Remove the test cable and slide the unit back into the cabinet.

(b) R.F. SYSTEM TEST.–The R.F. system test includes the R.F. amplifiers, converter, oscillator and local and remote R.F. amplifiers.

1. CALIBRATION.–For calibration checking a crystal calibrator located in the Oscillator Assembly O-131/FRR-24 can be used as a tuning marker. Unmodulated marker frequencies in multiples of 200 kilocycles are fed into the Amplifier-Converter unit through connector J-114. To check the dial calibration proceed as follows:

Step 1. Set the Amplifier-Detector AM-439/FRR-24 controls in the following manner:

1. Reception switch at Crystal.
2. A.G.C. switch at On.
3. Speaker switch at On.
4. A.F. Level control at the desired audio level.

Step 2. Set the Second Conversion Oscillator Selector switch located on the Frequency Converter CV-126/FRR-24 at Crystal. Set the Band switch located on Control Panel SB-142/FRR-24 at the desired frequency range.

Step 3. Patch the Crystal Calibrator into the selected Amplifier-Converter at the Patch Panel by connecting a patch cord between connectors 2J31 and 2J17, 2J18 or 2J19. Set the Calibrate switch located in the Oscillator Assembly O-131/FRR-24 at On. The Oscillator Assembly is located in bay 2.

Step 4. Tune the Amplifier-Converter to zero beat at the nearest 200 kilocycle harmonic in the por-

tion of the dial to be checked. The Index Set can be used to obtain greater accuracy in determining the accuracy of the dial calibration. Although the crystal calibrator is accurate to within 0.01% the accuracy of the dial should be within 0.1%. If any discrepancy is found in the dial calibration refer to para. 6. a. (4) of this section.

2. GAIN.

a. R.F. AMPLIFIERS.–To check the gain of the Amplifier-Converter R.F. amplifier stages proceed as follows:

Step 1. Repeat the procedure outlined in para. 5. c. (1). (a). Steps 1, 2 and 3.

Step 2. Set the A.G.C. switch on the Amplifier-Converter at Off and set the R.F. Gain control at 10.

Step 3. Set the Band switch on the Control Panel SB-142/FRR-24 at the frequency range corresponding to the Amplifier-Converter being tested.

Step 4. Connect the signal generator according to Method B, Par. 5. c. between the stator of C-131 (TP-1, see Figure 7–22) and chassis. This test point is accessible after removal of the coil compartment bottom. Tune the signal generator to the desired frequency.

Step 5. Adjust the signal generator Microvolt control for 10,000 microvolts output and tune the Main Tuning control on the Amplifier-Converter for maximum indication on the 2nd. I.F. Level meter.

Step 6. Adjust the R.F. Gain control of the R.F. Amplifier AM-454/FRR-24 until a reading of 1 milliampere is obtained on the 2nd. I.F. Level meter.

Step 7. Remove the signal generator and replace the coil compartment bottom.

Step 8. Remove the antenna input cable W-101 from J-102 (TP-2, see Figure 7–49) and connect the signal generator in its place, in accordance with Method C, Par. 5. c. Adjust the signal generator frequency and Antenna Trimmer control for maximum reading on the 2nd. I.F. Level meter.

Step 9. Reduce the setting of the signal generator Microvolt control until a reading of 1 milliampere is obtained on the 2nd. I.F. Level meter. The reading on the signal generator should be between 20 and 50 microvolts. The voltage gain from the antenna input to the converter grid should be approximately 50 decibels. If the above measurements are not obtained refer to Par. 6. a. (4). R.F. alignment.

Step 10. Remove the signal generator and reconnect the cable to jack J-102.

3. A.G.C. BIAS.–To check the A.G.C. action proceed as follows:

Step 1. Connect a high impedance D.C. vacuum tube voltmeter (OBQ or ME-25/U) between grid pin no. 1 of V-102 (TP-3, Figure 7–22) and the chassis. Set the voltmeter on the 25-volt scale and set the A.G.C. switch at Off.

Step 2. Vary the setting of the R.F. Gain control from minimum to maximum. A negative bias voltage ranging from 3 to 15 volts should be obtained on the voltmeter.

Step 3. Remove the voltmeter from pin no. 1 of V-102 and connect it to pin no. 1 of V-103 (TP-4, see Figure 7–22). Repeat Step 2.

Step 4. Set the A.G.C. switch at On. Remove the A.G.C. patch on the Patch Panel by disconnecting the patch cord from 1J3, 2J3 or 3J3 depending on the bay being tested. A negative 2.7-volt bias should be measured on the grids of V-102 and V-103. Remove the voltmeter.

Step 5. Connect the voltmeter to pin 1 of V-101 (TP-5, see Figure 7–22). Set the A.G.C. switch at Off and vary the setting of the R.F. Gain control from minimum to maximum. A negative bias voltage ranging from 1.4 to 7.5 volts should be obtained on the voltmeter.

Step 6. Replace the patch cord removed in Step 4.

4. OSCILLATOR INJECTION.–Before checking the oscillator injection voltage make sure all oscillator output connectors on the Patch Panels are covered with terminating caps. To check the oscillator injection voltage proceed as follows:

Step 1. To check the local oscillator, set the Heterodyne-Oscillator switch on Control Panel SB-142/FRR-24 at Local. Connect a DC vacuum tube voltmeter (OBQ or ME-25/U) between the test point C-180 and chassis. See Figure 7–49. A negative voltage between 6 and 15 volts should be obtained as the Main Tuning capacitor is tuned over the range. Remove the voltmeter.

Step 2. To check the remote R.F. amplifier stage V-109 it is necessary to patch the Oscillator Assembly O-131/FRR-24 into the Amplifier-Converter unit being checked. To connect the Oscillator Assembly into bay 2 connect a patch between 2J33 and 2J31. To connect the Oscillator Assembly into bay 1 connect a patch between 2J33 and 2J24 and between 1J24 and 1J21. To connect the Oscillator Assembly into bay 3 connect a patch between 2J33 and 2J25 and between 3J24 and 3J21.

Step 3. Set the Oscillator A switch at On and the Crystal A switch at the desired crystal frequency.

Step 4. Set the Tuning A control at the desired reception frequency.

Step 5. Set the Heterodyne-Oscillator switch on the Control Panel at Remote.

Step 6. Connect the vacuum tube voltmeter (OBQ or ME-25/U) between test point C-180 and chassis. Set the voltmeter on the 25-volt scale. Tune

the receiver for maximum voltmeter reading. A negative reading of between 6 to 15 volts should be obtained.

(2) OSCILLATOR ASSEMBLY O-131/FRR-24.

(a) CRYSTAL OSCILLATOR AND METER RECTIFIER PERFORMANCE TESTS.–To check each oscillator and meter rectifier proceed as follows:

Step 1. Insert a crystal between the range of 3.75 mc. to 15 mc. in any one of the crystal holders associated with oscillator A. See Figure 7–50.

Step 2. Set the Crystal 'A' switch at the position selected in Step 1.

Step 3. Turn Oscillator 'A' switch to the On position.

Step 4. Set the Output 'A' control between 4 and 6 on the dial.

Step 5. Rotate Tuning 'A' control for maximum output on Tuning Meter A at the dial frequency reading corresponding to the reception frequency. Tuning Meter A should read between 300 and 400 microamperes. If this measurement is not obtained perform Step 6.

Step 6. Remove the cover of the oscillator A compartment bottom of chassis and connect the electronic voltmeter (OBQ or ME-25/U) between pin 1 of V-802 (TP-1, see Figure 7–64) and the chassis. The voltmeter should read approximately 2 volts.

Step 7. Repeat above steps for oscillator 'B' using associated controls after plugging a crystal into an oscillator 'B' socket. The voltmeter in this case is connected to pin 1 of V-804 (TP-2, see Figure 7–64).

(b) 200 KC. OSCILLATOR AND HARMONIC AMPLIFIER PERFORMANCE TEST.

NOTE

Any harmonic of the 200-kc. oscillator and its associated Amplifier-Converter can be used for calibration. A test signal with a frequency of 30 mc. will be used in this description.

Step 1. Set the Calibrate switch to the ON position on unit O-131/FRR-24.

Step 2. Set the Band switch on Control Panel SB-142/FRR-24 at 16-32. Turn the A.G.C. Off and reduce the R.F. Gain control on the selected Amplifier-Converter unit.

Step 3. Make the necessary patch cord connection to permit injection of the 200 kc. harmonics into the Amplifier-Converter for calibration. To do so con-

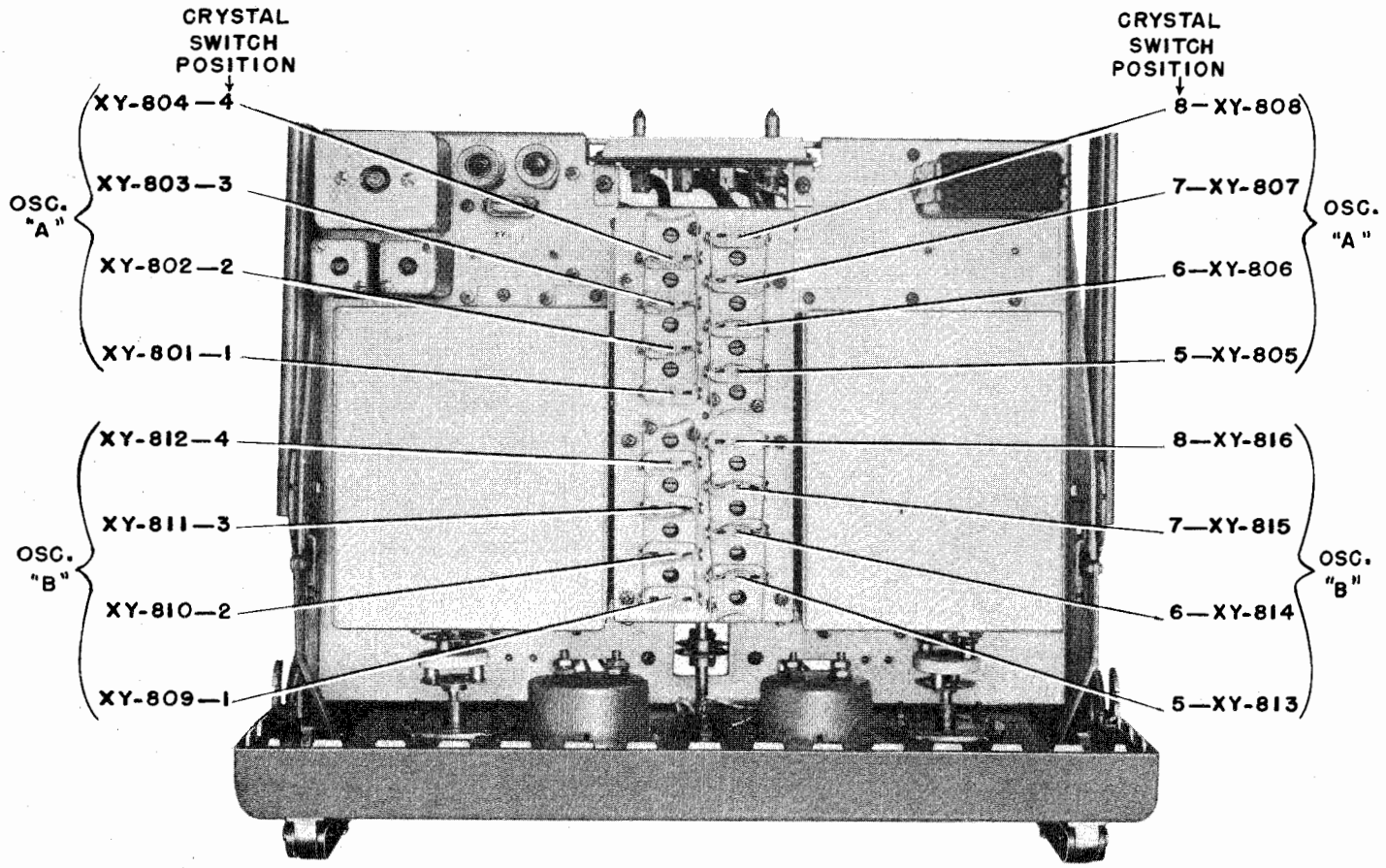


Figure 7–50. Crystal Socket Identification, O-131/FRR-24

nect a patch cord between 2J31 and 2J17, 2J18 or 2J19.

Step 4. Tune in the 30-mc. signal by adjustment of the tuning controls on the Amplifier-Converter selected in Step 2 for maximum reading on the 2nd. I.F. Level meter located in unit AM-454/FRR-24. Note the reading.

Step 5. Remove the patch cord connected in Step 3.

Step 6. Set the Calibrate switch at Off and connect the R.F. signal generator AN/URM-25 to jack 2J17, 2J18 or 2J19 on the Patch Panel according to Method B, Par. 5. c. except that test lead CX-1363/U is omitted. Adjust the R.F. output frequency of the generator to 30 mc.

Step 7. Adjust the Microvolt control on the generator until the 2nd. I.F. Level meter has an identical reading with that noted in Step 4.

Step 8. A generator reading in the order of 1500 to 2500 microvolts or more indicates proper functioning of the 200-kc. oscillator and harmonic generator.

(3) FREQUENCY CONVERTER CV-126/FRR-24.

(a) I.F. AMPLIFIER PERFORMANCE TEST.—To check the I.F. amplifier stage of each channel proceed as follows:

Step 1. Remove all cables connected to J-302 through J-307 at the rear of the cabinet.

Step 2. Connect signal generator AN/URM-25 between terminal no. 4 of Z-301 (TP-2, see Figure 7–54) and the chassis, in accordance with Method C, Par. 5. c. Adjust the generator output to a frequency of 1750 kc. at 0.01 volt as measured on electronic multimeter ME-6/U.

Step 3. Connect Multimeter ME-6/U set on the 1-volt scale between terminal no. 1 on Z-308 (TP-3, see Figure 7–54) and the chassis.

Step 4. A reading of approximately 0.06 volt indicates proper functioning of the I.F. stages through transformer Z-308.

Step 5. Repeat above steps by connecting the signal generator to other input channels in order i.e. terminal no. 4 of Z-302 (TP-1) for input 2, terminal no. 4 of Z-303 (TP-4) for input no. 3, terminal no. 4 of Z-304 (TP-5) for input no. 4. All the foregoing are located on Figure 7–54.

Step 6. Remove the generator and voltmeter.

(b) OSCILLATOR AND R.F. AMPLIFIER (V-309) PERFORMANCE TESTS.

Step 1. Remove the cover of the oscillator compartment bottom of chassis and connect a 33-ohm, half-watt composition resistor (SNSN N16-R-49364-811) between terminal no. 4 of Z-310 (TP-6, see Figure 7–54) and the chassis.

Step 2. Connect electronic multimeter ME-6/U across the 33-ohm resistor. Set the meter on the 1-volt scale.

Step 3. Set the Second Conversion Oscillator Selector switch at Crystal to check the crystal oscillator and at V.F.O. to check the variable oscillator.

Step 4. A reading of between 0.4 and 0.6 volt indicates proper functioning of the oscillators and R.F. amplifier V-309. Remove the 33-ohm resistor and voltmeter.

(c) R.F. AMPLIFIER (V-307) PERFORMANCE TEST.

Step 1. Connect signal generator AN/URM-25 between the input side of C-335 (TP-8, see Figure 7–54) and chassis, in accordance with Method C, Par. 5. c. Adjust the generator output to a frequency of 1700 kc. at 0.1 volt.

Step 2. Connect the electronic voltmeter (OBQ or ME-25/U) between pin 1 of V-310 (TP-7, see Figure 7–54) and the chassis. Set the voltmeter on the 10-volt D.C. scale.

Step 3. Set the Second Conversion Oscillator Selector switch at Ext.

Step 4. A negative reading between 0.6 and 2 volts indicates proper functioning of the R.F. amplifier circuit. Remove all test equipment, replace the oscillator compartment cover and reconnect the cables to J-302 through J-307.

(4) FILTER ASSEMBLY F-99/FRR-24.—The following stage gain measurements are made to check operation of this unit. To complete these measurements proceed as follows:

Step 1. Disconnect the cable connected to J-403 at the rear of the cabinet. To calibrate the 2nd. I.F. Level meter proceed as follows:

Connect signal generator AN/URM-25 between the input of V-410 (TP-1, Figure 7–56) and chassis. Connect the generator in accordance with Method B, Par. 5. Adjust the Microvolt control on the signal generator to 1100 uvs. and set the Mod. Selector switch at Off. Adjust the R.F. output frequency of the generator to 50 kc. Set the Selectivity switch at 18 kc. Set the A.G.C. switch located in the AM-454/FRR-24 at Off. Adjust the R.F. Gain and A.M. Diversity Gain controls on the AM-454/FRR-24 to obtain a reading of 1.0 ma. on the 2nd. I.F. Level meter.

Step 2. The stage gain measurements are made by adhering to the procedure outlined in Table 7–26. This procedure consists of setting the Selectivity switch as shown, connecting signal generator AN/URM-25 according to Method B, Par. 5. c. to the specified grid and then adjusting the Microvolt control of the generator to obtain a one-milliampere reading on the 2nd. I.F. Level meter on R.F. Amplifier AM-454/FRR-24. A one-milliampere reading should be obtained with a generator output in microvolts approximately equal to that shown on Table 7–26. Refer

to Figure 7–56 for the location of all test points listed on the table.

TABLE 7–26. TYPICAL STAGE GAIN MEASUREMENT DATA

Set Selectivity Switch at:	Connect Generator To:	Generator Output in microvolts (±35%) for 1-Ma. reading on 2nd. I.F. Level Meter
18 Kc.	V-410 grid (TP-1)	1000
	V-401 grid (TP-2)	1000
125 cycle	V-401 grid (TP-2)	1000
250 cycle	V-401 grid (TP-2)	1000
500 cycle	V-402 grid (TP-3)	900
	V-401 grid (TP-2)	830
1 Kc.	V-403 grid (TP-4)	670
	V-401 grid (TP-2)	830
3 Kc.	V-405 grid (TP-5)	900
	V-404 grid (TP-6)	620
	V-401 grid (TP-2)	1000
6 Kc.	V-407 grid (TP-7)	720
	V-406 grid (TP-8)	550
	V-401 grid (TP-2)	1100
12 Kc.	V-409 grid (TP-9)	1250
	V-408 grid (TP-10)	430
	V-401 grid (TP-2)	1100

Step 3. Remove the signal generator and reconnect the cable to J-403.

Figures 7–78 through 7–81 illustrate the I.F. selectivity characteristics of the seven bandwidths obtained in the filter assembly.

(5) R.F. AMPLIFIER AM-454/FRR-24.–The following tests are used to check operation of the unit stage by stage.

(a) I.F. AMPLIFIER PERFORMANCE TESTS (50 KC. AM).–To check the I.F. amplifier system (V-601, V-602 and V-603) proceed as follows:

Step 1. Remove all cables connected to J-602 through J-607 at the rear of the cabinet.

Step 2. Connect signal generator AN/URM-25 between the input side of capacitor C-601 (TP-1, see Figure 7–26) and the chassis, in accordance with Method B, Par. 5. c. Adjust the generator output to a frequency of 50 kc. at 140 microvolts, unmodulated.

Step 3. Connect voltmeter ME-6/U between pin no. 7 of V-604 (TP-2, see Figure 7–26) and the chassis. Use the 1-volt scale.

Step 4. Set the A.G.C. switch at Off, set the R.F. Gain control at 10 and set the A.M. Diversity Gain control at 10.

Step 5. A reading between 0.95 and 1.5 volts indicates proper functioning of the I.F. stages through V-604.

Step 6. Remove the voltmeter.

(b) I.F. AMPLIFIER PERFORMANCE TEST V-608.

Step 1. The signal generator remains connected and adjusted in the same manner as outlined in preceding paragraph (a).

Step 2. Set the F.S.K. Diversity Level control at 10.

Step 3. With a 70-ohm half-watt composition re-

sistor (SNSN N16-R-49508-986) across the voltmeter, connect the voltmeter between terminal no. 3 of transformer T-601 (TP-3, see Figure 7–26) and chassis. Set the meter on the 1-volt scale.

Step 4. A reading between 0.65 to 0.8 volt indicates proper functioning of the I.F. stages V-601, V-602, V-603, V-604 and V-608.

Step 5. Remove the voltmeter and 70-ohm resistor.

(c) F.S. C.O.N.S. PERFORMANCE TEST.

Step 1. The signal generator remains connected and adjusted in the same manner as outlined in paragraph (a).

Step 2. Connect the D.C. electronic voltmeter (OBQ or ME-25/U) between the junction of R-627 and C-623 (TP-4, see Figure 7–26) and the chassis. Set the meter to read DC voltages on the 30-volt scale.

Step 3. A reading of 8 to 10 volts indicates proper functioning of the C.O.N.S. circuit. Also a reading of 1 milliampere on the 2nd. I.F. Level meter indicates normalcy of the meter rectifier stage V-607.

Step 4. Remove all test equipment.

(d) A.G.C. BIAS PERFORMANCE TEST.

Step 1. Set the A.G.C. switch in the On position.

Step 2. Connect the electronic voltmeter OBQ or ME-25/U between pin 2 of V-605 (TP-5, see Figure 7–26) and the chassis. Set the meter on the 3-volt DC scale.

Step 3. A negative reading of approximately 2.8 volts indicates proper functioning of the bias circuit in this position.

Step 4. Set the A.C.G. switch in the Off position.

Step 5. Set the voltmeter on the 30-volt DC scale.

Step 6. With the R.F. Gain control R-620 fully clockwise the meter should read minus 3 volts. With the R.F. Gain control rotated fully counterclockwise the meter should read approximately minus 15 volts.

Step 7. Remove all test equipment and replace all cables.

(6) AMPLIFIER-DETECTOR AM-439/FRR-24.– The following tests are used to check operation of the unit stage by stage.

(a) I.F. AMPLIFIER.–To check the I.F. amplifier stage proceed as follows:

Step 1. Remove the cables from connectors J-705 and J-704 at the rear of the cabinet.

Step 2. Connect signal generator AN/URM-25 to the input side of C-701 (TP-1, see Figure 7–28) and chassis, in accordance with Method A, Par. 5. c. Adjust the generator for a 1-volt 50 Kc. AM output.

Step 3. Connect the electronic voltmeter (OBQ or ME-25/U) set on the 30-volt scale, across the diode load, (TP-2, see Figure 7–28) junction of R-723, R-724 and chassis. Set the R.F. Gain control at 10.

Step 4. A DC reading between 9 and 11 volts on the voltmeter indicates proper functioning of the I.F. stage.

(b) AUDIO

Step 1. Remove the electronic voltmeter from across the diode load and connect the audio level meter AN/URM-38 to the Phones jack (TP-3, see Figure 7–58) and chassis.

Step 2. Adjust the generator for an output test signal of 50 kc. modulated 30% at 1000 cps. Set the A.F. Level control at 10 and the Reception switch at AM.

Step 3. With the audio circuits functioning properly, approximately 0.1 of a volt input is required to produce at least 10 DB (10 milliwatts) on the audio level meter.

(c) A.G.C.

Step 1. Set the A.G.C. switch at On and R.F. Gain control at 10. Remove the meter from the Phones jack and connect the DC electronic voltmeter (OBQ or ME-25/U) between pin 2 of V-706 (TP-4, see Figure 7–28) and the chassis. Set the voltmeter on the 30-volt scale. Adjust the Microvolt control on the generator for an output of 1 volt.

Step 2. With the A.G.C. functioning properly a reading of between 4.5 to 5.5 volts should be obtained on the voltmeter with an input signal of 1 volt.

(d) NOISE LIMITER.

Step 1. Set up the voltmeter and signal generator as outlined in previous Par. c and connect oscilloscope OS-8/U across the Phones jack (TP-3, see Figure 7–58). Adjust the generator for an output of 1 volt modulated 30% at 1000 cps. Set the Reception switch at NL. Note the pattern on the oscilloscope. One modulation peak should be clipped between 25 and 35%.

Step 2. Remove the test equipment.

(e) CRYSTAL OSCILLATOR.

Step 1. Set the signal generator at 51 kc. unmodulated with an output of 0.1 volts.

Step 2. Connect the signal generator to the input side of C-701 (TP-1, see Figure 7–28) and the chassis, in accordance with Method B, Par. 5. c.

Step 3. Set the Reception switch at Crystal.

Step 4. Turn the A.F. Gain control to maximum.

Step 5. Connect the audio level meter across the Phones jack (TP-3, see Figure 7–58).

Step 6. With the crystal oscillator circuit functioning properly, less than 0.1 of a volt input is required to produce at least 12 DB (16 milliwatts) on the meter.

Step 7. The test equipment remains connected for the following test.

(f) B.F.O.

Step 1. Set the Reception switch at B.F.O.

Step 2. Set the B.F.O. control at 1 Kc.

Step 3. Set the signal generator to 50 Kc. unmodulated with an output of 0.1 of a volt.

Step 4. A reading of at least 11 DB (12.5 milliwatts) will indicate proper functioning of this circuit.

Step 5. Remove all test equipment and replace the cables.

(7) AMPLIFIER-DETECTOR AM-440/FRR-24, PERFORMANCE TEST.

Step 1. Remove the cable from connector J-907 at the rear of the cabinet.

Step 2. Connect signal generator AN/URM-25 to the input side of C-901 (TP-1, see Figure 7–31) and chassis, in accordance with Method A, Par. 5. c. Adjust the generator for a 1-volt 50 kc. unmodulated signal.

Step 3. Connect the electronic voltmeter (OBQ or ME-25/U) across the diode load i.e., between the junction of R-911 and S-901B (TP-2, see Figure 7–31) and chassis. Set the voltmeter on the 30-volt scale. Set the R.F. Gain control at 10.

Step 4. A reading of between 9 and 11 volts on the voltmeter with the Audio Bandwidth switch in both the 600-cycle and 6-kc. position indicates proper functioning of the I.F. stage.

Step 5. Remove the electronic voltmeter from across the diode load and connect it between pin 7 of V-903 (TP-4, see Figure 7–31) and chassis. Set the voltmeter on the 30-volt scale. Adjust the Microvolt control of the generator for an output of 1 volt.

Step 6. Set the R.F. Gain control at 10. With the A.G.C. functioning properly a reading between 4.5 and 5.5 volts should be obtained on the voltmeter with an input signal of 1 volt.

Step 7. Remove the electronic voltmeter from pin 7 of V-903 (TP-4). Connect Audio Level Meter AN/URM-38 to the Phones jack (TP-3, see Figure 7–59).

Step 8. Change the signal generator connections in accordance with Method B, Par. 5. c. and adjust it for an output test signal of 50 kc., modulated 30% at 1000 cps. Set the A.F. Level control at 10.

Step 9. With the audio circuits functioning properly, less than 0.1 of a volt input is required to produce at least 11.75 DB (15 milliwatts) on the audio level meter.

Step 10. Remove all test equipment and replace the cable disconnected from connector J-907.

(8) AMPLIFIER-DETECTOR AM-438/FRR-24, PERFORMANCE TESTS.–The tests and test equipment required to check the performance of this unit are identical to those used during the AM-440/FRR-24 performance test. It is necessary however to change the position of the input test signal corresponding to the channel being tested. For input 1 connect the test signal to the input side of C-1001 (TP-1, see Figure 7–33); input 2 connect the test signal to the input side of C-1007 (TP-2, see Figure 7–33); input 3 connect the test signal to the input side of C-1013 (TP-3, see Figure 7–33). For the Phones jack test point use TP-4 (Figure 7–60), for the A.G.C. check point use TP-11 (Figure 7–33).

(9) FREQUENCY SHIFT CONVERTER CV-127/FRR-24, PERFORMANCE TESTS.–It is essential when this unit is aligned or tested that it shall be connected to the Comparator-Keyer CM-32/FRR-24 and the R.F. Amplifier AM-454/FRR-24.

(a) DISCRIMINATOR BALANCE.

Step 1. Make the following connections on the AM-454/FRR-24. Connect signal generator AN/URM-25 between pin 1 of V-603 (TP-7, Figure 7–26) and chassis. Connect the generator in accordance with Method A, Par. 5. c.

Step 2. Connect the D.C. voltmeter OBQ or ME-25/U between the Deviation Compensation control R-1221 (TP-2, Figure 7–61) and chassis. Set the voltmeter on the 100-volt scale.

Step 3. Adjust the R.F. Output of the signal generator to 50 kc. The voltmeter should read zero with the signal generator set at 50 kilocycles.

Step 4. Vary the generator 3 kc. higher and then lower from the center frequency of 50 kilocycles. The voltmeter reading should be approximately 70 volts positive on one frequency and conversely 70 volts negative on the other frequency setting. Remove the signal generator and voltmeter.

(b) OSCILLATOR CHECK.

Step 1. Remove the cover of the oscillator compartment bottom of chassis

Step 2. Remove the cable from the 1700 kc. output connector J-1203 at the rear of the cabinet. Connect multimeter ME-6/U (with a 70-ohm half-watt composition resistor (SNSN N16-R-49508-986) across its terminals) between terminal 4 of Z-1206 (TP-3, see Figure 7–36) and chassis. A reading of approximately 0.5 volt should be obtained on the voltmeter.

Step 3. Remove the voltmeter connections, replace the cable to connector J-1203 and replace the oscillator compartment cover.

(c) OSCILLOSCOPE CHECK.–Check all controls associated with the oscilloscope circuit. They should perform their prescribed functions.

(d) A.F.C. CHECK.–In order to check the operation of the A.F.C. circuit it will be necessary to have a frequency-shift signal available with the equipment adjusted for normal operation except for the control settings given below. Proceed as follows:

Step 1. Set the Heterodyne Oscillator switch at

Local and the Band switch at the desired frequency range. These two controls are located on the Control Panel SB-142/FRR-24.

Step 2. Set the Second Conversion Oscillator Selector switch located on the Frequency Converter CV-126/FRR-24 at Crystal. Patch the 1700 kc. output of the Frequency Shift Converter into the CV-126/FRR-24. Depending on which Converter is being tested a patch will go from 4K18, 4K19 or 4K20 to either 4K6, 4K7 or 4K8 depending on which bay is being used on Patch Panel SB-143/FRR-24. A patch will also be necessary on the Patch Panel in the bay selected. This patch will go from 1J8 to 1J7 for bay 1, 2J8 to 2J7 for bay 2 and 3J8 to 3J7 for bay 3.

Step 3. Set the Automatic Frequency Control switch on the Frequency Shift Converter at Off.

Step 4. Adjust the Tuning control on the Amplifier-Converter selected in Step 1 until a frequency shift signal is received and centered on the oscilloscope.

Step 5. Adjust the A.M. Diversity Gain control on the R.F. Amplifier AM-454/FRR-24 until the 2nd. I.F. meter reads between 0.6 to 1.8 ma. Advance the F.S.K. Diversity Level control slightly beyond the point where maximum deflection on the Frequency Shift cathode ray monitor is observed. Set the Oscillator Selector switch located in the Frequency-Converter CV-126/FRR-24 at External.

Step 6. Observe the pattern obtained on the oscilloscope. The frequency shift pattern should be centered between the top and bottom lines of the transparent screen on the face of the oscilloscope. To center the oscilloscope pattern it may be necessary to adjust the Fine Tuning control on CV-127/FRR-24.

Step 7. Set the A.F.C. switch at On and if the pattern moves off the screen change the setting of the Mark-Polarity switch. Detune the Main Tuning dial approximately 1 kc. off center frequency. If the A.F.C. is in proper working condition the oscilloscope pattern should remain nearly centered. With the A.F.C. switch at Off the pattern should go off the screen.

(e) CONS AMPLIFIER CHECK.

Step 1. Keep all controls and adjustments set as in Par. d. AFC check. Connect signal generator AN/URM-25 as outlined under Discriminator Balance Par. (a). Set the frequency dial at 50 kc. and the output at 0.25 volt.

Step 2. Remove the cable from the F.S. output connector J-1204 at the rear of the cabinet. Connect voltmeter OBQ or ME-25/U to the F.S. keyed D.C. output line (TP-4, see Figure 7–36).

Step 3. Detune the Main Tuning control slightly off frequency until a reading of plus 8 volts is obtained on the voltmeter.

Step 4. Reduce the A.M. Diversity Gain control until the voltmeter drops quickly to 5.8 volts. The 2nd. I.F. Level meter should not read less than 0.54 ma.

Step 5. Increase the A.M. Diversity Gain control until the voltmeter reading jumps to a value not less than 8 volts. The 2nd. I.F. Level meter should not read more than 0.64 ma.

Step 6. Remove all test equipment and replace the disconnected cable.

(10) KEYER KY-62/FRR-24, PERFORMANCE TEST.

(a) TONE OSCILLATOR CHECK.

1. VARIABLE FREQUENCY OPERATION.

Step 1. Remove the cables from connectors J-1102, J-1103 and J-1105 at the rear of the cabinet.

Step 2. Connect the vertical amplifier input of an oscilloscope Model OBL series or AN type OS-8/U across resistor R-1155 (TP-1, see Figure 7–66). Connect audio level meter AN/URM-38 in parallel with the oscilloscope. Connect Navy Model LAJ series audio oscillator or AN type TS-382A/U to the horizontal amplifier input of the oscilloscope.

Step 3. Connect multimeter ME-6/U to the cathode (pin no. 2) of the tone oscillator V-1107 (TP-2, see Figure 7–66).

Step 4. Set the Reception switch S-1101 at Test. Set the Threshold control at zero. Set the Tone switch at Var.

Step 5. Adjust the A.F. Level control R-1116 to obtain a reading of 10.8 DB (12 milliwatts) on the audio level meter.

NOTE

For an accurate frequency check the following adjustments must be made with a temporary metal bottom on the chassis to simulate the effect of the cabinet.

Step 6. Set the Variable Frequency dial and the external audio oscillator dial at 5000 cycles. A circular pattern on the oscilloscope and a voltmeter reading of 1.9 volts should be obtained.

Step 7. Set the Variable Frequency dial and the external audio oscillator at 400 cycles. A circular pattern on the oscilloscope and a voltmeter reading of 1.9 volts should be obtained.

2. FIXED FREQUENCY OPERATION.

Step 1. Set the Tone switch at Fixed. Vary the Fixed Frequency switch from 595 cycles through 1785 cycles and adjust the audio oscillator simultaneously to the frequency setting corresponding to the

Fixed Frequency switch setting. A circular pattern on the oscilloscope and a voltmeter reading of 1.9 volts should be obtained at each setting of the Fixed Frequency switch and audio oscillator..

(b) OVERALL CHECK.

Step 1. Remove the voltmeter. Set the Tone switch at External. Remove the audio oscillator from the horizontal input circuit of the oscilloscope and connect it through a 0.01 mf capacitor (SNSN N16 -C-33627-7705) to the junction of R-1101 and R-1102 (TP-3, see Figure 7–66).

Step 2. Set the tuning dial of the audio oscillator at 500 cycles.

Step 3. Set the Tone switch at Variable. Set the Variable Frequency dial at 5000 cycles. A good keying rectangle should be observed on the oscilloscope (with proper adjustment of oscilloscope sweep). Remove the audio oscillator.

Step 4. To check the monitor output circuit insert headphones into the Phones jack. An audio tone should be heard.

Step 5. Remove all test equipment from the unit and reconnect the cables to J-1102, J-1103 and J-1105.

(11) COMPARATOR-KEYER CM-32/FRR-24, PERFORMANCE TEST.–Two separate channels are contained in this unit, therefore the test procedure applied to one channel is also applicable to the other channel. However, all test connections are made to different points for each channel.

(a) FLIP-FLOP OUTPUT TEST.–To check the operation of the flip-flop circuit, proceed as follows:

Step 1. Remove all cable connections from J-1304 through J-1309.

Step 2. For an output indication, connect the negative lead of voltmeter OBQ or ME-25/U (any voltmeter with a 300-volt scale can be used) to the plates of V-1314 and V-1315 (TP-2, see Figure 7–38). For the other channel use TP-7. Connect the positive lead to a plus 300-volt source (TP-3, see Figure 7–38).

Step 3. Connect the ends of a 10,000-ohm potentiometer (SNSN N16-R-9121-4928) across a 4.5-volt battery.

Step 4. Connect the negative end of the battery to chassis. Turn the arm of the potentiometer to the negative end of its range. Connect the arm of the potentiometer to the grid (pin no. 2 of V-1311 (TP-4, see Figure 7–38). For the other channel use TP-8.

Step 5. Connect multimeter ME-6/U to the grid (pin no. 2) of V-1311 (TP-4). For the other channel use TP-8.

Step 6. Set the potentiometer to indicate 300 volts on the voltmeter connected in the output circuit (plates of V-1314 and V-1315).

Step 7. Rotate the potentiometer slowly to produce an increase in voltage on the multimeter. Note the reading on the multimeter when the meter at the output indicates cutoff (approximately 160 volts). The reading should be between 2.2 and 3.0 volts.

Step 8. Rotate the potentiometer to reduce voltage on the grid of V-1311. Note the reading on the multimeter when the meter at the output indicates approximately 300 volts. The reading should be between 0.7 and 1 volt.

(b) KEYER OUTPUT TEST.

Step 1. Connect battery, potentiometer and multimeter as in steps 3, 4 and 5 above.

Step 2. Connect another multimeter ME-6/U between the junction of R-1368 and R-1369 and chassis (TP-5, see Figure 7–38). For other channel use TP-9.

Step 3. The output voltage should be 1.9 volts (Mark condition) when the output tubes are conducting.

Step 4. Rotate the potentiometer to increase the voltage at the grid of V-1311. The output voltage should be 4 volts (Space condition) when the output tubes are cut off.

Step 5. Remove all test equipment and reconnect all disconnected cables.

(12) POWER SUPPLY PP-590/FRR-24.

Step 1. Insert the positive probe of voltmeter OBQ or ME-25/U into the plus 210 socket TP-2001. See Figure 7–204. Insert the negative probe into the ground contact.

Step 2. Set the two front-panel mounted Plate-Standby switches S-2003 and S-2004 at On. The voltmeter should read plus 210 volts.

Step 3. Remove the voltmeter connections and connect Multimeter ME-6/U in its place. The A.C. ripple as measured on the multimeter should read less than 10 millivolts under full load conditions. Remove the voltmeter connections.

(13) POWER SUPPLY PP-648/FRR-24.

(a) PLUS 300 VOLT CHECK.

Step 1. Insert the positive probe of voltmeter OBQ or ME-25/U into the plus 300 socket TP-2201. See Figure 7–214. Insert the negative probe into the ground contact.

Step 2. Set the two front-panel mounted Plate Standby switches S-2203 and S-2204 at On. The voltmeter should read plus 300 volts.

Step 3. Remove the voltmeter connections and connect multimeter ME-6/U in its place. The A.C. ripple as measured on the multimeter should read less than 10 millivolts under full load conditions. Remove the voltmeter connections.

(b) NEGATIVE 300 VOLT CHECK.

Step 1. Set the voltmeter (OBQ or ME-25/U) selector switch at minus D.C. Insert the positive test probe of the voltmeter into the minus 300 socket, TP-2202. Insert the negative test probe into the ground contact. The voltmeter should read minus 300 volts.

Step 2. Remove the voltmeter connections and connect multimeter ME-6/U in its place. The A.C. ripple as measured on the multimeter should read less than 10 millivolts under full load conditions. Remove the voltmeter connections.

(14) POWER SUPPLY PP-649/FRR-24.

(a) PLUS 300 VOLT CHECK.

Step 1. Insert the positive probe of voltmeter OBQ or ME-25/U into the plus 300 socket TP-2101. See Figure 7–209. Insert the negative test probe into the ground contact.

Step 2. Set the two front-panel mounted Plate-Standby switches S-2102 and S-2103 at On. The voltmeter should read plus 300 volts.

Step 3. Remove the voltmeter connections and connect multimeter ME-6/U in its place. The A.C. ripple as measured on the multimeter should read less than 10 millivolts under full load conditions. Remove the voltmeter connections.

(b) 210 VOLT CHECK.

Step 1. Insert the positive test probe of the voltmeter (OBQ or ME-25/U) into the plus 210 socket TP-2102. Insert the negative probe into the ground contact. The voltmeter should read plus 210 volts.

Step 2. Remove the voltmeter connections and connect multimeter ME-6/U in its place. The A.C. ripple as measured on the multimeter should read less than 10 millivolts under full load conditions. Remove the voltmeter connections.

(15) OVERALL PERFORMANCE AND SENSITIVITY TEST.

(a) SENSITIVITY.–The following test is based on the use of bay 1 and Amplifier-Converter AM-450/FRR-24 (unit 1B). The test may be made with any bay or any Amplifier-Converter unit. To check the sensitivity of the receiver proceed as follows:

Step 1. Connect signal generator AN/URM-25, in accordance with Method C, Par. 5. c. to jack J-102 (TP-2, see Figure 7–49) on Amplifier-Converter AM-450/FRR-24. Set the Mod. Selector switch at Off. Set the A.G.C. switch on the Amplifier-Converter at Off and set the R.F. Gain control at 10.

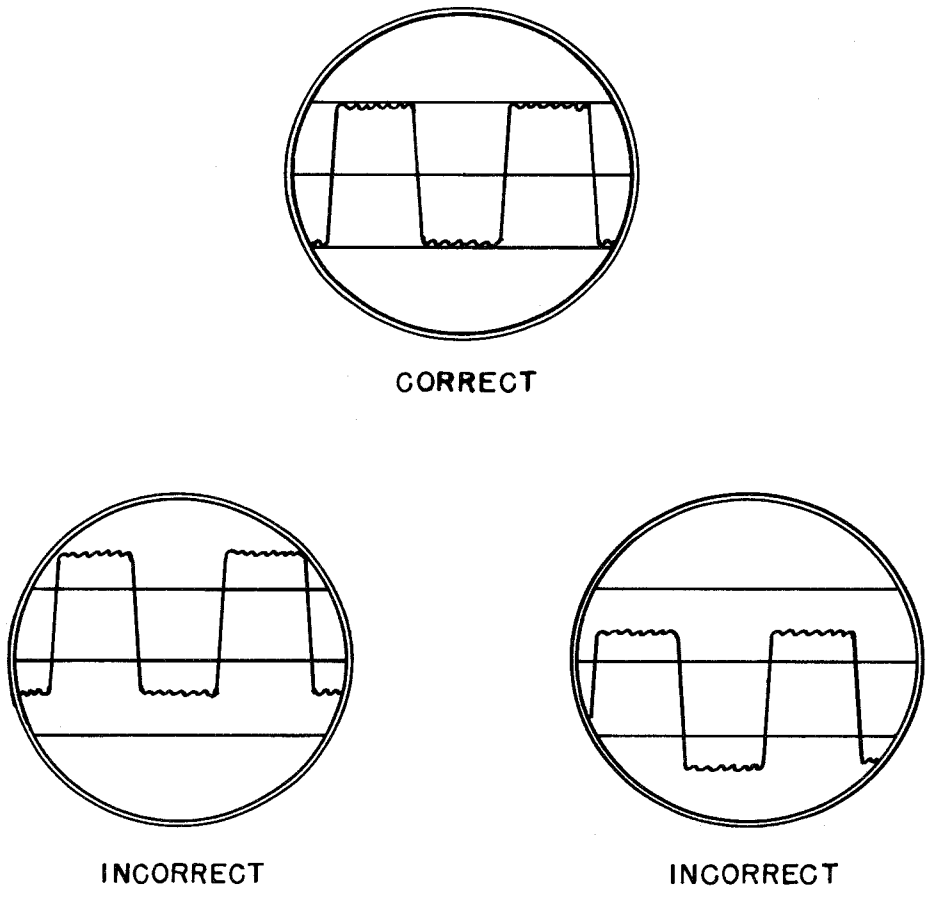


Figure 7–51. Oscillograph Patterns Illustrating Correct and Incorrect Tuning

Step 2. Set the Selectivity switch on the Filter Assembly F-99/FRR-24 at 3 kc.

Step 3. Set the signal generator and the Amplifier-Converter at the same frequency. Adjust the Microvolt control on the signal generator for an R.F. output of 2 microvolts.

Step 4. Set the A.G.C. switch at Off and adjust the R.F. Gain control on the R.F. Amplifier AM-454/FRR-24 for a reading of 1 milliampere on the 2nd. I.F. Level meter.

Step 5. Set the Reception switch on the Amplifier-Detector AM-439/FRR-24 at B.F.O. and set the B.F.O. dial at 1 kc.

Step 6. Connect audio level meter AN/URM-38, to the Phones jack, (TP-3, see Figure 7–58) on the Amplifier-Detector AM-439/FRR-24.

Step 7. Set the A.F. Level control for a reading of 20 DB (100 milliwatts) on the audio level meter and set the Speaker switch at Off.

Step 8. Set the signal generator carrier at Off by setting the Microvolt switch and Multiplier dial at Off. Adjust the A.F. Level control for an audio level meter reading of 0 DB (1 milliwatt).

Step 9. Set the signal generator carrier at On. Adjust the Microvolt control for a reading of 20 DB (100 milliwatts) on the audio level meter. The Microvolt meter should read 2 microvolts or less.

Step 10. Remove all test equipment.

(b) FREQUENCY SHIFT CHECK.–In order to check the frequency shift circuits it will be necessary to have a frequency shift signal available. Proper functioning of the Frequency Shift Converter is indicated when an output signal of correct waveform and magnitude is obtained on the cathode ray monitor. The waveform observed on the cathode ray monitor should be the same as the correct tuning pattern shown on Figure 7–51. The Comparator-Keyer CM-32/FRR-24 can be checked by connecting its output to a teletypewriter or Keyer. The unit should receive the keyed D.C. pulses from any or all of the Frequency Shift Converters CV-127/FRR-24 and combine and amplify them to a suitable level to actuate the teletypewriter or Keyer KY-62/FRR-24.

6. REPAIRS.

a. ELECTRICAL ADJUSTMENTS.–Electrical adjustments necessary on the AN/FRR-24 receiver consist of the alignment of the various electrical circuits contained within each functional unit. It should be assumed that all adjustments have been carefully made at the factory before shipment and realignment should not be undertaken unless there is ample evidence that it is required as determined by trouble shooting checks and/or performance tests. Before any adjustments are made allow the equipment to run for a suitable length of time with all voltages applied to bring the components up to a steady temperature.

Units of test equipment required to perform these tests are as follows:

An electronic voltmeter such as Navy Model OBQ Vacuum Tube Volt-Ohm Milliammeter, Multimeter ME-25/U or equivalent;

A heterodyne frequency meter Navy Model LR series AN type FR-47/U or equivalent;

An electronic voltmeter such as Electronic Multimeter ME-6/U;

A variable audio oscillator Navy Model LAJ, AN type TS-382A/U or equivalent;

An Audio Level Meter AN/URM-38;

An oscilloscope Navy Model OBL, AN type OS-8/U or equivalent;

A signal generator such as R.F. Signal Generator Set AN/URM-25 or equivalent;

A 4.5-volt dry cell battery;

A potentiometer with a resistance of approximately 10,000 ohms; (SNSN N16-R-91291-4928);

The following D.C. supplies are required for setting of the overvoltage relays in the power supplies. Since it is not likely that these adjustments will ever have to be made, it is not recommended that the activity procure batteries etc. unless the actual need arises.

A positive 235-volt D.C. source;

A positive 325-volt D.C. source;

A negative 325-volt D.C. source;

An insulated I.F. Alignment tool;

The methods of connecting the AN/URM-25 are as follows:

METHOD A

R.F. Output X 20,000: Connect the R.F. Cable Assembly CG-409A/U (W-104) between J-101 and Test Lead CX-1363/U. R.F. Output X 20,000 is a 500-ohm, 2-volt open circuit R.F. Output.

METHOD B

R.F. Output X Mult. into load impedance of 500 ohms or more: Connect the R.F. Cable Assembly CG-409A/U (W-104) between J-102 and the Impedance Adapter MX-1074/URM-25. Connect the R.F. Cable Assembly CG-409A/U (W-105 or W-106) between the Impedance Adapter and Test Lead CX-1363/U.

METHOD C

R.F. Output X Mult. into load impedance of 70 ohms: Connect the R.F. Cable Assembly CG-409A/U (W-104) between J-102 and Test Lead CX-1363/U. Terminate the signal generator with a 180 ohm resistor (N16-R-

49643-971). R.F. Output X Mult. is a 53.5 ohm step attenuator output.

(1) 1750 KC. I.F. ALIGNMENT.

(a) TRANSFORMER T-108, AM-450, 451, 452, 453/FRR-24 *(Figure 7–88).*–See Figure 7–52 for alignment adjustment locations.

Step 1. Remove the applicable antenna patch cord from 1J27, 2J27 or 3J27.

Step 2. Before proceding further it will be necessary to calibrate the 2nd. I.F. Level meter. This is done by connecting signal generator AN/URM-25, in accordance with Method C, Par. 6. a. to terminal 4 of Z-302 (TP-1, see Figure 7–54) located on the Frequency Converter CV-126/FRR-24. The procedure is as follows:

Adjust the signal generator output frequency to 1750 kc., unmodulated. Set the Second Conversion Oscillator switch, located on the CV-126/FRR-24, at Crystal. Set the Selectivity switch on F-99/FRR-24 at a broad position such as 18 Kc.

Step 3. Set the A.G.C. switch on the R.F. Amplifier AM-454/FRR-24 at Off and the A.M. Diversity Gain control at 10. Adjust the signal generator Microvolt control for an R.F. output of 100 microvolts.

Step 4. Adjust the R.F. Gain control on the AM-454/FRR-24 until the 2nd. I.F. Level meter reads 1 milliampere.

The 2nd. I.F. Level meter is now calibrated to read 1 milliampere with an input R.F. signal of 100 microvolts. Do not disturb the control settings of

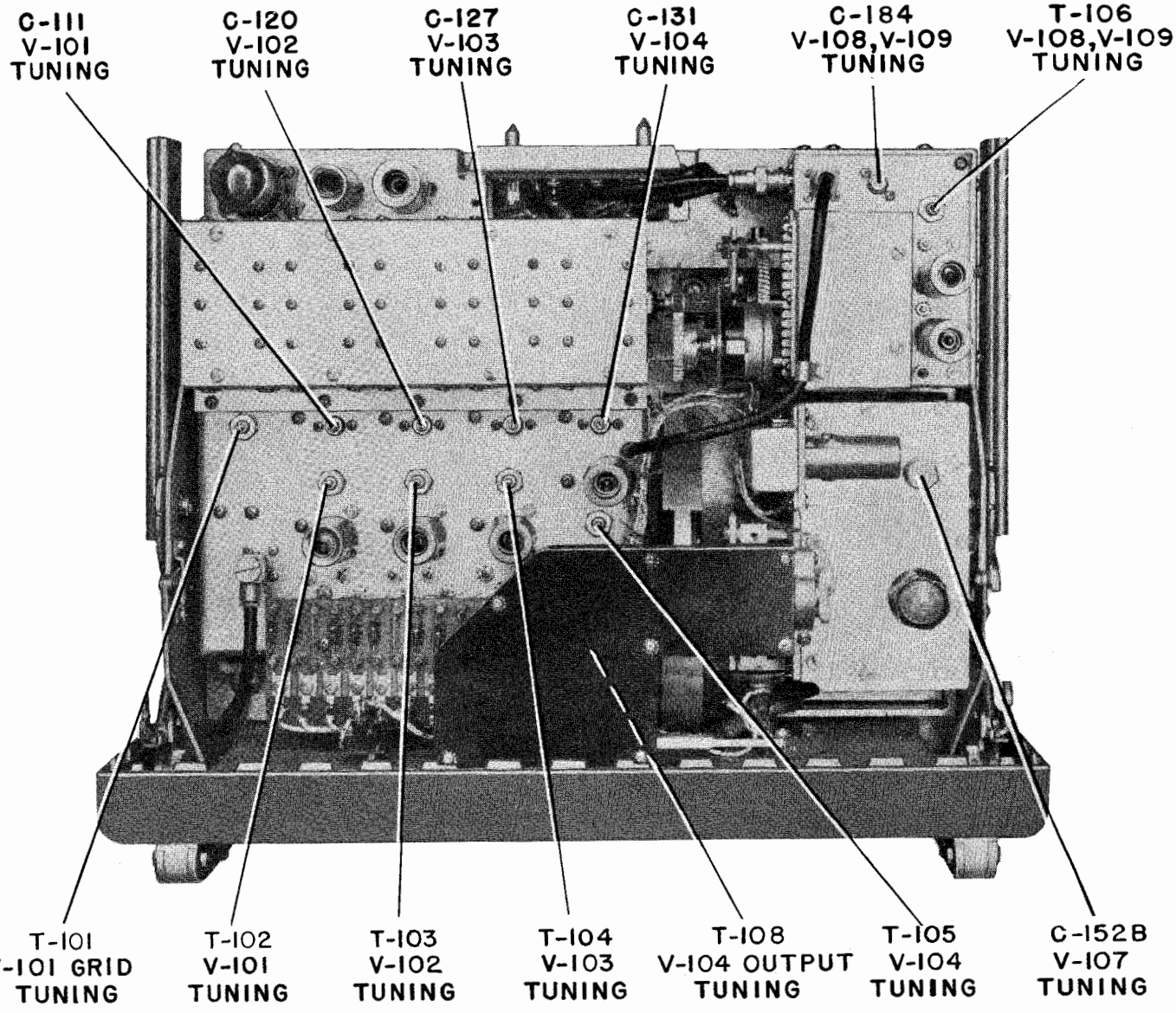


Figure 7–52. Alignment Adjustment Locations Top of Chassis, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

the AM-454/FRR-24 and the CV-126/FRR-24 until I.F. alignment has been completed.

Step 5. Slide the Amplifier-Converter unit out of its cabinet and connect a test cable between the multiconnector P-101 on the chassis and J-101 on the inside of the cabinet. Loosen the ten captivated screws around the edges of the coil compartment bottom on the Amplifier-Converter and remove the bottom. Disconnect the signal generator from CV-126/FRR-24 and connect it between the stator of trimmer capacitor C-131 (TP-1, see Figure 7–22) and the chassis of the Amplifier-Converter, in accordance with Method B, Par. 6. a. Set the generator output at approximately 1000 uvs. Set the Band switch on the Control Panel SB-142/FRR-24 at the position corresponding to the Amplifier-Converter under test.

Step 6. Loosen the seven Phillips head screws on the top of the optical housing. Remove the top. With the top removed care should be taken not to mar the surface of the mirror or the projection dial window.

Step 7. Insert an insulated I.F. alignment tool through the aperture in the bottom of the optical housing. Adjust the iron core tuning adjustment of transformer T-108 for maximum reading on the 2nd. I.F. Level meter and simultaneously adjust the Microvolt control of the signal generator to obtain a 1 milliampere reading on the 2nd. I.F. Level meter. The generator output readings obtained should not vary

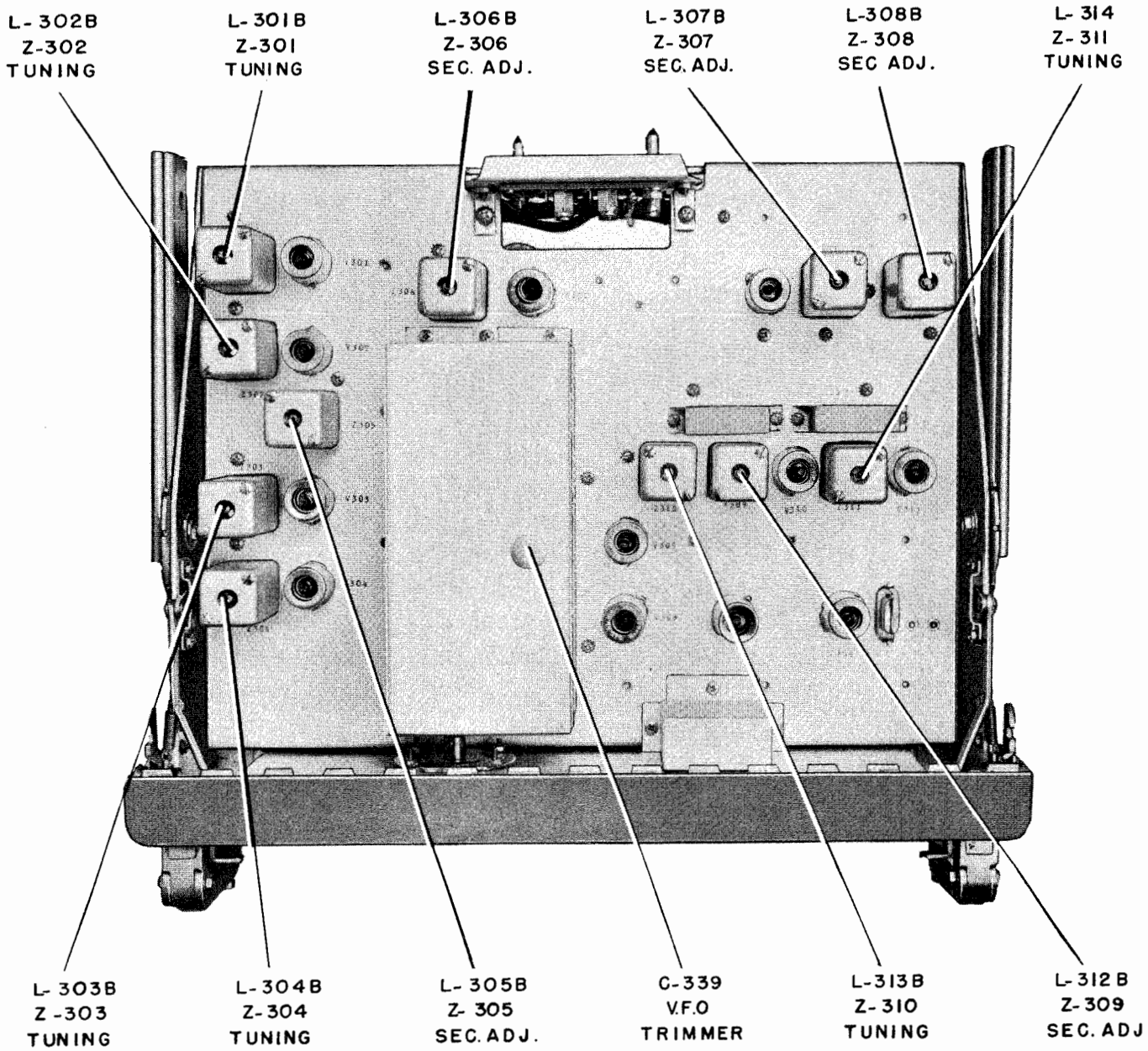


Figure 7–53. Alignment Adjustment Locations Top of Chassis, Frequency-Converter CV-126/FRR-24

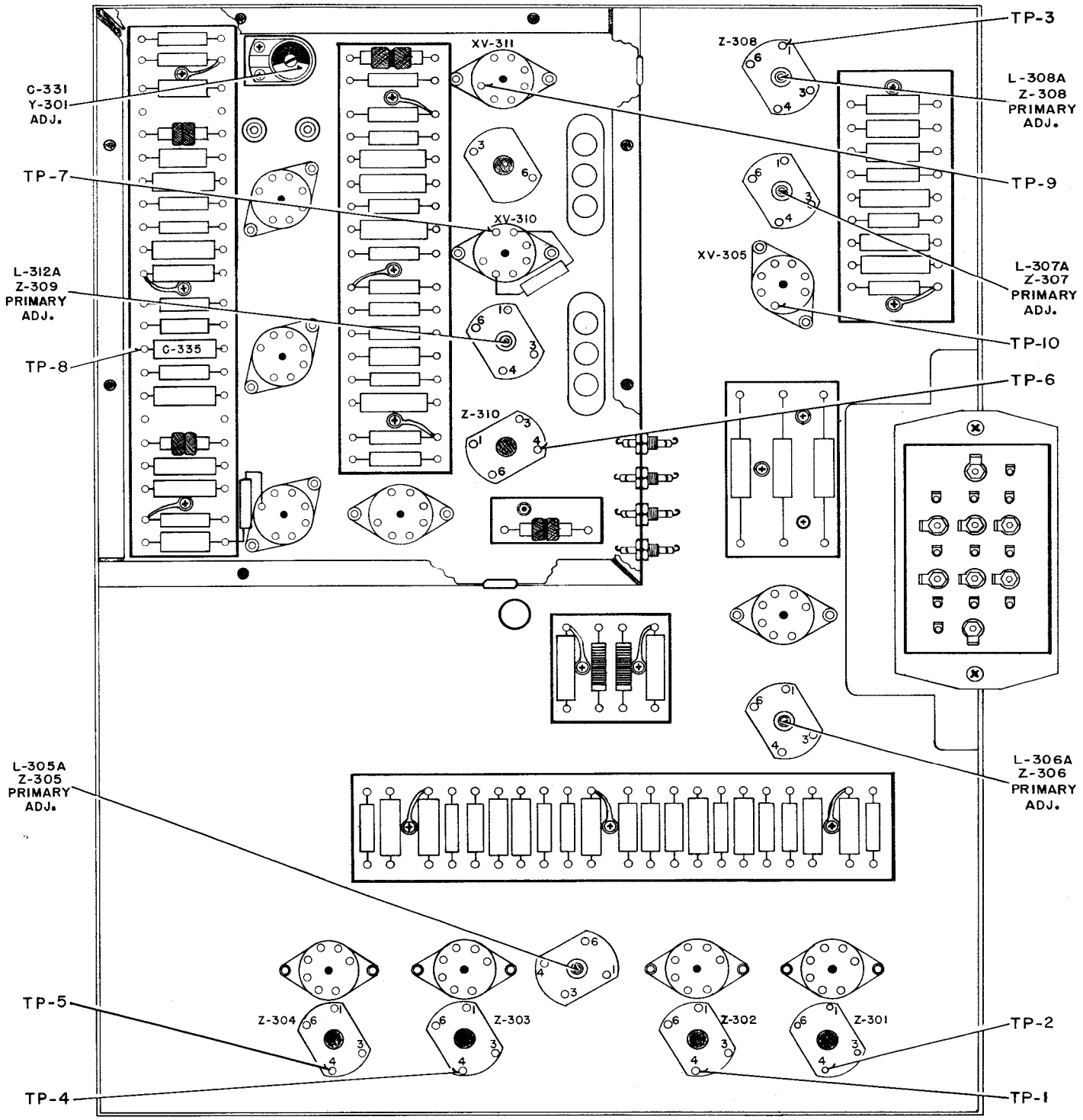


Figure 7–54. Alignment Adjustment and Test Point Locations Bottom of Chassis, Frequency-Converter CV-126/FRR-24

more than 20% from those in the following table.

Amplifier-Converter	AM-450/FRR-24	850 uvs.
Amplifier-Converter	AM-451/FRR-24	850 uvs.
Amplifier-Converter	AM-453/FRR-24	850 uvs.
Amplifier-Converter	AM-452/FRR-24	2000 uvs.

Step 8. Remove the signal generator and replace the bottom cover of the coil compartment. Replace the top cover of the optical housing. Make sure the mirror and window are dust-free by wiping them with a lint free cloth. Remove the test cable and slide the unit back into the cabinet. Replace the antenna patch cord.

(b) TRANSFORMER Z-301 THROUGH Z-308, CV-126/FRR-24 *(Figure 7–90).*–See Figures 7–53 and 7–54 for alignment adjustment locations.

Step 1. Remove the cables from connectors J-302, J-303, J-304, J-306 and J-307 at the rear of the cabinet. Slide the Frequency Converter CV-126/FRR -24 out of its cabinet and connect a test cable between the multiconnector P-301 on the chassis and J-301 on the inside of the cabinet.

Step 2. Connect signal generator AN/URM-25 tuned to an R.F. frequency of 1750 kc. between terminal 4 of Z-301 (TP-2, see Figure 7–54) and chassis in accordance with Method C, Par. 6. a.

Step 3. Remove the cover of the oscillator compartment bottom of chassis and connect multimeter ME-6/U between the cathode (pin 7) of V-311 (TP-9, see Figure 7–54) and the chassis. Set the voltmeter on the 1-volt scale.

Step 4. Set Second Conversion Oscillator Selector switch at Crystal. Adjust the iron core tuning adjustments L-301B of transformer Z-301, L-305A and L-305B of transformer Z-305, L-306A and L-306B of transformer Z-306, L-307A and L-307B of transformer Z-307, L-308A and L-308B of transformer Z-308 for maximum reading on the multimeter. While making the foregoing adjustments it will be necessary to retard the Microvolt control of the signal generator if the adjustment increases the I.F. amplifier gain to a point where overload occurs. Levels below 0.1 volt will prevent overload.

Step 5. Change the signal generator connection to terminal 4 of Z-302 (TP-1, see Figure 7–54).

Step 6. Adjust the iron-core tuning adjustment L-302B of transformer Z-302 for maximum output on the multimeter.

Step 7. Change the signal generator connection to terminal 4 of Z-303 (TP-4, see Figure 7–54).

Step 8. Adjust the iron-core tuning adjustment L-303B of transformer Z-303 for maximum output on the multimeter.

Step 9. Change the signal generator connection to terminal 4 of Z-304 (TP-5, see Figure 7–54).

Step 10. Adjust the iron-core tuning adjustment L-304B of transformer Z-304 for maximum output on the multimeter.

Step 11. Remove all test equipment.

(2) 1700 KC. ALIGNMENT, CV-126/FRR-24 *(See Figure 7–90).*

(a) TRANSFORMER Z-309 AND Z-310.

Step 1. Connect the electronic voltmeter (Model OBQ or ME-25/U) between the grid (pin no. 1) of the second converter tube V-310 (TP-7, see Figure 7–54) and chassis. Set the voltmeter on the 10-volt D.C. scale.

Step 2. Adjust the iron-core tuning adjustments L-312A and L-312B of transformer Z-309 for maximum output on the voltmeter.

Step 3. Remove the voltmeter from the grid of the second converter V-310. Connect the multimeter ME-6/U between terminal 4 of Z-310 (TP-6, see Figure 7–54) and chassis.

Step 4. Adjust the iron-core tuning adjustment L-313B of transformer Z-310 for maximum reading on the multimeter, approximately 0.5 volt.

Step 5. Remove the voltmeter and replace the bottom cover.

(3) 50 KC. I.F. DETECTOR AND DISCRIMINATOR ALIGNMENT.

(a) TRANSFORMER Z-311, CV-126/FRR-24 *(Figure 7–90).*

Step 1. Connect multimeter ME-6/U between the cathode (pin 7) of V-311 (TP-9, see Figure 7–54) and chassis. Connect the signal generator tuned to an R.F. frequency of 1750 kc. between terminal 1 of Z-308 (TP-3, see Figure 7–54) and chassis, in accordance with Method B, Par. 6. a. Set the multimeter on the 1-volt scale.

Step 2. Transformer Z-311 tunes very broadly at the 50-kc. I.F. frequency, therefore it is necessary to 'rock' the signal generator backward and forward between 1740 kc. and 1760 kc. until a peak is obtained. Adjust the iron-core tuning adjustment L-314 of transformer Z-311 for maximum output on the multimeter.

Step 3. Remove all test equipment including the test cable and slide the CV-126/FRR-24 back into its cabinet. Reconnect all cables.

(b) 50 KC. I.F. FILTER F-99/FRR-24, *(Figure 7–91).*–See Figures 7–55 and 7–56 for alignment adjustment locations.

Step 1. Slide the Filter Assembly F-99/FRR-24 out of its cabinet and connect a test cable between the multiconnector P-401 on the chassis and J-401 on the inside of the cabinet. Remove the cables connected to J-402 and J-403 at the rear of the cabinet.

Step 2. Connect signal generator AN/URM-25 between the input side of C-401 (TP-11, see Figure 7–56) and chassis, in accordance with Method B, Par. 6. a. Connect electronic voltmeter OBQ or ME-25/U between pin 7 of V-410 (TP-12, see Figure 7–56) and chassis.

Step 3. Before aligning any of the tuned circuits in the F-99/FRR-24 it is necessary to load the over-coupled circuits to obtain the correct alignment peaks. The following chart gives the step-by-step procedure to follow in effecting the alignment of each filter. All primary adjustments are located at the bottom of the chassis, all secondaries are on the top. Reference to Figure 7–56 will show location and identification of transformer terminals. The three values of resistors listed are all composition, half-watt types. Their stock numbers are:

15,000 -- N16-R-51371-811
33,000 -- N16-R-50417-0971
220,000 -- N16-R-50714-0971

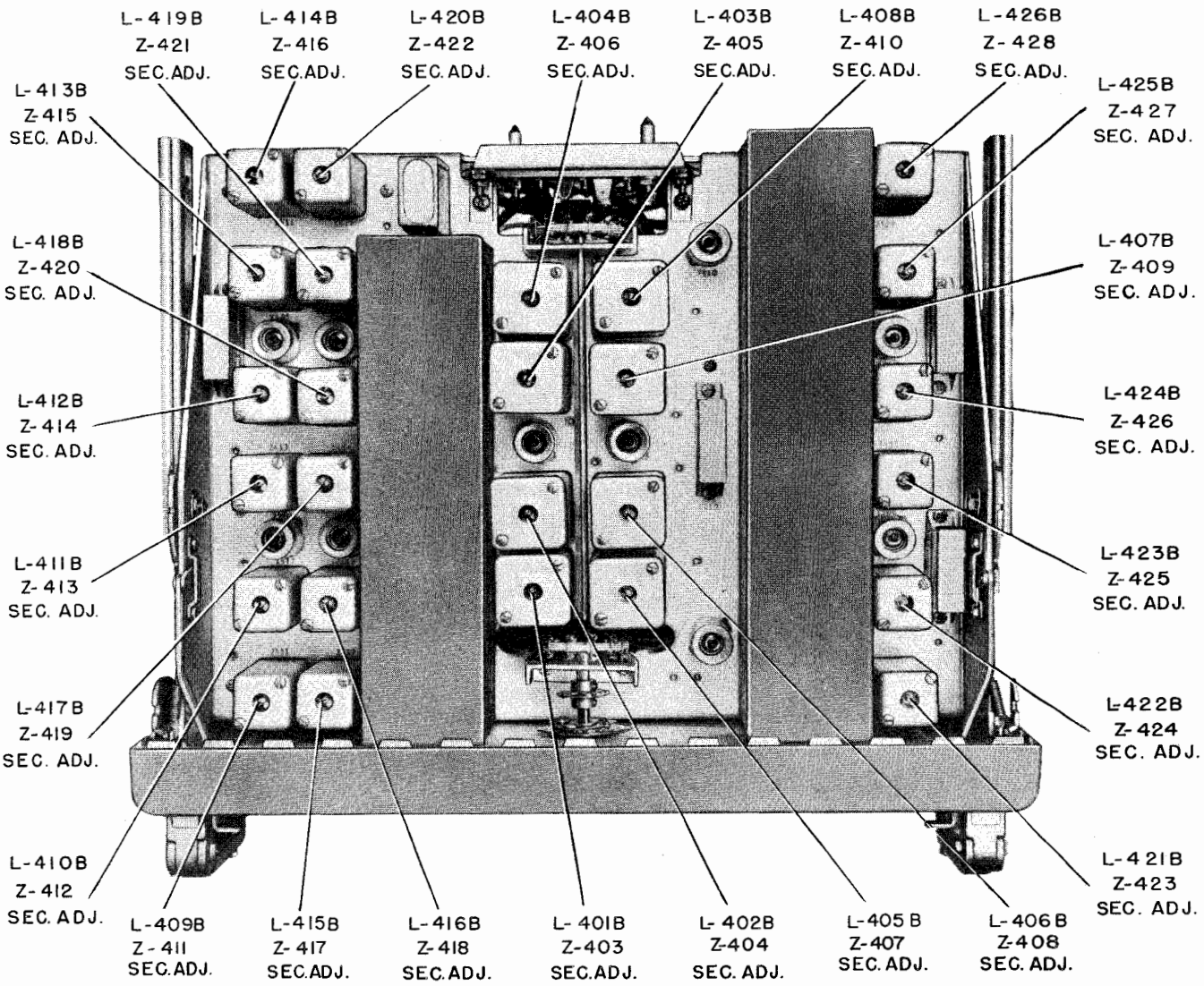


Figure 7–55. Alignment Adjustment Locations Top of Chassis, Filter Assembly F-99/FRR-24

Step	Set Selectivity Switch at:	Load resistor in ohms	Connect load resistor across terminals:	Set Generator at exactly	Adjust for maximum reading on voltmeter
			12 Kc. Channel		
1	12 Kc.	15,000	1 & 6 of Z-423	50.5 Kc.	L-421B
2	12 Kc.	15,000	3 & 4 of Z-423	50.5 Kc.	L-421A
3	12 Kc.	15,000	1 & 6 of Z-424	50.5 Kc.	L-422B
4	12 Kc.	15,000	3 & 4 of Z-424	50.5 Kc.	L-422A
5	12 Kc.	15,000	1 & 6 of Z-425	50.5 Kc.	L-423B
6	12 Kc.	15,000	3 & 4 of Z-425	50.5 Kc.	L-423A
7	12 Kc.	15,000	1 & 6 of Z-426	50.5 Kc.	L-424B
8	12 Kc.	15,000	3 & 4 of Z-426	50.5 Kc.	L-424A
9	12 Kc.	15,000	1 & 6 of Z-427	50.5 Kc.	L-425B
10	12 Kc.	15,000	3 & 4 of Z-427	50.5 Kc.	L-425A
11	12 Kc.	15,000	1 & 6 of Z-428	50.5 Kc.	L-426B
12	12 Kc.	15,000	3 & 4 of Z-428	50.5 Kc.	L-426A
			6 Kc. Channel		
1	6 Kc.	33,000	1 & 6 of Z-417	50.0 Kc.	L-415B
2	6 Kc.	33,000	3 & 4 of Z-417	50.0 Kc.	L-415A
3	6 Kc.	33,000	1 & 6 of Z-418	50.0 Kc.	L-416B
4	6 Kc.	33,000	3 & 4 of Z-418	50.0 Kc.	L-416A
5	6 Kc.	33,000	1 & 6 of Z-419	49.75 Kc.	L-417B
6	6 Kc.	33,000	3 & 4 of Z-419	49.75 Kc.	L-417A
7	6 Kc.	33,000	1 & 6 of Z-420	49.75 Kc.	L-418B
8	6 Kc.	33,000	3 & 4 of Z-420	49.75 Kc.	L-418A
9	6 Kc.	33,000	1 & 6 of Z-421	50.0 Kc.	L-419B
10	6 Kc.	33,000	3 & 4 of Z-421	50.0 Kc.	L-419A
11	6 Kc.	33,000	1 & 6 of Z-422	50.0 Kc.	L-420B
12	6 Kc.	33,000	3 & 4 of Z-422	50.0 Kc.	L-420A
			3 Kc. Channel		
1	3 Kc.	33,000	1 & 6 of Z-411	49.95 Kc.	L-409B
2	3 Kc.	33,000	3 & 4 of Z-411	49.95 Kc.	L-409A
3	3 Kc.	33,000	1 & 6 of Z-412	49.95 Kc.	L-410B
4	3 Kc.	33,000	3 & 4 of Z-412	49.95 Kc.	L-410A
5	3 Kc.	33,000	1 & 6 of Z-413	49.95 Kc.	L-411B
6	3 Kc.	33,000	3 & 4 of Z-413	49.95 Kc.	L-411A
7	3 Kc.	33,000	1 & 6 of Z-414	49.95 Kc.	L-412B
8	3 Kc.	33,000	3 & 4 of Z-414	49.95 Kc.	L-412A
9	3 Kc.	33,000	1 & 6 of Z-415	49.95 Kc.	L-413B
10	3 Kc.	33,000	3 & 4 of Z-415	49.95 Kc.	L-413A
11	3 Kc.	33,000	1 & 6 of Z-416	49.95 Kc.	L-414B
12	3 Kc.	33,000	3 & 4 of Z-416	49.95 Kc.	L-414A
			1 Kc. Channel		
1	1 Kc.	220,000	A & B of Z-407	50.05 Kc.	L-405B
2	1 Kc.	220,000	C & D of Z-407	50.05 Kc.	L-405A
3	1 Kc.	220,000	A & B of Z-408	50.05 Kc.	L-406B
4	1 Kc.	220,000	C & D of Z-408	50.05 Kc.	L-406A
5	1 Kc.	220,000	A & B of Z-409	50.05 Kc.	L-407B

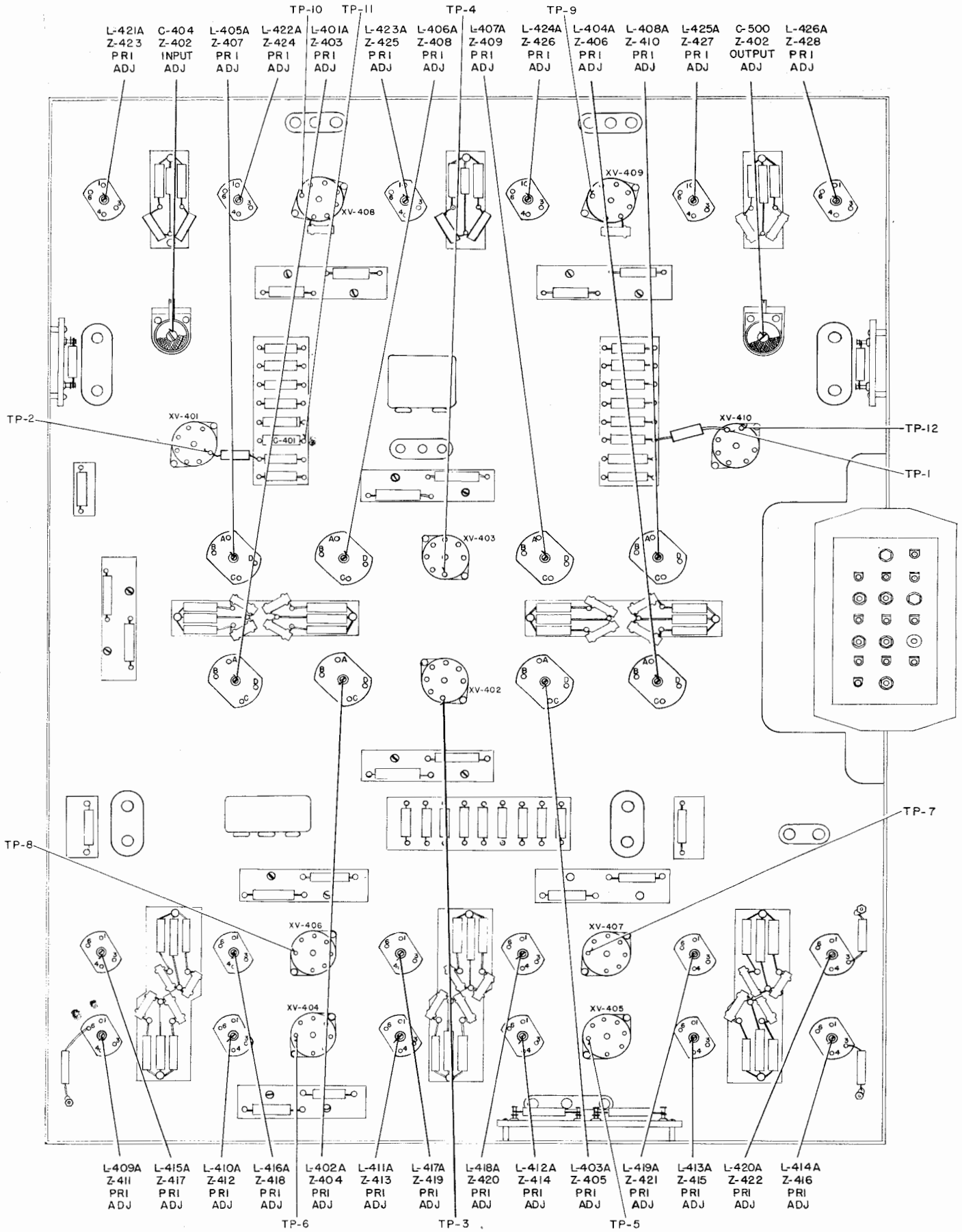


Figure 7–56. Alignment Adjustment and Test Point Locations Bottom of Chassis, Filter Assembly F-99/FRR-24

Step	Set Selectivity Switch at:	Load resistor in ohms	Connect load resistor across terminals:	Set Generator at exactly	Adjust for maximum reading on voltmeter
			1 Kc. Channel (Cont'd)		
6	1 Kc.	220,000	C & D of Z-409	50.05 Kc.	L-407A
7	1 Kc.	220,000	A & B of Z-410	50.05 Kc.	L-408B
8	1 Kc.	220,000	C & D of Z-410	50.05 Kc.	L-408A
			500 cycle Channel		
1	.5 Kc.	220,000	A & B of Z-403	50.0 Kc.	L-401B
2	.5 Kc.	220,000	C & D of Z-403	50.0 Kc.	L-401A
3	.5 Kc.	220,000	A & B of Z-404	50.0 Kc.	L-402B
4	.5 Kc.	220,000	C & D of Z-404	50.0 Kc.	L-402A
5	.5 Kc.	220,000	A & B of Z-405	50.0 Kc.	L-403B
6	.5 Kc.	220,000	C & D of Z-405	50.0 Kc.	L-403A
7	.5 Kc.	220,000	A & B of Z-406	50.0 Kc.	L-404B
8	.5 Kc.	220,000	C & D of Z-406	50.0 Kc.	L-404A
			250 cycle Channel		
1	.25 Kc.			50.0 Kc.	C-404
2	.25 Kc.			50.0 Kc.	C-500

Step 4. Replace the cables to J-402 and J-403. Remove the test cable and all test equipment. Slide the chassis back into its cabinet.

(c) TRANSFORMERS Z-602 AND Z-603, AM-454/FRR-24 *(Figure 7–92).*–See Figure 7–57 for alignment adjustment locations.

Step 1. Remove the cables from connectors J-602, J-603, J-604 and J-606 at the rear of the cabinet. Slide the R.F. Amplifier AM-454/FRR-24 out of its cabinet and connect a test cable between the multiconnector P-601 on the chassis and J-601 on the inside of the cabinet.

Step 2. Set the A.G.C. switch at Off and the R.F. Gain control at 10.

Step 3. Connect multimeter ME-6/U between pin no. 7 of V-604 (TP-2, see Figure 7–26) and the chassis. Set the voltmeter on the 1-volt scale.

Step 4. Connect signal generator AN/URM-25 tuned to a frequency of 40 kc. to terminal G of Z-601 (TP-6, see Figure 7–26) and chassis, in accordance with Method B, Par. 6. a. Set the Microvolt control for an output of 200 microvolts. Note the multimeter reading.

Step 5. Change the frequency of signal generator to 60 kc. and note the reading on the multimeter.

Step 6. A reading of approximately one volt for all frequencies between 40 and 60 kc. is indicative of proper adjustment of variable inductors L-601 and L-602 and no realignment is required.

Step 7. If realignment is indicated in either Steps 4 or 5, adjust inductors L-601 and L-602 with the generator set alternately at 40 kc. and 60 kc. until a reading of approximately one volt is obtained at all frequencies between 40 and 60 kc. This method is used to assure a flat response between 40 and 60 kc.

Step 8. Remove all the test equipment and reconnect the cables to connectors J-602, J-603, J-604 and J-606. Remove the test cable and slide the chassis back into its cabinet.

(d) TRANSFORMER Z-701, AM-439/FRR-24 *(See Figure 7–93).*–See Figure 7–58 for alignment adjustment locations.

Step 1. Remove the cable from connector J-705 at the rear of the cabinet. Slide the Amplifier-Detector AM-439/FRR-24 out of the cabinet and connect a test cable between the multiconnector P-701 on the chassis and J-701 on the inside of the cabinet.

Step 2. Connect signal generator AN/URM-25 tuned to an R.F. frequency of 51 kc. modulated 30% at 1000 cycles to the input side of C-701 (TP-1, see Figure 7–28) and chassis, in accordance with Method A, Par. 6. a. Connect audio level meter AN/URM-38 to the Phones jack (TP-3, see Figure 7–58). Set the Reception switch at AM.

Step 3. Connect a 4700-ohm half-watt resistor (SNSN N16-R-50129-811) across terminals A and C of

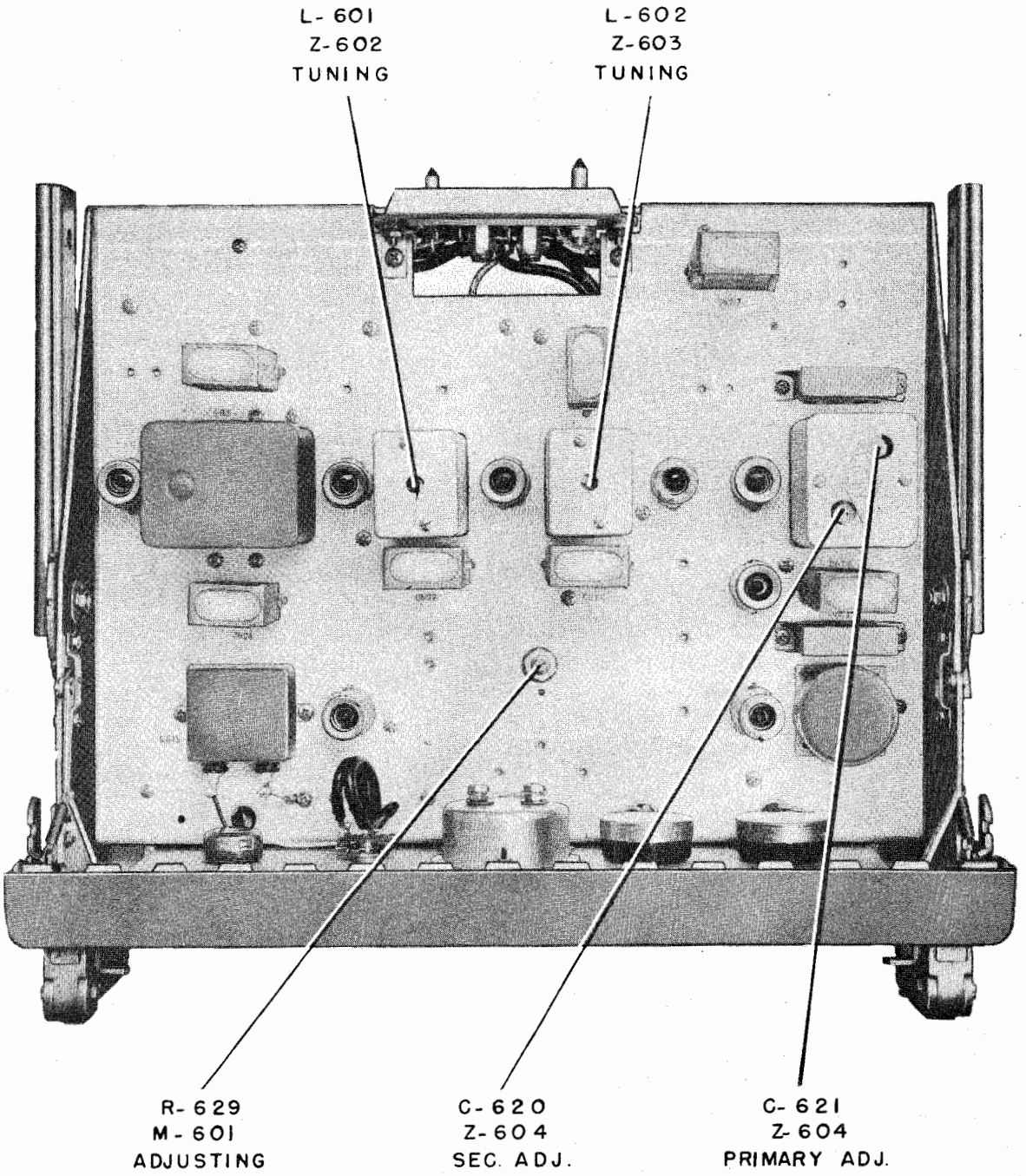


Figure 7–57. Alignment Adjustment Locations Top of Chassis, R.F. Amplifier AM-454/FRR-24

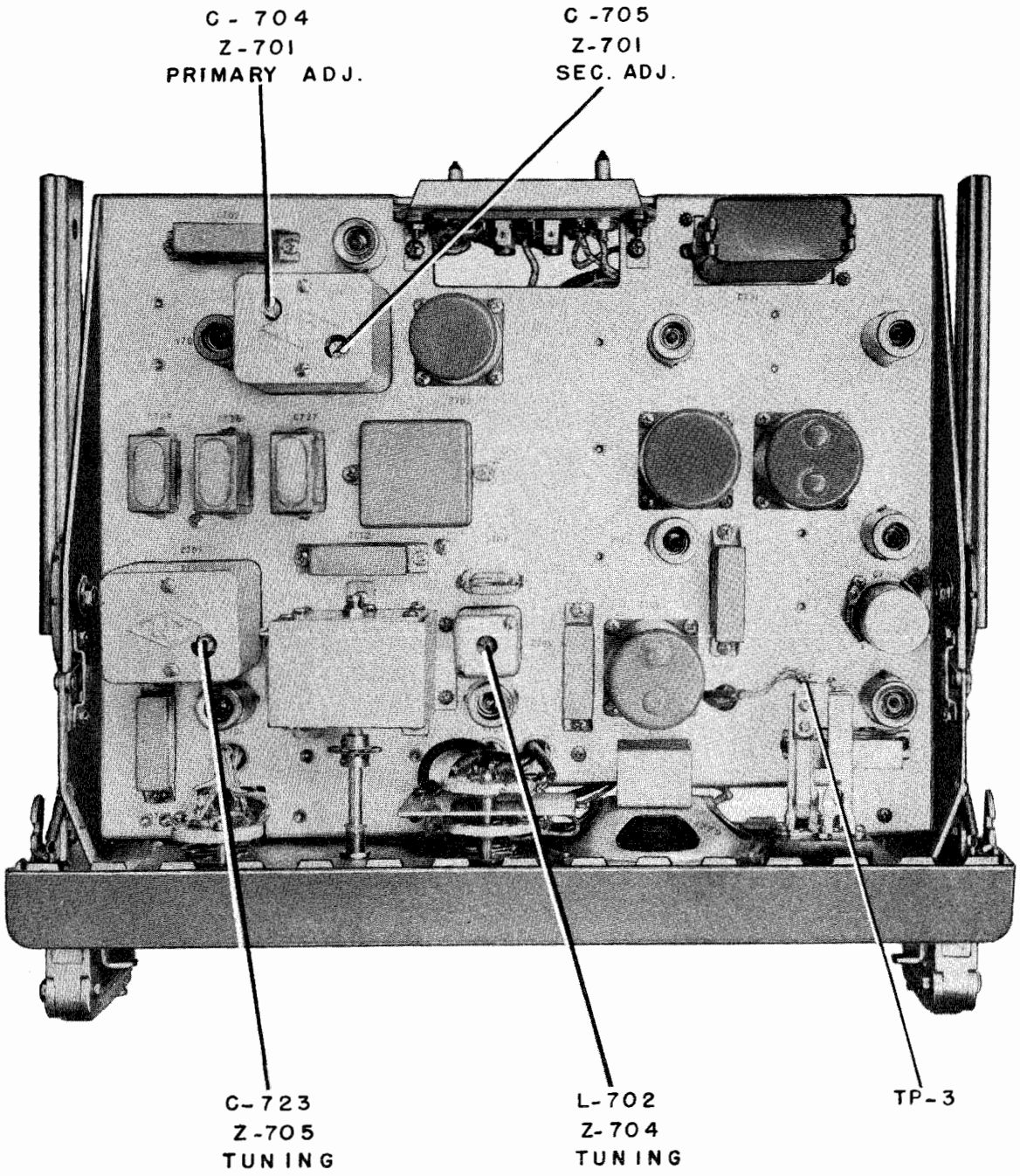


Figure 7–58. Alignment Adjustment and Test Point Locations Top of Chassis, Amplifier-Detector AM-439/FRR-24

transformer Z-701 (TP-5, see Figure 7–28). Adjust capacitor C-705 for maximum reading on the audio level meter.

Step 4. Remove the 4700-ohm resistor from terminals A and C and connect it across terminals F and D of Z-701 (TP-6, see Figure 7–28). Adjust capacitor C-704 for maximum reading on the audio level meter.

Step 5. Remove all test equipment and reconnect the cable to J-705. Remove the test cable and slide the chassis back into its cabinet.

(e) TRANSFORMER Z-901, AM-440/FRR-24 *(Figure 7–95).*–See Figure 7–59 for alignment adjustment locations.

Step 1. Remove the cable from the 50 kc. AM input connector J-907 at the rear of the cabinet. Slide the Amplifier-Detector AM-440/FRR-24 out of its cabinet and connect a test cable between the multiconnector P-901 on the chassis and J-901 on the inside of the cabinet.

Step 2. Connect signal generator AN/URM-25 tuned to an R.F. frequency of 51 kc. modulated 30% at 1000 cps. to the input side of C-901 (TP-1, see Figure 7–31) and chassis, in accordance with Method A, Par. 6. a. Connect audio level meter AN/URM-38 to the Phones jack (TP-3, see Figure 7–59). Set the A.G.C. switch S-903 at Off and the Audio Bandwidth switch S-901 at 6 kc. Set the A.N.L. switch S-902 at Off. The setting of the R.F. Gain control R-906 is optional. Set the A.F. Level control R-915 to obtain a suitable meter reading.

Step 3. Connect a 4700-ohm half-watt resistor

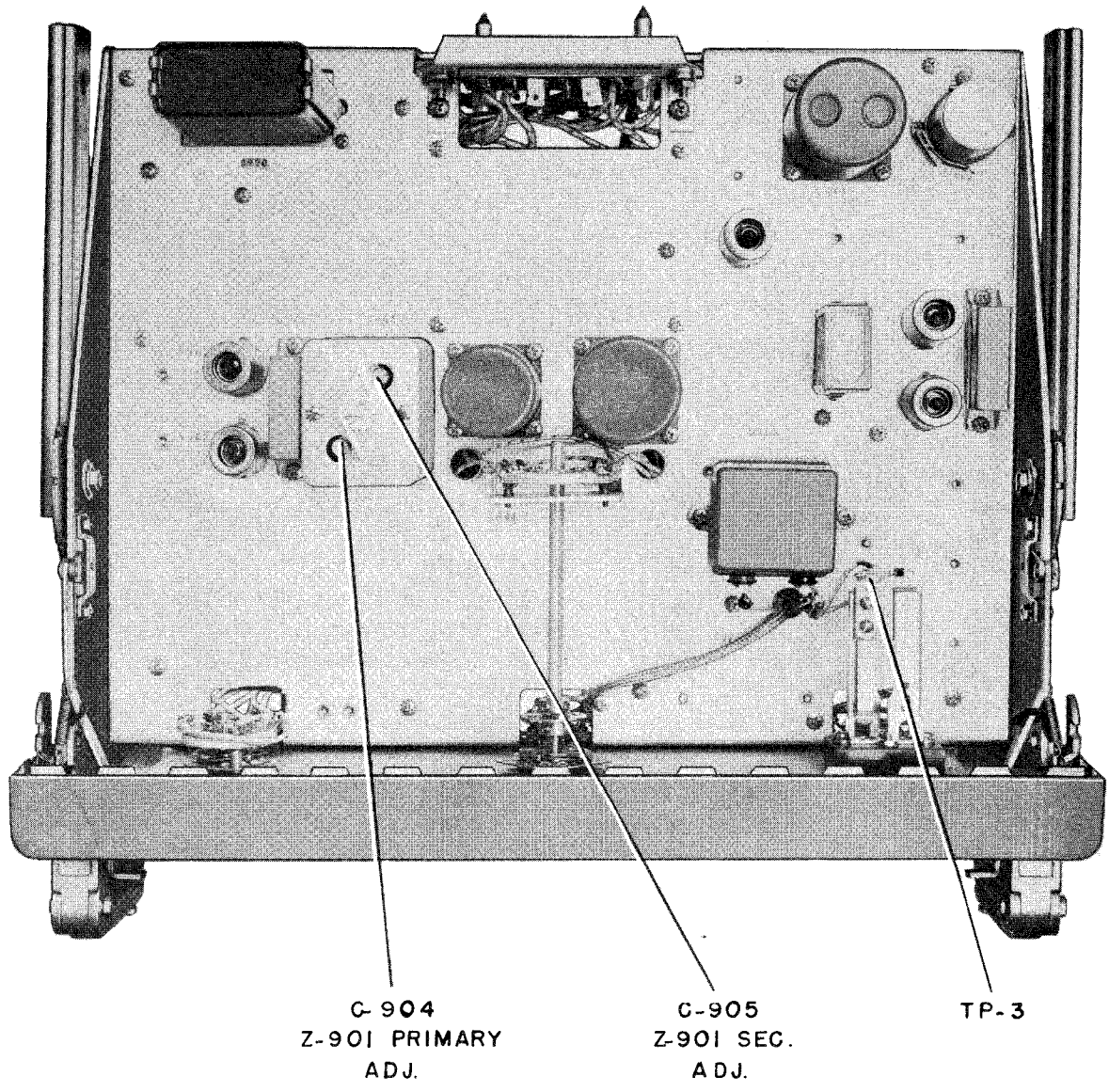


Figure 7–59. Alignment Adjustment and Test Point Locations Top of Chassis, Amplifier-Detector AM-440/FRR-24

(SNSN N16-R-50129–811) between terminals A and C of Z-901 (TP-5, see Figure 7–31). Adjust capacitor C-905 for maximum reading on the audio level meter.

Step 4. Remove the 4700-ohm resistor from terminals A and C and connect it across terminals F and D of transformer Z-901 (TP-6, see Figure 7–31). Adjust capacitor C-904 for maximum reading on the audio level meter.

Step 5. Remove all test equipment from the unit and reconnect the 50 kc. AM input cable to J-907. Slide the chassis back into its cabinet.

(f) TRANSFORMER Z-1001, Z-1002 AND Z-1003, AM-438/FRR-24 *(Figure 7–96).*–See Figure 7–60 for alignment adjustment locations.

Step 1. Remove the cables from connectors J-1004, J-1008 and J-1009 at the rear of the cabinet. Slide the Amplifier-Detector AM-438/FRR-24 out of its cabinet and connect a test cable between the multiconnector P-1001 on the chassis and J-1001 on the inside of the cabinet.

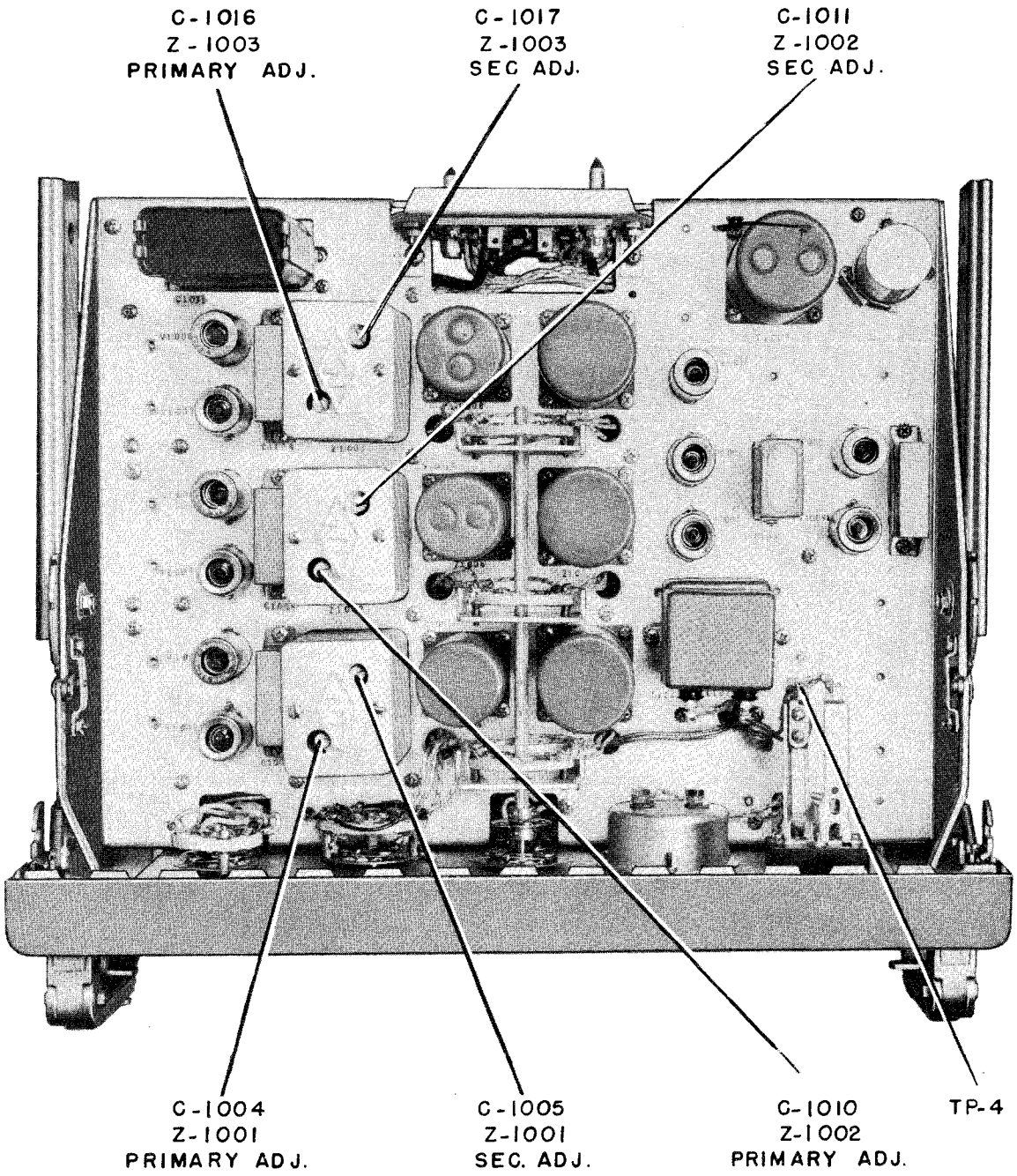


Figure 7–60. Alignment Adjustment and Test Point Locations Top of Chassis, Amplifier-Detector AM-438/FRR-24

Step 2. Connect signal generator AN/URM-25 tuned to an R.F. frequency of 51 kc. modulated 30% at 1000 cps. to the input side of capacitor C-1001 (TP-1, see Figure 7–33) and chassis, in accordance with Method A, Par. 6. a. Connect Audio Level Meter AN/URM-38 to the Phones jack J-1002 (TP-4, see Figure 7–60). Set the A.G.C. switch S-1003 at Off and the Audio Bandwidth switch S-1001 at 6 kc. Set the A.N.L. switch S-1004 at Off. The settings of the R.F. Gain control R-1023 and the Level Indicator switch S-1002 are optional as these settings do not affect the electrical alignment of transformers Z-1001, Z-1002 and Z-1003. Set the A.F. Level control R-1026 to provide a suitable reading on the audio level meter.

Step 3. Connect a 4700-ohm half-watt resistor (SNSN N16-R-50129-811) between terminals A and C of transformer Z-1001 (TP-5, see Figure 7–33). Adjust capacitor C-1005 for maximum reading on the audio level meter.

Step 4. Remove the 4700-ohm resistor from terminals A and C and connect it across terminals F and D of transformer Z-1001 (TP-6, see Figure 7–33). Adjust capacitor C-1004 for maximum reading on the meter. Remove the 4700-ohm resistor from terminals F and D.

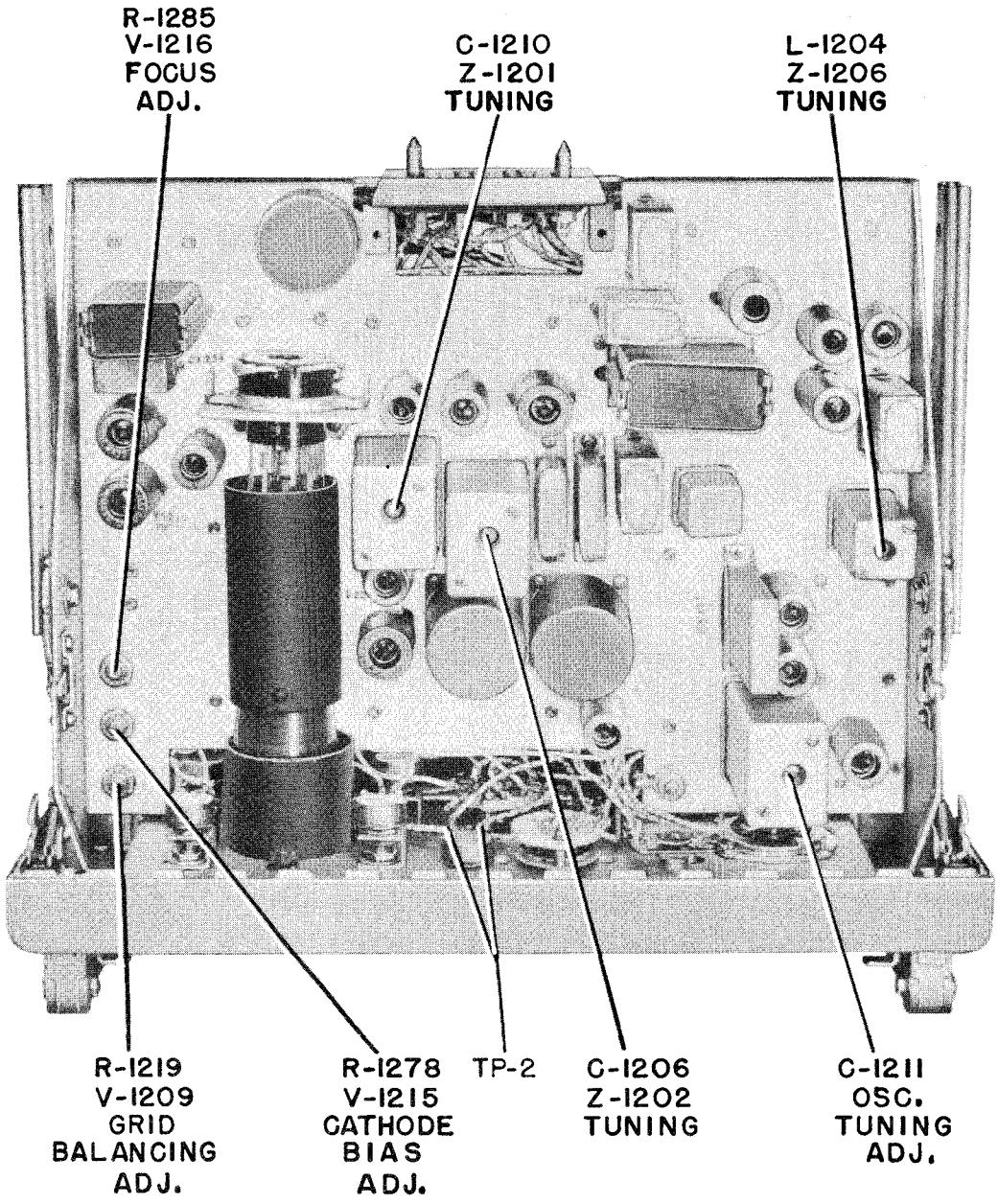


Figure 7–61. Alignment Adjustment and Test Point Locations Top of Chassis, F.S. Converter CV-127/FRR-24

Step 5. Remove the signal generator and connect it to the input side of capacitor C-1007 (TP-2, see Figure 7–33) and chassis.

Step 6. Connect the 4700-ohm resistor across terminals A and C of transformer Z-1002 (TP-7, see Figure 7–33). Adjust capacitor C-1011 for maximum reading on the meter.

Step 7. Remove the 4700-ohm resistor from terminals A and C and connect it across terminals F and D of transformer Z-1002 (TP-8, see Figure 7–33). Adjust capacitor C-1010 for maximum reading on the meter. Remove the 4700-ohm resistor from terminals F and D.

Step 8. Remove the signal generator and connect it to the input side of capacitor C-1013 (TP-3, see Figure 7–33) and chassis.

Step 9. Connect the 4700-ohm resistor across terminals A and C of transformer Z-1003 (TP-9, see Figure 7–33). Adjust capacitor C-1017 for maximum reading on the meter.

Step 10. Remove the 4700-ohm resistor from terminals A and C and connect it across terminals F and D of transformer Z-1003 (TP-10, see Figure 7–33). Adjust capacitor C-1016 for a maximum reading on the meter.

Step 11. Remove all test equipment from the unit and reconnect the cables to J-1004, J-1008 and J-1009. Slide the chassis back into its cabinet.

(g) DISCRIMINATOR ALIGNMENT, Z-1201 AND Z-1202, CV-127/FRR-24 *(Figure 7–98).*–See Figure 7–61 for alignment adjustment locations.

Step 1. Disconnect the cable connected to the F.S. input connector J-1206 at the rear of the cabinet. Slide the Frequency-Shift Converter CV-127/FRR-24 out of the cabinet and connect a test cable between the multiconnector P-1201 on the chassis and J-1201 on the inside of the cabinet.

Step 2. Connect signal generator AN/URM-25 between terminal 3 of T-1201 (TP-1, see Figure 7–36) and chassis, in accordance with Method C, Par. 6. a. Connect vacuum tube voltmeter OBQ or ME-25/U across resistor R-1217 (TP-5, see Figure 7–36).

Step 3. Set the signal generator output at 0.1 volt and the frequency dial at 53 kc. Set the Mod. Selector switch at Off.

Step 4. Adjust capacitor C-1206, which is located in transformer Z-1201, for maximum reading on the voltmeter.

Step 5. Remove the voltmeter connections and connect them across the Deviation Compensation control R-1221 (TP-2, see Figure 7–61). Change the signal generator output frequency to exactly 50 kilocycles. Set the 50-kc. output of the signal generator accurately by zero beating it against the 50-kc. crystal oscillator in the AM-439/FRR-24.

Step 6. Adjust capacitor C-1210, which is located in transformer Z-1202, for zero reading on the voltmeter.

Step 7. Remove all test equipment. Remove the test cable and slide the chassis back into its cabinet.

(4) R.F. ALIGNMENT, AM-450, 451, 452, 453/FRR-24 *(Figure 7–88).*–See Figures 7–52 and 7–62 for alignment adjustment locations.

The R.F. alignment as described herein consists of adjustment of the R.F. amplifiers, converters and the H.F. oscillator. No realignment of the H.F. oscillator should be attempted unless a reliable test signal source is available. A test signal source with a frequency accuracy better than 0.1% is required. If an accurate signal source is not available the crystal calibrator located in the Oscillator Assembly O-131/FRR-24 may be used provided sufficient care is taken to insure the selection of the correct harmonic.

Step 1. Slide the Amplifier-Converter out of the cabinet and connect a test cable between the multiconnector P-101 on the chassis and J-101 on the inside of the cabinet.

Step 2. Set the Reception switch on the Amplifier-Detector AM-439/FRR-24 at Crystal. Disconnect cable W-101 and connect signal generator AN/URM-25 to the antenna input connector J-102 (TP-2, see Figure 7–49), in accordance with Method C, Par. 6. a. Set the signal generator output at approximately 100 uvs. The 2nd. I.F. Level meter may be used as the output meter.

The following alignment chart gives the step-by-step procedure to follow in effecting the R.F. alignment of each Amplifier-Converter.

Step	Unit	Adjust Signal Source To:	Set Projection Dial At:	Adjust to Receive Test Signal	Adjust For Maximum Output
1.	AM-450/FRR-24	4.0 Mc.	4.0 Mc.	C-152A	C-111, C-120, C-127, C-131, C-102
	AM-451/FRR-24	8.0 Mc.	8.0 Mc.	C-152A	C-111, C-120, C-127, C-131, C-102
	AM-453/FRR-24	16.0 Mc.	16.0 Mc.	C-152A	C-111, C-120, C-127, C-131, C-102
	AM-452/FRR-24	32.0 Mc.	32.0 Mc.	C-152A	C-111, C-120, C-127, C-131, C-102
2.	AM-450/FRR-24	2.0 Mc.	2.0 Mc.	C-152B	T-101, T-102, T-103, T-104, T-105
	AM-451/FRR-24	4.0 Mc.	4.0 Mc.	C-152B	T-101, T-102, T-103, T-104, T-105
	AM-453/FRR-24	8.0 Mc.	8.0 Mc.	C-152B	T-101, T-102, T-103, T-104, T-105
	AM-452/FRR-24	16.0 Mc.	16.0 Mc.	C-152B	T-101, T-102, T-103, T-104, T-105
3.	AM-450/FRR-24	3.0 Mc.	3.0 Mc.	T-107	
	AM-451/FRR-24	6.0 Mc.	6.0 Mc.	T-107	
	AM-453/FRR-24	12.0 Mc.	12.0 Mc.	T-107	
	AM-452/FRR-24	24.0 Mc.	24.0 Mc.	T-107	
4.	Repeat steps 1, 2 and 3 until accuracy of alignment is obtained at all three dial settings.				
5.	Remove the signal generator.				

(5) LOCAL AND REMOTE R.F. AMPLIFIERS V-108, V-109.—To align the local and remote R.F. amplifiers proceed as follows:

Step 1. Connect an electronic voltmeter such as Navy Model OBQ or ME-25/U between the test point (C-180, see Figure 7–49) and the chassis.

Step 2. Set the Main Tuning dial at the high end of the tuning band. Adjust trimmer capacitor C-184 (see Figure 7–52) for maximum reading on the voltmeter.

Step 3. Set the Main Tuning dial at the low end of the tuning band. Adjust the iron-core tuning adjustment of T-106 (see Figure 7–52) for maximum reading on the voltmeter.

Step 4. Repeat steps 2 and 3 until maximum voltage is obtained at both the high and low frequency ends of the tuning range. Remove the test cable and slide the unit back into its cabinet. Reconnect the cable to J-102.

(6) OSCILLATOR ALIGNMENT.

(a) LOCAL H.F. OSCILLATOR V-107.—Refer to paragraph 6. a. (4) R.F. Alignment.

(b) SECOND CONVERSION VARIABLE OSCILLATOR V-308 AND CRYSTAL OSCILLATOR V-306 ALIGNMENT, CV-126/FRR-24 *(Figure 7–90).*—See Figures 7–53 and 7–54 for alignment adjustment locations.

Step 1. Slide the Frequency Converter CV-126/

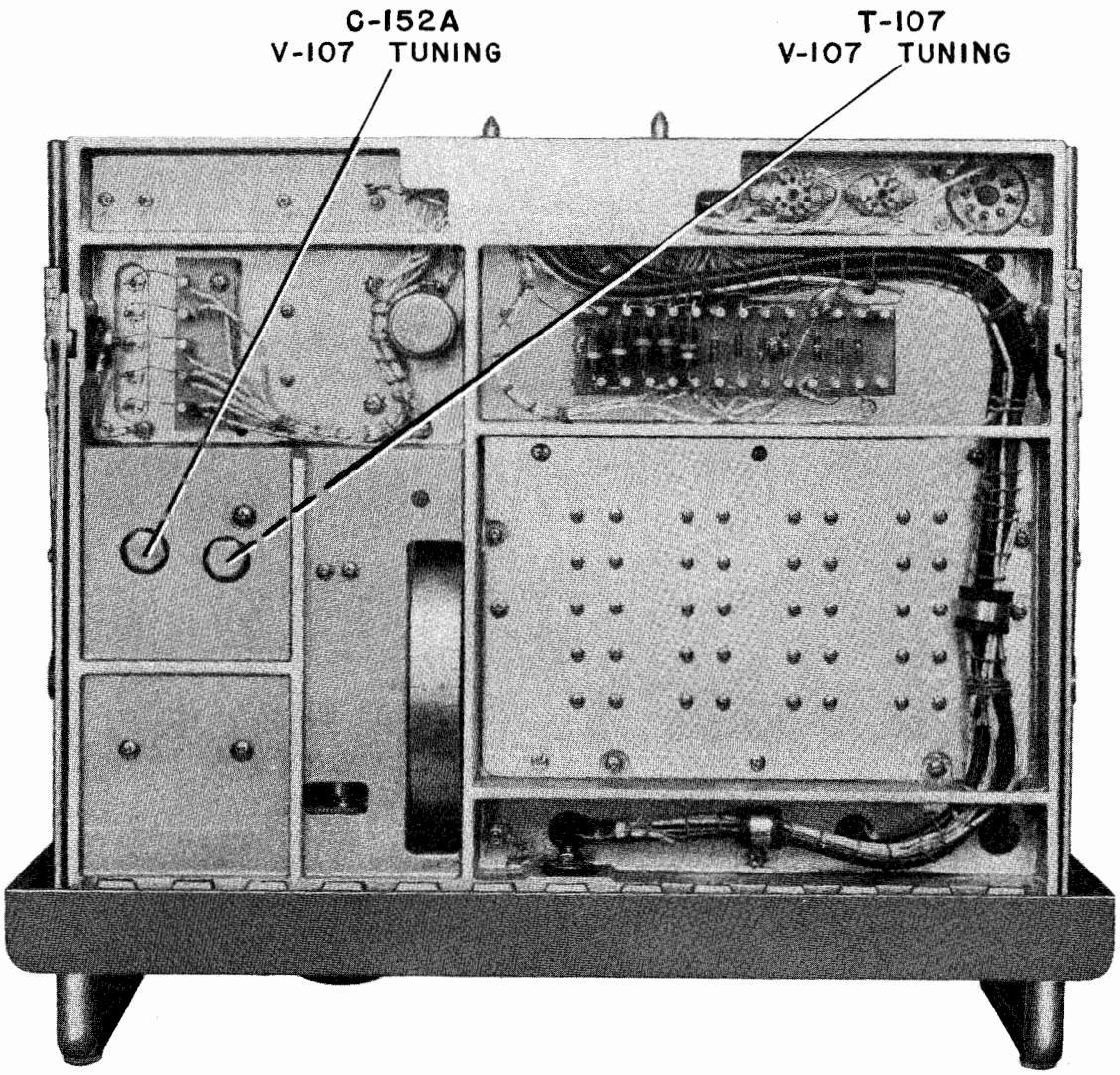


Figure 7–62. Alignment Adjustment Locations Bottom of Chassis, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

FRR-24 out of its cabinet and connect a test cable between the multiconnector P-301 on the chassis and J-301 on the inside of the cabinet. Disconnect the patch cord from 1J7, 2J7 or 3J7 as applicable.

Step 2. Set the Second Conversion Oscillator Selector switch at Crystal.

Step 3. Remove the oscillator compartment cover bottom of chassis and couple the output of the crystal oscillator from terminal 4 of Z-310 (TP-6, see Figure 7–54) to the input of a Navy Model LR or AN type FR-47/U frequency measuring device and check the accuracy of the crystal frequency. Capacitor C-331 is used to change the oscillating frequency of the crystal if adjustment is required.

Step 4. On the Amplifier-Detector unit AM-439/FRR-24 set the Reception switch at Crystal. Use this unit for audible monitoring of the signal. Tune in any CW signal on an Amplifier-Converter unit. Tune the Amplifier-Converter unit for zero beat as heard on the monitor.

Step 5. Set the Second Conversion Oscillator Selector switch at VFO and the Second Conversion VFO control at zero.

Step 6. If zero beat is not obtained adjust capacitor C-339.

Step 7. Remove the test cable, replace the oscillator compartment cover, slide the unit back into its cabinet and reconnect the patch cord.

(c) CRYSTAL OSCILLATOR V-703, AM-439/FRR-24 *(Figure 7–93).*–See Figure 7–58 for alignment adjustment locations.

Step 1. Remove the cable from connector J-705 at the rear of the cabinet. Slide the Amplifier-Detector AM-439/FRR-24 out of its cabinet and connect a

test cable between the multiconnector P-701 on the chassis and J-701 on the inside of the cabinet.

Step 2. Connect Navy Model OBQ or multimeter ME-25/U vacuum tube voltmeter to the injection grid (pin 1) of the heterodyne detector tube V-702 (TP-7, see Figure 7–28). Set the Reception switch S-702 at Crystal.

Step 3. Adjust the iron core tuning adjustment L-702B of Z-704 for maximum reading on the voltmeter. When the maximum voltmeter reading has been obtained detune the iron core tuning adjustment two turns counterclockwise. Remove the voltmeter.

(d) B.F. OSCILLATOR V-704, AM-439/FRR-24 *(Figure 7–93).*

Step 1. Connect signal generator AN/URM-25 tuned to an R.F. frequency of 50 kc. to the input side of C-701 (TP-1, see Figure 7–28) and chassis, in accordance with Method A, Par. 6. a.

Step 2. Set the Reception switch at Crystal and the Speaker switch at On.

Step 3. Set the signal generator modulation at Off. Set the Microvolt control for a 1-volt output. Set the signal generator to zero beat with the crystal oscillator.

Step 4. Set the Reception switch at B.F.O. and the B.F.O. control at zero. Adjust capacitor C-723 located in transformer Z-705 for zero beat.

Step 5. Remove all test equipment from the unit and reconnect the cable to J-705. Slide the chassis back into its cabinet.

(e) CRYSTAL OSCILLATOR A AND B, O-131/FRR-24 *(Figure 7–94).*—See Figures 7–63 and 7–64 for alignment adjustment locations.

Step 1. Slide the Oscillator Assembly O-131/FRR-24 out of its cabinet and connect a test cable between the multiconnector P-801 on the chassis and J-801 on the inside of the cabinet.

Step 2. Set the Oscillator 'A' switch at ON. The adjustments for both oscillators are similar therefore a discussion of one will be sufficient to cover both

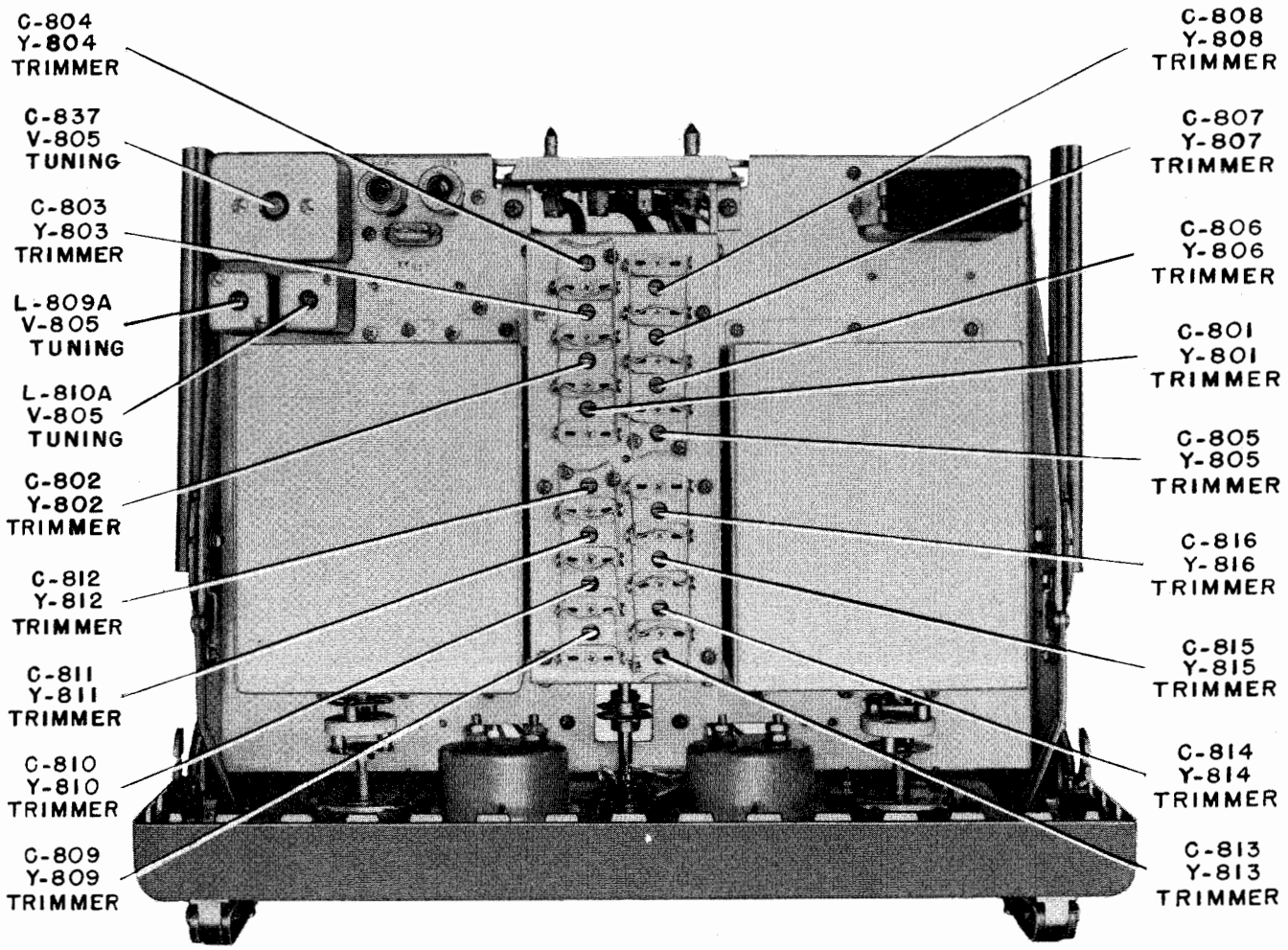


Figure 7–63. Alignment Adjustment Locations Top of Chassis, Oscillator Assembly O-131/FRR-24

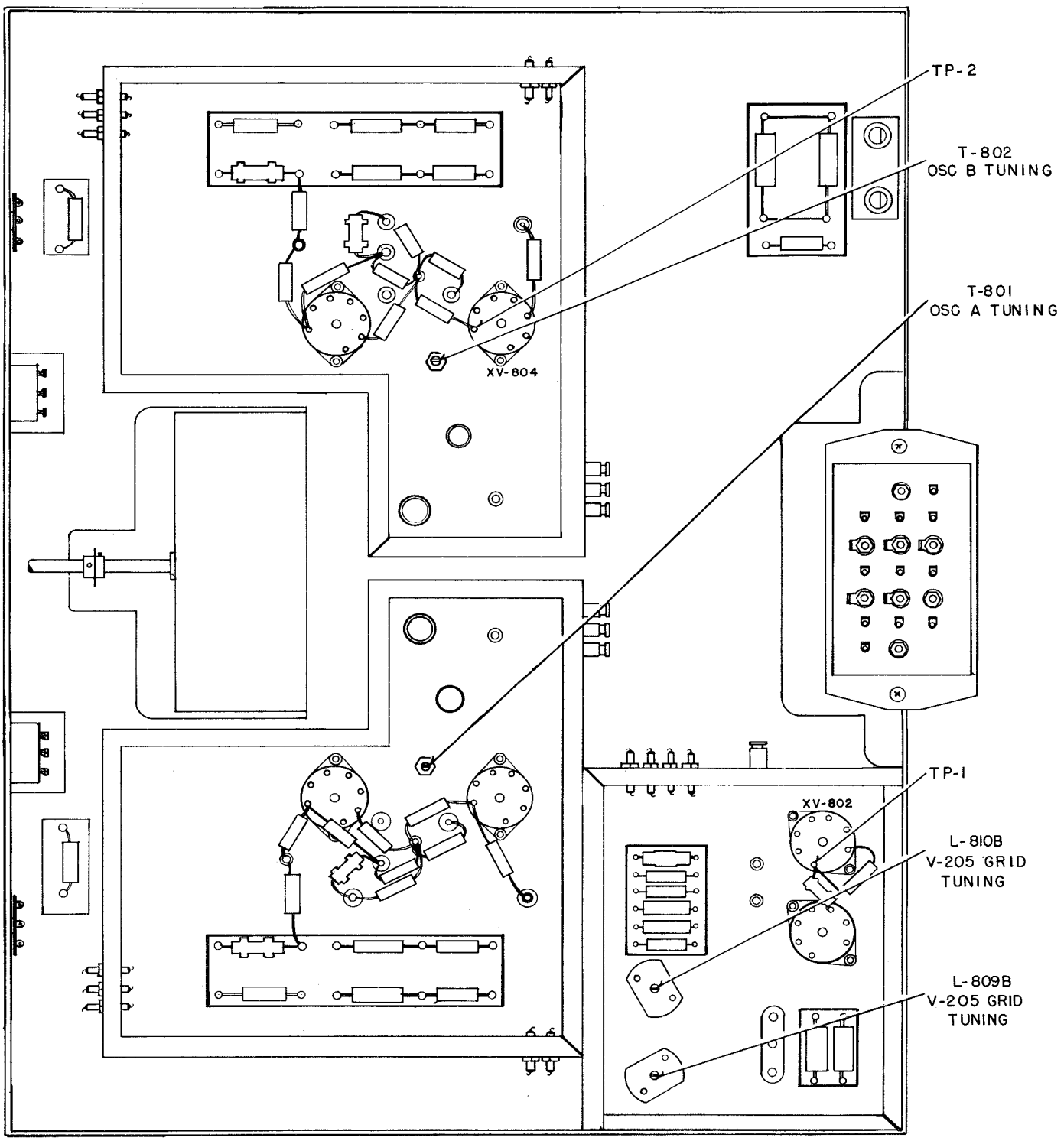


Figure 7–64. Alignment Adjustment and Test Point Locations Bottom of Chassis, Oscillator Assembly O-131/FRR-24

oscillators.

Step 3. Set the Crystal A switch at a position which selects a crystal of approximately 5 megacycles. Set the Tuning 'A' control at a position in which the tuning dial reads the crystal frequency minus 1.75 mc.

NOTE

A single tuning dial is provided with two concentric scales. For the higher frequencies read the outside scale, for low frequencies read the inside scale.

Step 4. Adjust the iron-core tuning adjustment of T-801 for maximum reading on Tuning Meter 'A'.

Capacitors C-801 through C-816 are pre-set at the middle of their capacity range. The above capacitors are provided to permit compensation for crystals slightly off frequency. The following units are necessary to make any adjustment on these trimmer capacitors; Amplifier-Converter, Frequency Converter, R.F. Amplifier, Amplifier-Detector and the Oscillator Assembly. To check any crystal and to make the required frequency correction proceed as follows:

Step 1. Provide a means of operating the Amplifier-Converter by using a remote external oscillator from O-131/FRR-24 which is accomplished by the proper connection of the patch cords.

Step 2. In unit CV-126/FRR-24 set the Second Conversion Osc. Selector switch at Crystal.

Step 3. In unit AM-439/FRR-24 set the Reception switch on Crystal.

Step 4. Insert a crystal in one of the crystal holders in the Oscillator Assembly unit. Set the Oscillator switch in the proper position and set the Tuning control for maximum output at the proper frequency.

Step 5. Tune the associated Amplifier-Converter unit to an 'on the air' signal on the channel frequency for which the crystal has been chosen.

Step 6. For A1, A2 and A3 signals, tune the trimmer capacitor associated with the crystal in use to produce zero beat while listening on the AM-439/FRR-24 unit. For frequency shift reception the crystal trimmer capacitor should be adjusted for correct tuning as indicated by the cathode ray monitor on the associated Frequency Shift Converter CV-127/FRR-24.

(f) 200 KC. OSCILLATOR V-805, O-131/FRR-24 *(Figure 7–94).*

Step 1. Set the Calibrate switch S-805 at On. Adjust the equipment to receive the standard frequency transmission from station WWV. A multiple of of the 200-kc. oscillator should fall directly on WWV. Connect headphones to the Amplifier-Detector AM-439/FRR-24 to provide an audible monitoring means of determining zero-beat.

Step 2. If zero beat is not obtained between the 200-kc. oscillator and WWV, adjust trimmer capacitor C-837 until a zero beat is obtained with WWV.

Step 3. Turn on the BFO in the AM-439/FRR-24 and set at 500 cycles. Adjust C-837 until waxing and waning of beat note is obtained indicating that both the harmonic of 200 kc. and WWV are producing the same audio beat. Reduce the rate of waxing and waning to as near zero as possible with C-837. This is best accomplished during the time when WWV carrier is not modulated.

Step 4. Remove the test cable and slide the unit back into its cabinet.

(g) TONE OSCILLATOR ADJUSTMENT, KY-62/FRR-24 *(Figure 7–97).*—See Figures 7–65 and 7–66 for alignment adjustment locations.

Step 1. Remove the applicable patch cord from 4K47, 4K48 or 4K49 and from 4K13, 4K38 or 4K39. Slide the Keyer KY-62/FRR-24 out of the cabinet and connect a test cable between the multiconnector P-1101 on the chassis and J-1101 on the inside of of the cabinet.

Step 2. Set the Reception switch at Test, set the Threshold control at zero, set the Tone switch at Ext, and set the A.F. Level control R-1116 at approximately 8 and the Monitor Gain control at 5.

1. VARIABLE TONE OPERATING ADJUSTMENTS.

Step 1. Connect the vertical amplifier input of an oscilloscope Navy Model OBL or AN type OS-8/U across resistor R-1155 (TP-1, see Figure 7–67). Connect the AN/URM-38 in parallel with the oscilloscope. Connect audio oscillator TS-382A/U set at 400 cycles to the horizontal amplifier input of the oscilloscope. Connect multimeter ME-6/U to the cathode (pin no. 2) of the tone oscillator V-1107 (TP-2, see Figure 7–67).

Step 2. Set the Tone switch S-1102 at Var. Adjust the A.F. Level control R-1116 for a reading of 10.8 DB (12 milliwatts) on the audio level meter.

NOTE

The following adjustments must be made with a temporary metal bottom on the chassis to simulate the effects of the cabinet.

Step 3. Set capacitors C-1153 and C-1156 at maximum capacity. See Figure 7–67 for capacity settings of these trimmer capacitors. Set the low-frequency compensating potentiometers R-1122 and R-1125 at minimum resistance, the extreme clockwise position.

Step 4. Set the Variable Frequency control dial

at 400 cycles. Adjust the feedback potentiometer R-1134 for a reading of 1.9 volts on the voltmeter.

Step 5. Set the Variable Frequency dial and the external audio oscillator dial at 5000 cycles. Adjust capacitors C-1153 and C-1156 simultaneously until a circular pattern is obtained on the oscilloscope and the voltmeter reads 1.9 volts. At the completion of this adjustment, capacitors C-1153 and C-1156 should be set at approximately equal capacity.

Step 6, Set the Variable Frequency dial and the external audio oscillator at 400 cycles. Adjust the low-frequency compensating potentiometers R-1122 and R-1125 simultaneously until a circular pattern is obtained on the oscilloscope and the voltmeter reads 1.9 volts. R-1122 and R-1125 should be adjusted in such a manner as to have approximately equal settings at the completion of the adjustment.

Step 7. Repeat steps 4, 5 and 6 until a circular pattern on the oscilloscope and a voltmeter reading of 1.9 volts is obtained at both Variable Frequency dial settings.

2. FIXED TONE OPERATING ADJUSTMENTS. —The following alignment chart gives the step-by-step procedure to follow in effecting the fixed tone operating adjustments.

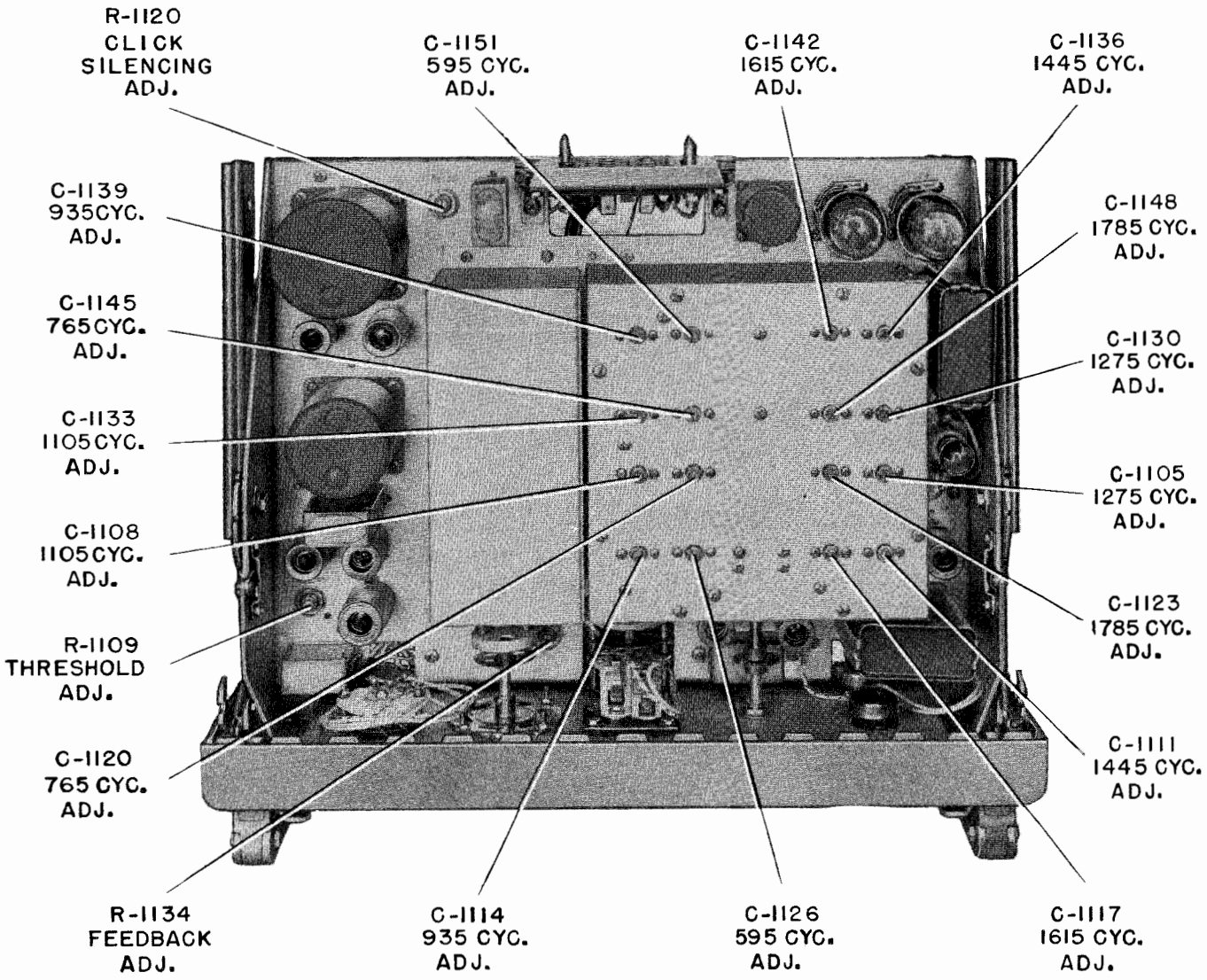


Figure 7–65. Alignment Adjustment Locations Top of Chassis, Keyer KY-62/FRR-24

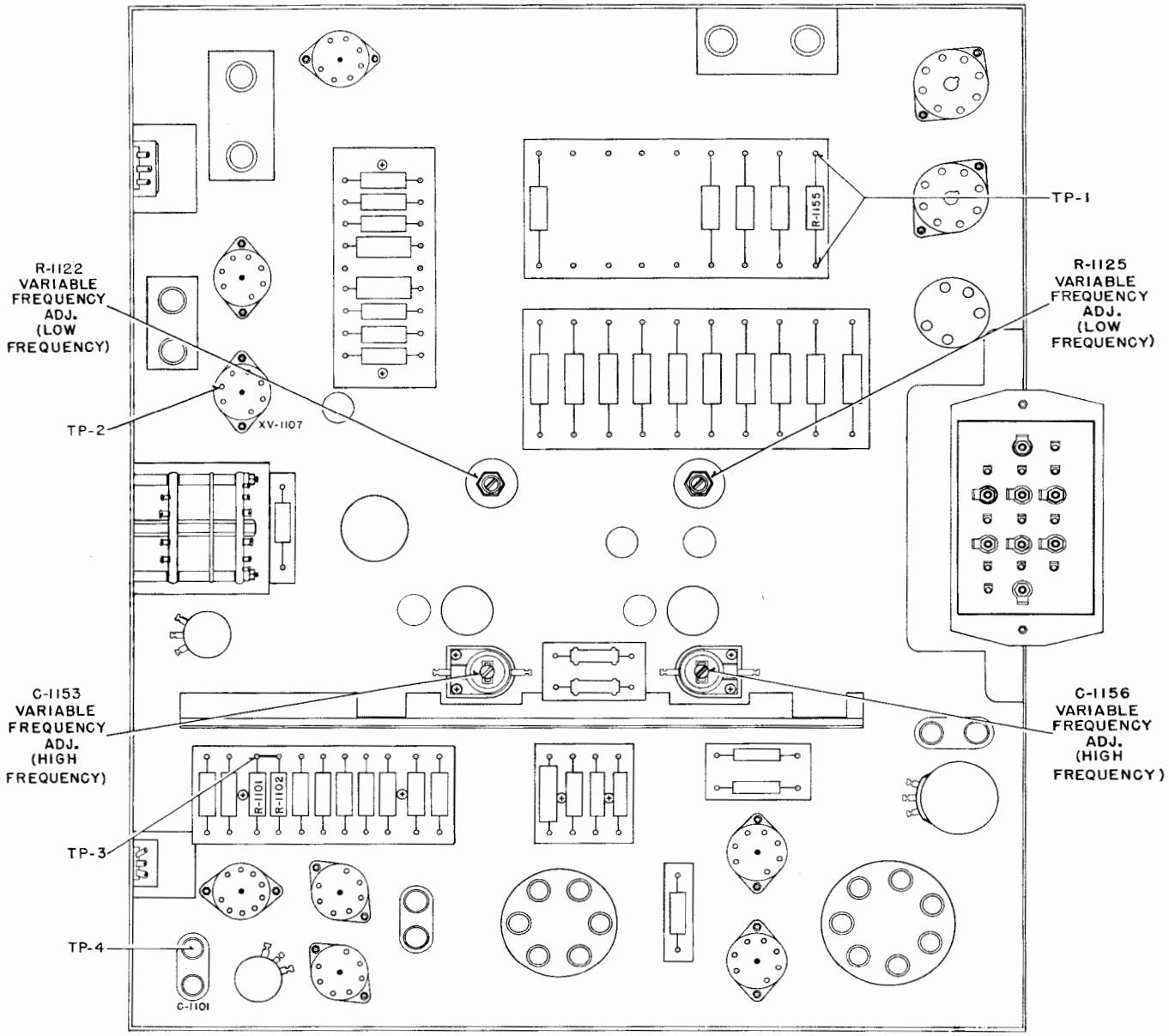


Figure 7–66. Alignment Adjustment and Test Point Locations Bottom of Chassis, Keyer KY-62/FRR-24

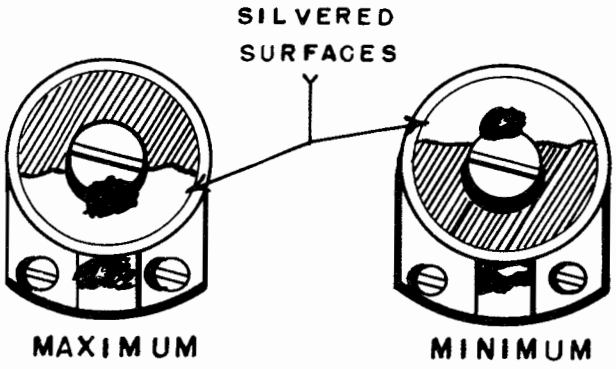


Figure 7–67. Maximum - Minimum Settings of Ceramic Type Trimmer Capacitors

Step	Set Tone Switch at:	Set Fixed Frequency Switch at:	Set External Oscillator at:	Adjust for circular pattern on the oscilloscope and a voltmeter reading of 1.9 volts
1	Fixed	595	595 cycles	C-1126, C-1151
2	Fixed	765	765 cycles	C-1120, C-1145
3	Fixed	935	935 cycles	C-1114, C-1139
4	Fixed	1105	1105 cycles	C-1108, C-1133
5	Fixed	1275	1275 cycles	C-1105, C-1130
6	Fixed	1445	1445 cycles	C-1111, C-1136
7	Fixed	1615	1615 cycles	C-1117, C-1142
8	Fixed	1785	1785 cycles	C-1123, C-1148

3. BIAS ADJUSTMENTS.

Step 1. Remove the voltmeter. Set the Tone switch at Var. Set the Variable Frequency dial at 5000 cycles. Adjust the A.F. Level control R-1116 for an audio level meter reading of 10.8 DB (12 milliwatts).

Step 2. Connect a pair of headphones to the Phones jack. Set the Reception switch at A1 and the Threshold control at zero. Adjust the cathode potentiometer R-1109 until no audio tone is heard in the headphones.

Step 3. Set the Tone switch at External. Adjust the oscilloscope for internal sweep. Remove the audio oscillator from the horizontal input circuit of the oscilloscope and connect it through a 0.01 mf capacitor (SNSN N16-C-33627-7705) to the junction of R-1101 and R-1102 (TP-3, see Figure 7–67). Set the tuning dial of the external audio oscillator at 500 cycles. Adjust the cathode balance potentiometer R-1120 for minimum output as indicated on the oscilloscope screen.

Step 4. Set the Tone switch at Variable. Set the Variable Frequency dial at 5000 cycles. Observe the output on the oscilloscope to assure that a good keying rectangle is obtained.

Step 5. Remove all test equipment from the unit and reconnect all patch cords. Remove the test cable and slide the unit back into its cabinet.

(b) 1700 KC. OSCILLATOR V-1208 ADJUSTMENT, CV-127/FRR-24 *(Figure 7–98).*–See Figure 7–61 for alignment adjustment locations.

Step 1. Slide the Frequency Shift Converter CV-127/FRR-24 out of its cabinet and connect a test cable between the multiconnector P-1201 on the chassis and J-1201 on the inside of the cabinet.

Step 2. Connect a frequency meter Navy Model LR or AN type FR-47/U to terminal 4 of Z-1206 (TP-3, see Figure 7–36). Set the Fine Tuning control at zero, A.G.C. switch at Off and adjust capacitor C-1211 for a frequency meter measurement of 1700 kilocycles.

Step 3. Remove the frequency meter connections. Remove the test cable and slide the unit back into its cabinet.

(7) FREQUENCY SHIFT KEYER ALIGNMENT.

(a) FLIP-FLOP TO TELETYPEWRITER OUTPUT ADJUSTMENT CM-32/FRR-24 *(Figure 7–99).*–See Figure 7–68 for alignment adjustment locations.

Step 1. Slide the Comparator-Keyer CM-32/FRR-24 out of its cabinet and connect a test cable between the multiconnector P-1301 on the chassis and J-1301 on the inside of the cabinet. Remove all cables from connectors J-1304 through J-1309.

Step 2. Connect the negative lead of voltmeter OBQ or ME-25/U (any voltmeter with a 300-volt scale may be used) set at 300 volts to the plates of V-1314 and V-1315 (TP-2, see Figure 7–38) as an output indicator. Connect the positive lead of the meter to a plus 300-volt source (TP-3, see Figure 7–38).

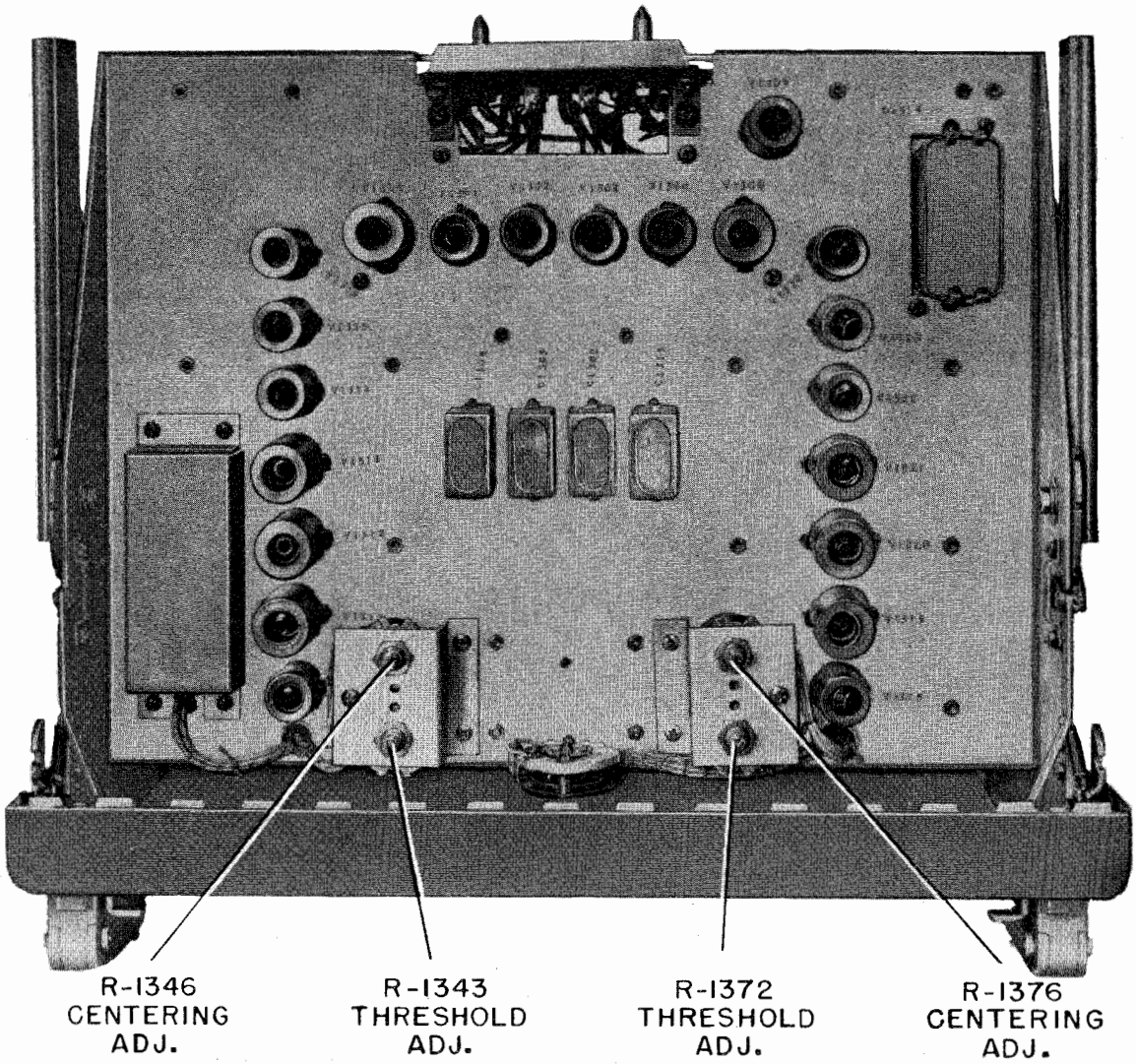


Figure 7–68. Alignment Adjustment Locations Top of Chassis, Comparator Keyer CM-32/FRR-24

Step 3. Connect the ends of a 10,000 ohm potentiometer (SNSN N16-R-91291-4928) across a 4.5-volt battery.

Step 4. Connect the negative end of the battery to chassis. Turn the arm of the potentiometer to the negative end of its range. Connect the arm of the potentiometer to the control grid (pin no. 2) of V-1311 (TP-4, see Figure 7–38).

Step 5. Set the sensitivity potentiometer R-1343 at its full clockwise position.

Step 6. Connect voltmeter OBQ or ME-25/U to the grid (pin no. 7) of V-1311 (TP-10, see Figure 7–38) and adjust the centering potentiometer R-1346 to obtain a reading of 1.75 volts.

Step 7. Connect the voltmeter to the control grid (pin no. 2) of V-1311 (TP-4, see Figure 7–38) and start the external potentiometer at zero voltage and rotate it to increase voltage and note at what voltmeter reading the output tubes are cut off (160 volts (Space condition) on the OBQ or ME-25/U).

Step 8. Decrease voltage slowly on the control grid (pin no. 2) and note the amount of voltage needed to return the circuit to Mark condition, which is when the output meter rises to approximately 300 volts.

Step 9. The difference in voltage reading in Step 7 and 8 is the voltage change necessary to cause the output to shift from mark to space and vice versa. Rotate the sensitivity adjustment R-1343 in small amounts repeating Steps 7 and 8 after each adjustment until a setting is found where the shift from mark to space and vice versa occurs at 2.6 volts and 1.0 volts. The centering adjustment R-1346 may require readjustment in order to accomplish this end result.

Step 10. Remove all test equipment and reconnect all cables disconnected from the unit. Remove the test cable and slide the unit back into its cabinet.

(8) POWER SUPPLY ADJUSTMENTS.

(a) PP-590/FRR-24 *(Figure 7–104).*

1. OVERVOLTAGE TRIP RELAY ADJUSTMENT R-2024.

Step 1. Set the Plate-Standby and Heater Protection switches at Off. Remove all cables at the rear of the cabinet.

Step 2. Loosen the twelve screws holding the cover in place at the rear of the cabinet and remove the cover.

Step 3. Connect a positive 235 volt D.C. supply between the arm of R-2024 (TP-1, see Figure 7–41) and chassis.

Step 4. Set the overvoltage trip relay adjustment R-2024 at its maximum resistance (full clockwise rotation).

Step 5. Readjust the overvoltage trip relay adjustment R-2024 until the contacts of the overvoltage trip relay are heard to close.

Step 6. Remove the positive 235-volt supply and replace the cover. Replace all cables.

2. VOLTAGE TEST ADJUSTMENT V-1.

Step 1. Set the Plate-Standby and Heater Protection switches at On.

Step 2. Insert the positive test probe of a D.C. voltmeter (OBQ or ME-25/U) into the plus 210 socket, TP-2001. Insert the negative test probe into the ground contact.

Step 3. Insert a screwdriver into socket V-1 located directly above the Voltage Test socket. Rotate Voltage control V-1, R-2017, until the voltmeter reads plus 210 volts.

Step 4. Remove the voltmeter connections.

(b) PP-648/FRR-24 *(Figure 7–106).*

1. OVERVOLTAGE TRIP RELAY ADJUSTMENT R-2238.

Step 1. Set the Plate Standby and Heater Protection switches at Off. Remove all cables at the rear of the cabinet.

Step 2. Loosen the twelve screws holding the blister cover in place at the rear of the cabinet and remove the cover.

Step 3. Connect the plus 325-volt D.C. source between the arm of R-2238 (TP-1, see Figure 7–44) and chassis.

Step 4. Set the overvoltage trip relay adjustment R-2238 at its maximum resistance (full clockwise rotation).

Step 5. Readjust the overvoltage trip relay adjustment R-2238 until the contacts of the overvoltage trip relay close.

Step 6. Remove the positive 325-volt supply.

2. OVERVOLTAGE TRIP RELAY ADJUSTMENT R-2239.

Step 1. Connect the negative 325-volt D.C. source between the arm of R-2239 (TP-2, see Figure 7–44) and chassis.

Step 2. Set the overvoltage trip relay adjustment R-2239 at its maximum resistance (full clockwise rotation) and then readjust it until the contacts of the overvoltage trip relay close.

Step 3. Remove the negative 325-volt supply and replace the cover. Replace all cables.

3. VOLTAGE TEST ADJUSTMENTS, V-1 AND V-2.

Step 1. Set the Plate-Standby and Heater Protection switches at On.

Step 2. Insert the positive test probe of the voltmeter (OBQ or ME-25/U) into the plus 300 socket, TP-2201. Insert the negative test probe into the ground contact.

Step 3. Insert a screwdriver into socket V-1 located directly above the plus 300 socket. Rotate Voltage Control V-1, R-2227, until the voltmeter reads plus 300 volts.

Step 4. Remove the positive test probe of the voltmeter from the plus 300 socket. Set the selector switch on the voltmeter at negative and insert the positive test probe of the voltmeter into the negative 300 socket TP-2202.

Step 5. Insert a screwdriver into socket V-2 located directly above the minus 300 socket. Rotate Voltage Control, R-2221, until the voltmeter reads minus 300 volts.

Step 6. Remove the voltmeter connections.

(c) PP-649/FRR-24 *(Figure 7–105).*

1. OVERVOLTAGE TRIP RELAY ADJUSTMENT R-2139.

Step 1. Set the Plate-Standby and Heater Protection switches at Off. Remove all cables at the rear of the cabinet.

Step 2. Loosen the twelve screws holding the cover in place at the rear of the cabinet and remove the cover.

Step 3. Connect the plus 325-volt D.C. source between the arm of R-2139 (TP-1, see Figure 7–47) and chassis.

Step 4. Set the overvoltage trip relay adjustment R-2139 at its maximum resistance (full clockwise rotation).

Step 5. Readjust the overvoltage trip relay adjustment R-2139 until the contacts of the overvoltage trip relay close.

Step 6. Remove the positive 325-volt supply.

2. OVERVOLTAGE TRIP RELAY ADJUSTMENT R-2140.

Step 1. Connect the positive 235-volt D.C. source between the arm of R-2140 (TP-2, see Figure 7–47) and chassis.

Step 2. Set the overvoltage trip relay adjust-

ment R-2140 at its maximum resistance (full clockwise rotation) and then readjust until the contacts of the overvoltage trip relay close.

Step 3. Remove the positive 235-volt supply and replace the cover. Replace all cables.

3. VOLTAGE TEST ADJUSTMENT, V-1 AND V-2.

Step 1. Set the Plate-Standby and Heater Protection switches at On.

Step 2. Insert the positive test probe of the voltmeter (OBQ or ME-25/U) into the plus 300 socket TP-2101. Insert the negative test probe into the ground contact.

Step 3. Insert the screwdriver into socket V-1 located directly above the plus 300 socket. Rotate V-1 control R-2120, until the voltmeter reads plus 300 volts.

Step 4. Remove the positive test probe of the voltmeter from the plus 300 socket and insert it into the plus 210 socket TP-2102.

Step 5. Insert a screwdriver into socket V-2 located directly above the plus 210 socket. Rotate Voltage control V-2, R-2128 until the voltmeter reads plus 210 volts.

Step 6. Remove the voltmeter connections.

(9) OPTICAL SYSTEM ADJUSTMENTS.—Instruc-

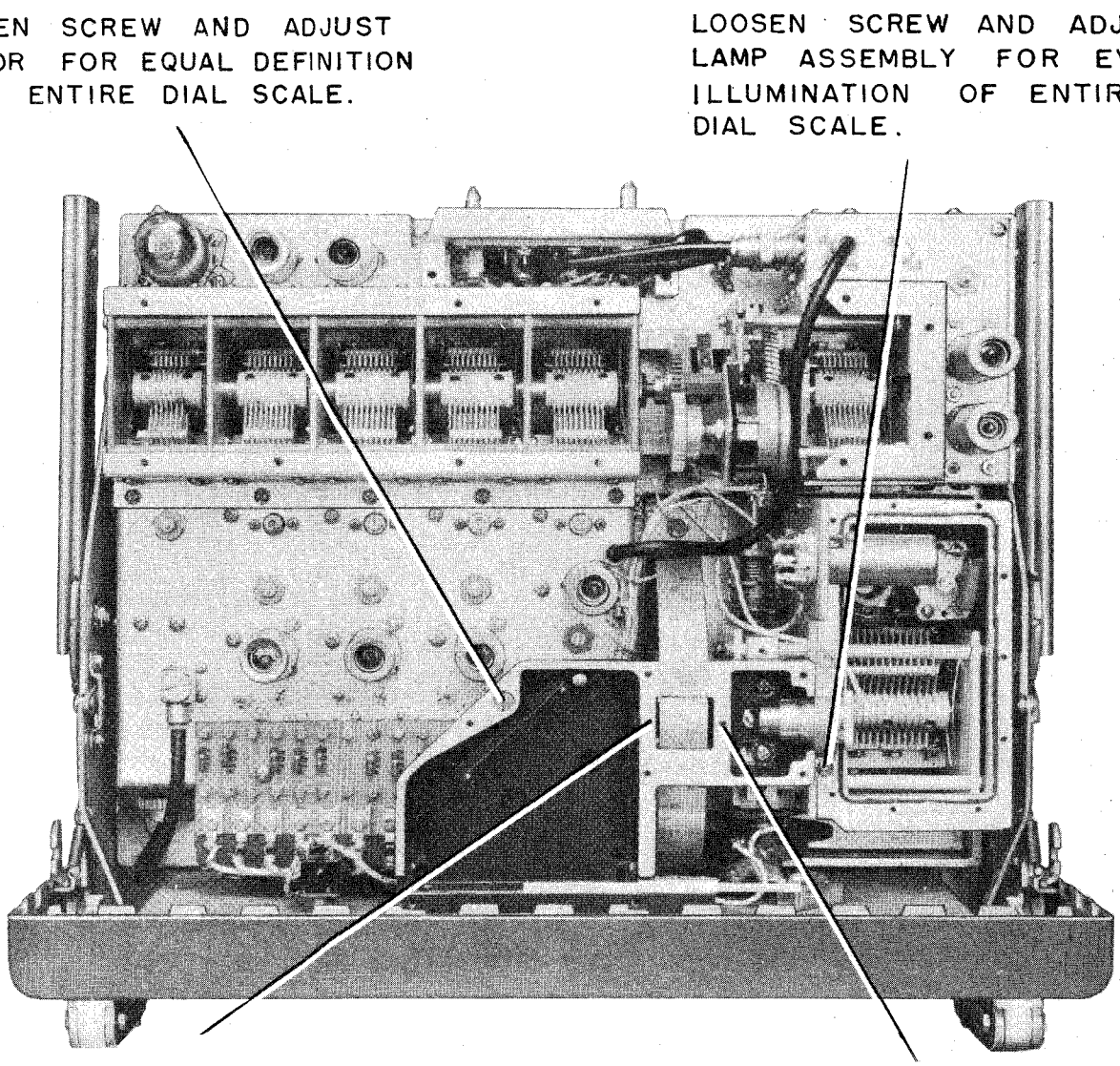


Figure 7–69. Instructions for Adjustment of Optical System, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

tions for the adjustment of the optical system are outlined on Figure 7–69.

b. MECHANICAL ADJUSTMENTS.–All tools required for the mechanical adjustments described herein are contained within the tool box located in bay 1. These tools consist of;

1. No. 4 Bristo wrench, Standard Navy Stock No. N41-W-2459-15.
2. No. 6 Bristo wrench, Standard Navy Stock No. N41-W-2460-3.
3. No. 8. Bristo wrench, Standard Navy Stock No. N41-W-2460-10.
4. No. 8 Allen wrench, Standard Navy Stock No. N41-W-2446.
5. 1/4 inch Allen wrench, Standard Navy Stock No. N41-W-2450-10.
6. Spanner wrench for No. 20 AN type cable connector, Standard Navy Stock No. N41-W-3250-760.
7. Spanner wrench for No. 14 and No. 16 AN type cable connectors, Standard Navy Stock No. N41-W-3250-780.
8. Spanner wrench for No. 14 and No. 16 AN type cable connectors.
9. Spanner wrench for No. 20 AN type cable connectors.
10. Adjustable wrench, single end 1/2 inch maximum capacity, Standard Navy Stock No. N41-W-484-10.
11. Adjustable wrench, single end 3/4 inch maximum capacity, Standard Navy Stock No. N41-W-485-6.
12. Adjustable wrench, single end 15/16 inch maximum capacity, Standard Navy Stock No. N41-W-486-6.
13. Double open-end hex wrench, 1/4 inch and 5/16 inch openings, Standard Navy Stock No. N41-W-1060-950.
14. Double open-end hex wrench, 3/8 inch and 7/16 inch openings, Standard Navy Stock No. N41-W-1063-20.
15. Double open-end hex wrench 1/2 inch and 9/16 inch openings, Standard Navy Stock No. N41-W-1064-987.
16. Double open-end hex wrench 5/8 inch and 11/16 inch openings, Standard Navy Stock No. N41-W-66750--50.
17. Double open-end hex wrench 3/4 inch and 13/16 inch openings, Standard Navy Stock No. N41-W-66750-80.
18. Socket wrench 1/4 inch hex opening, Standard Navy Stock No. N41-W-2877-110.
19. Socket wrench 5/16 inch hex opening, Standard Navy Stock No. N41-W-2877-127.
20. Socket wrench 3/8 inch hex opening, Standard Navy Stock No. N41-W-2877-148.
21. Socket wrench 7/16 inch hex opening, Standard Navy Stock No. N41-W-2877-170.
22. Socket wrench 1/2 inch hex opening, Standard Navy Stock No. N41-W-2877-115.
23. Socket wrench 9/16 inch hex opening, Standard Navy Stock No. N41-W-2877-180.
24. Socket wrench 5/8 inch hex opening, Standard Navy Stock No. N41-W-2877-190.
25. Socket wrench 11/16 inch hex opening, Standard Navy Stock No. N41-W-2877-210.
26. Socket wrench 3/4 inch hex opening, Standard Navy Stock No. N41-W-2877-240.
27. Socket wrench 13/16 inch hex opening, Standard Navy Stock No. N41-W-2877-280.
28. Phillips head screwdriver for Phillips head type screws nos. 2, 3 and 4, Standard Navy Stock No. N41-S-1636-10.
29. Phillips head screwdriver for Phillips head type screws nos. 5, 6, 8 and 10, Standard Navy Stock No. N41-S-1638-10.
30. Screwdriver for slot head type screws, 3 inch blade, Standard Navy Stock No. N41-S-1101-43.
31. Screwdriver for slot head type screws, 8 inch blade, Standard Navy Stock No. G41-S-1106.
32. Needle nose pliers, Standard Navy Stock No. N41-P-1864.
33. Thin nose, slip joint pliers.
34. Diagonal cutting pliers.
35. Alignment tool 5 5/8 inches long, Standard Navy Stock No. N17-T-751670-851.
36. Alignment tool 1 7/8 inches long, Standard Navy Stock No. N16-T-751611-301.

(1) CONTROL KNOBS, DIAL KNOB AND COUPLINGS.–All control knobs are fastened to their respective shafts by 8–32 Bristo set screws. To remove the knobs, insert a no. 8 Bristo wrench into the ends of the screws, rotate a few turns counterclockwise until the knob turns freely on the shaft. It can then be lifted off the shaft. The procedure for removing the main tuning dial knob is the same. All shaft couplings are secured by means of 6-32 Bristo set screws.

(2) REMOVAL OF THE CHASSIS FROM THE CABINET.–See Figure 7–2 for chassis removal instructions.

(3) REMOVAL OF CABINET FROM RACK.–To remove the individual cabinets from the racks, remove all cable connections from the cabinet, loosen and remove the four 12-24 screws holding the cabinet in place. Slide the cabinet forward through the front of the rack. The power supply cabinets are held in place by eight 12-24 screws.

(4) REMOVAL OF BLOWER UNIT.–To remove the blower unit from the rack proceed as follows:

Step 1. Remove all cable connections from the power supply.

Step 2. Loosen and remove the eight 12-24 screws holding the power supply cabinet in place. Remove

the power supply from the rack.

Step 3. Loosen the two 1/4 inch nuts securing the blower unit to the shock mounts on the sides of the cabinet. Remove the two 6-32 screws securing the shock mount to the front of the cabinet. Lift the blower unit upward and out of the cabinet.

(5) REMOVAL OF BLOWER UNIT MOTOR.

Step 1. Remove the blower unit from the rack as described above (4).

Step 2. Unsolder the four motor leads at the terminal board.

Step 3. Loosen and remove the four 6–32 screws securing the motor to the blower unit.

Step 4. Loosen and remove the four 8–32 screws from the blower motor mounting plate.

(6) REMOVAL OF BLOWER UNIT AIR FILTER.–To remove the air filter, loosen the two captive fasteners on the retaining cover. Remove the retaining cover and lift the air filter out of the rack.

(7) REMOVAL OF SILICA GEL DRIERS.–When the two silica gel driers mounted on top of the oscillator compartment in the Amplifier-Converter units become saturated, as indicated by a change in color of from blue to brown, it will be necessary to replace them. To replace a drier turn the drier assembly in a counterclockwise direction until it is loose enough to remove. Lift the drier upward and away from the chassis. Do not destroy the saturated drier as its drying properties can be restored by heating or baking.

(8) REMOVAL OF OSCILLATOR COMPARTMENT, AMPLIFIER-CONVERTER.–To remove the oscillator assembly follow the instructions outlined on Figure 7–70. The replacement of the assembly can be accomplished by adhering to the instructions shown on Figure 7–70 in reverse.

Electrical alignment of the R.F. unit is required after replacement of the Oscillator Assembly. Refer to paragraph 6. a. (4) of this section for realignment instructions.

(9) METHOD OF REMOVING BUFFER COMPARTMENT.–To remove the buffer compartment follow the instructions outlined on Figure 7–71.

(10) INSTRUCTIONS FOR REMOVING SIX-SECTION MAIN TUNING CAPACITOR C-103A, C-103B, C-103C, C-103D, C-103E, C-103G.–To remove the six section variable capacitor assembly it is first necessary to remove the buffer compartment as outlined in the preceding paragraph (9). After the buffer compartment has been removed follow the instructions outlined on Figures 7–72 and 7–73.

(11) INSTRUCTIONS FOR REASSEMBLY OF SIX-SECTION MAIN TUNING CAPACITOR.–The replacement of the capacitor assembly can be accomplished by adhering to the instructions outlined on Figure 7–74. It is extremely important to gang the R.F. section with the oscillator section by setting the rotors flush with the stators at maximum capacity. After the rotors are properly aligned, care must be taken when tightening the set screws on the coupling not to disturb the settings of the rotors. Incorrect alignment of the rotors will prevent proper receiver tracking and thus impair the sensitivity of the receiver.

Electrical adjustment of the oscillator and R.F. amplifier is required after replacement of the capacitor assembly. Refer to paragraph 6. a. (4) of this section for realignment instructions.

(12) METHOD OF REMOVING OPTICAL SYSTEM.–Instructions for the removal of the Optical system are shown on Figure 7–75.

(13) SLIDE MECHANISM ADJUSTMENTS.–If the chassis of any particular unit is changed it may be necessary to readjust the slider mechanism of the new chassis to fit the cabinet. To adjust the slide release mechanism of the new chassis follow the procedure outlined on Figure 7–76.

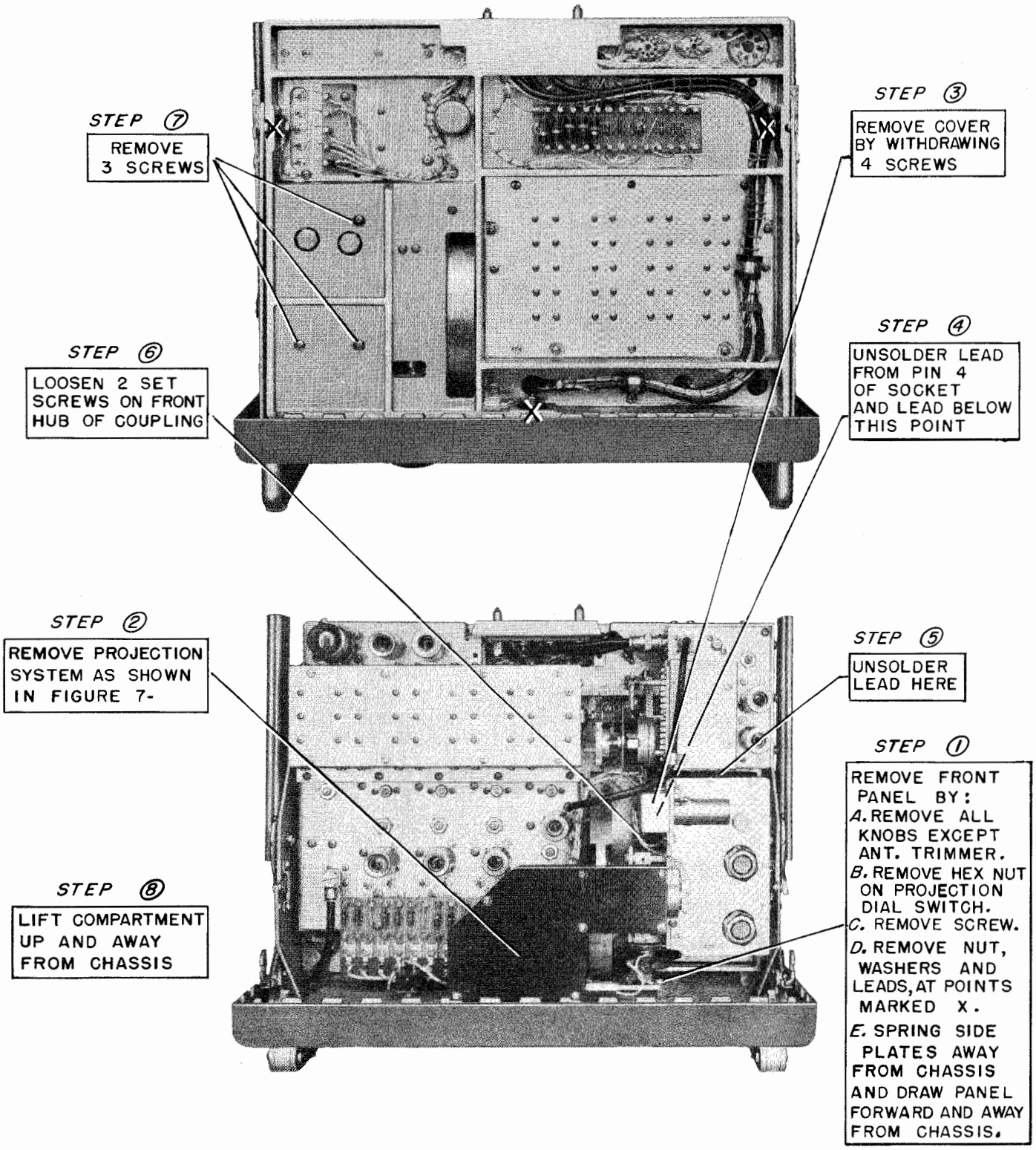


Figure 7–70. Instructions for the Removal of the Oscillator Compartment, Amplifier-Converter AM-450, AM-451 AM-452, AM-453/FRR-24

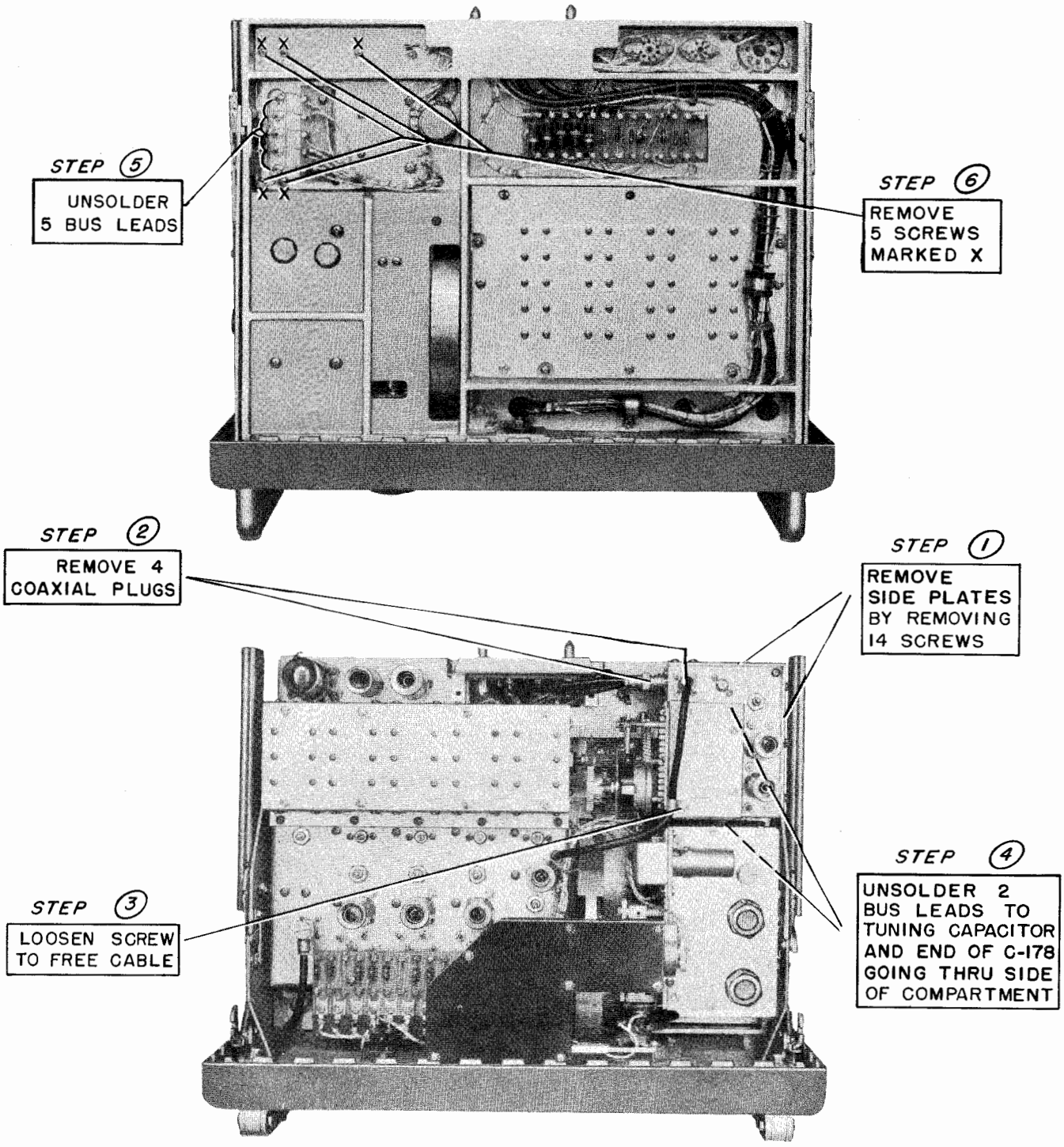
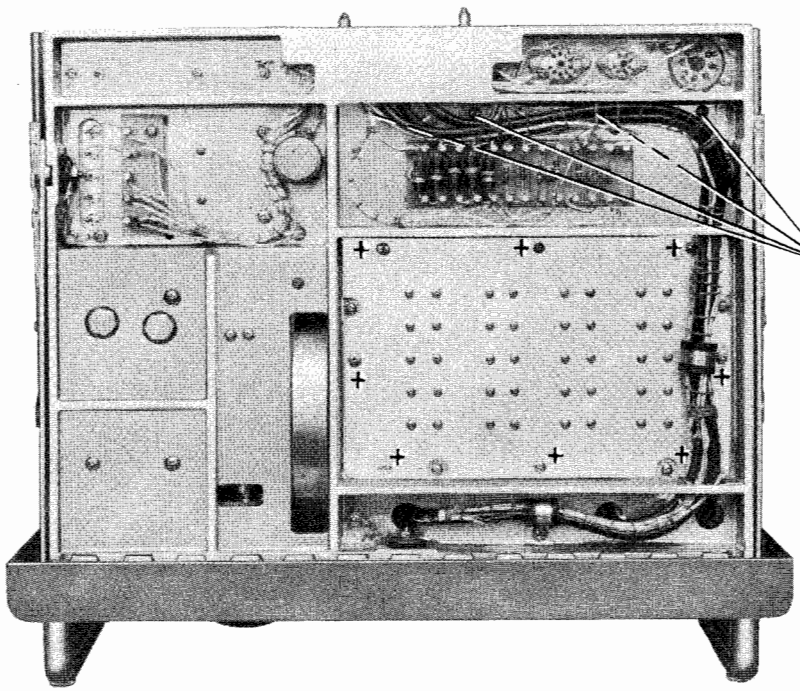


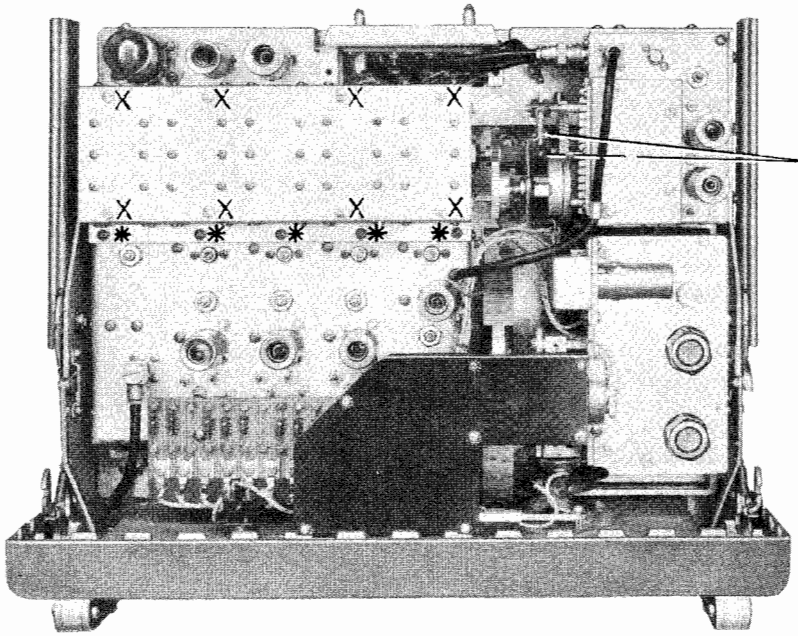
Figure 7–71. Instructions for the Removal of the Buffer Compartment, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24



STEP (4)
TO FREE OTHER SIDE PLATE REMOVE 4 SCREWS

STEP (5)
REMOVE BOTTOM COVER PLATE BY REMOVING 8 SCREWS MARKED +

STEP (2)
REMOVE TOP COVER BY DISENGAGING 8 CAPTIVE SCREWS MARKED X



STEP (1)
REMOVE POTENTIOMETER ASSEMBLY BY REMOVING 2 SCREWS

STEP (3)
REMOVE SIDE PLATE BY REMOVING 5 SCREWS MARKED *

Figure 7–72. Part A of Instructions for the Removal of the Six-Section Main Tuning Capacitor C-103A, B, C, D, E and G, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

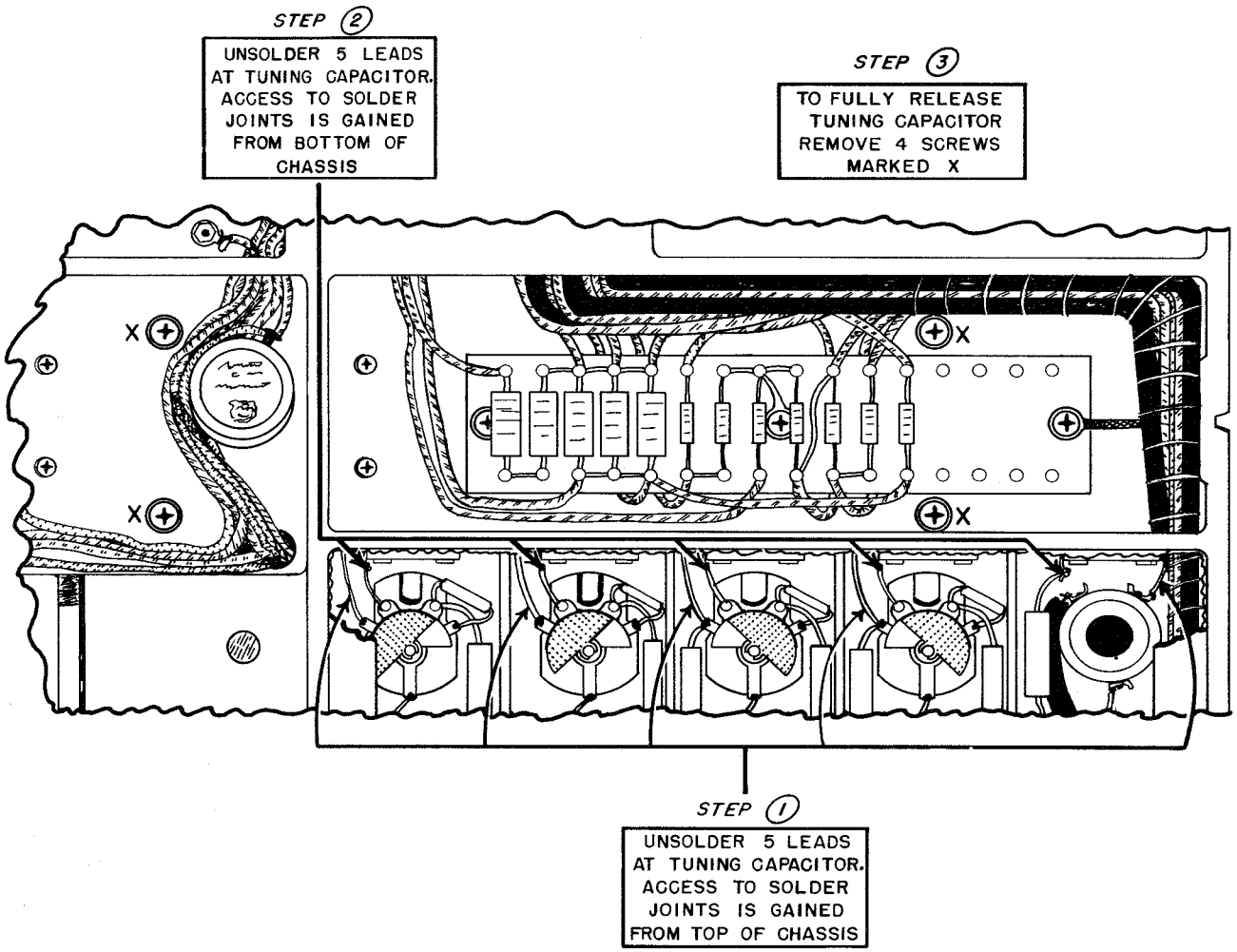


Figure 7–73. Part B of Instructions for the Removal of the Six-Section Main Tuning Capacitor C-103A, B, C, D, E and G, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

STEP (7)

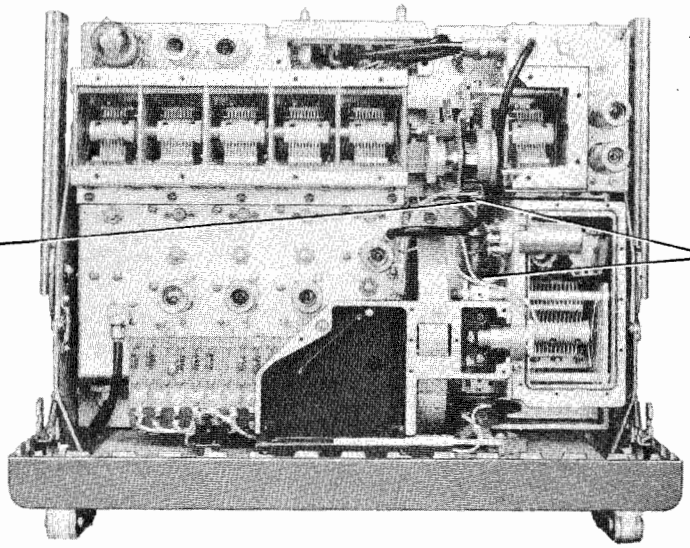
LOOSE SPLIT COLLAR ON DRUM DIAL AND SET AT ZERO, TIGHTEN SCREW

STEP (5)

SET POTENTIOMETER AT ITS MAXIMUM CLOCKWISE POSITION OF ROTATION (FACING THE GEARS) AND MOUNT IN POSITION

STEP (1)

REASSEMBLE FOLLOWING THE PROCEDURE IN REVERSE ON FIGURES 7-71, 7-72, 7-73 EXCEPT THAT THE POTENTIOMETER IS LEFT OFF



STEP (4)

GANG R.F. SECTION WITH OSCILLATOR BY SETTING ROTORS FLUSH WITH STATORS AND TIGHTENING SET SCREWS ON FRONT HUB

STEP (2)

MAKE SURE THESE SET SCREWS ARE LOOSE AND (FRONT HUB COUPLING OF TWO COUPLINGS) THAT STOP ON CAM ASSEMBLY DROPS INTO CHASSIS MOUNTED U SHAPED BRACKET

STEP (8)

AS A CHECK, LIGHT THE PROJECTION LAMP AND SET THE LOGGING SCALE AT 50. THE PROJECTION DIAL SCALE SHOULD READ THE NOMINAL LOW END FREQUENCY OF THE BAND.
WITH THE LOGGING DIAL AT ZERO, THE PROJECTION DIAL SCALE SHOULD BE AT THE LAST MARKER ON THE DIAL

STEP (6)

LOOSEN SET SCREWS ON LOGGING SCALE AND SET AT ZERO, TIGHTEN SCREWS

STEP (3)

ROTATE OSCILLATOR SECTION OF TUNING CAPACITOR VERY CAREFULLY SO THAT ROTOR BAR JUST TOUCHES STATOR PLATES. THEN BACK OFF ABOUT 2 DIVISIONS ON LOGGING SCALE AND TIGHTEN SET SCREWS ON STOP MECHANISM

Figure 7–74. Instructions for the Replacement of the Six-Section Main Tuning Capacitor C-103A, B, C, D, E and G, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

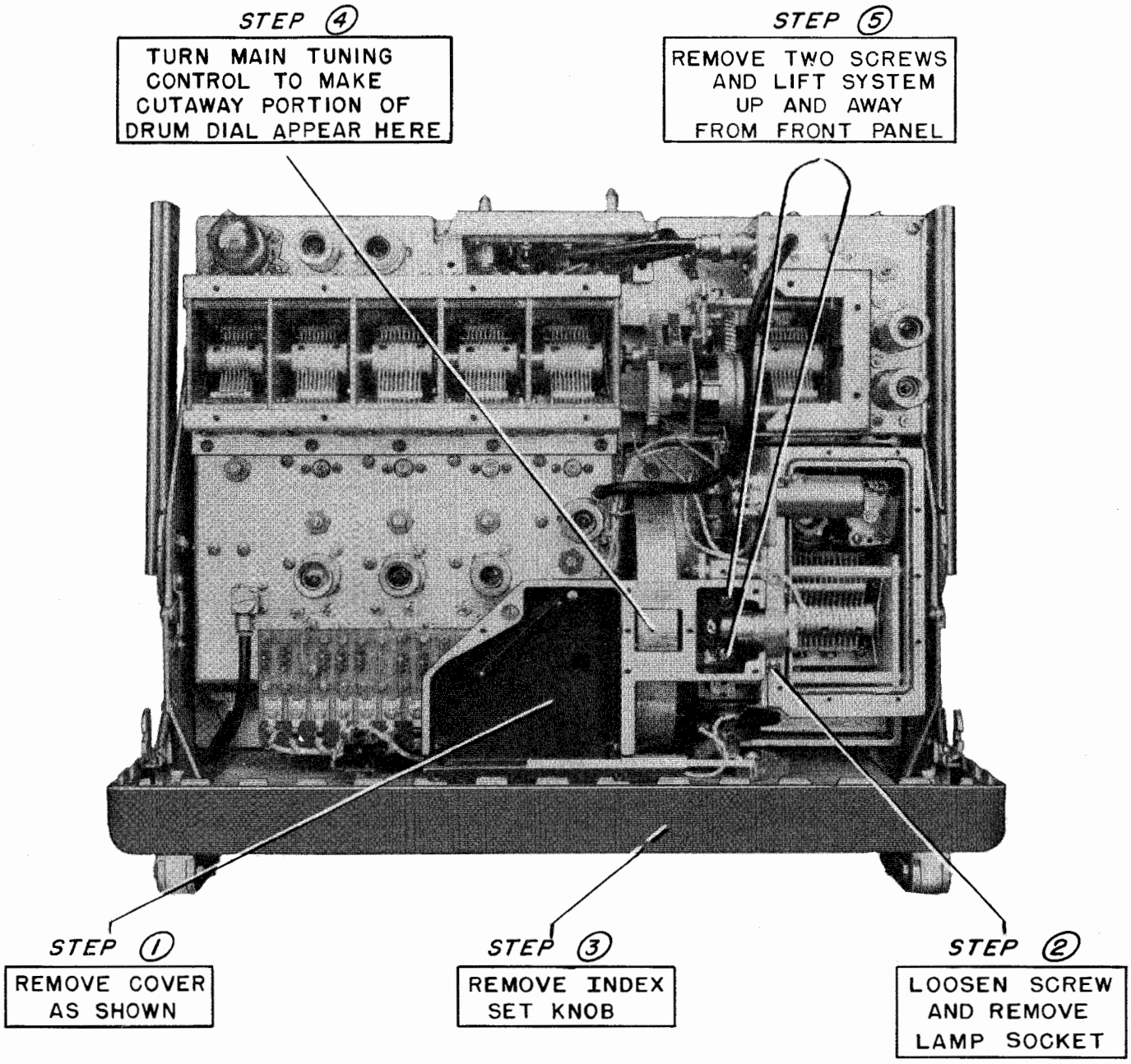
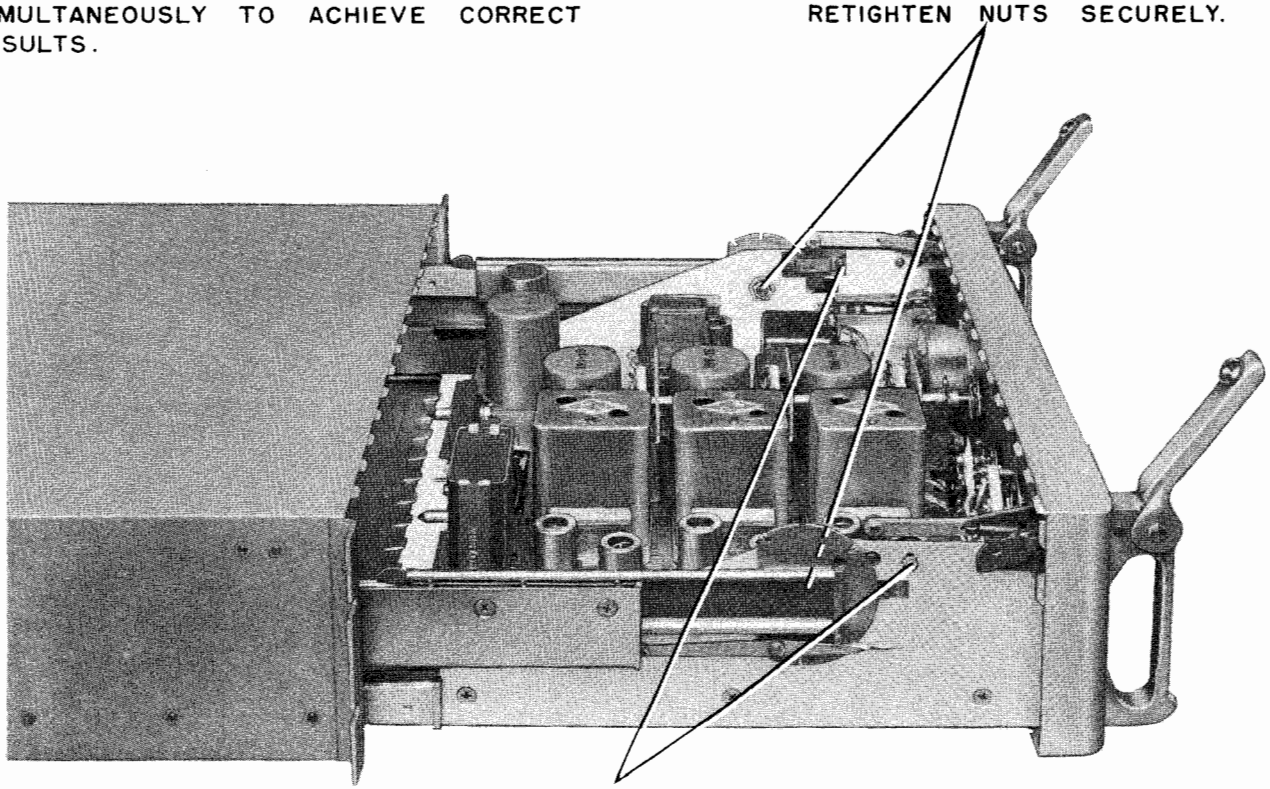


Figure 7–75. Instructions for the Removal of the Optical System, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

NOTE: ALTHOUGH THE TWO ADJUSTMENTS SHOWN HEREIN ARE PRIMARILY DESIGNED FOR THE FUNCTIONS STATED, THERE IS OVERLAP AND BOTH MAY BE ADJUSTED SIMULTANEOUSLY TO ACHIEVE CORRECT RESULTS.

LOOSEN NUTS AND ADJUST CHASSIS TO MAKE MATING EDGES OF FRONT PANEL ENGAGE SYMMETRICALLY WITH ALL FOUR SIDES OF CABINET. RETIGHTEN NUTS SECURELY.



LOOSEN NUTS AND ADJUST CHASSIS SO THAT SLIDES AND/OR MULTICONNECTOR ENGAGES PROPERLY WITH MATING ELEMENTS IN CABINET. RETIGHTEN NUTS SECURELY.

Figure 7–76. Instructions for the Adjustment of the Slide Mechanism, All Units of the AN/FRR-24

TABLE 7-27. RATED TUBE CHARACTERISTICS

TUBE TYPE	FILAMENT VOLTAGE (V)	FILAMENT CURRENT (A)	PLATE VOLTAGE (V)	GRID BIAS (V)	SCREEN VOLTAGE (V)	PLATE CURRENT (MA)	SCREEN CURRENT (MA)	A.C. PLATE RESISTANCE (OHMS)	VOLTAGE AMPLIFICATION FACTOR (MU)	TRANSCONDUCTANCE (MICROMHOS)		EMISSION	
										NORMAL	MINIMUM	IS (MA)	TEST VOLT.
6BA6	6.3	0.3	250	--	100	11	4.2	1,500,000	--	4400	3600	60	20
9003	6.3	0.15	250	-3	100	6.7	2.7	700,000	--	1800	1100	20	15
6BE6	6.3	0.3	250	-1.5	100	3.0	7.5	--------	--	470**	280**	50	15
12AX7	6.3	0.3	250	-2	--	1.2	--	62,500	100	1600	1250	55	30
OB2	--	--	108	--	--	5-30	--	--------	--	--	--	--	--
6AN5	6.3	0.5	120	-6	120	35	12	12,500	--	8000	5600	100	15
6C4	6.3	0.15	250	-8.5	--	10.5	--	7,700	17	2200	1750	30	15
6AU6	6.3	0.3	250	-1	150	10.8	4.3	2,000,000	--	5200	4150	60	20
6AG5	6.3	0.3	250	-8	150	7	2	800,000	--	5000	4000	25	10
6AK6	6.3	0.15	180	-9	180	15	2.5	200,000	--	2300	1840	45	30
OA2	--	--	150	--	--	5-30	--	--------	--	--	--	--	--
6AL5	6.3	0.3	165*	--	--	12.5*	--	--------	--	--	--	40	10
6AK5	6.3	0.175	200	-2	155	7.5	2.5	690,000	--	5000	3500	--	--
6AH6	6.3	0.45	300	--	150	10	2.5	500,000	--	9000	6000	40	10
6J6	6.3	0.45	300	-40	--	15	--	-------	--	5300	4000	40	10

*per plate.
**conversion transconductance.

TABLE 7-27. RATED TUBE CHARACTERISTICS (CONT'D)

TUBE TYPE	FILAMENT VOLTAGE (V)	FILAMENT CURRENT (A)	PLATE VOLTAGE (V)	GRID BIAS (V)	SCREEN VOLTAGE (V)	PLATE CURRENT (MA)	SCREEN CURRENT (MA)	A.C. PLATE RESISTANCE (OHMS)	VOLTAGE AMPLIFICATION FACTOR (MU)	TRANSCONDUCTANCE (MICROMHOS)		EMISSION	
										NORMAL	MINIMUM	IS (MA)	TEST VOLT.
6AQ5	6.3	0.45	250	-12.5	250	45	6	52,000	--	4100	3000	100	30
OC3/ VR105	--	--	105	--	--	5-40	--	-------	--	--	--	--	--
2D21	6.3	0.6	650#	0	0	500#	0	-------	--	--	--	--	--
2BP1	6.3	0.6	1000	0-76	150-280	--	--	-------	--	--	--	--	--
12AU7	6.3	0.15	250	-8.5	--	10.5	--	-------	17	2200***	1750***	70	30
12AT7	6.3	0.3	250	-2	--	10	--	10,000	55	5500	4500	50	10
5R4GY	5.0	2.0	900*	--	--	650*	--	-------	--	--	--	--	--
6AS7G	6.3	2.5	250*	--	--	125*	--	280	1.6	7000	5800	75	10

#peak.
*per plate.
***per triode.

TABLE 7-28. WINDING DATA CHART

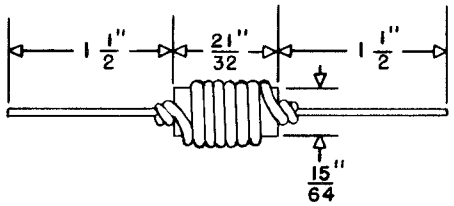
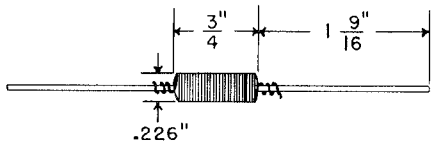
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-107	SA:8940		single layer	22E	7				Inductance:0.13 microhenries, wound on 100 ohm 1/2 watt resistor (R-133). Immerse in thinned out bakelite resin varnish, bake at 200°F for 1/2 hour, immerse in full strength bakelite resin varnish for 15 minutes then air dry. Redip and allow to dry hard.
L-109 L-111 L-112 L-114 L-318 L-319 L-427 L-428 L-429 L-604 L-605 L-606 L-705 L-706 L-707 L-816 L-817 L-902 L-903	SA:5109		single layer	26E	33	0.080			Inductance: 1.5 microhenries. Immerse in thinned out bakelite resin varnish until completely saturated. Bake at 200°F for 1/2 hour. Immerse in full strength bakelite resin varnish for 15 minutes then air dry. Redip and allow to dry hard.

TABLE 7-28. WINDING DATA CHART (CONT'D)

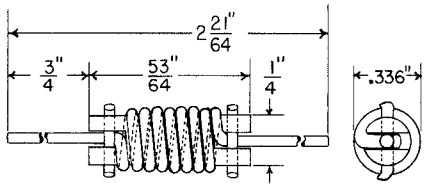
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-904 L-1004 L-1005 L-1006 L-1101 L-1102 L-1103 L-1209 L-1210 L-1211 L-1301 L-1302 L-1305	SA:5109 (cont'd)								
L-110 L-113 L-115 L-1212 L-1213 L-1214 L-1303 L-1304	SA:8131		single	16E	8				Inductance: .25 microhenries. Immerse in thinned out bakelite resin varnish until completely saturated. Bake at 200°F for 1/2 hour. Immerse in full strength bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.

TABLE 7–28. WINDING DATA CHART (CONT'D)

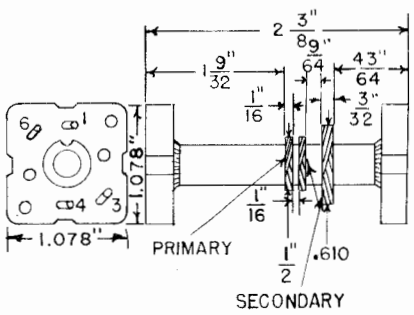
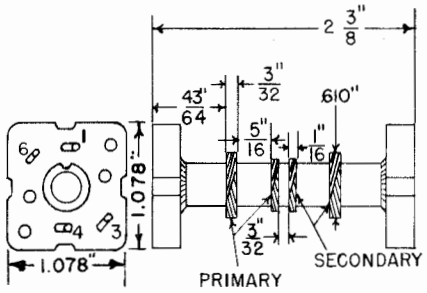
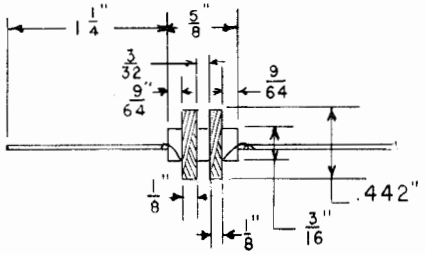
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-301 L-302 L-303 L-304 L-313 L-1204	SA:8049		2 windings 3 pie universal wound	Litz 15/41 SSE	1st pie 20 turns 2nd pie 13 turns 3rd pie 43 turns	1st pie 0.24 ohms 2nd and 3rd pie 0.72 ohms			Inductance: 1st pie 6.0 microhenries, 2nd and 3rd pie in series 32 microhenries. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Brush on bakelite resin varnish, then allow to dry hard.
L-305 L-306 L-307 L-308 L-312	SA:8041		2 windings 4 pie universal wound	Litz 15/41 SSE	1st pie 43 turns 2nd pie 9 turns 3rd pie 9 turns 4th pie 43 turns	1st and 2nd pie 0.62 ohms 3rd and 4th pie 0.62 ohms			Inductance: 1st and 2nd pie 27.5 microhenries, 3rd and 4th pie 27.5 microhenries. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Brush on bakelite resin varnish, then allow to dry hard.
L-309 L-311 L-315 L-320 L-801 L-804 L-805 L-806 L-1205	SA:9134		1 winding 2 pie universal wound	36 ESN	225 turns per pie	17 ohms			Inductance: 765 microhenries at 575 kc. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Immerse in bakelite resin varnish for 15 min-

TABLE 7-28. WINDING DATA CHART (CONT'D)

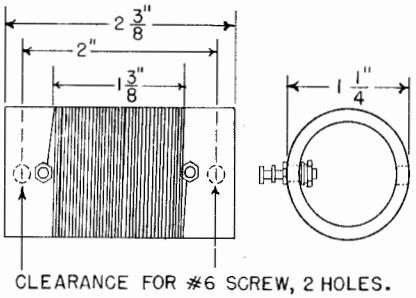
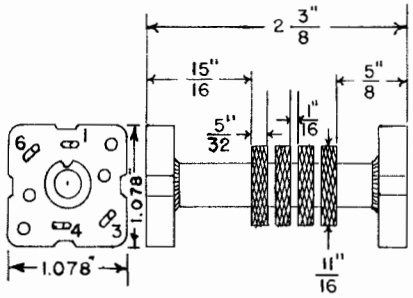
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
	SA:9134 (cont'd)								utes, then air dry. Redip and allow to dry hard.
L-310	SA:7176		single	Litz 50/41 ESN	48	0.455 ohms			Inductance: 48.5 microhenries at 2.5 mc. Immerse in thinned out bakelite resin varnish until completely saturated. Bake at 200°F for 1/2 hour. Immerse in full strength bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-314	SA:6708		4 pie universal wound	Litz 5/41 SSE	225 turns per pie	38 ohms			Inductance: 5 millihenries. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Brush on bakelite resin varnish, then allow to dry hard.

TABLE 7-28. WINDING DATA CHART (CONT'D)

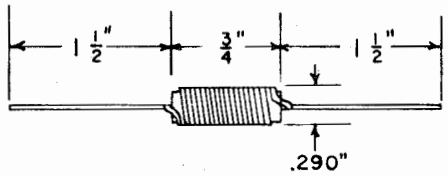
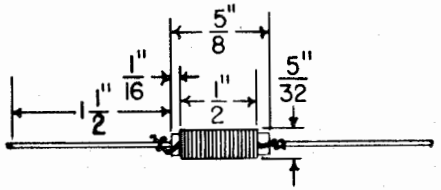
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-316 L-317 L-430 L-607 L-708 L-709 L-818 L-819 L-906 L-1104	SA:9148		single layer	24E	28	0.057			Inductance: 1.67 microhenries. Immerse in thinned out bakelite resin varnish until completely saturated. Bake at 200°F for 1/2 hour. Immerse in full strength bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-321 L-322	SA:8633		single layer	24E	24	0.039			Inductance: 6.5 microhenries. Immerse in thinned out bakelite resin varnish until completely saturated. Bake at 200°F for 1/2 hour. Immerse in full strength bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.

TABLE 7-28. WINDING DATA CHART (CONT'D)

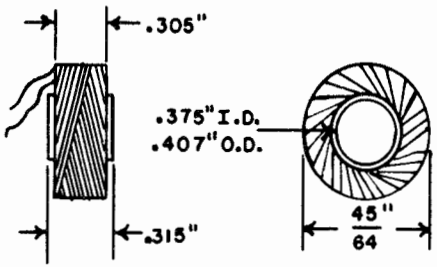
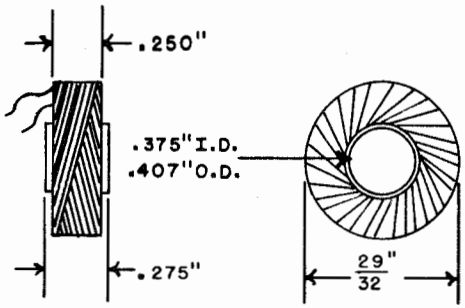
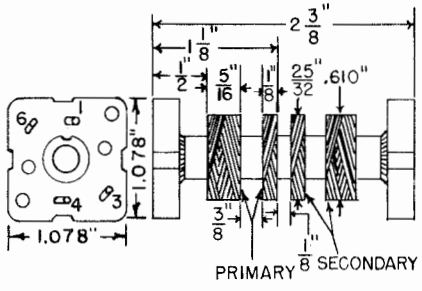
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-401A L-401B L-402A L-402B L-403A L-403B L-404A L-404B	SA:6959		single	Litz 7/38 SSE	195	3.0			Inductance: 0.45 millihenries. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Immerse in bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-405A L-405B L-406A L-406B L-407A L-407B L-408A L-408B	SA:6958		single	Litz 10/41 SSE	300	7.7			Inductance: 1.2 millihenries. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Immerse in bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-409 L-410 L-411 L-412 L-413 L-414 L-417 L-418	SA:7061		2 windings 4 pie universal wound	36 SSE	1st pie 800 2nd pie 355 3rd pie 355 4th pie 800	1st pie 57 2nd pie 23 3rd pie 23 4th pie 57			Inductance: 1st pie 7.1 millihenries; 2nd pie 1.75 millihenries; 3rd pie 1.75 millihenries; 4th pie 7.1 millihenries; Brush on bakelite resin varnish during winding. Bake at 200°F for

TABLE 7–28. WINDING DATA CHART (CONT'D)

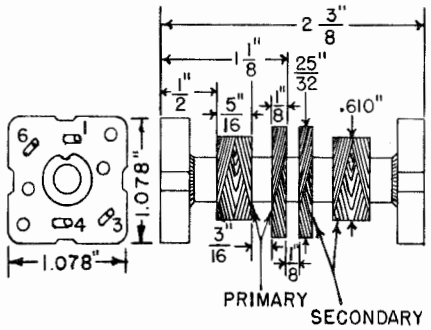
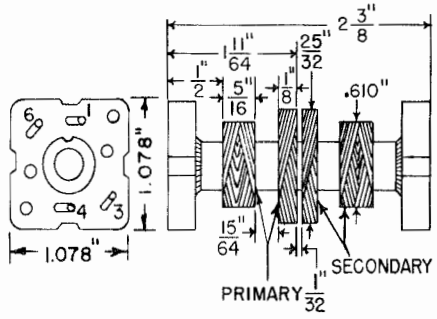
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
	SA:7061 (cont'd)								1/2 hour. Immerse in bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-415 L-416 L-419 L-420 L-423 L-424	SA:7062		2 windings 4 pie universal wound	36 SSE	1st pie 620 2nd pie 535 3rd pie 535 4th pie 620	1st pie 41 2nd pie 42 3rd pie 42 4th pie 41			Inductance: 1st pie 4.0 millihenries; 2nd pie 4.3 millihenries; 3rd pie 4.3 millihenries; 4th pie 4.0 millihenries. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Immerse in bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-421 L-422 L-425 L-426	SA:7063		2 windings 4 pie universal wound	36 SSE	1st pie 600 2nd pie 645 3rd pie 645 4th pie 600	1st pie 38 2nd pie 53 3rd pie 53 4th pie 38			Inductance: 1st pie 3.8 millihenries; 2nd pie 6.9 millihenries; 3rd pie 6.9 millihenries; 4th pie 3.8 millihenries. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour.

TABLE 7-28. WINDING DATA CHART (CONT'D)

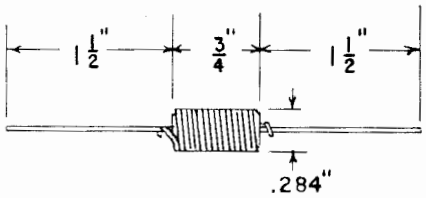
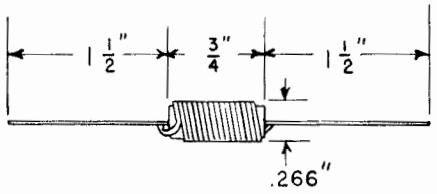
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
	SA:7063 (cont'd)								Immerse in bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-431 L-608 L-1105	SA:9150		single	26E	33	0.104			Inductance: 2.6 microhenries. Immerse in thinned out bakelite resin varnish until completely saturated. Bake at 200°F for 1/2 hour. Immerse in full strength bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-432 L-433	SA:9138		single	32E	67	0.750			Imductance: 10.0 microhenries. Immerse in thinned out bakelite resin varnish until completely saturated. Bake at 200°F for 1/2 hour. Immerse in full strength bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.

TABLE 7–28. WINDING DATA CHART (CONT'D)

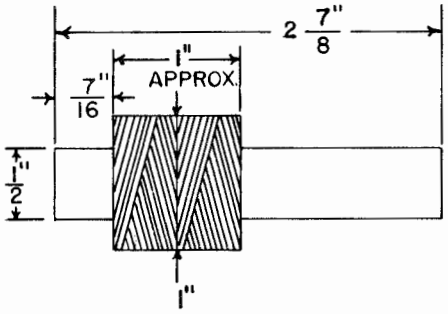
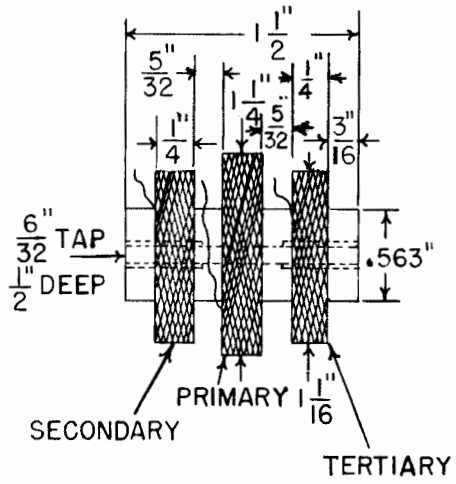
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-601 L-602	SA:6459		single winding 2 pie universal wound	36 SSE	1100 turns per pie	183			Inductance: 41.0 millihenries at 79 kc. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Immerse in bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-603 L-701 L-901 L-1001 L-1002 L-1003	SA:6410		2 windings 3 pie universal wound	36 SSE	Pri. 945 Sec. 685 Ter. 685	Pri. 88 Sec. 60 Ter. 60			Inductance: primary 17.0 millihenries; sec and ter. in series 17.6 millihenries. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Immerse in bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.

TABLE 7-28. WINDING DATA CHART (CONT'D)

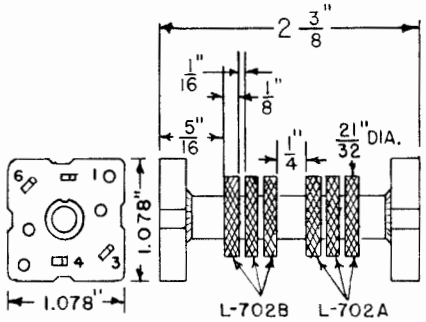
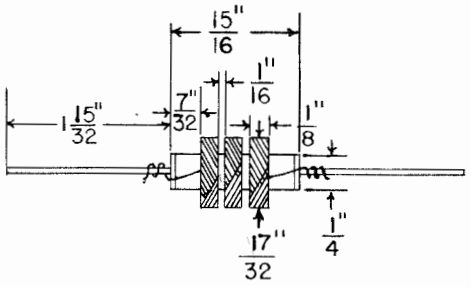
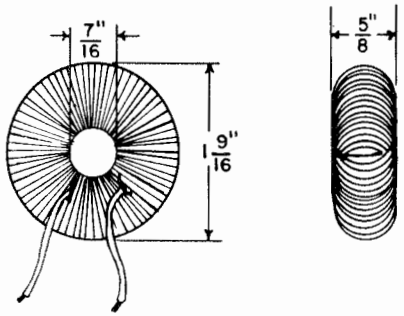
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-702	SA:7272		2 windings 6 pie universal wound	36 SSE	267 turns per pie	Pri. 45 Sec. 45			Inductance: primary 4.5 millihenries; sec. 4.5 millihenries. Brush on bakebakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Brush on bakelite resin varnish, then allow to dry hard.
L-703	SA:7230		single winding 3 pie universal wound	36 ESN	240 turns per pie	30			Inductance: 10.0 millihenries. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Immerse in bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-704	P359-2		single winding toroidal wound	26E	780	3.7			Inductance: 16.0 millihenries at 50 kc. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Immerse in bakelite resin varnish for 15 minutes, then air dry Redip and allow to dry hard.

TABLE 7–28. WINDING DATA CHART (CONT'D)

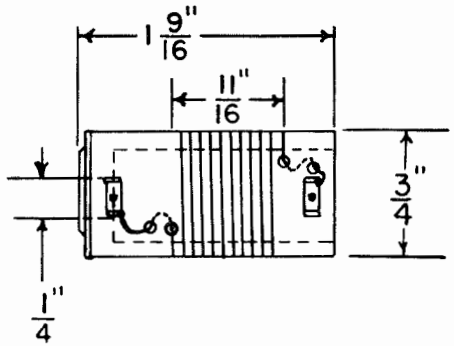
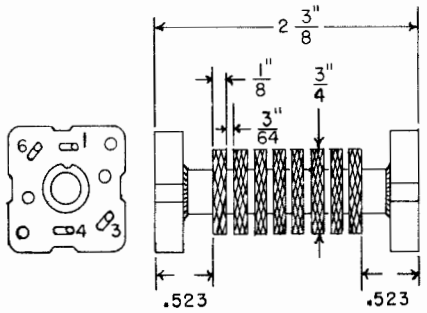
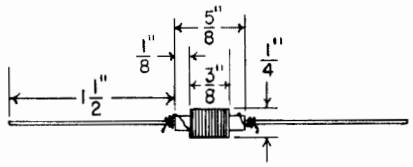
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-802 L-807	SA:7143		single winding single layer wound	24 tinned copper	10 3/4	0.055			Inductance: 1.59 microhenries. Coat with Q-Max.
L-809 L-810	SA:8159		single winding 8 pie universal wound	Litz 7/41 SSE	200 turns per pie	52.5			Inductance: 15 millihenries. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Brush on bakelite resin varnish, then allow to dry hard.
L-811	SA:8634		single	28 DN	14	0.062			Inductance: 2.7 microhenries. Immerse in thinned out bakelite resin varnish until completely saturated. Bake at 200°F for 1/2 hour. Immerse in full strength bakelite

TABLE 7-28. WINDING DATA CHART (CONT'D)

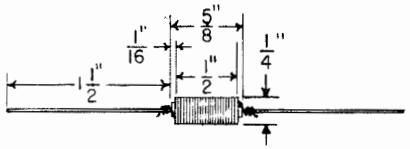
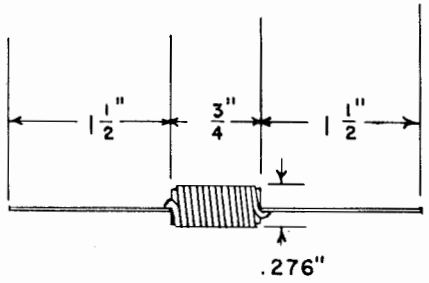
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
	SA:8634 (cont'd)								resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-812 L-813 L-814 L-815	SA:8425		single	28E	35	0.136			Inductance: 12.5 microhenries. Immerse in thinned out bakelite resin varnish until completely saturated. Bake at 200°F for 1/2 hour. Immerse in full strength bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-905	SA:9151		single	28E	43	0.205			Inductance: 4.2 microhenries. Immerse in thinned out bakelite resin varnish until completely saturated. Bake at 200°F for 1/2 hour. Immerse in full strength bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.

TABLE 7-28. WINDING DATA CHART (CONT'D)

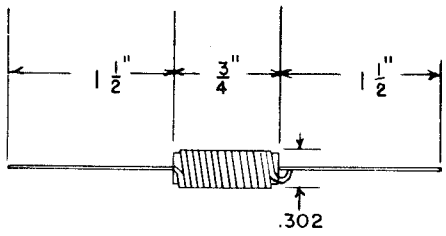
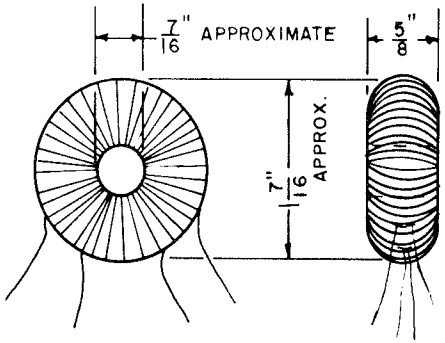
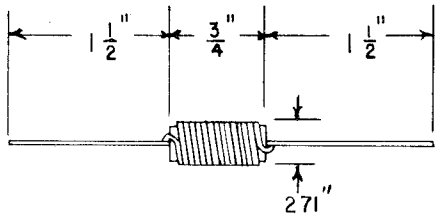
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-1007 L-1008	SA:9147		single	22E	24	0.031			Inductance: 1.1 microhenries. Immerse in thinned out bakelite resin varnish until completely saturated. Bake at 200°F for 1/2 hour. Immerse in full strength bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-1202 L-1203	P748-2		2 windings toroidal wound..	29E	410	7.5	1 to 1		Inductance: 15 millihenries at 50 kc. Brush on bakelite resin varnish during winding. Bake at 200° F for 1/2 hour. Immerse in bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-1207 L-1208	SA:9164		single	30	42	0.3			Inductance: 4.9 microhenries. Immerse in thinned out bakelite resin varnish until completely saturated

TABLE 7-28. WINDING DATA CHART (CONT'D)

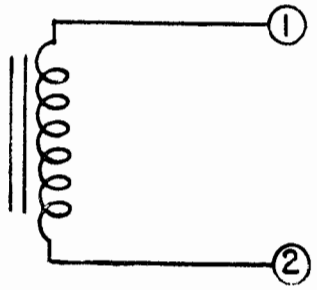
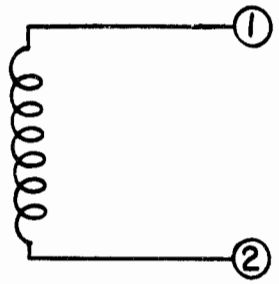
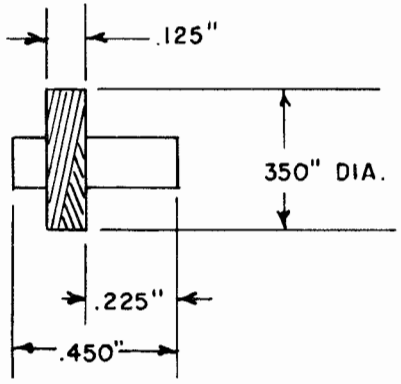
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
	SA:9164 (cont'd)								Bake at 200°F for 1/2 hour. Immerse in full strength bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.
L-2001 L-2102 L-2201	P808-1		single		23			1500	Inductance: 1.76 henries at 380 ma. max current 450 ma. Hermetically sealed.
L-2002 L-2101 L-2202	P809-1		single		220			1500	Inductance: 8 henries at 100 ma. Hermetically sealed.
L-1206	SA:7149		single winding universal wound	Litz 10/44 SSE	51 1/2	0.811			Inductance: 30 microhenries at 2.5 mc. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Immerse in bakelite resin varnish for 15 minutes, then air dry. Redip and allow to dry hard.

TABLE 7-28. WINDING DATA CHART (CONT'D)

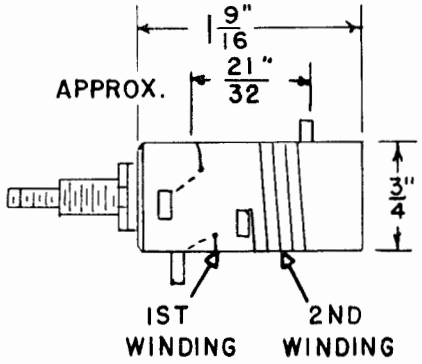
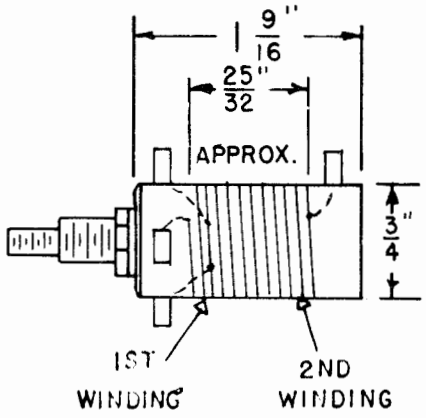
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-101[1]	SA:8169		1st winding 2nd winding	28E 19 tinned copper	3/4 4 1/2				Coat windings with Q-Max.
T-101[2]	SA:7147		primary secondary	26E 24 tinned copper	1 1/2 9				Coat windings with Q-Max.

TABLE 7-28. WINDING DATA CHART (CONT'D)

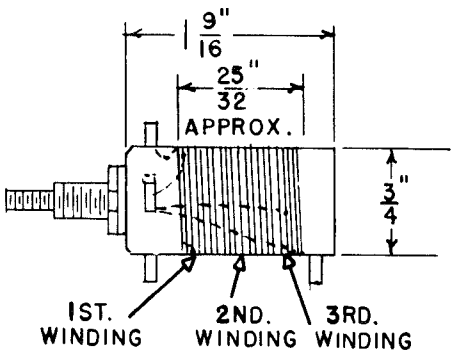
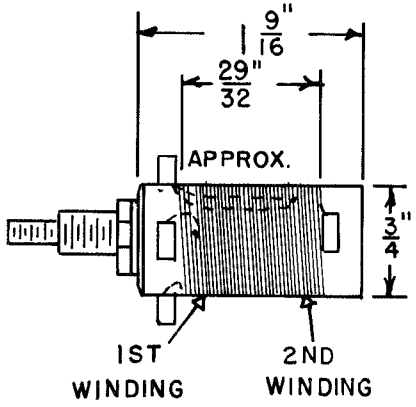
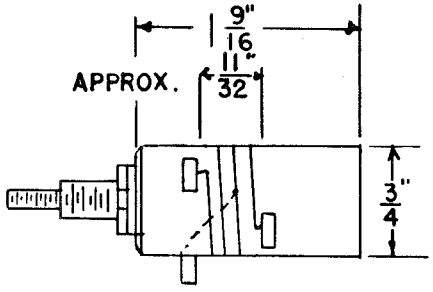
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-101[3]	SA:7153		1st winding 2nd winding 3rd winding	28E 24 tinned copper 24 tinned copper	2 15 3/4 4				Coat windings with Q-Max.
T-101[4]	SA:7159		1st winding 2nd winding 3rd winding	28E 26E 26E	4 25 7				Coat windings with Q-Max.
T-102[1]	SA:8170		single	19 tinned copper	3 1/4 turns tapped at 2 turns				Coat winding with Q-Max.

TABLE 7-28. WINDING DATA CHART (CONT'D)

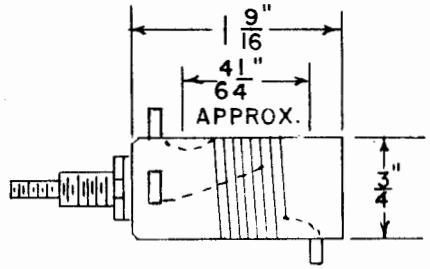
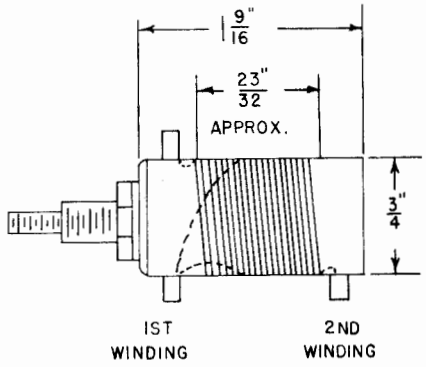
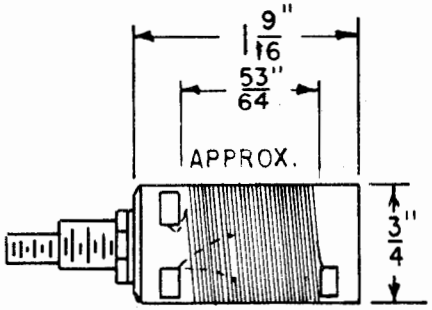
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-102[2]	SA:7148		single	24 tinned copper	8 1/2 turns tapped at 5 1/4 turns				Coat winding with Q-Max.
T-102[3]	SA:7154		1st winding 2nd,winding	24 tinned copper 24 tinned copper	7 1/2 12				Coat windings with Q-Max
T-102[4]	SA:7160		1st winding 2nd winding	26E 26E	10 22 3/4				Coat windings with Q-Max.

TABLE 7-28. WINDING DATA CHART (CONT'D)

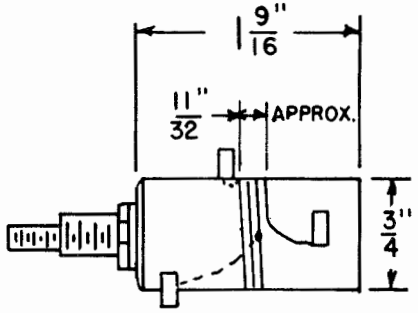
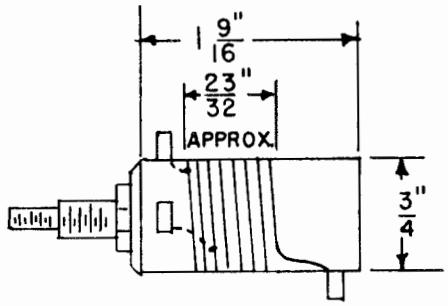
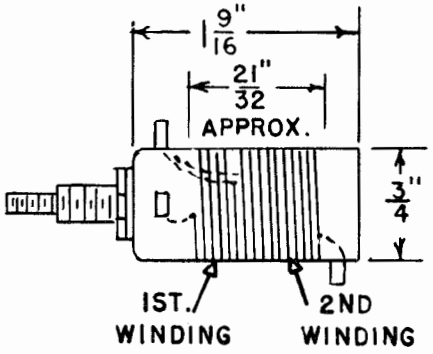
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-103[1]	SA:8912		single	19 tinned copper	3 1/4 tapped at 2 1/4 turns				Coat windings with Q-Max.
T-103[2]	SA:8817		single	24 tinned copper	8 1/2 turns tapped at 3 1/2 turns				Coat winding with Q-Max.
T-103[3]	SA:8818		1st winding 2nd winding	24 tinned copper 24 tinned copper	6 1/2 12 1/4				Coat windings with Q-Max.

TABLE 7–28. WINDING DATA CHART (CONT'D)

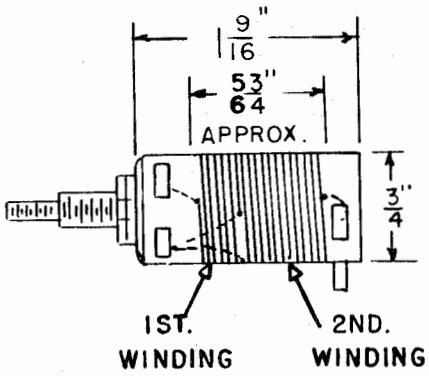
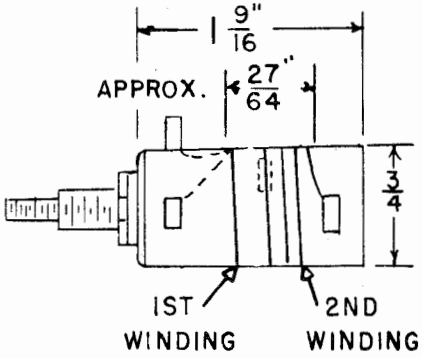
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-103[4]	SA:7161		1st winding 2nd winding	26E 26E	12 21 3/4				Coat windings with Q-Max.
T-104[1]	SA:8172		1st winding 2nd winding	28E 19 tinned copper	1 3 1/2				Coat windings with Q-Max.

TABLE 7–28. WINDING DATA CHART (CONT'D)

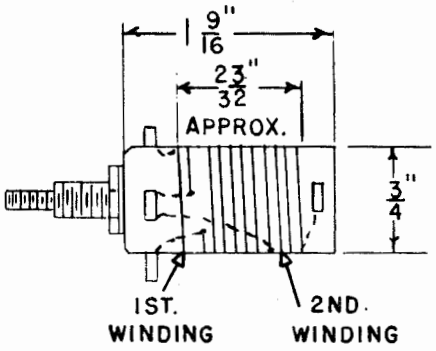
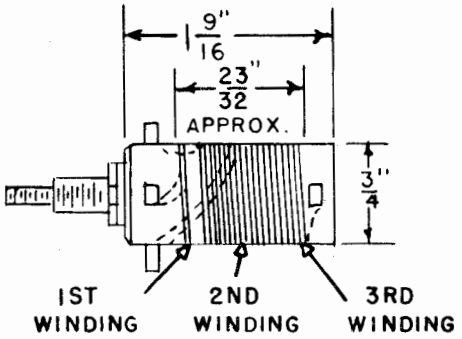
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-104[2] T-105[2]	SA:7150		1st winding 2nd winding	28E 24 tinned copper	1 1/4 8 3/4 tapped at 6th turn				Coat windings with Q-Max.
T-104[3] T-105[3]	SA:7156		1st winding 2nd winding 3rd winding	28E 24 tinned copper 24 tinned copper	1/2 7 3/4 11 1/2				Coat windings with Q-Max.

TABLE 7-28. WINDING DATA CHART (CONT'D)

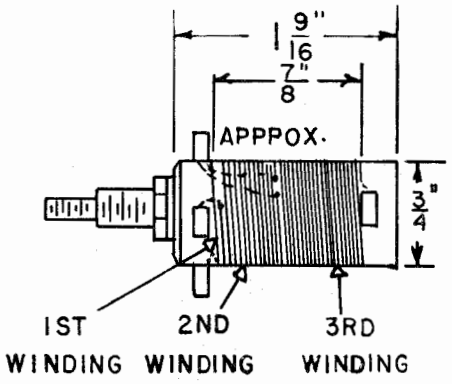
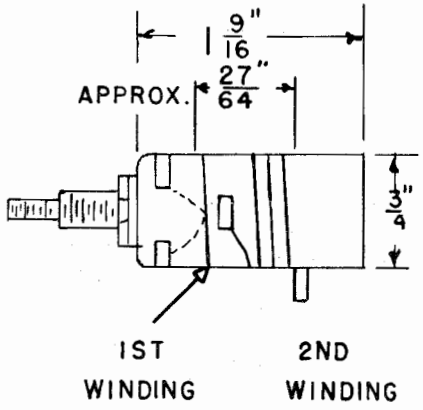
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-104[4] T-105[4]	SA:7163		1st winding 2nd winding 3rd winding	28E 26E 26E	1 12 3/4 21				Coat windings with Q-Max.
T-105[1]	SA:8173		1st winding 2nd winding	28E 19 tinned copper	1 3 1/4				Coat windings with Q-Max.

TABLE 7–28. WINDING DATA CHART (CONT'D)

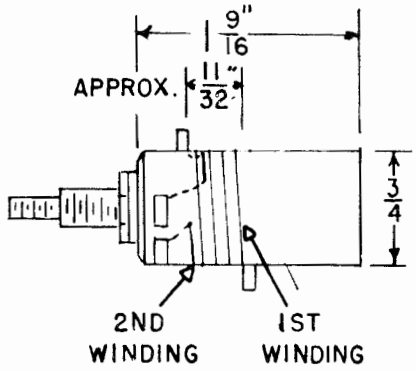
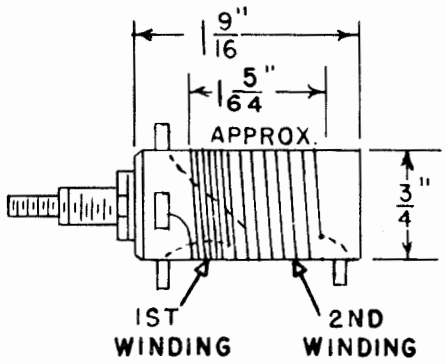
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-106[1]	SA:8816		1st winding 2nd winding	19 tinned copper 28 double Nylonel	3 1/2 1				Coat windings with Q-Max.
T-106[2]	SA:8815		1st winding 2nd winding	28E 24 tinned copper	6 1/4 8 1/2				Coat windings with Q-Max.

TABLE 7-28. WINDING DATA CHART (CONT'D)

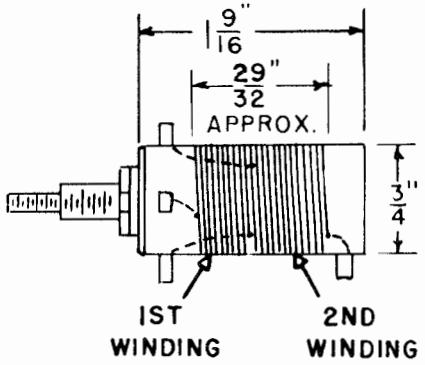
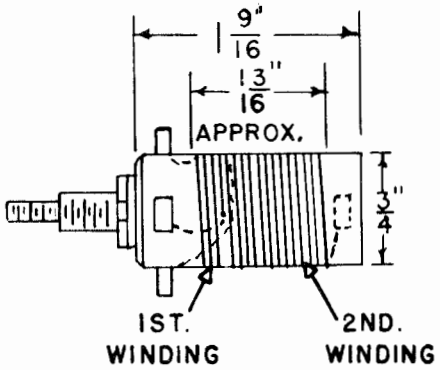
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-106[3]	SA:8814		1st winding 2nd winding	28E 24 tinned copper	9 15 1/2				Coat windings with Q-Max.
T-106[4]	SA:8813		1st winding 2nd winding	28E 26E	10 1/4 22				Coat windings with Q-Max.

TABLE 7–28. WINDING DATA CHART (CONT'D)

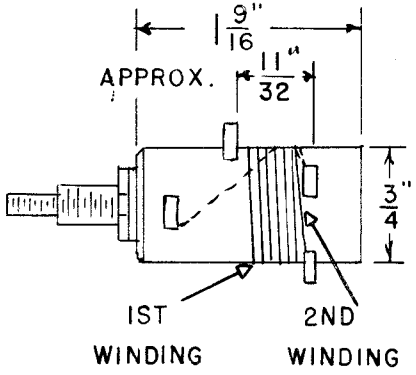
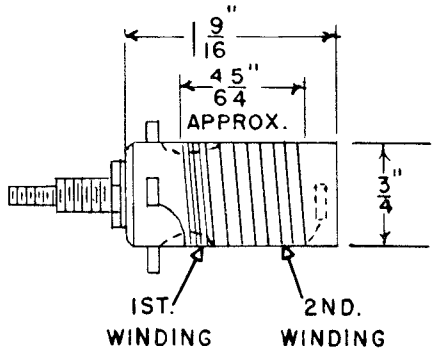
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D..C RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-107[1]	SA:8174		1st winding 2nd winding	19 tinned copper 28 single Nylonel	3 3/4 2				Coat windings with Q-Max.
T-107[2]	SA:7152		1st winding 2nd winding	28E 24 tinned copper	6 1/4 8 3/4				Coat windings with Q-Max.

TABLE 7-28. WINDING DATA CHART (CONT'D)

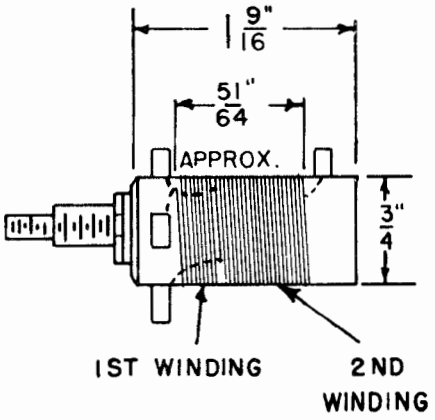
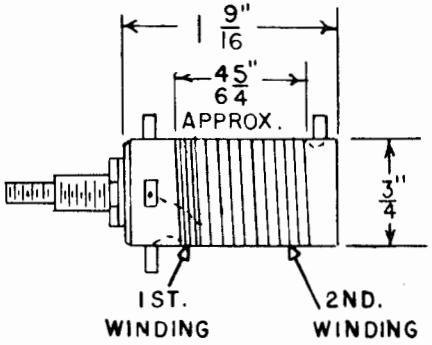
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-107[3]	SA:7164		1st winding 2nd winding	28E 26E	10 1/4 21				Coat windings with Q-Max.
T-107[4]	SA:7158		1st winding 2nd winding	28E 24 tinned copper	9 16				Coat windings with Q-Max.

TABLE 7-28. WINDING DATA CHART (CONT'D)

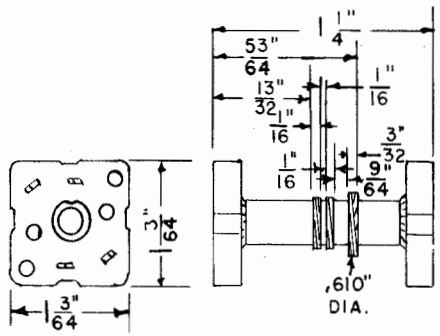
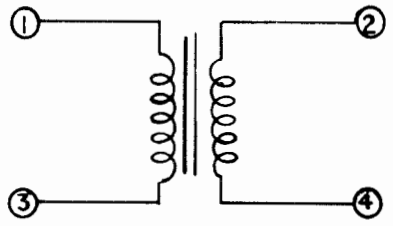
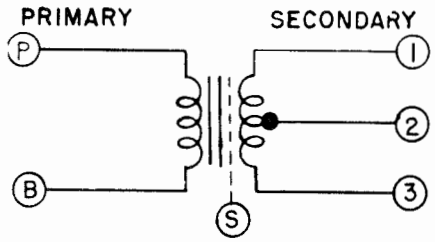
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-108	SA:8042		1st winding 2nd winding 3rd winding	15/41 Litz 15/41 Litz 15/41	20 13 43	0.24 2nd and 3rd winding in series, 0.72 ohms			Inductance: 1st winding 6.0 microhenries; 2nd and 3rd winding in series 32 microhenries. Brush on bakelite resin varnish during winding. Bake at 200°F for 1/2 hour. Brush on bakelite resin varnish, then allow to dry hard.
T-601 T-1201	P897-1		primary 1 and 2 secondary 3 and 4			50.4 0.34	10,000 ohms to 70 ohms	500	1.1 watt operating level. Hermetically sealed.
T-701 T-901 T-1001	M779-1		primary P and B secondary 1 and 3, 2 CT	37E 27E	3500 304 tap at 152	650 4.2	17,000 ohms to 120 ohms	1500 1000	Electrostatic shield between primary and secondary. 3 watt operating level. Max. current in primary 15 ma. Zero DC in secondary. Hermetically sealed.

TABLE 7-28. WINDING DATA CHART (CONT'D)

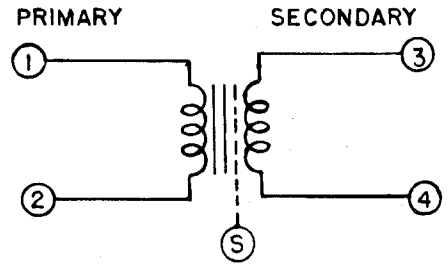
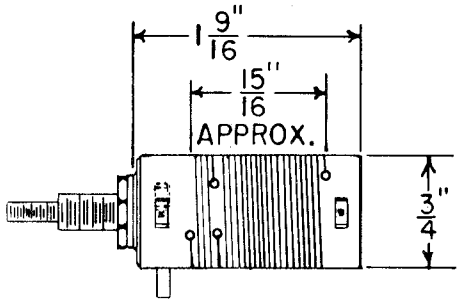
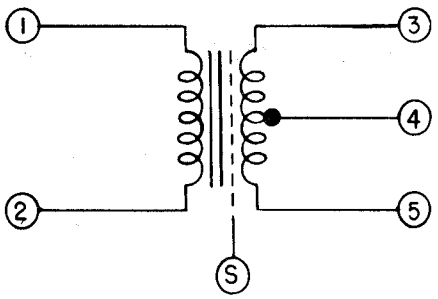
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-702	P401-1		primary secondary	26E 20	370 56	5.2 0.16	150 ohms to 3.2 ohms	500	Electrostatic shield between primary and secondary. 3 watt operating level. No DC in either winding. Hermetically sealed.
T-801 T-802	SA:7144		primary secondary	24 tinned copper 24 tinned copper	14 3 1/2				Windings coated with Q-Max.
T-1101	M780-1		primary 1 and 2 secondary 3 and 5, 4 CT	34 34	3000 3060 CT	161 204	10,000 ohms to 10,000 ohms	1500	Electrostatic shield between primary and secondary. 1 watt operating level. Maximum current in primary 15 ma. No DC in secondary. Hermetically sealed.

TABLE 7-28. WINDING DATA CHART (CONT'D)

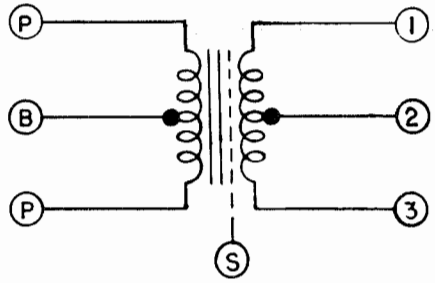
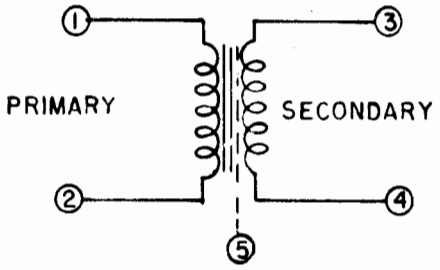
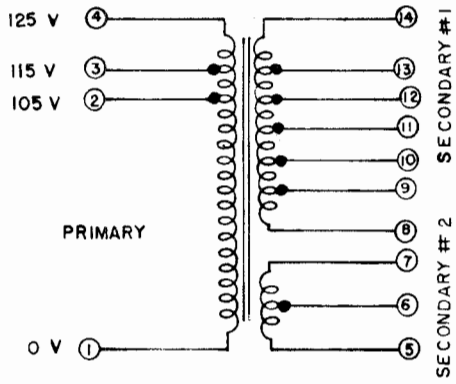
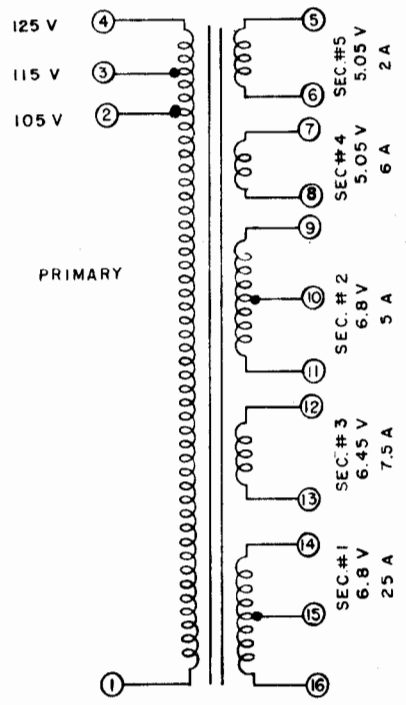
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-1102	M781-1		primary P and P, B CT second-ary 1 and 3, 2 CT secondary 3 and 4	36 28	4250 752	508 12 335	20,000 ohms to 600, and 600 ohms	1500	Electrostatic shield between primary and secondary. 3 watt operating level. Maximum current in primary 15 ma. No DC in secondaries. Hermetically sealed.
T-1103	Q932-1		primary 1 and 2 secondary 3 and 4			102 30.3	20,000 ohms to 600 ohms	1000	Electrostatic shield between primary and secondary. 10 milliwatts operating level. Maximum current in primary 10 ma. No DC in secondary. Hermet-ically sealed
T-2001 T-2101 T-2201	P807-1		primary secondary 1 secondary 2			1 and 4 term, 0.5 ohm 8 and 14 term, 30 ohms 9 and 13 term, 29 ohms 10 and 12 term, 20 ohms 11 CT 5 and 7 term, 63		2000 2000 2000	Voltage Rating 105, 115, 125. 995 v at .38 amps. DC 940 v at .33 amps. DC 670 v at .33 amps. DC 750 v at 100 ma. DC

TABLE 7-28. WINDING DATA CHART (CONT'D)

SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
	P807-1 (cont'd)					ohms, 6 CT			Hermetically sealed.
T-2002 T-2102 T-2202	P806-1		primary			1 and 4 term, 0.2 ohm		1500	Voltage Rating 105, 115, 125.
			secondary 1			14 and 16 term, less than 0.1 ohm, 15 CT		1500	6.8 v at 25 amps.
			secondary 2			9 and 11 term, less than 0.1 ohm, 10 CT		1500	6.8 v at 5 amps.
			secondary 3			12 and 13 term, less than 0.1 ohm		1500	6.45 v at 7.5 amps.
			secondary 4			7 and 8 term, less than 0.1 ohm		1500	5.05 v at 6 amps.
			secondary 5			5 and 6 term, less than 0.1 ohm		1500	5.05 v at 2 amps
									Hermetically sealed.

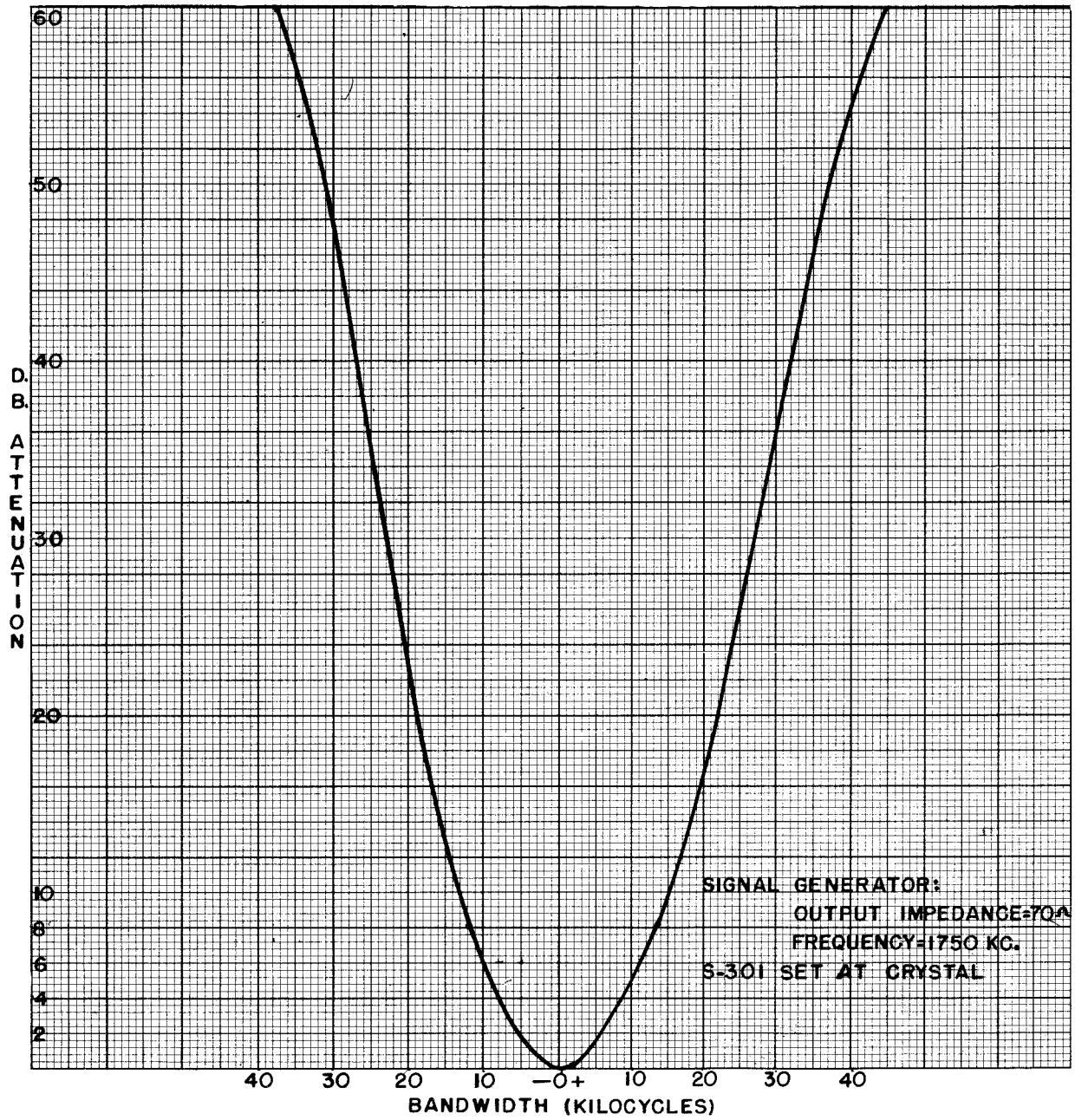


Figure 7–77. Overall 1750-Kc. I.F. Selectivity Characteristic

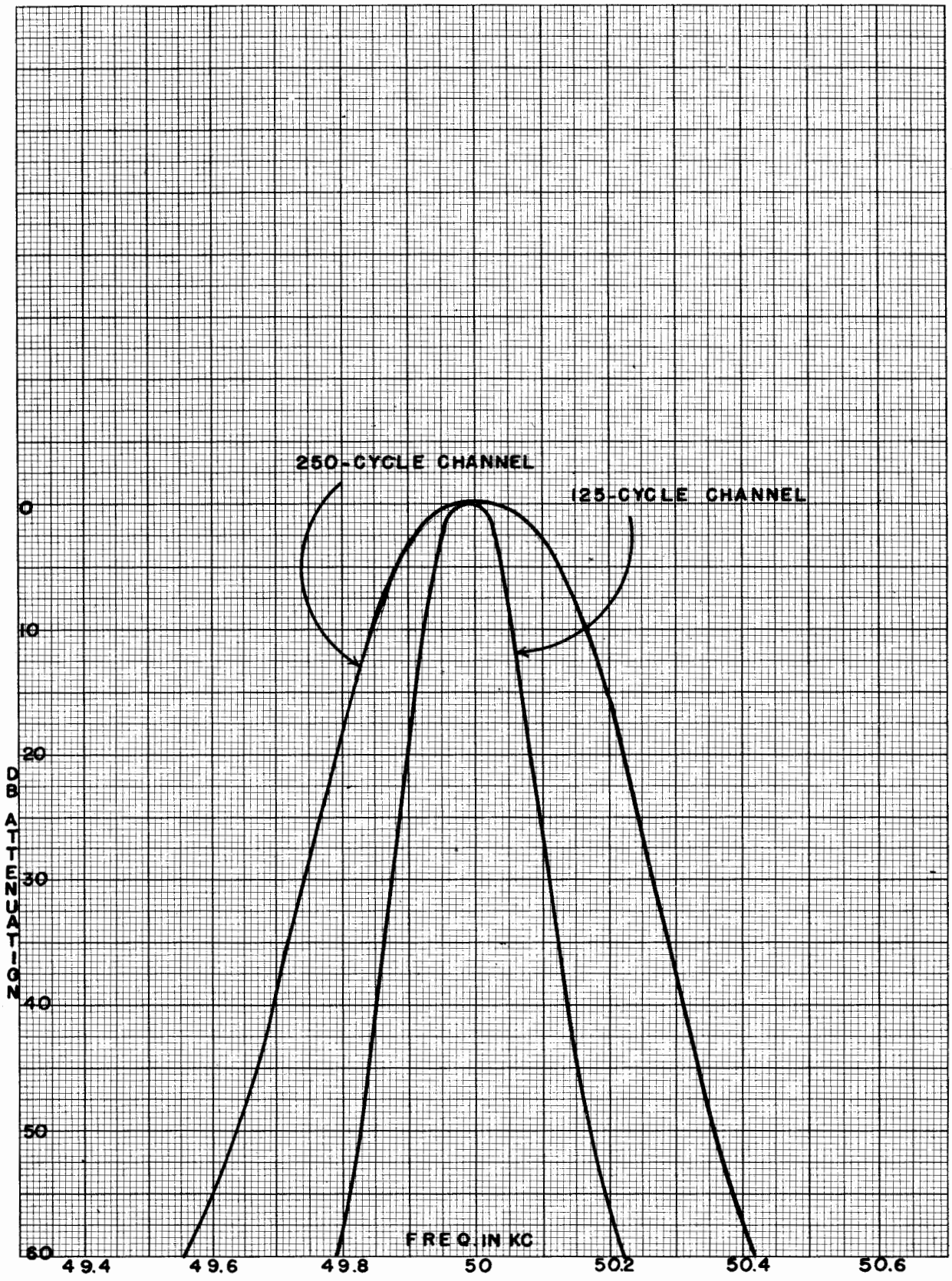


Figure 7–78. Selectivity Characteristic of 125 and 250-cycle Channels, Filter Assembly F-99/FRR-24

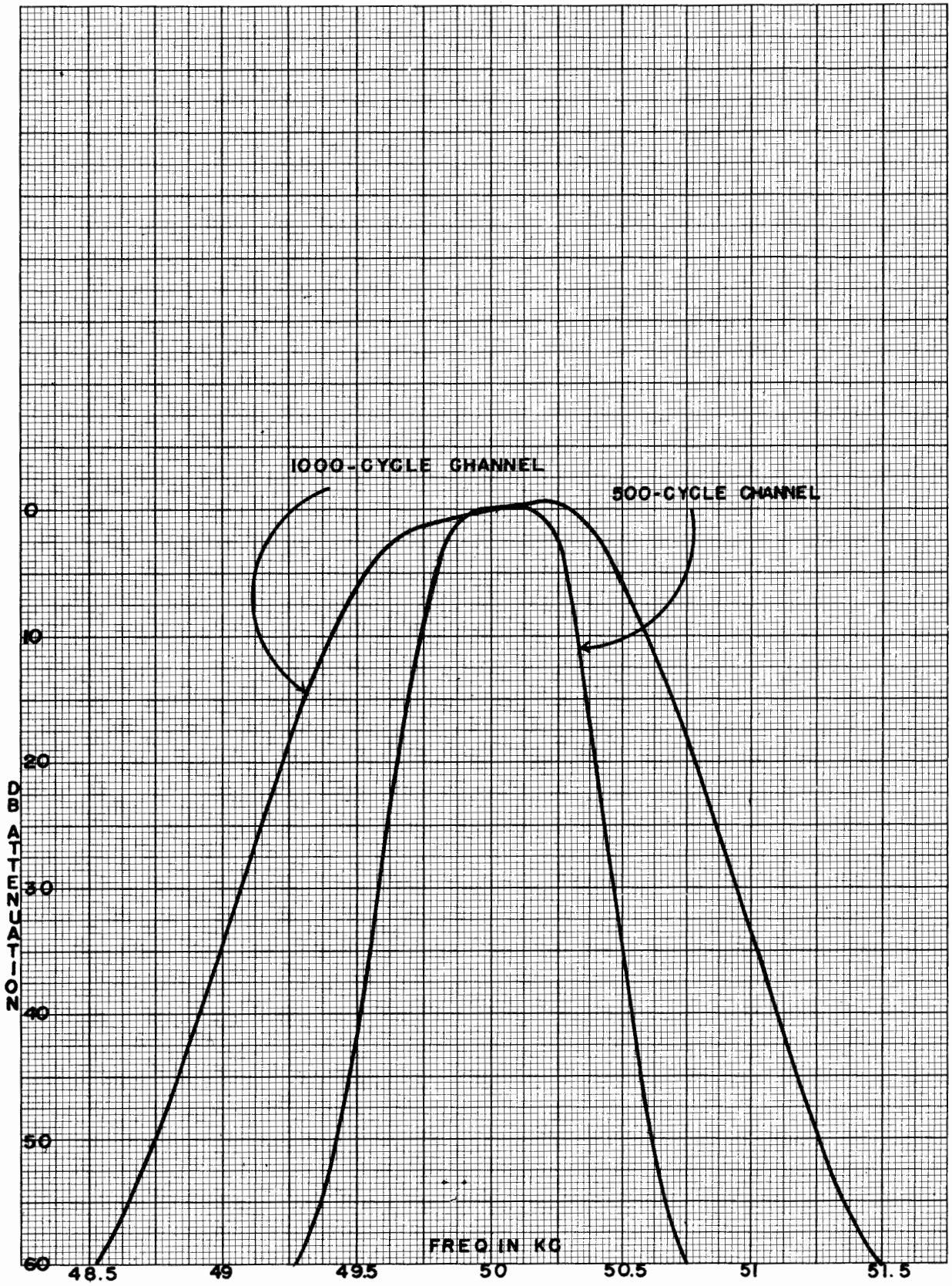


Figure 7–79. Selectivity Characteristic of 500 and 1,000-cycle Channels, Filter Assembly F-99/FRR-24

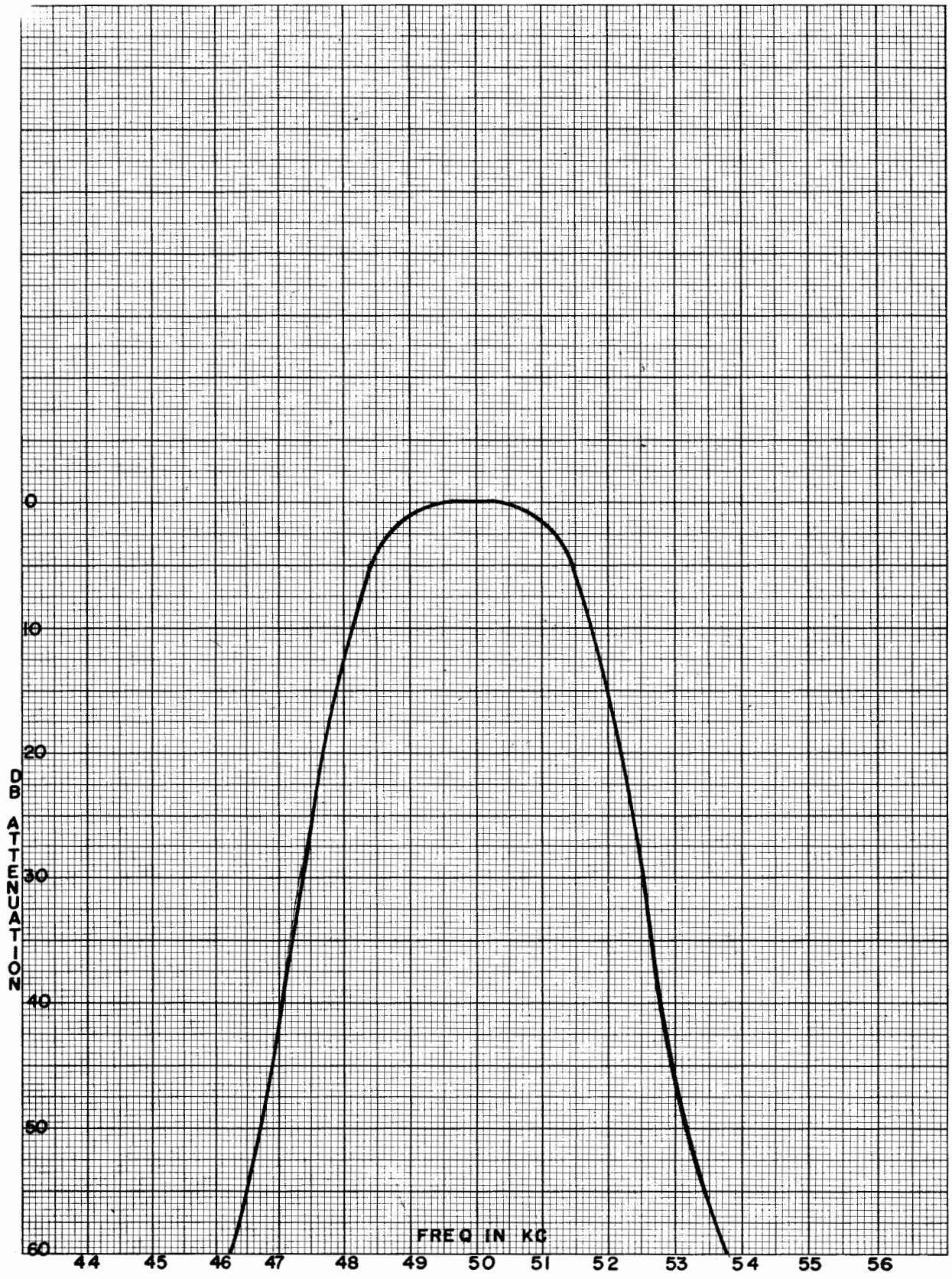


Figure 7–80. Selectivity Characteristic of 3-Kc. Channel, Filter Assembly F-99/FRR-24

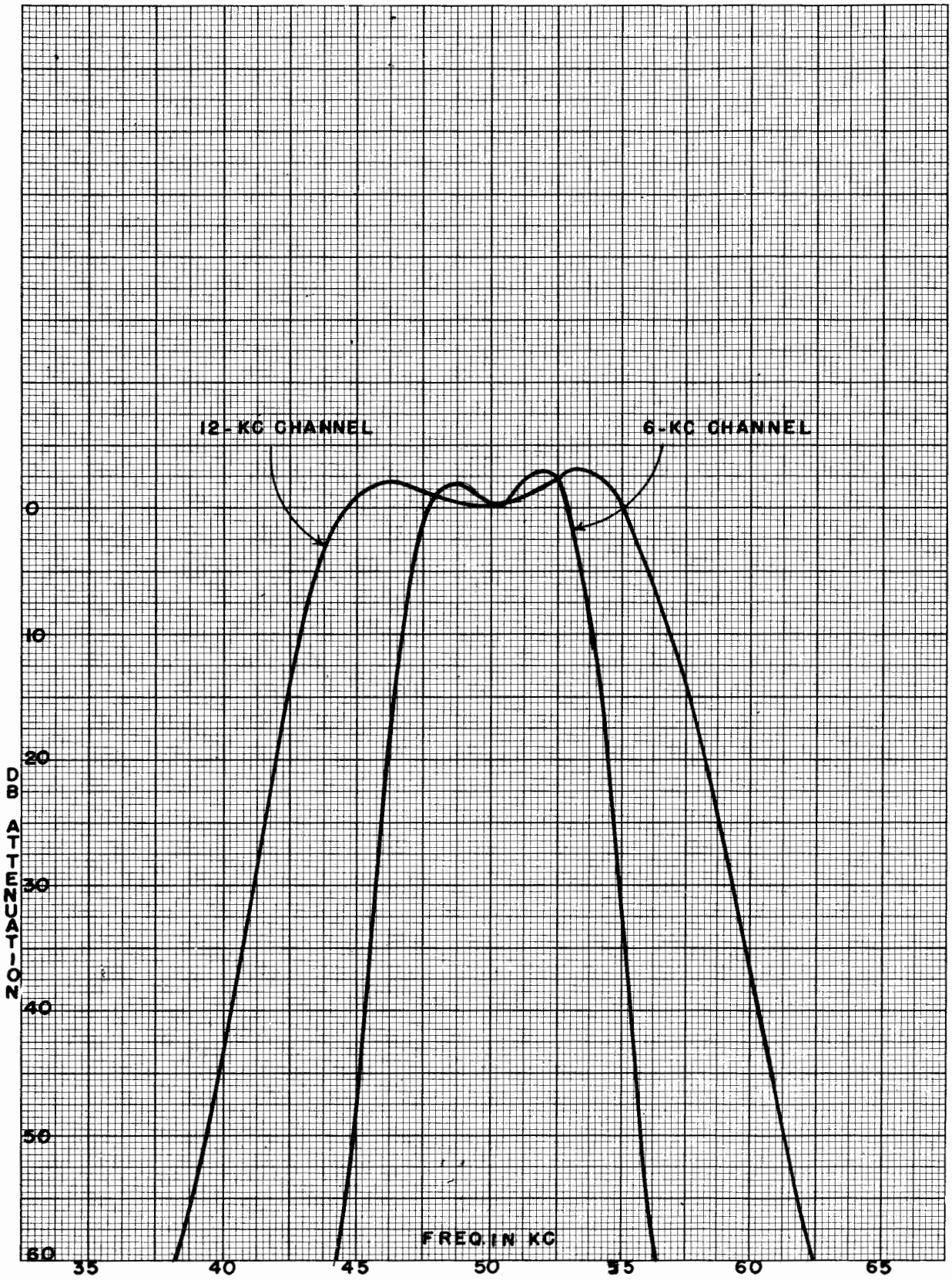


Figure 7–81. Selectivity Characteristic of 6-Kc. and 12-Kc. Channels, Filter Assembly F-99/FRR-24

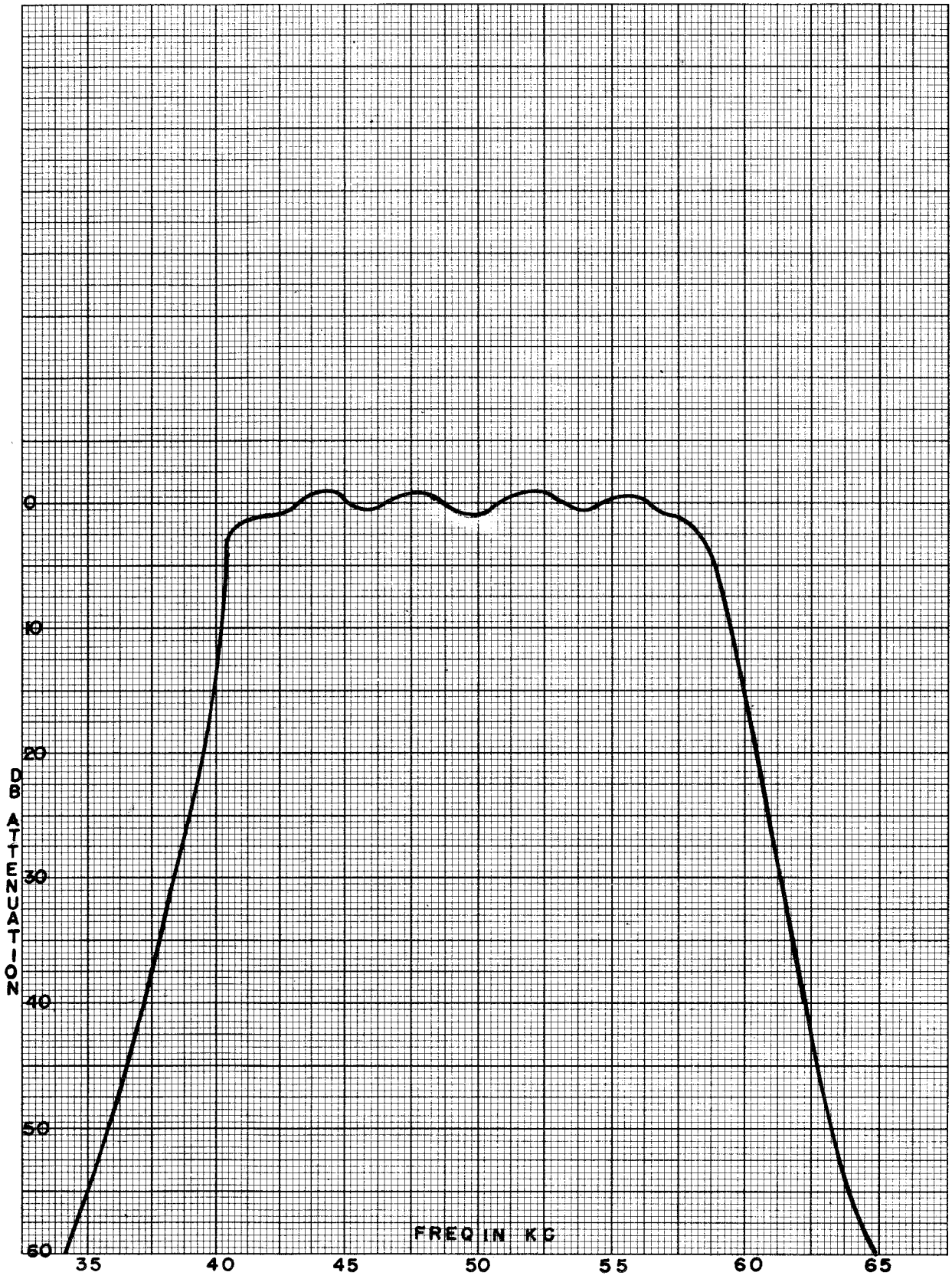


Figure 7–82. Selectivity Characteristic of 50-Kc. I.F. System, R.F. Amplifier AM-454/FRR-24

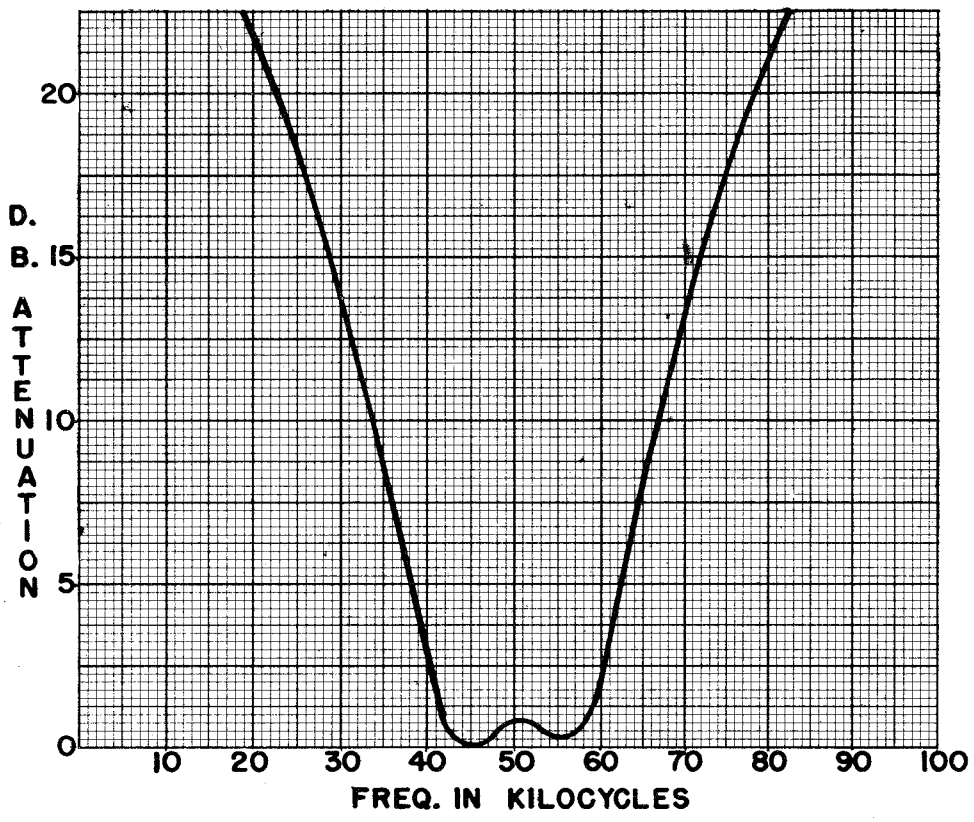


Figure 7–83. Selectivity Characteristic of 50-Kc. I.F. Stages, Amplifier-Detector AM-440/FRR-24 and AM-438/FRR-24

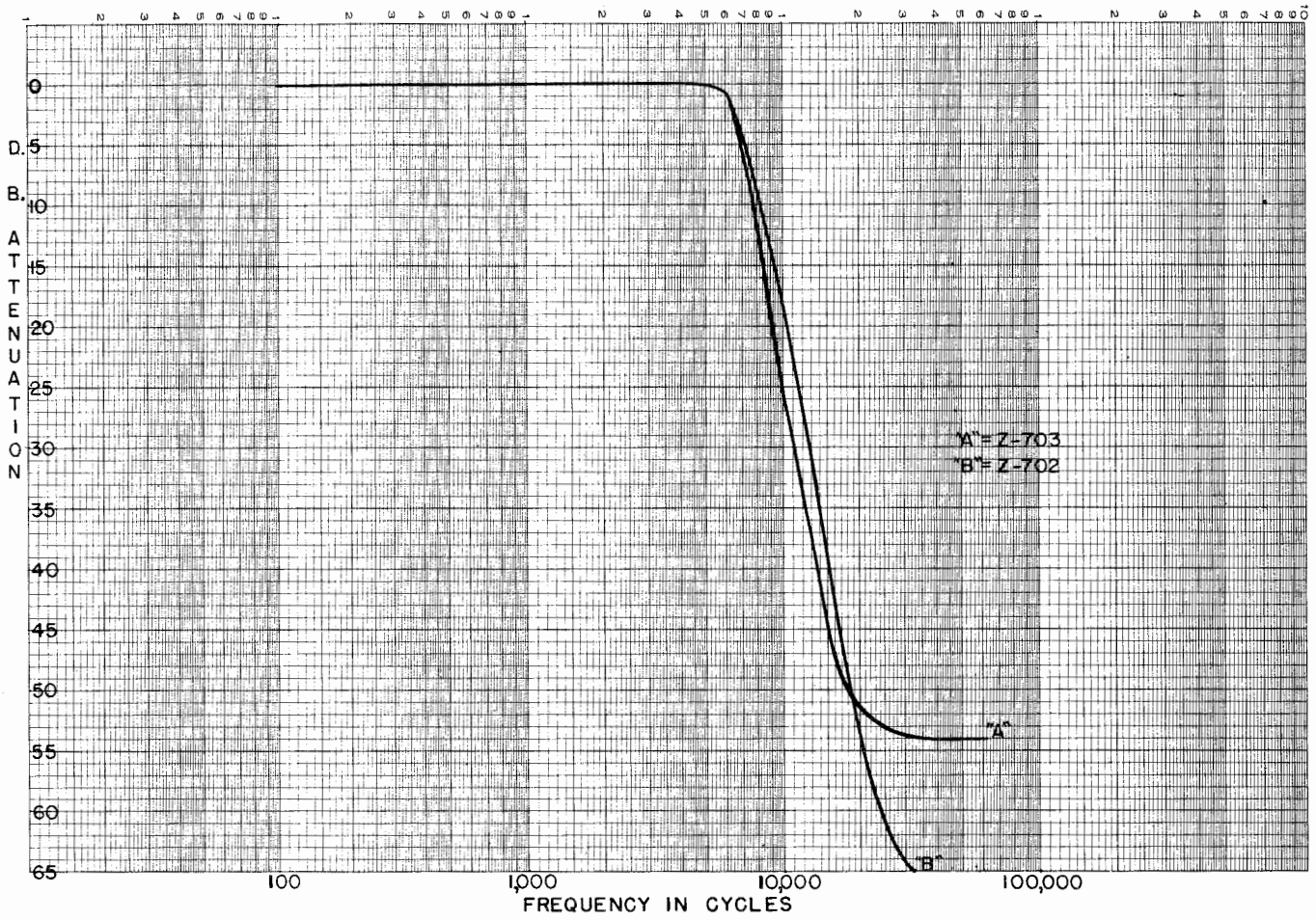


Figure 7–84. Audio Characteristic of Filters Z-702 and Z-703, Amplifier-Detector AM-439/FRR-24

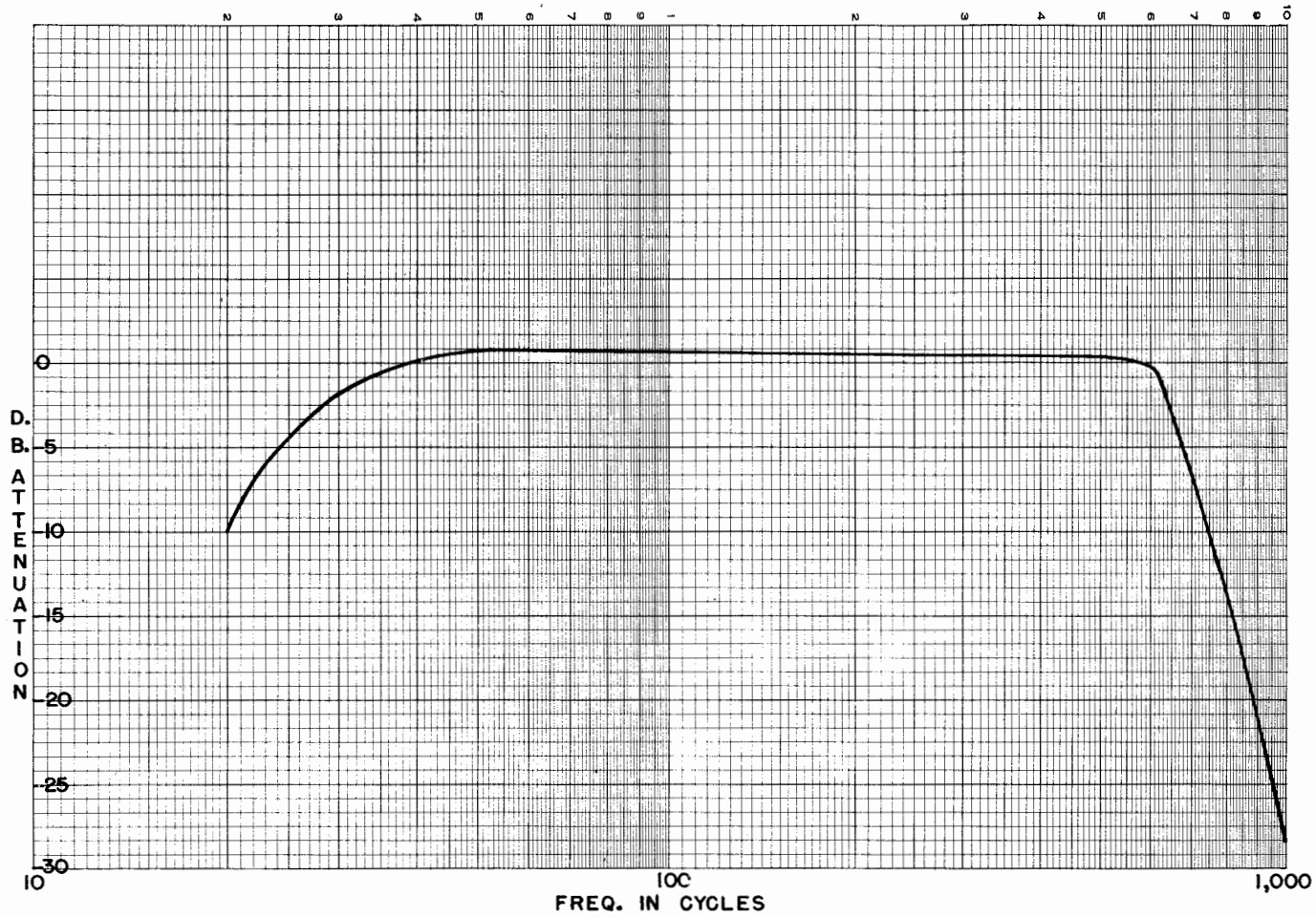


Figure 7–85. Audio Characteristic of 600-cycle Filter, Amplifier-Detector AM-440/FRR-24 and AM-438/FRR-24

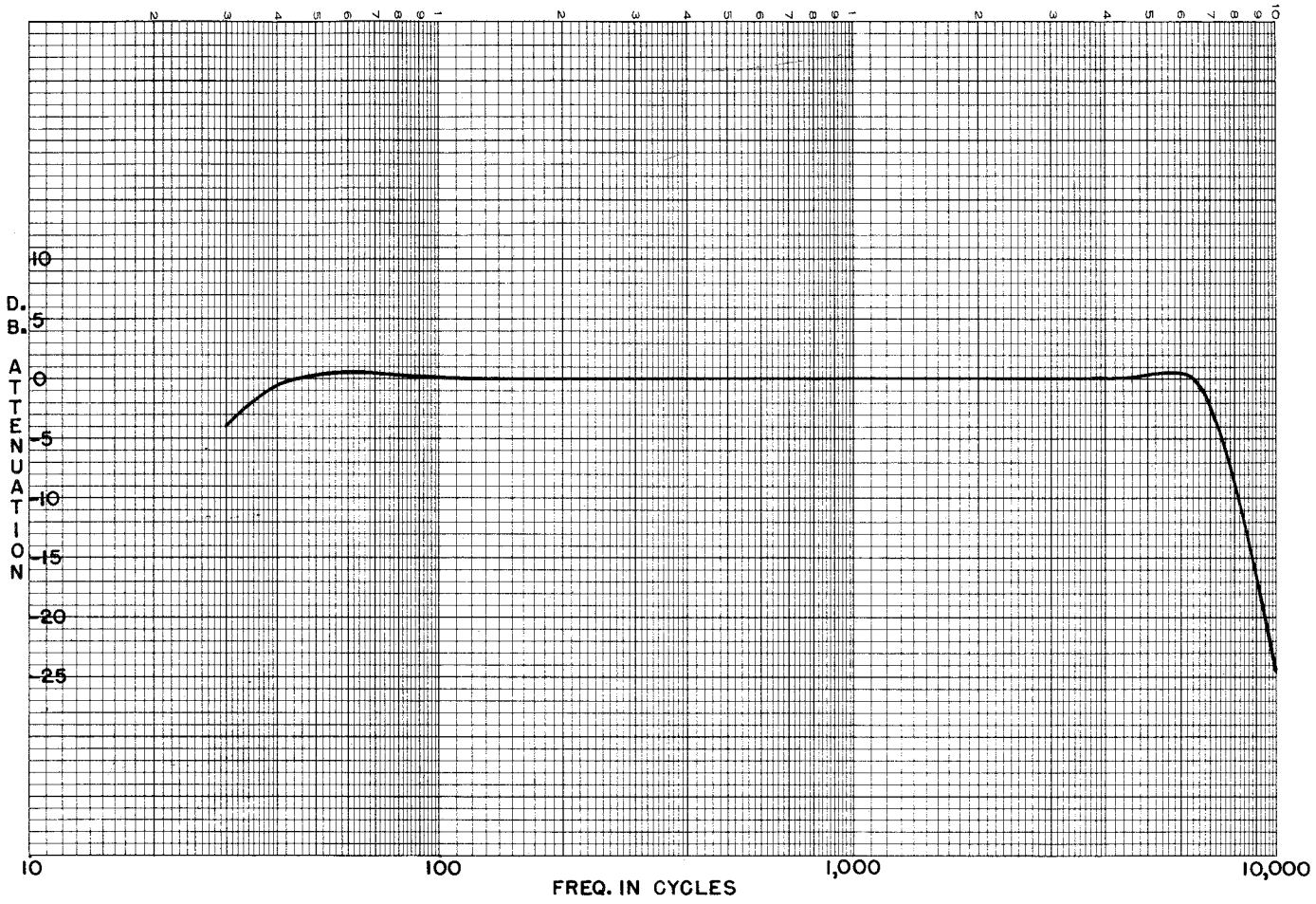


Figure 7–86. Audio Characteristic of 6-Kc. Filter, Amplifier-Detector AM-440/FRR-24 and AM-438/FRR-24

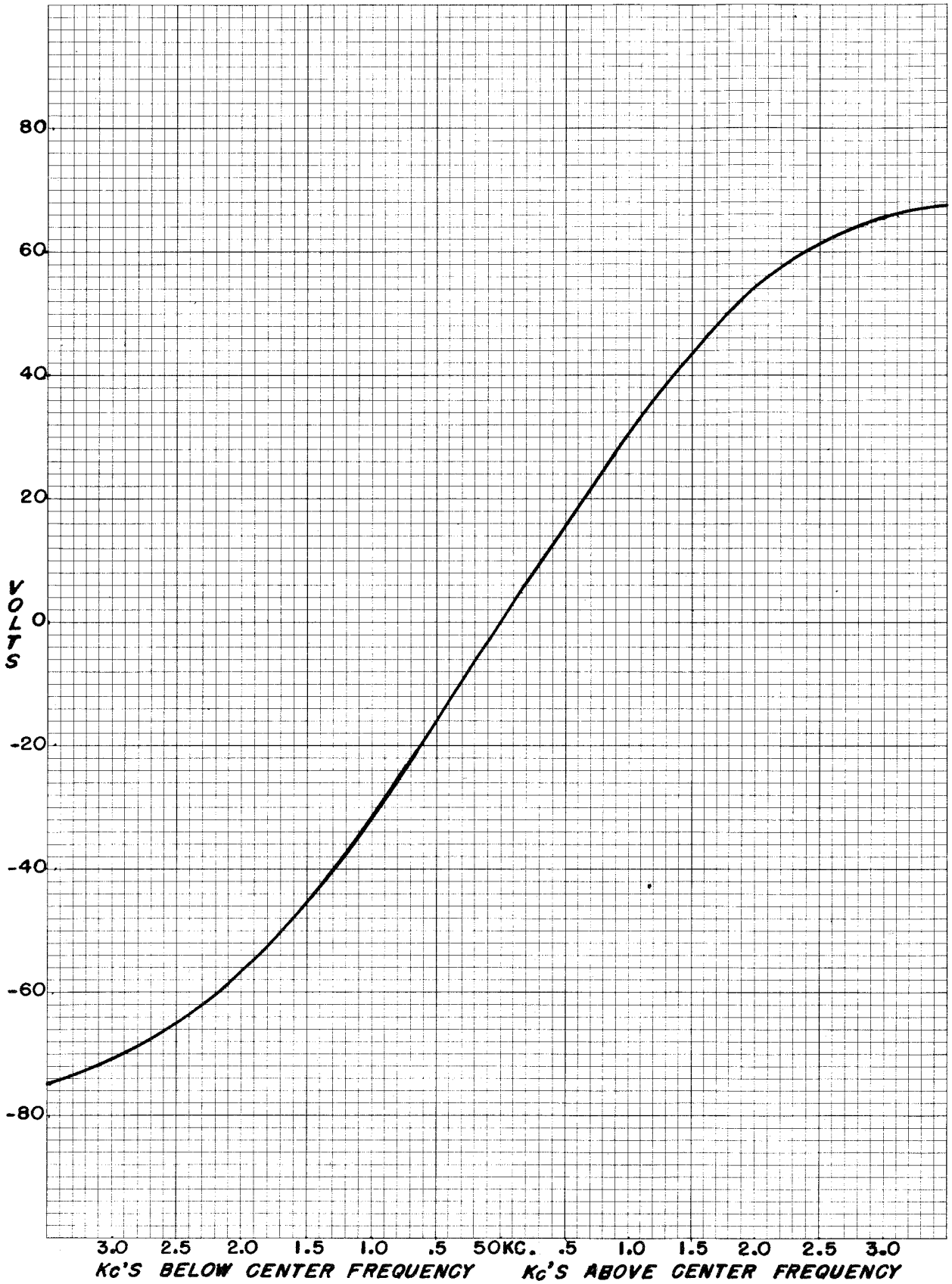
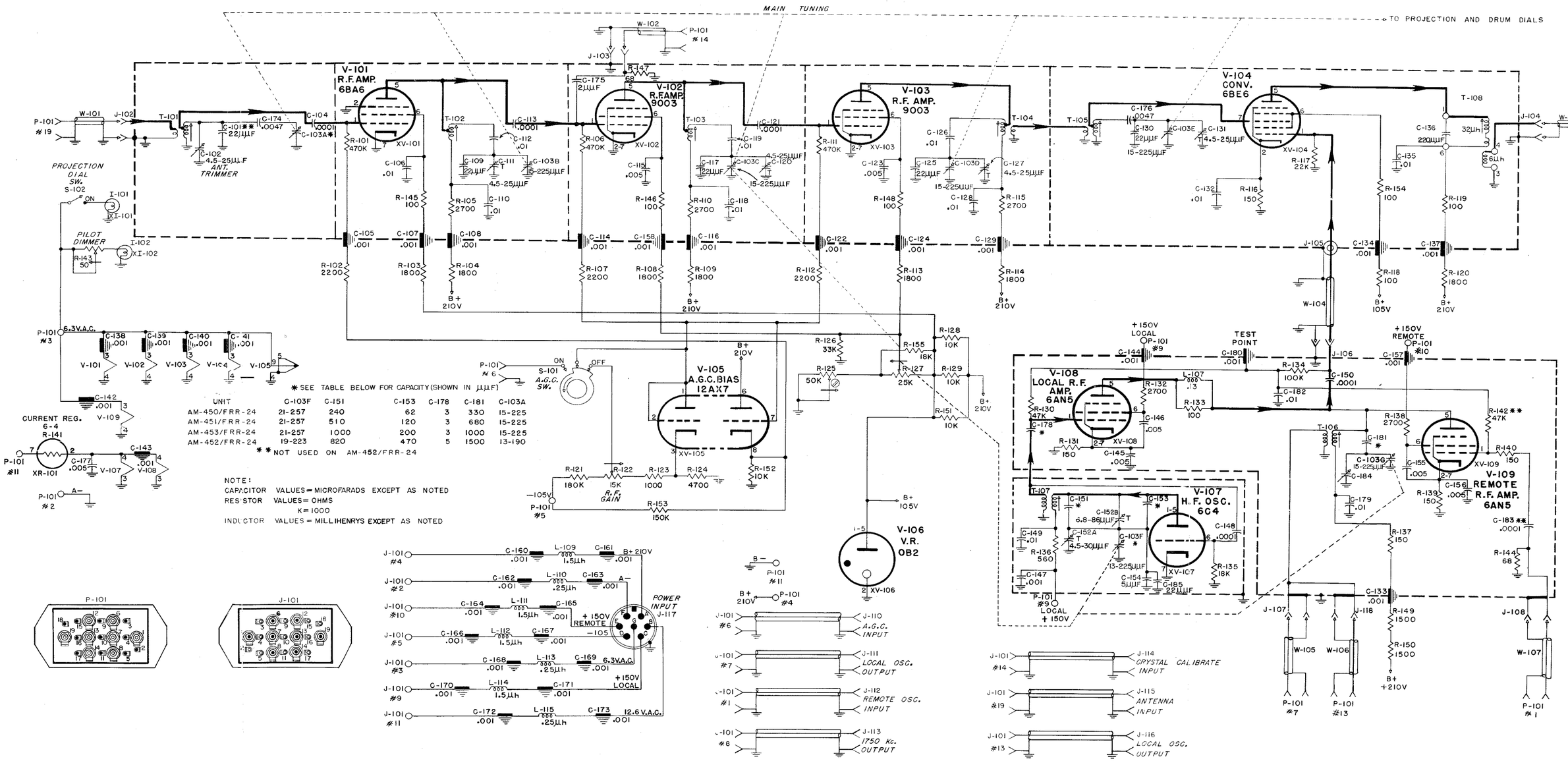


Figure 7–87. Discriminator Characteristic, Frequency Shift Converter CV-127/FRR-24



* SEE TABLE BELOW FOR CAPACITY (SHOWN IN μμF)

UNIT	C-103F	C-151	C-153	C-178	C-181	C-103A
AM-450/FRR-24	21-257	240	62	3	330	15-225
AM-451/FRR-24	21-257	510	120	3	680	15-225
AM-453/FRR-24	21-257	1000	200	3	1000	15-225
AM-452/FRR-24	19-223	820	470	5	1500	13-190

** NOT USED ON AM-452/FRR-24

NOTE:
CAPACITOR VALUES = MICROFARADS EXCEPT AS NOTED
RESISTOR VALUES = OHMS
K = 1000
INDUCTOR VALUES = MILLIHENRYS EXCEPT AS NOTED

Figure 7–88. Schematic Diagram, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

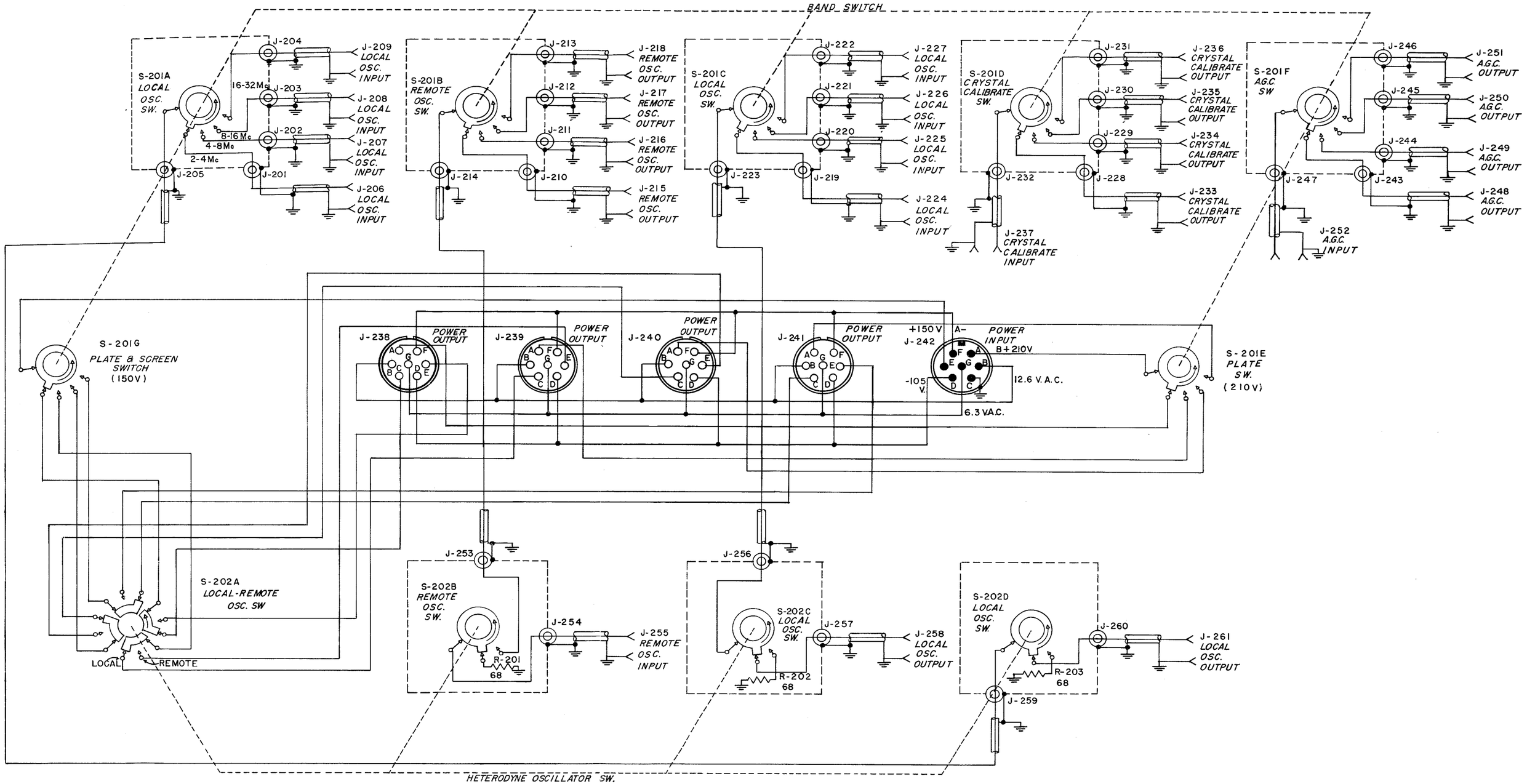
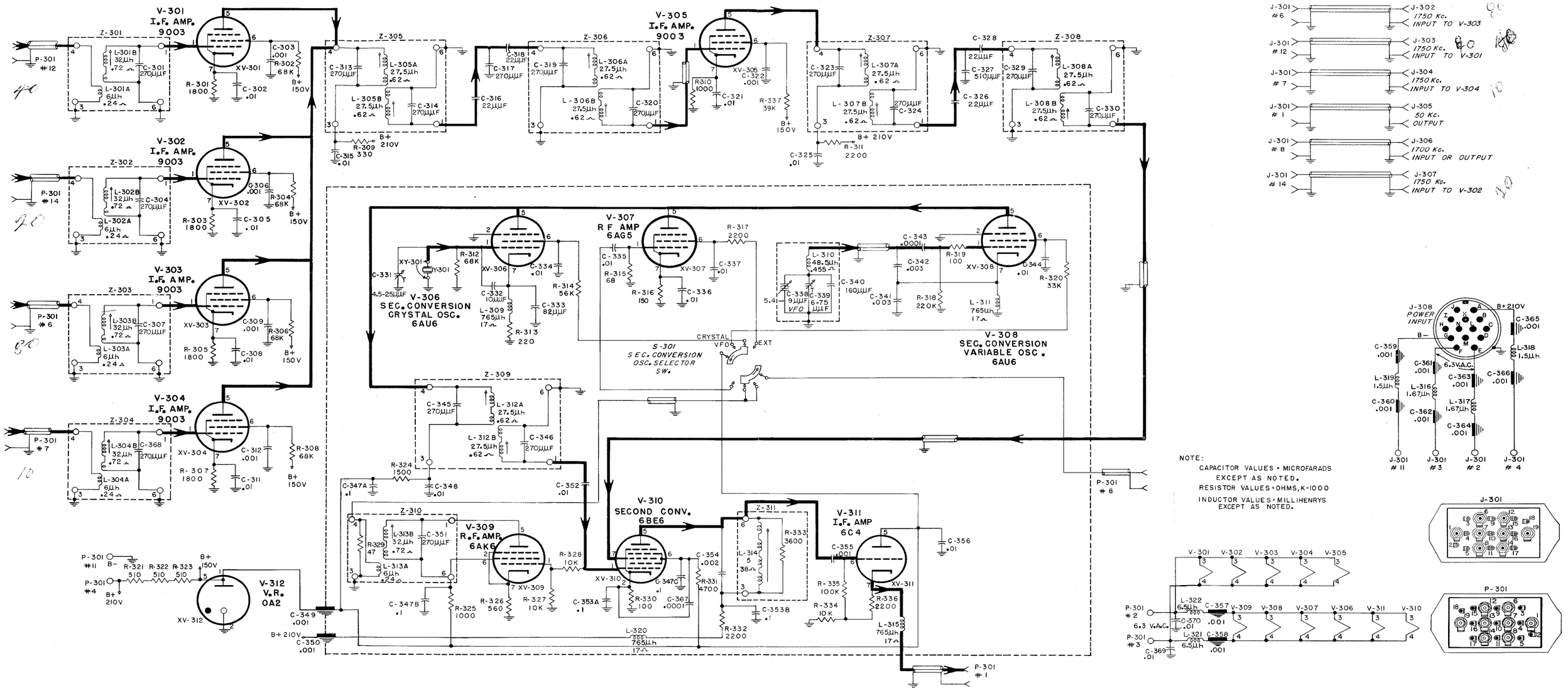


Figure 7–89. Schematic Diagram, Control Panel SB-142/FRR-24



NOTE:
CAPACITOR VALUES = MICROFARADS EXCEPT AS NOTED.
RESISTOR VALUES = OHMS, K = 1000
INDUCTOR VALUES = MILLIHENRYS EXCEPT AS NOTED.

Figure 7-90. Schematic Diagram, Frequency Converter CV-126/FRR-24

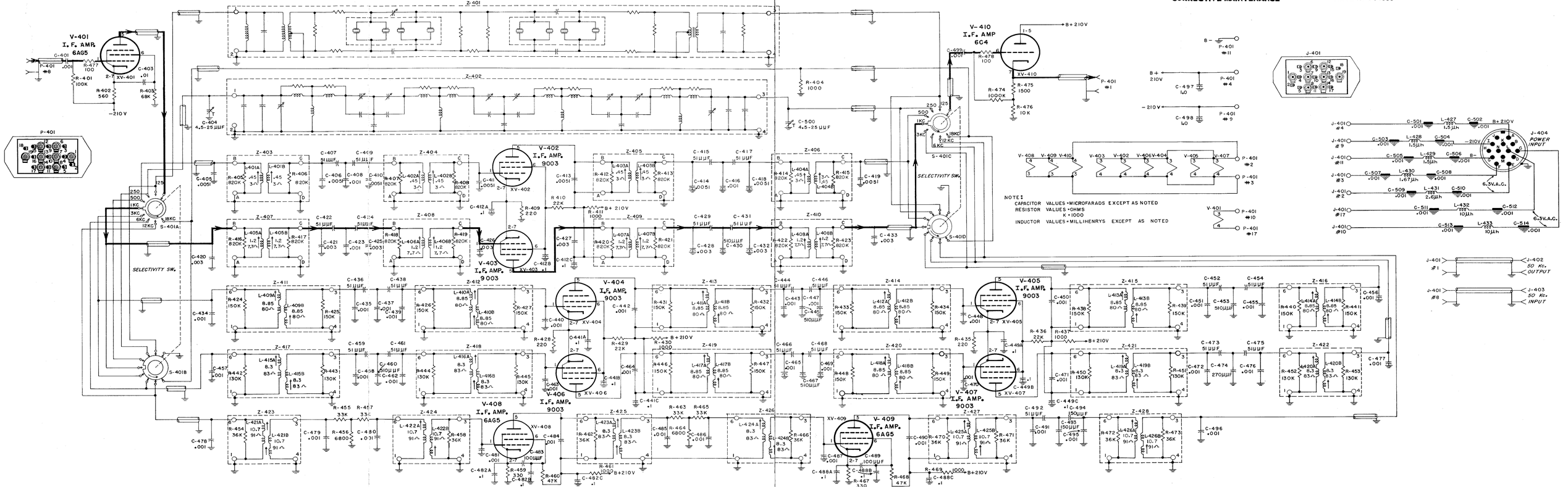
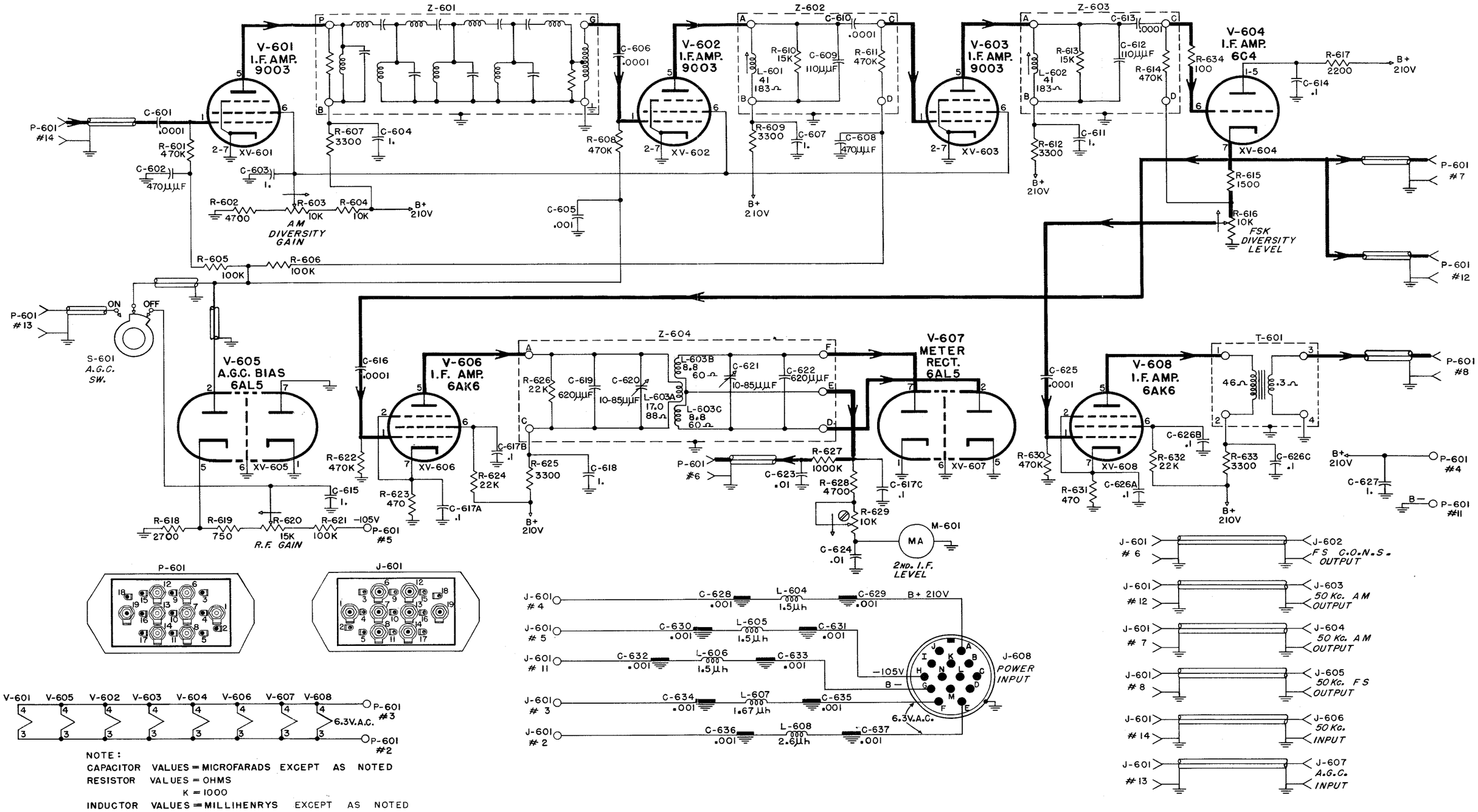


Figure 7–91. Schematic Diagram, Filter Assembly F-99/FRR-24



NOTE:
CAPACITOR VALUES = MICROFARADS EXCEPT AS NOTED
RESISTOR VALUES = OHMS
K = 1000
INDUCTOR VALUES = MILLIHENRYS EXCEPT AS NOTED

Figure 7-92. Schematic Diagram, R.F. Amplifier AM-454/FRR-24

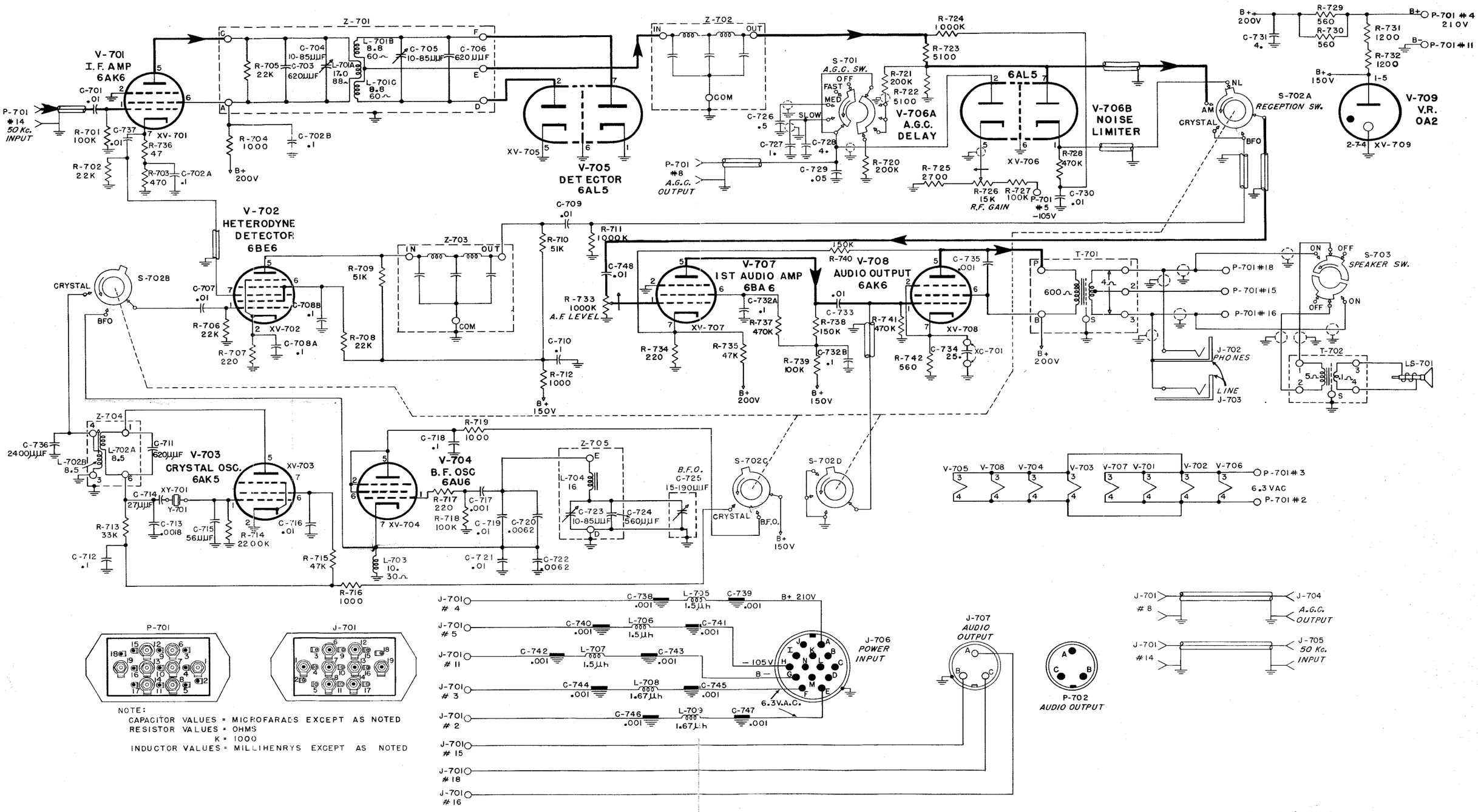
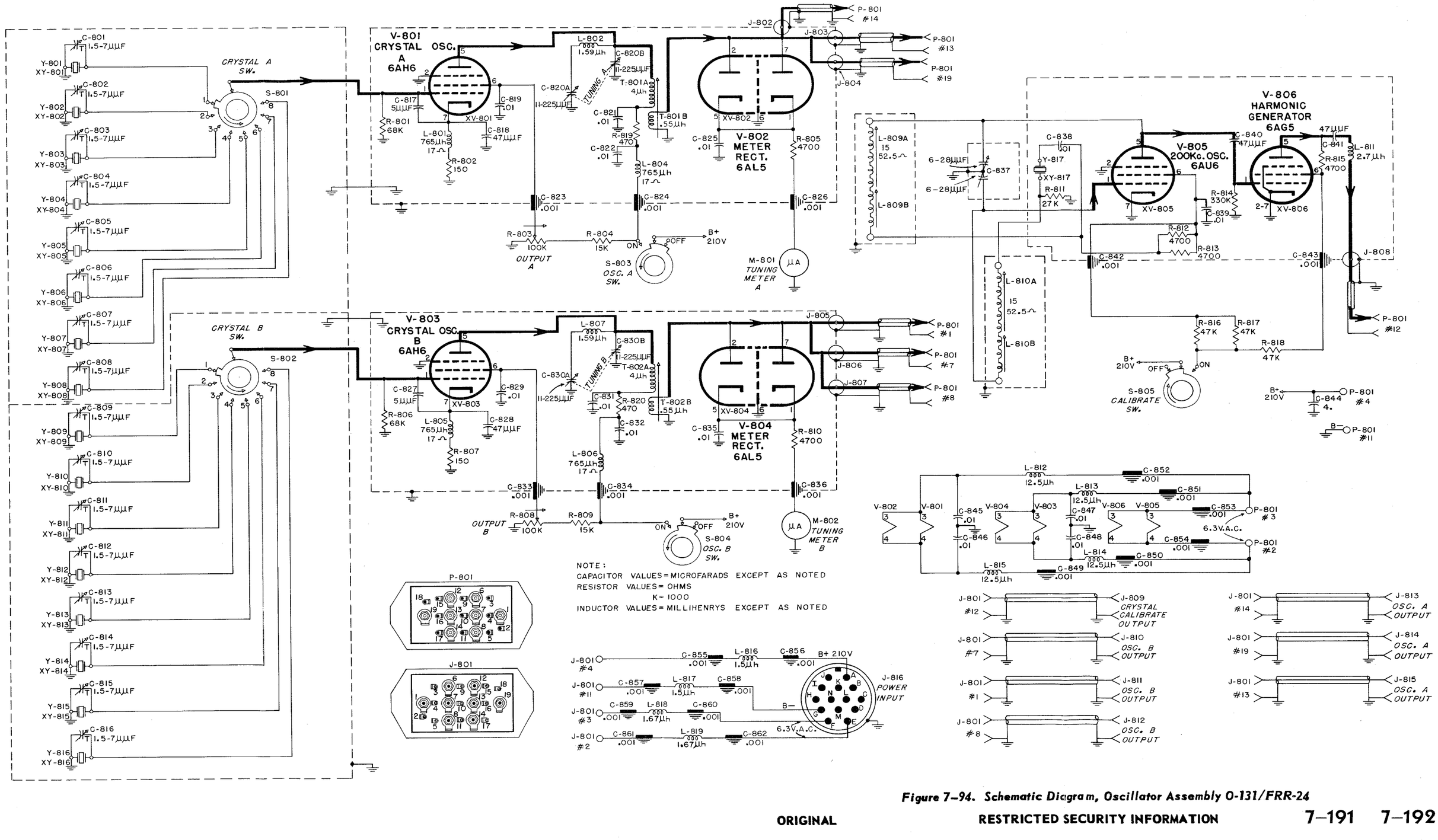


Figure 7–93. Schematic Diagram, Amplifier-Detector AM-439/FRR-24



NOTE:
CAPACITOR VALUES = MICROFARADS EXCEPT AS NOTED
RESISTOR VALUES = OHMS
K = 1000
INDUCTOR VALUES = MILLIHENRYS EXCEPT AS NOTED

Figure 7–94. Schematic Diagram, Oscillator Assembly O-131/FRR-24

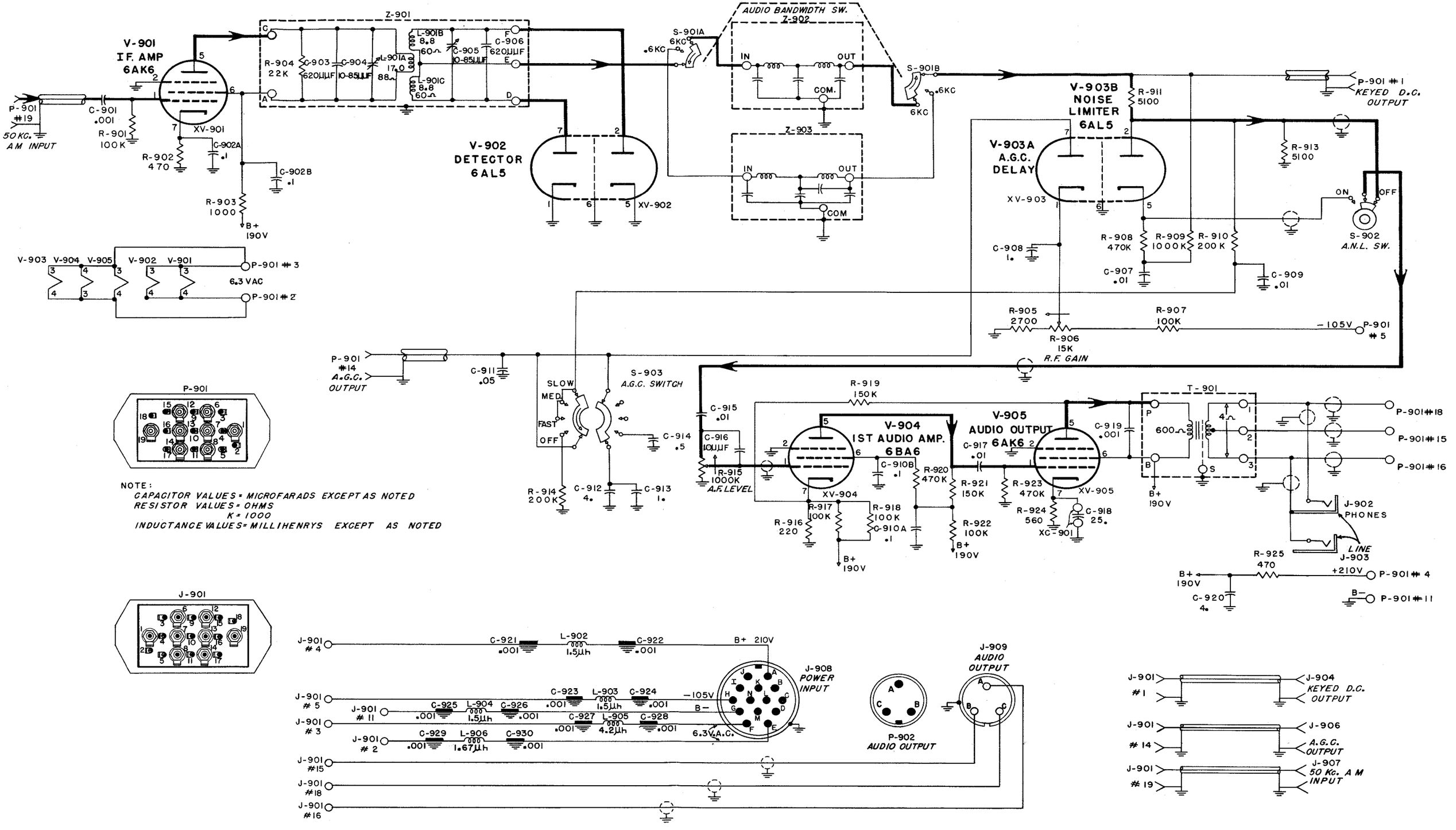


Figure 7–95. Schematic Diagram, Amplifier-Detector AM-440/FRR-24

NOTE:
CAPACITOR VALUES = MICROFARADS EXCEPT AS NOTED
RESISTOR VALUES = OHMS K = 1000
INDUCTOR VALUES = MILLIHENRYS EXCEPT AS NOTED

Figure 7–96. Schematic Diagram, Amplifier-Detector AM-438/FRR-24

NOTE:
CAPACITOR VALUES = MICROFARADS EXCEPT AS NOTED
RESISTOR VALUES = OHMS K = 1000
INDUCTOR VALUES = MILLIHENRYS EXCEPT AS NOTED

Figure 7–97. Schematic Diagram, Keyer KY-62/FRR-24

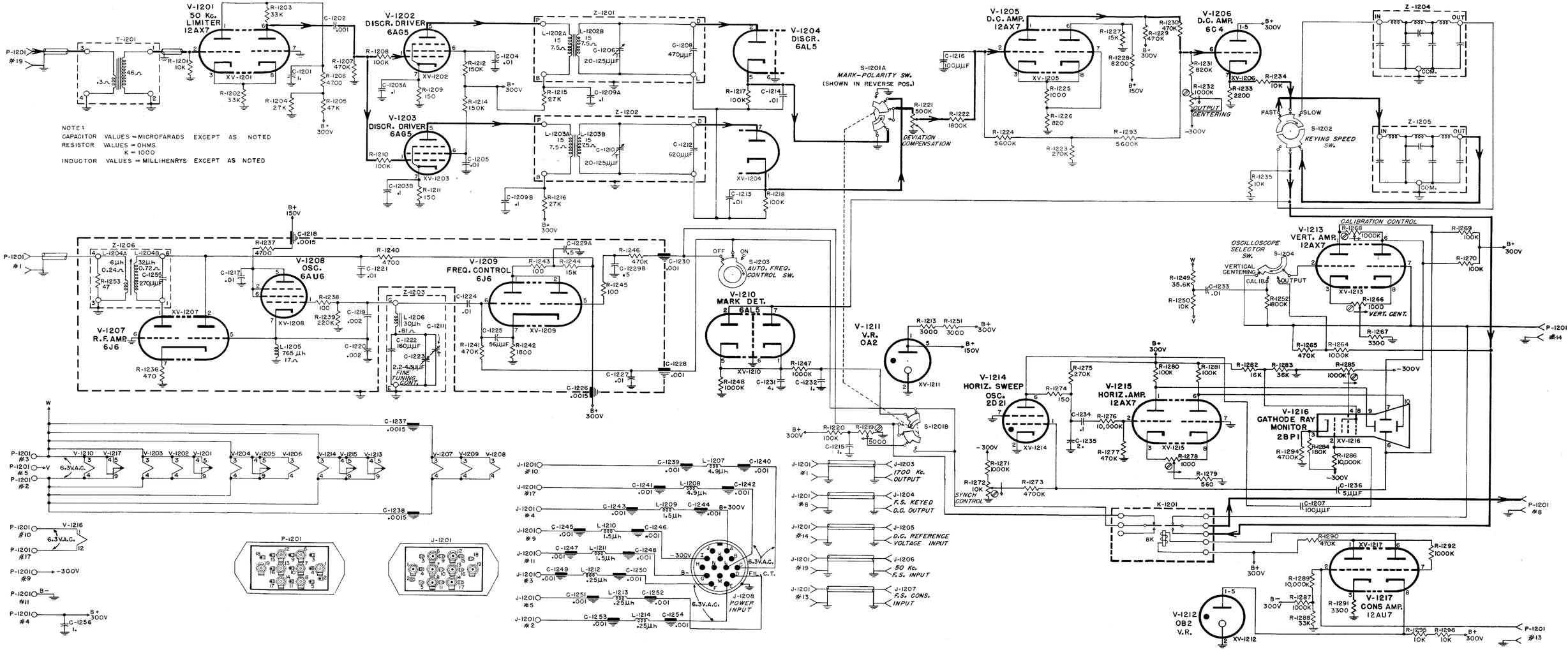
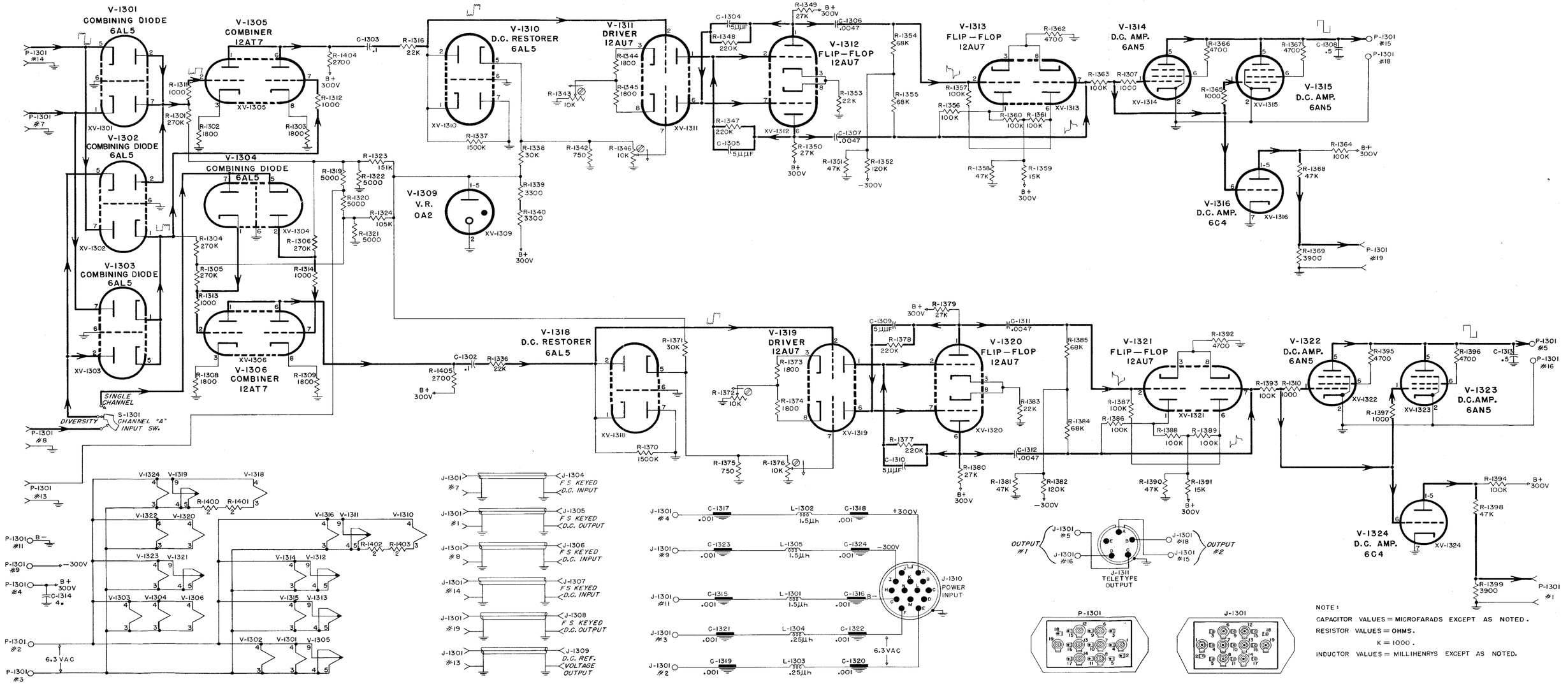


Figure 7–98. Schematic Diagram, Frequency Shift Converter CV-127/FRR-24



NOTE:
CAPACITOR VALUES = MICROFARADS EXCEPT AS NOTED.
RESISTOR VALUES = OHMS.
K = 1000.
INDUCTOR VALUES = MILLIHENRYS EXCEPT AS NOTED.

Figure 7–99. Schematic Diagram, Comparator Keyer CM-32/FRR-24

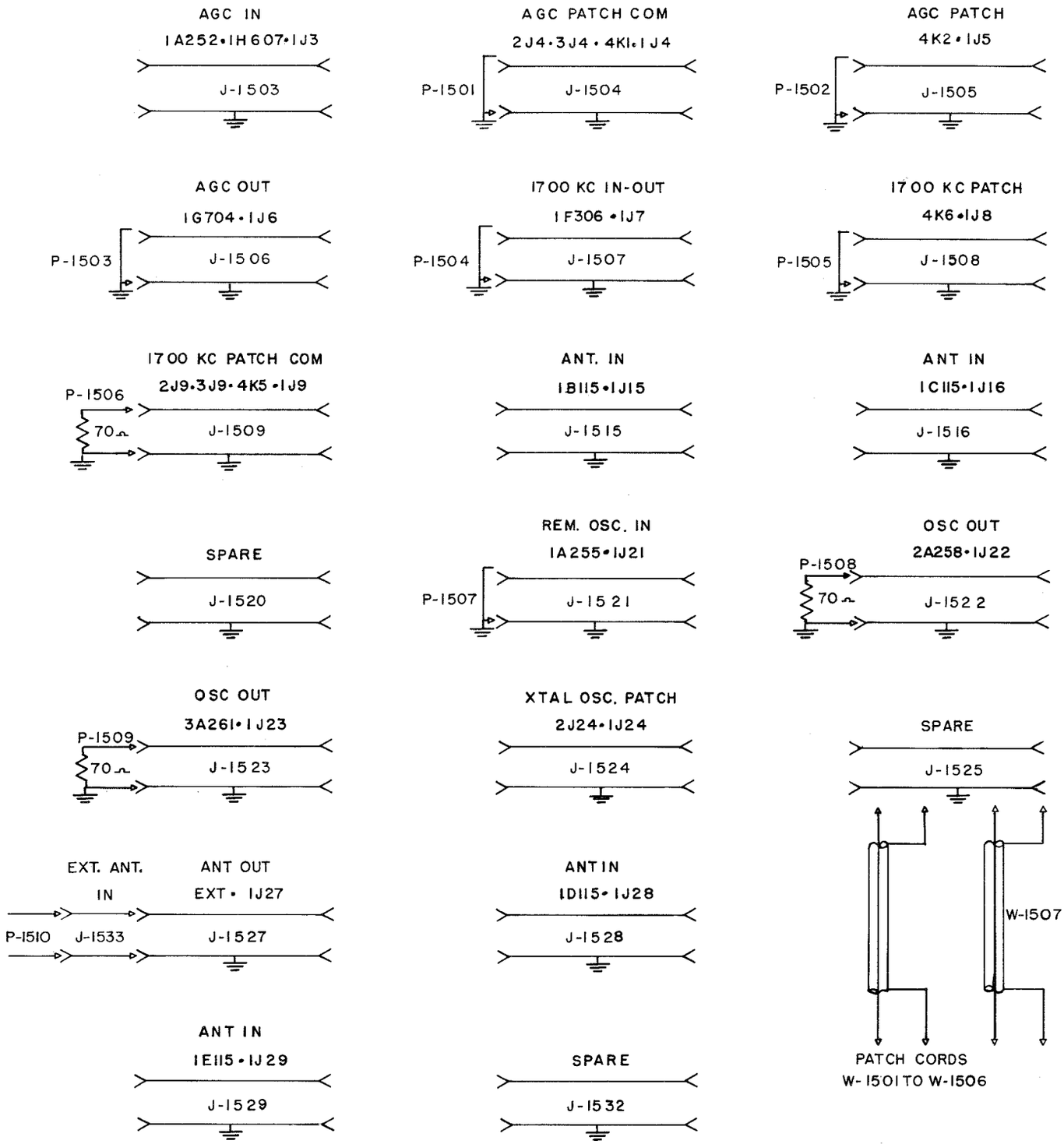


Figure 7–100. Schematic Diagram, Patch Panel SB-138/FRR-24

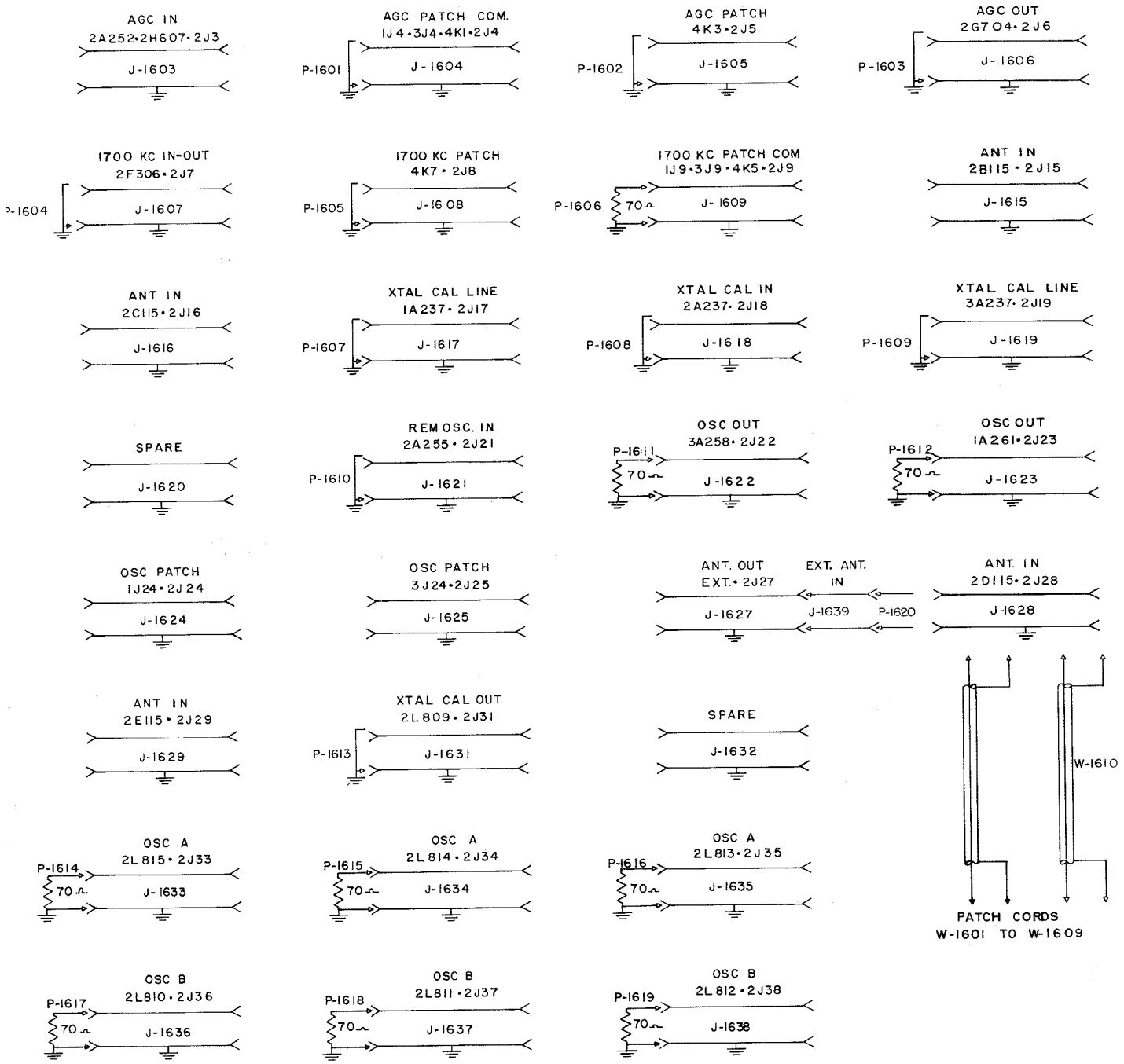


Figure 7–101. Schematic Diagram, Patch Panel SB-140/FRR-24

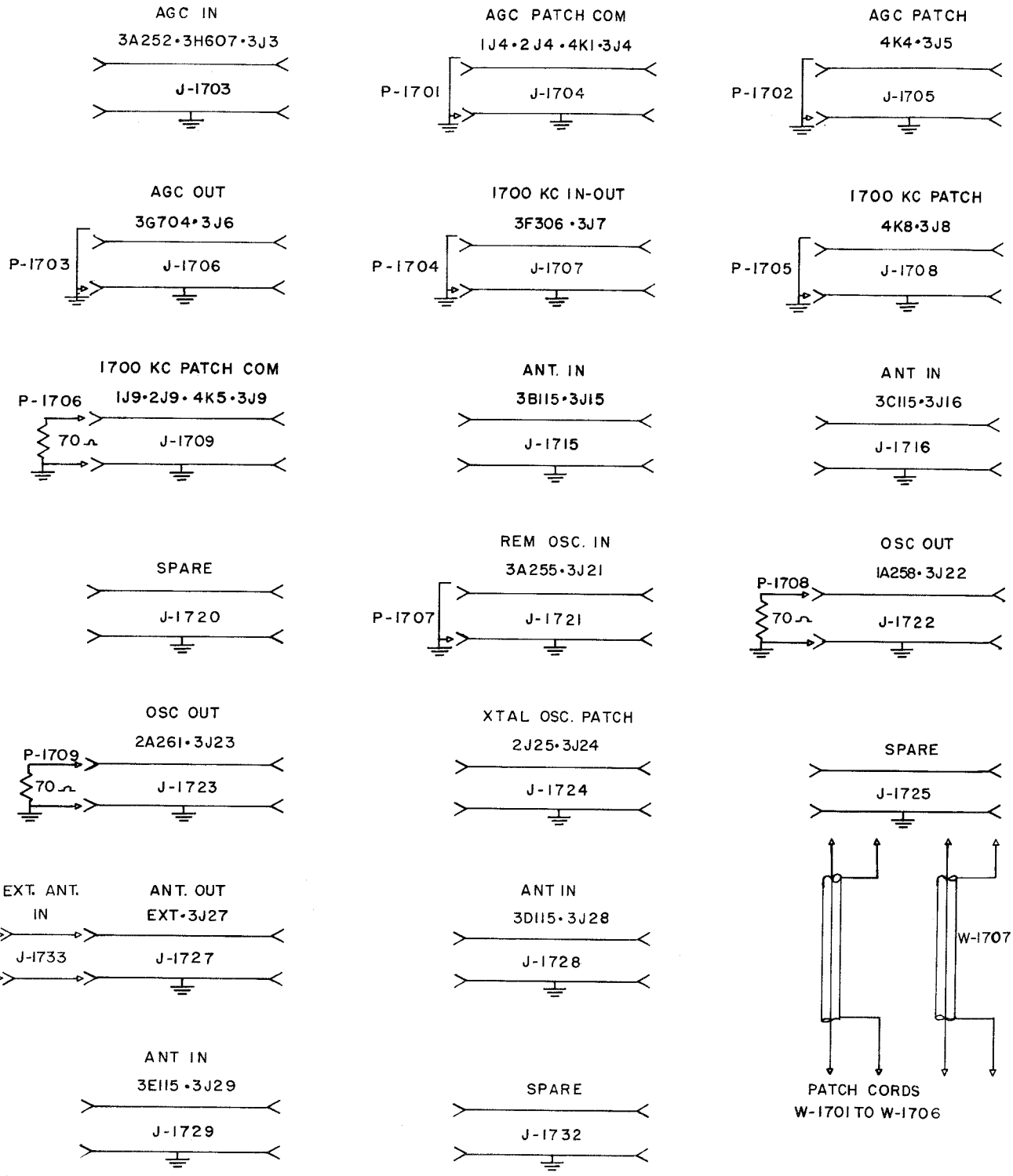


Figure 7–102. Schematic Diagram, Patch Panel SB-169/FRR-24

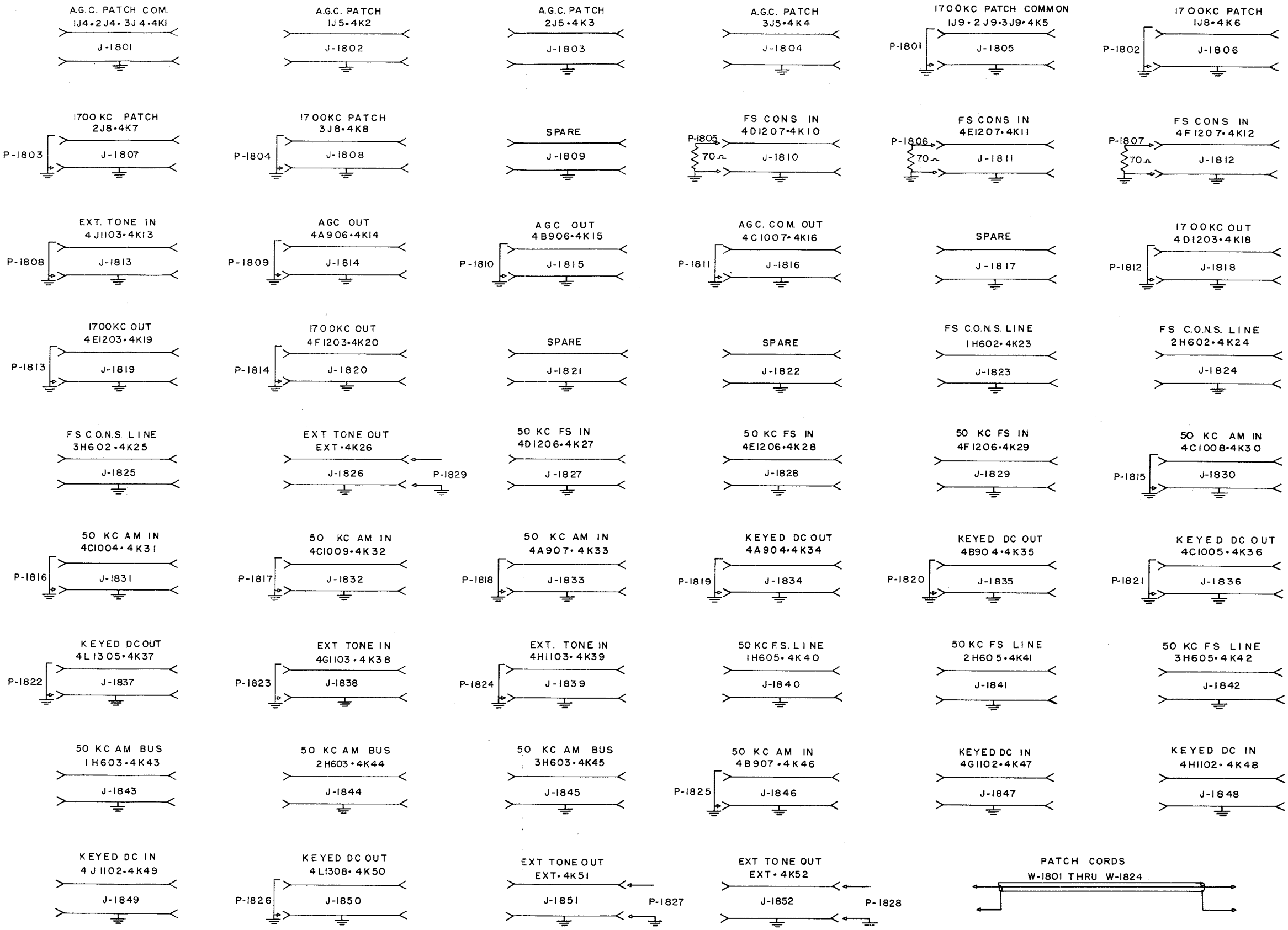
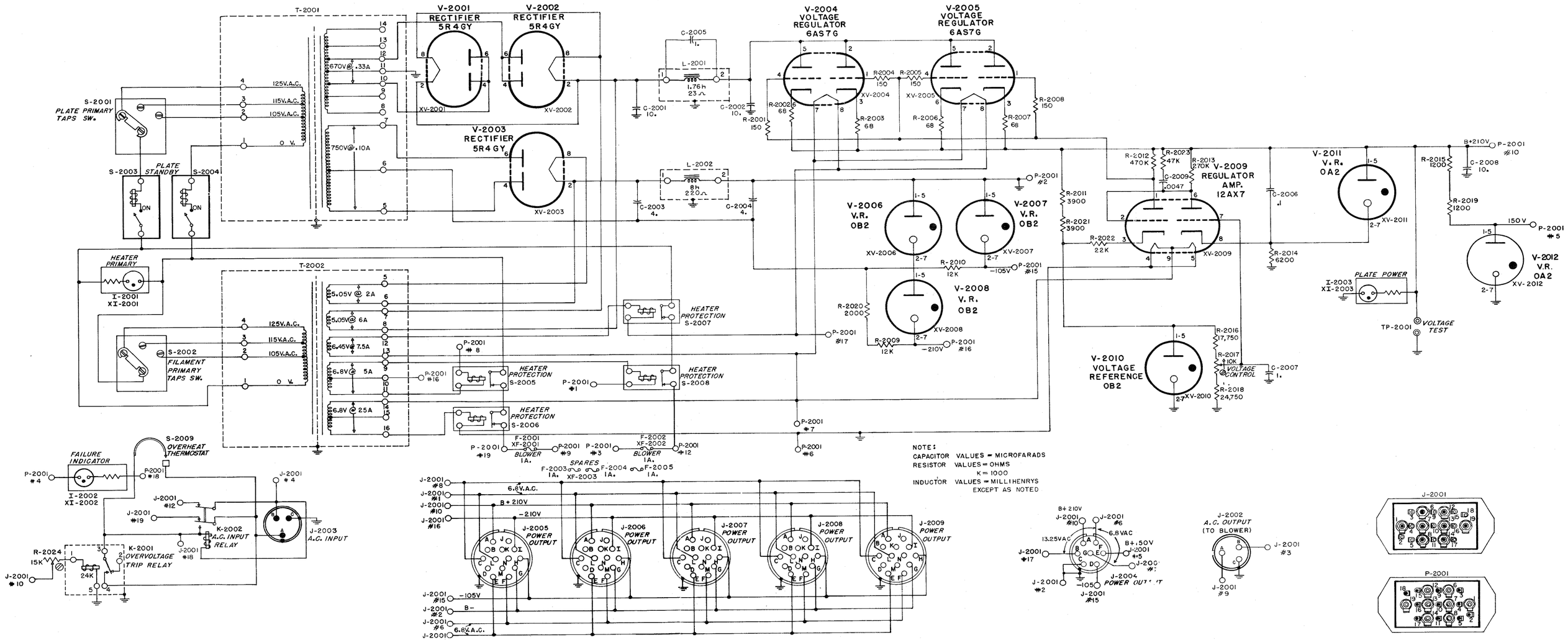
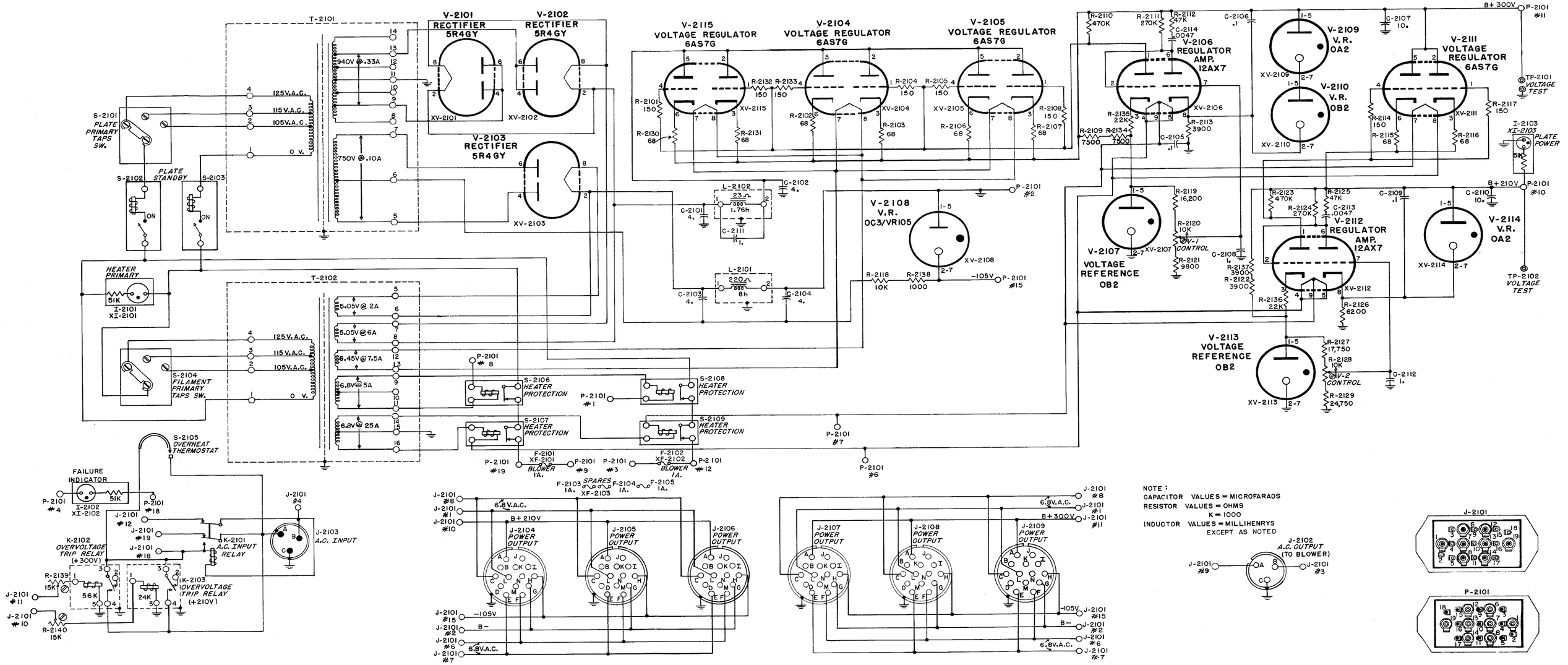


Figure 7–103. Schematic Diagram, Patch Panel SB-143/FRR-24



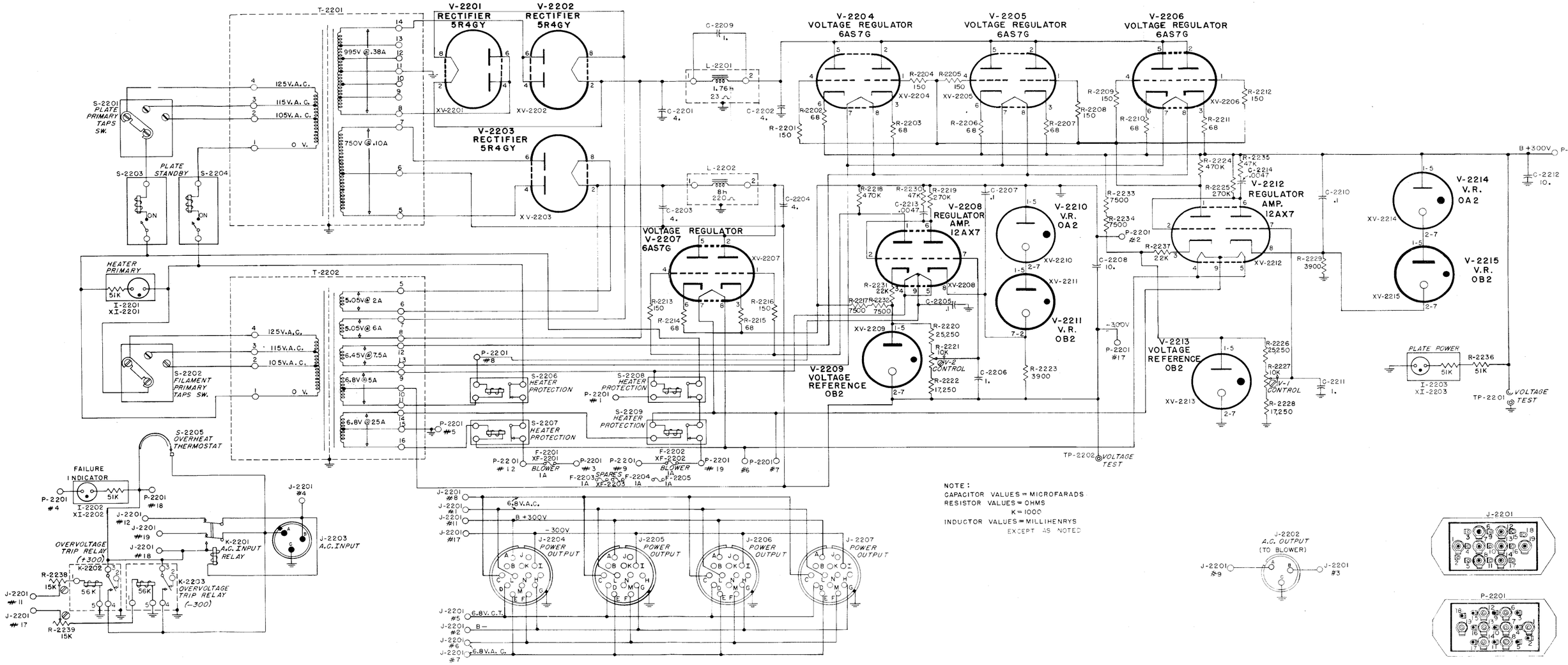
NOTE:
CAPACITOR VALUES = MICROFARADS
RESISTOR VALUES = OHMS
K = 1000
INDUCTOR VALUES = MILLIHENRYS
EXCEPT AS NOTED

Figure 7-104. Schematic Diagram, Power Supply PP-590/FRR-24



NOTE :
CAPACITOR VALUES = MICROFARADS
RESISTOR VALUES = OHMS
K = 1000
INDUCTOR VALUES = MILLIHENRYS
EXCEPT AS NOTED

Figure 7–105. Schematic Diagram, Power Supply PP-649/FRR-24



NOTE:
CAPACITOR VALUES = MICROFARADS
RESISTOR VALUES = OHMS
K = 1000
INDUCTOR VALUES = MILLIHENRYS
EXCEPT AS NOTED

Figure 7–106. Schematic Diagram, Power Supply PP-648/FRR-24

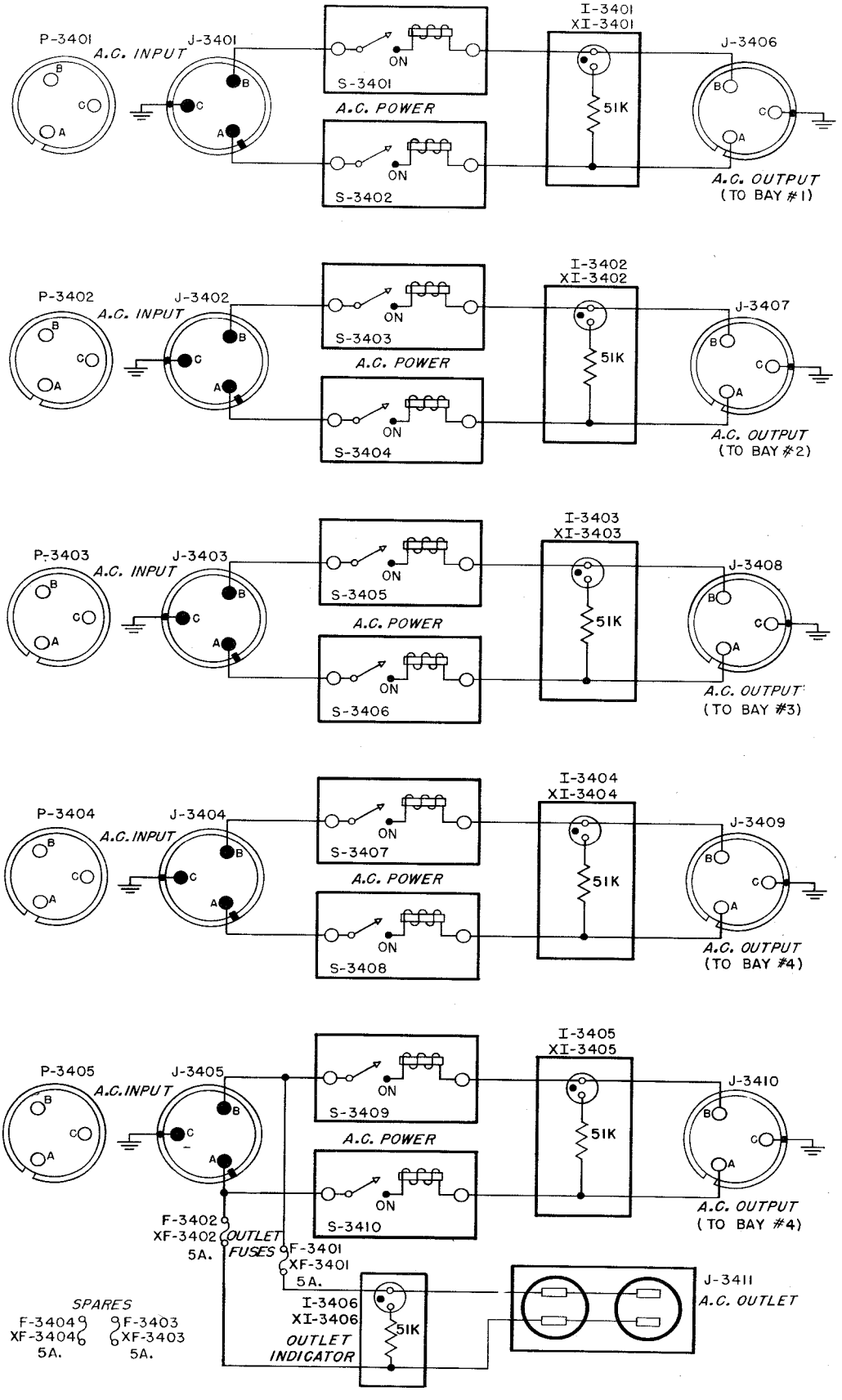


Figure 7–107. Schematic Diagram, Power Distribution Panel SB-141/FRR-24

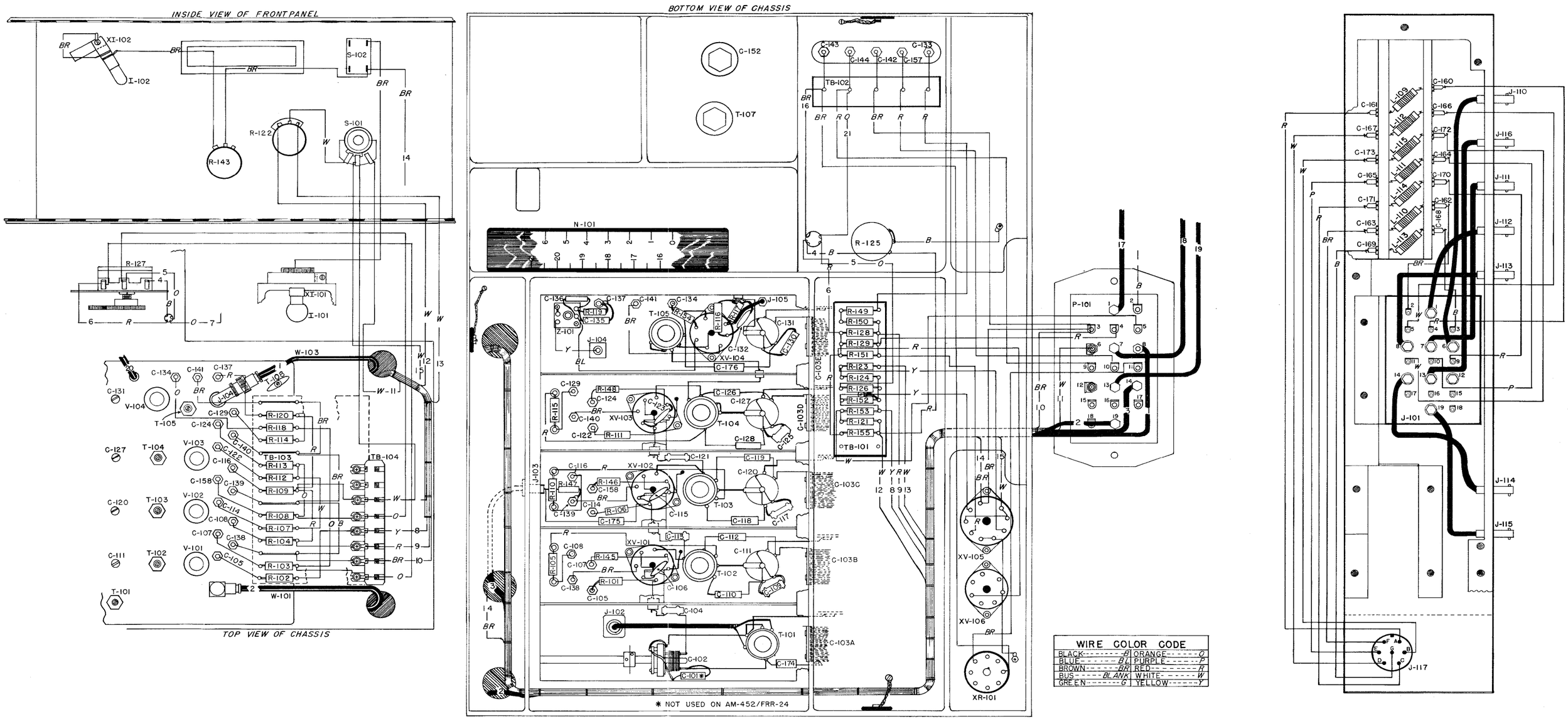


Figure 7–108A. Practical Wiring Diagram, Bottom of Chassis and R.F. Filter Compartment, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

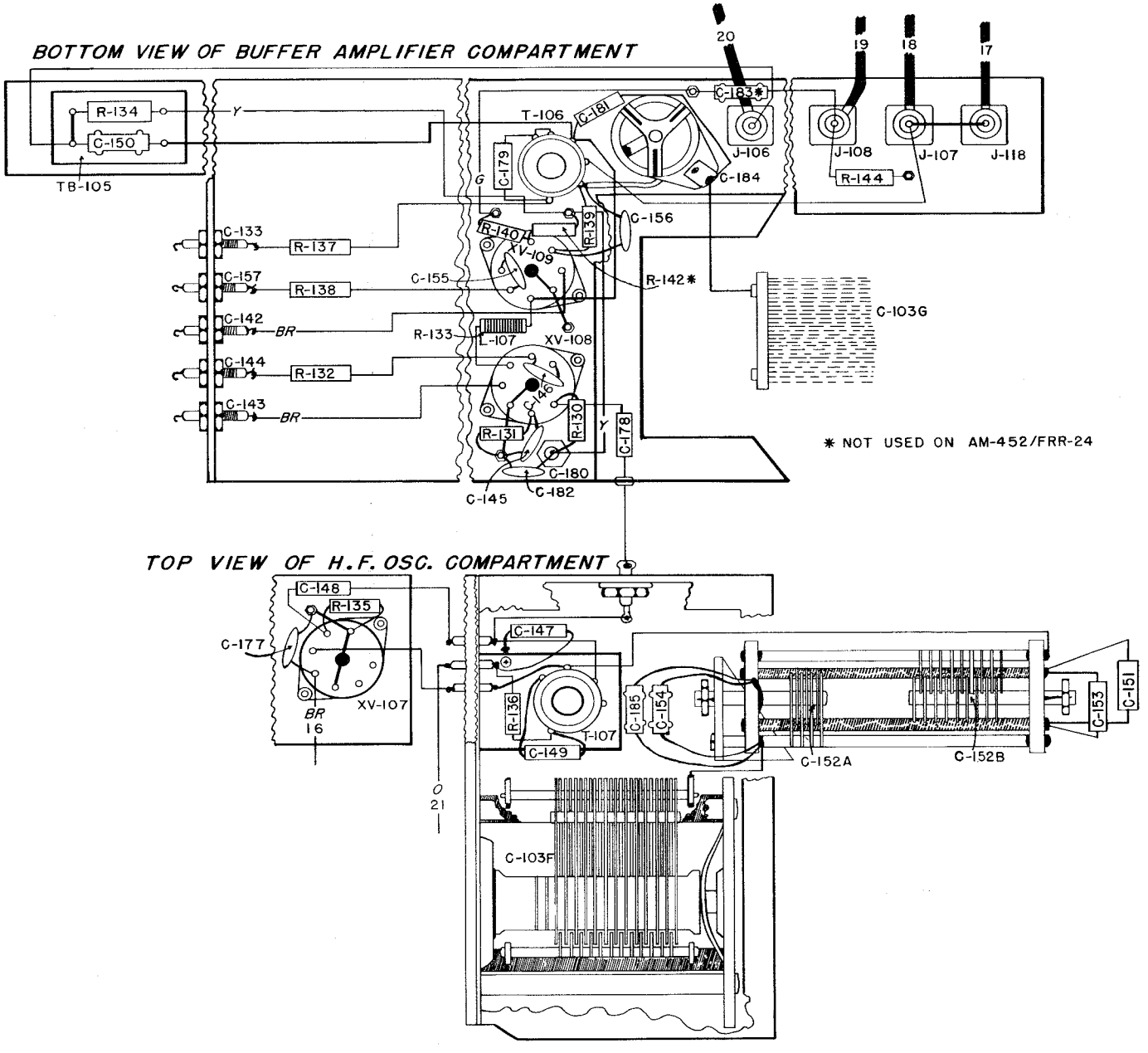


Figure 7–108B. Practical Wiring Diagram, Oscillator and Buffer Compartments, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

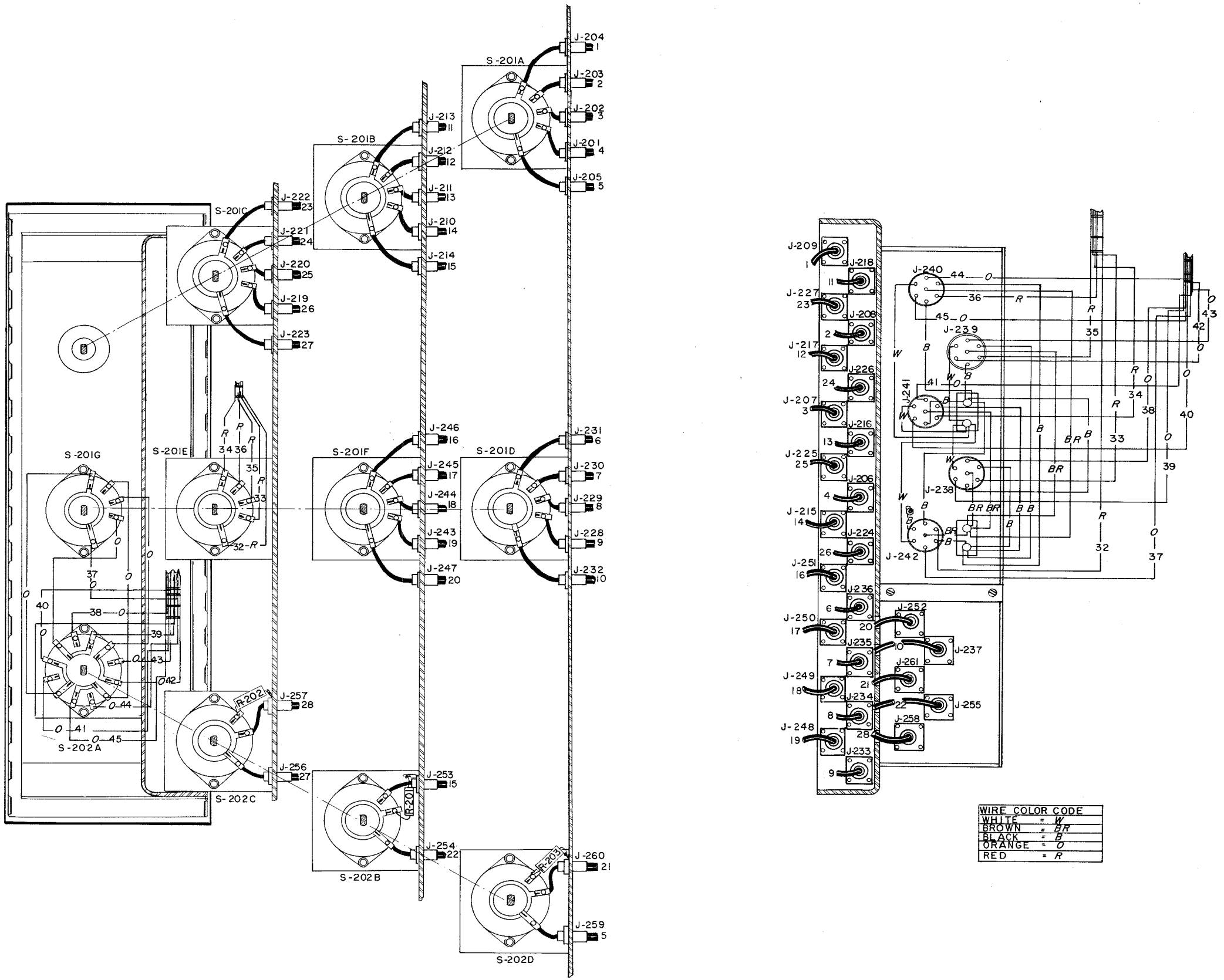
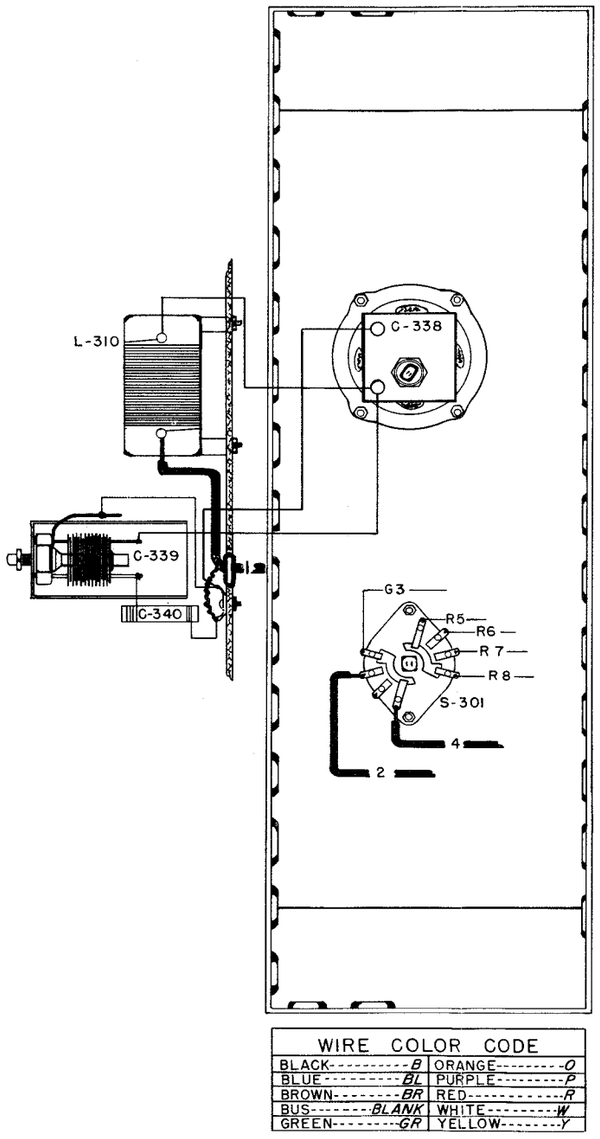


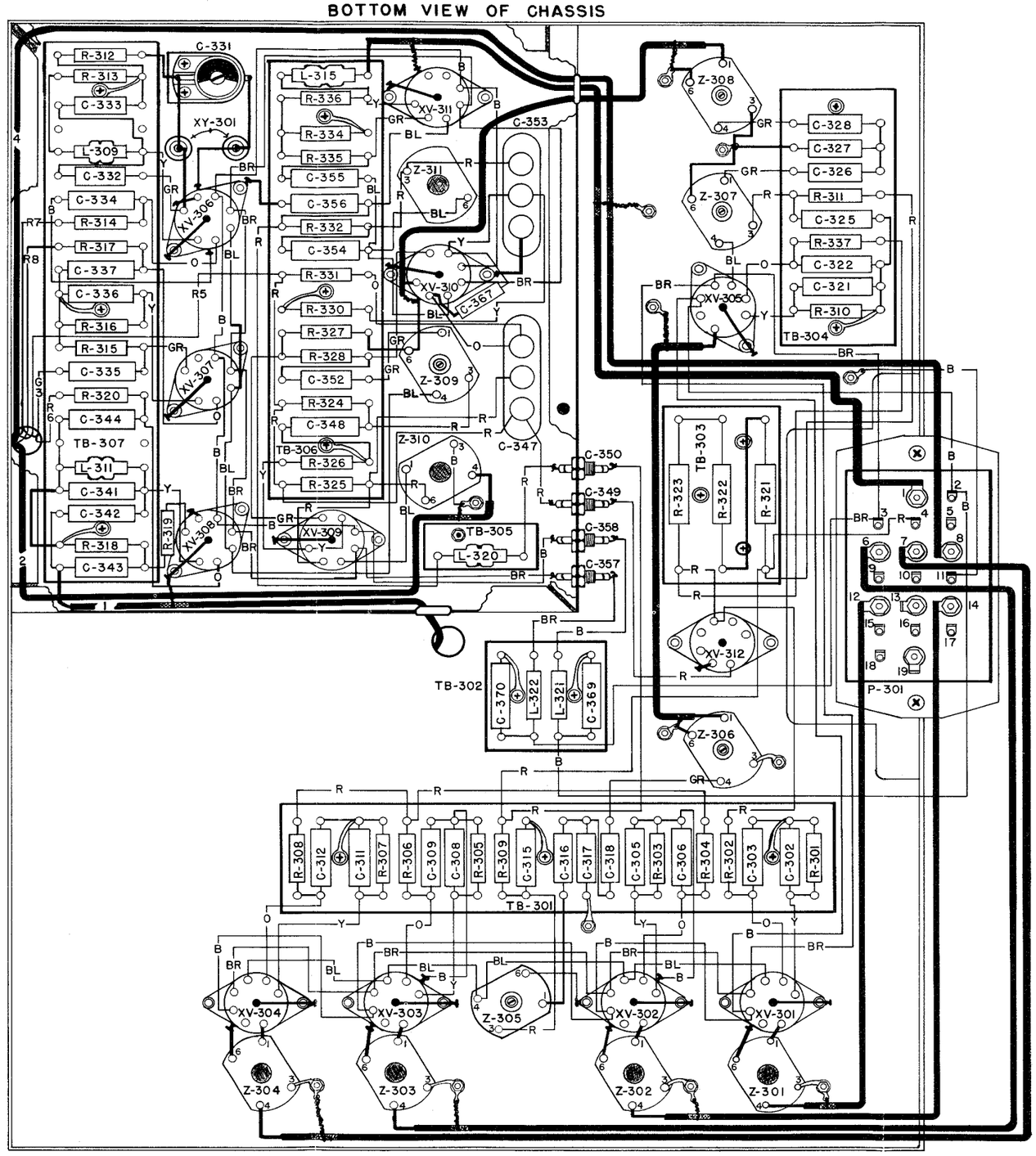
Figure 7–109. Practical Wiring Diagram, Control Panel SB-142/FRR-24

REAR VIEW OF FRONT PANEL



WIRE COLOR CODE			
BLACK	B	ORANGE	O
BLUE	BL	PURPLE	P
BROWN	BR	RED	R
BUS	BLANK	WHITE	W
GREEN	GR	YELLOW	Y

BOTTOM VIEW OF CHASSIS



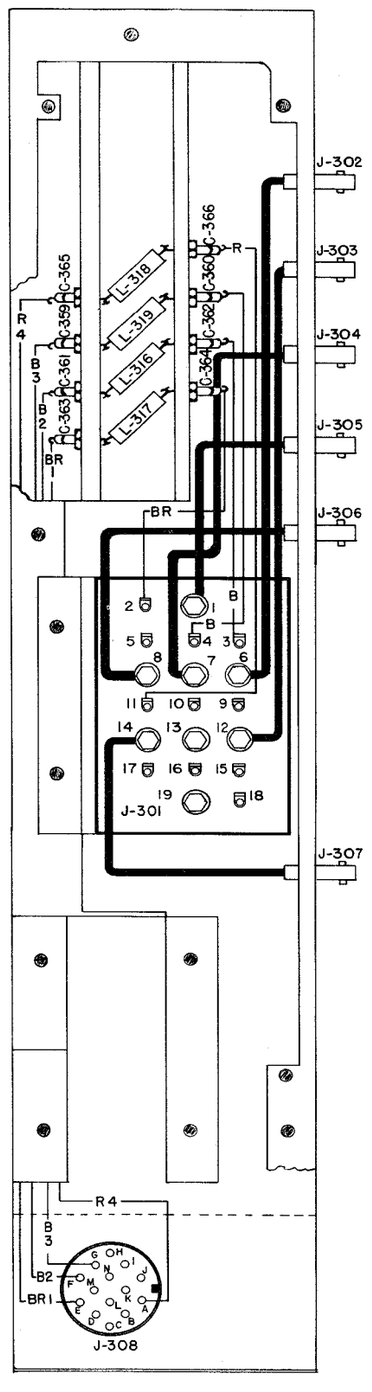
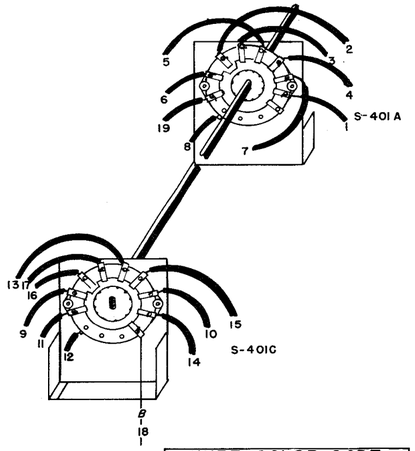


Figure 7–110. Practical Wiring Diagram, Frequency Converter CV-126/FRR-24



WIRE COLOR CODE			
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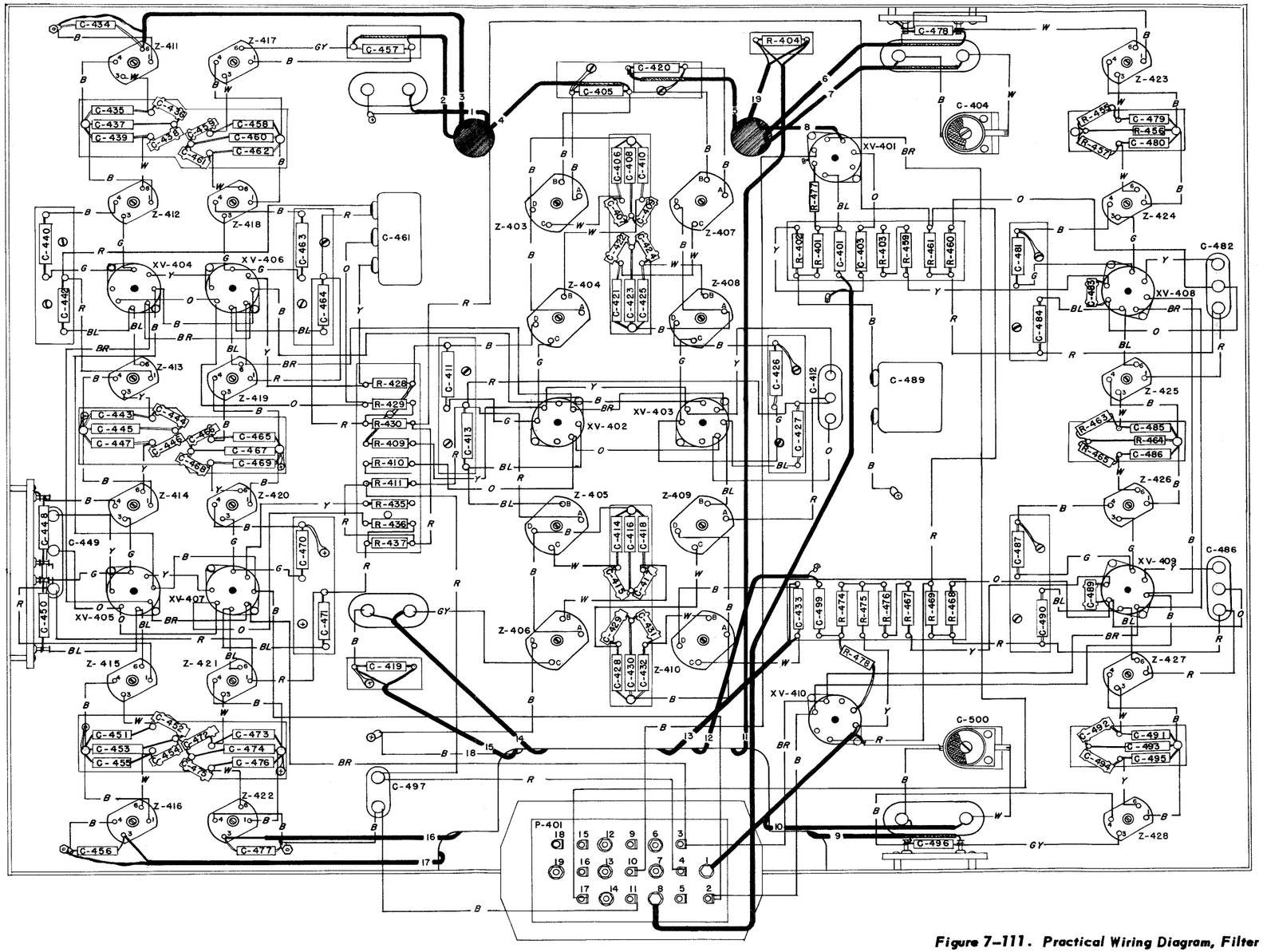
BLUE	BL	RED	R
BROWN	BR	GRAY	GR
BUS	BLANK	WHITE	W
GREEN	G	YELLOW	Y



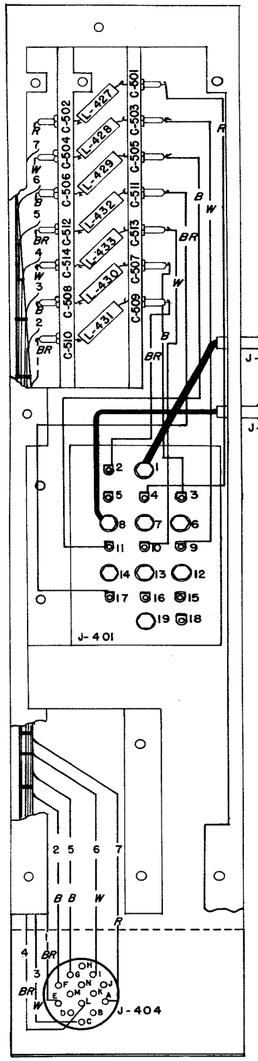
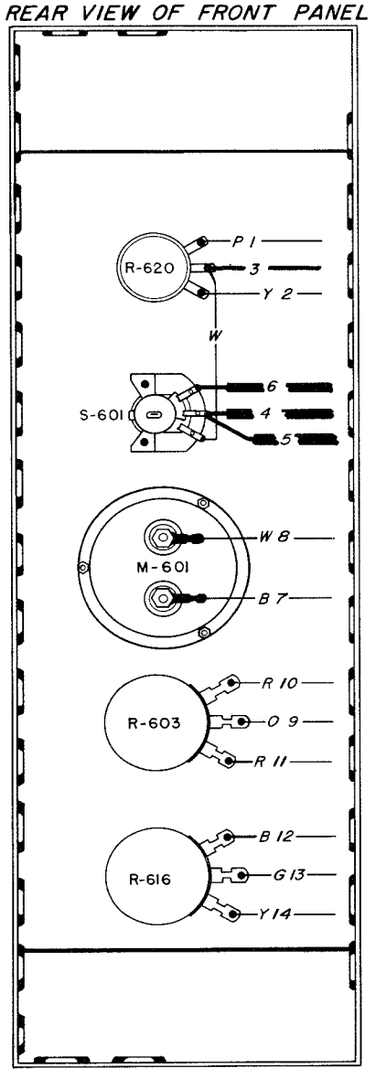


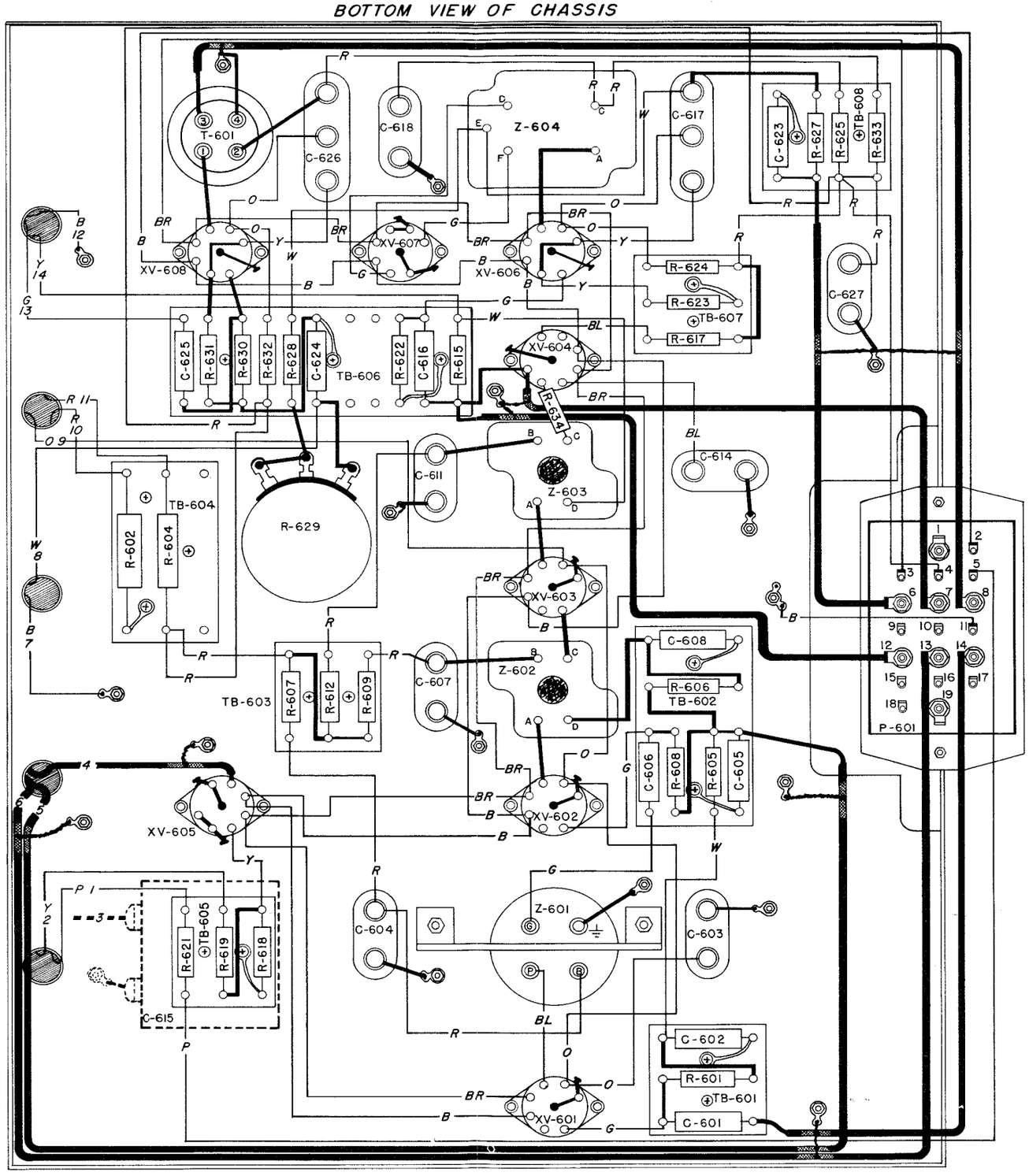
Figure 7-111. Practical Wiring Diagram, Filter Assembly F-99/FRR-24

REAR VIEW OF FRONT PANEL



WIRE COLOR CODE			
BLACK	B	ORANGE	O
BLUE	BL	PURPLE	P
BROWN	BR	RED	R
BUS	BLANK	WHITE	W
GREEN	G	YELLOW	Y

BOTTOM VIEW OF CHASSIS



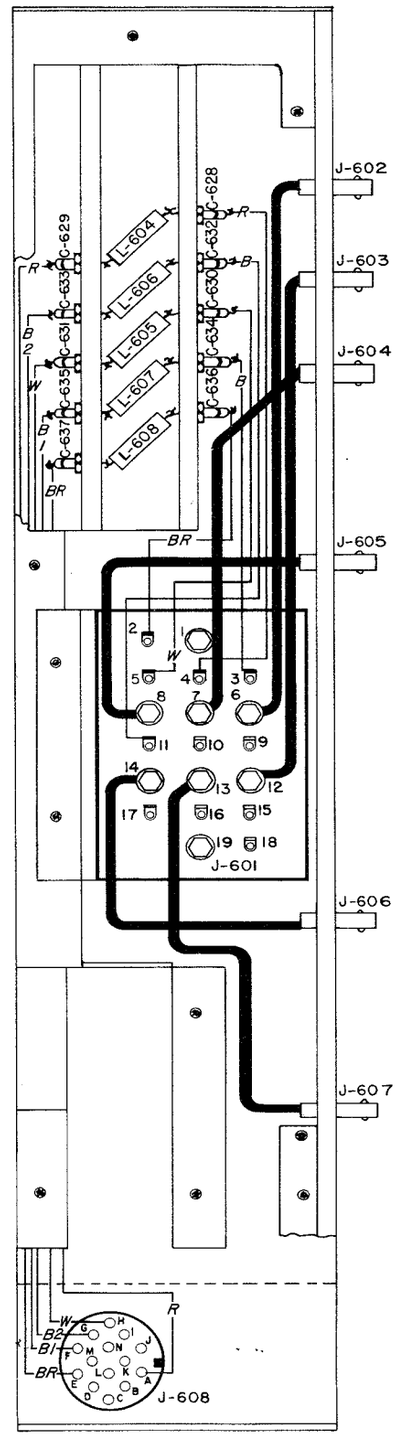


Figure 7–112. Practical Wiring Diagram, R.F. Amplifier AM-454/FRR-24

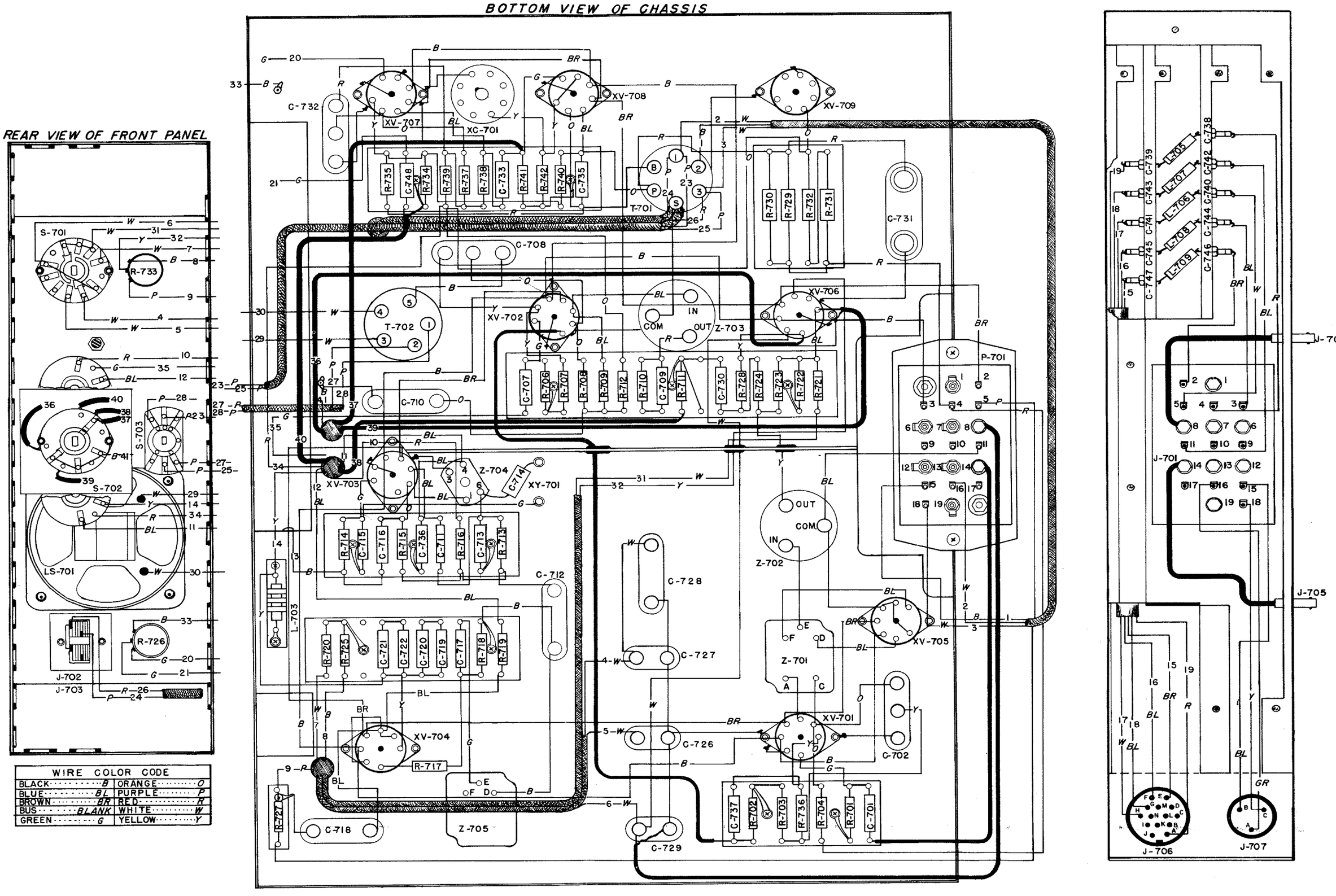


Figure 7–113. Practical Wiring Diagram, Amplifier-Detector AM-439/FRR-24

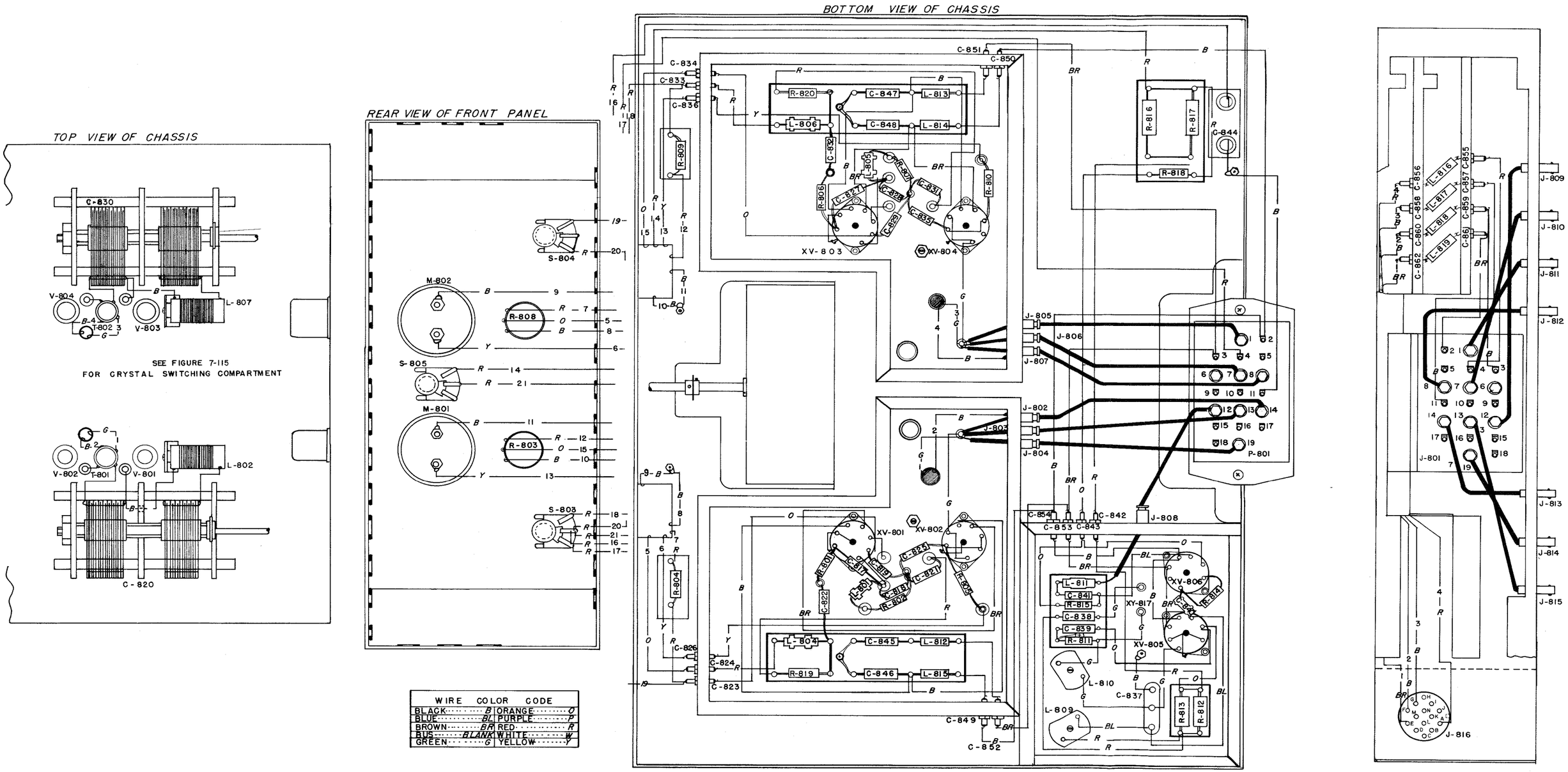


Figure 7-114. Practical Wiring Diagram, Oscillator Assembly O-131/FRR-24 (Excluding Crystal Compartment)

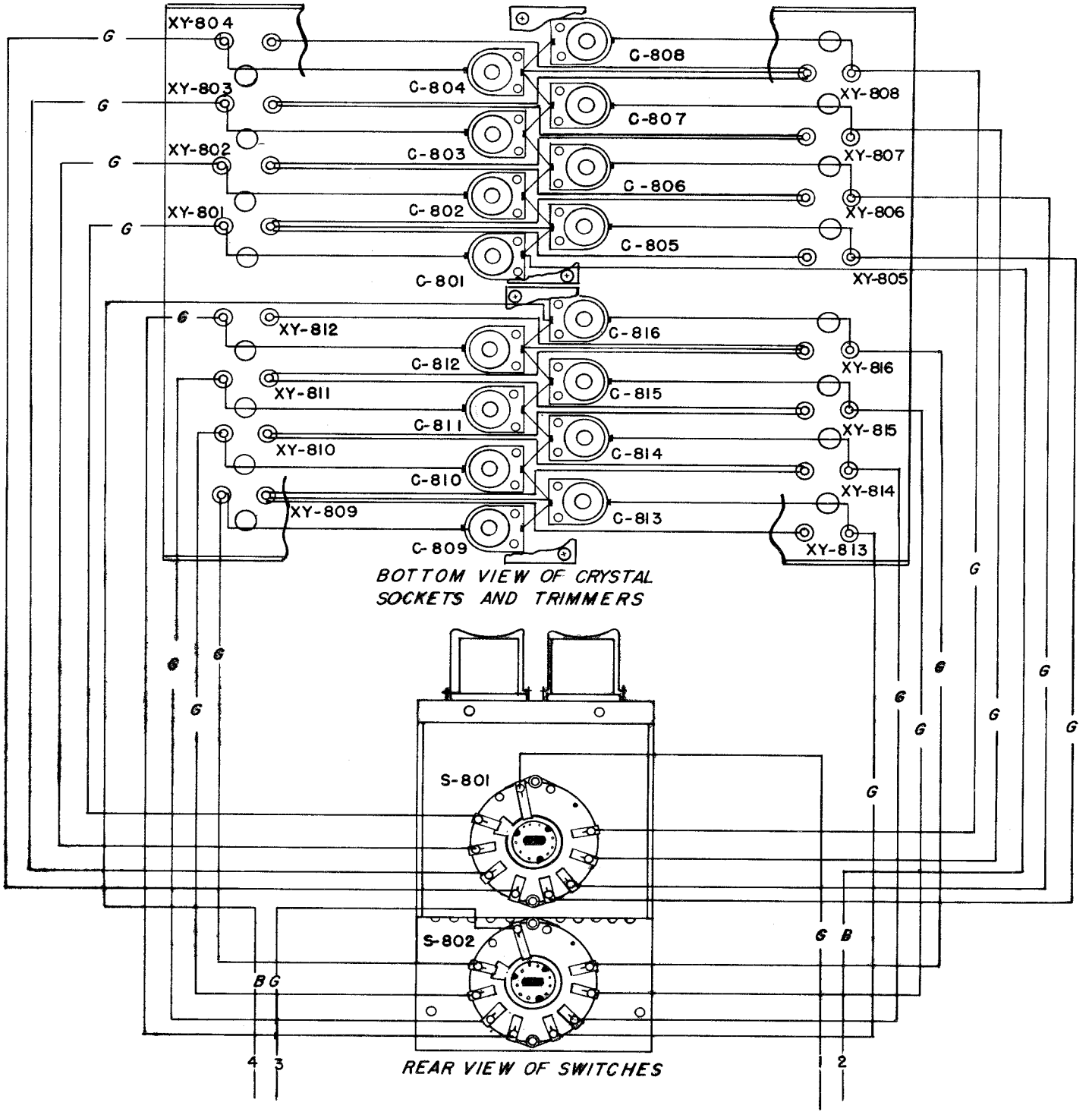


Figure 7–115. Practical Wiring Diagram, Crystal Compartment, Oscillator Assembly O-131 /FRR-24

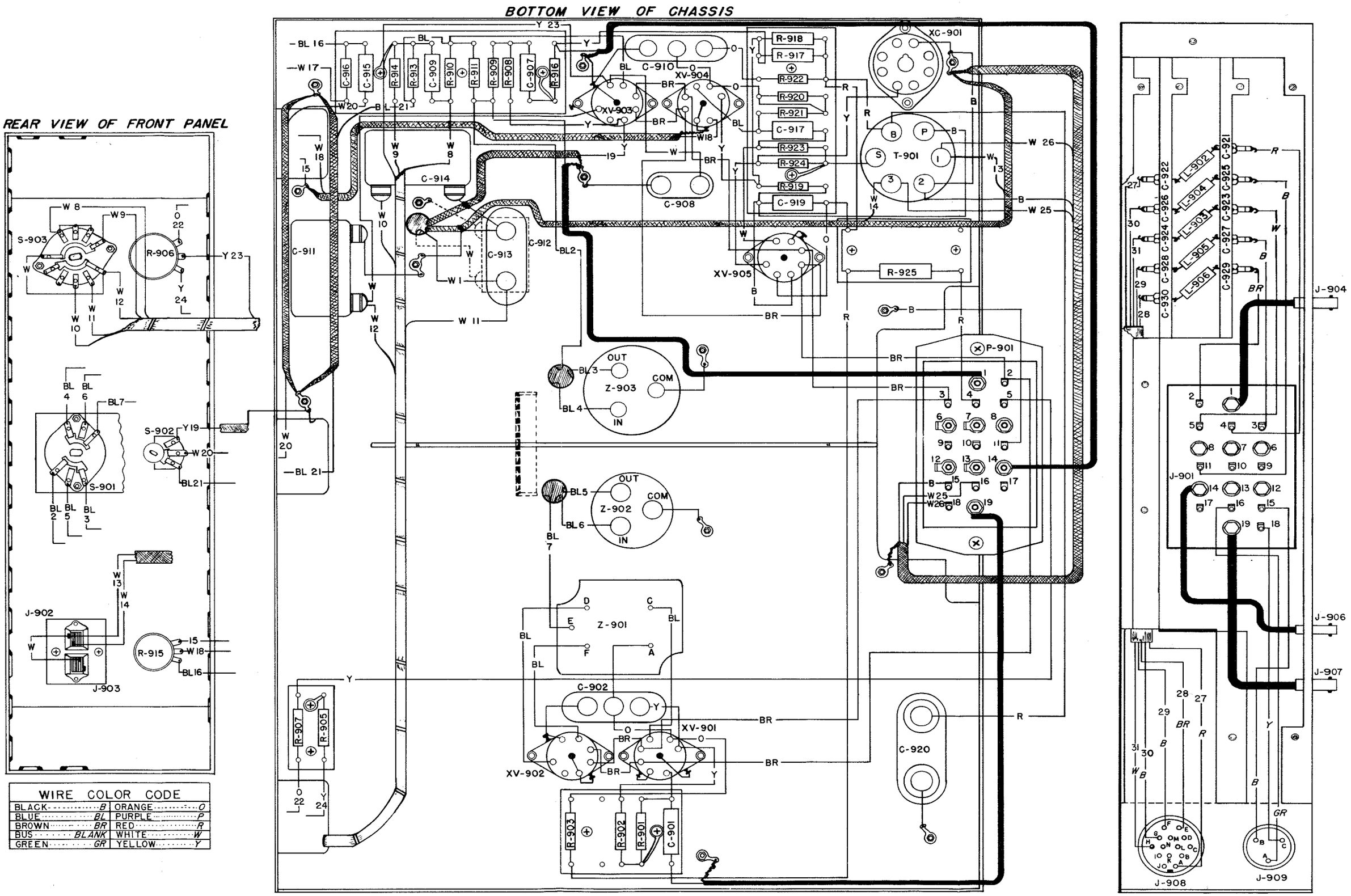


Figure 7–116. Practical Wiring Diagram, Amplifier-Detector AM-440/FRR-24

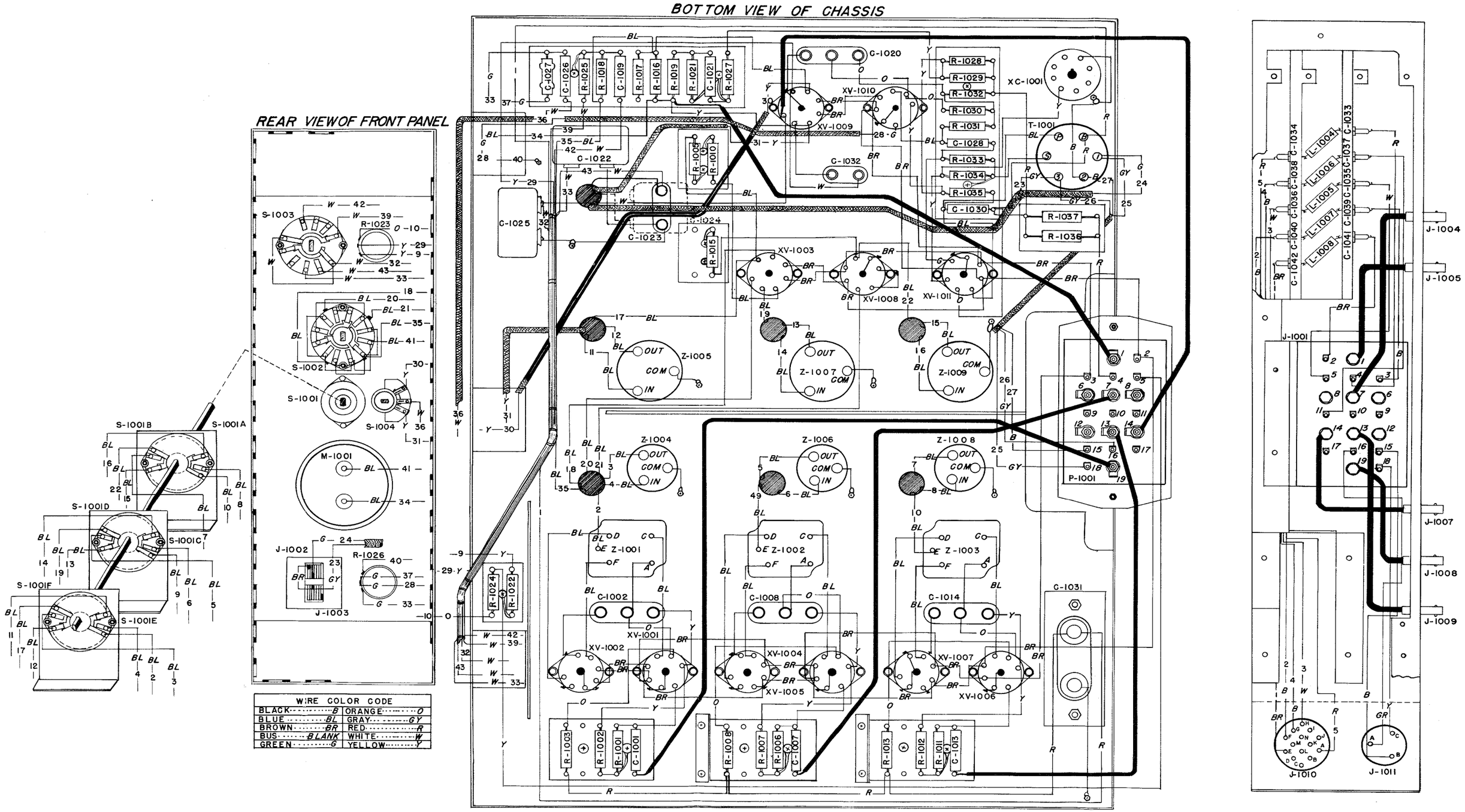


Figure 7–117. Practical Wiring Diagram, Amplifier-Detector AM-438/FRR-24

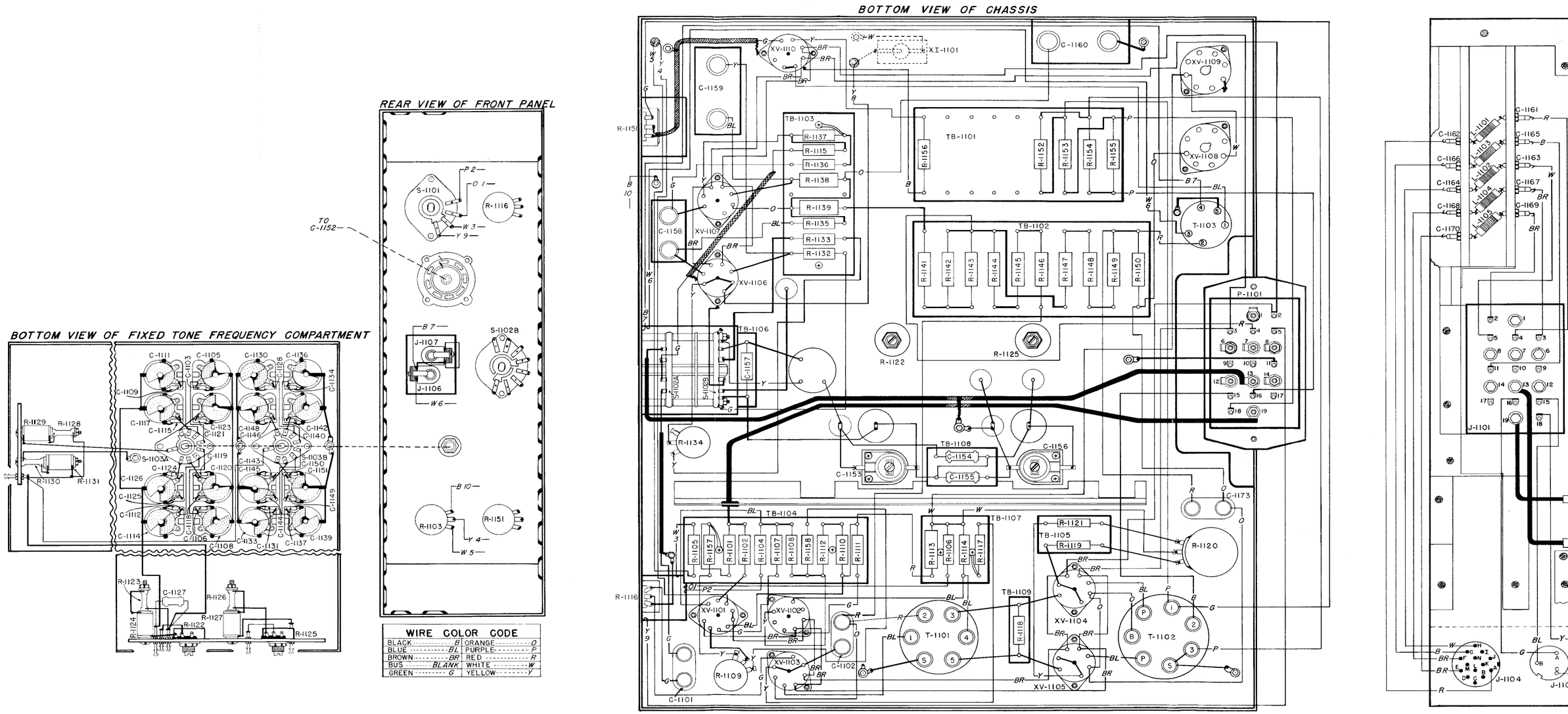
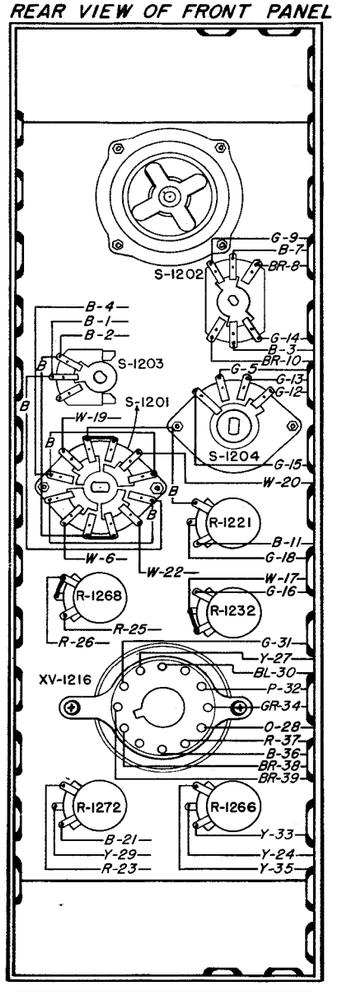


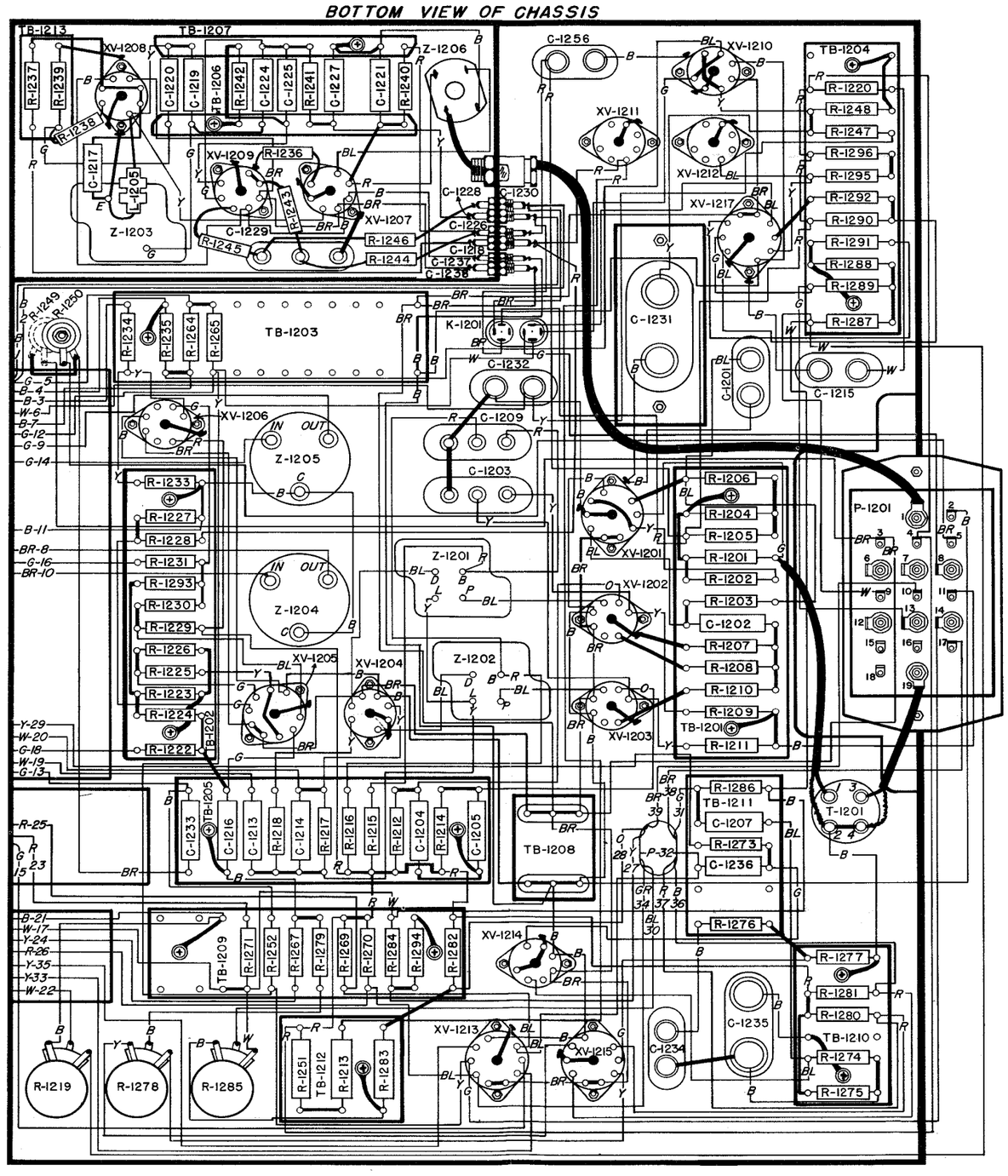
Figure 7–118. Practical Wiring Diagram, Keyer KY-62/FRR-24

REAR VIEW OF FRONT PANEL



WIRE COLOR CODE			
BLACK	B	ORANGE	O
BLUE	BL	PURPLE	P
BROWN	BR	RED	R
BUS	BLANK	WHITE	W
GREEN	G	YELLOW	Y
GRAY	GR		

BOTTOM VIEW OF CHASSIS



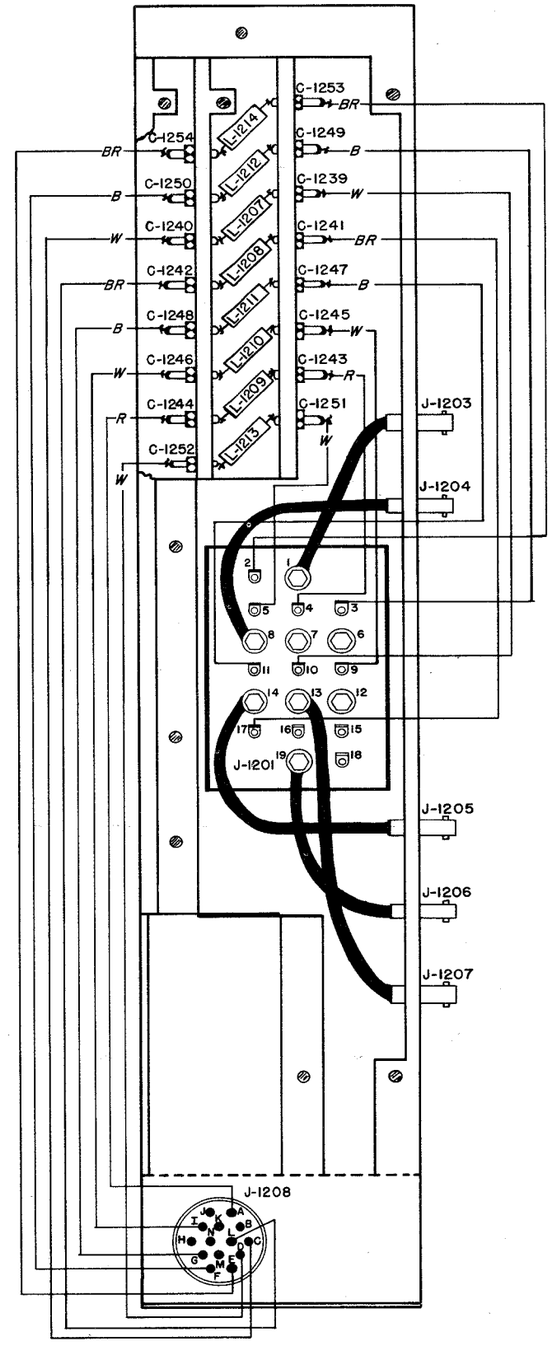


Figure 7–119. Practical Wiring Diagram, Frequency Shift Converter CV-127/FRR-24

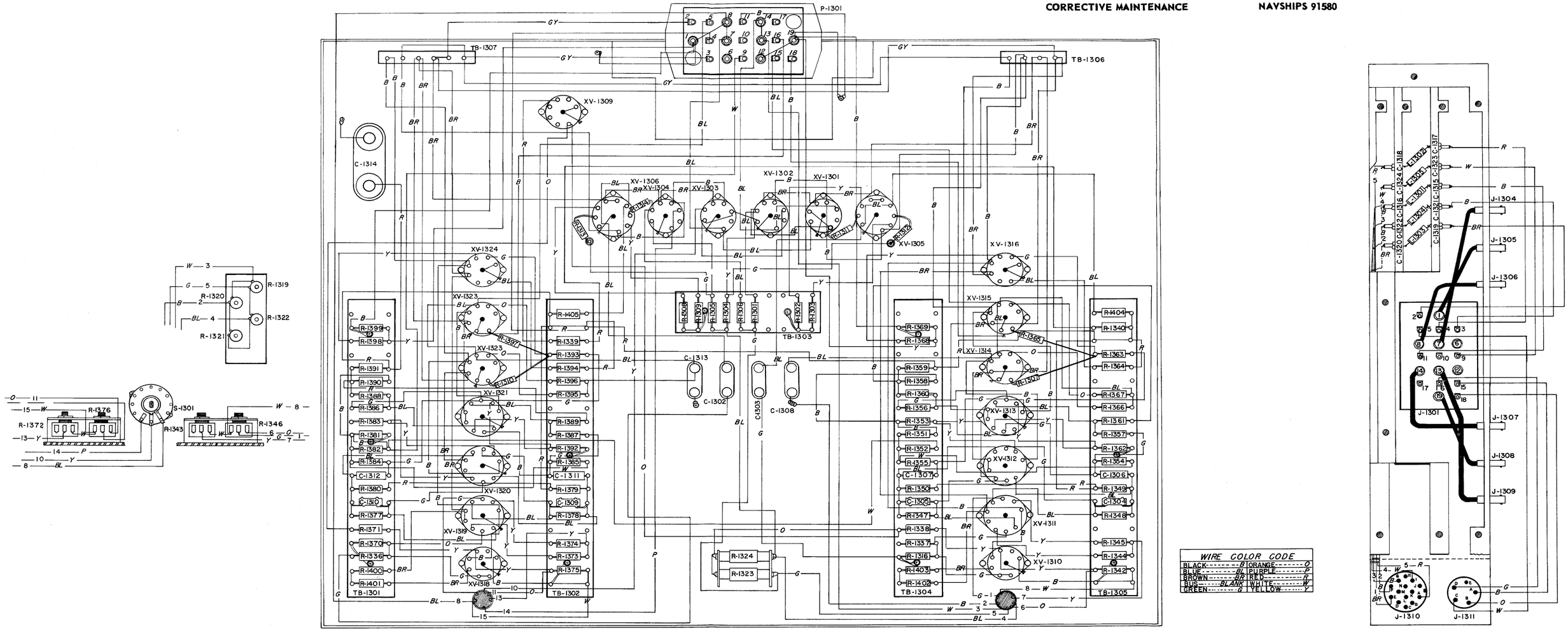
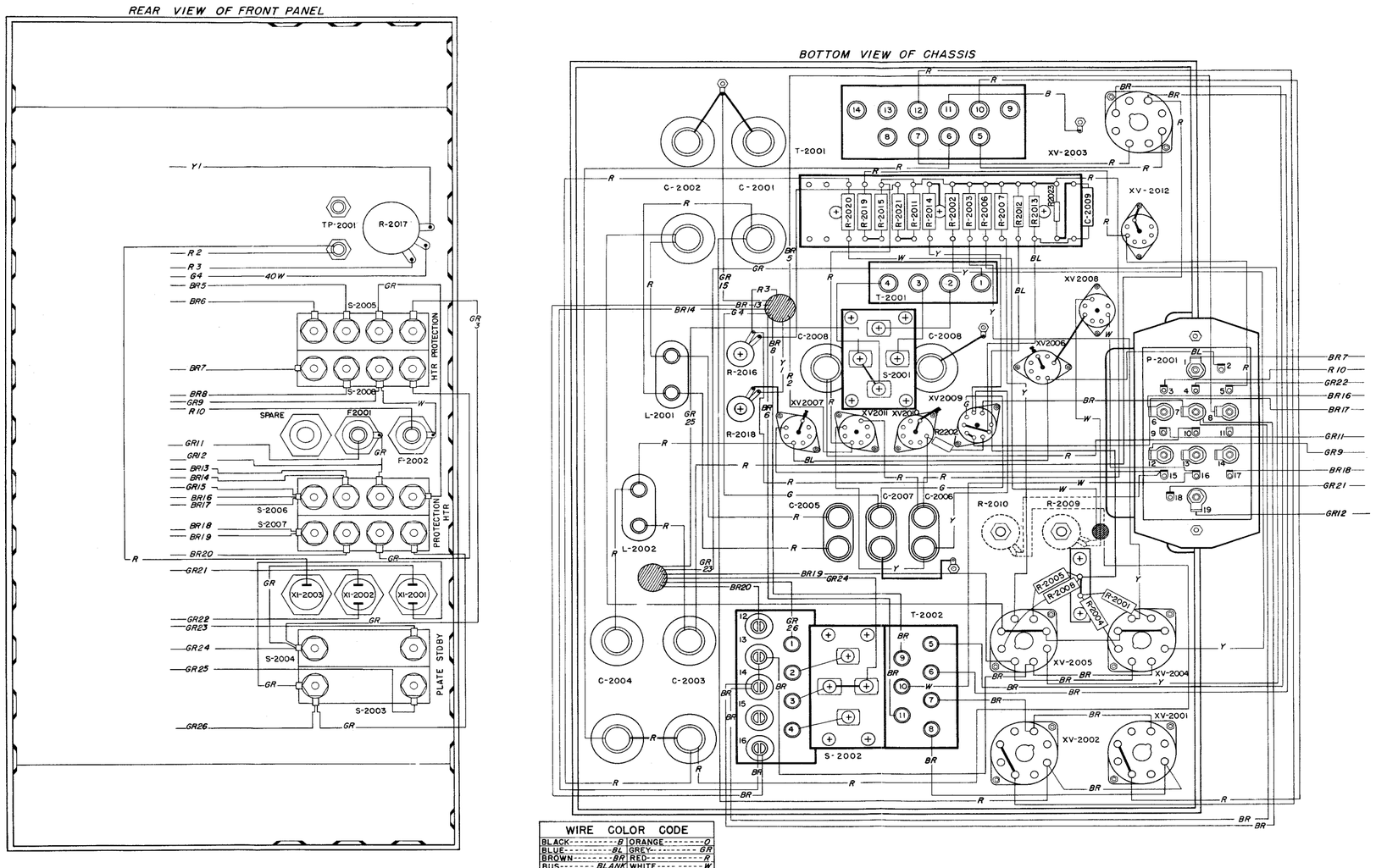
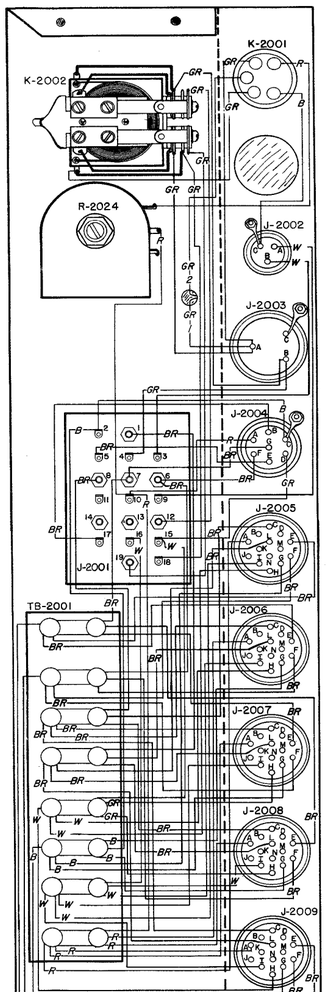


Figure 7–120. Practical Wiring Diagram, Comparator Keyer CM-32/FRR-24





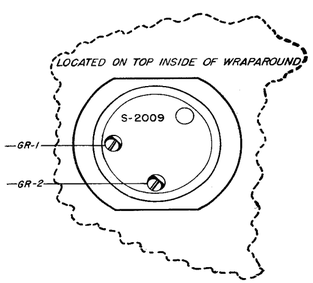


Figure 7–121. Practical Wiring Diagram, Power Supply PP-590/FRR-24

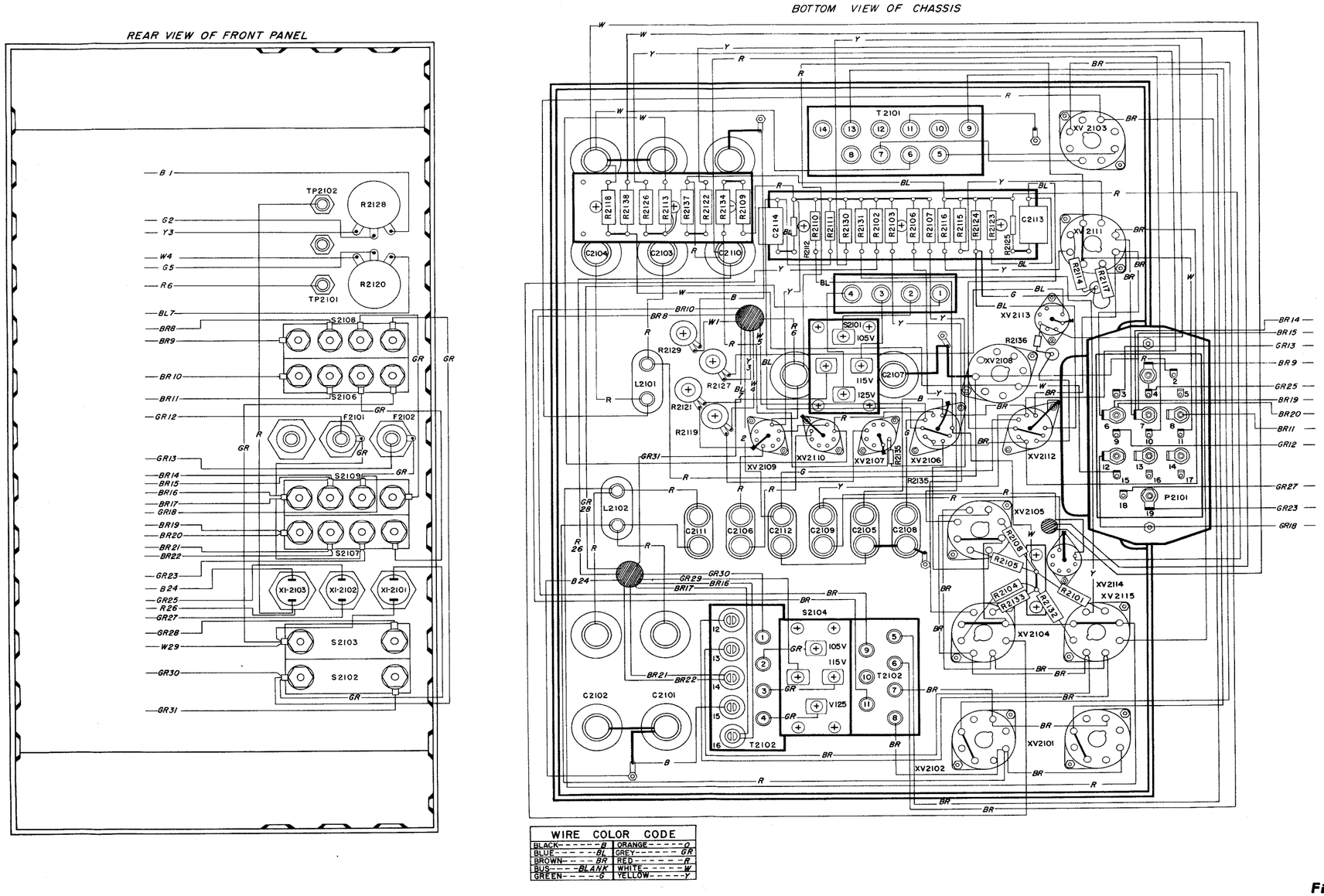


Figure 7–122. Practical Wiring Diagram, Power Supply PP-649/FRR-24

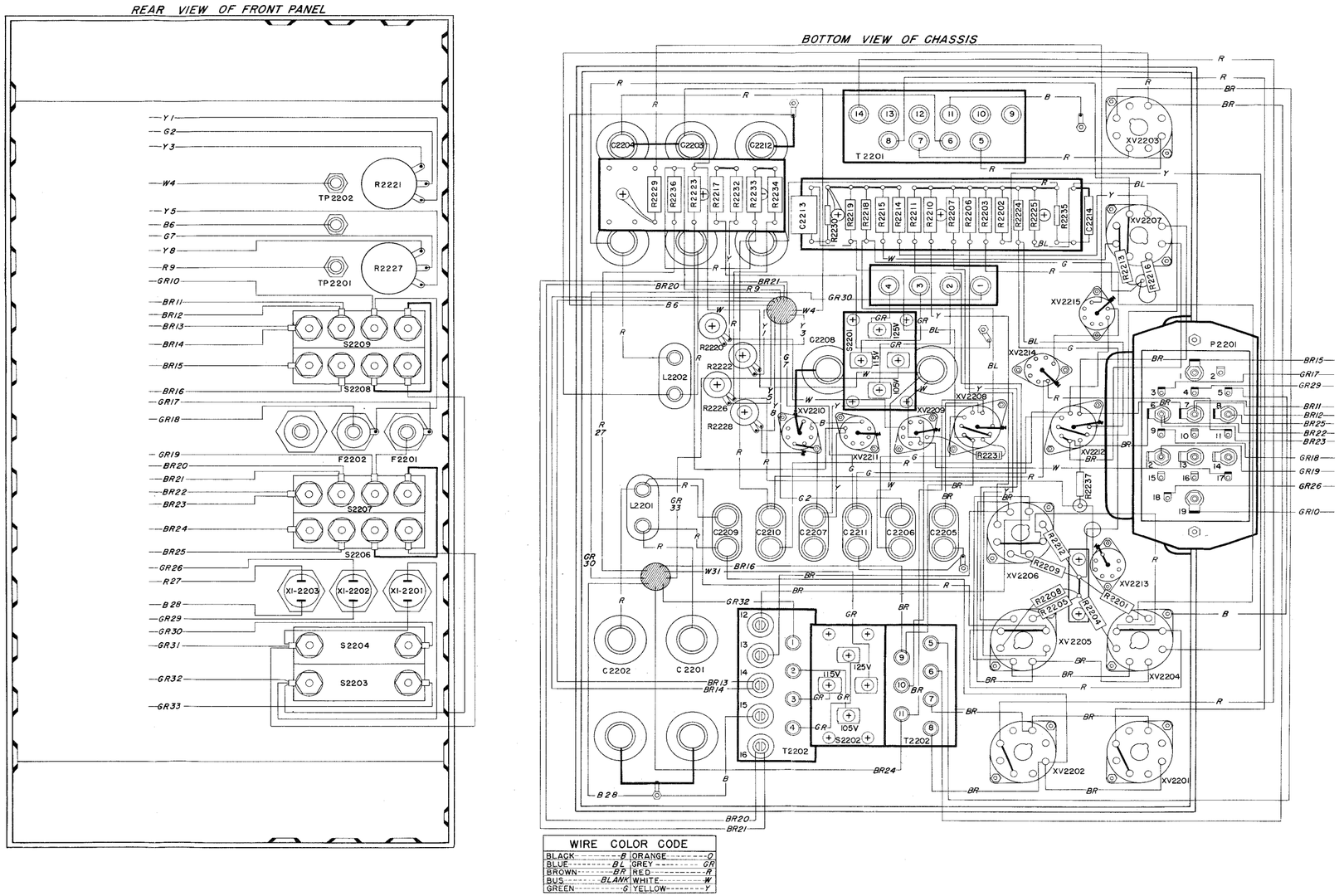


Figure 7–123. Practical Wiring Diagram, Power Supply PP-648/FRR-24

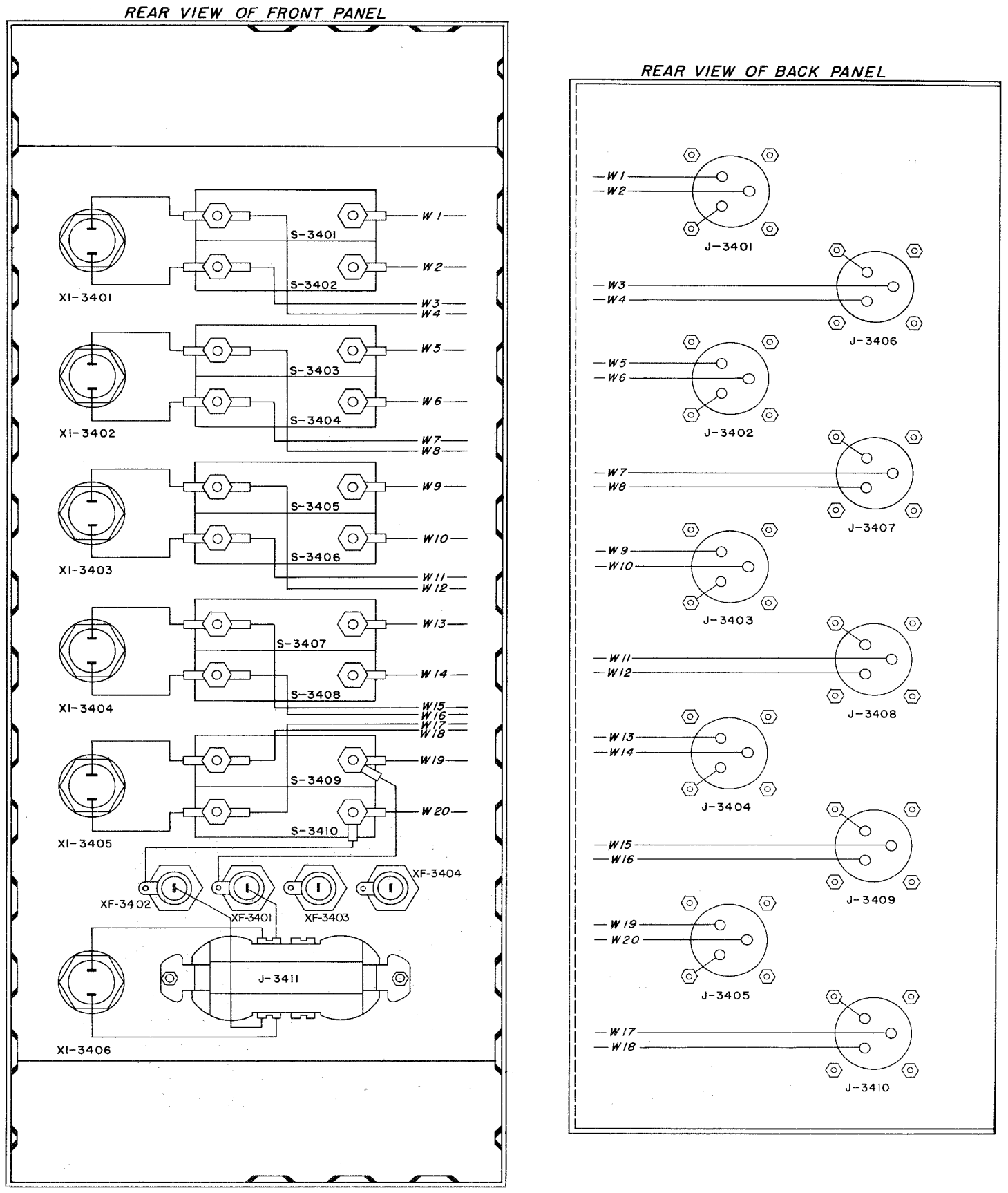


Figure 7-124. Practical Wiring Diagram, Power Distribution Panel SB-141/FRR-24

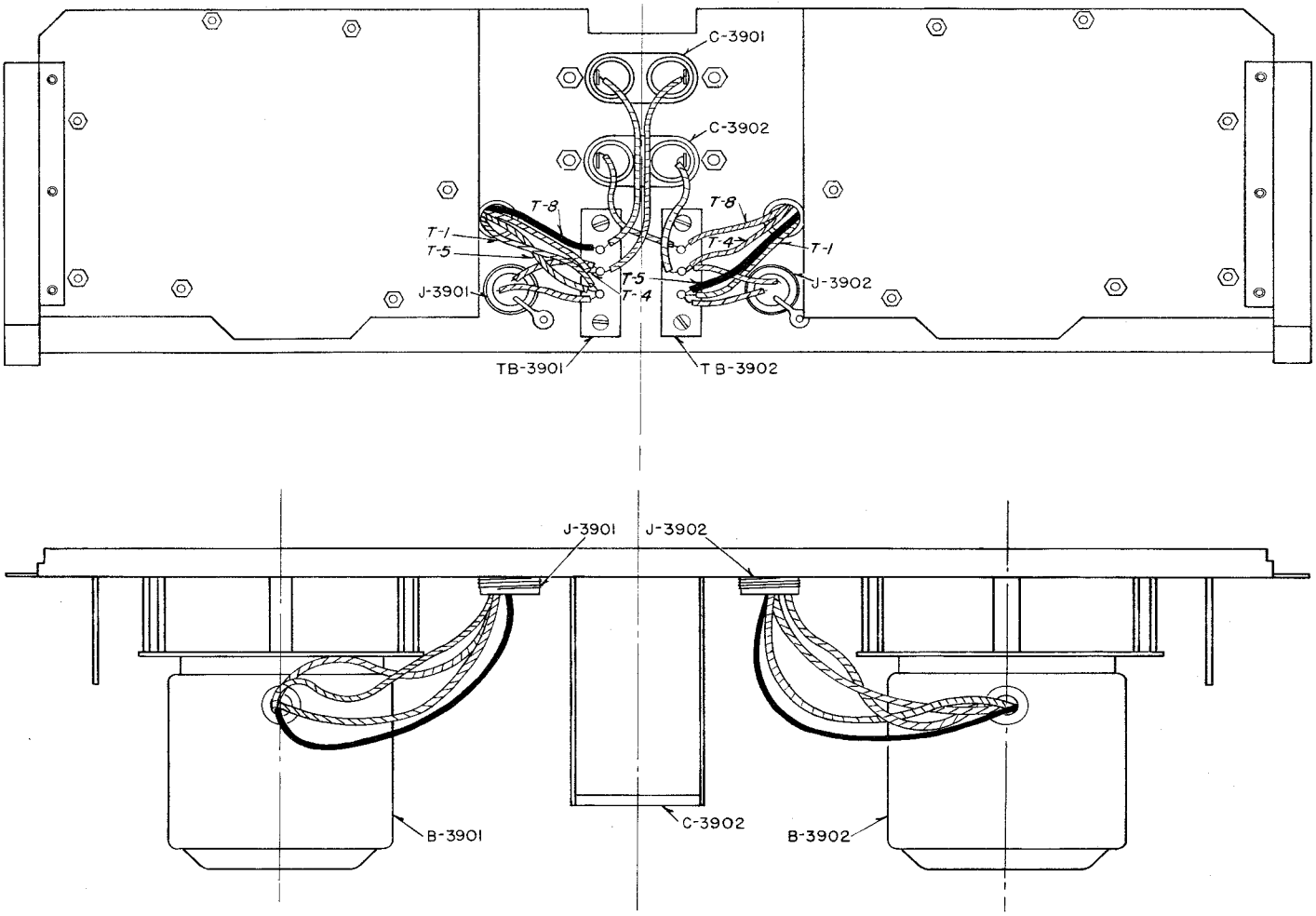


Figure 7–125. Practical Wiring Diagram, Blower Assembly

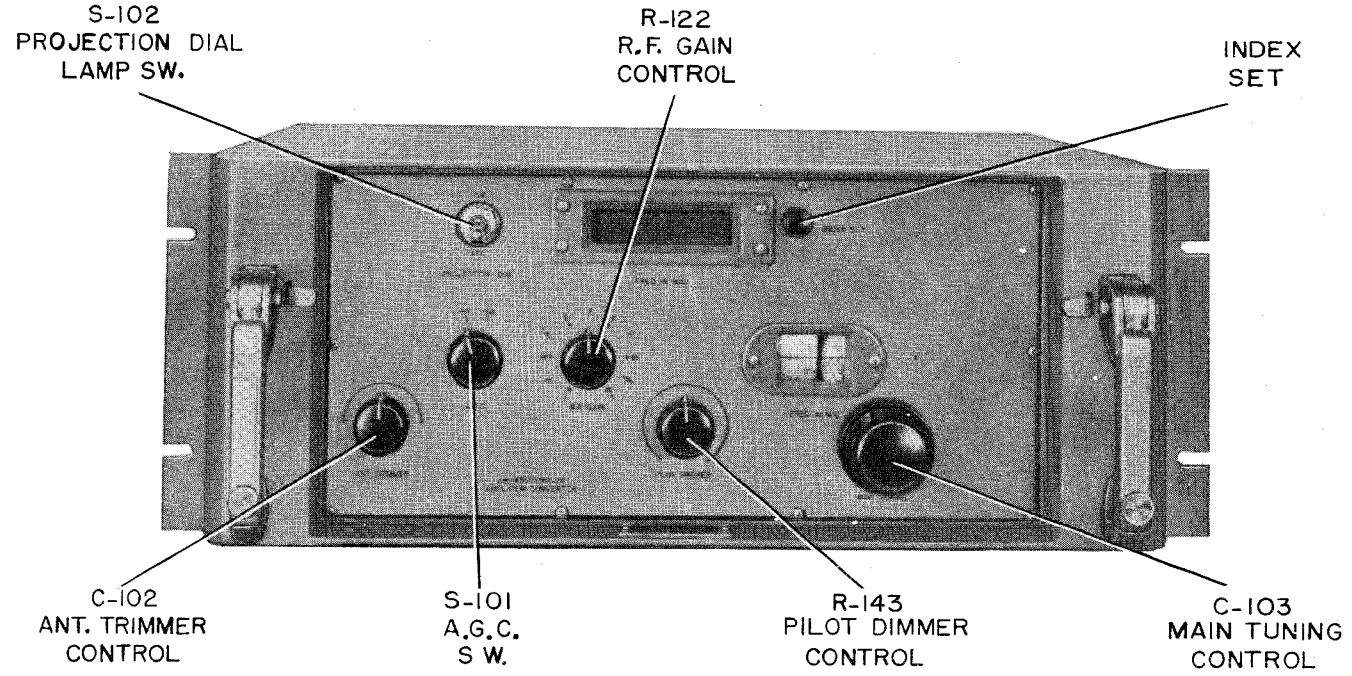


Figure 7–126. Component Locations Front View, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

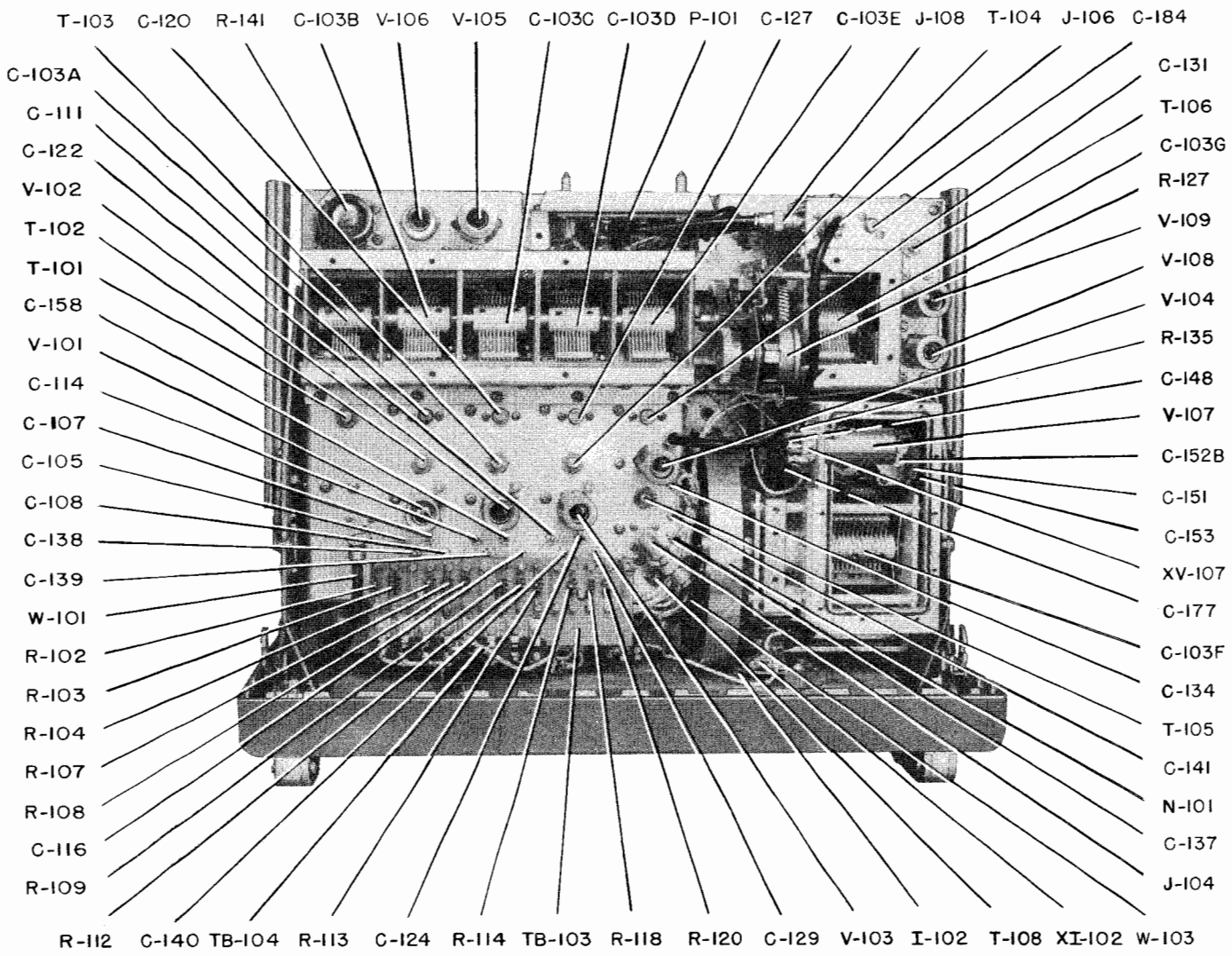


Figure 7–127. Component Locations Top of Chassis, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24 (Optical System Removed)

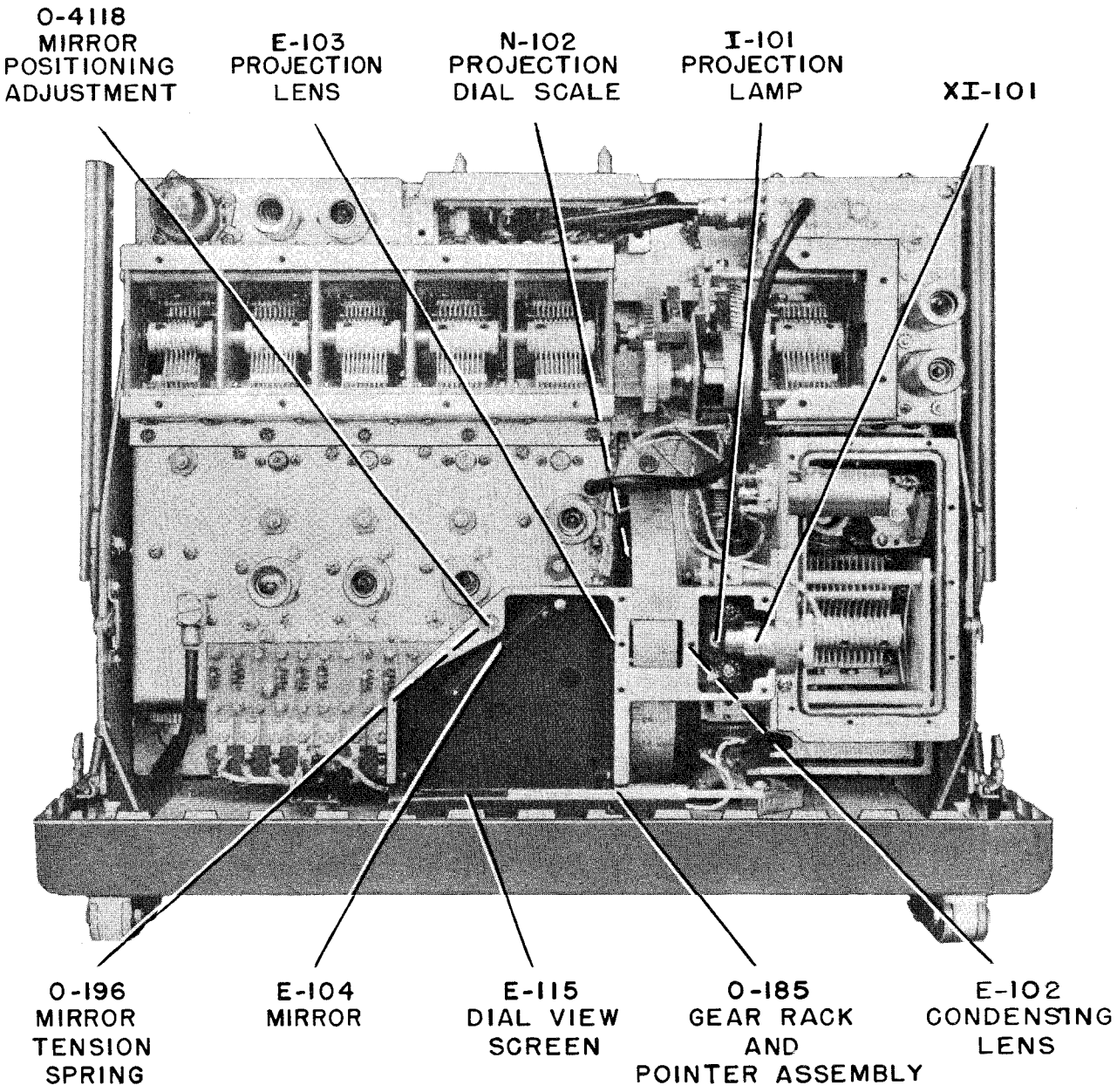


Figure 7–128. Component Locations Optical System, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

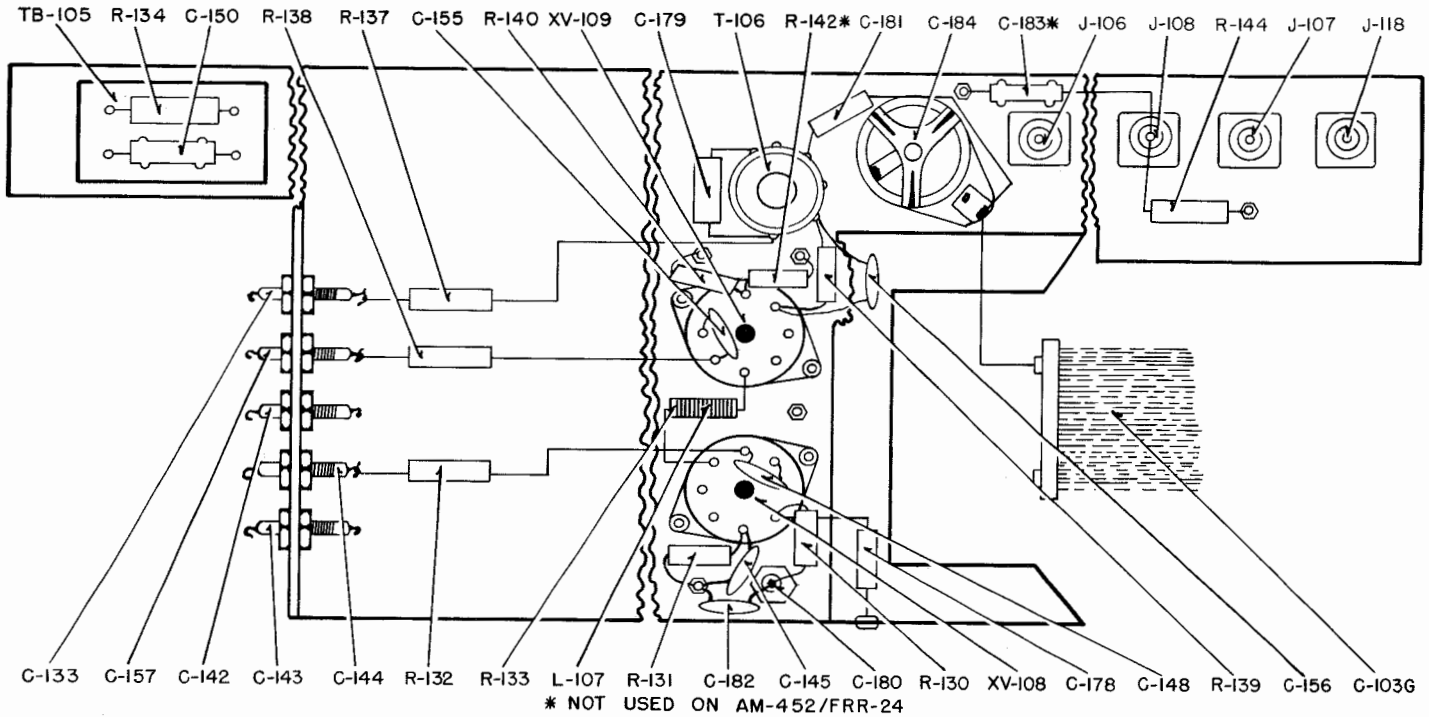


Figure 7–129. Component Locations Buffer Compartment, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

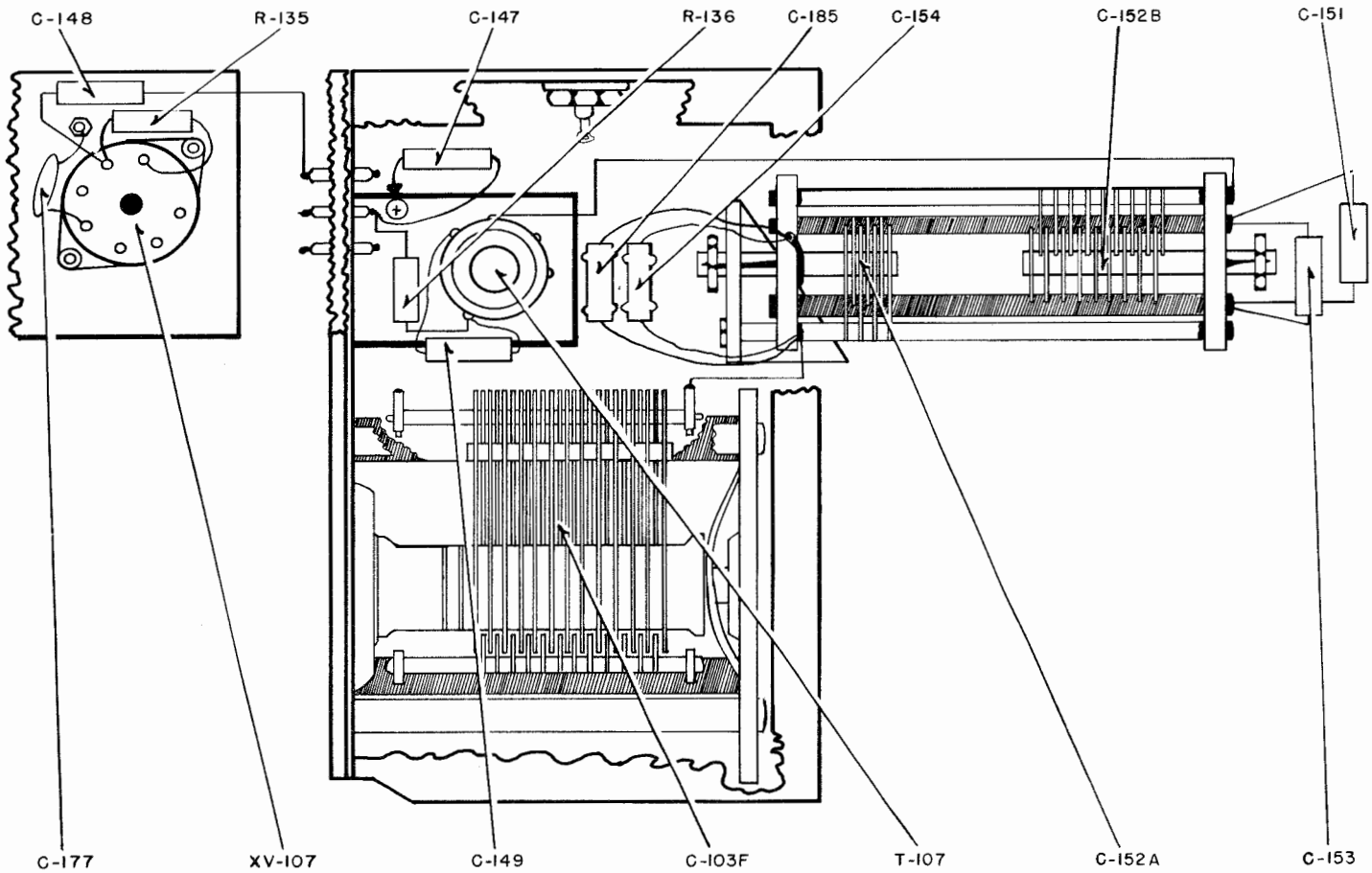


Figure 7–130. Component Locations Oscillator Compartment, Amplifier-Converter AM-450, AM-451, AM-452 AM-453/FRR-24

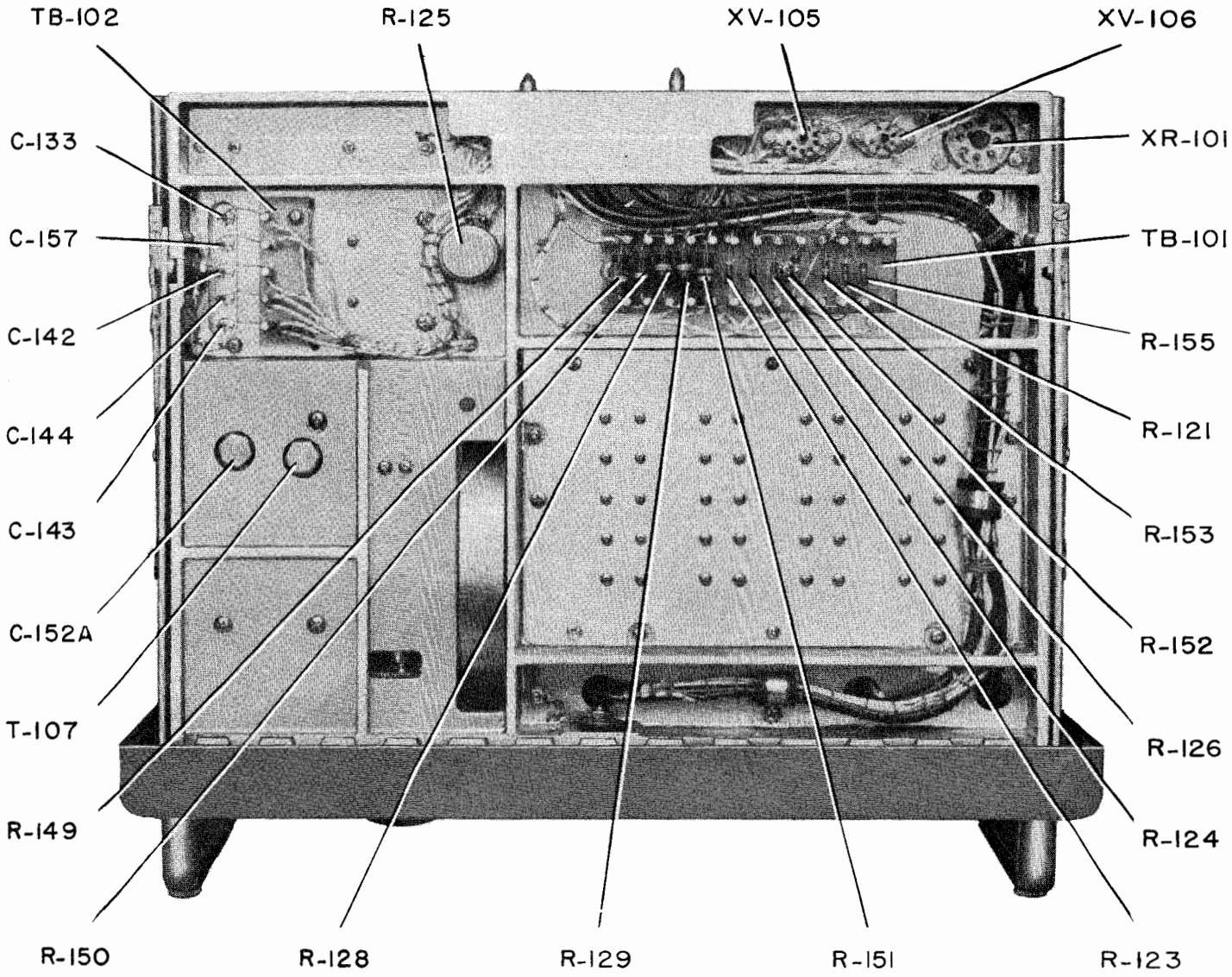


Figure 7–131. Component Locations Bottom of Chassis, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

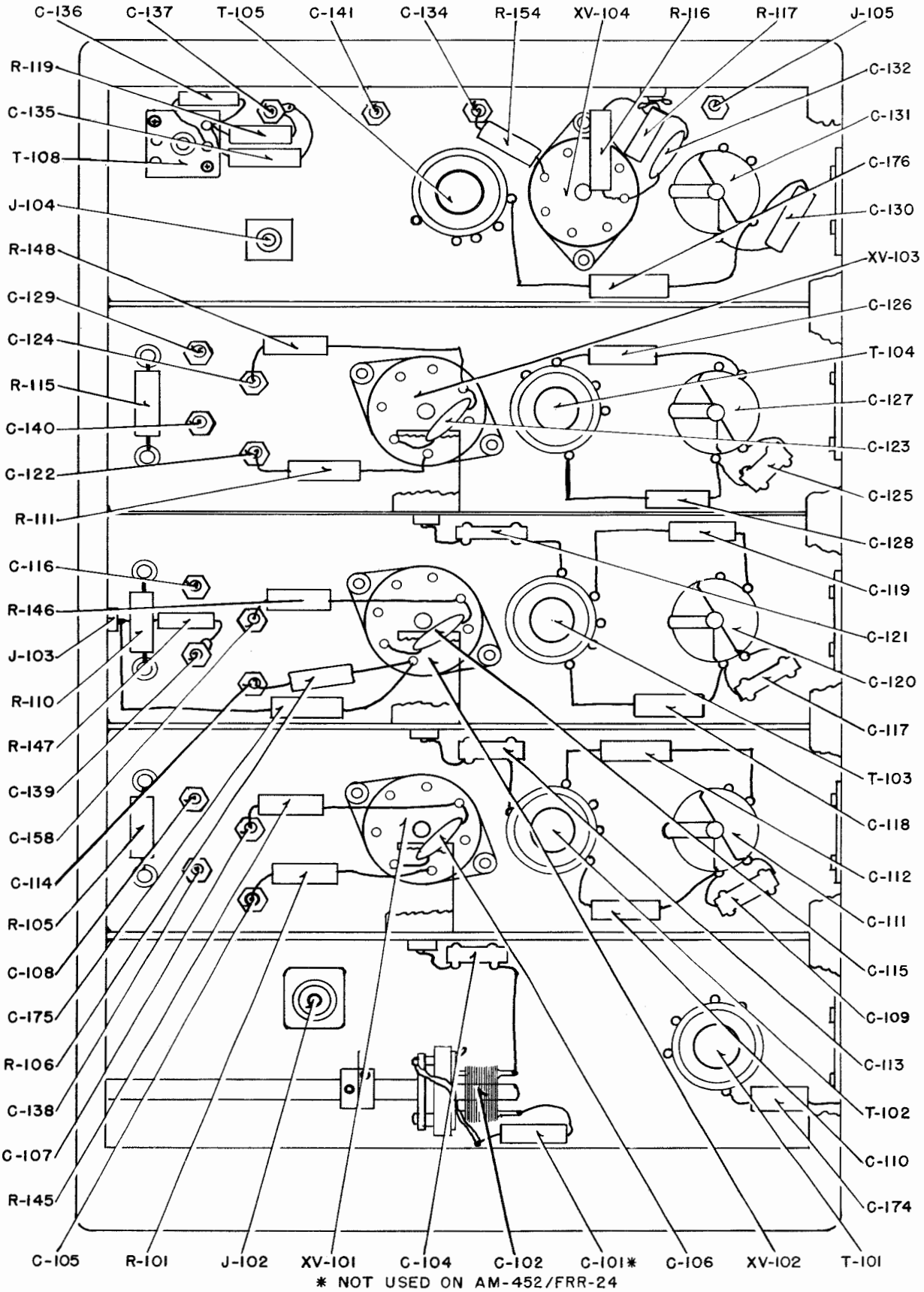


Figure 7–132. Component Locations Bottom of R.F. Amplifier Compartment, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

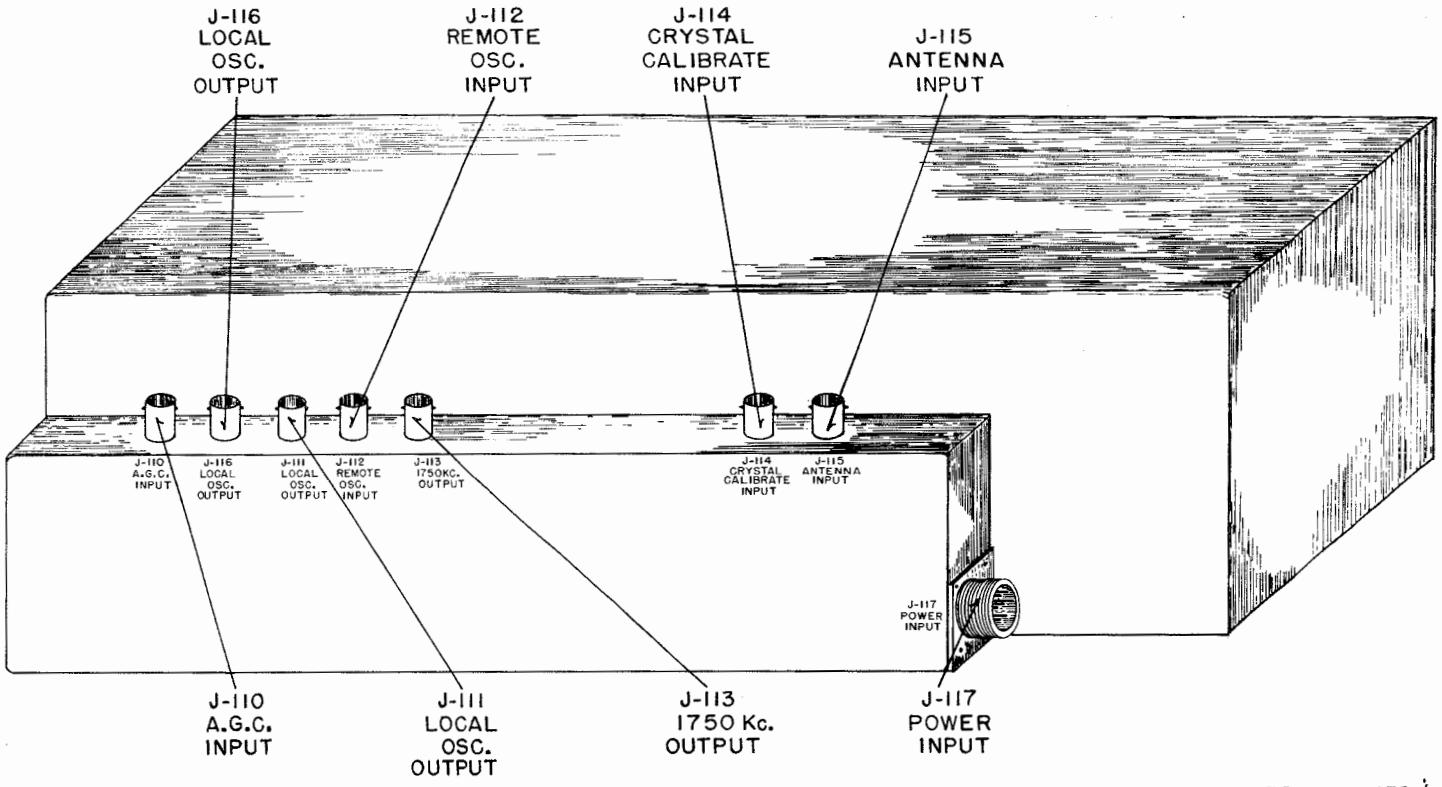


Figure 7–133. Component Locations Rear of Cabinet, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

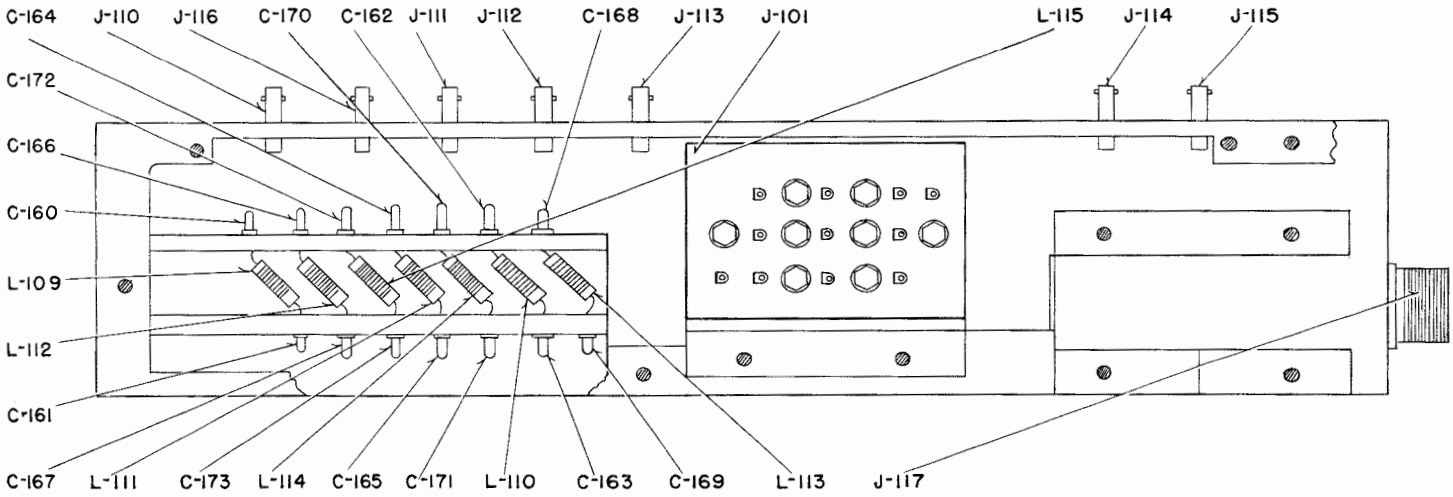


Figure 7–134. Component Locations Inside of R.F. Filter Compartment, Amplifier-Converter AM-450, AM-451, AM-452, AM-453/FRR-24

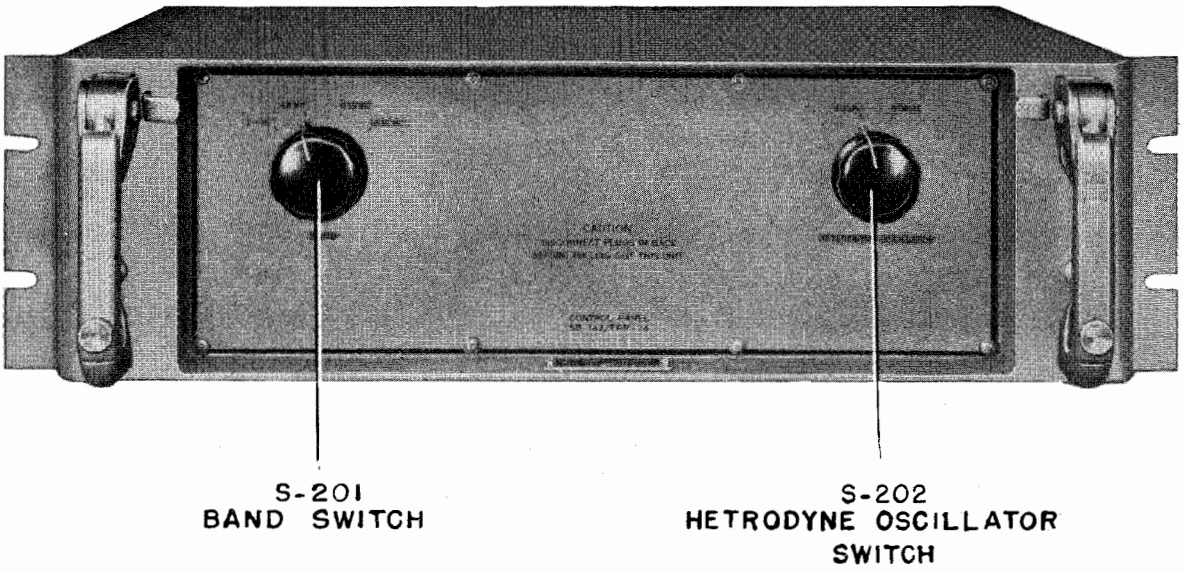


Figure 7–135. Component Locations Front View, Control Panel SB-142/FRR-24

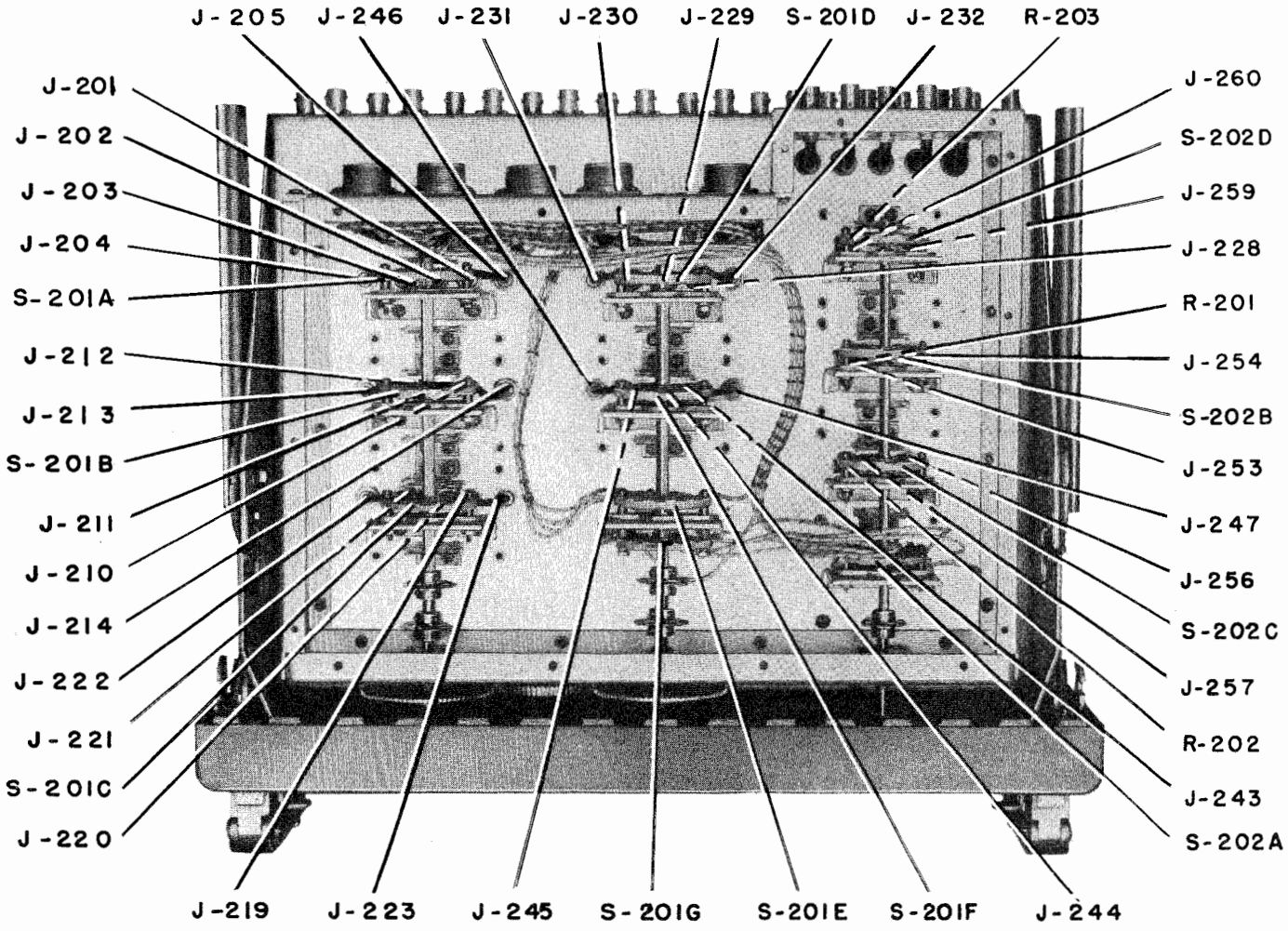


Figure 7–136. Component Locations Top of Chassis, Control Panel SB-142/FRR-24

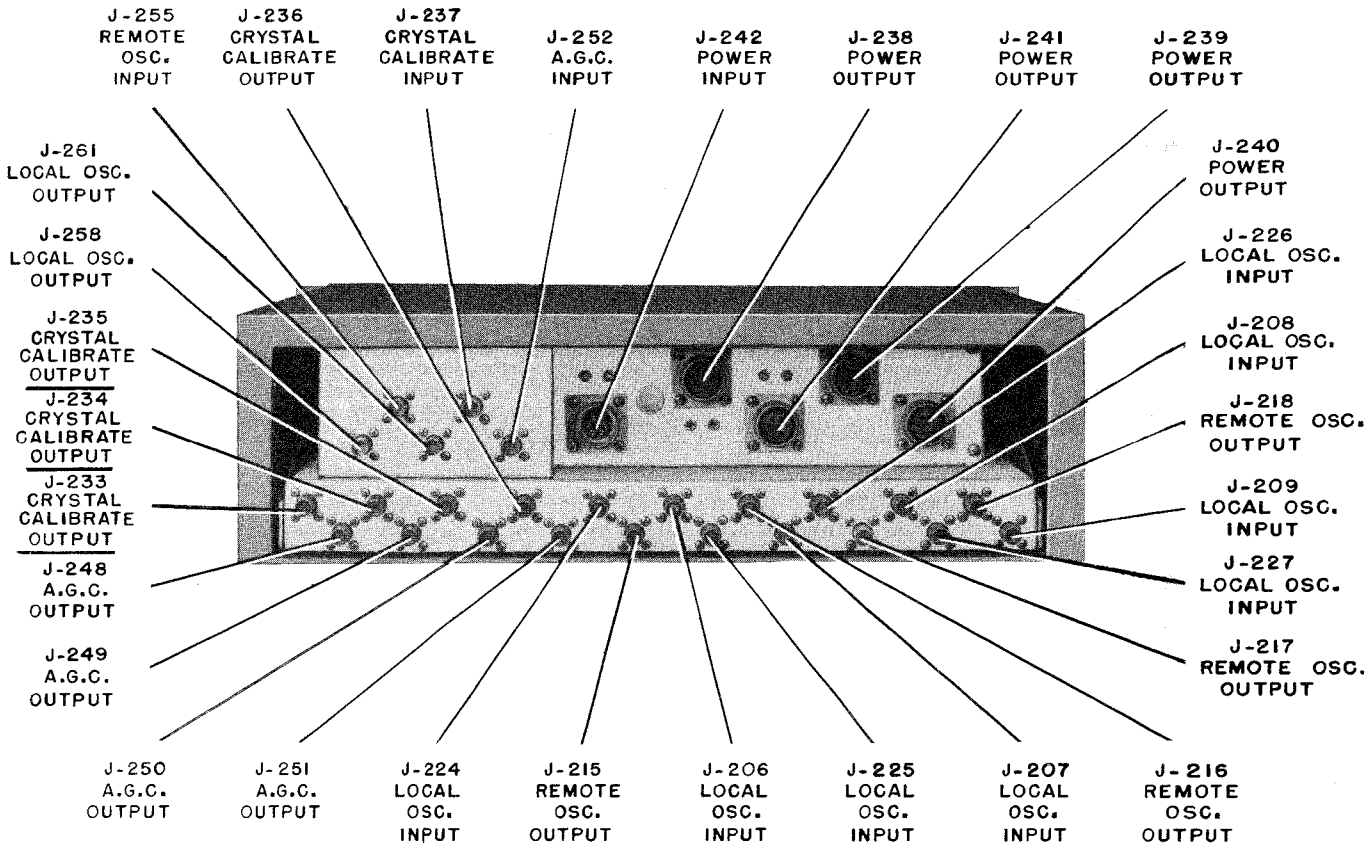


Figure 7–137. Component Locations Rear of Cabinet, Control Panel SB-142/FRR-24

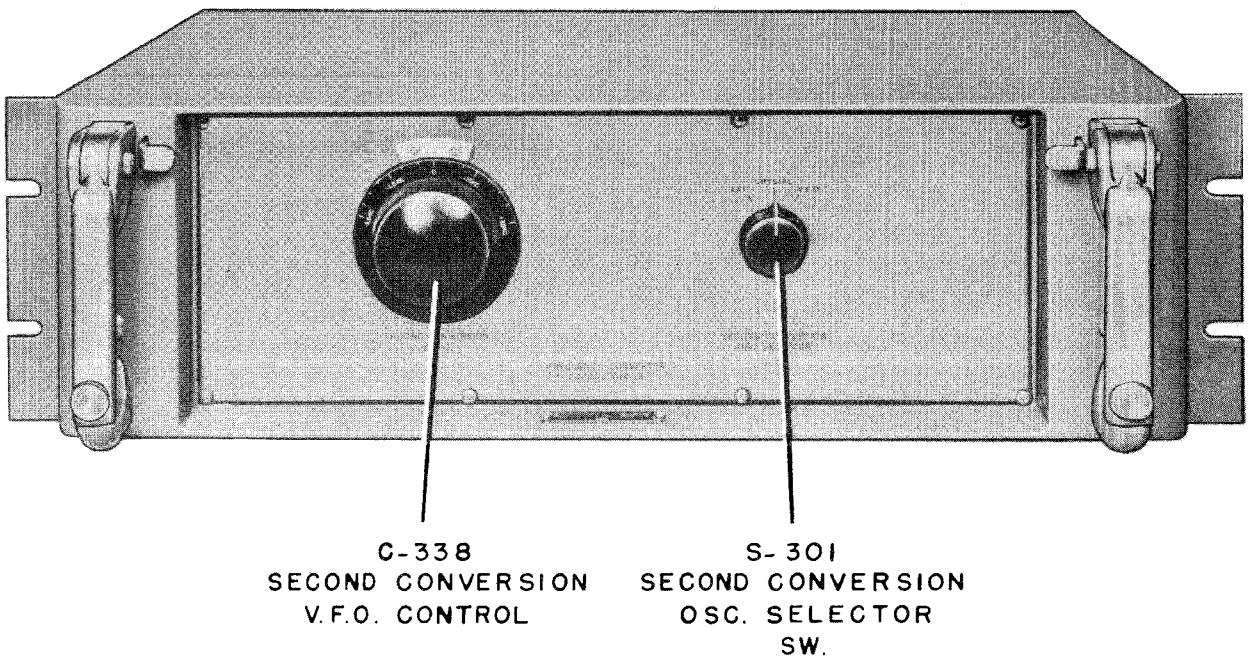


Figure 7–138. Component Locations Front View, Frequency Converter CV-126/FRR-24

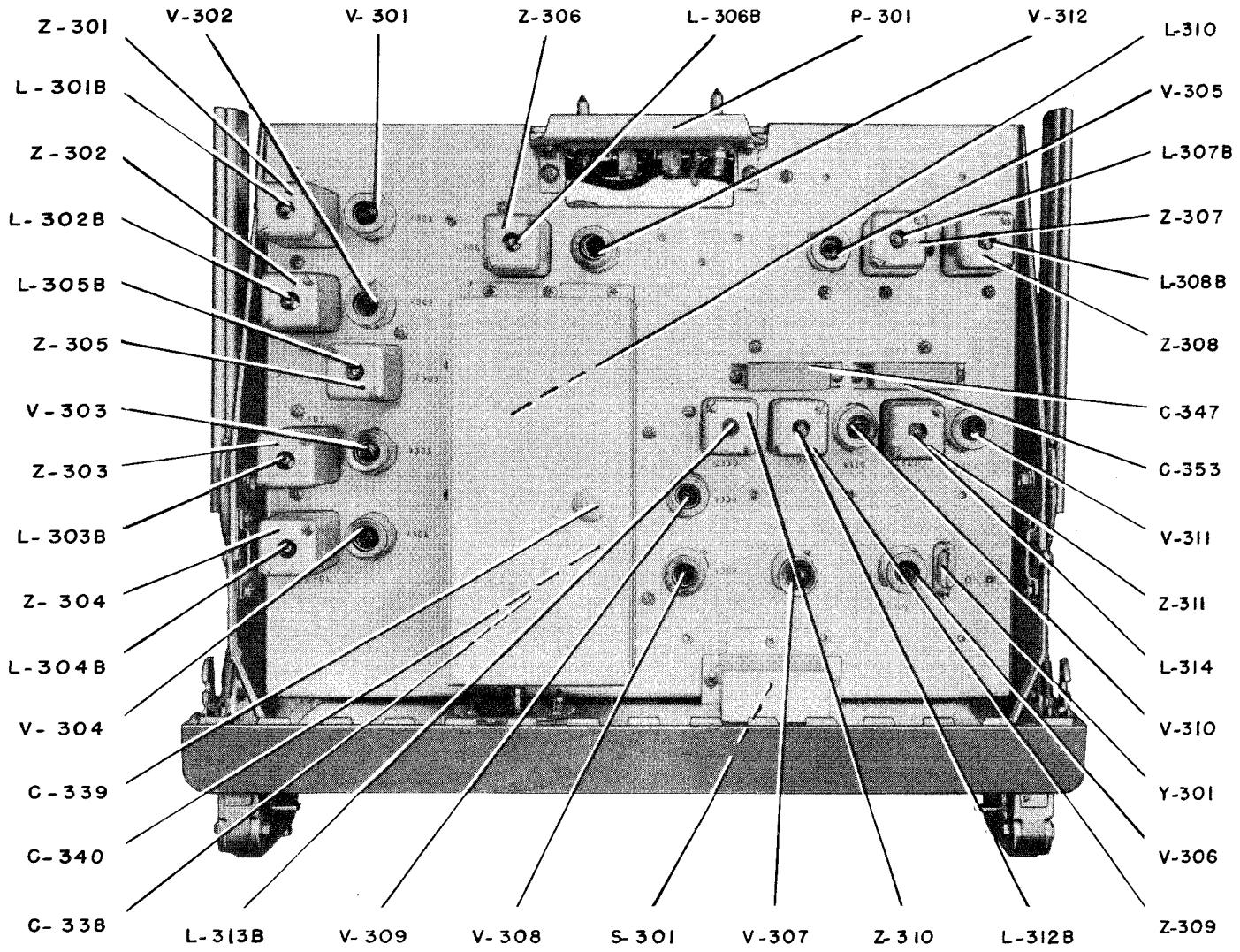


Figure 7–139. Component Locations Top of Chassis, Frequency Converter CV-126/FRR-24

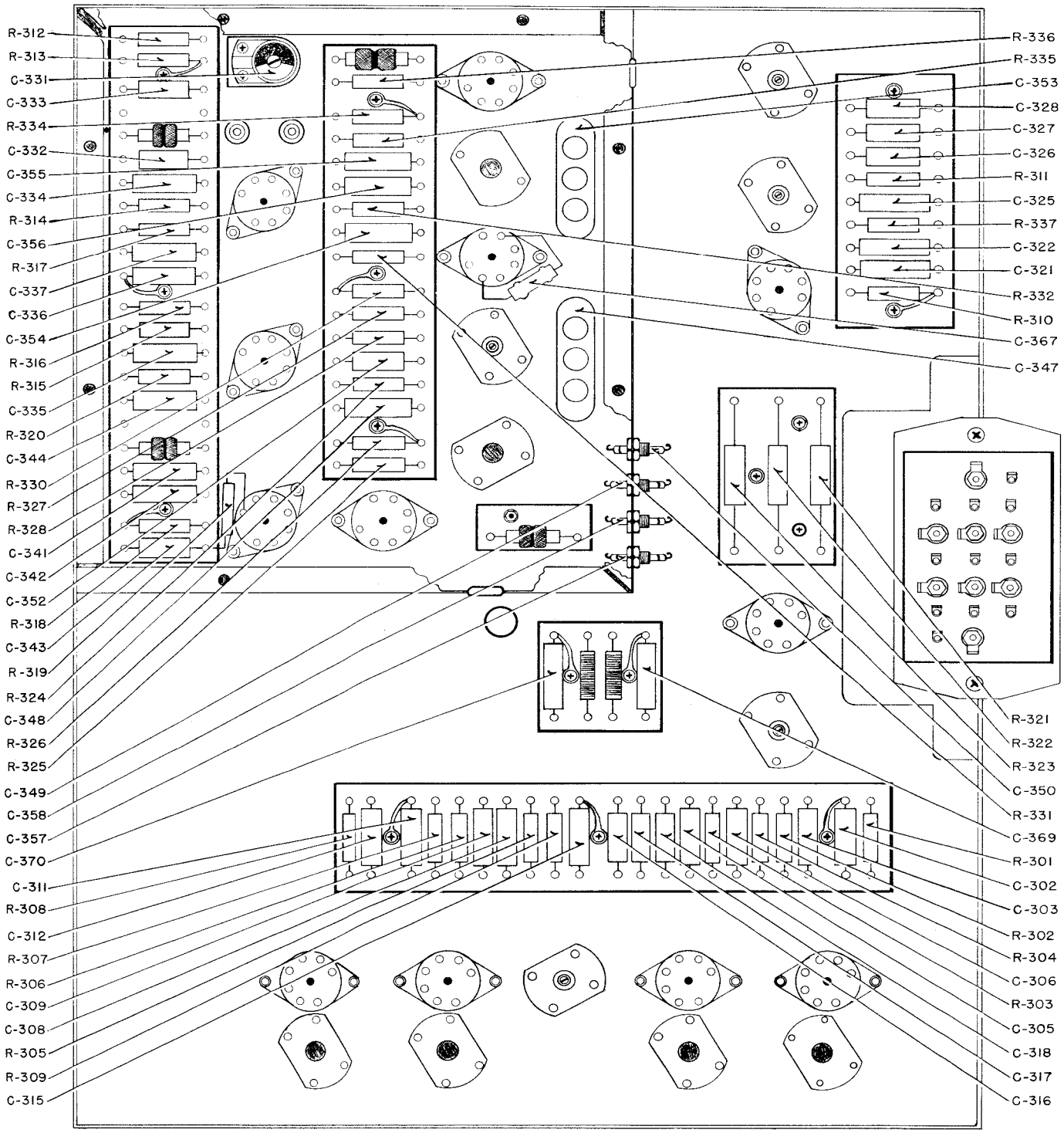


Figure 7–140. Capacitor and Resistor Locations, Bottom of Chassis, Frequency Converter CV-126/FRR-24

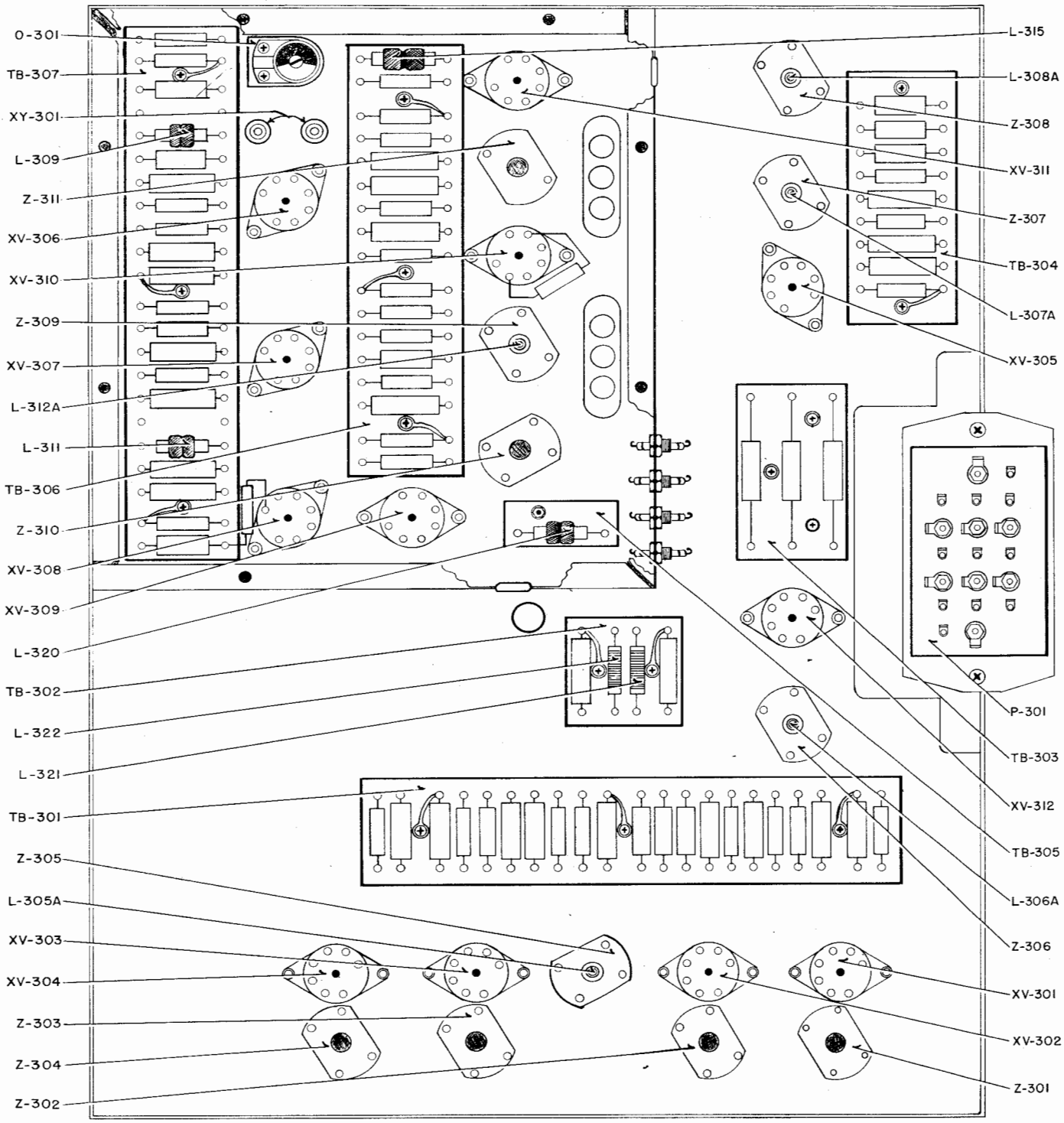


Figure 7–141. Miscellaneous Component Locations Bottom of Chassis, Frequency Converter CV-126/FRR-24

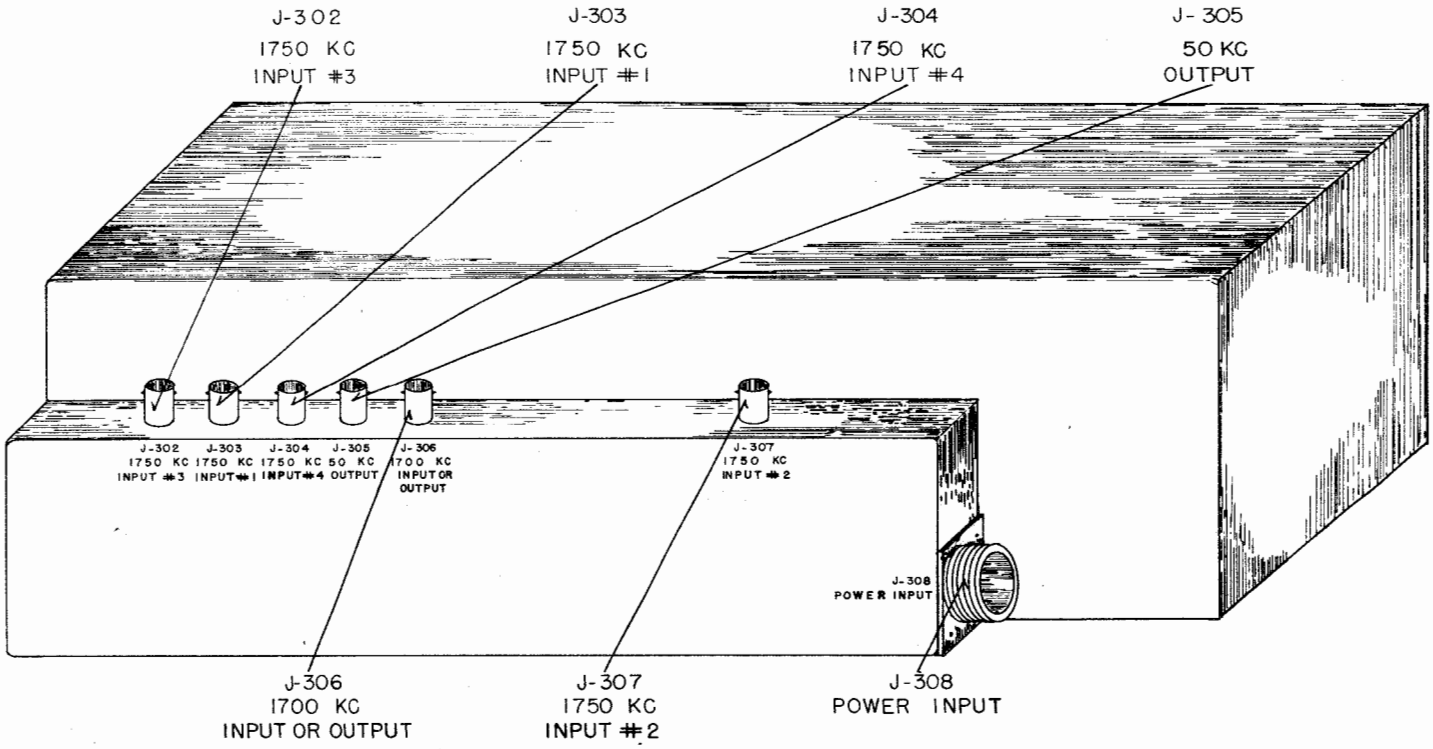


Figure 7–142. Component Locations Rear of Cabinet, Frequency Converter CV-126/FRR-24

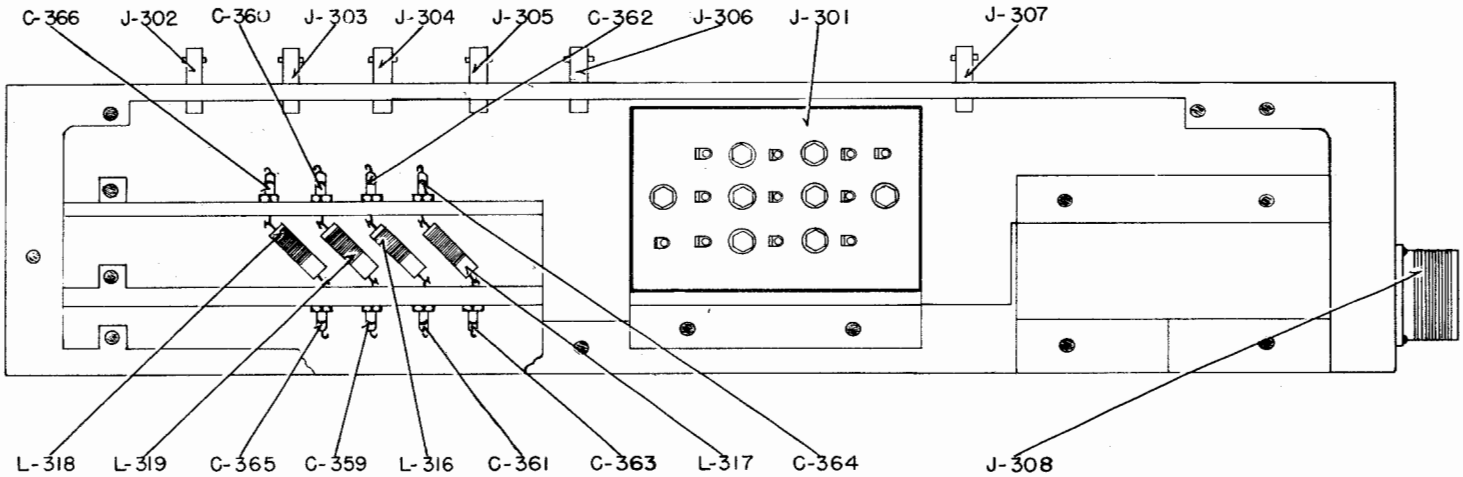


Figure 7–143. Component Locations Inside of R.F. Filter Compartment, Frequency Converter CV-126/FRR-24

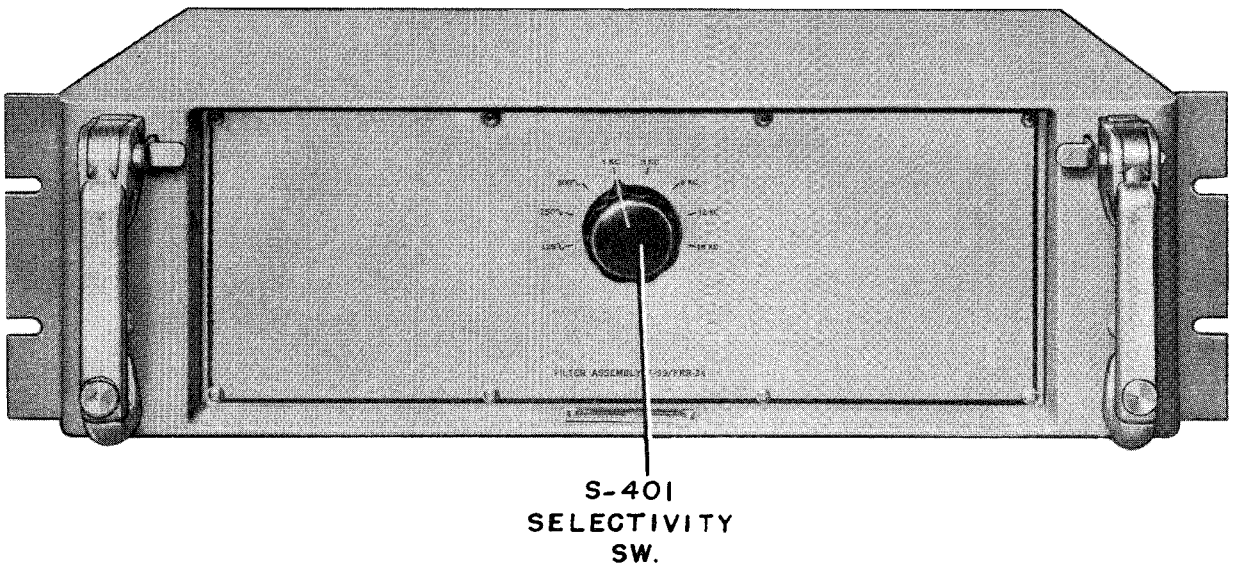


Figure 7–144. Component Locations Front View, Filter Assembly F-99/FRR-24

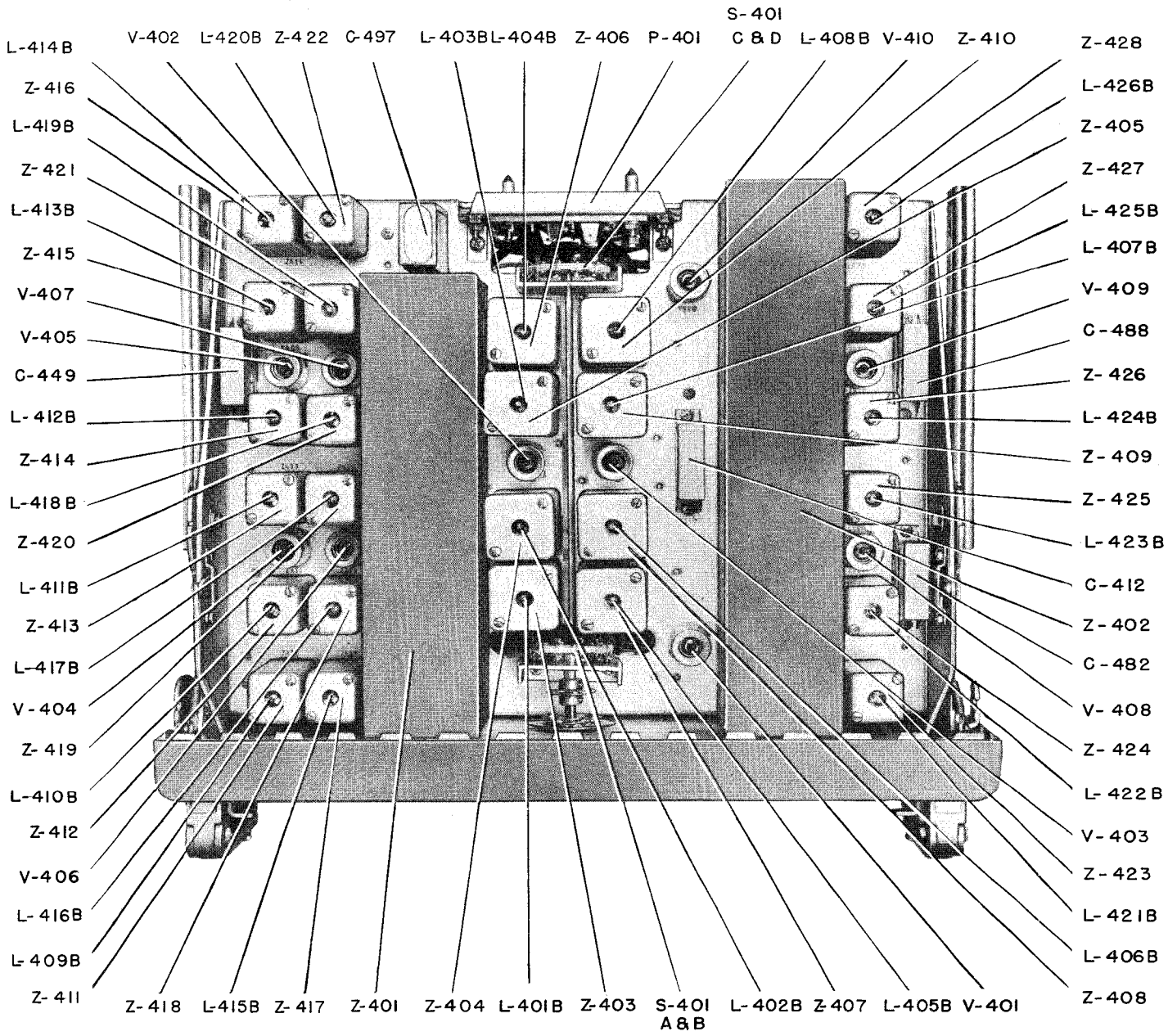


Figure 7–145. Component Locations Top of Chassis, Filter Assembly F-99/FRR-24

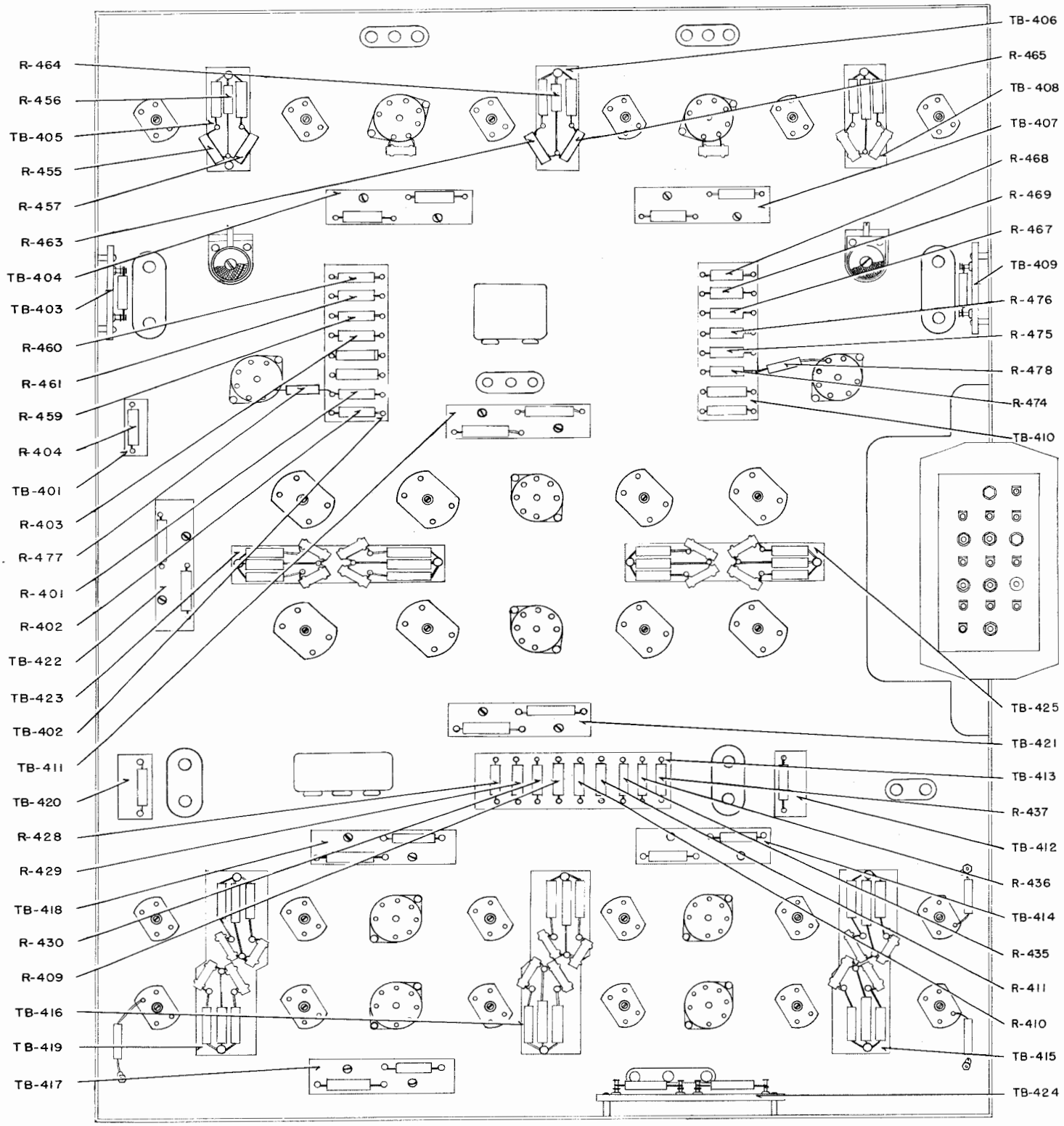


Figure 7–146. Resistor and Terminal Board Locations Bottom of Chassis, Filter Assembly F-99/FRR-24

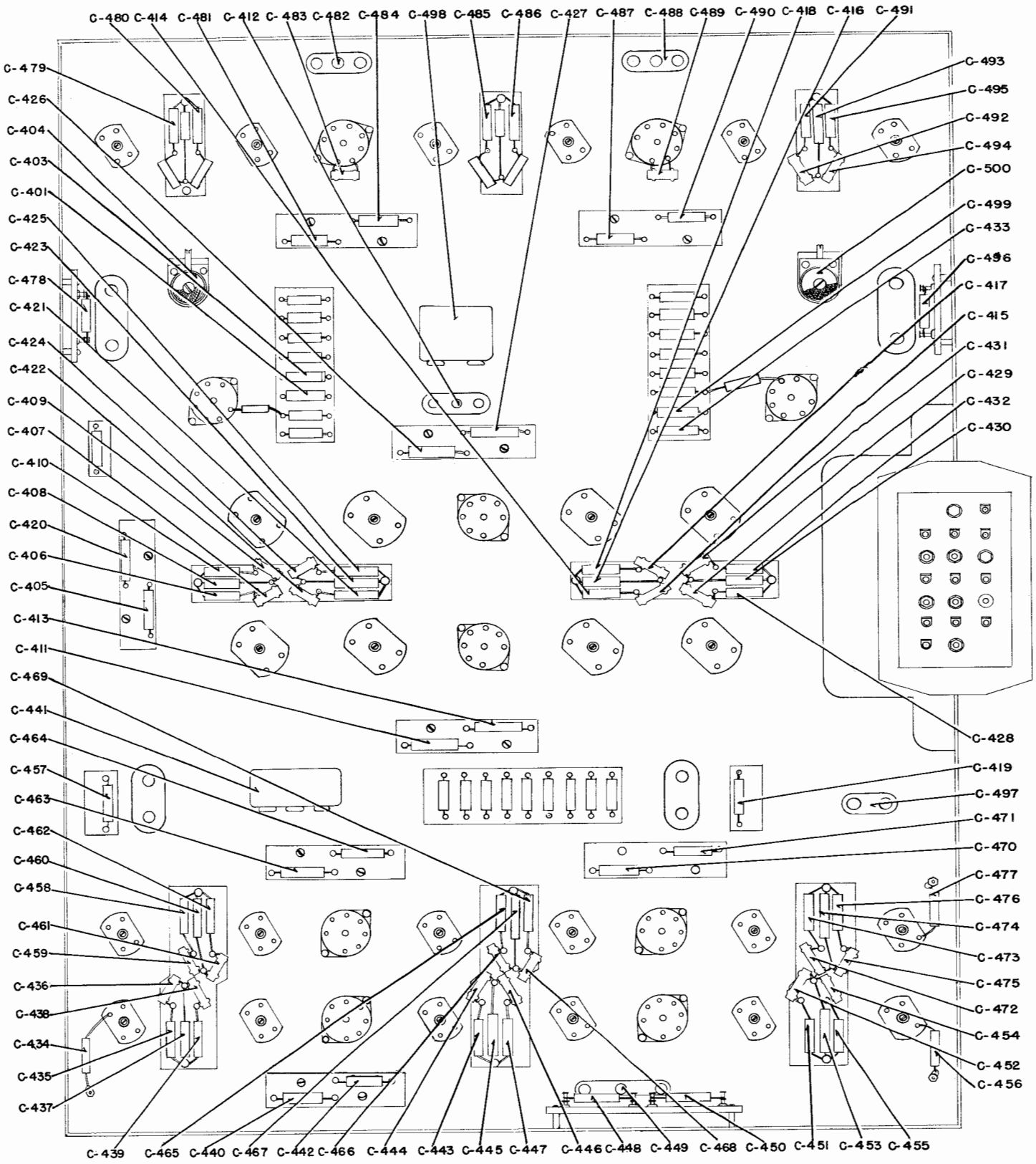


Figure 7–147. Capacitor Locations Bottom of Chassis, Filter Assembly F-99/FRR-24

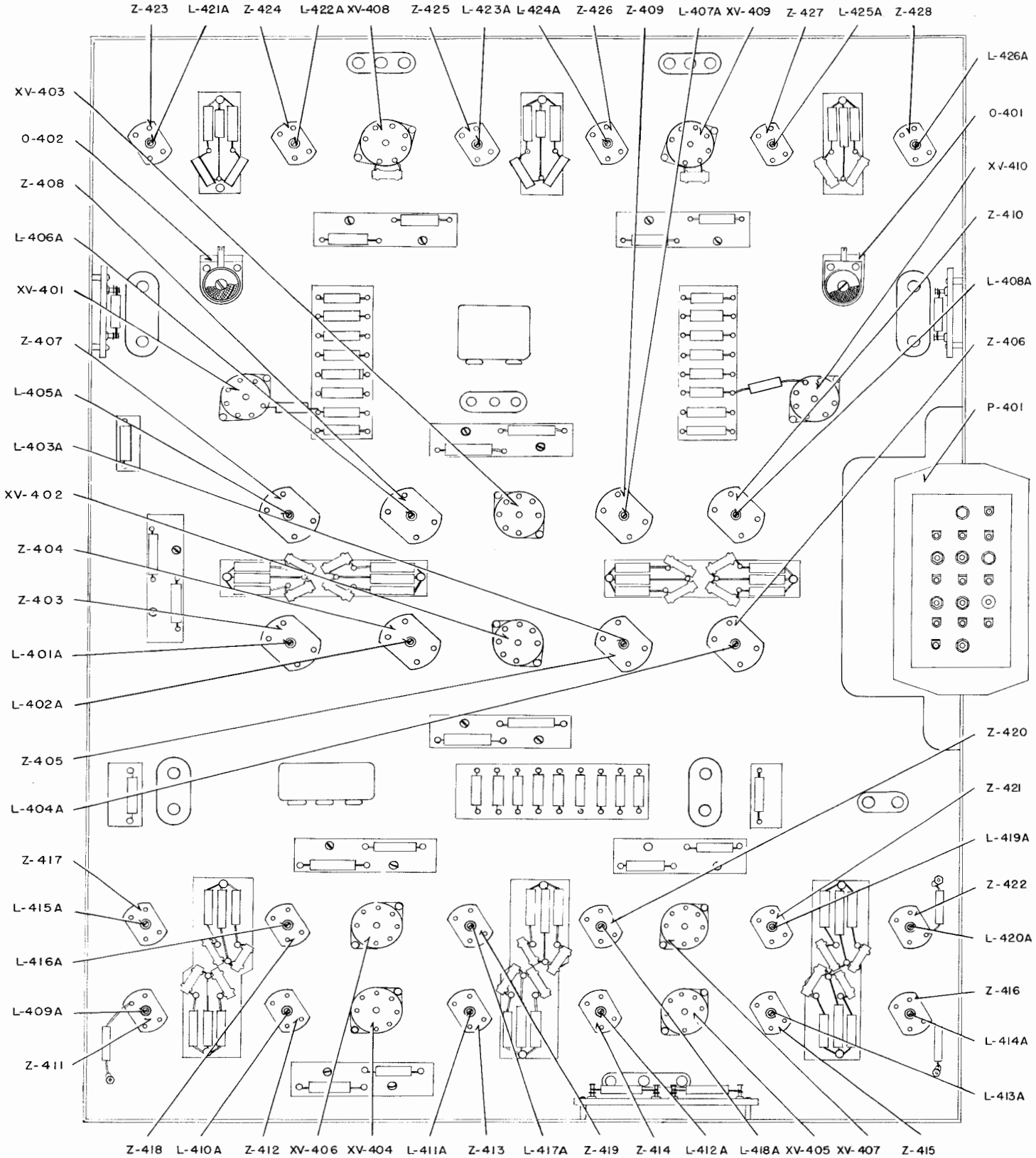


Figure 7-148. Miscellaneous Component Locations Bottom of Chassis, Filter Assembly F-99/FRR-24

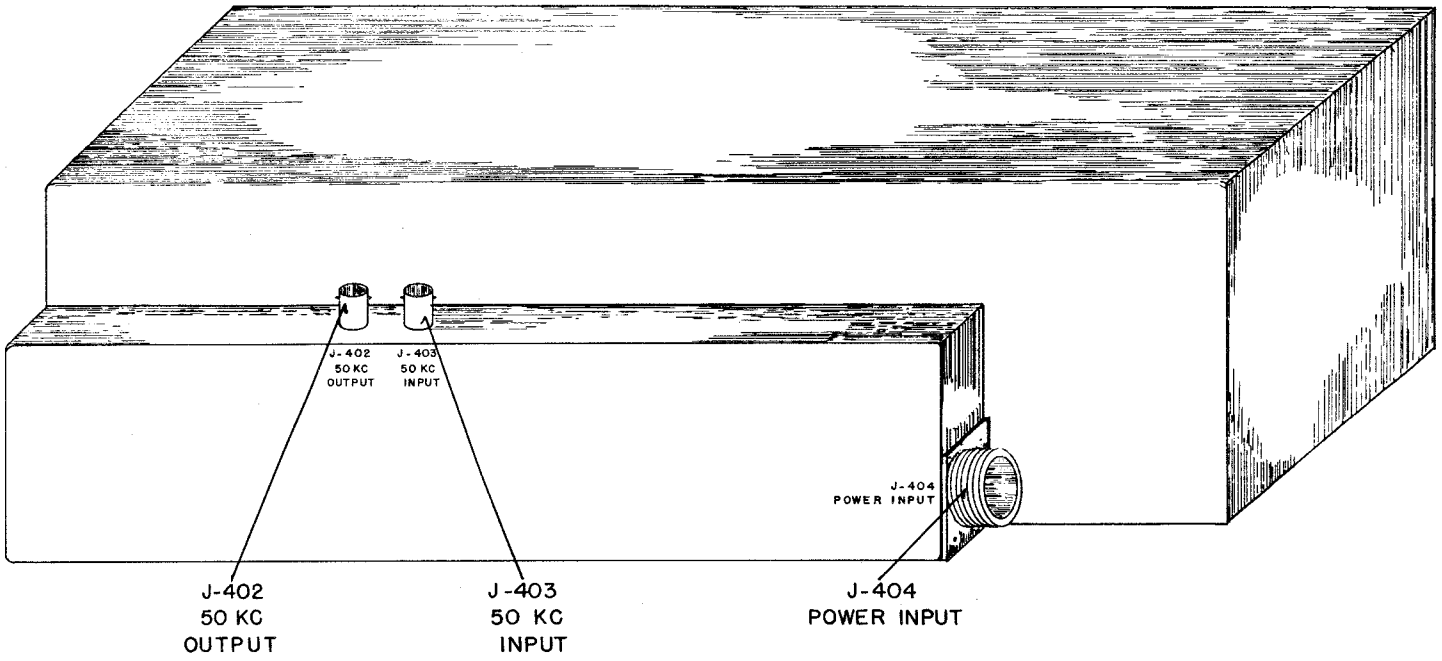


Figure 7–149. Component Locations Rear of Cabinet, Filter Assembly F-99/FRR-24

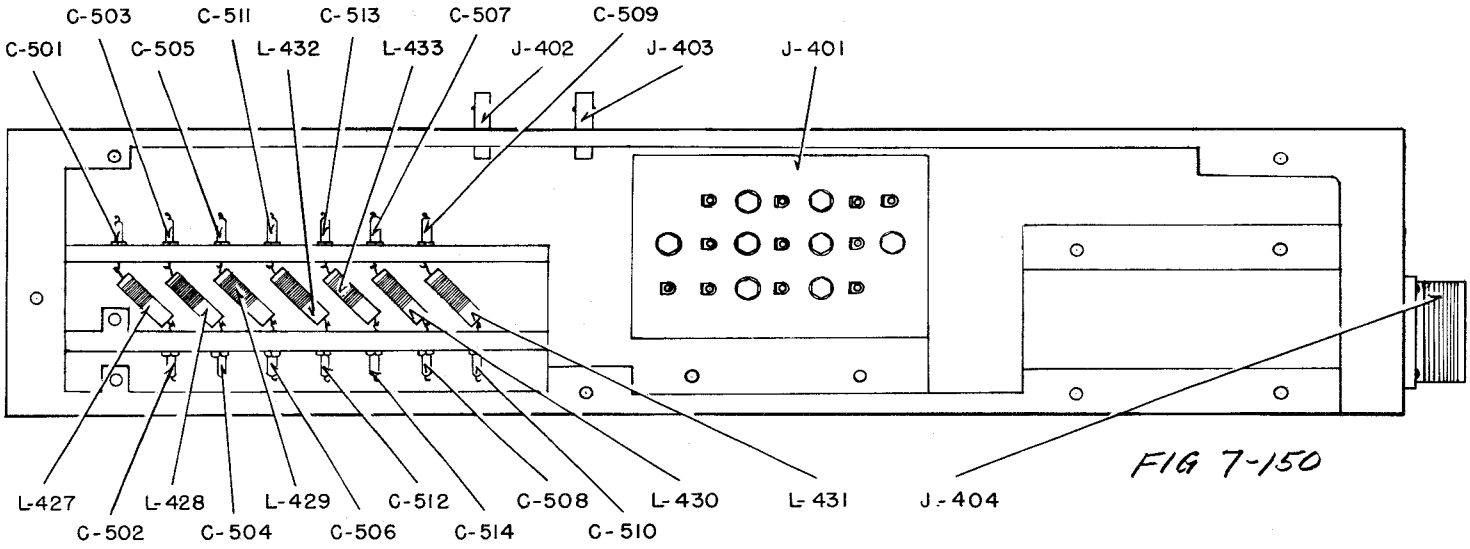


Figure 7–150. Component Locations Inside of R.F. Filter Compartment, Filter Assembly F-99/FRR-24

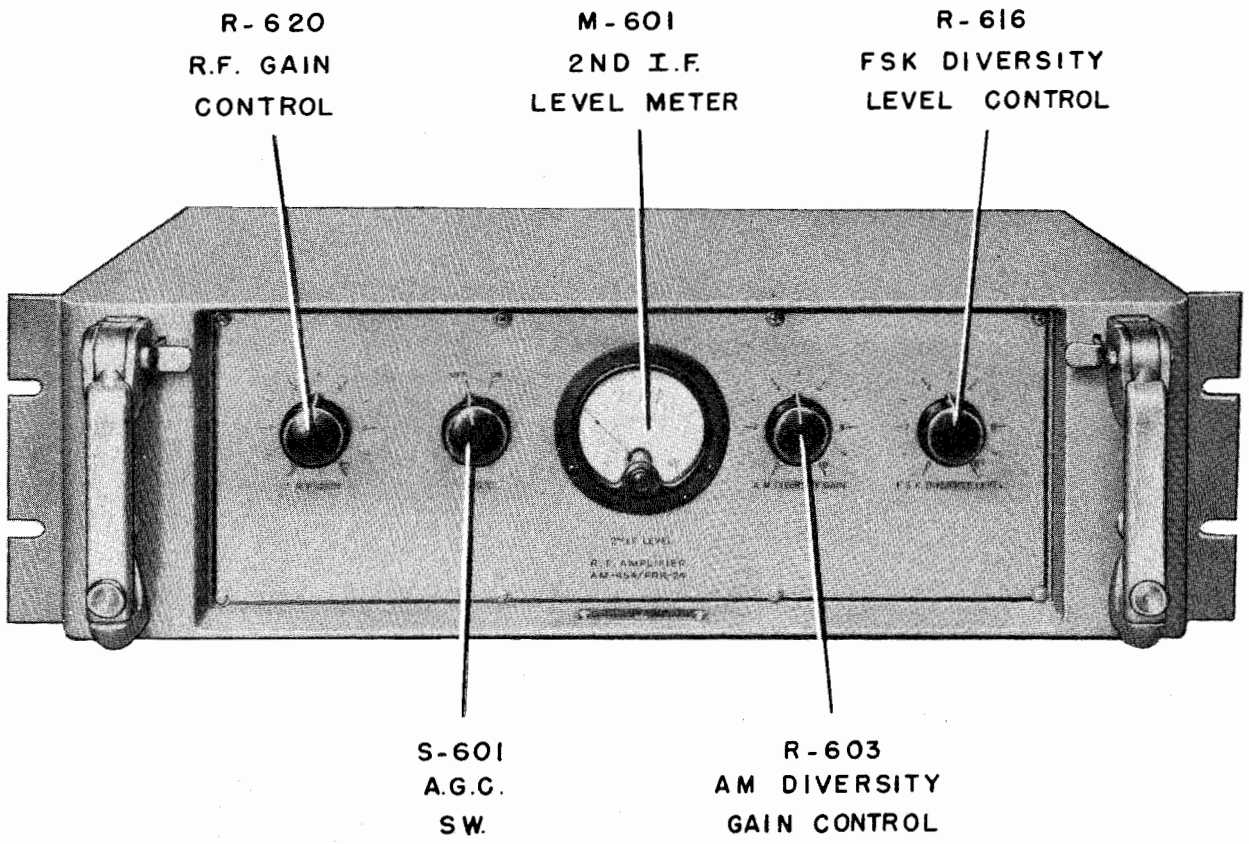


Figure 7–151. Component Locations Front View, R.F. Amplifier AM-454/FRR-24

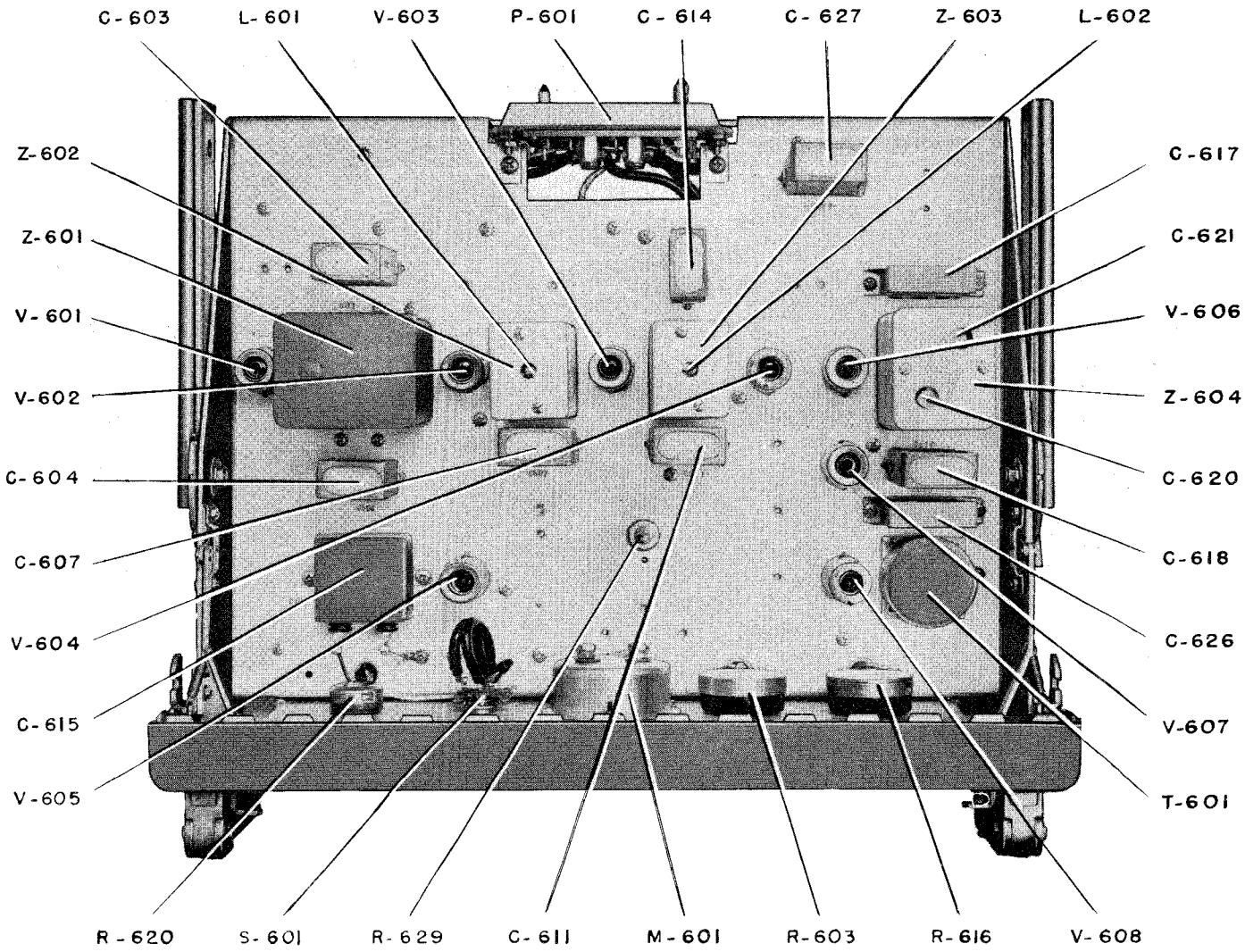


Figure 7–152. Component Locations Top of Chassis, R.F. Amplifier AM-454/FRR-24

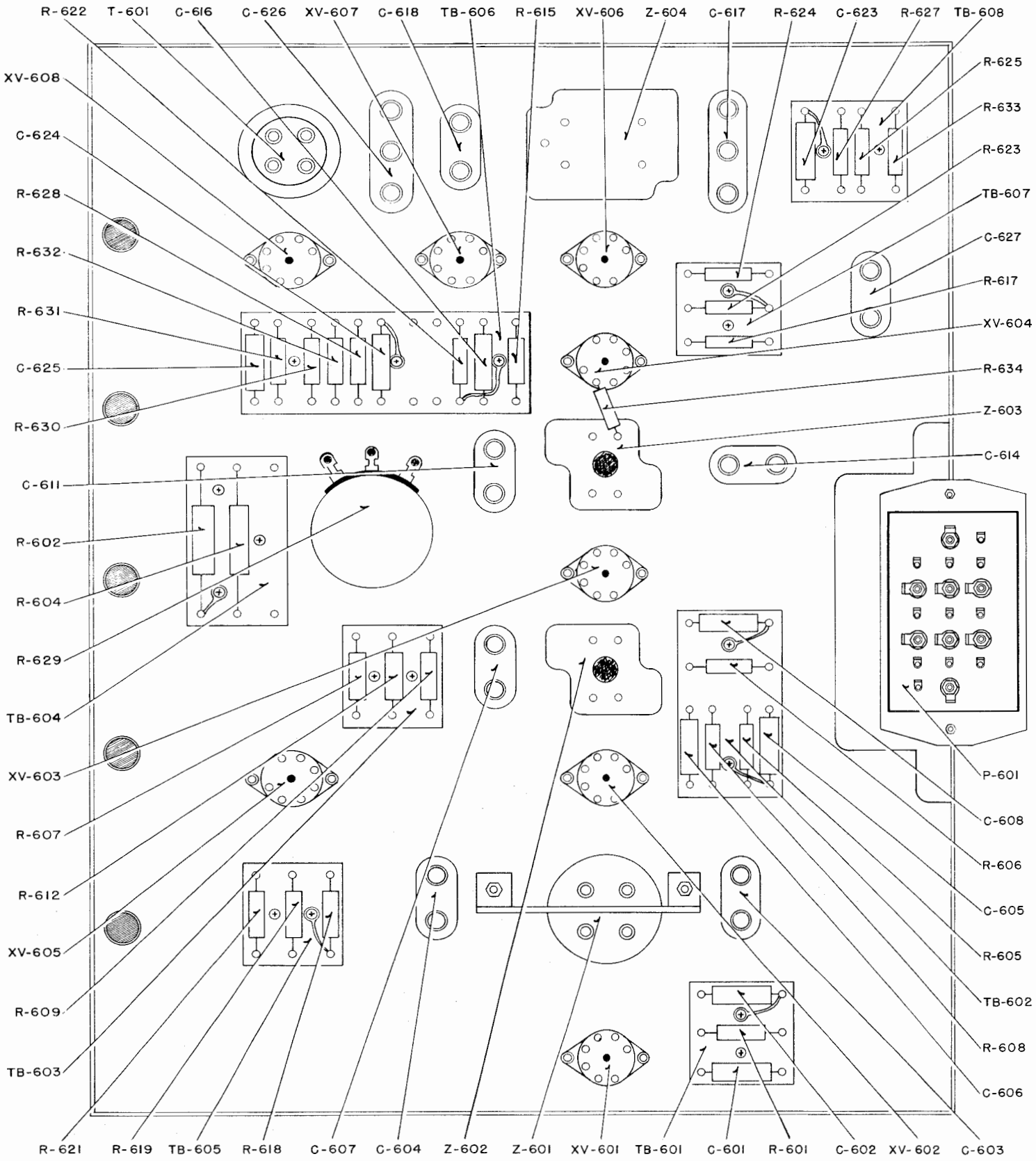


Figure 7–153. Component Locations Bottom of Chassis, R.F. Amplifier AM-454/FRR-24

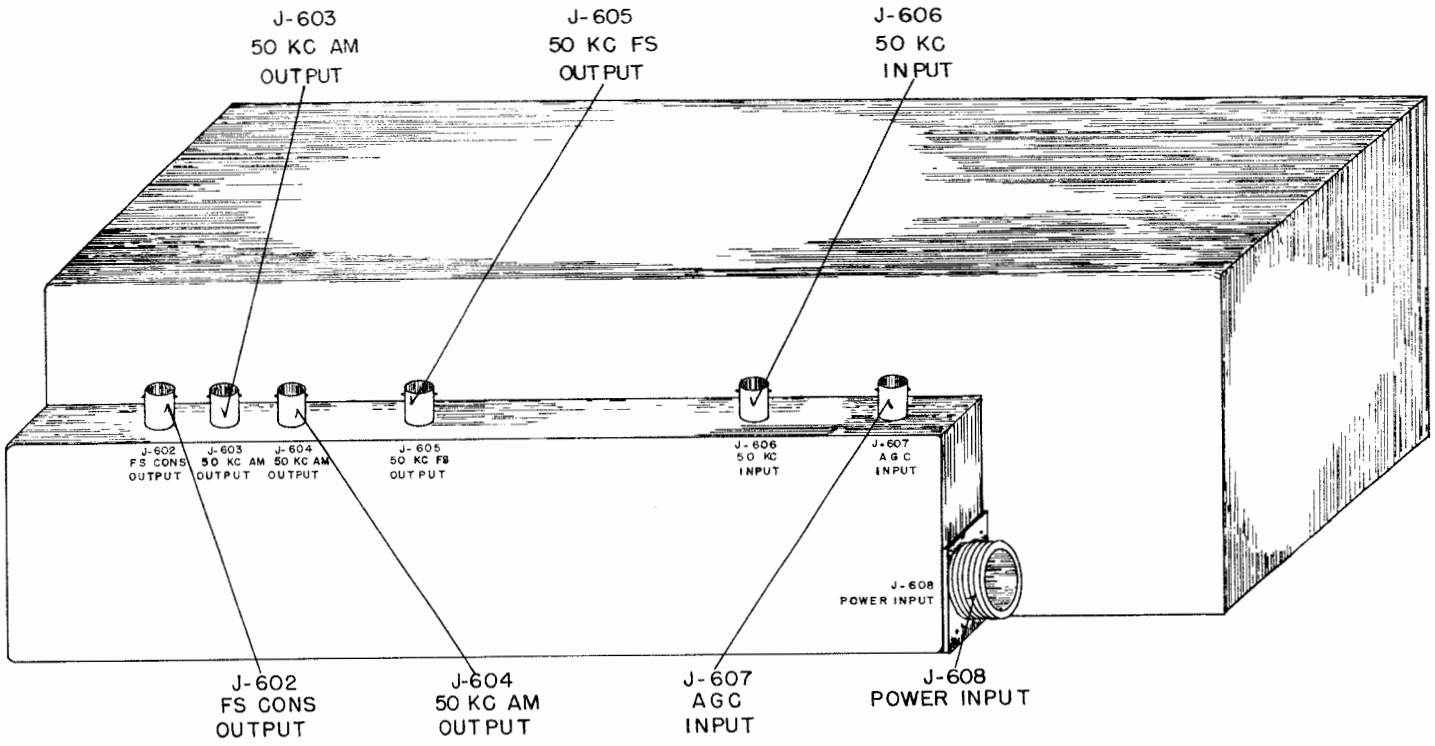


Figure 7–154. Component Locations Rear of Cabinet, R.F. Amplifier AM-454/FRR-24

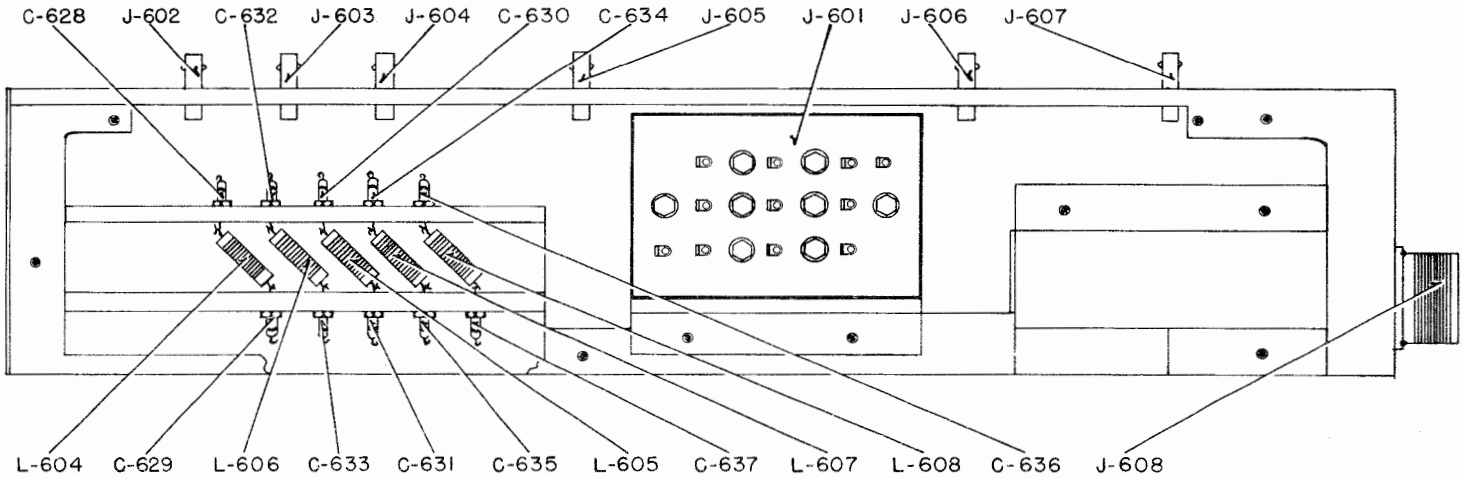


Figure 7–155. Component Locations Inside of R.F. Filter Compartment, R.F. Amplifier AM-454/FRR-24

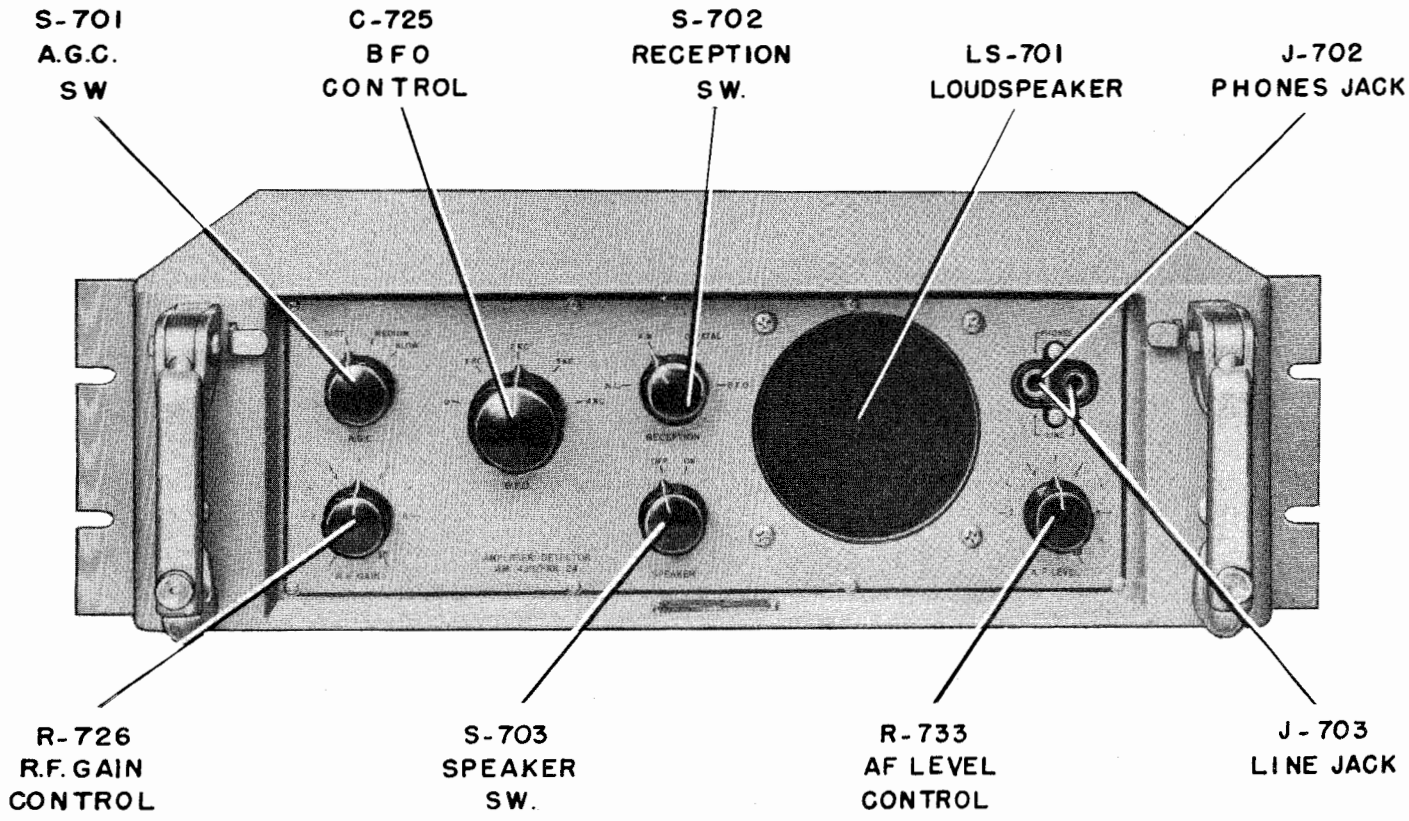


Figure 7–156. Component Locations Front View, Amplifier-Detector AM-439/FRR-24

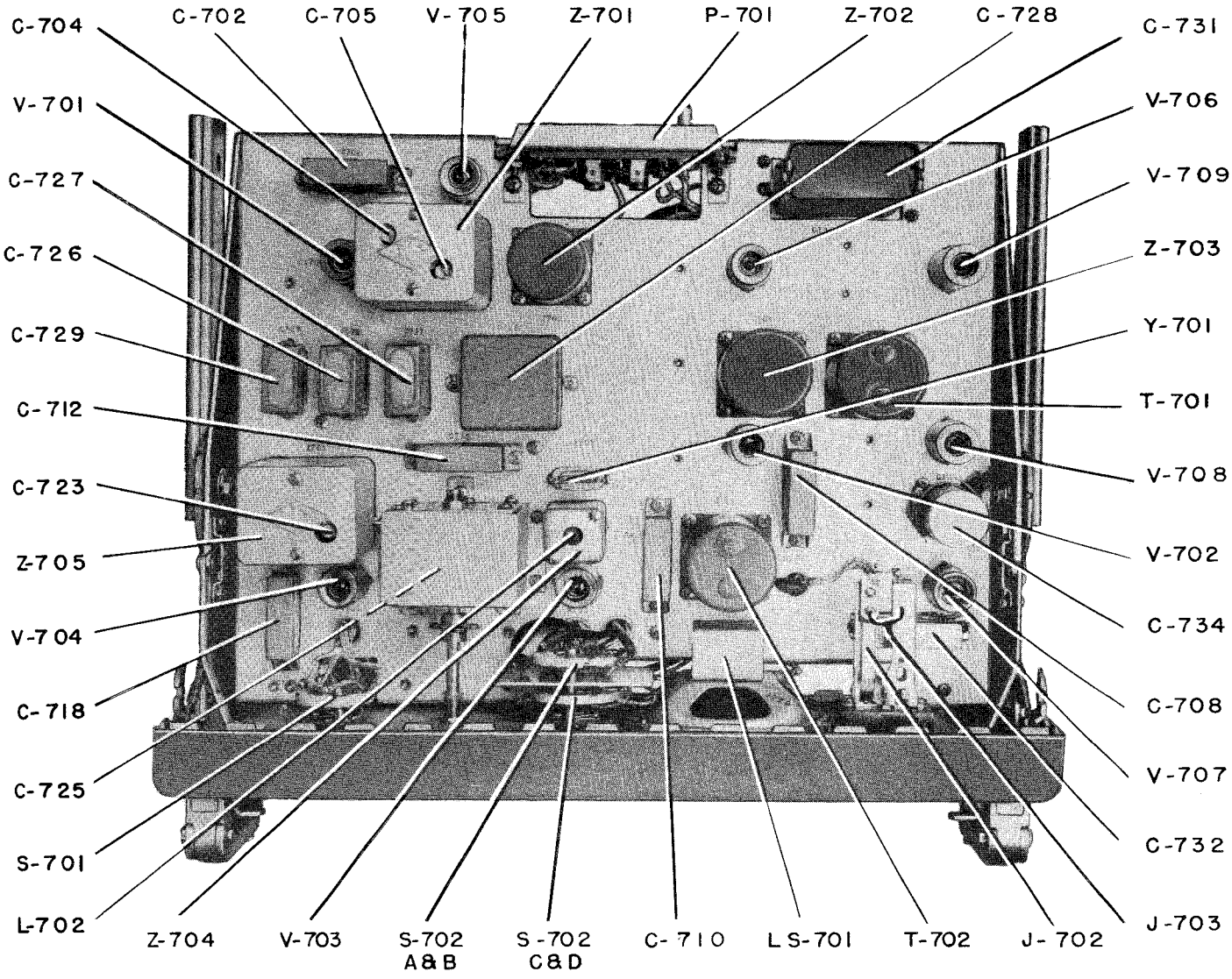


Figure 7–157. Component Locations Top of Chassis, Amplifier-Detector AM-439/FRR-24

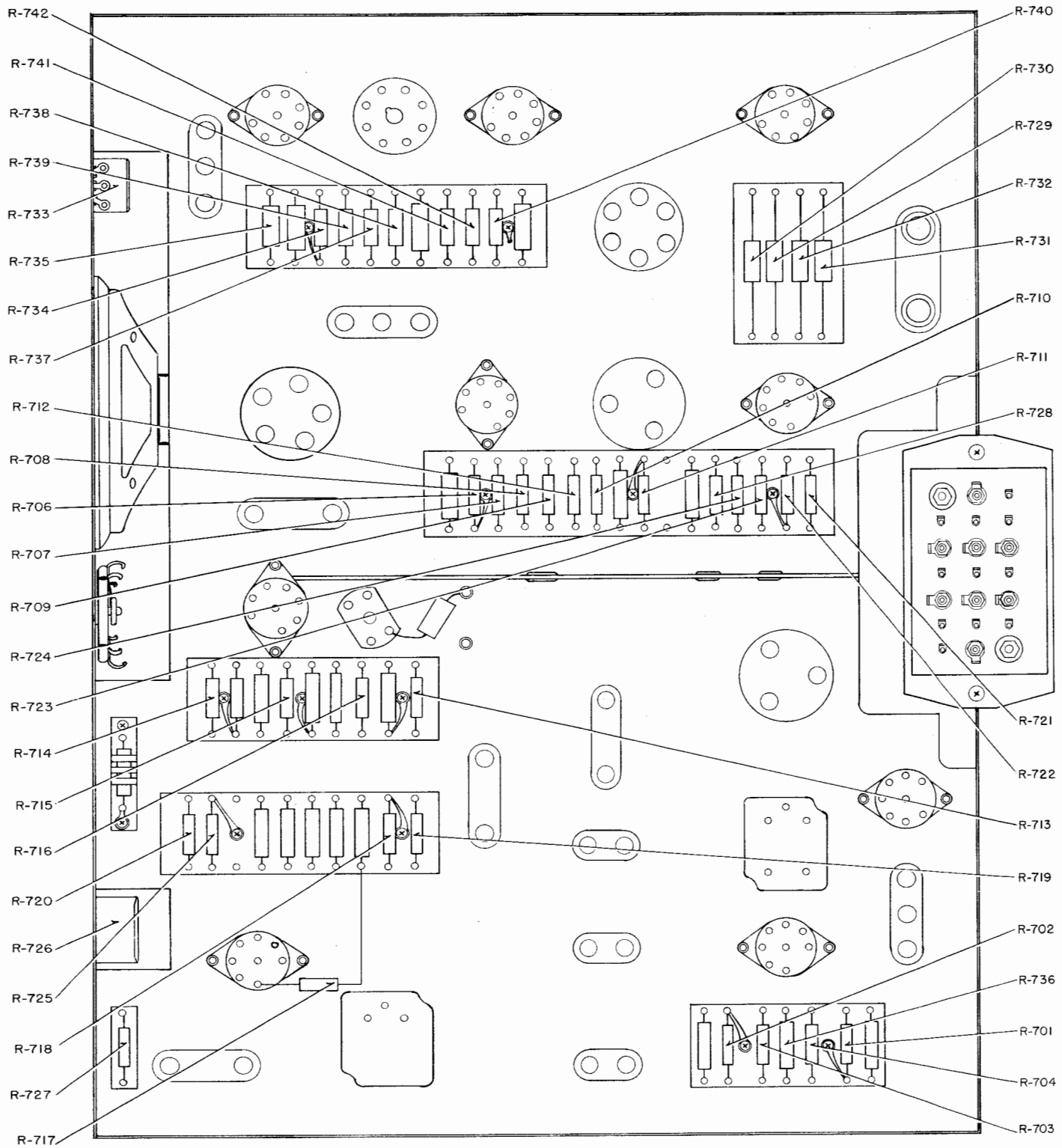


Figure 7–158. Resistor Locations Bottom of Chassis, Amplifier-Detector AM-439/FRR-24

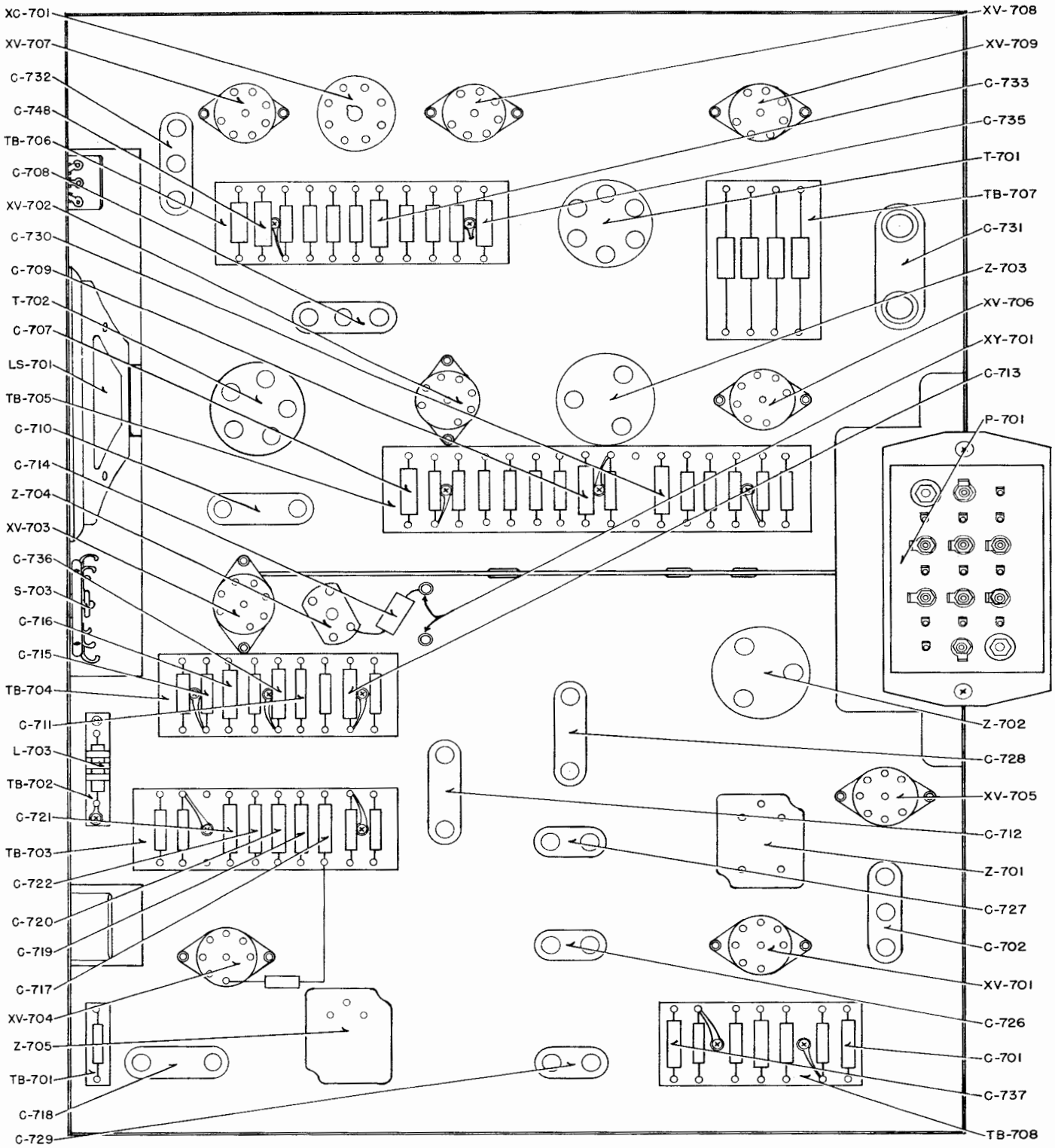


Figure 7–159. Capacitor and Miscellaneous Component Locations Bottom of Chassis, Amplifier-Detector AM-439/FRR-24

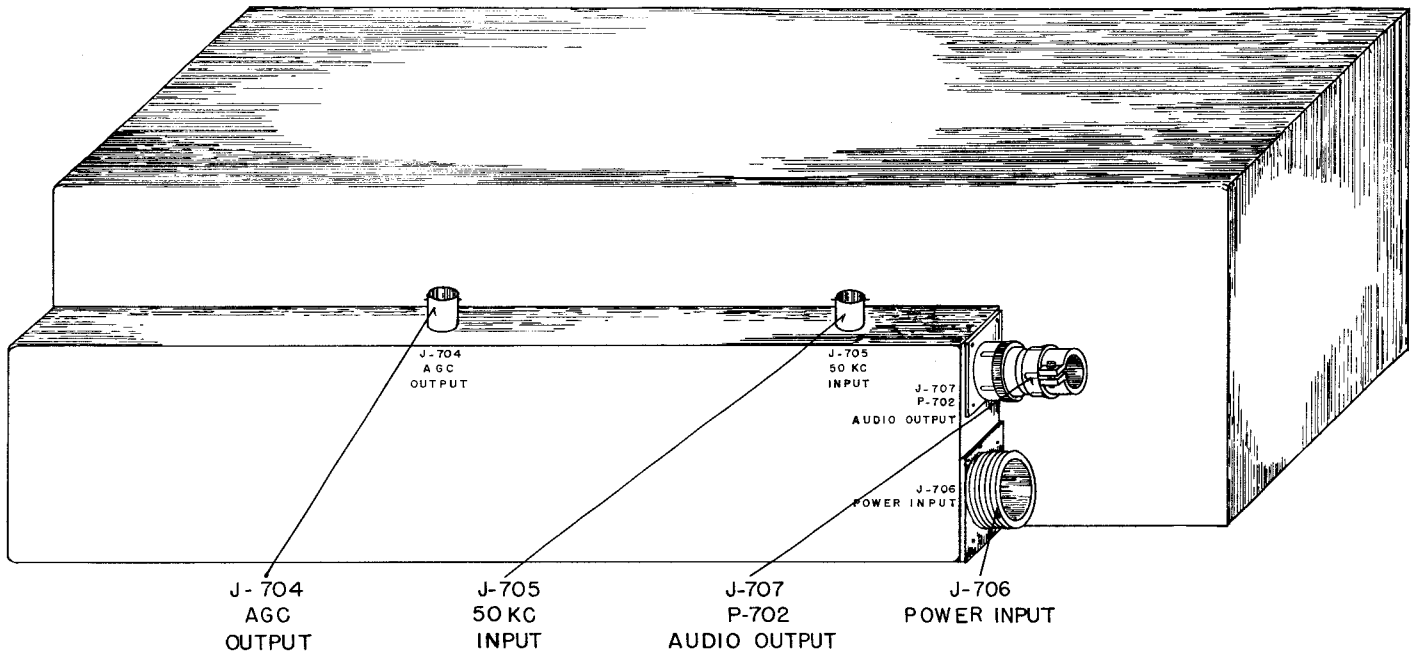


Figure 7–160. Component Locations Rear of Cabinet, Amplifier-Detector AM-439/FRR-24

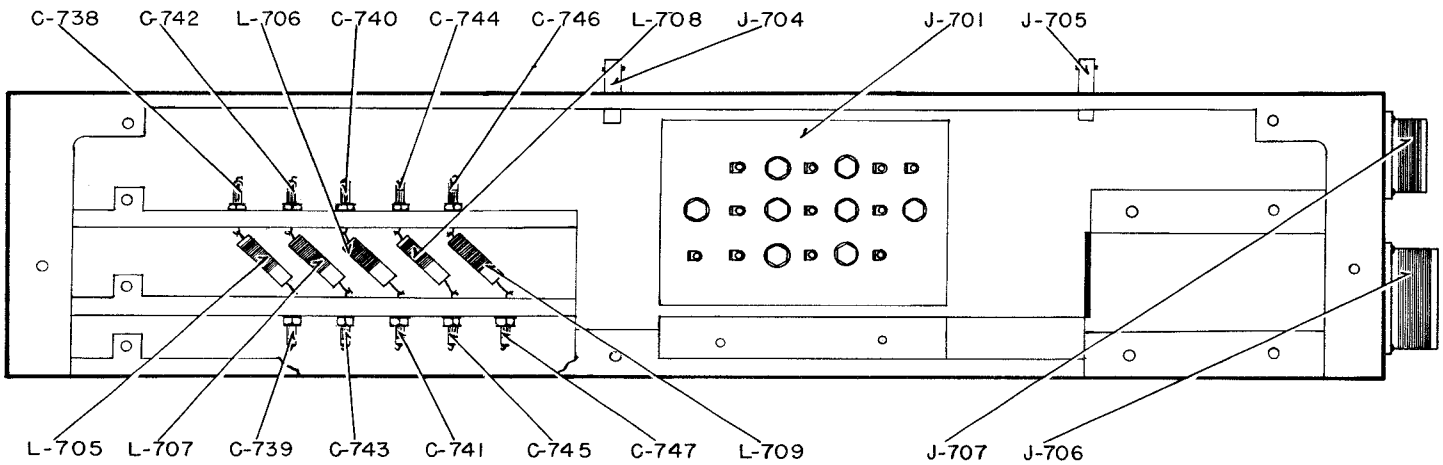


Figure 7–161. Component Locations Inside of R.F. Filter Compartment, Amplifier-Detector AM-439/FRR-24

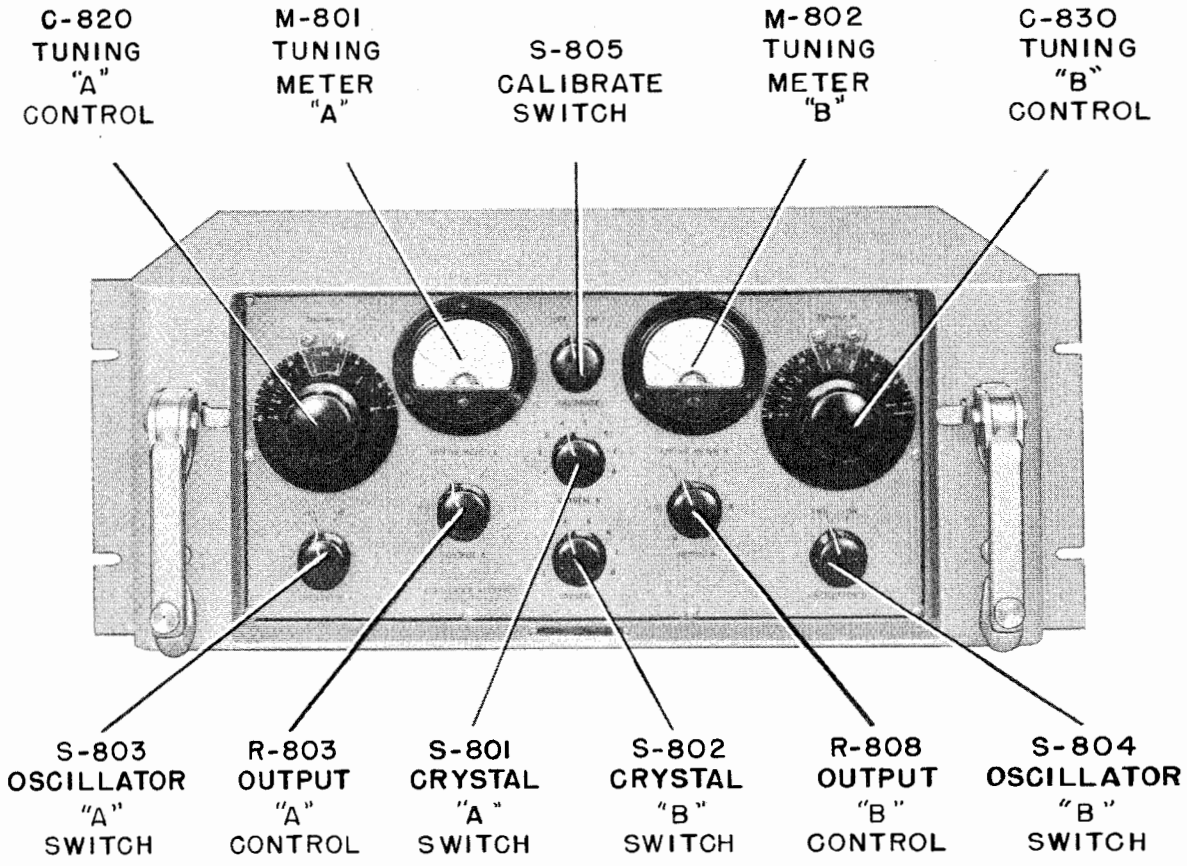


Figure 7–162. Component Locations Front View, Oscillator Assembly O-131/FRR-24

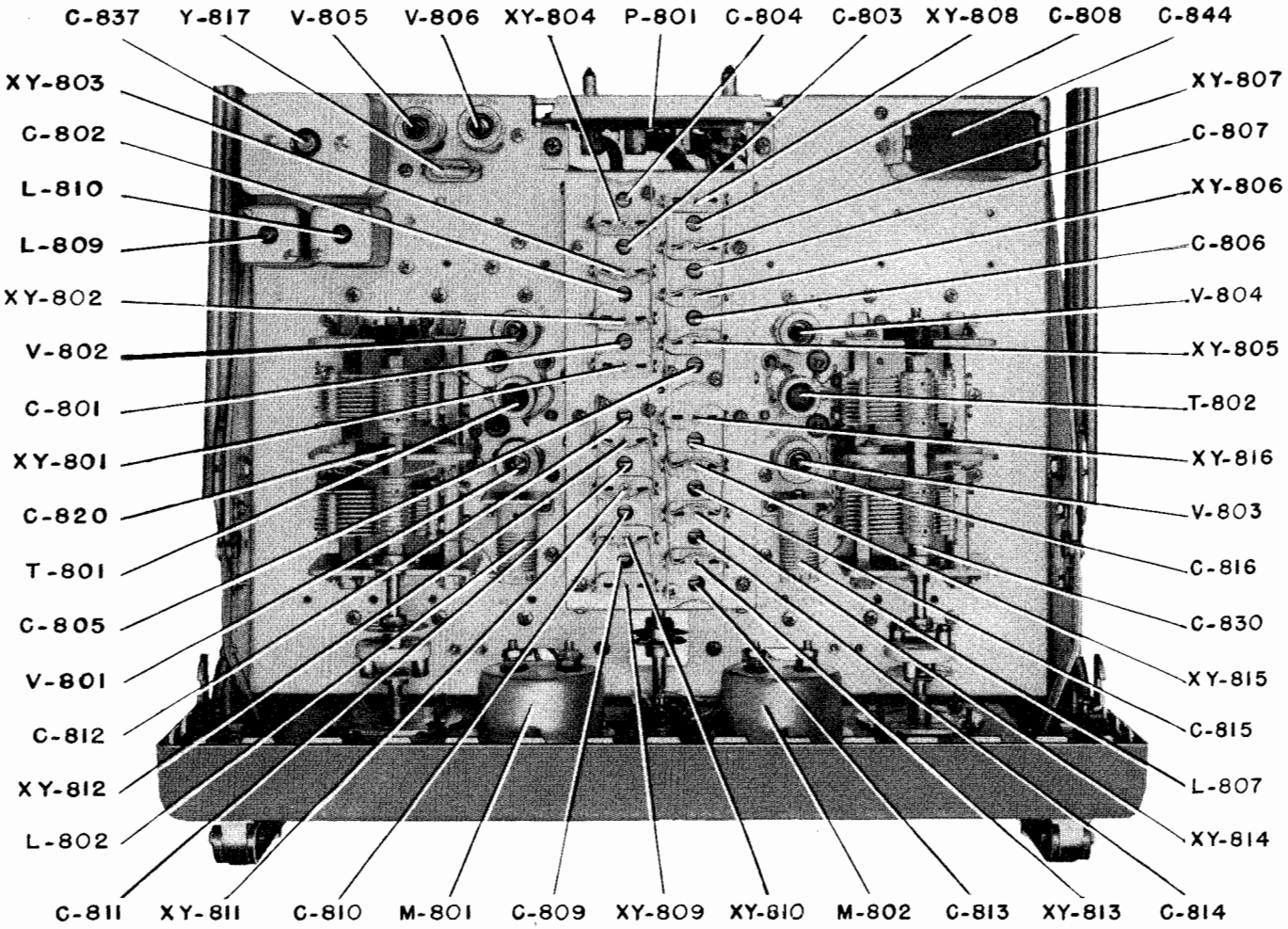


Figure 7–163. Component Locations Top of Chassis, Oscillator Assembly O-131/FRR-24

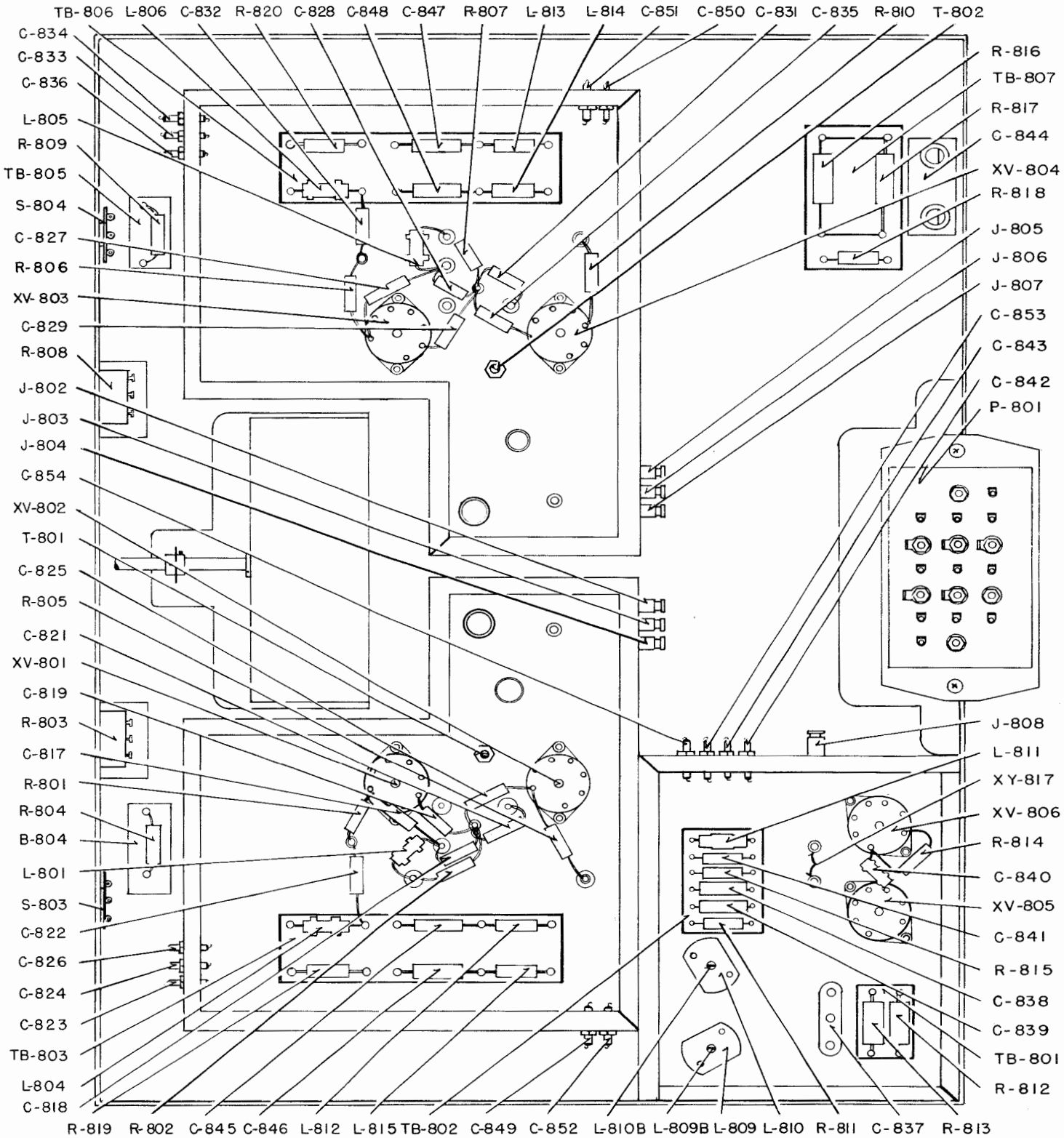


Figure 7–164. Component Locations Bottom of Chassis, Oscillator Assembly 0-131/FRR-24

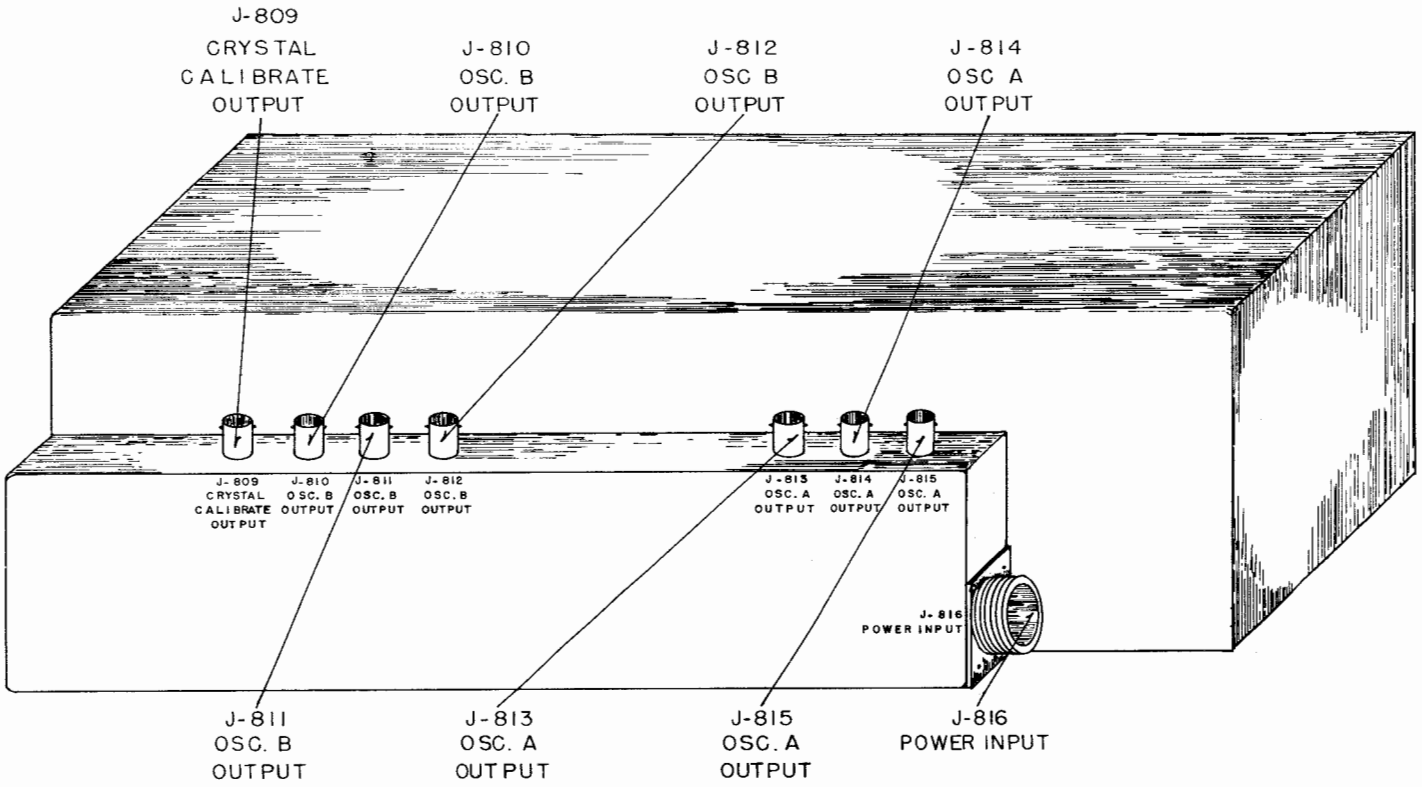


Figure 7–165. Component Locations Rear of Cabinet, Oscillator Assembly O-131/FRR-24

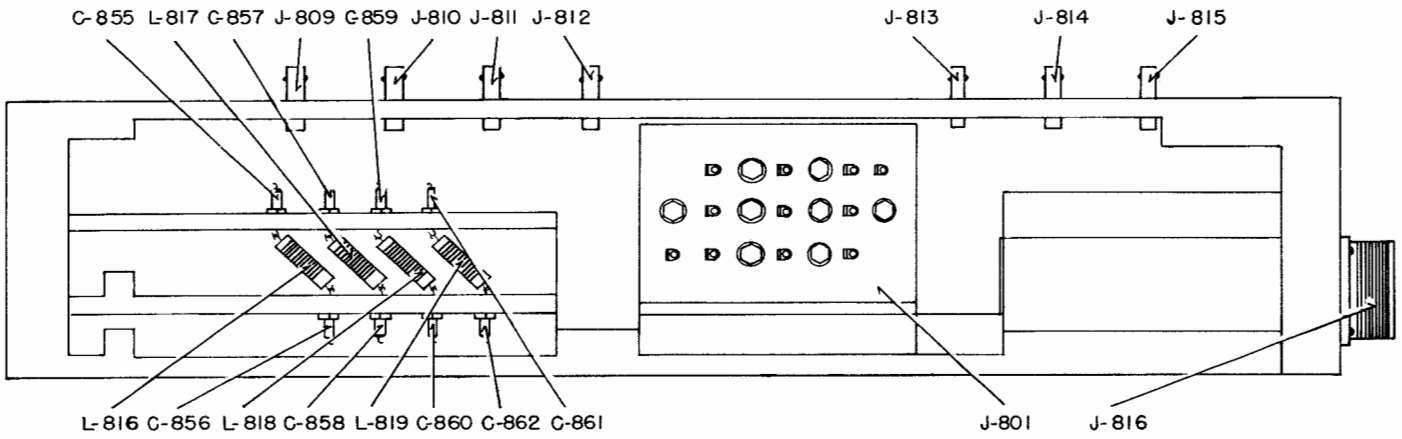


Figure 7–166. Component Locations Inside of R.F. Filter Compartment, Oscillator Assembly O-131/FRR-24

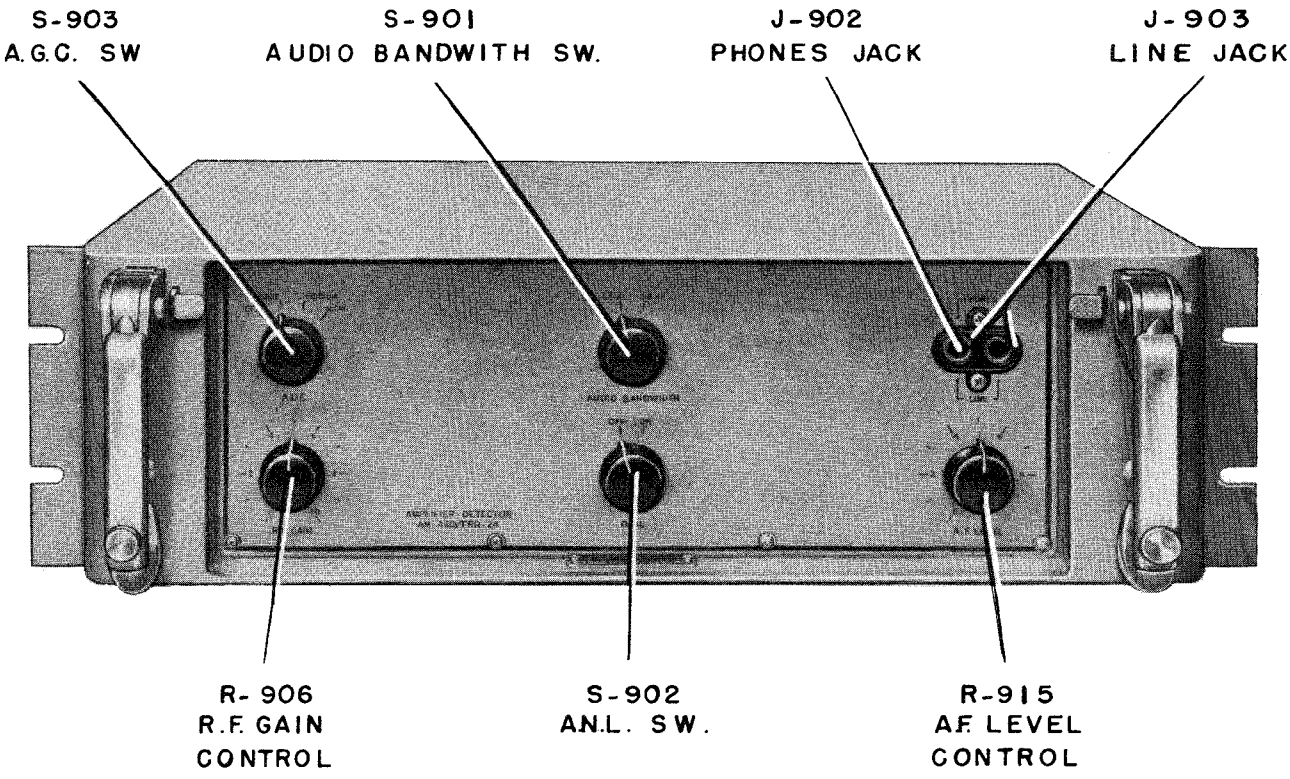


Figure 7–167. Component Locations Front View, Amplifier-Detector AM-440/FRR-24

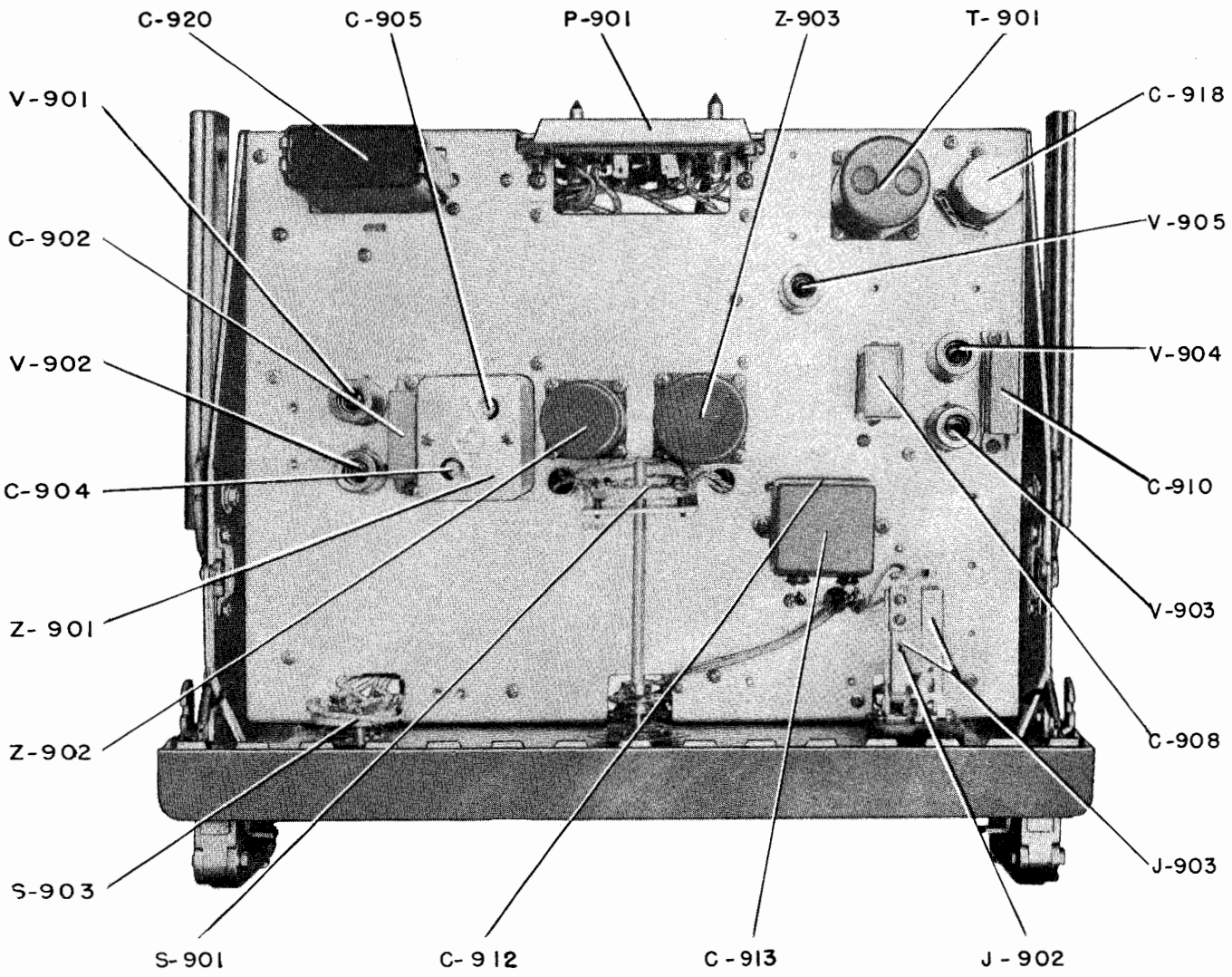


Figure 7–168. Component Locations Top of Chassis, Amplifier-Detector AM-440/FRR-24

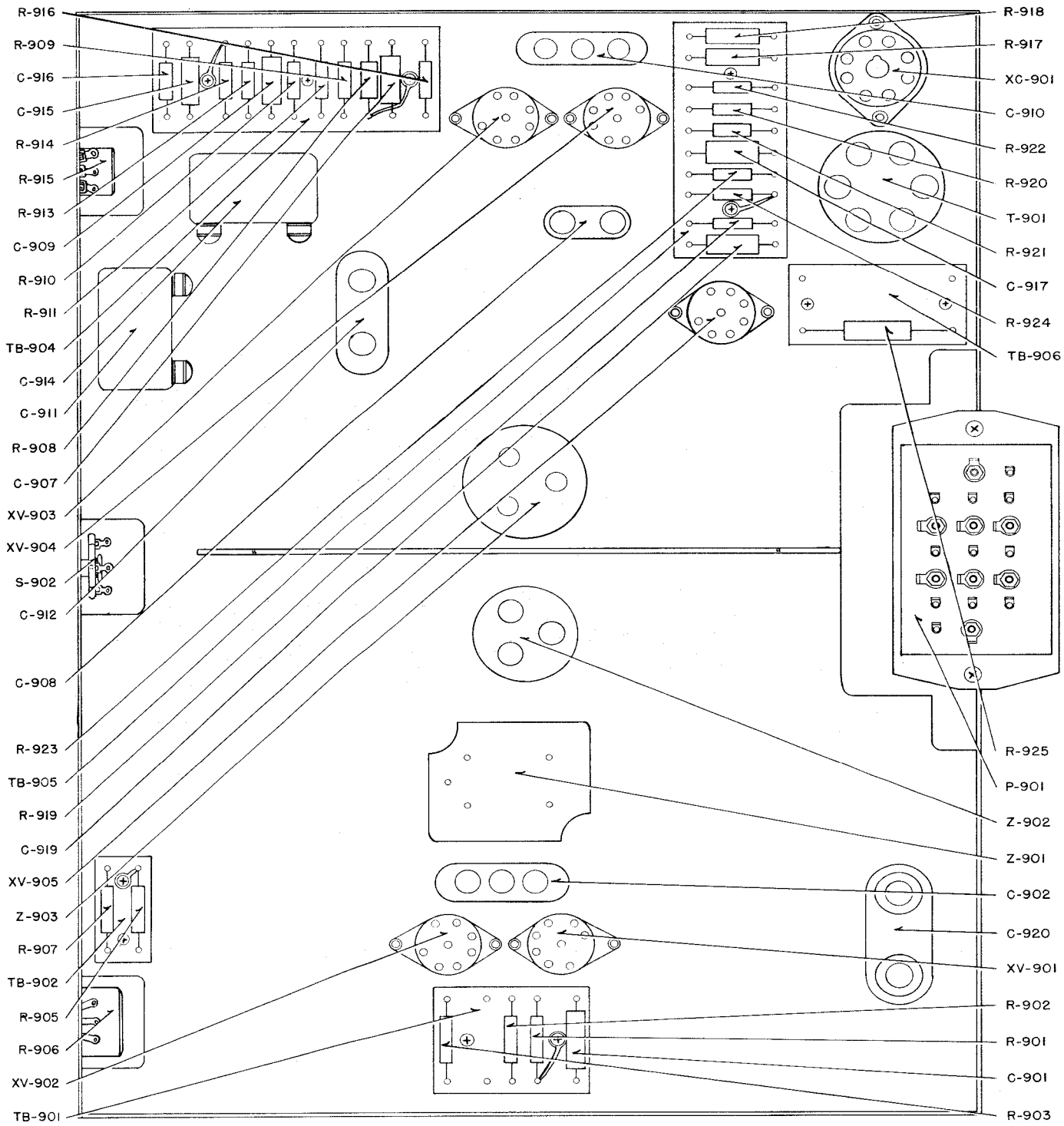


Figure 7–169. Component Locations Bottom of Chassis, Amplifier-Detector AM-440/FRR-24

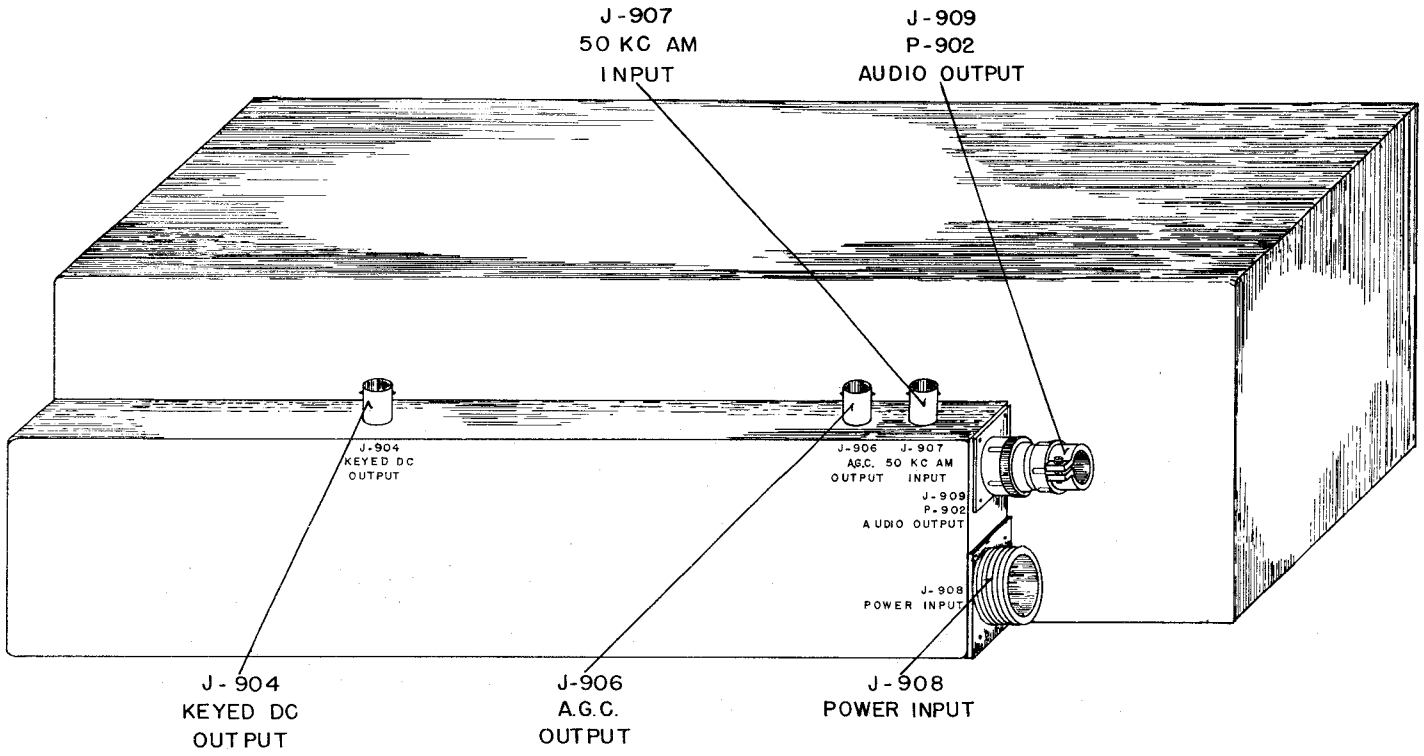


Figure 7–170. Component Locations Rear of Cabinet, Amplifier-Detector AM-440/FRR-24

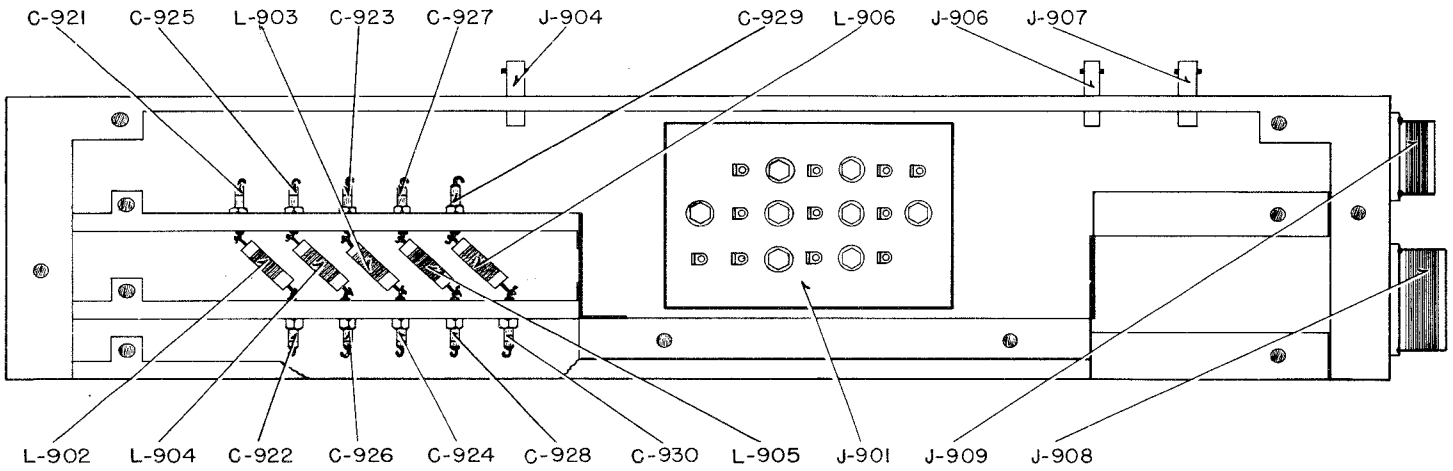


Figure 7–171. Component Locations Inside of R.F Filter Compartment, Amplifier-Detector AM-440/FRR-24

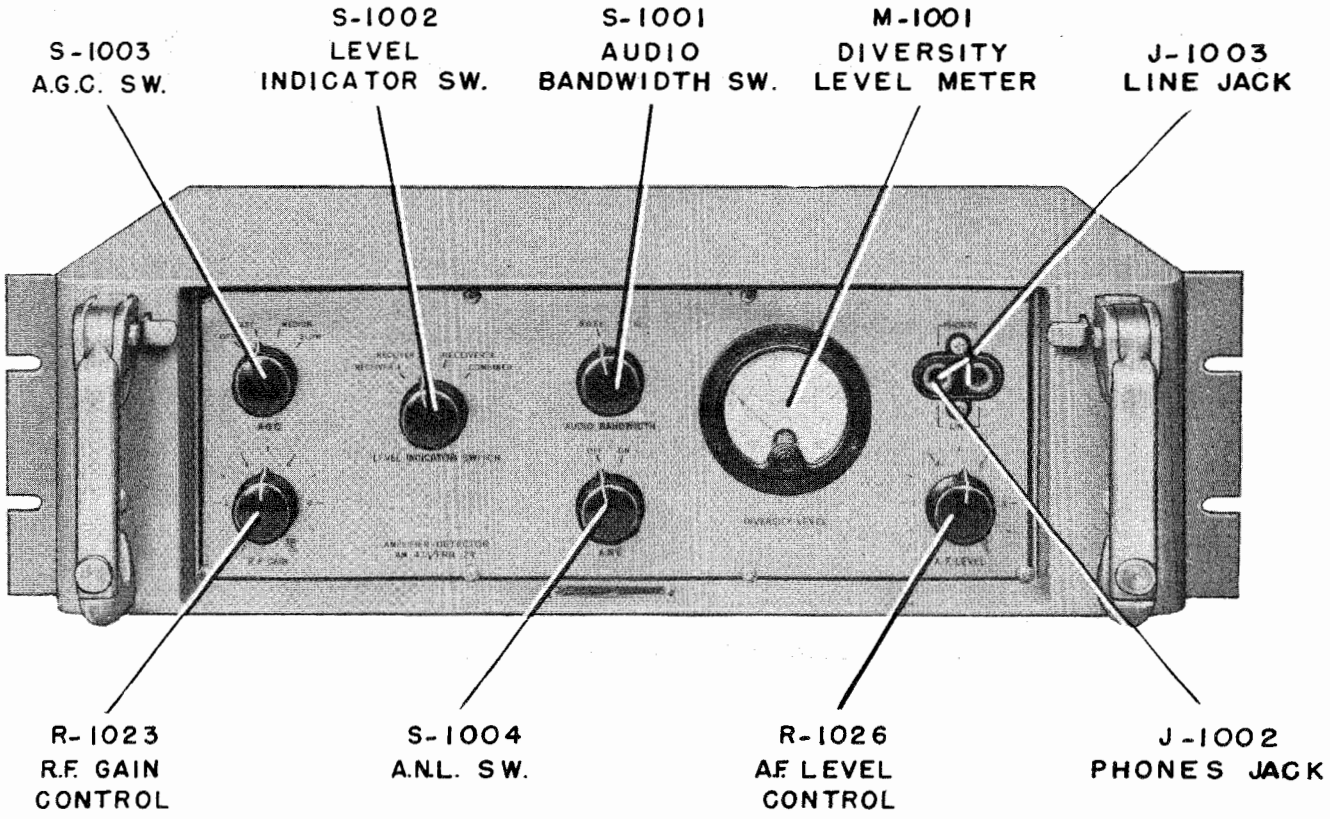


Figure 7–172. Component Locations Front View, Amplifier-Detector AM-438/FRR-24

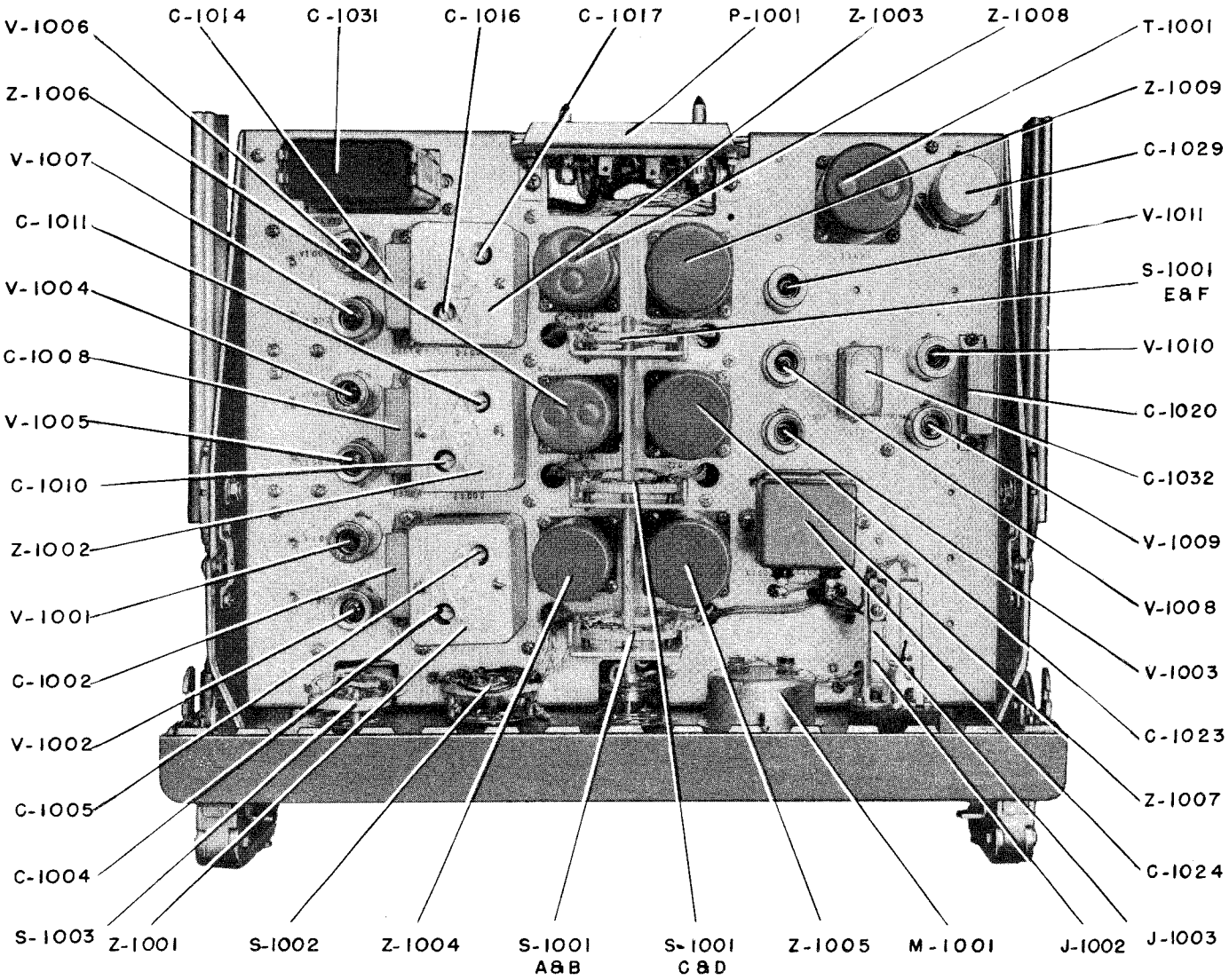


Figure 7–173. Component Locations Top of Chassis, Amplifier-Detector AM-438/FRR-24

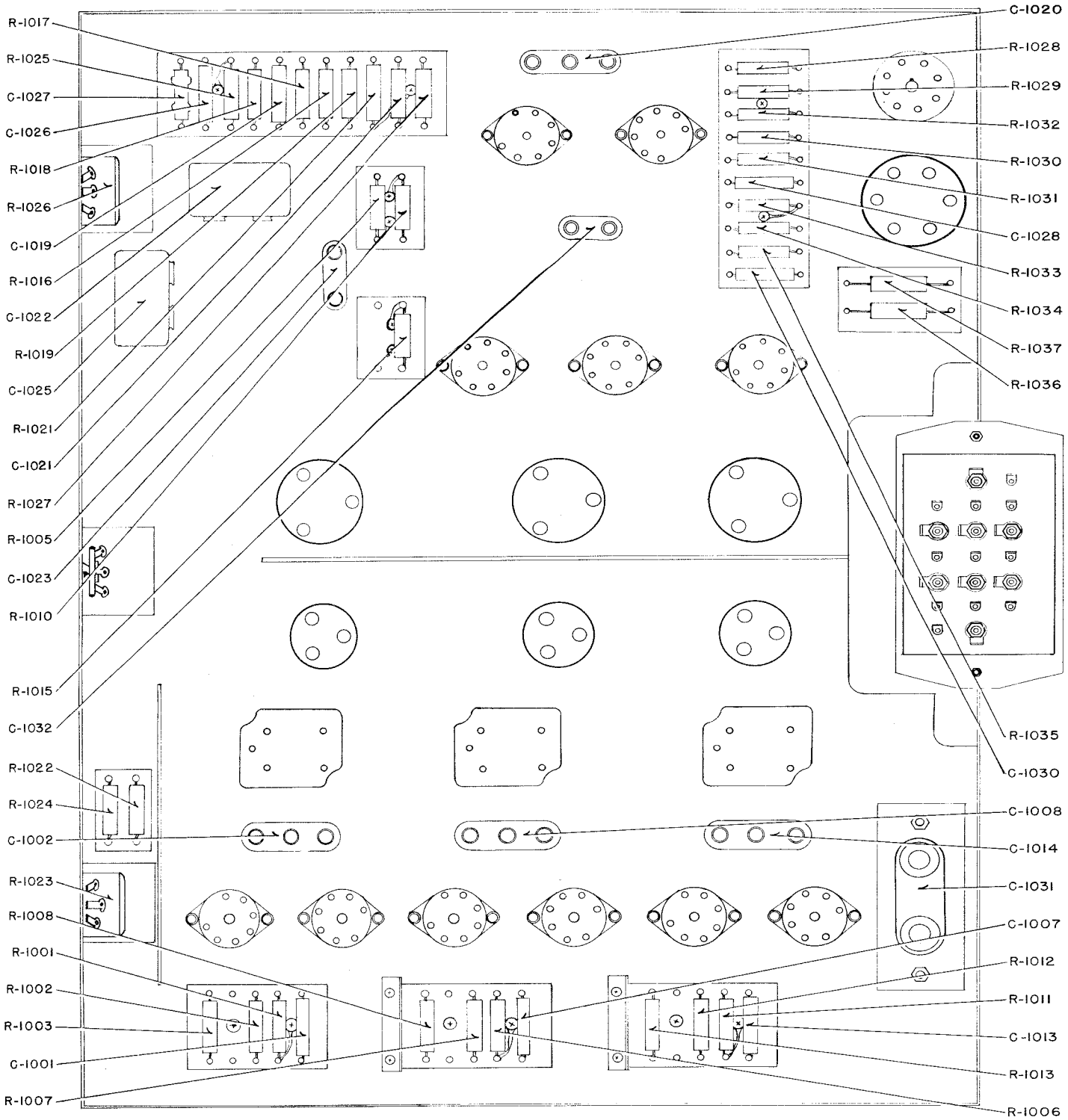


Figure 7–174. Capacitor and Resistor Locations Bottom of Chassis, Amplifier-Detector AM-438/FRR-24

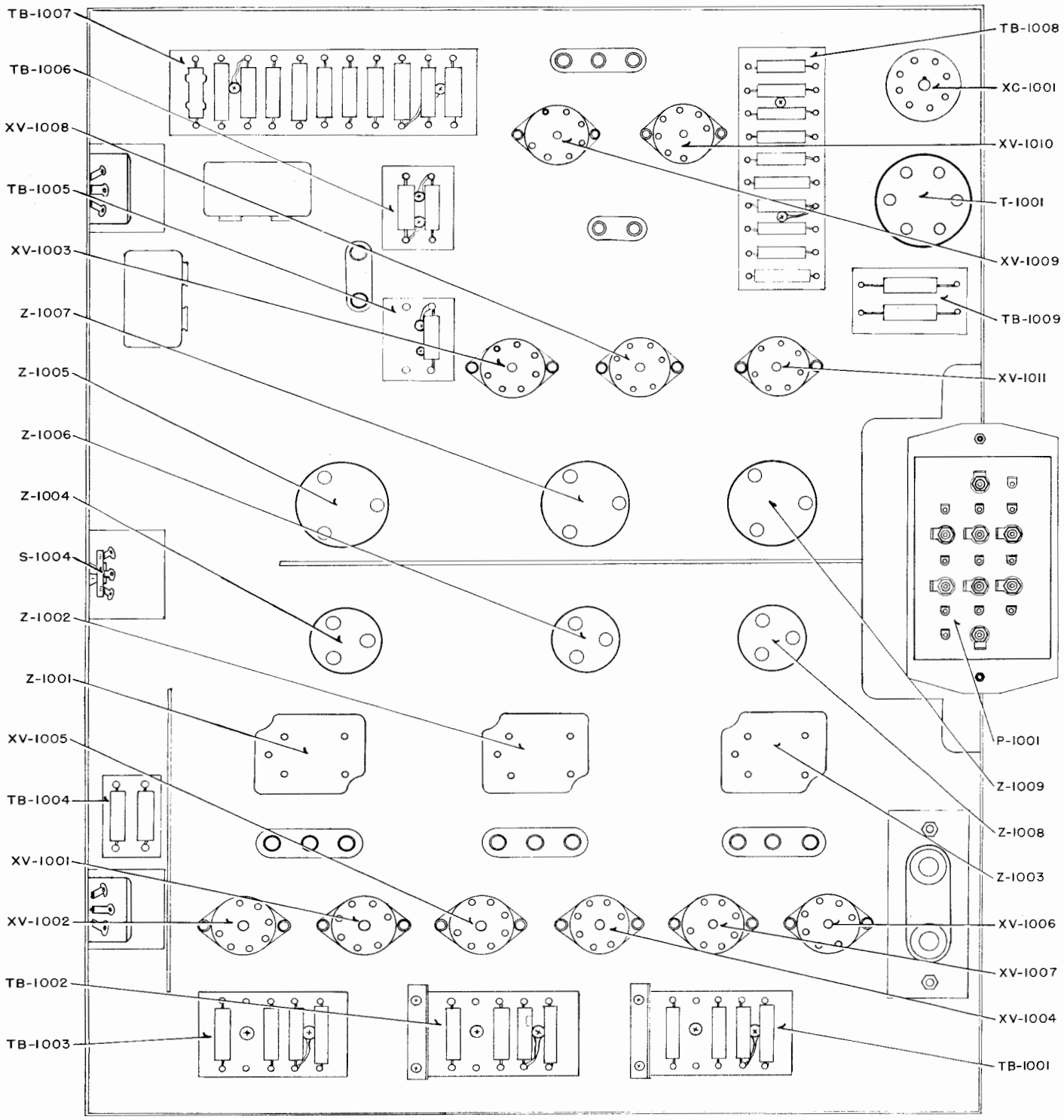


Figure 7–175. Miscellaneous Component Locations Bottom of Chassis, Amplifier-Detector AM-438/FRR-24

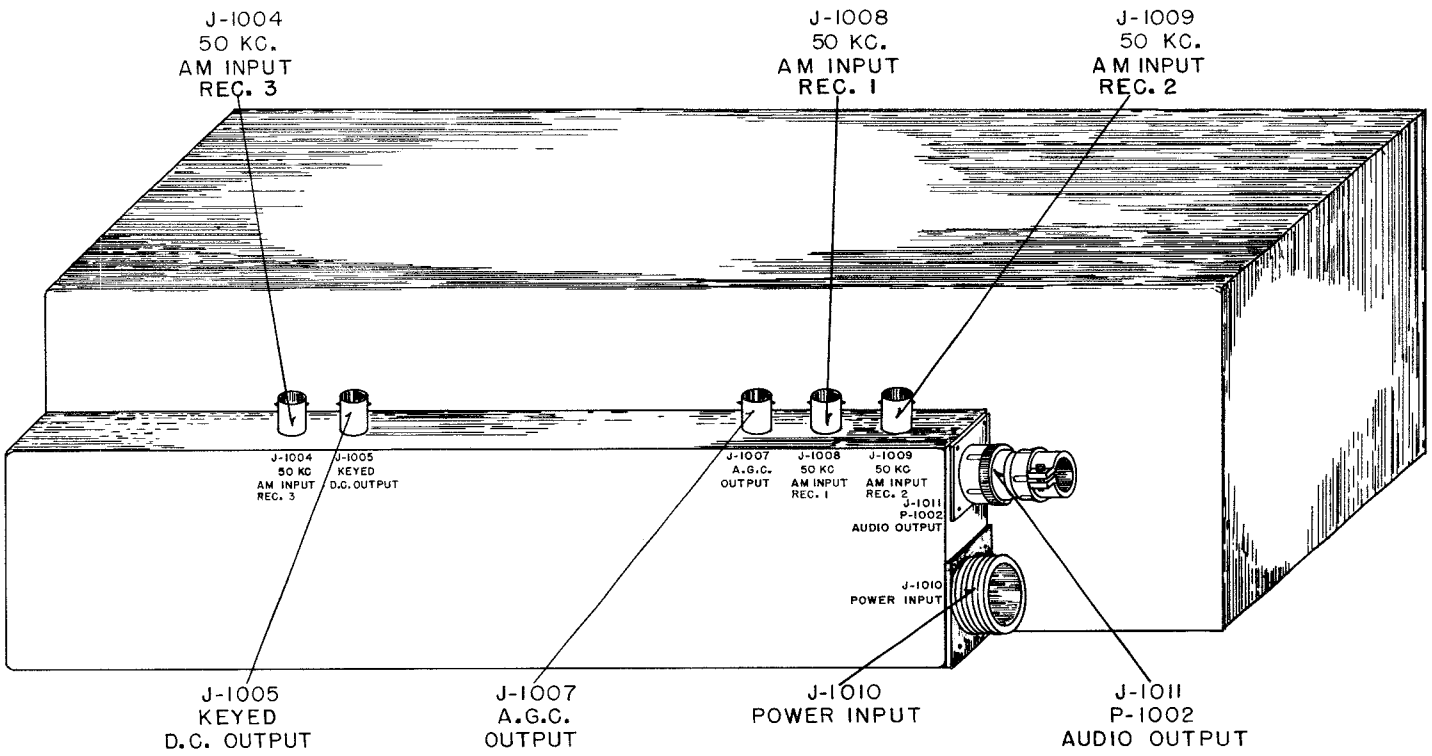


Figure 7–176. Component Locations Rear of Cabinet, Amplifier-Detector AM-438/FRR-24

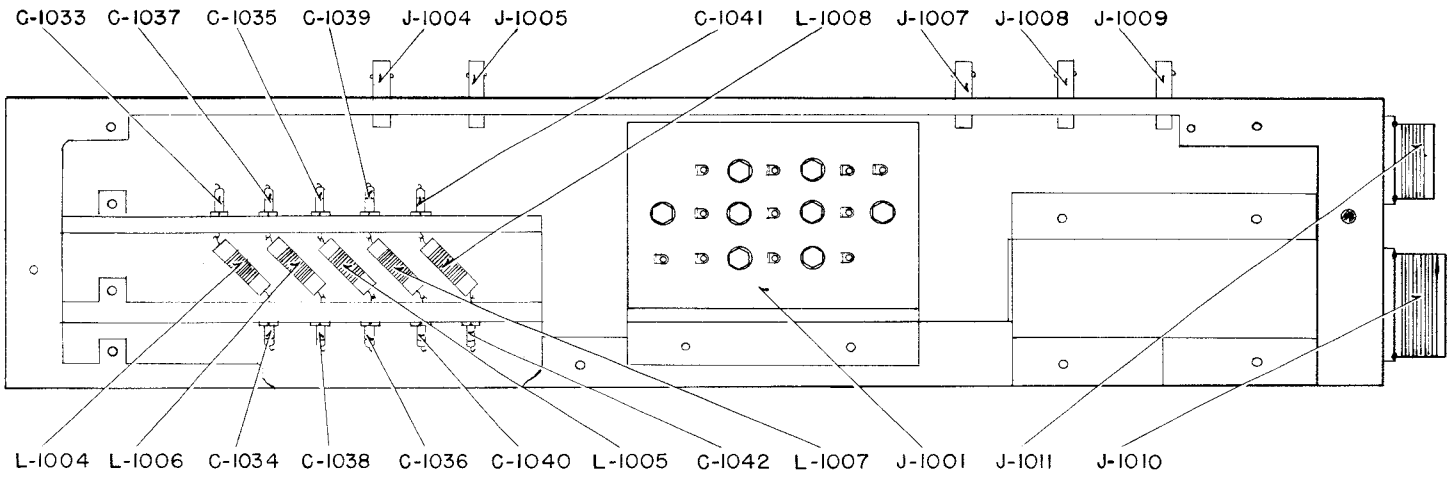


Figure 7–177. Component Locations Inside of R.F. Filter Compartment, Amplifier-Detector AM-438/FRR-24

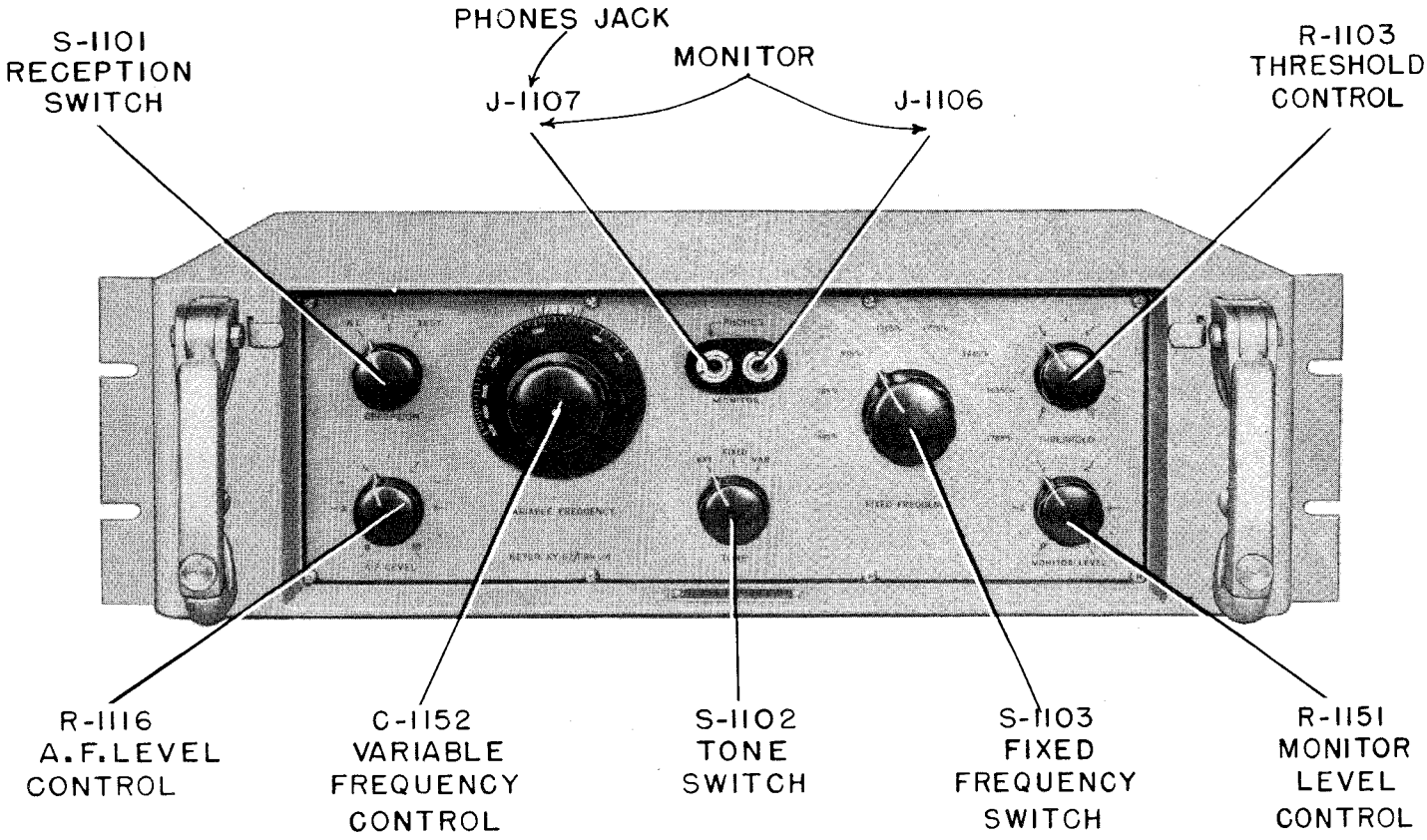


Figure 7–178. Component Locations Front View, Keyer KY-62/FRR-24

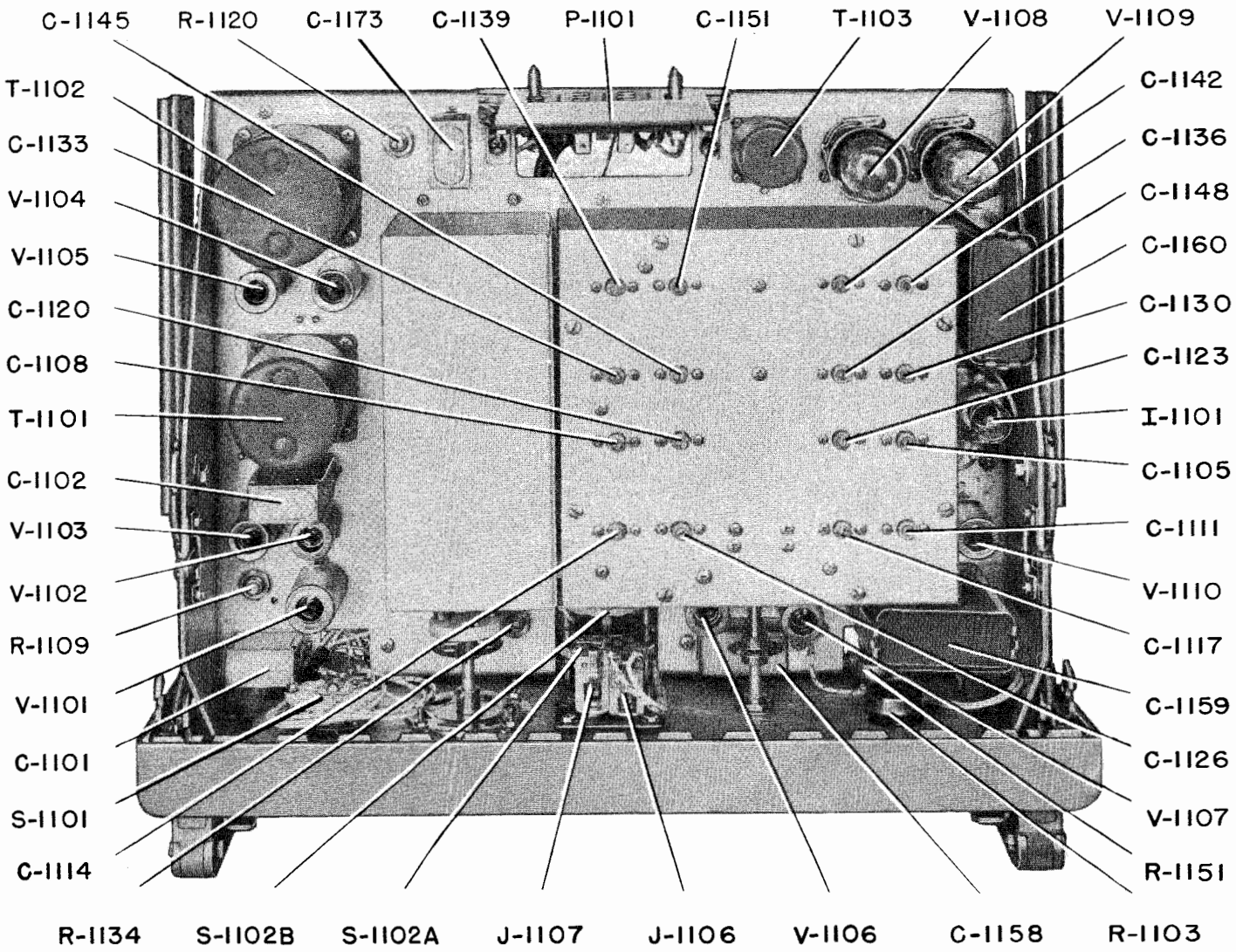


Figure 7–179. Component Locations Top of Chassis, Keyer KY-62/FRR-24

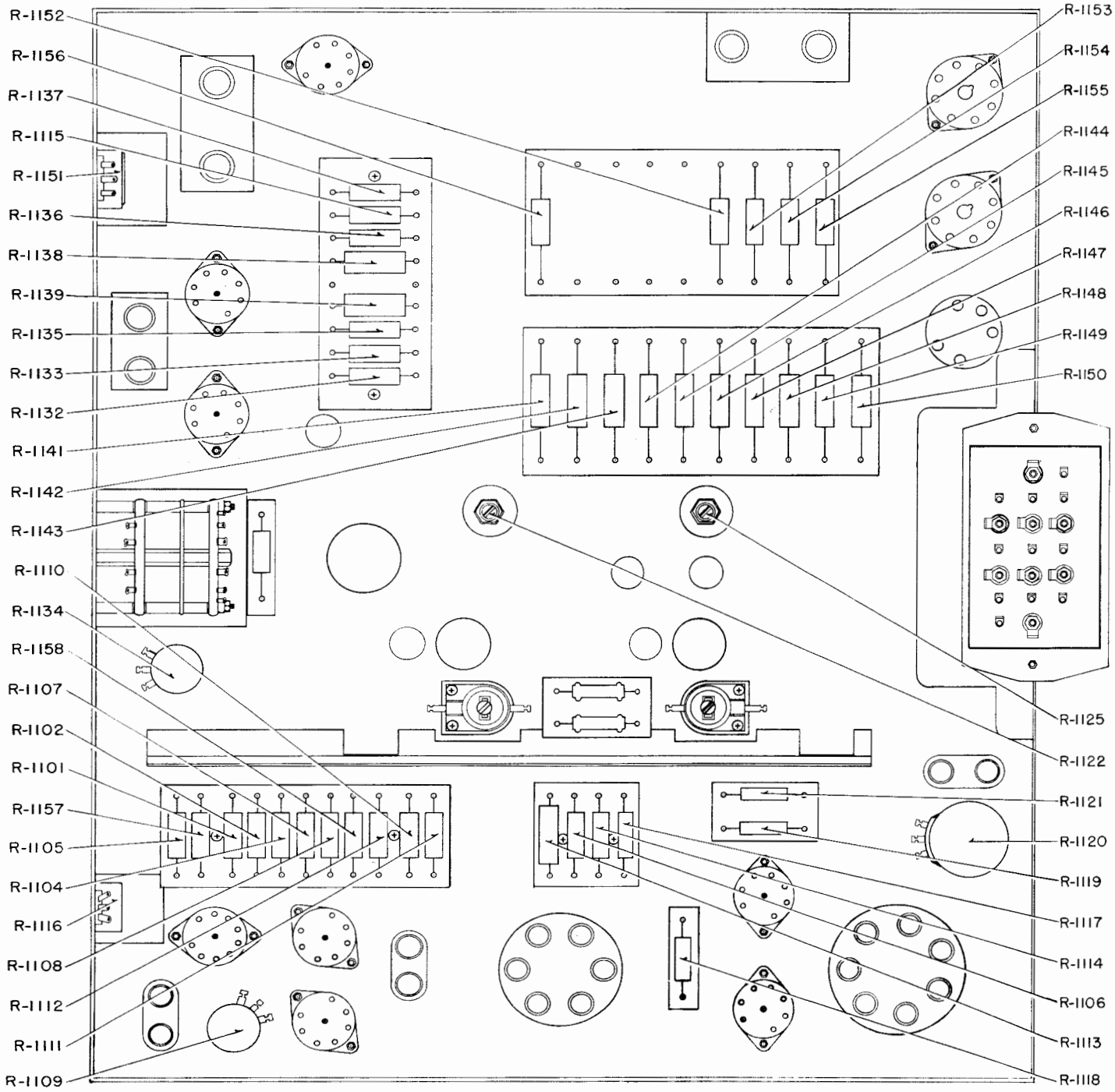


Figure 7-180. Resistor Locations, Bottom of Chassis, Keyer KY-62/FRR-24

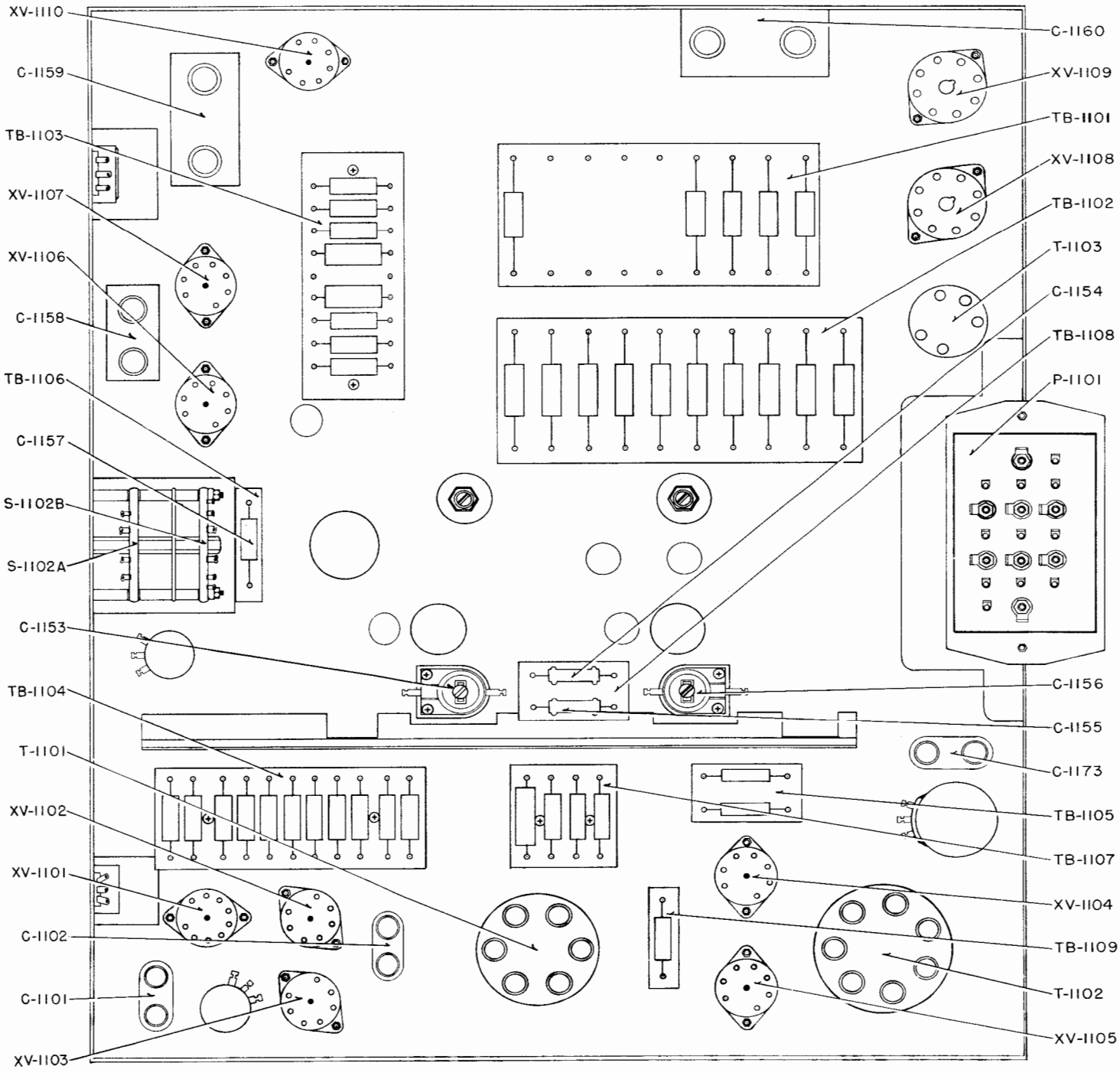


Figure 7–181. Capacitor and Miscellaneous Component Locations, Bottom of Chassis, Keyer KY-62/FRR-24

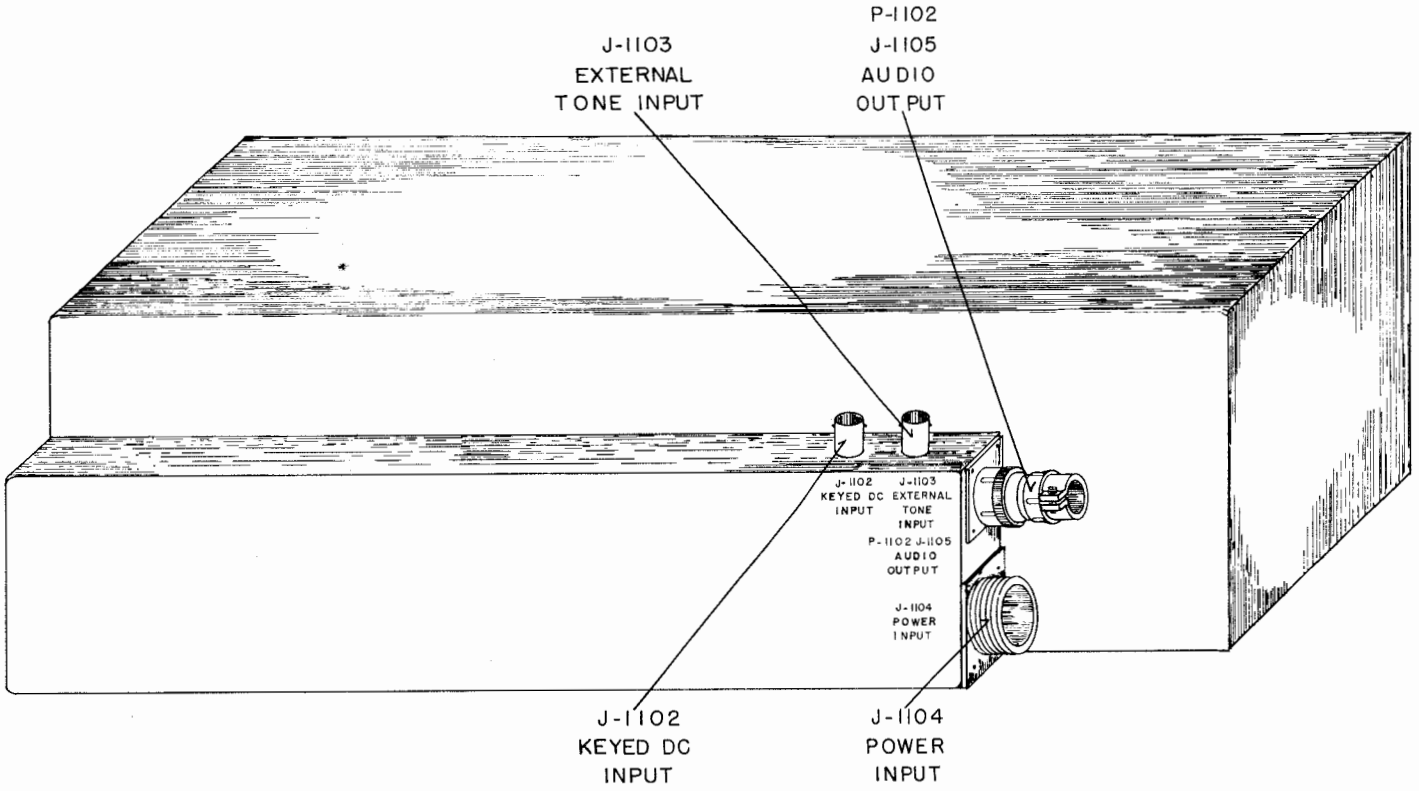


Figure 7–182. Component Locations Rear of Cabinet, Keyer KY-62/FRR-24

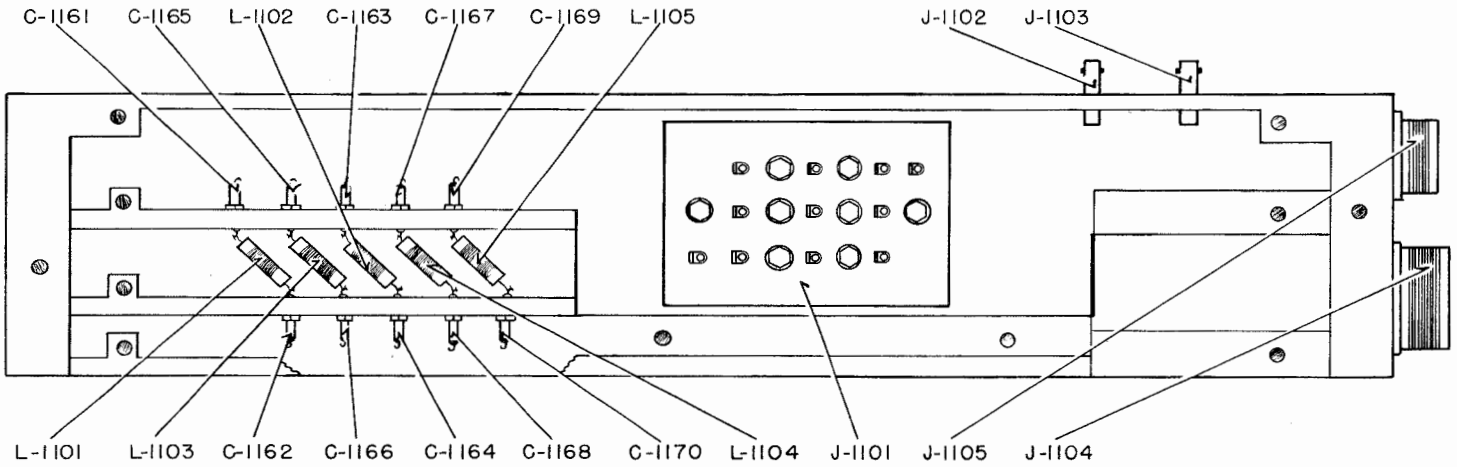


Figure 7–183. Component Locations Inside of R.F. Filter Compartment, Keyer KY-62/FRR-24

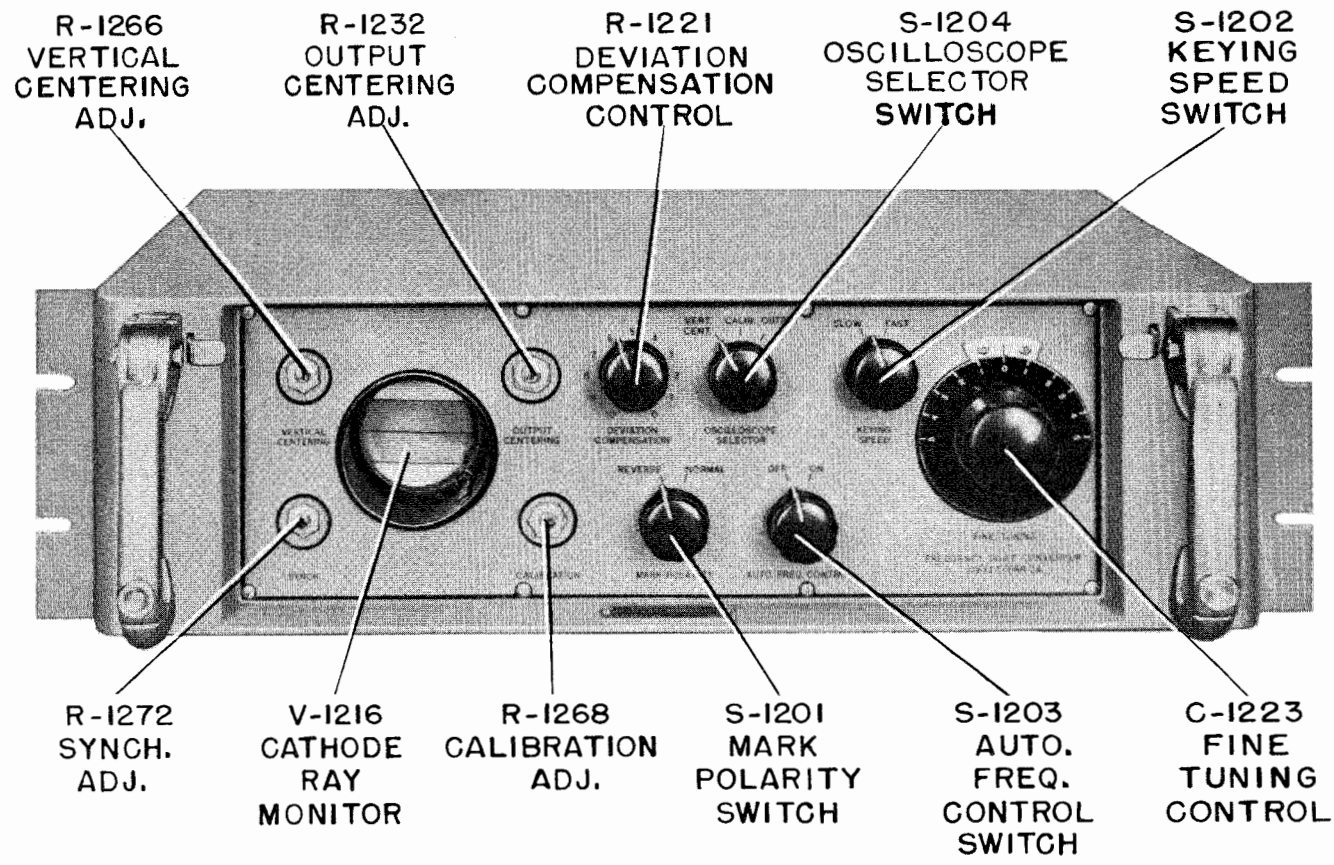


Figure 7–184. Component Locations Front View, Frequency Shift Converter CV-127/FRR-24

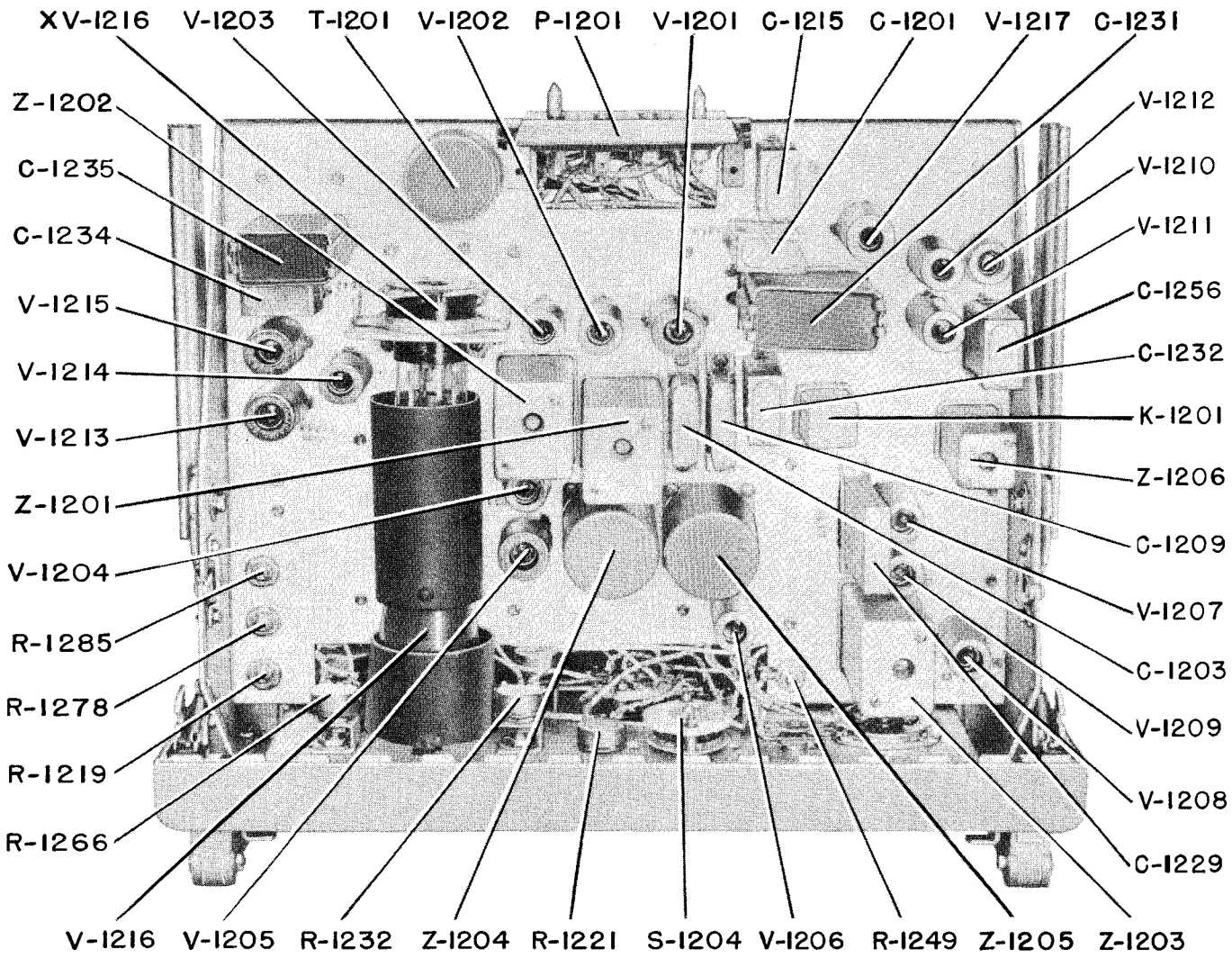


Figure 7–185. Component Locations Top of Chassis, Frequency Shift Converter CV-127/FRR-24

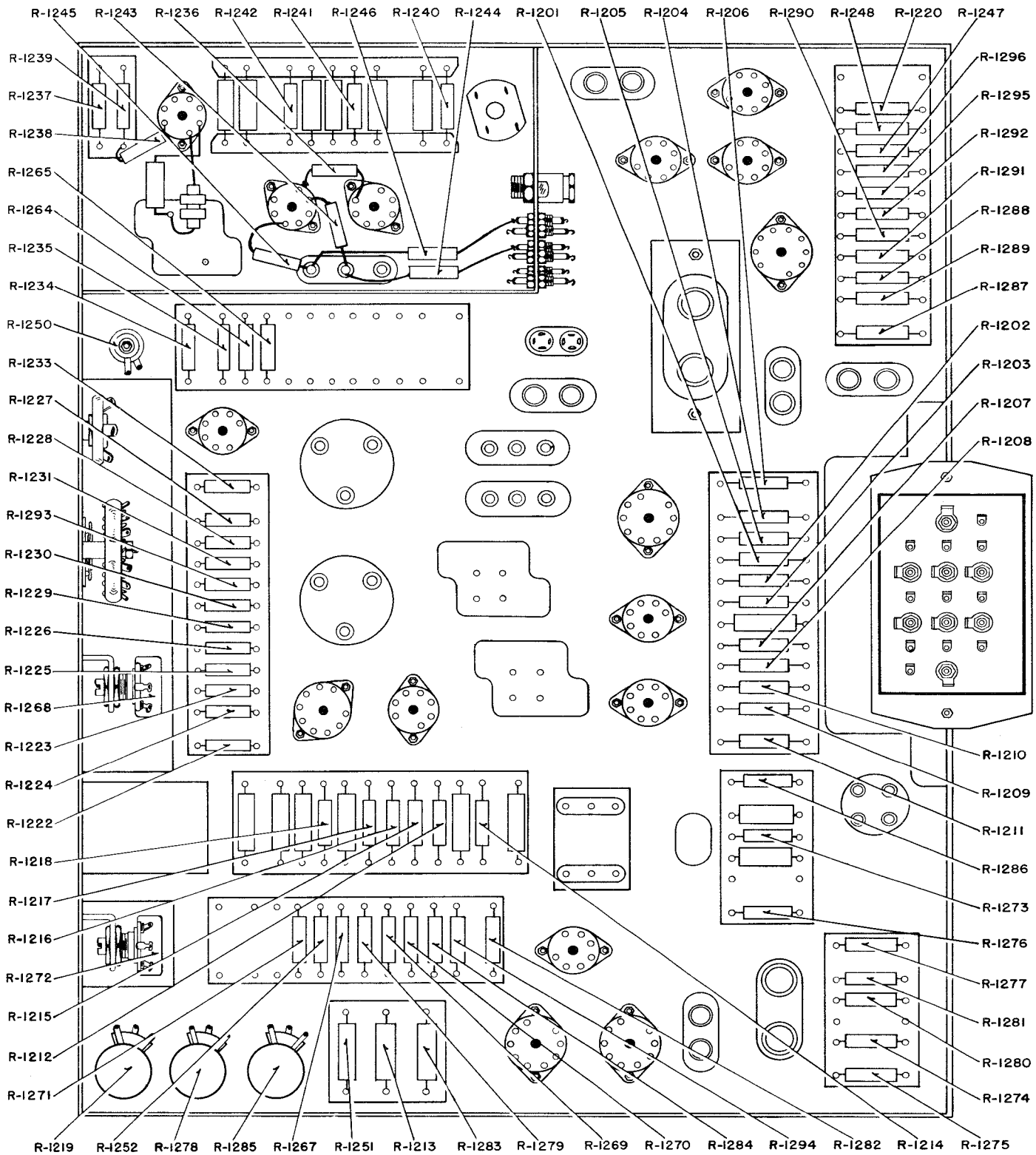


Figure 7–186. Resistor Locations Bottom of Chassis, Frequency Shift Converter CV-127/FRR-24

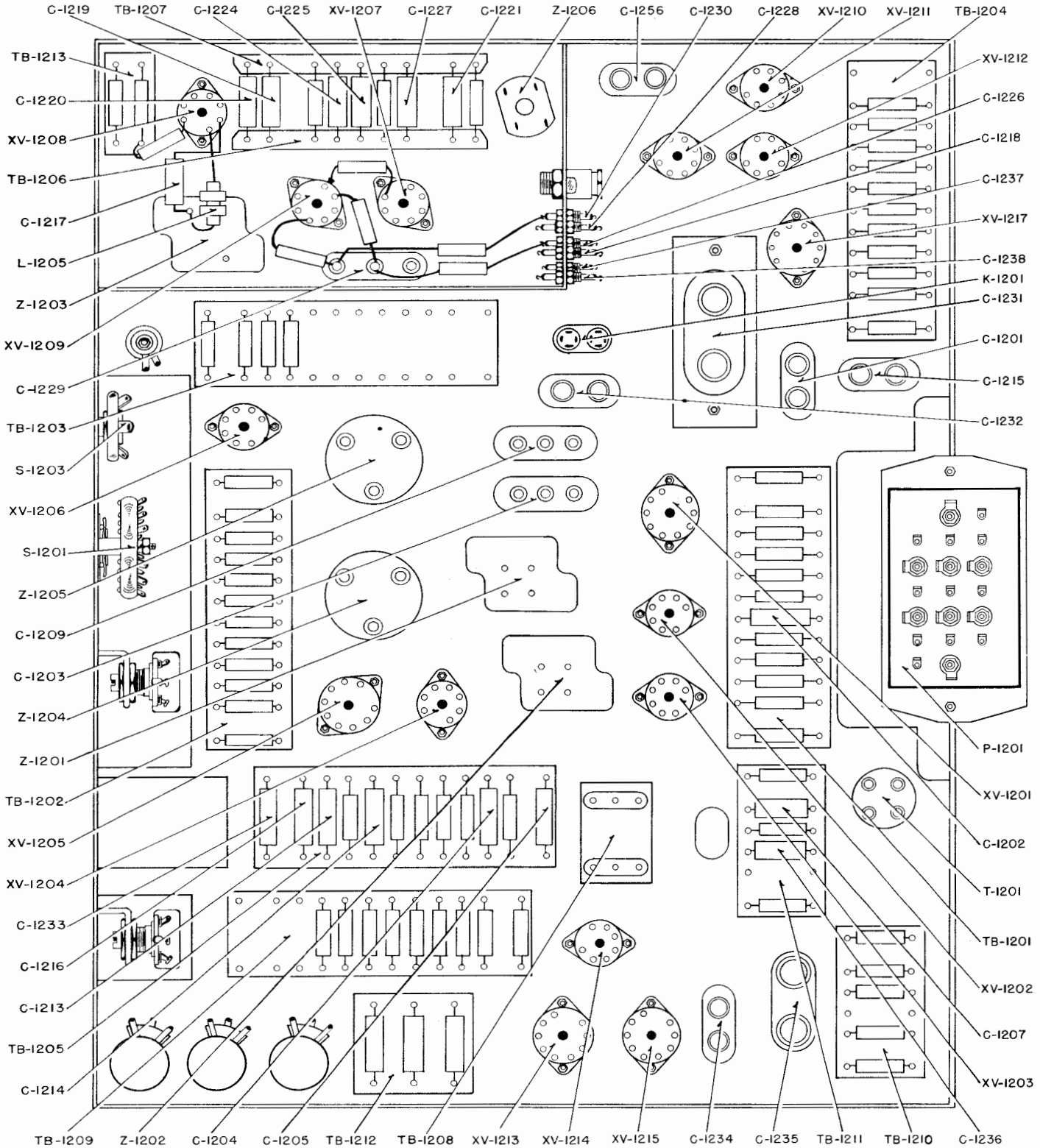


Figure 7–187. Capacitor and Miscellaneous Component Locations Bottom of Chassis, Frequency Shift Converter CV-127/FRR-24

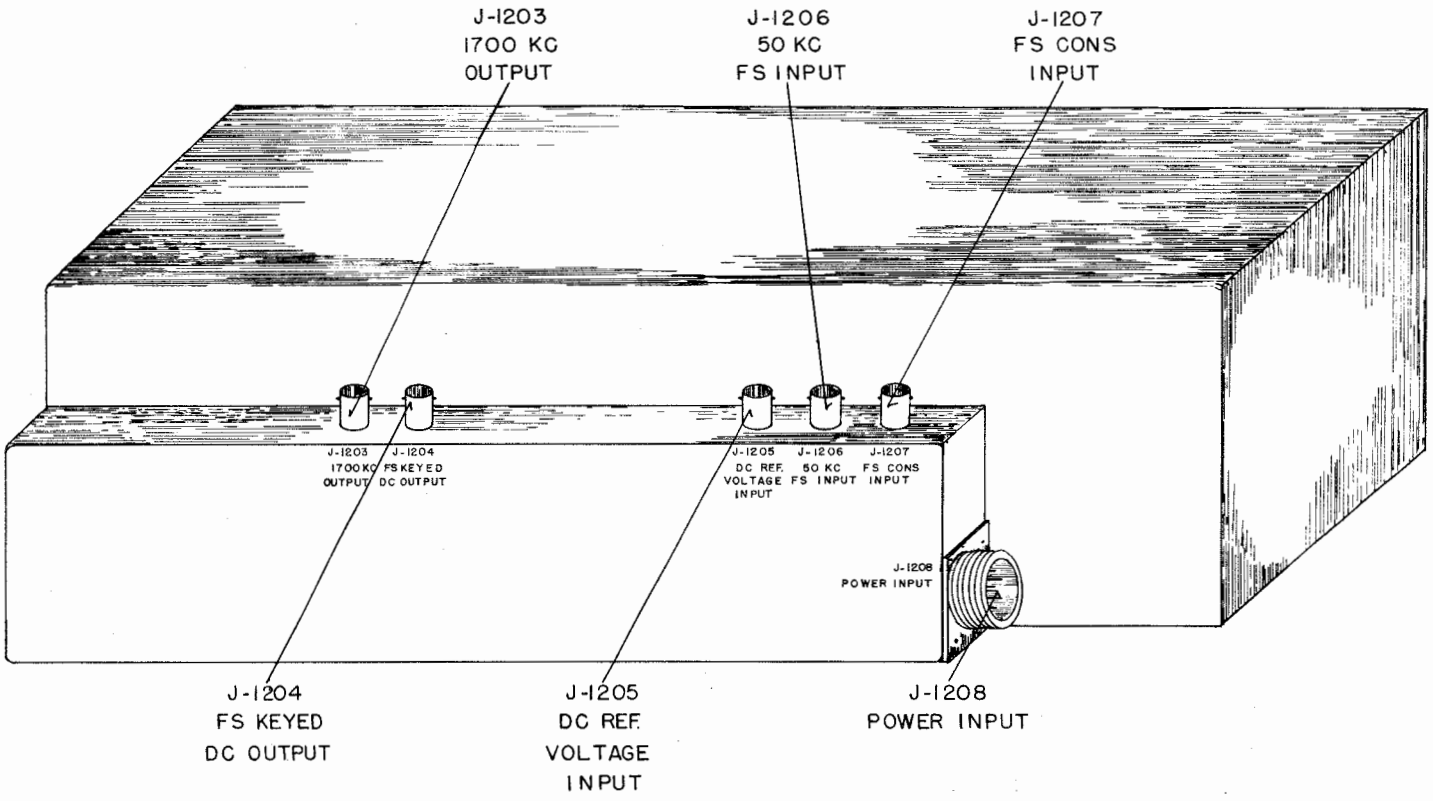


Figure 7–188. Component Locations Rear of Cabinet, Frequency Shift Converter CV-127/FRR-24

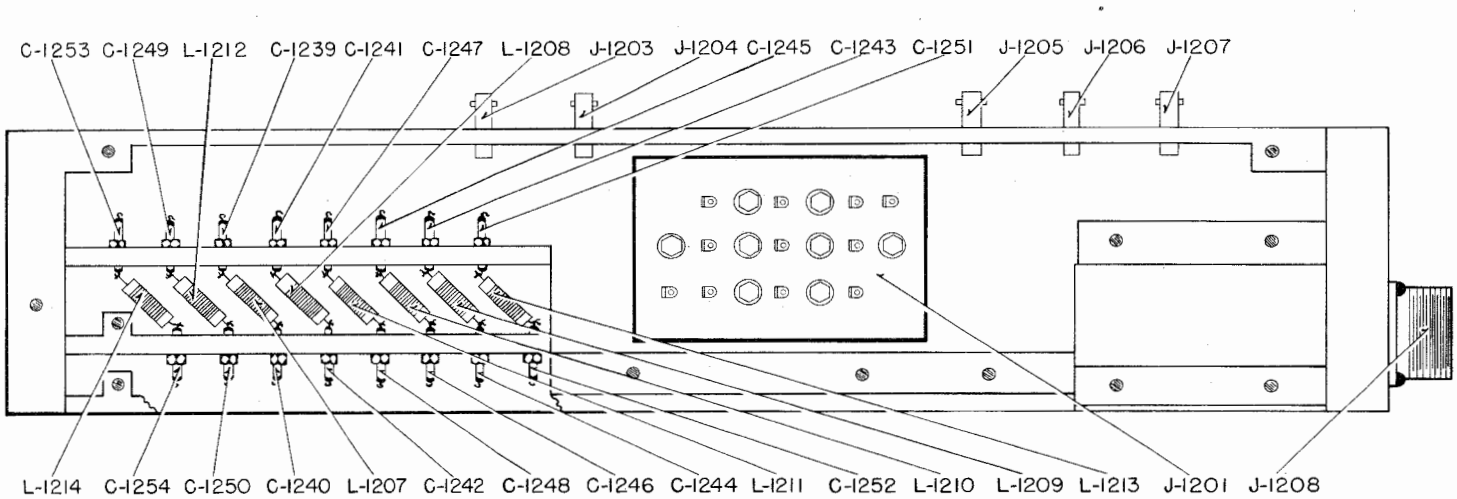


Figure 7–189. Component Locations Inside of R.F. Filter Compartment, Frequency Shift Converter CV-127/FRR-24

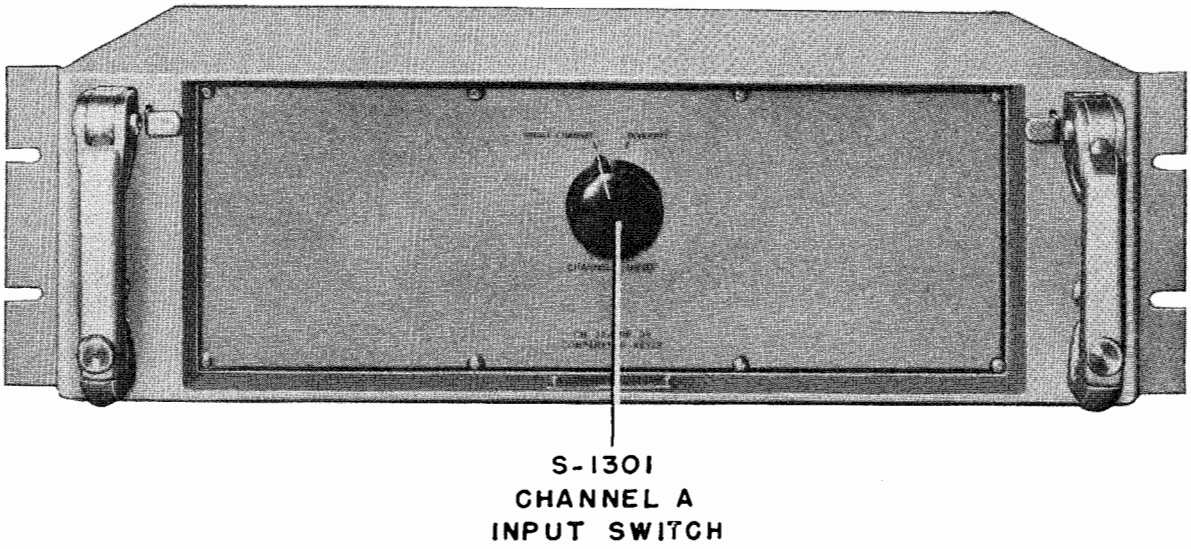


Figure 7–190. Component Locations Front View, Comparator Keyer CM-32/FRR-24

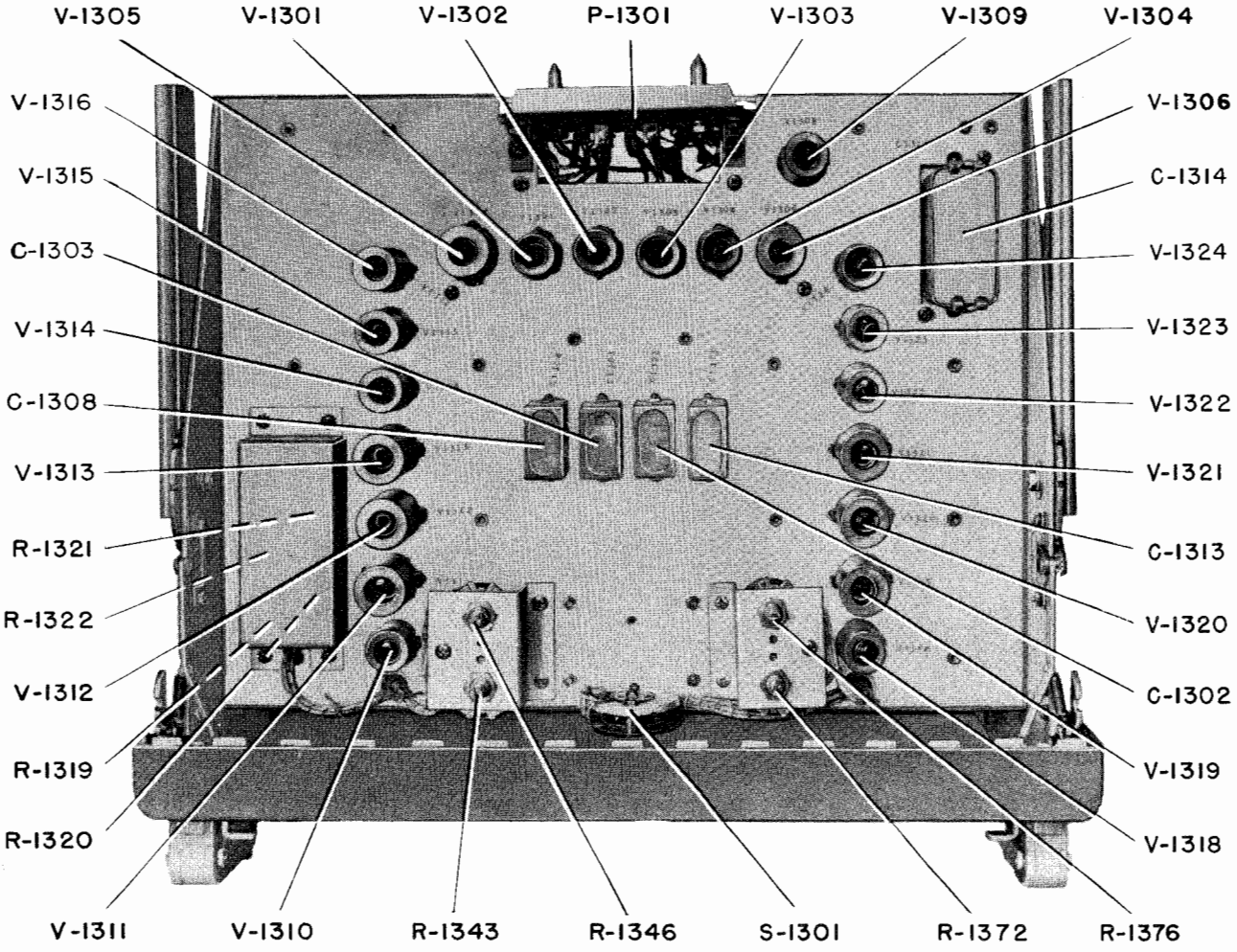


Figure 7–191. Component Locations Top of Chassis, Comparator Keyer CM-32/FRR-24

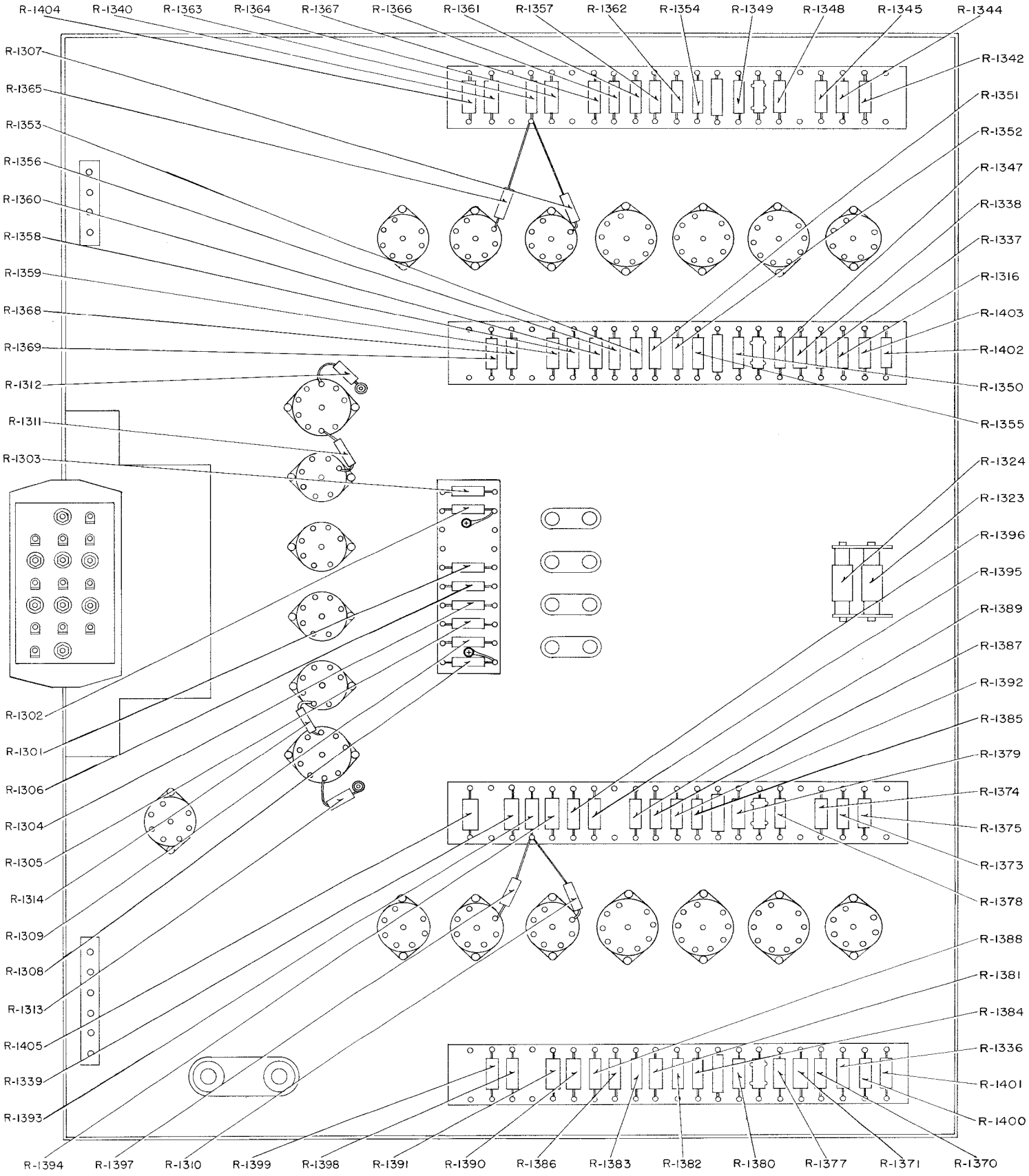


Figure 7–192. Resistor Locations Bottom of Chassis, Comparator Keyer CM-32/FRR-24

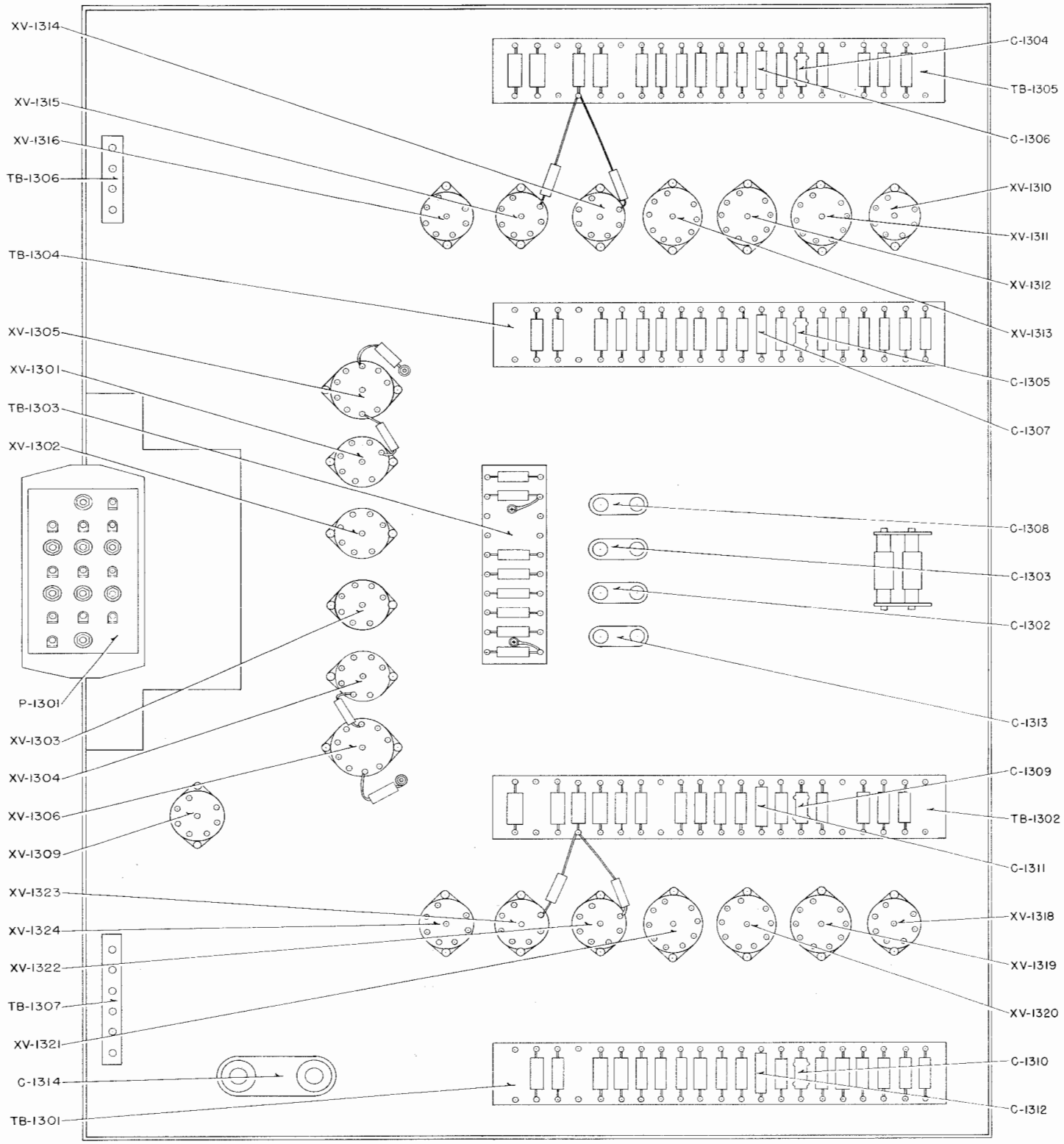


Figure 7–193. Miscellaneous Component Locations, Bottom of Chassis, Comparator Keyer CM-32/FRR-24

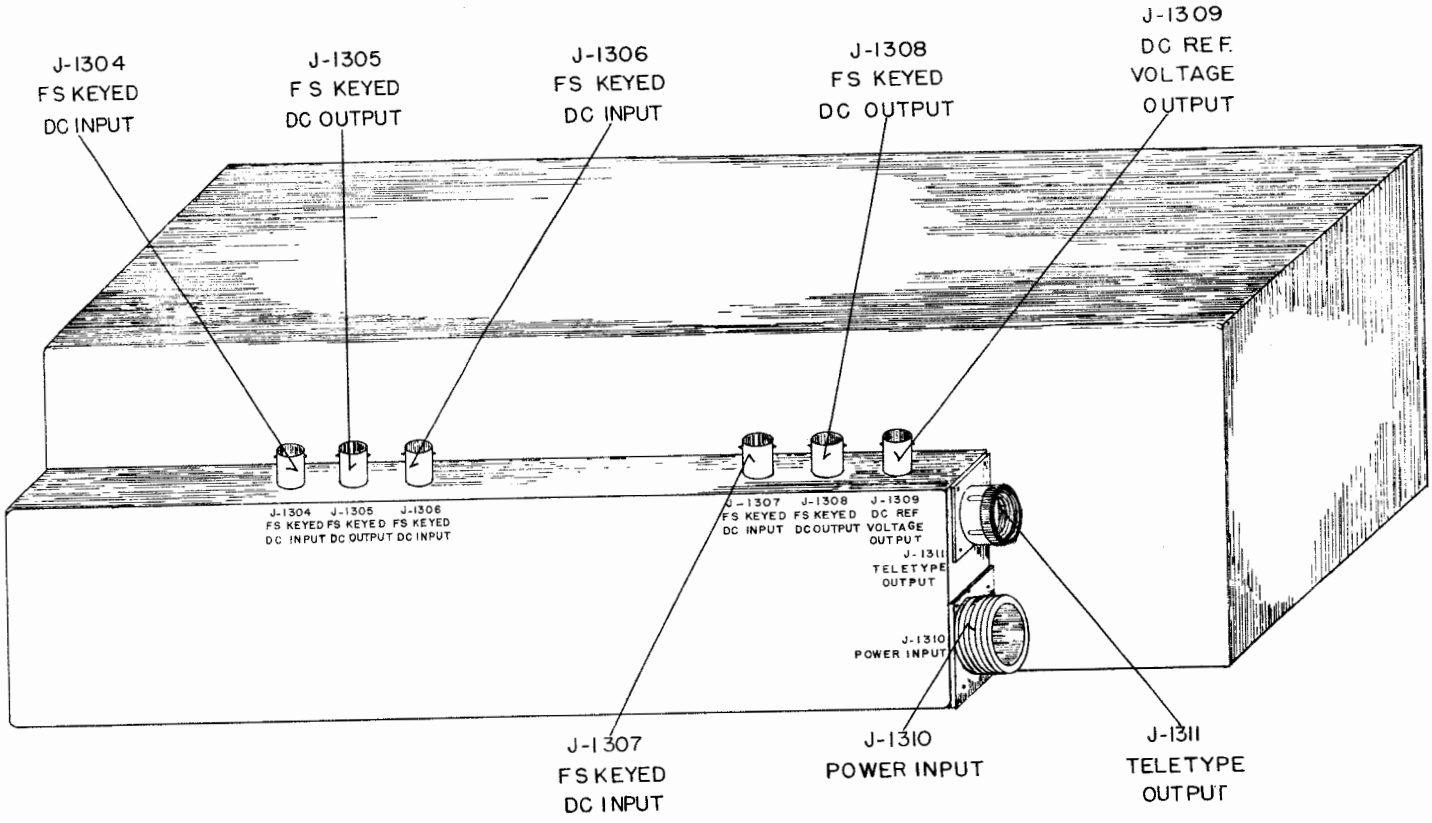


Figure 7–194. Component Locations Rear of Cabinet, Comparator Keyer CM-32/FRR-24

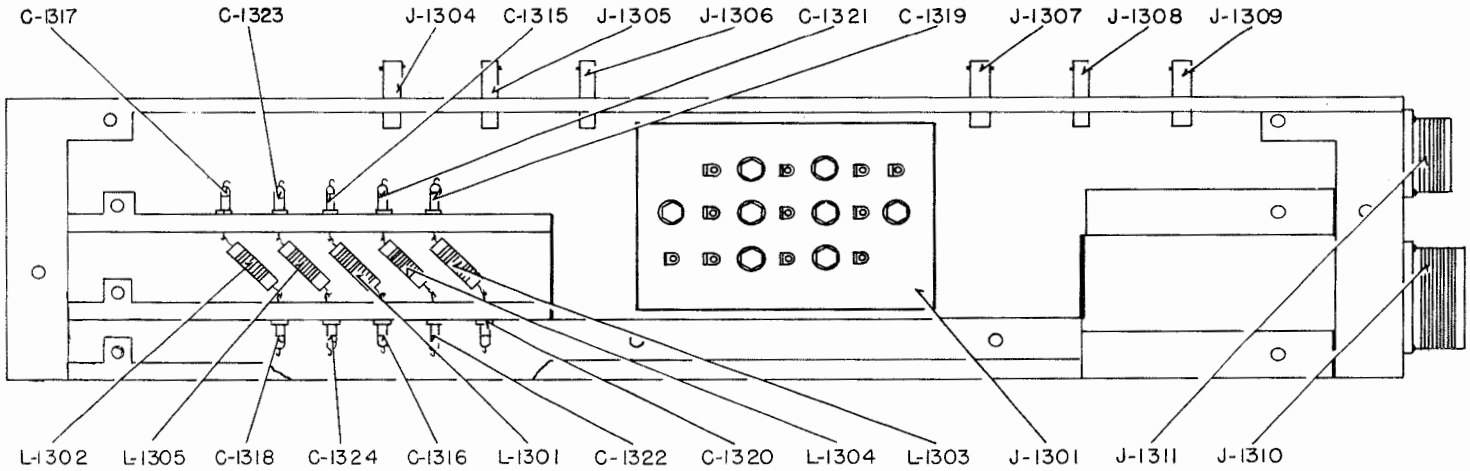


Figure 7–195. Component Locations Inside of R.F. Filter Compartment, Comparator Keyer CM-32/FRR-24

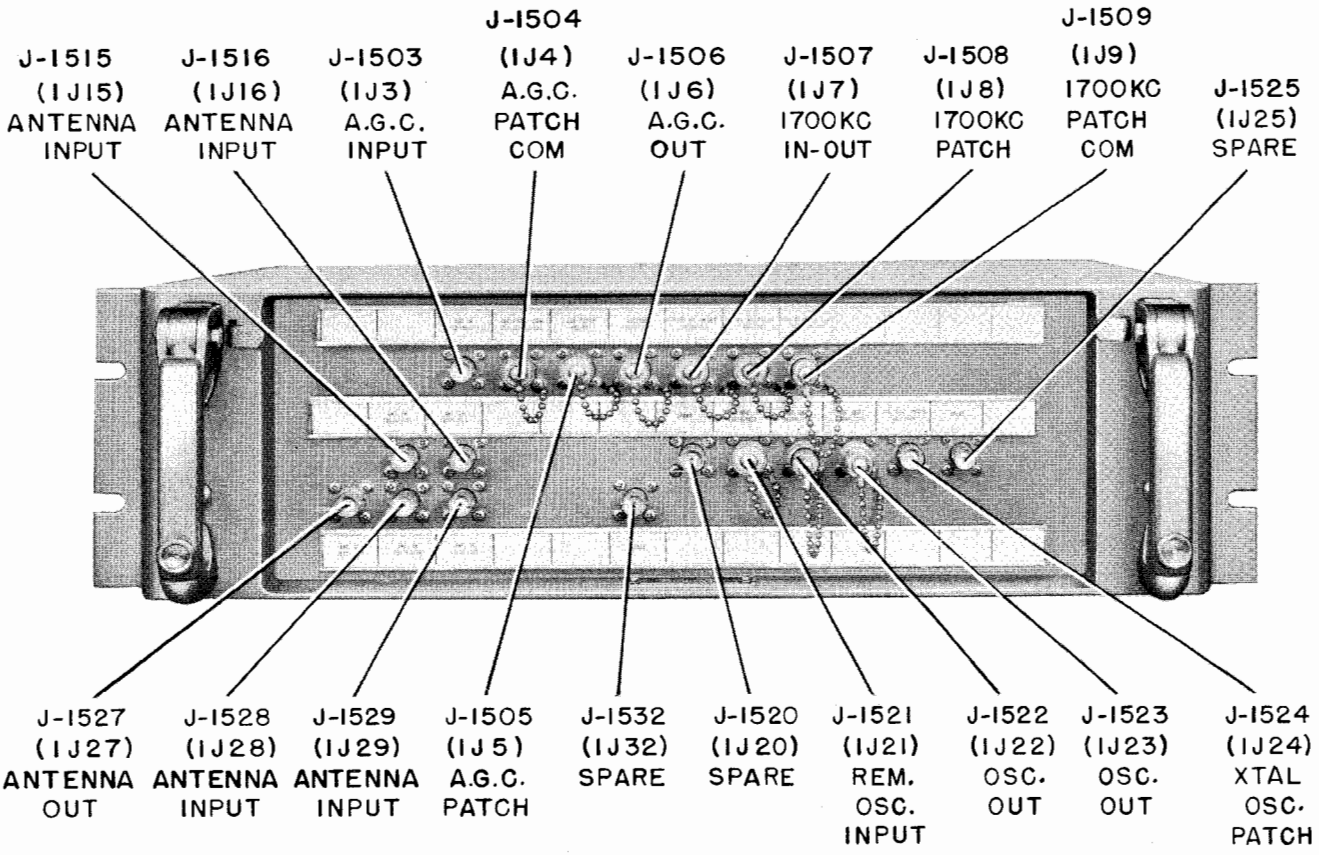


Figure 7–196. Component Locations Front View, Patch Panel SB-138/FRR-24

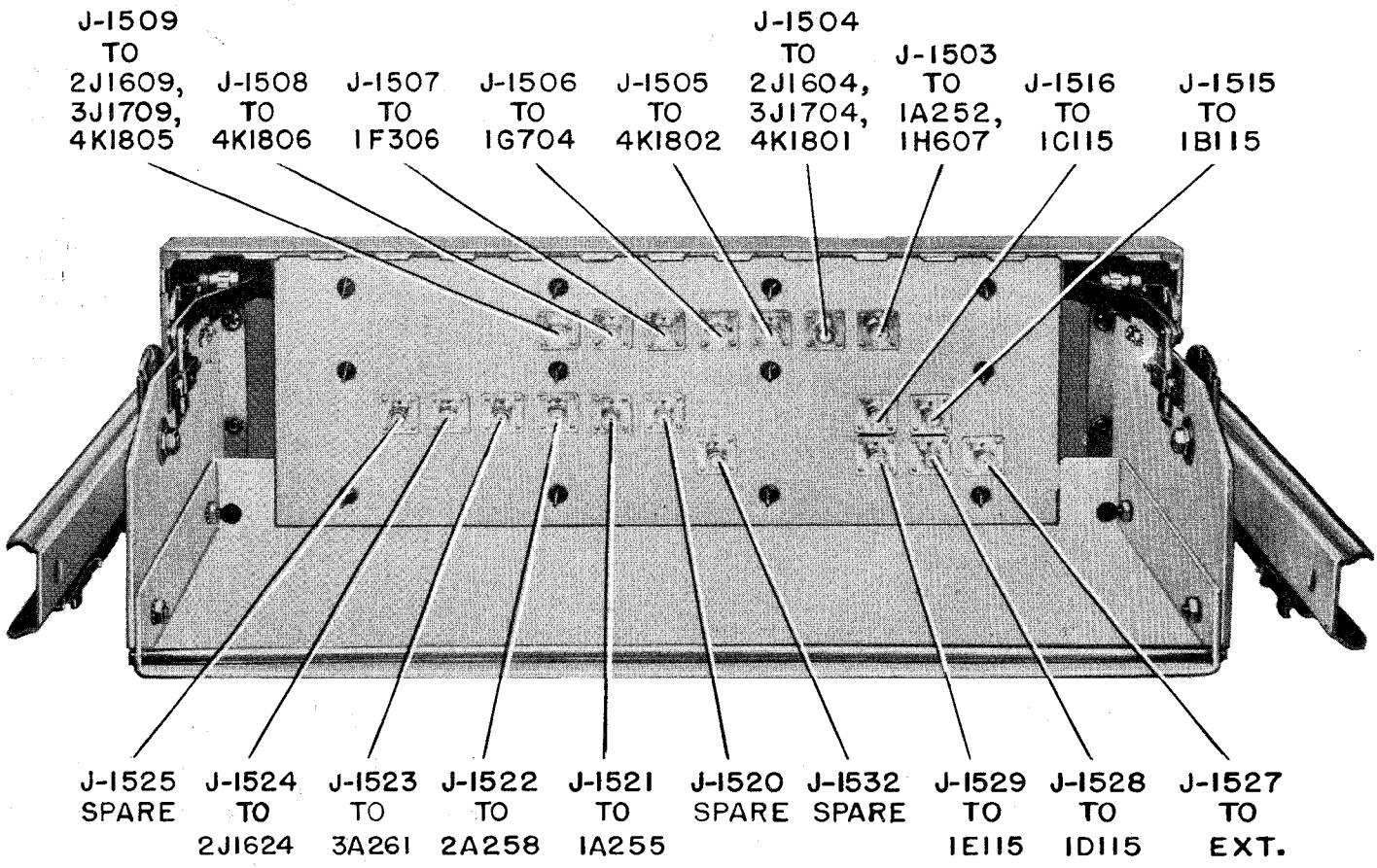


Figure 7–197. Component Locations Rear View, Patch Panel SB-138/FRR-24

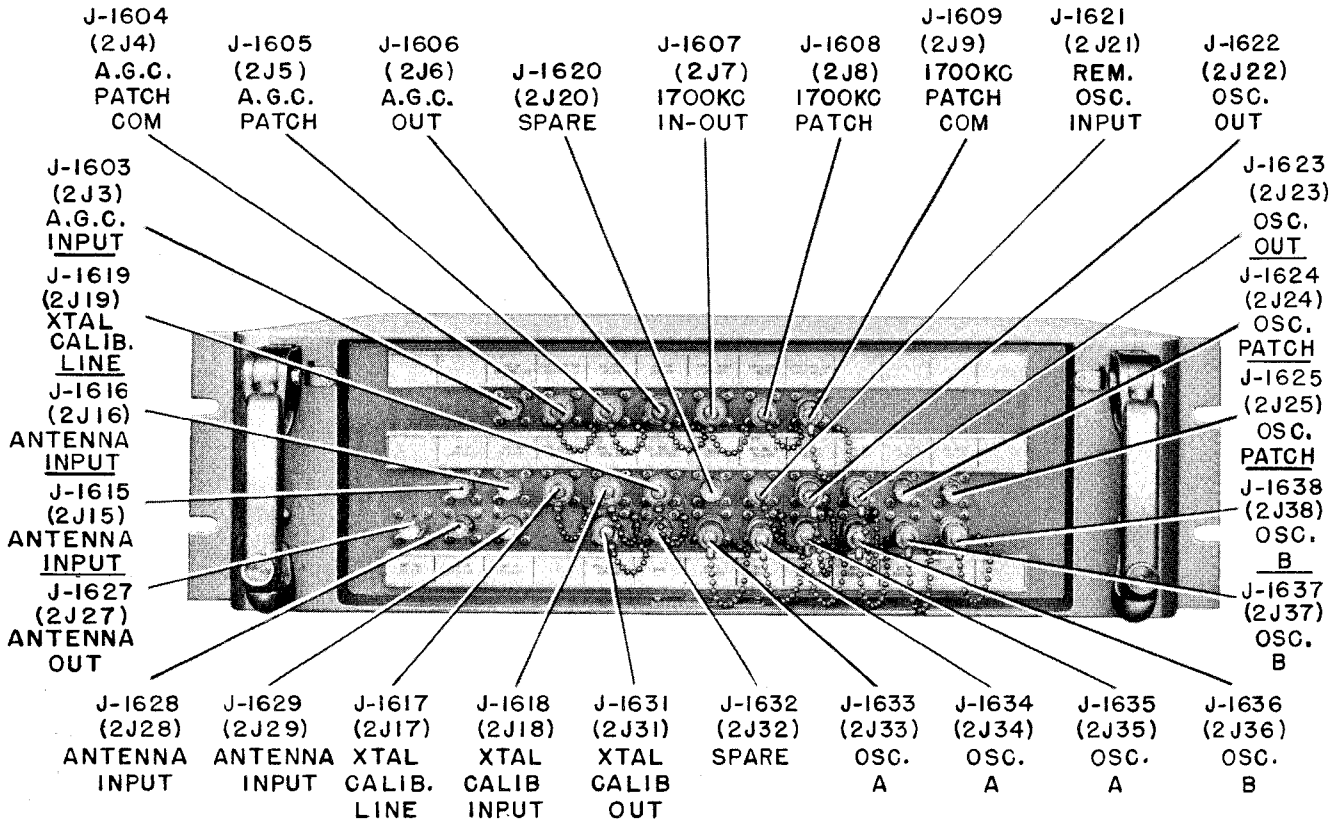


Figure 7–198. Component Locations Front View, Patch Panel SB-140/FRR-24

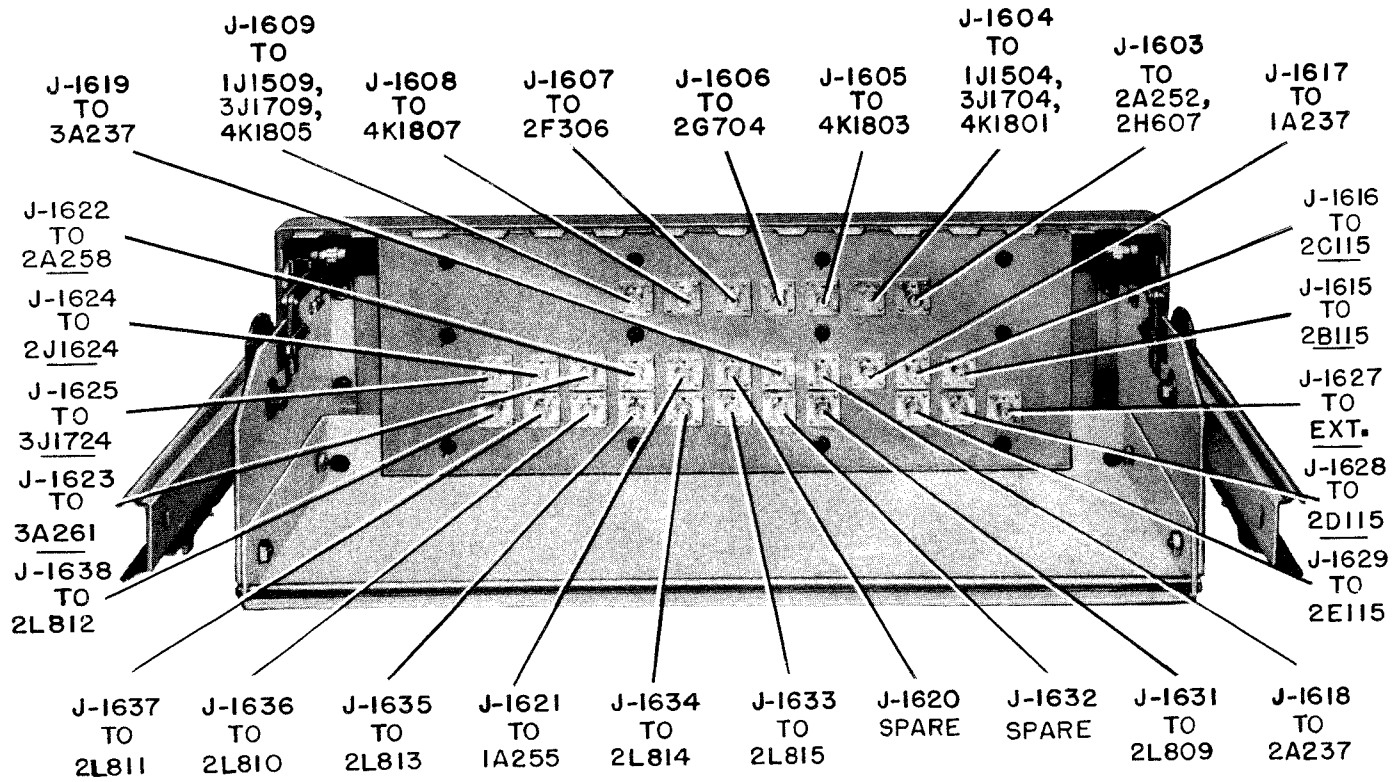


Figure 7–199. Component Locations Rear View, Patch Panel SB-140/FRR-24

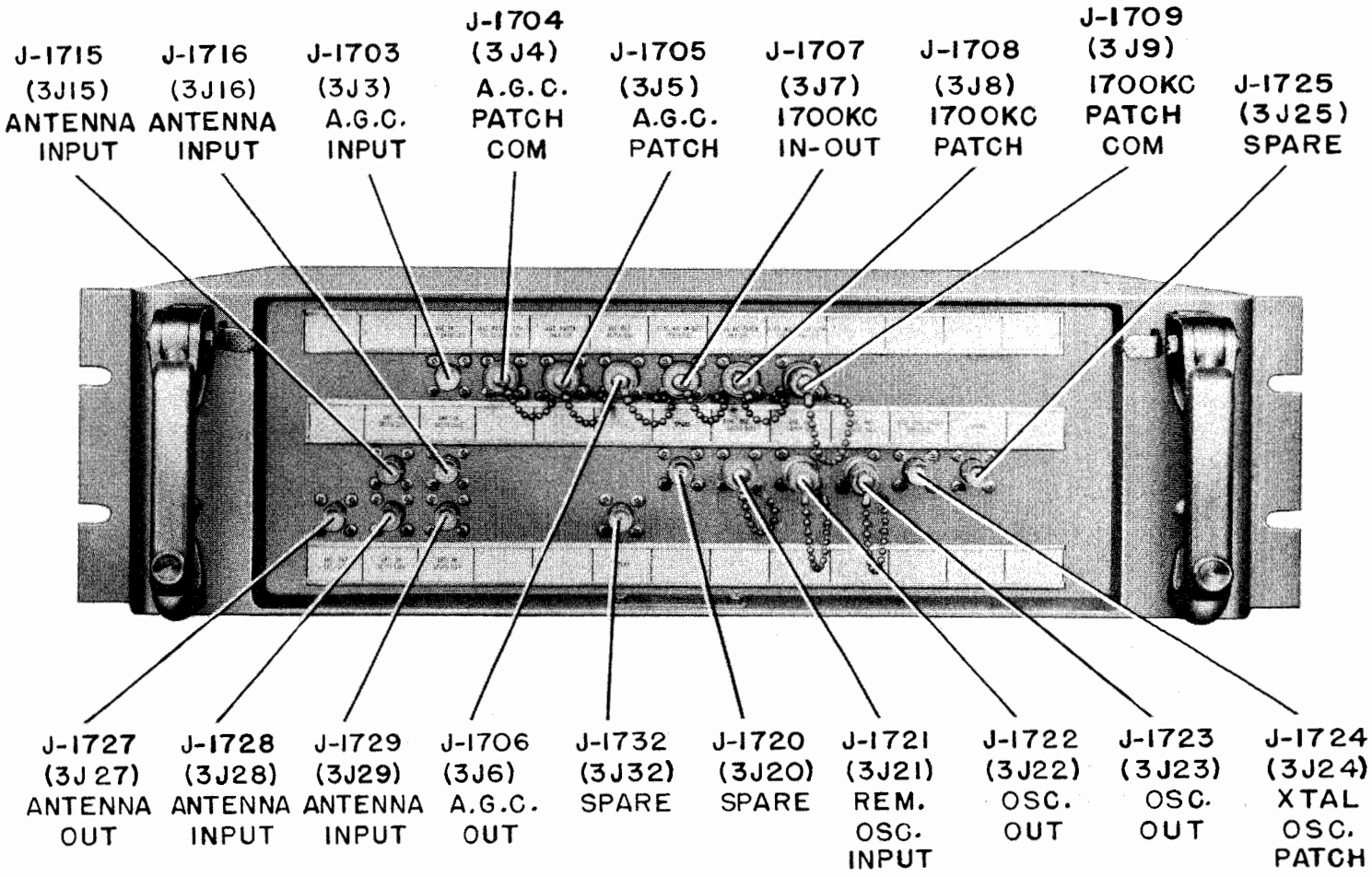


Figure 7–200. Component Locations Front View, Patch Panel SB-169/FRR-24

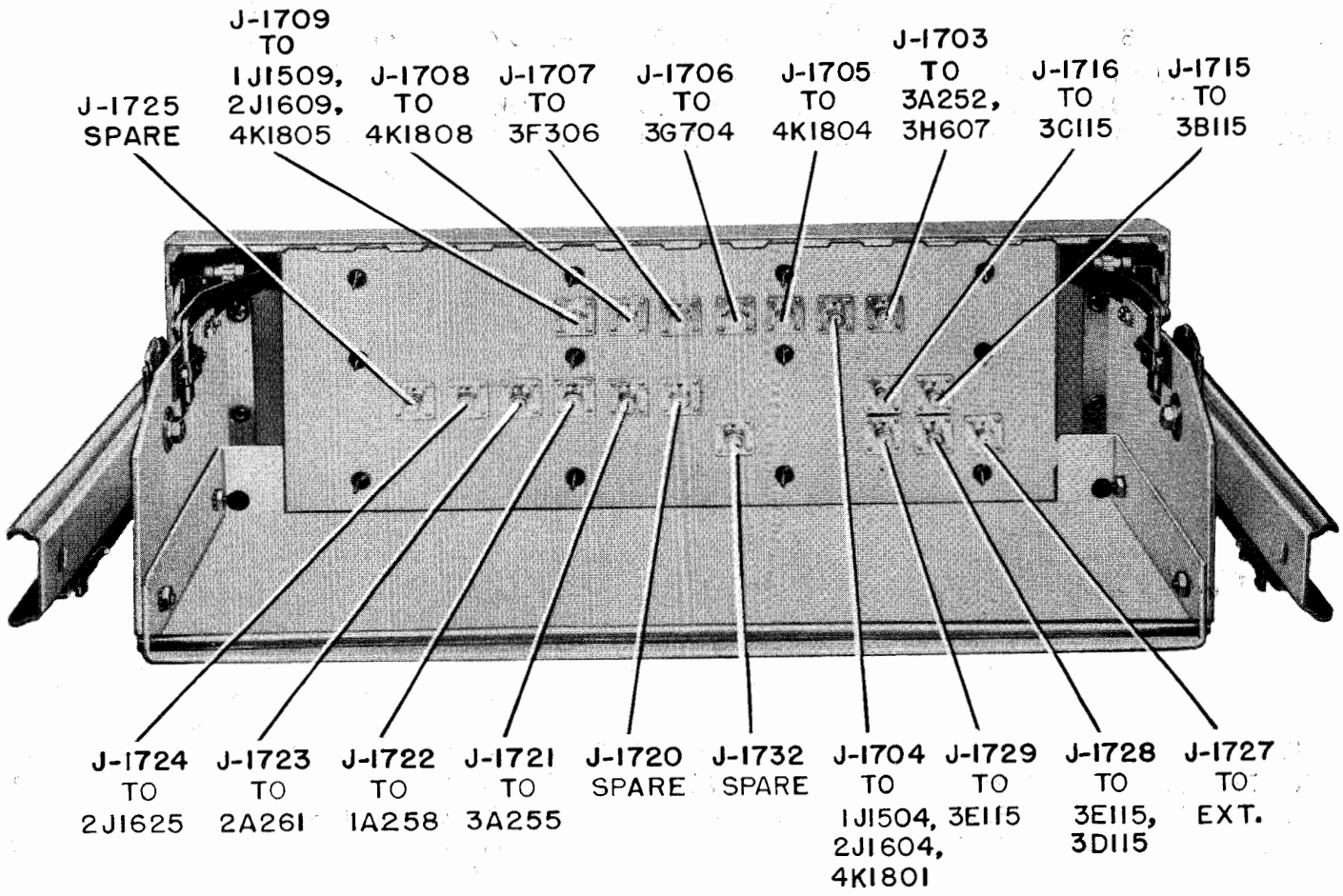


Figure 7–201. Component Locations Rear View, Patch Panel SB-169/FRR-24

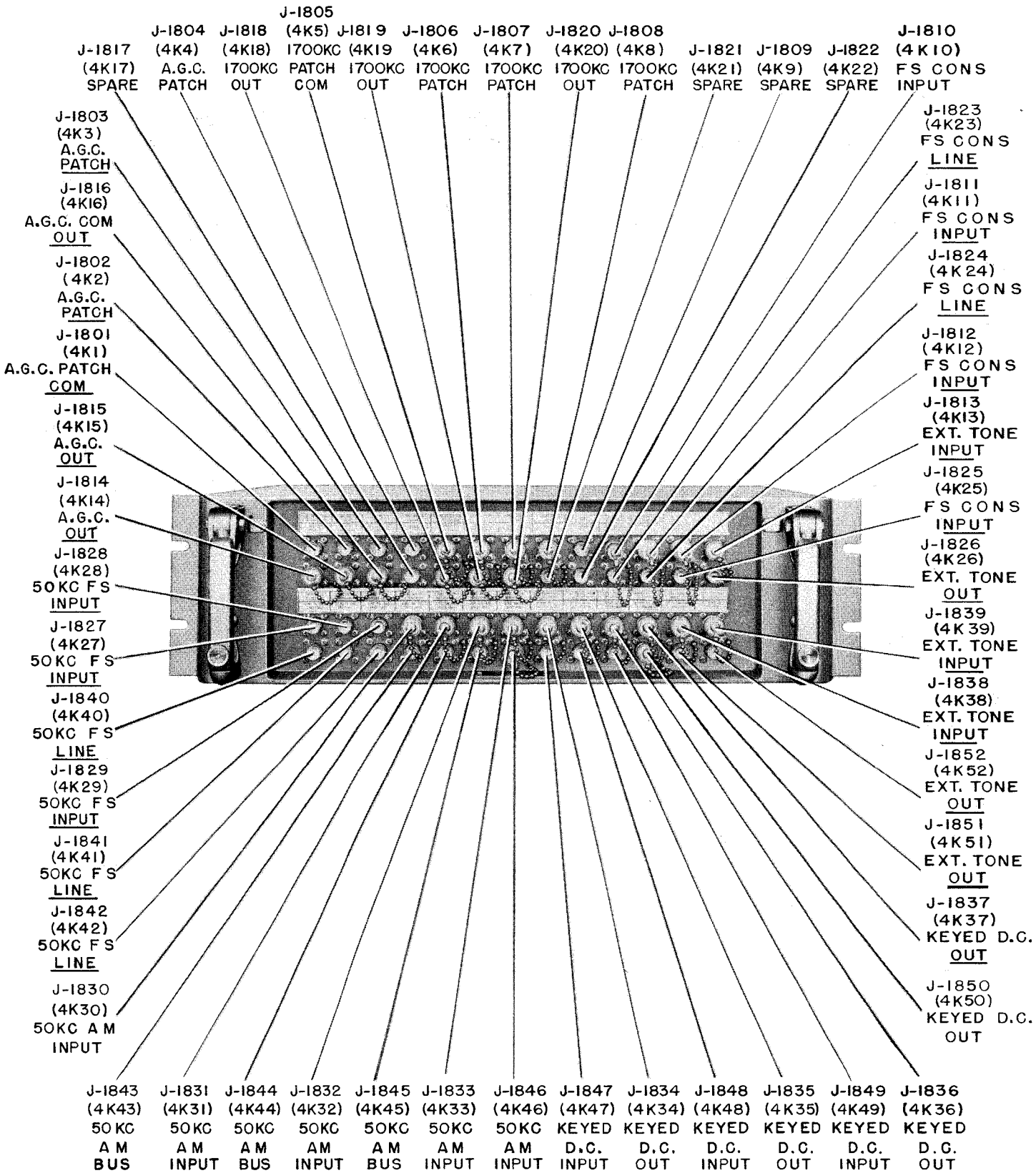


Figure 7–202. Component Locations Front View, Patch Panel SB-143/FRR-24

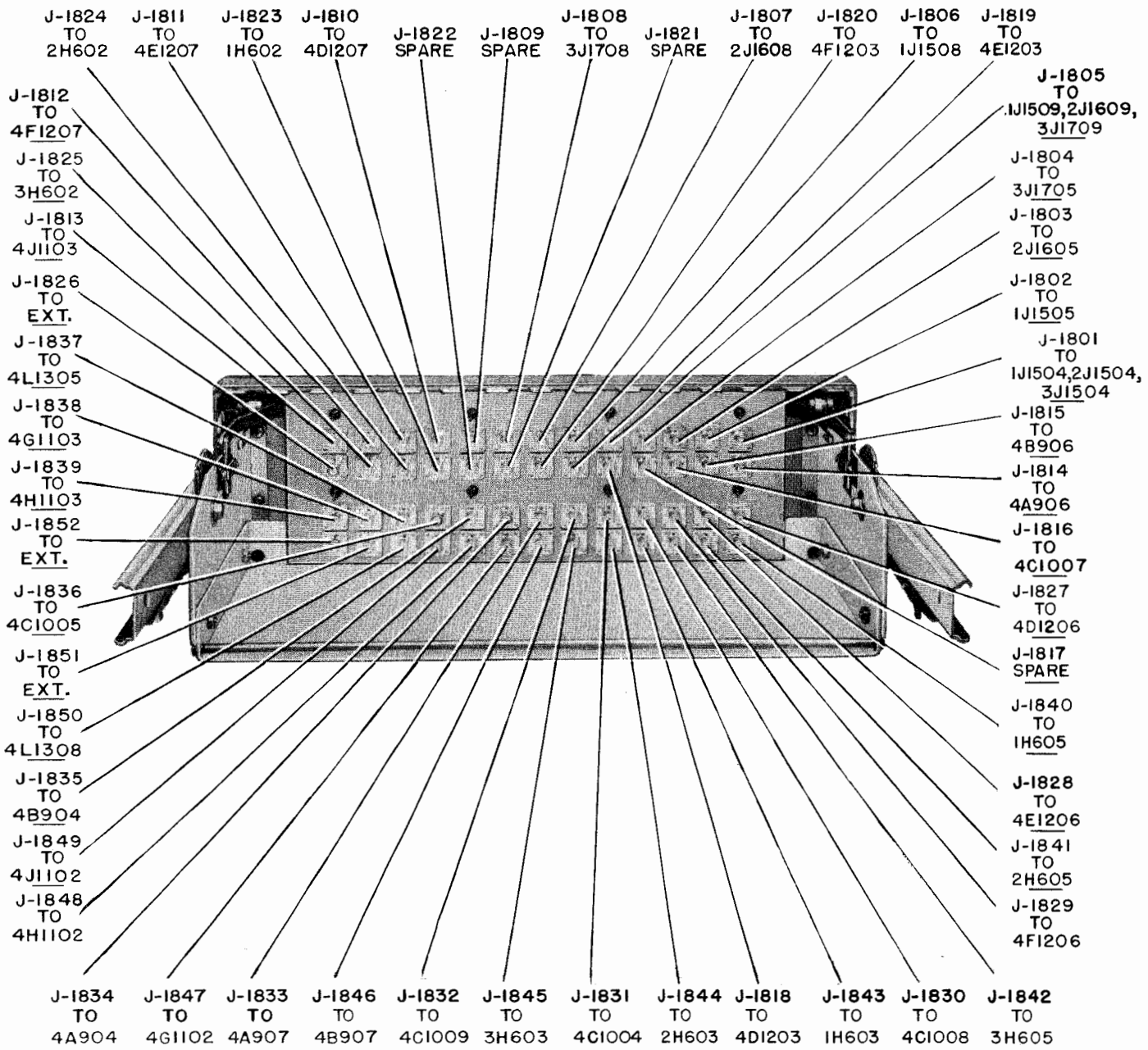


Figure 7–203. Component Locations Rear View, Patch Panel SB-143/FRR-24

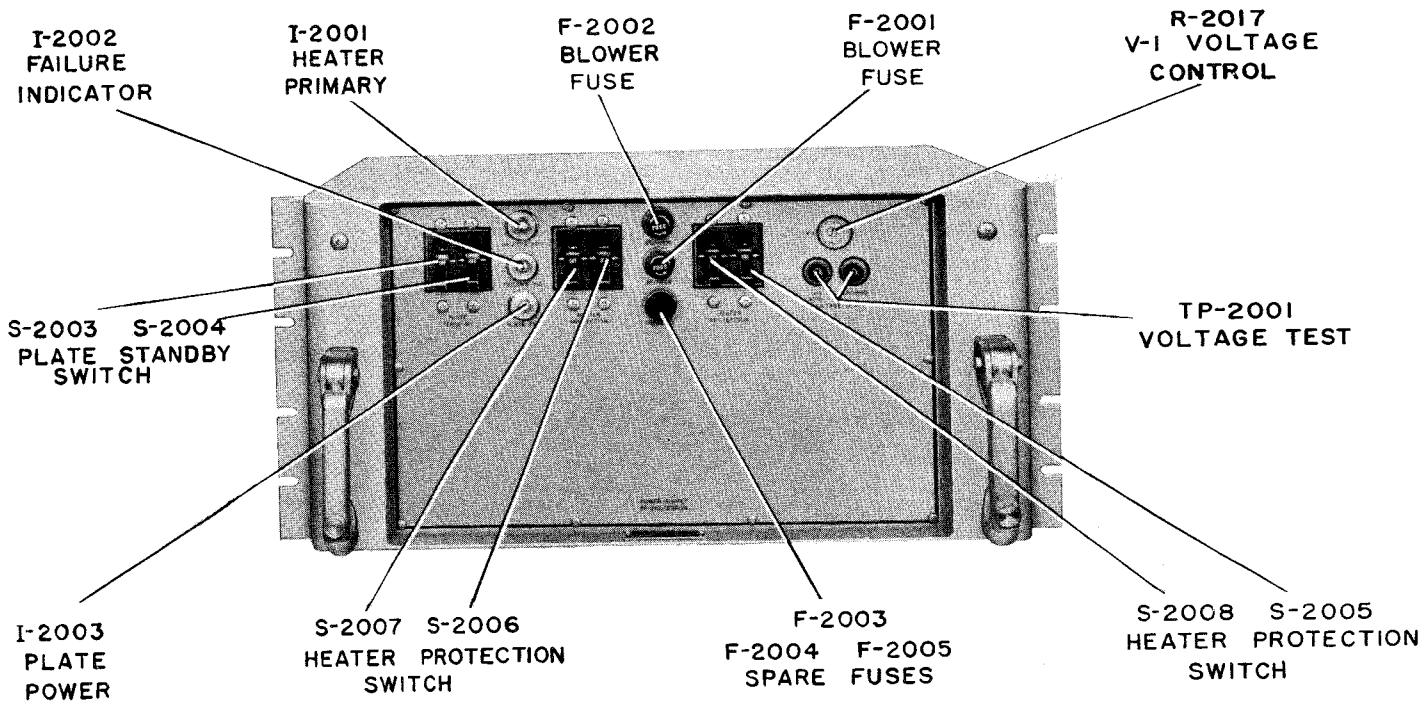


Figure 7–204. Component Locations Front View, Power Supply PP-590/FRR-24

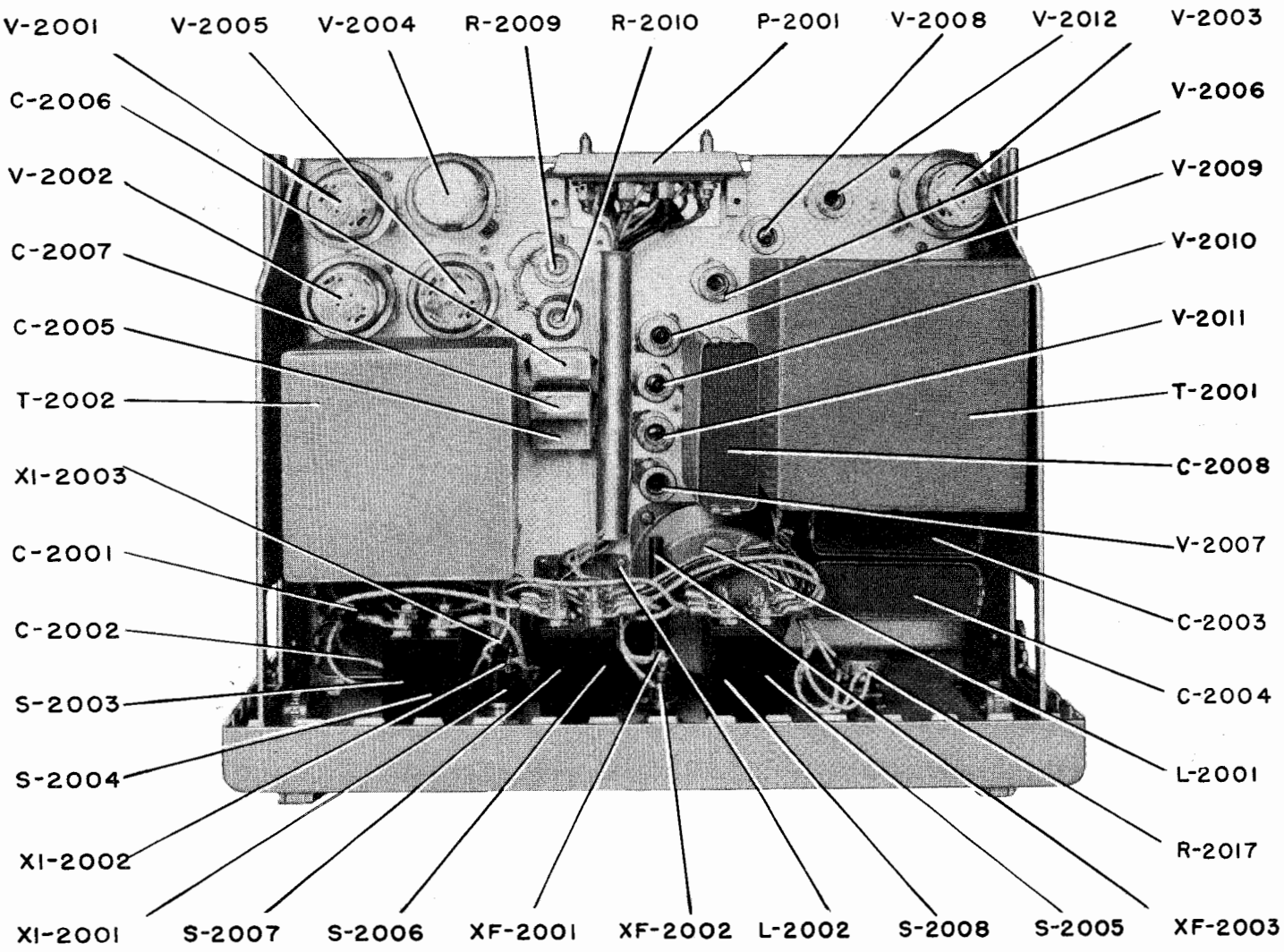


Figure 7–205. Component Locations Top of Chassis, Power Supply PP-590/FRR-24

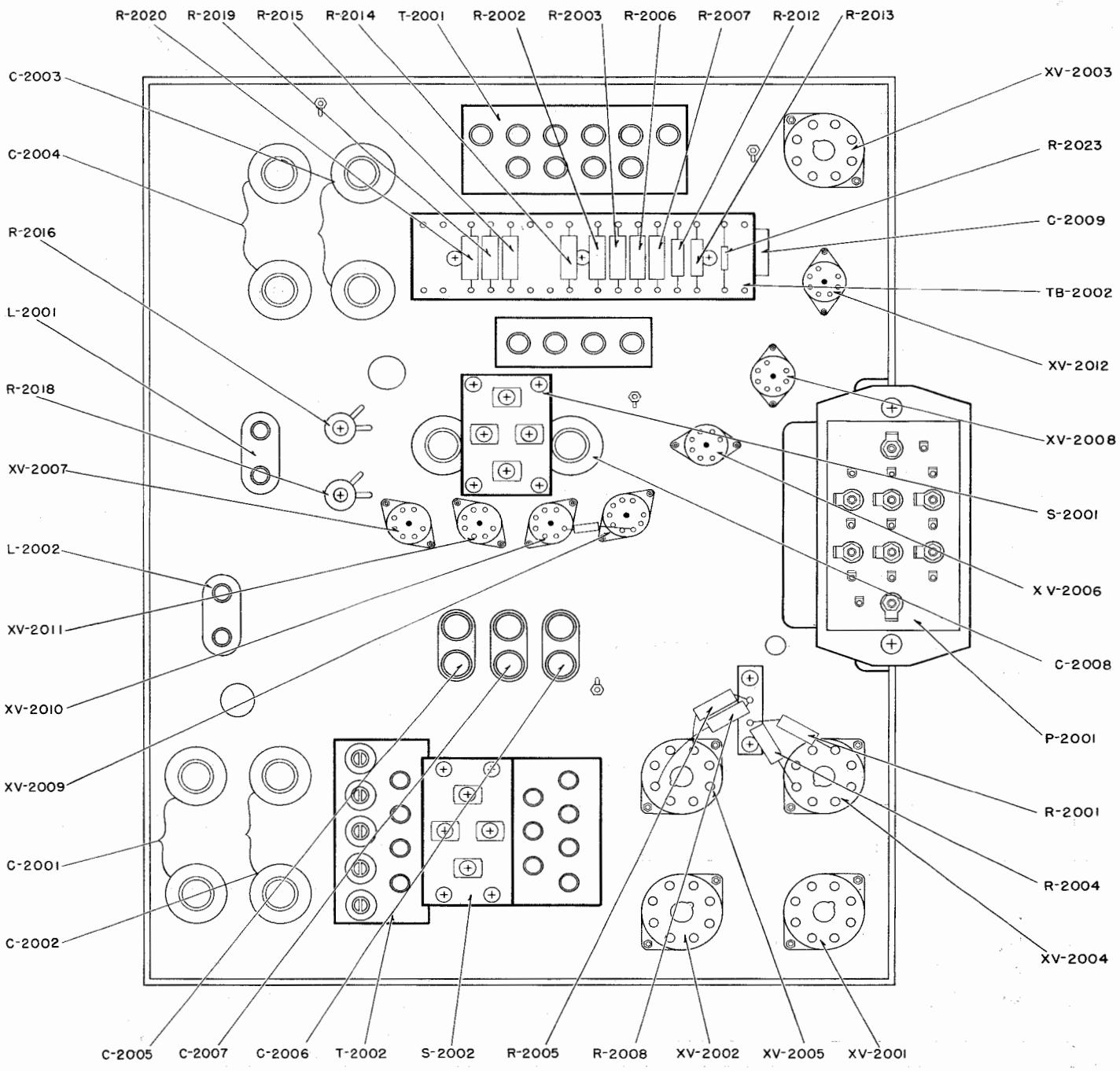


Figure 7–206. Component Locations Bottom of Chassis, Power Supply PP-590/FRR-24

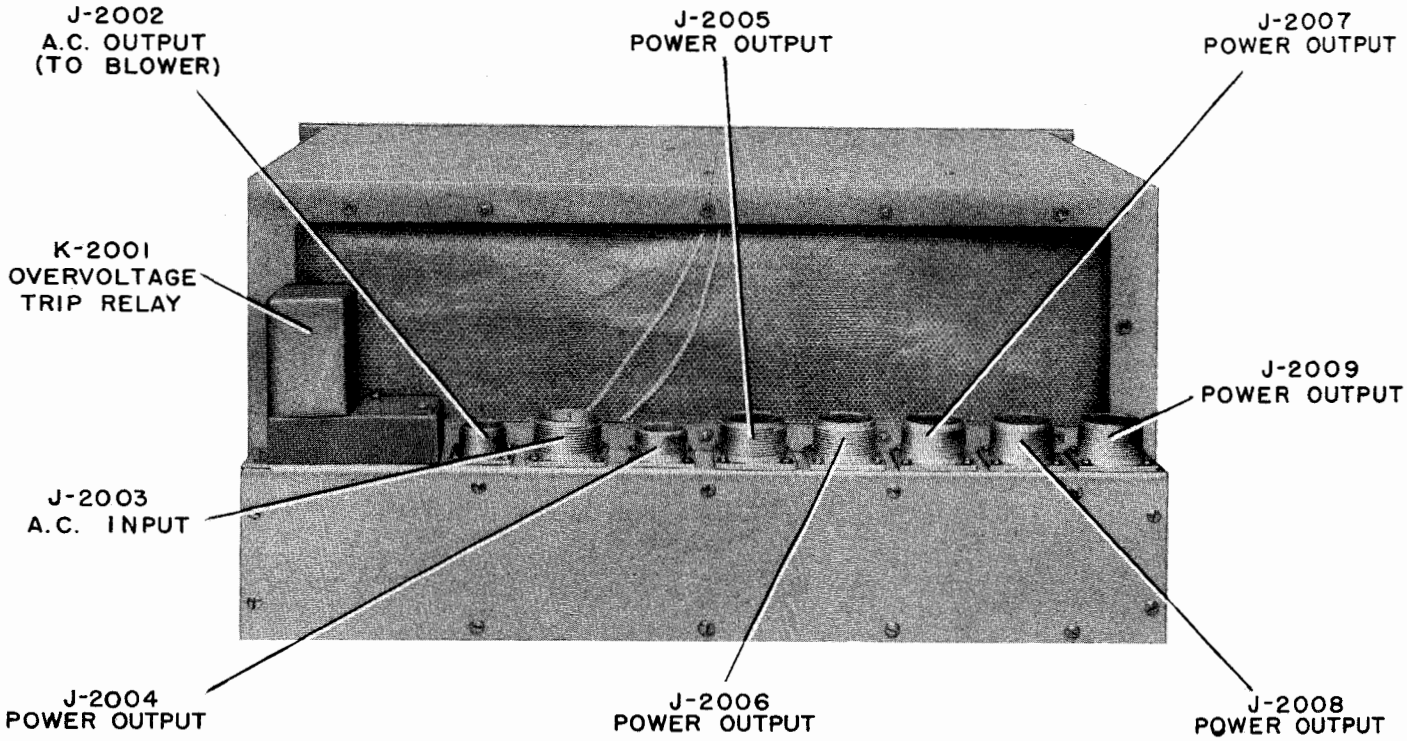


Figure 7–207. Component Locations Rear of Cabinet, Power Supply PP-590/FRR-24

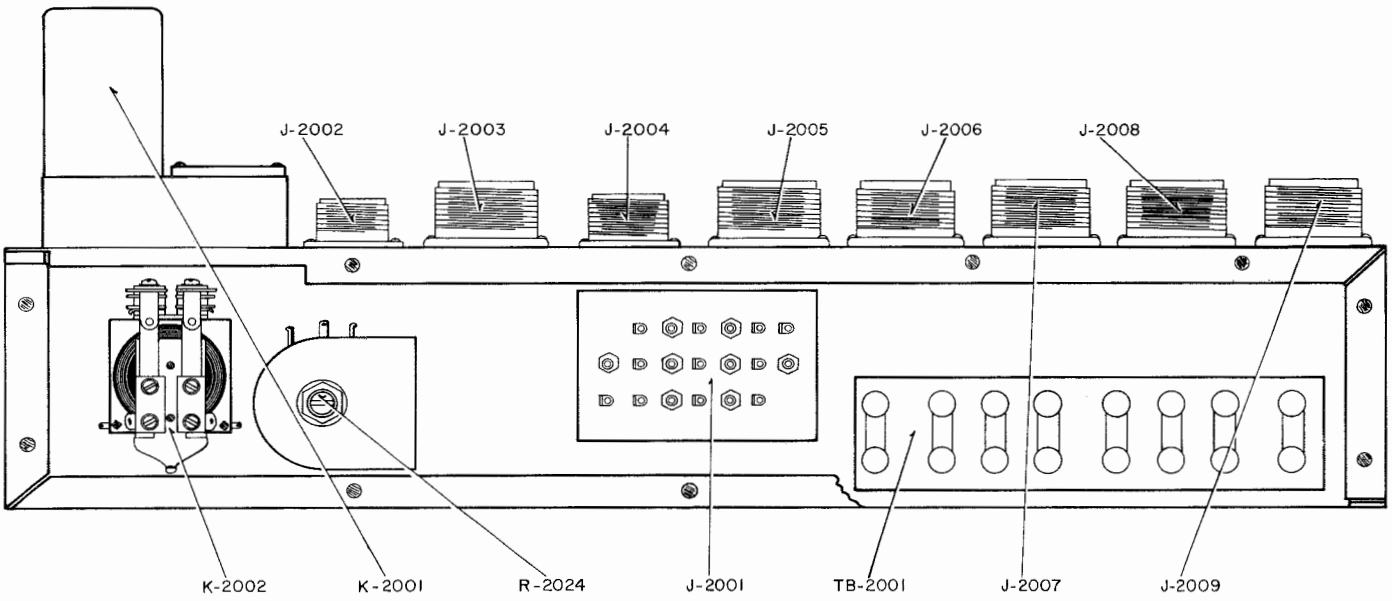


Figure 7–208. Component Locations Inside of R.F. Filter Compartment, Power Supply PP-590/FRR-24

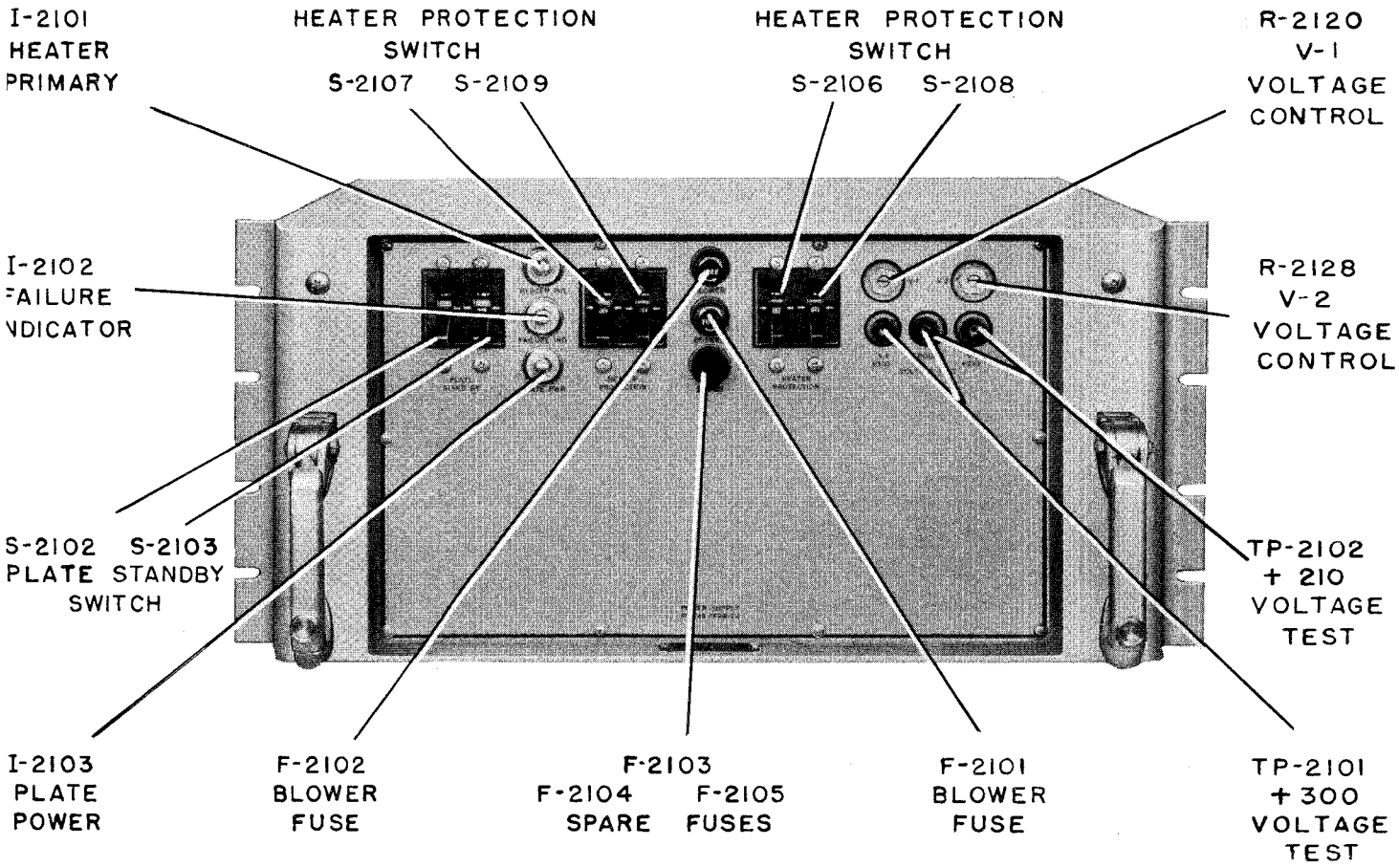


Figure 7–209. Component Locations Front View, Power Supply PP-649/FRR-24

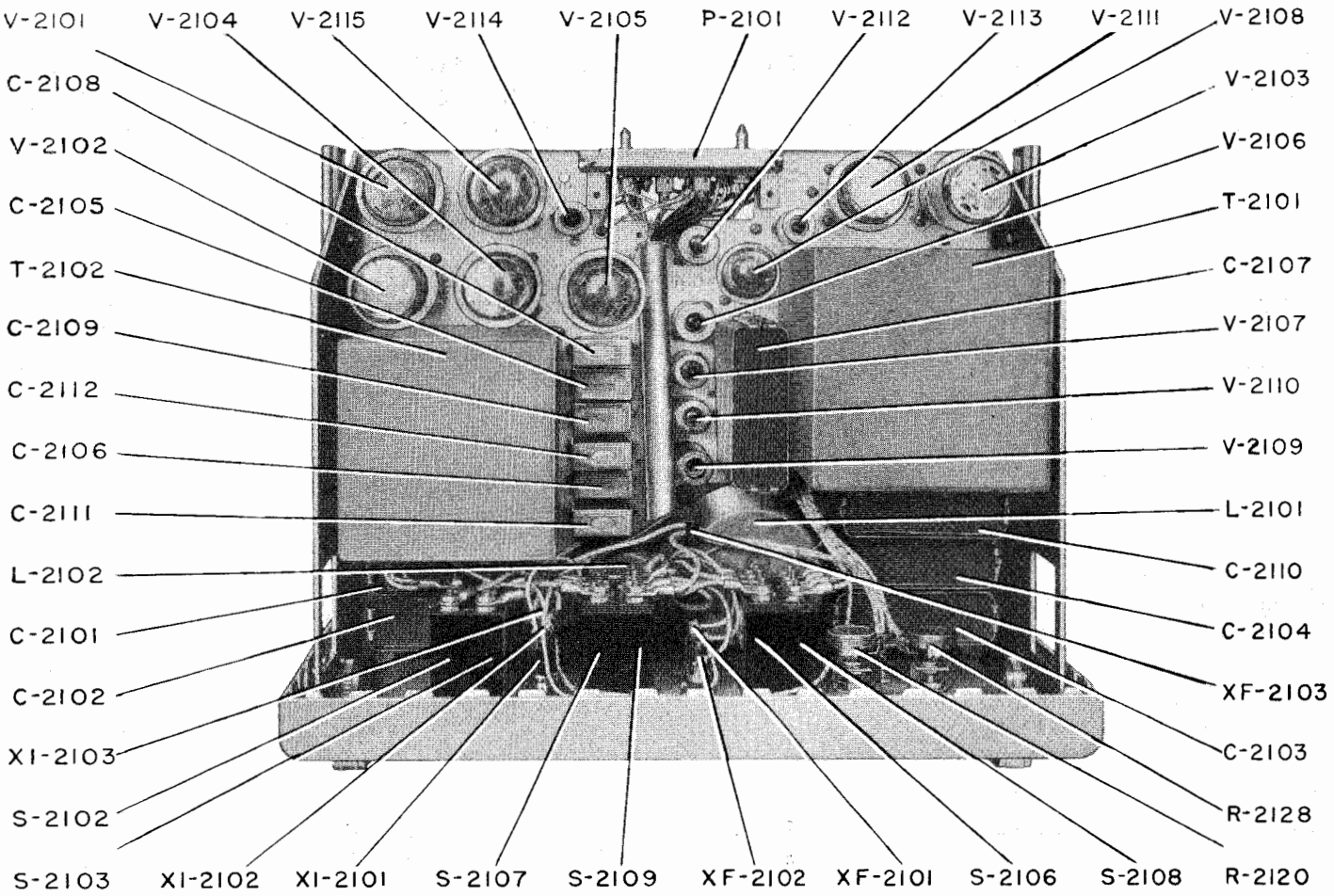


Figure 7–210. Component Locations Top of Chassis, Power Supply PP-649/FRR-24

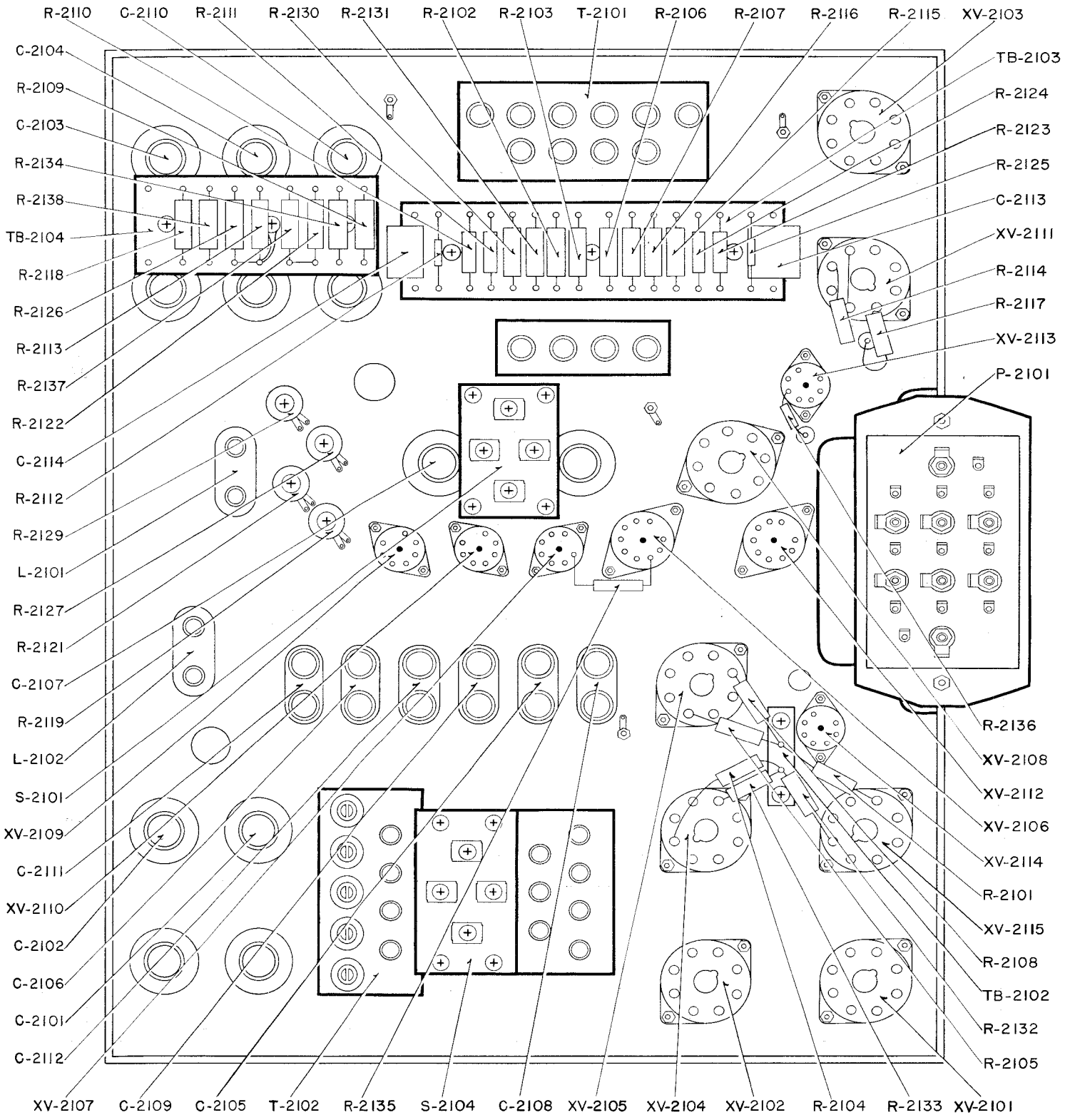


Figure 7–211. Component Locations Bottom of Chassis, Power Supply PP-649/FRR-24

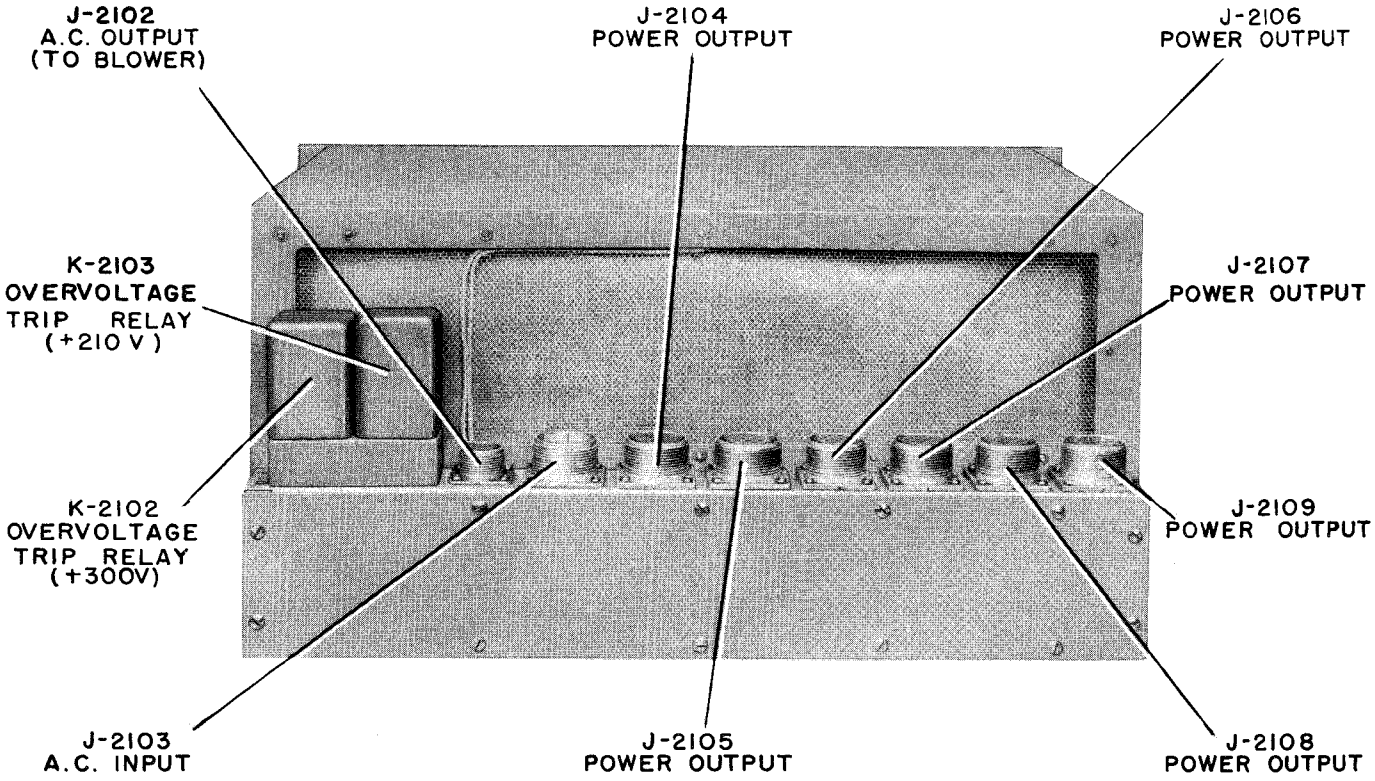


Figure 7–212. Component Locations Rear of Cabinet, Power Supply PP-649/FRR-24

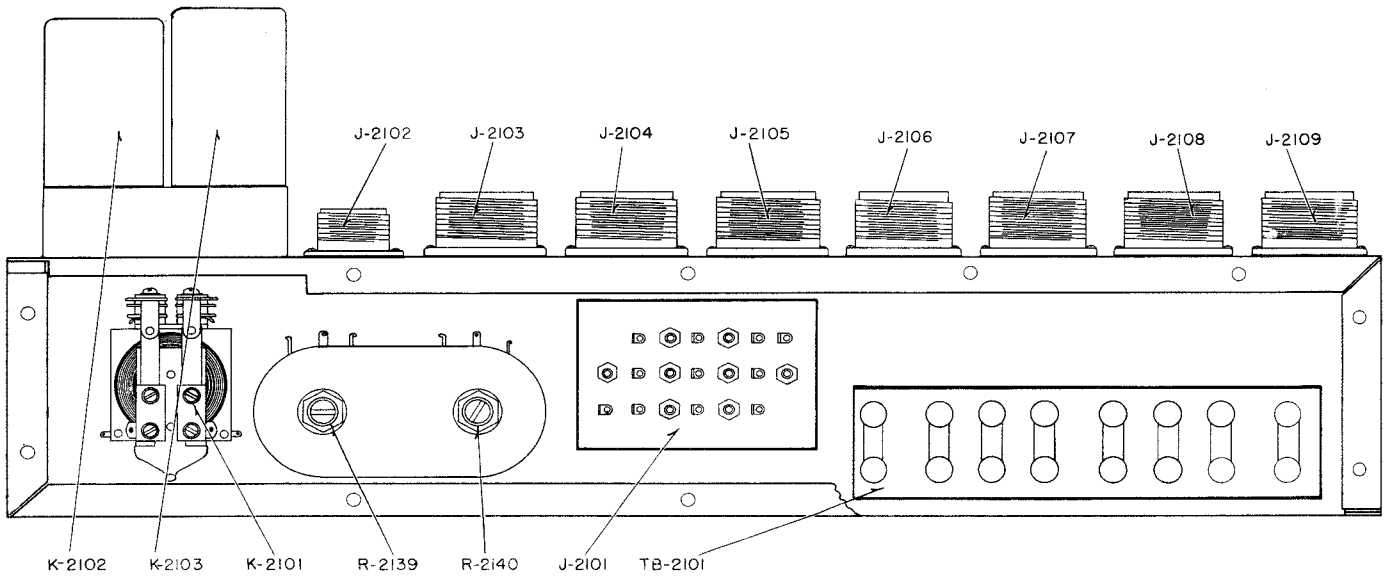


Figure 7–213. Component Locations Inside of R.F. Filter Compartment, Power Supply PP-649/FRR-24

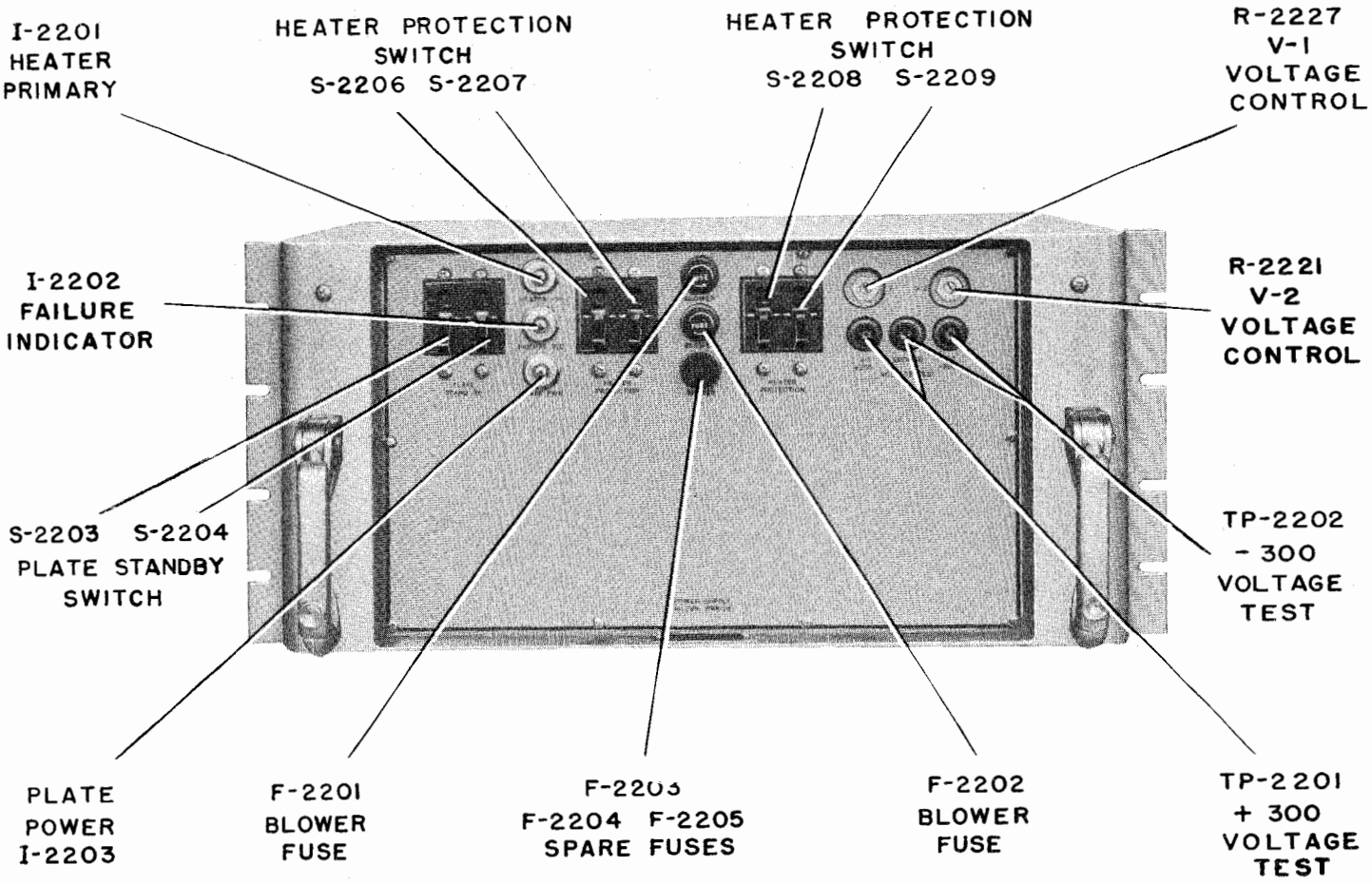


Figure 7–214. Component Locations, Front View, Power Supply PP-648/FRR-24

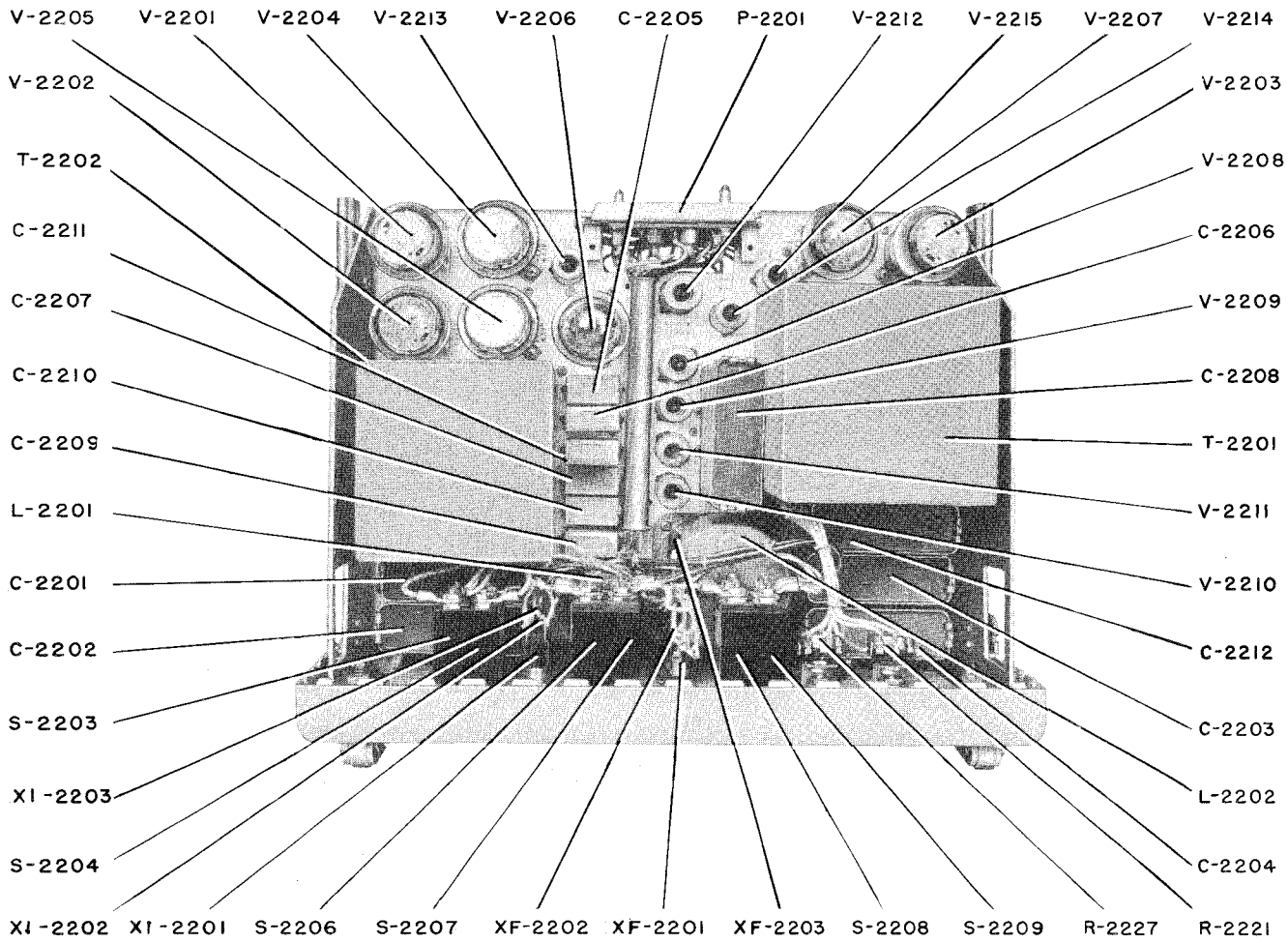


Figure 7–215. Component Locations Top of Chassis, Power Supply PP-648/FRR-24

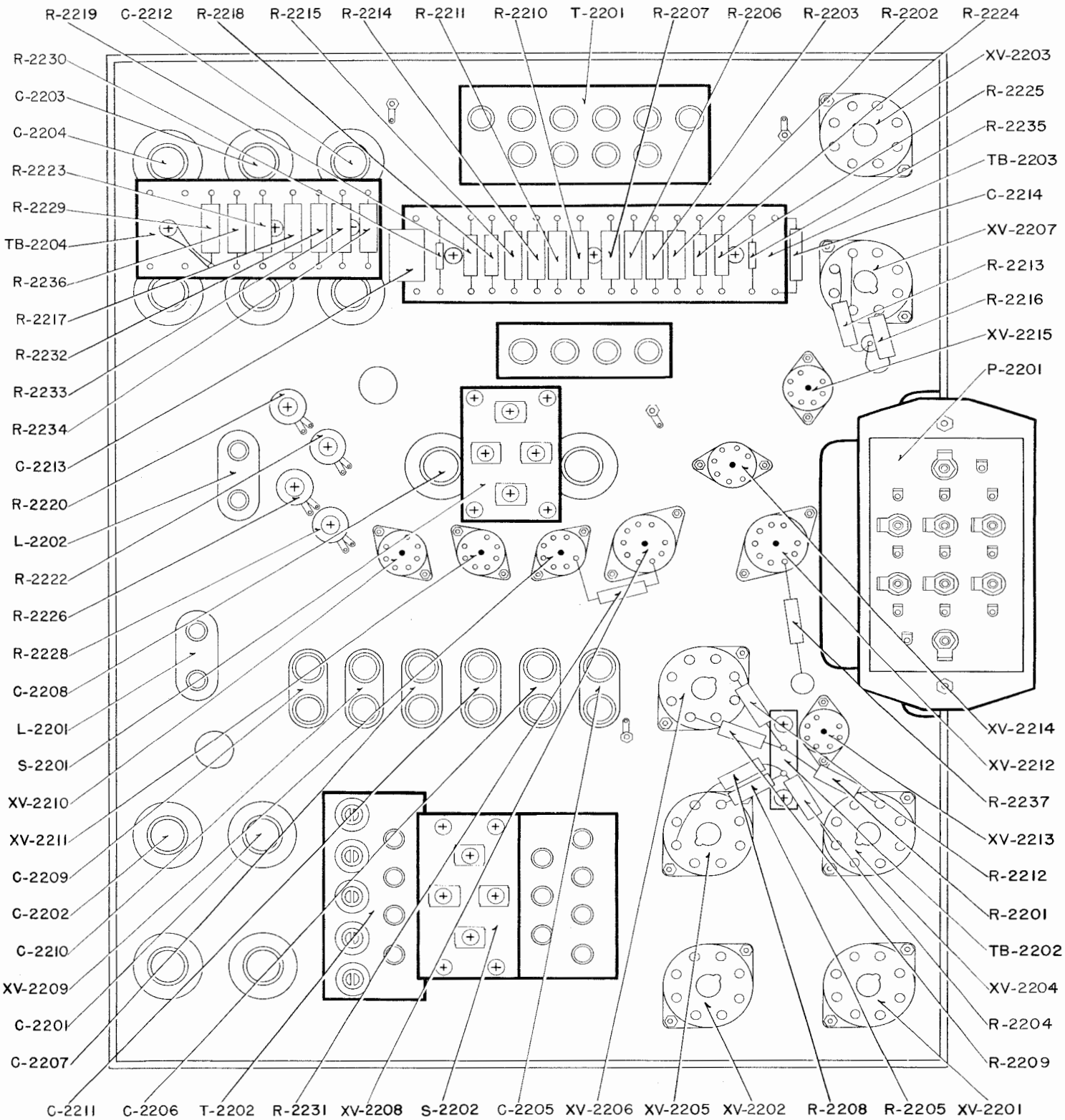


Figure 7–216. Component Locations Bottom of Chassis, Power Supply PP-648/FRR-24

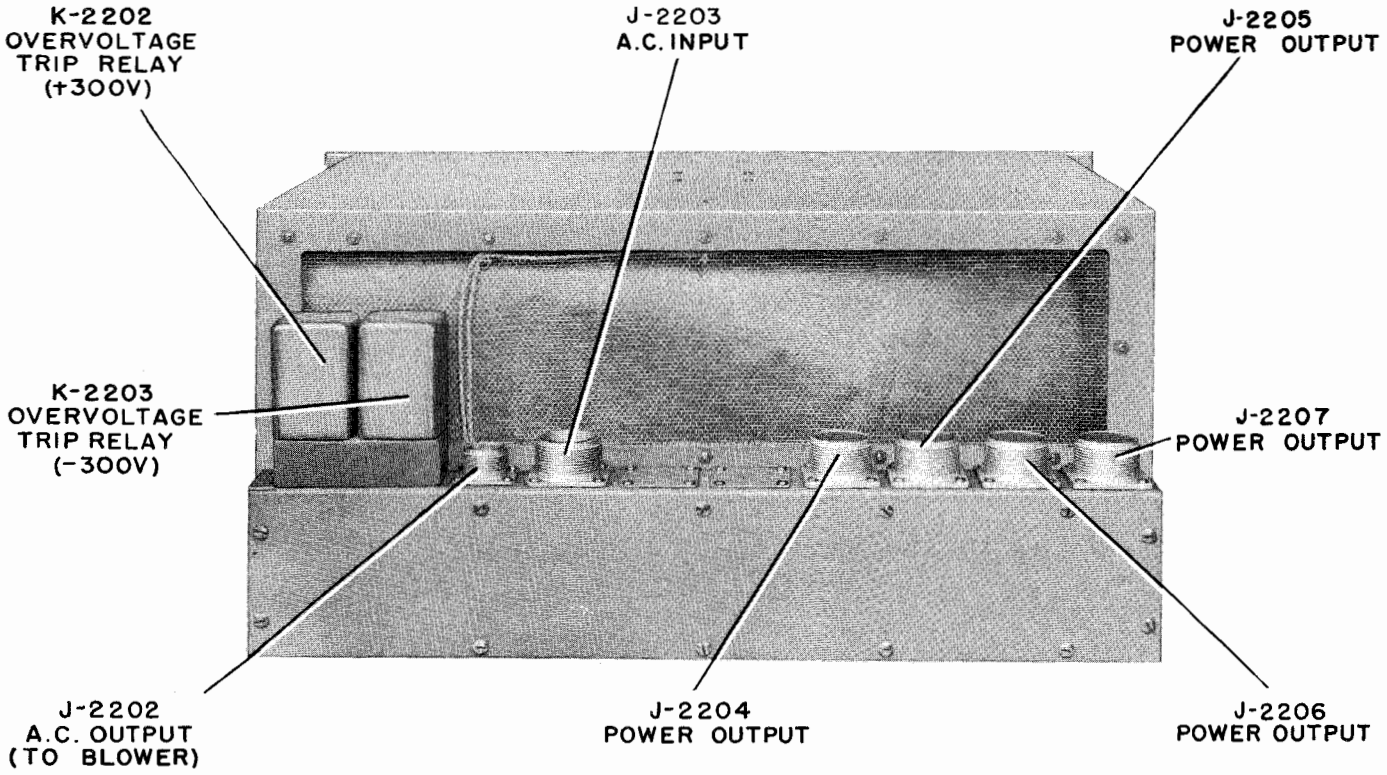


Figure 7–217. Component Locations Rear of Cabinet, Power Supply PP-648/FRR-24

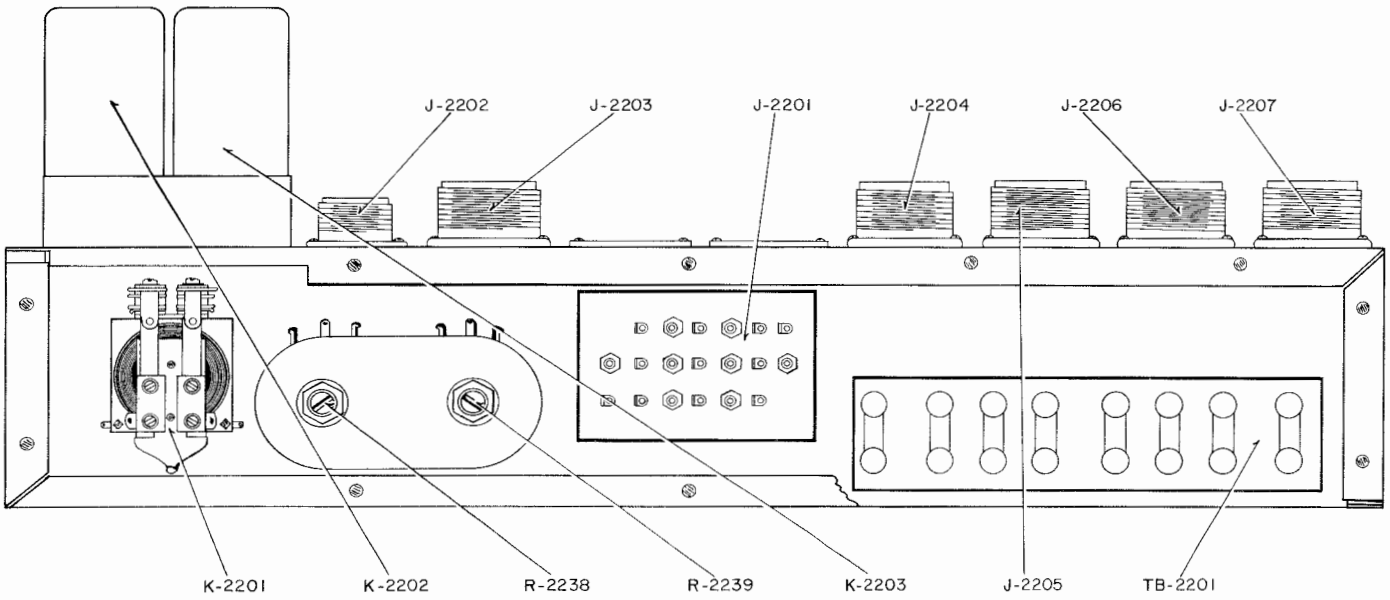


Figure 7–218. Component Locations Inside of R.F. Filter Compartment, Power Supply PP-648/FRR-24

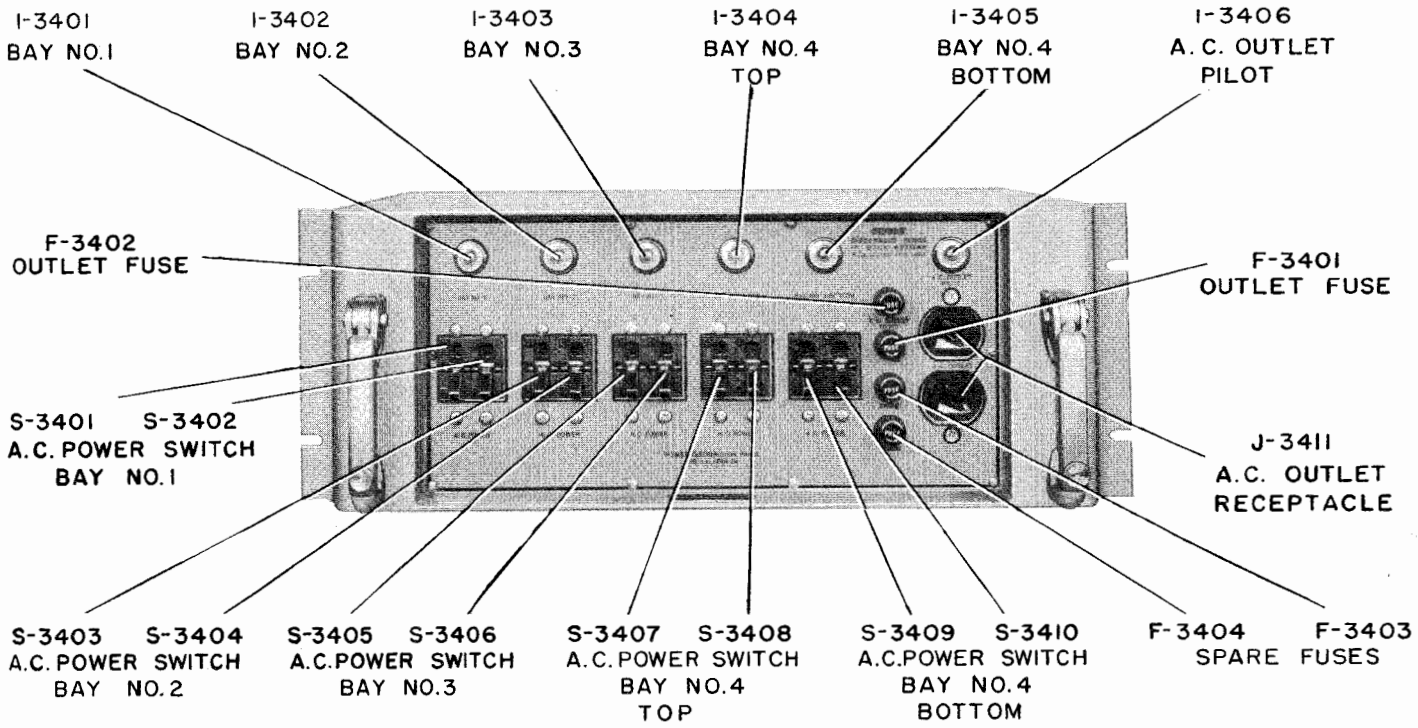


Figure 7–219. Component Locations Front View, Power Distribution Panel SB-141/FRR-24

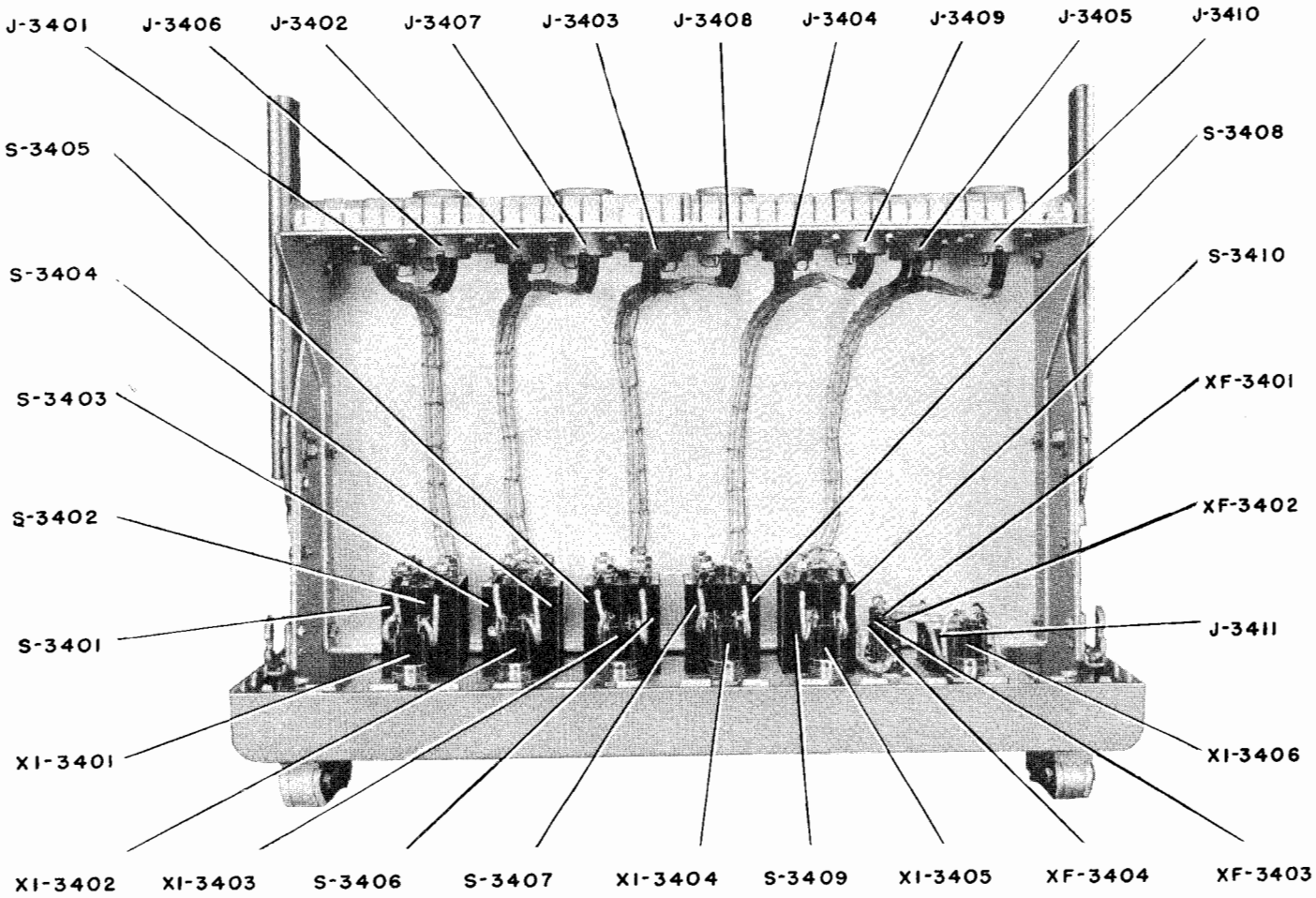


Figure 7–220. Component Locations Top of Chassis, Power Distribution Panel SB-141/FRR-24

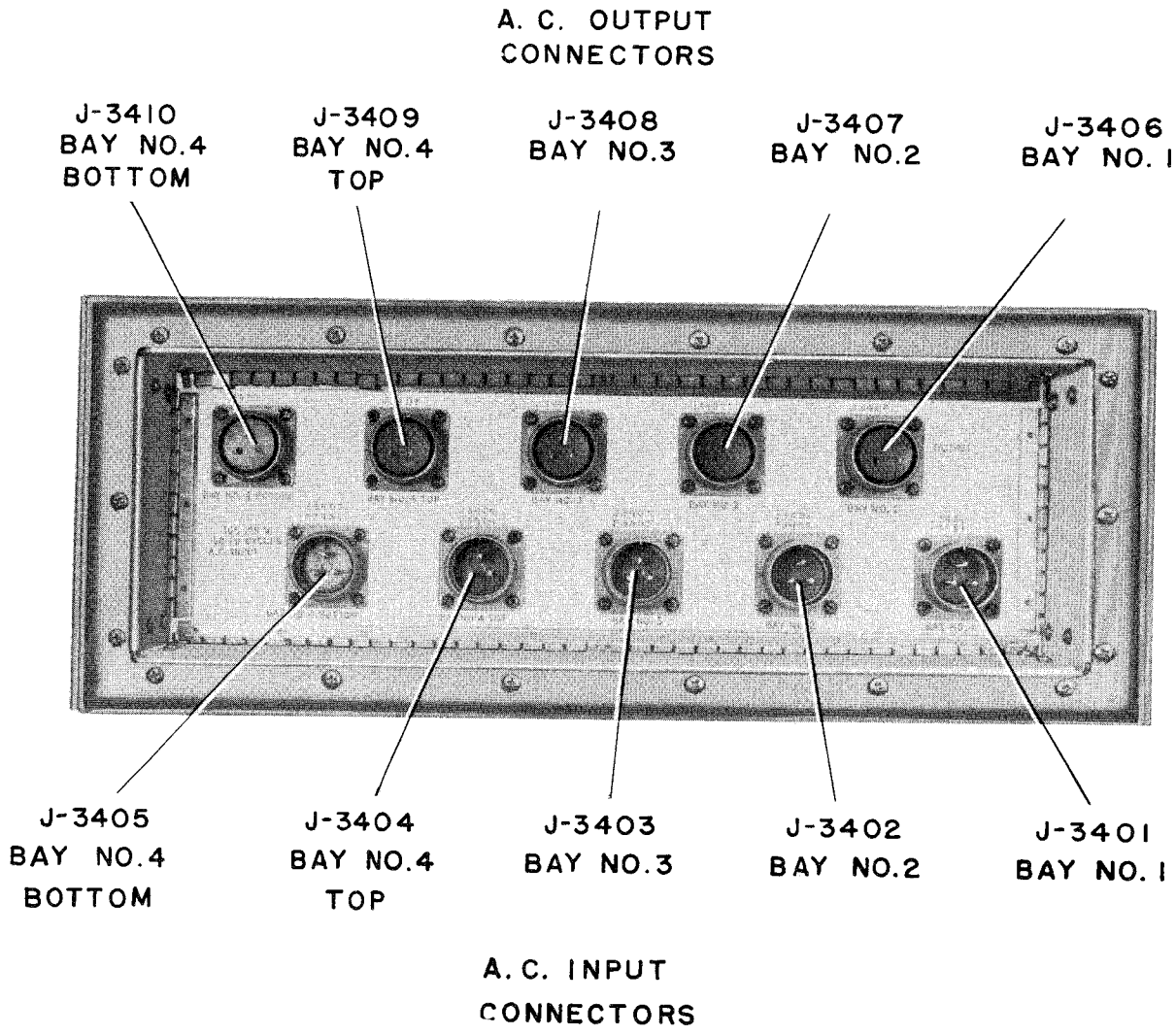


Figure 7–221. Component Locations Rear View, Power Distribution Panel SB-141/FRR-24

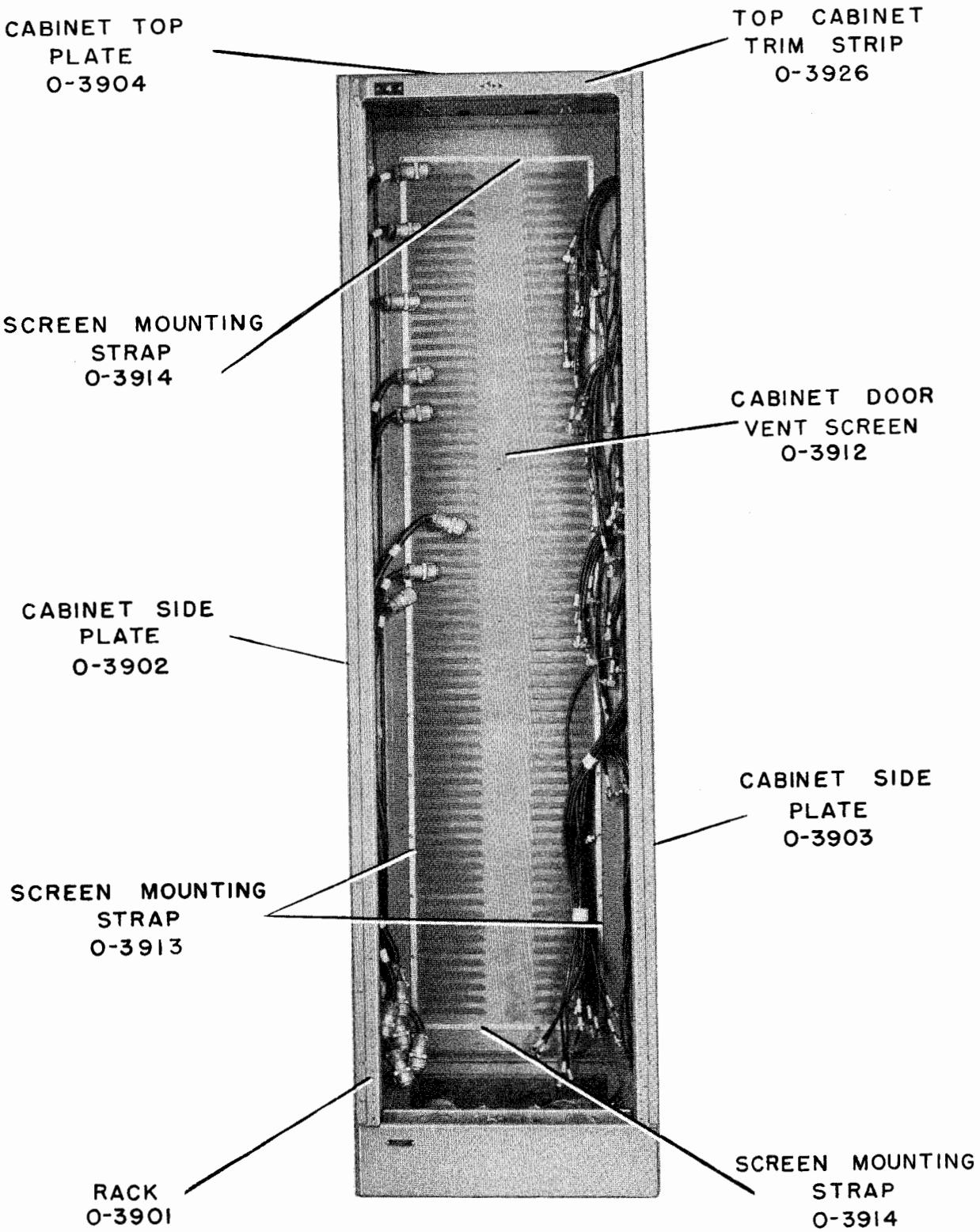


Figure 7-222. Component Locations Front View, Cabinet CY-860/FRR-24

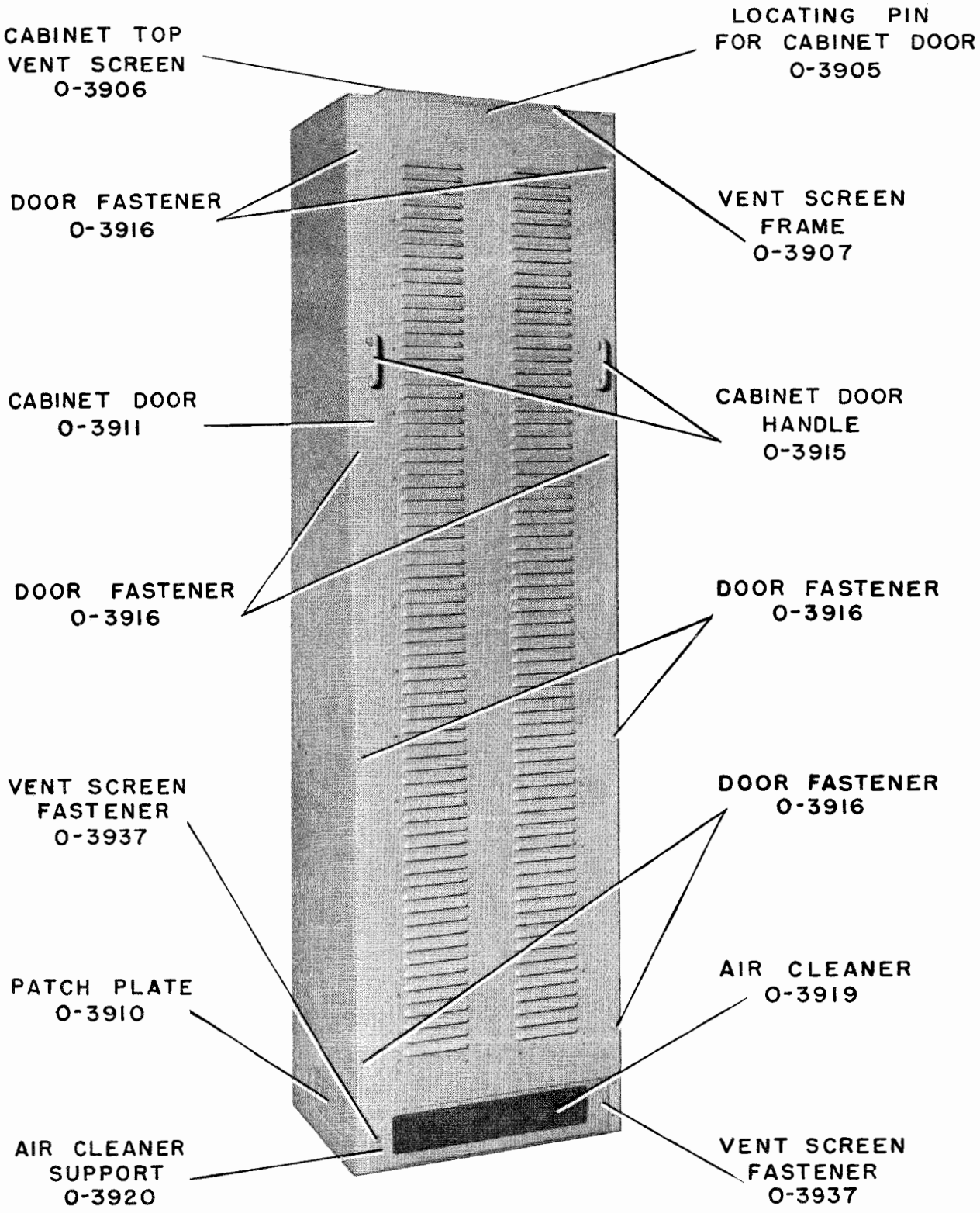


Figure 7–223. Component Locations Rear View, Cabinet CY-860/FRR-24

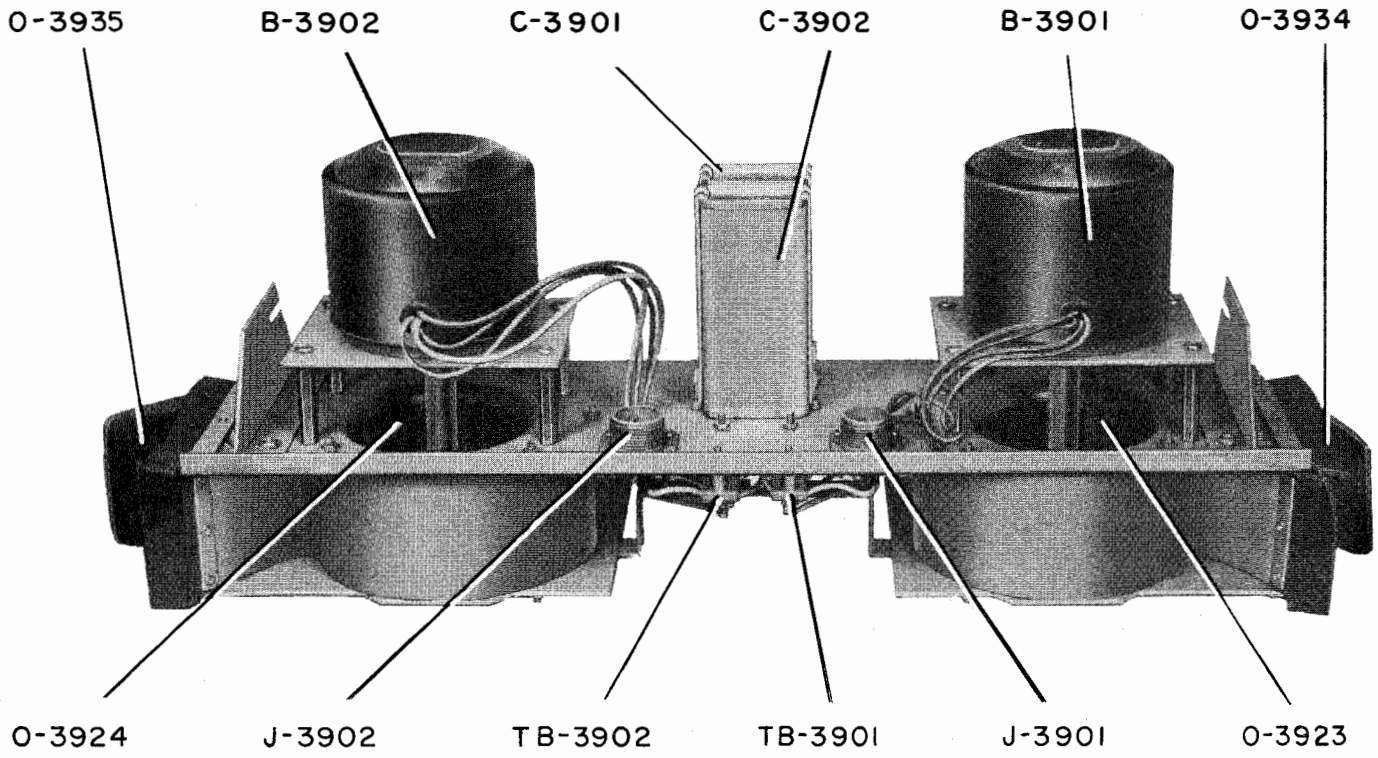


Figure 7–224. Component Locations Blower Assembly

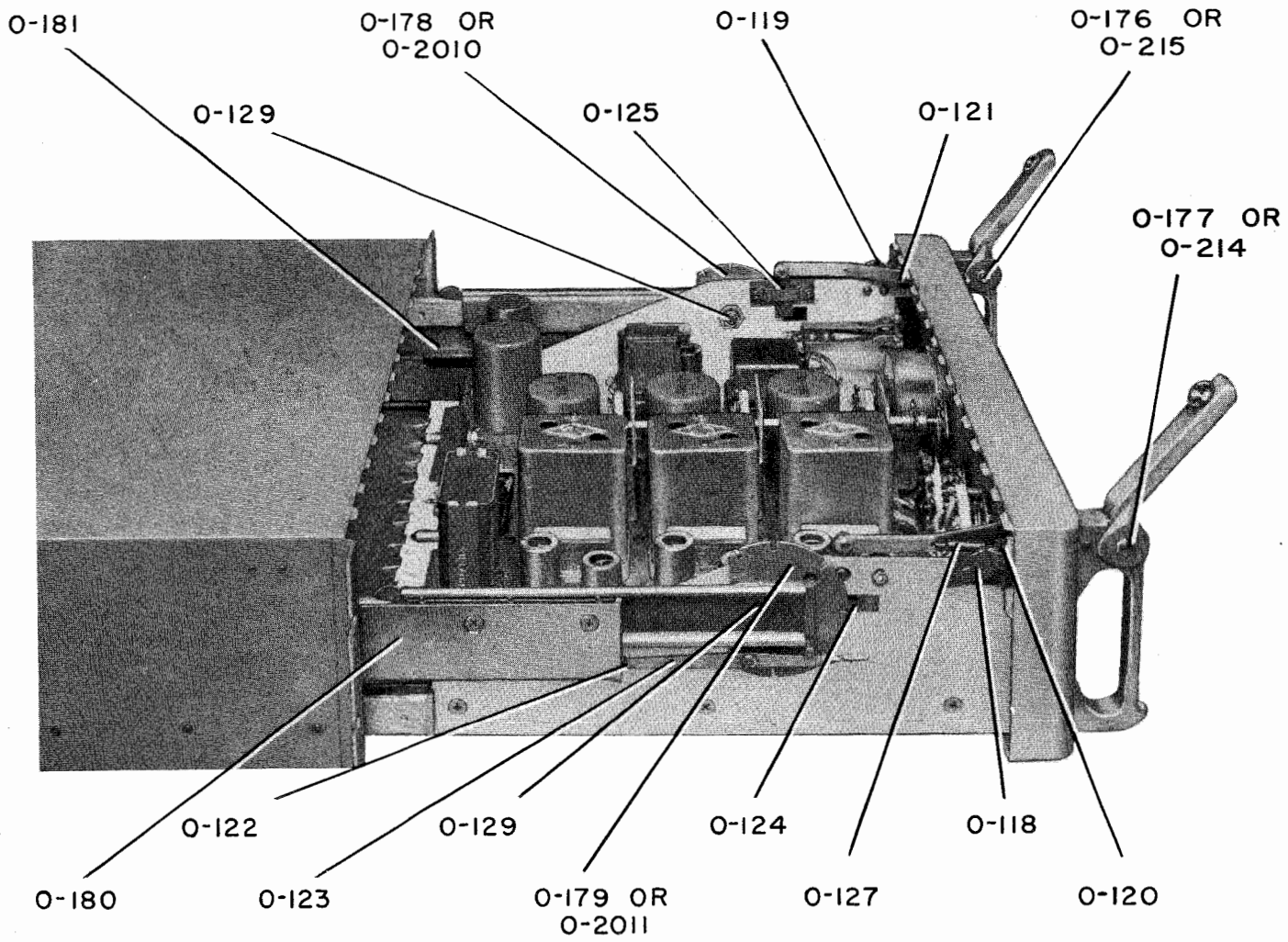


Figure 7–225. Component Locations, Typical Slide Mechanism

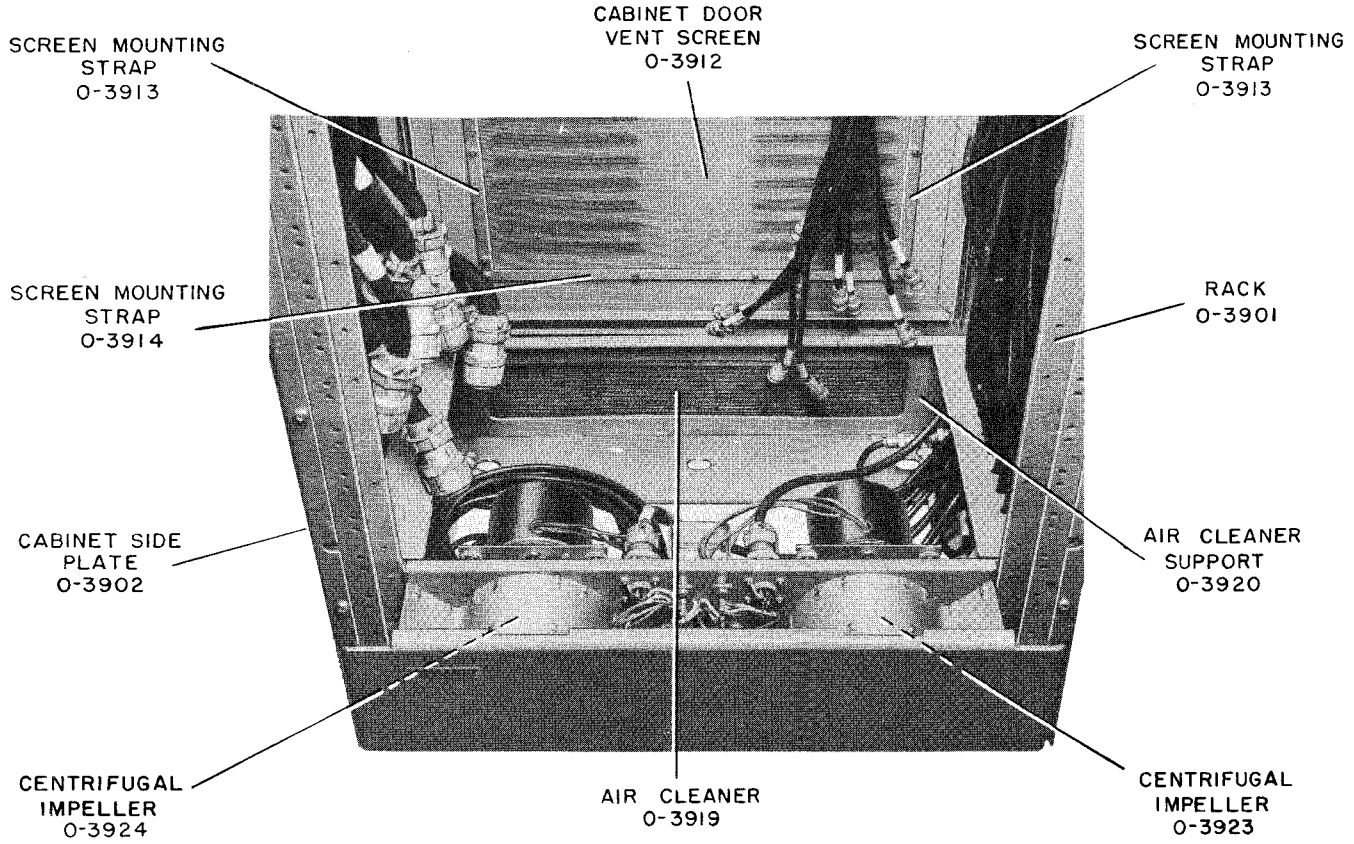


Figure 7–226. Component Locations, Detailed View of Bottom of Cabinet CY-860/FRR-24

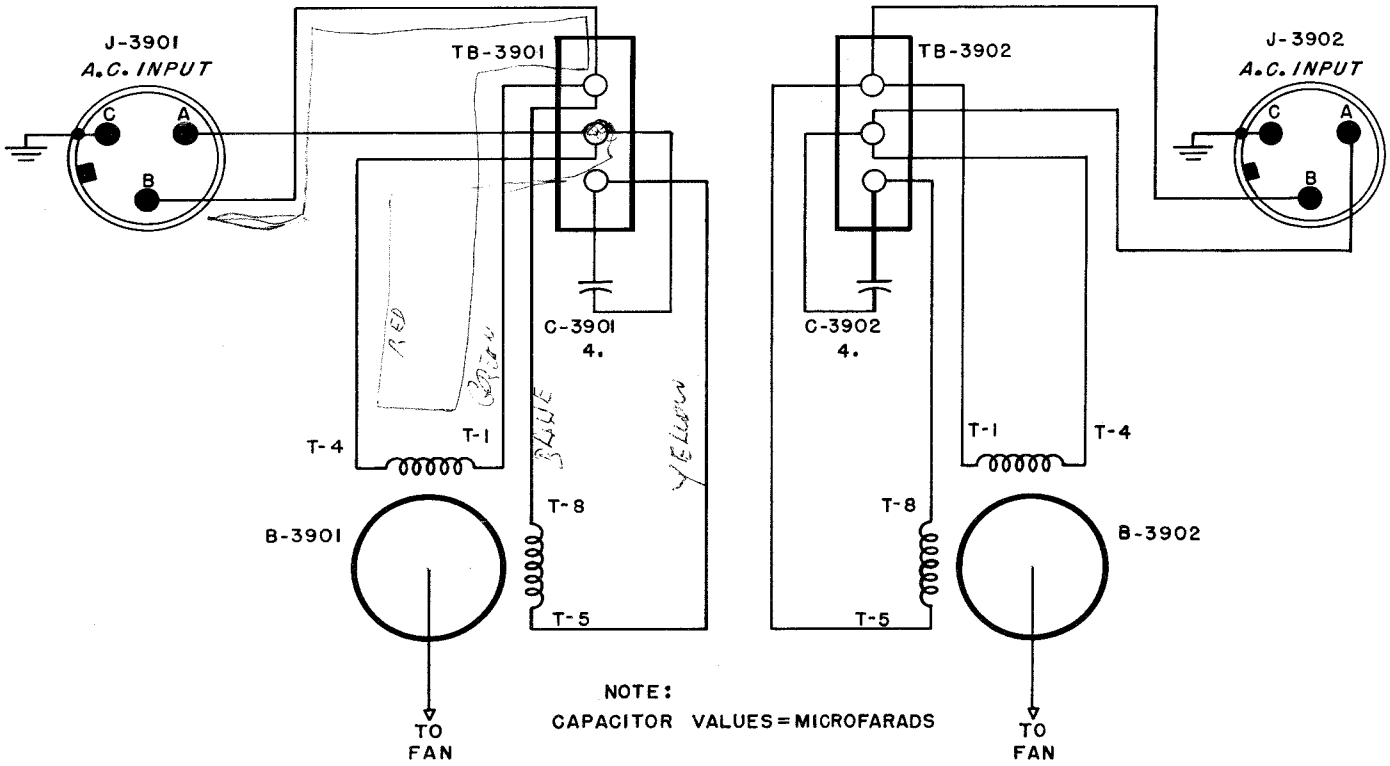


Figure 7–227. Schematic Diagram, Blower Assembly

NAVSHIPS 91580

RESTRICTED
SECURITY INFORMATION

INSTRUCTION BOOK

for

RADIO RECEIVING SET AN/FRR-24

SECTION 8—PARTS LIST

NATIONAL COMPANY, INC.
MALDEN 48, MASSACHUSETTS

BUREAU OF SHIPS

NAVY DEPARTMENT

Contract: NObsr-39402

Approved by BuShips: 15 April 1952

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TABLE 8-1. WEIGHTS AND DIMENSIONS OF REPAIR PARTS BOXES

EQUIPMENT SPARES					
REPAIR PARTS BOX	OVERALL DIMENSIONS			VOLUME cu. ft.	WEIGHT lbs.
	HEIGHT	WIDTH	DEPTH		
55	12	30 in.	15 in.	3.125	130

TABLE 8-2. SHIPPING WEIGHTS AND DIMENSIONS OF REPAIR PARTS BOXES

EQUIPMENT SPARES						
SHIPPING BOX NO.	REPAIR PARTS BOX	OVERALL DIMENSIONS			VOLUME cu. ft.	WEIGHT lbs.
		HEIGHT	WIDTH	DEPTH		
55	1	16 7/8''	33 5/8''	13 7/8''	4.55	145

RESTRICTED SECURITY INFORMATION
ORIGINAL

TABLE 8-3. LIST OF MAJOR UNITS

SYMBOL GROUP	QUANTITY	NAME OF MAJOR UNIT	STANDARD NAVY STOCK NUMBER	DESIGNATION
-----	1	Radio Receiving Set	F16-R-38376-6201	AN/FRR-24
101 to 199	3	Amplifier–Converter		AM-450/FRR-24
101 to 199	3	Amplifier–Converter		AM-451/FRR-24
101 to 199	3	Amplifier–Converter		AM-452/FRR-24
101 to 199	3	Amplifier–Converter		AM-453/FRR-24
201 to 299	3	Control Panel		SB-142/FRR-24
301 to 399	3	Frequency Converter	F16-C-90818-1001	CV-126/FRR-24
401 to 599	3	Filter Assembly		F-99/FRR-24
601 to 699	3	R.F. Amplifier		AM-454/FRR-24
701 to 799	3	Amplifier–Detector	F16-A-39348-1007	AM-439/FRR-24
801 to 899	1	Oscillator Assembly		O-131/FRR-24
901 to 999	2	Amplifier–Detector	F16-A-39348-1006	AM-440/FRR-24
1001 to 1099	1	Amplifier–Detector	F16-A-39348-1009	AM-438/FRR-24
1101 to 1199	3	Keyer	F16-K-49161-1003	KY-62/FRR-24
1201 to 1299	3	Frequency Shift Converter	F16-C-90908-1001	CV-127/FRR-24
1301 to 1499	1	Comparator Keyer	F16-K-47670-9551	CM-32/FRR-24
1501 to 1599	1	Patch Panel		SB-138/FRR-24
1601 to 1699	1	Patch Panel	F17-P-23168-4977	SB-140/FRR-24
1701 to 1799	1	Patch Panel		SB-169/FRR-24
1801 to 1899	1	Patch Panel	F17-P-23194-1001	SB-143/FRR-24
2001 to 2099	3	Power Supply		PP-590/FRR-24
2101 to 2199	1	Power Supply		PP-649/FRR-24
2201 to 2299	1	Power Supply		PP-648/FRR-24
3401 to 3499	1	Power Distribution Panel	F17-P-18151-2985	SB-141/FRR-24
3901 to 3999	1	Cabinet	F16-C-10633-9901	CY-860/FRR-24
--------	1	Tool Kit	N16-T-800001-148	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				STRUCTURAL PARTS						
A-101	Plate, cover: cover for optical system housing; 1/4-1/2 hd brass w/black ebenol finish; irregular shape; 6 19/32" lg x 4 1/16" wd x 0.064" thk o/a; mts by seven 0.171" diam mtg holes on irregularly spaced mtg/c, marked "1101" and "X1101"	Optical housing cover		N16-P-401881-200	1; Q081-1	Q081-1	A-101	12		
A-102	Housing, optical system: cast aluminum, black paint finish; irregular shape; 6 19/32" lg x 3 23/32" wd x 1.312" d o/a; mts by two 0.187" diam holes 1.125" between mtg/c	Optical housing casting			1; Q037-2	Q037-2	A-102	12		
				MOTORS						
B-101 thru B-3900	Not Used									
B-3901	Motor, AC: capacitor start, induction type; 1/35 hp, 3400 rpm; closed frame; pulley not included, shaft has 2 flats at 90°; 6 5/8" lg x 3 5/16" diam o/a, shaft 0.312" diam protuding 3 3/8" from frame; 115 vac, 60 cyc, single phase; mounts by shaft end of frame; four no. 10-32 tapped mtg holes equally spaced around 1.312" radius	Turns centrifugal impeller in blower system (left side)		N17-M-54952-7501	1360	Q-112-1	B-3901, B-3902	5		

B-3902	Same as B-3901	Turns centrifugal impeller in blower system (right side)								
			CAPACITORS							
C-101	Capacitor, fixed: ceramic dielectric, 22 mmf ±10%; zero temp coef +60 -110) mmf/mf/°C; 500 vdcw; 0.460'' lg x 0.240'' diam; two radial wire leads; JAN-C-20A spec; not used on AM-452/FRR-24	Fixed antenna trimmer	CC30CH220K	N16-C-16154-7430	496	J210-10	C-101, C-104, C-109, C-113, C-117, C-121, C-125, C-130, C-150, C-185	90		
C-102	Capacitor, variable: air dielectric; single section plate meshing type; 4.5 mmf to 25 mmf cap; SLC; 600 v RMS at 60 cycles; 1 3/64'' lg excl shaft x 15/16'' wd x 1 3/16'' h, shaft 7/32'' lg x 1/4'' diam; screwdriver adjustment; 8 polished aluminum plates; 180° rotation; ceramic insulation; solder lug terminals; mts by two no. 4-40 tapped mtg holes on 21/32'' mtg/c	Antenna trimmer			1; SA:7035	SA:7035	C-102	12		
C-103	Capacitor, variable: 7 sections	Main tuning capacitor								
C-103A, B, C, D, E, G[1]	Capacitor, variable: air dielectric, six section plate meshing type; 5 sections 15 to 225 mmf each section; one section 13-190 mmf; SLF tuning characteristic; 0.020'' air gap; 13 15/16'' lg x 3.625'' wd x 3.489'' h; gear driven adjustment; 5 sections 19 brass plates, one section 15 brass plates silver plate and water dipped lacquer finish; 180° clockwise rotation; ceramic insulation; lug terms; mts by four no. 8-32 tapped mtg holes on 7.875'' mtg/c; antibacklash gear	V-101, V-102, V-103, V-104, V-108 and V-109 tuning		N16-C-63673-5731	1; SA:8124	SA:8124	C-103A, B, C, D, E, G[1]	3		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-103A, B, C, D, E, G[1] (cont)	drive; part of C-103; incl E-129, O-143, O-136, O-135, O-107, O-102; used only on AM-452/FRR-24									
C-103 AX, BX, CX, DX, EX, GX	Capacitor, variable: air dielectric, six section plate meshing type; 15 to 225 mmf each section; SLF tuning characteristic; 0.020" air gap; 13 15/16" lg x 3.625" wd x 3.489" h; gear driven adjustment; 19 brass plates, silver plate and water dipped lacquer finish; 180° clockwise rotation; ceramic insulation; lug term; mts by four no. 8-32 tapped mtg holes on 7.875" mtg/c; anti-backlash gear drive; part of C-103; includes E-129, O-143, O-136, O-135, O-107, O-102; used only on AM-450, AM-451, AM-453/FRR-24	V-101 thru V-104 V-108, V-109 tuning			1; SA:8828	SA:8828	C-103AX, BX, CX, DX, EX, GX	9		
C-103F[1]	Capacitor, variable: air dielectric, single section plate meshing type; 21 mmf to 257 mmf cap; SLF tuning characteristic; 8 1/8" lg x 5 5/16" wd x 5 13/16" h; gear driven adjustment; 180° clockwise rotation; ceramic insulation; lug term; mts by seventeen 0.156" diam mtg holes on irregularly spaced mtg/c;	V-107 tuning			1; SA:8179	SA:8179	C-103F[1]	3		

C-103F[1] (cont)	anti-backlash gear drive; used only on AM-452/FRR-24; part of Z-101[1]									
C-103 FX	Capacitor, variable: air dielectric; single section plate meshing type; 19 mmf to 223 mmf cap; SLF tuning characteristic; 8 1/8" lg x 5 5/16" wd x 5 13/16" h; gear driven adjustment; 180° clockwise rotation; ceramic insulation; lug term; mts by seventeen 0.156" diam mtg holes on irregularly spaced mtg/c; anti-backlash gear drive; used only on AM-450, AM-451, AM-453/FRR-24; part of Z-101[2], Z-101[3], Z-101[4]	V-107 tuning			1; SA:9189	SA:9189	C-103FX	9		
C-104	Same as C-101	V-101 grid coupling								
C-105	Capacitor, fixed: ceramic dielectric; 1000 mmf ±20%; temp coef variable; 500 vdcw; 0.625" lg x 0.3125" across flats; two 0.055" axial wire leads w/hooks formed at ends; mounts by metal bushing w/ no. 12-28 thrd; uninsulated; feed-thru type	V-101 grid feed-thru	(-485007-20)	N16-C-18657-8801	83	K713-1	C-105, C-107, C-108, C-114, C-116, C-122, C-124, C-129, C-133, C-134, C-137 thru C-144, C-157, C-158, C-160, thru C-173, C-180, C-349, C-350, C-357 thru C-366, C-501, thru C-514, C-628 thru C-637, C-738 thru C-747, C-823, C-824, C, 826, C-833, C-834, C-836, C-842, C-843, C-849, thru C-862,	704		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-105 (cont)							C-921 thru C-930, C-1033 thru C-1042, C-1161 thru C-1170, C-1228, C-1230, C-1239 thru C-1254, C-1315 thru C-1324			
C-106	Capacitor, fixed: ceramic dielectric; 10,000 mmf, no tolerance rating; 450 vdcw; 3/4" diam x 5/32" thk; two radial wire leads	V-101 plate padder		N16-C-19111-1035	10	K946-2	C-106, C-132, C-182	36		
C-107	Same as C-105	V-101 screen feedthru								
C-108	Same as C-105	V-101 plate feedthru								
C-109	Same as C-101	Padder for tuning capacitor								
C-110	Capacitor, fixed: mica dielectric; 10,000 mmf ±5%; temp coef letter C; 300 vdcw; 53/64" lg x 53/64" wd x 11/32 thk; two axial wire leads; JAN-C-5 spec	V-101 plate bypass	CM35C103J	N16-C-33617-4746	14	H377-13	C-110, C-112, C-119, C-126, C-118, C-128, C-135, C-179, C-623, C-624	102		
C-111	Capacitor, variable: air dielectric; single section plate meshing type;	V-101 plate trimmer			1; SA:8485	SA:8485	C-111, C-120 C-127, C-131	48		

C-111 (cont)	4.5 mmf to 25 mmf cap; SLC; 600 v RMS at 60 cycles; 1 3/64" lg excl shaft x 15/16" wd x 1 3/16" h; screwdriver adjustment; 8 aluminum plates; 360° rotation; ceramic insulation; solder lug term; mounts by two no. 4-40 tap mtg holes on 21/32" mtg/c								
C-112	Same as C-110	V-101 plate padder							
C-113	Same as C-101	V-102 grid coupling							
C-114	Same as C-105	V-102 grid feedthru							
C-115	Capacitor, fixed: ceramic dielectric; 5000 mmf; no tolerance rating; 450 vdwc; 19/32" diam x 5/32" thk; two radial wire leads	V-102 screen bypass			10	K946-1	C-115, C-123 C-145, C-146 C-155, C-156 C-177	84	
C-116	Same as C-105	V-102 plate feedthru							
C-117	Same as C-101	V-102 padder							
C-118	Same as C-110	V-102 plate bypass							
C-119	Same as C-110	V-102 plate padder							
C-120	Same as C-111	V-102 trimmer							
C-121	Same as C-101	V-103 grid coupling							
C-122	Same as C-105	V-103 grid feedthru							
C-123	Same as C-115	V-103 screen bypass							
C-124	Same as C-105	V-103 screen feedthru							
C-125	Same as C-101	V-103 padder							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-126	Same as C-110	V-103 plate pad-der								
C-127	Same as C-111	V-103 trimmer								
C-128	Same as C-110	V-103 plate by-pass								
C-129	Same as C-105	V-103 plate feedthru								
C-130	Same as C-101	Padder								
C-131	Same as C-111	Trimmer								
C-132	Same as C-106	V-104 cathode bypass								
C-133	Same as C-105	Buffer B+ feed-thru								
C-134	Same as C-105	V-104 screen feedthru								
C-135	Same as C-110	B+ bypass								
C-136	Capacitor, fixed : mica dielectric; 220 mmf ±5%; temp coef letter E; 500 vdcw; 51/64" lg x 15/32" wd x 7/32" thk o/a two axial wire leads; JAN-C-5 spec	L-106A and L-106B tuning	CM20E221J		242	D925-23	C-136	12		
C-137	Same as C-105	B+ feedthru								
C-138	Same as C-105	V-101 filament feedthru								
C-139	Same as C-105	V-102 filament feedthru								

C-140	Same as C-105	V-103 filament feedthru						
C-141	Same as C-105	V-104 filament feedthru						
C-142	Same as C-105	V-109 filament feedthru						
C-143	Same as C-105	V-108 filament feedthru						
C-144	Same as C-105	V-108 screen feedthru						
C-145	Same as C-115	V-108 cathode bypass						
C-146	Same as C-115	V-108 screen bypass						
C-147	Capacitor, fixed: mica dielectric; 1000 mmf ±10%; temp coef letter C; 500 vdcw; 53/64" lg x 53/64" wd x 9/32" thk o/a; two axial wire leads; JAN-C-5 spec; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Oscillator B+ bypass	CM30C102K	N16-C-31090-4169	14	H640-14	C-147	12
C-148	Capacitor, fixed: ceramic dielectric; 100 mmf ±2% zero temp coef ±30 p/m; 500 vdcw; two radial wire leads; JAN-C-20A spec; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4],	V-107 grid coupling	CC32CG101G	N16-C-17067-8263	10	L480-2	C-148	12
C-149	Capacitor, fixed: mica dielectric; 10,000 mmf ±2%; 300 vdcw; 53/64" lg x 53/64" wd x 11/32" thk; moulded bakelite case; two axial wire leads; JAN-C-5 spec; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	V-107 B+ bypass	CM35E103G	N16-C-33612-3276	14	H377-11	C-149, C-719, C-721	18
C-150	Same as C-101	Coupling						
C-151[1]	Capacitor, fixed: mica dielectric; 820 mmf ±2%; 500 vdcw 53/64" lg x 53/64" wd x 9/32" thk; moulded bakelite case; two axial wire	V-107 fixed padder	CM25E821G	N16-C-30737-3327	14	J175-23	C-151[1]	3

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	ONAN
				CAPACITORS (continued)						
C-151[1] (cont)	leads; JAN-C-5 spec; part of Z101[1]									
C-151[2]	Capacitor, fixed: mica dielectric; 1000 mmf ±2%; 500 vdcw; 1 1/16" lg x 15/32" wd x 7/32" thk; moulded bakelite case; two axial wire leads; JAN-C-5 spec; part of Z-101[2]	V-107 fixed padder	CM30E102G	N16-C-31080-2219	14	H640-22	C-151[2]	3		
C-151[3]	Capacitor, fixed: mica dielectric; 510 mmf ±2%; 500 vdcw; 1 1/16" lg x 15/32" wd x 7/32" thk; moulded bakelite case; two axial wire leads; JAN-C-5 spec; part of Z-101[3]	V-107 fixed padder	CM25E511G	N16-C-30183-3927	242	J175-16	C-151[3] C-1112, C-1124, C-1137, C-1149	15		
C-151[4]	Capacitor, fixed: mica dielectric; 240 mmf ±2%; 500 vdcw; 1 1/16"lg x 15/32" wd x 7/32" thk; moulded bakelite case; two axial wire leads; JAN-C-5 spec; part of Z-101[4]	V-107 fixed padder	CM25E241G	N16-C-29444-7727	14	J175-19	C-151[4] C-1121, C-1146	6		
C-152A C-152B	Capacitor, variable: air dielectric; plate meshing type; dual section; 30 mmf to 4.4 mmf A section, 86 mmf to 6.8 mmf B section; SLC; 600 v RMS; 2 1/4" lg excl shaft x	Oscillator trimmer			1; SA:8918	SA:8918	C-152A, C-152B	12		

1 Used on AM-452/FRR-24 only.
2 Used on AM-453/FRR-24 only.
3 Used on AM-451/FRR-24 only.
4 Used on AM-450/FRR-24 only.

C-152A C-152B (cont)	31/32" wd x 1 11/32" h; shafts extend 1/2" beyond bushing; locking type; screwdriver adjustment; 22 polished aluminum plates one section, 8 polished aluminum plates other section; 360° rotation; isolantite insulation; solder lug term; mts by two no. 4-40 tapped holes on 21/32" mtg/c each end; for reference only; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]							
C-153[1]	Capacitor, fixed: ceramic dielectric; 470 mmf ±2%; neg temp coef 750 (+120-350) mmf/mf/°C; 500 vdcw; 1.2" lg x 0.330" diam; 2 radial wire leads 1 1/4" lg; insulated; part of Z-101[1]	V-107 fixed padder		N16-C-18157-2454	10 TC35A	R643-1	C-153[1]	3
C-153[2]	Capacitor, fixed: ceramic dielectric; 200 mmf ±2%; neg temp coef 750 (+120-350) mmf/mf/°C; 500 vdcw; 1.328" lg x 0.340" diam; axial wire leads, ceramic insulation; JAN-C-20A spec; part of Z-101[2]	V-107 fixed padder	CC36UJ201G	N16-C-17677-2619	496	Q947-1	C-153[2]	3
C-153[3]	Capacitor, fixed: ceramic dielectric; 120 mmf ±2%; neg temp coef 750 (+120-350) mmf/mf/°C; 500 vdcw; 1.328" lg x 0.340" diam; axial wire leads; ceramic insulation; JAN-C-20A spec; part of Z-101[3]	V-107 fixed padder	CC36UJ121G	N16-C-17197-2595	496	Q947-5	C-153[3]	3
C-153[4]	Capacitor, fixed: ceramic dielectric; 62 mmf ±2%; neg temp coef 750 (+120 -350) mmf/mf/°C; 500 vdcw; 0.812" lg x 0.250" diam; axial wire leads, ceramic insulation; JAN-C-	V-107 fixed padder	CC26UJ620G	N16-C-16717-2151	496	H-398-5	C-153[4]	3

[1] Used on AM-452/FRR-24 only.
[2] Used on AM-453/FRR-24 only.
[3] Used on AM-451/FRR-24 only.

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			CAPACITORS (continued)							
C-153[4]	20 spec; part of Z-101[4]									
C-154	Capacitor, fixed: ceramic dielectric; 5 mmf ±0.250 mmf; neg temp coef 750 (tol +120 -350) mmf/mf/°C; 500 vdcw; two axial wire leads; insulated; JAN-C-20A spec; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Padder	CC21UJ050C	N16-C-15625-7075	83	H872-28	C-154	12		
C-155	Same as C-115	V-109 screen by-pass								
C-156	Same as C-115	V-109 cathode by-pass								
C-157	Same as C-105	V-109 B+ feed-thru								
C-158	Same as C-105	V-102 screen feedthru								
C-159	Not used									
C-160	Same as C-105	RF filter feedthru								
C-161	Same as C-105	RF filter feedthru								
C-162	Same as C-105	RF filter feedthru								
C-163	Same as C-105	RF filter feedthru								
C-164	Same as C-105	RF filter feedthru								
C-165	Same as C-105	RF filter feedthru								
C-166	Same as C-105	RF filter feedthru								
C-167	Same as C-105	RF filter feedthru								

[4] Used on AM-450/FRR-24 only.

C-168	Same as C-105	RF filter feedthru						
C-169	Same as C-105	RF filter feedthru						
C-170	Same as C-105	RF filter feedthru						
C-171	Same as C-105	RF filter feedthru						
C-172	Same as C-105	RF filter feedthru						
C-173	Same as C-105	RF filter feedthru						
C-174	Capacitor, fixed: mica dielectric; 4700 mmf ±5%; 500 vdcw; temp coef letter C; two axial wire leads; JAN-C-5 spec	V-101 padder	CM35C472J	N16-C-32641-6333	14	H377-20	C-174, C-176	24
C-175	Capacitor, fixed: ceramic dielectric; 2 mmf ±0.5 mmf; negtemp coef 330 (tol +500 -718) mmf/mf/°C; 500 vdcw; JAN-C-20A spec	V-102 coupling	CC21SL020D	N16-C-15532-9005	83	H872-2	C-175	12
C-176	Same as C-174	V-104 padder						
C-177	Same as C-115	V-107 filament bypass						
C-178[1]	Capacitor, fixed: ceramic dielectric; 5 mmf ±0.25 mmf; zero temp coef (tol +30 -72) mmf/mf/°C; 500 vdcw;	Local RF amp coupling		N16-C-15624-3580	496	F912-17	C-178[1]	3
C-178[2]	Capacitor, fixed: ceramic dielectric; 3 mmf ±0.25 mmf; zero temp coef (tol +30 -72) mmf/mf/°C; 500 vdcw	Local RF amp coupling			496	F912-16	C-178[2], C-178[3], C-178[4]	9
C-178[3]	Same as C-178[2]	Local RF amp coupling						
C-178[4]	Same as C-178[2]	Local RF amp coupling						
C-179	Same as C-110	V-109 B+ bypass						

[1] Used on AM-452/FRR-24 only
[2] Used on AM-453/FRR-24 only
[3] Used on AM-451/FRR-24 only
[4] Used on AM-450/FRR-24 only

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-180	Same as C-105	Test point feed-thru								
C-181[1]	Capacitor, fixed: mica dielectric; 1500 mmf ±2%; 500 vdcw; temp coef letter D; JAN-C-5 spec	V-109 padder	CM30D152G	N16-C-31502-2614	14	H640-25	C-181[1]	3		
C-181[2]	Capacitor, fixed: mica dielectric; 1000 mmf ±2%; 500 vdcw; temp coef letter D; JAN-C-5 spec	V-109 padder	CM25D102G	N16-C-31080-2522	14	J175-24	C-181[2]	3		
C-181[3]	Capacitor, fixed: mica dielectric; 680 mmf ±2%; 500 vdcw; temp coef letter D; JAN-C-5 spec	V-109 padder	CM25D681G	N16-C-30526-3J22	14	J175-22	C-181[3]	3		
C-181[4]	Capacitor, fixed: mica dielectric; 330 mmf ±2%; 500 vdcw; temp coef letter D; JAN-C-5 spec; used only on AM-450/FRR-24	V-109 padder	CM25D331G	N16-C-29708-5722	14	J175-20	C-181[4]	3		
C-182	Same as C-106	V-109 grid								
C-183	Capacitor, fixed: ceramic dielectric; 100 mmf ±5%; neg temp coef 330 (tol +500 -718) mmf/mf/°C; 500 vdcw; JAN-C-20 spec; not used on AM-452/FRR-24	V-109 coupling	CC30SL101K	N16-C-17085-6995	83	J210-6	C-183, C-367, C-483, C-489	18		

[1] Used on AM-452/FRR-24 only.
[2] Used on AM-453/FRR-24 only.
[3] Used on AM-451/FRR-24 only.
[4] Used on AM-450/FRR-24 only.

C-184	Capacitor, variable: ceramic dielectric; rotary type, single section; 6.0 to 25.0 mmf; zero temp coef; 1.218" lg x 15/16" wd x 45/64" thk excluding term; solder lug term; two no. 4-40 tapped mtg holes on 0.656" mtg/c; screwdriver slot adjustment; ceramic base	V-109 trimmer	CV12A250	N16-C-64041-4565	10	P352-3	C-184	12		
C-185	Same as C-101, except part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	V-107 grid padder								
C-186 thru C-300	Not used									
C-301	Capacitor, fixed: mica dielectric; 270 mmf ±5%; temp coef letter D; 500 vdcw 51/64" lg x 15/32" wd x 7/32" thk o/a; two axial wire leads; JAN-C-5 spec	L-301B fixed tuning	CM20D271J	N16-C-29608-2206	14	D925-36	C-301, C-304, C-307, C-313, C-314, C-319, C-320, C-323, C-324, C-329, C-330, C-345, C-346, C-351, C-368, C-1255	48		
C-302	Capacitor, fixed: mica dielectric; 10,000 mmf ±20%; 300 vdcw; temp coef letter B; JAN-C-5 spec	V-301 cathode bypass	CM35B103M	N16-C-33627-7705	14	H377-3	C-302, C-305, C-308, C-311, C-315, C-321, C-325, C-334, C-335, C-336, C-337, C-344, C-348, C-356, C-369, C-370, C-701, C-707, C-709, C-716, C-730, C-733, C-737, C-748, C-819, C-821, C-822, C-825, C-829, C-831, C-832, C-835, C-838, C-839, C-845, C-846,	125		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-302 (cont)							C-847, C-848, C-907, C-909, C-915, C-917, C-1019, C-1021, C-1026, C-1028, C-1204, C-1205, C-1213, C-1214, C-1217, C-1221, C-1224, C-1227, C-1233			
C-303	Capacitor, fixed: mica dielectric; 1000 mmf ±10%; 500 vdcw; temp coef letter B; JAN-C-5 spec	V-301 screen bypass	CM30B102K	N16-C-31090-4164	14	H640-2	C-303, C-306, C-309, C-312, C-322, C-355, C-401, C-408, C-416, C-423, C-437, C-499, C-717 C-1202	42		
C-304	Same as C-301; part of Z-302	L-302B fixed tuning								
C-305	Same as C-302	V-302 cathode bypass								

C-306	Same as C-303	V-302 screen by-pass							
C-307	Same as C-301; part of Z-303	L-303B fixed tuning							
C-308	Same as C-302	V-303 cathode by-pass							
C-309	Same as C-303	V-303 screen by-pass							
C-310	Not used								
C-311	Same as C-302	V-304 cathode by-pass							
C-312	Same as C-303	V-304 screen by-pass							
C-313	Same as C-301; part of Z-305	L-305A fixed tuning							
C-314	Same as C-301; partof Z-305	L-305B fixed tuning							
C-315	Same as C-302	V-301 thru V-304 plate filter							
C-316	Capacitor, fixed: mica dielectric; 22 mmf ±5%; 500 vdcw; temp coef letter C; JAN-C-5 spec	Z-305 to Z-306 T pad section	CM20C220J		14	D925-34	C-316, C-318, C-326, C-328	12	
C-317	Capacitor, fixed: mica dielectric; 270 mmf ±5%; 500 vdcw; temp coef letter B; JAN-C-5 spec	Z-305 to Z-306 T pad section	CM20B271J (-481519-B5)	N16-C-29608 -2196	14	H371-4	C-317	3	
C-318	Same as C-316	Z-305 to Z-306 T pad section							
C-319	Same as C-301; part of Z-306	L-306A fixed tuning							
C-320	Same as C-301; par tof Z-306	L-306B fixed tuning							
C-321	Same as C-302	V-305 cathode by-pass							
C-322	Same as C-303	V-305 screen by-pass							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-323	Same as C-301; part of Z-307	L-307A fixed tuning								
C-324	Same as C-301; part of Z-307	L-307B fixed tuning								
C-325	Same as C-302	V-305 plate filter								
C-326	Same as C-316	Part of Z-307 to Z-308 voltage divider network								
C-327	Capacitor, fixed: mica dielectric; 510 mmf ±5%; 500 vdcw; temp coef letter D; JAN-C-5 spec	Part of Z-307 to Z-308 voltage divider network	CM20D511J	N16-C-30188-5006	242	H500-5	C-327	3		
C-328	Same as C-316	Part of Z-307 to Z-308 voltage divider network								
C-329	Same as C-301; part of Z-308	L-308A fixed tuning								
C-330	Same as C-301; part of Z-308	L-308B fixed tuning								
C-331	Capacitor, variable: ceramic dielectric; rotary type; single section; 4.5 to 25 mmf; 500 vdcw; zero temp coef ±100 mmf/mf/°C; 27/32" lg x 41/64" h x 13/32" thk excl term; solder lug term; two 0.120" diam mtg holes in base on 7/16" mtg/c; screwdriver slot adjustment; ceramic base	Y-301 trimmer		N16-C-64036-4540	10	K277-5	C-331, C-404, C-500, C-1211	12	55	1

C-332	Capacitor, fixed: ceramic dielectric; 10 mmf ±5%; 500 vdcw; neg temp coef 330 (tol +500-718) mmf/mf/°C; JAN-C-20A spec	V-306 grid to cathode feedback	CC21SL100D	N16-C-15916-9005	83	H872-1	C-332	3	
C-333	Capacitor, fixed: mica dielectric; 82 mmf ±5%; 500 vdcw; temp coef letter C; JAN-C-5 spec	V-306 cathode bypass	CM20C820J	N16-C-28210-2001	14	D925-17	C-333	3	
C-334	Same as C-302	V-306 screen bypass							
C-335	Same as C-302	V-307 input grid coupling							
C-336	Same as C-302	V-307 cathode bypass							
C-337	Same as C-302	V-307 screen bypass							
C-338	Capacitor, variable: air dielectric; plate meshing type, dual section; 5.4 to 9 mmf/sec; SLC characteristic; 0.0335" air gap; 3 9/64" lg x 1 9/16" wd x 1 13/16" h excl shaft; shaft 0.156" diam x 21/32" lg, extension shaft adjustment; 8 silver plated brass plates; 180° rotation; micalex insulation; solder lug term; 2 mtg holes 5/32" diam on 1 3/8" mtg/c on front end, one elongated mtg hole 9/32" lg x 5/32" wd on rear plate 2 19/64" from c/l of mtg hole	VFO control		N16-C-62066-9101	1; SA:8097	SA:8097	C-338	3	
C-339	Capacitor, variable: air dielectric; plate meshing type; single section 6 to 77 mmf, SLC characteristic; 0.0158" air gap; 1 13/32" lg x 15/16" wd x 1 3/16" h excl shaft, no shaft bushing; shaft 1/2" lg w/ rotor lock; screwdriver adjustment; 22 silver plated brass plates; 360° rotation; ceramic insulation; solder	VFO trimmer		N16-C-60401-1235	1; SA:8488	SA:8488	C-339	3	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-339 (cont)	lug term; mounted by two no. 4-40 tapped holes 5/32" d, 21/32" mtg/c									
C-340	Capacitor, fixed: ceramic dielectric; 160 mmf ±5%; neg temp coef 30 (tol +15 to -60) mmf/mf/°C; 500 vdcw; 1.165" lg x 0.315" diam; two radial wire lead; term mtg; uninsulated; JAN-C-20A spec	VFO fixed tuning	CC35HF161J	N16-C-17458-1321	10	H874-5	C-340	3		
C-341	Capacitor, fixed: mica dielectric; 3000 mmf ±2%; 500 vdcw; temp coef letter E; JAN-C-5 spec	V-308 cathode bypass	CM30E302G	N16-C-32188-1019	14	H640-10	C-341, C-342, C-420, C-421, C-425 thru C-428, C-432, C-433	30		
C-342	Same as C-341	V-308 cathode to grid feedback								
C-343	Capacitor, fixed: mica dielectric; 100 mmf ±10%; 500 vdcw; temp coef letter C; JAN-C-5 spec	V-308 grid coupling	CM30C101K	N16-C-28558-1681	14	D925-38	C-343	3		
C-344	Same as C-302	V-308 screen bypass								
C-345	Same as C-301; part of Z-309	L-312A fixed tuning								
C-346	Same as C-301; part of Z-309	L-312B fixed tuning								
C-347	Capacitor, fixed: paper dielectric; 3 sections; 100,000 mmf per section; +20% -10%; 600 vdcw; all sect		CP69B5EF104V	N16-C-54460-4310	14	M027-2	C-347, C-412, C-449, C-482, C-488, C-617,	21		

C-347 (cont)	tions, internally grounded; JAN-C-25 spec						C-626		
C-347A	Part of C-347	B plus voltage filter							
C-347B	Part of C-347	V-309 screen bypass							
C-347C	Part of C-347	V-310 screen bypass							
C-348	Same as C-302	V-306 plate filter							
C-349	Same as C-105	150 v B plus filter							
C-350	Same as C-105	B plus filter							
C-351	Same as C-301; part of Z-310	L-313B fixed tuning							
C-352	Capacitor, fixed: mica dielectric; 100 mmf ±10%; 500 vdcw; temp coef letter A; JAN-C-5 spec	V-310 osc injection grid coupling	CM20A101K	N16-C-28558-1671	14	D925-3	C-352, C-601, C-606, C-610, C-613, C-616, C-625	21	
C-353	Capacitor, fixed: paper dielectric; 2 sections; 100,000 mmf per section; +20% -10%; 600 vdcw; no internal ground connection; JAN-C-25 spec		CP69B4EF104V	N16-C-53204-4085	14	M027-3	C-353, C-702, C-708, C-732, C-902, C-910, C-1002, C-1008, C-1014, C-1020, C-1203, C-1209	26	
C-353A	Part of C-353	V-310 cathode bypass							
C-353B	Part of C-353	V-310 B plus plate filter							
C-354	Capacitor, fixed: mica dielectric; 2000 mmf ±5%; 500 vdcw; temp coef letter C; JAN-C-5 spec	L-314 fixed tuning	CM30C202J	N16-C-31797-5445	14	H640-19	C-354	3	
C-355	Same as C-303	V-311 grid coupling							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-356	Same as C-302	V-311 plate by-pass								
C-357	Same as C-105	Fil RF filter								
C-358	Same as C-105	Fil RF filter								
C-359	Same as C-105	B minus RF filter								
C-360	Same as C-105	B minus RF filter								
C-361	Same as C-105	Fil RF filter								
C-362	Same as C-105	Fil RF filter								
C-363	Same as C-105	Fil RF filter								
C-364	Same as C-105	Fil RF filter								
C-365	Same as C-105	B plus RF filter								
C-366	Same as C-105	B plus RF filter								
C-367	Same as C-183	V-310 screen to cathode H.F. filter								
C-368	Same as C-301; part of Z-304	L-304B fixed tuning								
C-369	Same as C-302	Fil RF bypass								
C-370	Same as C-302	Fil RF bypass								
C-371 thru C-400	Not used									
C-401	Same as C-303	V-401 input coupling								

C-402	Not used							
C-403	Capacitor, fixed: mica dielectric; 10,000 mmf ±10%; 300 vdcw; temp coef letter B; JAN-C-5 spec	V-401 screen bypass	CM35B103K	N16-C-33622-5222	14	H377-8	C-403	3
C-404	Same as C-331	Z-402 input tuning						
C-405	Capacitor, fixed: mica dielectric; 5100 mmf ±2%; 500 vdcw; temp coef letter E; JAN-C-5 spec	L-401A fixed tuning	CM35E512G	N16-C-32715-6063	14	H377-15	C-405, C-406, C-410, C-411, C-413, C-414, C-418, C-419	24
C-406	Same as C-405	L-401B fixed tuning						
C-407	Capacitor, fixed: ceramic dielectric; 51 mmf ±5%; neg temp coef 330 (+500 -718) mmf/mf/deg C; 500 vdcw; JAN-C-20A spec	Z-403 to Z-404 T-pad section	CC21SL510J	N16-C-16596-2481	83	H972-5	C-407, C-409, C-415, C-417, C-422, C-424, C-429, C-431, C-436, C-438, C-444, C-446, C-452, C-454, C459, C-461, C-466, C-468, C-473, C-475, C-492, C-494	66
C-408	Same as C-303	Z-403 to Z-404 T-pad section						
C-409	Same as C-407	Z-403 to Z-404 T-pad section						
C-410	Same as C-405	L-402A fixed tuning						
C-411	Same as C-405	L-402B fixed tuning						
C-412	Same as C-347							
C-412A	Part of C-412	V-402 and V-403 cathode bypass						
C-412B	Part of C-412	V-402 and V-403 screen bypass						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-412C	Part of C-412	V-402 and V-403 plate filter								
C-413	Same as C-405	L-403A fixed tuning								
C-414	Same as C-405	L-403B fixed tuning								
C-415	Same as C-407	Z-405 to Z-406 T-pad section								
C-416	Same as C-303	Z-405 to Z-406 T-pad section								
C-417	Same as C-407	Z-405 to Z-406 T-pad section								
C-418	Same as C-405	L-404A fixed tuning								
C-419	Same as C-405	L-404B fixed tuning								
C-420	Same as C-341	L-405A fixed tuning								
C-421	Same as C-341	L-405B fixed tuning								
C-422	Same as C-407	Z-407 to Z-408 T-pad section								
C-423	Same as C-303	Z-407 to Z-408 T-pad section								
C-424	Same as C-407	Z-407 to Z-408 T-pad section								

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C-425	Same as C-341	L-406A fixed tuning							
C-426	Same as C-341	L-406B fixed tuning							
C-427	Same as C-341	L-407A fixed tuning							
C-428	Same as C-341	L-407B fixed tuning							
C-429	Same as C-407	Z-409 to Z-410 T-pad section							
C-430	Capacitor, fixed: mica dielectric; 510 mmf ±10%; 500 vdcw; temp coef letter B; JAN-C-5 spec	Z-409 to Z-410 T-pad section	CM20B511K		14	H371-11	C-430, C445, C-453, C-467, C-460	15	
C-431	Same as C-407	Z-409 to Z-410 T-pad section							
C-432	Same as C-341	L-408A fixed frequency							
C-433	Same as C-341	L-408B fixed tuning							
C-434	Capacitor, fixed: mica dielectric; 1000 mmf ±10%; 500 vdcw; temp coef letter E; JAN-C-5 spec	V-401 input coupling	CM30E102K	N16-C-31090-4179	14	H640-13	C-434, C-435, C-439, C-440, C-442, C-443, C-447, C-451, C-455 thru C-458, C-462 thru C-465, C-469 thru C-472, C-476 thru C-481, C-484 thru C-487, C-490, C-491, C-495, C-496	102	
C-435	Same as C-434	L-409B fixed tuning							
C-436	Same as C-407	Z-411 to Z-412 T-pad section							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			CAPACITORS (continued)							
C-437	Same as C-303	Z-411 to Z-412 T-pad section								
C-438	Same as C-407	Z-411 to Z-412 T-pad section								
C-439	Same as C-434	L-410A fixed tuning								
C-440	Same as C-434	L-410B fixed tuning								
C-441	Capacitor, fixed: paper dielectric; 3 sections; 100,000 mmf per section; +20%-10%; 600 vdcw; all sections internally grounded; JAN-C-25 spec		CP53B5EF104V	N16-C-54460-4481	14	F858-3	C-441	3		
C-441A	Part of C-441	V-404 and V-406 cathode bypass								
C-441B	Part of C-441	V-404 and V-406 screen bypass								
C-441C	Part of C-441	V-404 and V-406 plate filter								
C-442	Same as C-434	L-411A fixed tuning								
C-443	Same as C-434	L-411B fixed tuning								
C-444	Same as C-407	Z-413 to Z-414 T-pad section								
C-445	Same as C-430	Z-413 to Z-414								

C-445 (cont)		T-pad section							
C-446	Same as C-407	Z-413 to Z-414 T-pad section							
C-447	Same as C-434	L-412A fixed tuning							
C-448	Capacitor, fixed: micd dielectric; 1000 mmf ±10%; temp coef letter E; JAN-C-5 spec	L-412B fixed tuning	CM25E102K	N16-C-31090-4487	14	J175-8	C-448, C-450	6	
C-449	Same as C-347								
C-449A	Part of C-449	V-405 and V-407 cathode bypass							
C-449B	Part of C-449	V-405 and V-407 screen bypass							
C-449C	Part of C-449	V-405 and V-407 plate filter							
C-450	Same as C-448	L-413A fixed tuning							
C-451	Same as C-434	L-413B fixed tuning							
C-452	Same as C-407	Z-415 to Z-416 T-pad section							
C-453	Same as C-430	Z-415 to Z-416 T-pad section							
C-454	Same as C-407	Z-415 to Z-416 T-pad section							
C-455	Same as C-434	L-414A fixed tuning							
C-456	Same as C-434	L-414B fixed tuning							
C-457	Same as C-434	L-415A fixed tuning							
C-458	Same as C-434	L-415B fixed tuning							
C-459	Same as C-407	Z-417 to Z-418							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
		CAPACITORS (continued)								
C-459 (cont)		T-pad section								
C-460	Same as C-430	Z-416 to Z-418 T-pad section								
C-461	Same as C-407	Z-417 to Z-418 T-pad section								
C-462	Same as C-434	L-416A fixed tuning								
C-463	Same as C-434	L-416B fixed tuning								
C-464	Same as C-434	L-417A fixed tuning								
C-465	Same as C-434	L-417B fixed tuning								
C-466	Same as C-407	Z-419 to Z-420 T-pad section								
C-467	Same as C-430	Z-419 to Z-420 T-pad section								
C-468	Same as C-407	Z-419 to Z-420 T-pad section								
C-469	Same as C-434	L-418A fixed tuning								
C-470	Same as C-434	L-418B fixed tuning								
C-471	Same as C-434	L-419A fixed tuning								

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C-472	Same as C-434	L-419B fixed tuning							
C-473	Same as C-407	Z-421 to Z-422 T-pad section							
C-474	Capacitor, fixed: mica dielectric; 270 mmf ±10%; 500 vdcw; temp coef letter B; JAN-C-5 spec	Z-421 to Z-422 T-pad section	CM20B271K (-481519-B10)	N16-C-29613-2676	242	H371-9	C-474	3	
C-475	Same as C-407	Z-421 to Z-422 T-pad section							
C-476	Same as C-434	L-420A fixed tuning							
C-477	Same as C-434	L-420B fixed tuning							
C-478	Same as C-434	L-421A fixed tuning							
C-479	Same as C-434	L-421B fixed tuning							
C-480	Same as C-434	L-422A fixed tuning							
C-481	Same as C-434	L-422B fixed tuning							
C-482	Same as C-347								
C-482A	Part of C-482	V-408 cathode bypass							
C-482B	Part of C-482	V-408 screen bypass							
C-482C	Part of C-482	V-408 plate filter							
C-483	Same as C-183	V-408 screen high frequency bypass							
C-484	Same as C-434	L-423A fixed tuning							
C-485	Same as C-434	L-423B fixed tuning							
C-486	Same as C-434	L-424A fixed							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			CAPACITORS (continued)							
C-486 (cont)		tuning								
C-487	Same as C-434	L-424B fixed tuning								
C-488	Same as C-347									
C-488A	Part of C-488	V-409 cathode by-pass								
C-488B	Part of C-488	V-409 screen by-pass								
C-488C	Part of C-488	V-409 plate filter								
C-489	Same as C-183	V-409 screen high frequency bypass								
C-490	Same as C-434	L-425A fixed tuning								
C-491	Same as C-434	L-425B fixed tuning								
C-492	Same as C-407	Z-427 to Z-428 T-pad section								
C-493	Capacitor, fixed: mica dielectric; 150 mmf ±10%; 500 vdcw; temp coef letter B; JAN-C-5 spec	Z-427 to Z-428 T-pad section	CM20B151K	N16-C-28980-2076	218	H371-2	C-493	3		
C-494	Same as C-407	Z-427 to Z-428 T-pad section								
C-495	Same as C-434	L-426A fixed tuning								

C-496	Same as C-434	L-426B fixed tuning						
C-497	Capacitor, fixed: paper dielectric; 1.0 mf ±10%; 600 vdcw; no internal ground connections; JAN-C-25 spec	B plus voltage filter	CP61B1EF105K	N16-C-48817-1090	14	L895-3	C-497, C-603, C-604, C-607, C-611, C-618, C-627, C-727, C-1102	27
C-498	Capacitor, fixed: paper dielectric; 1.0 mf ±10%; 600 vdcw; no internal ground connections; JAN-C-5 spec	B minus voltage filter	CP53B1EF105K	N16-C-48817-3883	14	F858-16	C-498, C-615, C-913, C-1024	9
C-499	Same as C-303	S-401C to V-410 coupling						
C-500	Same as C-331	Z-402 output tuning						
C-501	Same as C-105	B voltage RF filter						
C-502	Same as C-105	B voltage RF filter						
C-503	Same as C-105	B minus voltage RF filter						
C-504	Same as C-105	B minus voltage RF filter						
C-505	Same as C-105	Ground lead RF filter						
C-506	Same as C-105	Ground lead RF filter						
C-507	Same as C-105	Filament RF filter ter						
C-508	Same as C-105	Filament RF filter						
C-509	Same as C-105	Filament RF filter						
C-510	Same as C-105	Filament RF filter						
C-511	Same as C-105	Filament RF filter						
C-512	Same as C-105	Filament RF filter						
C-513	Same as C-105	Filament RF filter						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			CAPACITORS (continued)							
C-514	Same as C-105	Filament RF filter								
C-515 thru C-600	Not used									
C-601	Same as C-352	V-601 input coupling								
C-602	Capacitor, fixed: mica dielectric; 470 mmf ±10%; 500 vdcw; temp coef letter A; JAN-C-5 spec	AGC filter	CM20A471K	N16-C-30114-4271	14	D925-9	C-602, C-608	6		
C-603	Same as C-497	V-601 thru V-603 screen bypass								
C-604	Same as C-497	V-601 plate filter								
C-605	Capacitor, fixed: mica dielectric; 1000 mmf ±10%; 500 vdcw; temp coef letter A; JAN C-5 spec	AGC filter	CM30A102K	N16-C-31090-4159	14	H640-12	C-605, C-735, C-901, C-919, C-1001, C-1007, C-1013, C-1030	14		
C-606	Same as C-352	V-602 input coupling								
C-607	Same as C-497	V-602 plate filter								
C-608	Same as C-602	AGC filter								
C-609	Capacitor, fixed: mica dielectric; 110 mmf ±5%; 500 vdcw; temp coef letter C; JAN-C-5 spec; part of Z-602	L-601 fixed tuning	CM20C111J	N16-C-28658-5801	14	D925-14	C-609, C-612	6		

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C-610	Same as C-352; part of Z-602	V-603 input coupling						
C-611	Same as C-497	V-603 plate filter						
C-612	Same as C-609; part of Z-603	L-602 fixed tuning						
C-613	Same as C-352; part of Z-603	V-604 input coupling						
C-614	Capacitor, fixed: paper dielectric; 1 section; 100,000 mmf ±10%; 600 vdcw; no internal ground connections; JAN-C-25 spec	V-604 plate bypass	CP61B1EF104K	N16-C-45777-1074	14	L895-6	C-614, C-1101, C-1234, C-1302, C-1303	11
C-615	Same as C-498	Bias filter						
C-616	Same as C-352	V-606 input coupling						
C-617	Same as C-347							
C-617A	Part of C-617	V-606 cathode bypass						
C-617B	Part of C-617	V-606 screen bypass						
C-617C	Part of C-617	M-601 detector filter						
C-618	Same as C-497	V-606 plate filter						
C-619	Capacitor, fixed: mica dielectric; 620 mmf ±5%; 500 vdcw; temp coef letter D; JAN-C-5 spec; part of Z-604	L-603A fixed tuning	CM25D621J	N16-C-30373-2202	242	J175-5	C-619, C-622, C-703, C-706, C-711, C-903, C-906, C-1003, C-1006, C-1009, C-1012, C-1015, C-1018, C-1212	28
C-620	Capacitor, variable: air dielectric; plate meshing type; two sections 10 to 85 mmf per section; SLC; air	L-603A tuning		N16-C-62611-1361	1; SA:6408	SA:6408	C-620, C-704, C-904, C-1004,	11

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (cont)						
C-620 (cont)	gap 0.017"; 2 1/4" wd x 1 13/16" h x 1 5/16" lg; screwdriver adjustment; 36 brass silver plated plates; 180 deg clockwise rotation; ceramic insulation; lug terminals; two 0.147" diam mtg holes 1 7/16" c to c; includes C-621; part of Z-604						C-1010, C-1016			
C-621	Part of C-620	L-603B and L-603C tuning								
C-622	Same as C-619; part of Z-604	L-603B and L-603C fixed tuning								
C-623	Same as C-110	FS CONS filter								
C-624	Same as C-110	M-601 bypass								
C-625	Same as C-352	V-608 input coupling								
C-626	Same as C-347									
C-626A	Part of C-626	V-608 cathode bypass								
C-626B	Part of C-626	V-608 screen bypass								

C-626C	Part of C-626	V-608 plate filter
C-627	Same as C-497	B voltage filter
C-628	Same as C-105	B voltage RF filter
C-629	Same as C-105	B voltage RF filter
C-630	Same as C-105	B minus voltage RF filter
C-631	Same as C-105	B minus voltage RF filter
C-632	Same as C-105	Ground lead RF filter
C-633	Same as C-105	Ground lead RF filter
C-634	Same as C-105	Filament RF filter
C-635	Same as C-105	Filament RF filter
C-636	Same as C-105	Fila ment RF filter
C-637	Same as C-105	Filament RF filter
C-638 thru C-700	Not used	
C-701	Same as C-302	V-701 input coupling

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-702	Same as C-353									
C-702A	Part of C-702	V-701 cathode bypass								
C-702B	Part of C-702	V-701 screen bypass								
C-703	Same as C-619; part of Z-701	L-701A fixed tuning								
C-704	Same as C-620; part of Z-701	L-701A tuning								
C-705	Part of C-704; part of Z-701	L-701B and L-701C tuning								
C-706	Same as C-619; part of Z-701	L-701B and L-701C fixed tuning								
C-707	Same as C-302	V-702 input coupling								
C-708	Same as C-353									
C-708A	Part of C-708	V-702 cathode bypass								
C-708B	Part of C-708	V-702 screen bypass								

C-709	Same as C-302	Z-703 to S-702A coupling						
C-710	Capacitor, fixed: paper dielectric; 100,000 mmf +20% -10%; 600 vdcw; no internal ground connection; JAN-C-25 spec	V-702 plate filter	CP69B1DF104V	N16-C-45801-9583	14	M027-1	C-710, C-712, C-718	9
C-711	Same as C-619	L-702A fixed tuning						
C-712	Same as C-710	V-703 plate filter						
C-713	Capacitor, fixed: mica dielectric; 1800 mmf ±5%; 500 vdcw; temp coef letter C; JAN-C-5 spec	Y-701 feedback	CM30C182J (-481611-C5)	N16-C-31665-6489	14	H640-11	C-713	3
C-714	Capacitor, fixed: mica dielectric; 27 mmf ±5%; 500 vdcw; temp coef letter C; JAN-C-5 spec	Y-701 coupling	CM20C270J	N16-C-27075-8801	14	D925-33	C-714	3
C-715	Capacitor, fixed: mica dielectric; 56 mmf ±5%; 500 vdcw; temp coef letter C; JAN-C-5 spec	Frequency compensator	CM20C560J	N16-C-27761-7201	14	D925-41	C-715	3
C-716	Same as C-302	V-703 screen bypass						
C-717	Same as C-303	V-704 grid blocking						
C-718	Same as C-710	V-704 plate bypass						
C-719	Same as C-149	V-704 grid to cathode feedback						
C-720	Capacitor, fixed: mica dielectric; 6200 mmf ±2%; 500 vdcw; temp coef letter E; JAN-C-5 spec	V-704 grid to cathode feedback	CM35E622G	N16-C-32900-2863	14	H377-12	C-720, C-722	6

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	CAPACITORS (continued)									
C-721	Same as C-149	V-704 cathode to ground feedback								
C-722	Same as C-720	V-704 cathode to ground feedback								
C-723	Capacitor, variable: air dielectric; plate meshing type; single section; 10 to 85 mmf; SLC; air gap 0.017"; 2 1/4" lg x 1 13/16" wd x 1 5/16" h; screwdriver adjustment; 18 brass silver plated plates; 180 deg clockwise rotation; ceramic insulation; lug terminals; two 0.147" diam holes 1 7/16" c to c; part of Z-705	Z-705 tuning adjustment		N16-C-60490-5263	1; SA:6716	SA:6716	C-723	3		
C-724	Capacitor, fixed: mica dielectric; 560 mmf ±5%; 500 vdcw; temp coef letter E; JAN-C-5 spec; part of Z-705	Z-705 fixed tuning	CM25E561J	N16-C-30294-1007	14	J175-14	C-724	3		
C-725	Capacitor, variable: air dielectric; plate meshing type; single section; 13 to 190.5 mmf; SLC; air gap 0.023"; 2 7/8" lg x 2 1/2" wd x 2 5/8" h; extension shaft adjustment; shaft 1/4" diam x 5/16" lg; 17 brass silver plated plates; 180 deg rotation; grade L-4 ceramic	BFO tuning		N16-C-61457-5089	1; SA:6692	SA:6692	C-725	3		

C-725 (cont)	insulation; lug terminals; 3 elongated mtg holes 3/16" x 1/4", 2 forward holes 2" c to c, rear hole centrally located 2 9/27" away							
C-726	Capacitor, fixed: paper dielectric; 500,000 mmf ±10%; 600 vdcw; no internal ground connections; JAN-C-25 spec	AGC medium time constant	CP61B1EF504K	N16-C-47299-1111	14	L895-5	C-726	3
C-727	Same as C-497	AGC slow time constant						
C-728	Capacitor, fixed: paper dielectric; 4.0 mf ±10%; 100 vdcw; no internal ground connection; JAN-C-25 spec	AGC slow time constant	CP55B1EB405K	N16-C-49948-9349	14	M798-1	C-728, C-912, C-1023	6
C-729	Capacitor, fixed: paper dielectric; 50,000 mmf ±10%; 600 vdcw; no internal ground connection; JAN-C-25 spec	Fast time constant and AGC bypass	CP61B1EF503K	N16-C-44257-1102	14	L895-4	C-729	3
C-730	Same as C-302	V-706B cathode filter						
C-731	Capacitor, fixed: paper dielectric; 4.0 mf ±10%; 600 vdcw; no internal ground connection; JAN-C-25 spec	B voltage filter	CP70B1DF405K	N16-C-49957-5960	14	F949-2	C-731, C-844, C-920, C-1031, C-1159. C-1160, C-1231, C-1314	17
C-732	Same as C-353							
C-732A	Part of C-732	V-707 screen bypass						
C-732B	Part of C-732	V-707 plate filter						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			CAPACITORS (continued)							
C-733	Same as C-302	V-707 to V-708 coupling								
C-734	Capacitor, fixed: electrolytic; 25 mf; 50 vdcw; terminals insulated from can; no. 1 pin neg, no. 5 pin pos; JAN-C-62 spec	V-708 cathode bypass	CE51A250G	N16-C-19784-1591	14	J171-4	C-734, C-918, C-1029	6		
C-735	Same as C-605	Output frequency compensator								
C-736	Capacitor, fixed: mica dielectric; 2400 mmf ±5%; 500 vdcw; temp coef letter C; JAN-C-5 spec	L-702B fixed tuning	CM30C242J	N16-C-31982-2289	14	H640-23	C-736	3		
C-737	Same as C-302	V-701 to V-702 coupling								
C-738	Same as C-105	B voltage RF filter								
C-739	Same as C-105	B voltage RF filter								
C-740	Same as C-105	B minus RF filter								

C-741	Same as C-105	B minus RF filter							
C-742	Same as C-105	Ground lead RF filter							
C-743	Same as C-105	Ground lead RF filter							
C-744	Same as C-105	Filament RF filter							
C-745	Same as C-105	Filament RF filter							
C-746	Same as C-105	Filament RF filter							
C-747	Same as C-105	Filament RF filter							
C-748	Same as C-302	S-702A to V-707 coupling							
C-749 thru C-800	Not used								
C-801	Capacitor, variable: ceramic dielectric; rotary type; single section; 1.5 to 7.0 mmf; 500 vdcw; zero temp coef; 27/32" lg x 41/64" h x 13/32" thk excl term; solder lug term; two 0.120" diam mtg holes in base on 7/16" mtg/c; screwdriver slot adjustment; ceramic base; JAN-C-81 spec	Y-801 trimmer	CV11A070	N16-C-63900-6761	10	K277-2	C-801 thru C-816	16	
C-802 thru C-816	Same as C-801	Y-802 thru Y-816 trimmer							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-817	Capacitor, fixed: ceramic dielectric; 5 mmf ±0.5 mmf; neg temp coef 330 (tol +500 -718) mmf/mf/°C; 500 vdcw; JAN-C-20A spec	V-801 grid to cathode feedback	CC21SL050D	N16-C-15628-9005	83	H872-3	C-817, C-827, C-1236	5		
C-818	Capacitor, fixed: mica dielectric; 47 mmf ±5%; 500 vdcw; temp coef letter C; JAN-C-5 spec	V-801 cathode bypass	CM20C470J	N16-C-27577-1401	14	D925-13	C-818, C-828	2		
C-819	Same as C-302	V-801 screen bypass								
C-820	Capacitor, variable: air dielectric; plate meshing type, dual section; 225 mmf max cap, 11 mmf min cap; SLF; air gap 0.020"; 5 3/8" lg x 3" wd x 2 5/8" h excl shaft; 19 silver plated brass plates per section; 180° rotation; ceramic insulation; solder lug terminals; four no. 6-32 tapped mtg holes on 1.906" x 2.125" mtg/c	V-801 osc A tuning			1; SA:7273-1	SA:7273-1	C-820	1		
C-820A	Part of C-820	Part of V-801 osc A tuning								
C-820B	Part of C-820	Part of V-801 osc A tuning								
C-821	Same as C-302	V-801 plate filter								
C-822	Same as C-302	V-801 plate filter								

C-823	Same as C-105	V-801 screen feedthru							
C-824	Same as C-105	V-801 B+ feed-thru							
C-825	Same as C-302	V-802 cathode bypass							
C-826	Same as C-105	V-802 cathode feedthru							
C-827	Same as C-817	V-803 grid to cathode feedback							
C-828	Same as C-818	V-803 cathode bypass							
C-829	Same as C-302	V-803 screen bypass							
C-830	Capacitor, variable: air dielectric; plate meshing type; dual section; 225 mmf max cap; 11 mmf min cap; SLF; air gap 0.020''; 5 3/8'' lg excluding shaft x 3.000'' wd x 2 5/8'' h; shaft 5 3/8'' lg x 0.437'' diam w/1/4'' lg x 0.177'' diam shoulder at one end; 1 1/8'' lg x 0.250'' diam extension and 1/4'' lg x 0.281'' diam shoulder at opposite end	V-803 osc B tuning			1; SA:7273-2	SA:7273-2	C-830	1	
C-830A	Part of C-830	Part of V-803 osc B tuning							
C-830B	Part of C-830	Part of V-803 osc B tuning							
C-831	Same as C-302	V-803 plate filter							
C-832	Same as C-302	V-803 plate filter							
C-833	Same as C-105	V-803 screen feedthru							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			CAPACITORS (continued)							
C-834	Same as C-105	V-803 B+ feedthru								
C-835	Same as C-302	V-804 cathode bypass								
C-836	Same as C-105	V-804 cathode feedthru								
C-837	Capacitor, variable: air dielectric; plate meshing type, dual section; 6 to 28 mmf; SLC characteristic; 0.025" air gap; 2 7/16" lg x 2" wd x 3 7/64" h excl stud terminals 3 31/64" h o/a; screwdriver adjustment thru top; 20 silver plated brass plates; 180 degree rotation; ceramic insulation; 3 stud terminals; mtd by two no. 8-32 tapped holes, located diagonally on 1 3/8" x 1 13/16" mtg/c; capacitor mtd in shielded can	V-805 200 kc tuning		N16-C-62239-2158	1; SA:8635	SA:8635	C-837	1		
C-838	Same as C-302	Y-817 DC blocking								
C-839	Same as C-302	V-805 screen bypass								
C-840	Capacitor, fixed: ceramic dielectric; 47 mmf ±10%; neg temp coef 330 (tol +500 -718) mmf/mf/°C; 500 vdcw; JAN-C-20A spec	V-806 grid blocking	CC21SL470K	N16-C-16541-7014	83	H872-5	C-840, C-841, C-1222	5		
C-841	Same as C-840	V-806 plate								

C-841 (cont)		blocking
C-842	Same as C-105	V-805 screen feedthru
C-843	Same as C-105	V-806 screen feedthru
C-844	Same as C-731	V-801 B+ bypass
C-845	Same as C-302	V-801, V-802 fil filter
C-846	Same as C-302	V-801, V-802 fil filter
C-847	Same as C-302	V-803, V-804 fil filter
C-848	Same as C-302	V-803, V-804 fil filter
C-849 thru C-854	Same as C-105	V-801 thru V-806 fil feedthru
C-855	Same as C-105	B+ feedthru
C-856	Same as C-105	B+ feedthru
C-857	Same as C-105	B- feedthru
C-858	Same as C-105	B- feedthru
C-859 thru C-862	Same as C-105	V-801 thru V-806 fil feedthru
C-863 thru C-900	Not used	
C-901	Same as C-605	V-901 input coupling
C-902	Same as C-353	
C-902A	Part of C-902	V-901 cathode bypass
C-902B	Part of C-902	V-901 screen bypass

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			CAPACITORS (continued)							
C-903	Same as C-619; part of Z-901	L-901A fixed tuning								
C-904	Same as C-620; part of Z-901	L-901A tuning								
C-905	Part of C-904; part of Z-901	L-901B and L-901C tuning								
C-906	Same as C-619; part of Z-901	L-901B and L-901C fixed tuning								
C-907	Same as C-302	V-903B cathode bypass								
C-908	Capacitor, fixed: paper dielectric; 1.0 mf ±20%; 600 vdcw; no internal ground connection; JAN-C-25 spec	V-903A cathode bypass	CP61B1DF105V	N16-C-48841-9598	14	L895-2	C-908, C-1032, C-1201, C-1215, C-1232, C-1256	15		
C-909	Same as C-302	Audio bypass								
C-910	Same as C-353									
C-910A	Part of C-910	V-904 plate filter								
C-910B	Part of C-910	V-904 screen bypass								
C-911	Capacitor, fixed: paper dielectric; 50,000 mmf ±10%; 600 vdcw; no internal ground connections; JAN-C-25 spec	AGC fixed time constant	CP53B1EF503K	N16-C-44257-3124	14	F858-15	C-911, C-1025	3		
C-912	Same as C-728	AGC slow time								

C-912 (cont)		constant								
C-913	Same as C-498	AGC slow time constant								
C-914	Capacitor, fixed: paper dielectric; 500,000 mmf ±10%; 600 vdcw; no internal ground connections; JAN-C-25 spec	AGC medium time constant	CP53B1EF504K	N16-C-47297-3175	14	F858-10	C-914, C-1022	3		
C-915	Same as C-302	V-903A to V-904 coupling								
C-916	Capacitor, fixed: ceramic dielectric; 10 mmf ±1 mmf; neg temp coef 750 (tol +120 -350) mmf/mf/°C; 500 vdcw; JAN-C-20A spec	Frequency compensator	CC20UJ100F	N16-C-15925-1219	496	H972-3	C-916, C-1027	3		
C-917	Same as C-302	V-904 to V-905 coupling								
C-918	Same as C-735	V-905 cathode bypass								
C-919	Same as C-605	Output frequency compensator								
C-920	Same as C-731	B voltage filter								
C-921	Same as C-105	B voltage RF filter								
C-922	Same as C-105	B voltage RF filter								
C-923	Same as C-105	B minus RF filter								
C-924	Same as C-105	B minus RF filter								
C-925	Same as C-105	Ground lead RF filter								
C-926	Same as C-105	Ground lead RF filter								
C-927 thru C-930	Same as C-105	Filament RF filter								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-931 thru C-1000	Not used									
C-1001	Same as C-605	V-1001 input coupling								
C-1002	Same as C-353									
C-1002A	Part of C-1002	V-1001 cathode bypass								
C-1002B	Part of C-1002	V-1001 screen bypass								
C-1003	Same as C-619; part of Z-1001	L-1001A fixed tuning								
C-1004	Same as C-620; part of Z-1001	L-1001A tuning								
C-1005	Part of C-1004; part of Z-1001	L-1001B and L-1001C tuning								
C-1006	Same as C-619; part of Z-1001	L-1001B and L-1001C fixed tuning								
C-1007	Same as C-605	V-1004 input coupling								
C-1008	Same as C-353									
C-1008A	Part of C-1008	V-1004 cathode bypass								
C-1008B	Part of C-1008	V-1004 screen bypass								

C-1009	Same as C-619; part of Z-1002	L-1002A fixed tuning
C-1010	Same as C-620; part of Z-1002	L-1002A tuning
C-1011	Part of C-1010; part of Z-1002	L-1002B and L-1002C tuning
C-1012	Same as C-619; part of Z-1002	L-1002B and L-1002C fixed tuning
C-1013	Same as C-605	V-1006 input coupling
C-1014	Same as C-353	
C-1014A	Part of C-1014	V-1006 cathode bypass
C-1014B	Part of C-1014	V-1006 screen bypass
C-1015	Same as C-619; part of Z-1003	L-1003A fixed tuning
C-1016	Same as C-620; part of Z-1003	L-1003A tuning
C-1017	Part of C-1016; part of Z-1003	L-1003B and L-1003C tuning
C-1018	Same as C-619; part of Z-1003	L-1003B and L-1003C fixed tuning
C-1019	Same as C-302	AGC filter
C-1020	Same as C-353	
C-1020A	Part of C-1020	V-1010 plate filter
C-1020B	Part of C-1020	V-1010 screen bypass
C-1021	Same as C-302	V-1009A noise limiter bias filter
C-1022	Same as C-914	AGC medium time constant
C-1023	Same as C-728	AGC slow time constant

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-1024	Same as C-498	AGC slow time constant								
C-1025	Same as C-911	AGC fixed time constant								
C-1026	Same as C-302	V-1009A to V-1010 coupling								
C-1027	Same as C-916	Frequency compen-sator								
C-1028	Same as C-302	V-1010 to V-1011 coupling								
C-1029	Same as C-734	V-1011 cathode by-pass								
C-1030	Same as C-605	Output frequency compensator								
C-1031	Same as C-731	B voltage filter								
C-1032	Same as C-908	V-1009 cathode by-pass								
C-1033	Same as C-105	B voltage RF fil-ter								
C-1034	Same as C-105	B voltage RF fil-ter								
C-1035	Same as C-105	B minus voltage RF filter								
C-1036	Same as C-105	B minus voltage RF filter								

C-1037	Same as C-105	Ground lead RF filter						
C-1038	Same as C-105	Ground lead RF filter						
C-1039 thru C-1042	Same as C-105	Filament RF filter						
C-1043 thru C-1100	Not used							
C-1101	Same as C-614	V-1103 input coupling						
C-1102	Same as C-497	V-1103 plate and screen bypass						
C-1103	Capacitor, fixed: mica dielectric; 360 mmf ± 2%; 500 vdcw; temp coef letter E; JAN-C-5 spec	1275 cyc fixed reactance	CM25E361G	N16-C-29814-1327	14	J175-25	C-1103, C-1125, C-1128, C-1150	12
C-1104	Not used							
C-1105	Capacitor, variable: air dielectric; single section; 6 to 106 mmf; SLC tuning characteristic; 0.0165" air gap; 1 39/64" lg x 15/16" wd x 1 3/16" h excl shaft; shaft approx 17/32" lg x 3/16" diam; screwdriver slot adjustment; 28 brass silver plated plates; 360° either direction; two no. 4-40 tap mtg holes, 5/32" deep; locking type	1275 cyc adjustment		N16-C-60916-1841	1; SA:8489	SA:8489	C-1105, C-1108, C-1111, C-1114, C-1117, C-1120, C-1123, C-1126, C-1130, C-1133, C-1136, C-1139, C-1142, C-1145, C-1148, C-1151	48
C-1106	Capacitor, fixed: mica dielectric; 430 mmf ± 2%; 500 vdcw; temp coef	1105 cyc fixed reactance	CM25E431G	N16-C-29998-7127	14	J175-26	C-1106, C-1131	6

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-1106 (cont)	letter E; JAN-C-5 spec									
C-1107	Not used									
C-1108	Same as C-1105	1105 cyc adjust-ment								
C-1109	Capacitor, fixed: mica dielectric; 330 mmf ± 2%; 500 vdcw; temp coef letter E; JAN-C-5 spec	1445 cyc fixed re-actance	CM25E331G	N16-C-29708-5727	14	J175-7	C-1109, C-1134	6		
C-1110	Not used									
C-1111	Same as C-1105	1445 cyc adjust-ment								
C-1112	Same as C-151[3]	935 cyc fixed re-actance								
C-1113	Not used									
C-1114	Same as C-1105	935 cyc adjust-ment								
C-1115	Capacitor, fixed mica dielectric; 270 mmf ± 2%; 500 vdcw; temp coef letter E; JAN-C-5 spec	1615 cyc fixed re-actance	CM25E271G	N16-C-29603-1127	14	J175-27	C-1115, C-1140	6		
C-1116	Not used									
C-1117	Same as C-1105	1615 cyc adjust-ment								
C-1118	Capacitor, fixed: mica dielectric; 470 mmf ± 2%; 500 vdcw; temp coef letter E; JAN-C-5 spec	765 cyc fixed re-actance	CM25E471G	N16-C-30104-2727	14	J175-11	C-1118, C-1143, C-1208	9		

C-1119	Capacitor, fixed: mica dielectric; 180 mmf ± 2%; 500 vdcw; temp coef letter E; JAN-C-5 spec	765 cyc fixed reactance	CM25E181G	N16-C-29128-2927	14	J175-15	C-1119, C-1144	6	
C-1120	Same as C-1105	765 cyc adjustment							
C-1121	Same as C-151[4]	1785 cyc fixed reactance							
C-1122	Not used								
C-1123	Same as C-1105	1785 cyc adjustment							
C-1124	Same as C-151[3]	595 cyc fixed reactance							
C-1125	Same as C-1103	595 cyc fixed reactance							
C-1126	Same as C-1105	595 cyc adjustment							
C-1127	Capacitor, fixed: ceramic dielectric; 24 mmf ± 10%; 500 vdcw; zero temp coef (tol +60 -110) mmf/mf/°C; JAN-C-20A spec	Balancing capacitor	CC30CH240K	N16-C-16186-7629	83	J210-8	C-1127	3	
C-1128	Same as C-1103	1275 cyc fixed reactance							
C-1129	Not used								
C-1130	Same as C-1105	1275 cyc adjustment							
C-1131	Same as C-1106	1105 cyc fixed reactance							
C-1132	Not used								
C-1133	Same as C-1105	1105 cyc adjustment							
C-1134	Same as C-1109	1445 cyc fixed reactance							
C-1135	Not used								
C-1136	Same as C-1105	1445 cyc adjustment							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-1137	Same as C-151[3]	935 cyc fixed re-actance								
C-1138	Not used									
C-1139	Same as C-1105	935 cyc adjust-ment								
C-1140	Same as C-1115	1615 cyc fixed re-actance								
C-1141	Not used									
C-1142	Same as C-1105	1615 cyc adjust-ment								
C-1143	Same as C-1118	765 cyc fixed re-actance								
C-1144	Same as C-1119	765 cyc fixed re-actance								
C-1145	Same as C-1105	765 cyc adjust-ment								
C-1146	Same as C-151[4]	1785 cyc fixed re-actance								
C-1147	Not used									
C-1148	Same as C-1105	1785 cyc adjust-ment								
C-1149	Same as C-151[3]	595 cyc fixed re-actance								
C-1150	Same as C-1103	595 cyc fixed re-actance								

C-1151	Same as C-1105	595 cyc adjustment						
C-1152	Capacitor, variable: air dielectric; four section; plate meshing type; 23.5 to 548.5 mmf per section; MLF tuning characteristic; air gap 0.018;" 6.468" lg x 2 23/32" wd x 3 3/16" h excl shaft; 3/4" lg x 0.0250" diam shaft; extention shaft adjustment; 31 plates per section; brass silver plated; 180° counterclockwise rotation; grade L-3 ceramic insulation; lug term; four no. 8-32 spadebolts on 6.343" x 1 5/16" mtg/c	Variable frequency control		N16-C-63638-1149	284	P600-1	C-1152	3
C-1152A	Part of C-1152	Plate to grid reactance						
C-1152B	Part of C-1152	Plate to grid reactance						
C-1152C	Part of C-1152	Grid to ground reactance						
C-1152D	Part of C-1152	Grid to ground reactance						
C-1153	Capacitor, variable: ceramic dielectric; rotary type; single section; 7.0 to 45 mmf; 500 vdcw; neg temp coef 500°; 27/32" lg x 41/64" h x 13/32" thk excl term; solder lug term; two 0.120" diam mtg holes in base on 7/16" mtg/c; screwdriver slot adjustment; ceramic base; JAN-C-81 spec	Variable frequency trimmer	CV11C450	N16-C-64133-6581	83	K277-4	C-1153, C-1156	6
C-1154	Capacitor, fixed: ceramic dielectric; 39 mmf ± 10%; 500 vdcw; zero temp coef (tol +60 -110) mmf/mf/°C; JAN-C-20A spec	Variable frequency fixed trimmer	CC30CH390K	N16-C-16410-7629	83	J210-9	C-1154, C-1155, C-1157	9
C-1155	Same as C-1154	Variable frequency fixed trimmer						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-1156	Same as C-1153	Variable frequency trimmer								
C-1157	Same as C-1154	Balancing capacitor								
C-1158	Capacitor, fixed: paper dielectric; 100,000 mmf ± 10%; 600 vdcw; no internal ground connection; JAN-C-25 spec	V-1106 to V-1107 coupling	CP55B1EF104K	N16-C-45777-3131	14	M798-2	C-1158	3		
C-1159	Same as C-731	V-1107 to V-1106 feedback								
C-1160	Same as C-731	V-1107 screen bypass								
C-1161	Same as C-105	B+ voltage RF filter								
C-1162	Same as C-105	B+ voltage RF filter								
C-1163	Same as C-105	B minus voltage RF filter								
C-1164	Same as C-105	B minus voltage RF filter								
C-1165	Same as C-105	Ground lead RF filter								
C-1166	Same as C-105	Ground lead RF filter								
C-1167 thru C-1170	Same as C-105	Filament RF filter								

C-1171	Not used							
C-1172	Not used							
C-1173	Capacitor, fixed: paper dielectric; 2 sections; 100,000 mmf +20% -10%; 600 vdcw; internally grounded; JAN-C-25 spec		CP61B6DF104V	N16-C-53204-4067	14	L895-9	C-1173	3
C-1173A	Part of C-1173	B+ filter						
C-1173B	Part of C-1173	T-1103 feedback						
C-1174 thru C-1200	Not used							
C-1201	Same as C-908	V-1201 plate filter						
C-1202	Same as C-303	V-1201 to V-1202 and V-1203 coupling						
C-1203	Same as C-353							
C-1203A	Part of C-1203	V-1202 cathode bypass						
C-1203B	Part of C-1203	V-1203 cathode bypass						
C-1204	Same as C-302	V-1202 screen bypass						
C-1205	Same as C-302	V-1203 screen bypass						
C-1206	Capacitor, variable: ceramic dielectric; rotary type, single section; 20 to 125 mmf; temp coef -650 mmf/mf/°C; JAN-C-81 spec; part of Z-1201	Z-1201 adjustment	CV12D121	N16-C-64232-8500	10	P352-1	C-1206, C-1210	6
C-1207	Capactior, fixed: mica dielectric; 100 mmf ± 10%; 500 vdcw; temp coef letter B; JAN-C-5 spec	V-1214 plate to V-1216 grid flyback blanking coupling	CM20B101K (-48674-B10)	N16-C-28558-1676	14	H371-8	C-1207, C-1216	6
C-1208	Same as C-1118; part of Z-1201	Z-1201 fixed tuning						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-1209	Same as C-353									
C-1209A	Part of C-1209	V-1202 plate filter								
C-1209B	Part of C-1209	V-1203 plate filter								
C-1210	Same as C-1206; part of Z-1202	Z-1202 adjustment								
C-1211	Same as C-331; part of Z-1203	Z-1203 frequency adjustment								
C-1212	Same as C-619; part of Z-1202	Z-1202 fixed tuning								
C-1213	Same as C-302	V-1204 cathode filter								
C-1214	Same as C-302	V-1204 cathode filter								
C-1215	Same as C-908	AFC reference filter								
C-1216	Same as C-1207	V-1205 grid filter								
C-1217	Same as C-302	V-1208 plate bypass								
C-1218	Capacitor, fixed: ceramic dielectric; 1500 mmf; no specified temp coef; 350 vdcw; 21/32" lg x 5/16" across hex; axial hook leads; mts by 1/4"-28 threaded body	B voltage RF filter			496; CFC-1	M234-1	C-1218, C-1226, C-1237, C-1238	12		
C-1219	Capacitor, fixed: mica dielectric; 2000 mmf ± 2%; 500 vdcw; temp coef letter E; JAN-C-5 spec	V-1208 oscillator capacitive divider	CM30E202G	N16-C-31792-4018	242	H640-15	C-1219, C-1220	6		

C-1220	Same as C-1219	V-1208 oscillator capacitive divider								
C-1221	Same as C-302	V-1207 plate filter								
C-1222	Same as C-840	Z-1203 fixed tuning								
C-1223	Capacitor, variable: air dielectric; plate meshing type; single section; 2.2 to 4.3 mmf; SLC; air gap 0.030"; 1 15/16" lg x 15/16" wd x 1 3/16" h FMS; 1/4" diam shaft 7/16" lg FMS; extension shaft adjustment; two brass silver plated plates; 180° rotation; ceramic insulation; lug term; two no. 4-40 tapped mtg posts on each side of shaft on 21/32" mtg/c; part of Z-1203	Fine tuning control		N16-C-58009-6761	1; SA:7157	SA: 7157	C-1223	3		
C-1224	Same as C-302	V-1208 to Z-1203 coupling								
C-1225	Capacitor, fixed: mica dilectric; 56 mmf ± 10%; 500 vdcw; temp coef letter C; JAN-C-5 spec	AFC reactance	CM20C560K	N16-C-27766-7681	242	D925-46	C-1225	3		
C-1226	Same as C-1218	B+ voltage RF filter								
C-1227	Same as C-302	AFC filter								
C-1228	Same as C-105	AFC RF filter								
C-1229	Capacitor, fixed: paper dielectric; two section; 500,000 mmf per section +40% -15%; 600 vdcw; both sections internally grounded; JAN-C-25 spec	AFC RF filter	CP69B6DF504X	N16-C-53725-7890	14	M027-4	C-1229	3		
C-1230	Same as C-105	AFC RF filter								
C-1231	Same as C-731	AFC time constant								
C-1232	Same as C-908	AFC filter								
C-1233	Same as C-302	Calibration voltage coupling								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-1234	Same as C-614	V-1214 to V-1215 coupling								
C-1235	Capacitor, fixed: paper dielectric; single section; 2.0 mf ±10%; 600 vdcw; no internal ground connections; JAN-C-25 spec	V-1214 sweep discharge	CP70B1EF205K	N16-C-49197-3160	14	F949-4	C-1235	3		
C-1236	Same as C-817	V-1213 to V-1214 synch coupling								
C-1237	Same as C-1218	Filament RF bypass								
C-1238	Same as C-1218	Filament RF bypass								
C-1239 thru C-1244	Same as C-105	Filament RF bypass								
C-1245	Same as C-105	B minus voltage RF filter								
C-1246	Same as C-105	B minus voltage RF filter								
C-1247	Same as C-105	Ground lead RF filter								
C-1248	Same as C-105	Ground lead RF filter								
C-1249	Same as C-105	Filament RF filter								
C-1250	Same as C-105	Filament RF filter								

C-1251	Same as C-105	Filament CT RF filter						
C-1252	Same as C-105	Filament CT RF filter						
C-1253	Same as C-105	Filament RF filter						
C-1254	Same as C-105	Filament RF filter						
C-1255	Same as C-301; part of Z-1206	Z-1206 fixed tuning						
C-1256	Same as C-908	B voltage filter						
C-1257 thru C-1300	Not used							
C-1301	Not used							
C-1302	Same as C-614	Coupling						
C-1303	Same as C-614	DC blocking capacitor						
C-1304	Capacitor, fixed: ceramic dielectric; 5 mmf ±0.5 mmf; zero temp coef (tol +60 -110) mmf/mf/°C; 500 vdcw; JAN-C-20A spec	Flip-flop assisting	CC30CH050D	N16-C-15627-9144	83	J210-11	C-1304, C-1305, C-1309, C-1310	4
C-1305	Same as C-1304	Flip-flop assisting						
C-1306	Capacitor, fixed: mica dielectric; 4700 mmf ± 10%; 500 vdcw; temp coef letter B; JAN-C-5 spec	Coupling	CM35B472K	N16-C-32646-6808	14	H377-7	C-1306, C-1307, C-1311, C-1312, C-2009, C-2113, C-2114, C-2213, C-2214	11
C-1307	Same as C-1306	Time constant						
C-1308	Capacitor, fixed: mica dielectric; 500,000 mmf ± 20%; 600 vdcw; temp coef letter B; JAN-C-25 spec	Plate bypass	CP61B1DF504V	N16-C-47321-9555	14	L895-1	C-1308, C-1313	2

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-1309	Same as C-1304	Flip-flop assisting								
C-1310	Same as C-1304	Flip-flop assisting								
C-1311	Same as C-1306	Coupling								
C-1312	Same as C-1306	Time constant								
C-1313	Same as C-1308	Plate bypass								
C-1314	Same as C-731	B+ filter								
C-1315	Same as C-105	Ground lead RF bypass								
C-1316	Same as C-105	Ground lead RF bypass								
C-1317	Same as C-105	B+ lead RF bypass								
C-1318	Same as C-105	B+ lead RF bypass								
C-1319 thru C-1322	Same as C-105	Filament lead RF bypass								
C-1323	Same as C-105	B minus lead RF bypass								
C-1324	Same as C-105	B minus lead RF bypass								
C-1325 thru C-2000	Not used									

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C-2001	Capacitor, fixed: paper dielectric; single section; 10.0 mf ± 10%; 600 vdcw; no internal ground connections; JAN-C-25 spec	B+ voltage filter	CP70B1DF106K	N16-C-51858-2107	14	F949-6	C-2001, C-2002, C-2008, C-2107, C-2110, C-2208, C-2212	13	
C-2002	Same as C-2001	B+ voltage filter							
C-2003	Capacitor, fixed: paper dielectric; single section; 4.0 mf ± 10%; 1000 vdcw; no internal ground connections; JAN-C-25 spec	B minus voltage filter	CP70B1EG405K	N16-C-49961-2432	14	F949-5	C-2003, C-2004, C-2101 thru C-2104, C-2201 thru C-2204	14	
C-2004	Same as C-2003	B minus voltage filter							
C-2005	Capacitor, fixed: paper dielectric; single section; 1.0 mf ± 10%; 600 vdcw; no internal ground connections; JAN-C-25 spec	120 cyc filter	CP61B1DF105K	N16-C-48817-1073	14	L895-12	C-2005, C-2007, C-2108, C-2111, C-2112, C-2206, C-2209, C-2211	12	
C-2006	Capacitor, fixed: paper dielectric; single section; 100,000 mmf ± 10%; 600 vdcw; no internal ground connections; JAN-C-25 spec	Noise filter	CP61B1DF104K	N16-C-45777-1080	14	L895-11	C-2006, C-2105, C-2106, C-2109, C-2205, C-2207, C-2210	9	
C-2007	Same as C-2005	Noise filter							
C-2008	Same as C-2001	B+ voltage filter							
C-2009	Same as C-1306	Phase corrector							
C-2010 thru C-2100	Not used								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CAPACITORS (continued)						
C-2101	Same as C-2003	B+ voltage filter								
C-2102	Same as C-2101	B+ voltage filter								
C-2103	Same as C-2101	B minus voltage filter								
C-2104	Same as C-2101	B minus voltage filter								
C-2105	Same as C-2006	V-2106, V-2111 and V-2112 fila-ment bypass								
C-2106	Same as C-2105	Noise filter								
C-2107	Same as C-2001	B+ voltage filter								
C-2108	Same as C-2005	Noise filter								
C-2109	Same as C-2105	Noise filter								
C-2110	Same as C-2107	B+ voltage filter								
C-2111	Same as C-2108	120 cyc filter								
C-2112	Same as C-2108	Noise filter								
C-2113	Same as C-1306	V-2112 phase cor-rector								
C-2114	Same as C-2113	V-2106 phase cor-rector								
C-2115 thru C-2200	Not used									
C-2201	Same as C-2003	B+ voltage filter								
C-2202	Same as C-2003	B+ voltage filter								

C-2203	Same as C-2003	B minus voltage filter							
C-2204	Same as C-2003	B minus voltage filter							
C-2205	Same as C-2006	V-2208 filament bypass							
C-2206	Same as C-2005	Noise filter							
C-2207	Same as C-2006	Noise filter							
C-2208	Same as C-2001	B minus voltage filter							
C-2209	Same as C-2005	120 cyc filter							
C-2210	Same as C-2006	Noise filter							
C-2211	Same as C-2005	Noise filter							
C-2212	Same as C-2001	B+ voltage filter							
C-2213	Same as C-1306	Phase corrector							
C-2214	Same as C-1306	Phase corrector							
C-2215 thru C-3900	Not used								
C-3901	Capacitor, fixed: paper dielectric; hermetically sealed; 4 mf ± 10%; 1000 vdcw; no internal ground connections	Blower motor capacitor (left side)	CP70B1DG405K		14	F949-7	C-3901, C-3902	5	
C-3902	Same as C-3901	Blower motor capacitor (right side)							
		MISCELLANEOUS ELECTRICAL PARTS							
E-101	Not used								
E-102	Lens, condensing: 5/8" diam; screw-in mount; 9/16" lg x 5/8" diam; total length threaded 5/8"-32, four 0.078" diam holes spaced 90° apart 5/64" from one end	Projection dial scale condenser			1340	P941-1	E-102	12	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MISCELLANEOUS ELECTRICAL PARTS (continued)						
E-103	Lens, projection: dial projector; f/lg 12.7 mm; lens speed f/2.8; screw mounting; 13/16" lg x 5/8" diam; total length threaded 5/8"-32, four 0.078" diam holes 90° apart 5/64" from one end	Dial scale projection lens			1340	P940-1	E-103	12		
E-104	Mirror: 2 1/8" lg x 1/2" wd x 1/16" thk; non-magnifying; first surface silvered	Projection dial mirror			1340	P948-1	E-104	12		
E-105	Brush, electrical contact: ground brush; beryllium copper, silver plated and water dipped lacquer finish; rectangular, 1 7/8" lg x 7/16" wd x 0.005" thk o/a; mounts by three 0.128" diam mtg holes on 0.750" mtg/c	Grounding brush			929	P120-4	E-105	132		
E-106	Brush, electrical contact: ground brush; beryllium copper, silver plated and water dipped lacquer finish; rectangular, 2 5/8" lg x 7/16" wd x 0.005" thk o/a; mounts by three 0.128" diam mtg holes on 1.312" mtg/c	Grounding brush		N16-P-403081-118	929	P120-9	E-106, E-821, E-824	14		
E-107	Brush, electrical contact: ground brush; beryllium copper, silver plated and water dipper lacquer finish; rectangular, 1 1/2" lg x 7/16" wd x 0.005" thk o/a; mounts by two 0.128" diam mtg holes on	Grounding brush			929	P120-3	E-107	120		

E-107 (cont)	1.125" mtg/c							
E-108	Brush, electrical contact: ground brush beryllium copper, silver plated and water dipped lacquer finish; rectangular, 3 3/8" lg x 7/16" wd x 0.005" thk o/a; mounts by five 0.128" diam mtg holes on 0.750" mtg/c	Grounding brush			929	P120-5	E-108	216
E-109	Brush, electrical contact: ground brush no. 2 hard beryllium copper, silver plated and water dipped lacquer finish; rectangular, 1 7/8" lg x 29/32" wd x 0.005" thk mounts by three 0.128" diam mtg holes on 3/4" mtg/c	Grounding brush			929	Q912-2	E-109	120
E110	Brush, electrical contact: ground brush; beryllium copper, silver plated and water dipped lacquer finish; rectangular, 4 7/8" lg x 7/16" wd x 0.005" thk o/a; mounts by four 0.128" diam mtg holes on 1.500" mtg/c	Grounding brush			929	P120-6	E-110	24
E-111	Brush, electrical contact: ground brush; beryllium copper, silver plated and water dipped lacquer finish; rectangular, 8 5/8" lg x 7/16" wd x 0.005" thk o/a; mounts by five 0.128" diam mtg holes on 2.250" mtg/c	Grounding brush			929	P120-7	E-111	12
E-112	Plate assembly, grounding: capacitor frame grounding; rectangular, 1 9/16" lg x 7/8" wd x 9/64" thk o/a; mounts by two 1/8" mtg holes on 23/32" mtg/c	Tuning capacitor frame grounding plate		*	1; SA:6961	SA:6961	E-112	12
E-113	Brush, electrical contact: ground brush; beryllium copper, silver	Grounding brush			929	P120-12	E-113	24

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	MISCELLANEOUS ELECTRICAL PARTS (continued)									
E-113 (cont)	plated and water dipped lacquer finish; rectangular, 2 5/8" lg x 7/16" wd x 0.005" thk o/a; mounts by four 0.128" mtg holes on 0.937" mtg/c									
E-114	Brush, electrical contact: ground brush; beryllium copper, silver plated and water dipped lacquer finish; rectangular, 1.0" lg x 7/16" wd x 0.005" thk o/a; mounts by two 0.128" diam mtg holes on 0.625" mtg/c	Grounding brush			929	P120-2	E-114	24		
E-115	Glass, ground: tuning dial viewing screen rectangular shape; 2 3/4" lg x 3/4" wd x 1/16" thk; marked top center with 3/16" opague equi-lateral triangle	Dial calibration viewing screen			1340	P949-2	E-115	12		
E-116	Insulator, bushing: round spacer w/shoulder; white grade L-5 ceram-ic; 0.125" h o/a; 0.362" OD w/ 0.187" diam shoulder 0.031" h; 0.093" diam center hole	Stud insulating bushing		N17-I-49475-1171	254	K673-1	E-116, E-804	104		
E-117	Insulator, standoff: round post shape; white grade L-4 ceramic, side surface glazed; 1/2" h o/a; 3/8" OD w/no.6-32 tapped hole each 3/16" deep	Standoff insulator		N17-I-69154-6206	86	M040-1	E-117, E-805 thru E-809, E-1301	82		

E-118	Insulator, standoff: round post shape; grade L-5 ceramic, silicone treated; 25/32" h x 5/16" diam o/a w/no.6-32 thd stud 1/4" lg at one end and silver plated stud term at other end	Standoff insulator			298	Q977-1	E-118	30		
E-119	Insulator, feedthru: round post shape glass, clear finish; 3/4" lg o/a; 9/16" hex; one 1/8" neoprene O ring 3/8-24 thd; threaded portion 1/4" lg; glass insulator 0.135" h x 0.205" diam	Feedthru insulator			1; SA:9395	SA:9395	E-119	12	55	1
E-120	Cap, desiccator: oscillator compartment desiccator; silica gel desiccant; 4.7 gms min desiccant capacity; 1.38" lg x 0.94" diam exclusive of disposable sealing cap; mounts by 18 mm 1.5 pitch thread; re-usable; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Oscillator compartment desiccator			1357	L587-1	E-120	24		
E-121	Knob: round, black bakelite; for 1/4" diam shaft; double no. 8-32 Allen set screws; arrow marking; 1 1/16" diam o/a x 5/8" h cad plated brass insert; 8 notches on circumference	Fast tuning		N16-K-700310-982*	1; SA:2834	SA:2834	E-121, E-306, E-601 thru E-604, E-702 thru E-706, E-812 thru E-818, E-902 thru E-906, E-1002 thru E-1007, E-1106 thru E-1110, E-1209 thru E-1213	95		
E-122	Knob: round; aluminum, black anodized finish; for 3/16" diam shaft; double no. 6-32 set screw, 90° apart; 5/8" lg x 9/16" diam;	Index set		N16-K-700261-991*	570	L735-1	E-122	12		

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	MISCELLANEOUS ELECTRICAL PARTS (continued)									
E-122 (cont)	shaft hole 1/2" deep; straight knurl 30-36 TP1									
E-123	Knob: round, black ebenol finished brass; for 17/32" shaft; double no. 8-32 set screws; 90° apart; 1 3/4" diam x 1/2" thk; through shaft hole; straight knurl 32-36 TP1	Slow tuning		N16-K-700374-242*	1; L565-2	L565-2	E-123	12		
E-124	Knob: round; black bakelite; for 1/4" diam shaft; two 3/16" no. 8-32 multi-spline set screws; 1 1/2" OD x 7/8" h; cadmium plated brass insert; 9/16" shaft depth; 8 notches on circumference	Antenna trimmer setting		N16-K-700350-576*	1; SA:8288	SA:8288	E-124 thru E-127, E-810, E-811, E-1214	53		
E-125	Same as E-124	AGC switch								
E-126	Same as E-124	RF gain control setting								
E-127	Same as E-124	Pilot dimmer adjust								
E-128	Shield, electron tube: bright nickel plated brass shield, cadmium plated phos bronze spring; round, w/2 locking detents, single 1/2" diam ventilating hole on top; two twist locking detents, bayonet mtd; 0.810" diam x 19/32" h inside dimensions, 0.850" diam x 1.301" h outside body dimensions, 0.960"	V-102, V-103 shield		N16-S-34516-2337	1; SA:3848	SA:3848	E-128, E-302, E-403, E-606, E-710, E-803, E-1010, E-1203, E-1304	105		

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E-128 (cont)	o/a diam							
E-129	Brush, electrical contact: ground brush; silver plated phosphor bronze w/coin silver contacts, irregular shape 2 1/8" lg x 7/8" wd x 3/16" thk o/a; mts by single 0.152" diam mtg hole at one end; part of C-103	Capacitor rotor grounding brush		*	1; SA:8130	SA:8130	E-129	96
E-130	Shield, electron tube: bright nickel plated brass shield, cad plated phos bronze spring; round w/two locking detents, bayonet mtd; 0.810" diam x 1 21/32" inside dimensions, 0.850" diam x 1.676" h outside body dimensions, 0.960" o/a diam	V-105 shield		N16-S-34548-6620	1; SA:3387	SA:3387	E-130, E-303, E-402, E-607, E-709, E-802, E-908, E-1009, E-1104, E-1204, E-1305	126
E-131	Shield, electron tube: bright nickel plated brass shield, cad plated phos bronze spring; round, w/two locking detents, bayonet mtd; 0.810" diam x 2 5/32" h inside dimensions, 0.850" diam x 2.176" h outside body dimensions, 0.960" o/a diam	V-106 shield		N16-S-34599-7750	1; SA:3386	SA:3386	E-131, E-304, E-711, E-1105, E-1206, E-1303, E;2004, E-2104, E-2204	57
E-132	Shield, electron tube: bright nickel plated brass shield, cad plated phos bronze spring; round, w/two locking detents, single 1/2" diam ventilating hole on top; 2 twist locking detents, bayonet mtd; 0.950" diam x 1 23/32" lg inside dimensions, 0.990" diam x 1.738" h outside body dimensions, 1.10" o/a diam; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	V-101, V-104, V-107, V-108, V-109 shield		N16-S-34658-2580	1; SA:4987	SA:4987	E-132, E-1103, E-1205, E-1306, E-2002, E-2103 E-2202	93
E-133	Base, shield: lower shield; nickel plated brass; round hollow cylinder	V-101 thru V-104, V-106 thru V-109		N16-B-151921-125	1; SA:3847	SA:3847	E-133, E-301, E-404, E-605,	336

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	MISCELLANEOUS ELECTRICAL PARTS (continued)									
E-133 (cont)	shape; 0.750" 1D x 19/32" h excluding spade bolts; mts by two no. 4-40 tapped spade bolts on 7/8" c; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	shield base					E-708, E-801, E-907, E-1008, E-1102, E-1201, E-1307, E-2003, E-2101, E-2203			
E-134	Base, shield: lower shield; brass nickel plated; round hollow cylinder shape; approx 0.940" outside body diam x 19/32" h excluding spade bolts; mts by two no. 4-40 tapped spadebolts 13/16" lg x 1.125" c	V-105 shield base			1; SA:4989	SA:4989	E-134, E-1101, E-1202, E-1308, E-2001, E-2102, E-2201	45		
E-135 thru E-139	Not Used									
E-140	Plate, cover: 1/2 hd aluminum, caustic etched; rectangular shape, 1/4" rad rounded corners; 8 13/16" lg x 5 1/2" wd x 0.091" thk o/a; mts by eight 0.187" diam holes; four 1/4" rad cutouts, two on one side and one on each end	RF compartment bottom cover		N16-P-401881-198	1; P415-1	P415-1	E-140	12		
E-141	Plate cover: 1/4 hd aluminum; caustic etched w/water dip lacquer finish; rectangular shape; 8 7/8"	RF section tuning capacitor cover		N16-P-401881-199	1; P342-1	P342-1	E-141	12		

E-141 (cont)	lg x 3 1/8" wd x 0.064" thk o/a; mts by eight 6-32 tapped holes on irregularly spaced mtg/c								
E-142	Plate, cover: buffer capacitor cover; 1/4 hd aluminum, caustic etched w/water dip lacquer; 3 17/32" lg x 2 1/8" wd x 1 3/8"h; mts by four 6-32 tapped holes on irregularly spaced mtg/c; stamped "Caution: turn off heater supply before removing this tube"; three 0.203" diam holes irregularly spaced for mtg electrical contact brush	Buffer capacitor cover		N16-P-401881-202	1; L593-1	L593-1	E-142	12	
E-143	Plate, cover: 1/4 hd aluminum, caustic etched w/water dip lacquer finish, L shape; 4 11/16" lg x 3 15/32" wd x 2 5/8" h o/a; mts by fourteen 0.187" diam holes on irregularly spaced mtg/c	Buffer compartment side cover		N16-P-401881-201	1; P595-1	P595-1	E-143	12	
E-144	Plate, cover: oscillator compartment cover; 1/2 hd yellow brass; rectangular shape; 5 3/8" lg x 3 1/8" wd x 0.125" thk o/a; mts by ten 0.156" diam mtg holes on irregularly spaced mtg/c, contains two 1.000" holes for mtg desicators and one 3/8"-24 tapped hole in accordance with National Company, Inc. dwg Q509; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Osc compartment cover		N16-P-401881-196	1; Q509-1	Q509-1	E-144	12	
E-145	Plate, cover: R.F. filter compartment cover; 1/4 hd aluminum w/ gray paint finish, rectangular shape; 13 7/8" lg x 3 1/4" wd x 0.064" thk; mts by seventeen 6-32 tapped mtg holes on irregularly spaced mtg/c	RF filter compartment cover		*	1; M844-1	M844-1	E-145, E-311, E-405, E-608, E-713, E-833, E-910, E-1011, E-1115, E-1216, E-1309	35	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MISCELLANEOUS ELECTRICAL PARTS (continued)						
E-146	Plate, cover: 2S-1/2 hd aluminum, caustic etched, w/gray paint finish; square shape; 7/8" lg x 7/8" wd x 0.040" thk; four 0.125" diam holes on 0.500" x 0.500" mtg/c	Cover plate for additional outlets		N16-P-401881-169*	1; P245-1	P245-1	E-146	22		
E-147	Plate, cover: 2S-1/2 hd aluminum, caustic etched, w/water dip lacquer; square shape; 1 1/2" lg x 1 1/2" wd x 0.040" thk; four 0.125" diam holes on 1 5/32" mtg/c	Cover plate for additional power outlet		N16-P-401881-165*	1; Q011-1	Q011-1	E-147	12		
E-148 thru E-200	Not Used									
E-201	Knob: round w/pointer; black bakelite; for 1/4" diam shaft; two 3/16" no. 8-32 multi-spline set screws; arrow markings; 1 1/2" OD x 7/8" h; cadmium plated brass insert; 9/16" shaft depth; 8 equally spaced indents on circumference	Band switch knob		N16-K-700346-101	1; SA:6941	SA:6941	E-201, E-202, E-401, E-707, E-1302	13		
E-202	Same as E-201	Heterodyne Osc switch knob								
E-203	Plate, electrical shield: oscillator switch shield; aluminum 0.064" thk; rectangular box shape; 3 3/8" lg x 2 3/16" wd x 2 11/15" h incl mtg flanges; four no. 6-32 tapped	S-201A thru S-201D, S-201F, S-202B thru S-202D shield		N16-P-402241-117*	342	P936-1	E-203	24		

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E-203 (cont)	mtg holes on 2.437'' x 1.812'' mtg/c; contains cutouts peculiar to National Company, Inc. part/dwg P936-1									
E-204	Plate grounding: grounding brush; silver plated beryllium copper 0.005'' thk; rectangular plates w/ finger contacts; 1 5/16'' lg x 7/16'' wd x 1/4'' h; two 0.128'' diam mtg holes on 0.937'' mtg/c	E-203 grounding plate contacts		N16-P-403081-119	929	P120-8	E-204	48		
E-205	Bracket: ground brush bracket; silver plated brass; L shaped; 7/8'' lg x 7/16'' wd x 1 1/4'' h; two 0.156'' diam mtg holes on 0.437'' mtg/c	E-203 contact brush holder		N16-B-750001-423*	342	P934-1	E-205	48		
E-206	Brush; electrical contact: flat rectangular shape; 1 3/8'' lg x 1 1/8'' wd x 0.064'' thk; 53° beveled brush contact w/flat face; three 0.088'' diam holes on0.375'' mtg/c; silver plated, spring brass metal brush	E-203 brush contacts		N17-B-86784-1856	1234	H867-2	E-206	48	55	2
E-207	Not Used									
E-208	Plate, cover: 52S-1/4 hd aluminum, caustic etch w/water dip lacquer; irregular shape; 14'' lg x 11'' wd x 0.064'' thk o/a; mts by seventeen 6-32 tapped holes on irregularly spaced mtg/c	Unit cover plate		N16-P-401881-208*	1; P969-1	P969-1	E-208	3		
E-209	Plate, cover: 52S-1/2 hd aluminum, caustic etch w/water dip lacquer; rectangular shape; 15 1/4'' lg x 6'' wd x 0.091'' thk o/a; mts by four 0.156'' diam holes on 14.812'' x 4 1/2'' mtg/c; four 1/16 rad rounded corners	Bottom cover plate		N16-P-401881-214*	1; Q279-1	Q279-1	E-209	3		
E-210 thru E-300	Not Used									

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	MISCELLANEOUS ELECTRICAL PARTS (continued)									
E-301	Same as E-133	V-301 thru V-312 lower shield								
E-302	Same as E-128	V-301 thru V-305 upper tube shield								
E-303	Same as E-130	V-306 thru V-311 upper tube shield								
E-304	Same as E-131	V-312 upper tube shield								
E-305	Insulator: standoff; round; grade L-4 ceramic; white glazed on side; unglazed ends 7/8" lg; 3/8" OD; one no. 6-32 hole 11/32" d on each end	L-310 standoff insulator		N17-I-69159-6201	426	C429-1	E-305	6		
E-306	Same as E-121	Second conversion osc selector knob								
E-307	Knob: round crown shape; black bakelite; for 0.187" diam shaft; two no. 6-32 set screws 120° apart; 2" diam o/a, 15/16" h; brass insert; 11/16" shaft depth fastened to scale w/3 bosses, 148 corrugations around total circumference	Second conversion VFO knob		N16-K-701639-965	1; SA:2638-5	SA:2638-5	E-307, E-1111	6		
E-308	Plate, cover: 1/4 hd aluminum, 0.040" thk; U shape; approx 8 3/8" lg x 3.455" wd x 3.133" h o/a; mts by four 7/16" wd mtg flanges w/	Osc cover		N16-P-401881-209*	1; P542-1	P542-1	E-308	3		

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E-308 (cont)	four 0.156" diam mtg holes on 8" mtg/c; stamped "C-339" on top of plate								
E-309	Plate, cover: 1/4 hd aluminum, caustic etch w/water dip lacquer; rectangular shape; 3" lg x 1 9/16" wd x 2 39/64" h approx including flanges, mts by three elongated holes each 0.156" x 9/32" lg	Switch cover		N17-C-945001-861*	1; P541-1	P541-1	E-309	3	
E-310	Plate, cover: aluminum; rectangular shape; 7 13/16" lg x 7 13/32" wd x 0.064" thk o/a; mts by eight 6-32 tapped holes; four holes on 3.460" mtg/c 7.437" apart; four holes on 3.625" mtg/c 7.031" apart; two 3/8" diam holes	Osc bottom cover plate		N16-P-401881-162*	1; P549-1	P549-1	E-310	3	
E-311	Same as E-145								
E-312	Plate, cover: aluminum, 0.040" thk, 2S-1/2 hd, caustic etch w/gray paint finish; rectangular shape; 1 7/8" lg x 7/8" wd x 0.040" thk; four 0.125" diam holes on 1.500" x 0.500" mtg/c	Cover plate for additional outlets		N16-P-401881-170*	1; P245-2	P245-2	E-312	7	
E-313 thru E-400	Not Used								
E-401	Same as E-201	Selectivity control knob							
E-402	Same as E-130	V-401, V-408, V-409 and V-410 tube shield							
E-403	Same as E-128	V-402 thru V-407 tube shield							
E-404	Same as E-133	V-401 thru V-410 lower shield							

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	MISCELLANEOUS ELECTRICAL PARTS (continued)									
E-405	Same as E-145	Filter cover								
E-406	Plate, cover: 2S-1/2 hd aluminum, caustic etch w/gray paint finish; square; 1 3/16" lg x 1 3/16" wd x 0.040" thk; four 0.125" diam holes on 29/32" mtg/c	Cover plate for additional audio outlets		N16-P-401881-171*	1; P489-1	P489-1	E-406	14		
E-407	Plate, cover: 2S-1/2 hd aluminum, caustic etch w/gray paint finish; rectangular shape; 2 7/8" lg x 7/8" wd x 0.040" thk; six 0.125" diam mtg holes in two rows, irregularly spaced, 0.500" between rows	Cover plate for additional outlets		N16-P-401881-174*	1; P245-3	P245-3	E-407	8		
E-408 thru E-600	Not Used									
E-601	Same as E-121	RF gain control knob								
E-602	Same as E-121	AGC switch knob								
E-603	Same as E-121	AM diversity gain control knob								
E-604	Same as E-121	FSK diversity level control knob								
E-605	Same as E-133	V-601 thru V-608 lower shield								
E-606	Same as E-128	V-601 thru V-603,								

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E-606 (cont)		V-605, V-607 tube shield					
E-607	Same as E-130	V-604, V-606, V-608 tube shield					
E-608	Same as E-145	RF filter compartment cover					
E-609 thru E-700	Not Used						
E-701	Insulator, spacer: rectangular; grade LTS-E-3 black plastic per JAN-P-13 spec; 1 3/4" lg x 1 1/2" wd x 5/8" d; two 0.156" diam holes on 1" mtg/c, two 0.456" diam holes, 5/8" c to c, two no. 6-32 tapped holes 1 3/8" c to c; tropicalized wax impregnated	J-702, J-703 insulator	N17-I-67034-1001*	68	M845-2	E-701, E-901, E-1001	6
E-702	Same as E-121	AGC switch knob					
E-703	Same as E-121	Reception switch knob					
E-704	Same as E-121	RF gain control knob					
E-705	Same as E-121	Speaker switch knob					
E-706	Same as E-121	AF level control knob					
E-707	Same as E-201	BFO tuning knob					
E-708	Same as E-133	V-701 thru V-709 lower shield					
E-709	Same as E-130	V-701, V-702 V-704, V-707, V-708 tube shield					
E-710	Same as E-128	V-703, V-705, V-706 tube shield					

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MISCELLANEOUS ELECTRICAL PARTS(continued)						
E-711	Same as E-131	V-709 tube shield								
E-712	Plate, cover: 1/4 hd aluminum 0.050" thk, caustic etch w/water dip lacquer; U shape; approx 3.475" lg x 1 27/32" wd x 2.735" h o/a; mts by two 0.425" mtg flanges w/one 0.156" diam hole on one flange and two 0.156" diam holes on other, 1 11/32" between mtg/c	VFO capacitor cover		N16-P-401881-215*	1; P407-1	P407-1	E-712	3		
E-713	Same as E-145	Filter cover								
E-714	Plate, cover: 2S-1/2 hd aluminum, caustic etch w/grey paint finish; rectangular shape; 3 7/8" lg x 7/8" wd x 0.040" thk; six 0.125" diam mtg holes in two rows, irregularly spaced 0.500" between rows	Cover plate for additional outlet		N16-P-401881-173*	1; P245-4	P245-4	E-714	3		
E-715 thru E-800	Not Used									
E-801	Same as E-133	V-801 thru V-806 lower shield								
E-802	Same as E-130	V-801, V-803, V-805, V-806 upper tube shield								

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E-803	Same as E-128	V-802, V-804 upper tube shield
E-804	Same as E-116	Stud insulating bushing
E-805	Same as E-117	L-801, C-817 standoff insulator
E-806	Same as E-117	L-805, C-827 standoff insulator
E-807	Same as E-117	R-805, R-810 standoff insulator
E-808	Same as E-117	J-803 thru J-805 terminal post standoff insulator
E-809	Same as E-117	J-805 thru J-807 terminal post standoff insulator
E-810	Same as E-124	Tuning A control knob
E-811	Same as E-124	Tuning B control knob
E-812	Same as E-121	Osc A switch knob
E-813	Same as E-121	Output A control knob
E-814	Same as E-121	Crystal A switch knob
E-815	Same as E-121	Crystal B switch knob
E-816	Same as E-121	Cutput B control knob
E-817	Same as E-121	Osc B switch knob
E-818	Same as E-121	Calibrate switch knob

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	MISCELLANEOUS ELECTRICAL PARTS (continued)									
E-819	Mounting, capacitor: capacitor mtg panel; grade LTS-E-3 natural bakelite, semigloss finish; 3 13/16" lg x 1" wd x 0.125" thk; mtd by 2 diagonally opposite 0.156" mtg holes, on 3 5/16" mtg/c; 2 rows 1/2" apart of 0.125" diam holes, 8 holes each row , each hole 7/16" c to c	C-801 thru C-808 mtg panel		N16-M-61083-7638*	1; Q455-2	Q455-2	E-819, E-820	2		
E-820	Same as E-819	C-809 thru C-816 mtg panel								
E-821	Same as E-106	Crystal unit partition-plate ground contact								
E-822	Plate, grounding: grounding brush; silver plated beryllium copper; rectangular plate w/finger contacts along one side, fingers 0.140" wd; 3 1/8" lg x 7/16" h x 0.005" thk; four 0.120" diam mtg holes on 0.937" mtg/c, 5/32" from straight side	Crystal unit right side-plate ground contact		N16-P-403081-117*	929	P120-11	E-822, E-823	2		
E-823	Same as E-822	Crystal unit left side-plate ground contact								
E-824	Same as E-106	Crystal unit								

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E-824 (cont)		backplate ground contact						
E-825	Plate, grounding: grounding brush; silver plated beryllium copper; rectangular plate w/ finger contacts on one side, fingers 0.140" wd; 5 1/16" lg x 7/16" h x 0.005" thk; five 0.120" diam mtg holes on 1.187" mtg/c, 5/32" from straight side	C-820 left shield cover ground contact		N16-P-403081-116*	929	P120-10	E-825, E-826	4
E-826	Same as E-825	C-830 right shield cover ground contact						
E-827	Plate, cover: 52S-1/2 hd aluminum, 0.040" thk; U shape; approx 7" lg x 5.815" wd x 4" h o/a; mts by two 3/8" flanges on one end, each with two 6-32 tapped mtg holes on irregularly spaced mtg/c; other end has two 7/16" flanges, one with one 6-32 tapped mtg hole, other with one 0.156" diam hole on irregularly spaced mtg/c	Osc A compartment cover		N16-P-401881-206*	342	P916-1	E-827	1
E-828	Plate, cover: 52S-1/2 hd aluminum, 0.040" thk; U shape; approx 7" lg x 5.815" wd x 4" h o/a; mts by two 3/8" flanges on one end, each with two 6-32 tapped mtg holes on irregularly spaced mtg/c; one 7/16" flange on other end with three 6-32 tapped mtg holes on irregularly spaced mtg/c	Osc B compartment cover		N16-P-401881-207*	342	P916-2	E-828	1
E-829	Plate, cover: 52S-1/2 hd aluminum, caustic etch w/water dip lacquer finish; irregular shape, 6 7/8" lg x 6 7/16" wd x 0.064" thk; o/a; mts by seventeen 6-32 tapped holes on	Osc A cover plate		N16-P-401881-205*	342	P913-1	E-829, E-830	2

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MISCELLANEOUS ELECTRICAL PARTS (continued)						
E-829 (cont)	irregularly spaced mtg/c									
E-830	Same as E-829	Osc B cover plate								
E-831	Plate, cover: 52S-1/2 hd aluminum, rectangular shape; 5 7/32" lg x 3 9/16" wd x 0.064" thk; mts by seven 6-32 tapped mtg holes on irregularly spaced mtg/c	200 kc osc cover plate		N16-P-401881-204*	342	P893-1	E-831	1		
E-832	Plate, cover: 52S-1/4 hd aluminum, 0.064" thk; U shape; 3 3/8" lg x 1 11/16" wd x 2 1/2" h o/a; mts by four 0.156" diam holes on 2 7/8" mtg/c, four 0.156" diam holes on 2.875" mtg/c and two 0.203" diam holes on 1.750" mtg/c	Crystal B switch cover		N16-P-401881-203*	1; P802-1	P802-1	E-832	1		
E-833	Same as E-145	Filter cover								
E-834 thru E-900	Not Used									
E-901	Same as E-701	J-902, J-903 insulator								
E-902	Same as E-121	AGC switch knob								
E-903	Same as E-121	RF gain control knob								
E-904	Same as E-121	Audio bandwidth switch knob								

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E-905	Same as E-121	ANL switch knob
E-906	Same as E-121	AF level control knob
E-907	Same as E-133	V-901 thru V-905 lower shield
E-908	Same as E-130	V-901, V-904, V-905 tube shield
E-909	Same as E-128	V-902, V-903 tube shield
E-910	Same as E-145	Filter cover
E-911 thru E-1000	Not Used	
E-1001	Same as E-701	J-1002, J-1003 insulator
E-1002	Same as E-121	AGC switch knob
E-1003	Same as E-121	RF gain control knob
E-1004	Same as E-121	Level indicator switch knob
E-1005	Same as E-121	Audio bandwidth switch knob
E-1006	Same as E-121	ANL switch knob
E-1007	Same as E-121	AF level control knob
E-1008	Same as E-133	V-1001 thru V-1011 lower shield
E-1009	Same as E-130	V-1001, V-1004, V-1006, V-1010, V-1011 tube shield
E-1010	Same as E-128	V-1002, V-1003, V-1005, V-1007 thru V-1009 tube shield

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
		MISCELLANEOUS ELECTRICAL PARTS (continued)								
E-1011	Same as E-145	Filter cover								
E-1012 thru E-1100	Not Used									
E-1101	Same as E-134	V-1101 lower shield								
E-1102	Same as E-133	V-1102 thru V-1107, V-1110 lower shield								
E-1103	Same as E-132	V-1101 upper tube shield								
E-1104	Same as E-130	V-1102 thru V-1106, V-1110 upper tube shield								
E-1105	Same as E-131	V-1107 upper tube shield								
E-1106	Same as E-121	Reception switch knob								
E-1107	Same as E-121	Tone switch knob								
E-1108	Same as E-121	AF level control knob								
E-1109	Same as E-121	Fine threshold control knob								
E-1110	Same as E-121	Coarse threshold control knob								

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E-1111	Same as E-307	Variable frequency control knob						
E-1112	Knob, round: crown shape; black bakelite; for 0.252" diam shaft; two no. 6-32 set screw holes 120° apart; 2" o/a diam, 15/16" h; brass insert; 5/8" shaft hole depth; 148 corrugations around total circumference	Fixed frequency switch knob		N16-K-701639-975*	1; SA:4406-2	SA:4406-2	E-1112	3
E-1113	Insulator, spacer: rectangular shape, w/oval shape shank; XXP black bakelite type LTS-E3; 2" h; 1 1/2" wd x 0.296" thk, 0.171" thk; four 0.156" diam mtg holes on 1" x 1.5" mtg/c; two 0.390" diam holes counter bored at shank end 0.515" diam x 3/16" d spaced 5/8" c to c; shank 3/4" wd x 1 3/8" lg x 0.125" thk; rounded on 3/8" radius; JAN-P-13 spec	J-1106, J-1107 insulator		N17-I-67039-2690*	1; Q919-2	Q919-2	E-1113	3
E-1114	Plate, cover: 52S-1/4 hd aluminum, 0.040" thk; U shape; 8 3/32" lg x 2 3/32" wd x 3 9/16" h o/a; mts by four 17/32" flanges with four 0.156" mtg holes; stamped "C1152" on one end of top	VFO capacitor cover		N16-P-401881-212*	1; P156-1	P156-1	E-1114	3
E-1115	Same as E-145	RF filter compartment cover						
E-1116	Plate, cover: 2S-1/2 hd aluminum, caustic etch w/gray paint finish; rectangular shape; 4 7/8" lg x 7/8" wd x 0.040" thk; eight 0.125" diam mtg holes in two rows, 1 1/2" between/c, 0.500" between rows	Cover plate for additional outlets		N16-P-401881-172*	1; P245-5	P245-5	E-1116	3
E-1117 thru E-1200	Not Used							

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			MISCELLANEOUS ELECTRICAL PARTS (continued)							
E-1201	Same as E-133	V-1202 thru V-1204, V-1206 thru V-1212, V-1214 lower tube shield								
E-1202	Same as E-134	V-1201, V-1205, V-1213, V-1215, V-1217 lower tube shield								
E-1203	Same as E-128	V-1204, V-1210 tube shield								
E-1204	Same as E-130	V-1202, V-1203, V-1206, V-1207 thru V-1209, V-1214 tube shield								
E-1205	Same as E-132	V-1201, V-1205, V-1213, V-1215, V-1217 tube shield								
E-1206	Same as E-131	V-1211, V-1212 tube shield								
E-1207	Shield, electron tube: oscilloscope tube shield; 0.020" mumetal w/ black lacquer finish; spotwelded w/offset lap on outside; hollow cylinder shape w/mtg foot at each	V-1216 tube shield		N16-S-34783-1239*	153	M418-4	E-1207	3		

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E-1207 (cont)	end; 2 1/8" OD x 4" lg o/a w/o feet; 2.085" ID; two holes 0.156" diam on 4 7/16" mtg/c in mtg feet 1/2" wd x 0.437" lg; three 1/4" diam holes 120 deg apart on 5/16" c from top; shield assembly completely demagnetized							
E-1208	Shield, tube: brass w/dull black paint finish; cylindrical shape w/ open ends; 3 mtg brackets 90 deg apart on outside surface; 2 1/4" ID x 2 3/16" h; three no. 6-32 tapped holes on 2 7/8" pitch circle	V-1216 outer shield		N16-S-34601-6615*	1; SA:7562	SA:7562	E-1208	3
E-1209	Same as E-121	Mark polarity switch knob						
E-1210	Same as E-121	Deviation compensation knob						
E-1211	Same as E-121	Keying speed switch knob						
E-1212	Same as E-121	Oscilloscope selector switch knob						
E-1213	Same as E-121	AFC tuning control knob						
E-1214	Same as E-124	Fine tuning control knob						
E-1215	Plate, cover: 52S-1/4 hd aluminum; caustic etch w/water dip lacquer finish; rectangular shape; 6 5/16" lg x 3 9/16" wd x 0.064" thk; mts by seven 0.056" diam holes, irregularly spaced; four 3/32" rad rounded corners	1700 kc osc cover plate		N16-P-401881-210*	1; Q006-1	Q006-1	E-1215	3
E-1216	Same as E-145	R.F. Filter compartment cover						

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			MISCELLANEOUS ELECTRICAL PARTS (continued)							
E-1217 thru E-1300	Not Used									
E-1301	Same as E-117	R-1312, R-1313 support								
E-1302	Same as E-201	Channel A switch knob								
E-1303	Same as E-131	V-1309 shield								
E-1304	Same as E-128	V-1301 thru V-1304, V-1310, V-1318 tube shield								
E-1305	Same as E-130	V-1314 thru V-1316, V-1322 thru V-1324 tube shield								
E-1306	Same as E-132	V-1305, V-1306, V-1311 thru V-1313, V-1319 thru V-1321 tube shield								
E-1307	Same as E-133	V-1301 thru V-1304, V-1309, V-1310, V-1314 thru V-1316, V-1318, V-1322 thru V-1324 shield base								

E-1308	Same as E-134	V-1305, V-1306, V-1311 thru V-1313, V-1319 thru V-1321 shield base					
E-1309	Same as E-145	Filter cover					
E-1310 thru E-2000	Not used						
E-2001	Same as E-134	V-2009 lower shield					
E-2002	Same as E-132	V-2009 tube shield					
E-2003	Same as E-133	V-2006 thru V-2008, V-2010 thru V-2012 lower shield					
E-2004	Same as E-131	V-2006 thru V-2008, V-2010 thru V-2012 tube shield					
E-2005	Plate, cover: 52S-1/4 hd aluminum, gray paint finish on one side, unpainted surface finished with caustic etch w/water dip lacquer; rectangular shape; 17 1/8" lg x 3 1/4" wd x 0.064" thk; mts by twelve 6-32 holes on irregular spaced mtg/c	RF filter compartment cover	N16-P-401881-211*	1; Q126-1	Q126-1	E-2005, E-2106, E-2206	5
E-2006	Plate, cover: 52S-1/4 hd aluminum, gray paint finish on one side and edges, unpainted surfaces has caustic etch w/water dip lacquer finish; square shape; 1 3/8" lg x 1 3/8" wd x 0.064" thk; mts by two 0.156" diam holes on	Cover plate for additional relay outlets	N16-P-401881-213*	1; Q197-1	Q197-1	E-2006	3

Not furnished as a maintenance part. If failure occurs do not request replacement unless the item cannot be repaired or fabricated.

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			MISCELLANEOUS ELECTRICAL PARTS (continued)							
E-2006 (cont)	diagonally opposite corners 1 3/8" c to c									
E-2007 thru E-2100	Not used									
E-2101	Same as E-133	V-2107, V-2109, V-2110, V-2113. V-2114 lower shield								
E-2102	Same as E-134	V-2106, V-2112 lower shield								
E-2103	Same as E-132	V-2106. V-2112 tube shield								
E-2104	Same as E-131	V-2107, V-2109. V-2110, V-2113, V-2114 tube shield								
E-2105	Insulator, standoff: round post shape; white, grade L-4 ceramic, side surface glazed; 3/8" h o/a, 3/8" OD w/through hole tapped no. 6-32	Resistor tie point			46	M040-2	E-2105, E-2205	3		
E-2106	Same as E-2005	RF filter compartment cover								
E-2107 thru E-2200	Not used									

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E-2201	Same as E-134	V-2208, V-2212 lower shield								
E-2202	Same as E-132	V-2208, V-2212 tube shield								
E-2203	Same as E-133	V-2209 thru V-2211, V-2213 thru V-2215 lower shield								
E-2204	Same as E-131	V-2209 thru V-2211, V-2213 thru V-2215 tube shield								
E-2205	Same as E-2105	Resistor tie point								
E-2206	Same as E-2005	R.F. Filter compartment cover								
E-2207 thru E-3400	Not used									
E-3401	Plate, grounding: aluminum, 0.091" thk, 52S-1/4 hard, caustic etch, w/water dip lacquer; rectangular shape, with L cross section; 15 1/16" lg x 3 1/4" wd x 19/32" h; six no. 6-32 tapped mtg holes on 2 15/16" mtg/c, and four slotted holes 9/32" lg x 5/32" wd on 14 7/16" x 1.625" mtg/c	Chassis cabinet electrical grounding plate		N16-P-403081-121	1; SA:7335	SA:7335	E-3401	2		
E-3402	Plate, grounding: aluminum. 0.091" thk, 52S-1/4 hard, caustic etch w/ water dip lacquer; rectangular shape, with L cross section; 4 7/8" lg x 3 1/4" wd x 19/32" h; three no. 6-32 tapped mtg holes on 2 1/4" mtg/c and four slotted holes 9/32" lg x 5/32" wd on 4 5/32" x 1.625" mtg/c	Chassis cabinet electrical grounding plate			1; SA:7586	SA:7586	E-3402	2		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	MISCELLANEOUS ELECTRICAL PARTS (continued)									
E-3403	Brush, contact: ground brush; spring temper brass; rectangular, 4" lg x 5/8" wd x 0.016" thk o/a; mounts by five 0.136" diam mtg holes on 0.750" mtg/c	Grounding brush			1; H832-8	H832-8	E-3403	2		
E-3404	Brush, electrical contact: ground brush; spring temper brass; rectangular, 7 7/16" lg x 5/8" wd x 0.016" thk o/a; mounts by ten 0.136" diam mtg holes on 0.750" mtg/c	Grounding brush			1; H832-9	H832-9	E-3404	2		
			FUSES							
F-101 thru F-2000	Not used									
F-2001	Fuse, cartridge: 1.0 amp rating; 250 volts; one-time; glass body; ferrule type; 1/4" diam x 1 1/4" lg	Blower fuse			76; no. 1040	F135-3	F-2001 thru F-2005 F-2101 thru F-2105 F-2201 thru F-2205	25		
F-2002	Same as F-2001	Blower fuse								
F-2003	Same as F-2001	Spare fuse								
F-2004	Same as F-2001	Spare fuse								
F-2005	Same as F-2001	Spare fuse								
F-2006 thru F-2100	Not used									

F-2101	Same as F-2001	Blower fuse							
F-2102	Same as F-2001	Blower fuse							
F-2103	Same as F-2001	Spare fuse							
F-2104	Same as F-2001	Spare fuse							
F-2105	Same as F-2001	Spare fuse							
F-2106 thru F-2200	Not used								
F-2201	Same as F-2001	Blower fuse							
F-2202	Same as F-2001	Blower fuse							
F-2203	Same as F-2001	Spare fuse							
F-2204	Same as F-2001	Spare fuse							
F-2205	Same as F-2001	Spare fuse							
F-2206 thru F-3400	Not used								
F-3401	Fuse, cartridge: 5 amp; 250 v; one time; glass body; ferrule terminals; 1 1/4" lg x 1/4" diam; NEC term	A.C. outlet fuse		N17-F-16318	324	F135-8	F3401 thru F-3404	4	
F-3402	Same as F-3401	A.C. outlet fuse							
F-3403	Same as F-3401	Spare fuse							
F-3404	Same as F-3401	Spare fuse							
			HARDWARE						
H-101 thru H-4000	Not used								
H-4001	Wrench: for Bristo setscrew; distance across splines 0.060"; approx 1 5/8" lg x 7/16" wd; steel; 90° offset	Wrench for no. 4 Bristo setscrew		N41-W-2459-915	406	J301-1	H-4001	2	
H-4002	Wre nch: for Bristo setscrew; distance across splines 0.076"; approx 1 59/64" lg x 47/64" wd; steel; 90° offset	Wrench for no. 6 Bristo setscrew		N41-W-2460-3	406	J301-3	H-4002	4	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS								EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX / QUAN.
				HARDWARE (continued)					
H-4003	Wrench: for Bristo setscrews; distance across splines 0.094"; approx 2 1/16" lg x 51/64" wd; steel; 90° offset	Wrench for no. 8 Bristo setscrew		N41-W-2460-10	406	J301-4	H-4003	2	
H-4004	Wrench: for Allen setscrew; 5/64" across flats; approx 1 61/64" lg x 11/16" wd; hardened steel, cad plated; 90° offset	Wrench for no. 8 Allen setscrew		N41-W-2446	264	F131-7	H-4004	4	
H-4005	Wrench: for Allen setscrew; 1/8" across flats; approx 2 7/16" lg x 7/8" wd; hardened steel, cad plated; 90° offset	Wrench for 1/4" Allen setscrew		N41-W-2450-10	264	F131-12	H-4005	2	
H-4006	Wrench: for AN type cable connector; opening has a 43/64" radius; approx 5 1/4" lg x 27/32" wd; steel, pack harden finish; 120° offset; flat straight handle	Wrench for no. 20 AN type cable connector		N41-W-3250-760	1; Q147-1	Q147-1	H-4006	1	
H-4007	Wrench: for AN type cable connector; opening has a 9/16" radius; approx 5 1/16" lg x 25/32" wd; tool steel 0.0005" nickel plated; 120° offset; flat straight handle	Wrench for no. 14 and no. 16 AN type cable connectors		N41-W-3250-780	1; Q148-1	Q148-1	H-4007	1	
H-4008	Wrench: for AN type cable connector; 1 5/32" opening; approx 10 1/8" lg x 5 9/32" wd; cold-rolled steel handle, 1/16" tool steel jaw; straight; round 'L' handle	Wrench for no. 14 and no. 16 AN type cable connectors			1; SA:8422	SA:8422	H-4008	1	

H-4009	Wrench: for AN type cable connector; 1 13/32" opening; approx 10 1/8" lg x 5 15/32" wd; cold-rolled steel handle, 1/8" tool steel jaw; straight; round 'L' handle	Wrench for no. 20 type cable AN connector			1; SA:8423	SA:8423	H-4009	1		
H-4010	Wrench: single end, adjustable; 1/2" max cap; 4" lg, 5/16" jaw thickness; alloy steel, polished head offset 22 1/2 deg flat straight handle	Adjustable wrench for sq or hex head bolts and nuts		N41-W-484-10	1378	Q461-1	H-4010	1		
H-4011	Wrench: single end, adjustable; 3/4" max cap; 6" lg, 3/8" jaw thickness; alloy steel, polished; head offset 22 1/2 deg; flat straight handle	Adjustable wrench for sq or hex head bolts and nuts		N41-W-485-6	1378	Q461-2	H-4011	1		
H-4012	Wrench: single end, adjustable; 15/16" max cap; 8" lg, 1/2" jaw thickness; alloy steel, polished; head offset 22 1/2 deg; flat straight handle	Adjustable wrench for sq or hex head bolts and nuts		N41-W-486-6	1378	Q461-3	H-4012	1		
H-4013	Wrench: double open-end hex; 1/4"-5/16" openings; 3 1/2" lg x 7/32" thk; carbon steel, black crackle w/polished head; heads offset 15 deg from handle; flat straight handle	Wrench for sq or hex head bolts and nuts (1/4 - 5/16")		N41-W-1060-950	1378	Q462-1	H-4013	1		
H-4014	Wrench: double open-end hex; 3/8"-7/16" openings; 4 1/2" lg x 9/32" thk; carbon steel; black crackle w/polished head; heads offset 15 deg from handle; flat straight handle	Wrench for sq or hex head bolts and nuts (3/8" - 7/16")		N41-W-1063-20	1378	Q462-2	H-4014	1		
H-4015	Wrench: double open-end hex; 1/2" -9/16" openings; 5 1/2" lg x 5/16" thk; carbon steel, black crackle w/polished head; heads offset 15 deg from handle; flat straight handle	Wrench for sq or hex head bolts and nuts (1/2" -9/16")		N41-W-1064-987	1378	Q462-3	H-4015	1		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				HARDWARE (continued)						
H-4016	Wrench: double open-end hex; 5/8"-11/16" openings; 7" lg x 13/32" thk; carbon steel, black crackle w/ polished head; heads offset 15° from handle; flat straight handle	Wrench for sq or hex head bolts and and nuts (5/8" - 11/16")		N41-W-66750-50	1378	Q462-4	H-4016	1		
H-4017	Wrench: double open-end hex; 3/4"-13/16" openings; 9 1/4" lg x 15/32" thk; carbon steel, black crackle with polished head; heads offset 15° from handle; flat straight handle	Wrench for sq or hex head bolts and nuts (3/4" - 13/16")		N41-W-66750-80	1378	Q462-5	H-4017	1		
H-4018	Wrench: socket; 1/4" hex opening; 6 1/4" lg 3/8" hex cap diam; hardened tool steel, w/natural wood, varnished handle, nickel plated steel ferrule; straight; screwdriver type handle	Wrench for 1/4" hex nuts		N41-W-2877-110	1378	Q463-1	H-4018	1		
H-4019	Wrench: socket; 5/16" hex opening; 6 1/4" lg 15/32" hex cap diam; hardened tool steel, w/natural wood, varnished handle, nickel plated steel ferrule; straight; screwdriver type handle	Wrench for 5/16" hex nuts		N41-W-2877-127	1378	Q463-2	H-4019	1		
H-4020	Wrench: socket 3/8" hex opening; 6 1/4" lg 1/2" hex cap diam; hardened tool steel, w/natural wood, varnished handle nickel plated	Wrench for 3/8" hex nuts		N41-W-2877-148	1378	Q-463-3	H-4020	1		

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H-4020 (cont)	steel ferrule; straight; screwdriver type handle								
H-4021	Wrench: socket; 7/16" hex opening; 7 1/4" lg 5/8" hex cap diam; hardened tool steel, w/natural wood, varnished handle, nickel plated steel ferrule; straight; screwdriver type handle	Wrench for 7/16" hex nuts		N41-W-2877-170	1378	Q463-4	H-4021	1	
H-4022	Wrench: socket; 1/2" hex opening; 7 1/4" lg 11/16" hex cap diam; hardened tool steel, w/natural wood, varnished handle, nickel plated steel ferrule; straight, screwdriver type handle	Wrench for 1/2" hex nuts		N41-W-2877-175	1378	Q463-5	H-4022	1	
H-4023	Wrench: socket 9/16" hex opening; 7 1/4" lg 3/4" hex cap diam; hardeded tool steel, w/natural wood, varnished handle, nickel plated steel ferrule; straight; screwdriver type handle	Wrench for 9/16" hex nuts		N41-W-2877-180	1378	Q463-6	H-4023	1	
H-4024	Wrench: socket; 5/8" hex opening; 7 1/4" lg 7/8" hex cap diam; hardened tool steel, w/natural wood, varnished handle, nickel plated steel ferrule; straight; screwdriver type handle	Wrench for 5/8" hex nuts		N41-W-2877-190	1378	Q463-7	H-4024	1	
H-4025	Wrench: socket; 11/16" hex opening; 7 1/4" lg 7/8" hex cap diam; hardened tool steel, w/ natural wood, varnished handle, nickel plated steel ferrule; straight; screwdriver type handle	Wrench for 11/16" hex nuts		N41-W-2877-210	1378	Q463-8	H-4025	1	
H-4026	Wrench: socket; 3/4" hex opening; 7 1/4" lg 15/16" hex cap diam; hardened tool steel, w/natural wood, varnished handle, nickel plated steel ferrule; straight;	Wrench for 3/4" hex nuts		N41-W-2877-240	1378	Q463-9	H-4026	1	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				HARDWARE (continued)						
H-4026 (cont)	screwdriver type handle									
H-4027	Wrench: socket; 13/16" hex opening; 7 1/4" lg, 1" hex cap diam, hardened tool steel w/natural wood varnished handle, nickel plated steel ferrule; straight; screwdriver type handle	Wrench for 13/16" hex nuts		N41-W-2877-280	1378	Q463-10	H-4027	1		
H-4028	Screwdriver: phillips drive; 3" blade; 6 7/8" lg o/a; 0.187" diam round shank; fits Phillips head type screws no. 2, 3 and 4; natural wood, varnished handle	Screwdriver for Phillips head type screws no. 2, 3, and 4		N41-S-1636-10	136	H605-1	H-4028	1		
H-4029	Screwdriver: phillips drive; 4" blade; 8 3/8" lg o/a; 1 1/4" diam round shank; fits Phillips head type screws no. 5, 6, 8, and 10; natural wood, varnished handle	Screwdriver for Phillips head type screws no. 5, 6, 8, and 10		N41-S-1638-10	136	H605-2	H-4029	1		
H-4030	Screwdriver: for slot drive; 3" blade; 8" lg o/a; 1/4" diam round shank; bit 7/32" wd x 1/32" thk; hardwood handle w/nickel plated steel ferrule	Screwdriver for slot head type screws		N41-S-1101-43	136	Q460-1	H-4030	1		
H-4031	Screwdriver: for slot drive; 8" blade; 15" lg o/a; 3/8" diam round round shank; bit 3/8" wd x 3/32" thk; hardwood handle w/nickel plated steel ferrule	Screwdriver for slot head type screws		G41-S-1106	136	Q460-2	H-4031	1		

H-4032	Pliers: long needle nose; without cutters; o/a length approx 6" alloy steel, polished head, blued handles			N41-P-1864	1378	Q457-1	H-4032	1		
H-4033	Pliers: thin nose, slip joint; without cutter; o/a length approx 6" steel, nickel plated			N41-P-1996-6000	1378	Q458-1	H-4033	1		
H-4034	Pliers: diagonal cutting; o/a length approx 6" alloy steel, polished head, blued handles			G41-P-1714	1378	Q459-1	H-4034	1		
H-4035	Tool, aligment: grade x natural bakelite; 5 5/8" lg x 1/4" diam 0.148" wd x 0.020" thick metal nib screwdriver both ends, one end protrudes 1/8", other end recessed 1/32"			N17-T-751670-851	1; SA:3156	SA:3156	H-4035	1		
H-4036	Tool, aligment: grade x natural bakelite; 1 7/8" lg x 1/4" diam; 0.148" wd x 0.020" thk metal nib screwdriver both ends, one end protrudes 1/8", other end recessed 1/32"			N16-T-751611-301	1; SA:7433	SA:7433	H-4036	1		
			INDICATING DEVICES							
I-101	Lamp, incandescent: 6.5V 1.14A, 6CP; G-6 bulb, clear, 3/4" diam; 1 7/16" lg; miniature bayonet base; burn any position	Projection dial lamp		G17-L-6686	18	P938-1	I-101,102	24		
I-102	Same as I-101	Spare								
I-103	Lamp, incandescent: 6/8V; T-3 1/4 bulb, clear, 3/4" diam; 1 7/16" lg; miniature bayonet base; burn any position; GE type no. 47	Drum dial lamp		G17-L-6297	18	F136-6	I-103	12		
I-104 thru I-1100	Not Used									
I-1101	Lamp, incandescent: 115 volts, 3 watts; type S-6; clear; 1 3/4" max	V-1106 feedback stabilization		G17-L-3911-175	18	F136-9	I-1101	3		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				INDICATING DEVICES (continued)						
I-1101 (cont)	o/a lg; 7/16" diam standard candelabra socket; any burning position									
I-1102 thru I-2000	Not Used									
I-2001	Lamp, glow: operating voltage 105-125 VAC or DC, 1/25 watt, striking voltage 65VAC, 90 VDC; type T-3 1/4 clear bulb; 1 3/16" lg o/a; miniature bayonet base; burns any position; neon gas	Heater primary indicator		G17-L-6806-130	18; NE-51	H338-1	I-1201 thru I-2003, I-2101 thru I-2103 I-2201 thru I-2203, I-3401 thru I-3406	21		
I-2002	Same as I-2001	Failure indicator								
I-2003	Same as I-2001	Plate power indicator								
I-2004 thru I-2100	Not Used									
I-2101	Same as I-2001	Heater primary indicator								
I-2102	Same as I-2001	Failure indicator								
I-2103	Same as I-2001	Plate power indicator								
I-2104 thru I-2200	Not Used									

I-2201	Same as I-2001	Heater primary indicator							
I-2202	Same as I-2001	Failure indicator							
I-2203	Same as I-2001	Plate power indicator							
I-2204 thru I-3400	Not Used								
I-3401	Same as I-2001	Bay no. 1 lamp indicator							
I-3402 thru I-3405	Same as I-2001	Bay no. 2 thru Bay no. 4 lamp indicator							
I-3406	Same as I-2001	A.C. outlet indicator							
			JACKS						
J-101[1]	Connector, receptacle: 8 round shielded male contacts; 11 round unshielded female contacts; polarized; straight; 4 3/4" lg x 2 3/16" wd x 21/32" d excl contacts; 8 male contacts suitable for RG 59/U cable; rectangular brass cad plated frame w/brass silver plated contacts mounted on laminated plastic base; mts by two 0.390" diam holes 4.062" between mtg/c; guide pin bushing key A at 9 o'clock, guide pin bushing key B at 6 o'clock	Multiconnector for Amp-Conv		N17-C-73725-5315	1238	M822-5	J-101[1], J-401	6	55	1
J-101[2]	Connector, receptacle: 8 round shielded male contacts, 11 round unshielded female contacts; polarized; straight; 4 3/4" lg x 2 3/16" h x 21/32" d excl contacts; 8 male contacts suitable for RG-59/U	Multiconnector for Amp-Conv		N17-C-73725-5313	1238	M822-4	J-101[2], J-601, J-2201	7	55	1

[1] Used on AM-452/FRR-24 only
[2] Used on AM-453/FRR-24 only

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				JACKS (continued)						
J-101[2] (cont)	cable; rectangular cad plated brass frame w/silver plated brass contacts mtd on laminated plastic base; mts by two 0.390" diam holes 4.062" between mtg/c; guide pin bushing key A at 9 o'clock; guide pin bushing key B at 3 o'clock; for replacement use N17-C-73725-5315									
J-101[3]	Connector, receptacle: 8 round shielded male contacts, 11 round unshielded female contacts; polarized; straight; 4 3/4" lg x 2 3/16" h x 21/32" d excl contacts; 8 male contacts suitable for RG-59/U cable; rectangular cad plated brass frame w/silver plated brass contacts mtd on laminated plastic base; mts by two 0.390" diam mtg holes 4.062" between mtg/c; guide pin bushing key A at 9 o'clock guide pin bushing key B at 12 o'clock for replacement use N17-C-73725-5315	Multiconnector for Amp-Conv		N17-C-73725-5311	1238	M822-3	J-101[3], J-701, J-2101	7	55	1
J-101[4]	Connector, receptacle: 8 rounded shielded male contacts, 11 round unshielded female contacts; polar-	Multiconnector for Amp-Conv		N17-C-73725-5309	1238	M822-2	J-101[4], J-301, J-2001	9	55	1

2 Used on AM-453/FRR-24 only
3 Used on AM-451/FRR-24 only

J-101[4] (cont)	ized; straight; 4 3/4" lg x 2 3/16" h x 21/32" d excl contacts; 8 male contacts suitable for RG-59/U cable; rectangular cad plated brass frame w/silver plated brass contacts mtd on laminated plastic base; mts by two 0.390" diam mtg holes 4.062" between mtg/c; guide pin bushing keyA and B at 9 o'clock; for replacement use N17-C-73725-5315									
J-102	Connector, receptacle: one round female contact; straight; 11-16" sq x 1 1/32" lg o/a; brass silver plated, round body w/square mtg flange; suitable for RG-59/U cable; mts by four no. 3/56 tapped holes on 1/2" x 1/2" mtg/c	T-101 input	UG-262/U	N17-C-73108-7660	1374	L646-1	J-102, J-110 thru J-116, J-206 thru J-209, J-215 thru J-218, J-224 thru J-227, J-233 thru J-237, J-248 thru 252, J-255, J-258, J-261, J-302 thru J-307, J-402, J-403, J-602 thru J-607, J-704, J-705, J-809 thru J-815, J-904, J-906, J-907, J-1004, J-1005, J-1007 thru J-1009, J-1102, J-1103, J-1203 thru J-1207,	264		

4 Used on AM-450/FRR-24 only

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				JACKS (continued)						
J-102 (cont)							J-1304 thru J-1309			
J-103	Connector, receptacle: one round female contact; 90° angle type; 1 1/16" lg x 3/4" wd x 29/32" d o/a; cylindrical body w/90° elbow; sq mtg surface W/4 mtg holes 0.136" diam on 0.531" mtg/c	V-102 input		N17-C-72811-2237	1238	M368-1	J-103	12		
J-104	Connector, receptacle: one round female contact; straight; 1 1/16" lg x 3/8" diam w/11/16" sq mtg flange; 52 ohms impedance; round shape, brass silver plated; four 3-56 tapped holes on 1/2" x 1/2" mtc/c	T-108 output			1238	L648-1	J-104, J-106, J-107, J-108, J-118	60		
J-105	Adapter, connector: co-ax cable terminator; silver plated brass; 25/32" lg x 7/16" across flats; BNC type connector for RG-59/U and RG-62/U cable	V-104 injection input		N17-A-27451-1061	1374	L645-1	J-105, J-201 thru J-205, J-210 thru J-214, J-219 thru J-223, J-228 thru J-237, J-243 thru J-247, J-253, J-254, J-256, J-257, J-259, J-260, J-802 thru J-808, P-3907	151		

J-106	Same as J-104	Local RF amp output							
J-107	Same as J-104	Local Oscillator output							
J-108	Same as J-104	Remote oscillator input							
J-109	Not Used								
J-110	Same as J-102	AGC input							
J-111	Same as J-102	Local oscillator output							
J-112	Same as J-102	Remote oscillator input							
J-113	Same as J-102	1750 kc output							
J-114	Same as J-102	Crystal calibrate input							
J-115	Same as J-102	Antenna input							
J-116	Same as J-102	Local oscillator output							
J-117	Connector, male contact: 7 round male contacts; straight; 1 9/32" sq x 19/32" d; round aluminum body w/rectangular mtg flange; molded phenolic insert; cable opening 27/32" diam; mts by four 0.120" diam holes on 31/32" x 31/32" mtg/c	Power input connector			339	Q013-1	J-117, J-242	15	
J-118	Same as J-104	Local oscillator output							
J-119 thru J-200	Not Used								
J-201 thru J-204	Same as J-105	Local oscillator input feedthru							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				JACKS (continued)						
J-205	Same as J-105	S-201A to S-202D interconnection feedthru								
J-206	Same as J-102	Local osc input								
J-207 thru J-209	Same as J-102	Local osc input								
J-210 thru J-213	Same as J-105	Remote osc out-put feedthru								
J-214	Same as J-105	S-201B to S-202B interconnection feedthru								
J-215 thru J-218	Same as J-102	Remote osc output								
J-219 thru J-222	Same as J-105	Local osc input feedthru								
J-223	Same as J-105	S-201C to S-202C interconnection feedthru								
J-224 thru J-227	Same as J-102	Local osc input								
J-228 thru J-232	Same as J-105	Crystal calibrate output feedthru								

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J-233 thru J-236	Same as J-105	Crystal calibrate output						
J-237	Same as J-105	Crystal calibrate input						
J-238	Connector, receptacle: 7 round female contacts; straight type; 1 9/32" sq x 29/32" lg excl contacts; round body w/sq mtg flange; aluminum w/sand blast and clear lacquer finish; molded phenolic insert; 27/32" diam cable opening; mts by four 0.120" diam holes on 31/32" x 31/32" mtg/c	Power output	AN 3102-16S-1S		339	Q015-1	J-238 thru J-241, J-2004	15
J-239 thru J-241	Same as J-238	Power output						
J-242	Same as J-117	Power input						
J-243 thru J-246	Same as J-105	AGC output feed-thru						
J-247	Same as J-105	AGC input feed-thru						
J-248 thru J-251	Same as J-102	AGC output						
J-252	Same as J-102	AGC input						
J-253	Same as J-105	S-202B to S-201B interconnection feedthru						
J-254	Same as J-105	Remote osc input feedthru						
J-255	Same as J-102	Remote osc input						
J-256	Same as J-105	S-202C to S-201C interconnection feedthru						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				JACKS (continued)						
J-257	Same as J-105	Local osc output feedthru								
J-258	Same as J-102	Local osc output								
J-259	Same as J-105	S-202D to S-201A interconnection feedthru								
J-260	Same as J-105	Local osc output feedthru								
J-261	Same as J-102	Local osc output								
J-262 thru J-300	Not Used									
J-301	Same as J-101[4]	Multiconnector								
J-302	Same as J-102	1750 kc input to V-303								
J-303	Same as J-102	1750 kc input to V-301								
J-304	Same as J-102	1750 kc input to V-304								
J-305	Same as J-102	50 kc output								
J-306	Same as J-102	1700 kc input or output								
J-307	Same as J-102	1750 kc input to V-302								
J-308	Connector, receptacle: 14 round male contacts; polarized; straight;	Power input	AN 3102A-20--27P	N17-C-72637-4339	339	P-147-1	J-308,J-404, J-608,J-706,	23		

J-308 (cont)	1 1/2" sq x 1 3/8" lg round aluminum body w/sq mtg flange; molded brown melamine insert; 4 mtg holes 0.120" diam on flange on 1 5/32" x 1 5/32" mtg/c AN-W-C-591B spec MIL-C-5015						J-816, J-908, J-1010, J-1104, J-1208, J-1310		
J-309 thru J-400	Not Used								
J-401	Same as J-101[1]	Mulitconnector							
J-402	Same as J-102	50 kc output							
J-403	Same as J-102	50 kc input							
J-404	Same as J-308	Power input							
J-405 thru J-600	Not Used								
J-601	Same as J-101[2]	Multiconnector							
J-602	Same as J-102	FS CONS output							
J-603	Same as J-102	50 kc AM output							
J-604	Same as J-102	50 kc AM output							
J-605	Same as J-102	50 kc FS output							
J-606	Same as J-102	50 kc input							
J-607	Same as J-102	AGC input							
J-608	Same as J-308	Power input							
J-609 thru J-700	Not Used								
J-701	Same as J-101[3]	Multiconnector							
J-702	Jack, telephone: for 2 cond plug, 0.250" diam, plug shank lg 1 3/32" (approx); 3 15/32" lg x 9/16" wd x 13/16" h; single contact J-1; contains two holes 3/8" between/c, one hole 0.450" diam	Phone output	JJ-086		1150	M797-1	J-702, J-703, J-902, J-903, J-1002, J-1003	12	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			JACKS (continued)							
J-702 (cont)	for jack sleeve, other hole 0.156" diam for mtg hardware									
J-703	Same as J-702	Line output								
J-704	Same as J-102	AGC output								
J-705	Same as J-102	50 kc input								
J-706	Same as J-308	Power input								
J-707	Connector, receptacle: 3 round female contacts; polarized; straight; 1 3/16" sq x 1 3/16" max lg incl contacts; round aluminum body w/sq mtg flange; molded brown melamine insert; 4 mtg holes 0.120" diam on flange on 29/32" x 29/32" mtg/c; AN-W-C-591B spec	Audio output	AN 3102A-14S -12S	N17-C-72240-1705	128	M974-1	J-707, J-909, J-1011, J-1105, J-2002, J-2102, J-2202, J-3904, J-3905	16		
J-708 thru J-800	Not Used									
J-801	Connector, receptacle: 8 round shielded male contacts, 11 round unshielded female contacts; polarized; straight; 4 3/4" lg x 2 3/16" h x 21/32" d excl contacts; 8 male contacts suitable for RG-59/U cable; rectangular brass cad plated frame w/brass silver plated contacts mtd on laminated plastic base; mtd by two 0.390" diam holes 4.062" between mtg/c; guide	Female multicon-nector		N17-C-73725-5319	1238	M822-7	J-801, J-1001	2	55	1

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J-801 (cont)	pin bushing keys A and B at 12 o'clock; for replacement use N17-C-73725-5315									
J-802	Same as J-105	V-802 plate to P-801 no. 14 feed-thru								
J-803	Same as J-105	V-802 plate to P-801 no. 13 feed-thru								
J-804	Same as J-105	V-802 plate to P-801 no. 19 feed-thru								
J-805	Same as J-105	V-804 plate to P-801 no. 1 feed-thru								
J-806	Same as J-105	V-804 plate to P-801 no. 7 feed-thru								
J-807	Same as J-105	V-804 plate to P-801 no. 8 feed-thru								
J-808	Same as J-105	V-806 plate to P-801 no. 12 feed-thru								
J-809	Same as J-102	Crystal calibrate output								
J-810 thru J-812	Same as J-102	Osc B output								
J-813 thru J-815	Same as J-102	Osc A output								
J-816	Same as J-308	Power input								
J-817 thru J-900	Not Used									

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			JACKS (continued)							
J-901	Connector, receptacle: 8 round shielded male contacts, 11 round unshielded female contacts; polarized; straight; 4 3/4" lg x 2 3/16" h x 21/32" d excl contacts; 8 male contacts suitable for RG-59/U cable; rectangular brass cad plated frame w/silver plated contacts mounted on laminated plastic base; mts by two holes 0.390" diam 4.062" between mtg/c; guide pin bushing key A of 12 o'clock, guide pin bushing key B at 9 o'clock; for replacement use N17-C-73725-5315	Multiconnector		N17-C-73725-5317	1238	M822-6	J-901, J-4001	3	55	1
J-902	Same as J-702	Phone output								
J-903	Same as J-702	Line output								
J-904	Same as J-102	Keyed DC output								
J-905	Not Used									
J-906	Same as J-102	AGC output								
J-907	Same as J-102	50 kc AM input								
J-908	Same as J-308	Power input								
J-909	Same as J-707	Audio output								
J-910 thru J-1000	Not Used									
J-1001	Same as J-801	Multiconnector								

J-1002	Same as J-702	Phone output								
J-1003	Same as J-702	Line output								
J-1004	Same as J-102	50 kc AM input								
J-1005	Same as J-102	Keyed DC output								
J-1006	Not Used									
J-1007	Same as J-102	AGC output								
J-1008	Same as J-102	50 kc AM input								
J-1009	Same as J-102	50 kc AM input								
J-1010	Same as J-308	Power input								
J-1011	Same as J-707	Audio output								
J-1012 thru J-1100	Not Used									
J-1101	Connector, receptacle: 8 round shielded male contacts, 11 round unshielded female contacts; polarized straight; 4 3/4'' lg x 2 3/16'' h x 21/32'' wd excl contacts; 8 male contacts suitable for RG-59/U cable; rectangular brass cad plated frame w/brass silver plated contacts mtd on laminated plastic base; mts by two 0.390'' diam holes 4.062'' between mtg/c; guide pin bushing key A at 12 o'clock, guide pin bushing key B at 6 o'clock; for replacement use N17-C-73725-5315	Multiconnector		N17-C-73725-5323	1238	M822-9	J-1101	3	55	1
J-1102	Same as J-102	Keyed DC input								
J-1103	Same as J-102	External tone input								
J-1104	Same as J-308	Power input								
J-1105	Same as J-707	Audio output								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				JACKS (continued)						
J-1106	Jack, telephone: for two cond plug 0.250" diam; 1 19/32" lg x 5/8" wd x 1 3/32" h; contact arrangement J4-1B; incl 1 steel washer and 2 hex nuts; mts thru 3/8" hole	Phone output		N17-J-29513-6221	5	K314-1	J-1106, J-1107	6		
J-1107	Same as J-1106	Phone output								
J-1108 thru J-1200	Not Used									
J-1201	Connector, receptacle: 8 round shielded male contacts, 11 round unshielded female contacts; polarized; straight; 4 3/4" lg x 2 3/16" wd x 21/32" d excl contacts; 8 male contacts suitable for RG-59/U cable; rectangular brass cad plated frame w/brass silver plated contacts mtd on laminated plastic base; mts by two 0.390" diam holes 4.062" between mtg/c; guide pin bushing key A at 12 o'clock, guide pin bushing key B at 3 o'clock; for replacement use N17-C-73725-5315	Multiconnector			1238	M822-8	J-1201	3	55	1
J-1202	Not Used									
J-1203	Same as J-102	1700 kc output								
J-1204	Same as J-102	FS keyed DC output								

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J-1205	Same as J-102	DC reference voltage input								
J-1206	Same as J-102	50 kc FS input								
J-1207	Same as J-102	FS CONS input								
J-1208	Same as J-308	Power input								
J-1209 thru J-1300	Not Used									
J-1301	Connector, receptacle: 8 round shielded male contacts, 11 round unshielded female contacts; polarized; straight; 4 3/4'' lg x 2 3/16'' h x 21/32'' wd excl contacts; 8 male contacts suitable for RG-59/U cable; rectangular brass cadmium plated frame w/brass silver plated contacts mtd on laminated plastic base; mounts by two 0.390'' diam holes 4.062'' between mtg/c; guide pin bushing key A at 3 o'clock, guide pin bushing key B at 9 o'clock; for replacement use N17-C-73725-5315	Multiconnector		N17-C-73725-5209	1238	M822-10	J-1301	1	55	1
J-1302	Not Used									
J-1303	Not Used									
J-1304	Same as J-102	FS keyed DC input								
J-1305	Same as J-102	FS keyed DC output								
J-1306	Same as J-102	FS keyed DC input								
J-1307	Same as J-102	FS keyed DC input								
J-1308	Same as J-102	FS keyed DC output								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			JACKS (continued)							
J-1309	Same as J-102	DC ref voltage output								
J-1310	Same as J-308	Multiconnector								
J-1311	Connector, receptacle: 5 round male contacts; polarized; straight; 1 3/16" sq x 1 3/16" lg; aluminum body w/sq mtg flange; molded brown melamine insert; four mtg holes 0.120" diam on 29/32" x 29/32" mtg/c	Multiconnector	AN 3102A-14S -5P	N17-C-72616-1135	339	P492-1	J-1311	1		
J-1312 thru J-1502	Not Used									
J-1503	Connector, adaptor: double ended female; one round female contact on each end; straight; adapts UG-260/U plug to UG-260/U plug; 11/16" sq x 1 9/32" lg; brass silver plated, round body w/sq mtg flange; four no. 3-56 tapped mtg holes on 1/2" x 1/2" mtg/c	AGC in	UG-414/U	N17-C-67728-3321	1238	Q467-1	J-1503 thru J-1509, J-1515, J-1516, J-1520 thru J-1525, J-1527 thru J-1529, J-1532, J-1603 thru J-1609, J-1615 thru J-1625, J-1627 thru J-1629, J-1631 thru	119		

J-1503 (cont)								J-1638, J-1703 thru J-1709, J-1715, J-1716, J-1720 thru J-1725, J-1727 thru J-1729, J-1732, J-1801 thru J-1852		
J-1504	Same as J-1503	AGC patch com								
J-1505	Same as J-1503	AGC patch								
J-1506	Same as J-1503	AGC out								
J-1507	Same as J-1503	1700 kc in-out								
J-1508	Same as J-1503	1700 kc patch								
J-1509	Same as J-1503	1700 kc patch com								
J-1510 thru J-1514	Not Used									
J-1515	Same as J-1503	Ant in								
J-1516	Same as J-1503	Ant in								
J-1517 thru J-1519	Not Used									
J-1520	Same as J-1503	Spare								
J-1521	Same as J-1503	Rem osc in								
J-1522	Same as J-1503	Osc out								
J-1523	Same as J-1503	Osc out								
J-1524	Same as J-1503	Xtal osc patch								
J-1525	Same as J-1503	Spare								
J-1526	Not Used									

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			JACKS (continued)							
J-1527	Same as J-1503	Ant out								
J-1528	Same as J-1503	Ant in								
J-1529	Same as J-1503	Ant in								
J-1530	Not Used									
J-1531	Not Used									
J-1532	Same as J-1503	Spare								
J-1533	Adapter, N to BNC: male one end, female other end; one round male contact on one end; one round female contact on other end; straight; adapts N type plug to BNC type connector; 1" sq x 1 23/32" lg; brass silver plated, round body w/sq mtg flange; four 1/8" diam mtg holes on 23/32" x 23/32" mtg/c	Ant input	UG-335/U		1238	Q466-1	J-1533, J-1639, J-1733	3		
J-1534 thru J-1602	Not Used									
J-1603	Same as J-1503	AGC in								
J-1604	Same as J-1503	AGC patch com								
J-1605	Same as J-1503	AGC patch								
J-1606	Same as J-1503	AGC out								
J-1607	Same as J-1503	1700 kc in-out								
J-1608	Same as J-1503	1700 kc patch								

J-1609	Same as J-1503	1700 kc patch com
J-1610 thru J-1614	Not Used	
J-1615	Same as J-1503	Ant in
J-1616	Same as J-1503	Ant in
J-1617	Same as J-1503	Xtal cal line
J-1618	Same as J-1503	Xtal cal in
J-1619	Same as J-1503	Xtal cal line
J-1620	Same as J-1503	Spare
J-1621	Same as J-1503	Rem osc in
J-1622	Same as J-1503	Osc out
J-1623	Same as J-1503	Osc out
J-1624	Same as J-1503	Osc patch
J-1625	Same as J-1503	Osc patch
J-1626	Not Used	
J-1627	Same as J-1503	Ant out
J-1628	Same as J-1503	Ant in
J-1629	Same as J-1503	Ant in
J-1630	Not Used	
J-1631	Same as J-1503	Xtal cal out
J-1632	Same as J-1503	Spare
J-1633 thru J-1635	Same as J-1503	Osc A
J-1636 thru J-1638	Same as J-1503	Osc B
J-1639	Same as J-1533	Ant input
J-1640 thru J-1702	Not Used	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				JACKS (continued)						
J-1703	Same as J-1503	AGC in								
J-1704	Same as J-1503	AGC patch com								
J-1705	Same as J-1503	AGC patch								
J-1706	Same as J-1503	AGC out								
J-1707	Same as J-1503	1700 kc in-out								
J-1708	Same as J-1503	1700 kc patch								
J-1709	Same as J-1503	1700 kc patch com								
J-1710 thru J-1714	Not Used									
J-1715	Same as J-1503	Ant in								
J-1716	Same as J-1503	Ant in								
J-1717 thru J-1719	Not Used									
J-1720	Same as J-1503	Spare								
J-1721	Same as J-1503	Rem osc in								
J-1722	Same as J-1503	Osc out								
J-1723	Same as J-1503	Osc out								
J-1724	Same as J-1503	Xtal osc patch								
J-1725	Same as J-1503	Spare								
J-1726	Not Used									
J-1727	Same as J-1503	Ant out								
J-1728	Same as J-1503	Ant in								

J-1729	Same as J-1503	Ant in
J-1730	Not Used	
J-1731	Not Used	
J-1732	Same as J-1503	Spare
J-1733	Same as J-1533	Ant input
J-1734 thru J-1800	Not Used	
J-1801	Same as J-1503	AGC patch com
J-1802 thru J-1804	Same as J-1503	AGC patch
J-1805	Same as J-1503	1700 kc patch com
J-1806 thru J-1808	Same as J-1503	1700 kc patch
J-1809	Same as J-1503	Spare
J-1810 thru J-1812	Same as J-1503	FS CONS in
J-1813	Same as J-1503	Ext tone in
J-1814	Same as J-1503	AGC out
J-1815	Same as J-1503	AGC out
J-1816	Same as J-1503	AGC com out
J-1817	Same as J-1503	Spare
J-1818 thru J-1820	Same as J-1503	1700 kc out
J-1821	Same as J-1503	Spare
J-1822	Same as J-1503	Spare
J-1823 thru J-1825	Same as J-1503	FS CONS line

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				JACKS (continued)						
J-1826	Same as J-1503	Ext tone out								
J-1827 thru J-1829	Same as J-1503	50 kc FS in								
J-1830 thru J-1833	Same as J-1503	50 kc AM in								
J-1834 thru J-1837	Same as J-1503	Keyed DC out								
J-1838	Same as J-1503	Ext tone in								
J-1839	Same as J-1503	Ext tone in								
J-1840 thru J-1842	Same as J-1503	50 kc FS line								
J-1843 thru J-1845	Same as J-1503	50 kc AM bus								
J-1846	Same as J-1503	50 kc AM in								
J-1847 thru J-1850	Same as J-1503	Keyed DC in								
J-1851	Same as J-1503	Ext tone out								
J-1852	Same as J-1503	Ext tone out								
J-1853 thru J-2000	Not Used									

J-2001	Same as J-101[4]	Multiconnector							
J-2002	Same as J-707	AC output							
J-2003	Connector, receptacle: 3 round male contacts; polarized; straight; 1 7/16" lg x 1 1/2" wd x 1 1/2" h; cylindrical aluminum body w/ sq mtg flange; molded phenolic insert; cable opening 1 5/32" OD; four 0.120" diam mtg holes on 1.156" x 1.156" mtg/c	AC input	AN 3102A-20 -3P	N17-C-72605-2704	339	Q716-1	J-2003, J-2103, J-2203, J-3401 thru J-3405	9	
J-2004	Same as J-238	Power output							
J-2005	Connector, receptacle: 14 round female contacts; polarized; straight; 1 1/2" sq x 1 1/8" lg excl contacts; round aluminum body w/rectangular mtg flange; molded phenolic insert; mts by four 0.120" diam holes on 1 5/32" x 1 5/32" mtg/c; MIL-C-5015	Power output	AN 3102A-20 -27S	N17-C-72273-4276	339; 2062-66	P770-1	J-2005 thru J-2009, J-2104 thru J-2109, J-2204 thru J-2207	25	
J-2006 thru J-2009	Same as J-2005	Power output							
J-2010 thru J-2100	Not Used								
J-2101	Same as J-101[3]	Multiconnector							
J-2102	Same as J-707	AC output							
J-2103	Same as J-2003	AC input							
J-2104 thru J-2109	Same as J-2005	Power output							
J-2110 thru J-2200	Not Used								
J-2201	Same as J-101[2]	Multiconnector							
J-2202	Same as J-707	AC output							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN
				JACKS (continued)						
J-2203	Same as J-2003	AC input								
J-2204	Same as J-2005	Power putput								
J-2205 thru J-2207	Same as J-2204	Power output								
J-2208 thru J-3400	Not Used									
J-3401	Same as J-2003	AC input to S-3401								
J-3402 thru J-3405	Same as J-2003	AC input to S-3402 thru S-3405								
J-3406	Connector, receptacle: 3 contacts, round female; polarized; straight; 1 7/16" lg x 1 1/2" wd x 1 1/2" h; cylindrical aluminum body w/ sq flange; molded phenolic insert; cable opening 1 5/32" OD; four 0.120" diam mtg holes on 1.156" x 1.156" mtg/c; AN 3102A-20-3S, MIL-C-5015	AC output to Bay no. 1	AN 3102A-20 -3S	N17-C-72241-2704	339	Q980-1	J-3406 thru J-3410	5		
J-3407 thru J-3410	Same as J-3406	AC output to Bay no. 2 thru Bay no. 4								
J-3411	Connector, receptacle: double T slots w/parallel blades; straight	AC receptacle		N17-C-73746-7636	93; 9575	Q722-1	J-3411	1		

RESTRICTED SECURITY INFORMATION

ORIGINAL

J-3411 (cont)	type; 2.625" lg x 1.328" wd x 1.125" d excl mtg flanges; 10 amps at 250 v, 15 amps at 125 v; rectangular bakelite box; two side mtg flanges w/clearance holes for no. 6-32 screws; side wired								
J-3412 thru J-3900	Not Used								
J-3901	Connector, receptacle: 3 round male contacts; polarized; straight; 1 3/16" sq x 1 3/16" lg max o/a; round aluminum body w/sq mtg flange; molded brown melamine insert; four mtg holes 0.120" diam on 29/32" x 29/32" mtg/c	AC input for blower motor (left side)	AN 3102A-14S-12P	N17-C-72604-1705	339	H549-1	J-3901, J-3902	5	
J-3902	Same as J-3901	AC input for blower motor (right side)							
J-3903	Connector, receptacle: 5 round female contacts; polarized; straight; 1 3/16" sq x 1 5/16" lg max o/a; round aluminum body w/sq mtg flange; sandblast finish; molded brown melamine insert; four mtg holes 0.120" diam on 29/32" x 29/32" mtg/c	Terminal box teletype input	AN 3102A-14S-5S	N17-C-72252-1135	339	P792-1	J-3903	1	
J-3904	Same as J-707	Terminal box teletype output no. 1							
J-3905	Same as J-707	Terminal box teletype output no. 2							
J-3906 thru J-4000	Not Used								
J-4001	Same as J-901	Multiconnector							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RELAYS						
K-101 thru K-1200	Not Used									
K-1201	Relay, armature: DPDT; contact rating 2 amps at 28 v DC or 115 v AC; single winding, operating current 2.3 ma, release current 0.8 ma, DC resistance 8000 ohms; solder lug term on coil and contacts; 1" sq x 1 3/4" lg excl mtg studs and term; two no. 4-40 studs on 1/2" mtg/c; shock and vibration resisting; hermetically sealed	CONS relay		N17-R-65087-5801	1111; 22RJCC -8000G	R009-16	K-1201	3	55	1
K-1202 thru K-2000	Not Used									
K-2001	Relay, armature: SPDT; normally open; contact rating 100 ma at 200 v; single winding, contacts close at 200 v DC ±5%, coil resistance 24,000 ohms, insulated coil; solder lug term; 1 3/4" sq x 3 5/32" lg o/a; mts by two no. 6-32 studs located diagonally on 1.032" x 1.032" mtg/c hermetically sealed metal case	Overvoltage trip relay		N17-R-65656-6715	1111; 5RJ	Q174-2	K-2001, K-2103	4	55	1
K-2002	Relay, armature: DPDT; contact rating 10 amps at 115 v 50-60 cyc; silver contacts 1/4" diam; single	AC input relay		N17-R-64415-6910	684; 964B	Q012-1	K-2002, K-2101 K-2201	5		

K-2002 (cont)	winding, 120 v AC operation, insulated coil; solder lug term on coil and contacts; 2 11/16" lg x 1 5/8" wd x 1 9/16" h; mts by two no. 6-32 tapped holes 2" between/c									
K-2003 thru K-2100	Not Used									
K-2101	Same as K-2002	AC input relay								
K-2102	Relay, armature: SPDT; contact rating 100 ma inductive load at 115 v AC; single winding, contacts close at 300 v DC ±8%, coil resistance 56,000 ohms, insulated coil; solder lug term; 1 3/4" sq x 3 5/32" lg o/a; mts by two no. 6-32 studs located diagonally on 1.032" x 1.032" mtg/c; hermetically sealed metal case	Overvoltage trip relay (+300 v)		N17-R-65679-6001	1111; 5RJ	Q174-1	K-2102 K-2202 K-2203	3	55	1
K-2103	Same as K-2001	Overvoltage trip relay (+210 v)								
K-2104 thru K-2200	Not Used									
K-2201	Same as K-2002	AC input relay								
K-2202	Same as K-2102	Overvoltage trip relay (+300 v)								
K-2203	Same as K-2202	Overvoltage trip relay (minus 300 v)								
			INDUCTORS							
L-101 thru L-106	Not Used									

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				INDUCTORS (continued)						
L-107	Coil, RF: parasitic suppressor: single winding, single layer wound; unshielded; inductance 0.13 microhenry; 0.655" lg x15/64" diam; wound on 100 ohm, 1/2 watt composition resistor; two axial wire leads; 7 turns no. 22E	V-108 plate choke		*	1; SA:8940	SA:8940	L-107	12		
L-108	Not Used									
L-109	Coil, RF: RF choke; single winding, single layer wound; unshielded; inductance 1.50 microhenry; 3/4" lg x 0.226" diam; bakelite form; two axial wire leads; 33 turns no. 26E	Line filter		N16-C-72536-4385*	1; SA:5109	SA:5109	L-109,L-111, L-112,L-114, L-318,L-319, L-427,L-428, L-429,L-604, L-605,L-606, L-705,L-706, L-707,L-816, L-817,L-902, L-903,L-904, L-1004, L-1005, L-1006, L-1101, L-1102, L-1103, L-1209, L-1210, L-1211, L-1301,	113		

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

L-109 (cont)							L-1302, L-1305,		
L-110	Coil, RF: RF choke; single winding, single layer wound; unshielded; inductance 0.25 microhenry; 53/64'' lg x 0.336'' diam; bakelite form; Two axial wire leads; 8 turns no. 16E	Line filter		N16-C-71944-9492*	1; SA:8131	SA:8131	L-110, L-113, L-115, L-1212, L-1213, L-1214, L-1303, L-1304	47	
L-111 thru L-115	Same as L-109	Line filter							
L-116 thru L-300	Not Used								
L-301	Transformer, RF: IF transformer two windings, 3 pie universal wound; unshielded; 6.0 microhenries/32 microhenries; DC resistance 0.24 ohms/0.72 ohms; 1st pie 20 turns; 2nd pie 13 turns; 3rd pie 43 turns; 2nd and 3rd pie continuous winding; wire size ltiz no. 15/41 SSE; 2 3/8'' lg x 0.375'' max diam; ceramic form, air core; mts in shielded can; 4 wire lead terminals 2'' lg; lacquered for tropical use; part of Z-301; for reference only	Z-301 inductor		N17-T-82067-1117	1; SA:8049	SA:8049	L-301, L-302, L-303, L-304, L-313, L-1204	18	
L-301A	Part of L-301	L-301 primary							
L-301B	Part of L-301	L-301 secondary							
L-302	Same as L-301 except part of Z-302	Z-302 inductor							
L-302A	Part of L-302	L-302 primary							

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot repaired or fabricated.

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				INDUCTORS (continued)						
L-302B	Part of L-302	L-302 secondary								
L-303	Same as L-301 except part of Z-303	Z-303 inductors								
L-303A	Part of L-303	L-303 primary								
L-303B	Part of L-303	L-303 secondary								
L-304	Same as L-301 except part of Z-304	Z-304 inductors								
L-304A	Part of L-304	L-304 primary								
L-304B	Part of L-304	L-304 secondary								
L-305	Transformer, RF: IF transformer; two winding, 4 pie universal wound; unshielded; 1st pie: 43 turns; 2nd pie: 9 turns; 3rd pie: 9 turns; 4th pie: 43 turns; 1st and 2nd pie continuous winding; 3rd and 4th continuous winding; wire size litz; no. 15/41 SSE; 2 3/8" lg x 0.375" diam; ceramic form; air core; mts in shielded can; 4 wire terminal leads, 2" lg; lac-quered for tropical use; primary and secondary 27.5 microhenries ±2%; 0.62 ohms each ±5%; part of Z-305; for reference only	Z-305 inductors		N17-T-82076-6507	1; SA:8041	SA:8041	L-305, L-306, L-307, L-308, L-312	15		
L-305A	Part of L-305	L-305 primary								
L-305B	Part of L-305	L-305 secondary								
L-306	Same as L-305; part of Z-306	Z-306 inductors								

L-306A	Part of L-306	L-306 primary								
L-306B	Part of L-306	L-306 secondary								
L-307	Same as L-305 except part of Z-307	Z-307 inductors								
L-307A	Part of L-307	L-307 primary								
L-307B	Part of L-307	L-307 secondary								
L-308	Same as L-305 except part of Z-308	Z-308 inductor								
L-308A	Part of L-308	L-308 primary								
L-308B	Part of L-308	L-308 secondary								
L-309	Coil, RF: choke; single winding; two pie universal wound; unshielded; 765 microhenries ±20% at 575 kc; 17 ohms dc ±20% 225 turns per pie; total 450 turns; no. 36 ESN wire; 5/8" lg x 0.442" max diam; molded form, air core; 5/8" lg x 3/16" diam; two 1 1/4" lg pigtail; bakelite resin varnish impregnation	V-306 cathode inductor		N16-C-74251-2182	1; SA:9134	SA:9134	L-309,L-311, L-315,L-320, L-801,L-804, L-805,L-806, L-1205	19		
L-310	Coil, VFO: 1700 kc; oscillator; single winding, single layer wound; unshielded; 48.5 microhenries at 2.5 mc, dc resistance 0.455 ohms; 48 turns, litz no. 50/41 ESN wire; 2 3/8" lg x 1 1/4" diam; ceramic form, air core; two 0.160" diam holes on 2" mtg/c, 3/16" from edge; 2 brass terminal studs on 1 1/2" mtg/c	Oscillator coil		N16-C-73535-1021	1; SA:7176	SA:7176	L-310	3		
L-311	Same as L-309	V-308 cathode inductor								
L-312	Same as L-305 except part of Z-309	Z-309 inductors								
L-312A	Part of L-312	L-312 primary								
L-312B	Part of L-312	L-312 secondary								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				INDUCTORS (continued)						
L-313	Same as L-301 except part of Z-310	Z-310 inductors								
L-313A	Part of L-313	L-313 primary								
L-313B	Part of L-313	L-313 secondary								
L-314	Coil, RF: IF transformer; single winding, 4 pie universal wound; unshielded; 225 turns per pie, litz no. 5/41 SN; 2 3/8" lg x 0.375" diam; ceramic form, air core; mts in shielded can; 2 wire lead terminals, 2" lg; lacquered for tropical use; 5000 microhenries ±5%; 38 ohms dc ±10%; part of Z-311; for reference only	V-310 plate inductor		N16-C-74896-8731	1; SA:6708	SA:6708	L-314	3		
L-315	Same as L-309	V-311 cathode inductor								
L-316	Coil, RF: choke; single winding, single layer wound; unshielded; 28 turns no. 24E wire; 3/4" lg x 0.290" OD, excl wire lead term; bakelite form; 3/4" lg x 1/4" diam; 1 1/2" lg pigtails, 2 axial wire lead term; bakelite resin varnish impregnation for tropical use	Filament RF filter		N16-C-72833-1901*	1; SA:9148	SA:9148	L-316, L-317, L-430, L-607, L-708, L-709, L-818, L-819, L-906, L-1104	25		
L-317	Same as L-316	Filament RF filter								
L-318	Same as L-109	B+ RF filter								

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L-319	Same as L-109	B minus RF filter						
L-320	Same as L-309	B+ V-310 plate filter						
L-321	Coil, RF: choke, single winding single layer wound; unshielded; 24 turns of no. 24 copper enamel wire; 0.625" lg x 0.125" diam; powered iron form; 1 1/2" axial wire leads; lacquered for tropical use; 6.5 microhenries; 0.039 ohm DC resistance	Filament RF filter		N16-C-73039-8901*	1; SA:8633	SA:8633	L-321,L-322	6
L-322	Same as L-321	Filament RF filter						
L-323 thru L-400	Not Used							
L-401A	Coil, RF: IF transformer winding; single winding universal wound, unshielded; 3.0 ohm DC resistance; 195 turns no. 7-38 SSE litz wire; 45/64" diam x 0.315" lg; wire lead terminals 1 1/2" lg; lacquered for tropical use; part of Z-403	Z-403 primary		N16-C-72668-3706	1; SA:6959	SA:6959	L-401A, L-401B, L-402A, L-402B, L-403A, L-403B, L-404A, L-404B	24
L-401B	Same as L-401A	Z-403 secondary						
L-402A	Same as L-401A except part of Z-404	Z-404 primary						
L-402B	Same as L-401A except part of Z-404	Z-404 secondary						
L-403A	Same as L-401A except part of Z-405	Z-405 primary						
L-403B	Same as L-401A except part of Z-405	Z-405 secondary						
L-404A	Same as L-401A except part of Z-406	Z-406 primary						

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				INDUCTORS (continued)						
L-404B	Same as L-401A except part of Z-406	Z-406 secondary								
L-405A	Coil, RF: IF transformer winding; single winding universal wound; unshielded; 7.7 ohms DC resistance; 300 turns no. 10-41 litz wire; 29/32" diam x 0.275" lg; wire lead terminals 2" lg; lacquered for tropical use; part of Z-407	Z-407 primary		N16-C-72669-9486	1; SA:6958	SA:6958	L-405A, L-405B, L-406A, L-406B, L-407A, L-407B, L-408A, L-408B	24		
L-405B	Same as L-405A	Z-407 secondary								
L-406A	Same as L-405A except part of Z-408	Z-408 primary								
L-406B	Same as L-405A except part of Z-408	Z-408 secondary								
L-407A	Same as L-405A except part of Z-409	Z-409 primary								
L-407B	Same as L-405A except part of Z-409	Z-409 secondary								
L-408A	Same as L-405A except part of Z-410	Z-410 primary								
L-408B	Same as L-405A except part of Z-410	Z-410 secondary								
L-409	Coil, IF transformer: two windings, 4 pie universal wound; unshielded; primary 2 pie wound w/355 and 800 turns per pie,	Z-411 inductor		N16-C-71535-2689	1; SA:7061	SA:7061	L-409, L-410, L-411, L-412, L-413, L-414, L-417, L-418	24		

L-409 (cont)	secondary 2 pie wound w/355 and 800 turns, all wound w/no. 36SSE wire; 1.078" sq x 2 3/8" lg; grade L-4 ceramic form; wire lead terminals 1 1/2" lg top lead 2 1/2" lg; lacquered for tropical use; part of Z-411									
L-409A	Part of L-409	Z-411 primary								
L-409B	Part of L-409	Z-411 secondary								
L-410	Same as L-409 except part of Z-412	Z-412 inductors								
L-410A	Part of L-410	Z-412 primary								
L-410B	Part of L-410	Z-412 secondary								
L-411	Same as L-409 except part of Z-413	Z-413 inductors								
L-411A	Part of L-411	Z-413 primary								
L-411B	Part of L-411	Z-413 secondary								
L-412	Same as L-409 except part of Z-414	Z-414 inductors								
L-412A	Part of L-412	Z-414 primary								
L-412B	Part of L-412	Z-414 secondary								
L-413	Same as L-409 except part of Z-415	Z-415 inductors								
L-413A	Part of L-413	Z-415 primary								
L-413B	Part of L-413	Z-415 secondary								
L-414	Same as L-409 except part of Z-416	Z-416 inductors								
L-414A	Part of L-414	Z-416 primary								
L-414B	Part of L-414	Z-416 secondary								
L-415	Coil, IF transformer: two windings, 4 pie univeral wound; unshielded; primary 2 pie universal wound w/535 and 620 turns per pie, secondary 2 pie univer-	Z-417 inductors		N16-C-71535-6626	1; SA:7062	SA:7062	L-415,L-416, L-419,L-420, L-423,L-424	18		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				INDUCTORS (continued)						
L-415 (cont)	sal wound w/535 and 620 turns per pie; all wound w/no. 36 SSE wire; 1.078" sq x 2 3/8" lg; grade L-4 ceramic form; wire lead terminals 1 1/2" lg, top lead 2 1/2" lg; lacquered for tropical use; part of Z-417									
L-415A	Part of L-415	Z-417 primary								
L-415B	Part of L-415	Z-417 secondary								
L-416	Same as L-415 except part of Z-418	Z-418 inductors								
L-416A	Part of L-416	Z-418 primary								
L-416B	Part of L-416	Z-418 secondary								
L-417	Same as L-409 except part of Z-419	Z-419 inductors								
L-417A	Part of L-417	Z-419 primary								
L-417B	Part of L-417	Z-419 secondary								
L-418	Same as L-409 except part of Z-420	Z-420 inductors								
L-418A	Part of L-418	Z-420 primary								
L-418B	Part of L-418	Z-420 secondary								
L-419	Same as L-415 except part of Z-421	Z-421 inductors								
L-419A	Part of L-419	Z-421 primary								
L-419B	Part of L-419	Z-421 secondary								

L-420	Same as L-415 except part of Z-422	Z-422 inductors						
L-420A	Part of L-420	Z-422 primary						
L-420B	Part of L-420	Z-422 secondary						
L-421	Coil, IF transformer: two windings 4 pie universal wound; unshielded; primary 2 pie universal wound w/645 and 600 turns per pie, secondary 2 pie universal wound w/645 and 600 turns per pie, all wound w/no. 36 SSE wire; 1.078" sq x 2 3/8" lg; grade L-4 ceramic form; wire lead terminals 1 1/2" lg top lead 2 1/2" lg; lacquered for tropical use; part of Z-423	Z-423 inductors		N16-C-71535-6251	1; SA:7063	SA:7063	L-421, L-422, L-425, L-426	12
L-421A	Part of L-421	Z-423 primary						
L-421B	Part of L-421	Z-423 secondary						
L-422	Same as L-421 except part of Z-424	Z-424 inductors						
L-422A	Part of L-422	Z-424 primary						
L-422B	Part of L-422	Z-424 secondary						
L-423	Same as L-415 except part of Z-425	Z-425 inductors						
L-423A	Part of L-423	Z-425 primary						
L-423B	Part of L-423	Z-425 secondary						
L-424	Same as L-415 except part of Z-426	Z-426 inductors						
L-424A	Part of L-424	Z-426 primary						
L-424B	Part of L-424	Z-426 secondary						
L-425	Same as L-421 except part of Z-427	Z-427 inductors						
L-425A	Part of L-425	Z-427 primary						
L-425B	Part of L-425	Z-427 secondary						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				INDUCTORS (continued)						
L-426	Same as L-421 except part of Z-428	Z-428 inductors								
L-426A	Part of L-426	Z-428 primary								
L-426B	Part of L-426	Z-428 secondary								
L-427	Same as L-109	B voltage RF filter								
L-428	Same as L-109	B minus voltage RF filter								
L-429	Same as L-109	Ground lead RF filter								
L-430	Same as L-316	Filament RF filter								
L-431	Coil, RF: choke; single winding; single layer wound; unshielded; 33 turns no. 26E wire; 3/4" lg x 0.284" OD, excl wire lead term; bakelite form, 3/4" lg x 1/4" diam; 1 1/2" lg pigtails, 2 axial wire lead term; bakelite resin varnish impregnation for tropical use	Filament RF filter		N16-C-72888-6384*	1; SA:9150	SA:9150	L-431,L-608, L-1105	9		
L-432	Coil, RF: choke; single winding, single layer wound; unshielded; 67 turns no. 32E wire; 3/4" lg x 0.266" OD, excl wire lead term; bakelite form; 3/4" lg x 1/4" diam; 1 1/2" lg pigtails, 2 axial	Filament RF filter		*	1; SA:9138	SA:9138	L-432,L-433	6		

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L-432 (cont)	wire lead term; bakelite resin varnish impregnation for tropical use									
L-433	Same as L-432	Filament RF filter								
L-434 thru L-600	Not Used									
L-601	Coil, RF: IF amplifier input; one winding, 2 pie universal wound; unshielded; 41 mh measured at 79 kc, DC resistance 183 ohms; 1100 turns per pie, total 2700 turns no. 36 SSE wire; 31/32" diam x 2 7/8" lg o/a; grade XX natural bakelite form, air core; form 0.500" OD x 2 7/8" lg; mounts vertically in shield can; 2 wire lead terminals 2" lg; lacquered for tropical use; p art of Z-602	Z-602 inductor		N16-C-75509-3085	1; SA:6459	SA:6459	L-601,L-602	6		
L-602	Same as L-601 except part of Z-603	Z-603 inductor								
L-603	Transformer, RF: detector input; two windings; 3 pie universal wound; unshielded; pri 945 turns, sec 685 turns, ter 685 turns no. 36 SSE wire; 1 1/2" lg x 1 1/4" diam overall; grade L-4 ceramic form and core; form 0.563" OD x 1 1/2" lg; mounts vertically by single no. 6-32 tapped hole; 6 wire lead terminals from windings; lacquered for tropical use; part of Z-604	Z-604 inductors		N17-T-82004-2387	1; SA:6410	SA:6410	L-603,L-701, L-901, L-1001, L-1002, L-1003	11		
L-603A	Part of L-603	Z-604 primary								
L-603B	Part of L-603	Z-604 secondary								
L-603C	Part of L-603	Z-604 tertiary								
L-604	Same as L-109	B voltage RF filter								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				INDUCTORS (continued)						
L-605	Same as L-109	B minus voltage RF filter								
L-606	Same as L-109	Ground lead RF filter								
L-607	Same as L-316	Filament RF filter								
L-608	Same as L-431	Filament RF filter								
L-609 thru L-700	Not Used									
L-701	Same as L-603; part of Z-701	Z-701 inductor								
L-701A	Part of L-701	Z-701 primary								
L-701B	Part of L-701	Z-701 secondary								
L-710C	Part of L-701	Z-701 tertiary								
L-702	Transformer, RF: oscillator; 2 windings, 6 pie universal wound, 3 pie each winding; unshielded; primary 801 turns, secondary 801 turns; no. 36SSE wire; grade L-4 ceramic form; 0.375" diam form 2 3/8" lg w/flange ends 1.078" sq; mounts in shielded can 4 wire lead terminals 2" lg; lacquered for tropical use; part of Z-704	Z-704 inductor		N17-T-81985-5828	1; SA:7272	SA:7272	L-702	3		
L-702A	Part of L-702	Z-704 primary								

L-702B	Part of L-702	Z-704 secondary								
L-703	Coil, RF: choke; single winding, 3 pie universal wound; unshielded; 10 mh, 50 ma, 30 ohms resistance; 17/32" diam x 15/16" lg excl wire lead terminals; powdered iron core form; form 0.250" diam x 7/8" lg; axial wire lead terminals 1 15/32" lg; lacquered for tropical use	V-704 cathode		N16-C-75090-1973	1; SA:7230	SA:7230	L-703	3	55	1
L-704	Coil, RF: oscillator; single winding, toroidal wound; unshielded; 16 mh ±3% at 50 kc; 1 9/16" diam x 5/8" thk; powdered iron core; mts by one hole 7/16" diam; two wire lead terminals 4" lg; part of Z-705	Z-705 inductor		N16-C-75239-1021	1; P359-2	P359-2	L-704	3		
L-705	Same as L-109	B voltage RF filter								
L-706	Same as L-109	B minus RF filter								
L-707	Same as L-109	Ground lead RF filter								
L-708	Same as L-316	Filament RF filter								
L-709	Same as L-316	Filament RF filter								
L-710 thru L-800	Not Used									
L-801	Same as L-309	V-801 cathode inductor								
L-802	Coil, RF: HF oscillator; one winding; single layer wound; unshielded; 1.59 microhenries; 10 3/4 turns of no. 24 bus wire; 1 9/16" lg x 3/4" diam; ceramic	V-801 plate load 13 to 40 mc		N16-C-72827-8201	1; SA:7143	SA:7143	L-802, L-807	2		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				INDUCTORS (continued)						
L-802 (cont)	form air core; mtd on one end by hole threaded for no. 6-32 screw; two solder lug terminals; lacquered for tropical use									
L-803	Not Used									
L-804	Same as L-801	V-801 plate filter								
L-805	Same as L-801	V-803 cathode inductors								
L-806	Same as L-801	V-803 plate filter								
L-807	Same as L-802	V-803 plate tuning								
L-808	Not Used									
L-809	Coil, RF: oscillator; single winding, 8 pie universal wound; rectangular, aluminum shield can; 15 millihenries at 200 kc, 52.5 ohms DC res; 200 turns per pie no. 7/41 litz wire; 3 3/32" lg x 1 1/8" sq excl mtg studs; grade L-4 ceramic form, w/powderediron core; adjustable iron cores; screwdriver adjustment through top and bottom of can; mtd by two no. 6-32 mtg studs located diagonally on 1.125" mtg/c; 2 solder lug terminals on bottom; coil lacquered for tropical use	V-805 200 kc tuning		N16-C-76778-6541	1; SA:8159	SA:8159	L-809, L-810	2	55	1
L-809A	Part of L-809	L-809 inductor								
L-809B	Part of L-809	L-809 inductor								

L-810	Same as L-809	V-805 200 kc tuning								
L-810A	Part of L-810	L-810 inductor								
L-810B	Part of L-810	L-810 inductor								
L-811	Coil, RF: peaking; single winding; single layer wound; unshielded; 2.7 microhenries 0.062 ohms; 14 turns of no. 28 DN wire; 0.625" lg x 0.250" diam excl wire lead terminals; powdered iron form; mtd by axial wire lead 1 1/2" lg; lacquered for tropical use	V-806 plate inductor		N16-C-72895-4263	1; SA:8634	SA:8634	L-811	1	55	1
L-812	Coil, RF: heater choke; single winding, single layer wound, unshielded; 12.5 microhenries, 0.136 ohms, 35 turns of no. 28 DN wire; 0.625" lg x 0.250" diam excl wire lead terminals; powdered iron form; mtd by axial wire lead 1 1/2" lg; lacquered for tropical use	V-801, V-802 filament RF filter		N16-C-73171-6221*	1; SA:8425	SA:8425	L-812, L-813, L-814, L-815	4		
L-813	Same as L-812	V-803, V-804 filament RF filter								
L-814	Same as L-812	V-803, V-804 filament RF filter								
L-815	Same as L-812	V-801, V-802 filament RF filter								
L-816	Same as L-109	B+ RF filter								
L-817	Same as L-109	B minus RF filter								
L-818	Same as L-316	Filament RF filter								
L-819	Same as L-316	Filament RF filter								

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				INDUCTORS (continued)						
L-820 thru L-900	Not Used									
L-901	Same as L-603; part of Z-901	Z-901 inductors								
L-901A	Part of L-901	Z-901 primary								
L-901B	Part of L-901	Z-901 secondary								
L-901C	Part of L-901	Z-901 tertiary								
L-902	Same as L-109	B voltage RF filter								
L-903	Same as L-109	B minus RF filter								
L-904	Same as L-109	Ground lead RF filter								
L-905	Coil, RF: choke; single winding; single layer wound; unshielded; 43 turns no. 28E wire; 3/4" lg x 0.276" OD, excl wire lead term; bakelite form; 3/4" lg x 1/4" diam; 1 1/2" lg pigtails, 2 axial wire lead term; bakelite resin varnish impregnation for tropical use	Filament RF filter		N16-C-72969-4508*	1; SA:9151	SA:9151	L-905	2		
L-906	Same as L-316	Filament RF filter								
L-907 thru L-1000	Not Used									

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L-1001	Same as L-603 except part of Z-1001	Z-1001 inductors						
L-1001A	Part of L-1001	Z-1001 primary						
L-1001B	Part of L-1001	Z-1001 secondary						
L-1001C	Part of L-1001	Z-1001 tertiary						
L-1002	Same as L-603 except part of Z-1002	Z-1002 inductors						
L-1002A	Part of L-1002	Z-1002 primary						
L-1002B	Part of L-1002	Z-1002 secondary						
L-1002C	Part of L-1002	Z-1002 tertiary						
L-1003	Same as L-603 except part of Z-1003	Z-1003 inductors						
L-1003A	Part of L-1003	Z-1003 primary						
L-1003B	Part of L-1003	Z-1003 secondary						
L-1003C	Part of L-1003	Z-1003 tertiary						
L-1004	Same as L-109	B voltage RF filter						
L-1005	Same as L-109	B minus voltage RF filter						
L-1006	Same as L-109	Ground lead RF filter						
L-1007	Coil, RF: choke; single winding; single layer wound; unshielded; 24 turns no. 22E wire; 0.336" diam x 53/64" lg excl wire lead terminals; grade xx natural bakelite; form 1/4" diam x 53/64" lg; terminal mtd axial wire lead terminals 3/4" lg; lacquered for tropical use	Filament RF filter		*	1; SA:9147	SA:9147	L-1007, L-1008	2
L-1008	Same as L-1007	Filament RF filter						

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				INDUCTORS (continued)						
L-1009 thru L-1100	Not Used									
L-1101	Same as L-109	B+ RF filter								
L-1102	Same as L-109	B minus RF filter								
L-1103	Same as L-109	Ground lead RF filter								
L-1104	Same as L-316	Filament RF filter								
L-1105	Same as L-431	Filament RF filter								
L-1106 thru L-1200	Not Used									
L-1201	Not Used									
L-1202	Transformer, RF: two windings, toroidal wound; unshielded; 1 7/16" o/a diam x 5/8" thk; mts by 7/16" diam center hole, 4 wire lead terminals 5" lg; impregnated for tropical use; part of Z-1201	Z-1201 inductors		N17-T-82003-6651	1; P748-2	P748-2	L-1202, L-1203	6		
L-1202A	Part of L-1202	Z-1201 primary								
L-1202B	Part of L-1202	Z-1201 secondary								
L-1203	Same as L-1202 except part of Z-1202	Z-1202 inductors								

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L-1203A	Part of L-1203	Z-1202 primary					
L-1203B	Part of L-1203	Z-1202 secondary					
L-1204	Same as L-301 except part of Z-1206	Z-1206 inductors					
L-1204A	Part of L-1204	Z-1206 primary					
L-1204B	Part of L-1204	Z-1206 secondary					
L-1205	Same as L-309	V-1208 oscillator reactance					
L-1206	Coil, RF: oscillator; single winding, universal wound; unshielded; 51 1/2 turns no. 10/44 SSE wire; 0.350" diam x 0.450" lg; powdered iron core; form 0.145" diam x 0.450" lg; two wire lead terminals 1 1/4" lg; impregnated for tropical use; part of Z-1203	Z-1203 inductor		N16-C-73435-1001	1; SA:7149	SA:7149	L-1206	3
L-1207	Coil, RF: choke; single winding, single layer wound; unshielded; 42 turns no. 30E wire; 0.291" diam x 3/4" lg excl wire lead terminals; bakelite form; two axial wire lead terminals 1 1/2" lg; varnished for tropical use	Filament RF filter		N16-C-72986-5021*	1; SA:9164	SA:9164	L-1207, L-1208	6
L-1208	Same as L-1207	Filament RF filter						
L-1209	Same as L-109	B+ voltage RF filter						
L-1210	Same as L-109	B minus voltage RF filter						
L-1211	Same as L-109	Ground lead RF filter						
L-1212	Same as L-110	Filament RF filter						

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				INDUCTORS (continued)						
L-1213	Same as L-110	Filament CT RF filter								
L-1214	Same as L-110	Filament RF filter								
L-1215 thru L-1300	Not Used									
L-1301	Same as L-109	Ground lead RF filter								
L-1302	Same as L-109	B+ lead RF filter								
L-1303	Same as L-110	Filament RF filter								
L-1304	Same as L-110	Filament RF filter								
L-1305	Same as L-109	B minus RF filter								
L-1306 thru L-2000	Not Used									
L-2001	Reactor: filter choke; single section; 1.76 henry at 380 ma, max current 450 ma; 23 ohms DC resistance; 1500 V RMS; hermetically sealed metal case; 4 1/8" lg x 3 1/4" diam excl terminals; mts by four 0.194" diam holes on flange on 2.687" x 2.687" mtg/c; two solder lug terminals on standoff in-	Power supply filter choke		N16-R-28982-4415	123	P808-1	L-2001, L-2102, L-2201	5	55	1

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L-2001 (cont)	sulators within 5/8" x 1 3/8" area on bottom									
L-2002	Reactor: filter choke; single section; 8 henrys at 100 ma; 220 ohms DC resistance; 1500 V RMS; hermetically sealed metal case; 2 7/8" lg x 2 1/2" diam excl terminals; mts by four 0.169" diam holes on flange on 1.812" x 1.812" mtg/c; two solder lug terminals on standoff insulators within 5/8" x 1 3/8" area on bottom	Power supply filter choke			123	P809-1	L-2002, L-2101, L-2202	5	55	1
L-2003 thru L-2100	Not Used									
L-2101	Same as L-2002	Power supply filter choke								
L-2102	Same as L-2001	Power supply filter choke								
L-2103 thru L-2200	Not Used									
L-2201	Same as L-2001	Power supply filter choke								
L-2202	Same as L-2002	Power supply filter choke								
			METERS							
M-101 thru M-600	Not Used									
M-601	Meter, ammeter: DC; 0 to 3.0 ma; JAN-I-6 spec	2nd IF level	MR26W003DCMA		4	R081-1	M-601, M-1001	4		
M-602 thru M-800	Not Used									

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				METERS (continued)						
M-801	Meter: DC microammeter; range 0 to 500 microamperes; JAN-I-6 spec	Tuning meter A	MR26W500DCUA	N17-M-19167-5600	4	R081-2	M-801,M-802	2		
M-802	Same as M-801	Tuning meter B								
M-803 thru M-1000	Not Used									
M-1001	Same as M-601	Diversity level								
				NAME PLATES						
N-101[1]	Scale: projection dial; picture quality glass; round disk shape; 5 1/4" diam x 5/64" thk o/a; mts by single 2.250" diam center mtg hole; marked in KC from 15640 KC to 32420 KC	Projection dial scale		N16-S-117101-624	1287	P547-1	N-101[1]	3		
N-101[2]	Dial: projection dial; picture quality glass; round disk shape; 5 1/4" diam x 5/64" thk o/a; mts by single 2.250" diam center mtg hole; marked in KC from 7820 KC to 1622 KC	Projection dial scale		N16-S-117101-658	1287	P547-2	N-101[2]	3		
N-101[3]	Dial: projection dial; p icture quality glass; round disk shape; 5 1/4" diam x 5/64" thk o/a; mts by single 2.250" diam center mtg	Projection dial scale		N16-S-117101-659	1287	P547-3	N-101[3]	3		

1 Used on AM-452/FRR-24 only
2 Used on AM-453/FRR-24 only

N-101[3] (cont)	hole; marked in KC from 3915 KC to 8105 KC									
N-101[4]	Dial: projection dial; picture quality glass; round disk shape; 5 1/4" diam x 5/64" thk o/a; mts by single 2.250" diam center mtg hole; marked in KC from 1954 KC to 4054 KC	Projection dial scale		N16-S-117101-660	1287	P547-4	N-101[4]	3		
N-102[1]	Dial: drum dial for AM-452/FRR-24; round shape; 6.00" x 1.030" wd o/a; single 0.251" diam axial mtg hole; marked with frequency in KC on translucent scale, freq in MC on drum face	Tuning dial		N16-S-117101-675	1; SA;8181	SA;8181	N-102[1]	3		
N-102[2]	Dial: drum dial for AM-453/FRR-24; round shape; 6.00" diam x 1.030" wd o/a; single 0.251" diam axial mtg hole; marked with frequency in KC on translucent scale freq in MC on drum face	Tuning dial		N16-S-117101-677	1; SA:7167	SA:7167	N-102[2]	3		
N-102[3]	Dial: drum dial for AM-451/FRR-24; round shape; 6.00" diam x 1.030" wd o/a; single 0.251" diam axial mtg hole; marked with frequency in KC on translucent scale, freq in MC on drum face	Tuning dial		N16-S-117101-678	1; SA:7170	SA:7170	N-102[3]	3		
N-102[4]	Dial: drum dial for AM-450/FRR-24; round shape; 6.00 diam x 1.030" wd o/a; single 0.251" diam axial mtg hole; marked with frequency in KC on translucent scale, freq in MC on drum face	Tuning dial		N16-S-117101-676	1; SA:7173	SA:7173	N-102[4]	3		

1 Used on AM-452/FRR-24 only
2 Used on AM-453/FRR-24 only
3 Used on AM-451/FRR-24 only
4 Used on AM-450/FRR-24 only

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	NAVAL
	NAME PLATES (continued)									
N-103	Not Used									
N-104	Scale: logging dial; aluminum, satin polished dial plate w/cad plated brass hub; round disk shape; 2 1/4" diam x 27/64" thk; incl hub; marked from 0 to 100 thru 360°; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Logging dial		N16-S-117101-625	1; SA:8180	SA:8180	N-104	12		
N-105 thru N-302	Not Used									
N-303	Scale, frequency indicator: circular disc; aluminum; 2 9/16" diam o/a 0.060" thk; one scale with ±0.5 kc graduations, range 0 to ±3.5 kcs; three 0.128" diam tapped holes spaced 120° apart on 1" diam pitch circle	Second Conversion VFO scale		N16-S-117101-416	62	P171-3	N-303	3		
N-304 thru N-803	Not Used									
N-804	Scale: frequency calibration; circular shape, 2 7/8" OD x 0.062" thk w/11/16" inside diam hole; contains two calibration scales, inner scale calibrated from 2 to 11 mc in 1 mc divisions, outer scale calibrated from 11 to 40 mc in 1 mc divisions; mts by three 0.128"	Tuning A dial scale		N16-S-117101-522	62	P958-2	N-804, N-805	2		

N-804 (cont)	diam counter sunk holes 120° apart on 1" diam pitch circle									
N-805	Same as N-804	Tuning B dial scale								
N-806 thru N-1103	Not Used									
N-1104	Scale, frequency indicator: circular disc; aluminum; 2 9/16" o/a diam; one scale w/range 400 to 5000 cycles; three 0.128" diam holes spaced 120° apart on 1" diam pitch circle	Variable Frequency scale		N16-S-117101-448	62	P171-2	N-1104	3		
N-1105 thru N-1201	Not Used									
N-1202	Scale: indicates frequency on arbitrary scale; circular aluminum disc 2 9/16" diam x 0.060" thk; linear calibration of 5-0-5 on 180° rotation; three 0.128" diam holes spaced 120° apart on 1" diam pitch circle	Fine tuning dial scale		N16-S-117101-632	62	P171-4	N-1202	3		
N-1203 thru N-1500	Not Used									
N-1501	Card, designation: index board, semigloss finish; white; 11 13/16" lg x 5/8" wd x 0.010" thk; characters printed in black	Panel jacks identification card, top		N16-C-152601-110+	506	Q085-10	N-1501	1	55	10
N-1502	Card, designation: index board, semigloss finish; white; 11 13/16" lg x 5/8" wd x 0.010" thk; characters printed in black	Panel jacks identification card, center		N16-C-152601-111+	506	Q085-11	N-1502	1	55	10

+ When equipment spares are expended, do not request replacement. This item should be fabricated if additional parts are required.

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				NAME PLATES (continued)						
N-1503	Card, designation: index board, semigloss finish; white; 11 13/16" lg x 5/8" wd x 0.010" thk; characters printed in black	Panel jacks identification card, bottom		N16-C-152601-101+	506	Q085-12	N-1503	1	55	10
N-1504 thru N-1600	Not Used									
N-1601	Card, designation: index board, semigloss finish; white; 11 13-16" lg x 5/8" wd x 0.010" thk; characters printed in black	Panel jacks identification card, top		N16-C-152601-109+	506	Q085-1	N-1601	1	55	10
N-1602	Card, designation: index board, semigloss finish; white; 11 13/16" lg x 5/8" wd x 0.010" thk; characters printed in black	Panel jacks identification card, center		N16-C-152601-108+	506	Q085-2	N-1602	1	55	10
N-1603	Card, designation: index board, semigloss finish; white; 11 13/16" lg x 5/8" wd x 0.010" thk; characters printed in black	Panel jacks identification card, bottom		N16-C-152601-105+	506	Q085-3	N-1603	1	55	10
N-1604 thru N-1700	Not Used									
N-1701	Card, designation: index board, semigloss finish; white; 11 13/16" lg x 5/8" wd x 0.010" thk; characters printed in black	Panel jacks identification card, top		N16-C-152601-104+	506	Q085-7	N-1701	1	55	10

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N-1702	Card, designation: index board, semigloss finish; white; 11 13/16" lg x 5/8" wd x 0.010" thk; characters printed in black	Panel jacks identification card, center	N16-C-152601-103+	506	Q085-8	N-1702	1	55	10
N-1703	Card, designation: index board, semigloss finish; white; 11 13/16" lg x 5/8" wd x 0.010" thk; characters printed in black	Panel jacks identification card, bottom	N16-C-152601-102+	506	Q085-9	N-1703	1	55	10
N-1704 thru N-1800	Not Used								
N-1801	Card, designation: index board, semigloss finish; white; 11 13/16" lg x 5/8" wd x 0.010" thk; characters printed in black	Panel jacks identification card, top	N16-C-152601-107+	506	Q087-1	N-1801	1	55	10
N-1802	Card, designation: index board, semigloss finish; white 11 13/16" lg x 5/8" wd x 0.010" thk; characters printed in black	Panel jacks identification card, bottom	N16-C-152601-106+	506	Q087-2	N-1802	1	55	10
N-1803 thru N-3400	Not Used								
N-3401	Plate, identification: control identification; aluminum; 13" lg x 6 3/8" wd x 0.032" thk; inscribed: Power Distribution Panel SB-141/FFR-24, AC Power, Bay No. 1, Bay No. 2, Bay No. 3, Bay No. 4 - Top, Bay No. 4 - Bottom, Caution, Disconnect Plugs in Back Before Pulling Out This Unit, AC Outlet Fuses, Spare, AC Outlet Pilot, AC Outlet; black characters and border on gray background; ten 0.128" diam mtg	Front panel plate for Power Distribution Panel SB-141/FRR-24	N16-P-403501-647	62	P815-5	N-3401	1		

+ When equipment spares are expended, do not request replacement. This item should be fabricated if additional parts are required.

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	OAN
				NAME PLATES (continued)						
N-3401 (cont)	holes on 12.750" x 6.125" rectangular pattern irregularly spaced about a vertical center line; contains cutouts peculiar to National Company part/dwg P815-5									
N-3402 thru N-3901	Not Used									
N-3902	Plate, identification: 1/32" aluminum; 2" lg x 1" wd x 1/32" thk; inscribed; "2"; polished character on black background; two 0.156" diam holes on 1 1/2" mtg/c	Cabinet no. 2 identification plate		N16-P-403501-677	62	Q293-2	N-3902	1		
N-3903	Plate, identification: 1/32" aluminum; 2" lg x 1" wd x 1/32" thk; inscribed: "3"; polished character on black background; two 0.156" diam holes on 1 1/2" mtg/c	Cabinet no. 3 identification plate		N16-P-403501-676	62	Q293-3	N-3903	1		
N-3904	Plate, identification: 1/32" aluminum; 2" lg x 1 "wd x 1/32" thk; inscribed: "4"; polished character on black background; two 0.156" diam holes on 1 1/2" mtg/c	Cabinet no. 4 identification plate		N16-P-403501-675	62	Q293-4	N-3904	1		
				MECHANICAL PARTS						
O-101	Gear: worm type; carbon steel, cad plated; dial assembly driving; hel-	Dial driving			212	P143-2	O-101	12		

O-101 (cont)	ical teeth; left hand; 4 teeth; 32 pitch, 0.385" pitch diam; 0.447" diam x 6.0" lg o/a									
O-102	Gear: worm type; carbon steel, cad plated; dial assembly driving; helical teeth; right hand; 4 teeth; 32 pitch, 0.385" pitch diam; 0.447" diam x 3.625" lg o/a	Dial driving			212	P143-3	O-102	12		
O-103	Not Used									
O-104	Gear: spur type; phosphor bronze, cad plated; dial mechanism driving; helical teeth; RH; 36 teeth; 64 pitch; 0.600" pitch diam; 2" diam x 1.874" lg; straight face; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Dial mechanism driving			1; SA:8811	SA:8811	O-104	12		
O-105	Plug, machine thread: trimmer access plug; cad plated brass; 19/32" lg x 3/8" diam to 5/8" diam x 0.080" thk shoulder, hex head 9/16" across flats; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Trimmer access plug		*	1; SA:8680	SA:8680	O-105	36		
O-106	Gear: spur type; cad plated phosphor bronze; capacitor driving; straight teeth; 24 teeth; 48 pitch 0.500" pitch diam; 9/16" OD, 1/8" thk w/1 1/16" lg x 0.187" diam shaft; straight face	Drives projection dial pointer		N16-G-431376-521	1; SA:7392	SA:7392	O-106	12		
O-107	Spring: flat type; for capacitor shaft coupling; berylco no. 25 heat treated 1" lg x 1/4" wd x 0.032" thk o/a; two 0.043" diam mtg holes on 0.218" mtg/c	Capacitor shaft coupler spring		*	1; Q078-1	Q078-1	O-107	12		
O-108	Shaft, stop: capacitor shaft drive stop; cad plated brass; 1 15/16"	Dial mechanism stop shaft		N16-S-686141-102	1; SA:6948	SA:6948	O-108	12	55	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-108 (cont)	lg x 1/4" diam w/13/16" diam disk 1 1/32" from one end									
O-109	Washer, stop: C R steel cad plated; rounded w/fan shaped projection, 23/32" lg x 1/2" diam x 0.102" thk o/a; has 0.040" extruded stop pin	Dial shaft stop washer		N16-W-182501-103	1; P149-1	P149-1	O-109	144	55	12
O-110	Stop, dial: dial drive mechanism stop; cad plated C R steel; irregular shape; 3/4" h x 27/32" wd x 0.062" thk o/a; single 0.255" mtg hole	Dial shaft stop arm		N16-S-685341-110	1; P151-1	P151-1	O-110	12	55	1
O-111	Coupling, flexible: tuning shaft coupling; assembly consists of 2 hubs and spiders riveted to 1 1/16" diam brass disk; assembly nickel plated, brass; 1 1/16" diam x 3/4" lg o/a; hubs bored 1/4" ea end w/two no. 6-32 set screws on 90° angle each end	Dial drive shaft coupling		N17-C-98378-4005	1; SA:6176	SA:6176	O-111, O-204, P-403, O-708, O-806, O-905, O-1006	38		
O-112	Bushing: bearing for capacitor shaft; nickel plated brass; 1.00" lg x 3/8" diam; 0.435" -27 thd 7-16" lg; 3 3/32" thk hex head 5/8" across flats	Ant. Trimmer shaft bearing		N16-B-800199-871*	1; Q916-2	Q916-2	O-112	12		
O-113	Clamp, tube: electron tube clamp; stainless steel; 3/4" h x 1 1/4"	R141 clamp		N16-C-300798-621	296	F892-1	O-113	12		

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O-113 (cont)	ID, mts by single hole for no. 6-32 screw located 60° from tension loop, 115° from hinge on 27/32" radius; standard 1 1/4" tube base										
O-114	Bezel: dial window bezel; cast aluminum; rectangular shape; 4" lg x 1 3/8" wd x 7/32" thk o/a; mounts by four 0.140" diam mtg holes on 3.562" x 0.750" mtg/c	Dial window bezel		N16-B-300001-145	1; Q100-2	Q100-2	O-114	12			
O-115	Bezel: dial window bezel; cast aluminum; rectangular shape w/rounded ends; 2 5/8" lg x 1 3/8" wd x 1/4" thk o/a; mounts by two 9/32" x 3/32" slots on 2.187" mtg/c	Dial window bezel		N16-B-300001-146	1; Q103-2	Q103-2	O-115	12			
O-116	Clip, electrical: retainer type; for 9/16" diam cartridge fuse; nickel plated phosphor bronze; 1 3/16" lg x 5/8" wd x 19/32" thk o/a; mounts by single 0.203" mtg hole on/c	Spare optical lamp holder			76	L482-2	O-116	12			
O-117+	Seal, dust: neoprene; rectangular shape; 13/16" lg x 5/16" wd x 1/16" thk; contains a rectangular hole, 7/16" lg x 3/32" wd	Dust seal between panel and tilt control rod		N16-S-150053-107*	1156	Q004-1	O-117	78			
O-118	Latch, fastener: stainless steel; flat with two 60° bends; 2.260" lg x 9/32" wd x 0.598" h; single 0.127" diam mtg hole	Panel release Latch (left side)		N16-L-150001-140	1; P488-1	P488-1	O-118	49	55	1	

\+ Used on AM-450, 1, 2, 3/FRR-24, SB-142/FRR-24, CV-126/FRR-24, F-99/FRR-24, AM-454/FRR-24, AM-439/FRR-24, O-131/FRR-24, AM-440/FRR-24, AM-438/FRR-24, KY-62/FRR-24, CV-127/FRR-24, CM-32/FRR-24, Tool Box.

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-119	Latch, fastener: stainless steel; flat with two 60° bends; 2.260" lg x 9/32" wd x 0.598" h; single 0.127" diam mtg hole	Panel release latch (right side)		N16-L-150001-138	1; P488-2	P488-2	O-119	49	55	1
O-120	Guide, latch: stainless steel; L shape; 1" lg x 3/8" wd x 1" h; two 0.286" diam csk holes on 0.437" mtg/c; contains a rectangular hole, 0.750" lg x 0.109" wd	Guide for panel release latch (left side)		N16-G-934201-102	1; P487-1	P487-1	O-120	49	55	1
O-121	Guide, latch: stainless steel; L shape; 1" lg x 3/8" wd x 1" h; two 0.286" diam csk holes on 0.437" mtg/c; contains a rectangular hole, 0.750" lg x 0.109" wd	Guide for panel release latch (right side)		N16-G-934201-103	1; P487-2	P487-2	O-121	49	55	1
O-122	Spring: flat type; 0.020" beryllium copper, cadmium plated; 1.165" lg x 3/32" wd x 0.571" h; one terminal bent on 1/32" radius; hook shape	Spring for panel release latch		N17-S-46768-2501*	1; P484-1	P484-1	O-122	98		
O-123+	Lever: nickel plated brass; Z shape; 5 7/64" lg x 1 9/32" wd x 3/8" h; one 0.187" diam mtg hole; surface on one end knurled	Controls chassis tilt latch		N16-L-300001-134*	1; P495-1	P495-1	O-123	78		
O-124+	Latch, lever: consists of latch and bearing bracket; stainless steel; 2 1/64" lg x 0.484" wd x 1.608" h; two mtg holes, one hole	Latch for chassis tilt (left side)			1; SA:7362	SA:7362	O-124	39	55	1

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O-124+ (cont)	0.187" diam, other hole 0.203" diam, on 1.390" mtg/c									
O-125+	Latch, lever: consists of latch and bearing bracket; stainless steel; 2 1/64" lg x 0.484" wd x 1.608" h; two mtg holes, one hole 0.203" diam, other hole 0.187" diam on 1.390" mtg/c	Latch for chassis tilt (right side)			1; SA:7363	SA:7363	O-125	39	55	1
O-126+	Pin, straight: stainless steel; round; 5/16" lg x 1/4" diam	Connecting pin for control rod and chassis tilt latch		N42-P-99500-82*	665	P497-1	O-126	78		
O-127+	Spring, helical extension type; 0.033" diam stainless steel wire; 1.160" lg x 0.220" diam; 17 turns parallel hook terminals; terminals bent on 5/64" radius, located on 1 3/32" mtg/c	Supplies tension to chassis tilt latch		N17-S-46725-3101	1334	P746-1	O-127	78	55	1
O-128	Washer, flat: stainless steel; round; 0.812" ID, 1 5/8" OD, 0.0239" thk	Washer for chassis tilt bearing		N43-W-7624-895	30	P526-1	O-128	98		
O-129	Eccentric: stainless steel; hexagon shape; 3/4" hex, 5/32" thk	Eccentric bearing for chassis tilt		N16-E-300113-551	1375	Q501-1	O-129	98	55	1
O-130	Ball, bearing: stainless steel, spherical; 0.250" diam overall	Slider ball bearing		N77-B-999-75016-0200	1270	H613-4	O-130	1176		
O-131	Not Used									
O-132	Catch, fastener: steel, cad plated; rectangular shape; 1 7/8" lg	Catch for chassis latch in		N16-C-200001-124	1; SA:7045	SA:7045	O-132	98	55	1

\+ Used on AM-450, 1, 2, 3/FRR-24, SB-142/FRR-24, CV-126/FRR-24, F-99/FRR-24, AM-454/FRR-24, AM-439/FRR-24, O-131/FRR-24, AM 440/FRR-24, AM-438/FRR-24, KY-62/FRR-24, CV-127/FRR-24, CM-32/FRR-24., Tool Box.

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	ONAN
				MECHANICAL PARTS (continued)						
O-132 (cont)	x 7/16" wd x 1/2" h; two slotted holes for mtg 3/8" lg x 3/16" wd, on 0.625" mtg/c	cabinet								
O-133	Stop, roller: stainless steel; rectangular shape; 0.953" lg x 21/32" wd x 0.062" thk; single 0.385" diam csk mtg hole	Slider stop in cabinet		N16-S-686021-101*	1; P745-1	P745-1	O-133	98		
O-134****	Fastener, camloc: all parts cad plated; stud 49/64" lg x 5/8" diam, receptacle 1 3/8" lg x 11/16" wd x 9/16" h; stud fits into a 0.472" diam hole, receptacle has two 0.128" diam holes on 1" mtg/c	To fasten RF filter unit to cabinet		N42-F-4546-1010	772	L207-8 and L384-1	O-134	72		
O-135	Arm, coupling arm for tuning capacitor shaft; cast phosphor bronze, cad plated; 1 1/2" lg x 1/2" wd x 1/4" thk; 1/4" mtg hole w/2 holes spaced 120° apart tapped 6-32	Capacitor shaft coupling			1; Q076-2	Q076-2	O-135	12	55	1
O-136	Arm, driver: capacitor shaft driving; 1 1/2" lg x 1/2" wd x 9/16"	Tuning capacitor shaft driving			1; SA:8915	SA:8915	O-136	12		

**** Used on AM-450, 1, 2, 3/FRR-24, CV-126/FRR-24, F-99/FRR-24, AM-454/FRR-24, AM-439/FRR-24, O-131/FRR-24, AM-440/FRR-24, AM-438/FRR-24, KY-62/FRR-24, CV-127/FRR-24, CM-32/FRR-24, Tool Box.

O-136 (cont)	thk o/a; mounts by two set screws									
O-137	Gasket: dial gasket; black neoprene; round, 3" OD x 2 1/4" ID x 0.015" thk o/a	Dial gasket		*	1156	L036-1	O-137	24		
O-138	Gasket: mirror gasket; black neoprene; no holes; rectangular, 2 1/4" lg x 1/2" wd x 0.020" thk o/a	Projection dial mirror gasket		*	1156	Q079-1	O-138	12		
O-139	Gasket: oscillator cover plate gasket; black neoprene; round shape, 5.359" ID x 5 1/2" OD x 0.070" diam o/a; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Oscillator cover p late gasket			1156	Q384-1	O-139	12	55	1
O-140	Gasket: oscillator cover plate gasket; black neoprene; round shape, 4.484" ID x 4 5/8" OD x 0.070" diam; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Oscillator cover plate gasket			1156	Q384-3	O-140	12	55	1
O-141	Gasket: dial window gasket; black neoprene; rectangular, 2 13/16" lg lg x 27/32" wd x 0.015" thk o/a	Projection dial window gasket		*	1156	L035-2	O-141	12		
O-142	Gear: spur type; carbon steel, cad plated; dial assembly driving; straight teeth; 48 teeth; pitch 48, 1.00" pitch diam; 1.041" OD x 1.093" lg o/a; straight face; 0.406" diam x 0.906" lg hub; mounts by 0.281" diam hole each end; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Dial drive gear			1337	M972-1	O-142	12		
O-143	Gear: spur type; brass, cad plated; tuning capacitor driving; straight teeth; 60 teeth; 32 pitch, 1.875" pitch diam; 1.9374" OD x 0.251" ID x 1/4" thk o/a; straight face;	Capacitor shaft drive			1; SA:8696	SA:8696	O-143	12		

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PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-143 (cont)	1/2" diam x 1/4" lg hub									
O-144	Gear: Assembly: consists of two spur type gears; straight teeth; 96 teeth; 48 pitch, 2 pitch diam; one gear 2.942" OD x 0.250" ID x 0.500" thk o/a; other gear 2.042" OD x 0.7505" ID x 0.218" thk o/a; straight face on both; anti-backlash spring; loop type for split gear loading; 0.045" type 18-8 stainless spring steel; 13/16" lg x 0.840" OD o/a; two 3/16" hook terminals w/0.070" inside rad; phosphor bronze, cad plated; 2.042" diam x 0.500" thk o/a; 0.2500" diam shaft hole; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Capacitor shaft drive		N16-G-500001-390	1; SA:6927	SA:6927	O-144	12	55	1
O-145	Gear: spur type; natural paper base bakelite; dial assembly driving; helical teeth; left hand; 144 teeth; pitch 64, 2.40" pitch diam; 2.432" OD x 0.4685" ID x 0.156" thk o/a; straight face; hub diam 0.9360" x 0.080" thk; 0.4685" diam center mounting hole; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Dial assembly drive gear			662	Q724-1	O-145	12	55	1
O-146	Gear: spur type; brass, cad plated; potentiometer driving; straight	Potentiometer drive gear and		*	662	Q582-2	O-146	36		

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ORIGINAL

O-146 (cont)	teeth; 40 teeth; 32 pitch, 1.250" pitch diam; 1.312" OD x 0.251" ID x 7/16" thk o/a; straight face; hub 1/4" lg x 1/2" diam; two no. 6-32 tapped holes 90° apart for set screw mounting	Ant. Trimmer Driving gear								
O-147	Gear: spur type; phosphor bronze; tuning capacitor shaft drive; helical teeth; RH; 80 teeth; 32 pitch, 2.644" p itch diam; 2.706" OD x 0.312" ID x 0.406" thk o/a; straight face	Capacitor shaft drive			1; SA:8693	SA:8693	O-147	12		
O-148	Gear: spur type; p hosphor bronze; tuning capacitor shaft drive; helical teeth; LH; 80 teeth; 32 pitch, 2.644" pitch diam; 2.706" OD x 0.312" ID x 0.406" thk o/a; straight face	Capacitor shaft drive			1; SA:6925	SA:6925	O-148	12		
O-149	Gear: spur type; natural paper base bakelite; potentiometer driving; straight teeth; 40 teeth; 32 pitch; 1.250" pitch diam; 1.312" OD x 0.188" ID x 0.187" thk o/a; straight face; 0.188" diam center mounting hole	Potentiometer drive gear		N16-G-431690-189	212	Q597-1	O-149	12	55	1
O-150	Gear; spur type; natural paper base bakelite; dial assembly driving; helical teeth; LH; 144 teeth; 64 pitch, 2.40" pitch diam; 2.432" OD x 0.9375" ID x 0.078" thk o/a; straight face; 0.9375" diam center mtg hole; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Dial assembly drive gear			662	Q725-1	O-150	12	55	1
O-151	Not Used									

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-152	Nut, hexagon, X1112 steel, cad plated; 5/16''-32; 3/32'' thk; 5/8'' distance between flats	Slider mechanism tilt nut		N43-N-3948-5000*	570	Q911-1	O-152	98		
O-153	Block: spacing; chassis support bracket spacer; black neoprene; rectangular shape; 1 1/2'' lg x 1'' wd x 1/16'' thk o/a	Spacer for chassis support bracket		*	1366	Q913-1	O-153	24		
O-154	Pin, cotter; cad plated brass; 1/16' diam x 1/4'' lg o/a	Latch lock retainer		N42-P-5276-115	1; E314-6	E314-6	O-154	98		
O-155	Not Used									
O-156	Pointer, indicator: dial pointer assembly; consists of dial pointer, gear rack and stop pin, National Company, Inc. part/dwg L034-4, Q067-2 and L029-1 respectively; cad plated brass rack w/black painted brass pointer; 4 3/8'' lg x 1'' h x 9/64'' thk o/a	Dial pointer		N16-P-500001-167	1; SA:7393	SA:7393	O-156	12		
O-157	Not Used									
O-158	Ring, retainer: shaft retaining ring; beryllium copper; 0.693'' diam x 0.042'' thk o/a	Oscillator capacitor drive shaft retainer		N42-R-2047-89	289	H602-123	O-158	12		

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

O-159	Ring, retainer: shaft retaining ring; spring steel, cad plated; 0.175" ID x 0.215" OD x 0.020" thk o/a	Retaining ring		N42-R-2046-1325	1; F611-8	F611-8	O-159	12	
O-160	Ring, retainer: shaft retaining ring; steel, cad plated; 0.171" ID x 0.295" OD x 0.031" thk o/a	Retaining ring			97	P491-1	O-160	122	
O-161	Ring, retainer: shaft retaining ring; beryllium copper; 0.225" diam x 0.025" thk o/a; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Retaining ring		N42-R-2047-30	289	H602-107	O-161	12	
O-162	Ring, retainer: shaft retaining ring; spring steel, cad plated; 0.232" ID x 0.294" OD x 0.031" thk o/a; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Shaft retainer		N42-R-2046-1350	1; F611-4	F611-4	O-162	12	
O-163+	Ring, retainer: shaft retaining ring; beryllium copper; 0.225" diam x 0.025" thk o/a	Shaft retainer		N42-R-56566-2199	289	H602-7	O-163,O-216	38	
O-164	Gasket; tuning capacitor shaft gasket; neoprene w/monel seat; round 31/32" OD x 0.437" ID x 1/4" thk o/a; for reference only	Oscillator compartment tuning capacitor gasket			1356	L585-2	O-164	12	
O-165	Seal, bearing: oscillator capacitor shaft seal; 13/16" lg x 31/32" diam o/a; for reference only	Oscillator compartment tuning capacitor shaft seal			1356	L585-1	O-165	12	
O-166	Not Used								
O-167	Spring: helical compression type; for mirror positioning screw ten-	Mirror adjusting screw tension		*	1334	M110-1	O-167	12	

\+ Used on AM-450, 1, 2, 3/FRR-24, SB-142/FRR-24, CV-126/FRR-24, F-99/FRR-24, AM-454/FRR-24, AM-439/FRR-24, O-131/FRR-24, AM-440/FRR-24, AM-438/FRR-24, KY-62/FRR-24, CV-127/FRR-24, CM-32/FRR-24, Tool Box.

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	MECHANICAL PARTS (continued)									
O-167 (cont)	sion; 0.030" diam stainless steel wire; 0.312" lg x 0.155" diam o/a; 5 1/2 turns; 3/4 dead loop on ends									
O-168	Spring: loop type; for split gear loading; 0.050" stainless steel 1.962" lg x 0.874" wd o/a; terminals bent on 0.070" radius	Anti-backlash gear loading		*	24	P159-1	O-168	24		
O-169	Not Used									
O-170	Spring: helical extension type; for split gear loading; 0.023" diam stainless spring wire; 17/32" lg x 3/16" diam o/a; 7 1/2 turns; parallel hook terminals; terminals bent on 0.062" radius located on 11/32" mtg/c; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	Anti-backlash gear loading			233	H922-1	O-170	24	55	4
O-171	Glass: dial window; cellulose acetate, clear polish; rectangular shape; 1 3/4" lg x 1 1/8" wd x 1/16" thk o/a; two 0.125" diam mtg holes csk 0.218" diam x 82° on 1 1/2" mtg/c; marked w/hairline and dial separation marker	Tuning dial window		*	1376	Q104-1	O-171	12		
O-172	Washer, lock: stainless steel; round; 5/16" ID x 19/32" OD x 0.030" thk o/a; shake-proof type	Lock washer		N43-W-6813-580	42	H511-10	O-172	98		

* Not furnished as a maintence part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

O-172 (cont)	external teeth							
O-173	Washer, flat: brass nickel plated; round; 0.313" ID x 3/4" OD x 0.031" thk o/a	Washer	N43-W-3045-598	1; H284-122	H284-122	O-173	98	
O-174	Washer, flat: brass, nickel plated; round; 0.140" ID x 1/4" OD x 0.015" thk o/a	Washer	N43-W-3045-26	1; H284-144	H284-144	O-174	98	
O-175+	Washer, spring: phosphor bronze; cad plated, round, 3/16" ID x 3/8" OD x 0.008" thk o/a	Washer	N43-W-5740-268	42; 3502-10 -1	H974-1	O-175	78	
O-176****	Handle: equipment lock-release-tilt handle, right hand; exterior finish dull nickel plate; 4 29/32" lg x 2 31/32" wd o/a; mts by two no 10-32 tapped mtg holes on 3.312" mtg/c; contains locking and tilting mechanism	Right hand equipment handle		1; SA:7207	SA:7207	O-176	45	
O-177****	Handle, equipment lock-release-tilt handle, left hand; exterior finish dull nickel plate; 4 29/32" lg x 2 31/32" wd o/a; mts by two no. 10-32 tap ped mtg holes on 3.312" mtg/c; contains locking and tilting mechanism	Left hand equipment handle		1; SA:7206	SA:7206	O-177	45	
O-178**	Slide assembly, index: chassis tilt index, right hand; consists of slide spring release; 8 7/8" lg x 3" wd o/a; has 5/16" -32 thd on tilt bearing for mounting; includes	Chassis tilt mechanism right hand	N16-S-469501-120	1; SA:7205	SA:7205	O-178	44	

\+ Used on AM-450, 1, 2, 3/FRR-24, SB-142/FRR-24, CV-126/FRR-24, F-99/FRR-24, AM-454/FRR-24, AM-439/FRR-24, O-131/FRR-24, AM-440/FRR-24, AM-438/FRR-24, KY-62/FRR-24, CV-127-FRR-24, CM-32/FRR-24, and Tool Box.

**** Used on AM-450, 1, 2, 3/FRR-24, CV-126/FRR-24, F-99/FRR-24, AM-454/FRR-24, AM-439/FRR-24, O-131/FRR-24, AM-440/FRR-24, AM-438/FRR-24, KY-62/FRR-24, CV-127/FRR-24, CM-32/FRR-24, SB-138/FRR-24, SB-140/FRR-24, SB-169-FRR-24, SB-143/FRR-24, PP-590/FRR-24, PP-649/FRR-24, PP-648/FRR-24, Tool Box.

** Used on AM-450, 1, 2, 3/FRR-24, SB-142/FRR-24, CV-126/FRR-24, F-99/FRR-24, AM-454/FRR-24, AM-439/FRR-24, O-131/FRR-24, AM-440/FRR-24, AM-438/FRR-24, KY-62/FRR-24, CV-127/FRR-24, CM-32/FRR-24, SB-138/FRR-24, SB-140/FRR-24, SB-169/FRR-24, SB-143/FRR-24, SB-141/FRR-24, Tool Box.

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-178** (cont)	O-160									
O-179**	Slide assembly; index: chassis tilt index, left hand; consists of slide spring release; 8 7/8" lg x 3" wd o/a; has 5/16" -32 thd on tilt bearing for mounting: includes O-160	Chassis tilt mechanism left hand			1; SA:7204	SA:7204	O-179	44		
O-180	Slide assembly, drawer: equipment slide mechanism, left hand; rectangular 11 7/8" lg x 3 3/8" wd o/a; includes O-130	Chassis slide mechanism left hand			1; SA:7203	SA:7203	O-180	49		
O-181	Slide assembly, drawer: equipment slide mechanism, right hand; rectangular 11 7/8" lg x 3 3/8" wd o/a includes O-130	Chassis slide mechanism right hand			1; SA:7202	SA:7202	O-181	49		
O-182 thru O-200	Not Used									
O-201	Not Used									
O-202	Shaft; rotary switch: brass, cad plated; round w/2 parallel full length flats; 6 1/2" lg x 0.248" diam x 0.185" across flats	S-201 rotary shafts		N17-S-37027-9151*	1; M979-8	M979-8	O-202	6		

** Used on AM-450, 1, 2, 3/FRR-24, SB-142/FRR-24, CV-126/FRR-24, F-99/FRR-24, AM-454/FRR-24, AM-439/FRR-24, O-131/FRR-24, AM-440/FRR-24, AM-438/FRR-34, KY-62/FRR-24, CV-127/FRR-24, CM-32/FRR-24, SB-138/FRR-24, SB-140/FRR-24, SB-169-FRR-24, SB-143/FRR-24, SB-141/FRR-24, Tool Box

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

O-203	Shaft; rotary switch; brass, cad plated; round w/2 full length flats; 8 1/8" lg x 0.248" diam x 0.185" across flats	S-202 rotary shaft		N17-S-37040-6549*	1; M979-10	M979-10	O-203	3		
O-204	Same as O-111	S-201 and S-202 shaft couplings								
O-205	Shaft; extension: brass nickel plated; round w/2 right angle flats 5/16" lg at each end; 0.249" diam x 3/4" lg	S-201 extension shafts		N16-S-20881-7141*	1; P119-4	P119-4	O-205,O-805	8		
O-206	Bushing: bearing for extension shaft support; leaded brass, nickel plated; male; 1/2" across flats of hex end x 35/36" lg w/0.252" ID, 3/64" shoulder, 0.435"-27 thread	S-201 shaft bushings		N16-B-800200-580*	1; B713-18	B713-18	O-206	3		
O-207	Shaft: extension shaft: stainless steel; round; 1 11/16" lg x 1/4" diam; one end w/2 flats 120° apart x 1/2" lg, other end w/2 flats 90° apart; 2 grooves 0.028" wd x 0.609" apart	S-201 and S-202 extension shafts		N16-S-20907-4580*	1377	P961-1	O-207	6		
O-208	Detent: 4 position detent mechanism; stainless steel w/brass bushing; 2 17/32" lg x 1 33/64" wd x 1 7/8" h; single hole panel mts w/3/8"-32 threaded bushing and 13/64" lg x 1/8" diam stop	S-202 detent mechanism		N17-D-200001-115	111	P973-1	O-208	3		
O-209	Detent: 2 position detent mechanism; stainless steel w/brass bushing; 2 17/32" lg x 1 33/64" wd x 1 7/8" h; single hole panel mtg w/3/8"-32 bushing and 13/64" lg x 1/8" diam stop	S-201 detent mechanism		N17-D-200001-116	111	P974-1	O-209	3		
O-210	Gear, Band switch gear assembly: consists of spur type gear, AGMA	S-201 gear assembly		N16-G-432490-145	1; SA:7348	SA:7348	O-210	6	55	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-210 (cont)	std involute teeth; 80 teeth; 32 pitch; PD 2.500"; 1/16" thk; w/ 0.3757" bore; straight face; gear hub 1/2" diam x 1/4" lg; shoulder on one end 0.373" OD x 3/32" lg; 2.562" OD x 11/32" lg o/a; gear is brass, nickel plated; hub is brass, cad plated; 0.375" diam shaft hole									
O-211	Not Used									
O-212	Gear: spur type; brass, nickel plated; idler gear, straight teeth; 72 teeth; 32 pitch; 2.250" OD x 3/16" thk w/0.383" diam bore; straight face; hub 5/8" diam x 1/2" thk; single mtg hole 0.383" diam	C-210 idler gear		N16-G-432330-361*	1; P964-2	P964-2	O-212	3		
O-213	Bushing: sleeve; bearing for switch shaft; oilite bronze; .500" lg x 0.381" OD x 0.250" ID, 0.500" diam shoulder 0.062" wd	Switch shaft bearing			73; F310-2	L373-3	O-213	3		
O-214+	Handle: equipment handle, left hand; exterior finsh dull nickel plated; 4 29/32" lg x 2 31/32" wd o/a; mounts by two no. 10-32 tapped mtg holes on 3.312" mtg/c	Left hand equipment handle			1; SA:7589	SA:7589	O-214	4		

\+ Used on on SB-142/FRR-24 and SB-141/FRR-24

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the ttem cannot be repaired or fabricated.

O-215+	Handle: equipment handle, right hand; exterior finish dull nickel plate; 4 29/32" lg x 2 31/32" wd o/a; mounts by two no. 10-32 tapped mtg holes on 3.312" mtg/c	Right hand equipment handle		1; SA:7590	SA;7590	O-215	4
^-216	Same as O-163	Shaft retainer					
O-217 thru O-300	Not Used						
O-301	Retainer, crystal holder; base plate; brass, nickel plated; U shape; 1.155" lg x 1/2" wd x 5/16" h; single mtg hole 0.125" diam	Y-301 crystal retainer base	N16-R-501081-117	1316	K689-1	O-301, O-706, O-801	23
O-302	Clip: crystal holder; for holding crystal holder in socket; spring temper brass nickel plated; 0.937" wd x 1 1/4" lg x 0.050" h, uninsulated, 15/16" opening	Y-301 crystal holder clip	N17-C-805751-551	1; K690-1	K690-1	O-302, O-802	20
O-303	Bracket: capacitor mtg; aluminum; 1 1/4" sq x 2 7/16" lg o/a; mts by two no. 6-32 tapped holes on 3/4" mtg/c	C-338 mtg bracket	N16-M-60910-9607*	1; SA:8061	SA:8061	O-303	3
O-304	Coupling, flexible: tuning shaft coupling; assembly consists of two hubs and disc assemblies separated by 1/4" thk ceramic insulator; assembly nickel plated brass; 1 3/8" diam and 1 1/4" lg o/a; secured by two no. 6-32 set screws on 1/4" diam hole 90° apart and two no. 6-32 set screws on 5/32" diam hole 120° apart	VFO shaft coupling	N17-C-98378-1751	1; SA:8095	SA:8095	O-304	3
O-305	Shaft, assembly: extension; brass, nickel plated; round w/2 right	C-338 extension shaft	N16-S-212226-1108*	1; P119-6	P119-6	O-305	3

\+ Used only on SB-142/FRR-24 and SB-141/FRR-24

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-305 (cont)	angle flats 5/16" lg on each end; 7/8" lg x 1/4" diam									
O-306	Drive, dial: tuning dial drive; assembly consists of planet wheel, spring base; tension ring and shell; flat circular shape w/shaft extending from one side, other side has female coupling; 1 15/32" lg x 2.574" diam o/a; mounts to shaft w/2 Bristo set screws; shaft 0.1865" diam; coupling 0.437" diam w/0.252" hole	VFO dial drive control		N16-D-900411-111	1; SA:6175	SA:6175	O-306, O-809, O-1108	8		
O-307	Button, plug; cad plated steel; fits 1/2" diam hole; 17/64" lg x 21/32" diam	VFO shield button plug		N-16-B-807001-118	1; F190-5	F190-5	O-307	3		
O-308 thru O-400	Not Used									
O-401	Mounting, capacitor: flat shape; grade LTS-E3 bakelite in accordance with JAN-P-13; 1" lg x 3/4" wd x 1/4" thk; mts by two 0.125" diam holes 0.438" between mtg/c; tropicalized wax impregnated	C-500 capacitor mounting		N16-M-61072-8208*	1; P349-2	P349-2	O-401, O-1110	9		
O-402	Shaft: for rotary switch; brass cad plated; round, w/2 parallel flats	S-401A and B, S-401C and D		N16-S-21050-2641*	1; M979-6	M979-6	O-402	3		

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

O-402 (cont)	full length; 0.248" diam x 9 1/2" lg x 0.185" across flats	connecting shaft								
O-403	Same as O-111	S-401 shaft coupling								
O-404	Mounting, capacitor: non-magnetic; 3 3/16" h o/a x 49/64" wd w/2 no. 6-32 spadebolts 1/2" lg and 1 9/16" between/c; for capacitors 2 1/2" h x 1 5/16" lg x 49/64" wd excl term; "U" shape; JAN-C-25 spec	C-497 capacitor clamp	CP06SA6	N16-M-60906-8018	14	L896-3	O-404,O-601, O-702, O-1102	27		
O-405	Detent: switch detent mechanism; eight positions 30° apart, driving shaft 0.249" diam x 1/2" lg w/2 flats 90° apart, output shaft 0.249" diam x 7/16" lg w/2 parallel flats; stainless steel and/or non-magnetic metal; 1 3/4" lg x 1 33/64" wd x 1 7/8" h; mts by single hole for 3/8" -32 bushing; all non-magnetic metal parts except stainless steel plated to withstand a 200 hr 20% salt spray test in accordance with AN-QQ-S-91 spec without undue corrosion or other deleterious effects	S-401 switch detent		N17-D-200001-111	111	P327-1	O-405	3	55	1
O-406 thru O-600	Not Used									
O-601	Same as O-404	C-603,C-604, C-607,C-611, C-618,C-627 mounting								
O-602	Mounting, capacitor: non-magnetic; 1 13/16" h o/a x 49/64" wd w/2 no. 6-32 spadebolts 1/2" lg and 1 9/16" between c; for	C-614 mounting	CP06SA2	N16-M-60958-3571	14	L896-5	O-602, O-1103, O-1206, O-1303	20		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-602 (cont)	capacitors 1 3/8" h x 1 5/16" lg x 49/64" wd; "U" shape; JAN-C-25 spec						O-1304, O-2006, O-2105, O-2203, O-1369, O-1370			
O-603 thru O-700	Not Used									
O-701	Mounting, capacitor: rectangular; cast aluminum w/caustic etch finish; 3 3/8" lg x 1 1/2" wd x 3/16" thk; two 0.156" diam holes located diagonally on 1 1/8" x 3" c; w/recess 2 11/16" lg x 1 5/16" wd x 3/32"d; one large slotted hole 2 1/16" lg x 7/8" wd w/1 small slotted hole on each end for mtg capacitor	C-731 base support		N16-M-60919-6301*	1; M794-2	M794-2	O-701, O-902, O-1001, O-1205	9		
O-702	Same as O-404	O-727 mounting								
O-703	Mounting, capacitor: non-magnetic; 2 1/2" h o/a x 49/64" wd w/2 6-32 spadebolts 1/2" lg and 1 9/16" between c; for capacitors 1 5/16" lg x 49/64" wd x 2" h; "U" shape; JAN-C-25 spec	C-726 mounting	CP06SA4	N16-M-60958-3591	14	L896-1	O-703, O-1305, O-1306	5		

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

O-704	Mounting, capacitor: non-magnetic; 1 1/2" h o/a x 49/64" wd, w/2 no. 6-32 spadebolts 1/2" lg and 1 9/16" between c; for capacitors 1" h x 1 5/16" lg x 49/46" wd; "U" shape; JAN-C-25 spec	C-729 mounting	CP06SA1	N16-M-60958-3561	14	L896-4	O-704	3
O-705	Mounting, capacitor: non-magnetic; 4 1/8" lg o/a x 29/32" wd, one no. 10-32 spadebolt 5/8" lg; for capacitor 3 1/2" h x 1 3/16" wd excl term; "J" shape; JAN-C-25 spec	C-731 mounting	CP07SB3	N16-M-61145-2233	14	M793-1	O-705, O-803, O-907, O-1003, O-1104, O-1209, O-1301, O-1302	26
O-706	Same as O-301	Y-701 retainer						
O-707	Clip: crystal holder; for holding crystal holder in socket; spring brass, nickel plated; 1.687" h x 1 1/4" wd x 0.050" thk; uninsulated; 15/16" opening	Y-701 clip		N16-C-805941-201	1; K690-2	K690-2	O-707	3
O-708	Same as O-111	C-725 shaft coupling						
O-709	Bushing: extension shaft support; brass nickel plated; male; 1/2" across flats of hex end x 0.734" lg, 1/4" ID, 0.047" shoulder, 0.373" -32 thread	C-725 extension shaft bushing		N16-B-800200-568*	1; B713-51	B713-51	O-709	3
O-710	Shaft: extension; brass, nickel plated; round; 1/4" diam x 2 3/4" lg; two grooves at one end, one groove 0.230" diam x 0.028" wd 5/8" from end, other groove 0.230" diam x 0.028" wd 1 27/64" from end	C-725 extension shaft		N16-S-20964-1001*	1; P406-2	P406-2	O-710	3
O-711	Grille: speaker; aluminum w/black lacquer finish; 0.020" perforated aluminum 4 1/8" lg x 4 1/8" wd;	LS-701 grille		N17-G-77852-8709*	1; M138-1	M138-1	O-711	3

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-711 (cont)	four 7/32" diam mtg holes on 3 5/16" x 3 5/16" centers									
O-712	Clamp: capacitor; stainless steel; approx 2 9/16" lg x 1 7/16" wd x 17/32" h when open; mtg bracket w/single mtg hole for no. 6-32 screw located 60° from loop, 115° from hinge on 27/32" radius; suitable for 1 1/4" diam capacitors; w/holding spurs	C-734 clamp		N16-C-300442-625	296	F892-7	O-712, O-901, O-1004	6		
O-713 thru O-800	Not Used									
O-801	Same as O-301	Y-801 thru Y-817 retainer base								
O-802	Same as O-302	Y-801 thru Y-817 crystal holder clip								
O-803	Same as O-705	C-844 mtg bracket								
O-804	Coupling, flexible: tuning shaft coupling; assembly consist of 2 hub and disc assemblies; separated by 1/4" thk grade L-4 ceramic insulator, w/four 5/16" diam brass spacers; brass hub and phosphor bronze disc, nickel plated; 1 3/8" diam x 1 1/4" lg	C-820 and C-830 extension shaft coupling		N17-C-98378-8376	1; SA:8123	SA:8123	O-804, O-1105	5		

O-804 (cont)	o/a; hubs bored for 0.252" diam shaft and mtd by two no. 6-32 multispline set screws								
O-805	Same as O-205	C-820 and C-830 extension shaft							
O-806	Same as O-111 —	Crystal A and Crystal B switch coupling							
O-807	Shaft, extension: round w/2 right angle flats 7/16" lg at each end; 0.249" diam x 2 3/16" lg	Crystal A and Crystal B switch extension shaft		N16-S-20928-9891*	1; P937-2	P937-2	O-807	2	
O-808	Bushing: bearing for extension shaft support; brass, nickel plated; male; 1/2" across flats of hex end x 15/32" lg; 0.252" ID, 3/32" shoulder; 0.435"-27 thread	Crystal A and Crystal B switch extension shaft bushing		N16-B-800200-578*	1; B713-24	B713-24	O-808	2	
O-809	Same as O-306	Tuning A and Tuning B drive control							
O-810 thru O-900	Not Used								
O-901	Same as O-712	C-918 clamp							
O-902	Same as O-701	C-920 base support							
O-903	Mounting, capacitor: non-magnetic; 2 15/16" h o/a x 49/64" wd; w/2 no. 6-32 spadebolts 1/2" lg and 1 9/16" between/c; for capacitors 1 45/64" lg x 49/64" wd x 2 1/2" max h excl term; "U" shape; JAN-C-25 spec	C-908 cap acitor mounting	CP06SA5	N16-M-60911-4456	14	L896-2	O-903, O-1002, O-1208, O-2007, O-2104, O-2202	27	
O-904	Shaft: rotary switch; brass cad plated; round w/2 parallel flats full length of shaft; 0.248" diam	S-901A and B shaft		N17-S-37007-5126*	1; M979-4	M979-4	O-904	2	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	MECHANICAL PARTS (continued)									
O-904 (cont)	x 4 1/2" lg x 0.185" across flats									
O-905	Same as O-111	S-901A and B Shaft coupling								
O-906	Detent: switch detent mechanism; two positions; 30° apart, driving shaft 0.249" diam x 1/2" lg w/2 flats 90° apart, output shaft 0.249" diam x 7/16" lg w/2 parallel flats; stainless steel and/or non-magnetic metal; 1 33/64" wd x 1 7/8" h x 1 3/4" lg o/a; mts through single hole for 3/8" -32 bushing	S-901A and B detent		N17-D-200001-109	111	M836-1	O-906 O-1007	3	55	1
O-907	Same as O-705	C-920 mounting								
O-908 thru O-1000	Not Used									
O-1001	Same as O-701	C-1031 base support								
O-1002	Same as O-903	C-1032 mounting								
O-1003	Same as O-705	C-1031 mounting								
O-1004	Same as O-712	C-1029 clamp								
O-1005	Shaft: rotary switch; brass cad plated; round w/2 parallel flats	Shaft for S-1001A, S-1001B,		N16-S-21034-2801*	1; M979-2	M979-2	O-1005	1		

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O-1005 (cont)	full length; 0.248" diam x 7 3/8" x 0.185" across flats	S-1001C, S-1001D, S-1001E and S-1001F					
O-1006	Same as O-111	S-1001 shaft coupling					
O-1007	Same as O-906	Detent mechanism for S-1001					
O-1008 thru O-1100	Not Used						
O-1101	Clamp: electron tube clamp; stainless steel; type 302; 1 5/32" ID x 3/4" lg; single mtg bkt on 51/64" radius, 65° from tension loop, 100° from hinge; standard 1 5/32" diam tube base; w/holding spurs	V-1108 and V-1109 tube clamp	N16-C-300798-452	296	F892-3	O-1101, O-2103	7
O-1102	Same as O-404	C-1173A and C-1173B mtg bracket					
O-1103	Same as O-602	C-1158 mtg bracket					
O-1104	Same as O-705	C-1159 and C-1160 mtg bracket					
O-1105	Same as O-804	C-1152 extension shaft coupling					
O-1106	Shaft, extension: brass nickel plated; round w/2 right angle flats 1/4" lg at each end; 1" lg x 0.249" diam	C-1152 extension shaft	N16-S-20885-8031*	1; P119-2	P119-2	O-1106	3
O-1107	Coupling, flexible: switch, extension shaft coupling; consists of 2 hubs and spiders riveted to	Fixed freq switch extension shaft cou-	N17-C-98372-9437	1; SA:5033	SA:5033	O-1107	3

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-1107 (cont)	flexible brass disc; brass, nickel plated; 1 1/16" o/a diam x 0.562" lg; hubs bored for 1/4" diam shaft each end and mts w/4 no. 6-32 bristo setscrews, 2 for each hub 90° apart	pling								
O-1108	Same as O-306	Variable freq dial drive control								
O-1109	Shaft, extension: brass, nickel plated; round w/flats 3/8" lg at each end; 0.250" diam x 1 27/32" lg	Fixed freq switch extension shaft		N16-S-20912-5501*	1; P445-2	P445-2	O-1109	3		
O-1110	Same as O-401	C-1153 and C-1156 spacer mtg								
O-1111	Bushing: bearing for extension shaft support; brass; nickel plated; male; 1/2" across flats of hex end x 7/16" lg; 0.252" ID, 3/64" shoulder 0.435" -27 thread	O-1110 shaft bushing		N16-B-800200-583*	1; B713-5	B713-5	O-1111, O-2002	6		
O-1112 thru O-1200	Not Used									
O-1201	Cabinet: aluminum, gray paint finish; empty; 19" lg x 12 15/32" wd x 5 7/32" h o/a; empty interi-	Cabinet			1; SA:8628	SA:8628	O-1201	3		

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O-1201 (cont)	or; cutouts and finish peculiar to National Company part/dwg SA:8628; for reference only								
O-1202	Dial drive: vernier drive mechanism; nickel plated brass w/fibre spider; 2 37/64" diam x 1 19/32" lg o/a	Capacitor shaft vernier drive		N16-D-900411-120	1; SA:8242	SA:8242	O-1202	3	
O-1203	Scale: tuning indicator scale; round disc shape, 2 3/16" diam w/ 1 11/32" lg mtg/clips; three horizontal parallel lines scribed on cellulose acetate; mts by two 1 11/32" lg spring clips	Tuning indicator scale		N16-S-117101-607*	1; SA:7581	SA:7581	O-1203	3	
O-1204	Screen: shield; woven wire mesh cloth, nickel plated; rectangular; 5" lg x 1 5/8" wd; six 0.156" diam mtg holes on 2 1/4" mtg/c has 5/16" foldover on two sides	Shield		*	1; Q495-1	Q495-1	O-1204, O-1309	2	
O-1205	Same as O-701	C-1231 base mounting							
O-1206	Same as O-602	C-1234 mounting							
O-1207	Mounting, capacitor: non-magnetic; 3 1/4" lg o/a x 25/32" wd, one no. 10-32 spadebolt 5/8" lg; for capacitors 1 13/16" lg x 1 1/16" wd x 3 1/4" h excl term; J shape; JAN-C-25 spec	C-1235 mounting	CP07SA4	N16-M-61144-5178	14	M793-2	O-1207	6	
O-1208	Same as O-903	C-1201,C-1215, C-1232,C-1256 capacitor mounting							
O-1209	Same as O-705	C-1231 mounting							
O-1210 thru O-1300	Not Used								

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-1301	Same as O-705	C-1314 support								
O-1302	Same as O-705	C-1314 support								
O-1303	Same as O-602	C-1302 support								
O-1304	Same as O-602	C-1303 support								
O-1305	Same as O-703	C-1308 support								
O-1306	Same as O-703	C-1313 support								
O-1307	Mounting, resistor: natural bake-lite grade LTS-E-3; 2" lg x 1 3/32" wd x 1/16" thk; two 5/16" d slots 0.186" wd 1" between/c; two 0.156" diam mtg holes on 1 1/8" mtg/c; marked R-1323, R-1324	R-1323 and R-1324 support		*	1; Q123-2	Q123-2	O-1307	1		
O-1308	Mounting resistor: natural bake-lite grade LTS-E-3; for mtg 4 re-sistors; flat rectangular shape; 2 1/2" lg x 1 1/2" wd x 1/8" thk; mts by two 0.156" diam holes 3/4" c to c; marked R-1319, R-1320, R-1321, R-1322	R-1319 thru R-1322 mounting		*	1; Q508-2	Q508-2	O-1308	1		
O-1309	Same as O-1204	Shield								
O-1310 thru O-1500	Not Used									

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O-1501	Holder, card: 0.016" aluminum; 11 13/16" lg x 45/64" h x 0.164" thk; front holds identification card, rear holds mtg clips; mts with 4 spring clips	Holder for N-1501, N-1502 and N-1503		N16-H-61951-1004*	1; SA:7421	SA:7421	O-1501, O-1601, O-1701, O-1801	11	
O-1502	Window, card: clear cellulose acetate; 11 13/16" lg x 5/8" wd x 0.020" thk; mts in card holder	Window for N-1501, N-1502, and N-1503		N16-W-63738-9331*	1320	Q084-1	O-1502, O-1602, O-1702, O-1802	11	
O-1503	Clip: card holder; 0.054" diam spring steel wire, black enamel finish; 5/8" lg x 5/8" wd x 15/32" h; one end mts to card holder, other end mts into 0.312" diam mtg hole	Card holder mtg clip		N17-C-805261-551*	1342	Q083-1	O-1503, O-1603, O-1703, O-1803	44	
O-1504	Cabinet: aluminum, gray paint finish; empty; 19" lg x 12 15/32" wd x 5 7/32" h o/a; empty interior; cutouts and finish peculiar to National Company part/dwg SA:8420; for reference only	Cabinet			1; SA:8420	SA:8420	O-1504	4	
O-1505	Stop, range limit: 0.0625" stainless steel; L shape; 7/8" lg x 3/8" h x 7/8" wd; single 0.385" diam csk mtg hole	Slider stop		N16-S-685901-107*	1; Q464-1	Q464-1	O-1505	8	
O-1506	Clamp: cable armor clamp; brass; silver plated to withstand 200 hr salt spray test; 13/16" lg x 11/16" diam o/a	Clamp for antenna connector	MX-564/U	N17-C-780817-849	1374	R083-1	O-1506, O-1604, O-1704	3	
O-1507 thru O-1600	Not Used								
O-1601	Same as O-1501	Holder for N-1601 thru N-1603							

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
MECHANICAL PARTS (continued)										
O-1602	Same as O-1502	Window for N-1601 thru N-1603								
O-1603	Same as O-1503	Card holder mtg clip								
O-1604	Same as O-1506	Clamp for an-tenna connector								
O-1605 thru O-1700	Not Used									
O-1701	Same as O-1501	Holder for N-1701 thru N-1703								
O-1702	Same as O-1502	Window for N-1701 thru N-1703								
O-1703	Same as O-1503	Card holder mtg clip								
O-1704	Same as O-1506	Clamp for an-tenna connector								
O-1705 thru O-1800	Not Used									
O-1801	Same as O-1501	Holder for N-1801 and N-1802								
O-1802	Same as O-1502	Window for N-1801 and N-1802								

O-1803	Same as O-1503	Card holder mtg clip						
O-1804 thru O-2000	Not Used							
O-2001	Cabinet: aluminum, gray paint finish; empty; 19" lg x 12 15/32" wd x 8 23/32" h o/a; empty interior; cutouts and finish peculiar to National Company part/dwg SA:7366; for reference only	Cabinet		N16-C-10629-1576	1; SA:7366	SA:7366	O-2001	5
O-2002	Same as O-1111	R-2017 bushing						
O-2003	Bushing: bushing and washer fitting for multiconnector; brass, nickel plated; male; 1/2" OD x 0.203" ID x 0.125" lg o/a; bushing section is 0.296" diam x 0.078" lg	J-2001 spacer		N16-B-800175-736*	1; M823-2	M823-2	O-2003	6
O-2004	Mounting, capacitor: non-magnetic; J shape; 5 7/16" lg x 29/32" wd; mts by one no. 10-32 spadebolt 5/8" lg; JAN-C-25 spec	C-2001,C-2002, C-2008 capacitor mtg	CP07SC4	N16-M-61148-1050	14	M793-6	O-2004, O-2107, O-2205	26
O-2005	Mounting, capacitor: non-magnetic; J shape; 4 9/16" lg x 29/32" wd; mts by one no. 10-32 spadebolt 5/8" lg, JAN-C-25 spec	C-2003,C-2004 capacitor mtg	CP07SC2	N16-M-60918-1606	14	M793-5	O-2005, O-2106, O-2204, O-3925	38
O-2006	Same as O-602	C-2006 capacitor mounting						
O-2007	Same as O-903	C-2005 and C-2007 capacitor mounting						
O-2008	Clamp, tube: electron tube clamp; stainless steel; o/a dim 2 11/16" lg x 3/4" h, single mtg hole for no. 6-32 screw located on mtg bkt on 29/32" radius, 120° from	V-2001 through V-2005 tube clamp		N16-C-300798-866	296; 926c	F892-2	O-2008, O-2102, O-2206	29

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-2008 (cont)	hinge, 60° from loop; w/holding spurs									
O-2009	Screen: shield; woven wire mesh cloth, nickel plated; rectangular; 16 5/8" lg x 5" wd o/a; mounts by sixteen 0.156" mtg holes on irregularly spaced mtg/c; has 1/2" foldover on 4 sides	Shield			342	Q137-1	O-2009, O-2101, O-2201	5		
O-2010	Slide chassis: locked chassis tilt index, right hand; consists of slide, spring release, spring plate and chassis release; 8 7/8" lg x 3" wd o/a; has 0.625" diam mtg hole thru tilt bearing and 0.203" diam locking hole on 5.141" mtg/c; for replacement use 0-178 and drill hole; for replacement use N16-S-469501-120	Power supply right hand non-tilting index		N16-S-469501-121	1; SA:9156	SA:9156	O-2010	5		
O-2011	Slide chassis: locked chassis tilt index, left hand; consists of slide, spring release, spring plate and chassis release; 8 7/8" lg x 3" wd o/a; has 0.625" diam mtg hole thru tilt bearing and 0.203" diam locking hole on 5.141" mtg/c; for replacement use 0-179 and drill hole	Power supply left hand non-tilting index		N16-S-469501-122	1; SA:9157	SA:9157	O-2011	5		

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O-2012 thru O-2100	Not Used	
O-2101	Same as O-2009	Shield
O-2102	Same as O-2008	V-2101 thru V-2105, V-2111, V-2115 tube clamp
O-2103	Same as O-1101	V-2108 tube clamp
O-2104	Same as O-903	C-2108, C-2111, C-2112 capacitor clamp
O-2105	Same as O-602	C-2105, C-2106, C-2109 capacitor clamp
O-2106	Same as O-2005	C-2101 thru C-2104 capacitor clamp
O-2107	Same as O-2004	C-2107, C-2110 capacitor clamp
O-2108 thru O-2200	Not Used	
O-2201	Same as O-2009	Shield
O-2202	Same as O-903	C-2206, C-2209 C-2211 capa citor mounting
O-2203	Same as O-602	C-2205, C-2207, C-2210 capacitor mounting
O-2204	Same as O-2005	C-2201 thru C-2204 capacitor mounting
O-2205	Same as O-2004	C-2208, C-2212 capacitor mounting

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
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				MECHANICAL PARTS (continued)						
O-2206	Same as O-2008	V-2201 thru V-2207 tube clamp								
O-2207 thru O-3400	Not Used									
O-3401	Cabinet: aluminum, grey paint finish; empty; 19" lg x 12 21/32" wd x 6 31/32" h o/a; empty interior; cutouts and finish peculiar to National Company part/dwg SA:7376	Cabinet			1; SA:7376	SA:7376	O-3401	1		
O-3402	Not Used									
O-3403	Not Used									
O-3404	Ring, bonding: bonding ring for AN type connectors tinned copper; round; 1.105" OD x 0.914" ID	Bonding ring			339	P145-1	O-3404	5		
O-3405 thru O-3900	Not Used									
O-3901	Not Used									
O-3902	Plate, side: 0.0598" steel, gray paint finish; rectangular shape; 82 9/16" lg x 14 1/2" wd x 1 1/16" thk; front of plate has ten 0.250" diam holes on 8" mtg/c, top has three 0.250" diam holes on	Cabinet side plate (left side)		N16-P-404881-111*	1; M330-1	M330-1	O-3902	4		

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O-3902 (cont)	4 1/8" mtg/c, back has two 0.312" diam holes on 2 1/2" mtg/c							
O-3903	Plate, side: 0.0598" steel, gray paint finish; rectangular shape; 82 9/16" lg x 14 1/2" wd x 1 1/16" thk; front of plate has ten 0.250" diam holes on 8" mtg/c, top has three 0.250" diam holes on 4 1/8" mtg/c; back has two 0.312" diam holes on 2 1/2" mtg/c	Cabinet side plate (right side)		N16-P-404881-112*	1; M330-2	M330-2	O-3903	4
O-3904	Plate, cover: 0.0598" steel, gray paint finish; rectangular shape; 20 1/2" lg x 14 3/8" wd x 1" thk; eight 0.250" diam mtg holes in two rows, one row on each side of plate, 4 1/8" between holes, 19.375" between rows, two additional 0.250" diam holes on 6.500" mtg/c at back of plate	Cabinet top plate		N16-P-401881-163*	1; M858-1	M858-1	O-3904	4
O-3905	Screw, machine: slot drive; cheese head; stainless steel; no. 10-32; 3/8" lg; threaded portion 3/8" lg; head 0.312" diam x 7/32" lg	Locating pin for cabinet door		N43-S-16467-303*	570	M976-1	O-3905	4
O-3906	Cloth, wire: copper, nickel plated; 18 x 18 sq mesh; wire diam 0.011"; 12 1/2" lg x 6" wd; has eight 1/4" diam holes and four 3/8" diam holes	Cabinet top vent screen		N17-C-826004-108*	1; M978-1	M978-1	O-3906	4
O-3907	Frame: 0.0598" steel, gray paint finish; rectangular shape; 12 5/8" lg x 6 1/8" wd x 5/8" h; six 0.218" diam holes in two rows, 4 1/2" between holes, 5 1/4" between rows, two 0.218" diam holes on 11 3/4" mtg/c, four 0.312" diam holes on 10 1/2" x 5 1/4" mtg/c	Support for vent screen		N16-F-950001-120*	1; SA:6415	SA:6415	O-3907	4

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-3908	Cover: 0.0598" steel, gray paint finish; rectangular shape; 13 3/4" lg x 7 1/4" wd x 1 13/16" h; four 1/4" -20 threaded mtg studs on 10.500" x 5.250" mtg/c	Cover for cabinet vent		N16-C-650001-422*	1; SA:6416	SA:6416	O-3908	4		
O-3909	Spring: helical compression type; 0.052" diam stainless steel spring wire; 1.312" lg x 0.429" diam; 10 turns; flat ground ends	Supplies tension to cabinet vent cover		N17-S-46671-4147*	24	M983-1	O-3909	16		
O-3910	Panel, blank: 0.0598" steel, gray paint finish; rectangular shape; 7 3/16" lg x 3 3/16" wd x 0.0598" thk; six 0.286" diam csk mtg holes in two rows, 3 5/16" between holes, 2 5/8" between rows	Patch plate for unused cabinet cutout		N17-P-17663-9719*	1; M840-1	M840-1	O-3910	8		
O-3911	Door: 0.0598" steel, gray paint finish; rectangular shape; 78 1/16" lg x 20 3/8" wd x 3/4" d; eight 0.484" diam mtg holes in two rows, 23 3/8" between holes, 19 9/16" between rows; angle reinforcements used all round door	Cabinet door		*	1; SA:6434	SA:6434	O-3911	4		
O-3912	Cloth, wire: copper nickel plated; 18 x 18 sq mesh; wire diam 0.011" 72 1/8" lg x 14 7/8" wd; for reinforcement screen is folded over all four sides, 1/2" hem, 3/8" oval	Cabinet door vent screen		N17-C-826001-109*	1; M988-1	M988-1	O-3912	4		

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ORIGINAL

O-3912 (cont)	holes, 1/4" lg x 3/16" wd in hemmed edge							
O-3913	Strap, mounting: aluminum, 0.091" thk caustic etch, w/water dip lacquer; 71" lg x 1/2" wd x 0.091" thk; has 15 elongated mtg holes, 7/32" lg x 5/32" wd on 5" mtg/c	Cabinet door screen mtg strap		N17-S-691376-104*	1; M989-1	M989-1	O-3913	8
O-3914	Strap, mounting: aluminum, 0.091" thk, caustic etch, w/water dip lacquer; 14 7/8" lg x 1/2" wd x 0.091" thk; has four elongated mtg holes, 7/32" lg x 5/32" wd on irregular mtg/c	Cabinet door screen mtg strap		N17-S-691376-103*	1; M990-1	M990-1	O-3914	8
O-3915	Handle: die cast zinc alloy; gray paint finish; 4 1/4" lg x 9/16" wd x 1 1/8" d; two no. 10-32 tapped holes on 3.750" mtg/c	Cabinet door handle		N16-H-150001-235*	1; F514-5	F514-5	O-3915	8
O-3916	Fastener, camloc: all parts cad plated; stud 51/64" lg x 5/8" diam, receptacle 1 3/8" lg x 27/32" wd x 19/32" h; stud fits into a 0.472" diam hole , receptacle has two 1/8" diam holes on 1" mtg/c	Door fastener		N42-F-4546-1120	772	L207-2 and M814-1	O-3916	32
O-3917	Gasket: black neoprene; rectangular shape; 16" lg x 15/32" wd x 5/32" thk; one semicircular hole of 3/32" radius	Seal between cabinet vent opening and air cleaner element (top and bottom)		N17-G-158806-756*	236	P905-1	O-3917	8
O-3918	Gasket: black neoprene; rectangular shape; 3" lg x 15/32" wd x 5/32" thk; one semicircular hole of 3/32" radius	Seal between cabinet vent opening and air cleaner element (top and bottom)		N17-G-154907-974*	236	P905-2	O-3918	8

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-3919	Cleaner element, air: all bronze screen: reusable; rectangular shape, 16" lg x 4" wd x 3/4" thk	Air cleaner for blower system		N17-C-794001-159	1339	P914-1	O-3919	4		
O-3920	Holder, filter element: 0.0598" steel, gray paint finish; rectangular shape; 18 3/8" lg x 4 7/8" wd x 3/8" thk; two 0.484" diam holes on 17.375" mtg/c	Air cleaner support		N17-H-73511-1001*	1; Q387-1	Q387-1	O-3920	4		
O-3921	Cushion: cushion between air cleaner element and holder; neoprene; rectangular shape; 15" lg x 1/2" wd x 1/32" thk; mts by cementing	Cushion between air cleaner element and holder (top and bottom)		N17-C-965001-289*	1366	L568-1	O-3921	8		
O-3922	Not Used									
O-3923	Impeller, centrifugal: aluminum, caustic etch, w/water dip lacquer; clockwise rotation; 30 blades; 3 13/16" OD x 1 59/64" lg w/3 3/8" diam intake; hub has a bore of 0.312" diam, and two no. 8-32 tapped mtg holes, 90° apart; hub 15/16" OD	Centrifugal impeller for blower system (right side)		N17-I-19006-5181	1169	Q094-1	O-3923	1		
O-3924	Impeller, centrifugal: aluminum, caustic etch, w/water dip lacquer; counterclockwise rotation; 30 blades; 3 13/16" OD x 1 59/64" lg w/3 3/8" diam intake; hub has	Centrifugal impeller for blower system (left side)		N17-I-19006-5186	1169	Q094-2	O-3924	4		

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O-3924 (cont)	a bore of 0.312" diam and two no. 8-32" tapped mtg holes, 90° a-part; hub 15/16" OD							
O-3925	Same as O-2005	C-3901 and C-3902 mounting						
O-3926	Plate, front; cabinet trim (top) escutcheon: cast aluminum, gray paint finish; rectangular shape; 19" lg x 1 1/4" wd x 1 23/32" h; mts by four slotted holes, 1/2" lg x 1/4" wd on 18 1/4" x 1 1/4" mtg/c; has NC monogram in raised letters; letters and border painted red	Cabinet trim (top)		N16-P-402841-103*	1; P144-2	P144-2	O-3926	4
O-3927	Trim, metal: steel, gray paint finish; identification and frequency chart plates are made of 1/32" aluminum; rectangular shape; 77 3/16" lg x 3" wd x 9/32" d; three slotted mtg holes 7/16" lg x 1/4" wd irregularly spaced; contains 12 identification plates A to M, and one frequency chart	Cabinet trim		N16-P-403501-832*	1; SA:6441	SA:6441	O-3927	1
O-3928	Trim, metal: steel gray paint finish; identification and frequency chart plates are made of 1/32" aluminum; rectangular shape; 77 3/16" lg x 3" wd x 9/32" d; three slotted mtg holes 7/16" lg x 1/4" wd irregularly spaced; contains 12 identification plates A to M, and frequency chart	Cabinet trim		N16-P-403501-831*	1; SA:6442	SA:6442	O-3928	1
O-3929	Trim, metal: steel, gray paint finish; identification plates are made of 1/32" aluminum; rectangular shape; 77 3/16" lg 1 3/8" wd x 9/32" d; three slotted mtg holes	Cabinet trim		N16-P-403501-833*	1; SA:6440	SA:6440	O-3929	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-3929 (cont)	7/16" lg x 1/4" wd irregularly spaced; contains 12 identification plates A to M									
O3930	Trim, metal: steel, gray paint finish; identification plates are made of 1/32" aluminum; rectangular shape; 77 3/16" lg x 3" wd x 9/32" d; three slotted mtg holes 7/16" lg x 1/4" wd irregularly spaced; contains 13 identification plates A to N	Cabinet trim		N16-P-403501-830*	1; SA:7579	SA:7579	O-3930	1		
O-3931	Trim, metal: steel, gray paint finish; rectangular shape; 77 3/16" lg x 1 3/8" wd x 9/32" d; three slotted mtg holes 7/16" lg x 1/4" wd irregularly spaced	Cabinet trim		N16-T-801801-101*	1; SA:7580	SA:7580	O-3931	1		
O-3932	Screw, machine: slot drive; special type of head; brass, 0.0003" nickel plated; no. 10-32; 3/8" lg; threaded portion 5/16" lg; head 0.250" lg x 1/2" diam; center of head is undercut to 0.187" diam, wd of cut 0.094"	Mtg screw for trim strips		N43-S-99500-159*	1; P139-2	P139-2	O-3932	15		
O-3933	Nut, wing: steel; 1/4-20 thread; 37/64" h o/a; 1 1/16" wing spread	Wing nut		N43-W-11530-250*	779	M839-1	O-3933	16		
O-3934	Gasket: blower air stop gasket;	Blower gasket		*	1156	Q957-1	O-3934	4		

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O-3934 (cont)	black neoprene; 4 holes; rectangular, 2 5/8" lg x 1 11/16" wd x 0.062" thk o/a							
O-3935	Gasket: blower air stop gasket; black neoprene; two holes; rectangular, 2 3/8" lg x 1 1/2" wd x 0.062" thk o/a	Blower gasket		*	1156	Q957-2	O-3935	1
O-3936	Cushion: cushion between air cleaner element and holder; neoprene; rectangular shape; 4" lg x 1/2" wd x 1/32" thk; mts by cementing	Cushion between air cleaner element and holder (sides)		N17-C-965001-288*	1366	L568-2	O-3936	8
O-3937	Fastener, camloc: all parts cad plated; stud 59/64" lg x 5/8" diam, receptacle 1 3/8" lg x 27/32" wd x 19/32" h; stud fits into a 0.472" diam hole, receptacle has two 1/8" diam holes on 1" mtg/c	Vent screen fas - tener		N42-F-4546-1230	772	L207-7 and M814-1	O-3937	8
O-3938	Bracket: air baffle support (left side); rectangular shape w/L cross section; 0.0598" c.r. steel w/rubber dipped finish; 9/1/8" lg x 1 1/8" wd x 27/32" h o/a; three elongated mtg holes 7/16" lg x 3/16" wd on 3.312" mtg/c; contains 6 cutouts for cables peculiar to National Company part/dwg L569-2	Air stop bracket (left side)		N16-B-750001-436*	1; L569-2	L569-2	O-3938	2
O-3939	Bracket: air baffle support (right side); rectangular shape with L cross section; 0.0598" c.r. steel w/rubber dipped finish; 9 1/8" lg x 1/8" wd x 27/32" h o/a; three elongated mtg holes 7/16" lg x 3/16" wd on 3.312" mtg/c; contains nine cutouts for cables	Air stop bracket (right side)		*	1; L569-4	L569-4	O-3939	2

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-3939 (cont)	peculiar to National Company part/ dwg L569-4									
O-3940	Bracket: air baffle sup port (right side); rectangular shape with L cross section; 0.0598" c.r. steel w/rubber dipped finish; 9 1/8" lg x 1 1/8" wd x 27/32" h o/a; three elongated mtg holes 7/16" lg x 3/16" wd on 3.312" mtg/c; contains ten cutouts for cables peculiar to National Company part/dwg L569-6	Air stop bracket (right side)		*	1; L569-6	L569-6	O-3940	1		
O-3941	Bracket: air baffle support (left side); rectangular shape with L cross section; 0.0598" c.r. steel w/rubber dipped finish; 9 1/8" lg x 1 1/8" wd x 27/32" h o/a; three elongated mtg holes 7/16" lg x 3/16" wd on 3.312" mtg/c; contains nine cutouts for cables peculiar to National Company part/ dwg L569-8	Air stop bracket (left side)		*	1; L569-8	L569-8	O-3941	1		
O-3942	Bracket: air baffle support (left side); rectangular shape with L cross section; 0.0598" c.r. steel w/rubber dipped finish; 9 1/8" lg x 1 1/8" wd x 27/32" h o/a; three	Air stop bracket (left side)		*	1; L569-10	L569-10	O-3942	1		

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	O-3942 (cont)	elongated mtg holes 7/16" lg x 3/16" wd on 3.312" mtg/c; contains twelve cutouts for cables peculiar to National Company part/dwg L569-10								
	O-3943	Not Used								
	O-3944	Bracket: air baffle support (right side); rectangular shape with L cross section; 0.0598" c.r. steel w/rubber dipped finish; 9 1/8" lg x 1 1/8" wd x 27/32" h o/a; three elongated mtg holes 7/16" lg x 3/16" wd on 3.312" mtg/c; contains thirteen cutouts for cables peculiar to National Company part/dwg L569-13	Air stop bracket (right side)		*	1; L569-13	L569-13	O-3944	1	
	O-3945	Plate, baffle: ventilating system air stop (left side); 0.0598" c.r. steel w/rubber dipped finish; rectangular shape; 9 5/8" lg x 1 5/8" wd x 3/16" thk incl rubber coating; two elongated mtg holes 7/16" lg x 3/16" wd on 8 3/4" mtg/c; contains six cutouts for cables peculiar to National Company part/dwg L571-2	Air stop		N16-P-400741-105*	1; L571-2	L571-2	O-3945	2	
	O-3946	Plate, baffle: ventilating system air stop (right side); 0.598" c.r. steel w/rubber dipped finish; rectangular shape; 9 5/8" lg x 1 5/8" wd x 3/16" thk incl rubber coating; two elongated mtg holes 7/16" lg x 3/16" wd on 8 3/4" mtg/c; contains nine cutouts for cables peculiar to National Company part/dwg L571-4	Air stop		N16-P-400741-110*	1; L571-4	L571-4	O-3946	2	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				MECHANICAL PARTS (continued)						
O-3947	Plate, baffle: ventilating system air stop (right side); 0.0598" c.r. steel w/rubber dipped finish; rectangular shape; 9 5/8" lg x 1 5/8" wd x 3/16" thk incl rubber coating; two elongated mtg holes 7/16" lg x 3/16" wd on 8 3/4" mtg/c; contains ten cutouts for cables peculiar to National Company part/dwg L571-6	Air stop		N16-P-400741-106*	1; L571-6	L571-6	O-3947	1		
O-3948	Plate, baffle: ventilating system air stop (left side); 0.0598" c.r. steel w/rubber dipped finish; rectangular shape; 9 5/8" lg x 1 5/8" wd x 3/16" thk incl rubber coating; two elongated mtg holes 7/16" lg x 3/16" wd on 8 3/4" mtg/c; contains nine cutouts for cables peculiar to National Company part/dwg L571-8	Air stop		N16-P-400741-107*	1; L571-8	L571-8	O-3948	1		
O-3949	Plate, baffle: ventilating system air stop (left side); 0.0598" c.r. steel w/rubber dipped finish; rectangular shape; 9 5/8" lg x 1 5/8" wd x 3/16" thk incl rubber coating; two elongated mtg holes 7/16" lg x 3/16" wd on 8 3/4" mtg/c; contains six cutouts for cables pe-	Air stop		N16-P-400741-108*	1; L571-10	L571-10	O-3949	1		

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O-3949 (cont)	culiar to National Company part/ dwg L571-10									
O-3950	Plate, baffle: ventilating system air stop (right side); 0.0598" c.r. steel w/rubber dipped finish; rectangular shape; 9 5/8" lg x 1 5/8" wd x 3/16" thk incl rubber coating; two elongated mtg holes 7/16" lg x 3/16" wd on 8 3/4" mtg/c; contains thirteen cutouts for cables peculiar to National Company part/dwg L571-13	Air stop		N16-P-400741-109*	1; L571-13	L571-13	O-3950	1		
O-3951	Mount, vibration: diamond mtg; 14 lb load rating; 2.320" lg x 1 3/4" wd x 1 3/8" h; rubber cushion, cone form; 1 1/2" diam x 1 3/8" h, steel center sleeve w/0.250" bolt hole; steel holder, oval shape; two 0.166" diam holes on 1.945" mtg/c	Blower shock mounts		N17-M-75062-2136*	398	L577-1	O-3951	12		
			PLUGS							
P-101[1]	Connector, receptacle: 8 round shielded female contacts, 11 round unshielded male contacts; polarized; straight; 4 3/4" lg x 2 3/8" wd x 1 19/32" d o/a incl guide pins; 8 female contacts suitable for RG-59/U cable; rectangular cad plated brass frame, w/brass silver plated contacts mtd on laminated plastic base; mts by two 0.203" diam holes 4.062" between mtg/c; guide pin A w/flat at 3 o'clock, guide pin B w/flat at 6 o'clock	Multiconnector for Amp-Conv		N17-C-73725-5425	1238	M821-5	P-101[1], P-401	6	55	1

1 Used on AM-452/FRR-24 only

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				PLUGS (continued)						
P-101[2]	Connector, receptacle: 8 round shielded female contacts, 11 round unshielded male contacts; polarized; straight; 4 3/4" lg x 2 3/8" wd x 1 19/32" d o/a incl guide pins; 8 female contacts suitable for RG-59/U cable, rectangular cad plated brass frame w/brass silver plated contacts mtd on laminated plastic base; mts by 0.203" diam holes 4.062" between mtg/c; guide pin A w/flat at 3 o'clock, guide pin B w/flat at 9 o'clock	Multiconnector for Amp-Conv		N17-C-73725-5423	1238	M821-4	P-101[2],P-601, P-2201	7	55	1
P-101[3]	Connector, receptacle: 8 round shielded female contacts, 11 round unshielded male contacts; polarized; straight; 4 3/4" lg x 2 3/8" wd x 1 19/32" d o/a incl guide pins; 8 female contacts suitable for RG-59/U cable; rectangular cad plated brass frame w/brass silver plated contacts mtd on laminated plastic base; mts by two 0.203" diam holes 4.062" between mtg/c; guide pin A w/flat at 3 o'clock, guide pin B w/flat at 12 o'clock	Multiconnector for Amp-Conv		N17-C-73725-5491	1238	M821-3	P-101[3],P-701 P-2101	7	55	1
2/3	Used on AM-453/FRR-24 only Used on AM-451/FRR-24 only									

P-101[4]	Connector, receptacle: 8 round shielded female contacts, 11 round male contacts; polarized; straight; 4 3/4" lg x 2 3/8" wd x 1 19/32" d o/a incl guide pins; 8 female contacts suitable for RG-59/U cable; rectangular cad plated brass frame w/silver plated brass contacts mtd on laminated plastic base; mts by two 0.203" diam holes 4.062" between mtg/c; guide pins A and B w/flats at 3 o'clock	Multiconnector for Amp-Conv		N17-C-73725-5419	1238	M821-2	P-101[4] P-301, P-2001	9	55	1
P-102 thru P-300	Not Used									
P-301	Same as P-101[4]	Male multiconnector								
P-302 thru P-400	Not Used									
P-401	Same as P-101[1]	Multiconnector								
P-402 thru P-600	Not Used									
P-601	Same as P-101[2]	Multiconnector								
P-602 thru P-700	Not Used									
P-701	Same as P-101[3]	Multiconnector								
P-702	Connector, plug: three round male contacts; polarized; straight; 1 5/32" o/a diam x 1 11/16" lg; round alum body; molded brown melamine insert; 7/8"-20 coupling nut thread; incl cable clamp AN-W-C-591B; MIL-C-5015 spec	Audio output	AN 3106A-14S -12P	N17-C-70588-1706	1; SA:8622	SA:8622	P-702, P-902, P-1002, P-1102, P-3901, P-3902	11		

4 Used on AM-450/FRR-24 only

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				PLUGS (continued)						
P-703 thru P-800	Not Used									
P-801	Connector, receptacle 8 round shielded female contacts, 11 round unshielded male contacts; polarized; straight; 4 3/4" lg x 2 3/8" wd x 1 19/32" d o/a incl guide pins; 1/2" h less pins and contacts; 8 female connectors suitable for RG-59/U cable; rectangular cad plated brass frame, w/ brass silver plated contacts mtd on laminated plastic base; mts by two 0.203" diam holes 4.062" between mtg/c; guide pins A and B w/flats at 12 o'clock	Multiconnector		N17-C-73725-5429	1238	M821-7	P-801, P-1001	2	55	1
P-802 thru P-900	Not Used									
P-901	Connector, receptacle: 8 round shielded female contacts, 11 round unshielded male contacts; polarized ; straight; 4 3/4" lg x 2 3/8" wd x 1 19/32" d o/a incl guide pins; 8 female contacts suitable for RG-59/U cable; rectangular cad plated brass frame w/brass silver plated contacts mtd on la-	Multiconnector		N17-C-73725-5441	1238	M821-6	P-901, P-4001	3	55	1

P-901 (cont)	minated plastic base; mts by two holes 0.203" diam 4.062" between mtg/c; guide pin A w/flat at 12 o'clock, guide pin B w/flat at 3 o'clock									
P-902	Same as P-702	Audio output								
P-903 thru P-1000	Not Used									
P-1001	Same as P-801	Multiconnector								
P-1002	Same as P-702	Audio output								
P-1003 thru P-1100	Not Used									
P-1101	Connector, receptacle: 8 round shielded female contacts, 11 round unshielded male contacts; polarized; straight; 4 3/4" lg x 2 3/8" wd x 1 19/32" d o/a incl guide pins; 1/2" h less guide pins and contacts; 8 female connectors suitable for RG-59/U cable rectangular cad plated brass frame w/brass silver plated contacts mtd on laminated plastic base; mts by two 0.203" diam holes 4.062" between mtg/c; guide pin A w/flat at 12 o'clock, guide B w/flat at 6 o'clock	Multiconnector		N17-C-73725-5433	1238	M821-9	P-1101	3	55	1
P-1102	Same as P-702	Audio output								
P-1103 thru P-1200	Not Used									
P-1201	Connector, receptacle: 8 round shielded female contacts, 11 round unshielded male contacts; polarized; straight; 4 3/4" lg x 2 3/8"	Multiconnector			1238	M821-8	P-1201	3	55	1

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	PLUGS (continued)									
P-1201 (cont)	h x 1 19/32" d o/a incl guide pins, 1/2" h less guide pins and contacts; 8 female contacts suitable for RG-59/U cable; rectangular cad plated brass frame w/brass silver plated contacts mtd on laminated plastic base; mts by two 0.203" diam holes, 4.062" between mtg/c; guide pin A w/flat at 12 o'clock, guide pin B w/flat at 9 o'clock									
P-1202 thru P-1300	Not Used									
P-1301	Connector, receptacle: 8 round shielded female contacts, 11 round unshielded male contacts; polarized; straight; 4 3/4" lg x 2 3/8" wd x 1 19/32" d o/a incl guide pins; 1/2" h less pins and contacts; 8 female contacts suitable for RG-59/U cable; rectangular, cad plated brass frame w/brass silver plated contacts mtd on laminated plastic base; mts by two 0.203" diam holes 4.062" between mtg/c; guide pin A w/flat at 9 o'clock and pin B w/flat at 3 o'clock	Multiconnector			1238	M821-10	P-1301	1	55	1
P-1302 thru P-1500	Not Used									

P-1501	Cap: no contacts; straight; 5/8" lg x 19/32" diam excl chain; brass silver plated; round body; incl chain;	Cap for J-1504		N17-C-200982-501	1238	Q008-1	P-1501 thru P-1505, P-1507, P-1601 thru P-1605, P-1607 thru P-1610, P-1613, P-1701 thru P-1705, P-1707, P-1801 thru P-1804, P-1808 thru P-1826	45		
P-1502	Same as P-1501	Cap for J-1505								
P-1503	Same as P-1501	Cap for J-1506								
P-1504	Same as P-1501	Cap for J-1507								
P-1505	Same as P-1501	Cap for J-1508								
P-1506	Connector, plug: one round male contact; straight; 1 1/8" lg x 19/32" diam excl chain; brass silver plated, round body; includes 70 ohms 1/2 watt resistor and chain	Termination plug for J-1509	MX-554/U	N16-L-85756-7371	1238	Q208-1	P-1506, P-1508, P-1509, P-1606, P-1611, P-1612, P-1614, thru P-1619, P-1706, P-1708, P-1709, P-1805 thru P-1807	18	55	1
P-1507	Same as P-1501	Cap for J-1521								
P-1508	Same as P-1506	Termination plug for J-1522								
P-1509	Same as P-1506	Termination for for J-1523								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			PLUGS (continued)							
P-1510	Connector, plug: one round male contact; straight type; 1 3/4" lg x 13/16" diam o/a; 52 ohms impedance; cylindrical brass body silver plated to withstand 200 hr 20% salt spray test; molded polystyrene insert	Antenna connector	UG-21B/U	N17-C-71416-2550	1374	R082-1	P-1510, P-1620, P-1710	3		
P-1511 thru P-1600	Not Used									
P-1601	Same as P-1501	Cap for J-1604								
P-1602	Same as P-1501	Cap for J-1605								
P-1603	Same as P-1501	Cap for J-1606								
P-1604	Same as P-1501	Cap for J-1607								
P-1605	Same as P-1501	Cap for J-1608								
P-1606	Same as P-1506	Termination plug for J-1609								
P-1607	Same as P-1501	Cap for J-1617								
P-1608	Same as P-1501	Cap for J-1618								
P-1609	Same as P-1501	Cap for J-1619								
P-1610	Same as P-1501	Cap for J-1621								
P-1611	Same as P-1506	Termination plug for J-1622								
P-1612	Same as P-1506	Termination plug for J-1623								

P-1613	Same as P-1501	Cap for J-1631
P-1614	Same as P-1506	Termination plug for J-1633
P-1615	Same as P-1506	Termination plug for J-1634
P-1616	Same as P-1506	Termination plug for J-1635
P-1617	Same as P-1506	Termination plug for J-1636
P-1618	Same as P-1506	Termination plug for J-1637
P-1619	Same as P-1506	Termination plug for J-1638
P-1620	Same as P-1510	Antenna connector
P-1621 thru P-1700	Not Used	
P-1701	Same as P-1501	Cap for J-1704
P-1702	Same as P-1501	Cap for J-1705
P-1703	Same as P-1501	Cap for J-1706
P-1704	Same as P-1501	Cap for J-1707
P-1705	Same as P-1501	Cap for J-1708
P-1706	Same as P-1506	Termination plug for J-1709
P-1707	Same as P-1501	Cap for J-1721
P-1708	Same as P-1506	Termination plug for J-1722
P-1709	Same as P-1506	Termination plug for J-1723
P-1710	Same as P-1510	Antenna connector
	Not Used	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				PLUGS (continued)						
P-1711 thru P-1800	Not Used									
P-1801	Same as P-1501	Cap for J-1805								
P-1802	Same as P-1501	Cap for J-1806								
P-1803	Same as P-1501	Cap for J-1807								
P-1804	Same as P-1501	Cap for J-1808								
P-1805	Same as P-1506	Termination plug for J-1810								
P-1806	Same as P-1506	Termination plug for J-1811								
P-1807	Same as P-1506	Termination plug for J-1812								
P-1808	Same as P-1501	Cap for J-1813								
P-1809	Same as P-1501	Cap for J-1814								
P-1810	Same as P-1501	Cap for J-1815								
P-1811	Same as P-1501	Cap for J-1816								
P-1812	Same as P-1501	Cap for J-1818								
P-1813	Same as P-1501	Cap for J-1819								
P-1814	Same as P-1501	Cap for J-1820								
P-1815	Same as P-1501	Cap for J-1830								
P-1816	Same as P-1501	Cap for J-1831								
P-1817	Same as P-1501	Cap for J-1832								
P-1818	Same as P-1501	Cap for J-1833								

P-1819	Same as P-1501	Cap for J-1834							
P-1820	Same as P-1501	Cap for J-1835							
P-1821	Same as P-1501	Cap for J-1836							
P-1822	Same as P-1501	Cap for J-1837							
P-1823	Same as P-1501	Cap for J-1838							
P-1824	Same as P-1501	Cap for J-1839							
P-1825	Same as P-1501	Cap for J-1846							
P-1826	Same as P-1501	Cap for J-1850							
P-1827	Connector, plug: one round male contact; straight; 31/32" lg x 37/64" diam; brass silver plated; round body	Input connector for J-1851	UG-260/U	N17-C-71408-3425	1238	L649-1	P-1827 thru P-1829, P-3903	333	
P-1828	Same as P-1827	Input connector for J-1852							
P-1829	Same as P-1827	Input connector for J-1826							
P-1830 thru P-2000	Not Used								
P-2001	Same as P-101[4]	Multiconnector							
P-2002 thru P-2100	Not Used								
P-2101	Same as P-101[3]	Multiconnector							
P-2102 thru P-2200	Not Used								
P-2201	Same as P-101[2]	Multiconnector							
P-2202 thru P-3400	Not Used								
P-3401	Connector, plug: 3 round female contacts; polarized; straight; 2 1/8" lg x 1 15/32" OD; cylin-	AC input	AN 3106B-20 -3S	N17-C-70329-2704	339	Q717-1	P-3401 thru P-3405, P-3911	10	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			PLUGS (continued)							
P-3401 (cont)	drical aluminum body; molded phenolic insert; AN 3106B-20-3S; MIL-C-5015									
P-3402 thru P-3405	Same as P-3401	AC input								
P-3406 thru P-3900	Not Used									
P-3901	Same as P-702	Terminal box teletype output no. 1								
P-3902	Same as P-702	Terminal box teletype output no. 2								
P-3903	Same as P-1827	Used in cable assemblies								
P-3904	Connector, plug: right angle; one round male contact, angle type, 90°; 1 1/4" lg x 15/16" wd x 9/16" diam; round body; brass, silver plated	Used in cable assemblies			1238	L653-1	P-3904	164		
P-3905	Connector, receptacle: one round female contact; straight; 1 1/32" lg x 5/8" diam; round body; brass, silver plated	Used in cable assemblies	UG-261/U		1238	Q287-1	P-3905	15		
P-3906	Connector, plug: AN type UG-88/U; one round male contact; straight	Used in cable assemblies	UG-88/U	N17-C-71408-5333	1238	L649-2	P-3906	60		

P-3906 (cont)	type; 1 1/64" lg x 9/16" OD o/a max; cylindrical metal body; teflan insert; cable opening 0.212" max									
P-3907	Same as J-105	Used in cable assemblies								
P-3908	Shell, connector: cable connector; brass, silver plated, for RG-59/U cable; hex shape w/round right angle lead input; 1/2" lg x 0.434" wd x 9/16" h; single axial 5/16-32 tapped mtg hole; w/removable cap	Used in cable assemblies		N17-S-250051-276	1238	L647-1	P-3908	72		
P-3909	Connector, plug: five round female contacts; polarized; straight; 1 11/16" lg x 1 5/32" OD; cylindrical aluminum body; molded phenolic insert	Used in cable assemblies	AN 3106B-14S -5S	N17-C-70340-1131	339	P493-1	P-3909	1		
P-3910	Connector, plug: five round male contacts, polarized; straight; 1 11/16" lg x 1 5/32" OD; cylindrical aluminum body; molded phenolic insert	Used in cable assemblies	AN 3106B-14S -5P	N17-C-70600-1131	339	P793-1	P-3910	1		
P-3911	Same as P-3401	Used in cable assemblies								
P-3912	Connector, plug: three round male contacts, polarized; straight; 2 3/16" lg x 1 15/32" wd x 1 13/16" h; cylindrical aluminum body; sandblast finish; molded phenolic insert	Used in cable assemblies	AN 3106B-20 -3P	N17-C-70589-2703	339	Q979-1	P-3912	5		
P-3913	Connector, plug: seven round male contacts, polarized; straight; 1 11/16" lg x 1 1/4" OD; cylindrical aluminum body, molded phenolic insert	Used in cable assemblies	AN 3106B-16S -1P	N17-C-70607-6977	339	Q016-1	P-3913	15		
P-3914	Connector, plug: seven round female contacts, polarized; straight;	Used in cable assemblies	AN 3106B-16S -1S	N17-C-70347-6977	339	Q014-1	P-3914	15		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			PLUGS (continued)							
P-3914 (cont)	1 11/16" lg x 1 1/4" OD; cylindrical aluminum body; molded phenolic insert									
P-3915	Connector, plug: fourteen round female contacts, polarized; straight; 2 3/16" lg x 1 15/32" OD; cylindrical aluminum body; molded phenolic insert	Used in cable assemblies	AN 3106B-20 -27S	N17-C-70361-4337	339	P146-1	P-3915	22		
P-3916	Connector, plug: fourteen round male contacts, polarized; straight; 2 3/16" lg x 1 15/32" OD; cylindrical aluminum body; molded phenolic insert	Used in cable assemblies	AN 3106B-20 -27P	N17-C-70621-4337	339	P771-1	P-3916	22		
P-3917	Connector, plug: three round female contacts, polarized; straight; 1 11/16" lg x 1 5/32" OD; cylindrical body; molded phenolic insert	Used in cable assemblies	AN 3106B-14S -12S	N17-C-70328-1699	339	H550-1	P-3917	5		
P-3918	Connector, plug: three round male contacts; polarized; straight; 1 11/16" lg x 1 5/32" OD; cylindrical aluminum body; molded phenolic insert	Used in cable assemblies	AN 3106B-14S -12P	N17-C-70588-1699	128	M975-1	P-3918	5		
P-3919	Connector, adapter: adapter tee; two round female contacts; one round male contact; tee shape; tee adapter for RG-59/U cable; 1 9/32" lg x 1 1/6" h x 9/16" diam; cylindrical, brass, silver plated	Used in cable assemblies	UG-274/U	N17-C-68721-9579	1374	M859-1	P-3919	7		

P-3920	Connector, receptacle: eight round shielded male contacts, eleven round unshielded male contacts, polarized; straight; 4 3/4" lg x 2 3/8" h x 1 19/32" d o/a incl guide pins 1/2" h; eight male contacts suitable for RG-59/U cable; rectangular brass cad plated frame, w/brass silver plated contacts mtd on laminated plastic base; mts by two 0.203" diam holes 4.062" between mtg/c; guide guide pins C and D round	Used in test cable		N17-C-73613-7518	1238	M821-21	P-3920	8		
P-3921	Connector, receptacle: eight round shielded female contacts; eleven round unshielded female contacts, polarized; straight; 4 3/4" lg x 2 3/8" h x 1 19/32" d o/a; eight female contacts suitable for RG-59/U cable; rectangular brass cad plated frame, w/brass silver plated contacts mtd on laminated plastic base; mts by two 0.203" diam holes 4.062" between mtg/c; bushings C and D round	Used in test cable		N17-C-73322-8412	1238	M822-21	P-3921	8		
P-3922 thru P-4000	Not Used									
P-4001	Same as P-901	Multiconnector								
			RESISTORS							
R-101	Resistor, fixed: composition; 47,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-101 grid load	RC21BF474K (-63360-474)	N16-R-50822-0971	63	H376-19	R-101, R-106, R-111, R-601, R-608, R-611, R-614, R-622, R-630, R-728, R-737, R-741, R-908, R-920, R-923, R-1021,	102		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-101 (cont)							R-1030, R-1033, R-1101, R-1107, R-1111, R-1136, R-1207, R-1229, R-1230, R-1241, R-1246, R-1277			
R-102	Resistor, fixed: composition; 2200 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-101 AGC filter	RC21BF222K (-63360-222)	N16-R-50012-0971	63	H376-38	R-102, R-107, R-112, R-311, R-317, R-332, R-336, R-617, R-1133	54		
R-103	Resistor, fixed: composition; 1800 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-101 screen dropping	RC21BF182K (-63360-182)	N16-R-49985-0971	63	H376-8	R-103, R-104, R-108, R-109, R-113, R-114, R-120, R-301, R-303, R-305, R-307, R-1242	99		
R-104	Same as R-103	V-101 plate dropping								
R-105	Resistor, fixed: composition; 2700 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-101 plate isolating	RC21BF272K (-63360-272)	N16-R-50039-0971	63	H376-37	R-105, R-110, R-115	36		
R-106	Same as R-101	V-102 grid load								

R-107	Same as R-102	V-102 AGC filter								
R-108	Same as R-103	V-102 screen dropping								
R-109	Same as R-103	V-102 plate dropping								
R-110	Same as R-105	V-102 plate isolating								
R-111	Same as R-101	V-103 grid load								
R-112	Same as R-102	V-103 AGC filter								
R-113	Same as R-103	V-103 screen dropping								
R-114	Same as R-103	V-103 plate dropping								
R-115	Same as R-105	V-103 plate isolating								
R-116	Resistor, fixed: composition; 150 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-104 cathode bias	RC21BF151K (-63360-151)	N16-R-49625-0971	63	H376-1	R-116, R-131, R-137, R-139, R-140, R-316, R-802, R-807, R-1209, R-1211, R-1274,	74		
R-117	Resistor, fixed: composition; 22,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-104 injection grid load	RC21BF223K (-63360-223	N16-R-50372-0971	63	H376-41	R-117, R-624, R-626, R-632, R-702, R-705, R-706, R-708, R-904, R-1004, R-1009, R-1014, R-1316, R-1336, R-1353, R-1383, R-2022, R-2135,	49		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			RESISTORS (continued)							
R-117 (cont)							R-2136, R-2231, R-2237,			
R-118	Resistor, fixed: composition; 100 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-104 screen dropping	RC21BF101K (-63360-101)	N16-R-49580-0971	63	H376-42	R-118, R-119, R-133, R-145, R-146, R-148, R-154, R-319, R-330, R-447, R-478, R-634, R-1238, R-1243, R-1245	108		
R-119	Same as R-118	V-104 plate isolating								
R-120	Same as R-103	V-104 plate dropping								
R-121	Resistor, fixed: composition; 1800 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC21BF184J (-63355-184)	N16-R-50695-591	63	H376-97	R-121	12		
R-122	Resistor, variable: composition; 15,000 ohms ±20%; 1/8 watt; JAN A taper; no switch	RF gain control	RV2AURD153A	N16-R-87707-8250	307	M364-29	R-122, R-906, R-1023, R-620	8		
R-123	Resistor, fixed: composition; 1000 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC21BF102J (-63355-102)	N16-R-49921-591	63	H376-90	R-123, R-1225	15		
R-124	Resistor, fixed: composition; 4700 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC21BF472J (-63355-472)	N16-R-50128-0591	63	H376-57	R-124, R-1366, R-1367, R-1395, R-1396	16		

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R-125	Resistor, variable: composition; 50,000 ohms ±20%; 1/8 watt; JAN A taper; no switch	Screen voltage control	RV4ATSA503B	N16-R-87522-5536	307	M363-4	R-125	12		
R-126	Resistor, fixed: composition; 33,000 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC30BF333K (-63288-333)	N16-R-50418-0231	63	H370-41	R-126	12		
R-127	Resistor, variable: wire wound; 25,000 ohms ±10%; 4 watts; 3 solder lug term; enclosed bakelite case w/metal cover 1 21/32" diam x 1" d excl shaft and bushing; round brass nickel plated shaft 1/4" diam 7/8" lg from mtg/surface; linear taper; normal torque; ins cont arm; no Off position; non turn device on 17/32" rad at 9 o'clock; mts by 3/8"-32 thd bushing 3/8" lg; w/o switch	Screen voltage control		N16-R-91406-1391	11	L563-1	R-127	12	55	1
R-128	Resistor, fixed: composition; 10,000 ohms ±10%; 2 watts; F characteristic; JAN-R-11 spec	Voltage divider	RC42GF103K	N16-R-50283-512	273	P751-39	R-128, R-129, R-151, R-604	39		
R-129	Same as R-128	Voltage divider								
R-130	Resistor, fixed: composition; 47,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-108 grid load	RC21BF473K (-63360-473)	N16-R-50480-0971	63	H376-13	R-130, R-142, R-460, R-468, R-715, R-818, R-1115, R-1368, R-1398, R-2023, R-2112, R-2125, R-2230, R-2235	43		
R-131	Same as R-116	V-108 cathode bias								
R-132	Resistor, fixed: composition; 2700 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	V-108 screen dropping	RC30GF272K	N16-R-50040-233	273	P750-26	R-132, R-138	24		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-133	Same as R-118	Part of parasitic suppressor								
R-134	Resistor, fixed: composition; 100,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-108 AGC isolating	RC21BF104K (-63360-104)	N16-R-50633-0971	63	H376-30	R-134, R-335, R-401, R-605, R-606, R-701, R-718, R-739, R-901, R-922, R-1001, R-1005, R-1006, R-1010, R-1011, R-1015, R-1032, R-1208, R-1210, R-1217, R-1218, R-1356, R-1357, R-1360, R-1361, R-1363, R-1386 thru R-1389, R-1393	66		
R-135	Resistor, fixed: composition; 18,000 phms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec;	V-107 grid load	RC21BF183J (-63355-183)	N16-R-50353-591	63	H376-65	R-135, R-155	24		

R-135 (cont)	part of Z-101[1], Z-101[2], Z-101[3] Z-101[4]							
R-136	Resistor, fixed: composition; 560 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	V-107 plate isolating	RC21BF561K (-63360-561)	N16-R-49805-0971	63	H376-5	R-136, R-326, R-402, R-742, R-924, R-1034, R-1137, R-1279	30
R-137	Same as R-116	V-109 plate isolating						
R-138	Same as R-132	V-109 screen dropping						
R-139	Same as R-116	V-109 cathode bias						
R-140	Same as R-116	V-109 grid isolating						
R-141	Tube, ballast: for 6.3 v AC tubes; glass envelope; 5.2 to 7.5 v, 0.62 to 0.66 amps; T-9 bulb, 2 11/16" lg o/a	V-107 and V-108 ballast		N16-T-56090-25	424; 6-4B	R016-1	R-141	12
R-142	Same as R-130; not used on AM-452/FRR-24	V-109 grid load						
R-143	Resistor, variable: wire wound; 50 ohms ±10%; 2 watts; JAN A taper; JAN-R-19 spec	Pilot dimmer	RA20A1RD500 AK	N16-R-89956-7015	307	H345-6	R-143	12
R-144	Resistor, fixed: composition; 68 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-109 input loading	RC21BF680K (-63360-680)	N16-R-49499-0971	273	H376-51	R-144, R-147, R-201, R-202, R-203, R-315,	36
R-145	Same as R-118	V-101 screen isolating						
R-146	Same as R-118	V-102 screen isolating						
R-147	Same as R-144	Load resistor						
R-148	Same as R-118	V-103 screen isolating						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-149	Resistor, fixed: composition; 1500 ohms ±10%; 2 watts; F characteristic; JAN-R-11 spec	Voltage dropping	RC42GF152K	N16-R-49968-525	273	P751-89	R-149, R-150	24		
R-150	Same as R-149	Voltage dropping								
R-151	Same as R-128	Voltage divider								
R-152	Resistor, fixed: composition; 10,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-105 cathode bias	RC21BF103K (-63360-103)	N16-R-50282-0971	63	H376-9	R-152, R-327, R-328, R-334, R-476, R-1118, R-1135	30		
R-153	Resistor, fixed: composition; 150,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC21BF154K (-63360-154)	N16-R-50678-0971	63	H376-15	R-153, R-738, R-740, R-919, R-921, R-1031, R-1035	24		
R-154	Same as R-118	V-104 screen isolating								
R-155	Same as R-135	Voltage divider								
R-156 thru R-200	Not Used									
R-201	Same as R-144	S-202B remote oscillator load								
R-202	Same as R-144	S-202C local oscillator load								
R-203	Same as R-144	S-202D local oscillator load								

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R-204 thru R-300	Not Used								
R-301	Same as R-103	V-301 cathode							
R-302	Resistor, fixed: composition; 68,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-301 screen dropping	RC21BF683K (-63360-683)	N16-R-50552-0971	63	H376-74	R-302, R-304, R-306, R-308, R-312, R-403, R-801, R-806, R-1106, R-1354, R-1355, R-1384, R-1385	27	
R-303	Same as R-103	V-302 cathode							
R-304	Same as R-302	V-302 screen dropping							
R-305	Same as R-103	V-303 cathode							
R-306	Same as R-302	V-303 screen dropping							
R-307	Same as R-103	V-304 screen dropping							
R-308	Same as R-302	V-304 screen dropping							
R-309	Resistor, fixed: composition; 330 ohms ±10%; 1/2 watt; F characteric; JAN-R-11 spec	V-301 thru V-304 plate filter	RC21BF331K (-63360-311)	N16-R-49706-0971	63	H376-4	R-309, R-459, R-467	9	
R-310	Resistor, fixed: composition; 1000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-305 cathode	RC21BF102K (-63360-102)	N16-R-49922-0971	63	H376-7	R-310, R-325, R-404, R-704, R-712, R-716, R-719, R-903, R-1003, R-1008, R-1013, R-1156, R-1307, R-1310 thru R-1314,	37	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-310 (cont)							R-1365, R-1397			
R-311	Same as R-102	V-305 plate filter								
R-312	Same as R-302	V-306 grid								
R-313	Resistor, fixed: composition; 220 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-306 cathode	RC21BF221K (-63360-221)	N16-R-49661-0971	63	H376-2	R-313, R-707, R-717, R-734, R-916, R-1027	15		
R-314	Resistor, fixed: composition; 56,000 ohms ±10%; 1/2 watt; F characteristic; JAN R-11 spec	V-306 screen	RC21BF563K (-63360-563)	N16-R-50516-0971	63	H376-11	R-314	3		
R-315	Same as R-144	V-307 grid								
R-316	Same as R-116	V-307 cathode								
R-317	Same as R-102	V-307 screen dropping								
R-318	Resistor, fixed: composition; 220,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-308 grid	RC21BF224K (-63360-224)	N16-R-50714-0971	63	H376-16	R-318, R-1239, R-1347, R-1348, R-1377, R-1378	10		
R-319	Same as R-118	V-308 grid								
R-320	Resistor, fixed: composition; 33,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-308 screen dropping	RC21BF333K (-63360-333)	N16-R-50417-0971	63	H376-34	R-320, R-713, R-1104, R-1202, R-1203	15		

R-321	Resistor, fixed: composition; 510 ohms ±5%; 2 watts; F characteristic; JAN-R-11 spec	B voltage dropping	RC42GF511J	N16-R-49778-236	273	P751-80	R-321, R-322, R-323, R-1036, R-1037	11	
R-322	Same as R-321	B voltage dropping							
R-323	Same as R-321	B voltage dropping							
R-324	Resistor, fixed: composition; 1500 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	B voltage dropping	RC21BF152K (-63360-152)	N16-R-49967-0971	63	H376-47	R-324, R-475, R-615	9	
R-325	Same as R-310	V-309 plate and screen voltage dropping							
R-326	Same as R-136	V-309 cathode							
R-327	Same as R-152	V-309 grid							
R-328	Same as R-152	V-309 grid							
R-329	Resistor, fixed: composition; 47 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec; part of Z-310	L-313A loading	RC21BF470K (-63360-470)	N16-R-49427-0971	63	H376-88	R-329, R-736, R-1253	9	
R-330	Same as R-118	V-310 cathode							
R-331	Resistor, fixed: composition; 4700 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-310 screen dropping	RC21BF472K (-63360-472)	N16-R-50129-0971	63	H376-28	R-331, R-628, R-805, R-810, R-815, R-1206, R-1237, R-1240, R-1362, R-1392,	20	
R-332	Same as R-102	V-310 Plate filter							
R-333	Resistor, fixed: composition; 3600 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec; part of Z-311	V-314 loading	RC21BF362J (-63355-362)	N16-R-50083-0591	63	H376-26	R-333	3	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			RESISTORS (continued)							
R-334	Same as R-152	V-311 cathode load								
R-335	Same as R-134	V-311 grid								
R-336	Same as R-102	V-311 cathode								
R-337	Resistor, fixed: composition; 39,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-305 screen dropping	RC21BF393K (-63360-393)	N16-R-50444-0971	63	H376-123	R-337	3		
R-338 thru R-400	Not Used									
R-401	Same as R-134	V-401 grid								
R-402	Same as R-136	V-401 cathode								
R-403	Same as R-302	V-401 screen dropping								
R-404	Same as R-310	V-401 plate load								
R-405	Resistor, fixed: composition; 820,000 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec; part of Z-403	L-401A loading	RC21BF824J (-63355-824)	N16-R-50929-0591	63	H376-75	R-405 thru R-408, R-412 thru R-423	48		
R-406	Same as R-405; part of Z-403	L-401B loading								
R-407	Same as R-405, part of Z-404	L-402A loading								
R-408	Same as R-405, part of Z-404	L-402B loading								
R-409	Resistor, fixed: composition; 220 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-402 and V-403 cathode	RC20BF221K	N16-R-49661-0811	273	M828-2	R-409, R-428, R-435	9		

R-410	Resistor, fixed: composition; 22,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-402 and V-403 screen dropping	RC20GF223K	N16-R-50372-833	273	P749-43	R-410, R-429, R-436	9
R-411	Resistor, fixed: composition; 1000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-402 and V-403 plate filter	RC20GF102K	N16-R-49922-0730	273	P749-19	R-411, R-430, R-437, R-461, R-469	15
R-412	Same as R-405; part of Z-405	V-403A loading						
R-413	Same as R-405; part of Z-405	V-403B loading						
R-414	Same as R-405; part of Z-406	L-404A loading						
R-415	Same as R-405; part of Z-406	L-404B loading						
R-416	Same as R-405; part of Z-407	L-405A loading						
R-417	Same as R-405; part of Z-407	L-405B loading						
R-418	Same as R-405; part of Z-408	L-406A loading						
R-419	Same as R-405; part of Z-408	L-406B loading						
R-420	Same as R-405; part of Z-409	L-407A loading						
R-421	Same as R-405; part of Z-409	L-407B loading						
R-422	Same as R-405; part of Z-410	L-408A loading						
R-423	Same as R-405; part of Z-410	L-408B loading						
R-424	Resistor, fixed: composition; 150,000 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec; part of Z-411	L-409A loading	RC21BF153J (-63355-153)	N16-R-50336-0591	63	H376-110	R-424 thru R-427, R-431 thru R-434, R-438 thru R-441, R-446 thru R-449	48
R-425	Same as R-424; part of Z-411	L-409B loading						
R-426	Same as R-424; part of Z-412	L-410A loading						
R-427	Same as R-424; part of Z-412	L-410B loading						
R-428	Same as R-409	V-404 and V-406 cathode						
R-429	Same as R-410	V-404 and V-406 screen dropping						
R-430	Same as R-411	V-404 and V-406 plate filter						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			RESISTORS (continued)							
R-431	Same as R-424; part of Z-413	L-411 A loading								
R-432	Same as R-424; part of Z-413	L-411B loading								
R-433	Same as R-424; part of Z-414	L-412A loading								
R-434	Same as R-424; part of Z-414	L-412B loading								
R-435	Same as R-409	V-405 and V-407 cathode								
R-436	Same as R-410	V-405 and V-407 screen dropping								
R-437	Same as R-411	V-405 and V-407 plate filter								
R-438	Same as R-424; part of Z-415	L-413A loading								
R-439	Same as R-424; part of Z-415	L-413B loading								
R-440	Same as R-424; part of Z-416	L-414A loading								
R-441	Same as R-424; part of Z-416	L-414B loading								
R-442	Resistor, fixed: composition; 130,000 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec; part of Z-417	L-415A loading	RC21BF134J (-63355-134)	N16-R-50659-0591	63	H376-111	R-442 thru R-445, R-450 thru R-453	24		
R-443	Same as R-442; part of Z-417	L-415B loading								
R-444	Same as R-442; part of Z-418	L-416A loading								
R-445	Same as R-442; part of Z-418	L-416B loading								
R-446	Same as R-424; part of Z-419	L-417A loading								
R-447	Same as R-424; part of Z-419	L-417B loading								
R-448	Same as R-424; part of Z-420	L-418A loading								
R-449	Same as R-424; part of Z-420	L-418B loading								

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R-450	Same as R-442; part of Z-421	L-419A loading						
R-451	Same as R-442; part of Z-421	L-419B loading						
R 452	Same as R-442; part of Z-422	L-420A loading						
R-453	Same as R-442; part of Z-422	L-420B loading						
R-454	Resistor, fixed: composition; 36,000 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec; part of Z-423	L-412A loading	RC21BF363J (-63355-363)	N16-R-50434-0591	63	H376-77	R-454, R-458, R-462, R-466, R-470 thru R-473	24
R-455	Resistor, fixed: composition, 33,000 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Z-423 to Z-424 T-pad section	RC20BF333J	N16-R-50416-0431	63	M828-78	R-455, R-457, R-463, R-465	12
R-456	Resistor, fixed: composition; 6800 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	Z-423 to Z-424 T-pad section	RC21BF682K (-63360-682)	N16-R-50201-0971	63	H376-40	R-456, R-464, R-1132	9
R-457	Same as R-455	Z-423 to Z-424 T-pad section						
R-458	Same as R-454; part of Z-424	L-422B loading						
R-459	Same as R-309	V-408 cathode						
R-460	Same as R-130	V-408 screen dropping						
R-461	Same as R-411	V-408 plate filter						
R-462	Same as R-454; part of Z-425	L-423A loading						
R-463	Same as R-455	Z-425 to Z-426 T-pad section						
R-464	Same as R-456	Z-425 to Z-426 T-pad section						
R-465	Same as R-455	Z-425 to Z-426 T-pad section						
R-466	Same as R-454; part of Z-426	L-424B loading						
R-467	Same as R-309	V-409 cathode						
R-468	Same as R-130	V-409 screen dropping						
R-469	Same as R-411	V-409 plate filter						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			RESISTORS (continued)							
R-470	Same as R-454; part of Z-427	L-425A loading								
R-471	Same as R-454; part of Z-427	L-425B loading								
R-472	Same as R-454; part of Z-428	L-426A loading								
R-473	Same as R-454; part of Z-428	L-426B, L-426 loading								
R-474	Resistor, fixed: composition; 1.0 megohm ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-410 grid	RC21BF105K (-63360-105)	N16-R-50975-0971	63	H376-31	R-474, R-711, R-724, R-909, R-1019, R-1102, R-1247, R-1248, R-1271, R-1292,	27		
R-475	Same as R-324	V-410 cathode								
R-476	Same as R-152	V-410 cathode load								
R-477	Same as R-118	V-401 parasitic suppressor								
R-478	Same as R-118	V-410 parasitic suppressor								
R-479 thru R-600	Not Used									
R-601	Same as R-101	V-601 grid								
R-602	Resistor, fixed: composition; 4700 ohms ±10%; 2 watts; F character-	B voltage divider	RC42GF472K	N16-R-50130-511	273	P751-32	R-602, R-812, R-813	5		

R-602 (cont)	istic; JAN-R-11 spec								
R-603	Resistor, variable: wire wound 10,000 ohms ±10%; 4.0 watts; 3 solder lug term; 1.78" diam x 0.98" d; closed case; round metal shaft 0.250" diam x 7/8" lg from mtg surface; clockwise taper A; ins cont arm; normal torque; bushing 3/8"-32 NEF-2 thd. 0.375" lg; design similar to JAN type RA30A1RD103AK	AM diversity gain control		N16-R-91291-9040	307	M803-1	R-603, R-616	6	55	1
R-604	Same as R-128	B voltage divider							
R-605	Same as R-134	AGC filter							
R-606	Same as R-134	AGC filter							
R-607	Resistor, fixed: composition; 3300 ohms ±10%; 1/2 watt; F characteristic JAN-R-11 spec	V-601 plate filter	RC21BF332K (-63360-332)	N16-R-50066-0971	63	H376-60	R-607, R-609, R-612	9		
R-608	Same as R-101	V-602 grid							
R-609	Same as R-607	V-602 plate filter							
R-610	Resistor, fixed: composition; 15,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec; part of Z-602	L-601 loading	RC21BF153K (-63360-153)	N16-R-50336-0971	63	H376-10	R-610, R-613, R-804, R-809	8		
R-611	Same as R-101; part of Z-602	V-603 grid							
R-612	Same as R-607	V-603 plate filter							
R-613	Same as R-610; part of Z-603	L-602 loading							
R-614	Same as R-101; part of Z-603	V-604 grid							
R-615	Same as R-324	V-604 cathode							
R-616	Same as R-603	FSK diversity level control							
R-617	Same as R-102	V-604 plate filter							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-618	Resistor, fixed: composition; 2700 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Bias voltage divider	RC21BF272J (-63355-272)	N16-R-50038-591	63	H376-106	R-618, R-725, R-905, R-1022	9		
R-619	Resistor, fixed: composition; 750 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Bias voltage divider	RC21BF751J (-63355-751)	N16-R-49858-591	63	H376-104	R-619, R-1342, R-1375	5		
R-620	Same as R-122	RF gain control								
R-621	Resistor, fixed: composition; 100,000 ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	B minus voltage dropping	RC21BF104J (-63355-104)	N16-R-50632-0591	63	H376-115	R-621, R-727, R-907, R-1024, R-1269, R-1270, R-1280, R-1281	21		
R-622	Same as R-101	V-606 grid								
R-623	Resistor, fixed: composition; 470 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-606 cathode	RC21BF471K (-63360-471)	N16-R-49769-0971	63	H376-43	R-623, R-631, R-703, R-819, R-820, R-902, R-1002, R-1007, R-1012, R-1236	19		
R-624	Same as R-117	V-606 screen dropping								
R-625	Resistor, fixed: composition; 3300 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	V-606 plate filter	RC30BF332K (-63288-332)	N16-R-50067-0231	63	H370-59	R-625, R-633	6		

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R-626	Same as R-117; part of Z-604	L-603A loading						
R-627	Resistor, fixed: composition; 1.0 meg ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	FS CONS filter	RC21BF105J (-63355-105)	N16-R-50974-0591	63	H376-109	R-627, R-1264, R-1287	9
R-628	Same as R-331	Meter diode load						
R-629	Resistor, variable: wire wound; 10,000 ohms ±10%; 4.0 watt; 3 solder lug term; 1.78" diam x 0.98" d; closed case; slotted metal shaft 0.250" diam x 1/2" lg from mtg surface; clockwise taper A; ins cont arm; normal torque; bushing 3/8"-32 NEF-2 thd, 0.375" lg; design similar to JAN type RA30A1SA103AK	Meter calibrate adjust		N16-R-91291-9140	307	M803-2	R-629	3
R-630	Same as R-101	V-608 grid						
R-631	Same as R-623	V-608 cathode						
R-632	Same as R-117	V-608 screen dropping						
R-633	Same as R-625	V-608 plate filter						
R-634	Same as R-118	V-604 parasitic suppressor						
R-635 thru R-700	Not Used							
R-701	Same as R-134	V-701 grid						
R-702	Same as R-117	V-702 mixer grid						
R-703	Same as R-623	V-701 cathode						
R-704	Same as R-310	V-701 plate filter						
R-705	Same as R-117; part of Z-701	V-701A loading						
R-706	Same asR-117	V-702 grid						
R-707	Same as R-313	V-702 cathode						
R-708	Same as R-117	V-702 screen dropping						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-709	Resistor, fixed: composition; 51,000 ohms ±5%; 1/2 watt; characteristic; JAN-R-11 spec	V-702 plate load	RC21BF513J (-63355-513)	N16-R-50497-591	63	H376-23	R-709, R-710	6		
R-710	Same as R-709	Z-703 loading								
R-711	Same as R-474	Surge eliminator								
R-712	Same as R-310	V-702 plate filter								
R-713	Same as R-320	V-703 plate load								
R-714	Resistor, fixed: composition; 2.2 megohms ±10%; 1/2 watt; F charac-characteristic; JAN-R-11 spec	V-703 grid	RC21BF225K (-63360-225)	N16-R-50165-0971	63	H376-35	R-714	3		
R-715	Same as R-130	V-703 screen dropping								
R-716	Same as R-310	V-703 plate filter								
R-717	Same as R-313	V-704 grid								
R-718	Same as R-134	V-704 grid								
R-719	Same as R-310	V-704 plate filter								
R-720	Resistor, fixed: composition; 200,000 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	V-706A plate load	RC21BF204J (-63355-204)	N16-R-50704-0591	63	H376-72	R-720, R-721, R-910, R-914, R-1017, R-1025	12		
R-721	Same as R-720	AGC filter and time delay constant								
R-722	Resistor, fixed: composition; 5100 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	V-705 loading	RC21BF512J (-63355-512)	N16-R-50146-0591	63	H376-61	R-722, F-723, R-911, R-913, R-1016, R-1018	12		

R-723	Same as R-722	V-705 loading							
R-724	Same as R-474	V-706B cathode filter							
R-725	Same as R-618	B voltage divider							
R-726	Resistor, variable: composition; 15,000 ohms ±10%; 1/8 watt; JAN F taper; w/o switch; JAN-R-94 spec	RF gain control	RV2AURD153E	N16-R-87706-2137	307	M364-27	R-726	3	
R-727	Same as R-621	B voltage divider							
R-728	Same as R-101	V-706B cathode load							
R-729	Resistor, fixed: composition; 560 ohms ±10%; 2 watts; F characteristic; JAN-R-11 spec	B voltage dropping	RC42GF561K	N16-R-49806-493	273	P751-16	R-729, R-730, R-1147 thru R-1150	18	
R-730	Same as R-729	B voltage dropping							
R-731	Resistor, fixed: composition; 1200 ohms ±10%; 2 watts; F characteristic; JAN-R-11 spec	V-709 voltage drop ping	RC42GF122K	N16-R-49941-511	273	P751-82	R-731, R-732	6	
R-732	Same as R-731	V-709 voltage drop ping							
R-733	Resistor, variable: composition; 1.0 megohm ±20%; 1/8 watt; JAN C taper; w/o switch; JAN-R-94 spec	AF level control	RV2AURD105D	N16-R-88340-7113	307	M364-19	R-733, R-915, R-1026, R-1151	9	
R-734	Same as R-313	V-707 cathode							
R-735	Resistor, fixed: composition; 47,000 ohms ±10%; 2 watts; F characteristic; JAN-R-11 spec	V-707 cathode voltage divider	RC42GF473K	N16-R-50481-461	273	P751-48	R-735, R-816, R-817 R-1351, R-1358, R-1381, R-1390	9	
R-736	Same as R-329	V-701 cathode							
R-737	Same as R-101	V-707 screen dropping							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			RESISTORS (continued)							
R-738	Same as R-153	V-707 plate load								
R-739	Same as R-134	V-707 plate filter								
R-740	Same as R-153	V-708 to V-707 feedback								
R-741	Same as R-101	V-708 grid								
R-742	Same as R-136	V-708 cathode								
R-743 thru R-800	Not Used									
R-801	Same as R-302	V-801 grid								
R-802	Same as R-116	V-801 cathode								
R-803	Resistor, variable: composition; 100,000 ohms ±20%; 1/4 watt; JAN A taper; w/o switch; JAN-R-94 spec	Oscillator A output control	RV2AURD104B	N16-R-88010-9631	307	M364-28	R-803, R-808	2		
R-804	Same as R-610	V-801 B+ voltage divider								
R-805	Same as R-331	V-802 cathode								
R-806	Same as R-302	V-803 grid								
R-807	Same as R-116	V-803 cathode								
R-808	Same as R-803	Oscillator B output control								
R-809	Same as R-610	V-803 B+ voltage divider								
R-810	Same as R-331	V-804 cathode								

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R-811	Resistor, fixed: composition; 27,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-805 grid	RC21BF273K (-63360-273)	N16-R-50399-0971	63	H376-29	R-811, R-1105, R-1114	7	
R-812	Same as R-602	V-805 plate load							
R-813	Same as R-602	V-805 plate load							
R-814	Resistor, fixed: composition; 330,000 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	V-806 grid	RC21BF334K (-63360-334)	N16-R-50759-0971	63	H376-119	R-814	1	
R-815	Same as R-331	V-806 screen dropping							
R-816	Same as R-735	V-805 screen dropping							
R-817	Same as R-735	V-805 screen dropping							
R-818	Same as R-130	V-806 B+ voltage divider							
R-819	Same as R-623	V-801 plate filter							
R-820	Same as R-623	V-803 plate filter							
R-821 thru R-900	Not Used								
R-901	Same as R-134	V-901 grid							
R-902	Same as R-623	V-901 cathode							
R-903	Same as R-310	V-901 plate and screen dropping							
R-904	Same as R-117; part of Z-901	L-901A loading							
R-905	Same as R-618	V-903A cathode							
R-906	Same as R-122	RF gain control							
R-907	Same as R-621	B voltage dropping							
R-908	Same as R-101	V-903B cathode							
R-909	Same as R-474	V-903B filter							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-910	Same as R-720	AGC filter								
R-911	Same as R-722	V-903B load								
R-912	Not Used									
R-913	Same as R-722	V-903B load								
R-914	Same as R-720	AGC load								
R-915	Same as R-733	AF level								
R-916	Same as R-313	V-904 cathode								
R-917	Resistor, fixed: composition; 100,000 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	B voltage divider	RC30BF104K (-63288-104)	N16-R-50634-0231	63	H370-28	R-917, R-918, R-1028 R-1029	6		
R-918	Same as R-917	B voltage divider								
R-919	Same as R-153	V-905 to V-904 feedback								
R-920	Same as R-101	V-904 screen dropping								
R-921	Same as R-153	V-904 plate load								
R-922	Same as R-134	V-904 plate filter								
R-923	Same as R-101	V-905 grid								
R-924	Same as R-136	V-905 cathode								
R-925	Resistor, fixed: composition; 470 ohms ±10%; 2 watts; F characteristic; JAN-R-11 spec	B voltage dropping	RC42GF471K	N16-R-49770-519	273	P751-85	R-925	2		
R-926 thru R-1000	Not Used									

R-1001	Same as R-134	V-1001 grid
R-1002	Same as R-623	V-1001 cathode
R-1003	Same as R-310	V-1001 plate and screen dropping
R-1004	Same as R-117; part of Z-1001	L-1001A loading
R-1005	Same as R-134	V-1003A cathode
R-1006	Same as R-134	V-1004 grid
R-1007	Same as R-623	V-1004 cathode
R-1008	Same as R-310	V-1004 plate and screen dropping
R-1009	Same as R-117; part of Z-1002	L-1002A loading
R-1010	Same as R-134	V-1003B cathode
R-1011	Same as R-134	V-1006 grid
R-1012	Same as R-623	V-1006 cathode
R-1013	Same as R-310	V-1006 plate and screen dropping
R-1014	Same as R-117; part of Z-1003	L-1003A loading
R-1015	Same as R-134	V-1008 cathode
R-1016	Same as R-722	Diversity diode load
R-1017	Same as R-720	AGC filter
R-1018	Same as R-722	Diversity diode load
R-1019	Same as R-474	V-1009A noise limiter bias filter
R-1020	Not Used	
R-1021	Same as R-101	V-1009 A cathode
R-1022	Same as R-618	Bias voltage divider
R-1023	Same as R-122	RF gain control
R-1024	Same as R-621	B minus voltage dropping

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-1025	Same as R-720	V-1009B plate								
R-1026	Same as R-733	Audio frequency level control								
R-1027	Same as R-313	V-1010 cathode								
R-1028	Same as R-917	B voltage divider								
R-1029	Same as R-917	B voltage divider								
R-1030	Same as R-101	V-1010 screen dropping								
R-1031	Same as R-153	V-1010 plate load								
R-1032	Same as R-134	V-1010 plate filter								
R-1033	Same as R-101	V-1011 grid								
R-1034	Same as R-136	V-1011 cathode								
R-1035	Same as R-153	V-1011 to V-1010 feedback								
R-1036	Same as R-321	B voltage drop-ping								
R-1037	Same as R-321	B voltage drop-ping								
R-1038 thru R-1100	Not Used									
R-1101	Same as R-101	V-1101A grid								
R-1102	Same as R-474	V-1101A grid								

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R-1103	Resistor, variable: wire wound element; 10,000 ohms ±10%; 2 watts; 3 tab term; 1.28'' max diam x 0.62'' max thk; round metal shaft 7/8'' lg x 1/4'' diam; linear taper; ins cont arm; no Off position; normal torque; bushing 3/8''-32 thd x 3/8'' lg; non-turn device on 17/32'' radius at 9 o'clock; JAN-R-19 spec	Fine threshold control	RA20A1RD103 AK	N16-R-91291-4928	307	H345-12	R-1103	3	
R-1104	Same as R-320	V-1102 grid							
R-1105	Same as R-811	Voltage divider							
R-1106	Same as R-302	B+ voltage dropping							
R-1107	Same as R-101	V-1101B grid							
R-1108	Resistor, fixed: composition; 270,000 ohms ±10%; 1/2 watt; F charcteristic; JAN-R-11 spec	V-1101B grid	RC21BF274K (-63360-274)	N16-R-50741-0971	63	H376-17	R-1108, R-1110, R-1301, R-1304 thru R-1306	10	
R-1109	Resistor, variable: wire wound element; 2500 ohms ±10%; 2 watts; 3 tab term; 1.28'' max diam x 0.62'' max thk; slotted metal shaft 1/2'' lg x 1/4'' diam; linear taper; ins cont arm, no Off position; normal torque; bushing 3/8''-32 thd x 3/8'' lg non-turn device on 17/32'' radius at 9 o'clock; JAN-R-11 spec	V-1101B cathode	RA20A1SA252 AK	N16-R-90868-2980	307	H345-13	R-1109	3	
R-1110	Same as R-1108	V-1102 grid							
R-1111	Same as R-101	V-1102 grid							
R-1112	Resistor, fixed: composition; 1500 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	V-1102 cathode	RC21BF152J (-63360-152)	N16-R-49966-591	63	H376-122	R-1112, R-1157, R-1158	9	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-1113	Resistor, fixed: composition; 4700 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	V-1102 cathode B+ dropping	RC30BF472K (-63288-472)	N16-R-50130-0231	63	H370-49	R-1113	3		
R-1114	Same as R-811	V-1102 plate load								
R-1115	Same as R-130	V-1107 tone oscillator voltage divider								
R-1116	Resistor, variable: composition; 50,000 ohms ±20%; 1/8 watt; JAN C taper; w/o switch; JAN-R-94 spec	AF level	RV2AURD503D	N16-R-87850-7435	307	M364-25	R-1116	3		
R-1117	Resistor, fixed: composition; 330 ohms ±%5; 1/2 watt; F characteristic; JAN-R-11 spec	V-1103 cathode	RC21BF331J (-63355-331)	N16-R-49705-591	63	H376-3	R-1117	3		
R-1118	Same as R-152	T-1101 loading								
R-1119	Resistor, fixed: composition; 270 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	V-1104 cathode	RC21BF271J (-63355-271)	N16-R-49687-0591	63	H376-87	R-1119, R-1121	6		
R-1120	Resistor, variable: wire wound element; 350 ohms ±10%; 2 watts; 3 tab term; 1.28" max diam x 0.62" max thk; slotted metal shaft 1/2" lg x 1/4" diam; linear taper; ins cont arm, no Off position; normal torque, bushing 3/8"-32 thd x 3/8" lg, non turn device on 17/32" radius at 9 o'clock; JAN-R-19 spec	V-1104, V-1105 balance control	RA20A1SA351 AK	N16-R-90396-2394	307	H345-10	R-1120	3		
R-1121	Same as R-1119	V-1105 cathode								

R-1122	Resistor, variable: composition; 50,000 ohms ±20%; 1/4 watt; JAN A taper; w/o switch; JAN-R-94 spec	Tone network adj	RV2AUSA503B	N16-R-87850-9640	307	M364-26	R-1122, R-1125	6		
R-1123	Resistor, fixed: metallic film inductive; 60,000 ohms ±1%; 1/2 watt, 40°C temp; F characteristic; 0.780" lg x 0.280" diam; coating rubberized enamel resistant to humidity, spec 1.5% max resistance change at 100% relative humidity at 40°C for 1000 hours, non-resistant to salt water immersion; two radial wire leads; 0.05% temp coef per degree C negative	Tone network		N16-R-73511-1926	1321	M795-1	R-1123, R-1126, R-1128, R-1130	12	55	2
R-1124	Resistor, fixed: wire wound non-inductive; 264,000 ohms ±1%; 1 watt, max operating temp 100°C; body 1" lg x 9/16" diam; outside coating phenolic varnish and glyptol; resistant to humidity, not resistant to salt water immersion test; 5/16" lg x 3/16" wd solder lug term; thru bolt vertical mtg; 20°C to 100°C temp coef within 0.0022% degree C; JAN-R-93 spec	Tone network		N16-R-79450-8901	63	K061-4	R-1124, R-1127	6	55	2
R-1125	Same as R-1122	Tone network adj								
R-1126	Same as R-1123	Tone network								
R-1127	Same as R-1124	Tone network								
R-1128	Same as R-1123	Fixed frequency tone network								
R-1129	Resistor, fixed: wire wound, non-inductive; 240,000 ohms ±1%; 1 watt, max operating temp 100°C; body 1" lg x 9/16" diam; outside coating phenolic varnish and glyptol; resistant to humidity, not resistant to salt water immersion	Fixed frequency tone network		N16-R-79444-9424	63	K061-5	R-1129, R-1131	6	55	2

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
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	RESISTORS (continued)									
R-1129 (cont)	test; 5/16" lg x 3/16" wd solder lug term; thru bolt vertical mtg; 20°C to 100°C temp coef within 0.017% degree C; JAN-R-93 spec									
R-1130	Same as R-1123	Fixed frequency tone network								
R-1131	Same as R-1129	Fixed frequency tone network								
R-1132	Same as R-456	V-1106 grid								
R-1133	Same as R-102	V-1107 tone oscillator degeneration								
R-1134	Resistor, variable: wire wound element; 1500 ohms ±10%; 2 watts; 3 tab term; 1.28" max diam x 0.62" max thk; slotted metal shaft 1.2" lg x 1/4" diam; linear taper; ins cont arm; no Off position; normal torque; bushing 3/8"-32 thd, 3/8" lg; non-turn device on 17/32" radius at 9 o'clock;; JAN-R-19 spec	V-1106 tone oscillator degeneration adj	RA20A1SA152AK	N16-R-90803-2076	307	H345-14	R-1134	3		
R-1135	Same as R-152	V-1106 plate load								
R-1136	Same as R-101	V-1107 grid								
R-1137	Same as R-136	V-1107 cathode								
R-1138	Resistor, fixed: composition; 4700 ohms ±10%; 1 watt; F character-	V-1107 plate load	RC30GF472K	N16-R-50130-241	273	P750-32	R-1138	3		

R-1138 (cont)	istic; JAN-R-11 spec							
R-1139	Resistor, fixed: composition; 2200 ohms ±5%; 1 watt; F characteristic; JAN-R-11 spec	B+ voltage dropping	RC30BF222J	N16-R-50011-0751	63	H370-54	R-1139, R-1141	6
R-1140	Not Used							
R-1141	Same as R-1139	B+ voltage dropping						
R-1142	Resistor, fixed: composition; 15,000 ohms ±10%; 2 watts; F characteristic; JAN-R-11 spec	B+ voltage dropping	RC42GF153K	N16-R-50337-518	273	P751-40	R-1142, R-1143, R-1244, R-1359, R-1391	11
R-1143	Same as R-1142	B+ voltage dropping						
R-1144	Resistor, fixed: composition; 2200 ohms ±10%; 2 watts; F characteristic; JAN-R-11 spec	B+ voltage dropping	RC42GF222K	N16-R-50013-466	273	P751-23	R-1144, R-1145	6
R-1145	Same as R-1144	B+ voltage dropping						
R-1146	Resistor, fixed: composition; 2400 ohms ±5%; 2 watts; F characteristic; JAN-R-11 spec	B+ voltage dropping	RC42GF242J	N16-R-50021-131	273	P751-25	R-1146	3
R-1147	Same as R-729	V-1108 and T-1103 voltage dropping						
R-1148	Same as R-729	V-1108 and T-1103 voltage dropping						
R-1149	Same as R-729	V-1108 and T-1103 voltage dropping						
R-1150	Same as R-729	V-1108 voltage dropping						
R-1151	Same as R-733	Monitor gain						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-1152	Resistor, fixed: composition; 1200 ohms, ±5%; 1/2 watt; F character-istic; JAN-R-11 spec	Part of T-1102 attenuator pad	RC21BF122J (-63355-122)	N16-R-49939-591	63	H376-125	R-1152	3		
R-1153	Resistor, fixed: composition; 430 ohms, ±5%; 1/2 watt; F character-istic; JAN-R-11 spec	Part of T-1102 attenuator pad	RC21BF431J (-63355-431)	N16-R-49750-591	63	H376-124	R-1153, R-1154	6		
R-1154	Same as R-1153	Part of T-1102 attenuator pad								
R-1155	Resistor, fixed: composition; 820 ohms ±5%; 1/2 watt; F character-istic; JAN-R-11 spec	Part of T-1102 attenuator pad	RC21BF821J (-63355-821)	N16-R-49876-0591	63	H376-102	R-1155, R-1226	6		
R-1156	Same as R-310	V-1110 cathode								
R-1157	Same as R-1112	DC divider								
R-1158	Same as R-1112	DC divider								
R-1159 thru R-1200	Not Used									
R-1201	Resistor, fixed: composition; 10,000 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	T-1201 loading	RC30GF103K	N16-R-50283-0238	273	P750-39	R-1201, R-1295, R-1296	9		
R-1202	Same as R-320	V-1201 cathode								
R-1203	Same as R-320	V-1201 plate load								
R-1204	Resistor, fixed: composition; 27,000 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC30BF273K	N16-R-50400-0231	63	H370-40	R-1204	3		

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R-1205	Resistor, fixed: composition; 47,000 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC30GF473K	N16-R-50481-0233	273	P750-48	R-1205	3		
R-1206	Same as R-331	V-1201 plate filter								
R-1207	Same as R-101	V-1202, V-1203 grid return								
R-1208	Same as R-134	V-1202 parasitic suppressor								
R-1209	Same as R-116	V-1202 cathode								
R-1210	Same as R-134	V-1203 parasitic suppressor								
R-1211	Same as R-116	V-1203 cathode bias								
R-1212	Resistor, fixed: composition; 150,000 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	V-1202 screen dropping	RC30BF154K	N16-R-50679-0231	63	H370-29	R-1212, R-1214	6		
R-1213	Resistor, fixed: composition; 3000 ohms ±5%; 2 watt;s F characteristic; JAN-R-11 spec	V-1211 regulator dropping	RC42GF302J	N16-R-50048-0133	273	P751-100	R-1213, R-1251	6		
R-1214	Same as R-1212	V-1203 screen dropping								
R-1215	Resistor, fixed: composition; 27,000 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	V-1202 plate filter	RC30GF273K	N16-R-50400-0240	273	P-750-45	R-1215, R-1216	6		
R-1216	Same as R-1215	V-1203 plate filter								
R-1217	Same as R-134	V-1204 cathode load								
R-1218	Same as R-134	V-1204 cathode load								
R-1219	Resistor, variable: composition; 5000 ohms ±20%; 1/4 watt; JAN A taper; w/o switch; JAN-R-94 spec	AFC reference adj	RV2AUSA502B	N16-R-87520-9605	307	M364-20	R-1219	3		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-1220	Resistor, fixed: composition; 100,000 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC30GF104K	N16-R-50634-0234	273	P750-54	R-1220	3		
R-1221	Resistor, variable: composition; 500,000 ohms ±20%; 1/8 watt; JAN C taper; w/o switch; JAN-R-94 spec	Deviation compensation	RV2AURD504D	N16-R-88180-7510	307	M364-34	R-1221	3		
R-1222	Resistor, fixed: composition; 1.8 megohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	V-1205 grid filter	RC21BF185J (-63355-185)	N16-R-51037-0591	63	H376-112	R-1222	3		
R-1223	Resistor, fixed: composition; 270,000 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Negative feedback divider	RC21BF274J (-63355-274)	N16-R-50740-0591	63	H376-94	R-1223, R-1275	6		
R-1224	Resistor, fixed: composition; 5.6 megohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Negative feedback divider	RC21BF565J (-63355-565)	N16-R-51208-0591	63	H376-113	R-1224, R-1293	6		
R-1225	Same as R-123	V-1205 cathode bias								
R-1226	Same as R-1155	V-1205 cathode stabilizer								
R-1227	Resistor, fixed: composition; 15,000 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC20GF153J	N16-R-50335-0438	273	P749-40	R-1227	3		
R-1228	Resistor, fixed: composition; 8200 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC20GF822J	N16-R-50236-438	273	P749-37	R-1228	3		

R-1229	Same as R-101	V-1205 plate load								
R-1230	Same as R-101	V-1206 grid voltage divider								
R-1231	Resistor, fixed: composition; 820,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-1206 grid voltage divider	RC21BF824K (-63360-824)	N16-R-50930-0971	63	H376-21	R-1231	3		
R-1232	Resistor, variable: composition; 1.0 megohm ±20%; 1/4 watt; JAN A taper; w/o switch; JAN-R-94 spec	Output centering	RV2AUSC105B	N16-R-88340-9782	307	M364-32	R-1232	3		
R-1233	Resistor, fixed: composition; 2200 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	V-1206 cathode bias	RC21BF222J (-63355-222)	N16-R-50011-0591	63	H376-58	R-1233	3		
R-1234	Resistor, fixed: composition; 10,000 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Filter matching	RC21BF103J (-63355-103)	N16-R-50281-0591	63	H376-92	R-1234, R-1235	6		
R-1235	Same as R-1234	Filter load								
R-1236	Same as R-623	V-1207 cathode bias								
R-1237	Same as R-331	V-1208 plate filter								
R-1238	Same as R-118	V-1208 parasitic suppressor								
R-1239	Same as R-318	V-1208 grid bias								
R-1240	Same as R-331	V-1207 plate filter								
R-1241	Same as R-101	V-1209 grid filter								
R-1242	Same as R-103	V-1209 cathode bias								
R-1243	Same as R-118	V-1209 parasitic suppressor								
R-1244	Same as R-1142	V-1209 plate dropping								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			RESISTORS (continued)							
R-1245	Same as R-118	V-1209 parasitic suppressor								
R-1246	Same as R-101	V-1209 grid filter								
R-1247	Same as R-474	AFC filter								
R-1248	Same as R-474	V-1210 cathode load								
R-1249	Resistor, fixed: wire wound; 35,600 ohms ±1%; 1/3 watt; JAN-R-93 spec	Calibration voltage divider	RB11B35601F	N16-R-79318-6399	1109	P754-5	R-1249	3		
R-1250	Resistor, fixed: wire wound; 10,000 ohms ±1%; 1/3 watt; JAN-R-93 spec	Calibration voltage divider	RB11B10001F	N16-R-79257-5059	1109	P754-4	R-1250	3		
R-1251	Same as R-1213	V-1211 regulator dropping								
R-1252	Resistor, fixed: composition; 1.8 megohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-1213 grid return	RC21BF185K (-63360-185)	N16-R-51038-0971	63	H376-68	R-1252	3		
R-1253	Same as R-329; part of Z-1206	L-1204A loading								
R-1254 thru R-1263	Not Used									
R-1264	Same as R-627	V-1213 grid voltage divider								
R-1265	Resistor, fixed: composition; 470,000 ohms ±5%; 1/2 watt F characteristic; JAN-R-11 spec	V-1213 grid voltage divider	RC21BF474J (-63355-474)	N16-R-50821-0591	63	H376-18	R-1265, R-1290	6		

R-1266	Resistor, variable; composition; 1000 ohms ±20%; 1/4 watt; JAN A taper; w/o switch; JAN-R-94 spec	Vertical centering	RV2AUSC102B	N16-R-87350-9470	307	M364-30	R-1266	3	
R-1267	Resistor, fixed: composition; 3300 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	V-1213 cathode bias	RC21BF332J (-63355-332)	N16-R-50065-0591	63	H376-67	R-1267, R-1291	6	
R-1268	Resistor, variable: composition; 1.0 megohm ±20%; 1/8 watt; JAN C taper; w/o switch; JAN-R-94 spec	Calibration control	RV2AUSC105D	N16-R-88340-7118	307	M364-31	R-1268	3	
R-1269	Same as R-621	V-1213 plate load							
R-1270	Same as R-621	V-1213 plate load							
R-1271	Same as R-474	Voltage divider							
R-1272	Resistor, variable: composition; 10,000 ohms ±20% 1/4 watt; JAN A taper; w/o switch; JAN-R-94 spec	Synch control	RV2AUSC103B	N16-R-87680-9480	307	M364-33	R-1272	3	
R-1273	Resistor, fixed: composition; 4.7 megohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-1214 grid return	RC21BF475K (-63360-475)	N16-R-51173-0971	63	H376-100	R-1273, R-1294	6	
R-1274	Same as R-116	V-1214 current limiting							
R-1275	Same as R-1223	V-1214 plate load							
R-1276	Resistor, fixed: composition; 10.0 megohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-1215 grid voltage divider	RC21BF106K (-63660-106)	N16-R-51326-971	63	H376-99	R-1276, R-1286	6	
R-1277	Same as R-101	V-1215 grid voltage divider							
R-1278	Resistor, vairable: composition; 1000 ohms ±20%; 1/4 watt; JAN A taper; w/o switch; JAN-R-94 spec	Horizontal centering	RV2AUSA102B	N16-R-87350-9460	307	M364-21	R-1278	3	
R-1279	Same as R-136	V-1215 cathode bias							
R-1280	Same as R-621	V-1215 plate load							
R-1281	Same as R-621	V-1215 plate load							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-1282	Resistor, fixed: composition; 16,000 ohms ±5%; 1 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC30GF163J	N16-R-50344-758	273	P750-75	R-1282	3		
R-1283	Resistor, fixed: composition; 36,000 ohms ±5%; 2 watts; F characteristic; JAN-R-11 spec	Voltage divider	RC42GF363J	N16-R-50439-0940	273	P751-94	R-1283	3		
R-1284	Resistor, fixed: composition; 180,000 ohms±10%; 1/2 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC21BF184K (-63360-184)	N16-R-50696-0971	63	H376-39	R-1284	3		
R-1285	Resistor, variable: composition; 1.0 megohms ±20%; 1/4 watt; JAN A taper; w/o switch; JAN-R- 94 spec	Focus adj	RV2AUSA105B	N16-R-88340-9775	307	M364-23	R-1285	3		
R-1286	Same as R-1276	V-1215 grid return								
R-1287	Same as R-627	Voltage divider								
R-1288	Resistor, fixed: composition; 33,000 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC21BF333J (-63355-333)	N16-R-50416-0591	63	H376-78	R-1288	3		
R-1289	Resistor, fixed: composition; 10.0 megohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC21BF106J (-63355-106)	N16-R-51325-0591	63	H376-116	R-1289	3		
R-1290	Same as R-1265	V-1217 plate load								
R-1291	Same as R-1267	V-1217 cathode bias								
R-1292	Same as R-474	V-1217 current limiting								

R-1293	Same as R-1224	Negative feedback divider							
R-1294	Same as R-1273	V-1216 cathode voltage divider							
R-1295	Same as R-1201	V-1212 regulator dropping							
R-1296	Same as R-1201	V-1212 regulator dropping							
R-1297 thru R-1300	Not Used								
R-1301	Same as R-1108	V-1301 plate load							
R-1302	Resistor, fixed: composition; 1800 ohms ±5%; 1/2 watt; F characteristic; JAN-R-11 spec	V-1305 cathode	RC21BF182J (-63355-182)	N16-R-49984-0591	63	H376-118	R-1302, R-1303, R-1308, R-1309, R-1344, R-1345, R-1373, R-1374	8	
R-1303	Same as R-1302	V-1305 cathode							
R-1304	Same as R-1108	V-1302 cathode load							
R-1305	Same as R-1108	Voltage divider							
R-1306	Same as R-1108	V-1304 plate							
R-1307	Same as R-310	Limiting							
R-1308	Same as R-1302	V-1306 cathode							
R-1309	Same as R-1302	V-1306 cathode							
R-1310	Same as R-310	Limiting							
R-1311	Same as R-310	V-1305 grid							
R-1312	Same as R-310	V-1305 grid							
R-1313	Same as R-310	V-1306 grid							
R-1314	Same as R-310	V-1306 grid							
R-1315	Not Used								
R-1316	Same as R-117	V-1310 plate							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
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			RESISTORS (continued)							
R-1317	Not Used									
R-1318	Not Used									
R-1319	Resistor, fixed: wire wound; 5000 ohms ±1%; 1/3 watt; JAN R-93 spec	Back bias	RB11B50000F	N16-R-79200-3204	1109	P754-3	R-1319 thru R-1322	4		
R-1320 thru R-1322	Same as R-1319	Back bias								
R-1323	Resistor, fixed: wire wound; 151,000 ohms ±1%; 1 watt; JAN-R-93 spec	Back-bias	RB21B15102F	N16-R-76417-7171	1109	P752-5	R-1323	1		
R-1324	Resistor, fixed: wire wound 105,000 ohms ±1%; 1 watt; JAN-R-93 spec	Back bias	RB21B10502F	N16-R-76403-6354	1109	P752-6	R-1324	1		
R-1325 thru R-1335	Not Used									
R-1336	Same as R-117	V-1318 plate								
R-1337	Resistor, fixed: composition; 1.5 megohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	Time constant	RC21BF155K (-63360-155)	N16-R-51020-0971	63	H376-22	R-1337, R-1370	2		
R-1338	Resistor, fixed: composition; 30,000 ohms ±5%; 2 watts; F characteristic; JAN-R-11 spec	Voltage divider	RC42GF303J	N16-R-50408-130	273	P751-96	R-1338, R-1371	2		
R-1339	Resistor, fixed: composition; 3300 ohms ±10%; 2 watts; F character-	Voltage dropping	RC42GF332K	N16-R-50067-505	273	P751-28	R-1339, R-1340,	3		

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R-1339 (cont)	istic; JAN-R-11 spec						R-1394	
R-1340	Same as R-1339	Voltage dropping						
R-1341	Not Used							
R-1342	Same as R-619	V-1310 cathode load						
R-1343	Resistor, variable: wire wound; 10,000 ohms ±10%; 2 watts; JAN A taper; w/o switch; JAN-R-19-spec	Sensitivity adj	RA20A2SA103AK	N16-R-91291-4930	11	L882-4	R-1343, R-1346, R-1372, R-1376, R-2017, R-2120, R-2128, R-2221, R-2227	11
R-1344	Same as R-1302	V-1311 cathode resistor						
R-1345	Same as R-1302	V-1311 cathode resistor						
R-1346	Same as R-1343	Centering adj						
R-1347	Same as R-318	Coupling						
R-1348	Same as R-318	Coupling						
R-1349	Resistor, fixed: composition; 27,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	V-1312 plate	RC20GF273K	N16-R-50399-813	273	P749-46	R-1349, R-1350, R-1379, R-1380	4
R-1350	Same as R-1349	V-1312 plate						
R-1351	Same as R-735	Voltage divider						
R-1352	Resistor, fixed: composition; 120,000 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC30GF124K	N16-R-50652-233	273	P750-55	R-1352, R-1382	2
R-1353	Same as R-117	V-1312 cathode resistor						
R-1354	Same as R-302	Time constant						
R-1355	Same as R-302	Time constant						

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-1356	Same as R-134	Coupling								
R-1357	Same as R-134	Coupling								
R-1358	Same as R-735	Voltage divider								
R-1359	Same as R-1142	Voltage divider								
R-1360	Same as R-134	V-1313 plate load								
R-1361	Same as R-134	V-1313 plate load								
R-1362	Same as R-331	V-1313 cathode								
R-1363	Same as R-134	Isolating								
R-1364	Resistor, fixed: composition; 100,000 ohms ±10%; 2 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC42GF104K	N16-R-50634-503	273	P751-54	R-1364	1		
R-1365	Same as R-310	V-1315 grid								
R-1366	Same as R-124	Screen dropping								
R-1367	Same as R-124	Screen dropping								
R-1368	Same as R-130	Voltage divider								
R-1369	Resistor, fixed: composition; 3900 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	Voltage divider	RC21BF392K (-63360-392)	N16-R-50093-0971	63	H376-50	R-1369, R-1399,	2		
R-1370	Same as R-1337	Time constant								
R-1371	Same as R-1338	Voltage divider								
R-1372	Same as R-1343	Sensitivity adj								
R-1373	Same as R-1302	V-1319 cathode								
R-1374	Same as R-1302	V-1319 cathode								

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R-1375	Same as R-619	V-1318 cathode load								
R-1376	Same as R-1343	Centering adj								
R-1377	Same as R-318	Coupling								
R-1378	Same as R-318	Coupling								
R-1379	Same as R-1349	V-1320 plate								
R-1380	Same as R-1349	V-1320 plate								
R-1381	Same as R-735	Voltage divider								
R-1382	Same as R-302	Voltage divider								
R-1383	Same as R-117	V-1320 cathode								
R-1384	Same as R-302	Time constant								
R-1385	Same as R-302	Time constant								
R-1386	Same as R-134	Coupling								
R-1387	Same as R-134	Coupling								
R-1388	Same as R-134	V-1321 plate load								
R-1389	Same as R-134	V-1321 plate load								
R-1390	Same as R-735	Voltage divider								
R-1391	Same as R-1142	Voltage divider								
R-1392	Same as R-331	V-1321 cathode								
R-1393	Same as R-134	Isolating								
R-1394	Same as R-1339	Voltage divider								
R-1395	Same as R-124	Screen dropping								
R-1396	Same as R-124	Screen dropping								
R-1397	Same as R-310	V-1323 grid								
R-1398	Same as R-130	Voltage divider								
R-1399	Same as R-1369	Voltage divider								
R-1400	Resistor, fixed: wire wound; 2 ohms ±5%; 1/2 watt; JAN-R-184 spec	Heater voltage dropping	RU3B2R0J	N16-R-68282-2126	63	M103-8	R-1400 thru R-1403	4		
R-1401 thru R-1403	Same as R-1400	Heater voltage dropping								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			RESISTORS (continued)							
R-1404	Resistor, fixed: composition; 2700 ohms ±5%; 1/2 watt; JAN-R-11 spec	V-1305 plate load	RC20GF272J		273	P749-26	R-1404 R-1405	2		
R-1405	Same as R-1404	V-1306 plate load								
R-1406 thru R-2000	Not Used									
R-2001	Resistor, fixed: composition; 150 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	V-2004 grid	RC30BF151K	N16-R-49626-0231	273	H370-45	R-2001, R-2004, R-2005, R-2008, R-2101, R-2104, R-2105, R-2108, R-2114, R-2117, R-2132, R-2133, R-2201, R-2204, R-2205, R-2208, R-2209, R-2212, R-2213, R-2216,	28		
R-2002	Resistor, fixed: composition; 68 ohms ±10%; 2 watts; F character-	V-2004 cathode	RC42GF680K	N16-R-49500-493	273	P751-3	R-2002, R-2003	28		

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R-2002 (cont)	istic; JAN-R-11 spec						R-2006, R-2007, R-2102, R-2103, R-2106, R-2107, R-2115, R-2116, R-2130, R-2131, R-2202, R-2203, R-2206, R-2207, R-2210, R-2211, R-2214, R-2215			
R-2003	Same as R-2002	V-2004 cathode								
R-2004	Same as R-2001	V-2004 grid								
R-2005	Same as R-2001	V-2005 grid								
R-2006	Same as R-2002	V-2005 cathode								
R-2007	Same as R-2002	V-2005 cathode								
R-2008	Same as R-2001	V-2005 grid								
R-2009	Resistor, fixed: wire wound; 12,000 ohms ±5%; 30 watts; JAN-R-26A spec	V-2006, V-2008 dropping	RW34G123	N16-R-66425-6221	63	M043-41	R-2009, R-2010	6		
R-2010	Same as R-2009	V-2007 dropping								
R-2011	Resistor, fixed: composition; 3900 ohms ±5%; 2 watts; F characteristic; JAN-R-11 spec	V-2010 dropping	RC42GF392J	N16-R-50093-131	273	P751-30	R-2011, R-2021, R-2113, R-2122, R-2137, R-2223, R-2229	11		
R-2012	Resistor, fixed: composition; 470,000 ohms ±10%; 1 watt; F	V-2009 plate load	RC30BF474K	N16-R-50823-0231	63	H370-32	R-2012, R-2110,	7		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	ONAN
			RESISTORS (continued)							
R-2012 (cont)	characteristic; JAN-R-11 spec						R-2123, R-2218, R-2224			
R-2013	Resistor, fixed: composition; 270,000 ohms ±10%; 1 watt; F characteristic; JAN-R-11 spec	V-2009 plate load	RC30BF274K	N16-R-50742-0231	63	H370-69	R-2013, R-2111, R-2124, R-2219, R-2225	7		
R-2014	Resistor, fixed: composition; 6200 ohms ±5%; 2 watts; F characteristic; JAN-R-11 spec	Amplifier coupling	RC42GF622J	N16-R-50183-131	273	P751-97	R-2014, R-2126	4		
R-2015	Resistor, fixed: composition; 1200 ohms ±5%; 2 watts; F characteristic; JAN-R-11 spec	V-2012 dropping	RC42GF122J	N16-R-49940-126	273	P751-99	R-2015, R-2019	6		
R-2016	Resistor, fixed: wire wound; 17,750 ohms ±1%; 1/4 watt; JAN-R-93 spec	V-2010 voltage divider	RB10B17751F	N16-R-79280-3865	1368	P753-3	R-2016, R-2127	4		
R-2017	Same as R-1343	Voltage control								
R-2018	Resistor, fixed: wire wound; 24,750 ohms ±1%; 1/4 watt; JAN-R-93 spec	V-2010 voltage divider	RB10B24751F	N16-R-79297-9468	1368	P753-4	R-2018, R-2129	4		
R-2019	Same as R-2105	V-2012 dropping								
R-2020	Resistor, fixed: composition; 2000 ohms ±5%; 2 watts; F characteristic; JAN-R-11 spec	V-2006, V-2008 dropping	RC42GF202J	N16-R-49994-138	273	P-751-22	R-2020	3		
R-2021	Same as R-2011	V-2010 dropping								

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R-2022	Same as R-117	V-2009 cathode							
R-2023	Same as R-130	Phase corrector							
R-2024	Resistor, variable: wire wound; 15,000 ohms ±10%; 3 watts; JAN A taper; w/o switch; JAN-R-19 spec	K-2001 adj	RA25A2SA153-AK -AK	N16-R-91340-5962	307	M366-3	R-2024, R-2139, R-2140, R-2238, R-2239	7	
R-2025 thru R-2100	Not Used								
R-2101	Same as R-2001	V-2115 grid							
R-2102	Same as R-2002	V-2104 cathode							
R-2103	Same as R-2002	V-2104 cathode							
R-2104	Same as R-2001	V-2104 grid							
R-2105	Same as R-2001	V-2105 grid							
R-2106	Same as R-2002	V-2105 cathode							
R-2107	Same as R-2002	V-2105 cathode							
R-2108	Same as R-2001	V-2105 grid							
R-2109	Resistor, fixed: composition; 7500 ohms ±5%; 2 watts; F characteristic; JAN-R-11 spec	V-2107 dropping	RC42GF752J	N16-R-50219-131	273	P751-83	R-2109 R-2134, R-2217, R-2232, R-2233, R-2234	6	
R-2110	Same as R-2012	V-2106 plate load							
R-2111	Same as R-2013	V-2106 plate load							
R-2112	Same as R-130	Phase corrector							
R-2113	Same as R-2011	V-2106 cathode							
R-2114	Same as R-2001	V-2111 grid							
R-2115	Same as R-2002	V-2111 cathode							
R-2116	Same as R-2002	V-2111 cathode							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-2117	Same as R-2001	V-2111 grid								
R-2118	Resistor, fixed: wire wound;10,000 ohms; 30 watts; JAN-R-26A spec	V-2108 dropping	RW34G103	N16-R-66398-2631	63	M043-38	R-2118	1		
R-2119	Resistor, fixed: wire wound; 16,200 ohms ±1%; 1/4 watt; JAN-R-93 spec	V-2107 voltage divider	RB10B16201F		1368	P753-25	R-2119	1		
R-2120	Same as R-1343	Voltage control								
R-2121	Resistor, fixed: wire wound; 9800 ohms ±1%; 1/4 watt; JAN-R-93 spec	V-2107 voltage divider	RB10B98000F		1368	P753-24	R-2121	1		
R-2122	Same as R-2011	V-2113 voltage dropping								
R-2123	Same as R-2012	V-2112 plate load								
R-2124	Same as R-2013	V-2112 plate load								
R-2125	Same as R-130	Phase corrector								
R-2126	Same as R-2014	V-2112 cathode								
R-2127	Same as R-2016	V-2113 voltage divider								
R-2128	Same as R-1343	Voltage control								
R-2129	Same as R-2018	V-2113 voltage divider								
R-2130	Same as R-2002	V-2115 cathode								
R-2131	Same as R-2002	V-2115 cathode								
R-2132	Same as R-2001	V-2115 grid								
R-2133	Same as R-2001	V-2104 grid								
R-2134	Same as R-2109	V-2107 dropping								

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R-2135	Same as R-117	V-2106 cathode							
R-2136	Same as R-117	V-2112 cathode							
R-2137	Same as R-2011	V-2113 voltage dropping							
R-2138	Resistor, fixed: composition; 1000 ohms ±10%; 2 watts; F characteristic; JAN-R-11 spec	V-2108 voltage dropping	RC42GF102K	N16-R-49923-533	273	P751-87	R-2138	1	
R-2139	Same as R-2024	K-2102 adj							
R-2140	Same as R-2024	K-2103 adj							
R-2141 thru R-2200	Not Used								
R-2201	Same as R-2001	V-2204 grid							
R-2202	Same as R-2002	V-2204 cathode							
R-2203	Same as R-2002	V-2204 cathode							
R-2204	Same as R-2001	V-2204 grid							
R-2205	Same as R-2001	V-2205 grid							
R-2206	Same as R-2002	V-2205 cathode							
R-2207	Same as R-2002	V-2205 cathode							
R-2208	Same as R-2001	V-2205 grid							
R-2209	Same as R-2001	V-2206 grid							
R-2210	Same as R-2002	V-2206 cathode							
R-2211	Same as R-2002	V-2206 cathode							
R-2212	Same as R-2001	V-2206 grid							
R-2213	Same as R--2001	V-2207 grid							
R-2214	Same as R-2002	V-2207 cathode							
R-2215	Same as R-2002	V-2207 cathode							
R-2216	Same as R-2001	V-2207 grid							
R-2217	Same as R-2109	V-2209 dropping							
R-2218	Same as R-2012	V-2208 plate load							
R-2219	Same as R-2013	V-2208 plate load							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				RESISTORS (continued)						
R-2220	Resistor, fixed: wire wound; 25,250 ohms ±1%; 1/4 watt; JAN-R-93 spec	V-2209 voltage divider	RB10B25251F		1368	P753-6	R-2220, R-2226	2		
R-2221	Same as R-1343	B minus voltage control (V-2)								
R-2222	Resistor, fixed: wire wound; 17,250 ohms ±1%; 1/4 watt; JAN-R-93 spec	V-2209 voltage divider	RB10B17251F		1368	P753-5	R-2222, R-2228	2		
R-2223	Same as R-2011	V-2208 cathode								
R-2224	Same as R-2012	V-2212 plate load								
R-2225	Same as R-2013	V-2212 plate load								
R-2226	Same as R-2220	V-2213 voltage divider								
R-2227	Same as R-1343	B+ voltage control (V-1)								
R-2228	Same as R-2222	V-2213 voltage divider								
R-2229	Same as R-2011	V-2212 cathode								
R-2230	Same as R-130	Phase corrector								
R-2231	Same as R-117	V-2208 cathode								
R-2232	Same as R-2109	V-2209 dropping								
R-2233	Same as R-2109	V-2213 dropping								
R-2234	Same as R-2109	V-2213 dropping								
R-2235	Same as R-130	Phase corrector								
R-2236	Resistor, fixed: composition; 51,000 ohms ±10%; 1/2 watt; F characteristic; JAN-R-11 spec	I-2203 current limiter	RC21BF513K (-63360-513)		63	H376-126	R-2236	1		

R-2237	Same as R-117	V-2212 cathode								
R-2238	Same as R-2024	K-2202 adj								
R-2239	Same as R-2024	K-2203 adj								
			SWITCHES							
S-101	Switch, rotary: spdt, 2 positions, single section; coin silver rotor; spring silver contacts; body 1 1/32" wd x 1 1/8" h x 39/64" lg incl contacts, 1/4" diam shaft 7/8" lg, 2 right angle flats 3/8" lg; shorting type; 3 terms; panel mtd by 3/8"-32 bushing 3/8" lg; all non-magnetic parts except stainless steel and silver, plated to withstand a 20% 200 hr salt spray test in accordance with AN-QQ-S-91 spec without undue corrosion or other deleterious effects	AGC switch		N17-S-59673-6141	10	M838-1	S-101, S-803, S-804, S-805, S-902, S-1004	18	55	2
S-102	Switch, toggle: spst; 3A, 125V; black bakelite; 2 3/32" lg x 1 19/32" wd x 9/16" thk o/a; bat handle 11/16" lg; locking action; solder lug terms; single hole mtg type, bushing 15/32" lg x 15/32" diam	Projection dial switch		N17-S-70778-4234	3	H346-4	S-102	12		
S-103 thru S-200	Not Used									
S-201	Switch, rotary 7 sections	Band switch								
S-201A	Switch section, rotary: sp4t wafer switch, 4 positions; coin silver rotor blades; spring silver clips; grade L-4 ceramic wafer; oval shaped; 1 7/8" lg x 1 5/8" h x 3/16" thk; two rectangular mtg holes 0.145" lg x 0.130" wd on 1 9/16" mtg/c; solder lug terms	Local Osc switch		N17-S-91897-8770	111	P950-1	S-201A, S-201B, S-201C, S-201D, S-201E, S-201F, S-201G	21	55	2

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SWITCHES (continued)						
S-201B	Same as S-201A	Remote Osc switch								
S-201C	Same as S-201A	Local Osc switch								
S-201D	Same as S-201A	Crystal Calibrate switch								
S-201E	Same as S-201A	210 volt plate switch								
S-201F	Same as S-201A	AGC switch								
S-201G	Same as S-201A	150 volt plate switch								
S-202	Switch, rotary: 4 sections	Heterodyne Osc switch								
S-202A	Switch section, rotary: 4pdt wafer switch, 2 positions; coin silver rotor blades; spring silver clips; grade L-4 ceramic wafer; oval shape; 1 7/8" lg x 1 5/8" h x 3/16" thk; two rectangular mtg holes 0.145" lg x 0.130" wd on 1 9/16" mtg/c; solder lug terms;	Local-Remote Osc switch		N17-S-91897-8772	111	L572-1	S-202A	3	55	1
S-202B	Switch, section: rotary: spdt wafer switch, 2 position; coin silver rotor blades; spring silver clips, grade L-4 ceramic wafer; oval shaped; 1 7/8" lg x 1 5/8" h x 3/16" thk; two rectangular mtg holes 0.145" lg x 0.130" wd on 1 9/16" mtg/c; solder lug terms	Remote Osc switch		N17-S-91897-8771	111	P951-1	S-202B, S-202C, S-202D	9	55	1

S-202C	Same as S-202B	Local Osc switch								
S-202D	Same as S-202B	Local Osc switch								
S-203 thru S-300	Not Used									
S-301	Switch, rotary: 2 pole, 3 position; 3 throw; coin silver rotor, spring silver contacts; grade L-4 ceramic wafer; 1 5/8" wd x 1 7/8" h x 5/8" lg; non shorting; locking; solder lug terms; single hole mtg bushing 3/8"-32, 3/8" lg; shaft, 1/4" diam x 7/8" lg	Second conversion Osc Selector switch		N17-S-61163-5321	111	P544-1	S-301	3	55	1
S-302 thru S-400	Not Used									
S-401A and B	Switch, rotary: 2 pole 8 position; single wafer; coin silver rotor, spring silver stator contacts; grade L-4 ceramic body; 1 7/8" lg x 1 5/8" wd x 3/16" thk excl contacts; shorting type rotor on front section, non shorting type rotor on rear section; solder lug terms; mts by two 0.145" lg x 0.130" wd slotted holes on 1 9/16" mtg/c	Input Selectivity switch			111	P326-1	S-401A and B, S-401C and D	6	55	1
S-401C and D	Same as S-401A and B	Output Selectivity switch								
S-402 thru S-600	Not Used									
S-601	Switch, rotary: spdt 2 positions; single section; coin silver rotor, spring silver contacts; body 1 1/32" wd x 1 1/8" h x 39/64" lg incl contacts; 1/4" diam	AGC switch		N17-S-59673-6121	10	M838-2	S-601, S-1203	6	55	1

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	SWITCHES (continued)									
S-601 (cont)	shaft 7/8" lg, 2 right angle flats 3/8" lg; non shorting type; 3 terms; panel mtd by 3/8"-32 bushing 3/8" lg; all non magnetic parts except stainless steel and silver, plated to withstand a 200 hr 20% salt spray test in accordance with AN-QQ-S-91 spec without undue corrosion or other deleterious effects									
S-602 thru S-700	Not Used									
S-701	Switch, rotary: double pole 4 positions; single section; solid silver rotor and contacts; grade L-3 ceramic body; 1 33/64" wd x 1 7/8" h x 29/32" lg o/a; shorting type contacts; solder lug terms; single hole mtg 3/8"-32 bushing; 3/8" lg; 1/4" diam shaft, 7/8" lg	AGC switch		N16-S-61316-4401	111	H343-1	S-701,S-903 S-1003	6	55	1
S-702	Switch, rotary: 4 pole 4 position, 4 throws, 2 wafers; coin silver rotors, spring silver contacts; grade L-4 ceramic wafers; 1 9/16" lg x 1 5/8" wd x 1 7/8" h; shorting type rotor; lug terms; 3/8"-32 bushing, 7/16" lg; 1/4" diam shaft, 7/8" lg from mtg surface,	Reception switch		N17-S-65044-2136	111	P250-1	S-702	3	55	1

S-702 (cont)	w/2 right angle flats; alum shield 3" lg x 2 3/16" h between first and second section; all non magnetic parts except silver, stainless steel and aluminum plated to withstand 20%, 200 hr salt spray test in accordance with AN-QQ-S-91 spec without undue corrosion or deleterious effects									
S702A	Part of S-702	NL switch								
S-702B	Part of S-702	BFO/crystal switch								
S-702C	Part of S-702	BFO/crystal switch								
S-702D	Part of S-702	Click silencer								
S-703	Switch, rotary: double pole, double throw; 2 positions; single section; coin silver rotor, spring silver contacts; grade LTS-E-3 laminated phenolic body; 1 7/8" h x 1 5/32" wd x 39/64" lg incl contacts; non shorting type; lug terms; 3/8"-32 bushing, 3/8" lg; 1/4" diam shaft, 7/8" lg from mtg surface, w/2 right angle flats; all non-magnetic parts except silver and stainless steel plated to withstand 20%, 200 hr salt spray test in accordance with AN-QQ-S-91 spec without undue corrosion or deleterious effects	Speaker switch		N17-S-60905-7971	10	P251-2	S-703	3	55	1
S-704 thru S-800	Not Used									
S-801	Switch, rotary: single pole, 8 position 8 throws; coin silver rotor, spring silver contacts; grade L-4 ceramic wafer; approx 57/64" lg x	Crystal A switch		N17-S-60505-9871	111	Q399-1	S-801	1		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SWITCHES (continued)						
S-801 (cont)	1 5/8" wd x 1 7/8" h excl lug terms; solder lug terms; single hole mtg, bushing 3/8"-32 thd x 3/8" lg; shaft 1/4" diam x 7/8" lg w/7/16" lg flat									
S-802	Switch, rotary: single pole, 8 position 8 throws; coin silver rotor; spring silver contacts; grade L-4 ceramic wafer; approx 57/64" lg x 1 5/8" wd x 1 7/8" h excl lug terms; solder lug terms; single hole hole mtg; bushing 3/8"-32 thd x 3/8" lg; shaft 1/4" diam x 4 13/16" lg w/7/16" lg flat	Crystal B switch		N17-S-60505-9881	111	Q399-2	S-802	1		
S-803	Same as S-101	Osc A switch								
S-804	Same as S-101	Osc B switch								
S-805	Same as S-101	Calibrate switch								
S-806 thru S-900	Not Used									
S-901A and B	Switch section, rotary: dpdt; single section; spring silver contacts, coin silver rotor; grade L-4 ceramic body; 1 7/8" wd x 1 5/8" h x 0.187" thk excl contacts; solder lug terms; mts on bracket by 2 elongated holes 0.145" wd x 0.130" h; all metal parts are suit-	Audio bandwidth selector		N17-S-91897-8759	111	M835-1	S-901A and B S-1001A and B S-1001C and D S-1001E and F	5	55	1

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S-901A	ably plated to withstand a 200 hr 20% salt spray test in accordance with AN-QQ-S-91 spec without undue corrosion or deleterious effects									
S-902	Same as S-101	ANL switch								
S-903	Same as S-701	AGC selector								
S-904 thru S-1000	Not Used									
S-1001A and B	Same as S-901A and B	Input no. 1 audio bandwidth selector								
S-1001C and D	Same as S-901A and B	Input no. 2 audio bandwidth selector								
S-1001E and F	Same as S-901A and B	Input no. 3 audio bandwidth selector								
S-1002	Switch, rotary: 3 pole 4 position; single section; spring silver contacts, coin silver rotor; grade L-4 ceramic body; 1 7/8" h x 1 5/8" wd x 1" d excl contacts and shaft; shorting type contacts; solder lug terms; single hole mtg 3/8"-32 bushing 3/8" lg, 1/4" diam shaft 7/8" lg; all non-magnetic parts except stainless steel and silver, plated to withstand a 20% 200 hr salt spray test in accordance with AN-QQ-S-91 Spec without undue corrosion ot other deleterious effects	Level indicator		N17-S-62205-9841	111	M837-1	S-1002	1	55	1
S-1003	Same as S-701	AGC selector								
S-1004	Same as S-101	ANL switch								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
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	SWITCHES (continued)									
S-1005 thru S-1100	Not Used									
S-1101	Switch, rotary: 3 position 4 contacts; coin silver rotor blades, spring silver clips; grade L-4 ceramic wafer; 7/8" lg x 1 7/8" h x 1 5/8" wd excl shaft; solder lug terms; mts by 3/8"-32 thrd bushing 3/8" lg w/0.249" diam x 7/8" lg shaft	Reception switch		N17-S-59253-8221	111	Q471-1	S-1001	3	55	1
S-1102	Switch, rotary: 2 pole, 8 position 8 throw; 2 sections; coin silver rotor blades; spring silver clips; grade L-4 ceramic wafer; 3 9/16" lg x 1 7/8" h x 1 5/8" wd excl shaft; shorting type rotor; solder lug terms; mts by 3/8"-32 thrd bushing, 3/8" lg, w/0.249" diam x 3" lg shaft	Tone switch		N17-S-64656-6391	111	P178-1	S-1102	3		
S-1102A	Part of S-1102									
S-1102B	Part of S-1102									
S-1102C	Part of S-1102									
S-1103	Switch, rotary: 3 pole, 3 positions, 3 throw; 2 sections; coin silver rotor blades; spring silver clips; grade L-4 ceramic wafer; 2 1/32" lg x 1 7/8" h x 1 5/8" wd excl	Fixed Freq switch		N17-S-64815-3161	111	P181-1	S-1103	3		

S-1103 (cont)	shaft; solder lug terms; mts by 3/8"-32 thrd bushing 3/8" lg, w/0.249" diam x 7/8" lg shaft									
S-1103A	Part of S-1103									
S-1103B	Part of S-1103									
S-1103C	Part of S-1103									
S-1104 thru S-1200	Not Used									
S-1201	Switch, rotary: 4pdt; solid silver rotor and contacts; grade L-3 ceramic body; 1 7/8" h x 1 5/8" wd x 1" lg FMS, 1/4" diam shaft 7/8" lg FMS; solder lug terms; mts by 3/8"-32 thrd bushing 3/8" lg FMS, all non-magnetic metal parts except silver and stainless steel are plated to withstand a 200 hr 20% salt spray test in accordance with AN-QQ-S-91 spec without any undue corrosion or other deleterious effects	Mark-polarity switch		N17-S-62522-8601	111	H342-1	S-1201	3		
S-1201A	Part of S-1201									
S-1201B	Part of S-1201									
S-1202	Switch, rotary: dpdt; single section; coin silver rotor, spring silver contacts; grade LTS-E-3 laminated phenolic body; 1 7/8" h x 1 5/32" wd x 39/64" lg including contacts; shorting type; solder lug terms; 3/8"-32 thrd bushing 3/8" lg FMS, 1/4" diam shaft 7/8" lg FMS; all non-magnetic parts except silver and stainless steel are plated to withstand a 200 hr 20% salt spray test in accordance with AN-QQ-S-91 spec without undue corrosion or other deleterious effects	Keying speed		N17-S-60905-7973	10	P251-1	S-1202	3	55	1

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SWITCHES (continued)						
S-1203	Same as S-601	Automatic freq control								
S-1204	Switch, rotary: sp3t, 3 position; coin silver rotor, spring silver contacts; grade L-4 ceramic body; 1 7/8" h x 1 5/8" wd x 1 3/32" lg including contacts; non shorting contacts; solder lug term; 3/8"-32 threaded bushing 3/8" lg FMS, 1/4" diam shaft 7/8" lg FMS; all non-magnetic metal parts except silver and stainless steel are plated to withstand a 200 hr 20% salt spray test in accordance with AN-QQ-S-91 spec without undue corrosion or other deleterious effects	Oscilloscope selector		N17-S-59931-7467	111	R004-1	S-1204	3	55	1
S-1205 thru S-1300	Not Used									
S-1301	Switch, rotary: spdt; coin silver rotor blades; spring silver clips; ceramic wafer, grade L-4; 21/32" lg x 1 5/8" wd x 1 7/8" h excl shaft; non shorting type; solder lug term; single hole mtg, bushing 3/8" lg x 3/8"-32; shaft 7/16" lg x 0.249" diam; all non-magnetic metal except silver and stainless	Channel A input switch			111	P741-1	S-1301	1		

S-1301 (cont)	steel shall be plated to withstand 200 hr 20% salt spray test in accordance with AN-QQ-S-91									
S-1302 thru S-2000	Not Used									
S-2001	Switch, slide: single pole 3 position; natural bakelite panel grade LTS-E-3; 2 1/16" lg x 1 7/16" wd x 15/16" h including term; solder lug term; mts by four 0.156" diam holes on 1.687" x 1.062" mtg/c; marked 105 v, 115 v and 125 v	Plate primary taps switch			1; SA:8998	SA:8998	S-2001, S-2101, S-2201	5		
S-2002	Switch, slide: single pole 3 position; natural bakelite panel grade LTS-E-3; 2 1/2" lg x 1 7/16" wd x 15/16" h including terms; solder lug terms; mts by four 0.156" diam holes on 2 1/8" x 3/4" mtg/c; marked 105 v, 115 v and 125 v	Filament primary taps switch			1; SA:9129	SA:9129	S-2002, S-2102, S-2202	5		
S-2003	Circuit breaker: magnetic blowout arc quenching type; single pole single throw; 5 amp 125 v AC, 60 cycle; load rating 2000 amps; armature overload trip release w/manual auxiliary trip release, 100% plus to 125% of continuous load minimum tripping current, 6 sec/2 sec time delay at 200/300% of continuous load current; closing by toggle actuator automatic reset, trip free; phenolic enclosure; 2 1/2" lg x 3/4" wd x 3 11/64" h o/a; mts by two no. 6-32 tapped holes 2 1/16" c to c, 5/32" d; two no. 10-32 stud terms on rear of case 1/2" lg; copper cad plated	Plate standby		N17-C-51335-6001	1300; AM-12-M6	Q720-2	S-2003, S-2004, S-2103, S-2104, S-2203, S-2204	10	55	1

Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabriacted.

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SWITCHES (continued)						
S-2003 (cont)	main contacts, brass cad plated arcing contacts									
S-2004	Same as S-2003	Plate standby								
S-2005	Circuit breaker: magnetic; single pole; 10 amps at 125 v; plastic case; 2 1/2" lg x 3/4" wd x 2 55/64" h excl terminals; standard trip type; manual reset; mts through 1 7/16" x 3/4" hole, mts by two no. 6-32 tapped holes 2 1/16" between/c	Heater protection			1300; AM-12-M6 -RSK	Q945-2	S-2005, S-2008, S-2106, S-2108, S-2206, S-2208	10	55	1
S-2006	Circuit breaker: magnetic; single pole; 30 amps at 125 v; plastic case; 2 1/2" lg x 3/4" wd x 2 55/64" h excl terms; standard trip type; manual reset; mts through 1 7/16" x 3/4" hole, mts by two no. 6-32 tapped holes 2 1/16" between/c	Heater protection			1300; AM-12-M6 -RSK	Q945-1	S-2006, S-2007, S-2107, S-2109, S-2207, S-2209	10	55	1
S-2007	Same as S-2006	Heater protection								
S-2008	Same as S-2005	Heater protection								
S-2009	Switch, thermostatic; single pole single throw; contacts open at 140° F, contacts close at 160° F; non-adjustable; bakelite body; 2 9/16" o/a diam x 2 7/32" wd x 1/2" h excl terms; flange mtg; mts by four 5/32" diam holes on 1 17/32" x	Overheat thermostat			1125	L890-3	S-2009, S-2105, S-2205	5		

S-2009 (cont)	1 17/32" mtg/c	
S-2010 thru S-2100	Not Used	
S-2101	Same as S-2001	Plate primary switch
S-2102	Same as S-2002	Filament primary taps switch
S-2103	Same as S-2003	Plate standby
S-2104	Same as S-2003	Plate standby
S-2105	Same as S-2009	Overheat thermostat
S-2106	Same as S-2005	Heater protection
S-2107	Same as S-2006	Heater protection
S-2108	Same as S-2005	Heater protection
S-2109	Same as S-2006	Heater protection
S-2110 thru S-2200	Not Used	
S-2201	Same as S-2001	Plate primary taps switch
S-2202	Same as S-2002	Filament primary taps switch
S-2203	Same as S-2003	Plate standby
S-2204	Same as S-2003	Plate standby
S-2205	Same as S-2009	Overheat thermostat
S-2206	Same as S-2005	Heater protection
S-2207	Same as S-2006	Heater protection
S-2208	Same as S-2005	Heater protection
S-2209	Same as S-2006	Heater protection

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SWITCHES (continued)						
S-2210 thru S-3400	Not Used									
S-3401	Circuit breaker: magnetic blowout arc quenching; spst; 10 amps, 125 VAC, 60 cycle; load rating 2000 amps; armature overload trip release w/manual auxiliary trip release 100% plus to 125% of continuous load minimum tripping current, 6 sec/2 sec time delay at 200/300% of continuous load current	Bay no. 1 AC Power ckt breaker		N17-C-51351-6696	1300	Q720-1	S-3401 thru S-3410	10	55	1
S-3402	Same as S-3401	Bay no. 1 AC Power ckt breaker								
S-3403	Same as S-3401	Bay no. 2 AC Power ckt breaker								
S-3404	Same as S-3401	Bay no. 2 AC Power ckt breaker								
S-3405	Same as S-3401	Bay no. 3 AC Power ckt breaker								
S-3406	Same as S-3401	Bay no. 3 AC Power ckt breaker								
S-3407 thru S-3410	Same as S-3401	Bay no. 4 AC Power ckt breaker								

			TRANSFORMERS							
T-101[1]	Transformer, RF: first RF coil; two windings, single layer wound; unshielded; 1st winding 3/4 turns no. 28E wire, 2nd winding 4 1/2 turns no. 19 bus wire; 1 9/16" lg x 3/4" diam o/a; steatite form, powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4-32 thd bushing; four solder lug term at winding terminations; used only on AM-452/FRR-24	First RF coil		N17-T-82436-8032	1; SA:8169	SA:8169	T-101[1]	3		
T-101[2]	Transformer, RF: first RF coil; two windings, single layer wound; unshielded; 1st winding 1 1/2 turns no. 26E wire, 2nd winding 9 turns no. 24 bus wire tapped at 8 turns, 1 9/16" lg x 3/4" diam o/a; steatite form, powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; five solder lug term at winding terminations; used only on AM-453/FRR-24	First RF coil		N17-T-82436-5025	1; SA:7147	SA:7147	T-101[2]	3		
T-101[3]	Transformer, RF: first RF coil; two windings, single layer wound; unshielded; 1st winding 2 turns no. no. 28E wire, 2nd winding 15 3/4 turns, 3rd winding 4 turns, no. 24 bus wire; 1 9/16" lg x 3/4" diam	First RF coil		N17-T-82436-6545	1; SA:7153	SA:7153	T-101[3]	3		

1 Used on AM-452/FRR-24 only
2 Used on AM-453/FRR-24 only
3 Used on AM-451/FRR-24 only

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TRANSFORMERS (continued)						
T-101[3] (cont)	o/a; steatite form, powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; four solder lug terms at one end, one at the other; used only on AM-451/FRR-24									
T-101[4]	Transformer, RF: first RF coil; two windings, single layer wound; unshielded; 1st winding 4 turns no. 28E, 2nd winding 25 turns no. 26E, 3rd winding 7 turns no. 26E wire; 1 13/16" lg x 1" diam o/a; steatite form, powdered iron core; 1 13/16" lg x 1" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; four solder lug terms at one end, one at the other end; used only on AM-450/FRR-24	First RF coil		N17-T-82436-6568	1; SA:7159	SA:7159	T-101[4]	3		
T-102[1]	Transformer, RF: second RF coil; one winding, single layer wound; unshielded; winding 3 1/4 turns	Second RF coil		N16-C-76217-5901	1; SA:8170	SA:8170	T-102[1]	3		
[4]	Used on AM-450/FRR-24 only									
[1]	Used on AM-452/FRR-24 only									

T-102[1] (cont)	no. 19 bus tapped at 2 turns; 1 9/16" lg x 3/4" diam o/a; steatite form, powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; one solder lug term at top end, two at winding terminations; used only on AM-452/FRR-24									
T-102[2]	Transformer, RF: second RF coil; one winding, single layer wound; unshielded; winding 8 1/2 turns no. 24 bus tapped at 5 1/4 turns; 1 9/16" lg x 3/4" diam o/a; steatite form, powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; two solder lug term one end, one at the other end; used only on AM-453/FRR-24	Second RF coil		N16-C-76301-9901	1; SA:7148	SA:7148	T-102[2]	3		
T-102[3]	Transformer, RF: second RF coil; two windings, single layer wound; unshielded; 1st winding 7 1/2 turns no. 24 bus, 2nd winding 12 turns no. 24 bus; 1 9/16" lg x 3/4" diam o/a; steatite form; powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; three solder lug term one end, one on the other end; used only on AM-451/FRR-24	Second RF coil		N16-C-76420-6501	1; SA:7154	SA:7154	T-102[3]	3		

2 Used on AM-453/FRR-24 only

3 Used on AM-451/FRR-24 only

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TRANSFORMERS (continued)						
T-102[4]	Transformer, RF: second RF coil; two windings, single layer wound; unshielded; 1st winding 10 turns no. 26E, 2nd winding 22 3/4 turns no. 26E; 1 13/16" lg x 1" diam o/a; steatite form, powdered iron core; 1 13/16" lg x 1" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; two solder lug term one end, one at the other end; used only on AM-450/FRR-24	Second RF coil		N16-C-76457-5001	1; SA:7160	SA:7160	T-102[4]	3		
T-103[1]	Transformer, RF: second RF coil; one winding, single layer wound; unshielded; winding 3 1/4 turns no. 19 bus tapped at 2 1/4 turns; 1 9/16" lg x 3/4" diam o/a; steatite form, powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; one solder lug term at top end, two at winding terminations; used only on AM-452/FRR-24	Second RF coil		N16-C-76217-5501	1; SA:8912	SA:8912	T-103[1]	3		
4	Used on AM-450/FRR-24 only									
1	Used on AM-452/FRR-24 only									

T-103[2]	Transformer, RF: third RF coil; one winding, single layer wound; unshielded; winding 8 3/4 turns no. 24 bus tapped at 3 1/2 turns; 1 9/16" lg x 3/4" diam; steatite form, powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; two solder lug term one end, one at other end; used only on AM-453/FRR-24	Third RF coil		N16-C-76302-7481	1; SA:8817	SA:8817	T-103[2]	3		
T-103[3]	Transformer, RF: third RF coil; one winding, single layer wound; unshielded; 1st winding 6 1/2 turns, 2nd winding 12 1/4 turns no. 24 bus wire; 2 3/8" lg x 3/4" diam o/a; steatite form, powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; two solder lug term one end, one at other end; used only on AM-451/FRR-24	Third RF coil		N16-C-76420-7001	1; SA:8818	SA:8818	T-103[3]	3		
T-103[4]	Transformer, RF: third RF coil; one winding single layer wound; unshielded; 1st winding 12 turns, 2nd winding 21 3/4 turns no. 26E wire; 3 7/16" lg x 1" diam o/a; steatite form, powdered iron core; 1 13/16" lg x 1" diam form; adjustable powdered iron core; screwdriver adjustment top of coil; mts by 1/4"-32 thd bushing; four sol-	Third RF coil		N16-C-76454-8401	1; SA:7161	SA:7161	T-103[4]	3		

2 Used on AM-453/FRR-24 only
3 Used on AM-451/FRR-24 only
4 Used on AM-450/FRR-24 only

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TRANSFORMERS (continued)						
T-103[4] (cont)	der lug term at winding terminations; used only on AM-450/FRR-24									
T-104[1]	Transformer, RF: fourth RF coil; two windings, single layer wound; unshielded; first winding 1 turn no. 28E wire, second winding 3 1/2 turns no. 19 bus wire; 1 9/16" lg x 3/4" diam o/a; steatite form, powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment top of coil; mts by 1/4"-32 thd bushing; four solder lug term at winding terminations; used only on AM-452/FRR-24	Fourth RF coil		N17-T-82436-3864	1; SA:8172	SA:8172	T-104[1]	3		
T-104[2]	Transformer, RF: fourth RF coil; two windings, single layer wound; unshielded; first winding 1 1/4 turns no. 28E, second winding 8 3/4 turns no. 24 bus tapped at 6th turn; 1 9/16" lg x 3/4" diam o/a; steatite form, powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; four solder lug term one	Fourth RF coil		N17-T-82436-8045	1; SA:7150	SA:7150	T-104[2] T-105[2]	6		

1 Used on AM-452/FRR-24 only
2 Used on AM-453/FRR-24 only

T-104[2] (cont)	end, one at other end; only on AM-453/FRR-24								
T-104[3]	Transformer, RF: fourth RF coil; two windings, single layer wound; unshielded; 1st winding 1/2 turn no. 28E, 2nd winding 7 3/4 turns, 3rd winding 11 1/2 turns no. 24 bus; 2 3/8" lg x 3/4" diam o/a; steatite form, powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; four solder lug term one end, one at other end; used only on AM-451/FRR-24	Fourth RF coil		N17-T-82436-8040	1; SA:7156	SA:7156	T-104[3] T-105[3]	6	
T-104[4]	Transformer, RF: fourth RF coil; two windings, single layer wound; unshielded; 1st winding 1 turn no. 28E, 2nd winding 12 3/4 turns, 3rd winding 21 turns no. 26E wire ; 3 7/16" lg x 1" diam o/a; steatite form, powdered iron core; 1 13/16" lg x 1" diam form; adjustable powdered iron core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; four solder lug term one end, one at other end; used only on AM-450/FRR-24	Fourth RF coil		N17-T-82436-8060	1; SA:7163	SA:7163	T-104[4], T-105[4]	6	
T-105[1]	Transformer, RF: fifth RF coil; two windings, single layer wound; unshielded; first winding 1 turn no. 28E wire, second winding 3 1/4 turns no. 19 bus wire; 1 9/16" lg x 3/4" diam o/a; steatite form,	Fifth RF coil		N17-T-82436-3862	1; SA:8173	SA:8173	T-105[1]	3	

3 Used on AM-451/FRR-24 only

4 Used on AM-450/FRR-24 only

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	TRANSFORMER (continued)									
T-105[1] (cont)	powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment at top of coil; mts by 1/4"-32 thd bushing; two solder lug term at one end, two at winding terminations; used only on AM-452/FRR-24									
T-105[2]	Same as T-104[2]; used only on AM-453/FRR-24	Fifth RF coil								
T-105[3]	Same as T-104[3]; used only on AM-451/FRR-24	Fifth RF coil								
T-105[4]	Same as T-104[4]; used only on AM-450/FRR-24	Fifth RF coil								
T-106[1]	Transformer, RF: buffer coil; two windings, single layer wound; unshielded; first winding 3 1/2 turns no. 19 bus, second winding 1 turn no. 28 double Nylonel covered; 1 9/16" lg x 3/4" diam o/a; steatite form, powdered iron core; 1 9/16" lg x 3/4" diam form; adjustable powdered iron core; screwdriver adjustment at top of coil; mts by 1/4"-32 thd bushing; two	Buffer coil		N17-T-82436-3863	1; SA:8816	SA:8816	T-106[1]	3		

1 Used on AM-452/FRR-24 only
2 Used on AM-453/FRR-24 only
3 Used on AM-451/FRR-24 only
4 Used on AM-450/FRR-24 only

T-106[1] (cont)	solder lug term at one end, two at winding terminations									
T-106[2]	Transformer, RF: buffer coil; two windings, single layer wound; unshielded; first winding 6 1/4 turns no. 28E, second winding 8 1/2 turns no. 24 bus; 1 9/16" lg x 3/4" diam o/a; steatite form, brass core; 1 9/16" lg x 3/4" diam form; adjustable brass core; screwdriver adjustment at top of coil; mts by 1/4"-32 thd bushing; three solder lug term one end, one at other end; used only on AM-453/FRR-24	Buffer coil		N17-T-82437-9090	1; SA:8815	SA:8815	T-106[2]	3		
T-106[3]	Transformer, RF: buffer coil; two windings, single layer wound; unshielded; first winding 9 turns no. 28E, second winding 15 1/2 turns no. 24 bus; 1 9/16" lg x 3/4" diam o/a; steatite form, brass core; 1 9/16" lg x 3/4" diam form; adjustable brass core; screwdriver adjustment at top of coil; mts by 1/4"-32 thd bushing; three solder lug terms one end, one at other end; used only on AM-451/FRR-24	Buffer coil		N17-T-82438-7465	1; SA:8814	SA:8814	T-106[3]	3		
T-106[4]	Transformer, RF: buffer coil; two windings, single layer wound; unshielded; 1st winding 10 1/2 turns no. 28E, 2nd winding 22 turns no. 26E; 1 13/16" lg x 1" diam o/a; steatite form, brass core; 1 13/16" lg x 1" diam form; adjustable brass core; screwdriver adjustment at	Buffer coil		N17-T-82439-4540	1; SA:8813	SA:8813	T-106[4]	3		

1 Used on AM-452/FRR-24 only
2 Used on AM-453/FRR-24 only
3 Used on AM-451/FRR-24 only
4 Used on AM-450/FRR-24 only

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	TRANSFORMERS (continued)									
T-106[4]	top of coil; mts by 1/4"-32 thd bushing; three solder lug term one end, one at other end; used only on AM-450/FRR-24									
T-107[1]	Transformer, RF; oscillator coil; two windings, single layer wound; unshielded; first winding 3 3/4 turns no. 19 bus wire second winding 2 turns no. 28 single Nylonel covered wire, 1 9/16" lg x 3/4" diam o/a; steatite form, brass core; 1 9/16" lg x 3/4" diam form; adjustable brass core; screwdriver adjustment at top of coil; mts by 1/4" -32 thd bushing; one solder lug term one end, three at winding terminations; used only on AM-452/FRR -24; part of Z-101[1]	Oscillator coil		N17-T-82436-6572	1; SA:8174	SA:8174	T-107[1]	3		
T-107[2]	Transformer, RF: oscillator coil; two windings, single layer wound; unshielded; first winding 6 1/4 turns no. 28E, second winding 8 3/4 turns no. 24 bus; 1 9/16" lg x 3/4" diam o/a; steatite form, brass core; 1 9/16" lg x 3/4" diam form; ad-	Oscillator coil		N17-T-82437-9075	1; SA:7152	SA:7152	T-107[2]	3		

1 Used on AM-452/FRR-24 only
2 Used on AM-453/FRR-24 only

T-107[2] (cont)	justable brass core; screwdriver adjustment on top of coil; mts by 1/4" -32 thd bushing; three solder lug term one end, one at other end; used only on AM-453/FRR-24; part of Z-101[2]									
T-107[3]	Transformer, RF: oscillator coil; two windings; single layer wound; unshielded; first winding 10 1/4 turns no. 28E, second winding 21 turns no. 26E; 1 13/16" lg x 1" diam o/a; steatite form, brass core; 1 13/16" lg x 1" diam form; adjustable brass core; screwdriver adjustment on top of coil; mts by 1/4" -32 thd bushing; three solder lug term one end, one at other end; used only on AM-451/FRR-24; part of Z-101[3]	Oscillator coil		N17-T-82439-4520	1; SA:7164	SA:7164	T-107[3]	3		
T-107[4]	Transformer, RF: oscillator coil; two windings, single layer wound; unshielded; first winding 9 turns no. 28E, second winding 16 turns no. 24 bus; 1 9/16" lg x 3/4" diam o/a; steatite form, brass core; 1 9/16" x 3/4" diam form; adjustable brass core; screwdriver adjustment on top of coil; mts by 1/4"-32 thd bushing; three solder lug terms one end, one at other end; used only on AM-450/FRR-24; part of Z-101[4]	Oscillator coil		N17-T-82438-7453	1; SA:7158	SA:7158	T-107[4]	3		
T-108	Transformer, RF: 1st IF coil; three windings, pie wound; unshielded, 1st winding 20 turns per pie, 2nd winding 13 turns per pie, 3rd wind-	IF coil		N17-T-82067-1085	1; SA:8042	SA:8042	T-108	12		

3 Used on AM-451/FRR-24 only

4 Used on AM-450/FRR-24 only

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TRANSFORMERS (continued)						
T-108 (cont)	ing 43 turns per pie, 15 wires no. 41 guage per strand; 2 3/16" lg x 1 3/64" sq o/a, ceramic form, 1 1/4" lg x 1 3/64" sq form; mts by two no. 6-32 screws on 1 1/8" mtg/c; four solder lug terms on one end									
T-109 thru T-600	Not Used									
T-601	Transformer, AF: plate coupling type; primary 10,000 ohms impedance, secondary 70 ohms impedance; enclosed steel case; 1 13/16" diam x 1 3/16" lg; 1.1 watt operating level; freq response 40 kc to 60 kc ± 2 db; four solder lug term protuding from bottom; two no. 6-32 mtg holes on on bottom, 1 1/8" c to c, along vertical center line; impregnated for tropical use, marked P897-1; JAN-T-27 spec	V-608 output		N17-T-65494-5501	123	P897-1	T-601, T-1201	6	55	1
T-602 thru T-700	Not Used									
T-701	Transformer, AF: plate coupling type; primary impedance 17,000 ohms secondary impedance 120 ohms CT; max current in primary 15 ma, zero DC in secondary; hermetically sealed metal case; 1 13/	V-708 output		N17-T-65842-8750	123	M779-1	T-701, T-901, T-1001	6	55	1

T-701 (cont)	16" lg x 1 13/16" wd x 2 1/2" h excl term; 3 watt operating level; freq response 0 db. at 1000 cyc, 0 to minus 4 db. at 100 cyc, 0 to minus 1 db at 6000 cyc; electrostatic shield between primary and secondary brought to separate term; six solder lug term on bottom; four 0.144" diam holes on 1 1/2" x 1 1/2" mtg/c									
T-702	Transformer, AF: line type; primary impedance 150 ohms, secondary impedance 3.2 ohms, no DC in primary and secondary; hermetically sealed metal case; 1 13/16" lg x 1 13/16" wd x 2 1/2" h excl term; 3 watt operating level; freq response 0 db at 1000 cyc, 0 to minus 4 db at 100 cyc, 0 to minus 1 db at 6000 cyc; electrostatic shield between primary and secondary brought out to separate term; five solder lug term on bottom; mts by four 0.144" diam holes on 1 1/2" x 1 1/2" mtg/c; JAN-T-27 spec	Speaker matching		N17-T-62336-4021	123	P401-1	T-702	3	55	1
T-703 thru T-800	Not Used									
T-801	Transformer, RF: LF oscillator; two windings, single layer wound; unshielded; primary 4 microhenries, 14 turns; secondary 0.55 microhenries, 3 1/2 turns; no. 24 bus wire; 1 9/16" lg x 3/4" diam; ceramic form, air core; adjustable iron core; screwdriver slot adjustment; mtd on one end by hole threaded for 0.234" diam bushing; four solder lug term; lacquered for	V-801 plate load 3.6 to13 mc		N17-T-822267-7924	1; SA:7144	SA:7144	T-801,T-802	2	55	1

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TRANSFORMERS (continued)						
T-801 (cont)	for tropical use									
T-801A	Part of T-801	V-801 plate load								
T-801B	Part of T-801	V-801 osc A output								
T-802	Same as T-801	V-803 plate tuning								
T-802A	Part of T-802	V-803 plate tuning								
T-802B	Part of T-802	V-803 osc B output								
T-803 thru T-900	Not Used									
T-901	Same as T-701	V-905 output								
T-902 thru T-1000	Not Used									
T-1001	Same as T-701	V-1011 output								
T-1002 thru T-1100	Not Used									
T-1101	Transformer, AF: plate coupling type; primary 10,000 ohms impedance, secondary 10,000 ohms impedance CT; 15 ma in primary, zero DC in secondary; hermetically sealed w/term extending from bottom; 2 3/16" sq x 2 7/8" h excl term; 1	V-1103 toV-1104 and V-1005 coupling		N17-T-65504-3271	123	M780-1	T-1101	3	55	1

T-1101 (cont)	watt operating level; impedance ratio 10,000 to 10,000 ohms; freq responce ±1 db from 300 to 8000 cyc w/10,000 ohms resistive load; electrostatic shield between primary and secondary; 6 solder lug term protruding from bottom; four 0.1695" diam mtg holes on 1 13/16" mtg/c; JAN-T-27 spec									
T-1102	Transformer, AF: plate coupling type; primary 20,000 ohms impedance, secondary no. 1, 600 ohms impedance CT, secondary no. 2, 600 ohms impedance CT, 15 ma in each half of push-pull primary, zero direct current in secondary; hermetically sealed w/term extending from bottom; 2 9/16" sq x 3 1/4" h excl term; 3 watt operating level; impedance ratio push-pull 20,000 to 600 ohms; freq response ±1 db from 300 to 8000 cyc w/600 ohm resistive load; electrostatic shield between primary and secondary; 9 solder lug term protuding from bottom; four 0.1695" diam mtg holes on 2 3/32" mtg/c; JAN-T-27 spec	V-1104 and V-1105 output		N17-T-65936-7202	123	M781-1	T-1102	3	55	1
T-1103	Transformer, AF: plate coupling type; primary 20,000 ohms impedance, secondary 600 ohms impedance; hermetically sealed metal case; 1 3/8" sq x 1 11/16" h excl term, incl mtg flange, 1 5/16" diam less mtg flange; 10 milliwatts operating level; flat response within 4 db from 300 to 7000 cyc; electrostatic shield between primary and secondary; 5 solder lug term on bottom; four 0.125" diam mtg holes	V-1110 ouput		N17-T-65936-7867	123	Q932-1	T-1103	3	55	1

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TRANSFORMERS (continued)						
T-1103 (cont)	on 1 1/8" mtg/c; JAN-T-27 spec									
T-1104 thru T-1200	Not Used									
T-1201	Same as T-601	V-1201 input transformer								
T-1202 thru T-2000	Not Used									
T-2001	Transformer, power: plate type; 105, 115, 125 v 50-60 cyc, single phase; two output windings; secondary no.1 995 v at .38 amps DC, tapped at 940 v at .33 amps DC, tapped at 670 v at .33 amps DC, center tap common to all taps; secondary no. 2, 750v at 100 ma DC, CT; 2000 v RMS test; hermetically sealed metal case; 7 5/32" h x 5 1/4" lg x 5 1/4" d excl term; 14 standoff term 5/8" lg x 3/8" diam located on bottom; mts by four 1/4-20 studs 3/4" lg on 4.125" x 4.125" mtg/c	High voltage transformer		N17-T-77045-3937	123	P807-1	T-2001, T-2101, T-2201	5	55	1
T-2002	Transformer, power: filament type; 105, 115, 125 v 50-60 cyc, single phase; five output windings; secd no. 1 6.8 v at 25 amps CT, secd no. 2	Filament transformer		N17-T-69977-4140	123	P806-1	T-2002, T-2102, T-2202	5	55	1

T-2002 (cont)	6.8 v at 5 amps CT, secd no. 3 6.45 v at 7.5 amps, secd no. 4 5.05 v at 6 amps, secd no. 5 5.05 v at 2 amps; 1500 v RMS test; hermetically sealed metal case; 6 7/8" h x 4 3/4" lg x 4 1/2" w excl term; 16 standoff term located on bottom; 11 term 3/8" diam x approx 3/8" lg; 5 term 9/16" diam 7/8" lg; mtg by four 10-32 studs on 3.562" x 3.562" mtg/c									
T-2003 thru T-2100	Not Used									
T-2101	Same as T-2001	High voltage transformer								
T-2102	Same as T-2002	Filament transformer								
T-2103 thru T-2200	Not Used									
T-2201	Same as T-2001	High voltage transformer								
T-2202	Same as T-2002	Filament transformer								
			ELECTRON TUBES							
V-101	Tube, electron: JAN-6BA6; pentode; JAN-1A spec	First RF amplifier	6BA6	N16-T-56211	6BA6		V-101, V-707, V-904, V-1010	18		
V-102	Tube, electron: JAN-9003; pentode; JAN-1A spec	Second RF amplifier	9003	N16-T-29003	9003		V-102, V-103, V-301 thru V-305, V-402 thru V-407, V-601 thru V-603	66		
V-103	Same as V-102	Third RF amplifier								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			ELECTRON TUBES (continued)							
V-104	Tube, electron: JAN-6BE6; pentagrid converter; JAN-1A spec	Converter	6BE6	N16-T-56211-50	6BE6		V-104, V-310, V-702	18		
V-105	Tube, electron: JAN-12AX7; twin triode; JAN-1A spec	AGC bias	12AX7	N16-T-58241-60	12AX7		V-105, V-1101, V-1201, V-1205, V-1213, V-1215, V-2009, V-2106, V-2112, V-2208, V-2212	34		
V-106	Tube, electron: JAN-0B2; voltage regulator; JAN-1A spec	Voltage regulator	0B2	N16-T-52001-5	0B2		V-106, V-1212, V-2006, V-2007, V-2008, V-2010, V-2107, V-2110, V-2113, V-2209, V-2211, V-2213, V-2215	34		
V-107	Tube, electron: JAN-6C4; triode; JAN-1A spec; part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	HF oscillator	6C4	N16-T-56214	6C4		V-107, V-311, V-410, V-604, V-1102, V-1206, V-1316,	29		

RESTRICTED SECURITY INFORMATION

V-107 (cont)						V-1324		
V-108	Tube, electron: JAN-6AN5; power amplifier; JAN-1A spec	Local RF amplifier	6AN5	N16-T-56196-50	6AN5	V-108, V-109, V-1314, V-1315, V-1322, V-1323	28	
V-109	Same as V-108	Remote RF amplifier						
V-110 thru V-300	Not Used							
V-301 thru V-305	Same as V-102	IF amplifier						
V-306	Tube, electron: JAN-6AU6; pentode; JAN-1A spec	Second conversion crystal oscillator	6AU6	N16-T-56203-50	6AU6	V-306, V-308 V-704, V-805, V-1208	13	
V-307	Tube, electron: JAN-6AG5; RF pentode; JAN-1A spec	RF amplifier	6AG5	N16-T-56175	6AG5	V-307, V-401, V-408, V-409, V-806, V-1110, V-1202, V-1203	22	
V-308	Same as V-306	Second conversion variable oscillator						
V-309	Tube, electron: JAN-6AK6; pentode; JAN-1A spec	RF amplifier	6AK6	N16-T-56191	6AK6	V-309, V-606, V-608, V-701, V-703, V-708, V-901, V-905, V-1001, V-1004, V-1006, V-1011, V-1103, V-1104, V-1105	35	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			ELECTRON TUBES (continued)							
V-310	Same as V-104	Second converter								
V-311	Same as V-107	IF amplifier								
V-312	Tube, electron: JAN-OA2; diode JAN-1A spec	Voltage regulator	OA2	N16-T-52001	OA2		V-312, V-709, V-1211, V-1309 V-2011, V-2012, V-2109, V-2114, V-2110, V-2214	20		
V-313 thru V-400	Not Used									
V-401	Same as V-307	IF amplifier								
V-402	Same as V-102	IF amplifier								
V-403 thru V-407	Same as V-102	IF amplifier								
V-408	Same as V-307	IF amplifier								
V-409	Same as V-307	IF amplifier								
V-410	Same as V-107	IF amplifier								
V-411 thru V-600	Not Used									

V-601 thru V-603	Same as V-102	IF amplifier							
V-604	Same as V-107	IF amplifier							
V-605	Tube, electron: JAN-6AL5; twin diode; JAN-1A spec	AGC bias	6AL5	N16-T-56195	6AL5		V-605, V-607, V-705, V-706, V-802, V-804, V-902, V-903, V-1002, V-1003, V-1005, V-1007 thru V-1009, V-1204, V-1210, V-1301 thru V-1304, V-1310, V-1318	36	
V-606	Same as V-309	IF amplifier							
V-607	Same as V-605	Meter rectifier							
V-608	Same as V-309	IF amplifier							
V-609 thru V-700	Not Used								
V-701	Same as V-309	IF amplifier							
V-702	Same as V-104	Heterodyne detector							
V-703	Same as V-309	Crystal oscillator							
V-704	Same as V-306	BF oscillator							
V-705	Same as V-605	Detector							
V-706	Same as V-605								
V-706A	Part of V-706	AGC delay							
V-706B	Part of V-706	Noise limiter							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			ELECTRON TUBES (continued)							
V-707	Same as V-101	First audio amplifier								
V-708	Same as V-309	Audio output								
V-709	Same as V-312	Voltage regulator								
V-710 thru V-800	Not Used									
V-801	Tube, electron: JAN-6AH6; pentode; JAN-1A spec	Crystal oscillator A	6AH6	N16-T-56185	6AH6		V-801,V-803	2		
V-802	Same as V-605	Meter rectifier								
V-803	Same as V-801	Crystal oscillator B								
V-804	Same as V-605	Meter rectifier								
V-805	Same as V-306	200 kc oscillator								
V-806	Same as V-307	Harmonic generator								
V-807 thru V-900	Not Used									
V-901	Same as V-309	IF amplifier								
V-902	Same as V-605	Detector								
V-903	Same as V-605									
V-903A	Part of V-903	AGC delay								
V-903B	Part of V-903	Noise limiter								

V-904	Same as V-101	First audio amplifier
V-905	Same as V-309	Audio output
V-906 thru V-1000	Not Used	
V-1001	Same as V-309	Input no. 1 IF amplifier
V-1002	Same as V-605	Input no. 1 detector
V-1003	Same as V-605	
V--1003A	Part of V-1003	Input no. 1 switching diode
V-1003B	Part of V-1003	Input no. 2 switching diode
V-1004	Same as V-1001	Input no. 2 IF amplifier
V-1005	Same as V-605	Input no. 2 detector
V-1006	Same as V-1001	Input no. 3 IF amplifier
V-1007	Same as V-605	Input no. 3 detector
V-1008	Same as V-605	Input no. 3 switching diode
V-1009	Same as V-605	
V-1009A	Part of V-1009	Noise limiter
V-1009B	Part of V-1009	AGC delay
V-1010	Same as V-101	First audio amplifier
V-1011	Same as V-1001	Audio output
V-1012 thru V-1100	Not Used	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			ELECTRON TUBES (continued)							
V-1101	Same as V-105	DC amplifier								
V-1101A	Part of V-1101									
V-1101B	Part of V-1101									
V-1102	Same as V-107	DC amplifier								
V-1103	Same as V-309	First audio output								
V-1104	Same as V-309	Audio output								
V-1105	Same as V-309	Audio output								
V-1106	Tube, electron: JAN-6J6; twin tridoe; JAN-1A spec	Tone oscillator	6J6	N16-T-56360	6J6		V-1106, V-1207, V-1209	9		
V-1107	Tube, electron: JAN-6AQ5; beam power pentode; JAN-1A spec	Tone oscillator	6AQ5	N16-T-56198	6AQ5		V-1107,	3		
V-1108	Tube, electron: JAN-OC3/VR105 diode; JAN-1A spec	Voltage regulator	OC3/VR105	N16-T-53050	OC3/VR-105		V-1108 V-1109, V-2108	7		
V-1109	Same as V-1108	Voltage regulator								
V-1110	Same as V-307	Monitor output								
V-1111 thru V-1200	Not Used									
V-1201	Same as V-105	50 kc limiter								
V-1202	Same as V-307	Discriminator driver								
V-1203	Same as V-307	Discriminator driver								

V-1204	Same as V-605	Discriminator							
V-1205	Same as V-105	DC amplifier							
V-1206	Same as V-107	DC amplifier							
V-1207	Same as V-1106	RF amplifier							
V-1208	Same as V-306	Oscillator							
V-1209	Same as V-1106	Freq control							
V-1210	Same as V-605	Mark detector							
V-1211	Same as V-312	Voltage regulator							
V-1212	Same as V-106	Voltage regulator							
V-1213	Same as V-105	Vertical amplifier							
V-1214	Tube, electron: JAN-2D21; gas tetrode; JAN-1A spec	Horizontal sweep	2D21	N16-T-52421	2D21		V-1214	3	
V-1215	Same as V-105	Horizontal amplifier							
V-1216	Tube, electron: JAN-2BP1; cathode ray; JAN-1A spec	Cathode ray monitor	2BP1	N16-T-52230	2BP1		V-1216	3	
V-1217	Tube, electron: JAN-12AU7; twin triode; JAN-1A spec	CONS amplifier	12AU7	N16-T-58241	12AU7		V-1217; V-1311 thru V-1313, V-1319 thru V-1321	9	
V-1218 thru V-1300	Not Used								
V-1301 thru V-1304	Same as V-605	Combining diode							
V-1305	Tube, electron: JAN-12AT7; double triode JAN-1A spec	Combiner	12AT7	N16-T-58240-10	12AT7		V-1305, V-1306	2	
V-1306	Same as V-1305	Combiner							
V-1307	Not Used								
V-1308	Not Used								
V-1309	Same as V-312	Voltage regulator							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			ELECTRON TUBES (continued)							
V-1310	Same as V-605	DC restorer								
V-1311	Same as V-1217	Driver								
V-1312	Same as V-1217	Flip-flop								
V-1313	Same as V-1217	Flip-flop								
V-1314	Same as V-108	DC amplifier								
V-1315	Same as V-108	DC amplifier								
V-1316	Same as V-107	DC amplifier								
V-1317	Not Used									
V-1318	Same as V-605	DC restorer								
V-1319	Same as V-1217	Driver								
V-1320	Same as V-1217	Flip-flop								
V-1321	Same as V-1217	Flip-flop								
V-1322	Same as V-108	DC amplifier								
V-1323	Same as V-108	DC amplifier								
V-1324	Same as V-107	DC amplifier								
V-1325 thru V-2000	Not Used									
V-2001	Tube, electron: JAN-5R4GY; duo diode rectifier; JAN-1A spec	High voltage rectifier	5R4GY	N16-T-55444	5R4GY		V-2001 thru V-2003, V-2101 thru V-2103, V-2201 thru V-2203	15		

V-2002	Same as V-2001	High voltage rectifier							
V-2003	Same as V-2001	High voltage rectifier							
V-2004	Tube, electron: JAN 6AS7G; twin triode; JAN-1A spec	Voltage regulator	6AS7G	N16-T-56202	6AS7G		V-2004, V-2005, V-2104, V-2105, V-2111, V-2115, V-2204 thru V-2207	14	
V-2005	Same as V-2004	Voltage regulator							
V-2006 thru V-2008	Same as V-106	Voltage regulator							
V-2009	Same as V-105	Regulator amplifier							
V-2010	Same as V-106	Voltage reference							
V-2011	Same as V-312	Voltage regulator							
V-2012	Same as V-312	Voltage regulator							
V-2013 thru V-2100	Not Used								
V-2101	Same as V-2001	High voltage rectifier							
V-2102	Same as V-2001	High voltage rectifier							
V-2103	Same as V-2001	B minus rectifier							
V-2104	Same as V-2004	Voltage regulator							
V-2105	Same as V-2004	Voltage regulator							
V-2106	Same as V-105	Regulator amplifier							
V-2107	Same as V-106	Voltage reference							

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				ELECTRON TUBES (continued)						
V-2108	Same as V-1108	Voltage regulator								
V-2109	Same as V-312	Voltage regulator								
V-2110	Same as V-106	Voltage regulator								
V-2111	Same as V-2004	Voltage regulator								
V-2112	Same as V-105	Regulator ampli-fier								
V-2113	Same as V-106	Voltage reference								
V-2114	Same as V-312	Voltage regulator								
V-2115	Same as V-2004	Voltage regulator								
V-2116 thru V-2200	Not Used									
V-2201	Same as V-2001	High voltage rectifier								
V-2202	Same as V-2001	High voltage rectifier								
V-2203	Same as V-2001	B minus rectifier								
V-2204 thru V-2207	Same as V-2004	Voltage regulator								
V-2208	Same as V-105	Regulator ampli-fier								
V-2209	Same as V-106	Voltage reference								
V-2210	Same as V-312	Voltage regulator								
V-2211	Same as V-106	Voltage regulator								

V-2212	Same as V-105	Regulator amplifier								
V-2213	Same as V-106	Voltage regulator								
V-2214	Same as V-312	Voltage regulator								
V-2215	Same as V-106	Voltage regulator								
			CABLES							
W-101	Cable assembly, RF: RG-59/U; 28" lg excl terminations; right angle connector type BNC one end; right angle hood type BNC other end	Antenna input		N16-C-11965-1101*	1; SA:8925	SA:8925	W-101	12		
W-102	Cable assembly, RF: RG-59/U; 23" lg excl terminations; connector type UG-88/U at one end, right angle hood type BNC at other end	Second RF amp input		N16-C-11964-8310*	1; SA:8926	SA:8926	W-102	12		
W-103	Cable assembly, RF: RG-59/U; 23" lg excl terminations; connector type UG-88/U at one end, right angle hood type BNC at other end	IF output		N16-C-11964-8312*	1; SA:8927	SA:8927	W-103	12		
W-104	Cable assembly, RF: RG-59/U; 11" lg excl terminations; connector type BNC at one end, connector UG-260/U at other end	Buffer output		N16-C-11964-4901*	1; SA:8923	SA:8923	W-104	12		
W-105	Cable assembly, RF: RG-59/U; 3 1/4" lg excl terminations; connector type UG-88/U at one end; right angle hood type BNC at other end	Remote amp output		*	1; SA:8928	SA:8928	W-105	12		
W-106	Cable assembly, RF: RG-59/U; 4 1/2" lg excl terminations; connector type UG-88/U at one end; right angle hood type BNC at other end	Remote amp output		*	1; SA:8929	SA:8929	W-106	12		
W-107	Cable assembly, RF: RG-59/U; 2 1/2" lg excl terminations; connector type UG-88/U at one end; right angle hood type BNC at other end	Remote amp input		*	1; SA:8930	SA:8930	W-107	12		

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-108 thru W-1500	Not Used									
W-1501 thru W-1506	Cable assembly, RF: uses Army-Navy cable RG-59/U; 7 1/2" lg excl terminations; 8 1/2" lg over-all; terminated with Army-Navy type UG-260/U plug at both ends	Patch cord		*	1; SA:7578	SA:7578	W-1501 to W-1506, W-1601 to W-1609, W-1701 to W-1706, W-1801 to W-1824	45		
W-1507	Cable assembly, RF: uses Army-Navy No RG-59/U coaxial cable having 73 ohms impedance, no. 22 AWG copper conductor, braided copper outer shield conductor stabllized polyethylene dielectric w/ 0.146" OD, and round 0.242" OD vinylprotective covering; 19 1/2" lg cable; 20 3/4" approx o/a lg of assembly; JAN no. UG-261/U connector at one end, Army-Navy No UG-260/U connector at other end	Antenna connectors coupling		N16-C-11964-7024*	1; SA:7419	SA:7419	W-1507, W-1610, W-1707	3		
W-1508 thru W-1600	Not Used									

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RESTRICTED SECURITY INFORMATION

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W-1601 thru W-1609	Same as W-1501	Patch cord						
W-1610	Same as W-1507	Antenna connectors coupling						
W-1611 thru W-1700	Not Used							
W-1701 thru W-1706	Same as W-1501	Patch cord						
W-1707	Same as W-1507	Antenna connector coupling						
W-1708 thru W-1800	Not Used							
W-1801 thru W-1824	Same as W-1501	Patch cord						
W-1825 thru W-3000	Not Used							
W-3001	Cable assembly, power: seven no. 16AWG stranded copper cond, synthetic resin, 1000 V working; outer covering tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam 98" lg excl terminations; plug AN3106B-16S-1P one end, plug AN3106B-16S-1S other end	Connector J242 (1A) to J2004 (1M)		N17-C-48385-8751*	1; SA:7661	SA:7661	W-3001	1
W-3002	Cable assembly, RF: RG-59/U; one cable 49" lg excl terminations; one cable 59" lg excl term-	Interconnecting J252 (1A), J607 (1H) and J1503 (1J)		N16-C-12198-6076*	1; SA:9170	SA:9170	W-3002	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3002 (cont)	inations; one cable 90" lg excl terminations; 49" cable has connector UG-261/U at one end; at other end UG-260/U modified to right angle; 59" cable has one connector UG-260/U at each end; 90" cable has one connector UG-260/U at each end; cables joined together at UG-274/U tee									
W-3003	Cable assembly, RF: RG-59/U; 90" lg excl terminations; one UG-260/U connector at each end	Connector J255 (1A) to J1521 (1J)		N16-C-11967-1905*	1; SA:7663	SA:7663	W-3003	1		
W-3004	Not Used									
W-3005	Cable assembly, RF: RG-59/U; 159" lg excl terminations; one UG-260/U connector at each end	Connector J242 (1A) to J1623 (2J)		N16-C-11969-1238*	1; SA:7665	SA:7665	W-3005	1		
W-3006	Cable assembly, RF: RG-59/U; 179" lg excl terminations; one UG-260/U connector at each end	Connector J258 (1A) to J1722 (3J)		N16-C-16969-5262*	1; SA:7666	SA:7666	W-3006	1		
W-3007	Cable assembly, RF: RG-59/U; 50" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J218 (1A) to J112 (1E)		N16-C-11965-8281*	1; SA:7667	SA:7667	W-3007	1		
W-3008	Cable assembly, RF: RG-59/U; 38" lg excl terminations; connector UG-260/U at one end; at other end UG-	Connector J226 (1A) to J116 (1D)		N16-C-11965-4015*	1; SA:7668	SA:7668	W-3008	1		

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W-3008 (cont)	260/U modified to right angle							
W-3009	Cable assembly, RF: RG-59/U; 43" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J208 (1A) to J111(1D)		N16-C-11965-6105*	1; SA:7669	SA:7669	W-3009	1
W-3010	Cable assembly, RF: RG-59/U; 33" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J250 (1A) to J110 (1D)		N16-C-11965-2311*	1; SA:7670	SA:7670	W-3010	1
W-3011	Cable assembly, RF: RG-59/U; 41" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J251 (1A) to J110 (1E)		N16-C-11965-4915*	1; SA:7671	SA:7671	W-3011	1
W-3012	Cable assembly, RF: RG-59/U; 51" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J227 (1A) to J116 (1E)		N16-C-11965-8381*	1; SA:7672	SA:7672	W-3012	1
W-3013	Cable assembly, RF: RG-59/U; 53" lg excl terminations; connector UG-260 /U at one end, at other end UG-260/U modified to right angle	Connector J209 (1A) to J111 (1E)		N16-C-11965-8586*	1; SA:7673	SA:7673	W-3013	1
W-3014	Cable assembly, RF: RG-59/U; 41" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J235 (1A) to J114 (1D)		N16-C-11965-4921*	1; SA:7674	SA:7674	W-3014	1
W-3015	Cable assembly, RF: RG-59/U; 49" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J236 (1A) to J114 (1E)		N16-C-11965-8181*	1; SA:7675	SA:7675	W-3015	1
W-3016	Cable assembly, RF: RG-59/U; 43" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J217 (1A) to J112 (1D)		N16-C-11965-6110*	1; SA:7676	SA:7676	W-3016	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RAD ↄ RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3017	Cable assembly, power: seven no. 16 AWG stranded copper cond, synthetic resin, 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick, round; 1/2" diam; 20" lg excl terminations; plug AN 3106B-16S-1P one end, plug AN 3106B-16S-1P other end	Connector J238 (1A) to J117 (1B)		N17-C-48176-9001*	1; SA:7677	SA:7677	W-3017	1		
W-3018	Cable assembly, power: seven no. 16 AWG stranded copper cond, synthetic resin, 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick, round; 1/2" diam; 25" lg excl terminations; plug AN 3106B-16S-1P one end, plug AN 3106B-16S-1S other one	Connector J239 (1A) to J117 (1C)		N17-C-48381-1858*	1; SA:7678	SA:7678	W-3018	1		
W-3019	Cable assembly, power: seven no. 16 AWG stranded copper cond, synthetic resin, 1,000 v working outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 31" lg excl terminations; plug AN 3106B-16S-1P one end, AN-3106B-16S-1S other end	Connector J240 (1A) to J117 (1D)		N17-C-48381-6140*	1; SA:7679	SA:7679	W-3019	1		

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W-3020	Cable assembly, power: seven no. 16 AWG stranded copper cond, synthetic resin, 1,000 v, working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick, round; 1/2" diam; 42" lg excl terminations; plug AN 3106B-16S-1P one end, plug AN 3106B-16S-1S other end	Connector J241 (1A) to J117 (1E)		N17-C-48382-4001*	1; SA:7680	SA:7680	W-3020	1
W-3021	Cable assembly, RF: RG-59/U, 30" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J216 (1A) to J112 (1C)		N16-C-11965-1615*	1; SA:7681	SA:7681	W-3021	1
W-3022	Cable assembly, RF: RG-59/U; 18" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J116 (1B) to J224 (1A)		N16-C-11964-7020*	1; SA:7682	SA:7682	W-3022	1
W-3023	Cable assembly, RF: RG-59/U, 21" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J111 (1B) to J206 (1A)		N16-C-11964-7328*	1; SA:7683	SA:7683	W-3023	1
W-3024	Cable assembly, RF: RG-59/U; 13" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J248 (1A) to J110 (1B)		N16-C-11964-5501*	1; SA:7684	SA:7684	W-3024	1
W-3025	Cable assembly, RF: RG-59/U; 22" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J110 (1C) to J249 (1A)		N16-C-11964-8220*	1; SA:7685	SA:7685	W-3025	1
W-3026	Cable assembly, RF: RG-59/U; 19" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J112 (1B) to J215 (1A)		N16-C-11964-7320*	1; SA:7686	SA:7686	W-3026	1
W-3027	Cable assembly, RF: RG-59/U; 21" lg excl terminations; connector UG-260/U at one end, at other end UG-	Connector J233 (1A) to J114 (1B)		N16-C-11964-7901*	1; SA:7687	SA:7687	W-3027	1

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PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3027 (cont)	260/U modified to right angle									
W-3028	Cable assembly, RF: RG-59/U; 27" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J111 (1C) to J207 (1A)		N16-C-11964-9752*	1; SA:7688	SA:7688	W-3028	1		
W-3029	Cable assembly, RF: RG-59/U; 31" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J114 (1C) to J234 (1A)		N16-C-11965-1920*	1; SA:7689	SA:7689	W-3029	1		
W-3030	Cable assembly, RF: RG-59/U; 31" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J116 (1C) to J225 (1A)		N16-C-11965-1923*	1; SA:7690	SA:7690	W-3030	1		
W-3031	Cable assembly, RF: RG-59/U; 37" lg excl terminations; connector UG-260/U modified to right angle, at each end	Connector J113 (1B) to J302 (1F)		N16-C-11965-3725*	1; SA:7691	SA:7691	W-3031	1		
W-3032	Cable assembly, RF: RG-59/U; 33" lg excl terminations; connector UG-260/U modified to right angle, at each end	Connector J113 (1C) to J303 (1F)		N16-C-11965-1926*	1; SA:7692	SA:7692	W-3032	1		
W-3033	Cable assembly, RF: RG-59/U; 28" lg excl terminations; connector UG-260/U modified to right angle, at each end	Connector J307 (1F) to J113 (1D)		N-16-C-11965-1021*	1; SA:7693	SA:7693	W-3033	1		

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W-3034	Cable assembly, RF: RG-59/U; 19" lg excl terminations; connector UG-260/U modified to right angle, at each end	Connector J113 (1E) to J304 (1F)		N16-C-11964-7325*	1; SA:7694	SA:7694	W-3034	1
W-3035	Cable assembly, RF: RG-59/U; 38" lg excl terminations; connector UG-260/U modified to right angle, at each end	Connector J305 (1F) to J403 (1K)		N16-C-11965-4615*	1; SA:7695	SA:7695	W-3035	1
W-3036	Cable assembly, RF: RG-59/U; 51" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J306 (1F) to J1507 (1J)		N16-C-11965-8386*	1; SA:7696	SA:7696	W-3036	1
W-3037	Cable assembly, special purpose; ten no. 20AWG stranded copper cond. four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 36 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P other end	Connector J308 (1F) to J2009 (1M)		N17-C-48887-1208*	1; SA:7697	SA:7697	W-3037	1
W-3038	Cable assembly, RF: RG-59/U; 42" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J704 (1G) to J1506 (1J)		N16-C-11965-5513*	1; SA:7698	SA:7698	W-3038	1
W-3039	Cable assembly, RF: RG-59/U; 75" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J115 (1B) to J1515 (1J)		N16-C-11966-6156*	1; SA:7699	SA:7699	W-3039	1
W-3040	Cable assembly, RF: RG-59/U; 70" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J115 (1C) to J1516 (1J)		N16-C-11966-4659*	1; SA:7700	SA:7700	W-3040	1

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PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3041	Not Used									
W-3042	Cable assembly, RF: RG-59/U, 33" lg excl terminations; connector UG-260/U modified to right angle at each end	Connector J606 (1H) to J402 (1K)		N16-C-11965-2321*	1; SA:7702	SA:7702	W-3042	1		
W-3043	Cable assembly, RF: RG-59/U; 23" lg excl terminations; connector RG-260/U modified to right angle at each end	Connector J705 (1G) to J604 (1H)		N16-C-11964-8301*	1; SA:7703	SA:7703	W-3043	1		
W-3044	Cable assembly, special purpose; ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond, synthetic resin covered by glass outer braid; 1000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 32 1/2" lg excl terminations; plug AN 3106B-20-27S one end; plug AN 3106B-20-27P other end	Connector J706 (1G) to J2008 (1M)		N17-C-48886-9991*	1; SA:7704	SA:7704	W-3044	1		
W-3045	Cable assembly, RF: RG-59/U; two cables, each 57" lg excl terminations; one cable 27" lg excl terminations; one cable 79" lg excl terminations; one cable 74" lg excl terminations; each 57" cable has con-	Interconnecting J1504 (1J), J1604 (2J), J1704 (3J) and J1801 (4K)		N16-C-12233-3589*	1; SA:9171	SA:9171	W-3045	1		

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W-3045 (cont)	nector UG-260/U at one end and connector UG-261/U at other end; 27" cable has connector UG-260/U at each end; 79" cable has connector UG-260/U at each end; 74" cable has connector UG-260/U at each end; cables are joined together at two UG-274/U tees							
W-3046	Cable assembly, RF: RG-59/U; 172" lg excl terminations; one connector UG-260/U at each end	Connector J1505 (1J) to J1802 (4K)		N16-C-11969-3780*	1; SA:7706	SA:7706	W-3046	1
W-3047	Cable assembly, RF: RG-59/U; 172" lg excl terminations; one connector UG-260/U at each end	Connector J1508 (1J) to J1806 (4K)		N16-C-11969-3782*	1; SA:7707	SA:7707	W-3047	1
W-3048	Cable assembly, RF: RG-59/U; two cables each 57" lg excl terminations; one cable 27" lg excl terminations; one cable 79" lg excl terminations; one cable 74" lg excl terminations; each 57" cable has connector UG-260/U at one end, connector UG-261/U at other end; 27" cable has connector UG-260/U at each end; 79" cable has connector UG-260/U at each end; 74" cable has connector UG-260/U at each end; cables are joined together at two UG-274/U tees	Interconnecting J1509 (1J) J1609 (2J) J1709 (3J) and J1805 (4K)		N16-C-12233-3591*	1; SA:9172	SA:9172	W-3048	1
W-3049	Cable assembly, RF: RG-59/U; 162" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J602 (1H) to J1823 (4K)		N16-C-11969-1452*	1; SA:7709	SA:7709	W-3049	1
W-3050	Cable assembly, RF: RG-59/U; 165" lg excl terminations; connector UG-260 /U at one end; at other end UG-260/U modified to right angle	Connector J605 (1H) to J1840 (4K)		N16-C-11969-2298*	1; SA:7710	SA:7710	W-3050	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3051	Cable assembly, RF: RG-59/U; one cable 57" lg excl terminations; one cable 99" lg excl terminations; 57" cable has connector UG-260/U at one end; UG-261/U at other end; 99" cable has connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J603 (1H) to J1843 (4K)		N16-C-12165-8651*	1; SA:9177	SA:9177	W-3051	1		
W-3052	Cable assembly, RF: RG-59/U; 159" lg excl terminations; one connector UG-260/U at each end	Connector J237 (1A) to J1617 (2J)		N16-C-11969-1240*	1; SA:7712	SA:7712	W-3052	1		
W-3053	Not Used									
W-3054	Not Used									
W-3055	Cable assembly, special purpose: ten no. 20AWG stranded copper cond. four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 32 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P other end	Connector J404 (1K) to J2006 (1M)		N17-C-48886-9369*	1; SA:7715	SA:7715	W-3055	1		
W-3056	Cable assembly, special purpose: three no. 20AWG stranded copper	Connector J2002 (1M) to fan motor		N17-C-48614-5840*	1; SA:7716	SA:7716	W-3056	1		

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W-3056 (cont)	cond; synthetic resin; 1000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 5/16" diam; 26" lg excl terminations; plug AN 3106B-14S-12S one end; plug AN 3106B-14S-12P other end									
W-3057	Cable assembly, power: three no. 12AWG stranded copper cond; synthetic resin; 1000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 96 1/2" lg excl terminations, plug AN 3106B-20-3S at one end, plug AN 3106B-20-3P at other end	Connector J2003 (1M) to J3406 (3L)		N17-C-48298-5376*	1; SA:7717	SA:7717	W-3057	1		
W-3058	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam, 26 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; plug AN-3106B-20-27P other end	Connector J608 (1H) to J2007 (1M)		N17-C-48886-9798*	1; SA:7718	SA:7718	W-3058	1		
W-3059	Not Used									
W-3060	Not Used									
W-3061	Cable assembly, RF: RG-59/U; 61" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J115 (1D) to J1528 (1J)		N16-C-11966-1901*	1; SA:7987	SA:7987	W-3061	1		

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3062	Cable assembly, RF: RG-59/U; 55" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J115 (1E) to J1529 (1J)		N16-C-11965-9101*	1; SA:7988	SA:7988	W-3062	1		
W-3063 thru W-3500	Not Used									
W-3501	Cable assembly, power: seven no. 16AWG copper cond; synthetic resin, 1000 v working; outer covering of tinned copper braid shield, cotton braid synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam diam; 98" excl terminations; plug AN 3106B-16S-1S one end; plug AN 3106B-16S-1P other end	Connector J242 (2A) to J2004 (2M)		N17-C-48386-3209*	1; SA:7720	SA:7720	W-3501	1		
W-3502	Cable assembly, RF: RG-59/U; 90" lg excl terminations; one UG-260/U connector at each end	Connector J255 (2A) to J1621 (2J)		N16-C-11967-1906*	1; SA:7721	SA:7721	W-3502	1		
W-3503	Cable assembly, RF: RG-59/U; 93" lg excl terminations; one UG-260/U connector at each end	Connector J237 (2A) to J1618 (2J)		N16-C-11967-2503*	1; SA:7722	SA:7722	W-3503	1		
W-3504	Cable assembly, RF: RG-59/U; one cable 90" lg excl terminations; one cable 59" lg excl terminations; one cable 49" lg excl terminations; 90" cable has one UG-260/U connector	Interconnecting J252 (2A), J607 (2H) and J1603 (2J)		N16-C-12198-6086*	1; SA:9173	SA:9173	W-3504	1		

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W-3504 (cont)	at each end; 59" cable has one UG-260/U connector at each end; 49" cable has one UG-260/U connector modified to right angle at one end; at other end connector UG-261/U; three cables joined together at UG-274/U tee								
W-3505	Cable assembly, RF: RG-59/U; 159" lg excl terminations; one connector UG-260/U at each end	Connector J261 (2A) to J1723 (3J)		N16-C-11969-1244*	1; SA:7724	SA:7724	W-3505	1	
W-3506	Cable assembly, RF: RG-59/U; 159" lg excl terminations; one connector UG-260/U at each end	Connector J258 (2A) to J1522 (1J)		N16-C-11969-1245*	1; SA:7725	SA:7725	W-3506	1	
W-3507	Cable assembly, RF: RG-59/U; 33" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J250 (2A) to J110 (2D)		N16-C-11965-2504*	1; SA:7726	SA:7726	W-3507	1	
W-3508	Cable assembly, RF: RG-59/U; 38" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J226 (2A) to J116 (2D)		N16-C-11965-4016*	1; SA:7727	SA:7727	W-3508	1	
W-3509	Cable assembly, RF: RG-59/U; 43" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J208 (2A) to J111 (2D)		N16-C-11965-6111*	1; SA:7728	SA:7728	W-3509	1	
W-3510	Cable assembly, RF: RG-59/U; 41" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J251 (2A) to J110 (2E)		N16-C-11965-4923*	1; SA:7729	SA:7729	W-3510	1	
W-3511	Cable assembly, RF: RG-59/U; 46" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J236 (2A) to J114 (2E)		N16-C-11965-7883*	1; SA:7730	SA:7730	W-3511	1	
W-3512	Cable assembly, RF: RG-59/U; 41" lg excl terminations; connector UG-260/U at one end; at other end UG-	Connector J235 (2A) to J114 (2D)		N16-C-11965-4922*	1; SA:7731	SA:7731	W-3512	1	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	CABLES (continued)									
W-3512 (cont)	260/U modified to right angle									
W-3513	Cable assembly, RF: RG-59/U; 51" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J227 (2A) to J116 (2E)		N16-C-11965-8387*	1; SA:7732	SA:7732	W-3513	1		
W-3514	Cable assembly, RF: RG-59/U; 53" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J209 (2A) to J111 (2E)		N16-C-11965-8587*	1; SA:7733	SA:7733	W-3514	1		
W-3515	Cable assembly, RF: RG-59/U; 43" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J217 (2A) to J112 (2D)		N16-C-11965-6107*	1; SA:7734	SA:7734	W-3515	1		
W-3516	Cable assembly, power: seven no. 16AWG stranded copper cond; synthetic resin; 1,000 V working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 25" lg excl terminations; plug AN 3106B-16S-1S at one end; plug AN 3106B-16S-1P at other end	Connector J239 (2A) to J117 (2C)		N17-C-48381-1863*	1; SA:7735	SA:7735	W-3516	1		
W-3517	Cable assembly, power: seven no. 16AWG stranded copper cond; syn-	Connector J238 (2A) to J117		N17-C-48380-7101*	1; SA:7736	SA:7736	W-3517	1		

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W-3517 (cont)	thetic resin 1000V working; outer covering of tinned copper braid shield, cotton, braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 20" lg excl terminations; plug AN 3106B-16S-1S at one end; plug AN 3106B-16S-1P at other end	(2B)							
W-3518	Cable assembly, power: seven no. 16AWG stranded copper cond; synthetic resin, 1,000 V working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 43" lg excl terminations; plug AN 3106B-16S-1S at one end; plug AN 3106B-16S-1P at other end	Connector J241 (2A) to J117 (2E)		N17-C-48382-4201*	1; SA:7737	SA:7737	W-3518	1	
W-3519	Cable assembly, power: seven no. 16 stranded copper cond; synthetic resin; 1000 V working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam 31" lg excl terminations; plug AN 3106B-16S-1S at one end; plug AN 3106B-16S-1P at other end	Connector J240 (2A) to J117 (2D)		N17-C-48381-6145*	1; SA:7738	SA:7738	W-3519	1	
W-3520	Cable assembly, RF: RG-59/U; 21" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J206 (2A) to J111 (2B)		N16-C-11964-7904*	1; SA:7739	SA:7739	W-3520	1	
W-3521	Cable assembly, RF: RG-59/U; 18" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J224 (2A) to J116 (2B)		N16-C-11964-7022*	1; SA:7740	SA:7740	W-3521	1	
W-3522	Cable assembly, RF: RG-59/U; 30" lg excl terminations; connector UG-	Connector J216 (2A) to J112		N16-C-11965-1617*	1; SA:7741	SA:7741	W-3522	1	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3522 (cont)	260/U at one end; at other end UG-260/U modified to right angle	(2C)								
W-3523	Cable assembly, RF: RG-59/U; 13" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J248 (2A) to J110 (2B)		N16-C-11964-5505*	1; SA:7742	SA:7742	W-3523	1		
W-3524	Cable assembly, RF: RG-59/U; 22" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J249 (2A) to J110 (2C)		N16-C-11964-8221*	1; SA:7743	SA:7743	W-3524	1		
W-3525	Cable assembly, RF: RG-59/U; 19" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J215 (2A) to J112 (2B)		N16-C-11964-7324*	1; SA:7744	SA:7744	W-3525	1		
W-3526	Cable assembly, RF: RG-59/U; 27" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J207 (2A) to J111 (2C)		N16-C-11964-9750*	1; SA:7745	SA:7745	W-3526	1		
W-3527	Cable assembly, RF: RG-59/U; 31" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J225 (2A) to J116 (2C)		N16-C-11965-1922*	1; SA:7746	SA:7746	W-3527	1		
W-3528	Cable assembly, RF: RG-59/U; 21" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J233 (2A) to J114 (2B)		N16-C-11964-7905*	1; SA:7747	SA:7747	W-3528	1		

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W-3529	Cable assembly, RF: RG-59/U; 31" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J234 (2A) to J114 (2C)		N16-C-11965-1910*	1; SA:7748	SA:7748	W-3529	1	
W-3530	Cable assembly, RF; RG-59/U; 37" lg excl terminations; one UG-260/U at each end, modified to right angle	Connector J113 (2B) to J302 (2F)		N16-C-11965-3726*	1; SA:7749	SA:7749	W-3530	1	
W-3531	Cable assembly, RF: RG-59/U; 33" lg excl terminations; one UG-260/U at each end, modified to right angle	Connector J113 (2C) to J303 (2F)		N16-C-11965-2506*	1; SA:7750	SA:7750	W-3531	1	
W-3532	Cable assembly, RF: RG-59/U; 33" lg excl terminations; one UG-260/U at each end, modified to right angle	Connector J113 (2D) to J307 (2F)		N16-C-11965-1928*	1; SA:7751	SA:7751	W-3532	1	
W-3533	Cable assembly, RF: RG-59/U; 19" lg excl terminations; one UG-260/U at each end, modified to right angle	Connector J113 (2E) to J304 (2F)		N16-C-11964-7330*	1; SA:7752	SA:7752	W-3533	1	
W-3534	Cable assembly, RF: RG-59/U; 35" lg excl terminations; one UG-260/U at each end, modified to right angle	Connector J305 (2F) to J403 (2K)		N16-C-11965-3101*	1; SA:7753	SA:7753	W-3534	1	
W-3535	Cable assembly, RF: RG-59/U; 51" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J306 (2F) to J1607 (2J)		N16-C-11965-8393*	1; SA:7754	SA:7754	W-3535	1	
W-3536	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16 stranded copper cond; synthetic resin covered by glass outer braid; 1,000 V working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 36 1/2" lg excl terminations, plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P other end	Connector J308 (2F) to J2009 (2M)		N17-C-48887-1215*	1; SA:7755	SA:7755	W-3536	1	

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PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	ONAN
				CABLES (continued)						
W-3537	Cable assembly, RF: RG-59/U; 46" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J704 (2G) to J1606 (2J)		N16-C-11965-7885*	1; SA:7756	SA:7756	W-3537	1		
W-3538	Cable, assembly, RF: RG-59/U; 23" lg excl terminations; connector UG-260/U modified to right angle at each end	Connector J705 (2G) to J604 (2H)		N16-C-11964-8305*	1; SA:7757	SA:7757	W-3538	1		
W-3539	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 V working; outer covering of tinned copper braid shield; cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 32 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P other end	Connector J706 (2G) to J2008 (2M)		N17-C-48886-9997*	1; SA:7758	SA:7758	W-3539	1		
W-3540	Cable assembly, RF: RG-59/U; 29" lg excl terminations; one UG-260/U at each end modified to right angle	Connector J606 (2H) to J402 (2K)		N16-C-11965-1301*	1; SA:7759	SA:7759	W-3540	1		
W-3541	Cable assembly, RF: RG-59/U; 75" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J115 (2A) to J1615 (2J)		N16-C-11966-6160*	1; SA:7760	SA:7760	W-3541	1		

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W-3542	Cable assembly, RF: RG-59/U; 70" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J115 (2C) to J1616 (2J)		N16-C-11966-4663*	1; SA:7761	SA:7761	W-3542	1	
W-3543	Cable assembly, RF: RG-59/U; 142" lg excl terminations; connector UG-260/U at one end; at other UG-260/U modified to right angle	Connector J602 (2H) to J1824 (4K)		N16-C-11968-8201*	1; SA:7762	SA:7762	W-3543	1	
W-3544	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 V working; outer covering of tinned copper braid shield; cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 26 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P other end	Connector J608 (2H) to J2007 (2M)		N17-C-48886-9800*	1; SA:7763	SA:7763	W-3544	1	
W-3545	Cable assembly, RF: RG-59/U; 154" lg excl terminations; one connector UG-260/U at each end	Connector J1605 (2J) to J1803 (4K)		N16-C-11968-9395*	1; SA:7764	SA:7764	W-3545	1	
W-3546	Cable assembly, RF: RG-59/U; 154" lg excl terminations; one connector UG-260/U at each end	Connector J1608 (2J) to J1807 (4K)		N16-C-11968-9397*	1; SA:7765	SA:7765	W-3546	1	
W-3547	Cable assembly, RF: RG-59/U; 129" lg excl terminations; one connector UG-260/U at each end	Connector J1625 (2J) to J1724 (3J)		N16-C-11968-4299*	1; SA:7766	SA:7766	W-3547	1	
W-3548	Cable assembly, RF: RG-59/U; 129" lg excl terminations; one connector UG-260/U at each end	Connector J1624 (2J) to J1524 (1J)		N16-C-11968-4301*	1; SA:7767	SA:7767	W-3548	1	
W-3549	Cable assembly, RF: RG-59/U; 159" lg excl terminations; one connector UG-260/U at each end	Connector J1619 (2J) to J237 (3A)		N16-C-11969-1247*	1; SA:7768	SA:7768	W-3549	1	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3550	Cable assembly, RF: RG-59/U; 55" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J115 (2E) to J1629 (2J)		N16-C-11965-9105*	1; SA:7769	SA:7769	W-3550	1		
W-3551	Cable assembly, RF: RG-59/U; 61" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J115 (2D) to J1628 (2J)		N16-C-11966-1905*	1; SA:7770	SA:7770	W-3551	1		
W-3552	Cable assembly, RF: RG-59/U; 44" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1637 (2J) to J811 (2L)		N16-C-11965-6705*	1; SA:7771	SA:7771	W-3552	1		
W-3553	Cable assembly, RF: RG-59/U; 45" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1638 (2J) to J812 (2L)		N16-C-11965-7293*	1; SA:7772	SA:7772	W-3553	1		
W-3554	Cable assembly, RF: RG-59/U; 43" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1636 (2J) to J810 (2L)		N16-C-11965-6117*	1; SA:7773	SA:7773	W-3554	1		
W-3555	Cable assembly, RF: RG-59/U; 50" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1635 (2J) to J813 (2L)		N16-C-11965-8287*	1; SA:7774	SA:7774	W-3555	1		
W-3556	Cable assembly, RF: RG-59/U; 51" lg excl terminations; connector UG-	Connector J1634 (2J) to J814		N16-C-11965-8391*	1; SA:7775	SA:7775	W-3556	1		

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W-3556 (cont)	260/U at one end; at other end UG-260/U modified to right angle	(2L)						
W-3557	Cable assembly, RF: RG-59/U; 52" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1633 (2J) to J815 (2L)		N16-C-11965-8486*	1; SA:7776	SA:7776	W-3557	1
W-3558	Cable assembly, RF: RG-59/U; 42" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1631 (2J) to J809 (2L)		N16-C-11965-5517*	1; SA:7777	SA:7777	W-3558	1
W-3559	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 16 1/2" lg excl terminations; plug AN 3106 B-20-27S at one end; plug AN 3106 B-20-27P at other end	Connector J404 (2K) to J2006 (2M)		N17-C-48886-9374*	1; SA:7778	SA:7778	W-3559	1
W-3560	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam, 16 1/2" lg excl terminations; plug AN 3106 B-20-27S at one end; plug AN 3106 B-20-27P at other end	Connector J816 (2L) to J2005 (2M)		N17-C-48886-9379*	1; SA:7779	SA:7779	W-3560	1
W-3561	Cable assembly, special purpose: three no. 20 AWG stranded copper cond; synthetic resin; 1,000 v work-	Connector J2002 (2M) to fan motor (2)		N17-C-48614-5845*	1; SA:7780	SA:7780	W-3561	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3561 (cont)	ing; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 5/16" diam; 26" lg excl terminations; plug AN 3106B-14S-12S one end; plug AN-3106B-14S-12P other end									
W-3562	Cable assembly, power: three no. 12AWG stranded copper cond; synthetic resin; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 86 1/2" lg excl terminations; plug AN 3106B-20-3S at one end; plug AN 3106B-20-3P at other end	Connector J2003 (2M) to J3407 (3L)		N17-C-48297-7411*	1; SA:7781	SA:7781	W-3562	1		
W-3563	Cable assembly, RF: RG-59/U; 50" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J218 (2A) to J112 (2E)		N16-C-11965-8285*	1; SA:7782	SA:7782	W-3563	1		
W-3564	Not Used									
W-3565	Not Used									
W-3566	Cable assembly, RF: RG-59/U; 139" lg exl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J605 (2H) to J1841 (4K)		N16-C-11968-6974*	1; SA:7989	SA:7989	W-3566	1		

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W-3567	Cable assembly, special purpose: RG-59/U; one cable 57" lg excl terminations; other cable 77" lg excl terminations; 57" cable has connector UG-260/U at one end, jack UG-261/U at other end; 77" cable has connector UG-260/U at one end, at other end UG-260/U modified to right angle	Two cables joined to connect J603 (2H) and J1844 (4K)		N16-C-12164-7294*	1; SA:9179	SA:9179	W-3567	1		
W-3568 thru W-3600	Not Used									
W-3601	Cable assembly, RF: RG-59/U; one cable 49" lg excl terminations; one cable 59" lg excl terminations; one cable 90" lg excl terminations; 49" cable has connector UG-261/U at one end, at other end connector UG-260/U modified to right angle; 59" cable has one connector UG-260/U at each end; 90" cable has one connector UG-260/U at each end three cables are joined together at UG-274/U tee	Interconnecting J252 (3A), J607 (3H) and J1703 (3J)		N16-C-12198-6081*	1; SA:9174	SA:9174	W-3601	1		
W-3602	Cable assembly, power: seven no. 16AWG stranded copper cond; synthetic resin; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 98" lg excl terminations; plug AN 3106B-16S-1S one end; plug AN 3106B-16S-1P other end	Connector J242 (3A) to J2004 (3M)		N17-C-48385-8756*	1; SA:7785	SA:7785	W-3602	1		
W-3603	Cable assembly, RF: RG-59/U; 90" lg excl terminations; one connector UG-260/U at each end	Connector J255 (3A) to J1721 (3J)		N16-C-11967-1907*	1; SA:7786	SA:7786	W-3603	1		

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3604	Not Used									
W-3605	Cable assembly, RF: RG-59/U; 179" lg excl terminations; one UG-260/U connector at each end	Connector J261 (3A) to J1523 (1J)		N16-C-11969-5264*	1; SA:7788	SA:7788	W-3605	1		
W-3606	Cable assembly, RF: RG-59/U; 159" lg excl terminations; one UG-260/U connector at each end	Connector J258 (3A) to J1622 (2J)		N16-C-11969-1242*	1; SA:7789	SA:7789	W-3606	1		
W-3607	Cable assembly, RF: RG-59/U; 41" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J251 (3A) to J110 (3E)		N16-C-11965-4917*	1; SA:7790	SA:7790	W-3607	1		
W-3608	Cable assembly, RF: RG-59/U; 33" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J250 (3A) to J110 (3D)		N16-C-11965-2507*	1; SA:7791	SA:7791	W-3608	1		
W-3609	Cable assembly, RF: RG-59/U; 50" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J218 (3A) to J112 (3E)		N16-C-11965-8283*	1; SA:7792	SA:7792	W-3609	1		
W-3610	Cable assembly, RF: RG-59/U; 38" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J226 (3A) to J116 (3D)		N16-C-11965-4017*	1; SA:7793	SA:7793	W-3610	1		
W-3611	Cable assembly, RF: RG-59/U; 43" lg excl terminations; connector UG-260/U at one end; at other end UG-	Connector J208 (3A) to J111 (3D)		N16-C-11965-6112*	1; SA:7794	SA:7794	W-3611	1		

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W-3611 (cont)	260/U modified to right angle							
W-3612	Cable assembly, RF: RG-59/U; 49" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J236 (3A) to J114 (3E)		N16-C-11965-8183*	1; SA:7795	SA:7795	W-3612	1
W-3613	Cable assembly, RF: RG-59/U; 41" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J235 (3A) to J114 (3D)		N16-C-11965-4924*	1; SA:7796	SA:7796	W-3613	1
W-3614	Cable assembly, RF: RG-59/U; 51" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J227 (3A) to J116 (3E)		N16-C-11965-8376*	1; SA:7797	SA:7797	W-3614	1
W-3615	Cable assembly, RF: RG-59/U; 53" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J209 (3A) to J111 (3E)		N16-C-11965-8588*	1; SA:7798	SA:7798	W-3615	1
W-3616	Cable assembly, RF: RG-59/U; 43" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J217 (3A) to J112 (3D)		N16-C-11965-6115*	1; SA:7799	SA:7799	W-3616	1
W-3617	Cable assembly, power: seven no. 16AWG stranded copper cond; synthetic resin; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 25" lg excl terminations; plug AN 3106B-16S-1S one end; plug AN 3106B-16S-1P other end	Connector J239 (3A) to J117 (3C)		N17-C-48381-1868*	1; SA:7800	SA:7800	W-3617	1
W-3618	Cable assembly, power: seven no. 16AWG stranded copper cond; synthetic resin; 1,000 v working; outer covering of tinned copper braid	Connector J238 (3A) to J117 (3B)		N17-C-48380-7106*	1; SA:7801	SA:7801	W-3618	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3618 (cont)	shield; cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 20" lg excl terminations; plug AN 3106B-16S-1S one end; plug AN 3106B-16S-1P other end									
W-3619	Cable assembly, power: seven no. 16 AWG stranded copper cond; synthetic resin; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 42" lg excl terminations; plug AN 3106B-16S-1S one end; plug AN 3106B-16S-1P other end	Connector J241 (3A) to J117 (3E)		N17-C-48382-4006*	1; SA:7802	SA:7802	W-3619	1		
W-3620	Cable assembly, power: seven no. 16AWG stranded copper cond; synthetic resin; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 31" lg excl terminations; plug AN 3106B-16S-1S one end, plug AN 3106B-16S-1P other end	Connector J240 (3A) to J117 (3D)		N17-C-48381-6150*	1; SA:7803	SA:7803	W-3620	1		
W-3621	Cable assembly, RF: RG-59/U; 21"	Connector J206		N16-C-11964-7903*	1;	SA:7804	W-3621	1		

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W-3621 (cont)	lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	(3A) to J111 (3B)			SA:7804			
W-3622	Cable assembly, RF: RG-59/U; 18" lg excl terminations; connector UG-260/U at one end, at other end UG-260/U modified to right angle	Connector J224 (3A) to J116 (3B)		N16-C-11964-7006*	1; SA:7805	SA:7805	W-3622	1
W-3623	Cable assembly, RF: RG-59/U; 30" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J216 (3A) to J112 (3C)		N16-C-11965-1603*	1; SA:7806	SA:7806	W-3623	1
W-3624	Cable assembly, RF: RG-59/U; 13" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J248 (3A) to J110 (3B)		N16-C-11964-5503*	1; SA:7900	SA:7900	W-3624	1
W-3625	Cable assembly, RF: RG-59/U; 22" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J249 (3A) to J110 (3C)		N16-C-11964-8222*	1; SA:7807	SA:7807	W-3625	1
W-3626	Cable assembly, RF: RG-59/U; 19" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J215 (3A) to J112 (3B)		N16-C-11964-7326*	1; SA:7808	SA:7808	W-3626	1
W-3627	Cable assembly, RF: RG-59/U; 27" lg excl terminations, connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J207 (3A) to J111 (3C)		N16-C-11964-9754*	1; SA:7809	SA:7809	W-3627	1
W-3628	Cable assembly, RF: RG-59/U; 31" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J225 (3A) to J116 (3C)		N16-C-11965-1924*	1; SA:7810	SA:7810	W-3628	1
W-3629	Cable assembly, RF: RG-59/U; 21" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J233 (3A) to J114 (3B)		N16-C-11964-7902*	1; SA:7811	SA:7811	W-3629	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3630	Cable assembly, RF: RG-59/U; 31" lg excl terminations, connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J234 (3A) to J114 (3C)		N16-C-11965-1925*	1; SA:7812	SA:7812	W-3630	1		
W-3631	Cable assembly, RF: RG-59/U; 37" lg excl terminations; connector UG-260/U at each end modified to right angle	Connector J113 (3B) to J302 (3F)		N16-C-11965-3727*	1; SA:7813	SA:7813	W-3631	1		
W-3632	Cable assembly, RF: RG-59/U; 33" lg excl terminations; connector UG-260/U at each end modified to right angle	Connector J113 (3C) to J303 (3F)		N16-C-11965-2503*	1; SA:7814	SA:7814	W-3632	1		
W-3633	Cable assembly, RF: RG-59/U; 28" lg excl terminations; connector UG-260/U at each end modified to right angle	Connector J113 (3D) to J307 (3F)		N16-C-11965-1023*	1; SA:7815	SA:7815	W-3633	1		
W-3634	Cable assembly, RF: RG-59/U; 19" lg excl terminations; connector UG-260/U at each end modified to right angle	Connector J113 (3E) to J304 (3F)		N16-C-11964-7327*	1; SA:7816	SA:7816	W-3634	1		
W-3635	Cable assembly, RF: RG-59/U; 38" lg excl terminations; connector UG-260/U at each end modified to right angle	Connector J305 (3F) to J403 (3K)		N16-C-11965-4019*	1; SA:7817	SA:7817	W-3635	1		
W-3636	Cable assembly, RF: RG-59/U; 51" lg excl terminations; connector UG-	Connector J306 (3F) to J1707		N16-C-11965-8389*	1; SA:7818	SA:7818	W-3636	1		

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W-3636 (cont)	260/U at one end; at other end UG-260/U modified to right angle	(3J)						
W-3637	Cable assembly, special purpose: ten no. 20AWG stranded copper cond, four no. 16AWG stranded cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 36 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; AN 3106B-20-27P at other end	Connector J308 (3F) to J2009 (3M)		N17-C-48887-1220*	1; SA:7819	SA:7819	W-3637	1
W-3638	Cable assembly, RF: RG-59/U; 42" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J704 (3G) to J1706 (3J)		N16-C-11965-5515*	1; SA:7820	SA:7820	W-3638	1
W-3639	Cable assembly, RF: RG-59/U; 23" lg excl terminations; one connector UG-260/U at each end modified to right angle	Connector J705 (3G) to J604 (3H)		N16-C-11964-8303*	1; SA:7821	SA:7821	W-3639	1
W-3640	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 32 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P other end	Connector J706 (3G) to J2008 (3M)		N17-C-48886-1005*	1; SA:7822	SA:7822	W-3640	1
W-3641	Cable assembly, RF: RG-59/U; 75" lg excl terminations; connector UG-260/U at one end; at other end UG-	Connector J115 (3B) to J1715 (3J)		N16-C-11966-6158*	1; SA:7823	SA:7823	W-3641	1

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PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	CABLES (continued)									
W-3641 (cont)	260/U modified to right angle									
W-3642	Cable assembly, RF: RG-59/U; 70" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J115 (3C) to J1716 (3J)		N16-C-11966-4661*	1; SA:7824	SA:7824	W-3642	1		
W-3643	Cable assembly, RF: RG-59/U; 127" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J602 (3H) to J1825 (4K)		N16-C-11968-3705*	1; SA:7825	SA:7825	W-3643	1		
W-3644	Cable assembly, RF: RG-59/U; 33" lg excl terminations; one connector UG-260/U modified to right angle at each end	Connector J606 (3H) to J402 (3K)		N16-C-11965-2505*	1; SA:7826	SA:7826	W-3644	1		
W-3645	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass braid, 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick, round; 9/16" diam; 26 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P at other end	Connector J608 (3H) to J2007 (3M)		N17-C-48886-9805*	1; SA:7827	SA:7827	W-3645	1		

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W-3646	Cable assembly, RF: RG-59/U; 139" lg excl terminations; one UG-260/U connector at each end	Connector J1705 (3J) to J1804 (4K)		N16-C-11968-6972*	1; SA:7828	SA:7828	W-3646	1	
W-3647	Not Used								
W-3648	Cable assembly, RF: RG-59/U; 141" lg excl terminations; one UG-260/U connector at each end	Connector J1708 (3J) to J1808 (4K)		N16-C-11968-7200*	1; SA:7830	SA:7830	W-3648	1	
W-3649	Cable assembly, RF: RG-59/U; 61" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J115 (3D) to J1728 (3J)		N16-C-11966-1903*	1; SA:7831	SA:7831	W-3649	1	
W-3650	Cable assembly, RF: RG-59/U; 55" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J115 (3E) to J1729 (3J)		N16-C-11965-9103*	1; SA:7832	SA:7832	W-3650	1	
W-3651	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 16 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P at other end	Connector J404 (3K) to J2006 (3M)		N17-C-48886-9399*	1; SA:7833	SA:7833	W-3651	1	
W-3652	Not Used								
W-3653	Cable assembly, power: three no. 12AWG stranded copper cond; synthetic resin; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 86 1/2" lg excl terminations; plug AN 3106B-20-3S at one end; plug AN 3106B-20-3P	Connector J3410 (3L) to J2203 (4N)		N17-C-48297-7416*	1; SA:7835	SA:7835	W-3653	1	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3653 (cont)	at other end									
W-3654	Cable assembly, power: three no. 12AWG stranded copper cond; synthetic resin; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 36 1/2" lg excl terminations; plug AN 3106B-20-3S at one end; plug AN3106B-20-3P at other end	Connector J3408 (3L) to J2003 (3M)		N17-C-48289-4685*	1; SA:7836	SA:7836	W-3654	1		
W-3655	Not Used									
W-3656	Cable assembly, power: three no. 12AWG stranded copper cond; synthetic resin; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 1/2" diam; 96 1/2" lg excl terminations; plug AN 3106B-20-3S at one end; plug AN 3106B-20-3P at other end	Connector J3409 (3L) to J2103 (4M)		N17-C-48298-5381*	1; SA:7838	SA:7838	W-3656	1		
W-3657	Cable assembly, special purpose: three no. 20AWG stranded copper cond; synthetic resin; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, syn-	Connector J2002 (3M) to fan motor		N17-C-48614-5850*	1; SA:7839	SA:7839	W-3657	1		

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W-3657 (cont)	thetic (vinylite) insulation 3/64" thick; round; 5/16" diam; 26" lg excl terminations; plug AN 3106B-14S-12S at one end; plug AN 3106B-14S-12P at other end							
W-3658	Not Used							
W-3659	Not Used							
W-3660	Cable assembly, RF: RG-59/U; 127" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J605 (3H) to J1842 (4K)		N16-C-11968-3703*	1; SA:8367	SA:8367	W-3660	1
W-3661	Cable assembly, RF: RG-59/U; one cable 57" lg excl terminations; one cable 59" lg excl terminations; 57" cable has connector UG-260/U at one end; at other end connector UG-261/U; 59" cable has connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J603 (3H) to J1845 (4K)		N16-C-12162-9101*	1; SA:9181	SA:9181	W-3661	1
W-3662 thru W-3700	Not Used							
W-3701	Cable assembly, RF: RG-59/U; 99" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J906 (4A) to J1814 (4K)		N16-C-11967-3801*	1; SA:7841	SA:7841	W-3701	1
W-3702	Cable assembly, RF: RG-59/U; 94" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J904 (4A) to J1834 (4K)		N16-C-11967-2242*	1; SA:7842	SA:7842	W-3702	1
W-3703	Cable assembly, RF: RG-59/U; 99" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J907 (4A) to J1833 (4K)		N16-C-11967-3798*	1; SA:7843	SA:7843	W-3703	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3704	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 72 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P other end	Connector J908 (4A) to J2104 (4M)		N17-C-48887-2759*	1; SA:7844	SA:7844	W-3704	1		
W-3705	Cable assembly, RF: RG-59/U; 94" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J906 (4B) to J1815 (4K)		N16-C-11967-2863*	1; SA:7845	SA:7845	W-3705	1		
W-3706	Cable assembly, RF: RG-59/U; 89" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J904 (4B) to J1835 (4K)		N16-C-11966-9601*	1; SA:7846	SA:7846	W-3706	1		
W-3707	Cable assembly, RF: RG-59/U; 94" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J907 (4B) to J1846 (4K)		N16-C-11967-2866*	1; SA:7847	SA:7847	W-3707	1		
W-3708	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded cop-	Connector J908 (4B) to J2105 (4M)		N17-C-48887-2575*	1; SA:7848	SA:7848	W-3708	1		

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W-3708 (cont)	per cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 67 1/2" lg excl terminations; plug AN 3106B-20-27S one end; plug AN 3106B-20-27P other end							
W-3709	Cable assembly, RF: RG-59/U; 85" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1007 (4C) to J1816 (4K)		N16-C-11966-8801*	1; SA:7849	SA:7849	W-3709	1
W-3710	Cable assembly, RF: RG-59/U; 77" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1004 (4C) to J1831 (4K)		N16-C-11966-6726*	1; SA:7850	SA:7850	W-3710	1
W-3711	Cable assembly, RF: RG-59/U; 79" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1005 (4C) to J1836 (4K)		N16-C-11966-7432*	1; SA:7851	SA:7851	W-3711	1
W-3712	Cable assembly, RF: RG-59/U; 86" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1008 (4C) to J1830 (4K)		N16-C-11966-9001*	1; SA:7852	SA:7852	W-3712	1
W-3713	Cable assembly, RF: RG-59/U; 87" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1009 (4C) to J1832 (4K)		N16-C-11966-9201*	1; SA:7853	SA:7853	W-3713	1
W-3714	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield; cotton braid; synthetic (vinylite) insulation 3/64" thick;	Connector J1010 (4C) to J2106 (4M)		N17-C-48887-2421*	1; SA:7854	SA:7854	W-3714	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3714 (cont)	round; 9/16" diam; 61 1/2" lg excl terminations; plug AN 3106B-20-27S one end; plug AN-3106B-20-27P other end									
W-3715	Cable assembly, RF: RG-59/U; 59" lg excl terminations; one connector UG-260/U at each end	Connector J1204 (4D) to J1306 (4L)		N16-C-11966-1296*	1; SA:7855	SA:7855	W-3715	1		
W-3716	Cable assembly, RF: RG-59/U; 79" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1206 (4D) to J1827 (4K)		N16-C-11966-7437*	1; SA:7856	SA:7856	W-3716	1		
W-3717	Cable assembly, RF: RG-59/U; 80" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1207 (4D) to J1810 (4K)		N16-C-11966-7457*	1; SA:7857	SA:7857	W-3717	1		
W-3718	Cable assembly, RF: RG-59/U; one cable 76" lg excl terminations; one cable 71" lg excl terminations; one cable 67" lg excl terminations; one cable 43" lg excl terminations; one cable 6" lg excl terminations; 76" cable has connector UG-260/U at one end; at other end UG-260/U modified to right angle; 71" cable has connector UG-261/U at one end; at other end UG-260/U modified to right angle; 67" cable has	Interconnecting J1205 (4D), J1205 (4E), J1205 (4F), J1309 (4L)		N16-C-11968-4906*	1; SA:9175	SA:9175	W-3718	1		

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W-3718 (cont)	connector UG-261/U at one end; at other end UG-260/U modified to right angle; 43'' cable has connector UG-260/U at one end; at other end UG-260/U modified to right angle; 6'' cable has connector UG-260/U at each end; cables joined together at two UG-274/U tees							
W-3719	Cable assembly, RF: RG-59/U; 73'' lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1203 (4D) to J1818 (4K)		N16-C-11966-5510*	1; SA:7859	SA:7859	W-3719	1
W-3720	Not Used							
W-3721	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64'' thick; round; 9/16'' diam; 64 1/2'' lg excl terminations; plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P other end	Connector J1208 (4D) to J2204 (4N)		N17-C-48887-2451*	1; SA:7861	SA:7861	W-3721	1
W-3722	Cable assembly, RF: RG-59/U; 75'' lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1207 (4E) to J1811 (4K)		N16-C-11966-6165*	1; SA:7862	SA:7862	W-3722	1
W-3723	Cable assembly, RF: RG-59/U; 65'' lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1203 (4E) to J1819 (4K)		N16-C-11966-3106*	1; SA:7863	SA:7863	W-3723	1
W-3724	Cable assembly, RF: RG-59/U; 51'' lg excl terminations; one connector UG-260/U at each end modified to right angle	Connector J1204 (4E) to J1304 (4L)		N16-C-11965-8408*	1; SA:7864	SA:7864	W-3724	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3725	Cable assembly, RF: RG-59/U; 71" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1206 (4E) to J1828 (4K)		N16-C-11966-4911*	1; SA:7865	SA:7865	W-3725	1		
W-3726	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no.16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield; cotton braid; synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 56 1/2" lg excl terminations; plug AN 3106 B-20-27S at one end; plug AN 3106 B-20-27P other end	Connector J1208 (4E) to J2205 (4N)		N17-C-48887-2232*	1; SA:7866	SA:7866	W-3726	1		
W-3727	Cable assembly, RF: RG-59/U; 69" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1207 (4F) to J1812 (4K)		N16-C-11966-2211*	1; SA:7867	SA:7867	W-3727	1		
W-3728	Cable assembly, RF: RG-59/U; 62" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1203 (4F) to J1820 (4K)		N16-C-11966-2212*	1; SA:7868	SA:7868	W-3728	1		
W-3729	Not Used									
W-3730	Cable assembly, RF: RG-59/U; 45" lg excl terminations; one connector	Connector J1204 (4F) to J1307		N16-C-11965-7303*	1; SA:7870	SA:7870	W-3730	1		

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W-3730 (right	UG-260/U at each end modified to right angle	(4L)							
W-3731	Cable assembly, RF: RG-59/U; 69" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1206 (4F) to J1829 (4K)		N16-C-11966-4315*	1; SA:7871	SA:7871	W-3731	1	
W-3732	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield; cotton braid; synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 51 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P other end	Connector J1208 (4F) to J2206 (4N)		N17-C-48887-2030*	1; SA:7872	SA:7872	W-3732	1	
W-3733	Cable assembly, RF: RG-59/U; 65" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1102 (4G) to J1847 (4K)		N16-C-11966-3111*	1; SA:7873	SA:7873	W-3733	1	•
W-3734	Cable assembly, RF: RG-59/U; 63" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1103 (4G) to J1838 (4K)		N16-C-11966-2553*	1; SA:7874	SA:7874	W-3734	1	
W-3735	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 35 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P other end	Connector J1104 (4G) to J2107 (4M)		N17-C-48887-1126*	1; SA:7875	SA:7875	W-3735	1	

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PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3736	Cable assembly, RF: RG-59/U; 61" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1102 (4H) to J1848 (4K)		N16-C-11966-1907*	1; SA:7876	SA:7876	W-3736	1		
W-3737	Cable assembly, RF: RG-59/U; 61" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1103 (4H) to J1839 (4K)		N16-C-11966-2214*	1; SA:7877	SA:7877	W-3737	1		
W-3738	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 29 1/2" lg excl terminations; plug AN 3106 B-20-27S one end; plug AN 3106B-20-27P other end	Connector J1104 (4H) to J2108 (4M)		N17-C-48886-9873*	1; SA:7878	SA:7878	W-3738	1		
W-3739	Cable assembly, RF: RG-59/U; 51" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1102 (4J) to J1849 (4K)		N16-C-11965-8397*	1; SA:7879	SA:7879	W-3739	1		
W-3740	Cable assembly RF: RG-59/U; 52" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1103 (4J) to J1813 (4K)		N16-C-11965-8496*	1; SA:7880	SA:7880	W-3740	1		

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W-3741	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 26 1/2" lg excl terminations; plug AN 3106B-20-27S one end; plug AN 3106B-20-27P at other end	Connector J1104 (4J) to J2109 (4M)		N17-C-48886-9797*	1; SA:7881	SA:7881	W-3741	1	
W-3742	Not Used								
W-3743	Not Used								
W-3744	Not Used								
W-3745	Cable assembly, RF: RG-59/U; 45" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1837 (4K) to J1305 (4L)		N16-C-11965-7289*	1; SA:7885	SA:7885	W-3745	1	
W-3746	Cable assembly, RF: RG-59/U; 51" lg excl terminations; connector UG-260/U at one end; at other end UG-260/U modified to right angle	Connector J1850 (4K) to J1308 (4L)		N16-C-11965-8395*	1; SA:7886	SA:7886	W-3746	1	
W-3747	Cable assembly, special purpose: ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin covered by glass outer braid; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 9/16" diam; 21 1/2" lg excl terminations; plug AN 3106B-20-27S one end; plug AN 3106B-20-27P other end	Connector J1310 (4L) to J2207 (4N)		N17-C-48886-9553*	1; SA:7887	SA:7887	W-3747	1	
W-3748	Cable assembly, special purpose: five no. 20AWG stranded copper	Connector J1311 (4L) to J3903		N17-C-48693-1031*	1; SA:7888	SA:7888	W-3748	1	

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				CABLES (continued)						
W-3748 (cont)	cond; seven no. 28AWG copper strands; synthetic resin; color coded, 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 25/64" diam; 38" lg excl terminations; plug AN 3106B-14S-5S at one end; plug AN 3106B-14S-5P at other end									
W-3749	Cable assembly, special purpose: three no. 20AWG stranded copper cond; synthetic resin; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 5/16" diam; 26" lg excl terminations; plug AN 3106B-14S-12S at one end; plug AN 3106B-14S-12P at other end	Connector J2102 (4M) to fan motor		N17-C-48614-5851*	1; SA:7889	SA:7889	W-3749	1		
W-3750	Cable assembly, special purpose: three no. 20AWG stranded copper cond; synthetic resin; 1,000 v working; outer covering of tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thick; round; 5/16" diam; 26" lg excl terminations; plug AN 3106B-14S-	Connector J2202 (4N) to fan motor		N17-C-48614-5853*	1; SA:7890	SA:7890	W-3750	1		

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W-3750 (cont)	12S at one end; plug AN 3106B-14S-12P other end							
W-3751 thru W-3900	Not Used							
W-3901	Cable assembly, special purpose: two cables each with: four no. 22 AWG solid copper cond, four no. 20AWG stranded copper cond, two no. 16AWG stranded copper cond; synthetic resin insulations, color coded; 1000 vdcw; vinylite tape, cotton braid lacquer covered; 3/4" o/a diam x 42" lg excl term; one connector receptacle at each end, National Company part/dwg M821-21 at one end, part/dwg M822-21 at other end	Test cable		N17-C-48890-3402*	1; SA:7719	SA:7719	W-3901	8
W-3902	Cable, RF: JAN type RG-59/U	Reference listing	RG-59/U	*	128	L212	W-3902	
W-3903	Cable, power: interconnecting cable; seven no. 16AWG stranded copper cond; synthetic resin insulation; covered by tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thk; 1000 v working; round; 1/2" diam	Reference listing		*	1296	Q007	W-3903	
W-3904	Cable, special purpose: interconnecting cable, ten no. 20AWG stranded copper cond; four no. 16AWG stranded copper cond; synthetic resin insulation covered by glass outer braid; color coded; 1000 v working, covered by tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thk; round; 9/16" diam	Reference listing		*	1296	M857	W-3904	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	CABLES (continued)									
W-3905	Cable, special purpose: interconnecting cable; three no. 20AWG copper cond; synthetic resin insulation; color coded; 1000 v working; covered by tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thk; round; 5/16" diam	Reference listing		*	151	M856	W-3905			
W-3906	Cable, special purpose: five no. 20AWG stranded copper cond; synthetic resin; color coded; 1000 v working; covered by tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thk; round; 25/64" diam	Reference listing		*	151	P494	W-3906			
W-3907	Cable, power: three no. 12AWG stranded copper cond; synthetic resin insulation covered by tinned copper braid shield, cotton braid, synthetic (vinylite) insulation 3/64" thk; 1000 v working; round; 1/2" diam	Reference listing		*	151	Q978	W-3907			
W-3908	Cable, special purpose: test cable; four RG-59/U cond; four no. 20AWG stranded copper cond; two no. 16 AWG stranded copper cond; synthetic resin insulation; color coded; 1000 v working; vinylite tape, cot-	Reference listing		*	151	Q210	W-3908			

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

RESTRICTED SECURITY INFORMATION
ORIGINAL

W-3908 (cont)	ton lacquer covered insulation; round; 3/4" diam								
			CRYSTALS						
Y-101 thru Y-300	Not Used								
Y-301	Cystal unit, quartz: case marked CR-18/U; frequency 1700 kc; -55° C to 90° C temp range; 2 pins spaced on bottom 1/2" c to c; solid pins 0.050" diam x 3/16" lg; 15/16" h x 3/4" wd o/a; mtd in metal holder	1700 kc oscillator crystal	CR-18/U	N16-C-96846-7291	145	M789-1	Y-301	3	
Y-302 thru Y-700	Not Used								
Y-701	Crystal unit, quartz: type 21NA; 50,000 cyc; tem range -40° to +70° C; freq tol ±0.01% w/o ckt adj; two solid pins 0.050" diam x 0.217" max lg, oval body 1.516" lg x 0.750" wd x 0.345" h	50 kc oscillator		N16-C-96130-9101	1136	M804-1	Y-701	3	
Y-702 thru Y-800	Not Used								
Y-801 thru Y-816	Crystal unit, Government furnished				145		Y-801 thru Y-816	16	
Y-817	Crystal unit, quartz: case marked CR-25/U holder HC-6/U; frequency 200 kc; -40° to 70° C temp range; 2 pins spaced on bottom 0.486" c to c; solid pins 0.050" diam x 0.243" lg; 0.788" lg x 0.750" wd x 0.345" h; mtd in metal holder, material as per MIL-C-3098 spec; frequency tol ±0.01% of nominal freq over the temp	200 kc oscillator crystal	CR-25/U	N16-C-96250-1001	145	P956-1	Y-817	1	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
			CRYSTALS (continued)							
Y-817 (cont)	range; MIL-C-3098									
			COMPOUND TUNED CIRCUITS AND FILTERS							
Z-101[1]	Capacitor assembly: consists of one ea variable capacitor w/reduction gears, one dual section variable trimmer capacitor, six fixed capacitors, two resistors and one RF transformer contained in a hermetically sealed compartment; 8 1/8" lg x 5 11/16" wd x 6 9/16" h o/a; mts by three 8-32 tapped mtg holes on bottom; used only on AM-452/FRR-24; includes C-103F[1], C-147, C-148, C-149, C-151[1], C-152A, C-152B, C-153[1], C-154, C-185, E-120, E-132, E-133, E-144, N-104, O-104, O-105, O-139, O-140, O-142, O-144, O-145, O-150, O-161, O-162, O-170, R-135, R-136, T-107[1], V-V-107, XV-107	HF osc tuned circuit assembly			1; SA:9396	SA:9396	Z-101[1]	3		
Z-101[2]	Capacitor assembly: consists of one ea variable capacitor w/reduction gears, one dual section variable trimmer capacitor, six fixed capacitors, two resistors and one RF transformer contained in a hermeti-	HF osc tuned circuit assembly			1; SA:9397	SA:9397	Z-101[2]	3		

1 Used on AM-452/FRR-24 only
2 Used on AM-453/FRR-24 only

Z-101[2] (cont)	cally sealed compartment; 8 1/8" lg x 5 11/16" wd x 9 9/16" h o/a; mts by three 8-32 tapped mtg holes on bottom; used only on AM-453/FRR-24; includes C-103FX, C-147, C-148, C-149, C-151[2], C-152A, C-152B, C-153[2], C-154, C-185, E-120. E-132, E-133, E-144, N-104, O-104, O-105, O-139, O-140, O-142, O-144, O-145, O-150, O-161, O-162, O-170, R-135, R-136, T-107[2], V-107, XV-107									
Z-101[3]	Capacitor, assembly: consists of one ea variable capacitor w/reduction gears, one dual section variable trimmer capacitor, six fixed capacitors, two resistors and one RF transformer contained in a hermetically sealed compartment, 8 1/8" lg x 5 11/16" wd x 6 9/16" h o/a; mts by three 8-32 tapped mtg holes on bottom; used only on AM-451/FRR-24; includes C-103FX, C-147, C-148, C-149, C-151[3], C-152A, C-152B, C-153[3], C-154, C-185, E-120, E-132, E-133, E-144, N-104, O-104, O-105, O-139, O-140, O-142, O-144, O-145, O-150, O-161, O-162, O-170, R-135, R-136, T-107[3], V-107, XV-107	HF osc tuned circuit assembly			1; SA:9398	SA:9398	Z-101[3]	3		
Z-101[4]	Capacitor assembly, consists of one ea variable capacitor w/reduction gears, one dual section variable trimmer capacitor, six fixed capacapacitor, two resistors and one RF transformer contained in a hermetically sealed compartment; 8 1/8"	HF osc tuned circuit assembly			1; SA:9399	SA:9399	Z101[4]	3		

[3] Used on AM-451/FRR-24 only
[4] Used on AM-450/FRR-24 only

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				COMPOUND TUNED CIRCUITS AND FILTERS (continued)						
Z-101[4] (cont)	lg x 5 11/16" wd x 6 9/16" h o/a; mts by three 8-32 tapped mtg holes on bottom; used only on AM-450/FRR-24; includes C-103FX, C-147, C-148, C-149, C-151[4], C-152A, C-152B, C-153[4], C-154, C-185, E-120, E-132, E-133, E-144, N-104, O-104, O-105, O-139, O-140, O-142, O-144, O-145, O-150, O-161, O-162, O-170, R-135, R-136, T-107[4], V-107, XV-107									
Z-102 thru Z-300	Not Used									
Z-301	Transformer, IF: 1700 to 1750 kc; input shielded; 1 1/8" sq x 2 7/8" lg; powdered iron core; tuned sec'd only; adjustable iron core tuning; mts by two no. 6-32 studs located diagonally on 1.125" mtg/c; 4 solder lug terminals; incl C-301, L-301,	V-301 input		N17-T-67773-3161	1; SA:8048	SA:8048	Z-301, Z-302, Z-303, Z-304	12	55	1
Z-302	Same as Z-301 except incl C-304, L-302	V-302 input								
Z-303	Same as Z-301 except incl C-307, L-303	V-303 input								
Z-304	Same as Z-301 except incl C-368, L-304	V-304 input								

Z-305	Transformer, IF: 1700 to 1750 kc; interstage; shielded 1 1/8" sq x 2 7/8" lg; powdered iron core; double tuned; adjustable iron core tuning; mts by two no. 6-32 studs located diagonally on 1.125" mtg/c; 4 solder lug terminals; incl C-313, C-314, L-305	V-301 plate to Z-306		N17-T-67773-2126	1; SA:8040	SA:8040	Z-305, Z-306, Z-307, Z-308, Z-309	15	55	1
Z-306	Same as Z-305 except incl C-319, C-320, L-306	Z-305 to V-305 grid								
Z-307	Same as Z-305 except incl C-323, C-324, L-307	V-305 plate to Z-308								
Z-308	Same as Z-305 except incl C-329, C-330, L-308	Z-307 to V-310 mixer grid								
Z-309	Same as Z-305 except incl C-345, C-346, L-312	V-306 plate to V-310								
Z-310	Transformer, IF: 1700 kc; input shielded; 1 1/8" sq x 3 9/16" h overall; powdered iron core; tuned sec'd only; adjustable iron core tuning; mts by two no. 6-32 studs located diagonally on 1.125" mtg/c; 4 solder lug terminals; incl C-351, L-313, R-329	1700 kc VFO tuning coil			1; SA:7487	SA:7487	Z-310, Z-1206	6	55	1
Z-311	Coil, RF: variable IF inductor; single winding, 4 pie universal wound; rectangular aluminum shield can; 225 turns per pie, total 900 turns; no. 5/41 litz SN wire; 1 1/8" sq x 3 9/16" h overall; powdered iron core; adjustable iron core; screwdriver adjustment thru top of can; mts by two no. 6-32 studs located diagonally on 1.125" mtg/c; 4 solder lug terminals; lacquered for tropical use; includes L-314, R-333	V-310 plate to V-311 grid			1; SA:8251	SA:8251	Z-311	3		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	COMPOUND TUNED CIRCUITS AND FILTERS (continued)									
Z-312 thru Z-400	Not Used									
Z-401	Filter, band pass: 50,000 cyc peak, 49,938 to 50,062 cyc bandwidth; 10" lg x 2 3/8"wd x 3 7/16" h excl terminals and mtg studs; suitable for 6AG5 plate load; rectangular metal case; mts by four no. 10-24 studs on 9 1/2" x 1 3/4" mtg/c; four solder lug terminals; hermetically sealed JAN grade 1 construction	125 cyc bandpass filter		F16-F-32599-5279	1351	M782-1	Z-401	3		
Z-402	Filter, band pass: 50,000 cyc peak, 49,875 to 50,125 cyc bandwidth; 12' lg x 2 3/8" wd x 3 7/16" h excl terminals and mtg studs; suitable for 6AG5 plate load; rectangular metal case; mts by four no. 10-24 studs on 7 1/2" x 1 3/4" mtg/c; four solder lug terminals; hermetically sealed JAN grade 1 construction	250 cyc bandpass filter		F16-F-32599-6279	1351	M783-1	Z-402	3		
Z-403	Transformer, IF: 50 kc; interstage; shielded; 1 7/16" sq x 3 17/64" h excl terminals and mtg studs; powdered iron core; slug tuned pri and sec'd; adj iron core; mts by two no. 6-32 studs located diagonally on	V-401 output		N17-T-67439-1291	1; SA:6953	SA:6953	Z-403,Z-404, Z-405,Z-406	12	55	2

Z-403 (cont)	1.414" mtg/c; four stud terminals on bottom; designed for 500 kc bandwidth; incl L-401A, L-401B, R-405, R-406									
Z-404	Same as Z-403 except incl L-402A, L-402B, R-407, R-408	V-402 input								
Z-405	Same as Z-403 except incl L-403A L-403B, R-412, R-413	V-402 output								
Z-406	Same as Z-403 except incl L-404A, L-404B, R-414, R-415	V-410 input								
Z-407	Transformer, IF: 50 kc; interstage; shielded;1 7/8" sq x 3 17/64" h excl stud terminals and mtg studs; powdered iron core; slug tuned pri and sec'd; adj iron core; mts by no. 6-32 studs located diagonally on 1.414" mtg/c; four stud terminals; on bottom; designed for 1000 cyc bandwidth; incl L-405A, L-405B, R-416, R-417	V-401 output		N17-T-67439-1276	1; SA:6951	SA:6951	Z-407, Z-408, Z-409, Z-410	12	55	2
Z-408	Same as Z-407 except incl L-406A, L-406B, R-418, R-419	V-403 input								
Z-409	Same as Z-407 except incl L-407A, L-407B, R-420, R-421	V-403 output								
Z-410	Same as Z-407 except incl L-408A, L-408B, R-422, R-423	V-410 input								
Z-411	Transformer, IF: 50 kc; interstage shielded 1 1/8" sq x 2 7/8" lg; powdered iron core; tuned pri and secd; adjustable iron core; mts by 2 no. 6-32 studs located diagonally on 1.125" mtg/c; four solder terminals on bottom; designed for 3 kc bandwidth; incl L-409, R-424, R-425	V-401 output		N17-T-67438-9212	1; SA:7056	SA:7056	Z-411, Z-412, Z-413, Z-414, Z-415, Z-416, Z-419, Z-420	24	55	2

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	COMPOUND TUNED CIRCUIT AND FILTERS (continued)									
Z-412	Same as Z-411 except incl L-410, R-426, R-427	V-404 input								
Z-413	Same as Z-411 except incl L-411, R-431, R-432	V-404 output								
Z-414	Same as Z-411 except includes L-412, R-433, R-434	V-405 input								
Z-415	Same as Z-411 except incl L-413, R-438, R-439	V-405 output								
Z-416	Same as Z-411 except incl L-414, R-440, R-441	V-410 input								
Z-417	Transformer, IF: 50 kc; interstage; shielded; 1 1/8" sq x 2 7/8" lg; powdered iron core; tuned pri and secd; adjustable iron core; mts by two no. 6-32 studs located diagonally on 1.125" mtg/c; four solder terminals on bottom; designed for 6 kc bandwidth; includes L-415, R-442, R-443	V-401 output		N17-T-67438-9216	1; SA:7057	SA:7057	Z-417, Z-418, Z-421, Z-422	12	55	2
Z-418	Same as Z-417 except incl L-416, R-444, R-445	V-406 input								
Z-419	Same as Z-411 except incl L-417, R-446, R-447	V-406 output								
Z-420	Same as Z-411 except incl L-418, R-448, R-449	V-407 input								
Z-421	Same as Z-417 except includes L-419, R-450, R-451	V-407 output								

Z-422	Same as Z-417 except incl L-420, R-452, R-453	V-410 input								
Z-423	Transformer, IF: 50 kc; interstage; shielded; 1 1/8" sq x 2 7/8" lg; powdered iron core; tuned pri and secd; adjustable iron core; mts by two no. 6-32 studs located diagonally on 1.125" mtg/c; four solder terminals on bottom; designed for 12 kc bandwidth, resistor across leads of primary; incl L-421, R-454	V-401 output		N17-T-67438-9227	1; SA:7059-1	SA:7059-1	Z-423	3	55	1
Z-424	Transformer, IF: 50 kc; interstage; shielded; 1 1/8" sq x 2 7/8" lg; powdered iron core; tuned pri and secd; adjustable iron core; mts by two no. 6-32 studs located diagonally on 1.125" mtg/c; four solder terminals on bottom; designed for 12 kc bandwidth, resistor across leads of secondary; incl L-422, R-458	V-408 input		N17-T-67438-9231	1; SA:7059-2	SA:7059-2	Z-424	3	55	1
Z-425	Transformer, IF: 50 kc; interstage; shielded; 1 1/8" sq x 2 7/8" lg; powdered iron core; tuned pri and secd; adjustable iron core; mts by two no. 6-32 studs located diagonally on 1.125" mtg/c; four solder terminals on bottom; designed for 12 kc bandwidth; resistor across leads of primary; incl L-423, R-462	V-408 output		N17-T-67438-9220	1; SA:7058-1	SA:7058-1	Z-425	3	55	1
Z-426	Transformer, IF: 50 kc, interstage; shielded; 1 1/8" sq x 2 7/8" lg; powdered iron core; tuned pri and secd; adjustable iron core; mts by two no. 6-32 studs located diagonally on 1.125" mtg/c; four solder terminals on bottom; designed for 12 kc bandwidth, resistor across leads of secondary; incl L-424, R-466	V-409 input		N17-T-67438-9223	1; SA:7058-2	SA:7058-2	Z-426	3	55	1

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	COMPOUND TUNED CIRCUITS AND FILTERS (continued)									
Z-427	Transformer, IF: 50 kc; interstage; shielded; 1 1/8" sq x 2 7/8" lg; powdered iron core; tuned pri and secd; adjustable iron core; mts by two no. 6-32 studs located diagonally on 1.125" mtg/c; four solder terminals on bottom; designed for 12 kc bandwidth; incl L-425, R-470, R-471	V-409 output		N17-T-67438-9235	1; SA:7060	SA:7060	Z-427,Z-428	6	55	1
Z-428	Same as Z-427 except incl L-426 R-472, R-473	V-410 input								
Z-429 thru Z-600	Not Used									
Z-601	Filter, bandpass: 50 kc peak freq, 18,000 cyc bandwidth at 6 db, 36,000 cyc bandwidth at least 60 db; 2 13/16" lg x 2 3/16" wd x 3 7/16" h excl term; values of input and output impedances are for operation of 9003 type tubes; rectangular metal case; four no. 6-32 tapped holes on 1 13/16" x 2 7/16" mtg/c; four solder lug terminals; hermetically sealed grade 1 construction	V-601 to V-602 coupling		N16-F-32600-1147	123	M785-1	Z-601	3		
Z-602	Filter, bandpass: 50 kc peak freq, 40,000 cyc bandwidth at 1 db; 1.884" lg x 1.446" wd x 3 13/32"	V-602 to V-603 coupling		N16-F-32600-1157	1; SA:6456	SA:6456	Z-602,Z-603	6	55	1

Z-602 (cont)	h excl terminals and tuning slug stud; values of input and output impedance are for operation of 9003 type tubes; rectangular metal case; two no. 6-32 tapped holes located diagonally on 5/16" x 1 13/32" mtg/c; four stud terminals; incl C-609, C-610, L-601, R-610, R-611									
Z-603	Same as Z-602 except incl C-612, C-613, L-602, R-613, R-614	V-603 to V-604 coupling								
Z-604	Transformer, IF: 50 kc; detector input; shielded; 2 7/16" lg x 2" wd x 3 5/16" h excl terminals; ceramic core; tuned primary and secondary; variable air capacitor tuning; two no. 8-32 tapped holes located diagonally on 1 3/8" x 1 13/16" mtg/c; 5 stud terminals; incl C-619, C-620, C-621, C-622, L-603, R-626	V-607 input		N17-T-67437-5609	1; SA:6406	SA:6406	Z-604, Z-701 Z-901, Z-1001, Z-1002, Z-1003	11	55	1
Z-605 thru Z-700	Not Used									
Z-701	Same as Z-601 except incl C-703, C-704, C-705, C-706, L-701, R-705	V-705 input								
Z-702	Filter, low pass: 6 kc cutoff; 1 5/8" lg x 1 5/8" wd x 2 1/4" h excl terminals; input and output impedance 10,000 ohms; round metal case w/sq flange base; mts by four 0.144" diam holes on 1 5/8" sq mtg flange on 1 5/16" centers; three solder lug terminals; hermetically sealed JAN grade 1 construction	Detector circuit filter		N16-F-44083-2521	123	M787-1	Z-702, Z-902, Z-1004, Z-1006, Z-1008	8	55	1

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	COMPOUND TUNED CIRCUITS AND FILTERS (continued)									
Z-703	Filter, low pass: 6 kc cutoff; 1 13/16" lg x 1 13/16" wd x 2 1/2" h excl terminals; input and output impedance 50,000 ohms; round metal case w/sq flange base; mts by four 0.144" diam holes on 1 13/16" sq flange, on 1 1/2" centers; three solder lug terminals; hermetically sealed JAN grade 1 construction	V-702 plate filter		N16-F-44083-8521	123	M788-1	Z-703	3	55	1
Z-704	Transformer, RF: oscillator; two windings; 6 pie universal wound; shielded; primary 780 turns, secondary 780 turns no. 36SSE wire; 1 1/8" sq x 2 7/8" h excl term and mtg studs; grade L-4 ceramic form; adjustable powdered iron core; screwdriver adjustment through top of can; two no. 6-32 studs located diagonally 1.125" c to c; four solder lug terminals on bottom; incl L-702	V-703 to V-702 coupling		N17-T-81749-6041	1; SA:6930	SA:6930	Z-704	3	55	1
Z-705	Coil, RF: oscillator; single wind; ing torodial wound; shielded; 2 7/16" lg x 2" wd x 3 5/16" h excl terminals; built-in capacitors; screwdriver adjustment through top of can; mts by two no. 8-32 tapped holes located diagonally on	V-704 oscillator		N16-C-76181-1010	1; SA:6712	SA:6712	Z-705	3	55	1

Z-705 (cont)	1 3/8" x 1 13/16" mtg/c; three stud terminals on bottom 13/32" lg; incl C-723, C-724, L-704									
Z-706 thru Z-900	Not Used									
Z-901	Same as Z-604 except incl C-903, C-904, C-905, C-906, L-901, R-904	V-901 input								
Z-902	Same as Z-702	Input filter								
Z-903	Filter, low pass: 600 cyc cutoff; 1 13/16" lg x 1 13/16" wd x 2 1/2" h exl terminals; input and output impedance 10,000 ohms; round metal case w/sq flange base; four 0,144" diam mtg holes on flange on 1 1/2" x 1 1/2" mtg/c; three solder lug terminals; hermetically sealed grade 1 construction	Input filter		N16-F-44020-1501	123	M791-1	Z-903, Z-1005, Z-1007, Z-1009	5	55	1
Z-904 thru Z-1000	Not Used									
Z-1001	Same as Z-604 except inc C-1003, C-1004, C-1005, C-1006, L-1001, R-1004	V-1002 input								
Z-1002	Same as Z-604 except incl C-1009, C-1010, C-1011, C-1012, L-1002, R-1009	V-1005 input								
Z-1003	Same as Z-604 except incl C-1015, C-1016, C-1017, C-1018, L-1003, R-1014	V-1007 input								
Z-1004	Same as Z-702	Input no. 1 filter								
Z-1005	Same as Z-903	Input no. 1 filter								
Z-1006	Same as Z-702	Input no. 2 filter								
Z-1007	Same as Z-903	Input no. 2 filter								

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				COMPOUND TUNED CIRCUITS AND FILTERS (continued)						
Z-1008	Same as Z-702	Input no. 3 filter								
Z-1009	Same as Z-903	Input no. 3 filter								
Z-1010 thru Z-1200	Not Used									
Z-1201	Transformer, discriminator: 53 kc; discriminator: shielded; 1 15/16" lg x 1 1/2" wd x 3 11/32" h excl terminals and mtg studs; tuned secondary only; mica capacitor and variable ceramic capacitor tuning; two no. 4-40 studs 1/2" lg located diagonally on 1 3/8" x 7/8" mtg/c; four stud terminals on bottom; incl C-1206, C-1208, L-1202	V-1202 to V-1204 coupling		N17-T-67108-1001	1; SA:7374	SA:7374	Z-1201	3		
Z-1202	Transformer, discriminator: 47 kc; discriminator; shielded; 1 15/16" lg x 1 1/2" wd x 3 11/32" h excl terminals and mtd studs; tuned secondary only; mica capacitor and ceramic capacitor tuning; two no 4-40 studs 1/2" lg located diagonally on 1 3/8" x 7/8" mtg/c; four stud terminals on bottom; incl C-1210, C-1212, L-1203	V-1203 to V-1204 coupling		N17-T-67107-1721	1; SA:7430	SA:7430	Z-1202	3		
Z-1203	Coil, RF: oscillator; single winding, torroidal wound; shielded; 1 29/32" lg x 1 1/2" wd x	V-1208 oscillator inductor			1; SA:7431	SA:7431	Z-1203	3		

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Z-1203 (cont)	3 11/32" h excl shaft and stud terminals; built-in tuning and trimming capacitors; screwdriver adjustment on top of can; two no. 4-40 studs 17/32" lg located diagonally on 1 3/8" x 7/8" mtg/c; two stud terminals on bottom; incl-C-1211, C-1222, C-1223, L-1206									
Z-1204	Filter, low pass: designed for .006 sec or less rise time, 180 cps cutoff; 1 3/4" diam x 2 1/2" h excl terminals and mtg flange; 10,000 ohms input and output impedance; round metal case w/sq mtg flange; four 0.144" diam mtg holes on flange on 1 1/2" x 1 1/2" mtg c; three solder lug terminals on bottom; hermetically sealed	Slow keying speed noise filter		N16-F-44006-6739	123	M790-2	Z-1204	3		
Z-1205	Filter, low pass: designed for .0015 sec or less rise time, 600 cps cutoff; 1 3/4" diam x 2 1/2" h excl terminals and mtg flange; 10,000 ohms input and output impedance; round metal case w/sq mtg flange; four 0.144" diam holes on mtg flange on 1 1/2" x 1 1/2" mtg/c; three solder lug terminals on bottom; hermetically sealed	Fast keying speed noise filter		N16-F-44012-8374	123	M786-2	Z-1205	3		
Z-1206	Same as Z-310 except incl C-1255, L-1204, R-1253	V-1207 output transformer								
			SPEAKER							
LS-101 thru LS-700	Not Used									
LS-701	Speaker, dynamic: cone type 4" diam; PM field; 2 watts output; voice coil impedance 3.2 ohms; 4 1/8" wd x 4 1/8" h x 2" d o/a;	Monitoring speaker		N17-L-91269-9671	92	M137-1	LS-701	3		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SPEAKER (continued)						
LS-701 (cont)	mts by four 13/64" diam holes equally spaced on 4 11/16" diam pitch circle									
				TERMINAL BOARDS						
TB-101	Board, terminal: mts 12 resistors; 24 brass, silver plated stud terminals; 3/8" between terminal centers of rows; XXP natural bakelite, wax impregnated; 4 1/2" lg x 1 1/2" wd x 1/2" h; two 0.156" diam mtg holes on 3" mtg/c; marked R-149, R-150, R-128, R-129, R-151, R-123, R-124, R-126, R-152, R-153, R-121, R-155	Terminal board		N17-B-78178-3276*	1; SA:7121	SA:7121	TB-101	12		
TB-102	Board, terminal: 5 brass, silver plated stud terminals; 1/2" between terminal centers; XXP natural bakelite, wax impregnated; 2 3/4" lg x 15/16" wd x 1" h; two 0.156" diam mtg holes on 2" mtg/c; marked 6.3V, +150V, 6.3V, +150V, +210V	Terminal board		N17-B-77687-8947*	1; SA:7122	SA:7122	TB-102	12		
TB-103	Board, terminal: mts 11 resistors; 30 brass, silver plated stud terminals; 1" between terminal centers; XXP natural bakelite, wax impregnated 6 1/16" lg x 2 1/8"	Terminal board		N17-B-78257-3551*	1; SA:7123	SA:7123	TB-103	12		

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

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TB-103 (cont)	wd x 23/32" h; two 0.156" diam mtg holes on 3 11/16" mtg/c; marked: R-120, R-118, R-114, R-113, R-112, R-109, R-108, R-107, R-104, R-103, R-102									
TB-104	Board, terminal: RF cable terminal; 7 double solder lug on phenolic board; 3 1/2" lg x 1 1/32" wd x 25/64" thk o/a; marked H710-4 and SA:7174	RF cable terminal		N17-B-77789-7751*	1; SA:7174	SA:7174	TB-104	12		
TB-105	Board, terminal; mounts 1 resistor, 1 capacitor; 4 brass, silver plated stud terminals; 1/2" between terminal/c; XXP natural bakelite, wax impregnated; 1 1/2" lg x 7/8" wd x 39/64" h; two 0.156" diam mtg holes on 7/16" mtg/c; marked R-134, C-150	Terminal board		N17-B-77634-7898*	1; SA:9124	SA:9124	TB-105	12		
TB-106 thru TB-200	Not Used									
TB-201	Board, terminal: general purpose binding post strip; accommodates 2 silver plated brass solder lug term; 1/2" c to c; glass melamine board, 1 1/2" lg x 11/16" wd x 0.120" thk; two 0.120" diam mtg holes on 1 1/8" c to c, two 0.156" diam holes on 1/2" c/c	Binding post strip		N17-B-77407-1243*	1; P895-4	P895-4	TB-201, TB-202	6		
TB-202	Same as TB-201	Binding post strip								
TB-203 thru TB-300	Not Used									
TB-301	Board, terminal: mts 9 resistors 12 capacitors; 42 brass silver plated stud term; two rows 1 1/8" apart, stud term 5/16" apart; laminated	Terminal board		N17-B-78282-8150*	1; SA:8053	SA:8053	TB-301	3		

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TERMINAL BOARDS (continued)						
TB-301 (cont)	phenolic board grade LTS-E-3; 7 3/16" lg x 1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on 3" and 2 11/16" mtg/c; marked R-308, C-312, C-311, R-307, R-306, C-309, C-308, R-305, R-309, C-315, C-316, C-317, C-318, C-305, R-303, C-306, R-304, R-302, C-303, C-302, R-301									
TB-302	Board, terminal: mts 2 capacitors 2 inductances; 4 brass silver plated stud term; two rows 1 1/8" apart, stud term irregularly spaced; laminated phenolic board grade LTS-E-3; 1 9/16" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 3/4" mtg/c; marked C-370, L-322, L-321, C-369	Terminal board		N17-B-77834-9157*	1; SA:8632	SA:8632	TB-302	3		
TB-303	Board, terminal: mts 3 resistors; 6 brass silver plated stud term; two rows 2 3/16" apart, stud term 1/2" apart; glass melamine type GMG; 2 9/16" lg x 1 3/8" wd x 41/64" h; three 0.156" diam mtg holes in triangular pattern, 2 holes 1 9/16" apart, 1 hole centrally located on 1/2" altitude; marked R-323, R-322, R-321	Terminal board		N17-B-77737-4680*	1; SA:8162	SA:8162	TB-302	3		

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TB-304	Board, terminal: mts 3 resistors 6 capacitors; 18 brass silver plated stud term; two rows 1 1/8" apart, stud term 5/16" apart; laminated phenolic board grade LTS-E-3; 3 3/8" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 2 7/8" mtg/c; marked R-310, C-321, C-322, R-337, C-325, R-311, C-326, C-327, C-328	Terminal board		N17-B-78113-5806*	1; SA:8055	SA:8055	TB-304	3	
TB-305	Board, terminal: mts 1 inductance; 2 brass silver plated stud term; stud term 1 1/8" apart; laminated phenolic board grade LTS-E-3; 1 1/2" lg x 11/16" wd x 39/64" h; two 0.156" diam mtg holes on 1/2" mtg/c; marked L-320	Terminal board		N17-B-77534-7893*	1; SA:8630	SA:8630	TB-305	3	
TB-306	Board, terminal: mts 11 resistors 5 capacitors 1 inductance; 34 brass silver plated stud term; two rows 1 1/8" apart, stud term 5/16" apart; laminated phenolic board grade LTS-E-3; 5 15/16" lg x 1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on 2 1/16" and 2 3/8" mtg/c; marked R-325, R-326, C-348, R-324, C-352, R-328, R-327, R-330, R-331, C-354, R-332, C-356, C-355, R-335, R-334, R-336, L-315	Terminal board		N17-B-78242-5360*	1; SA:8057	SA:8057	TB-306	3	
TB-307	Board, terminal: mts 8 resistors 10 capacitors 2 inductances; 44 brass silver plated stud term; two rows 1 1/8" apart, stud term 5/16" apart; laminated phenolic board grade LTS-E-3; 7 5/16" lg x 1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on 2.937" mtg/c;	Terminal board		N17-B-78292-8835*	1; SA:8059	SA:8059	TB-307	3	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	TERMINAL BOARDS (continued)									
TB-307 (cont)	marked C-343, R-318, C-342, C-341, L-311, C-344, R-320, C-335, R-315, R-316, C-336, C-337, R-317, R-314, C-334, C-332, L-309, C-333, R-313, R-312									
TB-308 thru TB-400	Not Used									
TB-401	Board, terminal: mts 1 resistor; 2 brass, silver plated stud terminal; stud terminals 1 1/8" apart; laminated phenolic board grade LTS-E-3; 1 1/2" lg x 11/16" wd x 39/64" h; two 0.156" diam mtg holes on 1/2" mtg/c; marked R-404	Terminal board		*	1; SA:7078	SA:7078	TB-401	3		
TB-402	Board, terminal: mts 6 resistors 2 capacitors; 16 brass, silver plated stud terminals; two rows 1 1/8" apart, stud terminals 5/16" apart; laminated phenolic board grade LTS-E-3; 2 13/16" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 2" mtg/c; marked R-402, R-401, C-401, C-403, R-403, R-459, R-461, R-460	Terminal board		*	1; SA:7072	SA:7072	TB-402	3		
TB-403	Board, terminal: mts 1 capacitor; 2 brass, silver plated stud terminals;	Terminal board		*	1; SA:7082	SA:7082	TB-403	3		

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TB-403 (cont)	stud terminals 1 7/8" apart; laminated phenolic board grade LTS-E-3; 2 3/8" lg x 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 1 7/8" mtg/c; marked C-478									
TB-404	Board, terminal: mts 2 capacitors; 4 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 2 3/8" lg x 7/16" wd x 39/64" h; two 0.156" diam mtg holes on 1 1/8" mtg/c; marked C-481, C-484	Terminal board			*	1; SA:8033	SA:8033	TB-404	3	
TB-405	Board, terminal: mts 3 resistors 2 capacitors; 4 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 2 11/16" lg x 3/4" wd x 23/32" h; two 0.156" diam mtg holes on 2 3/16" mtg/c; marked R-455, R-456, R-457, C-479, C-480	Terminal board			*	1; SA:7086	SA:7086	TB-405	3	
TB-406	Board, terminal: mts 3 resistors 2 capacitors; 4 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 2 11/16" lg x 3/4" wd x 23/32" h; two 0.156" diam mtg holes on 2 3/16" mtg/c; marked R-463, R-464, R-465, C-485, C-486	Terminal board			*	1; SA:7088	SA:7088	TB-406	3	
TB-407	Board, terminal: mts 2 capacitors; 4 brass, silver plated stud terminal; irregularly spaced; laminated phenolic board grade LTS-E-3; 2 3/8" lg x 9/16" wd x 39/64" h; two 0.156" diam mtg holes on 1 1/8" mtg/c; marked C-487, C-490	Terminal board			*	1; SA:8035	SA:8035	TB-407	3	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	TERMINAL BOARDS (continued)									
TB-408	Board, terminal: mts 5 capacitors; 4 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 2 11/16" lg x 3/4" wd x 23/32" h; two 0.156" diam mtg holes on 2 3/16" mtg/c; marked C-491, C-492, C-493, C-494, C-495	Terminal board		*	1; SA:7090	SA:7090	TB-408	3		
TB-409	Board, terminal: mts 1 capacitor; 2 brass, silver plated stud terminal; stud terminals 1 1/8" apart; laminated phenolic board grade LTS-E-3; 2 3/8" lg x 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 1 7/8" mtg/c marked C-496	Terminal board		*	1; SA:7080	SA:7080	TB-409	3		
TB-410	Board, terminal: mts 6 resistors 2 capacitors; 16 brass, silver plated stud terminals; two rows 1 1/8" apart, stud terminals 5/16" apart; laminated phenolic board grade LTS-E-3; 2 13/16" lg x 1 1/2" wd x 39/64" h; two 0.156" diam holes on 2" mtg/c; marked C-433, C-499, R-474, R-475, R-476, R-467, R-469, R-468	Terminal board		*	1; SA:7070	SA:7070	TB-410	3		
TB-411	Board, terminal; mts 2 capacitors; 4 brass, silver plated stud terminal; irregularly spaced; laminated	Terminal board		*	1; SA:8029	SA:8029	TB-411	3		

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

TB-411 (cont)	phenolic board grade LTS-E-3; 2 3/8" lg x 9/16" wd x 39/64" h; two 0.156" diam mtg holes on 1 1/8" mtg/c; marked C-426, C-427								
TB-412	Board, terminal: mts 1 capacitor; 2 brass, silver plated stud terminals; stud terminals 1 1/8" apart; laminated phenolic board grade LTS-E-3; 1 1/2" lg x 11/16" wd x 39/64" h; two 0.156" diam mtg holes on 1/2" mtg/c; marked C-419	Terminal board		*	1; SA:7074	SA:7074	TB-412	3	
TB-413	Board, terminal: mts 9 resistors; 18 brass, silver plated stud terminals; two rows 7/8" apart, stud terminals 5/16" apart; laminated phenolic board grade LTS-E-3; 3 1/8" lg x 1 1/4" wd x 39/64" h; two 0.156" diam mtg holes on 1 11/16" mtg/c; marked R-428, R-429, R-430, R-409, R-410, R-411, R-435, R-436, R-437	Terminal board		*	1; SA:8037	SA:8037	TB-413	3	
TB-414	Board, terminal: mts 2 capacitors; 4 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 2 3/8" lg x 9/16" wd x 39/64" h; two 0.156" diam mtg holes on 1 1/8" mtg/c; marked C-470, C-471	Terminal board		*	1; SA:8025	SA:8025	TB-414	3	
TB-415	Board, terminal: mts 10 capacitors; 8 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 3 3/4" lg x 15/16" wd x 23/32" h; two 0.156" diam mtg holes located diagonally on 3 1/4" x 1/2" mtg/c; marked C-451, C-452, C-453,	Terminal board		*	1; SA:8015	SA:8015	TB-415	3	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	TERMINAL BOARDS (continued)									
TB-415 (cont)	C-454, C-455, C-472, C-473, C-474, C-475, C-476									
TB-416	Board, terminal: mts 10 capacitors; 8 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 3 3/4" lg x 15/16" wd x 23/32" h; two 0.156" diam mtg holes located diagonally on 3 1/4" x 1/2" mtg/c; marked C-443, C-444, C-445, C-446, C-447, C-465, C-466, C-467, C-468, C-469	Terminal board		*	1; SA:8013	SA:8013	TB-416	3		
TB-417	Board, terminal: mts 2 capacitors; 4 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 2 3/8" lg x 9/16" wd x 39/64" h; two 0.156" diam mtg holes located diagonally on 1 1/8" x 1/16" mtg/c; marked C-440, C-442	Terminal board		*	1; SA:8021	SA:8021	TB-417	3		
TB-418	Board, terminal: mts 2 capacitors; 4 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS- E-3; 2 3/8" lg x 9/16" wd x 39/64" h; two 0.156" diam mtg holes located diagonally on 1 1/8" x 1/16" mtg/c; marked C-463, C-464	Terminal board		*	1; SA:8023	SA:8023	TB-418	3		

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TB-419	Board, terminal: mts 10 capacitors; 8 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 3 3/4" lg x 15/16" wd x 23/32" h; two 0.156" diam mtg holes located diagonally on 3 1/4" x 1/2" mtg/c; marked C-435, C-436, C-437, C-438, C-439, C-458, C-459, C-460, C-461, C-462	Terminal board		*	1; SA:8011	SA:8011	TB-419	3
TB-420	Board, terminal: mts 1 capactior; 2 brass, silver plated stud terminals; stud terminals 1 1/8" apart; laminated phenolic board grade LTS-E-3; 1 1/2" lg x 11/16" wd x 39/64" h; two 0.156" diam mtg holes on 1/2" mtg/c; marked C-457	Terminal board		*	1; SA:7076	SA:7076	TB-420	3
TB-421	Board, terminal: mts 2 capacitors; 4 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 2 3/8" lg x 9/16" wd x 39/64" h; two 0.156" diam mtg holes on 1 1/8" mtg/c; marked C-411, C-413	Terminal board		*	1; SA:8027	SA:8027	TB-421	3
TB-422	Board, terminal: mts 2 capacitors; 4 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 2 3/8" lg x 9/16" wd x 39/64" h; two 0.156" diam mtg holes on 1 1/8" mtg/c; marked C-405, C-420	Terminal board		*	1; SA:8031	SA:8031	TB-422	3
TB-423	Board, terminal: mts 10 capacitors; 8 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 3 7/8" lg x 15/16" wd x 23/32" h;	Terminal board		*	1; SA:8017	SA:8017	TB-423	3

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TERMINAL BOARDS (continued)						
TB-423 (cont)	two 0.156" diam mtg holes located diagonally on 3 3/8" x 1/2" mtg/c; marked C-421, C-422, C-423, C-424, C-425, C-406, C-407, C-408, C-409, C-410									
TB-424	Board, terminal: mts 2 capacitors; 4 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 3 15/16" lg x 9/16" wd x 39/64" h; two 0.156" diam mtg holes on 3 7/16" mtg/c; marked C-448, C-450	Terminal board		*	1; SA:7084	SA:7084	TB-424	3		
TB-425	Board, terminal: mts 10 capacitors; 8 brass, silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 3 7/8" lg x 15/16" wd x 23/32" h; two 0.156" diam mtg holes located diagonally on 3 3/8" x 1/2" mtg/c; marked C-428, C-429, C-430. C-431, C-432, C-414, C-415, C-416, C-417, C-418	Terminal board		*	1; SA:8019	SA:8019	TB-425	3		
TB-426 thru TB-600	Not Used									
TB-601	Board, terminal: mts 1 resistor, 2 capacitors; 6 brass, silver plated	Terminal board		N17-B-77734-8092*	1; SA:6718	SA:6718	TB-601	3		

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TB-601 (cont)	stud term; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 1 1/2" lg x 1 3/8" wd x 39/64" h; two 0.156" diam mtg holes on 1/2" mtg/c; marked: C-601, R-601, C-602								
TB-602	Board, terminal: mts 3 resistors, 3 capacitors; 12 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 2 3/4" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg/ holes on 1 3/4" mtg/c; marked: C-606, R-608, R-605, C-605, R-606, C-608	Terminal board		N17-B-77984-4939*	1; SA:6719	SA:6719	TB-602	3	
TB-603	Board, terminal: mts 3 resistors; 6 brass silver plated stud term;1 1/8" between term centers; XXP natural bakelite; wax impregnated; 1 1/2" lg x 1 3/8" wd x 39/64" h; two 0.156" diam mtg holes on 1/2" mtg /c; marked R-607, R-612, R-609	Terminal board		N17-B-77734-8087*	1; SA:6720	SA:6720	TB-603	3	
TB-604	Board, terminal: mts 2 resistors; 6 brass silver plated stud term 2.187" between term centers; XXP natural bakelite; wax impregnated; 2 9/16" lg x 1 3/8" wd x 39/64"h; three 0.156" diam mtg holes w/ir-regularly spaced mtg/c; marked R-602, R-604	Terminal board		N17-B-77737-4601*	1; SA:6721	SA:6721	TB-604	3	
TB-605	Board, terminal: mts 3 resistors; 6 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 1 1/2" lg x 1 1/8" wd x 39/64" h; two 0.156" diam mtg holes on 1/2" mtg /c; marked: R-621, R-619, R-618	Terminal board		N17-B-77734-8082*	1; SA:6723	SA:6723	TB-605	3	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TERMINAL BOARDS (continued)						
TB-606	Board, terminal: mts 6 resistors; 3 capacitors; 22 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 3 7/8" lg x 1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on 1 3/8" mtg/c; marked: C-625, R-631, R-630, R-623, R-628, C-624, R-622, C-616, R-615	Terminal board		N17-B-78157-9434*	1; SA:6725	SA:6725	TB-606	3		
TB-607	Board, terminal: mts 3 resistors; 6 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 1 1/2" lg x 1 3/8" wd x 39/64" h; two 0.156" diam mtg holes on 1/2" mtg /c; marked: R-617, R-623, R-624	Terminal board		N17-B-77734-8077*	1; SA:6726	SA:6726	TB-607	3		
TB-608	Board, terminal: mts 3 resistors, 1 capacitor; 8 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 1 9/16" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 3/4" mtg/c; marked: C-623, R-627, R-625, R-633	Terminal board		N17-B-77834-9161*	1; SA:6727	SA:6727	TB-608	3		
TB-609 thru TB-700	Not Used									

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TB-701	Board, terminal: mts 1 resistor; 2 brass silver plated lug term; term 1.187" between c; XXP natural bakelite; 1 9/16" lg x 3/8" wd x 39/64" h; two 0.156" diam mtg holes on 7/16" c; wax impregnated, marked: R-727	Terminal board		N17-B-77534-9289*	1; SA:7477	SA:7477	TB-701	3		
TB-702	Board, terminal: mts 1 choke coil, 2 brass silver plated lug terminal; term 1.375" between c; XXP natural bakelite; 2 5/8" lg x 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 2 1/2" c; wax impregnated, marked: L-703	Terminal board		N17-B-77537-6063*	1; SA:6973	SA:6973	TB-702	3		
TB-703	Board, terminal: mts 4 resistors, 5 capacitors; 20 brass silver plated stud term; term 1.125" between c; XXP natural bakelite; 3 13/16" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 2 11/16" c; wax impregnated; marked: R-720, R-725, C-721, C-722, C-720, C-719, C-717, R-718, R-719	Terminal board		N17-B-78137-9220*	1; SA:6969	SA:6969	TB-703	3		
TB-704	Board, terminal: mts 4 resistors, 5 capacitors; 18 brass silver plated stud term; term 1 1/8" between c; XXP natural bakelite; 3 9/16" lg x 1 1/2" wd x 1/8" thk; three 0.156" diam mtg holes on ctr line spaced 1 9/16", 1 3/16" c to c; wax impregnated; marked: R-714, C-715, C-716, R-715, C-736, C-711, R-716, C-713, R-713	Terminal board		N17-B-78113-7048*	1; SA:6971	SA:6971	TB-704	3		
TB-705	Board, terminal: mts 12 resistors; 3 capacitors; 32 brass silver plated stud term; term 1.125" between c; XXP natural bakelite; 5 7/16" lg x 1 1/2" wd x 39/64" h; three	Terminal board		N17-B-78232-4295*	1; SA:6967	SA:6967	TB-705	3		

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	TERMINAL BOARDS (continued)									
TB-705 (cont)	0.156" diam mtg holes on 2" c; wax impregnated, marked: C-707, R-706, R-707, R-709, R-712, R-710, C-709, R-711, C-730, R-728, R-724, R-723, R-722, R-721									
TB-706	Board, terminal: mts 8 resistors, 3 capacitors; 22 brass silver plated stud term; term 1 1/8" between c; XXP natural bakelite; 3 7/8" lg x 1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on 1 3/8" c; wax impregnated, marked: R-735, C-748, R-734, R-739, R-737, R-738, C-733, R-741, R-742, R-740, C-735	Terminal board		N17-B-78157-9439*	1; SA:6975	SA:6975	TB-706	3		
TB-707	Board, terminal: mts 4 resistors; 8 brass silver plated stud term; term 2 1/8" between c; XXP natural bakelite; 2 1/2" lg x 1 7/8" wd x 39/64" h; two 0.156" diam mtg holes on 1" c holes on tranverse ctr line; wax impregnated, marked: R-730, R-729, R-732, R-731	Terminal board		N17-B-77837-3508*	1; SA:6965	SA:6965	TB-707	3		
TB-708	Board, terminal: mts 5 resistors, 2 capacitors; 14 brass silver plated stud term; term 1.125" between c; XXP natural bakelite; 2 5/8" lg x 1 1/2" wd x 39/64" h; two 0.156"	Terminal board		N17-B-78034-3523*	1; SA:6963	SA:6963	TB-708	3		

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TB-708 (cont)	diam mtg holes on 1 1/8" c; wax impregnated, marked: C-737, R-702, R-703, R-736, R-704, R-701, C-701								
TB-709 thru TB-800	Not Used								
TB-801	Board, terminal: mts 2 resistors; 4 brass silver plated stud terminals; stud terminals on 1 1/8" x 3/8" mtg/c; laminated phenolic board grade LTS-E-3; 2 1/4" lg x 3/4" wd x 39/64" h; two 0.156" diam mtg holes on 1.875" mtg/c; marked: R-812, R-813	Terminal board		N17-B-77636-8718*	1; SA:7327	SA:7327	TB-801	1	
TB-802	Board, terminal: mts 2 resistors 3 capacitors 1 RF choke; 12 brass silver plated stud terminals; two rows 1 1/8" apart, stud terminals 5/16" apart; laminated phenolic board grade LTS-E-3; 2 3/8" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 1 11/16" mtg/c; marked R-811, C-839, C-838, R-815, C-841, L-811	Terminal board		N17-B-77983-9860*	1; SA:7325	SA:7325	TB-802	1	
TB-803	Board, terminal: mts 1 resistor 2 capacitors 3 RF chokes; 10 brass silver plated stud terminals; two rows 0.625" part , stud terminals irregularly spaced; laminated phenolic board grade LTS-E-3; 4 7/16" lg x 1" wd x 41/64" h; two 0.156" diam mtg holes on 2" mtg/c; marked L-815, L-812, C-846, C-845, R-819, L-804	Terminal board		N17-B-77936-5986*	1; SA:8426	SA:8426	TB-803	1	
TB-804	Board, terminal: mts 1 resistors; 2 brass silver plated stud terminals; stud terminals 1 1/8" apart; lamin-	Terminal board		N17-B-77534-7895*	1; SA:7331	SA:7331	TB-804	1	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TERMINAL BOARDS (continued)						
TB-804 (cont)	ated phenolic board grade LTS-E-3; 1 1/2" lg x 11/16" wd x 39/64" h; two 0.156" diam mtg holes on 1/2" mtg/c; marked R-804									
TB-805	Board, terminal: mts 1 resistor; 2 brass silver plated stud terminals; stud terminals 1 1/8" apart; laminated phenolic board grade LTS-E-3; 1 1/2" lg x 11/16" wd x 39/64" h; two 0.156" diam mtg holes on 1/2" mtg/c; marked R-809	Terminal board		N17-B-77534-7897*	1; SA:7333	SA:7333	TB-805	1		
TB-806	Board, terminal: mts 1 resistor 2 capacitors 3 RF chokes; 10 brass silver plated stud terminals; two rows 0.625" apart, stud terminals irregularly spaced; laminated phenolic board grade LTS-E-3; 4 7/16" lg x 1" wd x 41/64" h; two 0.156" diam mtg holes on 2" mtg/c; marked L-814, L-813, C-848, C-847, L-806, R-820	Terminal board		N17B-77936-5983*	1; SA:8911	SA:8911	TB-806	1		
TB-807	Board, terminal: mts 3 resistors; 6 brass silver plated stud terminals; irregularly spaced; laminated phenolic board grade LTS-E-3; 2 5/8" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 1 7/8" mtg/c; marked R-816, R-817, R-818	Terminal board		N17-B-77737-6078*	1; SA:7329	SA:7329	TB-807	1		

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TB-808 thru TB-900	Not Used							
TB-901	Board, terminal: mts 3 resistors, 1 capacitor; 10 brass, silver plated stud term; term 1 1/8" between centers; XXP natural bakelite, wax impregnated; 2" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 1 1/8" centers; marked R-903, R-902, R-901, C-901	Terminal board		N17-B-77933-5647*	1; SA:6445	SA:6445	TB-901	2
TB-902	Board, terminal: mts 2 resistors; 4 brass, silver plated stud term; term 1 1/8" between centers; XXP natural bakelite, wax impregnated; 1 1/2" lg x 3/4" wd x 39/64" h; two 0.156" diam mtg holes on 7/16" centers; marked R-907, R-905	Terminal board		N17-B-77634-7881*	1; SA:6447	SA:6447	TB-902	2
TB-903	Not Used							
TB-904	Board, terminal: mts 7 resistors, 4 capacitors; 22 brass, silver plated stud term; term 1 1/8" between centers; XXP natural bakelite, wax impregnated; 3 7/8" lg x 1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on 1 3/8" centers; marked: C-916, C-915, R-914, R-913, C-909, R-910, R-911, R-909, R-908, C-907, R-916	Terminal board		N17-B-78157-9449*	1; SA:6453	SA:6453	TB-904	2
TB-905	Board, terminal: mts 8 resistors, 2 capacitors; 20 brass silver plated stud term; term 1 1/8" between centers; XXP natural bakelite, wax impregnated; 3 9/16" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 2 1/16" centers;	Terminal board		N17-B-78137-8037*	1; SA:6451	SA:6451	TB-905	2

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TERMINAL BOARDS (continued)						
TB-905 (cont)	marked: C-919, R-919, R-924, R-923, C-917, R-921,R-920, R-922, R-917, R-918									
TB-906	Board, terminal: mts 1 resistor; 2 brass silver plated stud term; term 1 1/8" between centers; glass mel-amine wax impregnated; 1 1/2" lg x 11/16" wd x 39/64" h; two 0.156" diam mtg holes on 1/2" centers; marked: R-925	Terminal board		N17-B-77534-7898*	1; SA:6449	SA:6449	TB-906	2		
TB-907 Thru TB-1000	Not Used									
TB-1001	Board, terminal: mts 3 resistors, 1 capacitor; 10 brass, silver plated stud term; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 2" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 1 1/8" mtg/c; marked R-1013, R-1012, R-1011, C-1013	Terminal board		N17-B-77933-5650*	1; SA:6422	SA:6422	TB-1001	1		
TB-1002	Board, terminal: mts 3 resistors, 1 capacitor; 10 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 2" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg	Terminal board		N17-B-77933-5649*	1; SA:6420	SA:6420	TB-1002	1		

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TB-1002 (cont)	holes on 1 1/8" mtg/c; marked: R-1008, R-1007, R-1006, C-1007							
TB-1003	Board, terminal: mts 3 resistors, 1 capacitor; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 2" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 1 1/8" mtg/c; marked R-1005, R-1002, R-1001, C-1001	Terminal board		N17-B-77933-5648	1; SA:6418	SA:6418	TB-1003	1
TB-1004	Board, terminal: mts 2 resistors; 4 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 1 1/2" lg x 3/4" wd x 39/64" h; two 0.156" diam mtg holes on 7/16" mtg/c; marked: R-1024, R-1022	Terminal board		N17-B-77634-7890*	1; SA:6424	SA:6424	TB-1004	1
TB-1005	Board, terminal: mts 1 resistor; 4 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite; wax impregnated; 1 1/2" lg x 3/4" wd x 39/64" h; two 0.156" diam mtg holes on 7/16" mtg/c; marked R-1015	Terminal board		N17-B-77634-7889*	1; SA:8045	SA:8045	TB-1005	1
TB-1006	Board, terminal: mts 2 resistors; 4 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite; wax impregnated; 1 1/2" lg x 3/4" wd x 39/64" h; two 0.156" diam mtg holes on 7/16" mtg/c; marked R-1005, R-1010	Terminal board		N17-B-77634-7888*	1; SA:8047	SA:8047	TB-1006	1
TB-1007	Board, terminal: mts 7 resistors, 4 capacitors; 22 brass silver plated stud term; 1 1/8" between term centers XXP natural bakelite, wax impregnated; 3 7/8" lg x 1 1/2"	Terminal board		N17-B-78157-9460*	1; SA:6430	SA:6430	TB-1007	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TERMINAL BOARDS (continued)						
TB-1007 (cont)	wd x 39/64" h; three 0.156" diam mtg holes on 1 3/8" mtg/c; marked C-1027, C-1026, R-1025, R-1018, C-1019, R-1017, R-1016, R-1019, R-1021, C-1021, R-1027,									
TB-1008	Board, terminal: mts 8 resistors, 2 capacitors; 20 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite; wax impregnated; 3 9/16" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 2 1/16" mtg/c; mark-ed C-1030, R-1035, R-1034, R-1033, C-1028, R-1031, R-1030, R-1032, R-1024, R-1028	Terminal board		N17-B-78137-6052*	1; SA:6428	SA:6428	TB-1008	1		
TB-1009	Board, terminal: mts 2 resistors; 4 brass silver plated stud term; 1/2" between term centers; XXP natural bakelite, wax impregnated; 1 1/2" lg x 7/8" wd x 39/64" h; two 0.145" diam mtg holes on 7/16" mtg/c; marked R-1037, R-1036	Terminal board		N17-B-77634-7893*	1; SA:6426	SA:6426	TB-1009	1		
TB-1010 thru TB-1100	Not Used									
TB-1101	Board, terminal: for mtg resistors; 18 brass silver plated stud term;	Terminal board		*	1; SA:6874	SA:6874	TB-1101	3		

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RESTRICTED SECURITY INFORMATION
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TB-1101 (cont)	two rows 1 3/4" apart, stud term 15/32" apart; laminated phenolic board grade LTS-E-3; 4 1/8" lg x 2 1/8" wd x 39/64" h; two 0.156" diam mtg holes on 3.281" mtg/c; marked R-1156, R-1152, R-1153, R-1154, R-1155							
TB-1102	Board, terminal: for mtg resistors; 20 brass silver plated stud term; two rows 1 3/4" apart, stud term 15/32" apart; laminated phenolic board grade LTS-E-3; 4 19/32" lg x 2 1/8" wd x 39/64" h; two 0.156" diam mtg holes on 2.812" mtg/c; marked R-1141 through R-1150	Terminal board		N17-B-78138-3696*	1; SA:6876	SA:6876	TB-1102	3
TB-1103	Board, terminal: for mtg resistors; 18 brass silver plated stud term; two rows 1 1/8" apart, stud term 5/16" apart; laminated phenolic board grade LTS-E-3; 3 3/8" lg x 1 1/2" wd x 39/64" h; marked R-1132, R-1133, R-1135, R-1139, R-1138, R-1136, R-1115, R-1137	Terminal board		*	1; SA:6878	SA:6878	TB-1103	3
TB-1104	Board, terminal: mts 11 resistors; 22 brass silver plated stud term; two rows 1 1/8" apart, stud terms 5/16" apart; laminated phenolic board grade LTS-E-3; 3 3/4" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 2.312" mtg/c; marked R-1105, R-1157, R-1101, R-1102, R-1104, R-1107, R-1108, R-1158, R-1112, R-1110, R-1111	Terminal board		N17-B-78157-8896*	1; SA:6884	SA:6884	TB-1104	3
TB-1105	Board, terminal: mts 2 resistors; 4 brass silver plated stud terms; stud terms on 1 1/8" x 1/2" mtg/	Terminal board		*	1; SA:6886	SA:6886	TB-1105	3

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TERMINAL BOARDS (continued)						
TB-1105 (cont)	c; laminated phenolic board grade LTS-E-3; 1 1/2" lg x 7/8" wd x 39/64" h; two 0.156" diam mtg holes on 0.437" mtg/c; marked R-1119, R-1121									
TB-1106	Board, terminal: mts 1 capacitor; 2 brass silver plated stud term, stud term 1 1/8" apart; laminated phenolic board grade LTS- E-3; 1 1/2" lg x 3/8" wd x 39/64" h; two 0.156" diam mtg holes on 11/32" mtg/c; marked C-1157	Terminal board		*	1; SA:6888	SA:6888	TB-1106	3		
TB-1107	Board, terminal: mts 4 resistors; 8 brass silver plated stud term; two rows 1 1/8" apart, stud term 5/16" apart; laminated phenolic board grade LTS-E-3; 1 1/2" lg x 1 5/16" wd x 39/64" h; two 0.156" diam mtg holes on 0.625" mtg/c; marked R-1113, R-1106, R-1114, R-1117	Terminal board		N17-B-77834-8026*	1; SA:6890	SA:6890	TB-1107	3		
TB-1108	Board, terminal: mts 2 capacitors; 4 brass silver plated stud term; stud term located on 1 1/8" x 1/2" mtg/c; laminated phenolic board grade LTS-E-3; 1 1/2" lg x 7/8" wd x 39/64" h; two 0.156" diam mtg holes on 0.437" mtg/c; marked C-1154, C-1155	Terminal board		N17-B-77634-7896*	1; SA:7036	SA:7036	TB-1108	3		

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TB-1109	Board, terminal: mts 1 resistor; 2 brass silver plated stud term; stud terms 1 1/8" apart; laminated phenolic board grade LTS-E-3; 1 1/2" lg x 3/8" wd x 39/64" h; two 0.156" diam mtg holes on 0.343" mtg/c; marked R-1118	Terminal board		*	1; SA:7038	SA:7038	TB-1109	3		
TB-1110 thru TB-1200	Not Used									
TB-1201	Board, terminal: mts 11 resistors; 1 capacitor; 24 brass silver plated stud terms; two rows 1 1/8" apart, stud terms 5/16" apart; laminated phenolic board grade LTS-E-3; 4 3/16" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 3 5/16" mtg/c; marked R-1211, R-1209, R-1210, R-1208, R-1207, C-1202, R-1203, R-1202, R-1201, R-1205, R-1204, R-1206	Terminal board		N17-B-78178-3009*	1; SA:7394	SA:7394	TB-1201	3		
TB-1202	Board, terminal: mts 12 resistors; 24 brass silver plated stud terms; two rows 7/8" apart, stud terms 5/16" apart; laminated phenolic board grade LTS-E-3; 4 3/16" lg x 1 1/4" wd x 39/64" h; two 0.156" diam mtg holes on 3 5/16" mtg/c; marked R-1222, R-1224, R-1223, R-1225, R-1226, R-1229, R-1230, R-1293, R-1231, R-1228, R-1227, R-1233	Terminal board		N17-B-78178-1818*	1; SA:7395	SA:7395	TB-1202	3		
TB-1203	Board, terminal: mts 4 resistors; 24 brass silver plated stud terms; two rows 7/8" apart, stud terms 5/16" apart; laminated phenolic board grade LTS-E-3; 4 3/16" lg x 1 1/4" wd x 39/64" h; two 0.156"	Terminal board		N17-B-78178-1823*	1; SA:7396	SA:7396	TB-1203	3		

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TERMINAL BOARDS (continued)						
TB-1203 (cont)	diam mtg holes on 3 5/16" mtg/c; marked R-1234, R-1235, R-1264, R-1265									
TB-1204	Board, terminal: mts 11 resistors; 24 brass silver plated stud terms; two rows 7/8" apart, stud terms 5/16" apart; laminated phenolic board grade LTS-E-3; 4 3/16" lg x 1 1/4" wd x 39/64" h; two 0.156" diam mtg holes on 3 5/16" mtg/c; marked R-1287, R-1289, R-1288, R-1291, R-1290, R-1292, R-1295, R-1296, R-1247, R-1248, R-1220	Terminal board		N17-B-78178-1828*	1; SA:7397	SA:7397	TB-1204	3		
TB-1205	Board, terminal: mts 6 resistors; 6 capacitors; 24 brass silver plated stud terms; two rows 1 1/8" apart, stud term 5/16" apart; laminated phenolic board grade LTS-E-3; 4 3/16" lg x 1 1/2"wd x 39/64" h; two 0.156" diam mtg holes on 3 5/16" mtg/c; marked C-1233, C-1216, C-1213, R-1218, C-1214, R-1217, R-1216, R-1215, R-1212, C-1204, R-1214, C-1205	Terminal board		N17-B-78178-2007*	1; SA:7398	SA:7398	TB-1205	3		
TB-1206	Board, terminal: mts resistors and capacitors; 9 brass silver plated stud terms; stud terms 5/16" apart; laminated phenolic board grade	Terminal board		N17-B-77889-7775*	1; SA:9182	SA:9182	TB-1206, TB-1207	6		

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TB-1206 (cont)	LTS-E-3; 3 1/2" lg x 3/8" wd x 39/64" h; two 0.156" diam mtg holes on 1 7/8" mtg/c								
TB-1207	Same as TB-1206	Terminal board							
TB-1208	Board, terminal: mts tie-points; 6 brass silver plated stud terms; two rows 1 1/8" apart; stud terms 5/8" apart; laminated phenolic board grade LTS-E-3; 1 1/2" lg x 1" wd x 5/8" h; two 0.156" diam mtg holes on 3/8" mtg/c	Terminal board		N17-B-77534-7942*	1; SA:7406	SA:7406	TB-1208	3	
TB-1209	Board, terminal: mts 9 resistors; 24 brass silver plated stud terms; two rows 7/8" apart, stud terms 5/16" apart; laminated phenolic board grade LTS-E-3; 4 3/16" lg x 1 1/4" wd x 39/64" h; two 0.156" diam mtg holes on 3 5/16" mtg/c; marked R-1271, R-1252, R-1267, R-1279, R-1269, R-1270, R-1284, R-1294, R-1282	Terminal board		N17-B-78178-2901*	1; SA:7402	SA:7402	TB-1209	3	
TB-1210	Board, terminal: mts 5 resistors; 12 brass silver plated stud term; two rows 7/8" apart, stud terms 5/16" apart; laminated phenolic board grade LTS-E-3; 2 5/16" lg x 1 1/4" wd x 39/64" lg; two 0.156" diam mtg holes on 1 7/16" mtg/c; marked R-1275, R-1274, R-1280, R-1281, R-1277	Terminal board		N17-B-77980-9801*	1; SA:7403	SA:7403	TB-1210	3	
TB-1211	Board, terminal: mts 3 resistors; 2 capacitors; 12 brass silver plated stud terms; two rows 7/8" apart, stud terms 5/16" apart; laminated phenolic board grade LTS-E-3; 2 5/16" lg x 1 1/4" wd x 39/64" h; two 0.156" diam mtg holes on	Terminal board		N17-B-77980-9806*	1; SA:7404	SA:7404	TB-1211	3	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	TERMINAL BOARDS (continued)									
TB-1211 (cont)	1 7/16" mtg/c; marked R-1276, C-1236, R-1273, C-1207, R-1286									
TB-1212	Board, terminal: mts 3 resistors; 6 brass silver plated stud terms; two rows 1 1/8" apart, stud term 5/8" apart; laminated phenolic board grade LTS-E-3; 1 5/8" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 5/8" mtg/c; marked R-1251, R-1213, R-1283	Terminal board		N17-B-77734-8501*	1; SA:7405	SA:7405	TB-1212	3		
TB-1213	Board, terminal: mts 2 resistors; 4 brass silver plated stud terms; stud terms on 7/16" x 1 1/8" mtg/c; laminated phenolic board grade LTS-E-3; 1 1/2" lg x 11/16" wd x 39/64" h; two 0.156" diam mtg holes on 3/8" mtg/c; marked R-1237, R-1239	Terminal board		N17-B-77634-7866*	1; SA:7400	SA:7400	TB-1213	3		
TB-1214 thru TB-1300	Not Used									
TB-1301	Board, terminal: mts 17 resistors; 2 capacitors; 42 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 7 3/16" lg x 1 1/2" wd x 39/64" h; three 0.156" diam	Terminal board		N17-B-78282-8188*	1; SA:7235	SA:7235	TB-1301	1		

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TB-1301 (cont)	mtg holes on irregularly spaced mtg/c marked R-1401, R-1400, R-1336, R-1370, R-1371, R-1377, C-1310, R-1380, C-1312, R-1384, R-1382, R-1381, R-1383, R-1386, R-1388, R-1390, R-1391, R-1398, R-1399							
TB-1302	Board, terminal: mts 15 resistors, 2 capacitors; 42 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 7 3/16" lg x 1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on irregularly spaced mtg/c marked R-1375, R-1373, R-1374, R-1378, C-1309, R-1379, C-1311, R-1385, R-1392,R-1387, R-1389, R-1395, R-1396, R-1394, R-1393, R-1339, R-1405	Terminal board		*	1; SA:7234	SA:7234	TB-1302	1
TB-1303	Board. terminal: mts 8 resistors; 20 brass silver plated stud term; 1 1/4" between term centers; XXP natural bakelite, wax impregnated; 3 9/16" lg x 1 1/2" wd x 39/64" h; two 0.156" diam mtg holes on 2 1/16" mtg/c; marked R-1303, R-1302, R-1301, R-1306, R-1304, R-1305, R-1309, R-1308	Terminal board		*	1; SA:7231	SA:7231	TB-1303	1
TB-1304	Board, terminal: mts 17 resistors, 2 capacitors; 42 brass silver plated stud term 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 7 3/16" lg x 1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on irregularly spaced mtg/c; marked R-1402, R-1403, R-1316, R-1337, R-1338, R-1347,	Terminal board		*	1; SA:7233	SA:7233	TB-1304	1

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS								EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX / QUAN.
				TERMINAL BOARDS (continued)					
TB-1304 (cont)	C-1305, R-1350, C-1307, R-1355, R-1352, R-1351, R-1353, R-1356, R-1360, R-1358, R-1359, R-1368, R-1369,								
TB-1305	Board, terminal: mts 15 resistors, 2 capacitors; 42 brass silver plated stud term; 1 1/8" between term centers; XXP natural bakelite, wax impregnated; 7 3/16" lg x 1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on irregularly spaced mtg/c; marked R-1342, R-1344, R-1345, R-1348, C-1304, R-1349, C-1306, R-1354, R-1362, R-1357, R-1361, R-1366, R-1367, R-1364, R-1363, R-1340, R-1404	Terminal board		*	1; SA:7232	SA:7232	TB-1305	1	
TB-1306 thru TB-2000	Not Used								
TB-2001	Board, terminal: for mtg tie-points; 16 brass silver plated stud term; two rows 3/4" apart, stud terms not less than 11/16" apart; glass melamine grade LTS-E-3; 6" lg x 1 1/2" wd x 1 9/32" h; mts by three 0.193" diam mtg holes 2 1/4" between/c	Terminal board		*	1; SA:7440	SA:7440	TB-2001, TB-2101, TB-2201,	5	

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TB-2002	Board, terminal: for mtg resistors and capacitors; 32 brass silver plated stud term; two rows 1 1/8" apart; studs not less the 5/16" apart; natural bakelite grade LTS-E-3; 5 7/16" lg x 1 1/2" wd x 5/8" h; mts by three 0.156" diam holes 2" between/c	Terminalboard		N17-B-78232-4301*	1; SA:7489	SA:7489	TB-2002	3	
TB-2003	Board, terminal: for mtg tie-points; two brass silver plated stud term; stud term 3/8" between/c; natural bakelite grade LTS-E-3; 1 1/2" lg x 3/8" wd x 5/8" h; mts by two 0.156" diam holes on 1 1/2" between/c	Terminal board		*	1; SA:7361	SA:7361	TB-2003, TB-2102, TB-2202	5	
TB-2004 thru TB-2100	Not Used								
TB-2101	Same as TB-2001	Terminal board							
TB-2102	Same as TB-2003	Terminal board							
TB-2103	Board, terminal: mts 14 resistors; 2 capacitors; 32 brass silver plated stud terms; two rows 1 1/8" apart; stud terms 5/16" apart; laminated phenolic board grade LTS-E-3; 5 7/16" lg x 1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on 2" mtg/c; marked C-2113, R-2125, R-2124, R-2123, R-2115, R-2116, R-2107, R-2106, R-2103, R-2102, R-2131, R-2130, R-2110, R-2111, R-2112, C-2114,	Terminal board		N17-B-78232-4232*	1; SA:7429	SA:7429	TB-2103	1	
TB-2104	Board, terminal: mts 6 resistors 1 capacitor; 18 brass silver plated stud terms; two rows 1 1/8" apart; stud terms 5/16" apart; laminated phenolic board grade LTS-E-3;	Terminal board		N17-B-78113-7043*	1; SA:9135	SA:9135	TB-2104	1	

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
	TERMINAL BOARDS (continued)									
TB-2104 (cont)	3 9/16" lg x 1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on 1 9/16" and 1 3/16" mtg/c; marked R-2138, R-2126, R-2113, R-2137, R-2122, R-2134, C-2109									
TB-2105 thru TB-2200	Not Used									
TB-2201	Same as TB-2001	Terminal board								
TB-2202	Same as TB-2003	Terminal board								
TB-2203	Board, terminal: mts 14 resistors 2 capacitors; 32 brass silver plated stud term; two rows 1 1/8" apart, stud term 5/16" apart; laminated phenolic board grade LTS-E-3; 5 7/16" lg x 1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on 2" mtg/c; marked C-2213, R-2230, R-2219, R-2218, R-2215, R-2214, R-2211, R-2210, R-2207, R-2206, R-2203, R-2202, R-2224, R-2225, R-2235, C-2214	Terminal board		N17-B-78232-4236*	1; SA:7357	SA:7357	TB-2203	1		
TB-2204	Board, terminal: mts 7 resistors; 18 brass silver plated stud term; two rows 1 1/8" apart, stud term 5/8" apart; laminated phenolic board grade LTS-E-3; 3 9/16" lg x	Terminal board		N17-B-78113-7041*	1; SA:9126	SA:9126	TB-2204	1		

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TB-2204 (cont)	1 1/2" wd x 39/64" h; three 0.156" diam mtg holes on 1 9/16" and 1 3/16" mtg/c; marked R-2229, R-2236, R-2223, R-2217, R-2232, R-2233, R-2234									
TB-2205 thru TB-3900	Not Used									
TB-3901	Board, terminal: 3 brass silver plated term; 0.344" between centers of term; XXP natural bakelite; 1 15/16" lg x 9/16" wd x approx 5/8" h; two 0.156" diam holes on 1.500" mtg/c	Tie points for power in and motor leads (left side)		N17-B-77585-9372*	1; SA:7476	SA:7476	TB-3901, TB-3902	5		
TB-3902	Same as TB-3901	Tie points for power in and motor leads (right side)								
			TEST POINTS							
TP-101 thru TP-2000	Not Used									
TP-2001	Connector, receptacle: incl TP-2001A and TP-2001B	Positive 210 v test point								
TP-2001A	Connector, receptacle: one round female contact; straight; black bakelite head; contact suitable for 0.080" diam tip plug; 1/2" o/a diam x 1 1/32" lg; round metal body; panel mtd thru 5/16" diam hole by 5/16"-40 threaded body	Part of TP-2001		N17-C-73108-1998	5; no. 419 p	K421-1	TP-2001A TP-2001B, TP-2101A, TP-2101B, TP-2102, TP-2201A, TP-2201B, TP-2202	12		
TP-2001B	Same as TP-2001A	Part of TP-2001								
TP-2002 thru TP-2100	Not Used									

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TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				TEST POINTS (continued)						
TP-2101	Connector, receptacle: incl TP-2101A and TP-2101B	Positive 300 v test point								
TP-2101A	Same as TP-2001A	Part of TP-2101								
TP-2101B	Same as TP-2001A	Part of TP-2101								
TP-2102	Same as TP-2001A	Positive 210 v test point (together with TP-2101B)								
TP-2103 thru TP-2200	Not Used									
TP-2201	Connector, receptacle: incl TP-2201A and TP-2201B	Positive 300 v test point								
TP-2201A	Same as TP-2001A	Part of TP-2201								
TP-2201B	Same as TP-2001A	Part of TP-2201								
TP-2202	Same as TP-2001A	Negative 300 v test point (together with TP-2201B)								
				SOCKETS						
XC-101 thru XC-700	Not Used									
XC-701	Socket, tube: 8 contacts, octal; below chassis saddle mtg; two 5/32" diam mtg holes 1 1/2" c to c on	C-734 capacitor socket	(-49358)	N16-S-63517-6481	1; SA:2640	SA:2640	XC-701, XC-901, XC-1001,	25		

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XC-701 (cont)	metal mtg saddle 1 7/8" lg x 1 1/2" wd; round ceramic body 1 3/16" diam x 3/8" h o/a excl term; phosphor-bronze cad plated contacts; two ground lugs on mtg saddle						XR-101, XV-1108, XV-1109, XV-2108 XV-2108		
XC-702 thru XC-900	Not Used								
XC-901	Same as XC-701	C-918 capacitor socket							
XC-902 thru XC-1000	Not Used								
XC-1001	Same as XC-701	C-1029 capacitor socket							
XF-101 thru XF-2000	Not Used								
XF-2001	Fuse holder: extractor post type; for single 3AG cartridge fuse 1 1/4" lg x 1/4" diam; molded black plastic; 115 v; 15 amps; 2 7/16" lg x 43/64" diam; threaded body for 1/2" diam mtg hole; two solder lug terms; all metallic parts except stainless steel, suitably plated to withstand 200 hr 20% salt spray test per AN spec AN-QQ-S-91 without corrosion or other deleterious effects	Blower fuse holder		N17-F-74266-9235	324 HKP-J-MOD	H477-1	XF-2001, XF-2002, XF-2101, XF-2102, XF-2201, XF-2202, XF-3401 thru XF-3404	14	
XF-2002	Same as XF-2001	Blower fuse holder							
XF-2003	Holder, fuse: extractor post type; for 3 type 3AG cartridge fuses; brass tubing; 4 13/16" lg x 3/4" o/a diam; panel mtd thru 7/16"-27	F-2003, F-2004 and F-2005 fuse holder			1; SA:7547	SA:7547	XF-2003, XF-2103, XF-2203	5	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SOCKETS (continued)						
XF-2003 (cont)	threaded bushing; suitable for 3 spare fuses									
XF-2004 thru XF-2100	Not Used									
XF-2101	Same as XF-2001	Blower fuse holder								
XF-2102	Same as XF-2001	Blower fuse holder								
XF-2103	Same as XF-2003	F-2103, F-2104 and F-2105 fuse holder								
XF-2104 thru XF-2200	Not Used									
XF-2201	Same as XF-2001	Blower fuse holder								
XF-2202	Same as XF-2001	Blower fuse holder								
XF-2203	Same as XF-2003	F-2203, F-2204 and F-2205 fuse holder								
XF-2204 thru XF-3400	Not Used									

XF-3401 thru XF-3404	Same as XF-2001	F-3401 thru F-3404 holders						
XI-101	Lampholder: miniature bayonet; aluminum body; 15/32" lg x 1" diam exclusive of pigtail; w/o switch; mts by clamps; has pigtail connecting lead	Projection dial lamp socket			1; SA:7388	SA:7388	XI-101	12
XI-102	Lampholder: miniature bayonet; steel shell body; 1 3/8" lg x 7/16" wd x 25/32" h o/a w/7/16" diam holder; no switch; one no. 6-32 tapped mtg hole 13/64" from one end; mtg clip located parallel to and behind socket	Drum dial pilot socket		N17-L-51626-5497	1; Q170-2	Q170-2	XI-102	12
XI-103 thru XI-1100	Not Used							
XI-1101	Lampholder: candelabra lamp S-6; ceramic body 1 9/16" lg x 1" wd x 1 9/32" h; two 0.156" diam mtg holes on 1 7/32" x 19/32" mtg/c; metal parts plated to be RSW	I-1101 socket		N17-L-50847-2423	3	P358-1	XI-1101	3
XI-1102 thru XI-2000	Not Used							
XI-2001	Light, indicator: w/lens; 5/8" diam clear plastic cap; for T-3 1/4 clear bulb w/min bayonet base; 125 v or 250 v; enclosed shell; chrome plated brass shell w/molded bakelite; 2 1/8" lg x 1" diam o/a; 11/16" diam mtg hole required; mts any position w/lamp replacable from front of panel; threaded jewel, two solder lug term term at base of socket; incl 51,000	Heater primary indicator socket and lens		N17-L-76743-4669*	317 95408-937	Q721-1	XI-2001, XI-2002, XI-2003, XI-2101, XI-2102, XI-2103, XI-2201, XI-2202, XI-2203, XI-3401 thru XI-3406	21

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SOCKETS (continued)						
XI-2001 (cont)	ohm internal resistor									
XI-2001A	Light, indicator: w/o lens; for T-3 1/4 clear bulb, min bayonet base; 125 v or 250 v; enclosed shell; chrome plated brass shell w/molded bakelite; 1 5/8" lg x 1" diam o/a; 11/16" mtg hole required; mts any position w/lamp replacable from front of panel; two solder lug term at base of socket; incl 51,000 ohm internal resistor; part of XI-2001	Heater primary indicator socket		N17-L-76662-4678	317	Q721-3	XI-2001A, XI-2002A, XI-2003A, XI-2101A, XI-2102A, XI-2103A, XI-2201A, XI-2202A, XI-2203A, XI-3401A, thru XI-3406A	21		
XI-2001B	Lens, indicator light: clear; threaded type; 5/8" diam clear plastic lens; part of XI-2001	Heater primary indicator lens		N17-L-250181-506	317	Q721-2	XI-2001B, XI-2002B, XI-2003B, XI-2101B, XI-2102B, XI-2103B, XI-2201B, XI-2202B, XI-2203B, XI-3401B thru XI-3406B	21		
XI-2002	Same as XI-2001	Failure indicator socket and lens								

XI-2002A	Same as XI-2001A; part of XI-2002	Failure indicator socket
XI-2002B	Same as XI-2001B; part of XI-2002	Failure indicator lens
XI-2003	Same as XI-2001	Plate power indicator socket and lens
XI-2003A	Same as XI-2001A; part of XI-2003	Plate power indicator socket
XI-2003B	Same as XI-2001B; part of XI-2003	Plate power indicator lens
XI-2004 thru XI-2100	Not Used	
XI-2101	Same as XI-2001	Heater primary indicator socket and lens
XI-2101A	Same as XI-2001A; part of XI-2101	Heater primary indicator socket
XI-2101B	Same as XI-2001B; part of XI-2101	Heater primary indicator lens
XI-2102	Same as XI-2001	Failure indicator socket and lens
XI-2102A	Same as XI-2001A; part of XI-2102	Failure indicator socket
XI-2102B	Same as XI-2001B; part of XI-2102	Failure indicator lens
XI-2103	Same as XI-2001	Plate power indicator socket and lens
XI-2103A	Same as XI-2001A; part of XI-2103	Plate power indicator socket
XI-2103B	Same as XI-2001B; part of XI-2103	Plate power indicator lens

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIGNATION	CONTRACTOR DRAWING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SOCKETS (continued)						
XI-2104 thru XI-2200	Not Used									
XI-2201	Same as XI-2001	Heater primary indicator socket and lens								
XI-2201A	Same as XI-2001A; part of XI-2201	Heater primary indicator socket								
XI-2201B	Same as XI-2001B; part of XI-2201	Heater primary indicator lens								
XI-2202	Same as XI-2001	Failure indicator socket and lens								
XI-2202A	Same as XI-2001A; part of XI-2202	Failure indicator socket								
XI-2202B	Same as XI-2001B; part of XI-2202	Failure indicator lens								
XI-2203	Same as XI-2001	Plate power indicator socket and lens								
XI-2203A	Same as XI-2001A; part of XI-2203	Plate power indicator socket								
XI-2203B	Same as XI-2001B; part of XI-2203	Plate power indicator lens								
XI-2204 thru XI-3400	Not Used									

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XI-3401	Same as XI-2001	I-3401 socket and lens
XI-3401A	Same as XI-2001A; part of XI-3401	I-3401 socket
XI-3401B	Same as XI-2001B; part of XI-3401	I-3401 lens
XI-3402	Same as XI-2001	I-3402 socket and lens
XI-3402A	Same as XI-2001A; part of XI-3402	I-3402 socket
XI-3402B	Same as XI-2001B; part of XI-3402	I-3402 lens
XI-3403	Same as XI-2001	I-3403 socket and lens
XI-3403A	Same as XI-2001A; part of XI-3403	I-3403 socket
XI-3403B	Same as XI-2001B; part of XI-3403	I-3403 lens
XI-3404	Same as XI-2001	I-3404 socket and lens
XI-3404A	Same as XI-2001A; part of XI-3404	I-3404 socket
XI-3404B	Same as XI-2001B; part of XI-3404	I-3404 lens
XI-3405	Same as XI-2001	I-3405 socket and lens
XI-3405A	Same as XI-2001A; part of XI-3405	I-3405 socket
XI-3405B	Same as XI-2001B; part of XI-3405	I-3405 lens
XI-3406	Same as XI-2001	I-3406 socket and lens
XI-3406A	Same as XI-2001A; part of XI-3406	I-3406 socket

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SOCKETS (continued)						
XI-3406B	Same as XI-2001B; part of XI-3406	I-3406 lens								
XR-101	Same as XC-701	R-141 socket								
XV-101 thru XV-104	Socket, tube: 7 miniature axial contacts; under chassis wafer mtg; two 1/8" diam mtg holes on 7/8" mtg/c; oval ceramic body 1.144" lg x 3/4" wd x 0.320" h excl term; beryllium copper contacts silver plated; marked CNA-491842; center shield; 0.167" ID w/o shock shield base	V-101 thru V-104 socket	(-491842)	N16-S-62603-6461	1; SA:4916-2	SA:4916-2	XV-101 thru XV-104, XV-106 thru XV-109, XV-301 thru XV-312, XV-401 thru XV-410, XV-601 thru XV-608, XV-701 thru XV-709, XV-801 thru XV-806, XV-901 thru XV-905, XV-1001 thru XV-1011, XV-1102 thru XV-1107, XV-1110, XV-1202, XV-1203, XV-1204, XV-1206 thru XV-1212,	336		

XV-101 thru XV-104 (cont)							XV-1214, XV-1301 thru XV-1304, XV-1309, XV-1310, XV-1314, XV-1315, XV-1316, XV-1318, XV-1322, XV-1323, XV-1324, XV-2006, XV-2007, XV-2008, XV-2010, XV-2011, XV-2012, XV-2107, XV-2109, XV-2110, XV-2113, XV-2114, XV-2209, XV-2210, XV-2211, XV-2213, XV-2214, XV-2215		
XV-105	Socket, tube: 9 miniature axial contacts; under chassis wafer mtg; two 1/8" diam mtg holes on 1 1/8" mtg/c; oval ceramic body 1.438" lg x 55/64" wd x 0.393" h excl term; beryllium copper contacts silver plated; marked CNA-491844; center shield 0.167" ID w/o metal shock shield base	V-105 socket	(-491844)	N16-S-64063-6456	1; SA:4927-2	SA:4927-2	XV-105, XV-1101, XV-1201, XV-1205, XV-1213, XV-1215, XV-1217, XV-1305, XV-1306, XV-1311,	45	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SOCKETS (continued)						
XV-105 (cont)							XV-1312, XV-1313, XV-1319, XV-1320, XV-1321, XV-2009, XV-2105, XV-2112, XV-2208, XV-2212			
XV-106	Same as XV-101	V-106 socket								
XV-107	Same as XV-101, except part of Z-101[1], Z-101[2], Z-101[3], Z-101[4]	V-107 socket								
XV-108	Same as XV-101	V-108 socket								
XV-109	Same as XV-101	V-109 socket								
XV-110 thru XV-300	Not Used									
XV-301 thru XV-312	Same as XV-101	V-301 thru V-312 socket								
XV-313 thru XV-400	Not Used									
XV-401 thru XV-410	Same as XV-101	V-401 thru V-410 socket								

XV-411 thru XV-600	Not Used	
XV-601 thru XV-608	Same as XV-101	V-601 thru V-608 socket
XV-609 thru XV-700	Not Used	
XV-701 thru XV-709, XV-710 thru XV-800	Same as XV-101	V-701 thru V-709 socket
XV-801 thru XV-806	Same as XV-101	V-801 thru V-806 socket
XV-807 thru XV-900	Not Used	
XV-901 thru XV-905	Same as XV-101	V-901 thru V-905 socket
XV-906 thru XV-1000	Not Used	
XV-1001 thru XV-1011	Same as XV-101	V-1001 thru V-1011 socket
XV-1012 thru XV-1100	Not Used	
XV-1101	Same as XV-105	V-1101 socket
XV-1102 thru XV-1107	Same as XV-101	V-1102 thru V-1107 socket

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SOCKETS (continued)						
XV-1108	Same as XC-701	V-1108 socket								
XV-1109	Same as XC-701	V-1109 socket								
XV-1110	Same as XV-101	V-1110 socket								
XV-1111 thru XV-1200	Not Used									
XV-1201	Same as XV-105	V-1201 socket								
XV-1202 thru XV-1204	Same as XV-101	V-1202 thru V-1204 socket								
XV-1205	Same as XV-105	V-1205 socket								
XV-1206 thru XV-1212	Same as XV-101	V-1206 thru V-1212 socket								
XV-1213	Same as XV-105	V-1213 socket								
XV-1214	Same as XV-101	V-1214 socket								
XV-1215	Same as XV-105	V-1215 socket								
XV-1216	Socket, tube: 12 pins small shell duodecal; one piece saddle mtg; two 0.187" diam mtg holes on 2 1/2" mtg/c; round plastic body w/metal saddle mtg, 1 7/8" diam x 7/8" h excl mtg saddle; silverplated contacts; contains wire leads from each contact except no. 5 and no. 11, all leads 10" lg	V-1216 socket		N16-S-64286-3992	127	M425-2	XV-1216	3		
XV-1217	Same as XV-105	V-1217 socket								
XV-1218	Not Used									

thru XV-1300									
XV-1301 thru XV-1304	Same as XV-101	V-1301 thru V-1304 socket							
XV-1305	Same as XV-105	V-1305 socket							
XV-1306	Same as XV-105	V-1306 socket							
XV-1307	Not Used								
XV-1308	Not Used								
XV-1309	Same as XV-101	V-1309 socket							
XV-1310	Same as XV-101	V-1310 socket							
XV-1311 thru XV-1313	Same as XV-105	V-1311 thru V-1313 socket							
XV-1314 thru XV-1316	Same as XV-101	V-1314 thru V-1316 socket							
XV-1317	Not Used								
XV-1318	Same as XV-101	V-1318 socket							
XV-1319 thru XV-1321	Same as XV-105	V-1319 thru V-1321 socket							
XV-1322 thru XV-1324	Same as XV-101	V-1322 thru V-1324 socket							
XV-1325 thru XV-2000	Not Used								
XV-2001 thru XV-2005	Socket, tube: 8 axial contacts, standard octal; mtd on brass ring; two 0.156" wd x 21/64" lg oval mtg holes on 1 43/64" mtg/c; circular ceramic body 1.380" diam x 0.385" h excl term; cad plated phos bronze contacts	V-2001 thru V-2005 socket		N16-S-63517-7401	1; SA:451	SA:451	XV-2001 thru XV-2005, XV-2101 thru XV-2105, XV-2111,	29	

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SOCKETS (continued)						
XV-2001 thru XV-2005							XV-2115, XV-2201 thru XV-2207			
XV-2006 thru XV-2008	Same as XV-101	V-2006 thru V-2008 socket								
XV-2009	Same as XV-105	V-2009 socket								
XV-2010 thru XV-2012	Same as XV-101	V-2010 thru V-2012 socket								
XV-2013 thru XV-2100	Not Used									
XV-2101 thru XV-2105	Same as XV-2001	V-2101 thru V-2105 socket								
XV-2106	Same as XV-105	V-2106 socket								
XV-2107	Same as XV-101	V-2107 socket								
XV-2108	Same as XC-701	V-2108 socket								
XV-2109	Same as XV-101	V-2109 socket								
XV-2110	Same as XV-101	V-2110 socket								
XV-2111	Same as XV-2001	V-2111 socket								
XV-2112	Same as XV-105	V-2112 socket								
XV-2113	Same as XV-101	V-2113 socket								
XV-2114	Same as XV-101	V-2114 socket								

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XV-2115	Same as XV-2001	V-2115 socket								
XV-2116 thru XV-2200	Not Used									
XV-2201 thru XV-2207	Same as XV-2001	V-2201 thru V-2207 socket								
XV-2208	Same as XV-105	V-2208 socket								
XV-2209 thru XV-2211	Same as XV-101	V-2209 thru V-2211 socket								
XV-2212	Same as XV-105	V-2212 socket								
XV-2213 thru XV-2215	Same as XV-101	V-2213 thru V-2215 socket								
XY-101 thru XY-300	Not Used									
XY-301	Socket, crystal: 2 round female contacts, 0.033" ID spaced 1/2" c to c; single hole mtd; mtd by 0.116" diam hole in center with 1/4" diam countersunk; rectangular shape w/round ends 1 1/16" lg x 7/16" wd x 5/16" h, o/a, excl term; beryllium copper silver plated contacts	Y-301 socket	(-492000)	N16-S-54393-7314	1; SA:5030	SA:5030	XY-301, XY-701, XY-801 thru XY-807	23		
XY-302 thru XY-700	Not Used									
XY-701	Same as XY-301	Y-701 socket								
XY-702 thru XY-800	Not Used									

TABLE 8-4. COMBINED PARTS AND REPAIR PARTS LIST FOR RADIO RECEIVING SET AN/FRR-24

PARTS									EQUIP. REPAIR PARTS	
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE) NO.	STANDARD NAVY AND (SIGNAL CORPS) STOCK NO.	MFGR. AND MFGR'S. DESIG-NATION	CON-TRACTOR DRAW-ING & PART NO.	ALL SYMBOL DESIG. INVOLVED	TOT. NO. PER EQ.	BOX	QUAN.
				SOCKETS (continued)						
XY-801 thru XY-817	Same as XY-301	Y-801 thru Y-817 socket								

TABLE 8–5 CROSS REFERENCE PARTS LIST

JAN DESIGNATIONS	KEY SYMBOL	JAN DESIGNATIONS	KEY SYMBOL	JAN DESIGNATIONS	KEY SYMBOL	JAN DESIGNATIONS	KEY SYMBOL	JAN DESIGNATIONS	KEY SYMBOL
AN3102-14S-5P	J-1311	CE51A250G	C-734	CM30C101K	C-343	CP61B1DF504V	C-1308	RB11B10001F	R-1250
AN3102-14S-12P	J-3901	CM20A101K	C-352	CM30C102K	C-147	CP61B1EF104K	C-614	RB11B35601F	R-1249
AN3102-14S-12S	J-707	CM20A471K	C-602	CM30C182J	C-713	CP61B1EF105K	C-497	RB11B50000F	R-1319
AN3102-16S-1S	J-238	CM20B101K	C-1207	CM30C202J	C-354	CP61B1EF503K	C-729	RB21B10502F	R-1324
AN3102A-14S-5S	J-3903	CM20B151K	C-493	CM30C242J	C-736	CP61B1EF504K	C-726	RB21B15102F	R-1323
AN3102A-20-3P	J-2003	CM20B271J	C-317	CM30D152G	C-181[1]	CP61B6DF104V	C-1173	RC20BF221K	R-409
AN3102A-20-3S	J-3406	CM20B271K	C-474	CM30E102G	C-151[2]	CP69B1DF104V	C-710	RC20BF333J	R-455
AN3102A-20-27P	J-308	CM20B511K	C-430	CM30E102K	C-434	CP69B4EF104V	C-353	RC20GF102K	R-411
AN3102A-20-27S	J-2005	CM20C111J	C-606	CM30E202G	C-1219	CP69B5EF104V	C-347	RC20GF153J	R-1227
AN3106-14S-5P	P-3910	CM20C220J	C-316	CM30E302G	C-341	CP69B6DF504X	C-1229	RC20GF223K	R-410
AN3106-14S-5S	P-3909	CM20C270J	C-714	CM35B103K	C-403	CP70B1DF106K	C-2001	RC20GF272J	R-1404
AN3106-14S-12P	P-3918	CM20C470J	C-818	CM35B103M	C-302	CP70B1DF405K	C-731	RC20GF273K	R-1349
AN3106-14S-12S	P-3917	CM20C560J	C-715	CM35B472K	C-1306	CP70B1DG405K	C-3901	RC20GF822J	R-1228
AN3106-16S-1P	P-3913	CM20C560K	C-1225	CM35C103J	C-110	CP70B1EF205K	C-1235	RC21BF101K	R-118
AN3106-16S-1S	P-3914	CM20C820J	C-333	CM35C472J	C-174	CP70B1EG405K	C-2003	RC21BF102J	R-123
AN3106-20-27P	P-3916	CM20D271J	C-301	CM35E103G	C-149	CR-18/U	Y-301	RC21BF102K	R-310
AN3106-20-27S	P-3915	CM20D511J	C-327	CM35E512G	C-405	CR-25/U	Y-817	RC21BF103J	R-1234
AN3106A-14S-12P	P-702	CM20E221J	C-136	CM35E622G	C-720	CV11A070	C-801	RC21BF103K	R-152
AN3106B-20-3P	P-3912	CM25D102G	C-181[2]	CP06SA1	O-704	CV11C450	C-1153	RC21BF104J	R-621
AN3106B-20-3S	P-3401	CM25D331G	C-181[4]	CP06SA2	O-602	CV12D121	C-1206	RC21BF104K	R-134
CC20UJ100F	C-916	CM25D621J	C-619	CP06SA4	O-703	MR26WOO3DCMA	M601	RC21BF105J	R-627
CC21SL020D	C-175	CM25D681G	C-181[3]	CP06SA5	O-903	MR26W500DCUA	M801	RC21BF105K	R-474
CC21SL050D	C-817	CM25E102K	C-448	CP06SA6	O-404	MX-564/U	O-1506	RC21BF106J	R-1289
CC21SL100D	C-332	CM25E181G	C-1119	CP07SA4	O-1207	RA20A1RD103AK	R-1103	RC21BF106K	R-1276
CC21SL510J	C-407	CM25E241G	C-151[4]	CP07SB2	O-705	RA20A1RD500AK	R-143	RC21BF122J	R-1152
CC21UJ050C	C-154	CM25E271G	C-1115	CP07SC2	O-2005	RA20A1SA152AK	R-1134	RC21BF134J	R-442
CC26UJ620C	C-153[4]	CM25E331G	C-1109	CP07SC4	O-2004	RA20A1SA252AK	R-1109	RC21BF151K	R-116
CC30CH050D	C-1304	CM25E361G	C-1103	CP53B1EF105K	C-498	RA20A1SA351AK	R-1120	RC21BF152J	R-1112
CC30CH220K	C-101	CM25E431G	C-1106	CP53B1EF593K	C-911	RA20A2SA103AK	R-1343	RC21BF152K	R-324
CC30CH240K	C-1127	CM25E471G	C-1118	CP53B1EF504K	C-914	RA25A2SA153AK	R-2024	RC21BF153J	R-424
CC30CH390K	C-1154	CM25E511G	C-151[3]	CP53B5EF104V	C-441	RB10B16201F	R-2119	RC21BF153K	R-610
CC30SL101K	C-183	CM25E561J	C-724	CP55B1EB405K	C-728	RB10B17251F	R-2222	RC21BF154K	R-153
CC32CG101G	C-148	CM25E821G	C-151[1]	CP55B1EF104K	C-1158	RB10B17751F	R-2016	RC21BF155K	R-1337
CC35HF161J	C-340	CM30A102K	C-605	CP61B1DF104K	C-2006	RB10B24751F	R-2018	RC21BF182J	R-1302
CC36UJ121G	C-153[3]	CM30B102K	C-303	CP61B1DF105K	C-2005	RB10B25251F	R-2220	RC21BF182K	R-103
CC36UJ201G	C-153[2]		C-908	CP61B1DF105V	C-908	RB10B98000F	R-2121	RC21BF183J	R-135

TABLE 8–5 CROSS REFERENCE PARTS LIST (CONT.)

JAN DESIGNATIONS	KEY SYMBOL	JAN DESIGNATIONS	KEY SYMBOL	JAN DESIGNATIONS	KEY SYMBOL	JAN DESIGNATIONS	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL
RC21BF184J	R-121	RC21BF475K	R-1273	RC42GF122K	R-731	UG-21B/U	P-1510	F16-A-39348-1006	AM-440/
RC21BF184K	R-1284	RC21BF512J	R-722	RC42GF152K	R-149	UG-88/U	P-3906	F16-A-39348-1007	FRR-24
RC21BF185J	R-1222	RC21BF513J	R-709	RC42GF153K	R-1142	UG-260/U	P-1827	F16-A-39348-1007	AM-439/
RC21BF185K	R-1252	RC21BF513K	R-2236	RC42GF202J	R-2020	UG-261/U	P-3905		FRR-24
RC21BF204J	R-720	RC21BF561K	R-136	RC42GF222K	R-1144	UG-262/U	J-102	F16-A-39348-1009	AM-438/
RC21BF221K	R-313	RC21BF563K	R-314	RC42GF242J	R-1146	UG-274/U	P-3919		FRR-24
RC21BF222J	R-1233	RC21BF565J	R-1224	RC42GF302J	R-1213	UG-335/U	J-1533	F16-C-10633-9901	CY860/
RC21BF222K	R-102	RC21BF680K	R-144	RC42GF303J	R-1338	UG-414/U	J-1503		FRR-24
RC21BF223K	R-117	RC21BF682K	R-456	RC42GF332K	R-1339	OA2	V-312	F16-C-90818-1001	CV126/
RC21BF224K	R-318	RC21BF683K	R-302	RC42GF363J	R-1283	OB2	V-106		FRR-24
RC21BF225K	R-714	RC21BF751J	R-619	RC42GF392J	R-2011	OC3/VR105	V-1108	F16-C-90908-1001	CV-127/
RC21BF271J	R-1119	RC21BF821J	R-1155	RC42GF471K	R-925	2BP1	V-1216		FRR-24
RC21BF272J	R-618	RC21BF824J	R-405	RC42GF472K	R-602	2D21	V-1214	F16-K-47670-9551	CM32/
RC21BF272K	R-105	RC21BF824K	R-1231	RC42GF473K	R-735	5R4GY	V-2001		FRR-24
RC21BF273K	R-811	RC30BF104K	R-917	RC42GF511J	R-321	6AG5	V-307	F16-K-49161-1003	KY-62/
RC21BF274J	R-1223	RC30BF151K	R-2001	RC42GF561K	R-729	6AH6	V-801		FRR-24
RC21BF274K	R-1108	RC30BF154K	R-1212	RC42GF622J	R-2014	6AK5	V-309	F16-R-38376-6201	AN/FRR-24
RC21BF331J	R-1117	RC30BF222J	R-1139	RC42GF680K	R-2002	6AL5	V-605	F17-P-18151-2985	SB-141/
RC21BF331K	R-309	RC30BF273K	R-1204	RC42GF752J	R-2109	6AN5	V-108		FRR-24
RC21BF332J	R-1267	RC30BF274K	R-2013	RU3B2R0J	R-1400	6AQ5	V-1107	F17-P-23168-4977	SB-140/
RC21BF332K	R-607	RC30BF332K	R-625	RV2ANRD153A	R-620	6AS7G	V-2004		FRR-24
RC21BF333J	R-1288	RC30BF333K	R-126	RV2AURD104B	R-803	6AU6	V-306	F17-P-23194-1001	SB-143/
RC21BF333K	R-320	RC30BF472K	R-1113	RV2AURD153A	R-122	6BA6	V-101		FRR-24
RC21BF334K	R-814	RC30BF474K	R-2012	RV2AURD153E	R-726	6BE6	V-104	G17-L-3911-175	I-1101
RC21BF362J	R-333	RC30GF103K	R-1201	RV2AURD503D	R-1116	6C4	V-107	G17-L-6297	I-103
RC21BF363J	R-454	RC30GF104K	R-1220	RV2AURD504D	R-1221	6J6	V-1106	G17-L-6686	I-101
RC21BF392K	R-1369	RC30GF124K	R-1352	RV2AUSA102B	R-1278	12AT7	V-1305	G17-L-6806-130	I-2001
RC21BF393K	R-337	RC30GF163J	R-1282	RV2AUSA502B	R-1219	12AU7	V-1217	G41-P-1714	H-4034
RC21BF431J	R-1153	RC30GF272K	R-132	RV2AUSA503B	R-1122	12AX7	V-105	G41-S-1106	H-4031
RC21BF470K	R-329	RC30GF273K	R-1215	RV2AUSC102B	R-1266	9003	V-102	N16-B-151921-125	E-133
RC21BF471K	R-623	RC30GF472K	R-1138	RV2AUSC103B	R-1272			N16-B-300001-145	O-114
RC21BF472J	R-124	RC30GF473K	R-1205	RV2AUSC105B	R-1232			N16-B-300001-146	O-115
RC21BF472K	R-331	RC42GF102K	R-2138	RV2AUSC105D	R-1268			N16-B-750001-423	E-205
RC21BF473K	R-130	RC42GF103K	R-128	RV4ATSA503B	R-125			N16-B-750001-436	O-3938
RC21BF474J	R-1265	RC42GF104K	R-1364	RW34G103	R-2118			N16-B-800175-736	O-2003
RC21BF474K	R-101	RC42GF122J	R-2015	RW34G123	R-2009			N16-B-800199-871	O-112

TABLE 8–5 CROSS REFERENCE PARTS LIST (CONT.)

STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL
N16-B-800200-568	O-709	N16-C-11964-9750	W-3526	N 16-C-11965-4921	W-3014	N16-C-11965-8486	W-3557	N16-C-11966-9601	W-3706
N16-B-800200-578	O-808	N16-C-11964-9752	W-3028	N16-C-11965-4922	W-3512	N16-C-11965-8496	W-3740	N16-C-11967-1905	W-3003
N16-B-800200-580	O-206	N16-C-11964-9754	W-3627	N16-C-11965-4923	W-3510	N16-C-11965-8586	W-3013	N16-C-11967-1906	W-3502
N16-B-800200-583	O-1111	N16-C-11965-1021	W-3033	N16-C-11965-4924	W-3613	N16-C-11965-8587	W-3514	N16-C-11967-1907	W-3603
N16-B-807001-118	O-307	N16-C-11965-1023	W-3633	N16-C-11965-5513	W-3038	N16-C-11965-8588	W-3615	N16-C-11967-2242	W-3702
N16-C-10629-1573	O-308	N16-C-11965-1101	W-101	N16-C-11965-5515	W-3638	N16-C-11965-9101	W-3062	N16-C-11967-2503	W-3503
N16-C-10629-1574	O-131	N16-C-11965-1301	W-3540	N16-C-11965-5517	W-3558	N16-C-11965-9103	W-3650	N16-C-11967-2863	W-3705
N16-C-10629-1576	O-2001	N16-C-11965-1603	W-3623	N16-C-11965-6105	W-3009	N16-C-11965-9105	W-3550	N16-C-11967-2866	W-3707
N16-C-11964-4901	W-104	N16-C-11965-1615	W-3021	N16-C-11965-6107	W-3515	N16-C-11966-1296	W-3715	N16-C-11967-3798	W-3703
N16-C-11964-5501	W-3024	N16-C-11965-1617	W-3522	N16-C-11965-6110	W-3016	N16-C-11966-1901	W-3061	N16-C-11967-3801	W-3701
N16-C-11964-5503	W-3624	N16-C-11965-1910	W-3529	N16-C-11965-6111	W-3509	N16-C-11966-1903	W-3649	N16-C-11968-3703	W-3660
N16-C-11964-5505	W-3523	N16-C-11965-1920	W-3029	N16-C-11965-6112	W-3611	N16-C-11966-1905	W-3551	N16-C-11968-3705	W-3643
N16-C-11964-7006	W-3622	N16-C-11965-1922	W-3527	N16-C-11965-6115	W-3616	N16-C-11966-1907	W-3736	N16-C-11968-4299	W-3547
N16-C-11964-7020	W-3022	N16-C-11965-1923	W-3030	N16-C-11965-6117	W-3554	N16-C-11966-2211	W-3727	N16-C-11968-4301	W-3548
N16-C-11964-7022	W-3521	N16-C-11965-1924	W-3628	N16-C-11965-6705	W-3552	N16-C-11966-2212	W-3728	N16-C-11968-4906	W-3718
N16-C-11964-7024	W-1507	N16-C-11965-1925	W-3630	N16-C-11965-7293	W-3553	N16-C-11966-2214	W-3737	N16-C-11968-6972	W-3646
N16-C-11964-7320	W-3026	N16-C-11965-1926	W-3032	N16-C-11965-7298	W-3745	N16-C-11966-2553	W-3734	N16-C-11968-6974	W-3566
N16-C-11964-7324	W-3525	N16-C-11965-1928	W-3532	N16-C-11965-7303	W-3730	N16-C-11966-3106	W-3723	N16-C-11968-7200	W-3648
N16-C-11964-7325	W-3034	N16-C-11965-2311	W-3010	N16-C-11965-7883	W-3511	N16-C-11966-3111	W-3733	N16-C-11968-8201	W-3543
N16-C-11964-7326	W-3626	N16-C-11965-2321	W-3042	N16-C-11965-7885	W-3537	N16-C-11966-4315	W-3731	N16-C-11968-9395	W-3545
N16-C-11964-7327	W-3634	N16-C-11965-2503	W-3632	N16-C-11965-8181	W-3015	N16-C-11966-4659	W-3040	N16-C-11968-9397	W-3546
N16-C-11964-7328	W-3023	N16-C-11965-2504	W-3507	N16-C-11965-8183	W-3612	N16-C-11966-4661	W-3642	N16-C-11969-1238	W-3005
N16-C-11964-7330	W-3533	N16-C-11965-2505	W-3644	N16-C-11965-8281	W-3007	N16-C-11966-4663	W-3542	N16-C-11969-1240	W-3052
N16-C-11964-7901	W-3027	N16-C-11965-2506	W-3531	N16-C-11965-8283	W-3609	N16-C-11966-4911	W-3725	N16-C-11969-1242	W-3606
N16-C-11964-7902	W-3629	N16-C-11965-2507	W-3608	N16-C-11965-8285	W-3563	N16-C-11966-5510	W-3719	N16-C-11969-1244	W-3505
N16-C-11964-7903	W-3621	N16-C-11965-3101	W-3534	N16-C-11965-8287	W-3555	N16-C-11966-6156	W-3039	N16-C-11969-1245	W-3506
N16-C-11964-7904	W-3520	N16-C-11965-3725	W-3031	N16-C-11965-8376	W-3614	N16-C-11966-6158	W-3641	N16-C-11969-1247	W-3549
N16-C-11964-7905	W-3528	N16-C-11965-3726	W-3530	N16-C-11965-8381	W-3012	N16-C-11966-6160	W-3541	N16-C-11969-1452	W-3049
N16-C-11964-8220	W-3025	N16-C-11965-3727	W-3631	N16-C-11965-8386	W-3036	N16-C-11966-6165	W-3722	N16-C-11969-2298	W-3050
N16-C-11964-8221	W-3524	N16-C-11965-4015	W-3008	N16-C-11965-8387	W-3513	N16-C-11966-6726	W-3710	N16-C-11969-3780	W-3046
N16-C-11964-8222	W-3625	N16-C-11965-4016	W-3508	N16-C-11965-8389	W-3636	N16-C-11966-7432	W-3711	N16-C-11969-3782	W-3047
N16-C-11964-8301	W-3043	N16-C-11965-4017	W-3610	N16-C-11965-8391	W-3556	N16-C-11966-7437	W-3716	N16-C-11969-5264	W-3605
N16-C-11964-8303	W-3639	N16-C-11965-4019	W-3635	N16-C-11965-8393	W-3535	N16-C-11966-7457	W-3717	N16-C-12162-9101	W-3661
N16-C-11964-8305	W-3538	N16-C-11965-4615	W-3035	N16-C-11965-8395	W-3746	N16-C-11966-8801	W-3709	N16-C-12164-7294	W-3567
N16-C-11964-8310	W-102	N16-C-11965-4915	W-3011	N16-C-11965-8397	W-3739	N16-C-11966-9001	W-3712	N16-C-12165-8651	W-3051
N16-C-11964-8312	W-103	N16-C-11965-4917	W-3607	N16-C-11965-8408	W-3724	N16-C-11966-9201	W-3713	N16-C-12198-6076	W-3002

TABLE 8-5 CROSS REFERENCE PARTS LIST (CONT.)

STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL
N16-C-12198-6081	W-3601	N16-C-28980-2076	C-493	N16-C-33612-3276	C-149	N16-C-63638-1149	C-1152	N16-C-76457-5001	T-102[4]
N16-C-12198-6086	W-3504	N16-C-29128-2927	C-1119	N16-C-33617-4746	C-110	N16-C-63673-5731	C-103	N16-C-76778-6541	L-809
N16-C-12233-3589	W-3045	N16-C-29444-7727	C-151[4]	N16-C-33622-5222	C-403	N16-C-63900-6761	C-801	N16-C-96130-9101	Y-701
N16-C-12233-3591	W-3048	N16-C-29603-1127	C-1115	N16-C-33627-7705	C-302	N16-C-64036-4540	C-331	N16-C-96250-1001	Y-817
N16-C-15532-9005	C-175	N16-C-29608-2196	C-317	N16-C-44257-1102	C-729	N16-C-64041-4565	C-184	N16-C-96846-7291	Y-301
N16-C-15624-3580	C-178[1]	N16-C-29608-2206	C-301	N16-C-44257-3124	C-911	N16-C-64133-6581	C-1153	N16-C-152601-101	N-1503
N16-C-15625-7075	C-154	N16-C-29613-2676	C-474	N16-C-45777-1074	C-614	N16-C-64232-8500	C-1206	N16-C-152601-102	N-1703
N16-C-15627-9144	C-1304	N16-C-29708-5722	C-181[4]	N16-C-45777-1080	C-2006	N16-C-71535-2689	L-409	N16-C-152601-103	N-1702
N16-C-15628-9005	C-817	N16-C-29708-5727	C-1109	N16-C-45777-3131	C-1158	N16-C-71535-6251	L-421	N16-C-152601-104	N-1701
N16-C-15916-9005	C-332	N16-C-29814-1327	C-1103	N16-C-45801-9583	C-710	N16-C-71535-6626	L-415	N16-C-152601-105	N-1603
N16-C-15925-1219	C-916	N16-C-29998-7127	C-1106	N16-C-47297-3175	C-914	N16-C-71944-9492	L-110	N16-C-152601-106	N-1802
N16-C-16154-7430	C-101	N16-C-30104-2727	C-1118	N16-C-47299-1111	C-726	N16-C-72252-1135	J-3903	N16-C-152601-107	N-1801
N16-C-16186-7629	C-1127	N16-C-30114-4271	C-602	N16-C-47321-9555	C-1308	N16-C-72536-4385	L-109	N16-C-152601-108	N-1602
N16-C-16410-7629	C-1154	N16-C-30183-3927	C-151[3]	N16-C-48817-1073	C-2005	N16-C-72668-3706	L-401A	N16-C-152601-109	N-1601
N16-C-16596-2481	C-407	N16-C-30188-5006	C-327	N16-C-48817-1090	C-497	N16-C-72669-9486	L-405A	N16-C-152601-110	N-1501
N16-C-16717-2151	C-1534	N16-C-30294-1007	C-724	N16-C-48817-3883	C-498	N16-C-72827-8201	L-802	N16-C-152601-111	N-1502
N16-C-16969-5262	W-3006	N16-C-30373-2202	C-619	N16-C-48841-9598	C-908	N16-C-72833-1901	L-316	N16-C-200001-124	O-132
N16-C-17067-8263	C-148	N16-C-30526-3122	C-181[3]	N16-C-48887-1208	W-3037	N16-C-72888-6384	L-431	N16-C-300442-625	O-712
N16-C-17085-6995	C-183	N16-C-30737-3327	C-151[1]	N16-C-49197-3160	C-1235	N16-C-72895-4263	L-811	N16-C-300798-452	O-1101
N16-C-17197-2595	C-153[3]	N16-C-31080-2219	C-151[2]	N16-C-49948-9349	C-728	N16-C-72969-4508	L-905	N16-C-300798-621	O-113
N16-C-17458-1321	C-340	N16-C-31080-2522	C-181[2]	N16-C-49957-5960	C-731	N16-C-72986-5021	L-1207	N16-C-300798-866	O-2008
N16-C-17677-2619	C-153[2]	N16-C-31090-4159	C-605	N16-C-49961-2432	C-2003	N16-C-73039-8901	L-321	N16-C-650001-422	O-3908
N16-C-18157-2454	C-153[1]	N16-C-31090-4164	C-303	N16-C-51858-2107	C-2001	N16-C-73171-6221	L-812	N16-C-805941-201	O-707
N16-C-18657-8801	C-105	N16-C-31090-4169	C-147	N16-C-53204-4067	C-1173	N16-C-73535-1021	L-310	N16-D-900411-111	O-306
N16-C-18983-1027	C-115	N16-C-31090-4179	C-434	N16-C-53204-4085	C-353	N16-C-74251-2182	L-309	N16-D-900411-120	O-1202
N16-C-19111-1035	C-106	N16-C-31090-4487	C-448	N16-C-53725-7890	C-1229	N16-C-74896-8731	L-314	N16-E-300113-551	O-129
N16-C-19784-1591	C-734	N16-C-31502-2614	C-181[1]	N16-C-54460-4310	C-347	N16-C-75090-1973	L-703	N16-F-32599-5279	Z-401
N16-C-27075-8801	C-714	N16-C-31665-6489	C-713	N16-C-54460-4481	C-441	N16-C-75239-1021	L-704	N16-F-32599-6279	Z-402
N16-C-27577-1401	C-818	N16-C-31792-4018	C-1219	N16-C-58009-6761	C-1223	N16-C-75509-3085	L-601	N16-F-32600-1147	Z-601
N16-C-27761-7201	C-715	N16-C-31797-5445	C-354	N16-C-60401-1235	C-339	N16-C-76181-1010	Z-705	N16-F-32600-1157	Z-602
N16-C-27766-7681	C-1225	N16-C-31982-2289	C-736	N16-C-60490-5263	C-723	N16-C-76217-5501	T-103[1]	N16-F-44006-6739	Z-1204
N16-C-28210-2001	C-333	N16-C-32188-1019	C-341	N16-C-60916-1841	C-1105	N16-C-76217-5901	T-102[1]	N16-F-44012-8374	Z-1205
N16-C-28558-1671	C-352	N16-C-32641-6333	C-174	N16-C-61457-5089	C-725	N16-C-76301-9901	T-102[2]	N16-F-44020-1501	Z-903
N16-C-28558-1676	C-1207	N16-C-32646-6808	C-1306	N16-C-62066-9101	C-338	N16-C-76420-6501	T-102[3]	N16-F-44083-2521	Z-702
N16-C-28558-1681	C-343	N16-C-32715-6063	C-405	N16-C-62239-2158	C-837	N16-C-76420-7001	T-103[3]	N16-F-44083-8521	Z-703
N16-C-28658-5801	C-609	N16-C-32900-2863	C-720	N16-C-62611-1361	C-620	N16-C-76454-8401	T-103[4]	N16-F-950001-120	O-3907

TABLE 8–5 CROSS REFERENCE PARTS LIST (CONT.)

STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL
N16-G-431376-521	O-106	N16-P-400741-108	O-3949	N16-P-403081-119	E-204	N16-R-49661-0811	R-409	N16-R-50067-505	R-1339
N16-G-431690-189	O-149	N16-P-400741-109	O-3950	N16-P-403081-121	E-3401	N16-R-49661-0971	R-313	N16-R-50067-0231	R-625
N16-G-432330-361	O-212	N16-P-400741-110	O-3946	N16-P-403501-574	N-701	N16-R-49687-0591	R-1119	N16-R-50083-0591	R-333
N16-G-432490-145	O-210	N16-P-401881-162	E-310	N16-P-403501-590	N-901	N16-R-49705-591	R-1117	N16-R-50084-0133	R-1213
N16-G-500001-390	O-144	N16-P-401881-163	O-3904	N16-P-403501-601	N-301	N16-R-49706-0971	R-309	N16-R-50093-131	R-2011
N16-G-934201-102	O-120	N16-P-401881-165	E-147	N16-P-403501-602	N-601	N16-R-49750-591	R-1153	N16-R-50093-0971	R-1369
N16-G-934201-103	O-121	N16-P-401881-169	E-146	N16-P-403501-603	N-1001	N16-R-49769-0971	R-623	N16-R-50128-0591	R-124
N16-H-61951-1004	O-1501	N16-P-401881-170	E-312	N16-P-403501-609	N-401	N16-R-49770-519	R-925	N16-R-50129-0971	R-331
N16-H-150001-235	O-3915	N16-P-401881-171	E-406	N16-P-403501-610	N-801	N16-R-49778-236	R-321	N16-R-50130-241	R-1138
N16-K-700261-991	E-122	N16-P-401881-172	E-1116	N16-P-403501-619	N-1101	N16-R-49805-0971	R-136	N16-R-50130-511	R-602
N16-K-700310-982	E-121	N16-P-401881-173	E-714	N16-P-403501-646	N-201	N16-R-49806-493	R-729	N16-R-50130-0231	R-1113
N16-K-700346-101	E-201	N16-P-401881-174	E-407	N16-P-403501-647	N-3401	N16-R-49858-591	R-619	N16-R-50146-0591	R-722
N16-K-700350-576	E-124	N16-P-401881-196	E-144	N16-P-403501-674	N-3901	N16-R-49876-0591	R-1155	N16-R-50165-0971	R-714
N16-K-700374-242	E-123	N16-P-401881-198	E-140	N16-P-403501-675	N-3904	N16-R-49921-591	R-123	N16-R-50183-131	R-2014
N16-K-701639-965	E-307	N16-P-401881-199	E-141	N16-P-403501-676	N-3903	N16-R-49922-0730	R-411	N16-R-50201-0971	R-456
N16-K-701639-975	E-1112	N16-P-401881-200	A-101	N16-P-403501-677	N-3902	N16-R-49922-0971	R-310	N16-R-50219-131	R-2109
N16-L-85756-7371	P-1506	N16-P-401881-201	E-143	N16-P-403501-738	N-4001	N16-R-49923-533	R-2138	N16-R-50236-438	R-1228
N16-L-150001-138	O-119	N16-P-401881-202	E-142	N16-P-403501-830	O-3930	N16-R-49939-591	R-1152	N16-R-50281-0591	R-1234
N16-L-150001-140	O-118	N16-P-401881-203	E-832	N16-P-403501-831	O-3928	N16-R-49940-126	R-2015	N16-R-50282-0971	R-152
N16-L-300001-134	O-123	N16-P-401881-204	E-831	N16-P-403501-832	O-3927	N16-R-49941-511	R-731	N16-R-50283-512	R-128
N16-M-60906-8018	O-404	N16-P-401881-205	E-829	N16-P-403501-833	O-3929	N16-R-49966-591	R-1112	N16-R-50283-0238	R-1201
N16-M-60910-9607	O-303	N16-P-401881-206	E-827	N16-P-403561-124	N-802	N16-R-49967-0971	R-324	N16-R-50335-0438	R-1227
N16-M-60911-4456	O-903	N16-P-401881-207	E-828	N16-P-403561-126	N-1105	N16-R-49968-525	R-149	N16-R-50336-0591	R-424
N16-M-60918-1606	O-2005	N16-P-401881-208	E-208	N16-P-403621-143	N-103[1]	N16-R-49984-0591	R-1302	N16-R-50336-0971	R-610
N16-M-60919-6301	O-701	N16-P-401881-209	E-308	N16-P-403621-144	N-103[2]	N16-R-49985-0971	R-103	N16-R-50337-518	R-1142
N16-M-60958-3561	O-704	N16-P-401881-210	E-1215	N16-P-404881-111	O-3902	N16-R-49994-138	R-2020	N16-R-50344-758	R-1282
N16-M-60958-3571	O-602	N16-P-401881-211	E-2005	N16-P-404881-112	O-3903	N16-R-50011-0591	R-1233	N16-R-50353-591	R-135
N16-M-60958-3591	O-703	N16-P-401881-212	E-1114	N16-P-500001-148	N-302	N16-R-50011-0751	R-1139	N16-R-50372-833	R-410
N16-M-61072-828	O-401	N16-P-401881-213	E-2006	N16-P-500001-167	O-156	N16-R-50012-0971	R-102	N16-R-50372-0971	R-117
N16-M-61083-7638	E-819	N16-P-401881-214	E-209	N16-R-28982-4415	L-2001	N16-R-50013-466	R-1144	N16-R-50399-813	R-1349
N16-M-61144-5178	O-1207	N16-P-401881-215	E-712	N16-R-49427-0971	R-329	N16-R-50021-131	R-1146	N16-R-50399-0971	R-811
N16-M-61145-2233	O-705	N16-P-402241-117	E-203	N16-R-49499-0971	R-144	N16-R-50038-591	R-618	N16-R-50400-0231	R-1203
N16-M-61148-1050	O-2004	N16-P-402841-103	O-3926	N16-R-49500-493	R-2002	N16-R-50039-0971	R-105	N16-R-50400-0240	R-1215
N16-P-400741-105	O-3945	N16-P-403081-116	E-825	N16-R-49580-0971	R-118	N16-R-50040-233	R-132	N16-R-50408-130	R-1338
N16-P-400741-106	O-3947	N16-P-403081-117	E-822	N16-R-49625-0971	R-116	N16-R-50065-0591	R-1267	N16-R-50416-0431	R-455
N16-P-400741-107	O-3948	N16-P-403081-118	E-106	N16-R-49626-0231	R-2001	N16-R-50066-0971	R-607	N16-R-50416-0591	R-1288

TABLE 8-5 CROSS REFERENCE PARTS LIST (CONT.)

STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL
N16-R-50417-0971	R-320	N16-R-51037-0591	R-1222	N16-R-90396-2394	R-1120	N16-S-117101-632	N-1202	N16-T-56360	V-1106
N16-R-50418-0231	R-126	N16-R-51038-0971	R-1252	N16-R-90803-2076	R-1134	N16-S-117101-658	N-101[2]	N16-T-58240	V-1305
N16-R-50434-0591	R-454	N16-R-51173-097	R-1273	N16-R-90868-2980	R-1109	N16-S-117101-659	N-101[3]	N16-T-58241	V-1217
N16-R-50439-0940	R-1283	N16-R-51208-0591	R-1224	N16-R-91291-4928	R-1103	N16-S-117101-660	N-101[4]	N16-T-58241-60	V-105
N16-R-50444-0971	R-337	N16-R-51325-0591	R-1289	N16-R-91291-4930	R-1343	N16-S-117101-675	N-102[1]	N16-T-751611-301	H-4036
N16-R-50480-0971	R-130	N16-R-51326-971	R-1276	N16-R-91291-9040	R-603	N16-S-117101-676	N-102[4]	N16-T-800001-148	BM:450
N16-R-50481-461	R-735	N16-R-66398-2631	R-2118	N16-R-91291-9140	R-629	N16-S-117101-677	N-102[2]	N16-T-801801-101	O-3931
N16-R-50481-0233	R-1205	N16-R-66425-6221	R-2009	N16-R-91340-5962	R-2024	N16-S-117101-678	N-102[3]	N16-W-63738-9331	O-1502
N16-R-50497-591	R-709	N16-R-68282-2126	R-1400	N16-R-91406-1391	R-127	N16-S-150053-107	O-117	N16-W-182501-103	O-109
N16-R-50516-0971	R-314	N16-R-73511-1926	R-1123	N16-R-501081-117	O-301	N16-S-212226-1108	O-305	N17-A-27451-1061	J-105
N16-R-50552-0971	R-302	N16-R-76403-6354	R-1324	N16-S-20881-7141	O-205	N16-S-469501-120	O-178	N17-B-77407-1243	TB-201
N16-R-50632-0591	R-621	N16-R-76417-7171	R-1323	N16-S-20885-8031	O-1106	N16-S-469501-121	O-2010	N17-B-77534-7893	TB-305
N16-R-50633-0971	R-134	N16-R-79200-3204	R-1319	N16-S-20907-4580	O-207	N16-S-469501-122	O-2011	N17-B-77534-7895	TB-804
N16-R-50634-503	R-1364	N16-R-79257-5059	R-1250	N16-S-20928-9891	O-807	N16-S-685341-110	O-110	N17-B-77534-7897	TB-805
N16-R-50634-0231	R-917	N16-R-79280-3865	R-2016	N16-S-20964-1001	O-710	N16-S-685901-107	O-1505	N17-B-77534-7898	TB-906
N16-R-50634-0234	R-1220	N16-R-79297-9468	R-2018	N16-S-21034-2801	O-1005	N16-S-686021-101	O-133	N17-B-77534-7942	TB-1208
N16-R-50652-233	R-1352	N16-R-79318-6399	R-1249	N16-S-21050-2641	O-402	N16-S-686141-102	O-108	N17-B-77534-9289	TB-701
N16-R-50659-0591	R-442	N16-R-79444-9424	R-1129	N16-S-34516-2337	E-128	N16-T-29003	V-102	N17-B-77537-6063	TB-702
N16-R-50678-0971	R-153	N16-R-79450-8901	R-1124	N16-S-34548-6620	E-130	N16-T-52001	V-312	N17-B-77585-9372	TB-3901
N16-R-50679-0231	R-1212	N16-R-87350-9460	R-1278	N16-S-34599-7750	E-131	N16-T-52001-5	V-106	N17-B-77634-7866	TB-1213
N16-R-50695-591	R-121	N16-R-87350-9470	R-1266	N16-S-34601-6615	E-1208	N16-T-52230	V-1216	N17-B-77634-7881	TB-902
N16-R-50696-0971	R-1284	N16-R-87520-9605	R-1219	N16-S-34658-2580	E-132	N16-T-52421	V-1214	N17-B-77634-7888	TB-1006
N16-R-50704-0591	R-720	N16-R-87522-5536	R-125	N16-S-34783-1239	E-1207	N16-T-53050	V-1108	N17-B-77634-7889	TB-1005
N16-R-50714-0971	R-318	N16-R-87680-9480	R-1272	N16-S-54393-7314	XY-301	N16-T-55444	V-2001	N17-B-77634-7890	TB-1004
N16-R-50740-0591	R-1223	N16-R-87706-2137	R-726	N16-S-61316-4401	S-701	N16-T-56090-25	R-141	N17-B-77634-7893	TB-1009
N16-R-50741-0971	R-1108	N16-R-87707-8239	R-620	N16-S-62603-6461	XV-101	N16-T-56175	V-307	N17-B-77634-7896	TB-1108
N16-R-50742-0231	R-2013	N16-R-87707-8250	R-122	N16-S-63517-6481	XC-701	N16-T-56185	V-801	N17-B-77634-7898	TB-105
N16-R-50759-0971	R-814	N16-R-87850-7435	R-1116	N16-S-63517-7401	XV-2001	N16-T-56191	V-309	N17-B-77636-6718	TB-801
N16-R-50821-0591	R-1265	N16-R-87850-9640	R-1122	N16-S-64063-6456	XV-105	N16-T-56195	V-605	N17-B-77687-8947	TB-102
N16-R-50822-0971	R-101	N16-R-88010-9631	R-803	N16-S-64286-3992	XV-1216	N16-T-56196-50	V-108	N17-B-77734-8077	TB-607
N16-R-50823-0231	R-2012	N16-R-88180-7510	R-1221	N16-S-117101-416	N-303	N16-T-56198	V-1107	N17-B-77734-8082	TB-605
N16-R-50929-0591	R-405	N16-R-88340-7113	R-733	N16-S-117101-448	N-1104	N16-T-56202	V-2004	N17-B-77734-8087	TB-603
N16-R-50930-0971	R-1231	N16-R-88340-7118	R-1268	N16-S-117101-522	N-804	N16-T-56203	V-306	N17-B-77734-8092	TB-601
N16-R-50974-0591	R-627	N16-R-88340-9775	R-1285	N16-S-117101-607	O-1203	N16-T-56211	V-101	N17-B-77734-8501	TB-1212
N16-R-50975-0971	R-474	N16-R-88340-9782	R-1232	N16-S-117101-624	N-101[1]	N16-T-56211-50	V-104	N17-B-77737-4601	TB-604
N16-R-51020-0971	R-1337	N16-R-89956-7015	R-143	N16-S-117101-625	O-104	N16-T-56214	V-107	N17-B77737-4680	TB-303

TABLE 8–5 CROSS REFERENCE PARTS LIST (CONT.)

STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL
N17-B-77737-6078	TB-807	N17-B-78178-2901	TB-1209	N17-C-48614-5853	W-3750	N17-C-70589-2703	P-3912	N17-C-98372-9437	O-1107
N17-B-77789-7751	TB-104	N17-B-78178-3009	TB-1201	N17-C-48693-1031	W-3748	N17-C-70600-1131	P-3910	N17-C-98378-1751	O-304
N17-B-77834-8026	TB-1107	N17-B-78178-3276	TB-101	N17-C-48886-1005	W-3640	N17-C-70607-6977	P-3913	N17-C-98378-4005	O-111
N17-B-77834-9157	TB-302	N17-B-78232-4232	TB-2103	N17-C-48886-9369	W-3055	N17-C-70621-4337	P-3916	N17-C-98378-8376	O-804
N17-B-77834-9161	TB-608	N17-B-78232-4236	TB-2203	N17-C-48886-9374	W-3559	N17-C-71468-3425	P-1827	N17-C-200982-501	P-1501
N17-B-77837-3508	TB-707	N17-B-78232-4295	TB-705	N17-C-48886-9379	W-3560	N17-C-71408-5333	P-3906	N17-C-780817-849	O-1506
N17-B-77889-7775	TB-1206	N17-B-78232-4301	TB-2002	N17-C-48886-9399	W-3651	N17-C-71416-2550	P-1510	N17-C-794001-159	O-3919
N17-B-77933-5647	TB-901	N17-B-78242-5360	TB-306	N17-C-48886-9553	W-3747	N17-C-72240-1705	J-707	N17-C-805261-551	O-1503
N17-B-77933-5648	TB-1003	N17-B-78257-3551	TB-103	N17-C-48886-9797	W-3741	N17-C-72241-2704	J-3406	N17-C-805751-551	O-302
N17-B-77933-5649	TB-1002	N17-B-78282-8150	TB-301	N17-C-48886-9798	W-3058	N17-C-72273-4276	J-2005	N17-C-826001-109	O-3912
N17-B-77933-5650	TB-1001	N17-B-78292-8835	TB-307	N17-C-48886-9800	W-3544	N17-C-72604-1705	J-3901	N17-C-826004-108	O-3906
N17-B-77936-5983	TB-806	N17-B-86784-1856	E-206	N17-C-48886-9805	W-3645	N17-C-72605-2704	J-2003	N17-C-945001-861	E-309
N17-B-77936-5986	TB-803	N17-C-48176-9001	W-3017	N17-C-48886-9873	W-3738	N17-C-72616-1135	J-1311	N17-C-965001-288	O-3936
N17-B-77980-9801	TB-1210	N17-C-48289-4685	W-3654	N17-C-48886-9991	W-3044	N17-C-72637-4339	J-308	N17-C-965001-289	O-3921
N17-B-77980-9806	TB-1211	N17-C-48297-7411	W-3562	N17-C-48886-9997	W-3539	N17-C-72811-2237	J-103	N17-D-200001-109	O-906
N17-B-77983-9181	TB-2901	N17-C-48297-7416	W-3653	N17-C-48887-1126	W-3735	N17-C-73108-1998	TP-2001A	N17-D-200001-111	O-405
N17-B-77983-9860	TB-802	N17-C-48298-5376	W-3057	N17-C-48887-1215	W-3536	N17-C-73108-7660	J-102	N17-D-200001-115	O-208
N17-B-77984-4939	TB-602	N17-C-48298-5381	W-3656	N17-C-48887-1220	W-3637	N17-C-73322-8412	P-3921	N17-D-200001-116	O-209
N17-B-78034-3523	TB-708	N17-C-48380-7101	W-3517	N17-C-48887-2030	W-3732	N17-C-73435-1001	L-1206	N17-F-16318	F-3401
N17-B-78113-5806	TB-304	N17-C-48380-7106	W-3618	N17-C-48887-2232	W-3726	N17-C-73613-7518	P-3920	N17-F-74266-9235	XF-2001
N17-B-78113-7041	TB-2204	N17-C-48381-1858	W-3018	N17-C-48887-2421	W-3714	N17-C-73725-5209	J-1301	N17-G-77852-8709	O-711
N17-B-78113-7043	TB-2104	N17-C-48381-1863	W-3516	N17-C-48887-2451	W-3721	N17-C-73725-5309	J-101[4]	N17-G-154907-974	O-3918
N17-B-78113-7048	TB-704	N17-C-48381-1868	W-3617	N17-C-48887-2575	W-3708	N17-C-73725-5311	J-101[3]	N17-G-158806-756	O-3917
N17-B-78137-6052	TB-1008	N17-C-48381-6140	W-3019	N17-C-48887-2759	W-3704	N17-C-73725-5313	J-101[2]	N17-H-73511-1001	O-3920
N17-B-78137-8037	TB-905	N17-C-48381-6145	W-3519	N17-C-48890-3402	W-3901	N17-C-73725-5315	J-101[1]	N17-I-19006-5181	O-3923
N17-B-78137-9220	TB-703	N17-C-48381-6150	W-3620	N17-C-51335-6001	S-2003	N17-C-73725-5317	J-901	N17-I-19006-5186	O-3924
N17-B-78138-3696	TB-1102	N17-C-48382-4001	W-3020	N17-C-51351-6696	S-3401	N17-C-73725-5319	J-801	N17-I-49475-1171	E-116
N17-B-78157-8896	TB-1104	N17-C-48382-4006	W-3619	N17-C-67728-3321	J-1503	N17-C-73725-5323	J-1101	N17-I-67034-1001	E-701
N17-B-78157-9434	TB-606	N17-C-48382-4201	W-3518	N17-C-68721-9579	P-3919	N17-C-73725-5419	P-101[4]	N17-I-67039-2690	E-1113
N17-B-78157-9439	TB-706	N17-C-48385-8751	W-3001	N17-C-70328-1699	P-3917	N17-C-73725-5423	P-101[2]	N17-I-69154-6206	E-117
N17-B-78157-9449	TB-904	N17-C-48385-8756	W-3602	N17-C-70329-2704	P-3401	N17-C-73725-5425	P-101[1]	N17-I-69159-6201	E-305
N17-B-78157-9460	TB-1007	N17-C-48386-3209	W-3501	N17-C-70340-1131	P-3909	N17-C-73725-5429	P-801	N17-J-29513-6221	J-1106
N17-B-78178-1818	TB-1202	N17-C-48614-5840	W-3056	N17-C-70347-6977	P-3914	N17-C-73725-5433	P-1101p	N17-L-50847-2423	XI-1101
N17-B-78178-1823	TB-1203	N17-C-48614-5845	W-3561	N17-C-70361-4337	P-3915	N17-C-73725-5441	P-901	N17-L-51626-5497	XI-102
N17-B-78178-1828	TB-1204	N17-C-48614-5850	W-3657	N17-C-70588-1699	P-3918	N17-C-73725-5491	P-101[3]	N17-L-76662-4678	XI-2001A
N17-B-78178-2007	TB-1205	N17-C-48614-5851	W-3749	N17-C-70588-1706	P-702	N17-C-73746-7636	J-3411	N17-L-76743-4669	XI-2001

TABLE 8-5 CROSS REFERENCE PARTS LIST (CONT.)

STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL
N17-L-91269-9671	LS-701	N17-S-250051-276	P-3908	N17-T-82436-6545	T-101[3]	N41-W-2877-180	H-4023		
N17-L-250181-506	XI-2001B	N17-S-691376-103	O-3914	N17-T-82436-6568	T-101[4]	N41-W-2877-190	H-4024		
N17-M-19167-5600	M-801	N17-S-691376-104	O-3913	N17-T-82436-6572	T-107[1]	N41-W-2877-210	H-4025		
N17-M-54952-7501	B-3901	N17-T-62336-4021	T-702	N17-T-82436-8032	T-101[1]	N41-W-2877-240	H-4026		
N17-M-75062-2136	O-3951	N17-T-65494-5501	T-601	N17-T-82436-8040	T-104[3]	N41-W-2877-280	H-4027		
N17-P-17663-9719	O-3910	N17-T-65504-3271	T-1101	N17-T-82436-8045	T-104[2]	N41-W-3250-760	H-4006		
N17-R-64415-6910	K-2002	N17-T-65842-8750	T-701	N17-T-82436-8060	T-104[4]	N41-W-3250-780	H-4007		
N17-R-65087-5801	K-1201	N17-T-65936-7202	T-1102	N17-T-82437-9075	T-107[2]	N41-W-66750-50	H-4016		
N17-R-65656-6715	K-2001	N17-T-65936-7867	T-1103	N17-T-82437-9090	T-106[2]	N41-W-66750-80	H-4017		
N17-R-65679-6001	K-2102	N17-T-67107-1721	Z-1202	N17-T-82438-7453	T-107[4]	N42-F-4546-1010	O-134		
N17-S-20912-5501	O-1109	N17-T-67108-1001	Z-1201	N17-T-82438-7465	T-106[3]	N42-F-4546-1120	O-3916		
N17-S-37007-5126	O-904	N17-T-67437-5609	Z-604	N17-T-82439-4520	T-107[3]	N42-F-4546-1230	O-3937		
N17-S-37027-9151	O-202	N17-T-67438-9212	Z-411	N17-T-82439-4540	T-106[4]	N42-P-5276-115	O-154		
N17-S-37040-6549	O-203	N17-T-67438-9216	Z-417	N17-T-751670-851	H-4035	N42-P-99500-82	O-126		
N17-S-46671-4147	O-3909	N17-T-67438-9220	Z-425	N17-T-822267-7924	T-801	N42-R-2046-1325	O-159		
N17-S-46725-3101	O-127	N17-T-67438-9223	Z-426	N41-P-1864	H-4032	N42-R-2046-1350	O-162		
N17-S-46768-2501	O-122	N17-T-67438-9227	Z-423	N41-P-1996-6000	H-4033	N42-R-2047-30	O-161		
N17-S-59253-8221	S-1101	N17-T-67438-9231	Z-424	N41-S-1101-43	H-4030	N42-R-2047-89	O-158		
N17-S-59673-6121	S-601	N17-T-67438-9235	Z-427	N41-S-1636-10	H-4028	N42-R-56566-2199	O-163		
N17-S-59673-6141	S-101	N17-T-67439-1276	Z-407	N41-S-1638-10	H-4029	N43-N-3948-5000	O-152		
N17-S-59931-7467	S-1204	N17-T-67439-1291	Z-403	N41-W-484-10	H-4010	N43-S-16467-303	O-3905		
N17-S-60505-9871	S-801	N17-T-67773-2126	Z-305	N41-W-485-6	H-4011	N43-S-99500-159	O-3932		
N17-S-60505-9881	S-802	N17-T-67773-3161	Z-301	N41-W-486-6	H-4012	N43-W-3045-26	O-174		
N17-S-60905-7971	S-703	N17-T-69977-4140	T-2002	N41-W-1060-950	H-4013	N43-W-3045-598	O-173		
N17-S-60905-7973	S-1202	N17-T-77045-3937	T-2001	N41-W-1063-20	H-4014	N43-W-5740-268	O-175		
N17-S-61163-5321	S-301	N17-T-87149-6041	Z-704	N41-W-1064-987	H-4015	N43-W-6813-580	O-172		
N17-S-62205-9841	S-1002	N17-T-81985-5828	L-702	N41-W-2446	H-4004	N43-W-7624-895	O-128		
N17-S-62522-8601	S-1201	N17-T-82003-6651	L-1202	N41-W-2450-10	H-4005	N43-W-11530-250	O-3933		
N17-S-64656-6391	S-1102	N17-T-82004-2387	L-603	N41-W-2459-915	H-4001	N77-B-999-75016-0200	O-130		
N17-S-64815-3161	S-1103	N17-T-82067-1085	T-108	N41-W-2460-3	H-4002				
N17-S-65044-2136	S-702	N17-T-82067-1117	L-301	N41-W-2460-10	H-4003				
N17-S-70778-4234	S-102	N17-T-82076-6507	L-305	N41-W-2877-110	H-4018				
N17-S-91897-8759	S-901A&B	N17-T-82436-3862	T-105[1]	N41-W-2877-127	H-4019				
N17-S-91897-8770	S-201A	N17-T-82436-3863	T-106[1]	N41-W-2877-148	H-4020				
N17-S-91897-8771	S-202B	N17-T-82436-3864	T-104[1]	N41-W-2877-170	H-4021				
N17-S-91897-8772	S-202A	N17-T-82436-5025	T-101[2]	N41-W-2877-175	H-4022				

TABLE 8-6. COLOR CODES

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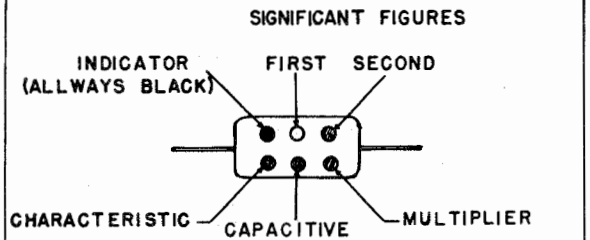
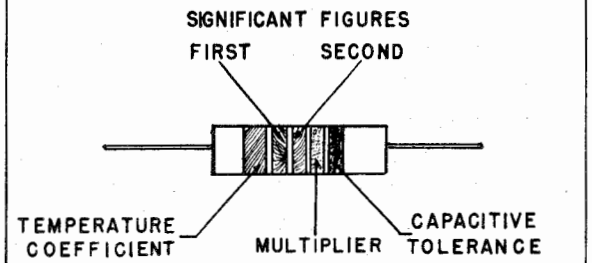
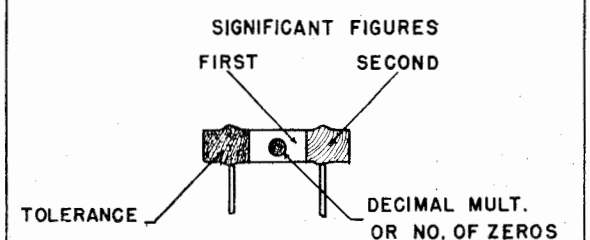


MICA-DIELECTRIC



CERAMIC-DIELECTRIC

RESISTOR COLOR CODE



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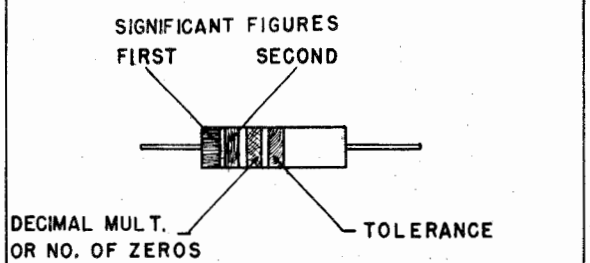
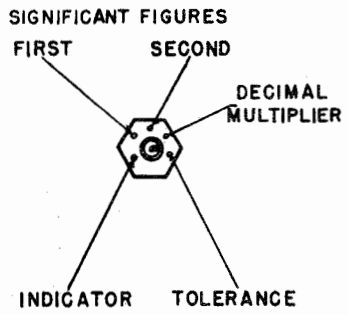


AXIAL TYPE

FEED-THRU TYPE CAPACITOR



CERAMIC-DIELECTRIC

RESISTORS				CAPACITORS							
					MICA - DIELECTRIC			*CERAMIC - DIELECTRIC*			
										TOLERANCE	
DECIMAL MULTIPLIER OR NO. OF ZEROS	TOLERANCE	SIGNIFICANT FIGURE	COLOR	SIGNIFICANT FIGURE	MULTIPLIER	CAPACITIVE TOL. IN %	CHARAC-TERISTIC	MULTIPLIER	TEMP. COEF. IN PARTS/MEG/°C	> 10 UUF IN %	< 10 UUF IN UUF
0		0	BLACK	0	1	20	A	1	0	20	2
1		1	BROWN	1	10		B	10	−30	1	
2		2	RED	2	100	2	C	100	−80	2	
3		3	ORANGE	3	1000		D	1000	−150		
4		4	YELLOW	4			E		−220		
5		5	GREEN	5			F		−330	5	.5
6		6	BLUE	6			G		−470		
7		7	VIOLET	7					−750		
8		8	GRAY	8				.01	+30		.25
9		9	WHITE					.1	−330 ± 500	10	1.0
.1	±5		GOLD		.1	5					
.01	±10		SILVER		.01	10					
	±20		NO COLOR								

TABLE 8-7. LIST OF MANUFACTURERS

CODE NO.	MFR'S PREFIX	NAME	ADDRESS
1	CNA	National Company, Inc.	61 Sherman Street, Malden, Mass.
3	CHH	Arrow-Hart & Hegeman Electric Co.	102 Hawthorne Street, Hartford, Conn.
4	CMY	Marion Electric Instrument Co.	Stork Street, Gate, Manchester, N.H.
5	CMA	P.R. Mallory & Co., Inc.	1941 Thomas Street, Indianapolis, Ind.
10	C3N	Central Radio Laboratory	900 E. Keefe Ave., Milwaukee, Wis.
11	CMC	Clarostat Mfg. Co.	285-287 North 6th Street, Brooklyn, N.Y.
14	CAW	Aerovox Corp.	742 Belleville Ave., New Bedford, Mass.
18	CG	General Electric Co. (Lamp Dept)	Nela Park, Cleveland, Ohio.
24		Humason Mfg. Co.	100 Peese Avenue, Forestville, Conn.
26		Cambridge Screw Co.	63 Potter Street, Cambridge, Mass.
30		Massachusetts Machine Shop, Inc.	818 Albany Street, Boston, Mass.
42	CAXO	Shakeproof, Inc.	2503 North Keeler Avenue, Chicago, Ill.
46	CAS	American Lava Corp.	219 Kruesi Bldg., Chattanooga, Tenn.
62		E.V. Yeuell Co.	253 Medford Street, Malden, Mass.
63	CIR	International Resistance Co.	1101 Terminal Commerce Bldg., Philadelphia, Pa.
68		Laminated Sheet Product Corp.	259 A Street, South Boston, Mass.
73	CAID	Chrysler Corp. (Amplex Div.)	6501 Harper Avenue, Detroit, Mich.
76	CLF	Littlefuse, Inc.	4765 North Ravenswood Avenue, Chicago, Ill.
83	CER	Erie Resistor Corp.	640 West 12th Street, Erie, Pa.
86	CDP	General Ceramic & Steatite Corp.	21 Crows Mill Road, Keasbey, N.J.
92	CJS	Jenson Mfg. Co.	6601 South Laramie Avenue, Chicago, Ill.
93	CHU	Harvey Hubbell, Inc.	447 Concord Avenue, Bridgeport, Conn.
97		The National Lock Washer Co.	65 Johnson Street, Newark, N.J.
111	COC	Oak Mfg. Co.	1260 North Clybourne Avenue, Chicago, Ill.
123	CUT	United Transformer Corp.	148 Varick Street, New York, N.Y.
127	CYA	Alden Products Co.	117 North Main Street, Brockton, Mass.
128	CPH	American Phenolic Corp.	1830 South 54th Avenue, Chicago, Ill.
136		The Stanley Works	195 Lake Avenue, New Britain, Conn.
145	CQB	Bliley Electric Co.	200 Union Station Bldg., Erie, Pa.
151		Boston Insulated Wire & Cable Co.	65 Bay Street, Dorchester, Mass.
153	CVQ	Allegheny Ludlum Steel Corp.	Oliver Bldg., Pittsburgh, Pa.
212		Massachusetts Gear & Tool Co.	22 Nashua Street, Woburn, Mass.
218	CMR	Micamold Radio Corp.	1087-1095 Flushing Avenue, Brooklyn, N.Y.
233		Connecticut Spring Corp.	440 Capitol Avenue, Hartford, Conn.
236		Atlantic India Rubber Works, Inc.	569 West Polk Street, Chicago, Ill.
242	CMF	Elmenco Products Co.	103 Lafayette Street, New York, N.Y.

TABLE 8-7. LIST OF MANUFACTURERS (CONT.)

CODE NO.	MFR'S PREFIX	NAME	ADDRESS
254	CCJ	Henry L. Crowley & Co., Inc.	25 Central Avenue, West Orange, N.J.
264	CAYT	Allen Mfg. Co.	100 Sheldon Street, Hartford, Conn.
273	CBZ	Allen-Bradley Co.	118 West Greenfield Avenue, Milwaukee, Wis.
284	CRK	Radio Condenser Co.	Camden, N.J.
289		Waldes Kohinoor Inc.	47-54 27th Street, Long Island City, N.Y.
296	CAIS	The Birtcher Corp.	5087 Huntington Drive, Los Angeles, Calif.
298	CAMQ	Cambridge Thermionic Corp.	445 Concord Ave., Cambridge, Mass.
307	CTC	Chicago Telephone Supply Co.	Bearsley Avenue, Elkhart, Ind.
324	CFA	Bussman Mfg. Co.	2538 West University Street, St. Louis, Mo.
339	CED	Cannon Electric Development Co.	3291 Humboldt Street, Los Angeles, Calif.
342		Stenman Tool Co. Inc.	44 Eastern Ave., Malden, Mass.
344		Nutile Machine Co.	95 Hemingway Street, Winchester, Mass.
398	CAYU	Barry Corp.	700 Pleasant Street, Watertown, Mass.
406	CTB	The Bristol Co.	117 Bristol Road, Waterbury, Conn.
496		Electrical Reactance Corp.	Franklinville, N.Y.
506		Smith & Welch, Printers	470 Atlantic Avenue, Boston, Mass.
570		United Screw Machine Products Co.	Draper Street, Worcester, Mass.
587		Electrical Industries Inc.	42 Summer Avenue, Newark, N.J.
662		Arch Gear Works	90 Holmes Street, North Quincy, Mass.
665		Automatic Machine Products Co.	124 West Boylston Drive, Worcester, Mass.
684		Advance Electric & Relay Co.	2435 North Naomi Street, Burbank, Calif.
772		Camloc Fastener Corp.	420 Lexington Avenue, New York N.Y.
779		Central Screw Co.	3511 Shields Avenue, Chicago, Ill.
929		Instrument Specialties Co., Inc.	236 Bergen Blvd., Little Falls, N.J.
1109	CSM	Shallcross Mfg. Co.	24 Pusey Avenue, Collingdale, Pa.
1136	CKZ	Standard Piezo Co.	126 Cedar Street, Carlisle, Pa.
1150	CBIM	Switchcraft Inc.	1328 North Halsted Street, Chicago, Ill.
1156		Technical Specialties Co.	168 Ninth Avenue, New York, N.Y.
1169		Torrington Mfg. Co.	100 Franklin Street, Torrington, Conn.
1234		H.E. Wright Co.	32 Cambridge Street, Boston, Mass.
1238	CARO	Industrial Products Co.	Brookfield Street, Danbury, Conn.
1270		Univeral Precision Ball Co.	Willow Grove, Pa.
1287		W. & L.E. Gurley	Station Plaza, Troy N.Y.
1296		Phalo Plastics	25 Foster Street, Worcester, Mass.
1300	CHN	Heineman Electric Co.	939 Plum Street, Trenton, N.J.
1316		HPLMfg. Co.	2003 East 65th Street, Cleveland, Ohio.

TABLE 8-7. LIST OF MANUFACTURERS (CONT.)

CODE NO.	MFR'S PREFIX	NAME	ADDRESS
1321	CCC	Continental Carbon Inc.	13900 Lorain Avenue, Cleveland Ohio.
1334	CBKT	Hardware Products Co.	100 Richmond Street, Boston, Mass.
1337		Technical Products Co., Inc.	Powder Mill Road, West Concord, Mass.
1339	CBEN	Air-Maze Corp.	5180 Harvard Avenue, Cleveland, Ohio.
1340	CBHZ	Bausch & Lomb Optical Co.	626 St. Paul Street, Rochester, N.Y.
1342		W.J. Grosvenor & Co., Inc.	270 Cedar Street, Somerville, Mass
1351		Vectron Inc.	235 High Street, Waltham, Mass.
1356		Rotary Seal Co.	2020 North Larrabee Street, Chicago, Ill.
1357	CBCO	Chandler-Evans Corp.	1 Charter Oak Blvd., West Hartford, Conn.
1360		Mission Electric Mfg. Co.	132 West Colorado Street, Pasadena, Calif.
1366		Progressive Steel Rule Die Co.	10 Allerton Street, Lynn, Mass.
1368		Resistance Products Co.	714 Race Street, Harrisburg, Pa.
1374		Tru-Connector Co.	416 Union Street, Lynn, Mass
1375		Wil-Sen Co.	6 Newland Street, Malden, Mass.
1376		J. Marshal Bertaldo	627 Salem Street, Malden, Mass.
1377	CQN	Slater Mfg. Co., Inc.	24 Water Street, Wakefield, Mass.
1378		Stevens Walden Inc.	499 Shrewsbury Street, Worcester, Mass.

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