INSTRUCTION BOOK

for

NAVY MODELS RBA, RBA-1, RBA-2 AND RBA-3 RADIO RECEIVING EQUIPMENTS

FREQUENCY RANGE: 15 TO 600 KC

This Instruction Book is furnished for the information of commissioned, warranted, enlisted and civilian personnel of the Navy and persons authorized by the Bureau of Ships whose duties involve design, manufacture, instruction, operation and installation of radio, radar, or underwater sound equipment. The word "RESTRICTED" as applied to this instruction book signifies that it is to be read only by the above personnel, and that its contents should not be made known to unauthorized persons not connected with the Navy.

Manufactured for

U. S. NAVY DEPARTMENT, BUREAU OF SHIPS

By

FEDERAL TELEPHONE AND RADIO CORPORATION

(Formerly FEDERAL TELEGRAPH COMPANY)

NEWARK, NEW JERSEY

Model	*Contract Number*	*Contract Date*
RBA	NOs-73055	April 13, 1940
RBA-1	NOs-91165	Sept. 2, 1941
RBA-2	NXs-11780	Oct. 5, 1942
RBA-3	NXss-16498	Oct. 31, 1942

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TABLES

Rectifier Power Unit tables corresponding to tables II, III, IV, V, and VI above will be found in the Power Unit Supplement at the back of this book.

FIGURES

NOTE: All photographs, drawings, etc., pertaining to the CRV-20130 Rectifier Power Unit are included in the Power Unit Supplement at the back of this book.

Following is a list of the contractor's drawing numbers corresponding to figure numbers (CFT-46154 Radio Receiver)

Figure No.	*Drawing No.*	*Figure No.*	*Drawing No.*	*Figure No.*	*Drawing No.*
1	RC-2930-2	9	F-42248-1	17	F-34837-1
2	RC-2929-2	10	F-42249-1	18	F-34838-1
3	RC-2928-2	11	F-42246-1	19	F-34839-1
4	RC-2934-2	12	F-38325-1	20	F-19671-1
5	RC-2933-2	13	F-38326-1	21	F-33357-1
6	RC-2931-2	14	F-38327-1	22	F-23808-2
7	RC-2932-2	15	F-42247-1	23	F-23536-14
8	F-42245-1	16	F-34836-1	24	F-41844-28

CONTRACTUAL GUARANTEE

Applicable only to Model RBA, Contract NOs-73055, dated April 13, 1940;
Model RBA-1, Contract NOs-91165, dated Sept. 2, 1941;
Model RBA-2, Contract NXs-11780, dated Oct. 5, 1942;
Model RBA-3, Contract NXss-16498, dated Oct. 31, 1942.

The equipment, including all parts and spare parts, except vacuum tubes, shall be guaranteed for a service period of one year with the understanding that, as a condition of this contract, all items found to be defective as to design, material, workmanship or manufacture shall be replaced without delay and at no expense to the Government, provided that such guarantee and agreement shall not obligate the contractor to make replacement of defective material unless the failure, exclusive of normal shelf life deterioration, occurs within a period of two years from the date of delivery of the equipment to and acceptance by the Government, and provided further, that if any part or parts (except vacuum tubes) fail in service or are found defective in ten per cent (10%) or more of the total number of equipments furnished under the contract, such part or parts, whether supplied in the equipment or as spares, shall be conclusively presumed to be of defective design, and as a condition of contract subject to one hundred per cent (100%) replacement of all similar units supplied on subject contract by suitable redesigned replacements. Failure due to poor workmanship while not necessarily indicating poor design, will be considered in the same category as failure due to poor design. Redesigned replacements which will assure proper operation of the equipment shall be supplied promptly, transportation paid, to the Naval activities using such equipment, upon receipt of proper notice and without cost to the Government. All defective parts originally furnished under contract shall be held subject to rejection and return to the contractor.

THIS PERIOD OF TWO YEARS AND THE SERVICE PERIOD OF ONE YEAR SHALL NOT INCLUDE ANY PORTION OF THE TIME THAT THE EQUIPMENT FAILS TO GIVE SATISFACTORY PERFORMANCE DUE TO DEFECTIVE ITEMS AND THE NECESSITY FOR REPLACEMENT THEREOF, AND PROVIDED FURTHER, THAT ANY REPLACEMENT PART SHALL BE GUARANTEED TO GIVE ONE YEAR OF SATISFACTORY SERVICE.

This guarantee applies only to the Type CFT-46154 Radio Receiver. The Type CRV-20130 Rectifier Power Unit, manufactured on separate contracts and by another contractor, is covered by the guarantee contained in the Power Unit Supplement at the back of the book.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its service life, shall be made to the Bureau of Ships in accordance with current instructions. The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failure see Chapter 31 (mimeographed form) of the Manual of Engineering Instructions, or Bureau of Ships Radio and Sound Bulletin Number 7, dated July 1, 1942, or superseding instructions.

PERTINENT DATES AFFECTING REPLACEMENTS UNDER THE GUARANTEE

Model RBA :	Contract NOs-73055	Date of Contract April 13th, 1940
RBA-1:	Contract NOs-91165	Date of Contract Sept. 2nd, 1941
RBA-2:	Contract NXs-11780	Date of Contract Oct. 5th, 1942
RBA-3:	Contract NXss-16498	Date of Contract Oct. 31st, 1942

Model and 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 in this book shall be filled in at time of installation. Operating personnel shall also mark the "date placed in service" on the date plate located below the model nameplate on the equipment, using suitable methods and care to avoid damaging the equipment.

All requests or requisitions for replacement material should include complete descriptive data covering the part desired, in the following form:

1. Name of part desired.
2. Navy Type number (if assigned) (including prefix and suffix as applicable).
3. Model designation (including suffix) of equipment in which used.
4. Navy Type designation (including prefix and suffix where applicable) of major unit in which part is used.
5. Symbol designation of part.
6. (a) Navy Drawing Number.
   (b) Manufacturer's Drawing Number.
7. Rating or other descriptive data.
8. Commercial designation.

SAFETY PRECAUTIONS

THE ATTENTION OF OFFICERS AND OPERATING PERSONNEL IS DIRECTED TO BUREAU OF SHIPS MANUAL OF ENGINEERING INSTRUCTIONS, CHAPTER 31 (MIMEOGRAPHED FORM) OR SUBSEQUENT REVISIONS THEREOF ON THE SUBJECT OF "RADIO—SAFETY PRECAUTIONS TO BE OBSERVED."

INSTRUCTION BOOK

for

MODELS RBA, RBA-1, RBA-2, AND RBA-3 RADIO RECEIVING EQUIPMENTS

1. INTRODUCTION

1-1 GENERAL

The models RBA, RBA-1, RBA-2, and RBA-3 Radio Receiving Equipments have been designed for use aboard vessels of the United States Navy and at Naval Radio Shore Stations.

MODELS RBA, RBA-1, RBA-2, and RBA-3 ARE IDENTICAL EXCEPT FOR NAMEPLATES, this difference being due to different contract data.

1-2 FUNCTION

The equipment is designed for the reception of pure, modulated, or interrupted continuous wave (CW) radio frequency signals in the frequency range 15 to 600 KC. Voice reception is possible throughout this range, but due to the high order of selectivity, and to the characteristics of filters employed in the audio frequency amplifier, intelligibility of speech is poor.

1-3 SPECIAL DESIGN FEATURES

Special features include:

(a) Provision for the operation of a number of receivers from a common antenna or transmission line.

(b) Provision for the simultaneous operation of two receivers from a common power unit, as an emergency measure.

(c) Automatic regulation of the receiver output signal voltage as a function of load resistance, so that from one to twenty 600-ohm headsets may be connected across the output circuit with less than 40 per cent change in output voltage.

1-4 COMPOSITION

Item	*Quantity*	*Description*	*Wt. Lbs.*
A	1	Type CFT-46154 Radio Receiver complete with one set of vacuum tubes (four 6SK7; one 6J5; two 6SJ7; one 6K6GT). Outline dimensions (overall, but excluding cable plugs): 14¾" high; 18$^{5}/_{32}$" wide; 20$^{9}/_{16}$" deep.	95
B	1	Type CRV-20130 Rectifier Power Unit, complete with one set of vacuum tubes (one 5U4G; one VR-105-30). Outline dimensions (overall): 13½" high; 15" wide; 9¾" deep.	52
C	1	Type CRV-49162 Interconnecting Power Cable; length: 6 feet.	3.5
D	1	Type -49121 Concentric Plug for connecting transmission line to receiver.	
E	1	Type -49152 Adaptor, for connecting antenna lead-in to receiver.	
F	1	Type -49160 Output Plug for receiver output receptacle.	
G	1	Power Input Plug for Power Unit.	
H	1	Set of Mounting Hardware for Receiver.	
I	1	Set of Mounting Hardware for Power Unit.	
J	2	Instruction Books.	
K	1	Set of Equipment Spart Parts in spare parts box 18" x 9" x 6". Equipment spare parts for the receiver and power unit are contained in a common spare parts box; however, the power unit spare parts are packaged separately from the receiver spare parts.	25

(Note: Items A to K inclusive are shipped in a common crate, gross weight 365 pounds, dimensions 56" x 32" x 28".)

1-5 ADDITIONAL EQUIPMENT REQUIRED

1 Headset, equipped with Navy Type C -49434 head telephone plug.

1 Receiving Antenna.

1-6 POWER REQUIREMENTS

The Power Unit is designed for operation from a 110/115/120 volt, 55-65 cycle, single-phase AC line.

When operating one receiver, the power required is approximately 66 watts; when operating two receivers, approximately 100 watts.

1-7 POWER OUTPUT

50 milliwatts, maximum undistorted, into a 600 ohm load; 500 milliwatts, maximum undistorted, into a 30 ohm load.

1-8 FREQUENCY RANGE

The frequency range of the receiver is 15 to 600 KC divided into four bands, as follows:

Band	*Nominal Range*
1	15- 38 KC
2	38- 95 KC
3	95-235 KC
4	235-600 KC

2. DETAILED DESCRIPTION, TYPE CFT-46154 RADIO RECEIVER

2-1 MECHANICAL CONSTRUCTION

The receiver unit consists of a shock-mounted cabinet housing a removable chassis-and-panel assembly. The chassis and panel form an integral unit, upon which are mounted all component parts.

The cabinet is fabricated from aluminum alloy, with all seams welded. The exterior is finished in black wrinkle and the interior in flat black. The cabinet is fitted with two guide strips upon which the chassis rests and which facilitate withdrawal of the chassis.

The chassis consists of a heavy aluminum alloy plate attached perpendicular to the front panel, and supported on the three remaining sides by a stiff U-shaped aluminum alloy strip, also secured to the front panel, and approximately equal in width to the height of the front panel. This supporting strip is punched with several large louvres, which decrease the weight of the piece and provide greater accessibility to component parts; the design of the punching die is such as to curve the edges of the louvres, actually increasing rigidity although material is removed.

The front of the panel is finished in black wrinkle; the rear of the panel, the chassis, the coil shields and tuning capacitor shield are finished first by a chemical etch process, and secondly by a pastel shade of grey lacquer. Wherever electrical contact is essential between chassis and panel, and between chassis and component parts mounted thereon, the adjoining surfaces are kept free of lacquer by "masking" before spraying the lacquer.

The under side of the chassis is subdivided, by means of shields, into compartments for the various circuits. A bottom plate is attached to the chassis completing the shielding of the various sub-chassis compartments.

At either side near the bottom of the chassis there is provided a stop mechanism which limits the forward movement of the chassis from the cabinet, unless these stops are manually disengaged. See Fig. 8. The degree of forward movement permitted by the stops is sufficient to provide access to the vacuum tubes for replacement.

Receptacles are provided at the upper rear of the chassis for connection to the antenna, to the load, and to the power supply. These receptacles are arranged to project through the rear of the cabinet when the receiver is completely housed. Around each receptacle there is provided a serrated spring washer which makes contact with the rear of the cabinet, thus preventing the entrance of strong radio frequency fields via the clearance holes provided in the cabinet for these receptacles. The antenna coupling switch, the antenna compensator capacitor, and the rear of the input jack are located in a common shield enclosure. Approximately two cubic inches of space is provided in this enclosure for the installation of an ultra high frequency filter in the antenna lead, by the Navy Department, should such procedure become desirable.

A serrated phosphor bronze strip is attached to the front edge of the cabinet and is designed to provide positive contact with the front panel, in order to guard against the entrance of strong radio frequency fields.

The frame of the main tuning capacitor is fabricated from brass. The shaft is of stainless steel. The serrated capacitor plates are

of soft copper to reduce microphonic effects; the remaining plates are of brass. The frame of the capacitor is cadmium plated and the plates are silver plated. Contact to the rotor plate assemblies is made by means of solid coin silver buttons bearing on silver discs attached to the plate assemblies. The main tuning capacitor is shielded by a two-piece aluminum alloy shield. The lower part of the shield is of thick material and provides some reinforcement to the frame as well as shielding. The upper section of the shield is of thinner material and is removable for inspection of the interior of the capacitor while the capacitor is mounted on the chassis. Isolantite insulation is employed.

The main tuning capacitor is controlled through a gear mechanism mounted within a cast aluminum alloy housing. Ten revolutions of the vernier control are required to cover the tuning capacitor range. A counterweight is provided in the coupling between the main tuning control and the tuning capacitor. An auxiliary gain control is ganged to the main tuning control and operates in such a manner as to maintain approximately constant overall receiver gain as a frequency band is traversed.

The band switch consists of five separately removable sections. These five sections are driven by a square stainless steel shaft which may be withdrawn through the rear of the chassis, should it become desirable to remove any of the band switch sections. Each band switch section employs Isolantite insulation and silver surfaced contacts. The rotor of any band switch section may be removed for purposes of cleaning or adjustment. The band switch is controlled from the front panel through a gear reduction mechanism provided with detents. A rotary dial mask, located in front of the main tuning dial, is geared to the band switch drive in such a manner that this dial exposes to view only the frequency-calibrated scale applicable to the frequency band in use. This dial mask is engraved to show the nominal limits in kilocycles of the frequency bands.

Each of the ten coil assemblies contains coils for two frequency bands. For example, coil assembly T-109 contains coils for bands 1 and 2 of the oscillator circuit, while coil assembly T-110 contains coils for bands 3 and 4 of the oscillator circuit. In each coil assembly, the lower-frequency-band coil is mounted in the upper position. The coil assemblies are attached directly to the chassis; the coil shields may be removed without removing the coil assemblies from the chassis. These shields may be withdrawn after removing the elastic stop nut at the top of the shield. The trimmer capacitors for each coil assembly are mounted within the shield and are accessible for adjustment through the top of the shield. Sliding cover-plates are provided at the top of each coil shield for covering the trimmer holes when not in use. Iron-dust cores are employed for all coils. The cores in the antenna and r. f. amplifier coils of bands 1 and 2 are fixed (i. e., non-adjustable) while the cores for all other coils are of the adjustable type. The cores of coils employed in the oscillator circuit are adjustable through the front panel of the receiver; a special adjusting tool is provided for this purpose. Plugs are provided for closing the two lower access holes in the front panel; the tuning chart covers the two upper holes.

To guard against the entrance of strong radio frequency fields the rear of the output meter and plate voltmeter are enclosed in shields and all major shafts extending through the front panel are grounded either by spring washers or by grounding contactors. The metal frequency-calibrated tuning dial, which is placed close to the viewing orifice provided in the front panel, is at ground potential and tends to act as a shield preventing the entrance of strong radio frequency fields at this point.

Where practicable, resistors, mica capacitors and the smaller foil-paper capacitors are mounted on bakelite supporting strips. The strip provided for this purpose in the audio frequency compartment is removable without the use of a soldering iron; that is, the leads attached to this panel are arranged to be sufficiently long so that the card may be withdrawn for a few inches, with wiring attached, to facilitate servicing. See Fig. 8.

The detector tube socket is cushion-mounted to reduce microphonics.

With the exception of the wave band switch and main tuning controls, all panel-mounted controls are marked by suitable engraving. The wave band switch control is located directly beneath the dial orifice. The main tuning control, provided with a crank-handle, is at the bottom center of the panel. Two panel-mounted knobs are provided for use in withdrawing the chassis from the cabinet.

2-2 ELECTRICAL CIRCUITS

(Note: Symbol numbers in this section refer to the schematic diagram, Fig. 23.)

2-2-1 General

The type CFT-46154 radio receiver is of the tuned-radio-frequency type, covering the range 15 to 600 KC in four bands, selected by means of a wave band switch controlled from the front panel. The nominal ranges are as follows:

Band	*Nominal Range*
1	15- 38 KC
2	38- 95 KC
3	95-235 KC
4	235-600 KC

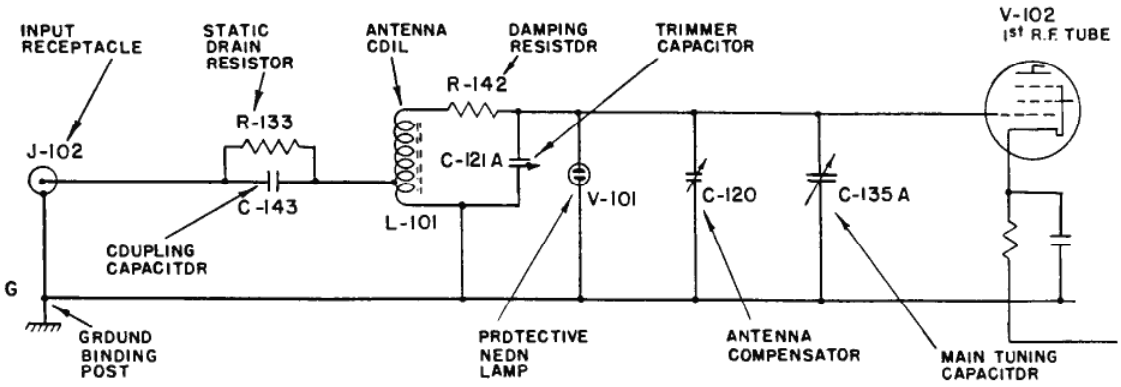


FIG. 1 SIMPLIFIED SCHEMATIC DIAGRAM, INPUT CIRCUIT
Band #1 Position, Input Cplg. #3 Position

Approximately 6 per cent overlap is provided between frequency ranges.

The receiver employs an antenna, or input, circuit, followed by three stages of radio frequency amplification, a detector, a heterodyne oscillator, two voltage-amplifying audio frequency stages and a power output stage. All radio frequency circuits and the oscillator circuit are simultaneously tuned by means of a single tuning control; likewise, all wave band switching is accomplished by means of a single control. The heterodyne oscillator tuned circuit is designed to automatically "track" with the radio frequency amplifier circuits, as the tuning control is varied, in such a manner that the heterodyne oscillator frequency is maintained one thousand cycles above the resonant frequency of the radio frequency amplifier within limits of ±.75 per cent of the resonant frequency. The second audio frequency stage is arranged to provide output limiting. Negative feedback is employed in the audio frequency amplifier for the purpose of maintaining approximately constant output voltage with variations in load between 30 and 600 ohms.

2-2-2 Voltage Supply Circuits

The receiver is connected to the power unit by means of the interconnecting cable supplied with the latter. The receiver On-Off switch S-101 is thereby connected in the AC supply line to the primary of the power transformer of the power unit. The power unit furnishes the following nominal voltages to the receiver unit.

(a) 6.3 volts AC, for vacuum tube heaters, dial lamps and pilot lamp.
(b) 200 volts DC.
(c) 105 volts DC, regulated, for the heterodyne oscillator.

The current taken from the 6.3 volt AC circuit is 2.95 amperes. The current drain on the 200 volt circuit is approximately 55 milliamperes; and on the 105 volt circuit, 1 milliampere.

The plate voltmeter M-101 indicates the voltage of the "200-volt" circuit. The actual voltage across this circuit may vary between 175 and 225 volts, depending upon the adjustment of various receiver controls, and upon whether one or two receivers are operated from the power unit. The normal voltage is approximately 204 volts when one receiver is operated at maximum gain from one power unit, 115 volts on AC line, power unit line-voltage adjustment link set on 115 volt tap.

All tube heaters and lamps are connected in parallel across the 6.3 volt circuit, one side of which is grounded to the chassis of the receiver. The common negative lead of the 105 volt and of the 200 volt DC circuits is also grounded to the receiver chassis.

2-2-3 Input Circuit

The input circuit is designed for direct connection to an antenna or to a concentric transmission line, the outer conductor of which is, or may be, grounded. This circuit is tuned by means of Section C-135a of the five-gang, main tuning capacitor. This is the rear section of this capacitor. The desired antenna coil is selected by means of Section S-106c of the ganged wave band switch. Section S-106b of this switch automatically short-circuits the next-lowest-frequency coil in order to avoid resonant absorption effects. Switch Section S-106a connects the receiver input jack J-102 to the tap on the desired antenna coil, through input coupling switch S-107 and one of its associated capacitors. Wave band switch sections S-106a, S-106b, and S-106c are incorporated into a single "wafer", or switch assembly, and form the rear section of the wave band switch.

The four coils employed in the input cir-

cuit are contained in two coil assemblies, T-101 and T-102. T-101 contains coils for bands 1 and 2, while T-102 encloses the coils of bands 3 and 4. Mounted at the top of coil assembly T-101 is the dual air-dielectric trimmer capacitor C-121, consisting of two adjustable capacitors mounted on a common base. Section C-121a of this dual capacitor is connected across the band 1 coil, L-101, while Section C-121b is connected across the band 2 coil, L-102. An equivalent arrangement is employed in T-102.

A resistor R-142 is connected in series with the band 1 coil, L-101, for the purpose of increasing the damping factor of the tuned circuit to the optimum value. This optimum value was determined, during development of the circuit, by listening tests and by oscilloscopic observation of receiver output. The degree of damping is such as to effect a rapid dissipation of signal energy remaining in the tuned circuit after the cessation of a transmitted radio-telegraphic signal element; similarly, there is also effected a reduction in the tendency of the tuned circuit to be shock-excited into a damped oscillatory state by heavy static crashes. Prior to the inclusion of these resistors, the receiver had a tendency to receive static as a fairly constant "ring" having a predominant frequency equal to that of the received signals; and to cause radio-telegraphic signals to be almost unreadable under certain conditions of operation. These phenomena resulted from the unusually low tuned-circuit decrement realized through the employment of iron-dust cores. Resistor R-155 is included in the circuit of L-102, the band 2 coil, for the same purpose. It was not found necessary to add resistors to the coils of bands 3 and 4.

An adjustable air-dielectric ANTENNA COMPENSATOR capacitor C-120 is connected across the input circuit, and is controlled from the front panel. This capacitor is employed for precise tuning of the input circuit and is used to compensate for the different capacity values coupled into the tuned circuit by various antenna systems.

A neon lamp V-101 is also connected across the tuned input circuit for purposes of over-voltage protection. When the voltage across the tuned circuit rises to approximately 90 volts (due, for example, to tuning the receiver to the frequency of a nearby transmitter) the lamp flashes, and in doing so effectively places a low impedance across the circuit, protecting the receiver components from damage. The lamp is extinguished immediately upon cessation of the over-voltage condition and normal receiver operation may be resumed.

The function of the INPUT COUPLING switch S-107 and the associated capacitors C-141 to C-145 is to permit the operation of the receiver from a wide variety of antennas or transmission lines. By proper adjustment of this switch, and the ANTENNA COMPENSATOR capacitor, the input circuit may be resonated when employing antennas or transmission lines having any capacity value. Resistor R-133 is bridged across the switch and capacitors to provide a leakage path to ground for static charges which might accumulate on the antenna.

A simplified schematic diagram of the input circuit is shown in Fig. 1.

2-2-4 Radio Frequency Amplifier

The receiver employs three stages of tuned radio frequency amplification. As the first two stages are identical, only the first will be described.

V-102, a type 6SK7 vacuum tube, is a pentode of the remote cut-off type. Control-grid bias is obtained by the flow of plate and screen current through the cathode resistor R-101, and from the gain controls R-128 and R-136a. Cathode currents are filtered by capacitor sections C-101a and C-108a. Screen grid potential is derived from the voltage divider circuit consisting of the series combination of gain controls R-128, R-136a, and resistors R-130, R-131. Screen current is filtered by resistor R-104 and capacitor sections C-101b and C-108b. Plate current flows through the primary winding of the particular radio frequency transformer selected by wave band switch section S-108a, and is filtered by resistor R-107 and capacitor section C-101c. The desired transformer secondary is selected by means of wave band switch section S-108c, while section S-108b short-circuits the next-lowest-frequency secondary winding to avoid resonant absorption effects. (See Fig. 2.) The selected secondary coil is tuned by means of main tuning capacitor section C-135b. A mica padding capacitor C-131 is connected across the tuned circuit to compensate for the capacity reflected into the input circuit by the antenna, thereby permitting circuit alignment to be effected.

Coil assembly T-103 contains two radio frequency transformers, L-105 and L-106, employed for wave bands 1 and 2, respectively. Each transformer consists of two inductively-coupled windings on a common form, the subscript "a" denoting the primary winding, and the subscript "b", the secondary winding. Mounted at the top of sub-assembly T-103 is the dual air trimmer C-123, consisting of two separate air-dielectric trimmer capacitors assembled on a common Isolantite base. Section C-123a is employed for trimming the band 1 secondary coil L-105b, while section C-123b is employed for L-106b. Resistors R-146 and R-156 are used for increasing the tuned circuit damping factor; their func-

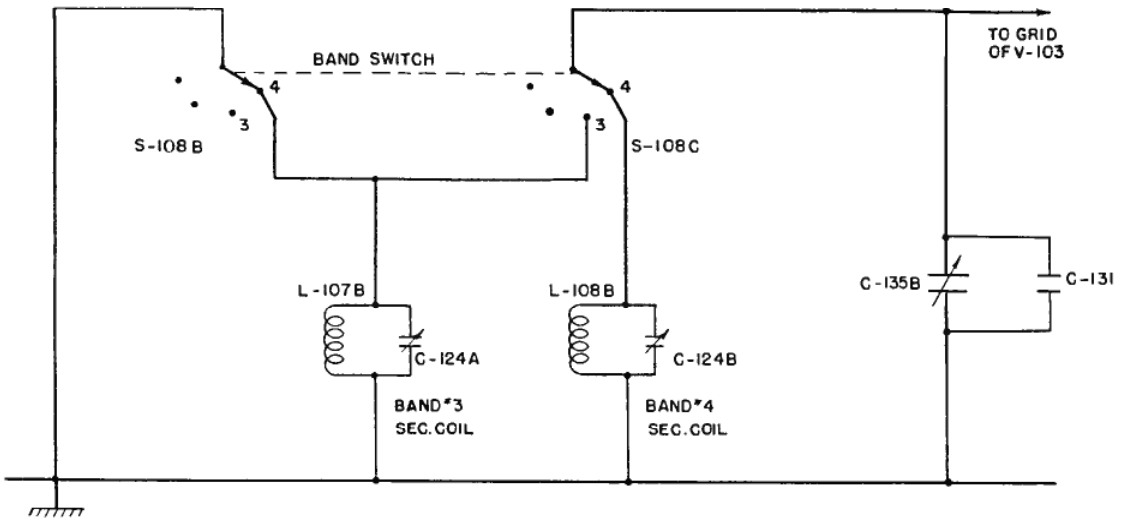


FIG. 2 DIAGRAM ILLUSTRATING BAND SWITCH OPERATION, BAND #4
Section S-108B Short Circuits the Band #3 Coil While the Band #4 Coil Is in Use

tion is the same as that of R-142 and R-155 in the input circuit, and is more completely explained in the description of that circuit. The schematic circuit arrangement of coil assembly T-104 is similar to that of T-103, except that no damping resistors are included. L-107 is the band 3 transformer, and L-108 is the band 4 transformer. Wave band switch sections S-108a, S-108b, and S-108c are assembled on a single Isolantite switch wafer.

A simplified schematic diagram of the first radio frequency amplifier stage is shown in Fig. 3.

The construction of the third radio frequency amplifier stage is identical to that of the first and second and the circuit arrangement is similar, except that the plate and screen potentials applied to V-104 are reduced to approximately 15 volts for the purpose of limiting the maximum signal output voltage to a value which will not seriously overload the following detector circuit. The low plate and screen potentials render gain control impracticable for this stage, hence the cathode resistor connects directly to ground. The screen and plate potentials are equal and are obtained from a voltage divider formed by R-109 and R-106.

2-2-5 Gain Control

The gain of the first and second radio frequency stages is controlled through regulation of the cathode potential of amplifier tubes V-102 and V-103 by means of a rheostat R-128 and a potentiometer R-136a, included in the main voltage divider circuit. As the cathode potential is made more positive, the control grid becomes more negative with respect to the cathode and the mutual conductance of the controlled amplifying tubes decreases, thereby decreasing the gain. Rheostat R-128 is geared to the main tuning control in such a manner that, as the main tuning control is advanced toward the high frequency end of a given wave band, the cathode potential becomes more positive, thus exerting a decreasing effect on the overall gain of the radio frequency amplifier. This effect tends to compensate for the natural tendency of the gain of the radio frequency amplifier to increase as the resonant frequency increases, and results in a fairly constant value of overall receiver gain over a given wave band. Potentiometer R-136a is manually adjustable from the front panel, and is assembled on a common drive shaft with R-136b. The assembly of these two potentiometers comprises the MANUAL GAIN CONTROL; the circuit arrangement is such that, as the manual gain control is turned counterclockwise from 100 (maximum gain) the gain of the radio frequency amplifier, and the signal applied to the audio frequency amplifier, decrease simultaneously; however, the tapers of the two potentiometers are such that from a scale position of 100 down to 70 nearly all the reduction in overall gain is accomplished in the audio frequency unit, while from 70 to 0 on the scale practically no further reduction in audio frequency gain occurs and the radio frequency section R-136a becomes effective. This circuit arrangement effectively reduces, for average reception conditions, the amplitude of microphonic disturbances reaching the receiver output. These disturbances arise in the heter-

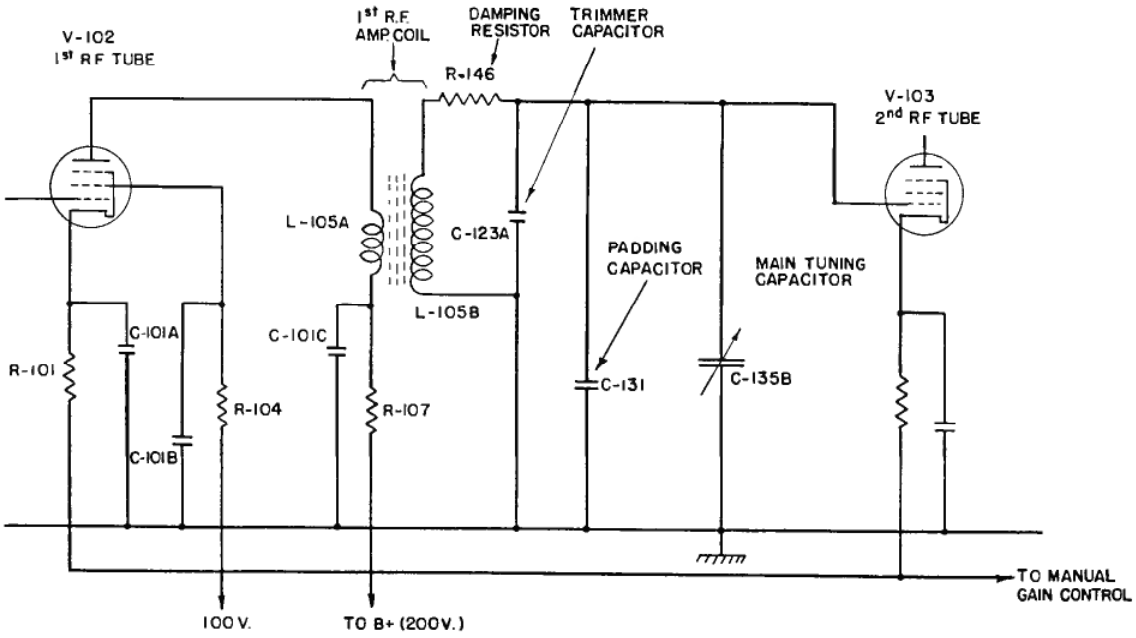


FIG. 3 SIMPLIFIED SCHEMATIC DIAGRAM, FIRST RF AMPLIFIER STAGE
Band #1 Position

odyne oscillator and detector circuits; therefore, it is desirable that the amount of amplification following the detector be as small as can be tolerated. In general, the maximum gain available from the receiver is more than can be used. The dual gain control arrangement described above acts to "cut out", first, sufficient audio frequency gain to effectively rid the receiver of microphonic disturbances. At, or near, maximum receiver gain the microphonic disturbances are "masked" by internal receiver noise.

2-2-6 Heterodyne Oscillator

The heterodyne oscillator is of the electron-coupled type, so designated because all coupling between the oscillating, or frequency-determining, circuit and the output circuit takes place within the electron-stream of the oscillator tube V-106.

The desired oscillator coil is selected by means of wave band switch section S-111c, while section S-111b short circuits the next-lowest-frequency coil to avoid resonant absorption effects. Section S-111a selects the tap of the desired coil. Sections S-111a, S-111b, and S-111c are mounted on a common Isolantite block and operate simultaneously.

The selected coil is tuned by means of main tuning capacitor section C-135e. C-116 and R-124 are the oscillator grid capacitor and grid leak. C-118 is a series padding capacitor employed for obtaining proper tracking of the band 1 tuned circuit. Resistor R-134 is shunted across this capacitor to provide a DC path to cathode for the grid leak. The parallel combination of C-112 and C-137, and resistor R-135 perform corresponding functions in band 2. (Two capacitors of equal value, C-112 and C-137, are employed in parallel in lieu of a single capacitor since the required capacity could not be obtained in a single mica capacitor having a low-loss bakelite case.)

The iron-dust cores of the four oscillator coils are adjustable through the front panel of the receiver. Coils L-117 and L-118, for bands 1 and 2 respectively, are located in assembly T-109 and are trimmed by air-dielectric capacitors C-129a and C-129b, mounted on a common Isolantite base at the top of the assembly. Similarly T-110 contains coils L-119 and L-120 for bands 3 and 4, respectively. C-134 is a mica shunt padding capacitor employed to secure proper tracking of the oscillator and RF amplifier circuits.

The constants of the oscillator tuned circuits have been adjusted so that, throughout the range of the receiver, the oscillator frequency is approximately 1000 cycles higher than the resonant frequency of the radio frequency amplifier.

The screen and plate voltage for the oscillator is supplied by the regulated 105 volt output of the type CRV-20130 power unit. Screen voltage is applied through R-125 and bypassed by capacitor section C-104c; plate voltage is applied through R-127. Both the

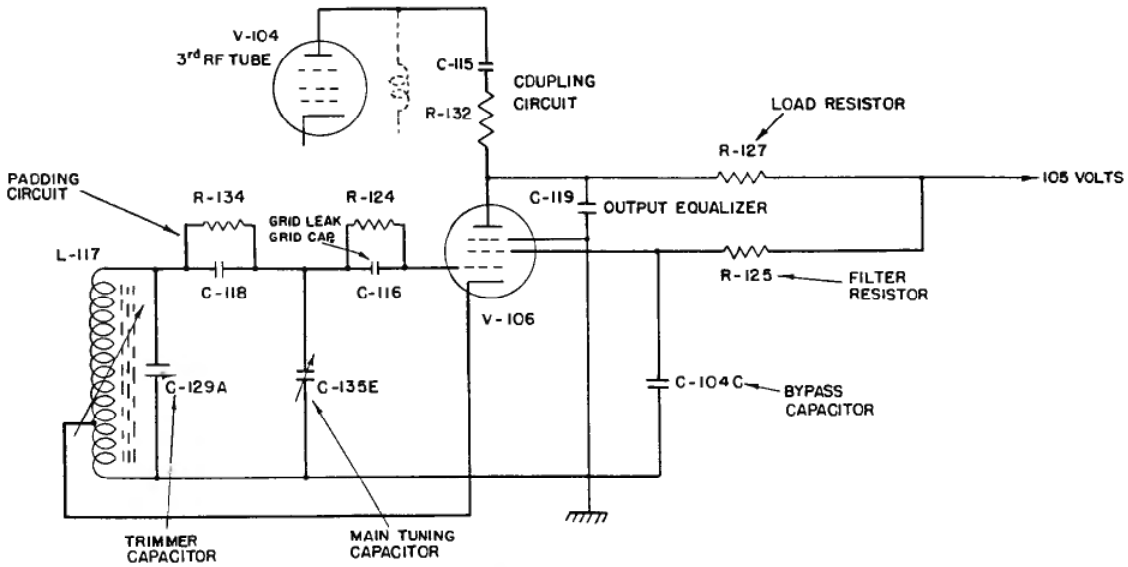


FIG. 4 SIMPLIFIED SCHEMATIC DIAGRAM, OSCILLATOR CIRCUIT
Band #1 Position

screen grid and suppressor grid are at ground potential, insofar as radio frequency potentials are concerned, and act as electrostatic shields between the control grid and plate circuits; thus the frequency-determining circuits associated with the grid are isolated from the output circuit except for coupling in the common electron stream.

The output of the oscillator is applied to the plate circuit of V-104, the third radio frequency amplifier tube, through coupling resistor R-132 and blocking capacitor C-115. The oscillator plate circuit is partially bypassed to ground by capacitor C-119. As the frequency of the oscillator is increased this capacitor bypasses a proportionately greater amount of oscillator energy to ground, thereby compensating for the tendency of the oscillator coupling circuit to apply an excessively high value of heterodyne excitation to the detector as the high frequency end of a given wave band is approached.

The oscillator may be turned on or off by means of S-102, the RECEPTION switch.

A simplified schematic diagram of the oscillator circuit is shown in Fig. 4.

2-2-7 Detector

The detector is of the plate rectification type. Grid bias approaching the cut-off value is derived from the flow of plate current through the cathode resistor R-110. Currents of radio frequency and audio frequency are bypassed around this resistor by capacitor section C-104a. A link E-101, normally closed, is provided in the cathode circuit. When checking selectivity this link is removed and a microammeter is connected in its place, to read detector cathode current. Detector plate voltage is applied through a hum filter consisting of resistor R-147 and the parallel combination of capacitor sections C-103c and C-104b, and through the detector coupling resistor R-111.

When the RECEPTION switch S-102 is in the MOD position, the heterodyne oscillator is inoperative and the receiver is in a suitable condition for the reception of modulated signals. The rectification process occurring in the detector causes the detector plate current to vary at the frequency of the modulation envelope; the plate current variations cause corresponding voltage variations across R-111, the detector coupling resistor; these voltage variations are applied to the wave filters through blocking capacitor C-109, which removes the direct current component of detector plate current from the wave filters. Radio frequency components of detector plate current are partially removed by detector plate shunt capacitor C-114, while additional radio frequency filtering is accomplished in the wave filters. There is thus delivered to the grid circuit of the first audio frequency amplifier tube, an audio frequency voltage, free of radio frequency components and having the frequency of the modulation envelope.

When the RECEPTION switch S-102 is in the CW position the heterodyne oscillator is functioning and the receiver is in a suitable condition for the reception of continuous wave (i. e., unmodulated) signals. When the radio frequency amplifier is tuned to resonance with the desired signal the heterodyne oscillator frequency is one kilocycle (1000 CPS) higher than the signal frequency (within 0.75 per cent of the signal fre-

quency). There are applied then, at the detector grid, two radio frequency voltages differing by approximately 1000 CPS. The rectification process inherent in the detector causes the detector plate current to vary at an audio frequency rate equal to the difference (approximately 1000 CPS) of these two radio frequency voltages. These plate current variations cause corresponding voltage variations to be developed across the detector load resistance R-111; the resulting audio frequency tone is delivered to the audio frequency amplifier through capacitor C-109 and one of the wave filters.

2-2-8 Wave Filters

The detector output circuit is connected through blocking capacitor C-109 to the AUDIO switch S-103. In the BROAD position this switch selects low-pass wave filter Z-101, and in the SHARP position, a bandpass filter, Z-102. An attenuating network or "T-pad" (R-112, R-113, and R-122) is connected to the low-pass filter Z-101, in order to equalize the effective insertion losses of the two filters at the center of the acceptance band (1000 CPS) of the bandpass filter. The filter in use is terminated in its characteristic impedance by the series combination of potentiometer R-136b and resistor R-114. This potentiometer is the audio frequency section of the dual manual gain control, and is further described under "Gain Control". Resistor R-114 limits the maximum attenuation inserted by potentiometer R-136b to 23.5 DB. Each filter has characteristic input and output impedances of 30,000 ohms. The low-pass filter cuts off at approximately 1300 CPS; the band-pass filter acceptance band is approximately 300 CPS wide, and is centered at 1000 CPS.

2-2-9 1st Audio Frequency Amplifier

The first audio frequency amplifier stage employs a type 6SJ7 pentode, V-107. Grid bias is derived from the voltage drop across cathode resistor R-115, which is bypassed by capacitor section C-106a. Screen potential is obtained from the voltage divider R-116, R-117, the screen being bypassed by capacitor section C-106b. R-118 is the plate coupling resistor and C-117 is the coupling capacitor.

2-2-10 2nd Audio Frequency Amplifier (Output Limiting)

This stage employs a type 6SJ7 pentode, V-108. The output of the preceding stage is applied through coupling capacitor C-117 and grid leak R-153. Control grid bias is derived from the DC voltage drop across cathode resistor R-149. Screen potential is applied through R-126, and the screen is bypassed by capacitor C-113. R-151 is the plate coupling resistor. The output of this stage is coupled to the following stage through capacitor C-138.

When the O.L. (Output Limiter) switch S-104 is in the OFF position, the plate and screen supply voltage is taken directly from the "200-volt" bus; however, when this switch is in the ON position, the plate and screen supply voltage is derived from the OUTPUT LEVEL control potentiometer R-137. The maximum value of the signal voltage which this stage can deliver to the output stage is proportional to the value of the screen and plate potentials on the 2nd audio frequency tube V-108. The OUTPUT LEVEL control provides the means for adjusting these voltages. Thus, through adjustment of this control, the signal voltage delivered to the output tube V-109, and hence the power delivered to the headset or output circuit, may be limited and maintained at a definite predetermined value in spite of very wide variations in the strength of the incoming signal.

2-2-11 3rd Audio Frequency Amplifier and Output Circuits

The output voltage of the preceding stage is applied to the grid of the 6K6-GT power pentode V-109 through coupling capacitor C-138 and grid leak R-119. Control grid bias is derived from the DC voltage drop across cathode resistor R-120. Screen and plate potential is applied through the filter formed by R-121 and C-107. This filter isolates the audio frequency component of plate current from the power supply circuits. Capacitor C-136, connected across the primary of output transformer T-111, prevents the occurrence of a transient oscillation in the windings of the transformer at the cessation of signal elements.

The output transformer T-111 consists of the primary winding P-B and two secondary windings. A grounded electrostatic shield is assembled between the primary and the two secondary windings, for the purpose of preventing the transfer of radio frequency energy between transformer windings by electrostatic coupling. The secondary winding having terminals marked T-T is the load winding. The turns ratio of this winding to the primary winding is such that the transformer presents the recommended load impedance (9000 ohms) to the 6K6-GT plate circuit when the load resistance connected across terminals T-T is 30 ohms. The load secondary winding is connected to the output receptacle J-103, mounted at the rear of the chassis, and also to telephone jack J-101 located on the front panel. To prevent the entrance of radio frequency energy into the receiver via the output circuit, the center tap of the load winding is connected to ground, and each side of the output circuit is bypassed

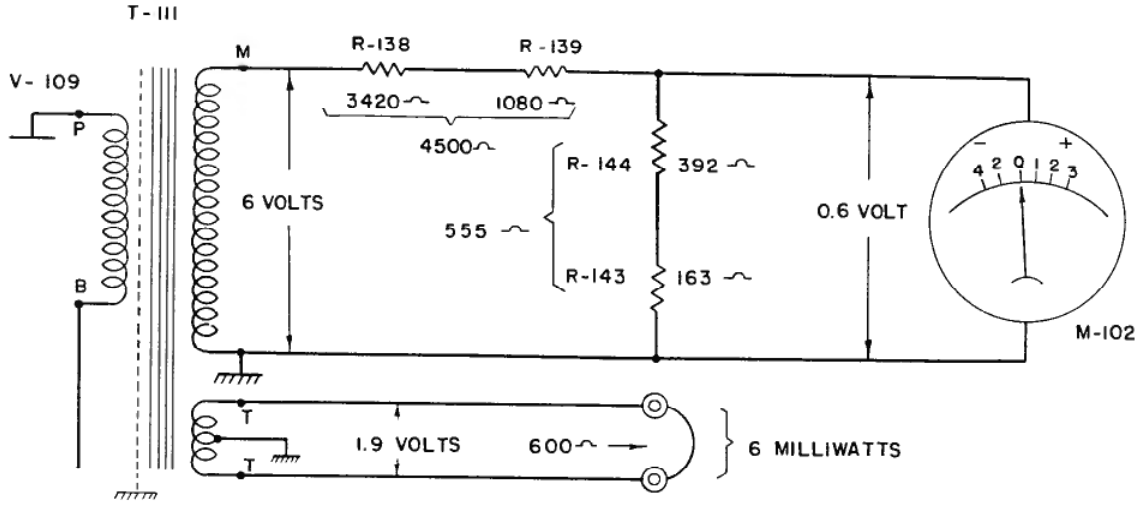


FIG. 5 SIMPLIFIED SCHEMATIC DIAGRAM, OUTPUT CIRCUIT
Showing Voltage Relations With "Add Decibels" Switch in the 20DB Position

to ground by means of capacitors C-110a and C-110b. As an additional safeguard against pickup of ultra-high frequency energy by the headset cords, an ultra-high frequency filter is connected between the telephone jack J-101 and the load secondary. This filter consists of two ultra-high frequency choke coils L-121, L-122, and two mica capacitors C-139 and C-140. An identical filter is also connected to the output receptacle J-103.

The other secondary winding is employed for connection to a 5000 ohm output meter M-102 through the output meter multiplier (S-105 and associated resistors). This meter winding bears a turns ratio of 3.16/1 to the load secondary winding T-T; this scheme is employed to increase the effective sensitivity of the meter, thereby permitting the measurement of lower values of output power than would be possible should the meter be connected directly across the load secondary. The meter calibration takes this voltage step-up into consideration, the meter indicating power delivered to the load on winding T-T. S-105, marked "ADD DB" on the front panel, forms with its associated resistors an adjustable attenuating network or "L-pad" presenting a constant impedance of 5000 ohms to the meter winding.

When S-105 is held in the DIRECT position, the output meter is connected directly across the meter winding. When the switch is in the "ADD 10 DB" position, a resistor R-138 is connected in series with the meter, and the series combination of resistors R-143, R-144 and R-145 is shunted across the meter. In this position the resistor values are such as to reduce the voltage at the meter terminals to 1/3.16 of the voltage at the terminals of the meter winding. This reduction of voltage through the resistor network corresponds to a loss of 10 DB; hence 10 DB must be added to the meter reading to compensate for this loss. The analysis of the operation of S-105 in the 20 DB and 30 DB positions is similar to the foregoing (see Fig. 5); in the OFF position the meter is short circuited and grounded, while the series combination of resistors R-138, R-139, R-140, and R-141, totalling 5000 ohms, is connected across the meter winding.

While the optimum load impedance for the receiver is 30 ohms, the receiver output circuits are designed for load impedances from 30 to 600 ohms (see section below entitled "Negative Feedback"). Since the receiver will most often be employed for operation into a 600 ohm headset the reference level, 60 microwatts, chosen for the output measurements is taken with respect to a 600 ohm load. The meter deflection is directly proportional to the VOLTAGE across the load, while the POWER delivered to the load is a function of load voltage and load resistance. The LOAD POWER INDICATED BY THE METER IS CORRECT FOR A 600 OHM LOAD ONLY; for other values of load resistance the error involved is proportional to the change in load resistance.

In the DIRECT position the meter will burn out if the receiver output is allowed to reach high values; as a safeguard against burn-out due to the meter's being left in this highly sensitive position, the "ADD DB" switch S-105 is provided with a spring-return from the DIRECT position to the adjacent (10 DB) position. This switch should, however, be returned to the OFF position when

the meter is not in use, to avoid the possibility of severe meter overload and damage by strong signals.

See Section 5-4 for operating instructions.

2-2-12 Negative Feedback

Negative feedback has been incorporated in the output circuit of the receiver for the purpose of maintaining substantially constant output voltage over a wide range of output load resistance. This feature is of practical value in preventing annoying variations in the signal level in a headset when other headsets are inserted or removed from the output line. Specifically, the output power developed in any given headset will not vary by more than three DB, when the total receiver load impedance varies between 30 and 600 ohms. For example, assume that the power developed in a single 600 ohm headset connected to the receiver is 1 milliwatt; as many as 19 additional 600 ohm headsets may then be bridged across the output terminals without affecting the signal level in the first headset by more than 3 DB (0.5 milliwatt in this example).

Negative feedback is applied from plate to grid of the output tube V-109 through blocking capacitor C-105b and resistor R-150, and also from the plate of the output tube to the cathode of the second audio frequency amplifier tube V-108 through C-105a and R-152.

The operation of the feedback circuits in regulating the output voltage is briefly as follows: The signal voltage fed back to the cathode of V-108 and the grid of V-109 opposes the incoming signal, hence effectively reduces the overall gain of the receiver. The extent to which the gain is thus reduced increases as the voltage applied to the feedback circuits increases (assuming a fixed setting of receiver controls and a constant incoming signal amplitude). This feedback voltage is developed across the plate circuit of the output tube, and tends to increase when the receiver load resistance increases. In the absence of feedback, an increase of load resistance would be accompanied by a proportionate increase in output voltage (within certain limits); the negative feedback feature utilizes this tendency to increase, in such a manner that the amplifier voltage gain is reduced almost in proportion to the increase in load resistance, thereby maintaining the output voltage substantially constant.

3. INSTALLATION, TYPE CFT-46154 RADIO RECEIVER

3-1 MOUNTING DETAILS

The following mounting hardware is furnished with each receiver:

Four 5/16"—18 cap screws
Four spring lock washers
Four 1¾" x ⅜" flat washers
Four 5/16"—18 nuts

Fig. 22 shows the outline and mounting dimensions of the receiver. To mount the receiver proceed as follows:

(a) Remove any plugs which may be attached to the receptacles at the rear of the cabinet. (The receptacles should not be confused with the plugs. The receptacles are permanently attached to the receiver chassis and protrude through the rear of the cabinet; the chassis cannot be withdrawn until the mating plugs are disconnected.)

(b) Unscrew the eight captive thumbscrews holding the panel to the cabinet.

(c) Withdraw the chassis from the cabinet, using the two metallic knobs located at the sides near the bottom of the panel (control knobs should not be used for this purpose). After the chassis has been drawn forward approximately 6 inches its movement will be blocked by the stop mechanisms located at each side near the bottom of the chassis (see Fig. 8). Disengage these stops by depressing the stop springs, accessible through holes in the side of the chassis, and remove the chassis from the cabinet.

(d) Secure the cabinet to the operating table through the medium of the four shock mountings, employing the machine screws and other hardware listed above.

(e) Make sure that all vacuum tubes are well-seated in their respective sockets.

(f) Replace the chassis in the cabinet, and tighten securely the eight panel thumbscrews.

3-2 CABLE CONNECTIONS

3-2-1 General

The three receptacles protruding through the rear of the cabinet are employed for connection to the input (antenna or concentric transmission line), output (a two-conductor shielded line) and to the Interconnecting Power Cable. In normal installations the receiver input connection will be made

through a concentric shielded line. In order to reduce interference from strong radio frequency fields, it is important that the three shielded cables and ground lead attached to the receiver be bunched together, and run as close as possible to the receiver cabinet and other grounded surfaces.

The various receptacles are identified on the chassis Layout Diagram, Fig. 20.

3-2-2 Interconnecting Power Cable

Having previously disconnected the CRV-20130 Rectifier Power Unit from the AC power line, plug the Interconnecting Power Cable into the mating receptacle, J-104, of the receiver and secure the plug by means of its knurled coupling ring, turning this ring clockwise as far as it can be turned by hand. (Wrenches should not be employed for this purpose.)

3-2-3 Input Connections

The type —49120 Input Receptacle, J-102, of the receiver is designed for mating the type —49121 Concentric Plug and the type —49152 Adaptor, both of which are furnished with the receiver. If the input connection is made through a concentric transmission line (or patch cord) the line or cord should terminate in the type —49121 Concentric Plug. If direct connection to an antenna is to be made, the —49152 Adaptor is employed in lieu of the Concentric Plug. The Adaptor is fitted with a binding post to which the antenna lead-in is to be connected.

3-2-4 Output Connections

The receiver output is available at the telephone jack on the front panel and at the output receptacle, J-103, at the rear of the chassis. A type —49160 three pin plug is supplied with the receiver to mate with the output receptacle. The output line should be two-conductor, shielded; neither side of the line should be grounded, since the center tap of the load winding in the output transformer is grounded in the receiver. In the —49160 plug, the two pins which are closest together (#2 and #3) should be soldered to the two line conductors, while the #1 pin should be connected to the line shield.

To attach this plug to the line proceed as follows:

(a) Disassemble the plug by unscrewing the knurled cap, and by removing the small flat-head screw from the side.

(b) Pull back or remove the wire shielding to about 1 inch. Bare and tin about ¾ inch at the ends of the line conductor and connect a wire to the shielding.

(c) Slip the disassembled plug elements over the line in the following order, with due regard to direction to permit reassembly: cap, coupling ring, spring guard, and shell.

(d) Insert the tinned leads and the shield lead through the correct pins of the pin assembly.

(e) Solder the leads to the pins, applying solder at the pin tips. Cut the leads flush with the pin tips; remove excess solder and rosin.

(f) Replace the pin assembly into the shell and replace the flat-head locking screw, taking care to select the proper tapped hole in the pin assembly so that the plug will mate with its receptacle.

(g) Reassemble the plug.

The plug is secured to its mating receptacle by means of the knurled coupling ring.

When installing Navy type TTHFA-1 cable between the receiver and phone jack boxes it is recommended that an adaptor be employed to join the cable to the type-49160 plug. It is expected that these adaptors, identified as "Output Extension Adaptors", will be purchased by the Navy under a separate contract with the RCA Victor Division of The Radio Corporation of America, Camden, New Jersey.

3-2-5 Ground Connection

A binding post is provided at the rear of the cabinet. This should be connected to the best available ground through the shortest practicable route, by means of a heavy copper conductor (#12 or #14 B & S gauge) or by copper braid (⅜ inch or ½ inch wide). A low impedance ground connection is desirable in order to reduce interference from strong radio frequency fields; it will be helpful to group the ground lead, as far as practicable, with the shielded cables leading from the receiver.

4. INITIAL ADJUSTMENTS, TYPE CFT-46154 RADIO RECEIVER

(a) Plug a 600 ohm headset into the phone jack on the receiver.

(b) Turn the POWER switch OFF, place RECEPTION switch in the CW position; turn GAIN control to 0; place O.L. (Output Limiter) switch in the OFF position; place the AUDIO (filter) switch in the BROAD position; place the ADD DECIBELS switch in the OFF position, turn the INPUT CPLG switch to position 5 (maximum coupling).

(c) Having made sure that the vacuum tubes are in the proper sockets in the power unit and receiver, plug the input cable of the power unit into the AC power line and turn the equipment ON by means of the POWER switch on the receiver panel. The DC VOLTMETER should then read approximately 200 volts.

(d) Adjust the wave band switch to the desired range. The band switch is controlled by means of the large knob directly beneath the dial window. The range in use is indicated by the frequency limits engraved on the dial mask. This mask, which rotates with the band switch, covers up all the frequency calibrated scales of the dial except the range applicable to the frequency range in use.

(e) Adjust the main tuning control (the knob fitted with a crank) until the receiver is tuned to the desired frequency (preferably near the high frequency limit of a frequency band for this initial adjustment) as indicated by the frequency calibrated dial. The vernier tuning dial calibration and the calibration of the outer scale of the main tuning dial are in arbitrary units which do not directly indicate frequency.

(f) Turn the gain control clockwise until a hissing noise (receiver background noise) of a comfortable level is heard in the headset.

(g) Adjust the tuning control back and forth slightly until the desired signal is picked up. If a beat note is heard on both sides of resonance, adjust for the louder beat note and adjust the beat note to approximately 1000 CPS.

(h) Having tuned in the signal as described above re-adjust the gain control for a low output level and adjust the ANT. COMP. (Antenna Compensator) to resonance as indicated by maximum signal strength, with the signal strength dropping sharply at each side of the resonant position. If this condition cannot be obtained turn the INPUT CPLG (Input Coupling) switch to position 4 and again slowly rotate the ANT. COMP. throughout its range; if unsuccessful try positions 3, 2 and 1, in turn, of the INPUT CPLG switch. For direct-connected antennas the operator should employ the highest setting of the INPUT CPLG switch which will permit resonating the ANT. COMP.; position 3 will be employed for very large antennas, and position 4 or 5 for average antennas. When employing transmission line input the operator should employ that position of the INPUT CPLG switch which provides maximum signal strength, unless interference is unusually severe, in which case it may be desirable to loosen the input coupling to improve selectivity. Maximum sensitivity for transmission line operation will usually be found on position 3; positions 1 and 2 provide looser coupling, with some loss in sensitivity, but with a gain in selectivity which may be appreciable for some types of transmission lines. In general, after having once adjusted the INPUT CPLG switch for a given input system it will not be necessary to re-adjust it until the input system is changed, except on occasions when decreased coupling is desirable to improve selectivity; additionally, if the ANT. COMP. is adjusted at the upper end of any frequency band in the receiver, re-adjustment of this control is seldom required at any other frequency in that band. If the input system incorporates a transformer for coupling the antenna to the transmission line, at certain critical frequencies considerable re-adjustment of both the INPUT CPLG and ANT. COMP. may be required.

5. OPERATION, TYPE CFT-46154 RADIO RECEIVER

Having made the initial equipment adjustments described in section 4 and having tuned-in a signal, the operator may employ several design features which will be found useful for various receiving conditions. The operation of these devices is described here:

5-1 RECEPTION SWITCH

For reception of voice, ICW and modulated CW signals the RECEPTION switch should be placed in the MOD position, thereby turning off the heterodyne oscillator; however, the initial tuning adjustments for signals of this class may be facilitated by placing the RECEPTION switch in the CW position if the signal is weak.

5-2 AUDIO SWITCH

This switch permits the selection of a low-pass filter in the BROAD position and a sharp band-pass filter in the SHARP position. When attempting to receive voice signals this switch should be in the BROAD position. Voice intelligibility will be very poor, since the filter cuts off at approximately 1300 CPS. The BROAD position should likewise be employed for the reception of tone-modulated and ICW signals unless the modulation frequency happens to coincide with the center of the pass-band of the sharp filter (1000 CPS). The BROAD position should be employed in the initial tuning adjustments for the reception of CW signals, and for "stand by" operation; however, when preparing to "copy" a message the switch should be in the SHARP position and the signal beat note should be carefully adjusted by means of the main tuning control for maximum volume, which will occur when the beat note frequency coincides with the center of the pass-band of the SHARP filter. The operator will then be relieved of interfering signals differing by only a few hundred cycles from the frequency of the desired signal. At the lower radio frequencies (15 to 60 KC) the SHARP filter will be found especially useful in increasing the effective selectivity of the receiver. When adjusting the beat note to the center of the filter pass-band the signal volume should be kept low and the output limiter should be turned off, in order to avoid inaccurate tuning due to overload conditions.

5-3 OUTPUT LIMITER

The output limiter is a device which permits control of the level to which the receiver output may rise, regardless of the strength of the incoming signal. This feature is primarily useful as a protective device, since the operator can adjust the output level of the signal to a comfortable value and will be assured that static crashes and strong interfering signals will not develop a value of receiver output much greater than the desired signal, even though the interfering signals may be many times stronger than the desired signal at the receiver input terminals. The limiter is also very useful when tuning over a wide frequency band searching for signals, as it limits painfully loud signals; its use is also advised for "stand by" operation for the same reason. It should not be employed when making accurate tuning adjustments as it has the effect of broadening resonance indications. The output limiter may be turned on or off by means of the O.L. switch; the output level is adjusted by means of the adjacent OUTPUT LEVEL control. The maximum output level of which the receiver is capable increases as this control is turned clockwise.

The adjustment of the output limiter should proceed as follows:

(a) With the output limiter off (O.L. switch in OFF position) complete the fine tuning adjustments—ANT. COMP. and beat note—and adjust the GAIN control for comfortable headset volume.

(b) Place the O.L. switch in the ON position and, starting with the OUTPUT LEVEL control at 100, slowly turn this control until the output level drops slightly.

(c) Now increase the setting of the GAIN control until the output level reaches a point where further increase in the gain control setting does not cause an appreciable increase in output.

(d) Decrease the setting of the OUTPUT LEVEL control until the desired output level is reached. If too much background noise (hiss, etc.) is heard between signal elements, turn down the gain control until the noise is no longer objectionable; if this adjustment reduces the output level too much, compensate for it by increasing the setting of the OUTPUT LEVEL control. After some experience in operating the receiver the operator will learn the scale position of the OUTPUT LEVEL control fixing the most desirable headset volume level; this will probably be between 10 and 20 on the scale. He will then turn the OUTPUT LEVEL control to this position and advance the GAIN CONTROL to a point just below that at which the background noise becomes objectionable.

5-4 OUTPUT METER

The OUTPUT METER and the ADD DECIBELS switch may be employed to measure the output of the receiver in milliwatts PROVIDED THE RECEIVER IS OPERATING INTO A 600 OHM LOAD. For loads other than 600 ohms the error is proportional to the change in load resistance. To measure the output level of the receiver proceed as follows:

(1) Make sure that the load resistance is 600 ohms. The output receptacle in the rear of the receiver and the telephone jack are connected in parallel; thus the effective load resistance will be equal to the parallel combination of the loads connected at these two points.

(2) Starting with the ADD DECIBEL switch in the OFF position turn this switch counterclockwise until a meter reading is obtained, preferably between −5 DB and +5 DB. Add the reading of the ADD DECIBELS switch to the reading of the output meter to obtain the output level in decibels. Examples:

(a) The meter reads +3 and the ADD DECIBELS switch reads 20: the output level is 20 + 3 = 23 decibels.

(b) The meter reads 0 and the switch reads 20: the output level is 20 + 0 = 20 decibels.

(c) The meter reads −3 and the switch reads 20: the output level is 20 + (−3) = 20 − 3 = 17 decibels.

(d) The meter reads +3 with the switch in the DIRECT position: the output level is +3. (In the DIRECT position the meter is connected directly across the meter winding of the output transformer; therefore the meter reads directly and nothing is to be added).

(3) If desired, the output level in decibels may be converted into power. Examples:

(a) The meter reads 0, with the switch in the DIRECT position: as indicated by the engraving directly under the meter, 0 DB = 60 microwatts.

(b) The output level is 20 decibels: 20 decibels corresponds to a power ratio of 100/1; that is, the power level is 100 times as great as the reference level (60 microwatts). Therefore the power output is 100 × 60 microwatts, or 6000 microwatts. Since 1000 microwatts = 1 milliwatt, 6000 microwatts = 6 milliwatts; thus the output level is 6 milliwatts, or 6 MW.

CAUTION: THE ADD DECIBELS SWITCH SHOULD ALWAYS BE LEFT IN THE OFF POSITION WHEN NOT USING THE OUTPUT METER, TO GUARD AGAINST METER DAMAGE DUE TO STRONG SIGNALS.

(4) Do not turn the ADD DECIBELS switch to the DIRECT position if the meter reads higher than −5 decibels with the switch in the 10 position. In the DIRECT position the meter is easily burned out by strong signals; for this reason a spring mechanism is incorporated in the switch design, making it necessary to manually hold the switch in the DIRECT position.

5-5 MAIN TUNING DIAL CALIBRATION

The accuracy of the frequency calibration of the main tuning dials is ±1 per cent. This means that if a CW signal is tuned in and the receiver is adjusted for a beat note of 1000 cycles (the oscillator frequency to be higher than the signal frequency) the frequency indicated by the main tuning dial will be equal to the frequency of the received signal, within limits of ±1 per cent of the received signal frequency.

The outer scale of the main tuning dial is designed to be read in conjunction with the scale of the vernier dial attached directly to the main tuning control knob. These two scales do not directly indicate frequency but are employed to sub-divide the range of the main tuning control into 1000 equally-spaced divisions for logging purposes. The vernier dial is divided into 100 divisions; ten revolutions of the vernier dial will cover the complete tuning range. In reading the two dials for logging purposes, add the next lowest reading of the main dial scale (ignoring odd multiples of 50) to the reading of the vernier dial. Examples:

(a) The vernier dial reads 32 and the main dial reads between 0 and 50—the complete reading is 0 + 32 = 32.

(b) The vernier dial reads 76 and the main dial reads between 650 and 700—the complete reading is 600 + 76 = 676. (As a reminder that only the multiples of 100 on the main dial are to be added to the vernier reading, the multiples of 100 are marked by wedges.)

Three tuning charts are provided with each receiver. All are mounted in the chart frame.

6. MAINTENANCE, TYPE 46154 RADIO RECEIVER

6-1 LUBRICATION

The principal bearings of the receiver employ bearing sleeves pressed from powdered bronze and impregnated with oil. No lubrication should be necessary for any bearing in the receiver except possibly the intermediate sleeve bearing of the main tuning capacitor, and lubrication of this bearing would probably not be required until after a period of several years service. To oil this bearing proceed as follows:

(a) Remove the five screws at the top of the main tuning capacitor, C-135, and remove the shield by lifting upward. A serrated spring strip along the lower left edge of the capacitor bears on the shield with considerable force, hence it may be necessary to pry the shield off the capacitor by means of a screwdriver or knife blade inserted between the shield and the capacitor frame.

(b) The sleeve bearing is located at the front end of the middle section of the tuning capacitor. Place one drop of light machine oil collected on the end of a wire in the oil hole provided at the top of the bearing.

(c) Replace the shield carefully, making sure that the side of the shield rests between the spring strip and the capacitor frame. Have the shield mounting holes aligned over their respective tapped holes in the capacitor frame before pressing the shield in place. Replace the shield mounting screws and lockwashers.

6-2 ROUTINE INSPECTION

(a) Inspect all cable plugs and make sure that they are firmly secured; coupling rings on plugs should be tight. Check condition of headset cords, and clean headset plugs.

(b) See that the pilot lamp and the two dial lamps are not burned out.

(c) Be sure that all tubes are well-seated in their sockets.

(d) Check mechanical operation and electrical functioning of all receiver controls. Tune in a signal in each frequency band.

(e) Check the control knob set screws for tightness by means of the Allen hexagon set screw keys mounted inside the receiver, at the upper right side of the chassis frame.

6-3 GENERAL OVERHAUL INSPECTION

6-3-1 General

This inspection involves the removal of the receiver from the cabinet, removal of the bottom plate of the receiver, examination and possibly repair of component parts and wiring. This service should not be attempted unless the following laboratory equipment is available: frequency-calibrated signal generator embracing the complete frequency range of the receiver, and a Navy Model OE (or equivalent) Test Set. A shielded test room is desirable, particularly if interference conditions are bad.

6-3-2 Mechanical

(a) Remove the chassis from the cabinet in the manner described under section 3-1 "Mounting Details".

(b) Remove the bottom cover plate of the chassis.

(c) Inspect all nuts, bolts and screws for looseness (both above and below chassis and on the front panel). Do not tamper with glyptal-treated screws unless it is evident these are loose, in which case remove the old glyptal, tighten the screw, and apply new glyptal to the screw-head and adjacent chassis area. Remove any loose solder or metallic chips. Remove any traces of corrosion and touch up scratched paint. Inspect wiring and soldered joints. If more than two strands of a stranded conductor are broken at a soldered joint, cut off the defective lead and re-solder. Inspect tube socket contacts, tube base pins, and contact elements of cable receptacles and plugs, cleaning if necessary with carbon tetrachloride on a rag or brush. Do not employ sandpaper or emery cloth for this purpose.

(d) Attach the bottom cover, replacing all the screws and lockwashers.

6-3-3 Electrical

(a) Check all tubes by means of a Navy Model O.D. Tube Tester, or equivalent, replacing any tubes having less than 80 per cent of normal plate current at a heater voltage of 6.3 volts. Replace the tubes in their proper sockets making sure that they are well-seated.

(b) Replace the chassis in the cabinet and check performance as described in section 6-7, "Receiver Servicing Data".

6-4 LOCATION AND REMEDY OF FAULTS

6-4-1 General

Faults can be more readily located by following an orderly, systematic procedure with the purpose of first determining whether the trouble is in the antenna circuit, the output circuit, the power supply unit and associated cables, or the receiver. After the difficulty is traced to one of these units the examination should proceed in a series of logical steps aimed at the isolation of the fault. For example, should the difficulty be traced to the receiver, determine first whether it is common to all frequency bands; if experienced in one band only, it is likely that the trouble exists only in the radio frequency or oscillator circuit, since the audio frequency circuits are in use for all bands. Moreover, if the trouble is confined to a single frequency band it would tend to exempt from suspicion those radio frequency elements common to all bands—for instance, the main tuning capacitor, vacuum tubes and associated sockets and circuit components, and the power supply and control circuits. Thus one would suspect one of the elements selected by the switching operation, or the switching device itself: the coil assemblies and the wave band switch should now receive attention. At this point a resistance analysis of the radio frequency amplifier and oscillator circuits should be made in order to determine which one of the tuned circuits is defective. If, in the defective circuit, the indicated resistance value should change with a slight movement of the band switch it might indicate a faulty contact; but if the abnormal resistance value remained constant the fault would probably be in the coil assembly or wiring. At this point the switch and wiring of the particular stage should be examined, and if these appeared to be in good condition the coil assembly should be investigated.

A rough guide to the circuit position of the fault is the amount and nature of receiver background noise in the headset. Complete absence of any sound would possibly be due to power failure or to trouble in the output stage or output circuits; normal microphonic sounds, with complete absence of hiss, would probably indicate a normal audio amplifier system but a faulty radio frequency system; weak signals accompanied by normal background noise might indicate some fault in the antenna system outside the receiver.

Some of the troubles encountered in receiver installations of this type are listed below, together with some common causes.

6-4-2 No Signal or Weak Signal

Possible Causes:

Failure of power supply, due to blown fuse in line or power unit, burned out or weak rectifier tube, faulty contact to rectifier tube pins, faulty receiver ON-OFF switch or break in continuity of power unit input or output cable (probably at cable plug). Cable plugs should be firmly seated in their mating receptacles. Failure of heater voltage will be indicated by failure of the pilot and dial lamps to light. Failure of the "200-volt" B supply will be indicated on the receiver DC voltmeter; if this meter reading is below 150 volts, it is probable that the rectifier tube needs replacing or that a short circuit exists in the equipment.

Faulty antenna connection. This may be due to poor contact between input receptacle and the mating plug or adaptor, or may be caused by a ground or open circuit in the antenna lead-in, transmission line, or patch cord.

Faulty output connection, due to open circuited, short circuited, or grounded output cable (neither side of the output line should be grounded); defective headset cord or plug; poor contact between output receptacle and plug.

Weak or burned out vacuum tube. If possible, check the tubes with a suitable test set; if this is not available, replace each tube, in turn, with a new tube or one known to be in good condition. If possible, check socket voltages with good tubes in place; unusual voltages are an indication that the particular stage involved is at fault.

Wrong vacuum tube inserted in socket.

Incorrect position of INPUT CPLG switch and ANT. COMP. control. The input circuit should be tuned to resonance.

Output Limiter adjusted for low output level.

Beat note frequency outside of pass band of filters.

Defective manual gain control or auxiliary gain control (ganged to main tuning control).

Defective wave filter. Try the other filter.

Defective toggle switch.

Defective section of wave band switch.

Broken wire lead. This is more likely to occur to leads connected to the long bakelite resistor-capacitor strip in the audio frequency compartment.

Short circuited bypass capacitor.

Detector cathode link E-101 open.

Shorted trimmer capacitor or tuning capacitor, due possibly to a drop of solder or to bent plates.

6-4-3 Noisy or Intermittent Reception

Possible Causes:

Faulty contact or noise pickup in antenna system. Disconnect the antenna and observe whether noise stops.

Faulty cable connection, due to connectors being loosely mated; or due to breakage of a cable conductor, usually where soldered to a receptacle or plug contact, or at a point where frequent cable bending occurs. Check by bending the cables.

Defective headset cord, or plug, or faulty connection between plug, cord, and headset.

Defective gain or output level control. Noise during operation of main tuning control may be due to a worn out auxiliary gain control, R-128 (geared to main tuning control).

Defective toggle switch.

Poor contact between some vacuum tube and its socket.

Defective vacuum tube. Lightly tap each tube.

Frayed or broken connection in receiver wiring. Check by shaking the receiver.

Poor contact between pilot or dial lamp and its socket.

Defective wave filter. Try the other filter.

Defective bypass or coupling capacitor.

Defective power unit. (Observe whether noise is accompanied by fluctuations in reading of DC voltmeter; marked fluctuations would indicate that the trouble is probably in the receiver or power unit or power cable rather than in the antenna or output system.)

Reception accompanied by a continuous, high value of receiver background noise (hiss) may be due to some external factor causing weak signals, since weak signal input voltage naturally results in a poor signal/noise ratio.

Retaining-nut on top of coil shield not tightened (these nuts are employed to ground the frames on which the coils are mounted).

Detector cathode link E-101 loosely secured.

Flaked plating on trimmer or main tuning capacitor.

Dirty or corroded band-switch contact.

Vacuum tube having "intermittent heater"; that is, a break in the heater element periodically makes and breaks contact due to expansion and contraction of the ceramic material in which the heater is embedded. A tube test set might indicate that such a tube was not defective, unless the tube were left in the test set long enough to become thoroughly warm.

6-4-4 Normal Stage-Gain Data

6-4-4-1 Radio Frequency Amplifier

Conditions: 30% Mod. at 400 cycles.
Broad Filter.
OL Off.
Gain Control at 100.
Input Cplg. Switch on #5.
Ant. Comp. tuned to resonance at high freq. band limit.
Oscillator Off.
Standard Dummy Antenna.

			*Stage Gain**		
Band	*Freq. KC*	*Antenna*	*1st RF*	*2nd RF*	*3rd RF*
1	15	1.1	18.0	14.6	5.7
1	38	14.6	5.8	7.3	32.0
2	38	2.6	19.7	17.6	7.9
2	95	33	5.4	7.1	32.6
3	95	5.3	18.2	17.9	6.9
3	235	41	2.9	3.2	18.7
4	235	6.3	21.5	20.6	10.6
4	600	42	3.9	4.3	26.6

* Ratio of output voltage to input voltage of stage indicated. Antenna gain is ratio of secondary voltage of antenna coil to signal generator voltage, employing standard dummy antenna.

6-4-4-2 Audio Frequency Amplifier

Conditions: 1000 cycles. Broad filter. OL off. Gain control at 100. 600 ohm load. Output level: 6 milliwatts. Before applying input to detector grid, insert a slip of paper between contacts on band switch section S-110C to avoid short-circuiting input voltage.

Input To	*Gain between point of input and 600 ohm load*
Grid, 3rd A.F. Amp. (V-109)	9 db
Grid, 2nd A.F. Amp. (V-108)	9* db
Grid, 1st A.F. Amp. (V-107)	49 db
Grid, Detector (V-105)	51 db

* Gain of 2nd A.F. stage neutralized by negative feedback.

6-5 VOLTAGE ANALYSIS

The following tables indicate typical tube socket voltages of a type CFT-46154 Radio Receiver. The DC voltage should be measured with a voltmeter having a resistance of 1,000 ohms-per-volt or greater and the highest scale permitting accurate reading should be employed. The values shown below were measured with a Weston Model 765 AC-DC Voltmeter-Ammeter (20,000 ohms-per-volt.) THOSE VALUES PARTICULARLY AFFECTED BY VOLTMETER RESISTANCE

ARE MARKED WITH AN ASTERISK. The data are based on operation of one receiver only, from a CRV-20130 Rectifier Power Unit; 60-cycle AC power line voltage equal to 115 volts; line voltage adjustment in Power Unit made for 115 volts.

A voltage analysis, as an aid to locating trouble, is of no value for grid circuits as these operate at ground potential insofar as DC measurements are concerned; a resistance check is of value here. Additionally, a voltage analysis of circuits employing high resistance values (detector, oscillator, 1st and 2nd audio frequency amplifiers) should be supplemented by a resistance analysis.

6-5-1 Heater Voltage

Heater voltage, measured between pins 2 and 7 of all tubes, should be approximately 6.6 volts, alternating current.

6-5-2 Test Conditions

The following DC voltage values are measured between the indicated tube pin and chassis. SEE FIG. 21 FOR IDENTIFICATION OF TUBE PINS. Particular attention must be paid to the specified test conditions. For any given set of conditions, the position of controls not listed is of no consequence. All voltages are measured with all tubes in place.

6-5-3 General Voltage Check

Conditions: (a) Main tuning control at 0 (that is, at the extreme low frequency limit of its tuning range).

(b) RECEPTION switch: in MOD position.

(c) Manual GAIN control: 100.

(d) O.L. switch: OFF.

	Voltage to Chassis					
Tube	*Pin #1*	*Pin #3*	*Pin #4*	*Pin #5*	*Pin #6*	*Pin #8*
V-102, 1st RF Amp.	0	6.6	0	6.6	103	194
V-103, 2nd RF Amp.	0	6.6	0	6.6	103	194
V-104, 3rd RF Amp.	0	1.1	0	1.1	14.6	14.6
V-105, Detector	0	*185	0	0	0	*10.5
V-106, Oscillator	0	0	0	0	0	0
V-107, 1st AF Amp.	0	1.25	0	1.25	31	*46
V-108, 2nd AF Amp.	0	0	0	1.0	*22	*46
V-109, Output	0	170	180	0	0	12.2

* Affected by voltmeter resistance.

6-5-4 To Check for Manual Gain Control Operation

Conditions: (a) Main tuning control at 0.

(b) Manual Gain Control: 0.

	Voltage to Chassis					
Tube	*Pin #1*	*Pin #3*	*Pin #4*	*Pin #5*	*Pin #6*	*Pin #8*
V-102, 1st RF Amp.	0	43	0	43	126	206
V-103, 2nd RF Amp.	0	43	0	43	126	206

6-5-5 To Check for Operation of Auxiliary Gain Control R-128

Conditions: (a) Main tuning control at 1,000 (that is, at the extreme high frequency limit of its tuning range).

(b) Manual Gain Control: 100.

	Voltage to Chassis					
Tube	*Pin #1*	*Pin #3*	*Pin #4*	*Pin #5*	*Pin #6*	*Pin #8*
V-102, 1st RF Amp.	0	20	0	20	129	204
V-103, 2nd RF Amp.	0	20	0	20	129	204

6-5-6 To Check Range of Output Level Control

Conditions: (a) Main tuning control at 1,000.

(b) Manual Gain Control: 100.

(c) O.L. switch: ON.

Output Level Control	*Voltage to Chassis, Pin #8 (Plate) of V-108, 2nd AF*
0	0
50	* 5.8
100	*18

* Affected by voltmeter resistance.

6-5-7 To Check Oscillator

Conditions: (a) Main tuning control at 0.

(b) RECEPTION switch: CW.

Frequency	*Voltage to Chassis, V-106, Oscillator*					
Band	*Pin #1*	*Pin #3*	*Pin #4*	*Pin #5*	*Pin #6*	*Pin #8*
1	0	0	*−14.5	0	*27	*85
2	0	0	*−13.4	0	*28	*70
3	0	0	*−12.9	0	*28	*65
4	0	0	*−10.4	0	*28	*52

* Affected by voltmeter resistance.

6-5-8 Power Receptacle (J-104)

Conditions: (a) Main tuning control at 0.

(b) Manual Gain Control: 100.

Between Terminals	*Voltage*
P & S	0 (When Receiver ON-OFF switch is ON)
C & D	6.6 Volts, AC
F & Chassis	0
E & F	106 Volts, DC
F & G	205 Volts, DC
P & S	115 Volts, AC (When Receiver is turned OFF)

6-6 RESISTANCE ANALYSIS

NOTE: BEFORE ATTEMPTING TO MEASURE ANY RESISTANCE VALUES, TURN OFF THE RECEIVER.

6-6-1 Heater Circuit

One side of the heater circuit is grounded to chassis. A resistance measurement between heater circuit contacts (#2 and #7) of any socket should indicate an open circuit provided that the power cable is disconnected and all tubes, dial lamps and pilot lamp are removed from their sockets.

6-6-2 Test Conditions

The following tables indicate typical resistance values of a type CFT-46154 Receiver. A variation of ±10 per cent from these values will, in general, be permissible. Resistance values are measured between chassis and the tube pins (or socket contacts). SEE FIG. 21 FOR IDENTIFICATION OF SOCKET CONTACTS.

6-6-3 General Resistance Analysis

Conditions: (a) POWER switch: OFF.
(b) RECEPTION switch: CW.
(c) GAIN: 100.
(d) O.L. switch: OFF.
(e) AUDIO switch: SHARP.
(f) MAIN TUNING CONTROL: 0 (L.F. limit of rotation).
(g) Interconnecting cable from Power Unit disconnected.

Tube	*Freq. Band*	*Resistance in Ohms from Pin to Chassis* *Pin #1 (Shell)*	*Pin #3*	*Pin #4*	*Pin #5*	*Pin #6*	*Pin #8*
V-102, 1st RF Amp. & V-103, 2nd RF Amp.	1	0	1,100	495	1,100	18,500	10,500
	2	0	1,100	58	1,100	18,500	10,500
	3	0	1,100	9.3*	1,100	18,500	10,500
	4	0	1,100	3.3	1,100	18,500	10,500
V-104, 3rd RF Amp.	1	0	2,700	495	2,700	9,000	9,000
	2	0	2,700	58	2,700	9,000	9,000
	3	0	2,700	5.5	2,700	9,000	9,000
	4	0	2,700	3.3	2,700	9,000	9,000
V-105, Detector	1	0	135,000	Open	495	Open	100,000
	2	0	135,000	Open	58	Open	100,000
	3	0	135,000	Open	5.5	Open	100,000
	4	0	135,000	Open	3.3	Open	100,000
V-106, Oscillator	1	0	0	110,000	27.6	Open**	Open**
	2	0	0	110,000	4.6	Open**	Open**
	3	0	0	100,000	1.2	Open**	Open**
	4	0	0	100,000	0.7	Open**	Open**
V-107, 1st AF Amp.		0	1,800	30,000	1,800	18,500	278,000
V-108, 2nd AF Amp.		0	0	560,000	1,500	1,008,000	278,000
V-109, Output		0	9,450	9,000	560,000	Open	620

NOTE: See Paragraph 6-6-1 for pins 2 and 7 (heater).
* 5.5 ohms for V-103.
** Resistance between pins 6 and 8 should be 320,000 ohms.

6-6-4 To Check Manual Gain Control

Conditions: Same as 6-6-3, except turn manual gain control to 0.

Tube	*Resistance in Ohms from Pin to Chassis* *Pin #4*	*Pin #5*
V-102, 1st RF Amp.		5,400
V-107, 1st AF Amp.	2,000	

6-6-5 To Check Auxiliary Gain Control

R-128 (geared to main tuning control)

Conditions: (a) Same as 6-6-3, except turn main tuning control to 1000 (H.F. limit of tuning range).
(b) Gain Control at 100.

Tube	*Resistance in Ohms from Pin #5 to Chassis*
V-102, 1st RF Amp.	3,100

6-7 RECEIVER SERVICING DATA

6-7-1 General

If the operation of the receiver appears to be abnormal a performance check should be made in accordance with the following instructions. After making any major repairs or adjustments the performance of the equipment should again be checked.

6-7-2 Standard Test Conditions

(a) STANDARD DUMMY ANTENNA: An inductance of 20 microhenries in shunt with a series combination of a 400 mmf. capacitor and a 400 ohm resistor, the entire combination being in series with a 200 mmf. capacitor. See Fig. 6. At this writing (1942) this is the Standard Dummy Antenna prescribed by the Institute of Radio Engineers. If such a device is not available, a 200 mmf. capaci-

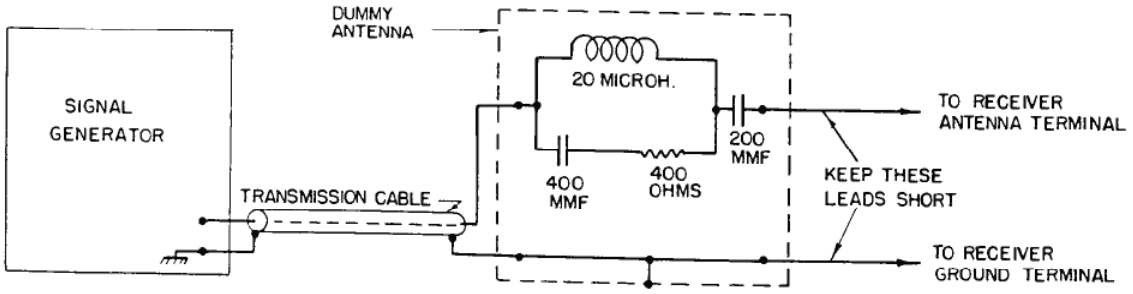


FIG. 6 DUMMY ANTENNA CONNECTIONS

tor may be used instead; performance will be essentially the same.

(b) DUMMY TRANSMISSION LINE: A 300 mmf. capacitor connected between signal generator output and receiver input; and a 3000 mmf. (.003 mfd.) capacitor shunted from receiver input to chassis. See Fig. 7.

(c) STANDARD NOISE LEVEL: 60 microwatts, developed in a 600 ohm resistive load.

(d) STANDARD OUTPUT: 6 milliwatts, developed in a 600 ohm resistive load.

(e) STANDARD SIGNAL: Signal generator carrier, unmodulated (pure CW).

(f) LINE VOLTAGE: 115 volts, 60 cycles.

6-7-3 Sensitivity Test

6-7-3-1 With Standard Dummy Antenna:

(A) If the receiver is in good condition, sensitivity should be approximately as indicated on Fig. 16.

(B) TEST PROCEDURE

(1) Turn the INPUT CPLG switch to position 5. Place RECEPTION switch in CW position; O.L. switch OFF; AUDIO in BROAD position.

(2) Connect the signal generator to the receiver input jack through the Standard Dummy Antenna. See Fig. 6. A General Radio Type 418G Dummy Antenna may be plugged directly into the receiver input jack and connected through the -49152 Adaptor.

(3) Connect a 600 ohm output meter to the output of the receiver, and shunt a headset across the meter for monitoring purposes; or alternatively, connect a 600 ohm resistor, shunted by a high impedance headset, to the receiver output and employ the output meter mounted on the receiver panel. A 600 ohm headset may be used for a load in lieu of a 600 ohm resistor but the results will not be quite as accurate.

(4) Adjust signal generator to 600 KC and to about 10 microvolts; tune in the signal and adjust beat note to approximately 1000 CPS (if beat notes are audible on each side of carrier, select the louder beat note); set the ANT. COMP. for maximum output.

(5) Cut off the signal generator and adjust the receiver GAIN control for 60 microwatts receiver noise output.

(6) Set signal generator output dial to zero, and turn on the signal generator. Gradually increase signal generator output until the receiver output is 6 milliwatts. The signal generator output voltage at this point is the sensitivity of the receiver, and should be numerically equal to or less than the sensitivity values indicated in Fig. 16.

(7) Proceed as above at the center and ends of each band, adjusting the ANT. COMP. only at the high frequency end of each band.

6-7-3-2 With Dummy Transmission Line:

(A) TEST PROCEDURE

Make this test with the INPUT

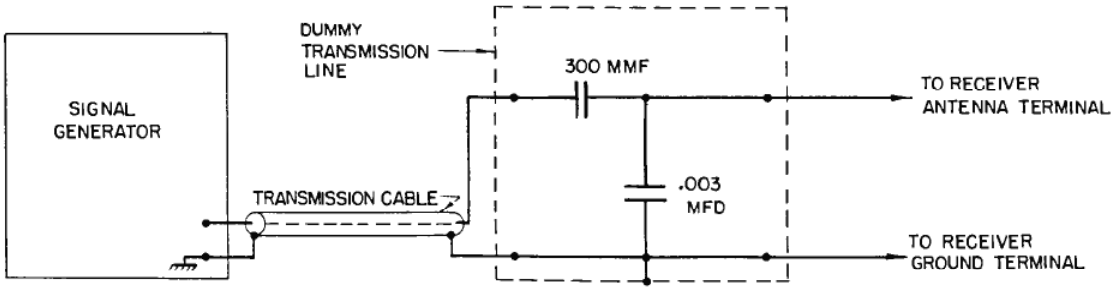


FIG. 7 DUMMY TRANSMISSION LINE CONNECTIONS

CPLG switch in position 3. Connect the signal generator to the receiver antenna terminal through a 300 mmf. capacitor, and shunt the receiver antenna terminal to chassis through a 3000 mmf. (.003 mfd.) capacitor as shown in Fig. 7. With these exceptions, proceed as for sensitivity test with Standard Dummy Antenna.

(B) If the receiver is in good condition, sensitivity should be approximately equal to the following:

Band No.	*Frequency KC*	*Sensitivity Microvolts*
1	15	60
1	38	10
2	38	20
2	95	5
3	95	12
3	235	5
4	235	9
4	600	5

6-7-4 Selectivity Test

6-7-4-1 General

Due to the high degree of selectivity provided in the receiver, and due also to the low radio frequencies encountered, it is not practicable to measure selectivity by means of a modulated carrier because of severe sideband attenuation. Selectivity is measured by employing a pure CW carrier, with the oscillator turned off. The carrier voltage level at the detector input circuit is indicated by the rise in detector cathode current; a pair of binding posts, normally joined by link E-101, is included in the detector cathode circuit to permit connection of a meter.

The selectivity of a normal receiver should be approximately as indicated on Fig. 17.

6-7-4-2 Selectivity Test Procedure

(A) Loosen the nuts which secure link E-101, located on the top side of the chassis adjacent to the detector tube (the type 6J5). Swing back the link and connect in its place a microammeter having a range of approximately 0 to 500 microamperes.

(B) Connect the signal generator to the receiver through the Standard Dummy Antenna, as described in section 6-7-2 (a) and illustrated in Fig. 6. Set INPUT CPLG switch to position 5. Put RECEPTION switch in MOD position.

(C) Set the signal generator to the desired frequency and adjust for 100 microvolts input. Carefully tune the receiver, including the ANT. COMP., to resonance with the signal, as indicated by maximum deflection of the microammeter. Adjust the GAIN control so that the microammeter reading is 140 microamperes.

(D) Now increase the signal generator output by a factor of 10/1, and detune the signal generator toward a higher frequency until the microammeter again reads 140 microamperes. Record accurately the frequency of the signal generator, and call this frequency F2. Repeat on the low frequency side of resonance and call this frequency F1. Subtract F1 from F2 and divide by 2, giving "KC off resonance". Divide this in turn by the resonant frequency, and multiply by 100, to obtain "% off resonance". Repeat this procedure with the signal generator output increased by 100/1, and by 1000/1.

6-7-5 Circuit Alignment

6-7-5-1 General

THE RECEIVER HAS BEEN CAREFULLY AND COMPLETELY ALIGNED AT THE FACTORY; NO ADJUSTMENTS OF THE TRIMMER CAPACITORS OR OSCILLATOR COIL CORES SHOULD BE ATTEMPTED IN THE FIELD.

Should re-alignment become necessary the receiver should be removed to a laboratory staffed with competent personnel and equipped with the required test instruments.

6-7-5-2 Test Equipment Required

(A) A standard signal generator, accurately calibrated in frequency and covering the entire frequency range of the receiver.

(B) A standard dummy antenna (see section 6-7-2 for description). A 200 mmf. capacitor may be used if the dummy antenna is not available.

(C) A microammeter having a range of approximately 0 to 500 microamperes.

(D) A source of sound having a frequency of 1000 CPS; for example, an audio frequency oscillator connected to a speaker or headset.

(E) A headset with Navy type —49434 plug, or equivalent.

6-7-5-3 Alignment Procedure

(A) TRIMMER LOCATIONS. The circuit positions of the trimmer capacitors are indicated on Fig. 20, Chassis Layout Diagram. The trimmer capacitors are located at the top of the coil assemblies and are accessible for adjustment through holes in the tops of the coil shields. These holes are normally covered by the rotary disks located on top of the shields. To expose the adjustment holes loosen the elastic stop nuts on top of the coil shields sufficiently to permit rotation of the disks; rotate the disks 90 degrees counterclockwise, which will bring the holes in the disks in line with the holes in the shields. The numbers marked over the openings are the symbol numbers of the particular trimmer capacitors.

The oscillator coils, contained within coil assemblies T-109 and T-110, are provided with adjustable iron cores to permit inductance adjustment. This adjustment is made by means of a special tool O-103, consisting of a hexagon set-screw key mounted in a long bakelite handle (this tool is mounted inside the receiver chassis, on the left chassis sidewall, directly above the oscillator coils). This tool is to be inserted through adjustment holes in the front panel. The location and wave-band identification of these holes are shown on Fig. 20, Chassis Layout Diagram. The two upper holes are covered by the tuning chart frame, which may be removed by unscrewing the two thumbscrews. The two lower holes are normally closed by the two hexagon cap nuts. To adjust the inductance of an oscillator coil, insert the trimming tool through the holes in the front panel and coil shield and into the coil, rotating the tool slightly until the end of the tool engages the hexagon socket-head of the core adjusting screw. The inductance decreases (oscillator frequency increases) as the tool is turned clockwise. The TOTAL range of adjustment is approximately 7 turns, which should be more than sufficient for alignment. DO NOT ATTEMPT TO FORCE THE ADJUSTMENT BEYOND ITS NORMAL RANGE, AS THIS MAY WRENCH THE ADJUSTMENT SCREW FROM THE IRON DUST CORE. Both the trimmer capacitors and the adjustable cores are of the "self-locking" type; that is, sufficient friction is provided by spring devices to hold the adjustment.

(B) Connect the signal generator to the receiver through the standard dummy antenna as shown in Fig. 6. Set INPUT CPLG switch to position 5.

(C) Connect the microammeter in the detector cathode circuit, as described in section 6-7-4-2 (A).

(D) Adjust the signal generator to 600 KC and turn the main tuning control of the receiver to 600 KC. Place the reception switch in the MOD position; O.L. switch OFF; AUDIO switch to BROAD; ADD DECIBEL switch to OFF. Set ANT. COMP. to —2 (two lines to the left of 0), AND LEAVE IT AT THIS POSITION THROUGHOUT THE ALIGNMENT OPERATIONS.

(E) Adjust signal generator output and/or the GAIN control until the microammeter reads about 150 microamperes. Adjust trimmer capacitors C-122b, C-124b, C-126b, and C-128b for maximum reading of the microammeter. Keep the microammeter reading below 300 by reducing signal generator output or gain control setting. (Current values in excess of this do not damage the receiver, but resonance indications will be broadened due to overloading of the 3rd radio frequency stage).

(F) Reduce the signal generator output and place the RECEPTION switch in the CW position; adjust the oscillator trimmer capacitor C-130b for a 1000 cycle beat note, taking care that the oscillator frequency is higher than the signal frequency. To check this, decrease the signal generator frequency slightly; if the beat note frequency increases, the oscillator adjustment has been correctly made.

(G) Place the RECEPTION switch in the MOD position, and adjust the main tuning control on the receiver to the nominal low frequency limit of the band (in this example, 235 KC). Resonate the signal generator with the receiver, as indicated by maximum reading of the microammeter. Switch to CW reception and adjust the oscillator coil inductance for a 1000 cycle beat note, again making sure that the oscillator frequency is higher than the signal frequency.

(H) Re-tune the receiver to 600 KC, switch to MOD reception and carefully adjust the signal generator to resonance. Switch to CW reception and readjust the oscillator trimmer capacitor C-130b (if necessary) for a 1000 cycle beat note.

(I) Repeat steps (G) and (H). This is necessary because the coil adjustment reacts on the capacitor adjustment, and vice versa.

(J) Repeat the procedure outlined from (D) to (I) above for the other frequency bands, starting at the upper nominal frequency limit of each band. The nominal frequency limits are engraved on the dial mask. When finished, close all trimmer adjustment holes and tighten the elastic stop nuts; replace the detector cathode link, the oscillator trimming tool, the tuning chart frame and the plugs for the oscillator coil adjustment holes.

6-7-6 Instructions for Removing Parts

6-7-6-1 Gain Control

(A) Remove knob after loosening the two set screws by means of the Allen #8 hexagon set-screw key O-101 mounted near the top of the right side wall of the chassis.

(B) Tag or otherwise identify the six wire leads attached to the control. Disconnect leads, remove hexagon panel mounting nut and withdraw the control.

6-7-6-2 Auxiliary Gain Control R-128 (Geared to Main Tuning Control)

(A) To Remove:

1. Tag leads for identification and remove wiring.
2. Loosen the Allen hex-head set screws securing the control shaft, using one of the set-screw keys mounted on the chassis side wall.
3. Remove the auxiliary gain control mounting nut.

(B) To Replace:

1. Mount the new auxiliary gain control but do not tighten the shaft set screws.
2. Turn the main tuning control (provided with a crank handle) clockwise as far as it will go (outer scale of main tuning dial should then read approximately 1000).
3. Turn the shaft of the auxiliary gain control all the way clockwise (as seen facing the shaft end) then turn it back 1 or 2 degrees.
4. Tighten the shaft set screws. Now turn the main tuning control all the way counterclockwise. It should be possible to turn the tuning control until the main tuning dial reads zero; that is, the range of the tuning control should be limited by the stops associated with the drive mechanism—not by the stops on the auxiliary gain control. If the gain control is limiting rotation of the tuning control, readjust the relative angular position of the gain control shaft

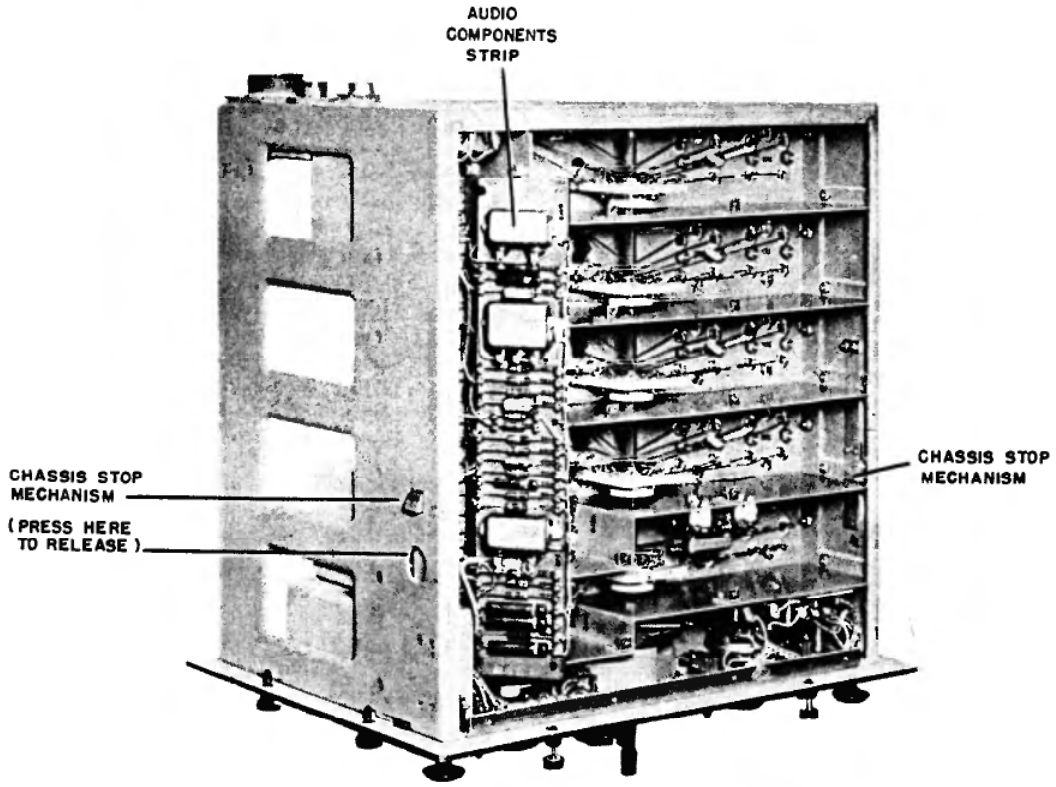


FIG. 8 RECEIVER CHASSIS, BOTTOM VIEW
Showing Audio Components Strip Partially Withdrawn

slightly until the entire tuning range can be covered.

5. Connect the leads of the auxiliary gain control.

6-7-6-3 Output Level Control

(A) Remove control knob after loosening the two set screws by means of the Allen #8 hexagon set-screw key O-101 mounted near the top of the right side wall of the chassis.

(B) Remove hexagon mounting nut.

(C) Partially withdraw the band switch shaft—for instruction see section 6-7-6-9 (B).

(D) Remove the four mounting screws and capacitor C-111 from the long compartment shield located directly behind and parallel with the front panel. Withdraw this shield, thereby providing ample room to unsolder the control leads and withdraw the control.

(E) If installing a new control, transfer the leads one at a time from the old control to the new one, thereby avoiding possible wiring errors.

6-7-6-4 O. L. Switch

Remove the knurled and hexagon mounting nuts; then remove the adjacent compartment shield as described in section 6-7-6-3, after which the switch may be disconnected and removed.

6-7-6-5 Foil-Paper Capacitor C-108

This unit is mounted on a bracket behind the power switch; the bracket is tapped and secured to the chassis by means of machine screws inserted from the top side of the chassis. First disconnect the wiring from the capacitor; then remove the bracket mounting screws; withdraw the bracket, and remove the capacitor.

6-7-6-6 Pilot Lamp

The bayonet base pilot lamp is removable through the front panel, after unscrewing the pilot lamp jewel. To remove the lamp, press in on the lamp and rotate slightly counterclockwise, thereby disengaging the retaining pin.

6-7-6-7 Dial Lamps

(A) The lamp sockets are attached to spring clips which can be withdrawn directly to the rear. After replacing the lamp, replace the clip on the mounting bracket and push all the way forward.

(B) Usually no adjustment will be required. If illumination is unsatisfactory, it may be desirable to readjust the lamp position slightly in order to place the filament directly over the space between the dial and dial mask. To do this, loosen the two bracket mounting screws, adjust the bracket to the most favorable position, and tighten the screws.

6-7-6-8 Audio Components Strip

This is the long bakelite strip upon which are mounted most of the resistors and capacitors employed in the audio frequency amplifier. It may be dismounted and partially withdrawn, for servicing the parts thereon, after disengaging the three thumbscrews securing the strip to the adjacent compartment shield. See Fig. 8.

6-7-6-9 Wave-Band Switch Section

(A) Remove all wiring from the defective section.

(B) Turn the band switch to the "38 to 15 KC" band. Loosen the set screw securing the band switch shaft to the drive shaft coupling, and withdraw the shaft through the rear bearing.

(C) Loosen one of the retaining screws bearing against the ceramic switch plate and withdraw the switch section.

(D) The rotor assembly may be withdrawn from the switch section after removing the crescent-shaped spring washer.

(E) When installing a new switch section, proper shaft alignment may be effected by suitably adjusting the two retaining screws bearing against the edges of the switch plate.

6-7-6-10 Coil Assemblies

Any coil shield may be withdrawn after removing the elastic stop nut at the top. In some cases this will provide sufficient access to the assembly.

Each coil assembly is secured to the chassis by means of two elastic stop nuts accessible from the bottom of the chassis. To remove an assembly disconnect all leads and unscrew the two mounting nuts. When mounting an assembly be sure to replace the bakelite bushing under each mounting nut.

To remove an individual coil from a coil assembly, first make a diagram showing the coil connections, then disconnect the coil leads. Unscrew the coil mounting screws and withdraw the coil. In some cases, to facilitate withdrawal, it may be necessary to spread the coil frame slightly by loosening one of the coil frame mounting nuts under the ceramic base. Do not use undue force in tightening the mounting screws when installing a coil.

The spare coils containing adjustable iron-dust cores have been adjusted for normal inductance at the factory, and the adjustment should not be disturbed. (Possible exceptions are the oscillator coils; although adjusted at the factory, some slight improvement in performance might be gained by proper readjustment after installation; however, this should not be attempted in the field. Instructions for oscillator adjustment are given in section 6-7-5 Circuit Alignment.)

6-7-6-11 Main Tuning Capacitor

NOTE: The main tuning capacitor should not be removed unless the necessity for this operation is definitely indicated. Access to the interior of the capacitor may be obtained without removing the capacitor from the chassis—it is only necessary to remove the capacitor shield, as described in section 6-1(a).

(A) Loosen the two Allen hex-head screws securing the counterweighted coupling to the capacitor shaft (a set screw key is mounted on the right-hand chassis side wall) and drive out the taper pin. Be sure to drive the small end of the taper pin; if in doubt as to which end is the smaller, test each end by a few light hammer blows.

(B) Turn the chassis upside down and remove the bottom cover plate.

(C) Disconnect all wiring to the five stator terminals, and unsolder the five rotor-grounding braided leads from the chassis ground terminals.

(D) The capacitor is secured to the chassis by three fillister-head machine screws, one at the rear and two at the front. The screws are accessible from the bottom side of the chassis. Each mounting screw passes through an adjustable mounting device, which permits precise control of elevation and alignment of the tuning capacitor shaft with the drive shaft. The adjustment of these mountings has been carefully made at the

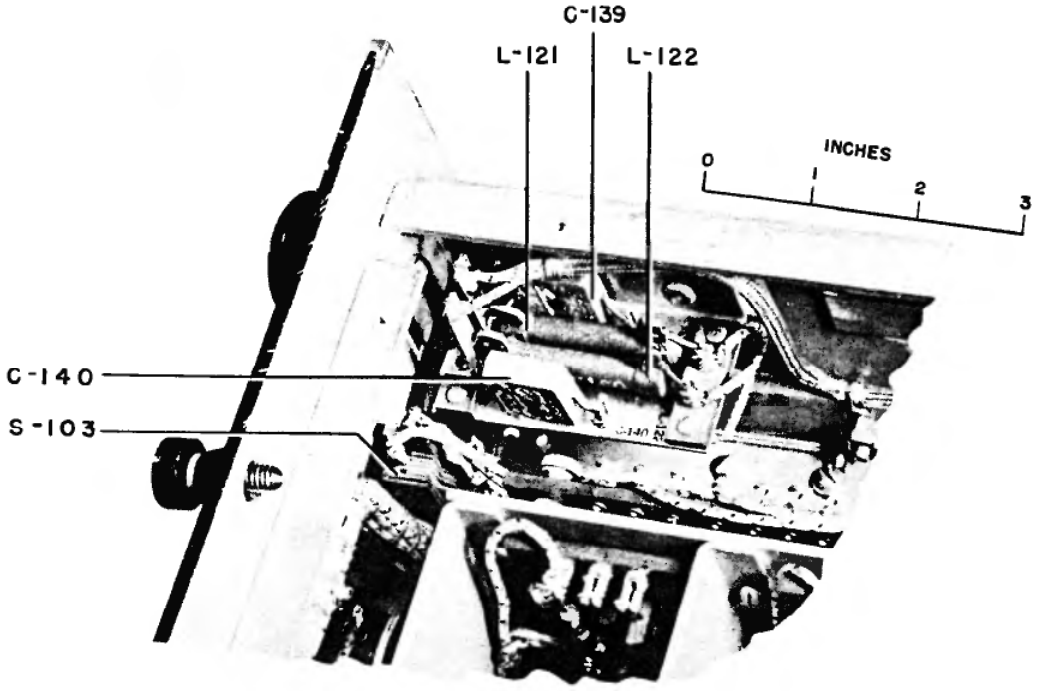


FIG. 9 TELEPHONE JACK FILTER—COVER REMOVED

factory for the particular capacitor in the receiver; the adjustment is locked by the large hexagon nut. In removing the capacitor simply remove the fillister-head machine screws—do not loosen the mounting lock nut.

(E) To proceed, turn the chassis on the left hand side (as seen facing the rear), place the left hand under the rear of the main tuning capacitor and remove the rear mounting screw.

(F) Holding the rear of the capacitor to avoid strain on the shafts, turn the chassis on its base (that is, to the normal operating position) allowing the front edge of the chassis to overhang the edge of the table by a few inches. Remove the two front capacitor-mounting machine screws with the chassis in this position to avoid strains on the capacitor and drive shafts.

(G) Slide the capacitor directly to the rear and out through the opening provided in the rear wall of the chassis.

(H) If a new capacitor is to be installed, it may be necessary to readjust the height of the three mounting assemblies. To do this, loosen the lock nuts and elevate or lower the threaded spacers as required to align the capacitor shaft with the coupling. This adjustment should be made with the mounting screws in place, but not tightened; additionally, the chassis should be resting on its base.

(I) When rewiring the capacitor, take care not to drop solder down into the plates through the terminal clearance holes; it is advisable to lay the chassis on its side when soldering.

6-7-6-12 Captive Panel-Retaining Screws

Each screw is retained in its mounting by a wire ring. To remove the screw, insert a pointed hooked instrument into the rear of the mounting and withdraw the ring sufficiently to engage the threads of the screw; thread the screw through the ring, after which the screw may be withdrawn.

6-7-6-13 Telephone Jack Filter Shield

(A) Remove the two flat-head screws securing the shield to the chassis.

(B) Loosen by two or three revolutions (but do not remove) the two flat head screws, adjacent to the shield-mounting screws. These screws mount the telephone jack filter assembly.

(C) Slide the shield to the rear and remove. (See Fig. 9.)

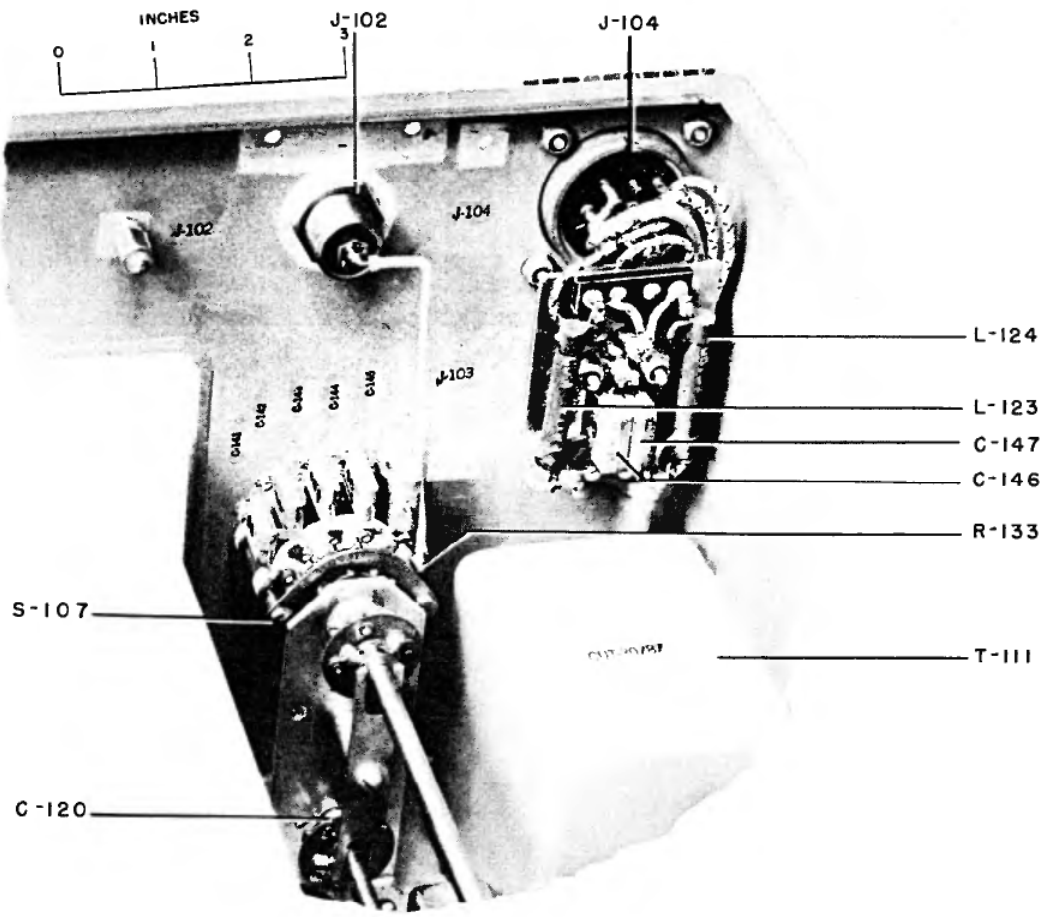


FIG. 10 INPUT COUPLING SWITCH AND OUTPUT RECEPTACLE FILTER—COVER REMOVED

6-7-6-14 Antenna Compensator Capacitor

(A) To Remove:

1. Remove grounding springs at both ends of the shaft.
2. Loosen set screws on flexible coupling for the Antenna Compensator and Input Coupling Switch, noting scale position of the Input Coupling Switch. Withdraw the two shafts through the front panel.
3. Remove Antenna Compensator shield enclosure. (See Fig. 10.)
4. Loosen mounting screws on bracket supporting the Antenna Compensator.
5. Unsolder antenna lead-in.
6. Cut the rotor lead to the Antenna Compensator and unsolder the stator lead.
7. Remove the Antenna Compensator.

(B) To Replace:

1. Solder a lead to the rotor terminal of the replaced capacitor, insert this lead through the chassis clearance holes, and mount the capacitor. Make wiring connections and reassemble the components, setting the Antenna Compensator at the maximum capacity position. When joining the drive shaft to the flexible coupling, turn the control knob so that it points to 10 on the right-hand end of the Antenna Compensator Scale. In the replacement operation care should be exercised to avoid axial strain on the Antenna Compensator drive shaft.

TABLE I
LIST OF MAJOR UNITS
NAVY MODELS RBA, RBA-1, RBA-2, & RBA-3 RADIO RECEIVING EQUIPMENTS *

QUANTITY	SYMBOL GROUP	NAVY TYPE DESIGNATION	NAME OF MAJOR UNIT	ASSEMBLY DRAWING NUMBER
1	101 to 199	CFT-46154	Radio Receiver	F-31670-14
-	201 to 299	--	Not Used	--
-	301 to 399	--	Not Used	--
1	401 to 499	CRV-20130	Rectifier Power Unit	

* The difference between models is one of contract numbers & dates only.

TABLE II
PARTS LIST BY SYMBOL DESIGNATION
TYPE CFT-46154 RADIO RECEIVER

SYMBOL DESIG.	#	FUNCTION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.
			CAPACITORS						
*C-101	A	1st RF Cathode Bypass	Paper: 0.25/0.25/0.25 Mfd. +10-3%	-481372	RE-48A-138E	1	430A		F-19749-1
	B	1st RF Screen Bypass	400 Volts DC Working						
	C	1st RF Plate Bypass							
*C-102	A	2nd RF Cathode Bypass	Same as C-101	-481372					
	B	2nd RF Screen Bypass							
	C	2nd RF Plate Bypass							
*C-103	A	3rd RF Cathode Bypass	Same as C-101	-481372					
	B	3rd RF Screen Bypass							
	C	Det. Hum Filter							
*C-104	A	Det. Cathode Bypass	Same as C-101	-481372					
	B	Det. Hum Filter							
	C	Osc. Screen Bypass							
*C-105	A	Neg. Feedback to 2nd AF	Paper: 0.25/0.25 Mfd. +10-3%	-48618A	RE-48AA-129C	1			
	B	Neg. Feedback to 3rd AF	400 Volts DC Working						
*C-106	A	1st AF Cathode Bypass	Same as C-105	-48618A					
	B	1st AF Screen Bypass							
*C-107		3rd AF Plate Bypass	Paper: 2 Mfd. +10-3%	-48403A	RE-48AA-129C	1	430		
			400 Volts DC Working						
*C-108	A	Man. Gain Control Bypass	Paper: 0.5/0.5/0.5 Mfd. +10-3%	-481371	RE-48A-133	1		See Footnote	F-27795-1
	B	RF Screen Bypass	400 Volts DC Working						
	C	OL Control Bypass							
*C-109		Det.-Filter Coupling	Paper: 0.05 Mfd. +10-3%	-481373	RE-48A-129H	1	430		F-27796-1
			400 Volts DC Working						
*C-110	A	Output RF Filter	Paper: 0.1/0.1 Mfd. +10-3%	-48313A	RE-48AA-129C	1			
	B	Output RF Filter	400 Volts DC Working						
*C-111		Osc. Plate Supply Filter	Paper: 0.5 Mfd. +10-3%	-48205A	RE-48AA-129C	1	430		
			400 Volts DC Working						
*C-112		Osc. Series Pad, Sect. 1	Mica: .025 Mfd. ±10%	-48591-B10	RE-48A-221B	1	1445LS		
			500 Volts DC Working						
*C-113		2nd AF Screen Bypass	Same as C-109	-481373					
*C-114		Det. Plate Bypass	Mica: .005 Mfd. ±10%	-481037-B10	RE-48A-143G	1	1467LS		
			300 Volts DC Working						
*C-115		Osc. Coupling	Mica: .001 Mfd. ±10%	-481070-B10	RE-48A-148D	1	1468LS		
			300 Volts DC Working						
*C-116		Osc. Grid	Same as C-115	-481070-B10					
*C-117		1st AF Coupling	Mica: 400 Mmf. ±10%, 500 Volts DC Working	-481015-B10	RE-48A-148D	1	1468LS		
*C-118		Osc. Series Pad	Mica: .015 Mfd. ±5%, 600 Volts DC Working	-481165-B5	RE-48A-221B	1	1445LS		
*C-119		Osc. Output Equalizer	Mica: 50 Mmf. ±10%, 500 Volts DC Working	-48895-B10	RE-48A-148D	1	1468LS		
*C-120		Antenna Comp.	Air, adj. 50 Mmf. max.	-481374		2			F-28300-2
*C-121	A	Ant. Trim., band 1	Air, adj. 15/15 Mmf. Max.	-481375		2			F-28180-2-1
	B	Ant. Trim., band 2							
*C-122	A	Ant. Trim., band 3	Same as C-121	-481375					
	B	Ant. Trim., band 4							

* Spare parts furnished; Refer to Table IV
\# Symbol part designation
-481371-10 (±10%) capacitors are used in lieu of -481371 in some equipments

TABLE II
PARTS LIST BY SYMBOL DESIGNATION
TYPE CFT-46154 RADIO RECEIVER

SYMBOL DESIG.	#	FUNCTION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.
			CAPACITORS (Continued)						
*C-123	A	1st RF Trim., band 1	Air, adj. 50/50 Mmf. Max.	-481376		2			F-28180-2-2
	B	1st RF Trim., band 2							
*C-124	A	1st RF Trim., band 3	Same as C-123	-481376					
	B	1st RF Trim., band 4							
*C-125	A	2nd RF Trim., band 1	Same as C-123	-481376					
	B	2nd RF Trim., band 2							
*C-126	A	2nd RF Trim., band 3	Same as C-123	-481376					
	B	2nd RF Trim., band 4							
*C-127	A	3rd RF Trim., band 1	Same as C-123	-481376					
	B	3rd RF Trim., band 2							
*C-128	A	3rd RF Trim., band 3	Same as C-123	-481376					
	B	3rd RF Trim., band 4							
*C-129	A	Osc. Trimmer, band 1	Same as C-123	-481376					
	B	Osc. Trimmer, band 2							
*C-130	A	Osc. Trimmer, band 3	Same as C-123	-481376					
	B	Osc. Trimmer, band 4							
*C-131		1st RF Padding	Mica: 20 Mmf. ±5%, 500 Volts DC Working	-48783-D5	RE-48A-148D	1	1469		
*C-132		2nd RF Padding	Same as C-131	-48783-D5					
*C-133		3rd RF Padding	Same as C-131	-48783-D5					
*C-134		Osc. Padding (Shunt)	Same as C-131	-48783-D5					
C-135	A	Main Tuning Cap., Ant.	Five-section adjustable air capacitor;			2			F-28458-14
	B	Main Tuning Cap., 1st RF	each section: 0-708 Mmf., effective						
	C	Main Tuning Cap., 2nd RF							
	D	Main Tuning Cap., 3rd RF							
	E	Main Tuning Cap., Osc.							
*C-136		3rd AF Plate Bypass	Same as C-114	-481037-B10					
*C-137		Osc. Series Pad, Sect. 2	Same as C-112	-48591-B10					
*C-138		2nd AF Coupling	Mica: .002 Mfd. ±10%, 500 Volts DC Working	-48856-B10	RE-48A-143G	1	1467LS		
*C-139		UHF Filter	Mica: .01 Mfd. ±20%, 300 Volts DC Working	-48848-B20	RE-48A-143G	1	1467 LS	See Footnote (1)	
*C-140		UHF Filter	Same as C-139	-48848-B20					
*C-141		Input Coupling	Mica: 80 Mmf. ±10%, 500 Volts DC Working	-481368-B10	RE-48A-148D	1	1468LS		
*C-142		Input Coupling	Mica: 200 Mmf. ±10%, 500 Volts DC Working	-48675-B10	RE-48A-148D	1	1468LS		
*C-143		Input Coupling	Mica: 500 Mmf. ±10%, 500 Volts DC Working	-48691-B10	RE-48A-148D	1	1468LS		
*C-144		Input Coupling	Mica: 800 Mmf. ±10%, 500 Volts DC Working	-481369-B10	RE-48A-148D	1	1468LS		
*C-145		Input Coupling	Same as C-138	-48856-B10					
*C-146		UHF Filter	Same as C-139	-48848-B20					
*C-147		UHF Filter	Same as C-139	-48848-B20					
			MISCELLANEOUS ELECTRICAL PARTS						
E-101		To permit meter connection	SPST Link; normally closed			2			F-26571-1

* Spare parts furnished; Refer to Table IV
\# Symbol part designation
(1) 48848-B10 (±10%) capacitors are used in lieu of -48848-B20 (±20%) in some equipments.

TABLE II
PARTS LIST BY SYMBOL DESIGNATION
TYPE CFT-46154 RADIO RECEIVER

SYMBOL DESIG.	#	FUNCTION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.
			INDICATING DEVICES						
*I-101		Pilot Lamp Bulb	6-8 Volt, 0.15 Amp., Tubular Bulb, Min. bayonet base			3	#47		
*I-102		Dial Lamp	Same as I-101						
*I-103		Dial Lamp	Same as I-101						
			RECEPTACLES						
J-101		Phone Jack	Navy Standard Telephone Jack, front-of-panel parts finished in black molybdemum	-49021A	RE-13A-481D	4		See Description	
J-102		Input Receptacle	Navy Standard Concentric Jack	-49120	RA-49F-215B	5			
J-103		Output Receptacle	Special Chassis Connector; 3-contact, female	-49161		6	SP-PC3F	Silver Plated Contacts	
J-104		Power Receptacle	9-Pin Type "AN" Chassis Type Receptacle, female	AN-3102-28-4S	AN-9534	6	AN-3102-28-4S		F-28789-1
			INDUCTORS						
L-101		Antenna Coil, band 1	Iron core; bakelite dowel			2			F-29215-1-1
L-102		Antenna Coil, band 2	Iron core; bakelite bar			2			F-29214-1-1
L-103		Antenna Coil, band 3	Iron core; ceramic form			2			F-29183-3-7
L-104		Antenna Coil, band 4	Iron core; ceramic form			2			F-29183-3-10
L-105	A	1st RF Coil, band 1; pri.	Iron core; bakelite dowel			2			F-29215-1-2
	B	1st RF Coil, band 1; sec.							
L-106	A	1st RF Coil, band 2; pri.	Iron core; bakelite bar			2			F-29214-1-2
	B	1st RF Coil, band 2; sec.							
L-107	A	1st RF Coil, band 3; pri.	Iron core; ceramic form			2			F-29183-3-8
	B	1st RF Coil, band 3; sec.							
L-108	A	1st RF Coil, band 4; pri.	Iron core; ceramic form			2			F-29183-3-11
	B	1st RF Coil, band 4; sec.							
L-109	A	2nd RF Coil, band 1; pri.	Same as L-105						
	B	2nd RF Coil, band 1; sec.							
L-110	A	2nd RF Coil, band 2; pri.	Same as L-106						
	B	2nd RF Coil, band 2; sec.							
L-111	A	2nd RF Coil, band 3; pri.	Same as L-107						
	B	2nd RF Coil, band 3; sec.							
L-112	A	2nd RF Coil, band 4; pri.	Same as L-108						
	B	2nd RF Coil, band 4; sec.							
L-113	A	3rd RF Coil, band 1; pri.	Same as L-105						
	B	3rd RF Coil, band 1; sec.							
L-114	A	3rd RF Coil, band 2; pri.	Same as L-106						
	B	3rd RF Coil, band 2; sec.							

* Spare parts furnished; Refer to Table IV
# Symbol part designation

TABLE II
PARTS LIST BY SYMBOL DESIGNATION
TYPE CFT-46154 RADIO RECEIVER

SYMBOL DESIG.	#	FUNCTION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.
			INDUCTORS (continued)						
L-115	A	3rd RF Coil, band 3; pri.	Same as L-107						
	B	3rd RF Coil, band 3; sec.							
L-116	A	3rd RF Coil, band 4; pri.	Same as L-108						
	B	3rd RF Coil, band 4; sec.							
L-117		Oscillator Coil, band 1	Iron core; ceramic form			2			F-29183-3-3
L-118		Oscillator Coil, band 2	Iron core; ceramic form			2			F-29183-3-6
L-119		Oscillator Coil, band 3	Iron core; ceramic form			2			F-29183-3-9
L-120		Oscillator Coil, band 4	Iron core; ceramic form			2			F-29183-3-12
L-121		UHF Filter	5.5 Microhenry RF Choke; DC Res. 0.85 Ohms	-47190		7	Z-1	Mark Navy # & Wax dip	F-28850-1
L-122		UHF Filter	Same as L-121	-47190					
L-123		UHF Filter	Same as L-121	-47190					
L-124		UHF Filter	Same as L-121	-47190					
			METERS						
M-101		Plate Voltmeter	0-250 Volts DC, 200 ohms/volt; 2-1/2"	-22354	17-I-12(INT)	8	506	Wide Flange	F-28653-1
M-102		Output Meter	-10 to +5 DB; 0 level 0.6 volt; 5000 ohms; 2-1/2"	-22353	17-I-12(INT)	8	506	Wide Flange	F-19570-1
			PLUGS						
P-101		Output Plug	Microphone Style Connector, 3 prong, male. With coupling ring.	-49160		6	MC3M	Silver-plated contacts	
P-102		Transmission Line Input	Navy Standard Concentric Plug	-49121	RA-49F-216B	5			
P-103		To facilitate antenna connection to input receptacle	Binding Post Adaptor. For use with type 49120 Concentric Jack (J-102)	-49152	RA-49AA-225-A	5			
			RESISTORS						
*R-101		1st RF Cathode	1000 ω ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1
*R-102		2nd RF Cathode	Same as R-101	-63360					
*R-103		3rd RF Cathode	2700 ω ±5%, 1/2 W. Comp.	-63355		9	BT 1/2		F-25192-1
*R-104		1st RF Screen	10,000 ω ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1
*R-105		2nd RF Screen	Same as R-104	-63360					
*R-106		3rd RF Volt.Divider	Same as R-104	-63360					
*R-107		1st RF Plate	2700 ω ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1
*R-108		2nd RF Plate	Same as R-107	-63360					
*R-109		3rd RF Volt. Divider	0.1 Meg. ±10%, 1 W. Comp.	-63288		9	BT-1		F-25192-1
*R-110		Det. Cathode	0.1 Meg. ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1
*R-111		Det. Plate	Same as R-110	-63360					
*R-112		Filter Pad	3300 ω ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1

* Spare parts furnished; Refer to Table IV
\# Symbol part designation

TABLE II
PARTS LIST BY SYMBOL DESIGNATION
TYPE CFT-46154 RADIO RECEIVER

SYMBOL DESIG.	#	FUNCTION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.
			RESISTORS (continued)						
*R-113		Filter Pad	Same as R-112	-63360					
*R-114		AF Gain Control Limit.	2000 ω ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1
*R-115		1st AF Cathode	1800 ω ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1
*R-116		1st AF Volt. Divider	22,000 ω ±5%, 1/2 W. Comp.	-63355		9	BT 1/2		F-25192-1
*R-117		1st AF Volt. Divider	0.1 Meg. ±5%, 1 W. Comp.	-63291		9	BT-1		F-25192-1
*R-118		1st AF Plate	0.27 Meg. ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1
*R-119		3rd AF Grid	0.56 Meg. ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1
*R-120		3rd AF Cathode	620 ω ±5%, 1 W. Comp.	-63291		9	BT-1		F-25192-1
*R-121		3rd AF Plate Filter	1000 ω ±10%, 1 W. Comp.	-63288		9	BT-1		F-25192-1
*R-122		Filter Pad	0.13 Meg. ±5%, 1/2 W. Comp.	-63355		9	BT 1/2		F-25192-1
*R-123		Out. Lim. Divider	10,000 ω ±5%, 2 W. Comp.	-63426		9	BT-2		F-25192-1
*R-124		Osc. Grid Leak	Same as R-110	-63360					
*R-125		Osc. Screen	0.22 Meg. ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1
*R-126		2nd AF Screen	1.0 Meg. ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1
*R-127		Osc. Plate	Same as R-110	-63360					
*R-128		Auxiliary Gain Control	W.W. Potentiometer; 2000 ω; linear, 3 W.	-631089	RE-13A-492B	10	P58-2000		F-28793-1
*R-129		Main Volt. Divider	100 ω ±5%, 1/2 W. Wire Wound	-63678-5	RE-13A-372J	9	BW 1/2		F-31588-1
*R-130		Main Volt. Divider	Same as R-123	-63426					
*R-131		Main Volt. Divider	Same as R-123	-63426					
*R-132		Osc. Coupling	0.2 Meg. ±5%, 1/2 W. Comp.	-63355		9	BT 1/2		F-25192-1
*R-133		Static Leak	Same as R-119	-63360					
*R-134		Osc. Pad Shunt	Same as R-104	-63360					
*R-135		Osc. Pad Shunt	Same as R-104	-63360					
*R-136	A	Manual Gain Control, RF	Dual W.W. Potentiometer. Front: 5000 ω Total 200 ω at 30% CCW rotation, RH Taper, 1.5 Watts. Rear: 28,000 ω total, 400 ω at 70% CW rotation, LH Taper, 1.5 Watts	-631090	RE-13A-492B	10	Dual P58		F-28791-1
	B	Manual Gain Control, AF							
*R-137		Output Level Control	W.W. Potentiometer. 10,000 ω, 2 Watts; LH Log. Taper	-631091	RE-13A-492B	10	P58-10,000 W		F-28792-1
*R-138		Output Meter Multiplier	3420 ω ±5%, 1/2 W. Comp.	-63355		9	BT 1/2		F-25192-1
*R-139		Output Meter Multiplier	1080 ω ±5%, 1/2 W. Comp.	-63355		9	BT 1/2		F-25192-1
*R-140		Output Meter Multiplier	342 ω ±5%, 1/2 W. Wirewound	-63678-5	RE-13A-372J	9	BW 1/2		F-31588-1
*R-141		Output Meter Multiplier	158 ω ±5%, 1/2 W. Wirewound	-63678-5	RE-13A-372J	9	BW 1/2		F-31588-1
*R-142		Damping Resistor	360 ω ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1
*R-143		Output Meter Multiplier	163 ω ±5%, 1/2 W. Wirewound	-63678-5	RE-13A-372J	9	BW 1/2		F-31588-1
*R-144		Output Meter Multiplier	392 ω ±5%, 1/2 W. Wirewound	-63678-5	RE-13A-372J	9	BW 1/2		F-31588-1
*R-145		Output Meter Multiplier	1765 ω ±5%, 1/2 W. Comp.	-63355		9	BT 1/2		F-25192-1
*R-146		Damping Resistor	Same as R-142	-63360					
*R-147		Det. Plate Hum Filter	27,000 ω ±10%, 1/2 W. Comp.	-63360		9	BT 1/2		F-25192-1
*R-148		Damping Resistor	Same as R-142	-63360					
*R-149		2nd AF Cathode	1500 ω ±5%, 1/2 W. Comp.	-63355		9	BT 1/2		F-25192-1

* Spare parts furnished; Refer to Table IV
# Symbol part designation

TABLE II
PARTS LIST BY SYMBOL DESIGNATION
TYPE CFT-46154 RADIO RECEIVER

SYMBOL DESIG.	#	FUNCTION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.
			RESISTORS (continued)						
*R-150		Negative Feedback	0.68 Meg. ±5%, 1/2 W. Comp.	-63355		9	BT 1/2		F-25192-1
*R-151		2nd AF Plate	Same as R-118	-63360		9	BT 1/2		F-25192-1
*R-152		Negative Feedback	0.1 Meg. ±5%, 1/2 W. Comp.	-63355		9	BT 1/2		F-25192-1
*R-153		2nd AF Grid	Same as R-119	-63360		9	BT 1/2		F-25192-1
*R-154		Damping Resistor	Same as R-142	-63360					
*R-155		Damping Resistor	33 ω ±5%, 1/2 W. Wirewound	-63678-5	RE-13A-372J	9	BW 1/2		F-31588-1
*R-156		Damping Resistor	Same as R-155	-63678-5					
*R-157		Damping Resistor	Same as R-155	-63678-5					
*R-158		Damping Resistor	Same as R-155	-63678-5					
			SWITCHES						
*S-101		Power Switch	SPST Toggle Switch, Dimension A=5/8" Rated 3 Amp., 125 V., D.C.	-24000	RE-24AA-118A, Fig. 2	11		Black Molybdenum Finish	
*S-102		Reception Switch	Same as S-101	-24000					
*S-103		Audio Selectivity Switch	DPDT Toggle Switch, Dimension A=5/8" Rated 3 Amp., 125 V., D.C.	-24003	RE-24AA-118A, Fig. 3	11		Black Molybdenum Finish	
*S-104		Output Limiter Switch	Same as S-103	-24003					
S-105		ADD DECIBEL Switch	Ceramic, 2-pole, 5-position. Spring return from extreme CCW position			12			F-27729-1
S-106	A	Band Switch - Ant. Tap	Ceramic, 3-pole, 4-position			13			F-21664-1
	B	Band Switch - Ant. Shorting							
	C	Band Switch - Ant. Sec.							
S-107		Input Coupling Switch	Ceramic, Single pole, 5-position			12			F-28737-1
S-108	A	Band Switch - 1st RF Pri.	Same as S-106						
	B	Band Switch - 1st RF Short.							
	C	Band Switch - 1st RF Sec.							
S-109	A	Band Switch - 2nd RF Pri.	Same as S-106						
	B	Band Switch - 2nd RF Short.							
	C	Band Switch - 2nd RF Sec.							
S-110	A	Band Switch - 3rd RF Pri.	Same as S-106						
	B	Band Switch - 3rd RF Short.							
	C	Band Switch - 3rd RF Sec.							
S-111	A	Band Switch - Osc. Tap	Same as S-106						
	B	Band Switch - Osc. Short.							
	C	Band Switch - Osc. Sec.							

* Spare parts furnished; Refer to Table IV
\# Symbol part designation

TABLE II
PARTS LIST BY SYMBOL DESIGNATION
TYPE CFT-46154 RADIO RECEIVER

SYMBOL DESIG.	#	FUNCTION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.
			TRANSFORMERS						
T-101		Ant. Coil Assem. Bands 1 & 2	Contains L-101, L-102 & C-121						F-31250-14-1
T-102		Ant. Coil Assem. Bands 3 & 4	Contains L-103, L-104 & C-122						F-31250-14-2
T-103		1st RF Coil Assem.Bands 1 & 2	Contains L-105, L-106 & C-123						F-31250-14-3
T-104		1st RF Coil Assem.Bands 3 & 4	Contains L-107, L-108 & C-124						F-31250-14-4
T-105		2nd RF Coil Assem.Bands 1 & 2	Contains L-109, L-110 & C-125						F-31250-14-3
T-106		2nd RF Coil Assem.Bands 3 & 4	Contains L-111, L-112 & C-126						F-31250-14-4
T-107		3rd RF Coil Assem.Bands 1 & 2	Contains L-113, L-114 & C-127						F-31250-14-3
T-108		3rd RF Coil Assem.Bands 3 & 4	Contains L-115, L-116 & C-128						F-31250-14-4
T-109		Osc. Coil Assem. Bands 1 & 2	Contains L-117, L-118 & C-129						F-31250-14-5
T-110		Osc. Coil Assem. Bands 3 & 4	Contains L-119, L-120 & C-130						F-31250-14-6
*T-111		Output Transformer	Pri. (P-B) 9000 ω; Sec. #1 (T-T) 30 ω load; Sec. #2 (G-M) bears 3.16/1 turns ratio to Sec. #1, and operates into 5000 ω load. Sec. #1 center-tap connected to G (ground). Freq. range 200-1300 cps. Pri. DC 19 MA; max. output 1.5 watts, Sec. #1.	-30787		14			F-25427-1
			VACUUM TUBES (FOR VACUUM TUBE DATA SEE TABLE VII)						
*V-101		Over-voltage Protection	Neon Lamp; T-2 bulb, unbased.			19	NE-2		
*V-102		1st RF Amp.	Remote cut-off pentode	6SK7	RE-13A-600D	15	6SK7		
*V-103		2nd RF Amp.	Same as V-102	6SK7					
*V-104		3rd RF Amp.	Same as V-102	6SK7					
*V-105		Detector	Medium-Mu Triode	6J5	RE-13A-600D	15	6J5		
*V-106		Oscillator	Same as V-102	6SK7					
*V-107		1st AF Amp.	Sharp cut-off pentode	6SJ7		15	6SJ7		
*V-108		2nd AF Amp.	Same as V-107						
*V-109		3rd AF Amp. (Output)	Power pentode	6K6-GT		15	6K6-GT		
			SOCKETS						
X-101		Symbol not used							
*X-102		1st RF Tube Socket	Octal, Ceramic, Silver-plated Contacts	-49367	RE-49A-314B	16	228		
*X-103		2nd RF Tube Socket	Same as X-102	-49367					
*X-104		3rd RF Tube Socket	Same as X-102	-49367					
*X-105		Detector Tube Socket	Same as X-102	-49367					
*X-106		Oscillator Tube Socket	Same as X-102	-49367					
*X-107		1st AF Tube Socket	Same as X-102	-49367					
*X-108		2nd AF Tube Socket	Same as X-102	-49367					
*X-109		3rd AF Tube Socket	Same as X-102	-49367					

* Spare parts furnished; Refer to Table IV
\# Symbol part designation

TABLE II
PARTS LIST BY SYMBOL DESIGNATION
TYPE CFT-46154 RADIO RECEIVER

SYMBOL DESIG.	#	FUNCTION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.
			SOCKETS (continued)						
X-110		Pilot Lamp Socket & Jewel	Pilot Light Assembly; Min. Bay. Base, Red.			18	#40	Modified	F-29790-1
X-111		Dial Lamp Socket	Dial Light Assembly; Min. Bay. Base			18	203-CH	Modified	F-19870-1
X-112		Dial Lamp Socket	Same as X-111						
			WAVE FILTERS						
*Z-101		Low-pass Filter	Low-pass Filter; Z=30,000 ω. Less than 6 DB attenuation below 1300 cycles; over 40 DB attenuation above 1650 cycles. Attenuation at 1000 cycles approx. 2 DB.	-53088		14			F-19469-1
Z-102		Band Pass Filter	Band-pass Filter; Z=30,000 ω. Band center 1000 cycles ±5%; band width at 6 DB attenuation - not less than 180 cycles; band width at 40 DB attenuation - not more than 450 cycles; attenuation below 725 cycles and above 1350 cycles - over 40 DB. (Attenuation values relative to response at band center.) Insertion loss at band center approx. 4 DB.	-53089		14			F-19485-1

* Spare parts furnished; Refer to Table IV
# Symbol part designation

TABLE III
PARTS LIST BY NAVY TYPE NUMBERS
TYPE CFT-46154 RADIO RECEIVER

QUANTITY	NAVY TYPE NUMBER	ALL SYMBOL DESIGNATIONS INVOLVED
MISCELLANEOUS - CLASS 10		
1		E-101
3		I-101, I-102, I-103
METERS - CLASS 22		
1	-22353	M-102
1	-22354	M-101
SWITCHES - CLASS 24		
2	-24000	S-101, S-102
2	-24003	S-103, S-104
1		S-105
5		S-106, S-108, S-109, S-110 S-111
1		S-107
TRANSFORMERS - CLASS 30		
1		T-101
1		T-102
1		T-103
1		T-104
1		T-105
1		T-106
1		T-107
1		T-108
1		T-109
1		T-110
1		T-111
INDUCTORS - CLASS 47		
1		L-101
1		L-102
1		L-103
1		L-104
3		L-105, L-109, L-113
3		L-106, L-110, L-114
3		L-107, L-111, L-115
3		L-108, L-112, L-116
1		L-117
1		L-118
1		L-119
1		L-120
4	-47190	L-121, L-122, L-123, L-124
CAPACITORS - CLASS 48		
1	-48205A	C-111
1	-48313A	C-110
1	-48403A	C-107
2	-48591-B10	C-112, C-137
2	-48618A	C-105, C-106
1	-48675-B10	C-142
1	-48691-B10	C-143
4	-48783-D5	C-131, C-132, C-133, C-134
4	-48848-B20	C-139, C-140, C-146, C-147
2	-48856-B10	C-138, C-145
1	-48895-B10	C-119
1	-481015-B10	C-117
2	-481037-B10	C-114, C-136
2	-481070-B10	C-115, C-116
1	-481165-B5	C-118
1	-481368-B10	C-141
1	-481369-B10	C-144
1	-481371	C-108
4	-481372	C-101, C-102, C-103, C-104
2	-481373	C-109, C-113
1	-481374	C-120
2	-481375	C-121, C-122
8	-481376	C-123, C-124, C-125, C-126 C-127, C-128, C-129 C-130
1		C-135
RECEPTACLES, PLUGS & SOCKETS - CLASS 49		
1	-49021A	J-101
1	-49120	J-102
1	-49121	P-102
1	-49152	P-103
1	-49160	P-101
1	-49161	J-103
8	-49367	X-102, X-103, X-104, X-105 X-106, X-107, X-108 X-109
1	AN-3102-28-4S	J-104
RECEPTACLES, PLUGS & SOCKETS - CLASS 49 (Continued)		
1		X-110
2		X-111, X-112
WAVE FILTERS - CLASS 53		
1	-53088	Z-101
1	-53089	Z-102
RESISTORS - CLASS 63		
1	-63288	R-121
1	-63288	R-109
1	-63291	R-120
1	-63291	R-117
1	-63355	R-139
1	-63355	R-149
1	-63355	R-145
1	-63355	R-103
1	-63355	R-138
1	-63355	R-116
1	-63355	R-152
1	-63355	R-122
1	-63355	R-132
1	-63355	R-150
4	-63360	R-142, R-146, R-148, R-154
2	-63360	R-101, R-102
1	-63360	R-115
1	-63360	R-114
2	-63360	R-107, R-108
2	-63360	R-112, R-113
5	-63360	R-104, R-105, R-106, R-134 R-135
1	-63360	R-147
4	-63360	R-110, R-111, R-124, R-127
1	-63360	R-125
2	-63360	R-118, R-151
3	-63360	R-119, R-133, R-153
1	-63360	R-126
3	-63426	R-123, R-130, R-131
4	-63678-5	R-155, R-156, R-157, R-158
1	-63678-5	R-129
1	-63678-5	R-141
1	-63678-5	R-143
1	-63678-5	R-140

TABLE III (Continued)
PARTS LIST BY NAVY TYPE NUMBERS
TYPE CFT-46154 RADIO RECEIVER

QUANTITY	NAVY TYPE NUMBER	ALL SYMBOL DESIGNATIONS INVOLVED
	RESISTORS - CLASS 63 (Continued)	
1	-63678-5	R-144
1	-631089	R-128
1	-631090	R-136
1	-631091	R-137
	VACUUM TUBES	
1	6J5	V-105
1	6K6-GT	V-109
4	6SK7	V-102, V-103, V-104, V-106
2	6SJ7	V-107, V-108
1		V-101

QUANTITY	NAVY TYPE NUMBER	ALL SYMBOL DESIGNATIONS INVOLVED

QUANTITY	NAVY TYPE NUMBER	ALL SYMBOL DESIGNATIONS INVOLVED

TABLE IV

EQUIPMENT
SPARE PARTS LIST BY NAVY TYPE NUMBER
TYPE CFT-46154 RADIO RECEIVER

QUANTITY	NAVY TYPE NUMBER	ALL SYMBOL DESIGNATIONS INVOLVED	DESCRIPTION	NAVY SPEC. OR DRAWING NO.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.
			MISCELLANEOUS - CLASS 10					
3		I-101, I-102, I-103	6-8 Volt, 0.15 Amp., Tubular Bulb. Min. bayonet base		3	#47		
1		*O-101	Allen #8 Hex. head set screw key		17		Ordnance Finish	
1		*O-102	Allen #10 Hex. head set screw key		17		Ordnance Finish	
1		*O-103	Oscillator Coil Core Adjusting Tool		2			F-28621-1
			SWITCHES - CLASS 24					
1	-24000	S-101, S-102	SPST Toggle Switch. Dimension A=5/8" Rated 3 Amp., 125 V., DC	RE-24AA-118A, Fig. 2	11		Black Molybdenum Finish	
1	-24003	S-103, S-104	DPDT Toggle Switch, Dimension A=5/8" Rated 3 Amp., 125 V., DC	RE-24AA-118A, Fig. 3	11		Black Molybdenum Finish	
			TRANSFORMERS - CLASS 30					
1	-30787	T-111	Pri. (P-B) 9000 ω; Sec. #1 (T-T) 30 ω load; Sec. #2 (C-M) bears 3.16/1 turns ratio to Sec. #1, and operates into 5000 ω load. Sec. #1 center-tap connected to G (ground). Freq. range 200-1300 cps. Pri. DC 19 MA; max. output 1.5 watts, Sec. #1		14			F-25427-1
			CAPACITORS - CLASS 48					
1	-48205A	C-111	Paper: 0.5 Mfd. +10-3% 400 Volts DC Working	RE-48AA-129C	1	430		
1	-48313A	C-110	Paper: 0.1/0.1 Mfd. +10-3% 400 Volts DC Working	RE-48AA-129C	1			
1	-48403A	C-107	Paper: 2 Mfd. +10-3% 400 Volts DC Working	RE-48AA-129C	1	430		
1	-48591-B10	C-112, C-137	Mica: .025 Mfd. ±10% 600 Volts DC Working	RE-48A-221B	1	1445LS		
1	-48618A	C-105, C-106	Paper: 0.25/0.25 Mfd. +10%-3% 400 Volts DC Working	RE-48AA-129C	1			
1	-48675-B10	C-142	Mica: 200 Mmf. ±10% 500 Volts DC Working	RE-48A-148D	1	1468LS		
1	-48691-B10	C-143	Mica: 500 Mmf. ±10% 500 Volts DC Working	RE-48A-148D	1	1468LS		
2	-48783-D5	C-131, C-132, C-133, C-134	Mica: 20 Mmf. ±5% 500 Volts DC Working	RE-48A-148D	1	1469		
2	-48848-B20 **	C-139, C-140, C-146, C-147	Mica: .01 Mfd. ±20% 300 Volts DC Working	RE-48A-143C	1	1467LS	See Footnote	
1	-48856-B10	C-138, C-145	Mica: .002 Mfd. ±10% 500 Volts DC Working	RE-48A-143G	1	1467LS		

* Items O-101, O-102 and O-103 are mounted on receiver chassis.
**-48848-B10 (±10%) capacitors are employed in some equipments. -48848-B20 is satisfactory for replacement.

TABLE IV

EQUIPMENT
SPARE PARTS LIST BY NAVY TYPE NUMBER
TYPE CFT-46154 RADIO RECEIVER

QUANTITY	NAVY TYPE NUMBER	ALL SYMBOL DESIGNATIONS INVOLVED	DESCRIPTION	NAVY SPEC.OR DRAWING NO.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.
			CAPACITORS - CLASS 48 (continued)					
1	-48895-B10	C-119	Mica: 50 Mmf. ±10%, 500 Volts DC Working	RE-48A-148D	1	1468LS		
1	-481015-B10	C-117	Mica: 400 Mmf. ±10%, 500 Volts DC Working	RE-48A-148D	1	1468LS		
1	-481037-B10	C-114, C-136	Mica: .005 Mfd. ±10% 300 Volts DC Working	RE-48A-143G	1	1467LS		
1	-481070-B10	C-115, C-116	Mica: .001 Mfd. ±10% 300 Volts DC Working	RE-48A-148D	1	1468LS		
1	-481165-B5	C-118	Mica: .015 Mfd. ±5% 600 Volts DC Working	RE-48A-221B	1	1445LS		
1	-481368-B10	C-141	Mica: 80 Mmf. ±10% 500 Volts DC Working	RE-48A-148D	1	1468LS		
1	-481369-B10	C-144	Mica: 800 Mmf. ±10% 500 Volts DC Working	RE-48A-148D	1	1468LS		
1	-481371	C-108	Paper: 0.5/0.5/0.5 Mfd. +10-3% 400 Volts DC Working	RE-48A-133	1		See Footnote	F-27795-1
2	-481372	C-101, C-102, C-103, C-104	Paper: 0.25/0.25/0.25 Mfd. +10-3% 400 Volts DC Working	RE-48A-138E	1	430A		F-19749-1
1	-481373	C-109, C-113	Paper: 0.05 Mfd. +10-3% 400 Volts DC Working	RE-48A-129H	1	430		F-27796-1
1	-481374	C-120	Air, adj. 50 Mmf. max.		2			F-28300-2
1	-481375	C-121, C-122	Air, adj. 15/15 Mmf. max.		2			F-28180-2-1
4	-481376	C-123, C-124, C-125, C-126 C-127, C-128, C-129, C-130	Air, adj. 50/50 Mmf. max.		2			F-28180-2-2
			SOCKETS - CLASS 49					
4	-49367	X-102, X-103, X-104, X-105 X-106, X-107, X-108, X-109	Octal, Ceramic, Silver-plated Contacts	RE-49A-314B	16	228		
			WAVE FILTERS - CLASS 53					
1	-53088	Z-101	Low-pass filter; Z=30,000 ω. Less than 6 DB attenuation below 1300 cycles; over 40 DB attenuation above 1650 cycles. Attenuation at 1000 cycles approx. 2 DB.		14			F-19469-1
			RESISTORS - CLASS 63					
1	-63288	R-121	1000 ω ±10%, 1 W. Comp.		9	BT-1		F-25192-1
1	-63291	R-120	620 ω ±5%, 1 W. Comp.		9	BT-1		F-25192-1
1	-63291	R-109, R-117	0.1 Meg. ±5%, 1 W. Comp.		9	BT-1		F-25192-1
1	-63355	R-139	1080 ω ±5%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63355	R-149	1500 ω ±5%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63355	R-145	1765 ω ±5%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63355	R-103	2700 ω ±5%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63355	R-138	3420 ω ±5%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63355	R-116	22,000 ω ±5%, 1/2 W. Comp.		9	BT-1/2		F-25192-1

-481371-10 (±10%) employed in some equipments

TABLE IV

EQUIPMENT
SPARE PARTS LIST BY NAVY TYPE NUMBER
TYPE CFT-46154 RADIO RECEIVER

QUANTITY	NAVY TYPE NUMBER	ALL SYMBOL DESIGNATIONS INVOLVED	DESCRIPTION	NAVY SPEC.OR DRAWING NO.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.
			RESISTORS - CLASS 63 (continued)					
2	-63355	R-152, R-111, R-124, R-127	0.1 Meg. ±5%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63355	R-122	0.13 Meg. ±5%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63355	R-132	0.2 Meg. ±5%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63355	R-150	0.68 Meg. ±5%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
2	-63360	R-142, R-146, R-148, R-154	360 ω ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63360	R-101, R-102	1000 ω ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63360	R-115	1800 ω ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63360	R-114	2000 ω ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63360	R-107, R-108	2700 ω ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63360	R-112, R-113	3300 ω ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
3	-63360	R-104, R-105, R-106, R-134, R-135	10,000 ω ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63360	R-147	27,000 ω ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63360	R-110	0.1 Meg. ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63360	R-125	0.22 Meg. ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63360	R-118, R-151	0.27 Meg. ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
2	-63360	R-119, R-133, R-153	0.56 Meg. ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
1	-63360	R-123	1.0 Meg. ±10%, 1/2 W. Comp.		9	BT-1/2		F-25192-1
2	-63426	R-123, R-130, R-131	10,000 ω ±5%, 2 W. Comp.		9	BT-2		F-25192-1
2	-63678-5	R-155, R-156, R-157, R-158	33 ω ±5%, 1/2 W. Wirewound	RE-13A-372J	9	BW-1/2		F-31588-1
1	-63678-5	R-129	100 ω ±5%, 1/2 W. Wirewound	RE-13A-372J	9	BW-1/2		F-31588-1
1	-63678-5	R-141	158 ω ±5%, 1/2 W. Wirewound	RE-13A-372J	9	BW-1/2		F-31588-1
1	-63678-5	R-143	163 ω ±5%, 1/2 W. Wirewound	RE-13A-372J	9	BW-1/2		F-31588-1
1	-63678-5	R-140	342 ω ±5%, 1/2 W. Wirewound	RE-13A-372J	9	BW-1/2		F-31588-1
1	-63678-5	R-144	392 ω ±5%, 1/2 W. Wirewound	RE-13A-372J	9	BW-1/2		F-31588-1
1	-631089	R-128	W.W. Potentiometer; 2000 ω; linear; 3 watts	RE-13A-492B	10	P58-2000		F-28793-1
1	-631090	R-136	Dual W.W. Potentiometer. Front: 5000 ω Total 200 ω at 30% CCW rotation, RH Taper, 1.5 Watts. Rear: 28,000 ω total, 400 ω at 70% CW rotation, LH Taper, 1.5 Watts	RE-13A-492B	10	Dual P58		F-28791-1
1	-631091	R-137	W.W. Potentiometer. 10,000 ω, 2 Watts; LH Log. Taper	RE-13A-492B	10	P58-10,000 W.		F-28792-1

TABLE IV

EQUIPMENT
SPARE PARTS LIST BY NAVY TYPE NUMBER
TYPE CFT-46154 RADIO RECEIVER

QUANTITY	NAVY TYPE NUMBER	ALL SYMBOL DESIGNATIONS INVOLVED	DESCRIPTION	NAVY SPEC. OR DRAWING NO.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.
			VACUUM TUBES					
1		V-101	Neon lamp; T-2 bulb, unbased		19	NE-2		
1	6J5	V-105	Medium Mu Triode	RE-13A-600D	15	6J5		
1	6K6-GT	V-109	Power pentode		15	6K6-GT		
2	6SJ7	V-107, V-108	Sharp cut-off pentode		15	6SJ7		
4	6SK7	V-102, V-103, V-104, V-106	Remote cut-off pentode	RE-13A-600D	15	6SK7		
1			Spare Parts Box	42-B-9			18" x 9" x 6"	RC-2590-1-1

STOCK SPARE PARTS
TYPE CFT-46154 RADIO RECEIVER

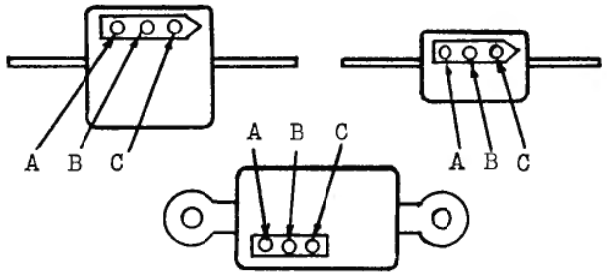
QUANTITY *	NAVY TYPE NUMBER	ALL SYMBOL DESIGNATIONS INVOLVED	DESCRIPTION	NAVY SPEC. OR DRAWING NO.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE RATING OR MODIFICATION	FEDERAL TEL. DRAWING NO.	PRICE UNIT	PRICE TOTAL
			METERS (CLASS 22)							
4	-22353	M-102	Decibel (Output) Meter. Scale -10 to +5 DB, responsiveness 0.6 sec. or less, damping factor between 16 & 200 when used on a 120 ohm line. Sensitivity: zero level = 72 microwatts, 0.6 volt. Resistance at zero level: 5000 ohms -0 +10% (1000 c.p.s.). 2-1/2" flush wide-flange metal case. Non-glare glass. Resistor wax-treated. Tropic-sealed. Buff-colored scale.	17-I-12 (INT)	8			F-19570-1		$86.84
4	-22354	M-101	Voltmeter, D.C. 0-250 Volts. Resistance: 200 ohms per volt. 2-1/2" flush wide-flange metal case. Non-glare glass. Tropic-sealed. Buff-colored scale.	17-I-12 (INT)	8			F-28853-1	11.79	
			R.F. CHOKE (CLASS 47)							
1	-47190	L-121,L-122, L-123,L-124	R.F. Choke 5.5 microhenries. DC resistance: 0.85 ohms		7	Z-1	Stamp Navy Type No.& War-Dip.	F-28850-1		
			WAVE FILTER (CLASS 53)							
2	-53089	Z-102	Band-pass filter; Z=30,000 ω. Band center 1000 cycles ±5%; band width at 6 DB attenuation - not less than 180 cycles; band width at 40 DB attenuation - not more than 450 cycles; attenuation below 725 cycles and above 1350 cycles - over 40 DB. (Attenuation values relative to response at band center.) Insertion loss at band center approximately 4 DB.		14			F-19485-1		
			INDUCTORS							
1		L-101	Antenna Coil,band 1.Iron core,bakelite dowel		2			F-29215-1-1		
1		L-102	Antenna Coil,band 2.Iron core,bakelite bar		2			F-29214-1-1		
1		L-103	Antenna Coil,band 3.Iron core,ceramic form		2			F-29183-3-7		
1		L-104	Antenna Coil,band 4.Iron core,ceramic form		2			F-29183-3-10		
1		L-105,L-109,L-113	R.F.Amp.Coil,band 1.Iron core,bakelite dowel		2			F-29215-1-2		
1		L-106,L-110,L-114	R.F.Amp.Coil,band 2.Iron core,bakelite bar		2			F-29214-1-2		
1		L-107,L-111,L-115	R.F.Amp.Coil,band 3.Iron core,ceramic form		2			F-29183-3-8		
1		L-108,L-112,L-116	R.F.Amp.Coil,band 4.Iron core,ceramic form		2			F-29183-3-11		
1		L-117	Osc. Coil, band 1.Iron core,ceramic form		2			F-29183-3-3		
1		L-118	Osc. Coil, band 2.Iron core,ceramic form		2			F-29183-3-6		
1		L-119	Osc. Coil, band 3.Iron core,ceramic form		2			F-29183-3-9		
1		L-120	Osc. Coil, band 4.Iron core,ceramic form		2			F-29183-3-12		

* Quantity per set of Stock Spare Parts.

TABLE V
APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

COLOR CODE IN MMFD. FOR CAPACITORS

COLOR	A 1ST DIGIT	B 2ND DIGIT	C CIPHERS
Black	-	0	.0
Brown	1	1	0
Red	2	2	00
Orange	3	3	000
Yellow	4	4	0000
Green	5	5	00000
Blue	6	6	000000
Purple	7	7	0000000
Gray	8	8	00000000
White	9	9	--



RCA Color Coded Capacitors

Capacity in mmfd.

Values designate tolerance by color.

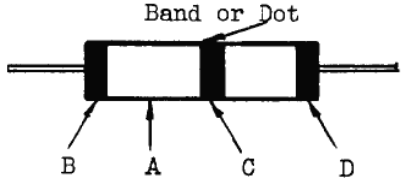
Yellow ±20% Blue ±10% Black ±5%

RMA COLOR CODE FOR RESISTORS

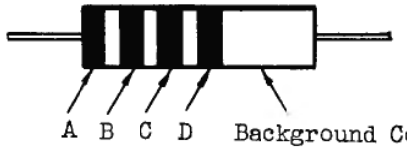
COLOR	A 1ST DIGIT	B 2ND DIGIT	C CIPHERS
Black	-	0	.0
Brown	1	1	0
Red	2	2	00
Orange	3	3	000
Yellow	4	4	0000
Green	5	5	00000
Blue	6	6	000000
Purple	7	7	0000000
Gray	8	8	00000000
White	9	9	--

D - Tolerance Code:

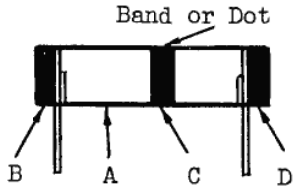
Gold = 5% Silver = 10% Omit = 20%



Original Color Arrangement for Axial Leads



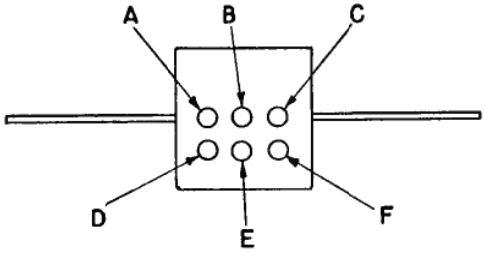
New Color Arrangement for Axial Leads



Standard Color Arrangement for Radial Leads

RMA SIX-DOT COLOR CODE FOR MICA CAPACITORS

A - 1st Significant Figure
B - 2nd " "
C - 3rd " "
D - Voltage Rating
E - Capacity Tolerance
F - Decimal Multiplier



(READ IN SAME DIRECTION AS BRAND NAME.)

COLOR	SIGNIFICANT FIGURE	DECIMAL MULTIPLIER	VOLTAGE RATING	CAPACITY TOLERANCE
Black	0	1		
Brown	1	10	100	1%
Red	2	100	200	2%
Orange	3	1,000	300	3%
Yellow	4	10,000	400	4%
Green	5	100,000	500	5%
Blue	6	1,000,000	600	6%
Violet	7		700	7%
Grey	8		800	8%
White	9		900	9%
Gold		.1	1000	
Silver		.01		10%
None			500	20%

EXAMPLES

A	B	C	D	E	F	DESCRIPTION
brown	black	black	orange	none	red	10,000 mmf (.01 mfi) ±20%; 300 V.
green	black	black	green	silver	brown	5,000 mmf (.005 mfd) ±10%; 500 V.
red	black	black	green	silver	brown	2,000 mmf (.002 mfd) ±10%; 500 V.
red	black	black	none	silver	black	200 mmf ±10%; 500 V.
black	red	black	none	green	black	20 mmf ±5%; 500 V.

TABLE VI

LIST OF MANUFACTURERS

FOR NAVY TYPE CFT-46154 RADIO RECEIVER

Code Number	Mfr's. Prefix	Name	Address
1	CAW	Aerovox Corporation	New Bedford, Massachusetts
2	FTC	Federal Telephone & Radio Corporation	200 Mount Pleasant Avenue, Newark, New Jersey
3	CG	General Electric Company	40 Seventeenth Avenue, Newark, New Jersey
4	CCN	Connecticut Telephone & Electric Corp.	Meriden, Connecticut
5	CN	National Electric Machine Shops, Inc.	2014 Fifth Street, N.E., Washington, D. C.
6	CPH	American Phenolic Corporation	1250 West Van Buren Street, Chicago, Illinois
7	CQM	Chmite Manufacturing Company	4835-55 West Flournoy Street, Chicago, Illinois
8	CV	Weston Electrical Instrument Corp.	614 Frelinghuysen Avenue, Newark, New Jersey
9	CIR	International Resistance Company	401 North Broad Street, Philadelphia, Pennsylvania
10	CMC	Clarostat Manufacturing Company, Inc.	285 North Sixth Street, Brooklyn, New York
11	CHH	Arrow Hart & Hegemann Electric Company	103 Hawthorn Street, Hartford, Connecticut
12		Oak Manufacturing Company	1260 Clybourn Avenue, Chicago, Illinois
13	CRV	RCA Manufacturing Company	Camden, New Jersey
14	CUT	United Transformer Company	150 Varick Street, New York, New York
15	CRC	RCA Radiotron	Harrison, New Jersey
16	CEJ	E. F. Johnson Company	Waseca, Minnesota
17		Allen Manufacturing Company	133 Sheldon Street, Hartford, Connecticut
18		Drake Manufacturing Company	1713 West Hubbard Street, Chicago, Illinois
19	CG	General Electric Company, Lamp Division	410 Eighth Street, Hoboken, New Jersey
20		Lord Manufacturing Company	Erie, Pennsylvania
21		Seaboard Metal Products Company	532 Mulberry Street, Newark, New Jersey
22		The National Company	Malden, Massachusetts
23		Isolantite, Inc.	Belleville, New Jersey

TABLE VII
VACUUM TUBE DATA

TUBE TYPE SYMBOL DESIGNATIONS:	6J5 V-105	6SJ7 V-107; V-108	6SK7 V-102; V-103: V-104; V-106	6K6-GT V-109
Pin No. 1:	Shell	Shell	Shell	Open
Pin No. 2:	Heater	Heater	Heater	Heater
Pin No. 3:	Plate	Suppressor Grid	Suppressor Grid	Plate
Pin No. 4:	Open	Control Grid	Control Grid	Screen Grid
Pin No. 5:	Grid	Cathode	Cathode	Control Grid
Pin No. 6:	Open	Screen Grid	Screen Grid	Open
Pin No. 7:	Heater	Heater	Heater	Heater
Pin No. 8:	Cathode	Plate	Plate	Cathode
TYPICAL OPERATING CONDITIONS				
Heater Voltage	6.3 V	6.3 V	6.3 V	6.3 V
Heater Current	0.3 A	0.3 A	0.3 A	0.4 A
Control Grid voltage	-8 V ***	-3 V	-3 V	-13.5 V
Plate Voltage	250 V	250 V	250 V	180 V
Screen Voltage	-	100 V	100 V	180 V
Suppressor Voltage	-	Cathode	Cathode	-
Plate Current	9 MA ***	3 MA	9.2 MA	18.5 MA
Screen Current	-	0.8 MA	2.4 MA	3.0 MA
Plate Resistance	7700 ohms	1,000,000 ohms	800,000 ohms (Approx.)	81,000 ohms
Amplification Factor	20	-	-	-
Transconductance	2600 Micromhos ***	1650 Micromhos	2000 Micromhos	1850 Micromhos
Control Grid Bias	-8 V ***	-9 V *	-35 V **	-13.5 V
Load Resistance	-	-	-	9000 ohms
Output	-	-	-	1500 MW
OPERATING LIMITS				
Plate Voltage	300 V Max.	300 V Max.	300 V Max.	315 V Max.
Screen Voltage	-	125 V Max.	125 V.Max.	285 V Max.
Control Grid Voltage	0 V Min.	0 V Min.	0 V Min.	-
Plate Dissipation	-	-	-	8.5 W Max.
Screen Dissipation	-	-	-	2.5 W Max.

* For cathode current cut-off ** For mutual conductance of 10 Micromhos *** As amplifier

Note 1. See paragraph 6-5-3 for actual operating conditions in equipment.

Note 2. Tubes should be replaced when the transconductance drops 25% below the values listed under "Typical Operating Conditions" above. Care should be taken to measure the transconductance under the voltage conditions in that table.

Note 3. ALL TUBES SUPPLIED WITH THE EQUIPMENT OR AS SPARES ON THE EQUIPMENT CONTRACT SHALL BE USED IN THE EQUIPMENT PRIOR TO EMPLOYMENT OF TUBES FROM GENERAL STOCK.

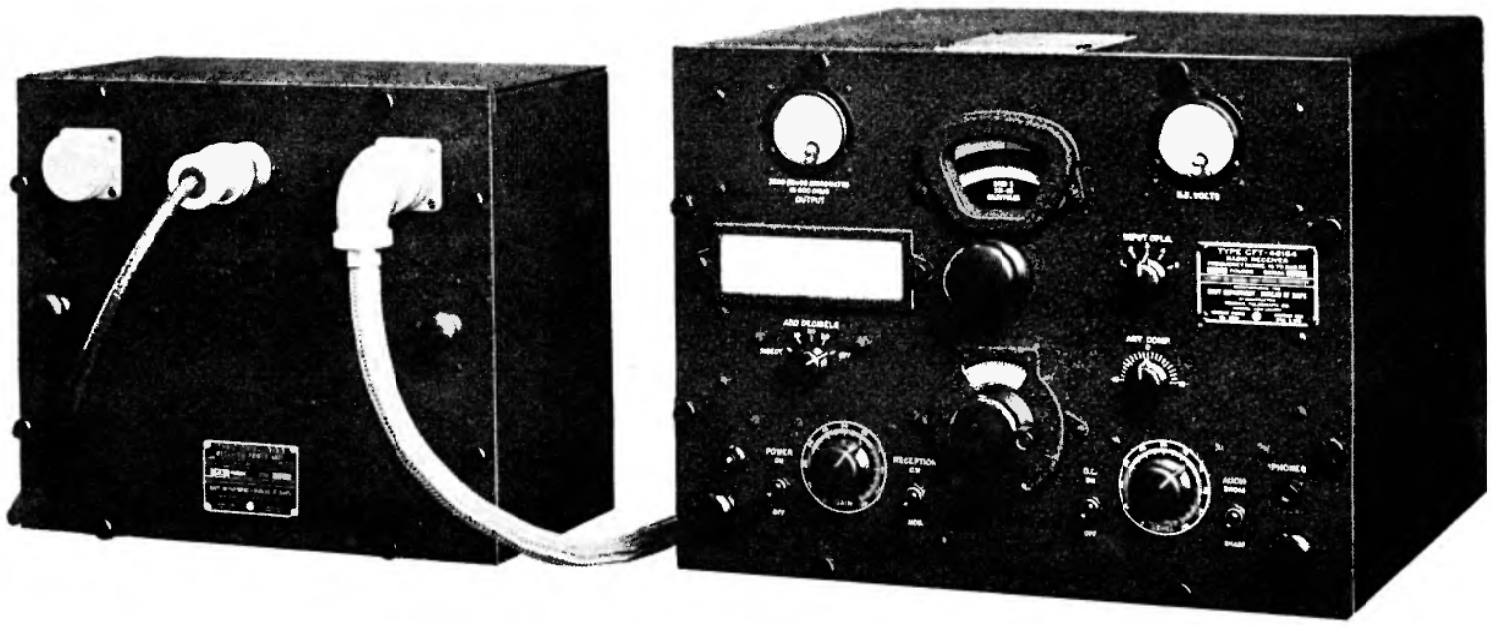


FIG. 11 MODEL RBA EQUIPMENT ASSEMBLED FOR OPERATION

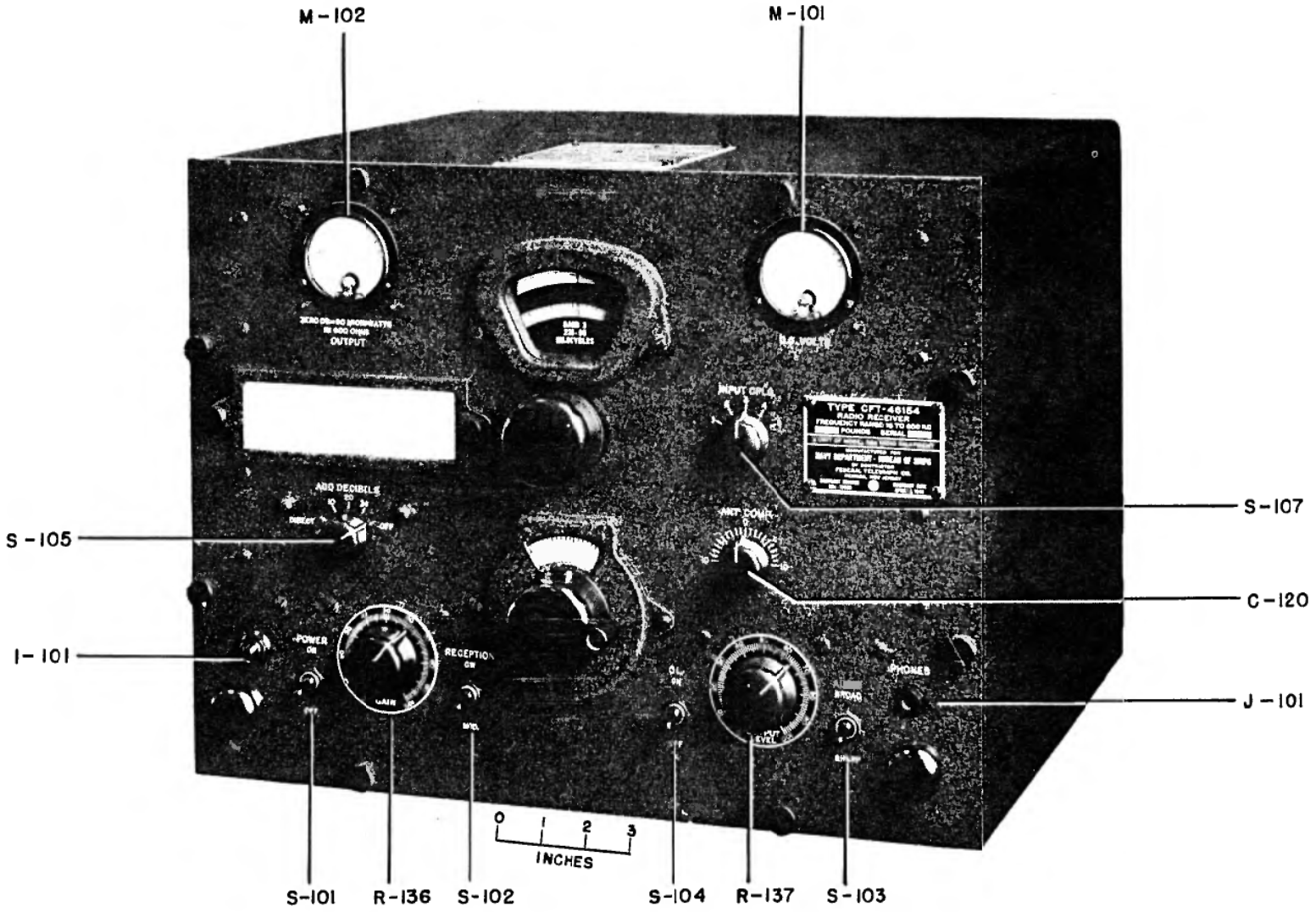


FIG. 12 NAVY TYPE CFT-46154 RADIO RECEIVER, IN CABINET

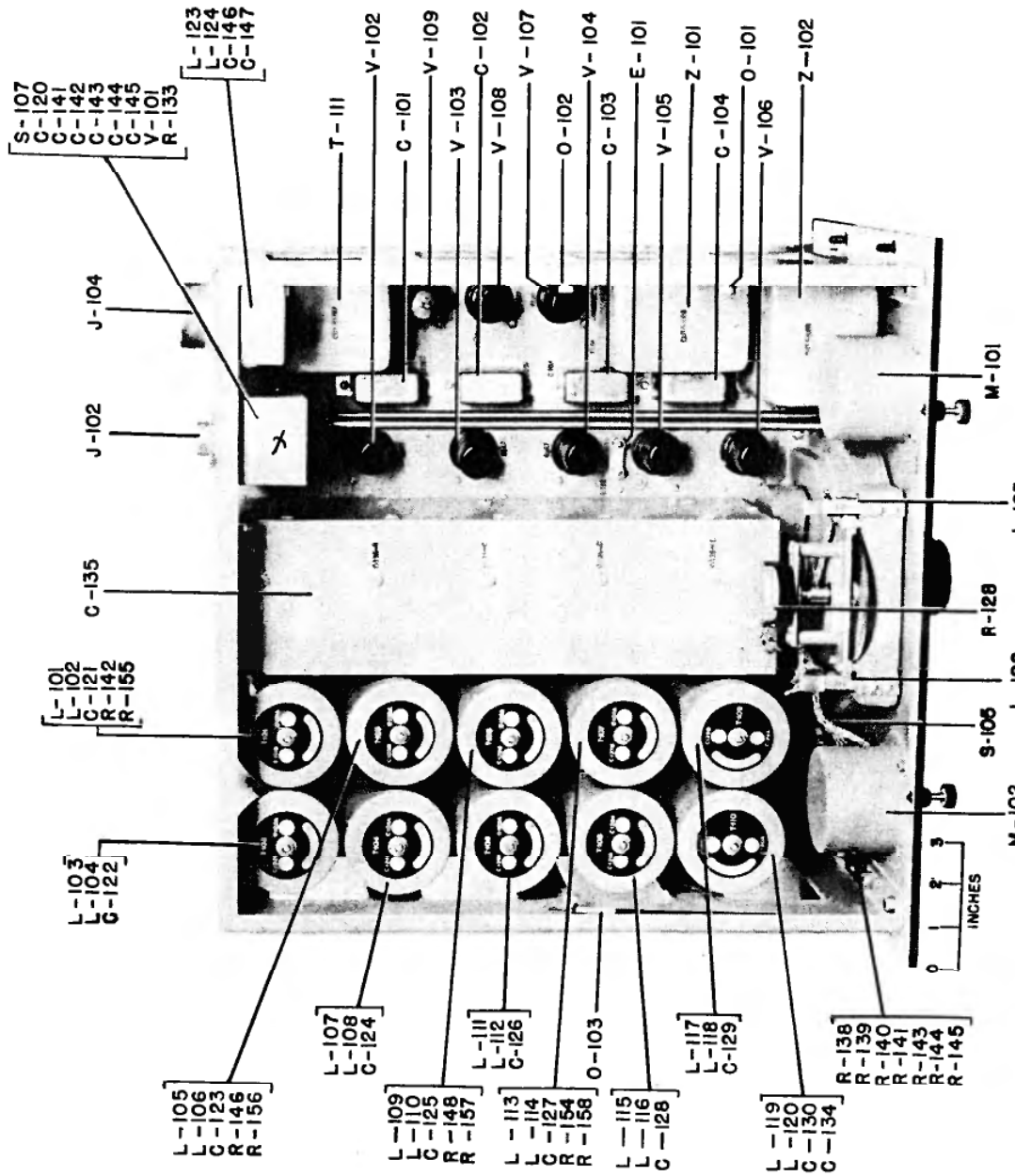


FIG. 13 NAVY TYPE CFT-46154 RADIO RECEIVER, TOP VIEW, CHASSIS

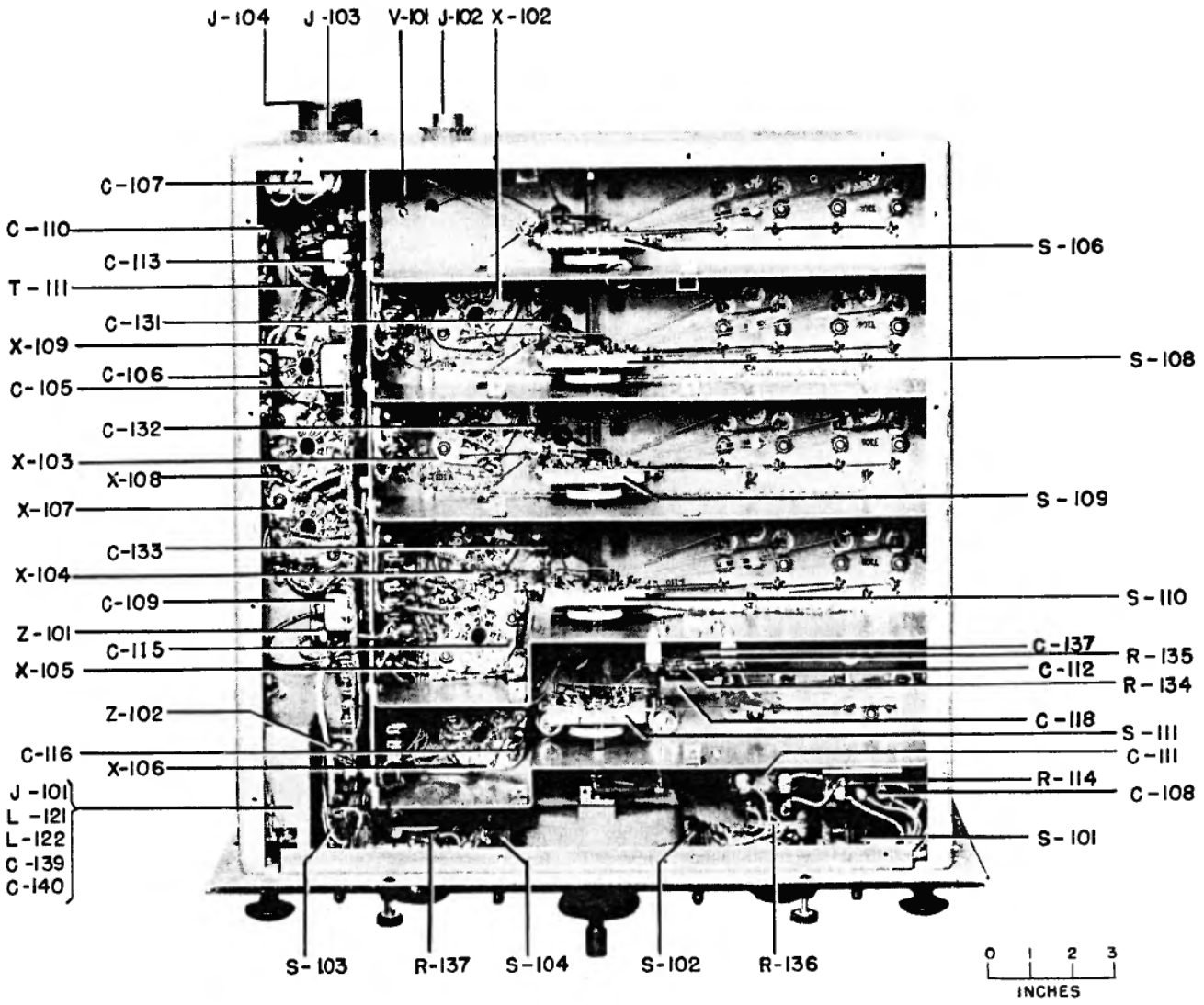


FIG. 14 NAVY TYPE CFT-46154 RADIO RECEIVER, BOTTOM VIEW, CHASSIS

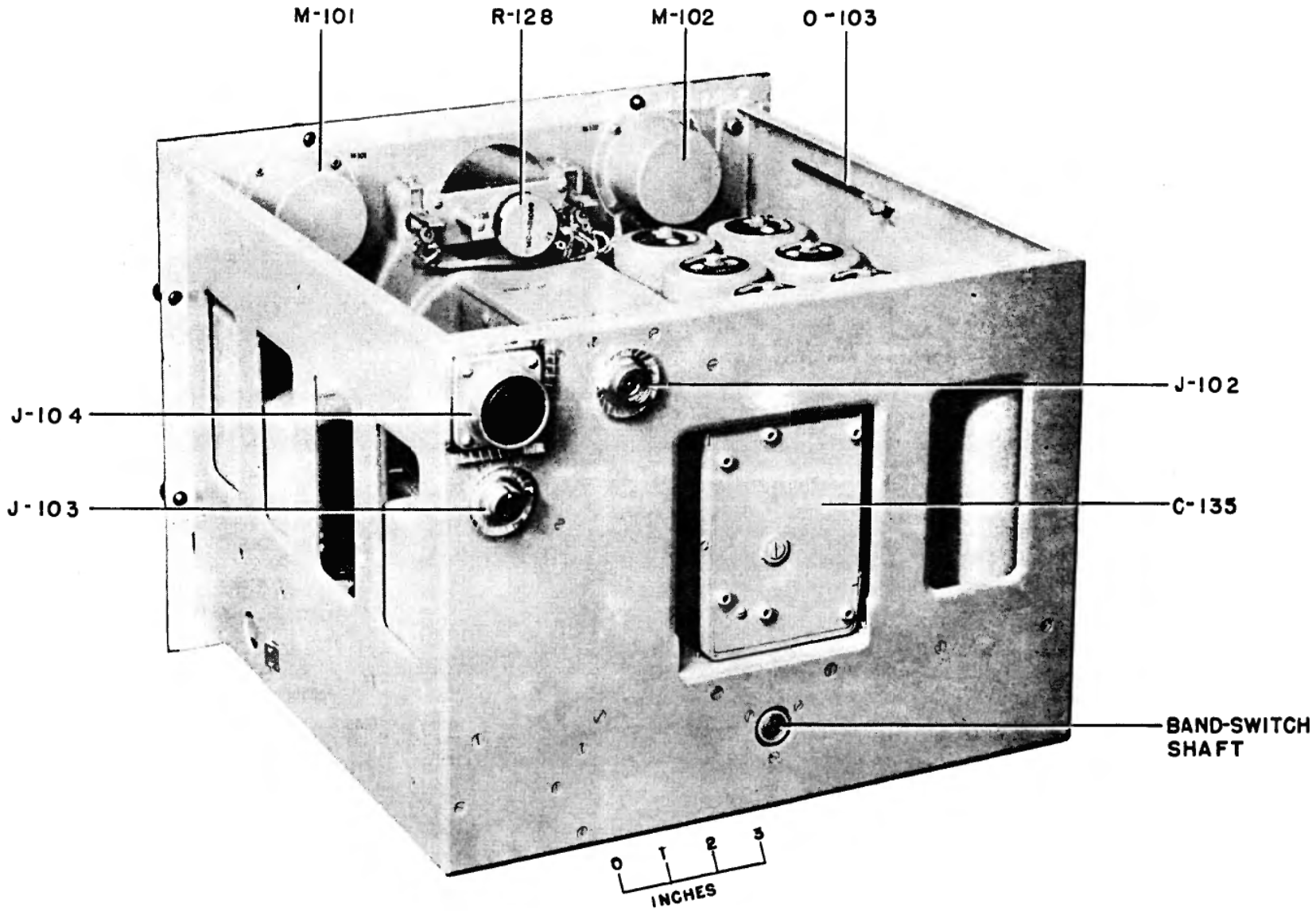


FIG. 15 NAVY TYPE CFT-46154 RADIO RECEIVER, REAR OBLIQUE VIEW, CHASSIS

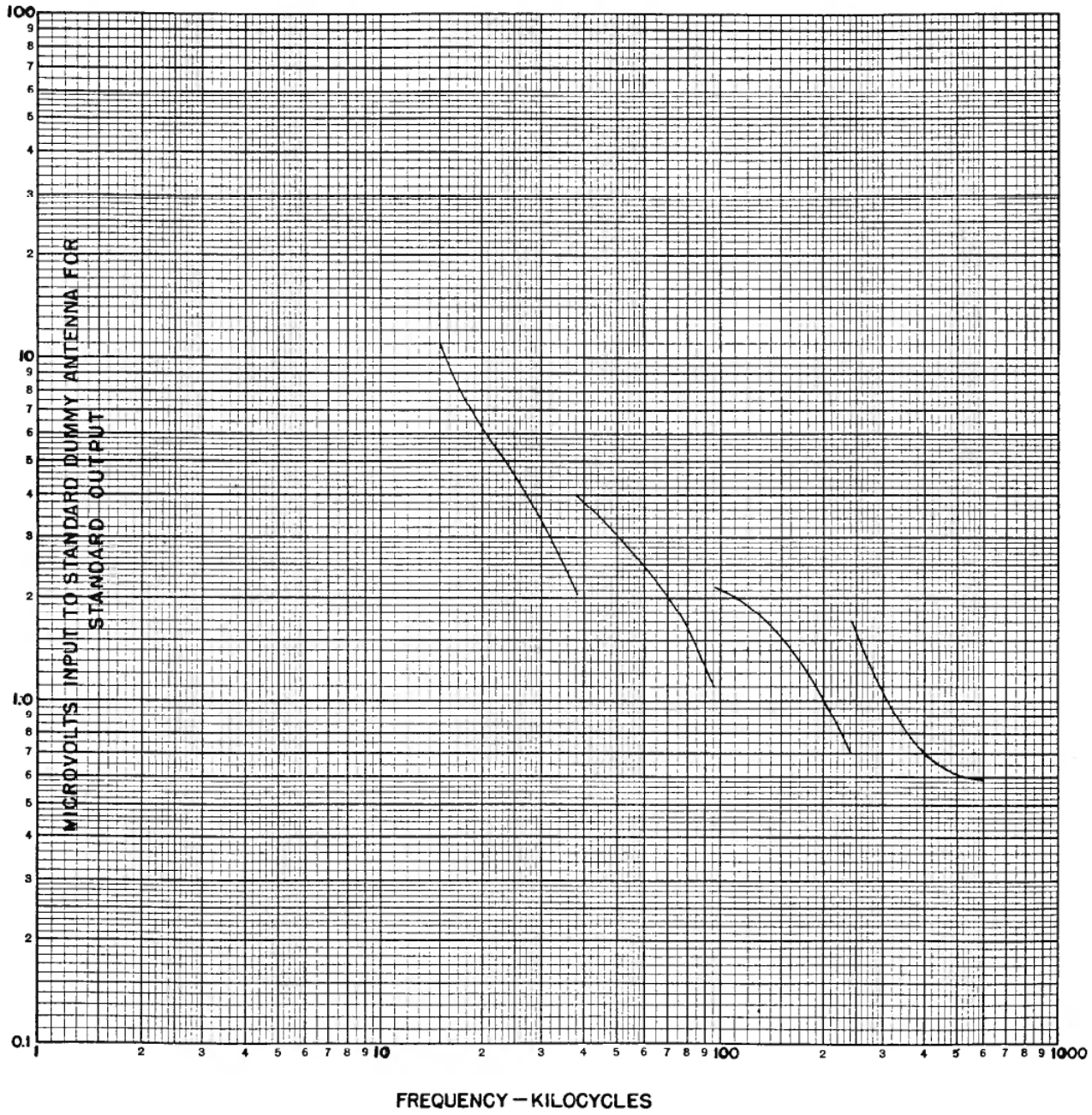


FIG. 16 TYPICAL CW SENSITIVITY

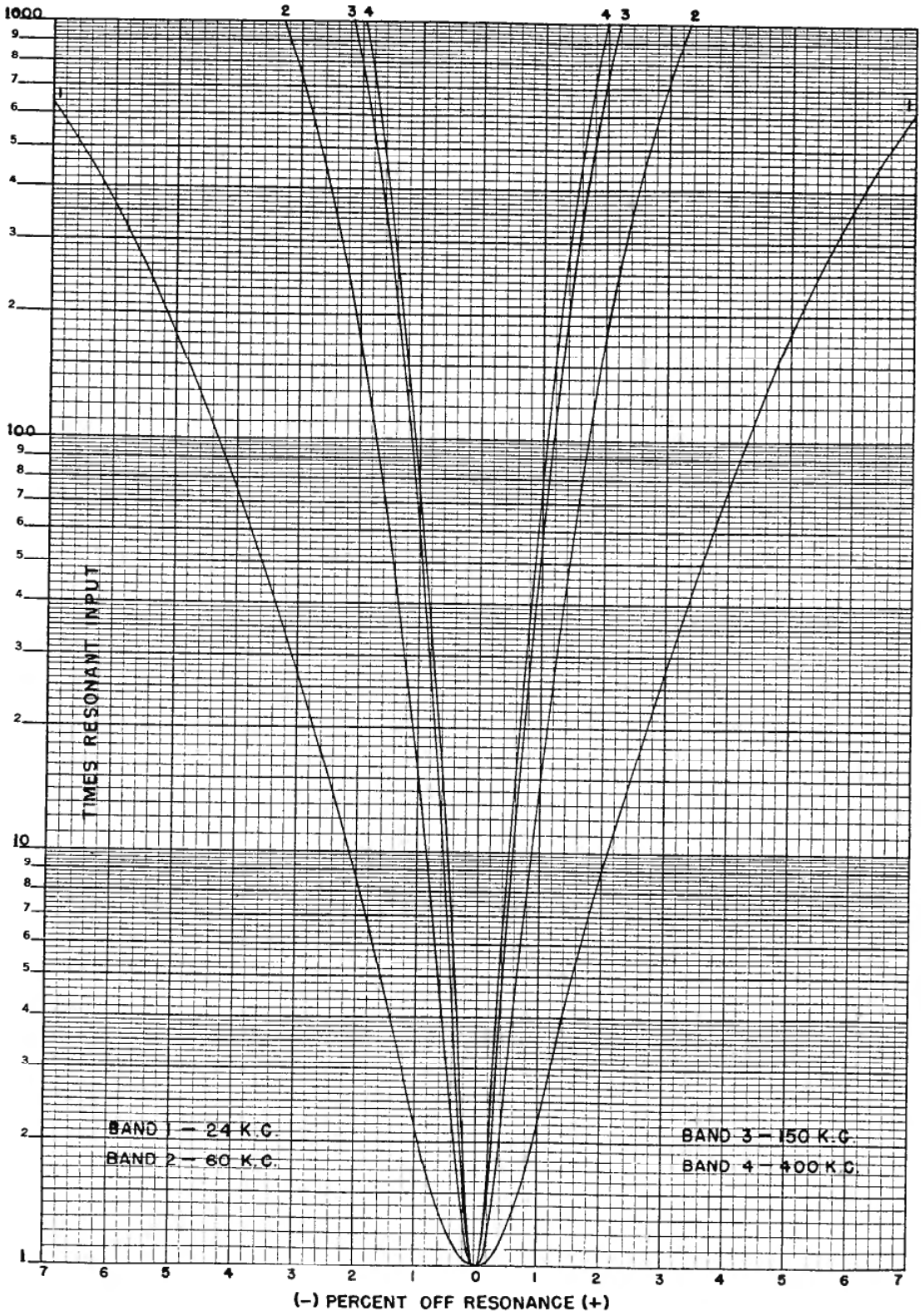


FIG. 17 TYPICAL SELECTIVITY, RADIO FREQUENCY AMPLIFIER

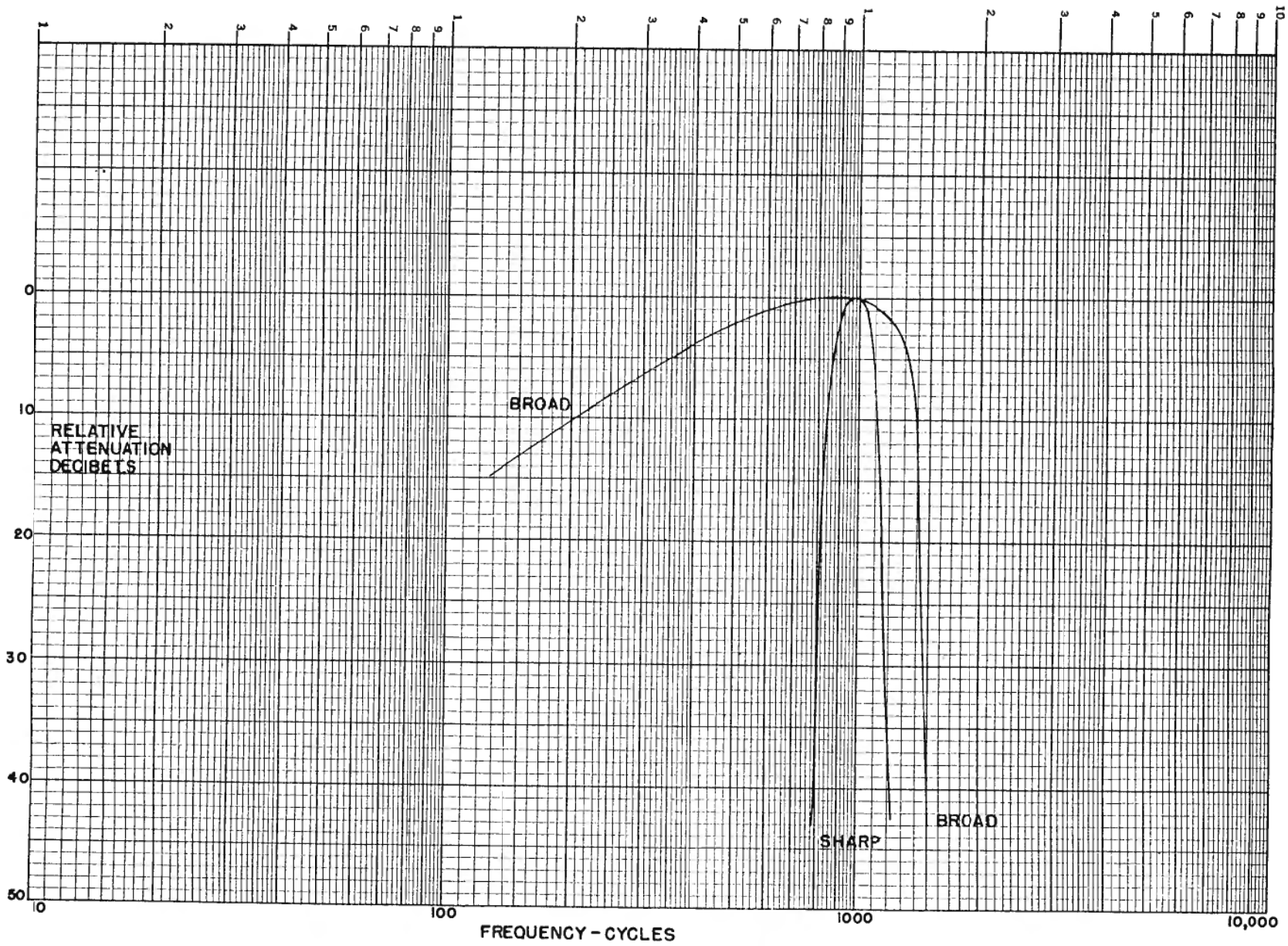


FIG. 18 TYPICAL FREQUENCY CHARACTERISTICS, AUDIO FREQUENCY AMPLIFIER

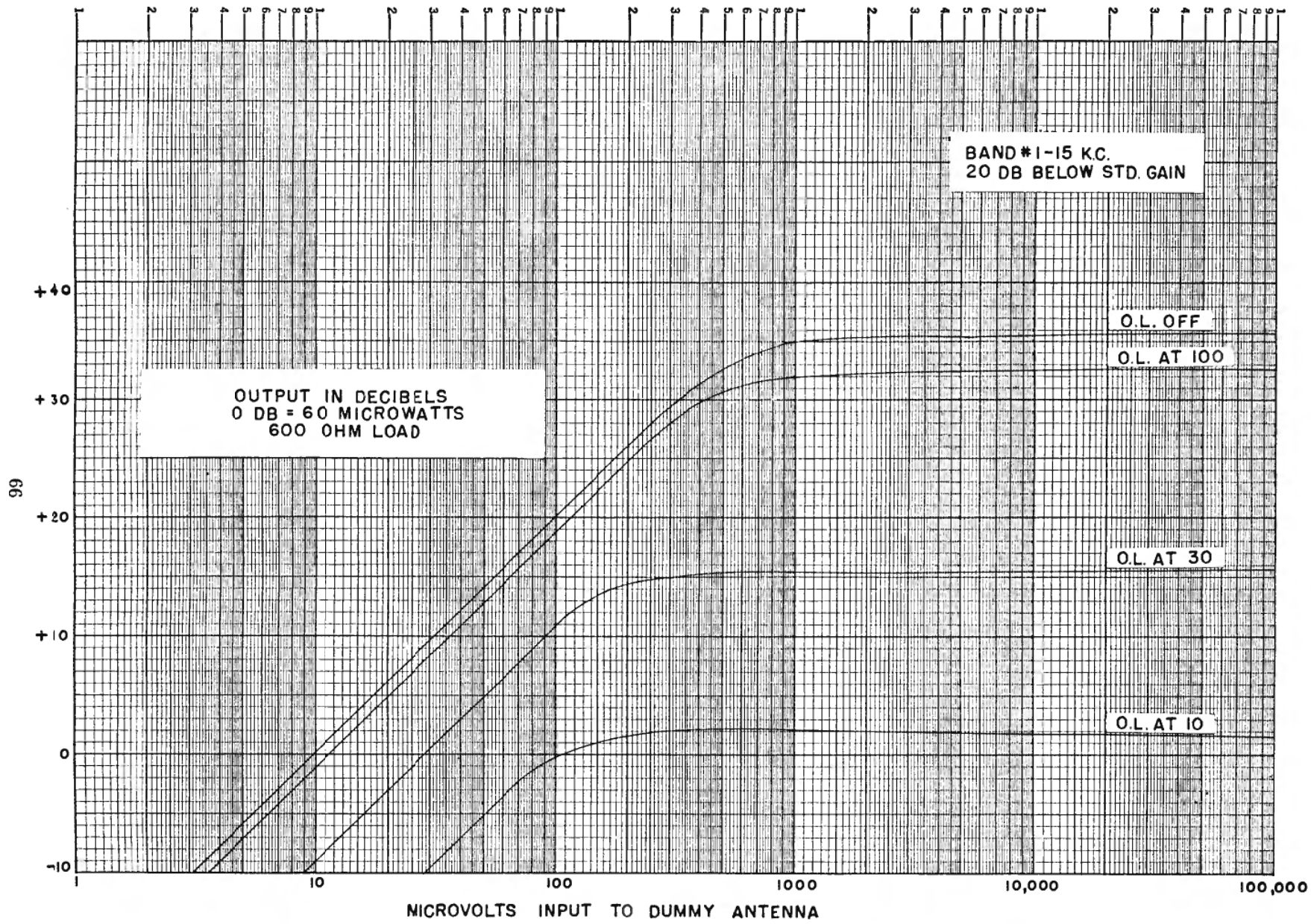


FIG. 19 TYPICAL RESONANT OVERLOAD AND OUTPUT LIMITER CHARACTERISTICS

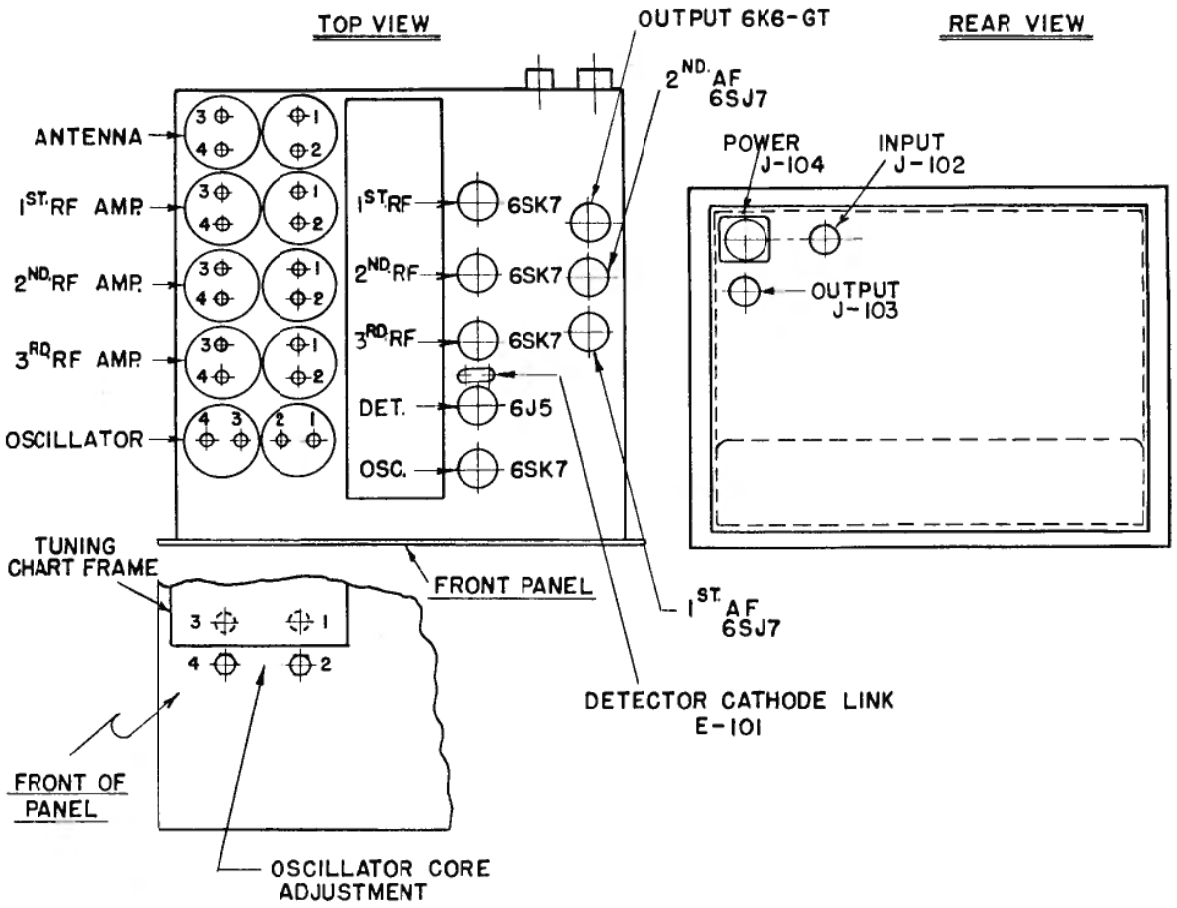


FIG. 20 RECEIVER CHASSIS LAYOUT DIAGRAM

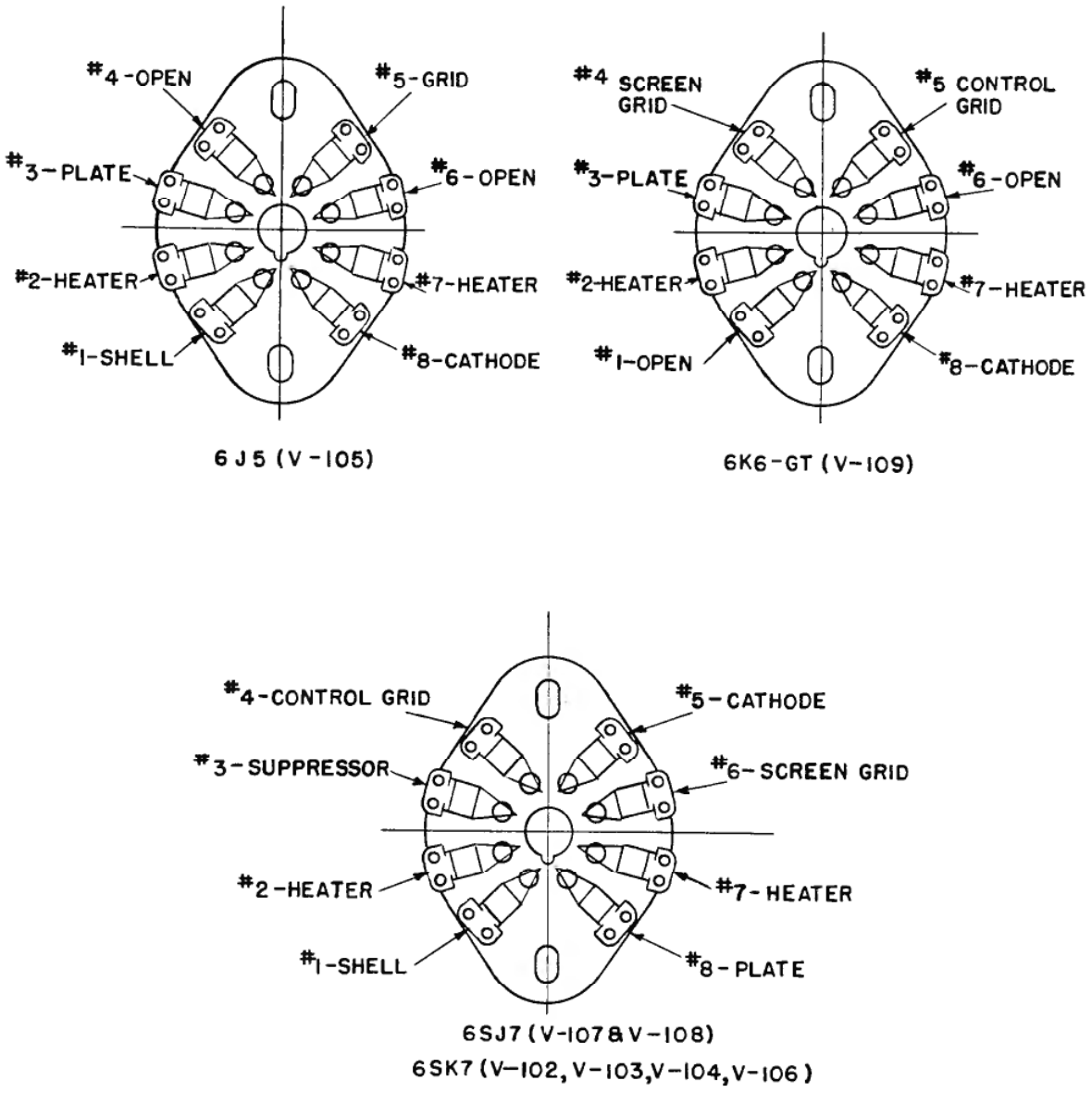


FIG. 21 TUBE SOCKET DIAGRAM, RECEIVER

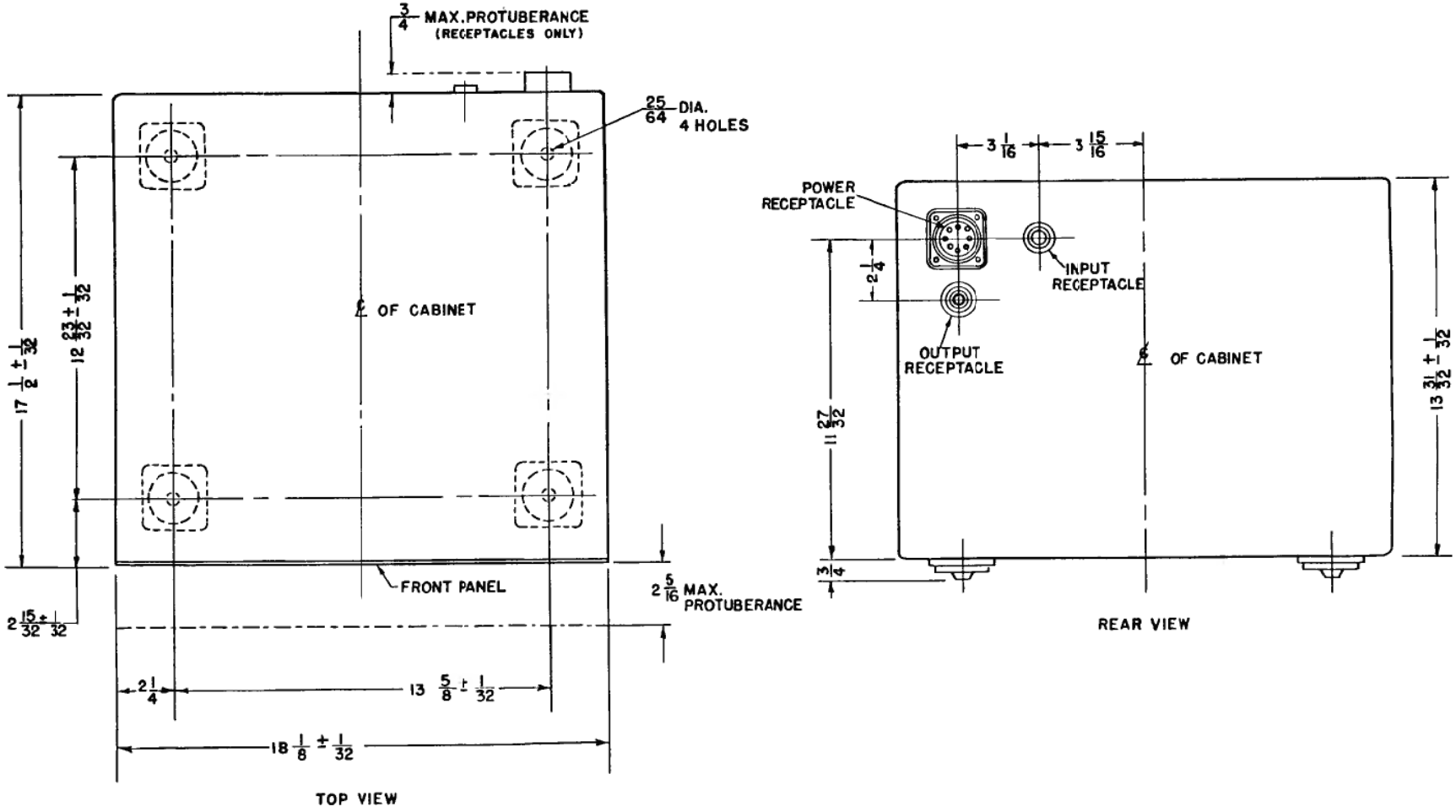
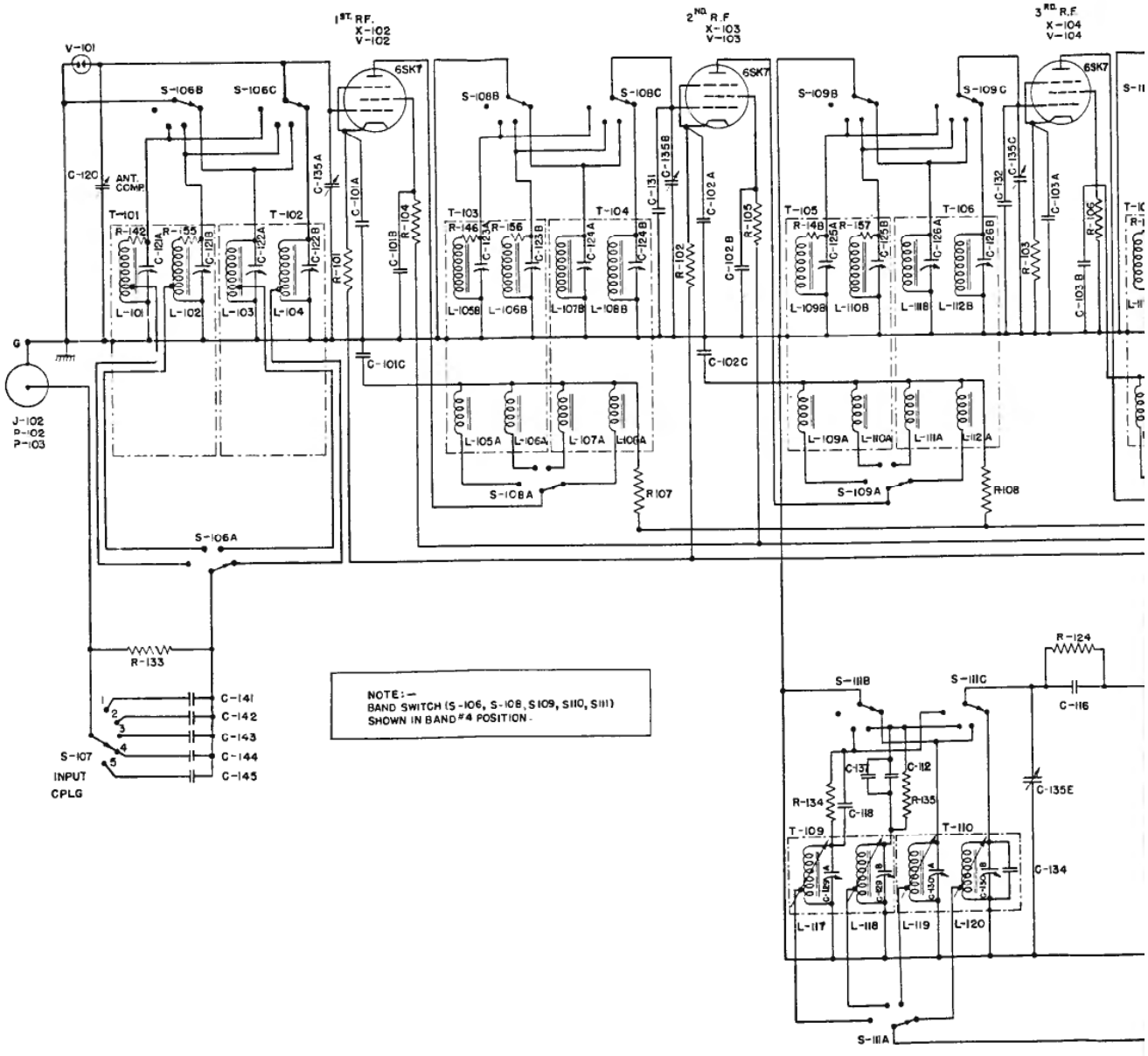


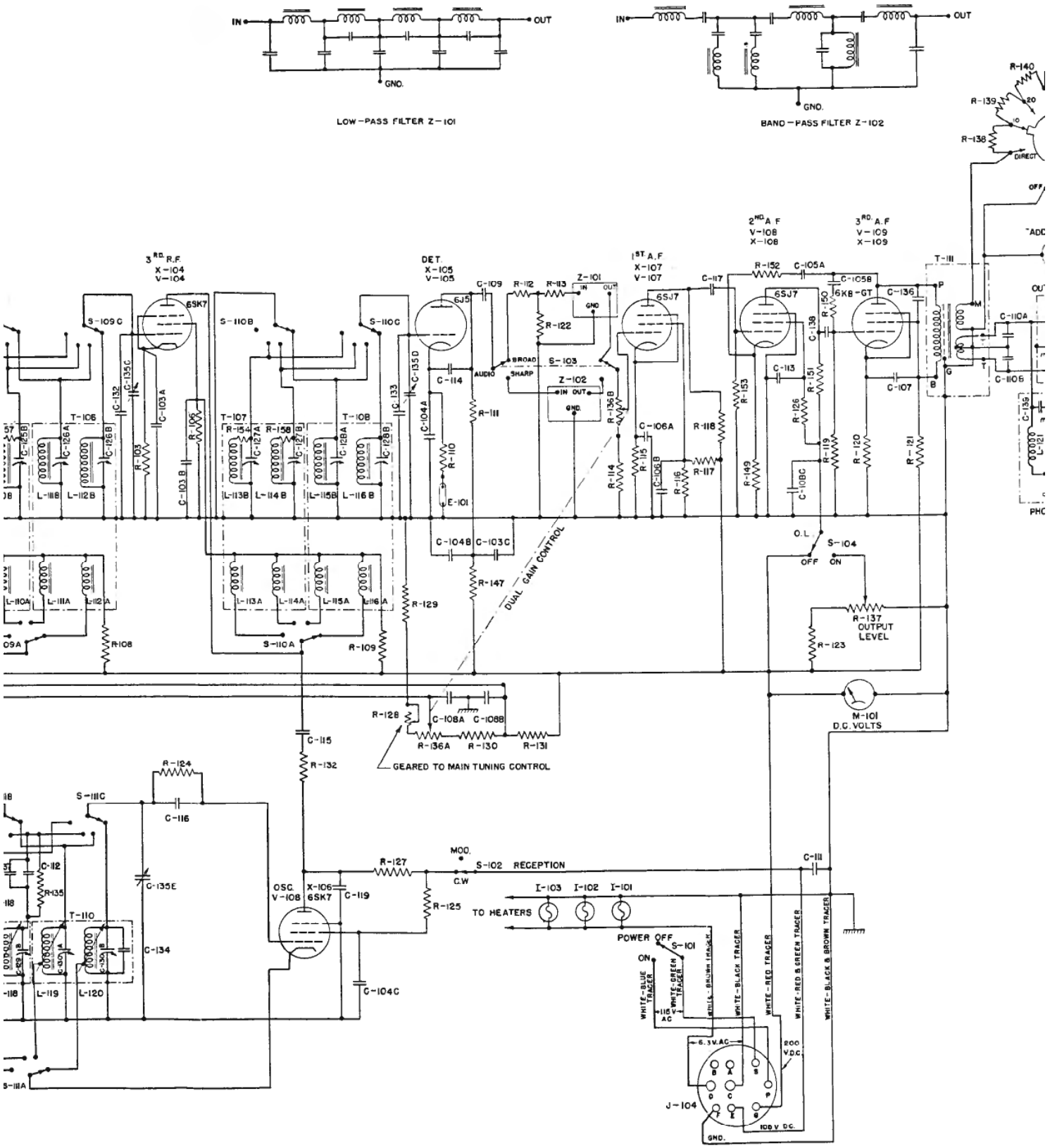
FIG. 22 OUTLINE DRAWING, NAVY TYPE CFT-46154 RADIO RECEIVER, IN CABINET

SIMPLIFIED PARTS LIST

(See Table II for Detailed Parts List)

C-101	.25/.25/.25 mfd.
C-102	.25/.25/.25 mfd.
C-103	.25/.25/.25 mfd.
C-104	.25/.25/.25 mfd.
C-105	.25/.25 mfd.
C-106	.25/.25 mfd.
C-107	2 mfd.
C-108	.5/.5/.5 mfd.
C-109	.05 mfd.
C-110	.1/.1 mfd.
C-111	.5 mfd.
C-112	.025 mfd.
C-113	.05 mfd.
C-114	.005 mfd.
C-115	.001 mfd.
C-116	.001 mfd.
C-117	400 mmfd.
C-118	.015 mfd.
C-119	50 mmf.
C-120	50 mmf. max.
C-121	15/15 mmf. max.
C-122	15/15 mmf. max.
C-123	50/50 mmf. max.
C-124	50/50 mmf. max.
C-125	50/50 mmf. max.
C-126	50/50 mmf. max.
C-127	50/50 mmf. max.
C-128	50/50 mmf. max.
C-129	50/50 mmf. max.
C-130	50/50 mmf. max.
C-131	20 mmf.
C-132	20 mmf.
C-133	20 mmf.
C-134	20 mmf.
C-135	0-708 mmf. effective
C-136	.005 mmf.
C-137	.025 mmf.
C-138	.002 mfd.
C-139	.01 mfd.
C-140	.01 mfd.
C-141	80 mmf.
C-142	200 mmf.
C-143	500 mmf.
C-144	800 mmf.
C-145	.002 mfd.
C-146	.01 mfd.
C-147	.01 mfd.
E-101	Link
I-101	Pilot Lamp
I-102	Dial Lamp
I-103	Dial Lamp
J-101	Phone Jack
J-102	Input Receptacle
J-103	Output Receptacle
J-104	Power Receptacle
L-101	Antenna Coil, band 1
L-102	" " " 2
L-103	" " " 3
L-104	" " " 4
L-105	1st. RF Coil, band 1
L-106	" " " " 2
L-107	" " " " 3
L-108	" " " " 4
L-109	2nd. RF Coil, band 1
L-110	" " " " 2
L-111	" " " " 3
L-112	" " " " 4
L-113	3rd. RF Coil, band 1
L-114	" " " " 2
L-115	" " " " 3
L-116	" " " " 4
L-117	Osc. Coil, band 1
L-118	Osc. Coil, band 2
L-119	Osc. Coil, band 3
L-120	Osc. Coil, band 4
L-121	RF Choke
L-122	RF Choke
L-123	RF Choke
L-124	RF Choke
M-101	Plate Voltmeter
M-102	Output Meter
P-101	Output Plug
P-102	Input Plug
P-103	Adaptor
R-101	1000 ohms
R-102	1000 ohms
R-103	2700 ohms
R-104	10,000 ohms
R-105	10,000 ohms
R-106	10,000 ohms
R-107	2700 ohms
R-108	2700 ohms
R-109	.1 meg.
R-110	.1 meg.
R-111	.1 meg.
R-112	3300 ohms
R-113	3300 ohms
R-114	2000 ohms
R-115	1800 ohms
R-116	22,000 ohms
R-117	.1 meg.
R-118	.27 meg.
R-119	.56 meg.
R-120	620 ohms
R-121	1000 ohms
R-122	.13 meg.
R-123	10,000 ohms
R-124	.1 meg.
R-125	.22 meg.
R-126	1.0 meg.
R-127	.1 meg.
R-128	2000 ohms
R-129	100 ohms
R-130	10,000 ohms
R-131	10,000 ohms
R-132	.2 meg.
R-133	.56 meg.
R-134	10,000 ohms
R-135	10,000 ohms
R-136	5000/28,000 ohms
R-137	10,000 ohms
R-138	3420 ohms
R-139	1080 ohms
R-140	342 ohms
R-141	158 ohms
R-142	360 ohms
R-143	163 ohms
R-144	392 ohms
R-145	1765 ohms
R-146	360 ohms
R-147	27,000 ohms
R-148	360 ohms
R-149	1500 ohms
R-150	.68 meg.
R-151	.27 meg.
R-152	.1 meg.
R-153	.56 meg.
R-154	360 ohms
R-155	33 ohms
R-156	33 ohms
R-157	33 ohms
R-158	33 ohms
S-101	Power
S-102	Reception
S-103	Audio
S-104	Output Limiter
S-105	Meter Multiplier
S-106	Band Switch
S-107	Input Coupling
S-108 to S-111	Band Switch
V-101	Neon Lamp
V-102	6SK7
V-103	6SK7
V-104	6SK7
V-105	6J5
V-106	6SK7
V-107	6SJ7
V-108	6SJ7
V-109	6K6-GT
Z-101	L. P. Filter
Z-102	B. P. Filter


1ST. R.F.
X-102
V-102
2ND. R.F
X-103
V-103
3RD. R.F.
X-104
V-104
V-101
6SK7
S-106B
S-106C
S-108B
S-108C
S-109B
S-109C
C-120
ANT. COMP.
C-135A
C-101A
C-101B
C-101C
R-101
R-104
T-101
T-102
T-103
T-104
T-105
T-106
L-101
L-102
L-103
L-104
L-105B
L-106B
L-107B
L-108B
L-109B
L-110B
L-111B
L-112B
C-131
C-135B
C-102A
C-102B
C-102C
R-102
R-105
C-132
C-135C
C-103A
C-103B
R-106
G
J-102
P-102
P-103
L-105A
L-106A
L-107A
L-108A
L-109A
L-110A
L-111A
L-112A
S-108A
S-109A
R107
R108
S-106A
R-133
S-107
INPUT
CPLG
C-141
C-142
C-143
C-144
C-145
NOTE:—
BAND SWITCH (S-106, S-108, S109, S110, S111)
SHOWN IN BAND #4 POSITION.
S-111B
S-111C
R-124
C-116
C-135E
C-131
C-112
R-134
C-118
R-135
T-109
T-110
C-134
L-117
L-118
L-119
L-120
S-111A


IN
OUT
GND.
LOW-PASS FILTER Z-101
BAND-PASS FILTER Z-102
3RD. R.F
X-104
V-104
6SK7
DET.
X-105
V-105
6J5
1ST. A.F
X-107
V-107
6SJ7
2ND. A F
V-108
X-108
6SJ7
3RD. A.F
V-109
X-109
6K8-GT
S-109C
S-110B
S-110C
S-110A
S-111C
S-111A
S-103
BROAD
SHARP
AUDIO
Z-102
Z-101
IN
OUT
GND
R-140
R-139
R-138
DIRECT
OFF
T-106
T-107
T-108
T-110
T-111
L-118
L-112B
L-113B
L-114B
L-115B
L-116B
L-110A
L-111A
L-112A
L-113A
L-114A
L-115A
L-116A
L-119
L-120
E-101
R-108
R-109
R-129
R-147
DUAL GAIN CONTROL
R-128
C-108A
C-108B
R-136A
R-130
R-131
GEARED TO MAIN TUNING CONTROL
R-124
C-116
C-115
R-132
C-112
R-135
C-135E
C-134
C-104C
OSC.
V-108
X-106
6SK7
C-119
R-127
MOD.
S-102 RECEPTION
C.W
R-125
C-111
I-103
I-102
I-101
TO HEATERS
POWER OFF
S-101
ON
O.L.
S-104
OFF
ON
R-137
OUTPUT
LEVEL
R-123
M-101
D.C. VOLTS
WHITE-BLUE TRACER
WHITE-GREEN TRACER
WHITE-BLACK TRACER
WHITE-RED TRACER
WHITE-RED & GREEN TRACER
WHITE-BLACK & BROWN TRACER
115 V. AC
6.3 V. AC
200 V.D.C.
J-104
100 V. D.C.
GND.

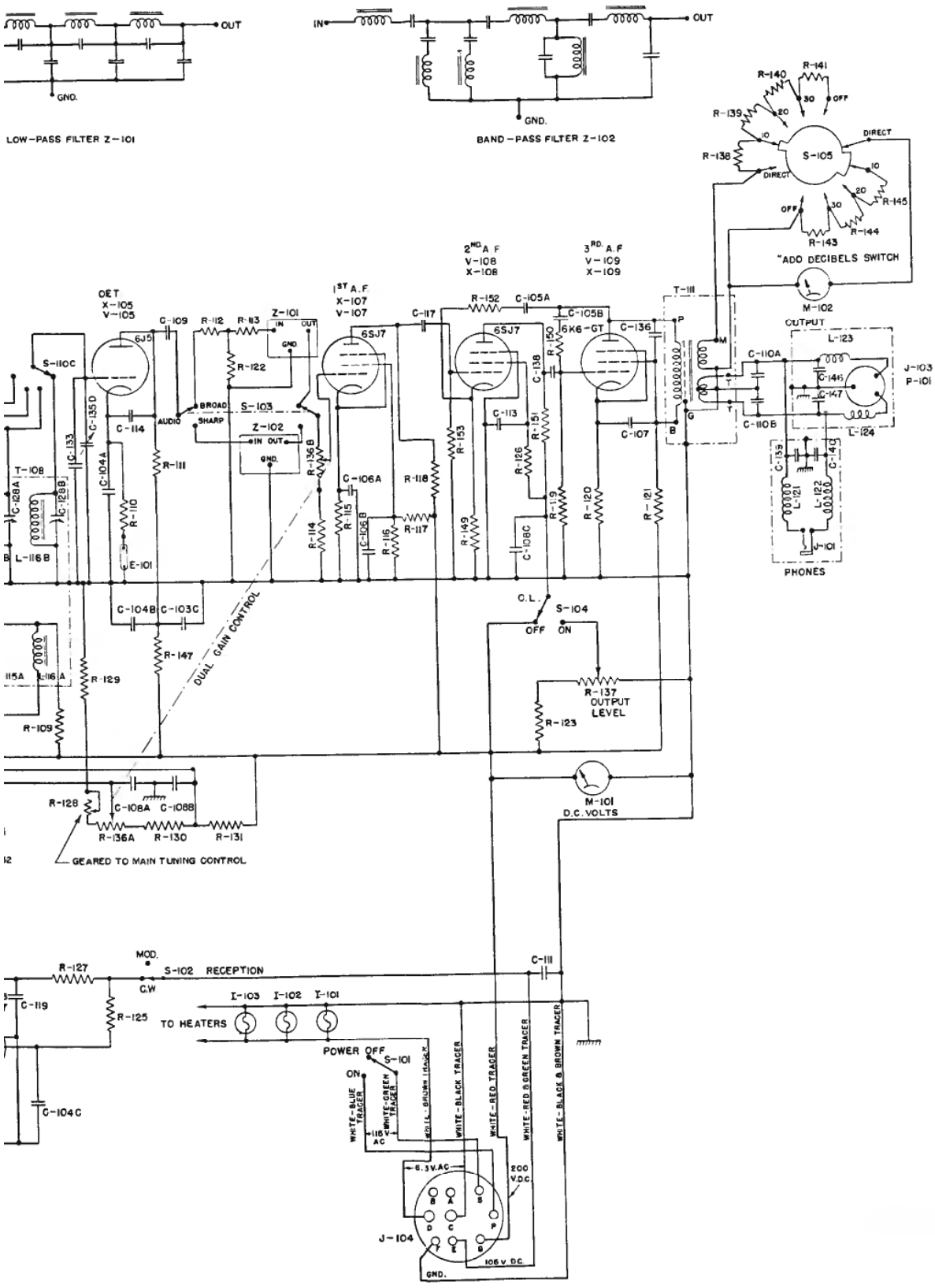
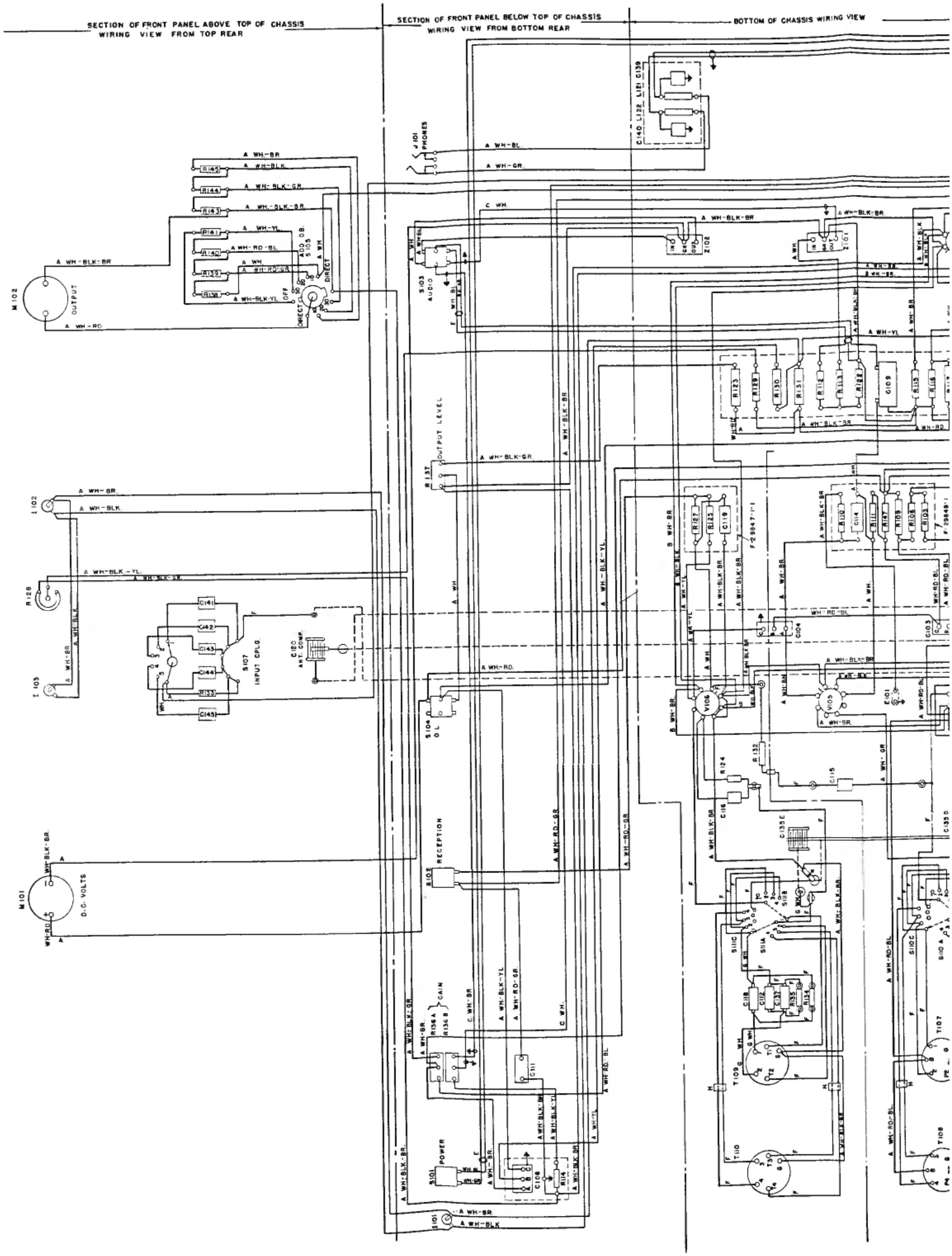
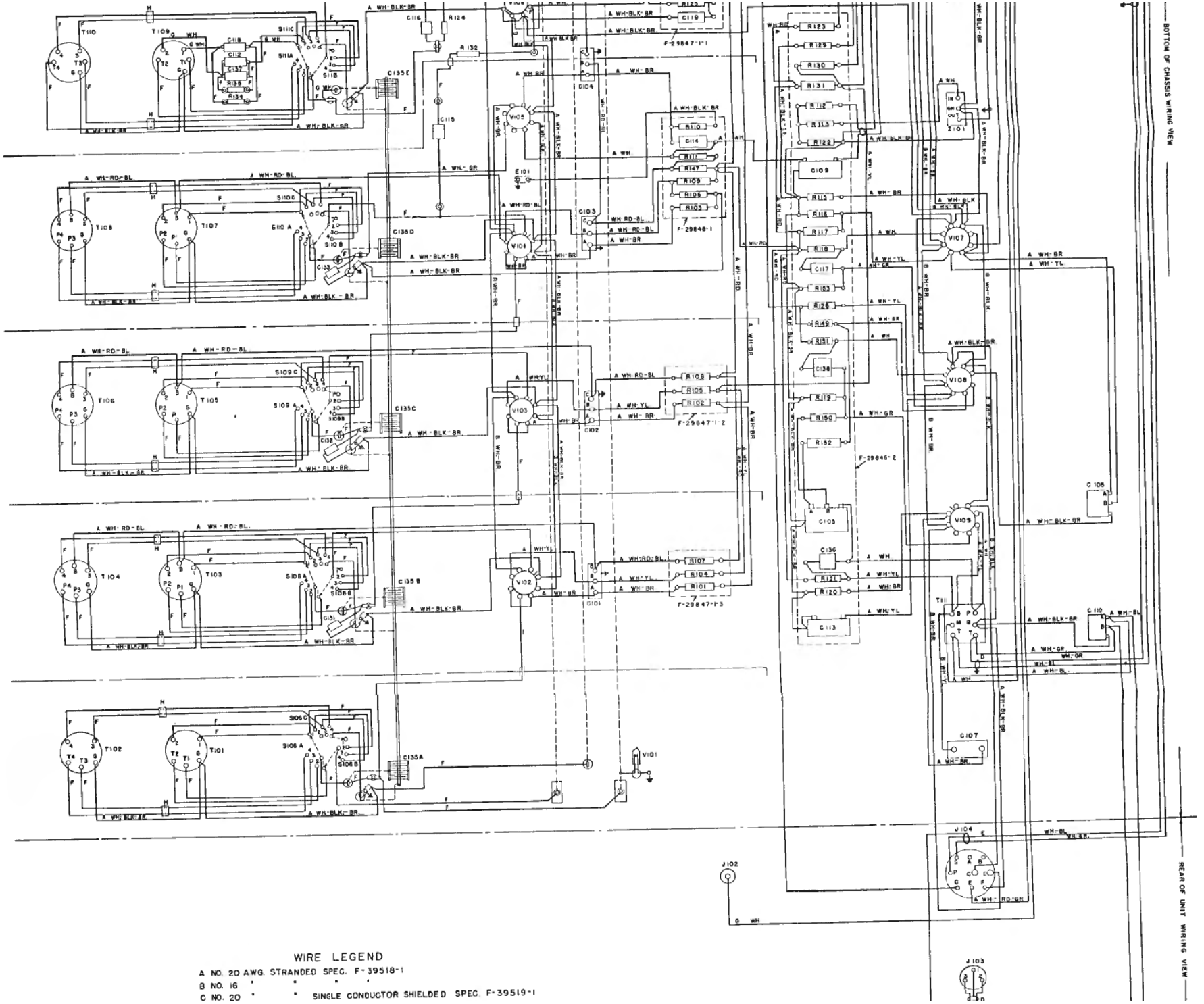


FIG. 23 SCHEMATIC CIRCUIT DIAGRAM, NAVY TYPE CFT-46154 RADIO RECEIVER


SECTION OF FRONT PANEL ABOVE TOP OF CHASSIS
WIRING VIEW FROM TOP REAR
SECTION OF FRONT PANEL BELOW TOP OF CHASSIS
WIRING VIEW FROM BOTTOM REAR
BOTTOM OF CHASSIS WIRING VIEW
J101 PHONES
S103 AUDIO
S105 ADD DB.
DIRECT
OFF
M102 OUTPUT
R137 OUTPUT LEVEL
L102
R128
I103
S107 INPUT CPLG.
C120 ANT. COMP.
S104 O.L.
S102 RECEPTION
M101 D.C. VOLTS
R136A R136B GAIN
S101 POWER
I101
C140 L122 L121 C139
Z102
Z101
V106
V105
E101
T109
T110
T107
T108
F-29847-1


BOTTOM OF CHASSIS WIRING VIEW
REAR OF UNIT WIRING VIEW
WIRE LEGEND
A NO. 20 AWG. STRANDED SPEC. F-39518-1
B NO. 16 " " " "
C NO. 20 " " SINGLE CONDUCTOR SHIELDED SPEC. F-39519-1

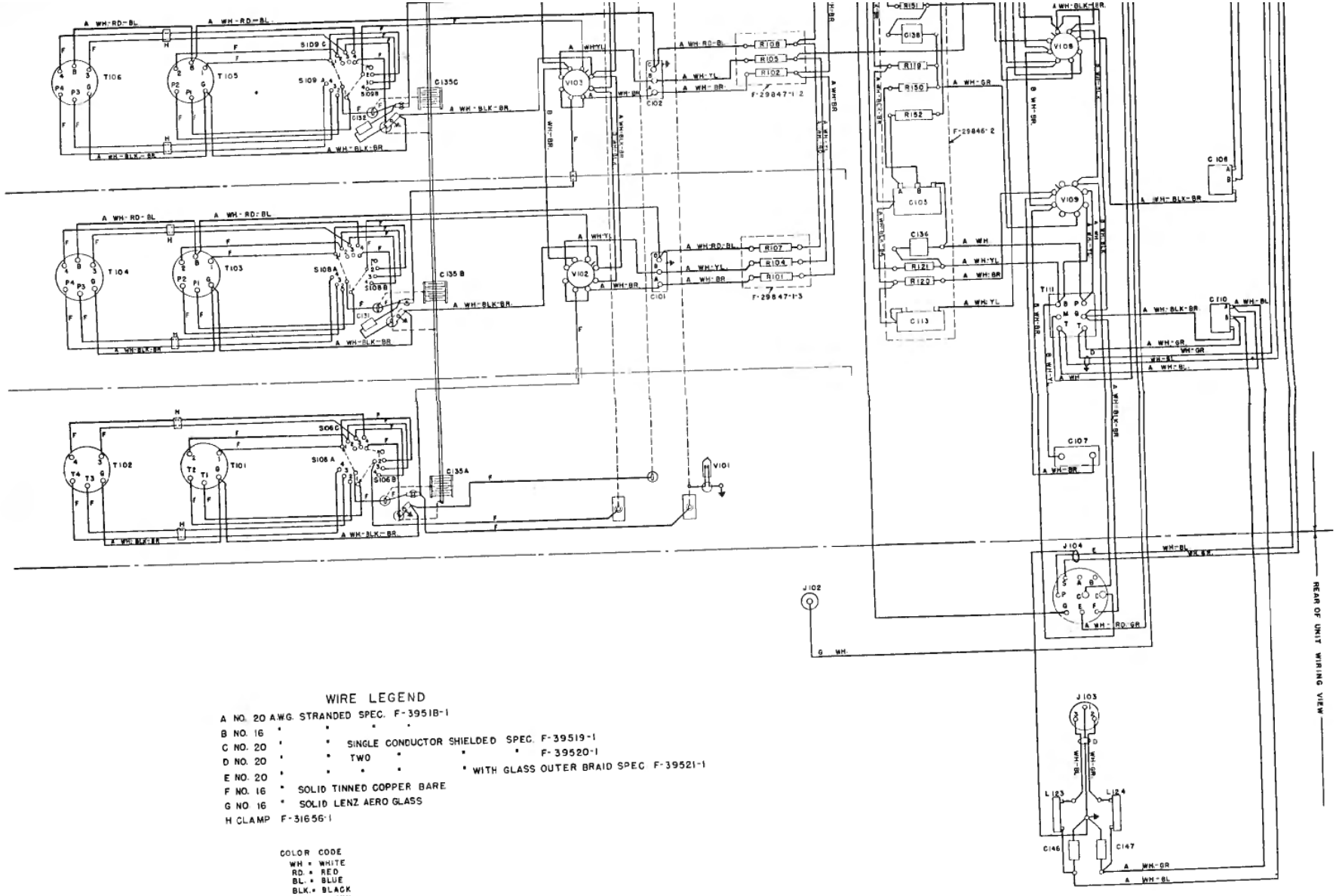


FIG. 24 WIRING DIAGRAM, NAVY TYPE CFT-46154 RADIO RECEIVER

Restricted

RECTIFIER POWER UNIT

TYPE CRV-20130

INSTRUCTIONS

This instruction book is furnished for the information of commissioned, warrant, enlisted and civilian personnel of the Navy whose duties involve design, instruction, operation and installation of radio and sound equipment. The word "RESTRICTED" as applied to this instruction book signifies that this instruction book is to be read only by the above personnel, and that the contents of it should not be made known to persons not connected with the Navy.

IN SOME CASES IT HAS BEEN FOUND NECESSARY TO MAKE SUBSTITUTIONS OF ORIGINAL MATERIALS. HOWEVER, ALL NECESSARY FACTORS HAVE BEEN MAINTAINED, SO THAT REPLACEMENTS CAN BE MADE, AND WHEREVER SPARE PARTS ARE INVOLVED IN THE SUBSTITUTIONS, THE SPARES ARE IDENTICAL TO THE PARTS MOUNTED IN THE EQUIPMENT. IF IT IS FOUND THAT THE LATTER CANNOT BE MET, SPECIAL INSTRUCTIONS WILL BE ISSUED AND SUPPLIED FOR ALL SHIPMENTS SO AFFECTED.

Manufactured for

NAVY DEPARTMENT—BUREAU OF SHIPS

by

RCA VICTOR DIVISION

of

RADIO CORPORATION OF AMERICA

Camden, N. J., U. S. A.

CONTRACT NOs-73056 Date: 13 April, 1940
NOs-91265 Date: 2 Sept., 1941
NXss-17001 Date: 17 June, 1943

IB-38100

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EQUIPMENT GUARANTEE

CONTRACT NOs-73056

CONTRACT NOs-91265

The equipment, including all parts and spare parts, except vacuum tubes, is guaranteed for a service period of TWO years with the understanding that, as a condition of this contract, all items found to be defective as to design, material, workmanship or manufacture will be replaced without delay and at no expense to the Government; provided that such guarantee and agreement will not obligate the contractor to make replacement of defective material unless the failure, exclusive of normal expected shelf life deterioration, occurs within a period of FIVE YEARS from the date of delivery of the equipment to and acceptance by the Government; and provided further, that if any part or parts (except vacuum tubes) fail or are found defective to the extent of ten per cent (10%) or more of the total number, of similar units furnished under the contract (exclusive of spares) such part or parts, whether supplied in the equipment or as spares, will be conclusively presumed to be of defective design, and as a condition of contract subject to one hundred per cent (100%) replacement by suitable redesigned units.

Failure due to poor workmanship, while not necessarily indicating poor design, will be considered in the same category as failure due to poor design. Redesigned replacements which will assure proper operation of the equipment will be supplied promptly, transportation paid, to the Naval activity using such equipment, upon receipt of proper notice and without cost to the Government.

All such defective parts 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 item or unit prior to replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service therefore may necessitate expeditious repair of such item or unit in order to prevent extended interruption of communications. In such cases the return of a defective item or unit for examination by the contractor prior to replacement will not be required. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable for effective adjustment under the provisions of this contractual guarantee.

The above period of FIVE YEARS and the service period of TWO YEARS will not include any portion of the time that the equipment fails to give satisfactory performance due to defective items and the necessity for replacement thereof. All replacement parts will be guaranteed to give TWO YEARS of satisfactory service.

EQUIPMENT GUARANTEE

CONTRACT NXss-17001

The equipment, including all parts and spare parts, except vacuum 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 conditions, against defects in design with the understanding that if ten per cent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such item 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 per cent (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 interruption 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 effecting 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.

TUBE GUARANTEE

All vacuum tubes supplied with this equipment are covered by the Manufacturer's warranty, regarding freedom from defects of design, material and workmanship. The use of each tube in these particular equipments will assure a tube life expectation of at least fifty (50) hours under full load conditions.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its service life, shall be made to the Bureau of Ships in accordance with current instructions. 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 31 (mimeographed form) of the Manual of Engineering Instructions, or Bureau of Ships Radio and Sound Bulletin Number 7, date July 1, 1942, or superseding instructions.

INSTALLATION RECORDS

Contract ..... Date of contract .....
day month year

Serial Number of equipment .....
Date of acceptance by the Navy .....
Date of delivery to contract designation .....
Date of completion of installation .....
Date placed in service .....

The above blank spaces shall be filled in at the time of installation.

RECTIFIER POWER UNIT

TYPE CRV-20130

I

INTRODUCTION

1.1 These instructions cover description, installation, operation, and servicing of the Rectifier Power Unit, Type CRV-20130. This unit contains all apparatus and equipment necessary for the operation of Receiver Units of type RBA, RBB, or RBC equipments from a 110/115/120 volt, 60 cycle, single phase, a-c source of supply.

1.2 The rectifier power unit is primarily designed to operate with a single receiver unit of the types RBA, RBB, or RBC equipments. Provision is made, however, for operation of two Receiver Units of the above equipments from a single Power Unit as an emergency condition.

1.3 The construction of the rectifier power unit permits mounting underneath a standard Navy type operating table or, if desired, the unit may be mounted on the surface of an operating table. In either case, the cabinet may be permanently secured to the table, the chassis being removable for servicing.

1.4 The circuit includes all necessary provisions for stable and reliable power supply for the above mentioned equipments. The unit is completely shielded in a metal cabinet and includes all necessary filtering for the reduction of a-c hum, and for minimizing interference from local transmitters.

II

EQUIPMENT

2.1 The Rectifier Power Unit, Type CRV-20130 has the following mechanical specifications:

Width (overall)	15 inches
Height (overall)	13½ inches
Depth (overall)	9¾ inches
Weight	52 pounds

2.2 The spare parts for the Rectifier Power Unit, Type CRV-20130, are included in the spare parts box for the type RBA, RBB or RBC Equipment.

2.3 The accessories supplied with the rectifier power unit include the following:

1 cable: weight, 3½ pounds; length, 6 feet.

2.4 The vacuum tubes used in the rectifier power unit are as follows:

Quantity	Type	Function
1	–5U4G	Full wave rectifier
1	–VR-105	Voltage regulator

2.5 The power requirements and average ratings for the rectifier power unit, when used as a part of type RBB or RBC Equipment, are as follows:

Normal load—one receiver

Input

110/115/120 volts[v]
55-65 cycles, single phase a-c
100 watts
Power factor 96%

Output

6.3 v. a-c	5.4 amps.
17.0 v. a-c	0.6 amps.
105 v. d-c	5 ma (Regulated)
200 v. d-c	78 ma

Emergency load—two receivers

Input

110/115/120 volts[v]
55-65 cycles, single phase a-c
160 watts
Power factor 97%

Output

5.5 v. a-c	10.4 amps.
16.5 v. a-c	1.2 amps.
105 v. d-c	10 ma (Regulated)
175 v. d-c	133 ma

Following are power requirements and average ratings for the rectifier power unit when used as part of type RBA Equipment:

Normal load—one receiver
Input
110/115/120 volts*
55-65 cycles, single phase a-c
67 watts
Power factor 95%

Output

6.6	v. a-c	3.1	amps
106	v. d-c	1.0	ma (Regulated)
205	v. d-c	58	ma

Emergency load—two receivers
Input
110/115/120 volts*
55-65 cycles, single phase a-c
100 watts
Power factor 97%

Output

6.3	v. a-c	5.9	amps
106	v. d-c	2.0	ma (Regulated)
185	v. d-c	105	ma

* A terminal board is provided for connection to taps on the power transformer primary for operation from 110, 115 or 120 volt supply.

III

DESCRIPTION

3.1 CONSTRUCTION (See Figures 1, 2, and 3)—The Rectifier Power Unit is completely enclosed in a black wrinkle finished metal cabinet. The cabinet is arranged for permanent mounting, the panel and chassis assembly being removable for servicing or tube replacements. The panel and chassis assembly carries all circuit components and is ruggedly constructed with a protective frame around the back and sides. The assembly is held into the cabinet by means of thumb screws attached to the front panel, and spring stops are provided to prevent the chassis from accidentally falling out of the cabinet when partially withdrawn. Two knobs are provided on the front panel of the unit to facilitate withdrawal of the chassis. The power input and output receptacles are mounted near the top of the front panel.

3.2 FUSES—Both sides of the a-c line within the power unit are provided with fuses, rated at 3 amperes. These fuses are accessible on the front panel of the unit. The a-c power supply plug should be removed from its receptacle when replacing these fuses.

3.3 CIRCUITS (See Figure 4)—The Power Unit Circuit includes a power transformer, rectifier, voltage regulator, filtering for a-c ripple, and r-f filtering. Both sides of the a-c input circuit are fused. An r-f filter is connected in the a-c input circuit. This filter, in conjunction with electrostatic shielding employed in the power transformer, provides attenuation (between either a-c input terminal and any d-c or a-c output terminal of the power unit) of at least 80 decibels to r-f interference in the range of 0.5 and 27 megacycles. The filter also offers excellent protection against r-f interference at lower frequencies. The "POWER" switch is located on the Receiver Unit and breaks one side of the a-c input circuit to the power transformer.

3.4 The input circuit connects to the power transformer, T401, through a terminal board which provides means of connecting to taps on the primary winding of the power transformer as required for operation from 110, 115, or 120 volt supply. The power transformer employs electrostatic shielding between the primary and secondary windings. Four secondary windings are provided for supplying rectifier heater voltage, rectifier plates, receiver 6.3 v. a-c, and receiver 17 v. a-c.

3.5 A type-5U4G full wave rectifier tube is used (V401). The rectified output of the tube is fed to a choke input, two stage ripple filter L405, C406, L406, C407. The capacitor C405 at the filter input is employed for r-f filtering and is of sufficiently low capacity as to have a negligible effect on regulation. The filter thus functions as a choke input filter and provides good regulation. The first stage of the filter employs a tapped choke, the tap portion being in series resonance with C406 at the ripple frequency. The d-c output is connected to the output receptacles, J402 to J403, and furnishes the receiver "B" supply.

3.6 The VR105 regulator tube (V402) is connected through the series dropping resistors R401, R402 and R403 to the rectified d-c output. This circuit provides a regulated d-c supply for the heterodyne oscillator in the receiver unit.

3.7 Two output receptacles, J402 and J403, are furnished. These receptacles are connected in parallel and either receptacle may be used for connection to the receiver unit. Both receptacles are used for the emergency condition of operation where two receiver units are operated from a single power unit.

IV

INSTALLATION

4.1 The Rectifier Power Unit is designed for mounting without shock mounts underneath an operating table as shown in Figure 7. The unit may also be mounted on the surface of an operating table through holes in the mounting channels attached to the bottom of the case. These channels extend ½ inch below the edges of the case in order to provide ventilation for the unit.

4.2 In order to mount the cabinet, the chassis must first be removed by loosening the panel thumb screws and withdrawing the chassis. When partly withdrawn, the chassis will strike stops which are released by pressing on the spring catches accessible through holes on each side of the chassis frame. If the equipment has been previously set up, the cables should be removed from the panel receptacles before the chassis is removed.

4.3 For mounting on the underside of the operating table, the table drilling dimensions are shown on Figure 7. Section "AA" on this drawing shows drilling for the top of the Power Unit cabinet. The holes in the top of the cabinet should be located within the area of the reinforcing strips as shown in the top view. After drilling the indicated mounting holes, the cabinet may be bolted in place with the bolts furnished.

4.4 Before replacing the chassis in the cabinet, insert tubes in their proper sockets and press down firmly. See Figure 6 for tube locations. Tube locations are also designated by chassis markings adjacent to the tube sockets.

4.5 The supply voltage should be measured and the link connection for the power transformer primary taps set for 110, 115, or 120 volts, whichever corresponds most closely with the supply voltage. This link connection is located on a small terminal board mounted on top of the chassis. The chassis may then be replaced in the cabinet and the thumb screws tightened.

4.6 A 3-pin a-c power plug is furnished with the rectifier power unit but the a-c power cable is not furnished. This cable should be a shielded, twisted pair of #14 or larger stranded wires. The wires should connect to plug terminals #1 and #2 and the shield should be connected to terminal "G." The shielded wires should run to a grounded junction box located near the equipment table. The a-c power plug should not be inserted into its receptacle until the installation is complete, and may be used as a means of disconnecting the power when working on the equipment.

4.7 The interconnection cable for the receiver unit should be plugged into one of the two receptacles provided to mate with the plugs on that cable. The unused receptacle should be covered with the cap provided unless, in an emergency, two receivers are operated from a single power unit. Refer to receiver unit installation instructions for recommendations as to grounding of power cables.

4.8 CAUTION—REMOVE THE A-C POWER SUPPLY CABLE PLUG FROM ITS SOCKET IN THE POWER UNIT BEFORE REPLACING EITHER THE UNIT TUBES OR FUSES.

V

OPERATION

5.1 The "POWER" switch for the rectifier power unit is located on the panel of the receiver unit of the type RBA, RBB, or RBC equipments, and operates to make or break the a-c supply circuit to the power unit through the interconnecting cable.

5.2 For the emergency condition where two receiver units are operated from a single power unit, the "POWER" switches on the respective receiver units are connected in parallel through the interconnecting cables, so that power is thrown on by throwing either switch to the "ON" position. To cut off the power supply, both switches must be thrown "OFF."

VI

MAINTENANCE—TROUBLE LOCATION AND REMEDY

6.1 GENERAL—The rectifier power unit has been carefully constructed and tested by the manufacturer before shipment and should remain in an operative condition over a reasonably long period of time. However, in case service is required at any time, every effort should be made to perform the work in a laboratory properly equipped with the necessary servicing tools. Moreover, the service man should refrain from disturbing the wiring of the unit until he has definitely determined that the difficulty being experienced is not the result of external or normal

deteriorating influences, such as worn-out vacuum tubes, improper operating voltages, blown fuses, external noises, etc. Furthermore, in view of the fact that in actual use, the rectifier power unit becomes an integral part of the complete receiving system, it is obvious that to a great extent, trouble location and remedy is largely dependent on symptoms manifested in the receiver section of the installation. When trouble-shooting, therefore, additional reference should be made to the Maintenance or Service section of the receiver instruction book applying to the specific receiver with which the power unit is being used.

6.2 Equipment Tests required for the accurate diagnosis of trouble may be made with the Model OE Radio Receiver Analyzing equipment or the following:

(1) Multirange D-C Voltmeter, 0-300 volts, 1,000 ohms per volt or higher.

(2) Multirange A-C Voltmeter, 0-150 volts.

(3) Continuity tester, preferably an ohmmeter.

6.3 OUTPUT (LOAD) VOLTAGES—If trouble has been traced to the Power Unit, the output voltages at the receiver end of the cable should be measured and compared with the following table. These voltages apply for a single receiver load and for 110/115/120 volt, 60 cycle, a-c supply with the corresponding tap connection to the power transformer primary.

Output voltages Measured across:	Single Type RBB or RBC Receiver load	Single Type RBA Receiver load
C-D	6.3 v. a-c	6.6 v. a-c
A-B	17.0 v. a-c	19 v. a-c
F-G	200 v. d-c	205 v. d-c
F-E	105 v. d-c	106 v. d-c

6.4 The above voltages should check within ±20% including usual tube variations and meter inaccuracies. Failure of these voltages to check indicates a fault in the receiver, interconnecting cable, or power unit. The receiver may be eliminated by a check of the above voltages using a receiver unit known to be in good operating condition or by measurement of no load voltages (see following paragraph). The interconnecting cable can be checked by a continuity test or by recheck of the above voltages at the power unit end of the cable. Note that the voltage between terminals C - D should measure approximately 0.3 volts higher than the values stated for the receiver end of the cable due to the cable voltage drop.

6.5 OUTPUT (NO LOAD) VOLTAGES. Since the output voltages are dependent upon load conditions, it may be found necessary to measure the power unit output voltages with no load on the output. For operation of the power unit with the receiver unit disconnected, it is necessary to close the a-c supply circuit by means of a short insulated wire jumper connected between terminals S and P of J402 or J403.

CAUTION: BEFORE CONNECTING TERMINALS S AND P, REMOVE A-C SUPPLY PLUG P401. ASCERTAIN THAT THE TYPE CRC VR105 TUBE AND CIRCUIT ARE FUNCTIONING. DO NOT OPERATE POWER UNIT WITHOUT LOAD ON THE OUTPUT FOR MORE THAN A FEW MINUTES.

6.6 Replace a-c plug P401 and compare output voltages with the following table, using 110/115/120 volt, 60 cycle supply with the corresponding primary tap connection:

Output voltages Measured across:	
C - D	7.3 v. a-c
A - B	18 v. a-c
F - G	240 v. d-c
F - E	108 v. d-c

6.7 If these voltages fail to check within ±20%, the power unit circuits should be checked with reference to the resistance table in the following paragraph (see also schematic Fig. 4). If vacuum tube faults are indicated, see paragraph 6.9, page 8.

6.8 POWER UNIT CIRCUIT RESISTANCES. For locating circuit faults, the following resistance measurements may be made to check various portions of the circuit. These measurements should be made with all cables removed from the Power Unit receptacles:

Points	Resistance Ohms	Circuit
J401-2 to J403-S	1.63	Line filter
J401-1 to T401-1	1.61	Line filter
J401-1 to T401-2	2.68	Line filter and power trans. pri.
J401-1 to T401-3	2.72	Line filter and power trans. pri.
J401-1 to T401-4	2.75	Line filter and power trans. pri.
J403P to J401-1 (link on 115 v.)	2.75	Line filter and power trans. pri.
V401-2 to V401-8 (tube out)	0.07	Rect. heater winding
J403-F to V401-4 or T401-7	43.6	Half of rectifier plate winding
J403-F to V401-6 or T401-5	43.6	Half of rectifier plate winding
J403-A to J403-B	0.52	17 v. winding and wiring
J403-C to J403-D	0.11	6.3 v. winding and wiring
J403-G to T401-12	200	Ripple filter chokes
J403-G to J403-E	3600	Regulator dropping resistors

6.9 TUBES—Incorrect output voltage, particularly at the 200 v. d-c or 105 v. d-c terminals, may be caused by defective tubes in the power unit. Following are average characteristics and limiting usable characteristics for the tubes used in this unit:

Type VR-105

Starting Supply voltage	127 min. volts d-c
Operating voltage (approx.)	105 volts d-c
Operating current	5 ma min. 30 ma max.
Max. usable ionization potential*	133 volts d-c

Type 5U4-G (Choke-input filter)

Filament voltage	5.0 volts a-c
Filament current	3.0 amps.
A-C Plate voltage per plate	550 max. volts (RMS)
D-C Output current	225 ma max.
Min. usable emission per plate at Ep = 75 volts d-c	80 ma

* Note: Include sufficient resistance in test circuit to limit the tube current to 30 ma after breakdown.

6.10 Conditions of excessive a-c hum in the receiver unit output may be caused by failure of some portion of the power unit ripple filter circuit. If equipment is available for measurement of a-c ripple voltage, the ripple voltage measured between output terminals F and G with a single receiver load should not exceed 40 millivolts. If a fault is indicated in the ripple filter, the circuit should be checked and the components L405, L406, C406 and C407 checked against the values specified in the parts list.

6.11 Excessive r-f interference from local transmitters may be traceable to a defective line filter in the power unit or imperfect ground connections or shielding. The following points should be checked: ground connections to a-c input cable, connection of cable shield to terminal G of P401, connection of terminal G of J401 to power unit panel, tightness of thumb screws in power unit panel, connection of terminal No. 8 of T401 to ground, line filter shield, line filter circuit and components.

TABLE I

LIST OF MAJOR UNITS

FOR RECTIFIER POWER UNIT FOR TYPES RBA, RBB & RBC RADIO RECEIVING EQUIPMENT

QUANTITY	SYMBOL GROUP	NAVY TYPE DESIGNATION	NAME OF MAJOR UNIT	ASSEMBLY DRAWING NUMBER
1	401 - 499	CRV-20130	POWER UNIT	T-620186-501

TABLE II
PARTS LIST BY SYMBOL DESIGNATION
FOR RECTIFIER POWER UNIT FOR TYPES RBA, RBB & RBC RADIO RECEIVING EQUIPMENT

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE, RATING OR MODIFICATION	RCA DRAWING NUMBER
		CAPACITORS						
*C401	Line Filter Capacitor	Fixed, molded, mica, 10,000 mmfd ±10%, 300 v d.c. working	-48938-B10	RE 48A 151B	2	1441W		P-720592-6
*C402	Line Filter Capacitor	Same as C401	-48938-B10					
*C403A	Line Filter Capacitor	Fixed, paper, oil filled, two sections, 0.125/0.125 mfd +10% -3%, 400 v d.c. working	-481167	RE 48A 110P	1	Type 86047-511		P-720555-55
B	Line Filter Capacitor							
*C404A	Line Filter Capacitor	Same as C403A&B	-481167					
B	Line Filter Capacitor							
*C405	H-V Filter Capacitor	Fixed, paper, oil filled, 0.1 mfd +10% -3%, 1250 v d.c. working	-48596	RE 48A 110P	1	Type 72044-506		P-720555-56
*C406	H-V Filter Capacitor	Fixed, paper, oil filled, 10 mfd +10% -3%, 600 v d.c. working	-48721	RE 48A 1593	4	Type 9CE5A87		K-860217-2
*C407	H-V Filter Capacitor	Same as C406	-48721					
		FUSES						
*F401	Line Fuse	250 v, 3 amps., glass body, cartridge type, 1-1/4" long, 1/4" dia. ferrules			5	Type 3AG		K-55544-4
*F402	Line Fuse	Same as F401						
		RECEPTACLES						
J401	Power Input Receptacle	3 pole, female, silver plated contacts, molded, bakelite body	-49126		7			K-864222-1
J402	Power Output Receptacle	9 contacts, 2" square flange, 1-3/4"-18 thread on one end		AN-9534	3			K-866555-1
J403	Power Output Receptacle	Same as J402						

* *EQUIPMENT SPARE PARTS FURNISHED, refer to TABLE IV, EQUIPMENT SPARES, for quantities.*

TABLE II (Continued)
PARTS LIST BY SYMBOL DESIGNATION
FOR RECTIFIER POWER UNIT FOR TYPES RBA, RBB & RBC RADIO RECEIVING EQUIPMENT

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE, RATING OR MODIFICATION	RCA DRAWING NUMBER
		REACTORS						
†L401	Line Filter Choke	Consists of 2 windings wound over a black laminated insulating material coil form 4-1/2" long, 3/4" dia., both windings connected in series, connection of both windings forming tap, 1st winding 3 sections, universal wound, 50 turns per section, #22 ES copper wire, 2nd winding single layer, close wound, 40 turns, same type wire, 1 adjustable composition core			1			K-826863-502
†L402	Line Filter Choke	Same as L401						
†L403	Line Filter Choke	Same as L401						
†L404	Line Filter Choke	Same as L401						
†L405	Filter Reactor	Reactor, impedance at 30 v, 60 cycles a.c. and 0.170 amp. d.c., 3770 ohms ±5%, inductance 10 henries ±5%, 3150 turns #27 E wire tapped at 3081 turns, d-c resistance 106 ohms	-30788		1	XT-3496A		K-900934-502
†L406	Filter Reactor	Same as L405	-30788					
		PLUGS						
P401	110 V Line Input Plug	3 pole, male, grounded	-49125		7	Ever-lok		K-864221-1
P402	Output Plug	"L" shaped, male, 9 contacts, 1-3/4"-18 threads		AN-3108-28-4P	8	2101-7		M-421449-4
P403	Output Plug	Same as P402						
		RESISTORS						
*R401	Bleeder Resistor	Fixed, carbon, insulated, 1200 ohms ±10%, 2 watts	-63474		6	Type BT-2		K-844302-63
*R402	Bleeder Resistor	Same as R401	-63474					
*R403	Bleeder Resistor	Same as R401	-63473					

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* *EQUIPMENT SPARE PARTS FURNISHED, refer to TABLE IV, EQUIPMENT SPARES, for quantities.*
† *BASE SPARE PARTS FURNISHED, refer to TABLE IV, BASE SPARES, for quantities.*

TABLE II (Continued)
PARTS LIST BY SYMBOL DESIGNATION
FOR RECTIFIER POWER UNIT FOR TYPES RBA, RBB & RBC RADIO RECEIVING EQUIPMENT

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE, RATING OR MODIFICATION	RCA DRAWING NUMBER
		TRANSFORMERS						
†T401	Power Transformer	Wind. / No Turns / Wire Size / D-C Res. / Volts / Amps. Pri. 272 #18 E 1.06 110/115/120 60 cy. Sec.#1 1350 #29 E 100 550/275 0.120 Sec.#2 16 0.095 Square 0.018 DC 6.3/3.15 11.1 Sec.#3 41 #20 E 0.38 17.0 1.2 Sec.#4 12 #15 E 0.045 5.0 3 Primary tapped at 248th and 260th turns secondary 1 and 2 center tapped, electrostatic shield between primary and secondary #1 to withstand 2500 v hi-pot test	-30790		1	XT-3497		K-901013-501
		VACUUM TUBES						
*V401	H-V Rectifier Tube	Full wave, high vacuum rectifier, octal 5 pin base, filament 5 v a.c. at 3.0 amps.	-5U4-G		1a	RCA-5U4-G		
*V402	Voltage Regulator	Octal 6 pin base, starting supply voltage 137 v d.c., operating voltage 105 v d.c.	-38205		1a	RCA-VR105-30		
		CABLES						
W401	Power Cable Assembly	Consists of one Army-Navy type AN-3108-28-4P nine contact plug on each end of a 67 inch long flexible shielding conduit, contains 9 color coded wires	-49162		1			P-721090-501
		SOCKETS						
*X401	Socket for V401	Octal, ceramic, with adapter ring	-49373	RE 49AA 313A	3	R558		M-421395-503
*X402	Socket for V402	Same as X401	-49373					

* *EQUIPMENT SPARE PARTS FURNISHED, refer to TABLE IV, EQUIPMENT SPARES, for quantities.*
† *BASE SPARE PARTS FURNISHED, refer to TABLE IV, BASE SPARES, for quantities.*

W2

TABLE III

PARTS LIST BY NAVY TYPE NUMBERS

FOR RECTIFIER POWER UNIT FOR TYPES RBA, RBB & RBC RADIO RECEIVING EQUIPMENT

QUANTITY	NAVY TYPE NUMBER	ALL SYMBOL DESIGNATIONS INVOLVED
PROTECTIVE DEVICES (CLASS 28)		
2		F401,402
TRANSFORMERS & REACTORS (CLASS 30)		
2	-30788	L405,406
1	-30790	T401
VACUUM TUBES (CLASS 38)		
1	-5U4-G	V401
1	-38205	V402
R-F TRANSFORMER-INDUCTANCES-CHOKES (CLASS 47)		
4		L401,402,403,404
CAPACITORS (CLASS 48)		
1	-48596-10	C405
2	-48721	C406,407
2	-48938-B10	C401,402
2	-481167-10	C403A&B,404A&B
PLUGS, RECEPTACLES, CABLES & SOCKETS (CLASS 49)		
1	-49125	P401
1	-49126	J401
1	-49162	W401
2	-49373	X401,402
2		J402,403
2		P402,403
RESISTORS (CLASS 63)		
3	-63474	R401,402,403

TABLE IV
SPARE PARTS LIST BY NAVY TYPE NUMBERS
FOR RECTIFIER POWER UNIT FOR TYPES RBA, RBB & RBC RADIO RECEIVING EQUIPMENT
EQUIPMENT SPARES

CONTRACT NXss-17001 DATED 17 JUNE 1943
CONTRACT NOs-91265 DATED 2 SEPT. 1941
CONTRACT NOs-73056 DATED 15 APRIL 1940

	ITEM	BOX NO.	QUANTITY	NAVY TYPE NUMBER	ALL SYMBOL DESIGNATIONS INVOLVED	DESCRIPTION	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE, RATING OR MODIFICATION	RCA DRAWING NUMBER
						FUSES (CLASS 28)					
	1		2		F401,402	Fuse, 250 v, 3 amps., glass body, cartridge type, 1-1/4" long, 1/4" dia. ferrules		5	Type 3AG		K-55544-4
						CONTACTS (CLASS 29)					
	2		4			Socket, contact, silver plated, with end hot tin dipped		3			M-421395-12
						*VACUUM TUBES (CLASS 38)					
	3		1	-5U4-G	V401	Tube, full wave, high vacuum, rectifier octal 5 pin base, filament 5 v a.c. at 3.0 amps.		1a	RCA-5U4-G		
	4		1	-38205	V402	Tube, octal 6 pin base, starting supply voltage 137 v d.c., operating voltage 105 v d.c.		1a	RCA-VR105-30		
						CAPACITORS (CLASS 48)					
	5		1	-48596	C405	Capacitor, fixed, paper, oil filled, 0.1 mfd +10% -3%, 1250 v d.c. working		1	Type 72053-504		P-720555-6
**	5a		1	-48596-10	C405	Capacitor, fixed, paper, oil filled, 0.1 mfd ±10%, 1250 v d.c. working		1	Type 72053-554		P-720555-56
	6		1	-48721	C406,407	Capacitor, paper, oil filled, 10 mfd +10% -3%, 600 v d.c. working		4	Type 9CR5A87		K-860217-2
	7		1	-48938-E10	C401,402	Capacitor, fixed, molded, mica, 0.01 mfd ±10%, 300 v d.c. working		2	Type 1441-W		P-720592-6
	8		1	-481167	C403A&B,404A&B	Capacitor, fixed, paper, oil filled, 2 sections, 0.125/0.125 mfd +10% -3%, 400 v d.c. working		1	Type 72053-512		P-720555-5
***	8a		1	-481167-10	C403A&B,404A&B	Capacitor, fixed, paper, oil filled, 2 sections, 0.125/0.125 mfd ±10%, 400 v d.c. working		1	Type 72053-562		P-720555-55
						SOCKETS (CLASS 40)					
	9		1	-49373	X401,402	Octal tube socket assembly (steatite), adapter plate	RE 49AA 313A	3			M-421395-503
						RESISTORS (CLASS 63)					
	10		2	-63474	R401,402,403	Resistor, fixed, carbon, 1200 ohms ±10%, 2 watts, insulated		6	BT-2		K-844302-63

* *To be packed separately.*
** *May be used as a substitute for Item 5.*
*** *May be used as a substitute for Item 8.*

IB-38100-X2

TABLE IV

SPARE PARTS LIST BY NAVY TYPE DESIGNATIONS

CONTRACT NXss-17001
CONTRACT NOs-91265
CONTRACT NOs-73056

FOR RECTIFIER POWER UNIT FOR TYPES RBA, RBB & RBC RADIO RECEIVING EQUIPMENT

BASE SPARES

DATED 17 JUNE 1943
DATED 2 SEPT. 1941
DATED 13 APRIL 1940

	ITEM	BOX NO.	QUANTITY	NAVY TYPE NUMBER	ALL SYMBOL DESIGNATIONS INVOLVED	DESCRIPTION	NAVY DRAWING OR SPEC.	MFR.	MFR. DESIG.	SPECIAL TOLERANCE, RATING OR MODIFICATION	RCA DRAWING NUMBER
						TRANSFORMERS & REACTORS (CLASS 30)					
*	1		2	-30788	L405,406	Reactor, impedance at 30 v, 60 cycles a.c. and 0.170 amp. d.c., 3770 ohms ±5%, inductance 10 henries ±5%, 3150 turns AWG #27 E wire tapped at 3081 turns, d-c resistance 106 ohms		1	XT-3496A		K-900934-502
*	2		2	-30790	T401	Transformer, power, in metal container 4-3/4" wide, 4-3/16" long, 5-5/32" high, terminals marked 1 to 15 inclusive, contains primary winding 110, 115, 120 v, high voltage secondary winding 550 v, center tapped, rated current 0.120 amp., 1 filament winding 6.3 v at 11.1 amps., center tapped, 1 winding at 17 v, 1.2 amps., 1 winding at 5 v, 3 amps.		1			K-901013-501
						INDUCTANCES (CLASS 47)					
**	3		2		L401,402,403,404	Line filter choke assembly, 2 sections, wound on tube 3/4" O.D., 1 section of winding, single layer wound, other 3 sections universal wound		1			K-826863-502

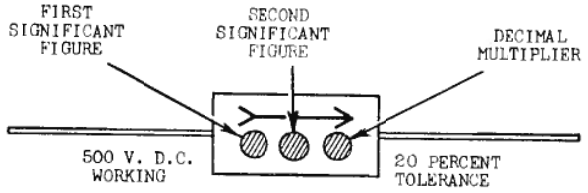
* *Total quantity Base Spares on Contract NOs-73056 was 12.*
** *Total quantity Base Spares on Contract Nos-73056 was 6.*

IB-38100-Y2

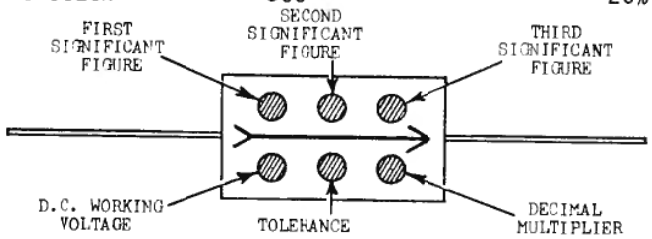
TABLE V

APPLICABLE COLOR CODES & MISCELLANEOUS DATA FOR RECTIFIER POWER UNIT FOR TYPES RBA, RBB & RBC RADIO RECEIVING EQUIPMENT

RMA COLOR CODES FOR CAPACITORS (MMFD)



COLOR	NUMERAL	VOLTS	MULTIPLIER	TOLERANCE
BLACK	0		1	
BROWN	1	100	10	1%
RED	2	200	100	2%
ORANGE	3	300	1,000	3%
YELLOW	4	400	10,000	4%
GREEN	5	500	100,000	5%
BLUE	6	600	1,000,000	6%
VIOLET	7	700	10,000,000	7%
GRAY	8	800	100,000,000	8%
WHITE	9	900	1,000,000,000	9%
GOLD		1000	0.1	5%
SILVER		2000	0.01	10%
NO COLOR		500		20%



RADIO CORP. OF AMERICA COLOR CODE FOR CAPACITORS

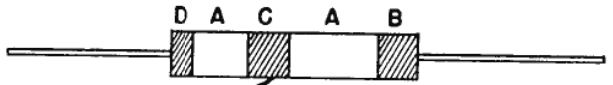
CAPACITY VALUES IN MMFD. ARE MARKED IN COLORS DESIGNATING TOLERANCE, THUS: YELLOW = 20%
BLUE = 10% BLACK = 5% GREEN = 2.5%

RMA COLOR CODE FOR RESISTORS (OHMS)

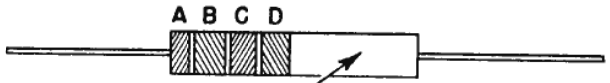
COLOR	A 1ST DIGIT	B 2ND DIGIT	C MULTIPLIER
SILVER			0.01
GOLD			0.1
BLACK		0	1.0
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
PURPLE	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	

D - TOLERANCE CODE:

GOLD = 5% SILVER = 10% NO COLOR = 20%



OLD COLOR ARRANGEMENT



NEW COLOR ARRANGEMENT

BODY COLOR (NEW COLOR ARRANGEMENT ONLY) INDICATES TYPE OF RESISTOR, AS FOLLOWS:-
BLACK - COMPOSITION, NON-INSULATED
TAN, OLIVE OR WHITE - COMPOSITION, INSULATED
DARK BROWN - WIRE-WOUND, INSULATED

TABLE VI

LIST OF MANUFACTURERS

FOR RECTIFIER POWER UNIT FOR TYPES RBA, RBB & RBC RADIO RECEIVING EQUIPMENT

CODE NUMBER	MFR. PREFIX	NAME	ADDRESS
1	CRV	Radio Corporation of America	Camden, N.J.
1a	CRC	Radio Corporation of America	Harrison, N.J.
2	CAW	Aerovox Corp.	740 Belleville Avenue New Bedford, Mass.
3	CPH	American Phenolic Corp.	1250 W. Van Buren Street Chicago, Ill.
4	CG	General Electric Company	Bridgeport, Conn.
5	CLF	Littelfuse Laboratories	4238 Lincoln Avenue Chicago, Ill.
6	CIR	International Resistance Co.	401 N. Broad Street Philadelphia, Pa.
7	CSR	Russell & Stoll Co., Inc.	125 Barclay Street New York, N.Y.
8	CED	Cannon Electric Development Co.	3201 Humboldt Street Los Angeles, Calif.

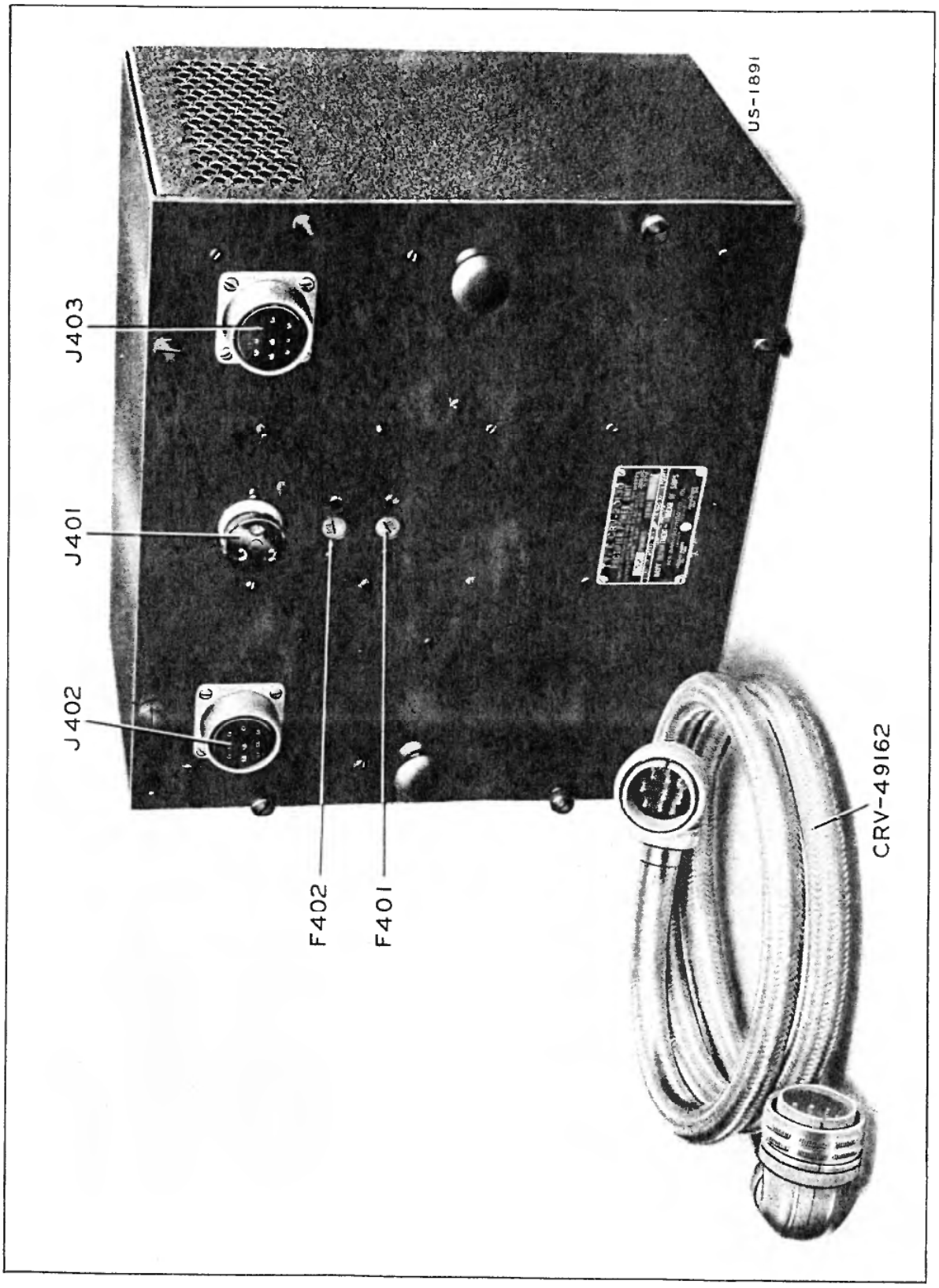


Figure 1—Rectifier Power Unit, Front View

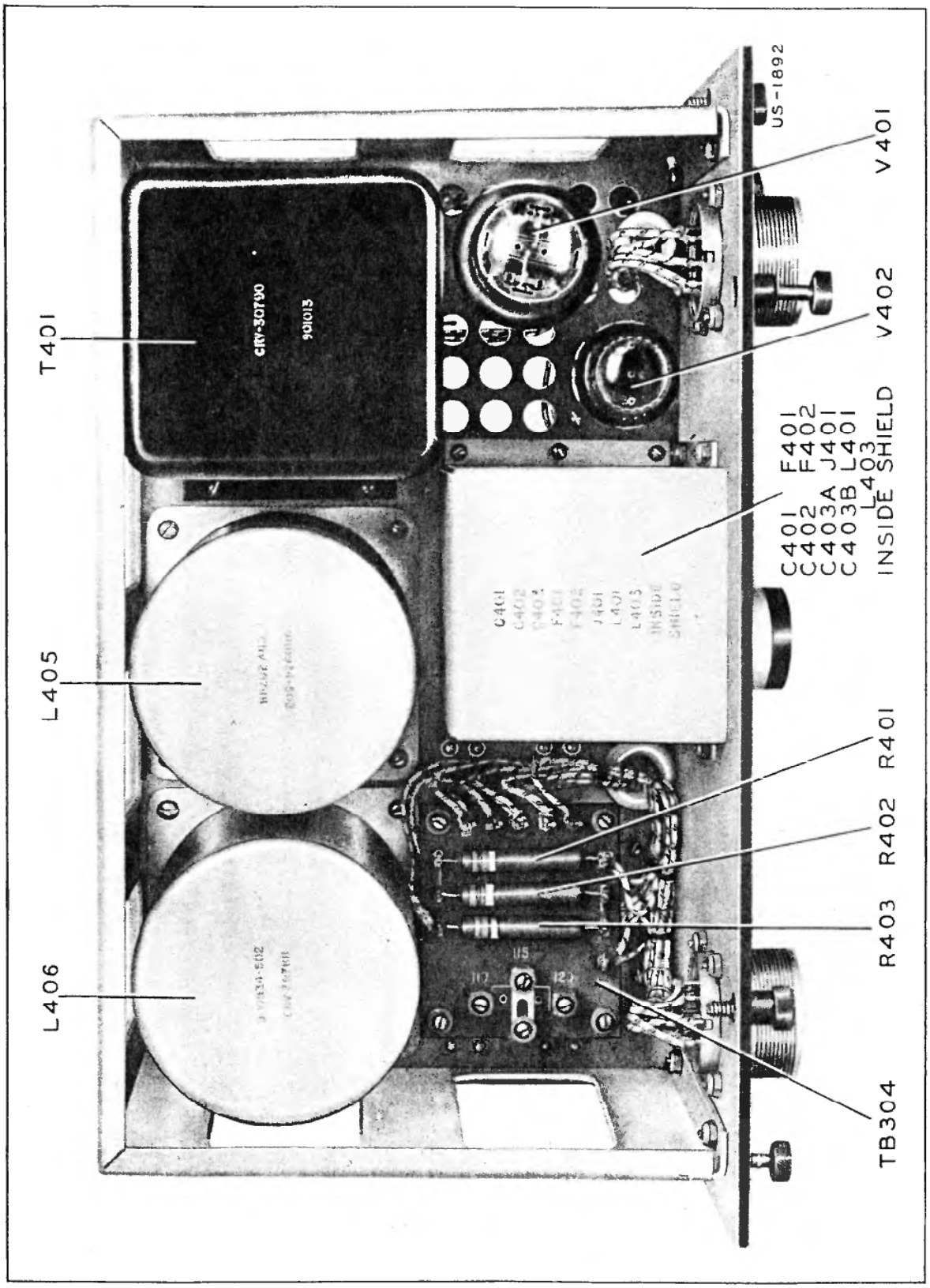


Figure 2—Rectifier Power Unit, Top View, A-C Line, Filter Shields Removed

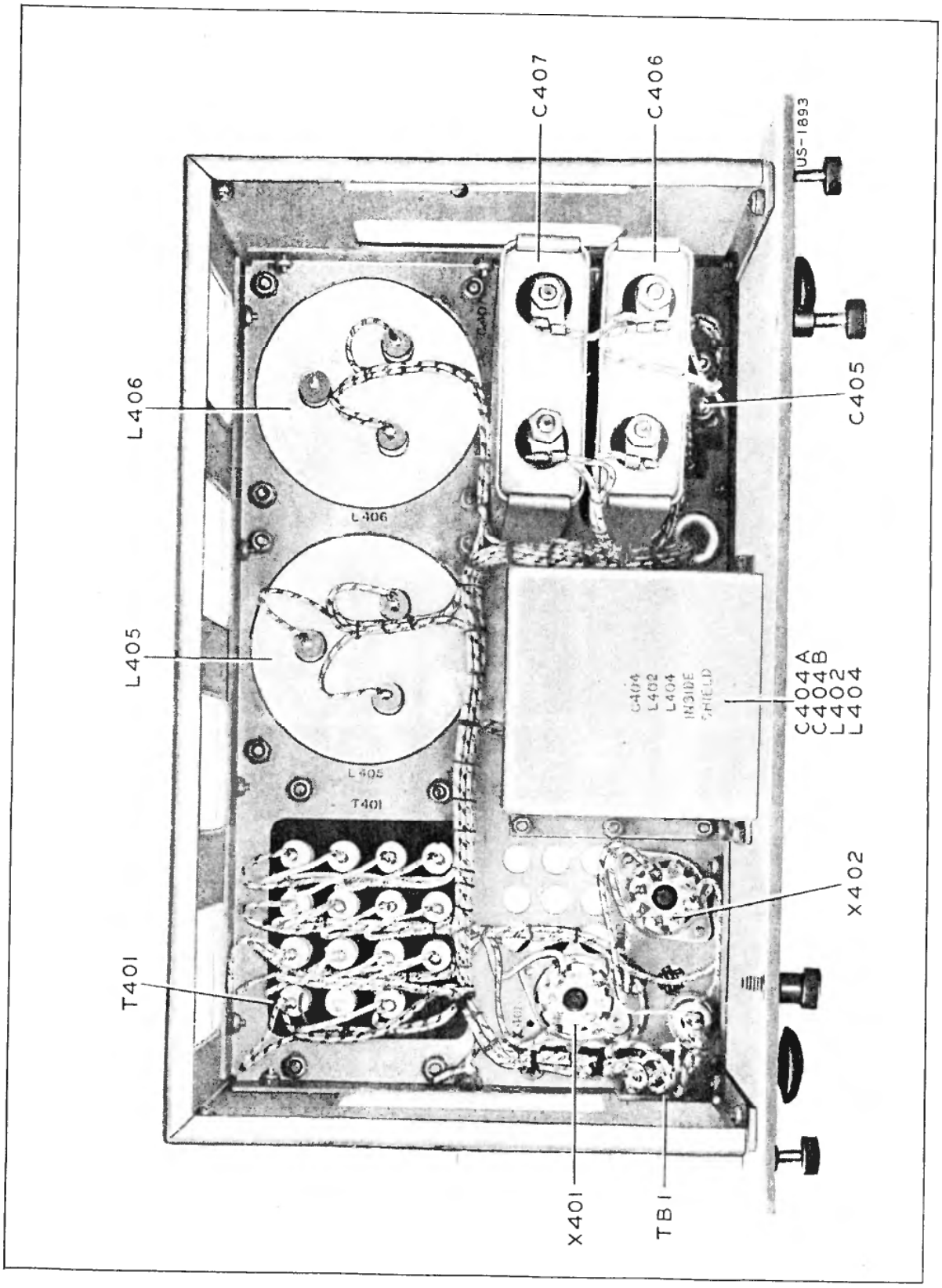


Figure 3—Rectifier Power Unit, Bottom View, A-C Line, Filter Shields Removed

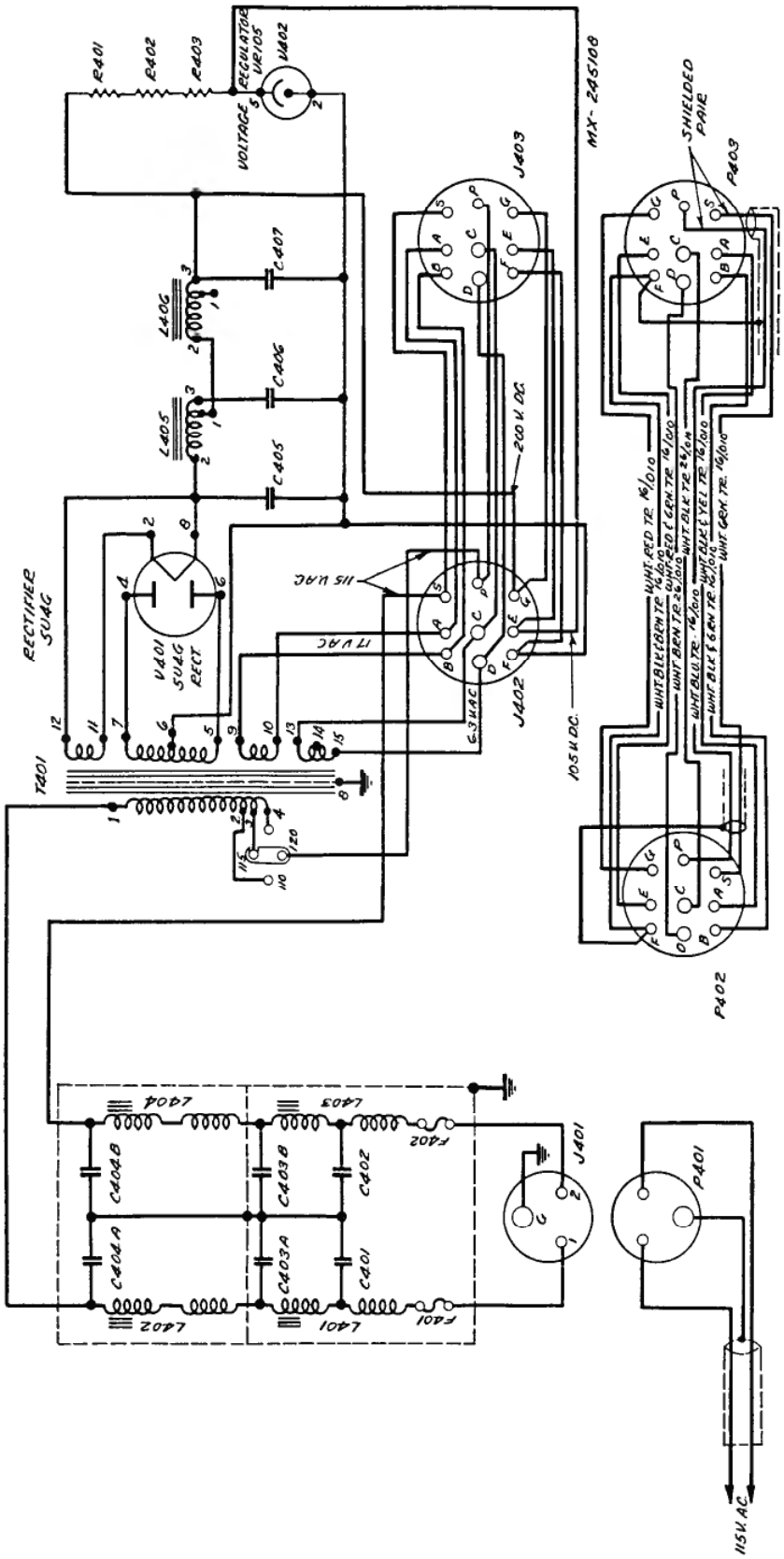


Figure 4—Rectifier Power Unit (Schematic MX-245108)

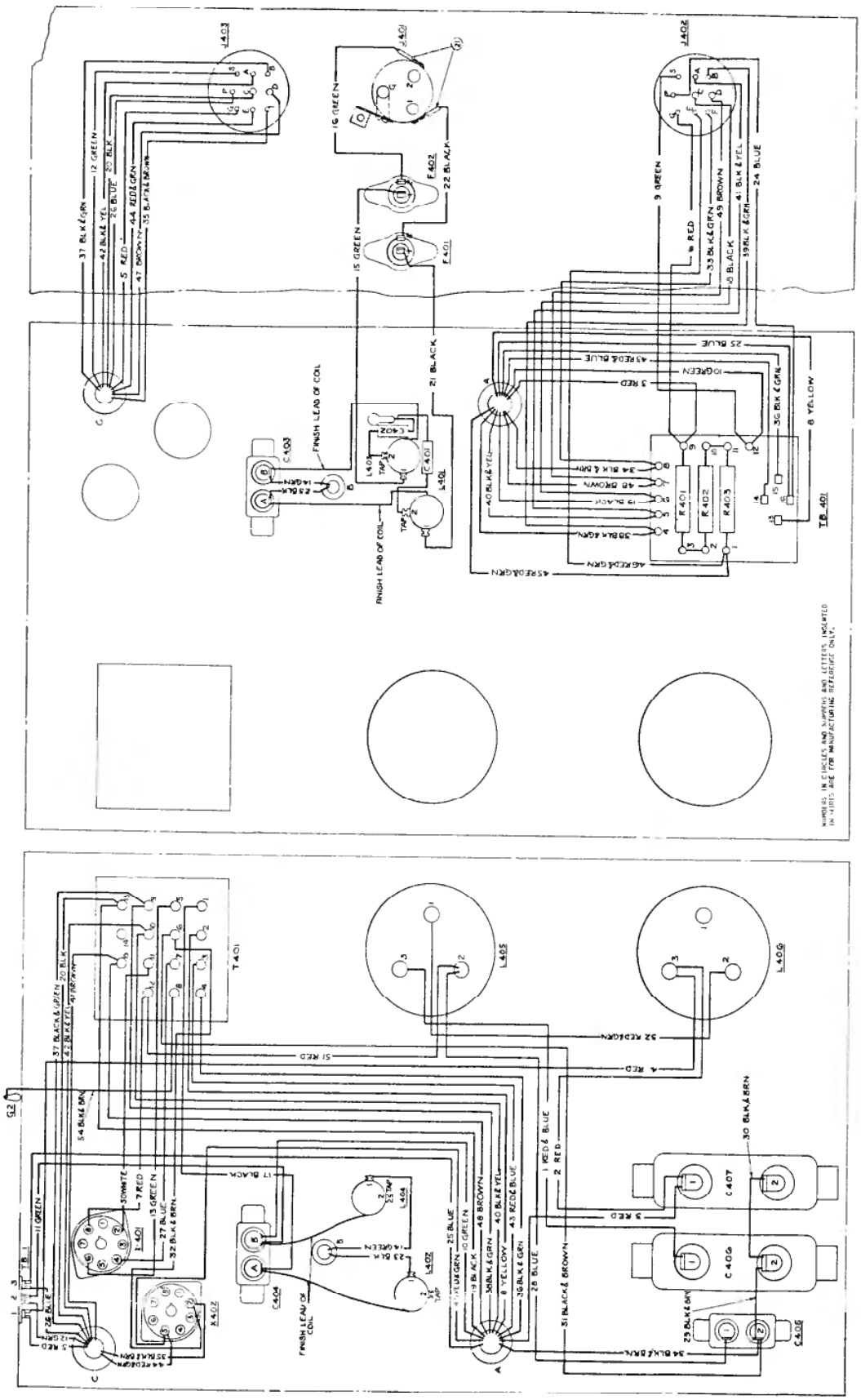


Figure 5—Rectifier Power Unit (Connections T-620737)

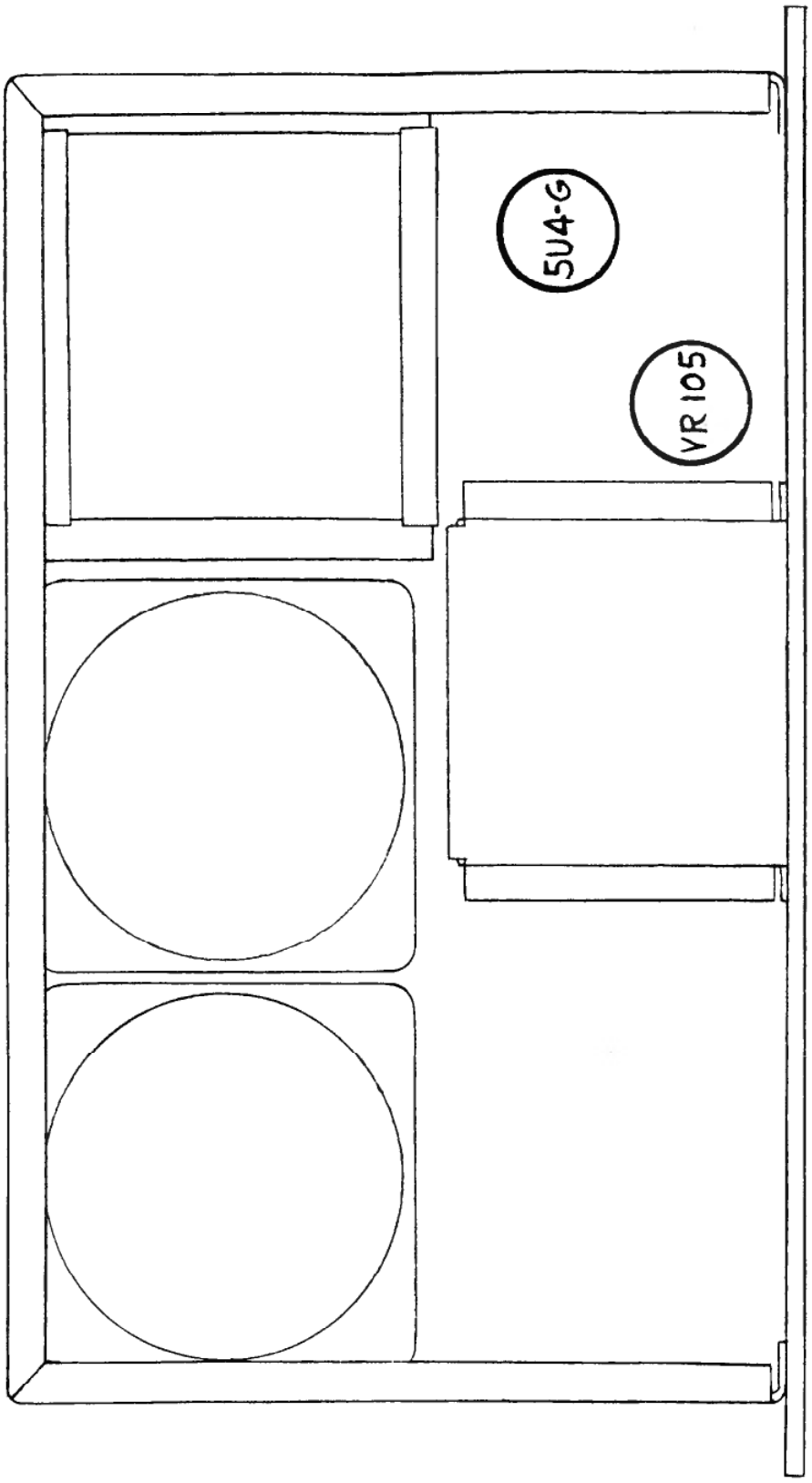
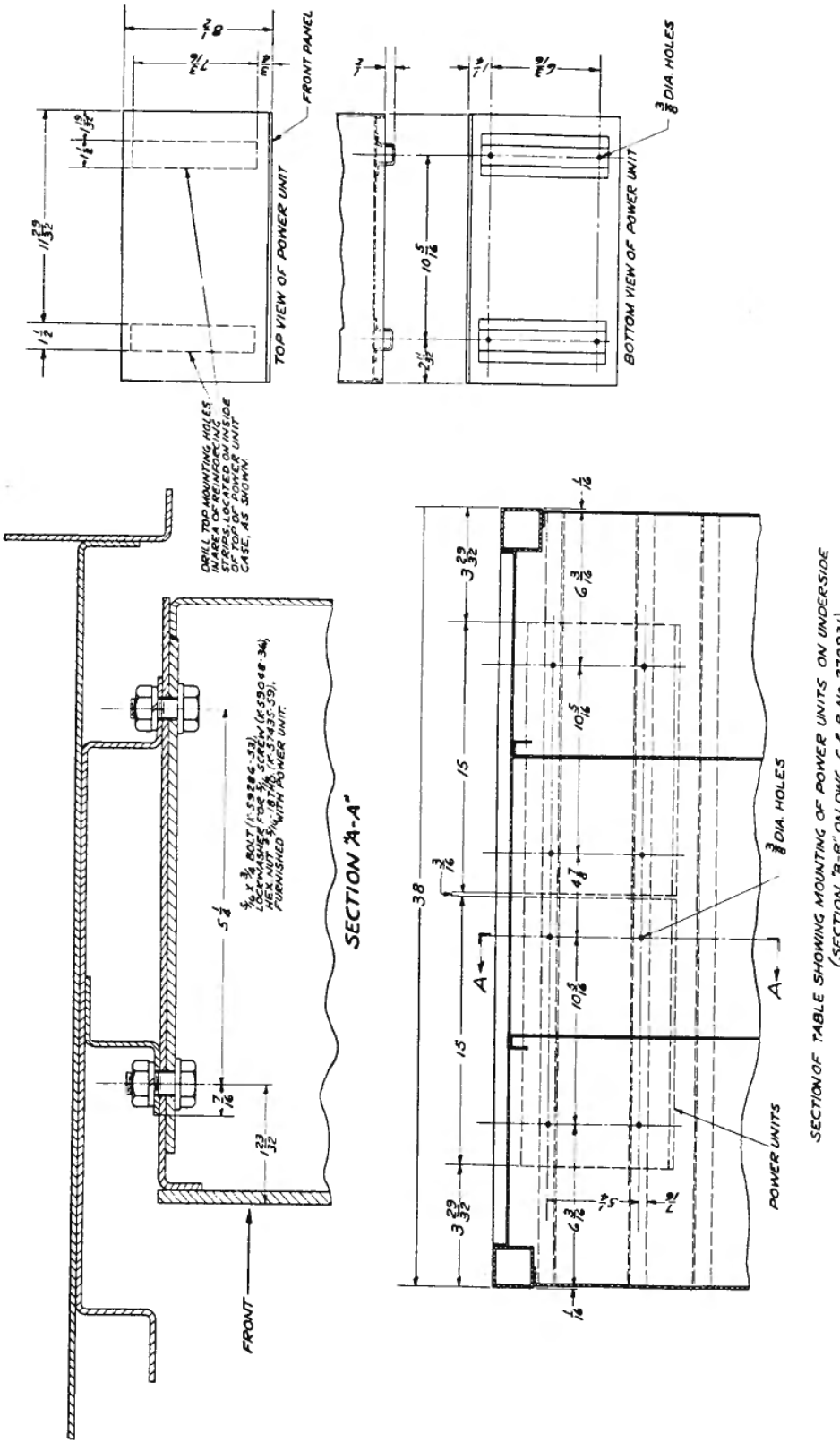


Figure 6—Rectifier Power Unit, Tube Locations (MX-244730)



SECTION OF TABLE SHOWING MOUNTING OF POWER UNITS ON UNDERSIDE
(SECTION "B-B" ON DWG. C & R No. 270931)
OR NORFOLK PLAN 38541

Figure 7—Rectifier Power Unit, Mounting
(PX-273650)