0967-106-6010
NAVSHIPS 92161(A)

INSTRUCTION BOOK

FOR

RADIO RECEIVING SET AN/URR-22

DEPARTMENT OF THE NAVY

BUREAU OF SHIPS

TEMPORARY CORRECTION T-1 FOR AN/URR-22 INSTRUCTION BOOK NAVSHIPS 92161(A)

The following changes are applicable to equipments bearing Serial Numbers 204 through 303:

Page	Revision
8–19	Item O-102A, on line 1 delete words "nickel plated" on line 8 add "Sub 1" to drawing number
	Item O-102B, on line 1 delete words "nickel plated" on line 7 add "Sub 1" to drawing number
	Item O-102C, on line 2 change 0.313" to 0.3135" on line 8 add "Sub 4" to drawing number
8–20	Item O-103C, on line 6 change 0.408" to 0.407" on line 7 add "Sub 4" to drawing number
8–22	Item O-105, on line 3 change 0.354" to 0.416" on line 5 add "Sub 1" to drawing number
	Item O-106, on line 4 change 0.251" to 0.250" on line 4 add "Sub 5" to drawing number
	Item O-107, on line 1 change 0.250" to 0.249" on line 2 change 0.068" to 0.064" on line 3 add "Sub 2" to drawing number
8–23	Item O-110, on line 1 change no. 303 to no. 302 on line 1 change 2.500" to 2 3/8" on line 4 change L801-3 to V049-1
	Item O-112, on line 6 change 0.375" to 0.250" on line 8 change 3" to 2 11/16" on line 10 add "Sub 2" to drawing number

NAVSHIPS 92161(A) *(Non-Registered)*

INSTRUCTION BOOK

FOR

RADIO RECEIVING SET AN/URR-22

NATIONAL COMPANY, INC.
MALDEN 48, MASSACHUSETTS

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS

CONTRACT: NObsr-43440
NObsr-52329

Approved by BuShips: 23 July 1954

LIST OF EFFECTIVE PAGES

PAGE NUMBER	CHANGE IN EFFECT	PAGE NUMBER	CHANGE IN EFFECT
A to C	Original	5–1 to 5–4	Original
i to iii	Original	6–1 to 6–2	Original
1–0 to 1–4	Original	7–1 to 7–34	Original
2–1 to 2–15	Original	8–0 to 8–59	Original
3–0 to 3–8	Original	i–0 to i–4	Original
4–1 to 4–4	Original		

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

IN REPLY REFER TO
Code 993-100
23 July 1954

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

Subj: Instruction Book for Radio Receiving Set AN/URR-22 NAVSHIPS 92161(A)

1. This is the instruction book for the subject equipment and is in effect upon receipt, superseding NAVSHIPS 92161.

2. When superseded by a later edition, this publication shall be destroyed.

3. Extracts from this publication may be made to facilitate the preparation of other Department of Defense Publications.

4. All Navy requests for NAVSHIPS Electronics publications should be directed to the nearest District Publications and Printing Office. When changes or revised books are distributed, notice will be included in the Bureau of Ships Journal and in the Index of Bureau of Ships Journal and Electronics Publications, NAVSHIPS 250-020.

W. D. LEGGETT, JR.
Chief of Bureau

RECORD OF CORRECTIONS MADE

CHANGE NO.	DATE	SIGNATURE OF OFFICER MAKING CORRECTION

TABLE OF CONTENTS

SECTION 1 – GENERAL DESCRIPTION

SECTION 2 – THEORY OF OPERATION

SECTION 3 – INSTALLATION

SECTION 4 – OPERATION

SECTION 5 – OPERATOR'S MAINTENANCE

SECTION 6 – PREVENTIVE MAINTENANCE

SECTION 7 – CORRECTIVE MAINTENANCE

SECTION 8 – PARTS LIST

LIST OF ILLUSTRATIONS

SECTION 1 – GENERAL DESCRIPTION

SECTION 2 – THEORY OF OPERATION

SECTION 3 – INSTALLATION

SECTION 4 – OPERATION

SECTION 5 – OPERATOR'S MAINTENANCE

SECTION 6 – PREVENTIVE MAINTENANCE

SECTION 7 – CORRECTIVE MAINTENANCE

LIST OF TABLES

SECTION 1 – GENERAL DESCRIPTION

SECTION 3 – INSTALLATION

SECTION 5 – OPERATOR'S MAINTENANCE

SECTION 6 – PREVENTIVE MAINTENANCE

SECTION 7 – CORRECTIVE MAINTENANCE

SECTION 8 – PARTS LIST

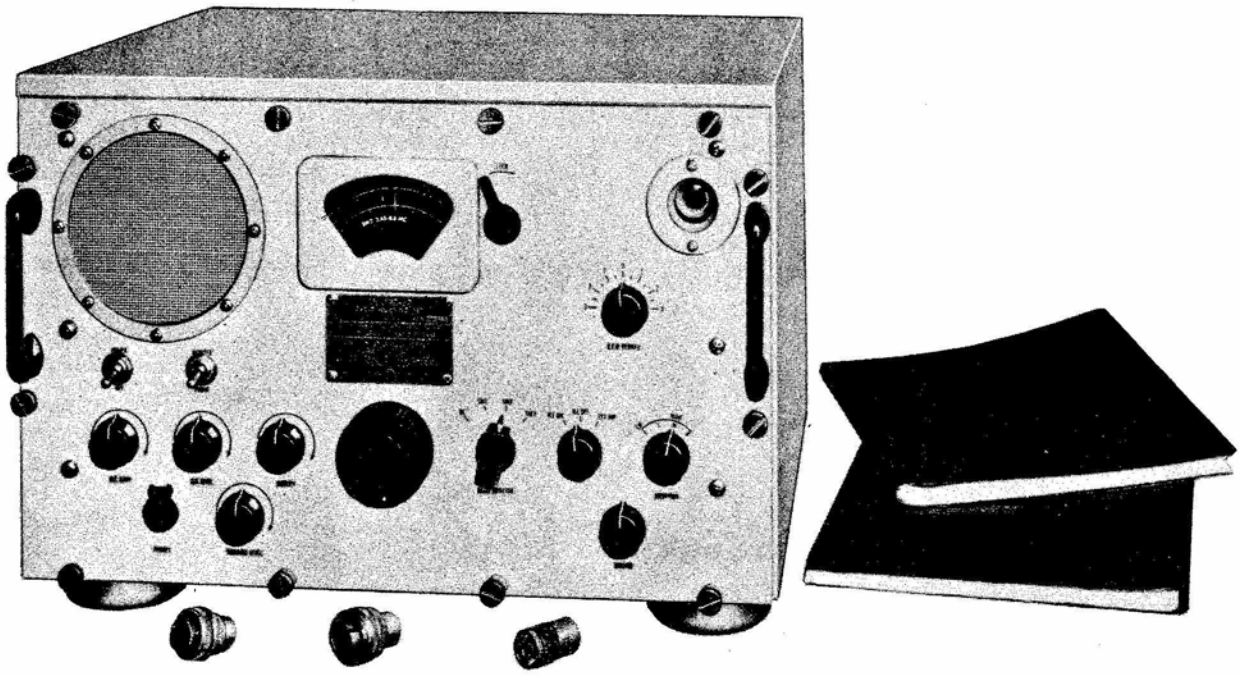


Figure 1–1. Radio Receiving Set AN/URR-22

SECTION 1
GENERAL DESCRIPTION

1. SCOPE OF THIS MANUAL.

Radio Receiving Set AN/URR-22 is described in this manual, including installation, operation and maintenance.

2. PURPOSE AND BASIC PRINCIPLES.

The complete Radio Receiving Set AN/URR-22 is shown in Figure 1–1, and includes Radio Receiver R-302/URR-22, three connector plugs for external cables and two instruction books.

The AN/URR-22 is a superheterodyne type radio receiving set designed for use aboard all types of U.S. Naval surface vessels and at Naval shore radio stations. The receiver is capable of receiving voice or tone modulated signals or C.W. telegraphy signals throughout its frequency range of 0.54 megacycles to 18.6 megacycles.

Radio Receiving Set AN/URR-22 has been designed primarily for reception of voice signals on the standard broadcast and international short wave broadcast bands but will also function as an excellent emergency communications receiver within its specified frequency range.

3. DESCRIPTION OF RADIO RECEIVER R-302/URR-22.

a. ELECTRICAL. *(See Figure 1–2.)*–Radio Receiver R-302/URR-22 is a fifteen-tube superheterodyne type receiver with a frequency coverage of 0.54 megacycles to 18.6 megacycles in four frequency bands as follows:

BAND	FREQUENCY RANGE
BC	0.54 to 1.6 megacycles
SW1	1.6 to 3.45 megacycles
SW2	3.45 to 8.6 megacycles
SW3	8.6 to 18.6 megacycles

The receiver has been designed for operation from a supply source of 105/115/125 volts, 50/60 cycles A.C. The signal circuits employed for reception on all frequencies within the range of the receiver, comprise one stage of R.F. amplification, a high frequency oscillator stage, a mixer stage, two stages of I.F. amplification, a diode type second detector and a noise limiter, two stages of resistance-coupled audio amplification, a phase splitter and a push-pull audio output amplifier providing faithful reproduction of received signals. A separate tube functions as the C.W. oscillator and buffer amplifier while another provides amplified automatic gain control voltage. An automatic tuning eye is mounted on the front panel to visually indicate correct tuning of the receiver. A self-contained power supply delivers all voltages required for operation of the receiver when connected to the proper source of supply.

The audio circuits of the receiver permit the use of one pair of standard 600-ohm headphones or the built-in monitor loudspeaker, plus from one to ten external loudspeakers, having individual amplifiers. Audio output at the built-in loudspeaker is at least 100 milliwatts, with at least 0.2 to 2.5 watts available at the terminals of audio output connector J-104, depending on the load impedance.

Provision has been made for connection of the high-impedance type of record player pickup or other similar apparatus to the audio circuits of the receiver.

b. MECHANICAL.–The R-302/URR-22 receiver employs enclosed cabinet-style construction so that the unit may be mounted atop an operating table or bench, while shock mounts on the bottom contribute to mechanical stability of the equipment. The chassis is secured to the front panel which forms the sixth side of the cabinet. Twelve knurled thumb-screws along the edges of the panel secure the chassis and panel assembly in place while allowing easy removal of the assembly from the cabinet for inspection and servicing. All operating controls are mounted on the front panel while the rear of the chassis mounts the power receptacle, antenna input connector, audio output connector, external audio input terminal board and fuses.

Harmonic radiation from the high-frequency oscillator circuit is minimized through the use of extensive shielding and filtering within the receiver. The R.F. amplifier tube, V-101, is completely enclosed by a removable shield cover while the antenna circuit,

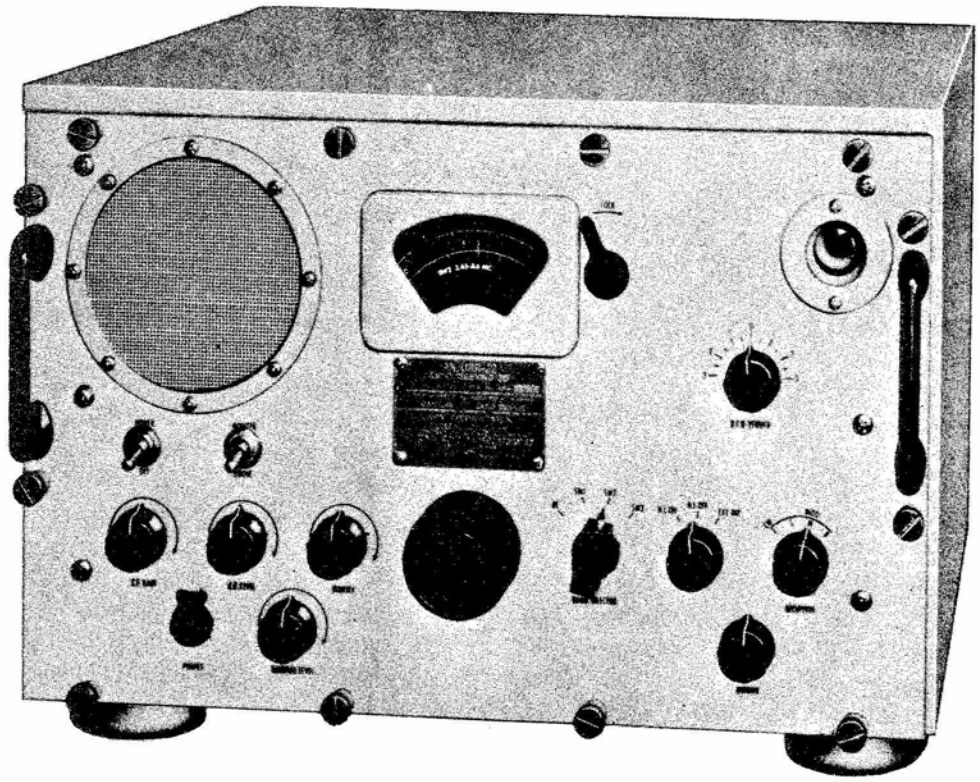


Figure 1–2. Radio Receiver R-302/URR-22

R.F. transformers and associated R.F. switching are enclosed by another shield. A third shielded compartment prevents stray radiated fields from reaching the R.F. transformers and associated switches for the mixer and H.F. oscillator circuits. Two separate 455 kilocycle wave traps in the R.F. section of the receiver prevent any spurious 455-kilocycle signals from reaching the mixer tube from the antenna input circuit.

c. ANTENNA.–The impedance of the antenna input circuit is 70 ohms unbalanced.

4. REFERENCE DATA.

a. NOMENCLATURE.–Radio Receiving Set AN/URR-22.

b. CONTRACT NUMBERS AND DATES.–NObsr-43440 dated 23 June 1949. NObsr-52329 dated 16 March 1951.

c. CONTRACTOR.–National Company, Inc., Malden 48, Mass., U.S.A.

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

e. NUMBER OF PACKAGES INVOLVED PER COMPLETE SHIPMENT OF EQUIPMENT.

One crate containing Radio Receiver R-302/URR-22, two instruction books and one set of equipment repair parts.

f. TOTAL CUBICAL CONTENTS.
(1) CRATED.–6.7 cu. ft.
(2) UNCRATED.
(a) Radio Receiver R-302/URR-22 – 2.24 cu. ft.
(b) Equipment Repair Parts – 1.03 cu. ft.

g. TOTAL WEIGHT.
(1) CRATED.–90 lbs.
(2) UNCRATED
(a) Radio Receiver R-302/URR-22 – 70 lbs.
(b) Equipment Repair Parts – 11 lbs.

h. FREQUENCY RANGE.–0.54 to 18.6 megacycles.

i. TUNING BANDS AND RANGE OF EACH BAND.
(1) FOUR BANDS.
(a) 0.54 – 1.6 megacycles
(b) 1.6 – 3.45 megacycles
(c) 3.45 – 8.6 megacycles
(d) 8.6 – 18.6 megacycles

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

k. TYPE OF FREQUENCY CONTROL.–Manual Tuned, self-excited oscillator.

l. TYPE OF RECEIVER.–Superheterodyne (AM).

m. INTERMEDIATE FREQUENCY.–455 kilocycles ±10%.

n. AUDIO OUTPUT.
(1) MONITOR SPEAKER OUTPUT.–100 milliwatts minimum.
(2) 600-OHM LINE OUTPUT.–200 milliwatts minimum.

(3) 60-OHM LINE OUTPUT.–2.5 watts minimum.

(4) HEADPHONE OUTPUT.–100 milliwatt minimum.

o. TYPE OF RECEPTION.

(1) A1 – Telegraphy without the use of a modulating audio frequency.

(2) A2 – Telegraphy by the keying of a modulating audio frequency.

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

p. IMPEDANCE.

(1) ANTENNA INPUT IMPEDANCE – 70 ohms, unbalanced.

(2) AUDIO OUTPUT IMPEDANCE.

(a) LINE OUTPUT – 600 to 60 ohms.

(b) PHONES JACK – 600 ohms.

(3) EXTERNAL AUDIO INPUT – high impedance.

q. RECOMMENDED ANTENNA.–Open-wire type approximately 50 ft. long, 70 ohms impedance.

r. CHARACTERISTICS OF POWER SUPPLY REQUIRED FOR OPERATION.

(1) Self Contained, full wave rectifier.

(2) A.C. Voltage – 105/115/125 volts.

(3) Frequency – 50/60 cycles.

(4) Number of Phases – Single phase.

(5) Current Drain – 0.73 amps.

(6) Power Consumption – 80 watts.

TABLE 1–1. EQUIPMENT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY OR AN DESIGNATION	OVERALL DIMENSIONS (IN.)			VOLUME CU. FT.	WEIGHT LBS.
			HEIGHT	WIDTH	DEPTH		
1	Radio Receiver	R-302/URR-22	12 3/8	18	17 3/8	2.24	70
2	Instruction Books	Navships 92161	11 1/2	8 7/8	1/2	.03	1
1 set	Connector Plugs	----------	----	----	----	----	---
1 set	Equipment Repair Parts	----------	6	19 1/2	15 1/4	1.03	11

TABLE 1–2. EQUIPMENT REQUIRED BUT NOT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY OR AN DESIGNATION	PURPOSE	REQUIRED CHARACTERISTICS
1	Antenna		Signal pickup	50 to 100 feet long, fed with 70-ohm coaxial cable
As required	Antenna transmission line		Antenna to receiver connection	Coaxial cable, 70-ohms impedance
As required	Power cable	MCOS-2	A.C. power input cable	Two wires, no. 18 or larger
As required	Audio output cable	TTHFWA-1 1/2	Audio output connection from receiver to external apparatus	Shielded, two-conductor cable
1	Headphones with cord and plug		Listening	600 ohms impedance

TABLE 1-3. SHIPPING DATA

SHIPPING BOX NO.	CONTENTS		OVERALL DIMENSIONS (IN.)			VOLUME CU. FT.	WEIGHT LBS.
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Radio Receiver	R-302/URR-22	22	30	17 1/2	6.7	90
	Instruction Books	Navships 92161					
	Connector Plugs	----------					
	Equipment Repair Parts	----------					

TABLE 1-4. ELECTRON TUBE COMPLEMENT

TUBE	QUANTITY	DESCRIPTION
OB2	1	Voltage Regulator
5Y3W-GTA	1	Full-Wave Vacuum Rectifier
6BA7	1	Pentagrid Mixer
6E5	1	Electron-Ray Tube
5670	1	Twin Triode
5686	2	Power Amplifier Pentode
5726	1	Twin Diode
5749	3	Remote Cut-Off Pentode
5814	1	Twin Triode
6135	3	Triode

SECTION 2
THEORY OF OPERATION

1. GENERAL.

The R-302/URR-22 is a fifteen-tube superheterodyne type receiver designed for use aboard Naval vessels and at Naval shore radio stations. The equipment is primarily intended to receive voice transmissions on the standard broadcast and international shore wave broadcast bands but has facilities for use as an emergency communications receiver for reception of C.W. and M.C.W. signals within its specified frequency range.

2. GENERAL DESCRIPTION OF RECEIVER CIRCUITS.

See Figure 2–1 for a functional block diagram and Figure 7–13 for a complete schematic diagram of the receiver.

The receiver employs one stage of R.F. amplification, an oscillator stage, a mixer stage, two stages of intermediate frequency amplification operating at 455 kilocycles (±10%), a diode type second detector, a noise limiter, two stages of audio amplification, a phase splitter, a push-pull audio output stage, an automatic tuning eye and an automatic gain control amplifier. The self-contained power supply consists of a full-wave rectifier and a voltage regulator. A C.W. oscillator and a buffer amplifier complete the receiver stages.

3. CIRCUIT ANALYSIS.

The following sub-paragraphs describe in detail the operation of the various stages of the R-302/URR-22 receiver. In general, the discussion follows the outline presented in Figure 2–1, Functional Block Diagram. To facilitate circuit description and to present theory in the most easily understandable form, the Band Selector switch is set at position BC (0.54 to 1.6 megacycles) and all symbol numbers unless otherwise noted will refer to components associated with this band. In order to further simplify the individual circuits, simplified schematic diagrams have been included with rotary switches deleted and connections shown for band BC. Since the circuits on all bands are basically identical the description will be equally applicable to bands SW1, SW2 and SW3 unless otherwise noted.

a. TUNING.–Simultaneous tuning of the R.F. amplifier, H.F. oscillator and mixer stages is accomplished by a front-panel mounted control which drives a three-section ganged tuning capacitor, C-109. Frequencies are indicated on the main Tuning dial calibrated in megacycles. The dial is fitted with a masking device actuated by the Band Selector switch which masks all frequencies but the band being tuned.

b. ANTENNA INPUT CIRCUIT AND R.F. AMPLIFIER V-101. *(See Figures 2–2 and 7–13.)*–The incoming signal from the antenna enters the receiver circuits through the antenna input connector, J-101. Each of the four bands has its own tuned circuit preceding R.F. amplifier V-101. Switch section S-101A of the Band Selector switch connects the input signal to the tuned circuit of the desired band. This switch has three main functions:

(1) To connect the input signal to the transformer primary of the tuned circuit of the desired band.

(2) To short out the primaries of the unused tuned circuits.

(3) For the BC and SW1 bands only, to connect the 455-kilocycle wave trap, Z-105, in parallel with the signal input circuits.

The secondary of the selected tuned circuit is connected to grid 1 of the R.F amplifier by switch section S-101B. This switch has five main functions:

(1) To connect the proper transformer secondary to the grid of R.F. amplifier V-101.

(2) To ground the secondaries of the unused input transformers.

(3) To connect section C-109A of the Main Tuning capacitor into the tuned circuit secondary of the desired band.

(4) To disconnect the small stator of the Main Tuning capacitor, C-109A, from the tuned circuit on the SW3 band only.

(5) To connect capacitor C-107 into the secondary of the tuned circuits of the SW1, SW2 and SW3 bands when the Band Selector switch is in those positions.

The simplified schematic diagram, Figure 2–2, traces the path of the signal when the Band Selector

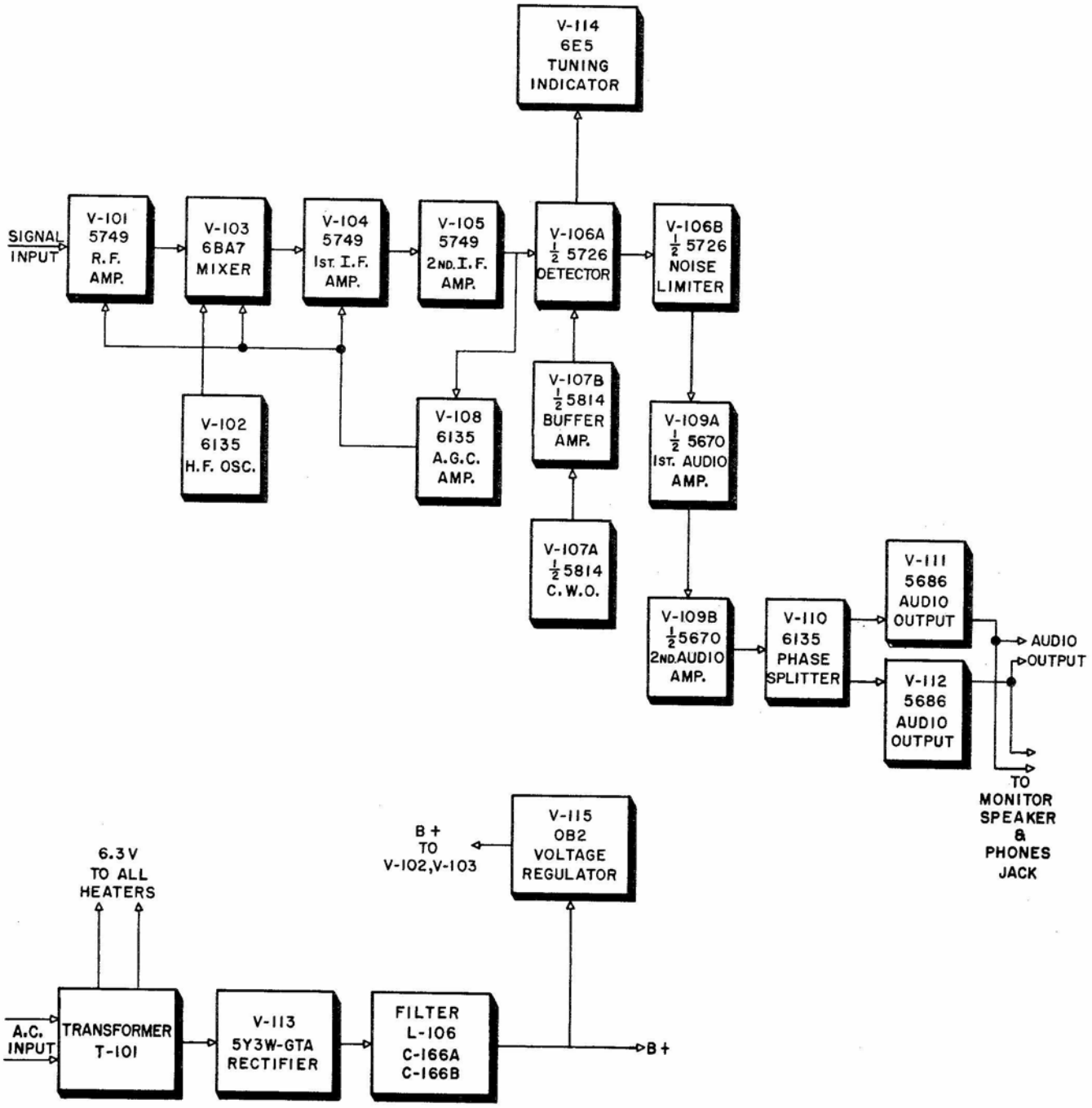


Figure 2–1. Radio Receiver R-302/URR-22, Functional Block Diagram

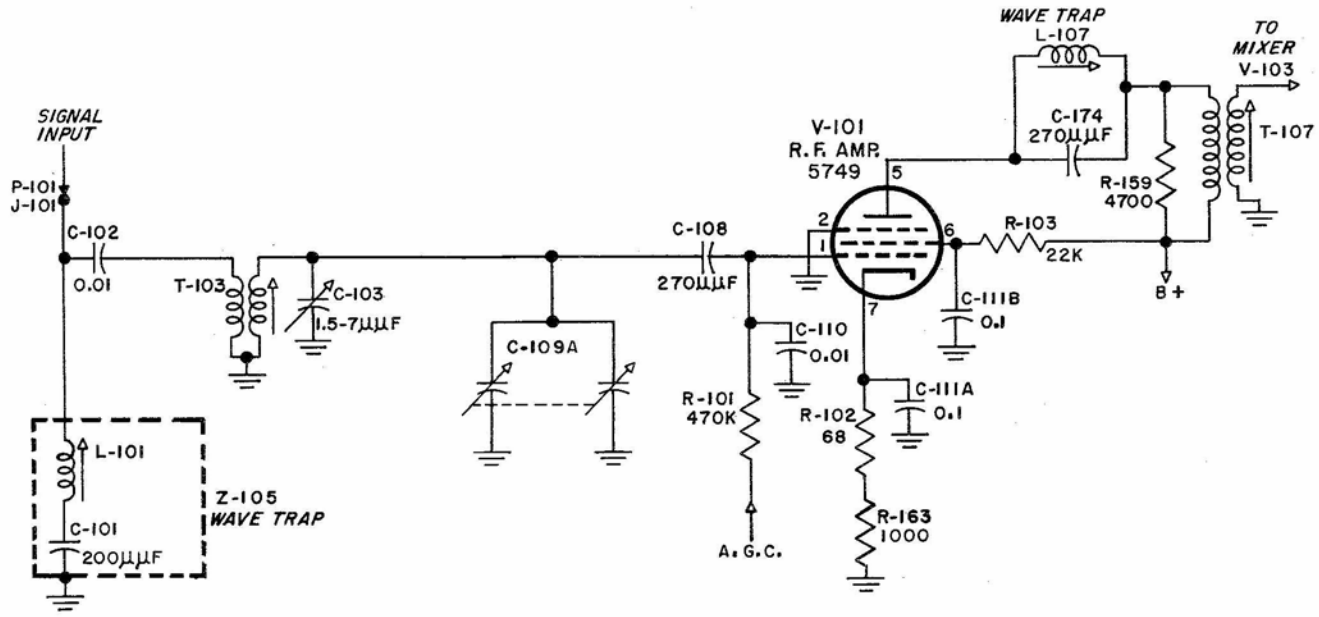


Figure 2–2. R.F. Amplifier V-101, Simplified Schematic Diagram

switch is in the BC position. The input signal is routed by switch S-101A to the primary of transformer T-103. From the secondary of T-103, the signal passes through switch S-101B and the parallel resonant tuned circuit composed of the secondary of T-103, trimmer capacitor C-103 and a section of the Main Tuning capacitor C-109A. The signal is then injected into the signal grid of R.F. amplifier V-101 through coupling capacitor C-108. The signal is amplified by V-101 and appears across mixer transformer T-107. R.F. amplifier is a type 5749 pentode used in a conventional R.F. amplifier circuit, its plate load being the parallel combination of resistor R-159 and mixer transformer T-107. Switch section S-101E of the Band Selector switch varies the resistance of the R.F. amplifier cathode circuit for each band. In the BC position, this switch connects R-163 into the cathode; in the SW1 band, R-167; and in the SW2 position, R-168. In the SW3 position, no additional resistor is connected into the cathode circuit, the bias being set by R-102 only. Varying the cathode bias resistor in this manner enables the stage to provide minimum gain to maintain the maximum sensitivity and at the same time, reduce cross modulation to a minimum. B+ is applied to V-101 through R-112, mixer transformer of each band, and switch section S-101D. C-134A and C-135A are the bypass capacitors. On the BC and SW1 bands only, a 455-kilocycle wave trap, Z-105, is connected in parallel with the signal input circuits. Z-105 consists of capacitor C-101 in series with variable inductor L-101 to form a series resonant circuit which offers a low impedance path to ground for any 455-kilocycle signals present in the input signal. A second 455-kilocycle wave trap is included in the plate circuit of V-101 consisting of capacitor C-174 in parallel with variable inductor L-107 to form a parallel resonant circuit tuned to 455 kilocycles. This constitutes a high impedance path for any 455-kilocycle signals.

c. H.F. OSCILLATOR V-102 CIRCUIT DETAILS. *(See Figures 2–3 and 7–13).*—High-frequency oscillator V-102 is a type 6135 triode in a conventional Hartley oscillator circuit with the plate of the oscillator tube at R.F. ground potential. Switch section S-101C selects the oscillator tuned circuit for the band in use and at the same time shorts out the unused tuned circuits. This switch also connects section C-109B of the Main Tuning capacitor into the selected oscillator tuned circuit. In the SW3 position only the large stator of C-109B is connected into the oscillator tuned circuit of that band, the small stator being shorted to ground. Simplified schematic diagram, Figure 2–3 illustrates the signal circuits with the Band Selector switch in the BC position. The oscillator tuned circuit is composed of oscillator coil T-111, variable trimmer capacitor C-112, padder capacitor C-117 in parallel with variable padder capacitor C-116, and section C-109B of main tuning capacitor C-109. C-109B determines the frequency of the oscillator as the receiver is tuned to signals in normal operation. Variable inductor T-111, variable trimmer capacitor C-112 and variable padder capacitor C-116 are adjusted for proper tracking of the oscillator with the R.F. amplifier and mixer tuned circuits. Capaci-

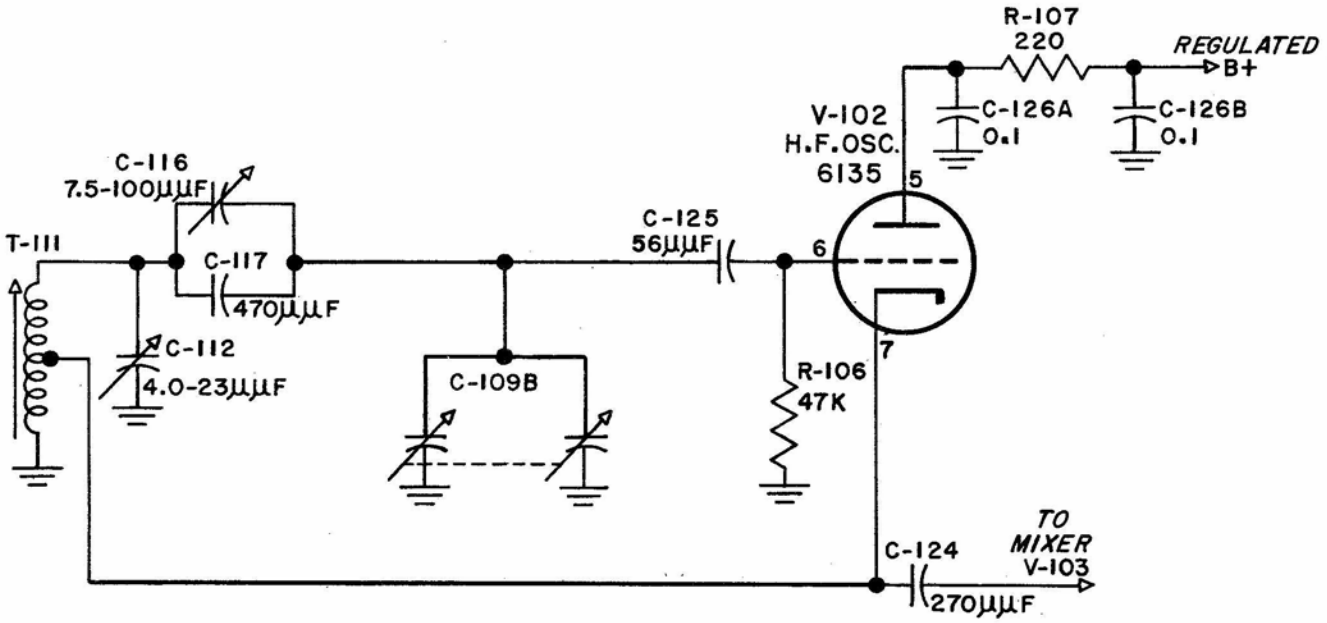


Figure 2–3. H.F. Oscillator V-102, Simplified Schematic Diagram

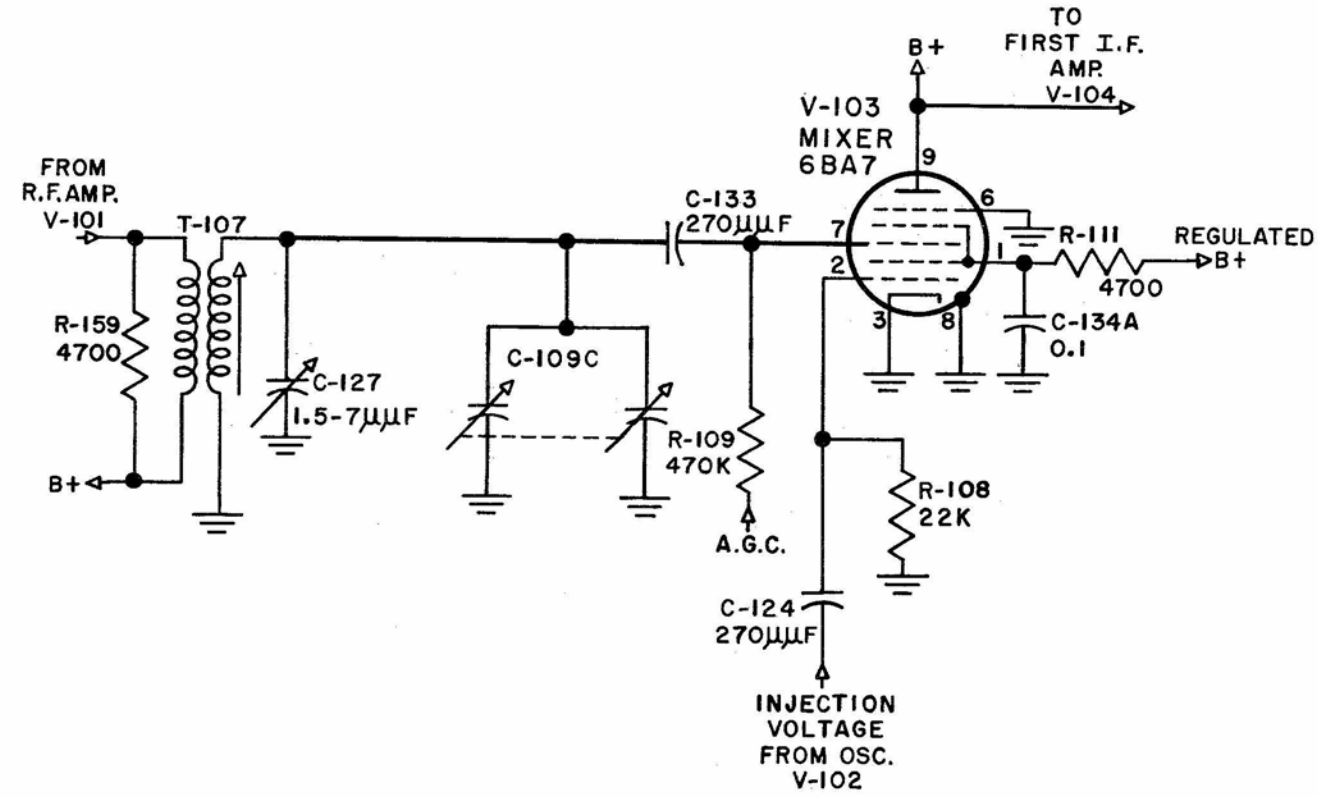


Figure 2–4. Mixer V-103, Simplified Schematic Diagram

tor C-125 is the feedback coupling capacitor to the grid of V-102, and C-126A is the bypass capacitor which maintains the plate of V-102 at R.F. ground potential. Regulated B+ voltage is fed to the oscillator plate through R-107. C-126A and C-126B are bypass capacitors.

d. MIXER V-103 CIRCUIT DETAILS. *(See Figures 2–4 and 7–13).*–V-103 is a type 6BA7 pentagrid converter used as the mixer tube. Incoming signal voltages, after amplification by R.F. amplifier V-101, are impressed across the primary of the mixer transformer, as selected by switch section S-101D. This switch has six main functions:

(1) To connect the output of R.F. amplifier V-101 to the primary of the mixer transformer of the band in use.

(2) To connect the secondary of the selected mixer transformer to the signal grid (pin 7) of mixer V-103 through coupling capacitor C-133.

(3) To short out the unused mixer transformers.

(4) To connect section C-109C of the Main Tuning capacitor to the selected mixer tuned circuit.

(5) In the SW3 position of the Band Selector switch to connect only the larger stator of C-109C to the tuned circuit and to disconnect the smaller stator.

(6) To connect B+ voltage to the plate of R.F. amplifier V-101.

The signal generated by H.F. Oscillator V-102 is 455 kilocycles higher in frequency than the incoming signal. This signal passes through coupling capacitor C-124 to the injection grid of V-103. The mixing of the oscillator signal with the incoming signal, applied at pin 7, produces a signal similar to the original incoming signal but at frequency of 455 kilocycles which is impressed across I.F. transformer Z-101. Figure 2–4 illustrates the mixer circuit with the Band Selector switch in the BC position. Resistor R-108 is the grid leak resistor for the oscillator injection grid of V-103 and C-134A is the screen bypass capacitor. Plate voltage is obtained through resistor R-113 and the primary of Z-101. (See Figure 7–13.) Regulated B+ voltage is supplied to the screen grids through resistor R-111. Automatic gain control voltage is applied to the signal grid of V-103 through isolating resistor R-109.

e. I.F. AMPLIFIER V-104 CIRCUIT DETAILS.–Figure 2–5 is a simplified schematic diagram of the first I.F. amplifier stage of the receiver. Both I F. amplifier stages are quite similar and a discussion of one will hold true for the other. Two type 5749 pentodes are used as intermediate frequency amplifiers operating at a frequency of 455 kilocycles ±10%. First and second I.F. transformers Z-101 and Z-102, and detector input transformer Z-103 are each made up of a primary and a secondary winding tuned to a frequency of 455 kilocycles. A fixed capacitor is connected in parallel with each winding. Tuning is accomplished by adjusting the iron cores of the transformers. In addition, each I.F. transformer has an extra winding connected in series with the secondary of the transformer. Front-panel mounted Reception switch S-102 has been provided to switch these tertiary windings either in or out of the circuit. Switching this winding in series with the secondary of the transformer provides increased coupling between primary and secondary thereby increasing the effective bandwidth of the individual transformer. Switch S-102 has four positions marked B, M, S and C.W. corresponding to the positions producing broad, medium and sharp selectivity, respectively, with the C.W. position providing sharp selectivity for reception of C.W. signals.

With switch S-102 in the B position the tertiary windings of both I.F. transformers are connected in series with the secondaries and maximum I.F. bandwidth is obtained. When placed in the M position, one-half of the tertiary winding on Z-102 is switched out of the circuit, effectively decreasing the bandwidth of that transformer. (See Figure 7–13.) If switch S-102 is placed in the S or C.W. position the extra winding on both Z-101 and Z-102 are cut out of the circuit and maximum selectivity is obtained. It may be noted that the tertiary winding of each I.F. transformer is composed of only a few turns so that connecting or disconnecting it from the transformer circuit will cause the resonant frequency of the transformer to change only a very small amount while producing large changes in the coupling between the two windings. This feature enables the bandwidth of the transformer to be controlled without shifting the resonant frequency of the transformers.

With switch S-102 in the C.W. position the cathodes of V-104 and V-105 are connected through their individual cathode biasing resistors to the movable arm of R.F. Gain control R-120 which is part of a voltage divider circuit consisting of resistors R-118, R-119 and R-120. The R.F. Gain control is operative only when Reception switch S-102 is in the C.W. position, S-102C connecting the cathodes of V-104 and V-105 to ground through resistors R-115, R-169 and R-121, respectively, in the B, M and S positions. In the B and M positions of the Reception switch, resistor R-169 is added to the V-104 cathode circuit in order to make the gain of V-104 equal for all positions of switch S-102. The value of R-169 will vary from equipment to equipment. Its value will depend on the gain of the IF stage in the individual receiver. Some R-302/URR-22 receivers will not require this resistor.

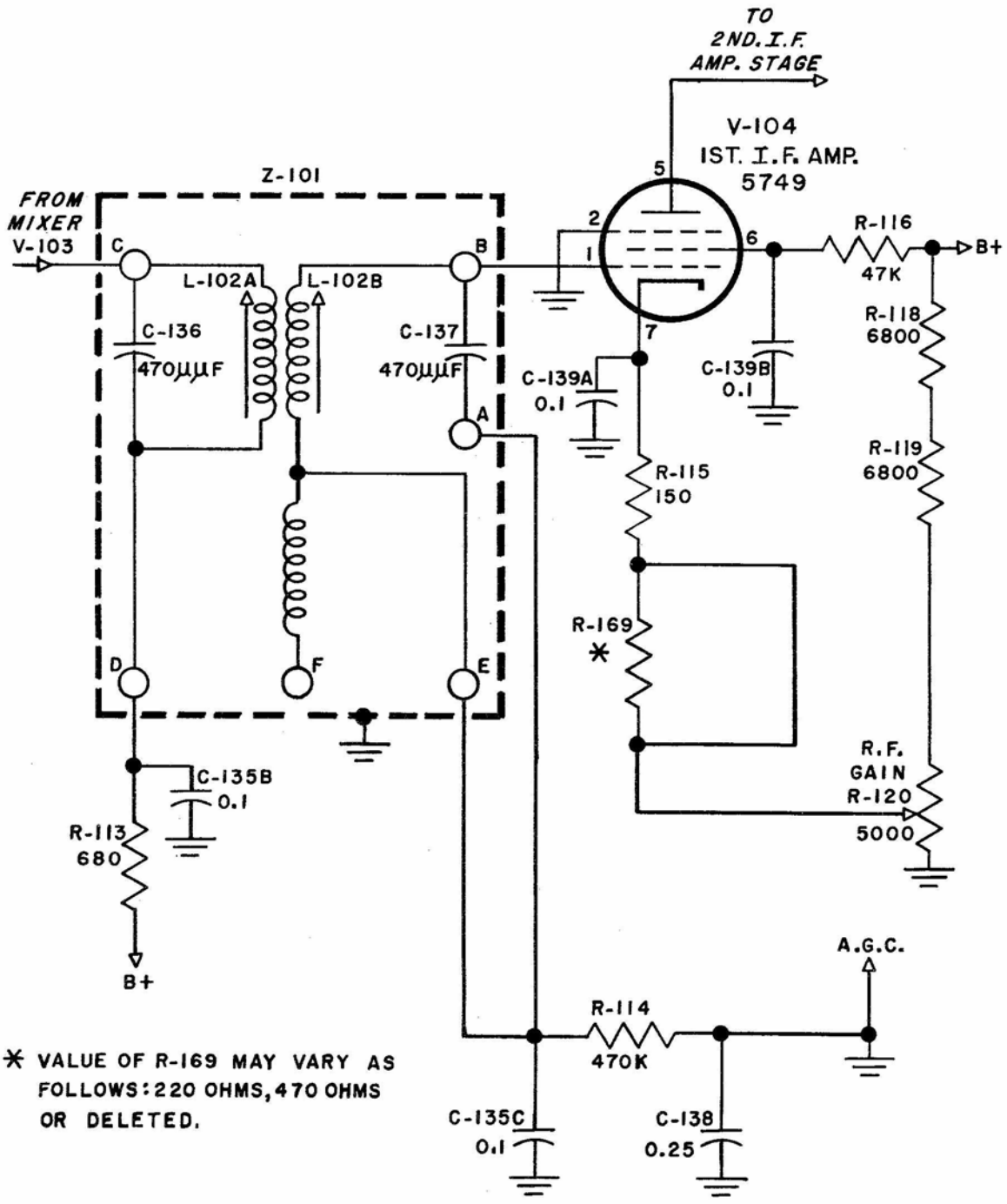


Figure 2–5. First I.F. Amplifier V-104, Simplified Schematic Diagram

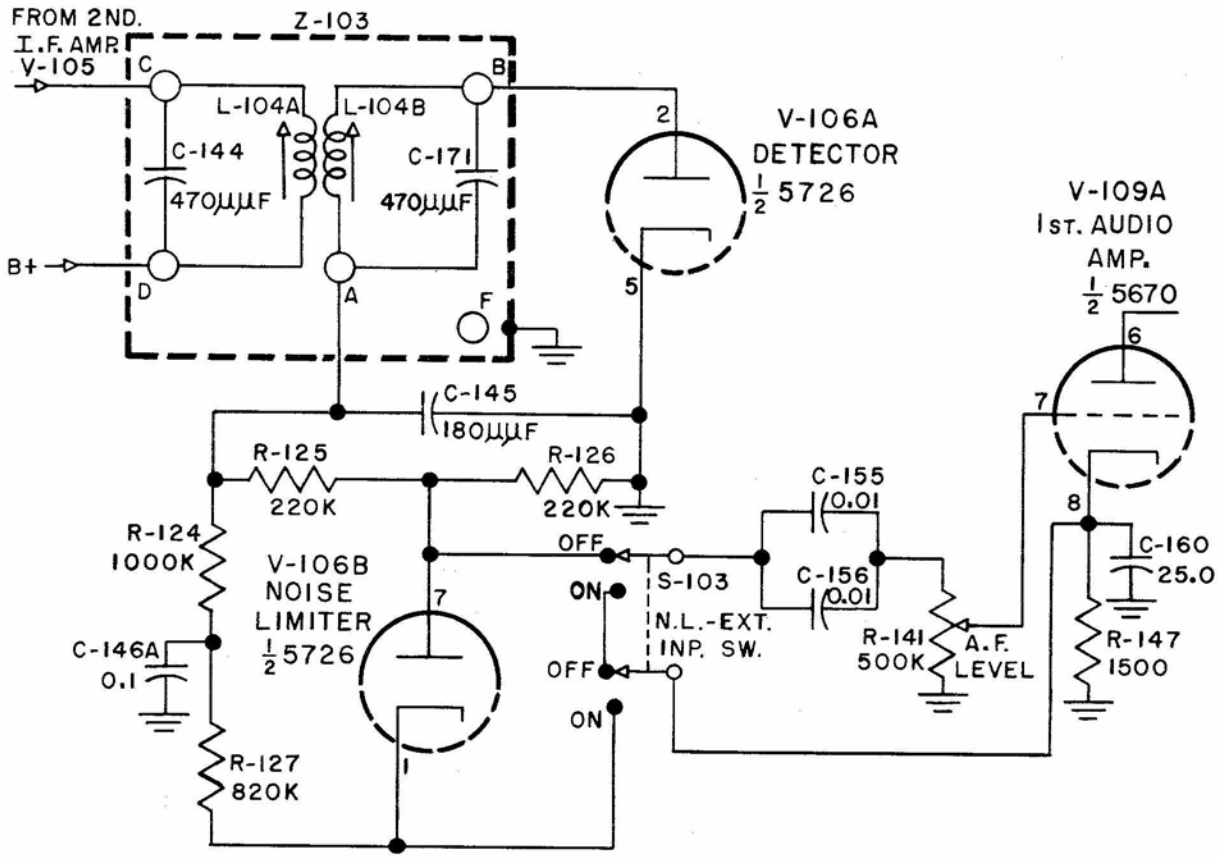


Figure 2–6. Detector V-106A and Noise Limiter V-106B, Simplified Schematic Diagram

When R-169 is included in the cathode circuit of V-104, its value will be either 220 ohms or 470 ohms.

Automatic gain control voltage is applied to the control grid of V-104 through isolating resistor R-114, switch S-102A and the secondary of transformer Z-101. When switch S-102 is in the C.W. position, the A.G.C. is disconnected.

f. DETECTOR V-106A AND NOISE LIMITER V-106B CIRCUIT DETAILS. *(See Figure 2–6.)*–Detector input transformer Z-103 and V-106A, one half of a type 5726 duo-diode, comprise a conventional diode second detector for the receiver. Transformer Z-103 is tuned to the intermediate frequency of 455 kilocycles by capacitor C-144 in parallel with the primary winding and C-171 in parallel with the secondary, the resonant frequency of the two circuits being adjustable by means of variable iron cores.

V-106B is the other half of the same type 5726 duo-diode and is used as the diode in a noise limiter circuit.

With N.L.-EXT INP switch S-103 in the N.L. OFF position, operation of the second detector circuit is as follows:

Signals appearing at the secondary of detector input transformer Z-103 are rectified by the action of detector V-106A, the cathode of this tube being connected directly to ground. Resistors R-126 and R-125 complete the D.C. circuit between the two ends of the secondary winding so that with a positive signal voltage from Z-103, a voltage which is negative with respect to ground and proportional to the incoming signal is produced at the junction of R-125 and R-126. This negative signal passes through switch S-103, coupling capacitors C-155 and C-156 and part of A.F. Level control R-141 to the grid of first A.F. amplifier V-109A. These signals also pass from the junction of resistors R-126 and R-125 through resistor R-138 to the grid of tuning indicator V-114 which provides a visual tuning indication. (See Figure 7–13.)

When the N.L.-EXT INP switch is in the N.L. ON position, the noise limiter is placed in series with the detector. The detector output voltage developed across R-126 is then coupled to the audio amplifier through the noise limiter diode. When a heavy positive swing of the modulated wave is impressed on the plate of detector V-106A, the output negative voltage developed across resistors R-125 and R-126 is applied to the plate of the noise limiter, V-106B. The limiter cathode does not change correspondingly because of the time to charge capacitor C-146A through resistor R-124. The time constant of these two components are such that, with a 100% modulated wave,

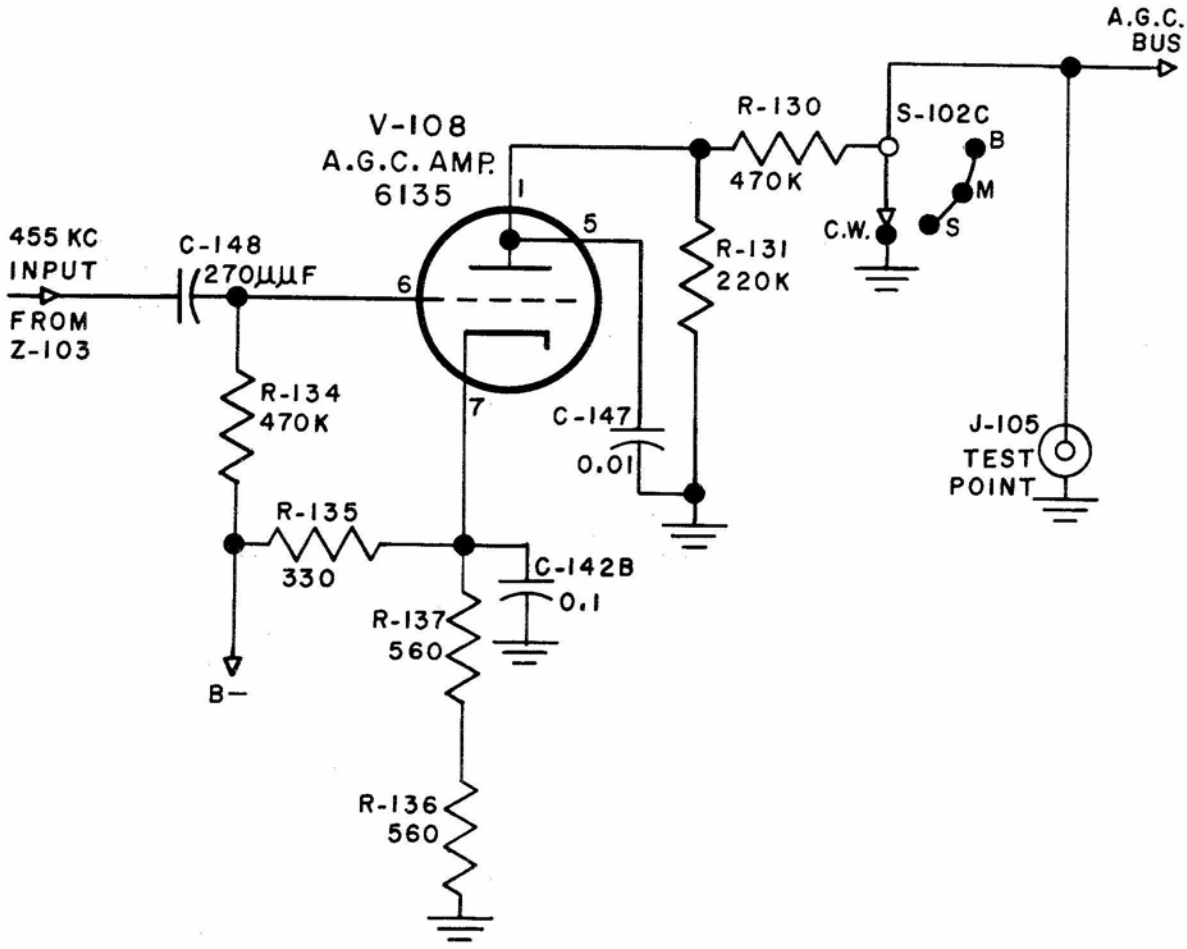


Figure 2–7. A.G.C. Amplifier V-108, Simplified Schematic Diagram

the limiter clips 35% off the peak value. On negative swings of the input signal to the plate of detector V-106A, the rectifying action of the detector clips off any signal beyond the peak value of the negative signal.

g. AUTOMATIC GAIN CONTROL V-108 CIRCUIT DETAILS. *(See Figure 2–7.)*–V-108 is a type 6135 triode used as the A.G.C. amplifier in the receiver, rectifying signals taken from the secondary of detector input transformer Z-103 and applying a corresponding D.C. negative voltage to the grids of R.F. amplifier V-101, mixer V-103 and first I.F. amplifier V-104. This biasing voltage controls the amplification of those three stages in inverse proportion to the strength of the signal being received. That is, when a strong signal is being received, A.G.C. amplifier V-108 converts the signal to a large negative voltage and applies this negative voltage to the A.G.C. bus. The control grids of the three controlled stages are connected to the A.G.C. bus so these A.G.C. voltages are actually grid biasing voltages which vary with the strength of the received signal and thus control the amplification of those three stages by the correct amount to provide essentially constant audio output with varying signal strength.

The plate of A.G.C. amplifier V-108 is connected to ground through plate load resistor R-131 while the cathode is connected to the B-minus lead through R-135. It will be noted at this time that the only connection within the receiver between chassis ground and B-minus is through the voltage divider network consisting of resistors R-135, R-137 and R-136 which are shown in Figure 2–7 as being in the cathode circuit of V-108. Therefore, the total cathode current of all tubes used in the receiver passes through these three resistors. In normal operation this current produces a negative voltage of approximately 60 volts at the cathode of V-108 while the B-minus lead is approximately 70 volts more negative than chassis ground. The value of resistor R-135 has been chosen so that the proper grid voltage to bias V-108 beyond cutoff is developed across R-135 and passes through grid leak resistor R-134 to the grid of V-108. With no signal or a very weak signal being received by the re-

ceiver, V-108 is not conducting and the only biasing voltage on the control grid of each tube in the receiver is that due to the action of the individual cathode biasing resistors associated with each stage. Assume now that a strong signal is picked up by the receiver and passes through each stage until it appears at the secondary of detector input transformer Z-103. In addition to being detected by second detector V-106A it also passes to the control grid of A.G.C. amplifier V-108 through coupling capacitor C-148. During the negative half-cycle it merely drives the grid of V-108 more negative and no A.G.C. action takes place. During the positive half-cycles, however, the grid of V-108 is driven positive and V-108 begins to conduct by an amount proportional to the amplitude of the incoming signal. The resultant voltage drop across plate load resistor R-131 appears at the plate of V-108 as a negative voltage which is passed to the A.G.C. bus through isolating resistor R-130. The RC circuit composed of R-131 and C-147 smoothes out this pulsating D.C. voltage to a steady D.C. voltage suitable for application to the various grid returns. The values of resistors R-135, R-136 and R-137 determine the correct delay voltage for the stage so that proper delay in A.G.C. action is obtained.

h. C.W. OSCILLATOR V-107A AND BUFFER AMPLIFIER V-107B CIRCUIT DETAILS. *(See Figure 2–8).*–The C.W. oscillator consists of one-half of a type 5814 dual-triode, V-107A, in a conventional Hartley oscillator circuit with the plate of the oscillator tube at R.F. ground potential. The other half of the same tube, V-107B, is connected in an ordinary resistance-coupled amplifier circuit and serves as a buffer amplifier for the C.W. oscillator.

The oscillator tuned circuit consists of variable iron-core inductor L-105, capacitor C-151 and front-panel mounted B.F.O. Vernier control C-150, a variable capacitor. Capacitor C-152 is the grid capacitor of V-107A and resistor R-132 is the grid resistor. The oscillator is tuned to a center frequency of 455 kilocycles by adjustment of the variable iron core of C.W. oscillator coil L-105. Resistor R-133 is the plate isolating resistor and C-169 the plate bypass capacitor for V-107A.

When Reception switch S-102 is placed in the C.W. position, switch section S-102C supplies B-plus voltage to V-107A through resistor R-133 and to V-107B through plate load resistor R-160. Output from the C.W. oscillator is coupled from the cathode of V-107A through coupling capacitor C-168 to the grid of V-107-B. The amplified signal is coupled from V-107B through coupling capacitor C-149 to the plate of second detector V-106A where it combines with the 455 kilocycle signal from detector input transformer Z-103 to produce a beat note. The frequency of the beat note depends upon the frequency of oscillation of the C.W. oscillator. Adjustment of the B.F.O. Vernier control will produce a maximum frequency deviation of approximately 1,750 cycles either side of zero beat.

Resistor R-161 is the grid leak resistor for buffer amplifier V-107B and resistor R-162 the cathode biasing resistor, bypassed by capacitor C-170.

i. AUDIO AMPLIFIER V-109 CIRCUIT DETAILS. *(See Figure 7–13.)*–Radio Receiver R-302/URR-22 utilizes two stages of audio amplification prior to the actual audio power amplifier and the phase splitter stage which feeds it. Each section of a type 5670 dual-triode, V-109, is used as a stage of audio amplification for the signal after it leaves the second detector and automatic noise limiter circuits. Basically the two stages consist of two resistance-coupled triode amplifiers with Fidelity control R-140 included as part of the coupling network between the first and second stages.

Rectified audio signals are coupled from the second detector and noise limiter circuits through coupling capacitors C-155 and C-156 to one side of A.F. Level control R-141 and are impressed upon the grid of first audio amplifier V-109A through the movable contact arm of R-141. Rotation of the A.F. Level control in a clockwise direction enables the operator to control the amplitude of the signal applied to the audio circuits and therefore also control the audio volume at the loudspeaker. The signals are then amplified by V-109A and coupled from the plate of V-109A to the grid of second audio amplifier V-109B through coupling capacitors C-158 and C-159.

The Fidelity control network consists of R-140, R-145, R-146 and C-154. Voltage from the first audio amplifier, V-109A is reduced by the voltage dropping action of R-145 and R-146. Since these are resistors, the voltage dropping action effects the high and low tones to the same degree when the Fidelity control, R-140, is in its position of maximum resistance. This essentially takes C-154 out of the circuit. Thus, a flat audio frequency voltage characteristic is produced at the grid of V-109B and is equal to about 1/10 of the amplitude of the signal coming from the plate of V-109A. When the Fidelity control is turned to zero resistance, then R-145 is shunted by capacitor C-154. Since the impedance of the capacitor at high frequencies is lower proportionally than at low frequencies, the high frequencies will be bypassed around R-145 to the grid of V-109B, providing more voltage at V-109B at high than at low frequencies. Hence a treble boost effect will result.

After passing through the coupling network the signal is impressed upon the grid of second audio amplifier V-109B where it is amplified and coupled to the grid of phase splitter V-110 through coupling

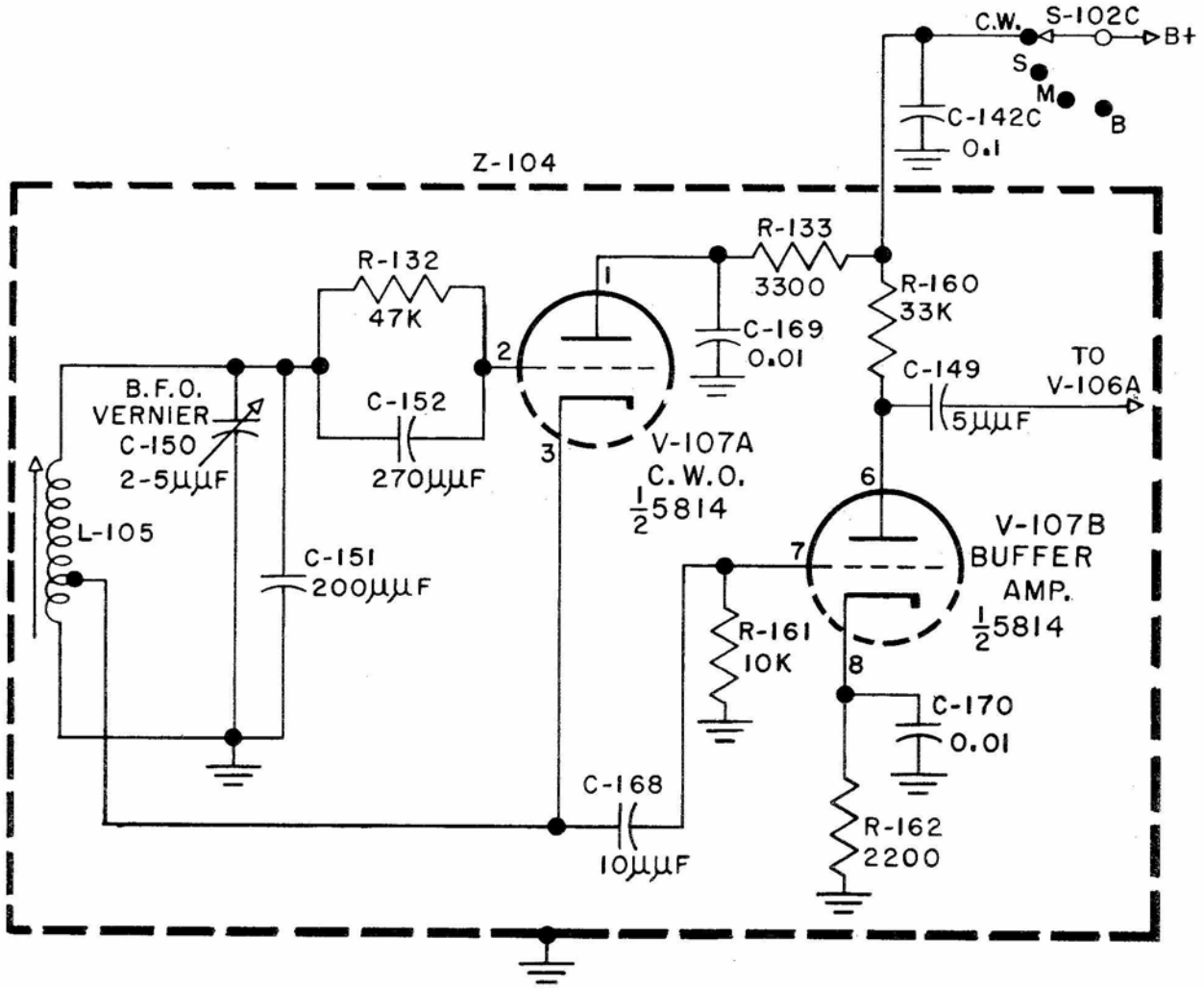


Figure 2–8. C.W. Oscillator V-107A and Buffer Amplifier V-107B, Simplified Schematic Diagram

capacitors C-162 and C-163.

Resistor R-142 is the plate load resistor for V-109A and resistor R-147 is the cathode biasing resistor bypassed by capacitor C-160. Resistor R-145 is part of the coupling network between V-109A and V-109B while resistor R-146 is the grid resistor for V-109B. Resistor R-144 is the plate load resistor for V-109B and resistor R-149 is the cathode biasing resistor. Degenerative feedback is provided to V-109B, its cathode being connected to the plate of audio output amplifier V-112 through resistor R-154.

j. PHASE SPLITTER V-110 CIRCUIT DETAILS. *(See Figure 2–9.)*–In order to provide push-pull audio output from the receiver the audio signal must be separated into two signals which are identical in shape and amplitude but opposite in phase. This is the function of phase splitter V-110, a type 6135 triode.

Signals amplified by second audio amplifier V-109B are coupled to the grid of phase splitter V-110 through coupling capacitors C-162 and C-163. The action of plate load resistor R-153 produces a signal at the plate which is 180 degrees out of phase with the input signal on the grid, while at the cathode, signals are obtained which are in phase with the signal on the grid. Resistor R-152 can be considered as being part of the plate load resistance with resistor R-153 comprising another part. Since these resistors are of equal value and in series with the tube, any voltage changes across one due to the variation of plate current through the tube will be approximately equal in amplitude to the voltage change across the other. Therefore, two signals of equal amplitude and opposite phase are obtained, one at the plate of V-110 and the other at the junction of load resistor R-152 and cathode biasing resistor R-151. The signal from the plate is coupled to the control grid of audio output amplifier V-111 through coupling capacitors C-164

and C-165, while the signal from the cathode circuit is coupled to the control grid of audio output amplifier V-112 through coupling capacitor C-175. Resistor R-150 is the grid leak resistor for V-110.

k. AUDIO OUTPUT AMPLIFIERS V-111 AND V-112 CIRCUIT DETAILS. *(See Figure 7–13.)*–Undistorted audio power output of at least 2.5 watts at 60 ohms or 0.2 watts at 600 ohms is provided through the use of two type 5686 pentodes, V-111 and V-112, connected in a conventional push-pull amplifier circuit.

The audio signal from the plate of phase splitter V-110 is coupled through capacitors C-164 and C-165 and is impressed upon the control grid of V-111. Simultaneously, a signal which is identical in shape and of equal amplitude but of opposite phase is coupled from the cathode circuit of V-110 through coupling capacitor C-175 to the control grid of V-112. Since the signals on the grids of V-111 and V-112 are 180° out of phase, when one grid goes in a negative direction, the other goes in a positive and one tube will conduct less than the other. As the signal swings in the opposite direction the reverse happens, the first tube draws more plate current while the other draws less.

Transformer T-102 is the audio output transformer used in the receiver. It has a single center-tapped primary winding and two secondary windings, one of which drives either the internal monitoring loudspeaker or the headphones inserted in Phones Jack J-103, and the other winding providing external output through a type. AN 3102-14S-2P connector, J-104, which is mounted on the rear of the chassis. Audio power of at least 2.5 watts at 60 ohms or 0.2 watts at 600 ohms is available at terminals A and C of audio connector J-104 to drive up to ten external amplifiers when properly connected. Audio power of at least 0.1 watts is supplied to either headphones jack J-103 or to the primary of transformer T-115 of the loudspeaker LS-101, as determined by the position of Monitor switch S-104. Monitor Level control R-166 provides a means of adjusting the audio power level delivered to the headphones jack or to the Monitor loudspeaker without affecting the power level available at J-104.

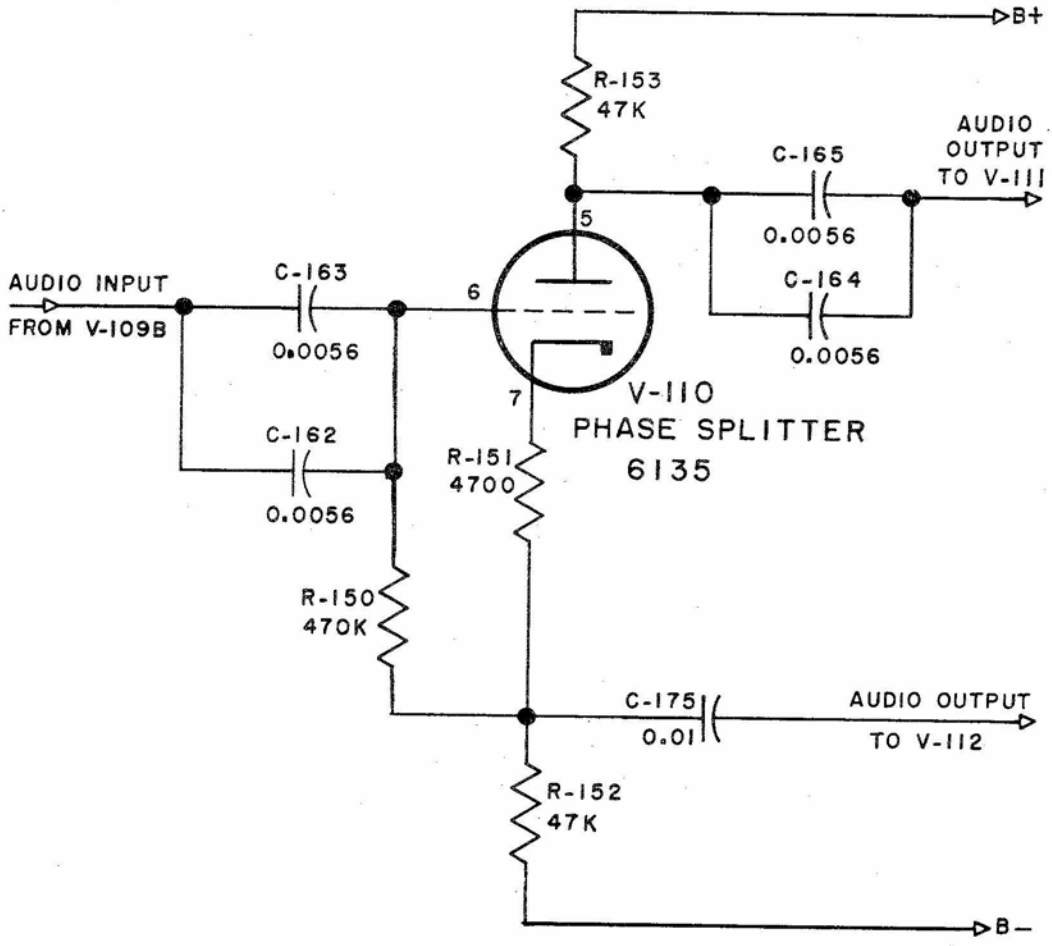


Figure 2–9. Phase Splitter V-110, Simplified Schematic Diagram

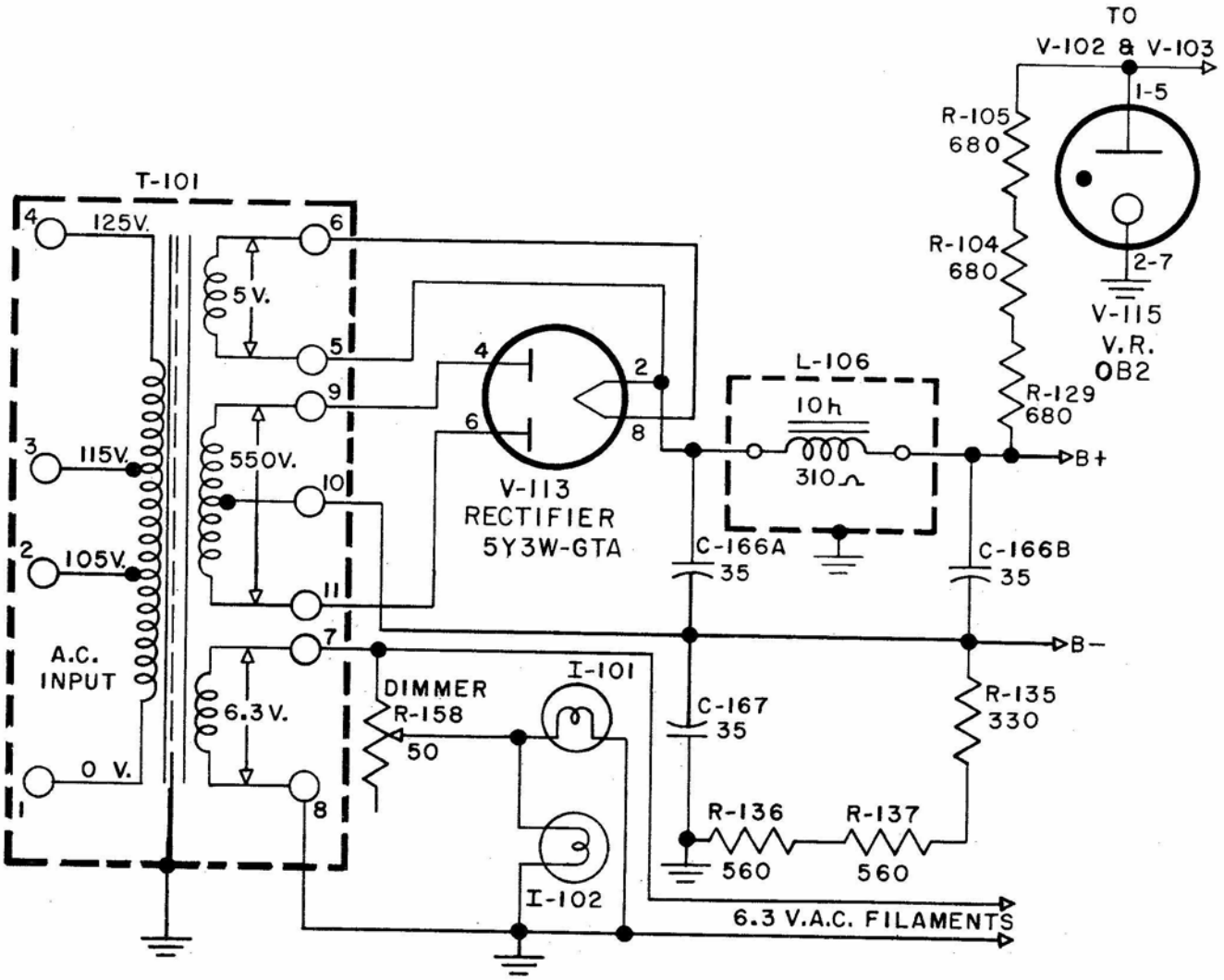


Figure 2–10. Power Supply, Simplified Schematic Diagram

1. POWER SUPPLY CIRCUIT DETAILS. *(See Figure 2–10.)*–The power supply used in the receiver has been designed to furnish filament voltage of 6.3 volts AC at 4 amperes, and B-plus voltages of 225 volts DC at 110 milliamperes and 108 volts DC, regulated, at 40 milliamperes when connected to the proper A.C. supply voltage. Power transformer T-101 has three taps on the primary permitting operation of the equipment from supply voltages of 105, 115, or 125 volts A C. depending upon the position of the movable link which is placed in the correct position when the equipment is installed.

V-113 is a type 5Y3W-GTA rectifier tube connected in a full-wave rectifier circuit with the two ends of the high-voltage secondary winding of power transformer T-101 connected to the plates of the tube. B-plus voltage is taken from one of the cathode leads while B-minus voltage is taken from the center-tap of the high-voltage secondary. The B-minus lead is not connected directly to the chassis, the circuit from chassis to B-minus being completed through resistors R-135, R-136 and R-137 as shown in Figure 2–10. Current flowing through these resistors produces a voltage drop across them so that the chassis is maintained at a positive potential of approximately 70 volts with respect to B-minus.

The filter circuit is of the capacitor-input pi-section type and consists of capacitors C-166A and C-166B and choke L-106. Capacitor C-167 is connected between chassis ground and B-minus to provide additional filtering.

V-115 is a type OB2 voltage regulator tube which supplies a positive regulated voltage of 108 volts DC to H.F. oscillator V-102 and the screen grids of mixer V-103 to insure stable operation. Resistors R-129, R-104 and R-105 are voltage dropping resistors used

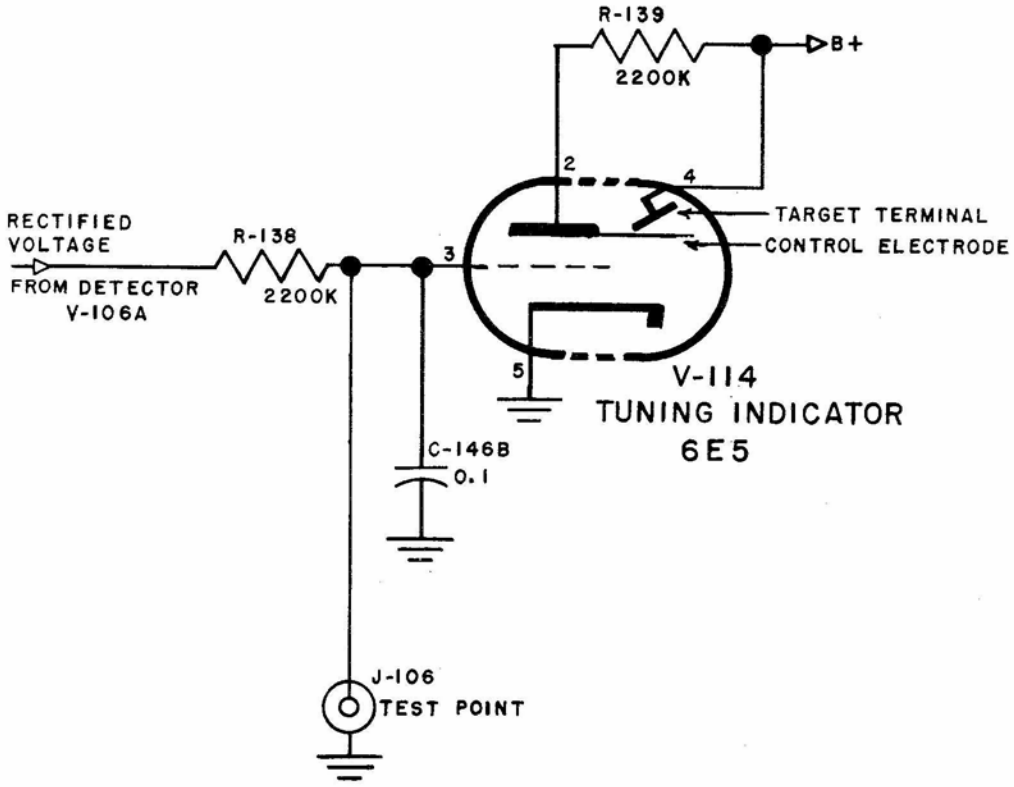


Figure 2–11. Tuning Indicator V-114, Simplified Schematic Diagram

to reduce the B-plus voltage to the approximate value required for proper operation of the regulator.

m. TUNING INDICATOR V-114 CIRCUIT DETAILS. *(See Figure 2–11.)*–A type 6E5 electron-ray tube is used as the tuning indicator to enable the operator to determine visually exactly when a station has been properly tuned on the receiver. Signals passing through the R.F. and I.F. circuits of the receiver are detected by second detector V-106A producing a negative voltage at the junction of resistors R-126 and R-125. (See sub-paragraph 3 f, Section 2, for a detailed explanation of the action of the second detector circuit.) This negative voltage is applied to the grid of V-114 through resistor R-138.

The electron-ray tube (often called "magic eye" or tuning eye) is a specially constructed tube which, during operation, exhibits a bright green luminous light circle when viewed from the end opposite the base. This luminous circle has a pie-shaped sector of a comparatively dark area as illustrated in Figure 2–12(a). The wide width of the sector is made to decrease from a maximum angle of 90° to a minimum of near zero degrees as the receiver is more closely tuned to the signal.

The electron-ray tube, V-114, contains two main parts within a single envelope. One is a high-mu triode section which operates as a D.C. amplifier. The rectified voltage from the output of detector V-106A, is applied to the triode grid and causes plate current of the triode to vary accordingly to the value of the applied signal. A cone-shaped target is mounted above the triode section. The inner surface of the target is coated with a fluorescent material which glows when struck by electrons. The target is connected directly to the plate voltage supply and therefore attracts electrons from the common cathode. A blade-like ray control is mounted between the cathode and the target. When the potential of the blade is less positive than the target, electrons flowing to the target are repelled by the electrostatic field of the electrode and so do not reach that portion of the target behind the electrode. Because the target does not glow where it is shielded from electrons, the ray control casts a wedge shaped shadow on the glowing target. The extent of the shadow varies from approximately 90° on the target when the control electrode is much more negative than the plate, to near zero degrees when the control electrode is at approximately the same potential as the target.

In operation, the potential of the ray-control electrode is determined by the voltage on the grid of the triode section. The flow of plate current through resistor R-139 produces a voltage drop which determines the potential of the control electrode. Since the rec-

tified negative voltage from the detector, V-106A, is a maximum when the receiver is correctly tuned to the incoming signal, the triode grid will be at a maximum negative potential for this condition. This makes the triode plate current a minimum. Since this current flows through resistor R-139 the voltage drop across R-139 will be a minimum value. The potential of the control electrode is then practically equal to that of the target, so that the shadow angle will be at a minimum. See Figure 2–12(b). When the receiver is off tune, the rectified voltage from the detector decreases. This decreases the negative potential of the triode section grid and the plate current increases. This causes the voltage drop across R-139 to increase, thus decreasing the positive potential on the control electrode. Since the latter is now more negative than the target, it prevents more electrons from reaching the target, thus increasing the angular width of the shadow. The receiver should then be tuned for minimum shadow angle.

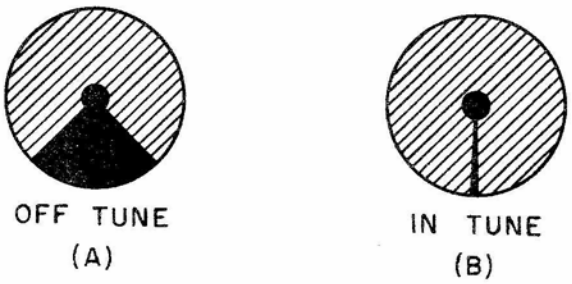


Figure 2–12. Shadow Angles of Tuning Indicator

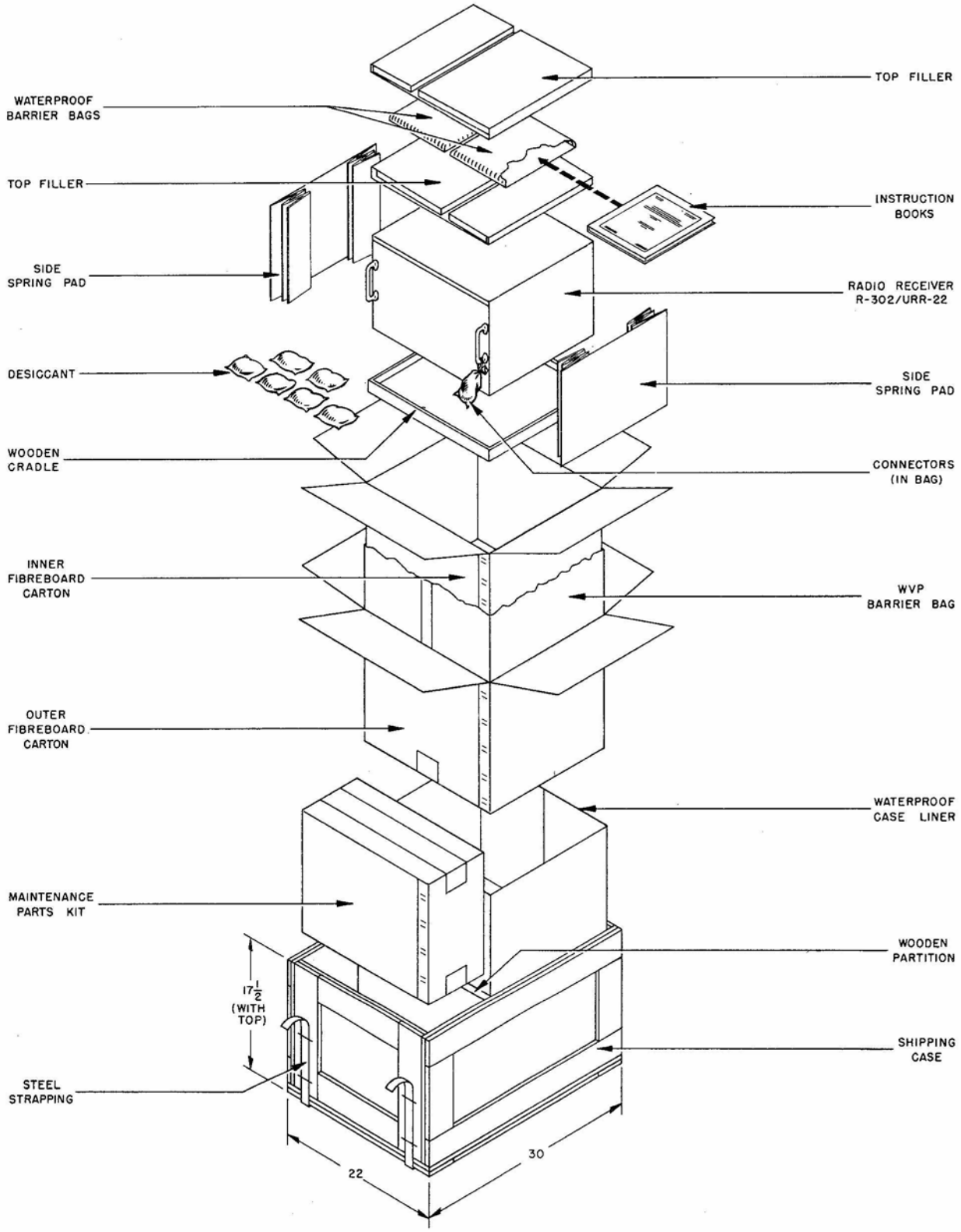


Figure 3–1. Unpacking Instructions

SECTION 3
INSTALLATION

1. UNPACKING.

The complete equipment consisting of one Radio Receiver R-302/URR-22, one set of equipment spare parts and two instruction books is packed in a wooden crate for overseas shipment. The equipment is protected from humidity by moisture-proof barrier cartons with an 18-month supply of silica gel inside each carton. The barrier cartons should not be opened until the equipment is to be installed since the silica gel will rapidly become saturated and lose its protective qualities upon exposure to humid atmosphere. The recommended procedure to be followed when unpacking the equipment is as follows:(See Figure 3–1.)

Step 1. Cut the metal straps around the crate and, using a nail puller or claw hammer to remove the securing nails, remove the side which is stencilled with the words, "Open this side."

Step 2. Remove sufficient filler material from the crate to permit access to the carton and lift out the packaged item.

Step 3. Remove the outer water-proof wrapper and remove the outer carton.

Step 4. Cut the moisture-vapor proof barrier along the heat-sealed seam and remove the barrier.

Step 5. Open the inner carton and remove the silica gel.

Step 6. Lift the equipment out of the carton.

Step 7. Thoroughly inspect the receiver inside and out for signs of any damage which may have been incurred during shipment. To gain access to the interior of the receiver loosen the twelve knurled thumb screws along the edges of the front panel and withdraw the chassis-panel assembly as far as it will go. Release the locks on either side of the chassis by pressing down on the two lever-type catches and lift the assembly out of the cabinet. (See Figure 5–1.)

Step 8. The packing crate and packing material should be saved in the event the equipmnet has to be repacked and shipped at a later date.

2. INSTALLATION.

Radio Receiving Set AN/URR-22 has been designed for permanent installation atop an operating table or bench. Figure 3–2 is a dimensional outline drawing showing the relative locations and size of the four holes which must be drilled in the mounting surface for permanent installations.

a. POSITIONING OF RECEIVER.–When determining the location of the receiver, make sure that a minimum access space of approximately three feet on all sides of the receiver is provided. This clearance insures easy access to the connections and fuses which are mounted on the rear of the cabinet. It also provides adequate space for servicing and operation of the receiver. The receiver should be located in a room or section of a room where the temperature will be more or less constant, away from any direct source of heat or cold. Extensive electrical shielding incorporated in the design of the receiver precludes the possibility of any interaction occurring between the receiver and other equipment in the room.

b. ANTENNA INSTALLATION.–The antenna input circuit of the receiver has been designed with a characteristic impedance of 70 ohms. This allows use of a single-wire type of antenna properly coupled to the receiver by means of an unbalanced transmission line. Best results will be experienced when the single-wire antenna is fed with coaxial cable of approximately 72 ohms nominal impedance such as RG-11/U or similar types. The antenna should be of optimum length and should be placed in the open as much as possible and spaced at least six feet from any parallel stay, mast or stack. A static drain resistor of approximately 500,000 ohms resistance should be permanently installed between the antenna and ground at any convenient point.

Connection between the antenna transmission line and the receiver is made through the use of two mating connectors. Antenna input connector J-101 is similar to a type UG-58A/U connector and is mounted on the rear of the chassis. Antenna plug P-101 is a type UG-21D/U connector which is packed with the receiver. P-101 is permanently affixed to the antenna transmission line when installation is performed. Figure 3–3 illustrates the method to be used when attaching P-101 to coaxial cable.

c. INTERCONNECTIONS.–Detailed instructions are given herein for connection of power, external amplifiers and/or external record player etc. All re-

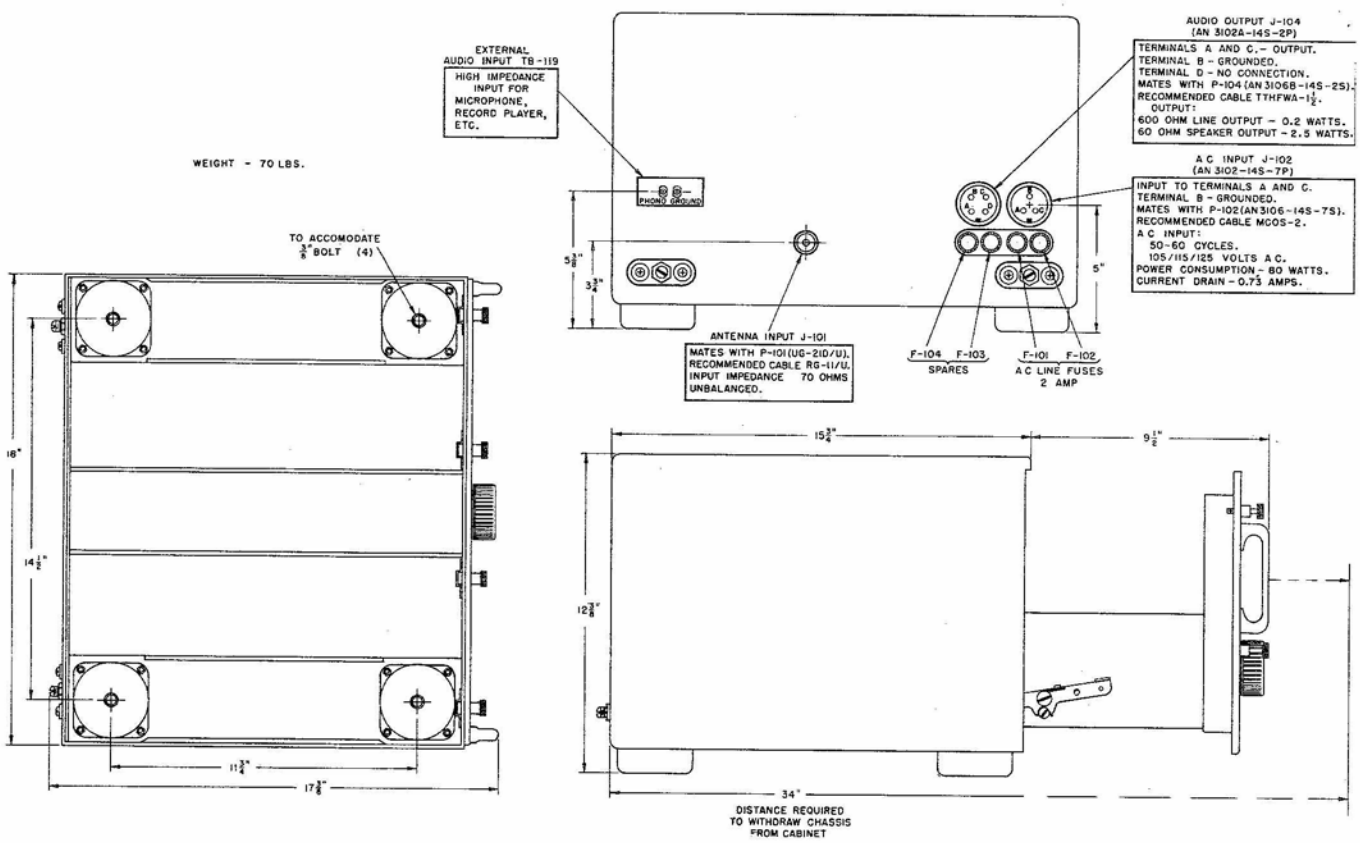


Figure 3–2. Dimensional Outline Drawing

TABLE 3–1. CONNECTOR PLUGS SUPPLIED FOR EXTERNAL CONNECTIONS

REF. SYMBOL OF PLUG	TYPE OF PLUG	MATING RECEPTACLE	CABLE USED WITH PLUG	EXTERNAL CIRCUIT
P-101	UG-21D/U	J-101 (ANT)	RG-11/U	Antenna
P-102	AN 3106-14S-7S	J-102 (A.C. POWER)	MCOS-2	105/115/125 volt, 50/60 cycle power source
P-104	AN 3106B-14S-2S	J-104 (AUDIO)	TTHFWA-1 1/2	External equipment

quired external connections from the receiver to other apparatus are illustrated and located in Figure 3–2, while Table 3–1 summarizes the type and functions of plugs supplied with the equipment.

(1) POWER CONNECTION.–In order to effect power connection to the receiver the A.C. power cable must be fabricated to its connector. Select a suitable length of two-conductor power cable such as Navy type MCOS-2 and terminate one end in a connector which will permit connection to the A.C. supply lines used in the installation. A.C. plug P-102, a type AN 3106-14S-7S connector is then attached to the other end of the power cable as illustrated in Figure 3–4. Connect one conductor to pin A of P-102 and the other conductor to pin C. Completely remove the chassis from the cabinet as described in paragraph 1, this Section and locate Primary switch panel S-106 underneath the chassis. Determine the supply voltage of the installation and connect the movable link on S-106 to the position corresponding to the available supply voltage. Proper placement of the link is accomplished by loosening the two screws which secure the link and loosening the screw corresponding to the correct voltage position. Each of the terminals on S-106 is marked to indicate the voltage with which it is to be used, either 105, 115 or 125 volts AC. Slide the link back along the direction of its slot until the link is free to pivot about its retaining screw. Slide the forked end of the link under the screw corresponding to the correct voltage setting and tighten all screws securely. Replace the chassis into the cabinet. The A.C. line cord may now be connected between the A.C. supply and the receiver A.C. input connector, J-102. (See Figure 3–6.)

(2) EXTERNAL AMPLIFIER CONNECTIONS.–The R-302/URR-22 receiver is fitted with an audio output receptacle, J-104, which is mounted on the rear of the chassis. J-104 is a type AN 3102A-14S-2P connector which is used when it is desired to connect external apparatus to be driven by the receiver audio circuits.

From one to ten external loudspeaker-amplifiers may be operated simultaneously from the audio output circuit of the receiver. The input circuits of the external amplifiers should be connected in parallel with each other. P-104 should be inserted in jack J-104. The method of fabricating Navy type TTHF-WA-1 1/2 shielded two-conductor cable to P-104 is illustrated in Figure 3–5. With external amplifiers connected to the receiver in this manner the input power level to them may be controlled by means of the A.F. Level control, while the Monitor Level control is used to control the amount of audio at the loudspeaker of Phones jack, J-103.

(3) EXTERNAL AUDIO INRUT CONNECTIONS.–The R-302/URR-22 receiver has been equipped to audibly reproduce the output of the high-impedance type of record player or similar device through the receiver audio circuits. EXT. INP connector TB-119 is a screw-type terminal board mounted on the rear of the chassis to accept the single-wire shielded cable from the external audio device.

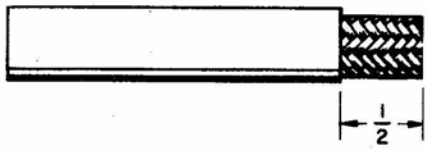
To connect a record player to the receiver, first loosen the two screws marked Phono and Gnd on TB-119. Wrap the center conductor of the shielded lead from the record player around the Phono screw and the shield around the screw marked Gnd. Tighten the two screws and installation is complete. See paragraph 3 c, Section 4 for the method of operation of the receiver when connected in this way.

3. INITIAL ADJUSTMENTS AND PERFORMANCE TESTS.

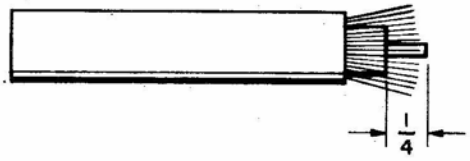
There are no initial adjustments required before the R-302/URR-22 receiver is placed in regular operation. To insure that the receiver has been properly installed and is in correct operating condition a listening test should be made. This test should be made on all four frequency bands and should be for both C.W. and M.C.W. operation. All controls should be operated to insure that they perform their intended functions properly. (See Figure 3–7.) Refer to Section 4, Operation, for a discussion of the various front-panel mounted controls.

No further tests or adjustments are necessary prior to turning the equipment over to operating personnel.

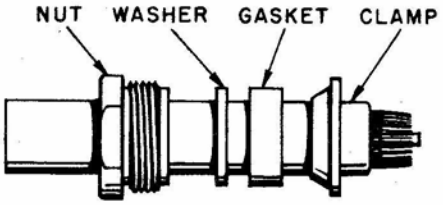
A- REMOVE 1/2" OF VINYL JACKET.



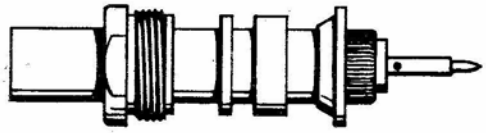
B- COMB OUT COPPER BRAID AS SHOWN. CUT OFF DIELECTRIC 1/4" FROM END. TIN CENTER CONDUCTOR.



C- TAPER BRAID AS SHOWN. SLIDE NUT, WASHER AND GASKET OVER VINYL JACKET. SLIDE CLAMP OVER BRAID WITH INTERNAL SHOULDER OF CLAMP FLUSH AGAINST END OF VINYL JACKET.



D- SMOOTH BRAID BACK OVER CLAMP AND TRIM. SOFT SOLDER CONTACT TO CENTER CONDUCTOR. AVOID USE OF EXCESSIVE HEAT AND SOLDER. SEE THAT END OF DIELECTRIC IS CLEAN. CONTACT MUST BE FLUSH AGAINST DIELECTRIC. OUTSIDE OF CONTACT MUST BE FREE OF SOLDER.



E- SLIDE BODY INTO PLACE CAREFULLY SO THAT CONTACT ENTERS HOLE IN INSULATOR. FACE OF DIELECTRIC MUST BE FLUSH AGAINST INSULATOR. SLIDE COMPLETED ASSEMBLY INTO BODY BY PUSHING NUT. WHEN NUT IS IN PLACE, TIGHTEN WITH WRENCHES UNTIL SUFFICIENTLY TIGHT.

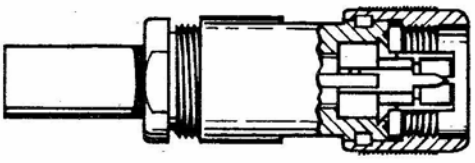
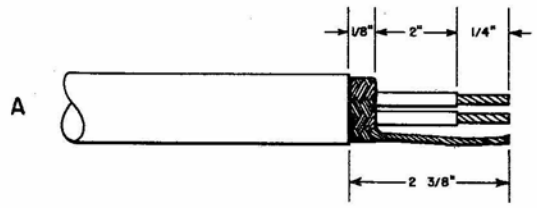
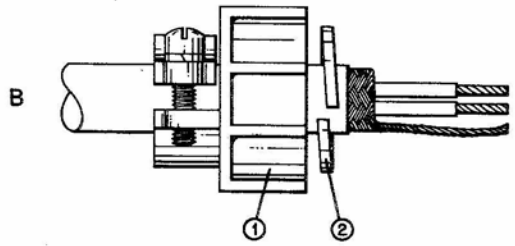


Figure 3–3. Fabrication of Coaxial Cable to Antenna Plug P-101

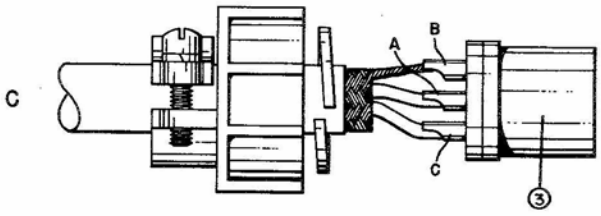
A – CUT BACK THE OUTER SHEATH TO DIMENSIONS SHOWN. REMOVE THE INSULATION FROM THE TWO INNER CONDUCTORS. UNBRAID THE SHIELD AND TWIST INTO A PIGTAIL.



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



C – SOLDER THE CONDUCTORS INTO PINS A AND C OF THE CONTACT ASSEMBLY ③. SOLDER THE PIGTAIL INTO PIN B.



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

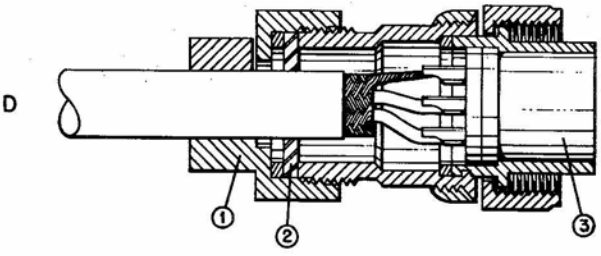
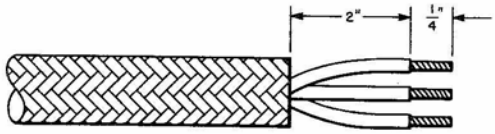


Figure 3–4. Fabrication of Power Cable to A.C. Power Plug P-102

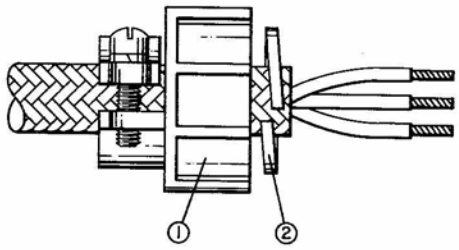
A– CUT BACK THE OUTER COVERINGS TO DIMENSION SHOWN. REMOVE THE INSULATION FROM THE THREE INNER CONDUCTORS.

A



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

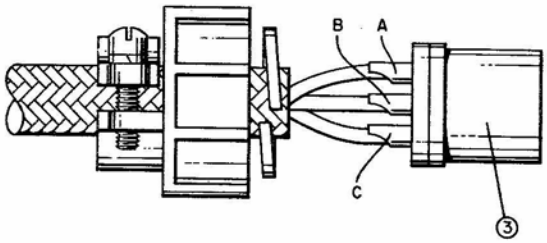
B



C– SOLDER THE CONDUCTORS INTO CONTACT ASSEMBLY ③ AS FOLLOWS:

TERMINALS A AND C – OUTPUT.
TERMINAL B – GROUND.
TERMINAL D – NO CONNECTION.

C



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

D

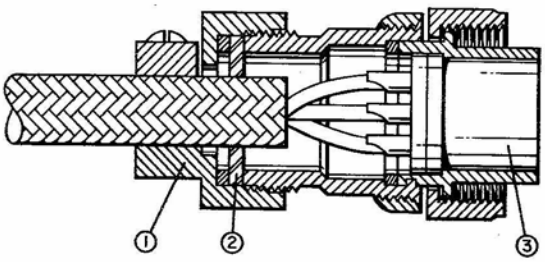


Figure 3–5. Fabrication of Audio Cable to Audio Plug P-104

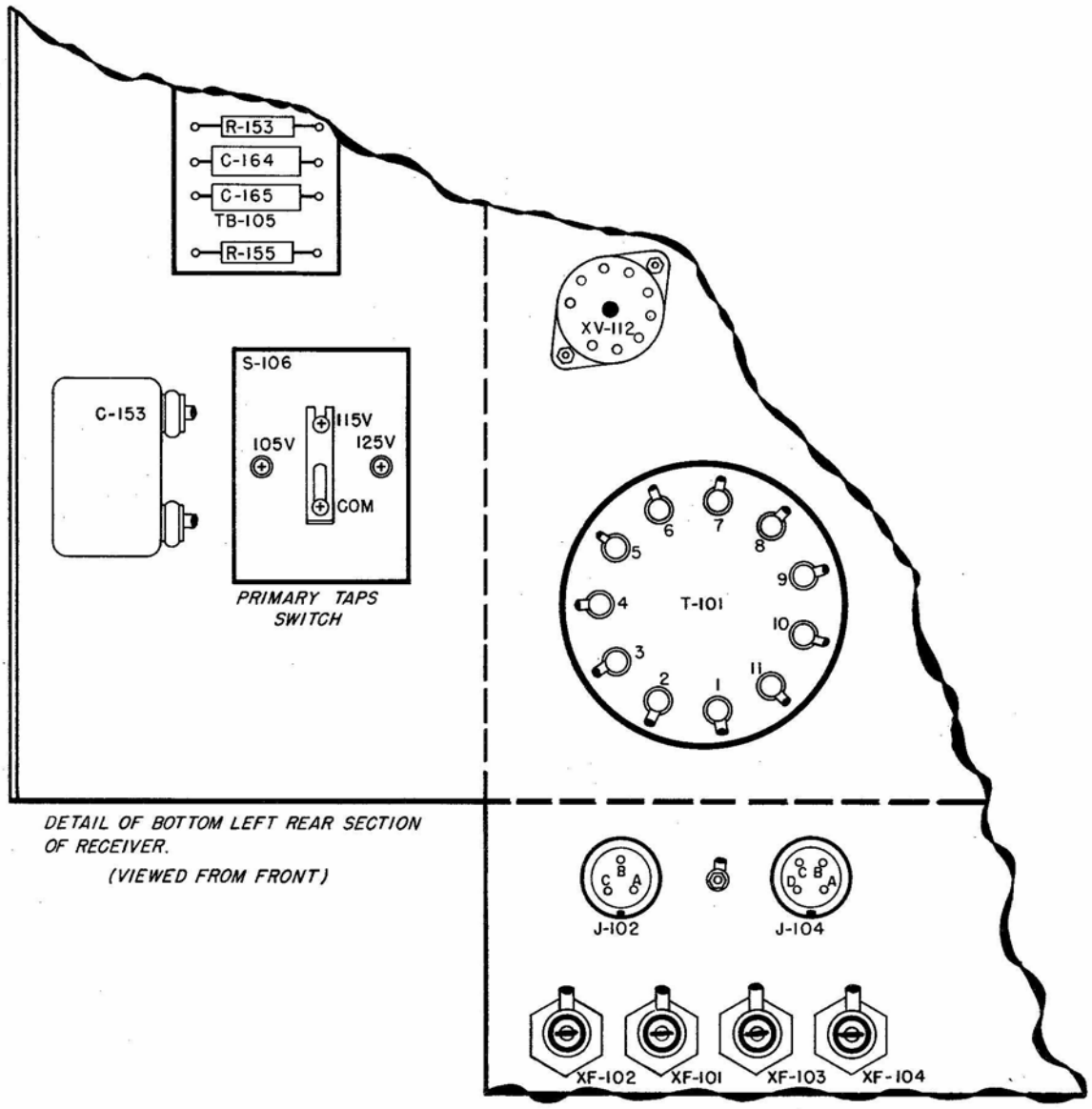


Figure 3–6. Detail View of S-106

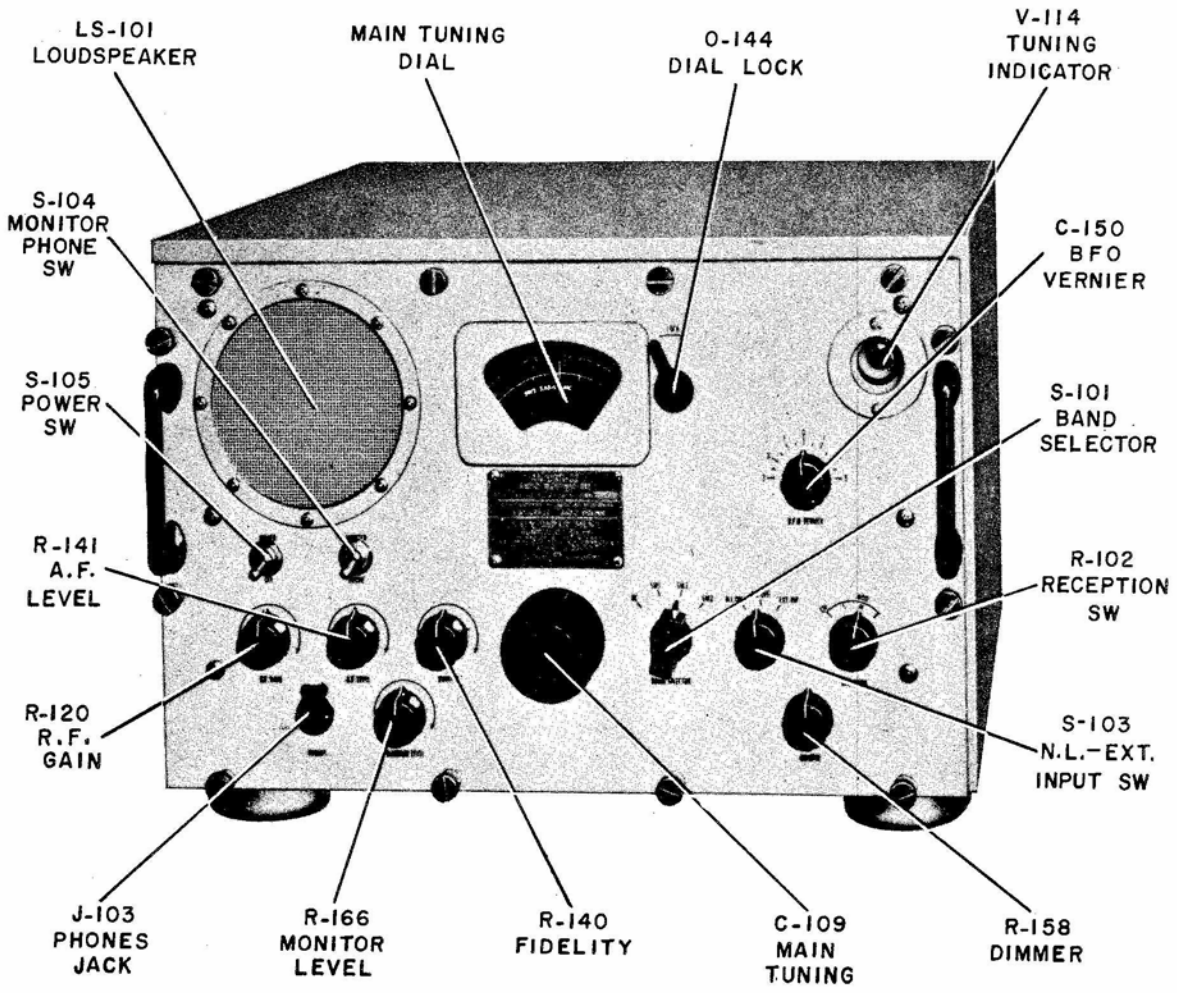


Figure 3–7. Front Panel Component Identification

SECTION 4
OPERATION

1. INTRODUCTION.

The R-302/URR-22 is a superheterodyne type radio receiver designed for use aboard all types of U.S. Naval surface vessels and at Naval shore radio stations. The receiver is capable of receiving voice or tone modulated signals or C.W. telegraphy signals over the frequency range of 0.54 megacycles to 18.6 megacycles.

The receiver is intended for use primarily for broadcast reception but it will also serve as an excellent emergency communications receiver within its specified frequency range.

This section is intended to provide the operator with sufficient information for efficient operation of the equipment.

2. CONTROLS.

All controls necessary for normal operation of the receiver are front-panel mounted and arranged in logical positions for most efficient operation. This sub-section is presented to familiarize the operator with the function of each operational control and device. Figure 3–5 locates and identifies all front-panel mounted controls of the receiver.

a. MAIN TUNING CONTROL.–This control is used to tune the receiver to any specific frequency between 0.54 megacycles and 18.6 megacycles. The tuning dial is calibrated directly in megacycles and frequencies may be read from the dial with an accuracy of plus or minus 1%. Clockwise rotation of the main Tuning control corresponds to an increase in frequency. The Tuning control varies the three sections of capacitor C-109 in the tuned circuits of the R.F. amplifier, the high frequency oscillator and the mixer.

b. LOCK CONTROL.–The lock control is a friction type device which functions to lock or unlock the main tuning drive mechanism. The mechanism is locked with the Lock control in the extreme right-hand position.

c. R.F. GAIN CONTROL.–Rotation of this control varies the gain of the receiver for C.W. reception only. Clockwise rotation of this control produces an increase in overall gain. The R.F. Gain control is operative only when the Reception switch is in the C.W. position.

d. POWER SWITCH.–This is a toggle switch which connects and disconnects both sides of the A.C. power line to turn the receiver on or off.

e. MONITOR SWITCH.–Another toggle switch, labeled Monitor, connects an audio circuit of the receiver to either the Phone jack or built-in loudspeaker, without affecting the main audio output line. With this switch in the Monitor position the speaker is connected into the circuit while the headphones are switched out, while the Phone position disconnects the loudspeaker and connects the Phones jack.

f. A.F. LEVEL CONTROL R-141.–This control is used to adjust the audio output volume of the receiver from a minimum at the extreme counter-clockwise position to a maximum at the extreme clockwise position.

g. MONITOR LEVEL CONTROL.–The Monitor Level control is used to adjust the audio power level delivered to the Monitor loudspeaker or to the Phones jack without affecting the audio level at the line output connector.

h. FIDELITY CONTROL.–This control determines the frequency response characteristics of the audio amplifier stages within certain limits. The extreme clockwise position of this control provides maximum high-frequency or treble response, while counter-clockwise rotation gives normal flat frequency response.

i. DIMMER CONTROL.–The Dimmer control raises or lowers the brilliance of the dial lamps, with minimum light at the extreme counter-clockwise position to full brilliance at the extreme clockwise position.

j. BAND SELECTOR.–This is a four-position switch which is used to select the desired frequency band upon which the receiver is to be operated. The four positions of the switch are marked on the front panel of the receiver as BC, SW1, SW2 and SW3. The BC position indicates that the receiver is set for operation on the broadcast band, while the three "SW" positions indicate the three short-wave bands on which the receiver may be operated. Depending upon its position, the Band Selector switch selects the proper tuned circuits of the antenna input section, the

R.F. amplifier, H.F. oscillator and mixer stages for the particular band of operation of the receiver. This switch also operates the dial mechanism to select the respective dial scales for each band for viewing corresponding to the switch section.

k. N.L.–EXT INP SWITCH.–This is a three-position switch which is used to select the desired manner of operation of the receiver audio circuits. The three positions of the N.L.–EXT INP switch are N.L. ON, N.L. OFF and EXT INP. With the switch in the N.L. ON position, the automatic noise limiter is switched into the receiver audio circuits for maximum suppression of most types of objectionable noise which could interfere with reception. In the N.L. OFF position the automatic noise limiter is switched out of the circuit for reception with best fidelity when objectionable noise is not a factor to be considered. When placed in the EXT INP position, the switch disables the signal circuits and connects the Phono terminal of EXT. INP. terminal board TB-119 to the receiver audio input circuit. In the EXT INP position, the only controls which remain operative are the Power switch, the A.F. Level control, the Fidelity control, the Monitor switch and control.

l. RECEPTION SWITCH.–The Reception switch is a four-position switch which is used to control the selectivity of the receiver. Three positions are marked B, M and S on the front panel. The B position indicates broadest receiver selectivity, the M position indicates medium and the S position denotes sharpest selectivity for minimum interference from unwanted stations. The B and M positions are normally used for broadcast reception. The fourth position of the Reception switch is marked C.W. for reception of code telegraph signals. When placed in the C.W. position the Reception switch activates the C.W. oscillator tube, disables the automatic volume control circuit, maintains the receiver I.F. stage at sharpest selectivity and makes the R.F. Gain control operative.

m. B.F.O. VERNIER CONTROL.–The B.F.O. Vernier control functions to vary the audio pitch of incoming C.W. signals. When the B.F.O. Vernier control is set at position 0, the audio beat note is at zero beat with the incoming signal. Rotating control either side of center enables the operator to vary the beat note to a tone which is most pleasing to him. The B.F.O. Vernier control is operative only when the Reception switch is in the C.W. position.

n. TUNING INDICATOR.–A type 6E5 electron-ray tube is used to provide a visual indication of correct tuning of the receiver. As the receiver is tuned to a signal the shadow on the face of the tube will suddenly narrow. When the receiver is exactly tuned to the incoming signal, the shadow angle will be at a minimum.

o. PHONES JACK.–The Phones jack is a Navy type -49025A telephone jack which is used to connect a pair of headphones to the audio output circuit of the receiver. The jack accomodates a JAN type PJ-055B head-telephone plug. The Monitor switch must be in the Phone position for headphone reception of the desired signal.

3. OPERATING INSTRUCTIONS.

This paragraph contains step-by-step instructions for proper operation of the receiver. Figure 4–1 contains pictorially the same information as is given here. Careful adherence to the procedure as given will enable the operator to operate the receiver in the most efficient manner.

a. PHONE RECEPTION.–After the receiver has been properly installed as described in Section 3, the following steps are taken to place the receiver in operation. With the receiver adjusted for phone reception as described, the R.F. Gain and B.F.O. Vernier controls have no effect on receiver performance.

Step 1. Place the Power switch in the Power position.

Step 2. Set the N.L.-EXT INP switch at N.L. OFF.

Step 3. Set the Reception switch at the S position. Better fidelity may be obtained with this switch in the M or B positions but the S position should always be used initially to insure accurate tuning of the receiver.

Step 4. Set the Monitor switch to the Monitor position.

Step 5. Set the Band Selector switch to the desired frequency range. See paragraph 3 a, Section 1, for the frequency range of each band covered by the receiver.

Step 6. Set the Monitor Level control at mid-position.

Step 7. Adjust the A.F. Level control to produce a small amount of receiver background noise in the Monitor loudspeaker.

Step 8. Loosen the dial lock by placing the Lock lever in the left-hand position. Tune in the desired signal by setting the Tuning control to the approximate frequency of the station to be received. Slowly rotate the main Tuning control back and forth until a point is found where the shadow on the face of the tuning indicator suddenly becomes narrow. This point is the correct position of the Tuning control for exact tuning of the desired signal. After the signal has been properly tuned in, tighten the dial lock.

Step 9. Set the Fidelity control at the position giving the desired audio response.

The receiver is now adjusted for proper reception

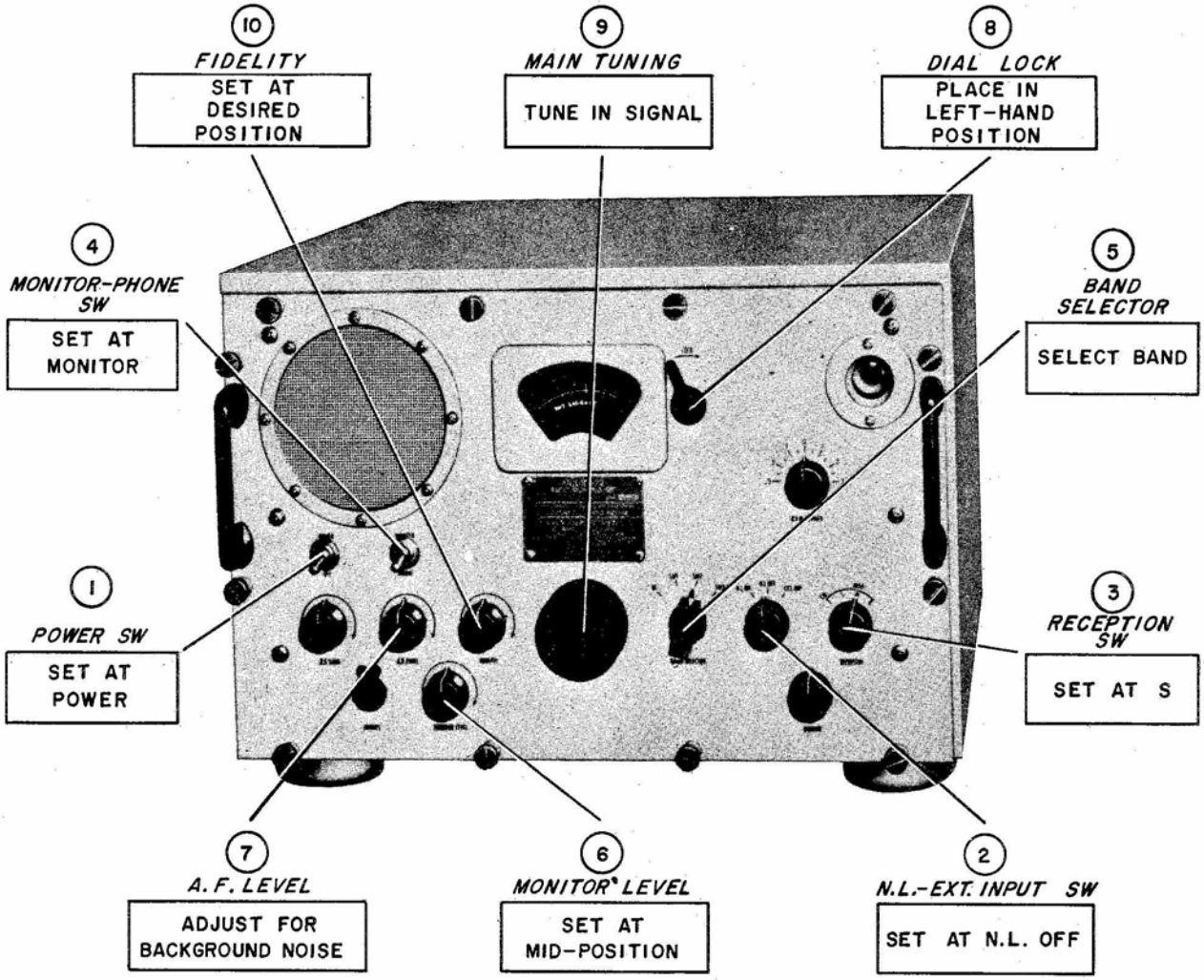


Figure 4–1. Operating Instructions for Phone Reception

of phone signals.

The settings given above in steps 1 through 9 are for the reception of signals of average strength. Variation from the average may require modification of the above settings. The A.F. Level control may be adjusted to produce the desired audio volume to the outgoing audio lines. An improvement in reception of weak signals may be had by setting the Fidelity control at the counter-clockwise position. When a signal is accompanied by static or noise pulses much of this noise may be suppressed by placing the N.L. EXT INP switch in the N.L. ON position.

When the receiver is driving external audio equipment, the volume of the Monitor loudspeaker or Phones may be varied without affecting the external equipment by adjustment of the Monitor Level control.

The receiver is turned off by placing the Power switch in the Off position.

b. C.W. RECEPTION.–For C.W. reception the receiver controls are set as described in paragraph 3 a, steps 1 through 9, of this Section with the following changes:

Step 1. Set the Reception switch at C.W.

Step 2. Set the A.F. Level control at the extreme clockwise position and adjust the R.F. Gain control to produce a small amount of noise in the loudspeaker.

Step 3. Set the B.F.O. Vernier control to position 0, the center of its range.

Step 4. The receiver may now be tuned as described in paragraph 3 a, step 8, of this Section except that the receiver should be tuned to "zero beat" with the desired signal. That is, as the receiver Tuning control is rotated back and forth across the frequency of the desired station two distinct beat notes will be heard, one on either side of the signal. "Zero beat" is at the center of these two beat notes, or the position which produces no audible tone.

Step 5. Adjust the B.F.O. Vernier control for that tone which makes the received signal most pleasing

to copy.

As is the case for phone reception, certain adjustments of the receiver controls may be made to provide more efficient reception of a C.W. signal. These adjustments are the same as for phone reception, except that for C.W. reception the A.F. Level control is set at the extreme clockwise position and the R.F. Gain control used to control the audio volume of the receiver.

c. EXTERNAL AUDIO INPUT OPERATION.–For operation of a high-impedance type of record player or other types of audio input devices through the receiver audio circuits, proceed as follows:

Step 1. Connect the audio input device to the audio input terminal board at the rear of the receiver.

Step 2. Place the Power switch in the Power position.

Step 3. Set the N.L. EXT INP switch to the EXT INP position.

Step 4. Activate the audio input device.

Step 5. Adjust the A.F. Level control for the desired audio volume to the outgoing audio lines and the Monitor Level control for the desired volume at the loudspeaker or headphone.

Step 6. Adjust the Fidelity control for the desired frequency response.

It will be noted the only controls which have any affect on the receiver performance during this mode of reception are the A.F. Level control, Fidelity control and the Monitor Level control and switch.

SECTION 5
OPERATOR'S MAINTENANCE

1. ROUTINE CHECKS.

The following routine checks of normal operation of the R-302/URR-22 receiver are to be made by the operating personnel at the beginning of each watch. The tests are to be made with the receiver operating under normal conditions. Careful routine check of the equipment very often prevents failure under conditions when maintenance personnel are not available. The following chart assumes that the Power switch is in the Power position.

TABLE 5–1. ROUTINE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
Pilot lamps	Observe that lamps are lighted. It may be necessary to adjust Dimmer control to provide more illumination.	Intermittent glow indicates poor contact in dimmer or loose connection.
Tuning Indicator	Observe the shadow angle of the electron-ray tube.	Intermittent glow indicates loose connection or defective electron-ray tube.
Receiver Operation	Make listening test for normal operation by tuning the receiver through each frequency band.	Note the operation of all controls.
External connections and cables	Inspect the firmness of all connections to the receiver. Check that cables have not been damaged.	Loose connections or damaged cables may result in faulty operation.

2. EMERGENCY MAINTENANCE.

The maintenance procedures given in the following paragraphs are intended for the guidance and use of the operator personnel in correcting or restoring the operation of the equipment at times when a technician may not be available.

Notice to Operators

Operators shall not perform any of the following emergency maintenance procedures without proper authorization.

a. WITHDRAWAL AND REPLACEMENT OF RECEIVER. *(See Figure 5–1.)*–If the receiver is inoperative it should be withdrawn from the cabinet to determine if there is some obvious fault that can be corrected easily. To withdraw the receiver from the cabinet proceed as follows:

Step 1. Remove all connections at the rear of the receiver.

Step 2. Loosen the twelve captive thumb screws around the outer edge of the front panel.

Step 3. Grasp the handles located on the front panel and pull the chassis forward as far as the release mechanism will permit. At this point the slide release mechanism on both sides of the chassis will drop into slotted grooves, thus locking the chassis in place and preventing forward or backward movement of the chassis. (See Figure 5–1.)

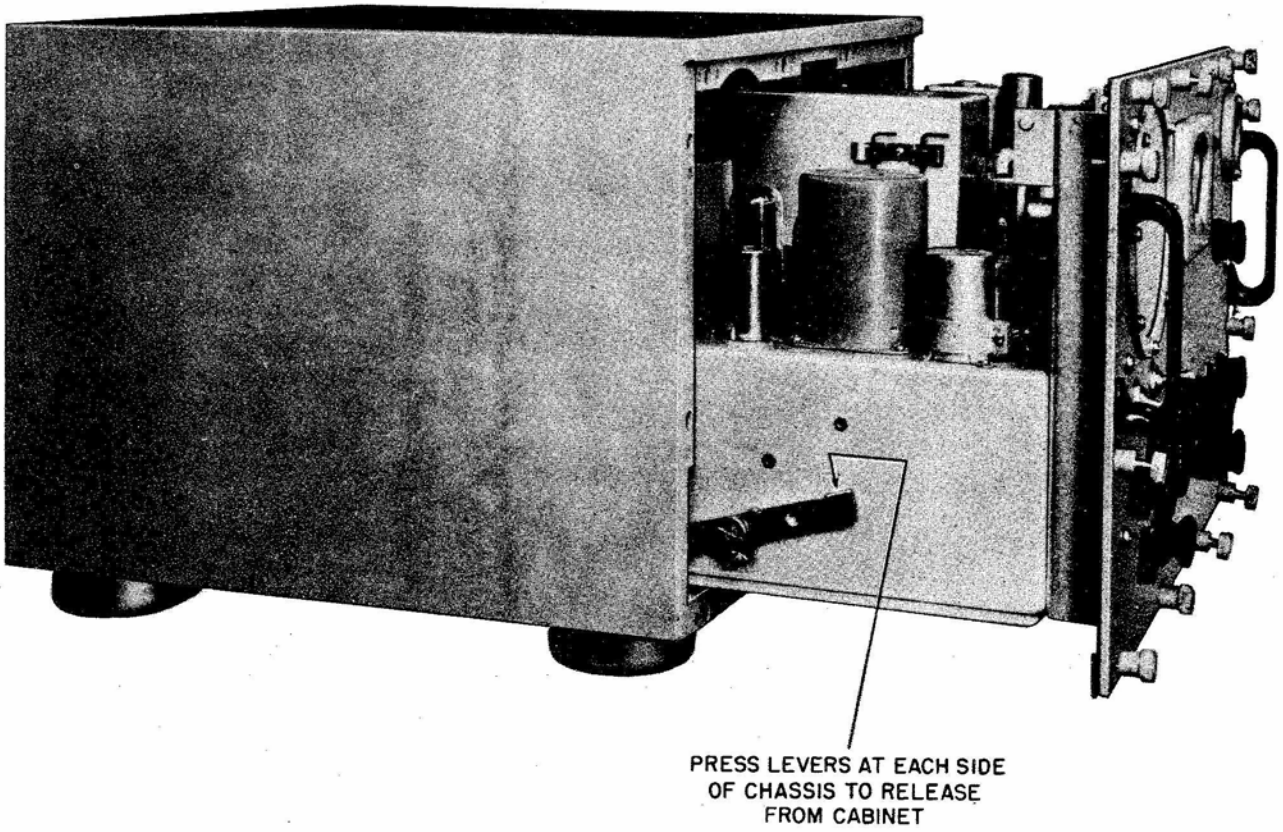


Figure 5–1. Operation of Receiver Release and Slide Mechanism

Step 4. To remove the chassis from the cabinet depress the slide release on each side of the chassis and pull the chassis forward.

CAUTION

When servicing the R-302/URR-22 receiver do not place the chassis on its back with its full weight resting on the receptacles. This practice may cause damage to the receptacles.

To replace the receiver chassis into the cabinet depress the slide release levers and push the chassis into the cabinet until the positioning pins fall into place. Tighten the captive screws around the outer edges of the front panel and replace all connections at the rear of the receiver.

b. FUSE REPLACEMENT. *(See Figure 5–2.)*–If the receiver is inoperative and the channel indicator pilot lamps are not lighted, check the receiver fuses F-101 and F-102. Fuses F-101 and F-102 are two-ampere fuses and are mounted with two spares, F-103 and F-104, at the rear of the receiver. Probable cause of fuse failure is a short-circuit in the primary of the power transformer, the filament circuit or the B-plus circuit.

CAUTION

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

c. ELECTRON TUBE REPLACEMENT.–All electron tubes employed in the R-302/URR-22 receiver are located and identified on Figure 5–3. If a particular tube is burned out as observed visually by the absence of heater or filament glow, the tube may be replaced by another of the same type of proven quality. The A.C. plug may be connected at this time to energize the receiver so that the tubes may be visually inspected.

To remove the rectifier tube V-113 it will be necessary to first loosen the clamp about the base of the tube. To loosen the clamp, locate the slotted hole in the lever arm of the clamp and insert a small screwdriver into the hole. Rotate the screwdriver in a counterclockwise direction and the clamp will release, permitting the tube to be removed from its socket by a straight upward pull. To fasten the

clamp after replacing the rectifier tube, push the lever arm of the clamp towards the tube, taking great care not to damage the tube or other nearby components.

R.F. Amplifier V-101 is enclosed in a metal shield which is secured by four captive screws. To remove the shield, remove the four screws around the bottom edge of the shield, with a screwdriver. Lift the shield upward and the R.F. amplifier tube will be seen mounted on a small bracket. To remove the tube press down on the small metal tube shield and, rotating the shield in a counter-clockwise direction, release the shield from the tube base and remove the shield. The tube may now be removed by carefully pulling the glass envelope straight out, using caution to prevent bending the tube pins. The tube may be replaced by proceeding in opposite fashion.

The remaining tubes used in the receiver are all visible and accessible when the chassis is removed from the cabinet and all but the tuning indicator may be removed in the same manner as the R.F. amplifier tube described above. H.F. oscillator tube V-102, in addition to having a metal shield, also has a spring clamp permanently mounted in the socket to insure mechanical stability.

Tuning indicator V-114 is mounted in a horizontal position by a single supporting clamp which encircles the base of the tube. To remove the tube, remove the socket from the tube by pulling the socket toward the rear of the chassis. Loosen the small Phillips-head screw which holds the clamp together at the top and carefully slide the tube to the rear, slanting the base of the tube upward, and withdraw the tube. When replacing the indicator tube, insert the tube in the clamp and, before tightening, press firmly on the bottom of the tube so that the top of the tube is snug against the rubber cushion. Energize the receiver to make sure that the shadow angle is at the bottom of the indicator.

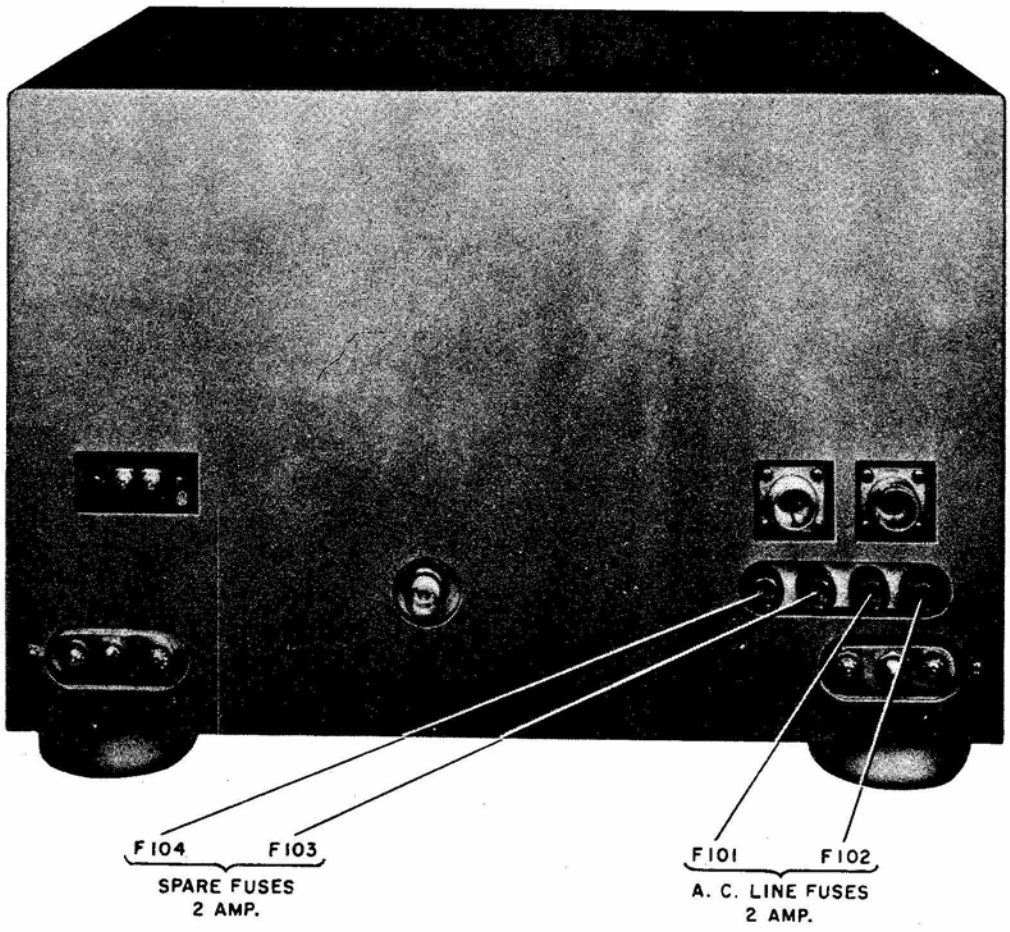


Figure 5–2. Fuse Locations

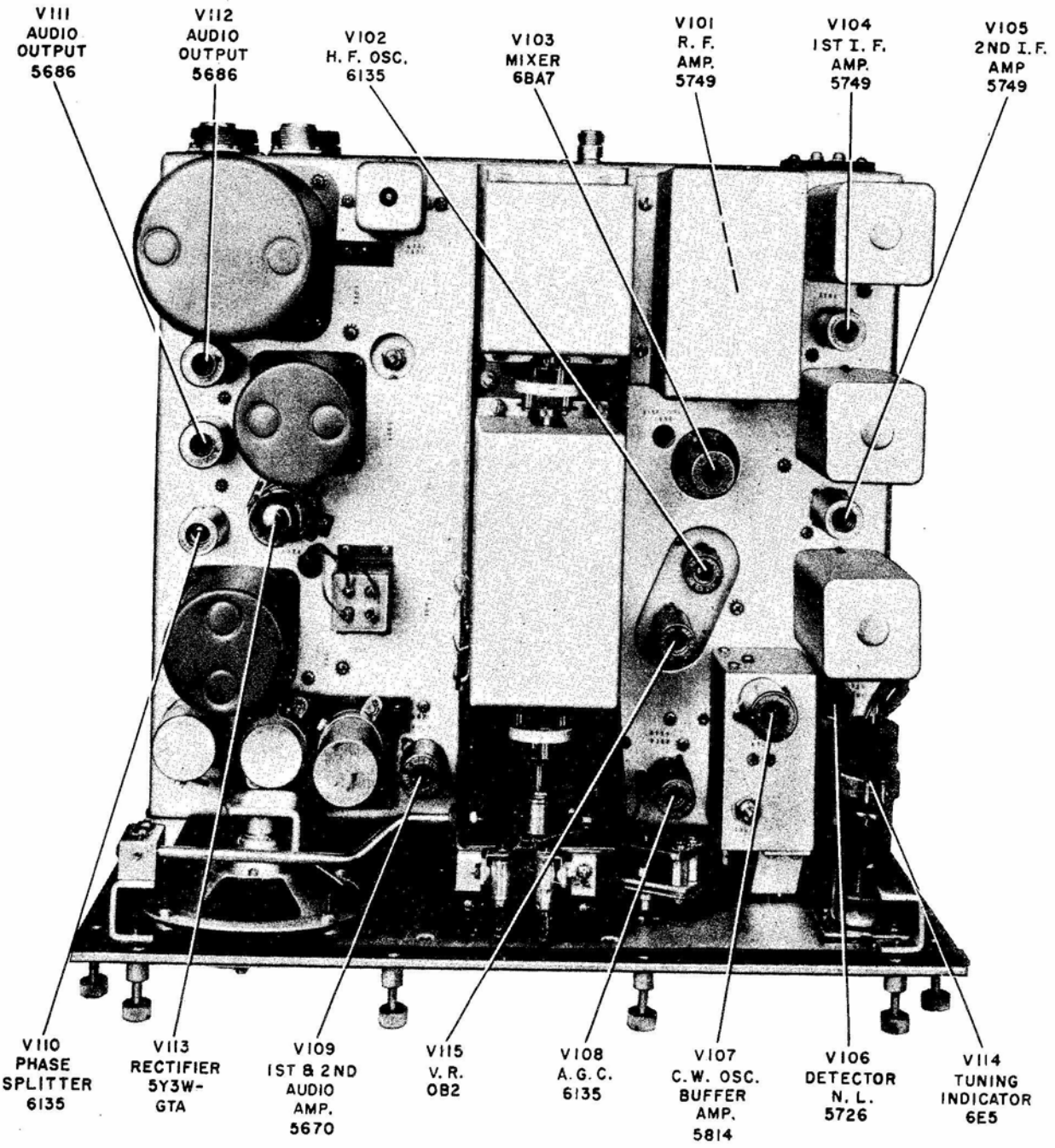


Figure 5–3. Tube Locations

SECTION 6
PREVENTIVE MAINTENANCE

1. ROUTINE MAINTENANCE CHECKS.

Preventive maintenance is a systematic series of operations performed at regular intervals on equipment to eliminate major breakdowns and unwanted interruptions in service and to keep equipment operating at top efficiency.

Table 6–1 is a list of the necessary periodic checks to be performed on the equipment, showing what to check, when and how to check, and precautions to be observed. The routine maintenance test schedule should be modified if the equipment is being used under adverse conditions, in which case the monthly checks should be performed weekly and the quarterly checks performed every one or two months, depending upon conditions.

NOTE

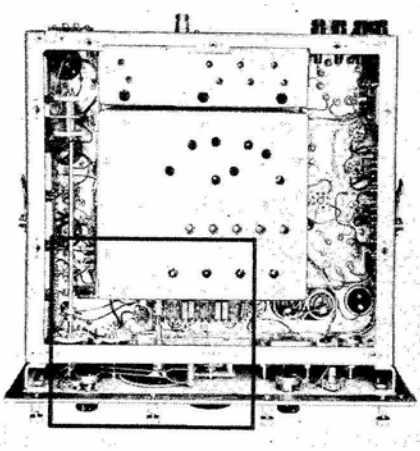
The attention of maintenance personnel is invited to the requirements of chapter 67 of the Bureau of Ships Manual, of the latest issue.

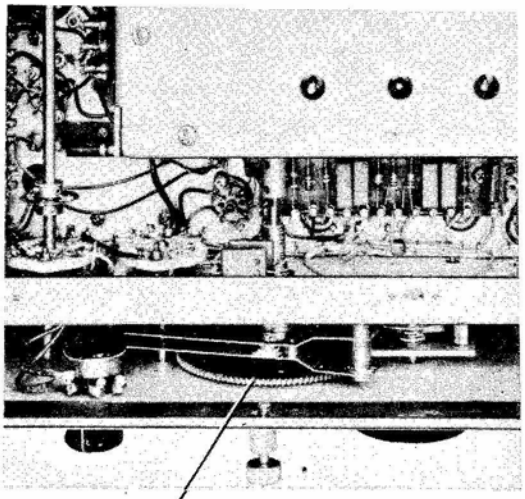
TABLE 6–1. ROUTINE MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
EACH WATCH		
Refer to Table 5–1, Operator's Routine Check Chart.		
MONTHLY		
Antenna and all connections to the receiver.	Inspect for corrosion, damage, or loose connections.	Tighten all connections.
QUARTERLY		
1. Receiver Sensitivity.	Check in accordance with paragraph 4 c, Section 7	
2. General Inspection.	Withdraw receiver from cabinet. a. Make a careful visual inspection of the interior to detect symptoms of trouble resulting from wear or overheating. b. Check for noisy or faulty components and/or connections.	Tap components and connections with a piece of insulating material while receiver is adjusted for normal operation with an audible output.

2. LUBRICATION.

See Figure 6–1 for lubrication information.





A. MIL–G–3278.*
SPRING LOADED GEAR OF TUNING DRIVE ASSEMBLY.
APPLY THIN FILM WITH BRUSH SNSN–G–38–B–4480.

M. MIL–G–3278.*
BAND SELECTOR DRIVE GEAR AND TWO DRIVEN GEARS.
APPLY THIN FILM WITH BRUSH SNSN–G–38–B–4480.

A.= ANNUALLY

M. = MONTHLY

STOCK NUMBERS

SPECIFICATION NO. AND TITLE	TYPE	GRADE	MILITARY SYMBOL	STANDARD NAVY STOCK NO.	
				8 OZ. TUBE	1 LB. CAN
MIL–G–3278 AIRCRAFT AND INSTRUMENT GREASE	—	—	—	W14–G–611–5 R14–G–984–500	W14–G–611–10 R14–G–982–20

* FORMERLY AN – G – 25

NATIONAL COMPANY, INC., MALDEN, MASS.
CONTRACTS NObsr–43440
NObsr–52329

Figure 6–1. Lubrication Chart

SECTION 7
CORRECTIVE MAINTENANCE

1. FAILURE REPORT.

A failure report must be filled out and forwarded through the proper channels in the event of failure of the equipment for any reason. Figure 7–1 gives instructions for filling out and forwarding these failure reports.

2. INTRODUCTION.

This section is intended to present all instructions necessary for complete repair of a malfunctioning R-302/URR-22 receiver. Maintenance personnel must be prepared to repair and adjust receivers that have failed in operation. The source of trouble must first be located, the trouble remedied, and the equipment restored to operating condition as soon as possible.

A trouble-shooting paragraph is included to aid the maintenance personnel in localizing trouble and determining the probable cause. The following paragraphs give detailed instructions for all electrical alignment procedures and adjustments. Also, a paragraph is included for guidance when making mechanical repairs or adjustments.

3. THEORY OF LOCALIZATION.

In the event of trouble with the equipment, the manner in which the receiver operates or fails to operate is often an unmistakable indication of the cause of

FAILURE REPORTS

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

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

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

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

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

Figure 7–1. Failure Report

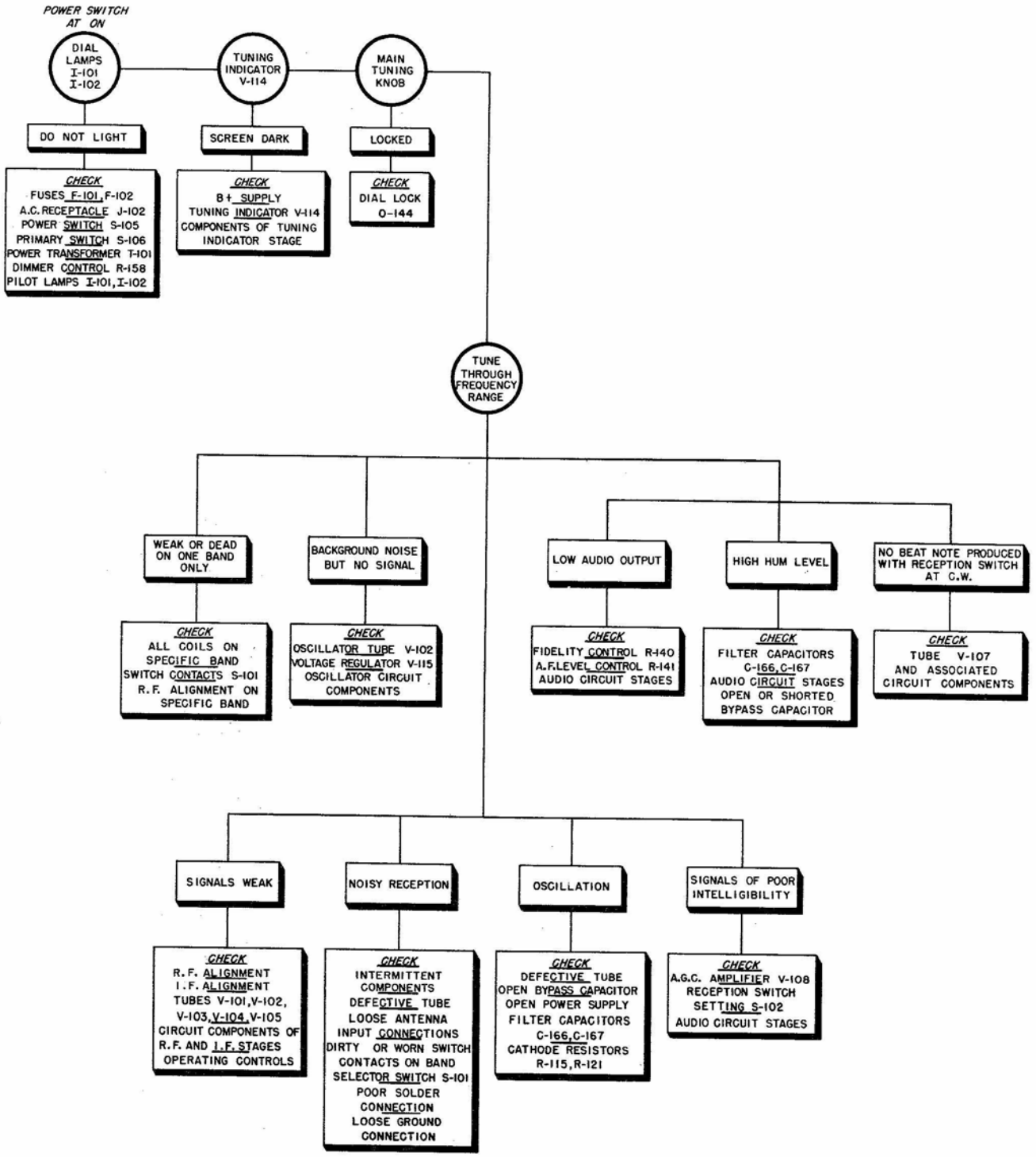


Figure 7–2. Trouble Shooting Chart

the trouble. For example, abnormal operation of a control will in most cases indicate the specific stage at fault.

Figure 7–2 is a trouble-shooting chart and is intended to aid maintenance personnel in localizing the source of trouble within the equipment. Several of the more common symptoms of trouble are given, together with the more common causes of these troubles. By following the chart the repair man can quickly determine which stages are probably at fault. For example, if the receiver is inoperative and the pilot lamps do not light, then the trouble is probably in the power supply or the A.C. connection to the receiver. If the pilot lamps do light but the tuning indicator has a normal shadow angle which does not change as the main Tuning control is rotated over its entire range, then the trouble is undoubtedly in the R.F. or I.F. stages of the receiver, since if a signal were getting through to the second detector then the shadow angle would narrow sharply when the receiver was tuned to a station, even though no signal could be heard on the loudspeaker. Similarly, if the trouble were in the audio circuits (excluding the second detector) the shadow angle on the tuning indicator would vary as the receiver was tuned to a station.

The systematic location and repair of faults can be summarized as follows:

(1) Determine the stage at fault by using the trouble shooting chart or your own knowledge of the operation of the receiver.

(2) Examine the stage in detail to determine what particular component or adjustment is at fault.

(3) Replace or repair the defective component and/or adjust correctly using the procedures described in this section.

(4) Make a thorough check of receiver performance before placing the equipment back into regular service.

4. TROUBLE SHOOTING.

a. GENERAL.–The location of trouble in the receiver can be accomplished by making the series of checks outlined on the Trouble Shooting Chart, Figure 7–2. Tubes should be checked in a mutual-conductance tube tester such as Tube Tester TV-3/U series or equivalent.

In the absence of a tube tester, tubes may also be checked by replacement with the same type of tube of proven quality. Specific stages and their associated components can be checked by taking voltage and resistance measurements and comparing the observed readings with the normal values as indicated on Figure 7–3. When making these checks, however, it must be borne in mind that certain faults may not cause voltage or resistance measurements to change by a measurable amount. For instance, a short-circuit occurring in a low-resistance inductor may not appear in point-to-point resistance measurements and, if the short should occur in an R.F. coil, false indication of the necessity for realignment may result.

Bypass or filter capacitors which develop poor internal connections or which become open-circuited will cause poor sensitivity and/or stability. An open capacitor can be located by temporarily connecting a good capacitor of the same rating in parallel with the unit under suspicion.

b. CIRCUIT CONSTANTS.–The value of all circuit components is given in the Parts List, Table 8–4, and on the Schematic Diagram, Figure 7–13. Actual connections are shown on the Practical Wiring Diagram, Figure 7–14. Locations of components are shown on Figures 7–4, 7–5 and 7–6.

c. PERFORMANCE TESTS.–Performance tests given in this subparagraph are used to aid maintenance personnel in checking the operation of the receiver, mainly to determine whether alignment may be necessary. These tests should also be performed following any adjustments or repairs on the receiver prior to returning the equipment to operational duty. The tests must be made in the order shown since the test of any specific section is based on the fact that the previous sections have been tested and found to be operating correctly. See Figure 7–7 for test point locations.

Units of test equipment required to perform these tests are as follows:

An accurately calibrated signal generator such as an R.F. Signal Generator Set AN/URM-25 or equivalent with a frequency range of 450 kilocycles to 20 megacycles.

An electronic meter such as Multimeter ME-25/U Series or equivalent.

An audio oscillator Navy Model LAJ or equivalent with a frequency range which includes 1,000 cycles.

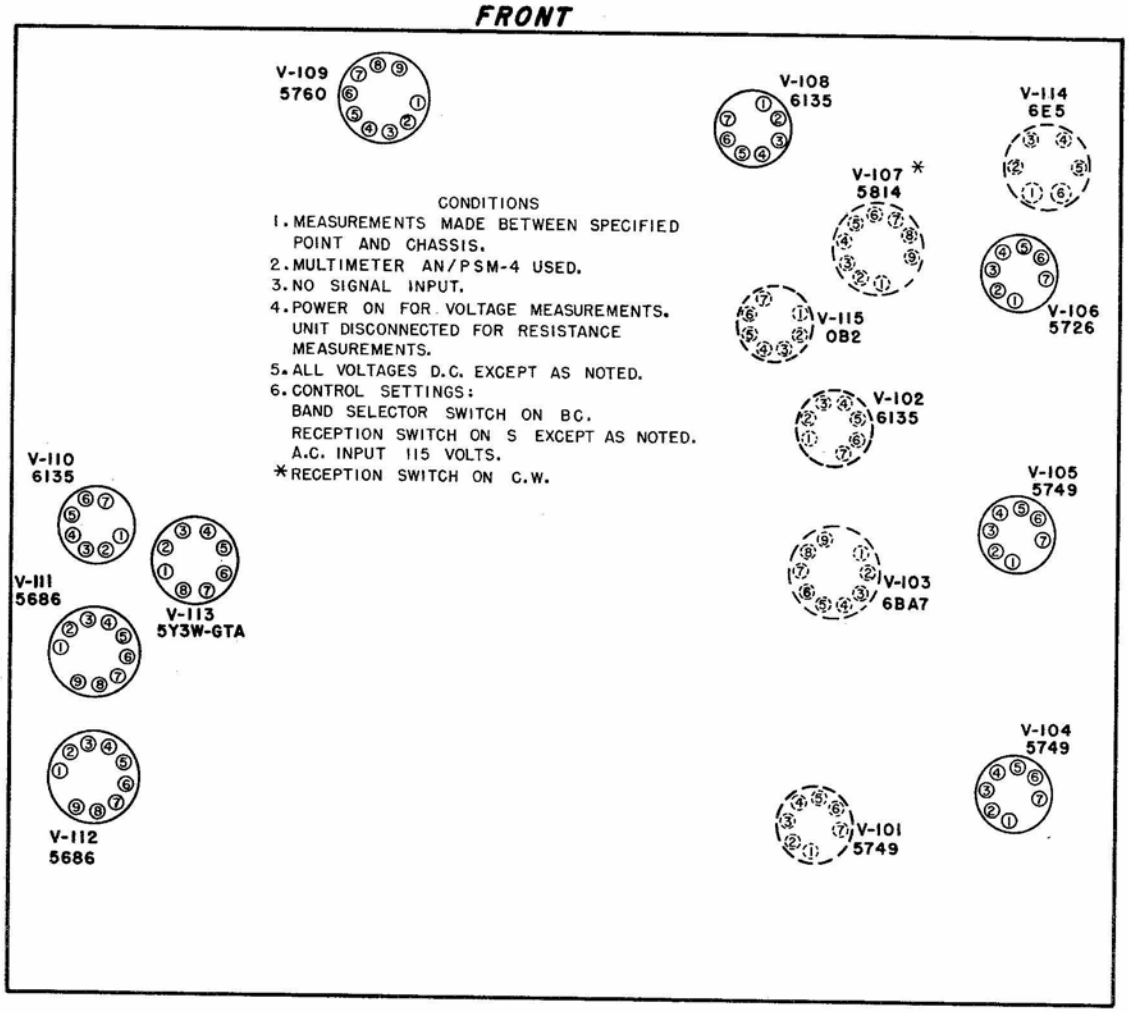
A non-inductive dummy antenna. The impedance of the dummy antenna plus the internal impedance of the signal generator should equal 70 ohms.

A 600-ohm dummy load. A 620-ohm carbon resistor such as Standard Navy Stock Number N16-R-49822-431 may be used.

A medium-size screwdriver such as Standard Navy Stock Number G41-S-1101.

CAUTION

When servicing the R-302/URR-22 receiver do not place the chassis on its back with the full weight resting on the receptacles. This practice may cause damage to the receptacles.



TUBE		PIN #1	PIN #2	PIN #3	PIN #4	PIN #5	PIN #6	PIN #7	PIN #8	PIN #9
V-101	VOLTS	0	0	6.4 A.C.	0	150	120	7.4		
	OHMS	1.1MEG	0	0	0	18K	38K	1.7K		
V-102	VOLTS	105	0	0	6.4 A.C.	105	−0.2	0		
	OHMS	∞	∞	0	0	18K	45K	< 1		
V-103	VOLTS	73	−5.8	0	6.4 A.C.	0	0	−0.2	0	150
	OHMS	24K	22K	0	0	0	0	1.6MEG	0	18K
V-104	VOLTS	0	0	0	6.4 A.C.	148	70	1.4		
	OHMS	1.1MEG	0	0	0	20K	60K	220		
V-105	VOLTS	0	0	0	6.4 A.C.	148	55	1.2		
	OHMS	0	0	0	0	17K	60K	150		
V-106	VOLTS	0.2	−0.5	0	5.4 A.C.	0	0	−0.3		
	OHMS	2.2MEG	440K	0	3.9	0	∞	220K		
*V-107	VOLTS	140	0	0	0	0	50	−3.5	6.2	6.4 A.C.
	OHMS	18K	45K	5	0	0	43K	10K	2K	0
V-108	VOLTS	0	0	6.4 A.C.	0	0	−75	−65		
	OHMS	220K	∞	0	0	∞	450K	1200		
V-109	VOLTS	0	1.6	0	90	0	65	0	0.9	6.4 A.C.
	OHMS	0	420	20K	60K	0	160K	440K	1.4K	0
V-110	VOLTS	95	0	6.4 A.C.	0	95	−1.8	18		
	OHMS	∞	∞	0	0	60K	500K	50K		
V-111	VOLTS	−70	−70	−70	6.4 A.C.	0	152	148	−70	152
	OHMS	∞	460K	1.6K	0	0	14K	14K	∞	∞
V-112	VOLTS	−70	−70	−70	6.4 A.C.	0	152	148	−70	152
	OHMS	∞	460K	∞	0	0	14K	14K	1.6K	∞
V-113	VOLTS	—	180	—	−85	—	−85	—	180	
	OHMS	∞	15K	∞	1.4K	∞	1.4K	∞	15K	
V-114	VOLTS	6.4 A.C.	8.7	0	150	0	0			
	OHMS	0	2.2 MEG	2.2 MEG	14K	0	0			
V-115	VOLTS	105	0	0	0	105	0	0		
	OHMS	16K	∞	∞	∞	∞	∞	0		

Figure 7–3. Voltage and Resistance Data

All the performance tests in the following paragraphs are to be conducted with the receiver chassis removed from the cabinet. Before withdrawing the chassis from the cabinet, remove all external connections from the rear of the receiver. See paragraph 2 a and Figure 5–1 in Section 5 for directions for removing the chassis from the cabinet. After the chassis is positioned on the test bench, connect the A.C. power cable to connector J-102 at the rear of the chassis.

(1) AUDIO SYSTEM TEST.–See Figure 7–10 for typical audio response curves. To check the audio stages of the receiver proceed as follows:

Step 1. Set the front panel controls in the following manner:

Power switch at Power.

A.F. Level control in its maximum clockwise position.

Fidelity control in its maximum counterclockwise position.

Step 2. Remove detector tube V-106 from its socket.

NOTE

The settings of the other front panel controls will not influence the results of the audio test.

Step 3. Connect the output lead of Audio Oscillator Navy Model LAJ through a 20,000 ohm, 1 watt resistor such as a Standard Navy Stock Number N16-R-50362-751 to pin 2 of detector V-106A. Connect the ground lead of the audio oscillator to the receiver chassis.

Step 4. Connect the A.C. lead of Multimeter ME-25 /U to pin 2 of the detector, and the ground lead to the receiver chassis. Use the 1 volt A.C. scale.

Step 5. Connect the 600-ohm load across terminals A and C of audio connector J-104 or across terminals 6 and 8 of transformer T-102.

Step 6. Tune the audio oscillator to an output of 1000 cycles at 0.5 volt as read on the multimeter.

Step 7. Disconnect the multimeter and reconnect it across the 600-ohm output load of the receiver. Use

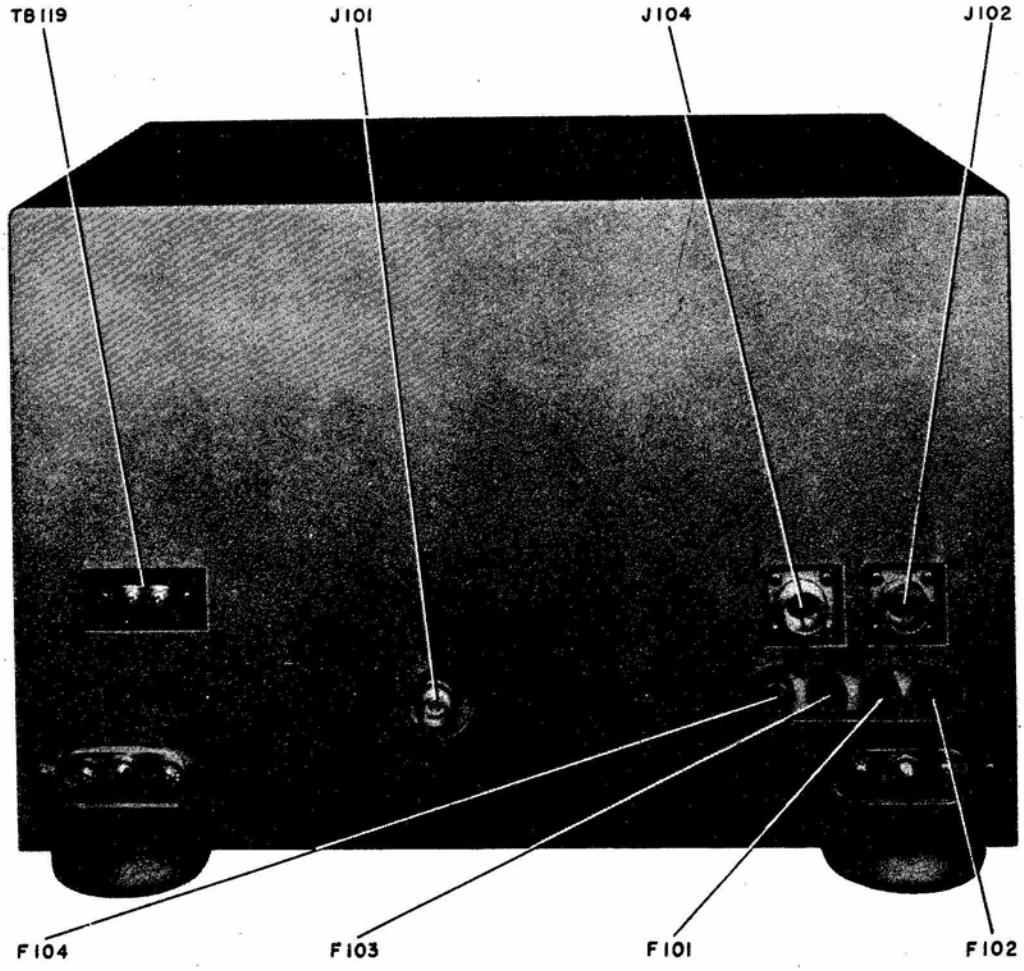


Figure 7–4. Component Locations, Rear of Chassis

the 2.5 volt A.C. scale. With the output of the audio audio oscillator as specified in Step 6, the audio output voltage should read at least 1.9 volts on the multimeter.

Step 8. Replace the detector tube.

(2) I.F. SYSTEM TEST.–See Figure 7–11 for typical I.F. selectivity curves. To check the I.F. stages of the receiver proceed as follows:

Step 1. Set the designated front panel controls as follows:

Power switch at Power.

Band Selector switch at BC.

Reception switch at C.W. and remove the C.W. oscillator tube, V-107. This procedure disables the A.G.C. of the receiver.

A.F. Level control at its extreme clockwise position.

Fidelity control in its extreme counterclockwise position.

N.L. EXT. INP. switch at N.L. OFF.

Step 2. Connect the multimeter across the 600-ohm load resistor at the audio output connector, J-104, of the receiver. Use the 2.5 volt AC scale.

Step 3. Connect the output of Signal Generator AN/URM-25 through a 0.01 mfd.-400-volt capacitor to test point J-107 and connect the ground lead of the signal generator to chassis. (See Figure 7–7.)

Step 4. Tune the signal generator to 455 kilocycles modulated 30% at 1000 cycles and with an output voltage of 15 microvolts. The multimeter should read

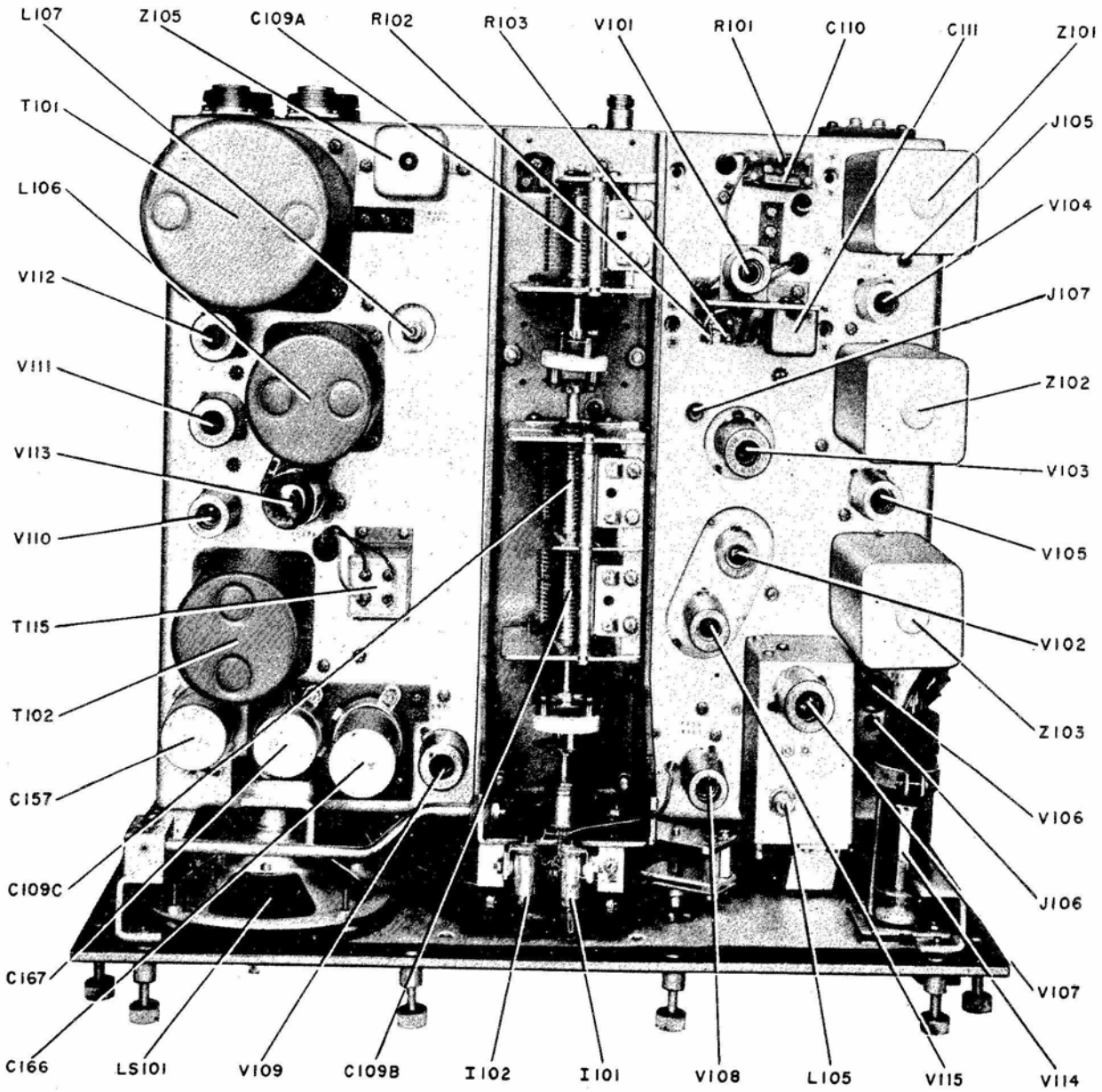


Figure 7–5. Component Locations, Top of Chassis

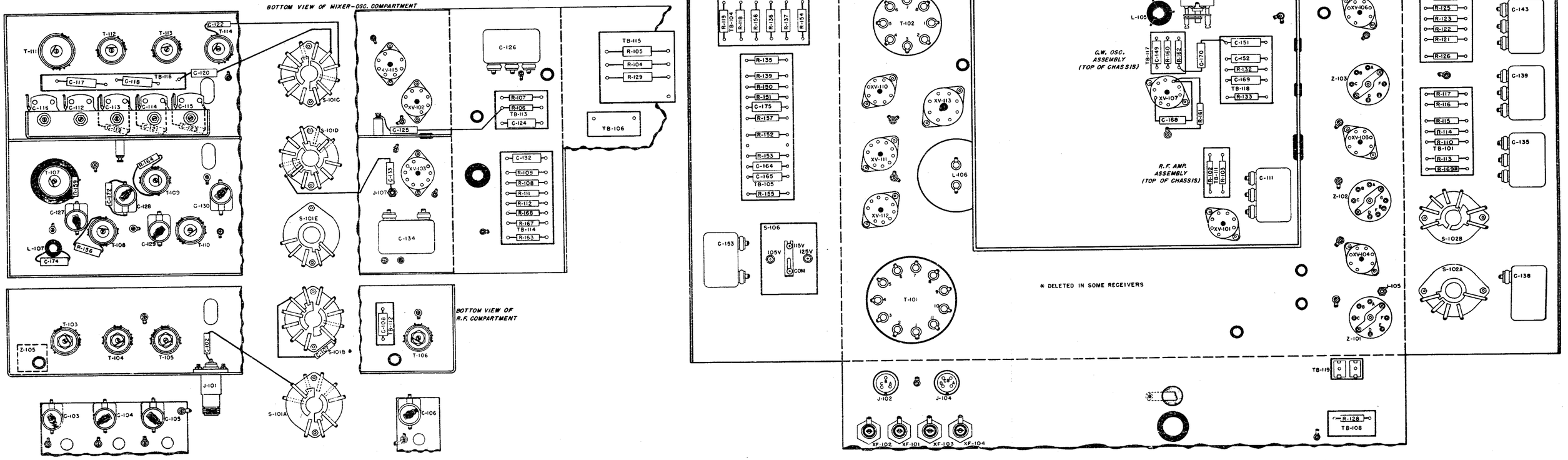


Figure 7–6.

Component Locations, Bottom of Chassis

at least 1.9 volts.

Step 5. Replace the C.W. oscillator tube.

(3) R.F. SYSTEM TEST.–The R.F. system consists of the R.F. amplifier, H.F. oscillator and mixer stages V-101, V-102 and V-103 respectively.

To perform tests on the R.F. system to determine the necessity for realignment proceed as outlined below. Test equipment required is the same as for the I.F. system test. Be sure that the signal generator used is an accurately calibrated one.

Step 1. Adjust the receiver controls as outlined in Section 7, paragraph 4 c (2), I.F. System Test, except that the Reception switch should be set at S and the C.W. oscillator tube V-107 re-inserted in its socket.

Step 2. Connect the R.F. output lead of the signal generator through the dummy antenna to antenna connector J-101 and connect the ground lead to the receiver chassis.

Step 3. Connect the multimeter across the 600-ohm load at the audio output connector, J-104, of the receiver. Use the 2.5 volt AC scale.

Step 4. Set the main Tuning dial of the receiver near the high end of its range.

Step 5. Turn the signal generator on and adjust for a signal modulated 30% at 1000 cycles, and tune the signal generator until its signal is picked up by the receiver. Using the tuning indicator for accurate tuning, tune the receiver and the signal generator to exactly the same frequency as indicated by a sharp narrowing of the shadow angle on the face of the tuning indicator. Compare the frequency read from the dial of the signal generator with that read from the main Tuning dial of the receiver. These two readings should be within plus or minus one percent of each other. If greater variation is obtained the receiver calibration is inaccurate and realignment on this band is necessary.

Step 6. Set the Reception switch in the C.W. position and remove C.W. oscillator tube V-107.

Step 7. Turn the signal generator modulation off and adjust the output attenuator of the signal generator for a generator output of eight microvolts.

Step 8. Adjust the receiver R.F. Gain control to produce a reading of 0.6 volts on the multimeter connected to the receiver output.

Step 9. Turn the signal generator modulation on and adjust the signal generator output attenuator to give a reading of 1.9 volts on the multimeter. Note the signal generator output voltage. A reading of eight microvolts or less indicates normal sensitivity.

NOTE

Do not touch the receiver R.F. Gain control during this operation.

Step 10. Repeat steps 4 to 9, above, for the low end of the particular band. If more than eight microvolts of signal generator output is required to produce a multimeter reading of at least 1.9 volts under the conditions specified in steps 6 to 9, realignment of the R.F. system for the band being tested is necessary.

Step 11. Repeat steps 4 to 10, above, for each of the three remaining bands of the receiver, noting on which bands realignment may be necessary. In the SW1, SW2, SW3 positions a five-microvolt input should give the required .6 volts for an unmodulated signal and 1.9 volts for a modulated signal.

Step 12. Replace the C.W. oscillator tube.

(4) A.G.C.–See Figure 7–12 for the A.G.C. characteristic curve. To check the A.G.C. the signal generator (AN/URM-25) should be connected to the antenna input terminal through the dummy antenna and the multimeter (ME-25/U) should be connected between test point J-105 and ground. Use the 10-volt D.C. scale on the multimeter.

Step 1. Make the following preliminary adjustments:

Band Selector switch at BC.

A.F. Level control at maximum clockwise.

R.F. Gain control at maximum clockwise.

Reception switch at S.

N.L.-EXT INP switch at N.L. Off.

Step 2. Tune the signal generator to a frequency of one megacycle 30% modulated at 1000 cycles at 1000 microvolts output.

Step 3. Tune the receiver to the same frequency as the signal generator. The tuning indicator will show when the receiver is tuned exactly to the signal.

Step 4. The multimeter at test point J-105 should read approximately 6.3 volts. At test point J-106 the multimeter should read approximately 5.5 volts.

Step 5. Remove all test equipment, place the chassis back into the cabinet and reconnect all cables.

(5) OVERALL PERFORMANCE TEST.–The overall performance capabilities of the receiver can be checked by performing a listening test. By tuning in known stations the accuracy of the dial calibration and the general receiver sensitivity can be checked.

5. REPAIRS.

a. ELECTRICAL ADJUSTMENTS.–Electrical adjustments of the R-302/URR-22 receiver consist of I.F. alignment, C.W. oscillator alignment and R.F. alignment. It should be borne in mind that all electrical adjustments have been carefully made at the factory before shipment and are of a sufficiently permanent nature so that realignment should not be necessary for a considerable period of time under normal operating conditions. However, under certain

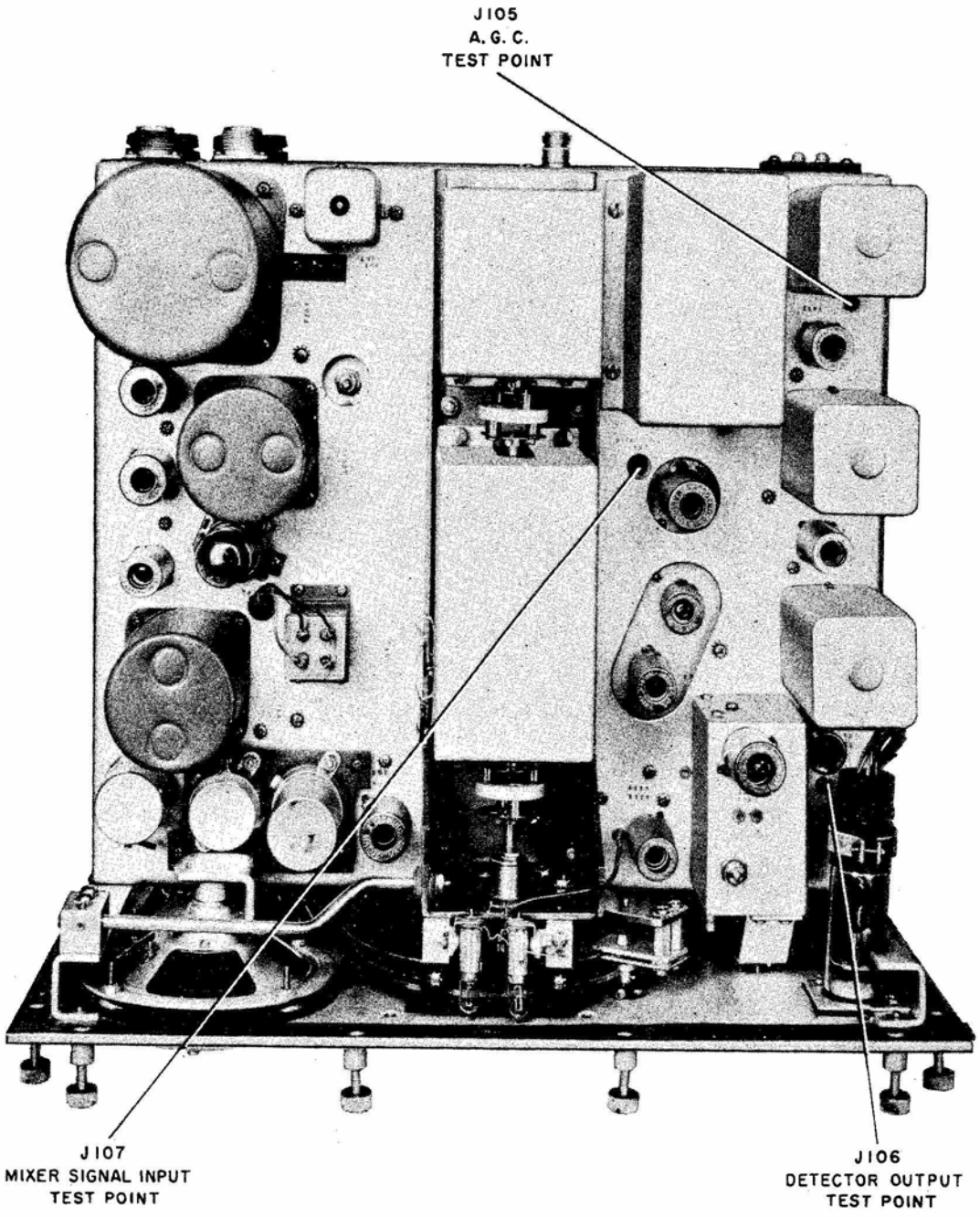


Figure 7–7. Test Point Locations, Top of Chassis

conditions realignment may become necessary, such as replacement of a tube associated with a tuned circuit or replacement of the tuned circuit itself for any reason. In all cases, before attempting alignment it must first be definitely established as being necessary by conducting performance tests as detailed in paragraph 4 c of this section.

(1) I.F. ALIGNMENT.–See Figures 7–8 and 7–9 for location of I.F. adjustments, and Figure 7–7 for test point locations.

Intermediate frequency transformers Z-101 and Z-102 and detector input transformer Z-103 each contain two adjustable powdered iron cores to provide for adjustment of their respective resonant frequencies. The slug associated with the primary is accessible through a hole in the bottom of the chassis, while those of the secondaries are accessible through a hole in the top of each I.F. shield.

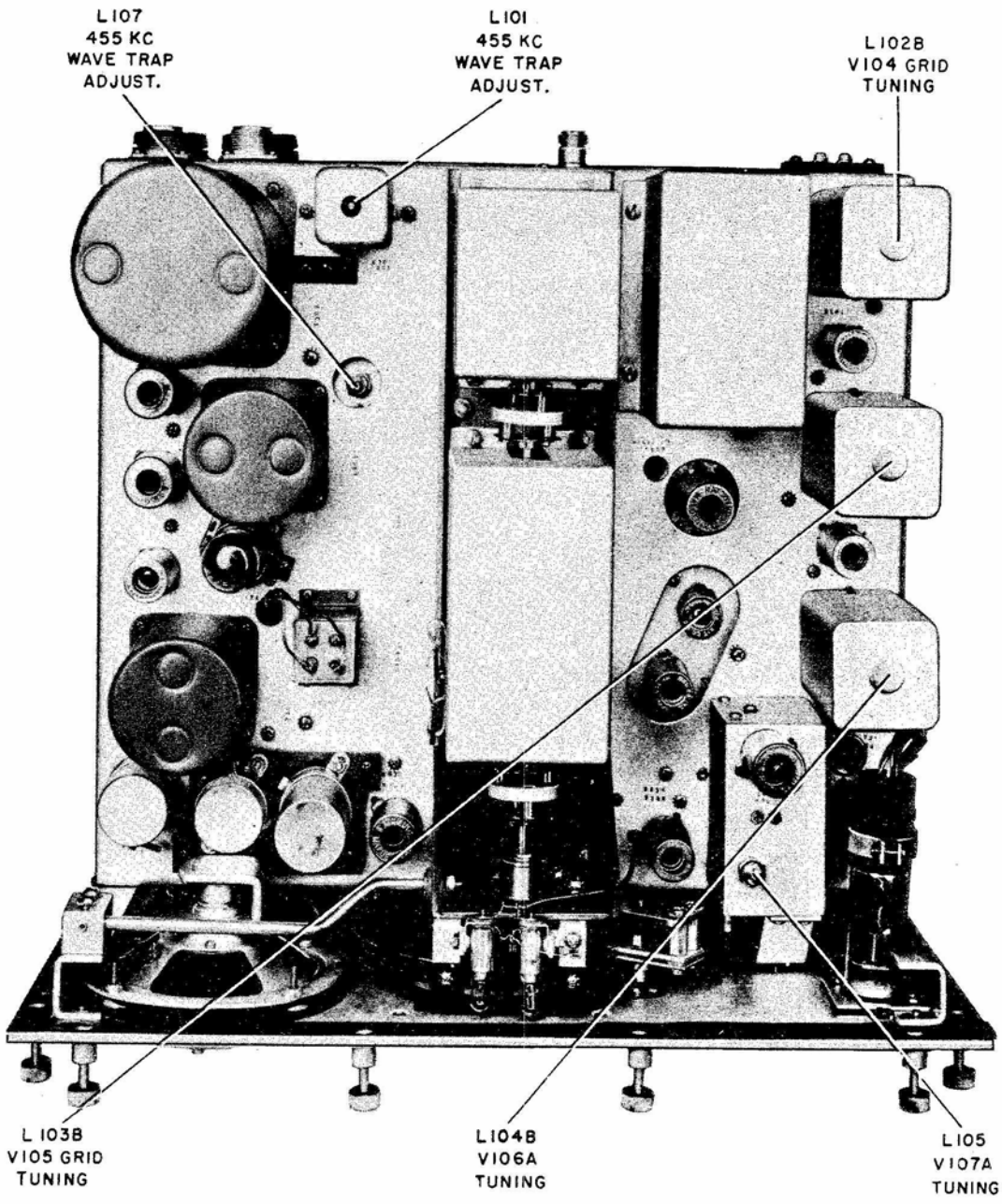


Figure 7–8. Alignment Adjustment Locations, Top of Chassis

Units of test equipment required for I.F. and C.W. oscillator alignment are as follows:

An accurately calibrated signal generator such as R.F. Signal Generator Set AN/URM-25 or equivalent which encompasses the range of frequencies 450 kilocycles to 20 megacycles.

An output meter such as Multimeter ME-25A/U Series or equivalent.

A non-inductive dummy antenna. The impedance of the dummy antenna plus the internal impedance of the signal generator should equal 70 ohms.

A 600-ohm dummy load. A 620-ohm carbon resistor such as Standard Navy Stock Number N16-R-49822-431 may be used.

An insulated alignment tool with a recessed blade on one end, such as Standard Navy Stock Number N16-T-751495-341 or equivalent.

To effect I.F. alignment proceed as follows:

Step 1. Remove all external connections from the rear of the receiver.

Step 2. Remove the receiver chassis from the cabinet and connect the A.C. power cable between the A.C. power line and the receiver.

Step 3. Connect the ground lead from the signal

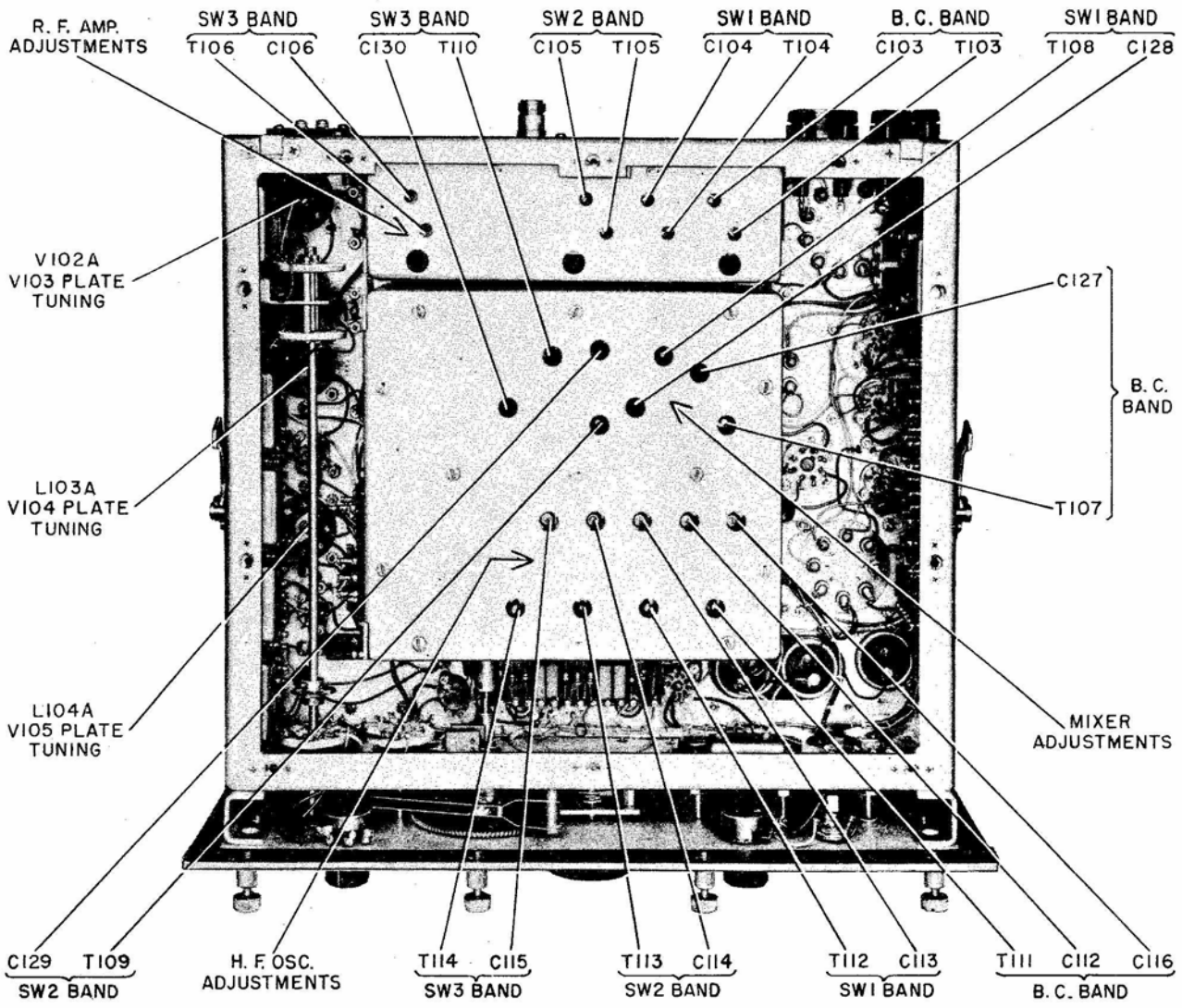


Figure 7–9. Alignment Adjustment Locations, Bottom of Chassis

generator to the receiver chassis. Connect the R.F. output lead from the signal generator through a 0.01 mfd 400-volt capacitor to test point J-107. (See Figure 7–7.)

Step 4. Connect the 600-ohm dummy load to terminals A and C of audio connector J-104 or to terminals 6 and 8 of transformer T-102.

Step 5. Connect the multimeter across the 600-ohm dummy load.

Step 6. Adjust the receiver controls as follows:

Set the Power switch at Power.

Set the Band Selector switch to band BC.

Rotate the A.F. Level control to the extreme clockwise position.

Set the Monitor switch at Monitor.

Set the N.L.-EXT INP switch at N.L. Off.

Set the Reception switch at C.W. and remove the C.W. oscillator tube.

Rotate the Fidelity control to the extreme counterclockwise position.

Step 7. Turn on the signal generator and carefully adjust the frequency to 455 kilocycles, modulated 30% at 1000 cycles. Increase the output of the signal generator until the multimeter at the output of the receiver reads about two volts.

Step 8. Using the R.F. Gain control, reduce the output voltage until the multimeter reads about one volt.

Step 9. Inserting the blade of the alignment tool into the access hole in transformer Z-103, turn the adjustable slugs until a peak in the multimeter reading is obtained. If two peaks are obtained, the correct peak is obtained when the slug is farthest out of the coil. Make this adjustment for both the secondary (top) and primary (bottom) slugs.

Step 10. Repeat this procedure for transformers

Z-102 and Z-101, in that order, tuning each slug separately for maximum deflection of the multimeter. Reduce the output of the signal generator, as necessary to keep the pointer on the multimeter at approximately one volt.

Step 11. Repeat the adjustments in steps 9 and 10 to insure accurate alignment.

Step 12. Replace the C.W. oscillator tube.

(2) C.W. OSCILLATOR ALIGNMENT.–The resonant frequency of the C.W. oscillator is adjusted by means of varying the inductance of coil L-105. The adjustment is located on the top of the C.W. oscillator compartment (See Figure 7–8.) For C.W. oscillator alignment set the front panel controls in the same positions as in the previous paragraph 5 a (1). The signal generator and multimeter connections are also the same.

Step 1. Tune the signal generator to 455 kilocycles, unmodulated, until a reading of about 1 volt is obtained on the multimeter.

Step 2. Set the B.F.O. Vernier control at zero.

Step 3. Using the alignment tool, adjust the movable slug of the C.W. oscillator coil, L-105, until a zero beat with the test signal is obtained on the Monitor speaker.

If the C.W. oscillator should become inoperative, before servicing can be undertaken, it is necessary to remove the C.W. oscillator from the top of the chassis and move it to a more accessible position. See paragraph 5 b (6) for the procedure for removing and reconnecting the C.W.O. for servicing.

(3) WAVE TRAP ADJUSTMENT.–The two wave traps are adjusted by varying the inductance of coils L-101 and L-107. See Figure 7–5 for the location and identification of wave trap adjustments.

To adjust the wave trap proceed as follows:

Step 1. Place the front panel controls in the same positions as in previous paragraph, 5 a (2).

Step 2. Remove the C.W.O. tube.

Step 3. Connect the signal generator through the dummy antenna to the antenna input connector, J-101, of the receiver.

Step 4. Connect the 600-ohm dummy load across terminals A and C of the audio output connector, J-104, of the receiver.

Step 5. Connect the multimeter across the 600-ohm dummy load.

Step 6. Tune the signal generator to 455 kilocycles modulated 30% at 1000 cycles.

Step 7. Tune receiver to 540 kilocycles.

Step 8. Increase the signal input until the modulation is heard and reads on the multimeter.

Step 9. Adjust slugs of L-101 and L-107 for minimum output.

(4) R.F. ALIGNMENT.–See Figures 7–8 and 7–9 for location and identification of all R.F. adjustments.

R.F. alignment as described herein means adjustment of the tuned circuits of the R.F. amplifier, mixer and H.F. oscillator stages to insure accurate tracking of these stages with each other as the receiver is tuned over its frequency range.

R.F. input transformers T-103, T-104, T-105 and T-106, mixer transformers T-107, T-108, T-109 and T-110, and oscillator coils T-111, T-112, T-113 and T-114 each contain an adjustable powdered iron core for varying the amount of inductance present in each tuned circuit. The amount of capacitance present in each tuned circuit is varied by means of adjustable trimmer capacitors connected in parallel with the secondary of each transformer, while different sections of main tuning capacitor C-109 provide tuning over the entire range of the receiver.

Step 1. Remove all external connections from the rear of the chassis and remove the receiver chassis from the cabinet.

Step 2. Remove the chassis bottom cover plate by releasing the ten captive screws around the outer edge of the plate. All R.F. alignment adjustments are now accessible through the access holes in the mixer-oscillator and R.F. coil compartment cover plates.

Step 3. Place the Reception switch in the C.W. position and remove C.W. oscillator tube V-107. This procedure disables the automatic gain control circuit of the receiver which is necessary for accurate R.F. alignment.

Step 4. Connect the A.C. power cable between the A.C. supply line and the receiver.

Step 5. Connect the multimeter across a 600-ohm dummy load at terminals A and C of audio connector J-104 or at terminals 6 and 8 of transformer T-102. Set the meter to one of the higher ranges to eliminate the possibility of any damage occurring to the meter.

Step 6. Connect the ground lead from the signal generator to the receiver chassis and connect the signal generator R.F. output lead through the dummy antenna to antenna connector J-101. Turn the signal generator on and adjust for a signal modulated 30% at 1000 cycles. Set the tuning dial of the signal generator to any frequency in the BC band.

Step 7. Adjust the receiver controls as follows:

Set the Power switch at Power.

Set the Band Selector switch to band BC.

Set the N.L.-EXT INP switch at N.L.-Off.

Place the Fidelity control in the extreme counterclockwise position.

Rotate the R.F. Gain and A.F. Level controls to the extreme clockwise positions.

Step 8. Tune the receiver until the signal from the signal generator is tuned in.

Step 9. Adjust the R.F. Gain control until a suitable audio output level is obtained, as indicated by approximately half-scale deflection of the pointer on the multimeter on one of the lower ranges. Tuning of the receiver to the signal generator must be as accurate as possible and the tuning indicator on the receiver should be utilized to this end. When the signal is exactly tuned in the shadow on the face of the tuning indicator will be at its sharpest, or most narrow point.

Alignment of the receiver may now be accomplished by following the Alignment Chart, Table 7–1, which gives step-by-step procedure for R.F. alignment. A few precautions must be taken, however, to insure that alignment will be carried out properly. Particular care must be taken to insure that the receiver is tuned to exactly the same frequency as the signal generator. It is imperative that the H.F. oscillator be set to operate at a frequency which is above the frequency of the R.F. amplifier and not below. This can be checked by tuning in the image of the test signal which must appear 910 kilocycles lower in frequency on the receiver dial than the signal from the signal generator. This image will be considerably weaker than the fundamental so that it may be necessary to advance the R.F. Gain control to identify the image signal. If it is found that the image does not appear at the proper point on the dial then the oscillator is incorrectly adjusted and the capacity of the oscillator trimmer capacitor must be varied until the image and fundamental signals appear at the proper points on the dial.

The following is the general procedure to be employed in the alignment of the R.F. amplifier, H.F. oscillator and mixer stages:

Step 1. Set the signal generator to the high-frequency alignment point of the desired band.

Step 2. Set the receiver dial to the corresponding high-frequency alignment point of the desired band.

Step 3. Adjust the corresponding trimmer capacitors of the H.F. oscillator, R.F. amplifier V-101 and mixer V-103 for maximum deflection of the pointer on the multimeter as directed in Table 7–1.

Step 4. Set the signal generator to the low-frequency alignment point of the desired band.

Step 5. Adjust the slugs on the corresponding transformers and coils for maximum deflection of the pointer on the multimeter.

After alignment has been completed a performance test should be conducted on the receiver to determine whether alignment has been performed correctly and was successful in restoring the original performance of the receiver. See Section 7, paragraph 4 c (3) for detailed instructions for conducting performance tests.

b. MECHANICAL ADJUSTMENTS.–Tools required for the mechanical procedures described herein consist of:

1. A No. 6 Bristo wrench, H-101.
2. A No. 8 Bristo wrench, H-102.
3. A medium-size offset Phillips-head screwdriver, H-103.
4. A medium-size screwdriver for slotted-head screws, such as Standard Navy Stock Number G41-S-1101.

NOTE: Bristo wrenches H-101 and H-102 and Phillips-head screwdriver H-103 are mounted inside the receiver on the outside of the shield enclosing the mixer section of the main tuning capacitor.

(1) REMOVAL OF RECEIVER CHASSIS FROM CABINET.–To remove the receiver chassis from the cabinet first remove all external connections from the rear of the receiver. Using a screwdriver, release the twelve slotted captive screws around the outer edges of the front panel by rotating each screw in a counterclockwise direction until they are loose in their mountings. Grasp the handles mounted on the front panel and pull the chassis forward until the slide release levers fall into place. Depress the slide release levers (one on each side, see Figure 5–1) with the thumbs and carefully pull the chassis out of the cabinet.

(2) REMOVAL OF CONTROL KNOBS, DIAL KNOBS AND COUPLINGS.–All control knobs except the Band Selector switch and Tuning dial are fastened to their respective shafts by two no. 8-32 Bristo set screws 90 degrees apart around the circumference of each knob. To remove a knob insert wrench H-102 into the end of each set screw and loosen a few turns. The knob can then be lifted from the shaft. The Band Selector switch and the Tuning dial knobs can be removed with a small standard screwdriver. All shaft couplings are fastened to their respective shafts by four no. 6-32 set screws, located two on each side of each coupling. To remove the coupling, use the Phillips-head or Bristo screwdriver, as the case may be, and loosen a few turns until the coupling will rotate on its shaft. To completely remove the coupling it will be necessary to loosen all mechanical connections to one of the shafts and slide the shafts away from the coupling until there is enough space between the two shafts to allow the coupling to be removed.

(3) REMOVAL OF THE CHASSIS BOTTOM COVER PLATE.–To remove the chassis bottom cover plate after having removed the receiver chassis from the cabinet, loosen the ten captive screws around the outer edges of the plate and lift the plate off.

TABLE 7–1. R.F. ALIGNMENT CHART

STEP	RANGE	ADJUST SIGNAL SOURCE AND RECEIVER TO	ADJUST TO RECEIVE TEST SIGNAL	ADJUST FOR MAXIMUM OUTPUT
1	BC	1.6 mc.	Trimmer capacitor C-112	Trimmer capacitors C-103, C-127
2	BC	0.54 mc.	Inductor T-111	Inductors T-103, T-107
3	BC	1.6 mc.	Trimmer capacitor C-112	Trimmer capacitors C-103, C-127
4	BC	1.0 mc.	Padder capacitor C-116	
Repeat in above order until calibration is correct.				
1	SW1	3.4 mc.	Trimmer capacitor C-113	Trimmer capacitors C-104, C-128
2	SW1	1.6 mc.	Inductor T-112	Inductors T-104, T-108
3	SW1	3.4 mc.	C-113	C-104, C-128
Repeat in above order until calibration is correct.				
1	SW2	8.5 mc.	Trimmer capacitor C-114	Trimmer capacitors C-105, C-129
2	SW2	3.5 mc.	Inductor T-113	Inductors T-105, T-109
3	SW2	8.5 mc.	C-114	C-105, C-129
Repeat in above order until calibration is correct.				
1	SW3	18.0 mc.	Trimmer capacitor C-115	Trimmer capacitors C-106, C-130
2	SW3	9.0 mc.	Inductor T-114	Inductors T-106, T-110
3	SW3	18.0 mc.	C-115	C-106, C-130
Repeat in above order until calibration is correct.				

(4) REMOVAL OF COVERS FROM COIL COMPARTMENTS.

(a) MIXER-OSCILLATOR COIL COMPARTMENT COVER.–To remove the cover from the mixer-oscillator coil compartment after having removed the chassis bottom cover plate, loosen the thirteen slotted-head captive screws around the outer edges and in the center of the cover and lift the cover off.

(b) R.F. COIL COMPARTMENT COVER.–To remove the cover from the R.F. coil compartment loosen the four slotted-head captive screws on top of the cover and the three which are inside the compartment. Three large access holes for access to these screws are drilled in the top of the compartment along one side.

(5) REMOVAL OF MIXER-OSCILLATOR COIL COMPARTMENT SIDE PLATE.–The mixer-oscillator coil compartment is enclosed on three sides by a single plate which may be removed if necessary to gain access to components during repair of the receiver. To remove this side plate, first loosen the eight slotted-head screws on the flange which runs around the bottom inside edge of the plate next to the chassis. Using the offset Phillips-head screwdriver remove the six screws on the side of the compartment that hold this plate. Carefully lift out the

entire side plate, using extreme caution to prevent damage to the coils and other nearby components.

(6) REMOVAL OF C.W. OSCILLATOR COMPARTMENT.–In the event the C.W. oscillator should become inoperative, before servicing can be undertaken it is necessary that the entire C.W. oscillator compartment be removed from the top of the chassis and moved to a more accessible position underneath the chassis. In order to perform this operation certain wires must be unsoldered and reconnected when the compartment is in its new position. After servicing has been completed the wires must be disconnected, the compartment returned to its original position above the chassis and the wires run through grommets and connections again made.

To remove the C.W. oscillator compartment proceed as follows:

Step 1. Using wrench H-102 loosen the two set screws which secure the B.F.O. Vernier control knob to its shaft and remove the knob.

Step 2. Remove the shield which encloses C.W. oscillator tube V-107 and remove the tube.

Step 3. Turning the chassis upside down, unsolder the four wires leading from the C.W. oscillator compartment to the following points:

Black – remove from the ground stud.
Brown – remove from terminal board TB-103.
Red – remove from section C of capacitor C-142C.
Green – remove from terminal board TB-103.

Step 4. Using a Phillips screwdriver, remove the three screws which secure the C.W. oscillator compartment to the chassis.

Step 5. Turn the chassis over and carefully lift the entire C.W. oscillator compartment to the rear and upward until the shaft clears the front panel and lift out the compartment. Note which wires run through which grommets and mark this information on a piece of paper or on the chassis.

Step 6. Remove the compartment side cover plate which is secured by two Phillips-head screws on the front of the compartment and two on the back.

To connect the C.W. oscillator compartment underneath the chassis for voltage measurements proceed as follows:

Step 7. Place the receiver chassis upside down on the service bench and connect the wires from the C.W. oscillator compartment to the following points:

Black – connect to any convenient ground stud.
Brown – connect to terminal 2 of terminal board TB-103.
Red – connect to section C of capacitor C-142C.
Green – connect to terminal 1 of terminal board TB-103.

Step 8. Rest the C.W. oscillator compartment on top of the mixer-oscillator coil compartment cover which should be in place to prevent damage to the coils. If the C.W. oscillator tube is inserted in its socket at this time, be sure to also include the shield.

CAUTION

Great care must be taken to prevent damage to the tube with the compartment in this unsteady position.

Replacement of the C.W. oscillator coil compartment is accomplished in reverse manner. Constant reference must be made to the Practical Wiring Diagram, Figure 7–14, and the Schematic Diagram, Figure 7–13, to prevent the possibility of any damage occuring because of improper connections.

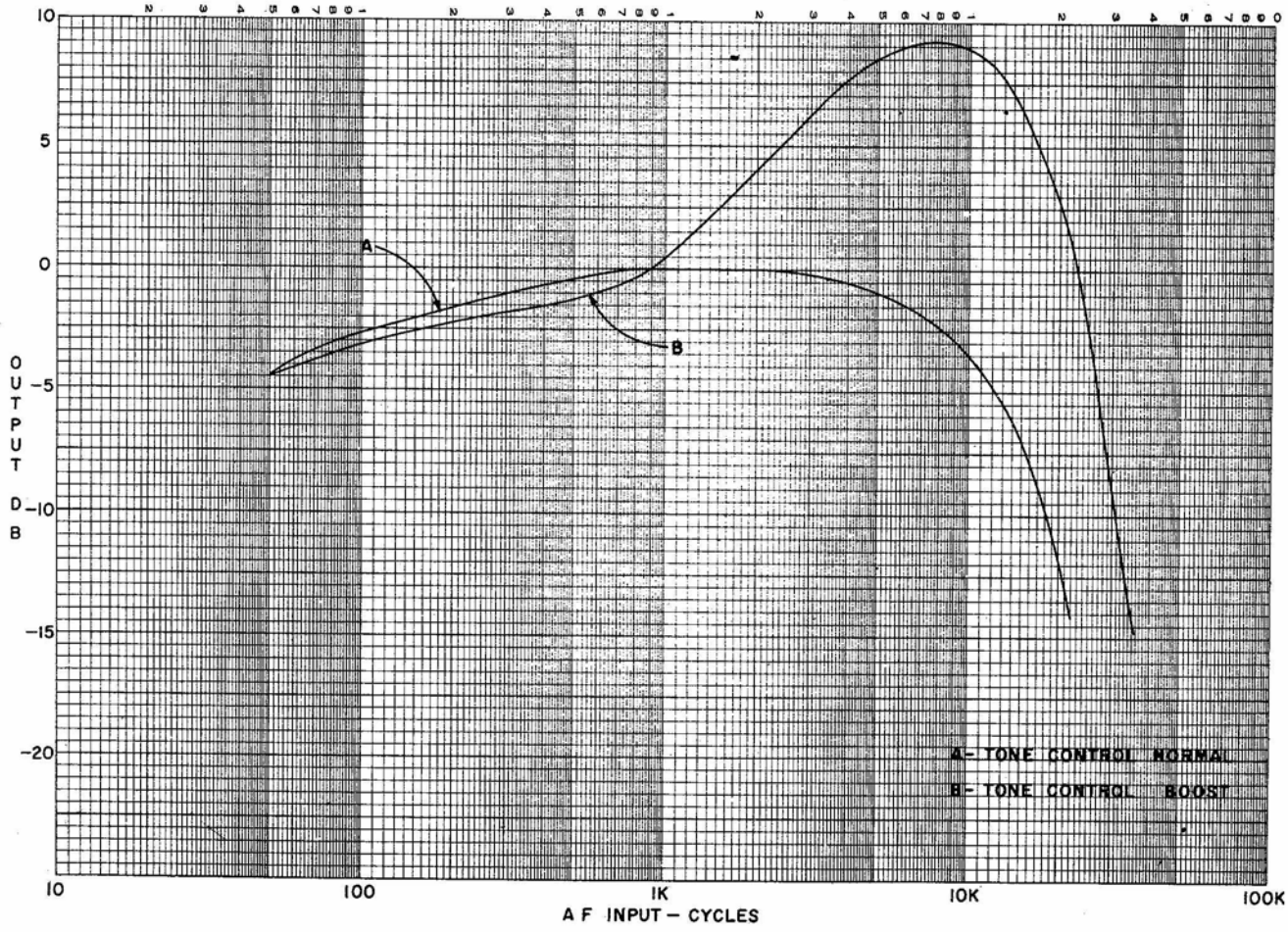


Figure 7–10. Typical Audio Response Curves

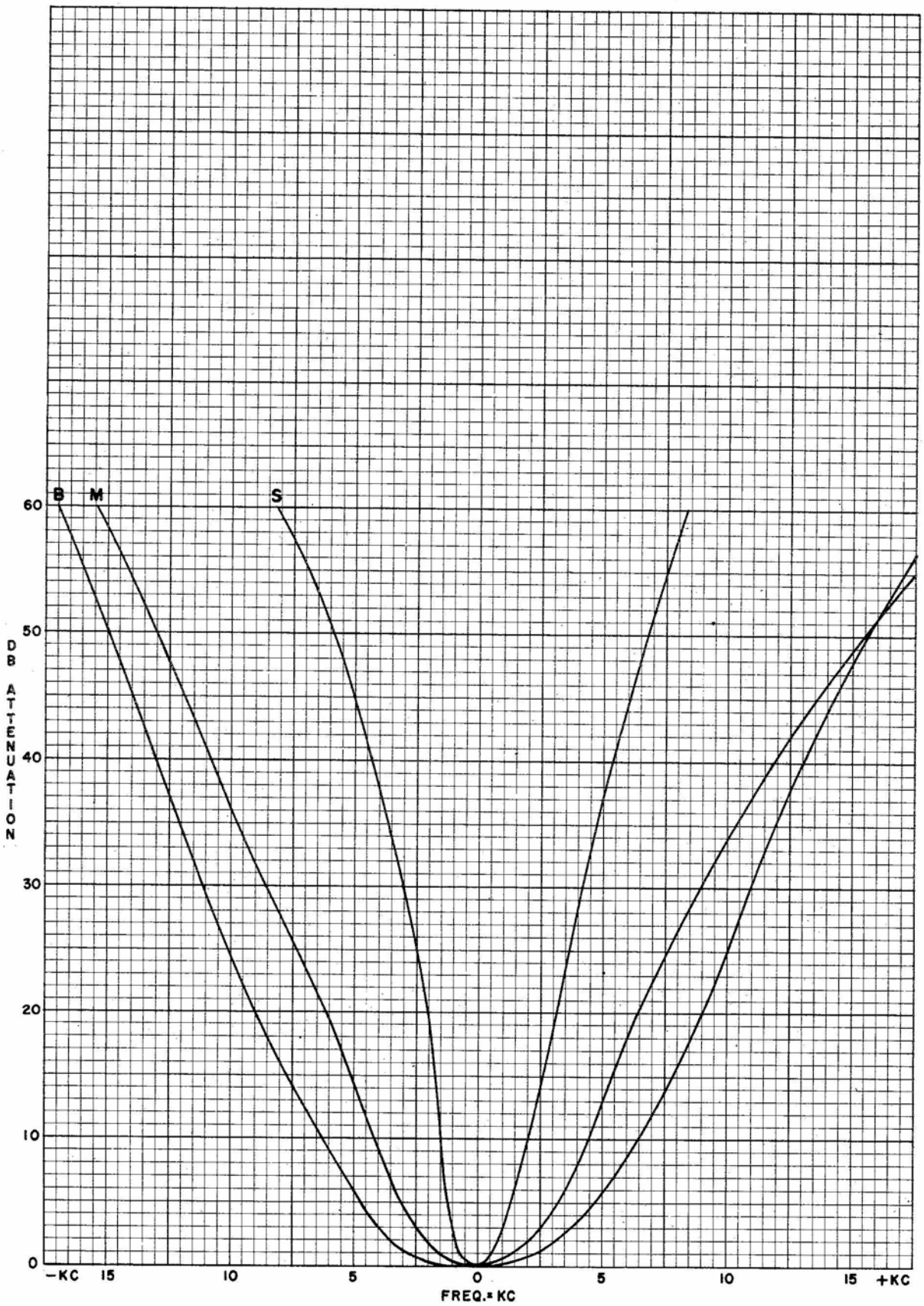


Figure 7–11. Typical I.F. Selectivity Curves

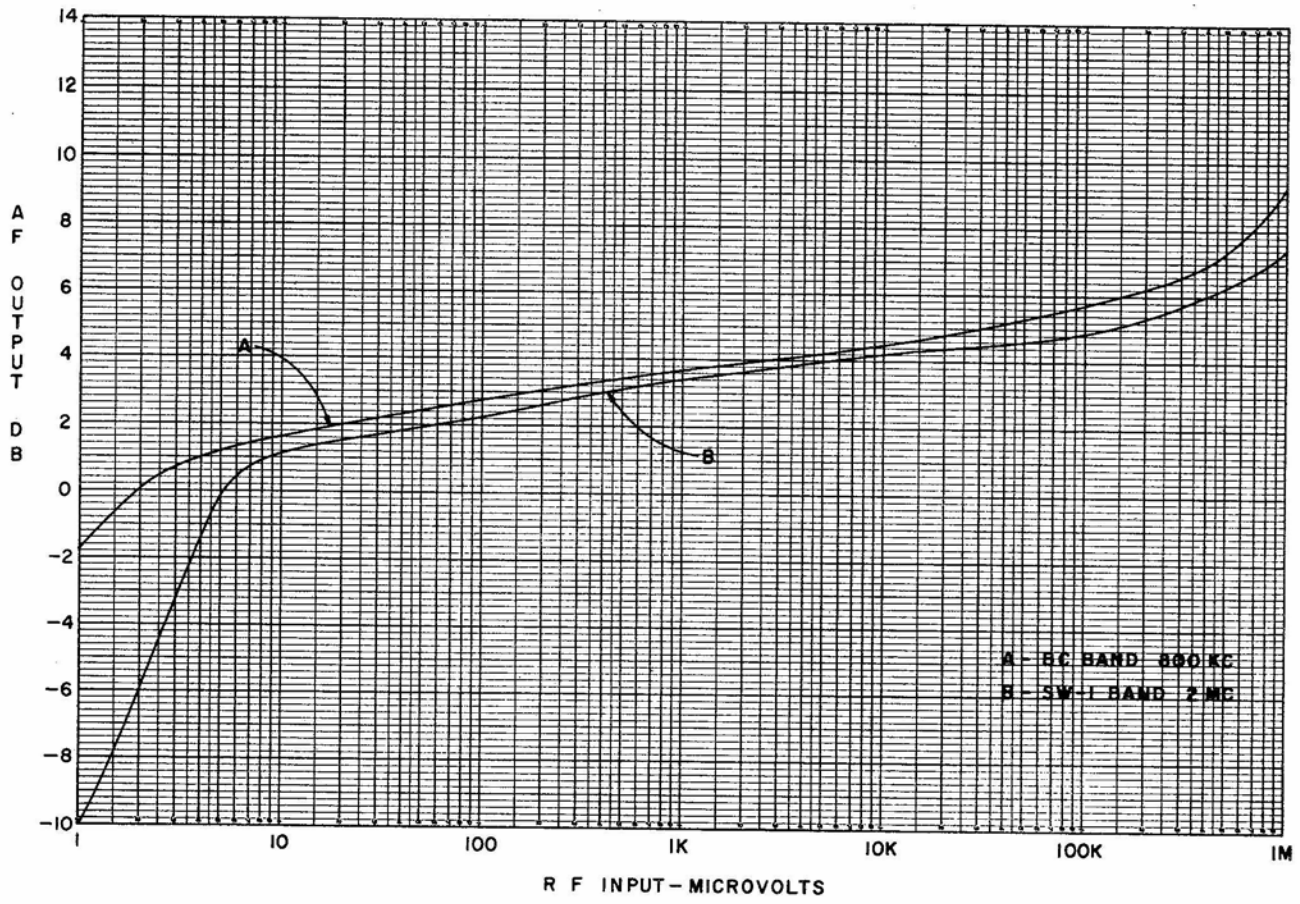


Figure 7–12. Typical A.G.C. Characteristic Curves

TABLE 7-2. TUBE OPERATING VOLTAGES AND CURRENTS

TUBE TYPE	FUNCTION	PLATE (E)	PLATE (MA)	SCREEN (E)	SCREEN (MA)	SUPP (E)	CATH (E)	GRID (E)	HEATER A.C. (E)
OB2	Voltage Regulator	105	10.3	--	--	--	0	--	--
5Y3W-GTA	Rectifier	--	--	--	--	--	180	--	5.1
6BA7	Mixer	150	3	72	8	0	0	0	6.4
6E5	Tuning Indicator	13	.065	156*	2.5*	--	--	--	6.4
1/2 5670	1st Audio Amp	62	.62	--	--	--	.8	0	6.4
1/2 5670	2nd Audio Amp	91	1.4	--	--	--	1.6	0	6.4
5686	Audio Output	148	21	156	4	--	-69	-76	6.4
5686	Audio Output	148	21	156	4	--	-69	-76	6.4
1/2 5726	Detector	-.5	--	--	--	--	0	--	5.4
1/2 5726	Noise Limiter	-.4	--	--	--	--	.4	--	5.4
5749	1st I.F. Amp	150	4.5	68	1.8	0	1.3	0	6.4
5749	2nd I.F. Amp	150	5.0	52	2.1	0	.9	0	6.4
5749	R.F. Amp	150	4.3	119	1.5	0	4.3	0	6.4
1/2 5814	C.W. Oscillator	144	1.4	--	--	--	0	-12	6.4
1/2 5814	Buffer Amp	67	2.0	--	--	--	6	-6.5	6.4
6135	H.F. Oscillator	105	14	--	--	--	0	-12.5	6.4
6135	AGC Amp	0	0	--	--	--	-64	-78	6.4
6135	Phase Splitter	94	1.3	--	--	--	-1.8	-19	6.4

*Target

TABLE 7–3. RATED TUBE CHARACTERISTICS

TUBE TYPE	FILAMENT VOLTAGE (V)	FILAMENT CURRENT (A)	PLATE VOLTAGE (V)	GRID BIAS (V)	SCREEN VOLTAGE (V)	PLATE CURRENT (MA)	SCREEN CURRENT (MA)	A.C. PLATE RESISTANCE (MA)	VOLTAGE AMPLIFICATION (MU)	NORMAL TRANSCONDUCTANCE (MICROHMOS)
OB2	--	--	108	--	--	5-30	--	------	--	--
5Y3W-GTA	5.0	2.00	400*	--	--	140	--	------	--	--
6BA7	6.3	0.30	250	-1	100	3.8	10	1 megohm	--	950
6E5	6.3	0.30	250	--	125/ 250#	5	4##	1 megohm	--	--
5670	6.3	0.35	150	-2	--	8.2	--	6370	35	5500
5686	6.3	0.35	250	-12.5	250	27	5	------	--	3100
5726	6.3	0.30	117*	--	--	9*	--	300*	--	--
5749	6.3	0.30	250	--	100	11	4.2	1 megohm	--	4400
5814	6.3 or 12.6	0.30 or 0.15	250	-8.5	--	10.5	--	6250	17	2200
6135	6.3	0.175	250	--	--	10.5	--	7700	17	2200

*Per plate.
#Min/max target voltage.
##Target current.

TABLE 7–4. WINDING DATA CHART

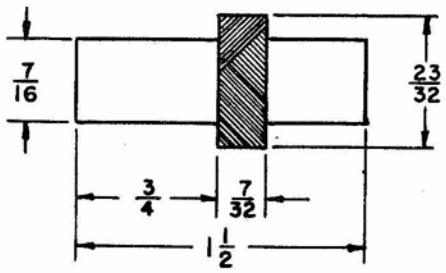
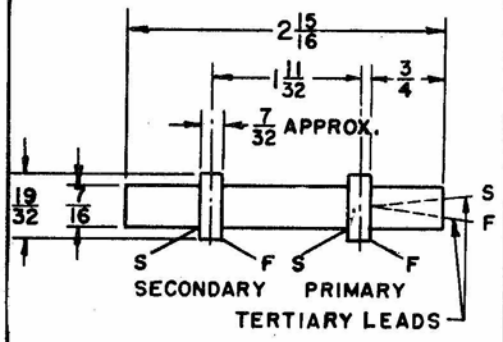
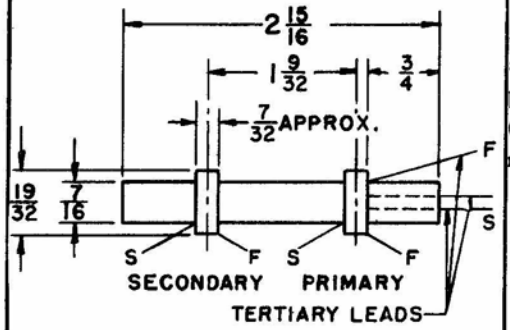
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-101	SA:9085		single pie wound	7/41 Litz	195	6.0			inductance 570 microhenries ±5% at 790 kc. Lacquered during winding and baked for at least 2 hours at 60° to 80° in ventilated oven.
L-102	SA:9079		3 windings, pri and sec 1 pie each (see remarks)	7/41 Litz	pri 115 sec 115 ter 6	pri 3.34 sec 3.17 ter not rated			pri inductance 194 microhenries. sec inductance 178 microhenries. ter not rated. Ter wound under pri and separated by one layer of Cambric cloth. Lacquered during winding. pri Q: 82 ± 15%. sec Q: 88 ±15%. inductance measured at 790 kc
L-103	SA:9080		3 windings, pri and sec 1 pie each (see remarks)	7/41 Litz	pri 115 sec 115 ter 3 1/4 tapped at 2 1/8	pri 3.40 sec 3.21 ter not rated			pri inductance 188 microhenries. sec inductance 178 microhenries. ter not rated. Ter wound under pri and separated by one layer of Cambric cloth. Lacquered during winding. pri Q: 82 ± 15%. sec Q: 88 ±15%.

TABLE 7–4. WINDING DATA CHART (CONT'D)

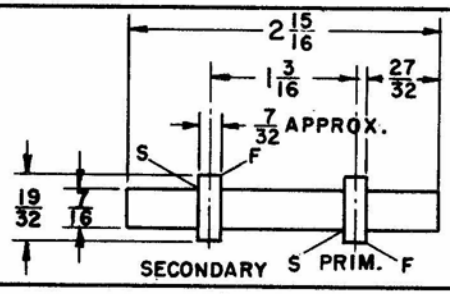
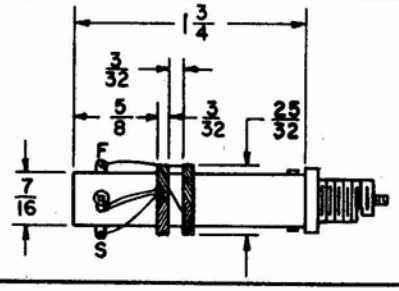
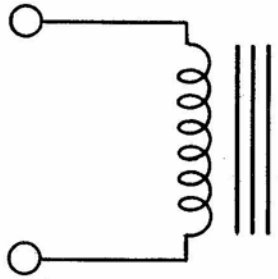
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-103 (cont'd)									inductance measured at 790 kc
L-104	SA:9077		2 windings each single pie wound	7/41 Litz	pri 115 sec 115	pri 3.20 sec 3.20			pri inductance 178 microhenries. sec inductance 178 microhenries. measured at 790 kc. varnished during winding. pri Q: 88 ± 15%. sec Q: 88 ±15%.
L-105	SA:9087		1 winding, 2 pie wound	7/41 Litz	100 turns per pie tapped at 34 turns from start	6.4			inductance 5.2 microhenries. measured at 790 kc. Q: 102 ±20%. current rating 150 ma. Lacquered during winding. adjustable powdered iron core.
L-106	P882-1		1 winding			310		1500	inductance 10 hy at 125 ma DC. hermetically sealed metal case.

TABLE 7-4. WINDING DATA CHART (CONT'D)

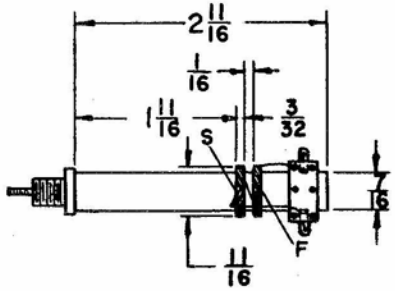
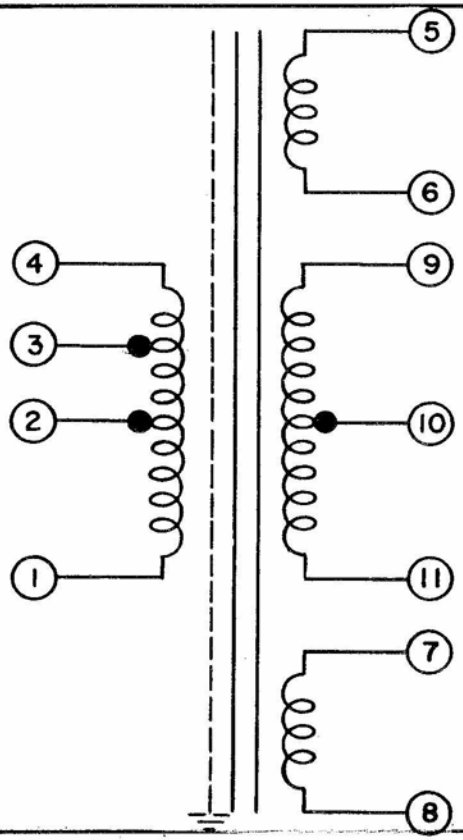
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-107	SA:9210		1 wind-ing, 2 pie wound	7/41 Litz	300 turns per pie	4.1			inductance 245 micro-henries measured at 790 kc. peak frequen-cy 455 kc. current rating 150 ma. adjust-able powdered iron core. JAN type CM20-D271J capacitor across winding. Lac-quered during winding.
T-101	P881-1		pri sec no. 1 sec no 2 sec no. 3			terms 1-2: 3.0 terms 1-3: 3.34 terms 1-4: 3.67 terms 5-6: 0.058 terms 9-11: 122. term 10 CT terms 7-8: 0.056		1500	input 105, 115, 125 v. output 5.0 v AC. output 580 v DC at 125 ma. CT. output 6.3 v AC. hermetically sealed metal case.

TABLE 7–4. WINDING DATA CHART (CONT'D)

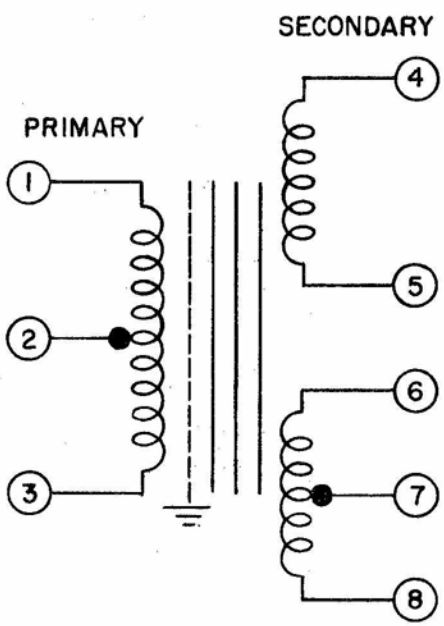
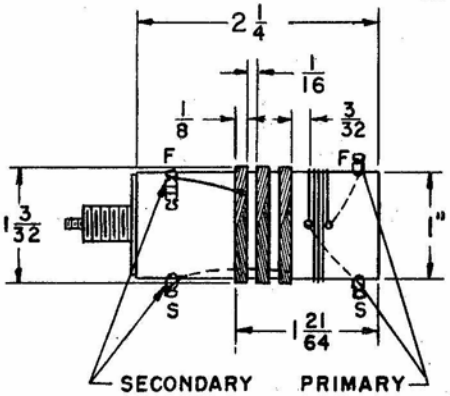
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-102	P883-1		pri sec no. 1 sec no. 2			terms 1-3: 500 terms 4-5: 21.0 terms 6-8: 1.28		1500	impedance 15,000 ohms at 3 watts, 40 ma push-pull, term no. 2 CT impedance 600 ohms, 0.25 watt ±1 db impedance 60 ohms, 2.5 watts. CT at term no. 7 for external grnd. Output voltage not to change more than 3 db from 60 to 600 ohms. Measurements made at 1,000 cycles. frequency range ±2 db from 100 to 5,000 cycles. grounded electrostatic shield between primary and secondary. hermetically sealed metal case.
T-103	SA:9110		2 windings, pri single layer, sec 3 pie	pri no. 18E sec 7/41 Litz	4 2 pies of 28 turns, 1 pie of 25 turns	pri 0.05 sec 4.38			pri inductance 0.72 microhenries at 25 mc. sec inductance 186 microhenries at 790 kc. Lacquered during winding. powdered iron core, adjustable.

TABLE 7-4. WINDING DATA CHART (CONT'D)

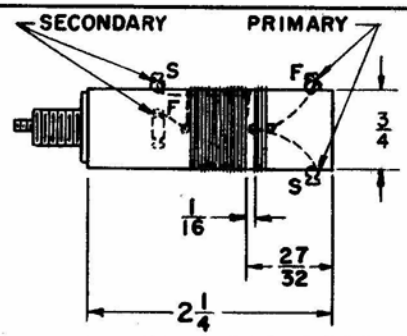
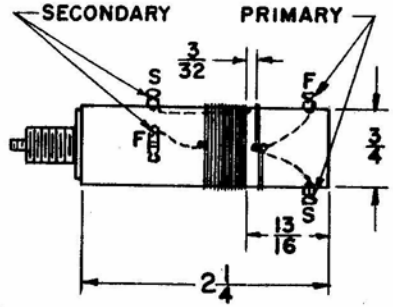
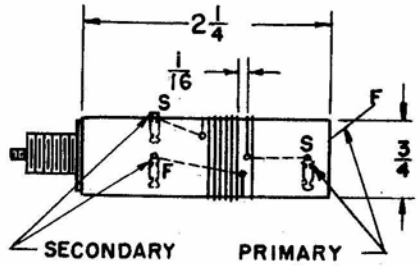
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-104	SA:9098		2 windings, single layer wound	pri no. 18E sec no. 30E	4 40 1/2	pri not rated sec 0.87			pri inductance not rated. sec inductance 26.5 microhenries. frequency range 1.6 to 3.45 mc. adjustable powdered iron core. Lacquered during winding.
T-105	SA:9104		2 windings, single layer wound	pri no. 18E sec no. 24E	2 15 1/4	pri not rated sec 0.10			pri inductance not rated. sec inductance 5.18 microhenries. frequency range 3.45 to 8.6 mc. adjustable powdered iron core. Lacquered during winding.
T-106	SA:9092		2 windings, single layer wound	pri no. 18E sec no. 24E	1 1/2 6 3/4	pri not rated sec 0.13			pri inductance not rated. sec inductance 1.025 microhenries at 790 kc. frequency range 8.6 to 18.6 mc. adjustable powdered iron core. Lacquered during winding.

TABLE 7-4. WINDING DATA CHART (CONT'D)

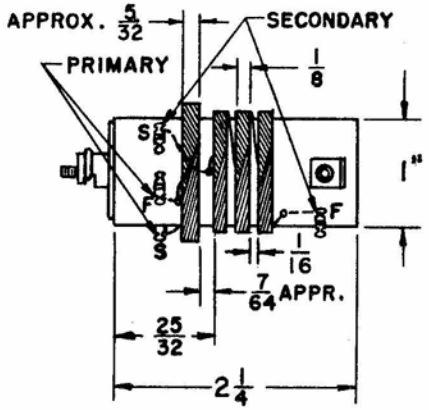
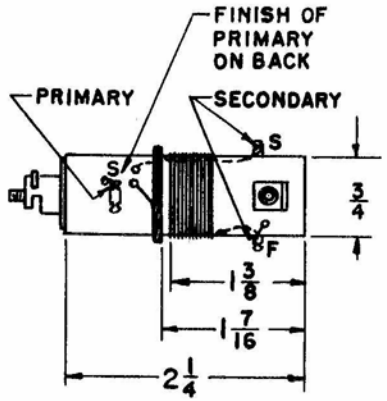
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-107	SA:9090		2 windings, pri single pie, sec 3 pies	pri no. 36E sec no. 10/41 Litz	450 28 turns per pie	pri 64.2 sec 3.3			pri inductance 1020 microhenries. sec inductance 175 microhenries. frequency range 0.54 to 1.6 mc. adjustable powdered iron core. Lacquered during winding.
T-108	SA:9096		2 windings, pri single pie wound. sec single layer wound	pri no. 34E sec no. 30E	13 1/2 37 1/2	pri 0.83 sec 0.80			pri inductance 6.95 microhenries at 790 kc. sec inductance 27.0 microhenries at 2.5 mc. frequency range 1.6 to 3.45 mc. adjustable powdered iron core. Lacquered during winding.

TABLE 7-4. WINDING DATA CHART (CONT'D)

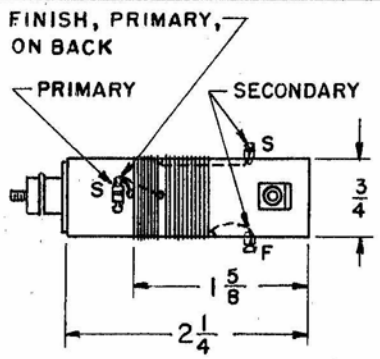
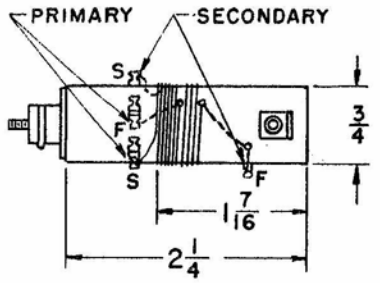
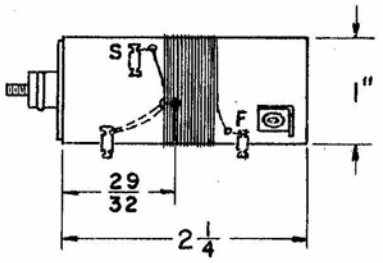
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-109	SA:9102		2 windings, single layer wound	pri no. 28E sec no. 24E	8 1/2 14 1/2	pri 0.128 sec 0.09			pri inductance 2.30 microhenries at 790 kc. sec inductance 4.80 microhenries at 790 kc. frequency range 3.45 to 8.6 mc. adjustable powdered iron core. Lacquered during winding.
T-110	SA:9108		2 windings, single layer wound	pri no. 28DSC sec no. 24E	6 1/4 6 3/4	pri 0.10 sec 0.043			pri inductance 1.075 microhenries at 790 kc. sec inductance 0.94 microhenries at 790 kc. frequency range 8.6 to 18.6 mc. adjustable powdered iron core. Lacquered during winding.
T-111	SA:9088		1 winding, single layer wound	32E	59 1/4 tapped at 12 1/4 turns	2.57			inductance 96 microhenries at 2.5 mc. frequency range 0.995 to 2.055 mc. adjustable powdered iron core. Lacquered during winding.

TABLE 7-4. WINDING DATA CHART (CONT'D)

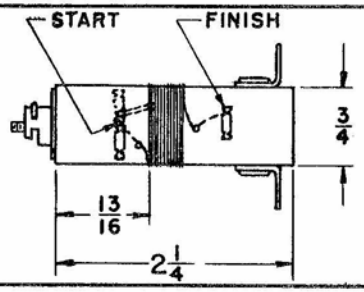
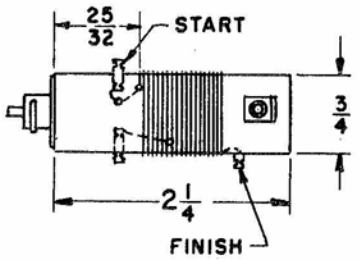
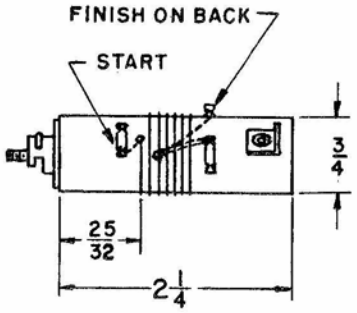
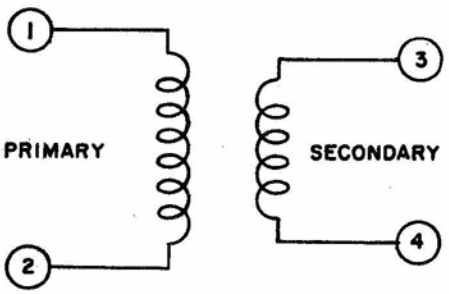
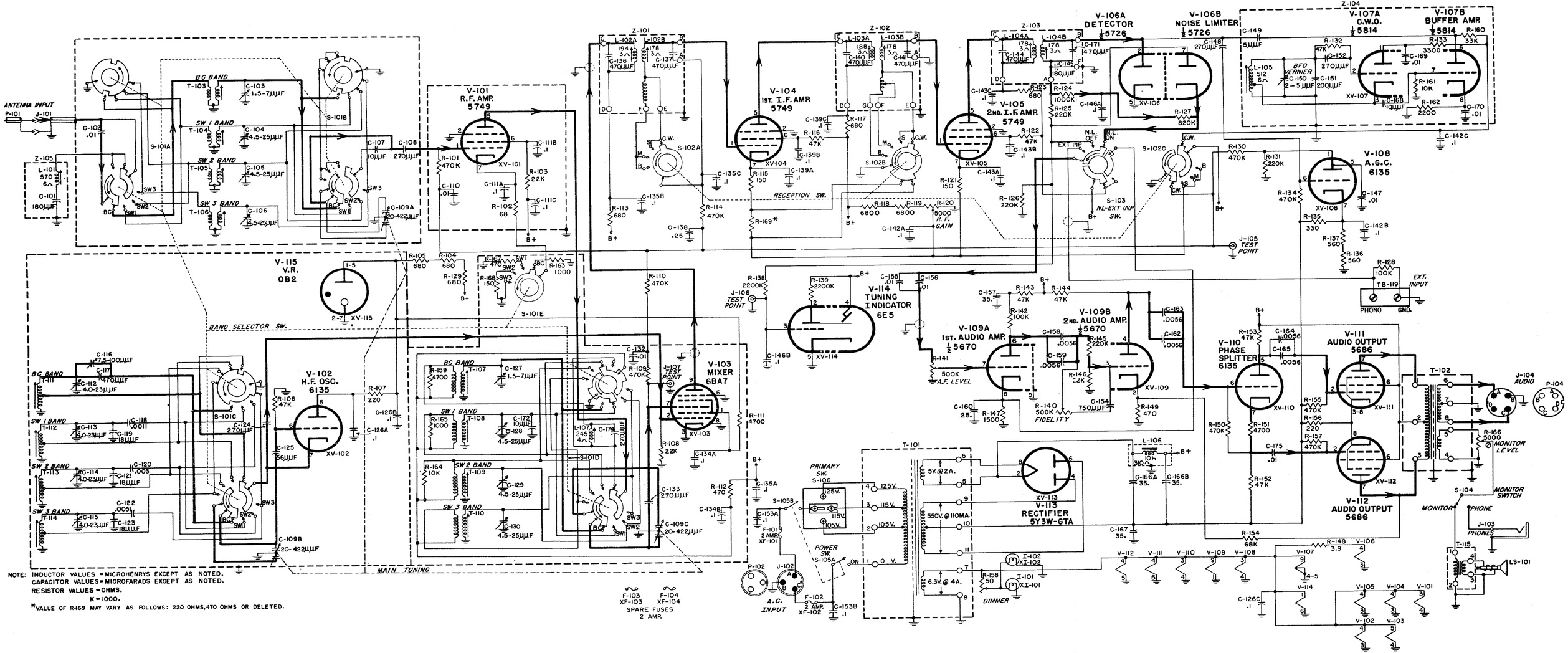
SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-112	SA:9094		1 winding, single layer wound	30E	30 tapped at 8 1/2 turns	0.68		500	inductance 19.8 microhenries at 2.5 mc. frequency range 2.055 to 3.905 mc. adjustable powdered iron core. Lacquered during winding.
T-113	SA:9100		1 winding, single layer wound	24E	16 tapped at 4 1/2 turns	0.11			inductance 3.8 microhenries at 790 kc. frequency range 3.905 to 9.055 mc. adjustable powdered iron core. Lacquered during winding
T-114	SA:9106		1 winding, single layer wound	24E	6 1/2 tapped at 1 7/8 turns	0.06			inductance 1.07 at 25 mc. frequency range 9.055 to 19.055 mc. adjustable powdered iron core. Lacquered during winding.

TABLE 7–4. WINDING DATA CHART (CONT'D)

SYMBOL DESIG.	NAT. PT. NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D.C. RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
T-115	T075-1		pri sec			terms 1-2: 66.0 terms 3-4: 0.43	187.5:1	500	impedance 600 ohms impedance 3.2 ohms 1/2 watt audio operating level. frequency range 100 to 5,000 cycles.



NOTE: INDUCTOR VALUES = MICROHENRYS EXCEPT AS NOTED.
CAPACITOR VALUES = MICROFARADS EXCEPT AS NOTED.
RESISTOR VALUES = OHMS.
K = 1000.
*VALUE OF R-169 MAY VARY AS FOLLOWS: 220 OHMS, 470 OHMS OR DELETED.

Figure 7–13.
Schematic Diagram, Radio Receiver R-302/URR-22

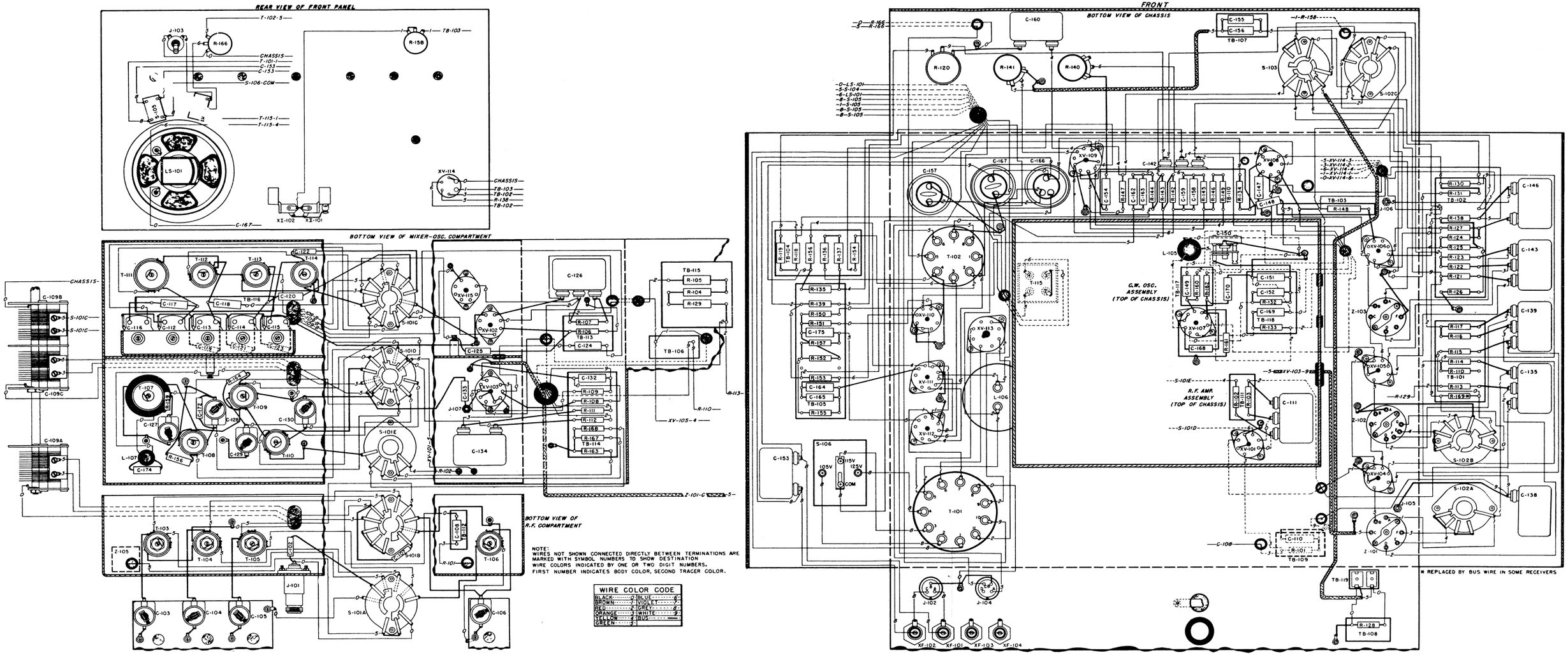


Figure 7–14.
Practical Wiring Diagram

TABLE 8–1. WEIGHTS AND DIMENSIONS OF EQUIPMENT SPARE PARTS BOX

OVERALL DIMENSIONS			VOLUME CU. FT.	WEIGHT LBS.
HEIGHT	WIDTH	DEPTH		
19 1/2"	15 1/4"	6"	1.03	11

TABLE 8–2. SHIPPING WEIGHTS AND DIMENSIONS OF EQUIPMENT SPARE PARTS BOX

SHIPPING BOX NO.	OVERALL DIMENSIONS			VOLUME	WEIGHT
	HEIGHT	WIDTH	DEPTH		
Included in same crate as Radio Receiver					

TABLE 8–3. LIST OF MAJOR UNITS

SYMBOL GROUP	QUANTITY	NAME OF MAJOR UNIT	STANDARD NAVY STOCK NUMBER	DESIGNATION
101–199	1	Radio Receiving Set	F16-Q-123890-200	AN/URR-22
101–199	1	Radio Receiver	F16-Q-123890-100	R-302/URR-22

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
	F16-Q-123890-200	Radio Receiving Set: for A1, A2, A3 reception, MBCA ref dwg group 5; 535 kc to 18,600 kc freq range in 4 bands; requires 105/115/125 volts AC, 60 cycles, single phase; one JAN-6E5 visual tuning indicator tube; table mtd; 18" wd x 12 3/8" h x 17 3/8" d o/a including vibration mounts; 15 electron tubes; superheterodyne circuit; beat frequency oscillator; includes Radio Receiver R-302/URR-22, connectors and repair parts (peculiar) as accessories; AN type AN/URR-22; CNA part ER:329; Mfr code 1, type AN/URR-22	Radio Receiving Set
101-199	F16-Q-123890-100	Receiver, Radio: for A1, A2, A3 reception; MBCA ref dwg group 5; 535 kc to 18,600 kc freq range in 4 bands; requires 105/115/125 volts AC, 60 cycles, single phase; uses one JAN-6E5 visual tuning indicator tube; table mtd; 18" wd x 12 3/8" h x 17 3/8" d o/a including vibration mounts; 15 electron tubes; superheterodyne circuit; beat frequency oscillator; AN type R-302/URR-22; CNA part BM:547; Mfr code 1, type R-302/URR-22	Radio Receiver
		CAPACITORS	
C-101	For reference only	Capacitor, Fixed, Mica Dielectric: case style no. 22, MBCA ref dwg group 1; 180 mmf ±5%; 500 vdcw; temp coef -20 +100 mmf/mf/°C; molded low loss bakelite case; 51/64" lg x 15/32" wd x 7/32" thk; two axial wire leads; term mtd; JAN type CM20E181J; CNA part/dwg D925-25; Mfr code 242; part of Z-105	Antenna wave trap tuning
C-102	For replacement use N16-C-33622-5588	Capacitor, Fixed, Mica Dielectric: case style no. 22, MBCA ref dwg group 1; 10,000 mmf ±10%; 300 vdcw; no specified temp coef; molded low loss bakelite case; 53/64" lg x 53/64" wd x 11/32" thk; two axial wire leads; term mtd; JAN type CM35B103K; CNA part/dwg H377-8; Mfr code 242	Antenna series capacitor
C-103	N16-C-63900-6761	Capacitor, Variable, Ceramic Dielectric: rotary type; 1 section, zero temp coef ±100 mmf/mf/°C; 1.5 mmf to 7 mmf; 500 vdcw; 27/32" lg x 41/64" h x 13/32" thk excl term; one solder lug term at each end; two 0.120" dia mtg holes in base on 0.450" mtg/c; screwdriver slot adjustment; ceramic base; similar to JAN type CV11A070; CNA part/dwg K277-2; Mfr code 83	T-103 tuning
C-104	N16-C-64036-4565	Capacitor, Variable, Ceramic Dielectric: rotary type; 1 section; zero temp coef ±100 mmf/mf/°C; 4.5 mmf to 25 mmf; 500 vdcw; 27/32" lg x 41/64" h x 13/32" thk excl term; one solder lug term at each end; two 0.120" dia mtg holes in base on 0.450" mtg/c; screwdriver slot adjustment; ceramic base; similar to JAN type CV11A250; CNA part/dwg K277-5; Mfr code 83	T-104 tuning
C-105		Same as C-104	T-105 tuning

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		CAPACITORS (CONT'D)	
C-106		Same as C-104	T-106 tuning
C-107	N16-C-15912-4671	Capacitor, Fixed, Ceramic Dielectric: case style no. 18, MBCA ref dwg group 1; 10 mmf ±0.25 mmf; 500 vdcw; insulated; 0.562" lg x 0.250" dia; two axial wire leads; term mtd; JAN type CC21-CH100C; CNA part/dwg H872-41; Mfr code 83	T-104, T-105, T-106 trimmer
C-108	N16-C-29608-2206	Capacitor, Fixed, Mica Dielectric: case style no. 22, MBCA ref dwg group 1; 270 mmf ±5%; 500 vdcw; temp coef ±100 mmf/mf/°C; molded low loss bakelite case; 51/64" lg x 15/32" wd x 7/32" thk; one axial wire lead at each end; term mtd; JAN type CM20D-271J; CNA part/dwg D925-36; Mfr code 83	V-101 grid input coupling
C-109	For reference only	Capacitor, Variable: consists of C-109A, C-109B, C-109C	Tuning control
C-109A	N16-C-99999-0999	Capacitor, Variable, Air Dielectric: plate meshing type; single section; 20 mmf to 422 mmf; straight line freq tuning characteristic; 1,000 volts AC peak voltage; 2 13/32" lg x 2 23/32" wd x 3 3/16" h excl shaft; 1/4" dia shaft extends 1.00" beyond front plate; CNA part/dwg Q780-1; Mfr code 284	R.F. tuning
C-109B C-109C	N16-C-99999-1000	Capacitor, Variable, Air Dielectric: plate meshing type; 2 sections; 20 mmf to 422 mmf each section; straight line freq tuning characteristic each section; 1,000 volts AC peak voltage; 4 7/16" lg x 2 23/32" wd x 3 3/16" h excl shaft; 1/4" dia thru shaft extends 1.00" beyond front and rear plates; gear driven adjustment; base not insulated; 4 solder lug term; CNA part/dwg Q781-1; Mfr code 284	Oscillator and mixer tuning
C-110		Same as C-102	V-101 grid return bypass
C-111	N16-C-54460-4481	Capacitor, Fixed, Paper Dielectric: 3 section; case style no. 42, MBCA ref dwg group 1; 0.1 mfd -10% +20%; 600 vdcw per section; hermetically sealed metal case; 1.812" wd x 1" d x 0.875" h excl mtg flanges; 3 solder lug type term 0.750" h located on one side spaced 1.062" c to c; internally grounded; two 0.187" dia mtg holes, one on each flange spaced 2.125" c to c; JAN type CP53B5EF104V; CNA part/dwg F858-3; Mfr code 14	
C-111A		Part of C-111	V-101 cathode bypass

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		CAPACITORS (CONT'D)	
C-111B		Part of C-111	V-101 screen bypass
C-111C		Part of C-111	V-101 screen B+ bypass
C-112	N16-C-58836-5280	Capacitor, Variable, Air Dielectric: plate meshing type; single section; 4.0 mmf to 23.0 mmf; straight line freq tuning characteristic; 1 9/32" lg x 15/16" wd x 1 7/32" h o/a; screwdriver adjustment; mts by two 4-40 tapped holes spaced 21/32" c to c; 1 solder lug term; JAN type CT1B025; CNA part/dwg S674-1; Mfr code 44	T-111 parallel trimmer
C-113		Same as C-112	T-112 parallel trimmer
C-114		Same as C-112	T-113 parallel trimmer
C-115		Same as C-112	T-114 parallel trimmer
C-116	N16-C-60528-2535	Capacitor, Variable, Air Dielectric: plate meshing type; single section; 7.5 mmf to 100 mmf; straight line freq tuning characteristic; 1 29/32" lg x 15/16" wd x 1 7/32" h o/a; screwdriver adjustment; mts by two 4-40 tapped holes spaced 21/32" c to c; 1 solder lug term; JAN type CT1B100; CNA part/dwg S675-1; Mfr code 44	T-111 series padder
C-117	N16-C-30104-2326	Capacitor, Fixed, Mica Dielectric: case style no. 22, MBCA ref dwg group 1; 470 mmf ±2%; 500 vdcw; temp coef ±100 mmf/mf/°C; molded low loss bakelite case; 51/64" lg x 15/32" wd x 7/32" thk; two axial wire leads; term mtd; JAN type CM20D471G; CNA part/dwg D925-51; Mfr code 242	T-111 series padder
C-118	N16-C-31185-6814	Capacitor, Fixed, Mica Dielectric: case style no. 22, MBCA ref dwg group 1; 1,100 mmf ±2%; 500 vdcw; temp coef ±100 mmf/mf/°C; 53/64" lg x 53/64" wd x 9/32" thk; two axial wire leads; JAN type CM30D112G; CNA part/dwg H640-26; Mfr code 242	T-112 series padder
C-119	N16-C-16053-1248	Capacitor, Fixed, Ceramic Dielectric: case style no. 18, MBCA ref dwg group 1; 18 mmf ±5%; 500 vdcw; neg temp coef 750 (+120 -350) mmf/mf/°C; insulated; 0.562" lg x 0.250" dia; two axial wire leads; term mtd; JAN type CC21UJ180J; CNA part/dwg H872-29; Mfr code 83	T-112 fixed trimmer

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		CAPACITORS (CONT'D)	
C-120	For replacement use N16-C-32188-1014	Capacitor, Fixed, Mica Dielectric: case style no. 22, MBCA ref dwg group 1; 3,000 mmf ±2%; 500 vdcw temp coef ±100 mmf/mf/°C; molded low loss bakelite case; 53/64" lg x 53/64" wd x 11/32" thk; two axial wire leads; term mtd; JAN type CM35D-302G; CNA part/dwg H377-22; Mfr code 242	T-113 series padder
C-121		Same as C-119	T-113 fixed trimmer
C-122	N16-C-32715-6063	Capacitor, Fixed, Mica Dielectric: case style no. 22, MBCA ref dwg group 1; 5,100 mmf ±2%; 500 vdcw; temp coef -20 +100 mmf/mf/°C; molded low loss bakelite case; 53/64" lg x 53/64" wd x 11/32" thk; two axial wire leads; term mtd; JAN CM35E512G; CNA part/dwg H377-15; Mfr code 242	T-114 series padder
C-123		Same as C-119	T-114 fixed trimmer
C-124		Same as C-108	V-102 output coupling
C-125	For replacement use N16-C-27761-7201	Capacitor, Fixed, Mica Dielectric: case style no. 22, MBCA ref dwg group 1; 56 mmf ±10%; 500 vdcw; temp coef -20 +100 mmf/mf/°C; 1 1/16" lg x 15/32" wd x 7/32" thk; two axial wire leads; term mtd; JAN type CM25E560K; CNA part/dwg J175-30; Mfr code 242	V-102 grid input coupling
C-126		Same as C-111	
C-126A		Part of C-126	V-102 plate bypass
C-126B		Part of C-126	V-115 plate bypass
C-126C		Part of C-126	V-102 heater bypass
C-127		Same as C-103	T-107 parallel trimmer
C-128		Same as C-104	T-108 parallel trimmer
C-129		Same as C-104	T-109 parallel trimmer

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		CAPACITORS (CONT'D)	
C-130		Same as C-104	T-110 parallel trimmer
C-131		Not used	
C-132		Same as C-102	V-103 grid return bypass
C-133		Same as C-108	V-103 grid input coupling
C-134	N16-C-53192-8189	Capacitor, Fixed, Paper Dielectric: 2 sections; case style no. 42, MBCA ref dwg group 1; 0.1 mfd ±15%; 600 vdcw per section; hermetically sealed metal case; 1.812" wd x 1" d x 0.750" h excl mtg flanges; 2 solder lug term 0.750" lg located on one side spaced 1.062" c to c; internally grounded; two 0.187" dia mtg holes, one on each flange, spaced 2.125" c to c; JAN type CP53B6EF104L; CNA part/dwg F858-6; Mfr code 14	
C-134A		Part of C-134	V-103 screen bypass
C-134B		Part of C-134	V-101 plate return bypass
C-135		Same as C_T111	
C-135A		Part of C-135	V-101 plate return isolating bypass
C-135B		Part of C-135	V-103 plate return bypass
C-135C		Part of C-135	V-104 grid return bypass
C-136	For reference only	Capacitor, Fixed, Mica Dielectric: case style no. 22, MBCA ref dwg group 1; 470 mmf ±2%; 500 vdcw; temp coef -20 to +100 mmf/mf/°C; molded low loss bakelite case; 51/64" lg x 15/32" wd x 7/32" thk; two axial wire leads; term mtd; JAN type CM20F471G; CNA part/dwg D925-21; part of Z-101; Mfr code 242	L-102A fixed tuning
C-137		Same as C-136; part of Z-101	L-102B fixed tuning

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		CAPACITORS (CONT'D)	
C-138	For replacement use N16-C-46347-3081	Capacitor, Fixed, Paper Dielectric: single section; case style no. 42, MBCA ref dwg group 1; 0.25 mfd ±10%; 600 vdcw; hermetically sealed metal case; 1.812" wd x 1" d x 0.750" h excl mtg flange; one solder lug type term 0.750" lg located on one side; internally grounded; two 0.187" dia mtg holes, one on each flange, spaced 2.125" c to c; JAN type CP53B2EF254K; CNA part/dwg F858-18; Mfr code 14	A.V.C. bus bypass
C-139		Same as C-111	
C-139A		Part of C-139	V-104 cathode bypass
C-139B		Part of C-139	V-104 screen bypass
C-139C		Part of C-139	V-104 plate return bypass
C-140		Same as C-136 except part of Z-102	L-103A fixed tuning
C-141		Same as C-136 except part of Z-102	L-103B fixed tuning
C-142		Same as C-111	
C-142A		Part of C-142	V-105 cathode return bypass
C-142B		Part of C-142	V-108 cathode bypass
C-142C		Part of C-142	V-107 plate return bypass
C-143		Same as C-111	
C-143A		Part of C-143	V-105 cathode bypass
C-143B		Part of C-143	V-105 screen bypass
C-143C		Part of C-143	V-105 plate return bypass

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		CAPACITORS (CONT'D)	
C-144		Same as C-136 except part of Z-103	L-104A fixed tuning
C-145		Same as C-101 except part of Z-103	V-106A plate return bypass
C-146		Same as C-134	
C-146A		Part of C-146	V-106B cathode return bypass
C-146B		Part of C-146	V-114 grid bypass
C-147		Same as C-102	V-108 plate bypass
C-148		Same as C-108	V-108 grid coupling
C-149	N16-C-15624-4666	Capacitor, Fixed, Ceramic Dielectric: case style no. 18, MBCA ref dwg group 1; 5 mmf ±0.25 mmf; 500 vdcw; insulated; 0.562" lg x 0.250" dia; two axial wire leads; term mtd; JAN type CC21CH050C; CNA part/dwg H872-40; Mfr code 83; part of Z-104	C.W.O. output coupling
C-150	N16-C-99999-0998	Capacitor, Variable, Air Dielectric: plate meshing type; single section; 2 mmf to 5 mmf; straight line freq tuning characteristic; 31/32" lg x 15/16" wd x 1 3/16" h excl shaft and term; 0.249" dia round shaft 2.25 lg FMS; mts by two 4-40 tapped holes 5/32" d spaced 0.656" c to c; two solder post term on rear; CNA part/dwg SB:2503; Mfr code 1, type SB:2503; part of Z-104	B.F.O. Vernier Control
C-151	N16-C-29265-3006	Capacitor, Fixed, Mica Dielectric: case style no. 22, MBCA ref dwg group 1; 200 mmf ±5%; 500 vdcw; temp coef ±100 mmf/mf/°C; molded low loss bakelite case; 51/64" lg x 15/32" wd x 7/32" thk; two axial wire leads; term mtd; JAN type CM20D201J; CNA part/dwg D925-42; Mfr code 242; part of Z-104	B.F.O. parallel trimmer
C-152		Same as C-108 except part of Z-104	V-107A grid coupling
C-153		Same as C-134	
C-153A		Part of C-153	A.C. power line bypass

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		CAPACITORS (CONT'D)	
C-153B		Part of C-153	A.C. power line bypass
C-154	For replacement use N16-C-30663-3292	Capacitor, Fixed, Mica Dielectric: case style no. 22, MBCA ref dwg group 1; 750 mmf ±5%; 500 vdcw; temp coef ±100 mmf/mf/°C; molded low loss bakelite case; 53/64" lg x 53/64" wd x 11/32" thk; two axial wire leads; term mtd; JAN type CM35D751J; CNA part/dwg H377-23; Mfr code 242	Fidelity control capacitor
C-155		Same as C-102	V-109A grid coupling
C-156		Same as C-102	V-109A grid coupling
C-157	N16-C-19892-7806	Capacitor, Fixed, Electrolytic; case style no. 16, MBCA ref dwg group 1; single section; 35 mfd; 400 vdcw; hermetically sealed metal can; 2 1/4" lg x 1 3/8" dia; two solder lug term; negative term grounded internally; separate mtg clamp required; JAN type CE31C350Q; CNA part/dwg P884-2; Mfr code 13	V-109A plate return isolating
C-158	For replacement use N16-C-32831-3740	Capacitor, Fixed, Mica Dielectric: case style no. 22, MBCA ref dwg group 1; 5,600 mmf ±10%; 500 vdcw; no specified temp coef; molded low loss bakelite case; 53/64" lg x 53/64" wd x 11/32" thk; two axial wire leads; term mtd; JAN type CM35B562K; CNA part/dwg H377-17; Mfr code 242	V-109B grid coupling
C-159		Same as C-158	V-109B grid coupling
C-160	For replacement use N16-C-19786-3791	Capacitor, Fixed, Electrolytic: case style no. 42, MBCA ref dwg group 1; single section; 25 mfd; 25 vdcw; hermetically sealed metal can; 1 13/16" wd x 1" d x 15/16" h excl mtg tabs and term; 3/16" dia hole on each mtg tab spaced 2 1/8" c to c; JAN type CE63B250F; CNA part/dwg H652-4; Mfr code 13	V-109A cathode bypass
C-161		Not used	
C-162		Same as C-158	V-110 grid coupling
C-163		Same as C-158	V-110 grid coupling
C-164		Same as C-158	V-111 grid coupling

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		CAPACITORS (CONT'D)	
C-165		Same as C-158	V-111 grid coupling
C-166	For replacement use N16-C-21943-1560	Capacitor, Fixed, Electrolytic: case style no. 16, MBCA ref dwg group 1; 2 sections; 35 mfd, 400 vdcw per section; temp coef, ±200 mmf/mf/°C; hermetically sealed metal can, 3 3/4" lg x 1 3/8" dia; three solder lug term; negative term internally grounded; separate mtg clamp required; JAN type CE32C350Q; CNA part/dwg P885-2; Mfr code 13	
C-166A		Part of C-166	Power supply B+ filter
C-166B		Part of C-166	Power supply B+ filter
C-167		Same as C-157	B- to ground filter
C-168		Same as C-107 except part of Z-104	V-107B grid coupling
C-169		Same as C-102 except part of Z-104	V-107A plate bypass
C-170		Same as C-102 except part of Z-104	V-107B cathode bypass
C-171		Same as C-136 except part of Z-103	L-104B fixed tuning
C-172		Same as C-107	T-108 parallel trimmer
C-173		Not used	
C-174		Same as C-108	L-107 fixed tuning
C-175		Same as C-102	V-112 grid coupling

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MISCELLANEOUS ELECTRICAL PARTS	
E-101	If required will be procured by nearest Naval Shore Supply Activity on demand	Base, Shield: lower shield; nickel plated brass; round hollow cylindrical shape; 0.750" ID x 19/32" h excl spade bolts; mts by two 4-40 tapped spade bolts on 7/8" c; CNA part/dwg SA:3847; Mfr code 1, type SA:3847	V-101 lower shield
E-102		Same as E-101	V-102 lower shield
E-103	If required will be procured by nearest Naval Shore Supply Activity on demand	Base, Shield: lower shield; nickel plated brass; round, hollow, cylindrical shape; approx 0.940" OD x 19/32" h excl spade bolts; mts by two 4-40 tapped spade bolts on 1.125" c; CNA part/dwg SA:4989; Mfr code 1, type SA:4989	V-103 lower shield
E-104		Same as E-101	V-104 lower shield
E-105		Same as E-101	V-105 lower shield
E-106		Same as E-101	V-106 lower shield
E-107		Same as E-103 except part of Z-104	V-107 lower shield
E-108		Same as E-101	V-108 lower shield
E-109		Same as E-103	V-109 lower shield
E-110		Same as E-101	V-110 lower shield
E-111		Same as E-103	V-111 lower shield
E-112		Same as E-103	V-112 lower shield
E-113		Same as E-101	V-115 lower shield
E-114	For replacement use N16-S-34557-8351	Shield, Electron Tube: bright nickel plated brass; cad plated phos bronze spring; round w/2 locking detents, bayonet mtd; 0.810" dia x 1 21/32" h inside dimensions; 0.850" dia x 1.676" h outside body dimensions; 0.960" dia o/a; CNA part/dwg SA:3387; Mfr code 1, type SA:3387	V-101 upper shield

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MISCELLANEOUS ELECTRICAL PARTS (CONT'D)	
E-115		Same as E-114	V-102 upper shield
E-116		Shield, Electron Tube: bright nickel plated brass; cad plated phos bronze spring; round w/2 locking detents, bayonet mtd; 2 5/32" h x 0.950" dia inside dimensions; 2.176" h x 0.990" dia outside dimensions; 1.100" dia o/a; CNA part/dwg SA:4988; Mfr code 1, type SA:4988	V-103 upper shield
E-117		Same as E-114	V-104 upper shield
E-118		Same as E-114	V-105 upper shield
E-119	N16-S-34516-2337	Shield, Electron Tube: bright nickel plated brass; cad plated phos bronze spring; round w/2 locking detents; single 1/2" dia ventilating hole on top; bayonet mtd; 0.810" dia x 19/32" h inside dimensions; 0.850" dia x 1.301" h outside body dimensions; 0.960" dia o/a; CNA part/dwg SA:3848; Mfr code 1, type SA:3848	V-106 upper shield
E-120	For replacement use N16-S-34557-8351	Shield, Electron Tube: bright nickel plated brass, cad plated phos bronze spring; round w/2 locking detents; single 1/2" dia ventilating hole on top; bayonet mtd; 0.950" dia x 1 23/32" h inside dimensions; 0.990" dia x 1.738" h outside body dimensions; 1.10" dia o/a; CNA part/dwg SA:4987; Mfr code 1, type SA:4987; part of Z-104	V-107 upper shield
E-121		Same as E-114	V-108 upper shield
E-122	N16-S-34511-1034	Shield, Electron Tube: bright nickel plated brass; cad plated phos bronze spring; round w/2 locking detents; single 1/2" dia ventilating hole on top; bayonet mtd; 0.950" dia x 1 9/32" h inside dimensions; 0.990" dia x 1.301" h outside body dimensions; 1.100" dia o/a; CNA part/dwg SA:4986; Mfr code 1, type SA:4986	V-109 upper shield
E-123		Same as E-114	V-110 upper shield
E-124		Same as E-120	V-111 upper shield
E-125		Same as E-120	V-112 upper shield

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MISCELLANEOUS ELECTRICAL PARTS (CONT'D)	
E-126	N16-S-34599-7750	Shield, Electron Tube: bright nickel plated brass; cad plated phos bronze spring; round w/2 locking detents; single 1/2" dia ventilating hole on top; bayonet mtd; 0.810" dia x 2 5/32" h inside dimensions; 0.850" dia x 2.176" h outside body dimensions; 0.960" dia o/a; CNA part/dwg SA:3386; Mfr code 1, type SA:3386	V-115 upper shield
E-127	Shop manufacture	Shield: tuning capacitor shield; open bottom box shape; 52S 1/4 hd aluminum, caustic etch w/water dip lacquer finish; 4 3/32" lg x 3 1/32" wd x 4" h including mtg flanges; flange mtd by four 6-32 tapped captive nuts on 3.719" x 2.156" mtg/c cutout on one end 2 5/8" h x 3/4" wd w/rounded top; CNA part/dwg SA:7526; Mfr code 1, type SA:7526	Shield for RF section of main tuning capacitor
E-128	Shop manufacture	Shield: tuning capacitor shield; open bottom box shape; 52S 1/4 hd aluminum; caustic etch w/water dip lacquer finish; 6 1/8" lg x 3 1/32" wd x 4" h including mtg flanges; flange mtd by four 6-32 tapped captive nuts on 5.750" x 2.156" mtg/c; cutout on one end 2 5/8" h x 3/4" wd w/rounded top; CNA part/dwg SA:7527; Mfr code 1, type SA:7527	Shield for oscillator and mixer section of main tuning capacitor
E-129	Shop manufacture	Shield: rectangular shape; 52S 1/4 hd aluminum; caustic etch w/water dip lacquer finish; 3 15/32" lg x 2 3/4" wd x 7/16" d o/a; one 7/16" mtg flange at each end w/two 0.203" dia mtg holes spaced 1.750" c to c; 7/16" lg x 3/32" d cutout on two bottom corners; CNA part/dwg Q744-1; Mfr code 1, type Q744-1; part of Z-104	B.F.O. compartment side cover
E-130	Shop manufacture	Shield: open bottom, box shape; 52S 1/4 hd 0.064" thk aluminum; caustic etch w/water dip lacquer finish; 4.5655" lg x 2 13/16" wd x 4 1/16" h excl mtg flanges; 7/16" wd flanges at bottom of long sides; mts by two 0.187" dia holes on each flange spaced 2.937" c to c; CNA part/dwg P100-1; Mfr code 1, type P100-1	R.F. amplifier compartment shield
E-131	Shop manufacture	Shield: flat, rectangular shape; 52S 1/4 hd aluminum; caustic etch w/water dip lacquer finish; 9 5/16" lg x 7 15/16" wd x 0.093" thk o/a; mts by ten 0.187" dia holes irregularly spaced around edges plus three 0.187" dia holes spaced 2.750" c to c on lengthwise line 4.093" from one edge; seventeen 0.437" dia clearance holes irregularly spaced; CNA part/dwg P099-1; Mfr code 1, type P099-1	Mixer compartment shield
E-132	Shop manufacture	Shield, Cover: 52S 1/4 hd 0.091 aluminum, caustic etch w/water dip lacquer finish; 9 9/32" lg x 3 11/32" wd x 2 9/16" h; L shaped cross section; 1/2" wd flange bent in on 90° angle around side and two ends of 3 11/16" wd section w/3/8" wd x 15/16" lg slot located 2.578" from one end of flanged section; one flush mtd 6-32 larkin nut in each end flange and 3 built up	R.F. compartment shield (under chassis)

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MISCELLANEOUS ELECTRICAL PARTS (CONT'D)	
E-132 (cont'd)		larkin nuts tapped 6-32 on long flange spaced 3.500" c to c; 4 cross-pin twist locking mtg studs w/slotted heads, one slightly off center at each end of flat side spaced 8.625" c to c and two along edge spaced 1.810" c to c; three 0.500" dia holes located on center line 13/32" from bend spaced 3.5" c to c; six 0.312" dia holes, 3 located on center line 1.781" from bend spaced 1.500" c to c with first hole spaced 4.890" from left end of cover; other three 0.312" dia holes located on center line 1.062" from bend and spaced 1.500" c to c, with first hole spaced 5.359" from left end of cover; side w/o flange has 1.625" lg cutout on edge 11/32" d and located 3 15/16" from left end; CNA part/dwg SA:7534; Mfr code 1, type SA:7534	
E-133	N16-K-700310-912	Knob: round, black bakelite w/white arrow marking; 1 1/16" dia x 5/8" h o/a; for 1/4" dia shaft; cad plated brass insert, shaft hole 1/2" d; double 8-32 Bristo set screws 90° apart; 8 notches on circumference; CNA part/dwg SA:7530; Mfr code 1, type SA:7530	R.F. Gain control knob
E-134		Same as E-133	A.F. Level control knob
E-135		Same as E-133	Fidelity control knob
E-136		Same as E-133	Monitor Level control knob
E-137		Same as E-133	B.F.O. Vernier control knob
E-138		Same as E-133	Noise Limiter control knob
E-139		Same as E-133	Reception Switch knob
E-140		Same as E-133	Dimmer control knob
E-141	If required will be procured by nearest Naval Shore Supply Activity on demand	Knob: round, black bakelite; 1 1/4" lg x 2 1/8" dia o/a; for 1/4" dia shaft; cad plated brass insert; 5/8" d shaft hole; 8 notches on circumference; double 8-32 Bristo setscrews 90° apart; CNA part/dwg SA:8340; Mfr code 1, type SA:8340	Tuning control knob

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MISCELLANEOUS ELECTRICAL PARTS (CONT'D)	
E-142	If required will be procured by nearest Naval Shore Supply Activity on demand	Knob, bar type w/pointer; bakelite body w/metal pointer; 1.500" lg x 1" dia x 0.645" h including pointer; cad plated brass insert; shaft hole 0.468" d for 1/4" dia shaft; CNA part/dwg SA:8853; Mfr code 1, type SA:8853	Band change knob
E-143	Shop manufacture	Shield, IF Transformer: aluminum, caustic etch w/water dip lacquer finish; rectangular box shape w/open end; 2" sq x 4 9/32" h excl spade bolts; mts by two 1 1/32" lg 6-32 tapped spade bolts located on opposite sides at bottom of can; CNA part/dwg SB:2225; Mfr code 1, type SB:2225	Z-101 shield
E-144		Same as E-143	Z-102 shield
E-145		Same as E-143	Z-103 shield
		FUSES	
F-101	G17-F-16302-100	Fuse, Cartridge: 2 amp rating; 250 volts; one time; glass body, ferrule type, 1 1/4" lg x 1/4" dia; CNA part/dwg F135-4; Mfr code 324, type 3AG	A.C. power line fuse
F-102		Same as F-101	A.C. power line fuse
F-103		Same as F-101	Spare
F-104		Same as F-101	Spare
		TOOLS	
H-101	N41-W-2460-10	Wrench, Multispline Key: for no. 8 Bristo setscrew; 6 splines; steel; 0.094" across splines; approx 2.062" lg x 0.7125" wd; 90° offset; CNA part/dwg J301-4; Mfr code 406	Wrench for no. 8 Bristo set-screws
H-102	If required will be procured by nearest Naval Shore Supply	Wrench, Multispline Key: for no. 6 Bristo setscrew; 4 splines; steel; 0.076" across splines; approx 3.170" lg x 0.732" wd; 90° offset; CNA part/dwg J301-9; Mfr code 406	Wrench for no. 6 Bristo set-screws
H-103	If required will be procured by nearest Naval Shore Supply Activity on demand	Screwdriver, Offset, Phillips: for no. 0 to no. 9 screws; cad plated steel; 3 1/2" lg x 1 1/4" wd x 1/4" thk; 90° offset; CNA part/dwg T408-1; Mfr code 136	Screwdriver for no. 0 to no. 9 Phillipshead screw

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		INDICATING DEVICES	
I-101	G17-L-6297	Lamp, Incandescent: 6-8 v; T-3 1/4 bulb clear; 3/4" dia x 1 7/16" lg; miniature bayonet base; burn any position; CNA part/dwg F136-6; Mfr code 18	Dial lamp
I-102		Same as I-101	Dial lamp
		JACKS	
J-101	N17-C-99999-0997	Connector, Receptacle: coaxial; one round female contact; 1" lg x 1" wd x 1 1/8" h o/a; material and finish per JAN-C-71 spec; nominal impedance 50 ohms; mts by four 0.125" dia holes on flange spaced on 0.718" x 0.718" mtg/c; similar to JAN type UG-58A/U; CNA part/dwg T089-1; Mfr code 1396	Antenna input
J-102	N17-C-72604-1338	Connector, Receptacle: 3 round male contacts; polarized; straight; 29/32" lg x 1 3/16" wd x 1 3/16" h excl contacts; cylindrical; aluminum w/clear lacquer finish; molded phenolic insert; 23/32" dia cable opening; four 0.120" dia mtg holes on 29/32" mtg/c; 7/8-20 coupling thd; type AN 3102-14S-7P; CNA part/dwg P604-1; Mfr code 339	A.C. input
J-103	N17-J-39248-4418	Jack, Telephone: for two conductor plug w/shank 1.00" lg x 0.25" dia; 1.271" lg x 1.00" wd x 0.750" h; mts by 3/8-32 thd bushing 0.271" lg; one metal washer and hex nut; NT-49025A; CNA part/dwg H464-1; Mfr code 1150	Phones jack
J-104	For replacement use N17-C-72610-5434	Connector, Receptacle: 4 round male contacts; polarized; straight; 9/32" lg x 1 3/16" sq excl contacts; cylindrical shape w/square mtg flange; four 0.120" dia mtg holes on 29/32" mtg/c; 7/8-20 coupling thd; type AN 3102A-14S-2P; CNA part/dwg J139-1; Mfr code 128	Audio output
J-105	N17-J-39979-8741	Jack, Telephone: phone tip jack; single contact; 29/32" lg x 3/8" dia o/a; white nylon insulation; nickel plated brass body; one piece silver plated beryllium copper contact for 0.081" dia pins with integral solder term; DC breakdown 11,000 volts; mts in 17/64" dia hole; CNA part/dwg S174-2; Mfr code 130	A.G.C. bus voltage test point
J-106		Same as J-105	2nd detector D.C. output alignment point jack

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		JACKS (CONT'D)	
J-107		Same as J-105	Mixer input alignment point jack
		INDUCTORS	
L-101	For reference only	Coil, RF: 1 winding, pie wound; 195 turns 7/41 Litz on XXX natural bakelite form 1 1/2" lg x 0.437" dia; 570 microhenries measured at 790 kc; DC resistance 6.0 ohms ±10%; CNA part/dwg SA:9085; Mfr code 1, type SA:9085; part of Z-105	Antenna wave trap inductor
L-102	For reference only	Transformer, IF: 3 windings, pie wound; primary and secondary each 115 turns 7/41 Litz on XXX natural bakelite form 1 1/2" lg x 0.437" dia; tertiary winding under primary 6 turns 7/41 Litz separated by one layer of cambric cloth; primary inductance 194 microhenries, secondary 178 microhenries, both measured at 790 kc; DC resistance primary 3.34 ohms, secondary 3.17 ohms; CNA part/dwg SA:9079; Mfr code 1, type SA:9079; includes L-102A and L-102B; part of Z-101	1st IF inductor
L-102A		Part of L-102	Z-101 primary
L-102B		Part of L-102	Z-101 secondary
L-103	For reference only	Transformer, IF: 3 windings, pie wound; primary and secondary each 115 turns 7/41 Litz on XXX natural bakelite form 1 1/2" lg x 0.437" dia; tertiary winding under primary 3 1/4 turns 7/41 Litz tapped at 2 1/8 turns; separated by one layer of cambric cloth; primary inductance 188 microhenries, secondary 178 microhenries, both measured at 790 kc; DC resistance primary 3.40 ohms, secondary 3.21 ohms; CNA part/dwg SA:9080; Mfr code 1, type SA:9080; includes L-103A and L-103B; part of Z-102	2nd IF inductor
L-103A		Part of L-103	Z-102 primary
L-103B		Part of L-103	Z-102 secondary
L-104	For reference only	Transformer, IF: 2 windings, pie wound; primary and secondary each 115 turns 7/41 Litz on XXX natural bakelite form 1 1/2" lg x 0.437" dia; each winding 178 microhenries measured at 790 kc; DC resistance each winding 3.20 ohms; CNA part/dwg SA:9077, Mfr code 1, type SA:9077; includes L-104A and L-104B; part of Z-103	Detector inductor

TABLE 8-4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		INDUCTORS (CONT'D)	
L-104A		Part of L-104	Z-103 primary
L-104B		Part of L-104	Z-103 secondary
L-105	N17-T-99999-0382	Coil, RF: 1 winding, 2 pie wound; 200 turns 7/41 Litz, 100 turns per pie, on XXX natural bakelite form 1 3/4" lg x 11/16" dia; 512 microhenries measured at 790 kc without slug; 6.4 ohms DC resistance; tapped at 34 turns; adjustable powdered iron core; uncased; 3 solder lug term; mts by 3/8-32 thd bushing 3/8" lg; CNA part/dwg SA:9087; Mfr code 1, type SA:9087; part of Z-104	CWO inductor
L-106	N16-R-29237-6037	Reactor: filter choke; 10 hy at 125 ma DC; 310 ohms max DC resistance; hermetically sealed metal case 2 1/2" dia x 3 1/4" h w/2 9/16" sq mtg flange on bottom; mts by four 0.177" dia holes in flange located on 2 3/32" mtg/c; two solder lug term on bottom located within 2 1/8" dia circle; item per MIL-T-27 spec; stamped "P882-1" on side of case; CNA part/dwg P882-1; Mfr code 123	Power supply filter choke
L-107	N16-C-99999-1001	Coil, RF: 1 winding, 2 pie wound; 600 turns 7/41 Litz, 300 turns per pie; 245 microhenries measured at 790 kc; DC resistance 4.1 ohms; current rating 150 ma; powdered iron core with screwdriver adjustment; 270 mmf capacitor across winding (C-174); peak freq 455 kc; form 2 11/16" lg x 7/16" dia; XXP natural bakelite form; mts by 3/8-32 thd bushing 7/16" lg; CNA part/dwg SA:9210; Mfr code 1, type SA:9210	455 kc rejection in mixer circuit
		MECHANICAL PARTS	
O-101	Shop manufacture	Plate, Cover: 52S 1/4 hd aluminum; rectangular shape; 16 7/8" lg x 13 27/32" wd x 0.091" thk o/a; mts by ten 0.187" dia csk holes spaced irregularly around edges; four 0.125" dia csk holes spaced 1.062" c to c on horizontal line 4.125" from one edge; caustic etch w/water dip lacquer finish; CNA part/dwg P869-1; Mfr code 1, type P869-1	Chassis bottom cover plate
O-102	For reference only	Capacitor Drive Assembly: c/o O-102A, O-102B, O-102C, O-102D	

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
O-102A	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Gear, Spur: part of capacitor drive split gear; nickel plated brass; straight teeth; 69 teeth; 2.156" pitch dia; diametrical pitch 32; pressure angle 14 1/2°; 2.218" OD; 0.062" thk; 0.375" dia center hole; three 0.156" dia holes equally spaced 120° apart on 0.594" dia base circle around center hole; 0.156" dia stud for tension spring located on 0.837" rad projects 0.187" from one side; 0.187" dia clearance hole located on 0.837" rad 105° from stud; CNA part/dwg SA:7524; Mfr code 1, type SA:7524; part of O-102	Capacitor driven gear
O-102B	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Gear, Spur: part of capacitor drive split gear; nickel plated brass; straight teeth; 69 teeth; 2.156" pitch dia; diametrical pitch 32; pressure angle 14 1/2°; 2.218" OD; 0.062" thk; 0.812" dia center hole; two 0.187" dia clearance holes on 0.837" rad spaced 105° apart; 0.187" dia stud for tension spring located on 0.837" rad, 30° from one clearance hole, projects 0.141" from one side; CNA part/dwg SA:7523; Mfr code 1, type SA:7523; part of O-102	Capacitor driven spring gear
O-102C	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Hub: for split gear mtg; brass, nickel plated; 15/32" lg x 0.937" dia o/a; 0.313" dia center hole; opposite end from set screws is 0.375" dia x 0.054" d; next dia 0.811" x 0.069" d; next dia 0.937" x 0.048" wd; next dia 0.781" x 0.068" wd; set screw section 0.843" dia x 0.229" wd; mts on shaft by two 6-32 tapped radial holes spaced 90° apart; three 5/16" d axial holes tapped 6-32 spaced 120° apart located on 0.297" rad for mtg gear; CNA part/dwg P048-1; Mfr code 1, type P048-1; part of O-102	Hub for capacitor drive split gear
O-102D	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Spring: split gear loading; 0.063" dia stainless spring steel type 18-8; approx 1.375" lg x 0.875" wd; terminals bent on 0.070" inside rad; CNA part/dwg P050-1; Mfr code 1417; part of O-102	Spring for split gear loading
O-103	For reference only	Pinch Drive Disk and Gear Assembly: consists of O-103A, O-103B, O-103C, for reference only	
O-103A	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Disk, Pinch Driven: 1/4-1/2 hd brass w/black enamel finish on all surfaces; 5.931" dia x 0.032" thk; 0.406" dia center hole; three 0.156" dia holes on 0.3435" rad equally spaced around center hole 120° apart; 0.132" dia stop projects 1/8" from face on 2.484" rad; CNA part/dwg P051-1 (disk) and P053-1 (stop); Mfr code 1, type P051-1, P053-1; part of O-103	Dial and tuning capacitor pinch driven disk
O-103B	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Spacer: nickel plated brass; 1.00" OD x 0.408" ID x 0.125" thk; three 0.156" dia holes equally spaced around center hole on 0.3435" rad, 120° apart; CNA part/dwg Q618-1; Mfr code 1, type Q618-1; part of O-103	Pinch drive assembly spacer

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
0-103C	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Gear, Spur: nickel plated brass; 35 teeth; straight teeth; 1.094" pitch dia, diametrical pitch 32; pressure angle 14 1/2°; 1.156" OD; A.G.M.A. std involute tooth form; face of teeth 3/16" wd w/3/8" lg x 7/8" dia hub; two 6-32 tapped radial holes in hub spaced 90° apart; three 6-32 tapped axial holes 1/4" d on side opposite hub located on 0.3435" rad spaced 120° apart; 0.408" dia bore; CNA part/dwg Q619-2; Mfr code 662; modified by CNA to include set screw holes, three axial holes and rebored from 3/8" to 0.408" dia; part of 0-103	Capacitor drive gear
0-104	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Pinch Drive Assembly: consists of front and rear plates separated by spacers w/pinch drive wheel mtd on shaft; CNA part/dwg SA:6482; Mfr code 1, type SA:6482; for reference only; includes 0-104A, 0-104B, 0-104C, 0-104D, 0-104E	Pinch drive assembly
0-104A	For reference only	Plate, Front: 52S 1/4 hd, 0.091" thk aluminum; 2 1/4" lg x 3/4" wd x 3/16" thk including bearing; 0.187" lg x 0.381" OD x 0.250" ID oilite bronze bearing w/0.500" dia x 0.0025" thk flange staked to plate in exact center; one 0.156" dia hole centrally located at each end spaced 1.750" c to c; CNA part/dwg SA: 7517; Mfr code 1, type SA:7517; part of 0-104	Pinch drive front plate
0-104B	For reference only	Plate, Rear: 52S 1/4 hd 0.091" thk aluminum; caustic etch w/ water dip lacquer finish; 2 3/4" lg x 1 5/8" wd x 3/16" thk including bearing; two corners on one side cutoff on 45° angle 3/8" d; three 0.250" dia holes, two located 1/4" from longest edge spaced 2.250" c to c, one centrally located 0.3130" from opposite edge; two 0.156" dia holes on center line located 5/8" from long edge spaced 1.750" c to c; 0.187" lg x 0.381" OD x 0.250" ID oilite bearing w/0.500" dia x 0.0025" thk flange, staked to plate centrally on centerline between the two 0.156" dia holes; CNA part/dwg SA:7528; Mfr code 1, type SA:7528; part of 0-104	Pinch drive rear plate
0-104C	For reference only	Washer, Flat: 0.0179" soft CR steel, nickel plated; 0.437" OD x 0.265" ID; CNA part/dwg P008-1; Mfr code 1, type P008-1; part of 0-104	Pinch drive spacer
0-104D	For reference only	Spacer: nickel plated brass; 3/4" lg x 1/4" across flats; thru axial center hole tapped 6-32; CNA part/dwg H348-12; Mfr code 345	Pinch drive assembly spacers (2 used)

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
O-104E	For reference only	Shaft and Pinch Wheel Assembly: consists of stainless steel shaft, 1 7/8" lg x 0.250" dia w/0.036" wd x 0.032" d groove located 7/32" from one end followed by 0.125" lg section w/ straight knurl, 50 pitch to 0.255" min dia w/second groove w/ same dim as the first located 0.328" from end of knurl; two 1/2" lg flats at other end 90° apart; pinch wheel consists of two parts exactly alike except for size of shaft hole; wheels approx 1 5/32" dia x 0.094" thk o/a w/30° bevel to 0.812" dia; one half of wheel has 0.250" dia center hole and is pressed on knurled section of shaft in a manner so that the mtg of the other half will form a radial V shaped groove; other half of wheel has 0.255" dia center hole; pressure against wheel provide by helical compression spring held in place by a washer and two lock rings; CNA part/dwg SA:8904; Mfr code 1, type SA:8904; includes O-104EA, O-104EB, O-104EC, O-104ED, O-104EE, O-104EF	
O-104EA	For reference only	Washer, Offset: nickel plated spring phos bronze; 1 5/16" dia x 0.008" thk; outer circumference bent on 30° angle 9/32" from edge; center hole 0.262" dia; CNA part/dwg P007-1; Mfr code 1, type P007-1; part of P-104E	2 used as pressure washers against each half of pinch drive wheel
O-104EB	For reference only	Wheel, Pinch Drive: nickel plated brass; approx 1" dia x 0.094" thk o/a w/30° bevel to 0.812" dia; 0.250" dia center hole; CNA part/dwg P006-1; Mfr code 1, type P006-1; part of O-104E	Pinch drive wheel
O-104EC	For reference only	Wheel, Pinch Drive: nickel plated brass; approx 1" dia x 0.094" thk o/a w/30° bevel to 0.812" dia; 0.255" dia center hole; CNA part/dwg P006-2; Mfr code 1, type P006-2; part of O-104E	Pinch drive wheel
O-104ED	For reference only	Spring, Compression: 0.055" dia music wire; nickel plated; free length 15/32"; inside dia 17/64"; mean dia 0.321" ±0.010"; 3 1/2" coils; loaded length 1/4"; 3/4 dead loop on ends; CNA part/dwg P010-1; Mfr code 1417	Pinch drive wheel compression spring
O-104EE	For reference only	Ring, Retainer: cad plated steel; from 1/4" dia shaft w/0.034" wd x 0.031" d groove; 0.260" ID open, 0.187" ID closed, 0.031" d groove; 0.260" ID open, 0.187" ID closed, 0.031" thk; CNA part/dwg P491-3; Mfr code 97; part of O-104E	Pinch drive shaft assembly retaining rings (2 used)

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
O-104EF	For reference only	Shaft: stainless steel; 1 7/8" lg x 0.250" dia w/0.036" wd x 0.032" d groove located 7/32" from one end followed by 0.100" lg section w/straight knurl, 50 pitch to 0.258" min dia w/second groove w/same dim as first, located 0.328" from end of knurl; two 1/2" lg flat at other end 90° apart; CNA part/dwg P004-1; Mfr code 1, type P004-1; part of O-104E	Pinch drive assembly shaft
O-105	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Gear, Spur: nickel plated brass; 108 teeth; straight teeth; 3.375" pitch dia; diametrical pitch 32; pressure angle 14 1/2°; A.G.M.A. std involute tooth form; 3.437" OD x 0.091" thk excl hub; 0.354" thd including hub; brass hub 5/8" OD w/0.252" dia bore; CNA part/dwg SA:7529; Mfr code 1, type SA:7529	Dial mask driver gear
O-106	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Gear, Spur: nickel plated brass; 64 teeth, straight teeth; 2.000" pitch dia; diametrical pitch 32; pressure angle 14 1/2° A.G.M.A. std involute tooth form; 2.062" OD x 0.125" thk o/a; 1/2" dia at center offset 1/16"; 0.251" dia center hole; CNA part/dwg Q753-1; Mfr code 662	Dial mask idler gear
O-107	Shop manufacture	Bearing: stainless steel; 0.125" lg x 0.250" dia w/0.375" dia x 0.068" thk shoulder w/screwdriver slot 1/16" wd x 0.047" d; 6-32 tapped axial center hole; CNA part/dwg Q749-1; Mfr code 1, type Q749-1	Idler gear bearing
O-108	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Dial Mask and Gear Assembly: consists of 52S 1/4 hd aluminum disk w/zinc chromate primer and black enamel finish on all surfaces and nickel plated brass gear riveted to disk; disk 5.500" dia x 1/32" thk; 0.625" dia center hole; contains four 1/2" wd cutouts concentric with the center spaced 10° apart and extending over an 80° arc; outside cutout at 2.312" rad, next at 1.937" rad, next at 1.562" rad and inside cutout at 1.187" rad; three 0.090" dia rivet holes equally spaced around center hole on 0.422" rad, 120° apart; gear has 36 teeth; 1.125" pitch dia; diametrical pitch 32; pressure angle 14 1/2°; A.G.M.A. std involute tooth form; 1.187" OD x 1/8" thk; 0.439" dia center hole; three 0.090" dia rivet holes equally spaced around center hole on 0.422" rad, 120° apart; CNA part/dwg SA:9073; Mfr code 1, type SA:9073	Dial mask and driven gear assembly
O-109	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Dial Scale, Frequency: assembly consists of circular calibrated plexiglass dial 5 31/32" dia x 1/8" thk w/center hole 7/8" dia counterbored 1.751" dia x 0.064" d; nickel plated brass dial mtg disc 1.750" OD x 0.656" ID x 0.064" thk w/three 0.136" dia holes on 0.625" rad spaced 120° apart; nickel plated brass reinforcing disc 1 3/4" OD x 3/4" ID x 0.32" thk w/three 0.128" dia holes on 0.625" rad spaced 120° apart; nickel plated brass hub 0.343" lg x 3/4" dia w/0.408" bore and counterbored at one end 0.562" dia x 0.078" d, counterbored end shouldered to 0.657"	Calibrated tuning dial

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
O-109 (cont'd)		dia x 0.104" d, two 6-32 tapped radial holes spaced 90° apart; hub staked to dial mtg disc; dial and dial reinforcing disc riveted to dial mtg disc; dial has four calibrated circular scales w/frequenices increasing in a clockwise direction; scale for broadcast band located on 1.562" rad inscribed from .55 mc to 1.6 mc, graduated in increments of 10 kc from .54 mc to .7 mc and in increments of 20 kc from .7 mc to 1.6 mc; short wave band no. 1 located on 1.937" rad inscribed from 1.4 mc to 3.6 mc, graduated in increments of 50 kc; short wave band no. 2 located on 2.312" rad inscribed from 3.25 mc to 9.0 mc, graduated in increments of 50 kc from 3.25 mc to 3.5 mc and in increments of 100 kc from 3.5 mc to 9.1 mc; short wave band no. 3 located on 2.687" rad inscribed from 8.5 mc to 19 mc, graduated in increments of 100 kc to 19.1 mc; dial made of heat resistant acrylic sheet, grade 2 plexiglass or equivalent; edges polished and free from cracks or other defects to assure good edge lighting; Gothic type figures 9/32" high; CNA part/dwg SA:7525; Mfr code 1, type SA:7525	
O-110	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Plate, Detent: no. 303 stainless steel; 2.500" dia x 0.0598" thk o/a; 4 detent positions spaced 30° apart w/90° total travel; 0.640" dia center hole and two 0.1495" dia holes on 0.469" rad spaced 180° apart; CNA part/dwg L801-3; Mfr code 1316; modified by CNA	Band switch detent plate (mtd on O-111)
O-111	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Shaft and Hub Assembly: consists of nickel plated brass shaft and hub; shaft 3 11/16" lg x 0.249" dia o/a w/two 3/8" lg flats at each end; two grooves 0.036" wd x 0.032" d spaced 1.253" apart, center groove located 1.719" from one end; section 1 3/16" from one end has straight knurl 50 pitch to 0.255" dia 3/8" lg; flatted section 0.031" d x 1/2" lg located 0.625" from knurl at opposite end from grooves; hub 1 1/4" dia x 0.308" lg o/a pressed onto knurled section of shaft; section of hub turned to 0.636" dia x 0.058" lg; two 6-32 tapped axial holes located on 0.469" rad spaced 180° apart; CNA part/dwg SA:9112; Mfr code 1, type SA:9112	Band switch detent shaft and hub
O-112	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Roller Arm, Detent: stainless steel; consists of 2 arms riveted together at one end and spot welded at other end; each arm 5 5/32" lg x 5/8" wd x 0.031" thk w/1.00" lg offset at one end and 0.406" lg offset at other end; arms separated by 1/4" dia x 0.199" lg nickel plated brass spacer located 3.468" from welded ends; free turning stainless steel roller 0.172" lg x 0.375" dia w/two 3/32" lg x 0.093" dia axial projections from each end mtd between arms 3" from welded end; other end of each arm has 0.380" dia hole for pivot mtg; single 0.098" dia hole at welded end for tension spring; CNA part/dwg SA:9072; Mfr code 1, type SA:9072	Detent roller arm

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
O-113	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Spring, Helical: no. 18-8 stainless steel spring wire; max free length 1.531"; load at length 2.187" equal to 1.7 lbs; operates between 2.187" and 2.562" lengths; twisted loop on each end; loop opening to pass 0.062" wire; operating temp -40°C to +60°C; approx 0.500" OD; CNA part/dwg L807-1; Mfr code 24	Supplies tension for detent roller arm
O-114	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Shaft, Rotary Switch: cad plated brass; 9 1/2" lg x 0.248" dia, two full length flats 180° apart, 0.185" across flats; CNA part/dwg M979-6; Mfr code 1, type M979-6	Reception switch shaft
O-115	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Coupling, Flexible: consists of 2 hubs and spiders riveted to spring tempered brass disk; approx 0.540" lg x 1 1/6" dia o/a; hubs bored 0.252" dia each w/two 6-32 tapped radial holes spaced 90° apart; assembly nickel plated; CNA part/dwg SA:6176; Mfr code 1, type SA:6176	Reception switch extension shaft coupling
O-116	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Shaft, Rotary Switch: cad plated brass; 7 7/8" lg x 0.248" dia; two full length flats 180° apart, 0.185" across flats; CNA part/dwg M979-12; Mfr code 1, type M979-12	Band change switch shaft
O-117	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Shaft, Extension: linen base bakelite, wax impregnated; 3 1/8" lg x 0.248" dia w/two full length flats, 0.185" across flats; CNA part/dwg P031-4; Mfr code 88	Band change switch extension shaft
O-118		Same as O-115	Band change extension shaft coupling
O-119	Shop manufacture	Coupling, Shaft: cad plated yellow leaded brass; 3/4" lg x 7/16" OD x 0.251" ID; two no. 8-32 tapped holes at each end spaced 90° apart and 5/32" c to c axially; CNA part/dwg J654-2; Mfr code 1, type J654-2	Band change extension shaft coupling
O-120	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Coupling, Shaft: consists of 2 hubs and disks bolted to ceramic insulator thru spacers; 1 1/4" lg x 1 3/8" dia o/a; hubs bored 0.252" each w/two 6-32 tapped radial holes spaced 90° apart; assembly nickel plated; CNA part/dwg SA:8123; Mfr code 1, type SA:8123	Tuning capacitor shaft coupling
O-121		Same as C-120	Tuning capacitor shaft coupling

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
O-122	If required will be procured by nearest Naval Shore Supply Activity on demand	Retainer, Electron Tube: stainless steel; approx 2 9/16" lg x 1 7/16" wd x 17/32" h when open; mtg bracket w/single hole for 6-32 screw located 60° from tension loop, 115° from hinge on 27/32" rad; for holding material 1 1/4" max dia; w/holding spurs; CNA part/dwg H892-7; Mfr code 296	V-113 clamp
O-123	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Retainer, Electron Tube: consists of two stainless steel pieces 2 13/16" lg x 3/8" wd x 0.0598" thk; each piece curved on 19/32" rad at a point 1 13/16" from one end scribed from a point 1/8" below edge opposite curve; two elongated holes 0.2185" lg x 0.156" wd located on longest end spaced 0.156" and 1.531" from center of curve respectively; one 0.156" dia hole at other end 13/16" from center of curve; curved sections fit around tube base w/tension supplied by bolt and nut; assembly mtd on bracket by the two elongated holes; CNA part/dwg P013-1; Mfr code 1, type P013-1	V-115 mtg clamp
O-124	Shop manufacture	Bezel, Speaker: 52S 1/4 hd, 0.091" thk aluminum w/gray paint finish; circular shape; 5.031" OD x 4.344" ID; eight 0.156" dia mtg holes spaced 45° apart; CNA part/dwg P095-1; Mfr code 1, type P095-1	Loudspeaker bezel
O-125	Shop manufacture	Gasket, Bezel: 0.016" neoprene, 50-60 durometer reading; black; circular shape; 5.031" OD x 4.344" ID; eight 0.187" dia mtg holes spaced 45° apart; CNA part/dwg P096-1; Mfr code 1400	Loudspeaker bezel gasket
O-126	Shop manufacture	Grille, Loudspeaker: 1/4" hd, 0.020" thk aluminum w/gray paint finish; circular shape; 5.031" OD; punched 0.046" dia holes 0.0666" on centers; 255 holes per square inch; 37.4% open; eight 0.156" dia mtg holes spaced 45° apart on 2.3435" rad; material cut so that lines of punched holes are parallel to a center line between two 0.156" dia holes; CNA part/dwg P098-1; Mfr code 1, type P098-1	Loudspeaker grille
O-127	Shop manufacture	Gasket, Loudspeaker: medium hard sponge rubber; 1/4" thk; circular shape; 5 1/16" OD x 4 1/8" ID; four 0.156" dia holes and four 0.250" dia holes spaced alternately 45° apart on 2.34275" rad; CNA part/dwg Q603-1; Mfr code 1400	Loudspeaker mtg gasket
O-128	Shop manufacture	Gasket, Loudspeaker: medium hard sponge rubber; 1/8" thk; circular shape; 5.031" OD x 4.344" ID; four 0.187" dia holes spaced 90° apart on 2.34275" rad; CNA part/dwg Q603-2; Mfr code 1400	Loudspeaker mtg gasket
O-129	Shop manufacture	Ring, Mounting: 52S 1/4 hard, 0.064" thk aluminum, caustic etch w/water dip lacquer finish; circular shape; 5.031" OD x 4.344" ID; four 0.156" dia holes spaced 90° apart on 2.34275" rad; CNA part/dwg P095-2; Mfr code 1, type P095-2	Loudspeaker mtg ring

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
O-130	For reference only	Frame, Window, Tuning Dial: cast aluminum w/gray paint finish; rectangular shape; 4.250" lg x 2.875" wd x 0.313" thk o/a; window opening w/top on 2.750" rad and bottom on 1.125" rad covering arc or 75° w/rad scribed from a point 0.250" from bottom and on vertical centerline of frame; top corners of opening rounded on 0.375" rad, bottom corners rounded on 0.187" rad; mts by four 6-32 tapped holes 0.188" d located on rear of frame spaced on 3.750" x 2.375" mtg/c; four corners of frame rounded on 0.375" rad; CNA part/dwg P097-1; Mfr code 1, type P097-1	Tuning dial bezel
O-131	Shop manufacture	Gasket, Dial Window Frame: 0.016 black neoprene, 50-60 durometer reading; rectangular shape, 4 1/4" lg x 2 7/8" wd w/ corners rounded on 3/8" rad; centrally located cutout 3 3/16" lg x 2.00" wd w/sq corners; mts by four 5/32" dia holes located on 3.750" x 2.375" centers; CNA part/dwg Q893-1; Mfr code 1400	Tuning dial window frame gasket
O-132	Shop manufacture	Window, Dial: heat resistant acrylic sheet grade 2 plexiglass or equivalent; rectangular shape; 3 13/32" lg x 2 7/32" wd x 0.125" thk; corners rounded on 1/8" rad; CNA part/dwg P867-1; Mfr code 88	Tuning dial window
O-133	Shop manufacture	Gasket, Dial Window: 0.016" black neoprene, 50-60 durometer reading; rectangular shape; 3 7/16" lg x 2 1/4" wd w/centrally located cutout 3.187" lg x 2.000" wd; all corners square; CNA part/dwg Q894-1; Mfr code 1400	Dial window gasket
O-134	Shop manufacture	Frame, Window, Tuning Indicator: cast aluminum w/gray paint finish; circular shape; 2 1/8" OD x 1.187" ID x 1/4" thk o/a; counter bored on back 0.135" d x 1.437" dia; mts by two 0.156" dia holes spaced 180° apart on 0.859" rad; CNA part/dwg P855-1; Mfr code 124	Tuning indicator bezel
O-135	Shop manufacture	Gasket, Tuning Indicator Window Frame: 0.016" black neoprene, 50-60 durometer reading; circular shape; 2.125" OD x 1.250" ID; mts by two 0.156" dia holes spaced 180° apart on 0.859" rad; CNA part/dwg Q896-1; Mfr code 1400	Tuning indicator window frame gasket
O-136	Shop manufacture	Window, Tuning Indicator: heat resistant acrylic sheet grade 2 plexiglass or equivalent; round disk shape; 1.422" dia x 0.125" thk; edges finished; CNA part/dwg P856-1; Mfr code 8	Tuning indicator window
O-137	Shop manufacture	Gasket, Tuning Indicator Window: 0.016" black neoprene, 50-60 durometer reading; circular shape; 1.437" OD x 1.187" ID; CNA part/dwg Q895-1; Mfr code 1400	Tuning indicator window gasket

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
O-138	Shop manufacture	Gasket, Front Panel: 0.031 black neoprene, 50-60 durometer reading; 19 3/32" lg x 3/4" wd o/a; semi-circular cutout 3 3/8" from one end on 2 5/8" rad scribed from a point 2 5/32" from top edge; mts by four 0.375" dia holes, first hole located 1 11/32" from end w/cutout and first 3 holes spaced 5" c to c; fourth hole located 2 11/16" from opposite end, all holes on same center line; CNA part/dwg P865-1; Mfr code 1400	Front panel gasket (top)
O-139	Shop manufacture	Gasket, Front Panel: 0.031 black neoprene 50-60 durometer reading; 19 3/32" lg x 3/4" wd o/a; mts by four 0.375" dia holes first hole located 1 11/32" from one end, first three holes spaced 5" c to c; fourth hole located 2 11/16" from opposite end; all holes on same center line; CNA part/dwg P865-2; Mfr code 1400	Front panel gasket (bottom)
O-140	Shop manufacture	Screw Externally Relieved Body: slot drive; medium diamond knurl thumb head; yellow brass, dull nickel plated; 1/4-20 threaded portion 5/16" lg; 5/8" lg x 0.185" dia shank; 1/4" thk x 9/16" dia head w/1/16" wd x 5/64" d slot; 1 3/16" lg o/a; CNA part/dwg P020-3; Mfr code 570	Front panel mtg captive screws (12 used)
O-141	Shop manufacture	Bail, Panel: zinc alloy w/black paint finish; 4 1/4" lg x 1 1/8" wd x 9/16" thk o/a; mts by two 10-32 tapped holes 3/8" d spaced 3.750" c to c; CNA part/dwg F514-2; Mfr code 237	Front panel handles
O-142	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Cover, Jack: steel w/dull black paint finish; keyhole shape; 1 1/32" lg x 13/16" wd x 9/16" thk o/a; mts on jack bushing by 0.386" dia hole; cover held in closed position by steel tension spring; CNA part/dwg Q628-1; Mfr code 416	Phones jack cover
O-143	If required will be procured by nearest Naval Shore Supply Activity on demand	Grommet:pure gum rubber; round; 19/32" OD x 5/16" ID x 3/8" thk; circumferencial groove 1/8" wd x 5/32" d; CNA part/dwg E923-16; Mfr code 16	Used as shock mounts on tuning capacitor mtg channel (5)
O-144	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Assembly, Dial Lock: consists of front and rear mtg plates, shaft, thrust bearing; washers, spacers and two dial locking plates; CNA part/dwg SA:8905; Mfr code 1, type SA:8905; includes O-144A, O-144B, O-144C, O-144D, O-144E, O-144F, O-144G	Dial lock assembly
O-144A	For reference only	Mounting, Dial Lock: stainless steel; rectangular shape; 3 17/32" lg x 1 1/4" wd x 0.125" thk; corners at one end rounded on 3/16" rad; two 0.187" dia holes at rounded corner end located 0.1836" from edge spaced 1/2" c to c; one 0.187" dia hole and one 0.156" dia hole located on lengthwise center line spaced 1.374" c to c w/0.156" dia hole nearest end w/	Dial lock mtg plate

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
O-144A (cont'd)		rounded corners; two 0.187" dia holes spaced 0.764" c to c located 17/64" from opposite end; CNA part/dwg P011-1; Mfr code 1, type P011-1; part of O-144	
O-144B	For reference only	Spacer: nickel plated brass; hexagon shape; 0.585" lg x 5/16" across flats w/axial center hole tapped 8-32; CNA part/dwg Q704-6; Mfr code 1, type Q704-6; part of O-144	Dial lock assembly spacers (2 used)
O-144C	For reference only	Plate, Pinch Dial Lock: 1/2 hd CR steel; 1 3/4" lg x 7/8" wd x 0.0598" thk; projection centrally located at one end projects 1/8" w/end of projection rounded on 0.046" rad; one 0.218" dia hole centrally located 19/32" from end w/projection; two 0.187" dia holes spaced 1/2" c to c located on centers 0.34335" from opposite end; CNA part/dwg Q705-1; Mfr code 1, type Q705-1; part of O-144	With O-144D functions as dial pinch lock
O-144D	For reference only	Plate, Pinch, Dial Lock: 52S 1/4 hd aluminum; caustic etch w/ water dip lacquer finish; 1 3/4" lg x 7/8" wd x 0.091" thk; one 0.265" dia hole centrally located 19/32" from one end; two 0.187" dia holes spaced 1/2" c to c located on centers 0.34335" from opposite end; CNA part/dwg P002-1; Mfr code 1, type P002-1; part of O-144	With O-144C functions as dial pinch lock
O-144E	For reference only	Washer: cad plated brass; round, flat; 0.375" OD x 0.187" ID x 0.062" thk; CNA part/dwg Q974-2; Mfr code 1, type Q974-2; part of O-144	Dial lock spacers (2 used)
O-144F	For reference only	Shaft, Dial Lock: cad plated brass; 1 7/8" lg x 0.437" dia o/a; one end 0.249" dia for length of 21/32" terminating w/0.437" dia shoulder 0.110" wd followed by a 0.215" dia x 0.108" wd shoulder followed by a 10-24 threaded section 5/8" lg ending with a 0.154" dia section 3/8" lg; CNA part/dwg P009-1; Mfr code 1, type P009-1; part of O-144	Dial lock shaft
O-144G	For reference only	Bearing, Thrust: brass retainer w/9 case hardened steel balls; 7/16" OD x 0.234" ID x 7/16" thk o/a; CNA part/dwg P174-2; Mfr code 39, type A01 modified by CNA by enlarging center hole; part of O-144	Dial lock shaft thrust bearing
O-145	N16-L-157001-121	Latch, Lever: type 302, 0.078" thk stainless steel; 4 5/8" lg x 9/32" wd x 1" h; knurled tab at one end; pointed latch hook at other; 0.312" dia pivot hole spaced 2.125" from hook end w/2 dimples approx 1/4" dia on center line w/pivot hole and spaced 1 1/4" apart; two projections spaced 0.343" apart 0.125" lg x 0.2035" wd on same side as hook w/first located 0.6575" from hooked end; CNA part/dwg Q474-1; Mfr code 512	Chassis latch arm (right side)

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
O-146	N16-L-157001-120	Same as O-145 except formed for left side; CNA part/dwg Q474-2; Mfr code 512	Chassis latch arm (left side)
O-147	N17-S-46844-5806	Spring, Torsion: 0.048" dia music wire, nickel plated; 15/16" lg x 15/16" wd x 0.096" thk approx; 1 1/4 turns; plain straight ends; 1/2" mtg hole; right hand turns; CNA part/dwg Q477-4; Mfr code 24	Latch lever spring (right hand)
O-148	N17-S-46844-5801	Spring, Torsion: 0.048" dia music wire, nickel plated; 15/16" lg x 15/16" wd x 0.096" thk approx; 1 1/4" turns, plain straight ends; 1/2" mtg hole; left hand turns; CNA part/dwg Q477-3; Mfr code 24	Latch lever spring (left hand)
O-149	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Stud, Pivot: type 304 stainless steel; 1/2" lg x 9/16" dia o/a; head 9/16" dia x 0.09375" thk w/screwdriver slot 0.055" wd x 0.040" d followed by 0.375" dia shoulder 0.119" thk followed by 0.311" dia shoulder 0.084" thk followed by 0.290" dia shoulder 0.028" thk followed by 0.311" dia shoulder 0.019" thk terminating 5/32" lg section w/10-32 thd; CNA part/dwg S514-1; Mfr code 1, type S514-1	Pivot stud for chassis latch arms (2 used)
O-150	N42-R-56578-2203	Ring, Retainer: external basic type; beryllium copper, bright cad plated; circular; 0.312" OD x 0.025" wd x 0.281" ID; CNA part/dwg H602-10; Mfr code 268	Chassis latch arm retainer (2 used)
O-151	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Screw, Shoulder, Cheese Head: type 304 stainless steel; 1/2" lg x 3/8" dia o/a; head 3/8" dia x 0.09375" thk w/screwdriver slot 0.055" wd x 0.040" d followed by 0.250" lg x 0.250" dia shoulder terminating 6-32 threaded section 5/8" lg; CNA part/dwg S513-1; Mfr code 1, type S513-1	Chassis latch arm stop (2 used)
O-152	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Mount, Vibration: metal and rubber parts; metal parts plated to withstand 20%, 200 hour salt spray test in accordance with AN-QQ-S-91 spec; 1 1/2" h x 3" dia w/3" sq mtg flange; four mtg holes 0.266" dia on 2 1/2" x 2 1/2" c; holds item by bolt, 3/8"-16 x 2 1/2" lg, 1 nut and 2 lockwashers; load range 60-80 lbs (military application); deflection range 0.013" to 0.032"; stamped "C2080-6" on top; CNA part/dwg P888-1; Mfr code 398; type C2080-6	Cabinet shock mounts (4 used)
O-153	Shop manufacture	Strap, Ground: 0.010" spring brass, silver plated; 2 11/32" lg x 5/8" wd x 23/64" h o/a; 0.390" dia hole located 21/64" from squared end; other end rounded on 1/4" rad w/0.255" hole located 1/4" from end; S shaped bend 1/2" lg x 23/64" h located 25/32" from squared end, CNA part/dwg R803-2; Mfr code 1, type R803-2	Shock mount grounding strap

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
O-154	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Screw, Cone Point: type 303 stainless steel; 1 3/16" lg x 0.310" dia; no head; 3/8-32 x 21/32" lg thread at one end w/end rounded and 0.064" wd x 3/32" d screwdriver slot; cone point 3/16" lg x 60° at other end; CNA part/dwg H782-1; Mfr code 1398	Chassis guide pins in cabinet (2 used)
O-155	Shop manufacture	Spacer: semi-gloss bakelite, wax impregnated; 11" lg x 7/16" wd x 5/32" thk; four 0.156" dia mtg holes on centers 0.250" from one edge spaced 3.500" apart; CNA part/dwg P092-2; Mfr code 88	Chassis slide spacers in cabinet (2 used)
O-156	Shop manufacture	Mounting: semi-gloss XXP bakelite, wax impregnated; 11" lg x 1" wd x 5/32" thk; four 0.156" dia mtg holes 0.250" from one edge spaced 3.500" apart; CNA part/dwg P093-2; Mfr code 88	Chassis slide mtg in cabinet (2 used)
O-157	Shop manufacture	Plate, Latch: type 304 stainless steel 0.094" thk; 11" lg x 21/32" wd x 5/32" thk o/a; 5/32" x 60° bend at one end; 0.25" d x 0.593" lg cutout located 3/8" from other end w/3/32" lg lip turned up on 1/64" rad; four 0.156" dia mtg holes on center line 0.250" from edge opposite cutout spaced 3.500" c to c; CNA part/dwg P094-1; Mfr code 1, type P094-1	Chassis slide latch plate in cabinet (left side)
O-158		Same as O-157 except formed for right side; CNA part/dwg P094-2; Mfr code 1, type P094-2	Chassis slide latch plate in cabinet (right side)
O-159	Shop manufacture	Gasket: medium hard sponge rubber; inside edges coated w/ rubber cement; rectangular shape; 4 1/4" lg x 3 1/4" wd x 3/8" thk o/a; cutout 2.3125" lg plus ends rounded on 15/32" rad x 15/16" wd w/center line located 5/8" from one long edge; two 7 1/16" x 7 1/16" cutouts spaced 2.8125" c to c w/centers spaced 1.5625" from lengthwise center of elongated hole and 1 7/32" from each end of gasket; CNA part/dwg Q708-2; Mfr code 1400	Cabinet gasket (inside rear)
O-160	Shop manufacture	Gasket: medium hard sponge rubber; inside edges coated w/ rubber cement; 1 3/4" sq x 3/8" thk w/centrally located round cutout 1.250" dia; CNA part/dwg Q707-2; Mfr code 1400	Cabinet gasket (inside rear)
O-161	Shop manufacture	Gasket: medium hard sponge rubber; inside edges coated w/ rubber cement; 2 3/4" lg x 1 5/8" wd x 3/8" thk; rectangular cutout centrally located, 2 1/4" lg x 1 1/8" wd; CNA part/dwg Q706-2; Mfr code 1400	Cabinet gasket (inside rear)

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		MECHANICAL PARTS (CONT'D)	
O-162	Shop manufacture	Bracket, Captive Nut: 0.032 stainless steel; 1 1/2" lg x 1/2" wd x 0.282" h o/a; 9/16" lg section in exact center raised 1/4" by four 90° angles to form broad U shape; 3/8" dia hole in exact center of raised section; one 0.125" hole spaced 0.562" either side of center hole; CNA part/dwg P018-2; Mfr code 1, type P018-2	Front panel mounting captive nut brackets on front of cabinet (12 used)
O-163	Low-failure item – if required requisition from ESO referencing NavShips 900,180a	Nut, Captive: nickel plated brass; 7/16" sq x 9/32" thk o/a w/1/16" lg x 0.297" dia shoulder; 1/4-20 tapped thru center hole; CNA part/dwg P019-1; Mfr code 1398	Captive nuts for mounting front panel (12 used)
O-164	N42-R-155-2103	Receptacle, Stud Fastener: cad plated steel; 1 1/32" lg x 9/16" wd x 7/32" h; two 0.125" dia mtg holes spaced 0.750" c to c; CNA part/dwg P886-2; Mfr code 61	Receptacle for stud fasteners, used to mount R.F. shields and chassis bottom cover (31 used)
O-165	Low failure item – if required requisition from ESO referencing NavShips 900,180a	Index, Dial: consists of bracket of 0.032" thk 1/2 hd brass 2 27/32" lg x 7/16" wd x 1/4" h o/a w/L shaped cross section and pointer of 0.016" thk brass 1 13/16" lg x 3/32" wd w/90° twist 1/4" from end; two 0.125" dia mtg holes on wider surface of bracket spaced 1/4" from each end and 2.343" c to c; pointer soldered to bracket on inside of lip at a point 1.312" from left hand mtg hole as viewed facing inside of bracket; black paint finish on bracket, lusterless white paint finish on pointer; CNA part/dwg SA:9904; Mfr code 1, type SA:9904	Tuning dial index
O-166	N17-C-781336-251	Clamp, Electrical: die cast aluminum w/sand blast finish; 2 screw type fastening devices; 27/32" lg x 1 3/64" dia o/a; mts by coupling nut w/3/4-20 thd; designed to hold cable 9/16" dia; AN type AN3057-6; CNA part/dwg H548-1; Mfr code 339	Cable clamp (used with P-102)
O-167		Same as O-166	Cable clamp (used with P-104)
O-168	N17-R-650211-112	Ring, Bonding: for type AN3057-6 cable clamp; tinned copper; round; 0.682" OD x 0.557" ID; CNA part/dwg P145-3; Mfr code 339, type 2250-3	Bonding ring (used with P-102)
O-169		Same as O-168	Bonding ring (used with P-104

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		PLUGS	
P-101	N17-C-99999-84	Connector, Plug: one round male contact; straight; 50 ohms nominal impedance; material and finish per JAN-C-71 spec; 1 1/2" lg x 13/16" dia o/a; JAN type UG-21D/U; CNA part/dwg T088-1; Mfr code 1396	Antenna input
P-102	N17-C-70328-1516	Connector, Plug: 3 round female contacts; polarized; straight; 1 5/32" lg x 1 5/32" dia max; cylindrical shape; aluminum alloy, sand blast and clear lacquer finish; split shell; locking type, molded phenolic insert; 1/2" dia max cable opening; 7/8-20 inside conduit thd; 3/4-20 outside conduit thd 3/8" lg; type AN3106B-14S-7S; CNA part/dwg Q676-1; Mfr code 339	A.C. input
P-103		Not used	
P-104	For replacement use N17-C-70334-5473	Connector, Plug: four round female contacts; polarized; straight; 1 21/32" lg x 1 1/8" dia; cylindrical shape; aluminum; sand blast w/clear lacquer finish; molded phenolic insert; split shell; 1/2" dia max cable opening; multiple piece construction w/ single mtg hole for cable; 7/8-20 inside coupling nut thd; 3/4-20 conduit thd 3/8" lg; type AN3106B-14S-2S; CNA part/dwg J138-1; Mfr code 339	Audio output
		RESISTORS	
R-101	For replacement use N16-R-50822-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 470,000 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF474K; CNA part/dwg H376-19; Mfr code 273	V-101 grid load
R-102	For replacement use N16-R-49499-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 68 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF680K; CNA part/dwg H376-51; Mfr code 273	V-101 cathode bias
R-103	For replacement use N16-R-50372-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 22,000 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF223K; CNA part/dwg H376-41; Mfr code 273	V-101 screen dropping

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		RESISTORS (CONT'D)	
R-104	N16-R-49842-511	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 680 ohms ±10%; 2 watts; F characteristic; 0.750" lg x 0.370" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC42GF681K; CNA part/dwg P751-17; Mfr code 273	V-115 plate load
R-105		Same as R-104	V-115 plate load
R-106	For replacement use N16-R-50480-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 47,000 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF473K; CNA part/dwg H376-13; Mfr code 273	V-102 grid bias
R-107	For replacement use N16-R-49961-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 220 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF221K; CNA part/dwg H376-2; Mfr code 273	V-102 plate load
R-108		Same as R-103	V-103 no. 1 grid bias
R-109		Same as R-101	V-103 no. 2 grid load
R-110		Same as R-101	V-103 no. 2 grid load
R-111	For replacement use N16-R-50129-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 4,700 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF472K; CNA part/dwg H376-28; Mfr code 273	V-103 screen dropping
R-112	For replacement use N16-R-49769-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 470 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF471K; CNA part/dwg H376-43; Mfr code 273	B+ filter
R-113	For replacement use N16-R-49841-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 680 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF681K; CNA part/dwg H376-53; Mfr code 273	V-103 plate B+ filter

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		RESISTORS (CONT'D)	
R-114		Same as R-101	A.V.C. filter
R-115	For replacement use N16-R-49625-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 150 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF151K; CNA part/dwg H376-1; Mfr code 273	V-101 cathode bias
R-116		Same as R-106	V-104 screen dropping
R-117		Same as R-113	V-104 plate load
R-118	N16-R-50201-137	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 6,800 ohms ±5%; 2 watts; F characteristic; 0.750" lg x 0.370" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC42GF682J; CNA part/dwg P751-105; Mfr code 273	Part of R.F. Gain control network
R-119		Same as R-118	Part of R.F. Gain control network
R-120	N16-R-91030-9812	Resistor, Variable, Wire Wound: 5,000 ohms ±10%; 2 watts; JAN A taper; three tab term; 0.62" lg x 1.28" dia max; 1/4" dia round metal shaft 2" lg FMS; insulated contact arm; no OFF position; normal torque; 3/8-32 thd bushing 3/8" lg; non-turn device on 17/32" rad at 9 o'clock; JAN type RA20A1RJ502AK; CNA part/dwg H345-27; Mfr code 307	R.F. Gain control
R-121		Same as R-115	V-105 cathode load
R-122		Same as R-106	V-105 screen dropping
R-123		Same as R-113	V-105 plate load
R-124	N16-R-50975-0971	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 1 megohm ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF105K; CNA part/dwg H376-31; Mfr code 273	Part of detector-noise limiter load network

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		RESISTORS (CONT'D)	
R-125	For replacement use N16-R-50714-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 220,000 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF224K; CNA part/dwg H376-16; Mfr code 273	Part of detector-noise limiter load network
R-126		Same as R-125	Part of detector-noise limiter load network
R-127	For replacement use N16-R-50930-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 820,000 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF824K; CNA part/dwg H376-21; Mfr code 273	Part of detector-noise limiter load network
R-128	For replacement use N16-R-50633-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 100,000 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF104K; CNA part/dwg H376-30; Mfr code 273	Audio input load
R-129		Same as R-104	V-115 plate load
R-130		Same as R-101	V-108 plate dropping
R-131		Same as R-125	V-108 plate load
R-132		Same as R-106 except part of Z-104	V-107A grid bias
R-133	N16-R-50067-0231	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 3,300 ohms ±10%; 1 watt; F characteristic; 0.750" lg x 0.280" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC30BF332K; CNA part/dwg H370-59; Mfr code 273; part of Z-104	V-107A plate dropping
R-134		Same as R-101	V-108 grid
R-135	N16-R-49706-115	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 330 ohms ±5%; 2 watts; F characteristic; 0.750" lg x 0.370" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC42GF331J; CNA part/dwg P751-13; Mfr code 273	V-108 grid

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		RESISTORS (CONT'D)	
R-136	N16-R-49805-116	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 560 ohms ±5%; 2 watts; F characteristic; 0.750" lg x 0.370" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC42GF561J; CNA part/dwg P751-90; Mfr code 273	V-108 cathode bias
R-137		Same as R-136	V-108 cathode bias
R-138	For replacement use N16-R-51065-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 2.2 megohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF225K; CNA part/dwg H376-35; Mfr code 273	V-114 grid load
R-139		Same as R-138	V-114 plate (pin 2) dropping
R-140	N16-R-88180-7545	Resistor, Variable, Composition: 500,000 ohms ±20%; 1/8 watt; three tab term; 33/64" lg x 31/32" dia max; 1/4" dia round metal shaft 2.00" lg FMS; JAN C taper; insulated contact arm; no OFF position; 3/8-32 thd bushing 3/8" lg; non-turn device on 0.438" rad at 9 o'clock; JAN type RV2AURJ504D; CNA part/dwg M364-43; Mfr code 307	Fidelity control
R-141		Same as R-140	A.F. Level control
R-142		Same as R-128	V-109A plate load
R-143		Same as R-106	V-109A plate dropping
R-144		Same as R-106	V-109B plate dropping
R-145		Same as R-125	V-109B grid load
R-146		Same as R-103	V-109B grid bias

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		RESISTORS (CONT'D)	
R-147	For replacement use N16-R-49967-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 1,500 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF152K; CNA part/dwg H376-47; Mfr code 273	V-109A cathode bias
R-148	N16-R-68292-3751	Resistor, Fixed, Wire Wound: body style no. 14, MBCA ref dwg group 2; 3.9 ohms ±10%; 1 watt; 1 9/32" lg x 9/32" dia; two axial wire leads; JAN type RU4B3R9K; CNA part/dwg L863-4; Mfr code 63	V-106 heater
R-149		Same as R-112	V-109B cathode bias
R-150		Same as R-101	V-110 grid bias
R-151		Same as R-111	V-110 cathode
R-152		Same as R-106	V-110 plate load
R-153		Same as R-106	V-110 plate dropping
R-154	N16-R-50552-142	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 68,000 ohms ±5%; 2 watts; F characteristic; 0.750" lg x 0.370" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC42GF683J; CNA part/dwg P751-104; Mfr code 273	V-112 to V-109B feedback
R-155		Same as R-101	V-111 grid load
R-156	N16-R-49662-511	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 220 ohms ±10%; 2 watts; F characteristic; 0.750" lg x 0.370" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC42GF221K; CNA part/dwg P751-10; Mfr code 273	V-111, V-112 cathode bias
R-157		Same as R-101	V-111 grid load

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		RESISTORS (CONT'D)	
R-158	N16-R-89956-7002	Resistor, Variable, Wire Wound: 50 ohms ±10%; 2 watts; JAN A taper; three tab term; 0.62" lg x 1.28" dia max; 1/4" dia round metal shaft 7/8" lg FMS; high torque; insulated contact arm; no OFF position; 3/8-32 thd bushing 3/8" lg; non-turn device on 17/32" rad at 9 o'clock; JAN type RA20A2RD500AK; CNA part/dwg H345-15; Mfr code 307	Pilot light dimmer
R-159	For replacement use N16-R-50128-431	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 4,700 ohms ±5%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF472J; CNA part/dwg H376-57; Mfr code 273	T-107 primary load
R-160	For replacement use N16-R-50417-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 33,000 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF333K; CNA part/dwg H376-34; Mfr code 273; part of Z-104	V-107B plate
R-161	For replacement use N16-R-50282-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 10,000 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF103K; CNA part/dwg H376-9; Mfr code 273; part of Z-104	V-107B grid bias
R-162	For replacement use N16-R-50012-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 2,200 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF222K; CNA part/dwg H376-38; Mfr code 273; part of Z-104	V-107B cathode bias
R-163	For replacement use N16-R-49922-811	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 1,000 ohms ±10%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF102K; CNA part/dwg H376-7; Mfr code 273	V-101 cathode bias
R-164	For replacement use N16-R-50281-431	Resistor, Fixed, Composition: body style no. 14, MBCA ref dwg group 2; 10,000 ohms ±5%; 1/2 watt; F characteristic; 0.655" lg x 0.249" dia; insulated; resistant to humidity and salt water immersion; two axial wire leads; JAN type RC21BF193J; CNA part/dwg H376-92; Mfr code 273	T-109 primary load
R-165		Same as R-163	T-108 primary load

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		RESISTORS (CONT'D)	
R-166	N16-R-91031-1117	Resistor, Variable, Wire Wound: 5,000 ohms ±10%; 2 watts; JAN C taper; three tab term; 0.62" lg x 1.28" dia max; 1/4" dia round metal shaft 7/8" lg FMS; high torque; insulated contact arm; no OFF position; 3/8-32 thd bushing 3/8" lg; non-turn device on 17/32" rad at 9 o'clock; JAN type RA20A2RD502CK; CNA part/dwg H345-28; Mfr code 307	Monitor Level control
R-167		Same as R-112	V-101 cathode bias
R-168		Same as R-115	V-101 cathode bias
R-169*		Same as R-107	V-104 cathode bias
R-169*		Same as R-112	V-104 cathode bias
		SWITCHES	
S-101	For reference only	Switch Assembly: consists of S-101A, S-101B, S-101C, S-101D, S-101E ganged together	Band Selector switch
S-101A	N17-S-99999-0436	Wafer, Rotary Switch: 2 poles, 4 positions; ceramic wafer; grade L-4 per JAN-I-10 spec; oval shape; 1 7/8" lg x 1 5/8" wd x 3/16" thk; mts by two 0.145" lg x 0.130" wd holes spaced 1 9/16" c to c; rotor blades of coin silver; clips of spring Elkonium-18; all non-magnetic metal parts except silver and stainless steel are plated to withstand a 20% 200 hr salt spray test in accordance with AN-QQ-S-91 spec; 0.250" lg x 0.187" wd shaft hole in center; CNA part/dwg Q606-1; Mfr code 111, part of S-101	Signal input transformer selector
S-101B	N17-S-99999-0435	Wafer, Rotary Switch: 2 poles, 4 positions; ceramic wafer, grade L-4 per JAN-I-10 spec; oval shape; 1 7/8" lg x 1 5/8" wd x 3/16" thk; mts by two 0.145" lg x 0.130" wd holes spaced 1 9/16" c to c; rotor blades of coin silver; clips of spring Elkonium-18; all non-magnetic metal parts except silver and stainless steel are plated to withstand a 20% 200 hr salt spray test in accordance with AN-QQ-S-91 spec; 0.250" lg x 0.187"	Signal input transformer selector

*Depending upon the individual requirements of each receiver, resistor R-169 may not be used or the value may be 220 ohms or 470 ohms.

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		SWITCHES (CONT'D)	
S-101B (cont'd)		wd shaft hole in center; CNA part/dwg Q608-1; Mfr code 111; part of S-101	
S-101C	N17-S-99999-0437	Wafer, Rotary Switch: 2 poles, 4 positions; ceramic wafer, grade L-4 per JAN-I-10 spec; oval shape; 1 7/8" lg x 1 5/8" wd x 3/16" thk; mts by two 0.145" lg x 0.130" wd holes spaced 1 9/16" c to c; rotor blades of coin silver; clips of spring Elkonium-18; all non-magnetic metal parts except silver and stainless steel are plated to withstand a 20%, 200 hr salt spray test in accordance with AN-QQ-S-91 spec; 0.250" lg x 0.187" wd shaft hole in center; CNA part/dwg Q607-1; Mfr code 111; part of S-101	H.F. Oscillator transformer selector
S-101D	N17-S-99999-0440	Wafer, Rotary Switch: 4 poles, 4 positions; ceramic wafer, grade L-4 per JAN-I-10 spec; 1 7/8" lg x 1 5/8" wd x 3/16" thk; mts by two 0.145" lg x 0.130" wd holes spaced 1 9/16" c to c; rotor blades of coin silver; clips of spring Elkonium-18; all non-magnetic metal parts except silver and stainless steel are plated to withstand a 20%, 200 hr salt spray test in accordance with AN-QQ-S-91 spec; 0.250" lg x 0.187" wd shaft hole in center; CNA part/dwg Q605-1; Mfr code 111; part of S-101	Mixer transformer selector
S-101E	N17-S-99999-0442	Wafer, Rotary Switch: 1 pole, 4 positions; ceramic wafer, grade L-4 per JAN-I-10 spec; oval shape; 1 7/8" lg x 1 5/8" wd x 3/16" thk; mts by two 0.145" lg x 0.130" wd holes spaced 1 9/16" c to c; rotor blades of coin silver; clips of spring Elkonium-18; all non-magnetic metal parts except silver and stainless steel are plated to withstand a 20%, 200 hr salt spray test in accordance with AN-QQ-S-91 spec; 0.253" lg x 0.187" wd shaft hole in center; CNA part/dwg Q604-1; Mfr code 111; part of S-101	Band selector
S-102	For reference only	Switch, Rotary: consists of S-102A, S-102B, S-102C, ganged	Reception switch
S-102A	N17-S-99999-0441	Wafer, Rotary Switch: 1 pole, 4 positions; ceramic wafer, grade L-4 per JAN-I-10 spec; oval shape; 1 7/8" lg x 1 5/8" wd x 3/16" thk; bracket mtd by two 0.145" lg x 0.130" wd holes spaced 1 9/16" c to c; rotor blades of coin silver, clips of spring Elkonium-18; all non-magnetic metal parts except silver and stainless steel are plated to withstand a 20%, 200 hr salt spray test in accordance with AN-QQ-S-91 spec; 0.253" lg x 0.187" wd shaft hole in center; CNA part/dwg Q712-1; Mfr code 111; part of S-102	Z-101 bandwidth selector

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		SWITCHES (CONT'D)	
S-102B	N17-S-99999-0439	Wafer, Rotary Switch: 2 poles, 4 positions; ceramic wafer grade L-4 per JAN-I-10 spec; oval shape; 1 7/8" lg x 1 5/8" wd x 3/16" thk; bracket mtd by two 0.145" lg x 0.130" wd holes spaced 1 9/16" c to c; rotor blades of coin silver, clips of spring Elkonium-18; all non-magnetic metal parts except silver and stainless steel are plated to withstand a 20%, 200 hr salt spray test in accordance with AN-QQ-S-91 spec; 0.253" lg x 0.186" wd shaft hole in center; CNA part/dwg T330-1; Mfr code 111; part of S-102	Z-102 bandwidth selector
S-102C	N17-S-99999-0443	Switch, Rotary: one section; 2 poles, 4 positions; shorting type rotor of coin silver; clips of spring Elkonium-18; 1 1/64" lg x 1 5/8" wd x 1 7/8" h excl bushing and shaft; ceramic wafer, grade L-4 per JAN-I-10 spec; 3/8-32 thd bushing 3/8" lg; 1/4" dia thru shaft extends 1 15/16" FMS and 39/64" from rear; detent mechanism balls, spring and index plate of stainless steel; all non-magnetic metal parts except stainless steel are plated to withstand a 20%, 200 hr salt spray test in accordance with AN-QQ-S-91 spec; CNA part/dwg P890-1; Mfr code 111; part of S-102; includes S-102CA, S-102CB	B.F.O. switch
S-102CA	For reference only	Wafer, Rotary Switch: 2 poles, 4 positions; ceramic wafer, grade L-4 per JAN-I-10 spec; 1 7/8" lg x 1 5/8" wd x 3/16" thk; mts by two 0.145" holes spaced 1 9/16" c to c; rotor blades of coin silver; clips of spring Elkonium-18; all non-magnetic metal parts except stainless steel are plated to withstand a 20%, 200 hr salt spray test per AN-QQ-S-91 spec; 0.250" lg x 0.187" wd shaft hole in center; CNA part/dwg P890-2; Mfr code 111; part of S-102C	S-102C wafer
S-102CB	For reference only	Detent, Switch: 4 positions; 5/32" lg x 1 5/8" wd x 1 7/8" h; mts by two 0.145" holes spaced 1 9/16" c to c; index balls, springs and plate of stainless steel; CNA part/dwg P890-3; Mfr code 111; part of S-102C	S-102C detent
S-103	N17-S-99999-0438	Switch, Rotary: one section; 3 poles, 3 positions; shorting type rotor of coin silver; clips of spring Elkonium-18; 1 1/64" lg x 1 5/8" wd x 1 7/8" h excluding bushing and shaft; ceramic wafer, grade L-4 per JAN-I-10 spec; 3/8-32 thd bushing 3/8" lg; 1/4" dia stainless steel flatted shaft 1 15/16" lg FMS; detent mechanism balls, spring and index plate of stainless steel; all non-magnetic metal parts except stainless steel are plated to withstand a 20%, 200 hr salt spray test in accordance with AN-QQ-S-91 spec; CNA part/dwg T077-1; Mfr code 111; includes S-103A, S-103B	Noise Limiter-Phono switch

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		SWITCHES (CONT'D)	
S-103A	For reference only	Wafer, Rotary Switch: 3 poles, 3 positions; ceramic wafer, grade L-4 per JAN-I-10 spec; 1 7/8" lg x 1 5/8" wd x 3/16" thk; mts by two 0.145" holes spaced 1 9/16" c to c; rotor blades of coin silver; clips of spring Elkonium-18; all non-magnetic metal parts except stainless steel are plated to withstand a 20%, 200 hr salt spray test in accordance with AN-QQ-S-91 spec; 0.250" lg x 0.187" wd shaft hole in center; CNA part/dwg T077-2; Mfr code 111; part of S-103	S-103 wafer
S-103B	For reference only	Detent, Switch: 3 positions; 5/32" lg x 1 5/8" wd x 1 7/8" h; mts by two 0.145" holes spaced 1 9/16" c to c; index balls, spring and plate of stainless steel; CNA part/dwg T077-3; Mfr code 111; part of S-103	S-103 detent
S-104	N17-S-72018-7719	Switch, Toggle: single-pole, double-throw; rated 5 amps at 125 VAC; bakelite body; 23/32" lg x 23/32" wd x 1 9/32" h max excl bushing and handle; bat type handle 11/16" lg beyond bushing; 3 solder lug term on back; 15/32-32 thd bushing 15/32" lg FMS; JAN type ST12D; CNA part/dwg H340-10; Mfr code 3	Monitor-Phone switch
S-105A-B	N17-S-73082-9028	Switch, Toggle: double-pole, single-throw; rated 5 amps at 125 VAC; bakelite body; 23/32" lg x 23/32" wd x 1 9/32" h max excl bushing and handle; bat type handle 11/16" lg beyond bushing; 4 solder lug term on back; 15/32-32 thd bushing 15/32" lg FMS; JAN type ST22K; CNA part/dwg H340-6; Mfr code 3	Power switch
S-106	Shop manufacture	Terminal Board: nylon base phenolic board; 4 Phillips head stud term; nickel plated brass jumper; 2 1/8" lg x 1 5/8" wd x 1 5/32" h o/a; mts by four 0.156" dia holes on 1 5/8" x 1 1/8" mtg/c; stamped F763-3, 105 v, 115 v, 125 v; CNA part/dwg SA:6479; Mfr code 1, type SA:6479	Power transformer primary tap switch
		TRANSFORMERS	
T-101	N17-T-73703-1406	Transformer, Power, Step-down and Step-up: hermetically sealed metal case; input: 105/115/125 VAC, 60 cycles, single phase; output: no. 1 secondary 5 v at 2 amps; no. 2 secondary 550 v at 110 ma; no. 3 secondary 6.3 v at 4 amps; no. 2 secondary center tapped; 4 1/4" h excl term x 3 5/8" dia w/3 23/32" sq mtg flange; 11 solder lug term 1/2" lg located within 2 3/4" circle on bottom; four 0.1935" dia mtg holes on 3" x 3" mtg/c; shielding grounded to case; CNA part/dwg P881-1; Mfr code 123	Power transformer

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		TRANSFORMERS (CONT'D)	
T-102	N17-T-99999-0379	Transformer, Audio Frequency: plate coupling type; two secondary windings; term 1, 2 and 3, primary; terms 4 and 5, secondary no. 1; term 6, 7 and 8, secondary no. 2; terms 1 and 3, 15,000 ohms at 3 watts, 40 ma push-pull w/center tap at term no. 2; terms 4 and 5, 0.25 watts ±1 db at 600 ohms; terms 6 and 8, 2.5 watts at 60 ohms, 0.2 watts min at 600 ohms w/center tap at term no. 7 for external ground, output voltage shall not change more than 3 db from 60 to 600 ohms; all measurements made at 1,000 cycles; freq range ±20 db from 100 to 5,000 cps; HIPOT: 1,500 volts RMS 60 cps; hermetically sealed metal case 2 1/2" dia x 3 1/4" h w/2 9/16" sq mtg flange; mts by four 0.177" dia holes in flange located on 2 3/32" x 2 3/32" mtg/c; 8 numbered solder lug term on bottom within 2 1/8" dia circle; grounded electrostatic shield between primary and secondaries; item per MIL-T-27 spec; stamped "P883-1" on side of case; CNA part/dwg P883-1; Mfr code 123	Audio output transformer
T-103	N17-T-82166-3997	Transformer, RF: 0.54 to 1.6 mc freq range; 2 windings; primary 0.72 microhenries at 25 mc. 4 turns no. 18E wire; 0.05 ohms DC resistance; secondary 186 microhenries at 790 kc, 2 pie wound, 1 pie 28 turns, other pie 25 turns of 7/41 Litz, DC resistance 4.38 ohms; uncased; XXP natural bakelite form 2 1/4" lg x 1" dia; adjustable powdered iron core tunes secondary only, screwdriver adjustment at bottom of form; mts by 3/8-32 thd bushing 7/16" lg; 4 solder lug term; CNA part/dwg SA:9110; Mfr code 1, type SA:9110	RF input transformer (BC Band)
T-104	N17-T-82181-8826	Transformer, RF: 1.6 to 3.45 mc freq range; 2 windings; primary inductance not rated, 4 turns of no. 18E wire; secondary 26.5 microhenries at 2.5 mc, 40 1/2 turns no. 30E wire, DC resistance 0.87 ohms; uncased; untapped; XXX natural bakelite form 2 1/4" lg x 3/4" dia; adjustable powdered iron core tunes secondary only, screwdriver adjustment at bottom of form; mts by 3/8-32 thd bushing 7/16" lg; 4 solder lug term; CNA part/dwg SA:9098; Mfr code 1, type SA:9098	RF input transformer (SW-1 Band)
T-105	N17-T-82187-4151	Transformer, RF: 3.45 to 8.6 mc freq range; 2 windings; primary not rated, 2 turns no. 18E wire; secondary 5.18 microhenries at 7.9 mc, 15 1/4 turns no. 24E wire, DC resistance 0.10 ohms; untapped; uncased; XXX natural bakelite form 2 1/4" lg x 3/4" dia; adjustable powdered iron core tunes secondary only; screwdriver adjustment at bottom of form; mts by 3/8-32 thd bushing 7/16" lg; 4 solder lug term; CNA part/dwg SA:9104; Mfr code 1, type SA:9104	RF input transformer (SW-2 Band)

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		TRANSFORMERS (CONT'D)	
T-106	N17-T-82202-8815	Transformer, RF: 8.6 to 18.6 mc freq range; 2 windings; primary not rated, 1 1/2 turns no. 18E wire; secondary 1.025 microhenries at 7.9 mc, 6 3/4 turns no. 24E wire, DC resistance 0.13 ohm; untapped, uncased; XXX natural bakelite form 2 1/4" lg x 3/4" dia; adjustable powdered iron core tunes secondary only; screwdriver adjustment at bottom of form; mts by 3/8-32 thd bushing at bottom of form; 4 solder lug term; CNA part/dwg SA:9092; Mfr code 1, type SA:9092	RF input transformer (SW-3 Band)
T-107	N17-T-82166-4052	Transformer, RF: 0.54 to 1.6 mc freq range; 2 windings; primary 1020 microhenries at 250 kc, 450 turns no. 36E wire pie wound, DC resistance 64.2 ohms; secondary 175 microhenries at 790 kc, 84 turns 10/41 Litz 3 pie wound, DC resistance 3.3 ohms; untapped, uncased; XXX natural bakelite form 2 1/4" lg x 1" dia; adjustable powdered iron core tunes secondary only; screwdriver adjustment at top of form; mts by two 0.156" dia holes spaced 1 7/16" c to c; 4 solder lug term; resistor JAN type RC21BF-472J across primary (R-159); measurements made without resistor or slug; CNA part/dwg SA:9090; Mfr code 1, type SA:9090	Mixer input transformer (BC Band)
T-108	N17-T-82181-8764	Transformer, RF: 1.6 to 3.45 mc freq range; 2 windings; primary 6.95 microhenries at 7.9 mc, 13 1/2 turns no. 34E wire, DC resistance 0.83 ohm; secondary 27 microhenries at 2.5 mc, 37 1/2 turns no. 30E wire; DC resistance 0.80 ohm; untapped, uncased; XXX natural bakelite form 2 1/4" lg x 3/4" dia; adjustable powdered iron core tunes secondary only; screwdriver adjustment at top of form; mts by two 0.156" dia holes spaced 1 3/16" c to c; 4 solder lug term; resistor JAN type RC21BF-102J across primary (R-165); measurements made without resistor or slug; CNA part/dwg SA:9096; Mfr code 1, type SA:9096	Mixer input transformer (SW-1 Band)
T-109	N17-T-82187-4018	Transformer, RF: 3.45 to 8.6 mc freq range; 2 windings; primary 2.30 microhenries at 7.9 mc, 8 1/2 turns no. 28 DSC wire; DC resistance 0.128 ohm; secondary 4.80 microhenries at 7.9 mc, 14 1/2 turns no. 24E wire; DC resistance 0.09 ohm; untapped, uncased; XXX natural bakelite form 2 1/4" lg x 3/4" dia; adjustable powdered iron core tunes secondary only; screwdriver adjustment at top of form; mts by two 0.156" dia holes spaced 1 3/16" c to c; 4 solder lug term; resistor JAN type RC21BF103J across primary (R-164); measurements made without resistor or slug; CNA part/dwg SA:9102; Mfr code 1, type SA:9102	Mixer input transformer (SW-2 Band)

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		TRANSFORMERS (CONT'D)	
T-110	N17-T-82202-8826	Transformer, RF: 8.6 to 18.6 mc freq range; 2 windings; primary 1.075 microhenries at 7.9 mc, 6 1/4 turns no. 28 DSC wire, DC resistance 0.10 ohm; secondary 0.94 microhenries at 7.9 mc, 6 3/4 turns no. 24E wire; DC resistance 0.043 ohm; untapped; uncased; XXX natural bakelite form 2 1/4" lg x 3/4" dia; adjustable powdered iron core tunes secondary only; screwdriver adjustment at top of form; mts by two 0.156" dia holes spaced 1 3/16" c to c; 4 solder lug term; measurements made without slug; CNA part/dwg SA:9108; Mfr code 1, type SA:9108	Mixer input transformer (SW-3 Band)
T-111	N17-T-99999-0378	Coil, RF: 1 winding, single layer wound; 59 1/4 turns no. 32E wire tapped at 12 1/4 turns; 96 microhenries at 2.5 mc; DC resistance 2.57 ohms; 100 ma current rating; XXX natural bakelite form 2 1/4" lg x 1" dia; mts by two 0.156" dia holes spaced 1 7/16" c to c; uncased; 3 solder lug term; measurements made without slug; CNA part/dwg SA:9088; Mfr code 1, type SA:9088	HF oscillator inductor (BC Band)
T-112	N17-T-99999-0377	Coil, RF: 1 winding, single layer wound; 30 turns no. 30 wire tapped at 8 1/2 turns; 19 microhenries at 2.5 mc; DC resistance 0.68 ohm; 150 ma current rating; XXX natural bakelite form 2 1/4" lg x 3/4" dia; mts by two 0.156" dia holes spaced 1 3/16" c to c; uncased; 3 solder lug term; measurements made without slug; CNA part/dwg SA:9094; Mfr code 1, type SA:9094	HF oscillator inductor (SW-1 Band)
T-113	N17-T-99999-0376	Coil, RF: 1 winding, single layer wound; 16 turns no. 24E wire tapped at 4 1/2 turns; 3.8 microhenries at 7.9 mc; 0.11 ohm DC resistance; 300 ma current rating; XXX natural bakelite form 2 1/4" lg x 3/4" dia; adjustable powdered iron core, screwdriver adjustment; mts by two 0.156" dia holes spaced 1 3/16" c to c; measurements made without slug; CNA part/dwg SA:9100; Mfr code 1, type SA:9100	HF oscillator inductor (SW-2 Band)
T-114	N17-T-99999-0381	Coil, RF: 1 winding, single layer wound; 6 1/2 turns no. 24E wire tapped at 1 7/8 turns; 1.07 microhenries at 25 mc; 0.06 ohm DC resistance; 300 ma current rating; XXX natural bakelite form 2 1/4" lg x 3/4" dia; adjustable powdered iron core, screwdriver adjustment; mts by two 0.156" dia holes spaced 1 3/16" c to c; uncased; measurements made without slug; CNA part/dwg SA:9106; Mfr code 1, type SA:9106	HF oscillator inductor (SW-3 Band)

TABLE 8-4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		TRANSFORMERS (CONT'D)	
T-115	N17-T-99999-0375	Transformer, Audio Frequency: plate coupling type; primary impedance 600 ohms; secondary impedance 3.2 ohms; untapped; test voltage rating 500 v RMS; hermetically sealed metal case; 1 1/4" lg x 1 1/4" wd x 1 13/16" h excl terms and mtg flanges; two mtg flanges located on opposite sides at base each w/two 0.125" dia mtg holes spaced on 1 11/16" x 7/8" c; audio operating level 1/2 watt; ratio of turns primary to secondary 13.7:1; frequency range 100 to 5,000 cycles; rated decibel variation over frequency range ±2 db; untuned; 4 solder lug type term located on top; schematic diagram and National Company part number stamped on side of case; item per MIL-T-27 spec; CNA part/dwg T075-1; Mfr code 123, type M-9708-1	Audio output to loudspeaker
		ELECTRON TUBES	
V-101	N16-T-75749	Tube, Electron: JAN-5749; pentode; glass RMA T-5 1/2 envelope; 7 pins on bottom; receiving tube	R.F. amplifier
V-102	N16-T-76135-0000	Tube, Electron: JAN-6135; triode; glass RMA T-5 1/2 envelope; 7 pins on bottom; receiving tube	H.F. oscillator
V-103	N16-T-56211-10	Tube, Electron: JAN-6BA7; pentagrid converter; glass RMA T-6 1/2 envelope; 9 pins on bottom; receiving tube	Mixer
V-104		Same as V-101	1st I.F. amplifier
V-105		Same as V-101	2nd I.F. amplifier
V-106	N16-T-75726	Tube, Electron: JAN-5726; twin diode; glass RMA T-5 1/2 envelope; 7 pins on bottom; receiving tube; includes V-106A, V-106B	
V-106A		Part of V-106	Detector
V-106B		Part of V-106	Noise limiter
V-107	N16-T-75814	Tube, Electron: JAN-5814; twin triode; glass, RMA T-6 1/2 envelope; 9 pins on bottom; receiving tube; includes V-107A, V-107B; part of Z-104	
V-107A		Part of V-107	B.F.O.

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		ELECTRON TUBES (CONT'D)	
V-107B		Part of V-107	Buffer amplifier
V-108		Same as V-102	A.V.C. amp
V-109	N16-T-75670	Tube, Electron: JAN-5670; twin-triode; glass, RMA T-6 1/2 envelope; 9 pins on bottom, receiving tube; includes V-109A, V-109B	
V-109A		Part of V-109	1st audio amplifier
V-109B		Part of V-109	2nd audio amplifier
V-110		Same as V-102	Phase splitter
V-111	N16-T-75686	Tube, Electron: JAN-5686; pentode; glass, RMA T-6 1/2 envelope; 7 pins on bottom; receiving tube	Audio output
V-112		Same as V-111	Audio output
V-113	N16-T-55738-5	Tube, Electron: JAN-5Y3WGTA; double diode rectifier; glass, RMA T-9 envelope; 5 pins on bottom; receiving tube	Rectifier
V-114	N16-T-56255	Tube, Electron: JAN-6E5; tuning indicator; glass, RMA T-9 envelope; 6 pins on bottom	Tuning indicator
V-115	For replacement use N16-T-52001-8	Tube, Electron: JAN-0B2; voltage regulator; glass, T-5 1/2 envelope; 7 pins on bottom	Voltage regulator
		COMPOUND TUNED CIRCUITS AND FILTERS	
Z-101	N17-T-99999-0380	Transformer, IF: 455 kc peak freq; input; requires separate shield (E143); 1 7/8" sq x 3 3/4" h excl term, tuning devices and mtg attachments; XXX natural bakelite form; adjustable powdered iron core; double tuned; 6 solder post term; mts by three 6-32 thd studs on 1 13/32" mtg/c; terms lettered A thru F; includes C-136 and C-137, 470 mmf 500 vdcw capacitors, one across terms C and D and one across terms A and B; CNA part/ dwg SA:9168; Mfr code 1, type SA:9168; includes L-102A and L-102B	1st IF transformer

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		COMPOUND TUNED CIRCUITS AND FILTERS (CONT'D)	
Z-102	N17-T-67635-7858	Transformer, IF: 455 kc peak freq; inter-stage; requires separate shield (E-144); 1 7/8" sq x 3 3/4" h excl term, tuning devices and mtg attachments; XXX natural bakelite form; adjustable powdered iron core; double tuned; 7 solder post term; mts by three 6-32 thd studs on 1 13/32" mtg/c; terms lettered A thru G; includes C-140 and C-141, 470 mmf 500 vdcw capacitors, one across terms C and D and one across terms B and A; CNA part/dwg SA:9167; Mfr code 1, type SA:9167; includes L-103A and L-103B	2nd IF transformer
Z-103	N17-T-67635-7912	Transformer, IF: 455 kc peak freq; output; requires separate shield (E-145) 1 7/8" sq x 3 3/4" h excl term, tuning devices and mtg attachments; XXX natural bakelite form; adjustable powdered iron core; double tuned; 6 solder post term; mts by three 6-32 thd studs on 1 13/32" mtg/c; terms lettered A thru F; 470 mmf 500 vdcw capacitor across terms C and D; 470 mmf 500 vdcw capacitor across terms B and F; 180 mmf 500 vdcw capacitor across terms A and F (C-144, C-145 and C-171); CNA part/dwg SA:9169; Mfr code 1, type SA:9169; includes L-104A and L-104B	Detector input transformer
Z-104	For reference only	B.F.O. Compartment: includes C-149, C-150, C-151, C-152, C-168, C-169, C-170, E-107, E-120, E-129, L-105, R-132, R-133, R-160, R-161, R-162, V-107 and XV-107	B.F.O. section
Z-105	N16-F-99999-0094	Wave Trap: consists of a coil and capacitor in series, tuned to pass a freq of 455 kc from antenna to ground; assembly mtd in shield can 1.425" sq x 2 3/4" h; mts by two 90° angle tabs mtd on opposite sides of can at base; one 0.156" dia hole in each tab, two holes spaced 2 1/16" c to c; "SA:9081" stamped on side of can; CNA part/dwg SA:9081; Mfr code 1, type SA:9081; includes C-101 and L-101	Antenna wave trap
		LOUDSPEAKER	
LS-101	N17-L-99999-0090	Loudspeaker, Magnetic: permanent magnet; voice coil impedance 3.2 ohms ±10% at 400 cycles per second; 2.5 watts power rating; cone type; no output transformer included; 5" dia x 2 7/16" d o/a; mts by eight 0.218" dia holes equally spaced 45° apart on 2.34375" rad; cone moisture proofed; CNA part/dwg P847-1; Mfr code 1066; type 09333 w/moisture proofed cone	Loudspeaker

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		TERMINAL BOARDS	
TB-101	Shop manufacture	Terminal Board: 14 silver plated brass solder post term; phenolic nylon fabric board 2 1/2" lg x 1 1/2" wd x 39/64" h; mts by two 0.156" dia holes spaced 1.062" c to c; stamped R-117, R-116, R-115, R-114, R-110, R-113, R-169; CNA part/dwg SA:6485; Mfr code 1, type SA:6485	Terminal board
TB-102	Shop manufacture	Terminal Board: 22 silver plated brass solder post term; phenolic nylon fabric board; 3 7/8" lg x 1 1/2" wd x 39/64" h; mts by two 0.156" dia holes spaced 2.687" c to c; stamped R-130, R-131, R-138, R-127, R-124, R-125, R-123, R-122, R-121, R-126; CNA part/dwg SA:6487; Mfr code 1, type SA:6487	Terminal board
TB-103	Shop manufacture	Terminal Board: 4 silver plated brass solder post term; phenolic nylon fabric board; 3 1/16" lg x 1/2" wd x 31/64" h o/a w/ corner on lower right of stamped symbol number cutoff at 45°, 5/32" d; mts by two 0.156" dia holes spaced 1.625" c to c; stamped R-148; CNA part/dwg SA:6489; Mfr code 1, type SA:6489	Terminal board
TB-104	Shop manufacture	Terminal Board: 12 silver plated brass solder post term; phenolic nylon fabric board; 2 13/16" lg x 1 1/2" wd x 39/64" h; mts by two 0.156" dia holes spaced 1.812" c to c; stamped R-119, R-118, R-156, R-136, R-137, R-154; CNA part/dwg SA:6491; Mfr code 1, type SA:6491	Terminal board
TB-105	Shop manufacture	Terminal Board: 24 silver plated brass solder post term; phenolic nylon fabric board; 4 3/8" lg x 1 1/2" wd x 39/64" h; mts by two 0.156" dia holes spaced 3 1/2" c to c; stamped R-135, R-139, R-150, R-151, C-175, R-157, R-152, R-153, C-164, C-165, R-155; CNA part/dwg SA:6493; Mfr code 1, type SA:6493	Terminal board
TB-106	Shop manufacture	Terminal Board: 2 silver plated brass solder post term; phenolic nylon fabric board; 1 1/2" lg x 11/16" wd x 39/64" h, mts by two 0.156" dia holes spaced 0.500" c to c; CNA part/dwg SB:2544; Mfr code 1, type SB:2544	Terminal board
TB-107	Shop manufacture	Terminal Board: 4 silver plated brass solder post term; phenolic nylon fabric board; 1 1/2" lg x 7/8" wd x 39/64" h; mts by two 0.156" dia holes spaced 0.500" c to c; stamped C-155, C-156; CNA part/dwg SA:6500; Mfr code 1, type SA:6500	Terminal board
TB-108	Shop manufacture	Terminal Board: 2 silver plated brass solder post term; phenolic nylon fabric board; 1 1/2" lg x 11/16" wd x 39/64" h; mts by two 0.156" dia holes spaced 0.500" c to c; stamped R-128; CNA part/dwg SA:6502; Mfr code 1, type SA:6502	Terminal board

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		TERMINAL BOARDS (CONT'D)	
TB-109	Shop manufacture	Terminal Board: 4 silver plated brass solder post term; phenolic nylon fabric board; 1 1/2" lg x 3/4" wd x 39/64" h; mts by two 0.156" dia holes spaced 0.437" c to c; stamped R-101, C-110; CNA part/dwg SA:6504; Mfr code 1, type SA:6504	Terminal board
TB-110	Shop manufacture	Terminal Board: 27 silver plated brass solder post term; phenolic nylon fabric board; 4 13/16" lg x 1 1/2" wd x 39/64" h o/a; 1 1/8" d x 5/16" wd cutout at one corner; mts by two 0.156" dia holes spaced 3.625" c to c; stamped R-134, R-149, R-146, R-145, C-158, C-159, R-142, R-143, R-144, C-163, C-164, R-147, C-154; CNA part/dwg SA:6506; Mfr code 1, type SA:6506	Terminal board
TB-111	Shop manufacture	Terminal Board: 4 silver plated brass solder post term; phenolic nylon fabric board; 1 1/2" lg x 3/4" dia x 39/64" h; mts by two 0.156" dia holes spaced 0.437" c to c; stamped R-102, R-103; CNA part/dwg SA:6508; Mfr code 1, type SA:6508	Terminal board
TB-112	Shop manufacture	Terminal Board: 2 silver plated brass solder post term; phenolic nylon fabric board; 1 1/2" lg x 11/16" wd x 39/64" h; mts by two 0.156" dia holes spaced 0.500" c to c; stamped C-108; CNA part/dwg SA:7532; Mfr code 1, type SA:7532	Terminal board
TB-113	Shop manufacture	Terminal Board: 6 silver plated brass solder post term; phenolic nylon fabric board; 1 1/2" lg x 1 3/16" wd x 39/64" h; mts by two 0.156" dia holes spaced 0.500" c to c; stamped R-107, R-106, C-124; CNA part/dwg SA:8831; Mfr code 1, type SA:8831	Terminal board
TB-114	Shop manufacture	Terminal Board: 16 silver plated brass solder post term; phenolic nylon fabric board; 2 13/16" lg x 1 1/2" wd x 39/64" h; mts by two 0.156" dia holes spaced 2.00 c to c; stamped C-132, R-109, R-108, R-111, R-112, R-168, R-167, R-163; CNA part/dwg SA:8833; Mfr code 1, type SA:8833	Terminal board
TB-115	Shop manufacture	Terminal Board: 7 silver plated brass solder post term; phenolic nylon fabric board; 2 1/8" lg x 2 1/16" wd x 39/64" h; mts by two 0.156" dia holes spaced 1.437" c to c, stamped R-105, R-104, R-129; CNA part/dwg SA:8835; Mfr code 1, type SA:8835	Terminal board
TB-116	Shop manufacture	Terminal Board: 5 silver plated brass solder post term; phenolic nylon fabric board; 4 5/16" lg x 5/8" wd x 39/64" h; mts by two 0.156" dia holes spaced 3.562" c to c; stamped C-117, C-118; CNA part/dwg SA:8837; Mfr code 1, type SA:8837	Terminal board
TB-117	Shop manufacture	Terminal Board: 6 silver plated brass solder post term; phenolic nylon fabric board; 1 1/4" lg x 1" wd x 39/64" h; mts by two 0.156" dia holes spaced 11/32" c to c; stamped C-149, R-160, R-162; CNA part/dwg SA:8845; Mfr code 1, type SA:8845	Terminal board

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		TERMINAL BOARDS (CONT'D)	
TB-118	Shop manufacture	Terminal Board: 10 silver plated brass solder post term; phenolic nylon fabric board; 2 1/16" lg x 1 1/2" wd x 39/64" h; mts by two 0.156" dia holes spaced 1.187" c to c; stamped R-133, C-169, R-132, C-152, C-151; CNA part/dwg SA:8847; Mfr code 1, type SA:8847	Terminal board
TB-119	Shop manufacture	Terminal Board: two cad plated brass screw type term on front and two cad plated brass solder lug term on rear; phenolic nylon fabric board 2" lg x 7/8" wd x 0.855" d including term; "PHONO" stamped under left front screw type term; "GND" stamped under right front screw term; CNA part/dwg SA:9755; Mfr code 1, type SA:9755	Audio input panel on rear of chassis
		SOCKETS	
XF-101	N17-F-74267-5075	Fuseholder: includes cap; extractor post type; 250 volt, 15 amp rating; accommodates one cartridge type fuse 1 1/4" lg x 1/4" dia; bakelite body, nickel plated brass contacts, friction type; 2 9/64" lg x 11/16" dia; 2 7/32" lg w/fuse inserted; 2 solder lug term; single hole panel mtd by 1/2-24 thd body w/flat; requires 1/2" dia mtg hole w/0.468" flat; item furnished w/one 21/32" OD x 1/2" ID x 1/16" thk neoprene washer, one stainless steel internal tooth lockwasher and one punched brass nickel plated w/iridite dip hex nut 11/16" hex x 1/2-24 thd x 3/32" thk; cap marked "FUSE" w/arrow pointing counterclockwise; bayonet mtd twist locking cap; inner solder lug band stamped "HKP 15A.250V"; end solder lug term may be rotated a total of 360°; CNA part/dwg H477-1; Mfr code 324, type HKP; includes XF-101A, XF-101B	F-101 holder and cap
XF-101A	For reference only	Fuseholder: w/o cap; extractor post type; 250 volt, 15 amp rating; accommodates one cartridge type fuse, 1 1/4" lg x 1/4" dia; molded bakelite body; nickel plated brass contacts; friction type; 1 7/8" lg x 11/16" dia; 2 solder lug term; single hole panel mtd by 1/2-24 thd body w/flat; requires 1/2" dia mtg hole w/0.468" flat; item furnished with one 21/32" OD x 1/2" ID x 1/16" thk neoprene washer, one stainless steel internal tooth lock washer and one punched brass nickel plated w/iridite dip hex nut 11/16" hex w/1/2-24 thd and 3/32" thk; accommodates bayonet type twist locking cap; inner solder lug band stamped "HKP 15A.250V." end solder lug term may be rotated a total of 360°; CNA part/dwg H477-2; Mfr code 324; part of XF-101	F-101 holder (w/o cap)

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		SOCKETS (CONT'D)	
XF-101B	For reference only	Cap, Fuseholder: molded bakelite and nickel plated brass; 37/64" lg x 11/16" dia; bayonet type twist locking mtg; marked "FUSE" w/white fill letters on face w/arrow pointing counter clockwise; CNA part/dwg H477-3; Mfr code 324; part of XF-101	F-101 fuse-holder cap
XF-102		Same as XF-101; includes XF-102A, XF-102B	F-102 fuse-holder and cap
XF-102A		Same as XF-101A; part of XF-102	F-102 fuse-holder (w/o cap)
XF-102B		Same as XF-101B; part of XF-102	F-102 fuse-holder cap
XF-103		Same as XF-101; includes XF-103A, XF-103B	Spare fuse-holder and cap
XF-103A		Same as XF-101A; part of XF-103	Spare fuse-holder (w/o cap)
XF-103B		Same as XF-101B; part of XF-103	Spare fuse-holder cap
XF-104		Same as XF-101; includes XF-104A, XF-104B	F-104 fuse-holder and cap
XF-104A		Same as XF-101A; part of XF-104	F-104 fuse-holder (w/o cap)
XF-104B		Same as XF-101B; part of XF-104	F-104 fuse-holder cap
XI-101	Low failure item – if required requisition from ESO referencing NavShips 900,180a	Lampholder: for miniature bayonet base lamp; 1" lg x 15/32" wd x 15/16" h; metal shell body; mtg bracket mtd at end of socket with 6-32 thd screw silver soldered to bracket; metal parts plated to withstand 200 hour salt spray test in accordance with AN-QQ-S-91 spec; insulating washers of paper base material treated for moisture and fungus resistance; CNA part/dwg T226-1; Mfr code 317	Dial light socket
XI-102		Same as XI-101	Dial light socket

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		SOCKETS (CONT'D)	
XV-101	Low failure item – if required requisition from ESO referencing NavShips 900,180a	Socket, Electron Tube: 5 axial, 2 radial term; under chassis wafer mtg; two 0.125" dia mtg holes spaced 0.875" c to c; oval ceramic body 1.144" lg x 0.750" wd x 0.320" h excl term; silver plated beryllium copper contacts; center shield 0.167" ID; no shock shield base; CNA part/dwg SB:2323; Mfr code 1, type SB:2323	V-101 socket
XV-102	N16-S-62603-6461	Socket, Electron Tube: 7 miniature axial contacts; under chassis wafer mtg; two 1/8" dia mtg holes spaced 7/8" c to c; oval ceramic body 1.144" lg x 0.750" wd x 0.320" h excl term; center shield 0.167" ID; no shock shield base; marked CNA-491842; CNA part/dwg SA:4916-2; Mfr code 1, type XOAC-7	V-102 socket
XV-103	N16-S-64063-6456	Socket, Electron Tube: 9 miniature axial contacts; under chassis wafer mtg; two 1/8" dia mtg holes on 1 1/8" mtg/c; oval ceramic body 1.438" lg x 55/64" wd x 0.393" h excl term; silver plated beryllium copper contacts; center shield 0.167" ID; no metal shock shield base; marked "CNA-491844"; CNA part/dwg SA:4927-2; Mfr code 1, type SA:4927-2	V-103 socket
XV-104		Same as XV-102	V-104 socket
XV-105		Same as XV-102	V-105 socket
XV-106		Same as XV-102	V-106 socket
XV-107		Same as XV-103 except part of Z-104	V-107 socket
XV-108		Same as XV-102	V-108 socket
XV-109		Same as XV-103	V-109 socket
XV-110		Same as XV-102	V-110 socket
XV-111		Same as XV-103	V-111 socket
XV-112		Same as XV-103	V-112 socket
XV-113	N16-S-63517-6441	Socket, Electron Tube: 8 contacts; under chassis wafer mtg; two 0.152" dia mtg holes spaced 1 1/2" c to c; oval shape; 1.875" lg x 1 1/2" wd x 3/8" h excl contacts; silver plated phos bronze contacts; ceramic body w/cad plated brass mtg plate; stamped "CNA-491066"; CNA part/dwg SA:2641; Mfr code 1, type SA:2641	V-113 socket

TABLE 8–4. TABLE OF REPLACEABLE PARTS

REF. DESIG.	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
		SOCKETS (CONT'D)	
XV-114	For reference only	Socket, Electron Tube: molded black phenolic body; tinned brass contacts; 13/16" lg x 1 1/8" dia excl wire leads; six contacts; contacts no. 5 and no. 6 connected internally; contacts no. 1 and no. 6 0.156" dia; remainder of contacts 0.125" dia; 5 color coded leads of no. 22 insulated wire; lead from contact no. 1 brown, 9" lg; no. 2 orange, 10" lg, no. 3 green, 10 1/2" lg; no. 4 blue, 7 1/2" lg; no. 5 no lead; no. 6 black, 10" lg; CNA part/dwg Q713-1; Mfr code 127	V-114 socket
XV-115		Same as XV-102	V-115 socket

TABLE 8–5. MAINTENANCE PARTS KIT

KEY SYMBOL DESIGNATION	QUANTITY
T-101	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	1
T-112	1
T-113	1
T-114	1
Z-101	1
Z-102	1
Z-103	1
Z-105	1
XV-102	1
XV-103	1
XV-113	1
L-107	1

TABLE 8–6. CROSS REFERENCE PARTS LIST

JAN DESIGNATIONS	KEY SYMBOL
AN3102-14S-7P	J-102
AN3102A-14S-2P	J-104
AN3106-14S-7S	P-102
AN3106B-14S-2S	P-104
CC21CH050C	C-149
CC21CH100C	C-107
CC21UJ180J	C-119
CE31C350Q	C-157
CE32C350Q	C-166
CE63B250F	C-160
CM20D201J	C-151
CM20D271J	C-108
CM20D471G	C-117
CM20E181J	C-101
CM20F471G	C136
CM25E560K	C-125
CM30D112G	C-118
CM35B103K	C-102
CM35B562K	C-158
CM35D302G	C-120
CM35D751J	C-154
CM35E512G	C-122
CP53B2EF254K	C-138
CP53B5EF104V	C-111
CP53B6EF104L	C-134
CT1B100	C-116
CV11A070	C-103
CV11A250	C-104
RA20A1RJ502AK	R-120
RA20A2RD500AK	R-158
RA20A2RD502CK	R-166
RC21BF102K	R-163
RC21BF103K	R-161
RC21BF104K	R-128
RC21BF105K	R-124
RC21BF151K	R-115
RC21BF152K	R-147
RC21BF193J	R-164
RC21BF221K	R-107
RC21BF222K	R-162
RC21BF223K	R-103
RC21BF224K	R-125
RC21BF225K	R-138
RC21BF333K	R-160
RC21BF471K	R-112
RC21BF472J	R-159
RC21BF472K	R-111
RC21BF473K	R-106

JAN DESIGNATIONS	KEY SYMBOL
RC21BF474K	R-101
RC21BF680K	R-102
RC21BF681K	R-113
RC21BF824K	R-127
RC30BF332K	R-133
RC42GF221K	R-156
RC42GF331J	R-135
RC42GF561J	R-136
RC42GF681K	R-104
RC42GF682J	R-118
RC42GF683J	R-154
RU4B3R9K	R-148
RV2AURJ504D	R-140
ST12D	S-104
ST22K	S-105A-B
UG-21D/U	P-101
UG-58A/U	J-101
OB2	V-115
5Y3WGTA	V-113
6BA7	V-103
6E5	V-114
5670	V-109
5686	V-111
5726	V-106
5749	V-101
5814	V-107
6135	V-102

STANDARD NAVY STOCK NO.	KEY SYMBOL
F16-Q-123890-100	101-199
F16-Q-123890-200	AN/URR-22
G17-F-16302-100	F-101
G17-L-6297	I-101
N16-C-15624-4666	C-149
N16-C-15912-4671	C-107
N16-C-16053-1248	C-119
N16-C-19786-3791	C-160
N16-C-21943-1560	C-166
N16-C-27766-8087	C-125
N16-C-29265-3006	C-151
N16-C-29608-2206	C-108
N16-C-30104-2326	C-117
N16-C-30663-3292	C-154

STANDARD NAVY STOCK NO.	KEY SYMBOL
N16-C-31185-6814	C-118
N16-C-32715-6063	C-122
N16-C-32831-3740	C-158
N16-C-33622-5588	C-102
N16-C-46347-3081	C-138
N16-C-53192-8189	C-134
N16-C-54460-4481	C-111
N16-C-58836-5280	C-112
N16-C-60528-2535	C-116
N16-C-63900-6761	C-103
N16-C-64036-4565	C-104
N16-C-99999-0998	C-150
N16-C-99999-0999	C-109A
N16-C-99999-1000	C-109B-C
N16-F-99999-0094	Z-105
N16-K-700310-912	E-133
N16-L-157001-120	O-146
N16-L-157001-121	O-145
N16-R-49662-511	R-156
N16-R-49769-0971	R-112
N16-R-50067-0231	R-133
N16-R-50552-142	R-154
N16-R-50975-0971	R-124
N16-S-34516-2337	E-119
N16-S-34599-7750	E-126
N16-S-62603-6461	XV-102
N16-S-63517-6441	XV-113
N16-S-64063-6456	XV-103
N16-T-55738-5	V-113
N16-T-56211-10	V-103
N16-T-56255	V-114
N16-T-75670	V-109
N16-T-75686	V-111
N16-T-75726	V-106
N16-T-75749	V-101
N16-T-75814	V-107
N17-C-70328-1516	P-102
N17-C-72604-1338	J-102
N17-C-72610-5434	J-104
N17-C-99999-0997	J-101
N17-C-781336-251	O-166
N17-F-74267-5075	XF-101
N17-J-39248-4418	J-103
N17-L-99999-0090	LS-101
N17-R-650211-112	O-168
N17-S-46844-5801	O-148
N17-S-46844-5806	O-147
N17-S-72018-7719	S-104

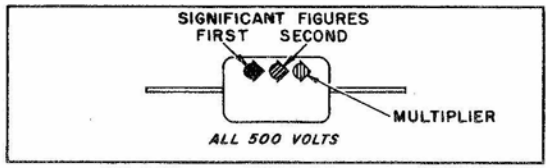
TABLE 8–6. CROSS REFERENCE PARTS LIST (CONT'D)

STANDARD NAVY STOCK NO.	KEY SYMBOL
N17-S-73082-9028	S-105A-B
N17-S-99999-0435	S-101B
N17-S-99999-0436	S-101A
N17-S-99999-0437	S-101C
N17-S-99999-0438	S-103
N17-S-99999-0439	S-102B
N17-S-99999-0440	S-101D
N17-S-99999-0441	S-102A
N17-S-99999-0442	S-101E
N17-S-99999-0443	S-102C
N17-T-67635-7858	Z-102
N17-T-67635-7912	Z-103
N17-T-73703-1406	T-101
N17-T-82166-3997	T-103
N17-T-82166-4052	T-107
N17-T-82181-8764	T-108
N17-T-82181-8826	T-104
N17-T-82187-4018	T-109
N17-T-82187-4151	T-105
N17-T-82202-8815	T-106
N17-T-82202-8826	T-110
N17-T-99999-0375	T-115
N17-T-99999-0376	T-113
N17-T-99999-0377	T-112
N17-T-99999-0378	T-111
N17-T-99999-0379	T-102
N17-T-99999-0380	Z-101
N17-T-99999-0381	T-114
N41-W-2460-10	H-101
N42-R-155-2103	O-164
N42-R-56578-2203	O-150

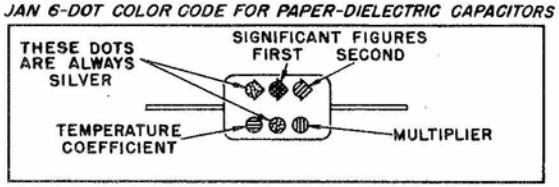
TABLE 8-7. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

CAPACITOR COLOR CODES

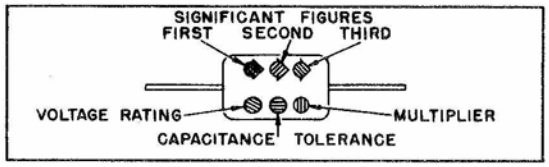
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



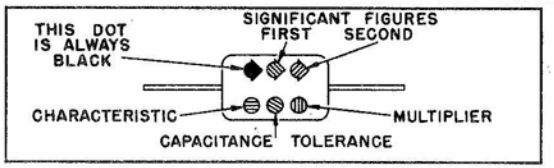
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



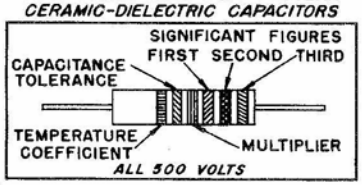
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

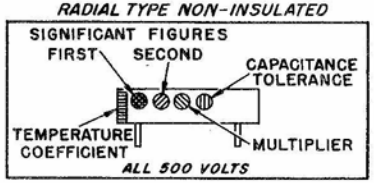


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

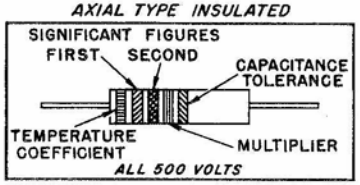


JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



AXIAL TYPE INSULATED



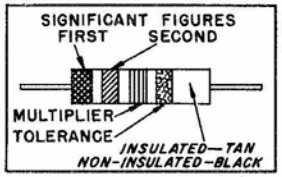
RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY - NAVY

RESISTORS		CAPACITORS						
				MULTIPLIER				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1,000	3	ORANGE	1,000	1,000	1,000	300	D
	10,000	4	YELLOW	10,000			400	E
	100,000	5	GREEN	100,000			500	F
	1,000,000	6	BLUE	1,000,000			600	G
	10,000,000	7	VIOLET	10,000,000			700	
	100,000,000	8	GREY	100,000,000		0.01	800	
	1,000,000,000	9	WHITE	1,000,000,000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

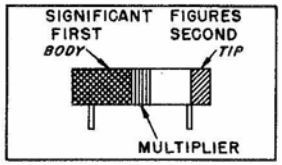
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

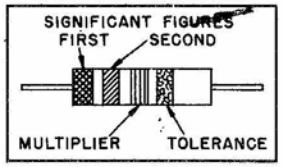


RADIAL TYPE



JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED

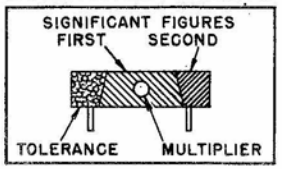


TABLE 8–8. LIST OF MANUFACTURERS

CODE NO.	MFR'S PREFIX	NAME	ADDRESS
1	CNA	National Company, Inc.	61 Sherman Street, Malden, Mass.
3	CHH	Arrow, Hart and Hegeman Co.	102 Hawthorne St., Hartford, Conn.
8	CMG	Cinch Mfg. Co.	2339 W. Van Buren St., Chicago, Ill.
13	CSF	Sprague Electric Co.	North Adams, Mass.
14	CAW	Aerovox Corp.	742 Belleville Ave., New Bedford, Mass.
16		Continental Rubber Works	Erie, Pa.
18	CG	General Electric Co.(Lamp Dept.)	Nela Park, Cleveland, Ohio
24		Humason Mfg. Co.	100 Peese Ave., Forestville, Conn.
39		Nice Ball Bearing Co.	Philadelphia, Pa.
44	CFW	F.W. Sickles Co.	Springfield, Mass.
61	CUF	United Carr Fastener Corp.	450 Main St., Cambridge, Mass.
63	CIR	International Resistance Co.	1101 Terminal Commerce Bldg., Phila, Pa.
83	CER	Erie Resistor Co.	640 West 12th St., Erie, Pa.
88		Insulating Fabricators, Inc.	150 Union Ave., East Rutherford, N.J.
97		National Lockwasher Co.	65 Johnson St., Newark, N.J.
111	COC	Oak Mfg. Co.	1260 N. Clybourne Ave., Chicago, Ill.
123	CUT	United Transformer Corp.	148 Varick St., New York, N.Y.
124		Boston Pattern Works	Norwood, Mass.
127	CYA	Alden Products Co.	117 North Main St., Brockton, Mass.
128	CPH	American Phenolic Corp.	1830 54th Ave., Chicago, Ill.
130	CEJ	E.F. Johnson Co.	Waseca, Minn.
136		Stanley Works	195 Lake Ave., New Britain, Conn.
237		New Products Corp.	450 N. Shore Drive, Benton Harbor, Mich.
242	CMF	Electro Motive Mfg. Co.	103 Lafayette St., New York, N.Y.
268		Bearing Specialities Co.	665 Beacon St., Boston, Mass.
273	CBZ	Allen Bradley Co.	118 W. Greenfield Ave., Milwaukee, Wis.
284	CRK	Radio Condenser Co.	Camden, N.J.
296	CAIS	Birtcher Corp.	5087 Huntington Drive, Los Angeles, Calif.
307	CTC	Chicago Telephone Supply Co.	Bearsley Ave., Elkhart, Ind.
317	CAYZ	Dial Light Corp. of America	60 Stewart Ave., Brooklyn, N.Y.
324	CFA	Bussman Mfg. Co.	2538 W. University St., St. Louis, Mo.
339	CED	Cannon Electric Development Co.	3291 Humboldt St., Los Angeles, Calif.
345		Spools, Inc.	283 Allens Ave., Providence, R.I.
398	CAYU	Barry Corp.	179 Sidney St., Cambridge, Mass.
406	CTB	Bristol Co.	117 Bristol Road, Waterbury, Conn.
416		Croname, Inc.	1765 Grace St., Chicago, Ill.
512		Tempco Mfg. Co.	3029 Hiawatha Ave., Minneapolis, Minn.
570		United Screw Machine Products	Draper St., Worcester, Mass.
662		Arch Gear Works	90 Holmes St., North Quincy, Mass.
1066	CAHM	Quam-Nichols Co.	33rd Place and Cottage Grove Ave., Chicago, Ill.
1150	CBIM	Switchcraft Inc.	1328 North Halsted St., Chicago, Ill.
1316		H.P.L. Co.	2003 East 65th St., Cleveland, Ohio
1396	CBYY	North Shore Research Corp.	Lynn, Mass.
1398		Williams Machine Co.	263 Broadway, Cambridge, Mass.
1400		Sealube Corp.	14 Valley St., Wakefield, Mass.
1417		Hurley Mfg. Co.	North and Center Streets, Collinsville, Conn.

INDEX