INSTRUCTION BOOK

FOR

NAVY MODEL RBZ
RADIO RECEIVING EQUIPMENT
FREQUENCY RANGE
2 to 5.8 Mcs.

5-13- MC

Manufactured for

U. S. NAVY DEPT. - BUREAU OF SHIPS

by

EMERSON RADIO & PHONOGRAPH CORP.
New York City, N. Y.

CONTRACT NO. NXss-15891

IMPORTANT WARNING

Remove rundown "A" and "B" batteries from battery power unit promptly.

If equipment is to be left unused for more than a few days, all batteries should be removed from the battery unit.

INSTRUCTIONS TO OPERATING PERSONNEL REGARDING REPORTS OF FAILURES

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

Pertinent dates affecting replacements under the guarantee, also space for pertinent dates to be filled in by Navy personnel and instructions shall be included as follows:

(a) Contract No. NXss-15891
Serial Number of equipment.....
Date of acceptance by the Navy.....
Date of delivery to contract destination.....
Date of completion of installation.....
Date placed in service.....

(b) Blank spaces in the book shall be filled in at time of installation. Operating personnel shall also mark the "date placed in service" below the nameplate on the equipment.

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

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

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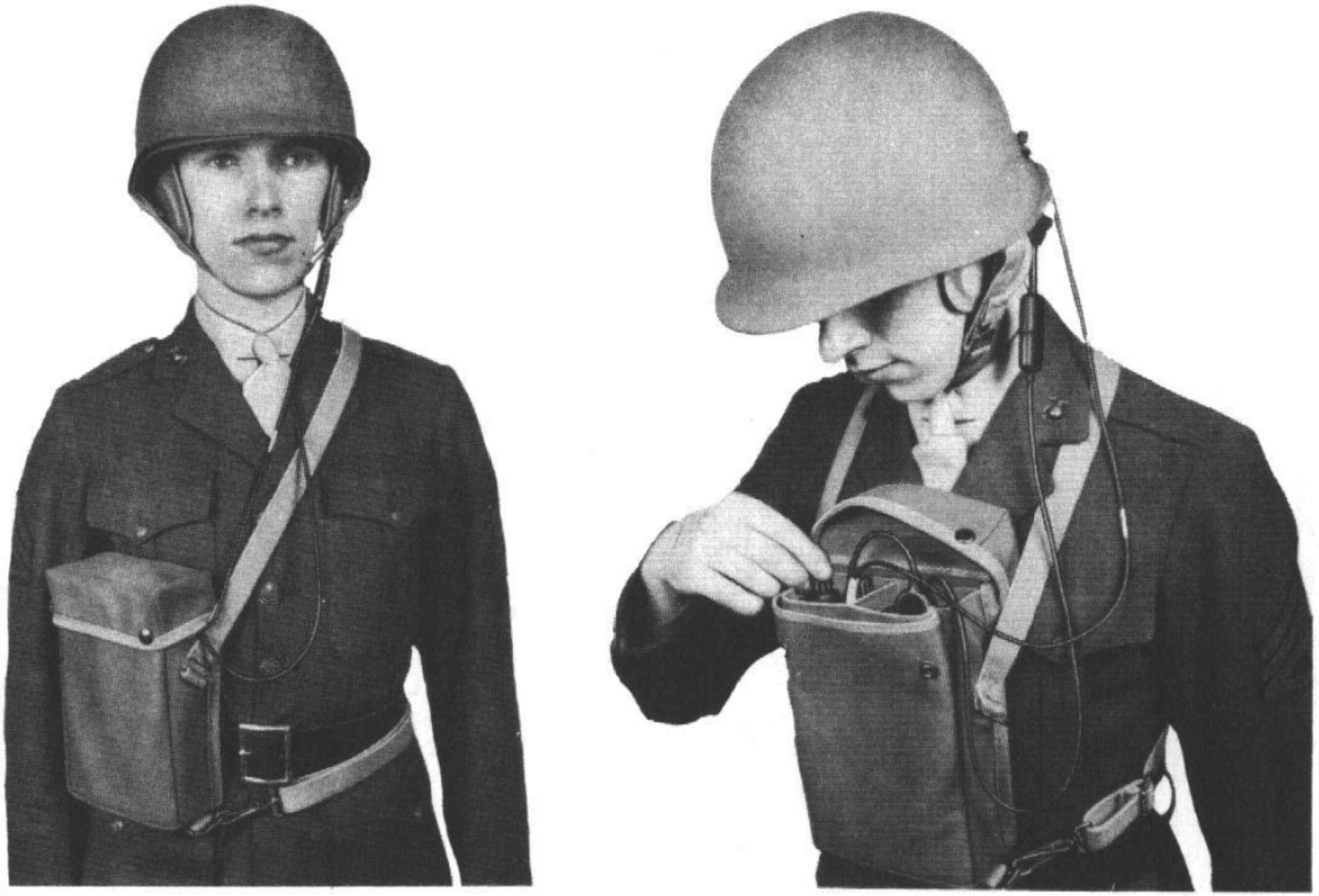


Figure 1—Model RBZ Radio Receiving Equipment (in use)

INSTRUCTION BOOK
for
NAVY MODEL RBZ
RADIO RECEIVING EQUIPMENT

I. INTRODUCTION

Intent of Design:

1-1. Model RBZ radio receiving equipment is designed to serve as a portable radio receiver intended to be carried primarily in a special canvas vest carrying holder, Type C__ -10203. Antenna lead Type CEX-49238, consists of a flexible cable, rubber shielded, with a clamp on one end for fastening to the standard metal helmet and a pin terminal on the other for connecting with the radio set. Headset, Type CEX-49214, which is mounted in a suitable canvas skull cap, Type C__-10204, is provided for use under the helmet. The equipment is light and compact and derives all operating power from self-contained dry batteries which are carried in one of the two identical and interchangeable water-tight plastic cases, Type CEX-10172, making up the equipment proper.

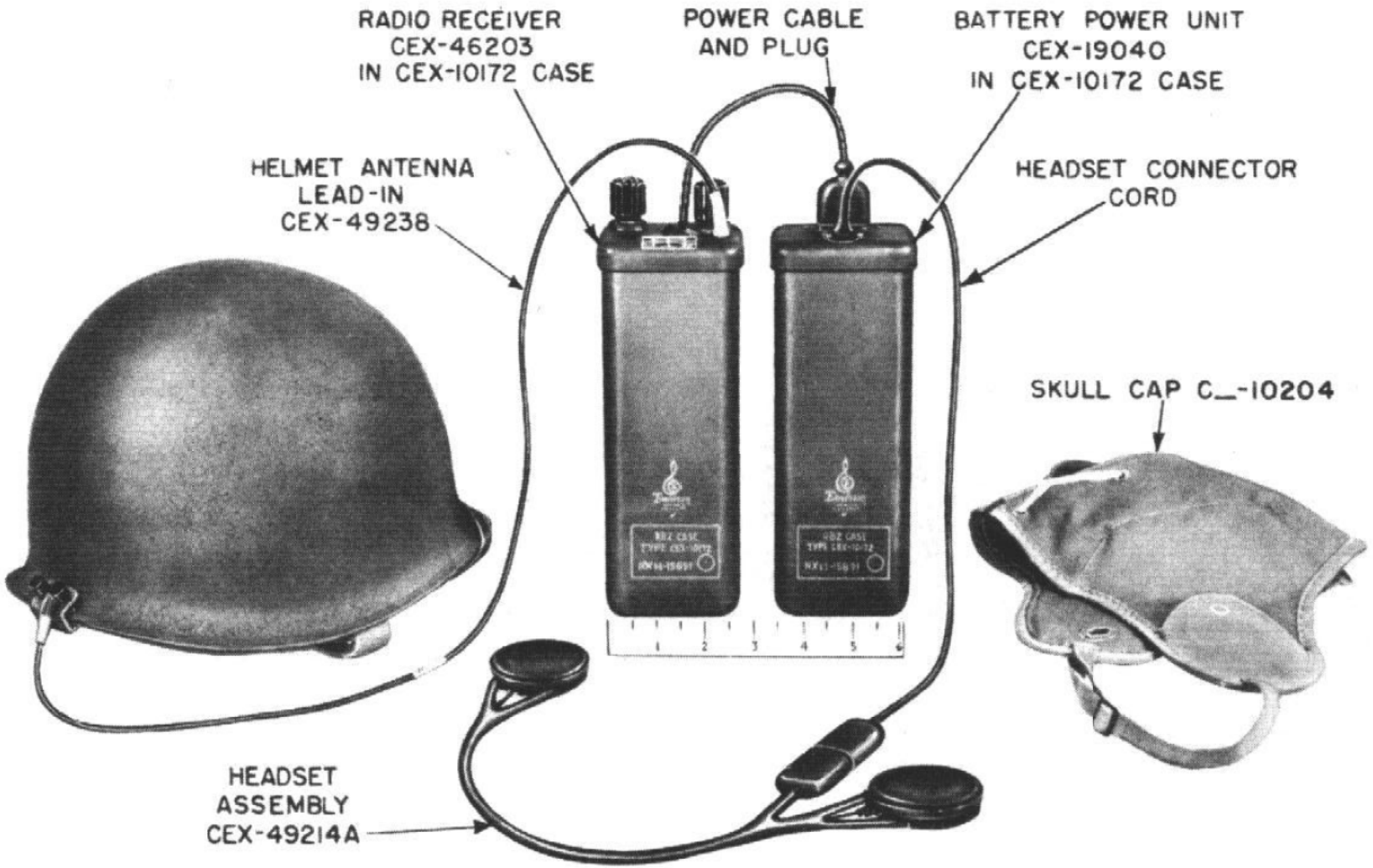


Figure 2—Major Units of Model RBZ Radio Receiving Equipment

List of Units:

1-2. Model RBZ radio receiving equipment consists of the following items:

2-Type CEX-10172 cases for radio receiver and battery power unit.

1-Type CEX-46203 radio receiver; frequency range 2 to 5.8 Mcs.; including:

1-Set of Vacuum tubes consisting of:
1-1T4—r.f. amplifier
1-1T4—i.f. amplifier
1-1R5—converter (oscillator-mixer)
1-1S5—diode detector, A.V.C. and first audio amplifier.
1-1L4—second audio, power amplifier.

1-Type CEX-19040 battery power unit, including:

2-Type C__-19031—1.5 volt filament dry batteries.
1-Type C__-19032—67.5 volt plate dry battery.

1-Type CEX-49214 headset assembly, consisting of:

2-Type C__-49215 headphone receivers.
1-Type C__-49216 headset connector cord.

1-Type CEX-49238 helmet antenna lead-in.

1-Type C__-10204 skull cap.

1-Type C__-10203 canvas carrying case.

Description:

1-3. The pocket radio receiving equipment Model RBZ consists of two major units housed in interchangeable light-weight plastic cases with panel covers attached to chassis and removable from the cases by release of the captivated knurled thumb screws in the recesses on the bottoms of the cases. A water-tight seal is maintained between the open end of the case and the panel cover by pressing the case against the soft rubber gasket which forms part of the panel cover. Pressure is exerted by tightening the knurled thumbscrew. One case contains the radio receiver Type CEX-46203. A second identical case contains the battery power unit Type CEX-19040. The battery power unit contains the three (3) dry batteries, two (2) round 1.5 volt "A" batteries and one (1) 67.5 volt "B" battery. *The "A" batteries will run down first and need replacement as they have approximately one-fifth (⅕) the life of the "B" battery.* The "A" batteries supply the filament voltage and the "B" battery the plate voltage necessary for operation of Type CEX-46203 Radio Receiver. All operating controls are located upon the panel cover of Type CEX-46203 Radio Receiver. The integral ON-OFF switch and GAIN control are mounted on the same shaft and operated by the same knob. Turning the white line knob (GAIN control) clockwise away from OFF switches the set on. Further turning of the knob in the direction marked GAIN increases the volume. The press-to-tune knob on the left hand side of the panel cover controls the permeability tuning and rotation of the dial which indicates the proper frequency. This TUNING control is provided with a clutch so that the tuning mechanism will be engaged only when the knob is pressed downward on its shaft. This has been done to prevent accidental disturbance of the frequency

setting. Rubber insulated cables terminating in suitable plugs project from the radio receiver and battery power unit. The plugs carried upon these cables provide for interconnection of the receiver to the battery power unit and of the battery power unit to the headset in such manner that proper connection must be made.

1-4. The helmet antenna lead-in, Type CEX-49238 consists of a 27" rubber covered wire, one end of which is terminated in a captivated locking screw clamp for secure connection to the helmet. A suitable pin terminal is provided on the other end for connection to the radio receiver Type CEX-46203.

1-5. The headset assembly, Type CEX-49214, consists of two (2) Type C__-49215 headphone receivers associated with one Type C__-49216 headset connector cord and breakaway connector. A cord projects from the battery power unit and is terminated in a breakaway connector matching that upon the headset cord. The headset assembly is fitted into the skull cáp Type C__-10204 which is worn under the standard metal helmet.

List of Components with Weights and Dimensions:

1-6. The following is a list of component items forming a part of Model RBZ Radio Receiving Equipment.

Navy Type CEX-46203 Radio Receiver Unit

Height—8″
Width—2⅞″
Thickness—1⅞″
Weight—1 lb. 14 oz. (including case Type CEX-10172).

Navy Type CEX-19040 Battery Power Unit

Height—8″
Width—2⅞″
Thickness 1⅞″
Weight—1 lb. 13 oz. (including two (2) Type 19031 and one (1) Type 19032 dry batteries, all in Type CEX-10172 case).

Navy Type CEX-49214 Headset Assembly

Diameter of Receivers—2″
Thickness of Receivers—⅛″
Length of Connector Cord—12¼″
Weight—6 oz. (with skull cap, Type C__-10204, 8 oz.)

Navy Type CEX-49238 Helmet Antenna Lead-In

Length—27″
Weight—1½ oz.

Navy Type C__-10203 Canvas Carrying Case

Weight—1 lb.

Model RBZ Radio Receiver Equipment

Total weight—5 lbs. 5½ oz.

II. DETAILED DESCRIPTION

Mechanical:

2-1. NOTE: The RBZ radio receiver and battery power supply cases are interchangeable.

Model RBZ radio receiver is contained in a plastic case, so constructed as to be water-tight at the bottom and at the upper end when sealed. The case is constructed of .062" thick plastic. The panel cover is of plastic with molded-in dial openings, control shaft and battery cable packing gland seats, antenna socket or jack and a deep recessed channel for retaining the rubber sealing gasket. The open end of the case presses against the rubber gasket making a water-tight seal when the chassis and panel cover assembly are inserted in the case. A captivated knurled thumb screw in a recess on the case bottom screws into the chassis and provides the pressure between the panel cover and the case.

2-2. Similar construction is employed for Type CEX-19040 battery power unit except that a suitable frame is attached to the inside surface of the cover. Upon this frame are mounted the necessary spring contacts for the two (2) Type C__-19031 filament batteries and the one (1) Type C__-19032 plate battery with leads terminating in the power supply plug receptacle mounted in the panel cover. The headphones connector cord is inserted through the panel cover and secured by a packing gland and retaining plate which are molded in rubber onto the end of the cable and fixed in place by three screws.

2-3. The radio receiver is built upon a heavy copper plated and water lacquer dipped chassis consisting of two (2) units fastened together by four (4) screws. The upper section is the tuning unit and is fastened to the panel cover. The tuning unit consists primarily of the three (3) permeability tuning iron core in-

ductors which are actuated by a triple threaded lead screw terminating in the "press to tune" knob. The lead screw, when rotated, drives the gear train which in turn rotates the frequency indicating dial. The dial consists of a gear on which is mounted the dial face frequency calibration using radium filled numerals of large size to permit good visibility in darkness. Also mounted on the tuning unit chassis are the integral volume control and ON-OFF switch, controlled by the same shaft and knob, audio output transformer, second i.f. transformer, three (3) ceramic trimmer condensers (adjustable through the openings in the chassis) and two terminal strips. The lower chassis or second unit includes the vacuum tubes, sockets, first i.f. transformer and the attendant capacitors and resistors. The vacuum tubes are held in their sockets by a retaining spring and bottom plate which are riveted together to form one unit. The bottom plate and spring assembly are secured to the chassis by two screws fastened into threaded studs which are screw fastened to the vacuum tube mounting chassis.

Electrical:

2-4. The circuits of Navy Type CEX-46203 radio receiver are fundamentally those of a conventional five tube permeability tuned superheterodyne receiver. The circuit consists of a stage of tuned radio frequency amplification employing Type 1T4 tube (V-1) followed by a pentagrid converter (mixer-oscillator) employing a 1R5 tube (V-2) a 1T4 pentode i.f. amplifier (V-3) a 1S5 diode detector AVC, and pentode first audio amplifier (V-4) followed by a 1L4 tube (V-5) triode connected (screen grid is connected to plate) audio power amplifier. The receiver has a frequency range of 2 to 5.8 Mcs. Tuning is accomplished by moving the iron plug cores of the ant., r.f.

and osc. coils. The carrier input signal is first amplified by the r.f. amplifier tube (V-1) and then is passed into the converter tube (V-2) which mixes the carrier with a local oscillation generated by the oscillator section of V-2. (The oscillator section employs the "Colpitts" type circuit.) The local oscillation is always 455 Kcs. above the input signal and the difference or intermediate frequency, of 455 Kcs., appears in the plate circuit of the 1R5 vacuum tube. This frequency passes through the 1st i.f. transformer (T-1) and is amplified by the i.f. amplifier tube (V-3). The 455 Kcs. intermediate frequency is then fed through the 2nd i.f. transformer (T-2) and demodulation takes place in the diode section of vacuum tube V-4. The audio component of the voltage appearing across the diode circuit resistor is amplified by the audio pentode section of vacuum tube V-4, passed through and amplified by the audio power amplifier tube V-5. The varying d.c. voltage developed across diode circuit resistor (R-6) is filtered and used as a.v.c. (automatic volume control). Automatic volume control is obtained by varying the negative bias on the r.f. amplifier (V-1), converter (V-2), and the i.f. amplifier (V-3). With strong input signals the negative bias is large and this large negative potential decreases the r.f. and i.f. gain of the receiver. With weak signals little bias is applied to the r.f. amplifier (V-1), converter (V-2), and i.f. amplifier (V-3) and the receiver operates at full gain. This conventional a.v.c. operates to maintain the output volume of the receiver relatively constant irrespective of whether a weak or a strong carrier is being received. Approximately 2 volts of negative grid bias required for audio power amplifier is obtained by filtering the d.c. potential appearing at the oscillator grid of V-2. This dispenses with the need of a grid bias battery. When receiving carriers of large amplitudes the amplification constant of the

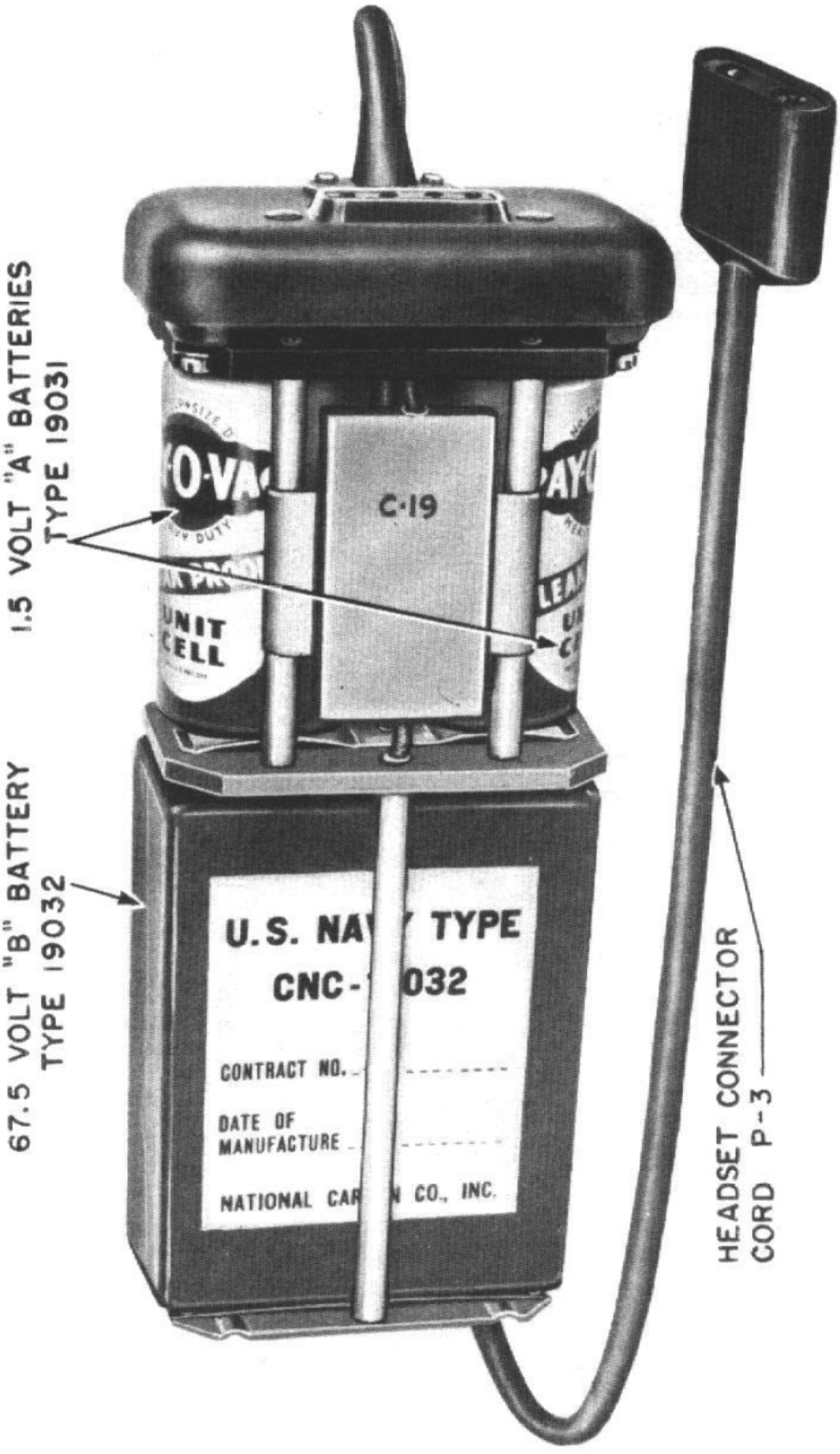


Figure 3—Battery Power Unit, Type CEX-19040 (case removed)

pentode audio section of tube V-4 is reduced to improve receiver stability. This is accomplished by applying a negative potential to the control grid of V-4 (pin No. 6) through the medium of the bleeder network R7 (4.7 megohms), R8 (either 10 megohms or 4.7 megohms). The output impedance of the receiver matches that of the headset assembly (approximately 600 ohms).

III. INSTALLATION

3-1. Unpack all units of the equipment. Examine each unit carefully. It is not desirable to remove the receiver from its case inasmuch as it is furnished in operating condition.

3-2. Install two (2) Type C__-19031 and one (1) Type C__-19032 dry batteries in Type CEX-19040 power unit as seen in Figure 3. It is *imperative* that the batteries be inserted with their tops toward the top of the case and that the centrally located metallic caps of the Type C__-19031 batteries be pressed against the contacts in the recesses of the bakelite top plate. Type C__-19032, 67.5 volt plate dry battery is inserted in the lower half of the battery power unit with the two round contacts on the top pressing against the spring contacts on the battery holder. Care should be taken that the batteries are installed properly with the contacts toward the top of the power unit and making connection with the contacts. *This is important,* otherwise, contact will not be made and the set will not operate. The battery power unit is to be inserted into one Type CEX-10172 case. Care should be taken upon insertion to see that the case seats properly upon the rubber gasket and that the knurled locking screw on the bottom of the case is *securely tightened.* A screw-driver, coin or other suitable implement should be used.

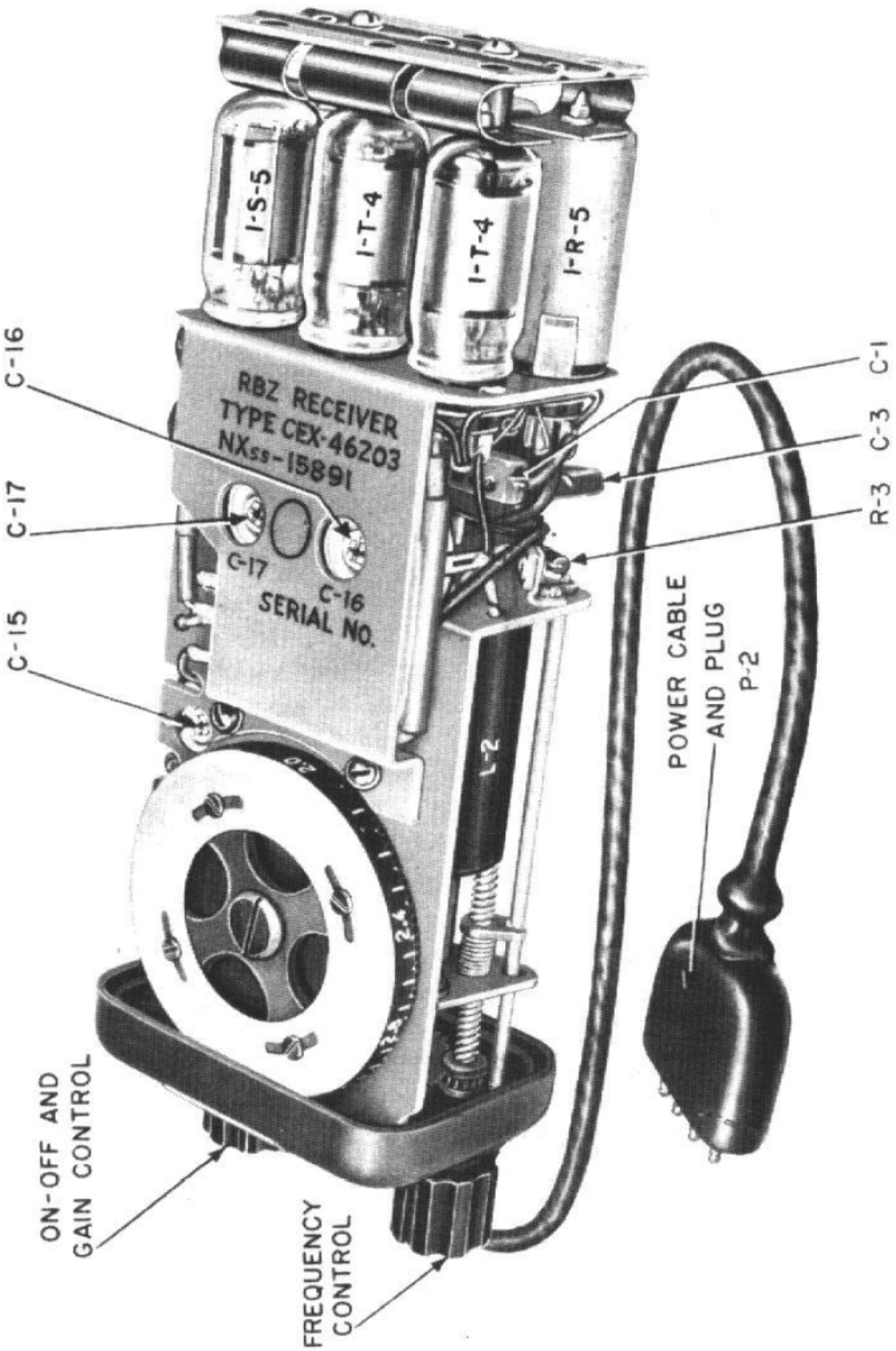


Figure 4—Radio Receiver, Type CEX-46203, top front view (case removed)

IV. OPERATION

4-1. ***Preparation for use:***

(a) Place the Radio Receiver and Battery Power Unit in the Carrying Case and wear as shown in Figure 1.

(b) Put on the skull cap containing the headphones.

(c) Clamp the antenna cord to the helmet, being sure to tighten the clamping screws as much as possible with fingers and place helmet on head.

(d) Plug the other end of the antenna lead-in into the jack receptacle on top of the set.

(e) Connect the four prong power cord plug, which is attached to the radio receiver, into the battery power unit receptacle. Press the rubber lip of the power cord plug firmly and evenly around the receptacle to insure a watertight seal.

(f) Connect the two halves of the breakaway connector, one on the headphones cord and the other on the battery power unit cable. Press the rubber lip of one of the connectors firmly and evenly around the other to insure a watertight seal.

4-2. ***To Switch set ON:***

NOTE: The GAIN control and ON-OFF switch are controlled by the same knob.

(a) Turn the white line knob (GAIN control) away from OFF in a clockwise direction until the switch clicks (about a quarter turn of the knob).

(b) Turn the knob further in the direction marked GAIN to increase the volume.

4-3. ***To TUNE the set:***

NOTE: The TUNING control is provided with a clutch so that the tuning mechanism will be engaged only when the knob is pressed downward on its shaft. This has been done to pre-

vent accidental disturbance of the frequency setting.

(a) Press the TUNING control knob in and rotate until the desired frequency is read in the dial opening or station is heard. Be sure the knob is pressed inward when tuning, otherwise the dial will not rotate and the set will not be tuned.

(b) Switch the radio set off by rotating the GAIN control knob all the way counter-clockwise when it is not in use.

V. MAINTENANCE

5-1. The dry batteries should be maintained in a fresh condition at all times. They should not be stored for more than a few days in the Type CEX-19040 battery power unit. As the current drain of the receiver is relatively low, a battery life of approximately 8-10 hours should be expected of the Type C__-19031 batteries in continuous operation and perhaps five times that amount for the Type C__-19032 battery, depending upon the decrease in receiver sensitivity which can be tolerated in operation. The battery voltage should be checked periodically, using a 1000 or higher ohm per-volt voltmeter and with the receiver turned on. Batteries should be replaced when the meter indicates less than 1.2 volts for Type C__-19031 batteries or less than 55 volts for Type C__-19032 batteries.

5-2. NOTE: Before the receiver is put into active service, fresh dry batteries should preferably be installed.

VI. SERVICING INSTRUCTIONS

General:

6-1. It is important to recognize the fact that improper operation of Model RBZ radio receiving equipment may be due to any one of a

multiplicity of causes, but that it is probable that in the majority of cases of poor operation the trouble may be traced to a simple, rather than to a complex source. It is important, therefore, that the simple causes of improper operation be examined before the more complex causes are sought.

Low sensitivity:

6-2. The causes of decreased sensitivity will ordinarily be as follows and in the order listed:

(a) *Low battery voltages* — particularly of 1.5 volt Type C__-19031 dry batteries. If sensitivity appears low, it should immediately be rechecked using new batteries of measured terminal voltage, not less than 1.4 volts for Type C__-19031 and not less than 65 volts for Type C__-19032 dry batteries, with set connected.

(b) *Deteriorated Tubes* — the second most usual cause of improper operation is deteriorated, damaged or defective tubes. This condition can most easily be checked by successively substituting new tubes, in place of the vacuum tubes in the equipment, from spare parts stock known to be in good condition.

(c) *Defective Output Transformer T3*—may be checked with an ohmmeter and should exhibit primary resistance of 1550 ohms approx. between terminals 1 and 2 and secondary resistances of either 34 or 63 ohms approx. between terminals 3 and 4. Transformer T3 should show very high resistance (substantial open circuit) between the 1-2 and 3-4 windings and between these windings and case.

(d) *Poor Contact in Breakaway Connectors* —this condition can be corrected by examination and cleaning the contact jacks and plugs making up the breakaway con-

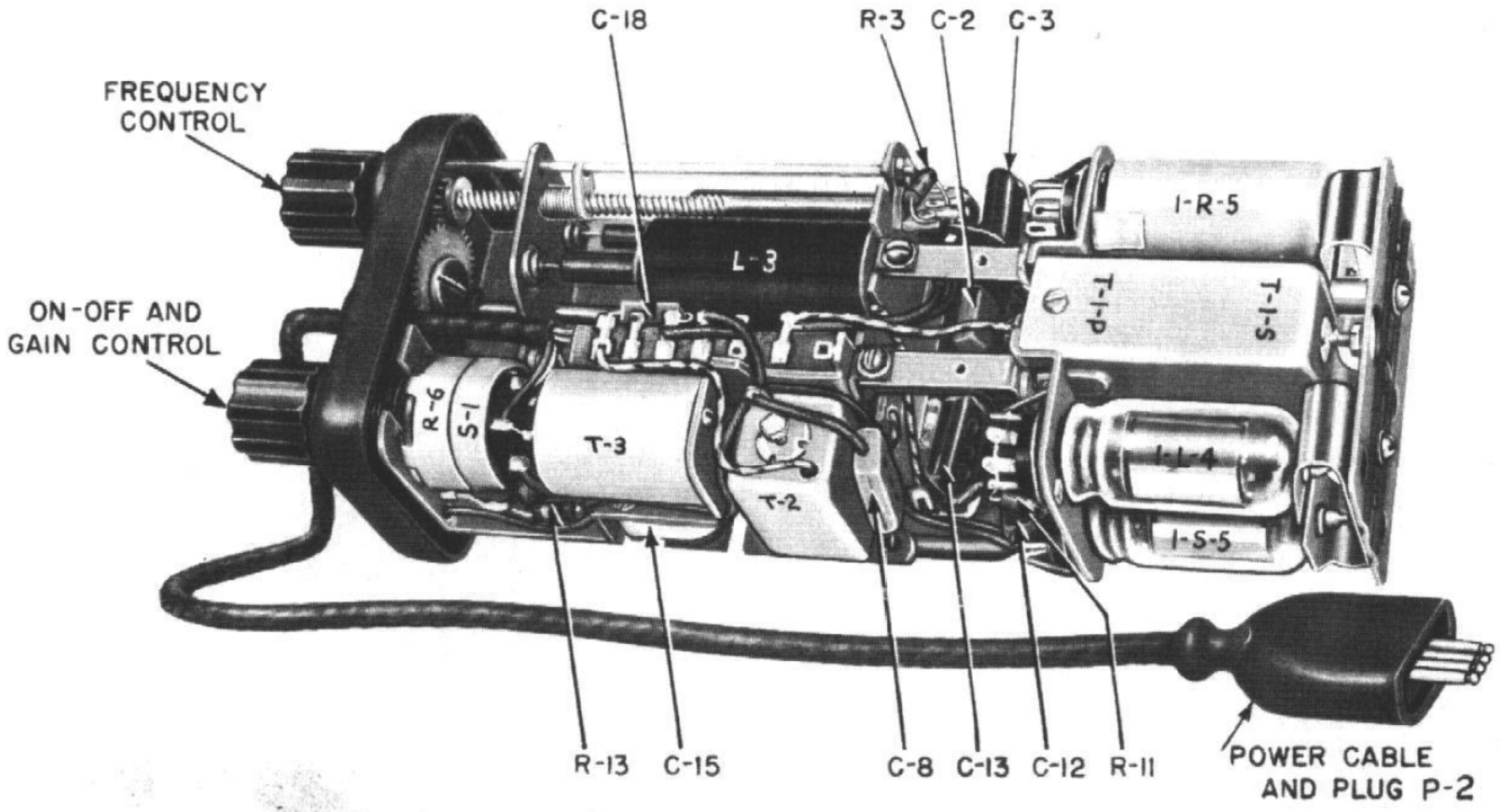


Figure 5—Radio Receiver, Type CEX-46203, bottom view (case removed)

nectors with a dry cloth, or a cloth saturated in carbon-tetrachloride.

(e) *Deteriorated Resistors* — this condition may be checked by measurement of the resistors with an ohmmeter. All resistors should check to within ± 20% of the value indicated by the standard color code thereupon and the parts list.

(f) *Open or deteriorated R.F. Coils or I.F. Transformers*—this condition can be checked with a suitable ohmmeter. The D.C. resistance of L-1 and L-2 is approximately 4 ohms and the resistance of L-3 is approximately 5 ohms. The primary and secondary resistances of the 1st I.F. transformer T-1 are approximately 22 ohms each. The primary resistance of the 2nd I.F. transformer T-2 is approximately 35 ohms and the secondary resistance approximately 27 ohms.

(g) *Deteriorated Capacitors*—capacitors can be checked with a capacity meter or more easily by checking with an ohmmeter for possible short circuits or leakage. The capacitor in the Battery Power Unit may be checked by first removing the 67.5 volt "B" battery and then applying meter leads. Do not attempt to check this condenser without first removing the "B" battery as the test meter may thus be damaged.

Poor Selectivity:

6-3. Poor selectivity may usually be traced to:
(a) Improper alignment.
(b) Defective i.f. transformers.

Blocking or Intermittent Operation:

6-4. This may be due to:
(a) Open grid circuits—this condition can be checked for by testing to determine that the circuits from ground to control grids

of V-1, V-2, V-3, V-4, and V-5 are electrically complete.

(b) Blocking may also be due to open or shorted capacitors.

Battery Current Drain:

6-5. (a) With all five tubes in position and receiving equipment operating properly, the filament circuit current drain from the two (2) 1.5 volt Type C__-19031 batteries connected in parallel should be substantially 250 ma. (0.25 amps.). Notably lower current would indicate a burned-out tube filament or a broken connection in the filament circuit. With all vacuum tubes removed from the equipment there should be no current drain from the Type C__-19031 batteries.

(b) With the receiver properly tuned and aligned, the total plate current drain from a fresh Type C__-19032 battery should be approximately 5.5 milliamperes. With the battery properly connected and all vacuum tubes removed from the circuit, the current drain from this battery should be zero.

(c) In the event that upon test for battery current, with all vacuum tubes removed from the equipment, any current drain is observed, the wiring should be checked for moisture, dirt, or short-circuits causing current leakage. Remedies are obvious.

Rubber Aging:

6-6. Spare headphone, battery and antenna cords are contained in the stock spare groups. If any of these cords deteriorate or are damaged in use, they should be replaced following instructions in para. 6-8 (g) and (h).

Alignment:

6-7. (a) *Alignment Equipment* — The equipment necessary for complete tune-up and align-

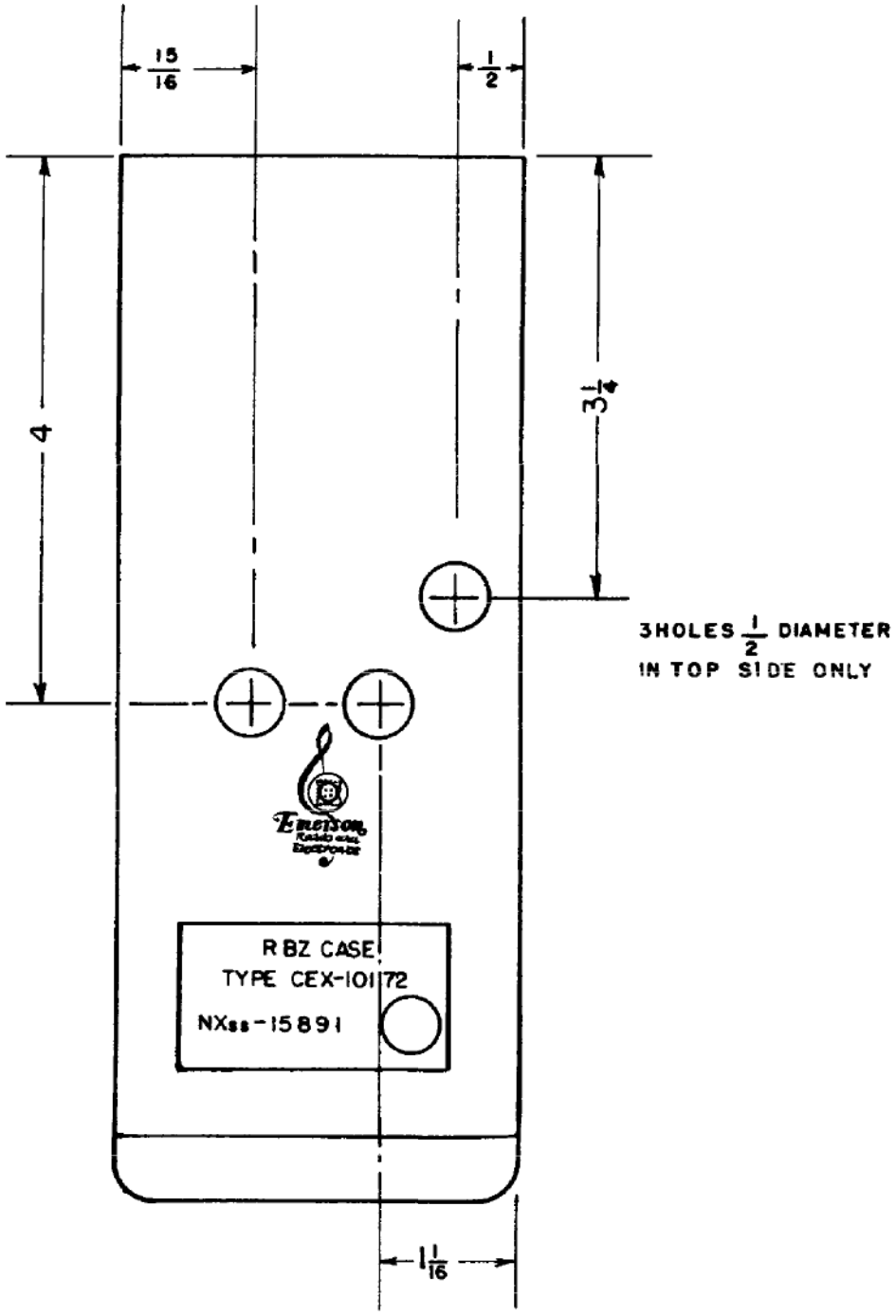


Figure 6—Dummy Case for R.F. Alignment—dimensional detail

ment of Navy Model RBZ radio receiving equipment consists of:

1. 1 reliable signal generator with output frequency of 455 Kcs. to 6,790 Kcs. modulated by 400 cycle audio note. This signal generator should have a maximum output of approximately 0.1 volt and should be equipped with an attenuator permitting attenuation of output voltage down to as low as 1 microvolt, internal impedance of generator approximately 7.5 ohms.
2. 1 output meter, suitable for connection to a 600 ohm output circuit.
3. 1 fixed paper capacitor, .1 mfd.
4. 2 screw drivers (1 fiber type for adjusting antenna trimmer C-15).
5. 1 socket wrench $\frac{3}{16}$" across flats.
6. 1-50 micro micro-farad mica condenser (dummy antenna).
7. 1 dummy alignment case with holes drilled for access to Ant. R.F. and Osc. trimmers (C-15, C-16 and C-17). See Figure 6.

(b) *Alignment Procedure*—

1. To check tuning and alignment of the equipment proceed as follows:
2. Remove Type CEX-46203 radio receiver from its case.
3. Connect the proper complement of fresh dry batteries to the receiver, utilizing Type CEX-19040 battery power unit for this purpose.
4. Connect the output meter in place of the headset to battery power unit breakaway connector.

(c) *I.F. Alignment*—

1. Remove chassis shield. Connect the external signal generator between ground (chassis) and grid terminal

(pin number 6) of vacuum tube socket of V-2. Be sure to place the .1 mfd. condenser in series with the connection between the "high" terminal of the signal generator and pin terminal number 6 of vacuum tube V-2. Switch set ON, GAIN at maximum. The receiver should have its tuning cores withdrawn from the coils (high frequency end of dial). Set the signal generator to 455 Kcs. and adjust the 1st and 2nd I.F. transformers, T-1 and T-2, for maximum output meter reading. Use a signal generator output of approximately 5,000 microvolts at the start of this adjustment decreasing it as the I.F. transformers are correctly tuned to the lowest input which will give a good readable indication upon the output meter. Complete the alignment of the I.F. transformers by readjusting and using the weakest possible signal from the signal generator.

2. The conversion efficiency of vacuum tube V-2 varies with the setting of the oscillator trimmer condenser (C-17). This in turn will affect the apparent R.F. and I.F. sensitivity of the receiver and slightly affect I.F. tuning adjustment. It is, therefore, necessary before making R.F. and I.F. sensitivity measurements to adjust the oscillator trimmer condenser. The dial should be rotated to its extreme high frequency position (inductor cores withdrawn) and the signal generator set for 5.88 Mcs. at an approximate signal input of 500 microvolts. The generator lead with its .1 mfd. series condenser is connected to pin terminal number 6 of tube V-2 and the oscillator trimmer (C-17) rotated until the

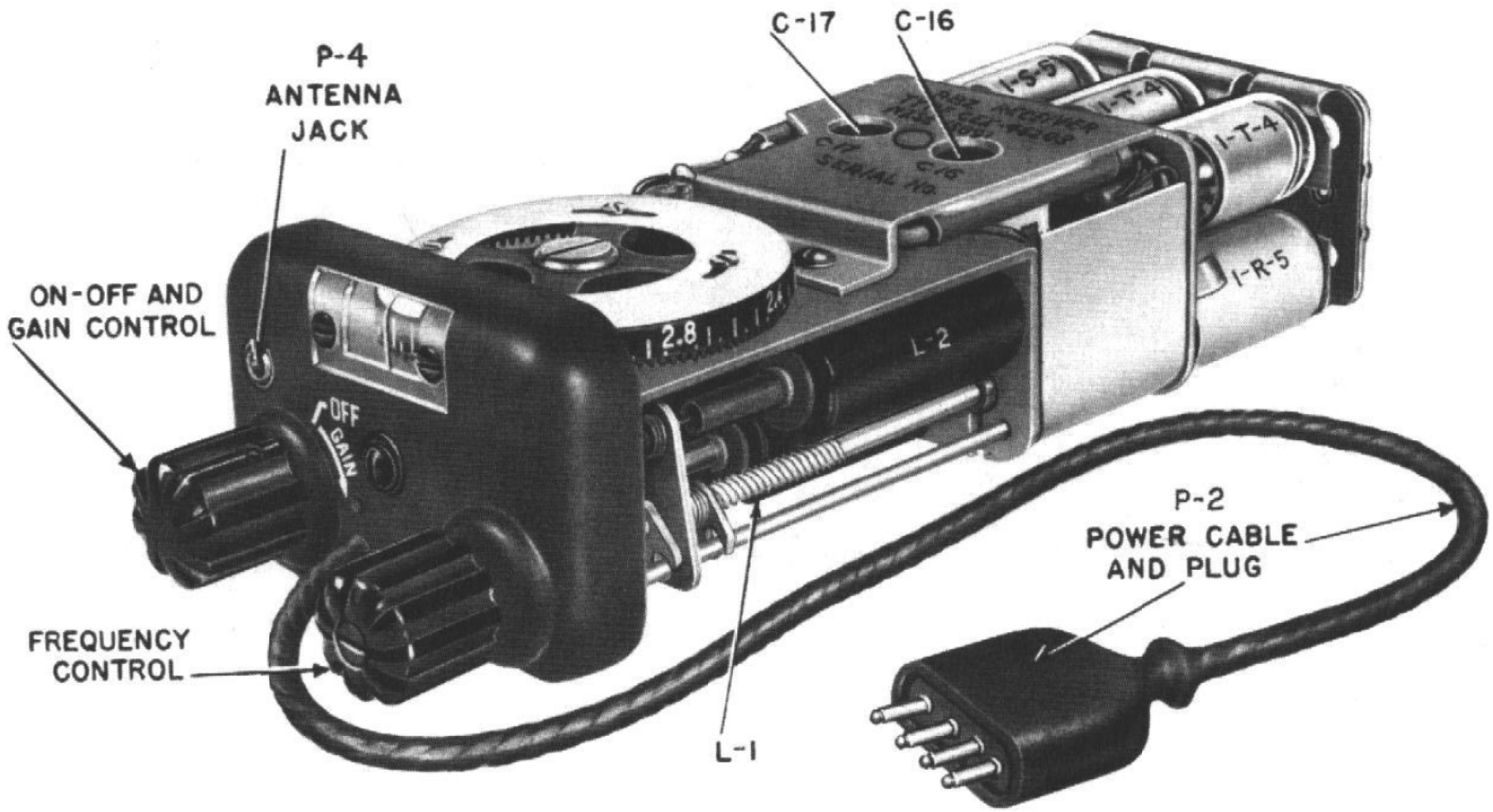


Figure 7—Radio Receiver, Type CEX-46203, top view (case removed)

correct signal is observed. The oscillator frequency of the receiver has been designed to operate at a certain frequency with the tuning cores withdrawn. Because of the heterodyne principle of this receiver, it is possible to obtain a signal at two or more different adjustments of the oscillator trimmer condenser. It is imperative, therefore, to ascertain that the *correct* frequency is selected with the oscillator trimmer. The frequency should be checked in the following manner, the oscillator trimmer is rotated until a response is observed on the output meter. The generator frequency is then changed from 5.88 megacycles to 6.79 megacycles (1000 microvolts input to No. 6 terminal of tube V-2.) If the signal is now heard, the oscillator is at the proper frequency and the trimmer is correctly adjusted. If instead, no signal is heard (at 6.79 megacycles) it may be concluded that the oscillator is at the incorrect frequency and the trimmer must therefore be readjusted. With the proper setting of the oscillator trimmer, signals will be observed at the 5.88 megacycle and also at 6.79 megacycle settings of the generator.

The I.F. sensitivity may now be measured and should be no more than 400 microvolts for an output of 1 milliwatt across a 600 ohm load (input at No. 6 terminal of V-2).

(d) *R. F. Alignment*—

NOTE: Insert set in dummy case for R.F. alignment.

1. The 50 micro-microfarad dummy antenna is connected in series with the "high" or "above ground" signal generator terminal and the receiver an-

tenna jack. Ground lead of generator connected to the knurled thumb screw in the bottom of the case and receiver dial rotated to the extreme high frequency position. A signal should be observed as the generator dial is rotated near 5.88 megacycles. The generator is set at the frequency producing the maximum receiver output for minimum generator input (generator output approximately 100 microvolts). The Antenna and R.F. trimmers (C-15 and C-16) are very carefully adjusted for maximum receiver output while the generator signal is maintained at the minimum necessary to produce 1 milliwatt output. The antenna trimmer (C-15) must be adjusted with the fiber screw-driver.

2. The generator is now set at exactly 5.88 megacycles and the oscillator trimmer is readjusted slightly for maximum output. (No more than a very slight rotation should be necessary.)
3. The antenna and R.F. trimmers are again peaked or retouched slightly for maximum output while decreasing the generator signal so as to produce no more than 1 milliwatt on the receiver output indicating meter. NOTE: In order to insure that antenna and R.F. trimmer alignment has not been made on an image frequency, the ratio of the image frequency sensitivity to the resonant frequency sensitivity should be measured as outlined in 5.
4. *Resonant Frequency Sensitivity.* The above alignment adjustments performed properly with batteries at full rated voltage and with good vacuum tubes in use should result in a receiver output of 1 milliwatt for signal gen-

erator inputs of approximately 1 to 4 microvolts when measured in accordance with the following procedure:
NOTE: This test must be made in a screen room.

(a) With the receiver dial set at 5.88 Mcs. tune the signal generator to the resonant frequency of the receiver as indicated by maximum audio response (signal generator modulated 30% at 400 c.p.s.)

(b) Beginning with a signal generator output of approximately 100 microvolts reduce the signal generator output to approximately 3 microvolts as resonance is reached.

(c) Turn signal generator modulation "OFF."

(d) Adjust receiver volume control for 0.1 milliwatt noise output.

(e) Turn signal generator modulation "ON."

(f) Adjust signal generator output to produce 1 milliwatt audio output from receiver. When this condition has been reached recheck original noise level setting by turning signal generator modulation "OFF" and observing if receiver output falls to 0.1 milliwatt noise or less.

(g) When the above operations have been performed note the signal generator output required for producing the 1 milliwatt audio output on the receiver.

5. *Image Rejection Ratio*

(a) With resonant frequency sensitivity test having been performed and the receiver conditions as specified in that test, reset the signal generator 910 Kcs. higher than the fre-

quency to which the receiver is tuned. A signal generator output setting of approximately 500 microvolts should be used in order to tune in the signal generator exactly to the image frequency.

(b) Adjust the signal generator frequency to produce peak response at the image frequency (resonant frequency + 910 Kcs.).

(c) Turn signal generator modulation "OFF".

(d) Adjust receiver volume control for 0.1 milliwatt noise output.

(e) Turn signal generator modulation "ON" (30% at 400 c.p.s.).

(f) Adjust signal generator output to produce 1 milliwatt audio output from receiver. When this condition has been reached recheck original noise level setting by turning signal generator modulation "OFF" and observing if receiver output falls to 0.1 milliwatt or less.

(g) When the above operations have been performed record the signal generator output required for producing the 1 milliwatt output from the receiver. This reading (image frequency sensitivity) divided by the sensitivity reading obtained for the resonant frequency in 4. (g) for the same dial setting of the receiver is the image rejection ratio and should be greater than 100:1. If it is not 100:1 or greater the antenna and R. F. trimmers should be repeaked.

(e) *Dial Calibration*—

Reset the signal generator for 5.0 Mcs. Retune the receiver for maximum output. The dial scale can now be set accurately

by loosening the scale screws and setting it to read 5.0 Mcs. on the dial windows.

Typical Voltages at Tube Sockets:

6-8. Measured with Weston 1,000 ohm-per-volt meter.

Grid voltage measured with a vacuum tube voltmeter having a sensitivity of at least 3 megohms per volt.

Type C__-19031 batteries at 1.4 volts; Type C__-19032 battery at 67.5 volts (receiver turned on).

TUBE	PLATE VOLTS (approx.)	SCREEN VOLTS (approx.)	FIL. VOLTS	GRID VOLTS (approx., no signal)
V-1-1T4—r.f. amplifier	66	20-30	1.35	.2- .8
V-2-1R5—converter	66	50*	1.35	.2- .8 5.5- 8.‡
V-3-1T4—i.f. amplifier	66	20-30	1.35	.2- .8
V-4-1S5—second detector, AVC and A.F.	7-22	4-6	1.35	.2- .8
V-5-1L4—a.f. amplifier	65	65	1.35	1. -2.

*Oscillator Plate
‡Oscillator Grid G1

NOTE: All above voltage measurements should be made directly from the tube socket pins to ground (chassis).

6-9. *Replacement of Components*

Radio Receiver Type CEX-46203

NOTE: Instructions for the removal of components is given only when the method of proceeding is not obvious, for example, the removal of the audio output transformer T-3, although it appears to be quite straightforward involves the removal of condenser C-8, the unsoldering of the two bottom leads of T-2 and the removal of T-2 (second I.F. transformer). It is assumed in all replacements of components of the Radio Receiver, Type CEX-46203, and Battery Power Unit, Type CEX-19040, that the Cases, Type CEX-10172, have been removed and that the shield cover has been removed from the receiver chassis.

(a) *Antenna trimmer condenser C-15*—

1. Unscrew the two hex nuts which secure T-2 to the tuning unit chassis.
2. Unsolder the green-white and blue-white leads from T-2.
3. Unsolder the lead from C-8 to ground.
4. Lift T-2 aside and remove the two round head screws securing T-3 to its mounting bracket and move T-3 aside.
5. Remove the ON-OFF and frequency control knobs.

   CAUTION: When removing the frequency control knob securing screw, place a metal rod or flat piece of metal about 2½" long between the tuning unit base and the moving core carriage so the carriage cannot move downward. This must be done or the carriage will be bent out of shape and the inductors damaged as the strain of unscrewing the knob is placed against the carriage.
6. Remove the panel cover mounting screw (in the center of the molded

plastic panel cover) and move the panel cover forward.

7. Remove the dial drum mounting screw, and lift off the dial drum.
8. The screws holding the ceramic trimmer condenser C-15 are now exposed and the condenser can be removed after unsoldering the leads. To reassemble reverse the above procedure.

(b) *R. F. plate trimmer condenser C-16*—

1. Remove the two round head screws on the front and the two round head screws on the back which secure the tube shelf or lower chassis to the tuning unit, or upper chassis.
2. Unsolder the two leads on the trimmer lug.
3. Unscrew the two lug terminal strip above C-16.
4. The hex nuts securing C-16 are now exposed. Remove the hex nuts and move the upper and lower chassis apart so that the trimmer mounting screws can be removed and the remaining leads unsoldered. To replace reverse the above procedure.

(c) *Oscillator trimmer condenser C-17*—

1. Remove the two round head screws on the front and the two round head screws on the back which secure the tube shelf, or lower chassis to the tuning unit, or upper chassis.
2. Unsolder the leads from C-17, at the trimmer lug, and cut the bare lead, from the other lug, which is soldered to the chassis (ground).
3. Move the upper and lower chassis apart, remove the screws holding C-17 and lift the trimmer from the chassis.

(d) *Integral volume control and ON-OFF switch R-6*—

1. Remove the control knobs. See para. 6-8 (a) 5.
2. Remove the panel cover mounting screw and loosen the panel cover.
3. Unsolder the power cable lead which goes to ground at the terminal board lug.
4. Unsolder the wire from the antenna jack to C-15 at the trimmer lug.
5. Unsolder the wires from the four switch lugs on R-6.
6. Remove the molded panel cover from the chassis.
7. Disconnect the bare wire which goes from the top of R-6 to the chassis (ground).
8. Remove the hex nut and washer which fix R-6 to the chassis.
9. Rotate R-6 and unsolder the leads which are now accessible.
10. Remove R-6 from the mounting slot in the chassis. To reassemble reverse the above procedure.

(e) *Condensers C-1, C-2, C-11, C-14, and resistors R-1, R-2, R-5, R-9, and R-12*—

1. Remove the two chassis supporting strips which are secured to the upper chassis by two round head screws and to the lower chassis by two hex nuts. (The hex nuts also serve to secure the 1st I.F. transformer, T-1).
2. The wiring of the resistors and condensers to the tube socket terminals is now exposed and the necessary replacement can be made. To reassemble reverse the above procedure.

(f) *Condensers and resistors under the six lug terminal board, C-6, C-18, R-4, and R-8*—

1. Unsolder the two black and white striped leads and the lead from R-1 at the lug on the terminal board.

2. Unsolder the ground lug connections which secure the terminal board in place.
3. Lift the terminal board out and upwards, thus exposing the condensers and resistors, and make the necessary replacement. To reassemble reverse the above procedure.

(g) *Power cable and plug*—

1. Unsolder the power cable leads.
2. Unsolder the antenna jack connection at C-15.
3. Remove the control knobs. See para. 6-8 (a) 5.
4. Remove the panel cover mounting screw and remove the panel cover, power cable and plug.
5. Remove the three screws holding the packing gland bracket and pull the cable through the panel opening.
6. In replacing the cable dip the screws holding the packing gland bracket in a suitable seam sealing compound.

Battery Power Unit Type CEX-19040

(h) *Headphone interconnecting cable and plug*—

1. Remove the three screws on the molded plastic panel cover which secure the cable retaining plate.
2. Remove the four filister-head screws in the corners of the black bakelite top plate. This plate secures the battery frame to the panel cover.
3. Lift up the panel to expose the wiring and unsolder the two leads from the interconnecting cable to the molded socket base.
4. To reassemble insert a new cable and reverse the above procedure.

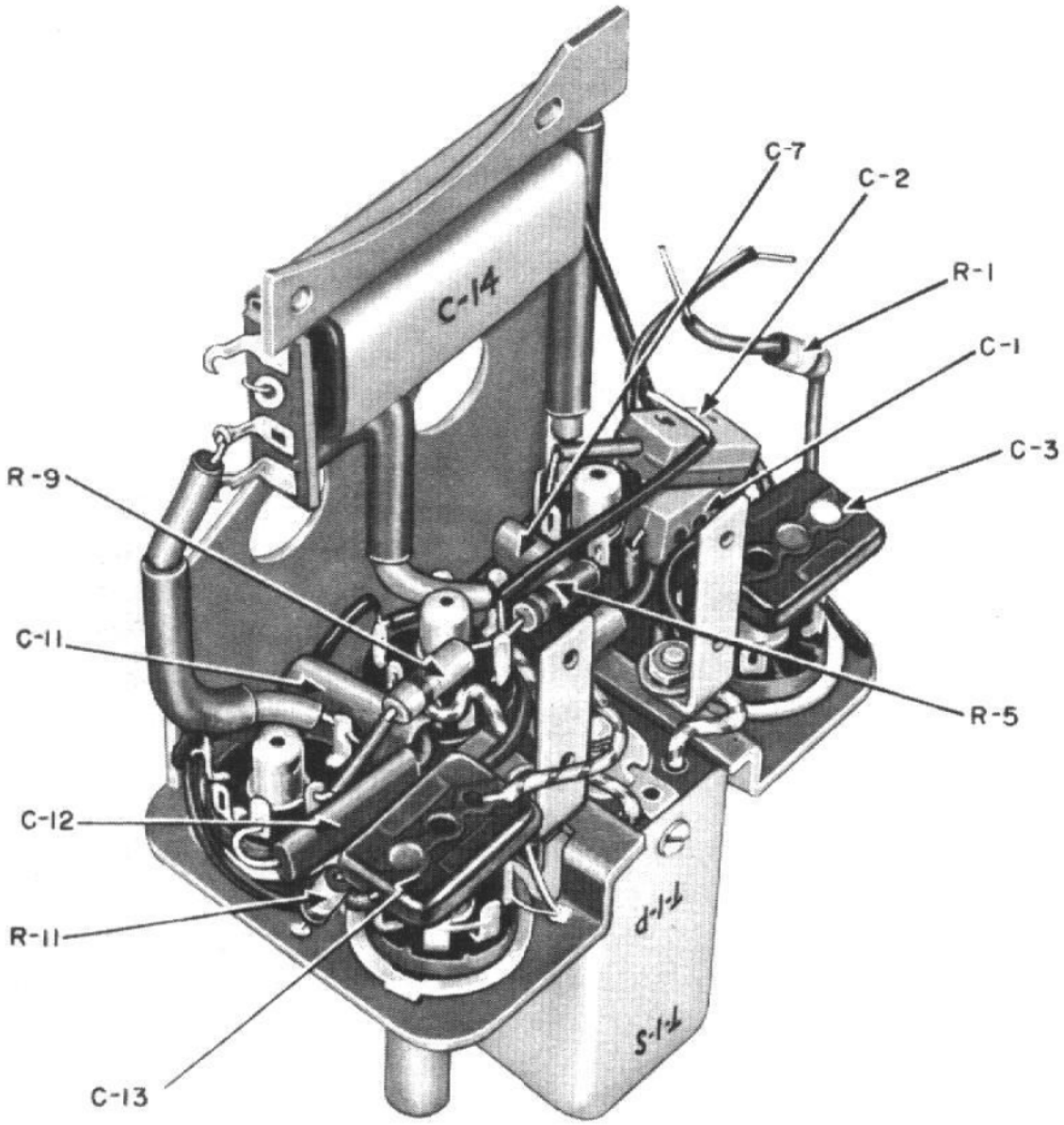


Figure 8—Vacuum Tube Shelf, view showing socket wiring

(i) *Molded socket base—*

1. See para. 6-8 (h) 1. and 2.
2. Unsolder all wiring to the socket base.
3. Drill and drive out the two rivets securing the socket base frame to the panel, being careful not to break the plastic panel.
4. Push out the socket base.
5. When replacing reseal the socket opening with a suitable seam compound.

TABLE I.

PARTS LIST BY SYMBOL DESIGNATION FOR NAVY MODEL RBZ RADIO RECEIVING EQUIPMENT

Symbol Desig.	Function	Description	Mfgr.	Mfgrs. Desig.	Emerson Desig.
		CAPACITORS			
C-1	R.F. coupling capacitor	.00015 MFD ± 30%, Mica, 100 v. d.c. working	7	Type Q	J-C-170
C-2	Oscillator Grid Blocking	60 MMFD ± 20%, Mica, 100 v. d.c. working	7	Type Q	J-C-112
C-3	Oscillator plate, fixed tuning capacitor	95 MMFD ± 5%, Mica, 100 v. d.c. working	7	Type PO	J-C-172
C-4	Primary I.F., fixed tuning capacitor	69 MMFD ± 1 MMFD, ceramic, 100 v. d.c. working	16	N680L	Part of T-1
C-5	Secondary I.F. fixed tuning capacitor	same as C-4	16	N680L	Part of T-1
C-6	A.V.C. filter	.01 MFD + 40%-10%, paper, 150 v. d.c. working	5	P1-7	J-C-178
C-7	Screen by-pass	same as C-6	5	P1-7	J-C-178
C-8	I.F. by-pass	.0001 MFD ± 20%, Mica, 100 v. d.c. working	7	Type O	J-C-115
C-9	2nd I.F. fixed tuning capacitor	43 MMFD ± 1 MMFD, ceramicon, 100 v. d.c. working	16	Type N680K	Part of T-2
C-10	Audio coupling capacitor	.002 MFD ± 20%, paper, 150 v. d.c. working	5	P1-4	J-C-177
C-11	Screen by-pass	same as C-6	5	P1-7	J-C-178
C-12	Audio coupling capacitor	same as C-10	5	P1-4	J-C-177
C-13	I.F. by-pass	.00005 MFD ± 20%, Mica, 100 v. d.c. working	7	Type O	J-C-171
C-14	"B+" by-pass	.25 MFD + 50%-0, flat paper, 100 v. d.c. working	5	P1-14	J-C-120
C-15	Antenna trimmer	Trimmer, ceramic, max. 50 MMFD, min. 5 MMFD. 500 v. d.c. working	2	822-AN	J-C-180

TABLE I. (continued)

Symbol Desig.	Function	Description	Mfgr.	Mfgrs. Desig.	Emerson Desig.
C-16	R.F. plate trimmer	Trimmer, ceramic, max. 25 MMFD, min. 4.5 MMFD, 500 v. d.c. working	2	822-AZ	J-C-181
C-17	Oscillator trimmer	same as C-16	2	822-AZ	J-C-181
C-18	I.F. filter capacitor	same as C-2	7	Type Q	J-C-112
C-19	"B+" by-pass	.45 MFD ± 10%, paper, metal clad, 100 v. d.c. working	17		J-C-126
		INDUCTORS			
L-1	Antenna coil	Part of tuning unit, d.c. res. approx. 4 ohms	10		Part of J-T-56
L-2	R.F. plate coil	Part of tuning unit, d.c. res. approx. 4 ohms	10		Part of J-T-56
L-2	Oscillator coil	Part of tuning unit, d.c. res. approx. 5 ohms	10		Part of J-T-56
		PLUGS AND CABLES			
	Head set connector	Headset connector cord and plug, Navy Type C__-49216 or C__-49216A	18-4	J-W-114	J-W-114
P-1	Battery power unit plug receptacle	4 prong plug receptacle. Part of Battery Power Unit panel cover	4	J-F-97	J-F-97
P-2	Battery Power Unit plug	4 prong plug, part of Receiver cable	4	J-F-95	J-F-95
P-3	Headset to Battery Power Unit connector	Battery Power Unit to Headset cable and plug	4	J-W-115	J-W-115
	Antenna plug	Part of helmet antenna lead-in, Navy type CEX-49238	4	J-H-113	J-H-113
P-4	Antenna plug receptacle	Part of receiver panel cover	4	J-H-99	J-H-99
	Battery power connector cable	Part of Receiver Unit, terminates in P-2	4	J-W-91	J-W-91

TABLE I. (continued)

Symbol Desig.	Function	Description	Mfgr.	Mfgrs. Desig.	Emerson Desig.
	Antenna lead-in and clamp assembly	Type CEX-49238, connects standard metal helmet to P-4	4	J-X-42	J-X-42
		RESISTORS			
R-1	Convertor grid leak	2 Megohms 1/4W ± 20% carbon, insulated, pigtail	6	BTS	J-H-171
R-2	Oscillator grid leak	.1 Megohm 1/4W ± 10% carbon, insulated, pigtail	12	MB 1/3	J-R-190
R-3	Oscillator plate resistor	10,000 ohms 1/4W ± 20% carbon, insulated, pigtail	6	BTS	J-R-105
R-4	A.V.C. filter resistor	3.3 Megohms 1/4W ± 20% carbon, insulated, pigtail	6	BTS	J-R-111
R-5	I.F. and R.F. screen voltage dropping resistor	same as R-2	12	MB 1/3	J-R-190
R-6	Volume control (includes switch S-1)	1 Megohm variable ± 20%, carbon, A taper	3	G-W-45	J-R-79
R-7	Signal bias bleeder resistor	4.7 Megohms 1/4W, ± 20%, carbon, insulated, pigtail	6	BTS	J-R-106
R-8	Grid resistor	same as R-7 or 10 Megohms 1/4W ± 20%, carbon, insulated, pigtail	12	MB 1/3	J-R-110
R-9	Screen voltage dropping resistor	same as R-4 or R-1	6	BTS	J-R-111
R-10	Plate resistor	.25 Megohm, 1/4W ± 20%, carbon, insulated, pigtail	6	BTS	J-R-191
R-11	Grid resistor	1 Megohm, 1/4W ± 20%, carbon, insulated, pigtail	6	BTS	J-R-112
R-12	Bias filter resistor	same as R-4	6	BTS	J-R-111
R-13	I.F. filter resistor	47,000 ohms 1/4W ± 20%, carbon, insulated, pigtail	6	BTS	J-R-108

TABLE I. (continued)

Symbol Desig.	Function	Description	Mfgr.	Mfgrs. Desig.	Emerson Desig.
		SWITCH			
S-1	ON-OFF switch	D.P.S.T. part of R-6	3	G-W-45	J-R-79
		TRANSFORMERS			
T-1	1st I.F. transformer	Primary, secondary, .427 turns each, 5 strands No. 44 S.S.E., wire, resistance, approx. 22 ohms each	10	12353	J-T-58
T-2	2nd I.F. transformer	Primary, 565 turns, No. 38 S.S.E. wire, d.c. resistance 35 ohms approx. Secondary, 503 turns, 5 strands No. 44 S.S.E. wire, d.c. resistance 27 ohms approx.	10	12354	J-T-59
T-3	Audio Output transformer	Matches 600 ohms headphones load to 60,000 ohms plate load. Primary 6400 turns No. 42 Formvar wire, d.c. resistance 1550 ohms approx. Secondary, 660 turns No. 37 Formvar wire, d.c. res.34 or 63 ohms approx.	14-13	J-T-57	J-T-57
		VACUUM TUBES			
V-1	R.F. Amplifier	1T4	9	1T4	1T4
V-2	Convertor (oscillator mixer)	1R5	9	1R5	1R5
V-3	I.F. Amplifier	same as V-1	9	1T4	1T4
V-4	Diode detector, A.V.C. and first audio amplifier	1S5	9	1S5	1S5
V-5	Second audio, power amplifier	1L4	9	1L4	1L4

TABLE I. (continued)

Symbol Desig.	Function	Description	Mfgr.	Mfgrs. Desig.	Emerson Desig.
		SOCKETS			
X-1	Miniature tube socket for V-1	Molded bakelite, 7 prong	4	J-S-41	J-S-41
X-2	Miniature tube socket for V-2	same as X-1	4	J-S-41	J-S-41
X-3	Miniature tube socket for V-3	same as X-1	4	J-S-41	J-S-41
X-4	Miniature tube socket for V-4	same as X-1	4	J-S-41	J-S-41
X-5	Miniature tube socket for V-5	same as X-1	4	J-S-41	J-S-41
		HEADPHONES			
	Headset Phones, Navy Type C___-49215	Part of Headset assembly, Navy Type CEX-49214	1	U-S-42	J-T-62
	Skull cap, Navy Type C___-10204	Holds headset assembly, Navy Type CEX-49214	15	CVH-10204	J-Z-48
		CASES			
	Receiver case	Type CEX-10172	4	J-X-41	J-X-41
	Battery Power Unit case	Type CEX-10172	4	J-X-41	J-X-41
	Receiver panel cover	Top of receiver case	4	J-F-82	J-F-82
	Battery Power Unit panel cover	Top of battery case	4	J-F-96	J-F-96
	Carrying case, Navy Type C___-10203	Canvas, with shoulder straps	15	CVH-10203	J-Z-58

SPARES PARTS (per 20 equipments) FOR NAVY MODEL RBZ RADIO RECEIVING EQUIPMENT CONTRACT NXss 15891

Quan. Spares	Symbol	Description	Mfgr.	Mfgrs. Desig.	Emerson Desig.
		COMPLETE UNITS			
1		Model RBZ Radio Receiver Equipment (less batteries)	4		
1		Complete Set Operating Batteries for RBZ Equipment Consisting of: 2—Type 19031 "A" Batteries; 1—Type 19032 "B" Battery	8		
		CAPACITORS			
3	C-1	.00015 MFD ± 30%. Mica, 100 v. d.c. working	7	Type Q	J-C-170
2	C-2 & C-18	60 MMFD ± 20%, Mica, 100 v. d.c. working	7	Type Q	J-C-112
3	C-3	95 MMFD ± 5%, Mica, 100 v. d.c. working	7	Type PO	J-C-172
2	C-8	.0001 MFD ± 20% Mica, 100 v. d.c. working	7	Type O	J-C-115
2	C-10 & C-12	.002 MFD ± 20%, paper, 150 v. d.c. working	5	P1-4	J-C-177
6	C-6, C-7 & C-11	.01 MFD + 40%-10%, paper, 150 v. d.c. working	5	P1-7	J-C-178
2	C-13	.00005 MFD ± 20%, Mica, 100 v. d.c. working	7	Type O	J-C-171
3	C-14	.25 MFD, + 50-0, flat paper, 100 v. d.c. working	5	P1-14	J-C-120
2	C-15	Trimmer, ceramic max. 50 MMFD, min. 5 MMFD. 500 v. d.c. working	2	822-AN	J-C-180
4	C-16 & C-17	Trimmer, ceramic, max. 25 MMFD, min. 4.5 MMFD. 500 v. d.c. working	2	822-AZ	J-C-181
3	C-19	.45 MFD ± 10%, paper, metal clad, 100 v. d.c. working	7	J-C-193	J-C-193
		INDUCTORS			
2	L-1, L-2, L-3	Tuning unit (replaceable as a complete unit only)	10	J-T-56	J-T-56
		PLUGS AND CABLES			
2		Headset connector cord and plug, Navy Type -49216 or -49216A	18-4	J-W-114	J-W-114
2	P-1	4 prong plug receptacle, Part of Battery Power Unit panel cover	4	J-F-97	J-F-97

TABLE II. (continued)

Quan. Spares	Symbol	Description	Mfgr.	Mfgr. Desig.	Emerson Desig.
2	P-3	Battery Power Unit to Headset cable and plug	4	J-W-115	J-W-115
2		Antenna plug, part of helmet antenna lead-in, Navy Type CEX-49238	4	J-H-113	J-H-113
3	P-2	Battery Power Unit to Receiver connector cable and plug	4	J-W-91	J-W-91
2		Helmet antenna lead-in and clamp assembly Navy Type CEX-49238	4	J-X-42	J-X-42
2		Antenna lead-in cable, part of CEX-49238	4	J-X-43	J-X-43
3		Pin jack assembly, part of P-1		J-S-43	J-S-43
HEADPHONES					
2		Headphones, Navy Type C___-49215	1	US-42	J-T-62
2		Skull cap, Navy Type C___-10204	15	CVH-10204	J-Z-48
RESISTORS					
2	R-1, R-9	2 Megohms 1/4W ± 20% carbon, insulated, pigtail	6	BTS	J-R-171
3	R-2, R-5	.1 Megohm 1/4W ± 10%, carbon, insulated, pigtail	12	MB 1/3	J-R-190
3	R-3	10,000 ohms 1/4W ± 20%, carbon, insulated, pigtail	6	BTS	J-R-105
2	R-4, R-9, R-12	3.3 Megohms 1/4W ± 20%, carbon, insulated, pigtail	6	BTS	J-R-111
3	R-6	1 Megohm variable ± 20%, carbon, A taper, (includes switch S-1)	3	G-W-45	J-R-79
1	R-7	4.7 Megohms 1/4W, ± 20%, carbon, insulated, pigtail	6	BTS	J-R-106
1	R-8	same as R-7 or 10 Megohms 1/4W ± 20%, carbon, insulated, pigtail	12	MB 1/3	J-R-110
2	R-10	.25 Megohm, 1/4W ± 20%, carbon, insulated, pigtail	6	BTS	J-R-191
1	R-11	1 Megohm 1/4W ± 20%, carbon, insulated, pigtail	6	BTS	J-R-112
2	R-13	47,000 ohms 1/4W ± 20%, carbon, insulated, pigtail	6	BTS	J-R-108

TABLE II. (continued)

Quan. Spares	Symbol	Description	Mfgr.	Mfgr. Desig.	Emerson Desig.
		TRANSFORMERS			
2	T-1	Primary, secondary, 427 turns each, 5 strands No. 44 S.S.E. wire, resistance, approx. 22 ohms each	10	12353	J-T-58
2	T-2	Primary, 565 turns, No. 38 S.S.E. wire, d.c. resistance 35 ohms, approx. Secondary, 503 turns, 5 strands No. 44 S.S.E. wire, d.c. resistance 27 ohms, approx.	10	12354	J-T-59
2	T-3	Matches 600 ohms headphones load to 60,000 ohms plate load. Primary 6400 turns No. 42 Formvar wire, d.c. resistance 1550 ohms approx. Secondary, 660 turns No. 37 Formvar wire, d.c. res. 34 or 63 ohms approx.	14-13	J-T-57	J-T-57
		MISCELLANEOUS			
2		Receiver panel cover, including antenna receptacle P-4	4	J-F-82	J-F-82
3		Dial crystal	4	J-F-83	J-F-83
2		Battery power unit panel cover	4	J-F-96	J-F-96
5		Case, Navy Type CEX-10172	4	J-X-41	J-X-41
1		Top mounting plate (power supply)	4	J-F-98	J-F-98
1		Center mounting plate (power supply)	4	J-F-100	J-F-100
5		"B" battery insulator	4	J-F-102	J-F-102
1		Knob, volume control	4	J-K-8	J-K-8
3		Knob, frequency control	4	J-K-9	J-K-9
2		Cable sealing grommet	4	J-G-30	J-G-30
4		Screw sealing washer	4	J-G-31	J-G-31

TABLE II. (continued)

Quan. Spares	Symbol	Description	Mfgr.	Mfgr. Desig.	Emerson Desig.
20		Rubber gasket, part of panel cover	4	J-G-157	J-G-157
10		Control shafts, sealing washer, rubber	4	J-G-158	J-G-158
4		Rubber tubing, antenna terminal bending relief	4	4ZZ789B	4ZZ789B
2		Mounting stud, part of tube shelf	4	J-H-97	J-H-97
4		Tuning knob screw	4	J-H-100	J-H-100
4		Helmet antenna clamp screw, part of CEX-49238	4	J-H-114	J-H-114
2		"A" battery positive contact	4	J-H-115	J-H-115
3		Power supply short rod, spacer	4	J-H-116	J-H-116
3		Power supply long rod, spacer	4	J-H-116A	J-H-116A
3		Unit terminal strip, 7 lug	4	J-L-38	J-L-38
3		Tube shelf terminal strip, 3 lug	4	J-L-39	J-L-39
3		Lug and bracket assembly	4	J-L-45	J-L-45
2		Shorting lug (battery)	4	J-L-46	J-L-46
2		3/8" x 32 hex nut			J-HN-30
6		4-40 hex nut			J-HN-33
9		No. 4 internal teeth lockwasher			J-LW-29
4		No. 6 internal teeth lockwasher			J-LW-30
2		3/8" internal teeth lockwasher			J-LW-31
4		No. 2 internal teeth lockwasher			J-LW-32
6		4-40 x 1/4" round head machine screw			J-MS-103
2		6-32 x 1/8" round head machine screw			J-MS-104
4		4-40 x 5/32" round head machine screw			J-MS-105
3		2-56 x 3/16" round head machine screw			J-MS-106
9		4-40 x 11/64" special head machine screw	4	J-MS-107	J-MS-107
4		4-40 oval head machine screw			J-MS-108
4		8-32 x 1/4" washer head machine screw			J-MS-109
6		6-32 x 3/16" set screw			J-MS-110

TABLE II. (continued)

Quan. Spares	Symbol	Description	Mfgr.	Mfgr. Desig.	Emerson Desig.
8		2-56 x .156 special head machine screw	4	J-MS-118	J-MS-118
4		6-32 x 1/4" filister head machine screw			J-MS-120
30		Eyelet	4	J-RT-29	J-RT-29
4		Rivet 1/8 dia. x 1/4			J-RT-33
2		Tube shelf support bracket	4	J-M-224	J-M-224
2		Ground clip (tube shelf)	4	J-M-225	J-M-225
2		Tube shield	4	J-M-226	J-M-226
2		Vacuum tube cushion retaining plate	4	J-M-227	J-M-227
2		Tube retaining spring	4	J-M-261	J-M-261
2		Cable mounting bracket	4	J-M-228	J-M-228
2		Calibrated dial ring	4	J-M-237	J-M-237
3		Helmet antenna clamp, part of CEX-49238	4	J-M-238	J-M-238
2		Battery power unit plug receptacle, mounting plate	4	J-M-239	J-M-239
4		"A" battery contact (power supply)	4	J-M-240	J-M-240
8		"B" battery contact (power supply)	4	J-M-241	J-M-241
2		Bottom mounting bracket (power supply)	4	J-M-243	J-M-243
2		Copper tubing	4	J-M-244	J-M-244
2		Strain relief terminal	4	J-M-265	J-M-265
2		Chassis shield assembly	4	J-X-44	J-X-44
10		Socket	4	J-S-41	J-S-41
8		Tuning knob spring	4	J-W-92	J-W-92
8		Retaining ring	4	J-W-93	J-W-93
2		Volume control sealing washer	4	J-W-99	J-W-99
2		Shielded antenna lead	4	J-W-126	J-W-126
2		Shielded I.F. lead (short)	4	J-W-127	J-W-127
2		Shielded I.F. lead (long)	4	J-W-128	J-W-128

TABLE III.

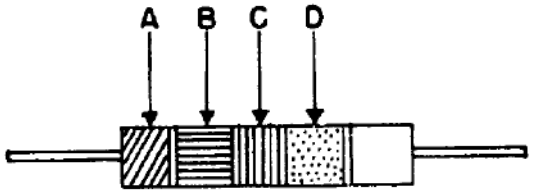
COLOR CODE, RESISTORS AND CAPACITORS

Color	Significant Figure	Multiplier	Tolerance	Voltage Rating
Black	0	1		
Brown	1	10	1%	100 Volts
Red	2	100	2%	200 Volts
Orange	3	1,000	3%	300 Volts
Yellow	4	10,000	.....	400 Volts
Green	5	100,000	5%*	500 Volts
Blue	6	1,000,000	10%*	600 Volts
Violet	7	10,000,000	.....	700 Volts
Gray	8	100,000,000	.....	800 Volts
White	9	1,000,000,000	2.5%	.....
*Gold	....	0.1	5%*	.....
*Silver	....	0.01	10%*	.....
*No Color	....	.....	20%	500 Volts

*NOTE: Use of the colors Green and Blue in place of Gold and Silver is optional in order to avoid use of strategic materials and effect of metallic content paints.

a. *Resistors*—The nominal resistance value of fixed carbon resistors is indicated in three manners.

The one in most common use for axial lead resistors indicates the value of bands of color as follows:



AXIAL LEAD TYPE

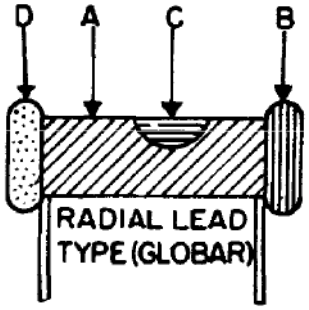
Band A indicates the first significant figure of the resistance of the resistor.

Band B indicates the second significant figure.

Band C indicates the multiplier.

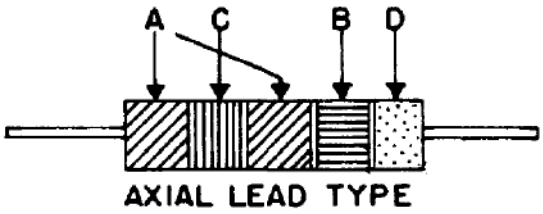
*Band D, if any, indicates the tolerance limits about the nominal resistance value. No tolerance color indicates 20%.

For radial lead resistors (such as Globar) the following system of indicating nominal resistance value is used:



The body (A) of the resistor is colored to represent the first significant figure of the resistance value. One end (B) is colored to represent the second significant value, and a dot (C) of color, located within the body color, indicates the multiplier. *Tolerance is indicated by color (gold or silver) on the other end of the resistor. No tolerance color indicates 20%.

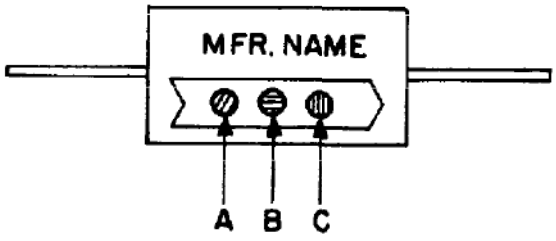
A system, not too commonly used at present, for indicating nominal resistance value of axial lead resistors is as follows:



The body (A) of the resistor is colored to represent the first significant figure of the resistance value. One end (B) is colored to represent the second significant figure and a band, or dot (C) of color, located within the body color, indicates the multiplier. *Band D, if any, indicates the tolerance. No color indicates 30%.

b. *Capacitors* — Two systems for color coding small fixed capacitors are in use. The colors employed to designate these significant digits in micro-microfarads, are listed in the chart above. Note that codes are read from left to right in the position required for reading of words molded in case, or by arrow.

In general, capacitors are coded by means of three dots of color as follows:



Dot A indicates the first significant figure of the capacitance of the capacitor.

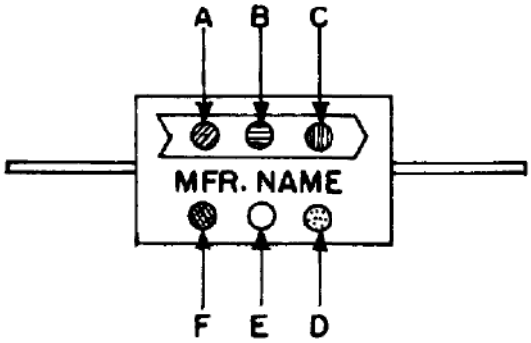
Dot B indicates the second significant figure.

Dot C indicates the multiplier.

An additional dot is sometimes shown. This dot indicates the working voltage of the capacitor.

RMA Standard Six Dot Capacitor Color Code

Six dot capacitors used in this equipment are coded in the following manner:



Dot A indicates the first significant figure of capacitance of the capacitor.

Dot B indicates the second significant figure.

Dot C indicates the third significant figure.

Dot D indicates the multiplier.

*Dot E indicates the tolerance of the nominal capacitance value.

Dot F indicates the voltage rating of the capacitor.

TABLE IV.

LIST OF MANUFACTURERS

Code No.	Name
1	Carron Manufacturing Company 407 S. Aberdeen St., Chicago, Ill.
2	Centralab 900 E. Keefe Ave., Milwaukee, Wisconsin
3	Chicago Telephone Supply Co. 401 N. Broad Street, Philadelphia, Pa.
4	Emerson Radio & Phonograph Corp. 111 Eighth Avenue, New York, New York
5	Dumont Electric Co., Inc. 34-54 Hubert Street, New York, New York
6	International Resistance Co. 401 N. Broad Street, Philadelphia, Pa.
7	Micamold Radio Corp. 1087 Flushing Avenue, Brooklyn, New York
8	Rayovac Co. Madison, Wisconsin
9	R.C.A. Manufacturing Co., Inc. Camden, New Jersey
10	F. W. Sickles Co. Box 920, Springfield, Mass.
11	Solar Mfg. Co. Bayonne, New Jersey
12	Stackpole Carbon Co. St. Mary's, Pa.
13	Super Electric Products Corp. 1057 Summit Avenue, Jersey City, New Jersey
14	Todd Products 179 Wooster Street, New York, New York
15	Wm. H. Vanderherchen, Inc. 2846 Emerald Street, Philadelphia, Pa.
16	Erie Resistor Corp. Erie, Pa.
17	Coronet Electric Co. 646 N. Michigan Avenue, Chicago, Ill.
18	Cords Limited, Inc. 23 Camp Place, Newark, N. J.

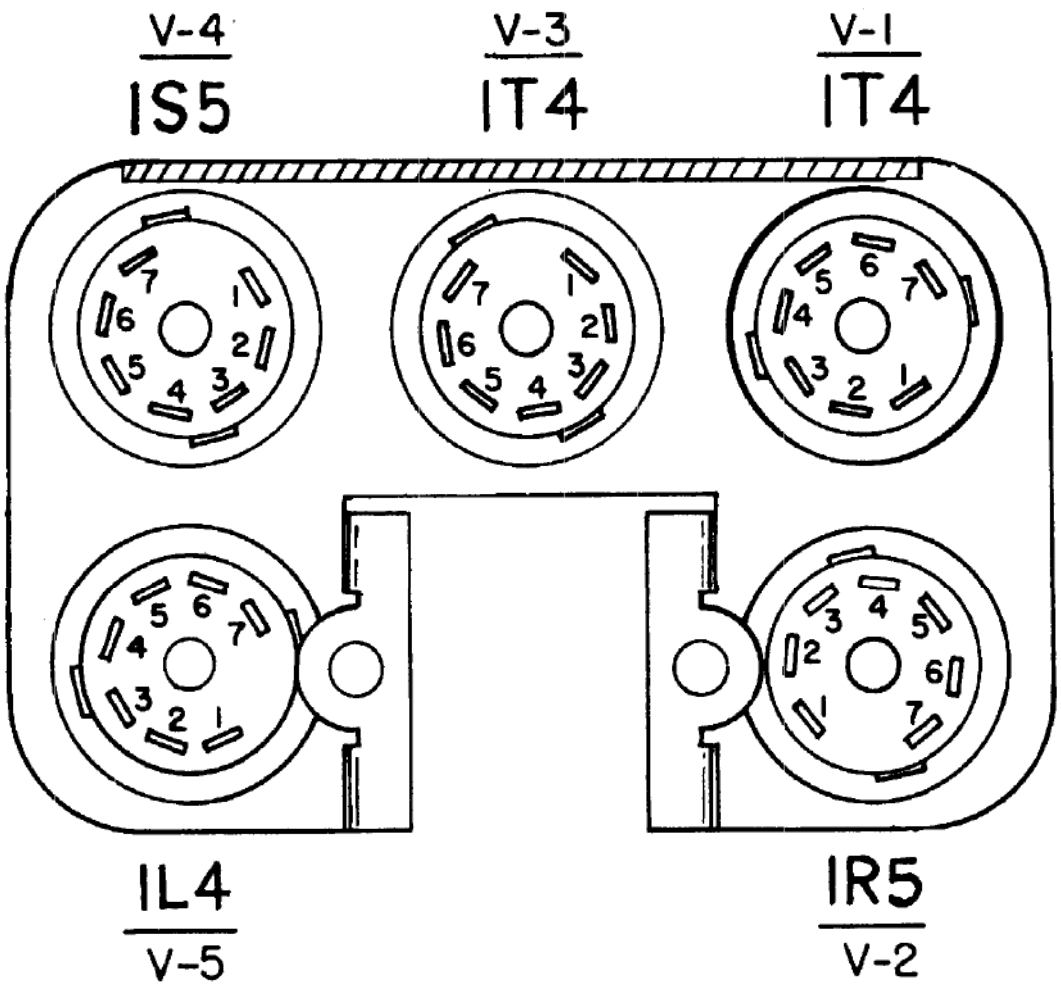
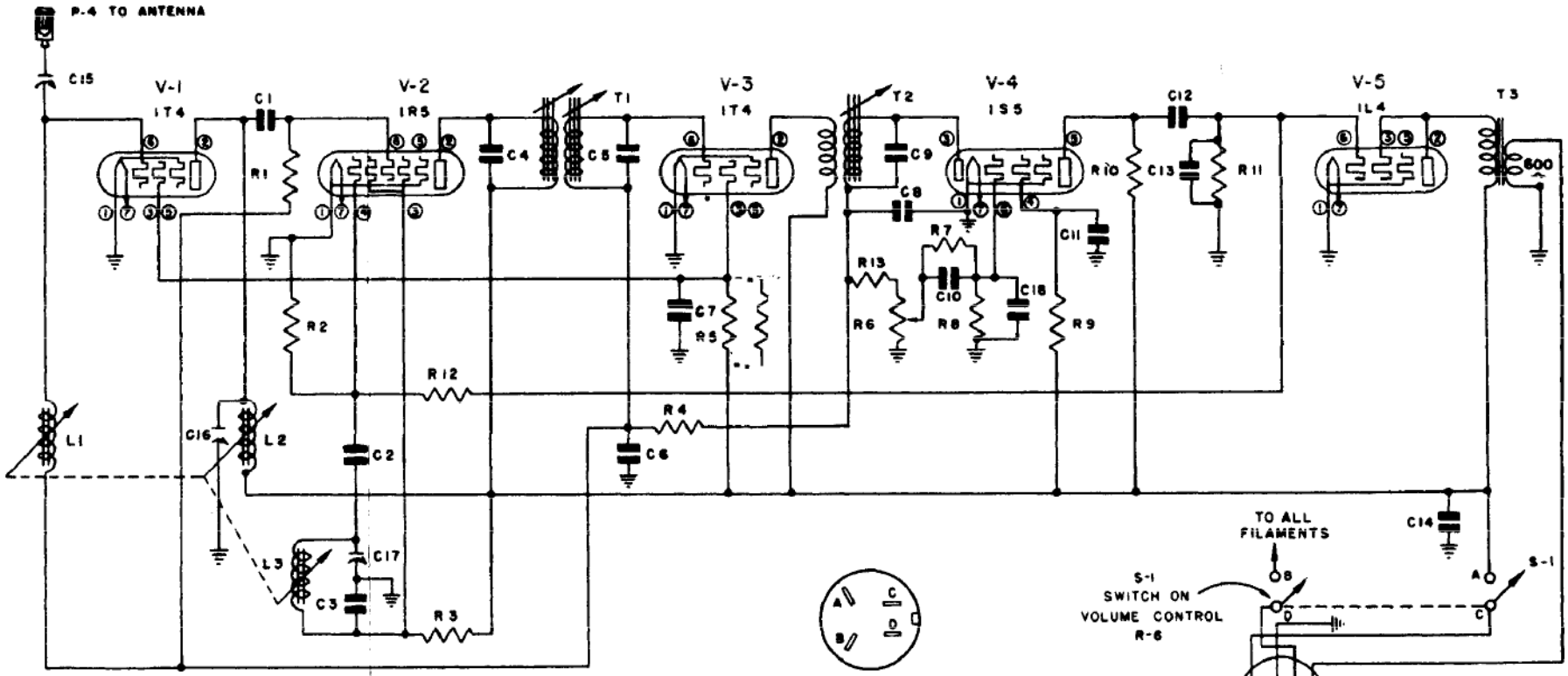


Figure 9—Vacuum Tube Socket, terminal location diagram (bottom view)



REAR VIEW OF S-1
SHOWING CONNECTIONS.

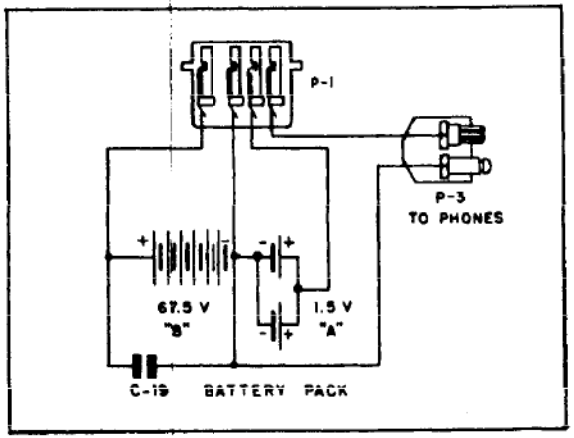
MEASURING FROM "A" TO GROUND – 66 VOLTS
" – "B" " " – 1.35 "
" – "C" " " – 66 "
" – "D" " " – 1.35 "

R5 IS SHUNTED WITH A 100,000 OHM RESISTOR

ITEM	DESCRIPTION
C-1	.00015 MFD. ± 30% MICA
C-2	60 MMF. MICA ± 20%
C-3	95 MMF. ± 5% SILVER MICA
C-4	IN IST. I.F. TRANS. 69MMF ± 1%
C-5	IN IST. I.F. TRANS. 69MMF. ± 1%
C-6	.01 MFD. + 40% – 10% PAPER
C-7	.01 MFD + 40% – 10% PAPER
C-8	.0001 MFD. MICA ± 20% MICA
C-9	IN 2ND I.F. TRANS. 43MMF. ± 1%
C-10	.002 MFD. ± 20% PAPER
C-11	.01 MFD. + 40% – 10% PAPER
C-12	.002 MFD. ± 20% PAPER
C-13	.00005 MFD. ± 20% MICA
C-14	.25 MFD. + 50% – 0 PAPER
C-15	TRIMMER MAX. 50MMF. ANT.
C-16	TRIMMER MAX. 25 MMF. R.F.
C-17	TRIMMER MAX. 25 MMF. OSC.
C-18	60 MMFD. ± 20% MICA
C-19	.45 MFD. ± 10% PAPER

ITEM	DESCRIPTION
P-1	POWER UNIT RECEPTACLE
P-2	POWER UNIT PLUG
P-3	HEADPHONES CONNECTOR PLUG
P-4	ANTENNA PLUG RECEPTACLE
R-1	2 MEG. Ω 1/4 W. ± 20% CARBON
R-2	.1 MEG. Ω 1/4W. ± 10% "
R-3	10,000 Ω 1/4 W. ± 20% "
R-4	3.3 MEG. Ω 1/4 W. ± 20% "
R-5	.1 MEG. Ω 1/4 W. ± 10% "
R-6	1 MEG. Ω VOLUME CONTROL
R-7	4.7 MEG. Ω 1/4 W ± 20% CARBON
R-8*	EITHER 10 MEG. Ω 1/4 W ± 20% "
	OR 4.7 MEG. Ω 1/4 W ± 20% "
R-9*	EITHER 3.3 MEG. Ω 1/4 W ± 20% "
	OR 2 MEG. Ω 1/4 W. ± 20% "
R-10	.25 MEG. Ω 1/4 W. ± 20% "
R-11	1 MEG. Ω 1/4 W. ± 20% "
R-12	3.3 MEG. Ω 1/4 W. ± 20% "

ITEM	DESCRIPTION
R-13	47,000 Ω 1/4 W. ± 20% CARBON
S-1	D.P.S.T. SWITCH, PART OF R-6
T-1	IST. I.F. TRANSFORMER
T-2	2ND I.F. TRANSFORMER
T-3	AUDIO OUTPUT TRANSFORMER
L-1	ANTENNA COIL
L-2	R.F. PLATE COIL
L-3	OSCILLATOR COIL
V-1	R.F. AMPLIFIER
V-2	CONVERTOR (OSCILLATOR MIXER)
V-3	I.F. AMPLIFIER
V-4	DIODE DETECTOR, A.V.C., 1ST. AUDIO
V-5	2ND AUDIO, POWER AMPLIFIER



* The latter value is used in later production and should preferably be used for replacement.

Figure 10—Schematic Circuit diagram of Model RBZ Radio Receiving Equipment