Section 8
RECEIVING EQUIPMENT
R Series

SECTION 8. RECEIVING EQUIPMENT

INSTALLATION OF RU RECEIVERS AND A-C POWER PACKS

RU receivers and a-c power packs have been received and installed in various Naval Air Activity Control Towers. At the Naval Air Training Bases, Corpus Christi, Tex., it was found necessary to modify the a-c power pack in order to bring each receiver output up to loud speaker volume. The modification was made as illustrated in Figure 1.

The GF-RU-LN equipment is installed in movable fabricated consoles, each containing two RU receivers, one a-c power pack, two speakers and controls for each receiver. The photograph of Figure 2 shows two of these consoles installed in a tower.

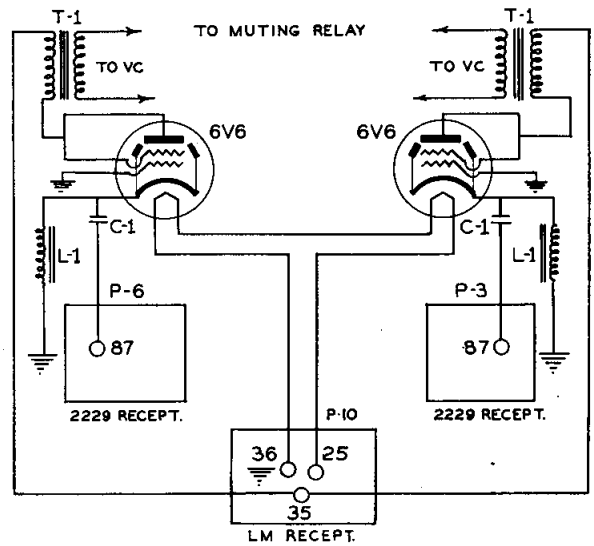

FIGURE 1.—Modification of power pack of model RU receiving equipment.

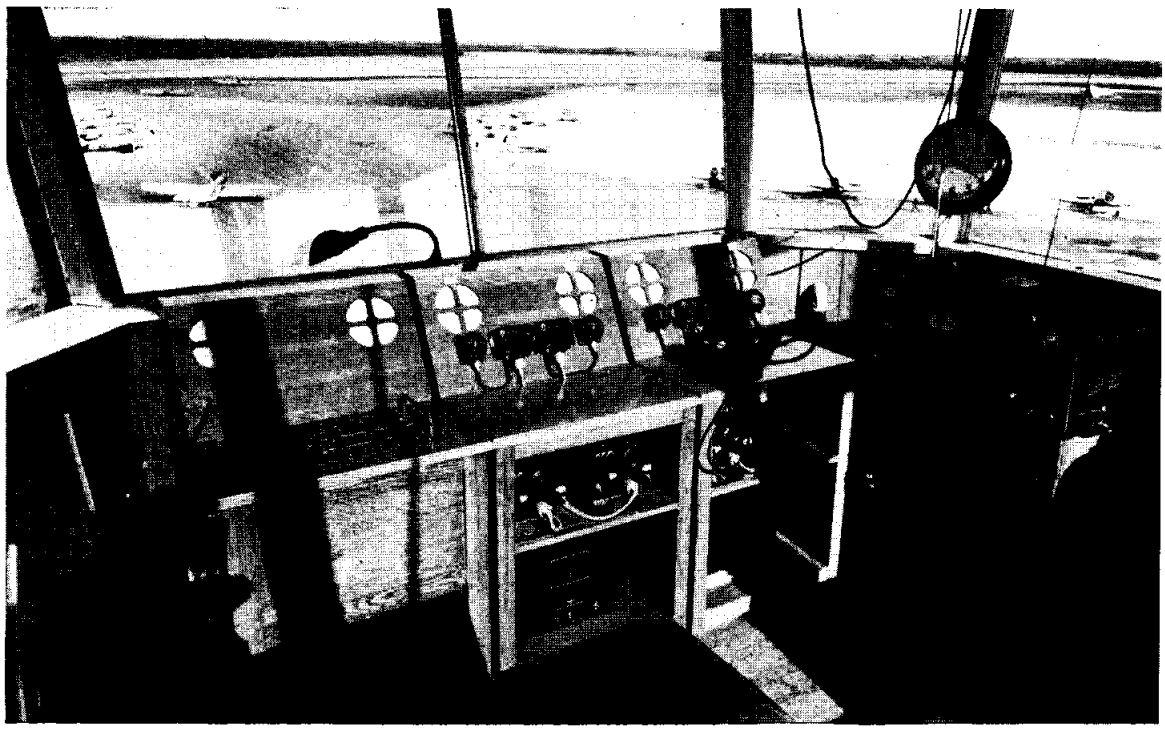

FIGURE 2.—Air control tower containing two movable consoles.

MODEL RAG–1 EQUIPMENT TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
RAG–1.— Very weak signals.	Found poor soldered joint where the lead to the second r. f. amplifier connects to the tube top cap clip. Repaired by re-soldering the joint.—U. S. S. *Refuge* (AH–11).

MODEL RAH SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Receiver very insensitive, noisy and intermittent. Operation occasionally restored by snapping power switch off and on.	Found no screen voltage on r-f tubes and 5 ohms resistance to ground from screen. Trouble found to be due to ground at screen end of iron core choke X–7. Emergency repair made by removing choke and connecting screens of r-f tubes directly to the voltage divider.—U. S. S. *Refuge* (AH–11)

HIGH HUM LEVEL IN MODELS RAK/RAL SERIES RECEIVING EQUIPMENTS

In the event that high hum level develops in the models RAK/RAL series receiving equipments, the trouble may be traced to the type 6D6 tubes employed in the detector and audio amplifier stages. It has been discovered that the type 6D6 manufactured by Ken-Rad produces excessive hum when used in these stages. This trouble has been traced to the construction of the heater element. The RCA tubes originally supplied in these equipments have a spiral wound heater, while the tubes in question (a large quantity are on hand at stock depots) use the folded type heater. In circuits employing a high resistance in the grid return or high bias, any leakage of electrons from the a-c operated heater over the top or under the bottom of the cathode to the grid can cause hum modulation. Any type 6D6 available should operate satisfactorily in r-f circuits and other circuits where the grid return resistance is of a relatively low value.

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60-WATT OPERATION OF MODEL RAK RECEIVING EQUIPMENTS

When one RAK and one RAL are energized by a 300-watt rotary converter, it is necessary to operate the RAL at 200 watts and the RAK at 60 watts.

Paragraph 9.5–6 of the instruction book for the subject equipment indicates that the switch[1] in the power unit disconnects the current regulator tube and switches the power transformer primary for operation directly connected to the line filter. The switch in the power unit disconnects the power transformer from the current regulator circuit but does not disconnect the current regulator tube from the a-c power line. The equipment therefore continues to require 200 watts. For 60-watt operation it is necessary that the type 876 current regulator tube be removed from the socket in the power unit, and that the switch be thrown to the "out" position.

[1] Switch designated as follows: RAK/–1—208 and 209, RAK–2/–3—S–102 and S–103, RAK–4/–5/–6/–7/–8—S–202.

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→ RAK RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 1 and RAL RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 1

PROVIDING CONCENTRIC ANTENNA JACK

Equipments affected.—All models RAK–6 and RAL–6 radio receivers except those in which the antenna coupling units have been installed for use with receiver antenna patch panels.

Purpose.—To provide a type 49120 concentric jack connection for the antenna permitting the use of a type 49123 concentric patchcord assembly reducing interference to a minimum.

General.—Numerous investigations have proven that a completely shielded low capacity antenna lead is an absolute necessity in practically all types of Naval vessels in order to reduce interference to an acceptable level. For this reason the Bureau has procured a number of modification kits for the models RAK–6 and RAL–6 receivers which provide a type 49120 concentric jack connection for the antenna and thus permit the use of a type 49123 concentric patchcord assembly. These kits are being procured under contract NOs–95022 and are being delivered to the various Electronic Pools for distribution to Naval activities.

Each modification kit contains two complete assemblies as shown in Figure 1; one (MI–8531) is for the model RAK–6, and one (MI–8532) for the model RAL–6. The two assemblies are identical except for the coupling capacitor, symbol C–101. This capacitor has a rating of 300 mmfd. on the RAK–6 assembly and 440 mmfd. on the RAL–6 assembly. One spare coupling capacitor is furnished for each assembly and should be placed in the respective receiver spare parts boxes. The two plug buttons supplied with each assembly are to be inserted in the two binding-post holes in the cabinet which are not required after installation of the new assembly.

The modification consists, basically, of removing the present binding-post-type antenna terminal board assembly and replacing it with the new concentric jack type assembly. Complete instructions and diagrams are packed with each kit and should be carefully followed. These instruction sheets should be inserted in the respective instruction books after completion of the modifications.

The choke and capacitor units should be removed from the replaced binding-post assemblies and stowed in the receiver spare parts boxes. The remainder of the assemblies may be discarded.

Vessels are requested to contact an Electronics Officer at the next opportunity for the installation of this kit.

A record of completion of this installation should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this installation should be reported on the NBS–383 form. *2/1/46*

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RAK RADIO RECEIVING EQUIPMENT
FIELD CHANGE NO. 2
and
RAL RADIO RECEIVING EQUIPMENT
FIELD CHANGE NO. 2

REPLACING POWER SUPPLY RESISTORS R–202, R–203 AND R–204 (NO KIT)

Equipments affected.—All model RAK series equipments through RAK–6, and all model RAL series equipments through RAL–6.

Purpose.—To replace resistors R–202, R–203, and R–204 with resistors of higher power rating.

Procedure.—(1) Remove R–202 and replace with a 20,000-ohm 4-watt resistor, JAN type RC 65 DE 203J.

(2) Remove R–203 and R–204 and replace each with a 6,200-ohm 4-watt resistor, JAN type RC 65 DE 622J.

(3) The JAN resistors are now standard for Naval use and may be obtained through supply channels.

General.—The Bureau has received numerous reports of failure of resistors R–202, R–203, and R–204 in the type CRV–20036A power supply for models RAK and RAL series receivers. This matter has been brought to the attention of the contractor who has advised that beginning with the RAK–7 and RAL–7 the power rating of the resistors has been increased from two to four watts.

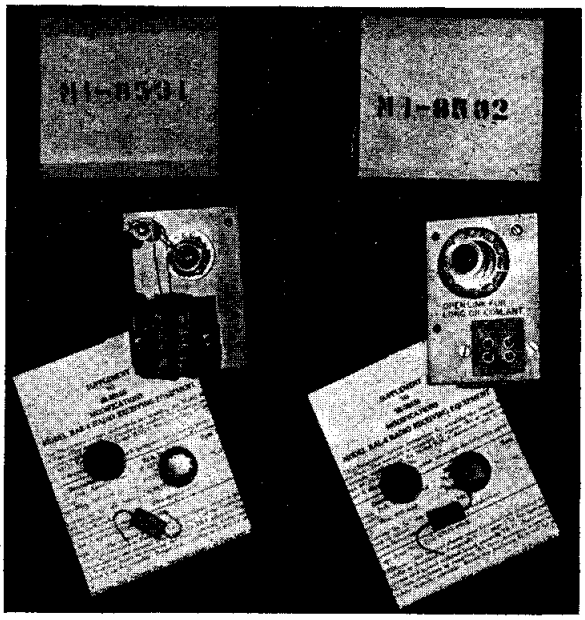

FIGURE 1.—Contents of kit.

Vessels are requested to contact an Electronics Officer at the earliest opportunity for the new resistors. This change is within the scope of the ship's force.

The instruction book and parts list should be corrected accordingly. A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *2/1/46*

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RAK RADIO RECEIVING EQUIPMENT
FIELD CHANGE NO. 3
and
RAL RADIO RECEIVING EQUIPMENT
FIELD CHANGE NO. 3

FUSING OF THE EQUIPMENTS (NO KIT)

Equipments affected.—All models RAK and RAL series receivers.

Purpose.—To provide a system of fusing where only one receiver is used at a time.

Procedure.—Change the connections in the power supply unit for each receiver so that the 110-volt a-c connections from the control unit pass through the 3-ampere fuses in each power supply unit. This is easily accomplished by moving the a-c line to the other set of terminals in the power supply unit.

General.—A deficiency has been reported in the fusing of the RAK/RAL series receivers. The receiver is fused as follows: 5-ampere fuses, F–301 and F–302, are located in each side of the 110-volt a-c line, at the control unit 23073; 3-ampere fuses, F–201 and F–202, are located in each side of the 110-volt a-c line at each power supply for the receivers RAK/RAL. The instruction books specify that where the control unit 23073 is used with a RAK/RAL installation, the 110-volt a-c supply shall be connected through only F–301 and F–302 and that F–201 and F–202 be used when only one receiver and no control unit 23073 is used. This system of fusing is satisfactory where both the RAK and RAL are used at the same time with the control unit 23073.

However, where only one receiver is used at a time, insufficient protection is afforded by fusing one receiver with the 5-ampere fuse of the control unit. In one incident, the transformer T–201 was damaged but insufficient current was drawn to blow the 5-ampere fuse.

This change will give maximum protection for each receiver whether used together or separately with or without the control unit.

The instruction book, schematic diagrams, and wiring diagrams should be changed accordingly. A record of completion of this change should be made on ship's "Radio Equipment Log," NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *2/1/46*

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RAK RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 4

MODIFICATION FOR USE WITH NAVY TYPE 66097 LOOP ANTENNA

Equipment affected.—Model RAK–6, RAK–7, and RAK–8 receiving equipment.

Purpose.—To permit more efficient communication when the model RAK–6, RAK–7 and RAK–8 receiving equipments used aboard Navy submarines are operated with the Navy type 66097 loop antenna, under submerged conditions. Vessels should contact the cognizant Electronics Officer at the earliest opportunity for this change.

Time required.—Approximately 8 man-hours.

Material required.—All of the parts and material required in this change are included in the kit.

Tools and instruments required.—The following tools are required to perform this change. The kit does not include any tools.

Screw driver.	Long nosed pliers.
Heavy electricians pliers.	Hammer.
Thin adjustable wrench or 11/16" open end wrench.	1/16" pin punch.
	Center punch.
Soldering iron.	Steel scale.
Rosin core solder.	Small brush for stenciling.
No. 27 drill.	1⅜" diameter punch or hole cutter.
Hand drill.	
3/16" drill.	

General.—In this change, a new input jack and input transformer are installed in the receiver, and the wiring of the band switch is modified which results in the following major changes in operation:

1—Loop antenna reception on band No. 1 only.

2—Nondirectional antenna reception on other 5 bands.

3—Elimination of the Navy type loop coupling unit.

After modification, the Navy type 66097 loop antenna is connected directly through the new

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jack to the new input transformer. The secondary winding of the new input transformer constitutes the grid circuit inductance of the first r. f. tube (for band No. 1 only). The loop and transformer is resonated by the receivers original ganged tuning capacitor and antenna trimmer. Thus, for band No. 1 only, the usual antenna (nondirectional) input is disconnected, and loop reception only is possible.

A quantity of 90 field change kits including complete instructions and diagrams have been produced on Contract NObsr–37148 and distributed to Mare Island and New London.

Routing instructions.—Completion of this change should be recorded on the applicable Machinery History Card and reported on the Field Change Report Card, NavShips 2369, included in the kit. The Type 47367 Loop Coupling unit is to be returned to the nearest Electronics pool for salvage. The field change bulletins shall be kept with the instruction books for the modified equipments. *4/1/47*

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→ RAK–6/–7/–8 RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 4

KITS NOT AVAILABLE FOR THIS F. C.

A quantity of 90 kits for F. C. No. 4–Models RAK–6/–7/–8 Radio Receiving Equipments, was procured in 1947 under Contract NObsr-37148 with National Electrical Machine Shops, Inc., Silver Spring, Maryland. Although this quantity was adequate for all installations contemplated at that time, increased requirements have resulted in exhaustion of stock. Therefore no further requests for these kits should be submitted. *7/1/49* ←

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MODELS RAK/RAL SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Noise, erratic regeneration.	Loose and dirty tube shields. Cleaned joints with fine sandpaper, made sure shields were tight.—U. S. S. *Suwanee.*
Low volume.	Check receiver attenuator relays for open antenna circuit.—RMO, *Galveston.*
RAK–7/RAL–7.—Fouling of band change switch pinion gears.	Shorten leads to bypass condensers in the vicinity of the band change switch pinion gears.—RMO, *Nymi.*
RAK.—Receiver inoperative.	Found loose connection at J–1 in loop coupling unit.—U. S. S. *Bowfin.*
Very weak signals in receivers. Antenna-to-ground resistance reading low.	Upon investigation of the antenna trunk, water was found in its base. The water was up over the entering insulator coming in contact with the antenna lead and causing it to be shorted to the ground. It was found that the water had entered through the seams on the whip antenna and through the standoff insulator which is between the ship antenna and trunk. A small hole was drilled in the base of the trunk and the water was allowed to drain. After the water had drained the hole was tapped and a plug installed.—U. S. S. *Herndon.*
Low audio output; loss of sensitivity.	Audio screen bypass condenser, C–125, shorted.
RAL Series.—Receiver dead. No plate voltage on second r.-f. amplifier.	The "regeneration" windings for bands 4, 5, and 6 on inductance L–108 pass through a steatite ceramic tube on the very edge of the slot that contains the primary windings. The regeneration winding is at ground potential and the primary winding has a potential of 80 volts. As a result of both windings being enamel covered, a short developed between them, thereby grounding the plate voltage for the second r.-f. stage. Repairs were made by removing the primary windings, placing a piece of varnished cambric over the slot in the tube at the point where the regeneration winding goes into the hole, and then rewinding the primary over the varnished cambric. This provided insulation between the two windings at the point of the shorting.—U. S. S. *Mercy.*
Extremely noisy in operation.	Cleaned moving contacts and resistance elements in both sections of sensitivity control with carbon tetrachloride. Operation restored to normal. A *very thin* coating of vaseline prevents subsequent trouble.—U. S. S. *Rowe.*
RAL Series.—Receiver not stable, stations drifted across dial, also receiver was very noisy.	Found resistor R–201 in power supply broken with wires making intermittent contact. Normal operation restored by replacement of resistor. The resistor in question is in series with the 874 current regulator tube and opening of the resistor caused loss of regulation.—U. S. S. *Calvert.*
RAL–6.—Intermittent operation and erratic regeneration.	It was found that the trouble was caused by a bad ground connection on the second r.-f. tube V–102, type 6D6. Normal operation was restored by making proper connection.—U. S. S. *Elkhorn* (AOG–7).

RAL Series.—Check of receiver disclosed that it operated normally on all bands but 7, 8, and 9.	Discovered, upon further checking, that the primary winding in the antenna transformer was open—a direct result of, at sometime, receiving a "shot" of RF. Since this opening was at a terminal connection, it was possible to "jump" the break by a piece of wire. The set then operated perfectly.—U. S. S. *Curtiss.*
RAK–6.—No signals were heard.	Sensitivity check showed 1500 microvolt sensitivity. The setting of the regeneration control was unusually high on those bands on which any regeneration could be obtained and the setting of this control was affected by movements of the sensitivity control. A voltage check showed that the 180-volt B supply was varied by changes in sensitivity control setting. The cause was due to capacitor C–112 developing a 0.25-megohm internal short circuit, thereby biasing the grid of the next stage positive. Replaced capacitor and operation was normal.
RAL–6.—Signals very weak.	Found R–101 in first r.-f. amplifier circuit burned out. Replaced with spare and operation again normal. R–101 is located under the shield plate in the variable capacitor compartment.—U. S. S. *Cinchona* (AN–12).
RAL–7.—Intermittent regeneration and erratic operation.	Detector tube socket plate prong receptacle discovered to be faulty. It had snapped in two resulting in contact on one side of prong only. Heavy seas or jars would cause signal to drop out. Installed new tube socket, circuit symbol X–103, and normal operation was resumed—U. S. S. *Signet.*
RAL–8.—Intermittent reception while tuning toward the low-frequency end on all bands.	This failure was found to be caused by the main tuning capacitor C–102C in the detector stage shorting. This defect was temporarily remedied by placing a small wood spacer under the spring at the end of the rotor shaft nearest the defective section. The failure was permanently corrected by replacing the capacitor.—U. S. S. *Winged Arrow.*
RAL–2.—Stray oscillations present on higher frequencies when switch S–15 is in SHARP position, the oscillation persisting even when volume and regeneration controls were set at minimum.	Feedback was found to be occurring between leads of L–13 (type CRV–53032 low pass filter) and grid lead of tube V–4 (type 6D6), Repaired by rerouting leads to L–13 and shielding grid lead of V–4. Receiver then was perfectly stable.—U. S. S. *Relief* (AH–1).
RAL–5.—Very noisy reception with frequency shift whenever the receiver was moved or jarred.	Cleaned and very lightly burnished the rotor and stator contacts of all coil switches which remedied the trouble.—U. S. S. *Alabama* (BB–60).
RAL–6.—Unable to pick up any signals on any band but receiver had normal amount of tube hiss noise.	Found to be due to an opening in the antenna patch cord.—U. S. S. *Breeman* (DE–104).
RAK/RAL–6.—Weak output from RAL–6 receiver.	Removing audio leads to control unit from the receiver brought the signal level back to normal. Upon investigation of control unit it was found that an audio lead was grounded by a lug. Ground was removed by bending lug back to shape and normal operation restored.—U. S. S. *Chiwawa* (AO–68).
RAK–6.—Lost signal entirely. No regeneration.	Found that solder joints between one side of R–114 and one side of R–115 were so close that they touched shorting out R–115. Pushed them apart to prevent further troubles.—U. S. S. *Cabildo* (LSD–16).

MODEL RAK/RAL RECEIVER TROUBLE-SHOOTING NOTES

→ Difficulty Encountered	Cause and Remedy
Model RAL and other types of receivers were using a common antenna. Reception was very poor on the other receivers when the model RAL receiver was being operated.	Antenna link (shorting link across decoupling capacitor C–101) was found to be closed. Opened the link. Reception then was good with the model RAL receiver in simultaneous use with the others.—U. S. S. *Carbonero* (SS–337). *10/1/47.* ←

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MODIFICATION OF MODELS RAO–9 AND RBK–14 COUNTERMEASURES RECEIVERS FOR USE WITH THE MODEL REM DUAL PAN ADAPTOR

See Page REM: 1 for complete write-up.

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→ MODEL RAO–9 AUDIO OUTPUT CONNECTIONS

The Model RAO–9 receiving equipments used in communication countermeasures installations have balanced, center-tapped, audio outputs. These installations require the use of coaxial cable between equipments. To prevent the shorting of one half of the output transformer by connecting one terminal to ground or to the shield of the coaxial cable, connect the center conductor of the coaxial cable to one terminal, either terminal of the speaking output, and directly ground the shield to the case. This will permit full audio output voltage to the phone jack and one half output voltage to the accessory equipment, which is sufficient.

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MODEL RAO SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
RAO–4.—Receiver oscillating on all bands.	Check fuse holders F–101 and F–102. This activity has found many of these fuse holders defective. The soldering lug connection through the middle of the hard rubber case to the inside ferrule is often not properly made. Even when properly soldered there is a tendency in this type of fuse holder for the lug to break off. To make repairs, the whole rear and bottom of the receiver must be removed.—RMO *Nynyk*
RAO–3.—Impossible to receive signals on band "C". Noticeable background noise received when the r-f and audio gains were full on. Other bands normal.	The r-f coil assembly was checked and it was found that the plates of the oscillator trimmer capacitor C–121 were shorted. The plates were not bent, but apparently had not been correctly spaced at the time of manufacture. To correct this, the condenser was detached from the coil assembly. The stator plate assembly was removed and unsoldered in the same manner. The stator plates were then respaced and centered so they would "mesh" correctly with the rotor plates. The condenser was reassembled and installed in receiver. Normal operation restored after oscillator realignment.
RAO–2.—No receiver output.	Investigation disclosed grounded antenna circuit and shorted C–150. Cleared grounds and replaced defective C–150 capacitor. Operation then was normal.—U. S. S. *Callaway*
Low receiver sensitivity.	Investigation disclosed dirty contacts on band switching unit. Cleaned contacts and reception was greatly improved.—U. S. S. *Callaway*
RAO–2.—Receiver very weak and sometimes dead.	Found that output transformer T–102 broke down under load. The transformer checked perfectly with set turned off, but failed to operate with set turned on. Cured by replacement of transformer.—U. S. S. *Silenus* (AGP–11)
Erratic operation of receiver on 1300-kc. to 2800-kc. band.	Found cold soldered joint between coil and terminal in band change circuit.—U. S. S. *Acoutis* (AGP–12)
Receiver cutting off and on.	Found cold soldered joint on antenna post stud.
RAO–3.—Very low audio output from receiver.	Trouble was found to be in the audio output transformer T–102, the two secondary leads having broken off completely at the terminal strip. When resoldered to the lugs, normal operation was restored. Apparently, the leads had broken off because they protruded too far above the chassis and were in the way of the coil carriage. Each time the band was changed on the receiver, the carriage hit the leads. Dressing the leads away from the carriage eliminated future troubles.—U. S. S. *LST–561*
RAO–3.—AVC system inoperative due to excessive negative voltage output.	This was caused by a faulty capacitor C–145 in the grid circuit of V–107B. C–145 had developed a high resistance leak. Operation satisfactory when the capacitor was replaced.—U. S. S. *Oceanus* (ARB–2)

RAO–4.—Receiver oscillating on all bands.	Found poor ground at capacitor shaft C–101A. Tightened capacitor shaft ground and sensitivity improved considerably.—*LST–869*
RAO–2.—Loss of receiver noise with strong signals just audible.	Found that volume control R–121 was open; also coupling capacitor C–138 broken loose at connection. Also found tube socket for first audio tube V–106 defective (rocking the tube in its socket caused the signals to cut in and out). Repaired socket by squeezing connections.—U. S. S. *Onslow* (AVP 38)
RAO–3.—The slighest vibration would put the receiver out of operation. After much checking the trouble was traced to crystal filter assembly.	Upon disassembly of IF transformer and crystal filter found a drop of solder in the IF transfarmer can and bits of corrosion on plates of capacitor C–133. Removed solder. Capacitor was cleaned and lubricated. Receiver functioned properly.—U. S. S. *Lancewood* (AN48).

MODIFICATION TO BROADEN THE TUNING OF MODEL RAS RECEIVING EQUIPMENTS

Model RAS receiver, Navy type CNA–46080, tunes very sharply and is often more useful to Naval air station control towers when arranged to tune more broadly. Practical methods for broadening the tuning include overcoupling, staggering the i-f tuning or installing more broadly tuned i-f transformers in place of the present ones.

Staggering may be accomplished by adjusting the transformer tuning while using a wobbulated signal and oscilloscope.

Model RAS series modification kits are available, for Naval air station control towers only, to Radio Material Officers under contract NXss–24547 by requisitioning them from Navy Yard, New York, and Navy Yard, Mare Island. These kits contain two i-f transformers (Navy type CNA–47340), one i-f transformer (Navy type CNA–47341), one capacitor (Navy type CAW–481072) and one nameplate labeled with Navy type CNA–46080–A.

Using this kit, the Navy type CNA–46080 radio receiver may be converted into the Navy type CNA–46080–A radio receiver by making the following changes:

(1) Replace the transformers now in positions T–101 and T–102 with Navy type CNA–47340.

(2) Replace transformer now in position T–104 with Navy type CNA–47341.

(3) Connect a Navy type CAW–481072 capacitor in parallel with capacitor C–137.

(4) Install a nameplate on the modified CNA–46080–A receiver which bears the Navy type number CNA–46080–A.

The result of this modification will be a receiver with a pass band approximately three times as wide as originally. The color code for the CNA–47340 and CNA–47341 is:

Grid—Green
Plate—Blue
Grid Return—Black
B-Plus—Red

The following method of broadening the i-f response by overcoupling is known as Navy Yard Pearl Harbor plan No. RV–46–A–124. The modification just described is preferred to this modification. In addition, it is pointed out that this is a delicate modification and should not be attempted except in a laboratory. It was accomplished as follows:

(1) Three intermediate-frequency coils were removed from the shield cans and the coupling

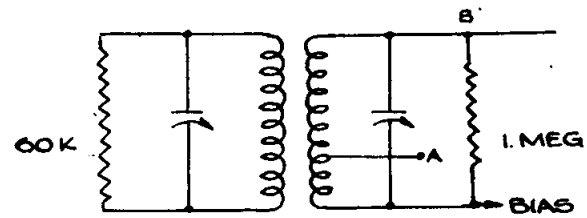

FIGURE 2.—Revised first and second i-f stages.

was increased by decreasing the distance between the primary and secondary coils from 1½″ to 7/16″. It was necessary to apply heat to the porcelain coil form to accomplish the movement of the primary coil.

(2) The secondaries of the first and second stage intermediate-frequency transformers have a tap to which the grid was connected in the original installation as shown at "A" in Figure 1. The grid connection was removed from this tap and attached to the extreme end of the coil which

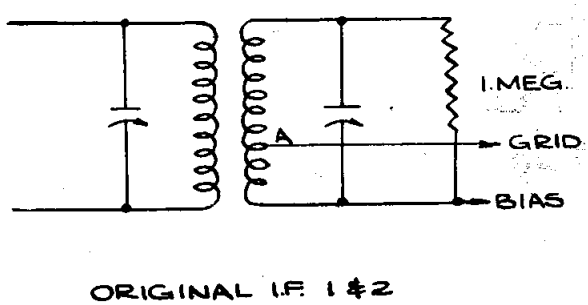

FIGURE 1.—Original connections.

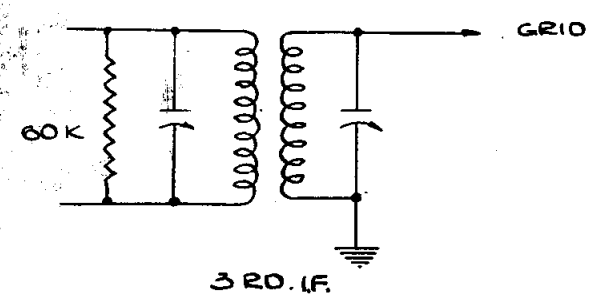

FIGURE 3.—Revised third i-f stage.

is connected to the stator plates of the trimmer condenser as shown at "B" in Figure 2.

(3) A ½-watt resistor of 60,000 ohms was connected in parallel with the primary circuit of each i-f stage, as shown in Figures 2 and 3.

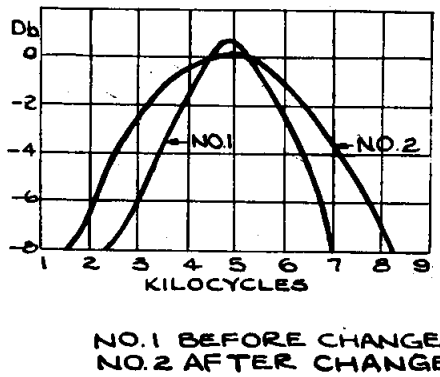

FIGURE 4.—Selectivity before and after the modification.

(4) Selectivity before and after modification is shown in Figure 4.

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MODIFICATION TO IMPROVE THE TUNING CONDENSERS OF MODEL RAS RECEIVING EQUIPMENTS

As the modification to be described is critical and the capacitance of the tuning condenser sections must be measured as part of the modification process, this modification should be attempted only by qualified personnel with adequate instruments. Read all directions thoroughly before starting the modification.

In certain RAS equipments the drive on the main tuning condenser has seized when working under conditions of high humidity. In order to effect a positive cure for this defect it is necessary to completely strip the assembly, remove a small amount from the bearing surface of the main shaft and finally to impregnate the bakelite covering of the shaft with wax to prevent further ingress of moisture. This modification should be carried out as required, or when an equipment is returned for complete overhaul. The necessary steps are as follows:

(1) As each pair of rotors and stators is carefully matched it is important that each section is marked before disassembling to insure reassembling in the same order.

(2) Remove dust cover from base of chassis, coil screening box, and coil unit.

(3) Unsolder the four stator and four rotor leads and grounding lead from right-hand end of assembly.

(4) Turn dial to zero, loosen set screws and remove; take great care not to disturb internal dial mechanism.

(5) Remove the four fixing screws from within base of chassis located immediately beneath condenser gear box. The gang assembly can then be withdrawn from the top of receiver.

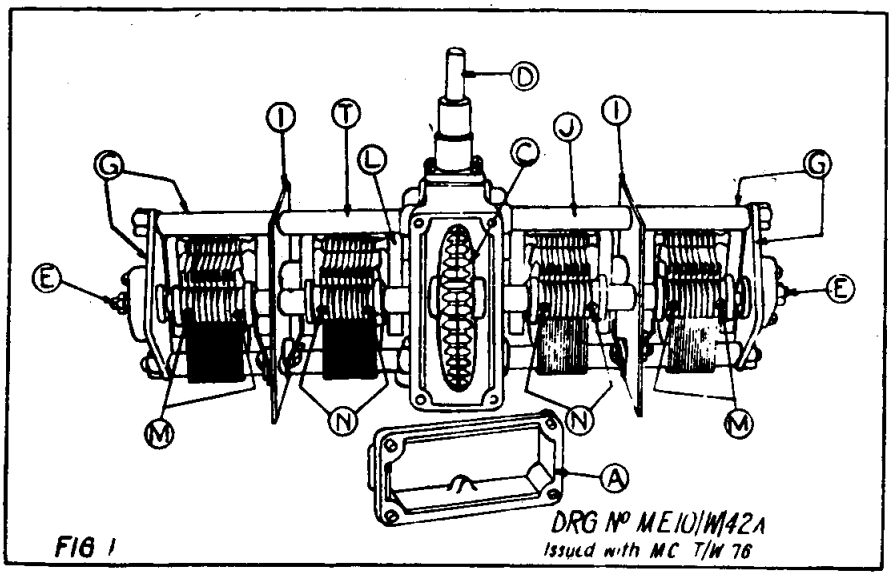

FIGURE 1.—Main tuning condenser assembly.

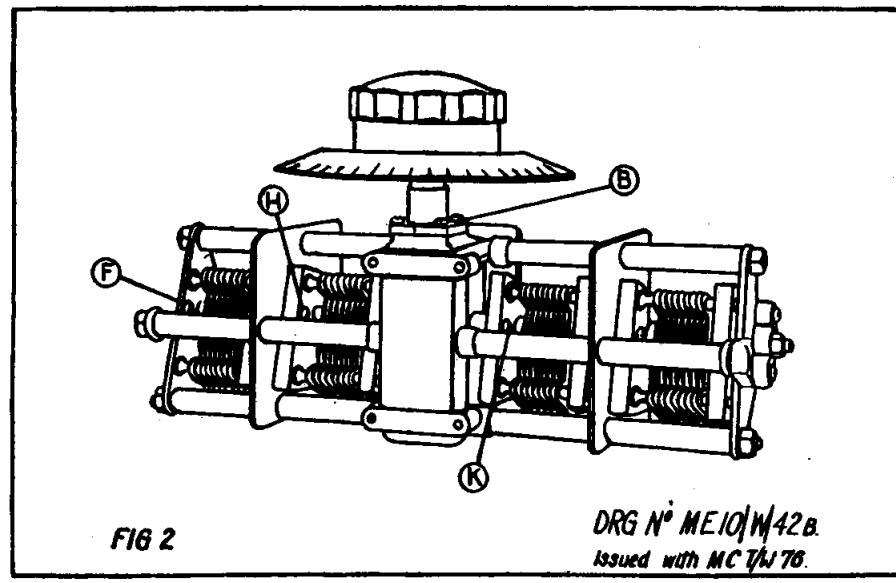

FIGURE 2.—Another view of main tuning assembly.

(6) Remove four screws retaining gear case top cover Figure 1 (A) and four screws retaining gear case cover Figure 2 (B).

(7) Bind a single loop of #12 B & S copper wire across teeth of large gear wheel Figure 1 (C) to retain the two halves in position; remove drive spindle Figure 1 (D) complete with thrust spring and two washers.

(8) Slacken off bearing screws Figure 1 (E) and remove three nuts from each plate.

(9) Remove two screws securing outer stator insulator bars to end plates Figure 2 (F).

(10) Remove end plates and spacing pieces, Figure 1 (G).

(11) Loosen Allen set screws securing outer rotors Figure 1 (M) to spindle and remove rotors taking care not to distort vanes.

(12) Remove screws securing inner stator insulator bars to screens Figure 2 (H).

(13) Remove screens complete with outer stators attached Figure 1 (I) and spacing pieces Figure 1 (J).

(14) Remove screws securing inner stator insulator bars Figure 2 (K) to gear box.

(15) Remove inner stators Figure 1 (L).

(16) Loosen Allen set screws securing inner rotors Figure 1 (N) to spindle and remove rotors, taking care not to distort vanes.

(17) Mark the spindle where it emerges from either side of the gear box.

(18) Loosen set screws securing large gear wheel to spindle and remove spindle from gear housing. Insure that gear wheel does not fall out in so doing as this is a diecasting and must be handled carefully. If spindle is badly seized it may be necessary to drive it out. To do this grip the gear box in a vise and use a punch ground to fit the contours of the spindle bearing surface.

(19) The spindle should now be set up in a lathe between centers and its diameter reduced by .002" between the two marks previously made in step (17). Under no circumstances should .002" be exceeded.

(20) The spindle should now be thoroughly cleaned and then immersed in a bath consisting of equal parts of paraffin wax and beeswax heated to a temperature of 250° to 300° F.

(21) Clean out the gear box and wipe the bearing surfaces free of all dirt.

(22) Reassemble the sections in reverse order but *do not* tighten any set screws until the bearing screws have been adjusted.

(23) The end plates have been assembled into position and the securing nuts tightened, locate spindle centrally between the bearings by slackening off one bearing screw and tightening the other until all end play is just taken up, leaving spindle to rotate quite freely between the centers. It is important that bearing screws are not overtightened, otherwise there will be danger of cracking the bearing insulators.

(24) Each rotor should now be lined up with

its respective stator, insuring that the vanes are located centrally. Tighten all rotor set screws. It is most important in doing this to see that the position of any one stator relative to the remainder is the same. This is best accomplished by lining up at maximum capacity with the "toes" (front edges) of the vanes in line. (An electrical test for this mechanical alignment will be made later and any slight adjustment can be made then.)

(25) Replace drive spindle with thrust spring and washers and secure cover in position with the four screws. Remove binding wire from large gear wheel; replace gear box cover temporarily.

(26) Locate rotor vanes so that "toes" are approximately $\frac{3}{16}''$ below "toes" of stators (i. e., just over the maximum capacity position). Rotate drive spindle clockwise until stop operates; remove gear box lid and tighten set screws in large gear wheel. These set screws are hardened steel and *must not* be overtightened, otherwise they will puncture the bakelite insulation of the spindle.

(27) Check with an ohmmeter for short circuits between vanes and for breakdown of spindle insulation.

(28) Set the rotors in line with stators at maximum capacity and fit dial to spindle. If dial has not been disturbed it should be still indicating more in one window; this window should be at the top before set screws are tightened. If the setting has been disturbed, before fitting rotate inner portion of dial until zero appears in one of the windows.

(29) Insert petroleum jelly into gear box and refit lid.

(30) Check operation of stops; stops should operate approximately 3° either side of maximum and minimum dial indications.

(31) Each section should now be checked for capacity and should give results as follows:

Maximum capacity—226 mmfd. ±5%

Minimum capacity—1212 mmfd. ±1 mmfd.

Dial setting±2 divisions	*Capacity mmfd.*
450	18.0
350	36.5
250	65.0
150	108.0
50	169.0

If the vanes have been lined up accurately as described in step (24) these figures should be obtained without difficulty; any major discrepancies will indicate bad mechanical alignment and action should be taken to correct this. Small discrepancies may be rectified by *slight* bending of the outer rotor vanes in the affected section.

(32) The dial should now be removed and the unit reassembled into chassis, screwed into position and all leads replaced. The dial should then be refitted as described in step (28), and finally the coil screening box and base of chassis reassembled.

(33) The r-f circuits should now be checked for alignment as detailed in the instruction manual.

●

INCREASING THE AUDIO OUTPUT OF MODEL RAS EQUIPMENTS WHEN USING HEADTELEPHONES

The audio output of the models, RAS, RAS–1, RAS–2, RAS–3 and RAS–4 when using headtelephones may be increased materially by means of a simple modification to the audio amplifier output circuit.

This modification consists of removing from the circuit the 300-ohm resistor R–138 shunted across the primary of the audio output transformer T–105.

After the above modification has been acomplished, the instruction book should be corrected accordingly—*Suggested by D. McC., NRL*

●

INSTALLATION OF TYPE CME 50063 PRESELECTOR ON MODEL RAS EQUIPMENTS

The Norfolk Navy Yard has developed a unique method of mounting the type CME 50063 preselector for use with the model RAS series receiver. This method of mounting offers the advantages of short leads between equipments, pleasing appearance, compact installation, ease of operation, control of both equipments on a single a-c switch, etc.

A standard relay rack panel is drilled to accommodate the dial and knobs of the preselector and the unit is installed behind the panel as

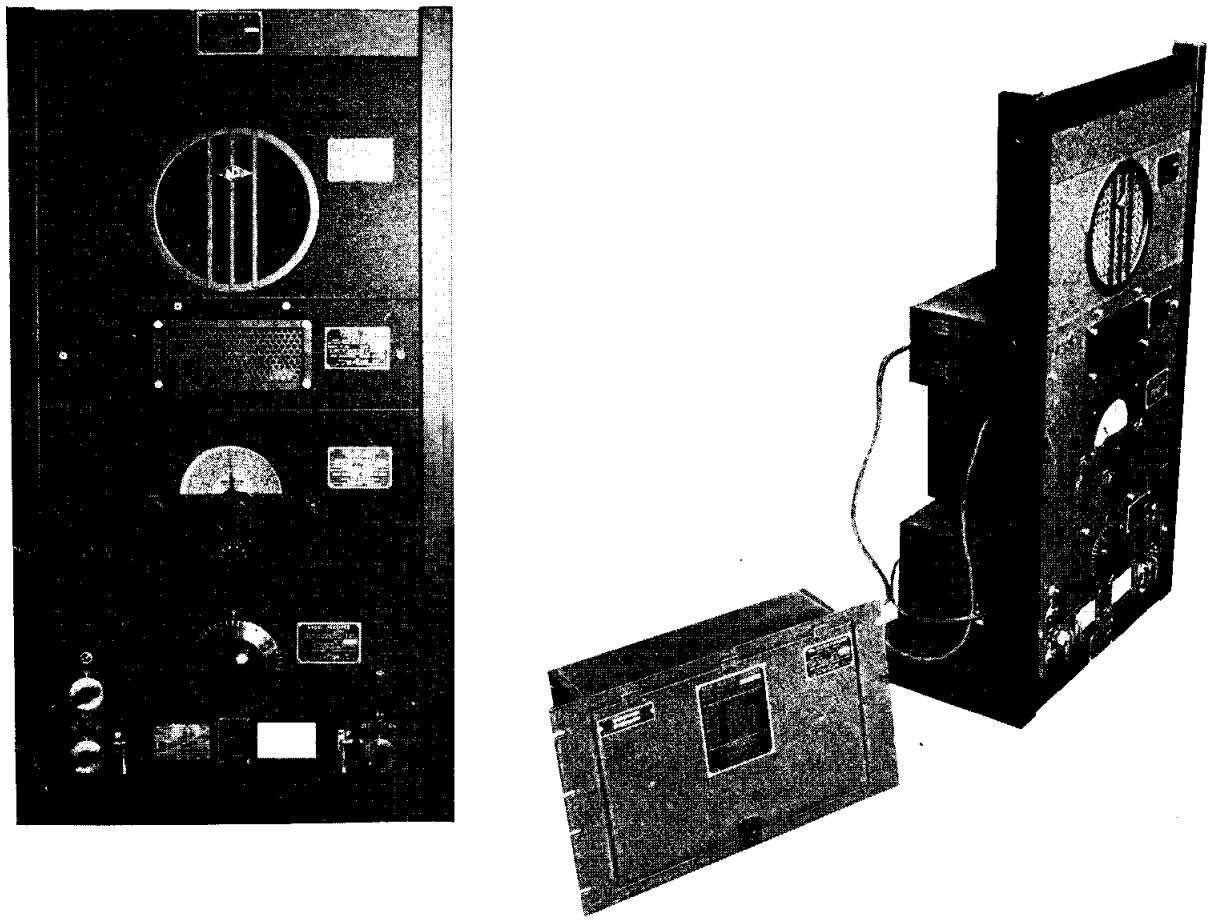

FIGURE 1.—Installation of 50063 preselector.

shown in figure 1. The coil container is removed from the rack and installed elsewhere in a convenient location.

The type CME 50063 preselector is required with the model RAS series receiver to improve the sensitivity and eliminate radiation from the receiver's local oscillator. It is not supplied as a part of the RAS equipment.

●

FAILURE OF OUTPUT TERMINAL STRIP IN MODEL RAS SERIES EQUIPMENTS

The U. S. S. *PC1122* reports failure of the insulated tip jack strip E–107. The casualty consisted of arcing between the tip jacks and between the tip jacks and ground. The arcing caused the strip to become carbonized, resulting in a permanent leakage path.

This difficulty may be prevented by a periodic cleaning of the terminal strip with carbon tetrachloride, as the collection of dust and dirt on the strip facilitates breakdown of the insulating surface of the strip.

If the arcing has occurred, a temporary repair may be made by thoroughly scraping the carbonized area with a sharp knife. Care should be taken to remove all of the carbon from the area as any unremoved carbon facilitates another breakdown. A thin coating of Glyptol or other insulating varnish may be applied to moisture-proof the exposed surface. The terminal strip should be replaced at the first opportunity.

●

REPLACING TUBES IN MODEL RAS SERIES RECEIVERS

When replacing tubes in the model RAS series receiver, care should be taken to see that the types 38636 (6C6) and types 38646 (6D6) are inserted in the proper sockets.

The type 38636 (6C6) is a sharp cut-off pentode tube. In the model RAS receiver, three type 6C6 tubes are used—one as mixer, another as a c.-w. beat oscillator, and the third as a high-frequency oscillator. The type 38646 (6D6) is a remote cut-off pentode tube. In the model RAS receiver four type 6D6 tubes are used—two as radio-frequency and two as intermediate-frequency amplifiers.

The type 6C6 and type 6D6 tubes are *not* interchangeable.

●

CHANGING COILS IN MODEL RAS SERIES RECEIVERS

When changing coils in the model RAS series receivers, the plate voltage should be removed from the receiver before the old coil is removed and should not be turned on again until the new coil is in place and dogged down. Plate voltage may be removed by the use of switch S–103 located directly above the r.-f. gain control on the front panel. This procedure eliminates the sparking at the coil terminals produced by the interruption of the plate circuits.

●

ERROR IN MODEL RAS–3 NAMEPLATES

The Bureau has received a number of radio failure reports which give the contract number for model RAS–3 receivers as NOs–99477. Investigation by the contractor discloses that this number is in error on all nameplates used with the model RAS–3 receiver. *The correct contract designation is NOs–94477* and appropriate correction should be made on all RAS–3 nameplates.—*10/1/45.*

●

MODEL RAS SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Static and howling when underway.	Poor connection between plug-in coil and receiver. Contact fingers may be carefully bent to provide better contact. The contacts and coil fingers may be polished with a pencil eraser followed by thorough washing with carbon tetrachloride.—U. S. S. *Thornton*
RAS–3.—Failure of power transformer T–201. V–201 filament winding shorted to high-voltage filament winding.	Cause of failure believed due to faulty fuse holder. Fuse clips were broken and fuses were lying loosely in holder. Fuses would partially make and break connection as ship vibrated, the resulting surges contributing to the overheating of the transformer. Suggested remedy: close inspection of fuse holder when cleaning set to see that fuses are in tightly and are held correctly.
Receiver was operating, but gradually lost its sensitivity.	Tube V–108 screen bypass capacitor C–127 and B-minus-to-chassis bypass capacitor C–138 shorted. Resistor R–118 developed a high resistance. Replaced these faulty parts and set operated normally.—*U. S. S. NAAF* Navy #401
Power supply becomes "hot and smokes".	Power transformer burned out. Completely rewired power supply and replaced power transformer. Operation satisfactory.—U. S. S. *Curtiss*
RAS–3.—Continuous a-v-c action when a-v-c switch S–102 set to VOICE and C-W positions.	Found to be due to defective switch S–102. Repair effected by replacement of switch.—*U. S. S. PC–580*
RAS–3.—Rapid frequency shift or wobble in c-w beat oscillator.	Found poor connection between rotors of C–144 and C–145. Resoldered.—*U. S. S. PC–580*
→ RAS–3.—Sensitivity normal but output weak.	Found bypass capacitor across cathode bias resistor of 6V6 open. Replaced.—NOB *Navy 1504*
RAS–3.—No AVC action on any band.	Investigation disclosed shorted capacitor C–141, V–107–B cathode bypass. Replaced from spares.—Charles L. Harris, RM1/c—U. S. S. *PC–580*
RAS–3.—CW signals had "hashy" sound and would change frequency slightly above and below the dial frequency.	Trouble found in CW oscillator tuning transformer T–103. Connector between rotors of trimmers C–144 and C–145 had never been soldered to lug on C–144. Replaced transformer from spares and repaired the one removed for use as a spare.—Charles L. Harris, RM1/c—U. S. S. *PC–580* ←

TYPE CABL–74039 PORTABLE FREQUENCY STANDARD FOR CALIBRATION AT AUDIO FREQUENCIES OF RAU OR AN/FMQ–1A RADIOSONDE RECEIVING AND RECORDING EQUIPMENT

The type CABL–74039 portable frequency standard (shown in Figures 1 and 2) is used to calibrate the frequency meter and recorder of RAU or AN/FMQ–1A radiosonde ground equipment. One portable frequency standard has been shipped marked FOR AEROLOGICAL OFFICER to all shore based radiosonde stations. This PFS will be retained by the Aerological Officer as a component of the radiosonde equipments. For shipborne and newly established shore installations one PFS has been shipped to the Electronics Officer at all Navy Yards, Electronic Pools, and Branch Electronic Pools. These will remain in the custody of the Electronics Officers.

→ In addition, one PFS has been shipped to each of the following Electronics Repair Ships, marked for "Commanding Officer (ATT: ELECTRONICS OFFICER)":

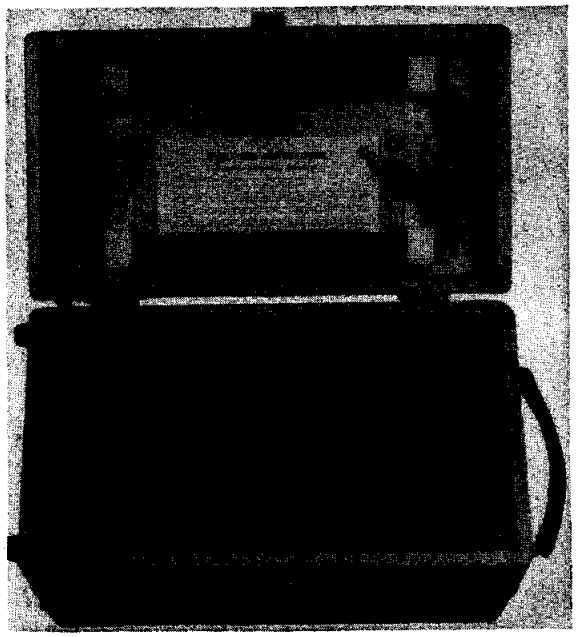

Figure 1.—CABL–74039 portable frequency standard–external view.

Figure 2.—CABL–74039 portable frequency standard–chassis.

AG–68	AG–74
AG–69	AG–75
AG–70	AG–76
AG–71	AG–77
AG–73	AG–78 ←

Ship and newly established shore radiosonde installations may obtain calibration service upon request to the nearest Electronics Officer or Electronics Repair Ship. Shore based radiosonde installations will be calibrated by aerological personnel with the assistance of the cognizant Electronics Officer under whose responsibility the maintenance and repair of radiosonde equipment falls.

Policy has been established to have radiosonde ground equipment calibrated every three months except at stations not readily accessible, where the interval may be six months. In addition to these periodic checks radiosonde stations having a PFS in their custody will calibrate their equipment once each month.

In the PFS, a small synchronous clock motor is driven at constant speed from the voltage generated by a self-excited vibrating reed. A flat transparent glass disc is mounted on the shaft of the motor. The face of the disc is made up of thirteen annular rings. Each ring consists of alternate transparent and opaque

segments. A concentrated light beam is interrupted by the opaque segments on the rotating disc. The light pulses thus formed are focused on a photo-electric cell and the resulting current is amplified to produce a suitable voltage at the selected frequency.

The PFS is capable of producing a minimum output voltage of 10 volts (peak) into any load impedance from 0.1 to 1.0 megohms at 20-cycle intervals from 10 to 250 cycles. The output wave-form is intermediate between a square wave and a sinusoidal wave. The percentage accuracy of the generated frequency is constant over the entire range of operation and is within 0.2 percent of the indicated frequency.

The unit operates from a 110- to 120-volt, 50- to 60-cycle power source. This standard is designed to be independent of wide variations in power line frequency and voltage as well as temperature variations.

The PFS is a precision instrument and should be handled accordingly. It consists of delicate and fragile parts such as vacuum tubes, clock motor, and thin glass discs. Storage in a warm dry location is recommended. The unit is not tropicalized and extra precautions against moisture must be provided in tropical areas.

A schematic diagram is provided in the cover of each instrument for maintenance purposes. The synchronous clock motor is self-lubricating. *Under no circumstances should adjustment of the vibrating reed be attempted.* A spare glass disc is provided with each unit and is attached to the inside bottom of the case. If faulty operation of the PFS is suspected, a nominal frequency check may be made by comparison with the output frequency of an audio oscillator such as the LO or LAJ. It should be noted, however that the accuracy of these oscillators may be less than that of the PFS. A more accurate check might be made using an oscilloscope and comparing the 110-cycle output with the WWV standard audio-frequency transmission of 440 cycles.

Calibration procedure is as follows:

(1) The radiosonde ground equipment should be turned on with all components functioning for a "warm up" period of 30 minutes before proceeding with the calibration.

(2) On the receiver, turn down the AUDIO GAIN and REGENERATION controls to zero position.

(3) Turn the radiosonde electronic frequency meter INPUT control to position marked SC.

(4) Adjust the ZERO SETTING knob located beneath the recorder so that the recorder prints a trace, the left edge of which falls exactly on the zero line of the chart.

(5) The meter on the radiosonde electronic frequency meter panel should also read zero.

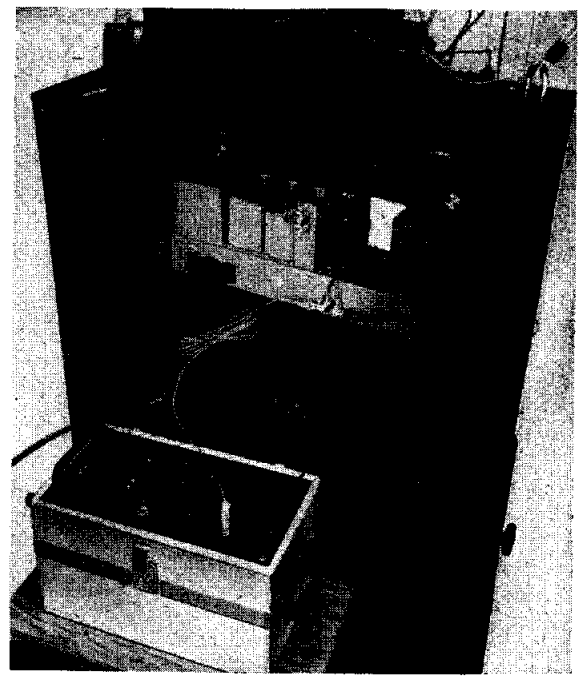

FIGURE 3.—CABL–74039 portable frequency standard attached to RAU receiver.

If not, adjust the zero setting screw on the meter with a small screw driver to obtain this value.

(6) After the preliminary adjustments above are completed, turn the radiosonde electronic frequency meter INPUT control to position X.

(7) Connect the *red* and *black* output leads of the PFS to the radiosonde receiver output terminals as shown in Figure 3. Turn on the PFS and set the selector switch to 190 CYCLES PER SECOND position. Instructions for operating the PFS are contained in the cover of the case. It should be allowed to warm up for

at least 10 minutes before attempting the calibration.

(8) With the PFS set on 190 CYCLES PER SECOND and in an operating condition, adjust the COARSE and FINE controls on the radiosonde electronic frequency meter until the recorder is printing a trace, the left edge of which falls exactly on the 95th division line of the chart. Simultaneously the meter on the radiosonde electronic frequency meter panel should also indicate 95 divisions. If not, remove the EQUALIZER cap on the electronic frequency meter panel and make the necessary adjustments until the meter reading and recorded trace value agree. Readjust the FINE control on the electronic frequency meter panel so that the recorder trace and meter reading simultaneously indicate 95 divisions. With this accomplished, the radiosonde electronic frequency meter COARSE and FINE controls *should not be touched during the remainder of the calibration.*

(9) Proceed with the actual calibration in 20-cycle intervals by adjustment of the selector switch on the PFS from 190 cycles down to 10 cycles and back up to 190 cycles. At each setting record the value indicated by the recorder trace and by the visual meter. The recorder trace value and meter reading on the electronic frequency meter panel should simultaneously indicate 95 divisions when the PFS is brought back to the 190 CYCLES PER SECOND setting at the end of the calibration. If not, this indicates that the equipment has drifted and the entire calibration, beginning with instruction (8) above, must be repeated.

(10) For each setting of the PFS from 10 to 190 cycles, the average error of the meter value and the trace value should be calculated. For example, on the standard setting of 150 cycles going down the recorder indicated 76 divisions. On the way up for the same 150-cycle setting the recorder indicated 76.8 divisions. The true reading should have been, in either case, 75 divisions. The average error is therefore $+1.0+1.8\div2=1.4$ divisions plus. The same procedure is used for all other settings except at the 190-cycle setting where the error should be zero. The same procedure is followed for determining the average errors for the visual meter on the radiosonde electronic frequency meter panel.

If the calibration data shows that the radiosonde recorder is in error by one-third of a division or less, at any point between the 5th and the 85th division, the errors may be neglected.

If the error is between one-third and one division at a few places along the recorder and are all plus or all minus the tapper bar on the recorder may be bent slightly in or out as necessary, or the recorder meter may be moved on its base. Only personnel thoroughly familiar with the equipment should attempt this. This procedure is described on page 14 of the RAU-2 instruction book approved 11 September 1944.

If the error is greater than one division but less than two divisions anywhere along the recorder trace, or changes from a plus to a minus error, then a correction curve for the recorder must be plotted. This curve could best be plotted on a piece of recorder chart paper with recorder divisions on the abscissa and average error (calculated in paragraph (10) above) along the ordinate. This curve should then be used to determine the correct recorder division value in the computation of each significant point in daily radiosonde soundings.

Should the calibration indicate a recorder error of greater than two divisions (plus or minus), the nearest Electronics Officer should be contacted for repairs, or overhaul, as necessary.

A correction curve for the visual meter on the radiosonde electronic frequency meter panel should be drawn for errors between two tenths and two divisions as mechanical adjustments cannot be made on this meter. *11/1/45*

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REPORTING OF FAILURES OF MODEL RAU SERIES AND AN/FMQ-1A RADIOSONDE EQUIPMENTS

Very few failure reports have been received by the Bureau on the model RAU series radiosonde equipments. These reports are described in an article in Section 1 of this Bulletin.

Failure reports provide first hand information under actual operating conditions and are

essential in the maintenance of the equipment.

The Bureau is particularly interested in all model RAU series and AN/FMQ–1A radiosonde equipments at this time and failure reports NAVSHIPS NBS–383, completely filled out, must be submitted for all failures on the radiosonde equipments. *5/1/46*

●

→ INTERFERENCE IN RADIO SONDE EQUIPMENTS

During recent months, several cases of interference in Models RAU series radio sonde equipments have been reported to the Bureau. Several ideas were suggested and these along with some practical pointers are passed on for further use. However, it must be remembered that each case of interference should be checked very carefully before taking any of the recommended steps as few of the cases are similar.

1. The AN–ARC–4 transmitter employs several frequency mutiplication stages and signals of about 72 megacycles find their way from these stages into the ARC–4 antenna and are radiated. This interference may be reduced or eliminated by the insertion of a wave trap in the transmitter, the trap being tuned to about 72 megacycles. Either a series or a parallel resonant circuit may be used, the choice being determined by the circuit location selected. In general, however, series resonant traps having as high an L to C ratio as possible should be used across high impedances (as across a tank circuit), while parallel resonant circuits of fairly high C should be used in series with low impedance loads (as in series with a coaxial line to an antenna). It should be also remembered that the interferring signals are not necessarily exactly on 72.2 megacycles. The radio sonde receiver is of the superregenerative type and in common with other receivers of this type tunes extremely broad, accepting strong signals over a considerable frequency variation from the nominal 72.2 megacycles.

2. In the case of the TBY, MBF, and TBS equipments, which operate on 72 megacycles, nothing must can be done except to secure them when the radio sonde equipment is in use.

3. The TBL which operates on 9320 kilocycles has an eighth harmonic that falls on 74.56 megacycles. This may cause trouble if the raysonde (balloon) transmitter frequency is off its nominal value in the direction of higher frequencies and the TBL harmonic is strong enough to enter the broad superregenerative receiver.

4. Electrical devices, such as motor generators, can also cause serious interference in radiosonde equipments. In the case of portable tools which are especially bad noise sources, the interference may be reduced by inserting a pair of capacitors in series across the power line and connecting the common wire to the frame of the tool. For permanently installed motors and generators maintenance work may reduce the interference but for complete suppression pi-section filters are recommended. A description of these filters and suggestions for their installation are contained in the "INT" section of the communication equipment maintenance bulletin.

Shielding harnesses are also available for the suppression of ignition noises from gasoline engines. Radar Interference produced by models SA, SC, and SK radars can be eliminated by use of the type 53153 filter, which is described on page "INT–4" of the communication equipment maintenance bulletin. No satisfactory filters are yet available for use in eliminating interference produced by the higher frequency radars such as the SG, but fortunately these systems do not generally interfere with the radiosonde equipment.

By following the above suggestions and using the appropriate filter it is possible to reduce the radiated noise field to less than 5 microvolts per meter at a distance of 3 feet from a noise source and to reduce the noise fed into the power line to the same figure. These figures may be obtained over a frequency range of 150 kilocycles to 150 megacycles. It is recommended that radiosonde equipped stations and vessels report all cases of interference on the NBS–383 failure report card or by special letter. If the foregoing suggestions do not remedy the situation, a statement should be included in this report to that effect. Electronic officers should install the type 53153 filter on all radiosonde receivers within his jurisdiction.

10/1/46

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LUBRICATION OF RADIOSONDE RECORDING EQUIPMENT

The Recorder of the Radio Sonde is the only unit of this equipment requiring periodic lubrication. This unit cannot be "tinkered with" and be expected to perform in a normal manner. Therefore, personnel assigned to the maintenance of these equipments should follow the lubrication instructions very carefully remembering that over-lubrication is as harmful as no lubrication at all. Figures 1, 2, and 3 give the instructions in pictorial form and are complete except for the following:

A. Once a Month:

The rack hinges, locks and fasteners, pivots and slides, optical adjustment and light bulb clampscrew threads and friction finger arm tension locks should be lubricated sparingly with type O. S.–1113 lubricant.

B. Every 6 Months:

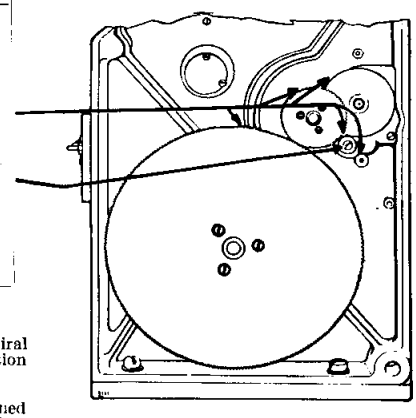
(*1*) *Light disk support shaft bearings.*—To lubricate the light disk support shaft bearings, the following disassembly is the first necessary: (*a*) Remove optical system gear. (*b*) Remove light disk assembly by unscrewing thumb nut and pulling light disk assembly from the shaft. (*c*) Remove two Allen-head screws from the optical gear hub. (*d*) Remove gear hub and key from shaft. (*e*) Remove bearing retainer and outer bearing. (*f*) Remove the shaft and inner bearing from the inner side of the recorder frame. (*g*) Clean and coat bearings sparingly with lubricating grease O. S.–1350. (*h*) Reassemble in reverse order.

(*2*) *Photo tube disk support bearings.*—The photo tube disk assembly is disassembled, lubricated, and reassembled in the same manner as the light disk assembly.

The following lists the Federal Standard Stock Catalog Number of the lubricant used:

Navy type	*Federal stock numbers*
O. S. –1350	14–G–715 (10 lbs).
	14–G–720 (25 lbs.).
O. S.–1113	14–O–88–10 (5 gal.).
	14–O–884–20 (55 gal.).

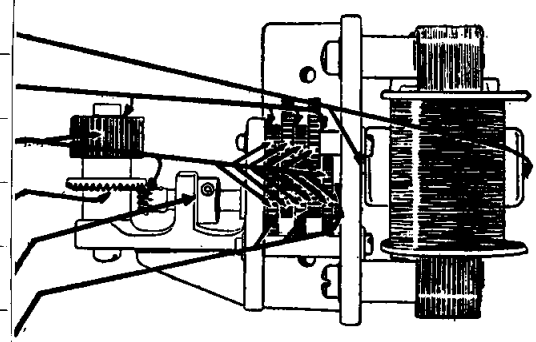
Instructions	Navy Type Lubricant	Monthly
DRIVE GEARS AND PINION Clean teeth and polished metal surfaces of gears and pinion. Apply lubricant O. S.-1350 sparingly to teeth. Then remove excess. Wipe polished metal surfaces with clean cloth lightly dampened with O. S.-1113.	O.S.-1350 and O. S.-1113	X
IDLER GEAR SHAFT Located behind main gear on right side. One or two drops.	O. S.-1113	X



NOTES

1. These features of the paper-drive mechanism (left side) and spiral drum cylinder drive mechanism (right side) are of similar construction and require the same lubrication and service attention.
2. Reduce intervals under severe operating conditions.
3. Clean parts with a clean brush or lint-free cloth lightly dampened with dry cleaning solvent. Allow parts to dry thoroughly before lubricating.

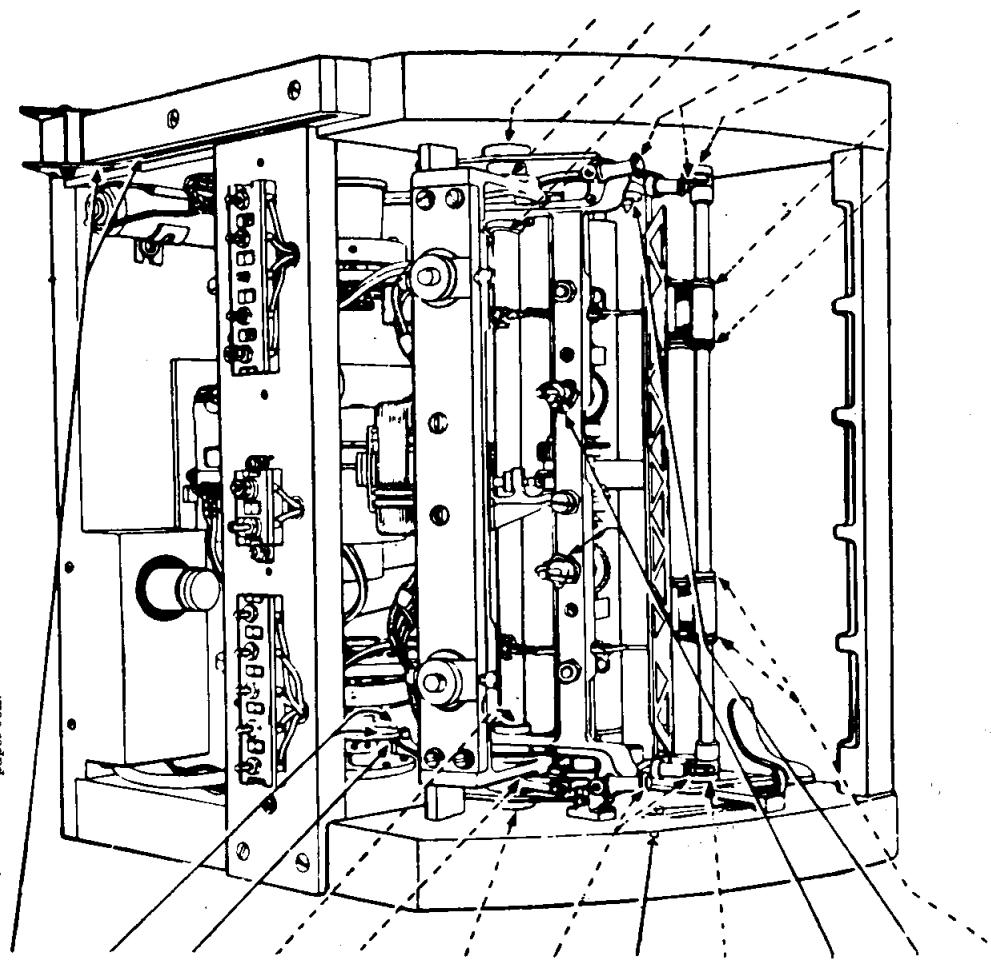
Instructions	Navy Type Lubricant	Monthly	Semi Monthly
DRIVE MOTOR BEARINGS 3 or 4 drops each oil hole	O. S.-1113		X
GEAR SHAFTS 1 or 2 drops each	O. S.-1113	X	
GEARS AND PINIONS Clean and coat teeth sparingly	O. S.-1350	X	
GEAR SHAFT 1 or 2 drops	O. S.-1113	X	
DRIVE SHAFT BEARING 1 or 2drops	O. S.-1113	X	
GEAR SHAFTS 1 or 2 drops each	O. S.-1113	X	



Navy Type	*Federal Stock No.*
O. S.-1350 (10 lbs.	14-G-715
O. S.-1350 (25 lbs.	14-G-720
O. S.-1113 (5 gal.	14-O-884-10
O. S.-1113 (55 gal.	14-O-884-20

FIGURE 1.—(*Top*) Drive mechanism. Right and left sides. Left side illustrated. (*Bottom*) Ribbon drive assembly removed from rocker arm frames.

CAUTION: Lubricate dotted arrow points on both sides. After lubricating, operate mechanism to distribute lubricant. Stop mechanism and wipe off excess lubricant to prevent spreading onto ribbon and paper roll.



NOTES

1. Reduce intervals under severe operating conditions.
2. Clean parts with a clean brush or lint-free cloth lightly dampened with dry-cleaning solvent. Allow to dry thoroughly before lubricating.

Instructions	Navy Lubricant	Monthly
CHASSIS RETURN ASSEMBLY Clean and apply light film of lubricant to contact surfaces of slide rollers and guide. Lubricate roller shafts with one drop of O. S.-1113.	O. S.-1350 and O. S.-1113	X
CAM AND CAM ROLLER Clean and coat contact surfaces sparingly.	O. S.-1350	X
CAM ROLLER SHAFT One or 2 drops	O. S.-1113	X
TOPPER BAR SUPPORT BEARING Two or 3 drops	O. S.-1113	X
ROCKER FRAME SUPPORT BEARING Two or 3 drops	O. S.-1113	X
BACK SECTOR GEAR SHAFT Three or 4 drops. Apply lubricant between sector gear hub and recorder frame.	O. S.-1113	X
RIBBON ROLLER SHAFTS One drop each	O. S.-1113	X
PULL-OUT ARM CATCH PIVOT One or 2 drops	O. S.-1113	X
FRICTION FINGER SUPPORT ARM PIVOT One drop	O. S.-1113	X
RIBBON SPOOL SHAFT ASSEMBLIES Lubricate lever shaft pivot sparingly and apply one drop of lubricant to lever shaft plunger bore.	O. S.-1113	X
PAPER ROLL SPRING LOADED BEARING One or 2 drops	O. S.-1113	X
FRICTION FINGER PIVOT One drop each end of pivot	O. S.-1113	X

FIGURE 2.—Top view. Recorder tilted out of rack.

704912—46——3

CAUTION: Lubricate dotted arrowpoints on both sides. After lubricating, operate mechanism to distribute lubricant. Stop mechanism and wipe off excess lubricant to prevent spreading onto ribbon and paper roll.

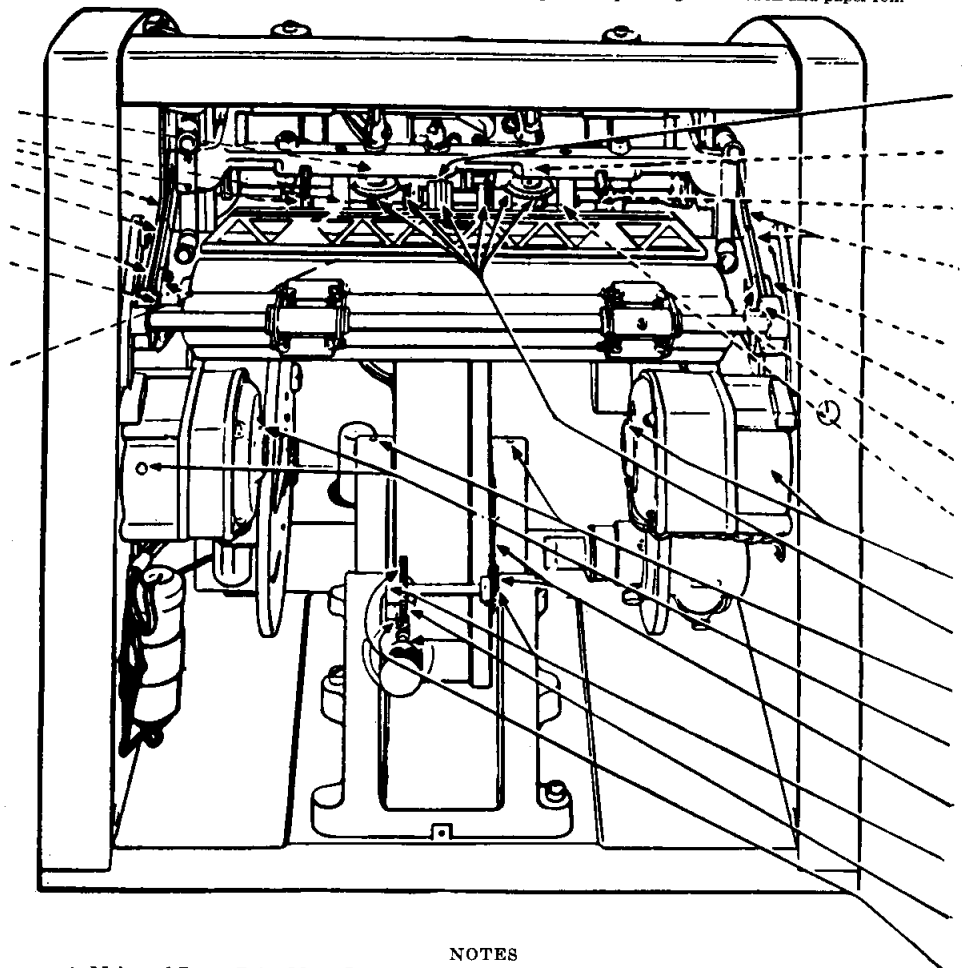


FIGURE 3.—Front view. Paper chute removed.

MONTHLY	SEMI-ANNUALLY	NAVY TYPE LUBRICANT	INSTRUCTIONS
X		O. S.-1113	**DETENT PIN HOLDER AND SPRING** One drop. Press in pin applying lubricant.
X		O. S.-1113	**RIBBON SPOOL DRIVE SHAFT** One drop.
X		O. S.-1113	**DOG-LEG ROLLER** One drop.
X		O. S.-1350	**FRONT AND BACK SECTOR GEARS** Clean and coat teeth sparingly.
X		O. S.-1113	**SUPPLY ROLL MOUNT PLATE BEARING** 2 or 3 drops. Apply lubricant between plate and recorder frame.
X		O. S.-1113	**PAPER DRIVE ROLL BEARING** 2 or 3 drops.
X		O. S.-1113	**SPIRAL DRUM SHAFT BEARING** 3 or 4 drops.
X		O. S.-1113	**RIBBON GEAR SHAFT SUPPORT BEARING** One drop.
	X	O. S.-1113	**MAIN DRIVE MOTOR BEARINGS** (See note 1)
X		O. S.-1350	**RIBBON DRIVE WORMS, GEARS, AND DETENT** (See note 2)
X		O. S.-1113	**METER CASE PIVOT BEARINGS** 2 or 3 drops each.
	X	O. S.-1113	**PAPER DRIVE MOTOR BEARINGS** (See note 1).
X		O. S.-1350	**METER ADJUSTMENT SECTOR AND PINION** Clean and coat teeth sparingly.
X		O. S.-1113	**SECTOR GEAR SHAFT BEARINGS** One or 2 drops each.
X		O. S.-1113	**WORM GEAR SHAFT BEARINGS** One or e drops each.
X		O. S.-1350	**SECTOR DRIVE GEAR AND WORM** Clean and coat teeth sparingly.

NOTES

1. Main and Paper Drive Motor Bearings: Add lubricant through oil hole until it appears at vent hole on under side of bearing. Lubricate main drive motor drive-end bearing from rear of recorder after removing light disc assembly.
2. Ribbon Drive Worms, Gears, and Detent: Clean worm and gear teeth and contact surface of detent. Lubricate worm and gear teeth sparingly and apply light film of lubricant to surface of detent.
3. Reduce intervals under severe operating conditions.
4. Clean parts with a clean brush or lint-free cloth lightly dampened with dry cleaning solvent. Allow parts to dry thoroughly before lubricating.

MODEL RAU RADIOSONDE EQUIPMENT TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
RAU.—The tapper-bar would operate only when the light assembly was turned over by hand.	All tubes tested o. k. All voltages in the photo cell and pre-amplifier appeared satisfactory. It was believed, however, that the bias on V–202, a 2051 tube, was too high. The actual trouble was that the slider contact on R–204 was making poor contact allowing the bias on V–202 to be very unstable. The contact was cleaned with crocus cloth and the tapper-bar operation returned to normal.—U. S. S. *Shangri-La.*

TENDER SPARE PARTS FOR THE POWER PACKS OF MODELS RBA, RBB, AND RBC EQUIPMENTS

The Bureau has under procurement 200 sets of tender spare parts for the power packs of model RBA equipments. These spare parts are applicable not only to the power packs of model RBA equipments, but also to those of models RBB and RBC equipments. In addition, the Bureau has on procurement 824 sets of stock spares which are applicable to the power packs of models RBA, RBB, and RBC. Upon exhaustion of tender spare parts, the Bureau will issue these stock spare parts in lieu of tender spare parts requested by the field. All power packs for these receivers are the same, and all types of spares are 100-percent interchangeable.

Tender and stock spares for the RBA, RBB, and RBC receivers themselves are not interchangeable, and should be requested for the specific receiver required.

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→ RBA RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 1

INSTALLATION OF TYPE 49509 PLUG ADAPTERS

Equipments affected.—All model RBA through RBA–4 series radio receivers.

Purpose.—To adapt the audio output plug to fit the type TTHFA–1 cable specified for use in audio circuits.

Procedure.—The plug adaptor is to be installed in the following manner: (The numbers, in brackets, referenced throughout the text, refer to Fig. 1.)

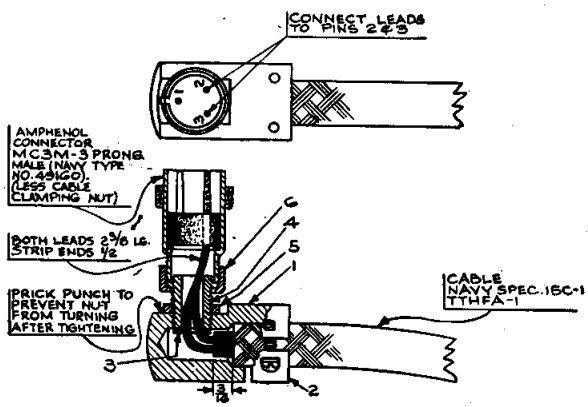

FIGURE 1.—Installation of plug adapter.

(1) Remove the cable clamping ring furnished with the plug, Navy type CPH–49160. This plug is supplied with the radio receiving equipments.

(2) Strip ½″ off the ends of the two conductors as shown in Figure 1.

(3) Insert the cable into the connector body [1] and pull the two conductors through the tapped hole in the body.

(4) Clamp the cable in place with clamp [2]. Two machine screws and lockwashers are furnished for this purpose.

(5) Insert the insulating washer [3] over the two conductors and into the bottom of the tapped hole in the conductor body [1]. (See Fig. 1.)

(6) Assemble bushing [4], locknut [5], coupling nut [6] and plug, Navy type CPH–49160. Insert the conductor leads into pins no. 2 and no. 3, as shown in Figure 1.

(7) Before tightening the locknut [5] note positions of the key and connections. Be sure that the positions agree with Figure 1. Tighten the locknut [5].

(8) Prick-punch the connector body adjacent to the locknut [5] to prevent it from turning.

(9) Solder leads to pins no. 2 and no. 3.

General.—Correspondence received in the Bureau indicates that the type 49509 plug adapter kits are not being utilized in every instance as originally intended. The kits are required to adapt the audio output plug, furnished with the above receivers, to fit the type TTHFA–1 cable specified for use in audio circuits.

Kits have been distributed, under contract NXsr–39245, to the various Electronic Pools in quantities equal to the number of receivers for which they are required. Until later models are available, the issuing Supply Officers for Radio should ascertain that a type 49509 adapter kit accompanies each receiver for which it is required. Vessels are requested to contact an Electronics Officer at the earliest opportunity for the installation of the plug adapter.

Instruction books should be corrected accordingly. A record of completion of this

change should be made on the ship's Radio Equipment Log, NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card.—*1/1/46*

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RBA RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 2

INVERSION OF POWER SUPPLY FILTER CHOKE (NO KIT)

Equipments affected.—RBA receivers with power units having the following serial numbers:

1– 451, incl.	2261–2263, incl.
488– 492, incl.	2265
801– 802, incl.	2267–2269, incl.
804– 844, incl.	2270
846	2272–2274, incl.
848– 850, incl.	2276–2279, incl.
852– 901, incl.	2281
907	2286
1601–1695, incl.	2289
1800–1819, incl.	2293
1821–1872, incl.	2295–2296, incl.
1874–1899, incl.	2298–2299, incl.
1900–1998, incl.	2303–2305, incl.
2000–2008, incl.	2307
2012–2016, incl.	2309–2310, incl.
2018–2021, incl.	2313–2314, incl.
2025	2316–2317, incl.
2028–2033, incl.	2320–2321, incl.
2038	2323–2326, incl.
2041	2328–2336, incl.
2050–2051, incl.	2340–2341, incl.
2058	2345
2062	2347–2351, incl.
2069	2353
2071–2075, incl.	2355–2399, incl.
2078–2079, incl.	2400–2402, incl.
2172	2404–2416, incl.
2213	2418–2471, incl.
2238	2473–2499, incl.
2241	2500–2527, incl.
2245–2246, incl.	2529–2548, incl.
2249	2550–2589, incl.
2251–2253, incl.	2591–2600, incl.
2255–2257, incl.	

Attention is invited to the fact that the serial numbers listed above are the serial numbers of the type CRV–20130 power units, not the serial numbers of the associated receivers.

Purpose.—To prevent the possibility of shorting of the filter choke or grounding of the the high-voltage output of the power pack.

Procedure.—This change consists of merely inverting the type CRV–30788 filter choke.

General.—One of the most frequent troubles encountered in models RBA equipments is failure of the type CRV–20130 power supply unit. The difficulty usually encountered is a shorting of the filter chokes or grounding of the high-voltage output of the power pack. It is caused by the melting of the wax potting compound of the type CRV–30788 filter choke due to the high temperature inside the unit. Softening of the wax potting compound permits the coil assembly to settle and make contact with the terminal studs to which it is connected, resulting in either the shorting of the choke or grounding of the terminal studs and consequent failure of the unit.

The contractor has taken steps to eliminate this difficulty, and in future production of the power supply unit this trouble will not be encountered. The improved chokes were installed in all equipments shipped by the contractor after 18 January 1943. The equipments shipped prior to that date were not entirely in serial number sequence.

In the inverted position, the chokes are not subject to casualty when melting occurs because the choke coil assembly simply comes to rest on the bottom of the container. It has been found that there is no strain or pull exerted on the connecting wires between the choke coil itself and the terminal studs in the case of inverted chokes where the coil assembly drops to the bottom of the container.

In the event that equipments having improved chokes (serial numbers not given above) have already been modified by inverting the filter chokes, no action need be taken to return the equipments to their original condition as inverting the chokes produces no change in the operation or function of the equipments.

The contractor is supplying a quantity of improved chokes for use in replacing those shorted or damaged. These are being supplied to the various Electronic Pools, and do not require inversion.

This change is within the scope of the ship's force and should be completed at the first opportunity. Record of completion of this change should be made on the ship's Radio Equipment Log, NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *1/1/46.*

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MODEL RBA SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Failure of filter chokes L–405 or L–406.	The faulty unit should be taken apart and a repair attempted. In the majority of cases the core of the choke has either shorted across the contacts or shorted a contact to ground. A repair can be effected by insulating these contacts thoroughly from each other and from the core of the coil. If the coil has had time to "burn out" this repair will be successful. In this case, a *temporary substitute* for the component can be effected by using a 400-ohm 50-watt resistor. The voltage output remains the same and the hum output will not increase noticeably. This procedure is recommended *only as an emergency repair measure.* Failures due to internal shorts may be prevented by adapting the procedure described on page RBA : 1.
Weak signals.	Set screws on coupling from main tuning dial to auxiliary gain control, R–128, were found loose. R–128 was set to proper operating value and coupling secured.—U. S. S. *Chandeleur.*
Failure of 250-volt d-c meter, M–101.	Usually traced to the multiplier, which may be temporarily replaced with a resistor of higher wattage, the resulting error depending the accuracy of the replacement.
Weak signals.	Cold-solder joint at antenna connection.—*U. S. Naval Station, Navy 129*
Weak signals.	Type 6SK7, third r-f tube shorting between elements after warming up.—*U. S. Naval Station, Navy 129*
Poor operation of low-frequency receivers, such as RAO, RBA and RAK when operated in parallel on the same antenna with a high-frequency receiver, such as the RBL, RBB, RBC and RAL.	This is due to the fact that the input impedance of the antenna circuit of high-frequency receivers is very low and, hence, practically short circuits the antenna to ground leaving little signal for the low-frequency receiver with its high input impedance. The best solution is to provide separate antennas for low- and high-frequency receivers. If conditions are such as to prevent this, the receivers may be decoupled by inserting a condenser in series with the antenna connection of the high-frequency receiver. The decoupling impedance may be mounted inside the junction box on the "Boston" line.
RBA.—Failure of dial lamps to light.	Found that cause was the shorting of the lamp holder to the chassis.—U. S. S. *Scribner* (APD–122)
RBA–1.—Intermittent operation.	Found poor solder joint on sockets for V–102 and V–107.—U. S. S. *Stack* (DD–406)

RBA–1.—No indication on output meter.	Emergency repair was made by substituting a type 22152 meter found in spare parts for model RAK–RAL series of equipments.——U. S. S. *Long Island* (CVE–1).

TENDER SPARE PARTS FOR THE POWER PACKS OF MODEL RBB EQUIPMENTS

See the article entitled "Tender Spare Parts for the Power Packs of Models RBA, RBB, and RBC Equipments," on page RBA : 2.

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ERROR IN INSTALLATION INSTRUCTIONS FOR PANORAMIC COUPLING KITS FOR MODELS RBU/RBV PANORAMIC ADAPTORS FOR USE WITH MODELS RBB/RBC RECEIVERS

The following change should be made to the subject instruction books (NAVSHIPS 900, 501 IB):

(1) Section 1, Page 1–1, Paragraph 2, Sub Item B—Change the RCA drawing reference from K–870738 to K–890738.

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→ RBB RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 1

INSTALLATION OF TYPE 49509 PLUG ADAPTERS

Equipment affected.—All model RBB through RBB–2 series radio receivers.

Purpose.—To adapt the audio output plug to fit the type TTHFA–1 cable specified for use in audio circuits.

Procedure.—The plug adapter is to be installed in the following manner: (The numbers, in brackets, referenced throughout the text, refer to Fig. 1).

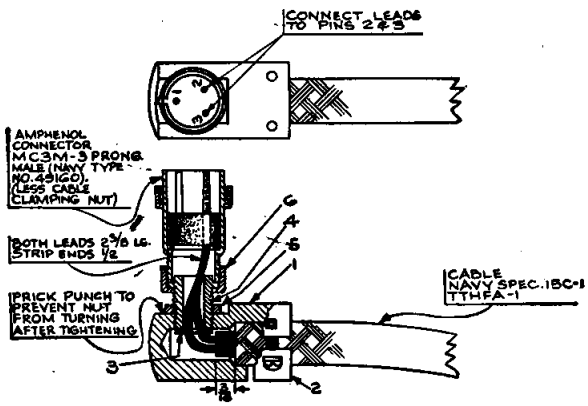

FIGURE 1.—Installation of plug adapter.

(1) Remove the cable clamping ring furnished with the plug, Navy type CPH–49160. The plug is supplied with the radio receiving equipments.

(2) Strip ½" off the ends of the two conductors as shown in Figure 1.

(3) Insert the cable into the connector body [1] and pull the two conductors through the tapped hole in the body.

(4) Clamp the cable in place with clamp [2]. Two machine screws and lockwashers are furnished for this purpose.

(5) Insert the insulating washer [3] over the two conductors and into the bottom of the tapped hole in the conductor body [1]. (See Fig. 1.)

(6) Assemble bushing [4], locknut [5], coupling nut [6] and plug, Navy type CPH–49160. Insert the conductor leads into pins no. 2 and no. 3, as shown in Figure 1.

(7) Before tightening the locknut [5] note positions of the key and connections. Be sure that the positions agree with Figure 1. Tighten the locknut [5].

(8) Prick-punch the connector body adjacent to the locknut [5] to prevent it from turning.

(9) Solder leads to pins no. 2 and no. 3.

General.—Correspondence received in the Bureau indicates that the type 49509 plug adapter kits are not being utilized, in every instance as originally intended. The kits are required to adapt the audio output plug, furnished with the above receivers, to fit the type TTHFA–1 cable specified for use in audio circuits.

Kits have been distributed, under contract NXsr–39245, to the various Electronic Pools in quantities equal to the number of receivers for which they are required. Until later models are available, the issuing Supply Officers for Radio should ascertain that a type 49509 adapter kit accompanies each receiver for which it is required. Vessels are requested to contact an Electronics Officer at the earliest opportunity for the installation of the plug adapter.

Instruction books should be corrected accordingly. A record of completion of this change should be made on the ship's Radio Equipment Log, NAVSHIPS 900,039. Com-

pletion of this change should be reported on the NBS–383 card. *1/1/46*

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RBB RADIO RECEIVING EQUIPMENT
FIELD CHANGE NO. 2

INVERSION OF POWER SUPPLY FILTER CHOKE (NO KIT)

Equipments affected.—RBB receivers with power units having the following serial numbers:

1–451, incl.	2261–2263, incl.
488–492, incl.	2265
801–802, incl.	2267–2269, incl.
804–844, incl.	2270
846	2272–2274, incl.
848–850, incl.	2276–2279, incl.
852–901, incl.	2281
907	2286
1601–1695, incl.	2289
1800–1819, incl.	2293
1821–1872, incl.	2295–2296, incl.
1874–1899, incl.	2298–2299, incl.
1900–1998, incl.	2303–2305, incl.
2000–2008, incl.	2307
2012–2016, incl.	2309–2310, incl.
2018–2021, incl.	2313–2314, incl.
2025	2316–2317, incl.
2028–2033, incl.	2320–2321, incl.
2038	2323–2326, incl.
2041	2328–2336, incl.
2050–2051, incl.	2340–2341, incl.
2058	2345
2062	2347–2351, incl.
2069	2353
2071–2075, incl.	2355–2399, incl.
2078–2079, incl.	2400–2402, incl.
2172	2404–2416, incl.
2213	2418–2471, incl.
2238	2473–2499, incl.
2241	2500–2527, incl.
2245–2246, incl.	2529–2548, incl.
2249	2550–2589, incl.
2251–2253, incl.	2591–2600, incl.
2255–2257, incl.	

Attention is invited to the fact that the serial numbers listed above are the serial numbers of the type CRV–20130 power units, not the serial numbers of the associated receivers.

Purpose.—To prevent the possibility of shorting of the filter choke or grounding of the high-voltage output of the power pack.

Procedure.—This change consists of merely inverting the type CRV–30788 filter choke.

General.—One of the most frequent troubles encountered in models RBA equipments is failure of the type CRV–20130 power supply unit. The difficulty usually encountered is a shorting of the filter chokes or grounding of the high-voltage output of the power pack. It is caused by the melting of the wax potting compound of the type CRV–30788 filter choke due to the high temperature inside the unit. Softening of the wax potting compound permits the coil assembly to settle and make contact with the terminal studs to which it is connected, resulting in either the shorting of the choke or grounding of the terminal studs and consequent failure of the unit.

The contractor has taken steps to eliminate this difficulty, and in future production of the power supply unit this trouble will not be encountered. The improved chokes were installed in all equipments shipped by the contractor after 18 January 1943. The equipments shipped prior to that date were not entirely in serial number sequence.

In the inverted position, the chokes are not subject to casualty when melting occurs because the choke coil assembly simply comes to rest on the bottom of the container. It has been found that there is no strain or pull exerted on the connecting wires between the choke coil itself and the terminal studs in the case of inverted chokes where the coil assembly drops to the bottom of the container.

In the event that equipments having improved chokes (serial numbers not given above) have already been modified by inverting the filter chokes, no action need be taken to return the equipments to their original condition as inverting the chokes produces no change in the operation or function of the equipments.

The contractor is supplying a quantity of improved chokes for use in replacing those shorted or damaged. These are being supplied to the

various Electronic Pools, and do not require inversion.

This change is within the scope of the ship's force and should be completed at the first opportunity. Record of completion of this change should be made on the ship's Radio Equipment Log, NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *1/1/46*

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RBA RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 3

IMPROVEMENT OF BAND SWITCH

Equipments affected.—All model RBB and model RBB–1, serial No. 1 through No. 1000, radio receivers.

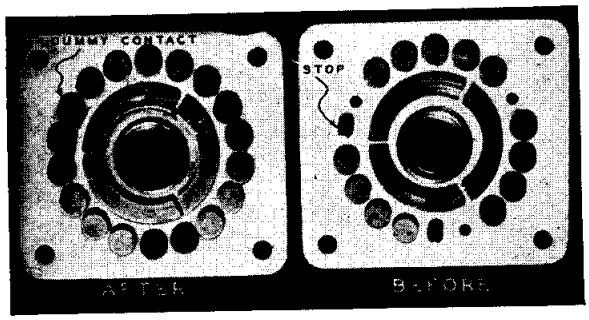

FIGURE 1.—RBB/RBC receivers band switch stators—before and after modification

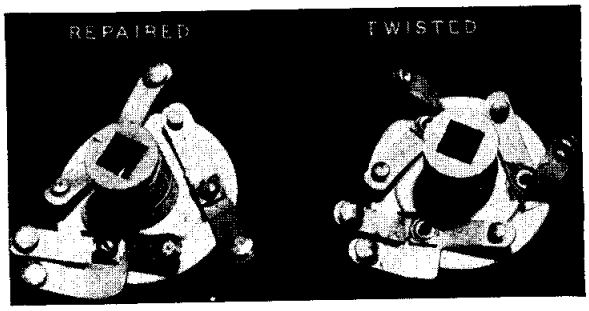

FIGURE 2.—RBB/RBC receivers band switch rotors—twisted and repaired.

Purpose.—To prevent the band switch rotor contacts from twisting.

Procedure.—Equipments should be modified as shown in the accompanying photographs, Figures 1 and 2. The modification, which was suggested by C. E. Swiger, RT 1/c of the U. S. S. *Cascade* (AD–16), consists of removing the stop pins and filling the holes on the band switch with plugs made of bakelite or other suitable insulating material. The plugs should be made as shown, having approximately the same top dimensions as the switch contact points. It is believed that the photographs are self-explanatory.

General.—The Bureau has received numerous failure reports covering failure of the band change switches in model RBB receivers. In most cases failure is due to "heavy handedness" or carelessness of operating personnel in turning the band switch beyond its allotted range and thus bending the contacts.

The contractor for these equipments has designed an improved band change switch which allows continuous rotation and thus eliminates the cause of the failure. The improved wave band switches were incorporated in production equipments as follows:

Contract NOs–91265, supplement A:
Model RBB–1 series, serial numbers 1001 through 2000, inclusive.

Contract NOs–91265, supplement B:
Model RBB–1 series, serial numbers 2001 through 2839, inclusive.

Contract NXss–17001:
Model RBB–2 series, serial numbers 1 through 1000, inclusive.

Improved switches will be included in all future production of RBB series equipments. Field activities are requested to advise the Bureau by separate correspondence in addition to the failure report NBS–383 of failure of the improved wave band switches in the above equipments.

This change is within the scope of the ship's force and should be completed at the first opportunity. Record of completion of this change should be made on the ship's Radio Equipment Log, NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. 1/1/46.

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MODEL RBB SERIES TROUBLE-SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Failure of filter chokes L–405 and L–406.	The faulty unit should be taken apart and a repair attempted. In the majority of cases the core of the choke has either shorted across the contacts or shorted a contact to ground. A repair can be effected by insulating these contacts thoroughly from each other and from the core of the coil. If the coil has had time to "burn out", this repair will not be successful. In this case, a *temporary substitute* for the component can be effected by using a 400-ohm 50-watt resistor. The voltage output remains the same and the hum output will not increase noticeably. This procedure is recommended *only as an emergency repair* measure.
RBB–1.—Receiver dead. All voltages appeared normal.	Condenser C–376 across primary of output transformer was found to be shorted. Normal operation of the receiver was obtained when the condenser was replaced.—U. S. S. *Bush*
Bent or broken fingers on band switch.	An analysis of these failures indicates careless or improper handling on the part of operators, i. e. applying too much force in operating the switch so that the switch fingers are brought against the stop too forcibly, running beyond the stop, thereby causing bent and broken fingers which render the switch inoperative.
RBB–1.—Receiver inoperative. The receiver acted as though the antenna circuit was open; i. e. no signals, slight noise when gain control was advanced.	The Amperite regulator tube V–206 was found to be open. Normal operation was restored by replacement of the tube. This tube is Amperite type 6–8–B and is used to stabilize the heater voltage on the local oscillator tube V–103. A simple and rapid test for the opening of this regulator tube is to feel the oscillator tube and note if it is warm. Failure of the regulator opens the heater circuit and the oscillator tube remains cold. The ballast resistance is connected to pins #1 and #4 of the tube and the nominal voltage drop across the tube is 10 volts AC.—U. S. S. *Bush*
Failure of 250-volt d-c meter M–101.	Usually traced to the multiplier, which may be temporarily replaced with a resistor of higher wattage, the resulting error depending on the accuracy of the replacement.
Receiver dead, "bulls-eye" lights dimly, dial lamps not lit, shielded cable from power supply very hot, and plate voltage meter reads normal voltage.	Caused by short circuit between heater circuit and ground occurring at dial lamp socket. May be checked rapidly by removing dial lamp socket from the chassis ear.
RBB/RBC.—The receivers failed to work when receiving c-w signals after equipment had been dusted out or tube changes made.	Investigation disclosed that the shield cover on transformer T–306 had been displaced, causing it to short out either or both the capacitors on the top of the transformer, usually the longer one. This failure has been corrected by wrapping a suitable sized piece of light varnished cambric around each of the capacitors on top of the transformer. By doing this, it makes it impossible for these condensers to be shorted out by the shield top in any position.

Difficulty Encountered	Cause and Remedy
Receiver completely inoperative.	One terminal of the a.-c. line switch, S–301, shorted to the adjacent shield can (phone junction box.) Corrected trouble by utilizing a piece of thin fishpaper 1½″ x 2½ inches and using a paper eyelet punch to punch a ⅜-inch hole according to the template below. The fishpaper was bent 90° at the dotted line as shown. Switch S–301 was dismounted from the chassis panel. The fishpaper was placed over the shank of the switch and the switch was remounted with the fishpaper between the switch and the shield can. Trouble was corrected. *1/1/50* ←
Set operates with bandswitch between bands and frequently cuts out when bandswitch is properly set on a band.	R. F. boxes were checked. Upon reassembly bandswitch shaft was noted to be out of line with hole in dial coupling. Dots on switch wafers were correct and the dial was set on proper band for assembly. It was discovered that the set screw in the dial coupling was not directly downward. After examination of the 18 contact switches and the 4 position hand-change mechanism, it was found that in 2 quadrants the bandswitch rotors fell between contacts. This was remedied by lifting the dial stop and moving the dial past the stop with the bandswitch shaft removed. The dial stop was then positioned in order that the dial could not be moved past the stop. This placed the coupling set screw downward to properly meet the bandswitch shaft. The switch rotors were directly on the contacts when the dial was set for any band. *1/1/50* ←

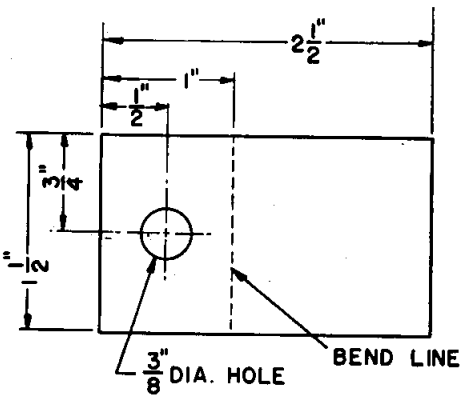

FIGURE 1.—Dimensions for fishpaper insulator.

TENDER SPARE PARTS FOR THE POWER PACKS OF MODEL RBC EQUIPMENTS

See the article entitled "Tender Spare Parts for the Power Packs of Models RBA, RBB, and RBC Equipments," on page RBA : 2.

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ERROR IN INSTALLATION INSTRUCTIONS FOR PANORAMIC COUPLING KITS FOR MODELS RBU/RBV PANORAMIC ADAPTORS FOR USE WITH MODEL RBC RECEIVERS

See the article of similar title on page RBB : 2 of this bulletin.

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→ RBC RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 1

INSTALLATION OF TYPE 49509 PLUG ADAPTERS

Equipments affected.—All model RBC through RBC–2 series radio receivers.

Purpose.—To adapt the audio output plug to fit the type TTHFA–1 cable specified for use in audio circuits.

Procedure.—The plug adaptor is to be installed in the following manner: (The numbers, in brackets, referenced throughout the text, refer to Fig. 1).

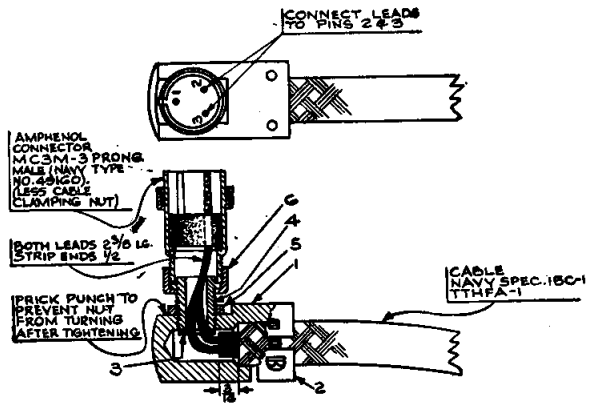

FIGURE 1.—Installation of plug adapter.

(1) Remove the cable clamping ring furnished with the plug, Navy type CPH–49160. The plug is supplied with the radio receiving equipments.

(2) Strip ½" off the ends of the two conductors as shown in Figure 1.

(3) Insert the cable into the connector body [1] and pull the two conductors through the tapped hole in the body.

(4) Clamp the cable in place with clamp [2]. Two machine screws and lockwashers are furnished for this purpose.

(5) Insert the insulating washer [3] over the two conductors and into the bottom of the tapped hole in the connector body [1]. (See Fig. 1.)

(6) Assemble bushing [4], locknut [5], coupling nut [6] and plug, Navy type CPH–49160. Insert the conductor leads into pins no. 2 and no. 3 as shown in Figure 1.

(7) Before tightening the locknut [5] note positions of the key and connections. Be sure that the positions agree with Figure 1. Tighten the locknut [5].

(8) Prick-punch the connector body adjacent to the locknut [5] to prevent it from turning.

(9) Solder leads to pins no. 2 and no. 3.

General.—Correspondence received in the Bureau indicates that the type 49509 plug adapter kits are not being utilized, in exery instance, as originally intended. The kits are required to adapt the audio output plug, furnished with the above receivers, to fit the type TTHFA–1 cable specified for use in audio circuits.

Kits have been distributed, under contract NXsr–39245, to the various Electronic Pools in quantities equal to the number of receivers for which they are required. Until later models are available, the issuing Supply Officers for Radio should ascertain that a type 49509 adapter kit accompanies each receiver for which it is required. Vessels are requested to contact an Electronics Officer at the earliest opportunity for the installation of the plug adapter.

Instruction books should be corrected accordingly. A record of completion of this change should be made on the ship's Radio Equipment Log, NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *1/1/46*

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RBC RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 2

INVERSION OF POWER SUPPLY FILTER CHOKE (NO KIT)

Equipments affected.—RBC receivers with power units having the following serial numbers:

1–451, incl.
488–492, incl.
801–802, incl.
804–844, incl.
846
848–850, incl.
852–901, incl.
907
1601–1695, incl.
1800–1819, incl.
1821–1872, incl.
1874–1899, incl.
1900–1998, incl.
2000–2008, incl.
2012–2016, incl.
2018–2021, incl.
2025
2028–2033, incl.
2038
2041
2050–2051, incl.
2058
2062
2069
2071–2075, incl.
2078–2079, incl.
2172
2213
2238
2241
2245–2246, incl.
2249
2251–2253, incl.
2255–2257, incl.
2261–2263, incl.
2265
2267–2269, incl.
2270
2272–2274, incl.
2276–2279, incl.
2281
2286
2289
2293
2295–2296, incl.
2298–2299, incl.
2303–2305, incl.
2307
2309–2310, incl.
2313–2314, incl.
2316–2317, incl.
2320–2321, incl.
2323–2326, incl.
2328–2336, incl.
2340–2341, incl.
2345
2347–2351, incl.
2353
2355–2399, incl.
2400–2402, incl.
2404–2416, incl.
2418–2471, incl.
2473–2499, incl.
2500–2527, incl.
2529–2548, incl.
2550–2589, incl.
2591–2600, incl.

Attention is invited to the fact that the serial numbers listed above are the serial numbers of the type CRV–20130 power units, not the serial numbers of the associated receivers.

Purpose.—To prevent the possibility of shorting of the filter choke or grounding of the high-voltage output of the power pack.

Procedure.—This change consists of merely inverting the type CRV–30788 filter choke.

General.—One of the most frequent troubles encountered in model RBC receiving equipments is failure of the type CRV–20130 power supply unit. The difficulty usually encountered is a shorting of the filter chokes or grounding of the high-voltage output of the power pack. It is caused by the melting of the wax potting compound of the type CRV–30788 filter choke due to the high temperature inside the unit. Softening of the wax potting compound permits the coil assembly to settle and make contact with the terminal studs to which it is connected, resulting in either the shorting of the choke or grounding of the terminal studs and consequent failure of the unit.

The contractor has taken steps to eliminate this difficulty, and in future production of the power supply unit this trouble will not be encountered. The improved chokes were installed in all equipments shipped by the contractor after 18 January 1943. The equipments shipped prior to that date were not entirely in serial number sequence.

In the inverted position, the chokes are not subject to casualty when melting occurs because the choke coil assembly simply comes to rest on the bottom of the canister. It has been found that there is no strain or pull exerted on the connecting wires between the choke coil itself and the terminal studs in the case of inverted chokes where the coil assembly drops to the bottom of the canister.

In the event that equipments having improved chokes (serial numbers not given above) have already been modified by inverting the filter chokes, no action need be taken to return the equipments to their original condition as inverting the chokes produces no change in the operation or function of the equipments.

The contractor is supplying a quantity of improved chokes for use in replacing those shorted or damaged. These are being supplied to the various Electronic Pools, and do not require inversion.

This change is within the scope of the ship's force and should be completed at the first op-

portunity. A record of completion of this change should be made on the ship's Radio Equipment Log, NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *1/1/46*

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RBC RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 3

IMPROVEMENT OF BAND SWITCH

Equipments affected.—All model RBC and model RBC–1, serial No. 1 through No. 1000, radio receivers.

Purpose.—To prevent the band switch rotor contacts from twisting.

Procedure.—Equipments should be modified as shown in the accompanying photographs, Figures 1 and 2. The modification, which was

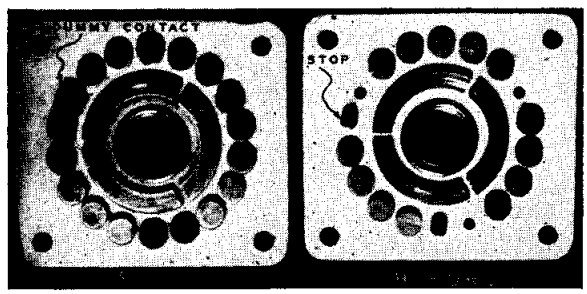

FIGURE 1.—RBB/RBC receiver band switch stator—before and after modification.

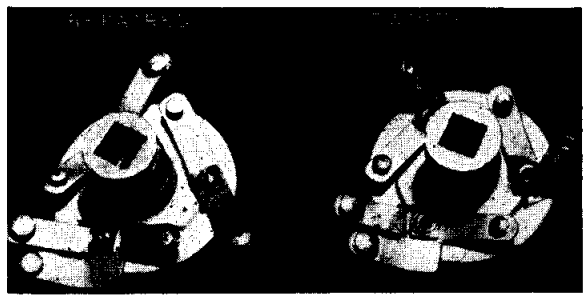

FIGURE 2.—RBB/RBC receiver band switch rotor—twisted and repaired.

suggested by C. E. Swiger, RT 1/c of the U. S. S. *Cascade* (AD–16), consists of removing the stop pins and filling the holes on the band switch with plugs made of bakelite or other suitable insulating material. The plugs should be made as shown, having approximately the same top dimensions as the switch contact points. It is believed that the photographs are self-explanatory.

General.—The Bureau has received numerous failure reports covering failure of the band change switches in model RBC receivers. In most cases failures is due to "heavy handedness" or carelessness of operating personnel in turning the band switch beyond its allotted range and thus bending the contacts.

The contractor for these equipments has designed an improved band change switch which allows continuous rotation and thus eliminates the cause of the failure. The improved wave band switches were incorporated in production equipments as follows:

Contract NOs–91265, supplement A:
Model RBC–1 series, serial numbers 1001 through 2000, inclusive.

Contract NOs–91265, supplement B:
Model RBC–1 series, serial numbers 2001 through 2839, inclusive.

Contract NXss–17001:
Model RBC–2 series, serial numbers 1 through 1012, inclusive.

Contract NXsr–39262:
Model RBC–2 series, serial numbers 1 through 906, inclusive.

Improved switches will be included in all future production of RBC series equipments. Field activities are requested to advise the Bureau by separate correspondence in addition to the failure report NBS–383 (rev. 3–45) of failure of the improved wave band switches in the above equipments.

This change is within the scope of the ship's force and should be completed at the first opportunity. A record of completion of this change should be made on the ship's Radio Equipment Log, NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *1/1/46* ←

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→IMPROVED METHOD OF INSTALLING CATHODE FOLLOWER ADAPTER TYPE 10563 IN MODEL RBC RECEIVER

→In the installation of the cathode follower adapter in the RBC, cable "B" should not be run over the top of the I. F. transformer as shown in figure 3–7 of the FRA book. In several instances this has caused oscillation, apparently in the cathode follower—I. F. combination, which was stopped by routing cable "B" close to the chassis. This oscillation was especially evident when operating the RCB on CW position with the gain well up.

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MODEL RBC SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Failure of filter chokes L–405 or L–406.	The faulty unit should be taken apart and a repair attempted. In the majority of cases the core of the choke has either shorted across the contacts or shorted a contact to ground. A repair can be effected by insulating these contacts thoroughly from each other and from the core of the coil. If the coil has had time to "burn out" this repair will not be successful. In this case, a temporary substitute for the component can be effected by using a 400-ohm 50-watt resistor. The voltage output remains the same and the hum output will not increase noticeably. This procedure is recommended only as an *emergency repair measure.*
Failure of 250-volt d-c meter M–101.	Usually traced to the multiplier, which may be temporarily replaced with a resistor of higher wattage, the resulting error depending on the accuracy of the replacement.
Ser. 64 . . . signal would cut out with BROAD-SHARP switch in SHARP position.	Audio band pass filter L–301 shorting to ground. Replaced L–301 with spare. This filter was repaired by removing the top of the can and insulating the leads that lay on top of the tar mold.—U. S. S. *Indiana*
Receiver dead, but produced noise when third i-f transformer was jarred.	Found wire to third i-f primary broken at terminal lug in can and making intermittent contact. Normal operation restored by repairing connection.—U. S. S. *Cushing*
RBC–1.—No audio output through phone-jack J–303.	Found to be caused by L–303 filter choke in audio output stage burned out. Rewound coil, cleaned out the box containing the filter unit and reinstalled.—U. S. S. *Colorado* (BB–45).
→Poor sensitivity on 16.5–27 mc. band. Best reception with antenna trimmer at one position.	Receiver was aligned with antenna trimmer at one end of its capacity range. Knob was removed and reset to midposition with capacitor at half-capacity. R. F. was realigned. Operation then normal. *1/1/50*
Signals weak in I-F SHARP Selectivity position.	I-F transformer out of line. Realigned with a *weak* signal from a Model LM frequency meter, coupled by pushing a few turns of insulator wire under the first detector tube. Set vernier at minus 7 and tuned B. F. O. to approximately zero beat; reset vernier to zero, placed receiver in SHARP AUDIO position and set B. F. O. accurately for maximum audio output on an unmodulated signal. *1/1/50*
1 or more bands dead with 1 band satisfactory.	Receiver was properly aligned. Length and tuning of coax lines in parallel to other receivers short-circuited the antenna at some frequencies. Repatched antennas in parallel with this receiver to avoid peculiar conditions. *1/1/50*
Set operates with bandswitch between bands and frequently cuts out when bandswitch is properly set on a band.	R-F boxes were checked. Upon reassembly, bandswitch shaft was noted to be out of line with hole in dial coupling. Dots on switch wafers were correct and the dial was set on proper band for assembly. It was discovered that the set screw in the dial coupling was not directly downward. After examination of the 18-contact switches and the 4 position band-change mechanism, it was found that in 2 quadrants the bandswitch rotors fell between contacts. This was remedied by lifting the dial stop and moving the dial past the stop with the bandswitch shaft removed. The dial stop was then positioned in order that the dial could not be moved past the stop. This placed the coupling set screw downward to properly meet the bandswitch shaft. The switch rotors were directly on the contacts when the dial was set for any band. *1/1/50*
Receiver completely inoperative.	See page RBB:102. *1/1/50*←

MODEL RBG SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Receiver not capable of receiving c-w signals. Beat frequency oscillator dead.	Resistor R–136 badly burned and broken; capacitor C–132–B measured 5000 ohms to ground without tube V–107. Checked and replaced R–127. Replaced R–136 and C–132–B. Receiver then operated normally.—*NOB Newport, R. I.*

MODIFICATION TO SIMPLIFY OPERATION OF MODEL RBH EQUIPMENTS

The Bureau is in receipt of numerous complaints from the fleet which express dissatisfaction with the model RBH radio receiving equipment because the multiplicity of controls on the panels of these receivers makes them ill suited for their intended purpose. This equipment has been allotted to the fleet for monitoring aircraft circuits, and was intended for installation at the conning station to be used for aircraft covering circuit watch.

A series of modifications are listed below which, if accomplished, will simplify the control panel of the receiver and make it possible to use the regular conning station personnel as operators:

(1) The knobs and shaft extensions should be removed from the crystal filter controls after these controls are set to give the desired selectivity. A broad-band response is desirable so the PHASING control should be set at OFF and the SELECTIVITY control set to give the greatest background noise.

(2) The beat oscillator should be rendered inoperative and automatic-volume-control made effective at all times. This is accomplished by turning the CONTROL switch to CWO and then throwing the two toggle switches inside the cabinet associated with this switch. This makes it impossible to operate the switches with the shaft. The knob is then removed.

(3) The r.-f. GAIN control is made semi-adjustable. This is accomplished by removing the knob, sawing a screw driver slot in the end of the shaft and applying a shaft lock such as the Millen type 10061. To adjust the r.-f. gain, it is first set at full gain and a strong station tuned in. The a.-f. gain is then set just below the point where the audio system begins to overload. The set is then turned off the signal, the r.-f. gain is set to give a tolerable noise output from the speaker, and the shaft is locked. Individual experience may suggest a more suitable method of adjustment under operating conditions.

MODIFICATION OF MODEL RBH–1 EQUIPMENTS TO PROVIDE CARRIER-CONTROLLED NOISE SUPPRESSION ACTION

The following modification to provide carrier-controlled noise suppression action in the model RBH–1 radio receiver was proposed by Henry L. Fletcher, CRT (AA) (T) USNR of the U. S. S. *Eichenberger* (DE–202). This modification blocks the audio system so that no sound is heard in the loudspeaker until a carrier wave comes on. The a.-v.-c. voltage developed by the carrier in the a.-v.-c. tube then unlocks the audio enabling reception of the message.

In the original modification resistor R–148 and switch S–103 which were employed in the "S-meter" circuit have been used, thereby removing the S-meter from the circuit. If it is desired to retain the S-meter feature, an additional potentiometer of 1,000 ohms and an S. P. S. T. switch must be procured and mounted on the front panel on the receiver. Other parts required are:

1 8-mfd. 450-v. d.-c. electrolytic capacitor.
1 1-mfd. 400-v. paper capacitor.
1 10,000-ohm, 2-watt resistor.
1 24,000-ohm, 2-watt resistor.

The wiring in the receiver is rearranged in accordance with figure 1, utilizing components already in the receiver as required. Resistor R–148 functions as a noise suppression thresh-

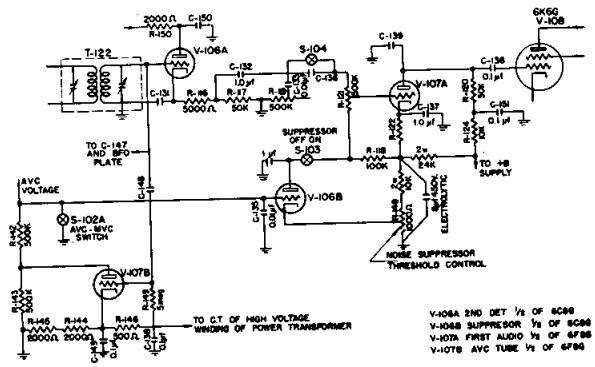

FIGURE 1.—Modification of model RBH–1 to provide carrier-controlled noise suppression action.

hold control or an adjustment which determines the strength of the incoming carrier necessary to unlock the audio system. Switch S–103 is used to remove the noise suppression feature if desired. The circuit is adjusted by setting the suppressor threshhold control so that atmospheric disturbances are just barely eliminated with the r.-f. gain full on and no carrier being received. The suppressor circuit is highly sensitive and only a very weak signal is required to trigger it. Sensitivity of the receiver may be reduced by the r.-f. gain control although too much reduction in gain will decrease or eliminate the a.-v.-c. voltage and as a consequence the suppressor circuits will not unlock the audio system.

MODEL RBH SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Lack of a-c power.	Check fuse holders F–101 and F–102. This activity has found many of these fuse holders defective. The soldering lug connection through the middle of the hard rubber case to the inside ferrule is often not properly soldered and there is a tendency in this type of fuse holder for the lug to break off. To make repairs, the whole rear and bottom of the receiver must be removed.—*RMO Navy Yard, New York*
Acoustic feedback, RBH speaker to any microphone.	In this instance an RBH was used with a TBL–6. Feedback was eliminated by connecting the TBL–6 keying relay in series with the RBH speaker so that the speaker circuit was open when the transmitter key was closed.—U. S. S. *Chenango*
No signal output. Low plate voltage.	The lead from the primary of the coil in CF–101 had been forced against the side of the shield by gunfire, shorting the plate lead to ground. The CF–101 unit was removed and the lead insulated.—U. S. S. *Herndon*
Low sensitivity on certain bands.	Check for shorted trimmer condenser on band with low sensitivity.
Volume reduced by over fifty percent when model PD–1 voice recorder equipment was connected to model RBH receivers.	The voice recorder input transformer was grounded on one side while the output transformer of the RBH receiver was grounded at center tap. Corrected difficulty by removing ground at RBH receiver.—U. S. S. *Solomons* (CVE–67)
Low sensitivity on band "C".	Band switching assembly contacts found loose and dirty. This condition was cleared up by cleaning and tightening the contacts.—U. S. S. *Callaway*
Power system shorted; operator received shock when he touched receiver. Set insensitive.	Discovered a 6F8G tube in the 6C8G socket and a bad 6J5 tube. The line ON/OFF switch was defective and one side was grounded to the chassis. Defective tubes and switch replaced. Set operated normally.—U. S. S. *Curtiss*
RBH–2.—No signals at all getting through the audio-frequency stages.	Found C–189 shorted.—U. S. S. *Jaccard* (DE–355)
RBH–2.—Usual receiver background noise but no signals on band C. By jarring receiver, the signals would come in and out.	Found fixed capacitor in r-f coil catacomb was not soldered to catacomb contact pin. Inspection of pin indicated this. Found by opening the catacomb and prodding the leads to band C coils with insulated screwdriver.—U. S. S. *Hollandia* (CVE–97)
RBH–1.—Weak or intermittent operation of receiver.	Due to failure of preselector coil to make contact at the same time as the coils in the main part of the receiver. May also be caused by the coil selector mechanism dropping down out of position due to loosening of rods supporting the same. Repaired by readjustment of the coil selector mechanism.—U. S. S. *Windsor* (APA–55).

ANTENNA CONNECTION TO MODEL RBK SERIES RECEIVERS

All RBK series receivers subsequent to model RBK (no numeral) should be carefully checked upon installation or when complaints of poor reception are received to make sure that the antenna is connected to the ANTENNA post and not to the coaxial fitting on the back of the receiver. This fitting is provided for use with a panoramic adaptor.—*Navy Yard, New York.*

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MODIFICATION OF MODELS RAO–9 AND RBK–14 COUNTERMEASURES RECEIVERS FOR USE WITH THE MODEL REM DUAL PAN ADAPTOR

See Page REM: 1 for complete write-up.
7/1/49

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→ INTERFERENCE BETWEEN MODEL RDC–1 AND MODEL RBK–14 RECEIVERS

Some of the known sources of interference to Model RBK–14 receivers when used in communication countermeasures installations are the local oscillator and synchronizing pulse radiations of the Model RDC–1 receiver. The interference can be noted as an audio output in the headset of the Model RBK–14 receiver at a rate determined by the scanning motor of the Model RDC–1 receiver. The local oscillator interference is noted when its frequency, during scanning, is the same as the Model RBK–14 receiving frequency. The synchronizing pulse interference is noted at the time of break of the synchronizing contacts.

The interference caused by the synchronizing pulses may be reduced if not eliminated by insuring that the synchronizing contacts are not in need of repair, the choke, L–107, is not defective, and the contacts are aligned according to the procedure outlined in the Model RDC–1 instruction book.

The interference caused by the oscillator radiation cannot be eliminated. It can be reduced with the use of good installation practices such as properly grounding all equipments and cables, removing any fungus-proof material from the equipments at points of metal-to-metal shielding contact, and tightening all covers and front panel knobs. *10/1/50* ←

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→ CORRECTION OF INSTRUCTION BOOKS FOR MODELS RBL–5 AND RBL–6 RADIO RECEIVERS

The instruction books for models RBL–5 and RBL–6 radio receivers incorrectly designate tube type 5Y3G to be used in socket X–107.

The type 5U4G rectifier tube is the correct type to use as V–107 in socket X–107. The following pages of the preliminary instruction book should be checked immediately by all personnel concerned and corrected accordingly:

Page 4—paragraph 1–7–9

Page 36—Equipment Spare Parts List

Page 40—Tender Spare Parts List

Page 48—Photograph of Tube Positions

Figure 1 is the correct diagram of the tube base. This should be copied on page 49. In the receiver, socket X–107 should be labeled correctly. The spare tubes in equipment and tender spares should be checked and tubes of the correct type should be drawn for use. *4/1/46*←

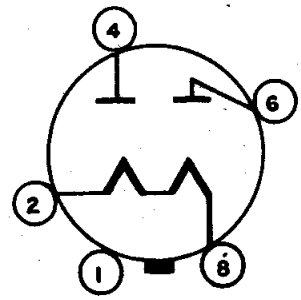

FIGURE 1.—Tube base connections for type 5U4G tubes.

MODEL RBL SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
No output.	Inspection disclosed grounded antenna plug. The grounds were cleared and the receiver operated normally.—U. S. S. *Callaway*.
RBL–2.—Intermittent drop in signal level on band "D."	Found cold-solder joint where lead from L–114 connects to lug of band switch S–107.
RBL.—Transmission from TBS transmitter located adjacent to RBL made signals on RBL unreadable.	Installed r.-f. choke in series with antenna of RBL between antenna terminal E–102 and antenna series capacitor C–101. R.-f. choke consisted of 5½ microhenries 0.85 ohm d.-c. resistance single layer, wound on steatite core.—U. S. S. *Manitowoc* (PF–61).
RBL–2.—Noisy operation of receiver.	Traced to a loose screw in the second r.-f. stage. This screw secured a grounding wire to the chassis. Repaired by tightening screw.—U. S. S. *Acontius* (AGP–12).

RBM RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 1

SHOCK-MOUNTING (KIT)

Equipment Affected.—All of the high-frequency receivers (type 46077 or 46077A) of the model RBM series receiving equipments and associated power supplies (type 20086 or 20086A) that are to be installed on shipboard.

Purpose.—To properly shock-mount the high-frequency receiver of the model RBM series receiving equipments when installed on shipboard, and to provide a coaxial jack for antenna connection and an audio jack for audio extension circuits. Activities and vessels should contact the cognizant Electronics Officer at the earliest opportunity for this change. The kits for this change are expected to be available starting in March 1948.

Time Required.—This field change requires approximately six man-hours to accomplish.

Material Required.—All of the parts and material required for this change are included in the Field Change Kit.

Tool and Instruments Required.—The following tools are required for this change and must be furnished by the activities effecting the modification:

¾" drill or ¾" tapered reamer.
Screw-driver.
Pliers.
Flat file.
Round file.
Soldering iron.
Solder.
¼" and #18 twist drills.
Drill.
Means to cut or punch four 1½" holes for the Series 150, 12-pound Lord shock-mounts.
Metal saw.
Metal snips.

Procedure.—Complete detailed installation instructions including diagrams and drawings for the accomplishment of this change are included in each kit.

General.—Completion of this change will result in the proper shock-mounting of the high-frequency receiver and the power supply of the model RBM series receiving equipments for installation on shipboard. A type 49120 receptacle will be incorporated for coaxial antenna line connection and a type PC3F amphenol receptacle will be installed at the rear of the receiver for audio output connection.

Routine Instructions.—Personnel making the field change shall record the completion of the change on the Electronics Equipment History Card, NAVSHIPS 536, and the completion date on the Field Change Record Card, NAVSHIPS 537.

The self-addressed Electronics Field Change Report Card, NAVSHIPS 2369, included with each kit, shall be filled in and mailed by personnel making the change, as soon as the work has been accomplished.

The type 46076 receiver (m-f), its associated cable and power unit and one instruction book and the water-tight cabinet which housed both receivers, are not to be utilized in this change and should be invoiced to the nearest Electronics Supply Officer.

The set of equipment spare parts included with the complete model RBM equipment and one instruction book shall be included with the type 46077 or 46077A receiver (h-f) after modification is complete.

The Model RBM instruction book, NAVSHIPS 900,385, shall be corrected in accordance with the temporary correction T–1, included with the bulletin. Final instruction books may be obtained upon request from the nearest District Publication and Printing Office. *4/1/48*

→ DISTRIBUTION OF KITS FOR FIELD CHANGE NO. 1–RBM

A quantity of 150 kits for Field Change No. 1–RBM has been procured from the Norfolk Naval Shipyard on Project Order 396/47. Of this quantity, 25 kits have been shipped to Mechanicsburg, Pa., 25 kits to Clearfield, Utah, and 10 kits to each of the Naval Shipyards except Portsmouth, N. H.

These Field Change kits are to be used with the Models RBM–4 and RBM–5 radio receivers to make these receivers suitable for shipboard installation. Models RBM–4 and RBM–5 radio receivers incorporating this Field Change become permanent substitute equipment for the Models RBS and RBH receivers.

The Type Allowance Booklet, NAVSHIPS 900,115, is to be modified accordingly. *10/1/48.* ←

BURNOUT OF CATHODE BIAS RESISTOR IN MODEL RBO SERIES EQUIPMENTS

A frequent cause of failure in the RBO is the burnout of the 680-ohm cathode bias resistor (R–145) for the type 6K6GT power-amplifier tube. This is due to inter-electrode short circuits inside the type 6K6GT power-amplifier tube.

During the early production of model RBO receivers, it became necessary to secure a quantity of type 6K6GT tubes on very short notice. A quantity of commercial tubes was available, and these tubes were obtained and used. These tubes were not built to Navy specifications and under conditions of shock and vibration frequently develop inter-electrode leakage or short circuits.

It is desired that all installation and maintenance activities remove all commercial 6K6GT tubes from model RBO receivers and replace them with Navy standard JAN 6K6GT tubes. The commercial tubes may be identified by the absence of the JAN designation and the Navy Inspector's anchor stamp.

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RBO RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 1

MODIFICATION OF THE AUDIO CIRCUIT (NO KIT)

This change is superseded by "RBO Radio Receiving Equipment—Field Change No. 3—Connecting for Balanced Line Speaker Connection." *2/1/46*

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RBO RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 2

REPLACING POWER TRANSFORMER AND RECTIFIER TUBES

Equipments affected.—Model RBO receivers, serial numbers 1 through 3799.

Purpose.—To prevent failure of the power transformer due to rectifier tube failure.

General.—The most frequent failure in the model RBO broadcast receiver is a burned out power transformer, the burn-outs occurring in either the high-voltage winding and/or the primary. The cause of the trouble usually lies in the type 6X5GT/G rectifier tube used in the model RBO. The elements in this tube are very closely spaced and the heater-to-cathode insulation appears to be poor with the result that frequently, especially under conditions of shock, the tube develops inter-element and/or heater-to-cathode leakage or short circuits. When this occurs a severe overload is placed on the power transformer with resultant damage to or burnout of the windings.

The manufacturer has removed the cause of the trouble in equipments having serial numbers greater than 3800. The correction consists of the use of another type power transformer having a separate 5.0-volt winding for heating the rectifier tube. A type 5Y3GT/G tube is used as rectifier instead of the type 6X5 or glass equivalent.

A quantity of kits have been procured on contract NXsr–56772. Instructions for the change are included in the kit and should be kept with the instruction book for the modified equipment.

Vessels should contact an Electronics Officer at the earliest availability for the kit. The replacement is within the scope of the ship's force. A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *2/1/46*

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RBO RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 3

CONNECTING FOR BALANCED LINE SPEAKER CONNECTION

Equipments affected.—All model RBO, RBO–1 and RBO–2 series receivers.

Purpose.—To improve the fidelity and electrical performance of the equipment.

General.—This modification should be made to all model RBO series broadcast receivers by Naval shipboard installation or fitting-out ac-

tivities during the initial installation period of these equipments. Modification of the receivers already installed in fleet vessels should be accomplished by ship's forces or tender forces at the first opportunity after the necessary materials are available. This modification shall not be accomplished by commercial installation or fitting-out yards.

Where the unmodified model RBO series equipment is installed in conjunction with one or more type 49131 series speaker-amplifier units, the installation results in one-half of the input to the speakers being grounded-out. This, of course, results in low volume and poor fidelity. Also, it has been found that the present output circuit results in numerous failures of the receiver output transformers.

A quantity of kits have been procured on contract NXsr–69250. Instructions for this change are included in the kit and should be kept with the instruction book for the modified equipment.

Vessels are requested to contact an Electronics Officer at the earliest opportunity for this kit. A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be made on the NBS–383 card. *2/1/46*

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ADDENDA TO FIELD CHANGE NO. 2 FOR MODEL RBO RADIO RECEIVERS

(1) Experience has shown that the voltage surge developed upon turning on the equipment causes internal shorting of C–107A and C–107B capacitors. In order to correct this condition, field change No. 2 should be modified as follows:

(a) Substitute a 0.1 mfd, 1,000-volt dual capacitor (→ Navy Type–48313C, Standard Navy Stock No. 16–C–53132–8720 ←) for the 0.1 mfd, 600-volt dual capacitor as screen bypass capacitor (C–107A and C–107B) in V–103 circuit.

(b) The 0.1 mfd, 1,000-volt dual capacitors should be obtained from local electronic material officers.

(2) An additional quantity of 500 kits for field change No. 2 have been procured on contract NObsr–30032. These kits have been distributed to the Supply Officer in Command, Naval Supply Depot, Mechanicsburg, Pa., and to the Supply Officer in Command, Naval Supply Depot, Clearfield, Utah.

They include all of the necessary parts and instructions and should be installed as soon as possible. Completion of the change should be recorded on the "Radio Equipment Log," NAVSHIPS 900,039 and reported in the field change report card. NAVSHIPS 2369. *2/1/47*

●

TUBE TYPE 6V6GT/G USED AS POWER AMPLIFIER IN MODEL RBO SERIES EQUIPMENTS

A type 6K6GT tube was utilized as the power amplifier (V–109) in early production of model RBO series receiving equipment. Later production, especially the model RBO–2 equipments, incorporated the type 6V6GT/G tube for this purpose.

Tube type 6V6GT/G is the proper tube to use in this application for all models. When the type 6K6GT tubes now used as the power amplifier fail, they should be replaced by the preferred type 6V6GT/G.

The parts list and spare parts lists of the equipment instruction book and its supplements should be corrected with respect to the type listed under Navy type number and manufacturers designation. *6/1/47*

●

FURTHER ADDITION TO FIELD CHANGE NO. 2 FOR MODEL RBO RADIO RECEIVERS

On page 1 of the bulletin of instructions supplied with Field Change No. 2 for model RBO radio receivers on contract NObsr–30032 the new power transformer is inadvertently listed as T–111. The correct symbol is T–115. The bulletins and the instruction books for the modified equipments should be checked and corrected at the earliest opportunity. The short title assigned to the above instruction bulletin is NAVSHIPS 98049. *4/1/48*

MODEL RBO SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
No audio output.	Look for open circuit in output transformer Thordarson T–46789.
Output transformer primary or secondary open.	This is caused by removal of the load from the receiver's output circuit. Under the original circuit arrangement it is possible, for example, that with two model RBO receivers on board, all speaker-amplifier units are switched to receiver 1, leaving receiver 2 without a load. The remedy is to modify the RBO receiver in accordance with the instructions on page RBO : 1. This will provide a permanently connected load for the receiver.
"Cross talk" between channels.	Due to capacitive coupling between "hot" wires of unbalanced system. Modify RBO in accordance with page RBO : 1. Make sure that center of input transformer of speaker-amplifier or speaker-amplifier unit is grounded.
Weak signals in one of the speaker amplifier units (49131).	One side of the input transformer was found open. Replaced transformer.—U. S. S. *Herndon*
Very weak signals in monitoring phones.	Found lead wire from phone jack J–101 to resistor R–108 poorly connected to resistor. Loose strands from wire shorted out phone jack. Corrected by resoldering the wire.—U. S. S. *Refuge* (AH–11)
Received signal barely audible on any band.	When volume control, potentiometer R–146, was checked, one side discovered open. The other side read 0.5 megohms. The part was replaced and equipment again worked satisfactorily.—U. S. S. *Calcaterra*
When first turned on, receiver operated perfectly. After a short period of time, the output suddenly dropped off.	The screen grid of V–109 (6K6GT) in the output stage was discovered to be red hot. Output tube circuits were checked with an ohmmeter and the primary of the output transformer was found to be open. Replaced the transformer, and the equipment operated normally.—U. S. S. *Libra*
Receiver extremely low in sensitivity on short wave bands and completely dead dead on the broadcast band.	The trouble was traced to a shorted C–107 cathode and screen bypass capacitor. This capacitor was replaced, resulting in normal short wave band sensitivity and excellent reception in the broadcast band.—U. S. S. *Sagittarius*
Equipment would work normally for a period of time, then would suddenly have a loud hum. When gear was checked for open windings, bad condensers or bad resistors, no indication of the cause of the trouble was found.	An open winding in the secondary coil of output transformer T–113 was discovered when the gear was checked in operation. It was found that after an hour or so of operation the secondary winding would open. This transformer was replaced and no further trouble was encountered.—U. S. S. *PC–1083*
Low volume on broadcast band of RBO receiver.	Antenna coil burned out while operating transmitter in the same compartment. Condition can be remedied by disconnecting RBO antenna before keying transmitter.—U. S. S. *Ascella* (AK–137)

Difficulty Encountered	Cause and Remedy
Weak signals on broadcast band.	Trouble found to be with antenna input assembly, broadcast r-f transformer primary, and trimmer C–149. Apparently a heavy shot of r-f current had passed through units at some time, burning and melting windings of T–103 primary and shorting C–149. Replaced units with spares and realigned broadcast section. Operation returned to normal.—Charles L. Harris, RM1/c—U. S. S. *PC–580*
Loss of signals on all bands.	Burned plate filter R–143, and shorted plate bypass C–106–B for oscillator V–102. Replaced from spares and returned operation to normal.—Charles L. Harris, RM1/c—U. S. S. *PC–580*
Poor sensitivity, poor selectivity, and distortion in RBO (and RCH) receivers.	The triple .1 mfd. capacitor in the r-f stage of these receivers found to be leaky. Replaced.—Robert E. Conroy, RT3/c—U. S. S. *Sangay* (AE–10)
RBO.—When in port or very near a broadcasting station, the RBO reecived the signal clearly. When fifty to a hundred miles existed between the transmitting and receiving antennas, no signal was received. Short wave broadcasts were picked up at night only, and then were very weak and the signals would fade in and out.	The trouble was found to be a shorted decoupling capacitor (C112A) and an open resistor (R113). When the capacitor shorted, the current through the resistor increased to a value which caused it to burn out. When these two faulty components were replaced the equivalent operated normally.—U. S. S. LC (FF) 657.
→ Receiver would operate properly at quarter volume but audio output would become greatly distored as volume was increased.	Resistor R–133 (0.22 megohm) had opened. Replaced R–133 and operation became normal.
Audio output was very low and distorted.	Voltage check disclosed zero voltage on screen of 1st Audio Amplifier V–107. Resistor R–138 had opened. Replaced R–138 and operation became normal. *7/1/49* ←

FAILURE OF BAND SWITCH IN MODEL RBS RECEIVING EQUIPMENT

The U. S. S. *Boxer* (CV–21) has reported failure of band switch S–501 in the model RBS radio receiver. The selector rachet on the shaft of the switch, which is a part of the dial mechanism, came loose from the shaft so that the shaft turned freely.

All ships and stations using model RBS receivers are requested to advise the Bureau of any similar failures in order that corrective action may be taken by the manufacturer.

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→RIGID CABINETS AND HINGED COVERS USED WITH MODEL RBS SERIES RECEIVING EQUIPMENTS

Outline dimensions, cable connections, and other pertinent information regarding the model RBS series receiving equipment was published in RIB No. 80.

The receiver and amplifier-power units can be separated from the mounting bracket and installed in a normal manner. The receiver may be installed on a standard operating table or shelf as shown in RIB No. 93.

The rigid cabinet and hinged cover shall not be considered an integral part of the receiver. It is not necessary to use these items when an RBS receiver is installed. The stocking of the cabinets and covers as a separate item apart from the receiver is authorized.

The Bureau recommends that activities follow the methods shown in RIB No. 93 when installing model RBS series receivers. *6/1/47* ←

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RBS EQUIPMENT TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
→RBS.—Receiver sensitivity was normal but audio output was barely audible.	Found to be due to coupling capacitor C–580 having a leakage resistance of about 40,000 ohms. Replaced capacitor.—U. S. S. *Sumpter* (APA–52). ←

DEFECTIVE COILS IN MODEL RBU–1 PANORAMIC ADAPTORS

The Radio Material Officer, Philadelphia Navy Yard, reports that several model RBU–1 panoramic adaptors have been received with defective coils. The iron cores used to tune the r-f and i-f coils were not free to turn inside the paper coil form. Consequently, the form turned as the cores were adjusted, breaking the connections from the coils to the terminal lugs on the transformer frame. Care should be taken when adjusting the coils in the subject equipments to be sure that the cores are free to rotate.

●

RADIATION SUPPRESSORS FOR MODEL RCF RECEIVING EQUIPMENTS

Type CN–50174A radiation suppressors for RCF receivers have been procured on contract NXsr–55609 and are available at the following locations:

GLEN–32 (41)	NYMI, RMO Disp.
EPIC–32	PACT–15–41
LEFT–32	Clearfield
FRAY–32	Mechanicsburg
DISH–32	

Complete instructions for installing the suppressors are supplied with the equipment.

→REPORTS OF UNSATISFACTORY PERFORMANCE OF MODEL RCH RECEIVING EQUIPMENTS

Reports received from installation and maintenance activities frequently complain of unsatisfactory performance of the model RCH equipment upon installation. The subject of these complaints is the lack of gain, low sensitivity and frequency instability. When the Bureau of Ships assumed control of the technical aspects of the subject equipment several preliminary models were tested and found to be better than any of the other available equipments which would fill the requirements for a non-radiating, low and high frequency communications receiving equipment. The performance of this equipment will not equal that of some other Navy receivers; however, with proper handling it can be made to give satisfactory service.

These equipments were not tropicalized and were not packed for overseas shipment so deterioration may possibly result from long storage periods. Complete re-alignment of the receiver may be necessary at the time of installation. Alignment should be performed by expert personnel carefully following the instruction book procedure because there is considerable interaction between frequency bands, and one band cannot be adjusted without affecting the adjustment of the other bands. Several repetitions of the alignment procedure may be necessary to obtain the best sensitivity and gain.

Overloading on strong signals accompanied by pulling of the oscillator frequency can be prevented by maintaining the gain control settings as low as possible consistent with adequate audio output. *2/1/46*

●

FAILURE OF PHONE CONTROL SWITCH S–103

Phone control switch S–103 operates in both the primary and the secondary circuits of the output transformer. When the equipment is operated with no load on the secondary of the transformer, extremely high audio voltage peaks occur across the primary winding and cause voltage breakdown between the two circuits of the switch and between the switch contacts and the grounded switch supports. It is important that a 600-ohm load be permanently connected to the 600-ohm speaker terminals to prevent the occurrence of these high voltage peaks. If a speaker is not used or if the speaker is disconnected, a 600-ohm resistor must be connected across the speaker terminals E–102.

In installations where no speaker is used it may be advantageous to set the PHONE OUTPUT ADJ. (screwdriver adjustment on left end of cabinet) to maximum to permit operating the gain control at a lower level.

In installations where there is no application for switch S–103 and arcing still occurs after applying the precautions described, the d–c portion of the switch can be removed from the circuit. Disconnect the three switch wires from the number three pin of V–110 and terminals B and P of T–120 (the wire from terminal B of T–120 to C–102 must be left connected). Connect a new lead from terminal P of T–120 to the number three pin of V–110. The 600-ohm load on the speaker terminals must still be maintained to avoid damaging the transformer. *2/1/46* ←

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MODEL RCH RECEIVER TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
→RCH.—Oscillation in either voice or CW reception.	Trace to open capacitor C-123 between plates of diode V-107 and plate of V-106.—U. S. S. *Carondelet* (IX136). ←

CRYSTAL FAILURES IN MODELS RCK AND TDQ SERIES EQUIPMENTS

Recent reports from the field indicate frequent failures in the crystals supplied with the models RCK and TDQ series equipments, resulting in failure of the oscillator circuit. Inability of the crystals to oscillate is due to manufacturing processes in the factory producing these crystals. These processes have been analyzed and corrective measures taken which it is believed will relieve the situation.

The Naval Research Laboratory and the manufacturer of the RCK and TDQ crystals are conducting further investigation in an endeavor to determine other possible causes of crystal failures. In order to carry out these investigations it is requested that all cognizant Naval activities and field personnel assist as follows:

(1) All defective crystals for RCK and TDQ equipments should be immediately returned to the Resident Inspector of Naval Material, Camden, N. J., untouched, unopened, and with seals unbroken if sealed.

(2) Failure reports (NBS–383, Revised 4–44) should be submitted to the Bureau *for each crystal* sent to the RINM, Camden, N. J. The failure report should state that the crystal has been sent to RINM, Camden, N. J. Replacement crystals should be requisitioned in the usual manner.

●

→ MODEL RCK C–113 CERAMIC SHAFT

Several reports of breakage of the ceramic shaft of the capacitor, C–113, have been reported. A large number of these failures can be attributed to improper maintenance. In some cases the five screws under the preselector unit which "jig" and secure the dial assembly in place have been replaced improperly. This has resulted in a loose dial assembly causing the ceramic shaft to crack. These screws should not be touched ordinarily and are painted red to call attention to this fact. Removal of the screws during routine removal of the preselector bottom plate places undue strain on the ceramic shafts causing breakage. Therefore—DON'T TOUCH. *10/1/50.* ←

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INSTALLATION NOTES COVERING MODEL RCK SERIES RECEIVING EQUIPMENTS

The model RCK series receiving equipments have been developed for use with the model TDQ series transmitting equipments. These receivers are the first of a new series of equipments in which the i-f, audio and power circuits are standardized and the r-f, oscillator and mixer circuits are varied from model to model.

The RCK is a superheterodyne receiver designed to receive signals on any of four crystal controlled frequencies within the range of frequencies covered by the model TDQ transmitter. The model RCK receiver is approximately 11 inches high, 18 inches wide and 18 inches deep and weighs approximately 115 pounds. Power requirements are 106 watts at 110–120-volt, single-phase, 55–65-cycle AC. The tube complement is as follows:

No.	*Type*	*Function*
1	956	R-F amplifier
1	717A	Converter
2	717A	Multipliers
1	6N7	Crystal oscillator-multiplier
5	6AB7	I-F amplifiers
1	6H6	Second detector-peak limiter
2	6AB7	Audio amplifiers
1	6V6GT	Audio output amplifier
1	6U4G	Rectifier
1	VR150/30	Voltage regulator

The power output is 15 milliwatts into a 600-ohm load. A single tuning control operates seven tuned circuits. This control has four mechanical detents which are present in accordance with the frequencies of the crystals in use. Change of frequency is rapid and the operating frequency to which the receiver is tuned is indicated by the "lighting up" of one of the four bull's-eyes over the tuning dial.

The receiver chassis is designed to be removed from the cabinet by loosening the thumbscrews on the front panel and sliding the entire chassis assembly forward on the guide strips on each side of the cabinet. The mounting base to which the shock mountings for the receiver are attached is drilled with four holes through which 3/8" bolts of the proper length may be

attached to fasten the receiver to a bench or table.

In planning an installation, care must be exercised to provide adequate clearance (minimum: 6¼″) from the back of the receiver to the bulkhead or nearest obstruction to provide access to the power-input plug, antenna-ground plug, speaker plug, silencer plug, and fuses.

The antenna input circuit is unbalanced to ground and is intended to terminate a 50-ohm transmission line. When used with the model TDQ series transmitter, the receiver input jack should be connected to the normally open position of the antenna change-over relay in the top chassis section of the transmitter.

Terminals are provided on the rear of the chassis for connection of 600-ohm speaker circuits. Speakers or speaker-amplifiers used in conjunction with the model RCK receiver should be operated with taps adjusted on the line side of the matching transformers for optimum impedance match.

Sufficient slack should be left in connecting cables to permit withdrawal of the chassis from the cabinet without necessitating removal of plugs. An angle adapter on the antenna input plug should not be used; it will prevent withdrawal of the chassis without removal of the plug.

Complete instructions regarding the setting of the dial detents, alinement, and adjustment are contained in the instruction books. In conformance with recent practice, the instruction books also contain a complete table of point-to-point voltages and resistance for use in servicing.

●

OPERATION OF LOUD-SPEAKERS WITH MODEL RCK SERIES RECEIVING EQUIPMENTS

The model RCK receiving equipment employs two stages of audio-frequency amplification which feed a power-amplifier output stage. The design is such as to impress a constant voltage (within three decibels) across the primary winding of the output transformer. This voltage is independent of changes in load resistance across the secondary terminals of the transformer from 600 to 30 ohms.

The maximum available undistorted output from the equipment is 100 milliwatts for a 600-ohm load. For a 30-ohm load, the power output is 850 milliwatts. The corresponding figures for resonant overload are 150 milliwatts and 1.35 watts. Thus, the model RCK is capable of operating a loud-speaker, such as the type 49155, having a 30-ohm impedance and a nominal power input rating of 2 watts. If the RCK is to operate into a 600-ohm load, an amplifier-speaker such as the type 49131 will have to be employed for satisfactory loud-speaker reproduction. The audio-frequency output characteristics of the model RCK equipment are approximately the same as the corresponding characteristics of the models RBB/RBC receiving equipments and the same treatment would apply to these latter equipments when loud-speaker operation is considered.

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PROPER CONNECTIONS BETWEEN MODEL RCK EQUIPMENTS AND TYPE 49155 LOUD-SPEAKER UNITS

The design of the audio output circuit of the model RCK receiver is such that maximum audio power is available at the speaker jack J–304 when the actual load impedance is much lower than 600 ohms.[1] Therefore, for satisfactory operation of single loud-speaker units of type 49155 with the model RCK, the 30-ohm input taps on the speaker unit should be connected to the receiver output, even though the latter is designated 600 ohms.

●

INCORRECT VALUE OF RESISTOR R–246 IN MODEL RCK EQUIPMENTS

NYMI has reported to the Bureau that resistor R–246 in many new model RCK receivers varies from 55,000 to 100,000 ohms. The correct value of this resistor is 47,000 ohms ± 10%, and unless this value is used, it is impossible to adjust the input meter to zero set. Activities experiencing this trouble should check the value of resistor R–246 and replace it if it does not read approximately 47,000 ohms.

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[1] This is explained in paragraph 1.115 of the instruction book.

→ RCK RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 1

ADDITIONAL TUNING SET-UP SYSTEM (NO KIT)

Equipments affected.—All model RCK radio receivers.

Purpose.—To set the tuning dial exactly on the required frequency for each crystal without the use of a signal generator, and to indicate normal functioning of the multiplier tubes and circuits up to the final multiplier.

Procedure.—Only slight additions to the present preselector are required. The changes in the model RCK preselector unit required to provide the alignment facilities are as follows:

(1) Replace resistor R–110 (10,000 ohms) with a new value of 47,000 ohms.

(2) Connect the contact arm of a high quality, single-pole, double-throw switch to the junction of resistors R–109 and R–110. Connect one contact of the switch to ground and the other to the a-v-c bus at terminal 14 on terminal board E–104. The connection to the a-v-c bus can probably be more easily made to terminal 14 on terminal board E–204 in the IF/AF unit, with the lead to the above switch fed through the slot between terminal boards E–104 and E–204. Connection to the junction of R–109 and R–110 will probably require slotting the right-hand edge of the forward wall of the compartment on the top side of the preselector chassis (possibly by filing), in order to allow clearance for the lead.

The system operates by using a portion of the negative grid-bias voltage developed across the the final multiplier grid-leak resistor to bias the a-v-c bus in the receiver, thereby causing the input meter on the IF/AF unit panel to indicate (when the SELECTOR switch is set to AVC ON). This bias is developed only when the multiplier circuits are tuned to the crystal oscillator and reaches maximum in the optimum resonance region.

The switch may be of the toggle type, provided that it is of a high quality, low leakage construction, with good, positive, silver contacts. It should be protected against the effects of humidity. The switch should be mounted in a suitable manner on a bracket fastened to the side-brace or "wrap-around" at the left, behind the front panel. It should be plainly marked to identify the SETTING-UP and OPERATING positions. The receiver is substantially inoperative in the SETTING-UP position.

Since the final multiplier grid is tuned by two coupled tuned circuits, the indication at resonance will be similar to the flat-topped resonance curve usually obtained with such circuits. By taking the CHART dial (lower dial window) readings corresponding to the two flanks of the curve at one-third or one-half the maximum input meter reading (as obtained with the above switch in the SETTING-UP position) and setting the tuning dial to the mean or mid-point of the two readings, tuning of the circuits within one or two chart dial divisions of optimum as obtained with a signal generator have been observed at the laboratory.

Figure 1 indicates in graph form the indications obtained on the input meter. For instance, if dial readings X1 and X2 are 365 and 385, respectively, the detent should be set at $\frac{385+365}{2}$

Or 375.

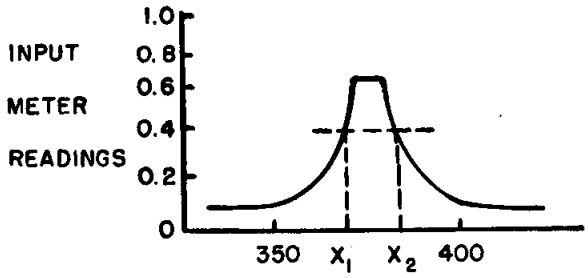

FIGURE 1.—Graph of the indications on the input meter while setting up the RCK tuning system.

Throwing the switch to OPERATING position grounds the junction of R–109 and R–110, and consequently grounds pin-jack J–103. This is desirable to avoid undesired biasing of the a-v-c system by possible leakage across the switch terminals in the OPERATING position. Since the input meter on the receiver can be used to indicate grid voltage conditions in the final multiplier, it is believed that the disabling of J–103 will not be objectionable.

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General.—This change using available material is within the scope of the ship's force and should be accomplished at the earliest opportunity. The instruction book should be corrected accordingly.

A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *2/1/46*

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RCK RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 2

NOISE SUPPRESSOR WIRING CORRECTION (NO KIT)

Equipments affected.—All model RCK radio receivers.

Purpose.—To connect noise suppressor (R–240) for proper operation.

Procedure.—If the circuit is not operating as designed (early models of the RCK receiver had the noise suppressor (R–240) wired incorrectly at the factory), correct connections, as follows:

(1) Orange wire from the screen of V–209 to the moving arm (center terminal of R–240).

(2) The black ground wires should go to the right outside terminal of R–240 (when looking at the back of R–240 with the lugs down).

(3) The orange wire from R–266 (33,000 ohms, the end resistor on the rear strip) should go to the left outside terminal of R–240 (when looking at the back of R–240 with lugs down).

(4) When properly connected, the screen of V–209 is grounded by maximum counterclockwise rotation of R–240 (looking at shaft side of R–240). When R–240 is rotated to a maximum clockwise position, the screen of V–209 connects to R–266. This provides for minimum silencing when the knob is set at zero and maximum silencing when the knob is set at ten.

(5) In addition, if remote noise silencing is not to be used, a jumper wire must be placed in J–305, connecting the lower right hole to the top hole (terminals 1 and 3).

General.—This change using available material is within the scope of the ship's force, and should be accomplished at the earliest opportunity. Technicians are requested to check all RCK receivers for the correct wiring of the noise suppressor. The instruction book should be corrected accordingly.

A record of completion of this change should be made on the ship's "Radio Equipment Log," NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *2/1/46*

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RCK RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 3

INSTALLATION OF TYPE 49509 PLUG ADAPTERS

Equipments affected.—All model RCK radio receivers.

Purpose.—To adapt the audio output plug to fit the type TTHFA–1 cable specified for use in audio circuits.

Procedure.—The plug adapter is to be installed in the following manner: (The numbers, in brackets, referenced throughout the text, refer to Fig. 1.)

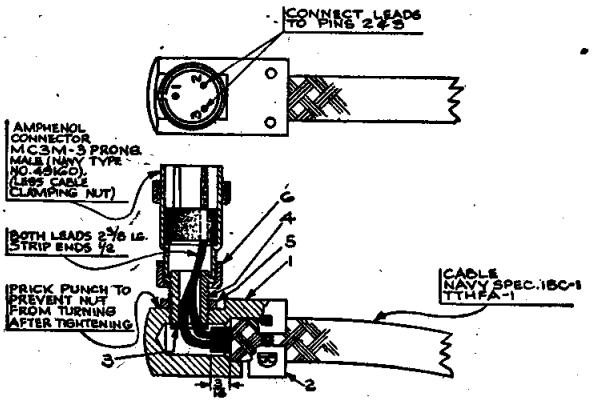

FIGURE 1.—Installation of plug adapter.

(1) Remove the cable clamping ring furnished with the plug, Navy type CPH–49160. The plug is supplied with the radio receiving equipments.

(2) Strip the ends of the two conductors ½" as shown in Figure 1.

(3) Insert the cable into the connector body [1] and pull the two conductors through the tapped hole in the body.

(4) Clamp the cable in place with clamp [2]. Two machine screws and lockwashers are furnished for this purpose.

(5) Insert the insulating washer [3] over the two conductors and into the bottom of the tapped hole in the conductor body [1]. (See Fig. 1.)

(6) Assemble bushing [4], locknut [5], coupling nut [6] and plug, Navy type CPH–49160. Insert the conductor leads into pins no. 2 and no. 3, as shown in Figure 1.

(7) Before tightening the locknut [5] note positions of the key and connections. Be sure that the positions agree with Figure 1. Tighten the locknut [5].

(8) Prick-punch the connector body adjacent to the locknut [5] to prevent it from turning.

(9) Solder leads to pins no. 2 and no. 3.

General.—Navy type 49509 plug adapter kits have been procured under contract NXsr–86317. Vessels are requested to contact an Electronics Officer at the earliest opportunity for the installation of the plug adapter. Instruction books should be corrected accordingly.

A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *2/1/46*

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CRYSTALS FOR ALIGNMENT OF THE MODEL RCK RADIO RECEIVING EQUIPMENT

Paragraph 4.13 of the instruction book, NavShips 900,228–IB, for the model RCK radio receiving equipment specifies that a crystal for the channel frequency of 151.20 megacycles be used when aligning the oscillator-multiplier. Crystals for this frequency are not now available and the Bureau does not contemplate procurement.

In view of the above, crystals for the channel frequency of 146.16 megacycles, which are available, should be used for alignment purposes.

The procedure as given in paragraph 4.13 of the instruction book remains unchanged except that crystals for channel frequency 146.14 mc. be substituted for the 151.20 mc. Instruction books should be corrected accordingly. *6/1/47*

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CRYSTAL FAILURES IN MODELS RCK AND TDQ RADIO EQUIPMENTS

Previous instructions requested that defective crystals for the models RCK and TDQ radio receiving equipments be returned to the Resident Inspector of Naval Material, Camden, N. J.

This practice should be discontinued immediately. Defective crystals should be returned instead to the Naval Supply Center, Norfolk, Va., which has assumed control of the supply of piezo-electric crystals.

Replacement crystals shall be requested from the Naval Supply Center in accordance with Chapter 67 of the Bureau of Ships Manual. These instructions are also published on page GEN: 66 of bulletin. *4/1/49*

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→ ADAPTING MODELS RCK AND TDQ FOR CCL SERVICE AT SHORE STATIONS

The following field changes are recommended in order to relieve the shortage of the TDG–1 and RBQ–1 transmitter and receiver which are presently utilized with the Model UN (Western Electric Type 42–A–1) Carrier Control System and also in order to fully utilize the capabilities of the Army CF–1 four-channel telephone terminal when utilized alone or when the Type CF–1 terminal is utilized with the Navy Model UF Carrier Telegraph Equipment.

To obtain best use of the Army Type CF–1 telephone terminal the u-h-f transmitter and receiver should have a flat frequency response up to 12 kc. The unmodified TDQ transmitter is down about 16 db at 10 kc and the unmodified RCK receiver is down about 8 db at 10 kc when band switch is set to "wide."

In their present form the Models TDQ/RCK combination will permit use only of channels one and two of the four channels of the Type CF–1 terminal.

MODEL RCK RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 4

INCREASED AUDIO BANDWIDTH FOR COMMUNICATION CONTROL LINK SERVICE

Equipments affected.—Any Model RCK receivers when used in communication control link service, provided increased audio bandwidth response is required.

Purpose.—The modifications outlined below will be made on Model RCK receivers to widen the audio bandwidth response to 12 kc.

Time required.—One-half man-hour.

Material required.—

Quantity	Name and Description of Part
1	200 mmf capacitor (600–v)
1	1,000 mmf capacitor (600–v)

No special tools or wiring are required.

Procedure.—

(1) Replace capacitor C–233 (700 mmf) across second detector (V–206A) load resistors R–227 and R–228 with a 200 mmf capacitor (600-volt).

(2) Remove capacitor C–252 (700 mmf) from grid input circuit of final output a-f amplifier tube (V-211).

(3) Connect 1,000-mmf 600-volt capacitor between plate of tube V-211 (above) and ground.

Note: Retain replaced parts with the equipment in the event reconversion is desired at some future time.

General.—All references to capacitor C–252 in the Model RCK instruction book should be deleted. This capacitor should also be deleted from all circuit diagrams.

All references to capacitor C–233 in the Model RCK instruction book as a 700-mmf capacitor should be corrected in ink to read as a 200–mmf capacitor.

All wiring diagrams in the Model RCK instruction book which include tube V–211 should have the above mentioned 1,000–mmf, 600–volt capacitor drawn in ink between the plate and ground of this tube.

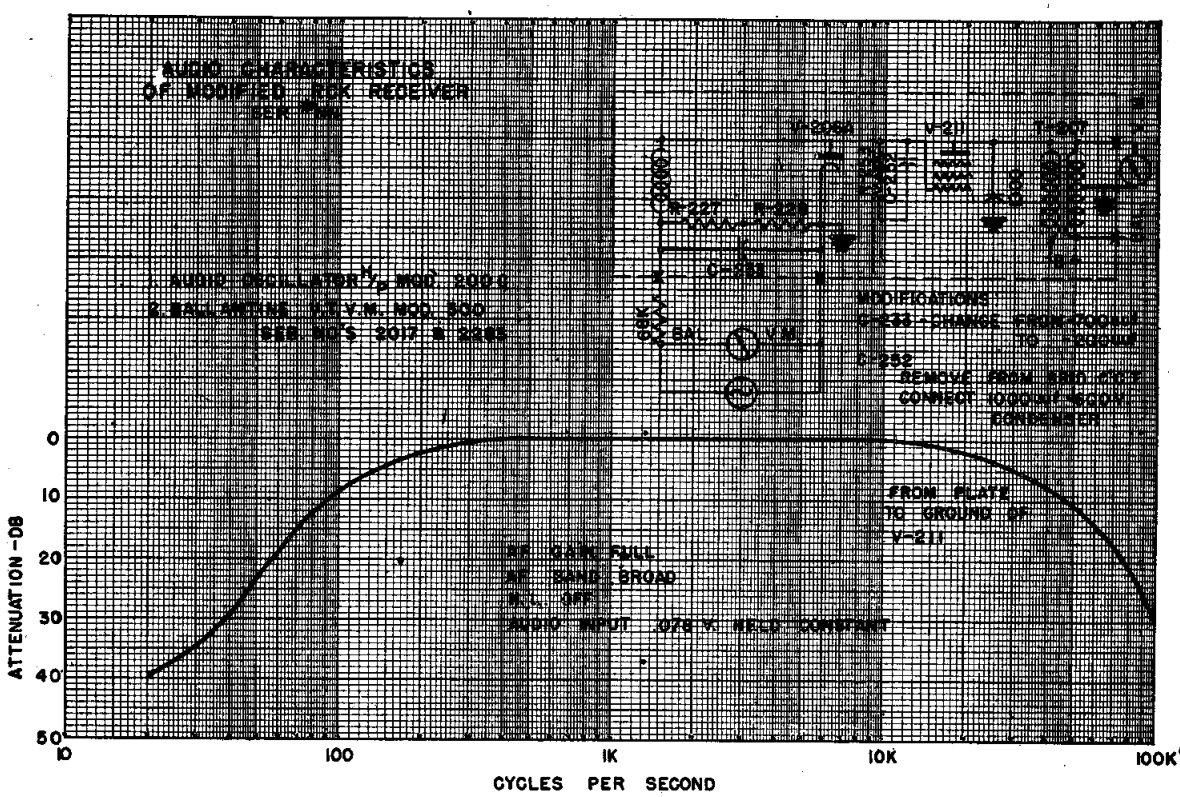

FIGURE 1.—Response curve and modified schematic for Model RCK receiver.

All RCK receivers on which the above detailed modifications have been made shall be redesignated the Model RCK–a. This change should be made in the instruction books and on nameplates of all affected equipments, preferably by steel stamping or engraving. Inventories are to be changed accordingly.

When changes are completed, the Bureau is to be advised of such action with serial numbers of affected equipments and any operational results when available.

The above redesignation is to be made on modified receivers as presently authorized by the Bureau, previous to issue of this field change. Modifications previously made are to conform to this field change. If not feasible, the Bureau is to be advised so that a new designation can be assigned.

These changes will provide a response very closely approximating that shown in figure 1 on the preceding page.

It should be noted that in the event it is desired to check the fidelity as a result of this modification, the data for the response curve should be measured by feeding audio frequency through a series resistor of half the value of the total diode load, with the second detector decommissioned. This procedure results in a more accurate determination of the true response characteristics since the modulating systems of average available r-f signal generators are incapable of sufficient frequency response. If it is desired to monitor the circuits, special wide-response telephones should be employed.

The Model RCK without these by-pass condensers is designed for about 20 to 30 kc fidelity and the output transformer for 50 kc. The i-f bandwith is 125 kc. Fidelity was deliberately restricted originally to meet specifications for desired performance at that time.

Model RCK receivers can be rackmounted by construction locally of suitable racks.

Unless specifically directed by the Bureau, the change is optional and is to be made at the discretion of the Electronics Officer.

Routine.—When a field change has been completed, the responsible technician should make sure that the person completing the field change follows the routine given below:

1—Fills out NavShips 383 to give installation data and mails it to the Bureau.

2—Records the field change on the "Record of Field Changes" NavShips 537. *7/1/49* ←

MODEL RCK SERIES TROUBLE-SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
No audio output.	Discovered one lead from capacitor C–243, on the side going to the second amplifier grid, was so close to chassis that voltage arced over to ground. However, it did not read "short" when measured to ground with an ohmmeter. Bent lead away from ground and replaced shorted capacitor, from silencer diode to second amplifier grid, with spare capacitor. Operation was again normal.—U. S. S. *Kassan Bay*
RCK.—Inability to zeroize the input meter.	Resistor, R–246, found to be outside 10 percent tolerance limit. Replaced resistor. Normal operation restored.—U. S. C. *Canberra* (CA70)
→ Receiver had very low sensitivity.	Faulty operation was traced to a defective high-frequency trimmer capacitor C–113. This capacitor is made up with a "slug" type adjustable screw. The "slug" had expanded and would not clear the tubular part of the capacitor. The capacitor was removed and the "slug" sanded down. The capacitor was reinstalled and the receiver operated normally. *1/1/50* ←

→ INTERFERENCE BETWEEN MODELS RDC–1 AND RBK–14 RECEIVERS

See page RBK:1 ←

→ X-RDJ PULSE ANALYZER EQUIPMENT FIELD CHANGE NO. 1

INCORPORATING CHANGES TO IMPROVE OPERATION OF MODEL X-RDJ PULSE ANALYZER EQUIPMENT (NO KIT)

Equipments affected.—All model X-RDJ pulse analyzer equipments, contract NXsr-51517, serial numbers 1 through 25.

Purpose.—To improve overall operation of the equipment.

Material required.—The following parts are necessary for this change and can be obtained from an Electronics Officer. One of each component should be properly labeled and placed in the equipment spare parts box. NOTE: *All resistors should have pig-tail type terminals.*

Item	Quantity	Part and description	JAN or Navy type
1	2	Carbon resistor; 200 ohm ±5%, 1 watt.	RC31BE201J (63288-201)
2	2	Carbon resistor; 0.47 megohms ±10%, 1 watt.	RC31BE474K (63288-474)
3	2	Carbon resistor; 33,000 ohms ±10%, 1 watt.	RC31BE333K (63288-333)
4	2	Carbon resistor; 0.1 megohm ±10%, 1 watt.	RC31BE104K (63288-104)
5	2	Carbon resistor; 1.2 megohms ±10%, 1 watt.	RC31BE125K (63288-125)
6	3	Carbon resistor; 6,800 ohms ±10%, 2 watt.	RC41BE682K (63474-682)
7	2	Capacitor, silver mica dielectric, 4300 mmfd. ±5%, 500 V. D-C W. ⅝" dia, 5/32 x 5/16 mtg. stud, gnd. lug and solder terminals.	(482788-5)
8	2	Capacitor, mica dielectric; .01 mfd. ±20% 300 V. D-C W., 1 1/32" x 41/64" x 1 1/32" molded bakelite case, axial wire leads.	JAN-CM40B103M
9	2	Capacitor, mica dielectric; 0.0039 mfd. ±20% 500 V. D-C W., 53/64" x 53/64" x 3/32" molded bakelite case, axial wire leads.	JAN-CM30B392M
10	1	Vacuum tube, type 6AC7. Miscellaneous connecting wire.	JAN-6AC7

Procedure.—Reference should be made to the schematic and wiring diagrams when making this change.

(1) The pulse rate frequency circuit should be changed as follows:

(*a*) Replace capacitor C-128 (connects to position #1 of S-102A) with a silver mica capacitor, 4300 mmfd. ±5% 500 V. D-C W. (item #7 of material required). Label the new capacitor C-128.

(*b*) Replace resistor R-130 (Grid leak resistor of V-107) with a carbon resistor, 0.47 megohm ±10%, 1 watt (item #2). Label the new resistor R-130.

(*c*) Replace resistor R-134 (plate load resistor of V-107) with a carbon resistor, 33,000 ohms ±10%, 1 watt (item #3). Label the new resistor R-134.

(*d*) Replace resistor R-133 (screen dropping resistor of V-107) with a carbon resistor, 0.1 megohm ±10%, 1 watt (item #4). Label the new resistor R-133.

(*e*) Remove resistor R-131 (cathode resistor of V-107) and connect potentiometer R-132 direct to tube V-107.

(*f*) Remove resistor R-138 (connects to position #3 of S-102B) and connect potentiometer R-137 direct to switch S-102B.

(*g*) Replace capacitor C-116 (screen by-pass of V-107) with a mica dielectric capacitor, .01 mfd. ±20%, 300 V. D-C W. (item #8). The new capacitor should be designated C-116 and should be physically located in place of R-138.

(*h*) Replace vacuum tube V-107 (6SJ7) with a tube type 6AC7 (item #10).

(2) Replace the delay line terminal resistor R-108 (cathode circuit of V-102) with a carbon resistor, 200 ohms ±5%, 1 watt (item #1). Label the new resistor R-108.

(3) The oscillator circuit should be changed as follows:

(*a*) Replace capacitor C-138 (cathode and suppressor by-pass for V-108) with a mica dielectric capacitor, .0039 mfd. ±20%, 500 V. D-C W. (item #9). Label the new capacitor C-138.

(*b*) Remove jumper between ungrounded end of capacitor C-138 and resistor R-106.

(*c*) Remove jumper between terminal #3 of vacuum tube V-108 and capacitor C-138.

(*d*) Connect a jumper from terminal #3 of vacuum tube V–108 to the terminal of resistor R–106 vacated in change in paragraph (b).

(*e*) Connect a jumper from the ungrounded side of capacitor C–138 to the ungrounded end of resistor R–162 (cathode resistor of V–109).

(4) The following changes should be made to protect the clamper tube:

(*a*) Break the direct connection between the high sides of the horizontal positioning controls R–194A and R–194B and insert a carbon resistor, 1.2 megohms ±10%, 1 watt (item #5). Label the new resistor R–201.

(*b*) Connect the high side of vertical positioning controls R–192A and R–192B to the regulated 150-volt d-c supply instead of the 300-volt d-c unregulated supply. This connection can be made at the terminal leg of R–133 facing the front panel of the receiver.

(5) The following change reduces the pattern shift between elliptical and slave sweeps at low sweep rates:

(*a*) Remove capacitor C–147 (connects between pin #5 of V–111 and positions #2 and #3 of S–104B) and connect the contacts of switch S–104B direct to the plate terminal #5 of tube V–111B and resistor R–178.

(6) The following change is made to reduce the number of failures of resistors R–128 and R–129:

(*a*) Replace resistors R–128 and R–129 with carbon resistors, 6,800 ohms ±10%, 2 watt (item #6). Label the new resistors R–128 and R–129.

General.—This field change, using available material, is within the scope of the ship's force and should be accomplished at the earliest opportunity. The schematic diagrams, wiring diagrams and parts lists should be corrected accordingly.

Tag and retain for emergency use the removed parts. Place the field change equipment spares in the equipment spare parts box.

A record of completion of this change should be made on the equipment log of modifications and changes. Completion of this change should be reported on the NBS–383 card. *4/1/46*

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RDJ PULSE ANALYZER EQUIPMENT FIELD CHANGE NO. 1

INCORPORATING CHANGES TO IMPROVE OPERATION OF MODEL RDJ PULSE ANALYZER EQUIPMENT (NO KIT)

Equipments affected.—Model RDJ pulse analyzer equipment, contract NXsr–66741, serial numbers 1 through 250.

Purpose.—To protect the clamper tube, to reduce the pattern shift between elliptical and slave sweeps at low sweep rates, and to reduce the number of failures of resistors R–128 and R–129.

Material required.—The following parts are necessary for this change and can be obtained from an Electronics Officer. One of each item should be properly labelled and placed in the equipment spare parts box. NOTE: *All resistors should have pig-tail type terminals.*

Item	Quantity	Part and description	JAN or Navy type
1	2	Carbon resistor, 1.2 megohm ±10%, 1 watt.	RC31BE125K (63288–125)
2	3	Carbon resistor, 6,800 ohm ±10%, 2 watt.	RC41BE682K (63474–682)
		Miscellaneous Connecting Wire.	

Procedure.—Reference should be made to the schematic and wiring diagrams when making this change.

(1) *The following changes to protect the clamper tube should be made to equipments numbered 1 through 67 only:*

(*a*) Break the direct connection between the high sides of the horizontal positioning controls R–194A and R–194B and insert a carbon resistor, 1.2 megohm ±10%, 1 watt (item #1). Label the new resistor R–201.

(*b*) Connect the high side of the vertical positioning controls R–192A and R–192B to the regulated 150-volt d-c supply instead of the 300-volt d-c unregulated supply. This connection can be made at the terminal leg of R–133 facing the front panel of the receiver.

(2) *The following change, reducing the pattern shift between elliptical and slave sweeps at low sweep rates, should be made to equipments numbered 1 through 216 only:*

(*a*) Remove capacitor C–147 (connects between pin #5 of V–111 and positions #2 and #3 of S–104B) and connect the contacts of switch S–104B direct to the plate terminal #5 of tube V–111B and resistor R–178.

(3) *The following change to reduce the number of failures of the resistors R–128 and R–129 should be made to equipments numbered 1 through 250:*

(*a*) Replace resistors R–128 and R–129 with carbon resistors, 6,800 ohms ±10%, 2 watts each (item #2). Label the new resistors R–128 and R–129.

General.—This field change, using available material, is within the scope of the ship's force and should be accomplished at the earliest opportunity. The schematic diagrams, wiring diagrams and parts lists should be corrected accordingly.

Tag and retain for emergency use the parts removed. Place the field change equipment spares in the equipment spare parts box.

A record of completion of this change should be made on the equipment log of modifications and changes. Completion of this change should be reported on the NBS–383 failure report form.

4/1/46 ←

MODEL RDJ SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
→RDJ.—Short to ground.	On many units the lights illuminating the elliptical sweep dial are too close to chassis. A piece of fish paper or other suitable insulating material can be placed between the light and chassis.—R. C. M. Bulletin #5, EFSG, NRL. ←

RECEIVER BURN-OUT

→The Bureau was advised by a field activity that frequent outages were occuring in RDM receivers being used with i-f type converters and without an audio load. Under this "no-load" condition the plate dissipation of the 6K6 output was exceeded causing the tube to short. The shorted output tube would then cause a burn-out of either the output transformer, the filter choke, or the power transformer. This type of failure may be largely eliminated by connecting a 500 ohm 5 w. resistor across terminals 1 and 2 of TB–4, which is located in the rear of the chassis. This resistor will place almost a normal load on the output tube but will not interfere with headphone reception. It should be removed when use of the loudspeaker is required.

If, under conditions of extremely high ambient temperature and high line voltages, the resistor does not offer sufficient protection, a ⅛ amp fuse may be installed between pin 2 of X–14 and L–50. As wired at the factory the original lead also serves as a filament lead for V–14. Care must be taken that the fuse is not inserted in the filament lead. The fuse may be mounted in an extractor type fuse holder mounted in a convenient spot on the rear apron of the chassis.

Where required, the foregoing modification is authorized without report to the Bureau. *4/1/51* ←

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RDO RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 1

REPLACEMENT OF 28-VOLT INPUT RECEPTACLE J–305

Equipment Affected. All model RDO radio receiving equipments.

Purpose.—To replace the 28-volt input receptacle, J–305, in order to prevent accidental failure of the audio filter and output transformers.

Vessels should contact the nearest Electronics Supply Office for the material necessary to make this change. This field change is within the scope of the ship's force and should be accomplished at the earliest opportunity.

No other alterations need be accomplished prior to this change.

Time Required.—This field change requires about one man-hour to accomplish.

Material Required.—

Quantity	*Description*	*Navy Type No.*	*Manufacturer*
1	Receptacle, male polarized, 2-contact.	AN–3102–14S–9P	American Phenolic Corp.

Tools and Instruments Required.—

Pliers.
Screw-driver.
Soldering iron.
Solder.

Procedure.—Servicing personnel must at all times observe all safety regulations. Do not make any field change to the equipment with high-voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the "off" position due to charges retained by capacitors. To avoid casualties always remove power and ground the circuits prior to touching them.

Remove the three-contact 28-volt input receptacle, J–305, presently installed. Solder the leads from the filter unit to pins A and B of the new receptacle, and mount the new male input receptacle in the mounting hole of the chassis, utilizing the bolt-holes and mounting screws from the old jack.

General.—At present the audio-output receptacle, J–304, and the 28-volt input receptacle, J–305, are physically similar, and, hence, it is possible to accidentally plug the 28-volt supply into the audio-input receptacle, which will cause failure of the audio filter circuit and output transformer. To prevent such failure, this field change should be accomplished at the earliest opportunity.

Routine Instructions.—Completion of this field change shall be reported to the Bureau on the Eletcronic Equipment Failure Report Card NBS–383 and shall be recorded on the Electronic Equipment History Card, NAVSHIPS 536; moreover, the completion date shall be recorded on the Field Change Record Card, NAVSHIPS 537—all by personnel making the change.

The receptacle removed from the chassis should be tagged properly and placed in the equipment spare parts box for emergency use.

The instruction book for the model RDO radio receiving equipment should be corrected in the following manner:

The parts list in the spare parts catalog for radio receiving equipment, model RDO, should be changed to show J–305 as a receptacle, male, polarized, 2-contact, with Navy type number and manufacturers designation listed as AN–3102–14S–9P. The contractor's drawing and part number in the parts list should be deleted.

The pictorial diagram, figure 10 in the instruction book, NAVSHIPS 900,527, and the schematic diagram of the power supply unit, figure 12, should be corrected in ink. *4/1/48*

REVISED SCHEMATICS AVAILABLE

Copies of revised schematics for field changes 2 and 3 to the Model RDO receiver are available at the Publication Supply Depot, Naval Supply Center, Bldg. 101 Naval Station, Norfolk 11, Va. as follows:

Figure 8A only of FCB for F. C. No. 2–RDO—NavShips 98140.

Figure 9A only of FCB for F. C. No. 3–RDO—NavShips 98134.

Figure 11A only of FCB for F. C. No. 3–RDO—NavShips 98134.

When ordering, itemize as given above.

10/1/50

→PROCEDURE FOR MEASURING THE SENSITIVITY OF RADIO RECEIVING EQUIPMENT MODEL RDO MODIFIED BY FIELD CHANGE NO. 2–RDO

With the modification of Model RDO Radio Receiving Equipment by Field Change No. 2–RDO, which adds a preamplifier stage to the IF input, a new procedure for *sensitivity* measurement is required. The stage gain sensitivity measurements given in table I, section 4, page 26, paragraph 14, of the Instruction Book for Radio Receiving Equipment Model RDO (NAVSHIPS 900, 527–IB) are no longer applicable in this case.

The procedure described below is to be used to determine the overall sensitivity of the receiver. The procedure given in the instruction book for alignment of the IF stages, section 4, paragraph 14, is NOT superseded by the procedure described below and must still be employed for receiver alignment.

1. Remove the Model RDO Receiver from the cabinet. Insert the TN–2B/APR–1 tuner unit.
2. Remove the tube V–207 and insert a tube adaptor, selected from adaptor kit NT–49992; then reinsert tube V–207 in the adaptor.
3. Connect the positive test lead of a vacuum-tube voltmeter to the tab on the tube adaptor that corresponds to prong 5 of V–207, and ground the other test lead on the chassis. Set the vacuum tube voltmeter on the lowest voltage range.
4. Connect the Model RDO Receiver to the power source.
5. Connect the signal generator Model LAF series to the antenna input of the TN–2B/APR–1.
6. Set the signal generator to 200 mc.
7. Tune the TN–2B/APR–1 to the signal generator output.
8. Set the following receiver controls:
   a. The RECEPTION switch to "ACV-OFF" position.
   b. The NOISE LIMITER-OUTPUT METER switch to "OFF" position.
9. Turn off the signal output of the signal generator and turn the receiver RF GAIN control to maximum.
10. Read the voltage as indicated by the vacuum tube voltmeter connected to prong 5 of tube V–207 and record the value.
11. Set the RF GAIN control to a reading of 9 on the RF GAIN control marking.
12. Turn the signal generator output on and increase the signal generator output level until the voltage indicated by the vacuum-tube voltmeter is the same as that recorded in step 10 above. Record the signal generator output level.
13. Increase the signal generator output level by 3 db. Record the voltage indicated by the vacuum-tube voltmeter.
14. Decrease the signal generator output level to approximately 80 db. below 0.1 volt.
15. Turn the RF GAIN control to maximum.
16. Adjust the signal generator output level so that the voltage as indicated by the vacuum-tube voltmeter is the same as that recorded in step 13 above.
17. Read the signal generator output level. It should not be less than 80 db. below 0.1 volt.
18. If the sensitivity is below that given above, align the receiver by the procedure given in the instruction book, section 4, paragraph 14.

4/1/52 ←

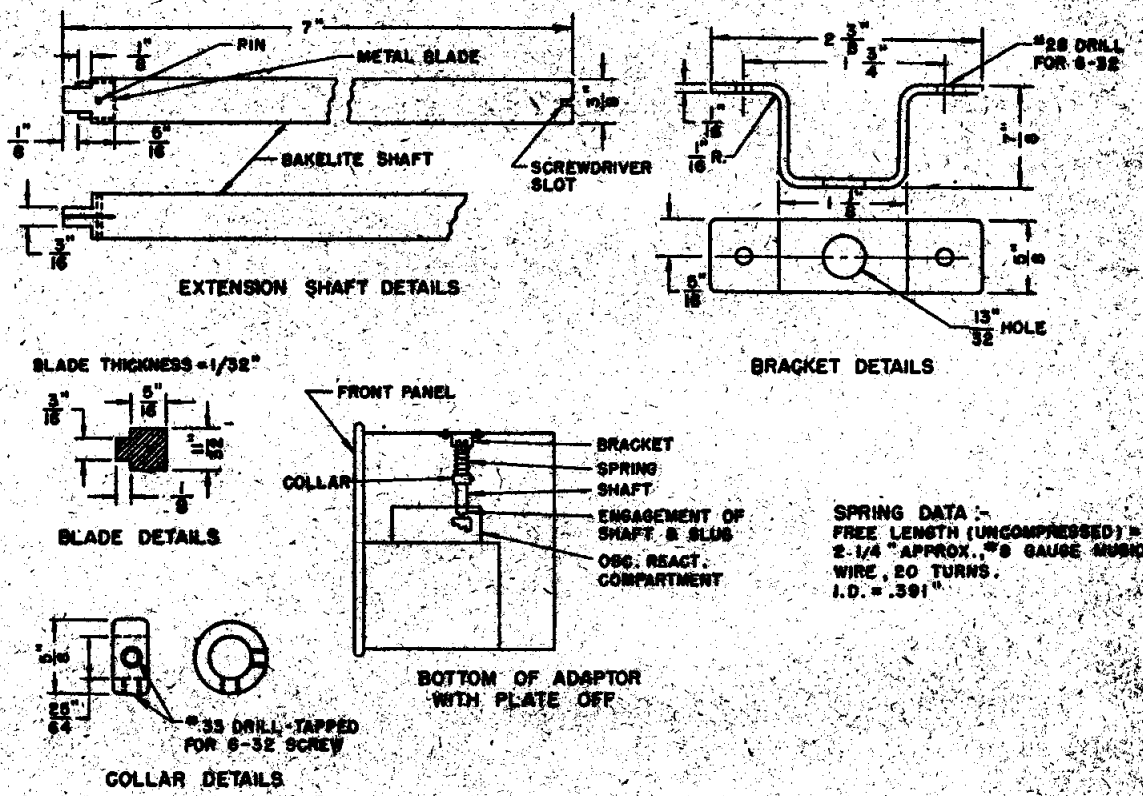
→ RDP PANORAMIC ADAPTORS

FIELD CHANGE NO. 1

EXTENSION OF SWEPT OSCILLATOR SHAFT (NO KIT)

Equipments affected.—All model RDP panoramic adaptors.

Purpose.—To alleviate alignment difficulties and safeguard personnel.



MODIFICATION TO PANORAMIC ADAPTOR MODEL RDP

FIGURE 1.—Field change No. 1 to the model RDP panoramic adaptor.

Procedure.—Details of this modification are shown in Figure 1. Minor alterations may be made to meet the particular needs of the activity making the modification.

A ⅜-inch diameter Bakelite shaft is supported in such a manner that one end continually engages the swept oscillator tuning slug. The other end of this shaft is slotted to provide for insertion of an ordinary screwdriver to allow for adjustment of the tuning slug. The outer end of the shaft is supported by a bracket extending from the inside edge of the adaptor chassis, and the other end of the shaft is supported by its insertion into the tuning slug assembly. The bracket is mounted by means of 6-32 screws and bolts, for which holes are drilled through the side of the chassis with a #28 drill. A third hole, $^{13}/_{32}$-inch in diameter, permits access to the screwdriver slot in the extension shaft. Spring loading is provided to prevent dislocation of the extension shaft due to shock or vibration.

To remove the extension shaft, a collar at the end of the compression spring must be loosened. This allows the shaft to be slid out through the access hole in the side of the chassis.

To adjust the swept oscillator tuning slug it is only necessary to slide the equipment out of its cabinet far enough to allow reaching the access hole exposing the screwdriver slot.

General.—Alignment difficulties have been encountered in the model RDP. It is neces-

sary to remove the bottom cover plate from the adaptor chassis in order to adjust the swept oscillator tuning slug Z–101–09. Insertion of an alignment tool brings the operator's fingers in close proximity to high voltage components.

Investigation of this condition revealed the possibility of a simple modification that could be made to existing equipments, thereby alleviating both difficulties.

This change using available material is within the scope of the ship's force and should be accomplished at the earliest opportunity. A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *3/1/46* ←

RDR RADIO EQUIPMENT

FIELD CHANGE NO. 1

SHOCKMOUNT REPLACEMENT

Equipments affected. — Shipboard installation kits which include a Navy type CRV–10508 shockmount assembly for mounting the Navy type CRV–46283 (RDR) radio receiver. Kits which contain a Navy type CRV–10629 shockmount assembly are not affected by this field change. Visual inspection of the Navy type number stenciled on the bottom of the shockmount frame will determine the applicability of this field change.

Purpose.—To convert a Navy type CRV–10508 shockmount frame assembly to a Navy type CRV–10629 shockmount frame assembly by the removal of the four Barry type C–2045 shockmount units from the Navy type CRV–10508 shockmount frame assembly and the installation of four of the Barry type C–2060 shockmounts furnished with this field change kit. The additional Barry type C–2060 shockmount supplied with this kit is to be placed with the equipment spares.

Time required.—Approximately 1 hour.

Material required.—Five shockmounts, Barry type C–2060 are furnished with this field change kit. A small quantity of light colored paint, not furnished with this kit, is required to obliterate the original Navy type number CRV–10508 from the changed shockmount frame assemblies and to mark them with the revised Navy number CRV–10629.

Disposition of replaced material.—Place the four shockmount units, Barry type C–2045, removed from the assembly, in equipment spares as spares for the Navy type CRV–10508 shockmount assembly used with the MAR transmitter-receiver.

General.—Field change kits are being made available in sufficient quantities to fill all requirements. Instructions for the change are enclosed in the kit and should be kept with the instruction book for the modified equipment.

Vessels should contact the Electronics Officer at the first opportunity for the replacement of the shockmounts. Completion of this change should be reported on the field change report card (NAVSHIPS 2369) included in the kit. *12/1/46*

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CRYSTAL OVEN EXTRACTOR

See the article entitled "Crystal Oven Extractor" on page MAR: 2 of this bulletin. *12/1/46*

RDR SERVICE INFORMATION

See article entitled "MAR/RDR Service Information" on page MAR: 2 of this bulletin. *2/1/47*

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RDR SERVICE HINTS

See article entitled "MAR/RDR Service Hints" on page MAR: 3 of this bulletin. *2/1/47*

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→ OBTAINING CRYSTALS

See the article entitled "Obtaining Crystals for Models MAR, RDR, RDZ, and TDZ" on page MAR: 5 of this bulletin. *1/1/48* ←

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RDZ RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 1

REMOVAL OF C–149 CAPACITORS (NO KIT)

Equipments affected.—All model RDZ receiving equipments having serial number 896 and below.

Purpose.—To improve frequency stability.

Procedure.—Remove the 5-mmfd. fixed ceramic capacitor, circuit symbol C–149, which is connected between the grid and cathode of the oscillator tube V–101.

General.—It was found that this capacitor causes an undesirable shift in the crystal frequency. It is known that removal of this capacitor from the circuit will correct this condition but it is expected that certain low-activity crystals will fail to operate properly in the modified circuit.

For this reason it is requested that after removal of the C–149 capacitor, all crystals supplied with the equipment be checked for operation and that deficiencies be reported to the Bureau in the usual manner. This is necessary in order to plan replacements.

This change is within the scope of the ship's force. The instruction book and parts lists should be corrected accordingly.

A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 failure report form. *5/1/46*

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CRYSTAL OVENS FOR MODELS RDZ, MAR, AND TDZ RADIO EQUIPMENTS

Several failures of the crystal oven, E–121, Navy type CFT–40148, used in models RDZ, MAR and TDZ radio equipments have occurred in test and in the field. Activities report that the fine wires connecting the crystal socket to the pin in the oven base break causing an open circuit.

The manufacturer has corrected this defect in all crystal ovens shipped after December 7, 1945. A larger wire is used for the connections.

The ovens can be identified by the color-coding of the two screws on the internal crystal socket. Both screws on the holder in the *old type ovens* are colored a brownish red. In the new improved ovens they are color-coded by the month of manufacture as shown in the following list:

Month of Manufacture	Color-Code	
	Screw nearest heater pins	Screw away from pins
Dec. 1945	Red	Blue.
Jan. 1946	Red	Yellow.
Feb. 1946	Red	Green.
Mar. 1946	Blue	Yellow.
April 1946	Blue	Blue.
May 1946	Brown	Brown.
June 1946	Red	Red.
July 1946	White	White.
Aug. 1946	Black	Black.

Figure 1 shows the oven and the two identifying screws.

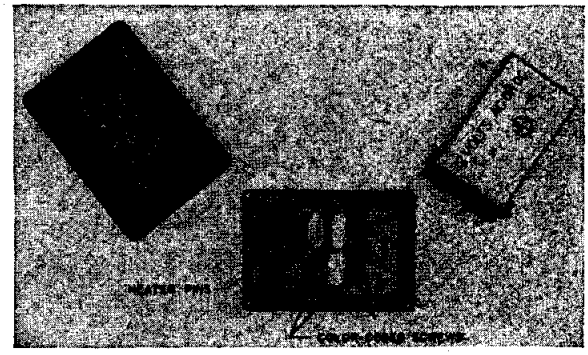

Figure 1.—The Crystal oven and the two identifying screws.

Crystal ovens of the old type should be returned to the Electronics Officer for replacement with the new improved ovens. Electronics Officers should ascertain that new improved ovens are provided for all model RDZ, MAR and TDZ equipments before installation. The spare parts should also be checked for inclusion of the new oven. *6/1/46*

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RDZ RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 2

ADJUSTMENT OF TUNING INDUCTANCE

Equipments affected.—Certain RDZ receiving equipments in the 1 through 500 serial number group manufactured by the national company, under contract NXsr–55624.

Purpose.—To decrease, by means of an auxiliary absorption loop, the tuning inductance in

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the mixer tank and thereby minimize the loss in gain at high ambient temperatures.

Time required.—Two (2) hours.

Procedure.—

1. Check the alignment of the receiver carefully in accordance with the procedure outlined in the instruction book.

2. Remove shield plates from the last multiplier mixer compartment. Determine by inspection the setting of the mixer inductance. If this trimmer is at minimum inductance setting (see fig. 1 of accompanying sketch) or within 30° of minimum (inside the inductance) it will be necessary to install the absorption vane on the trimmer as shown in figure 2 of the accompanying sketch. If the trimmer setting is 30° or more from the minimum position, the absorption vane is not necessary.

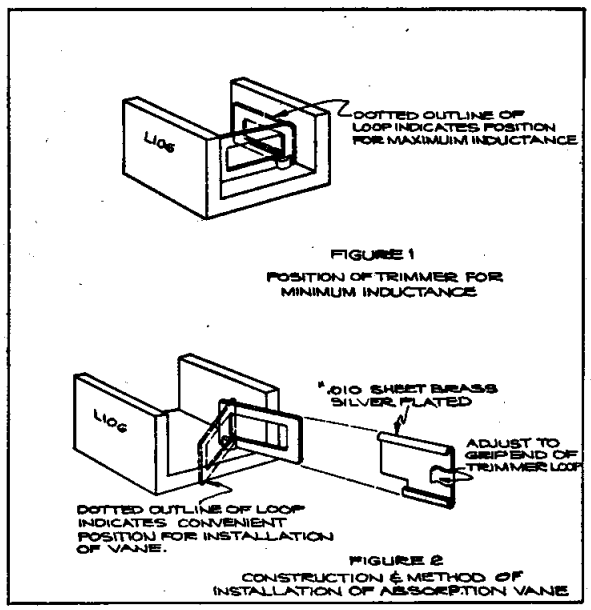

FIGURE 1.—Modification of mixer inductance trimmer to reduce value of the inductance.

(3) Replace shields and select a convenient channel frequency on the receiver from 250 to 260 mc. Tune a signal generator to the receiver. Allow time enough for receiver and generator to stabilize and recheck generator frequency.

(4) Turn the mixer trimmer to the *maximum* inductance position (extreme counterclockwise rotation as viewed from below chassis). Watching the output meter closely, slowly turn the trimmer back toward the minimum setting (clockwise rotation) until it has tuned through the resonant peak and has barely perceptibly started down on the high frequency side of resonance. This completes the adjustment. This trimming method permits the increase in capacity of the tuning condenser, due to temperature rise, to carry the determining effect across the top of the resonance curve toward the low frequency side with only a few decibels loss in gain at ambient temperature up to 500° C.

General.—In the early production of model RDZ equipments, the manufacturers (National Co.) had not developed accurate jigs for adjusting the tuning inductances prior to their permanent attachment to the variable tuning gang. As a consequence, certain of these equipments in the 1 through 500 serial number group have reached the field with the mixer tank slightly on the high inductance side which results in the loss in gain at high ambient temperatures. This condition shows to be most critical at approximately 258 megacycles. In most of these equipments it has been found necessary to insert an auxiliary absorption loop in the mixer tank as the inductance trimmer was already set at the minimum inductance position as shown in the accompanying sketch. All model RDZ receivers in the 1 through 500 serial number group should be investigated, in accordance with the above procedure, and this field change made in the receivers found to need same.

Field change kits are being made available in sufficient quantity to fill requirements. This change is within the scope of the ships force and should be accomplished at the earliest opportunity. Record of completion of this field change should be made on the equipment machinery history card and reported on the field change report card NAVSHIP 2369 included in the kit. *10/1/46*

●

CRYSTAL OVEN EXTRACTOR

See the article entitled "Crystal Oven Extractor" on page MAR:2 of this bulletin. *12/1/46*

●

FIELD CHANGE NO. 3–RDZ
RDZ RADIO RECEIVING EQUIPMENT
BONDING FOR AUTO-TUNE UNIT

Equipment affected.—Model RDZ/RDZ–1 receiving equipments, CNA–46275 Serial Nos. 1 through 2348 and CQC–46275 Serial Nos. 1 through 1100.

Purpose.—To insure a good ground connection from the auto-tune blister cover to the main front panel. The shielding integrity of the equipment is seriously affected if this field change is not made.

Time required.—Approximately 30 minutes.

Material required.—All material required for this field change is supplied in this kit.

Procedure.—Follow the step-by-step procedure depicted in the field change bulletin.

Routine instructions.—Field change kits are being made available in sufficient quantities to fill all requirements. The change should be accomplished at the earliest opportunity by maintenance personnel of the activity or vessel to which the affected equipment is assigned. Completion of this change should be recorded in the equipment Machinery History Card and reported by means of NAVSHIPS 2369 as soon as the work has been completed. One copy of the field change bulletin should be attached to the front of the instruction book for the equipment. *4/1/47*

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DISTRIBUTION OF CRYSTAL OVEN EXTRACTORS FOR MODELS RDZ AND TDZ EQUIPMENTS

Communication Equipment Maintenance Bulletin, supplement No. 15 dated December 1946, Electron for February 1947 and Radio Installation Bulletin No. 188 dated 15 November 1946, stated that crystal oven extractors for models TDZ, RDZ, MAR, and RDR equipments are being shipped with these equipments and that a sufficient quantity of the extractors would be stocked at a naval activity on each coast to take care of the equipments that were shipped before the extractors became available.

The above statement is not entirely correct due to the fact that crystal oven extractors were not procured for and are not being shipped with models MAR and RDR equipments as the crystal ovens in these equipments can be extracted without difficulty.

The extractors are now being shipped with each model TDZ and RDZ equipments only and the quantity of extractors now available in stock shall be issued exclusively to activities having the models TDZ and RDZ equipments that were shipped before the extractors became available. *6/1/47*

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ADDITIONAL INFORMATION ON CRYSTAL OVENS FOR MODEL RDZ RADIO EQUIPMENTS

See the new article with further material (Supplement 22), entitled "Additional Information on Crystal Ovens for Models RDZ, MAR, and TDZ Radio Equipments" on pages TDZ:4 and 5. *4/1/48*

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OBTAINING CRYSTALS

See the article entitled "Obtaining Crystals for Models MAR, RDR, RDZ, and TDZ" on page MAR:5. *1/1/48*

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FIELD CHANGE NO. 4–RDZ
MODEL RDZ RADIO RECEIVING EQUIPMENT
MODIFICATION TO IMPROVE STABILITY OF I–F AMPLIFIER

Equipments affected.—All Model RDZ and RDZ–1 Radio Receiving Equipments.

Purposes.—The scanning output of the RDZ and RDZ–1 is taken from the high-potential side of the cathode resistor of the first i-f amplifier tube and ground, and fed through a length of RG–55/U 50-ohm coaxial cable to the "Scan" output receptacle at the rear of the receiver. If a scanning unit such as an RDP is not included in the installation, the receiver "Scan" receptacle is not suitably terminated, and standing waves are set up in the receiver output cable. As a result, different degrees of

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phase displacement of the standing-wave voltage peaks are present at the "i-f" and "Scan" input components. Through stray couplings with other circuits, this results in varying degrees of regeneration in various i-f amplifier stages. The stray couplings are materially reduced by installation of a shield and plug-in type dummy load for the SCAN receptacle. The dummy load is a 47-ohm resistor in series with a 0.01-microfarad capacitor which serves to limit the standing-wave ratio.

Time required.—Approximately 20 minutes.

Material required.—All material furnished in kit.

Tools and instruments required.—Screwdriver, small adjustable wrench, socket or open end, to fit #6–32 and #10–32 nuts, pocket knife.

Procedure.—Complete instructions for accomplishing this change are included in the field change bulletin.

General.—These field change kits can be obtained from the Electronics Officer of any Naval shipyard or from any electronics supply center. Accomplishment of this change is considered within the ability of ship's personnel.

Routine instructions.—When this field change has been completed, personnel making the change shall:

(1) Make the proper entries on the "Electronic Equipment History Card" NAVSHIPS 536, and on the "Record of Field Changes Card" NAVSHIPS 537.

(2) Fill out and mail the self-addressed notification card, NAVSHIPS 2369, which is included as part of this field change.

(3) Place the field change bulletin in the front of the instruction book (NAVSHIPS 900,617) of the equipment so modified. *1/1/49.*

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ELIMINATION OF SPURIOUS OSCILLATIONS IN RDZ RECEIVERS

Recently the Bureau received a report of spurious oscillations in Model RDZ Radio Receiving Equipments. Considerable thought had been given to the problem by the originator of the report. The trouble had been located and several methods of correcting the condition had been determined.

The first source of trouble was in the scanning amplifier-circuit, due primarily to the lack of proper termination of the scanning input-receptacle. It was found that by providing proper termination and a shield for the receptacle a large percentage of the interference was eliminated.

A considerable amount of this work could have been eliminated if the maintenance activity had known of Field Change No. 4–RDZ. This field change kit has just recently been made available to all Naval Shipyards and regular stocking activities, and is applicable to all RDZ's.

Additional oscillations were also reported in the fourth and fifth i-f amplifier stages. The causes of this condition are not corrected by Field Change No. 4–RDZ but were found to be as follows:

(1) Filament leads, carrying relatively-high current, laid closely against the tube grid connections, thereby causing coupling and feedback.

(2) Poor grounds of socket clamps of fourth and fifth i-f amplifier tubes caused interstage coupling and regeneration.

Condition (1) was corrected by carefully dressing the leads away from the tube base connections.

Condition (2) was corrected by soldering a short lead between the ground lug on the tube socket clamp and lugs No. 1 and No. 3 of the sockets—particularly those of V–205 and V–206.

The Bureau appreciates receiving information of this character, and requests that it continue to flow in. *1/1/49.*

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→RDZ and TDZ—Crystal Oven Failure. See page TDZ: 8. *1/1/50*

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ADJUSTMENT OF TUNING CAPACITOR END PLATES

Reports have been received by the Bureau of Ships of RDZ radio receivers that have been

damaged by attempted adjustment of tuning capacitor end plates. While UHF equipment is especially sensitive to this type of maladjustment, the satisfactory adjustment of tuning capacitor end plates for *any* type communication receiver requires special information and equipment. *DO NOT TAMPER WITH TUNING CAPACITOR END PLATE ADJUSTMENTS. 1/1/50*

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UHF CASE HISTORIES

A total of 144 field reports of 281 Model TDZ/RDZ transmitting-receiving equipment failures reveals that approximately 92% of all the failures encountered are chronic troubles. These troubles are listed in the first column of the following chart in the order of their frequency of occurrence. The second and third columns give the exact nature of these troubles and the symptoms they produced.

Type of failure	Symptoms	Cause
Low emission, shorted, or intermittent	Weak output, no output, or intermittent operation.	Defective tubes.
I-f alignment, r-f alignment, or both required	Weak output or no output	Poor alignment.
Cold oven, broken wires connecting crystal socket to pin, poor connections on oven receptacle, or dirty or poor contacts on S601.	Weak output, no output, or excessive frequency drift.	Defective crystal oven or circuit.
Silencer circuit ungrounded when not using remote units, grounded when using remote, or defective resistors.	No silencing action	Silencer circuit inoperative.
Inactive or weak crystals	Weak output or no output on one or more channels.	Defective crystals.
Lubrication or replacement required	Remote dial selected higher channel than desired.	Defective minor switch.
Forms melted or warped	No output or poor i-f selectivity	Defective i-f coil forms.
Armature misadjusted or coil shorted	Autotune motor ran continuously.	Defective relay K106 in Navy Type CQC-23497.
Broken ceramic shaft or broken coupler on Autotune unit.	No output and no tuning	Faulty coupling between Autotune unit and tuning capacitor.
Bent pins or pin holders on sockets	Intermittent operation	Poor connections between tube pins and sockets.
Fuse missing or open	No output	Defective fuse.
No Panoramic Adaptor or dummy load plugged into J403.	I-f oscillation present	Improperly terminated SCAN Jack J403.
Open control or poor contact of rotor	Noisy output when control was turned, or intermittent operation.	Defective RF GAIN control.
Loose coupling with excessive play, or damaged linkage.	Poor i-f selectivity	Faulty linkage between IF BAND control shaft and i-f transformers.
Lock nut not tightened sufficiently	Dial failed to indicate proper frequency.	Loose lock nut on tuning dial.

1/1/51

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RDZ RECEIVERS

1. The most common fault of the RDZ receivers is the falling off in sensitivity of the receivers.

A. The usual cause of poor receiver sensitivity is the 6F4 tubes which are not too much better than the 2C39's in the transmitter. At the first signs of poor sensitivity these tubes should be checked and good ones installed where necessary.

B. The 956 tube in the receiver front end also causes poor receiver sensitivity and is frequently overlooked because of the awkwardness of removing and installing. However, it should be checked frequently also.

C. In addition to the poor sensitivities resulting from tubes there is also that caused by changes in receiver tuning, which may result from replacement of a tube with another of slightly different interelectrode capacities. The radio frequency amplifier stages should be checked frequently using a TS–497/A signal generator. (Previously referred to as the Model 80.)

(1) Three signal generators are presently available that cover the range of the r-f section of the RDZ's. They are the LX Signal Generator manufactured by General Radio, the LAF–1 Signal Generator, and the TS–497/A. The latter is to be preferred over the other two.

a. The LX signal generator covers most of the range of the RDZ but the higher frequency end of the receiver must be covered by harmonics of the LX's high band. The LX leaks badly, however, and for this reason is a difficult signal generator to use and should be avoided when either of the other two are available. The Attenuator is inaccurate also on these frequencies and sometimes of no value whatever.

b. The LAF signal generator is not provided with modulation and the Technician is thereby handicapped. The signal generator may be used without modulation although alignment is rather tricky and frequently unsatisfactory. The accuracy of calibration of the signal generator frequency is good on this signal generator but this is not necessarily required in the alignment as the receivers are Crystal controlled.

c. The TS–497/A is the most easily used of the three and has a good Attenuator.

(2) The receiver should be aligned both on the high and low frequency ends of the range of the receiver. This is best accomplished by using two crystals, such as 243.0 mcs. for the low end and 385.0 for the high frequency end. These two crystals are usually being used in the receiver anyway so that looking around for them is not required. Tuning below 243.0 megacycles and above 385.0 megacycles is not recommended since the receiver is then operating near the band limits and tracking is rather difficult. Poorer sensitivities result beyond these limits also.

D. If the receiver sensitivity is low, the first place to start is in the oscillator multiplier section. It is very easy to check and frequently trimming up these adjustments brings the sensitivity up to normal.

(1) The switch inside the front cover plate of the receiver should be used and instructions in the book explain its function.

(2) If two ET's are available the oscillator multiplier adjustments may be made very rapidly by placing the 243.0 megacycle crystals in channel 10 and the 385.0 megacycle crystal in channel 9 (They are usually on these channels anyway.) The 1st ET may take the two alignment tools and placing one on the front low frequency slug and the other on the high frequency adjustment screw, forward underneath the receiver, he may alternately adjust them as the other ET channels the receiver from channel 9 to channel 10. The tuning meter should be on position #1 and the receiver on AVC. With the receiver on channel 10 he would make an adjustment of the low frequency slug from the top for maximum meter reading, when completed the other ET immediately switches to channel 9, and the process is repeated by adjusting the high frequency trimmer on the bottom. (The one associated with the slug

above.) As soon as the trimmer is peaked the receiver is again channeled to #10 and the low frequency adjustment again checked. When an adjustment of the slug or trimmer fails to give an increase on either end of the receiver range then the tuning tools should be moved to the second slug and trimmer. (Receiver tuning meter still on position #1.) These adjustments are made in the same manner as before, with one man tuning while the other changes channels as required. When the second slug and trimmer are finally adjusted the meter is switched to position 2 and the 3rd slug and trimmer are peaked as before. The entire process takes only a few minutes and is quite accurate. When completed, however, the receiver should be checked in the middle of its range and at several other intermediate points. If they are off, the plates must be bent on the variable condenser in order to bring the tracking in line.

(3) If for any reason the meter readings on the tuning meter are still low the tubes in the oscillator multiplier section should be checked, particularly the 6F4 in the last multiplier stage. It is well to try several tubes rather than to depend upon the first one as being good when changing them by substitution.

E. Good 6F4 tubes (956 too) and proper alignment of the oscillator multiplier will pay good dividends in improved receiver sensitivity. These things alone may be all that is required.

F. Do not attempt the radio frequency alignment unless a good signal generator is available.

2. Another fault of the RDZ's is the squelch circuit. Frequently the Terminal "E" on the terminal strip 206 is not grounded in the remote unit and the squelch is inoperative. It is wise to check this first, if the squelch is not operative. Resistor R–253 and the plate resistors of the squelch tube should be checked for changes in value if the squelch control has no effect. The plate resistors are both 800,000 ohms.

3. If the receiver audio output is below normal, check the remote audio lines, these become shorted on occasions. There are several 0.01 mfd. condensers in this circuit across the output of the audio transformer (back of output meter) and in the r-f filter network. These should be checked for shorts.

4. The above troubles are the most frequent and if checked closely the receiver should perform very well providing the signal is coming down the co-ax to the receiver input terminals.

4/1/52

R. W. Thompson,
Philco Field Engineer.

Difficulty Encountered	Cause and Remedy
Low sensitivity.	Check 6AB7 i-f tubes. Replace if required and realign. *1/1/49.*
Low-audio output.	(1) Broken antenna plug. (2) Low emission of r-f amplifier tube type 956. (3) Realign completely. *1/1/49.*
Autotune motor runs continuously.	Relay K–106 of 23497 selector control unit out of adjustment. *1/1/49.*
Intermittent operation on one channel only.	Rosin joint on crystal oven receptacle. *1/1/49.*
Greatly reduced sensitivity when i-f band switch is in "sharp" position.	Check for failure of crystal oven. It should be hot. *1/1/49.*
→ No silencer action. High noise level.	Traced trouble to open circuit in remote squelch relay circuit. Found open circuit in remote control plug at rear of receiver. Cleaned and tightened plug which then resulted in proper squelch action consequently low noise level. Receiver was in otherwise good operating condition. *4/1/51* ←

→ REA RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 1

RECEIVER OUTPUT LINE CONNECTIONS (NO KIT)

Equipments affected.—All model REA radio receivers.

Purpose.—To prevent crossing of channels A and B into the voice frequency terminal equipment when channel switch S2 is moved from channel A to channel B position.

Procedure.—Connect the lines to the receiver output to terminals G1 and G2 for channel A and to terminals G3 and G4 for channel B on terminal panel no. 17 (near bottom of second bay).

General.—After modification, the lines will be connected on the receiver side of channel switch S2, located on the monitor panel of the center bay. With this connection there will be no possibility of crossing the outputs of channels A and B into the lines going to the voice frequency terminal equipment when the channel switch S2 is moved from channel A to channel B position. Switch S2 will still permit the switching of the monitor outputs of channel A and channel B into either monitor jack on the monitor panel of the second bay.

The instruction bulletin no. 982, paragraph 2.5, page 3 of volume two, should be corrected accordingly. This change using available material is within the scope of the ship's force and should be accomplished at the earliest opportunity. A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *3/1/46*

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REA RADIO RECEIVING EQUIPMENT FIELD CHANGE NO. 2

AVC CIRCUIT MODIFICATION

Equipment affected.—All model REA radio receivers.

Purpose.—To reduce the effect of any changes in a-v-c voltage due to gaseous grid current flow through R–22 and R–23.

Procedure.—Resistors R–22 and R–23, 2 megohms each, should be replaced by ½-megohm resistors. Capacitors C–7 and C–8, 4 mfds. each, should be replaced by 16-mfd. capacitors.

General.—As an example, assume that R–23 is left at 2 megohms. If a total of one microampere of gaseous grid current flows through R–23, then 2 volts will be developed across R–23 in opposition to the normal 10-volt a-v-c voltage providing a net a-v-c voltage of 8 volts which is applied to the stages using slow acting AVC. This condition would cause an increase in output of the channel branch amplifiers. This condition would be more objectionable if some gaseous grid current flows through R–22 in the compensating a-v-c circuit. By decreasing the values of R–22 and R–23 to ½-megohm each the effect of a slight amount of gaseous grid current would have a negligible effect on the a-v-c voltage. If it is assumed that 1 microampere of gaseous grid current flows through a ½-megohm resistance, only ½ volt would be developed across it. The net resultant a-v-c voltage in the modified circuit would be 9.5 volts instead of the 8 volts previously obtained. The time constant of the circuits is not changed by reducing the value of R–22 and R–23 if the values of the capacitances C7 and C8 are increased to such a value that the RC product remains constant. The change from 4 mfd. to 16 mfd. in each case is to satisfy this condition.

This change using available material is within the scope of the ship's force and should be accomplished at the earliest opportunity. The instruction book should be corrected accordingly. A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *3/1/46* ←

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→MODEL REK RECEIVING AND REPRODUCING EQUIPMENT FIELD CHANGE NO. 1

INSTALLATION OF AUTOMATIC RECORD PLAYER

Equipment affected.—Model REK receiving and reproducing equipment supplied on Contract NXsr–62358, now furnished with single manual-change record player only.

Purpose.—To replace one of the single manual-change record player units with an automatic-change player, to provide a new tone arm capable of improved tracking during roll and pitch conditions up to an angle of 10° from normal, and to make other improvements.

Vessels should contact the cognizant Electronics Officer for installation of this change during the next availability.

Time required.—Approximately 40 man-hours.

Material required.—All of the material and parts required for this installation are supplied with this kit.

Tools and instruments required.—There are no special tools or instruments required in this installation with the exception of the Bristol wrench No. 8 and the Allen wrench No. 4 which are supplied with each kit.

Procedure.—Complete instructions for making this change are outlined in the field change bulletin included with this kit.

General.—A quantity of six field change kits have been procured under Contract NXsr–62358. With each kit there are two instruction books and two copies of the field change bulletin.

Routine instructions.—Completion of this change should be recorded on the equipment Machinery History Card and reported by means of NavShips 2369 which is included in the kit.

Instruction book, NavShips 900,961 is applicable to the modified equipment. The field change bulletin should be kept with this book after completion of the change.

The material removed and no longer required shall be turned into stores at the nearest electronics supply office and held for distribution by BuShips. *8/1/47* ←

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MODIFICATION OF MODELS RAO–9 AND RBK–14 COUNTERMEASURES RECEIVERS FOR USE WITH THE MODEL REM DUAL PAN ADAPTOR

The Model REM Dual Panoramic Adaptors are now being made available to the fleet for special installations on vessels as designated by the Bureau of Ships to replace the Model RBW–2M and Model RCX–1 Pan Adaptor equipments used in the communication countermeasures installations.

To use the Model REM to the fullest extent requires that the Models RAO–9 and RBK–14 countermeasures receivers supply local oscillator voltage to the Model REM so as to produce marker pips on the pan presentation. The Model RBK–14 receivers have been so modified by the manufacturer and are supplied with an oscillator output connection. (See Figure 1.) The Model RBK–14 circuit was modified as shown in Figure 2. The instruction book circuit diagram and the circuit diagram on the inside of the cover of the receiver do not show that this change has been made. They should be corrected accordingly.

The Model RAO–9 was not modified by the manufacturer to supply the local oscillator voltage for use with the Model REM. The Bureau of Ships is now preparing a field change bulletin to cover the modification of the Model RAO–9 for oscillator output.

Pending availability of the above field change,

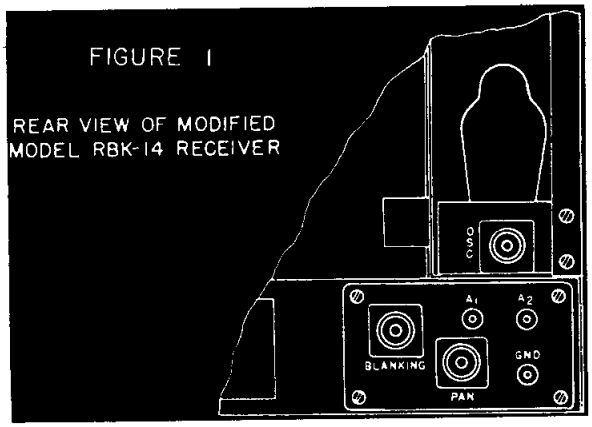

FIGURE 1.—Rear view of Model RBK–14 modified receiver.

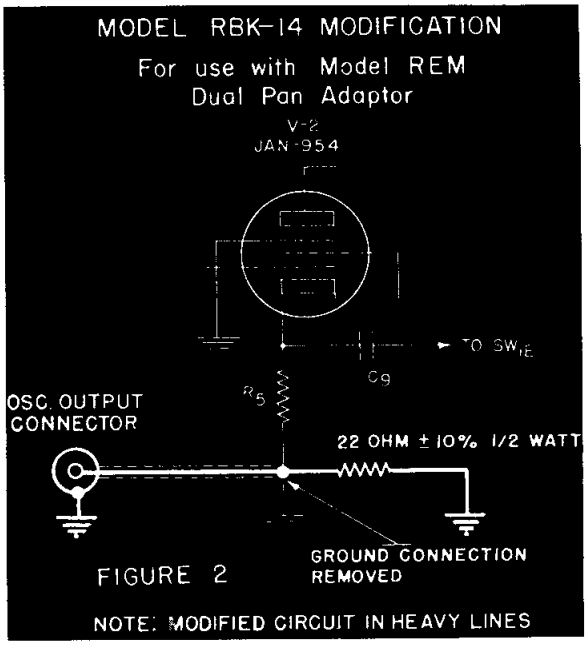

FIGURE 2.—Model RBK–14 modification.

the Model REM should be connected into the countermeasures system as shown in the Model REM instruction book, NavShips 91003 (A) minus the cable between the Model RAO–9 oscillator output and the Model RAO–9 oscillator input connector on the Model REM adaptor. The system will operate satisfactorily but minus the advantage of the marker pips.

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→ FAILURE OF T–104 HIGH VOLTAGE TRANSFORMER

The Model REM Dual Panoramic Adaptor Equipment has a high voltage supply transformer, T–104, which has been failing in service. Information indicates an arc-over is occurring between pin 1 of socket X–125 and the transformer case which is at ground potential. This is revealed by a small burned spot near the lower right-hand corner of transformer T–104.

To eliminate the failures which are occurring due to this arc-over, the tube socket X–125 should be loosened by means of the top screws

and moved away from the transformer case as much as is permitted by the size of the socket holes and then the screws should be retightened. The prongs of the socket should be bent down away from any metal parts.

This procedure may not eliminate all transformer failures. Another possible cause of failure is an arc-over between prongs of the sockets X–125 and X–124 and ground through the shield protecting the unused prongs.

The points on the shield which are in close proximity to the socket prongs and prong rivets should be marked on the shield. The shield should be removed and these points cut or filed to increase the arc-over distance. The shield should then be replaced. *10/1/50* ←