SECTION 6. COMBINATION TRANSMITTING AND RECEIVING EQUIPMENT

MODEL MN SERIES TROUBLE SHOOTING NOTES

DIFFICULTY ENCOUNTERED	CAUSE AND REMEDY
Audio output of receiver gradually became weaker and weaker. Fidelity perfect. All tubes and voltages checked perfectly.	Found both dual electrolytic audio bypass condensers C–28 and C–29 had "opened up." When replaced, good normal audio volume was secured.—U. S. S. *Preston* (DD–795)
The set became inoperative.	Before failing, it was observed that the power transformer T–1 was heating excessively and that the dual electrolytic filter condenser (in the power supply) C–64 was leaking. The components of this equipment become quite hot when used continually in hot weather. The bottom of this set was perforated to allow more ventilation to the elements and capacitor C–64 was replaced. The set operated satisfactorily after making the above modification and replacement.—U. S. S. *Fitch* (DMS–25)
Limiter circuits in receiver could not be tuned, no squelch action, high plate and grid voltages.	Found heater circuit return to ground open, hence tube failed to warm up.—U. S. S. *Council* (AM–165)
In tuning the receiver, the r-f amplifier was very critical and unstable.	It was found that if the local oscillator was detuned slightly, the r-f amplifier would oscillate driving the second limiter to the maximum grid current. Careful tuning of the oscillator produced satisfactory operation.—U. S. S. *Melvin* (DD–680)
Receiver blocked and unable to receive signals.	Found to be due to insulation breakdown between the contacts of relay RL–1.—U. S. S. *Diploma* (AM 221)

OPERATING PRECAUTIONS FOR THE MODELS MO–1/MAK EQUIPMENTS

Due to the high modulation capabilities of the MO–1/MAK equipments, it is essential to assure that the final amplifier is properly loaded at all times when modulation is applied. Otherwise, dangerously high voltages can be generated which may damage the insulation or the connector plugs. To eliminate the possibility of such damage to the equipments, the following precautions should be strictly observed:

(1) Preliminary tuning should be accomplished with an unmodulated carrier.

(2) Completely resonate the antenna circuit and adjust coupling so as to load the final amplifier to 95 to 100 ma. plate current.

(3) Do not apply modulation under any circumstances unless there is a load of at least 95 ma. on the final amplifier.

(4) With the final amplifier loaded from 95 ma. to 100 ma., 100 percent modulation is easily obtainable. If the plate current is allowed to drop below 95 ma., the transmitter can be easily overmodulated. If the plate current is more than 110 ma., the plate dissipation of the tube will be exceeded; also, the percentage modulation will be low. Therefore, care should be taken to maintain proper loading on the final amplifier at all times.

(5) When using ICW, it is recommended that the ICW feed-back resistor, R–122, be adjusted so that the percentage of modulation does not exceed 80 percent with the power amplifier loaded to 95 ma.

(6) Never attempt to shift frequency with the key down, using ICW. Under these circumstances, during switching, the final amplifier is momentarily unloaded and the insulation can be damaged.

Since there have been several failures of connector plugs in these equipments which are directly attributable to improper operation, strictest compliance with the above precautions is recommended. In this connection, it is suggested that a notice be posted near the equipment, reading as follows:

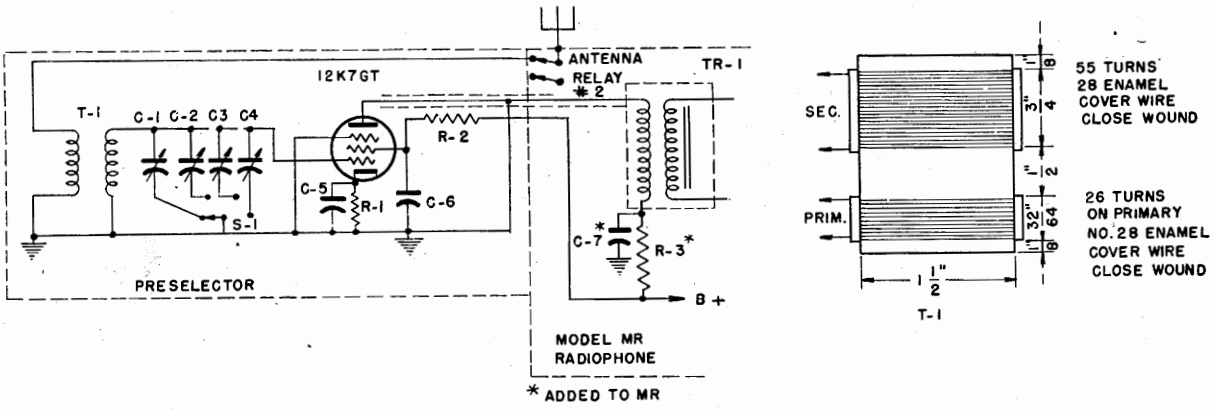
WARNING

NEVER ATTEMPT TO MODULATE THIS EQUIPMENT WITH THE FINAL AMPLIFIER LOADED TO LESS THAN 95 MA. PLATE CURRENT.

MODIFICATION TO PREVENT RADIATION FROM THE MODEL MR EQUIPMENTS

Tests have disclosed that Navy model MR, which is a converted commercial model as manufactured by the Gray Radio Company, produces a strong radiated signal and for security reasons should not be used on vessels employed on offshore missions.

The Navy Yard, Charleston, has developed a



PARTS LIST	
SYMBOL	
C-1-2-3-4	VARIABLE CAPACITOR, 75 MMFD
C-5	CAPACITOR PAPER, 0.01MFD, 600 V.
C-6	SAME AS C-5
C-7	SAME AS C-5
R-1	RESISTOR 2000 OHM, 1 WATT
R-2	RESISTOR 50,000 OHM, 1 WATT
R-3	RESISTOR 5000 OHM, 1 WATT
S-1	SELECTOR SWITCH, 4P-1T.
T-1	TRANSFORMER, AIR CORE PRIMARY - 26 TURNS NO. 28 ENAMEL CLOSE WOUND. SECONDARY 55 TURNS NO. 28 ENAMEL CLOSE WOUND. COIL FORM 1-1/2" O.D. FIBER TUBING. SPACING BETWEEN PRIMARY AND SECONDARY - 1/2."

FIGURE 1.—Schematic of preselector for model MR radiophone.

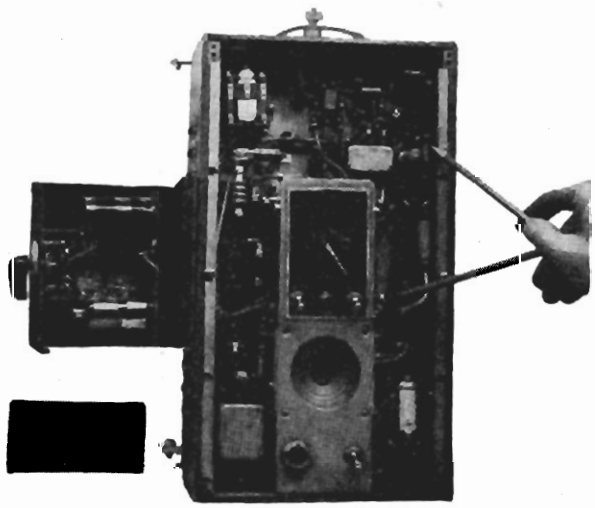


FIGURE 2.—Front view of MR with cover removed, showing connections to preselector.

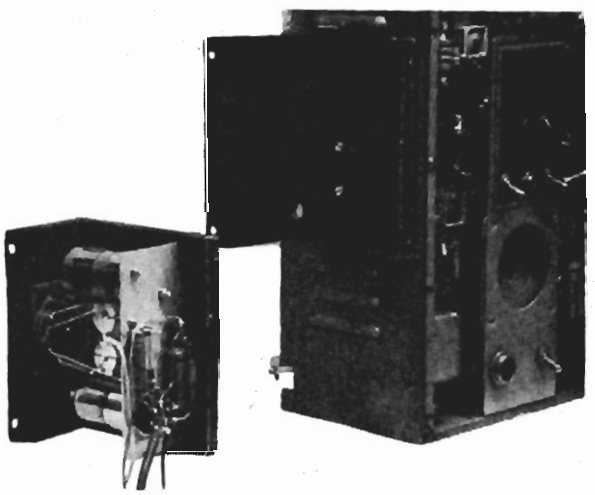


FIGURE 3.—Open view of preselector showing tube base connections.

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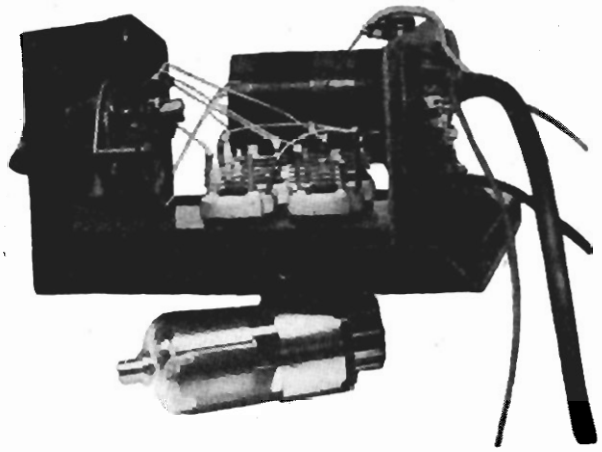

FIGURE 4.—Close-up of preselector with tube removed.

suitable preselector which prevents radiation of the local oscillator. When the preselector is incorporated in the equipment, the model MR may be used aboard ship. Figure 1 is the schematic diagram of the preselector. Figures 2 through 5 inclusive show constructional views of the preselector.

Switch S–1 provides for switching for the four fixed channels. The tuning condensers C–1, C–2, C–3, and C–4 are tuned on switch positions 1, 2, 3, and 4 respectively for any frequency in the range of the equipment. The tuning condensers have been so connected that the tuning of each channel is independent of all others. Adjustment of the tuning of one channel will not affect the tuning of the other three channels.

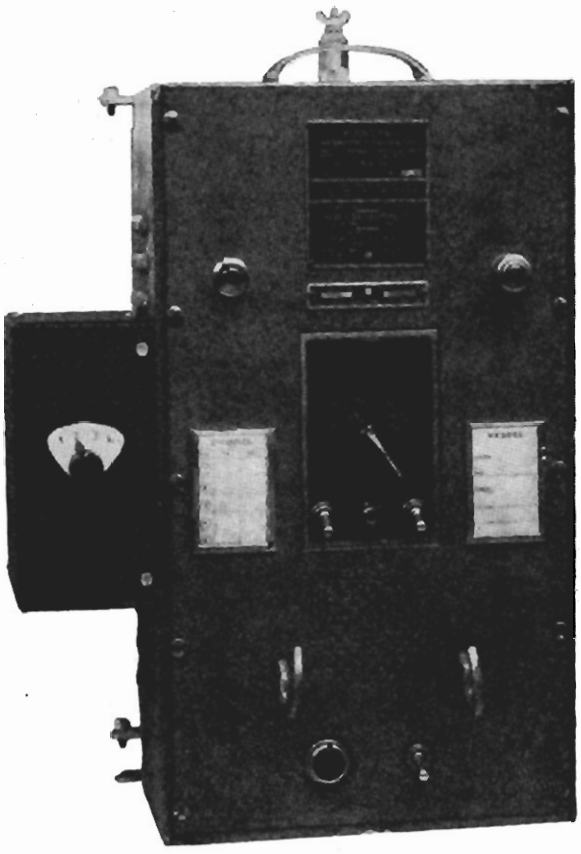

FIGURE 5.—Front view of MR.

MODIFICATION OF MODEL MS (ABBOTT TR–4) EQUIPMENTS

One activity has reported that the performance of the MS (Abbott model TR–4) transmitting-receiving equipment was appreciably improved by making the following modifications:

(1) Substitution of a 5,000-ohm bias resistor for the 1,000-ohm bias resistor (R–1) now used in the grid circuit of the HY–75 oscillator to operate the grid nearer its rated voltage value.

(2) Substitution of a 0.00005-mfd. (50-mmfd.) low-loss midget capacitor for the 0.0001-mfd. (100-mmfd.) capacitor (C–3) now used in the grid circuit of the HY–615.

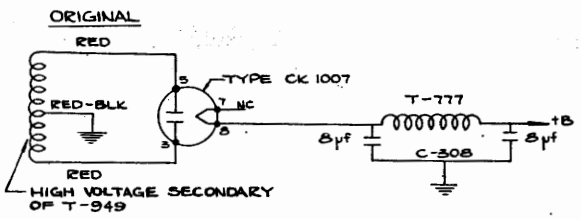

FIGURE 1.—Original socket connections.

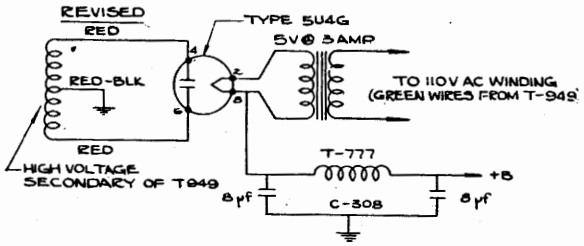

FIGURE 2.—Revised socket connections.

Further information concerning these modifications is not available in the Bureau. Accordingly, the accomplishment of them is left to the discretion of the individual users of the equipment.

In locations where there is considerable a-c line voltage fluctuation, it has been found that the life of the type CK 1007 gaseous rectifier tube in the model MS power supply is short.

The operation of the equipment may be improved by substituting a type 5U4G rectifier tube for the CK 1007 tube. Power is supplied to the filament of the 5U4G from a 110- to 5-volt step-down filament transformer. The secondary of the transformer should be capable of supplying 3 amperes continuously. Use of the 5U4G tube will require rearranging the socket connections as shown in Figures 1 and 2. Socket pin connections for the 5U4G are shown in Figure 3.

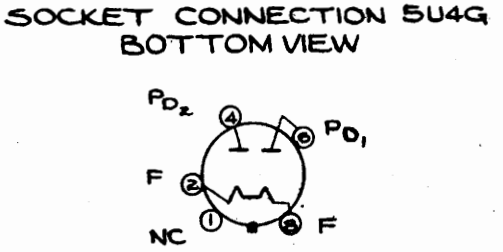

FIGURE 3.—Socket pin connections for the 5U4G.

It should be emphasized that this modification should be made only in equipments operating from 110 volts AC. It should NOT be made if there is any possibility of operating the equipment from 6 volts DC.

This last modification was devised by A. Gunther, CRM, Radio Laboratory, NOB, Adak, Alaska.

PREVENTION OF AMMETER BURNOUTS IN THE MODELS MAA AND MZ EQUIPMENTS

The possibility of burnout of the 60–0–60 ammeter and injury to the storage batteries of MAA and MZ equipments has been decreased by the manufacturer by improving the mechanical construction of certain generator connections. The improvements are described below, and may suggest solutions to maintenance problems in this circuit:

(1) The short screws furnished for fastening the slanted terminal cover have occasionally been replaced in the field with some that were long enough to cut into the cables and ground them. This process has been eliminated by changing the clinch nuts to welded nuts in the cable cover, and by changing the holes in the terminal cover to slots.

(2) The possibility of fraying and shorting the leads from the generator terminal strip to the radio power strip has been decreased by lengthening the leads and by placing a Vinylite tube over each lead, covering as much of each lug as possible.

(3) The leads from the generator terminal block are now shipped disconnected and taped to prevent their vibrating loose during shipment.

(4) A fish paper insulator is being added to the inside of the generator terminal block (slanted) cover to aid in avoiding short circuits when applying or removing this cover.

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OPERATING PRECAUTIONS FOR THE MODEL MAK EQUIPMENTS

See the article entitled "Operating Precautions for the models MO–1/MAK Equipments" on page MO : 1.

MODEL MAM WHIP ANTENNA MODIFICATION

The necessity for communication with aircraft 5 and 10 miles distant from the signal officer requires more radiation than is obtainable from the whip antennas furnished with model MAM equipments.

Experiments indicate that by supplanting the whip antenna furnished with a type BG–56A whip, or equivalent, the needed performance is obtained without interfering with other equipments at adjacent fields.

The photograph of Figure 1 shows a close-up of the method employed in mounting a complete type MP–37 whip assembly, including the spring base employed to prevent the whip from snapping off.

The above antenna modification may be made provided it is found necessary to maintain communication over distances greater than was originally intended.

—U. S. Naval Air Station,
Jacksonville, Fla.

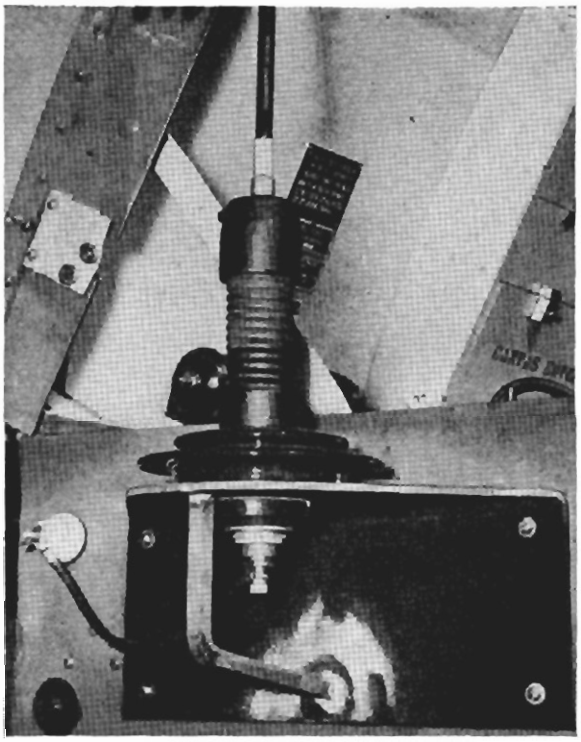

FIGURE 1.—Method of mounting a type MP–37 whip assembly on an MAM equipment.

→NYPEARL MAN MODIFICATION TO PERMIT OPERATION ON 115-VOLT AC

NYPEARL has devised a circuit to modify the MAN radio communication equipment for 115-volt a-c operation. This is primarily an emergency measure, and necessitates the construction of a special transformer. This modification will be known as MAN Field Change #1. Inasmuch as this modification will not be required by all activities, a field change kit will not be procured.

The following instructions and diagrams were prepared by NYPEARL and are presented for information in the event that the modified equipment needs servicing at some other location.

A 10-wire connection box must be mounted within 3 feet of the transmitter and receiver (see Fig. 1). This connection box is to splice

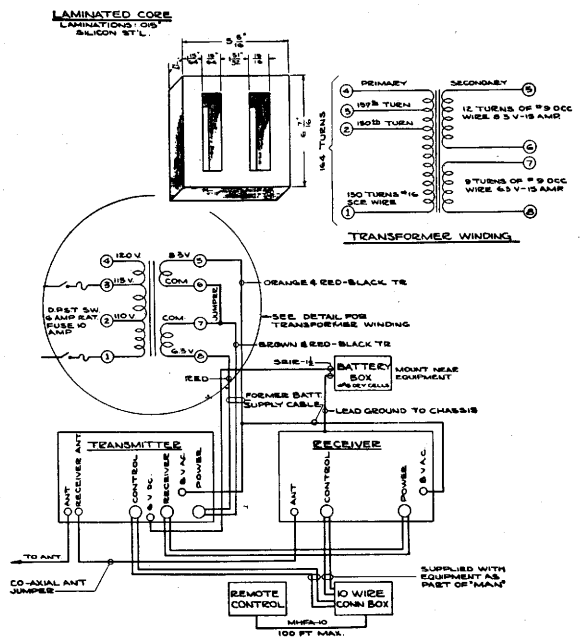

FIGURE 1.—Details of the transformer and interconnections needed for the modification.

the leads coming from the MAN equipment and the remote head if one is used. When wiring the remote, note that the numbers attached to the wires from the equipment correspond to numbers on the terminal board in the remote control head. Do not connect wire #1 to pin #1 on the plug, that is, pins on plugs do not correspond to numbers taped on wires.

The following changes are made to the transmitter vibrator power unit, as shown in Figure 2:

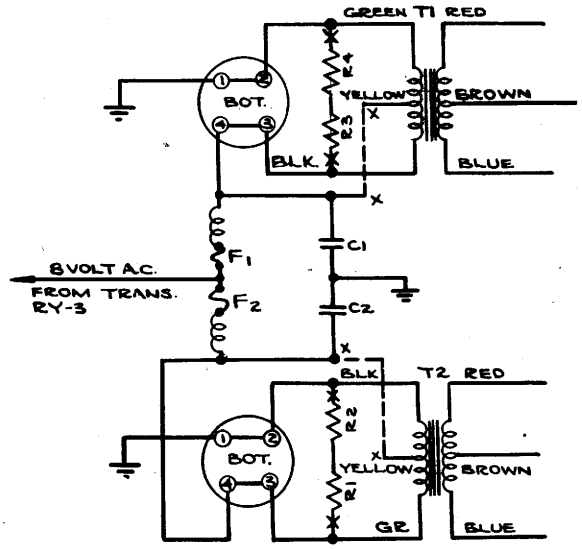

FIGURE 2.—FMT–25VW transmitter vibrator power unit modification.

(1) Remove vibrators.

(2) Remove R_1, R_2, R_3, and R_4.

(3) Connect jumpers from pin #1 to pin #2, and from pin #3 to pin #4 on both vibrator sockets.

(4) Disconnect the center tap of power transformer T–1 (two solid wires in yellow spaghetti). Solder together the two wires and tape up to insulate from the chassis. This connects the two halves of the primary in series. Power transformer T–2 is modified in the same manner.

(5) Disconnect and tape 6-volt power supply lead (copper rope). Run new lead from this point to 8-volt a-c supply.

(6) Replace 50-amp. main power fuse with a 15-amp. fuse.

(7) Replace 20-amp. receiver fuse with a 10-amp. fuse.

The following changes are made to the receiver vibrator power unit, as shown in Figure 3:

(1) Remove vibrators.

(2) Remove R_1 and R_2.

(3) Disconnect and solder together center-tap leads (yellow) on primary of T_1.

(4) Connect pins #1 and #2 on vibrator socket together.

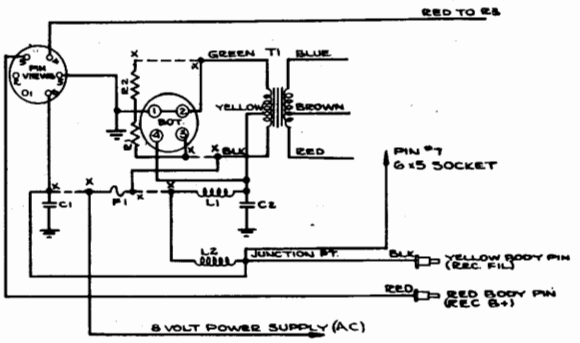

FIGURE 3.—FMR–13V receiver vibrator power unit modification.

(5) Remove wires as indicated by dotted lines and "X".

(6) Connect 8-volt a-c supply to F_1; remove black wire coming from transformer primary from vibrator pin #3, and connect it to remaining side of F_1.

(7) Run jumper, from the junction of pin #7 of 6X5 socket and yellow pin connector, to pin #6 of power plug.

(8) Rec. tube 6K6 by-pass condenser C–73 is changed from 0.02 to 0.002 mfd.

The following changes are made at the transmitter terminal strip, as shown in Figure 4:

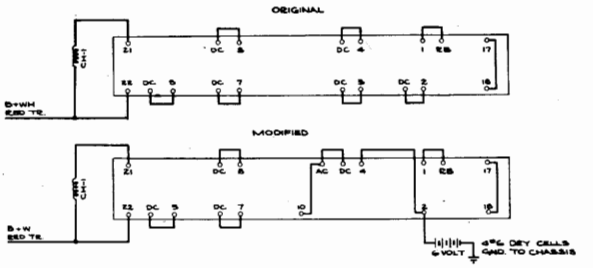

FIGURE 4.—Transmitter terminal strip modification.

(1) Remove jumper between DC and 4. Connect DC to AC. Extend jumper to lug 10.

(2) Connect lug 4 to lug 2.

(3) Make up pair 24-inch leads. Connect one to lug 2, other to chassis. Connect free ends to 6-volt battery, made up of four no. 6 dry cells in series—dry cells to be placed in compartments inside equipment case.

(4) Remove jumpers between lugs DC to 3, and DC to 2. ←

MODEL MAN SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
MAN.—Reports on transmitter output always less than the customary "Strength five, modulation good".	One-half of the high voltage series type power supply had no output. Check revealed no input to transformer. Fuse #1 tested open.—U. S. S. *Lind* (DD–703)
MAN.—Transmitter inoperative. No plate voltage. No input to the power supply.	Found one of the relays only partially operating. A small particle of iron filing was caught between the magnet and clapper arm.—U. S. S. *Lind* (DD–703)
MAN.—No power to equipment.	Six-volt a-c supply from transformer not getting to receiver or transmitter. 50–amp. fuse holder found to be making poor connection. This type of holder in which the fuse is pushed into a hole from the front and a bakelite cap is screwed down, relies only upon a metal capped spring at the opposite end for a good connection. Both corrosion of the cap and aging of the spring contribute toward poor contact.—U. S. S. *Lind* (DD–703) .

HALYARD TYPE ANTENNAS OF MODEL MBF EQUIPMENTS

Three hundred and twenty model MBF equipments have been shipped by Collins Radio Company as of 1 May 1945. These equipments contained halyard antennas and 75 feet of RG–8/U transmission line, consisting of 1 section of 50 feet and 1 section of 25 feet. The antennas, however, as determined by NRL tests, did not have the necessary broad-band characteristics. In order to tune the MBF transmitter to the antenna at the frequency of operation (in the frequency range of 60 mc. to 80 mc.) it may therefore be necessary to prune the transmission line, 3 inches at a time, until the transmitter loads properly. Collins Radio Company intends to replace these antennas later with halyard antennas of a satisfactory design.

The Magnavox Company is manufacturing antennas for permanent shipboard installation, to be used with the MBF equipment. The antennas are broad-band and the MBF will tune and load properly with these antennas without adjustment of transmission line length. These antennas (Navy type CMX–66143) will be shipped as soon as they become available.

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→ SHORTING OF COAXIAL CABLE IN THE MODEL MBF EQUIPMENT

U. S. S. *LCI–546* and U. S. S. *Rocky Mount* have pointed out a source of failure in the model MBF equipment. A coaxial cable runs from C–199 to L–113 and passes under C–126 (tuning control #4). Occasionally the shield on the coaxial cable grounds out C–126 thus preventing the tuning of the r-f amplifier V–108. All ships and stations using model MBF equipment are urged to check their gear for this defect and if there is insufficient clearance between C–126 and the coaxial cable, insulate or reroute the cable.

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MODIFICATION TO IMPROVE THE INTELLIGIBILITY OF THE MBF—FIELD CHANGE #2

To improve the intelligibility of the MBF equipment when the speaker is used as the microphone, change the value of the present audio coupling capacitor (C–119) from 0.01 mfd. to 0.002 mfd. This change applies to equipments having serial numbers below 750. An improved type speaker will be installed on forthcoming models.

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CORRECTION TO THE MBF PRELIMINARY INSTRUCTION BOOK

A correction should be noted in section II, paragraph 2 (4) (h) of the preliminary MBF instruction book. Control #1 should be substituted for control #2.

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SQUELCH MODIFICATION OF MBF—FIELD CHANGE #1

The MBF receiver beginning with equipment number 1000 (approx.), has a squelch sensitivity minimum threshold set at 3 microvolts maximum. Earlier equipments were found to have 7 to 10 microvolt minimum threshold so that weak signals could not cut it out. The result was that many calls did not come through. The following modification is recommended to improve the squelch sensitivity to 1.5 microvolts at the high sensitivity end of the range:

(1) Replace R–135 (resistor, 2d detector cathode with an 820-ohm ½-watt resistor.

(2) Replace R–138 (resistor, a-f amp. cathode) with a 5000-ohm ½-watt resistor.

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ALTERNATE METHOD FOR TUNING THE MBF TRANSMITTER

An alternate method may be used in tuning the MBF transmitter in addition to that outlined in the MBF instruction book, section II, paragraphs 2 (e) to 2 (t) and in the brief directions stenciled on the tuning control cover plates. With meter switch set on 6–7–8, tune #6 for maximum drive. If meter reads backwards, leave #6 at its approximate setting and tune #7 and #8 for maximum. Stages #6, #7, and #8 should then be tuned in that order for maxi-

mum in accordance with the instruction book. In the final stage of tuning, adjustments made to controls #9 and #11 can be accurately determined with the meter in the output r-f circuit. A state of maximum r-f absorption will occur at a point slightly below the red area on the meter scale. Maximum absorption can be determined using a pen lamp with a pick-up coil placed inside the final tank coil. ←

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FREQUENCY METER CONNECTIONS FOR MODEL TDN EQUIPMENT INSTALLED IN THE MODEL MBK TRAILER

See the article of similar title on page TDN : 1.

SECTION 6. COMBINATION TRANSMITTING AND RECEIVING EQUIPMENT

MODEL MN SERIES TROUBLE SHOOTING NOTES

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The set became inoperative.	Before failing, it was observed that the power transformer T–1 was heating excessively and that the dual electrolytic filter condenser (in the power supply) C–64 was leaking. The components of this equipment become quite hot when used continually in hot weather. The bottom of this set was perforated to allow more ventilation to the elements and capacitor C–64 was replaced. The set operated satisfactorily after making the above modification and replacement.—U. S. S. *Fitch* (DMS–25)
Limiter circuits in receiver could not be tuned, no squelch action, high plate and grid voltages.	Found heater circuit return to ground open, hence tube failed to warm up.—U. S. S. *Council* (AM–165)
In tuning the receiver, the r-f amplifier was very critical and unstable.	It was found that if the local oscillator was detuned slightly, the r-f amplifier would oscillate driving the second limiter to the maximum grid current. Careful tuning of the oscillator produced satisfactory operation.—U. S. S. *Melvin* (DD–680)
Receiver blocked and unable to receive signals.	Found to be due to insulation breakdown between the contacts of relay RL–1.—U. S. S. *Diploma* (AM 221)
MN.—Receiver inoperative and transmitter radiating r-f carrier normally, but with no modulation.	All voltages in receiver from 5 to 10 percent below specified value. Capacitors C–63 and C–64 found to be open-circuited. Replaced from spares.—U. S. S. *Los Angeles* (CA–135)
MN.—Signals intermittent and chopped. 60-cycle hum present with squelch ON or OFF.	Antenna transfer switch contact corroded and not making good electrical contact. Cleaned all contacts.—U. S. S. *Lind* (DD–703)
→ MN.—Receiving loudly and clearly but unable to transmit. Transmitter tuning normal. TT–1, TT–2, and TT–3 meter readings normal and peaked OK. TT–4 readings normal and coupling to load increased current. 6.3-volt dial lamp lit when placed in antenna jack.	With carrier 4.0, the modulator was assumed to be at fault. All socket voltages of oscillator-modulator tube checked OK as did all associated resistors and capacitors. Some parts were replaced, but all to no avail. Finally, as a long shot, C–64 was checked. The C and R bridge told the story. The capacitance had decreased from 8 to 0.015 mfd.—U. S. S. *Wren* (DD–568) *(Editor's note.—Since C–36 (8 mfd.) is in parallel with C–64 it appears that C–36 may also be defective. C–36 and C–64 form the a-c return path to ground for audio signals in the plate circuit of the 6SL7 modulator section. This trouble might have been detected by connecting the vertical plates of a cathode-ray-oscilloscope from B+ to chassis, speaking into the microphone and noting if audio signals (other than slight 120-cycle hum) were present on the B+ supply. If present, C–36 and/or C–64 are defective.)* ←

Difficulty Encountered	Cause and Remedy
MN.—Recently the sensitivity of our receiver dropped so low that it was almost impossible to hear a station, unless it was almost alongside.	The trouble was finally traced to C–32, the local oscillator to first mixer coupling capacitor, which had become leaky under load. This capacitor checked good on the model OE–8 capacitor tester, but when replaced, equipment sensitivity became normal.—Carl A. Fisher RT2/c, U. S. S. *Deft* (AM–216)

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