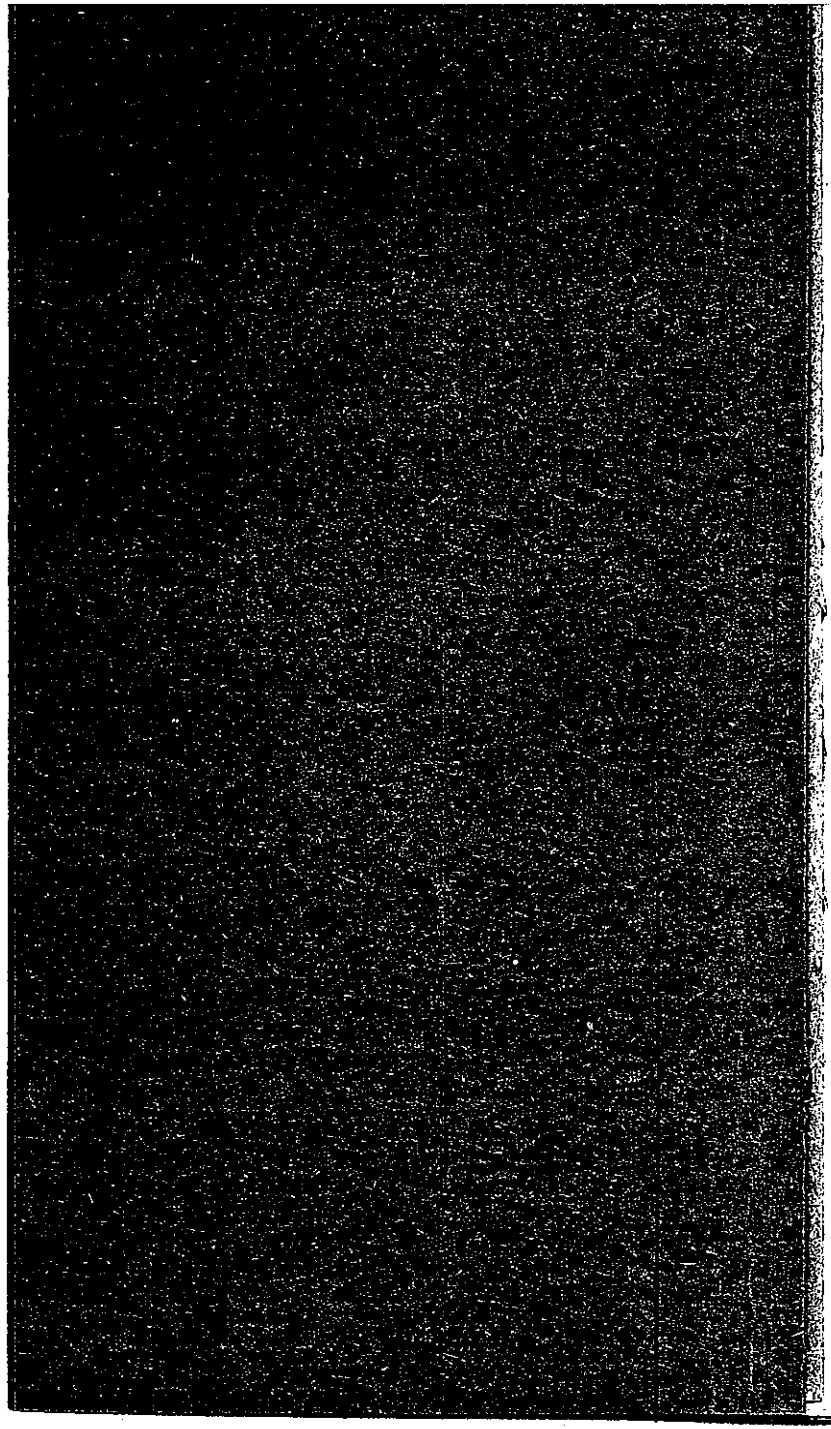
RESTRICTED

PRELIMINARY
INSTRUCTION BOOK
For
NAVY MODEL MAB-1
RADIO TELEPHONE TRANSMITTING AND RECEIVING EQUIPMENT

Manufactured for
U. S. NAVY DEPARTMENT
BUREAU OF SHIPS

By
COMMUNICATIONS COMPANY, INC.
Coral Gables, Florida

CONTRACT NXsr-38850
Dated: 13 October 1943



NOTICE

All References

Made Herein to

"MODEL MAB"

Shall Be Read As

"MODEL MAB-1"

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PRELIMINARY
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RADIO TELEPHONE TRANSMITTING AND RECEIVING EQUIPMENT

OUTPUT	EMISSION	FREQUENCY RANGE
0.2 Watts	A-3	2.3 to 4.5 MC

"This document contains information affecting the National Defense of the United States within the meaning of the Espionage Act (U.S.C. 50:31,32). The transmission of this document or the revelation of its contents in any manner to any unauthorized person is prohibited.

"This Instruction Book is furnished for the information of commissioned, warranted enlisted and civilian personnel of the Navy and persons authorized by the Bureau of Ships, whose duties involve design, manufacture, instruction, operation and installation of radio, radar, or underwater sound equipment.

"The word "RESTRICTED" as applied to this instruction book signifies that it is to be read only by the above personnel, and that its contents should not be made known to unauthorized persons not connected with the Navy."

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Operation of the Equipment does not involve the use of voltages greater than 135 volts and accordingly is not considered dangerous to life.

NAVY TYPE MAB
RADIO TELEPHONE TRANSMITTING & RECEIVING EQUIPMENT

GUARANTEE

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

GUARANTEE

All such defective parts will be subject to ultimate return to the contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective item or unit prior to replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service therefore may necessitate expeditious repair of such item or unit in order to prevent extended interruption of communications. In such cases the return of a defective item or unit for examination by the contractor prior to replacement will not be required. The report of a responsible authority, including details of the conditions surrounding the failure will be acceptable for effective adjustment under the provisions of this contractual guarantee. The above period of TWO YEARS and the service period of ONE YEAR will not include any portion of the time that the equipment fails to give satisfaction due to defective items and the necessity for replacement thereof. All replacement parts will be guaranteed to give ONE YEAR of satisfactory service.

REPORT OF FAILURES AND REPLACEMENT DATA

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

Contract NXsr-38850 Contract Dated: 13 Oct., 1943

Serial Number of Equipment_____
Date of Acceptance by the Navy_____
Date of Delivery to Contract Destination_____
Date of Completion of Installation_____
Date Placed in Service_____

Blank spaces in this book shall be filled in at time of installation. Operating personnel shall also mark the "date placed in service" on the equipment, using suitable methods and care to avoid damaging the equipment.

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

Name of Part Desired_____
Navy Type Number (if assigned) (including prefix and suffix) _____
Model Designation (including suffix) of equipment in which used_____
Navy Type Designation (including prefix and suffix where applicable) of Major Unit in which part is used _____
Symbol Designation of Part_____
Navy Drawing Number_____
Manufacturer's Drawing Number_____
Rating or Other Descriptive Data_____
Commercial Designation _____

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1. GENERAL DESCRIPTION

1-1 Intent of Design

The MODEL MAB Radio Telephone Transmitting and Receiving Equipment is primarily designed to furnish an ultra-compact single frequency radio communication link between paratroop forces. It is also suitable for reconnaissance or outpost communications.

Both radio unit and power supply fit in a watertight plastic case. This case can be carried on the operator's thigh, chest or back, either in a pocket of the uniform or in a canvas carrying case provided with the equipment.

Receiver and transmitter of this equipment are crystal controlled, and can be operated on any one channel in the frequency range of 2.3 mc to 4.5 mc. Voice communication (A3 emission) is the only type of operation provided. The power output of the equipment is approximately 0.2 watt, and satisfactory communication between units over average terrain can be maintained over a range of approximately one mile. This range will increase somewhat for communication between aircraft and ground units.

1-2 List of Units, with Weights and Dimensions:

The equipment consists of the following major units:

Radio Transmitter and Receiver unit, Navy type CCI-43045A, including complete set of vacuum tubes consisting of:

Symbol	Type	Function
V-101	1R5	Oscillator-Mixer
V-102	1T4	I.F. Amplifier
V-103	1S5	Detector-First Audio
V-104	3S4	Audio Output
V-105	3S4	Transmitter Power Amplifier
V-106	1T4	Transmitter Crystal Oscillator
V-107	3S4	Modulator

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Height — 6¼"
Width — 1-13/16"
Depth — 3-9/16"
Weight — 1¼ lbs.

Power Supply consisting of Vibrator Power unit, Navy Type CRF-20221 and Lead-Acid Storage Battery, Navy Type -19046. (Not furnished by Contractor)

Height — 6-9/16"
Width — 1⅞"
Depth — 3-11/16"
Weight — 3¼ lbs.

Power Supply (Alternate), Battery Pack Dry, Navy Type -19027A. (Not furnished by Contractor)

Height — 6-5/16"
Width — 1-13/16"
Depth — 3-11/16"
Weight — 2 lbs.

Antenna and Load Coil Assembly, Navy Type CCI-66081.

Length (Collapsed) — 15⅛" (approx.)
Length (Extended) — 85" (approx.)
Weight — 1 lb.

Plastic Case, Type CZP-10162

Weight — 1½ lbs.

Microphone and Cover Assembly, Navy Type CCI-51048 Consisting of:

Plastic Cover, Navy Type CZP-10163

Antenna Lead, Navy Type CTE-49212, with concentric Breakaway Connnector.

Microphone and Headset Cable Assembly, Navy Type CTE-49213, Including "Off-On" Switch, Navy Type CTE-24159, and flat-type Breakaway Connector for Headset.

Microphone, Navy Type CTE-50142, including press-to-talk Switch.

Weight of complete Microphone and Cover Assembly — 1.0 lb.

Headset Assembly, Navy Type CCI-49214, consisting of:

Connector Cable, Navy Type CTE-49216.

Two Headphones, Navy Type CUP-49215, 5/16" thick by 2" diameter.

Weight of complete Headset Assembly — 4 oz.

Weight of an entire MODEL MAB equipment, unpacked and ready for use; including vibrator power unit and lead-acid battery — 8 lb. 9 oz.

2. DETAILED DESCRIPTION

2-1 Mechanical

The MODEL MAB radio telephone transmitting and receiving equipment consists of a radio transmitter-receiver unit and a power supply housed in a watertight molded plastic case, a collapsible whip antenna, a carbon microphone with press-to-talk switch, and a head-set which can be worn under the standard metal helmet.

2-1 (a) Radio Transmitter-Receiver Unit

The Navy Type CCI-43045-A Radio Transmitter-Receiver Unit includes both the transmitter and receiver built in one hardened aluminum alloy chassis. On the chassis are mounted all the vacuum tubes for receiver and transmitter, two crystals, receiver oscillator coil, IF transformers, antenna coupling transformer, and audio transformers and inductors. A bakelite detail on the underside of the chassis is used to mount most of the resistors and most of the condensers of the unit. Slug tuning is used for adjustment of all tuned circuits, and spring locks are provided on all of the variable adjustments to assure that tuning will not change under vibration. Also spring type tube locks hold the tubes in their sockets.

All audio transformers and inductors, (T-101A, T-101B and L-103) are potted in wax in one metal container. Connections to these transformers are made by color-coded flexible wire and are brought out through a bakelite detail on the bottom of the container.

Specification details of this transformer assembly as well as of the RF choke, antenna coupling transformer, receiver oscillator coil, antenna load coil and IF transformer assemblies are given in Table 4.

The crystals in both transmitter and receiver sections, in Navy Type -40125 crystal holders, are the "zero temperature coefficient" type.

All voltages for the Radio Transmitter-Receiver Unit, as well as antenna lead and all necessary controls, terminate in an 11 pin female receptacle, (J-101),

mounted on one end of the chassis. An aluminum shield cover, fastened to the chassis by four screws, must be removed to replace any of the vacuum tubes or crystals. Holes in this cover are provided so that all tuning controls can be reached without requiring removal of the shield.

2-1 (b) Power Unit

Two power units are available for operating the MODEL MAB equipment. The primary power unit consists of a Type CRF-20221 vibrator power unit, powered by a Type -19046 non-spillable lead acid storage battery. A clamping arrangement holds the battery and vibrator power unit together as an integral unit, and also maintains the necessary electrical contact between the two. A complete description of this battery and vibrator power unit as well as all necessary operation and maintenance data, is included in Instruction Book for Navy Type CRF-20221 Power Supply Equipment.

As an alternate source of power, the Type -19027A dry battery pack may be used. This battery pack is considered satisfactory only for emergency operation when no vibrator power unit is available.

2-1 (c) Plastic Carrying Case

The Navy Type CZP-10162 plastic case is divided into two compartments, the power supply fitting into one and the Radio Transmitter-Receiver Unit into the other. The plastic cover, Navy Type CZP-10163, is fastened to the case by three captivated thumb screws which screw into brass inserts molded in the case. A rubber gasket in this plastic cover makes contact with a raised lip around the top of the plastic case, making a watertight seal. The antenna lead, and the microphone and headset cable assembly enter the plastic top through fittings which are provided with rubber packing glands to make the cable entrances watertight. A frequency designation plate, on which the frequency channel is marked, is also mounted on this cover.

2-1 (d) Antenna and Load Coil Assembly

The antenna and load coil assembly, Navy type

CCI-66081, consists of a seven section collapsible antenna, in a bakelite tube, and a plastic case housing the antenna load coil cemented to this tube. All sections of the antenna must be fully extended before they are locked in position. The antenna is completely watertight in either extended or collapsed position. A rubber bumper at the end of the smallest antenna section, when pressed into the end of the bakelite housing, holds the assembly locked in the collapsed position.

The telescoping antenna sections are covered with a lusterless green baked lacquer finish to make the surface non-reflecting.

The antenna and load coil assembly can be tuned to any frequency in the range of the MODEL MAB equipment by means of the slug-tuned load coil in the antenna housing. A screw at the base of this molded antenna housing must be removed to expose the tuning control Connection to the radio unit from the antenna is accomplished by a rubber-covered lead which enters the molded antenna housing through a fitting and packing arrangement similar to that used on the plastic case cover. This antenna lead terminates in a concentric break-away connector.

2-1 (e) Microphone, Headset, and Cables

Two cables enter the plastic case cover through watertight fittings. One is the Type CTE-49212 antenna lead, which terminates in a concentric breakaway connector for connection to the antenna. The other is the Type CTE-49213 microphone and headset cable assembly which is a "Y"-cord, one leg of which terminates in a flat type breakaway connector for connection to the headphones. The other leg goes through the Type CTE-24159 "OFF-ON" switch to the Type CTE-51042 microphone.

The "Off-On" switch is a small sleeve type push-through switch. A red disk on one side and a black disk on the other indicate "position" of the switch. The circuit is closed ("On" position) by pushing the button "in" on the red disk side.

The Type CTE-51042 microphone is a single button carbon type with the press-to-talk switch mounted in the case.

The Navy Type CTE-49214 headphone assembly consists of the Type CTE-49216 headphone cord connecting two Type CUP-49215 headphone units in series and terminating in a flat-type breakaway connector. The two headphone units fit into pockets in a canvas skull cap worn under the standard metal helmet.

2-2 Electrical

The circuits of the receiver section of the MODEL MAB equipment are those of a four-tube superheterodyne, employing a tuned antenna coil, a 1R5 oscillator-mixer tube, a 1T4 IF amplifier, a 1S5 second detector and first audio amplifier, and a 3S4 audio output stage, transformer-coupled to the headphones. The transmitter section employes a 1T4 crystal oscillator, a 3S4 modulator tube in a Class A Heising modulator circuit, and a 3S4 power amplifier stage. A single antenna coupling transformer, (T-102), is utilized both as receiver antenna coil and as transmitter antenna coupling transformer. Low-drain miniature type tubes are used throughout, and all tuned circuits are slug-tuned. Transfer from receiver to transmitter is by means of the "press-to-talk" switch in the microphone case, which is arranged to switch the receiver filaments off when transmitting and the transmitter filaments off when receiving.

Due to the use of a common tuned element, (T-102), in both transmitter and receiver circuits, the transmitter and receiver must always be aligned on the same frequency.

2-2 (a) Receiving Circuits

In the receive position, the signal from the tuned antenna is passed through the tuned antenna coupling transformer, (T-102), to the grid of the oscillator-mixer tube through a coupling condenser, (C-101). The oscillator-mixer tube, (V-101), a Type 1R5 tube, functions in a dual capacity, one section operating as a

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crystal controlled local oscillator, the other section operating as a first detector, with the signal frequency impressed on the signal grid, pin No. 6. The crystal oscillator is of the "Pierce" type, using the screen and #1 grid (pins 3 and 4 respectively) as a triode oscillator. Condenser C-103 provides proper division of oscillator voltage between the screen and oscillator grid. The oscillator frequency, determined by the receiver crystal frequency, must always be higher than the signal frequency by 455 kc., the intermediate frequency.

The plate circuit of the first detector stage is coupled through IF transformer Z-101 to the grid of the intermediate frequency amplifier tube, (V-102), Type 1T4. The output of this stage is passed through another IF transformer, (Z-102), to the diode plate of V-103, a Type 1S5 vacuum tube. This tube functions as a second detector, AVC voltage rectifier, and first audio amplifier. Audio voltage developed in the detector portion of this stage is coupled through condenser C-111 to the signal grid, (pin No. 6), of the same tube, (V-103), where it is amplified. This stage is resistance coupled to the audio output stage which employs a Type 3S4 power pentode, (V-104). The plate circuit of this stage is coupled to the 600 ohm headset through the output transformer, (T-101A). The maximum audio power output which can be obtained in this headset is approximately 6.0 milliwatts.

The AVC voltage for this receiver is obtained from the diode section of V-103, filtered through resistor R-103 and condenser C-110, and applied to first detector and IF amplifier stages. In addition, in order to prevent RF feedback from the transmitter into the receiver, grid bias voltage from grid No. 6 of the transmitter oscillator tube, (V-106), is applied to the receiver diode, AVC line and first audio stage control grid, biasing them beyond cut-off.

2-2 (b) Transmitter Circuits

The transmitter section of the Model MAB Equipment consists of a crystal oscillator stage, an RF amplifier stage and a modulator stage.

The oscillator circuit consists of a Type 1T4 tube, (V-106), triode-connected as a Pierce crystal oscillator, with the crystal connected between plate and grid of the tube. The RF choke of the oscillator plate circuit is L-101. The modulator tube, (V-107), is a Type 3S4 power pentode, connected in a Heising modulation circuit, with the grid driven directly by a carbon microphone through input transformer, (T-101B). The modulation reactor is L-102. Both screen and plate of the RF power amplifier tube, (V-105), are modulated.

The RF power amplifier output stage of the transmitter employs a Type 3S4 power pentode, (V-105). RF drive for the grid of this tube is obtained by coupling directly to the grid of the RF oscillator tube, (V-106), with the same grid leak resistor, (R-114), used for both tubes. The antenna coupling transformer, (T-102), of this power output stage is coupled inductively to the antenna.

Side-tone in the headphones during the transmission period is provided in the Model MAB Equipment by coupling a small amount of the modulator tube output to the primary of the receiver output transformer, (T-101A). This is accomplished by means of a 250,000 ohm resistor, (R-111), connected from the plate of the modulator tube, (V-107), to the plate of the audio output tube, (V-104).

2-3 Power Supply Current Drains

A tabulation of the normal voltage and current requirements of both receiver and transmitter is as follows:

Receiver Section			
Plates and Screens	(67.5v.)	.....	3.0 MA
	(135.0v.)	.....	4.0 MA
Filaments	(1.5v.)	.....	225.0 MA
Bias and Microphone	(6.0v.)	.....	0.0 MA
Transmitter Section			
Plates and Screens	(67.5v.)	.....	1.5 MA
	(135.0v.)	.....	19.0 MA
Filaments	(1.5v.)	.....	225.0 MA
Bias and Microphone	(6.0v.)	.....	30.0 MA

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3. INSTALLATION

3-1

Unpack all units of the Model MAB equipment.

Remove the plastic top from the plastic case by unscrewing the three thumb screws in the cover, loosening the center screw first. Care should be observed not to damage the rubber gasket if it tends to stick to the case.

The equipment is shipped with the radio transmitter-receiver unit in place in the plastic case. The power unit should be inserted into the case in its proper compartment, and the plastic top replaced, inserting the power unit plug and radio unit plug into their respective sockets. All thumb screws should be tightened uniformly. Instructions for preparing the lead acid storage battery, Type -19046 for use will be found in Appendix "A".

3-2

The equipment can be secured to the operator's person, carried either in the canvas case or in a uniform pocket, and the skull cap containing the headphones placed under the metal helmet. Attach the flat-type break-away connector to the headset and the concentric break-away connector to the antenna, and extend the antenna to full length.

4. OPERATION

4-1

Before transmitting or receiving, the "Off-On" switch in the microphone lead must be in the "On" position (red button pressed). A rush of background noise should be heard in the headset after this operation, indicating that the receiver is operative.

To operate the transmitter, the "press-to-talk" switch, located in the microphone case, is pressed. The microphone should be held close to the operator's mouth when transmitting, and a normal tone of voice used. Transmissions should be as brief as possible to conserve battery life.

To receive again, after a transmission period, the press-to-talk switch must be released.

4-2

When two or more Model MAB equipments are to be operated together, an indication that they are all on the same operating frequency can be obtained by operating the receivers of all equipments, and then depressing the "press-to-talk" switch of any one equipment. When this is done, the background rush in all of the headsets will disappear if all equipments are operating on the same frequency.

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5. MAINTENANCE

5-1 General

The power supply should be maintained in a "fresh" condition at all times. For maintenance of the vibrator power and lead-acid storage battery unit, see the Instruction Book for Navy Type CRF-20221 Power Supply Equipment. If the alternate power supply, dry battery pack, Type -19027A, is used, this battery should not be stored in the equipment case for more than a few days when the equipment is not in use. Batteries should always be replaced when the power supply voltages are low, as indicated by poor receiver sensitivity and reduced transmitter output.

Failure of the Model MAB equipment will most often be due to rundown batteries, bad vibrator or poor vacuum tubes. Before checking for more obscure circuit faults, the power supply should be replaced, and the tubes checked by substitution. The miniature type tubes used in this equipment are fragile, and to prevent breakage, the tubes should be carefully inserted in their respective sockets, rocking the tubes slightly if the socket holes are tight. For a list of circuit faults and possible causes, see "Troubleshooting," paragraph 5-3.

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

5-2 Alignment

The same procedure is followed in this equipment both for re-alignment of receiver and transmitter, and for effecting a change of operating frequency. For the latter, a set of crystals for the new operating frequency must first be installed. (See Table 5.) Whenever a change of operating frequency is made, the correct channel designation should be marked on the plastic plate located on the Type CZP-10163 cover. (See Table 5).

5-2 (a) Alignment Equipment

All tuned circuits of both transmitter and receiver of the Model MAB equipment, as well as the Type CCI-66081 antenna, can be completely aligned and resonated by using the Navy Type CCI-60063 alignment oscillator. This equipment consists of a self-contained crystal controlled signal generator capable of continuously variable output between approximately 1.0 and 100,000 microvolts. The output signal is modulated at 30 percent and the modulating frequency is approximately 400 cycles. An antenna-current indicator is provided for resonating the antenna.

The receiver section of the Model MAB equipment can also be aligned by use of any standard signal generator which will cover the frequency range of 2.3 to 4.6 megacycles. When this equipment is used, a 150 ohm non-inductive, (carbon type), resistor must be connected between the "high" side of the signal generator and the antenna connector. The antenna load coil can be resonated using a Field Strength Meter, Type CCI-60041.

All variable adjustments provided for the tuned circuits of the Model MAB equipment can be adjusted by using a small end screwdriver and a 3/16 inch hex nut wrench. This tool is furnished as an item of the Spare Parts equipment of the Model MAB, and is also furnished with the Navy Type CCI-60063 alignment oscillator.

5-2 (b) Alignment Procedure, using Type CCI-60063 Alignment Oscillator

1. Preparation

To prepare the Model MAB equipment for alignment or for change of operating frequency, the radio transmitter-receiver unit and the power supply unit must first be removed from the plastic case. The metal shield cover should then be removed from the radio unit and crystals of the proper frequency for the channel selected inserted. (See Table 5). All adjustments can be reached through openings provided in the shield cover.

NOTE: FOR COMPLETE INSTRUCTIONS IN USE OF TYPE CCI-60063 ALIGNMENT OSCILLATOR REFER TO THE INSTRUCTION BOOK FURNISHED WITH THE EQUIPMENT.

The cover of the Alignment oscillator should first be removed and the ground lead from the cover clipped to the ground terminal of the oscillator. Insert the handle of the antenna and load coil assembly in the opening provided and connect the breakaway connector to the antenna lead. Connect the Radio Transmitter-Receiver Unit, with shield cover in place, to the 11-contact plug. Insert a power supply with fresh battery in the recess provided, and plug the microphone and cover assembly, into this power supply and the 11-contact connector socket. The headset assembly can now be connected in the normal manner. A crystal of the same frequency as the channel frequency to which the Model MAB equipment is to be aligned should be inserted in the socket provided in the alignment oscillator.

The Model MAB "Off-On" switch should be pressed to the "On" position, and the switch of the Type CCI-60063 Alignment Oscillator turned on. The multiplier and microvolt switches should be manipulated to keep the headphone signal barely audible for most accurate alignment.

2. Receiver Alignment

NOTE: REFER TO FIGURES 5, 6, AND 7 FOR LOCATION OF TUNING ADJUSTMENTS.

Adjust the tuning control of the antenna coupling transformer, (T-102), for maximum headphone response.

Proceed next to adjust the tuning slugs on both the top and bottom of each of the two IF transformers, (Z-101 and Z-102), individually for maximum headphone response. After the IF stage has been aligned, the antenna adjustment should again be checked, followed by a final check on the IF transformers.

3. Transmitter Alignment

Due to the use of a common tuned element, (T-102), as both receiver antenna coil and transmitter antenna coupling transformer, the transmitter circuits are aligned when the receiver alignment is complete. To tune the antenna load coil, (L-301), first remove the screw on the bottom of the load coil housing, exposing the load coil adjustment which consists of a slotted screw-head extending from the coil can. Turn the multiplier switch to the "ANT" position. Check the antenna to insure that it is extended fully. Press the "press-to-talk" microphone switch, and adjust L-301 for maximum brilliance of the "antenna current" indicator lamp.

A rough indication of the functioning of the transmitter can be obtained by whistling into the microphone, with the "press-to-talk" switch maintained in the "talk" position. The brilliance of the antenna current indicator lamp should increase when this is done. If it does not, improper transmitter modulation is indicated. (See "Troubleshooting", paragraph 5-3).

5-2 (c) Alignment Procedure, using external signal generator

If it is necessary to use a standard signal generator in place of the Alignment Oscillator Type CCI-60063, a 150 ohm non-inductive resistor must be connected between the "high" side of the signal generator and the antenna connector. The procedure for receiver alignment outlined in sub-paragraph 5-2 (b)-2 should then be followed.

Tuning of the antenna load coil, (L-301), as well as the check on transmitter operation described in sub paragraph 5-2 (b)-3 can be made using the indication of Field Strength Meter, Type CCI-60041, in lieu of the indication of the antenna current indicator lamp of

Alignment Oscillator. In using this Field Strength Meter, the meter should be placed approximately six feet from the antenna of the Model MAB equipment.

5-3 Troubleshooting

Failure of the Model MAB equipment will most often be due to a weak power supply or to poor vacuum tubes. Before checking for more obscure circuit faults, the power supply should always be replaced, and the tubes checked by substitution.

A tabulation of some of the more common troubles which it is possible to encounter with this equipment in service use, as well as their possible causes, is given below:

5-3 (a) Transmitter and Receiver

Weak reception accompanied by poor transmission.

Check power supply battery and tubes. Check antenna sections for contact. (Antenna must be fully extended.) Check antenna load coil, (L-301), and antenna coupling transformer, (T-102), for continuity.

Weak reception, transmitter section operating satisfactorily.

Check tubes in receiver. Check alignment of receiver.

Weak transmission, receiver operating satisfactorily.

Check tubes in transmitter. Check "Transmitter Section", (sub-par. 5-3) (c).

Intermittent operation of transmitter, receiver or both.

Check for open or short-circuits. Check for loose connection. Check for moisture inside plastic carrying case due to condensation or leaks in case.

Check for defective control cables coming from plastic case cover. Check for bent or corroded plug contacts.

5-3 (b) Receiver Section

No signals, no background noise in headset.

Check tubes, power supply, headset and "OFF-ON" switch in microphone cable.

Background noise in headset, but no signals.

Check power supply battery and receiver tubes.

Check receiver crystal, (Y-101). Check receiver alignment.

5-3 (c) Transmitter Section

No carrier, no sidetone.

Bad tubes or batteries. Defective press-to-talk microphone switch.

No carrier, but sidetone in phones.

Bad oscillator RF choke, (L-101), Bad crystal, (Y-102). Bad PA or oscillator tube, (V-105 or V-106). Open crystal condenser, (C-118).

Very weak carrier (only audible nearby) and no modulation.

Bad transmitter tubes. Weak batteries.

Weak carrier, but modulated.

Open or short-circuited antenna load coil, (L-301). Open or short-circuited antenna coupling transformer, (T-102). Open PA screen resistor, (R-115).

Carrier, but no modulation.

Bad modulator tube, (V-107). Open bias lead to V-107. Defective input transformer, (T-101B). Defective microphone. Open circuit in microphone cables. Short-circuited modulation reactor, (L-102).

Carrier, but weak modulation.

Bad modulator tube, (V-107). Short-circuited turns in modulation reactor, (L-102). Defective input transformer, (T-101B). Weak battery in power supply.

Transmitted signal distorted or decreasing antenna current with modulation.

Bad transmitter tubes. Improper alignment. Weak battery in power supply.

5-4 Circuit Checking Data

(See Diagram Fig. 7 for Tube Socket and Pin Locations).

All resistance measurements are made with vacuum tubes and batteries removed, directly from the tube socket pins to ground, (chassis). All voltage measurements should be made with a "fresh" power supply, with the receiver or transmitter operating, and using a 10 megohm vacuum tube voltmeter.

TUBE ELEMENT	PIN	DC VOLTS	OHMS
		1R5 Oscillator MIXER TUBE, V-101):	
Plate	2	50	∞
Screen	3	50	∞
Control Grid	6	−0.75	8.0 megohms
Filament	1	0	0
Filament	7	1.4	∞
Oscillator Grid	4	−6	0.1 megohm
		1T4 IF amplifier Tube. (V-102).	
Plate	2	63	∞
Screen	3	63	∞
Control Grid	6	−0.75	6 megohms
Filament	1	0	0
Filament	7	1.4	∞

TUBE ELEMENT	PIN	DC VOLTS	OHMS
		1S5 Detector-1st Audio Tube. (V-103).	
Diode Plate	3	−.6	1.25 megohms
Plate	5	14	∞
Screen	4	19	∞
Control Grid	6	−.15	6 megohms
Filament	1	0	0
Filament	7	1.4	∞
		3S4 Audio Output Tube. (V-104).	
Plate	2,6	125	∞
Screen	4	40.0	∞
Control Grid	3	−6.0	∞
Filament	1	0	∞
Filament C.T.	5	1.4	0
Filament	7	0	∞
		3S4 Power Amplifier Tube. (V-105).	
Plate	2,6	125	∞
Screen	4	80	∞
Control Grid	3	−20.0	250M
Filament	1	0	0
Filament C.T.	5	1.4	∞
Filament	7	0	0
		1T4 Oscillator Tube, (V-106).	
Plate	2	85	∞
Screen	3	85	∞
Control Grid	6	−20.0	250M
Filament	1	0	0
Filament	7	1.4	∞
		3S4 Modulator Tube, (V-107).	
Plate	2,6	125	∞
Screen	4	63	∞
Control Grid	3	−6.0	∞
Filament	1	0	0
Filament C.T.	5	1.4	∞
Filament	7	0	0

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END