INSTRUCTION BOOK

RESTRICTED

MODEL TCP-2
TRANSMITTING - RECEIVING
RADIOTELEPHONE EQUIPMENT

TYPE OF EMISSION	NOMINAL POWER OUTPUT	FREQUENCY RANGE
Telephone (A3)	75 Watts Phone (A3)	2000 to 3000 Kcs.

32 VOLTS D.C. SUPPLY		115 VOLTS D.C. SUPPLY
CRM-43009-A	TRANSMITTER-RECEIVER	CRM-43010-A
CRM-53085	LINE FILTER UNIT	CRM-53086
CRM-51026	HAND TELEPHONE ASSEMBLY	CRM-51026
CRM-23230	REMOTE CONTROL UNIT	CRM-23230

Manufactured for U.S. Navy Department, Bureau of Ships

By

RADIOMARINE CORPORATION OF AMERICA

75 VARICK STREET, NEW YORK, N. Y.

Contract NXsR-36947 dated September 6, 1943

February 1944

PREFACE

WARNING

PERSONNEL ENGAGED IN THE INSTALLATION, OPERATION AND MAINTENANCE OF THIS EQUIPMENT OR SIMILAR EQUIPMENT ARE URGED TO BECOME FAMILIAR WITH THE FOLLOWING RULES BOTH IN THEORY AND IN THE PRACTICAL APPLICATION THEREOF. IT IS THE DUTY OF EVERY RADIOMAN TO BE PREPARED TO GIVE ADEQUATE FIRST AID AND THEREBY PREVENT AVOIDABLE LOSS OF LIFE. YOUR OWN LIFE MAY DEPEND ON THIS.

ELECTRIC SHOCK

First-Aid Treatment

Safety First: Regard electrical apparatus generally, and especially all current-carrying parts, as dangerous, irrespective of voltage. Exercise great care in handling, and avoid broad contacts such as are made by standing on a metal deck or in water.

Dangerous contact may result through lessened resistance when the skin and clothing are wet with perspiration. Contact with damp metal surfaces--decks, bulkheads, guns, machinery--may allow the current to ground through the moist skin and body.

Electric shock is due to current passing through the body--current actually passing--irrespective of the voltage. A pressure as low as 110 volts has caused death. Current passing through the body in the region of the heart is especially dangerous. In using electric breast drills avoid the possibility of a ground.

Usually electric shock does not kill instantly. Life can often be saved even though breathing has stopped.

Free the Victim from the Circuit Immediately. Use a dry nonconductor (rubber gloves, clothing, rope, board) to move either the victim or the wire. Beware of using metal or moist material.

Shut off the Current. If necessary to cut a live wire, use an ax or hatchet with a dry wooden handle; turn your face away from the electrical flash.

Attend Instantly to the Victim's Breathing. Begin resuscitation at once on the spot. Do not stop to loosen clothing; every moment counts. Feel with your finger in his mouth and throat for foreign bodies--tobacco, false teeth, etc.--and remove them. If the mouth is tightly shut, pay no attention to it until later.

RESUSCITATION BY THE PRONE PRESSURE METHOD OF ARTIFICIAL RESPIRATION

Electric Shock

Waste No Time. Lay the victim on his belly with one arm extended overhead, the other bent at the elbow; face turned to the side and resting on the forearm so that the mouth and nose are free for breathing. See Position 1.

Position 1 - Kneel, straddling the patient's hips with your knees just below his hip bones. Place your hands on the small of the back. Fingers extended over the lower ribs. Little finger over the last rib. Finger tips just out of your sight on the sides of the chest.

First Movement: - Make pressure while deliberately counting one--two--three, as follows:

With arms straight, bring your weight to bear upon the patient gradually and heavily but not violently. Swing forward slowly. This movement should take three seconds.

Second Movement: - Release the pressure suddenly by swinging back quickly to the position indicated in Position 1. Rest while deliverately counting one--two.

In performing this movement one does not actually remove the hands from the patient.

Repeat these movements from twelve to fifteen times a minute; pressure three seconds; rest two seconds; complete respiration, five seconds--never less than four seconds.

Continue resuscitation movements without interruption for four hours, or until a medical officer has declared further efforts futile, unless natural breathing is restored. If natural breathing stops after temporary restoration, resume artificial respiration at once.

Keep the patient warm. Give him fresh air. Without interrupting resuscitation movements have some one else loosen his clothing about the neck, chest, and waist.

Do not attempt to give any liquid by mouth. Ammonia may be placed near the patient's nose after determining how close it may be brought to somebody else's nose without causing irritation.

Some one should smartly tap the patient's shoe heels with a stick or hatchet handle, fifteen or twenty times, every five minutes until respiration has been restored.

Watch carefully for signs indicating the return of natural breathing. Do not block feeble respiratory efforts. Time your movements so that pressure is exerted only while the patient is breathing out. Release pressure instantly when he begins to breathe in.

If the patient revives do not allow him to get up or to be raised for any purpose. Keep him prone until a medical officer arrives.

THE PRONE PRESSURE METHOD OF ARTIFICIAL RESPIRATION SHOULD BE APPLIED BY ONE WHO HAS PRACTICED ON A VOLUNTEER SUBJECT.

SAFETY PRECAUTIONS

WARNING

OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. OPERATING PERSONNEL MUST AT ALL TIMES OBSERVE ALL SAFETY REGULATIONS. DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE EQUIPMENT WITH HIGH VOLTAGE SUPPLY ON. DO NOT DEPEND UPON DOOR SWITCHES OR INTERLOCKS FOR PROTECTION BUT ALWAYS SHUT DOWN MOTOR GENERATORS OR OTHER ASSOCIATED POWER EQUIPMENT AND OPEN MAIN SWITCH IN POWER SUPPLY CIRCUIT. UNDER CERTAIN CONDITIONS DANGEROUS POTENTIALS MAY EXIST IN CIRCUITS WITH POWER CONTROLS IN THE OFF POSITION DUE TO CHARGES RETAINED BY CAPACITORS, ETC. TO AVOID CASUALTIES ALWAYS DISCHARGE AND GROUND CIRCUITS PRIOR TO TOUCHING THEM.

Since the use of high voltages which are dangerous to human life is necessary to the successful operation of the radio transmitting equipment covered by these instructions, certain reasonable precautionary measures must be carefully observed by the operating personnel during the adjustment and operation of the equipment.

While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed:

KEEP AWAY FROM LIVE CIRCUITS. Under no circumstances should any person be permitted to reach within or in any manner gain access to the enclosure with interlocked gates or doors closed or with power supply line switches to the equipment closed; or to approach or handle any portion of the equipment which is supplied with power, or to connect any apparatus external to the enclosure to circuits within the equipment; or to apply voltages to the equipment for testing purposes while any non-interlocked portion of the shielding or enclosure is removed or open. Wherever feasible in testing circuits, check for continuity and resistance rather than directly checking voltage at various points.

DON'T SERVICE OR ADJUST ALONE. Under no circumstances should any person reach within or enter the enclosure for the purpose of servicing or adjusting the equipment without the immediate presence of another person capable of rendering aid.

CONTRACTUAL GUARANTEE

The equipment including all parts and spare parts, except vacuum tubes, batteries, rubber and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship or manufacture will be repaired or replaced, f.o.b. any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government; provided that such guarantee will not obligate the Contractor to make repair or replacement of any such defective items unless the defect appears within the aforementioned period and the Contractor is notified thereof in writing within a reasonable time and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above, is of the Contractor's design or is of a design selected by the Contractor, it is also guaranteed, subject to the foregoing conditions, against defects in design with the understanding that if ten percent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred percent (100%) correction or replacement by a suitably redesigned item.

All such defective items 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 items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communications. In such cases the return of the defective items for examination by the Contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for affecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactorily due to any such defects, and any items repaired or replaced by the Contractor will be guaranteed anew under this provision.

PERTINENT DATES AFFECTING REPLACEMENTS UNDER THE GUARANTEE

Contract No._____ Date of Contract _____
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 the book shall be filled in at time of installation. Operating personnel shall also mark the "Date Placed In Service" on the date plate located below the model nameplate on the equipment.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its service life, shall be made to the Bureau of Engineering in accordance with current instructions. The report shall cover all details of the failure and give the date of installation of the equipment. Refer to latest revision of Bureau of Engineering Circular Letter No. 40 for instructions concerning Report of Failures, etc.

ATTENTION

THE ATTENTION OF ENGINEER OFFICERS, RADIO OFFICERS AND OPERATING PERSONNEL IS DIRECTED TO BUREAU OF ENGINEERING CIRCULAR LETTER NO. 5a of 3 OCTOBER 1934, OR SUBSEQUENT REVISIONS THEREOF ON THE SUBJECT OF "RADIO - SAFETY PRECAUTIONS TO BE OBSERVED".

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RADIOMARINE CORPORATION OF AMERICA
75 Varick Street, New York, N.Y.

Contract NXsR-36947 dated September 6, 1943

This instruction book is furnished for the information of commissioned, warrant, enlisted and civilian personnel of the Navy whose duties involve design, instruction, operation and installation of radio and sound equipment. The word "RESTRICTED" as applied to this instruction book signifies that this instruction book is to be read only by the above personnel, and that the contents of it should not be made known to persons not connected with the Navy.

February 1944

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RADIOTELEPHONE EQUIPMENT

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TABLES
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I	List of Major Units (1 sheet)
II	Parts List by Symbol Designation (11 sheets)
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DRAWINGS AND CHARTS

KS-63 - Crystal Holder, Types R1 and R2.
K-145 - Transformers
K-147 - P. A. Coil Turns Vs Frequency
KS-12 - CRM-43009-A and CRM-43010-A Transmitter- Receiver
KS-13 - CRM-23230 Remote Control Unit
KS-14 - CRM-51026 Hand Telephone Assembly
KS-15 - CRM-53085 and CRM-53086 Line Filter Unit
T-1209- Receiver Circuits and External Connections
T-1210- Transmitter and Power Circuits

ILLUSTRATIONS

Fig. 1 - TCP-2 Front View Assembly
2 - TCP-2 Top View (Cover Removed)
3 - TCP-2 Right Side (Cover Removed)
4 - TCP-2 Left Side (Cover Removed)
5 - TCP-2 Radio Receiver Top View
6 - TCP-2 Radio Receiver Bottom View
7 - Transmitter Underside View
8 - TCP-2 Line Filter Unit
9 - Hand Telephone Assembly
10 - Remote Control Unit

INSTRUCTION BOOK
MODEL TCP-2
TRANSMITTING - RECEIVING
RADIOTELEPHONE EQUIPMENT

1 - GENERAL DESCRIPTION

1.1 - Application: The model TCP-2 radiotelephone equipment comprises a compact medium power radiotelephone transmitter and receiver, designed for installation aboard vessels of the United States Navy. Radio personnel are urged to study carefully the instructions contained in this book so that the equipment may be installed, adjusted, operated and maintained for maximum performance.

1.2 - Component Units: The component units furnished for each installation normally comprise the following items:

1 Transmitter Receiver Unit (CRM-43009-A for 32 volt D.C.) or (CRM-43010-A for 115 Volt D.C.)

1 Line Filter Unit (CRM-53086 for 115 volt D.C.) or (CRM-53085 for 32 volt D.C.)

1 Hand Telephone Assembly (CRM-51026)

1 Remote Control Unit (CRM-23230)

1 60 Ft. Length 7 conductor Remote Control Cable

1 Set of Vacuum Tubes Comprising: (18 Total)

5 - 807	2 - 809
3 - 6A6	4 - 6L7
1 - 6C5	1 - 6R7
1 - 6V6	1 - 5W4

1 Set of Type R1 Transmitter Crystals)
) As Called For
1 Set of Type R1 Receiver Crystals) By Contract.

1 Metal Spare Parts Box per Navy Specs 42-B-9 (INT)

1 Set of Spare Tubes and Spare Parts
(See Table No. IV in this book)

2 Instruction Books

1.3 - Power Output: The radio transmitter is designed to deliver 75 watts of carrier power into a typical 16 ohm, 200 mmfd. antenna. The modulation capability is substantially 100 percent.

1.4 - Frequency Range: The transmitter and receiver are designed to cover the frequency range of 2000 to 3000 K.C. There is provision for the use of a maximum of ten frequencies within this band. The exact number of frequencies supplied on a particular order are as specified on that order.

1.5 - Frequency Control: Type R1 transmitter and receiver Quartz crystals are used in the equipment. Crystals are of the plug-in type with .850 inch pin spacing. A crystal jack board marked "T" provides mounting for ten transmitter crystals, and a similar jack board marked "R" provides mounting for ten receiver crystals. Crystals are of the low temperature coefficient type (approximately 3 cycles per M.C. per degree C), and are ground for an operating tolerance of plus or minus .04 percent. Transmitter crystals are ground directly for the desired transmitting frequency, that is, the frequency on the nameplate is the same as the output frequency. In the case of receiver crystals, such crystals are ground for a frequency 455 K.C. higher or lower than the frequency of the signal to be received. Under present frequency assignments, the frequency of receiver crystals always end with an "odd" digit, such as 1, 3, 5, 7 or 9. To identify a receiver crystal, so that it may be paired up with the corresponding transmitter cyrstal, add or subtract the number 455 from the frequency on the receiver crystal nameplate. Either the sum or the difference will then equal the frequency of the signal to be received. When the equipment is used for communication with U. S. Coastal Harbor Stations, which transmit and receive on different frequencies, refer to the list in this book for such Coastal Harbor Stations to determine the correct transmitter and receiver crystal frequencies.

1.6 - Remote Control Unit: The remote control unit is used when it is desired to operate the equipment from a remote point after the desired frequency has been selected at the transmitter-receiver unit. The remote control unit may, therefore, be considered as an accessory, as it is not required when the equipment is to be operated directly from the transmitter-receiver unit. Two 7 conductor cables are needed to the remote unit to provide a total of 14 conductors.

1.7 - Selective Ringer: The radiotelephone equipment is designed so that, at a future date, a suitable type of selective ringer may be added. The purpose of this selective ringer is to enable a local Coastal Harbor Station to ring a bell aboard the ship on which the radiotelephone equipment is installed.

1.8 - Vacuum Tubes: The radio transmitter employs ten vacuum tubes as follows:

1 - 807 Crystal Control Oscillator
4 - 807 Power Amplifiers
2 - 809 Modulators
1 - 6A6 Driver Audio Amplifier
1 - 6A6 Microphone Audio Amplifier
1 - 6A6 Vodas Audio Rectifier

The radio receiver employs eight vacuum tubes as follows:

1 - 6L7 R. F. Amplifier
1 - 6L7 Mixer
2 - 6L7 Intermediate Amplifiers
1 - 6C5 Crystal Controlled R. F. Oscillator
1 - 6R7 Second Detector - First Audio Amplifier
1 - 6V6 Second Audio Amplifier
1 - 5W4 Power Rectifier

A socket for an additional 6C5 "ringer audio amplifier" tube is provided in the receiver for special installations which are furnished with an automatic bell ringing device.

1.9 - Transmitter-Receiver Unit Construction: Refer to KS-12 and the photographs in this book. The overall mechanical assembly is constructed with an aluminum frame with removable front, side, rear and top panels. The receiver unit itself is constructed on a separate chassis and arranged so that the receiver chassis and its front panel may be conveniently removed from the front of the cabinet. Four heavy duty rubber shock mounts are fastened to the base of the unit, and an additional rear bracket is furnished to brace the unit against an adjoining bulkhead.

1.10 - Transmitter-Receiver Unit Panel Controls: Two meters are provided in the upper section of the front panel, one of which reads antenna current and the other various tube currents as determined by the "current" switch beneath that meter.

(a) The antenna circuit is tuned by means of a continuously variable rotating coil which is adjusted by means of the control between the two meters.

(b) A "Trans" ten position switch mounted below the antenna ammeter is used to adjust the oscillator and power amplifier circuits of the radio transmitter to the desired transmitting frequency.

(c) A "Press-Talk - Automatic" switch is provided to control certain circuit functions as described further in this book. A small green pilot light "Transmitter On" is illuminated when the handset is removed from its support.

(d) The "Off-On" toggle switch on the front panel is used to turn the radio receiver off or on, and in the "On" position also permits the radio transmitter to be used whenever the handset is removed from its support.

(e) The various controls for the radio receiver are mounted in the center section of the front panel. A built-in loud speaker is provided. Beneath the loud speaker, a red pilot light indicates when the receiver has been turned on. The radio receiver may be set to any one of the pre-tuned frequencies for which it has been adjusted by means of the ten position "Recr" switch. Beneath the red "Receiver On" pilot light, there is mounted a toggle type "Volume Switch" which permits control of receiver volume (sensitivity) at either a local or remote position. To the left of this switch is mounted a local receiver "Volume Control".

(f) Frequency marker plates are mounted on the front panel, with provision for a maximum of ten plates, to indicate the positions to which the transmitter and receiver switches should be placed for the various frequencies. "Blank" plates are used for switch positions not provided with crystals.

(g) Access to the main terminal board, fuses, and the automatic starter for the transmitter motor generator unit, is obtained by removing the lower front panel section which is provided with thumb screws. Access to the radio receiver is accomplished by removing the screws of the receiver panel section and withdrawing the receiver chassis.

(h) A "Spkr-Handset" switch is provided so that either the loud speaker or the telephone receiver in the handset may be used for reception when operating under "Press-Talk" conditions. This "Spkr-Handset" switch must not be left in the speaker position when "automatic" operation is in use.

1.11 - Line Filter Unit: The line filter unit is a small external assembly mounted in a metal container for connection between the ship's power source and the transmitter-receiver unit. This unit, which contains radio frequency filters, a toggle type line switch and a fuse, is designed for installation near the transmitter-receiver unit and connects to that unit by means of the rubber covered, heavy duty, cable which is a part of the transmitter-receiver unit. Refer to drawing KS-15 and photograph in this book.

1.12 - Hand Telephone Assembly: The hand telephone assembly consists of a "Press-to-Talk" type of handset and a switch hook unit for supporting the handset. This assembly may be installed near the transmitter-receiver unit so that the user may manipulate the "Press-to-Talk" button on the handset as well as the various controls on the transmitter-receiver unit. A special rubber clamping device is provided on the hand telephone assembly so that the handset remains securely in place when not in use. Refer to drawing KS-14 and photograph in this book.

1.13 - Remote Control Unit: The remote control unit is designed for installation in any convenient location. This control unit includes a handset, loud speaker, volume control, and a "Volume Switch". When this unit is used, it provides means for receiving calls or placing calls from the remote point. Installation of a remote control unit does not prevent "local" operation of the set, since it is only necessary to place the "Volume Switch" on the transmitter-receiver unit in the correct position when local operation is desired. When the remote control unit is used, it is, of course, necessary to place the transmitter-receiver switches in the correct positions and to turn on the radio receiver at the transmitter-receiver unit and also to adjust the antenna tuning control. Provision is made in the remote control unit for future installation of a bell for special installations where an automatic ringing device is added to the radio receiver in the transmitter-receiver unit. See drawing KS-13 and photograph in this book.

1.14 - Power Supply: Model TCP-2 is designed to operate from a power supply of 32 volts D.C., or 115 volts D.C. as specified. It is necessary, of course, to use CRM-43009-A transmitter-receiver and CRM-53085 line filter unit for 32 volts D.C. supply, or CRM-43010-A transmitter-receiver and CRM-53086 line filter unit for 115 volts D.C. supply. The transmitter-receiver unit contains two rotating machines, one a rotary converter for the radio receiver and the other a motor generator for the radio transmitter.

1.15 - The power supply requirements for the equipment are approximately as follows:

Supply Voltage	Receiver "On" (Standby)	Two Way Communication	
		Receiving	Transmitting
32 V - D.C.	5.2 Amps	18	26
115 V - D.C.	1.4 Amps	6	8

Two way communication (receiving) means handset off support and transmitter is ready to use. Two way communication (transmitting) means handset off support and push button closed to talk.

1.16 - Data on Converter and Motor Generator:

Receiver Rotary Converter

Input	Output	Type	
31 V - 5.2 Amps D.C.	110 V - .605 Amp 60 Cycle	W-1144B	SS-1173
110 V - 1.4 Amps D.C.	110 V - .605 Amp 60 Cycle	W-910B	SS-1172

Converter is a 3600 RPM, ball bearing, enclosed machine, continuous duty, 40 degrees C rise, and has a built-in R.F. filter unit mounted underneath machine. Overall dimensions are 10 inches long, 9 inches high and 6 inches deep. Weight is 25 pounds.

Transmitter Motor Generator

Input	Output	Type	
31 V - 20 Amps D.C.	550 V - .5 Amp D.C. 22 V - 4.55 Amps 60 Cycle	8012-B	SS-2049
110 V - 5.5 Amps D.C.	550 V - 15 Amp D.C. 78 V - 1.28 Amps 60 Cycle	8012-B	SS-2048

Motor generator is a 3600 RPM, ball bearing, enclosed machine, continuous duty, 50 degrees C rise. Overall dimensions are 17-1/2 inches long, 8-3/4 inches high and 10-1/2 inches deep. Weight is 82 pounds.

1.17 - Dimensions and Weights: CRM-43009-A or CRM-43010-A transmitter-receiver unit - 37" high, 20-1/8" wide and 22" deep. Weight is 310 pounds.

CRM-53085 or CRM-53086 line filter unit - 10-9/16" high, 9-3/8" wide and 3-5/8" deep. Weight is 9 pounds.

CRM-51026 hand telephone assembly - 9" high, 3-1/2" wide and 6-1/4" deep. Weight is 4 pounds.

CRM-23230 remote control unit - 10-1/4" high, 13-5/8" wide and 5-3/8" deep. Weight is 11 pounds. (Dimensions include handset in position on control unit).

2 - CONDENSED OPERATING INSTRUCTIONS

2.1 - A small instruction card 5-3/8" by 8-3/8" furnished with each equipment should be posted near the transmitter-receiver unit for use by operating personnel. This card contains the following instructions:

1. Place "Trans" and "Recr" switches in the correct positions for the desired frequency. Adjust P. A. Tuning to setting indicated on calibration chart. Place "Handset" switch in the "Press-Talk" position. Place "Spkr-Handset" switch in "Spkr" position.

2. To Receive Calls: Turn "Off-On" switch to "On". "Receiver On" red light will glow. Adjust "Volume Control" clockwise to as high a value as possible. Incoming calls or atmospheric noise will be heard from loud speaker.

3. To Place Calls: Remove handset from support. "Transmitter On" green light will glow. Allow 15 seconds for tubes to warm up. Make sure P. A. Tuning is adjusted to correct setting. Press the button in the center of the handset and rotate antenna tuning control for maximum antenna current. While calling or talking, keep button depressed. Release button to hear the other party. Adjust "Volume" to desired value.

4. Important: After completing two way conversation, replace handset on support and readjust "Volume Control" to a high enough value so that the next incoming call will be clearly heard.

5. Use of Remote Control Unit: Installations with a CRM-23230 Remote Control Unit require suitable adjustment of the "Volume Switch". This switch transfers the Volume Control circuits. To use the Remote Control Unit, place this "Volume" switch either to the right or left, the correct position being the one which permits the Volume Control Knob to regulate the sound from the loud speaker. If set is to be used "locally", follow same procedure with "Volume Switch" on transmitter-receiver unit.

6. To shut down set completely, turn off panel "Off-On" switch and note that red light is extinguished.

7. When "Press-Talk" operation only is used, "Spkr-Handset" switch may be placed in either position, as required.

3 - ADDITIONAL OPERATING INSTRUCTIONS

3.1 - The "Trans" switch for the radio transmitter, simultaneously selects the appropriate transmitter circuits and transmitter crystal for the desired transmitting frequency. The "P. A. Tuning" control is the small knob mounted directly above the "Off-On" switch. This "P. A. Tuning" control should always be carefully adjusted to the calibrated setting as recorded in the small frame on the panel. If the correct setting is not known, it may be quickly determined by adjusting the knob for minimum P. A. cathode current as read on the plate current meter with the current switch in position 3, and with no antenna current. After this is done, the antenna circuit may be resonated for maximum antenna current.

3.2 - Under special conditions "cross channel" operation using "Navy" frequencies may be carried on with other vessels that are similarly equipped with model TCP-1 or TCP-2 radiotelephones. In other words, since there are separate transmitter and receiver switches, it is possible to transmit on one frequency and receive on a different frequency, provided both parties make suitable arrangements. "Cross Channel" operation, however, cannot be carried on with coastal harbor stations, since a definite transmitting frequency and a definite receiving frequency must be used with each harbor station.

3.3 - Familiarity should be acquired with the adjustment of the antenna tuning control marked "Adjust for maximum antenna current". Whenever the transmitting frequency is changed, this control should always be readjusted for maximum antenna current. When changing to a higher frequency from the one previously in use, the knob should be rotated counter-clockwise. If a lower frequency is selected, the knob should

be rotated clockwise. The "current" switch beneath the plate current meter should always be left in position 3. The other positions of this switch are for use in service and maintenance. TCP-2 equipment has Veeder-Root counter to assist in adjusting antenna tuning control. When all of the turns of the coil are in use (maximum inductance), the counter will read 1445. With the turns all out of circuit (minimum inductance), the counter will read 1000. In any case, however, it is recommended that the antenna tuning control be adjusted for maximum antenna current instead of depending upon a calibration record made with the Veeder-Root counter.

3.4 - The function of the handset switch should be understood. In the "Press-Talk" position, the incoming signal may be heard in the loud speaker or the telephone receiver in the handset, depending on the position of the "Spkr-Handset" switch. If the handset switch is placed in the "Automatic" position, the transmitter will go "on the air" each time speech is impressed on the microphone, and, under these conditions, loud speaker reception cannot be used as feedback will occur from the loud speaker to the microphone and prevent satisfactory operation. When "Automatic" transmission is used, it is important to speak steadily and clearly into the microphone, as, otherwise, "clipping" may occur resulting in the party at the other end of the circuit having difficulty in understanding your conversation. "Automatic" operation is undesirable under conditions of local noise aboard ship since any sound impressed on the microphone will actuate the transmitter whether or not you are talking.

4 - TRANSMITTER CIRCUITS

4.1 - Refer to drawing T-1210. The crystal controlled oscillator in the transmitter uses a type 807 tube (93). The control grid of this tube is connected to one of the sections of the ganged ten position frequency switch (39) so that the appropriate crystal may be selected. A choke coil (34) is connected in series with the cathode of the 807 oscillator tube to provide a small amount of regeneration or feedback for the crystal oscillator. The output circuit of the crystal oscillator consists of radio frequency transformer (26) which has its primary or plate winding tuned by capacitor (30) and its secondard tuned by capacitor (25). Variable coupling is provided between the primary and secondary of radio frequency transformer (26). The coupling of the radio frequency transformer and the tuning of the primary and secondary windings are adjusted by the factory and locked, so that the crystal oscillator circuit functions automatically throughout the 2000 to 3000 K.C. band of the transmitter. Two resistors (23) connected in parallel are used to load the secondary of the radio frequency transformer. The screen grid of the 807 oscillator tube receives its supply voltage through resistors (29) and is by-passed to ground through capacitor (32.)

Capacitor (31) by-passes the D.C. end of the primary of the radio frequency transformer. The capacitors (35 and 36) are used as radio frequency voltage dividers for the excitation of the oscillator control grid. The oscillator plate receives its D.C. voltage from the 550 volt output of the motor generator while the screen is supplied from the same source through resistors (29). Resistor (33) functions as a bleeder for resistors (29).

4.2 - The power amplifier circuit uses four 807 tubes (94 to 97) which are connected in parallel. The control grids of these four tubes receive their radio frequency excitation from the crystal oscillator stage through capacitor (24). The screen grids of the power amplifier tubes are by-passed to ground through capacitor (14), and receive their D.C. supply voltage through two resistors (12) connected in series. The D.C. plate circuit of the power amplifier tubes from the 550 volt generator passes through the secondary winding of modulation transformer (54), through radio frequency choke coil (11), and then to the plates of the tubes. It will be noted that the D.C. screen circuit also must pass through the secondary of transformer (54). This is to enable both plate and screen of the four power amplifier tubes to be modulated as described further in this book. The radio frequency plate circuit of the power amplifier tubes, after passing through plate blocking capacitor (10) connects to the P. A. tank inductors (8) and the P. A. tank capacitor (9). There are two P. A. tank inductors, one of which is tapped for connection to a section of the ten position frequency switch (39).

4.3 - A front panel control, marked "P. A. Tuning", has been provided on TCP-2 transmitters. This control permits the power amplifier tank capacitor (9) to be rotated from the front panel over a range of approximately 20 scale divisions. The "P. A. Tuning" scale is engraved from 10 to 40 divisions, but stops are provided on the capacitor shaft to limit the movement of the pointer over the scale between approximately 15 to 35 divisions. Therefore, each position of the transmitter frequency switch (39) may be "Set Up" and "Calibrated" for any one frequency falling within the bands listed below in paragraph 4.4. The major purpose of the "P. A. Tuning" control on the front panel is to enable the TCP-2 normal frequency "Set Up" for one Naval district to be conveniently changed to a new frequency "Set Up" for another district. A calibration chart frame is mounted on the transmitter panel and three charts are furnished with each equipment so that the necessary record may be made of transmitter switch position, frequency, P. A. tuning and antenna tuning for a maximum of 10 transmitting frequencies.

4.4 - The nominal frequency range that is provided on each of the 10 positions of the frequency switch, in conjunction with the "P. A. Tuning" control, is as follows:

Transmitter Switch Position	Approximate Range (K.C.)
1	2000 - 2250
2	2000 - 2275
3	2000 - 2310
4	2070 - 2385
5	2210 - 2560
6	2350 - 2700
7	2480 - 2870
8	2570 - 2960
9	2625 - 3000
10	2710 - 3000

4.5 - When setting up the transmitter for a group of frequencies for a particular Naval district, careful reference should be made to the ranges listed in paragraph 4.4. For example, with switch position 1 the transmitter crystal must be a frequency between 2000 and 2250 K.C., while for position 2 the crystal must be between 2000 and 2275 K.C. taking care in each case that the crystal frequency for any switch position must fall within the band listed for that position. Always endeavor to select crystals and switch positions so that the crystal frequency is approximately near the center of the specified bands. Since each equipment is normally shipped "Set Up" for a particular Naval district, no changes in the "Set Up" for that district are required.

4.6 - The calibration chart contains the following instructions:

> "Important: - Be sure to adjust P. A. Tuning Control for MINIMUM P. A. Cathode Current with Antenna Tuning adjusted for NO Antenna Current. Then tune Antenna for MAXIMUM Antenna Current. Record settings below."

In other words, for efficient operation it is important to make sure that the "P. A. Tuning" control has been adjusted for minimum P. A. cathode current for each operating frequency at the time the transmitter is installed and for subsequent operation. By recording the settings on the calibration chart, it will then be possible to quickly change from one transmitting frequency to another.

4.7 - Coupling between the power amplifier tank circuit and the antenna circuit is accomplished by means of capacitor (4), two capacitors (5) and four capacitors (6). A seven position antenna coupling switch (7) is used to connect one or more of capacitors (5 and 6) in parallel to capacitor (4). Since P. A. tank current flows through these antenna coupling capacitors and since the "low" end of the antenna inductor (1) is also connected to the antenna coupling capacitors, a suitable voltage is developed to couple out the P. A. tank to the antenna circuit. Access to the antenna coupling switch (7) is obtained through a small hinged door in the upper section of the right hand side panel.

4.8 - The antenna circuit is resonated to the desired frequency by means of a rotating variable inductor (1), controlled from the front panel, thereby enabling one or more turns of this coil to be used in the antenna circuit. Veeder-Root counter is geared to antenna inductor (1). This counter will read 1000 when the coil is rotated to its maximum counter-clockwise position for minimum inductance. The counter will read 1445 when the coil is rotated clockwise for maximum inductance. In changing from a lower to a higher frequency, the knob is rotated counter-clockwise and the counter will read toward lower numbers. Resistor (3) is used as a static leak for the antenna while the R.F. ammeter (2) is used to measure antenna current.

4.9 - The send-receive relay (40) is equivalent to a double-pole double-throw switch. One pole of this relay transfers the low potential side of the antenna loading inductor either to the transmitter coupling capacitors or to the receiver input circuit. The second pole of this relay, in the transmit position, connects the cathode circuits of the oscillator and P. A. tubes to ground. In the receive position, this pole connects the receiver audio output circuit to ground and also permits a negative cutoff bias voltage to be applied to the oscillator and P. A. grids, this cutoff voltage being developed around resistor (42). The coil of send-receive relay (49), for "Press-to-Talk" operation, is energized through resistor (51) from the transmitter plate supply voltage divider resistors (63, 64 and 65). In the "Automatic" condition of operation, the coil of the send-receive relay (49) receives its energy from the rectified output of the 6A6 Vodas tube (100). This Vodas tube functions as a full wave rectifier with the grids of the tubes acting as anodes which are connected across the secondary of the driver stage output transformer (55). Therefore, each time speech is impressed on the microphone under "Automatic" conditions, the send-receive relay is automatically energized placing the transmitter "on the air". A variable resistor (52) mounted inside the set and connected in parallel to the output of the Vodas tube permits an adjustment for Vodas sensitivity. In order to prevent overload or damage to the tubes, in the event that operation is attempted on any frequency for which no crystal is installed, the transmitter frequency switch (39) is provided with a ten position interlock section which is wired in series with the coil of send-receive relay (49). The color coded leads to this switch section are, therefore, to be connected to the contacts on the switch only for switch positions which have crystals inserted in the jacks

4.10 - Telephone modulation is accomplished as follows: The microphone receives its D.C. voltage from the drop across resistor (63). Reactor (58) and capacitor (59) are employed as filters. The microphone is connected to the primary of transformer (57) while the secondary of this transformer is connected to both control grids of the 6A6 microphone audio amplifier (98). The two parallel connected plates of this tube passes through

the primary of interstage transformer (56) and through resistor (62) to the 550 volt D.C. supply. Capacitor (67) is an audio by-pass and filter. Grid bias for the 6A6 microphone audio amplifier is obtained by means of cathode resistor (61) which is by-passed by capacitor (66). The secondary winding of interstage transformer (56) feeds the push-pull grids of the 6A6 driver tube (99). The push-pull plates of tube (99) are connected to the primary of driver transformer (55) while the secondary of this transformer is connected to push-pull grids of the 809 modulator tubes (101-102) as well as the two grids of the 6A6 Vodas tube (100). The push-pull plates of the 809 modulator tubes are connected to the primary of modulation transformer (54). The secondary of this transformer is in series with the D.C. plate supply of the power amplifier screen and plate circuits. Accordingly, when speech is impressed upon the microphone, the audio and modulator tubes ultimately develop an audio frequency voltage across the secondary of modulation transformer (54), thereby modulating the carrier wave.

4.11 - The filament circuits of all tubes in the transmitter obtain their supply from filament transformer (53). The primary of this transformer is connected to the collector rings on the transmitter motor generator. The transformer (53) has two secondary windings, one of which feeds the three 6A6 tubes and the two 809 tubes while the other secondary feeds all five 807 tubes.

4.12 - An automatic motor starter (86) assembled inside the transmitter-receiver cabinet is employed to start the transmitter motor generator. The starter coil is energized from the supply line through contacts on the switch hook of the hand telephone assembly (109), or similar contacts on the switch hook of the remote control unit. With this arrangement, the transmitter motor generator is automatically started each time the handset is removed from its switch hook.

4.13 - Metering of the various circuits is accomplished by means of an 0-50 m.a. D.C. meter (47) in conjunction with meter switch (46). This meter switch has five positions and permits checking of oscillator cathode current, P. A. grid current, P. A. cathode current, modulator cathode current and the current through the send-receive relay coil. Shunts are provided for the various positions of the meter switch. The following currents may be measured with the meter switch:

Position	Circuit	Approximate Scale Reading
1	Oscillator Cathode	20 - 30 **
2	P. A. Grid	6 - 12
*3	P. A. Cathode (loaded out)	22 - 32
*4	Modulator Cathode (Unmodulated)	6 - 8
5	Send-Receive Relay Coil (Push button Closed)	3

* On positions 3 and 4 of the meter switch, shunts are used internally so that the true current is ten times higher than that indicated on the meter scale. For example, in position "3" 30 m.a. on the meter is equivalent to 300 m.a. P. A. cathode current.

** On position 1 a shunt is used so that true oscillator current is twice as high as that indicated on meter scale. For example, when meter reads 25 m.a. oscillator cathode current is actually 50 m.a.

5 - RECEIVER CIRCUITS

5.1 - Refer to drawing T-1209. The radio receiver unit is a superheterodyne employing eight tubes and using an intermediate frequency of 455 K.C. Provision is made for a maximum of ten pre-tuned frequencies between 2000 and 3000 K.C. In the description which follows, the symbol designations used on the wiring diagrams for the various parts are the numbers in parenthesis used below.

5.2 - The input circuit to the receiver includes radio frequency transformer (3). Its primary winding is connected to the send-receive relay. The secondary winding of transformer (3) connects to the control grid of the 6L7 R. F. amplifier tube (103). The secondary winding is tuned for each of the desired receiving frequencies by means of the variable air trimmer capacitors (10), one of these capacitors being used for each of the frequencies. The control grid and grid #5 of the R. F. amplifier connect to the AVC bias through resistor (5).

5.3 - The second tube in the receiver is the mixer 6L7 tube (104) which is coupled to the R. F. amplifier through R. F. transformer (19). The secondary of this transformer is tuned by a second group of trimmer capacitors (11). Grid #5 of the mixer tube receives energy from the 6C5 crystal controlled oscillator tube (109) so that an intermediate frequency of 455 K.C. is produced in the plate circuit of the 6L7 mixer tube.

5.4 - The 6C5 crystal oscillator tube (109) is crystal controlled, provision being made for ten crystals one of which is used for each receiving frequency.

5.5 - The frequency of the receiver crystals always differs from the frequency of the desired received signal by 455 K.C. In order to keep the crystal frequencies themselves between 2000 and 3000 K.C., the crystals are ground 455 K.C. lower for receiving frequencies above approximately 2500 K.C., and are ground 455 K.C. higher for receiving frequencies below 2500 K.C. A cathode choke (17) in the 6C5 crystal oscillator tube furnishes feedback voltage through capacitor (16) to the control grid of this tube.

5.6 - The first intermediate frequency amplifier 6L7 tube (105) receives its 455 K.C. input through I. F. transformer (28) and delivers amplified output through I. F. transformer (60). The I. F. transformer (60) is coupled to the 6L7 second intermediate frequency amplifier tube (106) and the output of this tube is coupled through I. F. transformer (61) to the diodes of the 6R7 detector-A. F. amplifier tube (107).

5.7 - The audio component of the modulated signal appears across resistor (40) in the 6R7 diode circuit, and is then coupled through capacitor (55) and resistor (42) to the control grid of the triode section of the 6R7 tube. The amplified audio voltage of the plate circuit of the 6R7 tube appears across resistor (44) and is coupled through capacitor (51) to the control grid of the 6V6 output tube (108). The plate circuit of the 6V6 output tube is connected to the primary of output transformer (63). This transformer has two secondary windings, one of which feeds the loud speaker and the other the telephone receiver in the handset. To "Silence" receiver, while transmitting, bias voltage from P. A. grid leak in transmitter is applied through terminal 14 to the control grid of the 6R7 tube (107).

5.8 - Automatic volume control is applied to the control grid and number 5 grid of the R. F. amplifier, the first I. F. amplifier and the control grid of the mixer. The AVC voltage is developed across resistor (41) which is connected to diode #4 in the 6R7 tube. Resistor (35) and capacitor (59) are used as audio frequency filters on the AVC bus.

5.9 - Volume control is applied to the AVC bus by means of volume control (69) for local control only. The volume switch (71) is used to transfer the volume control circuit to volume control (5) in remote control units, when the latter are used.

5.10 - Plate screen and bias voltages for the receiver are obtained from the output of the 5W4 rectifier tube (110). The rectifier transformer (72) comprises a primary winding which is connected to the receiver rotary converter, and has three windings, one winding delivering 6.3 volts for the heaters of the tubes, one winding delivering 5 volts for the filament of the 5W4 rectifier, while the third winding, which is mid-tapped, furnishes 250 volts to the plates of the 5W4 rectifier tube.

5.11 - The receiver is provided with an additional tube socket for a 6C5 tube (111) and a "ringer socket", these parts not being used in normal TCP-2 equipments. The 6C5 ringer amplifier and the ringer socket are normally employed only in commercial installations where the radio receiver is fitted with an automatic bell ringing device.

5.12 - The sensitivity of the receiver is such that an R. F. input of 2 to 5 microvolts, modulated 30 percent, at 2500 K.C., will produce an output of 50 milliwatts in the loud speaker. The selectivity provides a total band width of 9 K.C. for a ratio of 2 DB between input voltage off resonance to voltage at resonance. The total band width is approximately 16 K.C. for a 40 DB ratio, and approximately 24 K.C. for a 60 DB ratio. The maximum audio output of the 6V6 output tube (108) is one watt. The radiation from the receiver, when used on any antenna with which the transmitter will operate does not exceed 400 micro-microwatts for compliance with Federal Communications Commission subsection 8.130(b).

5.13 - The ten position three pole frequency switch (13) in the receiver is used to select the R. F. amplifier grid capacitors, the mixer grid capacitors and the appropriate crystal for each of the ten pre-tuned frequencies.

5.14 - The hand telephone assembly CRM-51026 comprises a "Press-to-Talk" handset, a switch hook, and certain resistors, the latter being used to establish an appropriate audio level in the telephone receiver of the handset.

5.15 - The CRM-23230 remote control unit contains a handset and switch hook similar to that of the CRM-51026 hand telephone assembly, and in addition uses a loud speaker, volume control and volume switch. Two 7 conductor cables are to be used.

6 - INSTALLATION

6.1 - The transmitter-receiver unit should be installed in a location that permits access to both sides of the unit for adjustment and maintenance. Care should be taken not to install the set where it may be subjected to salt spray or excessive moisture conditions. A substantial ground connection should be run between the vessel's metal hull or ground plate, to the large stud near the right rear shock mount. The antenna lead-in should be run free from metal bulkheads or other grounded structures and should be connected to the stud on the insulator at the top of the set. The rear bracket for the transmitter-receiver unit should be installed between the bulkhead and the set so that the unit is properly braced against shipboard vibration.

6.2 - The line filter unit should be installed on a bulkhead or other convenient point so that it may be connected to the set with the five foot rubber covered cable provided with the transmitter-receiver unit. When connecting the line filter unit to the set, carefully observe the markings in the unit so that the fuse will be dead when the switch is placed in the off position.

6.3 - The incoming power line from the ship's power source connects to the "line" end of the line filter unit. Polarity should be observed to insure that the fuse is in the positive side of the line and that terminal 20 (white lead) on the set is positive. Terminal 19 (black lead) should be negative. Use the following table for wire sizes. Any attempt to employ smaller size of conductor than those listed below will result in excessive voltage drop and unsatisfactory operation of the radiotelephone.

CABLE LENGTH (2 CONDUCTORS) Feet	B & S GAUGE WIRE SIZE	CIRCULAR MILS
	32 VOLT SETS	
0 - 35	6	26,250
35 - 60	4	41,740
60 - 100	2	66,370
	115 VOLT SETS	
0 - 35	14	4,107
35 - 60	12	6,530
60 - 100	10	10,380

6.4 - When installing a remote control unit, refer to drawing T-1209, remove jumper between 6 and 7 on transmitter-receiver unit and splice and tape the pink lead from the local handset to the pink lead which runs to terminal "LH" on remote unit. Avoid confusing the color codes which are the same for each of the seven conductor remote cables.

7 - ANTENNA AND GROUND SYSTEM

7.1 - Careful consideration must be given to constructing an efficient antenna for use with the equipment. In general, the antenna capacitance should not be less than 150 mmfd. nor more than 300 mmfd. The antenna may be of the "T", "L" or vertical rod type. In the case of a "T" or "L" type of antenna using a single wire, the total length, including lead-in should be approximately 25 to 35 feet. If a vertical rod type of antenna is used, a height of not less than 23 feet is necessary. Since antenna characteristics vary greatly between vessels, and depend upon the proximity of rigging, stacks, etc., it is necessary to "cut" the antenna to properly match the equipment. For example, if the transmitter cannot be resonated for frequencies around 2000 K.C., a larger antenna is necessary. Likewise, if resonance is not obtained around 3000 K.C., a smaller antenna is needed. A suitable deck insulator is required to bring the antenna lead through the deck to the antenna post at the top of the transmitter-receiver cabinet. Below the deck, suitable stand-off insulators (approximately 3" long) should be used for the antenna lead.

7.2 - A good low resistance ground system is highly essential. Failure to provide an adequate ground connection will seriously impair transmitter and receiver performance. If the vessel hull is metal, a 1" copper strip or a #4 AWG wire should be run from the ground stud (adjacent to terminal 16 on transmitter-receiver cabinet) to the nearest point which is an integral part of the ship's metal hull. Paint, rust, etc., should be scraped from the hull connection to insure a positive low resistance ground. With wood hull vessels, a ground plate, below the water line, having an area not less than 12 square feet, should be used. This ground plate should then be connected through copper strip, or equivalent, as directly as possible to the ground stud on the transmitter-receiver cabinet. In some cases, the ground connection may be made to the engine bed or propeller shaft, provided the length of the lead to the transmitter-receiver ground stud is not too long. Miscellaneous piping, conduits, etc., on a vessel do not provide satisfactory ground connections.

8 - TRANSMITTER ADJUSTMENTS

8.1 - CAUTION: No adjustments should be made inside the transmitter-receiver unit except by authorized personnel who are familiar with the various circuits and the voltages that are involved. Bear in mind that, whenever the radio receiver is turned on and the handset removed from its switch hook, 550 volts D. C., dangerous to life, exists on filter capacitors, transmitter tube plate leads and other parts of the circuit. Always replace handset on switch hook when reaching inside transmitter-receiver unit.

8.2 - Insert all transmitter and receiver tubes in their respective sockets, observing the tube types marked on the chassis to insure that the correct tubes are placed in the proper sockets. Insert transmitter crystals in the jacks in the upper rear section of the transmitter making certain that the crystals plug into the proper jacks to correspond to the "Trans" switch positions

8.3 - The correct adjustment for the "P. A. Tuning" should then be determined so that a record of this adjustment may be made on the calibration chart, for future use. Place meter switch in position 3 to indicate P. A. cathode current. Temporarily disconnect antenna, or adjust antenna tuning so that no antenna current is obtained. Then turn "Off-On" switch to "On", remove handset, wait 15 seconds for tubes to warm up, and press handset push button. Next adjust "P. A. Tuning" for minimum P. A. cathode current (no antenna current should flow) Repeat this operation for each transmitting frequency which is to be adjusted. Refer to paragraph 4.4 to insure that the frequency for each "Trans" switch position falls within the frequency range shown in paragraph 4.4.

8.4 - Antenna coupling should be adjusted as follows: Connect antenna. Place the "Trans" switch in a position corresponding to the lowest frequency for which the set is to be used. Adjust the seven position antenna coupling condenser switch to position 6. The first position of this switch is marked zero (0). Start the transmitter in the "Press-to-Talk" condition. Close the handset push button and rotate the antenna tuning coil for maximum antenna current. This will correspond to maximum P. A. cathode current as read by position 3 of the meter switch. The ideal power amplifier cathode current, with all circuits properly adjusted, is approximately 300 m.a. (30 on the meter). If the P. A. current is less than this value, the coupling condenser switch may be adjusted to a lower number. Lower numbers on the coupling condenser switch increases antenna coupling, while higher numbers decrease the coupling. The highest coupling is obtained when the switch is at the position marked zero (0).

8.5 - Now adjust the transmitter for the highest operating frequency and observe P. A. cathode current. In general, the P. A. cathode current will be lower on the higher frequencies because of increased antenna resistance. The point to observe in adjusting antenna coupling is to obtain the best compromise value for all operating frequencies. It is permissible to use a P. A. cathode current between 225 and 325 m.a., but every effort should be made to adjust for 300 m.a. as nearly as possible. If the set loads out too greatly, even when position 6 is used on the coupling switch, it is recommended that additional coupling capacity be connected in parallel using condensers from the spare parts that are furnished. For example, a .0015 Model F condenser may be connected in parallel to the .0015 condenser already in the set and the coupling switch then readjusted.

8.6 - Important: After the correct antenna coupling adjustment has been determined, disconnect the antenna temporarily and check the "P. A. Tuning" control setting again for minimum P. A. cathode current. The purpose of this check is to insure that the P. A. tank is kept in resonance when new antenna coupling capacity values have been selected, since variations in antenna coupling capacity will slightly detune the P. A. tank. When final scale readings for "P. A. Tuning" have been determined, for each transmitting frequency, record these settings on the calibration chart.

8.7 - After transmitter circuits have been properly adjusted, "Automatic" operation should be checked. The 50,000 ohm Vodas sensitivity control in the upper left section of the transmitter is set in the factory at maximum sensitivity (full counter-clockwise) so that it acts as a high resistance shunt on the Vodas tube. If it is found that room noises are sufficient to energize the send-receive relay, then the control should be turned clockwise just enough to keep room noises from energizing the relay. If this control is turned too far clockwise, "Automatic" or "Vodas" operation from the microphone will be unsatisfactory and excessive "clipping" will occur.

8.8 - The installation man should be familiar with the arrangement for the "interlock" connections between the "trans" switch and the send-receive relay coil. The color coded leads to the switch are to be soldered only to used switch positions, all other leads to be taped up. Without this protective feature, the power amplifier tubes would draw excessive plate current each time the send-receive relay is closed, if an attempt were made to operate the set on any switch position which is not lined up and provided with a crystal. Refer to the table below for the color code.

1 - Red	6 - Red-Black
2 - Green	7 - Green-Black
3 - Orange	8 - Orange-Black
4 - Blue	9 - Blue-Black
5 - Brown	10 - Brown-Black

8.9 - Modulation should be checked by whistling into the microphone and noting that the antenna current increases during modulation. With the meter switch in position 4 and a whistle into the microphone, the meter reading will increase to approximately 30 to 40 m.a.

9 - RECEIVER ADJUSTMENTS

9.1 - All receiver tubes should be in sockets and the appropriate receiver crystals should be in jacks to correspond to the "Recr" switch positions that are to be used. Receiver crystal jacks are located between the group of ten trimmer capacitors toward the front panel and a second group of ten trimmer capacitors toward the rear. Access to the receiver for inserting tubes and crystals, and for alignment purposes, is obtained by loosening the four thumb screws on the receiver front panel and withdrawing chassis from the cabinet approximately two-thirds out. Take care not to withdraw chassis completely as this would cause the receiver to fall out of the cabinet and be damaged. Do not run transmitter when adjusting receiver. Keep handset on hook.

9.2 - The intermediate frequency of the receiver is 455 K.C. The I. F. circuits of the receiver have been carefully aligned at the factory and should not be altered unless there is definite evidence that readjustments are required. If the I. F. circuits require realignment, an accurately calibrated 455 K.C. modulated signal generator, or test oscillator, is required. Also required is an audio output voltmeter (0-3 volt rectifier type), which is to be connected across the four ohm voice coil of the loud speaker. One terminal of loud speaker voice coil is "hot" and the other terminal is "ground". The "high side" of the signal generator should be connected through a .01 mfd. blocking capacitor to the control grid cap of the 6L7 mixer tube (104), which is the tube adjacent to the 6C5 oscillator tube (109). Do not remove normal connection to the grid cap of 6L7 mixer tube (104). Connect ground lead from signal generator to chassis of receiver. With signal generator operating at

455 K.C., modulated, carefully adjust the two screws at the top of each I. F. transformer (28, 60 and 61), until the audio output voltmeter reads maximum. Volume control on receiver should be at maximum during these adjustments and the output from the signal generator should be kept fairly low so as not to overload the receiver circuits. A clearly defined "peak" should be observed when each one of the adjusting screws on the I. F. transformers has been correctly adjusted.

9.3 - The radio frequency adjustments are made by means of capacitors 10 and 11. There are ten separate variable air, 100 mmfd., units for the R. F. amplifier grid circuit and ten similar units for the mixer grid circuit. A pair of these units, that is, one in the R. F. amplifier grid and one in the mixer grid circuit, must be adjusted for each frequency to be received, with the "Recr" switch in the appropriate position. A modulated signal generator, or test oscillator, 2000-3000 K.C. range should be used and the "high side" of the generator connected to the antenna stud at the top of the cabinet. The low side should connect to receiver chassis (ground). Dependence should not be placed upon the frequency calibration of the signal generator, and instead the test frequency should be varied slightly around its nominal calibration until maximum audio output is obtained. This is permissible because the crystal in the receiver is more accurate than the test oscillator, and, by varying the latter, the required test frequency is automatically obtained. Then, keeping the receiver volume control adjusted to a fairly low value, to avoid overload, adjust trimmer capacitors 10 and 11 for maximum audio utput. This same procedure should be followed for each position of the "Recr" switch until all changes are correctly adjusted.

9.4 - If a signal generator, or test oscillator, is not available, trimmer capacitors 10 and 11 may be adjusted by receiving a signal from another vessel, or a shore station, taking care to keep the volume control at a low setting to avoid overload. If such facilities cannot be employed, incoming atmospheric noise may be used to adjust capacitors 10 and 11, provided special care is taken not to misadjust the capacitors to "image" frequencies. Two "peaks" may sometimes be obtained on capacitors 10 and 11, one of which is the correct "peak" and the other an "image". To avoid this, look at the trimmer capacitors from the underside of receiver chassis and observe that the following adjustment has been made. When the received signal frequency is below approximately 2500 K.C., the correct "peak" setting for capacitors 10 and 11 should be such that more than half of the plates are meshed. For frequencies above 2500 K.C., less than half of the plates should be meshed. On the other hand, if image peaks, using noise, have been accidently obtained, capacitors

10 and 11 would be misadjusted so that the plates are practically all "in" (fully meshed) for frequencies above 2500 K.C., and nearly all "out" (unmeshed) for frequencies below 2500 K.C. For example, suppose 3000 K.C. is the receiving frequency, the "image" 910 K.C. lower than this value would be 2090 K.C. To resonate capacitors 10 and 11 to 2090 K.C. requires nearly all of their capacity which is obviously incorrect since the capacitors would be adjusted to use only a small fraction of their capacity when properly tuned to 3000 K.C.

10 - MAINTENANCE

10.1 - The contacts on the send-receive relay should be inspected occasionally to insure that they are clean and properly adjusted. These contacts operate in a certain sequence and care should be taken when cleaning the relay not to bend any of the springs. The correct contact sequence which should occur when the relay armature closes is:

1 - Back movable contact arm breaks circuit.
2 - Forward movable contact arms breaks circuit.
3 - Forward movable contact arm makes circuit.
4 - Back movable contact arm makes circuit.

Correct contact sequence will insure no sparking at the antenna contact and freedom from clicks in the receiver. No adjustments should be made of relay armature clearance except by competent personnel.

10.2 - If a reduction in receiver sensitivity is observed and a check of the contacts on the send-receive relay indicates good contact, then the receiver tubes should be replaced one at a time with new tubes to determine if any one of the tubes require replacement. The various D.C. voltages from the receiver rectifier output circuit may be checked with a high resistance voltmeter by referring to the values on the circuit diagram.

10.3 - In the event of difficulties with the transmitter, or receiver which are not corrected by tube replacements, conventional measurements, with an ohmmeter and a voltmeter, may be made to determine if resistors, condensers, transformers, etc. are normal.

10.4 - After the equipment has been used for a reasonable period, the commutators and brushes on the machines should be inspected and cleaned, if necessary. New brushes should be installed, if inspection shows that the brushes in the machines have worn appreciably.

10.5 - The side panels for the set should be kept firmly fastened in place, all tubes kept properly seated in their sockets and the entire equipment maintained in an orderly manner for maximum performance and reliability.

10.6 - The taps on the primary of the receiver power transformer and on the primary and secondary of the transmitter filament transformer are adjusted by the manufacturer for the specified line voltage. In special cases, due to low or high ship's line voltage, it may be desirable to change these taps, provided appropriate measurements are made of the filament voltage. In the case of the receiver transformer, that primary tap should be selected which provides as closely as possible a value of 6.3 volts at the tube sockets. In the case of the transmitter filament transformer, a primary tap may be selected whick also provides 6.3 volts at the transmitting tube socket. The secondary taps on the transmitter filament transformer should not be altered.

10.7 - The radio receiver chassis may be withdrawn by removing the four thumb screws on the receiver front panel. The 13 conductor color coded cable permanently wired to the receiver chassis terminates on the other end at the main terminal board. This cable may be disconnected from the terminal board and the cable clamp above the fuses removed temporarily. The receiver should then be pulled straight out from the cabinet, taking care not to damage the parts on the underside of the upper transmitter sub-panel. If access is required to the various parts on the underside of the transmitter upper sub-panel, it is recommended that the receiver chassis be removed as outlined above.

10.8 - Inspection of the antenna tuning rotating inductor should be made occasionally by removing the top panel from the cabinet and observing that the movable contact shoe is properly engaging the turns. After considerable use, metal filings may accumulate between turns, due to normal wear and tear, and the coil may be cleaned by using a small brush. Do not apply any lubricant to the contact shoe or its supporting rod. The movable contact shoe engages against a stop at each end of the coil when the latter is rotated to its position of minimum or maximum inductance.

10.9 - No attempt should be made to alter the coupling or tuning adjustments of the crystal oscillator output circuit, as this circuit is carefully aligned at the factory and locked.

10.10 - The modulation capability of the transmitter should be checked at regular intervals by whistling into the microphone and noting that the antenna current increases approximately 15 to 20 percent. Modulation below normal can be due to a weak crystal oscillator tube, or weak 6A6 or 809 tubes. If no modulation at all is obtained and replacement of the tubes in the transmitter with spare tubes does not correct the trouble, this is an indication of an open circuit or shorted capacitor somewhere between the microphone and the 809 modulator circuit. Use of the meter switch for checking the currents in the various circuits will be found helpful in localizing the trouble.

10.11 - If the antenna current is below normal and the antenna insulation is in good condition, replacement of the crystal oscillator tube and one or more of the power amplifier tubes should be made. Normal operation of the power amplifier circuit, with antenna detuned or disconnected, should show a value of approximately 70 m.a. (7 on the meter) of P.A. cathode current, meter switch position 3. If this circuit appears normal and little or no antenna current is obtained when the antenna tuning inductor is adjusted for resonance, then the coupling capacitors 4, 5 and 6 and the antenna coupling switch 7 should be checked. A shorted coupling capacitor will, of course, result in no antenna current.

10.12 - WARNING: Operating personnel should not attempt to measure potentials in excess of 500 volts due to hazards to life. Maintenance personnel should exercise extreme care when using external meters to measure any voltages in excess of 500 volts. Reference should be made to the circuit diagrams enclosed in the book for various voltage measurements throughout the transmitter and receiver circuits. Such voltage measurements will be found useful in locating trouble and in determining whether or not resistors or coils are open circuited or capacitors short circuited. In making voltage measurements, it is essential to use a high resistance voltmeter such as the OE-5 or a similar instrument having a resistance of at least 1000 ohms per volt. This is particularly true in measuring receiver circuit voltages, since the current drawn by the voltmeter will produce additional drop in the various resistors connected in circuit.

10.13 - In the event of complete non-operation of the transmitter or receiver unit, it is apparent that the fuses on the fuse board should be checked and that the line voltage supply also be checked. If transmitter is tested with receiver unit removed from cabinet, be sure to temporarily connect terminal 13 on main terminal board to ground, otherwise P. A. grid leak circuit will be open.

10.14 - The push button in the telephone handset may be removed for inspection or cleaning by using the Hinckley-Myers spline wrench which is supplied with the spare parts.

11 - MACHINE MAINTENANCE

Receiver Rotary Converter Transmitter Motor Generator

11.1 - The receiver inverter (rotary converter) should be inspected and lubricated once every three months, if the equipment is in more or less continuous service. The transmitter motor generator should be inspected and lubricated once every nine months.

11.2 - For lubrication of ball bearings in the receiver rotary converter and transmitter motor generator, the following lubricants, or their equivalent, are recommended:

Lubrico M-6 - Master Lubricant Company, Philadelphia, Pa.
Andoc C - Standard Oil Company of New Jersey.
Lubriplate (Ball Bearing Type) - Fiske Brothers Refining Company, Newark, N. J.

11.3 - Access to the ball bearings of the receiver rotary converter is obtained by unscrewing the plugs at the end of each bearing. The entire rotary converter should be removed from the cabinet when the machine is lubricated and inspected, by unsoldering the two D. C. input leads removing the A. C. output plug and removing the nuts from the four studs which hold the base of the converter to the bottom of the cabinet. Do not remove the round head screws which pass through the rubber shock mounts on the mounting feet of the converter itself.

11.4 - Access to the transmitter motor generator is obtained by removing the lower front panel and the rear shield on the cabinet. Then remove the end covers of this machine. Next remove the bearing cover plates, held with two screws at the ends of the bearings.

11.5 - Pack receiver rotary converter and transmitter motor generator ball bearings with clean lubricant so that the bearings are not more than one-third filled. Bearings should not be totally packed as excess grease may cause overheating and dirt may collect on commutators or collector rings. After bearings are greased, replace grease plugs on rotary converter and bearing cover plates, and also end covers on motor generator.

11.6 - At the time bearings are lubricated, the conditions of commutators, collector rings and brushes should be checked. Commutators and rings in good condition should be free from burning and pitting, and should present a smooth light brown appearance. If necessary to sand commutators or rings, use #00 sandpaper or finer. Emery cloth must not be used as metallic particles will introduce shorts between commutator bars. Normally a clean piece of canvas may be used to "buff" commutators and rings. Avoid electric shock when dressing commutators and rings with machines rotating and with power on.

11.7 - When inspecting brushes, take special care to remove one brush at a time, placing a check mark on the top surface of the brush so that, when it is replaced in brush holder, it goes back in the same relative position. (If brush is replaced inverted, it will not bear on commutator in the same manner as originally "worn in".). When brushes have worn to approximately one-half their length when new, they should be replaced with new brushes. New brushes should be "sanded in" by placing a strip of #00 sandpaper around commutator or collector ring, with the rough side toward the brush, and the armature rotated by hand to conform the brush face to the curvature of commutator or collector ring.

12 - WINDING DATA

Radio Transmitter: The numbers in parenthesis correspond to similar numbers on drawing T-1210.

12.1 - Antenna Inductor (1): Coil form Alsimag 21852, 6 inches long by 2 inches O.D., threaded for a nine turn per inch winding and wound with a total of 45 turns of #14 AWG tinned copper wire.

12.2 - Power Amplifier Tank Coils (8): Two used. Black Isolanthe type #20849 or Alsimag F-9340. 3-1/2 inches long and 2-1/2 inches O.D. Each coil wound with 22 turns of #16 AWG tinned copper wire. One of the two coils is tapped at every turn.

12.3 - Oscillator Coil Assembly (26): Primary, #26 AWG enamel, close wound with a single layer of 28-1/2 turns on bakelite form 1-1/8 inches long and 1-1/2 inches O.D. Secondary #26 AWG enamel, close wound with a single layer of 31 turns on bakelite form 4 inches long and 1-7/8 inches O.D.

12.4 - Send-receive relay Coil (49): Coil wound with 37,000 turns of #39 AWG enamel copper wire, resistance 5,000 ohms D.C.

12.5 - Filament Transformer (53):

For 115 Volt Supply - Type S-8059

Primary: #21 enamelled, 212 turns, taps at 176 and 194 turns
Secondary: #14 enamelled, 21 turns, taps at 17½ and 19½ turns
Secondary: #12 enamelled, 18 turns, center tapped.

For 32 volt Supply - Type S-8074

Primary: #15 enamelled, 57 turns, taps at 46 and 52 turns
Secondary: #14 enamelled, 21 turns, taps at 17½ and 19½ turns
Secondary: #12 enamelled, 18 turns, center tapped.

12.6 - Modulation Transformer (54): - Type T-494-A

Primary: #27 enamelled, 1560 turns, taps at 315, 630 and 1050 turns.
Secondary: #28 enamelled, 840 turns, tapped at 360 turns
Secondary: #28 enamelled, 840 turns, tapped at 480 turns

12.7 - Interstage Transformer (56): - Type T-251

Primary: #36 Enamelled, 2300 turns
Secondary: Two sections - #33 enamelled, 1000 turns each

12.8 - Driver Transformer (55): - Type T-264-A

Primary: #33 enamelled, 700 turns, taps at 400 and 600 turns.
Primary: #33 enamelled, 700 turns, taps at 100 and 300 turns.
Secondary: #33 enamelled, 900 turns, tapped at 400 and 700 turns.
Secondary: #33 enamelled, 900 turns, tapped at 200 and 500 turns.

12.9 - Microphone Transformer (57): - Type T-1

Primary: #35 enamelled, 750 turns
Primary: #35 enamelled, 750 turns
Secondary: #42 enamelled, 9380 turns

12.10 - Microphone Reactor (58): - Type T-152

#30 enamelled, 2900 turns.

Radio Receiver: The numbers in parenthesis correspond to similar numbers on drawing T-1209.

12.11 - R. F. Coil Assembly (3):

Primary Winding #31 AWG enamelled, single silk, universal wound with 33 turns to an inductance of 50 microhenries.
Secondary Winding with 10/41 Litz single layer of 58-1/2 turns to an inductance of 60 microhenries. Spacing between primary and secondary, 1/8". Coil form bakelite 2-1/4" long, 1" O.D.

12.12 - Interstage Coil Assembly (19):

Same as R. F. Coil Assembly (3)

12.13 - I. F. Transformer (28): - Type 9900

Primary 7/41 Litz, Universal wound with 330 turns with tap at 60 Turns.
Secondary 7/41 Litz, Universal wound with 330 turns.

12.14 - I. F. Transformer (60): - Type 9900

Same as I. F. Transformer (28)

12.15 - I. F. Transformer (61): - Type 9901

Primary 7/41 Litz, Universal wound for 330 turns with tap at 150 turns.
Secondary 7/41 Litz, Universal wound with 330 turns.

12.16 - Audio Output Transformer (63): - Type T-104

Primary: #36 enamelled, 2822 turns.
Secondary: #32 enamelled, 735 turns, tapped at 315 turns
Secondary: #23 enamelled, 130 turns, tapped at 68 and 97 turns

12.17 - Power Transformer (72): - Type S-7961-B

Primary: #23 enamelled, 420 turns, tapped at 350 and 385 turns
Secondary: #33 enamelled, 1920 turns, center tapped.
Secondary: #16 enamelled, 19 turns.
Secondary: #18 enamelled, 24 turns.

13 - VACUUM TUBES

13.1 - All tubes supplied with the equipment or as spares on the equipment contract shall be used in the equipment prior to employment of tubes from general stock.

13.2 - List of Tubes Employed:

In The Transmitter

1 - Type 807 tube as Class "C" Oscillator, Crystal controlled (93)
4 - Type 807 tubes as Class "C" Amplifiers, plate modulated (94-95-96-97).
2 - Type 809 tubes as push pull Class "B" Modulators (101-102).
1 - Type 6A6 tube as push pull Class "B" Audio Driver (99).
1 - Type 6A6 tube as Class "A" Microphone Audio Amplifier (98).
1 - Type 6A6 tube as Vodas Audio Rectifier (100).

In The Receiver

1 - Type 6L7 tube as Radio Frequency Amplifier (103).
1 - Type 6L7 tube as Mixer (104).
1 - Type 6L7 tube as First I.F. Amplifier (105).
1 - Type 6L7 tube as Second I.F. Amplifier (106).
1 - Type 6C5 tube as Class "C" Oscillator, Crystal Controlled (109).
1 - Type 6R7 tube as Second Detector-First Audio Amplifier (107).
1 - Type 6V6 tube as Class "A" Second Audio Amplifier (108).
1 - Type 5W4 tube as power rectifier (110).

13.3 - The vacuum tubes used in this equipment must be operated at their correct filament potential in order to obtain satisfactory tube life. Excessive line voltage supply will result in over-voltage on the vacuum tubes, while subnormal supply voltage will result in reducing emission from the filaments and in time a decrease in performance. Reference should be made to the instructions in paragraphs 17.6 for cases where the supply voltage is regularly high or low.

13.4 - The following tabulation compares the operation of the tubes, as used in the equipment, with the maximum ratings as specified by the tube manufacturer.

13.5 - Type 807 tube as Class "C" Oscillator, crystal controlled.

	Full Load Operating Data	Maximum Rating
Plate Voltage	550 Volts	600 Volts
Plate current	50 m.a.	100 m.a.
Plate Dissipation	18 Watts	25 Watts
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.9 Amps	.9 Amps
Control Grid Volts (DC)	Minus 25 Volts	Minus 90 Volts
Control Grid Current (DC)	1 m.a.	3.5 m.a.
Screen Grid Voltage	150 Volts	300 Volts
Screen Grid Watts	1 Watt	2.5 Watts

13.6 - Type 807 tube as Class "C" Amplifier, plate modulated.

Plate Voltage	550 Volts	600 Volts
Plate current	80 m.a.	100 m.a.
Plate Dissipation	22 Watts	25 Watts
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.9 Amps	.9 Amps
Control Grid Volts (DC)	Minus 50 Volts	Minus 90 Volts
Control Grid Current (DC)	3 m.a.	3.5 m.a.
Screen Grid Voltage	200 Volts	300 Volts
Screen Grid Watts	2.5 Watts	2.5 Watts

13.7 - Type 809 tube (2 are used) as push pull, Class "B" Modulators.

Plate Voltage	550 Volts	750 Volts
Plate Current	40 m.a.	100 m.a.
Plate Dissipation	22 Watts	25 Watts
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	2.5 Amps	2.5 Amps
Control Grid Volts (DC)	0 Volts	0 Volts

13.8 - Type 6A6 tube as push pull Class "B" Audio Driver.

Plate Voltage	300 Volts	300 Volts
Plate Current	35 m.a.	35 m.a.
Plate Dissipation	10 Watts	10 Watts
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.8 Amps	.8 Amps

13.9 - Type 6A6 tube as Class "A" Microphone Audio Amplifier.

	Full Load Operating Data	Maximum Rating
Plate Voltage	270 Volts	300 Volts
Plate Current	7 m.a.	7 m.a.
Plate Dissipation	5.4 Watts	10 Watts
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.8 Amps	.8 Amps
Control Grid Voltage (DC)	Minus 6 Volts	Minus 6 Volts

13.10 - Type 6A6 tube as Vodas Audio Rectifier.

This tube is used as a simple full wave rectifier with the two grids functioning as anodes and with the two plates connected to the cathode to deliver approximately 3 m.a. at 150 volts D.C. for the send-receive relay coil.

13.11 - Type 6L7 tube as Class "A" Radio Frequency Amplifier.

Plate Voltage	210 Volts	300 Volts
Screen Voltage	90 Volts	100 Volts
Plate Dissipation	1 Watt	1.5 Watt
Screen Dissipation	.5 Watt	1 Watt
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.3 Amps	.3 Amps

13.12 - Type 6L7 tube as Mixer.

Plate Voltage	180 Volts	300 Volts
Screen Voltage	90 Volts	150 Volts
Plate Dissipation	.8 Watts	1 Watt
Screen Dissipation	.8 Watts	1.5 Watts
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.3 Amps	.3 Amps

13.13 - Type 6L7 tube as Class "A" I.F. Amplifier in First and Second Stages.

Same as Type 6L7 tube in paragraph 20.11

13.14 - Type 6C5 tube as Crystal Controlled R.F. Oscillator.

Plate Voltage	150 Volts	250 Volts
Plate Dissipation	.75 Watts	2.5 Watts
Plate Current	5 m.a.	8 m.a.
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.3 Amps	.3 Amps

13.15 - Type 6R7 tube as Second Detector and First Audio Amplifier.

	Full Load Operating Data	Maximum Rating
Plate Voltage	90 Volts	250 Volts
Plate Dissipation	.18 Watts	2.5 Watts
Plate Current	2 m.a.	9.5 m.a.
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	3 Amps	.3 Amps

13.16 - Type 6V6 Class "A" Second Audio Amplifier.

Plate Voltage	200 Volts	315 Volts
Screen Voltage	200 Volts	250 Volts
Plate Dissipation	6 Watts	12 Watts
Screen Dissipation	.8 Watts	2 Watts
Plate Current	30 m.a.	34 m.a.
Screen Current	4 m.a.	2.2 m.a.
Filament Voltage	6.3 Volts	6.3 Volts
Filament Current	.45 Amps	.45 Amps

13.17 - Type 5W4 tube as Full Wave Rectifier.

Peak Inverse Voltage	700 Volts	1400 Volts
Peak Inverse Plate Current (per plate)	200 m.a.	300 m.a.
DC Output Current	80 m.a.	100 m.a.
Filament Voltage	5 Volts	5 Volts
Filament Current	1.5 Amps	1.5 Amps

13.18 - In the above tabulation of transmitter tubes, the type 807 power amplifier tubes are operated as plate modulated power amplifiers between CCS and ICAS ratings. Due to the naturally intermittant nature of the load on these tubes in "send-receive" operation, normal average tube life will be obtained.

14 - COASTAL HARBOR STATIONS AND CRYSTAL LIST

HARBOR STATION	CALL LETTERS	TRANS. CRYS.	RECR. CRYS.	RECR. FREQ.
Boston	WOU	2110	2051	2506
San Francisco	KLH	2110	2051	2506
Miami	WDR	2118	2059	2514
Lorain	WMI	2118	2059	2514
Port Washington	WAD	2118	2059	2514
Duluth	WAS	2118	2059	2514
Lake Bluff	WAY	2118	2059	2514
New York (2nd Channel)	WOX	2126	2067	2522
Seattle	KOW	2126	2067	2522
San Juan	WCT	2134	2075	2530
Galveston	KQP	2134	2075	2530
Norfolk	WGB	2142	2083	2538
Tampa	WFA	2158	2095	2550
Lorain	WMI	2158	2095	2550
Port Washington	WAD	2158	2095	2550
Duluth	WAS	2158	2095	2550
Lake Bluff	WAY	2158	2095	2550
Wilmington (Delaware City)	WEH	2166	2103	2558
Ocean Gate	WAQ	2166	2103	2558
Charleston	WER	2174	2111	2566
Los Angeles (San Pedro)	KOU	2174	2111	2566
All Great Lakes Stations	(Calling)	2182	2637	2182
New York (1st Channel)	WOX	2198	2135	2590
New Orleans	WAK	2206	2143	2598
Astoria (Oregon)	KFX	2206	2143	2598
Portland (Oregon)	KQX	2206	2143	2598
U.S. Coast Guard Stations		2670	2215	2670
Intership		2738	2283	2738
C & D & Cape Cod Canals		2350	2805	2350
Second Intership Channel		2638	2183	2638
Buffalo	WBL	2118	2059	2514
Buffalo	WBL	2158	2095	2550

MODEL TCP-2

INSTRUCTIONS FOR POWER CONVERSION KIT

The following instructions apply with respect to 32 volt power conversion kit, when the latter is furnished, so that TCP-2 equipment, normally built for 115 volt D. C. supply, may be changed over for operation on 32 volts D. C.

The following units comprise a 32 volt kit. The symbol designations referred to are the same as those shown in the tables, circuit diagrams and photographs in the instruction book:

Quantity	Symbol Designation	Part
1	-	Nameplate, MODEL TCP-2, 32 V. DC (with blank serial number pad)
1	-	Nameplate, TYPE CRM-43009-A, 32 V. DC (with blank serial number pad)
1	-	Line Filter Unit, type CRM-53085, 32 V. DC.
1	53	Transformer, transmitter filament, Kenyon Type S-8074.
1	72	Fuse, cartridge, 2", renewable, 250 V, 15 amp.
1	73	Fuse, glass, Littelfuse Type 3-AG, 250 V, 10 amp.
1	76	R.F. Choke, transmitter motor generator input, Ohmite Type 3230
1	85	Motor Generator, transmitter, type ET-8012-B, Pioneer #ss-2049, 31 V. DC input.
1	86	Motor Generator Starter, GE CR-4052-Y1, cat. 6932935-G-15, 32 V. DC.
1	86b	Resistor, starter coil shunt, IRC type BT-2, 2 W, 2000 ohms. (Mounted in Starter).
1	87	Rotary Converter, receiver, type W-1144-B, Pioneer #SS-1173, 32V. DC input.

SPARE PARTS
32 VOLT POWER CONVERSION KIT

12	6 (sec. 5)	Fuse Link, 3", 250 V, 60 Amp.
12	72	Fuse Link, 2", 250 V, 15 Amp.
12	73	Fuse, glass, Littelfuse Type 3-AG, 250 V, 10 amp.
1	86b	Resistor, starter coil shunt, IRC Type BT-2, 2 watt, 2000 ohms.
2 sets	-	Brushes, for motor generator type ET-8012-B, SS-2049.
2 sets	-	Brushes, for rotary converter type W-1144-B, SS-1173
1	-	Filter Assembly, for rotary converter as above.
1	-	Starter Coil, #22D104 G3

To replace the existing 115 volt D.C. units with the equivalent 32 volt units, certain precautions should be observed as outlined below:

Line Filter Unit: Remove CRM-53086 line filter unit (115 volt) and replace with CRM-53085 line filter unit (32 volt).

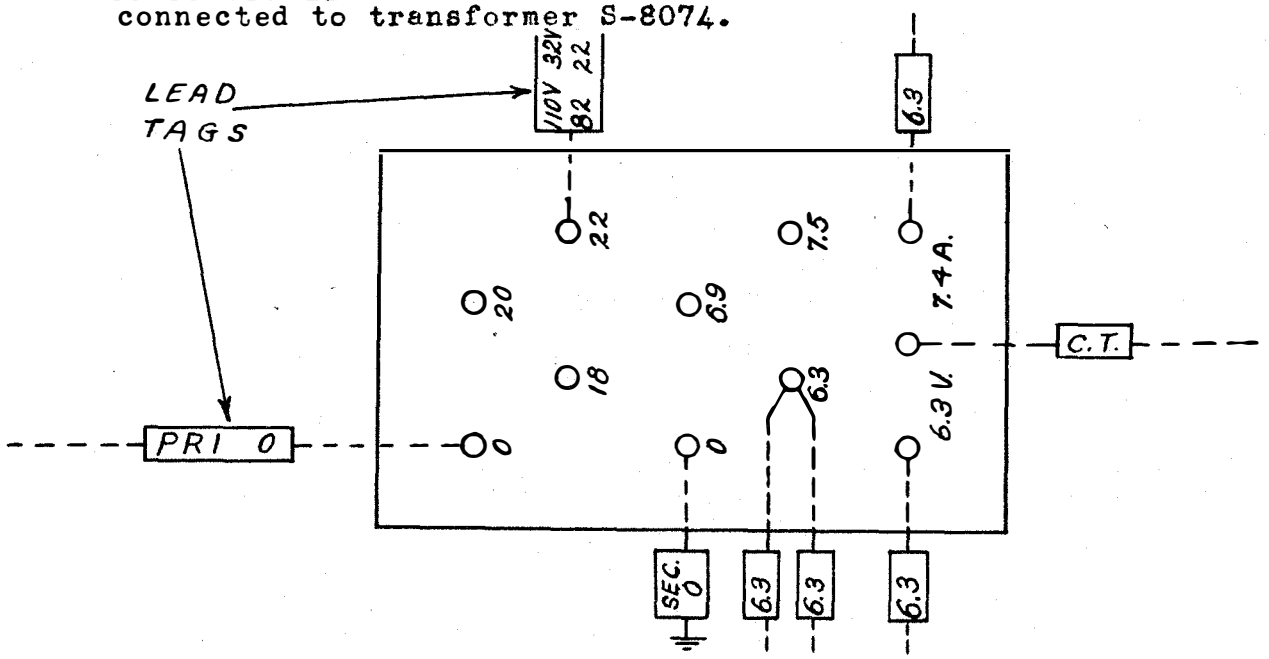
Transmitter Motor Generator: Remove motor generator SS-2048 (115 volt D.C.) and replace with motor generator SS-2049 (32 volt D.C.). In performing this operation, care should be taken to retain the leads to the terminal board in their same relative position so that transposition of wiring will not occur when the 32 volt machine is connected.

Receiver Rotary Converter: Remove rotary converter SS-1172 (115 volt D.C.) and replace with rotary converter SS-1173 (32 volt D.C.).

Transmitter Motor Generator R. F. Choke: Remove present type Z-22 choke and replace with type 3230. This choke is mounted underneath the rear end of the transmitter motor generator.

Fuses: Remove 250 volt, 10 amp, cartridge fuse and replace with 250 volt, 15 amp, cartridge fuse. Remove 250 volt, 3 amp, glass fuse and replace 250 volt, 10 amp, glass fuse (type 3-AG).

Filament Transformer: Remove radio receiver and turn set upside down to provide access to the soldered terminals at the base of the filament transformer. This is transformer symbol 53. Carefully unsolder leads, keeping them in their same relative position and then remove transformer S-8059. Replace with transformer S-8074. Refer to sketch below to identify the various leads as they are to be connected to transformer S-8074.



Nameplates: Install the Model and Type nameplates which are furnished.

Motor Starter: Remove present 115 volt D.C. motor starter and replace with catalog 6932935-G-15 starter for 32 volts D.C. When this is done, observe carefully the connections to the starter so that they are not transposed when the 32 volt unit is connected. The starter lead marked "Htr" is a lead which connects to the terminal marked "L2", drawing T-1210. Terminal "L2" is actually the connection for the heater type overload relay on the motor starter. Other starter leads are marked "A2", "A1-L1", and "2". The 2000 ohm, 2 watt, starter coil shunt resistor, symbol 86b, will be found already connected and mounted on the 32 volt starter.

May 1942

TABLE NO. I

LIST OF MAJOR UNITS

MODEL TCP-2 - RADIOTELEPHONE EQUIPMENT

CONTRACT NXSR 36947 Dated September 6, 1943

Navy Type Designation.	Name	Assembly Drawing
CRM-43009-A	Transmitter-Receiver (32 Volts)	KS-12
CRM-43010-A	Transmitter-Receiver (115 Volts)	KS-12
CRM-53085	Line Filter Unit (32 Volts)	KS-15
CRM-53086	Line Filter Unit (115 Volts)	KS-15
CRM-51026	Hand Telephone Assembly	KS-14
CRM-23230	Remote Control Unit	KS-13
	60 Ft. Length 7 Conductor - - Remote Control Cable	
	1 Set of Vacuum Tubes	
	4 Type R1 Transmitter Crystals	KS-63
	4 Type R1 Receiver Crystals	KS-63
	2 Metal Spare Parts Box (Navy Specs 42-B-9 (INT))	
	1 Set Spare Tubes and Spare Parts (See Table IV)	
	2 Instruction Books	

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 1 - TRANSMITTER PARTS ONLY - REFERENCE DRAWING T-1210

CRM-43009-A - 32 VOLTS D.C.

CRM-43010-A - 115 VOLTS D.C.

32 Volts	115 Volts	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING & PART NUMBER
				CAPACITORS - CLASS 48						
		*4	Ant. Coupling Capacitor	Mica, .0015 mfd., plus or minus 10% 1000 V, D.C. Working	None	None	1	Type A-50	None	CA-138
		*5	Ant. Coup. Capacitor (2 Used)	Mica, .0002 mfd., plus or minus 10% 3000 V, D.C. Test	None	None	1	Type C	None	CA-108
		*6	Ant. Coup. Capacitor (4 Used)	Mica, .0001 mfd., plus or minus 10% 3000 V, D.C. Test	None	None	1	Type C	None	CA-98
		9	P.A. Tank Capacitor	Air, .0001 mfd., plus or minus 5% 1000 V, D.C. 42 Plates	None	None	2	MT-100-GD	None	CA-33
		*10	P.A. Blocking Capacitor	Mica, .002 mfd., plus or minus 10% 5000 V, D. C. Test	None	None	3	Model NF	None	CA-146
		*14	P.A. Screen Capacitor	Mica, .002 mfd., plus or minus 10% 5000 V, D.C. Test	None	None	3	Model NF	None	CA-146
		*15	P.A. Filament Capacitor	Mica, .01 mfd., plus or minus 10% 2500 V, D.C. Test	None	None	3	Model NF	None	CA-181
		*19	P.A. Cathode Capacitor	Mica, .02 mfd., plus or minus 10% 1000 V, D.C. Test	None	None	3	Model NF	None	CA-197
		*24	Osc. Coup. Capacitor	Mica, .00005 mfd., plus or minus 10% 5000 V, D.C. Test	None	None	3	Model NF	None	CA-93
		25	P.A. Grid Capacitor	Air, .0001 mfd., plus or minus 5% 500 V, D.C. Working 19 Plates	None	None	2	Type S-6941	None	CA-58
		30	Osc. Plate Capacitor	Air, .00014 mfd., plus or minus 5% 500 V, D.C. Working 27 Plates	None	None	2	Type S-7041	None	CA-19
		*31	Osc. Plate By-Pass Capacitor	SAME AS 15	-	-	-	---	-	-
		*32	Osc. Screen By-Pass Capacitor	SAME AS 15	-	-	-	---	-	-
		*35	Osc. Grid Capacitor	Mica, .000025 mfd., plus or minus 10% 1000 V, D.C. Test	None	None	1	Type D	None	CA-86
		*36	Osc. Cathode Capacitor	Mica, .00025 mfd., plus or minus 10% 5000 V, D.C. Test	None	None	3	Model NF	None	CA-115
		*45	Meter Capacitor	Mica, .01 mfd., plus or minus 10% 1000 V, D.C. Test	None	None	1	Type B-10	None	CA-175
		*59	Microphone Capacitor	Paper, 4 mfd., plus 10% minus 2½% 600 V, D.C. Working	None	None	4	9CE5A24	None	CA-236
		*66	Audio Cathode Capacitor	SAME AS 59	-	-	-	---	-	-
		*67	Audio Plate Capacitor	SAME AS 59	-	-	-	---	-	-
		*68	Driver Plate Capacitor	Paper, 10 mfd., plus 10%, minus 2½% 600 V, D.C. Working	None	None	4	9CE5A28	None	CA-246
		*69	Main Filter Capacitor	SAME AS 59	-	-	-	---	-	-

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II
PARTS LIST BY SYMBOL DESIGNATION
SECTION 1 - TRANSMITTER PARTS ONLY - REFERENCE DRAWING T-1210
CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.

32 Volts	115 Volts	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING PART NUMBER
				CAPACITORS - CLASS 48 (Cont'd)						
		*79	Filter Capacitor (2 Used)	Paper, .1 mfd, plus 10% minus 2½% 1000 V, D.C. Working	None	None	4	9CE6A14	None	CA-202
		*80	Filter Capacitor (2 Used)	SAME AS 79	-	-	-	---	-	-
		*81	Filter Capacitor (2 Used)	SAME AS 79	-	-	-	---	-	-
		*82	Motor Capacitor (2 Used)	SAME AS 45	-	-	-	---	-	-
		*83	Slip Ring Capacitor (2 Used)	SAME AS 45	-	-	-	---	-	-
		*84	Generator Capacitor (2 Used)	Mica, .01 mfd, plus or minus 10% 2500 V., D.C. Test	None	None	1	Type B-25 or H-25	None	CA-185
		*88	Keying Capacitor	SAME AS 79	-	-	-	---	-	-
				MOTOR GENERATOR AND ROTARY CONVERTER - CLASS 21						
X		* 85	Transmitter Motor Generator	See Page 5 Inst. Book for complete rating	None	None	22	SS-2049	None	MG-2
	X	* 85	Transmitter Motor Generator	See Page 5 Inst. Book for complete rating	None	None	22	SS-2048	None	MG-4
X		* 87	Receiver Rotary Converter	See Page 5 Inst. Book for complete rating	None	None	22	SS-1173	None	CVR-4
	X	* 87	Receiver Rotary Converter	See Page 5 Inst. Book for complete rating	None	None	22	SS-1172	None	CVR-16
				FUSES - CLASS 28						
X		*72	Converter Motor Fuse	250 V, 15 Amp, 2" renewable link	None	None	5	Standard	None	FS-19
	X	*72	Converter Motor Fuse	250 V, 10 Amp, 2" renewable link	None	None	5	Standard	None	FS-17
X		*73	Filament Primary Fuse	25 V, 10 Amp, Glass, Littelfuse, 1-1/4" long	None	None	6	Type 3-AG	None	FS-16
	X	*73	Filament Primary Fuse	250 V, 3 Amp, Glass, Littelfuse, 1-1/4" long	None	None	6	Type 3-AG	None	FS-10
		*74	High Voltage Fuse	3000 V, .75 Amp, 5-7/16" long	None	None	6	Type 2113	None	FS-6
		*75	Converter Output Fuse	250V, 1 Amp, Glass, Littelfuse, 1-1/4" long	None	None	6	Type 3-AG	None	FS-7
				INDICATING LAMPS -						
		*18	Pilot Light	Mazda 40, 6.3 V, 0.15 Amps Miniature Base, Brown bead	None	None	4	Type 40	None	IA-5
				JACKS AND RECEPTACLES - CLASS 49						
		40	Crystal Jack Assembly	10 Prs of Gen. Radio Type 274-J Jacks	None	None	21	Type 274-J	None	JK-6
				RELAYS - CLASS 29						
		*49	Send-Receive Relay	Double Pole Double Throw. 5000 ohm coil	None	None	7	Type A-1662	None	RL-33
				R. F. TRANSFORMERS - INDUCTORS - CHOKES - CLASS 47						
		1	Ant. Loading Inductor	34 Microhenries Total, 45 Turns	None	None	8	Type 8020-A	None	CL-11
		8	P.A. Tank Inductor (2 Used)	Each Inductor 22 Turns #16 AWG, 16 microhenries Eash Coil tapped every turn	None	None	8	Special	None	CL-8
		*11	P.A. Plate Choke	1 Millihenry, 6 Ohms	None	None	9	Type R-154	None	CH-8

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV.

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 1 - TRANSMITTER PARTS ONLY - REFERENCE DRAWING T-1210

CRM-43009-A - 32 VOLTS D.C.

CRM-43010-A - 115 VOLTS D.C.

32 Volts	115 Volts	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING PART NUMBER
				R. F. TRANSFORMERS - INDUCTORS - CHOKES - CLASS 47 (Cont'd)						
		*13	P.A. Screen Choke (4 Used)	50 Ohms with 10 turns #14 Bare Wire in Parallel	None	None	12	Type BW-1	None	CH-21
		*20	P.A. Grid Choke	SAME AS 11	-	-	-	---	-	-
		26	Osc. Coil Assembly	Prim. 28½ Turns #26 AWG, Sec. 31 Turns #26 AWG	None	None	8	Special	None	TR-47
		*34	Osc. Cathode Choke	SAME AS 11	-	-	-	---	-	-
X		* 76	Motor Choke	2 Sections, each sec. 20 turns #10 AWG	None	None	11	Type 3230	None	CH-1
	X	* 76	Motor Choke	2 Sections, each sec. 30 turns #12 AWG	None	None	11	Type Z-22	None	CH-4
		* 77	A.C. Choke	2 Sections, each sec. 35 turns #22 AWG	None	None	11	Type Z-20	None	CH-2
		* 78	High Voltage Choke	SAME AS 77	-	-	-	---	-	-
				TRANSFORMERS AND REACTORS: POWER AND AUDIO - CLASS 30						
X		* 53	Filament Transformer	Prim. 18, 20 & 22 Volts. Sec. 1 - 6.3, 6.9, 7.5 Volts, 4.65 Amps Sec. 2 - 6.3 Volts, 7.4 Amps - Total Sec. 82 W	None	None	10	Type S-8074	None	TP-3
	X	* 53	Filament Transformer	Prim. 68, 75, 82 Volts. Sec. 1 - 6.3, 6.9, 7.5 Volts, 4.65 Amps Sec. 2 - 6.3 Volts, 7.4 Amps - Total Sec. 82 W	None	None	10	Type S-8059	None	TP-4
		* 54	Modulation Transformer	Prim. to match plate to plate load of two 809 tubes Sec. to modulate class "C" load of 550 volts, 300 m.a., D.C.	None	None	10	Type T-494-A	None	TA-7
		* 55	Driver Transformer	Prim. to match plate to plate load of 6A6 Tube Sec. to match grids of two 809 tubes	None	None	10	Type T-264-A	None	TA-12
		* 56	Interstage Transformer	Prim. to match parallel plates of 6A6 tube Sec. to match grids of 6A6 tube	None	None	10	Type T-251	None	TA-9
		* 57	Microphone Transformer	Prim. to match carbon microphone Sec. to match parallel grids of 6A6 tube	None	None	10	Type T-1	None	TA-2
		* 58	Microphone Reactor	D.C. Resistance 100 Ohms, 10 Henries	None	None	10	Type T-152	None	XL-13
				METERS - CLASS 22						
		*2	Antenna Current Ammeter	Ammeter 0-8 Amps, R.F., Internal Thermocouple 3½" flush, phenolic case	None	None	35	S-1159626	None	AM-17
		*47	Osc.,P.A.,Mod.,Cathode - P.A. grid,Relay Coil Ammeter	Milliammeter D.C., 0-50 m.a., 3½" flush, phenolic case	None	None	35	S-1159724	None	AM-28

*SPARE PARTS FURNISHED: For Actual quantity of spare parts, refer to Table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 1 - TRANSMITTER PARTS ONLY - REFERENCE DRAWING T-1210

CRM-43009-A - 32 VOLTS D.C.

CRM-43010-A - 115 VOLTS D.C.

32 Volts	115 Volts	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING & PART NUMBER
				RESISTORS - CLASS 63						
		*3	Antenna Drain Resistor	2 Megohms, 1 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-257
		*12	P.A.Screen Resistors (2 Used)	5000 Ohms, 5 W, plus or minus 10%, Carbon	None	None	14	Type D5ST2	None	RE-183
		*16	P.A.Plate Resistors (4 Used)	15 Ohms, 5W, plus or minus 10%, Wire Wound	None	None	12	Type AA-3-B(PW-2003)	None	RE-29
		*17	P.A.Grid Resistors (4 Used)	SAME AS 16	-	-	-	---	-	-
		*21	P.A. Grid Resistors (2 Used)	SAME AS 12	-	-	-	---	-	-
		*22	Meter Shunt Resistor	25 Ohms, 5 W, plus or minus 5%, Wire Wound	None	None	12	Type AA-3-B	None	RE-45
		*23	Osc. Load Resistors (2 Used)	10,000 Ohms, 2 W, plus or minus 10%, Metallized	None	None	12	Type BT-2	None	RE-194
		*27	Osc. Grid Resistor	SAME AS 16	-	-	-	---	-	-
		*28	Osc. Plate Resistor	SAME AS 16	-	-	-	---	-	-
		*29	Osc. Screen Resistors (2 Used)	100,000 Ohms, 2 W, plus 0, minus 20% Metallized	None	None	12	Type BT-2	None	RE-235
		*33	Osc. Screen Resistor	20,000 Ohms, 2 W, minus 0, plus 20%, Carbon	None	None	13	Standard	None	RE-208
		*37	Osc. Grid Resistor	25,000 Ohms, 1 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-214
		*38	Osc. Crystal Resistor	100 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-64
		*41	Meter Shunt Resistor	2 Ohms, 5 W, plus or minus 5%, Wire Wound	None	None	12	Type AA	None	RE-10
		*42	Keying Resistor	50,000 Ohms, 2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-230
		*43	Meter Shunt Resistor	0.22 Ohms, plus or minus 5%, Wire Wound	None	None	15	Type 1-FX	None	RE-1
		*44	Meter Shunt Resistor	SAME AS 43	-	-	-	---	-	-
		*50	Meter Shunt Resistor	SAME AS 22	-	-	-	---	-	-
		*51	Relay Coil Resistor	25,000 Ohms, 2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-215
		*52	Vodas Sensitivity Control Resistor	50,000 Ohms, plus or minus 10%, Carbon Variable	None	None	12	9851-9058	None	RM-47
		*60	Audio Grid Resistor	50,000 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-227
		*61	Audio Cathode Resistor	750 Ohms, 5 W, plus or minus 10%, Carbon	None	None	14	Type D5ST2	None	RE-126
		*62	Audio Plate Resistor	40,000 Ohms, 5 W, plus or minus 10%, Carbon	None	None	14	Type D5ST2	None	RE-225
		*63	Voltage Divider Resistor	200 Ohms, 5 W, plus or minus 10%, Carbon	None	None	14	Type D5ST2	None	RE-80
		*64	Voltage Divider Resistor (4 Used)	SAME AS 12	-	-	-	---	-	-
		*65	Voltage Divider Resistor (4 Used)	10,000 Ohms, 5 W, plus or minus 10%, Carbon	None	None	14	Type D5ST2	None	RE-196
		*70	Vodas Resistor (2 Used)	1000 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-133
X		*86b	Starter Coil Shunt Resistor	2000 Ohms, 2 W, plus or minus 10%, Metallized	None	None	12	Type BT-2	None	RE-148
	X	*86t	Starter Coil Shunt Resistor	SAME AS 23	-	-	-	---	-	-
		*89	Keying Filter Resistor	500 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-108
		*90	Osc. Keying Resistor	SAME AS 42	-	-	-	---	-	-
		*91	Coup. Capacitor Resistor	SAME AS 23	-	-	-	---	-	-

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 1 - TRANSMITTER PARTS ONLY - REFERENCE DRAWING T-1210

CRM-43009-A - 32 VOLTS D.C.

CRM-43010-A - 115 VOLTS D.C.

32 Volts	115 Volts	SYMBOL DESIG	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING & PART NUMBER
				SWITCHES - CLASS 24						
		7	Ant. Coup. Switch	S P, 7 position, shorting type	None	None	17	22291-HIC	None	SW-27
		39	Trans. Frequency Switch	3 Pole, 10 position	None	None	18	Type 8012-B	None	SW-67
		46	Meter Switch	2 Pole, 5 position	None	None	17	22432-HIC	None	SW-57
		48	Handset Switch	4 Pole, double throw	None	None	17	22431-HIC	None	SW-70
		*71	On-Off Switch	Double Pole, single throw	None	None	19	Type 80600	None	SW-38
		*92	Handset Speaker Switch	Single Pole, double throw	None	None	19	Type 21350	None	SW-11
				VACUUM TUBES - CLASS 38						
		*93	Crystal Osc. Tube	Transmitting Beam Power Tube	None	None	3	Type 807	None	
		*94	Power Amplifier Tube	SAME AS 93	None	None	3	Type 807	None	
		*95	Power Amplifier Tube	SAME AS 93	-	-	-	---	-	-
		*96	Power Amplifier Tube	SAME AS 93	-	-	-	---	-	-
		*97	Power Amplifier Tube	SAME AS 93	-	-	-	---	-	-
		*98	Microphone Amplifier Tube	Twin Triode Amplifier	None	None	3	Type 6A6	None	
		*99	Audio Driver Tube	SAME AS 98	None	None	3	Type 6A6	None	
		*100	Vodas Audio Rect. Tube	SAME AS 98	None	None	3	Type 6A6	None	
		*101	Modulator Tube	Class "F" Triode	None	None	3	Type 809	None	
		*102	Modulator Tube	SAME AS 101	None	None	3	Type 809	None	
				MOTOR GENERATOR STARTER - CLASS 21						
X		86	Motor Generator Starter	3 Step Constant Accellorator Type	None	None	4	CR-4052-Y1 6932935-G-15	None	STR-2
	X	86	Motor Generator Starter	3 Step Constant Accellorator Type	None	None	4	CR-4052-Y1 6932935-G-16	None	STR-3

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II
PARTS LIST BY SYMBOL DESIGNATION
SECTION 2 - RECEIVER PARTS ONLY - REFERENCE DRAWING T-1209
CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.

32 Volts	115 Volts	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING & PART NUMBER
				CAPACITORS - CLASS 4B						
		*4	By-Pass Capacitor	Mica, .01 mfd., plus or minus 10% 1000 V, D.C. Test	None	None	1	Type BE-10	None	CA-177
		*9	Filter Capacitor	Paper, .1.1.1 mfd., plus or minus 10% 300 V, D.C. Working	None	None	4	5239320-G1	None	CA-206
		10	R.F. Tun. Capacitor (10 used)	Var.Air,100 mmfd, 500 V DC Test, 27 Plates	None	None	36	AP-9	None	CA-56
		11	Mixer Tun. Capacitor (10 used)	SAME AS 10	-	-	-	---	-	-
		*15	Coupling Capacitor	Mica, 100 mmfd., plus or minus 10% 1000 V, D.C. Test	None	None	1	Type D	None	CA-63
		*16	Coupling Capacitor	SAME AS 15	-	-	-	---	-	-
		*18	By-Pass Capacitor	SAME AS 15	-	-	-	---	-	-
		*20	Coupling Capacitor	Mica, 200 mmfd., plus or minus 10% 1000 V, D. C. Test	None	None	1	Type D	None	CA-66
		*26	By-Pass Capacitor	SAME AS 9	-	-	-	---	-	-
		*29	By-Pass Capacitor	SAME AS 4	-	-	-	---	-	-
		*32	By-Pass Capacitor	SAME AS 9	-	-	-	---	-	-
		*50	Equalizing Capacitor	Mica, .004 mfd., plus or minus 10% 5000 V, D.C. Test	None	None	3	Model NF	None	CA-159
		*51	Coupling Capacitor	SAME AS 4	-	-	-	---	-	-
		*52	Coupling Capacitor	SAME AS 4	-	-	-	---	-	-
		*53	Volume Control Capacitor	Paper, .1 mfd., plus or minus 10% 200 V, D.C. Working	None	None	24	Type Z-282	None	CA-201
		*54	By-Pass Capacitor	SAME AS 15	-	-	-	---	-	-
		*55	By-Pass Capacitor	SAME AS 4	-	-	-	---	-	-
		*56	By-Pass Capacitor	Mica, 100 mmfd., plus or minus 10% 1000 V, D.C. Test	None	None	1	Type BE-10	None	CA-63
		*57	By-Pass Capacitor	SAME AS 56	-	-	-	---	-	-
		*58	By-Pass Capacitor	SAME AS 9	-	-	-	---	-	-
		*59	AVC Capacitor	SAME AS 4	-	-	-	---	-	-
		*62	Diode Capacitor	SAME AS 15	-	-	-	---	-	-
		*74	Filter Capacitor	Paper, 2 mfd., plus or minus 10% 600 V, D.C. Working	None	None	4	5225569	None	CA-231
		*75	Filter Capacitor	Electrolytic, 24 mfd., plus or minus 20% 350 V, D.C. Working	None	None	33or34	W-3630or SJ 174	None	CA-251
		*79	Bias Capacitor	Electrolytic, 25 mfd., plus or minus 20% 50 V, D.C. Working	None	None	25	EDJ-3250	None	CA-252
				INDICATING LAMPS -						
		*81	Pilot Light	Mazda 40, 6.3 V, 0.15 Amps Miniature Base, Brown Bead	None	None	4	Type 40	None	LA-5

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 2 - RECEIVER PARTS ONLY - REFERENCE DRAWING T-1209

CRM-43009-A - 32 VOLTS D.C.

CRM-43010-A - 115 VOLTS D.C.

32 Volts	115 Volts	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING & PART NUMBER
				JACKS AND RECEPTACLES - CLASS 49						
		12	Crystal Jack Assembly	10 Prs of Gen. Radio Type 274-J Jacks	None	None	21	Type 274-J	None	JK-6
				R. F. TRANSFORMERS - INDUCTORS - CHOKES - CLASS 47						
		3	Ant. R. F. Transformer.	Prim. Univ. Wound, 33 T, #31 Sin. Enam.Silk Sec. 58½ Turns 10/41 Litz, single layer	None	None	8	Special	None	TR-1
		*17	Osc. Cathode Choke	2.5 Millihenries, 125 m.a., 50 ohms	None	None	9	Type R-100	None	CH-13
		19	Interstage R.F. Transformer	SAME AS 3	-	-	-	---	-	-
		28	First I.F. Transformer	Prim. 7/41 Litz Univ. Wound, 330 Turns with tap at 60 Turns Sec. 7/41 Litz Univ. Wound, 330 Turns	None	None	26	Type 9900	None	TI-3
		60	Second I.F. Transformer	SAME AS 28	-	-	-	---	-	-
		61	Third I.F. Transformer	Prim. 7/41 Litz Univ. Wound, 330 Turns with tap at 150 Turns Sec. 7/41 Litz Univ. Wound, 330 Turns	None	None	26	Type 9901	None	TI-4
				TRANSFORMERS AND REACTORS: POWER AND AUDIO - CLASS 30						
		* 63	A. F. Output Transformer	Prim. to match plate circuit of 6V6 tube Sec. 1 to match 4 ohm load Sec. 2 to match 200 ohm load	None	None	10	Type T-104	None	TA-18
		* 72	Power Transformer	Prim. tapped for 100, 110, 120 V, 60 Cycle Sec. 1.250-0-250 V, A.C. for 80 m.a. D.C. load Sec. 2, 5 V, 2 Amp Sec. 3, tapped for 6.3 V, 3 amp	None	None	10	S-7961-B	None	TP-10
		* 73	Rectifier Filter Reactor	30 henries, 90 m.a., 350 ohms	None	None	10	Type T-153	None	XL-18
				RESISTORS - CLASS 63						
		*5	Grid Resistors	100,000 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-234
		*6	Screen Resistor	25,000 Ohms, 1 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-213
		*7	Screen Resistor	10,000 Ohms, 2 W, plus or minus 10%, Metallized	None	None	12	Type BT-2	None	RE-194
		*8	Plate Resistor	2500 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-151
		*14	Grid Resistor	SAME AS 5	-	-	-	---	-	-
		*21	Grid Resistor	500,000 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-245
		*22	Plate Resistor	10,000 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-190
		*23	Screen Resistor	SAME AS 6	-	-	-	---	-	-
		*24	Screen Resistor	SAME AS 7	-	-	-	---	-	-
		*25	Plate Resistor	SAME AS 8	-	-	-	---	-	-
		*27	Grid Resistor	SAME AS 5	-	-	-	---	-	-
		*30	Screen Resistor	SAME AS 6	-	-	-	---	-	-
		*31	Screen Resistor	SAME AS 7	-	-	-	---	-	-
		*33	Plate Resistor	SAME AS 8	-	-	-	---	-	-

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II
PARTS LIST BY SYMBOL DESIGNATION
SECTION 2 - RECEIVER PARTS ONLY - REFERENCE DRAWING T-1209
CRM-43009-A - 32 VOLTS D.C.
CRM-43010-A - 115 VOLTS D.C.

32 Volts	115 Volts	SYMBOL DESIG	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING & PART NUMBER
				RESISTORS - CLASS 63 (Cont'd)						
		*34	Cathode Resistor	500 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-108
		*35	AVC Resistor	SAME AS 21	-	-	-	---	-	-
		*36	Screen Resistor	SAME AS 6	-	-	-	---	-	-
		*37	Screen Resistor	SAME AS 7	-	-	-	---	-	-
		*38	Plate Resistor	SAME AS 8	-	-	-	---	-	-
		*39	Diode Resistor	50,000 ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-227
		*40	Diode Resistor	SAME AS 21	-	-	-	---	-	-
		*41	AVC Resistor	250,000 Ohms, 1/2 W, plus or minus 10%,Carbon	None	None	13	Standard	None	RE-243
		*42	Coupling Resistor	SAME AS 5	-	-	-	---	-	-
		*43	Grid Resistor	1 Megohm, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-252
		*44	Plate Resistor	SAME AS 5	-	-	-	---	-	-
		*45	Grid Resistor	SAME AS 43	-	-	-	---	-	-
		*46	Grid Resistor	SAME AS 21	-	-	-	---	-	-
		*47	Plate Resistor	25,000 Ohms, 2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-215
		*48	Grid Resistor	SAME AS 5	-	-	-	---	-	-
		*49	Audio Limit Resistor	100 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-64
		*66	Ringer Resistor	50,000 Ohms, 2 W, plus or minus 10%, Metallized	None	None	12	Type BT-2	None	RE-230
		*67	Ringer Resistor	SAME AS 66	-	-	-	---	-	-
		*68	Bias Limit Resistor	50,000 Ohms, 1/2 W, plus or minus 10%, Metallized	None	None	12	Type BT-2	None	RE-227
		*69	Volume Control Resistor	250,000 Ohms, Plus or minus 10%, Variable (includes switch 65)	None	None	12	9852-5241	None	RH-51
		*70	Isolating Resistor	5000 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-171
		*76	Bias Resistor	125 Ohms, 1 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-76
		*77	Bias Resistor	SAME AS 76	-	-	-	---	-	-
		*78	Bias Resistor	2 Units connected in Parallel (Each Unit SAME AS 76)	-	-	-	---	-	-
				SWITCHES - CLASS 24						
		13	Receiver Freq. Switch	3 Gang, 10 position	None	None	17	22290-H3C	None	SW-68
		*71	Volume Switch	Single Pole, double throw	None	None	19	Type 21350	None	SW-11
				VACUUM TUBES - CLASS 38						
		*103	R.F.Amplifier Tube	Pentagrid Mixer Amplifier	None	None	3	Type 6L7	None	
		*104	Mixer Tube	SAME AS 103	None	None	3	Type 6L7	None	
		*105	First I.F. Amplifier Tube	SAME AS 103	None	None	3	Type 6L7	None	
		*106	Second I.F. Amplifier Tube	SAME AS 103	-	-	-	---	-	-
		*107	Detector - 1st Aud. Amp. Tube	Duo Diode Triode (2nd Detector)	None	None	3	Type 6R7	None	
		*108	Audio Output Tube	Beam Power Amplifier	None	None	3	Type 6V6	None	

*SPARE PARTS FURNISHED: For actual quantity of spare parts, refer to Table IV

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 2 - RECEIVER PARTS ONLY - REFERENCE DRAWING T-1209

CRM-43009-A - 32 VOLTS D.C.

CRM-43010-A - 115 VOLTS D.C.

32 Volts	115 Volts	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING & PART NUMBER
				VACUUM TUBES - CLASS 38 (Cont'd)						
		*109	Oscillator Tube	Triode Amplifier Oscillator	None	None	3	Type 6C5	None	
		*110	Rectifier Tube	Full Wave High Vacuum Rectifier	None	None	3	Type 5W4	None	
		111	Ringer Amplifier Tube (not used in TCP-2)	SAME AS 109	None	None	3	Type 6C5	None	
				LOUD SPEAKER- CLASS 49						
		*64	Loud Speaker	Permanent Magnet Moving Coil, 3" Cone	None	None	27	PM-3-19268	None	LSR-1
				SECTION 3 - HAND TELEPHONE ASSEMBLY PARTS ONLY - REFERENCE DRAWING T-1210 CRM-51026						
		*1	Handset	Combination Microphone, Telephone Receiver and Press-to-Talk Push Button	None	None	28	F3-AW-3	None	HA-1
		2	Switch Hook Assembly	1 Single Pole double throw, 2 single pole single throw contact springs	None	None	28	Type G2-3	None	SW-14
		*3	Equalizing Resistor	500 ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-108
		*4	Equalizing Resistor	SAME AS 3	-	-	-	---	-	-
		*5	Push Button Resistor	10,000 Ohms, 1/2 W, plus or minus 10%,Carbon	None	None	13	Standard	-	RE-190
				SECTION 4 - REMOTE CONTROL UNIT PARTS ONLY - REFERENCE DRAWING T-1209 CRM-23230						
		*1	Handset	Combination Microphone, Telephone Receiver and Press-to-Talk Push Button	None	None	28	F3-AW-3	None	HA-1
		2	Switch Hook Assembly	1 Single Pole double throw, 2 single pole single throw contact springs	None	None	28	Type G2-3	None	SW-14
		*3	Equalizing Resistor	500 ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-108
		*4	Equalizing Resistor	SAME AS 3	-	-		---	-	-
		*5	Push Button Resistor	10,000 Ohms, 1/2 W, plus or minus 10%,Carbon	None	None	13	Standard	None	RE-190
		*6	Volume Switch	Single Pole, double throw	None	None	19	Type 21350	None	SW-11
		7	Volume Control	5000 Ohms, plus or minus 10%, Carbon, Variable, Type CS.	None	None	12	9852-5636	None	RH-39
		*8	Loud Speaker	Permanent Magnet moving coil, 3" Cone	None	None	27	PM-3-19268	None	LSR-1
		9	Bell (not used with TCP-2)	5 Volt A.C.	None	None	28	Type 156	None	BL-1

*SPARE PARTS FURNISHED: For actual quanitty of spare parts, refer to Table IV

TABLE NO. II
PARTS LIST BY SYMBOL DESIGNATION
SECTION 5 - LINE FILTER PARTS ONLY - REFERENCE DRAWING T-1209
CRM-53085 - FOR TCP-2 32 VOLTS D.C.
CRM-53086 - FOR TCP-2 115 VOLTS D.C.

32 Volts	115 Volts	SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR's DRAWING & PART NUMBER
X		* 1	Line Filter Choke	2 Sections, each sect. 20 turns #10 AWG	None	None	11	Type 3230	None	CH-1
	X	* 1	Line Filter Choke	2 Sections, each sect. 30 turns #12 AWG	None	None	11	Type Z-22	None	CH-4
X		* 2	Line Filter Choke	SAME AS 1	-	-	-	---	-	-
	X	* 2	Line Filter Choke	SAME AS 1	-	-	-	---	-	-
		3	Line Switch	Double Pole Single Throw	None	None	4	269846	-	SW-45
		* 4	Filter Capacitor	Mica, .01 mfd., plus or minus 10%, 2500 V, D.C. Test	None	None	3	Model NF	None	CA-181
		* 5	Filter Capacitor	SAME AS 4	-	-	-	---	-	-
X		6	Line Fuse	60 Amp, 250 V, Renewable 3" Cartridge	None	None	5	Standard	None	FS-30
	X	6	Line Fuse	30 Amp, 250 V, Renewable 2" Cartridge	None	None	5	Standard	None	FS-25
X		6a	Fuse Link	60 Amp, 250 Volts	None	None	5	Standard	None	FL-15
	X	6a	Fuse Link	30 Amp, 250 Volts	None	None	5	Standard	None	FL-10
				SECTION 6 - MISCELLANEOUS PARTS ONLY - REFERENCE DRAWINGS (NONE)						
		1	Vacuum Tube Socket	4 Prong Mycalex Insulation	None	None	30	4 Prong Spec.	None	SKT-6
		2	Vacuum Tube Socket	5 Prong Mycalex Insulation	None	None	30	5 Prong Spec.	None	SKT-11
		3	Vacuum Tube Socket	7 Prong Phenolic Insulation	None	None	31	12-DNO	None	SKT-17
		4	Vacuum Tube Socket	8 Prong Ceramic Insulation	None	None	9	CIR	None	SKT-23
X		* 5	Motor Starter Contact & Springs	Complete set of contacts and springs for Catalog 6932935-G-15 Starter	None	None	4	See Descrip.	None	CON-1
	X	* 5	Motor Starter Contact & Springs	Complete set of contacts and springs for Catalog 6932935-G-16 Starter	None	None	4	See Descrip.	None	CON-1
X		* 6	Motor Starter Coil	Starter Coil for Cat. 6932935-G-15 Starter	None	None	4	22D-104-G3	None	CL-93
	X	* 6	Motor Starter Coil	Starter Coil for Cat. 6932935-G-16 Starter	None	None	4	22D-104-G1	None	CL-117
	X	* 7	Motor Brushes for M.G.	2 Brushes with Springs & Caps for SS-2048 1/2" X 3/8" X 7/8" L. Grade HM-6782	None	None	22	See Descrip.	None	BRU-6 ø
X		* 7	Motor Brushes for M.G.	2 Brushes with Springs & Caps for SS-2049 1/2" X 3/8" X 7/8" L. Grade CM-9	None	None	22	See Descrip.	None	BRU-53 øø
		* 8	D.C. Generator Brushes for M.G.	2 Brushes with springs and caps for SS-2048 or SS-2049 1/2" X 1/4" X 7/8" L. Grade CM5H	None	None	22	See Descrip.	None	-----
		* 9	A.C. Generator Brushes for M.G.	2 Brushes with springs and caps for SS-2048 or SS-2049 3/8" X 1/8" X 7/8" L. Grade HM-6782	None	None	22	See Descrip.	None	-----
	X	* 10	Motor Brushes for Rot. Conv.	2 Brushes with Springs & Caps for SS-1172 3/8" X 1/4" X 7/8" L. Grade E-21	None	None	22	See Descrip.	None	BRU-2 øøø
X		* 10	Motor Brushes for Rot. Conv.	2 Brushes with Springs & Caps for SS-1173 3/8" X 1/4" X 7/8" L. Grade CM5H	None	None	22	See Descrip.	None	BRU-1 øøøø
		* 11	Generator Brushes for Rot.Conv.	2 Brushes with Springs & Caps for SS-1172 or SS-1173 3/8" X 1/4" X 7/8" L. Grade E-21	None	None	22	See Descrip.	None	-----

ø RMCA Part No. BRU-6 consists of a complete set of 6 brushes (2 motor, 2 D.C. Gen. & 2 A.C. Gen) for the SS-2048 M.G.
øø RMCA Part No. BRU-53 consists of a complete set of 6 brushes (2 motor, 2 D.C. Gen. & 2 A.C. Gen) for the SS-2049 M.G.
ø RMCA Part No. BRU-2 consists of a complete set of 4 brushes (2 motor & 2 A.C. Gen) for SS-1172 Rot. Conv.
øø RMCA Part No. BRU-1 consists of a complete set of 4 brushes (2 motor & 2 A.C. Gen) for SS-1173 Rot. Conv.

TABLE NO. II

PARTS LIST BY SYMBOL DESIGNATION

SECTION 6 - MISCELLANEOUS PARTS ONLY - REFERENCE DRAWINGS (NONE) Continued

CRM-53085 - FOR TCP-2 32 VOLTS D.C.

CRM-53086 - FOR TCP-2 115 VOLTS D.C.

		SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE DESIG.	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING & PART NUMBER
X		* 12	Filter Assembly for Rec. Conv.	Complete Filter Unit for SS-1173 Rot. Conv.	None	None	22	See Descrip.	None	FLT-2
	X	* 12	Filter Assembly for Rec. Conv.	Complete Filter Unit for SS-1172 Rot. Conv.	None	None	22	See Descrip.	None	FLT-1
		* 13	Spline Wrench	Hinckley Myers Wrench for removing handset push button	None	None	32	"RMCA"	None	TO-5
X		* 14ø	Starter Resistor	1.6 Ohm Resistor	None	None	4	2229471G6	None	----
	X	* 14ø	Starter Resistor	3 Ohm Resistor	None	None	4	2229471G15	None	----
X		* 15ø	Starter Resistor	.7 Ohm Resistor	None	None	4	2229471G6	None	----
	X	* 15ø	Starter Resistor	2.25 Ohm Resistor	None	None	4	2229471G15	None	----
X		* 16	Motor Gen. Bearings	Bearings for Motor Gen. SS-2049	None	None	39	8502	None	----
	X	* 16	Motor Gen. Bearings	Bearings for Motor Gen. SS-2048	None	None	39	8502	None	----
X		* 17	Rot. Conv. Bearings	Bearings for Rot. Conv. SS-1173	None	None	39	8502	None	----
	X	* 17	Rot. Conv. Bearings	Bearings for Rot. Conv. SS-1172	None	None	39	8502	None	----
		* 18	Sliders (4)	For Rotating R. F. Inductor	None	None	8	-----	None	----
		* 19	Plate Leads (5)	With #91 Alden Caps	None	None	8	-----	None	----
		* 20	Plate Leads (2)	With #12 National Clips	None	None	8	-----	None	----
		* 21	Shock Mounts	Lord Type 200-PH-25	None	None	37	200-PH-25	None	----
		* 22	Shock Mounts	Lord Type 200-XPH-75	None	None	37	200-XPH-75	None	----

ø Symbol Designations 14 and 15 in this Section are built as one unit.

TABLE NO. III
PARTS LIST BY SYMBOL DESIGNATION
(To show which items are of identical construction)

NOTE: Following code is used to identify which parts are in transmitter, receiver, hand telephone assembly, etc. Symbol designations preceded by
(S1) are transmitter parts
(S2) are receiver parts
(S3) are Hand Telephone Ass. Parts
(S4) are Remote control parts
(S5) are Line filter parts
(S6) are Miscellaneous parts

EXAMPLE: (S1) 4 is same as symbol 4, in section I, Table II.

QUAN.	NAVY TYPE NO.	SYMBOL DESIGNATION
		CAPACITORS - CLASS 48
1		(S1) 4
1		(S1) 5
1		(S1) 6
1		(S1) 9
2		(S1) 10, 14
5		(S1) 15, 31, 32 (S5) 4, 5
1		(S1) 19
1		(S1) 24
1		(S1) 25
1		(S1) 30
1		(S1) 35
1		(S1) 36
4		(S1) 45, 82, 83,
4		(S1) 59, 66, 67, 69
1		(S1) 68
4		(S1) 79, 80, 81, 88
6		(S2) 4, 29, 51, 52, 55, 59
6		(S2) 9, 10, 11, 26, 32, 58
5		(S2) 15, 16, 18, 54, 62
1		(S2) 20
1		(S2) 50
1		(S2) 53
2		(S2) 56, 57
1		(S2) 74
1		(S2) 75
1		(S2) 79
1		(S1) 84
		MOTOR GENERATOR AND ROTARY CONVERTER - CLASS 21
1		(S1) 85 (For 32 Volts)
1		(S1) 87 (For 32 Volts)
1		(S1) 85 (For 115 Volts)
1		(S1) 87 (For 115 Volts)

TABLE NO. III
PARTS LIST BY SYMBOL DESIGNATION
(To show which items are of identical construction)

NOTE: Following code is used to identify which parts are in transmitter, receiver, hand telephone assembly, etc. Symbol designations preceded by
(S1) are transmitter parts
(S2) are receiver parts
(S3) are Hand Telephone Ass. Parts
(S4) are Remote control parts
(S5) are Line Filter parts
(S6) are Miscellaneous parts

EXAMPLE: (S1) 4 is same as symbol 4, in section I, Table II.

QUAN.	NAVY TYPE NO.	SYMBOL DESIGNATION
		FUSES - CLASS 28
1		(S1) 72 (32 V)
1		(S1) 72 (115 V)
1		(S1) 73 (32 V)
1		(S1) 73 (115 V)
1		(S1) 74
1		(S5) 6 (32 V)
1		(S5) 6 (115 V)
1		(S1) 75
		INDICATING LAMPS
2		(S1) 18, (S2) 81
		JACKS AND RECEPTACLES - CLASS 49
2		(S1) 40, (S2) 12
		RELAYS - CLASS 29
1		(S1) 49
		R. F. TRANSFORMERS - INDUCTORS - CHOKES - CLASS 47
1		(S1) 1
1		(S1) 8
3		(S1) 11, 20, 34
1		(S1) 13
1		(S1) 26
3		(S1) 76, (S5)1, 2 (32 V)
3		(S1) 76, (S5)1, 2 (115 V)
2		(S1) 77, 78
2		(S2) 3, 19
1		(S2) 17
2		(S2) 28, 60
1		(S2) 61

TABLE NO. III
PARTS LIST BY SYMBOL DESIGNATION
(To show which items are of identical construction)

NOTE: Following code is used to identify which parts are in transmitter, receiver, hand telephone assembly, etc. Symbol designations preceded by
(S1) are transmitter parts
(S2) are receiver parts
(S3) are Hand Telephone Ass. Parts
(S4) are Remote control parts
(S5) are Line filter parts
(S6) are Miscellaneous parts

EXAMPLE: (S1) 4 is same as symbol 4, in section I, Table II.

QUAN.	NAVY TYPE NO.	SYMBOL DESIGNATION
		TRANSFORMERS AND REACTORS: POWER AND AUDIO - CLASS 30
1		(S1) 53 (32 V)
1		(S1) 53 (115 V)
1		(S1) 54
1		(S1) 55
1		(S1) 56
1		(S1) 57
1		(S1) 58
1		(S2) 63
1		(S2) 72
1		(S2) 73
		METERS - CLASS 22
1		(S1) 2
1		(S1) 47
		RESISTORS - CLASS 63
1		(S1) 3
3		(S1) 12, 21, 64
4		(S1) 16, 17, 27, 28
3		(S1) 22,
7		(S1) 23, 86b (115 V), 91. (S2) 7, 24, 31, 37
1		(S1) 29
1		(S1) 33
5		(S1) 37. (S2) 6, 23, 30, 36
2		(S1) 38. (S2) 49.
1		(S1) 41
2		(S1) 42, 90
2		(S1) 43, 44
2		(S1) 51. (S2) 47
1		(S1) 52
3		(S1) 60. (S2) 39,68
1		(S1) 61
1		(S1) 62
1		(S1) 63
1		(S1) 65

TABLE NO. III
PARTS LIST BY SYMBOL DESIGNATION
(To show which items are of identical construction)

NOTE: Following code is used to identify which parts are in transmitter, receiver, hand telephone assembly, etc. Symbol designations preceded by
(S1) are transmitter parts
(S2) are receiver parts
(S3) are Hand Telephone Ass. Parts
(S4) are Remote control parts
(S5) are Line filter parts
(S6) are Miscellaneous parts

EXAMPLE: (S1) 4 is same as symbol 4, in section I, Table II.

QUAN.	NAVY TYPE NO.	SYMBOL DESIGNATION
		RESISTORS - CLASS 63 (Cont'd)
1		(S1) 70
1		(S1) 86b (32 V)
6		(S1) 89. (S2) 34. (S3) 3, 4. (S4) 3, 4.
6		(S2) 5, 14, 27, 42, 44, 48
4		(S2) 8, 25, 33, 38
4		(S2) 21, 35, 40, 46
3		(S2) 22. (S3) 5. (S4) 5
1		(S2) 41
2		(S2) 43, 45
2		(S2) 66, 67
1		(S2) 69
1		(S2) 70
3		(S2) 76, 77, 78
1		(S4) 7,
		SWITCHES--CLASS 24
1		(S1) 7
1		(S1) 39
1		(S1) 46
1		(S1) 48
1		(S1) 71
3		(S1) 92, (S2) 71, (S4) 6.
1		(S2) 13
2		(S3) 2, (S4) 2.
1		(S5) 3

TABLE NO. III
PARTS LIST BY SYMBOL DESIGNATION
(To show which items are of identical construction)

NOTE: Following code is used to identify which parts are in transmitter, receiver, hand telephone assembly, etc. Symbol designations preceded by
(S1) are transmitter parts
(S2) are receiver parts
(S3) are Hand Telephone Ass. Parts
(S4) are Remote control parts
(S5) are Line filter parts
(S6) are Miscellaneous parts.

EXAMPLE: (S1) 4 is same as symbol 4, in section I, Table II.

QUAN.	NAVY TYPE NO.	SYMBOL DESIGNATION
		VACUUM TUBES - CLASS 38
5		(S1) 93, 94, 95, 96, 97
3		(S1) 98, 99, 100
2		(S1) 101, 102
4		(S2) 103, 104, 105, 106
1		(S2) 107
1		(S2) 108
2		(S2) 109, 111 (111 Not Used in TCP-2)
1		(S2) 110
		LOUD SPEAKER - CLASS 49
2		(S2) 64. (S4) 8.
		HANDSET
2		(S3) 1. (S4) 1.
		BELL
1		(S4) 9 (Not used in TCP-2)
		FUSE LINKS
1		(S5) 6a (32 V)
1		(S5) 6a (115 V)
		MOTOR GENERATOR STARTER - CLASS 21
1		(S1) 86 (32 V)
1		(S1) 86 (115 V)

TABLE NO. III
PARTS LIST BY SYMBOL DESIGNATION
(To show which items are of identical construction)

NOTE: Following code is used to identify which parts are in transmitter, receiver, hand telephone assembly, etc.
Symbol designations preceded by (S1) are transmitter parts
(S2) are receiver parts
(S3) are Hand Telephone Ass. Parts
(S4) are Remote control parts
(S5) are Line filter parts
(S6) are Miscellaneous parts

EXAMPLE: (S1) 4 is same as symbol 4, in section I, Table II.

QUAN.	NAVY TYPE NO.	SYMBOL DESIGNATION
		VACUUM TUBE SOCKETS
1		(S6) 1
1		(S6) 2
1		(S6) 3
1		(S6) 4
		MOTOR STARTER CONTACTS
1		(S6) 5 (32 V)
1		(S6) 5 (115 V)
		BRUSHES
1		(S6) 7
1		(S6) 8
1		(S6) 9 (32 V)
1		(S6) 9 (115 V)
1		(S6) 10 (32 V)
1		(S6) 10 (115 V)
1		(S6) 11 (32 V)
1		(S6) 11 (115 V)
		FILTER ASSEMBLY
1		(S6) 12 (32 V)
1		(S6) 12 (115 V)
		SPLINE WRENCH
1		(S6) 13
		MOTOR STARTER COIL
1		(S6) 6 (32 V)
1		(S6) 6 (115 V)

TABLE NO. IV
SPARE PARTS LIST BY SYMBOL DESIGNATION

NOTE: Numbers in parenthesis, preceding symbol designation, refer to corresponding section in Table II. EXAMPLE: (S1) 4 is same as symbol 4, in section 1, Table II.

32 Volts	115 Volts	QUAN.	SYMBOL DESIGNATION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING & PART NUMBER
				CAPACITORS - CLASS 48						
		1	(S1) 4	Mica, .0015 mfd., plus or minus 10% 1000 V. D.C. Working	None	None	1	Type A-50	None	CA-138
		1	(S1) 5	Mica, .0002 mfd., plus or minus 10% 3000 V. D.C. Test	None	None	1	Type C	None	CA-108
		1	(S1) 6	Mica, .0001 mfd., plus or minus 10% 3000 V. D.C. Test	None	None	1	Type C	None	CA-98
		1	(S1) 10, 14	Mica, .002 mfd., plus or minus 10% 5000 V. D.C. Test	None	None	3	Model NF	None	CA-146
		1	(S1) 15, 31, 32 (S5) 4, 5	Mica, .01 mfd., plus or minus 10% 2500 V. D.C. Test	None	None	3	Model NF	None	CA-181
		1	(S1) 19	Mica, .02 mfd., plus or minus 10% 1000 V. D.C. Test	None	None	3	Model NF	None	CA-197
		1	(S1) 24	Mica, .00005 mfd., plus or minus 10% 5000 V. D.C. Test	None	None	3	Model NF	None	CA-93
		1	(S1) 35	Mica, .000025 mfd., plus or minus 10% 1000 V. D.C. Test	None	None	1	Type D	None	CA-86
		1	(S1) 36	Mica, .00025 mfd., plus or minus 10% 5000 V. D.C. Test	None	None	3	Model NF	None	CA-115
		1	(S1) 45, 82, 83,	Mica, .01 mfd., plus or minus 10% 1000 V. D.C. Test	None	None	1	Type B-10	None	CA-175
		2	(S1) 59, 66, 67, 69	Paper, 4 mfd., plus 10%, minus 2½% 600 V. D.C. Working	None	None	4	9CE5A24	None	CA-236
		1	(S1) 68	Paper, 10 mfd., plus 10%, minus 2½% 600 V. D.C. Working	None	None	4	9CE5A28	None	CA-246
		2	(S1) 79, 80, 81, 88	Paper, .1 mfd., plus 10%, minus 2½% 1000 V. D.C. Working	None	None	4	9CE6A14	None	CA-202
		1	(S1) 84	Mica, .01 mfd., plus or minus 10% 2500 V. D.C. Test	None	None	1	Type B-25 or H-25	None	CA-185
		2	(S2) 4, 29, 51, 52, 55, 59	Mica, .01 mfd., plus or minus 10% 1000 V. D.C. Test	None	None	1	Type BE-10	None	CA-177
		2	(S2) 9, 26, 32, 58	Paper, .1.1.1 mfd., plus or minus 10% 300 V. D.C. Working	None	None	4	5239320-G1	None	CA-206
		1	(S2) 15, 16, 18, 54, 62	Mica, 100 mmfd., plus or minus 10% 1000 V. D.C. Test	None	None	1	Type D	None	CA-63
		1	(S2) 20	Mica, 200 mmfd., plus or minus 10% 1000 V. D.C. Test	None	None	1	Type D	None	CA-66
		1	(S2) 50	Mica, .004 mfd., plus or minus 10% 5000 V. D.C. Test	None	None	3	Model NF	None	CA-159
		1	(S2) 53	Paper, .1 mfd., plus or minus 10% 200 V. D.C. Working	None	None	24	Type Z-282	None	CA-201

TABLE NO. IV
SPARE PARTS LIST BY SYMBOL DESIGNATION

NOTE: Numbers in parenthesis, preceding symbol designation, refer to corresponding section in Table II. EXAMPLE: (S1) 4 is same as symbol 4, in section 1, Table II.

32 Volts	115 Volts	QUAN.	SYMBOL DESIGNATION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING PART NUMBER
				CAPACITORS - CLASS 48 (Cont'd)						
		1	(S2) 56, 57	Mica, 100 mmfd., plus or minus 10% 1000 V. D.C. Test	None	None	1	Type BE-10	None	CA-63
		1	(S2) 74	Paper, 2 mfd., plus or minus 10% 600 V. D.C. Working	None	None	4	5225569	None	CA-231
		2	(S2) 75	Electrolytic, 24 mfd., plus or minus 20% 350 V. D.C. Working	None	None	33or34	W-3630 or SJ 174	None	CA-251
		2	(S2) 79	Electrolytic, 25 mfd., plus or minus 20% 50 V. D.C. Working	None	None	25	EDJ-3250	None	CA-252
				FUSES - CLASS 28						
X		2	(S1) 72	250 V, 15 Amp, 2" renewable (with 10 ExtraLinks)	None	None	5	Standard	None	FS-19
	X	2	(S1) 72	250 V, 10 Amp, 2" renewable (with 10 ExtraLinks)	None	None	5	Standard	None	FS-17
X		10	(S1) 73	25 V, 10 Amp, Glass, Littelfuse, 1¼" long	None	None	6	Type 3-AG	None	FS-16
	X	10	(S1) 73	250 V, 3 Amp, Glass, Littelfuse, 1¼ long	None	None	6	Type 3-AG	None	FS-10
		10	(S1) 74	3000 V, .75 Amp, 5-7/16" long	None	None	6	Type 2113	None	FS-6
		10	(S1) 75	250V, 1 Amp, Glass, Littelfuse, 1¼" long	None	None	6	Type 3-AG	None	FS-7
X		2	(S5) 6	60 Amp, 250 V, Renewable 3" (with 10 ExtraLinks)	None	None	5	Standard	None	FS-30
	X	2	(S5) 6	30 Amp, 250 V, Renewable 2" (with 10 ExtraLinks)	None	None	5	Standard	None	FS-25
				INDICATING LAMPS						
		2	(S1) 18. (S2) 81	Mazda 40, 6.3 V, 0.15 Amps Miniature Base, brown bead	None	None	4	Type 40	None	LA-5
				RELAYS - CLASS 29						
		1	(S1) 49	Double Pole Double Throw, 5000 ohm coil	None	None	7	Type A-1662	None	RL-33
				R. F. TRANSFORMERS - INDUCTORS - CLASS 47						
		1	(S1) 11, 20, 34	1 Millihenry, 6 Ohms	None	None	9	Type R-154	None	CH-8
		1	(S1) 13	50 Ohms with 10 turns #14 Bare Wire in Parallel	None	None	12	Type BW-1	None	CH-21
		1	(S2) 17	2.5 Millihenries, 125 m.a., 50 ohms	None	None	9	Type R-100	None	CH-15
				METERS - CLASS 22						
		1	(S1)2	Ammeter 0-5 Amps, R.F., Internal Thermocouple 3½" flush, phenolic case	None	None	35	S-1159626	None	AM-17
		1	(S1) 47	Milliammeter D.C., 0-50 m.a. 3½" flush, phenolic	None	None	35	S-1159724	None	AM-28

TABLE NO. IV
SPARE PARTS LIST BY SYMBOL DESIGNATION

NOTE: Numbers in parenthesis, preceding symbol designation, refer to corresponding section in Table II. EXAMPLE: (S1) 4 is same as symbol 4, in section 1, Table II.

32 Volts	115 Volts	QUAN.	SYMBOL DESIGNATION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING & PART NUMBER
				RESISTORS - CLASS 63						
		1	(S1) 3	2 Megohms, 1 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-257
		3	(S1) 12, 21, 64	5000 Ohms, 5W, plus or minus 10%, Carbon	None	None	14	Type D5ST2	None	RE-183
		4	(S1) 16, 17, 27, 28	15 Ohms, 5W, plus or minus 10%, Wire Wound	None	None	12	Type AA-3-B(PW-2003)	None	RE-129
		2	(S1) 22, 50.	25 Ohms, 5W, plus or minus 5%, Wire Wound	None	None	12	Type AA-3-B	None	RE-45
		7	(S1) 23, 86b (115V), 91 (S2) 7, 24, 31, 37	10,000 Ohms, 2W, plus or minus 10%, Metallized	None	None	12	Type BT-2	None	RE-194
		1	(S1) 29	100,000 Ohms, 2W, plus 0, minus 20%, Metallized	None	None	12	Type BT-2	None	RE-235
		1	(S1) 33	20,000 Ohms, 2W, minus 0, plus 20%, Carbon	None	None	13	Standard	None	RE-208
		5	(S1) 37, (S2) 6, 23, 30, 36	25,000 Ohms, 1W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-214
		2	(S1) 38, (S2) 49	100 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-64
		1	(S1) 41	2 Ohms, 5W, plus or minus 5%, Wire Wound	None	None	12	Type AA-3-B	None	RE-10
		2	(S1) 42, 90	50,000 Ohms, 2W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-230
		2	(S1) 43, 44	0.22 Ohms, plus or minus 5%, Wire Wound	None	None	15	Type 1-FX	None	RE-1
		2	(S1) 51, (S2) 47	25,000 Ohms, 2W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-215
		1	(S1) 52	50,000 Ohms, plus or minus 10%, Carbon Variable	None	None	12	Type 510	None	RH-47
		3	(S1) 60, (S2) 39, 68	50,000 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-227
		1	(S1) 61	750 Ohms, 5W, plus or minus 10%, Carbon	None	None	14	Type D5ST2	None	RE-126
		1	(S1) 62	40,000 Ohms, 5W, plus or minus 10%, Carbon	None	None	14	Type D5ST2	None	RE-225
		1	(S1) 63	200 Ohms, 5W, plus or minus 10%, Carbon	None	None	14	Type D5ST2	None	RE-80
		1	(S1) 65	10,000 Ohms, 5W, plus or minus 10%, Carbon	None	None	14	Type D5ST2	None	RE-196
		1	(S1) 70	1000 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-133
X		1	(S1) 86b (32 V)	2000 Ohms, 2W, plus or minus 10%, Metallized	None	None	12	Type BT-2	None	RE-148
		6	(S1) 89, (S2) 34, (S3) 3, 4, (S4) 3, 4,	500 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-108
		6	(S2) 5, 14, 27, 42, 44, 48	100,000 Ohms, 1/2W, Plus or minus 10%, Carbon	None	None	13	Standard	None	RE-234
		4	(S2) 8, 25, 33, 38	2500 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-151
		4	(S2) 21, 35, 40, 46	500,000 Ohms, 1/2W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-245
		3	(S2) 22, (S3) 5, (S4) 5,	10,000 Ohms, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-190
		1	(S2) 41	250,000 Ohms, 1/2W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-243
		2	(S2) 43, 45	1 Megohm, 1/2 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-252
		2	(S2) 66, 67	50,000 Ohms, 2 W, plus or minus 10%, Metallized	None	None	12	Type BT-2	None	RE-230
		1								
		1	(S2) 69	250,000 Ohms, plus or minus 10%, Variable (includes switch 65)	None	None	12	9852-5100	None	RH-51
		1	(S2) 70	5000 Ohms, 1/2W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-171
		3	(S2) 76, 77, 78	125 Ohms, 1 W, plus or minus 10%, Carbon	None	None	13	Standard	None	RE-76

TABLE NO. IV
SPARE PARTS LIST BY SYMBOL DESIGNATION

NOTE: Numbers in parenthesis, preceding symbol designation, refer to corresponding section in Table II. EXAMPLE: (S1) 4 is same as symbol 4, in section 1, Table II.

32 Volts	115 Volts	QUAN	SYMBOL DESIGNATION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING & P RT NUMBER
				SWITCHES - CLASS 24						
		1	(S1) 71	Double Pole, Single Throw	None	None	19	Type 80600	None	SW-38
		1	(S1) 92 (S2) 71 & (S4) 6	Single Pole, Double Throw	None	None	19	Type 21350	None	SW-11
				VACUUM TUBES - CLASS 38						
		5	(S1) 93, 94, 95, 96, 97	Transmitting Beam Power Tube	None	None	3	Type 807	None	
		3	(S1) 98, 99, 100	Twin Triode Amplifier	None	None	3	Type 6A6	None	
		2	(S1) 101, 102	Class "B" Triode	None	None	3	Type 809	None	
		4	(S2) 103, 104, 105, 106	Pentagrid Mixer Amplifier	None	None	3	Type 6L7	None	
		1	(S2) 107	Duo Diode Triode (2nd Detector)	None	None	3	Type 6R7	None	
		1	(S2) 108	Beam Power Amplifier	None	None	3	Type 6V6	None	
		1	(S2) 109	Triode Amplifier Oscillator	None	None	3	Type 6C5	None	
		1	(S2) 110	Full Wave High Vacuum Rectifier	None	None	3	Type 5W4	None	
				MOTOR STARTER CONTACTS AND SPRINGS, ETC						
X		1	(S6) 5	Complete set of contacts and springs for Catalog 692935-G-15 Starter	None	None	4	See Descrip.	None	CON-1
	X	1	(S6) 5	Complete set of contacts and springs for Catalog 692935-G-16 Starter	None	None	4	See Descrip.	None	CON-1
X		1	(S6) 14 (1 unit includes 15)	1.6 Ohm Motor Starter Resistor	None	None	4	PTC	None	-----
	X	1	(S6) 14 (1 unit includes 15)	3 Ohm Motor Starter Resistor	None	None	4	PTC	None	-----
X		1	(S6) 15 (1 unit includes 14)	.7 Ohm Motor Starter Resistor	None	None	4	PTC	None	-----
	X	1	(S6) 15 (1 unit includes 14)	2.25 Ohm Motor Starter Resistor	None	None	4	PTC	None	-----
X		1	(S6) 6	Starter Coil for Cat. 692935-G-15 Starter	None	None	4	22D-104-G3	None	CL-93
	X	1	(S6) 6	Starter Coil for Cat. 692935-G-16 Starter	None	None	4	22D-104-G1	None	CL-117
				MOTOR GENERATOR & ROTARY CONVERTER - CLASS 21						
X		1	(S1) 85	Trans. M.G. - See Page 5 for complete rating	None	None	22	SS-2049	None	MG-2
	X	1	(S1) 85	Trans. M.G. - See Page 5 for complete rating	None	None	22	SS-2048	None	MG-4
X		1	(S1) 87	Rec.Rot.Conv.-See Page 5 for complete rating	None	None	22	SS-1173	None	CVR-4
	X	1	(S1) 87	Rec.Rot.Conv.-See Page 5 for complete rating	None	None	22	SS-1172	None	CVR-16
X		1	(S6) 16	Bearings for Motor Generator SS-2049	None	None	39	8502	None	----
	X	1	(S6) 16	Bearings for Motor Generator SS-2048	None	None	39	8502	None	----
X		1	(S6) 17	Bearings for Rotary Converter SS-1173	None	None	39	8502	None	----
	X	1	(S6) 17	Bearings for Rotary Converter SS-1172	None	None	39	8502	None	----
				BRUSHES						
	X	20	(S6) 7	2 Brushes with Springs & Caps for SS-2048	None	None	22	See Descrip	None	BRU-6
X		20	(S6) 7	2 Brushes with Springs & Caps for SS-2049	None	None	22	See Descrip	None	BRU-53
		20	(S6) 8	2 Brushes with Springs & Caps for SS-2048 or 2049	None	None	22	See Descrip	None	-----
		20	(S6) 9	2 Brushes with Springs & Caps for SS-2048 or 2049	None	None	22	See Descrip	None	-----
	X	20	(S6) 10	2 Brushes with Springs & Caps for SS-1172	None	None	22	See Descrip	None	BRU-2
X		20	(S6) 10	2 Brushes with Springs & Caps for SS-1173	None	None	22	See Descrip	None	BRU-1
		20	(S6) 11	2 Brushes with Springs & Caps for SS-1172 or 1173	None	None	22	See Descrip	None	-----

NOTE: Numbers in parenthesis, preceding symbol designation, refer to corresponding section in table II. EXAMPLE: (S1) 4 is same as symbol 4, in section 1, Table II.

TABLE NO. IV
SPARE PARTS LIST BY SYMBOL DESIGNATION

32 Volts	115 Volts	QUAN.	SYMBOL DESIGNA ION	DESCRIPTION	NAVY TYPE NUMBER	NAVY DWGS & SPEC. NO.	MFR	MFRS DESIGNATION	SPECIAL TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DRAWING & PART NUMBER
				CHOKES - CLASS 47						
X		1	(S1) 76	2 Sections, each Sect. 20 Turns #10 AWG	None	None	11	Type 3230	None	CH-1
	X	1	(S1) 76	2 Sections, each Sect. 30 Turns #12 AWG	None	None	11	Type Z-22	None	CH-4
		1	(S1) 77 & 78	2 Sections, each Sect. 35 Turns #22 AWG	None	None	11	Type Z-20	None	CH-2
				TRANSFORMERS - POWER AND AUDIO - CLASS 30						
X		1	(S1) 53	Prim. 18, 20 & 22 Volts. Sec. 1 - 6.3, 6.9, 7.5 Volts, 4.65 Amps Sec. 2 - 6.3 Volts, 7.4 Amps - Total Sec. 82 W	None	None	10	Type S-8074	None	TP-3
	X	1	(S1) 53	Prim. 68, 75, 82 Volts. Sec. 1 - 6.3, 6.9, 7.5 Volts, 4.65 Amps Sec. 2 - 6.3 Volts, 7.4 Amps - Total Sec. 82 W	None	None	10	Type S-8059	None	TP-4
		1	(S1) 54	Prim. to match plate to plate load of two 809 tubes Sec. to modulate class "C" load of 550 volts, 300 m.a., D.C.	None	None	10	Type T-494-A	None	TA-7
		1	(S1) 55	Prim. to match plate to plate load of 6A6 Tube Sec. to match grids of two 809 tubes	None	None	10	Type T-264-A	None	TA-12
		1	(S1) 56	Prim. to match parallel plates of 6A6 tube Sec. to match grids of 6A6 tube	None	None	10	Type T-251	None	TA-9
		1	(S1) 57	Prim. to match carbon microphone Sec. to match parallel grid of 6A6 tube	None	None	10	Type T-1	None	TA-2
		1	(S2) 63	Prim. to match plate circuit of 6V6 tube Sec. 1 to match 4 ohm load Sec. 2 to match 200 ohm load	None	None	10	Type T-104	None	TA-18
		1	(S2) 72	Prim. tapped for 100, 110, 120 V, 60 Cycle Sec. 1-250-0-250 V, A.C. for 80 m.a. D.C. load Sec. 2 - 5 V, 2 Amp Sec. 3 - Tapped for 6.3 V, 3 amp	None	None	10	S-7961-B	None	TP-10
				REACTORS - CLASS 30						
		1	(S1) 58	D. C. Resistance 100 Ohms	None	None	10	T-152	None	XL-13
		1	(S2) 73	30 Henries, 9 m.a., 350 ohms	None	None	10	T-153	None	XL-18
				MISCELLANEOUS						
		1	(S6) 13	Spline Wrench for removing handset Push But.	None	None	32	"RMCA"	None	TO-5
		4	(S6) 18	Sliders for Rotating R.F. Inductor	None	None	8	----	None	----
		5	(S6) 19	Plate Leads with #91 Alden Cap	None	None	8	----	None	----
		2	(S6) 20	Plate Leads with #12 National Cap	None	None	8	----	None	----
		1	(S6) 21	Shock Mounts	None	None	37	200-PH-25	None	----
		1	(S6) 22	Shock Mounts	None	None	37	200-XPH-75	None	----
		2	------	Metal Spare Parts Box, 18 X 12 X 12	None	None	38	-----	None	----

TABLE NO. V

APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

MODEL TCP AND TCP-1 RADIOTELEPHONE EQUIPMENT

RMA COLOR CODE FOR RESISTORS

Color	Body	End	Dot
Black	--	0	.0
Brown	1	1	0
Red	2	2	00
Orange	3	3	000
Yellow	4	4	0000
Green	5	5	00000
Blue	6	6	000000
Purple	7	7	0000000
Gray	8	8	00000000
White	9	9	---

Body color denotes first numeral in resistance value.
End color denotes second numeral.
Dot color denotes number of ciphers following first two numerals.
Gold color bronze end dip indicates 5% tolerance.
Silver color bronze end dip indicates 10% tolerance.
Other resistors 20% tolerance.

ADDENDUM

NOTE REGARDING WESTINGHOUSE 0-50 M.A. MILLIAMMETER, SYMBOL DESIGNATION 47

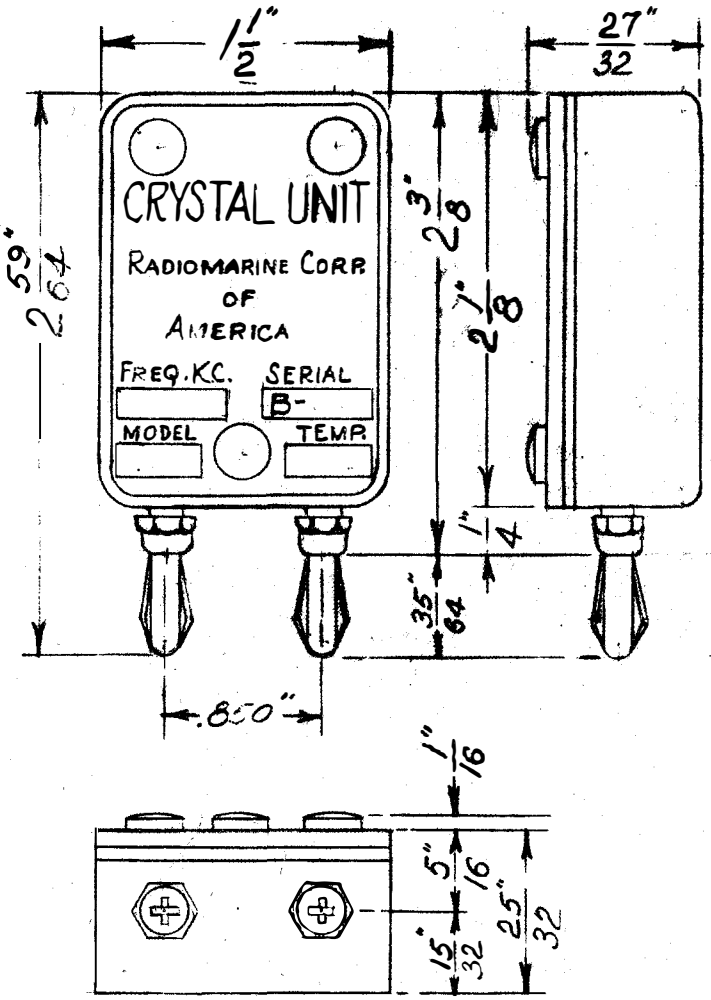
Model TCP-2 equipments which are furnished with a Westinghouse 0-50 m.a. milliammeter style NY-56418-2, type NX-35, use a one ohm series resistor, Clarostat type PR-10-B, tolerance plus or minus one percent. This resistor is mounted directly on the back of the meter. Simpson 0-50 m.a. milliammeters, model 25, do not require the one ohm series resistor. The internal resistance of the Westinghouse meter is half that of the Simpson meter, and, therefore, the use of the one ohm series resistor with Westinghouse meters permits the same shunts, symbols 41, 43, 44 and 50, to be used with either type of meter.

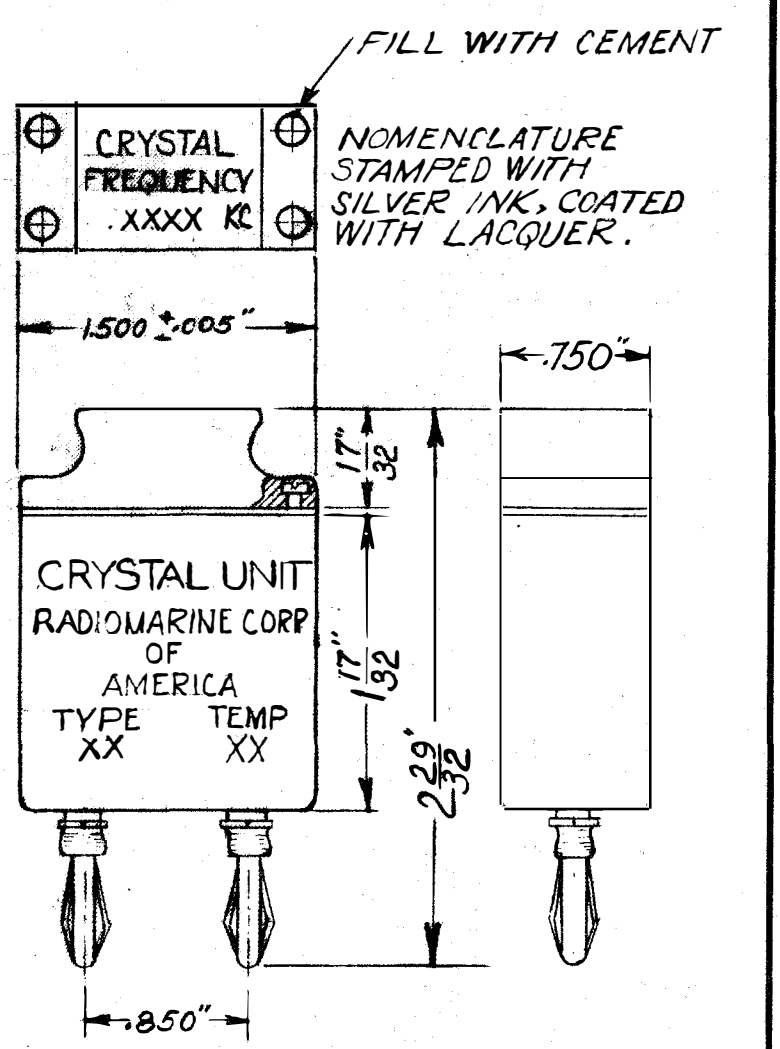
TABLE NO. VI
LIST OF MANUFACTURERS
MODEL TCP AND TCP-1 RADIOTELEPHONE EQUIPMENT

Reference	Name	Address
1	Sangamo Electric Company	Springfield, Ill.
2	Allan D. Cardwell Mfg. Co	81 Prospect St., Bklyn, N.Y.
3	RCA Manufacturing Co.	Camden, N. J.
4	General Electric Co.	Schnectady, N. Y.
5	Chase-Shawmut Fuse Co.	Newberryport, Mass.
6	Littelfuse, Inc.	4757 N. Ravenswood Ave., Chicago, Ill.
7	C. P. Clare & Co.	Lawrence & Lamon Aves., Chicago, Ill.
8	Radiomarine Corporation	75 Varick St., New York, N.Y.
9	National Company	Malden, Mass.
10	Kenyon Transformer Co.	840 Barry St., New York, N.Y.
11	Ohmite Manufacturing Co.	4805 Flournoy St., Chicago, Ill.
12	International Resistor Co.	401 N. Broad St., Phila, Pa.
13	Erie Resistor Co.	Erie, Pa.
14	Continental Carbon Co.	13900 Lorain Avenue, Cleveland, Ohio.
15	Clarostat Mfg. Co., Inc.	285 No. 6th St., Bklyn, N.Y.
16	P. R. Mallory	Indianapolis, Ind.
17	Oak Manufacturing Co.	1260 Clybourn Avenue, Chicago, Ill.
18	Communication Products Co.	245 Custer Avenue, Jersey City, N.J.
19	Hart & Hageman	Hartford, Conn.
20	Simpson Electric Co.	5200 Kinzie St., Chicago, Ill.
21	General Radio Co.	30 State St., Cambridge, Mass.
22	Pioneer Gen-E-Motor Corp.	5841 W. Dickens Avenue, Chicago, Ill.
23	Radio Condenser Corp.	Camden, N. J.
24	John E. Fast Co.	3123 N. Crawford Avenue, Chicago, Ill.
25	Cornell Dubilier Electric Corp.	South Plainfield, N. J.
26	F. W. Sickles Co.	Springfield, Mass.
27	Oxford Tartak Radio Corp.	3911-29 S. Michigan Ave., Chicago, Ill.
28	Western Electric Co.	300 Central Ave., Kearny, N.J.
29	Bryant Electric Co.	Bridgeport, Conn.
30	Electronic Mechanics, Inc.	85 Hazel St., Phila, Pa.
31	Hugh H. Eby, Inc.	4700 Stenton Ave., Phila, Pa.
32	Hinckley-Myers Co.	Jackson, Mich.
33	Sprague Products Co.	North Adams, Mass.
34	Solar Manufacturing Co.	Bayonne, N. J.
35	Westinghouse Elec. & Mfg. Co.	40 Wall St., New York, N. Y.
36	Teleradio Engineering Corp.	484 Broome St., New York, N.Y.
37	Lord Manufacturing Co.	Erie, Pa.
38	Acme Metal Products Co.	Dover, N. J.
39	New Departure, Div. Gen. Motors	Bristol, Conn.

ALTERNATE TYPE R-1 & R-2 HOLDER

INTERCHANGEABLE MECHANICALY & ELECTRICALLY





RADIOMARINE TYPE	R-1	R-2
MAX. TEMP. COEFF. IN % °C.	.0003	.0003
CRYSTAL CUT, 2-4 MEGACYCLES	A	A
CRYSTAL CUT, 4-11 MEGACYCLES	B	B
CALIBRATION TEMP. °C	35	45

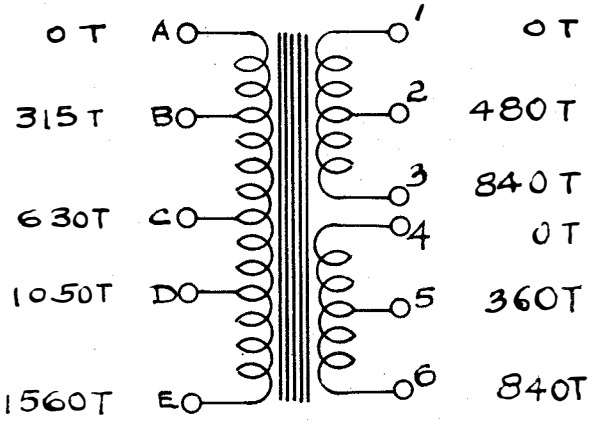
SUB #4. 1-31-44 M.R.

CRYSTAL HOLDER
RADIOMARINE TYPES R-1 & R-2

RADIOMARINE CORP. OF AMERICA

ENGINEERING DEPT.	F. MERKLER	KS-63
NEW YORK HBm	Sub. 4	Date 1-27-44

T-494 (54)



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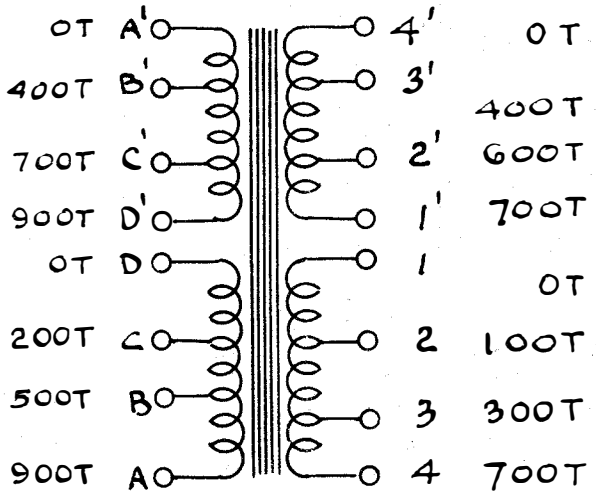
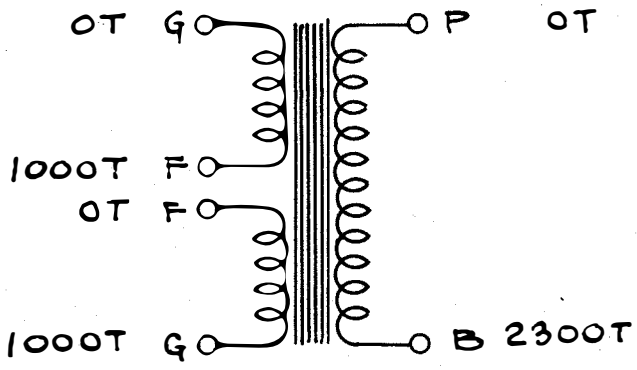
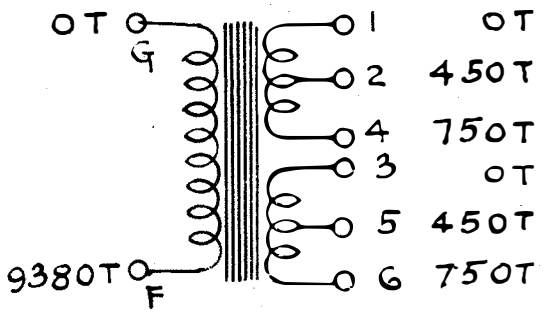


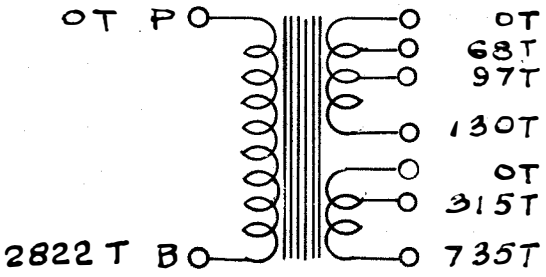
T-251 (56)



T-1 (57)



T-104 (63)

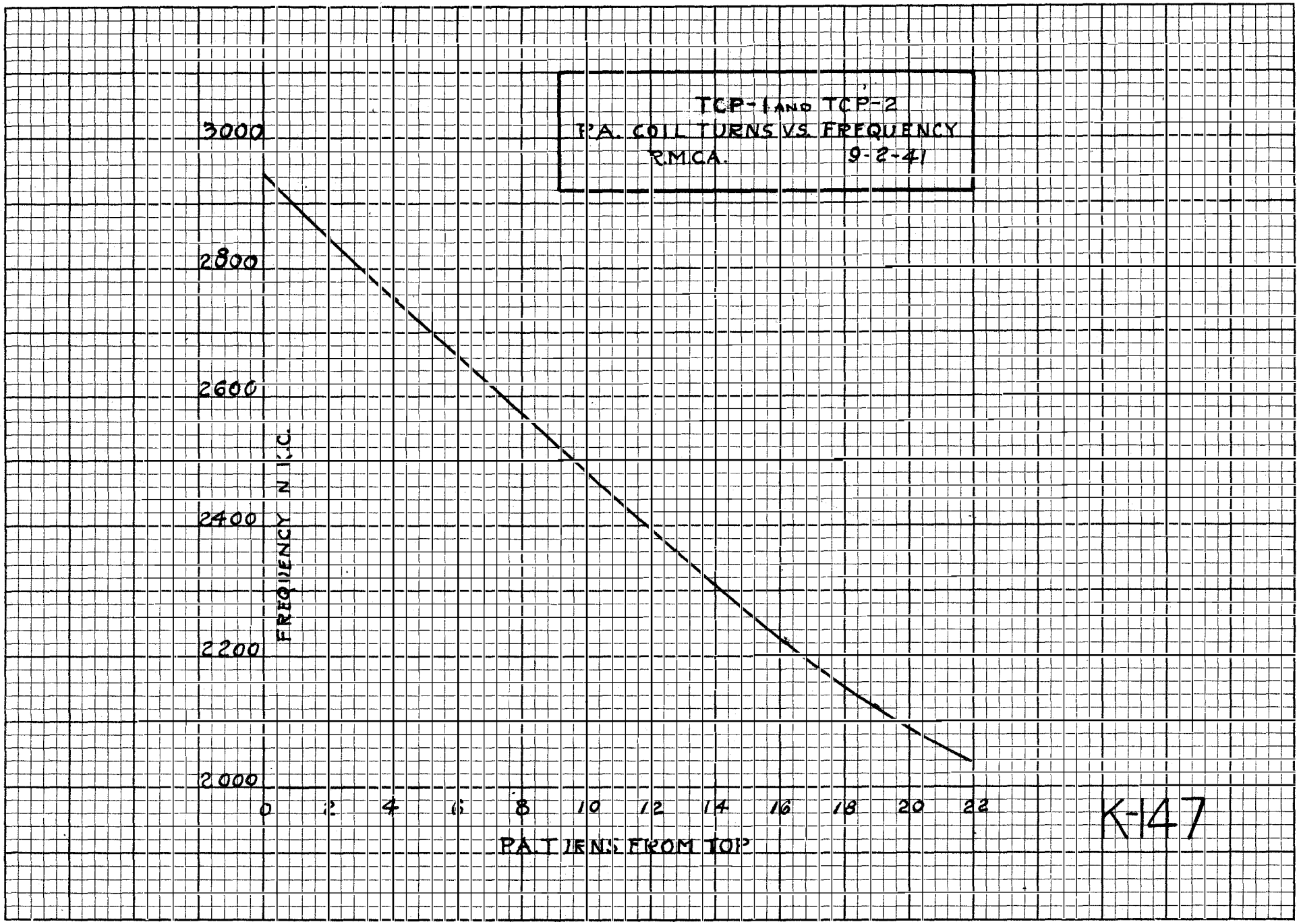


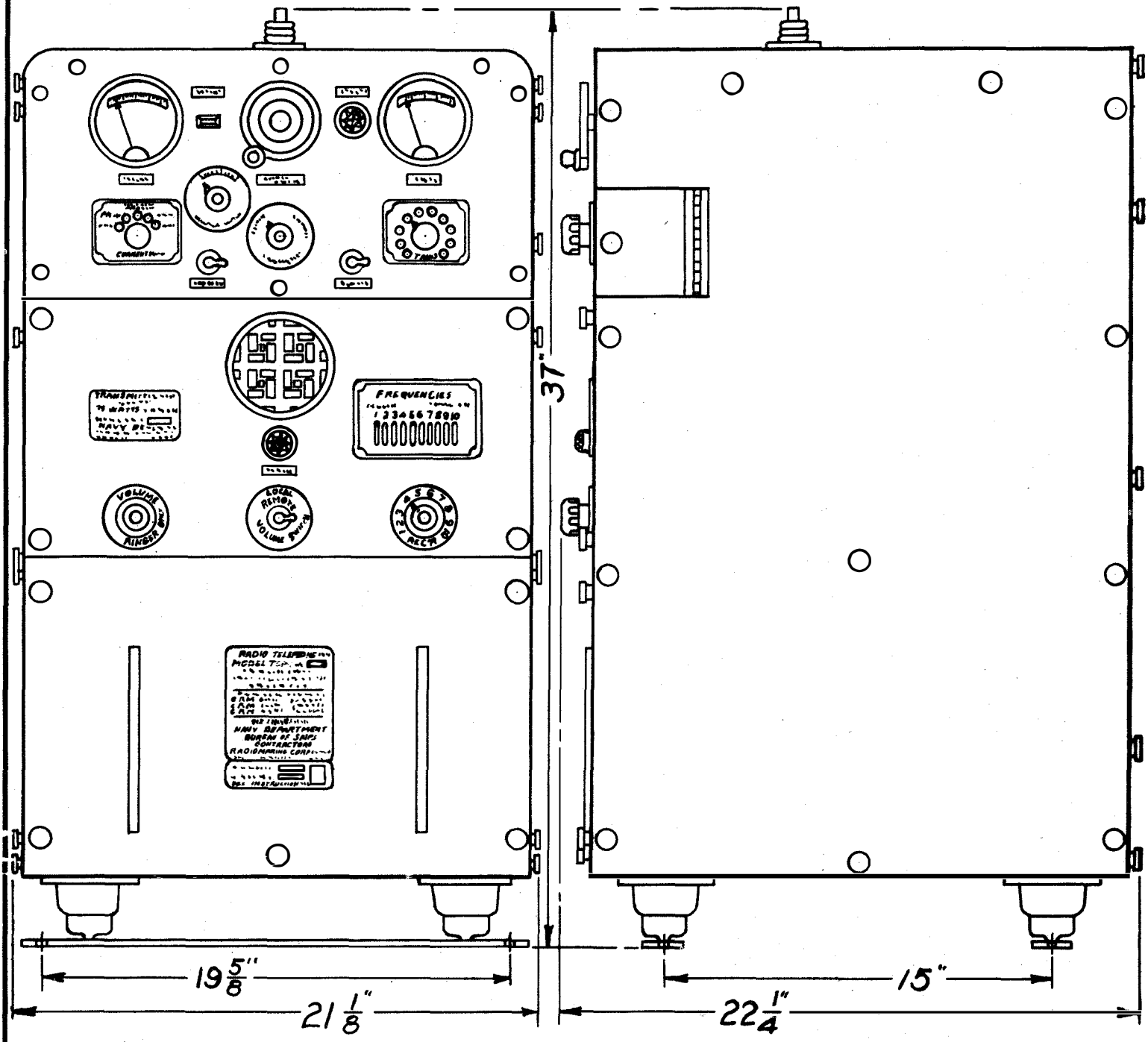
NOTE: NUMBERS IN BRACKETS ARE SYMBOL DESIGNATIONS ON SCHEMATIC DWGS. NUMBERS WITH "T" FOLLOWING INDICATE NO. OF TURNS

MODEL TCP & TCP-1 TRANSFORMERS (ALSO TCP-2)
SCHEMATIC DIAGRAM

RADIOMARINE CORP. OF AMERICA

ENGINEERING DEPT.	S.S.	K-145
NEW YORK YB	Sub. Ø1	Date 10/17/41


TCP-1 AND TCP-2
P.A. COIL TURNS VS. FREQUENCY
R.M.C.A. 9-2-41
3000
2800
2600
2400
2200
2000
FREQUENCY N.C.C.
0
2
4
6
8
10
12
14
16
18
20
22
PA. TURNS FROM TOP
K-147

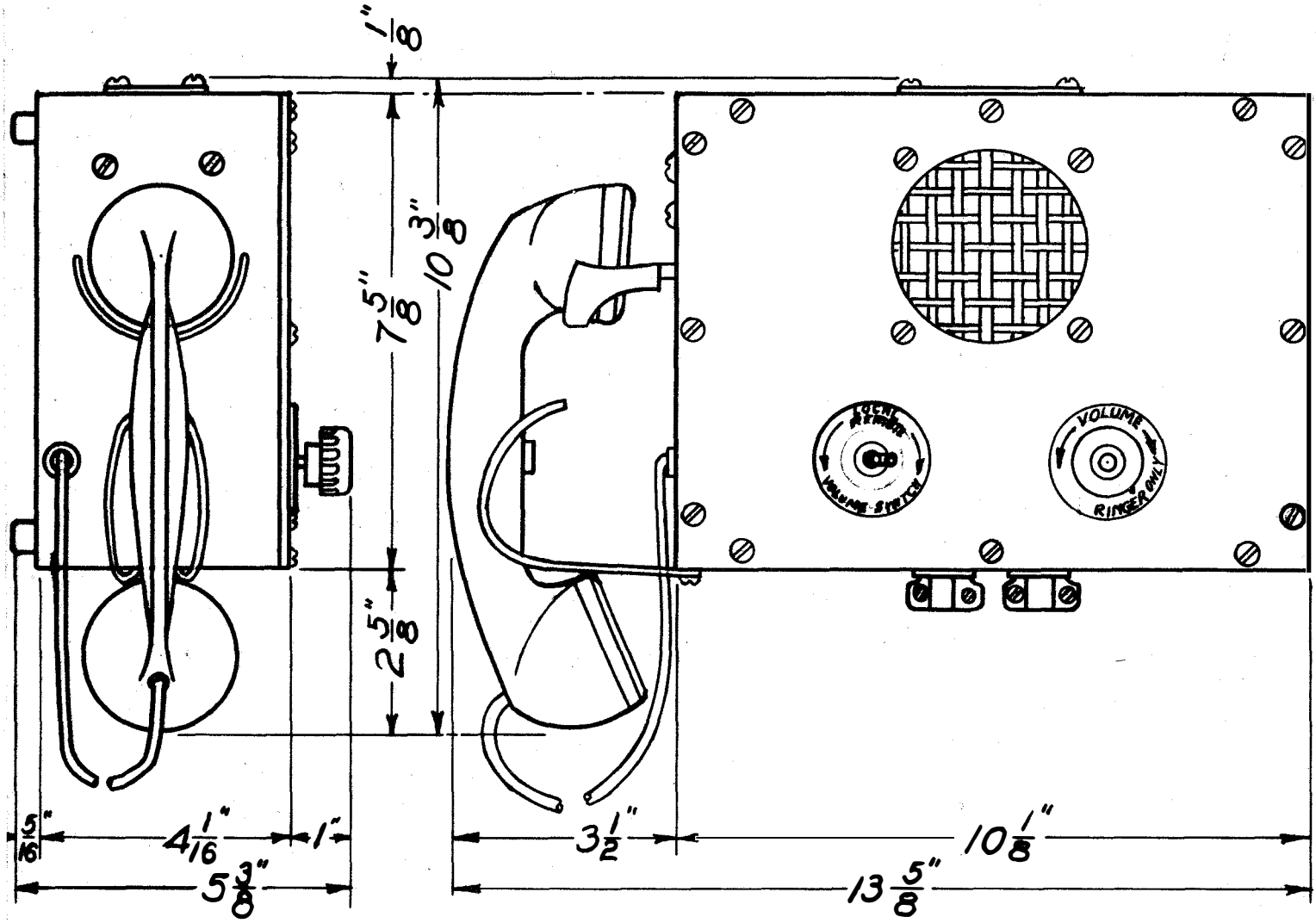


TRANSMITTER-RECEIVER UNIT
CRM-43009-A or 43010-A
A UNIT OF MODEL TCP-2 RADIO EQUIPMENT (also) (TCP-1)

RADIOMARINE CORP. OF AMERICA

SUB #1 5-5-42 S.R	ENGINEERING DEPT.	M.F.R.	KS-12
	NEW YORK	Sub. #1	Date 6-27-41

WEIGHT = 310 LBS.

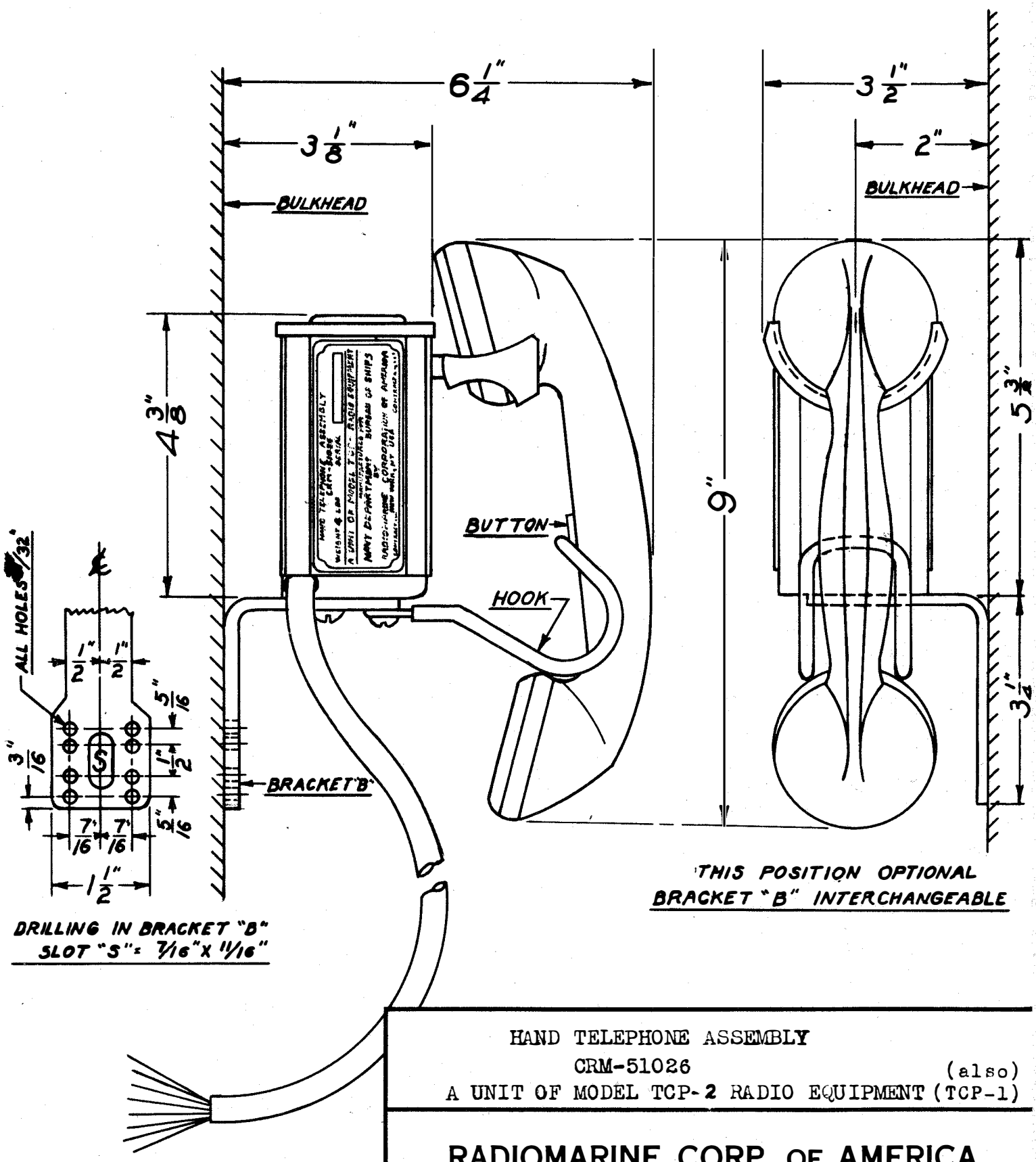


REMOTE CONTROL UNIT
CRM-23230 (also)
FOR USE WITH MODEL TCP-2 RADIO EQUIPMENT (TCP-1)

RADIOMARINE CORP. OF AMERICA

ENGINEERING DEPT.	M.F.R.	KS-13
NEW YORK	Sub. 0	Date 6-27-41

WEIGHT- 11 LBS



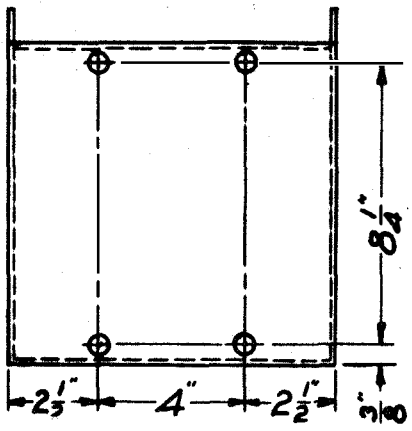
HAND TELEPHONE ASSEMBLY
CRM-51026 (also)
A UNIT OF MODEL TCP-2 RADIO EQUIPMENT (TCP-1)

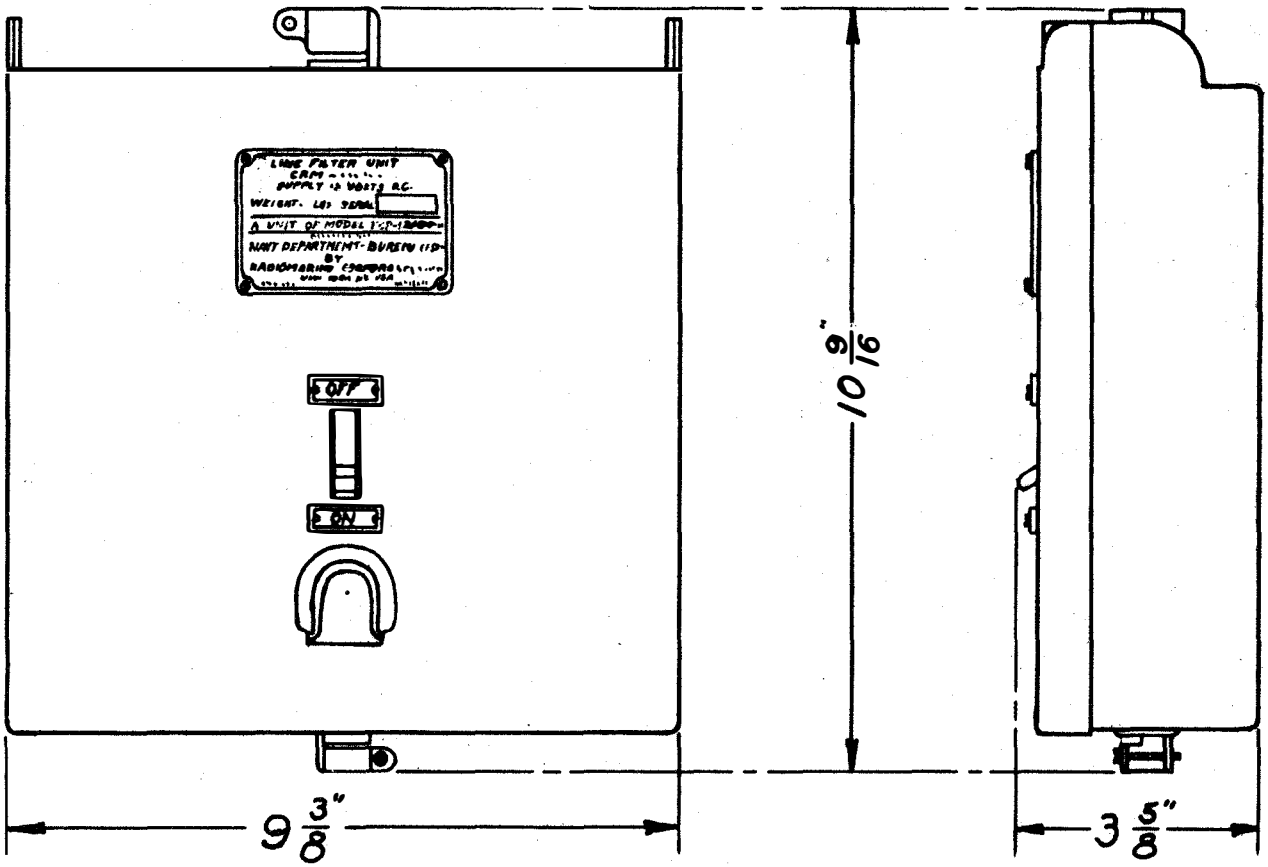
RADIOMARINE CORP. OF AMERICA

ENGINEERING DEPT.	M.F.R.	KS-14
NEW YORK	Sub. 0	Date 6-27-41

WEIGHT = 4 LBS

REAR VIEW
SHOWING DRILLING FOR
MTG. HOLES



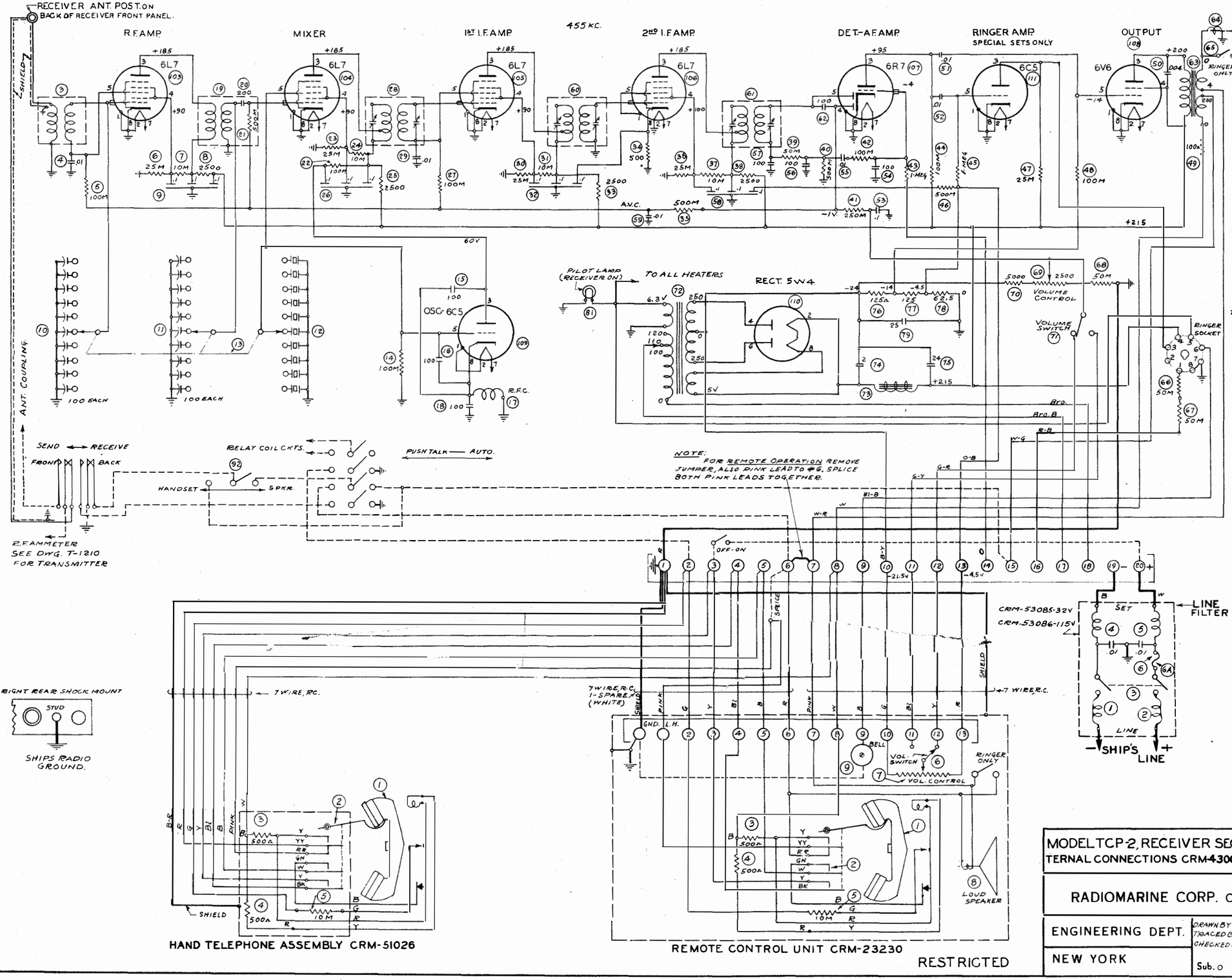


LINE FILTER UNIT
CRM-53085 or 53086 (also)
A UNIT OF MODEL TCP-2 RADIO EQUIPMENT (TCP-1)

RADIOMARINE CORP. OF AMERICA

ENGINEERING DEPT.	M.F.R.	KS-15
NEW YORK	Sub. 0	Date 6-27-41

WEIGHT - 9 LBS



COLOR CODE	
B	BLACK
B-Y	BLACK-YELLOW
Bro.	BROWN
Bro. B.	BROWN-BLACK
Bl.	BLUE
Bl-B	BLUE-BLACK
G	GREEN
G-R	GREEN-RED
G-Y	GREEN-YELLOW
O	ORANGE
O-B	ORANGE-BLACK
R.	RED
R-B	RED-BLACK
Y	YELLOW
W	WHITE
W-G	WHITE-GREEN
W-R	WHITE-RED
B-R	BLACK-RED

(ET-8012-D)

MODEL TCP-2, RECEIVER SECTION AND EXTERNAL CONNECTIONS CRM-~~43009-A~~, CRM-43010-A.

RADIOMARINE CORP. OF AMERICA

ENGINEERING DEPT.	DRAWN BY — GB TRACED BY — S.S. CHECKED BY —	T-1209
NEW YORK	Sub. O	Date 10/22/42

MECHANICAL GANGING

POWER AMPLIFIER- 4-807

OSC. 807

CRYSTALS

RECEIVER ANT. POST

SEND ↔ RECEIVE

ANT. COUPLING SWITCH

2-MEG.

0-5A

.0015

10M

(100 100 100 100)(100 100)

CRYSTAL INTERLOCK JUMPERS

Bro-B Bl-B O-B G-B R-B

SHIPS RADIO GROUND

CHASSIS

SPKR.

HANDSET

+50V.

PRESS TO TALK - AUTO

VODAS SENSITIVITY CONTROL

7.5v. 6.9v. 6.3v.

50M

25Ω

1.5M

+200V.

+550V.

2-5000Ω-5W.

.002

.02

.01

PILOT LAMP TRANS. ON.

METER SWITCH

M.A.

2.5Ω

-60V.

.22Ω

50M

500Ω

.00005

10000Ω

100Ω

140Ω

+150V.

150M

100M

20M

.00025

100Ω

25Ω

+550

50M

809

809

6A6

6A6

6A6

1000Ω

+300V.

+250V.

+6V.

40M-5W.

150Ω-5W.

4-5

2-3

4-10000Ω-5W.

4-5000Ω-5W.

200Ω-5W

+150v.

+550v.

+5v.

NOTE: VOLTAGES AND POLARITIES SHOWN ARE WITH RESPECT TO GROUND- WITH HANDSET PUSH BUTTON DRESSED. USE A 1000-OHM PER VOLT VOLTMETER.

TO HANDSET AND REMOTE CONTROL UNIT- IF USED

TERMINAL BOARD

OFF-ON

SHIPS LINE

RECEIVER

LAMP

D.C.

A.C.

RECEIVER ROTARY CONVERTER

A2

FLD.

O.L. RELAY

L2+

A1 L1

RED

WHITE

STARTER

+MOTOR-

A.C.

+ 550v.

H.V. .75AMP

TRANSMITTER MOTOR GENERATOR

SEE DWG. T-1134 FOR RECEIVER

COLOR CODE	
Bro-B	Brown-Black
Bl-B	Blue-Black
O-B	Orange-Black
G-B	Green-Black
R-B	Red-Black
Bro.	Brown
Bl	Blue
O	Orange
G	Green
R	Red.

RESTRICTED

MODEL TCP-2 TRANSMITTER AND POWER SUPPLY. SECTION CRM-43009A-CRM-43010A

(8012-D)

RADIOMARINE CORP. OF AMERICA

ENGINEERING DEPT. NEW YORK

DRAWN BY- G.B. TRACED BY- J.J. CHECKED BY-

Sub. #1

T-1210

Date 9/30/42

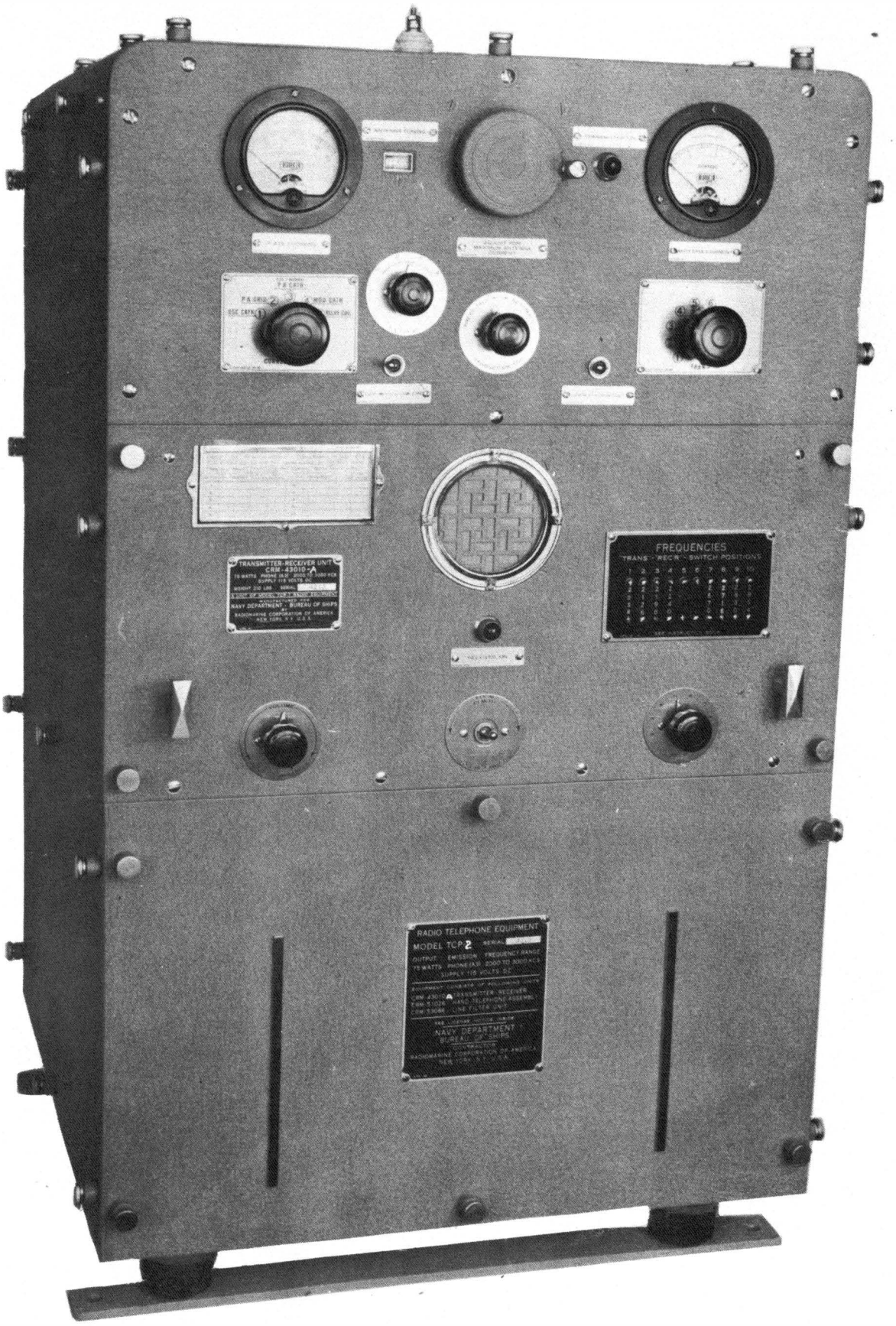

TRANSMITTER-RECEIVER UNIT
CRM-43010-A
NAVY DEPARTMENT - BUREAU OF SHIPS
FREQUENCIES
TRANS - REC'R - SWITCH POSITIONS
RADIO TELEPHONE EQUIPMENT
MODEL TCP 2
NAVY DEPARTMENT
BUREAU OF SHIPS

FIG. 1

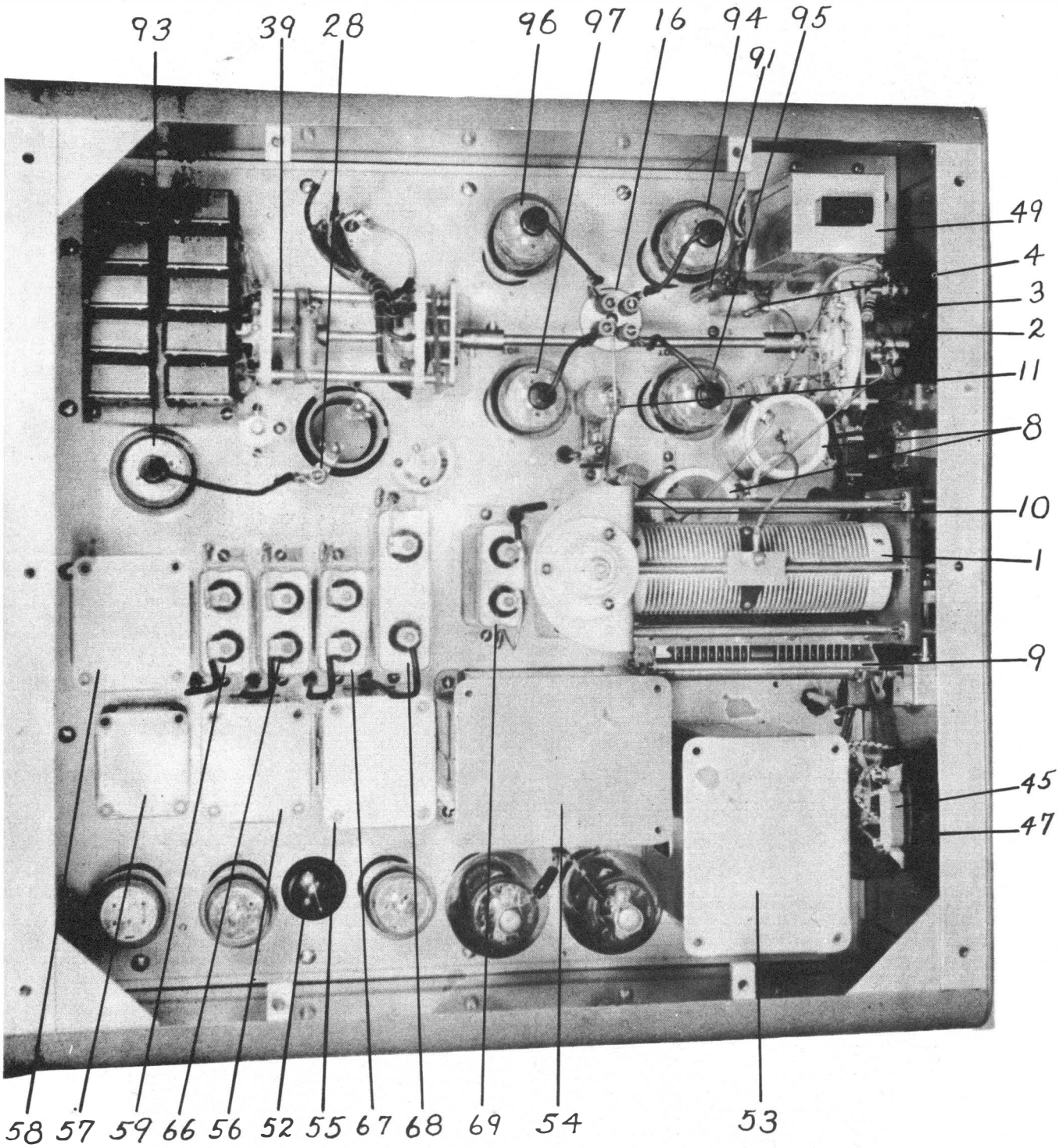

93
39
28
96
97
16
94
91
95
49
4
3
2
11
8
10
1
9
45
47
58
57
59
66
56
52
55
67
68
69
54
53

FIG. 2

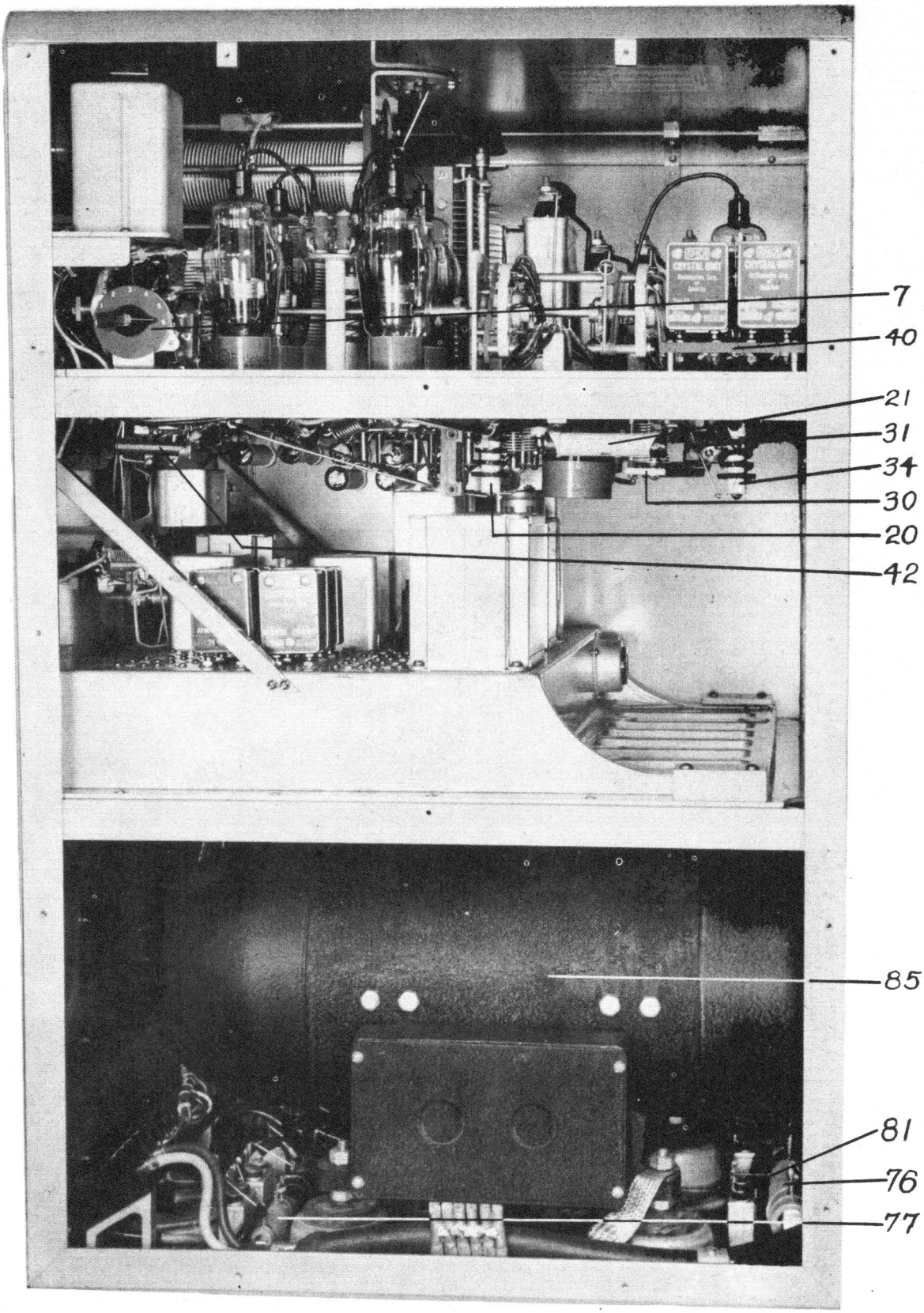


FIG. 3

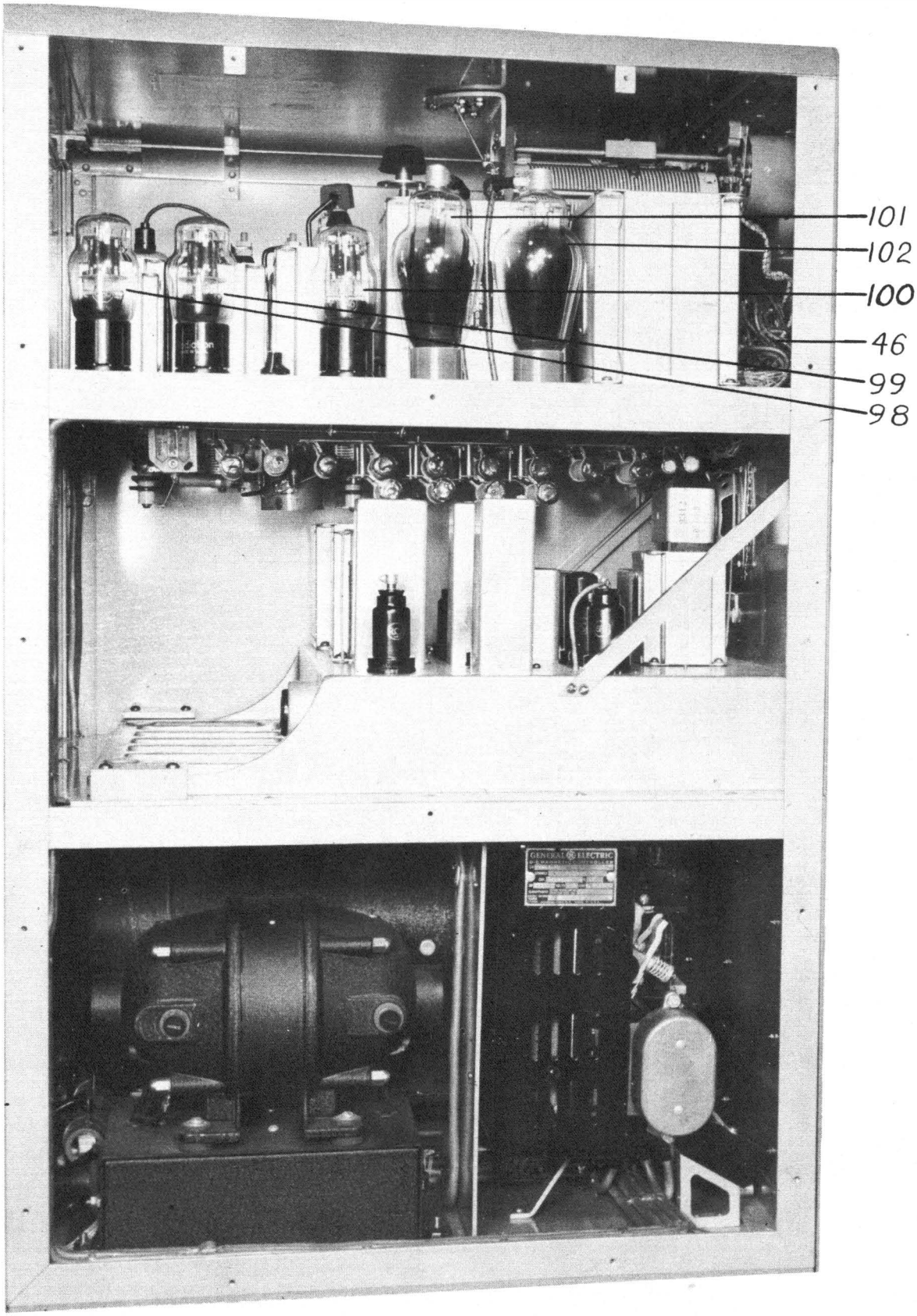


FIG. 4

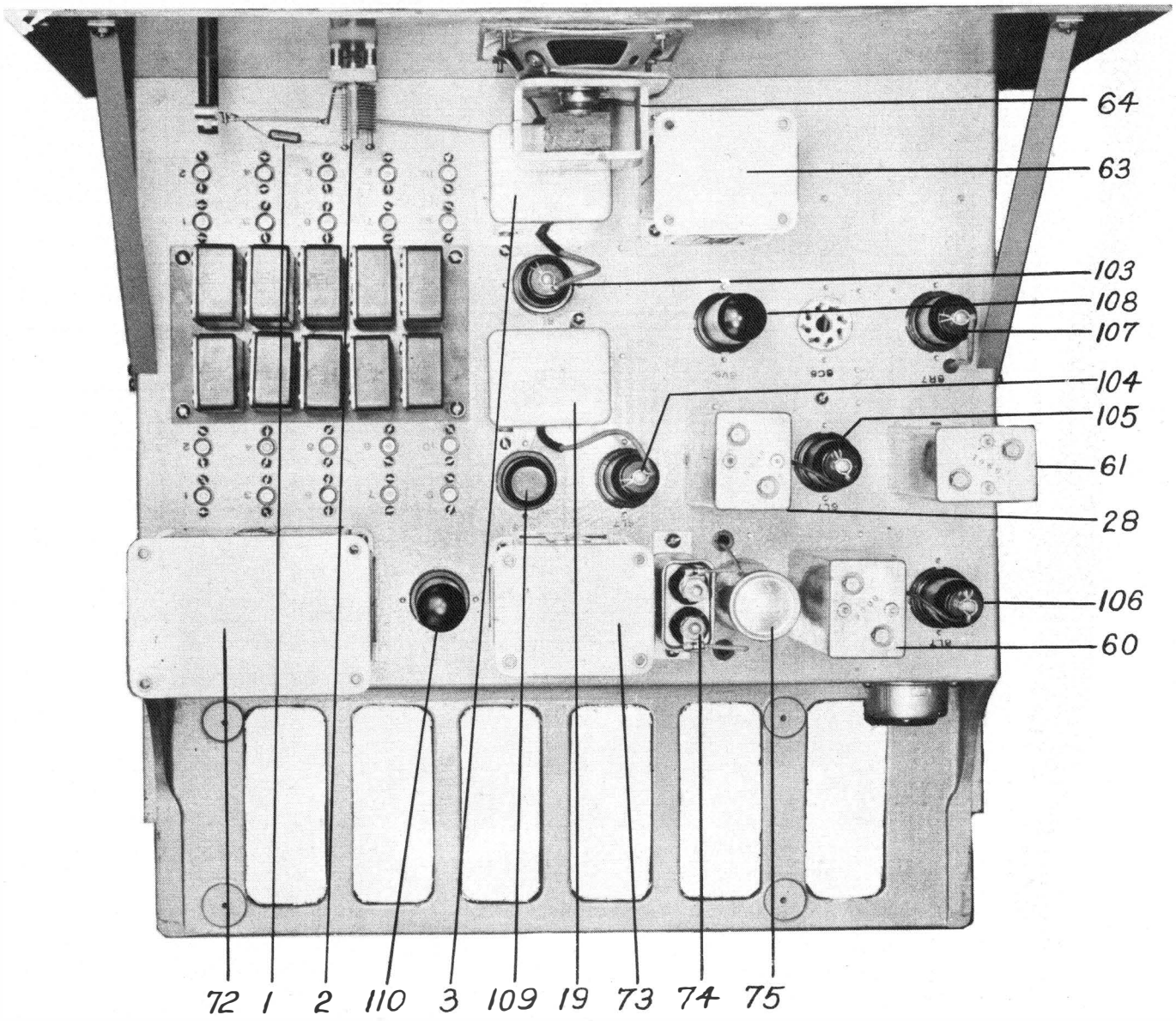
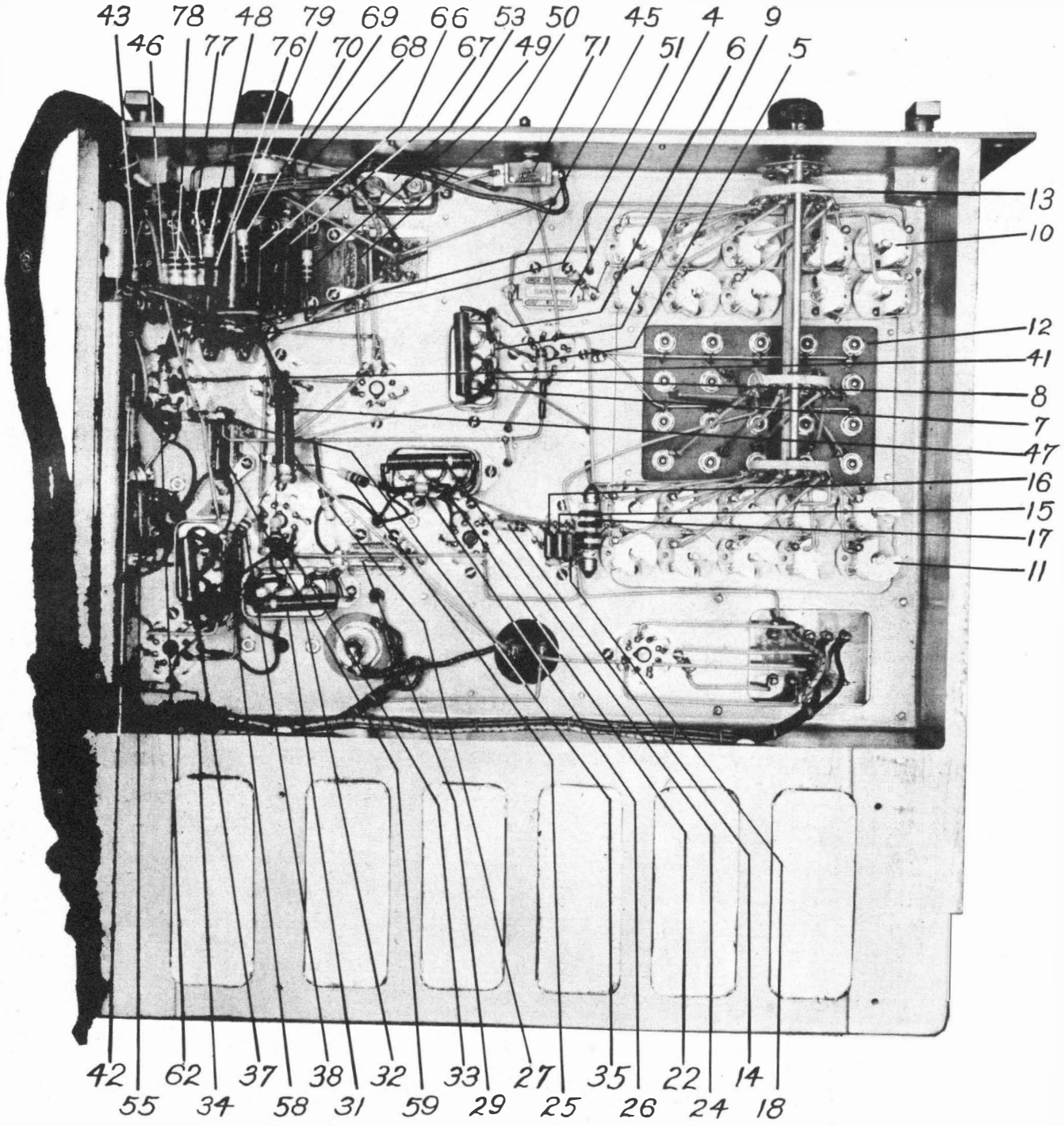


FIG. 5


43
78
48
79
69
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50
45
4
9
46
77
76
70
68
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71
51
6
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11
42
62
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59
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26
24
18

FIG. 6

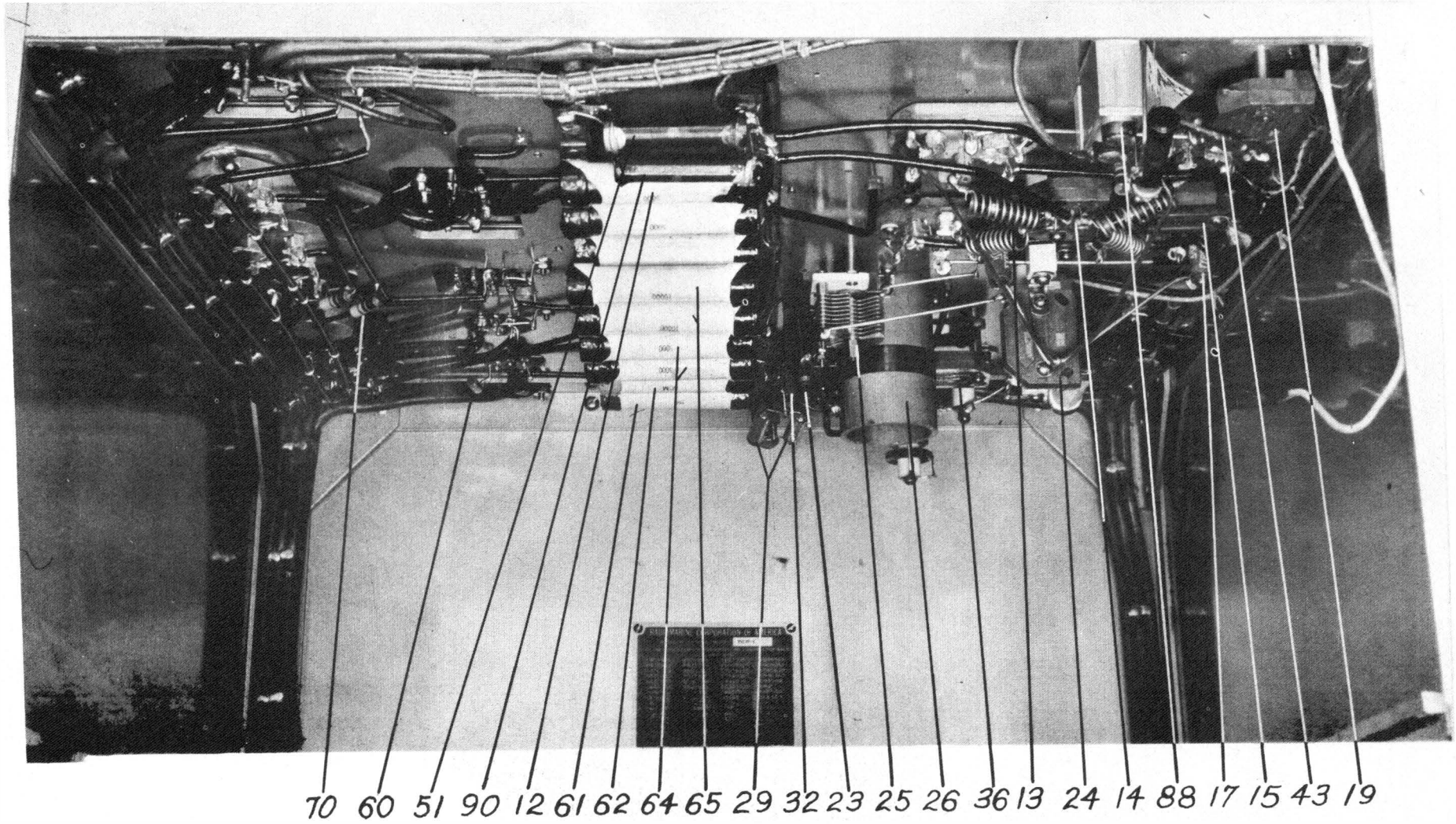

FIG. 7

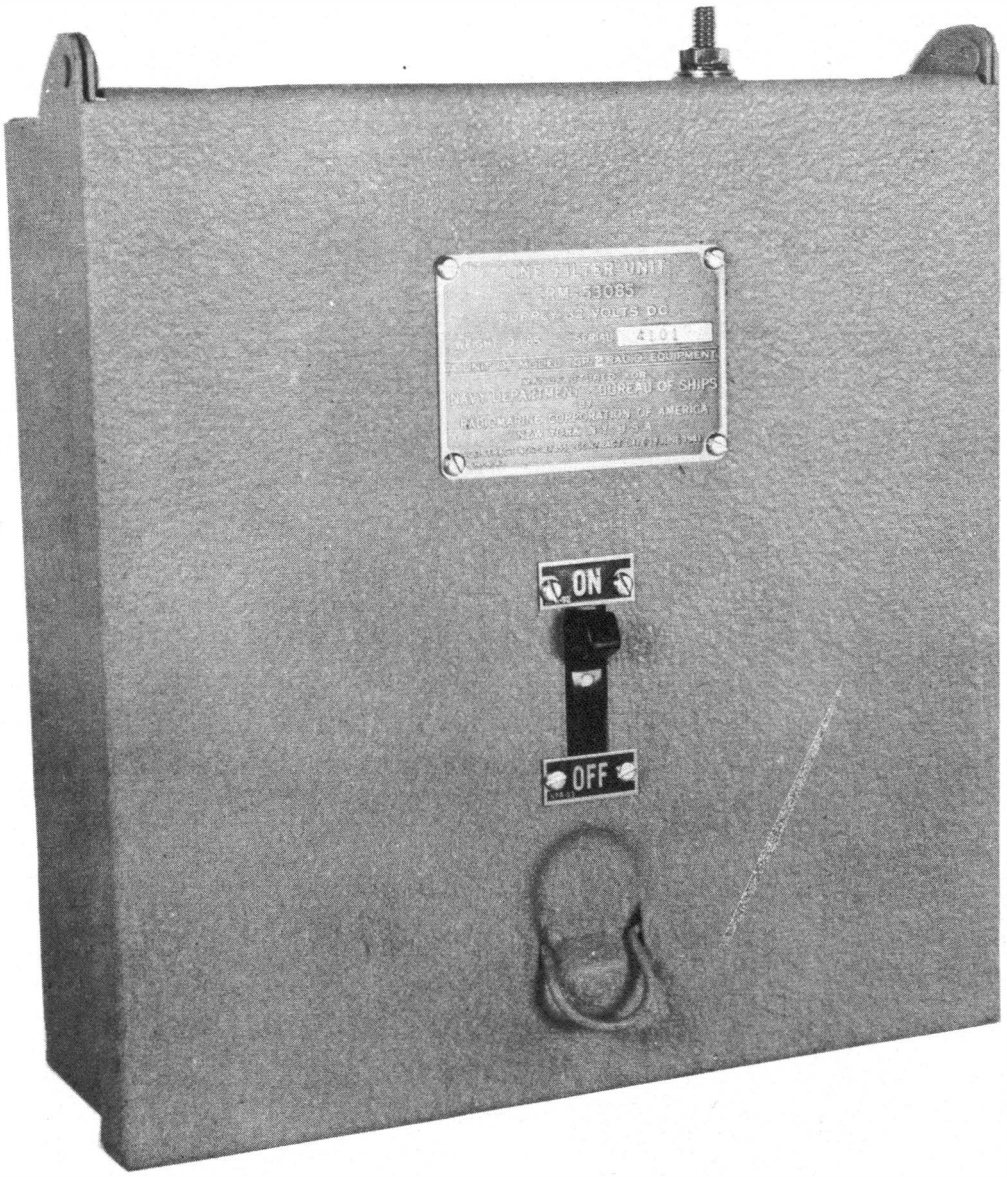

FIG. 8

FIG. 9

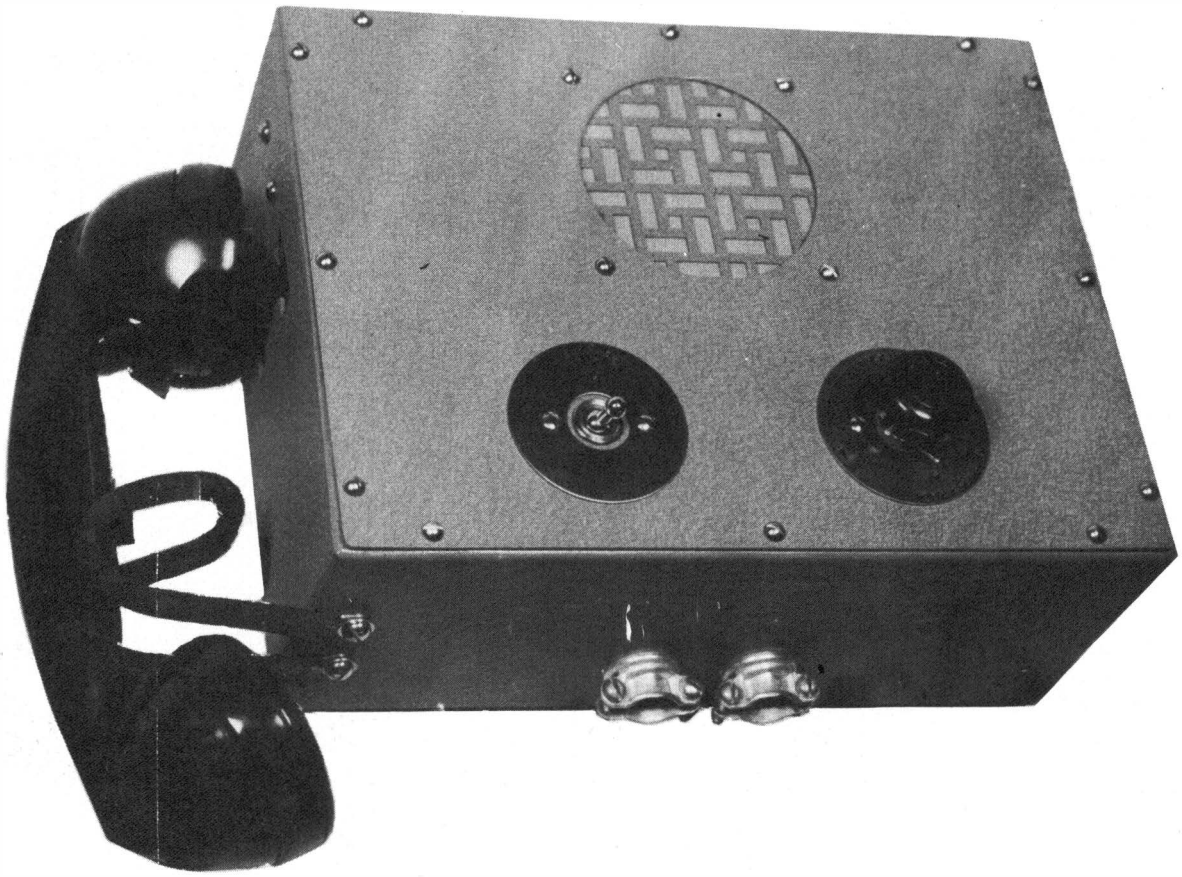

FIG. 10