PRELIMINARY INSTRUCTION BOOK

for

NAVY MODEL TBX-8 PORTABLE RADIO EQUIPMENT

RESTRICTED

(*For Official Use Only*)

Manufactured By

GAROD RADIO CORPORATION

Brooklyn, N. Y.

For

U. S. NAVY DEPARTMENT

BUREAU OF SHIPS

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RECORD OF CORRECTIONS MADE

Change No.	Date	Signature of Officer Making Correction

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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.

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 effecting 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.

As applied to quartz crystals, it is assmed that crystals returned under the terms of the above guarantee will be returned with the seals unbroken and showing no evidence of mechanical abuse and with the understanding that the crystals were used only in the model TBX series of portable radio equipment.

WARNING NOTE

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 OR MAKE ADJUSTMENTS INSIDE EQUIPMENT WITH HIGH VOLTAGE SUPPLIES ON. ALWAYS SHUT DOWN GENERATORS OR OTHER POWER EQUIPMENT. UNDER CERTAIN CONDITIONS, SUCH AS THE FAILURE OF A "BLEEDER" RESISTOR, DANGEROUS POTENTIALS MAY EXIST IN CIRCUITS WITH POWER CONTROLS IN THE OFF POSITION DUE TO CHARGES RETAINED BY CAPACITORS. TO AVOID CASUALTIES ALWAYS REMOVE POWER, DISCHARGE AND GROUND CIRCUITS BEFORE TOUCHING THEM.

Since the use of high voltages, which are dangerous to human life, is necessary to the successful operation of TBX-8 equipments, certain reasonable precautionary measures must be carefully observed by operating personnel during the adjustment and operation of the equipment.

The major portions of the equipment are within shielding enclosures, but INTERLOCK SWITCHES ARE NOT PROVIDED. Therefore, all power should be shut off before removing covers for adjustment or servicing, as removal of the covers allows access to circuits carrying voltages dangerous to human life.

While every practicable safety precaution has been incorporated in the TBX-8 equipment, the following safety 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 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 enclosure except as provided for by protected cabling, or to apply voltages to the equipment while it is out of its cover or case. Wherever feasible in testing circuits, check for continuity and resistance rather than directly checking voltage at various points.

DO NOT 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 or assistance of another person capable of rendering aid.

If it is ever necessary to operate any of the power supplies without connecting it to the equipment, care should be taken to CLOSE AND LOCK power socket covers to prevent accidental contact with the output terminals, all of which carry dangerous potentials.

THE ATTENTION OF OFFICERS AND OPERATING PERSONNEL IS DIRECTED TO BUREAU OF SHIPS MANUAL OF ENGINEERING INSTRUCTIONS, CHAPTER 31 (MIMEOGRAPHED FORM) OR SUBSEQUENT REVISIONS THEREOF ON THE SUBJECT OF "RADIO-SAFETY PRECAUTIONS TO BE OBSERVED."

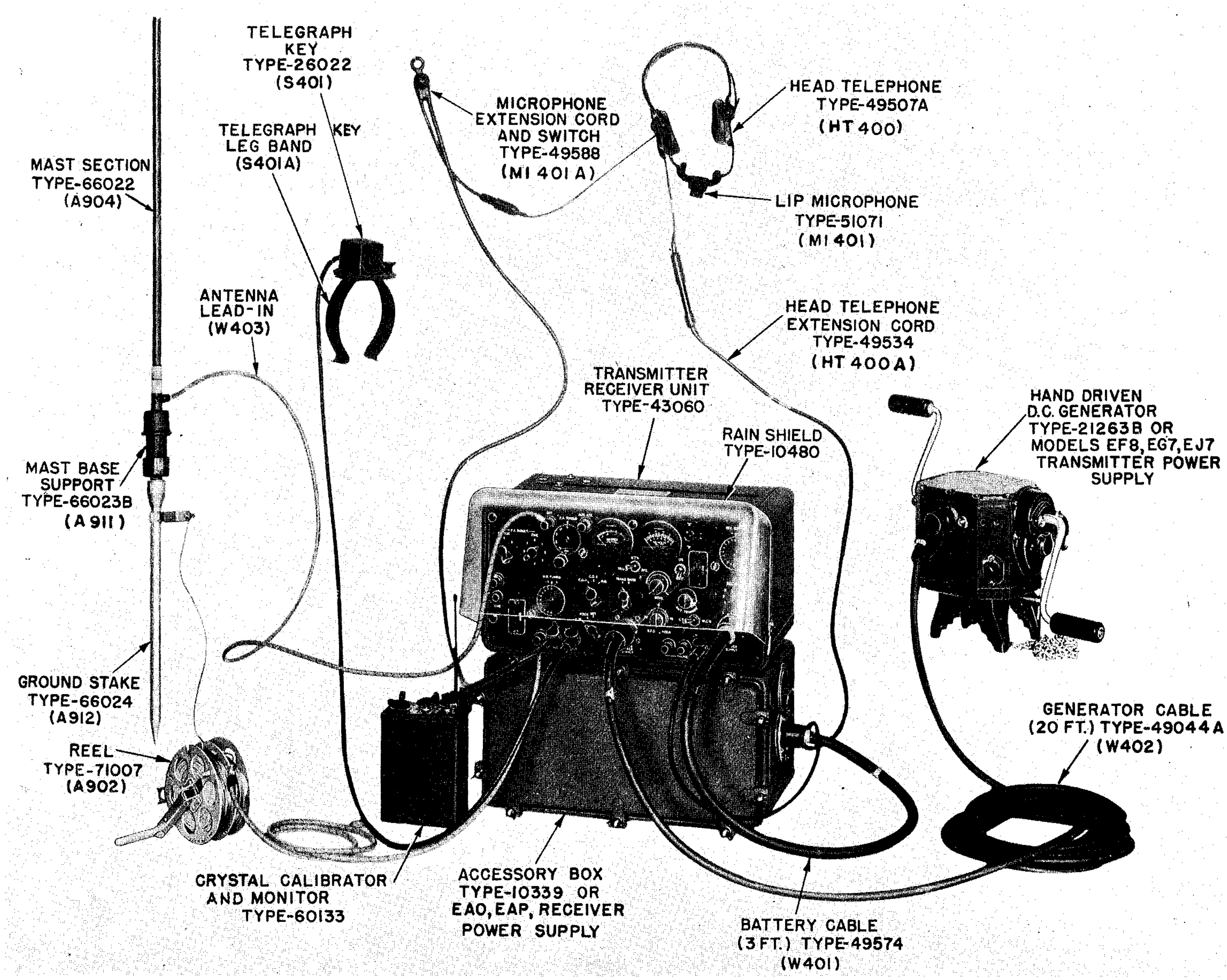

FIG. I. MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS: A TYPICAL ASSEMBLY SHOWING BASIC TRANSMITTER-RECEIVER UNIT TYPE -43060, AUXILIARY CRYSTAL CALIBRATOR AND MONITOR TYPE -60133, AND RAIN SHIELD TYPE -10480 SET UP FOR OPERATION AND INDICATING POSSIBLE SELECTION OF THE VARIOUS POWER SUPPLIES

Model TBX-8 Portable Radio Equipment

1. TBX SERIES OF EQUIPMENTS

The Model TBX Series of Portable Radio Equipments are designed to meet the paramount requirement of providing satisfactory communication between similar equipments installed ashore, aboard ship, or in small boats, and between such equipments and other units of the Naval Communication System at ranges of approximately 30 miles for CW transmission and 15 miles for Phone transmission.

The TBX-8 differs from earlier equipments of the TBX Series in many respects. Various additional features have been incorporated. These are as follows:

1. Previous models required the application of power to the transmitter for approximately 15 seconds before operation commenced. This has now been reduced to 4 seconds.
2. "PUSH TO TALK" and "BREAK-IN" operation permit immediate change-over from Send to Receive, without the necessity of manual switching. When the microphone switch is released, the receiver becomes operative. Likewise on "C.W.", with the key up the receiver functions.
3. Provision is made for the use of either low level microphones such as the lip type furnished with the basic equipment, or the high level hand microphone used with earlier models of the TBX Series. A modulation control contained within the Transmitter-receiver case is connected so that optimum "VOICE" operation may be obtained under all conditions.
4. During "C.W." operation, an audible tone is heard in the headphones so that the operator can hear hs own "keying".
5. If necessary, Signal Corps Type -FT243 (or similar crystal and holder) may be used in place of the type normally supplied with TBX equipment.
6. An additional binding post is included, which by means of a link arrangement, makes possible the use of individual antennas for the Transmitter and Receiver.
7. In addition, numerous circuit changes have been incorporated resulting in improved performance.
8. The addition of the following auxiliary equipment when in use with the TBX-8 basic equipment adds various additional features. These are as follows:

   (a) By means of the type -23453 "Remote Control" unit, remote operation of the TRANSMITTER-RECEIVER is made possible over a field telephone line (W-110 or equivalent) up to one mile in length.

   (b) By means of the type -60133 Crystal Calibrator and Monitor, crystal controlled accuracy and monitoring of the transmitter during self-excited transmission over the entire frequency range at any one of ten preselected crystal channels is possible. This also applies for the receiver between the frequency limits of 2 to 6 mc. Transmitter and receiver operating frequencies can be continuously monitored during operation and any deviation in frequency immediately corrected from the initial setting by zero beating with the selected crystal channel in use of the Crystal Calibrator and Monitor.

   (c) Operation of the type -43060 TRANSMITTER-RECEIVER during periods of rainy weather such as is encountered in the tropics is made possible by the addition of the type -10480 Rain Shield. The Rain Shield is constructed of transparent plastic material and fits over the front of the Transmitter-Receiver unit. Protection from a driving rain descending at any angle down to 45° from the vertical is obtained with the Rain-Shield installed on the Transmitter receiver unit set up for operation as shown in figure 1.

   (d) The second detector socket of the Receiver has been "Shock Mounted" to further minimize "Microphonic Noise."

   (e) Operation of the TBX-8 with the older type -10026A ACCESSORY BOX or Model EL thru EQ series of receiver power supplies is made possible by the addition of the type -632246 Adapter unit.

9. The units of the TBX-8 basic equipment and the auxiliary equipment except power equipments described above have all been *tropicalized* to eliminate the effects of moisture and fungus growth encountered when in use in tropical climates. Refer to section XII under Maintenance for a detailed description.

The Condensed Instructions For Installation and Operation included in the covers of Accessory Box Type -10339 and Transmitter-receiver Unit Type -43060, are intended for ready reference only and do not obviate the necessity of a careful study of this Instruction Book. Complete instructions for operation of the Model TBX-8 Portable Radio Equipment and Auxiliary Power Equipments are covered in this Instruction Book. One or more of the Auxiliary Power Equipments, for use with the Basic Model TBX Series of Portable Radio Equipment, may be supplied.

The Models EF-8, EG-7 and EJ-7 Auxiliary Transmitter Power Equipments filtered for R. F. "Hash" to permit CW (A 1) "Break-in" operation are supplied for use with the transmitter of the model TBX-8 portable radio equipment.

CW "Break-in" operation is not possible when older models of the EF, EG, EH and EJ series of Auxiliary Power Equipments other than those models described above are used unless filtered for R. F. "Hash". Use of older model Transmitter Auxiliary Power Equipments can be made simply by turning OFF the Transmitter Power Equipment in use when the receiver portion of the TBX-8 is in operation. This will prevent R. F. "Hash" from interfering with receiver operation.

The individual ratings of each of the Transmitter Auxiliary Power Equipments are given under section VI B.

The Models EL, EN series and models EAO and EAP Receiver Power Equipments are supplied for use with the model TBX series of Radio Equipments in lieu of the dry batteries used in Accessory Box Type -10339 for the Receiver Power Supply. With models EAO and EAP BATTERY CABLE TYPE

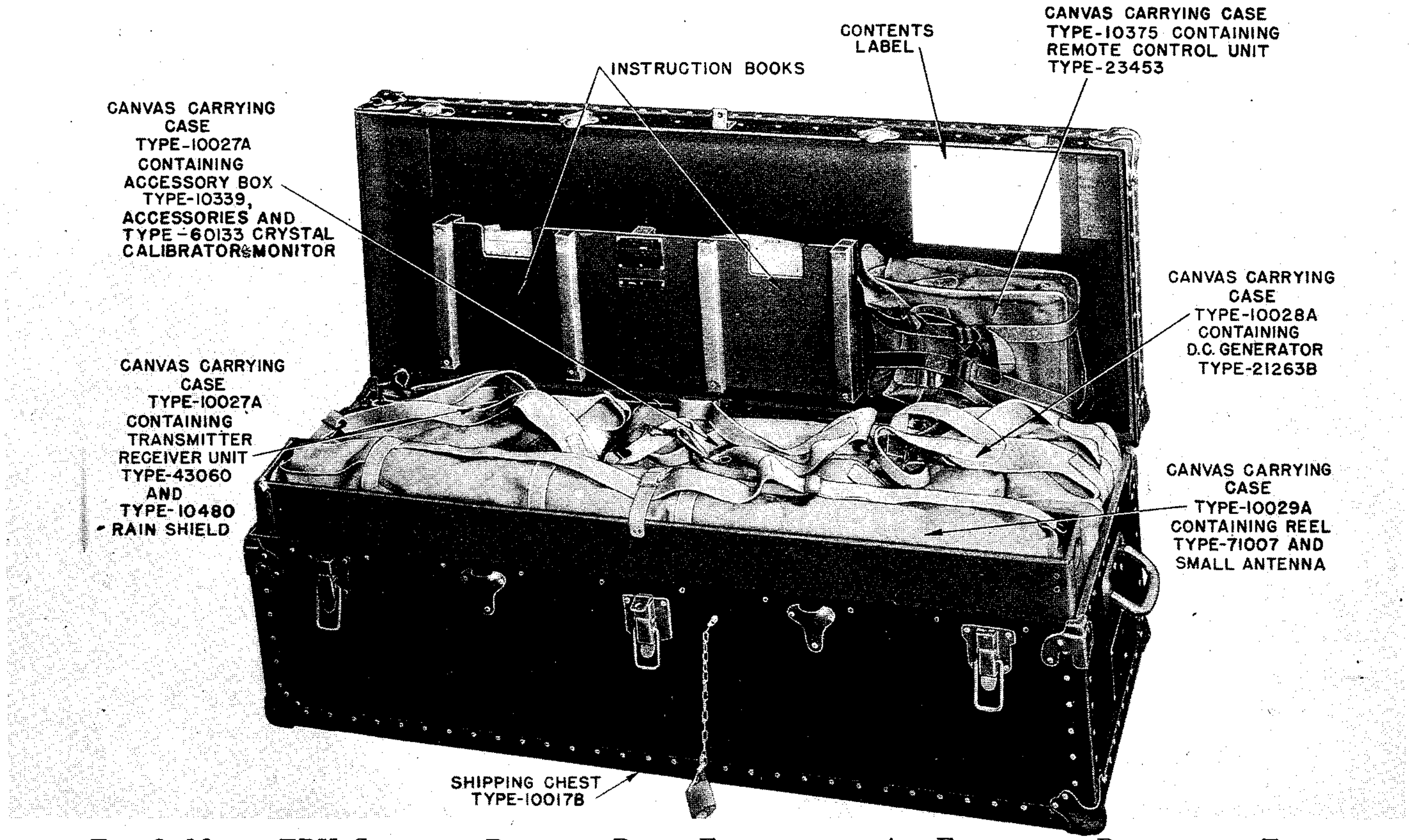

FIG. 2. MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS: AN EQUIPMENT PACKED FOR TRANSPORTATION IN SHIPPING CHEST TYPE -10017B

FIG 2-A MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS: AN EQUIPMENT PACKED FOR TRANSPORTATION

-49574 SUPPLIED WITH TBX-8 EQUIPMENT MUST BE USED FOR CORRECT OPERATION OF THE RECEIVER. This cable may be readily distinguished from the previous TBX battery cable type -49046 by means of a RED marker band.

If, however, OPERATION IS DESIRED FROM THE MODELS EN and EL SERIES, an ADAPTER type -632246 and battery cable type -49574 described above must be used. Should it be necessary to operate an older model TBX from Receiver Power Equipments type EAO and EAP simply connect the battery cable type -49046 in the normal manner. In this case, no adapter is necessary as all connections have been made internally.

II. FREQUENCY RANGE, POWER, AND TYPES OF OPERATION

A. RADIO TRANSMITTER: 2000-5800 kc; CW (A1), 9 watts; Voice (A3), 3 watts. Self-excited transmission is possible at any frequency in the above range; CW and Phone crystal-controlled transmission is possible at any two frequencies in the band for which crystals are provided.

B. RADIO RECEIVER: 2000-8000 kc; CW and MCW (voice modulated continuous wave or damped radio energy) at any frequency in the above range.

C. RECEIVER POWER EQUIPMENT: The Receiver Power Equipments are capable of supplying adequately filtered, polarized and isolated-filament, plate, screen, and bias voltages of 1.5, 3, 90, 135, 6, and 15 volts, as required for proper operation of the radio receiver.

The TBX-8 utilizes only the 1.5, 90 and 6 volt connections; the others are for use with older models of the TBX series as described previously.

The Model EN Series and EAP of Receiver Power Equipments are dynamotor-operated d-c equipments.

The Model EL Series and EAO are rectifier-operated a-c equipments.

These equipments are designed for operation from power sources having characteristics as given in Section VI. B.

III. MAJOR UNITS

A. MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS

Each Equipment of the Model TBX-8 Portable Radio Equipment includes the following major units:

(a) Basic Parts List

1 Shipping Chest Type -10017B, in which are packed the following:
1 Canvas Carrying Case Type -10027A containing
1 Transmitter-Receiver Type -43060 including
  3 Vacuum Tubes Type -1N5GT/G
  1 Vacuum Tube Type -1A7GT/G
  1 Vacuum Tube Type -2E22
  2 Vacuum Tubes Type -3A4
  1 Vacuum Tube Type -1A5GT/G
  1 Neon Tube Type -991
  2 Holders Type -40024A (with crystals)
  1 Canvas Carrying Case Type -10027A containing
  1 Accessory Box Type -10339 in which are contained
  1 Type -49507A Telephone Headset Assembly
  1 Type -49534 Telephone Extension Cord
  1 Generator Cable (20 ft.) Type -49044A
  1 Battery Cable (3 ft.) Type -49574
  1 Lip Microphone Assembly Type -51071
  1 Microphone Extension Cord and Switch Assembly Type -49588
  1 Vacuum Tube Type -1N5GT/G
  1 Vacuum Tube Type -1A7GT/G
  1 Vacuum Tube Type -2E22
  2 Vacuum Tubes Type -3A4
  1 Vacuum Tube Type -1A5GT/G
  1 Neon Tube Type -991
  1 Antenna Lead-in (Insulated, 5 ft.)
  1 -26022 Telegraph Key Assembly with leg Band
  2 Sponge Rubber Pads
  2 Batteries Type -19005 (Radio "B" 45 volts)
  2 Batteries Type -19010 (Radio "A", 1.5 Volts)
  1 Battery Type -19011 (Radio "C", 7.5 Volts)

Note: The above batteries comprise one complete set for operation.

CAUTION: Never leave batteries in Accessory Box Type -10339 when equipment is stored, or during shipment.

1 Canvas Carrying Case Type -10027A enclosing
2 Cranks for D-C Hand Generator Type -21263B
1 D-C Hand Generator Type -21263B (with Clamping Attachment) rated 12.6/500-550 volts, 2.0/0.085 amp max
2 Instruction Books
1 Canvas Carrying Case Type -10029A containing
1 Antenna System Assembly consisting of:
  3 Guy Stakes Type -66013
  1 Mast Section Type -66019 (Top Section)
  2 Mast Sections Type -66020 (2nd and 3rd from top)
  1 Mast Section Type -66021A (4th from top with 3 Insulators Type -61244 and 3 guy lines 20 ft. in length)
  3 Mast Sections Type -66022 (5th, 6th and 7th from top)
  1 Mast Base Support Type -66023B
  1 Ground Stake Type -66024
  1 Large Antenna and Counterpoise (Wound on Reel Type -71007)
  1 Padlock (attached to chest)

(b) Auxiliary Equipment Parts List

1 -60133 Crystal Calibrator and Monitor (carried in accessory box)
  10 -FT243 Holders with crystals
  1 -19011 Battery 7.5 Volts "C"

1 -19031 Battery 1.5 Volts "A"
1 -10480 Rain Shield (Packed with Type -43060 TRANS. -REC. Unit)
1 REMOTE CONTROL Unit Type -23453
1 Canvas Carrying Case Type -10375
6 -1.5 Volt "A" Battery Type -19031
1 ADAPTER UNIT Type -632246
(c) 1 SET OF BASIC EQUIPMENT SPARE PARTS consisting of:
2/L-SA-1670 Cover Fasteners (for TRANS.-REC. Unit Type -43060 or ACCESSORY BOX Type -10039)
2 B-PP-10006-1 Black Jack Covers
2 B-P-10006-2 Red Jack Covers
2 L-SA-10074 Binding Post Assemblies
1 Set of Brushes for -21263B D.C. Generator (4-B-BR-1004 L.V.) (4-B-BR-1005 H.V.)
2 B-SP-10005 Crankshaft Grounding Brush
1 B-SP-10006 Armature Shaft Grounding Spring
1 -22130-A Ammeter
1 -22291-D Multimeter
1 Resistor Part No. B-RE-919, 1.43 ohms Part of -22291-D Multimeter
1 Resistor Part No. B-RE-920, 140,000 ohms Part of -22291-D Multimeter
1 Resistor Part No. B-RE-921, 0.4 ohms Part of -22291-D Multimeter
1 -30334 Receiver Output Transformer
1 -301276 Microphone Transformer
1 -301278 Modulation Reactor
1 L-SA-1677 R.F. Choke
1 B-CL-10001 R.F. Choke
1 C-CL-10012 R.F. Choke
3 -1N5GT/G Vacuum Tubes
1 -1A7GT/G Vacuum Tubes
1 -1A5GT/G Vacuum Tube
1 -2E22 Vacuum Tube
2 -3A4 Vacuum Tubes
1 -991 Vacuum Tube
1 -66024 Ground Stake
2 -61244A Insulators
1 CM 50B 103K Capacitor .01 mfd.
1 48487-B10 Capacitor .01 mfd.
1 -48645-B10 Capacitor .001 mfd.
1 -48666-B2 Capacitor .0001 mfd.
1 CM 458 A111J Capacitor .00011 mfd.
3 -48770-B10 Capacitors .006 mfd.
1 -481043-B10 Capacitors .0005 mfd.
1 -481016-D1 Capacitor .0007 mfd.
1 -48674-B10 Capacitor .0001 mfd.
1 -48690-B10 Capacitor .00025 mfd.
1 -48771-B10 Capacitor 5 mmfd.
1 -481015-D1 Capacitor .0004 mfd.
1 -481014-D1 Capacitor .0003 mfd.
1 -48840-D10 Capacitor 15 mmfd.
1 -48675 Capacitor .0002 mfd.
1 CC 26-CK 250K Capacitor 25 mmfd.
1 -482068 Capacitor .02 mfd.
1 -481002-20 Capacitor .5 mfd.
1 -481998-10 Capacitor 1 mfd.
1 -482184-20 Dual .5 mfd.
1 -482928 Capacitor 15 mfd.
2 -482180 Capacitor 50 mfd.
1 -482434-10 Capacitor 2 mfd.
1 CM 30B 302K Capacitor .003 mfd.
1 -63360 Resistor 1 megohm
1 -63360 Resistor ½ megohm
1 -63360 Resistor 50,000 ohms
1 -63360 Resistor 2 megohms
1 -63360 Resistor 200,000 ohms
1 -63360 Resistor 30,000 ohms
1 -63360 Resistor 6,800 ohms
1 -63360 Resistor 150,000 ohms
2 -63355 Resistors 10,000 ohms
1 -63355 Resistor 100,000 ohms
1 -63360 Resistor 68,000 ohms
1 -63288 Resistor 11,000 ohms
1 -63291-5 Resistor 240 ohms
1 -63555B Resistor 42 ohms
1 -63288 Resistor 22 ohms
1 -63703-5 Resistor 30 ohms
1 -63705-5 Resistor 100 ohms
1 -63705-5 Resistor 68 ohms
1 -63705-5 Resistor 390 ohms
1 -63288 Resistor 3,300 ohms
1 -63689E-10 Resistor 20,000 ohms
1 -63634-10 Resistor 5,000 ohms
1 -632093-5 Resistor 4 ohms
1 -63360 Resistor 2,500 ohms
1 -63360 Resistor 1,000 ohms
1 Antenna Relay Part No. C-RL-10000
1 Line Relay Part No. C-RL-10001
1 L-SA-10080 Accessory Box Cable
1 -631987-10 Potentiometer 100,000 ohms
1 -631414-10 Potentiometer 20,000 ohms

(d) Auxiliary Equipment Spare Parts:
1 Set of Equipment Spares for Crystal Calibrator and Monitor Type -60133 consisting of:
1 RC 21 BF 224K Resistor 220,000 ohms
1 CC 21 CK 100 F Ceramicon 10 mmfd.
1 CC 21 CK 150 K Ceramicon 15 mmfd.
1 Vacuum Tube Type -3A4
1 L-CL-10014 R.F. Choke
1 L-SA-10151 Waterproof Jack Cover assembly
1 L-SA-10093 Binding Post Assembly
1 B-TE-1003 Binding Post
1 Set of Equipment Spares for Remote Control Unit, Type -23453 consisting of:
1 -63360 Resistor 1 megohm
1 -63705-10 Resistor 18 ohms
1 -481998-10 Capacitor 1 mfd.
1 -481721 Capacitor 25 mfd.
1 -301437 Line Matching Transformer
2 L-SA-10154 Red Waterproof Jack Cover Assembly
2 L-SA-10151 Black Waterproof Jack Cover Assembly
2 L-SA-10074 Binding Post Assemblies
2 B-PP-10027 Latch Fasteners
1 Set of Equipment Spares for Adapter Unit Type -632246 consisting of:
1 -63703-5 Resistor 6 ohms
1 -63703-5 Resistor 27 ohms
1 RC-21-BF-333J Resistor 33,000 ohms
1 RC-21-BF-822J Resistor 8,200 ohms
1 RC-41-BF-203J Resistor 20,000 ohms

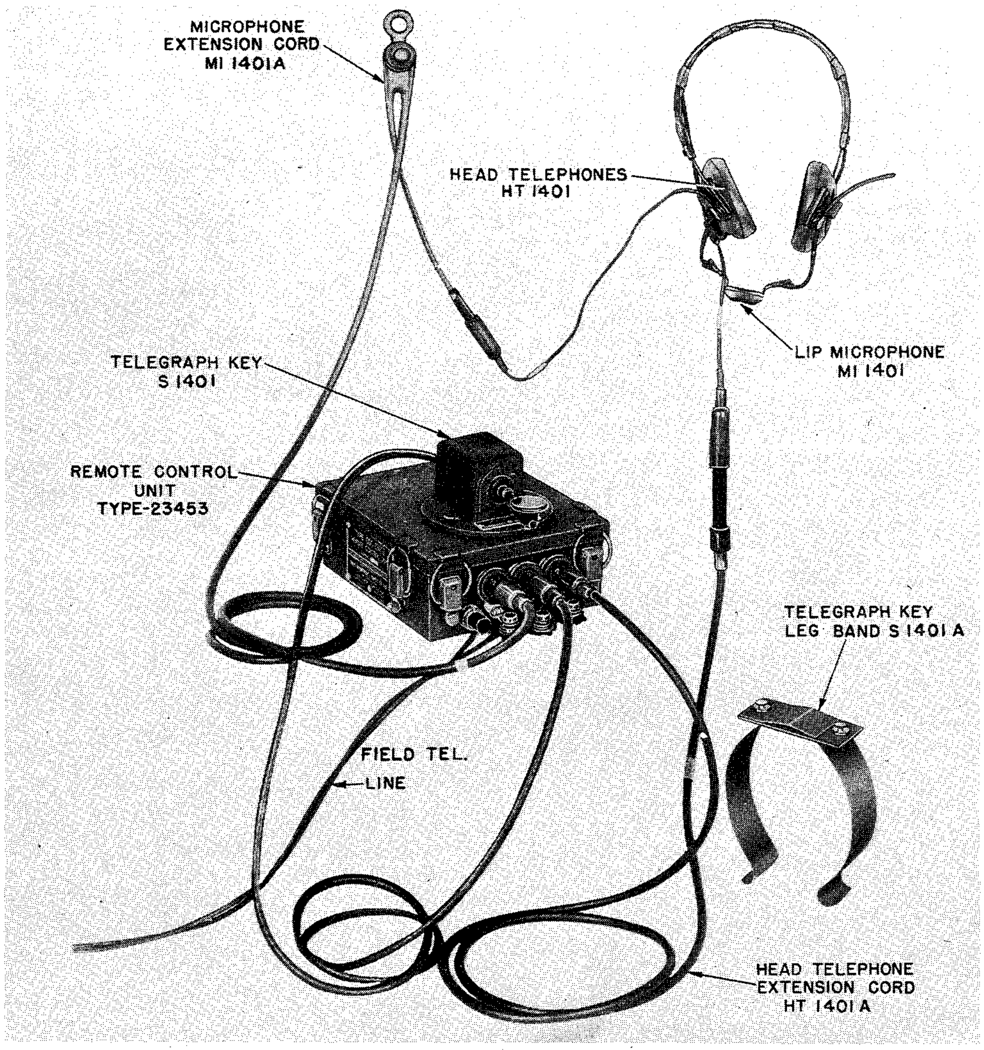

FIG. 3. REMOTE CONTROL UNIT TYPE -23453 SET UP FOR C.W. OR VOICE OPERATION

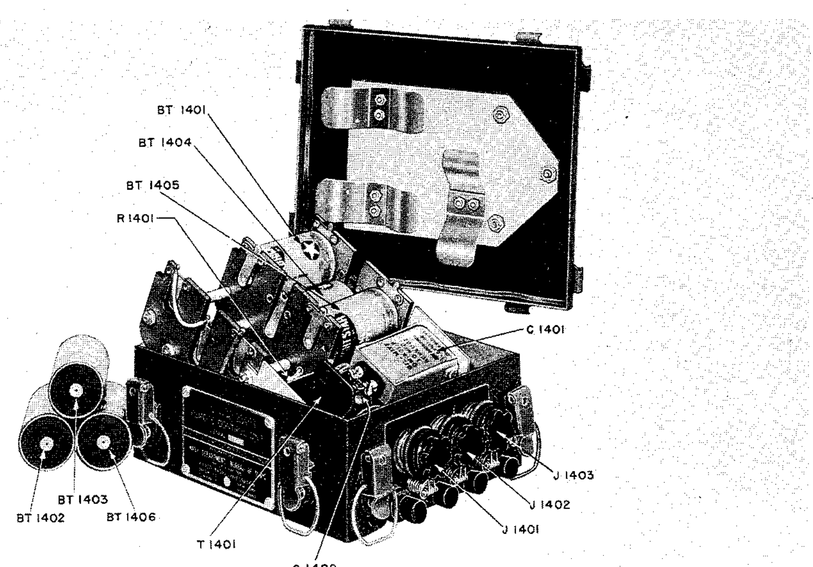

FIG. 3A. REMOTE CONTROL UNIT TYPE -23453 WITH COVER REMOVED

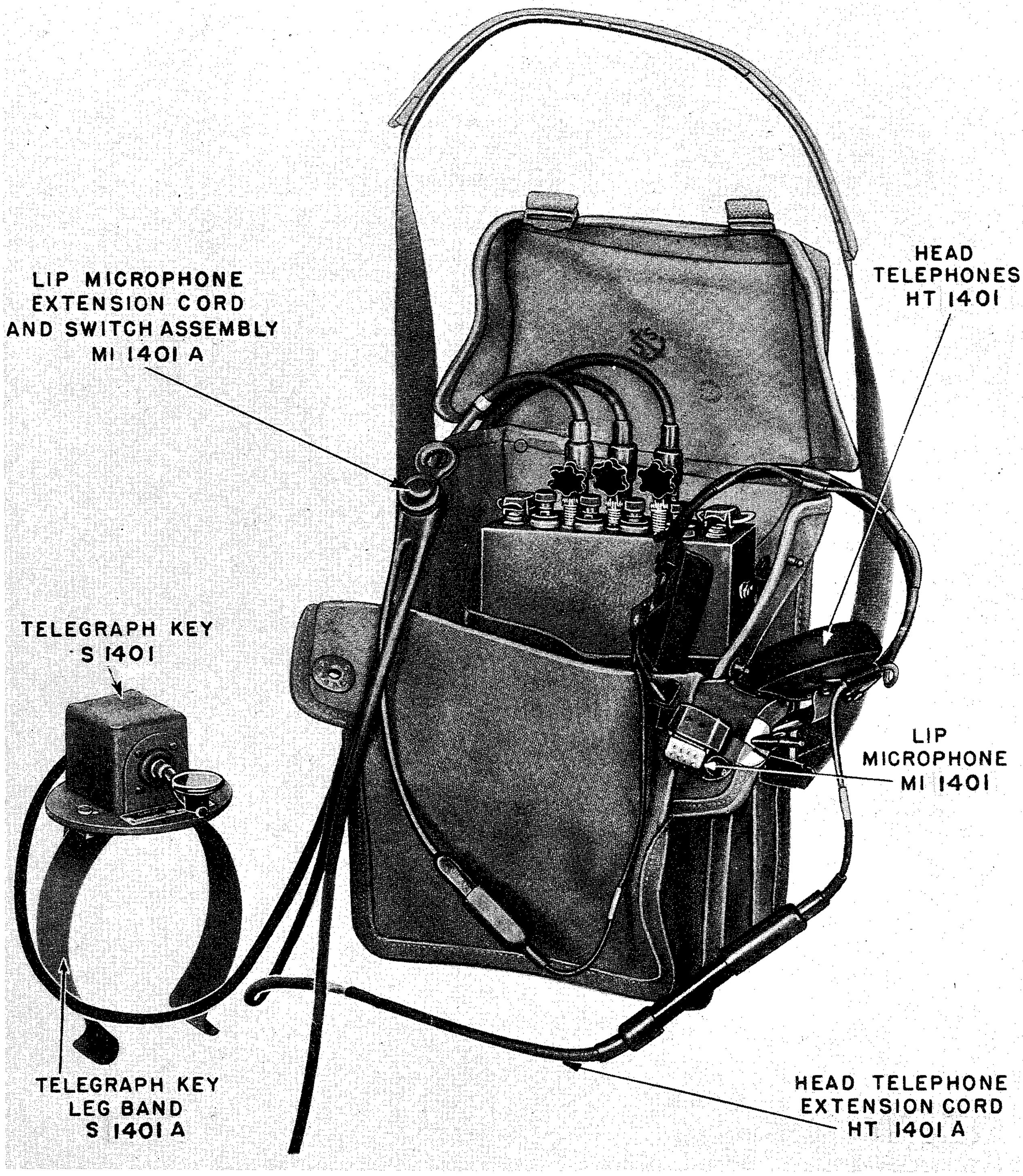

FIG. 3B. REMOTE CONTROL UNIT TYPE -23453 SHOWING UNIT INSTALLED IN CARRYING CASE

IV. FIELD EQUIPMENT

A. BASIC FIELD EQUIPMENT

The units of the Model TBX-8 Basic Portable Radio Equipment which are intended to be removed from shipping chest type -10017B for use in the field comprises the following:

(a) Type -43060 Transmitter-Receiver unit complete with carrying case type -10027A.

(b) Type -10339 Accessory Box complete with carrying case type -10027A.

(c) Type -21263B D-C Hand Generator complete with carrying case type -10028A.

(d) Antenna Assembly complete with carrying case type 10029A.

B. AUXILIARY EQUIPMENT

The units of the model TBX-8 Basic Portable Radio Equipment designated as "auxiliary equipment" which are intended for use in the field with the basic equipment are the following:

(a) Type -60133 Crystal Calibrator and Monitor. This unit is carried in the accessory box.

(b) Type -10480 Rain Shield. This unit is packed with type -43060 Transmitter-Receiver unit and is intended for use with the Transmitter-Receiver unit in rainy weather.

(c) Type -632246 Receiver Adapter Unit. This unit carried in the shipping chest need not be removed for use with the TBX-8 basic equipment.

V. REMOTE CONTROL UNIT

The Model -23453 Remote Control Unit permits operation of the Basic Equipment at a distance (up to one mile).

This consists of a Canvas Carrying Case Type -10375 containing:

1—Remote Control Unit Type -23453

1—Head Set Type -49507

1—Headphone Extension Cord Type -49534

1—Microphone Type -51071

1—Microphone Extension Cord and Switch Assembly Type -49588

1—Telegraph Key Assembly with Leg Band Type -26022

6—1.5 volt "A" Battery Type -19031

The remote control unit contains 6 Type 19031 batteries. These batteries are readily accessible for replacement by unlatching the cover. See Fig. 3B.

NOTE: THE BATTERIES MUST BE REMOVED FROM THE REMOTE UNIT WHENEVER THE EQUIPMENT IS STORED OR DURING SHIPMENT.

VI. POWER SUPPLY

A. BASIC POWER SUPPLY

1. Radio Transmitter

The radio transmitter of the Model TBX-8 Portable Radio Equipment is designed to operate from the following power supply which is furnished with each Basic Equipment:

Hand-driven D-C Generator Type -21263B rated 12.6/500-550 volts, 2.0/0.085 amp. max. d-c.

2. Radio Receiver

Battery Supply contained in Accessory Box Type -10339 comprising:

"A" Battery, 1.5 volts, consisting of two Batteries Type -19010 in parallel.

"B" Battery, 90 volts, consisting of two Batteries Type -19005 in series.

"C" Battery, 7.5 volts, Type -19001 (6 volt tap only utilized).

CAUTION: NEVER LEAVE BATTERIES IN THE ACCESSORY BOX WHEN THE EQUIPMENT IS STORED OR DURING SHIPMENT.

B. AUXILIARY POWER EQUIPMENTS

1. Transmitter [Reference is made to Cording Diagram Fig. 27]

Instead of Hand-driven D-C Generator Type -21263B, power supply for the radio transmitter may be obtained from one of the following Auxiliary Power Equipments when available:

1. Model EF Series, Gas Engine-driven Generator Equipments—self contained.
2. Model EG Series, A-C Motor-Generator Equipments—115 volts, 60 cycle, single phase.
3. Model EH Series, D-C Motor-Generator Equipments—115 volts d-c line.
4. Model EJ Series, Dynamotor Equipments—12 volt storage battery.

2. Receiver [Reference is made to Cording Diagram Fig. 27]

The Model EAO and EAP Receiver Power Equipments are capable of supplying adequately filtered, polarized and isolated filament, plate, screen and bias voltages of 1.5, 3, 135, 90, 15 and 6 volts respectively. 1.5, 90 and 6 volts are required for proper operation of the TBX-8 Radio Receiver without the use of the Type -632246 Adapter Unit.

Use of the Type -632246 Adapter Unit and Type -49574 3 foot cable is required for correct operation of the Receiver of the TBX-8 from the Receiver Power Equipments described below:

The Model EL Series are rectifier operated a-c equipments.

These equipments are designed for operation from power sources having the following characteristics:

Model EL Series—115 volt ($\pm 10\%$) 60 cycle ($\pm 2\%$) a-c line.

The Models EM, EN, EO, EP and EQ Series of

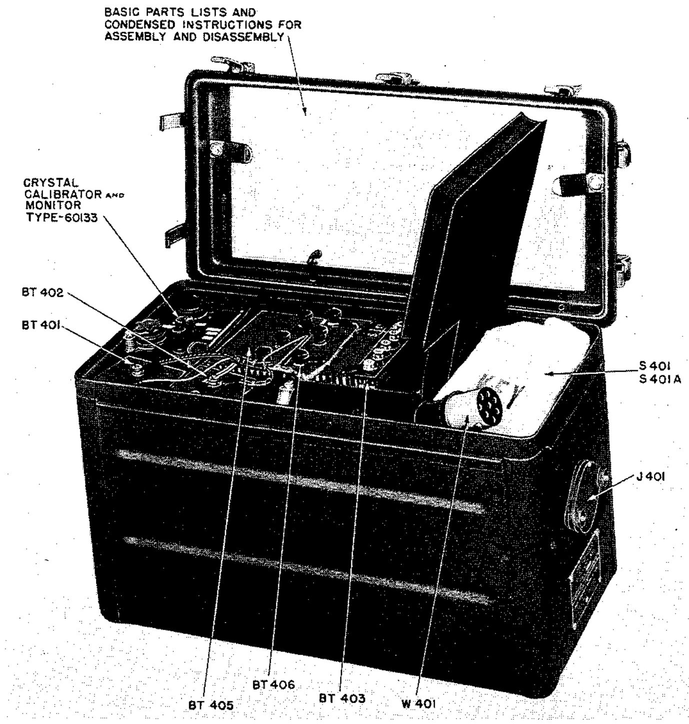

FIG. 4. ACCESSORY BOX TYPE -10339: COVER OPEN

the Receiver Power Equipments are all dynamotor-operated d-c equipments, and are similar to the Model EAP except for filtering against R.F. "Hash" and dynamotor ratings.

Model EM Series—6 volt ($\pm15\%$) storage battery, approximately 25 watts.

Model EN Series—12 volt ($\pm15\%$) storage battery, approximately 25 watts.

Model EO Series—24 volt ($\pm15\%$) storage battery, approximately 25 watts.

Model EP Series—32 volt ($\pm15\%$ storage battery, approximately 25 watts.

Model EQ Series—110 volt ($\pm10\%$) d-c line, approximately 25 watts.

VII. ANTENNAS

Two types of antennas are provided.

A. SMALL ANTENNA

This is a vertical rod antenna, approximately 24 feet in height, which is used for installations when space and time are limited. It may be used with, or without, the counterpoise wires, depending on the nature and conductivity of the soil over which it is erected. Short distance communication is possible using the three Type -66022 lower sections only.

B. LARGE ANTENNA

This antenna is of the single wire "L" type and is designed to be erected when space and time permit. It may be operated with or without the counterpoise wires, depending on the nature and conductivity of the soil over which it is erected; the ground post and mast (less the three top sections) are also required when the "large" antenna is used.

VIII. VACUUM TUBES

The Model TBX-8 Basic Portable Radio Equipment employs a total of nine vacuum tubes as follows:

Radio Transmitter:

- One Type 3A4 as Master Oscillator
- One Type 2E22 as Power Amplifier
- One Type 3A4 as Speech Amplifier (Modulator)
- One Type 991 neon tube as Side Tone Oscillator for "C.W."

Radio Receiver:

- One Type 1A7GT/G as Frequency Converter —(1st Detector-Oscillator)
- One Type 1N5GT/G as I-F Amplifier
- One Type 1N5GT/ as Beat Frequency Oscillator
- One Type 1N5GT/G as 2nd Detector
- One Type 1A5GT/G as Audio Amplifier
- Spaces are provided, in Accessory Box Type -10339, which include each of the above types

as mobile spares as follows:

One Type 2E22
Two Type 3A4
One Type 991
One Type 1A7GT/G
One Type 1N5GT/G
One Type 1A5GT/G

In addition, one complete set of tubes as listed above is carried as part of the Set of Equipment Spare Parts contained in Shipping Chest Type -10017B.

The Model -60133 Auxiliary Crystal Calibrator and Monitor employs one type 3A4 vacuum tube as a crystal controlled oscillator. An additional 3A4 vacuum tube is furnished as part of the equipment spare parts contained in Shipping Chest type -10017B.

TRANSMITTER

Type	Description	Fil. Potential Volts	Fil. Cur. Amp.	Function	Remarks
3A4	Minature Pentode	2.8	0.1	R.F. Osc.	Triode Connected
3A4	Minature Pentode	2.8	0.1	Speech Amplifier (Modulator)	
2E22	R.F. Low Power Pentode	6.3	1.5	Power Amplifier	Suppressor Modulated
991	Glow Discharge Voltage Tube	—	—	Side Tone Osc. on "C.W."	Double contact bayonet candelabra base.

RECEIVER

Type	Description	Fil. Potential Volts	Fil. Cur. Amp.	Function	Remarks
1A7GT/G	Pentagrid Converter	1.4	0.05	Converter 1st Detector (Oscillator)	....
1N5GT/G	R.F. Amplifier Pentode	1.4	0.05	I.F. Amplifier	....
1N5GT/G	R.F. Pentode	1.4	0.05	2nd Detector	....
1N5GT/G	R.F. Amplifier Pentode	1.4	0.05	Beat Freq. Osc.	....
1A5GT/G	Power Amplifier Pentode	1.4	0.05	Audio Amplifier	

IX. INSTALLATION

A. GENERAL

The complete TBX-8 Basic Equipment is normally transported and stowed in Shipping Chest Type -10017B. Refer to Outline Diagram Fig. 28. Care should be taken to check parts against the list given on the contents name plate whenever the equipment is replaced after field use. Requisition replacement promptly when any item is lost, damaged beyond repair, or is utilized in effecting repairs. The completeness of the equipment, including all listed Equipment Spare Parts, must be maintained intact.

Batteries, when removed from Accessory Box Type -10339, should be stowed in the spaces provided in Shipping Chest Type -10017B. Connection Diagram Fig. 23 shows the proper connections for the batteries as used in Accessory Box Type -10339. This diagram also appears in the cover of the accessory box for ready reference.

CAUTION: THE BATTERIES MUST BE REMOVED FROM THE ACCESSORY BOX WHENEVER THE EQUIPMENT IS STORED OR SHIPPED.

No particular problems should be encountered in the installation of the Receiver Power Units. They must be placed within three feet of the radio-receiver power receptacle in a position where the power switch is readily accessible and the indicator lamp visible (EAO or EL only). They can usually be installed in the space formerly occupied by Accessory Box Type -10339.

Before installation of any one of the Model EAO or EL Series of Receiver Power Equipments, be sure that the vacuum tube, filter capacitors, and indicator lamp bulb are firmly inserted in their proper sockets.

Any of the line-operated Receiver Power Equipments should be connected, by means of the attachment plugs provided, to suitable fused outlet receptacles.

The battery-operated Model EAP or EN series of Receiver Power Equipments should be connected to the battery panel board, where available, by means of the clips provided.

Battery Cable Type -49574, provided in Accessory Box Type -10339, is to be used for connection from the power unit to the radio receiver.

CAUTION: WHEN USING A UNIT OF THE "EL" OR "EN" SERIES OTHER THAN MODELS EAO OR EAP ADAPTER TYPE -632246 MUST BE USED,TOGETHER WITH 3 FT. CABLE TYPE -49574.

When installing the Basic Field Equipment, the instructions for assembly and disassembly (which are also contained in the Condensed Instructions, carried in the cover of the Accessory Box Type -10339) should be followed.

When it is desired to use any one of the Model TBX Series of Portable Radio Equipments in an open boat or in motor vehicles, a suitable wooden mounting rack can be constructed by the activities personnel for mounting and holding Radio Transmitter-receiver Unit Type -43060, Accessory Box Type -10339, and the "Small" antenna-mast base support.

Figs. 12 and 12A shows a suitable design for the mounting rack with the relative components of any of the Model TBX Series of Portable Radio Equipments mounted thereon. Radio Transmitter-Receiver Type -43060 is mounted on the top shelf with Accessory Box Type -10339 directly under it. Provision is made at the left for mounting the ground stake of the "Small" antenna. A space is provided, at the left of Accessory Box Type -10339, in which the microphone, headphones, and writing materials may be stowed when not in use. The rack has an extension at each end of the bottom to permit fastening to a bench, seat or other structural members as available. The rack can be fastened to its support by lashing, nailing, by the use of wood screws or machine bolts and nuts.

The rack illustrated is made of white-pine lumber and is fastened together with common nails. Almost any kind of wood can be used; the design is such as to be readily adapted to the available material.

Outline Diagram Fig. 29 shows the constructional details of the rack. Dimensions on this drawing indicate possible variations which can be made, depending on the material used. If desired, wood screws can be used to hold the parts together. The only tools required to build this rack, in its simplest form, are a saw and hammer. The hole, in the top shelf, for the ground stake is made by sawing off one corner of the shelf. The bottom support for this stake is a triangular block of wood nailed in position.

B. ASSEMBLY AND DISASSEMBLY INSTRUCTIONS

1. General

(a) Always check equipment against the Basic Parts List prior to taking into the field, and also upon disassembly.

(b) Keep all parts free of dirt and moisture.

(c) Set up equipment so that maximum possible antenna clearance is provided.

(d) The batteries must be removed from Accessory Box Type -10339, whenever the equipment is to be out of use for periods exceeding three days.

2. To Install "Small" Antenna

(a) Locate and drive the ground stake. Drive guy stakes 120 degrees apart, about 12 feet from the ground stake.

(b) Assemble antenna by screwing sections together in the order listed under the Basic Parts List and lay it on a line with one of the guy stakes, with the base adjacent to the ground stake. To assist in rapid assembly, all screw fittings with corresponding threads have been coded with the same color (Red or Yellow).

(c) Unwind and separate all guy lines. Adjust guys to approximate lengths required.

(d) Screw the insulated base section into the bottom section of the mast assembly. Erect this assembly to a vertical position and screw the ground stake to the bottom section.

(e) Fasten the guys to the guy stakes with sufficient tension to prevent bowing of the antenna.

(f) Connect the Transmitter-Receiver ground post to the ground stake, using the stub sections of the counterpoise. The five-foot insulated section should be connected to the equipment and the two-foot section connected to the ground stake by means of the clip provided.

(g) Connect the Transmitter-Receiver antenna post to the post on the insulated base section, using the antenna lead-in. Keep this lead clear of the ground by moving Transmitter-Receiver Unit Type -43060 to take up the slack.

(h) When the counterpoise is used, it should be spread out under the antenna.

(i) Reverse the procedure to disassemble. Wrap the guy lines neatly between the hooks provided on the mast section:

NOTE: For short range communication it is only necessary to use the three lower sections of the "Small" antenna.

3. To Install "Large" Antenna

(a) Assemble the "Small" antenna as previously described, omitting the three top sections and inserting the connecting ring of the end of the "Large" antenna wire between the 4th and 5th mast sections from the top. Erect and guy the antenna mast so formed.

(b) Unroll the antenna; attach a heavy object to the end of the antenna line, and toss the end of the line across a suitable object, in such a manner that the antenna can be pulled up tightly. The far end of the antenna should be from 20 to 30 feet above the ground, and have a total span of from 40 to 70 feet.

(c) The counterpoise, if used, should be spread out under the antenna with the stub lead connected to the ground stake of the mast.

(d) To disassemble, reverse the above procedure. When winding the antenna, take care neither to snarl nor twist the wire. When winding the couterpoise, bring the far ends together at the reel and wind carefully and with sufficient tension to equalize the winding of the parallel wires. Separating the wire slightly, by allowing them to run between the fingers, will prevent twisting.

4. To Install D-c Hand Generator Type 21263B with Clamping Attachment

(a) Remove the generator from its carrying case and unfasten the gasketed covers over the plug and hand crank holes.

(b) Attach, with socket down, about shoulder high, to a suitable vertical object which is approximately 1½ inches to 12 inches in diameter. See that the thumbscrew is loose, then take up all extra slack in the chain around the object in the notch provided. Clamp by operating the thumbscrew.

(c) Insert generator cranks so that they form a 180-degree angle, and connect Transmitter-Receiver Unit Type -43060 and the generator by means of the generator cable Type -49044A.

(d) Retighten clamp after several minutes operation.

(e) Reverse the procedure to disassemble, taking care to fasten the gasketed covers evenly and tightly.

5. To Unpack and Install Transmitter-Receiver Unit Type-43060 Accessories

(a) Remove Transmitter-Receiver Unit Type -43060 and Accessory Box Type -10339 from their canvas carrying cases and open by disengaging the clamps. Open the gasketed cover of the accessory box socket.

(b) Remove the lids and locate them conveniently near the Transmitter-Receiver unit. The lead-in should approach the set from the left rear of the operator as he faces the panel.

(c) Remove the head telephone set, key, microphone, and extension cords from the accessory box. Attach the key to the buttons on top of the transmitter-receiver unit so that the top of the set forms an arm rest. Connect the Head Phone Set and Microphone to their respective extension cords. Plug in the key, microphone and head telephone set. If a headset with cord tips instead of plugs is available, it may be connected to the binding posts adjacent to the phone jack.

(d) The Transmitter-Receiver unit may be set on top of the accessory box for operation. Two sponge rubber pads are provided for this purpose and are to be placed between the Transmitter-Receiver unit and the top of the Accessory Box.

(e) Attach the 3 Ft. battery cable Type -49574 to the Accessory Box and Transmitter-Receiver unit.

(f) See that the antenna, ground (or counterpoise), and power cable connections are properly made.

(g) The equipment is now ready for operation.

(h) Provision is made for the use of an auxiliary receiving antenna. The binding post for this is located to the left of the R. F. Ammeter.

6. **To Disassemble and Pack Transmitter-receiver Unit Type-43060 Accessories**
   (a) Reverse the foregoing procedure.
   (b) The accessory box should be repacked as follows:
   Roll the cables together and place them on the bottom.
   Pack in the antenna lead-in.
   Wrap the key, head telephone set, and microphone separately in packing material, place in their respective bags and pack on top of the other units.
   (c) Tighten all covers down tightly and evenly, and return the equipment to the respective canvas carrying cases.

AUXILIARY EQUIPMENT

C. REMOTE CONTROL UNIT TYPE-23453

(a) Remove the Remote Control Unit type -23453 from its Canvas Carrying Case.

(b) Remove the cover by loosening the eight latches located at each side of the box.

(c) Install six Navy type -19031 or equivalent, 1½ volt flashlight cells as shown in Fig. 3A. The batteries are inserted between the bakelite uprights, so that the cap (positive terminal) slides into the groove in the bakelite supports.

(d) When properly installed as described above, the batteries are all connected in series for a total supply of 9 volts. Care should be taken that none of the batteries are forced or reversed into the holder, as improper or no operation will result.

CAUTION: REMOVE THE SIX TYPE -19031 BATTERIES WHENEVER THE EQUIPMENT IS TO BE OUT OF USE FOR PERIODS EXCEEDING THREE DAYS.

These batteries should have a useful life of approximately 80 hours (based upon an intermittent use of 4 hours per day). When the voltage drops below 7 volts the cells should be replaced.

(e) Some difficulty may be experienced in removing dead cells. This may be faciliated by partially lifting the complete assembly from the box, so that the batteries may be pushed out of the holder from the underside. See Figure 3A. Any bits of paper, torn from the battery cover, adhering to the contact springs should be removed before a replacement is made.

(f) Remove the head telephone set, key, microphone, and extension cords from the Canvas Carrying Case. Attach the key to the key studs located on the top cover of the Remote Control Unit. See Fig. 3. Connect the head phone set and lip microphone to their respective extension cords. Plug in the key, lip microphone and head set. Attach headset with cord tips instead of plug if used to binding posts below the "Phones" jack. Connect the field telephone line to the "LINE" binding posts. It is assumed that the other end of the line has been connected to the "LINE" posts of the Transmitter-Receiver Unit; which has already been set up for operation in the normal manner. The line must be properly polarized for correct operation. This is described in detail under "Operation and Adjustment" Paragraph E.

(g) For "Voice" operation the Remote Control Unit may be operated from the Canvas Carrying Case, since all jacks and binding posts are accessible when the flaps are open. See Fig. 3B.

(h) The Remote Control Unit is now ready for operation with the type -43060 Transmitter-Receiver Unit.

7. **To Disassemble and Pack Remote Control Unit Type -23453 Accessories**
   (a) Reverse the foregoing procedure.
   (b) Repack accessories in compartment provided in the type -10375 Canvas Carrying Case.

D. INSTRUCTIONS FOR ASSEMBLY AND DISASSEMBLLY OF THE TYPE -60133 CRYSTAL CALIBRATOR AND MONITOR.

(a) Remove the Crystal Calibrator and Monitor from the type -10339 Accessory Box.

(b) Loosen the two thumb screws located on the top cover of the unit and slide out of box.

(c) Install the type FT243 Crystal Holders and Crystals in the 10 socket positions and mark channel frequency in space markers opposite each lettered switch position. Install high frequency crystal channels between 5 and 6 megacycles in positions A, B, I and J for best operation.

CAUTION: Only type FT243 Crystal Holders of the front loading type with un-ungrounded nameplates should be used in the type -60133 Crystal Calibrator and Monitor. Use of type FT-243 Crystal Holders with grounded front nameplates will result in grounding one side of the crystal to the inside retaining channel of the Crystal Calibrator Monitor case and prevent operation.

(d) Install the Navy Type -19031 or equivalent 1½ volt flashlight cell and the Navy type -19011 or equivalent 7½ Volt "C" Battery in the positions shown by Figs. 13 and 13A. Strip off the insulation from the black lead of the "C" Battery and connect the black lead to the adjacent binding post. Connect the Blue Lead with attached spade lug to the + terminal of the "C" Battery.

(e) Install the unit into its box and tighten the two thumb screws securely.

(f) Clamp the Crystal Calibrator Monitor under the thumb nut located at the upper left side

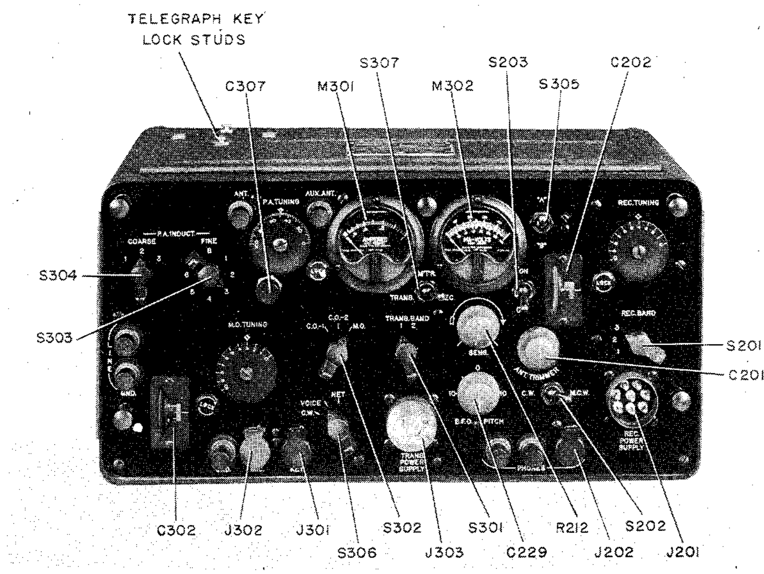

FIG. 5. RADIO TRANSMITTER-RECEIVER UNIT TYPE -43060:
FRONT VIEW OF PANEL

of the type -10339 Accessory Box as shown in Fig. 1.

(g) Turn the collapsible rod antenna to the vertical position and extend.

(h) The Crystal Calibrator Monitor is now ready for operation with the Type -43060 Trans.-Rec. Unit.

8. To Disassemble and Pack the Type -60133 Crystal Calibrator Monitor

(a) Reverse the procedure in paragraph (f) and (g) to disassemble and repack the Crystal Calibrator Monitor in the Type -10339 Accessory Box.
CAUTION: Remove the Type -19031 Flashlight cell and the type -19011 "C" Battery or equivalents whenever the Equipment is to be out of use for periods exceeding three days and store in Type -10339 Accessory Box.

E. INSTRUCTIONS FOR ASSEMBLY AND DISASSEMBLY OF THE TYPE -10480 RAIN SHIELD (for use during rainy weather)

(a) The Type -10480 Rain Shield is normally attached when not in use to the rear bottom case of the Type -43060 Trans.-Rec. Unit by means of a retaining strap which is permanently attached to one side of the shield and is stretched across the bottom of the case to a stud on the other side of the shield. See Fig. 15A.

(b) In rainy weather remove the Rain Shield from the case by detaching the synthetic rubber strap securing it to the case and mount over the guides on the front of the Type -43060 Trans.-Rec. Unit set up for operation.

(c) With the Rain Shield in place secure the synthetic rubber strap around the front portion of the Trans-Rec. Unit and attach to the stud on the other side of the Rain Shield as shown in Fig. 15.

9. To Disassemble and Pack the Type -10480 Rain Shield

(a) Reverse the above procedure to disassemble the Type -10480 Rain Shield and pack with type -43060 Trans.-Rec. Unit.

F. INSTRUCTIONS FOR ASSEMBLY AND DISASSEMBLY OF THE TYPE -632246 ADAPTER UNIT

(a) Remove the Type -632246 Adapter Unit from the battery compartment of the Shipping Chest.

(b) Remove the Adapter Unit from its bag and plug into the receptacle of the auxiliary power equipment or Type -10026-A Accessory Box Equipment to be used. See Fig. 27 for models of Auxiliary Equipment to be used with Adapter Unit.

(c) Plug the Type -49574 cable into the Adapter Receptacle Socket and connect the other end of the cable to the Receiver Receptacle Socket of the TBX-8 equipment.

10. To Disassemble and Pack the Type -632246 Adapter Unit

(d) Reverse the above procedure to disassemble and replace the Adapter Unit in the Shipping Chest battery compartment.

X. OPERATION AND ADJUSTMENT

A. WARNING

OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF VOLTAGES WHICH ARE DANGEROUS TO LIFE. OPERATING PERSONNEL MUST AT ALL TIMES OBSERVE ALL SAFETY REGULATIONS. DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE THE EQUIPMENT WITH HIGH-VOLTAGE SUPPLY "ON."

In general, whenever the chassis is removed from the case to replace tubes or make adjustments, the generator and receiver power cables should both be removed from the panel sockets.

If it is desired to run any power unit when not connected to the radio transmitter through the power cable, the socket on the power unit should be closed by its cover to prevent accidental contact with socket terminals.

B. GENERAL

The operation and adjustment of the Model TBX-8 Portable Radio Equipment and Auxiliary Equipment are described in this section. The adjustment of the transmitter is essentially the same whether Hand-driven D-C Generator Type -21263B or the Auxiliary Power Equipments are used.

Assuming that the Basic Field Equipment has been set up and checked in accordance with the Installation Instructions given under Section IX the following procedure should be observed in adjusting the radio transmitter to a particular desired frequency or form of operation. For convenience of the operator, operating instructions in a condensed form appear in the cover of Transmitter-Receiver Unit Type -43060. Typical Transmitter performance data under average operating conditions are given in Fig. 17.

Typical settings for the P.A.-Antenna tuning controls are indicated by this data for both "large" and "small" antennas. In general, the "P.A.IND.FINE" switch setting and the "P.A. TUNING CAP." will vary somewhat from the typical settings between equipments and installations, while the "P.A.IND. COARSE" switch settings will be as shown. For a particular installation and equipment, the settings, to give optimum performance, should be determined for the most commonly used frequencies and recorded in ink in the spaces provided on the "TUNING CHARTS" at the bottom of the proper CALIBRATION CURVE.

Care must be exercised to prevent radiation on the second harmonic instead of the fundamental M-O frequency. This is most likely to occur when operating in the frequency range 2000-3000 kc ("Trans. Band" in No. 1 position), and can be avoided when using the two antennas supplied by referring to the typical performance settings. The typical resonant frequency limits of the P.A.-Ant. circuit, when operated with each of the two antennas for "P.A.IND.COARSE" switch settings and for the extreme settings of the "P.A.IND.FINE" switch and the "P.A. TUNING CAP.", are given below:

P.A. Ind. Coarse	P.A. Ind. Fine	P.A. Tuning Cap	App. P.A.-Ant. Resonant Freq Kc	
			"Large" Ant.	"Small" Ant.
1	1	0	1620	1750
1	8	100	2356	2487
2	1	0	2180	2346
2	8	100	4463	4750
3	1	0	2800	3058
3	8	100	6480	7500

If it is ever necessary or desirable to operate on any antenna other than one of the two for which the equipments were designed (e.g., it might be desirable to operate into a shipboard receiving antenna for emergency use), particular care must be taken to avoid combinations of P.A.-Ant. tuning which would result in emission at the second harmonic of the M-O frequency. In this case, a check with a wavemeter should be made.

Transmitter M-O and receiver tuning calibrations appear on the "TUNING CHARTS" carried in the cover of each transmitter-receiver unit.

Typical meter readings for the radio receiver with fresh batteries and at any frequency of operation are:

Operation	Filament Current (Milliamperes)	Plate Voltage (Volts)
C.W. or M.C.W.	245	86

WARNING

Each of the Model TBX Series of Portable Radio Equipments is individually calibrated; therefore, care must be exercised to utilize only the calibration charts which were supplied with the particular equipment involved. The serial number of each Transmitter-Receiver unit is engraved on a Type Plate located on the cabinet. Each calibration chart bears the serial number of the equipment to which it is applicable.

C. RADIO TRANSMITTER

1. C.W.—(Crystal Controlled)

(a) Turn "C.W.-VOICE-NET" switch to "C.W."

(b) Turn "C.O.-1, C.O.-2, M.O." switch to "C.O.-1" or "C.O.-2" depending on the desired crystal frequency (see proper TUNING CHART at bottom of the transmitter CALIBRATION CURVE.)

(c) Turn the "TRANS. BAND" switch to position "1" or position "2" depending on the assigned crystal frequency (see TUNING CHART at bottom of proper transmitter CALIBRATION CURVE.)

(d) Turn the milliammeter ("M'T'R.") switch "TRANS.-REC." to "TRANS."

(e) Refer to the TUNING CHART selected above and set the "M.O. TUNING" dial to the recorded reading for the particular crystal selected. Also turn the "P.A. INDUCT" switches, both "COARSE" and "FINE" and the "P.A. TUNING" dial to the approximate settings recorded for the particular antenna in use.

(f) Operate the GENERATOR at approx. 65 R.P.M. and press the key. The transmitter current should reach a maximum reading in about 4 seconds.

(g) With the key depressed, rotate the "P.A. TUNING" dial until maximum antenna current is obtained. The transmitter current should have a value between 50 and 70 milliamperes (*lower scale reading*).

(h) Further adjustment of the "P.A. INDUCT-FINE" switch and the "P.A. TUNING" dial may be necessary to obtain maximum radiation.

(i) In general, the optimum crystal setting is obtained as follows: starting from zero, turn the "M.O. TUNING" dial until crystal oscillation is indicated by a sharp increase in the transmitter current. When this occurs the side tone oscillator will be heard in the earphones. The dial is then rotated 50 to 75 divisions in the same or increase-reading direction.

2. VOICE—(Crystal Controlled)

(a) Proceed as in "1" above. Then turn the "C.W. - VOICE - NET" switch to the "VOICE" position.

3. C.W.—(Self-excited or M.O.)

(a) Procedure is the same as in "1," above, except that the "C.O.-1, C.O.-2, M.O." switch is set to the "M.O." position and the "M.O. TUNING" dial, the "P.A. TUNING" dial, the "P.A. INDUCT-COARSE" switch, and the "P.A. INDUCT-FINE" switch are set in accordance with the proper TUNING CHART for the desired frequency and the particular antenna used. If the desired frequency is not recorded on the TUNING CHART, the "M.O. TUNING" dial setting is obtained from the CALIBRATION CURVE and the transmitter is tuned as described above.

4. VOICE—(Self-excited)

(a) Proceed as in "3". Then throw the "C.W.-VOICE-NET" switch to the "VOICE" position.

5. MODULATION CONTROL

When using the standard lip microphone, Type-51071, supplied with TBX-8 Equipment, the "MODULATION" control should be set at the maximum (or #10 position). This control is located on the left side of the chassis, and is accessible by removing the chassis from the cabinet.

With this maximum adjustment, when speaking in a normal manner, 90-100% modulation should be obtained. This is evidenced by an increase in the reading of the R.F. Ammeter of approximately 12½% over the value obtained without modulation.

If substantially less than 90% modulation is used, a loss in intelligibility when communicating over long distance or under adverse atmospheric conditions will result. Modulation considerably in excess of 100% will cause severe distortion.

Should the type -49007A microphone used in older TBX equipments be used the "Modulation" control should be turned to a lower setting so that at normal speech levels OVER-MODULATION will not result.

D. RADIO RECEIVER

1. C.W. Reception

(a) Cease operating the GENERATOR, allowing it to come to rest normally

(b) Set the "C.W.-M.C.W." switch in the "C.W." position.

(c) Turn the milliammeter ("M'T'R.") switch "TRANS.-REC." to the "REC." position. The meter now reads the "A" or receiver filament current on the *upper* scale. This should be between the limits of the red shaded area.

(d) Test the "B" battery voltage by holding the "A-B" switch momentarily down and reading the *lower* scale. The scale reading should fall between the limits of the indicated red range on the *lower* or 140 volt scale.

(e) Refer to the RECEIVER CALIBRATION CURVES or the proper TUNING CHART at the bottom of these curves and set the "REC. BAND" switch and the "REC. TUNING" dial for the desired frequency. Advance the "SENS" control while tuning the dial near this setting and locate the desired signal. Readjust the "SENS." control for optimum signal and retune the "REC. TUNING" dial for maximum volume, adjusting the "ANT. TRIMMER" as necessary. Adjust the "B.F.O. PITCH" control for the desired beat note frequency.

2. **PHONE or M.C.W. Reception**
   (a) Turn the "C.W.-M.C.W." switch to the "M. C.W." position. Readjust the "SENS." control, proceeding as for C. W. reception.

3. **NET Operation**
   (a) Throw the "C.W.-M.C.W." switch to "C.W." Set the "B.F.O. PITCH" control to zero. Tune in the station with which it is desired to "NET" and by means of the "REC. TUNING" dial adjust to zero beat.
   (b) Turn the "C.W.-VOICE-NET" switch to "NET." From the calibration or recorded tuning data set the "M.O. TUNING" dial to the approximate frequency of the received signal as determined from the receiver calibration. Apply power to the transmitter. Reduce the ssensitivity control so as to bring the signal to a suitable level for headphone reception. Adjust the "M.O. TUNING" dial for zero beat. Tune the antenna circuit for maximum power output as indicated by the R.F. Ammeter. NOW CAREFULLY READJUST the "M.O. TUNING" DIAL FOR ZERO BEAT.
   (c) Turn the "C.W.-VOICE-NET" switch to either "VOICE" or "C.W." as desired.

4. **Auxiliary Antenna**
   The "AUX" binding post permits the use of a separate antenna for the receiver, as discussed in Section X-B (Auxiliary Antenna). Remove chassis from cabinet and slide the link on the terminal board on the rear of the panel to the "AUX" position. A screw driver fastened to the underside of the chassis may be used for this purpose.

AUXILIARY EQUIPMENT

E. REMOTE CONTROL UNIT OPERATION

(a) Connect the line between the "LINE" binding posts of the Transmitter-Receiver and those on the remote unit. If line polarity is known, connect the plus wire of line from transmitter to L2.

(b) Plug the headphones, key, and microphone into their respective jacks at the remote unit.

(c) It is assumed that the Transmitter-Receiver has been set up and tuned for operation on a specific frequency, but with the Transmitter power supply not functioning. The key, microphone and headphones are left connected as for normal operation.

(d) Depress the microphone switch. The operator or monitor at the Transmitter may now be instructed to start operation of the Transmitter power supply and set the "C.W.-VOICE-NET" switch to "C.W."

(e) Depress the key. The side tone should now be heard in the headphones. If such is not the case, the line wires should be reversed and the test repeated.

(f) The "TRANS." and "ANT" meters should now read.

(g) If required, further adjustments of the Transmitter and Receiver can now be made. The equipment is then ready for operation on C.W.

(h) If "VOICE" operation is desired, instructions may be transmitted, to the operator at the Transmitter by depressing the microphone switch and talking into the microphone. The voice currents are of sufficient intensity to override the side tone.

(i) Two-way intercommunication without radiation, over the remote line may be obtained by setting the "C.W.-VOICE-NET" switch to the "NET" position. During such operation power must be supplied to the Transmitter, and remove the antenna lead. Power need not be supplied to the receiver for this type of operation.

CAUTION: CONTINUOUS OPERATION OF THE HAND GENERATOR IS NECESSARY AT THE TRANSMITTER-RECEIVER STATION DURING TWO-WAY COMMUNICATION WITH REMOTE CONTROL UNIT.

(j) Check modulation by noting change in antenna current and adjust "MODULATION" control (in transmitter) if necessary as described under "Modulation Control," Section C. Paragraph 5.

F. CRYSTAL CALIBRATOR AND MONITOR OPERATION

I. Assuming that the basic field equipment has been set up for field use with the Crystal Calibrator and Monitor as shown in Fig. 1, the following procedure should be followed in adjusting the Transmitter or Receiver to a particular crystal channel frequency in conjunction with the Crystal Calibrator and Monitor.

II. Crystal Calibrator and Monitor operation with the Transmitter.

(a) C.W. (Self-Excited or M.O.).
   1. Select the crystal channel desired on the Calibrator Monitor and set the selector switch to that position. The crystal channel frequencies are pencilled in to correspond to the internal crystals plugged into the respective sockets.
   2. Proceed with adjustment of the Transmitter as described in paragraph (C3) except turn the "CW-Voice-Net" switch to the "Net" position.
   3. Plug the headphones into the "Phones" jack of the Crystal Calibrator and Monitor.
   4. Refer to the Transmitter tabulated "M.O. dial" settings for M.O. Bands 1 and 2 given on the chart located in the lid of the type -43060 Transmitter-Receiver Unit. Select the nearest M.O. dial setting that approximates the crystal channel selected on the Crystal Calibrator and Monitor.
   5. Extend the collapsible rod antenna to maximum length for maximum coupling to the antenna lead.
   6. Hold the momentary On-Off switch to the On position and at the same time rotate the M.O. tuning dial back and forth until

an audible beat frequency is heard in the Phones. Now carefully by rotating the M.O. tuning dial readjust the audible beat frequency to "Zero Beat" and lock the M.O. tuning dial. Release the Crystal Calibrator and Monitor momentary switch to the "Off" position.

7. Turn the "CW-Voice-Net" switch to "CW" or "Voice" and proceed with normal transmitter operation.
8. The Transmitter M.O. dial lock should be released and the initial setting checked for "Zero Beat" against the Crystal Calibrator and Monitor channel being used and the M.O. tuning dial reset at short intervals for initial "Warm-Up" drift. The procedure outlined in paragraph (6) above should be repeated with the "CW-Voice-Net" switch in the "Net" position.
9. The above procedure is the same for all other crystal channels selected on the Crystal Calibrator and Monitor. Continuous Monitoring of the Transmitter Signal is thereby made possible at all times that an M.O. frequency corresponding to the selected crystal channel is used. Readjust the rod antenna for optimum coupling dedesired to the Transmitter antenna lead to avoid blocking of the Crystal Calibrator and Monitor signal.

III. Crystal Calibrator and Monitor Operation with the Receiver.

(a) "CW" Reception.

1. Turn the "CW-Voice-Net" switch to "CW" or "Voice" for proper Receiver operation.
2. Remove the Phones from the "Phones" jack of the Crystal Calibrator and Monitor and plug into the Receiver Phones jack.
3. Proceed with Receiver adjustments as described in paragraph (D1).
4. Select the crystal channel desired on the CRYSTAL CALIBRATOR AND MONITOR by turning the selector switch to the lettered position that bears the pencilled in frequency desired.
5. Refer to the receiver tabulated "Tuning Dial" settings for Bands 1, 2 and part of 3 given on the chart located in the lid of the type -43060 Transmitter-Receiver Unit. Select the nearest "Tuning Dial" setting that approximates the crystal channel selected on the CRYSTAL CALIBRATOR AND MONITOR.
6. Hold the On-Off momentary switch to the On position and at the same time rotate the "Receiver" Tuning" dial back and forth until an audible beat frequency is heard in the Phones. Now carefully by rotating the "Receiver Tuning" readjust the audible beat frequency to "Zero Beat" and lock the "Receiver Tuning" dial.
7. Proceed with normal receiver operation.
8. Recheck the receiver frequency with the Crystal Calibrator and Monitor as described above at short intervals for "Warm-Up" drift and monitoring.
   NOTE: Figure 18 and figure 18A are tabulated data for Transmitter and receiver bands for use with the Crystal Calibrator and Monitor. This data appears on the chart that is mounted in the lid of the type -43060 TRANSMITTER-RECEIVER UNIT.

XI. ELECTRICAL CIRCUIT DESCRIPTION AND THEORY OF OPERATION

A. RADIO TRANSMITTER: [Reference is made to Schematic Diagram Fig. 19]

The type -43060 Transmitter-Receiver supplied as a unit of TBX-8 equipment, consists of a five tube superheterodyne Receiver and a four tube Transmitter.

This equipment employs "Push-to-Talk" operation on voice and "Break-In" operation on C.W., thereby eliminating the "Send-Receive" switch.

Provision is made, by means of the Type -23453 Remote Control unit for remote voice or C. W. operation over a W-110 (or equivalent) field telephone line up to one mile in length.

The transmitter consists of a 3A4 master oscillator, 2E22 Power amplifier and a 3A4 speech amplifier (Modulator). A 991 neon tube is employed as a tone oscillator to permit the operator to monitor his keying.

The oscillator consists of vacuum tube V302 together with inductor L301, variable capacitor C302 and padding capacitor C303. For Master Oscillator (Self-Excited) operation, the frequency is determined by the setting of variable capacitor C302 and band switch S301. Capacitor C303 is used to set the high frequency coverage to a predetermined limit.

Switch S302 selects either of two fixed crystal frequencies or operation as a continuously tuned Self-Excited Oscillator. With Switch S302 in position "C.O.-1" or "C.O.-2" the corresponding crystal is connected to the grid of V302; padding capacitor (C302 and L301) is switched to the plate circuit of V302 to form a tuned anode crystal oscillator.

The voltage for V302 is dropped to the proper operating potential by means of series resistors R313 and R316. The potential for the screen of the Power Amplifier Tube (V301) is also obtained from R313.

Bias for the oscillator is developed in the grid leak consisting of resistors R301 and R302 in series. R.F. choke L302 in series with this grid leak provides a high impedance while maintaining the correct D.C. resistance for proper operation of V301 and also serves to prevent the entry of R.F. into the suppressor and modulation circuits. On self-excited operation the grid leak (R301 and R302) is common to the power amplifier and oscillator grid circuits.

On crystal operation, since the grid of the oscillator, V302 is no longer connected to the grid of the power amplifier V301, separate grid leaks R317 and R318, are provided, which are connected across the individual crystals.

The plate of the 2E22 (V301) power amplifier is shunt fed thru R.F. choke L304 from the 550 volt supply which is by-passed for R.F. by capacitors C309 and C314. V301 is coupled by means of capacitor C308 to the output tank and Antenna loading circuits. Static drain resistor R315 prevents shock from the discharge of blocking capacitor C308.

The antenna and power amplifier plate circuits are common and are tuned to the desired frequency by the antenna coil L303, variable capacitor C307 and fixed capacitor C313. Coarse circuit adjustment of L303, and selection of fixed capacitor C313 are accomplished by switch S304. Fine adjustment of L303 is achieved by means of taps selected by switch S303. By this arrangement, a multiplicity of resonant combinations is obtained for any frequency in the Transmitter range to insure maximum output with either long or short antenna under various conditions of installation.

Resistor R323 inserted between L304 and the plate cap of V301 functions as a parasitic suppressor when the key is up while the voltage is applied to the Transmitter.

Switch S306 provides selection of C.W. or Phone. The third or "NET" position will be described elsewhere, in connection with the Receiver.

In the "C.W." position of S306, oscillator plate voltage is keyed through relay K301. This keyed voltage also feeds Neon tube V305 which functions as an oscillator to provide an audible side tone which is heard in the head phones. The suppressor of V301 is brought to ground potential in order to obtain maximum power output.

On "Phone" the suppressor is connected to the junction of R301 and R302. This provides a negative potential to limit the amplitude of the R.F. carrier to a value suitable for 90% phone modulation, with minimum distortion. Modulation choke L305 with grid swamping resistor R322 connected in parallel is inserted between the suppressor, which is bypassed for R.F. by capacitor C306 and this bias point. The voice currents from the microphone are fed through transformer T301 to the grid of modulator tube V303. The output of this tube is fed to the suppressor through coupling capacitor C317 and appears across modulation choke L305.

Modulator tube V303 operates as a Class A Pentode audio amplifier and provides sufficient gain to obtain 90% modulation at normal speech levels with a Navy type -51071 lip microphone.

Modulation control R321 is provided to reduce the output of higher level microphones to a suitable value, to prevent overmodulation.

Changeover from "Send" to "Receive" is accomplished automatically by means of relay K301. On "C.W." the relay is actuated when the key is depressed; on "Phone" when the microphone button is pressed. When this is done, the antenna is transferred from "Receive" to "Send," voltage is applied to the R.F. Oscillator V302 and the tone oscillator V305 (on C.W. only), and the B+ potential is removed from the receiver output tube, thereby rendering it inoperative. Since the plate voltage is always applied to the 2E22 while the transmitter power supply is functioning, it is necessary in the "key-up" position to limit the plate dissipation of tube V301 (2E22). This is accomplished by bleeder resistor R303 which limits the screen grid voltage, resulting in low plate current hence low plate dissipation. On remote operation this is accomplished by the use of an auxiliary relay RL302, the action of which will be described later.

When Switch S307 is thrown to the "TRANS" position, shunt resistor R310 is connected across the multimeter M302, which then reads the total "B+" current of the oscillator and amplifier tubes. The meter is by-passed for R.F. by capacitor C311.

Power for microphone excitation is obtained from the 12.6 V. microphone supply (Pin 66) which is filtered within the generator. Capacitor C310 provides additional filtering.

The filament of the modulator tube V303 is fed from this same source and is dropped through series resistors R307 and R308. R308 also provides a negative bias for the proper operation of V303 as an amplifier. R309 shunts one half of the filament (Pin 5 to Pin 7) to equalize the voltage across each half. Without this shunt, excessive voltage would develop across this half, with resultant decreased life. Capacitor C315 in conjunction with resistor R307 further filters the supply.

The filament current for the oscillator tube (V302) is obtained from the unfiltered 12.6 volt supply (Pin 64) through series dropping resistor R305. Here again, as in the case of the modulator tube V303, half the filament is shunted by resistor R306.

Resistor R304 is connected in series with the unfiltered 12.6 volt supply (Pin 64) to feed the filament of the 2E22 (V301).

The excitation for relay K301 is furnished by the unfiltered 12.6 volt supply (Pin 64). The auxiliary (remote control) relay is energized from the 12.6 volt filtered source (Pin 66) in addition to the batteries in the remote control unit. This will be described more fully, in connection with the remote control.

The plate of the modulator tube (V303) is fed through plate load resistor R320 and the screen through series resistor R319. Capacitor C316 bypasses the screen.

The high "B+" voltage is reduced through the common series dropping resistor R314 and bypassed by capacitor C318.

In order to facilitate keying, side tone has been incorporated to provide an audible note in the headphones. Neon tube V305 in conjunction with capacitor C322 and feed resistor R324 constitute the tone oscillator. This tone is coupled through capacitor C321 to the grid of V303. Note that this tube is now operating solely as an amplifier and is not functioning as a modulator. The plate of this tube is coupled through isolating resistor R326 and capacitor C323 to the primary of the receiver output transformer (T201).

On voice operation, speech side tone is provided in the same manner. The tone oscillator is disconnected and no longer functions when Switch S306 is set to "Voice" operation.

Series limiting resistor R325, connected at the low end of the modulation control maintains sufficient resistance in the grid circuit of V303 to provide a satisfactory degree of side tone under all settings of the modulation control.

The following additions shown in Fig. 19 were made to the Transmitter section of the TBX-8 on all equipments above serial #295:

(a) In order to eliminate a spurious parasitic oscillation when the transmitter is set for CO-1 or CO-2 operation, M.O. dial between 100 and 600 (either crystal not oscillating) "Trans. Band 1", and "Coarse" setting 1 capacitor (C324) was added. This capacitor is connected between pin 5 and pin 1 (ground) of V301.

(b) A condition of high plate current exists (M302 pointer swings off scale) when the transmitter is adjusted for *VOICE* operation of CO-1 or CO-2 (either crystal not oscillating). With these settings the suppressor of P.A. tube V301 has no bias. When the microphone switch (MI401A) is depressed lightly a positive charge is applied to the suppressor of V301 causing excessive plate current to flow. Resistor (R327) has been added and connected between the suppressor pin #4 of V301 and ground to minimize this effect.

Equipments below serial No. 295 do not contain the changes outlined above. Should similar conditions exist the additional parts C324 and R327 should be added. A supplement describing the changes was added to Instruction Book IBT-8.

B. RADIO RECEIVER [Reference is made to Schematic Diagram Fig. 19]

The receiver is of the superheterodyne type employing a total of five tubes; one type 1A7GT/G, three type IN5GT/G and one type 1A5GT/G all of which are of the 1.4 volt low drain (0.05 ampere) series.

When the relay K301 is in its normal or deënergized position, the radio frequency energy which is picked up in the antenna is connected through the relay contacts to capacitor C234. This in turn couples to the control grid (Grid #4) of the converter tube V201 and the input tuned circuit.

The input circuit is tuned by variable capacitor C202-A (antenna section of the two gang tuning capacitor), antenna trimmer C201, and either L201, L203, or L205, which are selected by "Band Selector" Switch S201, together with their respective trimmer capacitors C206, C205 and C204. These capacitors limit the high frequency range of each band.

Antenna trimmer C201, which is manually operated from the front panel permits accurate alignment of the input circuit with respect to the oscillator.

The band selector switch selects the proper oscillator inductor and shunt trimmer capacitor combination (L202, C216, C239), (L204, C215, C238), (L206, C214, C237) and the corresponding series padding capacitors (C213, C210), (C212, C209), (C211, C208).

This switch also short circuits the antenna and oscillator inductors not in use. Capacitor C207 serves to maintain the low potential side of the antenna circuits at radio frequency ground potential.

The oscillator tuned circuit is coupled to the No. 1 grid of converter tube V201 by means of coupling capacitor C203 and grid leak resistor R201.

The feedback winding is coupled to the anode or No. 2 grid by means of coupling capacitor C217 and series feed resistor R202. Capacitors C213, C210; C212, C209 and C211, C208 in addition to their padding function provide additional coupling for feedback and serve to maintain uniform oscillation throughout the range.

Screen grids (No. 3 and No. 5) of the converter tube are internally conected and are maintained at proper potential by means of series resistor R203 and by-passed to ground by capacitor C218.

The plate of the converter tube is coupled to the control grid of the intermediate frequency amplifier tube V202 through transformer T202 in which the plate and grid circuits are both tuned. The supply voltages fed to transformer T202 are suitably filtered by capacitors C219 and C220 and resistors R204 and R216 (which are located within the transformer shield).

The screen grid of intermediate-frequency-amplifier tube V202 is maintained at proper potential by series resistor R214 and by-passed with capacitor C222. Capacitor C221A serves to by-pass radio-frequency currents in the filament supply leads to this tube.

The plate of the intermediate-frequency-amplifier tube V202 is coupled to the grid of the second detector tube IN5GT/G (V203) by means of the coupling unit T203. In order to further reduce "Microphonics" the second detector socket is shock mounted.

Coupling unit T203 consists of a plate coil tuned to the intermediate frequency by means of its shunt trimmer and filtered from the plate supply by capacitor C223 and decoupling resistor R205. Coupling to the second detector grid is provided by C224 and the grid leak R206. The screen grid of this tube is maintained at proper potential by means of series resistor R207 and by-passed with capacitor C226.

The plate load of the detector consists of the iron core reactor L208 shunted by R217 and C235 in series. The RF component is by-passed by capacitor C228. Coupling to the audio amplifier tube V204 is provided by coupling capacitor C227 and grid leak resistor R208. Additional RF filtering is provided by series grid resistor R213 and by-pass capacitor C240.

Negative grid bias is obtained by returning R208 to the —6 volt connection of C Battery BT 403.

The audio amplifier functions as a pentode, the output of which is coupled to the phones by means of the impedance matching transformer T201. Capacitor C221B in conjunction with resistor R218 serves as audio plate filter.

The "Phones" Binding Posts are connected in parallel with Jack J202, so that headphones terminating either in cord tips or in a standard plug may be used. Two pairs of phones may thereby be utilized simultaneously. In this case, the resultant impedance mismatch does not seriously affect the Receiver operation.

The beat frequency oscillator tank circuit consists of permeability tuned inductor L207, fixed capacitor C233 and variable capacitor C229. Capacitor C232 provides an RF ground return. The control grid is coupled by means of capacitor C231 and grid leak resistor R210, while the screen grid, serving as the oscillator anode, is directly connected to the other side of this tank circuit. Screen voltage is supplied through series resistor R211. The plate of V205 is fed from the B+ supply through series resistor R209. Capacitor C230 prevents undesired coupling through the supply leads. The beat frequency oscillator operates at one-half the intermediate frequency; the second harmonic of which is fed through coupling capacitor C225 to the plate of IF amplifier tube (V202) to produce an audio frequency beat note in the second detector. The pitch of this note can be varied by "B.F.O. PITCH" control capacitor C229 located on the front panel. The initial setting (mean frequency) is obtained by the adjustment of the iron core in L207.

Batteries BT 405 and BT 406 in series, supply 90 volts to the plates and screens of all tubes in the Receiver.

Variable grid bias for sensitivity control is supplied to the converter and intermediate frequency amplifier tubes through potentiometer R212 located on the front panel.

The filaments of all tubes are supplied directly from 1.5 Volt "A" Batteries BT 401 and BT 402 connected in parallel. Switch S203, the "ON-OFF" switch located on the front panel controls all batteries.

When switch S307 is set to the "REC" position, meter M302 is shunted by resistor R312 and reads the filament current.

The "CW-MCW" switch S202 located on the front panel turns the beat frequency oscillator off in the MCW position by removing the potential from the screen. Note that the filament of this tube is on at all time when the Receiver is in operation.

Receiver "B" battery voltage may be read on meter M302 by holding switch S305 in the "B" or momentary position, which conects R311 in series with the multimeter. Note that the battery voltage can be read only when switch S307 is in the "REC" position.

AUXILIARY ANTENNA

An additional antenna binding post (AUX. ANT.) is provided on the front panel so that a separate receiving antenna may be used. This may be desirable in order to utilize the Transmitter of this equipment as a frequency source or driver to operate a higher powered amplifier. The auxiliary antenna remains permanently connected to the Receiver. In this case the Transmitter is connected through the main antenna post to the power amplifier. The transmitting antenna is now connected to the output of the power amplifier and is in no way directly connected to the TBX basic equipment. A terminal board fitted with a sliding link is located on the rear of the front panel behind the "AUX. ANT." post. This permits either type of connection.

NETTING

In the description of the Transmitter, reference was made to the "NET" or third position of switch S306. This enables the operator to tune his Transmitter to the same frequency (zero beat) as an incoming received signal for "netting" operation.

In this position the relay K301 is energized (without the necessity of depressing the key) thereby supplying voltage to the oscillator tube V302, the screen grid of power amplifier tube (V301) and simultaneously connecting the "B+" voltage of the output tube V204 into the circuit for Receiver operation. After the preliminary netting adjustments have been made, it is necessary to turn switch S306 to either "C.W." or "Voice" position as desired. In the "NET" position plate voltage from the Receiver converter tube V201 is removed rendering it insensitive. The plate voltage is removed from V201 so that in the "NET" position of switch S306, the Transmitter does not block the Receiver and cause it to emit spurious beat notes. (Filament voltage is supplied to all tubes in the receiver as long as switch S203 is "ON").

Should it be necessary, it is possible to check the calibration of the Transmitter against the Receiver or vice-versa by utilizing the beat frequency oscillator instead of the incoming signal. This will be discussed under "MAINTENANCE."

C. BREAK-IN OPERATION (C.W.) [Reference is made to Schematic Diagram Fig. 19]

"Break-in" operation enables the operator at either station to break-in or interrupt during periods of transmission.

When the key is depressed relay K301 is energized and the following occurs:

1. The antenna is switched from its normal or receiver connection to the output of the Transmitter.
2. Voltage is applied to the oscillator tube V302, side tone oscillator tube V305 and the screen of V301. (The plate potential of V301 is continuously maintained as long as the transmitting power supply is functioning.)
3. The "B" supply is removed from the Receiver thereby rendering it inoperative.

Conversely, with the key up, the antenna is reconnected to the Receiver, the plate voltage is removed from the oscillator tube V302, side tone oscillator V305 and the screen of V301 and "B" voltage is restored to the Receiver.

The operator is therefore able to hear any transmission during this key-up period.

D. PUSH-TO-TALK (Voice Operation) [Reference is made to Schematic Diagram Fig. 19]

Similarly, when the microphone button is held down, relay K301 is closed, the antenna is switched, voltage is applied to the oscillator tube and the screen of the P.A. tube and the Receiver becomes inoperative. However, S306 in the "Voice" position has interrupted the voltage to the Side Tone Oscillator, so that it no longer functions. Releasing the button, reverses the above procedure.

E. HAND-DRIVEN D-C GENERATOR TYPE-21263B [Reference is made to Schematic Diagram Fig. 19]

CAUTION: ONLY TYPE *CBF-21263-B* HAND DRIVEN GENERATOR IS TO BE USED WITH TBX-8 EQUIPMENTS, OTHERWISE EXCESSIVE INTERFERENCE WITH RECEIVER RECEPTION WILL RESULT.

This is a double commutator generator which obtains its field excitation from the low-voltage commutator through regulator resistor R501. Vibrator VR501 varies the amount of field resistance in the circuit between two values above and below the normal resistance value, in such a manner as to maintain a constant voltage across the low-voltage output, thus also maitaining the high voltage substantially constant. The actual value of output voltage is dependent upon the rate at which the vibrator operates, depending in turn upon the spring tension of the vibrator armature. In this manner, substantially constant output voltages are maintained despite changes in speed or loading of the generator.

The high voltage supply is filtered by means of capacitor C502, bypassed for R.F. with capacitor C501, R.F. choke L502 and capacitors C503 and C504 in parallel.

The low-voltage supply is bypassed for R.F. by capacitor C505 and is filtered by R.F. choke L503 and capacitor C506. The microphone supply is further filtered by means of Audio Reactor L501 and capacitor C507.

Radiation of R.F. disturbance or "Hash" from the crank handles has been eliminated by means of grounding wipers at each end of the crank shaft. An additional wiper mounted in the gear housing grounds the armature shaft.

Auxiliary Equipment

F. REMOTE CONTROL UNIT [Reference is made to Schematic Diagram Fig. 19 and 20]

An auxiliary relay K302 has been included in the transmitter section of the TBX-8 equipment to permit operation over a field telephone line (W-110 or equivalent) up to one mile in length.

With the addition of Remote Control unit type -23453 the Transmitter may be keyed for "C.W." or modulated for "Voice". "Break-In" and "Push To Talk" operation as described previously are still maintained. It is assumed that the Transmitter and Receiver have already been set up for normal operation on a specific frequency for either "Voice" or "C.W.". No control of these functions is possible over the remote line.

The remote control consists of an impedance matching transformer, batteries for operation of microphone and the remote control relay (in the Transmitter), together with associated jacks for headphone microphone and key, as well as the headphone blocking condenser, key click filter and binding posts for connection to the remote line.

When either the key or the microphone button (at the remote station) is depressed, excitation for remote control relay K-302 is furnished by the filtered 12.6 V supply (Pin 66) in series with batteries in the Remote Control unit. Operation is as follows:

When the key at the remote position is depressed, current flows from this 12.6 Volt source, through the coil of relay K302, through line L2, through transformer T1401, then through the batteries (BT-1401 to BT1406) to ground and returns through line L1 to the generator. This activates this relay (K302) and closes the contacts which supply energy to the main relay K301. This, in turn, performs the functions of break-in keying, as described previously.

For "Voice" operation, the microphone button is depressed and activates two circuits, as follows. The talking circuit supplies microphone current through winding 2-1 of transformer T1401, then through batteries BT1401 to BT1404, and returns to the microphone through resistor R1401. The other or control circuit of the microphone switch grounds the battery through resistor R1401. This, as in the case of CW operation, in series with the 12.6 V filtered supply (Pin 66) energizes relay K302 which in turn controls relay K301. The audio component of the voice currents in winding 2-1 of transformer T1401 induces a voltage across the entire transformer 6-1, which is carried through the line L1-L2 and transferred by relay contacts 3-4 of relay K302 through C319 and is thereby impressed across the primary of the microphone input transformer T301, where it is amplified to modulate the carrier.

With the key up or microphone button not pressed relay K302 is in its normal position allowing the audio voltages of the Receiver to be fed from the ungrounded side of the Receiver output transformer T201, through capacitor C320 and contacts 4-5 (relay K302) into line (L2), through winding 6-5 of transformer T1401 into capacitor C1401, through this capacitor into the headphones through jack J1403.

Should the microphone button and the key be depressed simultaneously batteries BT1405 and BT-1406 would be short circuited through the microphone switch contacts. In order to avoid injury to the contacts, current limiting resistor R1401 is inserted between the microphone control circuit and the batteries. Capacitor C1402 and resistor R1402 connected across the key reduce key clicks.

With the Transmitter power supply inoperative, it is possible for the operator at the Remote unit to talk to the operator at the basic equipment in order to issue instructions as regards adjustments or operation of the equipment or for any other purpose. Microphone excitation is supplied by the batteries in the Remote Control unit.

The voice currents are carried by line L1 and L2 as in normal operation. However since the Transmitter power supply, which in conjunction with the batteries activates relay K302, is not functioning, insufficient current is supplied for relay operation. The line therefore remains connected through contacts 4-5 (K302) to the headphones.

In order to reply, the operator at the basic equipment must utilize the Transmitter power supply.

G. CRYSTAL CALIBRATOR AND MONITOR Type -60133 [Reference is made to Schematic Diagram Fig. 21]

With the addition of the Crystal Calibrator and Monitor type -60133 it is possible to obtain crystal controlled accuracy and stability of the transmitter during self-excited transmission over the entire frequency range at any one of the ten pre-selected crystal channels, incorporating type FT243 crystal holders and crystals. This also applies to the receiver section of the TBX-8 between the frequency limits of two to six megacycles.

The Transmitter and Receiver operating frequencies can be continuously checked during operations against the selected crystal channels of the Crystal Calibrator and Monitor. Any deviation in frequency of the Transmitter or Receiver due to initial "Warm-up" drift can be immediately checked and corrected from the initial setting by "Zero Beating" with the selected crystal channel in use of the Crystal Calibrator and Monitor. The Transmitter and Receiver can also be continuously monitored at the crystal channel chosen for operation.

The type -60133 Crystal Calibrator and Monitor comprises a crystal controlled Pierce Oscillator employing a 3A4 tube running at 1.5 volts (nominal) filament and 7.5 volts (nominal) plate. The unit includes a momentary type On-Off switch which breaks both "A" and "B" voltage. A ten point selector switch selects any one of the ten type FT243 crystal holders and crystals plugged into their respective sockets. A closed circuit jack permits use of a Navy type 49507-A headset for transmitter operation. A telescoping three section type rod antenna is attached to the antenna binding post of the Crystal Calibrator and Monitor for coupling to the Transmitter-Receiver antenna.

When momentary switch S1701 is depressed filament voltage is supplied the triode connected 3A4 (V1701) tube. At the same time plate voltage is supplied through radio frequency choke L1701 bypassed by capacitor C1702.

The crystal (Y1701-Y1710) is placed in the network that couples the output plate (pin #2-6) of the 3A4 (V1701) to the input grid (pin #4) thereby creating feedback for self-oscillation of the crystal. Grid leak resistor completes the circuit and is connected between pin #4 of the 3A4 (V1701) tube and returned to + filament. The Pierce crystal-controlled oscillator circuit thus formed causes the crystal to vibrate at a frequency determined primarily by the frequency of mechanical resonance of the crystal.

Output amplitude of the Crystal Calibrator and Monitor is dependent on three factors. These are operating frequency of the crystal in use, Gm of the 3A4 (V1701) tubes, and plate voltage supply to the 3A4 (V1701) tube. The amount of radio frequency energy supplied to the antenna terminal through coupling capacitor C1701 is therefore determined by the above factors.

The radio frequency energy produced is radiated by a telescoping three section rod antenna (A1701) that is connected to the antenna terminal of the Crystal Calibrator Monitor. Coupling to the antenna terminal of the Transmitter-Receiver unit may be varied by simply raising or lowering the sections of the telescoping rod antenna.

The closed circuit phone jack (J1701) connected to the output of the Crystal Calibrator Monitor permits detection of the signal during Transmitter operation.

Releasing momentary switch S1701 to the Off position makes the Crystal Calibrator and Monitor inoperative disconnecting both the "A" and "C" batteries. In order to preserve the life of the internal batteries momentary switch S1701 should always be returned to the Off position.

XII. MAINTENANCE

A. GENERAL

(a) This equipment is designed to minimize maintenance requirements. However, with any such intricate electrical mechanical device, certain precautions and periodic inspections will assure good performance and reduce probabilities of failure.

(b) The units of the TBX-8 basic equipment, auxiliary equipment, except auxiliary power equipments have all been "Tropicalized" to eliminate the effects of moisture and fungus growth encountered when in use in tropical climates. Wax impregnated wire has been replaced in all units except the type CBF-21263B Hand Generator by a vinylite coated, fungus resistant wire.

CAUTION: When replacing any part in the equipment or making any repairs clear the connecting leads of all coating material before soldering. Each unit of the TBX-8 equipment is stamped or has a label affixed to it bearing the above information together with the date of tropicalization. The repaired units should be recoated with a moisture and fungus resistant material upon completion.

B. VACUUM TUBES

Vacuum tubes, especially in the Radio Receiver Crystal Calibrator and Monitor and Transmitter should be replaced at stated intervals rather than as failures occur in each tube. An optimum replacement interval may usually be obtained after some experience under actual operating conditions. If tube testing equipment is available, periodical checks of all tubes should be made.

Tubes should be discarded when the end of useful life is indicated, in a Standard Navy Tube Testing Equipment such as the Model OD-1, by the following, in accordance with Navy Specifications JAN-1A for radio electron tubes.

Type 2E22	Is=200 ma. Dc (min.)
Type 3A4	Sm=1310 umhos (min.)
Type 1A7GT/G	Sc=125 umhos (min.) Icl=22ua Dc (min.)
Type 1N5GT/G	SM=450 umhos (min.)
Type 1A5GT/G	Po=50 mw (min.)

When changing tubes in the radio Receiver, it is suggested that the Receiver power cable be removed from the power supply or turn the Receiver switch to the "off" position.

C. BATTERIES

(a) The Receiver batteries are designed to give at least 100 hours of service, based on intermittent use of four hours per day, with Fresh batteries. Batteries should be put in service prior to the expiration date stamped thereon. After this date the battery characteristics can be no longer predicted or guaranteed.

The "A" battery may be operated until the voltage falls to 1.1 volts before the operation of the equipment is appreciably affected.

The "C" battery should be replaced, in general, whenever the "B" batteries are replaced. In any case replacement should be made whenever its voltage falls below 4.5 volts.

The condition of the "A" and "B" batteries may be readily checked by means of the meter provided on the front panel of Transmitter-Receiver Unit Type-43060.

Operating ranges for "A" and "B" batteries are indicated respectively by the upper and lower red shaded areas. When the pointer indicates a reading below 200 MA, the "A" batteries should be replaced. The "B" batteries should be replaced when a reading below 67 volts is obtained.

CAUTION: THE BATTERIES MUST BE REMOVED FROM THE ACCESSORY BOX WHENEVER THE EQUIPMENT IS STORED OR DURING SHIPMENT.

(b) The Crystal Calibrator and Monitor batteries are designed to give at least 50 hours of service, based on intermittent use of two hours per day with fresh batteries.

The type -19031 1.5 volt "A" battery should be replaced when the voltage falls below 1.1 volts.

The type -19011 7.5 volt "C" battery should be replaced when the voltage falls below 6.0 volts.

CAUTION: The batteries must be removed from the Crystal Calibrator Monitor whenever the unit is out of use for periods exceeding three days and store in type -10339 Accessory box.

D. HAND-DRIVEN D-C GENERATOR TYPE-21263B

The generator should be checked occasionally for brush wear and brushes replaced when duly worn.

The generator should be checked on the bench periodically for voltage-regulator adjustment. A 1000-ohm-per-volt voltmeter should give full load readings between terminals 63 and 65 of 550 volts ± 4%, when the generator crank speed is between 60 and 70 rpm. The voltage indicated in a like manner between terminals 64 and 63 should be 12.6 ± 5%. If the generator "full load voltage" deviates appreciably from the above values, the cover should be removed and the vibrator tension screw "C" of voltage regulator VR501, located near the coil at the bottom, should be turned to the right to raise the voltage or to the left to lower it. It will generally not be necessary nor desirable to disturb the settings of the fixed contacts. When the generator is cold, the voltmeter readings will be near the lower limit.

In the event that the "full load check" indicates a voltage across terminals 63 and 65 of approximately 100 volts, worn or dirty vibrator points are indicated. Clean the contacts with a fine grade of sandpaper and adjust according to the following instructions and use the gauge provided in the cover of the generator. (These instructions also appear in the cover of the generator.)

Adjust "A" (right-hand contact looking at gear end of generator) to 1/64 in. between vibrator core and vibrator armature (use gauge).

Adjust "B" to 0.0008 in. between vibrator contact and contact screw (use gauge provided; a "loose" gauge setting, i.e., slightly over 0.0008 in., is preferable to a tight gauge setting).

Adjust "C" to obtain the voltage shown on the nameplate, full load condition.

DO NOT ATTEMPT THIS ADJUSTMENT UNLESS ABSOLUTELY NECESSARY.

E. RADIO TRANSMITTER-RECEIVER UNIT, TYPE -43060

1. General

Radio-frequency switches S301, S302, S303, S304, S306, and S201 may, after long periods of disuse under unfavorable conditions of storage, show some tendency toward poor contact. In such cases, it is generally not necessary to clean these switches since operating them in all positions several times should effectively clean off the contacts.

Transmitter-receiver Unit Type-43060 should be inspected periodically and kept as clean and dustfree as possible. Collection of dust or dirt on parts, particularly the capacitor plates, may result in poor performance in the radio receiver and "flash-over" in the Transmitter capacitors, besides being a nutrient for fungus growth in tropical areas.

2. Radio Receiver

The radio Receiver is designed to maintain its alignment under the most adverse conditions of operation normally encountered in the service intended. However, for best performance it is good practice after any considerable period of use to check alignment of the radio Receiver. A signal generator, capable of supplying a 30 per cent modulated 400-cycle r-f output up to about 1000 microvolts at the alignment frequencies given below, and an output meter, scale 0 to 3 volts (approximately) are necessary.

Alignment frequencies

I.f.-1515 kc
R.f.-1967.8 kc-3283.6 kc Band No. 1
-3102.0 kc-5182.4 kc Band No. 2
-4903.7 kc-8187.5 kc Band No. 3

The i.f. may be aligned by putting the Receiver tuning controls in "Band No. 1-Dial 0" position, applying a signal of approximately 1000 microvolts between the antenna and ground, and adjusting the i-f transformers for maximum output voltage.

The r-f sections should be aligned in the sequence given above by means of appropriate trimmer capacitor C214, C215, C216, C204, C205, or C206 at the high-frequency end of each band. Padder capacitors C211, C212, and C213 should then be adjusted at the low-frequency end, repeating the process by alternate adjustments of "SERIES PADDER" and "SHUNT TRIMMER" until alignment at the given frequencies is obtained. During adjustment of the r-f sections, antenna trimmer capacitor C201 should be set to mid-position. The beat oscillator should be set to 757.5 kc with the "WOBBLER" control set on zero, or midscale.

CAUTION: NEVER ATTEMPT TO ALIGN THE RADIO RECEIVER UNLESS PROPER TEST EQUIPMENT IS AVAILABLE.

F. ACCESSORY BOX TYPE-10339

Accessory Box Type-10339 requires no special maintenance other than making sure that the batteries are removed during any 3-day period of inactivity, and that the socket is kept clean and free from moisture. After periods of operation in which the equipment has been exposed to rain and moisture, particular care should be taken to see that this socket is wiped clean and dry prior to tightening the cover. The parts contained in the box should be wiped clean and dry after use in the field.

G. "SMALL" ANTENNA

This unit requires no special care other than normal cleaning after field operation. The joints should be wiped with an oily rag after exposure to rain or dust.

H. LUBRICATION

1. Transmitter-receiver Drive Mechanism

Periodically wipe, clean, and oil with one or two drops of Navy Grade 1075 oil.

2. Hand-driven D-c Generator Type 21263B

This equipment is designed to run for long periods of time without lubrication. However, the following procedure is recommended.

The generator shafts run on ball bearings, six altogether, which require only enough grease to keep the balls from rusting. Excessive greasing will result in generator trouble as surely as failure to grease the bearings.

Every six months the bearings should be greased with Non-fluid Oil, which corresponds to Navy Department lubricant Specification "Ball Bearings-14L-3."

CAUTION: ONLY UNPAINTED, CADMIUM-PLATED SCREWS NEED BE REMOVED AT ANY TIME. ALL SCREWS ARE SEALED WITH "ALUMILASTIC" SEALING COMPOUND TO MAKE THEM WATERTIGHT AND, IF REMOVED, SHOULD BE SEALED AGAIN.

To grease the bearings, remove the gear case held by five screws. This allows access to two ball bearings in the gear case and two in the generator housing. To reach the other two bearings, remove the two plates at the end of the generator opposite the gear case. The upper plate is held by four screws, the lower plate by two screws. Spread grease on the gear teeth, adding new grease if required.

When reassembling, care should be taken that the gaskets and surfaces bearing against them are free from dirt. The screws should be tightened gradually and evenly to insure good contact.

When reassembling the gear case, it is necessary to give a forward and backward rocking motion with the handcrank while pressing on the gear case so as to allow the balls of the bearings to take their seat in the outer race.

3. "Small" Antenna Joints

Use a drop of Navy Grade 1075 oil occasionally.

4. "Large" Antenna Reel

Use a drop of Navy Grade 1075 oil occasionally on the axle joint.

I. MICROPHONE CONNECTIONS

Microphones furnished with TBX-8 equipments are connected per Navy Specification RE-8944A, circuit "A", wherein the microphone plug sleeve is common, microphone connected to ring and control circuit to tip. (RED code marking.)

In the event that microphones are supplied, or that it is desired to use microphones connected per circuit "B" of the above Navy Specification, which is the WHITE connection, it will be necessary to change the microphone leads within the set so that the ring and tip connections are interchanged on jack J302.

If such a change is made in the field, the proper code color should be marked on the jack cover.

XIII. DIMENSIONS AND WEIGHTS

A. MODEL TBX-8 PORTABLE RADIO EQUIPMENT

The dimensions and weights of the components of the Model TBX-8 Portable Radio Equipment, packed for transportation and as assembled for operation are shown on Outline Diagram Fig. 28.

A summary of weights of components of the Equipment complete in carrying cases for field transportation:

1. Radio Transmitter-Receiver Unit type-43060, with type-10480 Rain Shield .... 36.1 lb.
2. Accessory box type-10339 .... 31.1 lb.
3. Antenna Assembly .... 11.2 lb.
4. D.C. Generator type-21263B .... 27.2 lb.
5. Remote control unit type-23453 .... 8.6 lb.
6. Adapter unit type-632246 .... ¾ lb.
7. Crystal Calibrator and Monitor type -60133 .... 2⅝ lb.
8. Shipping chest type-10017B (complete with one set of spare batteries) .... 209 lb.

XIV. ORDERING OF RENEWAL PARTS

Replacement of defective items during the guarantee period should be made in accordance with the provisions under "guarantee" at the beginning of this book.

When ordering replacement parts, the "Part Designation" and "Navy Type JAN or A.W.S. Number," together with a description of the parts and the Navy contract number should be given. This information appears in the Parts List which follows.

When ordering replacement crystals, all information given in the Parts List; the Government Contract Number under which the Equipment was furnished; and the CRYSTAL FREQUENCY DESIRED should be given.

XV. SERVICING

A. TYPICAL VOLTMETER READINGS

Troubles due to possible failures of parts such as transformers and resistors can be traced by the following typical voltmeter readings. These were taken with a 20,000 ohms per volt voltmeter. Since these readings must be taken with the case off and power on PRECAUTION MUST BE TAKEN TO PREVENT COMING IN CONTACT WITH PARTS OF THE TRANSMITTER CARRYING HIGH POTENTIALS.

1. Radio Receiver

Operation: CW, Band No. 1, DIAL 0, Sensitivity control at maximum. Tubes in sockets, Average Battery Conditions.

Terminal Designation	Meter Full Scale Volts	20000 ohm-per-volt Meter Readings to Ground
Power Socket J201		
No. 41	250	85
No. 52	10	0
No. 50	10	.1
No. 48	10	−5.9
No. 40	10	−1.4
Converter Socket X201		
Cap	2.5	−1.22
Pin 3	250	84
Pin 4	50	45
Pin 5	10	−3.5
Pin 6	250	72
Pin 7	2.5	−1.4
I-F Socket X202		
Cap	2.5	−1.05
Pin 3	250	85
Pin 4	250	83
Pin 7	2.5	−1.4
Detector Socket X203		
Cap	2.5	−.55
Pin 3	250	80
Pin 4	250	83
Pin 7	2.5	−1.4
Audio Amplifier Socket X204		
Pin 5	10	−6
Pin 3	250	84
Pin 4	250	84
Pin 7	2.5	−1.4
Beat Freq. Osc. Socket X205		
Cap	2.5	−1.1
Pin 3	250	1.1
Pin 4	250	37
Pin 7	2.5	−1.4

2. Radio Transmitter

Large Antenna, M.O. Band 1, 2716KC

P.A. IND. COARSE 2
P.A. IND. FINE 4
P.A. CAP Approx. 12

Power socket terminal voltage held constant at values given below.

Terminal Designation	Meter Scale	Voltage to Ground	Condition of Operation
Power Socket J303			
Pin No. 64	50	12.6	....
Pin No. 65	1000	550	....
Pin No. 66	50	12.9	....
Oscillator Socket X302			
Pin 2 & 6	250	55	CW Crystal Control
Pin 4	50	−25	CW Crystal Control
Pin 5	2.5	1.35	....
Pin 7		2.75	....
P.A. Socket X301			
Pin 2	250	170	CW Crystal Control
		160	Voice Crystal Control
		185	CW Self Excited
		170	Voice Self Excited
Pin 3	250	0	CW Crystal Control
Pin 4	250	0	CW Self Excited
		38	Voice Self Excited
Pin 5	10	6.3	....
301 Plate Cap	1000	545	CW Crystal Control
Common Connection between L304, C309 and R313	1000	545	CW Crystal Control
	1000	550	Voice Crystal Control
	1000	545	CW Self Excited
	1000	550	Voice Self Excited
Modulator Socket X303			
Pin 1	10	9.7	....
Pin 2 or 6	250	130	....
Pin 3	250	90	....
Pin 7	10	7.2	....
Common Connection between R314, R320 and R319	250	240	CW or Voice

B. INCORRECT OPERATION AND SUGGESTED REMEDIES

1. Radio Receiver

Incorrect Operation	Suggested Remedy
(a) I.F. oscillates with sensitivity control maximum.	See that the tube shields are tightly in place. Check voltages, particularly "C" battery. Replace I.F. tube. Realign I.F. (ONLY IF NECESSARY).
(b) Receiver "DEAD."	Check voltages and headphones. Check battery connections. Check continuity with use of connection diagram Fig. 25.
(c) Sensitivity low.	Check voltages. Change tubes. Realign Receiver (ONLY IF NECESSARY). Check position of "C.W.-VOICE-NET" switch, it should be in "C.W." or "VOICE" position.

2. Radio Transmitter

(a) No output, crystal controlled or self excited operation.	See that the antenna is properly erected and connected. See section IX, installation paragraph B2. Check power sources and cable. Check voltages. Check for continuity with use of connection diagram Fig. 24. Replace tubes. Check key and cord, check relay K301. Check antenna ammeter.
(b) No indicated transmitter current operation otherwise correct.	See that the "MTR" switch is in the "TRANS" position. Check continuity of meter M302 and connections.
(c) Radio transmitter does not key, crystal controlled or self-excited operation.	Check relay K301. Check continuity of key and cord. Check continuity of keying circuit.
(d) Radio transmitter keys, no output on crystal controlled operation.	Be sure that the crystals are in their correct positions (see Calibration Chart). Check setting of M-O. dial in accordance with the calibration chart. If operation is satisfactory under M.O. conditions (same frequency) crystal failure is indicated. Replace crystal.
(e) No indication of modulation, operation otherwise correct.	Check 3A4 Modulator Tube. Check voltages. Check continuity of microphone transformer and modulation reactor. Check microphone and switch cord for continuity. Be sure the "C.W.-VOICE-NET" switch is in the "VOICE" position. Check continuity of this switch. Check setting of modulation control.
(f) Radio transmitter operates in "C.W." position, no indication of side tone in headphones. Receiver operates.	Check continuity of side tone circuit. Replace 991 neon tube.

3. Hand-driven D-c Generator Type 21263B

(a) Low output voltage.	Adjust as described under "MAINTENANCE." Check voltages at generator outlet. Check cable.
(b) No output voltages.	Check internal continuity. See Fig. 19. Check brushes and if necessary replace. Check and adjust vibrator as described under "MAINTENANCE."
(c) High ripple in "C.W." or "VOICE" operation.	Indicates failure of filter capacitor C501. Check connections; replace capacitor if necessary.

4. Remote Control Unit

It is assumed that the Transmitter-receiver is functioning normally.

Incorrect Operation	Suggested Remedy
(a) Voice not heard in headphone when speaking into microphone.	Check battery contact springs, and batteries. If necessary replace batteries. Check headphones and jack. Check microphone. Check continuity of line. Check for and remove any water in microphone jacket J1402.
(b) Side tone not heard at remote position when key is depressed but audible at receiver.	Check polarity of line as described in Section X paragraph E. Check continuity of headphones. Check continuity of auto transformer T1401. Check relay K302 in transmitter. Check continuity of line. Check key.
(c) Transmitter does not key.	Check continuity of key, cord and plug. Check batteries. Check continuity of T1401. Check line. Check relay K302. Check for and remove any water in key Jacket J1403.
(d) Transmitter does not modulate.	Check microphone, switch and connections. Check batteries. Check relay K302.
(e) No incoming signal (Voice or C.W.)	Check headphones, Transformer T1401, jack J1403, line and remote relay K302 (in transmitter).

5. Crystal Calibrator and Monitor

(a) No output.	Replace crystal, check battery connections. Check selector switch position.
(b) Low output.	Check condition of "A" and "C" battery. Check or replace 3A4 tube.
(c) Intermittent operation.	Check telescoping ant. connection at ant. post. Tighten if loose. Rotate selector switch to clean contacts.
(d) No phone output.	Check continuity of closed circuit jack (J1701) for open connection inside jacket.

XVI. LIST OF MAJOR UNITS

Navy Type Designation		Name	Symbol Group
Unit	Accessories		
–10017B	—	Shipping Chest for Model TBX Series of Equipments	101-199
—	—	Carrying Cases for Model TBX Series of Equipments	101-199
–43060	—	Receiver Section of Transmitter-receiver Unit.	201-299
–43060	—	Transmitter Section of Transmitter-receiver Unit.	301-399
—	–10339	Accessory Box and Contents	401-499
21263B	—	Hand-driven D-c Generator	501-599
—	—	Antenna System for Model TBX Series of Equipments	901-999
–23453	—	Remote Control Unit	1401-1499
–632246	—	Receiver Power Supply Adapter	1501-1599
—	–10480	Rain Shield	1601-1699
–60133	—	Crystal Calibrator and Monitor	1701-1799

TABLE I

PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS

RECEIVER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
SHIPPING CHEST AND CARRYING CASES								
A100	Shipping Chest	Vulcanized fiber plywood chest with wooden inner partitions for units of basic and auxiliary equipment and station spare parts	CFU-10017B	. . . . . .	1	. . . .	. . . . . .	E-PC-1104
A101	Carrying Case	Canvas carrying case for Trans.-rec. Type 43060	CWP-10027A	. . . . . .	2	. . . .	. . . . . .	E-SA-1386
A102	Carrying Case	Same as A101 except for Accessory Box Type 10339.	CWP-10027A	. . . . . .	2	. . . .	. . . . . .	
A103	Carrying Case	Canvas Carrying case for Hand-driven Generator Type CBF-21263B	CWP-10028A	. . . . . .	2	. . . .	. . . . . .	E-SA-1401
A104	Carrying Case	Canvas Carrying Case for antenna system	CWP-10029A	. . . . . .	2	. . . .	. . . . . .	D-SA-1388

TABLE I
PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
RECEIVER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
CAPACITORS								
C201	Antenna Trimmer Capacitor	Midget variable; 13.3 mmfd max.	CAIM-482212	. . . . .	3	Type H Code 13G	. . . . .	C-CO-808
C202	Main Tuning Capacitor	Two secion var cap 140 mmfd, approx. max.	. . . . . .	. . . . .	4	. . . .	. . . . .	D-CO-812
C203	Oscillator Grid Blocking Capacitor	Mica: 0.00025 mfd ± 10% 500 Volts d-c. working	CSL-48690-B10 †(CM 20B 241J)	JAN-C-5	5	. . . .	Tropicalized Wax Imp.	B-CO-728
C204	Band 3 R-F Padding Capacitor	Variable Ceramicon 7-45 MMFD N500 Temp. Coefficient	CER-481623	. . . . .	6	TS2A	. . . . .	B-CO-10004
C205	Band 2 R-F Padding Capacitor	Same as C204	CER-481623	. . . . .	6	TS2A	. . . . .	
C206	Band 1 R-F Padding Capacitor	Same as C204	CER-481623	. . . . .	6	TS2A	. . . . .	
C207	R-F. By-Pass Capacitor	Oil Filled .02 Mfd +20% -10% 400 volts working	CSL-482068	RE-13A-488E	5	XTMOW	. . . . .	B-CO-992
C208	Band 3 Fixed Osc. Padding Cap.	Mica: 0.0007 MFD ± 1% 500 Volts D.C. working	CSL-481016-D1	RE-13A-389K	5	MWSDW-1224	Tropicalized Wax Imp.	B-CO-741
C209	Band 2 Fixed Osc. Padding Cap.	Mica: 0.0004 MFD ± 1% 500 Volts d.c. working	CSL-481015-D1	RE-13A-389K	5	MOSDW-1421	Tropicalized Wax Imp.	B-CO-742
C210	Band 1 Fixed Osc. Padding Cap.	Mica: 0.0003 MFD ± 1% 500 Volts d.c. working	CSL-481014-D1	RE-13A-389K	5	MOSDW-1420	Tropicalized Wax Imp.	B-CO-743
C211	Band 3 Variable Osc. Padding Cap.	Same as C204	CER-481623	. . . . .	6	. . . .	. . . . .	
C212	Band 2 Variable Osc. Padding Cap.	Same as C204	CER-481623	. . . . .	6	. . . .	. . . . .	
C213	Band 1 Variable Osc. Padding Cap.	Same as C204	CER-481623	. . . . .	6	. . . .	. . . . .	

† *Not exact equivalent, but may be used as an alternate.*

TABLE I

PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS

RECEIVER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

Symbol Designation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Designation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			CAPACITORS (Continued)					
C214	Band 3 Osc. Trimmer Cap.	Variable Ceramicon 7-45 MMFD N500 Temp. Coeff.	CER-481623	. . . . . .	6	TS2A	. . . . .	B-CO-10004
C215	Band 2 Osc. Trimmer Cap.	Same as C214	CER-481623	. . . . . .	6	. . . .	. . . . .	
C216	Band 1 Osc. Trimmer Cap.	Same as C214	CER-481623	. . . . . .	6	. . . .	. . . . .	
C217	Oscillator Plate Blocking Capacitor	Mica: 0.006 mfd ± 10% 500 Volts d.c. working	CSL-48770-B10 †(CM 35B 622J)	JAN-C-5	5	MWBW-1241	Tropicalized Wax Imp.	B-CO-723
C218	Converter Screen Grid By-pass Capacitor	Same as C217	CSL-48770-B10 †(CM 35B 622J)	JAN-C-5	5	. . . .	Tropicalized Wax Imp.	
C219	Converter Plate By-Pass Capacitor	Same as C217	CSL-48770-B10 †(CM 35B 622J)	JAN-C-5	5	. . . .	Tropicalized Wax Imp.	
C220	I.F. Grid By-pass Capacitor	Same as C217	CSL-48770-B10 †(CM 35B 622J)	JAN-C-5	5	. . . .	Tropicalized Wax Imp.	
C221A	Filament By-Pass Capacitor	Paper, Oil filled: 0.5-0.5 mfd ± 20%, 200 Volts d.c. working	CSL-482184-20	RE-13A-488E	5	2XKHRB2-5 -1020	. . . . .	C-CO-10000
C221B	Audio Amplifier Plate By-pass Cap.							
C222	I.F. Screen By-Pass Capacitor	Same as C217	CSL-48770-B10 †(CM 35B 622J)	JAN-C-5	5	. . . .	Tropicalized Wax Imp.	
C223	I.F. Plate By-Pass Capacitor	Same as C217	CSL-48770-B10 †(CM 35B 622J)	JAN-C-5	5	. . . .	Tropicalized Wax Imp.	
C224	Detector Grid Coupling Capacitor	Mica: 0.0001 MFD ± 10% 500 Volts d.c. working	CSL-48674-B10 (CM 20B 101K)	JAN-C-5	5	MOBW-1416	Tropicalized Wax Imp.	B-CO-725
C225	B-F-O Coupling Capacitor	Mica: 5MMFD ± 10% 500 Volts d.c. working	CSL-48771-B1C (CM 20B 050K)	JAN-C-5	5	MOBW-1401	Tropicalized Wax Imp.	B-CO-732

† *Not exact equivalent, but may be used as an alternate.*

TABLE I

PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS RECEIVER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
CAPACITORS (Continued)								
C226	Detector Screen By-Pass Capacitor	Paper Oil Filled: 0.5-0.5 MFD ± 20%. Used as a 1.0 MFD Capacitor	CSL-482184-20	RE-13A-488E	5	2XKHRB-5-1020	. . . . .	C-CO-10000
C227	Audio Amplifier Coupling Capacitor	Mica: .01 MFD ± 10% 600 Volts d.c. working	CSL-48487-B10 (CM 45B 103K)	JAN-C-5	5	XQBW6-11	Tropicalized Wax Imp.	B-CO-734
C228	Detector Plate Filter Capacitor	Mica: 0.0001 MFD ± 10% 500 Volts d.c. working	CSL-48674-B10 (CM 20B 101K)	JAN-C-5	5	. . . .	Tropicalized Wax Imp.	
C229	Beat Frequency Osc. Tuning Capacitor	Midget Variable: 13.3 MMFD. Max.	CAIM-482212	. . . . .	3	Type H Code 13G	. . . . .	
C230	Beat Frequency Osc. Plate Filter Capacitor	Mica: 0.006 MFD ± 10% 500 Volts d.c. working	CSL-48770-B10 † (CM 35B 622J)	JAN-C-5	5	MWBW-1241	Tropicalized Wax Imp.	B-CO-723
C231	Beat Frequency Osc. Grid coupling Cap.	Mica: 0.0002 MFD ± 5% 500 Volts d.c. working	CSL-48675-D5 CM 20B 201J	JAN-C-5	5	MOSW-1418	Tropicalized Wax Imp.	B-CO-10002
C232	Beat Frequency Osc. By-Pass Capacitor	Same as C230	CSL-48770-B10 †(CM 35B 622J)	JAN-C-5	5	. . . .	Tropicalized Wax Imp.	
C233	Beat Frequency Osc. Fixed Tank Cap.	Same as C231	CSL-48675-D5 (CM 20B 201J)	JAN-C-5	5	. . . .	Tropicalized Wax Imp.	
C234	Antenna Coupling Capacitor	Mica: 15 MMFD ± 10% 500 Volts d.c. working	CSL-48840-D10 CM 20B 150K	JAN-C-5	5	MOSW	Tropicalized Wax Imp.	B-CO-971
C235	Detector Audio Plate Filter Cap.	Mica: 0.0005 MFD ± 10% 500 volts d.c. working	CSL-481043-B10 †CM 30B 511K	JAN-C-5	5	MWBW-1222	Tropicalized Wax Imp.	B-CO-733
C236	Plate Supply Filter Capacitor	Electrolytic: 15 MFD + 75%-10% 150 Volts D.C. Working	CTD-482928	RE-13A-549	18	ECDR-48	. . . . .	C-CO-10018
C237	Band 3 Fixed Osc. Trimmer Cap.	Ceramicon: 25MMFD ± 10%	CC 26 CK 250K	JAN-C-20	6	NPOL	. . . . .	B-CO-10006
C238	Band 2 Fixed Osc. Trimmer Cap.	Same as C237	CC 26 CK 250K	JAN-C-20	6	NPOL	. . . . .	

† *Not exact equivalent, but may be used as an alternate.*

TABLE I

PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS RECEIVER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or(A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
CAPACITORS (Continued)								
C239	Band 1 fixed Osc Trimmer Cap	Ceramicon: 25 MMFD ± 10%	CC-26 CK-250K	JAN-C-20	6	NPOL	. . . . .	B-CO-10006
C240	R.F. Filter Cap.	Mica: 0.00025 ± 10% 500 Volts d.c. working	CSL-48690-B10 †(CM 20B 241J)	JAN-C-5	5	MOBW-1419	. . . . .	B-CO-728
C241	B+ R.F. By Pass Capacitor	Oil filled paper 0.5MFD. ± 20%, 600 Volts D.C. Working	CSL-481002-20 CP51B1FF504MM	AWS C75.16	5	XDMRT 6-5-20	. . . . .	B-CO-10010
RECEPTACLES								
J201	Power Receptacle	Eight Circuit Receptacle	CUF-49043	. . . . .	8	. . . . .	. . . .	C-RC-1034
J202	Headphone Jack	Single Circuit, open, short frame type	CTC-49025A	. . . . .	7	JK 34A	Tropicalized Varnish Imp.	C-RC-1032
R.F. INDUCTORS AND CHOKE COILS								
L201	Band 1 ant. and R.F. coil.	Coil: 36 turns of # 30 S. E. copper wire wound 72 turns per inch, 32.85 micro henries adjusted to standard coil ± .2% tol. 1 in. diameter by 2 in. long ceramic form.	. . . . .	. . . . .	10	. . . . .	Tropicalized Wax Imp.	C-CL-10002
L202	Band 1 Heterodyne Oscillator Coil	Coil: 25¼ and 23 1/3 turns of # 30 S.E. copper wire 11.35 and 15.3 micro henries adjusted to standard coil ± .2% tol. 5/8 in. diam by 2 in. long ceramic form.	. . . . .	. . . . .	10	. . . . .	Tropicalized Wax Imp.	C-CL-10006

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TABLE I

PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
RECEIVER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or(A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			R. F. INDUCTORS AND CHOKE COILS (Continued)					
L203	Band 2 Antenna and R. F. Coil	Coil: 23 turns of #26S.E. copper wire wound at 44 turns per inch, 13.6 micro henries adjusted to standard coil ±.2% tol., 1 in. diam. by 2 in. long ceramic form.	. . . . .	. . . . .	10	. . . .	Tropicalized Wax Imp.	C-CL-10003
L204	Band 2 Heterodyne Oscillator Coil	Coil: 18¼ turns of #30S.E. and 24¼ turns of #26S.E. copper wire, close wound, 7.25 and 8.35 micro henries adjusted to standard coil ± 0.2% tol., 5/8 in. diam. by 2 in. long ceramic form.	. . . . .	. . . . .	10	. . . .	Tropicalized Wax Imp.	C-CL-10007
L205	Band 3 Antenna and R. F. Coil	Coil: 15 turns of #22S.E. copper wire wound at 28 turns per inch, 5.45 micro henries adjusted to standard coil ± 0.2% tol., 1 in. diam. by 2 in. long ceramic form.	. . . . .	. . . . .	10	. . . .	Tropicalized Wax Imp.	C-CL-10004
L206	Band 3 Heterodyne Oscillator coils	Coil: 16¼ turns of #30 S.E. copper wire, 17¼ turns of #22S.E. copper wire close wound. 5.95 and 3.9 micro henries adjusted to standard coil ± 0.2% tol., 5/8 in. diam. by 2 in. long ceramic form.	. . . . .	. . . . .	10	. . . .	Tropicalized Wax Imp.	C-CL-10008

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TABLE I
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Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
R. F. INDUCTORS AND CHOKE COILS (Continued)								
L207	Beat Frequency Oscillator Coil	Coil: 43 turns of # 32 D.S.E. copper wire, 67 turns of # 32 D.S.E. Copper wire, wound 4 crosses per turn. 37.4 and 90.2 micro henries adjusted to standard coil + 3% -2% tol., on 1/2 in. diam. ceramic coil form.	. . . . . in.	. . . . .	10	. . . .	Tropicalized Wax Imp.	C-CL-10005
L208	Detector Plate Reactor	Audio Reactor: 325 Henries at 0.0003 amp d.c. 5500 ohms d.c. Resistance	CG-30335	. . . . .	11	. . . .	. . . . .	C-CL-1025
RESISTORS								
R201	Heterodyne Oscillator Grid leak Resistor	Compositon: 200,000 ohms ± 10% ½ Watt	CSA-63360-10 (RC21 BF 204K)	JAN-R-11	23	CM-½	Wax Dipped	B-RE-10000
R202	Heterodyne Oscillator Plate Dropping Resistor	Composition: 10,000 ohms ± 10% ½ Watt	CSA-63360-10 (RC21 BF 103K)	JAN-R-11	23	CM-½	Wax Dipped	B-RE-897
R203	Converter Screen Dropping Resistor	Composition: 50,000 ohms ± 10% ½ Watt	CSA-63360-10 † (RC21 BF 513J)	JAN-R-11	23	CM-½	Wax Dipped	B-RE-903
R204	Converter Plate Resistor	Composition: 2,500 ohms ± 10% ½ Watt	CSA-63360-10 † (RC21 BF 242J)	JAN-R-11	23	CM-½	Wax Dipped	B-RE-892
R205	I.F. Plate Resistor	Composition: 1000 ohms ± 10% ½ Watt	CSA-63360-10 (RC21 BF 102K)	JAN-R-11	23	CM-½	Wax Dipped	B-RE-893
R206	Detector Grid Leak Resistor	Composition: 2 megohm ± 10% ½ Watt	CIR-63360-10 † (RC21 BF 205J)	JAN-R-11	12	BT-½	Wax Dipped	B-RE-907
R207	Detector Screen Dropping Resistor	Same as R202	CSA-63360-10 (RC21 BF 103K)	JAN-R-11	23	. . . .	. . . . .	
R208	Audio Amplifier Grid Leak Resistor	Composition: 1 megohm ± 10% ½ Watt	CIR-63360-10 (RC21 BF 105K)	JAN-R-11	12	BT-½	Wax Dipped	B-RE-898

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RECEIVER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or(A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			RESISTORS (Continued)					
R209	Beat Frequency Osc. Plate Dropping Resistor	Composition: 1 megohm ± 10% ½ Watt	CIR-63360-10 (RC21 BF 105K)	JAN-R-11	12	BT-½	Wax Dipped	B-RE-898
R210	Beat Frequency Osc. Grid Leak Resistor	Composition: 50,000 ohms ± 10% ½ Watt	CSA-63360-10 †(RC21 BF 513J)	JAN-R-11	23	CM-½	Wax Dipped	B-RE-903
R211	Beat Frequency Osc. Screen Dropping Resistor	Composition: 150,000 ohms ± 10% ½ Watt	CIR-63360-10 (RC21 BF 154K)	JAN-R-11	12	BT-½	Wax Dipped	B-RE-10007
R212	Sensitivity Control	20,000 ohms max. logarithmic taper 2 Watts, Carbon	CSA-631414-10	RE-13A-492	23	Type C	Sealed	C-PT-1003
R213	R.F. Filter Resistor	Composition: 30,000 ohms ± 10% ½ Watt	CIR-63360-10 (RC21 BF 303K)	JAN-R-11	12	BT-½	Wax Dipped	B-RE-10001
R214	I.F. Screen Dropping Resistor	Composition: 10.000 ohms ± 10% ½ Watt	CIR-63360-10 (RC21 BF 103K)	JAN-R-11	12	BT-½	Wax Dipped	B-RE-897
R215	Sensitivity Control Series Resistor	Composition: 6800 ohms ± 10% ½ Watt	CSA-63360-10 †(RC21 BF 682K)	JAN-R-11	23	CM-½	Wax Dipped	B-RE-10026
R216	I.F. Grid Resistor	Same as R214	CIR-63360-10 (RC21 BF 103K)	JAN-R-11	12	. . . .	. . . . .	
R217	Detector Audio Plate Filter Resistor	Composition: 500,000 ohms ± 10% ½ Watt	CSA-63360-10 †(RC21 BF 513J)	JAN-R-11	23	CM-½	Wax Dipped	B-RE-899
R218	Plate Filter Resistor	Composition: 1000 ohms ± 10% ½ Watt	CSA-63360-10 †(RC21 BF 102K)	JAN-R-11	23	CM-½	Wax Dipped	B-RE-893
			SWITCHES					
S201	Band Change Switch	Multiple Band Change Switch 4 Banks, 2 Wafers, 3 Positions Position 1-Band 1 (1967.8-3283.6 K.C.) Position 2-Band 2 (3102.0-5182.4 K.C.) Position 3-Band 3 (4903.7-8187.5 K.C.)	. . . . . .	. . . . .	14	DH	. . . . . .	C-SW-10000

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PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS

RECEIVER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			SWITCHES (Continued)					
S202	Beat Frequency Osc. On-Off Switch	Double-Pole, Double Throw, Miniature Toggle Switch; 1 AMP 250 Volts, 3 AMP 125 Volts.	CG-24033	RE-24AA-118A (C75.15)	11	Cat#49x36 (modified)	. . . . .	C-SW-1007
S203	Filament On-Off Switch	Same as S202	. . . . .	. . . . .	11	. . . .	. . . . .	
			TRANSFORMERS					
T201	Output Transformer	Audio Transformer: Ratio 6.5 to 1 Step Down, 400 to 4000 Cycles, Primary D.C. Resistance 552 ohms, Secondary D.C. Resistance 57 ohms.	CG-30334	RE-13A-553B	11	. . . .	. . . . .	C-TR-1019
T202	Ist I.F. Transformer	Transformer for 1515 K.C. Operation. Includes Items C219, C220, R204 and R216	CFW-47401	. . . . .	15	. . . .	Tropicalized	D-TR-1017
T203	2nd I.F. Transformer	Transformer for 1515 K.C. Operation. Includes Items C223, C224, R205 and R206	CFW-47402	. . . . .	14	. . . .	Tropicalized	D-TR-1016
			VACUUM TUBES					
V201	Converter Tube	Pentagrid Converter	CHS-1A7GT/G	JAN-1A	16	. . . .	. . . . .	B-TU-10000
V202	I-F Tube	R-F Amplifier Pentode Sharp Cut Off.	CHS-1N5GT/G	JAN-1A	16	. . . .	. . . . .	B-TU-10001
V203	Detector Tube	Same as V202	CHS-1N5GT/G	JAN-1A	16	. . . .	. . . . .	
V204	Audio Amplifier Tube	Power Amplifier Pentode	CHS-1A5GT/G	JAN-1A	16	. . . .	. . . . .	
V205	Beat Freq. Osc. Tube	Same as V202	CHS-1N5GT/G	JAN-1A	16	. . . .	. . . . .	B-TU-10006

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SOCKETS								
X201	Tube Socket for Converter Tube	Octal Socket Ceramic	CPH-49373	RE-49A-300B	17	. . . .	. . . . .	B-SO-10000
X202	Tube Socket for I-F Tube	Same as X201	CPH-49373	RE-49A-300B	17	. . . .	. . . . .	
X203	Tube Socket for Detector Tube	Same as X201	CPH-49373	RE-49A-300B	17	. . . .	. . . . .	
X204	Tube Socket for Audio Tube	Same as X201	CPH-49373	RE-49A-300B	17	. . . .	. . . . .	
X205	Tube Socket for B.F.O. Tube	Same as X201	CPH-49373	RE-49A-300B	17	. . . .	. . . . .	

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PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS TRANSMITTER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

Symbol Desig- nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig- nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
CAPACITORS								
C301	M.O. Coupling Capacitor	Mica: 0.0001 MFD ± 2% 600 Volts D.C. working	CSL-48668-B2 † (CM-45B 101G)	JAN-C-5	5	XQBW6-31	Tropicalized Wax imp.	B-CO-751
C302	M.O.-C.O. Tuning Capacitor	Variable: 171 MMFD max. ± 2%, 10.3 MMFD min. ± 2 MMFD, straight line freq.	. . . . .	. . . . .	4	. . . .	. . . . .	D-CO-813
C303	M.O. Padding Capacitor	Midget Variable 25 MMFD	CAIM- 482182	. . . . .	3	. . . .	. . . . .	C-CO-814
C304	Power Amplifier Screen By Pass Capacitor	Mica: .01 MFD. ± 10% 600 Volts d.c. working	CSL-48487-B10 CM 45B 103K	JAN-C-5	5	XQBW6-11	Tropicalized Wax imp.	B-CO-734
C305	M.O.C.O. Supply By Pass Capacitor	Same as C304	CSL-48487-B10 CM 45B 103K	JAN-C-5	5	. . . .	Tropicalized Wax imp.	
C306	P.A. Suppressor By Pass Capacitor	Mica: 0.001 MFD ± 10% 600 Volts D.C. working	CSL-48645-B10 † (CM 45B 102K)	JAN-C-5	5	XQBW6-21	. . . . .	B-CO-740
C307	P.A. Tuning Capacitance	Variable: 193 MMFD max. ± 2% 10.3 MMFD min, ± 2 MMFD straight line freq.	. . . . .	. . . . .	4	. . . .	. . . . .	D-CO-815
C308	Antenna Blocking Capacitor	Same as C306	CSL-48645-B10 † (CM 45B 102K)	JAN-C-5	5	. . . . .	. . . . .	
C309	P.A. High Voltage By Pass Capacitor	Mica: .01± 10% 1200 Volts d.c. working	CM 50B 103K	JAN-C-5	5	XQBW	Varnish vacuum impregnation	B-CO-10015
C310	Microphone supply Filter Capacitor	Electrolytic: 50 MFD + 75% - 10% 25 Volts D.C. working	CSL-482180	RE-13A-549	5	LDXDR	. . . . .	B-CO-10011
C311	Meter By Pass Capacitor	Mica: 0.006 MFD ± 10% 500 Volts d.c. working	CSL-48770-B10 † (CM 35B 622J)	JAN-C-5	5	MWBW-1241		
C312	NOT ASSIGNED							
C313	P.A. Fixed Tank Capacitance	Mica: 0.00011 MFD ± 10% 1200 Volts d.c. working	CM 45B 111K	JAN-C-5	5	XQBW	. . . . .	B-CO-10003
C314	Plate Supply By Pass Capacitor	Same as C309	CM 50B 103K	JAN-C-5	5	XQBW	Varnish vacuum imp.	

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TRANSMITTER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

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			CAPACITORS (Continued)					
C315	Modulator filament by pass capacitor	Electrolytic: 50 MFD. + 75 -10% 25 Volts d.c. working	CSL-482180	RE-13A-549	5	LDXDR	. . . . .	B-CO-10011
C316	Modulator screen by pass capacitor	Oil filled paper 0.5 MFD. ± 20% 600 Volt d.c. working	CSL-48100-20 CP51B1FF504MM	AWS C75.16	5	XDMRT 6-.5-20	. . . . .	B-CO-10010
C317	Modulator coupling capacitor	Same as C316	CSL-481002-20 CP51B1FF504MM	AWS C75.16	5	XDMRT 6-.5-20	. . . . .	. . . . .
C318	Modulator supply by pass capacitor	Same as C316	CSL-481002-20 CP51B1FF504MM	AWS C75.16	5	XDMRT 6-.5-20	. . . . .	. . . . .
C319	Remote input coupling capacitor	Paper, oil filled 1 MFD ± 10% 600 Volts D.C. working	CTD-481998-10	AWS C75.16	18	OM-601	. . . . .	B-CO-10009
C320	Receiver output coupling capacitor	Same as C319	CTD-481998-10	AWS C75.16	18	. . . . .	. . . . .	. . . . .
C321	Side Tone Osc. Coupling Cap.	Mica: 0.006 mfd ± 10% 500 Volts d.c. working	CSC-48770-B10 † (CM 35B 622J)	JAN-C-5	5	MWBW-1241	Tropicalized Wax imp	B-CO-723
C322	Side Tone Osc. Tank Cap.	Mica: 0.0001 MFD ± 10% 500 Volts d.c. working	CSL-48674-B10	JAN-C-5	5	MOBW 1416	Tropicalized Wax imp	B-CO-725
C323	Side Tone Amp. Coupling Cap.	Same as C321	CSL-48770-B10 † (CM 35B 622J)	JAN-C-5	5	. . . . .	Tropicalized Wax imp	. . . . .
C324	Filament Bypass Cap.	Same as C321	CSL-48770-B10 † (CM 35B 622J)	JAN-C-5	5	. . . . .	Tropicalized Wax imp	. . . . .
			JACKS & RECEPTACLES					
J301	Key Jack	Single Circuit, open, short frame type	CTC-49025A	. . . . .	7	JK34A	Tropicalized varnish imp.	C-RC-1032
J302	Microphone Jack	Three Circuit, two spring, short frame type	CTC-49039	. . . . .	7	JK33A	Tropicalized varnish imp.	C-RC-1030
J303	Power Input Receptacle	Four Circuit Ceramic Insulation	CUF-49041	. . . . .	8	. . . . .	. . . . .	C-RC-1033

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			RELAYS					
K301	Keying Relay	50 ohm coil 2 S.P.D.T. circuits and one normally closed single circuit	. . . . .	. . . . .	20	. . . . .	Tropicalized	C-RL-10000
K302	Remote Relay	200 ohm coil one S.P.D.T. Circuit one single pole Circuit normally open.	. . . . .	. . . . .	19	505-20-1	Tropicalized	C-RL-10001
			R.F. INDUCTORS AND CHOKE COILS					
L301	M.O.C.O. Tank Coil	Coil: 49 turns, with 3 taps: 12 turns, 22 turns, 34 turns from the start of the winding wound with # 20 D.E. copper wire on 1½ in. dia. ceramic form	. . . . .	. . . . .	10	. . . . .	Tropicalized Wax imp.	L-CL-10009
L302	M.O. P.A. Grid Choke	3 coils in series, each 103 turns of # 32 E.D.S. Copper wire, Universal Wound 4 crosses per turn on ½ in. diam ceramic form.	. . . . .	. . . . . .	10	. . . . .	Tropicalized Wax imp.	L-CL-1027
L303	P.A. Antenna Coil	Coil consisting of 60 turns of # 20 D.E. Copper wire with 9 taps, 3 1/16, 5 15/16, 9 1/16, 11 15/16, 15 1/16, 16 15/16, 19 1/16, 28 and 44 turns from start of winding. Wound on 2" O.D. Ceramic form.	. . . . .	. . . . .		. . . . .	Tropicalized Wax imp.	L-CL-10011
L304	P.A. Plate Choke	3 coils in series each 128 turns of #32 E.D.S. copper wire Universal Wound 4 crosses per turn on ½ in. diam ceramic form.	. . . . .	. . . . .	10	. . . . .	Tropicalized Wax imp.	L-CI-10001

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METERS								
M301	Antenna Ammeter	Ammeter 0-1.0 Amp. R.F. 2½ in. diam; flush, phenolic case, anti-glare glass	CAY-22130A (MR-25-F-001-RF-AA)	JAN-I-6	21	NY-57352-1	Tropicalized	C-PP-1151-1
M302	Multimeter	Multimeter with the following scales: 140 m.a. d-c; 140 volts d-c; 500 ma d-c; 2½ in. diam; flush, phenolic case, anti-glare glass.	CAY-22291-D	17-I-12	21	NY-57353-1A	Tropicalized	C-PP-1152-2
RESISTORS								
R301	M.O. P.A. Grid Leak Resistor	Composition: 10,000 ohms ± 5% ½ watt	CIR-63355-5 (RC21 BE 103J)	JAN-R-11	12	BT ½	Wax Dipped	B-RE-10012
R302	M.O. P.A. Grid Lead Resistor	Same as R301	CIR-63355-5 (RC21 BE 103J)	JAN-R-11	12	BT ½	Wax Dipped	
R303	P.A. Screen Bleeder Resistor	Wire Wound, 5000 ohms ± 10% 8 watts	CIR-63634-10	RE-13A-372J	12	DG	(C) Coating	B-RE-10028
R304	P.A. Filament Resistor	Wire Wound, 4 ohms ± 5%, 20 watts	CIR-632093-5	RE-13A-372J	12	DG	(C) Coating	B-RE-10020
R305	M.O. C.O. Filament Resistor	Wire Wound, 100 ohms ± 5%, 2 watts	CIR-63705-5	RE-13A-372J	12	BW-2	Wax Dipped	B-RE-10013
R306	M.O. C.O. Filament Shunt Resistor	Wire Wound: 240 ohms ± 5%, 1 watt	CSA-63291-5	RE-13A-372J	23	CM-1	Wax Dipped	B-RE-981
R307	Modulator Filament Resistor	Wire Wound: 30 ohms ± 5%, 1 watt	CIR-63703-5	RE-13A-372J	12	BW-1	Wax Dipped	B-RE-10017
R308	Modulator Filament Resistor	Wire Wound: 68 ohms ± 5%, 2 watts	CPQ-63705-5	RE-13A-372J	40	SI-2	Wax Dipped	B-RE-10015
R309	Modulator Filament Shunt Resistor	Wire Wound: 390 ohms ± 5%, 2 watts	CPQ-63705-5	RE-13A-372J	40	SI-2	Wax Dipped	B-RE-10016

TABLE I
PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
TRANSMITTER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
RESISTORS (Continued)								
R310	Multimeter Shunt Resistor for Transmitter	1.43 ohms ± 5% (75M.A.) Evacuated type. Non Inductive Construction.	. . . . .	. . . . .	22	20NIF	. . . . .	B-RE-919
R311	Receiver Voltmeter Multiplier Resistor	140,000 ohms ± 2% (1.0.M.A.) Evacuated type Standard Construction	. . . . .	. . . . .	22	20F	. . . . .	B-RE-920
R312	Receiver Filament Meter Shunt Resistor	0.4 ohms ± 5% (250M.A.) Evacuated type, Standard Construction	. . . . .	. . . . .	22	20F	. . . . .	B-RE-921
R313	P.A. Screen Dropping Resistor	Wire Wound: 20,000 ohms ± 10% 8 watts	CIR-63689E-10	RE-13A-372J	12	DG	(C) Coating	B-RE-10010
R314	Modulator Plate Supply Resistor	Same as R313	CIR-63689E-10	RE-13A-372J	12	DG	(C) Coating	
R315	Static Drain Resistor	Composition: 2 megohms ± 10% ½ Watt	CIR-63360-10 † (RC21 BE 205J)	JAN-R-11	12	BT ½	Wax Dipped	B-RE-907
R316	M.O. Supply Series Resistor	Composition: 3300 ohms ± 10% 1 watt	CSA-63288-10	JAN-R-11	23	CM 1	Wax Dipped	B-RE-10029
R317	C.O. 1, Grid Leak Resistor	Composition: 100,000 ohms ± 5% ½ watt	CSA-63355-5 (RC21 BE 104J)	JAN-R-11	23	CM ½	Wax Dipped	B-RE-10014
R318	C.O. 2, Grid Leak Resistor	Same as R317	CSA-63355-5 (RC21 BE 104J)	JAN-R-11	23	CM ½	Wax Dipped	
R319	Modulator Screen Series Resistor	Composition: 68000 ohms ± 10% ½ watt	CIR-63360-10 (RC21 BE 683K)	JAN-R-11	12	BT ½	Wax Dipped	B-RE-10019
R320	Modulator Plate Series Resistor	Composition: 11,000 ohms ± 10% 1 watt	CSA-63288-10 (RC31 BE 113K)	JAN-R-11	12	CM 1	Wax Dipped	B-RE-911
R321	Modulation Control Potentiometer	100,000 ohms ± 10% Linear Taper 2 watts, carbon	CSA-631987-10	RE-13A-492	23	Type C	Sealed	C-PT-10000
R322	Modulation Reactor Parallel Resistor	Same as R319	CIR-63360-10 (RC21 BE 683K)	JAN-R-11	12	BT ½	Wax Dipped	
R323	P.A. Plate Parasitic Resistor	Composition: 22 ohms ± 10% 1 watt	CER-63288-10	JAN-R-11	6	518	. . . . .	B-RE-10022

† *Not exact equivalent, but may be used as an alternate.*

TABLE I

PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
TRANSMITTER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			RESISTORS (Continued)					
R324	Side Tone Oscillator Series Resistor	Composition: 2 megohm ± 10% ½ Watt	CIR-63360-10 † (RC21 BE 205J)	JAN-R-11	12	BT-½	Wax Dipped	B-RE-907
R325	Side Tone Limiting Resistor	Composition: 10,000 ohms ± 5% ½ Watt	CIR-63355-5 † (RC21 BE 103J)	JAN-R-11	12	BT-½	Wax Dipped	B-RE-10012
R326	Side Tone Decoupling Resistor	Composition: 150,000 ohms ± 10% ½ Watt	CIR-63360-10 † (RC21 BE 154K)	JAN-R-11	12	BT-½	Wax Dipped	B-RE-10007
R327	V301 Supressor Grid Leak Resistor	Composition: 68,000 ohms ± 10% ½ Watt	CIR-63360-10 RE21 BE 683K	JAN-R-11	12	BT-½	Wax Dipped	B-RE-10019
			SWITCHES					
S301	M.O. Band Change Switch	Rotary Tap Switch: two circuit, two positions, single wafer, ceramic.	. . . . .	. . . . .	14	. . . . .	. . . . .	B-SW-1008
S302	C.O.-1, C.O.-2 or M.O. Switch	Rotary Tap Switch: single wafer, three positions, three circuits, ceramic.	. . . . .	. . . . .	14	. . . . .	. . . . .	B-SW-1009
S303	P.A. Inductor Switch (Fine)	Rotary tap switch; single wafer, 8 positions; includes S304 in common mounting, ceramic.	. . . . .	. . . . .	8	. . . . .	. . . . .	E-SW-10001
S304	P.A. Inductor Switch (Coarse)	Rotary Tap Switch; single wafer, 3 positions; includes S303 in common mounting, ceramic.	. . . . .	. . . . .	8	. . . . .	. . . . .	E-SW-10001
S305	Meter Momentary Switch	Double Pole, Double Throw momentary in one position, normally closed in other position 3 Amp 125 Volts.	CG-24034	RE-24AA-118A (C 75.15)	11	1GA4C12 Modified	. . . . .	C-SW-1006
S306	C.W. Voice Net Switch	Rotary Switch 2 wafers, 3 positions, 3 circuits per bank, ceramic	. . . . .	. . . . .	14	. . . . .	. . . . .	C-SW-10002
S307	Transmitter - Receiver Meter Switch	Double-Pole Double Throw, Miniature Toggle Switch; 1 amp 250 Volts 3 amp 125 volts	CG-24033	RE-24AA-118A (C75.16)	11	Cat#49x36 Modified	. . . . .	C-SW-1007

† *Not exact equivalent, but may be used as an alternate.*

TABLE I

PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS TRANSMITTER SECTION OF TYPE CGQ-43060 TRANSMITTER-RECEIVER UNIT

Symbol Designation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Designation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
		IRON CORE TRANSFORMERS AND REACTORS						
L305	Modulation Reactor	Total Inductance 40 Henries with 12.5 M.A. DC tested at 60 cycles, 20 volts	CUT-301278	. . . . .	24	81749	. . . . .	D-TR-10002
T301	Microphone Transformer	Ratio 1-10 step up ± 2 DB of 1000 cycles 200 to 3000 cycles	CUT-301276	. . . . .	24	81748	. . . . .	D-TR-10001
		TUBES						
V301	P.A. Tube	R.F. Power Amplifier Pentode	CTL-2E22	JAN-1A	25	. . . . .	. . . . .	B-TU-10004
V302	M.O.-C.O. Tube	R.F. Amplifier Pentode	CTL-3A4	JAN-1A	25	. . . . .	. . . . .	B-TU-10003
V303	Modulator Tube	Same as V302	CTL-3A4	JAN-1A	25	. . . . .	. . . . .	
V304	Side Tone Oscillator Tube	Glow Discharge Tube (neon lamp)	CG-991	JAN-1A	11	. . . . .	. . . . .	B-TU-10005
		CRYSTALS						
Y301	Quartz Crystal and Holder	At cut, quartz crystal and holder	CG-40024A	. . . . .	11	. . . . .	. . . . .	B-SA-1409
Y302	Quartz Crystal and Holder	Same as Y301	CG-40024A	. . . . .	11	. . . . .	. . . . .	B-SA-1409
		SOCKETS						
X301	P.A. Tube Socket	5 prong ceramic	CNA-49328	RE-13A-524A	27	. . . . .	. . . . .	B-SO-10002
X302	M.O.-C.O. Tube Socket	7 prong midget ceramic	CMG-49571	. . . . .	28	9834	. . . . .	B-SO-10001
X303	Modulator Tube Socket	Same as X302	CMG-49571	. . . . .	28	. . . . .	. . . . .	
X304	Side Tone Osc. Tube Socket	Double Candelabra	. . . . .	. . . . .	29	NE991 Flush	. . . . .	B-SO-10003

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PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
ACCESSORY BOX TYPE CGQ-10339 AND ACCESSORIES

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			ACCESSORY BOX					
A400	Accessory Box	16 in. by 8 in. to the outside of the cover, 10 in. high	CGQ-10339	. . . . .	10	. . . .	. . . . .	L-SA-10036
			BATTERIES					
BT401	"A" Battery	Dry Battery: Rated 1.5 Volts	-19010	JAN-B-18	.	. . . .	. . . . .	B-BT-1000
BT402	"A" Battery	Same as BT401	-19010	JAN-B-18	.	. . . .	. . . . .	
BT403	"C" Battery	Dry Battery Rated 7.5 Volts. Terminals on each Cell with Black Flexible Negative Lead	-19011	JAN-B-18	.	. . . .	. . . . .	B-BT-1001
BT405	"B" Battery	Dry Battery Rated 45 Volts	-19005	JAN-B-18	.	. . . .	. . . . .	C-BT-1002
BT406	"B" Battery	Same as BT405	-19005	JAN-B-18	.	. . . .	. . . . .	
			HEAD TELEPHONES					
HT400	Head Telephone Receiver Set	Consists of Navy Type CW-49504 Head Band, cord and plug, 2 Navy Type CW-49505 Headphones, and 2 Navy Type CW-49506 Synthetic Rubber Molded Ear Cushions.	CW-49507A	RE13 A 980	38	. . . .	Tropicalized	E-PP-10024
HT400A	Head Telephone Extension Cord	6 Foot Extension Cord With 1-Type PL-55 Plug and 1-Type JK-48 Receptacle.	CW-49534	. . . . .	38	. . . .	. . . . .	C-PP-10025

TABLE I

PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS

ACCESSORY BOX TYPE CGQ-10339 AND ACCESSORIES

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			RECEPTACLES					
J401	Power Receptacle Socket	Eight Circuit Receptacle	CUF-49043	. . . . .	8	. . . .	. . . . .	C-RC-1034
			MICROPHONES					
MI401	Microphone	Lip Microphone Assembly Consisting of Navy Type CW-51066 Microphone, Cord and Plug Assembly Navy Type 10312	CW-51071	RE-9340	38	. . . .	Tropicalized	C-MK-10000
MI401A	Microphone Extension Cord and Switch Assembly	Consists of Waterproof Switch, 5 foot Cable with Type PL-68 three circuit Plug, 8 inch cable with Type JK-48 receptacle.	CTE-49588 † (CD 318A)	. . . .	9 39	. . . .	. . . . .	D-PP-10020
			TELEGRAPH KEYS					
S401	Telegraph Key	Consists of Enclosed Water proof key on special base with two mounting holes.	CAQZ-26022	16K1(RE)	13	Model 288	Tropicalized	D-SA-10137
S401A	Telegraph Key Leg Band	Leg band with two studs for Mounting to key base.	Part of CAQZ-26022	16K1(RE)	13			
			VACUUM TUBES					
V401	Spare Tube Mobile	R.F. Power Amplifier Pentode	CTL-2E22	JAN-1A	25	. . . .	. . . . .	B-TU-10004
V402	Spare Tube Mobile	R.F. Amplifier Pentode	CTL-3A4	JAN-1A	25	. . . .	. . . . .	B-TU-10003
V403	Spare Tube Mobile	R.F. Amplifier Pentode	CTL-3A4	JAN-1A	25	. . . .	. . . . .	B-TU-10003
V404	Spare Tube Mobile	Power Amplifier Pentode	CTL-1A5 GT/G	JAN-1A	16	. . . .	. . . . .	B-TU-10006

† *Not exact equivalent, but may be used as an alternate.*

TABLE I
PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
ACCESSORY BOX TYPE CGQ-10339 AND ACCESSORIES

Symbol Designation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Designation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			VACUUM TUBES (Continued)					
V405	Spare Tube Mobile	Glow Discharge (Neon Lamp)	CG-991	JAN-1A	11	. . . .	. . . . .	B-TU-10005
V406	Spare Tube Mobile	Pentagrid Converter	CHS-1A7GT/G	JAN-1A	16	. . . .	. . . . .	B-TU-10000
V407	Spare Tube Mobile	R. F. Amplifier Pentode	CHS-1N5GT/G	JAN-1A	16	. . . .	. . . . .	B-TU-10001
			WIRES AND CABLES					
W401	Battery Cable	Consists of 2 Navy Type CGQ 49042 Eight-Circuit Plugs and 3 Feet of Navy Type CG 49048 Seven Conductor Cordage.	CGA-49574	. . . . .	10	. . . .	. . . . .	L-SA-10058
W401A	Battery Cable Plug	Eight Circuit Plug	CGQ-49042	. . . . .	10	. . . .	. . . . .	L-SA-1690
W401B	Battery Cable Cordage	3 Feet Seven Conductor Cordage	CG-49048	. . . . .	11	. . . .	. . . . .	
W402	Generator Cable	Consists of 2 Navy Type CGQ-49040 Four Circuit Plugs and 20 Feet of Navy Type CG-49047 Four Conductor Cordage	CGQ-49044A	. . . . .	10	. . . .	. . . . .	C-SA-1531
W402A	Generator Cable Plug	Four Circuit Plug	CGQ-49040	. . . . .	10	. . . .	. . . . .	L-SA-1688
W402B	Generator Cable Cordage	20 Feet Four Conductor Cordage	CG-49049	. . . . .	11	. . . .	. . . . .	B-CA-1061
W403	Antenna Lead	5 ft. of # 16 A.W.G. Stranded, Packard # 344 ignition wire with terminals	. . . . .	. . . . .	10	. . . .	. . . . .	L-SA-10078

TABLE I
PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
HAND DRIVEN GENERATOR - TYPE CBF-21263B

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			HAND CRANKS					
A-501-	Hand Cranks	Hand Cranks for operation of Type CBF-21263B	CBF-21263B	. . . . .	31	S-15974	. . . . .	C-PP-1132
			CAPACITORS					
C501	H-V R.F. Filter Capacitor	Mica: .01 MFD ± 10% 1200 volts D.C. Working	CM 50B 103K	JAN-C-5	5	XQBW	Varnish Vacuum Impregnation	B-CO-10015
C502	H-V Filter Capacitor	Paper, oil filled 1 MFD ± 10% 600 volts D.C. working	CTD-481998-10	AWS-C75.16	18	OM-601	. . . .	B-CO-10009
C503	H-V Filter Capacitor	Paper Oil Filled 2 MFD ± 10% 600 Volts D.C. Working	CTD-482434-10	RE-13A-488E	18	OM-602	. . . .	B-CO-10013
C504	H-V Filter Capacitor	Same as C503	CTD-482434-10	RE-13A-488E	18	OM-602	. . . .	. . . . .
C505	L-V R.F. Filter Capacitor	Mica: .003 MFD ± 10% 500 Volts D.C. Working	CM 30B 302K	JAN-C-5	5		Varnish Vacuum Impregnation	B-CO-10016
C506	L-V Filter Capacitor	Same as C503	CTD-482434-10	RE-13A-488E	18	OM-602	. . . .	. . . . .
C507	Microphone Filter Capacitor	Same as C502	CTD-481998-10	AWS-C75.16		OM-601	. . . .	. . . . .
			GENERATORS					
G500	Hand Driven Generator	12.6/500-550 Volts ± 5% 2.0/0.08 Amp. D.C. Crank Speed 60 to 70 R.P.M.	CBF-21263B	. . . . .	31	. . . .	. . . .	E-SA-1413
			RECEPTACLES					
J501	Power Receptacle	Four Circuit Ceramic Insulation	CUF-49041	. . . . .	8	. . . .	. . . .	C-RC-1033

TABLE I
PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
HAND DRIVEN GENERATOR TYPE CBF-21263B

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
		R.F. INDUCTORS AND CHOKE COILS						
L501	Microphone Supply Filter Reactor	0.5 Henries, 0.1 amps., 32 ohms D.C. Res.	CG-30336	. . . . . .	11	. . . .	. . . .	B-CL-1024
L502	H-V R.F. Filter Choke Coil	Consists of Approximately 90T of #16 "Formex" Wire Approximate IND=36 Microhenries on 1/2 Diam. Form.	. . . . . .	. . . . . .	10	. . . .	. . . .	L-CL-10012
L503	L-V R.F. Filter Choke Coil	Same as L502	. . . . . .	. . . . . .	10	. . . .	. . . .	. . . . .
		RESISTORS						
R501	Regulator Resistor	42 Ohms ± 5% Tapped at 32 Ohms Wound with No. 32 "Double Advance" Wire	CBF-63555B	. . . . . .	31	. . . .	. . . .	B-RE-956
		VOLTAGE REGULATOR						
VR501	Voltage Regulator	No Load to Full Load Regulation Not to Exceed 5% on the H.V. and 5% on the L.V. Windings	. . . . . .	. . . . . .	31	S-15737-A	. . . .	Part of E-SA-1413

TABLE I
PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
ANTENNA SYSTEM

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			FLAGELLIFORM ANTENNA					
A903	Flagelliform Antenna	Seven Section Chrome molybdenum steel tube mast	. . . . .	. . . . .	30	. . . . .	. . . . .	D-MA-1067
A904	Mast Section No. 1	Seamless chrome molybdenum steel tubing 3 ft. 7-1/4 in. long with screw fittings on both ends for screwing into adjacent mast sections	CFM-66022	. . . . .	30	. . . . .	. . . . .	B-SA-1734
A905	Mast Section No. 2	Same as A904	CFM-66022	. . . . .	30	. . . . .	. . . . .	
A906	Mast Section No. 3	Same as A904	CFM-66022	. . . . .	30	. . . . .	. . . . .	
A907	Mast Section No. 4	Seamless chrome molybdenum steel tubing 3 ft. 7-1/4 in. long with screw fittings on both ends and 4 sets of guy line clips	CFM-66021A	. . . . .	30	. . . . .	. . . . .	C-SA-1735
A908	Mast Section No. 5	Seamless chrome molybdenum steel tubing 3ft. 7-1/4 in. long with screw fittings on both ends for screwing into adjacent mast sections	CFM-66020	. . . . .	30	. . . . .	. . . . .	B-SA-1737
A909	Mast Section No. 6	Same as A908	CFM-66020	. . . . .	30	. . . . .	. . . . .	
A910	Mast Section No. 7	Seamless chrome molybdenum steel tubing 3 ft. 7-1/4 in. long with screw fittings on one end and other end plugged.	CFM-66019	. . . . .	30	. . . . .	. . . . .	B-SA-1736

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PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS

ANTENNA SYSTEM

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
		FLAGELLIFORM ANTENNA (Cont'd)						
A911	Mast Base Support	Mycalex with dural cap on one end, stainless steel screw fittings on both ends, overall length 8-1/4 in.	CFM-66023B	. . . . .	30	. . . . .	. . . . .	C-SA-1739
A912	Ground Stake	Body of Stake chrome molybdenum steel tubing, with inserted head and point of stainless steel, overall length 15-1/8 in.	CFM-66024	. . . . .	30	. . . . .	. . . . .	B-SA-1738
A913	Guy Stake	Sheet Steel 9 in. long	CCR-66013	. . . . .	34	. . . . .	. . . . .	B-SA-1402
		ANTENNA WIRES, CABLES Etc.						
W901	"Large" Antenna	Consists of 30 ft. of Model J Antenna wire, insulator Navy Type 61244A, approximately 60 ft. of waterproof non-stretch braided linen line 0.090 in. diam. and connector.	. . . . .	. . . . .	10	. . . . .	. . . . .	B-SA-1499
W901A	Insulator for "Large" Antenna	Ceramic Strain Insulator	CCJ-61244A	RE-13A-317F	35	. . . . .	. . . . .	B-MP-1038
W902	Counterpoise	Consists of four 20 ft. lengths, one 2 ft. length of Model J Antenna wire, with ground clamps on one end of 2 ft. section. One 5 ft. section of #16 A.W.G. Packard #344 cable with terminal on one end	. . . . .	. . . . .		. . . . .	. . . . .	C-SA-1500

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PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS

ANTENNA SYSTEM

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
ANTENNA WIRES, CABLES Etc. (Cont'd)								
W903	Guy lines for Flagelliform Antenna (3)	Waterproof non-stretch braided linen line not over .090 in. diam. by 20 ft. in length.	. . . . .	. . . . .	36	. . . . .	. . . . .	B-CD-1000
W903A	Insulator for Guy line	Ceramic strain insulator	CCJ-61244A	RE-13A-317F	35	. . . . .	. . . . .	B-MP-1038
W904	Antenna Reel	Reel for "Large" Antenna and counterpoise	-71007	. . . . .	32	. . . . .	. . . . .	D-SA-1492

TABLE I
PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
REMOTE CONTROL UNIT NAVY TYPE CGQ-23453

Symbol Designation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Designation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			CARRYING CASE					
A105	Carrying Case	Canvas Carrying Case for remote Control Unit Type-23453	CAQF-10375	. . . . . .	41	. . . .	. . . . . .	E-SA-10084
			BATTERIES					
BT1401	Dry Cell	1½ Volt Flashlight Cell	-19031	JAN-B-18		. . . .	. . . . . .	B-BT-10000
BT1402	Dry Cell	Same as BT1401	-19031	JAN-B-18		. . . .	. . . . . .	
BT1403	Dry Cell	Same as BT1401	-19031	JAN-B-18		. . . .	. . . . . .	
BT1404	Dry Cell	Same as BT1401	-19031	JAN-B-18		. . . .	. . . . . .	
BT1405	Dry Cell	Same as BT1401	-19031	JAN-B-18		. . . .	. . . . . .	
BT1406	Dry Cell	Same as BT1401	-19031	JAN-B-18		. . . .	. . . . . .	
			CAPACITORS					
C1401	Series Blocking Capacitor	Paper, oil filled 1 MFD ± 10% 600 volts D.C. working.	CTD-481998-10	AWS C75.16	18	OM-601	. . . . . .	B-CO-10009
C1402	Click Suppression Capacitor	Electrolytic: 25 MFD + 100 -10% 25 volts D.C. working.	CTD-481721	RE-13A-549	18	ECDR-45	. . . . . .	B-CO-703
			HEAD TELEPHONES					
HT1401	Head Telephones	Consists of Navy Type CW-49504 Head band, cord and plug, 2 Navy type CW-49505 headphones, and 2 Navy type CW-49506 Synthetic rubber molded ear cushions.	CW-49507A	RE-13A-980	38	. . . .	Tropicalized	E-PP-10024

† *Not exact equivalent, but may be used as an alternate.*

TABLE I

PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS

REMOTE CONTROL UNIT NAVY TYPE CGQ-23453

Symbol Designation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Designation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
HEAD TELEPHONES (Cont'd)								
HT1401A	Head Telephones Extension Cord	6 Foot extension cord with 1-type PL-55 plug and 1-type JK-48 Receptacle	CW-49534	. . . . .	38	. . . .	. . . . .	C-PP-10025
JACKS AND RECEPTACLES								
J1401	Key Jack	Single circuit, open, short frame type	CTC-49025A	. . . . .	7	JK 34A	Tropicalized Varnish Imp.	C-RC-1032
J1402	Microphone Jack	Three Circuit, two spring short frame type	CTC-49039	. . . . .	7	JK 33A	Tropicalized Varnish Imp.	C-RC-1030
J1403	Headphone Jack	Single circuit, open, short frame type	CTC-49025A	. . . . .	7	JK 34A	Tropicalized Varnish Imp.	C-RC-1032
MICROPHONES								
MI1401	Lip Microphone	Lip Microphone Assembly consisting of Navy type CW-51066 microphone, cord and plug assembly Navy type-10312	CW-51071	RE-9340	38	. . . .	Tropicalized	C-MK-10000
MI1401A	Microphone Extension cord and switch assembly	Consists of waterproof switch, 5 foot cable with type PL-68 three circuit plug, 8 inch cable with type JK-48 receptacle	CTE-49588	. . . . .	9	. . . .	. . . . .	D-PP-10020
RESISTORS								
R1401	Current Limiting Resistor	Wire Wound 18 ohms ± 10% 2 Watt	CIR-63705-10	RE-13A372J	12	BW-2	Wax Dipped	B-RE-10025
R1402	Click suppression resistor	Composition: 1 megohm ± 10% 1/2 watt	CIR-63660-10 (RC21 BF 105K)	JAN-R-11	12	BT-1/2	Wax Dipped	B-RE-698

† *Not exact equivalent, but may be used as an alternate.*

TABLE I

PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
REMOTE CONTROL UNIT NAVY TYPE CGQ-23453

Symbol Designation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Designation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			TELEGRAPH KEYS					
S1401	Telegraph Key	Consists of enclosed waterproof key on special base with two mounting holes.	CAQZ-26022	16K1(RE)	13	Model 288	Tropicalized	D-SA-10137
S1401A	Telegraph Key Leg Band	Flexible leg band with two studs for mounting to key base.	Part of CAQZ-26022	16K1(RE)	13			
			TRANSFORMERS AND REACTORS					
T1401	Line Matching Auto Transformer.	Tapped Autotransformer for Microphone and Phones	CCT-301437	. . . . .	19	D-13729	Tropicalized	C-CL-10010

† *Not exact equivalent, but may be used as an alternate.*

TABLE I
PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
RECEIVER POWER SUPPLY ADAPTER NAVY TYPE CGQ-632246

Symbol Designation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Designation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			RECEPTACLES					
J1501	Power Receptacle Socket	Eight Circuit Receptacle	CUF-49043	. . . . . .	8	. . . .	. . . .	C-RC-1034
			PLUGS					
P1501	Battery Cable Plug	Eight Circuit Plug	CGQ-49042	. . . . . .	10	. . . .	. . . .	L-SA-1690
			RESISTORS					
R1501	Filament Series Dropping Resistor	Wire Wound: 6 ohms ± 5% 1 Watt	CPQ-63703-5	RE-13A-372J	40	SI-1	Wax Dipped	B-RE-10027
R1502	Filament Load Resistor	Wire Wound: 27 ohms ± 5% 1 Watt	CPQ-63703-5	RE-13A-372J	40	SI-1	Wax Dipped	B-RE-10034
R1503	Bias Series Dropping Resistor	Composition: 33,000 ohms ± 5% 1 Watt	RC-31-BF-333-J	JAN-R-11	23	CM-1	Wax Dipped	B-RE-10032
R1504	H.V. Series Dropping Resistor	Composition: 8,200 ohms ± 5% 1 Watt	RC-31-BF-822-J	JAN-R-11	23	CM-1	Wax Dipped	B-RE-10033
R1505	H.V. Load Resistor	Composition: 20,000 ohms ± 5% 2 Watts	RC-41-BF-203-J	Jan-R-11	40	SI-2	Wax Dipped	B-RE-10031

TABLE I

PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS

RAIN SHIELD TYPE CAUQ-10480

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
RAIN SHIELD								
A1600	Trans. - Rec. Rain Shield	Shield: Consisting of Transparent plastic material formed to fit over Front of Trans-Rec. unit with synthetic rubber strap for attaching to Case.	CAUQ-10480	. . . .	37	500	. . . . .	E-SA-10141
STRAPS								
A1601	Synthetic rubber strap	Synthetic rubber strap, one side of which is permanently fastened to one side Rain shield and equipped with a clip on other side for attachment to shield when in place.	. . . .	. . . .	37	. . . .	. . . . .	C-SA-10147

† *Not exact equivalent, but may be used as an alternate.*

TABLE I
PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
CRYSTAL CALIBRATOR AND MONITOR TYPE CGQ-60133

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			ROD TYPE ANTENNA					
A1701	Rod Antenna	3 section Telescoping type antenna	. . . .	. . . .	42	. . . .	. . . . .	C-SA-10157
			BATTERIES					
B1701	Dry Cell	1 ½ Volt flashlight cell	†-19031	JAN-B-18	.	. . . .	. . . . .	B-BT-10000
B1702	"C" Battery	Dry Battery: Rated 7 ½ Volts. Terminals on each cell with black flexible negative lead.	†-19011	JAN-B-18	.	. . . .	. . . . .	B-BT-1001
			CAPACITORS					
C1701	Antenna Coupling Capacitor	Ceramicon: 15 MMFD. ±10%	CC 21CK 150K	JAN-C-20	6	. . . .	. . . . .	B-CO-10020
C1702	R.F. Choke Shunt Capacitor	Ceramicon: 10 MMFD. ±10%	CC 21CK 100F†	JAN-C-20	6	. . . .	. . . . .	B-CO-10019
			JACKS					
J1701	Headphone Jack	Single, closed circuit short frame type	. . . .	. . . .	43	IJ-102	. . . . .	C-RC-10000
			R.F. INDUCTORS					
L1701	R.F. Plate choke	Coil consisting of 3 coils in series, each 103 turns #32 E.D.S. copper wire universal wound 4 crosses per turn on ½" ceramic form.	. . . .	. . . .	10	. . . .	. . . . .	L-CL-10014

† *Not exact equivalent, but may be used as an alternate.*

TABLE I
PARTS LIST BY SYMBOL DESIGNATIONS FOR MODEL TBX SERIES OF PORTABLE RADIO EQUIPMENTS
CRYSTAL CALIBRATOR AND MONITOR TYPE CGQ-60133

Symbol Desig-nation	Function	Description	Navy Type Designation JAN / or A.W.S. No.	Navy JAN and/or (A.W.S.) Specification Number	Mfr.	Mfr. Desig-nation	Special Tolerance, Rating or Modification	Garod Dwg. and Part No.
			RESISTORS					
R1701	Grid leak resistor	Composition: 220,000 ohms ±10% ½ watt	RC21BF224K RC21BF224K	JAN-R-11	23	CM ½	. . . . . .	B-RE-10040
			SWITCHES					
S1701	Momentary on-off switch	Double pole, double throw momentary in one position, normally closed in other positions 3 AMP 125 volts.	CG 24034	A.W.S. C75.15	11	1GA4C12 Modified	. . . . . .	C-SW-1006
S1702	Crystal channel selector switch	Rotary tap switch 2 wafers, 10 positions per wafer, ceramic	. . . .	. . . .	14	. . . .	. . . . . .	C-SW-10003
			TUBES					
V1701	Oscillator† tube	R.F. amplifier pentode	CTL-3A4	JAN-1A	25	. . . .	. . . . . .	B-TU-10003
			SOCKETS					
X1701	Oscillator tube socket	7 prong Midget Ceramic	CMG-49571A	JAN-S-28	28	. . . .	. . . . . .	B-SO-10001
			CRYSTALS					
Y1701 thru Y1710	Quartz Crystal and holder	At cut quartz crystal and holder	Signal Corps Type FT243 holder	. . . .		. . . .		

† *Not exact equivalent, but may be used as an alternate.*

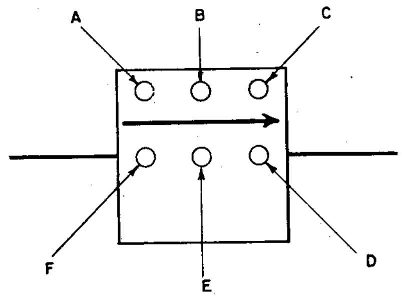
LIST OF MANUFACTURERS

Code No.	Mfr. Prefix	Name	Address
1	CFU	Tillitson Furniture Co.	Jamestown, N.Y.
2	CWP	Winship Co., Inc.	Utica, N.Y.
3	CAIM	American Steel Package Co.	Defiance, Ohio
4	CHC	Hammurland Mfg. Co., Inc.	New York, N.Y.
5	CSL	Solar Mfg. Co.	New York, N.Y.
6	CER	Erie Resistor Corp.	Erie, Pa.
7	CTC	Chicago Telephone Supply Co.	Elkhart, Ind.
8	CUF	The Ucinite Mfg. Co.	Newtonville, Mass.
9	CTE	Telephonics Corp.	New York, N.Y.
10	CGQ	Garod Radio Corp.	Brooklyn, N.Y.
11	CG	General Electric Co.	Schenectady, N.Y.
12	CIR	International Resistance Co.	Philadelphia, Pa.
13	CAQZ	Brelco Corp.	New York, N.Y.
14	COC	Oak Mfg. Co.	Chicago, Ill.
15	CFW	F.W. Sickles Co.	Springfield, Mass.
16	CHS	Hygrade Sylvania Corp.	Salem, Mass.
17	CPH	American Phenolic Corp.	Chicago, Ill.
18	CTD	Tobe-Deutschmann	Canton, Mass.
19	CCT	Stromberg Carlson Tel. & Mfg. Co.	Rochester, N.Y.
20	CGE	Guardian Electric Mfg. Co.	Chicago, Ill.
21	CAY	Westinghouse Electric & Mfg. Co.	Bloomfield, N.J.
22	CSF	Sprague Specialties Co.	North Adams, Mass.
23	CSA	Stackpole Carbon Co.	St. Mary's, Pa.
24	CUT	United Transformer Co.	New York, N.Y.
25	CTL	Tung-Sol Lamp Works Inc.	Baltimore, Md.
26	CHY	Hytron Corp.	Salem, Mass.
27	CNA	National Company Inc.	Malden, Mass.
28	CMG	Cinch Mfg. Co.	Chicago, Ill.
29		Dial Light Co. of America	New York, N.Y.
30	CFM	Froiland Mfg. Co.	Springfield, Mass.
31	CBF	Burke Electric Co.	Erie, Pa.
32		Dahlstrom Metallic Door Co.	Jamestown, N.Y.
33	CALJ	The Archwin Co.	Brooklyn, N.Y.
34	CCR	Chisholm-Ryder Co.	Niagara Falls, N.Y.
35	CCJ	Henry L. Crowley Co.	West Orange, N.J.
36		Ashaway Line & Twine Co.	Ashaway, R.I.
37	CAUQ	Design Center	New York, N.Y.
38	CW	Western Electric Co.	Kearny, N.Y.
39	CAGY	Walter L. Schott Co.	Beverly Hills, Calif.
40	CPQ	Speer Resistor Corp.	St. Mary's, Pa.
41	CAQF	Hamilco	Port Chester, N.Y.
42		Spirling Products Co.	New York, N.Y.
43		Utau Products Co.	Chicago, Ill.

APPLICABLE COLOR CODES

RMA 6 COLOR CODE SYSTEM FOR CAPACITORS

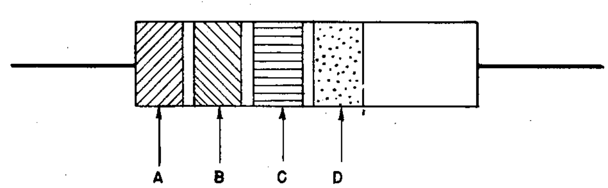
COLOR	SIGNIFICANT FIGURE	DECIMAL MULTIPLYER	TOLERANCE	VOLTAGE RATING
Black. . .	0	1		
Brown. . .	1	10	1%	100
Red. . . .	2	100	2%	200
Orange . .	3	1000	3%	300
Yellow . .	4	10000	4%	400
Green. . .	5	100000	5%	500
Blue . . .	6	1000000	6%	600
Violet . .	7	10000000	7%	700
Gray . . .	8	100000000	8%	800
White. . .	9	1000000000	9%	900
Gold . . .	-	0.1	5%	1000
Silver . .	-	0.01	10%	2000
No Color .	-	----	20%	500



Dot A, indicates the first significant figure of the capacitance.
Dot B, indicates the second significant figure of the capacitance.
Dot C, indicates the third significant figure of the capacitance.
Dot D, indicates the decimal multiplyer.
Dot E, indicates the tolerance of the capacitor.
Dot F, indicates the voltage rating of the capacitor.

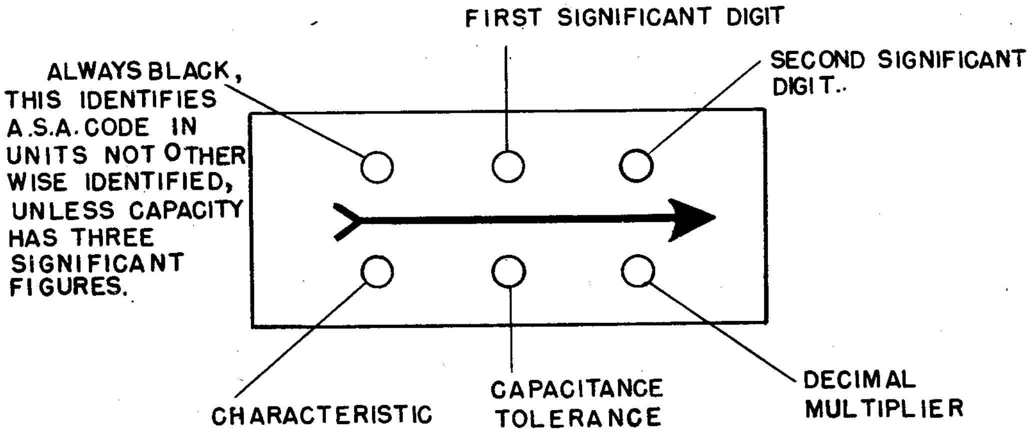
RMA COLOR CODE FOR RESISTORS

COLOR	"A" 1st DIGIT	"B" 2nd DIGIT	"C" MULTIPLYING VALUE	"D" TOLERANCE
Black. . .	0	0	1	
Brown. . .	1	1	10	
Red. . . .	2	2	100	
Orange . .	3	3	1000	
Yellow . .	4	4	10000	
Green. . .	5	5	100000	
Blue . . .	6	6	1000000	
Violet . .	7	7	10000000	
Gray . . .	8	8	100000000	
White. . .	9	9	1000000000	
Gold . . .	-	-	0.1	±5%
Silver . .	-	-	0.01	±10%
No Color .	-	-	----	±20%



BAND A indicates the first significant figure of the resistance.
BAND B indicates the second significant figure of the resistance.
BAND C indicates the multiplier.
BAND D if any indicates the tolerance limits.

APPLICABLE COLOR CODE FOR
JAN-C-5 JOINT ARMY-NAVY SPECIFICATION

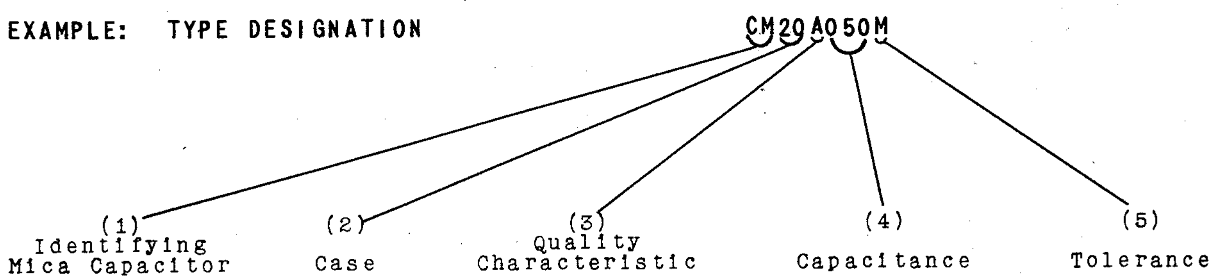


Color	Significant Figure	Decimal Multiplier	Designation Letter & Tolerance	Characteristic
Black . .	0	1	20% (M)	A
Brown . .	1	10		B
Red . . .	2	100	2% (G)	C
Orange. .	3	1000		D
Yellow. .	4			E
Green . .	5			F
Blue. . .	6			G
Violet. .	7			
Gray. . .	8			
White . .	9			
Gold. . .	-	0.1	5% (J)	
Silver. .	-	.01	10% (K)	

Characteristic	Temperature Coefficient parts/million/^{0}C	Capacitance Drift
A.	Not Specified	Not Specified
B.	Not Specified	Not Specified
C.	-200 to +200	±0.5%
D.	-100 to +100	±0.3%
E.	-20 to +100	± (0.1% +0.1MMF)
F.	0 to +70	± (0.05% + 0.1 MMF)
G.	0 to -70	± (0.05% + 0.1 MMF)

The reverse side of this condenser contains a method of identifying by a comprehensive letter and number system comprised of five elements.

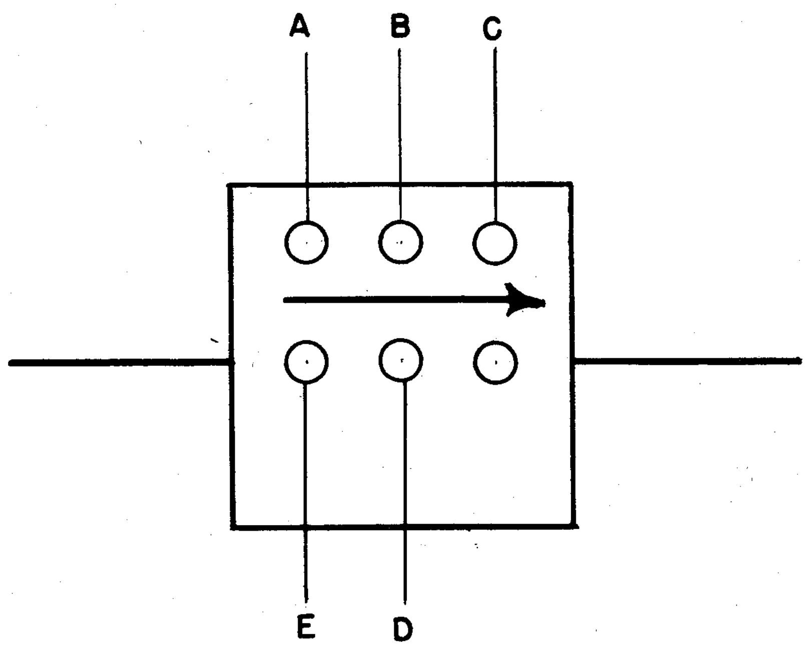
EXAMPLE: TYPE DESIGNATION



The above designation, for example identifies a 5 micromicrofarad mica capacitor of ±20% tolerance having an unspecified quality characteristic.

RMA (MODIFIED) 3 COLOR CODE SYSTEM FOR CAPACITORS

Color	A 1st Digit	B 2nd Digit	C Ciphers	D Tolerance	E Voltage Rating
Black. . .	0	0	.0		
Brown. . .	1	1	0	1%	100
Red. . . .	2	2	00	2%	200
Orange . .	3	3	000	3%	300
Yellow . .	4	4	0000	4%	400
Green. . .	5	5	00000	5%	500
Blue . . .	6	6	000000	6%	600
Violet . .	7	7	0000000	7%	700
Gray . . .	8	8	00000000	8%	800
White. . .	9	9	000000000	9%	900
Gold . . .	-	-	-	5%	100
Silver . .	-	-	-	10%	200
No Color .	-	-	-	20%	500



Dot A, indicates the first significant figure of the Capacitance.
Dot B, indicates the second significant figure of the Capacitance.
Dot C, indicates the number of ciphers (zero following two significant figures).
Dot D, indicates the Tolerance.
Dot E, indicates the voltage rating.

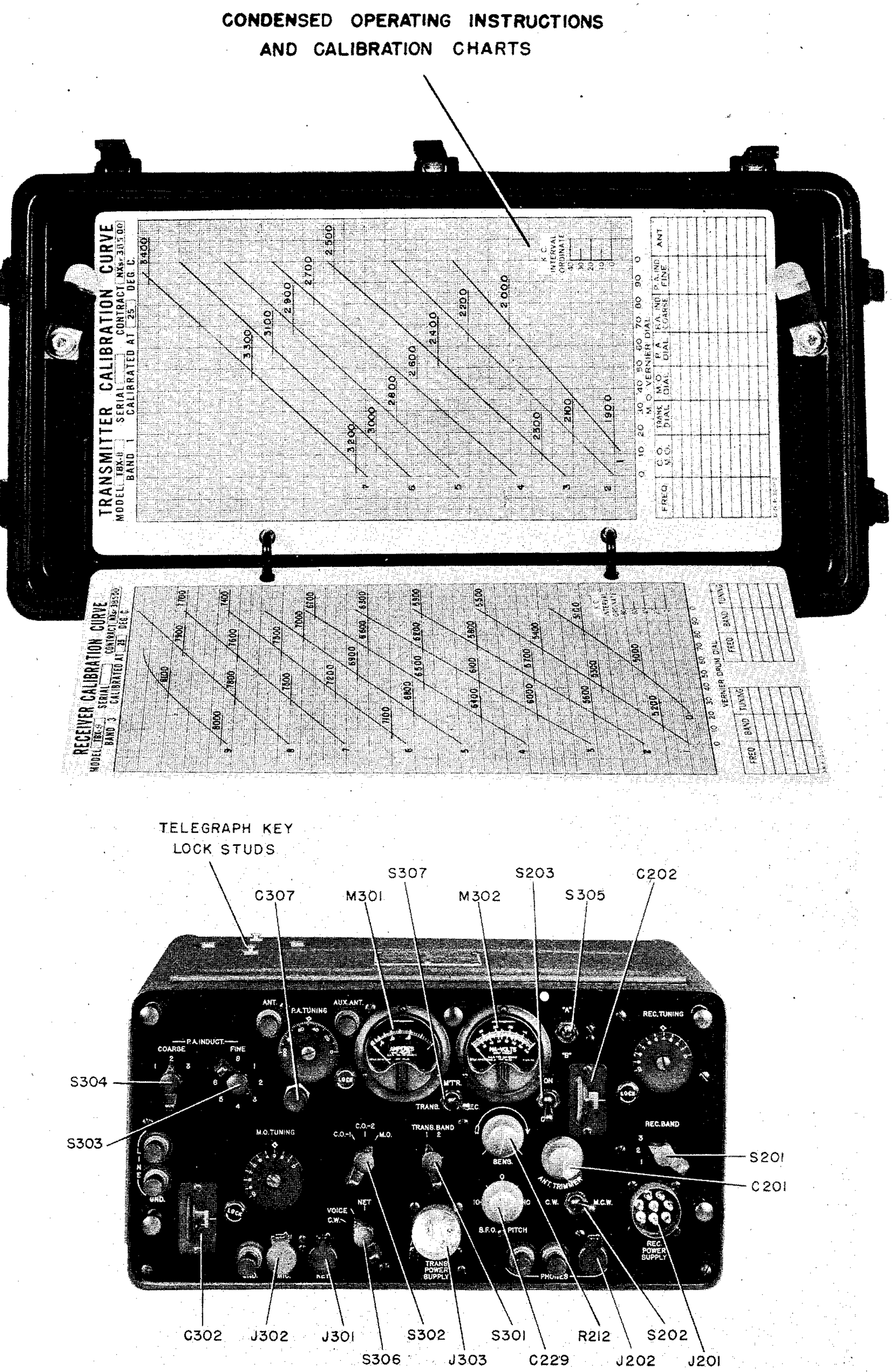


FIG. 6. RADIO TRANSMITTER-RECEIVER UNIT TYPE -43060: FRONT VIEW, COVER REMOVED

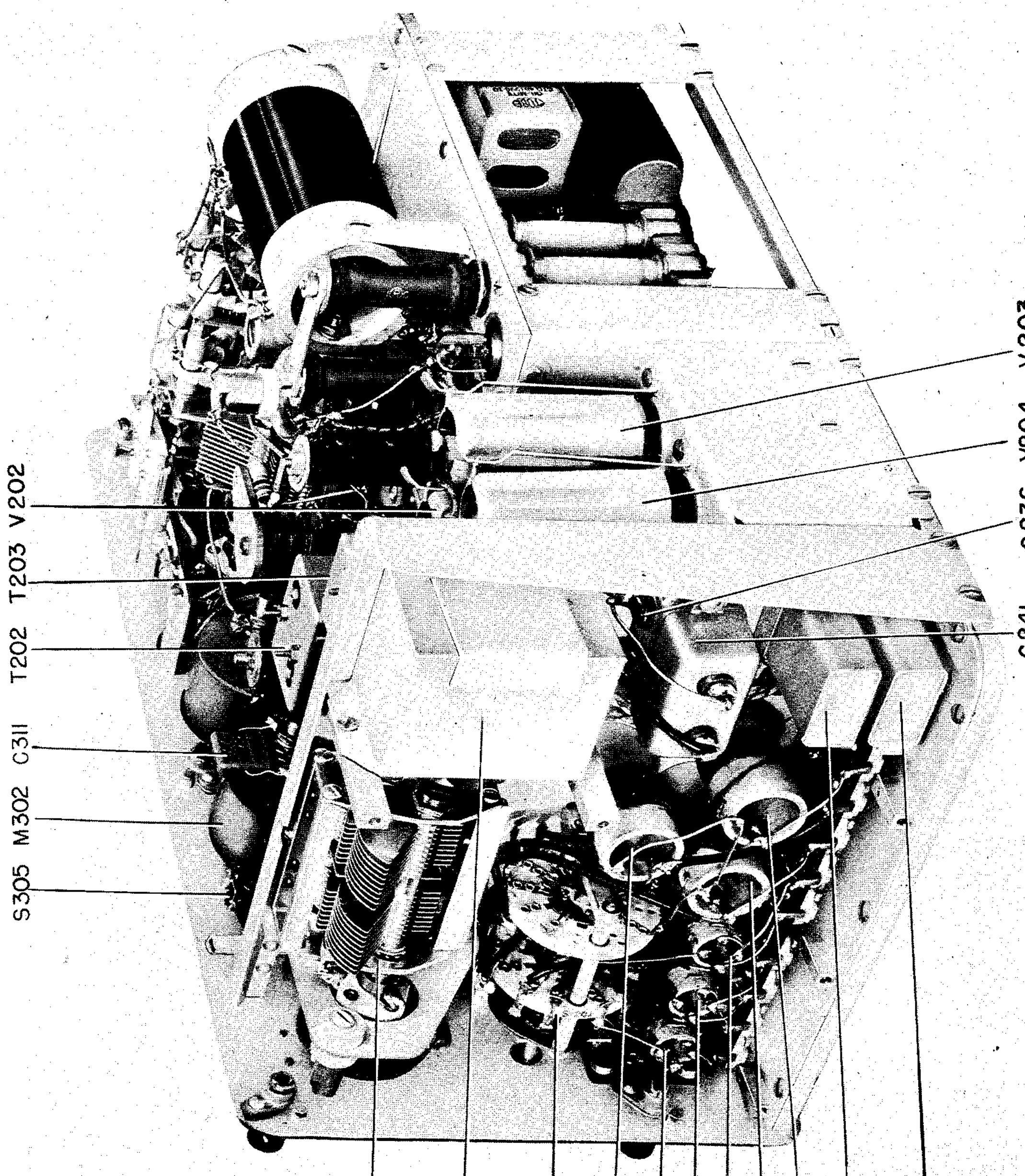


FIG. 7. RADIO TRANSMITTER-RECEIVER UNIT TYPE -43060:
RIGHT REAR OBLIQUE VIEW OF CHASSIS

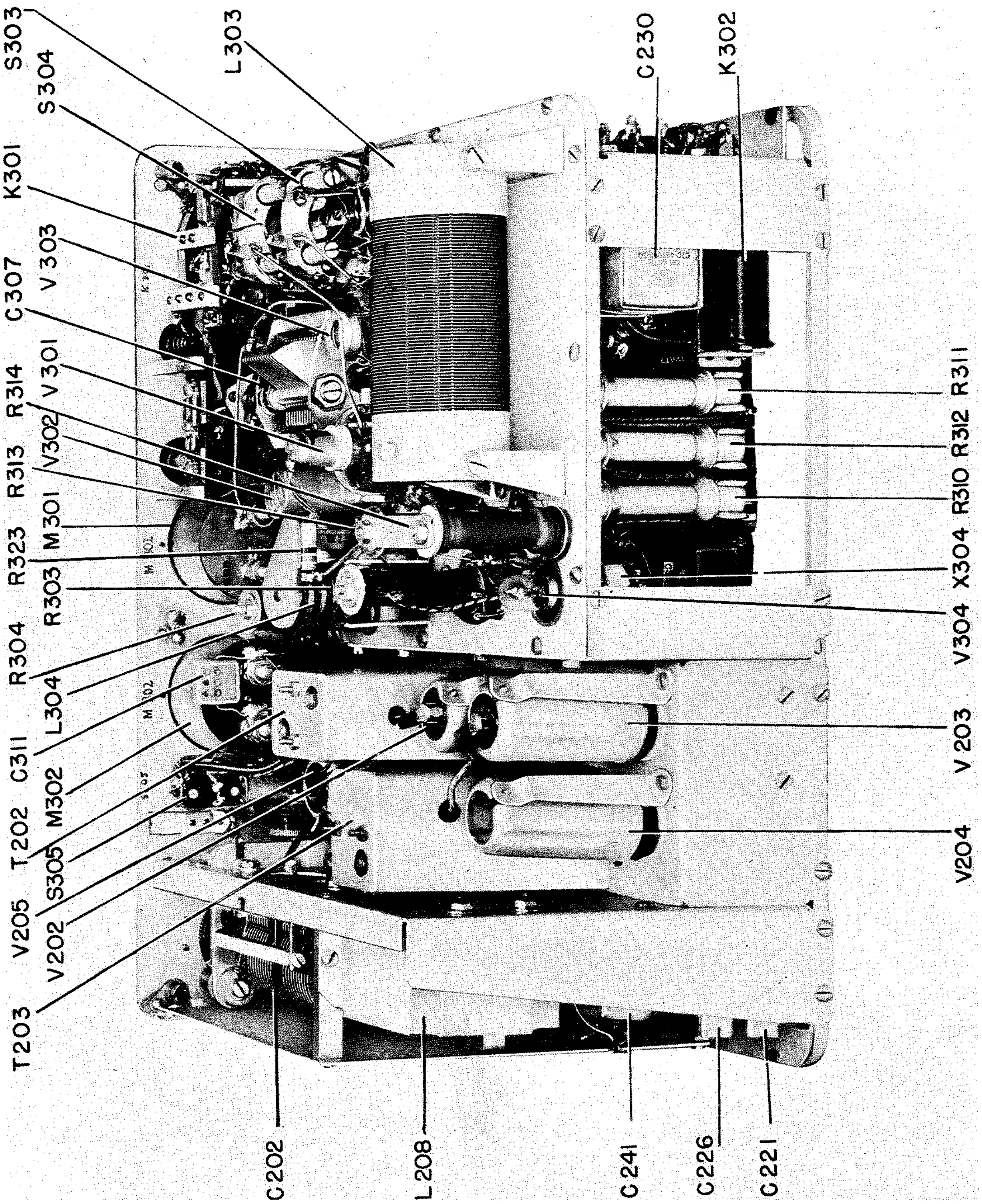


FIG. 8. RADIO TRANSMITTER-RECEIVER UNIT TYPE -43060:
TOP REAR VIEW OF CHASSIS

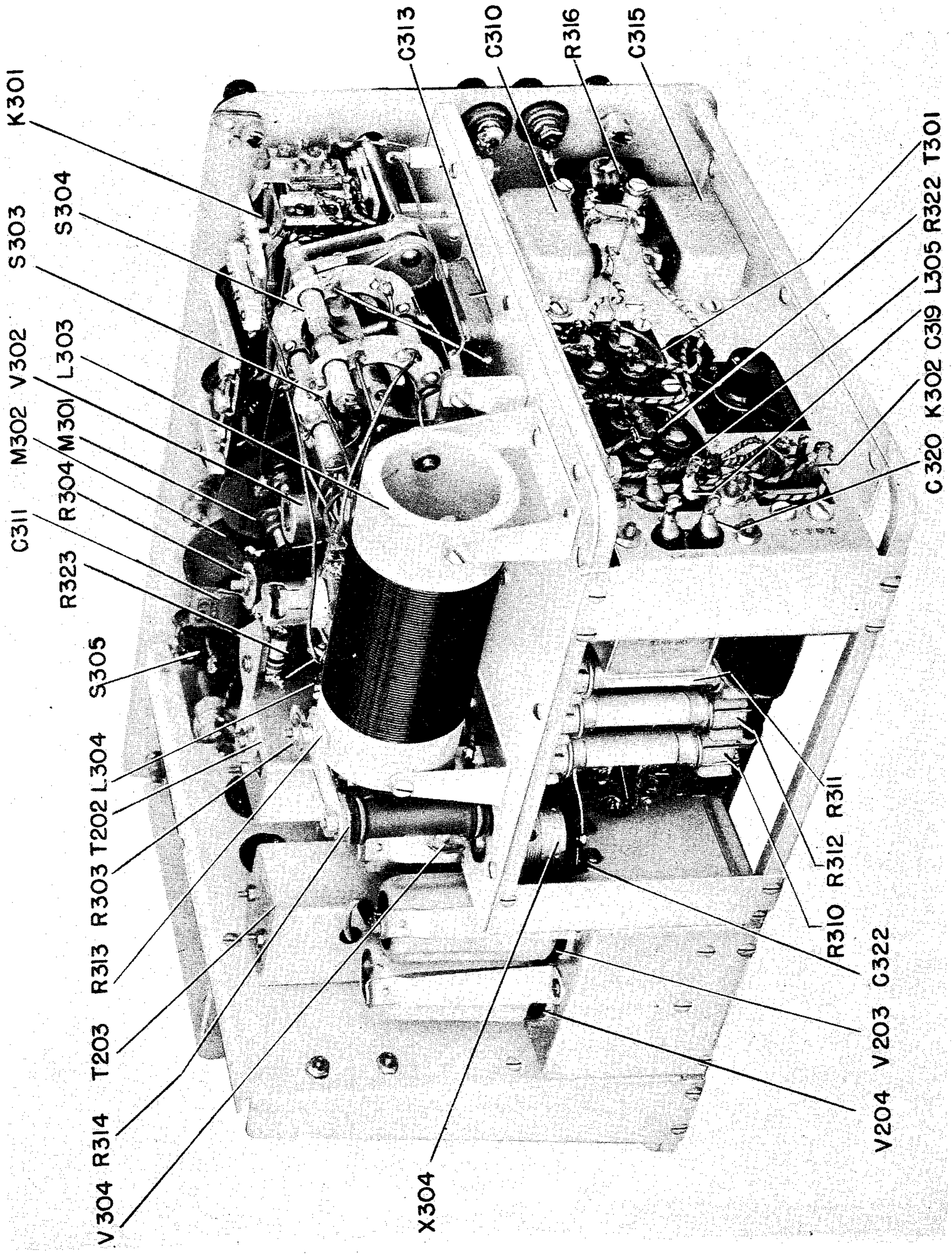


FIG. 9. RADIO TRANSMITTER-RECEIVER UNIT TYPE -43060: REAR LEFT OBLIQUE VIEW OF CHASSIS

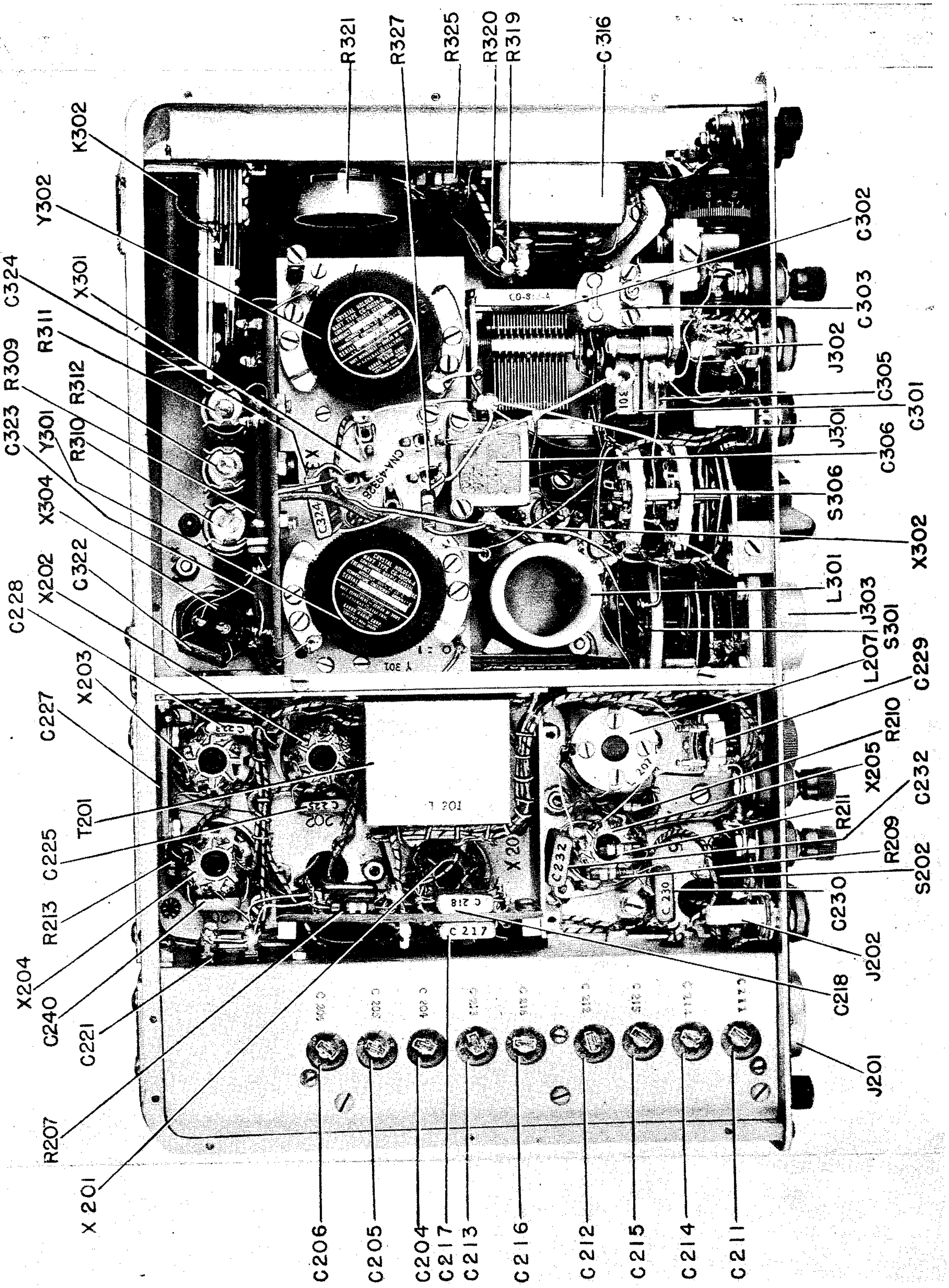


Fig. 10. Radio Transmitter-Receiver Unit Type -43060:
Bottom View of Chassis

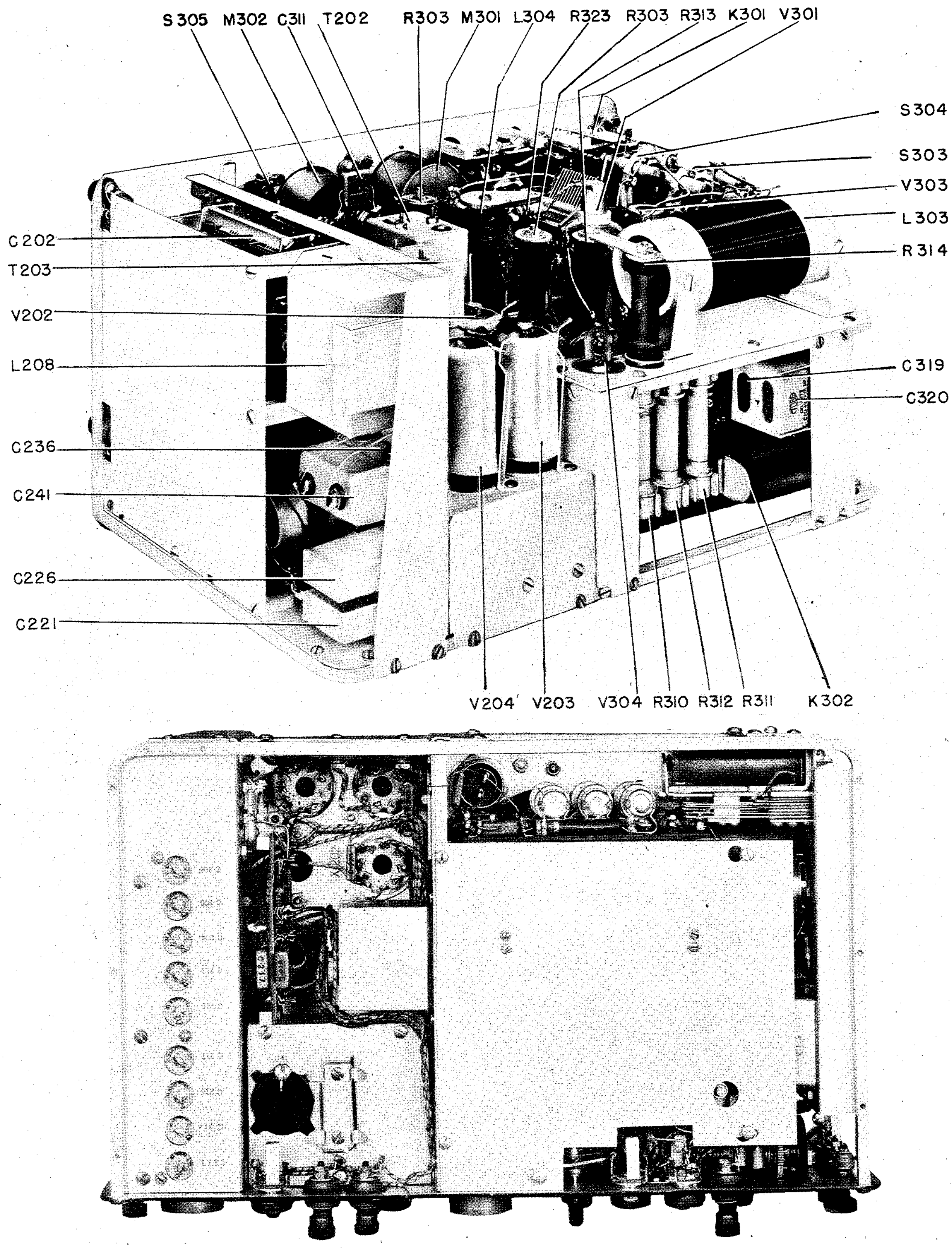


FIG. 11. RADIO TRANSMITTER-RECEIVER UNIT TYPE -43060:
RIGHT REAR OBLIQUE AND BOTTOM VIEWS WITH SHIELD PLATES ATTACHED

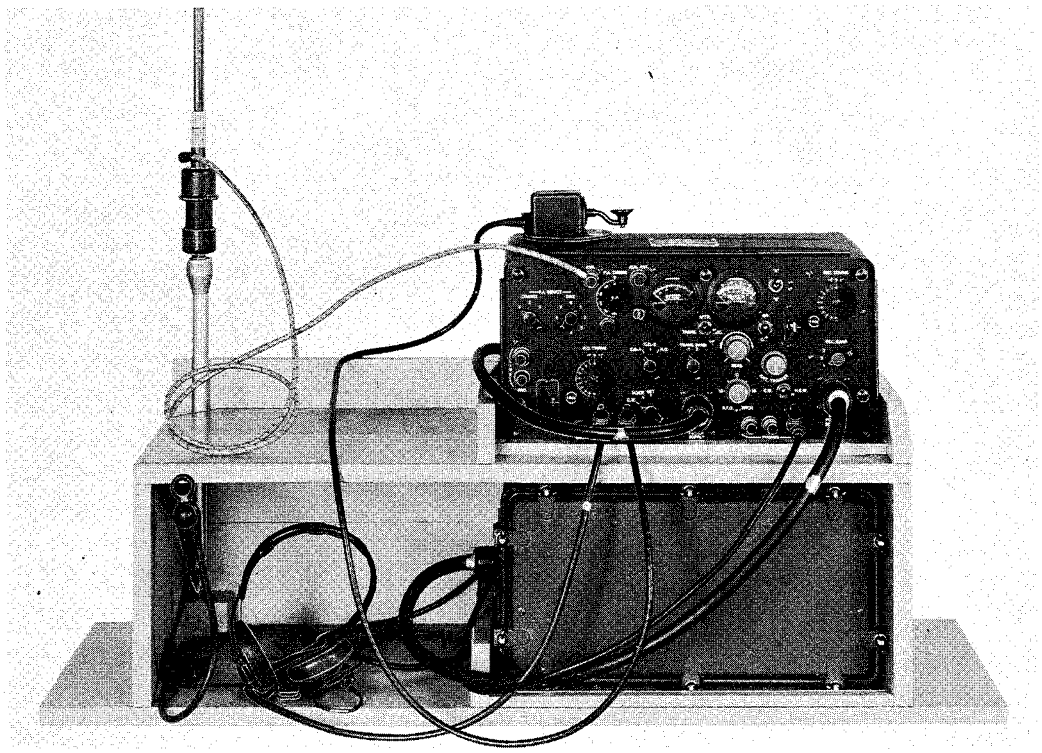


Fig. 12. Model TBX-8 Portable Radio Equipment:
An Equipment Mounted on Typical Wooden Mounting Rack

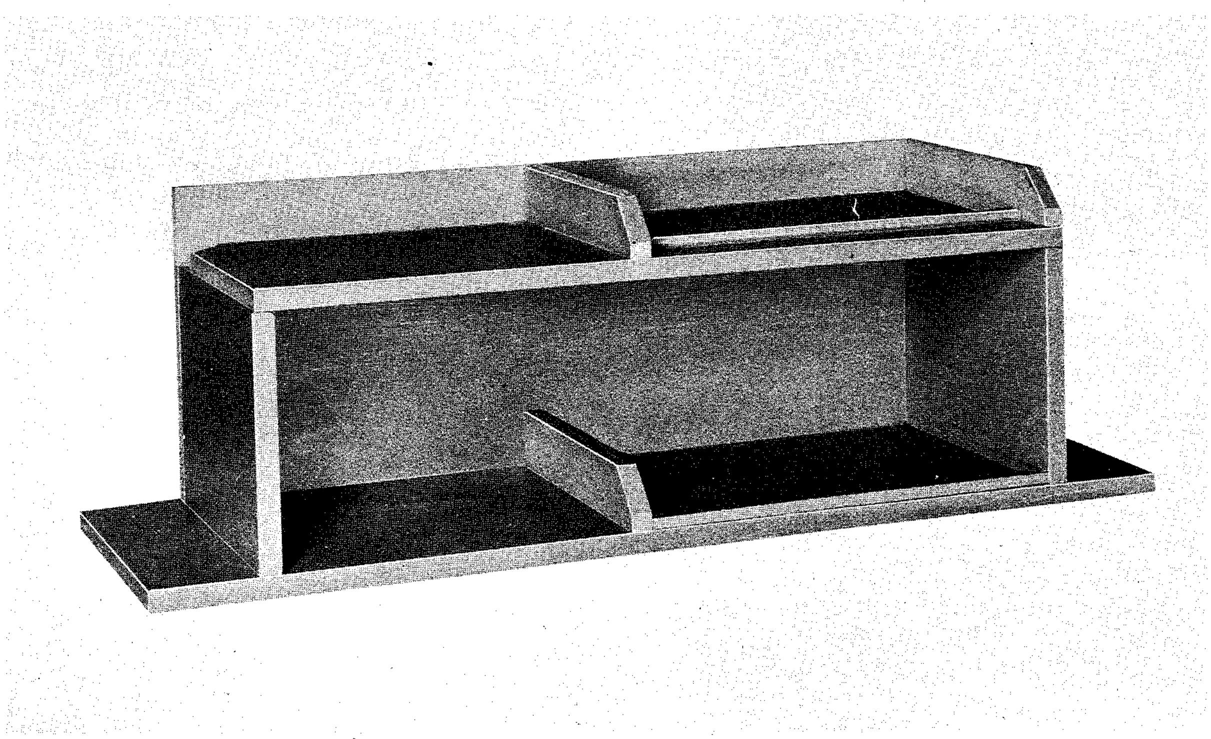


Fig. 12-A. Typical Wooden Mounting Rack

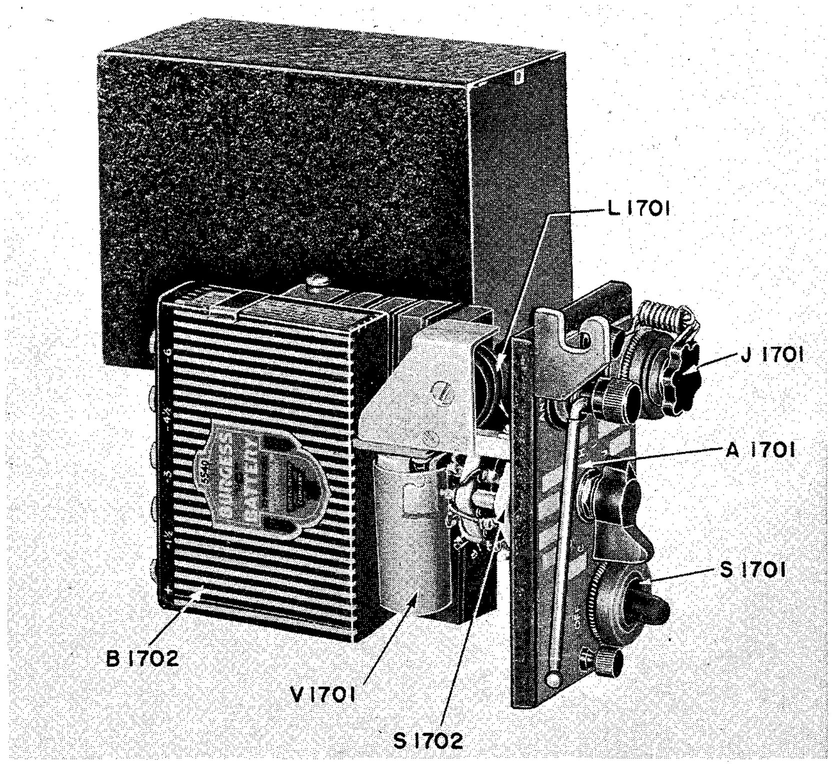


FIG. 13. CRYSTAL CALIBRATOR AND MONITOR, TYPE -60133:
LEFT OBLIQUE VIEW

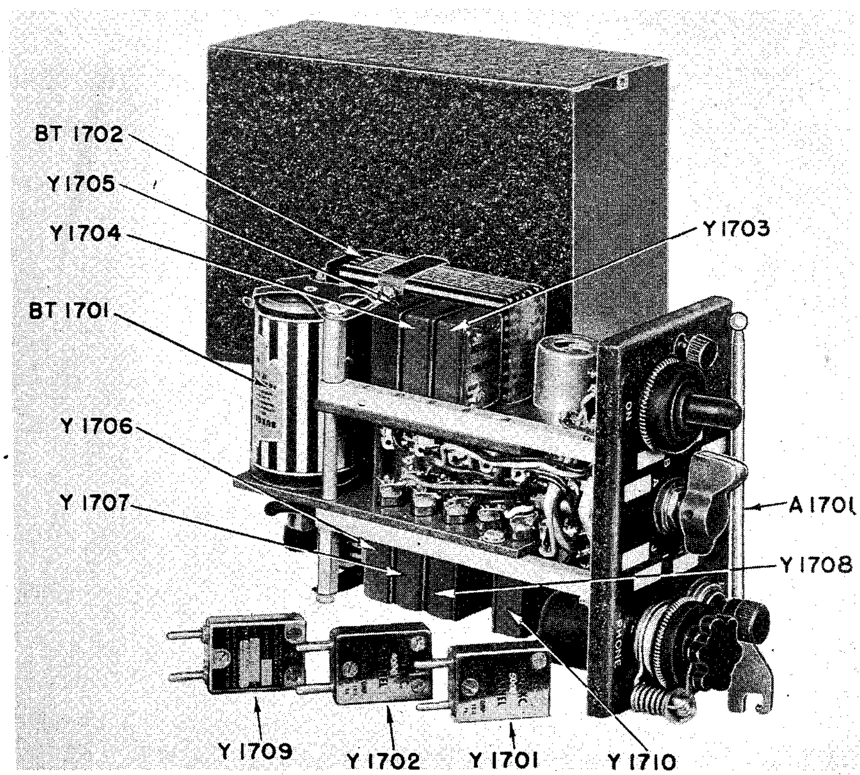


FIG. 13-A. CRYSTAL CALIBRATOR AND MONITOR, TYPE -60133:
RIGHT OBLIQUE VIEW

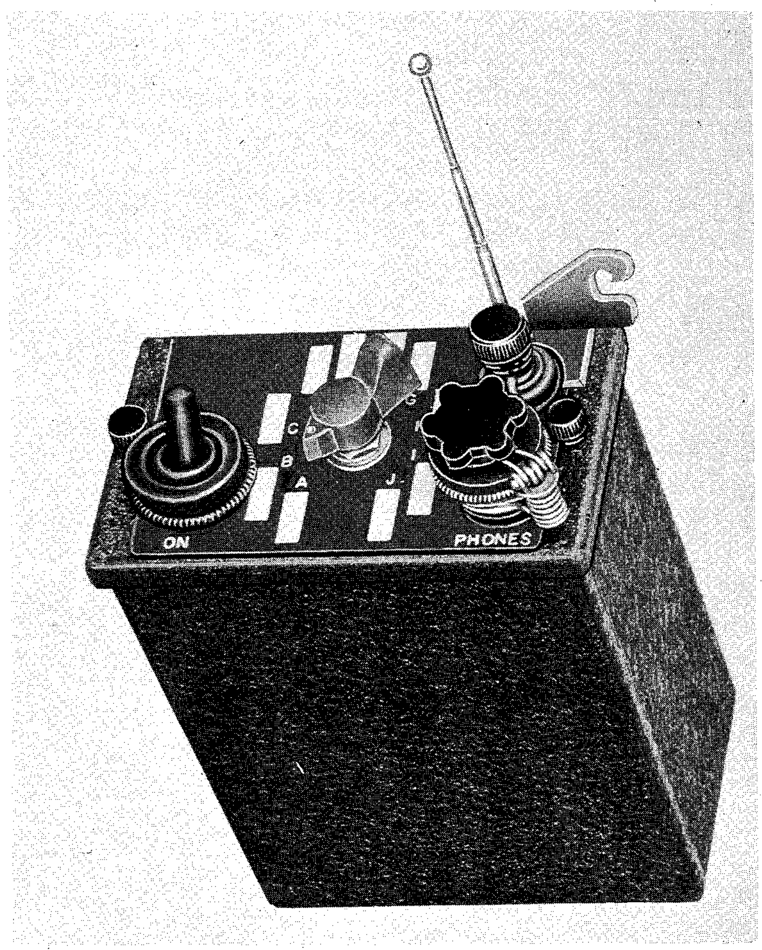


FIG. 14. CRYSTAL CALIBRATOR AND MONITOR, TYPE -60133:
WITH EXTENDED ANTENNA

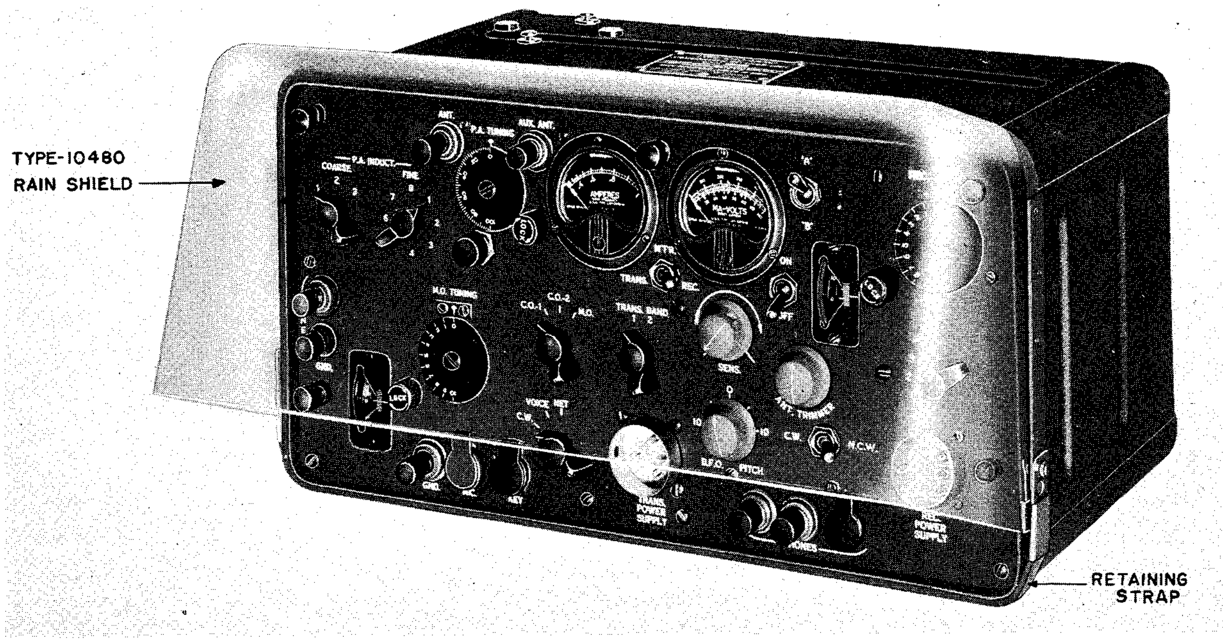


FIG. 15. RAIN SHIELD, TYPE -10480:
MOUNTED ON TYPE -43060 TRANSMITTER-RECEIVER UNIT

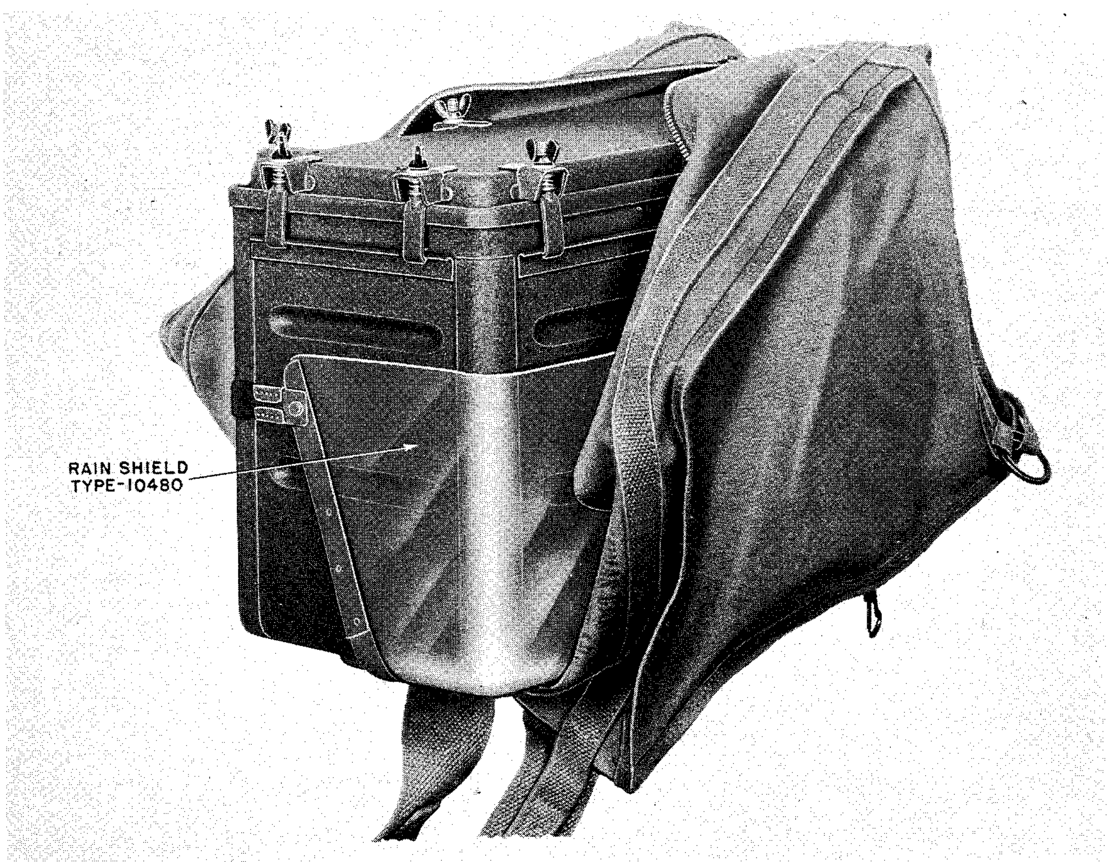


FIG. 15-A. RAIN SHIELD, TYPE -10480:
ASSEMBLED FOR TRANSMISSION IN CARRYING CASE, TYPE 10023A

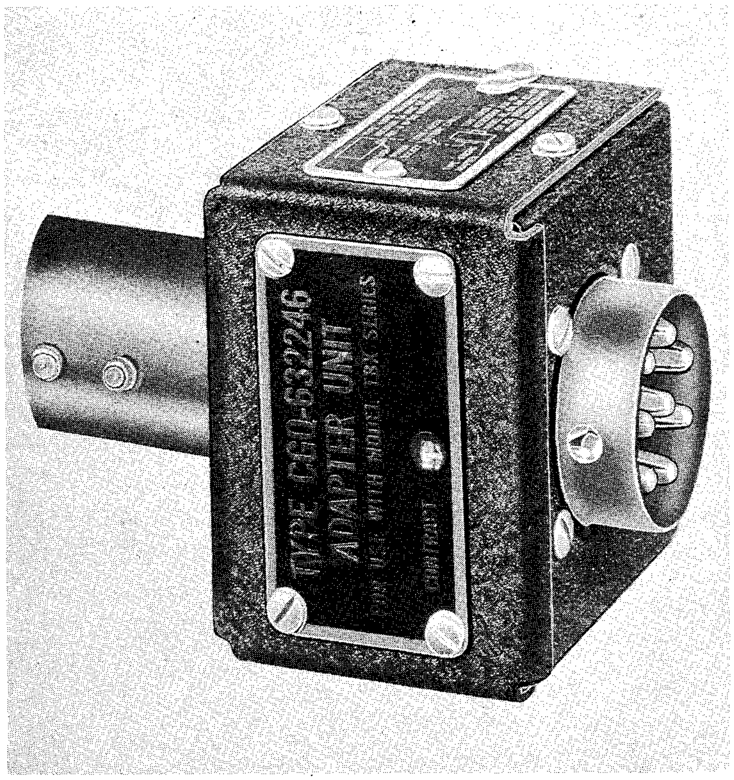


FIG. 16. ADAPTER UNIT, TYPE -632246:
COMPLETELY ASSEMBLED

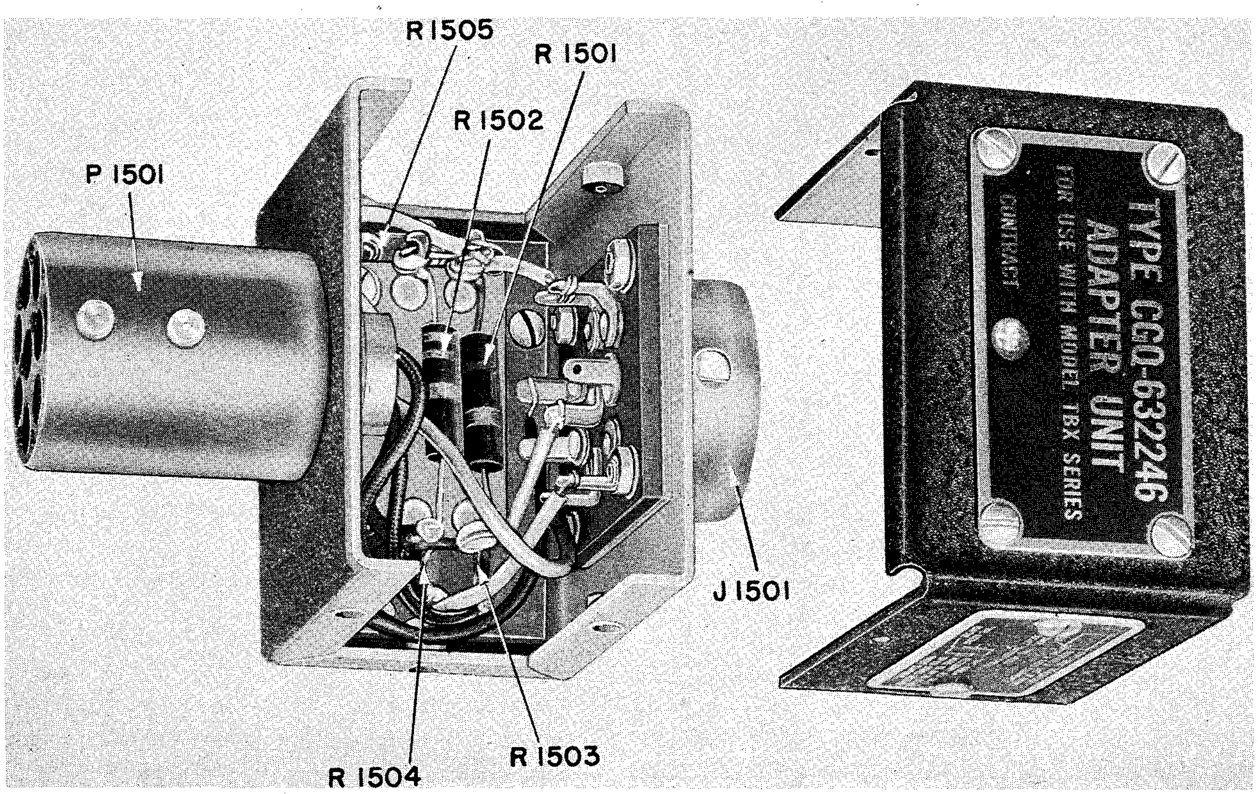


FIG. 16-A. ADAPTER UNIT, TYPE -632246:
WITH COVER REMOVED

TYPICAL TRANSMITTER PERFORMANCE

Ep=525 Volts. Ef=12.6 Volts. Large Ant. 26 ohms. Small Ant. 10.4 ohms

Freq. KC	Operation	Ant. Large or Small	M.O. Dial	M.O. Band	P.A. Coarse	INDUCT. Fine	P.A. Dial	Trans. Curr. MA.	Ant. Cur. Amp.
2000	CW	L	190	1	1	4	54	58	.6
	MCW	L	190	1	1	4	54	48	.4
	CW	S	190	1	1	4	18	60	.86
	MCW	S	190	1	1	4	18	48	.59
2500	CW	L	414	1	2	3	14	64	.63
	MCW	L	414	1	2	3	14	48	.4
	CW	S	414	1	2	2	6	56	.83
	MCW	S	414	1	2	2	6	44	.53
3000	CW	L	635	1	2	6	22	62	.6
	MCW	L	635	1	2	6	22	45	.34
	CW	S	635	1	2	5	18	52	.78
	MCW	S	635	1	2	5	18	40	.48
3500	CW	L	238	2	3	2	42	57	.46
	MCW	L	238	2	3	2	42	45	.3
	CW	S	238	2	3	2	23	55	.77
	MCW	S	238	2	3	2	23	45	.53
4000	CW	L	382	2	3	3	58	57	.36
	MCW	L	382	2	3	3	58	46	.25
	CW	S	382	2	3	3	40	56	.63
	MCW	S	382	2	3	3	40	44	.46
4500	CW	L	519	2	3	5	50	64	.42
	MCW	L	519	2	3	5	50	49	.24
	CW	S	519	2	3	5	24	63	.81
	MCW	S	519	2	3	5	24	48	.51
5000	CW	L	657	2	3	6	54	65	.34
	MCW	L	657	2	3	6	54	49	.2
	CW	S	657	2	3	6	25	66	.73
	MCW	S	657	2	3	6	25	52	.48
5800	CW	L	881	2	3	7	78	62	.2
	MCW	L	881	2	3	7	78	47	.05
	CW	S	881	2	3	7	44	60	.66
	MCW	S	881	2	3	7	44	46	.41

FIG. 17. TYPICAL TRANSMITTER PERFORMANCE

TABULATED TRANSMITTER AND RECEIVER DATA

Freq. Kc.	M. O. Band	M. O. Dial (Approx.)	Freq. Kc.	M. O. Band	M. O. Dial (Approx.)
2000	1	180	3200	2	145
2100	1	231	3400	2	212
2200	1	279	3600	2	275
2300	1	326	3800	2	334
2400	1	371	4000	2	389
2500	1	415	4200	2	444
2600	1	459	4400	2	498
2700	1	502	4600	2	553
2800	1	547	4800	2	607
2900	1	590	5000	2	663
3000	1	635	5200	2	719
3100	1	680	5400	2	775
3200	1	725	5600	2	830
3300	1	773	5800	2	884
3400	1	817	6000	2	940

Fig. 18. Tabulated Transmitter Bands 1 and 2, Calibration Data for Use With Type -60133 Crystal Calibrator and Monitor.

Band 1		Band 2		Band 3	
Freq. Kc.	Dial (Approx.)	Freq. Kc.	Dial (Approx.)	Freq. Kc.	Dial (Approx.)
2000	32	3100	0	5000	39
2100	108	3200	59	5100	69
2200	175	3300	107	5200	98
2300	239	3400	151	5300	126
2400	301	3500	193	5400	152
2500	363	3600	233	5500	178
2600	426	3700	274	5600	204
2700	492	3800	313	5700	229
2800	562	3900	352	5800	254
2900	636	4000	392	5900	278
3000	716	4100	432	6000	303
3100	802	4200	473	6100	327
3200	891	4300	516		
		4400	560		
		4500	606		
		4600	653		
		4700	703		
		4800	754		
		4900	808		
		5000	862		
		5100	917		

Fig. 18-A. Tabulated Receiver Bands 1, 2, and Part of 3, Calibration Data for Use with Type -60133 Crystal Calibrator and Monitor.

TYPE-43060 TRANSMITTER-RECEIVER UNIT

RESISTOR-CAPACITOR PARTS LIST BY SYMBOL NUMBER FOR SCHEMATIC DIAGRAM FIG. 19

Refer to Table I for Complete Description of All Components

RECEIVER RESISTORS

Symbol	Value
R201	200k ±10% ½w
R202	10k ±10% ½w
R203	50k ±10% ½w
R204	2.5k ±10% ½w
R205	1k ±10% ½w
R206	2 Meg. ±10% ½w
R207	10k ±10% ½w
R208	1 Meg. ±10% ½w
R209	1 Meg. ±10% ½w
R210	50k ±10% ½w
R211	150k ±10% ½w
R212	20k ±10% Potentiometer
R213	30k ±10% ½w
R214	10k ±10% ½w
R215	6.8k ±10% ½w
R216	10k ±10% ½w
R217	500k ±10% ½w
R218	1k ±10% ½w

RECEIVER CAPACITORS

Symbol	Value
C201	13.3 mmfd Var.
C202	139.4 mmfd Var.
C203	250 mmfd ±10% 500v
C204	7-45 mmfd Var.
C205	7-45 mmfd Var.
C206	7.45 mmfd Var.
C207	0.02 mfd ±10% 400v
C208	700 mmfd ±1% 500v
C209	400 mmfd ±1% 500v
C210	300 mmfd ±1% 500v
C211	7-45 mmfd Var.
C212	7-45 mmfd Var.
C213	7-45 mmfd Var.
C214	7-45 mmfd Var.
C215	7-45 mmfd Var.
C216	7-45 mmfd Var.
C217	0.006 mfd ±10% 500v
C218	0.006 mfd ±10% 500v
C219	0.006 mfd ±10% 500v
C220	0.006 mfd ±10% 500v
C221	2x.5 mfd ±10% 200v
C222	0.006 mfd ±10% 500v
C223	0.006 mfd ±10% 500v
C224	100 mmfd ±10% 500v
C225	5 mmfd ±10% 500v
C226	2x.5 mfd ±10% 200v
C227	0.01 mfd ±10% 600v
C228	100 mmfd ±10% 500v
C229	13.3 mmfd Var.
C230	0.006 mfd ±10% 500v
C231	200 mmfd ±5% 500v
C232	0.006 mfd ±10% 500v
C233	200 mmfd ±5% 500v
C234	15 mmfd ±10% 500v
C235	500 mmfd ±10% 500v
C236	10 mfd Elec. 150v
C237	25 mmfd ±10% Ceramic
C238	25 mmfd ±10% Ceramic
C239	25 mmfd ±10% Ceramic
C240	250 mmfd ±10% 500v
C241	0.5 mfd ±20% 600v

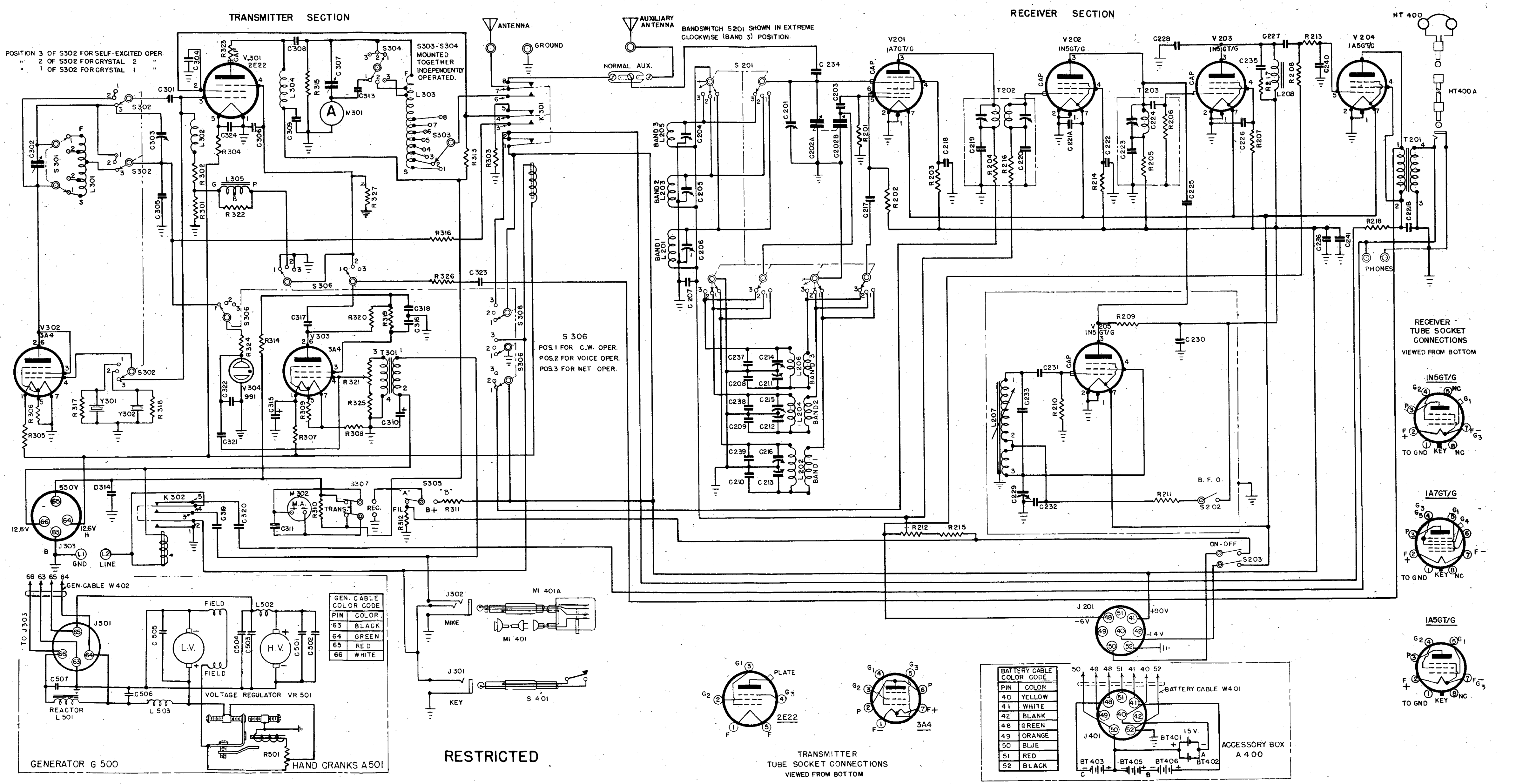
TRANSMITTER RESISTORS

Symbol	Value
R301	10k ±5% ½w
R302	10k ±5% ½w
R303	5k ±10% 8w
R304	4.0 Ohms ±5% 20w
R305	100 Ohms ±5% 2w
R306	240 Ohms ±5% 1w
R307	30 Ohms ±5% 1w
R308	68 Ohms ±5% 2w
R309	390 Ohms ±5% 2w
R310	1.43 Ohms—Evac.
R311	140k—Evac.
R312	0.4 Ohms—Evac.
R313	20k ±10% 8w
R314	20k ±10% 8w
R315	2 Meg. ±10% ½w
R316	3.3k ±10% 1w
R317	100k ±5% ½w
R318	100k ±5% ½w
R319	68k ±10% ½w
R320	11k ±10% 1w
R321	100k ±10% Potentiometer
R322	68k ±10% ½w
R323	22 Ohms ±10% 1w
R324	2 Meg. ±10% ½w
R325	10k ±5% ½w
R326	150k ±10% ½w
R327	68k ±10% ½w

TRANSMITTER CAPACITORS

Symbol	Value
C301	100 mmfd ±2% 600v
C302	171 mmfd Var.
C303	25 mmfd Var.
C304	0.01 mfd ±10% 600v
C305	0.01 mfd ±10% 600v
C306	0.001 mfd ±10% 600v
C307	193 mmfd Var.
C308	0.001 mfd ±10% 600v
C309	0.01 mfd ±10% 1200v
C310	50 mfd Elec. 25v
C311	0.006 mfd ±10% 500v
C313	110 mmfd ±10% 1200v
C314	0.01 mfd ±10% 1200v
C315	50 mfd Elec. 25v
C316	0.5 mfd ±20% 600v
C317	0.5 mfd ±20% 600v
C318	0.5 mfd ±20% 600v
C319	1 mfd ±10% 600v
C320	1 mfd ±10% 600v
C321	0.006 mfd ±10% 500v
C322	0.0001 mfd ±10% 500v
C323	0.006 mfd ±10% 500v
C324	0.006 mfd ±10% 500v

k = Kilohms
Meg = Megohms



GEN. CABLE COLOR CODE	
PIN	COLOR
63	BLACK
64	GREEN
65	RED
66	WHITE

BATTERY CABLE COLOR CODE	
PIN	COLOR
40	YELLOW
41	WHITE
42	BLANK
48	GREEN
49	ORANGE
50	BLUE
51	RED
52	BLACK

Fig. 19. Schematic Diagrams Type -43060 Radio Transmitter-Receiver Unit; Type -21263B Hand Driven Generator and Type -10339 Accessory Box.

RESTRICTED **Fig. 19**

GEN. CABLE COLOR CODE	
PIN	COLOR
63	BLACK
64	GREEN
65	RED
66	WHITE

BATTERY CABLE COLOR CODE	
PIN	COLOR
40	YELLOW
41	WHITE
42	BLANK
48	GREEN
49	ORANGE
50	BLUE
51	RED
52	BLACK

SCHEMATIC DIAGRAM, RADIO TRANSMITTER-RECEIVER UNIT, NAVY TYPE -43060 (TBX-8)

RESTRICTED

Fig. 14

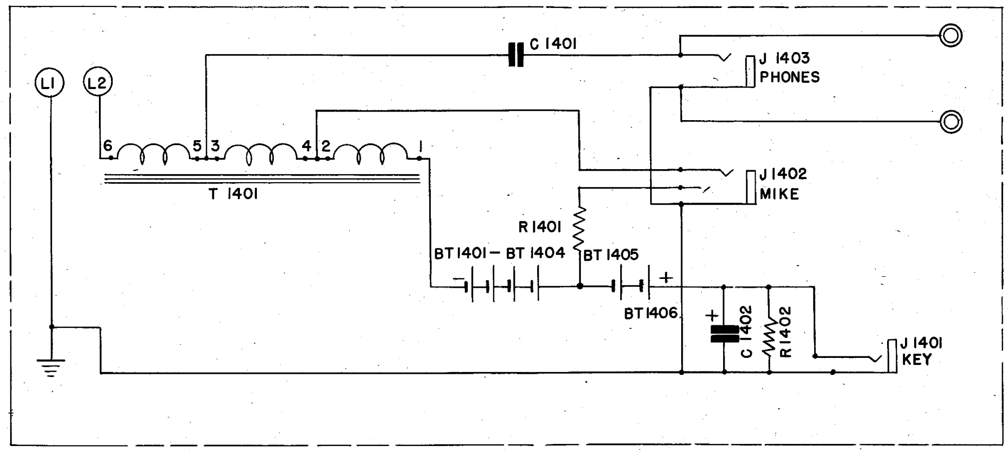


FIG. 20. SCHEMATIC DIAGRAM, REMOTE CONTROL UNIT NAVY TYPE -23453

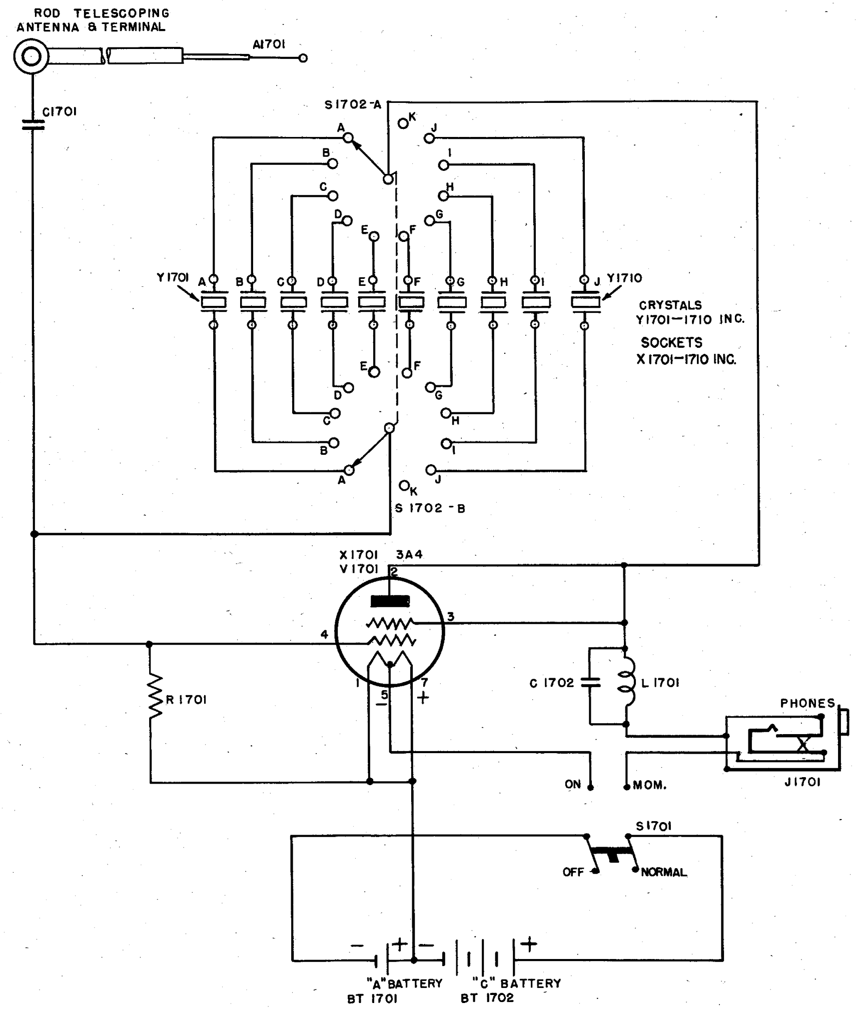


FIG. 21. SCHEMATIC DIAGRAM, CRYSTAL CALIBRATOR AND MONITOR, TYPE -60133

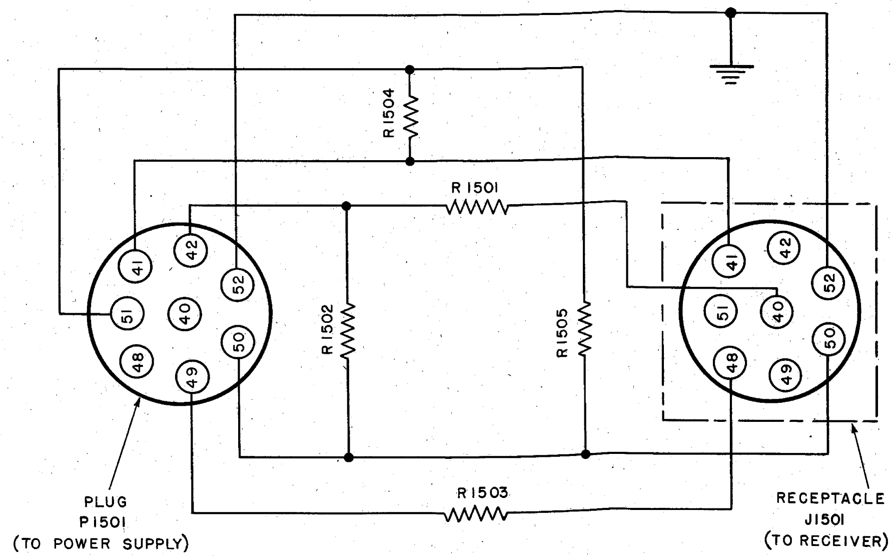
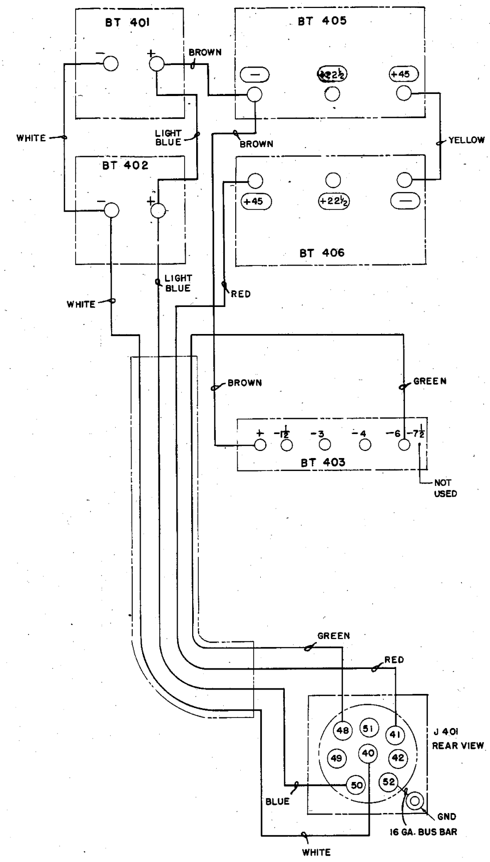


FIG. 22. SCHEMATIC DIAGRAM, RECEIVER POWER SUPPLY ADAPTER NAVY TYPE -632246

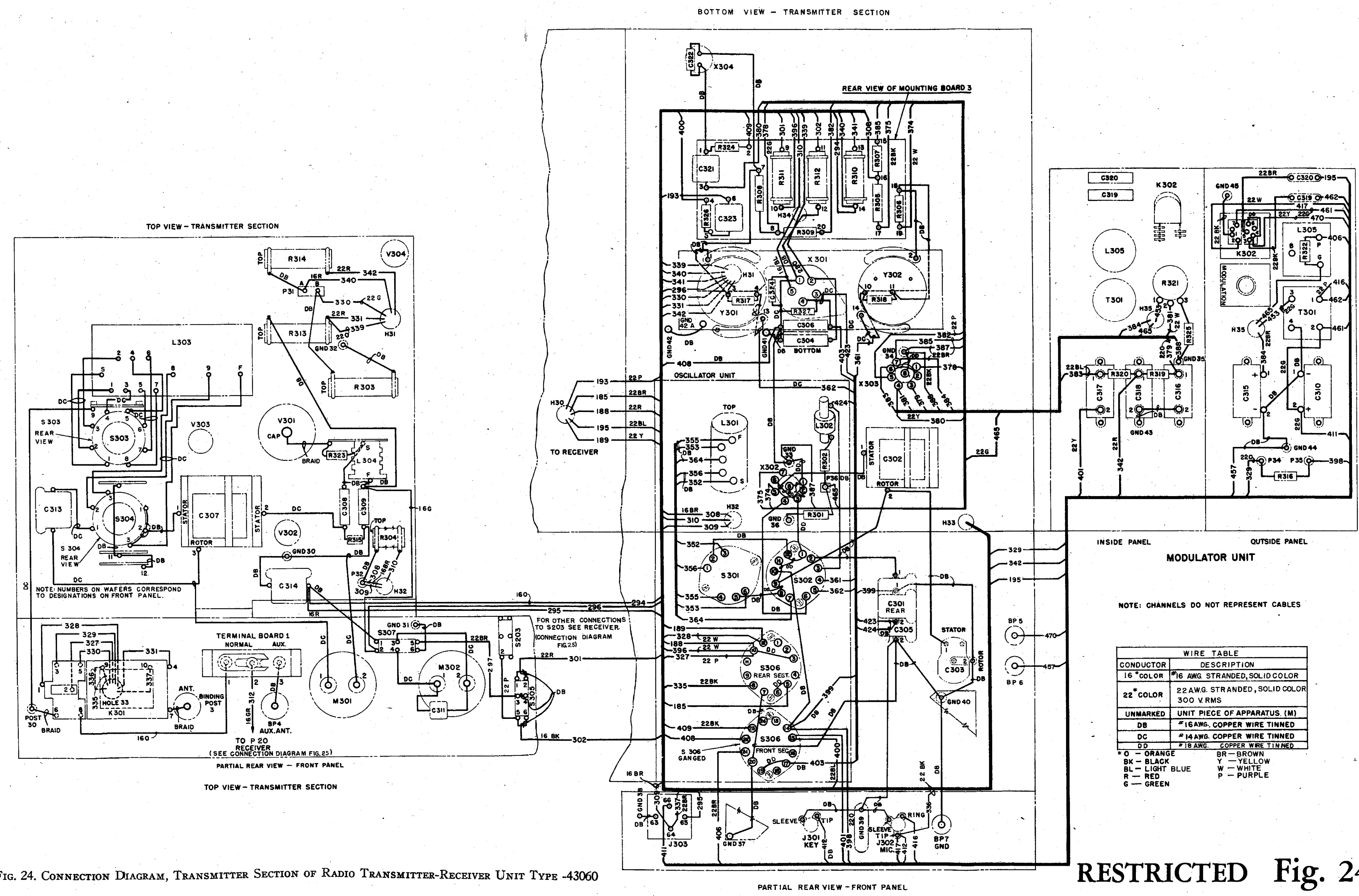
ACCESSORY BOX
CONNECTION DIAGRAM FOR TBX-8



CAUTION:-
THE BATTERIES MUST BE REMOVED FROM ACCESSORY BOX WHENEVER THE EQUIPMENT IS STORED OR DURING SHIPMENT.

FIG. 23. CONNECTION DIAGRAM, ACCESSORY BOX NAVY TYPE -10339

RESTRICTED Fig. 23

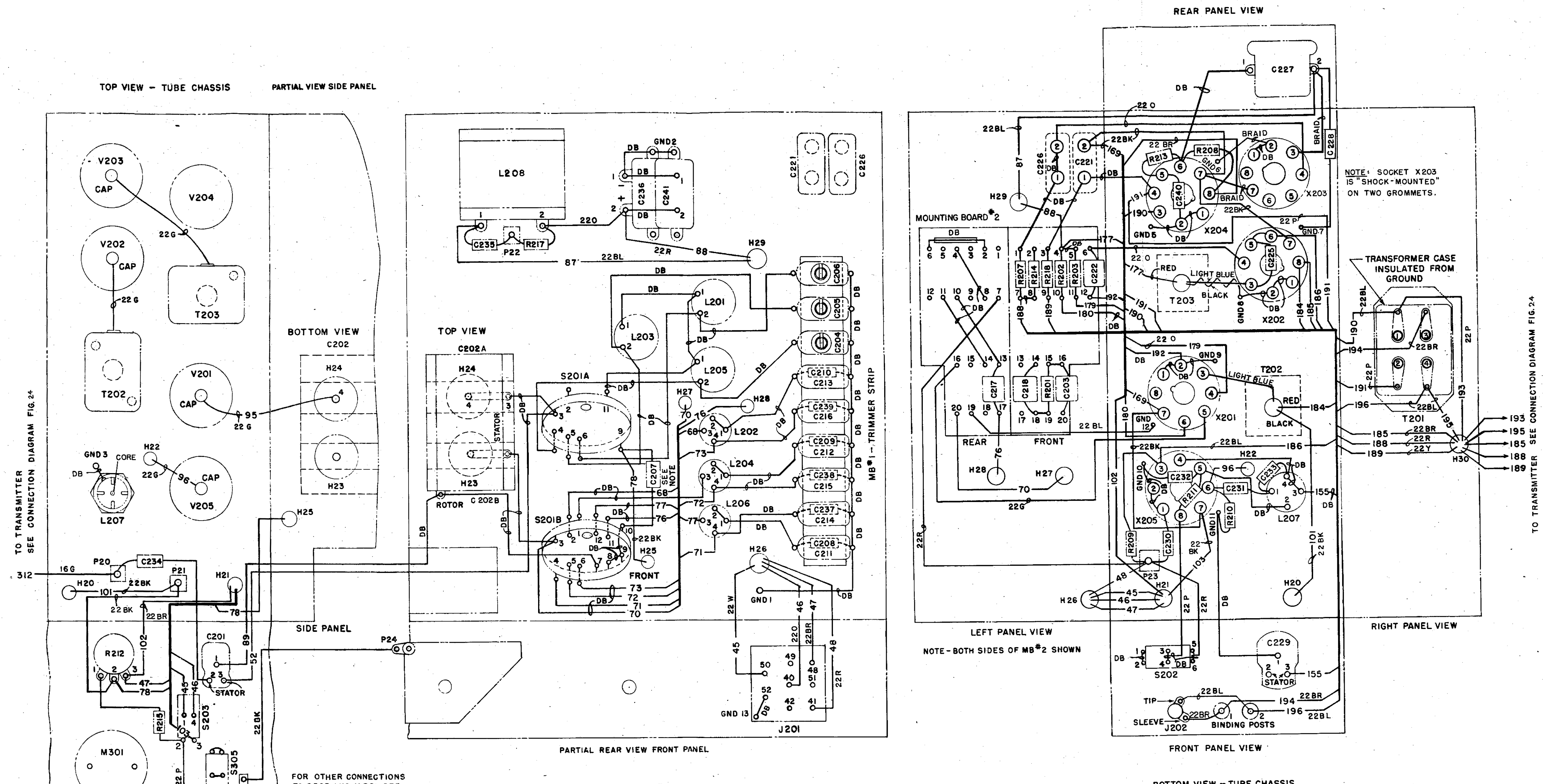


WIRE TABLE	
CONDUCTOR	DESCRIPTION
16 *COLOR	#16 AWG. STRANDED, SOLID COLOR
22* COLOR	22 A.W.G. STRANDED, SOLID COLOR 300 V. RMS
UNMARKED	UNIT PIECE OF APPARATUS. (M)
DB	#16 AWG. COPPER WIRE TINNED
DC	#14 AWG. COPPER WIRE TINNED
DD	#18 AWG. COPPER WIRE TINNED

* O – ORANGE
BK – BLACK
BL – LIGHT BLUE
R – RED
G – GREEN
BR – BROWN
Y – YELLOW
W – WHITE
P – PURPLE

Fig. 24. Connection Diagram, Transmitter Section of Radio Transmitter-Receiver Unit Type -43060

RESTRICTED **Fig. 24**

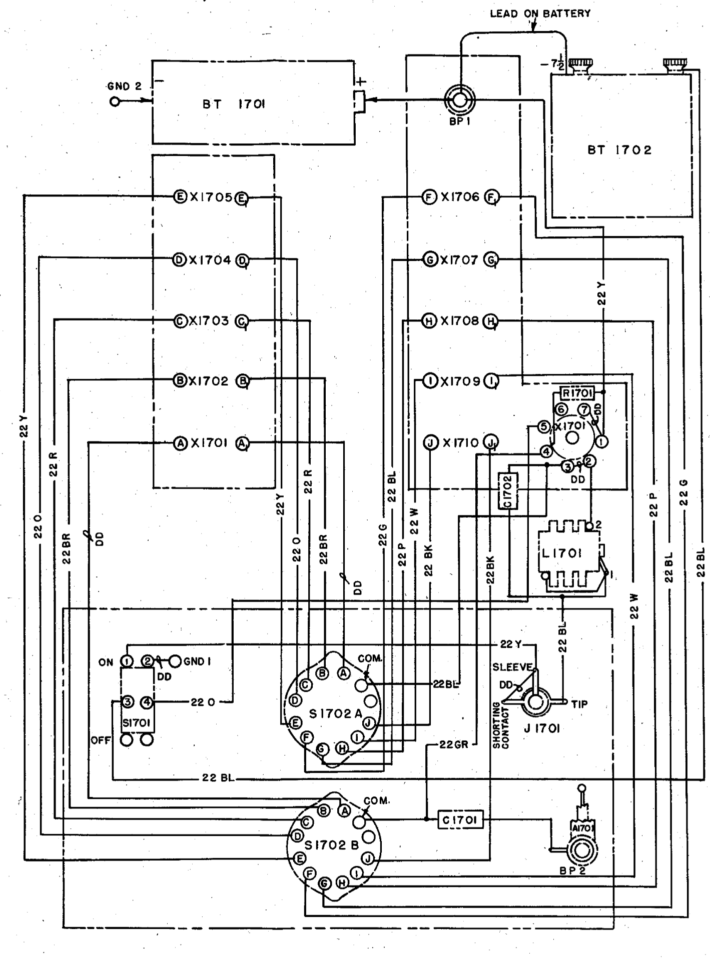


WIRE TABLE	
CONDUCTOR	DESCRIPTION
22*(COLOR)	22 AWG STRANDED, SOLID COLOR, 300 V. RMS.
UNMARKED	UNIT PIECE OF APPARATUS (M)
DB	.040" DIA. COPPER WIRE TINNED

*BK — BLACK
BL — LIGHT BLUE
R — RED
O — ORANGE
G — GREEN
W — WHITE
P — PURPLE
Y — YELLOW
BR — BROWN

FIG. 25. CONNECTION DIAGRAM, RECEIVER SECTION OF RADIO TRANSMITTER-RECEIVER UNIT TYPE -43060

RESTRICTED **Fig. 25**



WIRE TABLE	
CONDUCTOR	DESCRIPTION
22* (COLOR)	22 AWG STRANDED, SOLID COLOR 300v RMS
DD	#20 COPPER WIRE TINNED

BR - BROWN
R - RED
O - ORANGE
Y - YELLOW
G - GREEN

BL - BLUE
P - PURPLE
W - WHITE
BK - BLACK

Fig. 26. Connection Diagram, Crystal Calibrator and Monitor, Type -60133

RESTRICTED **Fig. 26**

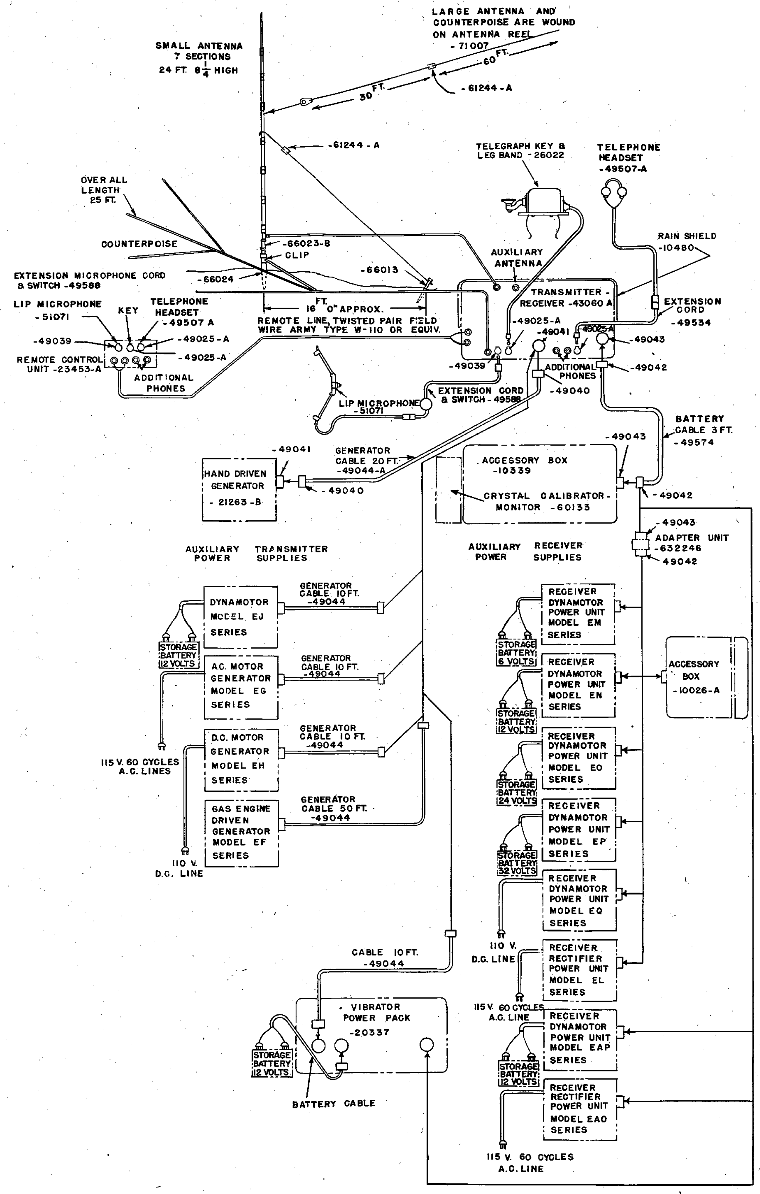
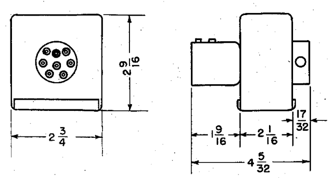
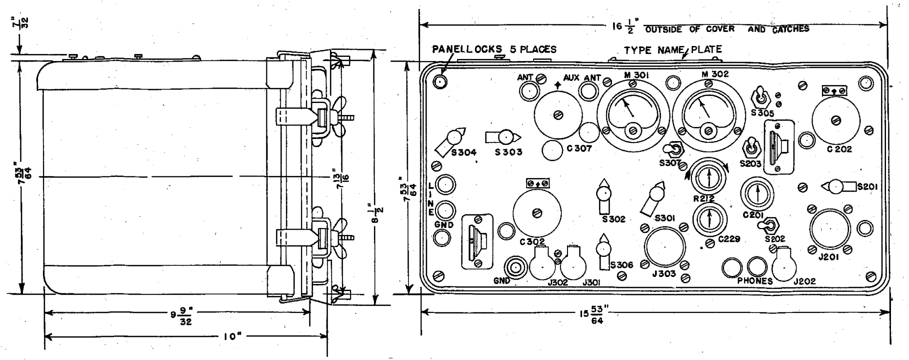


FIG. 27. CORDING DIAGRAM, TYPE -43060 TRANSMITTER-RECEIVER UNIT, SHOWING POSSIBLE SELECTION OF THE VARIOUS POWER SUPPLIES

RESTRICTED **Fig. 27**

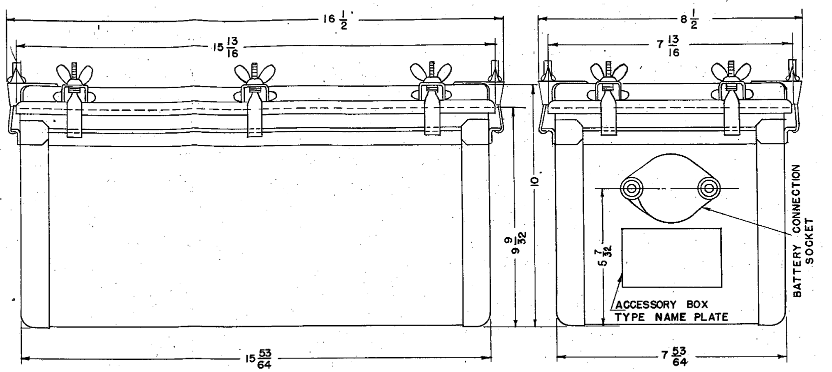


Type -632246 Adapter Unit



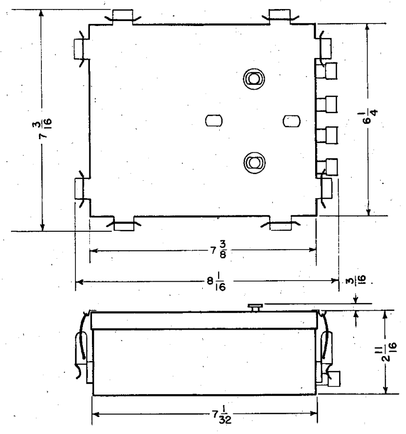
Type -43060 Transmitter and Receiver

ITEM NO	DESCRIPTION
C201	ANTENNA TRIMMER CAPACITOR
C202	RECEIVER TUNING CAPACITOR
C229	B. F. O. PITCH CAPACITOR
C302	M.O. TUNING CAPACITOR
C307	P.A. TUNING CAPACITOR
J201	RECEIVER POWER SOCKET
J202	EARPHONE JACK
J301	KEY JACK
J302	MICROPHONE JACK
J303	TRANSMITTER POWER SOCKET
M301	R.F. AMMETER
M302	MULTIMETER
R212	SENSITIVITY CONTROL
S201	RECEIVER BAND SWITCH
S202	CW.- M.C.W. SWITCH
S203	OFF-ON SWITCH
S301	TRANS. BAND SWITCH
S302	CO-1, CO-2, MO. SWITCH
S303	P.A. INDUCTANCE (FINE)
S304	P.A. INDUCTANCE (COARSE)
S305	"A"-"B" SWITCH
S306	CW-VOICE-NET SWITCH
S307	"TRANS." "REC." METER SWITCH

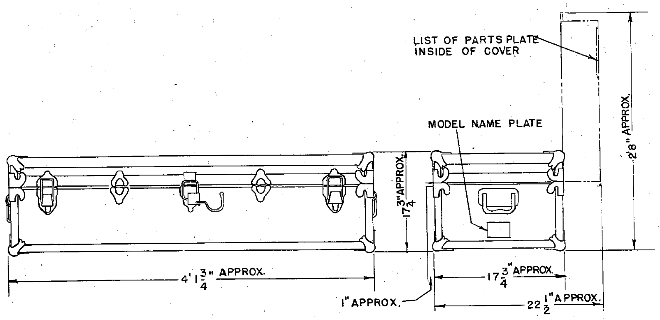


Type -10339 Accessory Box

Accessory Box Complete, Less Carrying Case, 29.75 Lbs.



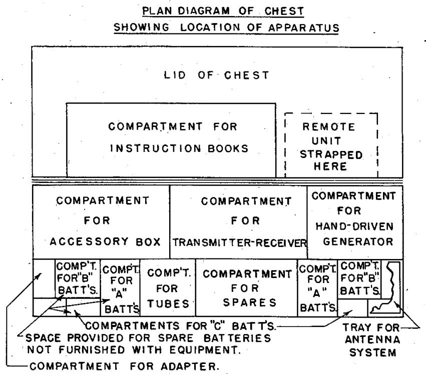
Type -23453 Remote Control Unit

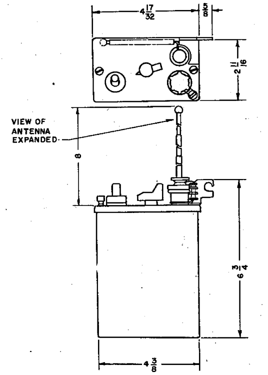


Type -10017B Shipping Chest

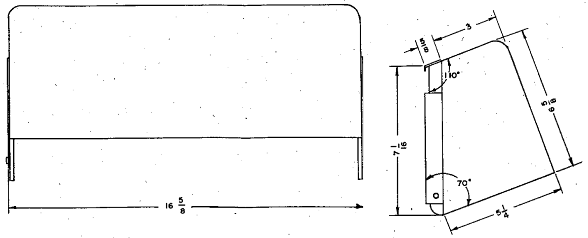
Shipping Chest, Empty.............. 80.0 Lbs.

Shipping Chest, Complete........209.0 Lbs.

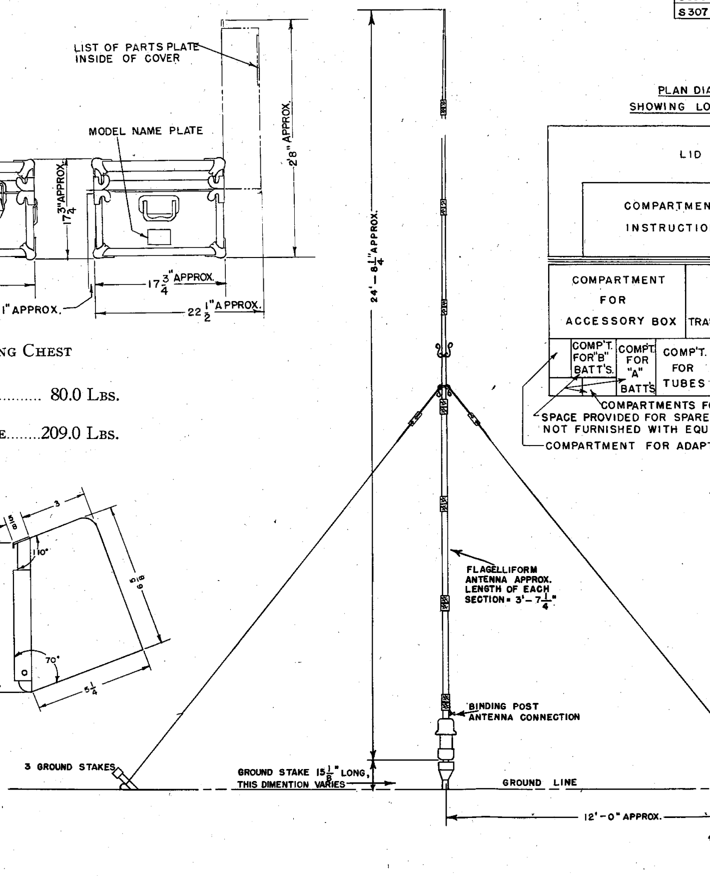


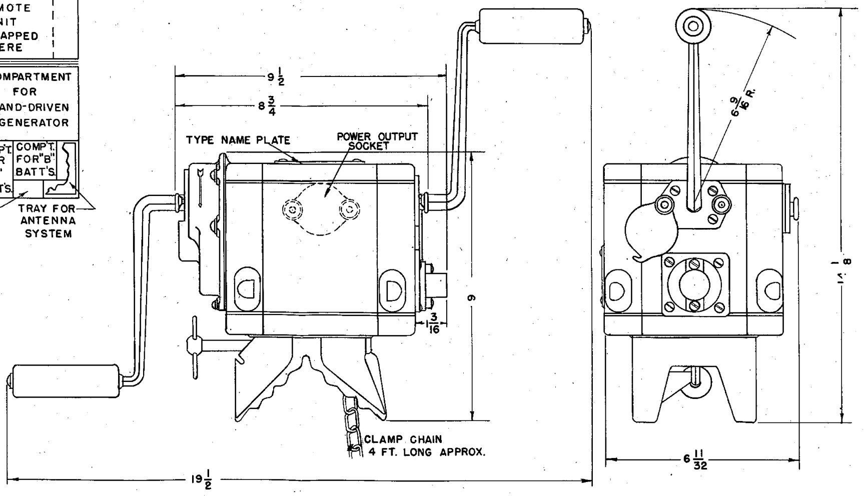


Type -60133 Crystal Calibrator and Monitor



Type -10480 Rain Shield





Type -21263B Hand Driven Generator

RESTRICTED Fig. 28

Fig. 28. Outline Diagram, Model TBX-8 Portable Radio Equipment