

HANDBOOK OF
MAINTENANCE INSTRUCTIONS

for

RADIO TRANSMITTING
EQUIPMENT AN/CRN-4



RESTRICTED
(For Official Use Only)

★
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RESTRICTED
AN 08-30CRN4-2

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Destruction of Abandoned Materiel in the Combat Zone

In case it should become necessary to prevent the capture of this equipment and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:—

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper, or wood.
4. Grenades and shots from available arms.
5. Burying all debris or disposing of it in streams or other bodies of water, where possible and when time permits.

Procedure:—

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch- and instrument-boards.
3. Destroy all controls, switches, relays, connections, and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil, and water-cooling systems in gas-engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving, or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING

Unsatisfactory Report

For U. S. Army Air Force Personnel:

In the event of malfunctioning, unsatisfactory design, or unsatisfactory installation of any of the component units of this equipment, or if the material contained in this book is considered inadequate or erroneous, an Unsatisfactory Report, AAF Form No. 54, or a report in similar form, shall be submitted in accordance with the provisions of Army Air Force Regulation No. 15-54, listing:

1. Station and organization.
2. Nameplate data (type number or complete nomenclature if nameplate is not attached to the equipment).
3. Date and nature of failure.
4. Radio model and serial number.
5. Remedy used or proposed to prevent recurrence.
6. Highlight errors or inadequacies, if applicable.

For U. S. Navy Personnel:

Report of failure of any part of this equipment during its guaranteed life shall be made on Form N. Per. 4112, "Report of Unsatisfactory or Defective Material," or a report in similar form, and forwarded in accordance with the latest instructions of the Bureau of Aeronautics. In addition to other distribution required, one copy shall be furnished to the inspector of Naval Materiel (location to be specified) and the Bureau of Ships. Such reports of failure shall include:

1. Reporting activity.
2. Nameplate data.
3. Date placed in service.
4. Part which failed.
5. Nature and cause of failure.
6. Replacement needed (yes—no).
7. Remedy used or proposed to prevent recurrence.

For British Personnel:

Form 1022 procedure shall be used when reporting failure of radio equipment.

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SAFETY NOTICE

THIS EQUIPMENT CONTAINS HIGH VOLTAGES WHICH
ARE DANGEROUS AND MAY BE FATAL IF CON-
TACTED BY PERSONNEL. USE EXTREME CAUTION
WHEN WORKING WITH THE EQUIPMENT.



Figure 1-1. Radio Transmitting Equipment AN/CRN-4—Components

SECTION I GENERAL DESCRIPTION

1. GENERAL.

a. Radio Transmitting Equipment AN/CRN-4 (see fig. 1-1) is a single tube, battery powered, low-frequency ground transmitter, complete with batteries and flat top antenna. The equipment is air-transportable and is designed to be carried to the ground on the person of the paratrooper who is to operate it. However, it may also be dropped by separate parachute when rolled in an A-5 or A-6 Aerial Delivery Bag. The equipment provides for either manual or automatic transmission of a predetermined signal. This signal is used for homing purposes by U. S. Army aircraft equipped with an automatic radio compass.

b. The equipment transmits a non-directional c-w signal in the frequency range of 1450 to 1700 kilocycles.

The signal is automatically keyed 180 times per minute. Transmission identification consists of the repetition every 30 seconds for a period of two hours of any one of 12 code letters. The strength and range of the signal depends on the condition of the battery, type of ground, and atmospheric conditions. Normally, the signal may be picked up at least 30 miles from the point of transmission.

c. Power requirements for this transmitter are 675 volts for tube plate supply and positive 7.5 volts for the filament and motor. All power is supplied by dry batteries accompanying the set.

2. EQUIPMENT SUPPLIED.

The equipment supplied is listed below.

Quantity	Name of Unit	Army Type Designation	Navy Type Designation	Overall Dimensions (inches)	Approximate Weight (lbs.)	Numerical Series of Reference Numbers
1	Radio transmitter with tube JAN 6V6GT/1 (VT-107-A) installed in socket and connecting cable attached	T-59/CRN-4	T-59/CRN-4	23 ³ / ₄ x 51 ¹ / ₈ x 61 ¹ / ₂	9.5	101-199 series
1	Battery Box (less batteries)	CY-83/CRN-4	CY-83/CRN-4	12 ³ / ₄ x 51 ¹ / ₈ x 61 ¹ / ₂	16.44	201-299 series
1	Antenna assembly	AS-85/CRN-4	AS-85/CRN-4	33 x 111 ¹ / ₂ x 4 1 ¹ / ₄	15.62	
1	Bag (transmitter)	CW-25/CRN-4	CW-25/CRN-4	81 ¹ / ₂ x 71 ¹ / ₂ x 13 ³ / ₄	3.23	
1	Bag (battery)	CW-26/CRN-4	CW-26/CRN-4	81 ¹ / ₂ x 71 ¹ / ₂ x 13 ³ / ₄	3.23	
1	Maintenance parts kit containing: 1 adjusting tool 2 code disc assembly 4 spool and ribbon assemblies 1 keying switch 2 "A" battery jumper cable assembly 7 "B" battery jumper cable assembly			103 ³ / ₈ x 103 ³ / ₈ x 51 ¹ / ₂	5	

3. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The equipment required but not supplied is listed below.

Quantity	Name of Unit	Army Type Designation	Navy Type Designation	Required Characteristics
1	Frequency meter set	SCR-211 (*)		
7	‡ Battery (B)	BA-56		
6	‡ Battery (A)	BA-15A		
1	† Plug	PL-55		
1	† Radio telegraph key	J-5-A		
As req'd	Cord			Any suitable cord for connection of plug and telegraph key.

* Any issue letter is applicable.

† Used for manual operation.

‡ These batteries shipped with equipment but supplied by Signal Corps.

§ Used for test purposes only.

4. DESCRIPTION OF MAJOR ASSEMBLIES.

(See fig. 1-1.)

a. Radio Transmitter T-59/CRN-4 is enclosed in a rectangular metal case. All controls and the battery cable are located on the control panel at one end of the transmitter. (See fig. 1-2 and fig. 3-1.) Studs and a dummy socket are provided on the panel to hold the battery cable while it is being transported. A receptacle for the antenna plug is located on one side of the transmitter. On the right side of the transmitter are two slots through which the counterpoise ribbons are unreeled. Bag CW-

25/CRN-4 is provided with the transmitter for carrying purposes.

b. Battery Case CY-83/CRN-4 is a metal box designed to carry six 11½-volt "A" batteries and seventeen 45-volt "B" batteries. On one end of the case are two 4-prong sockets, one marked "START" and the other marked "BOOSTER," used for connection of the power supply to the transmitter. Bag CW-26/CRN-4 is provided for carrying purposes.

c. Antenna Assembly AS-85/CRN-4 is contained in three cylinders; the antenna masts in two cylinders and the antenna flat top and guy wire assembly in the third.

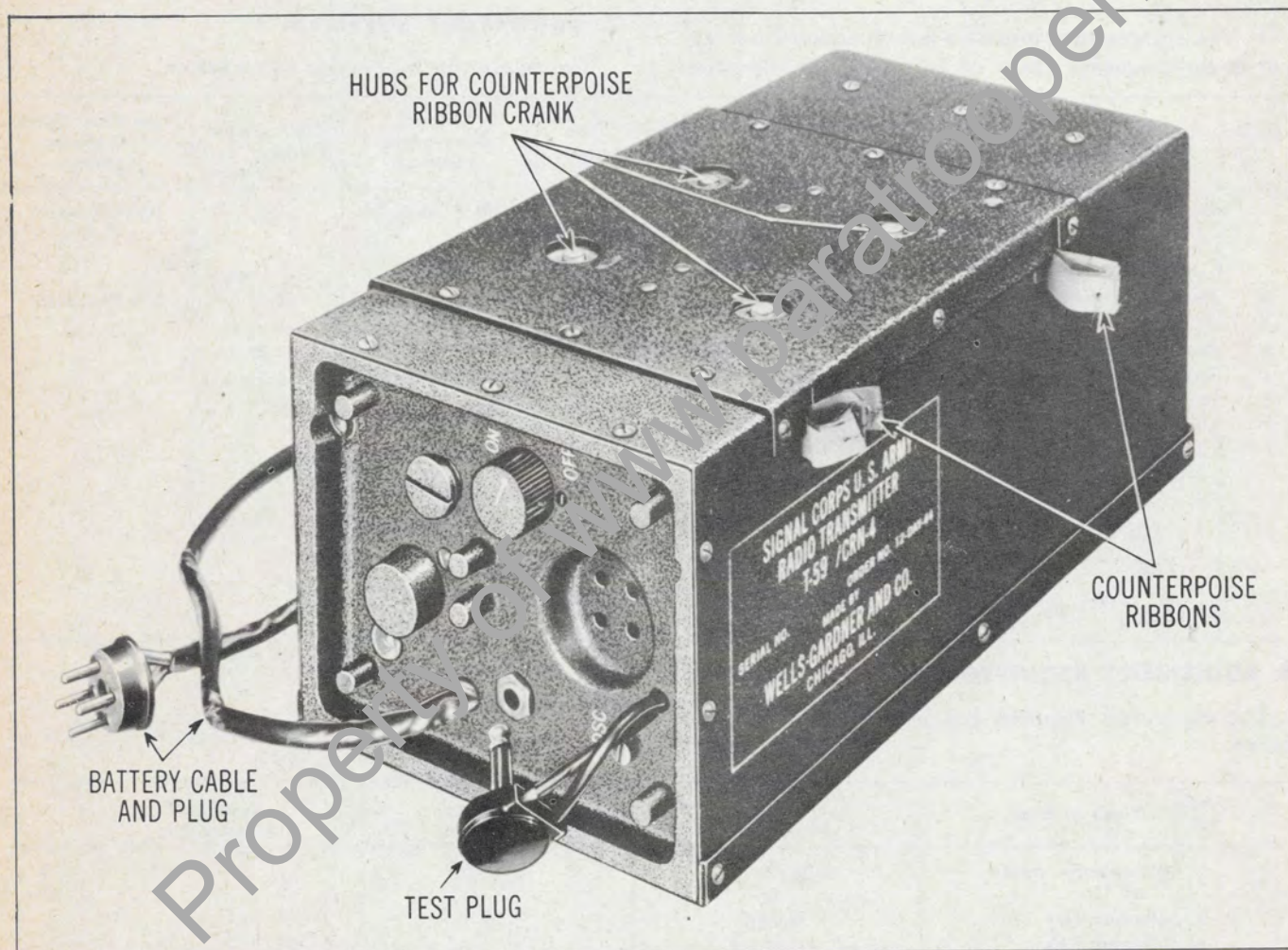


Figure 1-2. Radio Transmitter T-59/CRN-4

SECTION II INSTALLATION AND ADJUSTMENT

IMPORTANT

The compensating control located above the "ON-OFF" switch is adjusted at the factory. Do not readjust at any time.

1. BENCH TEST.

The bench test is intended to give an indication of satisfactory performance of the equipment prior to use. For best results, discard the antenna, counterpoise, and batteries after they have been used once and obtain new parts.

a. Check parts received against list of equipment supplied.

b. Examine fastenings of straps on carrying cases.

c. Remove equipment from carrying cases and examine for evidence of external damage.

d. To perform a brief operating test, proceed as follows:

(1) Construct a phantom antenna using a 245-micromicrofarad capacitor and a 12-ohm resistor connected in series and wired to a banana jack such as J-101. See table of component parts.

(2) Insert the phantom antenna between the antenna jack on the side of transmitter and the chassis of the transmitter.

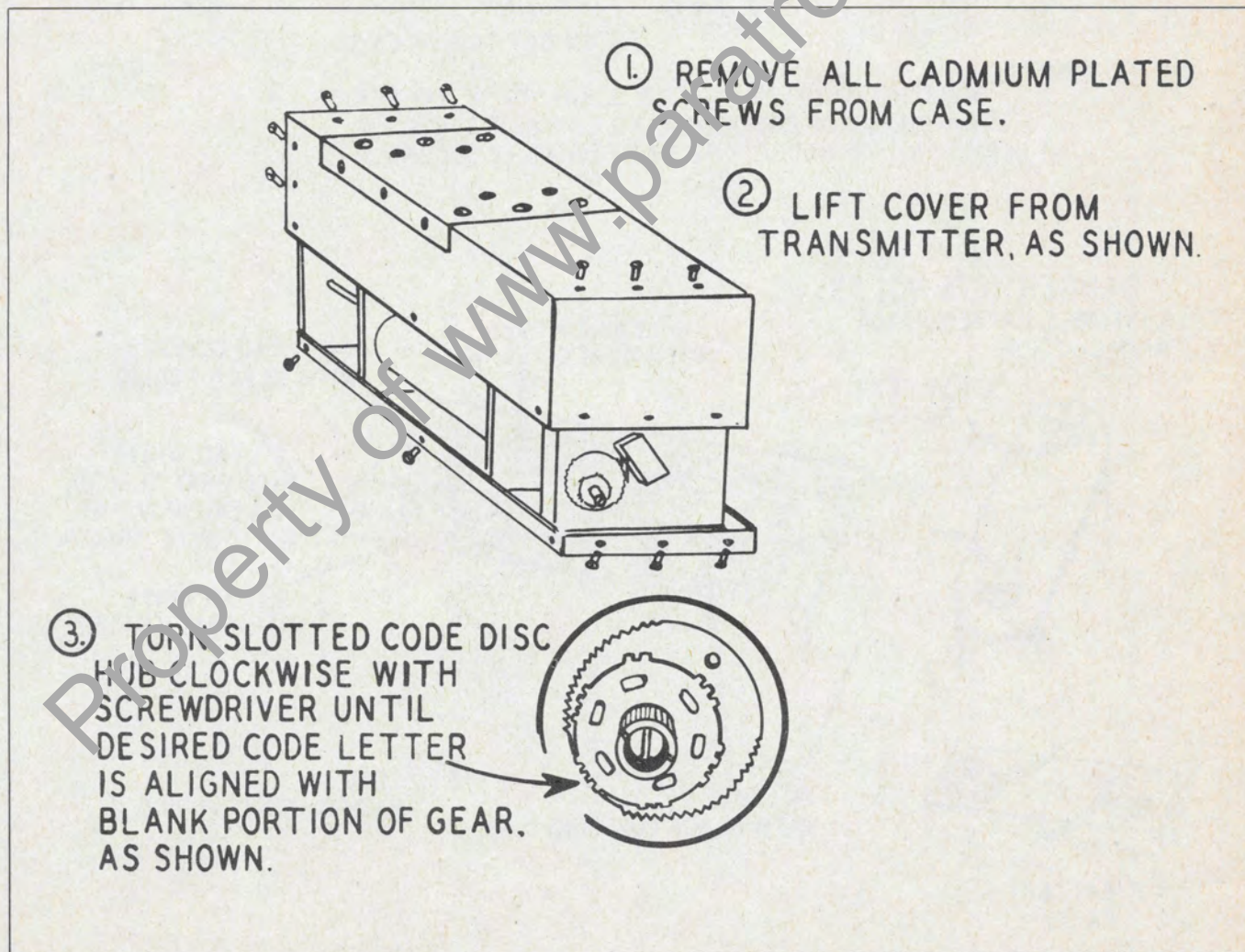


Figure 2-1. Selection of Code Letter

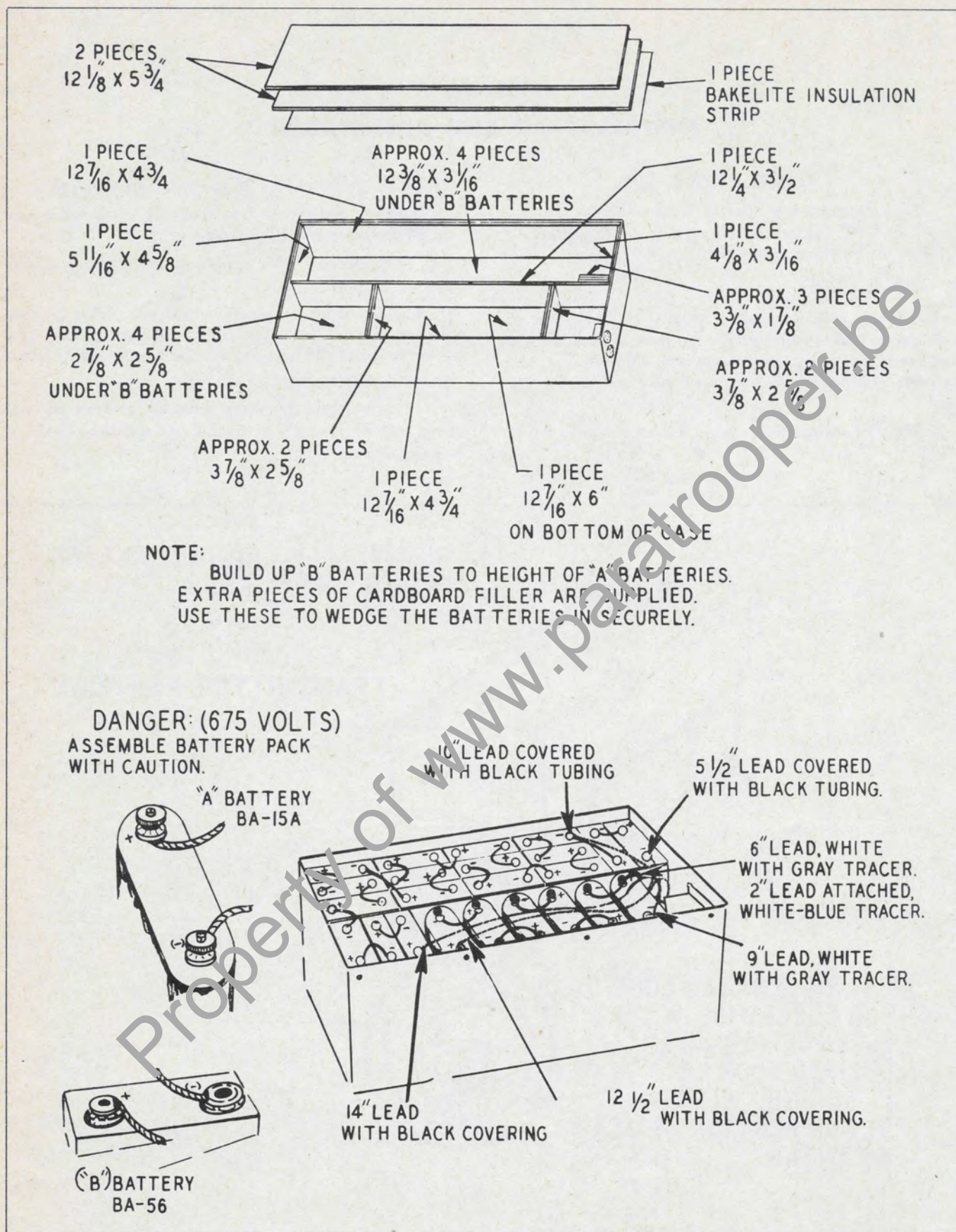


Figure 2-2. Installation of Batteries in Battery Case CY-83/CRN-4

WARNING

High Voltage! Keep away from uninsulated points on connectors.

(3) Connect battery connector or transmitter to plug on battery case. Use a spare set of batteries, if possible, rather than the batteries which are to be used with the equipment during actual operation.

(4) Turn "ON-OFF" switch to "ON."

(5) Adjust the "ANT" control for maximum brilliance of the neon indicator light.

(6) Remove the test plug from the manual key jack.

(7) The code letter for which the transmitter was set at the factory will be transmitted automatically on the frequency specified on the tag attached to the transmitter.

(8) Transmission will be indicated by intermittent glowing of the neon indicator light.

(9) As a further indication of transmission, tune a suitable receiver to the transmitting frequency and listen for code signal.

2. PRE-USE ADJUSTMENTS.

Note

Instructions in paragraphs 2, 3, and 4 are to be carried out immediately prior to the start of a mission. Instructions in paragraph 5 are carried out after landing with the equipment.

a. REMOVAL OF TRANSMITTER COVER. Remove transmitter from carrying bag. If it is necessary to change the code disc, remove all of the cadmium-plated screws from the transmitter and lift the cover off carefully. (See fig. 2-1.)

b. INSTALLATION OF CODE DISC.—If the desired code disc is not on the transmitter (disc 68 for the letters Q, M, O, Y, K or X and disc 73 for the letters S, B, T, G, W, or R), install the correct one from the maintenance parts kit as follows:

(1) Remove the screw in the hub of the mounted code disc.

(2) Lift disc out.

(3) Insert desired disc.

(4) Replace screw.

c. SELECTION OF CODE LETTER. — Turn code disc clockwise until the desired letter stamped on the code disc is opposite the blank portion of the gear. (See fig. 2-1.)

d. REPLACEMENT OF TRANSMITTER COVER. Place cover over the transmitter. Replace cadmium-plated screws.

e. INSTALLATION OF BATTERIES.—If it is necessary to install batteries in the battery case, refer to figure 2-2 for their proper location. Jumpers are provided in the battery box, and spare jumpers are in the maintenance

parts kit. Several pieces of waxed cardboard filler are provided to pack around the batteries. Be sure to use this filler instead of ordinary cardboard to prevent absorption of moisture.

3. OPERATING TEST.

CAUTION

Do not operate the transmitter on test any longer than necessary. Such operation will reduce the operating life of the battery.

Well in advance of a mission, perform an operating test to insure that the equipment is in good operating condition. For such tests erect and use Antenna Assembly AS-85/CRN-4. Use only one antenna assembly to test any number of transmitters *separately*. (See par. 5b, this section.) After erection of the antenna, proceed as follows:

a. Open covers on both the battery and transmitter carrying case.

b. Remove the battery plug from the socket on the transmitter.

c. Insert the battery plug in the socket in the battery case marked "START."

d. Insert the connection from the test antenna into the antenna jack on the side of the transmitter.

e. Make certain the test plug is inserted in the manual key jack. (Use of this plug will reduce the battery pack "B" current drain during operating tests and will prevent damage to the tube.)

f. Turn the "ON-OFF" switch to the "ON" position.

g. Allow about 30 seconds for the tube to warm up, then adjust the "ANT." control for maximum brilliance of the neon indicator light.

h. Check the operating frequency of the transmitter by means of Frequency Meter Set SCR-211-(*). (See directions in sec. VI, par. 2.)

4. CHANGING TRANSMITTER FREQUENCY.

If the frequency is different than the frequency on the tag attached to the transmitter or if it is desired to

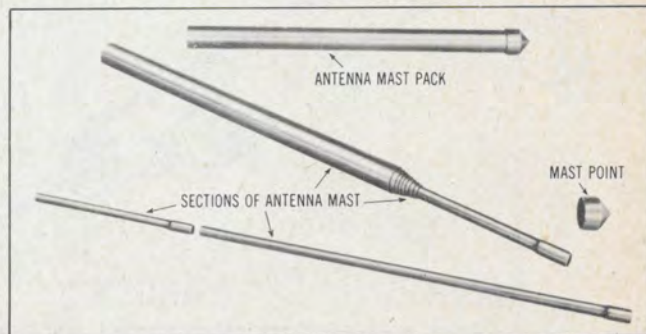


Figure 2-3. Antenna Masts

* Any issue letter is applicable.

change the transmitter frequency, adjust the control as follows:

a. Turn the "OSC" control clockwise until a stop is reached. The transmitter frequency at this point is approximately 1300 kilocycles.

b. Determine the approximate position of the oscilla-

tor control for any desired frequency by using this position of the oscillator control as a reference.

c. To adjust to the frequency desired, turn the "OSC" control counterclockwise the *approximate* number of turns shown on the following page and then *accurately* adjust the control by means of the Frequency Meter Set SCR-211-(*). (See directions in section VI, par. 2.)

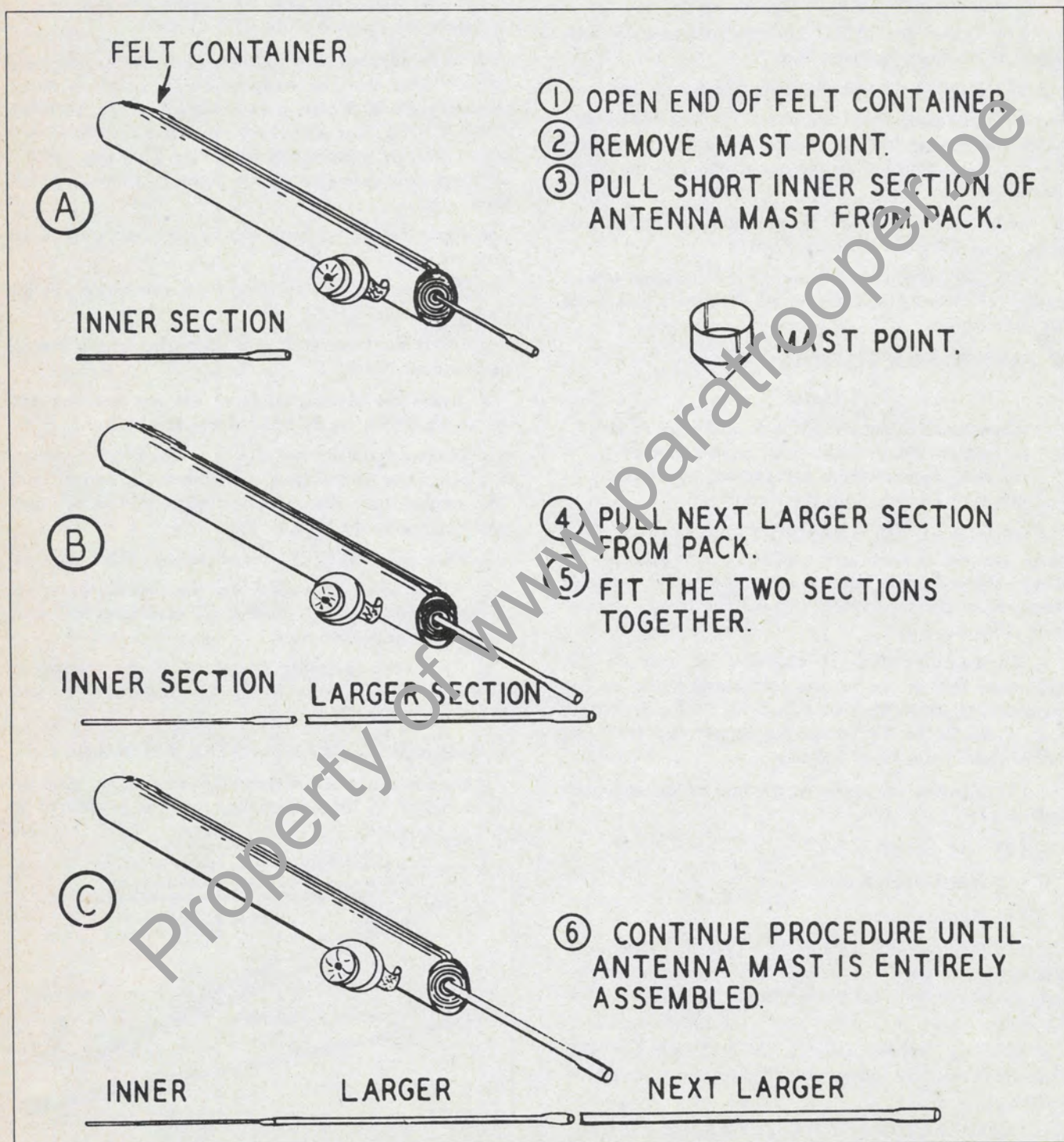


Figure 2-4. Antenna Mast Assembly

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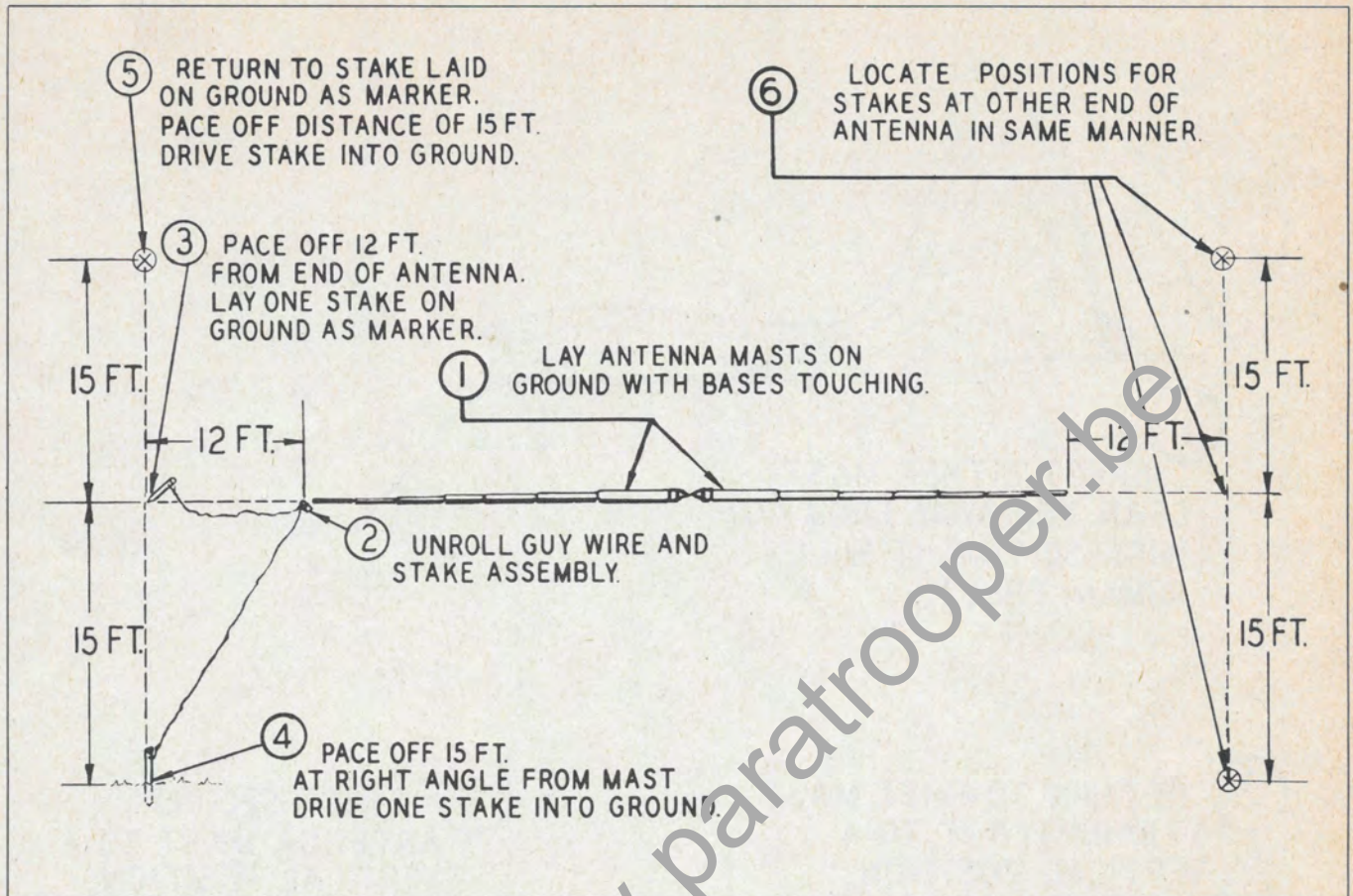


Figure 2-5. Location of Guy Wire Stakes

TURNS	FREQ. (KILOCYCLES)
0	1300
6	1400
10	1500
12	1550
14	1600
17	1650
19	1700
25	1750

d. After the "OSC" control has been set for the desired frequency, adjust the antenna control for maximum glow on the neon indicator light.

5. INSTALLATION OF THE EQUIPMENT.

Installation of the equipment involves four operations; selection of the position for the equipment, erection of the antenna, spreading of the counterpoise ribbons, and interconnection of the components.

a. LOCATION OF EQUIPMENT.—To prevent loss of radiated energy, locate the antenna as far as possible from trees or tall metal structures. Do not erect the antenna in a gully or where the signal will be affected by hills.

b. INSTALLATION OF ANTENNA.

(1) The flat top antenna assembly is wrapped around a cardboard tube 2 1/2 inches in diameter and fastened with tape and wrapping paper. A cord is fastened under the paper to provide a means of cutting the tape quickly at the time the antenna is erected.

(2) The two guy wires and insulator assemblies are rolled on the same tube and the stakes and insulators inserted in the ends. Cords are provided as a means of withdrawing these assemblies quickly from the tube.

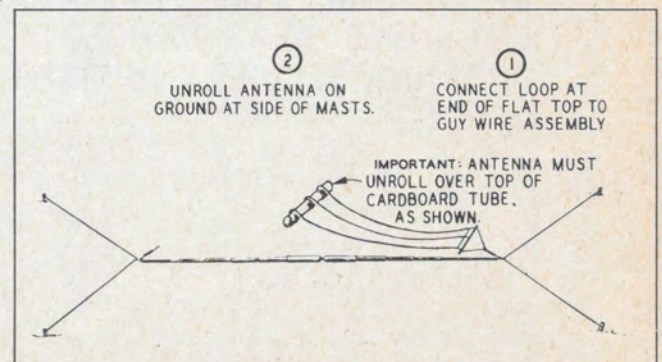


Figure 2-6. Unrolling Antenna Flat Top Assembly

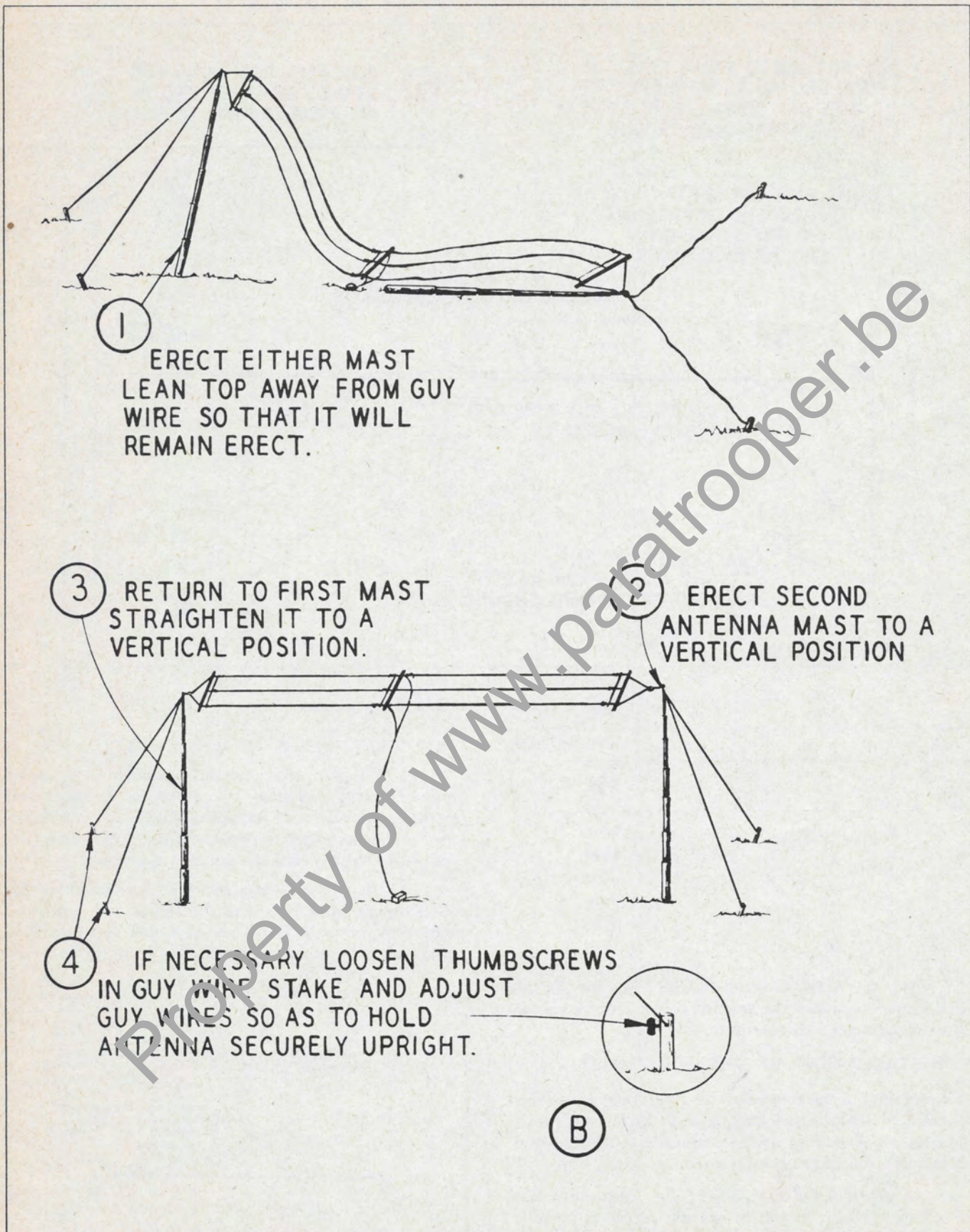


Figure 2-7. Erection of Antenna Masts

(3) Determine the positions for the guy wire stakes by assembling the antenna masts and laying them end to end on the ground. Make measurements for the positions of the stakes from the ends of the two masts, and erect the antenna over the position where the masts were laid on the ground.

(4) Erect the antenna as follows:

(a) Remove the antenna masts from the containers. Fit the sections together to complete the two 25-foot masts. (See figs. 2-3 and 2-4.)

(b) Lay the two antenna masts end to end with the bases at the center.

(c) Pull the rip cord that is visible on the cardboard tube. Remove the guy wire stakes and insulator

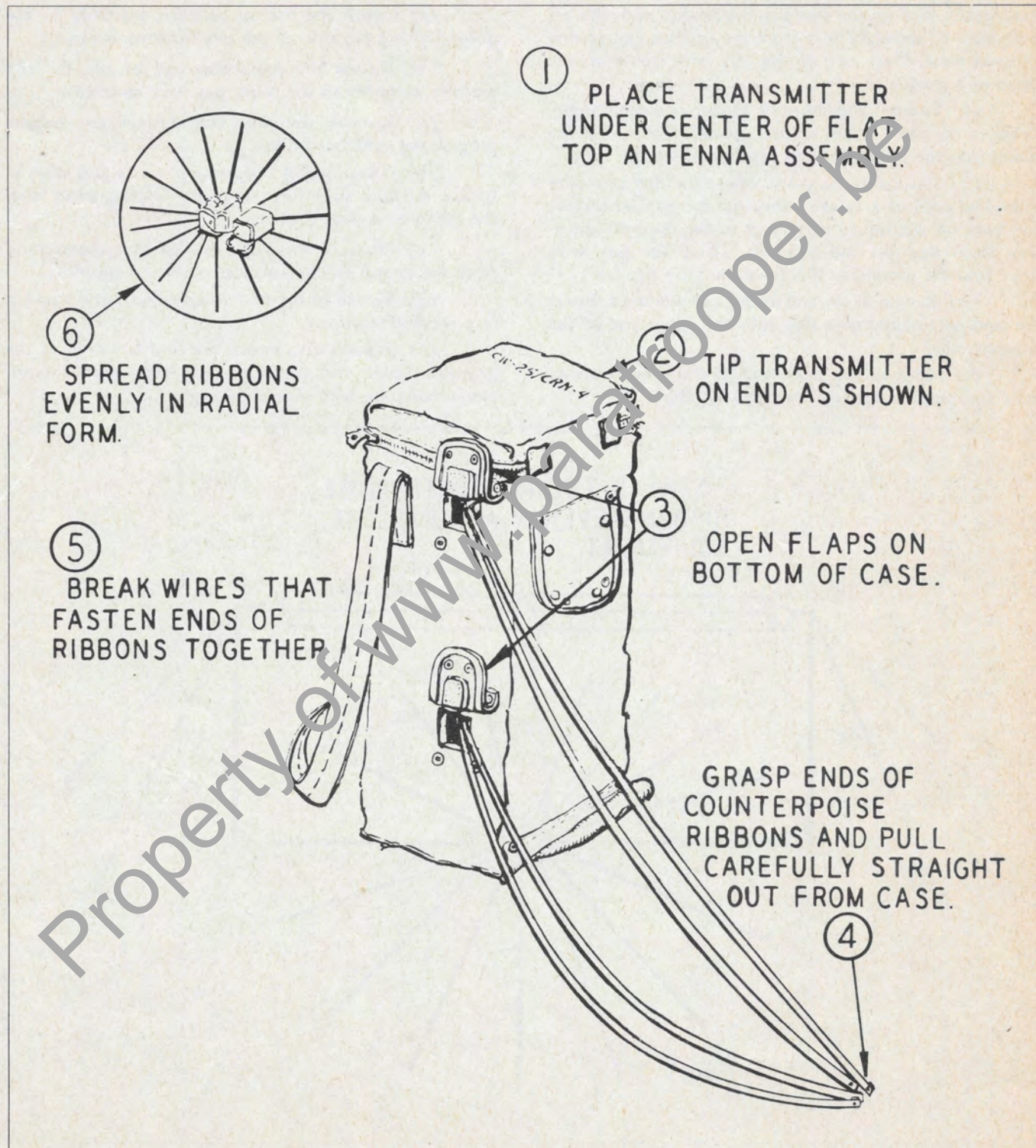


Figure 2-8. Spreading of Counterpoise Ribbons

Paragraph 5

AN 08-30CRN4-2

from the inside of the tube. Slip the rip cord from the bottom of the stakes.

(d) Unroll 5 or 6 feet of guy wire from the outside of the cardboard tube. Drive the guy wire stakes in the ground about 2 feet apart to provide support. Finish unrolling the guy wire.

(e) The smaller ends of the antenna masts are used as a means of determining the location for the guy wire stakes. Pick up the two guy wire stakes and pace off a distance of about 12 feet from the smaller end of one antenna mast. Place one of the guy wire stakes at this point as a marker.

(f) Pace off a distance of 15 feet at a right angle, either to the right or left of this point. Drive one of the stakes into the ground at this position. (See fig. 2-5.)

(g) Return to the point where the first guy wire stake was used as a marker. Pick up the guy wire stake and pace off a distance of 15 feet in the opposite direction from that previously taken. Drive the guy wire stake into the ground at this position. (See fig. 2-5.)

(h) Return to the end of the antenna mast. Insert the stud on the guy wire ring into the upper end of the antenna mast.

(i) Move to the small end of the other antenna mast and repeat steps (c) through (h), above.

(j) Pull the remaining rip cord off the antenna roll to free the flat top antenna assembly. Hold the flat top antenna assembly so that the antenna will unroll *over the top* of the cardboard tube. (See fig. 2-6.) Unroll 2 or 3 feet of the assembly.

(k) Fasten the snap fastener on the guy wire assembly at the end of the antenna mast to the loop at the end of the flat top antenna assembly.

(l) Unroll the flat top antenna assembly on the ground along the side of the two antenna masts.

(m) Fasten the remaining end of the flat top antenna assembly to the other guy wire assembly.

(n) Remove the tape that fastens the banana plug to the cardboard tube.

(o) Grasp one of the antenna masts and erect it. Incline the mast slightly with the top leaning away from the guy wire stakes. (See fig. 2-7.)

(p) Move to the other end of the antenna and erect the second antenna mast in a vertical position.

(q) Return to the first antenna mast and stand it in a vertical position.

(r) If necessary, loosen the thumb screws in the guy wire stakes and adjust the guy wires until the antenna masts are held securely upright.

SPREAD THE 16 COUNTERPOISE
RIBBONS EVENLY AROUND THE
EQUIPMENT.

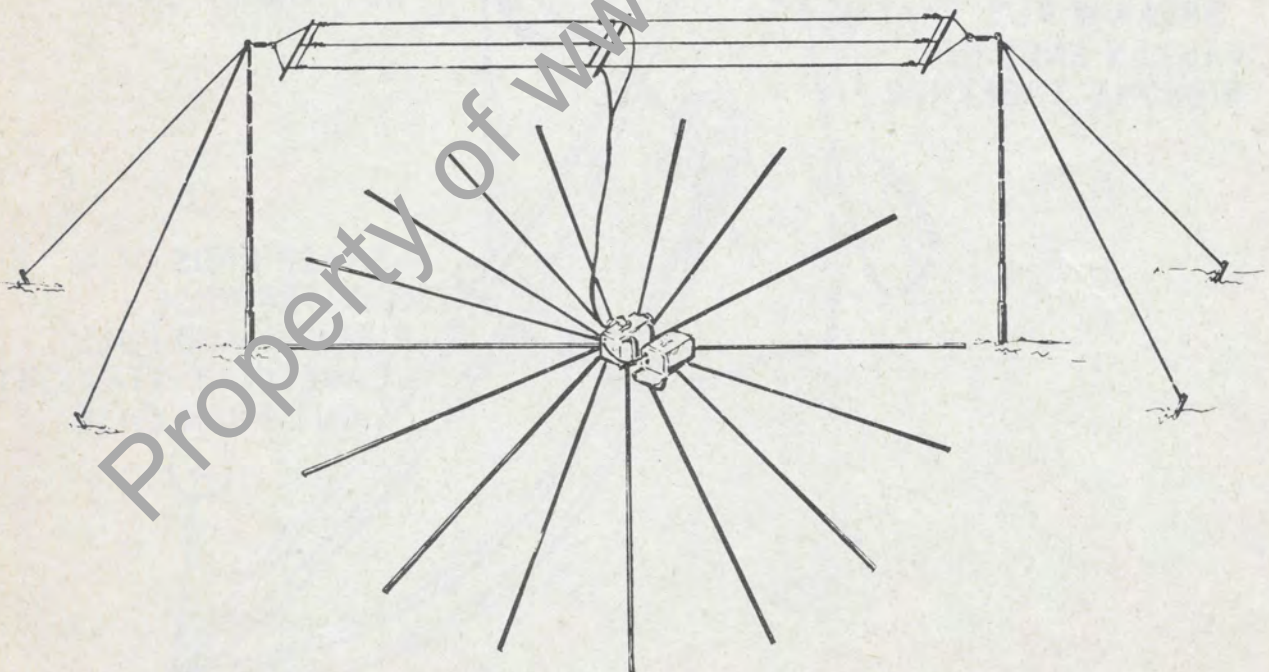


Figure 2-9. Radio Transmitting Equipment AN/CRN-4—Transmitting Position

c. SPREADING COUNTERPOISE RIBBONS.

(1) Place the transmitter on one end directly beneath the center of the flat top assembly as shown in figure 2-8.

(2) Open the two small flaps on the under side of the transmitter carrying case.

(3) Pull the four groups of ribbons from the transmitter. Grasp the ribbons and walk away from the transmitter until the ribbons are completely extended.

(4) Break the wires that fasten the ends of each group of four ribbons together.

(5) Spread the ribbons as shown in figure 2-8. Do this by walking in a circle around the transmitter and dropping one ribbon at a time until all are spread.

IMPORTANT

Keep the distance between ribbons uniform to prevent loss of radiated energy.

d. INTERCONNECTION OF EQUIPMENT. — To interconnect equipment proceed as follows:

(1) Open both the end cover on the transmitter

case and the flap at the side of the case marked "ANT." (This flap gives access to the antenna jack.)

(2) Bend the flap back over the top of the transmitter case and weight it in place by means of the carrying strap and snap fasteners.

(3) Insert the plug on the end of the antenna lead into the antenna jack on the transmitter.

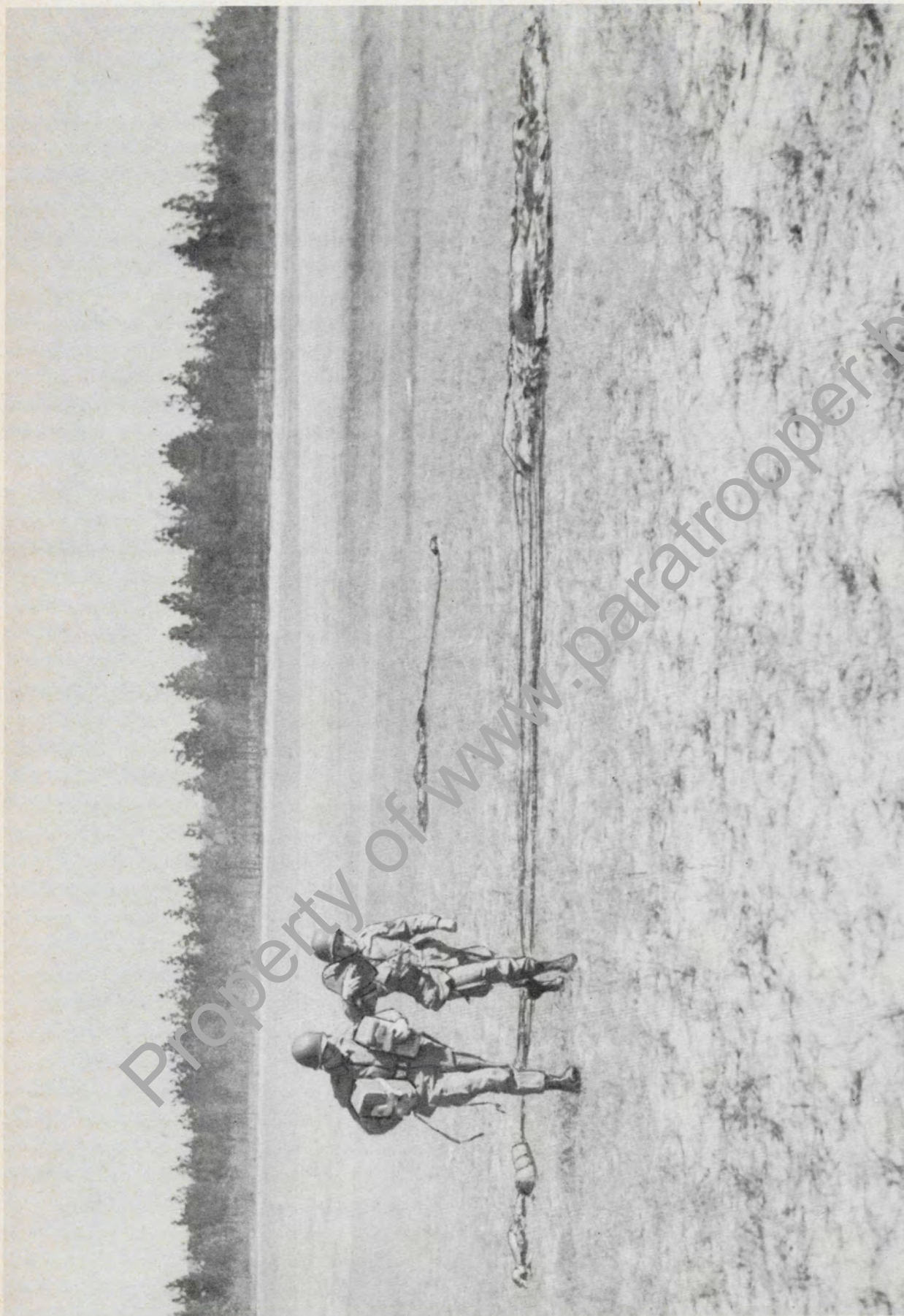
(4) Place the battery supply next to the transmitter. Open the cover on the battery supply carrying case.

(5) Remove the battery plug from the socket on the transmitter case and insert it into the socket on the battery case marked "START."

IMPORTANT

If the equipment is operated in the rain or snow, close the covers on the two carrying bags as far as possible by means of the zippers.

e. INSTALLATION PROCEDURE. — The photographs which follow give a pictorial summary of the complete procedure involved in installing the equipment in the most efficient manner.



Step 1. When free from harness, move quickly to favorable terrain to erect the antenna.



Step 2. Open carrying bags.



Step 3. Begin to assemble antenna masts.



Step 4. Fit sections of antenna masts together.



Step 5. Complete the assembly of antenna masts.



Step 6. Pull cord to open guy-wire antenna flat top assembly.



Step 7. Drive guy-wire stakes in ground near small end of mast.



Step 8. Unroll guy wires. One man should unroll the wire and the other should keep the wires straight.



Step 9. Go five paces out from small end of mast, turn 90 degrees to the right, and go four paces. Drive the guy-wire stakes in securely, both men working at the same time.



Step 10. Insert guy-wire assembly into top of antenna mast.



Step 11. Connect hook at end of flat top to guy-wire assembly.



Step 12. Raise one mast. One man should hold other mast to prevent slipping or fouling of wires.



Step 13. Raise other mast carefully. Watch tension of antenna flat top and slack in guy wires.



Step 14. Pull out counterpoise ribbons and insert antenna plug in antenna jack.



Step 15. Turn transmitter on.



Step 16. *Adjust antenna control knob for maximum brilliance of the neon indicator light.*



Step 17. *Give all equipment one final check, roll up extra equipment and take cover.*

SECTION III OPERATION

WARNING

Operation of this equipment involves voltages which are dangerous to human life (675 volts d.c.). Do not contact uninsulated portions of plugs or sockets while batteries are connected. Do not contact the antenna lead while the transmitter is in operation.

1. PREOPERATION PROCEDURE.

Due to the nature of this equipment, installation (see sec. II, par. 5) will immediately precede operation.

2. TO START AND STOP THE EQUIPMENT.

a. To start the equipment, turn the "ON-OFF" switch to "ON." (See fig. 3-1 for location of controls.)

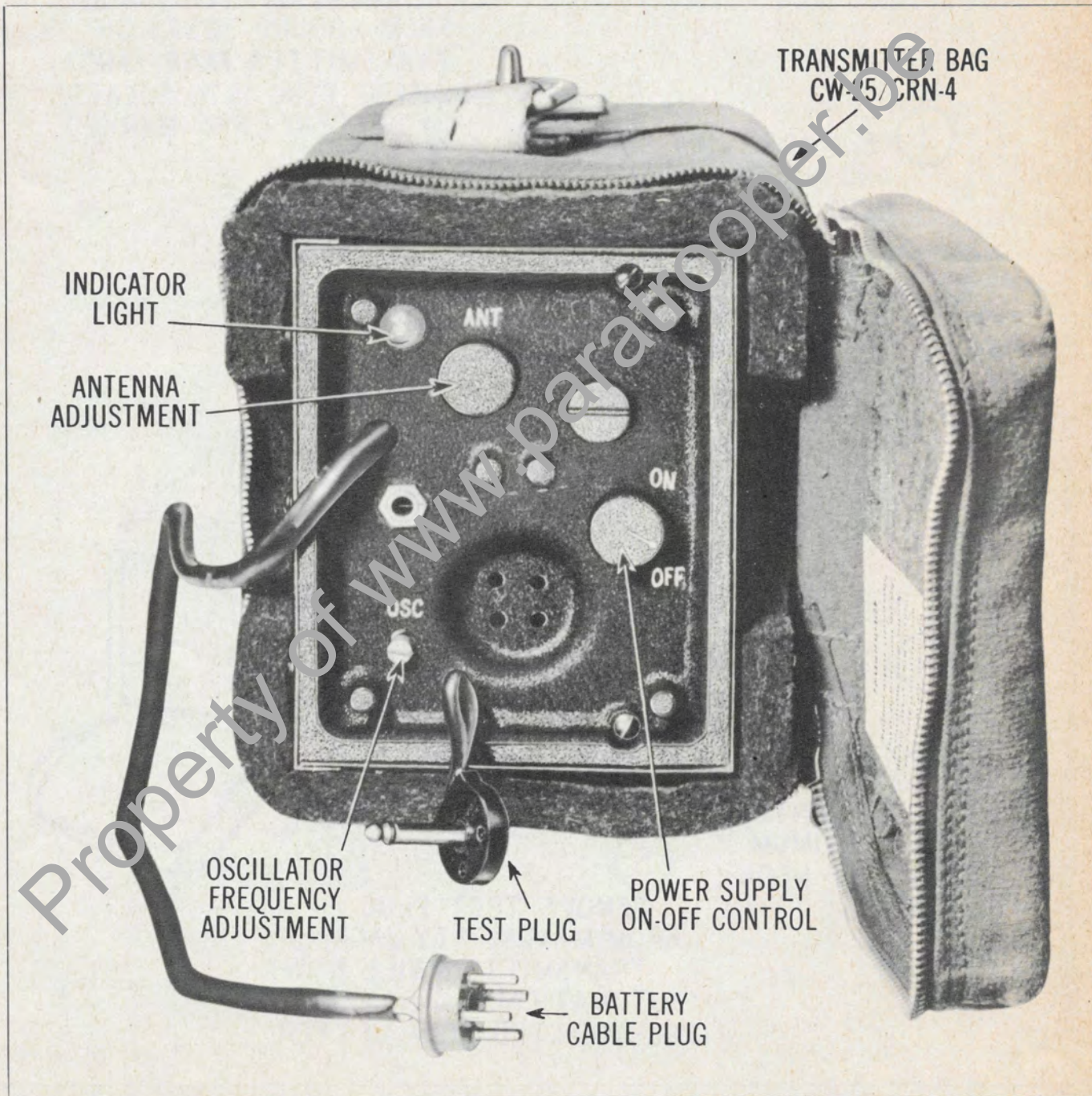


Figure 3-1. Radio Transmitter T-59/CRN-4—Panel View

b. To stop the equipment, turn the "ON-OFF" switch to "OFF."

3. OPERATION OF THE EQUIPMENT.

The equipment may be used to transmit signals either automatically or manually.

a. AUTOMATIC OPERATION.—(See fig. 3-2.)
For automatic operation, proceed as follows:

- (1) Turn the "ON-OFF" switch to the "ON" position.
- (2) Stay as far as possible from the antenna lead

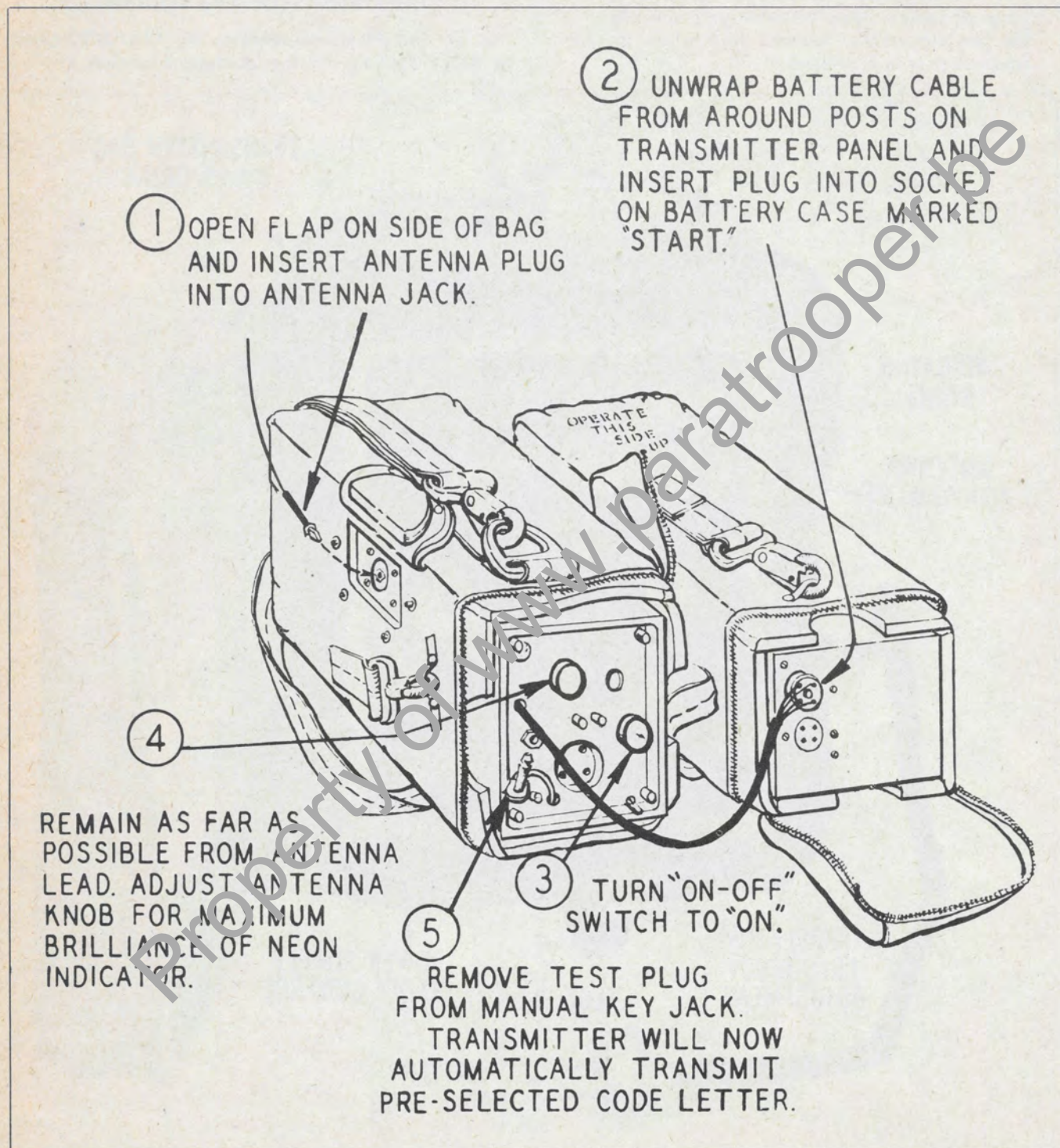


Figure 3-2. Operation of Equipment

and adjust the antenna control knob for maximum brilliance of the neon indicator light.

WARNING

Do not contact the antenna lead or uninsulated portions of plugs or sockets while the transmitter is operating.

(3) Remove the test plug from the manual key jack.

(4) The equipment will now automatically transmit the code letter that was previously selected.

(5) After about 20 minutes of operation, remove the battery plug from the socket marked "START" and insert it in the socket marked "BOOSTER."

b. MANUAL OPERATION.—For manual operation, proceed as follows:

(1) Turn the "ON-OFF" switch to "ON."

(2) Stay as far as possible from the antenna lead and adjust the control knob for maximum brilliance of the neon indicator light.

(3) Remove test plug from the manual key jack and insert the manual key plug into this jack.

(4) Transmit the desired signals by means of the manual key.

CAUTION

Do not use a dash or signal of more than 10 seconds duration. Equipment is designed for intermittent code signals only.

(5) After about 20 minutes of operation, remove the battery plug from the socket marked "START" and insert it in the socket marked "BOOSTER."

4. OPERATING NOTES.

a. FAILURE OF MOTOR TO OPERATE.—Under certain conditions the motor armature will fail to start when the "ON-OFF" switch on the control panel is turned on. This condition is normal and does not indicate faulty operation of the equipment.

Failure of the motor to operate is indicated by lack of noise from the transmitter or by a continuous glow of the neon indicator if the transmitter is adjusted for automatic operation. (Test plug removed from manual key jack.) To start the motor, operate the "ON-OFF" switch several times or jar the transmitter case slightly. If necessary, jar the case at the same time the switch is operated.

Note

In actual tactical operation the complete antenna system, including the counterpoise ribbons, is abandoned after use. If for training purposes or in an emergency it is necessary to rewind counterpoise ribbons, see directions which follow.

b. REWINDING COUNTERPOISE RIBBONS.

(1) To rewind a reel after operation, open the large flap on the side of the transmitter carrying case, insert the rewinding tool into the proper opening in the counterpoise cover plate, and turn in the direction indicated by the arrow.

(2) As the ribbons are rewound, straighten them with one hand and at the same time even the edges of the four ribbons so they will enter the slot in the case as one ribbon.

SECTION IV THEORY OF OPERATION

1. GENERAL.

This equipment is designed to transmit a non-directional, c-w signal in the frequency range of 1450 to 1700 kilocycles. Any one of 12 code letters may be transmitted at intervals of 30 seconds for a period of 2 hours. The electrical functioning of this equipment is comparatively simple since only one tube is used.

2. DETAILED FUNCTIONING.

a. The electron coupled oscillator circuit which is designed to cover the frequency range of 1300 to 1700 kilocycles uses a Jan 6V6GT/G tube. The grid coil assembly, T-101, and the antenna coil assembly, T-102, are tuned by means of variable iron cores. A slotted end shaft on the front panel permits tuning the grid circuit to the desired frequency. The antenna control on the front panel permits varying the antenna coil core in order to match the oscillator tube to the antenna.

b. The plate of the oscillator tube is connected directly to the B+ supply through the primary of the antenna tank coil. Resistors R-102 and R-103 serve as dropping resistors for the screen circuit and, together with capacitor C-105 and capacitor C-107, provide a filter for the screen circuit.

c. The heater of the tube is directly connected to the 7.5-volt "A" battery supply through switch S-101.

d. The motor, B-101, receives its power directly from the 7.5-volt "A" supply through switch S-101. The motor turns the code disc which opens and closes the keying switch in the high voltage circuit of the transmitter. The switch is opened and closed at intervals corresponding to the character of certain code letters.

e. The neon indicator bulb, visible on the front panel, indicates maximum radiation when it is brightest. The light also serves to indicate transmitter operation.

f. Connection to the external battery supply is provided through a cable, with a four-prong plug attached, which passes through the front panel.

g. Resistors R-104 and R-105 are current limiting resistors. They are connected into the B+ circuit, when testing the transmitter, in order to reduce the current drain on the battery supply.

b. The battery power supply, 675 volts "B" voltage and 7.5 volts "A" voltage, is housed in a separate case that has two 4-prong sockets to which external connections may be made. Connection to the socket, marked "START," provides power for the first 20 minutes of operation after which connection is made to the socket marked "BOOSTER." This latter connection brings ad-

ditional batteries into the circuit and provides sufficient power for the remainder of the transmission period.

i. The transmitting antenna is of the *flat top* type, arranged in the form of a "T," and consisting of three wires, 50 feet in length, connected together electrically at the center. Connection to the transmitter is provided by means of a single lead connected to the center of the flat top.

j. An artificial ground system is used. This is a counterpoise system composed of sixteen 25-foot ribbons. These ribbons are laid out with equal space between them, since the area of the counterpoise must be at least equal to that of the flat-topped portion of the antenna to prevent loss of radiated energy.

SECTION V

MAINTENANCE AND REPAIR

1. GENERAL.

The equipment requires little maintenance or repair. Replacement of parts will usually be confined to the replacement of jumper wires or to the installation of a new counterpoise reel. (See fig. 5-1.) Additional jumper wires for "A" and "B" battery connections are provided in the maintenance parts kit to replace jumpers that may be lost when new batteries are installed in the battery case.

2. PRE-USE INSPECTION.

The procedure for pre-use inspection is the same as that outlined in section II, paragraph 1.

3. SALVAGE INSPECTION.

This inspection is performed on equipment which has been salvaged for possible re-use.

a. Examine carrying bag noting condition of straps, felt padding, and zipper fastened covers.

b. Examine both battery and transmitter case for evidences of external damage.

c. Unwind counterpoise ribbons. Look for torn spots in ribbons.

d. Perform operating test as outlined in section II, paragraph 3.

4. TROUBLE CHART.

The following chart gives information on common troubles encountered, their cause and remedy.

Note

This equipment should be serviced only where a Frequency Meter Set SCR-211-(*) is available.

Trouble	Cause	Remedy
Transmitter dead; no output	Discharged battery pack.	Replace battery pack.
Transmitter operating at incorrect frequency	Open connections to batteries.	Make proper connections.
No B + voltage	Misadjustment of grid circuit tuning control.	Readjust tuning control (see sec. II).
	Open connection to four-prong plug on transmitter.	
	Completely discharged batteries due to possible shorted capacitors.	Check connection and repair if necessary.
Low B + battery voltage	Battery partially discharged due to age or operation.	Check capacitor for short; replace if necessary.
No A - voltage	Open connections to the "A" section of the battery pack or a discharged battery.	Replace battery.
Motor does not start		Make proper connection or
Neon light glows continuously on automatic operation	Keying switch defective.	Replace "A" battery.
		Operate "ON-OFF" switch several times. Jar the case as switch is operated.
		Replace keying switch. (See par. 10 this section.)

* Any issue letter is applicable.

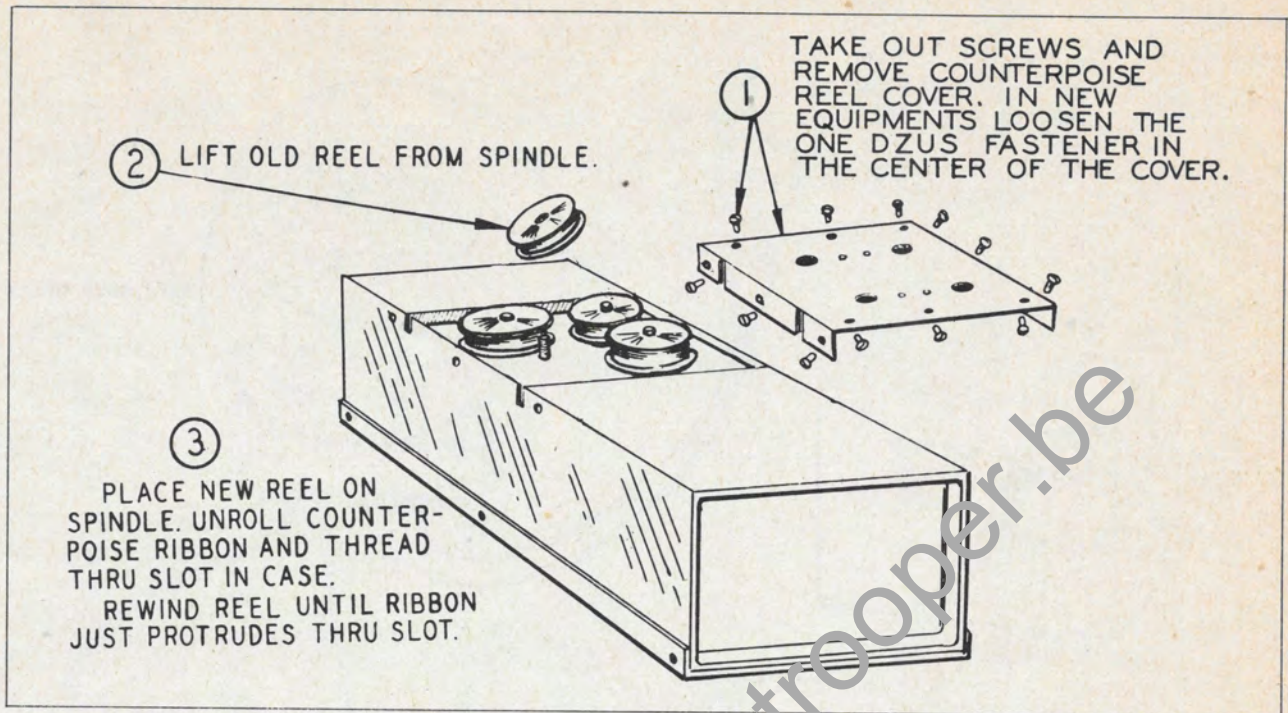


Figure 5-1. Installation of New Counterpoise Ribbon.

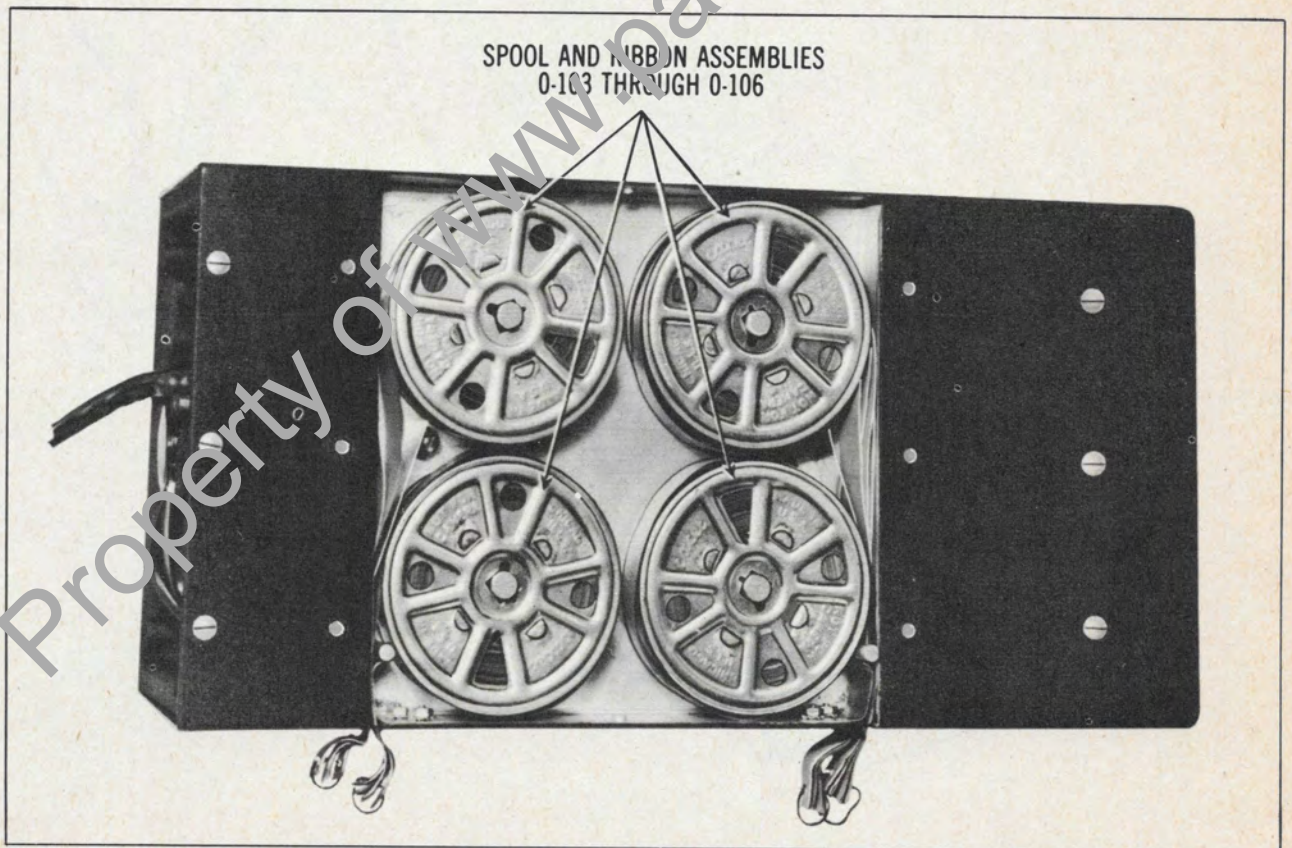


Figure 5-2. Counterpoise Reels

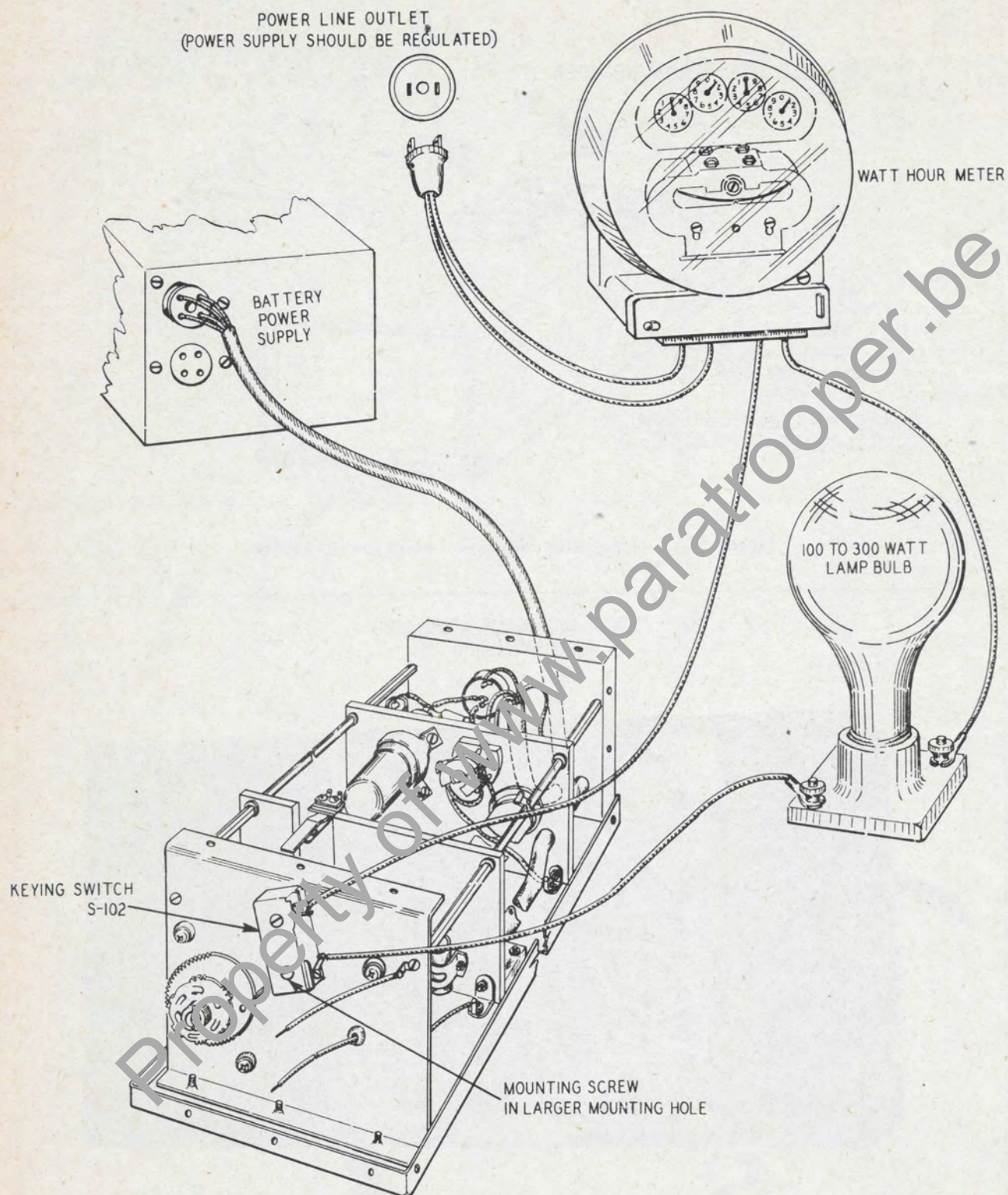


Figure 5-3. Connections for Timing the Keying Switch

5. VOLTAGE MEASUREMENTS (DEPOT TEST).

WARNING

Handle disassembled equipment carefully to prevent shocks from the B+ voltage supply. Even after battery supply is disconnected capacitors may retain a charge that will be dangerous.

a. Wherever possible, voltage measurements made at the tube socket and other points in the transmitter should be made on a 1000-volt scale with a 1000-ohm-per-volt meter.

b. A table of voltage and current data is given below. (See figs. 5-5 and 5-6 for location of parts.) All measurements were made with a 1000-ohm-per-volt meter.

WARNING

The "ON-OFF" switch on the transmitter control panel controls only the "A" battery voltage. The "B" voltage (675 volts) is present in the transmitter whenever the battery cable is connected to the battery power supply.

Measurement	Point of Measurement	Reading
Oscillator tube plate voltage	Tube socket terminal No. 3	675 volts
Oscillator tube screen voltage	Tube socket terminal No. 4	300 volts
Oscillator tube cathode voltage	Tube socket terminal No. 8	0 volts
Battery cable B +	Battery cable lead red and black tracer	675 volts
Battery cable A -	Battery cable lead grey tracer	-7.5 volts
Battery cable B -	Battery cable lead blue tracer	0 volts
Battery cable A +	Battery cable lead blue tracer	0 volts
B - battery current	Meter inserted in series with battery socket and battery cable plug terminals No. 2	38 ma.

6. RESISTANCE AND CONTINUITY MEASUREMENTS (DEPOT TEST).

a. Before making resistance and continuity measurements, disconnect the battery and discharge all capacitors by shorting them. Leave tube in socket. (See figs. 5-5 and 5-6 for location of parts.)

b. Use an ohmmeter that allows readings to be taken near the center or lower side of the scale.

c. Short the prods of the ohmmeter together and adjust for zero before taking measurements. Do this for each range used.

d. The following table gives approximate resistances that would be encountered when measuring between the tube socket and ground as well as to the battery plug.

CAUTION

Discharge all capacitors to the transmitter frame before taking measurements. They may retain a charge that will injure the ohmmeter.

Measurement	Point of Measurement	Reading Ohms
Tube socket terminal to ground	Tube socket terminal No. 1	0
	Tube socket terminal No. 2	0
	Tube socket terminal No. 3	No reading
	Tube socket terminal No. 4	No reading
	Tube socket terminal No. 5	100,000
	Tube socket terminal No. 6	No reading
	Tube socket terminal No. 7	2
	Tube socket terminal No. 8	0
Tube socket to battery plug	Tube socket terminal No. 3 to battery plug No. 2	3.1
	Tube socket terminal No. 4 to battery plug No. 2	100,000
	Tube socket terminal No. 7 to battery plug No. 4 (Switch S-101 closed)	0
	T-101	
Grid winding	*C-101 and C-102 connection to white	.244
Plate winding	*Red-Blue to white	.0835
T-102		
Primary	*Red tracer to Red-Blue tracer	3.1
Secondary	*Antenna jack to white	.334

* Colors shown are those of wire connected to terminal.

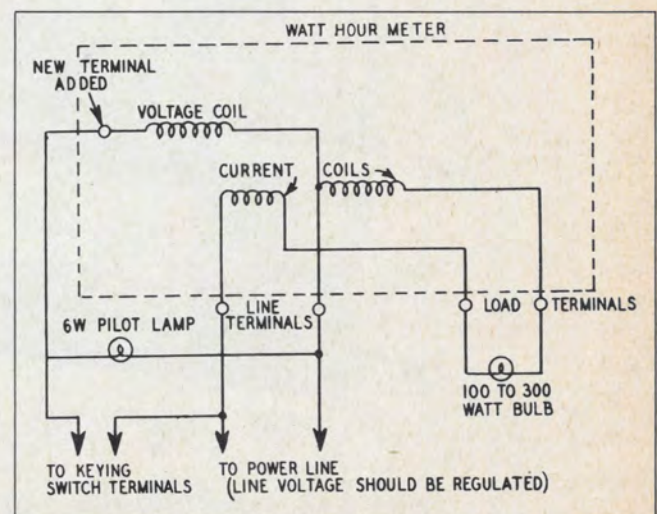


Figure 5-4. Alternate Keying Switch Test Setup

RESTRICTED
AN 08-30CRN4-2

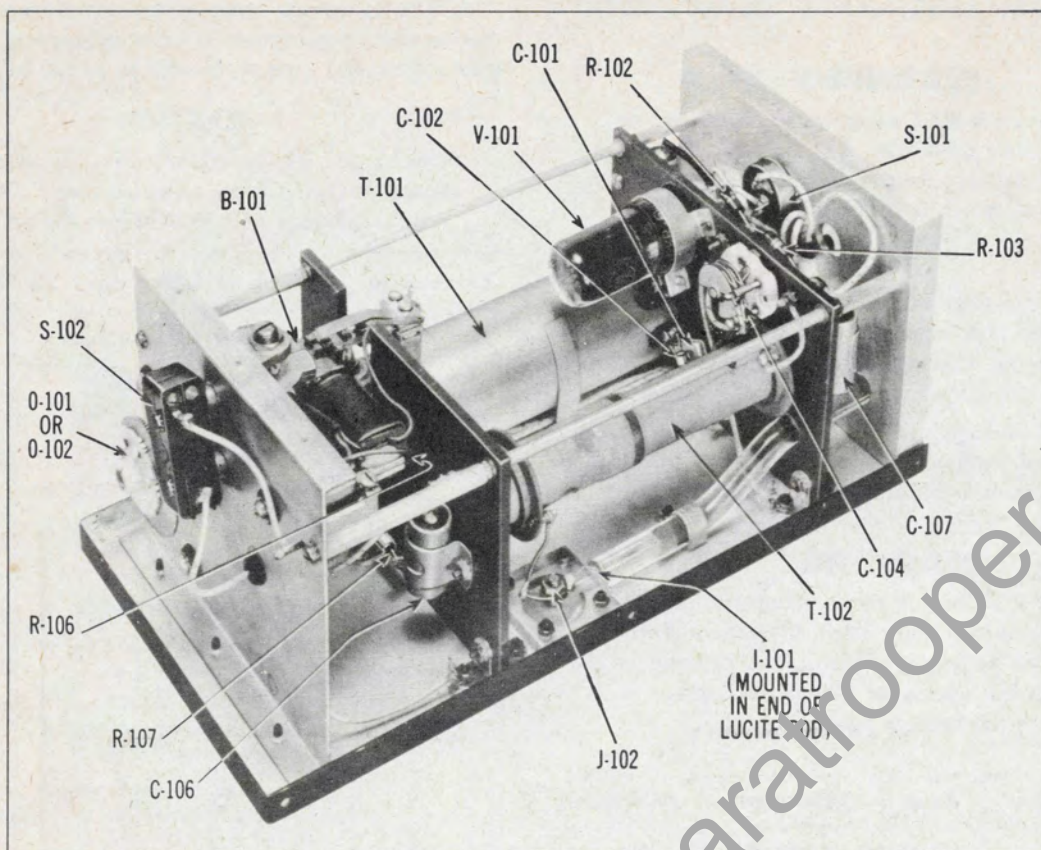


Figure 5-5. Radio Transmitter T-59/CRN-4—View of Left Side of Chassis

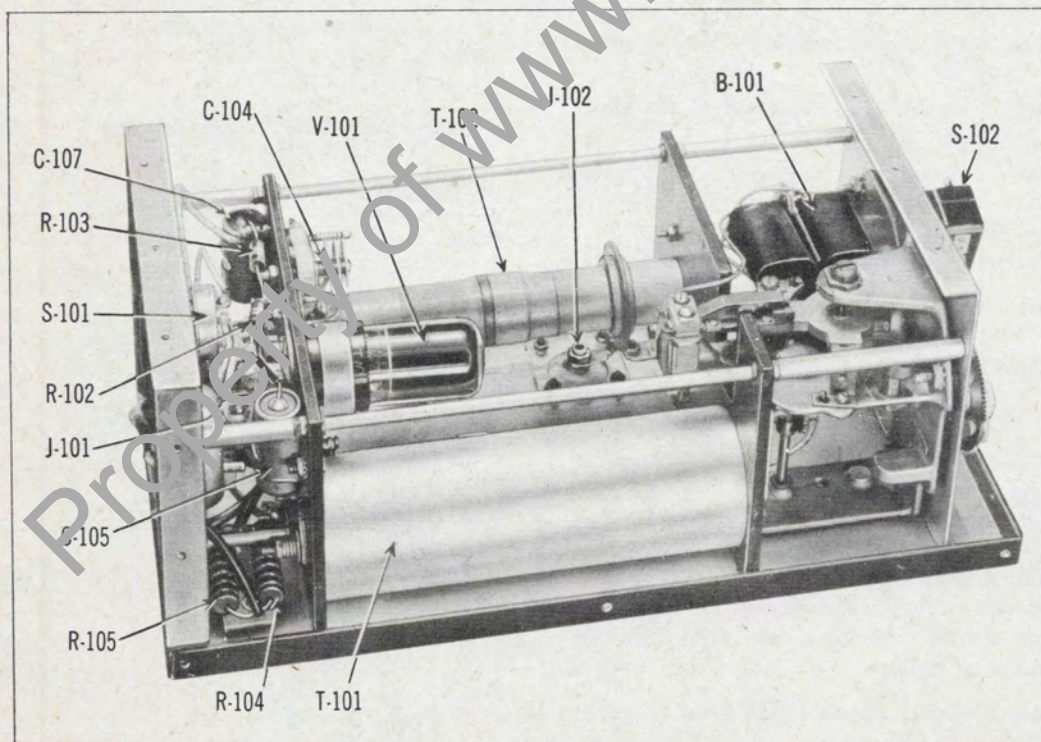


Figure 5-6. Radio Transmitter T-59/CRN-4—View of Right Side of Chassis

RESTRICTED

7. INSTALLATION OF SPARE COUNTERPOISE REEL.

If it becomes necessary to replace any one of the counterpoise ribbons, it will be necessary to replace the entire reel assembly to which the ribbon is attached. (See figs. 5-1 and 5-2.) To make this replacement proceed as follows:

- a. Remove the 12 binding head screws that hold the counterpoise cover plate to the side of the transmitter case. In some models, this plate may be removed by turning the Dzus fastener a quarter turn counterclockwise.
- b. Lift the cover plate from the transmitter case and lift the defective reel from the spindle on which it is mounted.
- c. Pull the ribbons out of the slot in the side of the transmitter case.
- d. Place the new reel on the spindle.
- e. Pull the end of the ribbons from the reel and thread them through the slot in the side of the transmitter case.
- f. Replace the cover plate.

8. REPLACEMENT OF CODE DISCS.

- a. Two different code discs are supplied in the maintenance parts kit.
- b. The code disc, marked with the numerals "68," is to be used whenever it is necessary to transmit any one of the letters Q, M, O, Y, K, or X.
- c. For the letters S, B, T, W, G, or R, use the code disc marked "73."
- d. The procedure to follow when replacing a code disc or selecting a code letter is given in section II, paragraph 2.

9. SELECTION OF TRANSMISSION FREQUENCY.

The frequency on which the transmitter is to operate may be adjusted by means of the control marked "OSC" on the control panel and Frequency Meter Set SCR-211-(*). The procedure for such adjustment is given in section II, paragraph 2b.

10. REPLACEMENT OF KEYING SWITCH.

- a. INSTALLING THE SWITCH.
 - (1) Unscrew all the cadmium-plated screws in the transmitter case and lift the cover off.
 - (2) Disconnect the switch from the transmitter circuits by unsoldering the switch leads at the terminal lugs.
 - (3) Remove the two mounting bolts and lift the switch from the transmitter.
 - (4) Mount the new switch with the same mounting bolts and sandpaper washers.
 - (5) Do not connect the leads to the switch terminals until the switch position is adjusted for the correct keying action.

b. ADJUSTING SWITCH FOR CORRECT KEYING ACTION (TIMING PROCEDURE).

(1) ADJUSTMENT USING FREQUENCY METER SET SCR-211-(*).

- (a) Rotate the keying disc and vary the position of the switch so that the switch contacts close when the switch lever arm is half way up the incline of the teeth on the keying disc.
- (b) To check, turn the transmitter on and listen to the signal with Frequency Meter Set SCR-211-(*).
- (c) At the same time, observe the neon indicator through the front panel.
- (d) Make any small adjustment in the position of the keying switch to give a 50 percent "on" and 50 percent "off" operation of the transmitter.

(e) Tighten the keying switch mounting bolts.

(2) ADJUSTMENT USING A WATT-HOUR METER, A LAMP AND A STOP WATCH.

- (a) Disconnect any wires in the transmitter which are connected to the keying switch terminals.
- (b) Reconnect the keying switch in series with a suitable load and the load terminals of the watt-hour meter. A 100- to 300-watt lamp bulb may be used depending on the type of watt-hour meter used. (See fig. 5-5.)
- (c) Connect the other terminals of the watt-hour meter to the proper power supply outlet.
- (d) Connect the transmitter battery plug to a suitable power supply. (The battery pack supplied with the equipment may be used.)
- (e) Turn on the power to both the watt-hour meter and the transmitter.
- (f) Hold the switch contacts on the keying switch closed.
- (g) With a stop watch, accurately determine the time required for five revolutions of the watt-hour meter disc. Designate this time as "T."
- (h) Allow the contacts of the keying switch to spring open.
- (i) Again determine the time required for five revolutions of the watt-hour meter disc. The time thus determined should be between "1.4 T" and "1.5 T."
- (j) If the time is found to be too long take the following steps:
 1. Push the switch closer to the keying disc.
 2. Tighten the mounting screws.
 3. Recheck the timing as above.
- (k) If further adjustment is necessary, again loosen the mounting screw and move the switch.
- (l) If the time is found to be too short, move the switch away from the keying disc and tighten the switch mounting screw.

* Any issue letter is applicable.

(m) Recheck the time interval as before.

(n) A summary of the procedure outlined above is as follows:

1. Suppose the time found for the watt-hour meter disc to complete five revolutions with the keying switch closed is 15 seconds.

2. With this figure for the five revolutions of the watt-hour meter disc with closed switch contacts, the correct time for five revolutions with the switch contacts operating is between "1.4 T" to 1.5 T." This is between 21 and 22.5 seconds.

3. However, suppose that the time when measured is found to be only 19 seconds. It is then evident that the time measured for five revolutions of the watt-hour meter disc with the contacts operating is not equal to "1.4 T" to "1.5 T" and is too short.

4. Therefore, loosen the switch mounting bolts and move the switch away from the keying disc.

5. If the time is over 22.5 seconds, move the switch closer to the keying disc.

6. After the keying switch is adjusted, recheck the time as before, and, if necessary, make further adjustments in order to obtain the correct timing.

(3) ALTERNATE METHOD OF USING WATT-HOUR METER.

(a) The time arrived at for "1.4 T" to "1.5 T" by the procedure in paragraph 10b(2) this section will not be exactly correct due to the thermal lag of the load lamp filament.

(b) A more accurate method of timing the action of the keying switch is to use the test setup as shown in figure 5-4.

(c) This method involves three additional steps as follows:

1. Disconnect the voltage coil of the watt-hour meter from the line terminal.

2. Solder a wire of suitable length to the end of the voltage coil, and bring it out of the meter for connection to the keying switch terminals.

3. Connect a 6-watt pilot lamp across the voltage coil.

Note

The pilot lamp serves to limit the current flow through the voltage coil. If it is not used the coil may burn out.

(d) The procedure for timing the keying switch with this alternate setup is the same as the procedure outline in paragraph 10b, this section.

SECTION VI SUPPLEMENTARY DATA

1. SUMMARY.

a. Radio Transmitting Equipment AN/CRN-4 uses one JAN6V6GT/G tube as an oscillator and amplifier. The equipment transmits any one of 12 code letters at 30 second intervals for a period of 2 hours.

b. The frequency range extends from 1300 to 1700 kilocycles. Frequency stability is within 2.5 kilocycles.

c. Peak output current is 15 amperes at 1700 kilocycles when matched to a 245-micromicrofarad antenna.

d. A battery pack provides the 675-volt "B" supply and the 7.5-volt "A" supply. The total "B" current drain on the battery pack is about 38 milliamperes. The total "A" current drain is about 0.650 amperes.

2. OPERATION OF FREQUENCY METER SET SCR-211-(*).

Note

Instructions which follow cover 20 models in the Frequency Meter Set SCR-211-(*) series. They are: Frequency Meter Sets SCR-211-A, SCR-211-B, SCR-211-C, SCR-211-D, SCR-211-E, SCR-211-F, SCR-211-J, SCR-211-K, SCR-211-L, SCR-211-M, SCR-211-N, SCR-211-O,

SCR-211-P, SCR-211-Q, SCR-211-R, SCR-211-AA, SCR-211-AC, SCR-211-AE, and SCR-211-AF. Some of these models are electrically and mechanically identical; others differ in detail but not in general purpose. For convenience in reference in this handbook, an asterisk (*) enclosed in parentheses is used in place of the suffix letters (e.g., "-A," "-B," "-C," etc.) of the different models and their components in the series. However, when information is applicable only to a specific equipment, or component, the appropriate suffix letter is used.

a. PURPOSE OF EQUIPMENT.—Frequency Meter Set SCR-211-(*) (composed of Frequency Meter BC-221-(*) and Crystal Unit DC-9-(*)), is an instrument designed to measure the frequency of radio waves. It is portable and self-contained. The set can be used either in a laboratory or in the field for calibrating radio transmitters and receivers or for measuring any frequency within range of 125 to 20,000 kilocycles. The 1000-kilocycle crystal contained is used to calibrate the meter's heterodyne oscillator at a number of points in each band.

Note

For greatest accuracy, perform all operations in

the shortest possible time. Otherwise changes in voltage or temperatures may cause the frequency meter to drift. However, turn on the power switch and plug in the headset at least 10 minutes before the meter is to be used.

b. CORRECTING FREQUENCY METER BC-221-(*) TO CALIBRATION.—Preparatory to using the frequency meter, proceed as follows:

(1) Push the plug of the headset into the "PHONES" jack.

(2) Turn the "POWER" switch to the "ON" position and allow the tubes to heat for 10 minutes. (On Frequency Meters BC-221-M, BC-221-P, BC-221-T, BC-221-AA, and BC-221-AE the power switch is incorporated in the "OFF-CRYSTAL OPERATE-CHECK" switch.)

(3) Turn the crystal oscillator on in the check position as follows: on Frequency Meters BC-221-A, BC-221-C, BC-221-D, BC-221-F, BC-221-J, BC-221-K, and BC-221-L turn the "CRYSTAL" switch to the "ON" position; on Frequency Meters BC-221-M, BC-221-O, BC-221-P, BC-221-R, BC-221-T, BC-221-AC, and BC-221-AF turn the "HET. OSC.-XTAL CHECK-XTAL ONLY" switch to the "XTAL CHECK" position; on Frequency Meters BC-221-B, BC-221-E, BC-221-N, BC-221-AA, and BC-221-AE turn the "OFF-CRYSTAL-OPERATE-CHECK" switch to the "CHECK" position.

(4) Turn the "FREQ. BAND" switch to "LOW" if the desired frequency value is between 124 and 2000 kilocycles, and to "HIGH" if the desired frequency value is between 2000 and 20,000 kilocycles.

(5) Open the calibration book to the page listing the desired frequency. At the bottom of this page, the nearest crystal check point (refer to par. 3, this section) will appear in red and the associated dial setting in black.

(6) Set the main tuning dial (refer to par. 2f, this section) to correspond with the appropriate dial setting found according to instructions in paragraph 2b(5), above.

(7) Rotate the "GAIN" control clockwise about half way or until a sound is heard in the headset.

(8) Turn the "CORRECTOR" control until exact zero beat is obtained.

Note

Do not disturb the "CORRECTOR" control adjustment from here on. When correcting the heterodyne oscillator to calibration, numerous beat points will be heard.

c. TUNING A TRANSMITTER TO A DESIRED FREQUENCY VALUE.—The method of tuning a transmitter to a desired frequency value consists of zero beating the transmitter signal with the proper heterodyne oscillator signal.

(1) Correct the heterodyne oscillator to calibration at the crystal check point nearest to the desired frequency value as explained in paragraph 2b, this section.

(2) Depending upon the model being used, set the switches in the following positions:

* Any issue letter is applicable.

(a) On Frequency Meters BC-221-A, BC-221-C, BC-221-D, BC-221-F, BC-221-J, BC-221-K, and BC-221-L set the "CRYSTAL ON-OFF" switch to the "OFF" position.

(b) On Frequency Meters BC-221-M, BC-221-O, BC-221-P, BC-221-R, BC-221-T, BC-221-AC and BC-221-AF, set the "HET. OSC.-XTAL CHECK-XTAL ONLY" switch to the "HET. OSC." position.

(c) On Frequency Meters BC-221-B, BC-221-E, BC-221-N, BC-221-AA, and BC-221-AE, set the "OFF-CRYSTAL-OPERATE CHECK" switch in the "OPERATE" position.

(3) From the calibration book, determine the dial setting for the desired frequency.

(4) Turn the main tuning dial to the correct dial setting. Lock the dial.

(5) Loosely couple the frequency meter antenna to the transmitter output and tune the transmitter to give an audible sound in the headset. Adjust the "GAIN" control to obtain a comfortable volume in the headset.

(6) Tune the transmitter to zero beat with the frequency meter. The transmitter is now radiating at the same frequency value as the frequency meter.

d. USE OF THE CALIBRATION BOOK.

(1) FINDING THE MAIN TUNING DIAL SETTING FOR A GIVEN FREQUENCY.

(a) Open the book to the page on which the main tuning dial settings for a particular frequency are listed. Use index of frequencies listed at the top of the page as an aid in locating the correct page.

(b) Look down the right-hand columns until the desired frequency is found. Look along the same line to the left to find the correspondingly correct dial setting.

(2) FINDING THE FREQUENCY FOR A GIVEN MAIN TUNING DIAL SETTING.

(a) Open the book to the page in the calibration book on which the main tuning dial setting is listed. Use the index of dial settings listed at the top of each page as an aid in locating the correct page.

(b) Look down the left-hand column of dial settings until the dial setting nearest the desired setting is

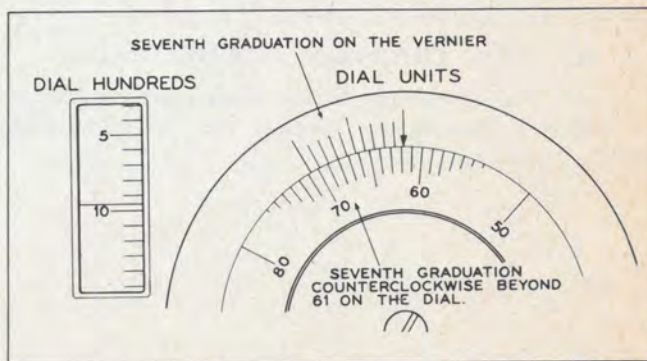


Figure 6-1. Frequency Meter Set SCR-211-(*)
—Main Tuning Dial Scale

found. Look along that same line to the appropriate column of frequencies and find the corresponding frequency.

(3) DETERMINING INTERMEDIATE VALUES BETWEEN LISTED FREQUENCIES.

(a) The error introduced by merely reading the nearest frequency listed instead of splitting the difference, does not exceed 0.025 percent in the high band, or 0.04 percent on the low band.

(b) If an accuracy equal to or better than 0.012 percent on the high band and 0.02 percent on the low band is desired, compute mid-points between the listed values and read the frequency or the dial setting as a listed point or a mid-point, whichever is closer.

e. MEASURING THE FREQUENCY OF A LOCAL TRANSMITTER, APPROXIMATE VALUE KNOWN.

(1) Correct the heterodyne oscillator to calibration at the crystal check point nearest the approximate frequency as explained in paragraph 1, this section.

(2) Depending upon the model being used, set the switches in the following positions:

(a) On Frequency Meters BC-221-A, BC-221-C, BC-221-D, BC-221-F, BC-221-J, BC-221-K, and BC-221-L set the "CRYSTAL ON-OFF" switch to the "OFF" position.

(b) On Frequency Meters BC-221-M, BC-221-O, BC-221-P, BC-221-R, BC-221-T, BC-221-AC, and BC-221-AF, set the "HET. OSC. - XTAL CHECK - XTAL ONLY" switch in the "HET. OSC. - XTAL CHECK - XTAL ONLY" switch in the "HET. OSC." position.

(c) On Frequency Meters BC-221-B, BC-221-E, BC-221-N, BC-221-AA, and BC-221-AE, set the "OFF - CRYSTAL-OPERATE-CHECK" switch in the "OPERATE" position.

(3) Loosely couple the meter to the transmitter. Turn the main tuning dial to the frequency to be checked by turning the tuning dial from the low frequency end to the high frequency end of the dial and obtain zero beat at the unknown frequency.

(4) Open the calibration book to the dial setting found according to the directions in paragraph 2c, this section, and read the corresponding frequency.

f. READING THE MAIN TUNING DIAL.

(1) The adjustment of the main tuning capacitor is indicated directly by reading the "DIAL HUNDREDS" control.

(2) One revolution of the "DIAL UNITS" control advances the "DIAL HUNDREDS" control one division. This subdivides each division on the "DIAL HUNDREDS" control into 100 parts.

(3) A vernier (see fig. 6-1) is provided to subdivide each division accurately on the "DIAL UNITS" control. To read the vernier, observe which graduation on the vernier scale aligns with a graduation on the "DIAL UNITS" control. Start with the arrow as zero, count over to this graduation. The resulting number expresses in tenths, the fraction of a "DIAL UNITS" division.

(4) For example, observe the dial setting in figure 6-1. The setting is as follows:

Dial	Setting
"DIAL HUNDREDS"	0900
"DIAL UNITS"	61.
Vernier	0.7
Correct reading	0961.7

(5) Before using the frequency meter for actual measurements, practice on the dial until settings can be established or read off quickly and accurately.

g. ZERO BEAT.

(1) When two signals of slightly different frequencies are combined (such as in the detector circuit of the frequency meter) a signal results whose frequency is equal to the difference between the original two. This is called the beat frequency.

(2) When the beat frequency is a few thousand cycles or less, it is in the audible range and can be heard in a headset.

(3) As the frequencies of the two signals come closer together, the beat frequency becomes lower. Thus, the whistle or tone heard in the headset decreases in pitch.

(4) When the frequencies of the two signals become nearly equal, a continuous series of muffled beating sounds is heard in the headset.

(5) When these sounds disappear and there is complete silence in the headset, the frequencies of the two signals are exactly equal. This is the point of zero beat.

(6) As the tuning dial is rotated slowly to either side of the zero beat point, muffled beating sounds are heard and then the tone rises in pitch.

3. RMA COLOR CODES.

The RMA Color Codes for resistors and capacitors are given below.

FOR CAPACITORS (MMFD)				
COLOR	NUMERAL	VOLTS	MULTIPLIER	TOLERANCE
BLACK	0		1	
BROWN	1	100	10	1%
RED	2	200	100	2%
ORANGE	3	300	1,000	3%
YELLOW	4	400	10,000	4%
GREEN	5	500	100,000	5%
BLUE	6	600	1,000,000	6%
VIOLET	7	700	10,000,000	7%
GRAY	8	800	100,000,000	8%
WHITE	9	900	1,000,000,000	9%
GOLD		1000	0.1	5%
SILVER		2000	0.01	10%
NO COLOR		500		20%

FOR RESISTORS (OHMS)			
COLOR	A 1st DIGIT	B 2nd DIGIT	C MULTIPLIER
SILVER			0.01
GOLD			0.1
BLACK		0	1.0
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
PURPLE	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	
D — TOLERANCE CODE:			
GOLD = 5% SILVER = 10% NO COLOR = 20%			
OLD COLOR ARRANGEMENT			
NEW COLOR ARRANGEMENT			
BODY COLOR (NEW COLOR ARRANGEMENT ONLY) INDICATES TYPE OF RESISTOR, AS FOLLOWS:—			
BLACK — COMPOSITION, NON-INSULATED			
TAN, OLIVE OR WHITE — COMPOSITION, INSULATED			
DARK BROWN — WIRE-WOUND, INSULATED			

4. TABLE OF COMPONENT PARTS.

The following table is for reference only, since none of the parts listed are available from depots for repair of the equipment.

TABLE OF COMPONENT PARTS

MODEL Radio Transmitting Equipment AN/CRN-4

MAJOR ASSEMBLY: Radio Transmitter T-59/CRN-4

Reference Symbol	Name of Part and Description	Function
101-199 Series	RADIO TRANSMITTER T-59/CRN-4: Transmitter proper in metal case, 12.687" x 6.250" x 5.000" high; includes canvas carrying bag, CW-25/CRN-4 and Antenna Assembly AS-85/CRN-4 with masts; "On-Off" switch and other controls located on front panel.	
B-101	MOTOR ASSEMBLY: Complete; includes timer switch and code disc assembly.	Key operation

TABLE OF COMPONENT PARTS

MODEL: Radio Transmitting Equipment AN/CRN-4

MAJOR ASSEMBLY: Radio Transmitter T-59/CRN-4

Reference Symbol	Name of Part and Description	Function
C-101	CAPACITOR: Fixed; silvered mica; 550 micromicrofarads; $\pm 5\%$.	Oscillator fixed tuning capacitor
C-102	CAPACITOR: Fixed; ceramic; 50 micromicrofarad; $\pm 10\%$; temp. coeff., $-.00075$; body .460" x .160" dia.	Oscillator fixed tuning compensating capacitor
C-103	CAPACITOR: Fixed; silvered mica; 225 micromicrofarad; $\pm 5\%$; 500 volts DCW; part of T-101.	Control grid coupling
C-104	CAPACITOR: Variable; minimum capacity, more than 2.0 micromicrofarad; effective capacity, less than 5.0 micromicrofarad; ceramic base; screw driver adjustment shaft with locking nut; must withstand 200 hr. salt spray test.	Neutralizing capacitor
C-105	CAPACITOR: Fixed; tubular; 2 layers, .0010" paper; .013 microfarad; $+20\%$ (measured at 60 cycle frequency) 1000 volts DCW; body; 1.375" long x .687" dia., two 2.625" #19 dead soft, tinned copper wire, pigtail type leads one each end; mounting clamp attached.	Screen grid bypass
C-106	CAPACITOR: Same as C-105.	Key filter
C-107	CAPACITOR: Same as C-105.	B+ bypass
I-101	NEON LAMP: Nominal watts, NE-2; starting voltage, 65 AC, 90 DC; overall length, 1.062" tapering at end x .260" dia.; two 1.062" leads at one end; unbased; average life 3000 hrs.	Resonance indicator
J-101	PHONE JACK: Single pin type.	B— to resistor test circuit connector
J-102	BANANA JACK: Single pin type; with mtg. nut and terminal.	Antenna connector
*O-101	CODE DISC ASSEMBLY: Aluminum disc and rubber cutouts for code letters K, M, O, Q, X and Y; cadmium plated.	Code letter selector
*O-102	CODE DISC ASSEMBLY: Same as O-101, except cutouts for code letters B, G, R, S, T and W.	Same as O-101
*O-103	SPOOL AND RIBBON ASSEMBLY: Four 25 ft. brass ribbons; wound on spool similar to standard 0.16, 16 MM. picture projector reel; .750" x 2.875" O.D., 1.187" O.D. of core; cad. plated.	Counterpoise
P-101	PLUG: 4-prong; mica filled bakelite; overall dimensions .406" x 1.125" dia., with molded finger grip; nickel plated, brass contacts; length, .531"; contacts 1 and 4, .156" dia., 2 and 3 .125" dia.	Battery connector
P-102	FLAT PHONE PLUG: Single pin type.	B— to resistor test circuit connector
R-101	RESISTOR: Fixed; carbon; 100,000 ohms; $\pm 10\%$; 0.5 watt; insulated; 2 pigtail type leads; part of T-101.	Control grid resistor
R-102	RESISTOR: Fixed; carbon; 50,000 ohms; $\pm 10\%$; 1.0 watt; insulated; 2 pigtail type leads.	Screen resistor
R-103	RESISTOR: Same as R-102.	Screen resistor
R-104	RESISTOR: Fixed; carbon; 25,000 ohms; $\pm 10\%$; 2.0 watt; insulated; 2 pigtail type leads.	Current limiting resistor
R-105	RESISTOR: Same as Ref. No. R-105.	Current limiting resistor
R-106	RESISTOR: Fixed; carbon; 4000 ohms; $\pm 10\%$; 1.0 watt; insulated; 2 pigtail type leads.	Motor filter
R-107	RESISTOR: Same as R-106.	Key filter
S-101	SWITCH: Rotary; S.P., S.T.; knob control shaft.	Transmitter unit "ON-OFF" control
*S-102	KEY SWITCH: S.P., S.T.; contacts normally open; leaf arm actuator; bakelite case.	Transmission interrupter key

* Item designated with one asterisk in the Reference Symbol Column is included in the group of maintenance parts.

TABLE OF COMPONENT PARTS

MODEL: Radio Transmitting Equipment AN/CRN-4

MAJOR ASSEMBLY: Radio Transmitter T-59/CRN-4

Reference Symbol	Name of Part and Description	Function
T-101	OSCILLATOR COIL ASSEMBLY: Two windings; #90 —44 S.S.E. "A" litz wire; grid winding 30½ turns, tapped at 3 turns; inductance at 1000 cycles in air, 13.0 millihenries; ±1%; Q, greater than 105 at 2.5 megacycles; DC resistance, 0.244 ohms ±10%; plate winding 8¾ turns; inductance at 1000 cycles in air 3.0 millihenries; ±1%; Q, greater than 30 at 4.5 megacycles; DC resistance 0.0835 ohms ±10%; total inductance of coil 23 millihenries; ±5%; wax impregnated.	Tunes transmitter unit to desired frequency
T-102	ANTENNA COIL ASSEMBLY: Two winding; primary 23 turns #36 S.S.E. wire; inductance at 1000 cycles in air 19 millihenries; ±1.0%; Q greater than 50 at 2.1 megacycles; DC resistance 3.1 ohms ±10%; secondary 37 turns #90-44 S.S.E. litz wire; inductance; at 1000 cycles in air 21 millihenries; greater than 200 at 3.1 megacycles; DC resistance .334; ±10%; mutual inductance, primary to secondary 9 millihenries ±5%; coefficient of coupling 45.0% ±10%; wax impregnated.	Tunes output circuit to oscillator frequency
V-101	TUBE: Glass; beam power amplifier; octal base; heater; 6.3 volts, 0.45 amp.	Power oscillator

MODEL: Radio Transmitting Equipment AN/CRN-4

MAJOR ASSEMBLY: Miscellaneous Hardware

*H-101	ADJUSTING TOOL: C.R. steel screw driver tip one end; extension pin other end; cadmium plated.	Spool and ribbon assembly winding and coil adjustment tool
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MODEL: Radio Transmitting Equipment AN/CRN-4

MAJOR ASSEMBLY: Battery Box CY-83/CRN-4

201-299	BATTERY BOX CY-83/CRN-4: Unit cover in metal case, 12.625" x 6.250" x 5.000" high; includes battery jumper cable assemblies and canvas carrying Bag CY-20/CRN-4.	
*W-201 thru W-204	"A" BATTERY JUMPER CABLE ASSEMBLY: 2" approx., #18 stranded, tinned copper wire; blue tracer; flame proof lacquer finish; 1000-volt rating; one eyelet terminal each end.	Interconnecting lead for "A" batteries
*W-205 thru W-219	"B" BATTERY JUMPER CABLE ASSEMBLY: 2" approx., #20 stranded, tinned copper wire; red black tracer; flame proof lacquer finish 5000 volt rating; one male snap fastener on end one female snap fastener other end.	Interconnecting lead for "B" batteries

* Item designated with one asterisk in the Reference Symbol Column is included in the group of maintenance parts.

SECTION VII
DRAWINGS

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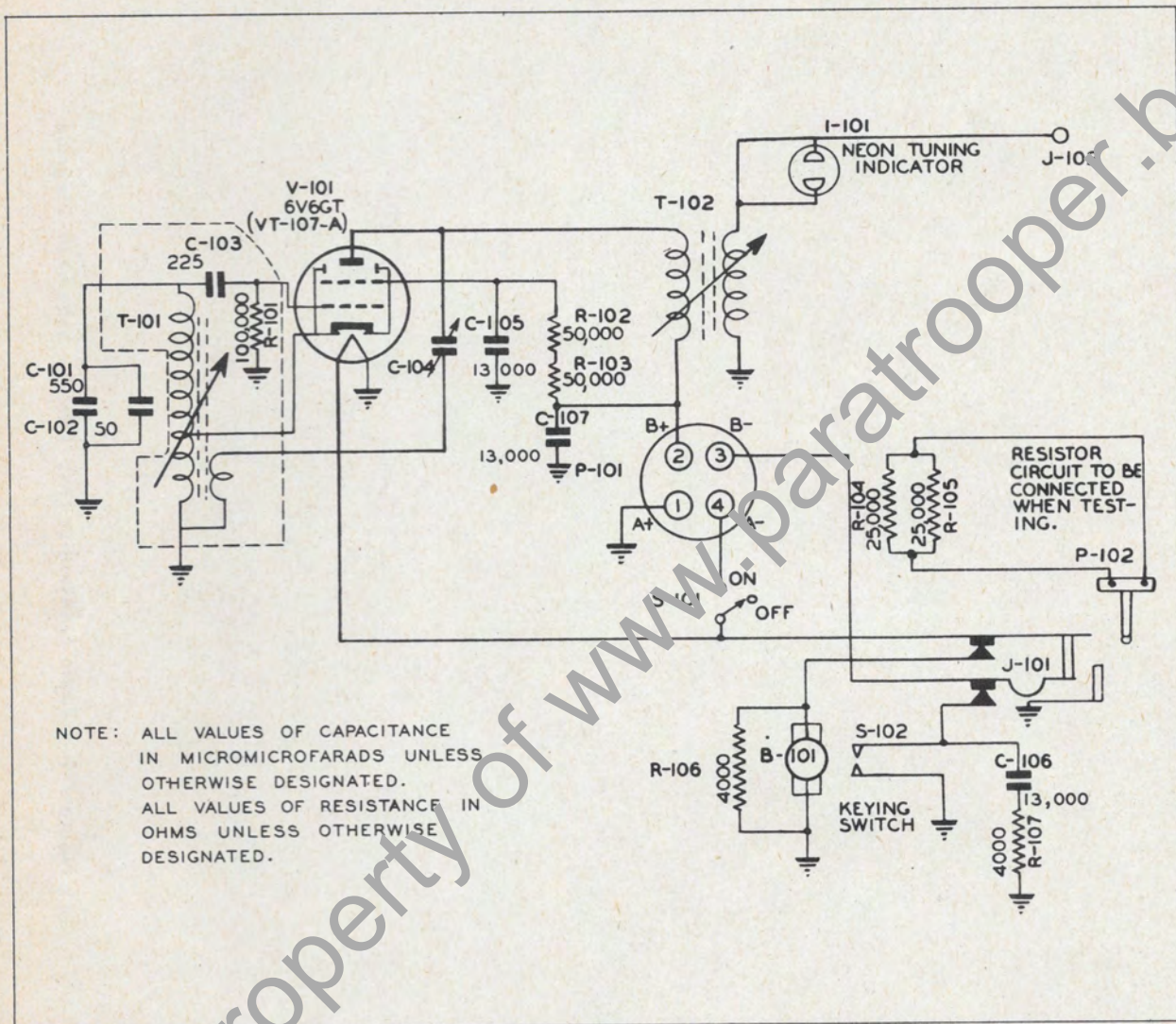
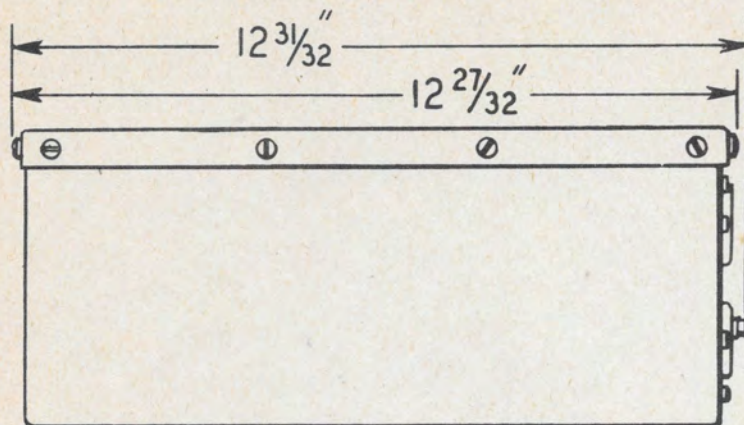
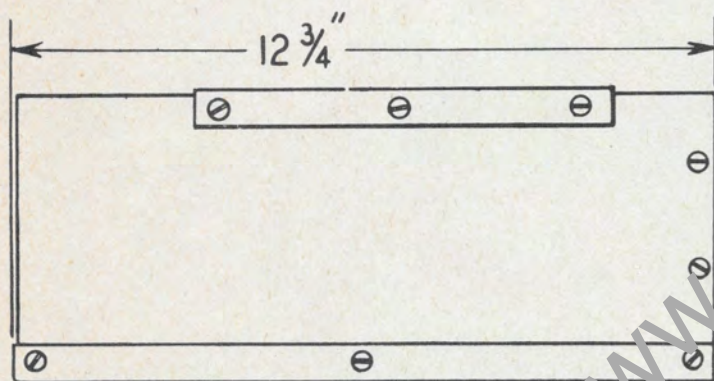
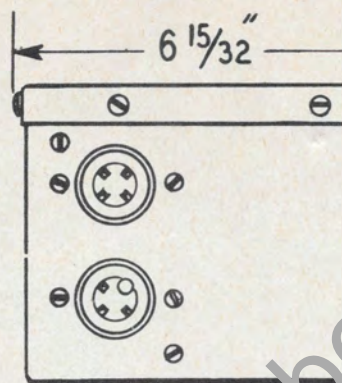


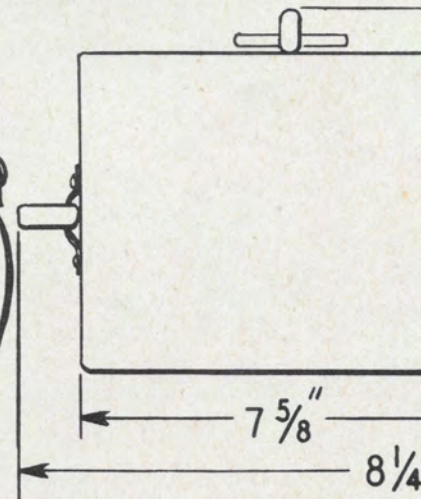
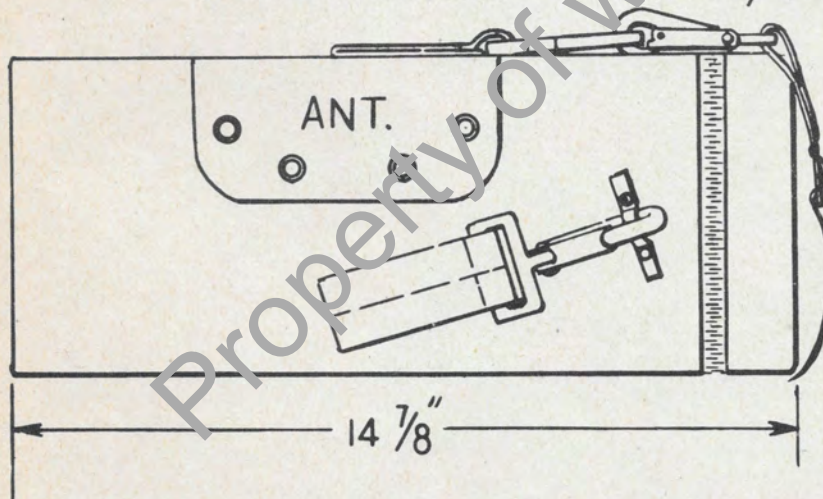
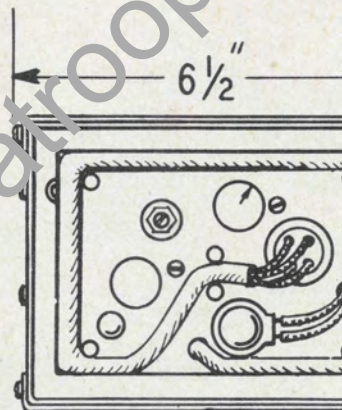
Figure 7-1. Radio Transmitter T-59/CRN-4—Schematic Diagram



BATTERY BOX
CY-83/CRN-4



RADIO TRANSMITTER T-59/CRN-4



BAG, CW-25/CRN-4 (TRANSMITTER)
USE SAME DIMENSIONS FOR BAG, CW-26/CRN-4 (BATTERY)

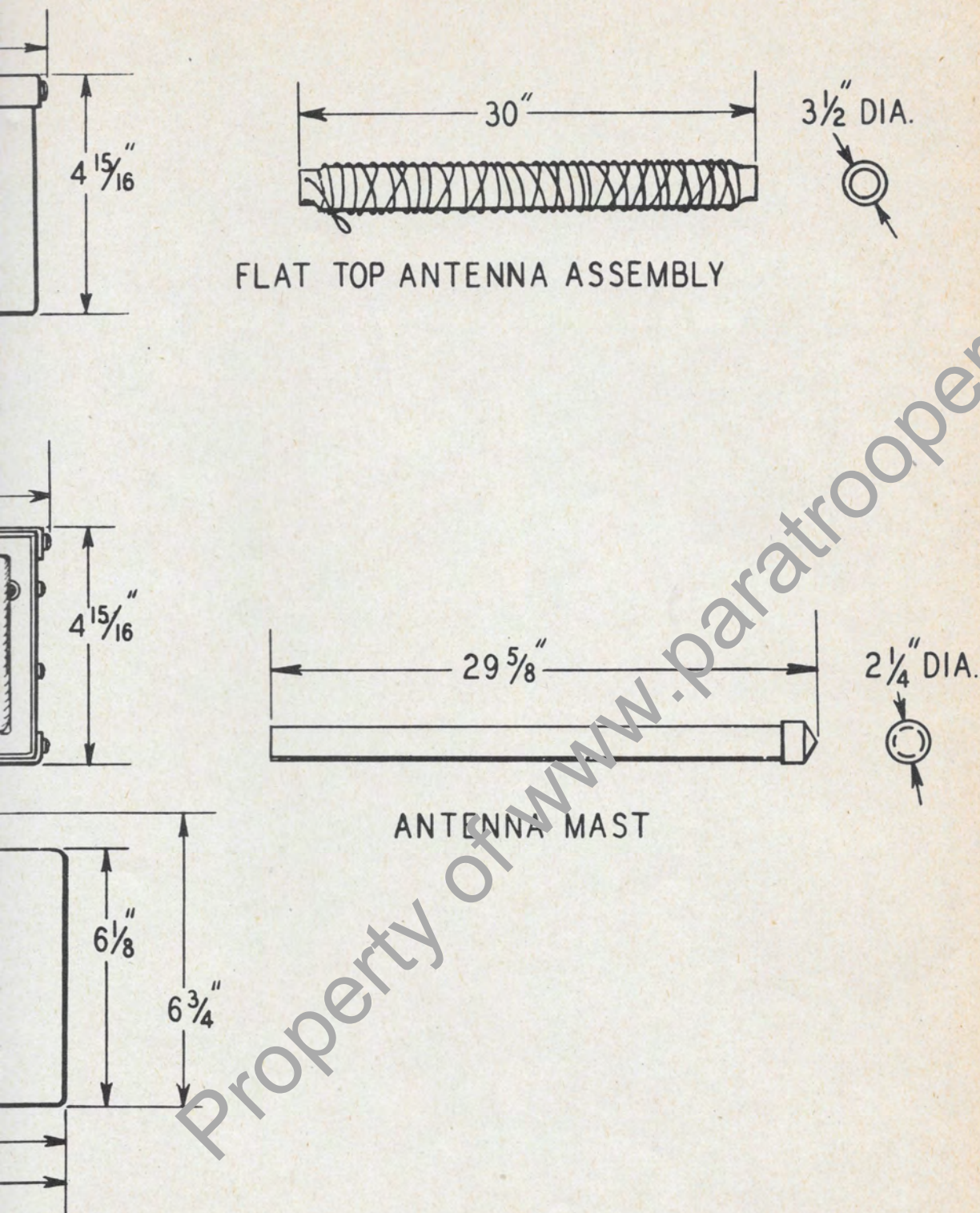


Figure 7-2. Radio Transmitting Equipment AN/CRN-4—Outline Dimensions