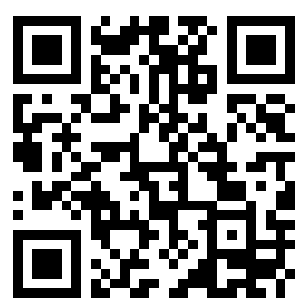

TM 11-1077

WAR DEPARTMENT TECHNICAL MANUAL

RADIO TRANSMITTING SET AN/CRN-11

RESTRICTED. DISSEMINATION OF RESTRICTED MATTER. The information contained in restricted documents and the essential characteristics of restricted materiel may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or to the press except by authorized military public relations agencies. (See also par. 28, AR 380-5, 15 March 1944.)

WAR DEPARTMENT *3 AUGUST 1944*

WAR DEPARTMENT TECHNICAL MANUAL

TM 11-1077

This technical manual supersedes Tentative TM 11-1077 (26 May 1944)

RADIO TRANSMITTING SET AN/CRN-11

WAR DEPARTMENT *3 AUGUST 1944*

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WAR DEPARTMENT
Washington 25, D. C., 3 August 1944.

TM 11–1077, War Department Technical Manual, Radio Transmitting Set AN/CRN-11, is published for the information and guidance of all concerned.

[A. G. 300.7 (19 Jan. 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

DISTRIBUTION:

Armies (Sig) (5); Sv C (Sig) (5); Depts (Sig) (5); Def C (Sig) (2); D (2): *Tech Sv (2); Arm & Sv Boards (2); Posts, Camps & Stas (2); ROTC (5); Sp Sv Schs (10); T of Opns (5); Base C (5); Sig C Dep (2); Gen Oversea, SOS Dep (Sig Sec) (2); Sig C Labs (2); Sig C Rep Shs (2); PE (Sig) (2)

*IBn 1, 11 (2); IC 11 (5).

IBn 1: T/O & E 1–300–1; 1–310–1; 1–312; 1–317; 1–420–1; 1–447.

IBn 11: T/O & E 11–15; 11–95.

IC 11: T/O & E 11–18; 11–97; 11–107; 11–127; 11–237; 11–287; 11–587; 11–597.

For explanation of symbols, see FM 21–6.

WARNING!

HIGH VOLTAGE

is used in the operation of

this equipment

DEATH ON CONTACT

may result if operating personnel

fail to observe safety precautions

RADIO TRANSMITTING SET AN/CRN-11

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LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

DESTRUCTION NOTICE

When in imminent danger of capture
DESTROY EVERYTHING

WHY — To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN — When ordered by your commander, or when in immediate danger of capture.

HOW — 1. *Smash* — Use sledges, axes, hand-axes, pick-axes, crow-bars, heavy tools.

2. *Cut* — Use axes, hand-axes, machetes, etc.

3. *Burn* — Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. *Explosives* — Use firearms, grenades, TNT.

5. *Disposal* — Bury in slit trenches, fox holes, other holes. Throw into streams. Scatter.

USE ANYTHING AVAILABLE FOR DESTRUCTION
OF THIS EQUIPMENT

WHAT — 1. *Smash* — Crystals, tubes, transformers, meters, switches, resistors, capacitors, insulators, gasoline engine, fuel tanks, fuel lines.

2. *Cut* — Antenna loops and intercommunication cables.

3. *Burn* — Everything possible, including instruction manual and all papers pertaining to operation of the equipment.

4. *Bend or break* — Chassis, cases, covers, handles.

5. *Bury or scatter* — Any or all of the above pieces after breaking.

DESTROY EVERYTHING

SAFETY NOTICE

Voltages used in this equipment are high enough to endanger life and may be fatal if contacted by operating personnel. Operators must be careful not to contact high-voltage plate circuits or a-c input connections while checking or servicing equipment.

NEVER depend upon the action of the interlock switches for safety. Disconnect all a-c voltages before making repairs or adjustments within any cabinet.

FIRST AID TREATMENT FOR ELECTRIC SHOCK

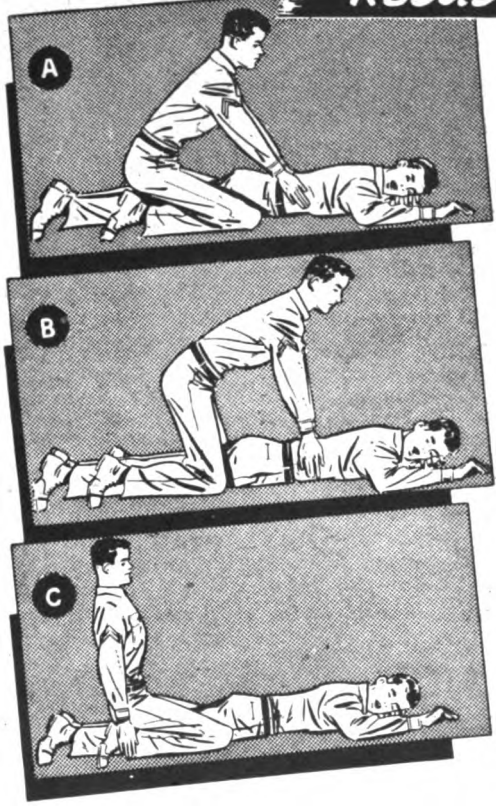
I. FREE THE VICTIM FROM THE CIRCUIT IMMEDIATELY.

Shut off the current. If this is not immediately possible, use a dry nonconductor (rubber gloves, rope, board) to move either the victim or the wire. Avoid contact with the victim. If necessary to cut a live wire, use an axe with a dry wooden handle. Beware of the resulting flash.

II. ATTEND INSTANTLY TO THE VICTIM'S BREATHING.

Begin resuscitation at once on the spot. Do not stop to loosen the victim's clothing. Every moment counts. Keep the patient warm. Wrap him in any covering available. Send for a doctor. Remove false teeth or other obstructions from the victim's mouth.

RESUSCITATION



POSITION

1. Lay the victim on his belly, one arm extended directly overhead, the other arm bent at the elbow, the face turned outward and resting on hand or forearm, so that the nose and mouth are free for breathing (fig. A).

2. Straddle the patient's thighs, or one leg, with your knees placed far enough from his hip bones to allow you to assume the position shown in figure A.

3. Place your hands, with thumbs and fingers in a natural position, so that your palms are on the small of his back, and your little fingers just touch his lowest ribs (fig. A).

FIRST MOVEMENT

4. With arms held straight, swing forward slowly, so that the weight of your body is gradually brought to bear upon the victim. Your shoulders should be directly over the heels of your hands at the end of the forward swing (fig. B). Do not bend your elbows. The first movement should take about 2 seconds.

SECOND MOVEMENT

5. Now immediately swing backward, to remove the pressure completely (fig. C).

6. After 2 seconds, swing forward again. Repeat this pressure-and-release cycle 12 to 15 times a minute. A complete cycle should require 4 or 5 seconds.

CONTINUED TREATMENT

7. Continue treatment until breathing is restored or until there is no hope of the victim's recovery. Do not give up easily. Remember that at times the process must be kept up for hours.

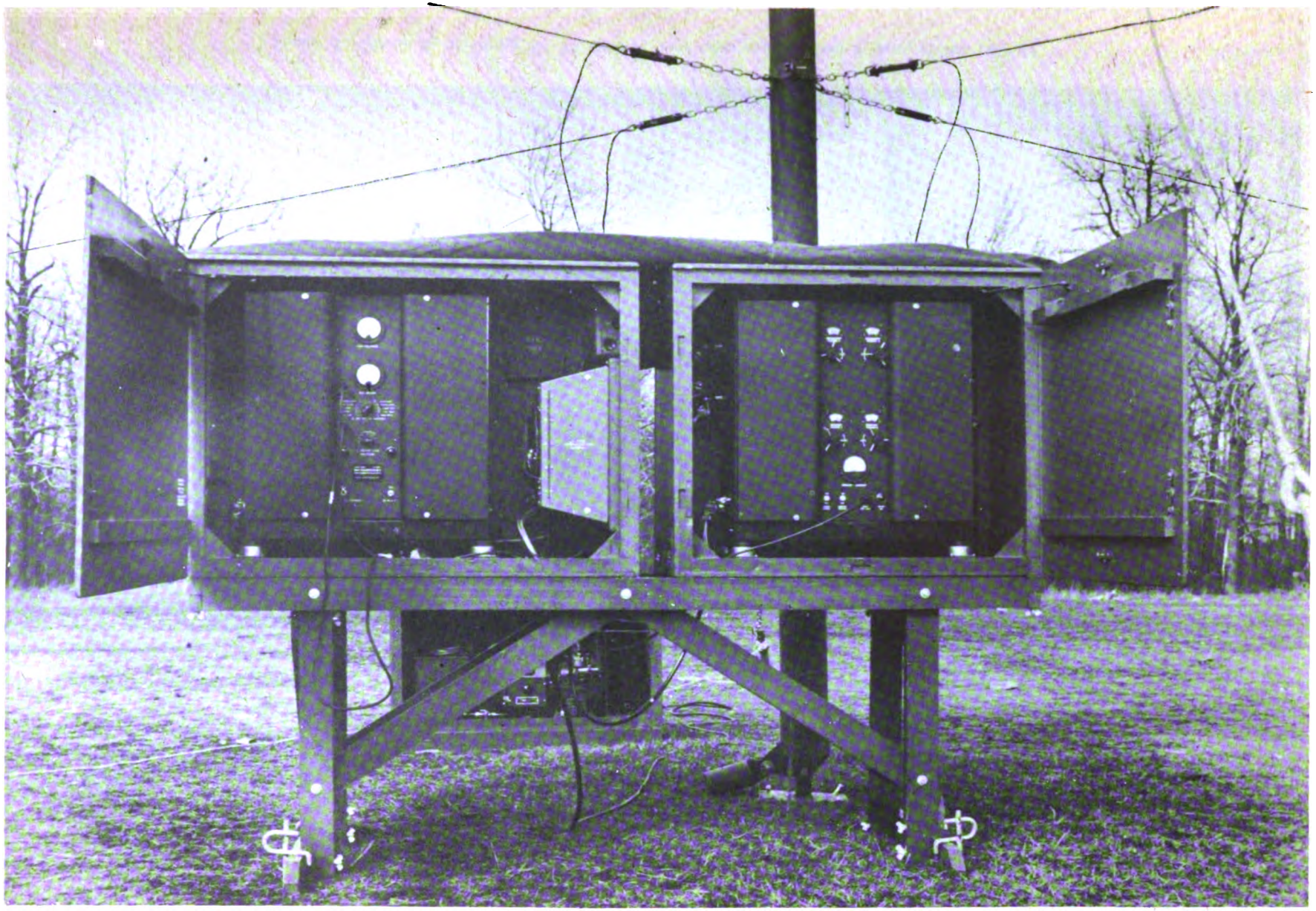
8. During artificial respiration, have someone loosen the victim's clothing. Wrap the victim warmly; apply hot bricks, stones, etc. Do not give the victim liquids until he is fully conscious. If the victim must be moved, keep up treatment while he is being moved.

9. At the first sign of breathing, withhold artificial respiration. If natural breathing does not continue, immediately resume artificial respiration.

10. If operators must be changed, the relief operator kneels behind the person giving artificial respiration. The relief takes the operator's place as the original operator releases the pressure.

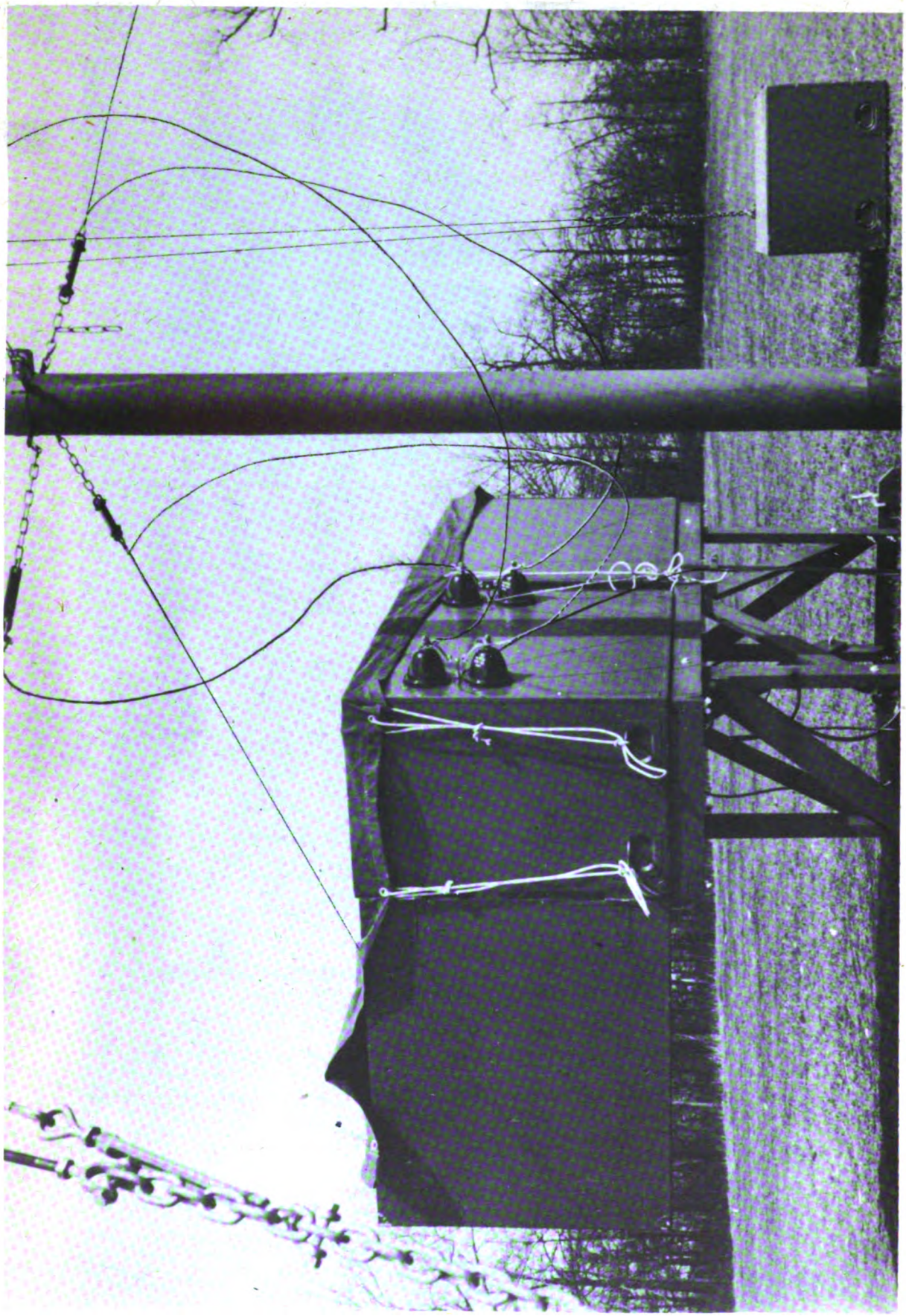
11. Do not allow the revived patient to sit or stand. Keep him quiet. Give hot coffee or tea, or other internal stimulants.

HOLD RESUSCITATION DRILLS REGULARLY



TI.-14601

Figure 1.—Radio Transmitting Set AN/CRN-11, set up for operation in the field.



TL-14602

Figure 2.—Radio Transmitting Set AN/CRN-11, rear view, and Antenna System AS-102/CRN-11.

This technical manual supersedes Tentative TM 11-1077 (26 May 1944)

Section I

DESCRIPTION

1. FUNCTION AND GENERAL DESCRIPTION

a. Purpose.—Radio Transmitting Set AN/CRN-11 serves as a normal radio range transmitter to guide aircraft or other suitably equipped vehicles on a predetermined course, and also provides one-way voice communication. It is intended for use under conditions where the equipment must be easily and quickly moved. The entire equipment can be carried in one medium-sized airplane and can be set up in approximately two hours. It can be operated alternately as follows:

(1) As a normal A-N tone modulated radio range.

(2) As a normal speech modulated, non-directional radio transmitter.

(3) As a remotely controlled, speech modulated, non-directional radio transmitter, using a remote microphone.

b. Frequency Range.—The equipment will transmit at any frequency from 200 to 400 kilocycles, as determined by the crystal used.

c. Power.—The equipment includes its own gasoline motor driven generator, delivering 115 volts, 60 cycles alternating current, with a nominal power output of approximately 750 watts. It can be operated also from any local power supply of the same capacity, voltage, and frequency, although such source must be provided with a proper receptacle for the twist-lock plug of the transmitter.

2. OPERATING CHARACTERISTICS

a.	Power supply	110-120 volts, 60 cycles, single-phase
b.	Power input	600 watts
c.	Power output, modulated 100%	50 watts, nominal
d.	Output frequency	200 to 400 kc
e.	Load	Two crossed loop antennas, coupled through Coupling Unit CU-38/CRN-11
f.	Temperature range	−15 C to + 50 C
g.	Frequency stability	0.01%
h.	Modulation tone frequency	700 cps or 1,100 cps

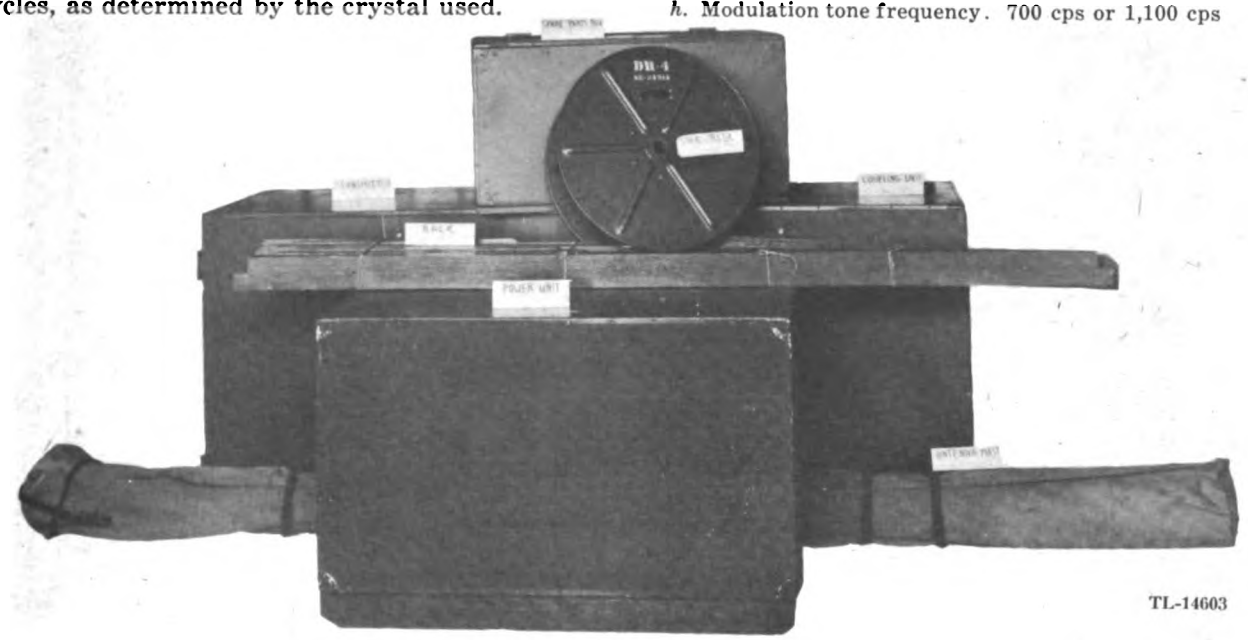


Figure 3.—Radio Transmitting Set AN/CRN-11, packed for air transport.

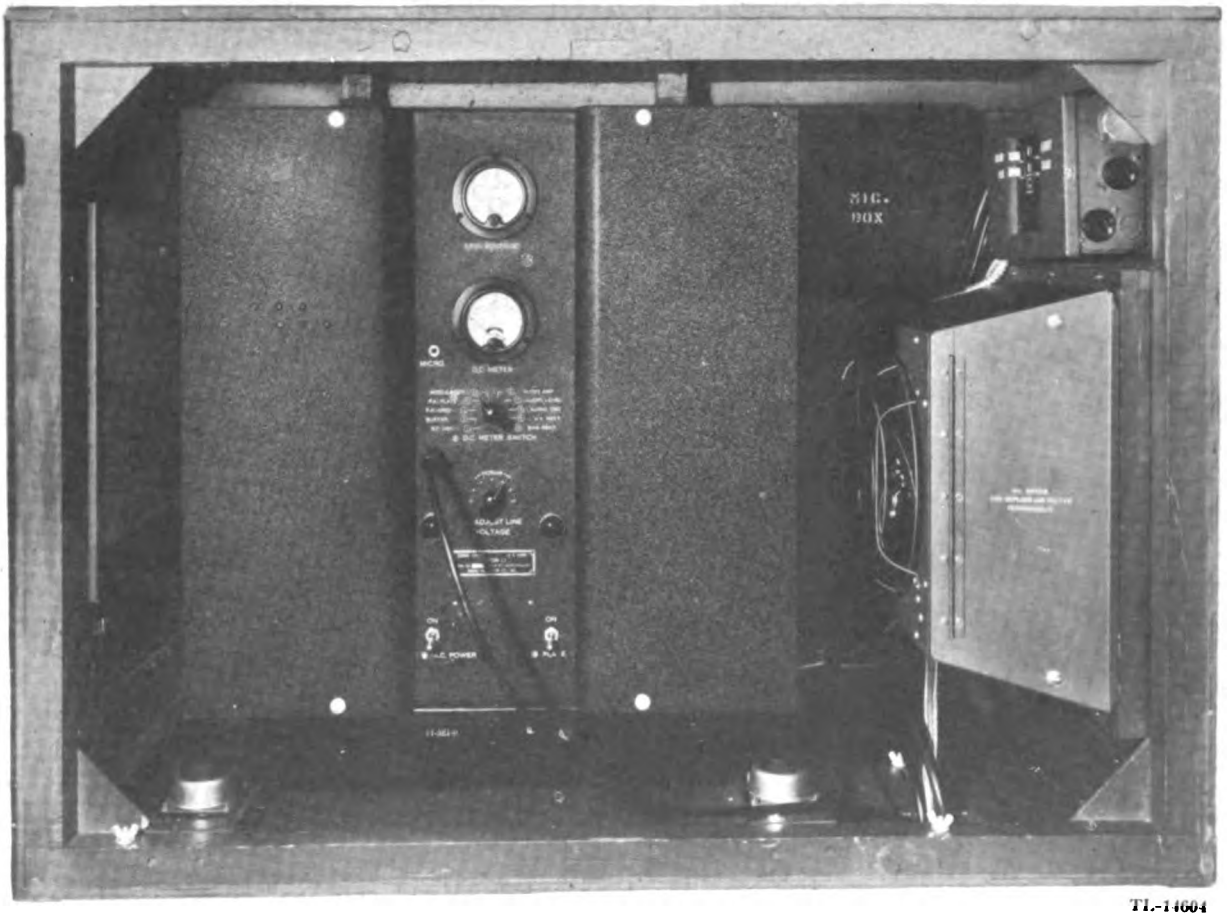


Figure 4.—Radio Transmitter T-65/CRN-11, in Cabinet CY-127/CRN-11.

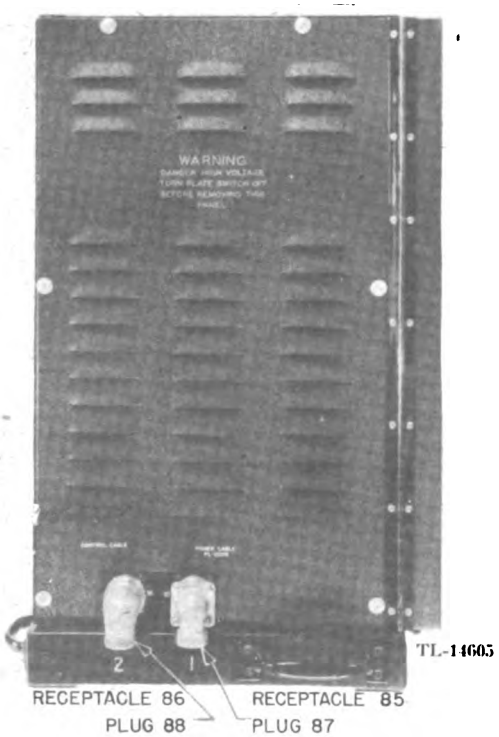


Figure 5.—Radio Transmitter T-65/CRN-11, left side, shield on.

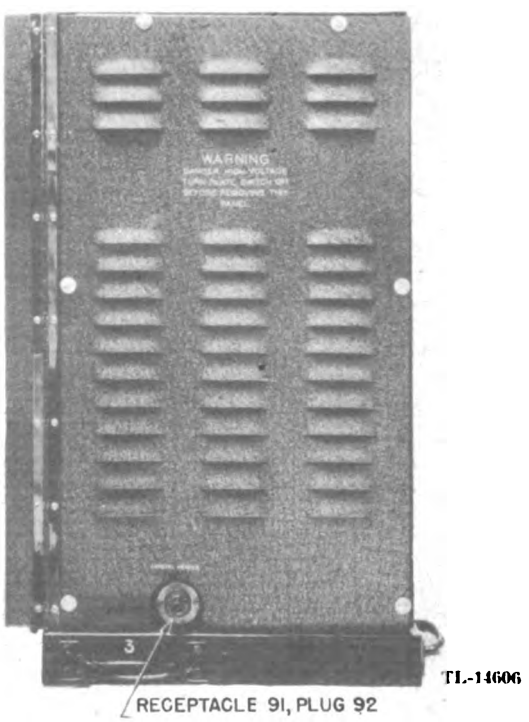


Figure 6.—Radio Transmitter T-65/CRN-11, right side, shield on.

3. MAJOR COMPONENTS OF EQUIPMENT

a. General.—Major components of the equipment consist of the following items which are either installed or packed in four cabinets, except for the antenna mast and short poles which are packed separately in a canvas bag, and the radio receiver which is packed in its own separate crate.

(1) 1 Radio Transmitter T-65/CRN-11, complete with tubes, installed in Cabinet CY-127/CRN-11 which contains also fan unit and power panel. (For export shipment power panel is contained in Spare Parts Cabinet CY-130/CRN-11.)
(2) 1 Coupling Unit CU-38/CRN-11, installed in Cabinet CY-128/CRN-11.
(3) 1 Antenna System AS-102/CRN-11.
(4) 1 Power Unit PE-236-A, installed in Cabinet CY-129/CRN-11, complete with fuel tank.
(5) 1 Radio Receiver Learadio RM-402-A*, packed in separate crate.
(6) 1 Headset P-18*, contained in Spare Parts Cabinet CY-130/CRN-11.
(7) 2 Microphone (Kellogg T-17), contained in Transmitter Cabinet CY-127/CRN-11.
(8) 1 Rack MT-222/CRN-11 upon which the cabinets containing the transmitter and the coupling unit are mounted upon installation.
(9) Spare parts for all components, contained in Cabinet CY-130/CRN-11.
(10) 1 Tool kit, contained in Spare Parts Cabinet CY-130/CRN-11.
(11) 1 Remote Microphone Jack Box, contained in Spare Parts Cabinet CY-130/CRN-11.
(12) 1 Canvas tarpaulin for covering the two cabinets containing the transmitter and coupling unit, contained in Spare Parts Cabinet CY-130/CRN-11 when not in use.
(13) 2 Technical Manual No. 11-1077, Radio Transmitting Set AN/CRN-11, contained in Spare Parts Cabinet CY-130/CRN-11.
(14) 2 Manual on Power Unit PE-236-A, contained in Spare Parts Cabinet CY-130/CRN-11.
(15) Alternately:
†(*a*) 1 Reel DR-4/CRN-11 containing 1,500 feet of 3-wire microphone cable.
-or-
‡(*b*) 1 Coil 300 feet of 3-wire microphone cable.
(16) Also required but not furnished:§
2 Crystal of suitable frequency in Holder FT-164.

*Shipped by contractor but not part of equipment supplied under contract.
†Supplied with Radio Transmitting Sets AN/CRN-11 of serial numbers 21 to 100 inclusive only.
‡Supplied with Radio Transmitting Sets AN/CRN-11 of serial numbers 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 16, 17, 18, 21, 22, 32, 33 only.
§Exceptions: Radio Transmitting Sets AN/CRN-11 of serial numbers 1 to 6 inclusive are accompanied by 20 crystals, and sets 7, 8, 10, 11, 12, 13 inclusive are accompanied by 40 crystals.

b. Weights and Dimensions.—Weights and dimensions of complete equipment as packed for air transport are as follows:

Item	Size	Displacement (cubic feet)	Weight (lb)
(1) Transmitter Cabinet CY-127/CRN-11	4′ long x 1′ 9″ wide x 3′ 2″ high	20.1	390
(2) Coupling Unit Cabinet CY-128/CRN-11	3′ 4″ long x 1′ 10″ wide x 2′ 10″ high	17.5	240
(3) Power Unit Cabinet CY-129/CRN-11	3′ 3″ long x 2′ 1″ wide x 2′ 5″ high	18	280
(4) Spare Parts Cabinet CY-130/CRN-11	3′ long x 2′ wide x 1′ 6″ high	8.9	360*
(5) Rack MT-222/CRN-11, with 7-foot tarpaulin pole	8′ long x 1′ wide x 6″ thick	4	46
(6) Antenna Mast Bag	11′ long x 7″ x 7″	2.0	93
(7) Radio Receiver Learadio RM-402-A	1′ 1½″ long x 1′ 2″ wide x 11¼″ high	2	46
(8) †Reel DR-4/CRN-11 containing 1,500 feet of cable	22″ diam. x 7″ thick	2	83

c. Detailed List.—Contents of each cabinet are listed in section II of this manual.

*Weight includes coil of microphone wire (paragraph 2*a*(15)(*b*), weighing 12 lb, shipped with Radio Transmitting Sets AN/CRN-11 of serial numbers 1 to 20 inclusive only.
†Shipped with Radio Transmitting Sets AN/CRN-11 of serial numbers 21 to 100 inclusive only.

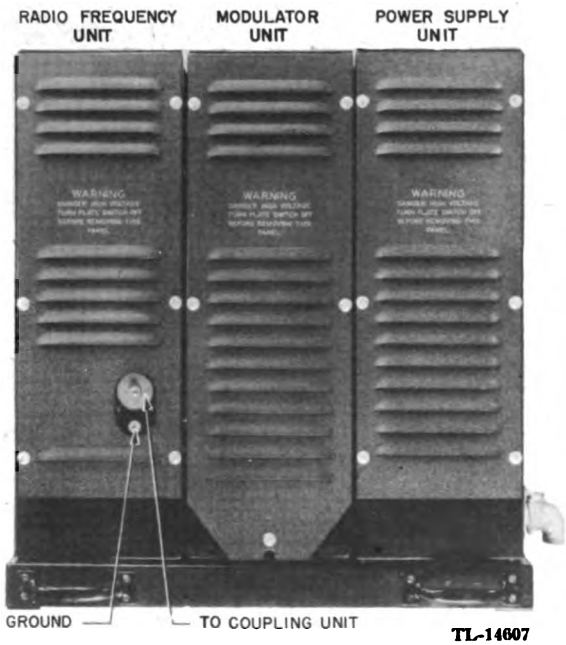


Figure 7.—Radio Transmitter T-65/CRN-11, rear view, shield on.

4. RADIO TRANSMITTER T-65/CRN-11
(Figs. 4 to 28 inclusive)

a. The transmitter is mounted by means of shock mountings (204-PHM-100) in Cabinet CY-127/CRN-11, with fan and power panel.

b. The fan and power panel are mounted to the inner right-hand side of the cabinet. The fan keeps the air moving through the cabinet and prevents over-heating. The power panel serves as junction box for the power and control lines. From the power panel box, cables run to the transmitter, the fan, and the coupling unit.

c. The transmitter consists of three welded frame assemblies mounted side by side on the mounting base with a clamping device at the top between the units. Doors cover the fronts of the two outside units, leaving the front panel of the middle unit exposed. Each of the frames is individually clamped to the mounting base by screw-operated clamps, which have spring locking devices, controlled by knobs on the front

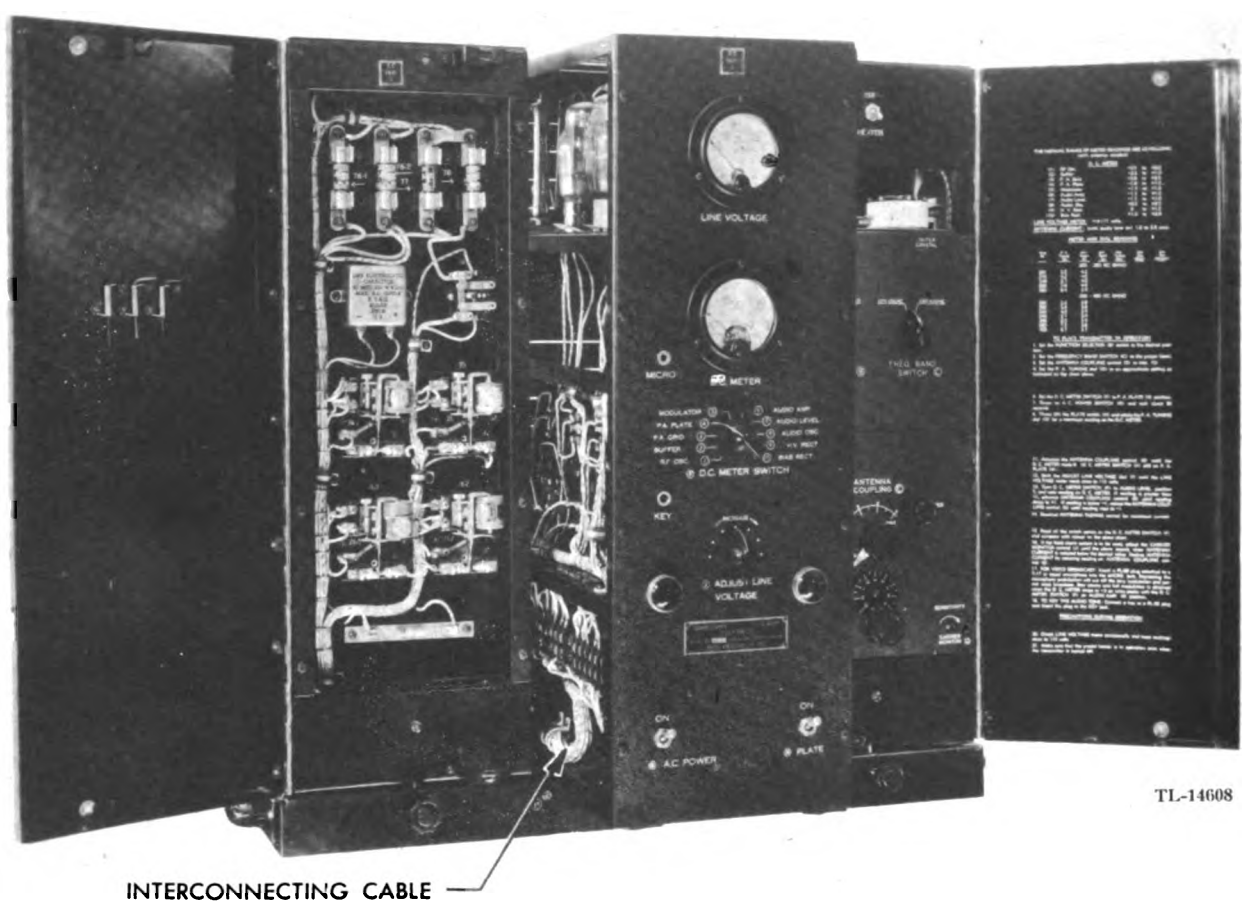


Figure 8.—Radio Transmitter T-65/CRN-11, front view, open for servicing.

apron of the base. Electrical interconnection between the units is made by cables which run from the two outer units to terminal boards on the middle unit. The cables rest in position underneath the units, and clearance is arranged so that the middle unit can be drawn forward its complete length without disconnecting the cables. This is provided to give adequate accessibility for servicing. In each of the units the vacuum tubes are mounted on the upper shelf which is made accessible by opening the hinged tops. The side of the outer units and the rear of all units are covered by shields held in place by snap fasteners.

d. The power supply unit or left-hand unit contains the high-voltage rectifier equipment, all power fuses, and all control relays. The fuses and relays are located on the front panel behind the left-hand door. Power and control line connections to the transmitter are made through AN type connectors on the lower left-hand side of the unit. The three high-voltage rectifier tubes are mounted on a shelf at the top of the unit.

e. The modulator unit or middle unit contains the audio and bias rectifier equipment. The power switches, meters, meter switch, and jacks for microphone and key are mounted on the exposed front panel. The audio oscillator, audio amplifier, modulator, audio monitor, and bias rectifier vacuum tubes, and a fuse for the d-c circuit meter are mounted on the tube shelf.

f. The radio-frequency unit or right-hand unit contains all the r-f elements except those necessary to resonate the antenna. The crystal oscillator is constructed as an integral unit in the removable shield box. This is provided to permit substitution of a master oscillator, should the transmitter be converted to mobile service. The front panel, which contains the tuning controls, is accessible behind the door. Connections to ground and to the coupling unit are made at the rear. A

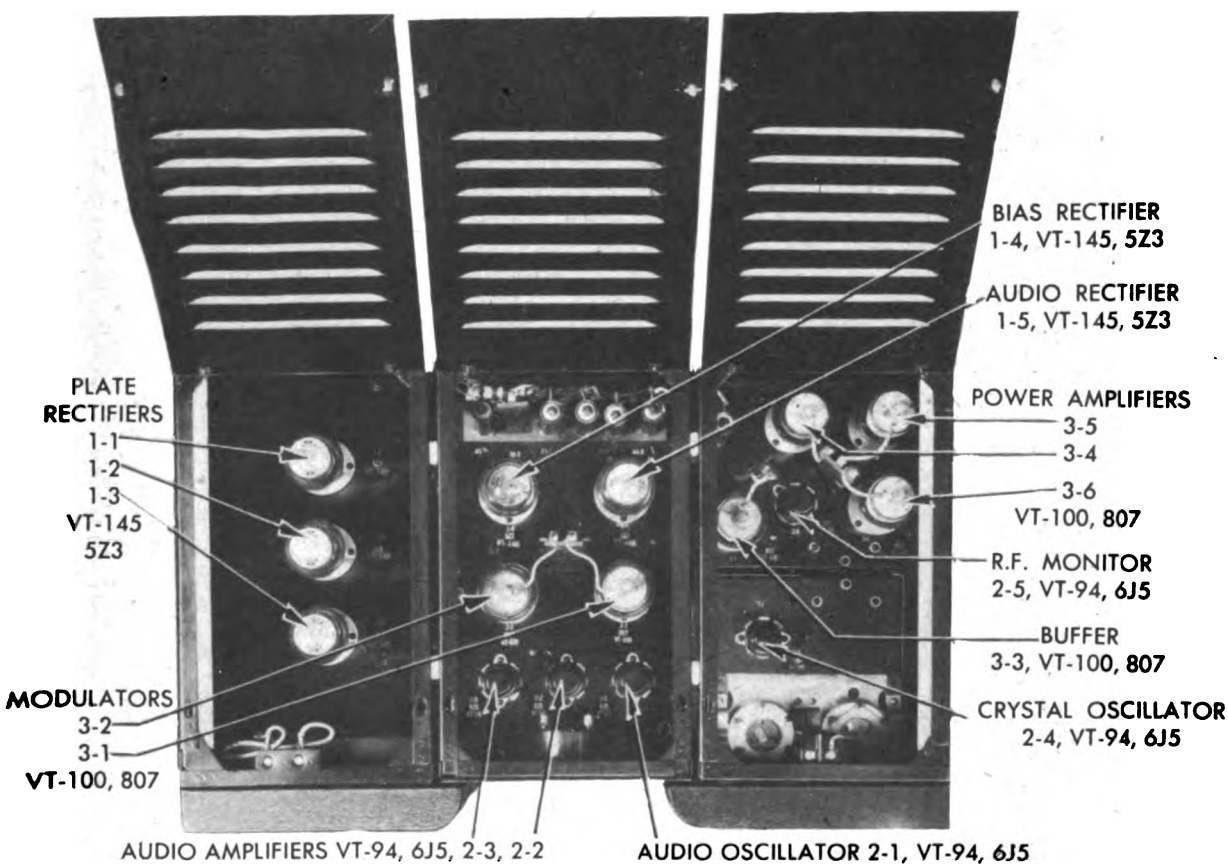


Figure 9.—Radio Transmitter T-65/CRN-11, top view, covers open. TL-14609

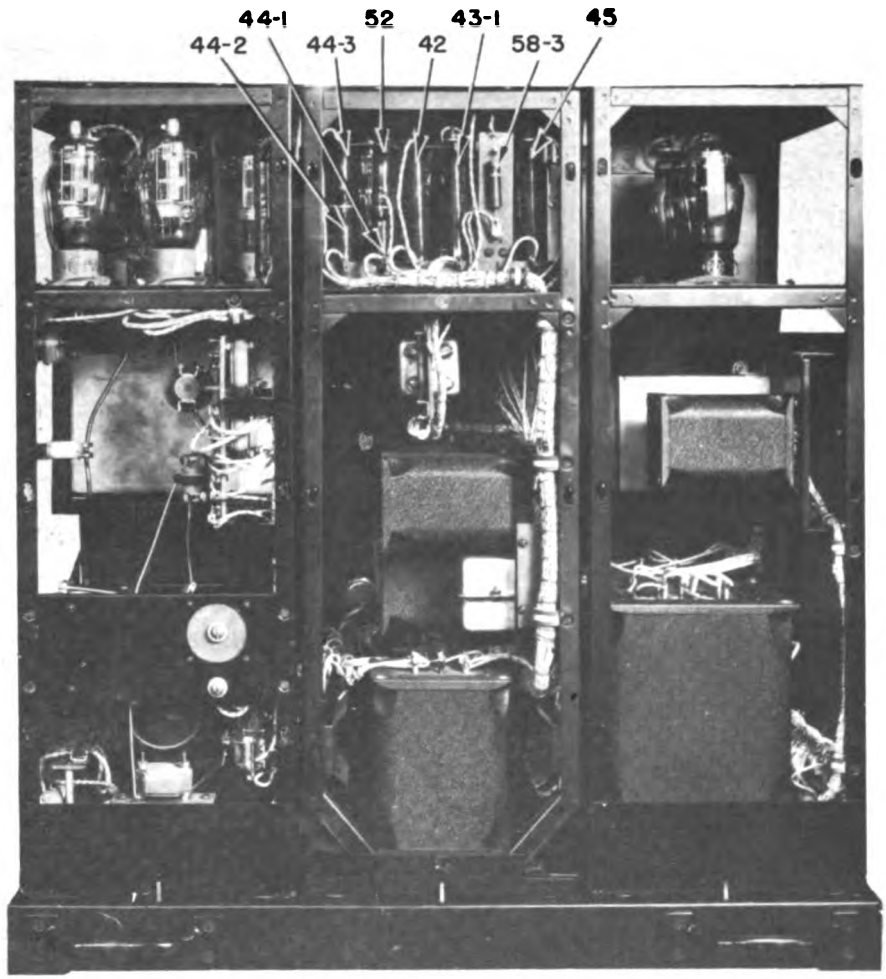


Figure 10.—Radio Transmitter T-65/CRN-11, rear view, shields off.

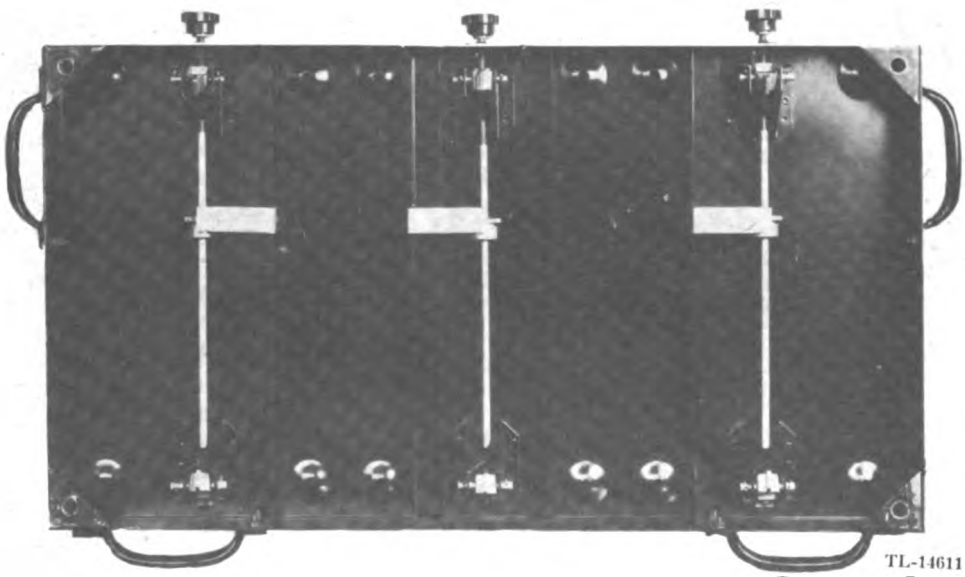


Figure 11.—Radio Transmitter T-65/CRN-11, Base Mounting FT-381-A, bottom view.

twist-lock, a-c line receptacle is provided on the lower right-hand side to bring a-c power to a heater located underneath the crystals. This heater is kept on when the equipment is not operating, to prevent any condensation of moisture on the crystal holders. Another heater controlled by a switch on the front panel is used to heat the transmitter itself. All the r-f tubes except the crystal oscillator tube are mounted on the tube shelf. The crystals and crystal oscillator tube are mounted on the top of the crystal oscillator box.

g. A terminal strip with three terminals is located on the inner, left-hand side of the transmitter cabinet, near the bottom. This strip has a microphone plug attached to it. When operation from a remote position is desired, this plug is inserted in the MICRO jack on the front panel, instead of the plug on the local microphone cable. A 3-wire cable of the desired length (not over 1,500 feet) is then fastened to the terminal strip and the remote microphone can be used.

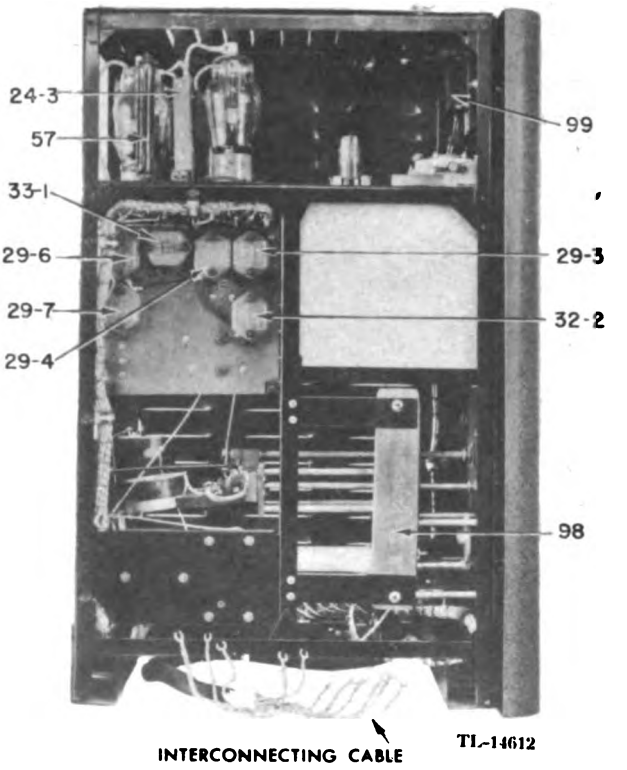


Figure 13.—Radio Transmitter T-65/CRN-11, radio frequency unit, left side.

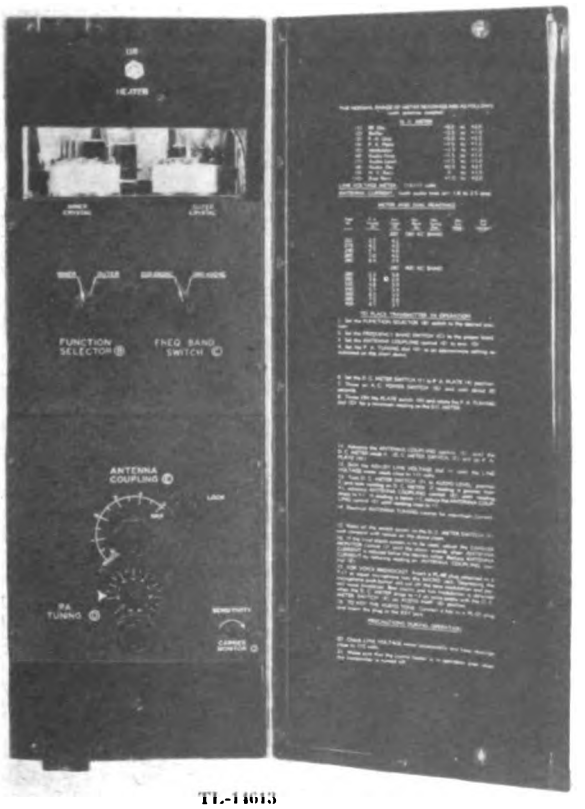


Figure 12.—Radio Transmitter T-65/CRN-11, radio frequency unit, front view.

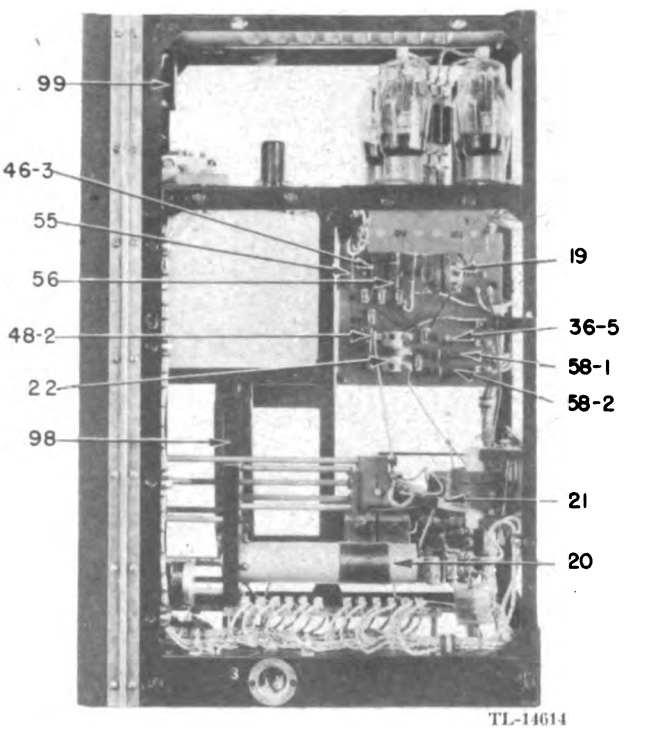


Figure 14.—Radio Transmitter T-65/CRN-11, radio frequency unit, right side, shield off.

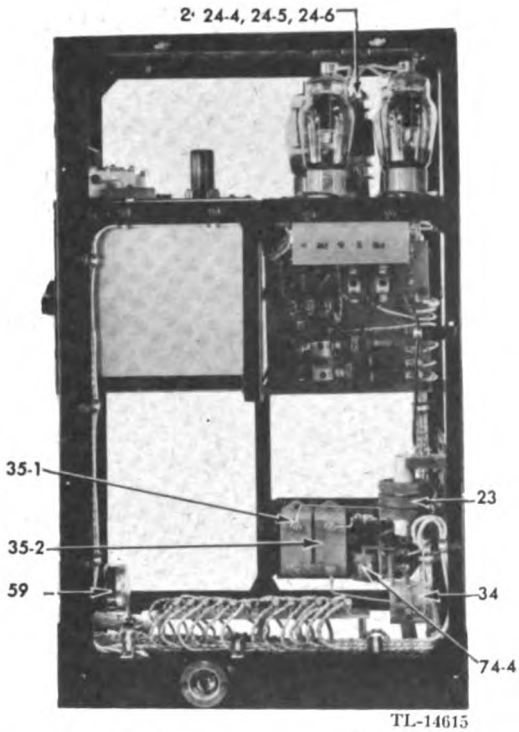


Figure 15.—Radio Transmitter T-65/CRN-11, radio frequency unit, right side, power amplifier tank and heater removed.

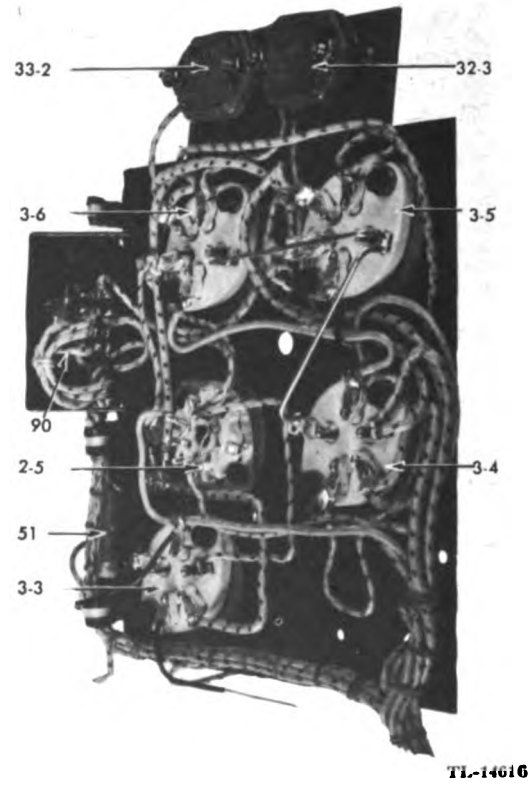


Figure 16.—Radio Transmitter T-65/CRN-11, radio frequency unit, tube shelf, bottom view.

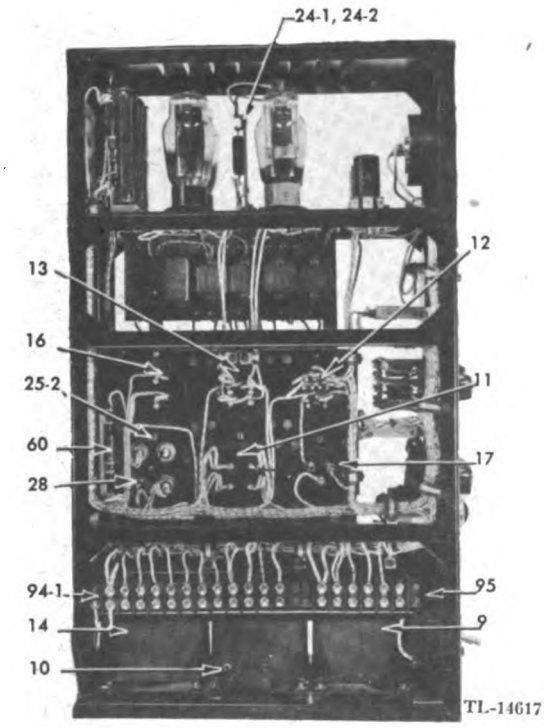


Figure 17.—Radio Transmittter T-65/CRN-11, modulator unit, left side.

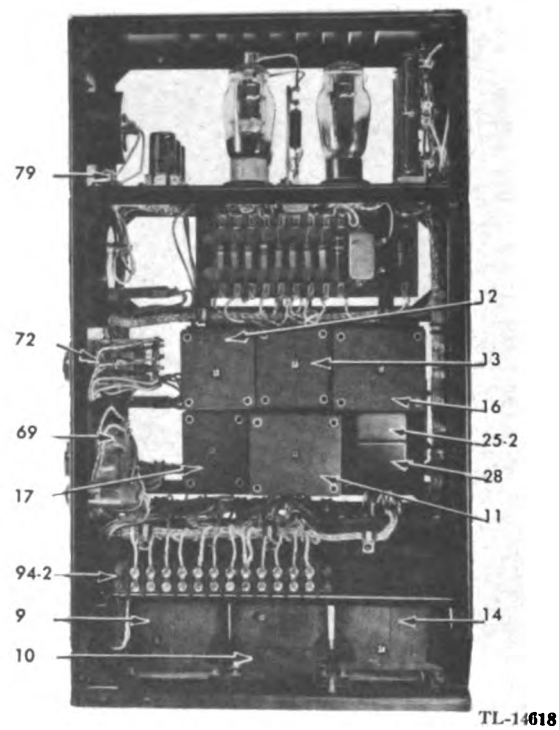


Figure 18.—Radio Transmitter T-65/CRN-11, modulator unit, right side.

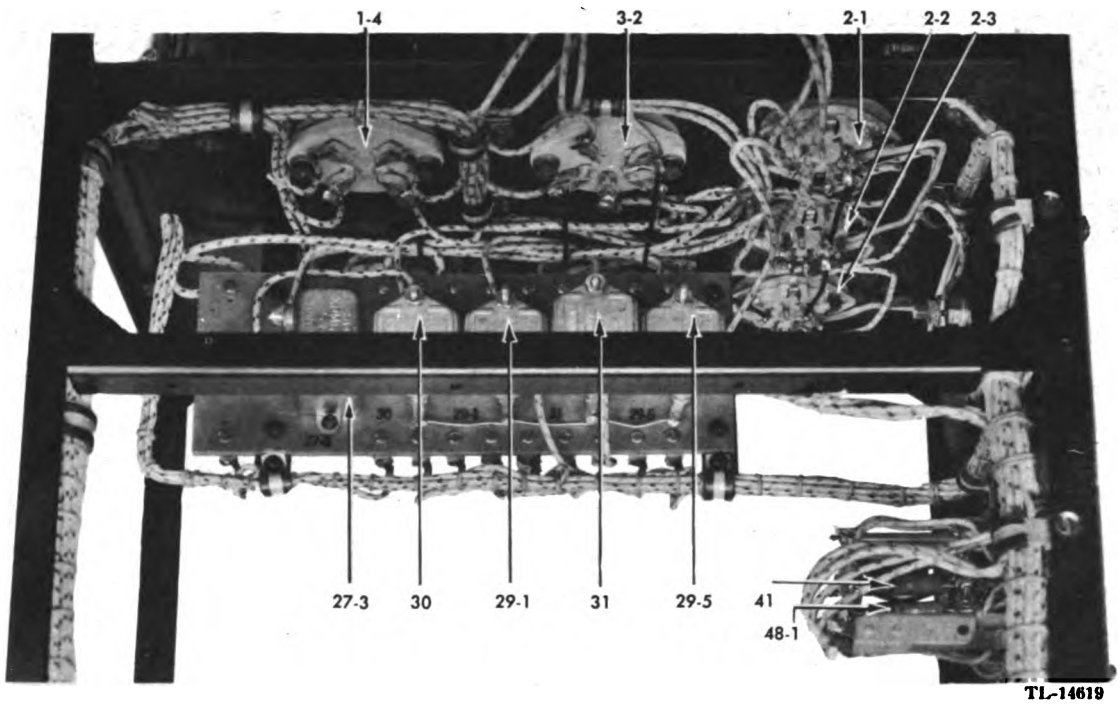


Figure 19.—Radio Transmitter T-65/CRN-11, modulator unit, middle section, left side.

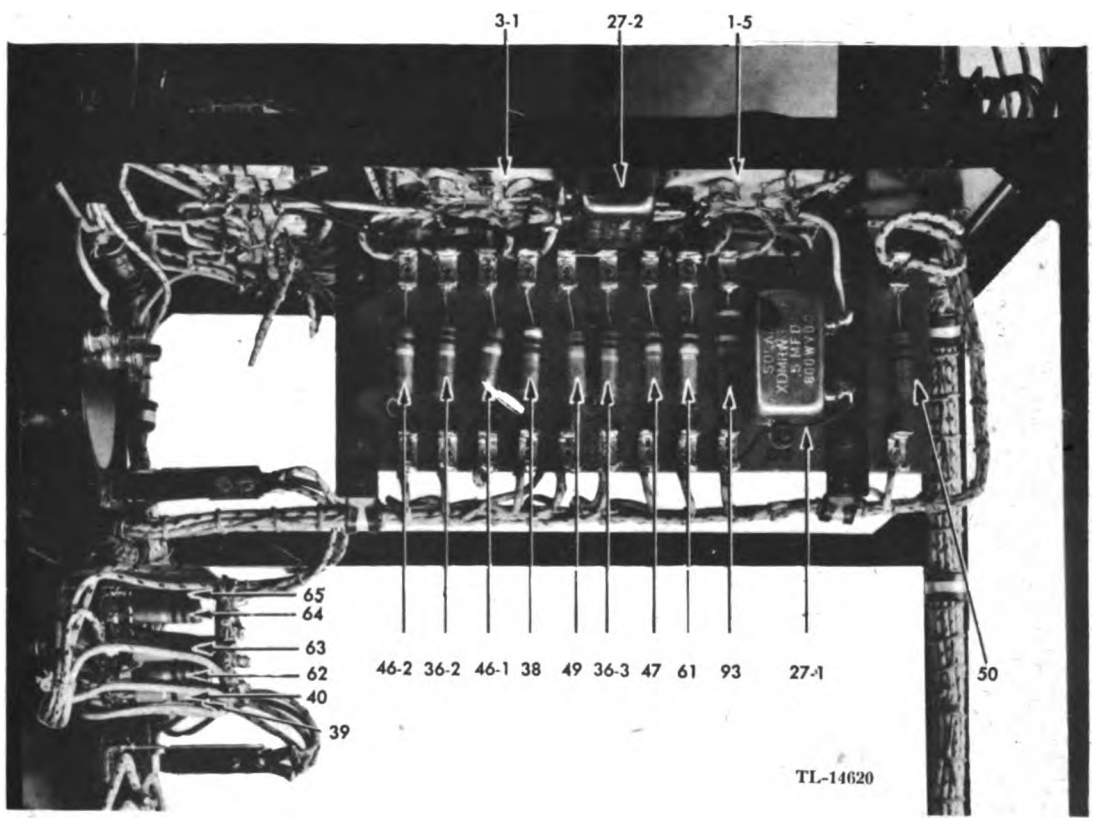


Figure 20.—Radio Transmitter T-65/CRN-11, modulator unit, middle section, right side.

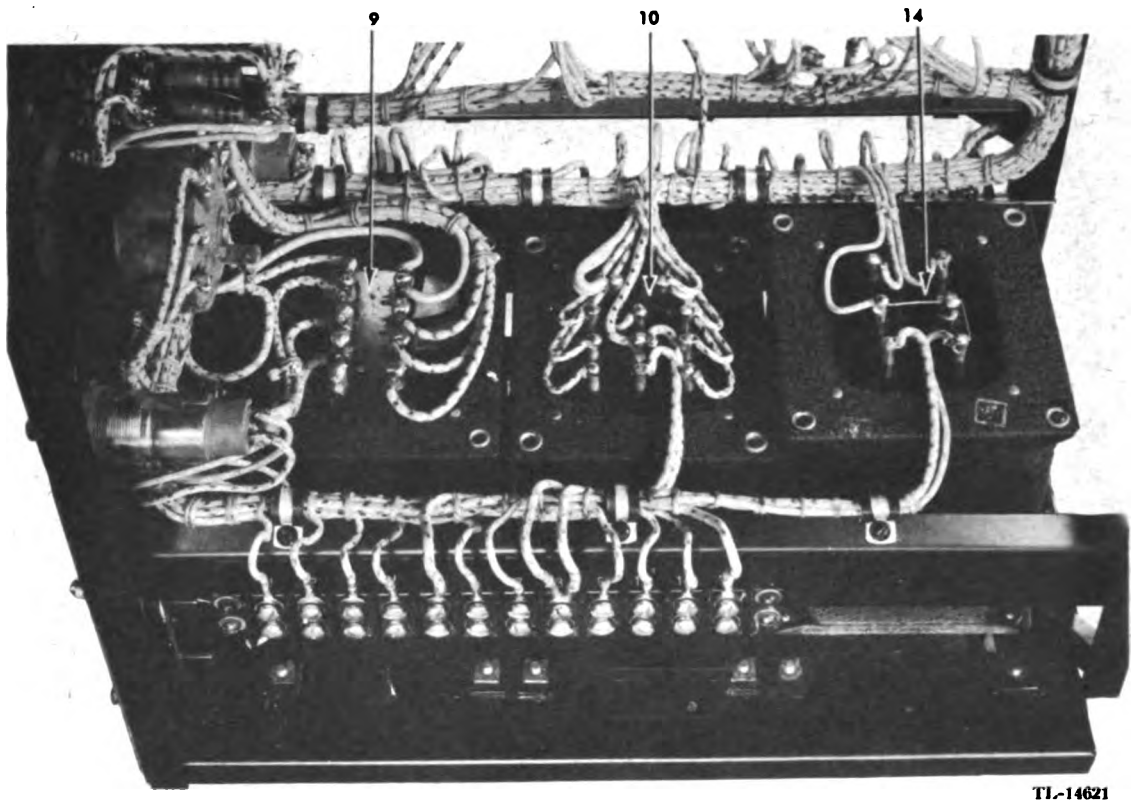


Figure 21.—Radio Transmitter T-65/CRN-11, modulator unit, bottom section, right side.

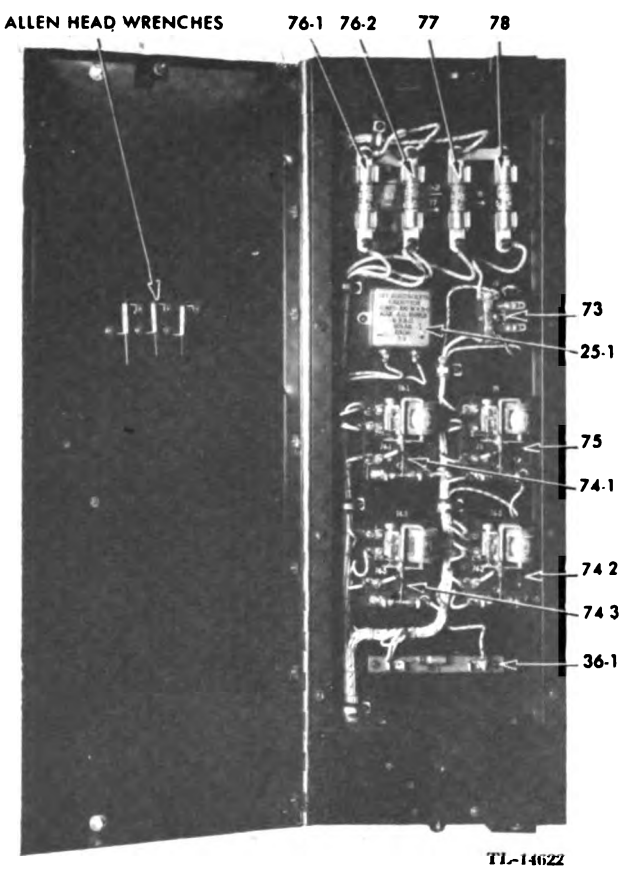


Figure 22.—Radio Transmitter T-65/CRN-11, power supply unit, front view, door open.

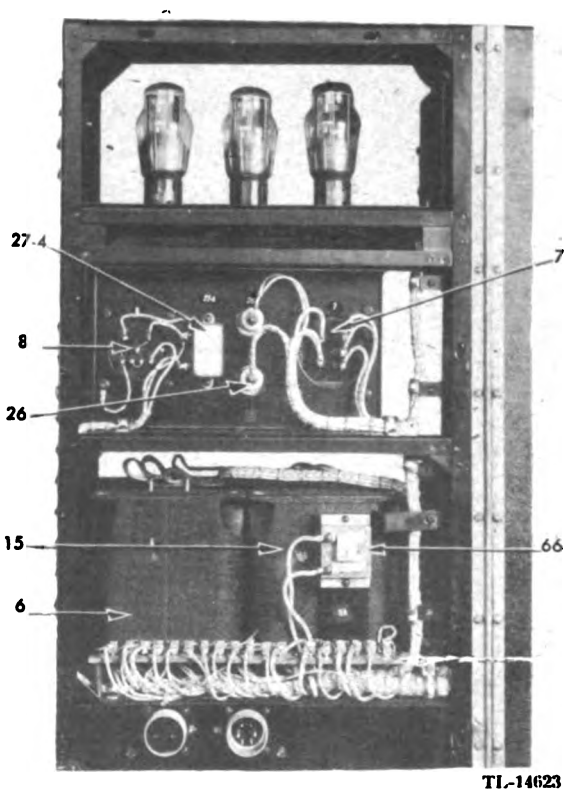


Figure 23.—Radio Transmitter T-65/CRN-11, power supply unit, left side, shield off.

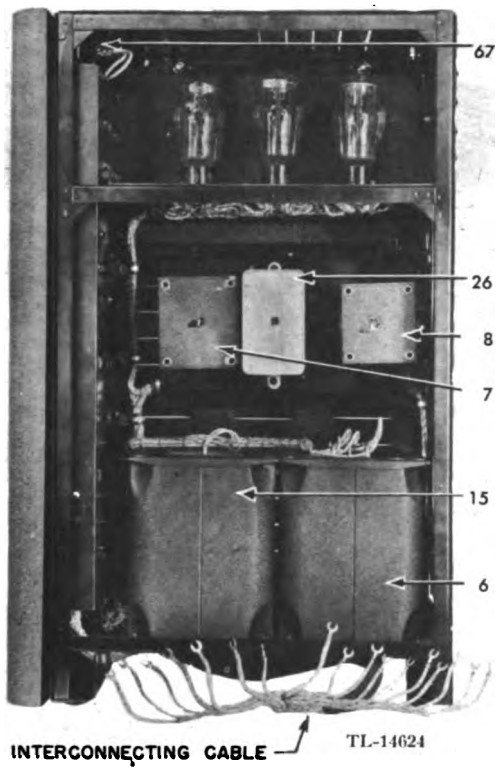


Figure 24.—Radio Transmitter T-65/CRN-11, power supply unit, right side.

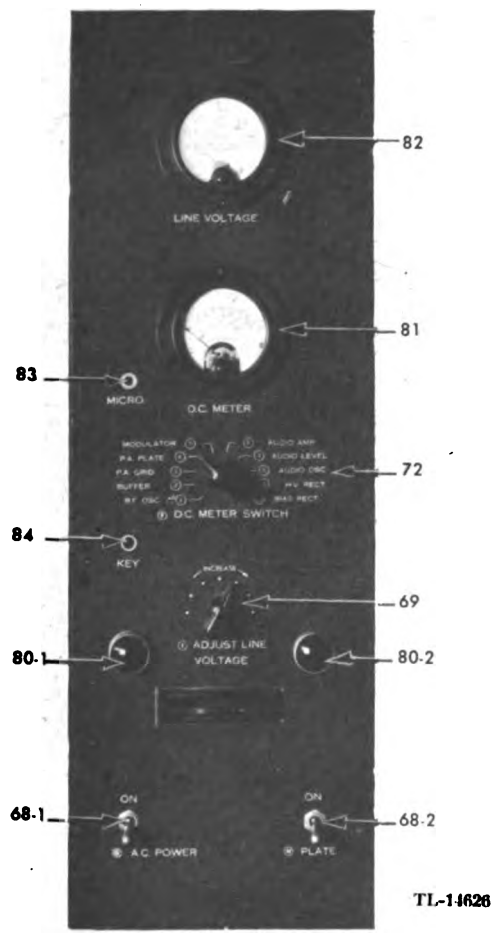


Figure 25.—Radio Transmitter T-65/CRN-11, modulator unit, front view.

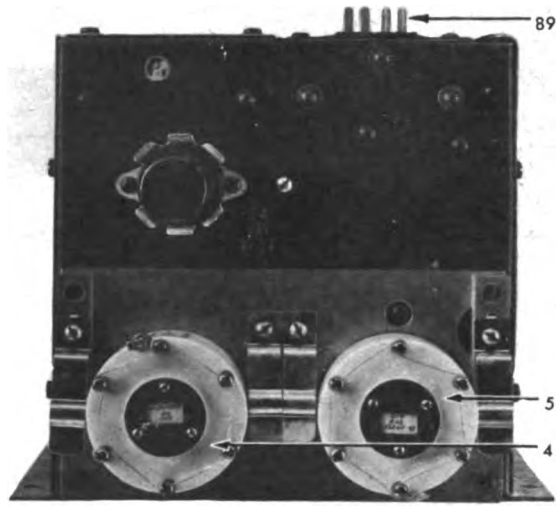


Figure 26.—Radio Transmitter T-65/CRN-11, oscillator box, top view.

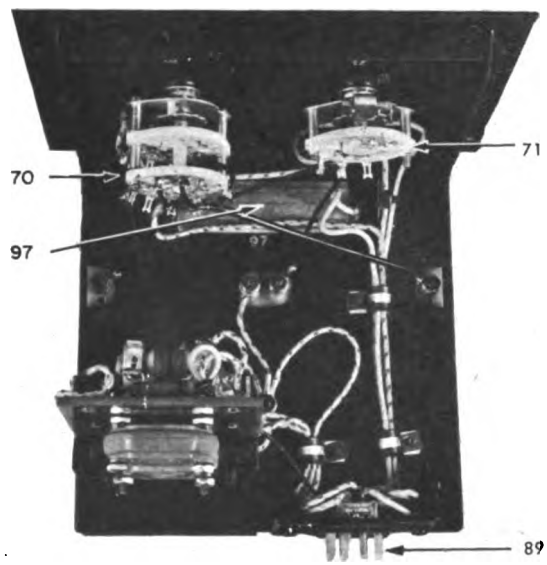


Figure 27.—Radio Transmitter T-65/CRN-11, oscillator box, bottom view, cover off.

TL-15237

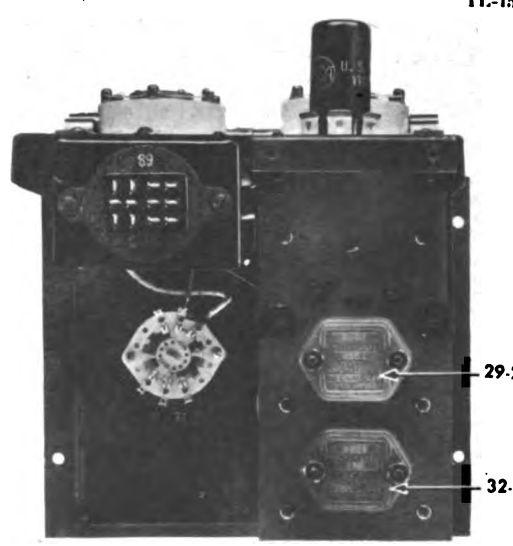
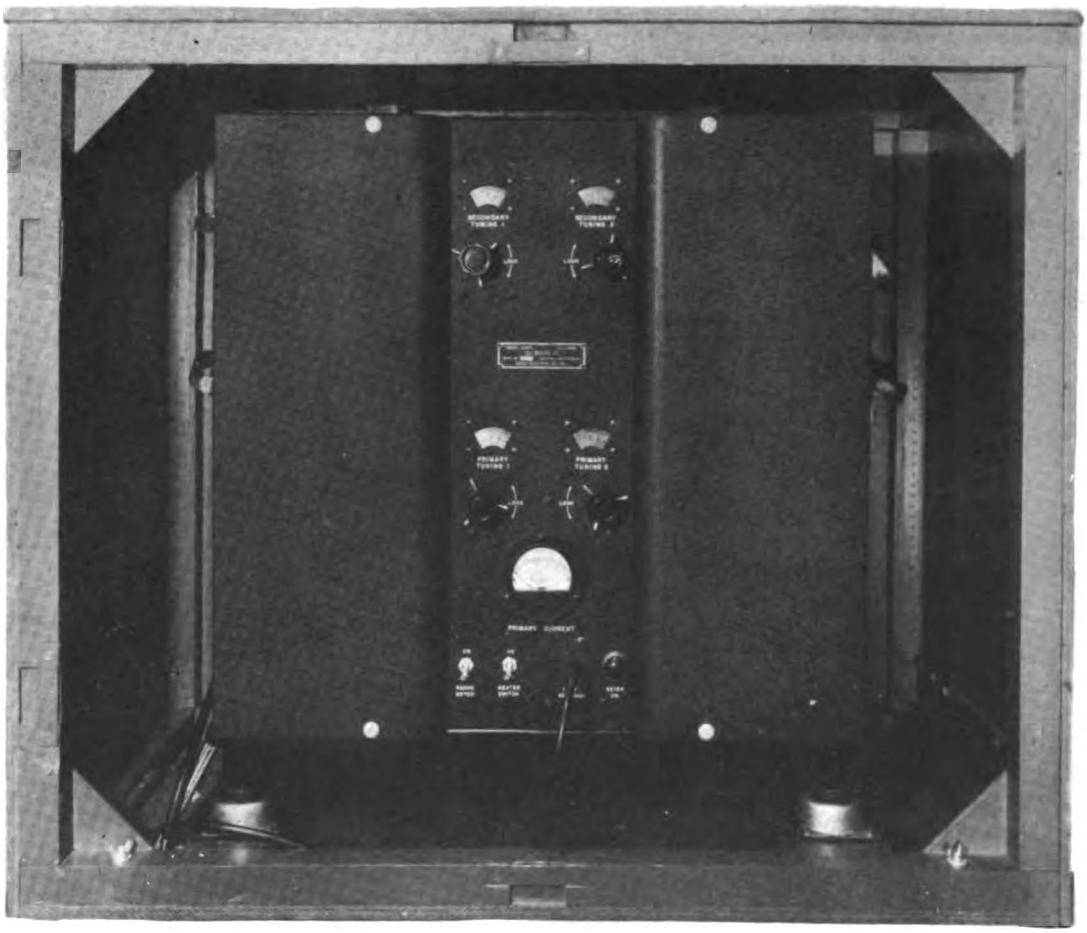


Figure 28.—Radio Transmitter T-65/CRN-11, oscillator box, rear, cover off.

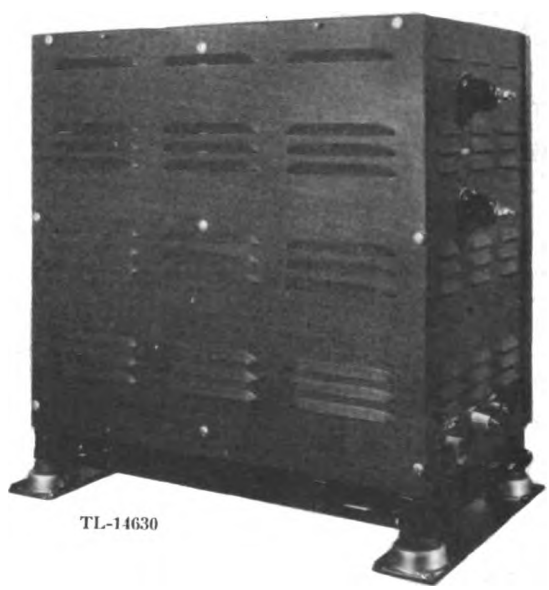


TL-14628

Figure 29.—Coupling Unit CU-38/CRN-11, in Cabinet CY-128/CRN-11 (cabinet door removed).

TL-14629

Figure 30.—Coupling Unit CU-38/CRN-11, front three-quarter view.



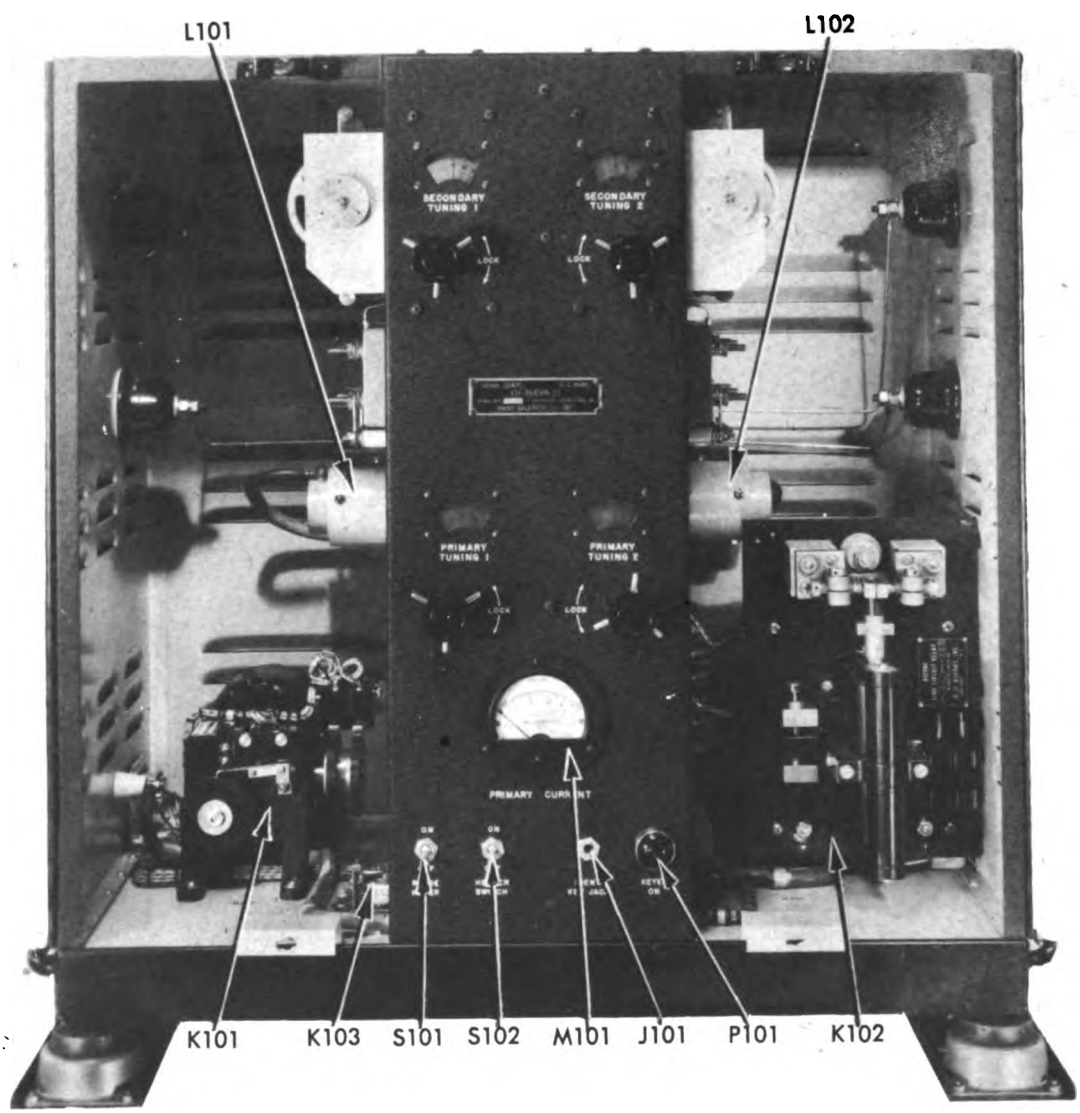
TL-14630

Figure 31.—Coupling Unit CU-38/CRN-11, rear three-quarter view.

5. COUPLING UNIT CU-38/CRN-11

(Figs. 29 to 40 inclusive)

a. The coupling unit is housed in Cabinet CY-128/CRN-11. The unit has two doors at the front for ready access to the parts inside the cabinet. The doors when closed leave a vertical recessed strip in the center. The two primary tuning controls, two secondary tuning controls, and the monitoring meter are located on this strip. The keyer and link circuit relays are located on the bottom shelf. The unit has a selenium rectifier which supplies direct current for the link circuit relay in the unit. The heater is controlled by a switch on the front panel. The front panel also contains a main power switch, a pilot light, and a jack for connecting the tone keying line. A quarter-phasing section, consisting of a coil and several capacitors, is mounted on a bakelite panel behind the front panel. Radio frequency output is made through large bowl insulators at the rear of the cabinet.



TL-14631

Figure 32.—Coupling Unit CU-38/CRN-11, front view, doors open.

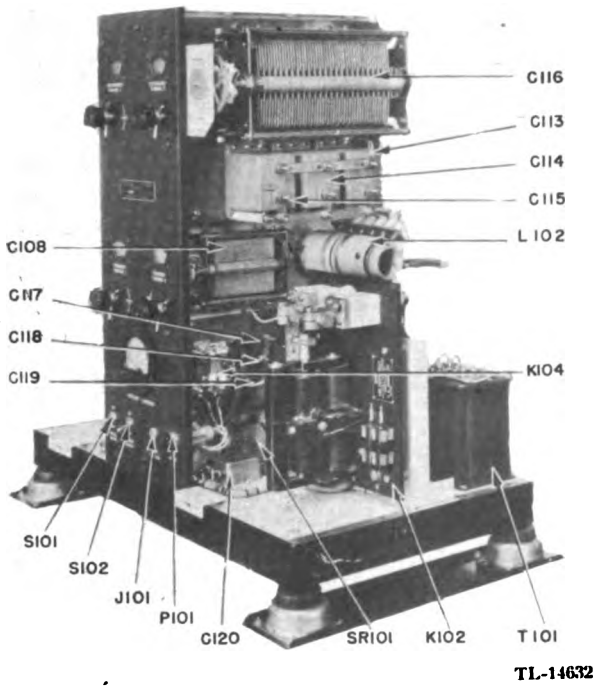


Figure 33.—Coupling Unit CU-38/CRN-11, interior, right side, viewed from front.

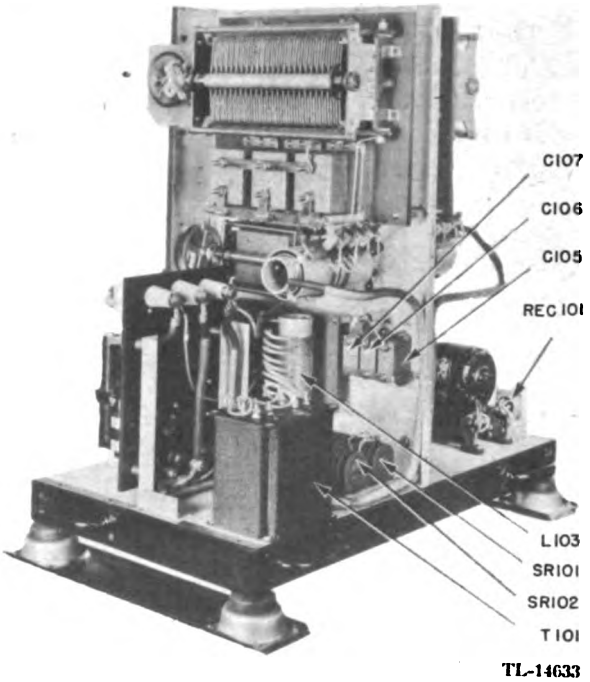


Figure 34.—Coupling Unit CU-38/CRN-11, interior, right side, viewed from rear.

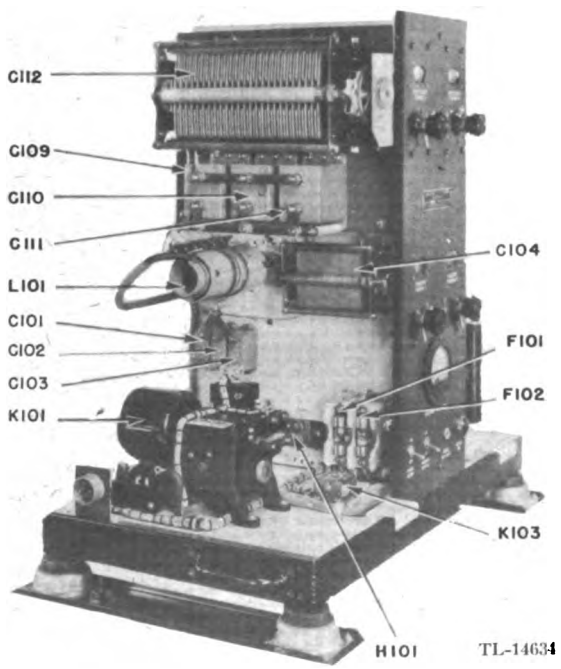


Figure 35.—Coupling Unit CU-38/CRN-11, interior, left side, viewed from front.

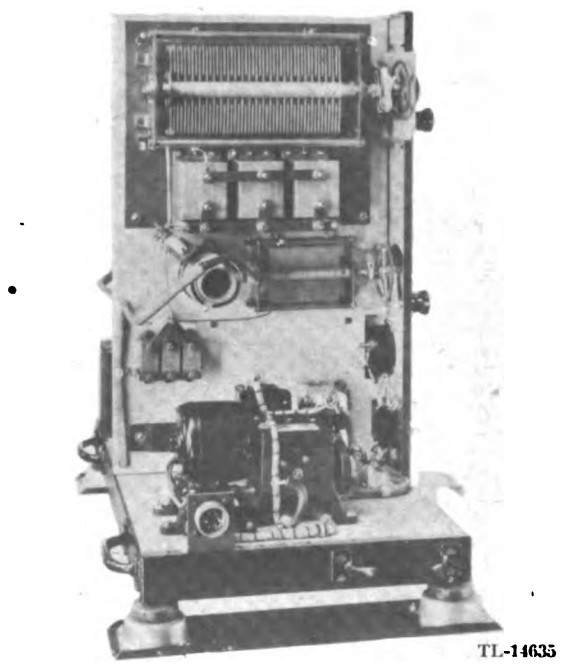


Figure 36.—Coupling Unit CU-38/CRN-11, interior, left side, viewed from rear.

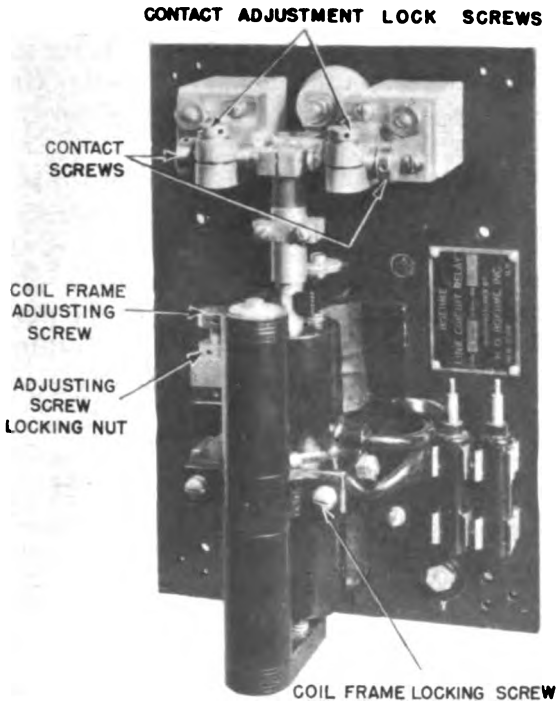


Figure 37.—Coupling Unit CU-38/CRN-11, link circuit relay, front view.

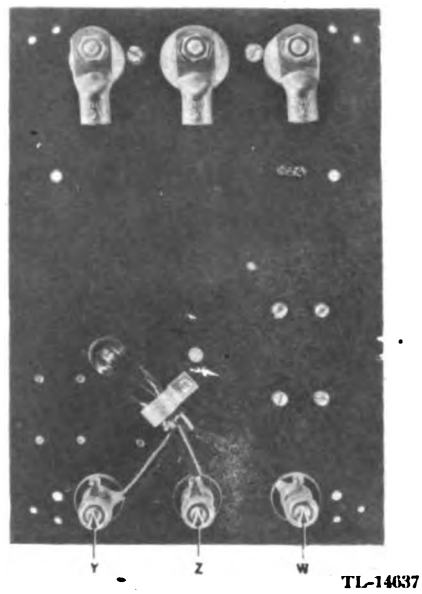


Figure 38.—Coupling Unit CU-38/CRN-11, link circuit relay, rear view.

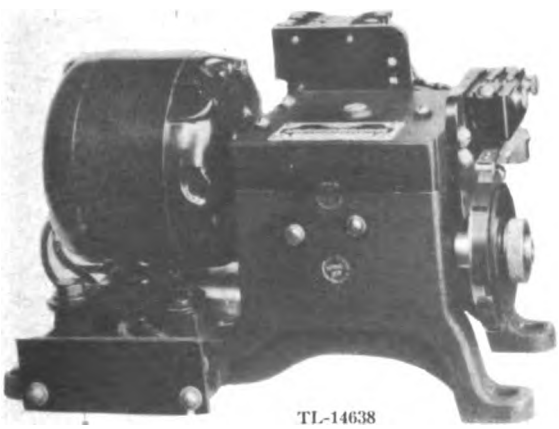


Figure 39.—Coupling Unit CU-38/CRN-11, keyer, left-hand side view from front.

Figure 40.—Coupling Unit CU-38/CRN-11, keyer, right-hand side view from front.

6. ANTENNA SYSTEM AS-102/CRN-11 (Figs. 2 and 51)

a. The antenna consists of two triangular loops of wire set at right angles to each other. The triangles have a base of approximately 200 feet, and an altitude of approximately 54 feet. The loops are single wires supported at the apex by a main tower, and at the bottom by smaller towers. The entire structure is supported by guy wires and anchors. See section II, Installation and Operation, for further details on the antenna system.

7. POWER UNIT PE-236-A (Fig. 41)

a. The power unit is mounted in Cabinet CY-129/CRN-11. A 5-gallon tank for gasoline is also mounted in the cabinet. Full instructions for this unit are contained in the manual for Power Unit PE-236-A, packed in Spare Parts Cabinet CY-130/CRN-11.

b. Alterations made to the power unit for purposes of this assembly consist of the incorporation of a twist-lock receptacle on the side of the voltmeter box for receiving the plug of the input power line, and a petcock in place of the drain plug in the oil pan, to allow oil to be drained downward through a hole in the cabinet.

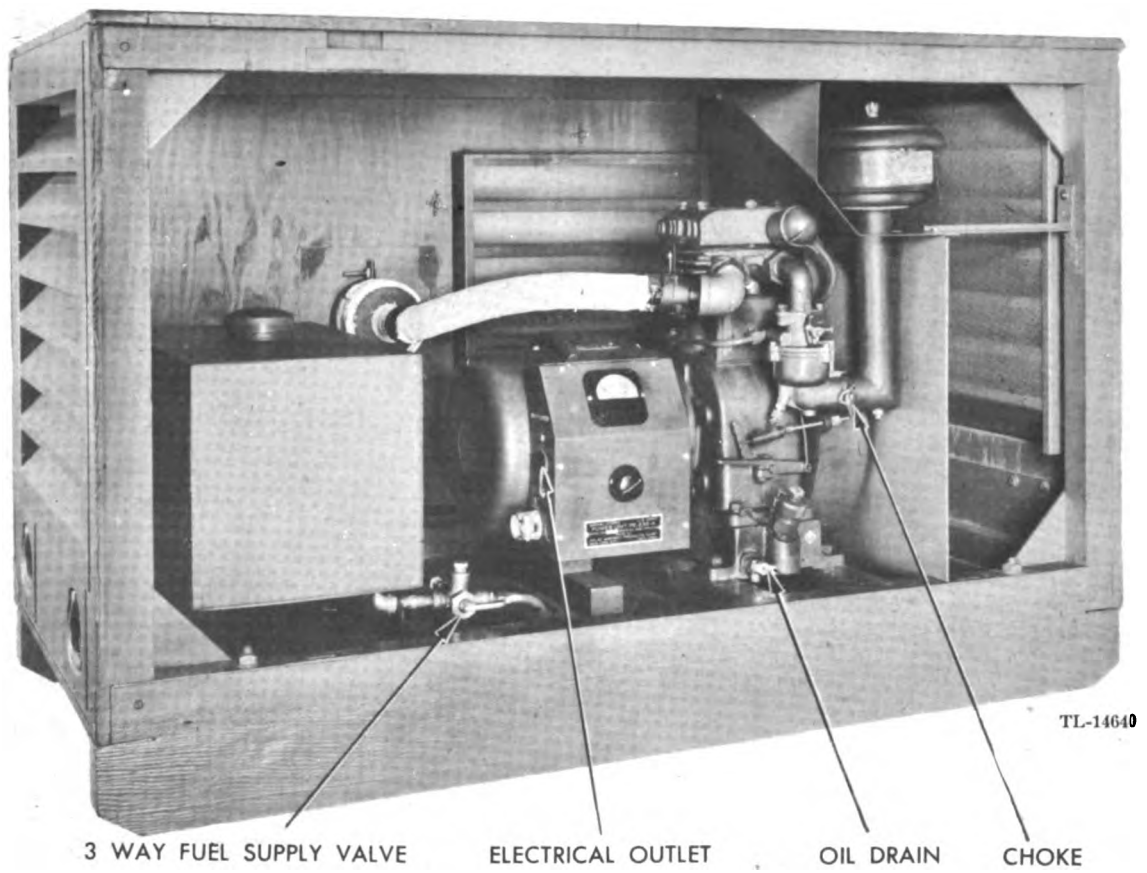


Figure 41.—Power Unit PE-236-A, in Cabinet CY-129/CRN-11 (cabinet door removed).

Section II
INSTALLATION AND OPERATION

8. CONTENTS OF PACKAGES AS SHIPPED

Note.—Items are cased for shipment as follows. Shipping cases are eliminated for air transport. For detailed list of all items see Shipping List in Case 4.

a. Case 1: Cabinet CY-127/CRN-11 (Transmitter).—

(1) Radio Transmitter T-65/CRN-11 (mounted to cabinet by means of Mounting FT-381-A)
(2) Blower Unit (mounted to cabinet)
(3) Power Panel (mounted to cabinet) (Packed separately in Spare Parts Cabinet CY-130/CRN-11 in export shipments only)
(4) Microphones T-17 (2 each) in small case attached to rear wall of cabinet (Packed inside transmitter for export shipments only)
(5) Tubes, mounted or packed inside transmitter
(6) Ventilation fan and fibreglas filter

b. Case 2: Cabinet CY-128/CRN-11 (Coupling Unit).—

(1) Coupling Unit CU-38/CRN-11

c. Case 3: Cabinet CY-129/CRN-11 (Power Unit).—

(1) Power Unit PE-236-A, complete with accessories

d. Case 4: Cabinet CY-130/CRN-11 (Spare Parts and Accessory Parts) and Reel DR-4/CRN-11.—

Note.—Items (1) to (25) inclusive are contained in Spare Parts Cabinet CY-130/CRN-11. For air transport there are included in the spare parts cabinet also items (3) and (4) of paragraph 8*e* following. Item (25) when included is in Case 4 but outside the spare parts cabinet, except when air transported, it then being carried as a separate unpackaged item.

(1) Spikes for mast base (4)
(2) Antenna cable assembly (4)
(3) Antenna insulating and lightning gap assembly
(4) Hardware for cabinet and rack assembly
(5) Spare hardware for cabinets
(6) Quartz crystals as supplied by Signal Corps in FT-164 holders
(7) Maintenance Parts for Radio Transmitter T-65/CRN-11, Signal Corps Stock No. 2C6903-139 A/MP (See paragraph 10*a*)
(8) Spare parts for Coupling Unit CU-38/CRN-11 and miscellaneous (see paragraph 10*b*, *c*)
(9) Remote Microphone Jack Box
(10) Accessory parts (see paragraph 9*a*)
(11) Rack MT-222/CRN-11, accessory parts, and hold-down stakes (4)
(12) (*a*) Technical Manual 11-1077 (2), Radio Transmitting Set AN/CRN-11; (*b*) Manual for Power Unit PE-236-A (2)
(13) Spare parts for Power Unit PE-236-A
(14) Keying cable
(15) R-f cable
(16) Rope (30 ft)
(17) Radius rope for antenna layout (20 ft)
(18) Adjustable spanner wrench
(19) Filter, fibreglas, spare for FIL101
(20) Top plate assembly
(21) Set of condensers
(22) Meter (spare for meter M101)
(23) Copperweld cable, 3 conductor, No. 12 strand (250 ft)
(24) Pair of headphones with plug, Type P-18, Signal Corps stock No. 2-B-918
(25) Microphone cable, 2 conductor with belden braid shield (300 ft) (or, alternately, Reel DR-4/CRN-11 with 1,500 feet of cable is supplied)

e. Case 5: Antenna Mast, etc., Cabinet Tarpaulin, and Cabinet Rack.

Note.—For air transport only, items (1) and (2) are contained in the canvas bag; items (3) and (4) are contained in Spare Parts Cabinet CY-130/CRN-11; and item (5) is transported as a separate package.

(1) Antenna Mast AB-30/CRN-11, contained in canvas bag
(2) Short poles (4)
(3) Guy anchor stakes (4)
(4) Canvas tarpaulin for covering transmitter and coupling unit cabinets
(5) Rack MT-222/CRN-11, knocked down and banded with metal straps. Bolts are placed in bag in Spare Parts Cabinet CY-130/CRN-11.

f. Case 6: Radio Receiver Learadio RM-402-A.

g. Case 7: Spare Power Unit PE-236-A (where supplied).

9. ACCESSORY PARTS PACKED IN SPARE PARTS CABINET CY-130/CRN-11

a. Tool Kit:

(1) 1 6 inch screwdriver
(2) 1 8 inch Phillips head screwdriver
(3) 1 10 inch screwdriver
(4) 1 Adjustable end wrench
(5) 1 Hatchet with spare handle
(6) 1 Gas pliers
(7) 1 Combination pliers
(8) Heavy-duty extension light, 25 ft cord

b. Antenna Insulating and Lightning Gap Assembly:

(1) 8 Bowl insulator, spare for IN101
(2) 8 Rubber gasket, ⅛" OD x 4⅛" ID
(3) 8 Vellumoid washer ⅞" OD x ⅜" ID
(4) 16 Hex nut, ⅜-16 thread x ⅜" thick
(5) 28 Flat washer, ⅜" ID x ⅞" OD x 0.081"
(6) 4 Lightning gap arm
(7) 8 Lock washer, ⅜", internal tooth

(8) 4 Stud for antenna insulator bowl
(9) Belden braid ½" wide in 4 to 8 inch pieces with lug attached (32 in.)
(10) 4 Lug, ¼" hole
(11) 2 Stove bolts, ⅜-18, round head, 3½" long
(12) 6 Hex nut, ⅜-18, $\frac{31}{64}$" thick
(13) 12 Flat washer, ⅞" OD x ⅜" ID x 0.064" thick
(14) 4 Lock washer, ⅜", internal tooth
(15) 2 Wing nut, ⅜-18 thread, $1\frac{5}{16}$" wing spread
(16) 2 Lug on cable
(17) 1 Copperweld cable, 3 conductor, No. 12 strand (10 ft)

c. Power Unit parts:

1 15' Flexible gasoline line with strainer

10. SPARE PARTS PACKED IN SPARE PARTS CABINET CY-130/CRN-11

a. Spare Parts for Radio Transmitter T-65/CRN-11 (Signal Corps Maintenance Parts Stock No. 2C6903-139 A/MP):

(1) 6 VT-100 vacuum tubes
(2) 5 VT-145 vacuum tubes
(3) 5 VT-94 vacuum tubes
(4) 12 S-6 mazda 120 v pilot lamps
(5) 20 10 amp renewal links for 250 v cartridge fuses
(6) 10 3 amp renewal links for 250 v cartridge fuses
(7) 10 5 amp renewal links for 250 v cartridge fuses
(8) 1 set Allen wrenches, 1 each sizes, 6, 8, and 10

b. Spare Parts for Coupling Unit CU-38/CRN-11:

(1) 2 sets Replacement contacts for relay K102
(2) 1 Coil type #374 for relay K104
(3) 1 Coil type #360 B for relay K103
(4) 2 sets Replacement contacts for relay K104
(5) 2 sets Replacement contacts for relay K103
(6) 10 sets Cartridge link, 1 amp (2 per set)
(7) 6 S-6 light bulbs
(8) 1 set Dash and dot segments for three-letter identification
(9) 4 Insulator bowl, type U-91136-A

c. Spare Parts, miscellaneous:

(1) 1 Flexible gas line with strainer (15 ft.)
(2) 1 Lamp, 60 watt
(3) 2 Strain insulator, spare for IN102
(4) 2 Guy insulator, spare for IN103

11. UNPACKING

a. General.—For shipment by means other than air transport, equipments are packed as described in paragraph 8, with cabinets and other items crated in unfinished packing cases with stenciled markings and identifying color bands. For air transport the unfinished cases are omitted (fig. 3) and packing is accomplished as qualified by notes and footnotes in paragraph 8. To remove the unfinished cases, proceed as follows:

(1) Cut metal bands around the packing case.
(2) Remove the nails from the packing case, using a nail puller. Never use a crowbar or force a packing case open; it contains damageable parts.

NOTE.—CHECK ALL ITEMS IN THE EQUIPMENT IMMEDIATELY FOR DAMAGE.

b. Radio Transmitter T-65/CRN-11 and Cabinet CY-127/CRN-11.—

(1) Using a screwdriver, open the twist-fasteners on the door.
(2) Swing the door open.
(3) Slit the waterproof wrapping, being careful not to damage any parts within the wrapping.
(4) Remove the wrapping.
(5) Remove bags of silica-gel which will be found attached to the transmitter.
(6) Open the top covers of the transmitter and inspect tubes for breakage. To do this slide transmitter out of cabinet and set it on top of spare parts box.
(7) Remove the side and rear shields and check for any apparent damage.
(8) Check the controls for easy operation.
(9) Open the package of maintenance parts, and check its contents against the list accompanying the package.
(10) Examine tubes and pilot lamps for breakage.

c. Coupling Unit CU-38/CRN-11 and Cabinet CY-128/CRN-11.—Follow the same instructions given in steps (1) to (6), of paragraph 11*a* foregoing.

d. Power Unit PE-236-A and Cabinet CY-129/CRN-11.—

(1) Using a screwdriver, open the twist-fasteners on the cover.
(2) Let the front cover drop forward and lift it out of its sockets.

(3) Place the front cover in a safe place for future use.

e. Spare Parts Cabinet CY-130 CRN-11.—

(1) Using a screwdriver, open the twist-fasteners on the top cover.

(2) Lift the cover and let it down carefully at the rear, in order not to break the hinges off the cabinet.

(3) Unpack and examine the crystal units. DO NOT TAMPER WITH THE CRYSTAL HOLDERS.

f. Rack MT-222 CRN-11.—

(1) Remove the steel bands which clamp the rack components together.

g. Antenna Mast AB-30 CRN-11.—

(1) Unfasten the buckle that holds the end cap in place.

(2) Pull the end cap back.

(3) Remove the mast sections from the canvas bag.

12. SITE OF INSTALLATION

a. Choose the site or location in line with the airport runway and ½ to 4 miles out. The space must be open and reasonably flat over an area of a 300 foot square. The range course is on a line half way between the two loops, so the short poles at the corners of the loops should be set 45 degrees from the course. (Fig. 51.)

13. INSTALLATION OF ANTENNA SYSTEM

a. Layout.—The antenna system for this equipment consists of two single turn loop antennas crossing each other at right angles as shown in figures 45 and 51. The procedure of layout and erecting the mast is shown in figures 42, 43, and 44, and should be followed very carefully. These drawings show the method of locating the position of the guy anchors as well as the position of the crossed loops.

b. Mast Assembly. — Using the small drive-stakes as anchors, place the center mast base fixture on the point (0). Assemble the mast sections together with the top pointing directly along the airport runway as shown in figure 44.

c. Main Guys.—For the main guys use the large drive-stake anchors, driving them into the ground as far as possible. Connect each side guy to one of the side anchors.

d. Gin Pole.—One short mast section, 3⅜ inches diameter, is to be used as a gin pole. Set one end into the base fixture. Attach the gin pole erection fixture to the top of the gin pole. Attach two bridle ropes, one for each side of the gin pole, to the ring at each side anchor stake. Attach the upper and lower mast back guy wires to the gin pole erection fixture.

e. Back Anchor.—Connect the block and tackle from the fitting on top of the gin pole to the back drive-stake anchor. The back anchor stake must be especially well tightened as it carries most of the pull in erecting the mast.

f. Erection of Mast and Antenna.—(1) After the assembly as shown in figure 44 is completed, tighten the block and tackle rope to raise the pole. When the top of the pole is about 5 feet above the ground, connect the front guy and anchor, and check all guys and fittings. Mount the square antenna cross-over block with the loop antenna on the top of the pole. The continuity of the loop across the cross-block must be maintained. (Figs. 45 and 48.)

(2) Pull on the tackle rope until the mast is up. Remove the block and tackle, and connect the back guy chain directly to the anchor by means of the clevis.

(3) Pull the copper loop antenna wires out in line with (O-H) and (O-G) (fig. 43). At 112 feet out, an insulator will be found. Attach this insulator to the 6 inch corner strain insulator by means of the boat-snap. The other end of the insulator goes to the boat-snap on the top of the 10 foot 10 inch corner pole. For these details see figure 47. Two short steel guys go from the top fitting of the short pole to two guy stakes driven in the ground in back of the corner pole.

(4) Return the copper loop antenna wire to the mast. At approximately 8 feet up on the center mast a marking circle is painted to show where to place the center pole lower clamp assembly. The boat-snap attached to this center clamp is snapped into one of the links of the 2 foot chain on the end of the loop. These chains are length adjusting arrangements to provide for variations caused by ground slope. Select the links which make the sloping and horizontal parts of each loop, equally tight.

(5) Attach the 6½ foot leads from the thimble to one of the stud terminals at the back of the coupling unit. (Figs. 46 and 50.) Connect the adjacent stud terminal to the other end of the same copper loop wire. Take great care to obtain one continuous turn of copper wire. The two adjacent antenna studs on the coupling unit must be connected to the ends of the same loop antenna. At the top of the center pole there is no change in direction of the loop wire at the cross-over point. (Figs. 45 and 48.)

14. INSTALLATION OF TRANSMITTER CABINET AND COUPLING UNIT CABINET

a. Set up the equipment mounting rack in the center of the area. Place the cabinets with relation to the loop antennas as shown in figures 1, 2, and 46. The cabinets should be placed on one side of the mast, so that it is possible to lower the mast without moving the cabinets, exactly as shown.

b. Bolt Transmitter Cabinet CY-127/CRN-11 in position on the left and Coupling Unit Cabinet CY-128/CRN-11 on the right, as shown in figure 46. The power unit should be set on the ground about 15 to 20 feet away.

15. INSTALLATION OF POWER UNIT
(Figs. 67 and 68)

a. With this equipment, provision has been made for the use of either the 5 gallon gasoline tank in the power unit, or an external drum of gasoline. If the external drum of gasoline is to be used, the 15 foot flexible gas line found in the spare parts cabinet should be uncoiled and brought out of the power unit through the hole in the bottom where the power cable enters. The end of the flexible hose which goes to the gasoline drum should be screwed into the outlet side of the gasoline filter unit. The filter is lowered into the gasoline drum through a cap screw or plug in the top of the gasoline drum. Either source of gasoline may be selected by turning the handle of the three-way valve in the gas line to the engine. To use the 5 gallon inside fuel tank, the valve handle should point toward the pipe from this tank. To use an outside drum of gasoline, turn the handle 90 degrees in a clockwise direction unless the handle is marked with an arrow, in which case point the arrow toward the desired fuel supply.

b. The engine is shipped without oil. It requires oil in the crankcase and also in the air filter. Use SAE 20 grade oil and fill the crankcase to indicated levels.

c. For further details of engine installation and maintenance refer to the manual on Power Unit PE-236-A.

16. ELECTRICAL CONNECTIONS

a. General.—(1) Connect the inter-unit cables as shown in figures 69 and 70.

(2) Remove the plywood cover plates which cover the holes for the feed-through bowl insulators at the rear of the coupling unit cabinet.

(3) Mount the bowl insulators. The insulators are held in place by brass studs through the center of the bowls. (Fig. 50.)

(4) Connect the flexible output leads from the coupling unit loop antenna terminals to the studs in the feed-through insulator bowls.

(5) Install the ground studs of the lightning gap assembly between the two sets of insulator bowls as shown in figure 50. The ground stud consists of a brass bolt, several flat washers, lockwashers, hex nuts, and a wing-nut. Insert the stud through the hole provided between the bowls, and place the washers and other hardware in position, as shown in the diagram. The ground stake will be equipped with two short lengths of wire, with a terminal lug at one end. Place the terminal lug over the brass bolt and tighten with the hex nut. Drive the stake into the ground midway between the two sets of insulator bowls.

(6) A ground wire will be found inside the coupling unit cabinet which is connected to the chassis. Connect this to the inside of the two ground studs, using the wing-nuts provided.

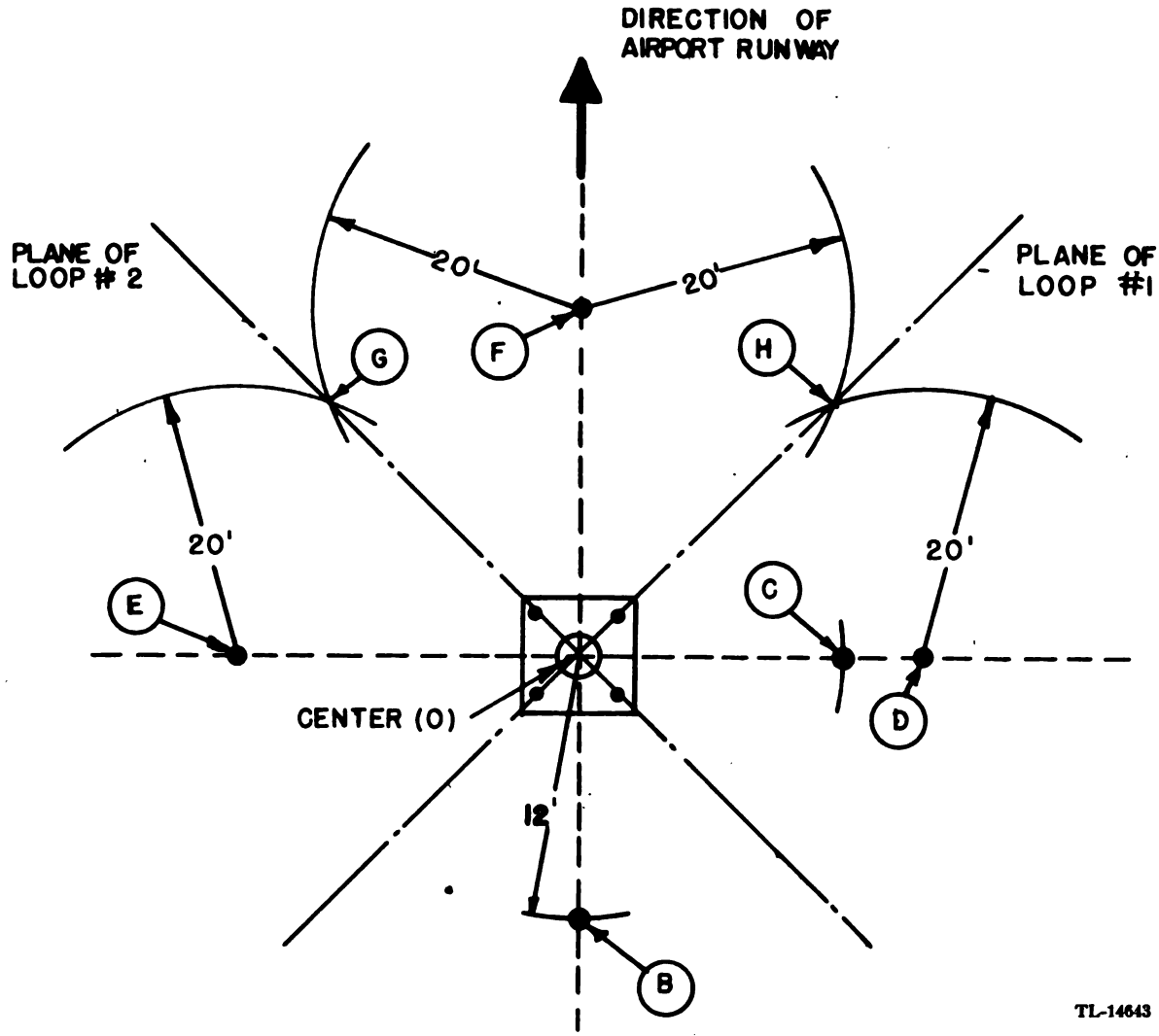
(7) Install the lightning gap arms to the outside of the insulator bowls as shown in figure 50.

(8) Bring the ends of the loop antennas to the insulator bowls but do not connect them until instructed in paragraph 20.

(9) The other ground stake should be driven into the ground near the Power Unit Cabinet CY-129/CRN-11, and a connection made to the frame of the gas engine.

b. Transmitter Functional Connections.—(1) Power.—(Plug PL-Q228, is part #87, receptacle part #85, located on left-hand side of transmitter, front plug.) Terminals E and B are for a-c input to the transmitter (105-125 v, 50-60 cps). Terminals C and D are for the alarm circuit. This presents an open circuit with plate switch (H) OFF,

(Turn to page 39)



Procedure:

1. Using points (D) and (F) as centers, take a 20 foot rope and lay out two arcs. Find the intersection of the arcs. This determines point (H).
2. Repeat the same procedure using points (E) and (F) as centers to get point (G).
3. Put temporary stakes at points (G) and (H). After the center pole is up, the loops must be lined up with the direction of (O-G) and (O-H).

Figure 43

Figure 42.—Antenna System AS-102/CRN-11, Step 1 of mast erection.

Figure 43.—Antenna System AS-102/CRN-11, Step 2 of mast erection.

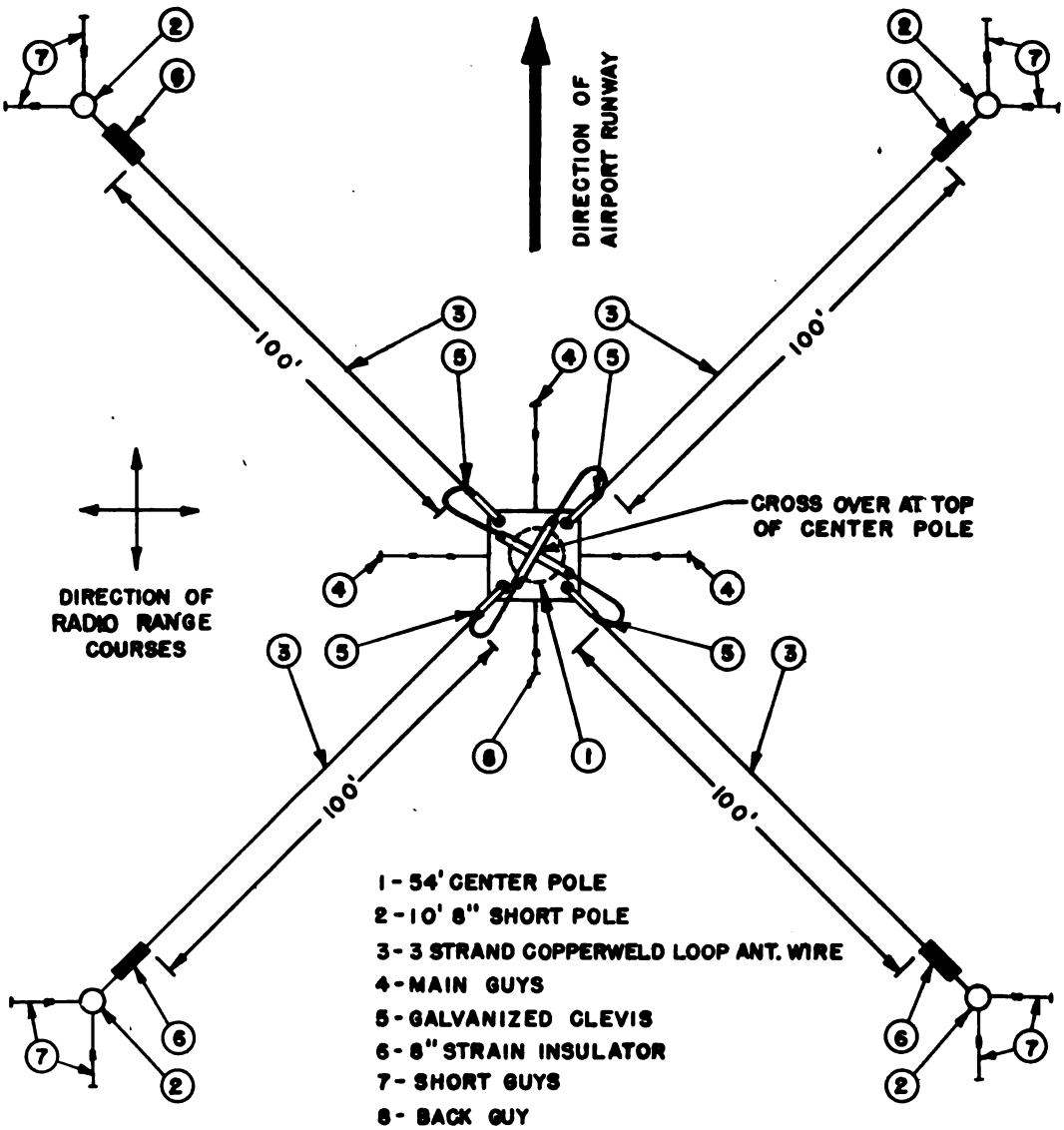


Figure 45

TL-14645

Figure 44.—Antenna System AS-102/CRN-11, Step 3 of mast erection.

Figure 45.—Antenna System AS-102/CRN-11, top view of system.

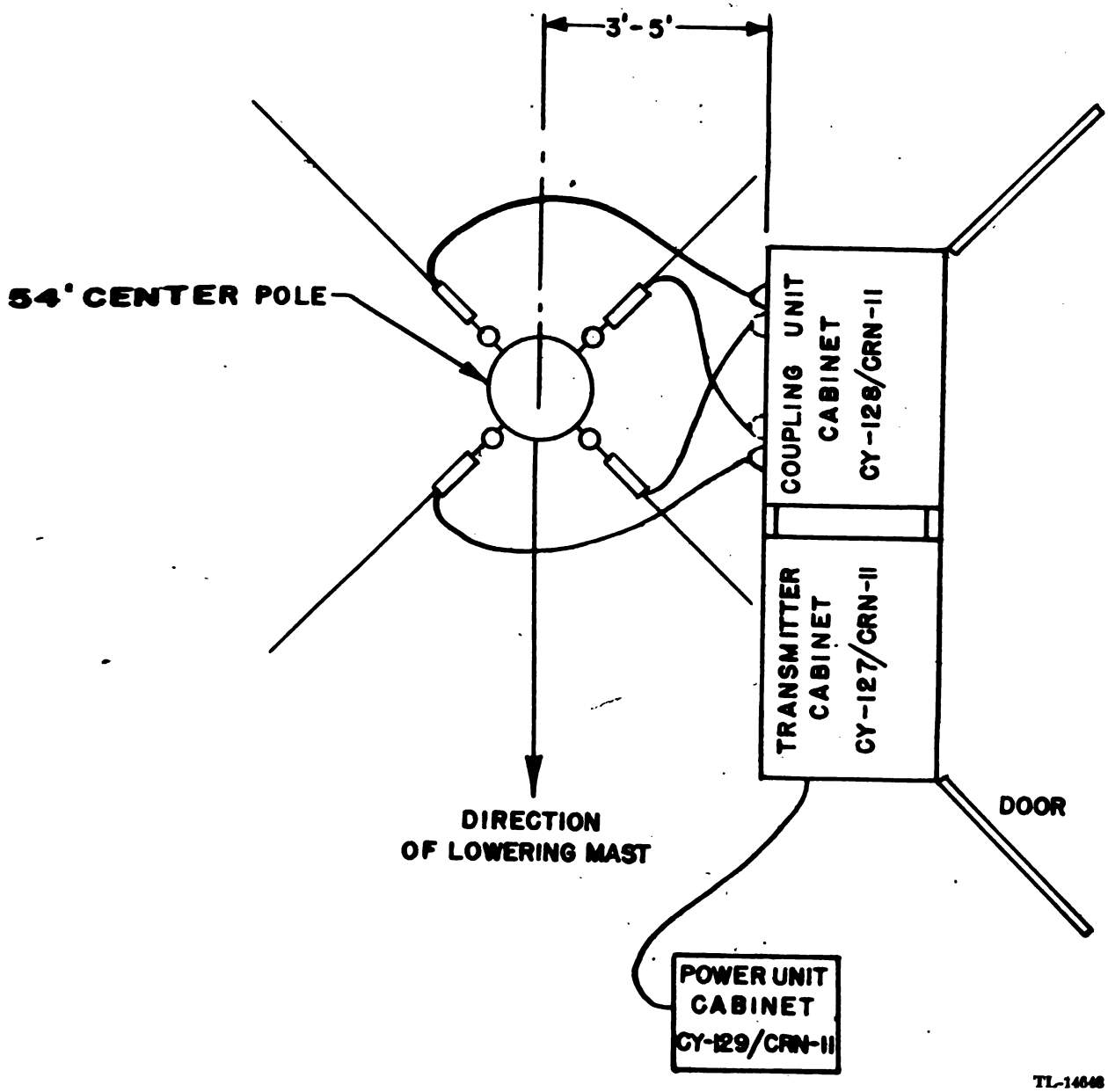
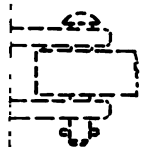


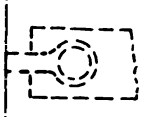
Figure 46.—Antenna System AS-102/CRN-11, top view of cabinet arrangement.



Short Pole and Clamp Variations

Short Pole Section	Short Pole Diameter	Use with Clamp Number	Use with Clamp Dimensions	Required
7	3 3/8" OD x 3" ID	1	3 3/8" ID x 2 1/4" long	1
8	2 7/8" OD x 2 1/2" ID	2	2 7/8" ID x 2 1/4" long	1
9	2 3/8" OD x 2" ID	3	2 3/8" ID x 2 1/4" long	1
10	1 7/8" OD x 1 1/4" ID	4	1 7/8" ID x 2 1/4" long	1

LEVIS - DET. "F" OF
CABLE ASSEMBLY.



Item	Description	Required
1	Short pole (see table)	1
2	Short pole clamp (see table)	1
3	Wing screw, 7/16" - 14 x 2" long, steel, zinc plated	1
4	Washer, 1" x 7/16" x 0.081", steel, zinc plated	1
5	Lap link	1
6	Boat snap	1
7	Galvanized wire rope thimble	2
8	Nicopress sleeve, 5/32" diam	6
9	Guy insulator	2
10	Burndy buttin clamp	2
11	Aircraft cable, 5/32" diam	21'
12	Anchor stake	2

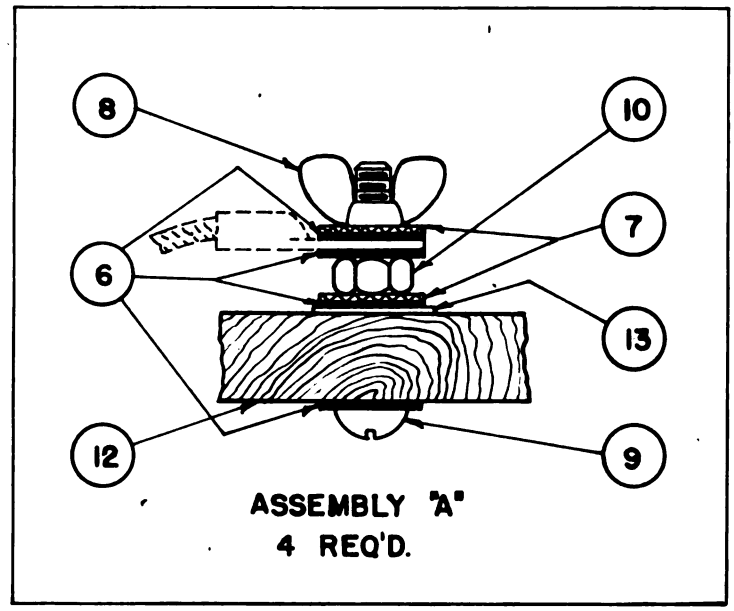
TL-14641

TL-14647

Figure 47.—Antenna System AS-102/CRN-11, antenna short pole insulating assembly.

SNAP-DET "E" OF
LE ASSEMBLY.

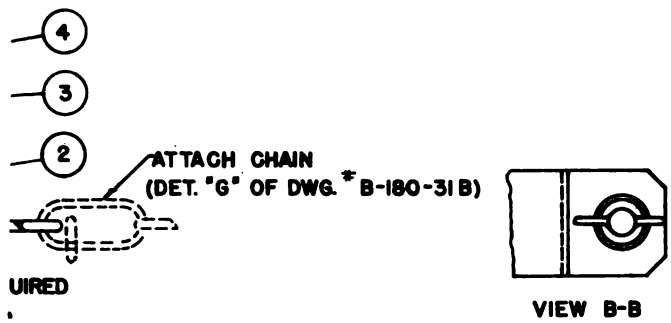
ET. "D"- ANTENNA
TWEEN TWO FLAT
HTEN WITH WING



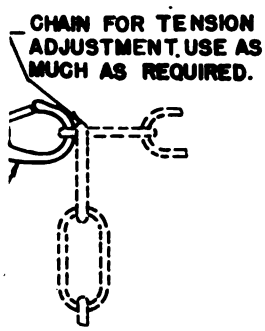
Item	Description	Required
1	Top antenna pole, mast section #6	1
2	Clamp bracket for top insulator plate	1
3	Wing screw, 7/16"-14 x 2", zinc plated	1
4	Flat washer, 1" x 7/16" x 0.081" steel, zinc plated	1
5	Shackle with cotter pin and bolt	4
6	Flat washer, 7/8" x 5/16" x 0.064", brass, nickel plated	16
7	Lockwasher, 5/16" internal and external tooth, phosphor bronze	10
8	Wing nut, 5/16"-18 thread, brass, nickel plated	4
9	Round head machine screw, 5/16"-18 x 2", brass nickel plated	4
10	Hex nut, 5/16"-18 x 19/32 x 19/64", brass, nickel plated	6
11	Round head machine screw, 5/16"-18 x 1 1/2", brass nickel plated	2
12	Top insulator plate	1
13	Crossover strips - items #1 and #2	2

TL-14646

Figure 48.—Antenna System AS-102/CRN-11, top insulator plate assembly.



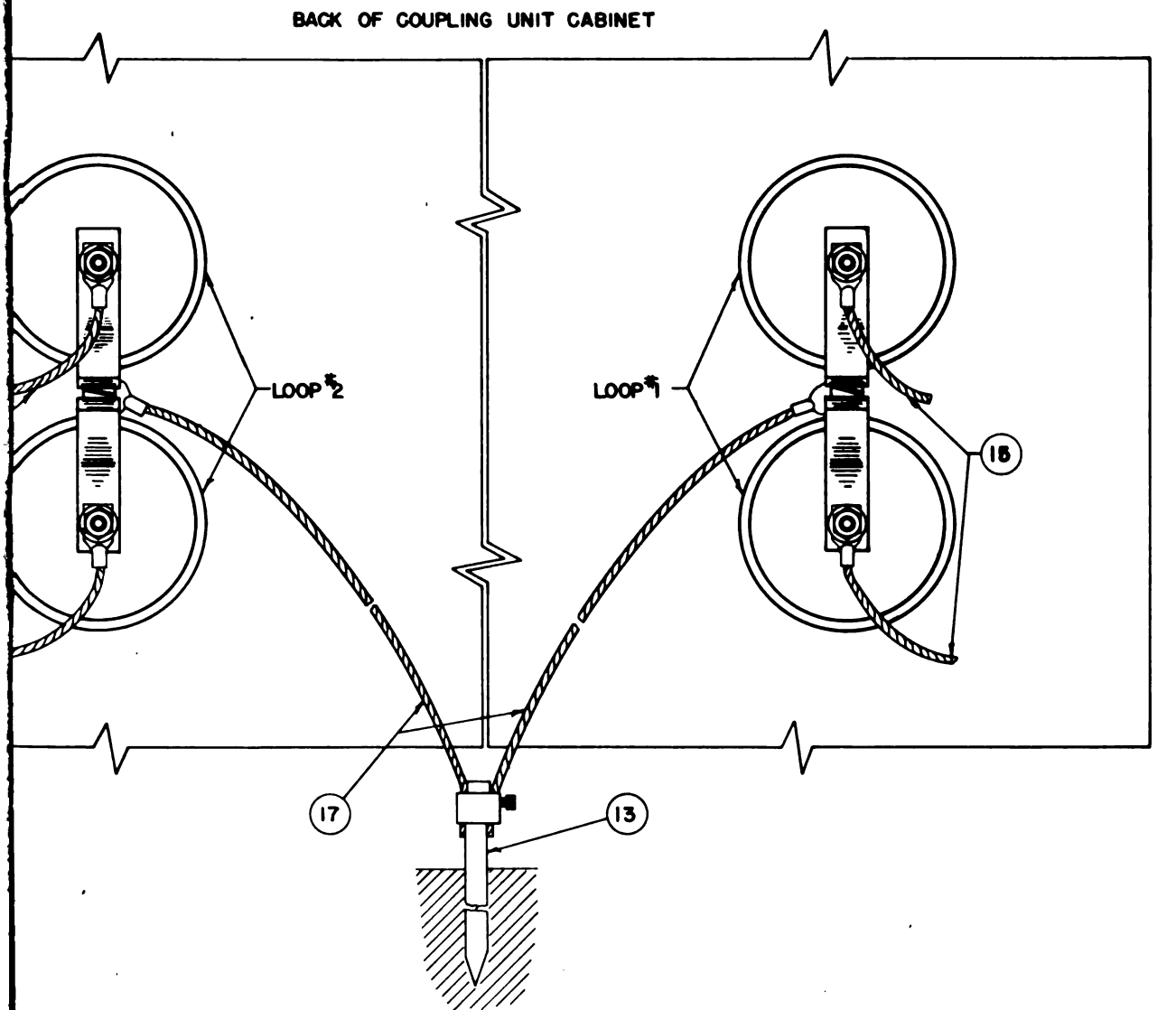
4P ON WHITE MARKING
ROM BOTTOM OF MAST.



Required
1
1
1
1
4
4

TL-14649

Figure 49.—Antenna System AS-102/CRN-11 lower center insulator assembly.



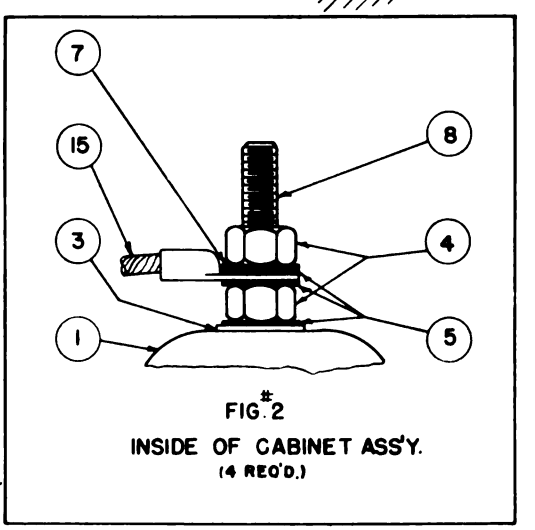


FIG. #2
INSIDE OF CABINET ASS'Y.
(4 REQ'D.)

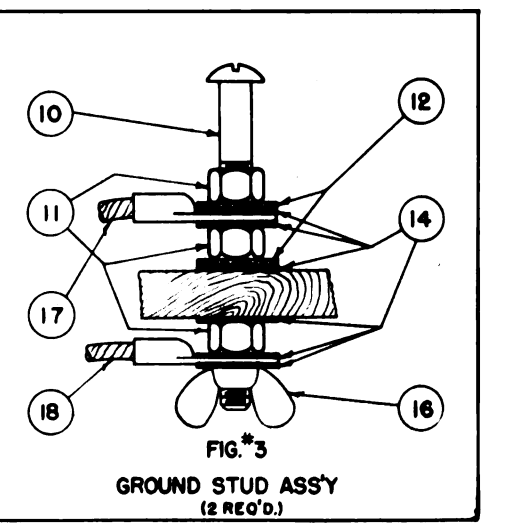


FIG. #3
GROUND STUD ASS'Y
(2 REQ'D.)

TI-14650

Figure 50.—Antenna System AS-102/CRN-11, insulator and lightning gap assembly.

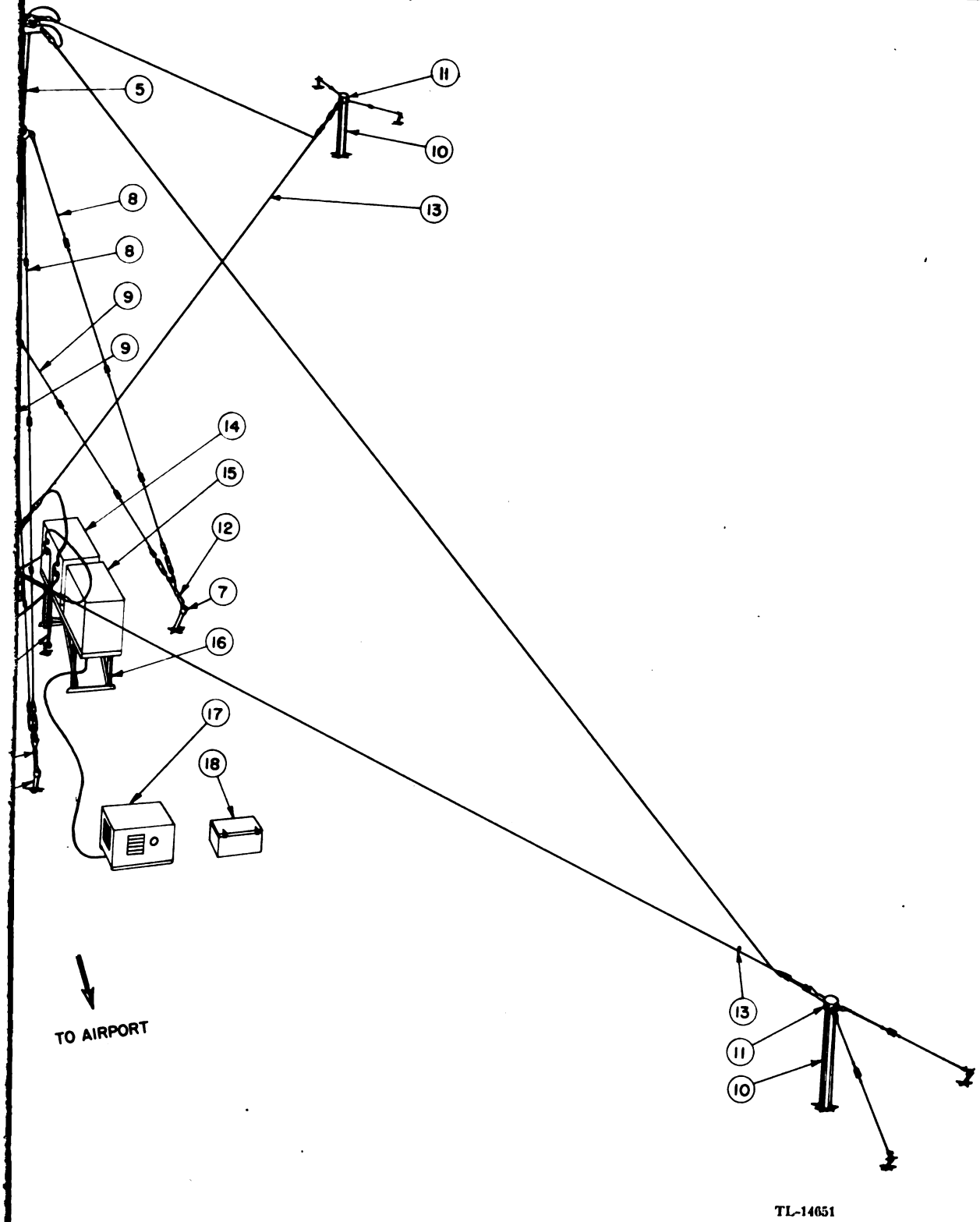
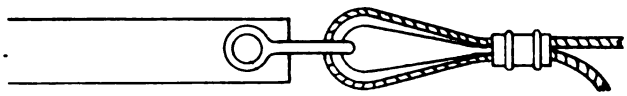
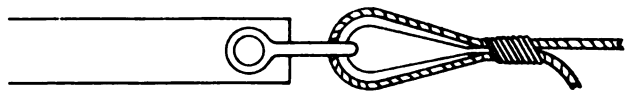


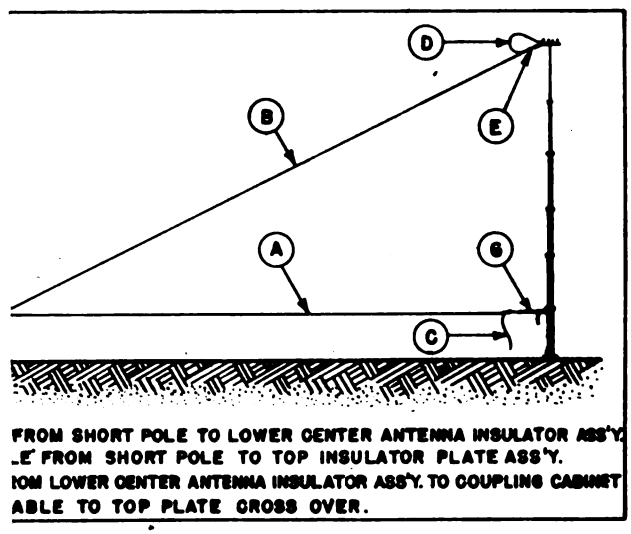
Figure 51.—Antenna System AS-102/CRN-11, complete assembly.



) LOWER CENTER CLAMP ASS'Y.



) SHORT POLE CLAMP ASS'Y.



FROM SHORT POLE TO LOWER CENTER ANTENNA INSULATOR ASS'Y.
.E FROM SHORT POLE TO TOP INSULATOR PLATE ASS'Y.
IOM LOWER CENTER ANTENNA INSULATOR ASS'Y. TO COUPLING CABINET
ABLE TO TOP PLATE CROSS OVER.

TL-14652

Figure 52.—Antenna System AS-102/CRN-11, antenna cable assembly.

or with the transmitter in proper operation. It presents a closed circuit with plate switch ON but insufficient carrier or modulation. The alarm circuit is not necessary for range operation. Terminals F and A are for external meter reading proportional to primary r-f current. (Meter is provided in Coupling Unit CU-38/CRN-11.)

(2) Control. — (Plug is part #88, receptacle part #86, located on lower left-hand side of transmitter, rear plug.) Terminals E and B are for monitor audio output, which is available but not essential for range operation. Terminal B is also for external ground. In normal transmitter operation these will supply audio from demodulated antenna current at a level of 15 milliwatts across 600 ohms. Terminals C and D are for 600 ohm line audio input, 48 milliwatts required for 100% modulation at 1,000 cps. Terminals F and A go to coil of voice-range control relay in coupling unit.

(3) Crystal Heater and Transmitter Heater.— (Plug is part #92, receptacle #91, located on lower right-hand side of transmitter.) This receptacle connects directly to heater resistor 97 in crystal oscillator box. It should be permanently energized at 105-125 volts a-c to prevent condensation of moisture in the crystal holders under any conditions. The main transmitter heater, part #98, is used in tropical climates to dry out the transmitter before starting, and should be turned off after the transmitter has warmed up.

(4) Radio Frequency.—Two binding post connections are available on the lower right-hand rear of the transmitter. The lower post is ground. The upper post is to be connected to the center wire of the r-f cable to the Coupling Unit CU-38/CRN-11. In addition to the center conductor connection, the woven braid shield lead must be connected to the ground terminal of the transmitter.

c. Connections for Remote Operation. — (1) Connect a 3-wire telephone line using the 300 feet of cable as found in the spare parts box or Reel DR-4/CRN-11 with 1,500 feet of cable. The transmitter end is connected to the terminal block inside the Transmitter Cabinet CY-127/CRN-11. This terminal block is fastened to the left-hand side of the cabinet near the bottom, and has a microphone cord and plug connected to it. Insert the plug into the microphone jack on Radio Transmitter T-65/CRN-11.

(2) The remote control terminal and jack box should be placed at the desired location. It may be hung by means of the tab provided on the box. Remove the cover. Connect the 3-wire telephone cable to the terminal strip, making sure that the wires are connected in the same manner as they were connected to the terminal strip on the transmitter cabinet. Insert the microphone plug into the jack. Replace the cover. There is a tab attached to the cover which is designed to prevent the microphone plug from being pulled out. The tab should fit into place easily.

17. PREPARATION FOR USE

Note.—Before starting up the equipment, the heaters in both the coupling unit and the transmitter should be turned on for a short time to dry out the units before turning on for operation. Do not leave heaters on except when drying out the equipment.

CAUTION.—All ventilation louvers in this equipment are covered during shipment to protect the louver openings. These plywood cover plates must be removed before the equipment is operated, otherwise serious overheating will result. These plywood covers and the packing blocks may be kept in the spare parts cabinet when the equipment is in use.

a. The keyer K101 normally leaves the factory with the identification letters KDY set up. If other letters have been assigned, set them up in accordance with the instructions in paragraph 43.

b. Check line voltage. It must be between 105 and 125 volts at 50 to 60 cps.

c. Check antenna system and wiring. The antenna loops must be taut, to insure a minimum of motion in the wind, and the lead-ins should be rigidly away from all conductors. A good ground connection should be provided.

d. Check all tubes to see that they are firmly in their sockets.

e. Insert crystals under crystal clips.

f. Before connecting to a-c power, see that all doors, shields, and covers are closed. Make sure that power switch (G) and plate switch (H) are in the OFF position.

g. Connect the external source of a-c power. Operate the A.C. POWER switch (G) to ON. The green pilot above this switch should light and the LINE VOLTAGE meter should read. Rotate the ADJUST LINE VOLTAGE switch 1 until the LINE VOLTAGE meter reads 115 volts. (This adjustment will be repeated later.)

18. PRELIMINARY ADJUSTMENT

a. Leaving the loops disconnected at the bowl insulators of the coupling unit, tune the transmitter by following the procedure outlined. These instructions are also printed on the inside of the right hand door of the transmitter.

THE NORMAL RANGE OF METER READINGS IS AS FOLLOWS:
(with antenna coupled)
(Refer to paragraph 30)

D. C. METER

(1) RF Osc.	−0.5 to +2.0
(2) Buffer	−2.5 to +1.0
(3) P.A. Grid	−2.0 to +3.5
(4) P.A. Plate	−1.0 to +1.0
(5) Modulator	−1.5 to +1.0
(6) Audio Amp.	−1.5 to +1.0
(7) Audio Level	−1.5 to +1.0
(8) Audio Osc.	+0.5 to +3.5
(9) H.V. Rect.	0 to +1.5
(10) Bias Rect.	+1.0 to +2.0

LINE VOLTAGE METER: 113-117 volts.
ANTENNA CURRENT: (with audio tone on) 1.6 to 2.5 amp.

METER AND DIAL READINGS

Freq. Kc	P.A. Tuning (D)	Ant. Coupl. (E)	Ant. Band Sw.	Ant. Tuning Dial	Ant. Cur. (Mod.)	Ant. Cur. (Unmod.)
		200-280 KC BAND				
201	2.5	4.2				
219	4.2	4.0				
240	5.7	4.0				
260	7.0	4.0				
280	8.4	3.9				
		280-400 KC BAND				
280	2.3	3.8				
300	3.8	3.8				
320	4.8	3.9				
340	5.7	3.9				
360	6.5	3.9				
380	7.5	3.8				
400	8.7	3.7				

TO PLACE TRANSMITTER IN OPERATION

1. Set the FUNCTION SELECTOR (B) switch to the desired position.

2. Set the FREQUENCY BAND SWITCH (C) to the proper band.

3. Set the ANTENNA COUPLING control (E) to min. (0).

4. Set the P.A. TUNING dial (D) to an approximate setting as indicated on the preceding chart.

5. (Void and blanked out on transmitter.)

6. Set the D.C. METER SWITCH (F) to P.A. PLATE (4) position.

7. Throw on A.C. POWER SWITCH (G) and wait about 30 seconds.

8. Throw ON the PLATE switch (H) and rotate the P.A. TUNING dial (D) for a minimum reading on the D.C. METER.

9. (Void and blanked out on transmitter.)

10. (Void and blanked out on transmitter.)

11. Advance the ANTENNA COUPLING control (E) until the D.C. METER reads 0. D.C. METER SWITCH (F) still on P.A. PLATE (4).

12. Shift the ADJUST LINE VOLTAGE dial (1) until the LINE VOLTAGE meter reads close to 115 volts.

13. Turn D.C. METER SWITCH (F) to AUDIO LEVEL position 7 and note reading on D.C. METER. If reading is greater than +1, advance ANTENNA COUPLING control (E) until reading drops to +1. If reading is below −1, reduce the ANTENNA COUPLING control (E) until reading rises to −1.

14. Readjust ANTENNA TUNING control for maximum current.

15. Read all the switch points on the D.C. METER SWITCH (F) and compare with values on the preceding chart.

16. If the local alarm system is to be used, adjust the CARRIER MONITOR control (J) until the alarm sounds when ANTENNA CURRENT is reduced below the desired value. Reduce ANTENNA CURRENT by reducing reading on ANTENNA COUPLING control (E).

17. FOR VOICE BROADCAST: Insert a PL-68 plug attached to a T-17 or equal microphone into the MICRO. jack. Depressing the microphone push-button will cut off the tone modulation and permit voice broadcast. Best clarity and full modulation is obtained when the D.C. METER drops to −3 on voice peaks with the D.C. METER SWITCH (F) on AUDIO AMP. (6) position.

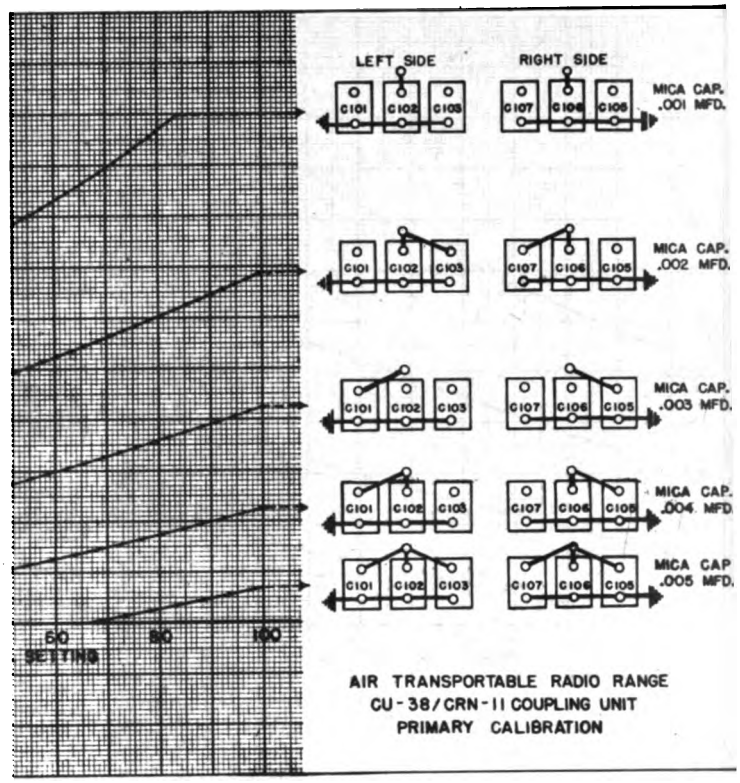
18. TO KEY THE AUDIO TONE: Connect a key to a PL-55 plug and insert the plug in the KEY JACK.

PRECAUTIONS DURING OPERATION

19. (Void and blanked out on transmitter.)

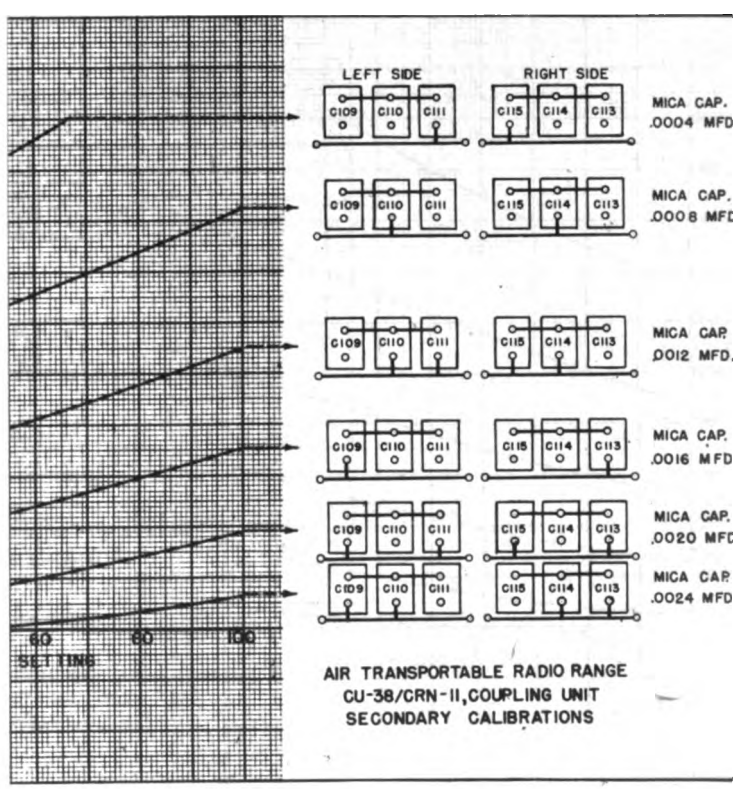
20. Check LINE VOLTAGE meter occasionally and keep readings close to 115 volts.

21. Make sure that the crystal heater is in operation even when the transmitter is turned off.



TL-1464

Figure 53.—Coupling Unit CU-38/CRN-11, primary circu tuning calibration chart.



TL-1463

Figure 54.—Coupling Unit CU-38/CRN-11, secondary circu tuning calibration chart.

19. TUNING PRIMARY CIRCUITS IN THE COUPLING UNIT

a. With the loops still disconnected at the bowl insulators, open the right-hand door of the coupling unit and wedge the link circuit relay K102 to the right side (clockwise) with a small piece of wood or cardboard (do not use metal). Use the primary calibration curves for preliminary setting as shown in figure 53. Increase the ANTENNA COUPLING slowly until a reading of 1 or 2 ma is obtained on the monitoring meter M101. Tune the right primary circuit for a maximum current on the monitoring meter M101. If the reading goes off scale at resonance, reduce the ANTENNA COUPLING. If resonance occurs at or near 100 on the dial, change to the next higher frequency range. If resonance occurs at or near 0 on the dial, change to the next lower frequency range.

b. When the right primary circuit has been tuned, reduce the ANTENNA COUPLING to 0 again. Wedge the link circuit relay K102 to the left side (counterclockwise). Tune the left primary circuit, following the same general procedure as used for the right primary. Leave the link circuit relay wedged to the left side.

20. TUNING SECONDARY CIRCUITS IN THE COUPLING UNIT

a. After the primaries have been tuned, reduce the ANTENNA COUPLING to 0, shut off the transmitter and connect the loop antenna to the antenna coupling unit. Refer to the secondary calibration curves as shown in figure 54 and preliminary settings. Turn the transmitter on and increase the ANTENNA COUPLING until a slight reading (not over 1 ma) is obtained on the monitoring meter M101. Tune the left secondary circuit for a minimum current on the monitoring meter M101. The point of minimum current will be rather sharp. If no dip is observed, change to the next higher or lower band as required. The ANTENNA COUPLING may be increased after the circuit has been resonated to make a finer adjustment of the tuning.

b. After the left secondary circuit has been resonated, decrease the ANTENNA COUPLING to 0 again and wedge the link circuit relay K102 to the right side (clockwise). Tune the right secondary circuit, following the same general procedure as used for the left secondary. When tuned, the secondary circuits should have approximately the same dial setting. Leave the wedge in the link circuit relay.

c. When the right secondary has been tuned, increase the ANTENNA COUPLING until the P.A. PLATE current reads 0 on the D.C. METER scale. This provides full output power. Shut off the transmitter and remove the wedge from the link circuit relay. The equipment is now completely tuned and ready for operation.

d. When the link circuit relay is unenergized, the circuit is open at both contacts. During this time there is no load whatsoever on the transmitter. Therefore, the power switch S101 in the coupling unit must be turned on before the transmitter is started. If the link circuit relay does not operate, do not turn the transmitter on. The power amplifier tubes 3-4, 3-5, and 3-6 may be damaged if the transmitter is operated for more than a few seconds without a load.

21. CHECKING COURSES

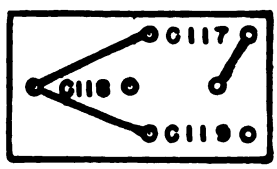
a. In setting up this range equipment great care should be taken to keep tanks, trucks and cars out of the immediate field of the loop antennas. This equipment should be kept 300 feet or more from the outer edge of the antennas. Metal in the immediate field of the loops is very apt to distort the range pattern. If any difficulty is experienced in obtaining sharp courses at approximately the correct angle (45 degrees from either loop), the cause might be due to a distortion of the field pattern in this way.

b. In any case, if a course is not sharp or is incorrectly located, check to see that the two loops are exactly at right angles to each other. This may be checked mechanically with the measuring rope, or electrically by placing an r-f meter (approximately 3-5 ampere) in series with the unused loop, and rotating one loop by moving the outer poles with respect to the other loop. At one position a zero reading of the meter will be found, and this is the correct setting. If it is only necessary to rotate a range course which is satisfactory except for direction, then all four outer poles should be rotated together until the course points in the desired direction.

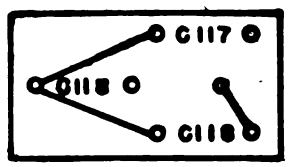
c. The direction of the course is checked by carrying a receiver across the runway of the airport and finding the line where the A and N signals merge to give a continuous tone. When this tone is secured on a line down the center of the runway, the range course is correctly set.

d. If it is necessary to interchange the A and N

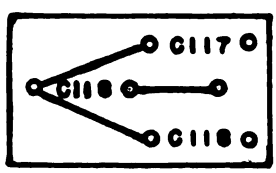
QUARTER-PHASING CAPACITOR CONNECTIONS



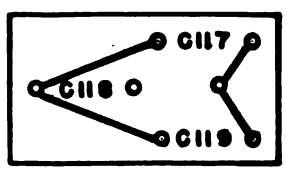
.005 MFD.



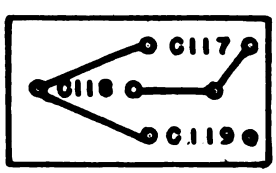
.02 MFD.



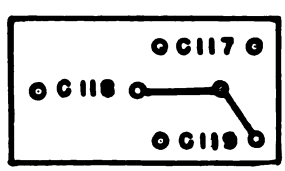
.01 MFD.



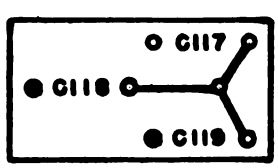
.025 MFD.



.015 MFD.



.03 MFD.



.035 MFD.

QUARTER-PHASING INDUCTOR (L103) CONNECTIONS

FREQ. KC.	TAP
200-240	2 & 7
240-280	3 & 9
280-320	3 & 8
320-360	3 & 8
360-400	3 & 8

QUARTER-PHASING CAPACITOR CONNECTIONS

FREQ. KC.	CAPACITANCE
200-240	.035
240-280	.03
280-320	.025
320-360	.025
360-400	.02

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Figure 55.—Coupling Unit CU-38/CRN-11, quarter-phasing calibration chart.

quadrants of the range course later, simply interchange both leads on the left with both loop leads on the right at the back of the coupling unit. When this is done, the tuning of the secondary circuits in the coupling unit should be checked.

22. QUARTER-PHASING

(Figs. 55 and 56)

a. The adjustment of the quarter-phasing coil and capacitor, giving an approximate adjustment which is accurate enough for most purposes, is as follows:

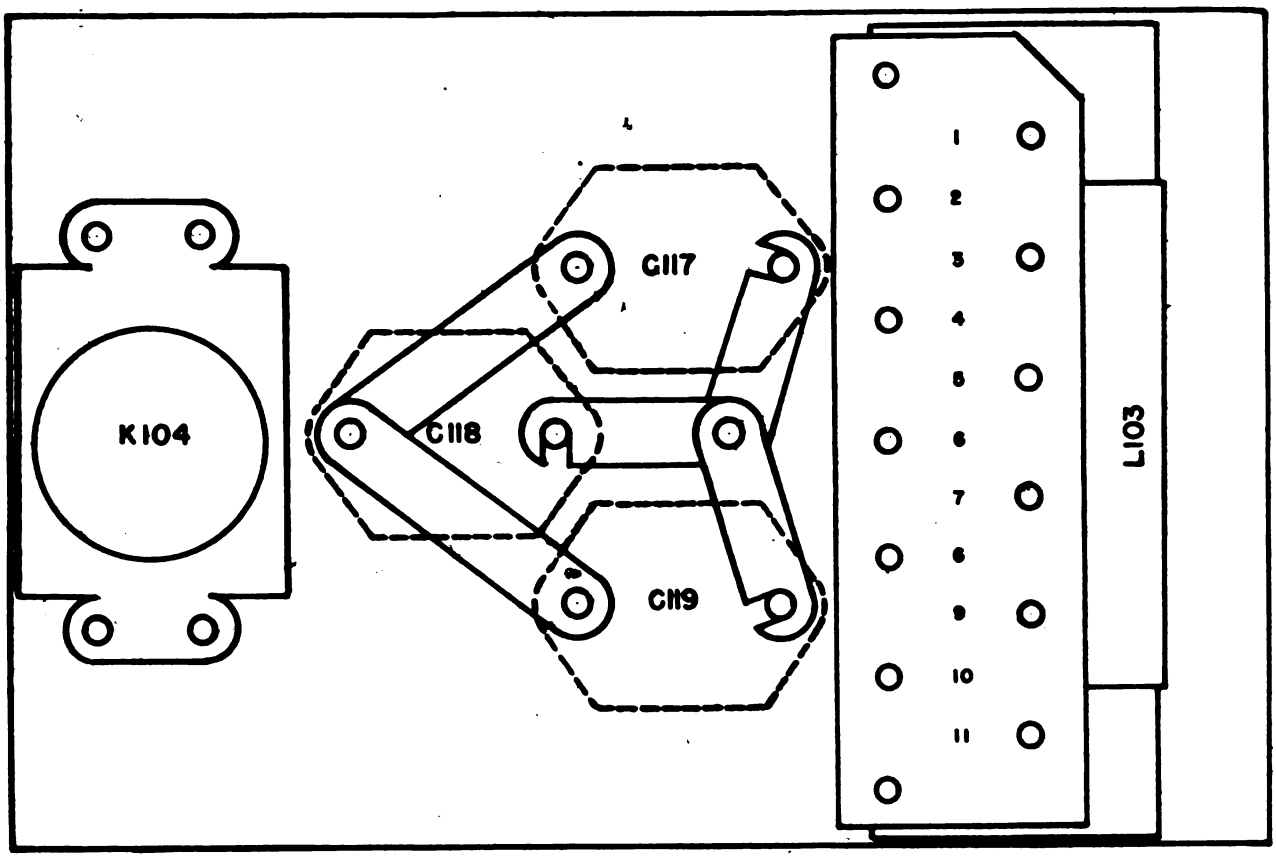
Frequency	Capacity	Inductance	Inductor Taps
200-240 kc	0.035 μf	50 turns	2 and 7
240-280 kc	0.03 μf	46 turns	3 and 9
280-320 kc	0.025 μf	43 turns	3 and 8
320-360 kc	0.025 μf	43 turns	3 and 8
360-400 kc	0.02 μf	43 turns	3 and 8

23. OPERATION

a. Voice Transmission. — For voice transmission, plug microphone T-17 into jack 83 on the transmitter, press the PRESS TO TALK tab, and speak into the microphone.

b. Range Transmission.—Range transmission may be obtained by simply operating the range power switch on the coupling unit to ON.

c. Remote Control. — Remove the microphone line plug from its holder on the terminal board inside Cabinet CX-127/CRN-11 and insert into the microphone jack 83. Using the remote microphone, press the PRESS TO TALK tab, and speak into the microphone.



TL-14655

Figure 56.—Coupling Unit CU-38/CRN-11, parts location diagram for quarter-phasing panel.

Section III

FUNCTIONING OF PARTS

24. GENERAL

a. A radio range establishes four straight line courses or aerial paths directed radially from the station location. The courses are lines along which an unbroken signal is received. They are separated by regions or quadrants in which either an A or N signal is received. The A and N quadrants alternate around the compass. The horizontal radiation pattern of a vertical loop antenna is a figure-eight with the nulls broadside to the loop. If two loops are placed at right angles to each other and alternately energized, they will establish alternate figure-eight patterns at right angles to each other. If the two loops are now alternately energized with interlocked A and N characters, so that a mark on one loop is a space on the other, a continuous tone will be received on the lines which make an angle of 45 degrees with the loops. Along these lines the signal from each loop is equal in intensity. Moving off these lines, either A or N signal will predominate.

b. Since each loop can only radiate a figure-eight pattern, they are individually unsuited for voice broadcast, inasmuch as a plane may be located on a radiation null at the time of broadcast. Two crossed loops fed simultaneously in phase will still produce a figure-eight pattern. However, if the loops are simultaneously excited 90 degrees out of phase with each other, the over-all radiation pattern will be circular. This is true because with the currents in the loops 90 degrees out of phase with each other, the fields can never subtract and produce nulls. A so-called synchronous rotating field is established. The method of exciting the loops 90 degrees out of phase is accomplished by feeding the primaries of the antenna coupling transformers 90 degrees out of phase. This is accomplished by inserting a capacity in series with one primary and an inductance in series with the other. The values of capacity and inductance are so chosen that the current is made to lead by 45 degrees in one primary and lag by 45 degrees in the other primary, which places them 90 degrees apart.

25. RADIO FREQUENCY CIRCUITS OF THE TRANSMITTER (Fig. 57)

a. The crystal oscillator is triode tube VT-94 (2-4) in an untuned plate circuit. FUNCTION SELECTOR (B) switch (70) selects the crystal to be used. The output of the oscillator is inductively coupled through transformer 18 to the grid of beam tetrode tube VT-100 (buffer tube 3-3). The plate circuit of the buffer drives the power amplifier through an untuned coupling arrangement composed of transformer 19 and capacitor 33-1. The power amplifier consists of three beam tetrode tubes VT-100 (3-4, 3-5, and 3-6) connected in parallel. The plate circuit of the power amplifier is tuned by capacitors 35-1 and 35-2 and variable iron core inductor 20. Capacitor 35-2 is only used on the lower frequency band, 200 to 280 kc, and is connected by band-changing relay 74-4 which is operated by BAND SWITCH (C) (71) on the crystal oscillator unit. The output of the power amplifier is inductively coupled from inductor 20 to the coupling unit circuit by coupling inductor 21.

b. Monitoring transformer 22 is connected in the ground lead of inductor 21. This monitoring transformer is designed to produce substantially constant current flow through its primary, independent of frequency. The secondary voltage is rectified by r-f monitor triode tube VT-94 (2-5), connected as a diode.

c. Parasitic suppressors 24-1 to 24-6 inclusive are connected in the plate circuits of each tube VT-100 (3-1 to 3-6 inclusive).

26. AUDIO CIRCUITS OF THE TRANSMITTER

a. The audio tone oscillator triode tube is a VT-94 (2-1) connected in a Hartley circuit with the plate grounded. The output of the oscillator is delivered to the audio amplifier tube grids through capacitor 29-5 and resistor 46-1. For 1,100 cps operation, tank capacitor 30 is used to tune the oscillator; 700 cps is obtained by connecting capacitor 31 across the tank circuit through FUNCTION SELECTOR (B) (70).

b. The audio amplifier consists of two triode tubes VT-94 (2-2) and (2-3) connected in push-pull transformer-coupled circuit. Input transformer 12 has two primaries, one to match a 600 ohm balanced telephone line, and the other, carbon microphone T-17. Provision for plugging in the microphone is made by jack 83.

c. The output of the audio amplifier feeds the modulator tubes through driver transformer 13. The modulator consists of two beam tetrode tubes VT-100 (3-1) and (3-2) operated as Class B amplifiers.

d. An unconventional feature of the audio system is the audio monitor tube, rectifier tube VT-145 (1-5). The filament of this tube is connected to the high audio potential side of the secondary of modulation transformer 14. One anode of the tube returns through resistor 36-3 to the junction of 43-1 and 42, a point on the high voltage rectifier bleeder approximately 80 volts d-c above ground. When the audio output of transformer 14 reaches an amplitude such that on its negative peak the instantaneous voltage on the filament of audio monitor tube 1-5 is less than 80 volts above ground, the anode will conduct and potential will appear across resistor 36-3. This potential is applied through resistor 49 to the grids of audio amplifier tubes 2-2, and 2-3, lowering the gain of the audio amplifier stage. This arrangement allows the output of the modulator to rise to a high percentage of modulation, but prevents it from seriously overmodulating the transmitter. The other anode of audio monitor tube 1-5 returns through dropping resistor 47, metering resistor 48-1, and the coil of audio monitor relay 74-1 to the low audio potential side of transformer 14 and hence provides a means of metering the modulation level with D.C. METER switch (72) at AUDIO LEVEL 7 and operating a low modulation limit monitor relay.

e. Modulation is accomplished by introducing the output of modulation transformer 14 into high voltage supply for the plates and screens of power amplifier tubes 3-4, 3-5, and 3-6.

27. RECTIFIER CIRCUITS OF THE TRANSMITTER

a. The high voltage plate rectifier consists of rectifier tubes VT-145 (1-1), (1-2), and (1-3), connected in parallel in a full-wave circuit rectifying the output of transformer 6. This unit delivers approximately 420 volts through a filter composed of choke 15 and capacitor 26. The bias rectifier consists of rectifier tube VT-145 (1-4) in a full-wave circuit rectifying the output of the high voltage secondary on bias transformer 10. This unit delivers approximately 70 volts through a filter consisting of choke 16, and capacitor 25-2.

28. PRIMARY POWER CIRCUITS OF THE TRANSMITTER

a. Input power is taken through over-temperature thermostat 66, door switch 67, line fuses 76-1, and 76-2, and power switch 68-1, through selector switch 69, to the line voltage compensating auto-transformer 9, This combination will permit readjustment of line voltage supplied to the transmitter to 115 volts, indicated on line voltage meter 82. Closing switch 68-1 applies power to the filament transformer primaries and bias transformer 10.

b. Primary power is supplied to the plate rectifier through contactor 73. This contactor is operated by plate switch 68-2 from the d-c output of the bias rectifier. Fuse 77 protects the filament and bias rectifier circuits, and fuse 78 protects the plate rectifier.

29. CONTROL CIRCUITS OF THE TRANSMITTER

a. FUNCTION SELECTOR (B) switch 70 is used to select either crystal 4 or 5 at will. This selector switch also changes the modulation frequency from 700 to 1,100 cps when operated. If two different r-f frequencies are employed, the modulation frequency can be interchanged for the two r-f frequencies by interchanging the two crystals in their receptacles.

b. Switch-over to voice broadcast is controlled by a PRESS TO TALK tab on the microphone. The voice switch-over functions are arranged so that the transmitter will shift from normal tone modulated output to voice when the tab is pressed. This is accomplished by press-to-talk relay 75. In the normal unenergized position of this relay, the back contact shorts to ground the voltage obtained from the bias bleeder through bias-isolating resistor 58-3. The grid of audio oscillator tube VT-94 (2-1) is also returned to ground through grid resistors 46-2, and the same contacts on relay 75. When relay 75 is energized, the back contacts are opened, permitting blocking bias to be applied to the tube through resistors 58-3 and 46-2. At the same time, relay 75 closes a contact which places bias rectifier volt-

age on the coil of alarm relay 74-2, making the alarm circuit (if used) inoperative during the period of voice broadcast. The coil of relay 75 is in series with the coil of relay K103 in the coupling unit so that both relays are operated simultaneously. When the PRESS TO TALK tab is down, the output of the bias rectifier is applied to relays 75 and K103 by grounding the tip circuit of the microphone. The switch-over to voice broadcast may be accomplished locally by plugging a T-17 microphone into jack 83 or remotely by plugging the microphone plug from the terminal strip inside the cabinet into jack 83 and operating from the remote control box.

c. The tone key jack 84 accepts the plug on the end of the tone keying line coming from the coupling unit. This is a shorting type jack in the grid circuit of tube VT-94 (2-1). When the connection to ground is broken, blocking bias is applied to the audio oscillator tube VT-94 (2-1) through resistors 58-3 and 46-2.

d. When alarm relay 74-2 is unenergized the contacts are closed, making a closed circuit from terminals C and D of plug 87 when switch 68-2 is closed. This circuit may be used to actuate an external battery-operated alarm. When the press-to-talk relay 75 is not energized for voice operation, relay 74-2 can only be energized if both carrier monitor relay 74-3 and audio monitor relay 74-1 are energized. When the transmitter is operating normally with the correct percentage of modulation, relays 74-3 and 74-1 are both energized and the alarm circuit is open at the contacts of relay 74-2. Relay 74-3 is operated by the rectified output of monitor transformer 22 and relay 74-1 is operated by the rectified output of modulation transformer 14. Provision for adjusting the value of antenna current at which relay 74-3 will drop out is made by variable resistor 59. Meter M101 of the coupling unit is in series with the coil of 74-3, the connection being made through terminal F and A of plug 87. For remote monitoring purposes the demodulated audio component of the rectified carrier is applied through plateline transformer 8 to terminals B and E of plug 88. The normal audio level of this circuit is approximately 15 milliwatts across 600 ohms.

30. METERING CIRCUITS OF THE TRANSMITTER

a. Pertinent Data for Switch Points.—

Switch Point	Circuit Metered	Metering Resistor	Current or Voltage*
(1) R-F OSC.	Crystal oscillator cathode current	Part 65, 400 ohms, connected as meter shunt.	3.6 ma
(2) BUFFER	Buffer cathode current	Part 64, 150 ohms, connected as meter shunt.	9 ma
(3) P.A. GRID	P-a and buffer grid current	Part 63, 150 ohms, connected as meter shunt.	3 ma
(4) P.A. PLATE	P-a cathode current	Part 62, 5 ohms, connected as meter shunt.	250 ma
(5) MODULATOR	Modulator cathode current	Part 40, 6 ohms, connected as meter shunt.	210 ma
(6) AUDIO AMP.	Audio amplifier cathode current	Part 39, 100 ohms, connected as meter shunt.	13 ma
(7) AUDIO LEVEL	Rectified audio current from anode circuit of audio rectifier tube 1-5	Part 48-1, 1,000 ohms, connected as meter shunt.	80% mod
(8) AUDIO OSC.	Audio oscillator plate current	Part 41, 2,000 ohms, connected as meter shunt.	1.1 ma
(9) H.V. RECT.	Plate rectifier output voltage	Part 60, 750,000 ohms, connected as voltmeter multiplier.	380 v
(10) BIAS RECT.	Bias rectifier output voltage	Part 61, 100,000 ohms, connected as voltmeter multiplier.	50 v

*When D-C METER reads 0.

b. D.C. METER 81 is a 1-milliampere full scale d-c meter with 2,500 ohms internal resistance. It has a special scale reading from −5 to +5 with zero at mid-scale. The scale resistors used in the various circuits have been chosen so that normal readings are near zero on the scale. (A table of tolerances is printed inside the right-hand door of the transmitter.) The meter is used as a milliammeter when connected across resistors which are in series with the unknown current, and as a voltmeter when connected in series with a dropping resistor.

c. LINE VOLTAGE meter 82 is a standard a-c voltmeter calibrated to read voltage directly.

31. RADIO-FREQUENCY CIRCUITS OF THE COUPLING UNIT (Fig. 64)

a. During radio range transmission, a tone modulated r-f signal from the transmitter is received at the r-f input terminals. The r-f energy passes through the back contacts on relay K104. Link circuit relay K102 switches the r-f energy from the primary of r-f transformer L101 to the primary of r-f transformer L102 in accordance with the keying pattern established by keyer K101. The primaries of r-f transformers L101 and L102 are series resonated. Variable capacitor C104 and the proper combination of fixed capacitors C101, C102, and C103 for the frequency used, tune the primary of r-f transformer L101. Variable capacitor C108 and a combination of fixed capacitors C105, C106, and C107 tune the primary of r-f transformer L102. Each secondary consists of two balanced windings and is series resonated. Variable capacitor C112 and the proper combination of fixed capacitors C109, C110, and C111 tune the secondary of L101 with loop attached. Variable capacitor C116 and the proper combination of C113, C114, and C115 tune the secondary of L102 with loop attached.

b. During voice transmission, the PRESS TO TALK tab on the microphone completes a circuit which actuates voice transfer control relay K103. The coil of this relay is in series with the coil of relay 75 in the transmitter. When relay K103 is energized, 115 v, 60 cycle a-c is applied to the coil of quarter-phasing relay K104 through the contacts on relay K103. Relay K104 is a double pole relay, which places capacitors C117, C118, C119 in series with primary of the r-f transformer L101 and inductor L103 in series with the primary of r-f transformer L102. The values of capacitive and inductive reactance are so chosen that the current in the primary of r-f transformer L101 is made to lead the applied r-f voltage by 45 degrees and the current in r-f transformer L102 is made to lag by 45 degrees, placing the currents in the primaries 90 degrees out of phase. The values of the capacitive and inductive reactance must be changed when the frequency is changed. The proper setting for the capacitors and the inductor for different frequencies is given in paragraph 22. The back contacts on relay K104 break the connection to the link circuit relay K102.

32. LINK CIRCUIT RELAY K102

a. This relay uses an unconventional magnetic structure in order to achieve the speed and precision of operation required to produce clean A-N signals. The field coil wound around the rear magnetic leg of the circuit is continuously energized from the output of the relay rectifier and pulls the soft iron core armature clockwise as viewed from the front. When the armature coil, located around the armature, is energized by the closing of the interlock switch in the keyer, magnetic flux, opposite in polarity to the flux from the field coil, is driven through the armature, overcoming the effect of the field coil and pulling the armature counterclockwise. The field coil draws approximately 25 milliamperes and the armature coil draws approximately 200 milliamperes.

33. KEYER K101

a. The keyer operates the link circuit relay in predetermined sequence as controlled by the cams on the motor shaft. Electrically, the keyer K101 contains only two sets of contacts which connect to external circuits. These are the link circuit relay contacts and the identification keying contacts. The mechanical system of the keyer serves to activate them in such a manner that the following sequence is followed.

b. The A-N cam switch operates the link circuit relay which transfers the r-f energy from one primary to the other so that the one primary receives energy to form the A character and the other to form the N character. A total of 12 A-N characters are formed, occupying a total time of 30 seconds.

c. Upon completion of the A-N keying cycle, the link circuit relay is thrown to one side, while the identification cam keys the identification signal once. Then the link circuit is thrown to the other side while the identification signal is keyed once more. In this manner each loop receives one

identification signal at the conclusion of the A-N keying. The two identification periods occupy a total time of 7½ seconds.

d. The tone keying line connects the identification switch contacts to jack 84 on the transmitter. With the identification switch closed, the audio oscillator functions in a normal manner and the r-f output is tone modulated. When the identification switch is open, a blocking bias is applied to the audio oscillator tube VT-94 (2-1) through resistors 58-3 and 46-2. The r-f output is unmodulated during this interval.

34. RELAY RECTIFIER IN THE COUPLING UNIT

a. This rectifier employs two selenium stacks, SR101 and SR102, in a full-wave bridge rectifier. The output is filtered by capacitor C120. Transformer T101 is provided with taps on the secondary to compensate for aging of the selenium rectifiers. The primary of this transformer has a dual winding and may be operated from a 115 volt line with the two windings in parallel or from a 230 volt line with the two windings in series. However the transformer is connected for 115 volts and no attempt should be made to change it.

35. METERING CIRCUIT IN THE COUPLING UNIT

a. Meter M101 is a 0-5 milliampere d-c meter connected across terminals D and C of receptacle REC-101 and used to monitor the r-f output of the transmitter. The meter is placed in series with the cathode circuit of monitor tube VT-94 (2-5) in the transmitter.

36. POWER PANEL

a. This unit serves as a junction box for the power and control lines (exclusive of the microphone cable, r-f coupling cable, and the tone keying line). The power panel is equipped with 4 circuit breakers. MAIN circuit breaker 3 controls the entire power for both the transmitter and coupling unit. FAN circuit breaker 1 is used as a switch to operate the fan. RADIO circuit breaker 2 supplies the power to the transmitter. LIGHT circuit breaker 4 supplies power to the lamp and convenience outlet.

b. Each circuit breaker handle operates to turn the current ON or OFF like an ordinary wall switch. If too much current is used, the circuit breaker will shut off the current automatically. The circuit that has been shut off is indicated when the white line on top of the handle lines up with the word TRIPPED on the name plate. To restore current after it has been shut off automatically, push the handle as far as possible beyond the OFF position to RESET, then move the handle to ON. If the handle will not stay in the ON position, there is an overload on the line.

Section IV
MAINTENANCE

Failure or unsatisfactory performance of equipment will be reported on W.D., A.G.O. Form No. 468. If this form is not available, see TM 38-250.

37. DAILY INSPECTION

a. Check and readjust the LINE VOLTAGE to 115 volts. If this voltage is found to fluctuate considerably during a 24 hour period, the LINE VOLTAGE adjustment should be checked every few hours.

b. Check the readings of the DC METER for each position of the DC METER SWITCH. These readings should be recorded day by day for any continuous change. Tube failure often can be anticipated by continuous decline in certain readings.

c. Inspect the insulators for accumulation of dust or dirt. Keep brush and weeds cut away from under the various parts of the antenna system. Wipe any accumulation of dirt or grease from the large bowl insulators on the coupling unit.

d. Check the crystal heater to see that it remains on when the transmitter is turned off.

e. Detailed instructions for the maintenance and repair of Power Unit PE-236-A are given in the instruction book accompanying that unit. Follow these directions carefully.

38. OPENING THE TRANSMITTER FOR SERVICING

a. Provide a suitable support or bench upon which the transmitter can be placed. (The spare parts box can be used for this purpose.) Place this support in front of the transmitter cabinet.

b. Disconnect all cables from the transmitter. Remove the two screws in each of the rubber shock mountings which support the transmitter. These screws can be reached from the under side of the wooden cabinet. Remove the transmitter and its mounting from the cabinet.

c. Open the top covers of the individual units. Remove the four clamps which securely fasten the units together at the top.

d. The individual units are held in place at the bottom by clamps loosened by the knobs which project through the front apron of Mounting FT-381-A. To remove any unit, loosen the clamp by rotating the knob counterclockwise as far as possible and pulling the unit upward and forward. The knob turns unevenly because of the spring locking device. The best arrangement to use for servicing is to pull the middle (modulator) unit forward. In this position, with side shield removed, practically all the terminals of the transmitter may be reached by test probes. If desired, all three units may be removed from the base and placed in any convenient position. The interconnection cables are long enough to permit considerable separation.

39. OPENING THE COUPLING UNIT FOR SERVICING

a. The coupling unit is constructed so that all the parts can be reached from the front through either of the two front doors. Normally, the two parts which will require servicing most often are the link circuit relay K102 and the keyer K101. The link circuit relay is reached through the right front door, while the keyer is accessible through the left door.

40. RELAY MAINTENANCE

a. The best way to maintain relays is to leave them alone. Do not attempt to repair or adjust any relay until it is positively known to be defective. If contacts of a relay are dirty, clean by pulling a piece of hard, lintless paper through the contacts, keeping them pressed to the paper by light finger pressure. If this does not clean the contacts, repeat the procedure using crocus cloth.

b. Do not use emery or sandpaper on any relay except plate contactor 73. A fine sandpaper may be used on this relay if it appears badly pitted. If emery or carborundum paper is used, be extremely careful to keep the dust out of the transmitter.

c. Audio monitor relay 74-1 and radio frequency monitor relay 74-3 have been set at the factory to drop out at definite values of current. Avoid tampering with their adjustments. If, for some reason, they are thrown out of adjustment reset audio monitor relay 74-1 to drop out when the direct current in its coil drops to 1.2 milliamperes and reset r-f monitor relay 74-3 to drop out when the direct current in its coil drops to 0.6 milliamperes.

41. CARE OF THE LINK CIRCUIT RELAY

a. The radio frequency contacts on link circuit relay K102 require a periodic cleaning with carbon tetrachloride which should be applied saturated in a strip of blotting paper. If this cleaning is neglected, irregularities will form on the contact surfaces which can only be removed by the use of a sharp abrasive. (Behr-Manning Speed Wet paper #320 is suitable.) Excessive use of abrasives should be avoided and the thorough cleaning of the contacts periodically with carbon tetrachloride should not be neglected.

b. After considerable use and cleaning of contacts, it will be necessary to reset the stationary contacts. This is done by loosening the lockscrew to the side and above the contact, using the tommy wrenches provided in the clip holder on the base of the relay. The contact adjusting screw is then moved in or out as required and the lockscrew again tightened. These contacts were set at the factory to provide 0.002 inch clearance between each pair of contacts when the armature is centered, and this value should be maintained when readjusting.

42. CARE OF THE KEYER (Fig. 66)

a. The gear box of the keyer unit is filled with a special lubricating grease (grease, lubricating special AX5-637) which should not require refilling for at least one year of service. The keyer should be filled to a point where the drive worm wheel is immersed for one-quarter of its diameter in the lubricant. The surfaces of the various cams should occasionally be treated with a very light application of graphited grease (grease, graphited AX5-683 or Air Corps-3592). The motor is permanently lubricated and should not be oiled.

b. The Acro switches will not require readjustment for at least six months of operation, and should not be tampered with unless absolutely necessary. In the event that it does become necessary to adjust the switches, proceed as follows:

(1) Insert an Allen wrench in the under part of the actuating arm where the Allen set screw is located.

(2) Adjust the Allen set screw so that the switch is actuated when the lever arm is one-half the distance between the inner and outer radii of a segment of the cam. Any segment may be used for this adjustment.

43. SETTING UP THE IDENTIFICATION CAM SEGMENTS ON THE KEYER

a. Unscrew the knurled thumbscrew from the end of the identification cam shaft. Remove the lockwasher and segment locking disc. The segments can then be lifted off the mounting disc. Extreme care must be exercised during this operation to prevent chipping the corners of the segments. Remove all the segments except the large space segment which is held by a locating pin. Any combination of letters may be set up, provided there is enough room on the disc. Extra identification switch segments are packed in the spare parts box.

b. The letters are set up in a clockwise direction on the mounting disc. Begin by inserting a blank segment immediately after the space segment. Follow this with either a dot or dash segment to begin the first letter of the identification. After the first letter has been set up, insert a blank segment before proceeding with the next letter. Be sure that the sloping edge of the segment is leading. The segments should be fit snugly but not tightly on the mounting disc. Do not attempt to force a segment into place. If it cannot be inserted by light finger pressure, adjust the segment to fit by filing the edges of the segments a little at a time until the segment fits properly. After the letters have been set up, complete the filling in with blank segments. The entire circumference of the identification cam must be filled with segments. This can be accomplished by using the blank segments of different sizes. *Do not operate with insufficient number of segments in the kolder. Serious damage to the gears, shafts or motor may result.* There must be at least one blank segment at the end and just ahead of the large space segment.

c. After the segments have been placed on the mounting disc, replace the locking disc, lockwasher and thumb nut.

44. CARE OF THE VENTILATING FAN

a. The motor of the ventilating fan should be oiled twice a month with a medium grade motor oil, if the equipment is operated continuously. The motor is accessible through a door in the side of the housing.

b. The air filter should be inspected once a month and replaced when it becomes dirty.

45. POINT-TO-POINT VOLTAGES, RADIO TRANSMITTER T-65/CRN-11

Note.—All measurements made at 201 kc with a dummy loop antenna connected across output of coupling unit. All voltages are d-c unless otherwise specified (measured with 1,000 ohm/volt meter).

a. Power Supply Unit.—

	Antenna Connected						Antenna Disconnected	
	Minimum		Normal		Maximum			
Measured Across	Tone	Speech	Tone	Speech	Tone	Speech	Tone	Speech
Resistor 36-1	20	0	24.5	0	33	0	0	0
Relay 73		60		70		80		70
Relay 74-2	30	10	35	14	40	18		14
Relay 75	0	0.95	0	1.15	0	1.3		1.0

b. Modulator Unit.—

	Antenna Connected						Antenna Disconnected	
	Minimum		Normal		Maximum			
Measured Across	Tone	Speech	Tone	Speech	Tone	Speech	Tone	Speech
Resistor 36-2	11	0	13	0	15	0	12	0
Resistor 38	4.0	5	4.7	6	5.5	7	0	5
Resistor 42	65	65	80	80	95	95	82	93
Resistor 43-1	180	180	200	200	200	220	225	220
Resistor 44-1	35	35	40	40	45	45	36	34
Resistor 44-2	30	30	35	35	42	42	34	32
Resistor 44-3	28	28	33	33	38	38	31	31
Resistor 45	120	120	135	135	150	150	130	130
Resistor 47	70		80		90		120	
Resistor 50		1.1		1.5		1.9		0
Resistor 52	23	21	30	28	37	35	30	28
Resistor 58-3	30		35		40		0	

c. Radio Frequency Unit.—

	Antenna Connected						Antenna Disconnected	
	Minimum		Normal		Maximum			
Measured Across	Tone	Speech	Tone	Speech	Tone	Speech	Tone	Speech
Resistor 36-5	38	38	43	43	47	47	47	47
Resistor 97	105*	105*	115*	115*	125*	125*	115*	115*
Resistor 51	200	200	240	240	125	290	240	245
Resistor 55	11	11	15	15	19	19	13	13
Resistor 56	36	36	42	42	48	48	42	42
Resistor 57	95	110	120	140	150	170	300	300
Resistor 58-1	45	45	50	50	55	55	55	55
Resistor 58-2	45	45	50	50	55	55	55	55
Relay 74-4	60	60	65	65	70	70	64	64

*Alternating current.

46. TERMINAL STRIP AND PLUG VOLTAGES AND CURRENTS, RADIO TRANSMITTER T-65/CRN-11

Note.—All measurements made at 201 kc with a dummy loop antenna connected across output of coupling unit. All voltages are d-c unless otherwise specified (measured with 1,000 ohm/volt meter).

a. Power Supply Unit.—

Term. No.	Voltage to ground	Current
1	0	0
2	11	1 ma
3 Key down	0	4 ma
Key up	−32	0 ma
4 Speech	−60	54 ma
Tone	−65	32 ma

(Continued on next page)

46. TERMINAL STRIP AND PLUG VOLTAGES AND CURRENTS, RADIO TRANSMITTER T-65/CRN-11 (cont'd)

a. Power Supply Unit (cont'd).—

Term. No.	Voltage to ground	Current
5, 6	0	0
7	385	1.3
8 Key down	0	4 ma
Key up	−32	0 ma
9	400	520 ma
10	115 v a-c (to term. 12)	4.1 amp a-c
11 Speech	0	27 ma
Tone	−65	0 ma
12	115 v a-c (to term. 10)	4.1 amp a-c
13	115 v a-c (to term. 14)	3 amp
14	115 v a-c (to term. 13)	1.3 amp a-c
15	115 v a-c (to term. 13)	0.05 amp a-c
16, 17	0	0
18 Speech	−60	0
Tone	−65	0

b. R-f Unit.—

Term. No.	Voltage	Current (ma)
1	1.25	230
2	1.25	3.8
3	−70	9.1
4	−70	2.8
5	0	0
6	0	0
7	420	8.5
8	420	230
9	280	6.6
10	−70	5.5
11	Approx. 21 v with antenna coupled	1.2
12	6.3 v a-c	

c. Receptacle Voltages and Currents.—

	Term. No.	Voltage to gnd.	Current
Receptacle 85:	A	0	1 to 2 ma
	B	115 v a-c (to E)	4.1 amp a-c
	C, D	0	0
	E	115 v a-c (to BO)	4.1 amp a-c
	F	0	1 to 2 ma
Receptacle 86:	A Speech	−60	27 ma
	Tone	−65	0
	B, C, D, E, F	0	0
	F Speech	0	27 ma
	Tone	−65	0
Receptacle 89:	1	−100	1 ma
	2	−115	1 ma
	3, 4, 5	0	0
	6	160	5 ma
	7	0	0
	8	1.8	4.6 ma
	9 (200-280 kc)	0	5.4 ma
	(280-400 kc)	−65	0
	10	6.3 v a-c	0.3 amp a-c
	11	115 v a-c (to term. 12)	0.39 amp a-c
	12	115 v a-c (to term. 11)	0.39 amp a-c

47. ELECTRODE VOLTAGES AND CURRENTS, RADIO TRANSMITTER T-65/CRN-11

a. Dummy Loop Connected.—All measurements made at 201 kc with a dummy loop antenna connected across output of coupling unit. All voltages are d-c unless otherwise specified (measured with 1,000 ohm/volt meter).

Ident. No.	Tube and Function (Part No.)	Plate to Cath. Voltage	Screen to Cath. Voltage	Plate Current ma/Tube	Grid Current ma	Grid Volts
2-4	Tube JAN-6J5 (VT-94) Xtal osc.	180	...	3	...	...
3-3	Tube JAN-807 (VT-100) buffer	490	290	7.0	...	−50
3-4	Tube JAN-807 (VT-100) p-a	420	265	82	2.5	−110
3-6						
2-2	Tube JAN-6J5 (VT-94) driver	190	...	18	...	70
2-3						
2-1	Tube JAN-6J5 (VT-94) aud. osc.	70	...	7	...	...
3-1	Tube JAN-807 (VT-100) mod.	420	290	100	...	−32
3-2						
		Plate to Ground Voltage				
1-5	Tube JAN-5Z3 (VT-145)	300 pin #3	...	1.25	...	...
		88 pin #2	...	...	...	...
1-1	Tube JAN-5Z3 (VT-145)	540 a-c/plate	...	185/plate	...	...
1-2	h-v					
1-3						

b. Loops Disconnected.—All measurements made at 201 kc with loops disconnected.

Ident. No.	Tube and Function (Part No.)	Plate to Cath. Voltage	Screen to Cath. Voltage	Plate Current ma/Tube	Grid Volts
2-4	Tube JAN-6J5 (VT-94) Xtal osc.	180	...	3	...
3-3	Tube JAN-807 (VT-100) buffer	490	265	7	−50
3-4	Tube JAN-807 (VT-100) p-a	455	150	25	−110
3-5					
3-6					
2-2	Tube JAN-6J5 (VT-94) driver	290	...	2	70
2-3					
2-1	Tube JAN-6J5 (VT-94) aud. osc.	70	...	7	...
3-1	Tube JAN-807 (VT-100) mod.	455	290	36	−32
3-2					
		Plate to Ground Voltage			
1-5	Tube JAN-5Z3 (VT-145) limiter	420 pin #3	...	0	...
	audio tone off	88 pin #2	...	0	...
1-1	Tube JAN-5Z3 (VT-145) h-v	540 a-c/plate	...	115/plate	

48. TERMINAL STRIP AND PLUG RESISTANCE TO GROUND MEASUREMENTS, RADIO TRANSMITTER T-65/CRN-11 (All cables disconnected. Resistances to ground.)

a. Modulator Unit.—

Terminal Number	Terminal Board 94-1 and 95 (left-hand side)*	Terminal Board 94-2 (right-hand side)*
1	0	5.5
2	Infinity	360
3	0	500
4	2,000 (68-2 open)	950
5	Infinity	0
6	Infinity	Function Selector (B) (Outer-Infinity) Function Selector (B) (Inner-0)

(Continued on next page)

*Resistance in ohms.

48. TERMINAL STRIP AND PLUG RESISTANCE TO GROUND MEASUREMENTS, RADIO TRANSMITTER T-65/CRN-11 (cont'd) (All cables disconnected. Resistances to ground.)

a. Modulator Unit (cont'd).—

Terminal Number	Terminal Board 94-1 and 95 (left-hand side)*	Terminal Board 94-2 (right-hand side)*
7	15,000	3,700
8	0	3,600
9	3,700	2,600
10	Infinity	2,000 (68-2 open)
11	Infinity (68-2 open)	Infinity
12	Infinity	0
13	Infinity	
14	Infinity	
15	Infinity	
16	Infinity	
17	Infinity	

b. Power and Control Line Receptacles.—

Terminal	Receptacle 85*	Receptacle 86*
A	0	1,750
B	Infinity	0
C	Infinity	Infinity
D	Infinity	Infinity
E	Infinity	16
F	Infinity	Infinity

c. R-f Unit Plug.—

Terminal	Receptacle 89*	Receptacle 91*
1	250,000	
Across prongs		2,000
Prongs to ground		Infinity
2	250,000	
3	0	
4	Infinity	
5	Infinity	
6	23,800	
7	Function Selector (Inner −0) (Outer-Infinity)	
8	340	
9	Freq. band switch (200-280 kc 0) Freq. band switch (280-400 kc 15,000)	
10	0	
11	Infinity	
12	Infinity	

* Resistance in ohms

49. TEST DATA, COUPLING UNIT CU-38/CRN-11

Note.—All readings taken with Simpson multimeter, 5,000 ohms/volt d-c, 1,000 ohms/volt a-c. Coupling unit operating normally feeding dummy loop antennas.

a. Normal Point to Point Voltages (Coupling Unit).—

Measured Across	Scale Used	Voltage
C120	250 v	95 to 125 v d-c
T101 secondary (5-8)	250 v	140 v a-c
H101 (S102 closed)	250 v	115 v a-c
Coil of K103 (when energized)	250 v	65 v d-c
Coil of K104 (when energized)	250 v	115 v a-c

49. TEST DATA, COUPLING UNIT CU-38/CRN-11 (cont'd)

b. Normal Resistances of Parts (Coupling Unit).—

Part Measured	Scale Used	Resistance in ohms
H101	X1	350
T101 primary 1-3	X1	6.5
2-4	X1	6.5
T101 secondary 5-8	X1	5
Coil of K103	X100	2,250
Coil of K104	X100	600
K102 field (Z-W)	X100	7,000
K102 armature (Y-W)	X100	550
L103 outside terminals	X1	0.2
L101 primary	X1	0.2
L101 secondary	X1	0 each winding
L102 primary	X1	0.2
L102 secondary	X1	0 each winding

50. TROUBLE LOCATION AND REMEDY CHART

The following chart lists some of the possible troubles which may be encountered during operation of the equipment together with their possible causes and remedies. No such chart can ever be complete, however, and there is no substitute for an understanding of the equipment on the part of the serviceman. Remember that DANGEROUSLY HIGH VOLTAGES EXIST WHEN THE EQUIPMENT IS OPERATED WITH SIDE OR TOP SHIELDS REMOVED. An attempt should be made to diagnose the trouble and a check or remedy made with the AC POWER SWITCH OFF. Detailed instructions for the care, operation and maintenance of Power Unit PE-236-A are given in the instruction book for that unit.

Symptom *Possible Cause*	*Check and Remedy*
a. Green pilot does not light when AC POWER switch is operated to ON.	
1. Defective pilot lamp. 2. No line voltage. 3. Defective fuses 76-1, 76-2 or 77. 4. Defective door interlock switch 67. 5. Defective thermostat 66.	If the line voltage meter 82 reads, try a new pilot lamp. If there is no indication of voltage on meter 82, check the a-c input to the transmitter. If this is all right, check the fuses 76-1, 76-2 and 77. The door interlock switch 67 may be open. Check for continuity through thermostat 66. This thermostat should be closed at ordinary operating temperatures and will only be open when the temperature becomes dangerously high.
b. Green pilot on. Red pilot does not light when PLATE SWITCH is operated to ON.	
1. Defective pilot. 2. Defective fuse 78. 3. Defective relay 73. 4. Defective tube 1-4. 5. Defective transformer 10. 6. Defective capacitor 25-2. 7. Open reactor 16. 8. Defective switch 68-2.	Check the BIAS RECTIFIER voltage. If this is normal, try a new fuse 78. If this gives no results try a new pilot lamp. If the BIAS RECTIFIER voltage is low or zero, try a new tube for 1-4. Observe whether relay 73 closes when tube 1-4 reaches operating temperature. If not, try a resistance check on the coil of 73. Clean the contacts. If a new tube for 1-4 does not help, make a resistance check of the parts in the bias supply rectifier circuit.

(Continued on next page)

Symptom *Possible Cause*	*Check and Remedy*
c. Both pilots on. Low or no H.V. RECT. voltage.	
1. Defective tubes 1-1, 1-2, 1-3. 2. Defective transformer 6 or 7. 3. Open or grounded reactor 15. 4. Shorted capacitor 26. 5. Grounded transformer 10. 6. Grounded transformer 14 or other load parts.	Check to see if the filaments of tubes 1-1, 1-2 and 1-3 are lighted. If not, transformer 7 is probably defective. If only one or two tubes are lighted, the transformer is probably all right and the unlit tubes are defective. If tubes light and the voltage is low, try new tubes for 1-1, 1-2 and 1-3. If there is no voltage at all, look for a defect in transformer 6. If this appears all right, shut off the power and try a resistance check from the tube sockets of 1-1, 1-2 and 1-3 to ground.
d. P.A. PLATE current does not dip when P.A. TUNNING dial is rotated.	
1. Defective crystal. 2. Defective tubes. 3. Open or shorted inductors 18, 19, 23 or 20. 4. Open capacitors 33-1 or 34. 5. Open or shorted capacitors 35-1, 35-2 or 96.	Try operating with FUNCTION SELECTOR switch in the other position. If satisfactory operation is now obtained, the crystal is probably defective. If operation is not obtained in either position of the FUNCTION SELECTOR switch, try a new tube for 2-4. If still no results, try new tubes in all the r-f stages. If this does not help, shut off the power and make resistance checks on the various parts of the r-f unit. A defective coupling capacitor would be the most likely defect.
e. PA PLATE tunes normally but there is no r-f output.	
1. Loops detuned. 2. Shorted cable from transmitter to coupling unit. 3. Open r-f transformers L101 or L102. 4. Defective contacts on relays K102, K104.	Try retuning the loops. If this cannot be done, look for a short or open circuit in the r-f coupling cable. Examine L101 and L102 for an open or shorted winding. Check the contacts on relays K102 and K104.
e. P.A. PLATE tunes normally but there is no r-f output.	
1. Defective audio tubes. 2. Defective inductor 17. 3. Defective transformer 12, 13 or 14.	Check to see if the transmitter will operate normally on voice. If it does, try a new tube for 2-1. If this does not help, check the resistance to ground from the tube socket of 2-1. If voice signals will not come through either, try new tubes one at a time for 2-2, 2-3, 3-1 and 3-2. If this does not help, listen for a tone across the secondary of transformer 13 using earphones and then transformer 12. In this way the defective stage can be located. Then try a resistance check from tube socket to ground to locate the defective part.

Symptom *Possible Causue*	*Check and Remedy*
g. Identification keying is garbled.	
1. Defective tube 2-1. 2. Identification switch cam out of adjustment.	Try a new tube for 27-3. If this does not improve the keying, check the adjustment of the identification switch actuating arm on the keyer as given in paragraph 42.
h. Transmitter will not throw over to voice.	
1. Defective press to talk switch. 2. Defective relay 75 or K103. 3. Defective relay K104.	Make sure that the microphone is working properly by checking to see that a closed circuit exists between the tip and sleeve of the microphone plug when the press to talk tab is down. If this is all right, check the coil of relay 75 and K103. Check the coil of relay K104.
i. A-N signals normal. No identification signal.	
1. Defect in tone keying line. 2. Identification switch out of adjustment.	Make certain that the tone keying line is not shorted. Check the jacks J101 on the coupling unit and 84 on the transmitter. Check adjustment of the identification key switch actuating arm as given in paragraph 42.
j. Transmitter throws over to voice but voice signals do not get through. Tone is normal.	
1. Defective transformer 12. 2. Defective microphone cable.	Check the voice input winding of transformer 12. Check the microphone cable and plug.
k. Transmitter will not throw over to voice from the remote microphone.	
1. Defective cable or remote junction box..	Be sure that the line for the remote microphone is connected properly. If this is all right, check for an open or short circuit in either the cable or the remote junction box.
l. Pilot P101 does not light when switch S102 is thrown.	
1. Defective pilot. 2. Defective fuses F101 or F102. 3. Defective switch S102. 4. No line voltage.	Open the left door of the coupling unit and note whether the keyer is operating. If it is, try a new pilot bulb. If the keyer is not operating, check the line voltage and fuses F101 and F102.
m. Keyer operates but link circuit relay does not operate.	
1. Defective transformer T101. 2. Defective selenium stacks SR101 or SR102. 3. Defective capacitor C120. 4. Defective link circuit relay. 5. Defective keyer A-N switch.	Operate switch S101 on and off and note whether the link circuit relay is drawn to one side (clockwise). If this is so, the A-N switch or cam in the keyer is probably defective. If the link circuit relay is not energized at all, look for a defect in the relay rectifier. Check the windings of transformer T101. Check capacitor C120 for a short.

Section V
SUPPLEMENTARY DATA

51. FIXED PLANT MAINTENANCE LIST FOR RADIO TRANSMITTING SET AN/CRN-11 (Signal Corps Stock No. 2S1504-11)

Parts are listed alphabetically by name under headings as follows: Radio Transmitter T-65/CRN-11, Coupling Unit CU-38/CRN-11, Antenna System AS-102/CRN-11, Cabinet CY-127/CRN-11, Cabinet CY-128/CRN-11, and Remote Microphone Jack Box.

Note.—Order maintenance parts by stock number, name, and description.

Ref. symbol	Signal Corps stock No.	Name of part and description	Station stock	Region stock	Quantity per unit
a. Radio Transmitter T-65/CRN-11.—					
25-1, 25-2	3DKB50-21	CAPACITOR: electrolytic, 50 μf, 100 v d-c working.	*	*	2
26	3DKB20-23	CAPACITOR: paper, oil, 20 μf, 600 v d-c working.	*	*	1
27-1 27-2, 27-3, 27-4	3DA500-97.19	CAPACITOR: paper, oil, 0.5 μf, 600 v d-c working.	*	*	4
28	3DBK200-4	CAPACITOR: dry electrolytic, 200 μf, ±5%, 20 v d-c working.	*	*	1
29-1, 29-2, 29-3, 29-4, 29-5, 29-6, 29-7	3K5510322	CAPACITOR: mica, 0.01 μf, ±5%, 1,200 v d-c test.	*	*	7
30	3K6120322	CAPACITOR: mica, 0.02 μf, ±3%, 1,200 v d-c test.	*	*	1
31	3DA30-5	CAPACITOR: mica, 0.03 μf, ±3%, 1,200 v d-c test.	*	*	1
32-1, 32-2, 32-3	3K5520322	CAPACITOR: mica, 0.02 μf, ±5%, 600 v d-c working.	*	*	3
33-1, 33-2	3K602062	CAPACITOR: mica, 0.002 μf, ±5%, 2,500 v d-c test.	*	*	2
34	3K6010322	CAPACITOR: mica, 0.01 μf, ±5%, 2,500 v d-c test.	*	*	1
35-1, 35-2	3DKA3-66	CAPACITOR: mica, 0.003 μf, ±2%, 3,000 v rms test.	*	*	2
96	3D9050-22	CAPACITOR: ceramicon, 50 μμf, ±10%, 500 v d-c working.		*	1
15	3CK552-174	CHOKE: filter, plate, 7.5 h, 0.65 amp d-c, 35 ohms.		*	1
16	3CK552-172	CHOKE: filter, 2.5 h, 0.25 amp d-c, 37 ohms.		*	1
23	3CK344-4	CHOKE: r-f, 13.5 millihenries.		*	1
17	2Z9717-46094	COIL: inductor, audio-oscillator, 0.97 h, tapped at 0.13 h.			1
18	2Z9636.12	COIL: r-f, crystal-oscillator, air core, primary and secondary 1.8 millihenries each, close coupled.			1
19	3CK344-2	COIL: r-f, iron core, primary and secondary 5.9 millihenries each, close coupled.			1
20	3CK2905	COIL: inductor, variable, 50 to 150 microhenries, iron core.			1
21	3CK2905-1	COIL: inductor, antenna coupling, 40 microhenries.			1
22	3CK344-3	COIL: r-f, primary 1.0 microhenry, secondary 3.0 millihenries, close coupled, iron core.			1
76-1, 76-2	3Z1931	FUSE: standard cartridge, renewable, 10 amp, 250 v (uses link, fuse, 10 amp, 250 v, Signal Corps stock No. 3Z3010).	*	*	2
77	3Z1901-3	FUSE: standard cartridge, renewable, 3 amp, 250 v (uses link, fuse, 3 amp, 250 v, Signal Corps stock No. 3Z3003).	*	*	1

Only maintenance parts can be requisitioned. Parts not stocked in station or region stock are carried in depot stock.

51. FIXED PLANT MAINTENANCE LIST FOR RADIO TRANSMITTING SET AN/CRN-11 (cont'd)

Ref. symbol	Signal Corps stock No.	Name of part and description	Station stock	Region stock	Quantity per unit
a. Radio Transmitter T-65/CRN-11 (cont'd).—					
78	2Z1901-5.1	FUSE: standard cartridge, renewable, 5 amp, 250 v (uses link, fuse, 5 amp, 250 v, Signal Corps stock No. 3Z3005).	*	*	1
79	3Z2572	FUSE: meter, 1/32 amp.	*	*	1
98	2Z5015-24	HEATER: chromolox strip, 230 v, 150 w.			1
4, 5	2X39	HOLDER FT-164: crystal, supplied with crystal (frequency as specified).			2
83	2Z5523.1	JACK: microphone, for Plug PL-68.		*	1
84	2Z5581	JACK: closed circuit, 2 conductor, for Plug PL-55.		*	1
80-1, 80-2	2Z5903	LAMP: pilot, 120 v, candelabra screw base.	*	*	2
	3Z3010	LINK: fuse, 10 amp, 250 v, for 76-1 and 76-2.	*	*	2
	3Z3003	LINK: fuse, 3 amp, 250 v, for 77.	*	*	1
	3Z3005	LINK: fuse, 5 amp, 250 v, for 78.	*	*	1
81	3FK891-18	METER: 0-1 ma, d-c.		*	1
82	3F7356	METER: 0-150 v, a-c.		*	1
73	2ZK7658-14	RELAY: plate-contactor, single pole, double break, 15 amp, a-c, 40 v, 2,000 ohm coil.		*	1
74-1, 74-2, 74-3, 74-4	2ZK7658-15	RELAY: audio-monitor, single pole, double throw, 1 ma d-c, 12,000 ohm coil.		*	4
75	2ZK7658-16	RELAY: push-to-talk, single pole, double throw, 16 ma d-c, 50 ohm coil.		*	1
36-1, 36-2, 36-3, 36-4, 36-5	3RC31AE103M	RESISTOR: carbon, 10,000 ohms, ±20%, 1 w.	*	*	5
38	3Z6040-37	RESISTOR: carbon, 400 ohms, ±20%, 1 w.	*	*	1
39	3RC31AE101J	RESISTOR: carbon, 100 ohms, ±5%, 1 w.	*	*	1
40	3Z5996-10	RESISTOR: carbon, 6 ohms, ±5%, 1 w.	*	*	1
41	3Z6250-55	RESISTOR: carbon, 2,500 ohms, ±5%, 1 w.	*	*	1
42	3ZK6080-39	RESISTOR: wire-wound, 800 ohms, 50 w.	*	*	1
43-1	3Z6200-78	RESISTOR: wire-wound, 2,000 ohms, 50 w.	*	*	1
44-1, 44-2, 44-3	3Z6050-80	RESISTOR: wire-wound, 500 ohms, 25 w.	*	*	3
45	3Z6100-139	RESISTOR: wire-wound, 1,000 ohms, 50 w.	*	*	1
46-1, 46-2, 46-3	3Z6725-33	RESISTOR: carbon, 250,000 ohms, ±20%, 1 w.	*	*	3
48-1, 48-2	3RC31AE102J	RESISTOR: carbon, 1,000 ohms, ±5%, 1 w.	*	*	2
47	3RC31AE513J	RESISTOR: carbon, 50,000 ohms, ±5%, 1 w.	*	*	1
49	3Z6620-90	RESISTOR: carbon, 20,000 ohms, ±20%, 1 w.	*	*	1
50	3Z6002E5-31	RESISTOR: carbon, 25 ohms, ±20%, 1 w.	*	*	1
51	3RC41BE104K	RESISTOR: carbon, 100,000 ohms, 2 w.	*	*	1
52	3Z6040-36	RESISTOR: wire-wound, 400 ohms, 25w.	*	*	1
53	3RC31AE105M	RESISTOR: carbon, 1 megohm, ±20%, 1 w.	*	*	1
54	3Z6300-58	RESISTOR: carbon, 3,000 ohms, ±20%, 1 w.	*	*	1
55	3RC45CE182K	RESISTOR: carbon, 2,000 ohms, ±20%, 2 w.	*	*	1
56	3ZK6620-103	RESISTOR: carbon, 20,000 ohms, ±20%, 2 w.	*	*	1
57	3Z6560-18	RESISTOR: wire-wound, 6,000 ohms, 50 w.	*	*	1
58-1, 58-2, 58-3	3RC40AE103M	RESISTOR: carbon, 10,000 ohms, ±20%, 2 w.	*	*	3

51. FIXED PLANT MAINTENANCE LIST FOR RADIO TRANSMITTING SET AN/CRN-11 (cont'd)

Ref. symbol	Signal Corps stock No.	Name of part and description	Station stock	Region stock	Quantity per unit
a. Radio Transmitter T-65/CRN-11 (cont'd).—					
59	2Z7280-40	RESISTOR: (potentiometer) wire-wound, 10,000 ohms, 3 w.		*	1
60	3Z6775-13	RESISTOR: carbon, 750,000 ohms, ±5%, 2 w.	*	*	1
61	3RC31AE104J	RESISTOR: carbon, 100,000 ohms, ±5%, 1 w.	*	*	1
62	3Z5995-15	RESISTOR: carbon, 5 ohms, ±5%, 1 w.	*	*	1
63	3RC31AE511J	RESISTOR: carbon, 500 ohms, ±5%, 1 w.	*	*	1
64	3RC31AE151J	RESISTOR: carbon, 150 ohms, ±5%, 1 w.	*	*	1
65	3Z6040-38	RESISTOR: carbon, 400 ohms, ±5%, 1 w.	*	*	1
93	3Z6630-18	RESISTOR: carbon, 30,000 ohms, 2 w.	*	*	1
1-1-SO, 1-2-SO, 1-3-SO, 1-4-SO, 1-5-SO	2Z8762.1	SOCKET: 4-prong, for Tube VT-145.			5
2-1-SO, 2-2-SO, 2-3-SO, 2-4-SO, 2-5-SO	2Z8762.2	SOCKET: octal, for Tube VT-94.			5
3-1-SO, 3-2-SO, 3-3-SO, 3-4-SO, 3-5-SO, 3-6-SO	2C6386A/S1	SOCKET: 5-prong, for Tube VT-100.		*	6
24-1, 24-2, 24-3, 24-4, 24-5, 24-6	3CK344-5	SUPPRESSOR: parasitic, 4 microhenries, shunted by resistor, 350 ohms, 2 w.		*	6
67	3Z9558-7	SWITCH: door, snap action, normally open, 10 amp, a-c.		*	1
68-1, 68-2	3Z9849.4	SWITCH: toggle, double pole, single throw.		*	2
69	3Z9825-64.2	SWITCH: single pole, 7 position.			1
70	3Z9825-15.2	SWITCH: rotary, ceramic, 3 pole, 2 position.			1
71	3Z9825-58.15	SWITCH: rotary, ceramic, double pole, 2 position, 1-section.			1
72	3Z9825-58.35	SWITCH: rotary, bakelite, double pole, 10 position.			1
99	3Z9849.56-1	SWITCH: toggle, single pole, single throw.		*	1
66	2Z9488-3	THERMOSTAT: open at 160 F (71.1 C), ±3%, closed at 150 F (65.5 C), ±3%.		*	1
6	2ZK9717-168	TRANSFORMER: plate, primary 115 v, 60 cps, secondary, 540-0-540 v, at 0.65 amp d-c.		*	1
7	2ZK9717-167	TRANSFORMER: rectifier filament, primary 115 v, 60 cps, secondary 5 v, 9 amp (center-tapped).		*	1
8	2ZK9717-681	TRANSFORMER: audio, primary 20,000 ohms, plate, 10 ma d-c, secondary 500-600 ohms, balanced line.		*	1
9	2ZK9717-204	TRANSFORMER: auto, primary 103, 107, 111, 115, 119, 123, 127 v, 60 cps, secondary 115 v, 6amp.		*	1
10	2ZK9717-165	TRANSFORMER: filament, primary 115 v, 60 cps, secondary No. 1, 5 v, 3 amp (center-tapped), secondary No. 2, 5 v, 3 amp (center-tapped), secondary No. 3, 135-0-135 v, 0.25 amp d-c.		*	1

51. FIXED PLANT MAINTENANCE LIST FOR RADIO TRANSMITTING SET AN/CRN-11 (cont'd)

Ref. symbol	Signal Corps stock No.	Name of part and description	Station stock	Region stock	Quantity per unit
a. Radio Transmitter T-65/CRN-11 (cont'd).—					
11	2ZK9717-164	TRANSFORMER: filament, primary 115 v, 60 cps, secondary 6.4 v, 8 amp.		*	1
12	2ZK9717-679	TRANSFORMER: audio-input, primary No. 1, 600 ohms, balanced line, primary No. 2, 30 ohms, microphone secondary 100,000 ohms, push-pull grids.		*	1
13	2ZK9717-170	TRANSFORMER: audio-driver, ratio primary to secondary 2.2 to 1.		*	1
14	2ZK9717-680	TRANSFORMER: modulation, primary 3,800 ohms, push-pull, secondary, class C, 425 v, 240 ma d-c.		*	1
1-1, 1-2, 1-3, 1-4, 1-5	2T145	TUBE VT-145: JAN5Z3	*	*	5
2-1, 2-2, 2-3, 2-4, 2-5	2T94	TUBE VT-94: JAN6J5	*	*	5
3-1, 3-2, 3-3, 3-4, 3-5, 3-6	2T100	TUBE VT-100: JAN807	*	*	6
b. Coupling Unit CU-38/CRN-11.—					
C101, C105	2DA3-53.1	CAPACITOR: mica, 0.003 μf, ±5%, 2,000 v d-c working.	*	*	2
C102, C103, C106, C107	3DA1-125	CAPACITOR: mica, 0.001μf, ±5%, 3,000 v d-c working.	*	*	4
C104, C108	3DA1.50V-1	CAPACITOR: variable, 1,500 μμf, single section.			2
C109, C113	3DA1.600-1	CAPACITOR: mica, 0.0016 μf, ±2%, 8,000 v d-c working.	*	*	2
C110, C114	3D9800-16	CAPACITOR: mica, 0.0008 μf, ±2%, 8,000 v d-c working.	*	*	2
C111, C115	3D9400-31	CAPACITOR: mica, 0.0004 μf, ±5%, 8,000 v d-c working.	*	*	2
C112, C116	3D9625V	CAPACITOR: variable, 663 μμf, single section.			2
C117	3DA5-120	CAPACITOR: mica, 0.005 μf, ±5%, 1,200 v d-c working.	*	*	1
C118	3K6010322	CAPACITOR: (Same as capacitor 34, transmitter list.)			1
C119	3DA20-64.1	CAPACITOR: mica, 0.02 μf, ±10%, 1,200 v d-c working.	*	*	1
C120	3DB2-8.5	CAPACITOR: paper, oil, 2 μf, 600 v d-c working.	*	*	1
CO102	3C1108-5	COIL: for K103.		*	1
CON103	2Z7587-35/1	CONTACTS: set for K102.		*	1
CON102	3Z3191-3	CONTACTS: set for relay 1021 (part of K103), 115 v, 4 amp.		*	1

51. FIXED PLANT MAINTENANCE LIST FOR RADIO TRANSMITTING SET AN/CRN-11 (cont'd)

Ref. symbol	Signal Corps stock No.	Name of part and description	Station stock	Region stock	Quantity per unit
		b. Coupling Unit CU-38/CRN-11 (cont'd).—			
CON101	2Z7654-2/1	CONTACTS: set for relay 1177 (part of K104), ¼" silver.		*	1
H101	2Z5015-24	HEATER: (Same as heater 98, transmitter list.)			1
J101	2Z5534A	JACK JK-34-A: keyer circuit, 1 open circuit.		*	1
K101	2C740-38/K1	KEYER: radio-range, motor-driven, with 1 complete set of 3-letter dash and dot signals, motor 1/100 horsepower, 0.24 amp, 50-60 cps, 95-130 v, single phase, 1,725 rpm.			1
P101	2Z5903	LAMP: pilot, consisting of receptacle, cap, and bulb. (Same as 80-1, 80-2, transmitter list.)	*	*	1
M101	3F895-17	METER: 0-5 ma, d-c.		*	1
PL101, PL102	2Z7111.63	PLUG: phone, 2-circuit.		*	2
PL103	2Z867655	PLUG: 6-contact, female, polarized.		*	1
SR101, SR102	3H4857-2	RECTIFIER: disk, selenium stack.		*	2
REC101	2Z8799-208	RECEPTACLE: 6-contact, male, bakelite.		*	1
K102	4A2003	RELAY: link-circuit (uses contacts, set of Signal Corps stock No. 2Z7587-35/1).		*	1
K103	2Z7589-34.1	RELAY: voice-transfer control, normally open, 110-115 v d-c, modified for single pole, double break; uses 2,250 coil (Signal Corps stock No. 3C1108-5), contacts (Signal Corps stock No. 3Z3191-3).			1
K104	2Z7654-2	RELAY: 115 v a-c, double pole, double throw; uses set of contacts (Signal Corps stock No. 2Z7654-2/1).			1
S101	3Z9849.4	SWITCH: (Same as 68-1, 68-2, transmitter list.)		*	1
S102	3Z9849.56-1	SWITCH: (Same as 99, transmitter list.)			1
T101	2Z9608-10	TRANSFORMER: selenium-rectifier, primary 115-230 v, 60 cps, secondary 100-120-140 v, 600 ma a-c.		*	1
		c. Antenna System AS-102/CRN-11.—			
IN102	3G1100-118	INSULATOR: strain, porcelain, for insulating and supporting antenna, 7⅞" long, ¾" thick, 1" wide.	*	*	8
IN103	3G1250-34.2	INSULATOR: guy, porcelain, for insulating and supporting antenna, 2⅛" long, 1¼" diameter.		*	1
		d. Cabinet CY-127/CRN-11			
FIL101	6Z3856-39	FILTER: air, fibreglas, 14" x 16" x 1".		*	1
BL101	3H3000A02-9	MOTOR: blower, single phase, 115 v, 60 cps, 1/40 horsepower, 1,600 rpm.		*	1
PP101	3H4177	PANEL: power, multi-breaker, 4-circuit, each 10 amp.		*	1
		e. Coupling Unit Cabinet CY-128/CRN-11			
IN101	3G1000-28	INSULATOR: bowl, antenna feed-through.	*	*	8
		f. Remote Microphone Jack Box			
J102	2Z5533A	JACK: Western Electric type 246E, remote microphone jack box, 3-conductor.		*	1

Only maintenance parts can be requisitioned. Parts not stocked in station or region stock are carried in depot stock.

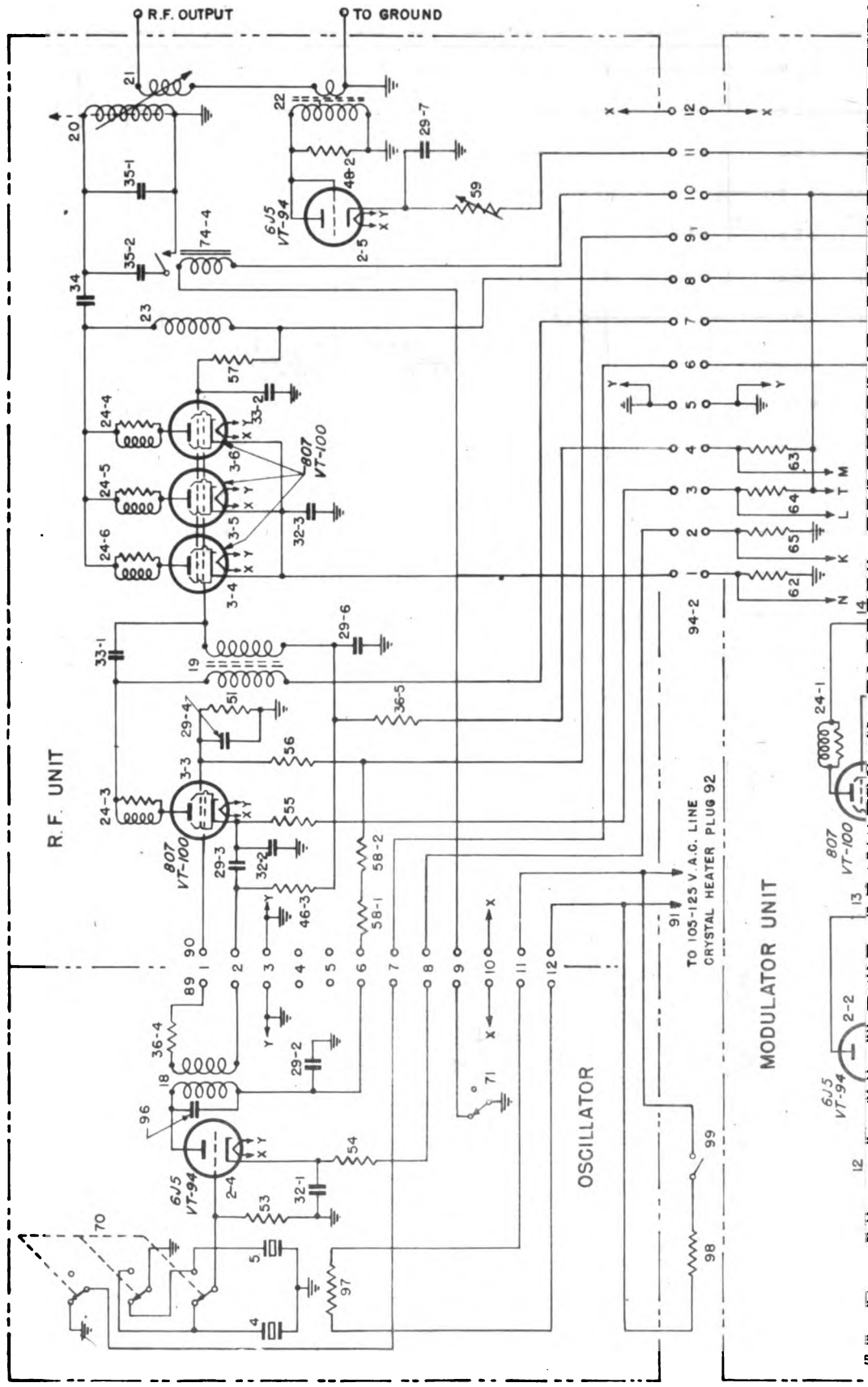


Figure 57.—Radio Transmitter T-65/CRN-11, complete schematic diagram.

FUNCTIONS OF PARTS

RADIO TRANSMITTER T-65/CRN-11

ITORS

tor relay
r
ge filter
rol voltage bypass
screen bypass
llator plate bypass
dio transformer

filter
llator grid
cillator plate by-

d block
een
feed
ifier grid bypass
thode
llator tuning
llator tuning
cillator cathode
hode
ifier cathode

ck
ifier screen
ifier plate block
ifier tank
ifier tank, low-
padder
lator plate

OKES

er
r
ifier shunt feed

ILS

llator
cillator

ifier tank
upling

TALS

uency
uency

SES

rimary
ary

ERS

ater
r heater

CKS

jack

LAMPS

80-1	Filament pilot
80-2	Plate pilot

METERS

81	Switched d-c meter
82	A-c primary

PLUGS

87	Power and alarm circuit to connect to receptacle 85
88	Remote control to connect to receptacle 86
92	Crystal heater connector

RECEPTACLES

85	Power and alarm circuit
86	Remote control
91	Crystal heater

RELAYS

73	Plate contactor
74-1	Audio monitor
74-2	Alarm
74-3	Radio frequency monitor
74-4	Power amplifier band switch
75	Push-to-talk

RESISTORS

36-1	Alarm relay dropping
36-2	Audio oscillator plate
36-3	Audio control rectifier
36-4	Buffer grid series
36-5	Power amplifier grid leak
38	Audio amplifier cathode
39	Audio amplifier metering
40	Modulator metering
41	Audio oscillator metering
42	High voltage bleeder
43-1	High voltage bleeder
44-1	Bias bleeder
44-2	Microphone bleeder
44-3	Microphone bleeder
45	High voltage bleeder
46-1	Audio oscillator tone feed
46-2	Audio oscillator grid
46-3	Buffer grid filter
47	Audio metering series
48-1	Audio metering shunt
48-2	Monitor grid plate
49	Audio grid filter
50	Microphone bleeder
51	Buffer screen bleeder
52	Bias bleeder
53	Crystal grid leak
54	Crystal cathode
55	Buffer cathode
56	Buffer screen
57	Power amplifier screen
58-1	Crystal oscillator plate
58-2	Crystal oscillator plate
58-3	Audio oscillator bias
59	Carrier monitor control
60	High voltage metering
61	Bias metering

RESISTORS (Cont'd)

62	Power amplifier metering
63	Power amplifier grid metering
64	Buffer metering
65	Crystal oscillator metering
93	Driver grid load

SUPPRESSORS

24-1	Modulator
24-2	Modulator
24-3	Buffer
24-4	Power amplifier
24-5	Power amplifier
24-6	Power amplifier

SWITCHES

67	Door safety
68-1	Power
68-2	Plate
69	Line compensator
70	Radio frequency band
71	Function selector
72	Direct-current meter
99	Transmitter heater switch

THERMOSTAT

66	Over-temperature control

TERMINAL STRIPS

94-1	Modulator power supply
94-2	Modulator r-f
95	Modulator power supply

TRANSFORMERS

6	Plate rectifier
7	Rectifier filament
8	Monitor audio
9	Auto line compensator
10	Bias and filament
11	Filament
12	Audio input
13	Audio driver
14	Modulation

TUBES

1-1	Plate rectifier
1-2	Plate rectifier
1-3	Plate rectifier
1-4	Bias rectifier
1-5	Audio rectifier
2-1	Audio oscillator
2-2	Audio amplifier
2-3	Audio amplifier
2-4	Crystal oscillator
2-5	R-f monitor
3-1	Modulator
3-2	Modulator
3-3	Buffer
3-4	Power amplifier
3-5	Power amplifier
3-6	Power amplifier

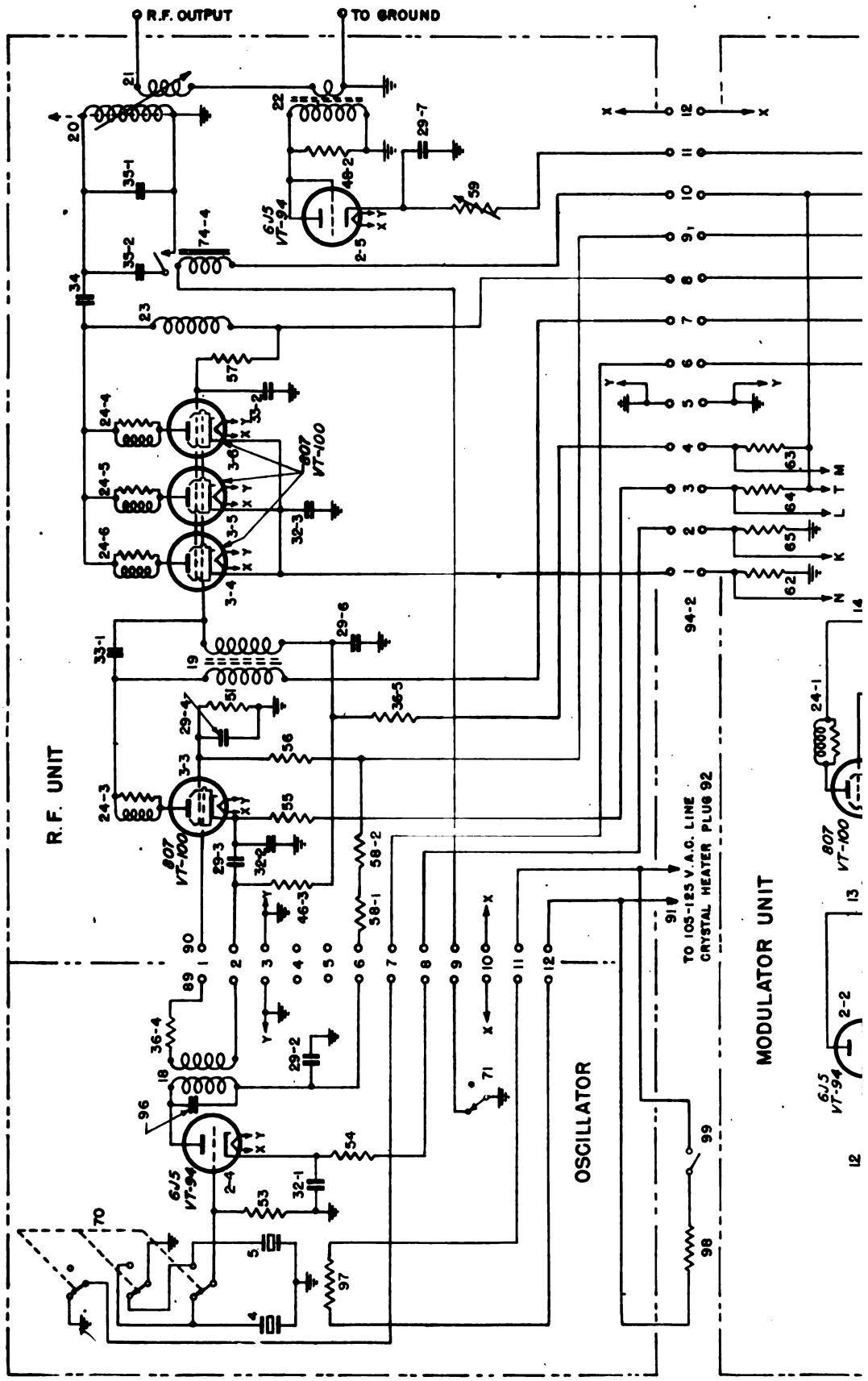
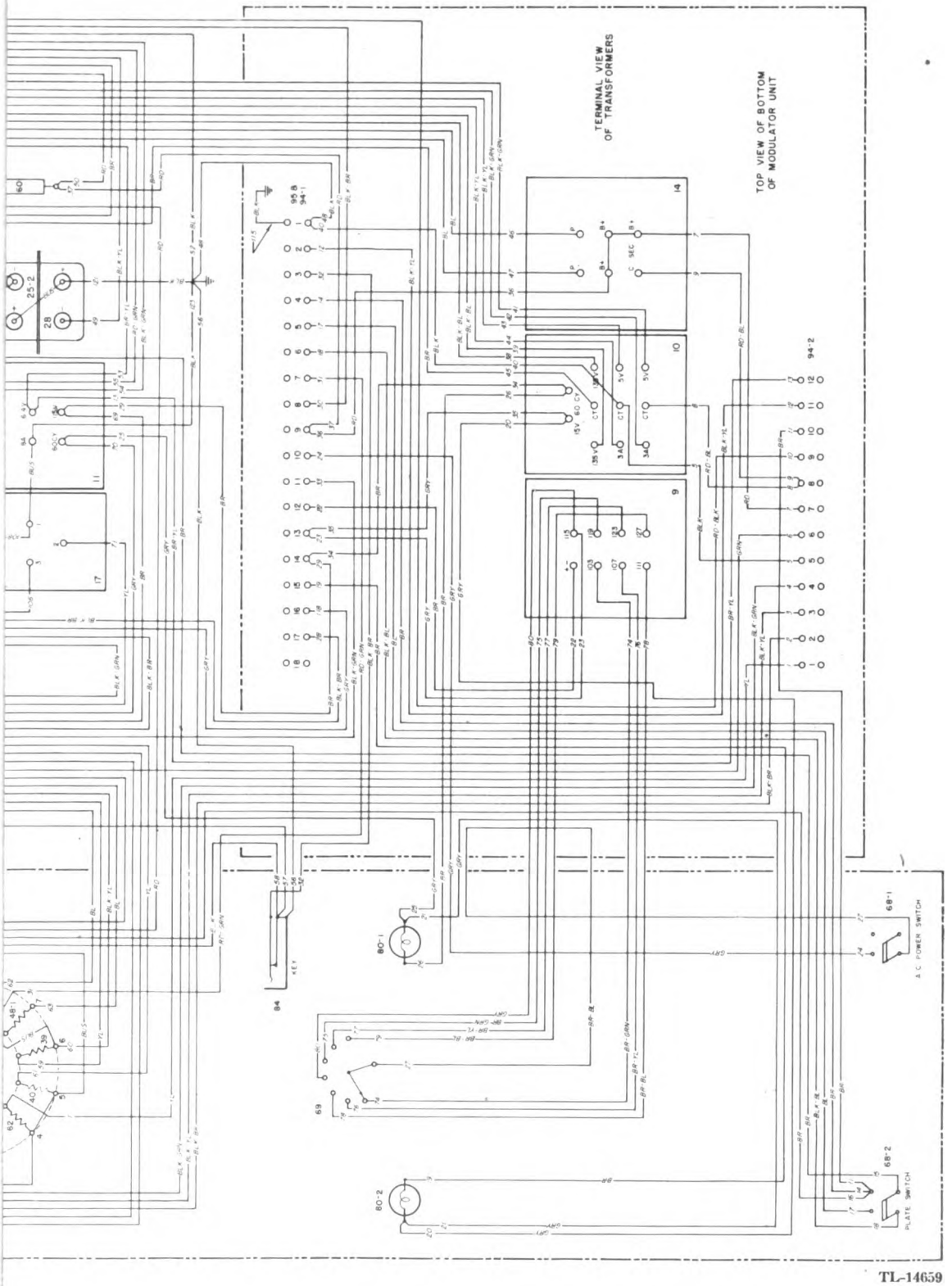
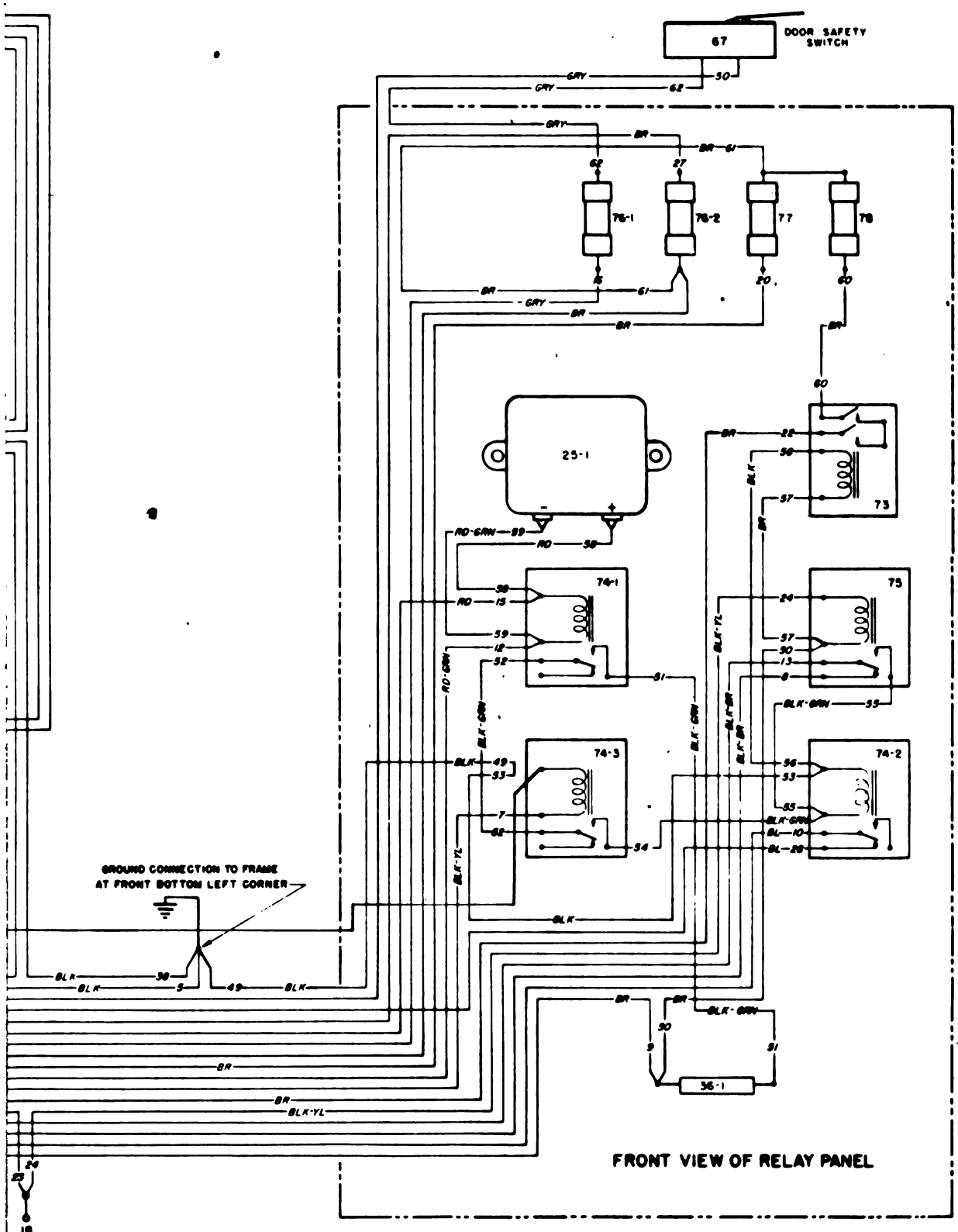


Figure 57.—Radio Transmitter T-65/CRN-11, complete schematic diagram.



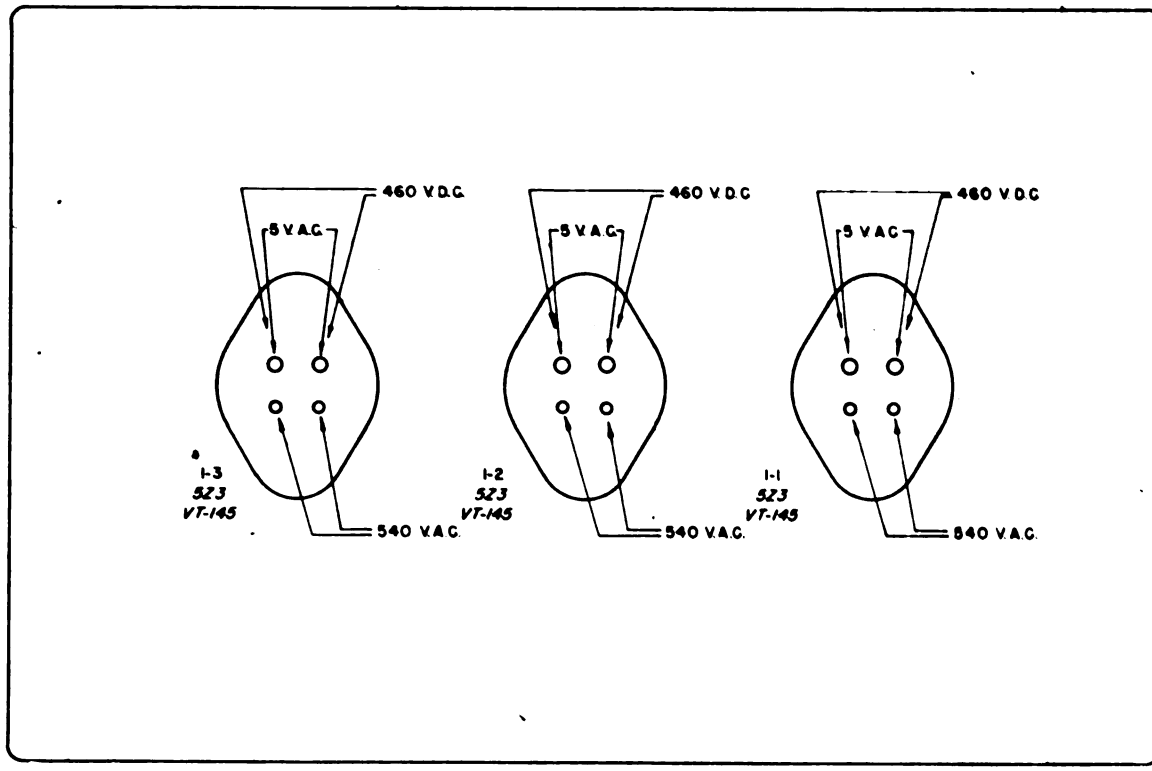
TL-14659

Figure 59.—Radio Transmitter T-65/CRN-11, wiring diagram, modulator unit.



TL-14660

Figure 60.—Radio Transmitter T-65/CRN-11, wiring diagram, power supply unit.



T1.-14663

TUBE SHELF BOTTOM VIEW
ALL VOLTAGES MEASURED TO GROUND, EXCEPT WHERE OTHERWISE INDICATED, WITH TEST SET I-56-A

Figure 63

Figure 61.—Radio Transmitter T-65/CRN-11, tube socket voltage diagram, radio-frequency unit.

Figure 62.—Radio Transmitter T-65/CRN-11, tube socket voltage diagram, modulator unit.

Figure 63.—Radio Transmitter T-65/CRN-11, tube socket voltage diagram, power supply unit.

FUNCTIONS

COUPLING UNIT

CAPACITORS

C101	Left primary tuning
C102	Left primary tuning
C103	Left primary tuning
C104	Left primary tuning
C105	Right primary tuning
C106	Right primary tuning
C107	Right primary tuning
C108	Right primary tuning
C109	Left secondary tuning
C110	Left secondary tuning
C111	Left secondary tuning
C112	Left secondary tuning
C113	Right secondary tuning
C114	Right secondary tuning
C115	Right secondary tuning
C116	Right secondary tuning
C117	Quarter-phasing capacitor
C118	Quarter-phasing capacitor
C119	Quarter-phasing capacitor
C120	Power supply filter

COILS

CO101	Part of K104
CO102	Part of K103
L101	Left output coupling transformer
L102	Right output coupling transformer
L103	Quarter-phasing inductor

CONTACTS

CON101	Part of K104
CON102	Part of K103
CON103	Part of K102

FUSES

F101	Line fuse
F102	Line fuse

HEATER

H101	Coupling unit heater

JACK

J101	Connects the keyer in the coupling unit to the audio circuit of the transmitter

KEYER

K101	For identification and range signals

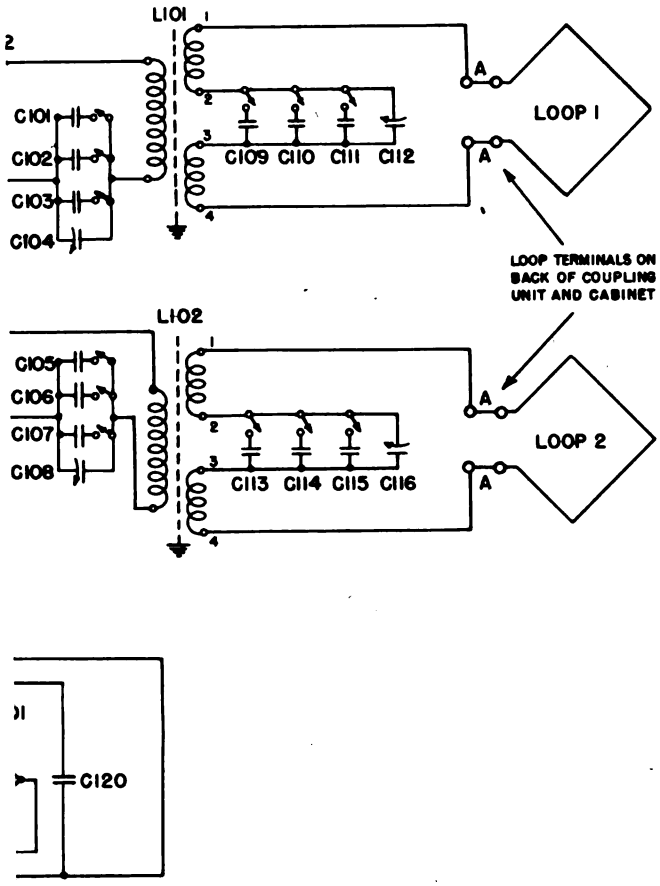


Figure 64.—Coupling Unit CU-38/CRN-11, complete schematic diagram.

FUNCTIONS OF PARTS

COUPLING UNIT CU-38/CRN-11

CAPACITORS

C101	Left primary tuning
C102	Left primary tuning
C103	Left primary tuning
C104	Left primary tuning
C105	Right primary tuning
C106	Right primary tuning
C107	Right primary tuning
C108	Right primary tuning
C109	Left secondary tuning
C110	Left secondary tuning
C111	Left secondary tuning
C112	Left secondary tuning
C113	Right secondary tuning
C114	Right secondary tuning
C115	Right secondary tuning
C116	Right secondary tuning
C117	Quarter-phasing capacitor
C118	Quarter-phasing capacitor
C119	Quarter-phasing capacitor
C120	Power supply filter

COILS

C0101	Part of K104
C0102	Part of K103
L101	Left output coupling transformer
L102	Right output coupling transformer
L103	Quarter-phasing inductor

CONTACTS

CON101	Part of K104
CON102	Part of K103
CON103	Part of K102

FUSES

F101	Line fuse
F102	Line fuse

HEATER

H101	Coupling unit heater

JACK

J101	Connects the keyer in the coupling unit to the audio circuit of the transmitter

KEYER

K101	For identification and range signals

LAMP

P101	Indicates power supplied to keyer

METER

M101	Primary circuit meter

PLUG

PL101	Connects the keyer in the coupling unit to transmitter
PL102	Used with PL101
PL103	Connects transmitter to coupling unit

RECEPTACLE

REC101	Connects transmitter to coupling unit

RECTIFIERS

SR101	The two rectifiers SR101 and SR102 make a bridge rectifier which supplies d-c current to the link circuit relay K102
SR102	Used with SR101

RELAY

K102	To switch r-f energy from one loop antenna to the other in accordance to the A and N keying
K103	Voice transfer control
K104	Quarter-phasing

SWITCH

S101	Power control
S102	Used with H101 heater control

TRANSFORMER

T101	Supplies current to SR101 and SR102

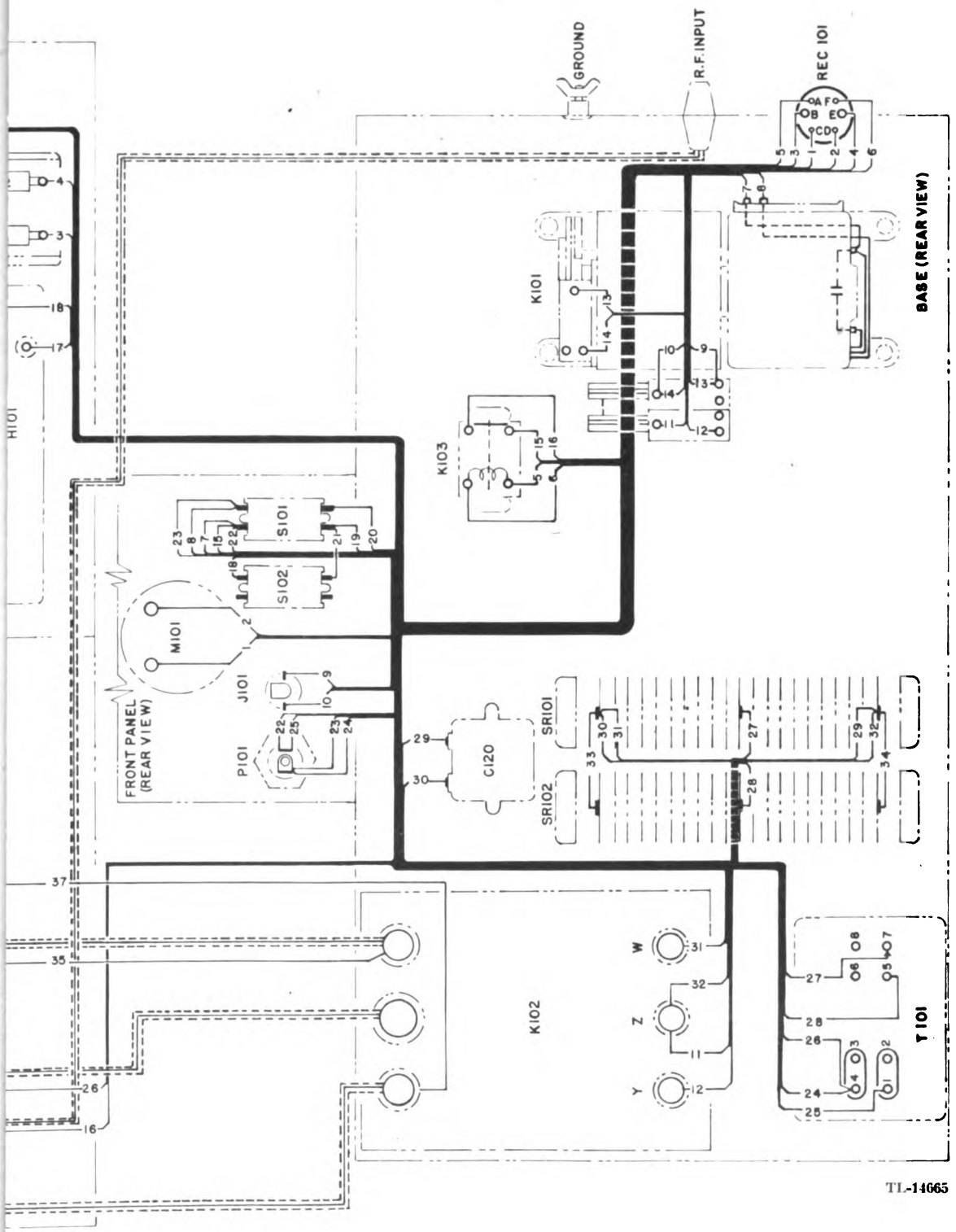


Figure 65.—Coupling Unit CU-38/CRN-11, wiring diagram.

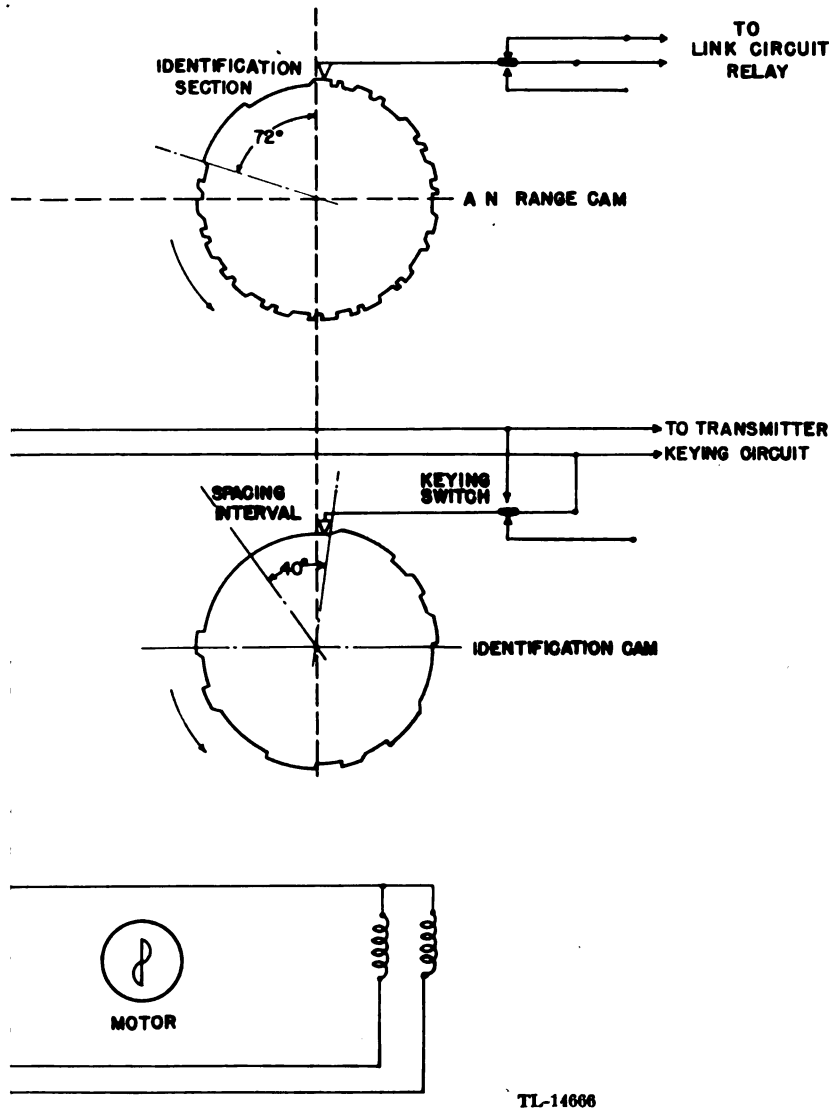


Figure 66.—Coupling Unit CU-38/CRN-11, schematic diagram, radio range keyer.

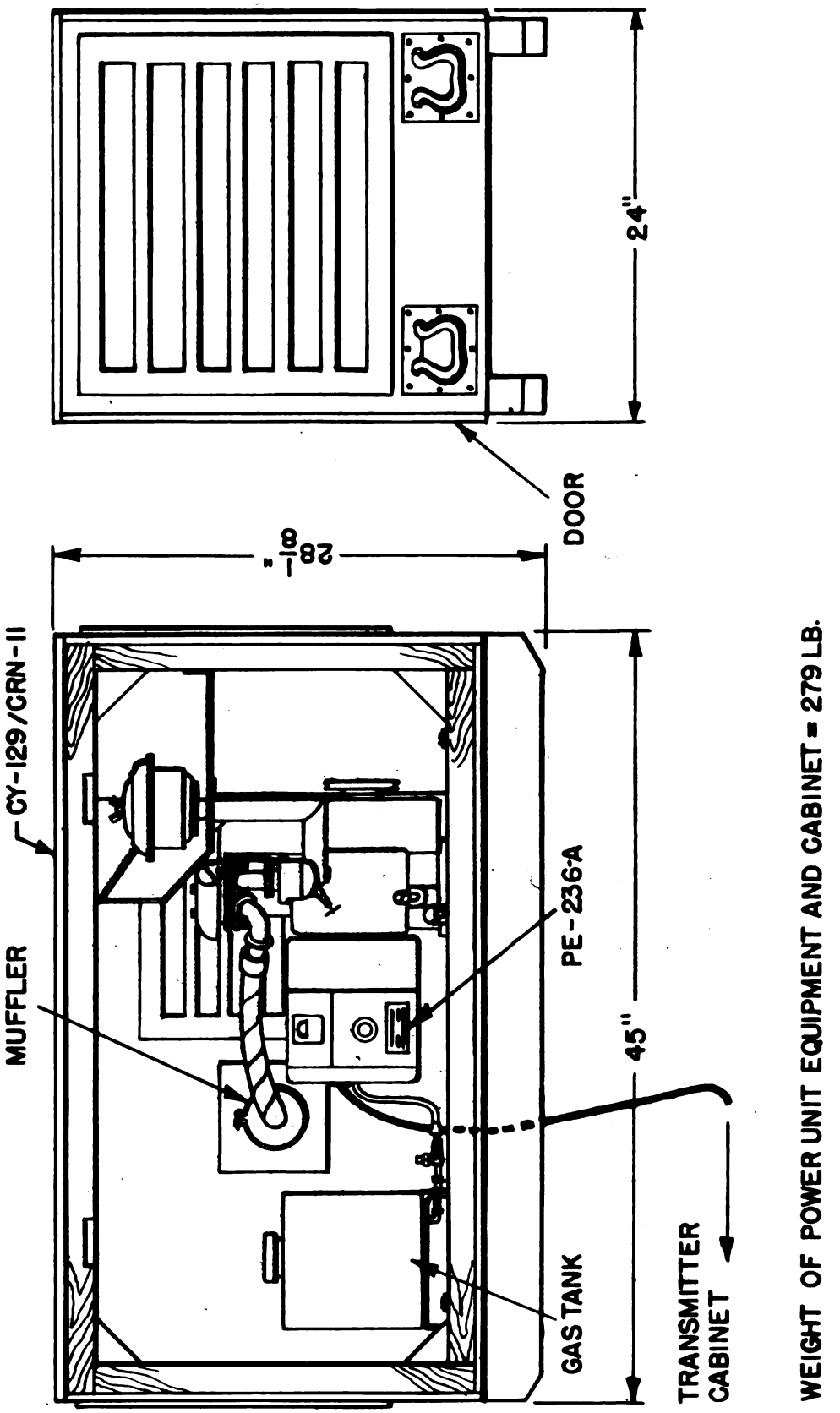


Figure 67.—Power Unit PE-236-A, outline diagram.

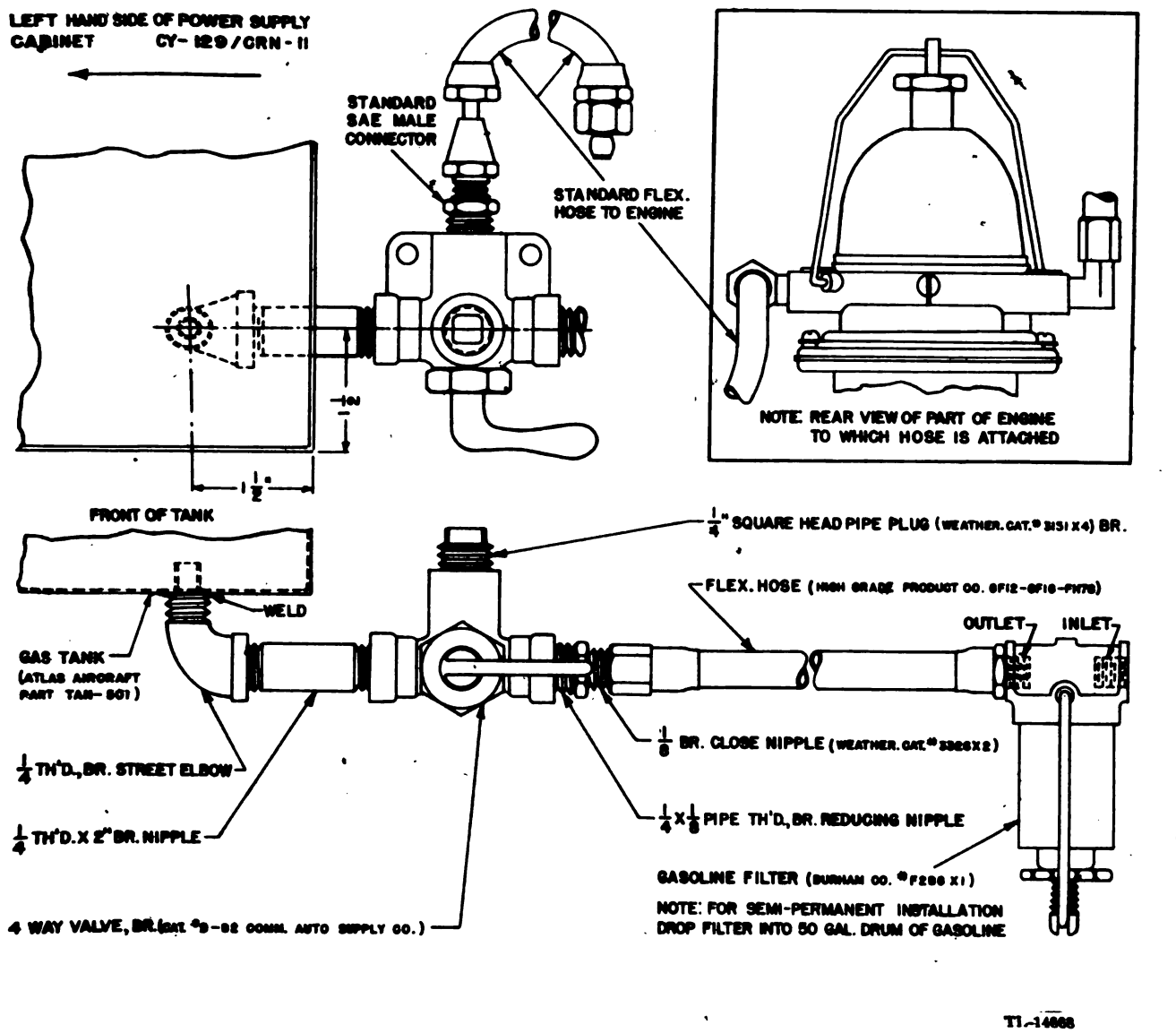
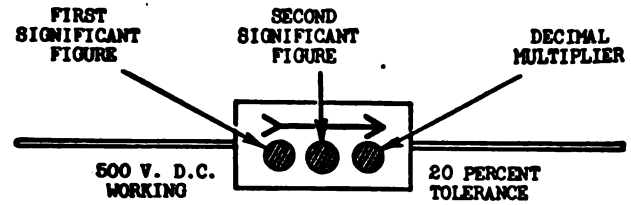
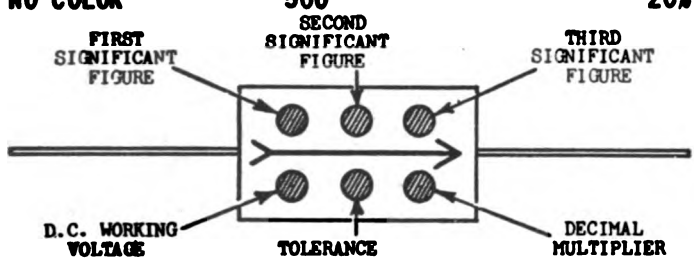


Figure 68.—Power Unit PE-236-A, gasoline supply control valve.

RMA COLOR CODES 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%



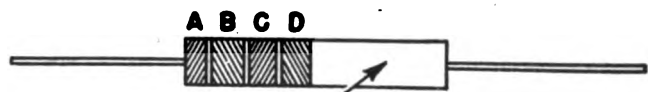
RMA COLOR CODE FOR RESISTORS (OHMS)

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



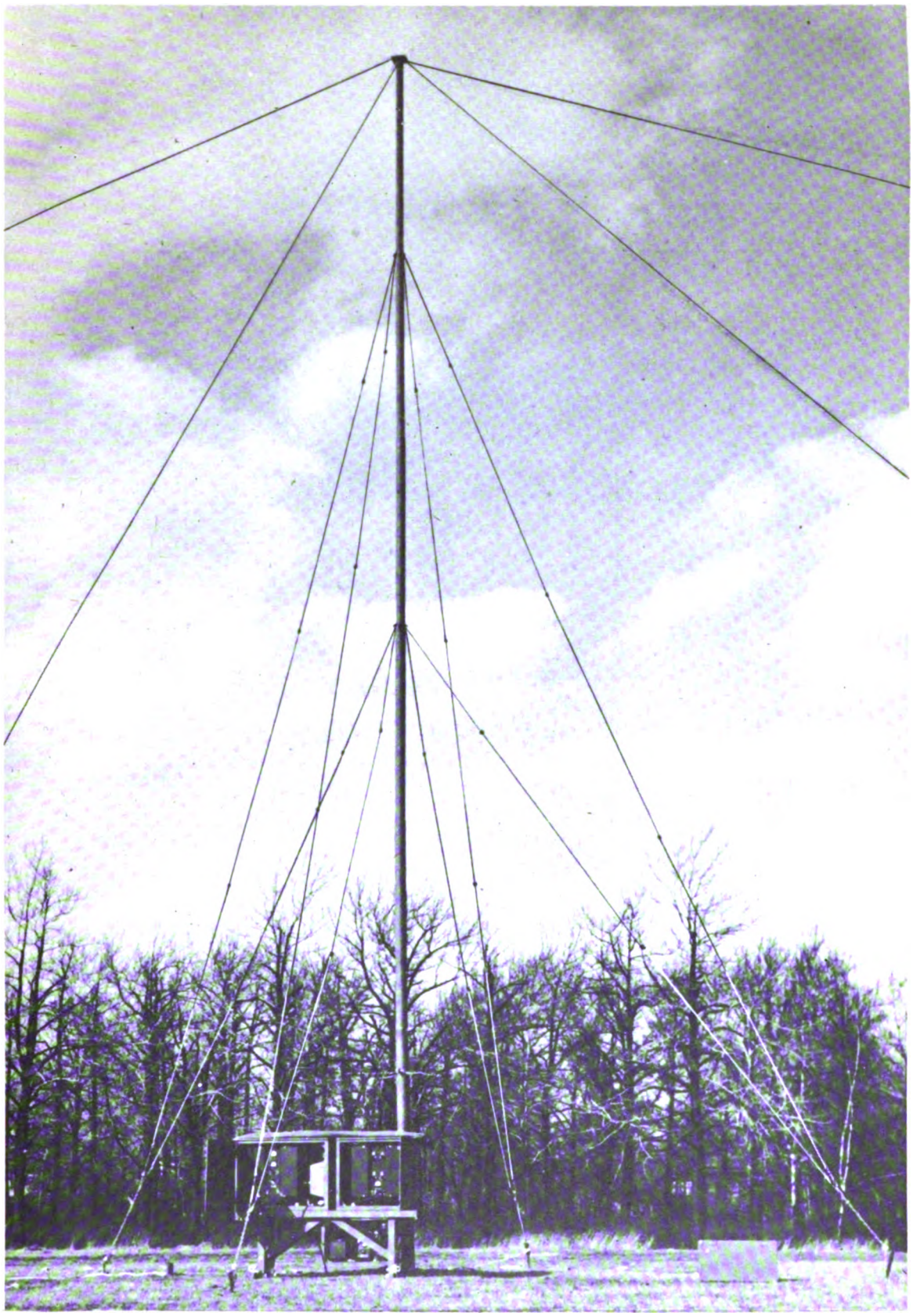
NEW COLOR ARRANGEMENT

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

TL-14656

Figure 73.—R.M.A. capacitor and resistor color code chart.



TL-15428

Figure 74.—Radio Transmitting Set AN/CRN-11 with Antenna System AS-102/CRN-11, showing mast and guys.

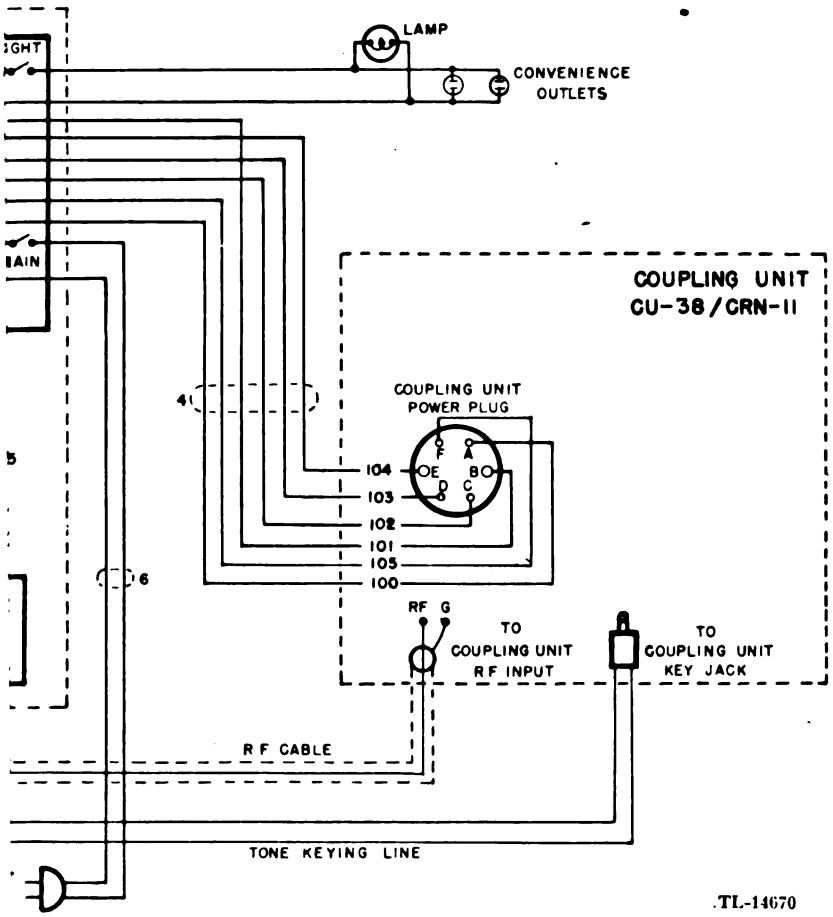
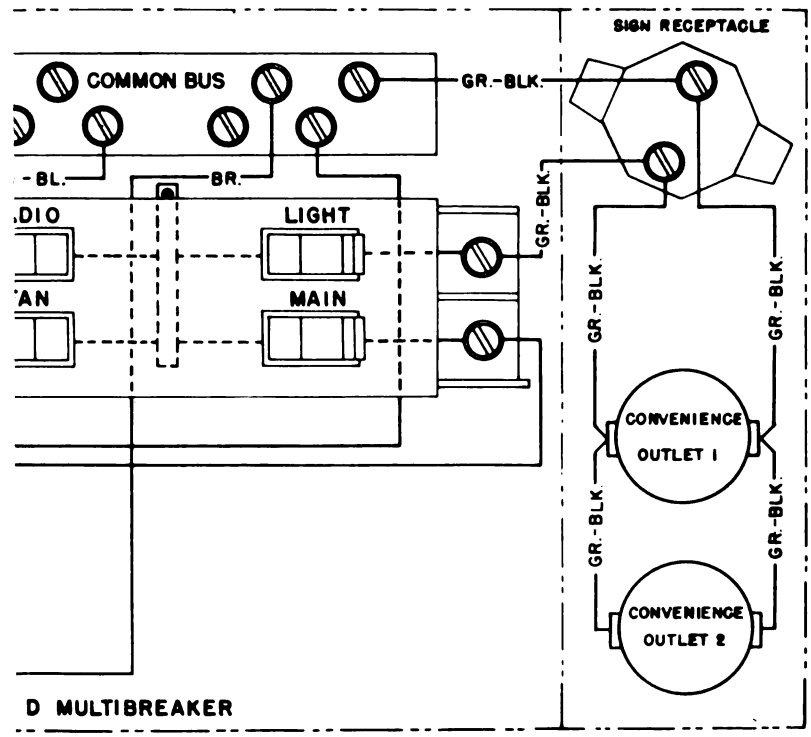


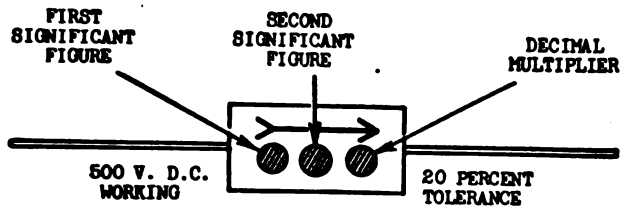
Figure 70.—Radio Transmitting Set AN/CRN-11, interconnecting cable schematic diagram.



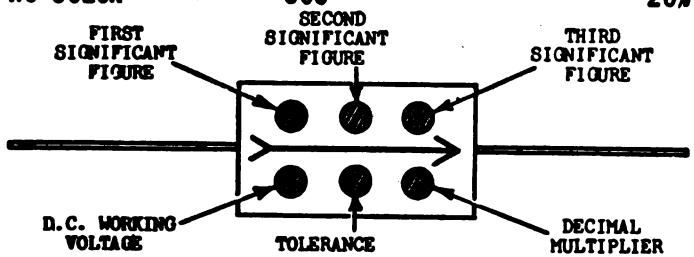
TL-14671

Figure 71.—Radio Transmitting Set AN/CRN-11, power panel, interconnecting cable wiring diagram.

RMA COLOR CODES 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%



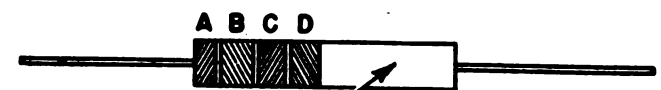
RMA COLOR CODE FOR RESISTORS (OHMS)

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

TL-14656

Figure 73.—R.M.A. capacitor and resistor color code chart.

Order No. 18295-Phila-44-04
8-8-44—1800