DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER

TM 11-264A

TO 16-30GRC26-15

RADIO SET AN/GRC-26A

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

JANUARY 1953

RADIO SET AN/GRC-26A





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For explanation of distribution formula, see SR 310-90-1.

WARNING

HIGH VOLTAGE

is used in the operation
of this equipment.

DEATH ON CONTACT

may result if personnel fail
to observe safety precautions.

Be sure that high voltage plate circuits and input connections are dead before performing preventive maintenance on this equipment. High-voltage capacitors in power supplies must be discharged manually before performing preventive maintenance operations.

EXTREMELY DANGEROUS POTENTIALS

exist in the following units:
Antenna Tuning Unit BC–939–B
Radio Transmitter BC–610–(*)

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First Aid for Electric Shock

RESCUE.

In case of electric shock, shut off the high voltage at once and ground the circuits. If the high voltage cannot be turned off without delay, free the victim from contact with the live conductor as promptly as possible. Avoid direct contact with either the live conductor or the victim's body. Use a dry board, dry clothing, or other nonconductor to free the victim. An ax may be used to cut the high-voltage wire. Use extreme caution to avoid the resulting electric flash.

SYMPTOMS.

a. Breathing stops abruptly in electric shock if the current passes through the breathing center at the base of the brain. If the shock has not been too severe, the breath center recovers after a while and normal breathing is resumed, provided that a sufficient supply of air has been furnished meanwhile by artificial respiration.

b. The victim is usually very white or blue. The pulse is very weak or entirely absent and unconsciousness is complete. Burns are usually present. The victim's body may become rigid or stiff in a very few minutes. This condition is due to the action of electricity and is not to be considered rigor mortis. Artificial respiration must still be given, as several such cases are reported to have recovered. The ordinary and general tests for death should never be accepted.

TREATMENT.

a. Start artificial respiration immediately. At the same time send for a medical officer, if assistance is available. Do not leave the victim unattended. Perform artificial respiration at the scene of the accident, unless the victim's or operator's life is endangered from such action. *In this case only,* remove the victim to another location, but no farther than is necessary for safety. If the new location is more than a few feet away, artificial respiration should be given while the victim is being moved. If the method of transportation prohibits the use of the Shaeffer prone pressure method, other methods of resuscitation may be used. Pressure may be exerted on the front of the victim's diaphragm, or the direct mouth-to-mouth method may be used. Artificial respiration, once started, must be continued, without loss of rhythm.

b. Lay the victim in a prone position, one arm extended directly overhead, and the other arm bent at the elbow so that the back of the hand supports the head. The face should be turned away from the bent elbow so that the nose and mouth are free for breathing.

c. Open the victim's mouth and remove any foreign bodies, such as false teeth, chewing gum, or tobacco. The mouth should remain open, with the tongue extended. Do not permit the victim to draw his tongue back into his mouth or throat.

d. If an assistant is available during resuscitation, he should loosen any tight clothing to permit free circulation of blood and to prevent restriction of breathing. He should see that the victim is kept warm, by applying blankets or other covering, or by applying hot rocks or bricks wrapped in cloth or paper to prevent injury to the victim. The assistant should also be ever watchful to see that the victim does not swallow his tongue. He should continually wipe from the victim's mouth any frothy mucus or saliva that may collect and interfere with respiration.

e. The resuscitating operator should straddle the victim's thighs, or one leg, in such manner that:

(*1*) the operator's arms and thighs will be vertical while applying pressure on the small of the victim's back;

(*2*) the operator's fingers are in a natural position on the victim's back with the little finger lying on the last rib;

(*3*) the heels of the hands rest on either side of the spine as far apart as convenient without allowing the hands to slip off the victim;

(*4*) the operator's elbows are straight and locked.

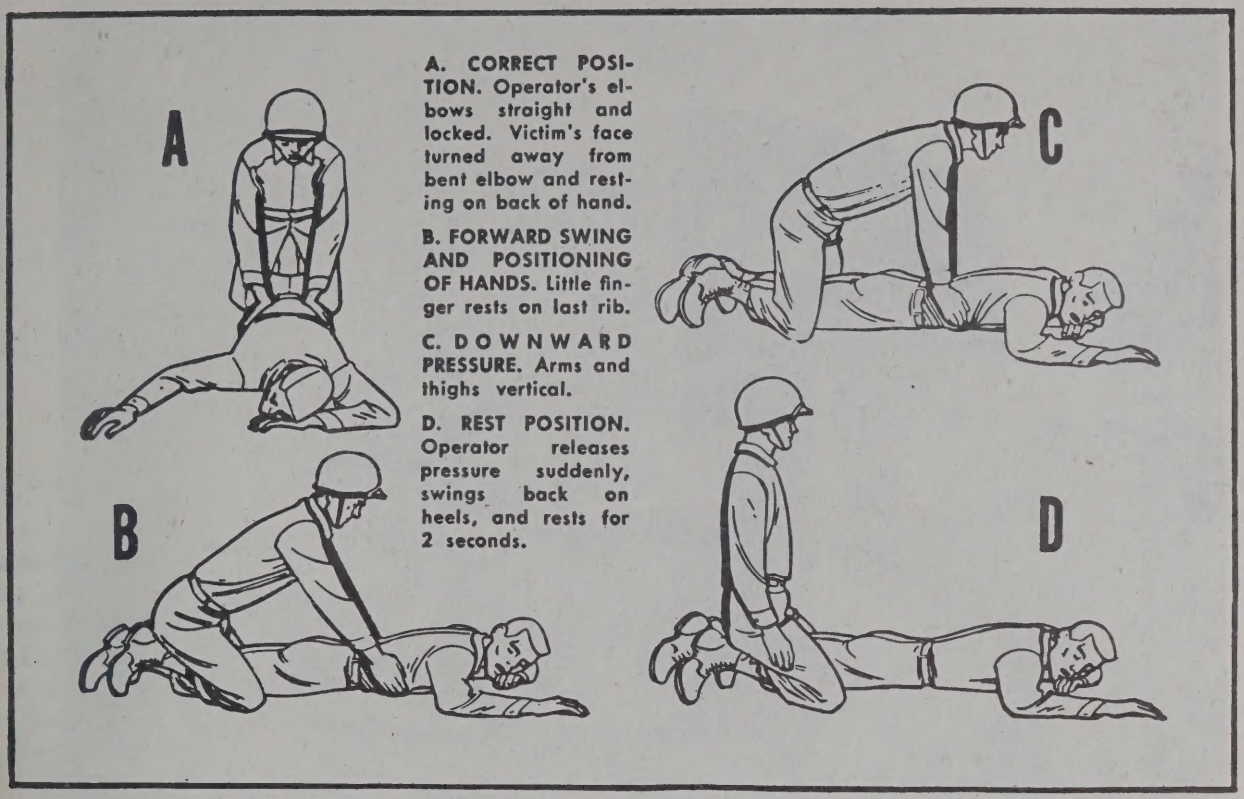
f. The resuscitation procedure is as follows:

(*1*) Exert downward pressure, not exceeding 60 pounds, for 1 second.

(*2*) Swing back, suddenly releasing pressure, and sit up on the heels.

(*3*) After 2 seconds rest, swing forward again, positioning the hands exactly as before, and apply pressure for another second.

g. The forward swing, positioning of the hands, and the downward pressure should be accomplished in one continuous motion, which requires 1 second. The release and backward swing require 1 second. The addition of the 2-second rest makes a total of 4



A. CORRECT POSITION. Operator's elbows straight and locked. Victim's face turned away from bent elbow and resting on back of hand.

B. FORWARD SWING AND POSITIONING OF HANDS. Little finger rests on last rib.

C. DOWNWARD PRESSURE. Arms and thighs vertical.

D. REST POSITION. Operator releases pressure suddenly, swings back on heels, and rests for 2 seconds.

seconds for a complete cycle. Until the operator is thoroughly familiar with the correct cadence of the cycle, he should count the seconds aloud, speaking distinctly and counting evenly in thousands. Example: one thousand and one, one thousand and two, etc.

h. Artificial respiration should be continued until the victim regains normal breathing or is pronounced dead by a medical officer. Since it may be necessary to continue resuscitation for several hours, relief operators should be used if available.

RELIEVING OPERATOR.

The relief operator kneels beside the operator and follows him through several complete cycles. When the relief operator is sure he has the correct rhythm, he places his hands on the operator's hands without applying pressure. This indicates that he is ready to take over. On the backward swing, the operator moves and the relief operator takes his position. The relieved operator follows through several complete cycles to be sure that the new operator has the correct rhythm. He remains alert to take over instantly if the new operator falters or hesitates on the cycle.

STIMULANTS.

a. If an inhalant stimulant is used, such as aromatic spirits of ammonia, the individual administering the stimulant should first test it himself to see how close he can hold the inhalant to his own nostril for comfortable breathing. Be sure that the inhalant is not held any closer to the victim's nostrils, and then for only 1 or 2 seconds every minute.

b. After the victim has regained consciousness, he may be given hot coffee, hot tea, or a glass of water containing ½ teaspoon of aromatic spirits of ammonia. *Do not give any liquids to an unconscious victim.*

CAUTIONS.

a. After the victim revives, keep him LYING QUIETLY. Any injury a person may have received may cause a condition of shock. Shock is present if the victim is pale and has a cold sweat, his pulse is weak and rapid, and his breathing is short and gasping.

b. keep the victim lying flat on his back, with his head lower than the rest of his body and his hips elevated. Be sure that there is no tight clothing to restrict the free circulation of blood or hinder natural breathing. Keep him warm and quiet.

c. A resuscitated victim must be watched carefully as he may suddenly stop breathing. *Never leave a resuscitated person alone until it is CERTAIN that he is fully conscious and breathing normally.*

TL 15338-E



Figure 1. Radio set AN/GRC–26A.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual contains instructions for the installation, operation, and maintenance of Radio Set AN/GRC–26A (fig. 1). In addition, two appendixes include a list of references and an identification table of parts.

b. Official nomenclature followed by (*) is used to indicate all models of an item of equipment included in this manual. Thus Radio Transmitter BC–610–(*) represents Radio Transmitters BC–610–H and –I; Speech Amplifier BC–614–(*) represents Speech Amplifiers BC–614–H and –I; Rectifier RA–87–(*) represents Rectifiers RA–87 and RA–87–A; Microphone T–17–(*) represents Microphones T–17–B through –F; Frequency Shift Exciter O–39(*)/TRA–7 represents Frequency Shift Exciters O–39B/TRA–7 and O–39C/TRA–7; Headset HS–30–(*) represents Headsets HS–30–A through –H, –J through –M, –R, and –J; Power Supply PP–712(*)/GRC–26A represents Power Supplies PP–712/GRC–26A and PP–712A/GRC–26A; Frequency Shift Converter CV–182(*)/GRC–26A represents Frequency Shift Converters CV–182/GRC–26A and CV–128A/GRC–26A. Where used in this manual, the word *teletypewriter* refers to Teletypewriters TT–55/MGC (used in early models of Radio Set AN/GRC–26A) and TT–4A/TG (used in later models). Radioteletypewriter Control C–808/GRC–26A will be referred to as the "control unit".

c. Technical manuals have been published covering detailed operation and maintenance of most of the major components of Radio Set AN/GRC–26A. The manuals and the associated equipments are tabulated below:

Equipments	Technical manual
Frequency Shift Exciter O–39(*)/TRA–7	TM 11–257
Frequency Shift Converter CV–182(*)/GRC–26A.	TM 11–5062
Speech Amplifier BC–614–H; –I	TM 11–5054
Antenna Tuning Unit BC–939–B	TM 11–826
Radio Transmitter BC–610–H; –I	TM 11–826
Power Unit PE–95–G	TM 11–904
Radio Receivers R–388/URR	TM 11–854
Rectifier RA–87–(*)	TM 11–957
Teletypewriter TT–55/MGC	TM 11–352
Teletypewriter TT–4A/MGC	TM 11–2234
Perforator-Transmitter TT–56/MGC	TM 11–2201
Transmitter-Distributor	TM 11–2222
Power Supply PP–712(*)/GRC–26A	TM 11–5062

2. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army matériel and equipment.

a. DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745–45–5 (Army) and AFR 71–4 (Air Force).

b. DA Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700–45–5.

c. USAF Form 54, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700–45–5 and AFR 65–26.

d. DA AGO Form 11–238, Operator First Echelon Maintenance Check List for Signal Corps Equipment (Radio, Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with the instructions on the back of the form.

e. DA AGO Form 11–239, Second and Third Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with the instructions on the back of the form.

f. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Purpose

Radio Set AN/GRC–26A (fig. 1) consists of a transportable assembly of equipment which provides facilities for the transmission and reception of RTT (radioteletypewriter) signals by means of FS (frequency-shift) modulation over a range of 2 to 18 mc (megacycles). In addition, c-w (continuous-wave) telegraphy and voice facilities are provided. The a-m (amplitude-modulated) voice signals can be sent alone or together with the FS modulated RTT signals. The radio set can be operated when in motion or when at halt using two types of operation, full-duplex or one-way reversible. The teletypewriter equipment operates most satisfactorily when stationary, but where the terrain is smooth, operation in motion on a one-way reversible basis is possible. In addition, provision has been made to operate the teletypewriter equipment from a remote position.

4. System Application

The actual applications of Radio Set AN/GRC–26A depend on the tactical situation. Some of the possible applications are as follows:

a. Beachhead landing force signal communications, in amphibious operations, to higher headquarters.

b. Signal communications, from advanced command posts and other command and administrative headquarters in land operations, to higher headquarters.

c. Signal communication with mobile communication centers.

d. Interconvoy and intraconvoy signal communication.

e. Signal communication from ground headquarters to airborne commands.

f. Signal communication from corps command post to rapidly moving subordinate or supporting echelons.

g. Signal communications from division command post to subordinate or supporting elements.

h. Signal communications from fixed bases prior to the establishment of permanent facilities.

5. Simplified System Explanation

a. Transmission. Figure 2 shows a simplified block diagram of the major components of Radio Set AN/GRC–26A. The transmitter may be used for voice and RTT transmission at the same time. The sending portions of the teletypewriter equipment, the send section of Radioteletypewriter Control C–808/GRC–26A, Frequency Shift Exciter O–39(*)/TRA–7, Speech Amplifier BC–614–(*), and Radio Transmitter BC–610–(*), are used in this type of operation. The transmitter output is fed into a single antenna.

b. Reception. During reception on a dual diversity basis, two antennas are used. The voice portion of the received signal is amplified and detected by two Radio Receivers R–388/URR and fed into Loudspeakers LS–3. The RTT portion of the received signal is fed into Frequency Shift Converter CV–182(*)/GRC–26A directly from the receiver i-f (intermediate-frequency) stages. The output of the frequency-shift converter is fed into the control unit and then to the teletypewriter receiving equipment.

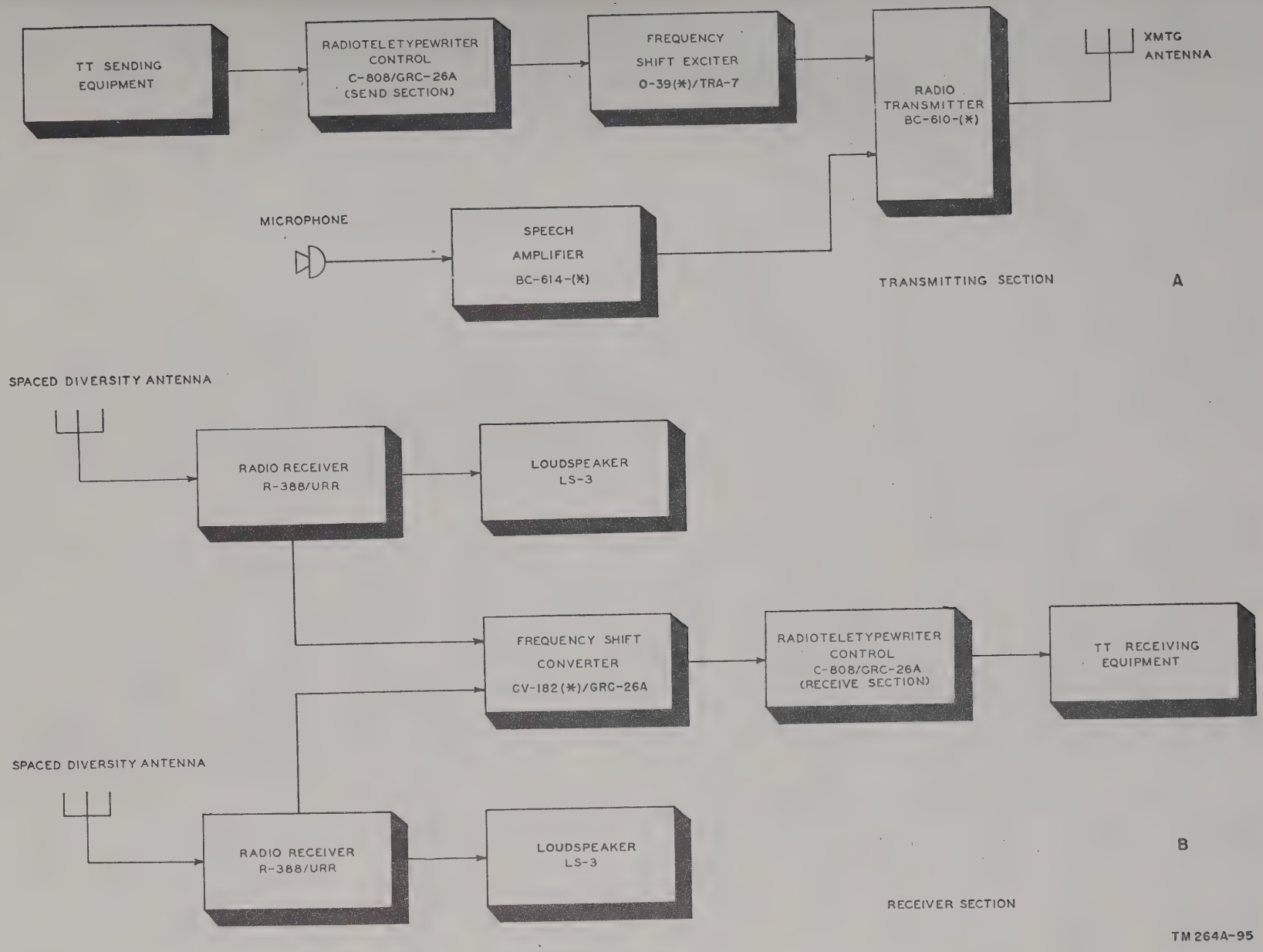


Figure 2. Radio set AN/GRC-26A, simplified block diagram.

6. Technical Characteristics

a. Radio Transmitter BC–610–(*).

Frequency range	2 to 18 mc (3 channels).
Transmitter type	Master or crystal oscillator, buffer-doubler, intermediate amplifier, and p-a (power-amplifier).
Types of signals transmitted.	850 cycle fs radioteletype, fs manual keying, c-w, voice (with Speech Amplifier BC–614–(*)).
Distance range (par. 120):	
C-w or FS	250 miles.
Voice	100 miles.
Type of modulation	Fs and a-m simultaneously or separately.
Number of tubes	16.
Antennas:	
Whip antenna	15 feet long, consists of Mast Sections MS–49 through MS–53.
Doublet	Wire W–1 cut to desired length supported by Masts AB–155A/U or lance poles.
Long wire	25 to 100 feet long.
Power output:	
C-w or FS operation	400 watts maximum.
Voice operation	300 watts maximum.
FS and voice simultaneously.	300 watts maximum.
Power input	115 volts a-c (alternating-current). 50 to 60 cps (cycles per second).
Power consumption	1,700 to 2,000 watts.
Weight	401 pounds.

b. Frequency Shift Exciter O–39 (*)/TRA–7.

Input signals	D-c (direct-current), mark +.020 ampere; space —.025 ampere.
Output frequency	2 to 6 mc.
Frequency shift	212.5, 425, or 850 cps, depending on frequency multiplication in the transmitter.
Number of tubes	10.
Power input	115 volts a-c, 50 to 60 cps.
Power consumption	185 watts.
Weight	125 pounds.

c. Speech Amplifier BC–614–(*).

Input signals:	
Carbon microphone	200 to 2,600 cps (±3 db (decibels)).
Dynamic microphone	200 to 3,500 cps (±3 db).
Number of tubes	8.
Power output	2 watts.
Power input	115-volts a-c, 60 cps.
Power consumption	40 watts.
Weight	31 pounds.

d. Radioteletypewriter Control C–808/GRC–26A.

Polar input	Mark +.025 ampere; space —.025 ampere.
Polar output	Mark +.020 ampere; space —.025 ampere.
Neutral input and output	Mark .060 ampere; space 0 ampere.
Number of tubes	2.
Power source	115 volts a-c, 50 to 60 ops.
Power consumption	75 watts.
Weight	40 pounds.

e. Radio Receiver R–388/URR.

Number of bands	30 (in 1-mc steps).
Range of frequencies	.5 to 30.5 mc.
Types of signals which can be received.	C-w, FS, tone, voice.
Type	Single, double, or triple conversion superheterodyne.
Number of tubes	18.
I-f	500 kc (kilocycles).
Output impedances	4 and 600 ohms (voice coil and transmission line).
Antenna input impedance (unbalanced).	50 ohms, 100 uuf (micromicrofarads).
Power input	115 or 230 volts a-c at 45 to 70 cps.
Power consumption	85 watts.
Weight	35 pounds.

f. Frequency Shift Converter CV–182(*)/GRC–26A.

Signal input	Fs radioteletypewriter.
Frequency range (input)	440–510 kc.
Number of tubes	18.
Output signals:	
Neutral	Mark .060 ampere; space 0 ampere.
Polar	Mark +.025 ampere; space —.025 ampere.
Input impedance	300 ohms.
Power input	Supplied by Power Supply PP–712(*)/GRC–26A.
Power consumption (including Power Supply PP–712(*)/GRC–26A).	175 watts.
Weight	75 pounds.

g. Power Supply PP–712(*)/GRC–26A (Including Tone Oscillator).

Number of tubes	7.
Power input	115 volts a-c, 50 to 60 cps.
Power consumption (with Frequency Shift Converter CV–182(*)/GRC–26A).	175 watts.
Weight	65 pounds.

h. Power Unit PE–95–G.

Number of cylinders	4.
Engine speed	1,800 rpm (revolutions per minute).
Type of cooling	Water.
Cooling system capacity	15.5 quarts.
Spark plugs:	
Size	14 mm (millimeters).
Gap	.025 inch.
Fuel tank capacity	10½ gallons.
Crankcase oil capacity	5 quarts.
Battery voltage	12 volts d-c consisting of two 6-volt batteries in series.
Generator:	
Power output	10 kw (kilowatts) at 80 percent power factor.
Voltages	120 and 240 volts a-c, 60 cps.
Fuel consumption	1.1 gallons per hour.
Weight (without trailer)	1,556 pounds.

i. Rectifier RA–87–(*).

Type of rectifier	Full-wave selenium stack.
Power input with full a-c and d-c:	
loads	Approx 555-volt amperes.
with no load	Approx 35-volt amperes.
Power output:	
D-c	41 watts.
A-c	460-volt amperes.
Input voltages	95–125 and 190–250 volts a-c.
Output voltages (full load)	50–60 cps.
A-c receptacles	115 volts; 400 ma (milliampere) at 50–60 cps.
D-c receptacles	107 volts at 380 ma.
Weight	40 pounds.

7. Packaging Data

a. When packaged for export shipment, Radio Set AN/GRC–26A is packed in two wooden export crates. Items may be packaged in a different manner than that shown, depending on the supply channel. The size, weight, and volume of each crate are as follows:

Number of crates	Height (in.)	Length (in.)	Depth (in.)	Volume (cu. ft.)	Unit weight (lb.)
1	93⅞	155	91¼	768	10, 000
1	75¾	108	80¾	382	5, 40
Total weight (lb)					15, 400

b. When packaged for domestic shipment, Shelter S–69/GRC is not crated. Power Unit PE–95–G, mounted on Trailer K–52, is in a protective wooden crate. The size, weight, and volume of each unit is as follows:

Number of crates	Height (in.)	Length (in.)	Depth (in.)	Volume (cu. ft.)	Unit weight (lb.)
Shelter	79½	142	83½	544	6, 590
Trailer	75¾	108	80¾	382	5, 360
Total weight (lb)					11, 950

c. The following list indicates the contents of each case. Refer to the packing list attached to each case for a detailed list of contents.

Case dimensions (in.)	Item	Contents
93⅞ x 155 x 91¼.	Shelter S–69/GRC in external crate.	Contains operating components, antenna equipment, Reel Unit RL–31, power cables, shoring, and desiccants.
79½ x 145 x 81½.	Shelter S–69/GRC less external crate.	Same components as with external crate.
75¾ x 108 x 80¾.	Power Unit PE–95–G mounted on Trailer K–52.	Contains gasoline cans, racks, desiccants, and moisturev-aporproof barriers.

d. An aircraft loading data plate, mounted on the outside of Shelter S–69/GRC, gives the weight, dimensions, and center of gravity of the shelter, less external crate. Note that the weight includes shelter shoring, desiccant, and other packing materials which are inside the shelter (fig. 3) when it is shipped initially from the plant of the manufacturer. The weight shown on the plate is reduced



Figure 3. Radio set AN/GRC–26A, interior of shelter packed for shipment.

by approximately 1,000 pounds when the shoring, desiccant, and packing materials are removed. The center of gravity remains substantially unchanged.

8. Table of Components

The following is a tabular listing of the components of Radio Set AN/GRC–26A:

Component	Required No.	Height (in.)	Depth (in.)	Length (in.)	Unit volume (cu. ft.)	Unit weight (lb.)
Adapter M–359	2					0.1
Adapter Kit M–459	3	5¾	3 1/16	3 1/16	0.032	1.5
Antenna Tuning Unit BC–939–B	1	14½	23½	11¼	2.24	48
Bracket MT–657/GRC	1	8½	10	10	.492	3
Broom, floor	1	60	2½	10	.87	1
Brush, cleaning	1	3¾	¾	14½	.01	.2
Cabinet CY–1050/GRC–26A	1	60⅝	20 3/16	20¼	14.33	120
Cast CY–689/GRC–26	1	22¾	15½	20	4.02	6
Chair, metal	2	32	15	14¼	6.84	8
Chair, wood	1	31	17⅛	19½	6.00	10
Clipboard	1	12½	⅛	9	.01	.5
Clock, Longines-Wittnauer	1	2½	3	3	.013	1
Compass, magnetic	1	4	¾	3½	.006	1
Radioteletypewriter Control C–808/GRC–26A in Radioteletypewriter Control Case CY–901/GRC–26A.	1	10⅞	10¼	19¾	1.26	42
Frequency Shift Converter CV–182(*)/GRC–26A (less cabinet).	1	10½	18½	19	2.14	65.5
Electrical Power Cable Assembly CX–1939/U loudspeaker (1 spare).	3			60		.5
Cord CD–307 (red)	3			48		1
Cord CD–307 (black)	3			48		1
Cord CD–307 (gray)	1			48		1
Cord CG–389/U	1			72		2
Cord CG–390/U	1			210		1.8
RF Cable Assembly CG–557A/U transmission line.	1			75 ft		7
RF Cable Assembly CG–557A/U	2			500 ft		37
RF Cable Assembly CG–558/U	1			27		.5
RF Cable Assembly CG–562A/U	2			96		1.5
Cord CD–605, headset	1			82		1
Cord CD–763	1			165		3
Cord CD–764	1			179		1.5
Cord CX–954/TRA–7	2			72		1.5
Cord CX–959/TRA–7	1			72		1.5
Cord CX–961/TRA–7 (blue)	1			48		1.5
Cord CX–961/TRA–7 (red)	2			48		1.5
Cord CX–962/TRA–7	1			48		1.5
Cord CG–67/MRQ–2	2			66		2
Special Purpose Cable Assembly CS–1120/U	2			54		.5
Special Purpose Cable Assembly CX–1150/U	1			180		1.5
Special Purpose Cable Assembly CX–1151/U	1			180		1.5
Special Purpose Cable Assembly CX–1152/U	1			54		.8
Power Cable Assembly CX–1165/U	2			12 ft		10
Power Cable Assembly CX–1166/U	2			50 ft		30
Special Purpose Cable Assembly CX–1200/U	1			45		.5
Special Purpose Cable Assembly CX–1201/U	1			45		.5
Electrical Special Purpose Cable Assembly CX–1850/U.	1			36		1
Electrical Special Purpose Cable Assembly CX–1851/U.	2			48		1.5
Cover BG–198 [a]	3	15⅞	21⅜	18½	3.63	3
Cover BG–199 [b]	1	13⅛	21¾	17⅝	2.91	3
Cover BG–200	1	10¼	17½	9	.93	1.5
Drum, gasoline	6	17¾	6½	13⅜	.93	10
Frequency Shift Exciter O–39(*)/TRA–7 in Case CY–827/GRC–26.	1	12⅝	16⅜	19	2.28	110
Ground Rod GP–26	1	½	½	54	.0078	2.5

See footnotes at end of table.

Component	Required No.	Height (in.)	Depth (in.)	Length (in.)	Unit volume (cu. ft.)	Unit weight (lb.)
Hammer, sledge	1	37	2½	5	.267	7
Headset HS–30–(*)	2	1½	5	5	.024	.8
Heater, electric, 1,500 w, 115 v, 60 cyc ac	1	12¼	7⅝	8½	.458	18
Insulator, bowl, steatite	1		5¼ dia	$2\frac{23}{32}$	.044	1
Insulator, strain, JAN NS4B5224	24		¾ dia		.00134	0.2
Key J–45 (including Cord CD–201–A)	1	6	4½	5⅝	.088	1.5
Lamp, fluorescent, 20 w, 110–125 v a-c, 60 cps	8	2	2	24	.055	.1
Lamp, incandescent, 15 w, 115–125 v	4	3	3	2⅝	.0137	.1
Lamp, trouble	1	5¾	4	25 ft cord	.33	2.5
Lead, electrical #7 AWG wire braid	2	1/16	1	120	.00435	.5
Loudspeaker LS–3	2	8¼	5¼	8¼	.206	5
Mast AB–155A/U	6	5¾	7¼	66	1.6	55
Mast Base MP–47–A	2	8½	8½	20	.84	30
Mast Base MP–65–C	3	3	3	16½	.086	5
Mast Base Bracket MP–50–A	3	5½	5¼	9	.15	4.5
Mast Section MS–49	3	½	½	38½	.0056	1
Mast Section MS–50	3	½	½	39¼	.0057	1
Mast Section MS–51	3	½	½	$39\frac{5}{16}$	.0057	1
Mast Section MS–52	3	½	½	39½	.0057	1
Mast Section MS–53	3	½	½	39⅝	.0057	1
Mast Section MS–116	8	½	½	39½	.0057	1
Mast Section MS–117	4	½	½	39½	.0057	1
Mast Section MS–118	4	½	½	39½	.0057	1
Microphone T–17–(*), including Microphone Cover CW–110/U.	1	2⅝	2⅝	5¾	.023	1
Microphone T–50	1	4	2	2¼	.0104	1.5
Mucilage, 4-oz. bottle	2 bottles	4				
Multimeter TS–352/U (less batteries)	1	8¾	6⅛	11¼	.349	13
Oil, lubricating, 3-in-1 in 3-ounce can	2	1	2	4½	.0052	.4
Paper, bond, white	2 reams	8½	3	10½	.155	5
Paper, teletypewriter, 8½ in. wd, 4½ in. roll, stock No. 4T1.	15 rolls	4½	4½	8½	.10	5
Paper, teletypewriter, 8½ in. wd by 350 ft lg, with 2 carbon inserts, stock No. 4T3.	15 rolls	6	6	8½	.177	5.5
Pencil M–139	1 doz	¾	2	7	.0061	.4
Pencil M–140	2 doz	¾	2	7½	.0065	.4
Perforator Transmitter TT–56/MGC	1	13½	21	25	4.1	85
Pole, wood, lance	4	1¾	1¾	137	.242	3.5
Power Supply PP–712(*)/GRC–26A (less cabinet).	1	10½	16¼	19	1.88	76.5
Rack MT–655/GRC	2	2	7½	17	.148	8
Rack MT–656/MRC (for gasoline drums)	1	17	15¾	44⅛	6.8	40
Radio Receiver R–388/URR (less cabinet)	2	10½	13½	19	1.48	45
Radio Transmitter BC–610–(*)	1	45	30	31	24.2	400
Rectifier RA–87–(*)	1	7½	8⅜	$14\frac{9}{16}$	.53	40
Reel RL–29	2	5½		11½ dia	.0069	2
Rope RP–5	50 ft				.012	1.02
Shelter S–69/GRC, includes cabinets, operating tables, and fire extinguisher, 4 lb, CO_2 type.	1	79½	83½	142	540	3,100
Solder M–31, resin core	1 lb	3	3	3	.016	1
Speech Amplifier BC–614–(*)	1	9½	9¾	16½	.885	30
Spout, for gasoline drum	3	2	2	16¼	.038	1.5
Stamp MC–181–A, time clock	1	10½	6¼	6¾	.257	8
Starter, lamp	8	¾	¾	1½	.0005	.1
Strap (for folding chair)	2	⅛	1	11	.0007	.1
Strap, web (for lance pole)	4	⅛	1½	18	.002	.2
Strap, web (for Mast AB–155A/U)	3	⅛	1½	56	.006	.5
Strap, web (for broom and sledge)	2	⅛	1½	6¾	.00073	.1

Component	Required No.	Height (in.)	Depth (in.)	Length (in.)	Unit volume (cu. ft.)	Unit weight (lb.)
Tape TL–83 (friction)	1 roll	3	3	¾	.0039	.5
Tape TL–192 (rubber)	1 roll	3¾	3¾	¾	.006	.5
Tape, measuring, steel, 100 ft	1	¾	4⅜	4⅜	.0083	2
Telephone EE–8–(*)	2	9½	3½	7 1/16	.143	16
Teletypewriter TT–4A/TG [b]	2	11¼	18⅞	22½	2.73	43
Teletypewriter TT–55/MGC [b]	15½	18	18			
Teletypewriter TT–55/MGC [a]	2	15½	18	18	2.92	60
Trailer K–52; includes Power Unit PG–95–G						
Tube, flexible, exhaust, for Power Unit PE–95–G.	1	1⅞	1⅞	120	.244	10
Typewriter MX–322/U	1					
Typing Unit (for Teletypewriter TT–55/-MGC).	1	12	14	15½	1.51	35
Whip antenna hold-down (receiver)	3			135		1
Whip antenna hold-down (transmitter)	2			137		1
Wire W–1 (500-ft length)	2 lengths			1,000 ft		2.5
Wire W–128 (lead-in)	1			24		
Wire WD–1/TT, ½ mile on Spool DR–8–A	2 quarter mile length.	6½	15	15	.845	30
Wrench (for removing bolts of transmitter)	1	7⅛	1 1/16	44	.136	2.5
Technical Manual TM 11–257	2	½	7⅞	10¼	.024	1.3
Technical Manual TM 11–264A	2	½	7⅞	10¼	.024	1.3
Technical Manual TM 11–281	2	½	7⅞	10¼	.024	1.3
Technical Manual TM 11–300	2	¼	7⅞	10¼	.012	.5
Technical Manual TM 11–333	1	⅛	5⅞	9⅛	.004	.3
Technical Manual [a] TM 11–352	2	½	7⅞	10¼	.024	1.3
Technical Manual TM 11–359	2	⅛	5⅝	8½	.003	.4
Technical Manual TM 11–826	2	½	7⅞	10¼	.024	1.3
Technical Manual TM 11–854	2	⅛	7⅞	10¼	.006	.8
Technical Manual TM 11–957	2	⅛	5⅞	9⅛	.004	.3
Technical Manual TM 11–2201	2	½	7⅞	10¼	.024	1.3
Technical Manual TM 11–2222	2	½	7⅞	10¼	.024	1.3
Technical Manual TM 11–2223	2	½	7⅞	10¼	.024	1.3
Technical Manual [b] TM 11–2234	4	½	7⅞	10¼	.024	1.3
Technical Manual TM 11–5054	2	⅛	7⅞	10¼	.006	.8
Technical Manual TM 11–5500	2	⅛	7⅞	10¼	.006	.8

[a] Contained in some earlier models of the radio set.
[b] Contained in later models (par. 29).

9. General Description

a. Radio Set AN/GRC–26A consists primarily of two radio receivers, a transmitter with an antenna tuning unit, a speech amplifier, a frequency-shift exciter, a radioteletypewriter control, a frequency-shift converter, a power supply for the converter, and teletypewriter equipment. The components of Radio Set AN/GRC–26A are mounted either in a compact shock-mounted cabinet, or in cases, so that they may be set up in the limited space available in the shelter. Operating components, installed on shelves, are easily accessible to the operating personnel in Shelter S–69/GRC. Storage cabinets, along one wall, provide ample space for storing spare parts and accessories. Figures 4, 5, and 6 show the operating equipment installed. Shelter S–69/GRC usually is mounted on a 2½-ton, 6 by 6, cargo truck. Power for the operation of this equipment is supplied by Power Unit PE–95–G which is mounted on a 1-ton, two-wheel, Trailer K–52.

b. In mobile, one-way reversible operation, three-whip antennas are used; one for transmission and two for reception. In mobile-at-halt operation, whip antennas normally are used. In semifixed installations, doublet antennas can be used for transmission and reception. In the latter case, two receiving antennas are necessary for dual diversity reception. One-way reversible or full-duplex service may be used in both mobile-at-halt or semifixed operation.

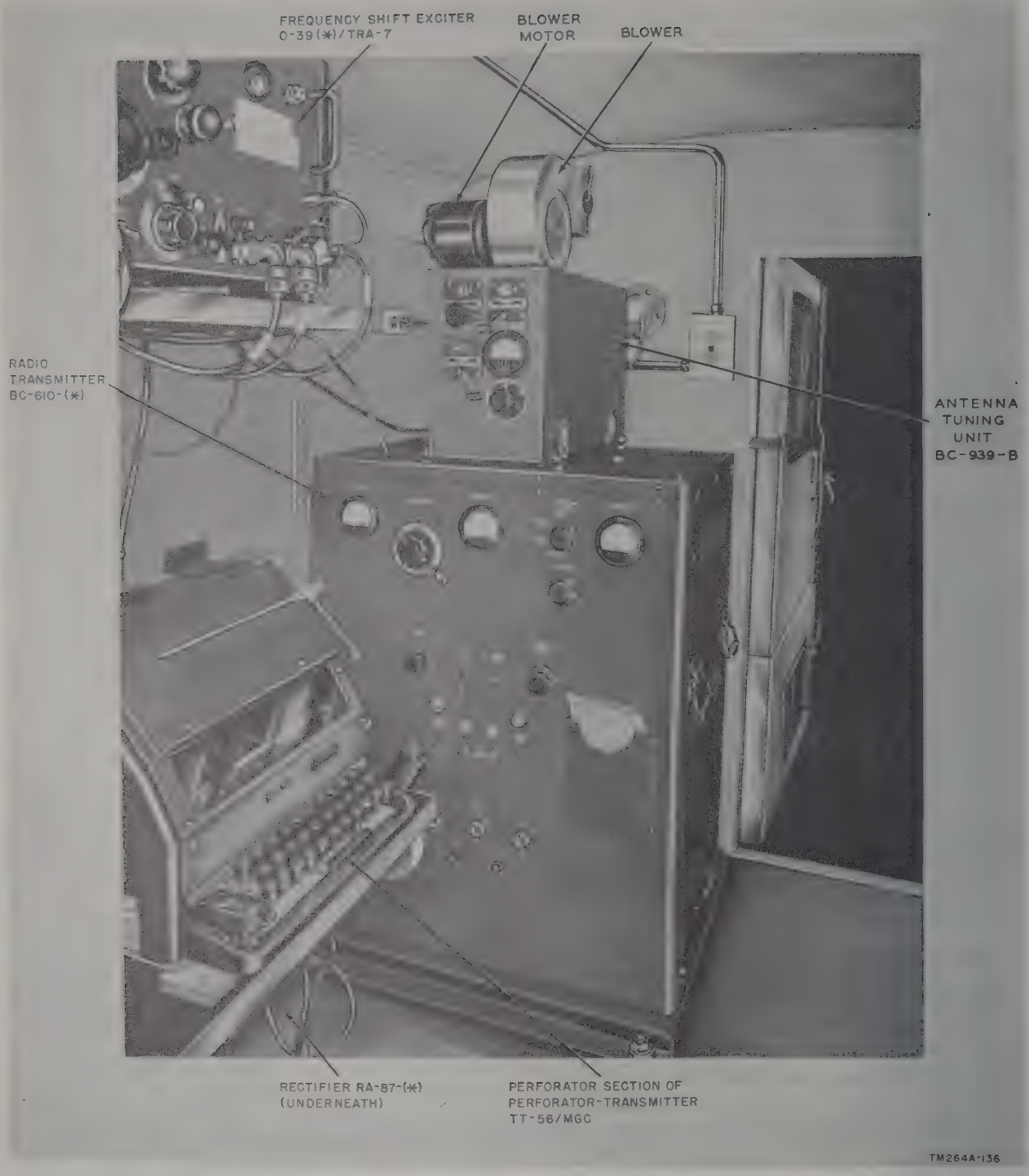


Figure 4. Radio set AN/GRC–26A, interior rear view of shelter.

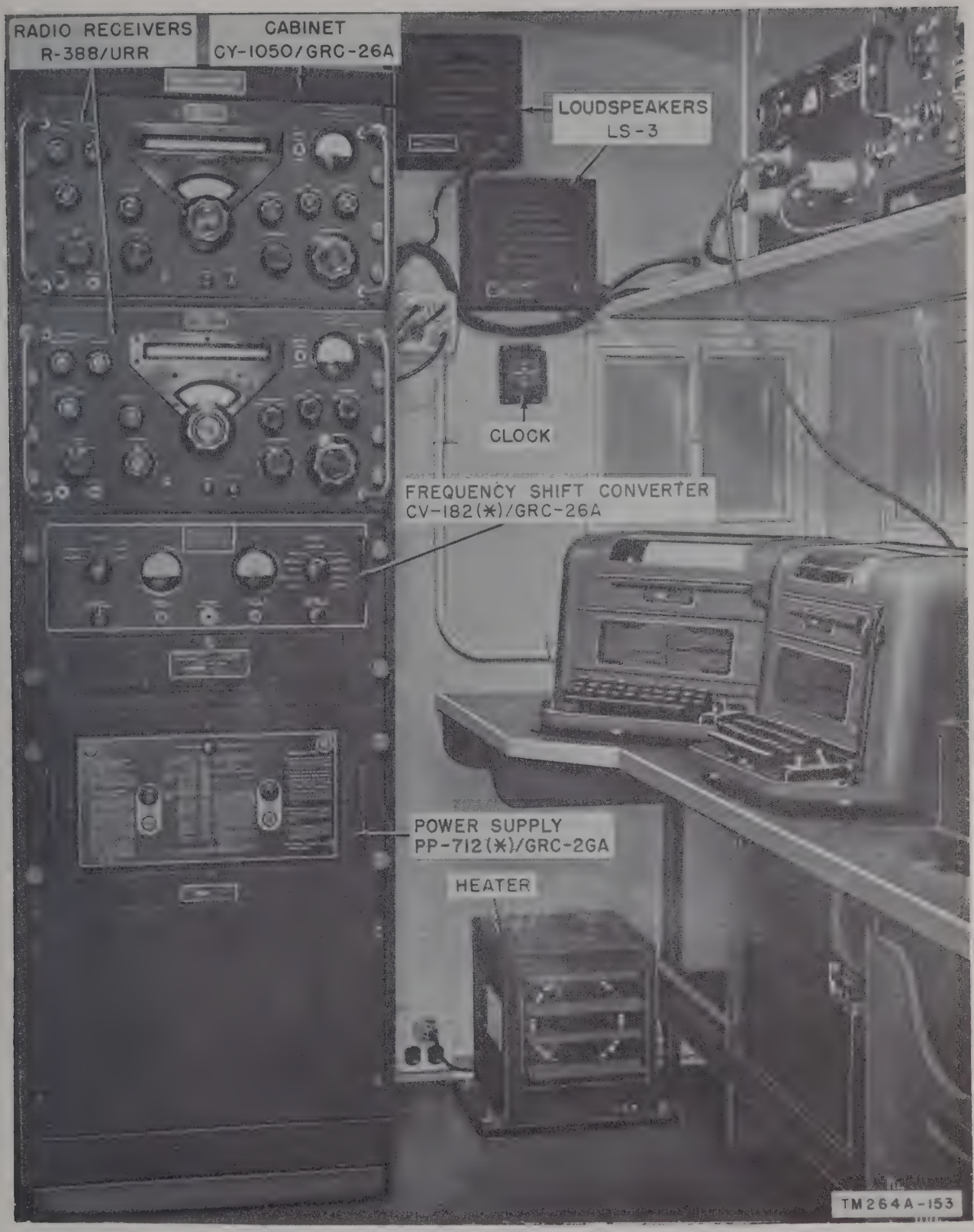


Figure 5. Radio set AN/GRC–26A, interior front view of shelter.

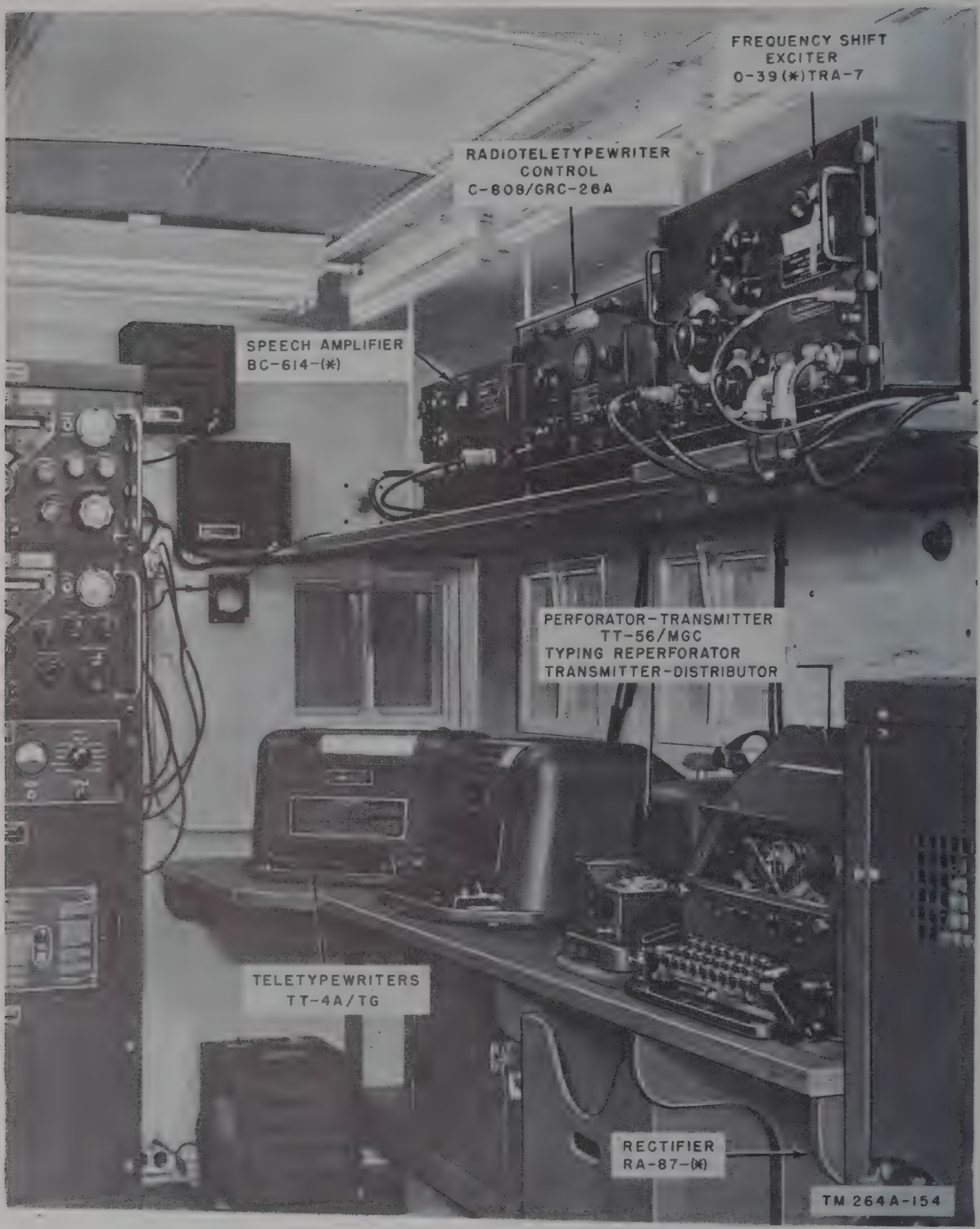


Figure 6. Radio set AN/GRC-26A, interior side view of shelter.

10. Description of Shelter S–69/GRC

a. Shelter S–69/GRC (figs. 37 and 40) is a steel and plywood structure designed to house the operating components of Radio Set AN/GRC–26A. The shelter mounts on a standard ordnance 80- by 144-inch cargo truck body for the purpose of transportation or mobile operation. The wall cabinets, operating tables, shelves, wiring, electrical outlets, fluorescent lights, and ventilating blower are permanent parts of the shelter. A roof hatch, six wall windows, and the window in the rear door are provided with screening and blackout blinds. The blinds may be opened for ventilation. R-f bypass capacitors have been installed in the fluorescent lights.

b. The power for the operation of Radio Set AN/GRC–26A is connected to an entrance control box (located at the left of the transmitter) by means of a feedthrough receptacle. This control box is provided with two current-limiting (circuit-breaking) switches. The current-limiting switch to the left controls the power to the receptacles in two branches of conduit; the current-limiting switch to the right controls the power to the receptacles in the other two branches (par. 131). The entrance box is connected by conduit to a control box near the door of the shelter where a single current-limiting switch controls the power to the fluorescent fixtures.

c. Shelter S–69/GRC also contains a long T-wrench which is used to loosen the bolts which secure the transmitter to the floor, a fire extinguisher, a heavy sledge hammer, and a broom. Mounted on the end of the cabinets are two field-telephone holders.

11. Radio Transmitter BC–610–(*)

a. Radio Transmitter BC–610–(*) (fig. 7), located near the door, is a medium-power transmitter for voice or c-w signals over a frequency range of 2 to 18 mc. Frequency coverage is accomplished by means of plug-in crystals, tuning units, coils, and a plug-in-type vacuum capacitor. The frequency is controlled by either the mo (master oscillator) or the crystal oscillator. In an emergency, the transmitter may be used to send manual c-w signals by interrupting the r-f (radio-frequency) carrier at socket SO 5 (par. 121).

b. The transmitter has three chassis. The top chassis is referred to as the r-f section since it contains the r-f components. The center section is referred to as the modulator section since it contains most of the a-f (audio-frequency) equipment. The bottom chassis, containing the h-v (high-voltage) power supply and the overload relay, is referred to as the power supply section. The three sections are assembled in a sheet-metal cabinet with a front panel on which the controls, switches, pilot lamps, and meters are mounted. Two insulated terminals and a coaxial socket provide means for connecting either an antenna lead-in or Antenna Tuning Unit BC–939–(*).

12. Speech Amplifier BC–614–(*)

a. Speech Amplifier BC–614–(*) (fig. 8) raises the microphone output to the proper level for feeding the grids of the audio driver tubes in the transmitter. It is located on the top shelf to the left of the control unit and is housed in a black crackle-finished steel cabinet which is shock-mounted to the shelf permanently. The chassis, with the front panel attached, may be removed from the housing entirely by unscrewing the four captive wing fasteners which secure it to the housing.

b. The front panel contains jacks for the interconnecting cables to the transmitter and the control unit and for the carbon and dynamic microphones. A KEY jack provides the means of keying the cathode of the r-f oscillator tube in the transmitter when emergency c-w transmission is desired. A meter indicates the plate current of the modulator tubes in the transmitter. Two controls to the left of the DYNAMIC MIC. 2 and CARBON MIC. 1 jacks provide means for adjusting the gain of the microphones. The a-c power input is fed through from the transmitter; the applied power is indicated by the lighting of the pilot lamp.

13. Frequency Shift Exciter O–39(*)/TRA–7

a. Frequency Shift Exciter O–39(*)/TRA–7 (fig. 9), assembled on a single chassis, is inclosed in a black crackle-finish steel case (Case CY8–27/GRC–26). This shock-mounted unit is located on the top shelf to the right of the control unit in Shelter S–69/GRC. The front panel and chassis is attached firmly to the case by four thumbscrews on each side of the panel.

b. All controls, pilot lamps, switches, fuses, jacks, and receptacles are located on the front panel. Power is applied to a three-prong, twist-lock male receptacle located in the lower right-hand corner.



Figure 7. Radio transmitter BC–610–(*).

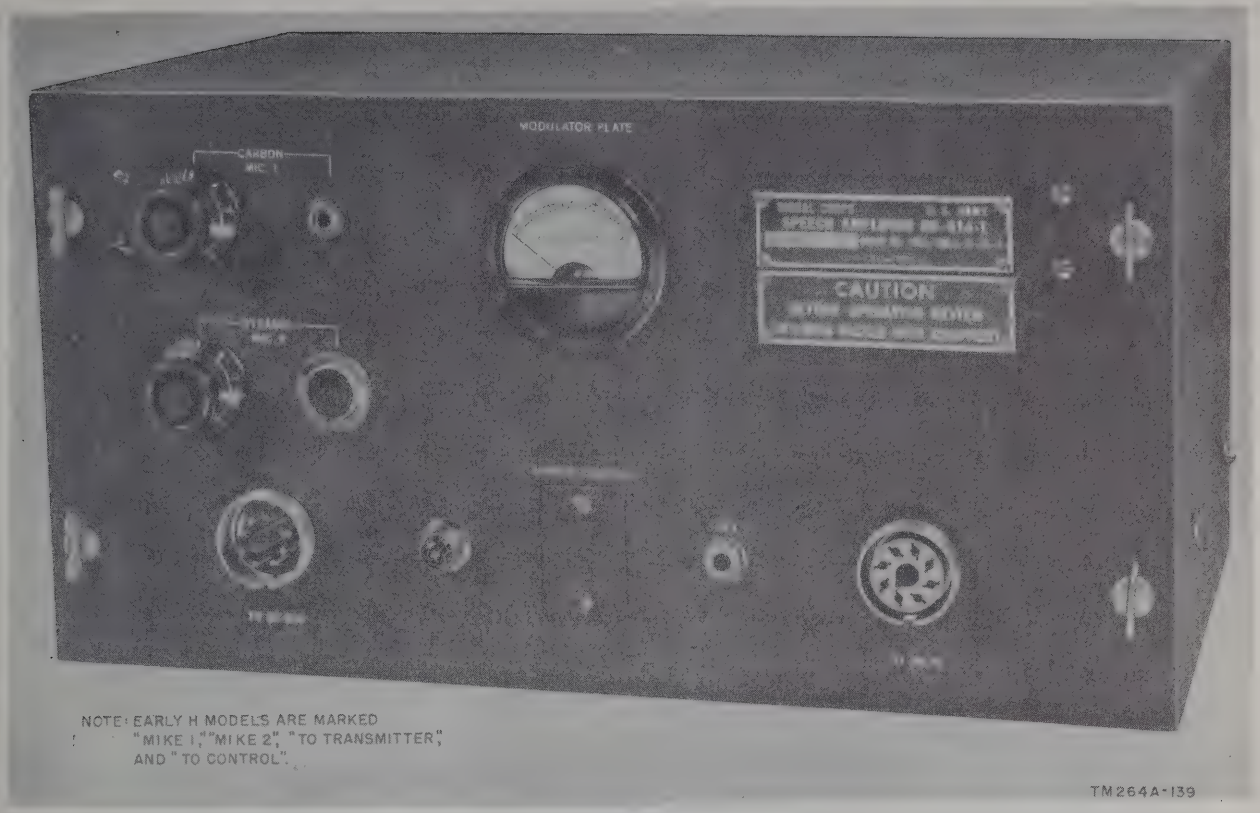


Figure 8. Speech amplifier BC–614–(*).

c. The frequency-shift exciter functions as an mo for the transmitter, controlling the output frequency of the transmitter. The exciter unit consists of an mo, an 850-cycle audio test oscillator, a monitoring circuit, and a buffer amplifier. The power supply for the exciter is an integral part of the unit. The exciter unit is adjusted so that the output frequency of the transmitter is the assigned carrier frequency +425 cps when transmitting a mark signal and −425 cps when transmitting a space signal. Frequency multiplication on the transmitter converts the 2- to 6-mc range of the frequency-shift exciter to the 2- to 18-mc range of the transmitter.

d. The oscillator portion of the exciter unit is located in an oven provided with a thermostatically controlled heater. This oven is designed to maintain a constant temperature of approximately 60° C. (centigrade), thereby minimizing frequency drift.

14. Radioteletypewriter Control C–808/GRC–26A

a. Radioteletypewriter Control C–808/GRC–26A (fig. 10), assembled on a single chassis, is inclosed in Case CY–901/GRC–26. This shock-mounted unit is located on the top shelf between the speech amplifier and the frequency-shift exciter in Shelter S–69/GRC. The radioteletypewriter control is attached firmly to the case by means of two knurled thumbscrews on each side of the panel.

b. The front panel of the radioteletypewriter control contains the switches, meters, controls, terminal posts, jacks, pilot lamps, and fuses necessary for the adjustment and operation of this and the associated teletypewriter units. The receptacles for interconnecting cables to the frequency-shift converter, the frequency-shift exciter, the speech amplifier, and the teletypewriter equipments are located in the rear of the chassis.

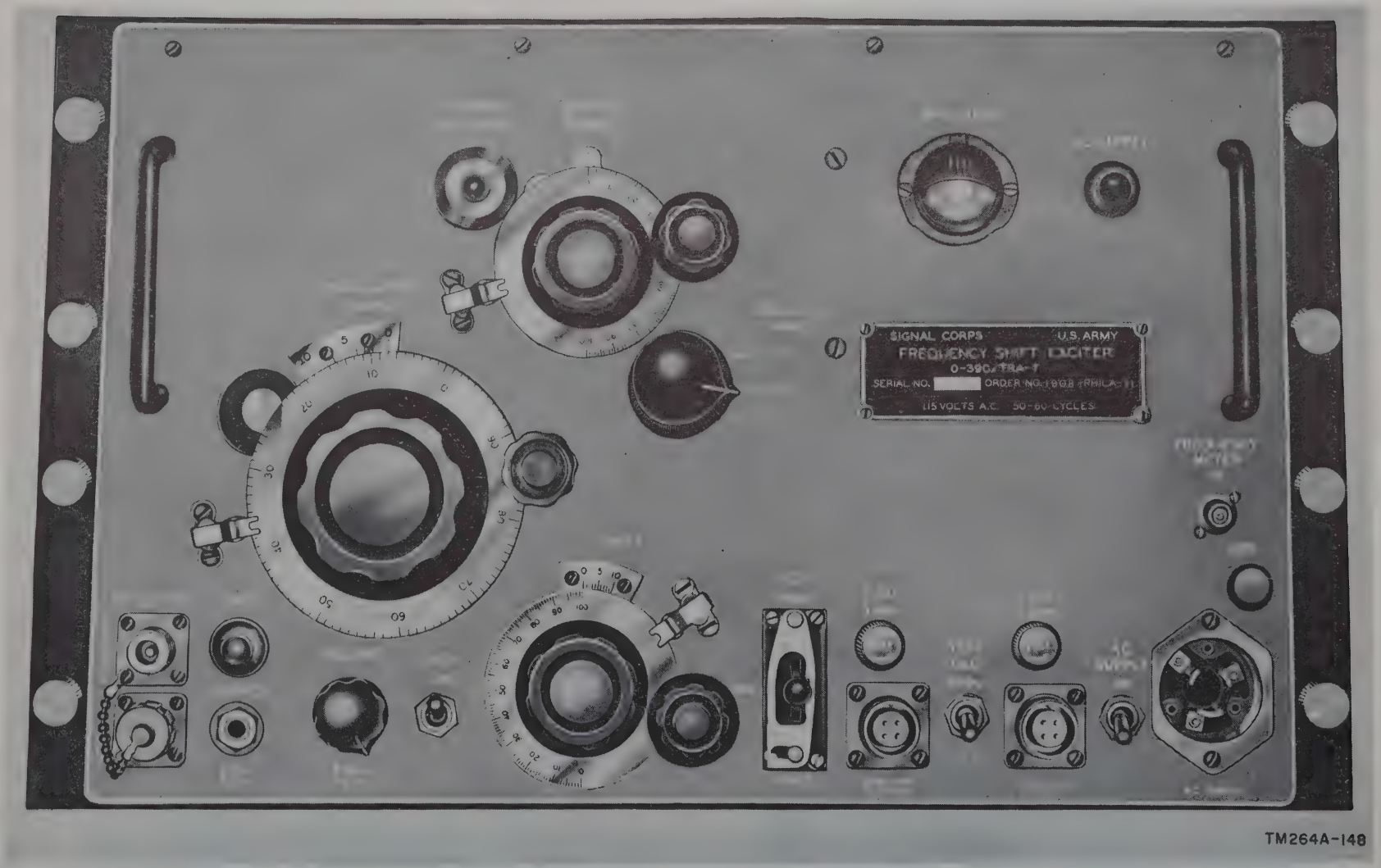


Figure 9. Frequency shift exciter O–39C/TRA–7



Figure 10. Radioteletypewriter control C–808/GRC–26A.

Power for the operation of this unit is obtained through a three-prong, twist-lock male receptacle located on the rear of the chassis.

c. Radioteletypewriter Control C–808/GRC–26A is the *control center* for Radio Set AN/GRC–26A. It selects the receiving and sending teletypewriter equipments to be used. The basis of operation, full-duplex or one-way reversible, is controlled from the front panel. The adjustment of the current for space and mark signals is accomplished by controls and switches (together with the meter indications). The control unit receives the polar and neutral signals from the converter and directs them to the teletypewriter equipments. The signals from the teletypewriter equipments are directed to the frequency-shift exciter. It controls the functioning of the disabling circuits in the transmitter and the receivers. It also provides jacks for the manual c-w and FS keying circuits. The power supply for the control unit is an integral part of the unit.

15. Cabinet CY–1050/GRC–26A

Cabinet CY–1050/GRC–26A (fig. 11), located in the front end of the shelter, is designed to house two Radio Receivers R–388/URR, Frequency Shift Converter CV–182 (*)/GRC–26A, and Power Supply PP–712 (*)/GRC–26A. Guide rails provide the means for properly positioning the units in the cabinet. Rows of tapped holes, along both sides of the front panel, provide the means for securing the components to the cabinet. The cover on the right-hand side panel provides access to the converter and power supply units without removing them from the cabinet.



Figure 11. Cabinet CY–1050/GRC–26A.

16. Radio Receiver R–388/URR

a. Two Radio Receivers R–388/URR (fig. 12) are placed one above the other in Cabinet CY–1050/GRC–26A. For identification purposes, the top receiver is designated as channel A and the bottom one as channel B. Both receivers are identical in every respect. Four thumbscrews, two on each side, secure the panel to the case. A metal dustcover, which fits over the chassis, can be removed after the chassis has been removed from the cabinet.

b. This receiver is a 30-band superheterodyne receiver covering a range of .5 to 30.5 mc in 1-mc steps. The band change switch selects the frequency range desired, and also changes the horizontal dial scale to the proper range. This dial scale is graduated in tenths of an mc. The main tuning knob, located below the KILOCYCLES window, covers a range of 100 kc (.1 mc) per revolution; 10 revolutions cover the complete 1-mc band. The circular dial scale is graduated in kc from 0 to 100 in black and also has a reciprocal 0 to 100 scale, in red. The frequency setting of the tuner is determined first by reading the mc and tenths indicated on the horizontal scale, and then by adding the kc indicated in black on the circular dial scale.

c. The receiver contains four oscillator circuits, r-f amplifier circuits, three mixer circuits, a crystal filter, a detector, an automatic volume

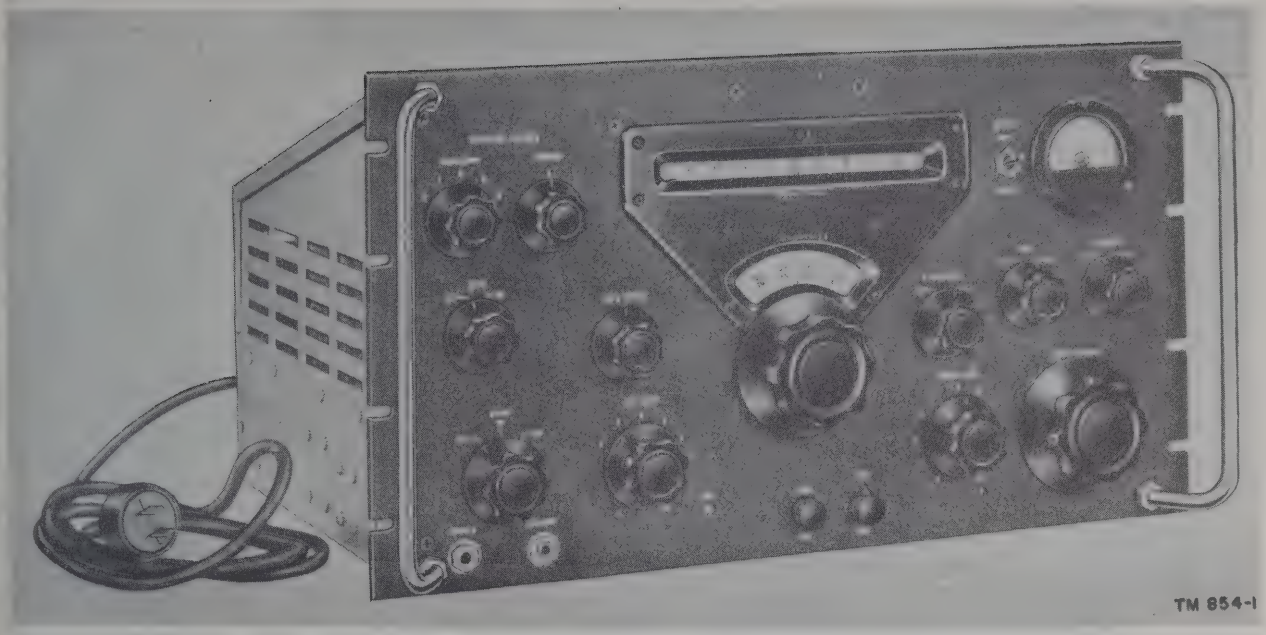


Figure 12. Radio receiver R–388/URR.

control, an automatic noise limiter, and an audio-amplifier circuit. The power supply is an integral part of the receiver.

d. The detector separates the af from the FS intermediate frequency. The audio signal is fed to a limiter which removes any strong noise impulse; then, after amplification, it is fed to Loudspeaker LS–3. The FS 500-kc i-f signal is fed from the cathode of the i-f output tube to the frequency-shift converter.

e. The controls, meters, switches, and certain jacks are located on the front panel. A heavy-duty cord, provided with a standard two-prong male connector, connects a-c power to the receiver. The r-f signal input jack, remote control terminal strip, audio-output terminal strip, and i-f output jack are located on the rear of the chassis. These are made accessible by unscrewing the knurled thumbscrews and pulling the receiver partially out of the cabinet.

17. Frequency Shift Converter CV–182(*)/GRC–26A

a. Frequency Shift Converter CV–182(*)/GRC-26A (fig. 13) is located in the cabinet below the channel B receiver. The front panel and chassis are attached firmly to the cabinet by means of two knurled thumbscrews on each side of the front panel.

b. Some of the controls and switches are located in back of the hinged door held closed by a captive knurled thumbscrew. Turning this screw until it is free allows the door to swing open. The controls and switches located in back of the door are used initially for adjusting the frequency-shift converter and therefore used only ocassionally. The other controls, meters, switches, and headset jack are located on the front panel. The jack which is used to connect the converter to the power supply and jacks which supply connections to the other components are located at the rear of the chassis.

c. The 500-kc i-f signals from the receivers are applied to the input circuit of the converter. The i-f signal from the channel A receiver is converted to 50 kc; the i-f signal from the channel B receiver is converted to 29.3 kc. These two signals are limited, amplified, and applied separately to a discriminator network. The output of this discriminator is the combined voltage from both receivers. The discriminator output signal is amplified and converted into d-c polar and neutral signals which key the receive section of the control unit.

18. Power Supply PP–712(*)/GRC–26A

a. Power Supply PP–712(*)/GRC–26A (fig. 14), which contains a tone oscillator on the same chassis, is located in the cabinet below the converter. Two knurled thumbscrews on each side secure the chassis firmly to the cabinet.



Figure 13. Frequency shift converter CV–182/GRC–26A.

b. A hinged door is held closed by two slotted screws in the upper right- and left-hand corners of the panel. One-half turn of this slotted fastener releases the door. A pilot lamp (white) and switch for the a-c power and a pilot lamp (red) and switch for plate voltage to the converter are mounted on this door. Located in back of the door are interlock switches, fuses, terminal strips, tube sockets, transformers, chokes, and capacitors. The cable which connects the converter to the power supply is connected to a jack in the rear of the power supply chassis. The cable which connects the tone oscillator to the converter also is connected to a jack in the rear of the power supply chassis. The tone oscillator, mounted on the power supply, contains the control relay for disabling the receivers, a d-c power supply, and jacks for interconnecting cables.

c. The power supply provides —400 volts, —150 volts, +150 volts regulated, —150 volts regulated, +275 volts, and filament voltages necessary for the operation of Frequency Shift Converter CV–182A/GRC–26A and the tone oscillator. The tone oscillator produces an audible tone when a mark signal is produced by the converter.

19. Teletypewriters

a. Teletypewriter TT–4A/TG (fig. 15) (used with later models of the radio set) is a lightweight portable field teletypewriter with a standard keyboard. It is capable of sending or receiving teletypewriter messages, by electrical impulses, to and from a distant station. It is provided with a power cord which connects power to the drive motor and two cords for the signal circuit. One cord (marked CX–1200/U) is provided with a telephone plug for the receiving circuit. The other cord (marked CX–1201/U) is provided with a telephone plug for the sending circuit. The

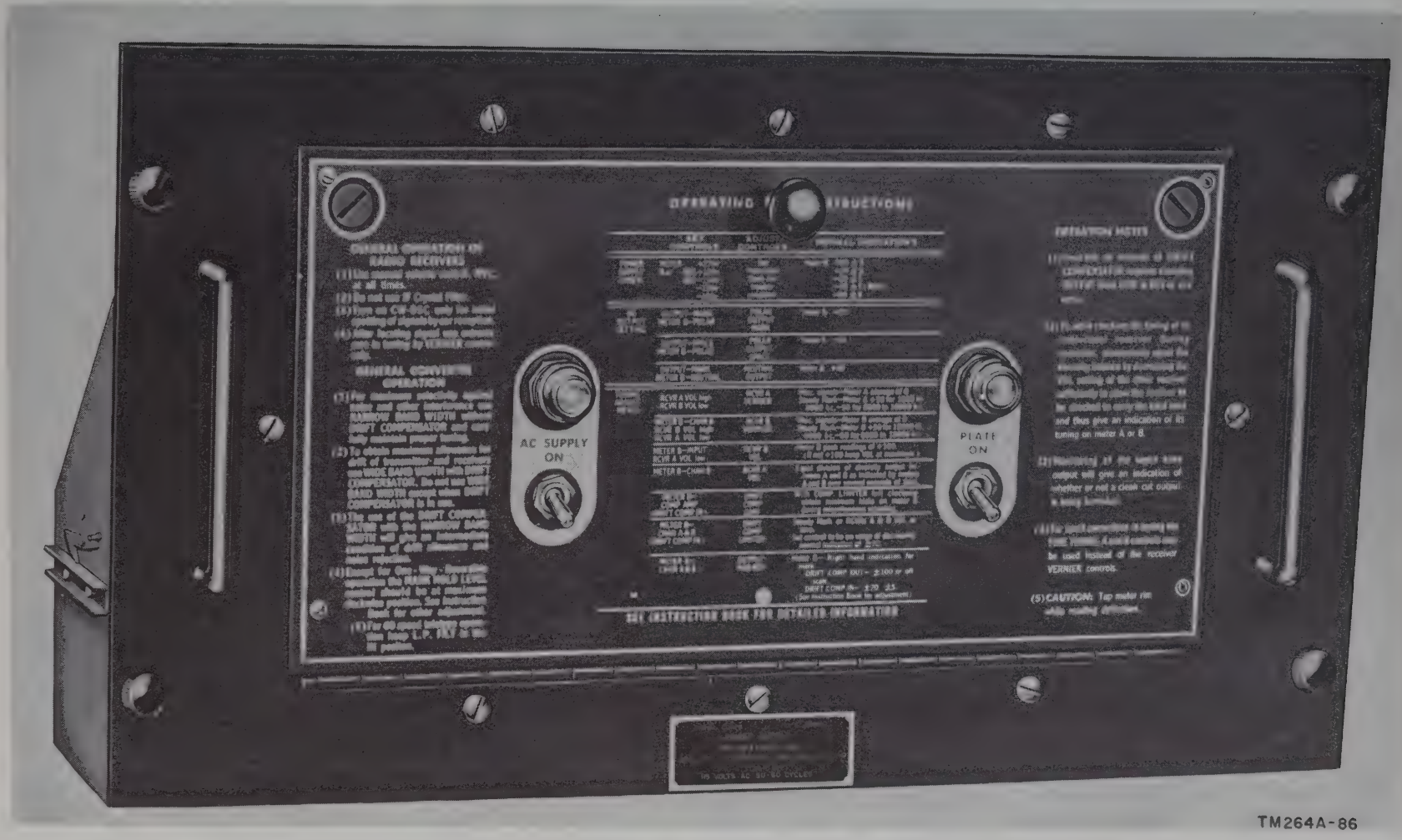


Figure 14. Power supply PP–712(*)/GRC–26A.



Figure 15. Teletypewriter TT–4A/TG.

teletypewriter can transmit or receive, depending on the position of the switches in the control unit. This is accomplished without operating any switches in the signal circuit of the teletypewriter. A button label BREAK, next to the MOTOR switch, opens the signal circuit when depressed. The LINE INCREASE control, located in back of the hinged cover above the keyboard, is used as an auxiliary control for maintaining the signal loop current at 60 ma.

b. Teletypewriter TT–55/MGC (used with earlier models of the radio set) consists of Teletypewriter TG–7–B which has been modified by the following additions:

(1) A power lead filter.
(2) A .01-μf (microfarad) capacitor to ground from one side of the a-c line.
(3) A .1-μf capacitor to ground from one side of the selector magnet lead.
(4) A ground connection to the keyboard.

c. Refer to TM 11–352 (with changes) for a complete description of Teletypewriter TG–7–B.

20. Perforator-Transmitter TT–56/MGC

a. General. Perforator-Transmitter TT–56/MGC (fig. 16) consists of a typing reperforator, a transmitter distributor, and a connection box. It is designed both to receive teletypewriter signals and record them on tape and to transmit teletypewriter signals either from a keyboard or from a previously prepared tape. Perforator-Transmitter TT–56/MGC is used by the Army as tactical (field) equipment or as fixed plant (signal center) equipment. Normally, this equipment is used as a part of a complete teletypewriter set or system and not as an independent unit. This type of tape recording makes it especially useful in signal centers where large amounts of traffic (both relay and terminal) must be handled without delay.

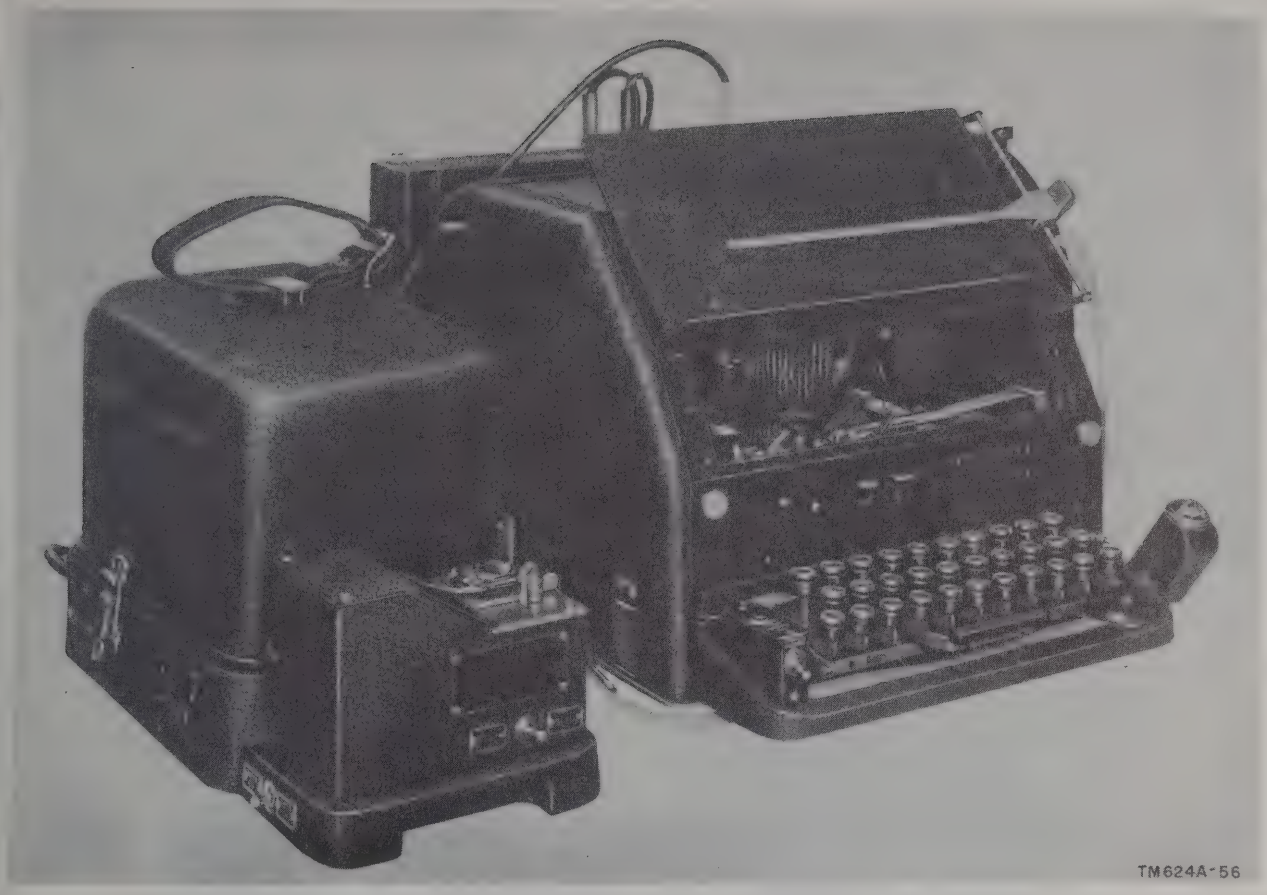


Figure 16. Perforator-transmitter TT–56/MGC.

b. Typing Reperforator. The typing reperforator is a motor-driven device for receiving or transmitting messages in the form of electrical impulses and recording the messages both in code perforations and in typewritten characters on the perforated tape. Operation of the keyboard sets up electrical impulses which activate a simultaneous dual action; the impulse goes out over the line for transmission to a distant station and at the same time, the impulse actuates the perforating mechanism of the home station, and records the outgoing message on perforated tape. The typing reperforator also may be used without the transmission feature; then it is used only as a source of perforated tape for later transmission by the transmitter-distributor. The typing reperforator is a modified Reperforator-Transmitter TG–26–A. The modification consists of a .1-uf capacitor which has been connected to ground from the common junction of the two 50-ohm resistors and the motor field winding. It has been added for the purpose of r-f noise suppression.

c. Transmitter-Distributor. The transmitter-distributor is a motor-driven device which changes coded tape perforations into electrical impulses and transmits these impulses as a five-unit teletypewriter code to one or more receiver stations simultaneously. The electrical impulses produced by the transmitter distributor are suitable for transmission by either direct wire lines, carrier, or radio channels. It always is used in connection with other teletypewriter equipment, such as a Perforator-transmitter, since it can be used only with previously perforated tape. It can be plugged into any teletypewriter signal (send) line circuit. The transmitter-distributor is provided with a MOTOR ON-MOTOR OFF power switch, which is located on the left side of the unit, and a SEND-STOP control. A tight-tape stop lever mounted on the transmitter distributor stops the tape feed mechanism when the tension on the tape becomes too great.

d. Connection Box. The connection box (fig. 17) is mounted on/the base at the rear of the typing reperforator. It consists of resistors, fuses, terminal strips, jacks, and a three-position switch.

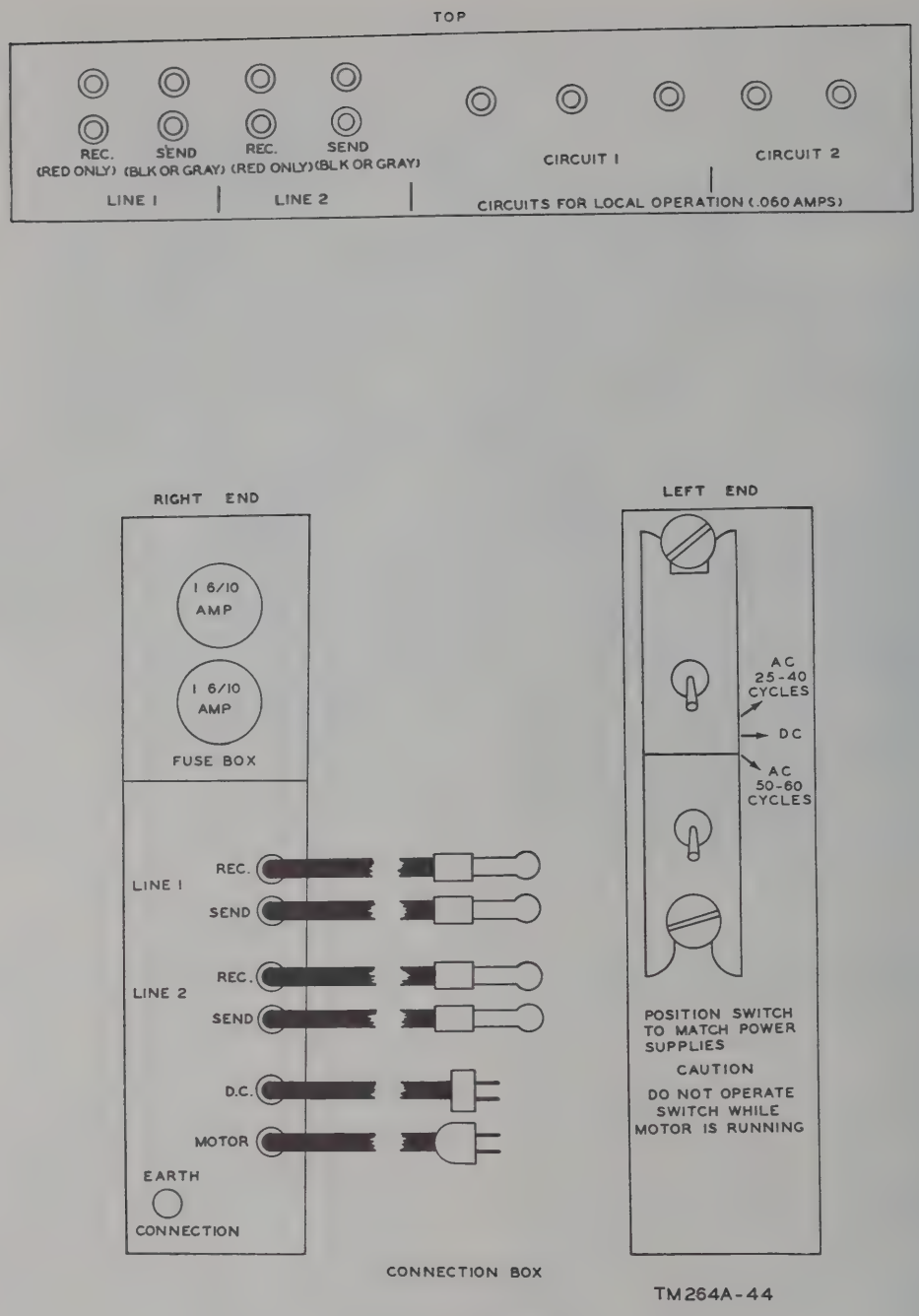


Figure 17. Connection box.

The 115-volt a-c power and the 115-volt d-c power are connected to this connection box by means of two cords. (The source of this power (a-c and d-c) is Rectifier RA–87–(*).) The position of the three-position power switch is determined by the type of a-c input power available. Time-delay fuses, located in this box, protect the motors of the typing reperforator and the transmitter distributor. The power for the operation of these two teletypewriter equipments is connected directly by cords to the connection box. The connection box provides two circuits for local operation. One local circuit consists of three closed circuit jacks and the other circuit consists of two closed circuit jacks. Fixed resistors limit the current in each circuit to approximately 60 ma. Four pairs of jacks; two for LINE 1 and two for LINE 2, provide the means for connecting other teletypewriter

equipments into the send and receive signal circuits.

21. Antenna Tuning Unit BC–939–B

a. Antenna Tuning Unit BC–939–B (fig. 18) consists of coils, capacitors, a switch, and a meter assembled in a black crackle-finished metal cabinet. It is mounted on top of Radio Transmitter BC–610–(*) and is secured firmly to the transmitter by means of four wingnuts.

b. The tuning unit is designed to match the impedance of the transmitter p-a (power-amplifier) stage to the antenna when a whip or auxiliary long-wire transmitting antenna is used. It is connected to the transmitter by a coaxial cable. A meter measures the r-f current, maximum current indicating optimum impedance match between the transmitter and the antenna.

22. Antenna Equipment

a. Whip Antennas.

(1) Two receiving whip antennas are furnished, each consisting of two Mast Sections MS–116–A, one Mast Section MS–117–A, and one Mast Section MS–118–A in Mast Base MP–65–C. Mast Base MP–65–C, with Adapter Kit M–459 is mounted on Mast Bracket MP–50–A, which is secured to the front exterior wall of the shelter (fig. 38). Components are furnished for one additional antenna which may be used with auxiliary equipment. Spare mast sections also are furnished. The whips are tied down with insulated guy assemblies when the radio set is in motion.



Figure 18. Antenna tuning unit BC–939–B.

(2) One transmitting whip antenna is furnished, consisting of one each of Mast Sections MS–49, MS–50, MS–51, MS–52, and MS–53 in Mast Base MP–47–A. The mast base is mounted on Bracket MT–657/GRC and is secured to the rear exterior wall of the shelter (fig. 40). An insulated guy assembly is provided to tie the whip in a horizontal position when the radio set is in motion.

b. Doublet Antennas. Six Masts AB–155A/U (fig. 19) and 1,000 feet of Wire W–1 are furnished for the construction of half-wave doublet antennas. At the higher frequencies (4 to 18 mc), where shorter wire lengths are required, two masts are used to support each doublet. Therefore, three antennas may be erected, two are used for receiving on dual diversity basis and one is used for transmitting. Four wooden lance poles are available for use as antenna masts in temporary installations. Two RF Cable Assemblies CG–557/U (500-ft) on Reels DR–4 are used for receiving antenna lead-ins. One RF Cable Assembly CG–557/U (75-ft) is used as a transmission line for the transmitting doublet.

23. Power Unit PE–95–G

a. Power Unit PE–95–G is a complete electric generating plant. It consists of an engine and a generator with the necessary accessories and controls, all mounted in a metal housing with a skid base. The complete unit is mounted in a 1-ton, two-wheel, cargo Trailer K–52.

b. The power unit supplies single-phase 60-cycle ac at 120 or 240 volts. The rated capacity is 10 kw at 80 percent power factor or 12.5 kva (kilovolt-amperes).

24. Rectifier RA–87–(*)

a. Rectifier RA–87–(*) (fig. 20) converts 95- to 125-volt or 190- to 250-volt, 50- to 60-cps a-c power to 115-volt d-c power for the operation of teletypewriter line circuits.

b. The rectifier chassis base, which mounts all parts and connections, is inclosed at the top and bottom with sheet-steel covers. The top cover has a small door in the front which is used to give access to the voltage tap-changing panel. Two twist-type receptacles for d-c loads, three receptacles for a-c loads, an ON-OFF switch, and the input power cord are located on the front panel of the chassis.

25. Typewriter MX–322/U

Typewriter MX–322/U (fig. 21) is a conventional portable typewriter provided with a telegrapher's keyboard. It prints 12-point gothic characters. It is finished in black or gray wrinkle-baked enamel. This typewriter is provided with a ½-inch wide two-color ribbon. When not in use, it is placed in a black leather-covered carrying case.

26. Multimeter TS–352/U

a. Multimeter TS–352/U (fig. 22) is a portable, general purpose instrument consisting of Multi-

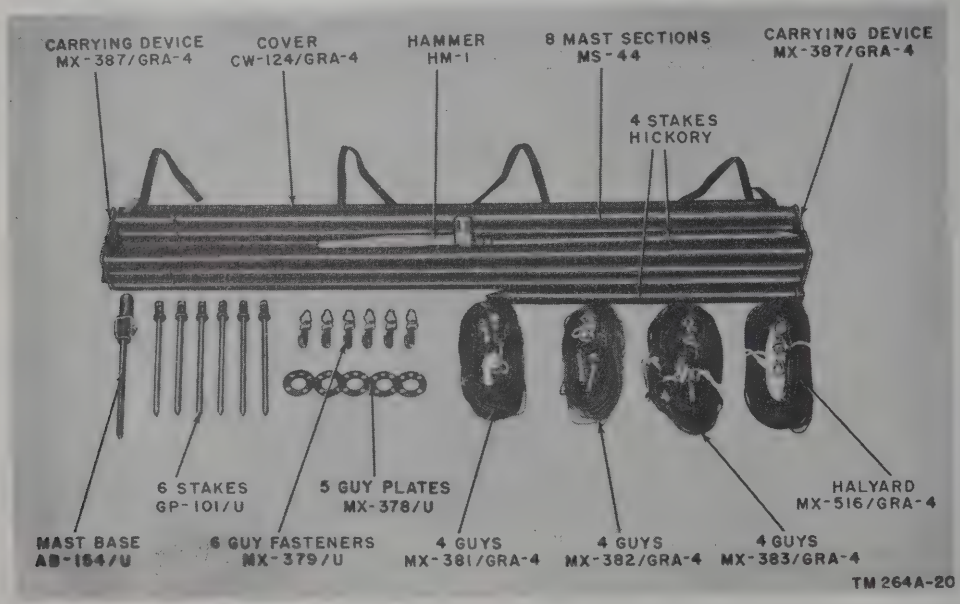


Figure 19. Mast AB–155A/U.



Figure 20. Rectifier RA–87–A



Figure 21. Typewriter MX–322/U.



Figure 22. Multimeter TS–352/U.

meter ME–9B/U and Multiplier Kit MX–815/U mounted in one transit case. Two test leads, one 5,000-volt lead, one multiplier patch cord, several test clips, and battery connection links are furnished with this instrument. It is used for circuit analysis and trouble shooting on electrical and electronic equipment. Multiplier Kit MX–815/U is used to extend the range of the instrument to the 5,000-volt d-c range.

b. The technical characteristics are as follows:

Ranges:

0 to 1,000 volts ac
0 to 5,000 volts dc
0 to 10 amperes dc
0 to 30 megohms

Power:

Battery operated, requires three Batteries BA–31 and one Battery BA–30.

27. Minor Components

a. Reel RL–29. Reel RL–29 (fig. 23) is an H-shaped wire holder with a handle fastened to one side of the H. It is made of 3/16-inch galvanized steel rod and is 5½ inches wide, exclusive of the handle, and 11½ inches long. Antenna Wire W–1 is wound on Reel RL–29.

b. Compass, Keuffel and Esser No. 5600 1/2. The compass (fig. 24) is a moving needle-magnetic compass incased in a black wrinkle-finished aluminum case. It is graduated in degrees from 0 to 360 in a raised metal ring with the zero point at the North position. It is unmounted and can be carried suspended from the neck by a silk cord which is fastened to the case. A small button near the periphery of the glass is depressed when the hinged cover is closed. This clamps the needle when the compass is not being used.

c. Stamp MC–181–A. Time Stamp MC–181–A (fig. 25) is a key wound mechanical clock housed in a black wrinkle-finished steel housing. It prints *message center*, organization, month, day, year, and time of day on a 24-hour basis (0000 to 2359). It is located between the right-hand teletypewriter and the perforator-transmitter.

d. Clock, Longines-Wittnauer No. A–11. This aircraft-type clock (fig. 26) is mounted in a black wrinkle-finished metal case. The mounting frame

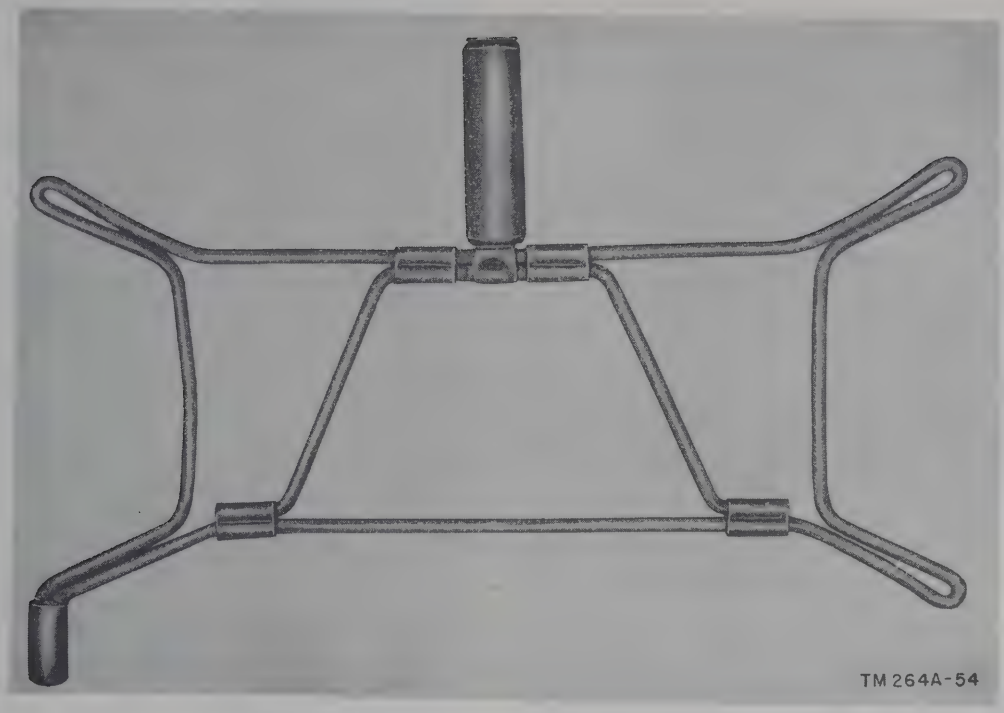


Figure 23. Reel RL–29.

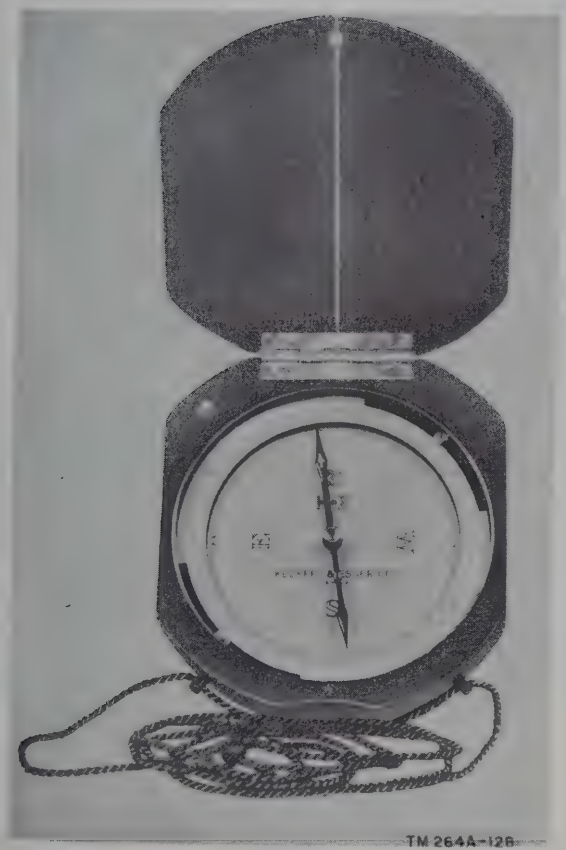


Figure 24. Compass, Keuffel and Esser 5600 ½.

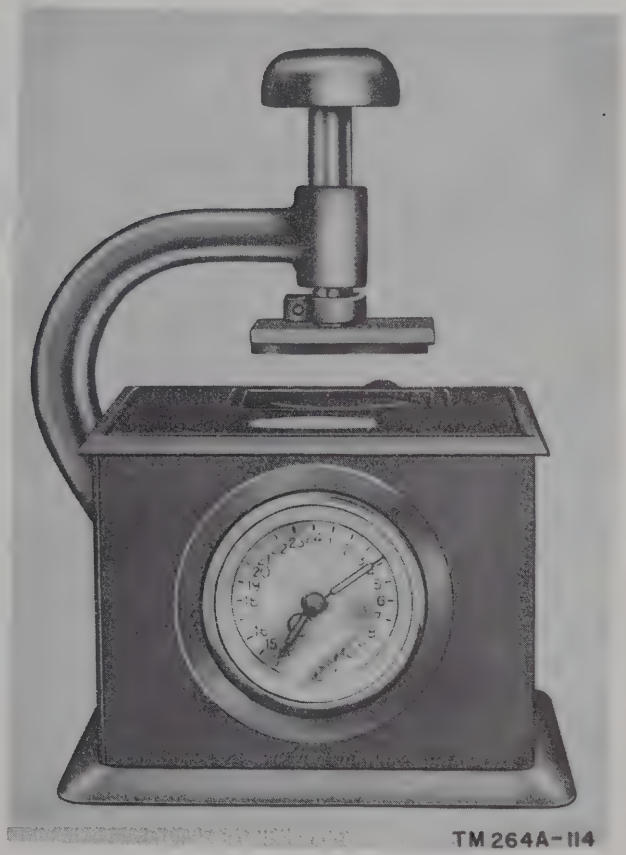


Figure 25. Time stamp MC–181–A.

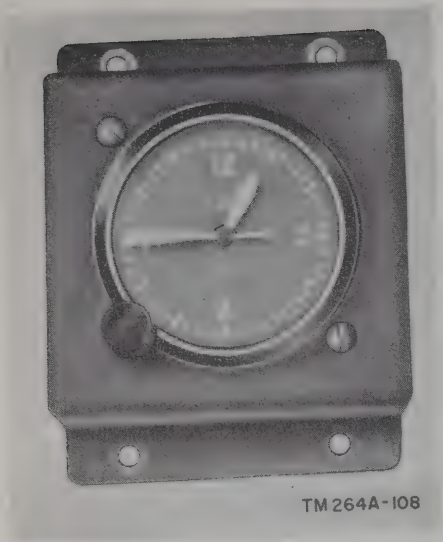


Figure 26. Clock, Longines-Wittnauer A–11.

has four holes which are used to mount the clock on the wall below Loudspeakers LS–3.

e. Headset HS–30–(*). Headset HS–30–(*) (fig. 27) is used in setting up and adjusting Radio Set AN/GRC–26A. It consists of two small telephone receivers which can be adjusted on the metal head band to suit each individual. Cord CD–605 (6 ft, 6 in.), provided with a telephone plug at one end, is connected to the receivers by a Y-cord.

f. Telephone EE–8–B. Telephone EE–8–B (fig. 28) is incased in a leather or weatherproofed canvas case. The handpiece, provided with a switch for talking or listening, is connected by a cord to the terminals at the top of the telephone case. Turning the handle generates the power for ringing. Two Batteries BA–30 (not supplied with the telephone) are fixed in position when the handpiece has been removed from the case. Each battery is held in place by a coil spring. This is a portable field telephone designed for use on either local or common battery telephone systems. The telephone will operate in a system with a 30-db net circuit loss.

g. Key J–45. Key J–45 (fig. 29) is a hand-keying device provided with a metal band which can be placed around the thigh, and which can be adjusted easily to suit the individual operator. A Cord CD–201–A, provided with a two-conductor headset-type plug at one end, is connected permanently to the key at the other end. By plugging Key J–45 into the control unit, manual FS or C–W keying can be accomplished; with the speech amplifier, only C–W keying is available.

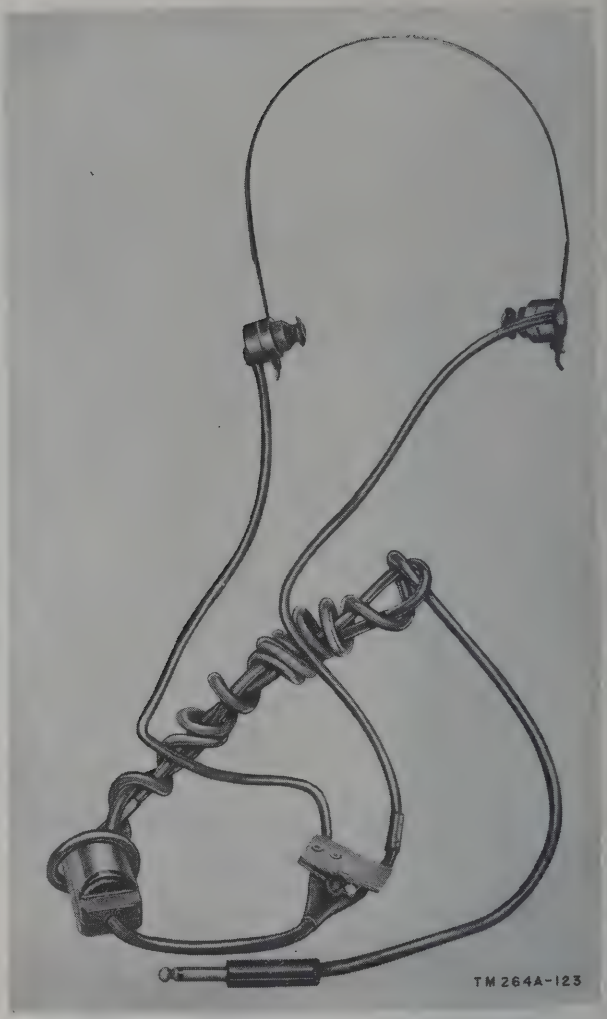


Figure 27. Headset HS–30–(*) and Cord CD–605.

h. Microphones.

(1) Microphone T–07–(*) (fig. 30) is a low-impedance, carbon-button hand microphone. It is provided with a three-wire cord terminating in Plug PL–68 on one end and in the microphone (through a switch) on the other. It is plugged into the CARBON MIC. 1 jack on the speech amplifier and operated by the press-to-talk button on the handle.

(2) Microphone T–50 (fig. 31) is a dynamic high-impedance (21,000 ohms) microphone. It is provided with a 6-foot cord which terminates in a three-pin coaxial-type connector. It is plugged into the DYNAMIC MIC. 2 jack on the speech amplifier and operated by depressing the press-to-talk switch.



Figure 28. Telephone EE–8–B.

i. Loudspeaker LS–3. Loudspeaker LS–3 (fig. 32) is a permanent magnet-type speaker housed in a black wrinkle-finished steel case. Electrical Power Cable Assembly CX–1939/U connects the receiver to the loudspeaker.

j. Adapter Kit M–459. Adapter Kit M–459 (fig. 33) consists of a two-section ceramic insulator, a steel ground ring connected to a metal clamp by means of a tinned copper braid, and two rubber washers. One ceramic insulator has a coaxial-type connector fitted into one end. The other has a bakelite bushing. It is used as an adapter for the receiving whip antenna mast base.

k. Case CY–689/GRC–26. Case CY–689/GRC–26 is an olive drab finished plywood bin provided with two handholes. This bin, 19 15/16 inches long by 15 7/16 inches wide by 22 7/16 inches over-all, is used to store teletypewriter tape. It is located under the table to the left of the transmitter-distributor.

l. Heater, Electric Air Heater No. AAF–15. This is an electric heater housed in a black metal case provided with a cast aluminum grid (fig. 5).

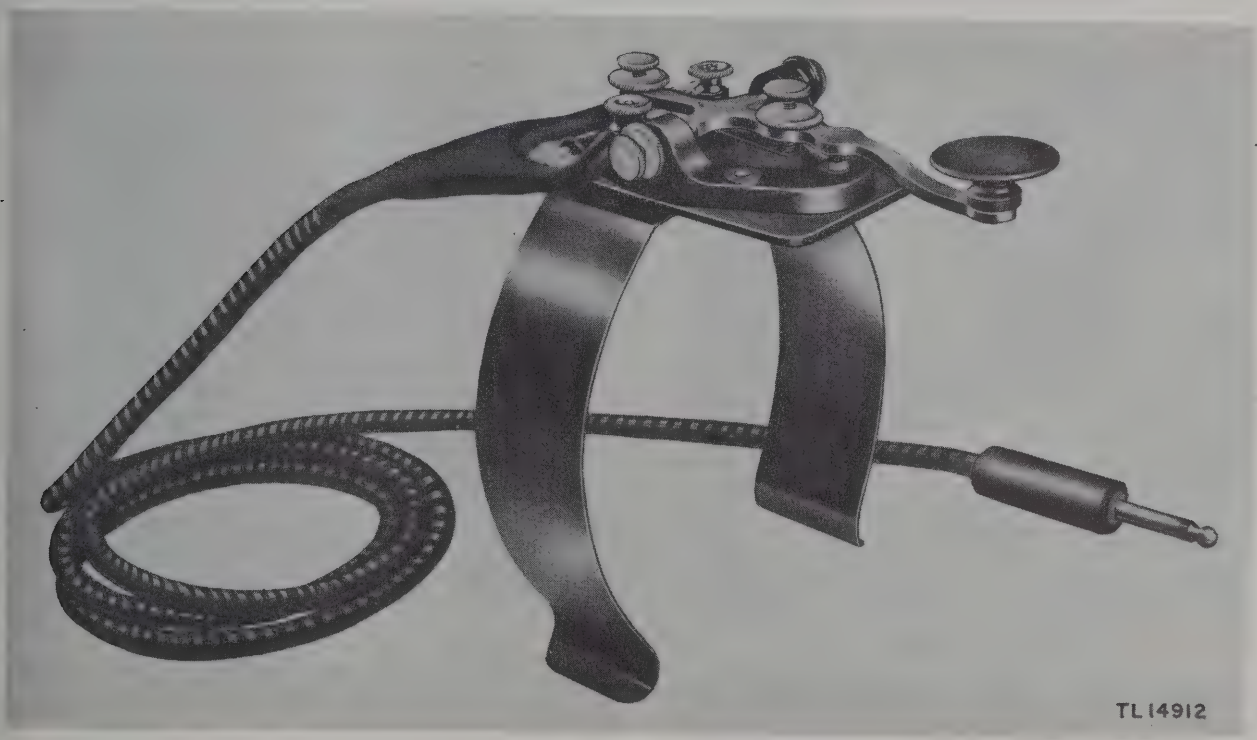


Figure 29. Key J–45 and cord CD–201–A.



Figure 30. Microphone T–17–(*).



Figure 31. Microphone T–50.



Figure 32. Loudspeaker LS–3.

It operates on 115-volt 50 to 60-cycle, single-phase, ac and consumes 1,500 watts. It is controlled by the ON-OFF switch located on the front panel below the grid. A fan mounted in front of the heater element circulates the heated air. Four wing nuts permanently secured the heater to the floor of the shelter.

28. Running Spares

A group of running spares is supplied with Radio Set AN/GRC–26A and is installed in Shelter S–69/GRC. The spare parts are stowed in the built-in cabinets located along the left

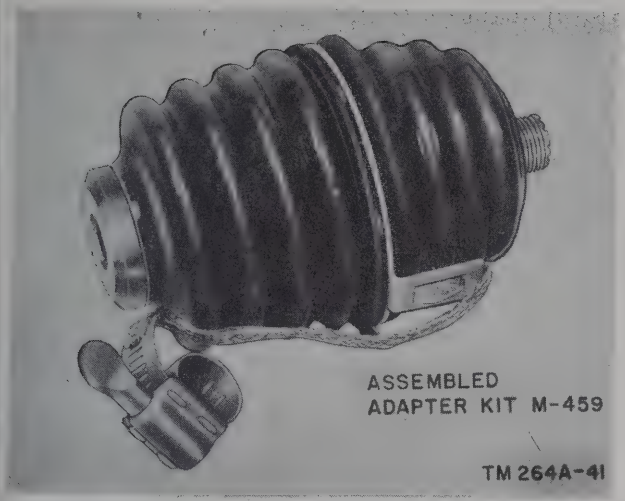


Figure 33. Adapter kit M–459.

wall (fig. 34). The following is a list of running spares:

a. General Running Spares.

24 connectors, solderless.
1 Cord CX–954/TRA–7 (6 ft 0 in.).
1 Cord CX–959/TRA–7 (6 ft 0 in.).
1 Cord CX–961/TRA–7 (4 ft 0 in.) (blue).
1 Cord CX–961/TRA–7 (4 ft 0 in.) (red).
1 Cord CX–962/TRA–7 (4 ft 0 in.).
1 Electrical Power Cable Assembly CX–1939/U.
1 Electrical Special Purpose Cable Assembly CX–1851/U (4 ft 0 in.).
1 Headset HS–30–(*).
2 lamps, incandescent, 115-125 volts, 15 watts.
1 lamp, incandescent, 120 volts, 50 watts.
1 lead, electrical, 1 conductor No. 7 AWG; 10 ft lg.
1 Plug PL–259–A.
1 Power Cable Assembly CX–1165/U (12 ft 0 in.).
1 Power Cable Assembly CX–1166/U (50 ft 0 in.).
1 RF Cable Assembly CG–562/U (8 ft 0 in.).
1 Special Purpose Cable Assembly CX–1120/U (5 ft.)
1 Special Purpose Cable Assembly CX–1150/U (red) (15 ft 0 in.).
1 Special Purpose Cable Assembly CX–1151/U (blue) (15 ft 0 in.).
1 Special Purpose Cable Assembly CX–1152/U (4 ft 6 in.).
24 Splice, conductor, oval slotted head.

b. Running Spares for Antennas.

1 Adapter M–359.
1 Cord CG–67/MRQ–2.
2 Guy Fasteners MX–379/U.
2 Guy Plates MX–378/U.
1 insulator, bowl steatlite, Natl Co. XS–5.
18 insulators, strain, JAN type NS4B5224.
1 Mast Base MP–47–A.
1 Mast Base MP–65–C.
2 Mast Sections MS–49.
2 Mast Sections MS–50.
2 Mast Sections MS–51.
2 Mast Sections MS–52.
2 Mast Sections MS–53.
4 Mast Sections MS–116.
2 Mast Sections MS–117.
2 Mast Sections MS–118.
1 RF Cable Assembly CG–558/U.
2 Stakes GP–101/U.
1 whip guy, hold-down, receiving antenna.
1 whip guy, hold-down, transmitting antenna.

c. Running Spares for Frequency Shift Converter CV–182(*)/GRC–26A.

4 tubes 6H6.
4 tubes 6SA7GTY.
6 tubes 6SJ7Y.
4 tubes 6SLGT.
2 tubes 6SQ7.
4 tubes 6V6GTY.
2 tubes 6Y6G.

d. Running Spares for Frequency Shift Exciter O–39(*)/TRA–7.

1 Cord CG–391/U.
20 Fuses FU–50, 3 ampere, Littelfuse type 3AG, #312003.
2 Lamps LM–52, 6 to 8 volts, .15 ampere, Mazda No. 47.
2 Lamps, 12 to 16 volts, .1 ampere, Mazda No. 1813.
1 lamp, 105 to 125 volts, $\frac{1}{25}$ watt, GE No. NE–51.
2 lamps, 105 to 125 volts, $\frac{1}{4}$ watt, GE No. NE–45.
2 tubes 6AG7.
2 tubes 6AL5.
2 tubes 6E5.
4 tubes OC3.
2 tubes 5R4GY.
2 tubes 6SA7GT.
3 tubes 6SJ7Y.

e. Running Spares for Perforator-Transmitter TT–56/MGC.

1 cover BG–198.
4 fuses, cartridge type, ½ ampere, 250 volts.
5 fuses, cartridge type, 15 amperes, 250 volts.
12 fuses, plug type, .6 ampere, 125 volts.
5 fuses, ¼ ampere, 250 volts.
2 lamps, 210 to 250 volts, 1/10 watt.
1 ribbon, typewriter, black.
49 tape, 11/16 inch wide, 8 inches outside diameter roll.

f. Running Spares for Power Supply PP–712(*)/GRC–26A.

29 Fuses FU–37, 3 ampere, 250 volts.
4 Lamps LM–52, 6 to 8 volts, .15 ampere, GE No. 47.
2 tubes OD3.
2 tubes 5R4GY.
4 tubes 5Y3GT.
2 tubes 6SJ7.
2 tubes 6V6GTY.

g. Running Spares for Radioteletypewriter Control C–808/GRC–26A.

10 Fuses FU–64, 1 ampere, Bussman No. 4AG.
4 Lamps LM–52, 6 to 8 volts, .15 ampere, Mazda No. 47.
2 tubes 5Y3GT.

h. Running Spares for Radio Receiver R–388/URR.

5 fuses, 1½ ampere, 250 volts, Littelfuse type 3AG.
6 Lamps LM–52, 6 to 8 volts, .15 ampere, GE No. 47.
1 tube OA2.
1 tube 5V4G.
1 tube 6AK5.
1 tube 6AQ5.
1 tube 6BA6.
1 tube 6BE6.
1 tube 12AU7.
1 tube 12AX7.

i. Running Spares for Radio Transmitter BC–0–(*).

61 1 Capacitor CA–423.
1 chart set, calibration.
1 Coil Unit C–387–D.
1 Coil Unit C–388–C.
1 Coil Unit C–389–C.
1 Coil Unit C–390–C.
1 Coil Unit C–447–B.
1 Coil Unit C–448–B.
1 Coil Unit C–449–B.
6 Fuses FU–50, 3 ampere, Littelfuse type 3AG.
6 fuses, cartridge type, 6 amperes, 250 volts, Littelfuse No. 1359.
6 fuses, plug type, 20 amperes, 125 volts.
6 fuses, plug type, 25 amperes, 125 volts.
1 Lamp LM–27, 6 to 8 volts, .25 ampere, GE No. 44.
2 Lamps, 120 volts, 6 watts, Mazda No. 686.
1 tube OD3.
2 tubes 2A3.
2 tubes 3B28.
2 tubes 5Z3.
1 tube 6L6Y.
1 tube 6V6Y.
2 tubes 100TH.
1 tube 250TH.
2 tubes 807.

j. Running Spares for Rectifier RA–87–(*).

4 fuses, ½ ampere, 250 volts.
2 fuses, 15 amperes, 250 volts.

k. Running Spares for Shelter S–69/GRC.

3 lamps, fluorescent, white, 20 watts, 110 to 125 volts.
3 starters, fluorescent lamp, 20 watts.

l. Running Spares for Speech Amplifier BC–614–(*).

1 Lamp LM–27, 6 to 8 volts, .25 ampere, GE No. 44.
1 tube 6J5.
1 tube 6SN7GT.
1 tube 6SQ7.
1 tube 6SR7.
1 tube 80.

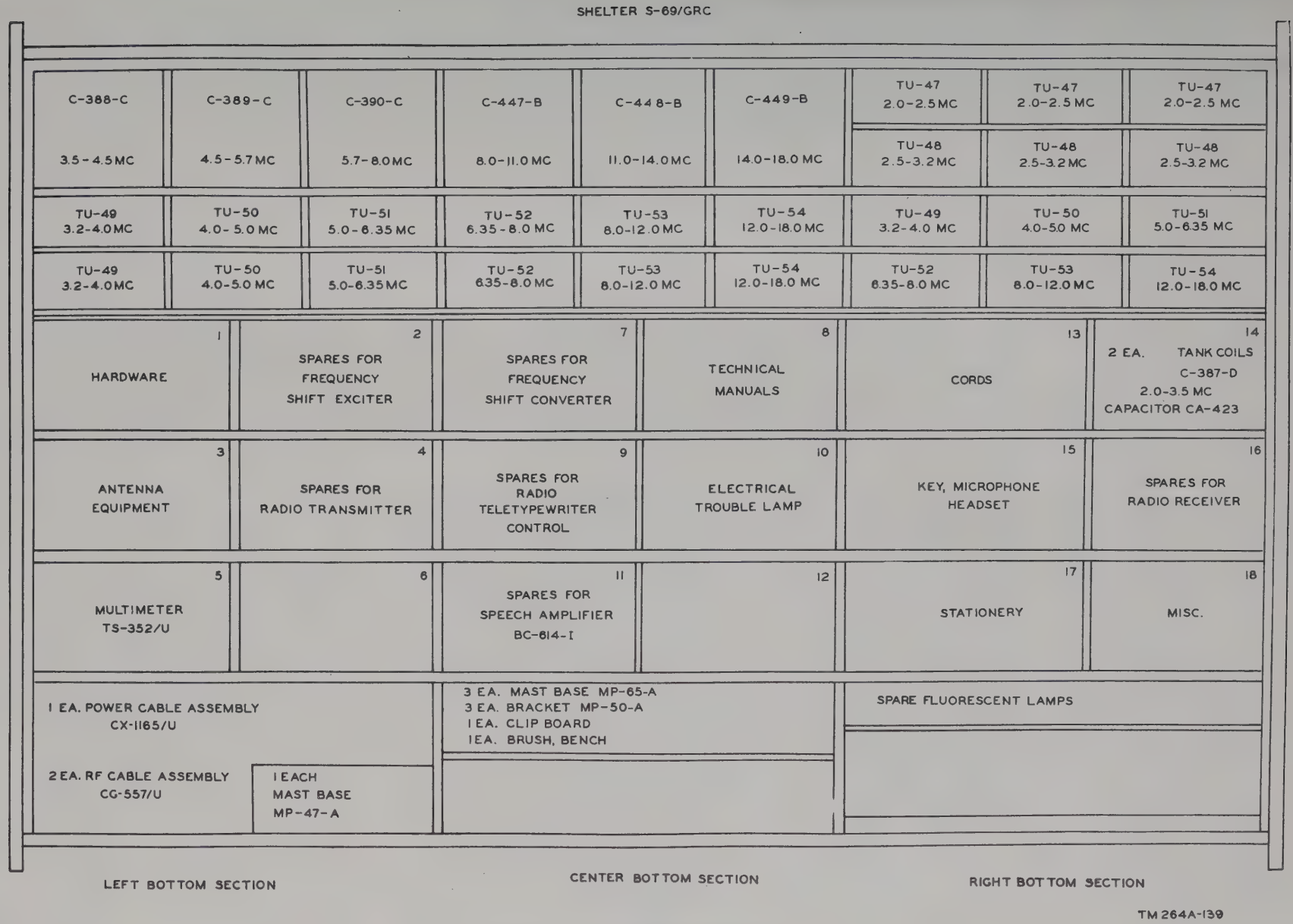


Figure 34. Storage cabinet for spare parts.

m. Running Spares for Teletypewriter TT-55/MGC.

1 bond strap, 5 feet long.
3 fuses, 1.6 amperes, 125 volts.
2 lamps, 115 to 125 volts, 15 watts.
13 rolls teletypewriter recording paper; 8½ inches wide by 4½ inches diameter.
13 rolls teletypewriter recording paper; 8½ inches wide by 350 feet long; with 2 carbon inserts.
3 ribbons, typewriter, black.

n. Running Spares for Teletypewriter TT-4A/TG.

1 fuse, ⅛ ampere, 250 volts.
1 fuse, 2 amperes, 250 volts.
1 lamp, 120 volts, 15 watts.
1 ribbon, typewriter, black.

o. Running Spares for Tone Oscillator (Part of Power Supply PP-712(*)/GRC-26A).

10 fuses FU-64, 1 ampere, Littel fuse type 4AG.
2 tubes 6SL7GT.

29. Differences in Models

a. Early models of Radio Set AN/GRC-26A differ slightly in the model numbers of the components. These differences are listed in the table which follows. However, the different models of a particular component are interchangeable. For the specific changes within a component, refer to the applicable technical manual (par. 1).

Component	Model	
	Early	Late
Radio Transmitter BC-610-(*)	H	I
Speech Amplifier BC-614-(*)	H	I
Rectifier RA-87-(*)	Plain	A
Teletypewriter TT-55/MGC	(Used in early models).	
Teletypewriter TT-4A/TG	(Used in later models).	
Frequency Shift Exciter 0-39(*)/TRA-7.	B	C
Power Supply PP-712(*)/GRC-26A.	Plain	A
Frequency Shift Converter CV-182(*)/GRC-26A.	Plain	A

b. In early procurements of Radioteletypewriter Control C-808/GRC-26A, resistor R12 is omitted and resistor R9 is 1,600 ohms (fig. 120). As used in Radio Set AN/GRC-26A, Radio Receiver R-388/URR has a wire connecting capacitors C214A and C214B where they are connected to the B+ line (fig. 115). This connection is in parallel with one set of contacts of the disabling relay and effectively shorts these two contacts. This permits the transmitter signal to be monitored on the frequency-shift converter (par. 112). Some radio sets on Order No. 3135-Phila-51 were shipped without Microphone T-17; the item has been deleted from the packing list of these equipments.

CHAPTER 2

INSTALLATION

Section I. SERVICE UPON RECEIPT OF RADIO SET AN/GRC–26A

30. Siting

a. For efficient operation of Radio Set AN/GRC–26A, the best available site should be chosen. Where possible, choose a flat, well-drained, elevated location (fig. 35) for the installation of the radio set. Signals from Radio Set AN/GRC–26A have a greater range if the antenna is high and clear of hills, buildings, cliffs, densely wooded areas, and other obstructions. Depressions, valleys, and other low places are poor locations for radio reception and transmission because the surrounding high terrain absorbs r-f energy. Weak or otherwise undesirable signals may be expected if the radio set is operated under or close to steel bridges, underpasses, power lines, hospitals or power units. Normally, transmission over water is better than over land. Be certain that the drainage is adequate to prevent flooding the interior of the shelter. In locating the antenna, avoid obstructions which are about 2° or 3° above the horizontal plane of the antenna in the direction of desired transmission. This is approximately 200 to 300 feet high at a distance of 1 mile from the antenna.

b. If dual diversity reception is to be used (par. 109) a clear area suitable for the erection of two doublet receiving antennas is required. These antennas should be located as far apart as possible, but not more than 900 feet. If possible, the broadsides of the receiving antennas should be in positions which are not in the direction of signals transmitted by other local installations. The broadside of the receiving doublet antenna should be toward the remote transmitter site (fig 36). For each receiving antenna, it is desirable to have a level area, the size of which is determined by the frequency of operation. At 2 mc, each antenna will require an area of 285 feet by 50 feet, the long dimension being perpendicular to the direction of reception. At 18 mc, each antenna will require an area of only 80 feet by 50 feet. The shelter should be located midway between the two receiving antennas. If a long wire transmitting antenna is desired, an additional level area of approximately 200 feet by 40 feet should be provided. The center of the transmitting antenna should be approximately 30 feet from the shelter.

c. When it is necessary to use several transmitters and receivers in the same general locality, the mutual interference between the radio sets may be great enough to destroy the intelligibility of the incoming signals. The major type of interference to be guarded against is interference in receivers from nearby transmitters. Mutual interference may be reduced by separating the transmitting antennas from the receiving antennas as much as possible, by orienting the antennas so as to take advantage of the minima in the directional patterns, by properly selecting frequencies, by the accurate tuning of transmitters, and lining up the receivers. For more detailed information on this subject, refer to TM 11–486.

31. Uncrating, Unpacking, and Checking New Equipment

Check the crates carefully and inspect them for possible damage during shipment, Check all components against the packing list inclosed with the equipment to determine if quantities and types are correct.

a. Uncrating Shelter S–69/GRC.

(1) Use nail pullers and crowbars to remove the top of the packing box. The top must be removed first in order to facilitate the removal of the sides.



Figure 35. Siting radio set AN/GRC–26A, typical location.

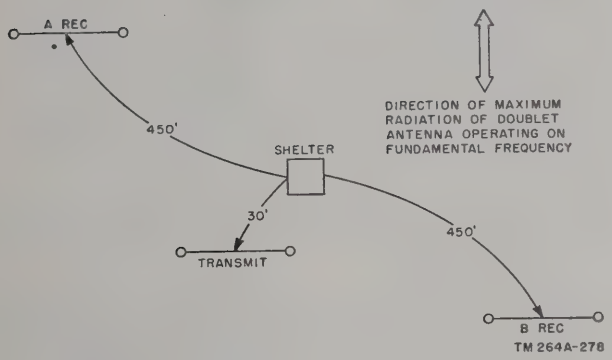


Figure 36. Orientation of the two doublet antennas.

(2) Attach one end of a steel cable or strong rope to the rear of a truck. Fasten a hook to the other end and catch this hook over the top edge of one side of the shelter crate. (If a truck is not available, use nail pullers and a crowbar to remove the side.)

(3) Follow the directions outlined in (2) above for removing the other side and the ends of the shipping crate.

(4) The openings (windows, doors, hatches, etc.) are covered with moisture-vaporproof paper which is held in place with adhesive tape (fig. 37). To remove the protective material, loosen a small section of the edge with a sharp instrument such as a screw driver or chisel. Grasp the adhesive tape and pull it away from the shelter. The barrier will come off with the tape.

(5) Unfasten the four hold-down assemblies from the crate platform.

(6) Enter the shelter and carefully remove the shoring (wooden props) and bags of desiccant (silica gel).

(7) Remove the straps which hold the separately packaged components (such

as the antenna tuning unit, and the masts) in position on the floor of the shelter.

(8) Check the contents of each box against the master packing list.

(9) Remove teletypewriter typing mechanisms from the chests, remove the S-hooks from the carriage, and install the units under the covers on the operating table.

(10) Remove the package of fluorescent lamps stowed underneath the bench and install the lamps in the ceiling fixtures.

b. Power Unit PE–95–G. Power Unit PE–95–G is installed in Trailer K–52. For complete instructions on crating and unpacking the power unit see TM 11–904.

c. Domestic Packing. Radio Set AN/GRC–26A may be received in domestic packing cases. The instructions given above apply also to unpacking domestic shipments except that no external crate is used for the shelter.

Note. Remove all protruding nails and bolts. Save the original packing cases and containers from both export and domestic shipments; they can be used again when the equipment is repacked for storage or shipment.

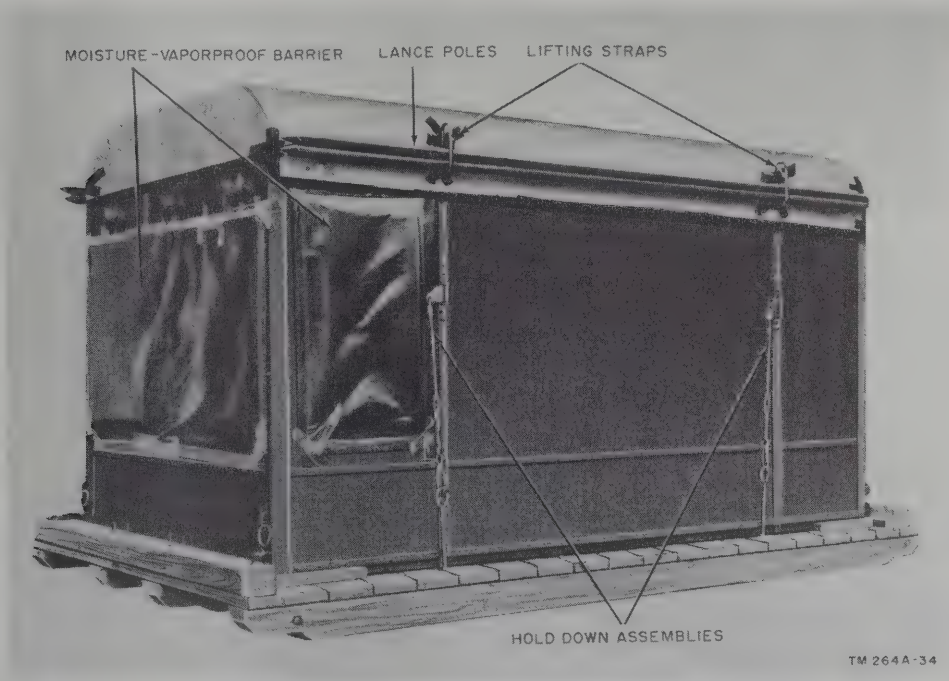


Figure 37. Shelter S–69/GRC on shipping crate platform.

Section II. INSTALLATION OF RADIO SET AN/GRC–26A

32. General

If Radio Set AN/GRC–26A is to be used as a mobile station, Shelter S–69/GRC should be installed on a 2½-ton, 6 by 6 cargo truck (fig. 1). The following procedure for setting up the radio set for mobile use is recommended:

a. Remove the canvas cover, roof bows, and side framing from the truck; drop the tail gate. With all equipment installed, the shelter weighs about 2½-tons. If a suitable hoist is available, lift the shelter by its four lifting straps and place it on the truck body so that the entrance door is toward the rear of the truck. If no hoist is available, some other method must be devised for raising the shelter to truck level and sliding it on to the truck. Skid Equipment MX–157/U (Sig C stock No. 6R22515–157), which consists of ropes and two wooden skids, may be obtained for this purpose. Hook the skids to the rear of the truck platform. Attach ropes to the shelter and feed them through the front gate of the truck; one on each side of the cab. Attach the other ends of the ropes to a second truck and pull the shelter up the skids.

b. Attach the hold-down clamps to the truck body sides to hold the shelter firmly in place. There are two clamps on each side of the shelter. If the cargo truck has a wooden platform, secure the shelter by means of four anchor rings.

c. Couple the trailer to the rear of the truck.

33. Installation of Whip Antennas

a. Remove the antenna bracket assemblies from the cartons. Be careful not to lose the mounting hardware contained in the attached cloth bags.

b. Remove the receptacle housing (provided with gasketed covers) mounted on the front end of the shelter. Mount the three Mast Brackets MP–50–A to the front of the shelter (fig. 38) with the nuts and bolts provided.

c. Assemble Mast Base MP–65–C (fig. 39) substituting Adapter Kit M–459 (fig. 33) for the parts below the body of the mast base. The adapter kit provides a coaxial type connector for the coaxial cable transmission line. Mount this assembly on Mast Bracket MP–50–A; locate the spacing washer on the top side of the bracket and the metal ring, with the braid and clamp attached, against the bottom side of the bracket. Place the clamp around the coaxial cable connector after the cable has been installed. Remount the receptacle housings in their original locations.

d. Mount Bracket MT–657/GRC, the transmitter antenna bracket, at the rear of the shelter; use the hardware provided. Apply the calking compounds, furnished in a metal tube, around all bracket and housing mounting bolts to achieve an effective seal.

e. Mount Mast Base MP–47–A on Bracket MT–657/GRC (fig. 40).

f. Select the following items from the wall cabinet:

4 Mast Section MS–116
2 Mast Sections MS–117
2 Mast Sections MS–118

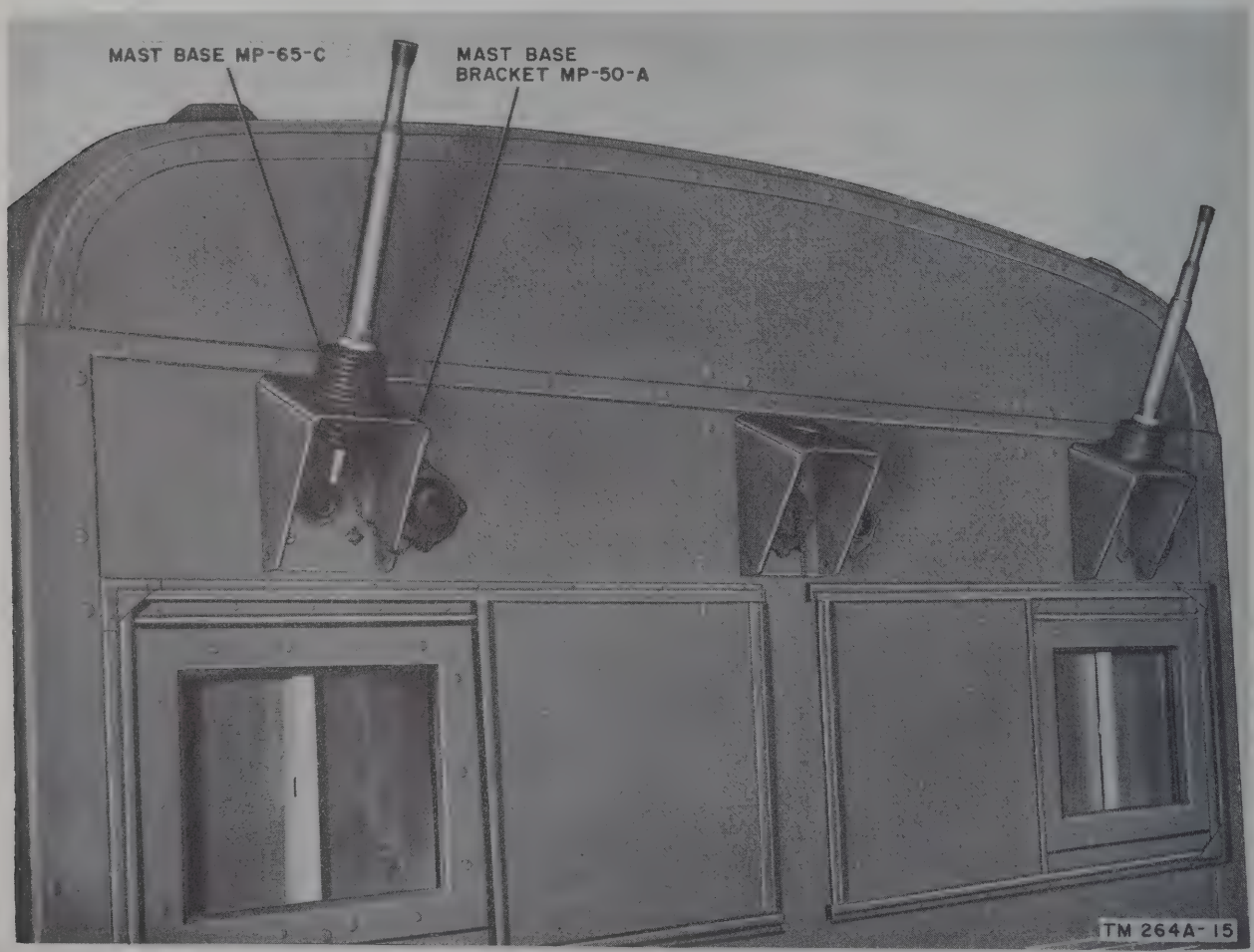


Figure 38. Front view of shelter, showing the receiving antenna mast bases.

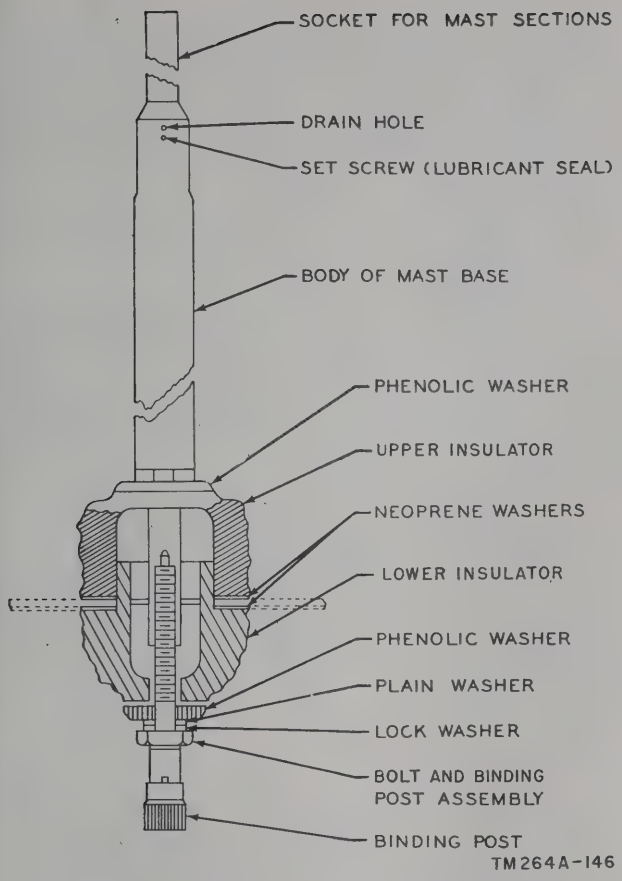


Figure 39. Assembly of mast base MP–65–C.

1 Mast Sections MS–49, MS–50, MS–51, MS–52, and MS–53
2 receiving antenna hold-down guys
1 transmitting antenna hold-down guy

g. Assemble a receiving whip antenna as follows:

(1) Screw one Mast Section MS–116 into another Mast Section MS–116. Be sure that the connection is tight. Tape the joint with ¾-inch friction tape.

(2) Repeat this procedure with Mast Sections MS–117 and MS–118.

(3) Screw the two assembled sections together; tape the joint. One receiving antenna will consist of two Mast Sections MS–116 and one each Mast Sections MS–117 and MS–118.

(4) Screw the bottom Mast Section MS–116 into Mast Base MP–65–C on the left front corner of the shelter.

(5) Assemble another receiving antenna by repeating the steps outlined in (1) through (3) above. Screw the bottom Mast Section MS–116 into Mast Base MP–65–C on the right front corner of the shelter.

(6) If the radio set is to operate in motion, attach antenna hold-down guys to the

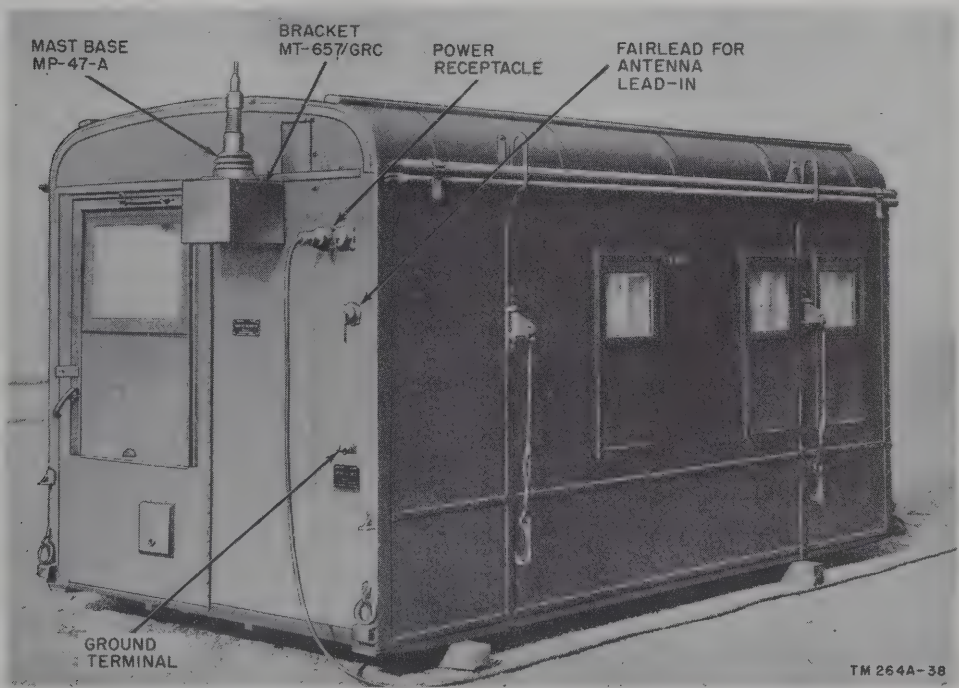


Figure 40. Rear view of shelter showing the transmitting mast base MP–47–A and bracket MT–657/GRC.

receiving antennas at the junction of the third and fourth sections. Pull the antennas down to a forward horizontal position. Secure the other ends of the antenna hold-down guys to the headlight grill of the truck.

h. Screw Mast Section MS–49 into Mast Section MS–50 and tighten the connection. Tape the joint with ¾-inch friction tape. Repeat this procedure with Mast Sections MS–51, MS–52, and MS–53. In the transmitting antenna, the mast section with the lower number is located above the one with the higher number.

i. Place the transmitting antenna hold-down guy and the assembled antenna sections on the shelter roof. Screw Mast Section MS–53 into Mast Base MP–47–A. Bend the antenna forward to a horizontal position and attach the antenna hold-down guy rope to the top of Mast Section MS–51. Swing the antenna around to the rear and attach the other end of the antenna hold-down guy rope to the cargo trailer. *The transmitting and receiving antennas must be vertical when the radio set is being operated.*

34. Semifixed Installations

a. Unwind Power Cable Assembly CX–1165/U (which supplies power to the shelter), and connect the two lugs to the A C OUTLET nuts on Power Unit PE–95–G. Connect the other end to the power receptacle in the rear of the shelter. If it is desired, in fixed installations, to locate the power unit at a greater distance from the shelter, attach one end of Power Cable Assembly CX–1166/U to Power Cable Assembly CX–1165/U and the other end to the power receptacle. Power Cable Assembly CX–1166/U is a 50-foot power cable extension. During operation, raise the canvas end pieces from the front and rear of the trailer and tie them securely; this is to allow adequate ventilation and cooling of the power unit.

b. If communication between the cab of the truck and the shelter is desired, install one Telephone EE–8–(*) in the cab of the truck and one in the shelter. Cut a 15-foot length of Wire WD–1/TT from the roll. Connect one end to Telephone EE–8–(*) in the shelter; pass the wire through the bushing of Mast Bracket MP–50 and nto the truck cab, to the other Telephone EE–8–(*).

c. Two 10-foot copper braid ground straps are furnished with the equipment. In mobile operation, ground the shelter to the truck by fastening one of the straps from the external ground terminal located at the rear of the shelter to the truck body. In semifixed or fixed operation, ground the shelter by driving Ground Rod GP–26 (held in a bracket mounted on the inside shelter wall) into the ground and securing the braid to it.

35. Installation of Doublet Transmitting Antenna

a. A doublet transmitting antenna may be used for Radio Set AN/GRC–26A instead of the whip antenna which is normally used. The doublet type antenna is used for fixed and semifixed installations, and when the greater directivity and signal pick-up of a doublet antenna are desired.

b. Three 40-foot Masts AB–155A/U are required to support the antenna at lower frequencies (approximately 2 to 4 mc). At higher frequencies, the length of the antenna is short enough to omit the center mast and use only two supports. The lance poles are particularly useful in mobile-at-halt installations or when an antenna must be set up for emergency operation.

c. The antenna wire is made up of sections of Wire W–1 separated by strain insulators. The sections may be connected by jumpers which will allow preselection of various lengths for operation on different frequencies (fig. 41). The jumper wires should be fastened securely to the antenna sections. Dirty or loose jumpers reduce the power radiated by the antenna. Compute the lengths desired for the various antenna sections as follows:

(1) The antenna is a half-wave doublet designed to operate at the half-wave fundamental of the desired frequency, or on any odd harmonic of the fundamental. Figure 42 is a graph of frequency plotted against antenna length for the half-wave fundamental, third, fifth, and seventh harmonics. The antenna normally is used on the half-wave fundamental wavelength. If operation of the antenna at any of its harmonics is contemplated, *consideration must be given to the change in the radiation pattern* (fig. 79). The radiation pattern will be broadside *only* when the antenna is used at its half-wave fundamental length.

(2) Refer to figure 41 and select the proper antenna lengths for the operating frequencies to be used.

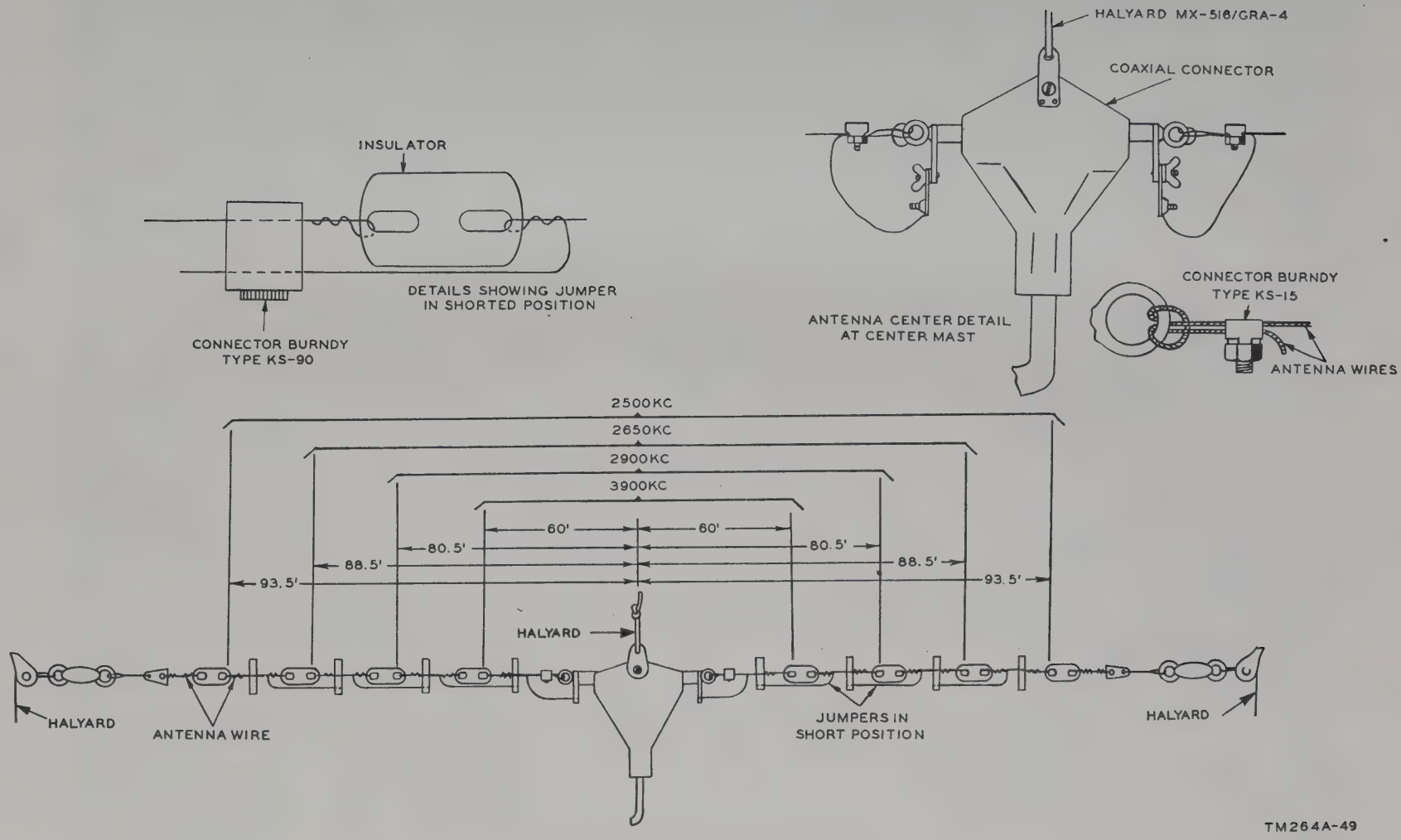


Figure 41. Construction and assembly of doublet antenna.

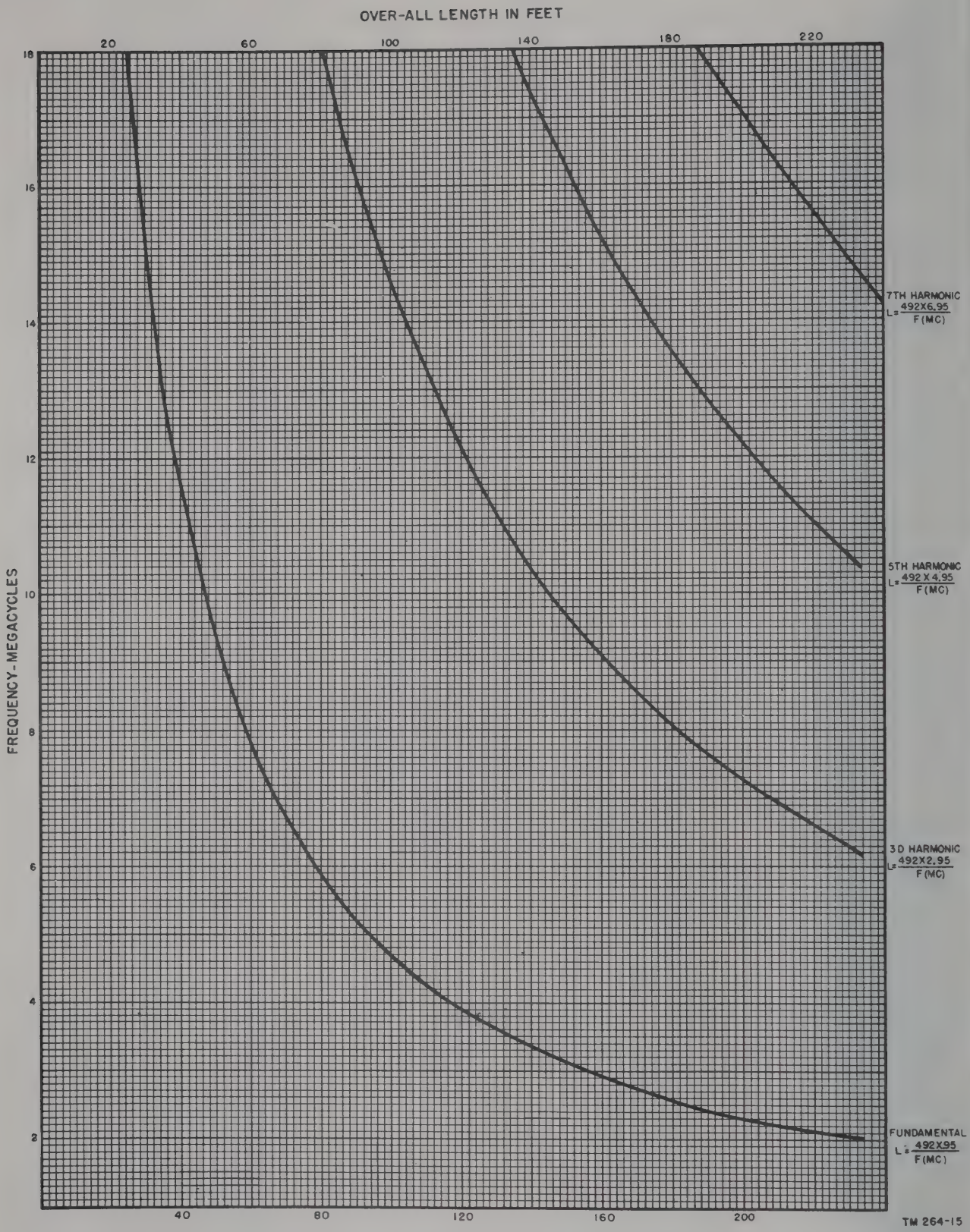


Figure 42. Graph of antenna length versus frequency.

Example: Assume that operation is desired on frequencies of 2500, 2650, 2900, and 3900 kc. These frequencies require antenna lengths of 187, 177, 161, and 120 feet, respectively (fig. 42).

(3) The shortest length antenna must be constructed first. In the case of the above example, the shortest antenna is the 120-foot, 3900-kc antenna.

(4) Determine the length of a quarter-wave antenna for the shortest half-wave to be used. In this example, a quarter-wave would be $\frac{120}{2}$=60 feet. Attach one end of the antenna wire to the coaxial cable connector (fig. 41). Attach the other end of the antenna wire to an insulator; make sure that the distance from the center of the coaxial connector to the end fastened to the insulator is exactly 60 feet as shown in figure 41. Construct the other half of the half-wave antenna in a similar fashion, using the remaining terminal on the coaxial cable connector as a starting point.

(5) Select the next shortest length of antenna desired, in this case the 161-foot, 2900-kc antenna. Attach a piece of antenna wire to the unused end of the insulator of the 3900-kc antenna (already constructed) and allow a sufficient length of free wire which can be used for a jumper connection. Determine the length of a quarter-wave antenna for 2900 kc $\left(\frac{161}{2}=80.5 \text{ feet}\right)$. Run out a sufficient length of wire to bring the total length of one side of the antenna to 80.5 feet, measured from the center of the terminating block to the end of the antenna. Include length of the insulators in this measurement. The other side of the antenna is made up in the same manner.

(6) Each additional lower-frequency antenna is constructed by adding more wire to the antenna already formed. Each antenna length is calculated from the center of the coaxial connector to the end of the antenna being constructed.

(7) After the various lengths have been determined, and constructed, connect the correct jumpers in place as shown in figure 41. Each antenna selected will operate on the fundamental and odd harmonics of the frequency to which it is cut. In the example explained in (2) through (6) above, the antenna will be the correct length for the following frequencies:

Fundamental (kc)	Third harmonic (kc)	Fifth harmonic (kc)
2500	7500	12, 500
2650	7950	13, 250
2900	8700	14, 500
3900	11, 700	19, 500

Note. Refer to figure 42 to calculate harmonics versus length of antenna wire.

d. After the antenna wire has been constructed, determine the orientation of the antenna. The radiation pattern will be broadside *only* when the antenna is used at its fundamental frequency length. A compass (fig. 24) is provided for accurate determination of antenna orientation. Stretch the cut antenna wire along the ground in the desired direction. Locate the end masts several feet beyond the end insulators. The center mast should be at the coaxial cable connector, offset 3 feet from the line between the two end masts (fig. 43), so that the antenna will clear the center

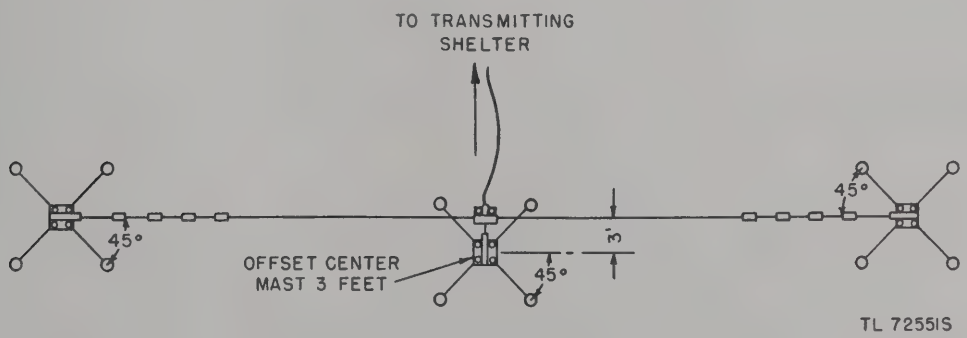


Figure 43. Erected doublet antenna, top view.

mast. Locate the center mast within 30 feet of the shelter to allow for connection of RF Cable Assembly CG–557A/U which is 75 feet long. A center mast may not be required if the antenna is less than 120 feet long. In this case, use only the two end masts. The r-f cable assembly should be taped to the center mast to relieve the strain on the coaxial connector.

e. Place Mast AB–155A/U at each mast location and remove the canvas cover from Carrying Device MX–387/GRA–4. Drive the stake of Mast Base AB–154/U into the ground at the desired mast locations, with the swivel end parallel to the antenna wire (fig. 44). If the ground is soft or sandy, place one end plate of the carrying device on the ground and push it down firmly. Then drive the stake on the mast base through one of the tubes in the end plate. Hammer HM–1 is furnished with Mast AB–155A/U.

f. Assemble the eight Mast Sections MS–44–A in a line with the female ends of the sections toward the mast base. Slip the end of the second section over the first section and place Guy Plate MX–378/U over the third section. Add two additional sections, another guy plate, three more mast sections, and a third guy plate over the last section (fig. 44).

g. Remove four Stakes GP–101/U and four Guy Fasteners MX–379/U from the carrying device (fig. 19). Slip a guy fastener over each stake before it is driven into the ground. Drive one stake (called the back stake) as close as possible to the junction of the fifth and sixth mast sections (25 feet from base). Use a guy

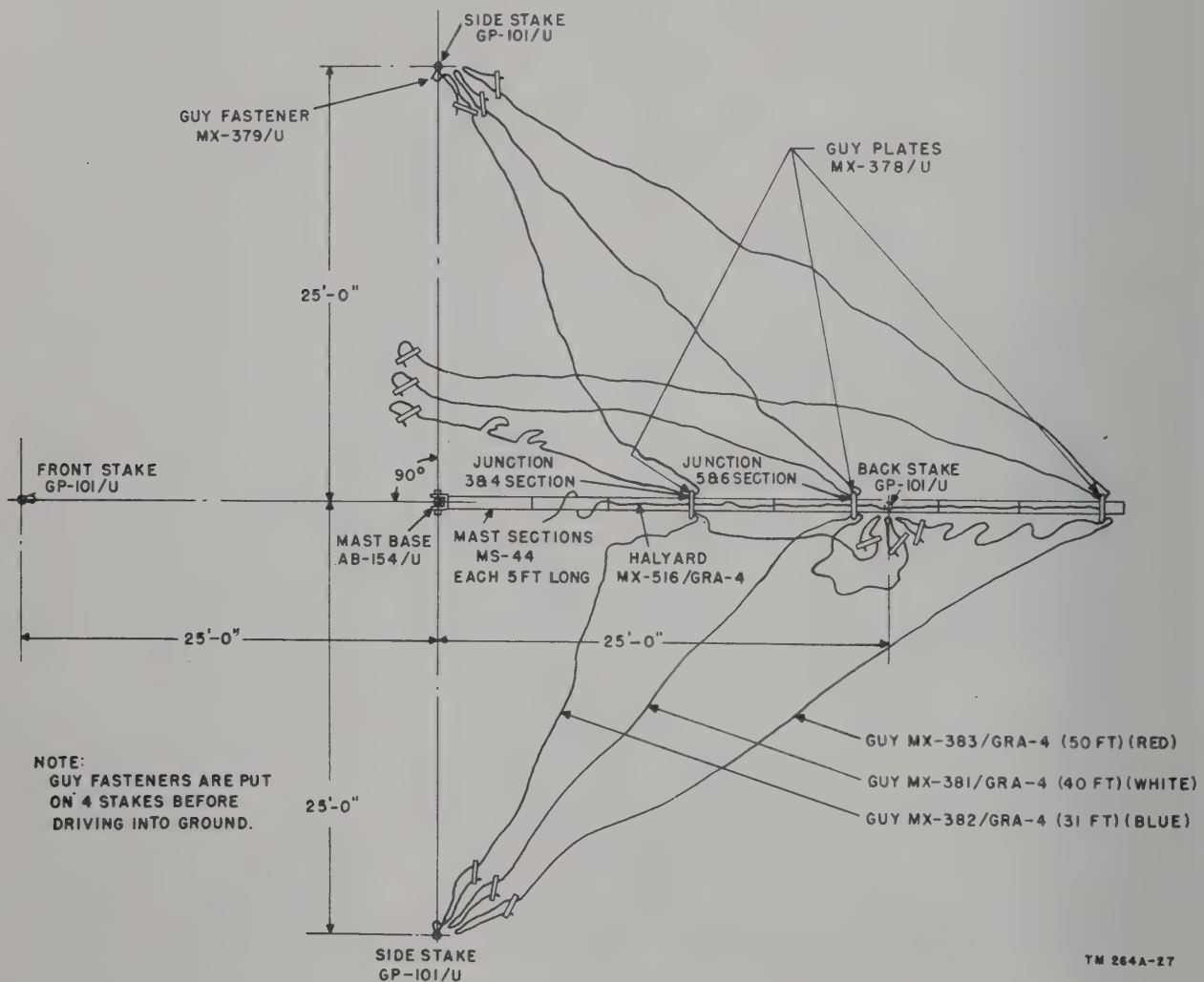


Figure 44. Preparing antenna mast for erection.

rope to measure the distance between the back stake and the mast base. Use this measurement to position the other three stakes. Locate them as shown in figure 44. If the ground is soft or sandy, use the wooden stakes provided instead of aluminum stakes, and omit the guy fasteners. In this case, the guys should be looped over the stakes.

h. The next step requires four each Guys MX–381/GRA–4, MX–382/GRA–4, and MX–383/GRA–4. These guys are color-coded at one end; the top guys (50 feet long) are red, the center guys (40 feet long) are white, and the lowest guys (31 feet long) are blue. Fasten the four red guys to the top Guy Plate MX–378/U, the four white guys to the center guy plate, and the four blue guys to the bottom guy plate by snapping the fastener at the end of each guy into one of the four holes which are spaced 90° apart on the guy plate. Next, carry the free ends of the three back guys to a side stake, to determine their correct length. Fasten these guys to the back stake by means of Guy Fastener MX–379/U. Connect both sets of side guys to their respective side stakes and remove slack by adjusting Slide Fasteners FT–9. Do not make them too tight; the mast may bend. Tie the three front guys together and stretch them along the mast toward the front stake.

i. Remove Halyard MX–516/GRA–4 from the carrying device and fasten it, with the snap fastener, to the unused hole in the top guy plate. Slip the halyard rope through the pulley and tie the free ends of the rope near the mast base to keep the rope from running through the pulley during erection of the mast.

j. Assemble additional masts by repeating operations outlined in *e* through *i* above.

k. If a center mast is used, fasten the center coaxial cable connector to the halyard.

l. Fasten the halyard on each end mast to the end insulator on the antenna wire.

m. Three men are required to raise the masts. One man takes a position near the mast base. One holds the front guys and the halyard. The third man takes a position near the top end of the mast (fig. 45), raising the mast as he walks toward the mast base.

(1) The man holding the guys pulls steadily on them, keeping slightly more tension on the top guy so that the mast bows slightly while being raised. Simultaneously, the man at the bottom end of the mast holds the end at the designated position as the mast is raised to a vertical position.

(2) The man who raised the mast then helps the other men adjust the front guys to the proper lengths.

(3) The rest of the guys are given final adjustment so that the mast is vertical. If one guy is tightened, the opposite one must be loosened slightly so that the mast will not bow.

n. When all masts are erected, pull the antenna wire into position by means of the halyards. Tie each halyard to the mast to prevent the weight of the antenna from pulling the loose end of the halyard back through the halyard pulley. Figure 46 shows a doublet antenna completely erected.

o. After erection of the doublet antenna is completed, be sure to disconnect RF Cable Assembly CG–558/U (which is used in whip antenna operation) from between the transmitter and the antenna tuning unit. Feed the unconnected end of the antenna transmission line, the 75-foot RF Cable Assembly CG–557A/U, through the fairlead in the shelter wall (fig. 40) and connect it to socket SO10 on the transmitter, using right-angle Adapter M–359 as a coupling. The antenna lead-in should be raised off the ground on lance poles, etc. In cold weather, this prevents the lead-in from freezing to the ground and, at all times, minimizes damage which might result from accidental pull on the lead-in. In addition, the lead-in should be taped both to the mast and to the shelter to relieve the tension on the coaxial connectors. Remember that the coaxial cable is structurally weak and should not be used as a support or line. This information also applies to the lead-ins of the receiving antennas.

36. Installation of Doublet Receiving Antenna

a. The doublet receiving antennas should be spaced *at least three wavelengths apart* for satisfactory diversity reception. At the lowest operating frequencies, the centers of the antennas should be spaced about 950 feet apart. The antennas must be positioned broadside to the received signal (fig. 36).

b. Normally, three 40-foot Masts AB–155A/U are used to support each doublet antenna; however, for operation in the frequency range of 4 to 18 mc, the length of antenna wire is short enough (120 feet or less) to omit the center mast, thus requiring only four masts for a dual diversity receiving antenna installation (two antennas).

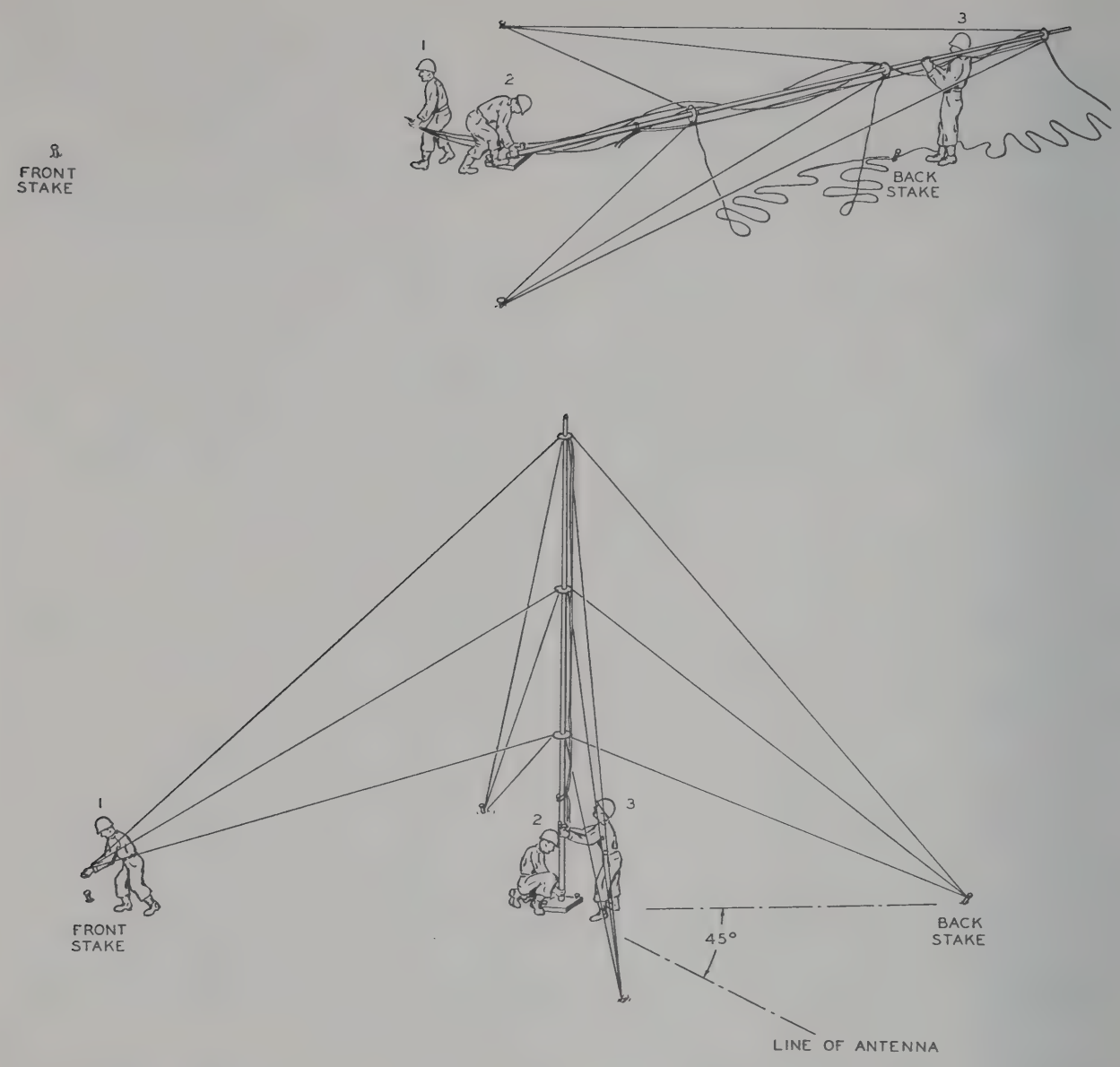


Figure 45. Raising the assembled antenna mast.

c. Construction and erection of receiving antennas is the same as for the transmitting antenna (par. 37).

d. After the antennas have been erected, the lead-ins must be connected to the receivers. Two methods are provided for doing this (fig. 127). In the first case, disconnect Cords CG–67/MRQ–2 from Mast Bases MP–65–B and from Radio Receivers R–388/URR. Withdraw the ends of these cords from the fairleads. Pass one end of each RF Cable Assembly CG–557A/U (the antenna lead-in) through the fairlead and connect it to the ANTENNA connector on the rear of each receiver; use Adapter M–359 as a coupling. In the second case, disconnect Cords CG–67/MRQ–2 from Mast Bases MP–65–B (but not from the receivers) and withdraw the ends of these cords from the fairleads. Connect Plug PL–258 to the free end of this cord. Now pass one end of each RF Cable Assembly CG–557A/U through the fairlead and connect it to the other end of Plug PL–258. This second method has been provided because of the limited space behind the radio receivers.

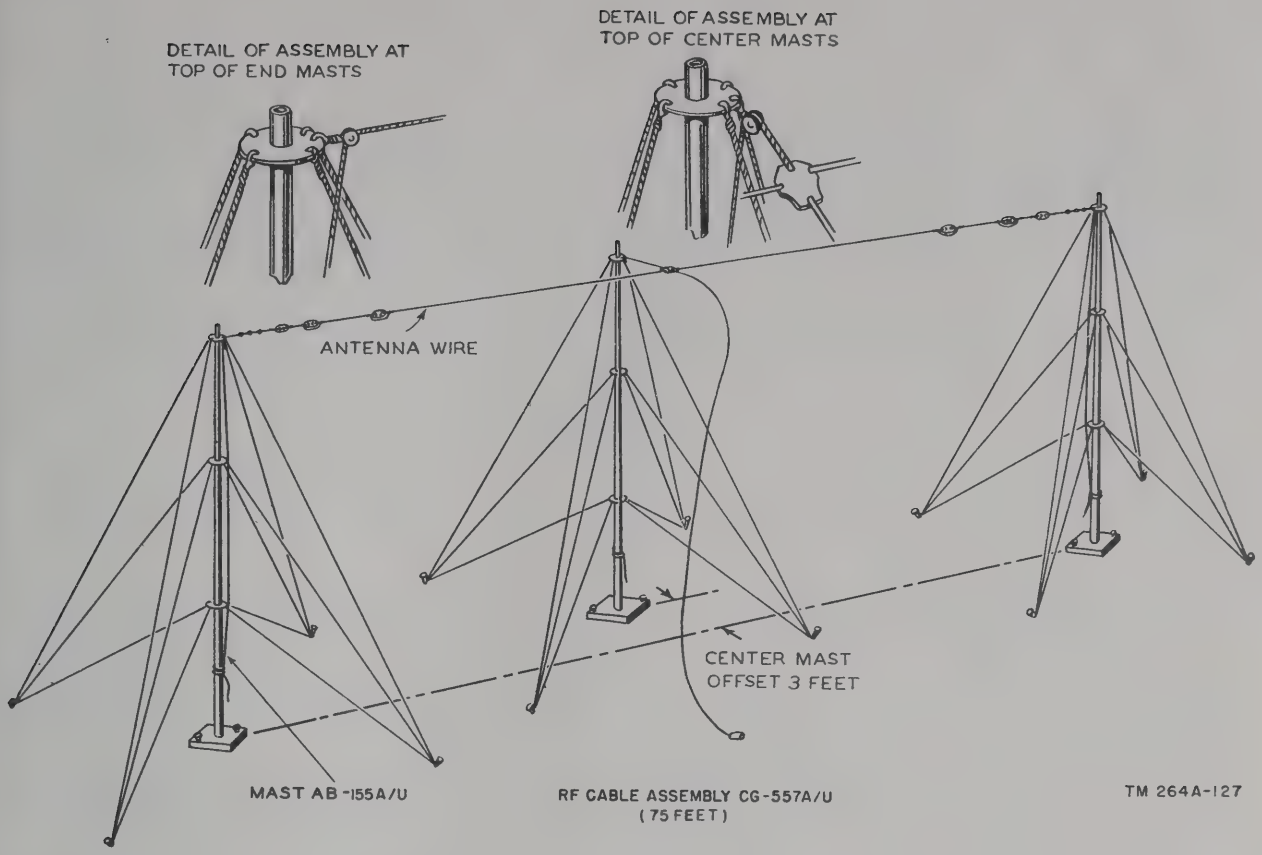


Figure 46. Doublet antenna, erection completed.

37. Other Antenna Installations

In all semifixed installations, when there is insufficient time for erection of the 40-foot masts, the wooden lance poles supplied may be used to support the doublet antenna wire. The lance poles are forced into the ground in the desired locations and guyed with Rope RP–5 attached to Stakes GP–101/U. If greater height is desired, one of the lance poles may be fastened to the outside of the shelter in a vertical position. In this case, the transmitting antenna may be located approximately 60 feet from the shelter. Various systems for erecting antennas may be improvised by using poles, trees, buildings, or other suitable supports. The doublet antenna always must be insulated from the supports.

38. Installation of Operating Equipment

The operating equipment is installed in the shelter by the manufacturer. Check to see that the tubes have not shaken loose in their sockets and that the tube caps are firmly in place. In addition, be sure that the correct fuses have been installed in the equipment. Equipment failure may result if fuses other than those specified are used. The following chart lists the rating and location of the fuses used in each equipment:

Equipment	Fuse	Rating (amp.)	Location
Radio Transmitter BC–610–(*)	FS1	25	On front panel (fig. 48).
	FS2	25	
	FS3	20	
	FS4	6	
	FS5	3	
Power Supply PP–712(*)/GRC–26A	F301	3	Behind hinged door on front panel (fig. 55).
	F302	3	
	F401	1	

Equipment	Fuse	Rating (amp.)	Location
Frequency Shift Exciter O–39(*)/TRA–7 (except serial numbers 630 through 811 in the B model, Order No. 3135–Phila-51).	F101	3	On front panel (fig. 52).
	F102	3	
Frequency Shift Exciter O–39B/TRA–7, serial numbers 630 through 811, Order No. 3135–Phila-51.	F101	3	On front panel (par. 29).
	F103	.3	
Rectifier RA–87–A	F1	15	Behind hinged door (fig. 58).
	F2	.5	
Teletypewriter TT–4/TG	MOTOR	2	Behind hinged door (fig. 57).
	LINE	⅛	
Perforator-Transmitter TT–56/MGC	Fusetron for transmitter distributor.	1.6	On connection box (fig. 17).
	Fusetron for typing reperforator.	1.6	
Radioteletypewriter Control C–808/GRC–26A	F1	1	On front panel (fig. 56).
Radio Receiver R–388/URR	F101	1.5	On rear apron of chassis (fig. 47).

39. Installation of Antenna Tuning Unit BC–939–B

Remove Antenna Tuning Unit BC–939–B (fig. 18) from the cartons in which it is packed and remove the wrappings. Set the tuning unit on the top of Radio Transmitter BC–610–(*) and secure it to the transmitter with the four wingnuts.

40. Installation of Dry Batteries

Dry batteries are not furnished with Radio Set AN/GRC–26A. These must be requisitioned from a depot or other stock source. Four Batteries BA–30 are required for the two Telephones EE–8–B. One Battery BA–30 and three Batteries BA–31 are required for Multimeter TS–352/U. Refer to TM 11–333 and TM 11–5527, respectively, for battery installation instructions.

41. Placing Storage Batteries in Service

Examine the storage batteries used by Power Unit PE–95–G. A card attached to each battery gives the manufacturer's instructions for preparing the battery for service. *Read the manufacturer's instructions and follow them carefully.* The following is an example of the information shown on a manufacturer's instruction card:

Caution: If the electrolyte is spilled on the skin or clothing, *immediately* wash the affected areas with large amounts of cold water. If available, apply bicarbonate of soda or ammonia to the affected areas.

a. This battery is the dry-charged type.

b. The electrolyte to be used is diluted sulphuric acid with a specific gravity of 1.256 at 80° F. It is packed in a separate container. In tropical climates, use electrolyte with a specific gravity of 1.200, produced by mixing 10 parts of the 1.265 electrolyte with 3 parts of water. Be sure to use distilled water, or soft water, such as *clean* rain water, in a lead-acid storage battery.

Caution: Never add the water to the acid· heat and spattering of the acid will result.

c. Remove the vent caps. Remove and destroy the scotch tape which covers the vent holes. Fill each cell with the correct electrolyte to a level ⅝ inch above the tops of the separators. Replace the vent caps and tighten them securely.

Caution: Do not put cold electrolyte into a warm battery or warm electrolyte into a cold battery; severe damage will result.

d. If the battery is filled with 1.200 electrolyte for tropical use, stamp the number *1* on the lead top connector at the positive cell, for the information of anyone servicing the battery in the future.

e. Before placing the battery in service, allow it to stand from 4 to 12 hours after filling it. In an emergency, the battery may be placed in service 1 hour after it has been filled with the proper electrolyte. However, this is not good practice.

f. If possible, give the battery a freshening charge at 6.0 amperes for 16 to 20 hours before placing it in service. It will give satisfactory service without this charge if the battery temperature is above 50° F. If the battery temperature is below 50° F., it must be given a freshening charge.

42. Connections

(figs. 47 and 127)

a. The power outlets for operating the components of Radio Set AN/GRC–26A are wired permanently in Shelter S–69/GRC. When Power Unit PE–95–G is used as a power source, connect Power Cable Assembly CX–1165/U to the shelter outlet. If it is necessary to have the power unit some distance from the shelter, extension Power Cable Assembly CX–1166/U is inserted between Power Cable Assembly CX–1165/U and the shelter.

b. All of the interconnecting cords inside Shelter S–69/GRC are installed when the equipment is initially shipped. A cording diagram for the interconnecting cables in the rear of Cabinet CY–1050/GRC–26A is shown in figure 47. For a complete cording diagram, see figure 127. The following chart contains a complete list of the cords supplied with Radio Set AN/GRC–26A:

Cable No.	Cord	Requisition No.	Length (ft)	Connects	
				From	To
1	Cord CG–67/MRQ–2	2	5½	Mast Base MP–65–B	Receivers Chan A and Chan B (J101) with Adapters M–359.
[a]1A	RF Cable Assembly CG–557A/U.	2	500	Doublet antennas	Receivers Chan A and Chan B (J101).
2	Power cord	2	6½	Receiver Chan A and Chan B	A-c outlet.
3	RF Cable Assembly CG–562/U.	1	6	Receiver Chan B i-f output	Frequency-shift converter, J102.
3A	RF Cable Assembly CG–562/U.	1	6	Receiver Chan A i-f output	Frequency-shift converter, J101.
4	Electrical Power Cable Assembly CX–1939/U.	2	5	Receivers Chan A and Chan B audio terminal strip.	Loudspeakers LS–3.
5	Special Purpose Cable Assembly CX–1150/U (red).	1	15	Tone oscillator (p/o power supply), J404.	Control unit, J10.
6	Special Purpose Cable Assembly CX–1151/U (blue).	1	15	Frequency-shift converter, J103.	Control unit, J11.
7	Cord CX–954/TRA–7	1	6	Frequency-shift converter, J104.	A-c outlet.
8	Power cord	1		Heater	A-c outlet.
9	Power cord	2		Left and right teletypewriter	A-c outlet.
[b]10	Cord CD–307 (red)	2	4	Control unit, J1 or J4	Teletypewriters (left and right) receive circuit.
[b]11	Cord CD–307 (black)	2	4	Control unit, J3 or J6	Teletypewriters (left and right) send circuit.
12	Cord CX–961/TRA–7 (blue)	1	4	Control unit, J12	Frequency - shift exciter, J107, send and control.
12A	Cord CX–961/TRA–7 (red)	1	4	Control unit, J13	Frequency - shift exciter, J106, local c-w control.
13	Electrical Special Purpose Cable Assembly CX–1850/U.	1	3	Power supply, P405	Frequency-shift converter, J106.
14	Electrical Special Purpose Cable Assembly CX–1851/U.	1	4	Tone oscillator (p/o power supply), J403.	Receiver Chan B; term. strip E101.
14A	Electrical Special Purpose Cable Assembly CX–1851/U.	1	4	Tone oscillator (p/o power supply), J402.	Receiver Chan A; term. strip E101.
15	Cord CX–959/TRA–7	1	6	Control unit, J15	A-c outlet.
16	Special Purpose Cable Assembly CX–1120/U.	1	4½	Control unit, J2	Teletypewriter connection box.
[b]17	Cord CD–307 (gray)	1	4	Control unit, J5	Transmitter distributor.
[b]18	Cord CD–307 (red)	1	4	Control unit, J7	Typing reperforator.
[b]19	Cord CD–307 (black)	1	4	Control unit, J8	Typing reperforator.
20	Special Purpose Cable Assembly CX–1152/U.	1	4½	Control unit, J14	Speech amplifier SO 102.

See footnotes at end of table.

Cable No.	Cord	Requisition No.	Length (ft)	Connects	
				From	To
21	Cord CG–389/U	1	6	Frequency-shift exciter; NORMAL through Radio Frequency Adapter UG–27/U.	Transmitter crystal socket.
22	Cord CG–390/U	1	17½	Frequency-shift exciter, J105	Receiver A PHONES jack.
23	Cord CX–962/TRA–7	1	4	Frequency-shift exciter a-c supply, jack J103.	A-c outlet.
24	Power cord	1		Transmitter distributor	Teletypewriter connection box.
25	Power cord	1		Typing reperforator	Teletypewriter connection box.
26	Power cord	1		Rectifier RA–87–(*) 115 v dc	Teletypewriter connection box.
27	Power cord	1		Rectifier RA–87–(*)	A-c outlet.
28	Cord CD–764	1	14 1½	Speech amplifier; SO 105	Transmitter; SO 5.
29	Cord CD–763	1	13¾	Transmitter; SO 6	A-c outlet.
30	RF Cable Assembly CG–558/U	1	2¼	Transmitter; SO 10 through Adapter M–359.	Antenna tuning unit input terminals.
C30A	RF Cable Assembly CG–557A/U.	1	75	Transmitter; SO 10	Doublet transmitting antenna.
31	Wire W–128	1	1½	Antenna tuning unit	Whip antenna.
32	Power Cable Assembly CX–1165/U.	1	12	Power output feedthrough receptacle.	Commercial a-c source or power Unit PE–95–G.
33	Power Cable Assembly CX–1166/U.	1	50	Power feedthrough receptacle	Power Cable Assembly CX–1165/U.
34	#7 AWG copper braid	1		Ground bus	Transmitter.
35	#7 AWG copper braid	1		Modified Ground Rod GP–26	Ground bus.
36	#7 AWG copper braid	1		Power circuit breaker	Ground bus.

[a] Replaces Cord CG–67/MRQ–2 when doublet antenna is used.

[b] Seven extension Cords CD–307 are necessary to make the connections from Radioteletypewriter Control C–808/GRC–26A to the two teletypewriters, the typing reperforator and the transmitter distributor. Each one of these cords is provided with a female cord jack on one end and a male phone plug on the other. Three of the shells are red, three are black, and one is gray.

43. Service Upon Receipt of Used or Reconditioned Equipment

a. Follow the instructions in paragraph 31 for uncrating, unpacking, and checking the equipment.

b. Check the used or reconditioned equipment for tags or other indications pertaining to changes in the wiring of the equipment. If any changes in wiring have been made, note the changes in this manual, preferably on the schematic diagram. Include the serial number of the altered equipment.

c. Check the operating controls for ease of rotation. Where lubrication is required (as in Power Unit PE–95–G) refer to the lubrication instructions in individual equipment manuals.

d. Perform the applicable installation and connection procedures given in paragraphs 30 through 42.

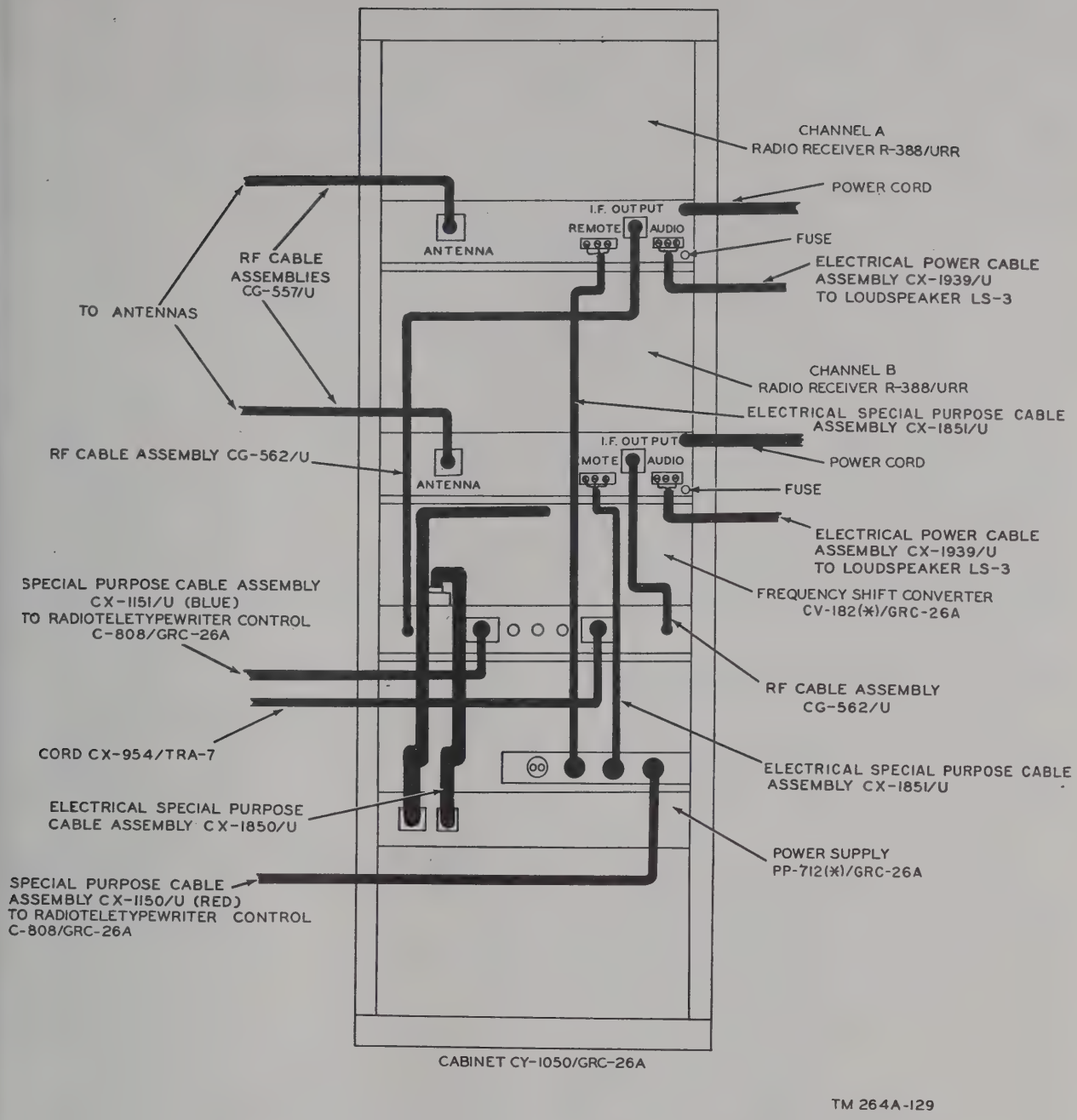


Figure 47. Cable connections, rear of cabinet CY-1050/GRC-26A.

CHAPTER 3

OPERATION

Section I. CONTROLS AND INSTRUMENTS

44. General

Indiscriminate operation and improper setting of the controls may cause serious damage to Radio Set AN/GRC–26A. Therefore, the operator should familiarize himself with the controls and their functions before attempting to operate the radio set. The setting-up procedure for the individual components, in the proper order, will be discussed in sections II and III of this chapter.

45. Radio Transmitter BC–610–(*) Controls (fig. 48)

The following table lists the radio transmitter controls and indicates what they do:

Control	Function
P. A. PLATE TUNING control (C12).	Controls the tuning of the p-a plate circuit.
P. A. PLATE meter (M2)	Measures the current in the p-a cathode (plate) circuit.
EXCITATION METER (M1).	Indicates resonance (minimum current in the doubler plate circuit, the ipa plate circuit, and maximum current in the ipa or p-a grid circuits, depending upon the position of the EXCITATION METER SWITCH).
FILAMENT VOLTAGE meter (M3).	Measures p-a filament voltage.
EXCITATION METER SWITCH (SW8).	Switches EXCITATION METER M1 into doubler and ipa plate circuits, and into ipa and p-a grid circuits.
BAND SWITCH (SW11)	Connects any one of the three tuning units into the transmitter circuits.
PHONE-CW switch (SW7)	Disconnects modulator, applies full power to p-a stage (CW position).
	Connects modulator, applies reduced power to the p-a stage (PHONE position).
OVERLOAD RESET switch (SW12).	Resets the overload relay when it has been tripped by an overload in the p-a or modulator stage.
FILAMENT POWER switch (SW1).	Applies power to the filaments of all tubes, and to the plate circuits of the bias supply rectifier. A green pilot lamp lights when this switch is in the on position.
EXCITER PLATE POWER switch (SW3).	Grounds keying line and applies power to the plate circuits of the oscillator, buffer-doubler, and ipa (up position).
	Removes plate voltage from these circuits until relay RY1 is operated by closing the hand key, microphone switch, or PLATE POWER switch (NORMAL position).
HIGH VOLTAGE PROTECT switch (SW4).	Connects resistor R37 in series with primary of plate power transformer, reducing plate voltage (PROTECT position).
	Applies full power to the transmitter in the NORMAL position.
PLATE POWER switch (SW6).	Applies a-c line voltage to plate transformer T6.
	Caution. The *receiver* disabling circuits are not operated by this switch.

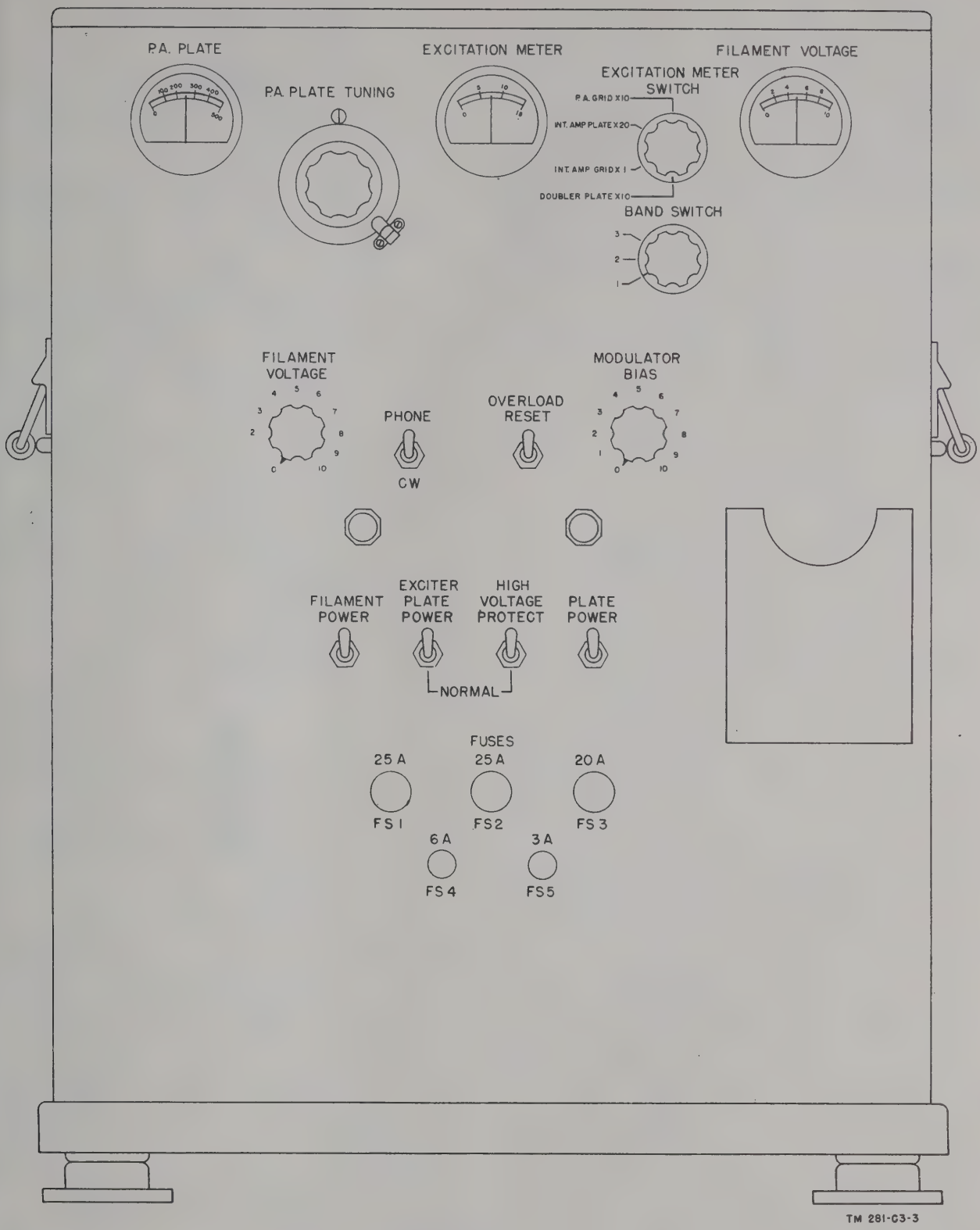


Figure 48. Radio transmitter BC–610–(*) controls.

Control	Function
FILAMENT VOLTAGE control (R18).	Adjusts the filament voltage of all tubes in the transmitter except the bias rectifier and a-f drivers.
MODULATOR BIAS control (R12).	Adjusts the bias on the grids of modulator tubes V3 and V4, when the PHONE-C.W. switch is on PHONE.
FUSES FS1, FS2	115-volt, a-c, 25-ampere line fuses.
Fuse FS3	Protects transformer T6.
Fuse FS4	Protects transformers T2, T5, relays RY1 through RY4, and lamp LM3.
Fuse FS5	Protects transformer T1 and T101 in the speech amplifier power supply.

46. Tuning Unit Controls
(fig. 49)

The following table lists the transmitter tuning unit controls and indicates what they do:

Control	Function
M.O.–XTAL (crystal) switch (SW15).	Controls the type of frequency control: M.O. position for master-oscillator control, XTAL position for crystal control.
MO (C32 or C33)	Determines the frequency of the mo. Calibrations on the dial allow presetting to values obtained from the tuning chart.
DOUB. (doubler) control (C31).	Tunes the buffer-doubler tank circuit to resonance with the first, second, or fourth harmonic of the signal from the oscillator. Approximate settings for this control are given on the tuning charts.
INT. AMP. control (C34 or C35).	Tunes the ipa tank circuit to resonance with the signal from the buffer-doubler. Approximate settings for this control are given on the tuning charts.

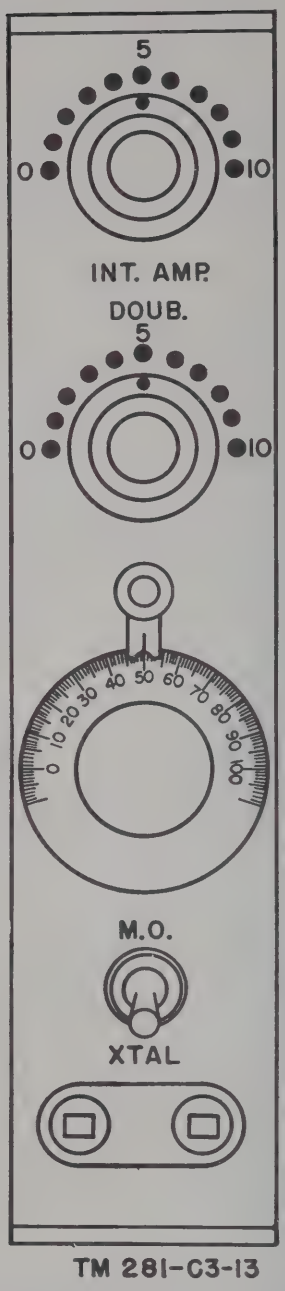


Figure 49. Transmitter tuning unit, controls.

47. Antenna Tuning Unit BC–939–B Controls
(fig. 50)

The following table lists the antenna tuning unit controls and indicates what they do:

Control	Function
COUPLING INCREASE control (L5).	Varies the inductive reactance of the link coil for optimum plate load resistance.
FREQUENCY 10MC-INCREASE-2MC (coil L6).	Changes inductance of the l-f (low-frequency) loading coil by varying the tap position on this coil (for whip antenna).
FREQUENCY 18MC-INCREASE-10MC control (coil L4).	Changes inductance of the h-f (high-frequency) loading coil by varying the tap on this coil (for whip antenna).
ANTENNA CURRENT meter (M4).	Measures the r-f antenna current.
2-10MC-LONG WIRE-10–18MC switch (SW9).	In the 2-10MC position, allows matching a whip antenna to the 2- to 10-mc range of the transmitter. In the LONG WIRE position, a long wire antenna may be matched to any transmitter frequency. In the 10–18MC position, allows matching the transmitter to the 10- to 18-mc range to a whip antenna.

48. Speech Amplifier BC–614 (*) Controls

(fig. 51)

The following table lists the speech amplifier controls and indicates what they do:

Control	Function
CARBON MIC. 1 jack (J102).	Connector for Microphone T–17–(*).
CARBON MIC. 1 control (R123).	Adjusts gain of the speech when Microphone T–17–(*) is used.
DYNAMIC MIC. 2 jack (SO 101).	Connector for Microphone T–50–(*).
DYNAMIC MIC. 2 control (R111).	Adjusts gain of the speech amplifier when Microphone T–50–(*), or remote Telephone EE–8–(*) is used.
TO BC–610 socket (SO 103).	Connector for the cable to the transmitter supplying a-c power, keying circuit, plate relay, modulation meter, audio output, and ground.
TO JB–70 socket (SO 102).	Connector for cable to control unit; contains a-c control line to plate relay.
KEY jack (J101).	Connector for Key J–45.
LIMITER CONTROL (R134).	Sets upper limit of modulation to prevent overmodulation.
MODULATOR PLATE meter (M101).	Measures the cathode current of modulator tubes V3 and V4 in the transmitter.
Pilot lamp LM101 (red).	Indicates when a-c power is supplied to the speech amplifier, when the transmitter FILAMENT POWER switch is on.
SIDETONE VOLUME control (R137).	Controls the output level of the sidetone amplifier.

49. Frequency Shift Exciter O–39 (*)/TRA 7 Controls

(fig. 52)

The following table lists the frequency shift exciter controls and indicates what they do:

Control	Function
OSCILLATOR TUNING capacitor (C102).	Varies the frequency in the range of 2 to 3.5 and 3.5 to 6 mc. A vernier knob, scale, and lockscrew are associated with the dial to provide and maintain accurate calibration.
BUFFER TUNING capacitor (C110).	Varies the frequency over the range of 2 to 3.5 and 3.5 to 6 mc. A vernier knob, scale and lockscrew are associated with the main tuning dial.
OSCILLATOR RANGE switch.	Selects the frequency range (2 to 3.5 or 3.5 to 6 mc) desired.
SHIFT capacitor (C111).	Varies the oscillator output frequency to obtain an 850-cycle shift of the transmitted space output frequency.
TEST switch (S104).	On MARK, produces a constant mark signal. On NORM, connects input circuit for keying by teletypewriter equipments (mark and space). On SPACE, produces a constant space signal.

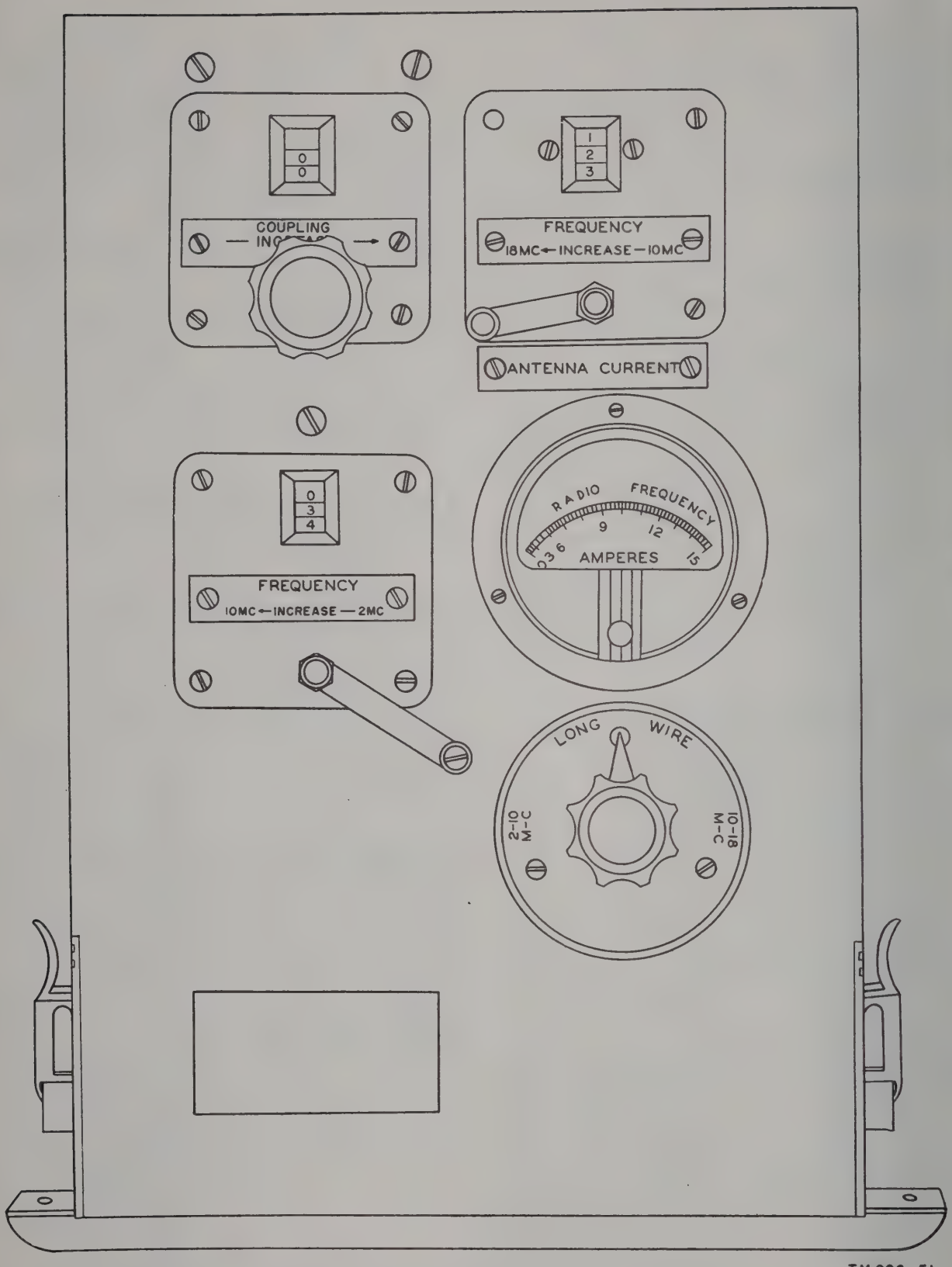


Figure 50. Antenna tuning unit BC–939–B, controls.

Control	Function
TEST OSC switch (S106)	Disconnects B+ voltage from the monitoring section (OFF position). Applies 850-cps signal to the PHONES jack (850~ position).
VOLUME 850~TEST (R132).	Varies the amplitude of the 850-cps oscillation output from the monitor.
OVEN switch (S108)	Applies power to the oven heaters.
OVEN indicator lamp	Indicates when oven heaters are on.
AC SUPPLY switch (S105)	Applies 115-volt, 50–60 cps, a-c power to the frequency-shift exciter.
AC SUPPLY indicating lamp (I 102).	Indicates that a-c power is applied to the exciter.
RF OUTPUT NORMAL jack (J101).	Connects the fixed impedance r-f output of the exciter to a coaxial cable.
ADJ. jack (J102)	Connects the selected output impedance, as determined by the position of switch S103, to a coaxial cable (when a higher-than-normal driving voltage is needed).
850~TEST indicator (V110).	Indicates (by the smallest shadow angle) a zero beat note when adjusting the exciter for 850-cycle shift.

Control	Function
BUFFER INDICATOR lamp (I 101).	Indicates (by maximum brilliance) proper position of the buffer tuning control.
F101 3 AMP and F102 3 AMP fuse.	Protects the exciter from damage due to an overload of the a-c power input.
SEND AND CONTROL jack (J107).	Connects (by *blue* Cord CX–961/TRA–7) the teletypewriter signal circuit between the control unit and the exciter; also the signal control circuit in conjunction with the TEST switch.
LOCAL CW CONTROL jack (J106).	Connects (by *red* Cord CX–961/TRA–7) the disabling circuit of the monitoring receiver and the c-w keying circuit.
FREQUENCY METER IN jack (J105).	Connects output of the radio receiver to the monitoring circuit.
GRD binding post	For grounding the exciter to the shelter ground.
PHONES jack (J104)	Connection for Headset HS–30–(*). Used as an audible indication of the beat note between the 850–cps oscillator and the receiver output.
AC SUPPLY connector (J103).	Connects 115-volt, 50–60 cps, a-c power.

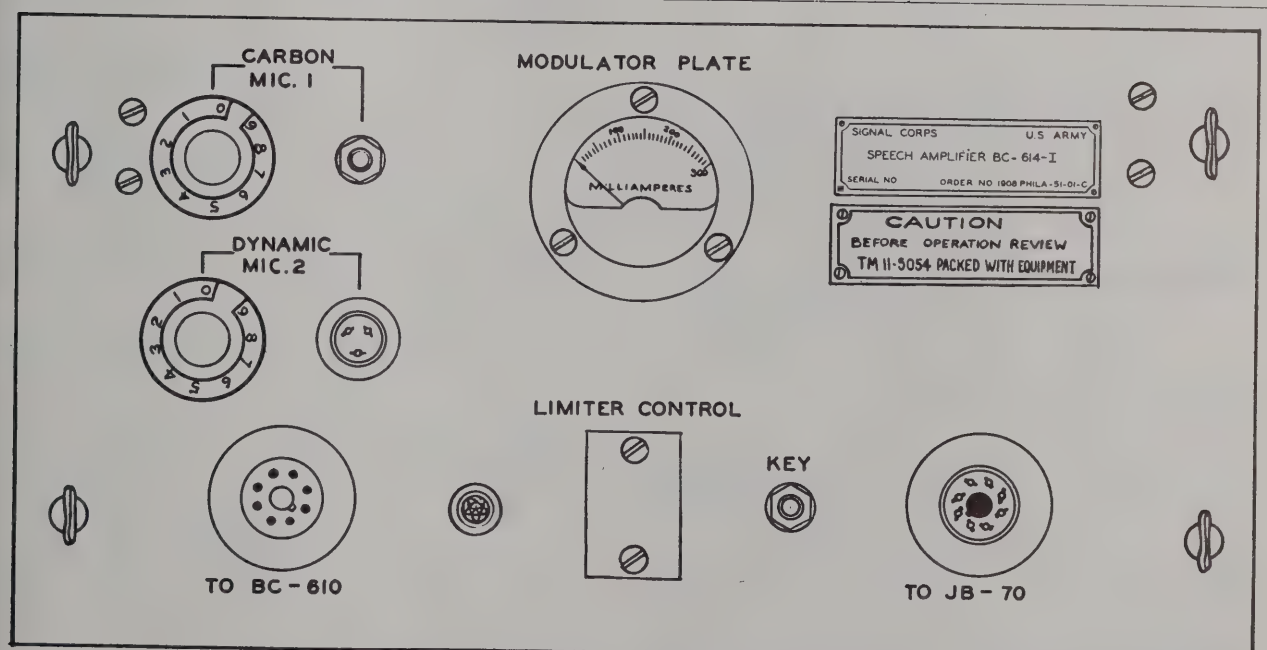


Figure 51. Speech amplifier BC–614–(*) controls.

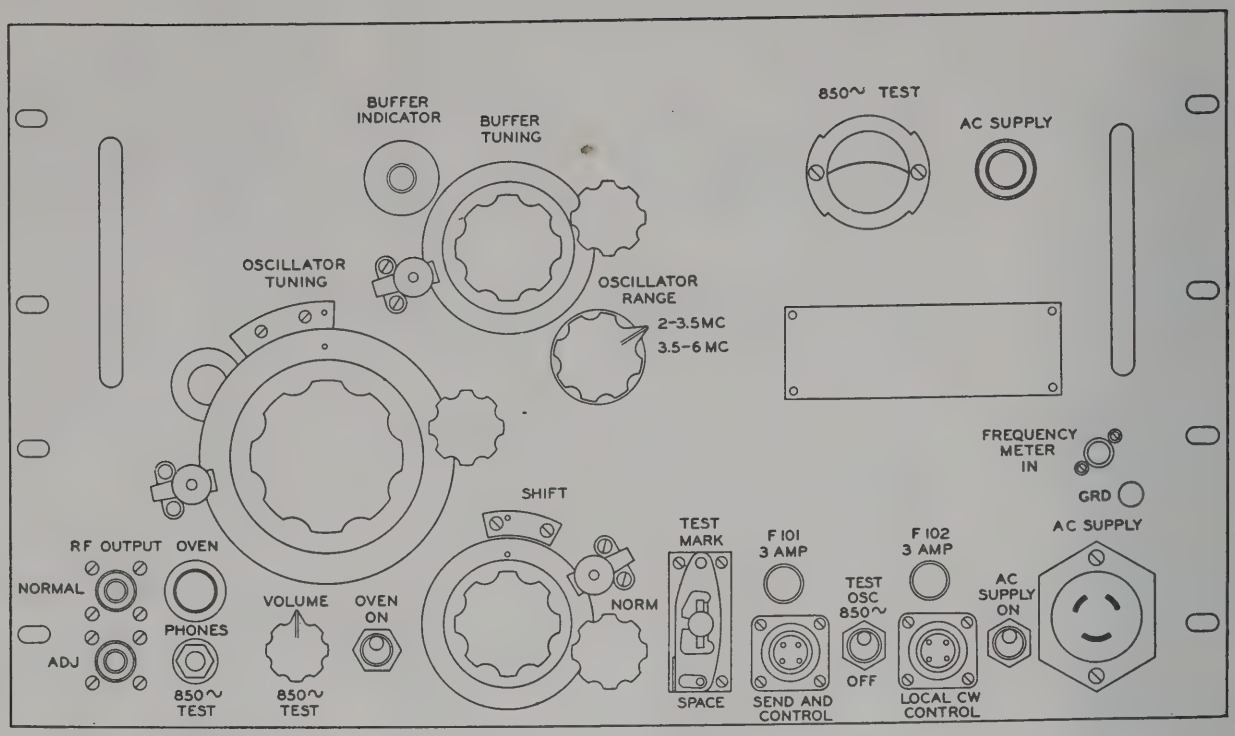


Figure 52. Frequency shift exciter O–39C/TRA–7, controls.

50. Radio Receiver R–388/URR Controls
(fig. 53)

The following table lists the radio receiver controls and indicates what they do:

Control	Function
CRYSTAL FILTER SELECTIVITY switch (S114).	Provides increasing signal selectivity from positions 0 through 4 (greatest selectivity) for reducing interference. (Not used for RTT service.)
PHASING control (C188)	Varies the frequency at which the filter signal rejection is the greatest. (Not used for RTT service.)
METER SWITCH (S117)	Momentary type switch, with INPUT position as normal.
INPUT scale	Indicates in normal position the r-f input of the receiver (S meter).
OUTPUT scale	Indicates the audio output in db relative to a 6 mw (milliwatt) level.
BFO (beat-frequency oscillator) OFF-ON switch (S112).	Energizes the bfo to furnish audible c-w signals (ON position).
BFO PITCH control (in T106).	Varies the pitch of the received c-w signal beat note.
OFF-STANDBY-ON switch (S113).	Disconnects a-c power (OFF position). Connects filament voltage only (STANDBY position). Connects filament voltage and plate voltage to all stages (ON position).
PHONES jack (J103)	Connects headset.
SPEAKER jack (J102)	Connects loudspeaker.
RF GAIN control (R148)	Adjusts r-f signal amplification.
CAL control (C224)	Adjusts 100-kc calibration oscillator for zero beat with a primary frequency standard.
METER ZERO control R140 (fig. 98).	Adjusts meter M101 to zero when meter switch is in the INPUT position, ANTENNA terminals shorted, AVC OFF-ON switch ON, BFO OFF-ON and CALIBRATE OFF-ON switches OFF, and RF GAIN at 10.
ANT TRIM control (C230).	Adjusts antenna tuning trimmer capacitor.

Control	Function
AUDIO GAIN control (R154).	Adjusts audio output level to headset or speaker.
CALIBRATE OFF-ON switch (S118).	Energizes 100-kc calibration oscillator (ON position).
AVC OFF-ON switch (S115).	Energizes avc (automatic volume control) circuit (ON position).
LIMITER OUT-IN switch (S116; in some models, this switch is designated LIMITER OFF-ON).	Reduces noise peaks (IN position).
Meter (M101)	Indicates r-f input signal level or audio output signal level depending on setting of METER INPUT-OUTPUT switch.
BAND CHANGE switch	Selects the mc band (1 through 30 mc) containing the desired frequency.
Main tuning control (below KILOCYCLES).	Selects the frequency within a particular band. (Ten complete revolutions of this knob changes the frequency 1 mc.)
AC SUPPLY jack (P101)	Connector for 115-volt, 50–60 cps, a-c input power cable.
ZERO ADJ knob	Adjusts the tuning control scale to coincide with the index line.

51. Frequency Shift Converter CV–182 (*)/GRC–26A Controls

(fig. 54)

The following table lists the frequency shift converter controls and indicates what they do:

Control	Function
OUTPUT switch (S102) NORMAL-REVERSE.	Reverses the polarity of the mark and space output signals.
MARK-SPACE	Establishes a constant mark or space signal for testing purposes.
A meter (M101)	Measures channel A discriminator output current.
B meter (M102)	Measures the current or voltage of the circuit selected by METER B switch.
METER B switch (S105) INPUT.	Measures voltage applied to the mark-hold circuit.
NEUTRAL	Measures neutral loop current.
POLAR	Measures polar loop current.
CHAN A+B	Measures the combined output current of channels A and B.
CHAN B	Measures the discriminatol output current of channer B.

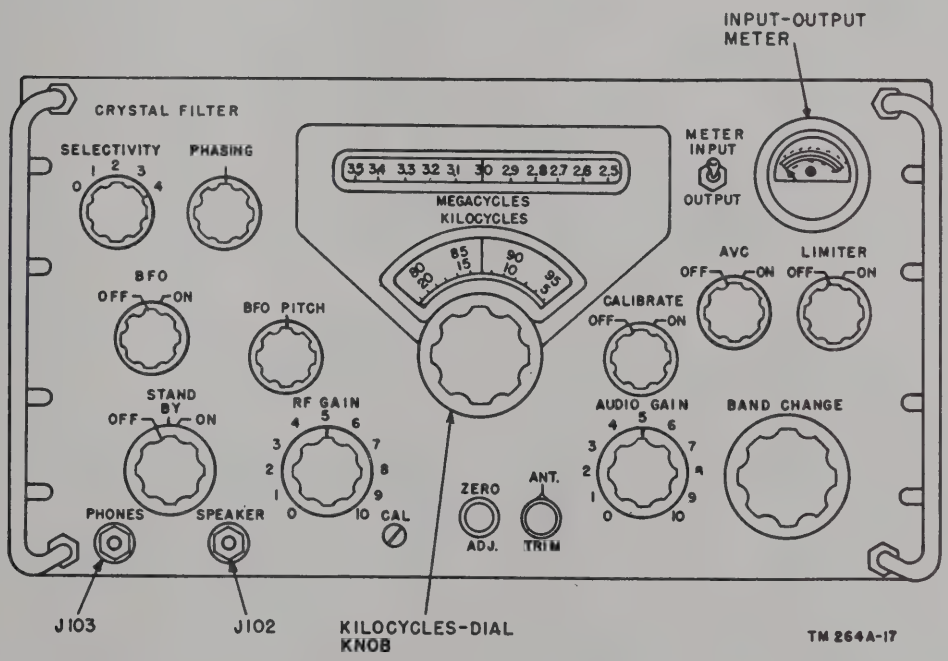


Figure 53. Radio receiver R–388/URR, controls.

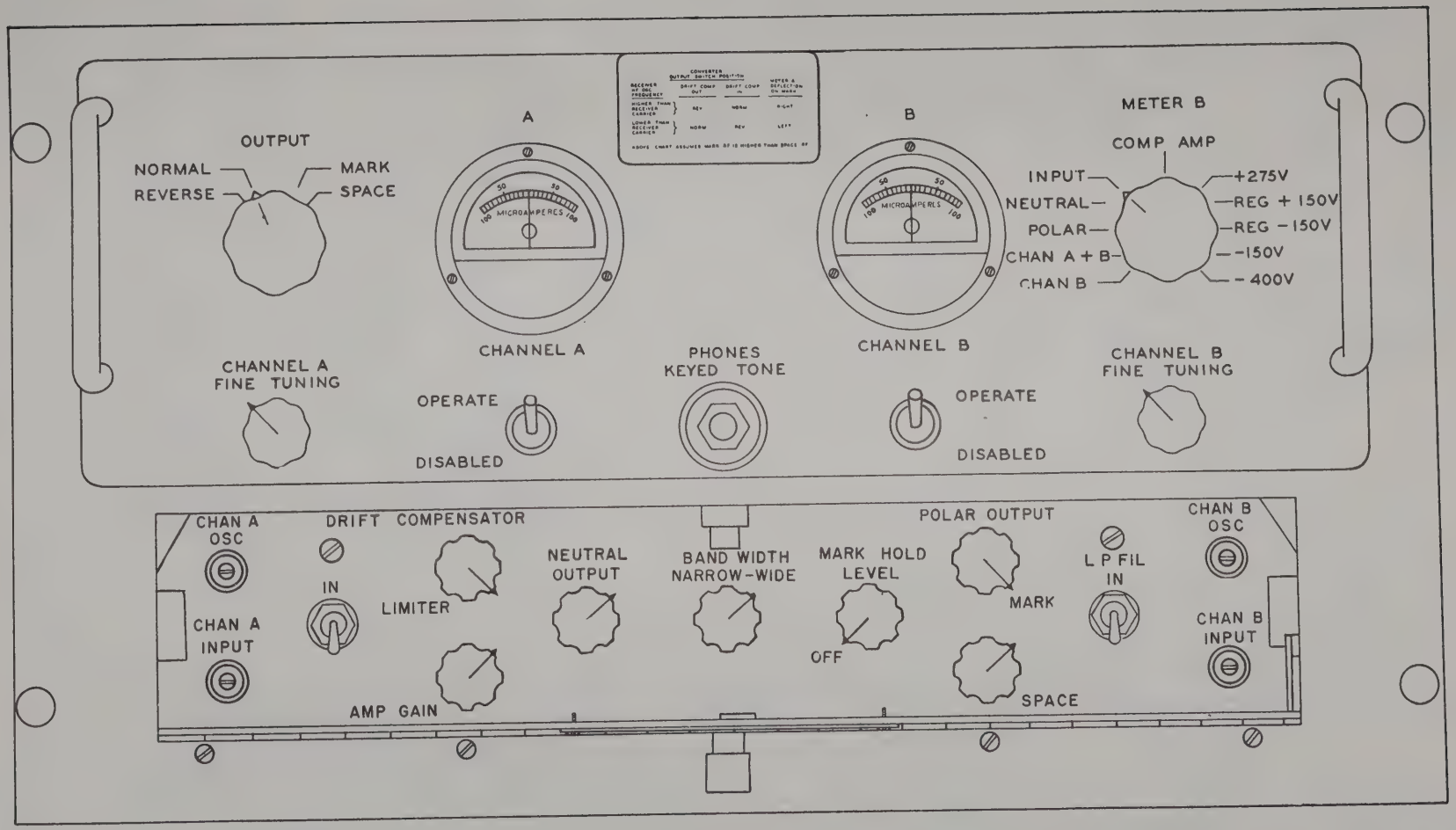


Figure 54. Frequency shift converter CV–182(*)/GRC–26A, controls.

Control	Function
−400V	Measures the voltage of the unregulated −400-volt supply.
−500V	Measures the voltage of the unregulated −150-volt supply.
REG−150V	Measures voltage of the regulated −150-volt supply.
REG +150V	Measures the voltage of the regulated +150-volt supply.
+275V	Measures the voltage of the unregulated +275-volt supply.
COMP AMP	Measures the feedback voltage from the drift compensator circuit.
CHANNEL A FINE TUNING control (C102).	Varies the frequency, very slowly, of the bfo for channel A.
CHANNEL B FINE TUNING control (C104).	Varies the frequency, very slowly, of the bfo for channel B.
CHANNEL A disabling switch (S107) (switch is marked DISABLING on some units).	Disables channel A converter input circuit to permit adjustment of channel B (down position).
CHANNEL B disabling switch (S108) (switch is marked DISABLING on some units).	Disables channel B converter input circuit to permit adjustment of channel A.
PHONES KEYED TONE jack (J105).	Connects headset for audible monitoring of mark signals produced by the converter.
CHAN A OSC control (C105) (screw driver control).	Alines channel A input circuit with i-f output frequency of channel A receiver.
CHAN B OSC control (C106) (screw driver control).	Alines channel B input circuit with i-f output frequency of channel B receiver.
CHAN A INPUT control (C101) (screw driver control).	Varies the resonant frequency of the tuned circuit which is a part of the channel A input signal circuit.
CHAN B INPUT control (C103) (screw driver control).	Varies the resonant frequency of the tuned circuit which is a part of the channel B input signal circuit.
DRIFT COMPENSATOR IN switch (S104).	Switches the drift compensator circuit in or out of the converter circuit.
LIMITER control (R152)	Varies the bias voltage in one section of the limiter tube, preventing lock-in of mark or space signals.
AMP GAIN control (R207)	Varies the magnitude of the signal delivered to the amplifier (drift amplifier circuit) from the discriminator.
NEUTRAL OUTPUT control (R182).	Varies the loop current for a mark signal.
BAND WIDTH switch (S101):	
(NARROW)	Provides a band-pass filter of 1,500 cycles for signals from channel A and B receivers.
(WIDE)	Provides a band-pass filter of 3,000 cycles for signals from channel A and B receivers.
MARK HOLD LEVEL switch (S106) and control (R109).	Connects or disconnects the mark-hold circuit which maintains a marking condition if carrier fails.
*BIAS A (R155) (screw driver control).	Varies grid bias voltage on tube V113.
*BIAS B (R160) (screw driver control).	Varies grid bias voltage on tube V114.
*COMP BAL (R194) (screw driver control).	Varies voltage applied to plate of tube V114.
*COMP AMP (R145) (screw driver control).	Varies grid bias voltage for tube V111.
POLAR OUTPUT:	
(MARK) (R171)	Varies the magnitude of the loop current of the mark signal.
(SPACE) (R174)	Varies the magnitude of the loop current of the space signal.
LP FIL (IN) switch (S103)	Connects two filter capacitors in the discriminator output circuit for reduction of noise.

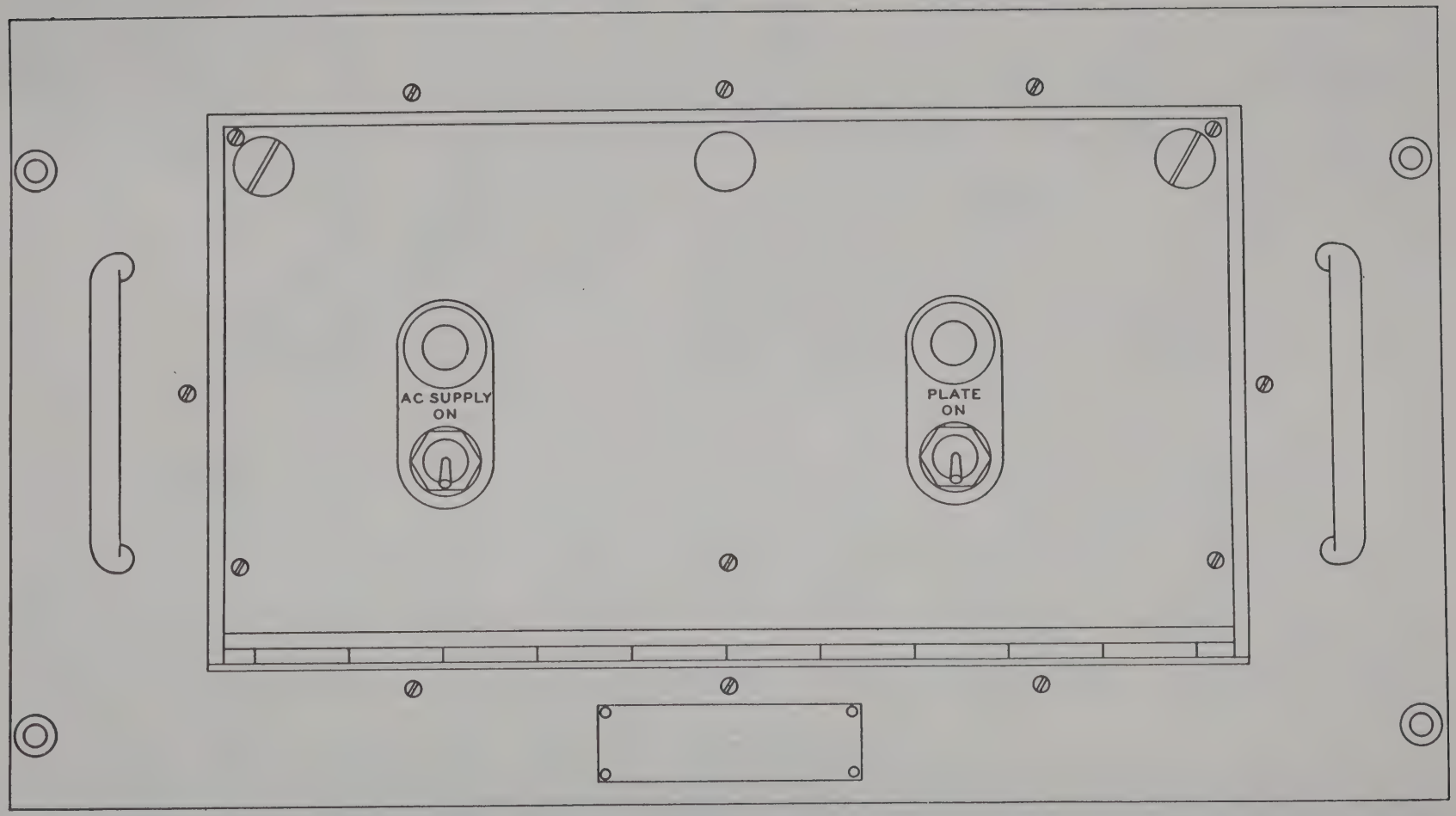
*These controls are located on the under side of the chassis.

52. Power Supply PP–712(*)/GRC–26A Controls

(fig. 55)

The following table lists the power supply controls and indicates what they do:

Control	Function
AC SUPPLY ON switch (S303).	Applies 115-volt, 50–60 cps, a-c input to power supply, converter, and tone oscillator. White lamp indicates when power is applied.
PLATE ON switch (S304)	Applies B+ voltage to the converter. Red lamp indicates when plate voltage is applied.



TM 278-C5-5

Figure 55. Power Supply PP–712(*)/GRC–26A, controls.

53. Radioteletypewriter Control C–808/GRC–26A Controls

(fig. 56)

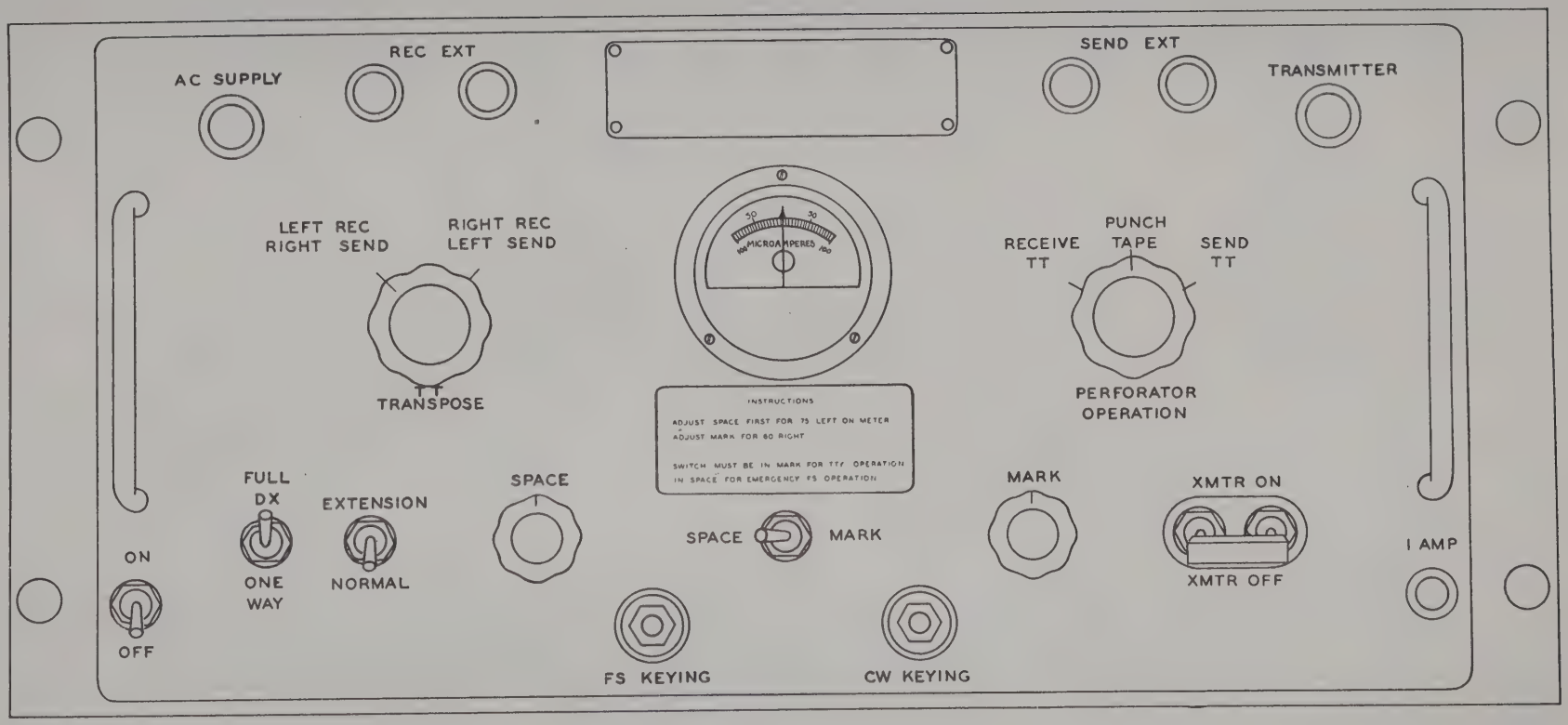
The following table lists the radioteletypewriter controls and indicates what they do:

Control	Function
ON-OFF switch (S7)	Connects or disconnects 115-volt, 50–60 cps, a-c power to the control unit.
FULL DX-ONE WAY switch (S4).	Selects the basis of operation of Radio Set AN/GRC–26A.
EXTENSION-NORMAL switch (S3).	In EXTENSION position, connects the teletypewriter signal circuit to the remote teletypewriter equipment (if used).
	In NORMAL position, connects the teletypewriter signal circuit to the local teletypewriter equipment.
FS KEYING jack (J16)	Connection for frequency-shift keying of the exciter unit.
CW KEYING jack (J9)	Connection for c-w keying of the transmitter.
SPACE-MARK switch (S8)	Selects the mark or space meter circuits.
SPACE control (R3)	Adjusts the output space current.
MARK control (R11)	Adjusts the output mark current.
XMTR ON-XMTR OFF switch (S5 and S6):	
XMTR ON	*Disables* the receiver and *enables* the transmitter. Completes transmitter plate power and exciter plate power circuits.
XMTR OFF	*Disables* the transmitter *enables* the receivers.
1 AMP fuse (F1)	Fuse for a-c power input.
Meter (M1)	Measures the mark and space current for the local teletypewriter circuit.
TT TRANSPOSE switch (S1).	In LEFT REC-RIGHT SEND position, permits incoming messages to be received on left teletypewriter while right teletypewriter is being utilized for sending.
	In RIGHT REC-LEFT SEND position, permits incoming messages to be received on the right teletypewriter while the left teletypewriter is being utilized for sending.
PERFORATOR OPERATION switch (S2).	RECEIVE TT position; permits tape copy of incoming message to be made on perforator-transmitter.
	PUNCH TAPE position; allows independent tape preparation on perforator-transmitter.
	SEND TT position; will permit the perforator-transmitter to make tape copy of the outgoing message from the right or left teletypewriter as selected by TT TRANSPOSE switch S1 or from the perforator-transmitter keyboard.
REC EXT terminals (E1 and E2).	Binding posts for connecting extension lines for polar receiving loop.
SEND EXT terminals (E3 and E4).	Binding posts for connecting extension lines for polar sending loop.
TRANSMITTER indicator lamp (I 1).	Lights when switches S5 and S6 are in the XMTR ON position.

54. Teletypewriter TT–55/MGC Controls

The following table lists the controls of the teletypewriter and indicates what they do:

Control	Function
Operation key SEND	Prepares teletypewriter for sending and receiving.
REC	Prepares teletypewriter for receiving only.
BREAK	Opens d-c loop.
Power switch	Applies a-c power to the drive motor.
Keyboard	Actuates send contacts in accordance with letters and numbers to be sent by manual operation.



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Figure 56. Radioteletypewriter Control C–808/GRC–26A, controls.

55. Teletypewriter TT–4A/TG Controls
(fig. 57)

The following table lists the controls of the teletypewriter and indicates what they do:

Control	Function
VOICE FREQ LINE-D. C. LINE switch.	VOICE FREQ LINE: Connects 20-ma signal to selector magnet from REC. terminals D. C. LINE: Connects 60-ma signal to selector magnet from REC. terminals.
LINE INCREASE control	Sets receiving line current level indicated on D. C. MILLIAMPERES meter (turn clockwise for an increase and counterclockwise for a decrease of current).
ARMATURE dial control	Adjusts selector armature for proper actuation at prevailing line current level.
ARMATURE dial clamp	Locks ARMATURE dial at the selected position.
RANGE dial control	Prevents signal bias and end distortion from causing errors in printing.
RANGE dial clamp	Locks RANGE dial at selected position.
LIGHT switch	Lights or extinguishes panel lamp.
MOTOR FUSE (2 amp)	Protects power motor from damage by power surges or overloads.
LINE FUSE (⅛ amp)	Protects selector magnets from damage by overload.
D. C. MILLIAMPERES meter.	Measures value of the *received* current in full-duplex circuit; measures value of *transmitted* current in a half-duplex circuit when the transmitter contacts are in series with the selector magnet.
MOTOR switch	Applies a-c power to drive motor.
BREAK switch	Opens signal line circuit.

56. Typing Reperforator Controls

The following table lists the controls of the perforator-transmitter and indicates what they do:

Control	Function
MOTOR switch	Applies a-c power to drive motor.
LINE BREAK KEY	Opens signal line circuit.
End of line indicator	Indicates when carriage reaches end of travel.

57. Transmitter-distributor Controls

The following table lists the controls of the transmitter-distributor and indicates what they do:

Control	Function
MOTOR OFF-MOTOR ON	Applies a-c power to the drive motor. Disconnects a-c power to the drive motor.
SEND-STOP switch	Starts and stops tape transmission.
Tight tape stop lever	Stops transmission if tape becomes twisted or if all the slack is taken up in the tape. (Transmission may be stopped manually by pushing lever.)

58. Rectifier RA–87–A Controls
(fig. 58)

The following table lists the controls of Rectifier RA–87–A and indicates what they do:

Control	Function
Power switch	Applies a-c power to the rectifier.
FUSE, F2, ½ amp	Protects selenium rectifier from d-c overload.
FUSE F1, 15 amp (at rear of unit).	Protects transformer from overload.

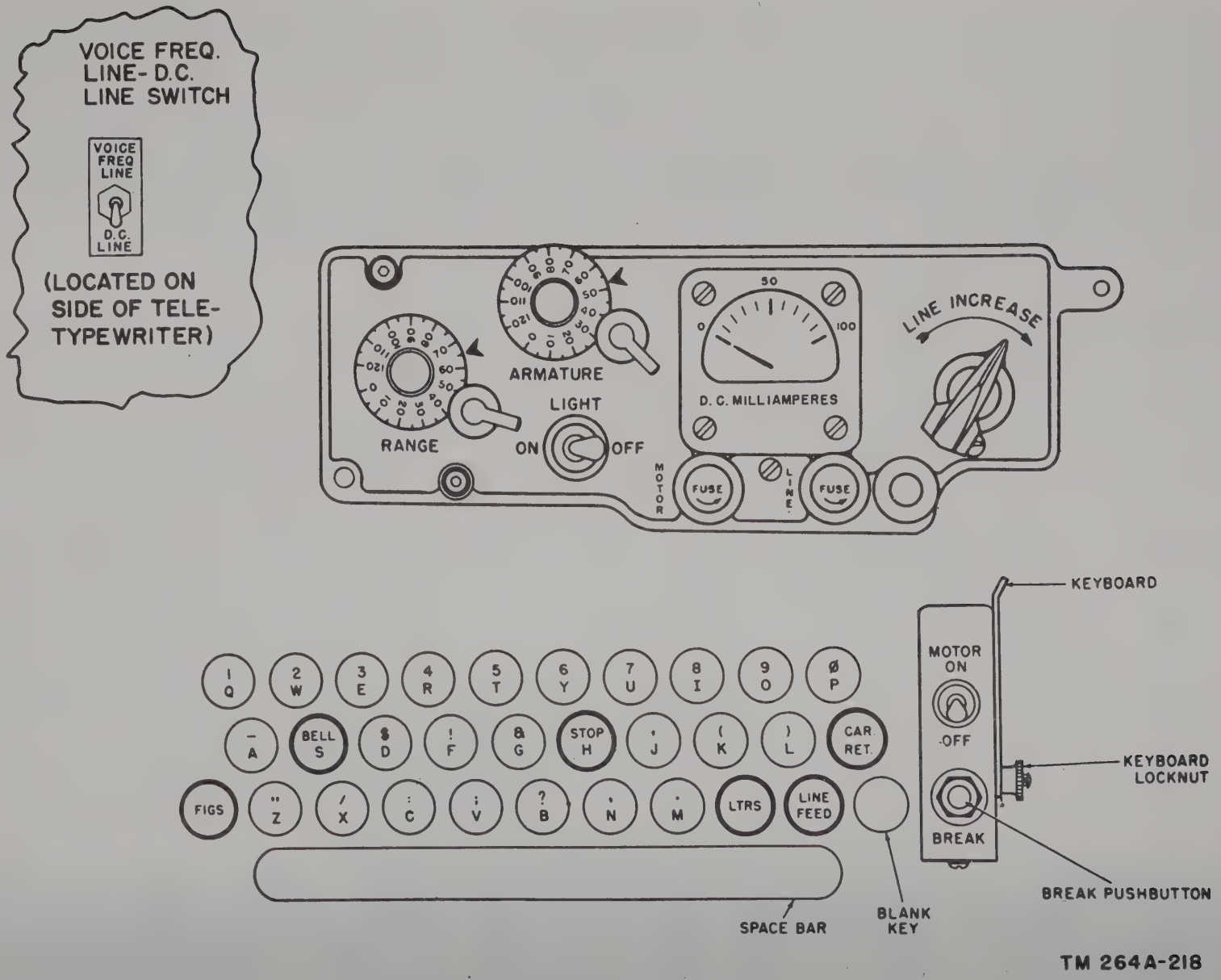


Figure 57. Teletypewriter TT-4A/TG, controls.

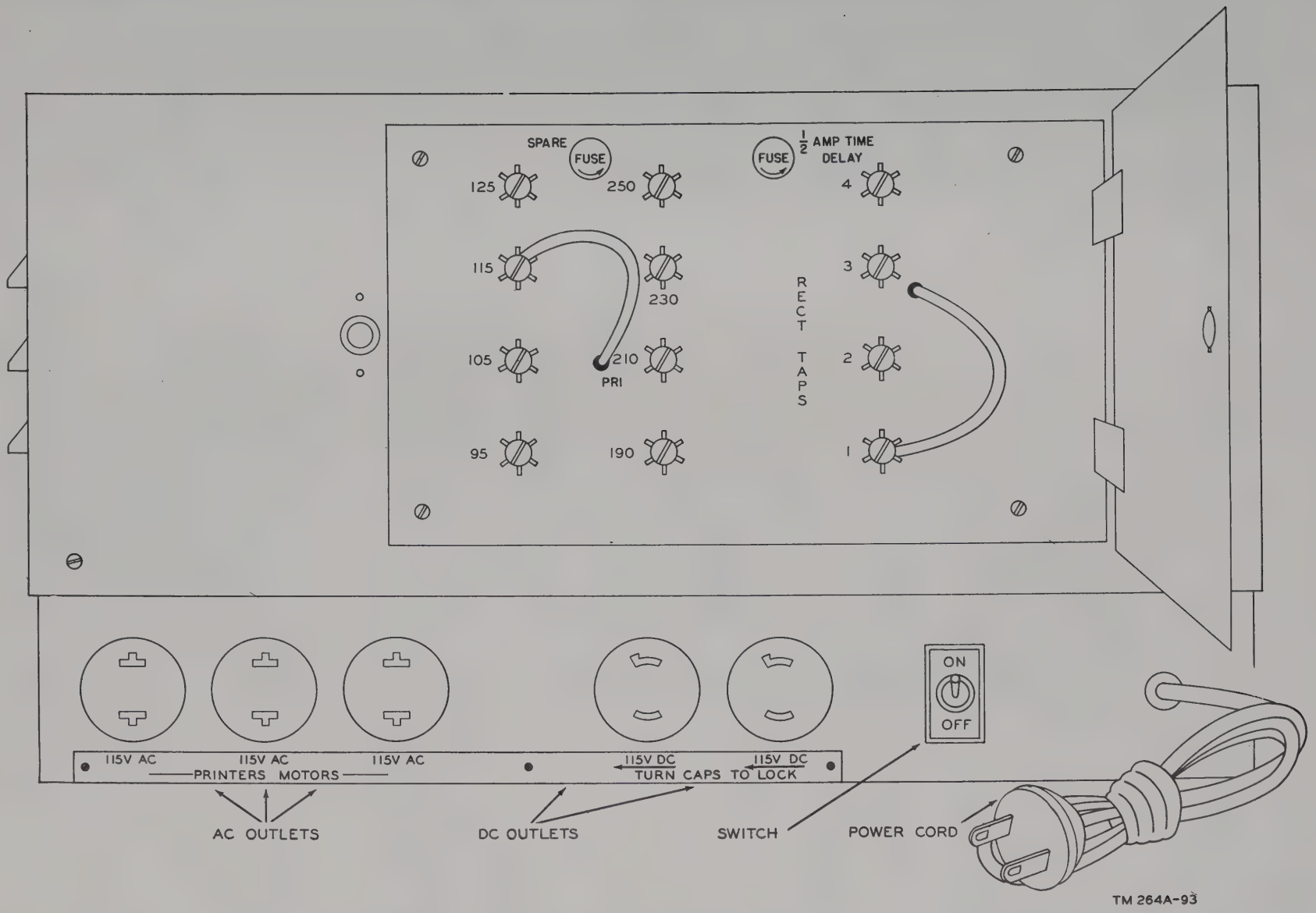


Figure 58. Rectifier RA–87–A controls.

59. Power Unit PE–95–G Controls

(fig. 59).

The following table lists the controls of the power unit and indicates what they do:

Control	Function
AC VOLTS meter	Indicates the output voltage of the generator.
AC AMPERES meter	Indicates the magnitude of the output current of the generator.
FUEL GAUGE indicator	Indicates the amount of gasoline in the supply tank.
BATTERY CHARGE RATE meter.	Indicates the rate of charge or discharge of the battery.
OIL PRESSURE gauge	Indicates the pressure of the oil being applied to the bearings.
WATER TEMPERATURE gauge.	Indicates the temperature of the engine.
RUNNING TIME METER.	Indicates, in hours, the time the engine has been running.
FREQUENCY METER	Indicates the frequency, in cps, of the ac generated.
CIRCUIT BREAKER switch	In the ON position, connects the output of the generator to the load. In the OFF position, disconnects the output of the generator from the load.
MANUAL START-REMOTE START switch.	In the MANUAL START position, the engine is hand cranked until started. In the REMOTE START position, connect the battery to the exciter and the automatic choke through the START button.
START-STOP switch	Depressing START button; connects power to the automatic choke solenoid; closes the circuit from the battery to the exciter through the 12-volt solenoid. The exciter acts as a motor and cranks the engine. Depressing the STOP button operates the stopping relay. The engine ignition is grounded through contacts of this relay.
TROUBLE LAMP outlet	Supplies a connection to the source of 120-volt ac from the generator.
Indicating lamp	Lights when the CIRCUIT BREAKER is in the ON position.

Section II. ADJUSTMENTS

60. General

Before operating Radio Set AN/GRC–26A, check to see that the controls are set as indicated in the table that follows. The procedures in this paragraph are set up to insure that the radio set is capable of sending and receiving r-f signals befoer attempting to operate the teletypewriters. Full-duplex operation is used for these procedures, since both the receiving and transmitting sections of the radio set must be used simultaneously.

Component	Control	Position
Shelter S–69/GRC	Power circuit breaker	OFF.
	Lighting circuit breaker	OFF.
Radio Receiver R–388/URR	OFF STANDBY ON switch	OFF.
	AVC OFF-ON switch	OFF.
	BAND CHANGE switch	Band desired.
	Main tuning knob	Set to desired frequency.
	CALIBRATE OFF-ON switch	OFF.
	BFO OFF-ON switch	OFF.
	BFO PITCH	Set to white mark.
	RF GAIN	Set to zero.
	LIMITER OUT-IN switch	OUT.
	METER INPUT-OUTPUT switch	INPUT.
	CRYSTAL FILTER SELECTIVITY	0.
	PHASING	Set to white line.

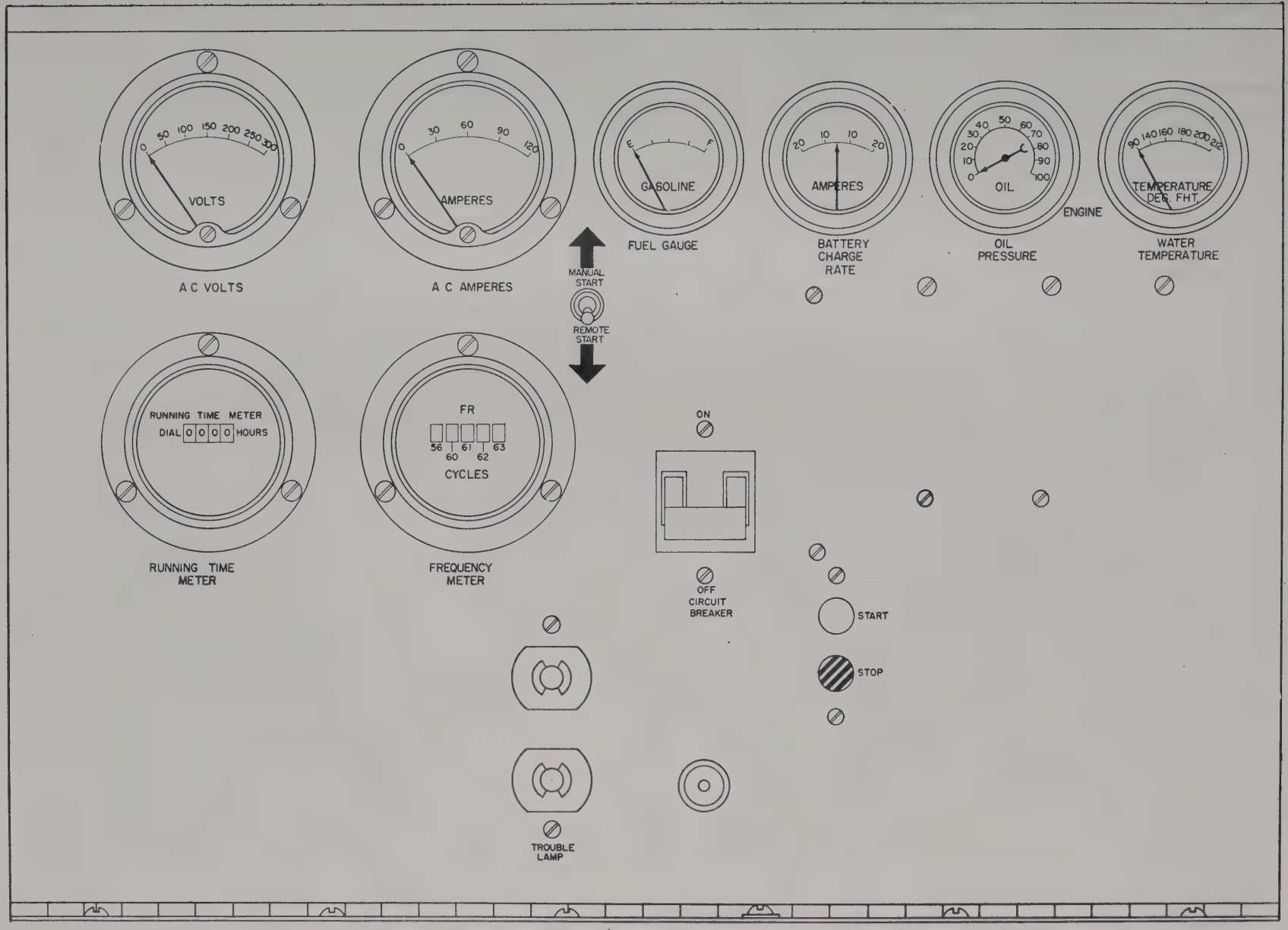


Figure 59. Power unit PE–95–G, controls.

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Component	Control	Position
Frequency Shift Converter CV–182(*)/GRC–26A.	OUTPUT switch	NORMAL.
	METER B switch	INPUT.
	DRIFT COMPENSATOR	Out (down).
	BANDWIDTH switch	NARROW.
	CHANNEL A disabling	OPERATE.
	CHANNEL B disabling	DISABLED.
	NEUTRAL OUTPUT	Full counterclockwise.
	MARK HOLD LEVEL (switch and control)	OFF (full counterclockwise).
	LP FIL switch	Out (down).
Power Supply PP–712(*)/GRC–26A	AC SUPPLY switch	Off (down).
	PLATE switch	Off (down).
Radioteletypewriter Control C–808/GRC–26A	ON–OFF switch	OFF.
	XMTR ON-XMTR OFF	XMTR OFF.
	EXTENSION-NORMAL	NORMAL.
	FULL DX-ONE WAY	FULL DX.
	SPACE-MARK	SPACE.
Teletypewriter TT–55/MGC (if used)	ON-OFF switch	OFF.
Teletypewriter TT–4A/TG (if used)	MOTOR switch	OFF.
	VOICE FREQ LINE-D. C. LINE switch	D. C. LINE.
	LINE INCREASE control	Full counterclockwise.
Typing reperforator Transmitter-distributor	POWER switch	OFF (up).
	MOTOR ON–MOTOR OFF	MOTOR OFF.
Transmitter Distributor	STOP-SEND switch	STOP.
Rectifier RA–87(*)	ON-OFF switch	OFF.
Frequency Shift Exciter O–39(*)/TRA–7	AC SUPPLY switch	Off (down).
	OVEN switch	Off (down).
	TEST OSC 850 ~ switch	OFF.
	TEST switch	NORM.
Radio Transmitter BC–610–(*)	FILAMENT POWER switch	Off (down).
	FILAMENT VOLTAGE control	Full counterclockwise position.
	EXCITER PLATE POWER switch	NORMAL (down).
	HIGH VOLTAGE PROTECT switch	NORMAL (down).
	PLATE POWER switch	Off (down).
	CW-PHONE switch	CW.
	EXCITATION METER switch	INT. AMP. GRID.
	BAND SWITCH	To correspond with band to be used with tuning unit.

61. Starting Procedure

a. Power Unit PE–95–G (fig. 59). Check to see that the fuel gage indicates an adequate supply of fuel and that the oil level in the crankcase comes up to the full mark on the bayonet gage (found under the side panel on the right-hand side of the power unit when facing the radiator). Check the water level in the storage battery; it should be ⅜ inch above the tops of the separators. Place the CIRCUIT BREAKER switch to the OFF position. Be sure that the MANUAL START-REMOTE START switch is in the REMOTE START position. Press the START button in for not more than 20 seconds; the engine should start. Allow at least 10 minutes running time before applying the load by placing the CIRCUIT BREAKER in the ON position.

b. Frequency Shift Exciter O–39(*)/TRA–7 (fig. 52). Turn the OVEN and AC SUPPLY switches to ON, and allow 2 hours for the equipment to reach the proper operating temperature. (If the equipment is required before a 2 hour warm-up period can be completed, careful checks must be made on the transmitted frequency.)

c. Radio Receiver R–388/URR (fig. 53). Turn the OFF-STANDBY-ON switch of both channel A and channel B receivers to STANDBY.

d. Radio Transmitter BC–610–(*) (figs. 48 and 49).

(1) Select from the wall storage cabinet the proper tuning units and the p-a tank coil corresponding to the assigned operating frequency and insert them firmly and carefully into their proper sockets in the transmitter. The tuning unit compartment is under the top right-hand door, and the p-a tank coil compartment is under the top left-hand door. The following chart indicates the tuning units and coils corresponding to the various frequency ranges of the transmitter:

Transmitter tuning unit	Frequency range (mc)
TU–47	2.0 – 2.5
TU–48	2.5 – 3.2
TU–49	3.2 – 4.0
TU–50	4.0 – 5.0
TU–51	5.0 – 6.35
TU–52	6.35– 8.0
TU–53	8.0 –12.0
TU–54	12.0 –18.0
Coil unit	
C–387–D*	2.0 – 2.5
C–387–D	2.5 – 3.5
C–388–C	3.5 – 4.5
C–389–C	4.5 – 5.7
C–390–C	5.7 – 8.0
C–447–B	8.0 –11.0
C–448–B	11.0 –14.0
C–449–B	14.0 –18.0

*Used with capacitor C28.

Caution: Ground the frame of the PA tuning capacitor with a grounding stick before touching the tank coil in the transmitter.

(2) Set the BAND SWITCH on the transmitter front panel to the position corresponding to the channel number into which the tuning unit was inserted.

(3) Set the M. O. XTAL switch on the tuning unit to XTAL.

(4) Insert the plug end of Cord CG–389/U into the XTAL socket of the tuning unit.

(5) Turn the FILAMENT POWER switch to the on (up) position.

(6) Rotate the FILAMENT VOLTAGE control clockwise until an indication of 5 to 5.3 volts ac appears on the FILAMENT VOLTAGE meter. Allow at least 1 minute for warm-up.

e. Power Supply PP–712(*)/GRC–26A (fig. 55).

(1) Turn the two large slotted screws on the front panel one-half turn, grasp the knob in the door and pull forward. Check to see that the input connections of transformers T301 and T302 are both at terminals 1 and 3.

(2) Set the AC SUPPLY switch to the ON position.

(3) Set the PLATE switch to the ON position.

(4) Check to see that both white (filament) and red (plate) pilot lamps are lighted.

f. Frequency Shift Converter CV–182(*)/GRC–26A (fig. 54).

(1) Set the CHANNEL A and CHANNEL B disabling switches to the OPERATE position.

(2) Turn the METER B switch to the following switch positions and observe the meter indications. (Values given are for an input voltage of 115 volts, 50–60 cps, ac. For negative readings, the pointer deflects to the *left;* for positive readings the pointer deflects to the *right.*)

Switch position	Meter reading (volts) (approximate)
+275 v	60±6 (right)
REG+150 v	30±5 (right)
REG−150 v	30±5 (left)
−150 v	30±5 (left)
−400 v	80±8 (left)

g. Radioteletypewriter Control C–808/GRC–26A (fig. 56).

(1) Turn ON-OFF switch to ON.

(2) Check to see that the white pilot lamp is lighted.

h. Rectifier RA–87–(*) (fig. 58.) Turn the ON-OFF switch to the ON position.

i. Teletypewriters TT–55/MGC. Turn the ON-OFF switch to the ON position; the teletypewriters should run closed.

j. Teletypewriters TT–4A/TG (fig. 57).

(1) Turn the MOTOR switch to the ON position.

(2) Adjust the LINE INCREASE CONTROL for an indication of 60 ma on the

D. C. MILLIAMPERES meter. The teletypewriters should run closed.

k. Perforator-Transmitter TT–56/MGC.

(1) Set the typing reperforator MOTOR switch to ON (down).

(2) Set the transmitter distributor MOTOR ON-MOTOR OFF switch to the MOTOR ON position.

l. Antenna Tuning Unit BC–939–B (fig. 50). If a whip antenna is used, set the range switch knob at 2–10MC if operating below 10MC, or at 10–18MC if operating above 10MC. If a long wire antenna is used, set the knob at LONG WIRE. Set the COUPLING control at about 2.0 The white numbers on the control represent digits and the red numbers tenths. From the tuning chart (par. 62), determine the approximate setting of the antenna tuning inductor for the selected frequency. The antenna tuning unit is not used when operating from a doublet antenna.

62. Adjustment of Transmitting Equipment

The frequency of the frequency-shift exciter output must be either the same as, one-half of, or one-quarter of the assigned operating frequency of the radio transmitter as shown in the chart below. With the frequency to be transmitted known, determine the frequency range required for the frequency-shift exciter and the required frequency shift from this chart. The frequency shift of the mark and space signals must be reduced from 850 to 425 cycles when the frequency of the exciter is one-half the assigned transmitter frequency, and to 212.5 cycles when the exciter frequency is one-quarter (.25) of the assigned transmitter frequency. The frequency shift of the transmitted radio frequencies is always 850 cps. Tuning charts for the transmitter and frequency-shift exciter are given at the end of this paragraph.

a. Turn the OSCILLAVOR RANGE switch on the frequency-shift exciter to the frequency range indicated by the calibration chart which is located in a pocket on the right side of the exciter cabinet.

b. Set the OSCILLATOR TUNING, BUFFER TUNING, and the SHIFT dials to the required settings according to the calibration chart. (These are only approximate settings.) In setting the OSCILLATOR TUNING dial, the first two integers are read in the window, and the last two are read on the large dial. For example, if the transmitter operating frequency is 2100 kc, the approximate OSCILLATOR TUNING dial setting is 0704 (refer to tuning charts). Hence, set the numbers 07 to the hairline in the window and 04 on the large dial to the index mark.

c. Adjust the BUFFER TUNING dial to obtain maximum illumination on the BUFFER INDICATOR lamp, with the TEST switch in the MARK position.

Caution: Radio Transmitter BC–610–(*) develops extremely high voltages which are dangerous to life if contacted. The protective electrical interlock switches should not be relied upon. Be sure that the back cover and cover doors are closed before applying plate power. A red bull's-eye pilot lamp, labeled PLATE POWER, on the front panel of the transmitter, indicates when the high voltage supply is turned on. However, since this lamp may burn out, do not rely upon it to show that no high voltage is present. When the transmitter is in operation, extremely high r-f voltages are present around the antenna tuning unit. Make certain that the voltage is off before changing parts and making repairs.

d. Set the EXCITATION METER SWITCH on the front panel of the transmitter at INT. AMP. GRID.

e. Set the EXCITER PLATE POWER switch to on (up).

f. Operate the TEST key on the frequency-shift exciter to the MARK position, and adjust the DOUB. knob of the tuning unit in the transmitter for maximum indication on the EXCITATION METER (1 to 8 ma with the EXCITATION METER SWITCH at the INT. AMP. GRID position).

g. Adjust the INT. AMP. knob of the tuning unit in the transmitter for maximum indication on the EXCITATION METER (60 to 100 ma with the EXCITATION METER SWITCH at the P. A. GRID position).

h. Repeat steps outlined in subparagraphs *c* and *d* above until maximum possible deflection is obtained on the EXCITATION METER.

i. Set the EXCITER PLATE POWER switch to NORMAL (down).

j. Make certain that both doors in the top cover of the transmitter are closed firmly upon the interlock switches; otherwise, plate power cannot be applied. Set the TEST switch on the frequency-shift exciter to NORM.

k. Set the PLATE POWER switch to on (up). This will operate plate relay RY1 and antenna shorting relay RY4. This is accomplished normally during operation by the XMTR ON switch

on Radioteletypewriter Control C–808/GRC–26A, which shorts pins 3 and 4 in socket SO 5. Socket SO 5 is located on the rear of the modulator chassis. The red pilot lamp on the transmitter should light.

l. Set the EXCITER PLATE POWER switch to on (up). This will key the cathode circuit of the m-o stage. All subsequent tuning adjustments are made with the circuit keyed. The P. A. PLATE meter should indicate a flow of current in the circuit. The quantity of current will depend on the setting of the P. A. PLATE TUNING dial and the coupling coil in the final tank coil.

m. Unlock the P. A. PLATE TUNING dial on the transmitter by unscrewing the small bakelite knob. Rotate the dial until the P. A. PLATE meter dips to a *minimum* reading. Lock the P. A. PLATE TUNING dial. Turn the antenna tuning unit inductor crank to approach the chart setting, and watch for an indication of rising plate current on the P. A. PLATE meter on the transmitter.

Note. Fewer turns of the loading coil will be necessary when a long wire antenna is used instead of a whip antenna. Adjust the proper crank for maximum indication of the P. A. PLATE meter. Either increase or decrease the degree of coupling with the COUPLING knob of the antenna tuning unit so that the P. A. PLATE meter reads 100 ma. The ANTENNA CURRENT meter now will give some indication of antenna current.

n. Set the PLATE POWER switch to off (down) before setting the HIGH VOLTAGE PROTECT switch to NORMAL (down). Set the PLATE POWER switch to on (up). The P. A. PLATE meter now will indicate a substantially higher reading.

o. Adjust the antenna tuning unit to a maximum antenna current as indicated by the ANTENNA CURRENT meter when the P. A. PLATE meter reads 290 ma.

Caution: Never exceed a P. A. PLATE meter reading of 290 ma on c-w operation.

p. Check the FILAMENT VOLTAGE meter. If necessary, reset the FILAMENT VOLTAGE knob until this meter reads 5.0 to 5.3 volts.

Transmitter frequency (mc)	Multiplication factor	Exciter frequency (mc)	Frequency shift (cycles)
2 to 4	1	2 to 4	850
4 to 12	.5	2 to 6	425
12 to 18	.25	3 to 4.5	212.5

Table I. Tuning Chart for Transmitting Tuning Unit TU–47

Note. Use plug-in vacuum capacitor C28 between 2 and 2.5 mc.

Operating freq. (kc.)	Xtal freq. (kc.)	Coil unit	Tuning controls			P. A. PLATE TUNING	Antenna Tuning Unit BC–939–B		
			M. O.	DOUB.	INT. AMP.		Band switch position	Coupling	Loading
2000	2000	C–387–D	11	2.4	4.7	20	2–10	4.9	4.6
2050	2050	C–387–D	22	3.2	5.2	30	2–10	4.9	7.1
2100	2100	C–387–D	32	3.8	5.5	39	2–10	5.1	9.4
2150	2150	C–387–D	41	4.3	5.9	47.5	2–10	4.9	11.4
2200	2200	C–387–D	49	4.8	6.3	56.5	2–10	4.8	13.3
2250	2250	C–387–D	57	5.2	6.7	63.5	2–10	4.7	15.1
2300	2300	C–387–D	63	5.6	7.0	70	2–10	4.6	16.8
2350	2350	C–387–D	69	6.0	7.4	77	2–10	4.5	18.3
2400	2400	C–387–D	75	6.3	7.7	83	2–10	4.5	19.8
2450	2450	C–387–D	81	6.7	8.0	88	2–10	4.6	21.3
2500	2500	C–387–D	85	7.0	8.2	94	2–10	4.6	22.6

Table II. Tuning Chart for Transmitter Tuning Unit TU–48

Operating freq. (kc.)	Xtal freq. (kc.)	Coil unit	Tuning controls			P. A. PLATE TUNING	Antenna Tuning Unit BC–939–B		
			M. O.	DOUB.	INT. AMP.		Band switch position	Coupling	Loading
2500	2500	C–387–D	10	0. 7	2. 8	7	2–10	4. 3	22. 6
2550	2550	C–387–D	18	1. 7	3. 4	12. 5	2–10	4. 3	23. 9
2600	2600	C–387–D	26	2. 4	3. 9	17	2–10	4. 3	25. 0
2650	2650	C–387–D	33	3. 1	4. 4	21. 5	2–10	4. 2	26. 2
2700	2700	C–387–D	40	3. 7	4. 9	25. 5	2–10	4. 2	27. 3
2750	2750	C–387–D	46	4. 1	5. 3	29. 0	2–10	4. 2	28. 3
2800	2800	C–387–D	52	4. 5	5. 8	33. 0	2–10	4. 2	29. 3
2850	2850	C–387–D	58	4. 9	6. 1	36. 5	2–10	4. 2	30. 2
2900	2900	C–387–D	63	5. 2	6. 5	40. 5	2–10	4. 5	31. 0
2950	2950	C–387–D	68	5. 6	6. 8	43. 5	2–10	4. 1	32. 0
3000	3000	C–387–D	73	5. 9	7. 2	47. 0	2–10	4. 1	32. 7
3050	3050	C–387–D	78	6. 1	7. 4	50. 0	2–10	4. 1	33. 5
3100	3100	C–387–D	82	6. 4	7. 7	53. 0	2–10	4. 1	34. 2
3150	3150	C–387–D	87	6. 6	7. 9	55. 5	2–10	4. 2	35. 0
3200	3200	C–387–D	90	6. 8	8. 0	58. 3	2–10	4. 2	35. 6

Table III. Tuning Chart for Transmitter Tuning Unit TU–49

Operating freq. (kc.)	Xtal freq. (kc.)	Coil unit	Tuning controls			P. A. PLATE TUNING	Antenna Tuning Unit BC–939–B		
			M. O.	DOUB.	INT. AMP.		Band switch position	Coupling	Loading
3200	3200	C–387–D	25	3. 4	5. 8	58. 5	2–10	4. 2	35. 6
3250	3250	C–387–D	30	3. 8	6. 1	61. 0	2–10	4. 3	36. 3
3300	3300	C–387–D	35	4. 2	6. 3	63. 0	2–10	4. 3	37. 0
3350	3350	C–387–D	40	4. 6	6. 5	65. 5	2–10	4. 5	37. 5
3400	3400	C–387–D	45	4. 9	6. 7	67. 0	2–10	4. 6	38. 2
3450	3450	C–387–D	50	5. 3	6. 9	69. 5	2–10	4. 7	38. 7
3500	3500	C–387–D	55	5. 6	7. 1	71. 5	2–10	5. 1	39. 3
3500	3500	C–388–D	55	5. 6	7. 1	21	2–10	3. 4	38. 9
3550	3550	C–388–D	59	5. 9	7. 3	23. 5	2–10	3. 5	39. 5
3600	3600	C–388–C	64	6. 1	7. 5	26. 5	2–10	3. 5	39. 9
3650	3650	C–388–C	68	6. 4	7. 7	29. 5	2–10	3. 6	40. 4
3700	3700	C–388–C	72	6. 6	7. 9	32	2–10	3. 7	40. 9
3750	3750	C–388–C	75	6. 8	8. 1	35	2–10	3. 8	41. 3
3800	3800	C–388–C	79	7. 0	8. 3	37. 5	2–10	3. 9	41. 7
3850	3850	C–388–C	82	7. 2	8. 5	40. 5	2–10	3. 9	42. 2
3900	3900	C–388–C	85	7. 4	8. 7	43	2–10	4. 0	42. 5
3950	3950	C–388–C	88	7. 6	8. 8	45	2–10	4. 0	42. 9
4000	4000	C–388–C	91	7. 8	8. 9	48	2–10	4. 0	43. 2

Talbe IV. Tuning Chart for Transmitter Tuning Unit TU–50

Operating freq. (kc.)	Xtal freq. (kc.)	Coil unit	Tuning controls			P. A. PLATE TUNING	Antenna Tuning Unit BC–939–B		
			M. O.	DOUB.	INT. AMP.		Band switch position	Coupling	Loading
4000	2000	C–388–C	7	2. 2	3. 5	48	2–10	4. 0	43. 2
4050	2025	C–388–C	13	2. 5	3. 9	50	2–10	4. 0	43. 7
3100	2050	C–388–C	19	2. 9	4. 3	52	2–10	4. 0	44. 0
2150	2075	C–388–C	24	3. 2	4. 6	54. 5	2–10	3. 9	44. 3
4200	2100	C–388–C	29	3. 5	5. 0	56. 5	2–10	3. 9	44. 6
4250	2125	C–388–C	34	3. 8	5. 3	58. 5	2–10	3. 9	44. 9
4300	2150	C–388–C	39	4. 1	5. 6	60. 5	2–10	4. 0	45. 2
4350	2175	C–388–C	44	4. 4	5. 9	62. 5	2–10	4. 0	45. 5
4400	2200	C–388–C	48	4. 6	6. 1	63. 5	2–10	4. 0	45. 8
4450	2225	C–388–C	52	4. 8	6. 4	65. 5	2–10	4. 0	46. 1
4500	2250	C–388–C	56	5. 1	6. 6	67	2–10	4. 0	46. 3
4500	2250	C–389–C	56	5. 1	6. 6	12. 5	2–10	2. 8	46. 2
4550	2275	C–389–C	60	5. 3	6. 8	15	2–10	2. 8	46. 4
4600	2300	C–389–C	64	5. 6	7. 0	17. 5	2–10	2. 9	46. 7
4650	2325	C–389–C	67	5. 8	7. 2	20	2–10	2. 9	46. 9
4700	2350	C–389–C	71	6. 0	7. 3	22	2–10	2. 8	47. 2
4750	2375	C–389–C	74	6. 2	7. 5	24. 5	2–10	2. 9	47. 4
4800	2400	C–389–C	78	6. 4	7. 7	26. 5	2–10	2. 9	47. 6
4850	2425	C–389–C	81	6. 6	7. 8	29	2–10	2. 9	47. 9
4900	2450	C–389–C	84	6. 8	8. 0	31	2–10	2. 9	48. 1
4950	2475	C–389–C	88	7. 0	8. 2	33	2–10	2. 8	48. 3
5000	2500	C–389–C	91	7. 1	8. 4	34. 5	2–10	2. 8	48. 5

TABLE V. *Tuning Chart for Transmitter Tuning Unit TU–51*

Operating freq. (kc.)	Xtal freq. (kc.)	Coil unit	Tuning controls			P. A. PLATE TUNING	Antenna Tuning Unit BC–939–B		
			M. O.	DOUB.	INT. AMP.		Band switch position	Coupling	Loading
5000	2500	C–389–C	5	2. 5	4. 0	35. 5	2–10	2. 8	48. 5
5050	2525	C–389–C	10	2. 8	4. 3	37. 5	2–10	2. 8	48. 7
5100	2550	C–389–C	15	3. 1	4. 6	39. 5	2–10	2. 8	48. 9
5150	2575	C–389–C	19	3. 4	4. 8	41. 5	2–10	2. 8	49. 1
5200	2600	C–389–C	23	3. 7	5. 1	43	2–10	2. 8	49. 3
5250	2625	C–389–C	27	3. 9	5. 3	45	2–10	2. 8	49. 5
5300	2650	C–389–C	31	4. 2	5. 6	47	2–10	2. 8	49. 6
5350	2675	C–389–C	34	4. 4	5. 8	48. 5	2–10	2. 8	49. 8
5400	2700	C–389–C	38	4. 6	6. 0	50. 5	2–10	2. 8	50. 0
5450	2725	C–389–C	41	4. 8	6. 2	52	2–10	2. 8	50. 1
5500	2750	C–389–C	44	5. 0	6. 4	54	2–10	2. 8	50. 4
5550	2775	C–389–C	48	5. 2	6. 6	55. 5	2–10	2. 8	50. 5
5600	2800	C–389–C	51	5. 4	6. 7	57	2–10	2. 8	50. 7
5650	2825	C–389–C	55	5. 5	6. 9	58. 5	2–10	2. 8	50. 9
5700	2850	C–389–C	58	5. 7	7. 1	60	2–10	2. 8	51. 0
5700	2850	C–390–C	58	5. 7	7. 1	21	2–10	2. 2	50. 9
5750	2875	C–390–C	61	5. 9	7. 2	23	2–10	2. 2	51. 0
5800	2900	C–390–C	64	6. 1	7. 4	25	2–10	2. 3	51. 2
5850	2925	C–390–C	66	6. 2	7. 5	26. 5	2–10	2. 2	51. 3
5900	2950	C–390–C	69	6. 4	7. 7	28. 5	2–10	2. 2	51. 4
5950	2975	C–390–C	72	6. 5	7. 8	29. 5	2–10	2. 3	51. 5
6000	3000	C–390–C	74	6. 7	8. 0	31. 5	2–10	2. 3	51. 7
6050	3025	C–390–C	77	6. 8	8. 1	33. 5	2–10	2. 3	51. 9

TABLE V. *Tuning Chart for Transmitter Tuning Unit TU–51*—Continued

Operating freq. (kc.)	Xtal freq. (kc.)	Coil unit	Tuning controls			P. A. PLATE TUNING	Antenna Tuning Unit BC–939–B		
			M. O.	DOUB.	INT. AMP.		Band switch position	Coupling	Loading
6100	3050	C–390–C	79	7. 0	8. 2	35	2–10	2. 3	51. 9
6150	3075	C–390–C	82	7. 1	8. 4	36. 5	2–10	2. 3	52. 0
6200	3100	C–390–C	84	7. 2	8. 5	38. 5	2–10	2. 3	52. 2
6250	3125	C–390–C	87	7. 3	8. 7	40	2–10	2. 3	52. 3
6300	3150	C–390–C	89	7. 5	8. 8	41. 5	2–10	2. 3	52. 5
6350	3175	C–390–C	90	7. 5	8. 9	43. 5	2–10	2. 3	52. 5

Table VI. Tuning Chart for Transmitter Tuning Unit TU–52

Operating freq. (kc.)	Xtal freq. (kc.)	Coil unit	Tuning controls			P. A. PLATE TUNING	Antenna Tuning Unit BC–939–B		
			M. O.	DOUB.	INT. AMP.		Band switch position	Coupling	Loading
6350	3175	C–390–C	8	4. 4	2. 8	43. 5	2–10	2. 3	52. 5
6400	3200	C–390–C	10	4. 6	3. 5	45	2–10	2. 2	52. 7
6500	3250	C–390–C	17	5. 0	3. 8	47. 5	2–10	2. 2	53. 0
6600	3300	C–390–C	23	5. 4	4. 2	50. 5	2–10	2. 2	53. 1
6700	3350	C–390–C	29	5. 8	4. 7	53	2–10	2. 2	53. 4
6800	3400	C–390–C	35	6. 1	5. 1	55	2–10	2. 2	53. 6
6900	3450	C–390–C	41	6. 4	5. 6	58	2–10	2. 2	53. 7
7000	3500	C–390–C	47	6. 6	6. 0	60. 5	2–10	2. 2	54. 0
7100	3550	C–390–C	52	6. 9	6. 4	63	2–10	2. 2	54. 2
7200	3600	C–390–C	57	7. 1	6. 8	65	2–10	2. 2	54. 4
7300	3650	C–390–C	62	7. 3	7. 1	67	2–10	2. 2	54. 5
7400	3700	C–390–C	67	7. 5	7. 4	69	2–10	2. 2	54. 7
7500	3750	C–390–C	71	7. 7	7. 7	71	2–10	2. 2	54. 9
7600	3800	C–390–C	75	7. 9	8. 0	72. 5	2–10	2. 2	55. 1
7700	3850	C–390–C	79	8. 1	8. 2	74. 5	2–10	2. 2	55. 2
7800	3900	C–390–C	83	8. 3	8. 4	76	2–10	2. 2	55. 4
7900	3950	C–390–C	87	8. 4	8. 6	77. 5	2–10	2. 2	55. 5
8000	4000	C–390–C	91	8. 5	8. 8	78. 5	2–10	2. 2	55. 7

Table VII. Tuning Chart for Transmitter Tuning Unit TU–53

Operating freq. (kc.)	Xtal freq. (kc.)	Coil unit	Tuning controls			P. A. PLATE TUNING	Antenna Tuning Unit BC–939–B		
			M. O.	DOUB.	INT. AMP.		Band switch position	Coupling	Loading
8000	4000	C–447–B	6	1. 5	1. 5	20. 5	2–10	1. 5	55. 5
8100	4050	C–447–B	9	1. 8	1. 8	23. 5	2–10	1. 5	55. 7
8200	4100	C–447–B	13	2. 0	2. 0	26	2–10	1. 5	55. 9
8300	4150	C–447–B	16	2. 3	2. 3	28. 5	2–10	1. 5	56. 1
8400	4200	C–447–B	19	2. 6	2. 6	31	2–10	1. 5	56. 1
8500	4250	C–447–B	23	2. 8	2. 8	33. 5	2–10	1. 5	56. 2
8600	4300	C–447–B	26	3. 1	3. 1	36	2–10	1. 5	56. 4
8700	4350	C–447–B	29	3. 3	3. 3	38. 5	2–10	1. 5	56. 5
8800	4400	C–447–B	32	3. 6	3. 6	41	2–10	1. 5	56. 7
8900	4450	C–447–B	35	3. 8	3. 8	43	2–10	1. 5	56. 8
9000	4500	C–447–B	38	4. 0	4. 0	45. 5	2. 10	1. 5	57. 1
9100	4550	C–447–B	41	4. 2	4. 2	47. 5	2. 10	1. 5	57. 3
9200	4600	C–447–B	43	4. 3	4. 3	49. 5	2–10	1. 5	57. 4
9300	4650	C–447–B	46	4. 5	4. 5	52	2–10	1. 5	57. 5
9400	4700	C–447–B	49	4. 7	4. 7	53. 5	2–10	1. 5	57. 7
9500	4750	C–447–B	51	4. 9	4. 9	55. 5	2–10	1. 5	57. 7
9600	4800	C–447–B	53	5. 1	5. 1	57. 5	2–10	1. 5	57. 8
9700	4850	C–447–B	55	5. 3	5. 3	59	2–10	1. 5	58. 0
9800	4900	C–447–B	57	5. 4	5. 4	60. 5	2–10	1. 4	58. 3
9900	4950	C–447–B	59	5. 6	5. 6	63	2–10	1. 4	58. 4
10,000	5000	C–447–B	61	5. 7	5. 7	64. 5	2–10	1. 4	58. 5
10,000	5000	C–447–B	61	5. 7	5. 7	64. 5	10–18	1. 1	[a] 2. 5
10,100	5050	C–447–B	63	5. 8	5. 8	65. 5	10–18	1. 1	[a] 2. 7
10,200	5100	C–447–B	65	6. 0	6. 0	67	10–18	1. 1	[a] 3. 0
10,300	5150	C–447–B	67	6. 2	6. 2	68. 5	10–18	1. 1	[a] 3. 4
10,400	5200	C–447–B	68	6. 3	6. 3	70	10–18	1. 1	[a] 3. 7
10,500	5250	C–447–B	70	6. 4	6. 4	71. 5	10–18	1. 1	[a] 4. 0
10,600	5300	C–447–B	72	6. 6	6. 6	72. 5	10–18	1. 1	[a] 4. 5
10,700	5350	C–447–B	73	6. 7	6. 7	74	10–18	1. 1	[a] 4. 7
10,800	5400	C–447–B	75	6. 8	6. 8	75	10–18	1. 1	[a] 5. 0
10,900	5450	C–447–B	76	7. 0	7. 0	76. 5	10–18	1. 1	[a] 5. 3
11,000	5500	C–447–B	78	7. 1	7. 1	77. 5	10–18	1. 1	[a] 5. 7
11,000	5500	C–448–B	78	7. 1	7. 1	37	10–18	1. 2	[a] 5. 6
11,100	5550	C–448–B	79	7. 2	7. 2	39	10–18	1. 2	[a] 5. 8
11,200	5600	C–448–B	81	7. 3	7. 3	40. 5	10–18	1. 2	[a] 6. 1
11,300	5650	C–448–B	82	7. 4	7. 4	42. 5	10–18	1. 2	[a] 6. 5
11,400	5700	C–448–B	83	7. 5	7. 5	44. 5	10–18	1. 2	[a] 6. 7
11,500	5750	C–448–B	84	7. 6	7. 6	46	10–18	1. 2	[a] 7. 0
11,600	5800	C–448–B	85	7. 7	7. 7	48	10–18	1. 2	[a] 7. 1
11,700	5850	C–448–B	86	7. 8	7. 8	49. 5	10–18	1. 2	[a] 7. 4
11,800	5900	C–448–B	87	7. 9	7. 9	51	10–18	1. 2	[a] 7. 7
11,900	5950	C–448–B	88	8. 0	8. 0	52. 5	10. 18	1. 2	[a] 7. 9
12,000	6000	C–448–B	90	8. 1	8. 1	54. 5	10–18	1. 2	[a] 8. 1

[a] Set 10 MC–FREQUENCY INCREASE–2 MC loading coil dial at 30.

Table VIII. Tuning Chart for Transmitter Tuning Unit TU–54

Operating freq. (kc.)	Xtal freq. (kc.)	Coil unit	Tuning controls			P. A. PLATE TUNING	Antenna Tuning Unit BC–939–B		
			M. O.	DOUB.	INT. AMP.		Band switch position	Coupling	Loading
12,000	3000	C–448–B	6	0. 3	1. 1	54. 5	10–18	1. 2	[a] 8. 1
12,100	3025	C–448–B	9	. 4	1. 4	55. 5	10–18	1. 2	[a] 8. 4
12,200	3050	C–448–B	12	. 6	1. 6	57	10. 18	1. 1	[a] 8. 6
12,300	3075	C–448–B	14	. 8	1. 8	58. 5	10–18	1. 1	[a] 8. 8
12,400	3100	C–448–B	17	1. 0	2. 1	60	10–18	1. 1	[a] 9. 0
12,500	3125	C–448–B	19	1. 2	2. 3	61	10–18	1. 1	[a] 9. 2
12,600	3150	C–448–B	21	1. 4	2. 5	62. 5	10–18	1. 1	[a] 9. 5
12,700	3175	C–448–B	23	1. 5	2. 7	64	10–18	1. 1	[a] 9. 8
12,800	3200	C–448–B	25	1. 7	2. 9	65	10–18	1. 1	[a] 9. 9
12,900	3225	C–448–B	27	1. 8	3. 1	66. 5	10–18	1. 1	[a] 10. 0
13,000	3250	C–448–B	29	1. 9	3. 2	67. 5	10–18	1. 1	[a] 10. 3
13,100	3275	C–448–B	31	2. 1	3. 3	69	10–18	1. 1	[a] 10. 4
13,200	3300	C–448–B	33	2. 2	3. 5	70	10–18	1. 1	[a] 10. 7
13,300	3325	C–448–B	35	2. 4	3. 7	71	10–18	1. 1	[a] 10. 8
13,400	3350	C–448–B	37	2. 5	3. 8	72	10–18	1. 1	[a] 11. 0
13,500	3375	C–448–B	38	2. 6	4. 0	73	10–18	1. 1	[a] 11. 2
13,600	3400	C–448–B	40	2. 7	4. 1	74. 5	10–18	1. 1	[a] 11. 3
13,700	3425	C–448–B	41	2. 8	4. 3	75	10–18	1. 1	[a] 11. 6
13,800	3450	C–448–B	43	3. 0	4. 4	76. 5	10–18	1. 1	[a] 11. 6
13,900	3475	C–448–B	45	3. 1	4. 5	77	10–18	1. 0	[a] 11. 8
14,000	3500	C–448–B	46	3. 2	4. 6	78	10–18	1. 0	[a] 11. 9
14,000	3500	C–449–B	46	3. 2	4. 6	37. 5	10–18	1. 1	[a] 12. 0
14,200	3550	C–449–B	49	3. 4	4. 8	40. 5	10–18	1. 1	[a] 12. 3
14,400	3600	C–449–B	52	3. 6	5. 1	43	10–18	1. 1	[a] 12. 4
14,600	3650	C–449–B	55	3. 8	5. 3	46	10–18	1. 1	[a] 12. 8
14,800	3700	C–449–B	58	3. 9	5. 5	48. 5	10–18	1. 1	[a] 13. 0
15,000	3750	C–449–B	61	4. 1	5. 7	52. 5	10–18	1. 1	[a] 13. 2
15,200	3800	C–449–B	63	4. 3	5. 8	54. 5	10–18	1. 1	[a] 13. 6
15,400	3850	C–449–B	65	4. 5	6. 1	57	10–18	1. 0	[a] 13. 8
15,600	3900	C–449–B	68	4. 7	6. 2	59	10–18	1. 0	[a] 14. 2
15,800	3950	C–449–B	70	4. 8	6. 4	61. 5	10–18	1. 0	[a] 14. 2
16,000	4000	C–449–B	72	5. 0	6. 6	63	10–18	1. 0	[a] 14. 4
16,200	4050	C–449–B	74	5. 2	6. 7	65	10–18	1. 0	[a] 14. 6
16,400	4100	C–449–B	76	5. 3	6. 8	67	10–18	. 9	[a] 14. 7
16,600	4150	C–449–B	78	5. 5	6. 9	69	10–18	. 9	[a] 14. 7
16,800	4200	C–449–B	80	5. 6	7. 1	71	10–18	. 8	[a] 14. 9
17,000	4250	C–449–B	82	5. 7	7. 2	73	10–18	. 8	[a] 15. 1
17,200	4300	C–449–B	84	5. 8	7. 4	75	10–18	. 8	[a] 15. 4
17,400	4350	C–449–B	85	5. 9	7. 5	76. 5	10–18	. 7	[a] 15. 4
17,600	4400	C–449–B	87	6. 1	7. 7	77	10–18	. 5	[a] 15. 6
17,800	4450	C–449–B	89	6. 2	7. 9	80	10–18	. 4	[a] 16. 0
18,000	4500	C–449–B	91	. 6. 3	8. 1	82	10–18	. 4	16. 3

[a] Set 10 MC-FREQUENCY INCREASE-2 MC loading coil dial at 30.

Table IX. Crystals and Operating Frequencies

GROUP I

Xtal freq. (kc.)	Operating freq. (kc.)	Tuning unit	Operating freq. (kc.)	Tuning unit	Operating freq. (kc.)	Tuning unit
2030	2030	TU–47	4060	TU–50		
2045	2045	TU–47	4090	TU–50		
2065	2065	TU–47	4130	TU–50		
2105	2105	TU–47	4210	TU–50		
2105	2105	TU–47	4210	TU–50		
2125	2125	TU–47	4250	TU–50		
2145	2145	TU–47	4290	TU–50		
2155	2155	TU–47	4310	TU–50		
2220	2220	TU–47	4440	TU–50		
2258	2258	TU–47	4516	TU–50		
2260	2260	TU–47	4520	TU–50		
2282.5	2282. 5	TU–47	4565	TU–50		
2290	2290	TU–47	4580	TU–50		
2300	2300	TU–47	4600	TU–50		
2305	2305	TU–47	4610	TU–50		
2320	2320	TU–47	4640	TU–50		
2360	2360	TU–47	4720	TU–50		
2390	2390	TU–47	4780	TU–50		
2415	2415	TU–47	4830	TU–50		
2435	2435	TU–47	4870	TU–50		
2442.5	2442. 5	TU–47	4885	TU–50		
2532.5	2532. 5	TU–48	5065	TU–51		
2545	2545	TU–48	5090	TU–51		
2557.5	2557. 5	TU–48	5115	TU–51		
3202.5	3202. 5	TU–49	6405	TU–52	12, 810	TU–54
3215	3215	TU–49	6430	TU–52	12, 860	TU–54
3237.5	3237. 5	TU–49	6475	TU–52	12, 950	TU–54
3250	3250	TU–49	6500	TU–52	13, 000	TU–54
3322.5	3322. 5	TU–49	6645	TU–52	13, 290	TU–54
3510	3510	TU–49	7020	TU–52	14, 040	TU–54
3520	3520	TU–49	7040	TU–52	14, 080	TU–54
3550	3550	TU–49	7100	TU–52	14, 200	TU–54
3570	3570	TU–49	7140	TU–52	14, 280	TU–45
3580	3580	TU–49	7160	TU–52	14, 320	TU–54
3945	3945	TU–49	7890	TU–52	15, 780	TU–54
3955	3955	TU–49	7910	TU–52	15, 820	TU–54

Table IX. Crystals and Operating Frequencies—Continued

GROUP II

Xtal freq. (kc.)	Operating freq. (kc.)	Tuning unit	Operating freq. (kc.)	Tuning unit	Operating freq. (kc.)	Tuning unit
2030	2030	TU–47	4060	TU–50		
2052.5	2052. 5	TU–47	4105	TU–50		
2085	2085	TU–47	4170	TU–50		
2117.5	2117. 5	TU–47	4235	TU–50		
2160	2160	TU–47	4320	TU–50		
2200	2200	TU–47	4400	TU–50		
2217.5	2217. 5	TU–47	4435	TU–50		
2390	2390	TU–47	4780	TU–50		
2415	2415	TU–47	4830	TU–50		
2436	2436	TU–47	4872	TU–50		
2532.5	2532. 5	TU–48	5065	TU–51		
2647.5	2647. 5	TU–48	5295	TU–51		
2772	2772	TU–48	5544	TU–51		
2980	2980	TU–48	5960	TU–51		
3000	3000	TU–48	6000	TU–51	12, 000	TU–54
3035	3035	TU–48	6070	TU–51	12, 140	TU–54
3100	3100	TU–48	6200	TU–51	12, 400	TU–54
3120	3120	TU–48	6240	TU–51	12, 480	TU–54
3150	3150	TU–48	6300	TU–51	12, 600	TU–54
3155	3155	TU–48	6310	TU–51	12, 620	TU–54
3232.5	3232. 5	TU–49	6465	TU–52	12, 930	TU–54
3265	3265	TU–49	6530	TU–52	13, 060	TU–54
3322.5	3322. 5	TU–49	6645	TU–52	13, 290	TU–54
3417.5	3417. 5	TU–49	6835	TU–52	13, 670	TU–54
3475	3475	TU–49	6950	TU–52	13, 900	TU–54
3588	3588	TU–49	7176	TU–52	14, 352	TU–54
3665	3665	TU–49	7330	TU–52	14, 660	TU–54
3725	3725	TU–49	7450	TU–52	14, 900	TU–54
3785	3785	TU–49	7570	TU–52	15, 410	TU–54
3792.5	3792. 5	TU–49	7585	TU–52	15, 170	TU–54
3850	3850	TU–49	7700	TU–52	15, 400	TU–54
3865	3865	TU–49	7730	TU–52	15, 460	TU–54
3905	3905	TU–49	7810	TU–52	15, 620	TU–54
3935	3935	TU–49	7870	TU–52	15, 740	TU–54
3995	3995	TU–49	7990	TU–52	15, 980	TU–54
3997.5	3997. 5	TU–49	7995	TU–52	15, 990	TU–54

Table X. Calculation Chart for Frequency Shift Exciter O–39(*)/TRA–7

Note.—The settings for the SHIFT dial are different for each unit.

Radio transmitter operating freq in kc.	Exciter freq in kc.	Osc range switch position (mc.)	Approx osc dial setting	Approx buffer dial set ting	Shift dial setting	Freq shift in cyc
2000	2000	2–3. 5	0454	3. 1		850
2050	2050	2–3. 5	0579	6. 3		850
2100	2100	2–3. 5	0704	8. 8		850
2150	2150	2–3. 5	0830	12. 2		850
2200	2200	2–3. 5	0955	14. 8		850
2250	2250	2–3. 5	1080	17. 2		850
2300	2300	2–3. 5	1206	19. 8		850
2350	2350	2–3. 5	1332	22. 5		850
2400	2400	2–3. 5	1457	24. 7		850
2450	2450	2–3. 5	1583	26. 9		850
2500	2500	2–3. 5	1708	29. 0		850
2550	2550	2–3. 5	1834	31. 6		850
2600	2600	2–3. 5	1960	33. 1		850
2650	2650	2–3. 5	2085	35. 7		850
2700	2700	2–3. 5	2211	37. 9		850
2750	2750	2–3. 5	2337	40. 0		850
2800	2800	2–3. 5	2462	42. 3		850
2850	2850	2–3. 5	2588	43. 0		850
2900	2900	2–3. 5	2714	46. 6		850
2950	2950	2–3. 5	2839	48. 2		850
3000	3000	2–3. 5	2960	50. 0		850
3050	3050	2–3. 5	3082	52. 3		850
3100	3100	2–3. 5	3208	54. 5		850
3150	3150	2–3. 5	3324	56. 3		850
3200	3200	2–3. 5	3460	58. 3		850
3250	3250	2–3. 5	3585	60. 6		850
3300	3300	2–3. 5	3712	62. 3		850
3350	3350	2–3. 5	3837	64. 3		850
3400	3400	2–3. 5	3963	67. 1		850
3450	3450	2–3. 5	4089	68. 2		850
3500	3500	2–3. 5	4215	69. 9		850
3500	3500	3–5–6	0324	3. 1		850
3550	3550	3. 5–6	0399	5. 4		850
3600	3600	3. 5–6	0475	7. 6		850
3650	3650	3. 5–6	0550	9. 3		850
3700	3700	3. 5–6	0626	11. 3		850
3750	3750	3. 5–6	0701	13. 0		850
3800	3800	3. 5–6	0777	14. 8		850
3850	3850	3. 5–6	0852	16. 5		850
3900	3900	3. 5–6	0928	18. 2		850
3950	3950	3. 5–6	1003	20. 0		850
4000	4000	3. 5–6	1079	21. 7		850
4000	2000	2–3. 5	0454	3. 1		425
4050	2025	2–3. 5	0517	4. 8		425
4100	2050	2–3. 5	0579	6. 3		425
4150	2075	2–3. 5	0642	7. 6		425
4200	2100	2–3. 5	0704	8. 8		425
4250	2125	2–3. 5	0767	10. 5		425
4300	2150	2–3. 5	0830	12. 2		425
4350	2175	2–3. 5	0893	13. 5		425
4400	2200	2–3. 5	0955	14. 8		425
4450	2225	2–3. 5	1018	16. 0		425
4500	2250	2–3. 5	1080	17. 2		425
4550	2275	2–3. 5	1143	18. 5		425

Table X. Calculation Chart for Frequency Shift Exciter O–39(*)/TRA–7—Continued

Note.—The settings for the SHIFT dial are different for each unit.—Con.

Radio transmitter operating freq in kc.	Exciter freq in kc.	Osc range switch position (mc.)	Approx osc dial setting	Approx buffer dial set ting	Shift dial setting	Freq shift in cyc
4600	2300	2–3. 5	1206	19. 8		425
4650	2325	2–3. 5	1269	21. 1		425
4700	2350	2–3. 5	1332	22. 5		425
4750	2375	2–3. 5	1395	32. 6		425
4800	2400	2–3. 5	1457	24. 7		425
4850	2425	2–3. 5	1520	25. 8		425
4900	2450	2–3. 5	1583	26. 9		425
4950	2475	2–3. 5	1646	27. 9		425
5000	2500	2–3. 5	1708	29. 0		425
5050	2525	2–3. 5	1771	30. 3		425
5100	2550	2–3. 5	1834	31. 6		425
5150	2575	2–3. 5	1897	32. 4		425
5200	2600	2–3. 5	1960	33. 1		425
5250	2625	2–3. 5	2023	34. 4		425
5300	2650	2–3. 5	2085	35. 7		425
5350	2675	2–3. 5	2148	36. 8		425
5400	2700	2–3. 5	2211	37. 9		425
5450	2725	2–3. 5	2274	38. 9		425
5500	2750	2–3. 5	2337	40. 0		425
5550	2775	2–3. 5	2400	41. 1		425
5600	2800	2–3. 5	2462	42. 3		425
5650	2825	2–3. 5	2525	43. 1		425
5700	2850	2–3. 5	2588	43. 9		425
5750	2875	2–3. 5	2651	45. 3		425
5800	2900	2–3. 5	2714	46. 6		425
5850	2925	2–3. 5	2777	47. 4		425
5900	2950	2–3. 5	2839	48. 2		425
5950	2975	2–3. 5	2900	49. 1		425
6000	3000	2–3. 5	2960	50. 0		425
6050	3025	2–3. 5	3021	51. 1		425
6100	3050	2–3. 5	3082	52. 3		425
6150	3075	2–3. 5	3145	53. 4		425
6200	3100	2–3. 5	3208	54. 5		425
6250	3125	2–3. 5	3266	55. 4		425
6300	3150	2–3. 5	3324	56. 3		425
6350	3175	2–3. 5	3392	57. 3		425
6400	3200	2–3. 5	3460	58. 3		425
6450	3225	2–3. 5	3523	59. 4		425
6500	3250	2–3. 5	3585	60. 6		425
6550	3275	2–3. 5	3649	61. 4		425
6600	3300	2–3. 5	3712	62. 3		425
6650	3325	2–3. 5	3775	63. 3		425
6700	3350	2–3. 5	3837	64. 3		425
6750	3375	2–3. 5	3900	65. 7		425
6800	3400	2–3. 5	3963	67. 1		425
6850	3425	2–3. 5	4026	67. 5		425
6900	3450	2–3. 5	4089	68. 0		425
6950	3475	2–3. 5	4152	68. 9		425
7000	3500	2–3. 5	4215	69. 9		425
7000	3500	3. 5–6	0324	3. 1		425
7100	3550	3. 5–6	0399	5. 4		425
7200	3600	3. 5–6	0475	7. 6		425
7300	3650	3. 5–6	0550	9. 3		425
7400	3700	3. 5–6	0626	11. 3		425

Table X. Calibration Chart for Frequency Shift Exciter O–39(*)/TRA–7—Continued

Note.—The settings for the SHIFT dial are different for each unit.—Con.

Radio transmitter operating freq in kc.	Exciter freq in kc	Osc range switch position (mc.)	Approx osc dial setting	Approx buffer dial setting	Shift dial setting	Freq shift in cyc
7500	3750	3. 5–6	0701	13. 0		425
7600	3800	3. 5–6	0777	14. 8		425
7700	3850	3. 5–6	0852	16. 5		425
7800	3900	3. 5–6	0928	18. 2		425
7900	3950	3. 5–6	1003	20. 0		425
8000	4000	3. 5–6	1079	21. 7		425
8100	4050	3. 5–6	1154	23. 5		425
8200	4100	3. 5–6	1230	25. 0		425
8300	4150	3. 5–6	1305	27. 7		425
8400	4200	3. 5–6	1381	28. 5		425
8500	4250	3. 5–6	1456	30. 0		425
8600	4300	3. 5–6	1532	31. 4		425
8700	4350	3. 5–6	1607	33. 1		425
8800	4400	3. 5–6	1683	35. 1		425
8900	4450	3. 5–6	1758	36. 2		425
9000	4500	3. 5–6	1834	37. 6		425
9100	4550	3. 5–6	1909	39. 1		425
9200	4600	3. 5–6	1985	41. 1		425
9300	4650	3. 5–6	2060	42. 5		425
9400	4700	3. 5–6	2136	44. 0		425
9500	4750	3. 5–6	2211	45. 7		425
9600	4800	3. 5–6	2287	47. 4		425
9700	4850	3. 5–6	2362	49. 1		425
9800	4900	3. 5–6	2438	50. 6		425
9900	4950	3. 5–6	2513	52. 7		425
10,000	5000	3. 5–6	2589	53. 8		425
10,100	5050	3. 5–6	2664	55. 8		425
10,200	5100	3. 5–6	2740	57. 8		425
10,300	5150	3. 5–6	2815	60. 0		425
10,400	5200	3. 5–6	2891	61. 5		425
10,500	5250	3. 5–6	2966	63. 1		425
10,600	5300	3. 5–6	3042	65. 5		425
10,700	5350	3. 5–6	3117	67. 1		425
10,800	5400	3. 5–6	3193	69. 5		425
10,900	5450	3. 5–6	3268	70. 8		425
11,000	5500	3. 5–6	3344	73. 4		425
11,100	5550	3. 5–6	3419	75. 1		425
11,200	5600	3. 5–6	3495	77. 3		425
11,300	5650	3. 5–6	3570	79. 3		425
11,400	5700	3. 5–6	3646	82. 1		425
11,500	5750	3. 5–6	3721	84. 3		425
11,600	5800	3. 5–6	3797	86. 8		425
11,700	5850	3. 5–6	3872	88. 7		425
11,800	5900	3. 5–6	3948	90. 9		425
11,900	5950	3. 5–6	4023	93. 1		425
12,000	6000	3. 5–6	4100	96. 0		425
12,000	3000	2–3. 5	2960	50. 0		212. 5

Table X. Calibration Chart for Frequency Shift Exciter O–39(*)/TRA–7—Continued

Note.—The settings for the SHIFT dial are different for each unit.—Con.

Radio transmitter operating freq in kc.	Exciter freq in kc.	Osc range switch position (mc.)	Approx osc dial setting	Approx buffer dial setting	Shift dial setting	Freq shift in cyc
12,100	3025	2–3. 5	3021	51. 1		212. 5
12,200	3050	2–3. 5	3082	52. 3		212. 5
12,300	3075	2–3. 5	3145	53. 4		212. 5
12,400	3100	2–3. 5	3208	54. 5		212. 5
12,500	3125	2–3. 5	3266	55. 4		212. 5
12,600	3150	2–3. 5	3324	56. 3		212. 5
12,700	3175	2–3. 5	3392	57. 3		212. 5
12,800	3200	2–3. 5	3460	58. 3		212. 5
12,900	3225	2–3. 5	3523	59. 4		212. 5
13,000	3250	2–3. 5	3585	60. 6		212. 5
13,100	3275	2–3. 5	3649	61. 4		212. 5
13,200	3300	2–3. 5	2712	62. 3		212. 5
13,300	3325	2–3. 5	3775	63. 3		212. 5
13,400	3350	2–3. 5	3837	64. 3		212. 5
13,500	3375	2–3. 5	3900	65. 7		212. 5
13,600	3400	2–3. 5	3963	67. 1		212. 5
13,700	3425	2–3. 5	4026	67. 5		212. 5
13,800	3450	2–3. 5	4089	68. 0		212. 5
13,900	3475	2–3. 5	4152	68. 9		212. 5
14,000	3500	2–3. 5	4215	69. 9		212. 5
14,000	3500	3. 5–6	0324	3. 1		212. 5
14,100	3525	3. 5–6	0362	4. 2		212. 5
14,200	3550	3. 5–6	0399	5. 4		212. 5
14,300	3575	3. 5–6	0437	6. 5		212. 5
14,400	3600	3. 5–6	0475	7. 6		212. 5
14,500	3625	3. 5–6	0513	8. 4		212. 5
14,600	3650	3. 5–6	0550	9. 3		212. 5
14,700	3675	3. 5–6	0588	10. 3		212. 5
14,800	3700	3. 5–6	0626	11. 3		212. 5
14,900	3725	3. 5–6	0664	12. 1		212. 5
15,000	3750	3. 5–6	0701	13. 0		212. 5
15,200	3800	3. 5–6	0777	14. 8		212. 5
15,400	3850	3. 5–6	0852	16. 5		212. 5
15,600	3900	3. 5–6	0928	18. 2		212. 5
15,800	3950	3. 5–6	1003	20. 0		212. 5
16,000	4000	3. 5–6	1079	21. 7		212. 5
16,200	4050	3. 5–6	1154	23. 5		212. 5
16,400	4100	3. 5–6	1230	25. 0		212. 5
16,600	4150	3. 5–6	1305	27. 7		212. 5
16,800	4200	3. 5–6	1381	28. 5		212. 5
17,000	4250	3. 5–6	1456	30. 0		212. 5
17,200	4300	3. 5–6	1532	31. 4		212. 5
17,400	4350	3. 5–6	1607	33. 1		212. 5
17,600	4400	3. 5–6	1683	35. 1		212. 5
17,800	4450	3. 5–6	1758	36. 2		212. 5
18,000	4500	3. 5–6	1834	37. 6		212. 5

63. Adjustment of Radio Receiver R–388/URR for Use as a Frequency Standard

(fig. 53)

Final adjustment of the exciter unit for mark frequency output of the transmitter requires the use of Radio Receiver R–388/URR as a frequency standard. A portion of the r-f output of the transmitter is fed to the receiver.

a. Plug one end of Cord CG–390/U (17 ft., 6 in.) into the FREQUENCY METER IN jack on the front panel of the exciter and the other end into the PHONES jack on the front panel of channel A receiver.

b. Set the OFF-STANDBY-ON switch to ON.

c. Turn the RF GAIN control to 10.

d. Turn the AUDIO GAIN control to 5. Loudspeaker LS–3 will monitor the audio tone.

e. Set the SELECTIVITY control to 0.

f. Set the BFO switch to ON.

g. Set the BFO PITCH control to the white line.

h. Set the CALIBRATE switch to ON. A beat note should be audible.

i. Set the AVC OFF-ON switch to OFF.

j. Set the LIMITER switch to OUT.

k. Set the XMTR ON-XMTR OFF switch in the radioteletypewriter control to XMTR ON.

l. Set the FULL DX-ONE WAY switch in the radioteletypewriter control to ONE WAY.

m. Turn the BAND CHANGE switch until the range of frequencies containing the frequency (in mc and tenths of mc) desired appears behind the window above MEGACYCLES.

n. Turn the KILOCYCLES tuning control until the indicator behind the window above MEGACYCLES coincides with the proper megacycle division desired.

o. Adjust the KILOCYCLES tuning control until a zero beat is obtained from the loudspeaker. Do not touch BFO PITCH control.

p. Turn the ZERO ADJ. control to set the tuning control scale to coincide with the index line.

q. Turn the CALIBRATE switch to OFF.

r. Set the FULL DX-ONE WAY switch in the radioteletypewriter control to FULL DX.

s. Set the tuning control accurately to the assigned frequency of the transmitter.

Note. Do not change the setting of the tuning control or the BFO PITCH control. This receiver now is used as a frequency standard for comparison with the transmitter frequency.

64. Final Adjustments of Transmitter

The exciter and transmitter now are to be adjusted to transmit the assigned frequency plus 425 cycles and to transmit a 850-cycle shift for the space signal. Set the SHIFT dial as indicated by the calibration chart located in a metal pocket on the right side of the exciter.

a. Plug Headset HS–30–(*) into the PHONES jack on the exciter front panel.

b. Adjust the OSCILLATOR TUNING control with the TEST key set at the MARK position on the exciter front panel to obtain a zero beat in the loudspeaker. Tune for a zero beat of the strongest signal heard. If a great change in oscillator dial setting is required on the exciter, adjust the BUFFER TUNING control at the same time. Check to see that the shadow on the 850~ TEST tuning indicator is practically stationary; or changes very slowly when the zero beat is obtained.

c. Readjust the BUFFER TUNING control for maximum illumination of the BUFFER INDICATOR, and lock the dial. Any further readjustments of this control will effect the oscillator frequency slightly.

d. Repeat adjustments of the DOUB., INT. AMP., and P. A. PLATE TUNING controls on the transmitter if any change is noticed on the EXCITATION METER readings (pars. 62*d* through *h*).

e. Check for zero beat again. Readjust the OSCILLATOR TUNING control in the exciter, if necessary. Throw the TEST key to the SPACE position and the TEST OSC switch to 850~ position. With the above switches in these positions, it is possible to adjust accurately the output frequency of the transmitter on space signals to obtain exactly and 850-cps shift from the marking frequency. This condition is indicated as a zero beat in the headset when the SHIFT control on the exciter is positioned properly. This condition is obtained when the frequency difference between the mark and space frequency transmitted by the transmitter beats against the 850-cps frequency produced by the 850-cps oscillator in the exciter.

f. Adjust the SHIFT control until a zero beat is obtained. Check the 850~ TEST indicator tube for zero beat indication. This is indicated when the shadow angle is smallest. If the SHIFT control is moved more than a few divisions, an erroneous frequency shift may result.

g. Since any change of the SHIFT dial will affect the oscillator frequency, it will be necessary to readjust the OSCILLATOR TUNING control. Set the TEST OSC key to OFF, and the TEST key to the MARK position. Readjust the OSCILLATOR TUNING control as outlined in *b* above.

h. Set the TEST key to the SPACE position and the TEST OSC key to the 850~ position, and repeat the adjustment of the SHIFT dial as in *f* above.

i. On the control unit, place the SPACE-MARK switch in the SPACE position and adjust the SPACE control for a needle deflection of 75 to the left of the 0 line on the meter.

j. Place the SPACE-MARK switch in the MARK position and adjust the MARK control for a needle deflection of 60 to the *right* on the meter.

k. Leave the switch in the MARK position unless emergency frequency-shift keying is to be used.

l. Set the control unit XMTR ON-XMTR OFF switch to the XMTR ON position. With the exciter TEST key set at NORM and the TEST OSC switch at the OFF position, readjust the OSCILLATOR TUNING control until a zero beat is heard in the loudspeaker and is indicated by the 850~ TEST indicator tube (do not retune the buffer at this time).

m. Throw the exciter TEST OSC switch to the 850~ position and send a space signal by setting the SPACE-MARK switch in the control unit to the SPACE position. Adjust the SHIFT dial until a zero beat is obtained in the headset. The zero beat also is indicated by the 850~ TEST indicator tube.

n. Operate the TEST OSC switch to OFF.

o. Set the SPACE-MARK switch of the control unit to the MARK position. If a zero beat is not heard in the headset, slightly readjust the OSCILLATOR TUNING dial to obtain a zero beat.

p. Repeat steps in *b*, *c*, and *d* above until proper indications are obtained.

q. Turn XMTR ON-XMTR OFF switch on the control unit to XMTR OFF.

65. Adjustment of Radio Receivers for Reception

(fig. 53)

a. Check Radioteletypewriter Control C–808/GRC–26A to see that the XMTR ON-XMTR OFF switch is in XMTR OFF position.

b. Turn the BAND CHANGE control to place the range of frequencies containing the desired frequency in upper window above MEGACYCLES.

c. Set the tuning control to the frequency of the distant station.

d. Turn the RF GAIN to 10.

e. Turn the OFF-STANDBY-ON switch from the STANDBY position to the ON position.

f. Rotate the tuning control for a maximum deflection on the INPUT scale of the meter (METER B switch in INPUT position).

g. If a very strong signal is being received which swings the meter indicator past the right-hand end of the scale, reduce the RF GAIN until the meter reads 75.

h. Readjust the tuning control, if necessary, to give the same indication as outlined in *f* above.

i. Follow the same procedure in *a* through *h* above for the second receiver.

j. The signal may be monitored with phones or speakers by turning the BFO switch to ON and adjusting the BFO PITCH and AUDIO GAIN for the desired pitch and *low* volume. High volume will cause undesirable effects in the i-f output circuit.

Note. Under weak signal conditions the input signal may be increased by adjusting the ANT TRIM control. Observe the indication of the meter on the receiver front panel while adjusting this control. Set the control to the position which shows the maximum indication on the meter. This control should be adjusted each time the position of the BAND CHANGE switch is changed.

66. Tuning to a Distant Station

The adjustments given in *a* below will permit the operator to tune the receiving equipment prior to the time contact is scheduled with the distant station. If time does not permit preliminary tuning, omit *a* below and proceed directly to *b* below.

a. Receiving Equipment Adjustments, No Transmitted Signal.

(1) Turn the BAND CHANGE switches of both receivers to the band (range of frequencies) containing the scheduled frequency. Set the tuning control of the receivers to the scheduled frequency.

(2) Set the converter CHANNEL A and CHANNEL B disabling switches to the up position and the down position, respectively. Turn the RF GAIN control of the channel A receiver clockwise to increase the gain.

(3) Turn the METER B switch on the converter unit to the INPUT position and adjust the tuning control on the channel A receiver.

(4) Peak the meter B reading at 50 or higher by rotating the tuning control. Attenuate the signal by rotating the RF GAIN control on the channel A receiver counterclockwise, if necessary.

(5) Set the CHANNEL A FINE TUNING control of the converter unit to the straight up position.

(6) Rotate the tuning control of the channel A receiver very carefully until the indicator on meter A rests on zero, between two closely spaced off-scale deflections. (The input level shown on meter B with the METER B switch at the INPUT position should remain high.) The zero reading indicates the exact center of the converter discriminator circuit output.

(7) Make certain the channel B receiver is tuned to the same frequency as the channel A receiver.

(8) Set the converter CHANNEL A and CHANNEL B disabling switches to the down position and the up position, respectively. Turn the RF GAIN control of the channel B receiver to the maximum clockwise position.

(9) Peak the meter B reading at 50 or higher by rotating the tuning control. (Attenuate the signal by rotating the RF GAIN control on the channel B receiver counterclockwise, if necessary.)

(10) Turn the METER B switch to the CHAN B position and set the CHANNEL B FINE TUNING control of the converter to the straight up position.

(11) Rotate the tuning control of the channel B receiver very carefully until the indicator on meter B rests on zero, between two closesly spaced off-scale readings.

(12) Turn METER B switch to the INPUT position. The reading should be 50 or higher. If not, repeat the step in (11) above.

(13) Turn the DRIFT COMPENSATOR switch to the off (down) position, and throw the LP FIL switch to IN.

(14) Check to see that the indicator of meter B (METER B switch in CHAN B position) deflects to the right when the CHANNEL B FINE TUNING control is turned to the right, and that it deflects to the left when the CHANNEL B FINE TUNING control is turned to the left.

(15) Set the OUTPUT control to the NORMAL position.

(16) Plug Headset HS–30–(*) into the PHONES KEYED TONE jack on the converter front panel, and note that when the CHANNEL B FINE TUNING control is turned to the left or right to obtain the meter B readings (METER B switch in CHAN B position) indicated below, a tone is or is not heard in the headset as indicated.

OUTPUT switch position	Meter B reading	Tone in headphones
NORMAL	−50	On.
NORMAL	+50	Off.
REVERSE	−50	Off.
REVERSE	+50	On.

(17) Adjust the drift compensator circuit as follows:

(*a*) Check to see that the fine tuning controls are in the straight-up position.

(*b*) Check to see that the receivers are tuned properly. Decrease the RF GAIN control of the channel B receiver.

(*c*) Set the DRIFT COMPENSATOR switch to the IN position.

(*d*) Turn the OUTPUT switch to the NORMAL position.

(*e*) Set the BANDWIDTH switch to WIDE.

(*f*) Set the LP FIL switch to IN.

(*g*) Turn the METER B switch to the CHAN A+B position, the AMP GAIN control to approximately the straight-up position, and the LIMITER control fully clockwise.

(*h*) Check to see that the converter output can be changed from a steady mark signal (about +70 on meter B) to a steady space signal (about −70 on meter B) or vice versa by a fast movement of the CHANNEL A FINE TUNING control from one side to the other. If the meter B indicator will

not stay on the space side (left), turn the AMP GAIN control clockwise and repeat the above check. The AMP GAIN control will be set more accurately during reception of a teletypewriter signal.

b. Tuning with Transmitted Signal.

(1) Set the converter CHANNEL A and CHANNEL B disabling switches to the up and down positions, respectively. Turn the RF GAIN control of channel A receiver clockwise to obtain maximum gain.

(2) Tune in the desired station by ear; locate the signal at the center of the i-f band by adjusting the tuning control.

(3) Decrease the RF GAIN of the channel A receiver if the input is more than 100 on meter B (with the METER B switch of the converter set at INPUT position).

(4) Carefully tune the channel A receiver while observing the meter indication on meter A of the converter.

(5) Check to see that meter A deflects to the right and to the left of zero for miscellaneous keying signals; these deflections being of approximate equal plus and minus values when the receiver is tuned properly.

(6) If the distant station transmits a steady mark, tune the channel A receiver until the meter A deflection is approximately 50 (for a frequency shift of 850 cycles).

(7) Set the converter CHANNEL A and CHANNEL B disabling switches to the down position and the up position, respectively. Turn the RF GAIN control of the channel B receiver clockwise to obtain maximum gain.

(8) Carefully tune the channel B receiver while observing the meter indication on meter B with METER B switch set to CHAN B.

(9) Check to see that meter B deflects to the right and to the left of zero for miscellaneous keying signals; these deflections are of approximate equal plus and minus values when the receiver is tuned properly.

(10) If the distant station transmits a steady mark signal, tune the channel B receiver until the meter B deflection is approximately 50 (for a frequency shift of 850 cycles).

(11) Set the converter CHANNEL A disabling switch to the up position. Increase the RF GAIN of the channel A receiver to maximum with the distant transmitter sending miscellaneous keying signals; adjust the RF GAIN of the channel B receiver to make the maximum swings of meter A and meter B equal (with METER B switch at CHAN B position).

(12) Check to see that each meter averages near zero when signals are received over a considerable time.

67. Final Adjustment of Receiving Equipment

a. Set the converter METER B switch to the INPUT position and set the OUTPUT switch to the MARK position. Turn on the receiving teletypewriter and check to see that the teletypewriter holds.

b. Set the OUTPUT switch to the SPACE position and check to see that the teletypewriter runs open. Return the OUTPUT switch to the MARK position.

c. Check to see that the converter CHANNEL A and CHANNEL B disabling switches are set to the up position and the down position, respectively. Turn the RF GAIN control clockwise on the channel A receiver to obtain maximum gain.

d. Check on channel A and channel B receivers to see that the OFF-STANDBY-ON switch is set to the ON position; that the CALIBRATE switch is at the OFF position; that the AVC switch is at the OFF position; and that the SELECTIVITY switch is set at the 0 position.

e. Set METER B switch to the INPUT position and tune channel A receiver to the received frequency.

f. Adjust the tuning control for a maximum deflection on meter B and until the miscellaneous kicks on meter A center around 0.

g. Check to see that the DRIFT COMPENSATOR switch in the converter is in the out (down) position.

h. Set the OUTPUT switch to the REVERSE or NORMAL position as required.

Note. The position of the OUTPUT switch (NORMAL or REVERSE) depends on the frequency band of the receiver being used. Some bands have the oscillator frequency 500 kc above the incoming carrier frequency and

some have the oscillator frequency 500 kc below the incoming carrier. Therefore, it will be necessary to set the OUTPUT switch in the NORMAL or REVERSE position in order that the transmitter mark frequency will be indicated as a mark frequency in the converter. The position of the DRIFT COMPENSATOR switch (IN or out) also will affect the polarity of the mark signal.

i. Check to see that the teletypewriter signals are being received without error. The position of the OUTPUT switch (REVERSE or NORMAL) depends on the frequency band the receiver is operating on.

j. Set the converter CHANNEL A and CHANNEL B disabling switches to the up position and the down position, respectively. Repeat steps in *e* through *i* above for the channel B receiver.

k. Adjust the equipment with the DRIFT COMPENSATOR set at the IN position.

(1) Set the converter CHANNEL A and CHANNEL B disabling switches to the up position and the down position, respectively. Turn the RF GAIN control of the channel A receiver clockwise to increase the gain.

(2) Set the DRIFT COMPENSATOR switch to the IN position.

(3) Turn the OUTPUT control to NORMAL or REVERSE, depending on the band the receiver is operating on.

(4) Adjust the channel A receiver tuning control so that the meter A indication centers at zero.

(5) Turn the METER B switch to the COMP AMP position.

(6) Check to see that the LIMITER control is in the full clockwise position. Turn the AMP GAIN control fully counterclockwise position. Turn the AMP GAIN control fully counterclockwise and then turn it very slowly clockwise while observing meter B for irregular deflections or kicks. This adjustment is very critical. Set the control at the point where the kicks are a minimum and the meter needle is essentially steady at zero.

(7) Turn the METER B switch to CHAN A+B position.

(8) Operate the exciter TEST key to the MARK position.

(9) Check that the converter meter B indicates approximately 70 to the right of zero. Turn the LIMITER control counterclockwise until the meter B reading just starts to decrease. This is the proper position for the LIMITER control.

(10) Operate the exciter TEST key to the SPACE position.

(11) Check to see that meter B reads approximately 70 to the left of zero.

(12) Restore the exciter TEST key to the NORM position.

l. Check the copy on the receiving teletypewriters. Adjust the rangefinder of the teletypewriter, if necessary, using TM 11–352 or TM 11–2234 for reference.

m. Check neutral d-c loops as follows:

(1) Set the converter OUTPUT switch to the MARK position.

(2) Turn the METER B switch to NEUTRAL.

(3) Adjust the NEUTRAL OUTPUT control until meter B indicates 60 to the right of zero.

(4) Restore the OUTPUT switch to NORMAL.

n. Send tape signals and check the teletypewriters for proper copy. Adjust the range (TM 11–680) on the teletypewriters, if necessary.

o. Set the converter CHANNEL A disabling switch to the down position and the CHANNEL B disabling switch to the up position. Turn the RF GAIN control of the channel B receiver clockwise. Tune the channel B receiver until meter B indications on the converter center around zero with the METER B switch in the CHAN B position.

p. Check to see that the receiving teletypewriter is copying correctly.

q. Set the converter CHANNEL A disabling switch to the up position. Turn the RF GAIN control of the channel A receiver fully clockwise. Turn the RF GAIN control of the channel B receiver until the indications on meter A and meter B are approximately equal.

68. Adjustment of Output Control Circuit

a. Drift Compensator Feature Disconnected.

(1) The drift compensator feature need not be used if the i-f outputs of the channel A and channel B receivers remain stable. A sufficiently stable output is indicated if it is not necessary to retune the receiver more often than once an hour.

(2) Do not use the drift compensator feature if weak r-f signals are received with

prevailing high noise levels. Maintain accurate tuning at these times by constantly monitoring the output of the converter.

(3) Check to see that the DRIFT COMPENSATOR switch is set to off (down) and turn the AMP GAIN control clockwise to a point a little to the left of midposition.

(4) Turn the OUTPUT switch to the position which provides mark and space signals of proper polarities, as indicated in the following chart:

Deflection of meters A and B for a mark signal	Position of OUTPUT switch
Right	REVERSE.
Left	NORMAL.

(5) Plug Headset HS–30–(*) into the PHONES KEYED TONE jack on the front panel of the converter, and verify that distinct tones are heard. Distinct tones indicate the absence of noise peaks or distortion arising from improper tuning.

b. Drift Compensator Feature Connected.

(1) Turn the DRIFT COMPENSATOR switch to the IN position.

(2) Turn the OUTPUT switch to a position which is opposite to that used when the drift compensator feature is disconnected, as follows:

Deflection of meters A and B for a mark signal	Position of OUTPUT switch
Right	NORMAL.
Left	REVERSE.

(3) Turn the METER B switch to the COMP AMP position.

(4) Turn the AMP GAIN control fully counterclockwise and then, when miscellaneous signals are being received, slowly turn the control clockwise while observing meter B for a minimum of irregular deflections or kicks. A tapered control is provided, and the normal setting usually will be 30° or 40° from the counterclockwise stop for 850-cycle frequency shift. Set the AMP GAIN knob in a position which provides keyed tone output from the converter and results in minimum kicks on meter B. A more definite setting of the AMP GAIN knob may be found if the LIMITER knob first is turned fully clockwise.

(5) Turn the METER B switch to the CHAN A + B position.

(6) Verify that the deflection of meter B on a steady mark signal is 70 to the right of zero. During a steady mark signal, reset the LIMITER knob to a position which causes the 70 indication to just start decreasing.

(7) Plug Headset HS–30–(*) into the PHONES KEYED TONE jack and verify that clear, distinct tones are produced. Distinct tones indicate the absence of noise peaks or distortion arising from improper tuning.

69. Adjustment of the Mark-hold Feature

The mark-hold feature is provided to maintain a steady marking condition, automatically, if the signal level drops below the noise level or disappears for any reason. *It must be used for one-way reversible service.* For full-duplex service the carrier-control mark-hold feature is not required. It is removed by turning the MARK HOLD LEVEL control to the extreme counterclockwise position until the mark-hold switch is heard to operate. When the mark-hold feature is used, the following adjustments are made:

a. Turn the MARK HOLD LEVEL switch and control fully clockwise.

b. With the power at the distant transmitter off or with both receivers detuned from the signal, verify that a steady marking signal is connected to the receiving d-c loops (the teletypewriter does not run open). Do not turn the receiver RF GAIN down for test because total noise should be present.

Note. Occasional kicks may be transmitted if a relatively high noise level prevails. In this case, slowly turn the MARKHOLD LEVEL control counterclockwise until a steady marking signal is produced.

c. When the transmitted signal is again received, verify that the setting in *b* above will not cause steady marking signals which will interrupt normal keying.

d. Check the setting of the MARK HOLD LEVEL knob from time to time, since it is im-

portant to provide a setting which is as far clockwise as possible. This setting should be such that the mark-hold circuit will not interfere when weak or fading r-f signals are received, yet far enough counterclockwise to provide application of a steady marking signal when the received signal is discontinued. The setting of the control is subject to some change due to variable noise levels and different RF GAIN control adjustments of the associated receivers.

Section III. OPERATION UNDER USUAL CONDITIONS

70. Operating Conditions

a. General. Radio Set AN/GRC–26A is designed primarily for teletypewriter signal transmission and reception under various operating conditions. It can be operated while in motion. The term *mobile* is used to describe the operation of the radio set while moving from one position to another. The term *mobile-at-halt* describes the operation while the vehicle is stopped, but may move again with a minimum of preparation. The term *semifixed* describes a more permanent condition in which antennas are erected and are not a part of the shelter which houses the equipment.

b. Mobile. It is often desirable to operate Radio Set AN/GRC–26A while the vehicle is in motion. Under these conditions, the whip antennas are used for transmission and reception of signals. The one-way reversible basis of operation, which is described more fully in paragraph 71*c* usually is used. It is advantageous to use two frequencies separated by at least 400 kc for transmission and reception in order to change quickly to the full-duplex basis of operation. The full-duplex basis (par. 71) is used in a permanent or semipermanent position. Single channel reception, obviously, is used under these operating conditions.

c. Mobile-at-halt. The difference between mobile and mobile-at-halt type of operation is that, in the latter case, a temporary doublet antenna often may be substituted for the whip antenna. The full-duplex basis of operation may be used instead of the one-way reversible. Whether a doublet or whip antenna is used will depend on the time element and the tactical situation involved. Single channel reception may be used. The frequency separation between the transmitter and receiver must be more than 400 kc. To prevent interference, the transmitter frequency must not be close to a harmonic or to an image frequency of the receiver.

d. Semifixed. To operate under these conditions permits the erection of temporary doublet antennas for reception and transmission. Either the full-duplex or one-way reversible basis of operation can be used and, normally, dual diversity reception is employed. The shelter may be removed from the vehicle and placed in a more tactical position.

71. Modes of Operations

a. General. Radio Set AN/GRC–26A, although used primarily for teletypewriter signal transmission and reception, also is used for voice. Voice and teletypewriter signals can be transmitted and received simultaneously. This radio set also can be used for c-w and f-s keying. Radio Set AN/GRC–26A provides two bases of operation: full-duplex and one-way reversible.

b. Full-duplex. For full-duplex operation the transmitter and receiver operate on separate frequencies. These frequencies should be separated by at least 400 kc. This makes it possible for the radio set to transmit and receive messages simultaneously without interference between the receiver and the transmitter.

c. One-way Reversible. For this basis of operation, the transmitter and receiver do not operate at the same time. When the transmitter is used the receivers are disabled, and when the receivers are used the transmitter is disabled. The transmitter and receivers often use the same frequency.

72. Single Channel Voice Communication

a. General. Voice operation of Radio Set AN/GRC–26A can be accomplished alone or simultaneously with teletypewriter signal transmission and reception. Operation on a single channel means that only one of the two receivers are used for reception. To operate on a one-way reversible basis means transmission and reception of intelligence alternately. When the transmitter is in operation the receivers are disabled and vice versa.

b. Voice Transmission. Voice transmission requires the operation of Radio Transmitter BC–610–(*), Radioteletypewriter Control C–808/GRC–26A, Speech Amplifier BC–614–(*) and, normally, Frequency Shift Exciter O–39(*)/TRA–7. Antenna Tuning Unit BC–939–B is used with a whip

antenna or with a long wire antenna. If the exciter is not to be used, *disconnect the cable plugged into the tuning unit of the transmitter.* The transmitter now may be operated by either mo or crystal control by placing the M. O.-XTAL switch in the desired position and tuning to the desired frequency as explained in TM 11–826. Either Microphone T–17–(*) (carbon) or Microphone T–50 (dynamic) may be used to modulate the transmitter. The following procedure is for operation on a one-way reversible basis:

(1) Tune the transmitter to the desired frequency as explained in paragraphs 62 and 64 for c-w operation.
(2) Set the PLATE POWER switch to off (down).
(3) Set the CW-PHONE switch of the transmitter to PHONE.
(4) Set the MODULATOR BIAS control of the transmitter to the extreme counterclockwise position (increases the bias).
(5) Set the FULL DX-ONE WAY switch in the radioteletypewriter control to ONE WAY.
(6) Set the XMTR ON-XMTR OFF switch of the radioteletypewriter control to XMTR ON. Set the XMTR ON-XMTR OFF switch to XMTR ON. This will have the same effect in the transmitter as setting the PLATE POWER switch to on (up).
(7) Check to see that the P. A. PLATE meter in the transmitter indicates approximately 250 ma. Changing the CW-PHONE switch from CW to PHONE reduces the p-a plate meter reading from 290 ma to 250 ma. If the P. A. PLATE meter reads more than 250 ma, reduce the antenna coupling until the plate current is 250 ma.
(8) Plug Microphone T–17–(*) into the CARBON MIC. 1 jack or Microphone T–50 into DYNAMIC MIC. 2 jack on the front panel of the speech amplifier.
(9) With the microphone in the left hand, push the press-to-talk switch on the microphone and adjust the MODULATOR BIAS control of the transmitter until the MODULATOR PLATE meter of the speech amplifier indicates approximately 40 ma.
(10) Talk into the microphone and adjust the CARBON MIC. 1 or DYNAMIC MIC. 2 control (depending on which one is used) and observe that the modulator current reaches approximately 200 ma on voice peaks.

Caution: *Under no circumstances* change the position of the CW-PHONE switch while the PLATE POWER switch of the transmitter is on (up) or the XMTR ON-XMTR OFF switch of the control unit is in the XMTR ON position.

(11) Communicate with the distant station operator and when the message has been completed, give him a go-ahead signal.
(12) Set the XMTR ON-XMTR OFF switch of the control unit to XMTR OFF. The receivers now will be able to receive messages.

c. Voice Reception. Voice reception on a single channel one-way reversible basis requires the use of Radio Receiver R–388/URR, Radioteletypewriter Control C–808/GRC–26A and Loudspeaker LS–3. Only one receiver and one loudspeaker is used on single channel reception.

(1) Set the XMTR ON-XMTR OFF switch of the control unit to XMTR OFF. The transmitter is disabled and the receiver is enabled.
(2) Tune the channel A receiver (par. 65) to the frequency of the distant station.
(3) When the message from the operator at the distant station is completed, set the XMTR ON-XMTR OFF switch of the control unit to XMTR ON.

73. Teletypewriter Operation

a. General. The signals from the sending teletypewriter equipment keys the transmitter indirectly by keying the control unit which, in turn, keys the frequency-shift exciter. The receiving teletypewriter equipment is actuated by signals received from the control unit through the two receivers and the frequency-shift converter. The control unit is the central point for both the sending and receiving of teletype signals. The sending and receiving cords for the teletypewriters, the perforator, and the sending cord for the transmitter-distributor must be plugged into the proper jacks of the control unit (fig. 127). Voice modulation can be accomplished simultaneously with teletypewriter transmission and reception.

b. Cord Connections. The right and left teletypewriters and the typing reperforator each have

two cords; one cord terminates in a black shell phone plug (sending) and the other cord terminates in a red shell phone plug (receiving). The transmitter-distributor has one cord terminating in a gray shell phone plug (sending). The black and gray shell phone plugs are connected by a two-conductor cord to the sending contacts of the teletypewriter equipment. The red shell phone plugs are connected by a two-conductor cord to the receiving magnets of the teletypewriter equipment.

c. Connection or Jack Box. A connection or jack box (fig. 17), mounted on the base of the rear of the typing reperforator, makes it possible to arrange the teletypewriters, the transmitter-distributors, and the typing reperforator in a variety of operating combinations. One cord terminating in a two-prong plug is plugged into one of the a-c outlets of Rectifier RA–87–(*). Another cord with a polarized two-prong plug, labeled DC on the connection box, is plugged into one of the d-c outlets of Rectifier RA–87–(*). The transmitter-distributor and the connection box are connected electrically with a four-conductor cord and the typing reperforator is connected electrically with the connection box by a three-conductor cord. The connection box supplies the switching arrangement and circuits for the transmitter distributor and the typing reperforator for several types of input power. It contains four sets of closed circuit jacks. Each set contains two jacks which are connected in series with the two conductors of the cord terminating in a telephone plug. Two of the cords terminate in red (receiving) shell plugs and two terminate in black (sending) shell plugs. One cord with a black shell plug is connected to line 1 and the other two cords are connected to line 2 (fig. 60). In addition, the connection box supplies two circuits for local operation. Local CIRCUIT 1 consists of three closed circuit jacks in series with a 1,600 ohm resistor and local CIRCUIT 2 consists of two closed circuit jacks in series with a 1,600 ohm resister. These two circuits are connected in parallel with the 115-volt, d-c, 60-ma supply from Rectifier RA–87–(*).

74. Starting Procedure for Teletypewriter Operation

The following procedure assumes Radio Set AN/GRC–26A has been set up for operation as described in sections I and II of chapters 2 and 3. Set the switches of the teletypewriter components as follows:

Component	Switch	Position
Radioteletypewriter Control Unit C–808/GRC–26A	EXTENSION-NORMAL	NORMAL.
	SPACE-MARK	MARK.
Rectifier RA–87–(*)	ON-OFF	ON.
Typing Reperforator	MOTOR	ON (down).
Transmitter-distributor	MOTOR ON-OFF	ON.
Teletypewriter	ON-OFF	ON.
Connection box	Power selector	Set to proper position for power available.

75. Dual Diversity Full-duplex Teletypewriter Reception

a. General. Dual diversity reception means receiving signals from two antennas spaced approximately 1,000 feet apart. The signals from each antenna are fed to separate receivers. The teletypewriter signals are fed from each receiver into the frequency-shift converter where they are combined and fed to the teletypewriter equipment through the control unit. The purpose of the separate antennas is to minimize the effects of selective fading.

b. Teletypewriter operation. The right or left teletypewriter can be used for receiving messages in each of the three positions of the PERFORATOR OPERATION switch. The TT TRANSPOSE switch selects the right or the left teletypewriter in each of the three positions of the PERFORATOR OPERATION switch. The procedure for the right teletypewriter is as follows:

(1) Tune the two receivers to the frequency of the distant station, and establish a working receiving circuit while receiving an RY signal test tape or miscellaneous

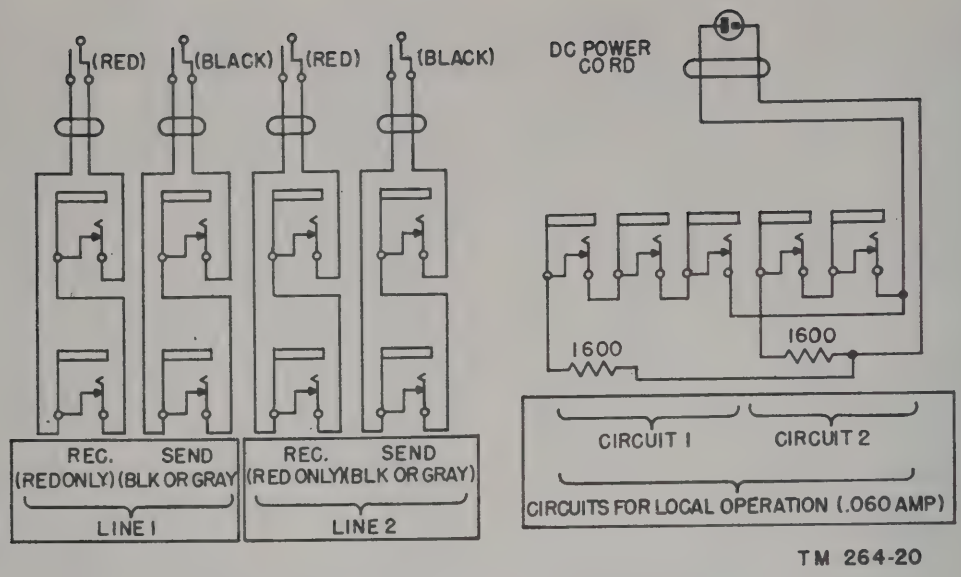


Figure 60. Connection box patching circuits.

teletypewriter signals. Tune the channel A receiver with the RF GAIN of channel B receiver at minimum; then tune the channel B receiver with the RF GAIN of the channel A receiver at minimum.

(2) Check to see that the output indicated on meter A and then meter B (with METER B switch set at CHAN B) centers near zero.

(3) Set METER B switch to INPUT. Check to see which receiver shows a lower input to the converter. A reading of more than 50, when the signal fades, will give satisfactory operation.

(4) Return the weaker receiver to the circuit and set the RF GAIN to maximum.

(5) Slowly bring the stronger receiver into the circuit until meters A and B (with the METER B switch in CHAN B) oscillate in unison.

(6) Maintain the RF GAIN in both receivers as near maximum as possible.

(7) On steady mark signals, meters A and B (METER B set to the CHAN B) should show the diversity effect of the two antennas if there is considerable fading. First one meter should read a full mark deflection (50 for an 850-cycle shift) and the other zero; then the second meter should read a full mark deflection while the first meter reads zero. If both signals are of equal strength, the reading should divide equally; that is, an indication of 25 on each meter. If the strengths are unequal they will divide proportionally. In either case, however, the reading always should add up to the full mark deflection of either receiver alone.

(8) Check to see that each meter reading averages zero over long periods of time when receiving miscellaneous signals.

(9) Use extreme care in adjusting the tuning control of the channel A receiver since the circuit will fail if the receiver frequency is changed too much or too rapidly.

(10) Set the FULL DX-ONE WAY switch of the control unit to FULL DX.

(11) Set the TT TRANSPOSE switch of the control unit to RIGHT REC-LEFT SEND.

(12) Set the PERFORATOR OPERATION switch of the control unit to RECEIVE TT.

(13) Messages will be received as page copy by the right teletypewriter.

Note. When receiving messages over a period of time on Teletypewriter TT–4A/TG, lock the keyboard of the receiving teletypewriter by loosening the thumbnut on the right-hand side of the MOTOR ON-OFF switch box and pushing the thumbnut and lever forward. Tighten the thumbnut again. This prevents the keys of the keyboard from being operated and spoiling the received message.

c. Typing Reperforator Operation. The typing reperforator can be used to receive messages in

only two positions of the TT TRANSPOSE switch and in one position of the PERFORATOR OPERATION switch of the control unit.

(1) Perform the steps as outlined in *b*(1) through (10), above.
(2) Set the TT TRANSPOSE switch to either of the two positions.
(3) Set the PERFORATOR OPERATION switch to the RECEIVE TT position.
(4) Messages will be received on a tape which is printed and perforated.
(5) The right or left teletypewriter (depending on the position of the TT TRANSPOSE switch) can receive the message simultaneously with the perforator-transmitter by setting the SEND-REC-BREAK key of the chosen teletypewriter to the REC position.

76. Single-channel Full-duplex Teletypewriter Transmission

a. General. Single-channel operation (as opposed to dual diversity) means using one antenna and one receiver for the reception of signals. The operation of the teletypewriter equipment is independent of the type of reception (single channel or dual diversity) used. Two switches in the control unit determine which of the teletypewriters is available for sending, leaving the other for the operation of the typing reperforator.

b. Sending with the Left Teletypewriter. The right or the left teletypewriter can be used to send messages in any of the three positions of the PERFORATOR OPERATION switch in the control unit. The position of the TT TRANSPOSE switch in the control unit determines which one is available for sending. The typing reperforator will monitor the message by perforating tape. The procedure for the left teletypewriter is as follows:

(1) Tune the transmitter to the assigned frequency (pars. 62 through 64).
(2) Set the FULL DX-ONE WAY switch of the control unit to FULL DX.
(3) Set the TT TRANSPOSE switch in the control unit to RIGHT REC-LEFT SEND position.
(4) Set the PERFORATOR OPERATING switch in the control unit to the SEND TT position.
(5) Set the SEND-REC-BREAK key of the left Teletypewriter TT–55/MGC to the SEND position. (When using Teletypewriter TT–4A/TG, omit this step.)
(6) Type out the message on the keyboard of the left teletypewriter.
(7) The message will be transmitted to a distant station; the typing reperforator will monitor the message by printing and perforating tape. The message will be printed as page copy by the left teletypewriter.

c. Typing Reperforator. The typing reperforator can be used to send messages in only one of the three positions of the PERFORATOR OPERATION switch and in the two positions of the TT TRANSPOSE switch of the control unit. The right or the left teletypewriter can be used to monitor the message depending on the position of the TT TRANSPOSE switch. The procedure for sending with the typing reperforator and monitoring with the left teletypewriter is as follows:

(1) Perform the steps as outlined in *b*(1) and (2) above.
(2) Set the TT TRANSPOSE switch of the control unit to LEFT REC-RIGHT SEND.
(3) Set the PERFORATOR OPERATION switch of the control unit to SEND TT.
(4) Set the SEND-REC-BREAK key of the left Teletypewriter TT–55/MGC to REC (not necessary with Teletypewriter TT–4A/TG).
(5) Type out the message on the keyboard of the typing reperforator.
(6) The message will be transmitted to a distant station. The message will be printed on a perforated tape by the typing reperforator and the message will be monitored as printed page copy by the left teletypewriter.

d. Transmitter Distributor. The transmitter distributor can send messages in the two positions of the TT TRANSPOSE switch and in the three positions of the PERFORATOR OPERATION switch of the control unit. The right or left teletypewriter can be used to monitor the message in any of the three positions of the PERFORATOR OPERATION switch of the control unit. The TT TRANSPOSE switch determines which one is available for monitoring. The typing reperforator

can be used to monitor the message in only one position of the PERFORATOR OPERATION switch and in the two positions of the TT TRANSPOSE switch of the control unit. The procedure for using the transmitter distributor for sending messages and monitoring with the right teletypewriter is as follows:

(1) Perform the steps as outlined in *b*(1) and (2) above.
(2) Set the TT TRANSPOSE switch of the TT control to RIGHT REC-LEFT SEND.
(3) Set the PERFORATOR OPERATION switch of the control unit to SEND TT.
(4) Set the SEND-REC-BREAK key of the left Teletypewriter TT–55/MGC to REC (not necessary with Teletypewriter TT–4A/TG).
(5) Feed a perforated tape into the transmitter distributor through the tight-tape switch mechanism.
(6) The message will be transmitted to a distant station by the transmitter distributor; the right teletypewriter will monitor the message by printing page copy.

77. One-way Reversible, Dual Diversity, Typing-reperforator Operation

a. General. In the one-way reversible basis of operation, the transmitter and receiver do not operate at the same time. Transmission and reception of messages is done alternately. The receiver is disabled when the transmitter is transmitting and vice versa. Dual diversity reception uses two antennas and two receivers. The signals from each receiver are combined in the converter and the output is fed to the teletypewriter equipment through the control unit.

b. Receiving with the Typing Reperforator. The typing reperforator can be used for receiving messages from a distant station.

(1) Set the MARK HOLD LEVEL switch and control to ON (clockwise) until a click is heard.
(2) Set the FULL DX-ONE WAY switch of the control unit to ONE WAY.
(3) Set the XMTR ON-XMTR OFF switch of the control unit to XMTR OFF.
(4) Communicate with the distant station and have the operator turn the FULL DX-ONE WAY switch to ONE WAY at a predetermined time.
(5) Tell the operator of the distant station to adjust the MARK HOLD LEVEL control inside the door of the frequency-shift converter in accordance with paragraph 69. The mark-hold function maintains a steady marking signal, automatically, for holding the teletypewriter in the absence of a sufficiently strong r-f signal.
(6) Adjust the MARK HOLD LEVEL control of the frequency-shift converter according to paragraph 69.
(7) Send a "go-ahead" signal to the distant operator.
(8) Set the XMTR ON-XMTR OFF switch of the control unit to XMTR OFF. The receivers are enabled and the transmitter is disabled.
(9) Messages from the distant station can be received. When the distant operator gives a go-ahead signal, set the XMTR ON-XMTR OFF switch to XMTR ON.

Note. The XMTR ON-XMTR OFF switch in the control unit operates the disabling relays in the receivers and the transmitter. When communicating with a distant station, the XMTR ON-XMTR OFF switch must be in the XMTR ON position. This grounds the input terminal of the receivers. When receiving, the XMTR ON-XMTR OFF switch must be in the XMTR OFF position. This shorts out the transmitter output and enables the receivers for reception.

(10) Set the TT TRANSPOSE switch in the control unit to LEFT REC-RIGHT SEND.
(11) Set the PERFORATOR OPERATION SWITCH OF THE CONTROL UNIT to RECEIVE TT.
(12) The typing reperforator will perforate and print on tape messages from the distant station.

c. Sending with the Typing Reperforator.

(1) Perform the steps outlined in *b*(1) through (9) above.
(2) Set the TT TRANSPOSE switch in the control unit to LEFT REC-RIGHT SEND.
(3) Set the PERFORATOR OPERATION switch of the control unit to SEND TT.
(4) Type out the message on the keyboard of the typing reperforator.
(5) A printed and code perforated tape will be made and the message will be transmitted to a distant station.

d. Preparing Tape. Messages can be prepared by printing and code perforating tape. The message is not transmitted to a distant station. This operation is accomplished in only one position of the PERFORATOR OPERATION switch and in two positions of the TT TRANSPOSE switch of the control unit. A 60-ma, d-c current is necessary to prevent the typing reperforator from running open. The procedure is as follows:

(1) Set the FULL DX-ONE WAY switch to either position.
(2) Set the TT TRANSPOSE switch in the control unit to either position.
(3) Set the PERFORATOR OPERATION switch of the control unit to PUNCH TAPE.
(4) Type out the message on the typing reperforator, keyboard. The typing reperforator will print and code perforate the message on a tape.

78. Single-channel, Full-duplex, Transmitter-distributor Operation

Single-channel operation uses only one antenna and only one of the two receivers for reception of signals. Full-duplex requires the use of two frequencies separated by at least 400 kc for reception and transmission. On this basis, transmission and reception is possible simultaneously. The prepared tape necessary for transmission by the transmitter distributor is obtained from two sources.

a. To transmit with the transmitter distributor directly from the typing reperforator, proceed as follows:

(1) Tune one receiver to the frequency of the distant station and establish a working receiving circuit while receiving on RY signal test tape or miscellaneous TT signals. Tune the channel A receiver to the frequency of the distant station (par. 66).
(2) Set METER B switch to INPUT. Check to see that a reading of more than 50 is obtained when the signal fades.
(3) Adjust the CHANNEL A FINE TUNING control to obtain a maximum reading on meter B.
(4) Set the RF GAIN on the channel A receiver to maximum.
(5) Check to see that the meter A reading averages zero over a long period of time when receiving miscellaneous signals.
(6) Use extreme care in adjusting the tuning control of the channel A receiver since the circuit will fail if the receiver frequency is changed too much or too rapidly.
(7) Set the FULL DX-ONE WAY switch of the control unit to FULL DX.
(8) Set the TT TRANSPOSE switch of the control unit to LEFT REC-RIGHT SEND.
(9) Set the PERFORATOR OPERATION switch of the control unit to RECEIVE TT.
(10 Set the STOP-SEND switch of the transmitter-distributor to SEND.
(11) The typing reperforator will perforate and print the message received from a distant station.
(12) Feed the prepared tape coming from the typing reperforator into the transmitter distributor.
(13) The transmitter distributor acts as a relay in this operation.

b. To transmit with the transmitter distributor from previously prepared tape and to receive with the right teletypewriter proceed as follows:

(1) Perform the steps outlined in *b*(1) through (7) above.
(2) Set the TT TRANSPOSE switch of the control unit to RIGHT REC-LEFT SEND.
(3) Set the PERFORATOR OPERATION switch of the control unit to SENT TT.
(4) Set the STOP-SEND switch of the transmitter distributor to SEND.
(5) Messages from a distant station will be received by the right teletypewriter and will be recorded as page copy.
(6) Feed the prepared tape into the transmitter distributor. Messages on the tape will be transmitted to a distant station.

79. Emergency Operation

a. C-w Transmission.

(1) Set the XMTR ON-XMTR OFF switch to XMTR ON and set the PLATE POWER switch of the radio transmitter to on (up). The latter operation prevents the keying of relays RY1 and RY4 when c-w keying the exciter. Operating relay RY4 *enables* the transmitter by

removing the short across the transmitter output.

(2) Tune the transmitter to the assigned frequency (par. 62).

(3) Insert the plug of telegraph Key J–45 into the CW KEYING jack on the front panel of the control unit.

(4) Set the TEST key of the frequency-shift exciter to MARK.

(5) Depress Key J–45. The BUFFER INDICATOR lamp lights.

(6) Release Key J–45. The light goes out on the BUFFER INDICATOR.

(7) Check to see that proper meter readings are indicated by the meters on the transmitter.

(8) The transmitter is ready for c-w operation.

b. Frequency-shift Transmission.

(1) Tune the transmitter to the assigned frequency (par. 62). Set the TEST key of the frequency-shift exciter to NORM and the FULL DX-ONE WAY switch of the control unit to FULL DX.

(2) Turn the EXTENSION-NORMAL switch of the control unit to NORMAL.

(3) Insert the plug of Key J–45 into the FS KEYING jack on the front panel of the control unit.

(4) Depress Key J–45. A mark signal will be transmitted.

(5) Release Key J–45. A space signal will be transmitted.

(6) Depressing and releasing Key J–45 transmits mark and space signals. The transmitter is ready for frequency-shift keying.

c. Alternate C-w Transmission.

(1) Tune the mo of the transmitter (TM 11–826); tune the transmitter (par. 62).

(2) Insert Key J–45 into the KEY jack on the front panel of the speech amplifier.

(3) Depressing Key J–45 grounds the cathode of the r-f oscillator in the transmitter.

(4) Releasing Key J–45 opens the cathode circuit to ground.

(5) Depressing and releasing Key J–45 keys the r-f oscillator.

80. Operation with Connection Box

a. Making Page Copy from Prepared Tape.

(1) Plug the d-c power cord into Rectifier RA–87–(*).

(2) Plug the gray cord (send) from the transmitter distributor into one of the jacks of CIRCUIT 1.

(3) Plug the red shell plug (receive) of the right teletypewriter into one of the unused jacks of CIRCUIT 1.

(4) Set the STOP-SEND switch of the transmitter distributor to SEND.

(5) Feed the prepared tape into the transmitter distributor.

(6) The right teletypewriter will record the message as page copy.

b. Sending and Receiving Messages through the Connection Box.

(1) Plug the two sets of send and receive, black and red shell, plugs from the connection box into the black and red jacks (J1, J3, J4, and J6, respectively) of the control unit.

(2) Plug the red and black shell plugs of the right teletypewriter into a pair of jacks in LINE 1 and the red and black shell plugs of the left teletypewriter into a pair of jacks in LINE 2.

(3) The connection box will serve as a feed-through device.

(4) The gray shell plug of the transmitter distributor can be plugged into the jack in series with the black shell plug of the teletypewriter in either LINE 1 or LINE 2.

(5) The typing reperforator may be substituted for one of the teletypewriters.

81. Checklist of Switch Positions

If the equipment does not operate in the desired manner, check for proper tuning of the transmitter, receiver, and frequency-shift exciter. Then, check to see that the switches on all components are in the positions indicated below for the service and operation desired.

Component	Switch	Position for				
		Teletypewriter		Emergency c-w keying	Emergency f-s keying	Voice
		Full-duplex	One-way			
Radio Transmitter BC–610–(*).	FILAMENT POWER.	On (up)------	On (up)------	On (up)------	On (up)------	On (up).
	EXCITER PLATE POWER.	NORMAL----	NORMAL----	NORMAL----	On (up)------	On (up).
	PLATE POWER.	Off (down)---	Off (down)---	On (up)------	Off (down)---	On (up).
	PHONE-CW.	CW----------	CW----------	CW----------	CW----------	PHONE.
	BAND SWITCH.	Set to select tuning unit used.	Set to select tuning unit used.			
	HIGH VOLTAGE PROTECT.[a]	NORMAL----	NORMAL----	NORMAL----	NORMAL----	NORMAL.
Radioteletypewriter Control C–808/GRC–26A.	XMTR ON-XMTR OFF.	XMTR ON---	XMTR ON to send; XMTR OFF to receive.	XMTR ON---	XMTR ON---	XMTR ON for sending. XMTR OFF for receiving.
	FULL DX-ONE WAY.	FULL DX---	ONE WAY---	ONE WAY---	ONE WAY---	ONE WAY.
	EXTENSION NORMAL.	NORMAL----	NORMAL----	NORMAL----	NORMAL----	NORMAL.
	AC SUPPLY.	ON----------	ON----------	ON----------	ON----------	ON.
	SPACE-MARK.	MARK------	MARK------	MARK------	MARK------	MARK.
Frequency Shift Exciter 0–39(*) TRA–7.	TEST-------	NORM------	NORM------	MARK------	NORM------	MARK.
	OVEN-------	ON----------	ON----------	ON----------	ON----------	ON.
	AC SUPPLY--	ON----------	ON----------	ON----------	ON----------	ON.
Frequency Shift Converter CV–182(*)/GRC–26A.	OUTPUT----	NORMAL or REVERSE (depending on frequency).	----------	ANY--------	ANY--------	ANY.
	CHANNEL A or CHANNEL B disabling.	Up position---	Up position to receive; down position for sending.	Down position.	Down position.	Up position.
Power Supply PP–712(*)/GRC–26A.	AC SUPPLY	ON----------	ON----------	ON----------	ON----------	ON.
	PLATE.	ON----------	ON----------	ON----------	ON----------	ON.
Radio Receiver R–388/URR.	OFF-STAND-BY-ON.	ON----------	ON----------	ON----------	ON----------	ON.
	METER------	INPUT------	INPUT------	INPUT------	INPUT------	INPUT.
	SELECTIVITY.	0----------	0----------	0----------	0----------	0.
	PHASING----	White line----	White line----	White line----	White line----	White line.
	BFO----------	OFF----------	OFF----------	OFF----------	OFF----------	OFF.
	CALIBRATE--	OFF----------	OFF----------	OFF----------	OFF----------	OFF.
	AVC----------	OFF----------	OFF----------	OFF----------	OFF----------	OFF.
	LIMITER----	OFF----------	OFF----------	OFF----------	OFF----------	OFF.

[a] When tuning, the HIGH VOLTAGE PROTECT SWITCH is in the up position.

Component	Switch	Position for				
		Teletypewriter		Emergency c-w keying	Emergency f-s keying	Voice
		Full-duplex	One-way			
Rectifier RA–87–(*)	ON-OFF	ON	ON	ON	ON	ON.
Teletypewriters TT–55/MGC.	ON-OFF	ON	ON			
	SEND-REC-BREAK.	SEND for right teletypewriter. REC for left teletypewriter.				
Teletypewriters TT–4A/TG.	MOTOR	ON	ON.			
Reperforator	MOTOR ON	MOTOR ON	MOTOR ON.			
Transmitter-distributor.	MOTOR ON-MOTOR OFF.	MOTOR ON	MOTOR ON.			
	STOP-SEND	SEND	SEND.			

82. Stopping Procedure

For tactical reasons, it may be necessary or desirable to shut down for a short period of time. Under some circumstances it may be desirable to shut down more completely.

a. Partial. Use the following procedure to shut down for a short period of time so that starting-up can be accomplished with a minimum of preparation.

(1) Set the FILAMENT POWER switch in the transmitter to off (down).

(2) Set the XMTR ON-XMTR OFF switch of the radioteletypewriter control to XMTR OFF.

(3) Set the TEST key of the exciter to NORM.

(4) Set the circuit breakers in the shelter to OFF.

(5) Depress the STOP button in the power unit until the engine stops.

(6) The radio set can be operated again by starting the power unit engine; setting the circuit breakers to ON in the shelter; setting the FILAMENT POWER switch in the transmitter to on (up) after a suitable time has elapsed.

b. Complete. When shutting down completely, use the following procedure for each component in the order indicated in the chart.

Equipment	Switch or control	Procedure
Radio Transmitter BC–610–(*)	PLATE POWER	Set to off (down).
	FILAMENT VOLTAGE	Turn fully counterclockwise.
	FILAMENT POWER	Set to off (down).
Frequency Shift Exciter 0–39(*)/TRA–7	TEST	NORM.
	AC SUPPLY	Set to off (down).
	OVEN	Set to off (down).
Rectifier RA–87–(*)	ON-OFF	OFF.
Perforator-Transmitter TT–56/MGC	MOTOR	Set at OFF.
Transmitter-Distributor	MOTOR ON-MOTOR OFF	MOTOR OFF.
	STOP-SEND	STOP.
Teletypewriter TT–55/MGC	ON-OFF	OFF.
Teletypewriter TT–4A/TG	MOTOR	OFF.
Radioteletypewriter Control C–808/GRC–26A	A-c supply ON-OFF	OFF.
	XMTR ON-XMTR OFF	XMTR OFF.

Equipment	Switch or control	Procedure
Power Supply PP–712(*)/GRC–26A	PLATE	Set to off (down).
	AC SUPPLY	Set to off (down).
Radio Receiver R–388/URR	OFF-STANDBY-ON	OFF.
Shelter S–69/GRC	Circuit breaker	OFF.
Power Unit PE–95–G	STOP button	Press firmly until engine stops.

Section IV. REMOTE RADIOTELETYPEWRITER OPERATION

83. General

This section describes the operation of Radio Set AN/GRC–26A from a remote site by means of *neutral* loop circuits. The following paragraphs describe installation and operation of the equipment for one-way reversible remote operation, full duplex remote operation, one-way reversible remote operation using a teletypewriter from the radio set at the remote site, and teletypewriter communication to a remote site simultaneously with normal RTT operation.

84. Remote One-way Reversible Operation

a. Installation in Shelter S–69/GRC (fig. 61).

(1) Remove the red and black plugs of the reperforator from Cords CD–307. These cords come from PERF jacks J7 and J8 of the RTT control. Insert the red and black plugs from LINE 1 of the connection box at the rear of the reperforator into the jacks on Cords CD–307 which lead to PERF jacks J7 and J8 of the RTT control.

(2) Terminate the incoming remote line with Plug PL–55. Insert this terminated plug into a RED LINE 1 jack in the connection box.

b. Installation at Remote Site. Terminate the end of the remote line at the remote site with two Jacks JK–26. Connect these two jacks in series as shown in figure 61. Insert the red and black plugs of the remote teletypewrtier equipment into these two jacks.

c. Operation.

(1) *Remote radioteletype.* Set the PERFORATOR OPERATION switch on the control unit to the RECEIVE TT position for reception of RTT signals. Set the PERFORATOR OPERATION switch to the SEND TT position for transmission of radioteletype traffic from the remote site. The transmitted and received messages may be monitored in the radio set shelter by either the left or right teletypewriter. If one of these has been moved to the remote site (par. 87), set the TT TRANSPOSE switch to receive on the remaining unit.

(2) *Perforator-Transmitter TT–56/MGC.*

(*a*) To punch a local tape, insert the red and black plugs of the reperforator into the LOCAL OPERATION CIRCUIT 2 jacks on the connection box.

(*b*) To make a tape of the messages that are being sent or received, insert the red and black plugs of the reperforator into LINE 1 of the connection box and set the PERFORATOR OPERATION switch to the desired function.

(3) *Teletypewriter communication between radio set and remote site.* Set the PERFORATOR OPERATION switch to the SEND TT position and communicate with the remote TT operator by using the left or right teletypewriter in the shelter.

85. Remote Full Duplex Operation

a. Installation in Shelter S–69/GRC (fig. 62).

(1) Remove the red and black plugs of the reperforator from Cords CD–307. Insert the red and black LINE 1 plugs of the connection box into Cords CD–307.

(2) Remove the gray plug of the transmitter distributor from the jack on Cord CD–307 and replace it with the red plug of LINE 2 from the connection box.

(3) Terminate the remote receive line into a Plug PL–55 and insert the plug into a red jack of LINE 1 in the connection box.

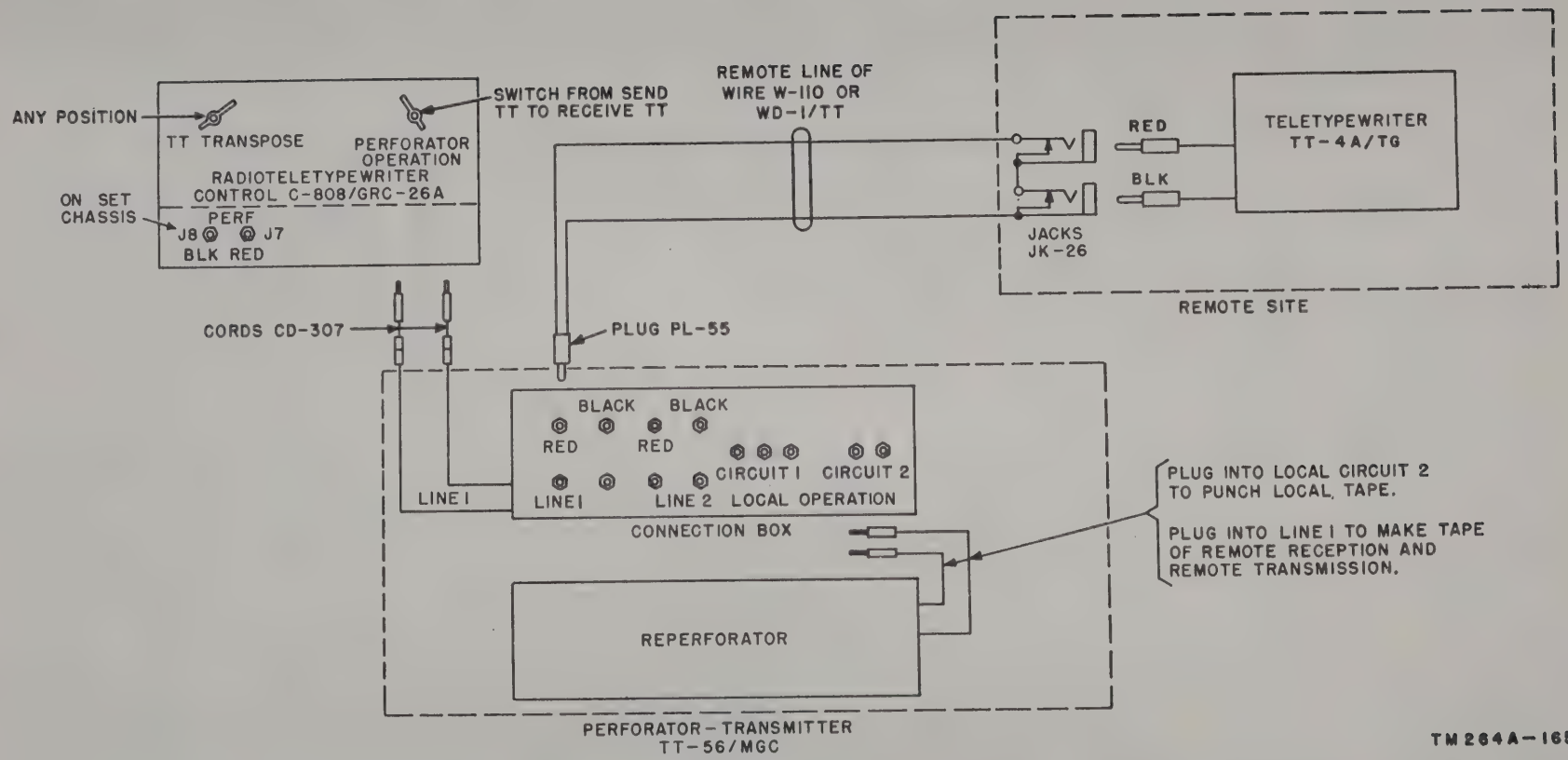


Figure 61. One-way reversible remote operation using neutral loop, wiring diagram.

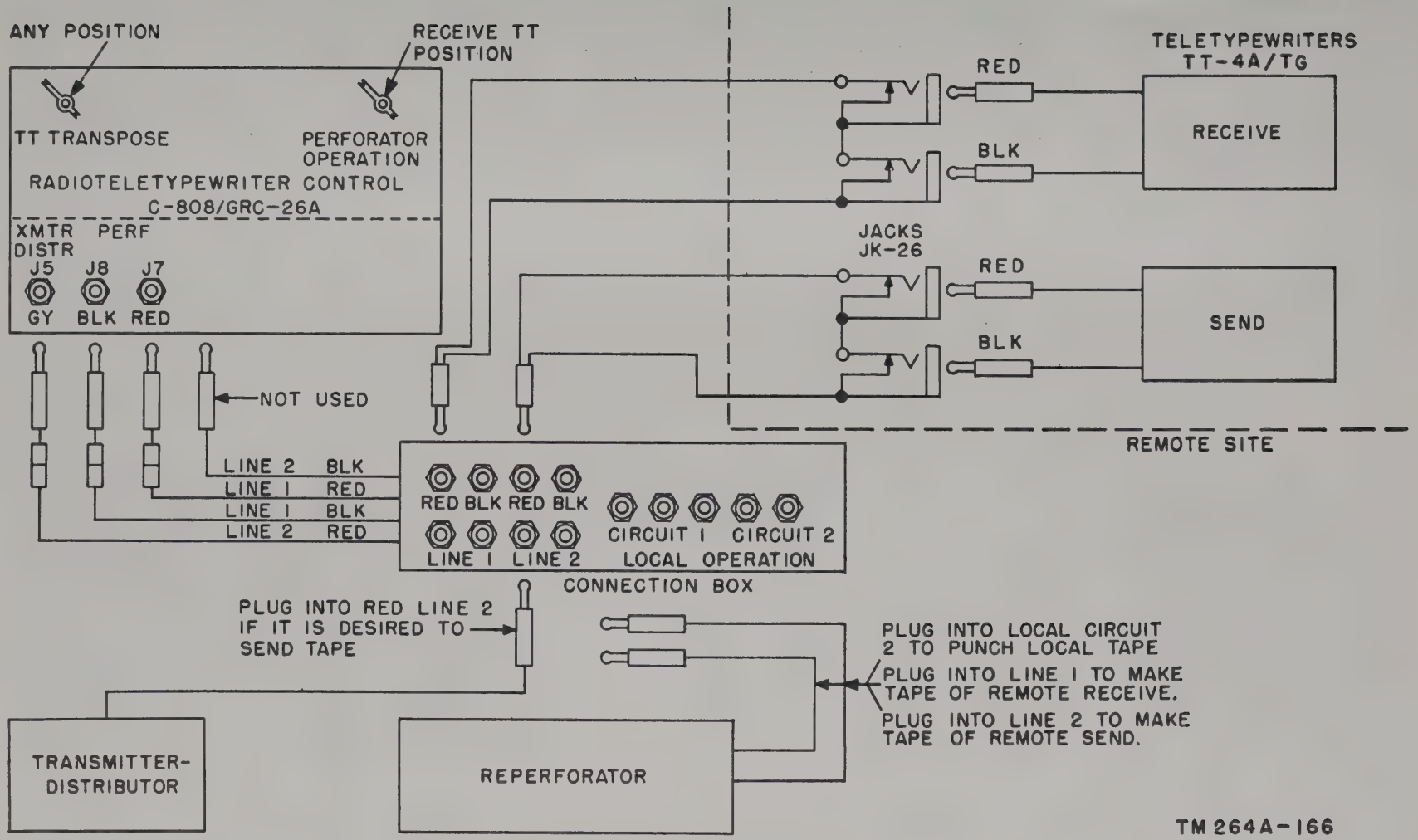


Figure 62. Full duplex remote operation using neutral loops, wiring diagram.

(4) Terminate the remote send line into a Plug PL–55 and insert the plug into a red jack of LINE 2 in the connection box.

b. Installation at Remote Site. Terminate each remote line into two Jacks JK–26 that have been connected in series. Insert the red and black plugs of the sending teletypewriter into the jacks terminated to the RED LINE 2 jacks in the reperforator connection box. Insert the red and black plugs of the receiving teletypewriter into the jacks terminated to the RED LINE 1 jack of the connection box.

c. Operation.

(1) *Remote radioteletype.* Set the PERFORATOR OPERATION switch on the control unit to RECEIVE TT position.

(2) *Perforator-transmitter TT–56/MGC.*

(*a*) To punch a local tape, insert the red and black plugs of the reperforator into LOCAL OPERATION CIRCUIT 2 in the connection box.

(*b*) To make a tape of the RTT reception, insert the red and black plugs of the reperforator into LINE 1 in the connection box.

(*c*) To make a tape of the RTT transmission, insert the red and black plugs of the reperforator into LINE 2 in the connection box.

(3) *Transmitter distributor.* To send a tape message, insert the gray plug of the transmitter distributor into a red LINE 2 jack in the connection box.

(4) *Teletypewriter communication between radio set and remote site.* Communicate with the remote teletypewriter operator by using the left or right teletypewriter in the shelter. See that the TT TRANSPOSE switch is set correctly.

86. Remote One-way Reversible Operation Using a Teletypewriter from the Radio Set

a. Installation in Shelter S–69/GRC (fig. 63).

(1) Remove the four Cords CD–307 connected to the two teletypewriters from the control unit.

(2) Remove the *left* teletypewriter from the shelter.

(3) Remove the red and black plugs of the reperforator from Cords CD–307 and replace them with the red and black plugs of LINE 1 from the connection box.

(4) Insert the red and black connection box plugs of LINE 2 into the red and black jacks of LINE 1 on the box.

(5) Insert the red and black plugs of the *right* teletypewriter into the red and black jacks of LINE 1 in the connection box.

(6) Terminate the remote line in Plug PL–55 and insert the plug into the RED LINE 2 jack in the connection box.

b. Installation at the Remote Site. Terminate the remote line into two Jacks JK-26 that have been connected in series. Insert the red and black plugs of the remote teletypewriter into these jacks.

c. Operation.

(1) *Remote radioteletypewriter.* Set the PERFORATOR OPERATION switch to the RTT control to the RECEIVE TT position for reception of RTT signals, and to the SEND TT position for transmission of RTT messages from the remote site. The sent and received copy can be monitored in the shelter.

(2) *Perforator-transmitter TT–56/MGC.*

(*a*) To punch a local tape, insert the red and black plugs of the reperforator into LOCAL OPERATION CIRCUIT 2 in the connection box.

(*b*) To make a tape of received or sent messages, insert the red and black plugs of the reperforator into LINE 2 in the connection box and set the PERFORATOR OPERATION switch on the RTT control to the desired function.

(3) *Teletypewriter communication between radio set and remote site.* Set the PERFORATOR OPERATION switch on the RTT control to the SEND TT position and communicate with the remote teletypewriter operator.

87. Simultaneous Remote and Local Operation

a. Installation at Shelter S–69/GRC and Remote Site.

(1) Follow the same procedure given in paragraph 88*a* and *b* below, except that the *left* teletypewriter is left intact in the shelter.

(2) Do not remove Special Purpose Cable Assembly CX–1120/U from the LOCAL OPERATION CIRCUIT 1 jack.

b. Operation in Shelter S–69/GRC.

(1) *Communication to remote site.* Set the PERFORATOR OPERATION switch

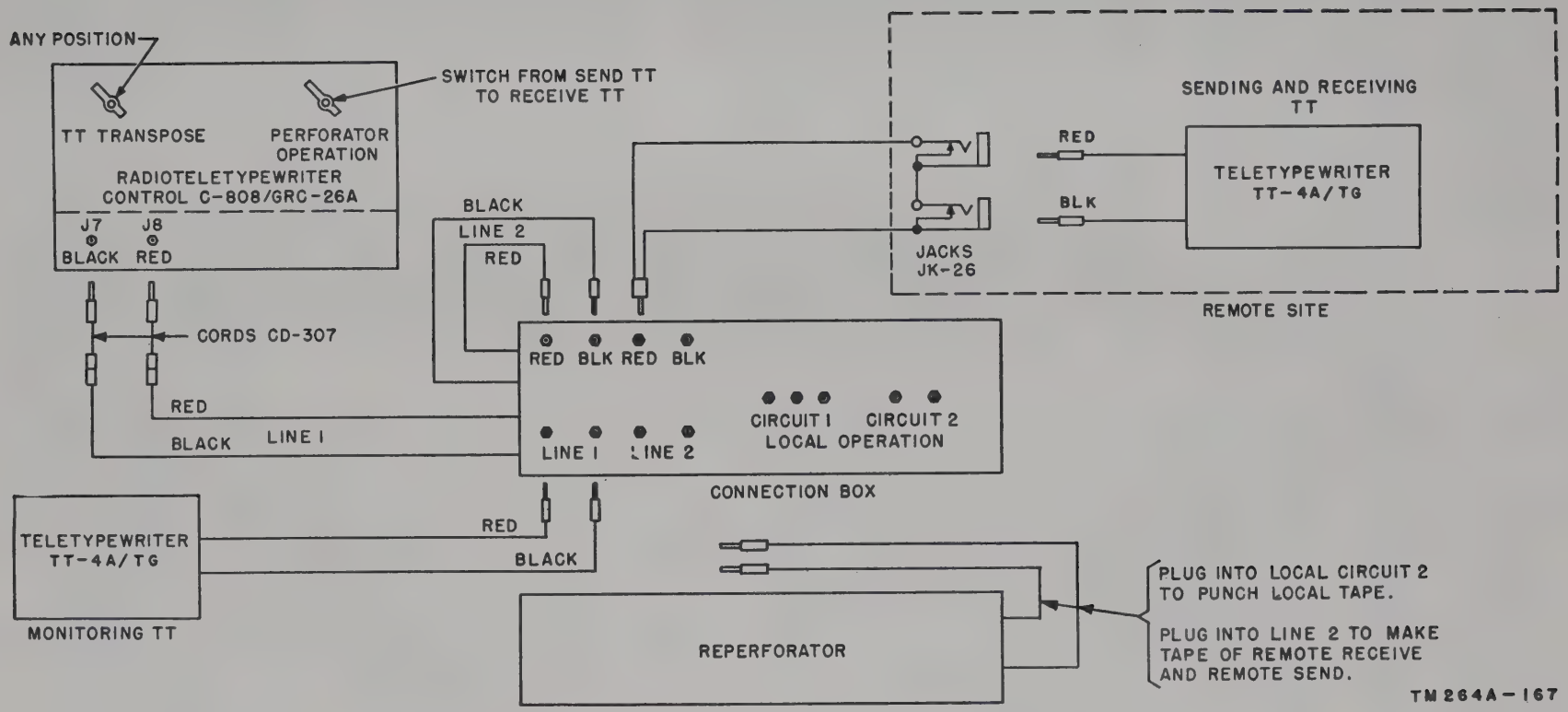


Figure 63. One-way operation using neutral loop, wiring diagram.

to the PUNCH TAPE position and communicate with the remote operator by using the *right* teletypewriter.

(2) *Radioteletypewriter communication.* Set the TT TRANSPOSE switch to the LEFT REC position for reception and to the LEFT SEND position for transmission; use the *left* teletypewriter.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

88. General

The operation of Radio Set AN/GRC–26A may be difficult in regions where extreme cold, heat, humidity and moisture, sand conditions, etc., prevail. In the following paragraphs, instructions are given on procedures for minimizing the effect of these unusual operating conditions.

89. Operation in Arctic Climates

Subzero temperatures and climatic conditions associated with cold weather affect the efficient operation of the equipment. Instructions and precautions for operation under such adverse conditions follow:

a. Handle the equipment carefully.

b. Keep the equipment warm and dry. Keep the shelter heater turned on at all times and regulate ventilation as necessary. Electric air heaters are provided to heat the shelters. If one is not sufficient for this purpose, additional heaters may be requisitioned.

c. Take precautions to prevent cold air from coming into contact with heated tubes when the shelter door is opened. A sudden draft of cold air often is sufficient to shatter the glass envelope of a heated tube.

d. Do not attempt to operate teletypewriters when they are cold because the typing mechanism is inoperable at low temperatures. Allow adequate warm-up time before using them.

e. Heavy coatings of frost will gather on mouth-type microphones in extreme cold weather when the microphones are used in the open air or in a cold room. Breath will cause frost to form in the small holes of the cap, and will affect transmitter modulation. Rubber and fabric diaphragms have been designed to protect some types of microphones; use them when available. Have a spare microphone ready, if possible, in case the one in use fails to function properly.

f. The equipment will sweat until it is brought up to operating temperature after exposure to the cold. This condition also arises when equipment is used after exposure during a cold night. When the equipment has reached room temperature, dry it thoroughly.

g. Use any improvised means to protect dry batteries, since they will fail if not protected against the cold. Preheat the batteries. To prevent heat loss, place them in bags lined with kapok, spun glass fiber materials, or woolen clothing.

90. Operation in Tropical Climates

a. When operating the equipment in tropical climates, high relative humidity will cause condensation of moisture on the equipment whenever the temperature of the equipment becomes lower than the ambient air. To minimize this condition, place lighted electric bulbs under the equipment. Dry the equipment thoroughly before operating it.

b. Tape all cable connectors with rubber tape to prevent shorts and leakage caused by moisture.

91. Operation in Desert Climates

a. Conditions similar to those encountered in tropical climates often prevail in desert areas. Use the same measure to insure proper operation of the equipment.

b. The main problem which arises with equipment operation in desert areas is the large amount of sand or dust and dirt which enters the moving parts of radio equipment, such as motors and power units. The ideal preventive precaution is to house the equipment in a dustproof shelter. Since, however, such a building seldom is available and would require air conditioning, the next best precaution is to make the shelter in which the equipment is located as dustproof as possible with available materials. Hang wet sacking over the windows, skylight, and door.

c. Take care to keep the equipment as free from dust as possible. Make frequent preventive maintenance checks (pars. 95 through 97). Pay particular attention to the lubrication of the equipment. Excessive amounts of dust, sand, or dirt that come into contact with oil and grease result in grit, which will damage the equipment.

d. Make periodic checks of doublet antenna guy assemblies to prevent damage during sudden wind squalls which occur in desert areas.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

92. Materials Supplied with Radio Set AN/GRC–26A

Materials supplied for the maintenance of this radio set are as follows:

Lint-free bleached cheesecloth.
Three-ounce can of lubricating oil.
Solder M1.
Friction Tape TL–83.
Rubber Tape TL–192.

93. Special Tools for Radio Set AN/GRC–26A

a. The tools and test equipment furnished with Radio Set AN/GRC–26A should be adequate for organizational maintenance of the equipment. Additional tools, if required, often may be improvised. For example, a safety shorting stick and several shorting jumper wires may be constructed.

b. To construct a safety shorting stick (fig. 64), secure a dry piece of wood or some other material which is a good electrical insulator. It should be about 36 inches long and about 1 inch square. Securely fasten a piece of copper or brass rod (or thin tubing) to one end of the stick, with the rod extending 12 inches beyond the end of the stick. The free end of the rod should be bent in the form of a small hook. Solder a piece of heavy flexible hook-up wire about 18 inches long to the metal rod at the point where it is fastened to the stick. Attach a heavy clip to the free end of the wire. The jumper wires are made from heavy flexible wire, about 18 inches long, with heavy clips attached to each end.

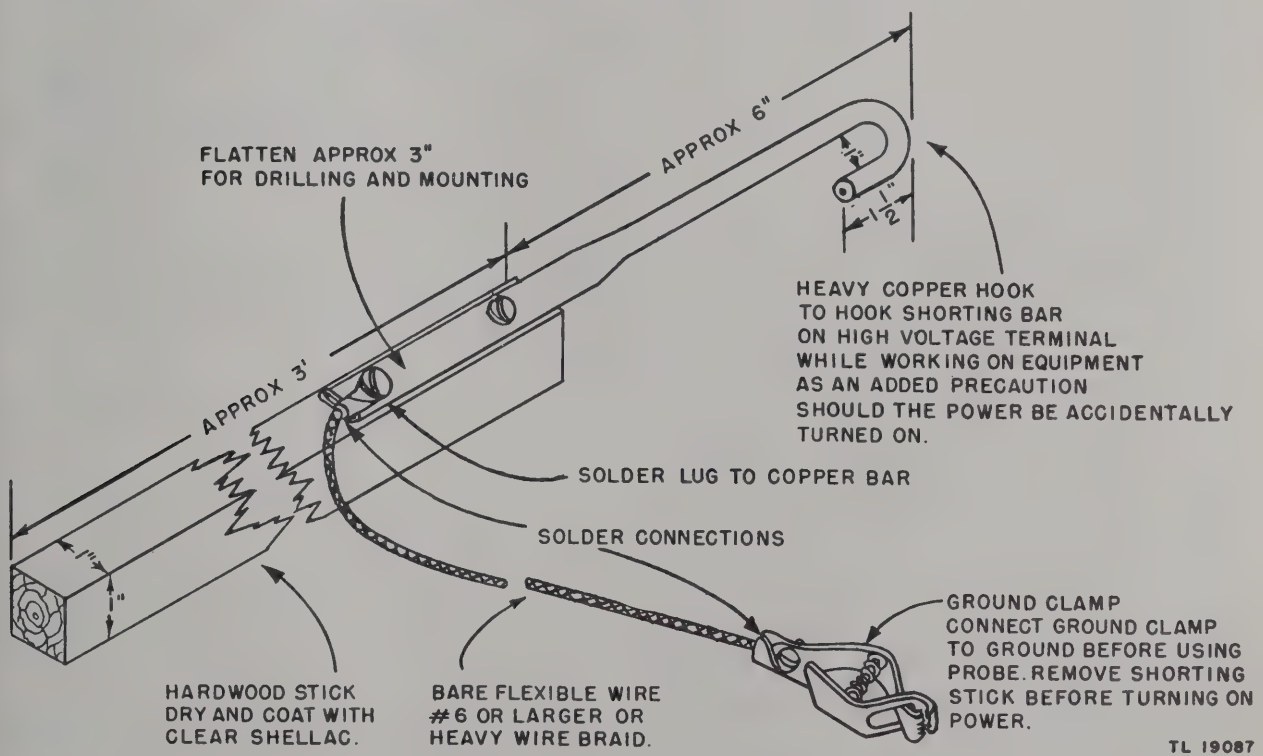


Figure 64. Construction of shorting stick.

c. To use this stick, attach the grounding clamp to a reliable ground connection. Then touch the hook to all positive connections of capacitors and to all high-voltage circuits. The hook on the end of the stick will enable the user to hook the device to a high-voltage point as protection in case the power should be accidentally turned on. If this should happen, the high voltage would be grounded.

Section II. PREVENTIVE MAINTENANCE SERVICES

94. Definition of Preventive Maintenance

Preventive maintenance is work performed on equipment (usually when the equipment is not in use) to keep it in good working order so that breakdowns and needless interruptions in service will be kept to a minimum. Preventive maintenance differs from trouble shooting and repair. Its object is to prevent certain troubles *before* they can occur. Refer to AR 750–5.

95. General Preventive Maintenance Techniques

a. Use the floor broom, bench brush, and cheesecloth for cleaning the shelter and components.

b. Use No. 0000 sandpaper to remove corrosion from cable connectors, switches, relays, and terminals of electrical components.

c. Use No. 0000 sandpaper to remove corrosion from the antenna mast. After cleaning, touch up all areas not used for electrical contact with olive drab paint.

d. Use a clean, dry, lint-free cloth or a dry brush for cleaning.

(1) If necessary, except for electrical contacts, moisten the cloth or brush with Solvent, Dry Cleaning (SD); then wipe the parts with a dry cloth.

(2) Clean electrical contacts with a cloth moistened with carbon tetrachloride, then wipe them with a dry cloth.

Caution: Repeated contact of carbon tetrachloride with the skin or prolonged breathing of the fumes is dangerous. Make sure adequate ventilation is provided.

e. If available, dry compressed air may be used at line pressure *not exceeding 60 psi* (pounds per square inch) to remove dust from inaccessible places; *be careful,* however, or mechanical damage from the air blast may result.

f. For further information on preventive maintenance techniques, refer to TB SIG 178.

96. Use of Preventive Maintenance Forms (figs. 65 and 66)

a. The decision as to which items on DA AGO Forms 11–238 and 11–239 are applicable to this equipment is a tactical decision to be made in the case of first echelon maintenance by the communication officer/chief or his designated representative, and in the case of second and third echelon maintenance, by the individual making the inspection. Instructions for the use of each form appear on the reverse side of the form.

b. Circled items in figures 65 and 66 are partially or totally applicable to Radio Set AN/GRC–26A. References in the ITEM block refer to paragraphs in text which contain additional maintenance information. For information concerning the maintenance of an individual component, refer to the applicable technical manual.

97. Performing Preventive Maintenance

The following preventive maintenance operations should be performed by organizational personnel at the intervals indicated on the forms (figs. 65 and 66), unless these intervals are changed by the local commander.

Caution: Screws, bolts, and nuts should not be tightened carelessly. Fittings tightened beyond the pressure for which they are designed may become damaged or broken.

a. Exterior.

(1) Check completeness and general condition of the equipment (par. 8).

(2) Check to see that the location and installation are suitable for normal operation (chap. 2).

(3) Clean dirt and moisture from antennas, mast bases, fairleads, the exterior of the shelter, microphones, plugs, jacks, and panels.

(4) Inspect controls for binding, scraping, excessive looseness, worn or chipped gears, misalinement, and positive action.

(5) Check for normal operation (par. 107).

OPERATOR FIRST ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT

RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE	EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: Satisfactory; X Adjustment, repair or replacement required; (X) Defect corrected.
NOTE: Strike out items not applicable.

DAILY

NO.	ITEM	CONDITION S	M	T	W	T	F	S
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT *(receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories).* PAR. 97 a(1)							
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 97 a(2)							
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR. 97 a(3)							
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS. PAR. 97 b(2)							
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 97 a(4)							
6	CHECK FOR NORMAL OPERATION. PAR. 97 a(5)							

WEEKLY

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 97 a(6)		13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES. PAR. 97 a(12)	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 97 a(7)		14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES. PAR. 97 a(13)	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 97 a(8)		15	INSPECT METERS FOR DAMAGED GLASS AND CASES. PAR. 97 a(14)	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS. PAR. 97 a(9)		16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING. PAR. 97 a(15)	
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING. PAR. 97 a(10)		17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION. PAR. 97 a(16)	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES. PAR. 97 a(11)		18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE. PAR. 97 a(17)	

19 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. PAR. 97 a(18)

DA AGO FORM 1 MAY 51 11-238 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

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Figure 65. DA AGO Form 11-238.

SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT

RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE	EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; (1) Defect corrected.
NOTE: Strike out items not applicable.

NO.	ITEM	CONDITION
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT *(receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories).* PAR. 97a(1)	
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 97a(2)	
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR. 97a(3)	
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS. PAR. 97 b(2)	
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 97a(4)	
6	CHECK FOR NORMAL OPERATION. PAR. 97a(5)	
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 97a(6)	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 97a(7)	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 97a(8)	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS. PAR. 97a(9)	
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING. PAR. 97a(10)	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES. PAR. 97a(11)	
13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES. PAR. 97a(12)	
14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES. PAR. 97a(13)	
15	INSPECT METERS FOR DAMAGED GLASS AND CASES. PAR. 97a(14)	
16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING. PAR. 97a(15)	
17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION. PAR. 97a(16)	
18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE. PAR. 97a(17)	
19	ELECTRON TUBES - INSPECT FOR LOOSE ENVELOPES, CAP CONNECTORS, CRACKED SOCKETS: INSUFFICIENT SOCKET SPRING TENSION; CLEAN DUST AND DIRT CAREFULLY; CHECK EMISSION OF RECEIVER TYPE TUBES. PAR. 97b(1)	
20	INSPECT FILM CUT-OUTS FOR LOOSE PARTS, DIRT, MISALIGNMENT AND CORROSION.	
21	INSPECT FIXED CAPACITORS FOR LEAKS, BULGES, AND DISCOLORATION. PAR. 97b(3)	
22	INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR LOOSE MOUNTINGS; BURNED, PITTED, CORRODED CONTACTS; MISALIGNMENT OF CONTACTS AND SPRINGS; INSUFFICIENT SPRING TENSION; BINDING OF PLUNGERS AND HINGE PARTS. PAR. 97b(4)	
23	INSPECT VARIABLE CAPACITORS FOR DIRT, MOISTURE, MISALIGNMENT OF PLATES, AND LOOSE MOUNTINGS. PAR. 97 b(5)	
24	INSPECT RESISTORS, BUSHINGS, AND INSULATORS, FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE. PAR. 97b(6)	
25	INSPECT TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR CORROSION, DIRT AND LOOSE CONTACTS. PAR. 97b(7)	
26	CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, BLOWERS, RELAY CASES, AND INTERIORS OF CHASSIS AND CABINETS NOT READILY ACCESSIBLE. PAR. 97b(8)	
27	INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS. PAR. 97b(9)	
28	CHECK SETTINGS OF ADJUSTABLE RELAYS. PAR. 97b(10)	
29	LUBRICATE EQUIPMENT IN ACCORDANCE WITH APPLICABLE DEPARTMENT OF THE ARMY LUBRICATION ORDER. PAR. 97b(11)	
30	INSPECT GENERATORS, AMPLIDYNES, DYNAMOTORS, FOR BRUSH WEAR, SPRING TENSION, ARCING, AND FITTING OF COMMUTATOR.	
31	CLEAN AND TIGHTEN CONNECTIONS AND MOUNTINGS FOR TRANSFORMERS CHOKES, POTENTIOMETERS, AND RHEOSTATS. PAR. 97b(12)	
32	INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS FOR OVERHEATING AND OIL-LEAKAGE. PAR. 97 b(13)	
33	BEFORE SHIPPING OR STORING - REMOVE BATTERIES. PAR. 97 b(14)	
34	INSPECT CATHODE RAY TUBES FOR BURNT SCREEN SPOTS.	
35	INSPECT BATTERIES FOR SHORTS AND DEAD CELLS. PAR. 97 b(15)	
36	INSPECT FOR LEAKING WATERPROOF GASKETS, WORN OR LOOSE PARTS. PAR. 97 b(16)	
37	MOISTURE AND FUNGIPROOF. PAR. 97 b(17)	
38	IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. PAR. 97 b(18)	

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Figure 66. DA AGO Form 11–239.

(6) Clean and tighten exterior of components and cases, rack mounts, shock mounts, antenna mounts, coaxial transmission lines, and cable connections (fig. 127). Do not merely brush the dirt off, only to have it settle on some other equipment. Use a lightly oiled dust cloth.

(7) Inspect cases, mountings, antennas, masts, and exposed metal surfaces for rust, corrosion, and moisture.

(8) Inspect cord, cable, wire, and shock mounts for cuts, breaks, fraying, deterioration, kinks, and strain (fig. 127).

(9) Inspect antennas for eccentricities, corrosion, loose fit, and damaged insulators (pars. 33 and 35).

(10) Inspect canvas items, leather, and cabling for mildew, tears, and fraying.

(11) Inspect equipment for looseness of accessible items: switches, knobs, jacks, connectors, electrical transformers, relays, motors, blowers, capacitors, generators, and pilot light assemblies.

(12) Inspect storage batteries for dirt, loose terminals, electrolyte level and specific gravity, and for damaged cases (par. 41).

(13) Clean air filters, brass nameplates, dial and meter windows, and pilot-light jewels.

(14) Inspect meters for damaged glass and cases.

(15) Inspect shelter and covers for adequacy of weatherproofing (fig. 101).

(16) Check antenna guy wires for looseness and proper tension (fig. 46).

(17) Check terminal box covers for cracks, leaks, damaged gaskets, dirt, and grease.

(18) If deficiencies noted are not corrected during inspection, indicate action taken for correction.

b. Interior.

(1) Inspect electron tubes for loose envelopes, cap connections, cracked sockets, insufficient socket spring tension; clean away dust and dirt carefully; check emission of receiver-type tubes (figs. 96 through 101).

(2) Inspect seating of readily accessible *pluck out* items: tubes, lamps, crystals, fuses, connectors, plug-in coils and resistors.

(3) Inspect fixed capacitors for leaks, bulges, and discoloration.

(4) Inspect relay and circuit breaker assemblies for the following: loose mountings; burned, pitted, corroded contacts; misalinement of contacts and springs; insufficient spring tension; binding of plungers and hinge parts.

(5) Inspect variable capacitors for dirt, moisture, misalinement of plates, and loose mountings.

(6) Inspect resistors, bushings, and insulators, for cracks, chipping, blistering, discoloration, and moisture.

(7) Inspect terminals of large fixed capacitors and resistors for corrosion, dirt, and loose contacts.

(8) Clean and tighten switches, terminal blocks, blowers, relay cases, and interiors of chassis and cabinets not readily accessible.

(9) Inspect terminal blocks for loose connections, cracks, and breaks.

(10) Lubricate equipment in accordance with applicable Department of the Army lubrication order (pars. 98 through 100).

(11) Clean and tighten connections and mountings for transformers, chokes, potentiometers, and rheostats.

(12) Inspect transformers, chokes, potentiometers, and rheostats, for overheating and oil leakage.

(13) Remove batteries before shipping or storing (par. 158).

(14) Inspect batteries for shorts and dead cells.

(15) Inspect for leaking waterproof gaskets, worn or loose parts.

(16) Check moistureproofing and fungiproofing.

(17) If deficiencies noted are not corrected during inspection, indicate the action taken for correction.

98. Detailed Lubrication Instructions

a. General.

(1) The type of lubricant to be used, the interval, and the specific instructions for each part listed under Radio Set AN/GRC–26A are given in the respective technical manuals covering the components of the radio set. Lubrication for the blower unit motor is given in *b* below.

(2) Before applying lubricant, be sure parts are thoroughly clean and free from dust and dirt. Lubricate sparingly. Wipe off excess lubricant.

(3) Apply Oil, Lubricating, Preservative, Special (PL Special) sparingly to springs and loops of all helical springs, to prevent wear and rust.

b. Shelter Ventilating Blower. Lubricate with Oil, Engine, Heavy Duty (OE–10) in oil cups located at each end of motor. This blower motor is located near the ceiling of the shelter above the transmitter.

c. Mechanical Devices of the Shelter. The movable parts of the shelter should be covered weekly with a thin film of oil (OE–10). Following is a list of the parts to be lubricated:

Hinges of the ventilator hatches covers.
Latches of the ventilator hatches covers.
Runway of the sliding storage cabinet doors.
Hinges of the entrance door.

d. Raceways of Cabinets. The raceways of cabinets should be lubricated with oil (PL Special) to assure easy removal of chassis for repairs.

e. Component Hinged Doors. Each week, place a few drops of oil on the hinges of the following components:

Two doors on the top of the transmitter.
Door in the front panel of the converter unit.
Door in the front panel of the power supply unit.

Note. Intervals given are maximums for normal 8-hour-day operation. For abnormal conditions or activities, intervals should be shortened accordingly.

99. Parts of Radio Set AN/GRC–26A Lubricated by Manufacturer

The parts of the equipment which have been lubricated by the manufacturer prior to delivery of the equipment are listed in the following table:

Major component	Parts lubricated	Commercial lubricant	Signal Corps equivalent
Shelter	Roller bearings in all wall cabinets		Oil (PL Special).
	Hinges for door, windows, cabinets, locking devices, and snap fasteners.		Oil (PL Special).
	Blower and blower motor	SAE 10	Oil (OE–10).

100. Lubrication Under Unusual Conditions

a. Arctic Regions. Lubricants which are satisfactory at moderate temperatures stiffen and solidify at subzero temperatures; as a result, moving parts bind or become inoperative. Use the grade of lubricant recommended for the equipment in arctic regions. Refer to TM 11–904 for lubricating information on Power Unit PE–95–G. When preparing the equipment for low-temperature operation, see that the lubricants used for moderate temperatures are thoroughly removed. Even small amounts of such lubricants, if allowed to remain, may impair the operation of moving parts. *Be sure to use the lubricant specified for low-temperature operation.*

b. Tropical Regions. High temperatures and moisture due to rain, condensation, etc., may cause lubricants which are normally satisfactory to flow from moving parts and other surfaces. These bearing surfaces will wear excessively, and hinges, fastenings, and other parts will become damaged or destroyed by rust and corrosion. Inspect the equipment daily and lubricate it as required to insure efficient operation. Use lubricants suitable for high temperatures.

c. Desert Regions. Dust and sand infiltration into the equipment causes grit in the lubricants and will seriously impair and damage the moving parts of the set. Hot, dry temperatures cause the

lubricants to flow from the moving parts, and conditions similar to those described in *b* above will result. Use lubricants suitable for high temperatures. Inspect and clean the equipment daily.

d. Lubricants. For operation under climatic conditions in which extreme temperatures are encountered, the lubricants listed below should be used in place of those specified in paragraphs 98 and 99.

Lubricant specified	For temperature		
	Above 32° F.	32° F. to 0° F.	Below 0° F.
OE–10	OE–10	PL-Special	PL-Special.
PL-Special.			
GL[a]	GL	GL	PL-Special.
WB[b]	WB	GL	GL.

[a] Grease, Aircraft and Instrument (GL).
[b] Grease, General Purpose, No. 2 (WB).

Section IV. WEATHERPROOFING

101. Weatherproofing

a. General. Signal Corps equipment, when operated under severe climatic conditions such as prevail in tropical, arctic, and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

b. Tropical Maintenance. A special moisture-proofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is explained in TB SIG 13 and TB SIG 72.

c. Winter Maintenance. Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low temperatures are explained in TB SIG 66.

d. Desert Maintenance. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperature, low humidity, and excessive sand and dust are explained in TB SIG 75.

e. Lubrication. The effects of extreme cold and heat on materials and lubricants are explained in TB SIG 69. Observe all precautions outlined in TB SIG 69 and pay strict attention to all lubrication orders when operating equipment under conditions of extreme cold or heat. Refer to paragraphs 98 through 100 for detailed instructions.

102. Rustproofing and Painting

a. When the finish on the case has been badly scarred or damaged, rust and corrosion can be prevented by touching up bare surfaces. Use fine sandpaper to clean the surface down to the bare metal; obtain a bright smooth finish.

Caution: Do not use steel wool. Minute particles frequently enter the equipment case and cause harmful internal shorting or grounding of circuits.

b. When a touch-up job is necessary, apply paint with a small brush. Remove rust from the case by cleaning corroded metal with solvent (SD). In some cases it may be necessary to use solvent (SD) to soften the rust, and to use sandpaper to complete the preparation for painting. Paint used will be authorized according to existing regulations. Refer to TM 9–2851.

Section V. TROUBLE SHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

103. Scope

a. The trouble-shooting and repair work that can be performed at the organizational maintenance level (operators and repairmen) is necessarily limited in scope by the tools, test equipment, and replaceable parts issued, and by the existing tactical situation. Accordingly, trouble shooting is based on the performance of the equipment and the use of the senses in determining such trouble as burned-out tubes, fuses, etc.

b. The following paragraphs in this section will help to determine which component is at fault. After localizing the fault to a component, the operator should refer to the technical manual covering that particular component for information on further localizing the trouble to the defective stage or part.

104. Visual Inspection

a. Many of the faults appearing in Radio Set AN/GRC–26A may be detected by a visual inspection of the system components. Pilot lamps are used to indicate when the power source is connected to a component. If the indicating lamp fails to light, check to see that the power cords are connected to the proper receptacle and that the plugs are properly inserted.

b. One type of fault is the improper setting of switches and controls. Check the switch and control settings for the mode of operation to be used. Check to see that the type of operation and service is one that is permitted by the tactical situation (for example, full-duplex services should not be attempted during mobile operation); check to see that frequencies are chosen properly when the whip antennas are being used.

105. System Sectionalization of Trouble to a Component

a. System sectionalization consists of determining whether the trouble is in the receiver, frequency shift converter, control unit, frequency shift exciter, transmitter, speech amplifier, power supply, or the teletypewriter equipment.

b. Operate the entire set and observe its performance. Refer to the equipment performance checklist (par. 107) for normal operating indications.

(1) If the entire radio set is inoperative and the lights do not light, the trouble is probably in the power source.

(2) If only one component is inoperative, the trouble is in that component and may be only a fuse (par. 38). Do not continue to burn out fuses before looking elsewhere to determine the source of the trouble.

(3) If the signal is present in one component (as indicated by the proper meter reading) but there is no indication of a signal in the component which follows it, the trouble may be a defective connector or disconnected cord.

Note. The order in which one component follows the other is shown on the complete block diagram (fig. 72).

(4) If the teletypewriter equipment does not operate properly, the trouble is probably in the TT equipment cords, plugs, or jacks, or in the setting of switches in Radioteletypewriter Control C–808/GRC–26A.

c. To find the source of excessive noise, remove the antenna cord from the operating receiver. If noise becomes less pronounced or stops, the trouble is in the antenna, or is from a source external to the shelter. If noise persists, operate one receiver at a time. If the noise continues with each receiver, the trouble is in one of the components.

d. By the use of procedures similar to the simple checks given above, the trouble usually can be isolated to a particular unit. If these checks are not productive, use the equipment performance checklist (par. 107) as explained in the following paragraph.

106. Trouble Shooting by Using Equipment Performance Checklist

a. General. The equipment performance checklist (par. 107) will help the operator to locate trouble in the equipment. The chart gives the item to be checked, the conditions under which the item is checked, the normal indications and tolerances of correct operation, and the corrective measures the operator can take. *When using this chart, follow the items in numerical sequence.*

b. Action or Condition. For some items, the information given in the *Action or condition* column consists of various switch and control settings under which the item is to be checked. For other items, it represents an action that must be taken to check the normal indication given in the normal indications column.

c. Normal Indications. The normal indications listed include the visible and audible signs that the operator should perceive when checking the items. If the indications are not normal, the operator should apply the recommended corrective measures.

d. Corrective Measures. The corrective measures listed are those which the *operator* can make without turning in the equipment for repairs. A reference in the checklists to a paragraph or technical manual indicates that the trouble probably cannot be corrected during operation and that trouble shooting by an experienced repairman is necessary. If the set is completely inoperative, or if the recommended corrective measures do not yield results, trouble shooting is necessary. However, if the tactical situation requires that communication be maintained and if the set is not completely inoperative, the operator must attempt to maintain the set in operation as long as it is possible to do so.

107. Equipment Performance Checklist

a. Preparatory Operations.

(1) *Shelter S–69/GRC.*

Item No.	Item	Action or condition
1	Circuit breakers	Set at OFF position.

(2) *Frequency Shift Exciter 0–39 (*)/TRA–7.*

Item No.	Item	Action or condition
2	AC SUPPLY switch	Set at off (down) position.
	OVEN switch	Set at off (down) position.
	TEST OSC 850 ~ switch	Set at OFF position.
	TEST key	Set at NORM position.

(3) *Radio Transmitter BC–610–(*).*

Item No.	Item	Action or condition
3	FILAMENT POWER switch	Set at off (down).
4	FILAMENT VOLTAGE control	Set to full counterclockwise position.
5	HIGH VOLTAGE PROTECT switch	Set at off (NORMAL).
6	EXCITER PLATE POWER switch	Set at off (down).
7	PHONE-CW switch	Set at CW position.
8	EXCITATION METER switch	Set at INT. AMP. GRID.
9	BAND SWITCH	Set to channel corresponding to desired tuning unit.
10	Tuning unit	Check selection of proper tuning unit.
11	Coil unit	Check selection of proper coil unit for frequency desired.

(4) *Frequency Shift-Converter CV–182(*)/GRC–26A.*

Item No.	Item	Action or condition
12	OUTPUT switch	Set to NORMAL position.
13	METER B switch	Turn to INPUT.
14	DRIFT COMPENSATOR switch	Set to out (down).

(5) *Power Supply PP–712(*)/GRC–26A.*

Item No.	Item	Action or condition
15	AC SUPPLY switch	Set to off (down) position.
16	PLATE power switch	Set to off (down) position.

(6) *Radio Receiver R–388/URR.*

Item No.	Item	Action or condition
17	OFF-STANDBY-ON	Turn to OFF.
18	AVC-OFF-ON switch	Set to OFF position.
19	BAND CHANGE switch	Set to band desired.
20	Tuning control	Set to frequency desired.
21	CALIBRATE OFF-ON	Set to OFF position.
22	LIMITER-OFF-ON	Set to OFF position.
23	CRYSTAL FILTER	
	SELECTIVITY	Set to 0 position.
	PHASING	Set to white line.

(7) *Rectifier RA–87–A.*

Item No.	Item	Action or condition
24	ON-OFF switch	Set to OFF position.

(8) *Radioteletypewriter Control C–808/GRC–26A.*

Item No.	Item	Action or condition
25	TT TRANSPOSE switch	Set to RIGHT REC-LEFT SEND.
26	PERFORATOR OPERATION	Set to PUNCH TAPE.
27	XMTR ON-XMTR OFF	Set to XMTR OFF position.
28	ON-OFF power switch	Set to OFF position.

(9) *Teletypewriter TT–55/NGC.*

Item No.	Item	Action or condition
29	ON-OFF switch	Set to OFF.

(10) *Teletypewriter TT–4A/TG.*

Item No.	Item	Action or condition
30	MOTOR switch	Set to OFF.

(11) *Typing reperforator (part of Perforator-Transmitter TT–56/MGC).*

Item No.	Item	Action or condition
31	MOTOR switch	Set to MOTOR OFF position.

(12) *Transmitter Distributor (part of Perforator-Transmitter TT–56/MGC).*

Item No.	Item	Action or condition
32	MOTOR ON-MOTOR OFF switch	Set to MOTOR OFF position.
33	STOP-SEND	Set to STOP position.

b. Start Operations.

(1) *Power Unit PE–95–G.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
34	START button	Press and hold in	Power unit starts	Check for discharged battery. Add fuel. Refer to TM 11–904.
35	CIRCUIT BREAKER switch.	Set to ON	Normal line voltage (117 volts indicated on AC VOLTS meter on power unit panel).	Check circuit breaker. Refer to TM 11–904.

(2) *Shelter S–69/GRC.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
36	Circuit breakers	Set to ON	Shelter lamps go on	Check circuit breaker. Check Power Cable Assemblies CX–1165/U, CX–1166/U from Power Unit PE–95–G or commercial source if used.

(3) *Frequency Shift Exciter O–39(*)/TRA–7.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
37	AC SUPPLY and OVEN switches.	Set to ON position at least 2 hours before initial adjustment.	AC SUPPLY and OVEN indicator lamps light.	Check Cord CX–962/TRA–7, fuses and lamps.
38	OSCILLATOR RANGE switch.	Set in accordance with calibration chart.		Refer to paragraph 62.

(4) *Radio Transmitter BC–610–(*).*

Item No.	Item	Action or condition	Normal indications	Corrective measures
39	FILAMENT POWER switch.	Set switch to on (up). Wait 1 minute for filaments to reach operating temperature.	Green pilot lamp and transmitter tuning unit lamp (inside transmitter) light. Red pilot lamp on Speech Amplifier BC–614–(*) lights.	If both lamps are out, check fuses FS1, FS2, FS4 and Cord CD–763. Replace lamp, check Cord CD–764.
40	FILAMENT VOLTAGE.	Turn partially clockwise	FIL. VOLTAGE meter reads 5 to 5.3 volts.	Adjust FILAMENT VOLTAGE control.

(5) *Power Supply PP–712(*)/GRC–26A.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
41	AC SUPPLY switch	Set to ON position	White-capped pilot lamp should light.	Check Cord CX–954/TRA–7, fuses, and lamp.
42	PLATE power switch	Set to ON position	Red-capped pilot lamp should light.	Check Cord CX–954/TRA–7, fuses, and lamp.

(6) *Radio Receivers R–388/URR.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
43	OFF-STANDBY-ON switch.	Turn to ON position	Dial lamps light	Check fuse at rear of chassis. Check power cord and plugs.
44	RF GAIN-AUDIO GAIN.	Turn clockwise	Increased signal or noise is heard.	Check antenna connection and Cord CG–67/MRQ–2 or RF Cable Assembly CG–557A/U.

(7) *Rectifier RA–87–(*).*

Item No.	Item	Action or condition	Normal indications	Corrective measures
45	ON-OFF switch	Set to ON position		

(8) *Receiving Teletypewriter TT–55/MGC.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
46	Power switch	Set to ON position	Motor runs	Check power selector switch for correct position.
			Machine runs closed	Check power cord and plug. Check adjustment of frequency-shift converter (par. 67).

(9) *Receiving Teletypewriter TT–4A/TG.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
47	MOTOR switch	Set to ON	Motor runs	Check MOTOR FUSE. Check power source for correct power. Check power cord and plug.
			Machine runs closed	Check LINE FUSE and the D. C. MILLIAMMETER for 60-ma reading. Check black and red shell plugs and line signal cords. Check that the line signal cords are plugged into the proper jacks of the RTT control jacks.

(10) *Sending Teletypewriter TT–55/MGC.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
48	Power ON-OFF switch	Set to ON position	Motor runs; machine runs closed.	Check TT power selector switch for correct 50–60 cycle position. Check a-c cord. Check to verify that LEFT TT–55/MGC switch is set at SEND.

(11) *Sending Teletypewriter TT–4A/TG.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
49	MOTOR switch	Set to ON	Motor runs Machine runs closed.	Check MOTOR FUSE. Check power source for correct power. Check power cord and plug. Check LINE FUSE and D. C. MILLIAMMETER for 60-ma reading. Check black and red shell plugs and line signal cords. Check to see that the line signal cords are plugged into the proper RTT control jacks (fig. 127).

(12) *Typing reperforator (part of Perforator-Transmitter TT–56/MGC).*

Item No.	Item	Action or condition	Normal indications	Corrective measures
50	MOTOR switch	Set to ON (down)	Motor runs. Machine runs closed.	Check motor connection box a-c cord. See TM 11–2223. Check Rectifier RA–87–A. Check send and receive cords of perforator. Check Special Purpose Cable Assembly CX–1120/U.

(13) *Transmitter Distributor (part of Perforator-Transmitter TT–56/MGC).*

Item No.	Item	Action or condition	Normal indications	Corrective measures
51	MOTOR ON-MOTOR OFF switch.	Set to MOTOR ON	Motor runs	Refer to TM 11–2222.
52	STOP-SEND switch	Set to SEND		Refer to TM 11–2222.

c. Equipment Performance Operation.

(1) *Frequency Shift Exciter O–39(*)/TRA–7.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
53	BUFFER TUNING control.	All dials and controls set in accordance with charts. TEST key set at MARK or SPACE. BUFFER TUNING dial rotated in either direction.	BUFFER INDICATOR lamp glows with maximum brilliance when BUFFER TUNING dial is tuned to resonance.	Refer to paragraph 62.
54	TEST key	With transmitter alined to exciter frequency and transmitter switch on RTT control in XMTR ON position: Set on MARK; Set on SPACE; Set on NORM.	BUFFER INDICATOR lamp glows and normal meter readings are observed on the transmitter in all three positions.	Refer to paragraphs 62 through 69. Check Cord CX–961/TRA–7 (blue).
55	Headset	With plug inserted into PHONE 850~TEST jack, Cord CG–390/U connected between receiver and the exciter, VOLUME 850~TEST control set to midposition and TEST OSC switch set to 850~ position.	850-cycle tone in headset	Refer to paragraphs 64 through 68.
56	TEST OSC switch	Throw to 850 ~ position	850-cycle tone heard in phones.	Refer to paragraph 62.
57	VOLUME control. (850 ~ TEST).	Rotate in either direction	Level of 850-cycle tone will vary.	Refer to paragraph 62.
58	OSCILLATOR TUNING control.	TEST OSC switch in OFF position. TEST key in MARK position. Set one receiver as frequency standard, paragraph 63. Rotate OSCILLATOR TUNING dial in either direction.	Zero beat obtained in phones when exciter is tuned to operating frequency.	Refer to paragraph 62.

(1) *Frequency Shift Exciter O–39(*)/TRA–7*—Continued

Item No.	Item	Action or condition	Normal indications	Corrective measures
59	SHIFT dial	TEST OSC switch in 850 ~ position. One receiver set as in paragraph 63. TEST key in SPACE position. Rotate SHIFT dial very slightly in either direction. Transmitter alined to exciter frequency.	Audio tone heard with 850-cycle tone. Second tone varies in frequency as SHIFT dial is adjusted, and zero beat is obtained when properly adjusted. This point is also indicated on 850 ~ TEST indicator tube by very slow flutter of shadow angle.	Refer to paragraph 62.

(2) *Radio Transmitter BC–610–(*).*

Item No.	Item	Action or condition	Normal indications	Corrective measures
60	EXCITATION METER.	TEST key on exciter unit set to MARK. EXCITATION METER switch set to-DOUBLER PLATE INT. AMP. GRID INT. AMP. PLATE P. A. GRID.	EXCITATION METER reads 25 o 45 ma, 1 to 8 ma, 125 to 175 ma, 60 to 100 ma.	If the meter does not indicate in any position, check Cord CX–961/TRA–7 (red). Installation and tuning of the tuning unit. Setting of the BAND SWITCH. Position of the M. O.-XTAL switch on the tuning unit. It should be in XTAL position. If the meter readings are improper, retune the transmitter; replace tube V8, V9, V10, or V11, if necessary. Check fuse FS4.
61	P. A. PLATE meter	TEST key on exciter set to MARK.	200 to 300 ma	Check tuning of P. A. TUNING control. Check plate coil and the position of the link. Check Cord CX–961/TRA–7 (blue). Operate the overload relay reset switch. Check fuses FS1, FS2, and FS3. Check all interlock switches. Replace V6, V7, or V16, if necessary.

(3) *Frequency Shift Converter CV–182(*)/GRC–26A.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
62	−400-volt supply	METER B switch in −400V position.	Meter B indicates between 65 and 95 to the *left.*	Refer to TM 11–5062.
63	−150-volt supply	METER B switch in −150V position.	Meter B indicates between 20 and 40 to the *left.*	Refer to TM 11–5062.
64	Regulated −150-volt supply.	METER B switch in REG −150V position.	Meter B indicates between 20 and 40 to the *left.*	Refer to TM 11–5062.
65	Regulated +150-volt supply.	METER B switch in REG +150V position.	Meter B indicates between 20 and 40 to the *right.*	Refer to TM 11–5062.
66	±275-volt supply	METER B switch in +275V position.	Meter B indicates between 50 and 70 to the *right.*	Refer to TM 11–5062.
67	Input signal	METER B switch in INPUT position.	Peak indication on meter B of 100 to the *right.*	Increase receiver volume. Retune receivers.
68	Neutral loop current	METER B switch in NEUTRAL position.	Meter B indicates 60 to the *right* for mark signals, 0 for space.	Adjust NEUTRAL OUTPUT control. Refer to TM 11–5062.
69	Polar loop current	METER B switch in POLAR position.	Meter B indicates 25 to the *right* (.025 amp) for mark signals, and 25 to the *left* for space signals.	Adjust POLAR OUTPUT MARK and SPACE controls. Refer to TM 11–5062.
70	Channel A+B signal	METER B switch in CHAN A+B position.	Drift compensator out: Meter B indicates 100 to the *right* (mark) and to the *left* 100 (space.)	Refer to TM 11–5062.
			Drift compensator in: Meter B indicates 70 to the *right* (mark) and 70 to the *left* (space).	Adjust DRIFT COMPENSATOR LIMITER control.
71	Output of Channel B discriminator.	METER B switch in CHAN B position, receiver A volume reduced.	Meter B indicates ±50 for steady mark signal, averages 0 for miscellaneous signals.	Check tuning of CHANNEL B, FINE TUNING control and tuning of receiver B. (Frequency shift of transmitter may not be 850 cycles).
72	Output of Channel A discriminator.	Receiver B volume reduced.	Meter A indicates ±50 for a steady mark signal, averages 0 for miscellaneous TT signals.	Check tuning of CHANNEL A, FINE TUNING control and tuning of receiver A. (Frequency shift of transmitter may not be 850 cycles.)
73	Diversity output of Channel A and B discriminators.	METER B switch in CHAN B position.	Reading on meter A will exceed reading of meter B about 50 percent of the time when steady mark signal is received.	Refer to TM 11–5062.
74	Drift compensator circuit.	METER B switch in COMP AMP position, LIMITER control in full clockwise position.	Minimum kicks on meter B while receiving signals.	Adjust AMP GAIN control for minimum meter kicks.

(4) *Radio Receiver R–388/URR.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
75	ANT. TRIM control	Rotate	Maximum noise peaks or signal can be obtained.	Check antenna. Check Cord CD–67/MRQ–2.
76	Tuning control	Adjust	Use for receiver tuning	Retune signal, using tuning control.
77	BFO set to ON	Rotate BFO PITCH control in either direction.	Beat note can be heard to pass through zero beat.	Refer to paragraph 65.
78	Loudspeakers	Set operating normally	Signal is heard	Check cable connections.

(5) *Radioteletypewriter Control C–808/GRC–26A.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
79	Mark and Space current EXTENSION-NORMAL switch in NORMAL position.	Set SPACE-MARK switch to MARK. Set SPACE-MARK switch to SPACE.	Meter should read 60 to the right. Meter should read 75 to the left.	Adjust MARK control to read 60. Adjust SPACE control to read 75.

(6) *Receiving Teletypewriter TT–55/MGC.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
80	TT TRANSPOSE switch set to LEFT REC. RIGHT SEND.	Set SPACE-MARK switch to MARK.	Left teletypewriter runs closed.	Check that the left teletypewriter switch is set at REC. Check jacks and plugs on left TT.
81	TT TRANSPOSE switch to LEFT REC. RIGHT SEND.	Set SPACE-MARK switch to SPACE.	Left teletypewriter runs open.	Refer to TM 11–352.
82	Manual carriage return lock bar.	Press carriage return lock bar.	Carriage returns to left side of machine.	Refer to TM 11–352.

(7) *Receiving Teletypewriter TT–4A/TG.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
83	TT TRANSPOSE switch set to LEFT REC-RIGHT SEND.	Set SPACE-MARK switch to MARK.	Left teletypewriter runs closed.	Check to see that the signal line plugs are in the proper jacks of the TT control unit. Check signal line cords and plugs.
84	TT TRANSPOSE switch set to LEFT REC-RIGHT SEND.	Set SPACE-MARK switch to SPACE.	Left teletypewriter runs open.	Refer to TM 11–2234.
85	Manual carriage return lock bar.	Press carriage return lock bar.	Carriage returns to left side of machine.	Refer to TM 11–2234.

(8) *Sending Teletypewriter TT–55/MGC.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
86	BREAK key	Depress BREAK key momentarily.	TT control meter indicates 60 to the left of zero.	Refer to TM 11–352.
87	Space bar	Hold space bar down momentarily.	Carriage travels to right and stops when released.	Refer to TM 11–352.
88	Manual carriage return lock bar.	Press carriage return lock bar.	Carriage returns to left side of machine.	Refer to TM 11–352.
89	Test message	SEND-REC-BREAK switch in SEND position. Type out test message on keyboard.	Machine prints test message.	Refer to TM 11–352.

(9) *Sending Teletypewriter TT–4A/TG.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
90	BREAK switch	Depress button	RTT control meter indicates 60 to the left of zero.	Refer to TM 11–2234.
91	Space bar	Hold bar down momentarily.	Carriage travels to right and stops when released.	Refer to TM 11–2234.
92	Manual carriage return lock bar.	Depress bar	Carriage returns to left side of machine.	Refer to TM 11–2234.
93	Test message	Type out message on keyboard.	Machine prints message	Refer to TM 11–2234.

(10) *Typing reperforator (part of Perforator-Transmitter TT–56/MGC).*

Item No.	Item	Action or condition	Normal indications	Corrective measures
94	LINE BREAK KEY	Press Release	Machine runs open Machine runs closed	Refer to TM 11–2223.
95	Space bar	Hold down for 10 seconds	Signal lamp lights, indicating end of line.	Press LINE FEED and CAR RET keys.
96	CAR RET key	Press	Lamp goes out	Check lamp. Refer to TM 11–2223.
97	Test message	Type test message on keyboard.	Tape should be printed and perforated correctly.	Refer to TM 11–2223 and TM 11–2201.
98	Transmitter-distributor tight-tape stop lever.	Place tight-tape stop lever in down position. Raise tight-tape stop lever.	Tape moves through the TD (transmitter-distributor). Tape stops.	

(11) *Transmitter Distributor (part of Perforator-Transmitter TT–56/MGC).*

Item No.	Item	Action or condition	Normal indications	Corrective measures
99	Transmitter-distributor test tape.	Place test tape in TD and send.	Same message appears on the TT in the line circuit, if SEND-REC-BREAK key is at REC.	Refer to TM 11–2201 and TM 11–2223.

(12) *Final equipment test.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
100	Test message	Send test message by prearrangement with a distant station. Tune receivers to distant station. Have distant station send test message.	Test message should be printed correctly on receiving TT at distant station. Test message from distant station should be printed correctly on receiving TT as well as on sending TT at distant station.	

d. Stop Procedures.

(1) *Typing reperforator (part of Perforator-Transmitter TT–56/MGC).*

Item No.	Item	Action or condition	Normal indications	Corrective measures
101	MOTOR switch	Set to OFF position	Motor stops	Refer to TM 11–2223.
102	Transmitter-distributor STOP-SEND switch.	Set at STOP position	Stops feeding tape through transmitter-distributor.	Refer to TM 11–2222.
103	Transmitter-distributor MOTOR ON-MOTOR OFF switch.	Set to MOTOR OFF position.	Motor stops.	

(2) *Teletypewriter TT–55/MGC.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
104	Teletypewriter power	Set to OFF position	Motor stops	Refer to TM 11–352.
105	SEND-REC-BREAK key.	Set to BREAK position	Transmission stops	

(3) *Teletypewriter TT–4A/TG.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
106	MOTOR switch	Set to OFF	Motor stops	Refer to TM 11–2234.
107	BREAK switch	Depress button	Transmission stops	Refer to TM 11–2234.

(4) *Radioteletypewriter Control C–808/GRC–26A.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
108	Transmitter switch XMTR ON-XMTR OFF.	Set to XMTR OFF TEST key of exciter unit in NORM position.	Green TRANSMITTER indicator lamp should go out. Transmitter plate power goes off.	Check switch S6 and S5 Check to see that switch S6 in transmitter is off (down).
109	ON-OFF power switch	Set to OFF position	AC SUPPLY indicator lamp should go out.	Check switch S7.

(5) *Rectifier RA–87–A.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
110	Power ON-OFF switch	Set to OFF position		Refer to TM 11–957.

(6) *Radio Receiver R–388/URR.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
111	OFF-STANDBY-ON switch.	Turn to OFF position	Dial lamp goes out	Check switch S113.

(7) *Power Supply PP–712(*)/GRC–26A.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
112	PLATE power switch	Set to off (down) position	Red-capped pilot lamp goes out.	Check switch S304.
113	AC SUPPLY switch	Set to off (down) position	White-capped pilot lamp goes out.	Check switches S301, S302, and S303.

(8) *Radio Transmitter BC–610–(*).*

Item No.	Item	Action or condition	Normal indications	Corrective measures
114	FILAMENT POWER switch.	Set to off (down) position.	White light goes out and power to filament is removed.	Check switch SW1.

(9) *Frequency Shift Exciter 0–39(*)/TRA–7.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
115	TEST key	Set to NORM	BUFFER INDICATOR lamp goes out.	Check switch S104.
		XMTR ON-XMTR OFF on TT control set at XMTR OFF.	Green lamp goes out	
116	AC SUPPLY and OVEN switches.	Set at off (down)	Lamp goes out. Oven lamp goes out.	Check switches S105 and S108.

(*10*) *Shelter S–69/GRC.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
117	Circuit breakers	Set at OFF	Shelter lights go out	Check circuit breaker.

(11) *Power Unit PE–95–G.*

Item No.	Item	Action or condition	Normal indications	Corrective measures
118	CIRCUIT BREAKER switch.	Set at off position		See TM 11–904.
119	STOP button	Press STOP button firmly until engine stops.	Engine stops. AC VOLTS meter indicator decreases to 0.	

CHAPTER 5

SYSTEM THEORY

Section I. GENERAL

108. Scope

a. This chapter describes the system theory of Radio Set AN/GRC–26A. The information presented is designed to aid in the efficient installation, operation, and maintenance of the radio set. Technical manuals have been published which cover the theory of all the major components of the radio set except Radioteletypewriter Control C–808/GRC–26A (par. 1). The theory of the control unit is given in paragraphs 135 through 138.

b. The remaining paragraphs in this section give some general information to support the more specific theory described in paragraphs 112 through 138. The radio set consists of a number of wire and radio equipments working as a unit and consequently involves the theory of both. Since the primary use of the radio set is for RTT communications, emphasis is placed on the adaptation of the equipment to this mode of operation.

109. Space Diversity Reception

a. Space diversity reception is designed to overcome the effects of fading radio signals. In the case of high-speed RTT operation, even short variations in signal strength have a marked effect upon the accuracy of a message. Briefly, fading is caused by several factors such as a shift in the height of the ionosphere and multipath signal transmission with the resulting out-of-phase recombination of the signal at the antenna. The most practical methods developed to reduce the effects of fading have been automatic gain control and frequency, polarization, and space diversity reception. Of these, space diversity reception is the most efficient for a RTT system.

b. A space diversity system is based on the assumption that instantaneous fading will not occur everywhere at one time. Therefore, if two receiving antennas are spaced several wavelengths apart, it is highly probable that a strong signal always will be received on at least one of them even though the signal at the other may be fading. Such a system is used in Radio Set AN/GRC–26A; the major components required are two receiving antennas, two receivers (one for each antenna), a unit which combines the output of the receivers, and the associated equipment required for RTT operation.

110. Basic Circuits

a. Teletypewriter. Figure 67 shows the fundamental circuit used for operating two interconnected teletypewriter equipments. Note that ale components (including the source of current) art series-connected. This circuit is a *neutral* circuil since the transmission and reception of intelligence depends entirely on the make-and-break of the sending contacts, and the energizing and de-energizing of the selector magnet coils. The condition of current flowing in any neutral circuit is known as a *mark* condition. Conversely, when the circuit is interrupted and no current flows, a *space* condition results. A continuous mark or a continuous space condition would be meaningless, as would random mark or space impulses. In land-line Morse telegraphy, the mark and space impulses are of unequal length, and the interpretation of the transmitted intelligence depends on auditory discrimination between the lengths of combinations of these impulses. Such a method is impractical in teletypewriter operation, so a system of coded, equal-length signal impulses is used. In this coded, 5-unit pulse system (fig. 68), the current (mark) and no-current (space) impulses are the same length. For each letter of the alphabet, plus certain punctuation and operating symbols, a combination of five mark and space impulses is used. The five impulses are transmitted by interrupting the current at equal intervals by means of electrical contacts in the teletypewriter transmitting mechanism. In addition to the five impulses which make up the letter and

symbol combinations, two other impulses are transmitted for each cycle representing the transmission of one character. These additional impulses are known as the *start* and *stop* impulses. The start impulse is always a *space* and is used to prepare the receiving mechanism for the reception of the character impulses which immediately follow it. The stop impulse is always a *mark* impulse, and it is used to stop the cycle of code transmission momentarily to insure that perfect synchronism exists between the transmitting and receiving mechanisms. Referring to figures 67 and 68, if the sending contact at station A were opened, then closed for two impulse intervals, then opened again for three impulse intervals, then closed again, the series current in the neutral circuit would be interrupted in the selector magnet winding and the armatures at both station A and station B would respond. These armatures actuate the printer mechanisms at both stations and the letter A would be printed on the page copy. If no other signals were transmitted, the sending mechanism would remain on the stop (closed) position, a continuous mark would be transmitted, both armatures would be held against the selector magnet, and the circuit would be idle; it would be *running closed*. In this condition, the receiving mechanisms are instantly available for receiving traffic, requiring only the transmission of a start impulse (space) for operation. Any interruption of the mark signal for a time interval longer than the specific interval assigned to a space impulse causes the circuit to *run open*.

b. Radioteletypewriter. Figure 69 is a simplified block diagram of a RTT system, showing the relationship of the teletypewriter equipments to the r-f equipments.

(1) *Sending circuit.* The sending contacts of the transmitting teletypewriter equipment (which may be either a transmitter distributor or the keyboard of any teletypewriter or typing reperforator) are connected directly to the control unit and in series with a source of loop current, which must be 60 ma for proper operation of all teletypewriter equipments. The control unit acts as a switching center for the teletypewriter equipments. The neutral signals initiated by the sending contacts are converted by the control unit to polar signals which excite the *r-f transmitting* section of the system. This causes FS signals to be transmitted from the antenna. For every mark and space initiated by the sending contacts, the transmitted frequency shifts a specified amount. This frequency shifting is the radio means of conveying the intelligence contained in the teletypewriter signaling impulses.

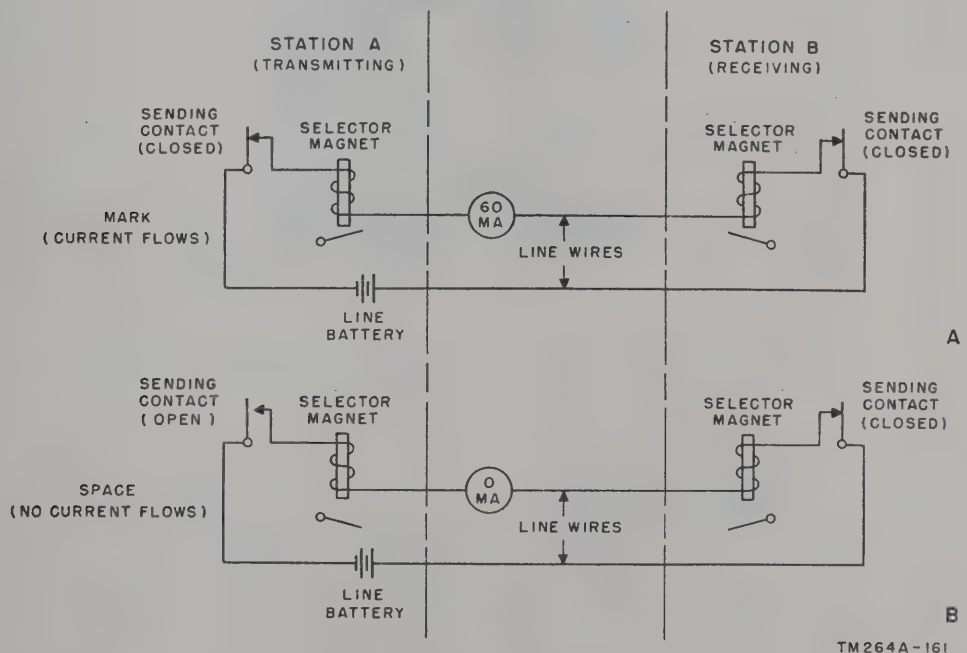


Figure 67. Basic teletypewriter circuit, schematic diagram.

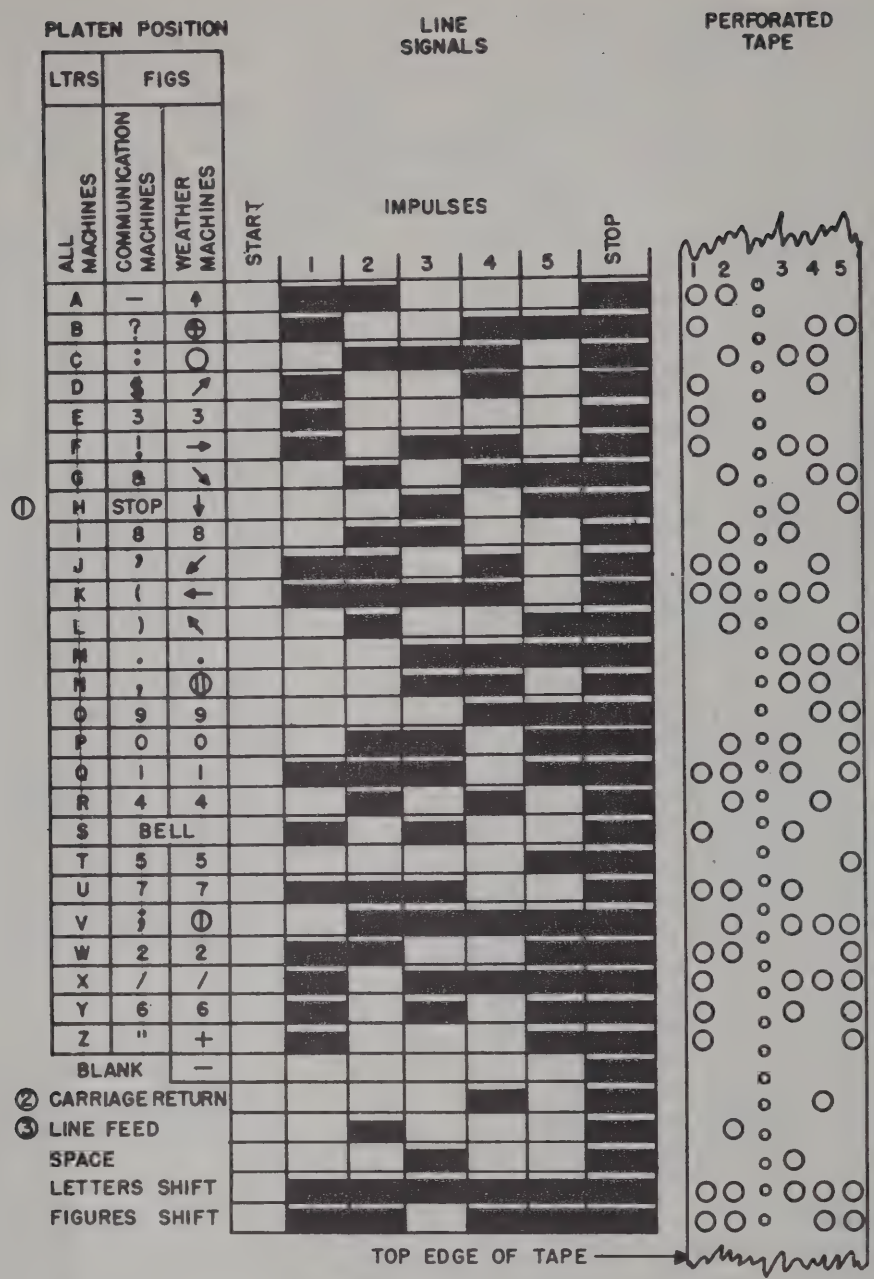


Figure 68. Teletypewriter code.

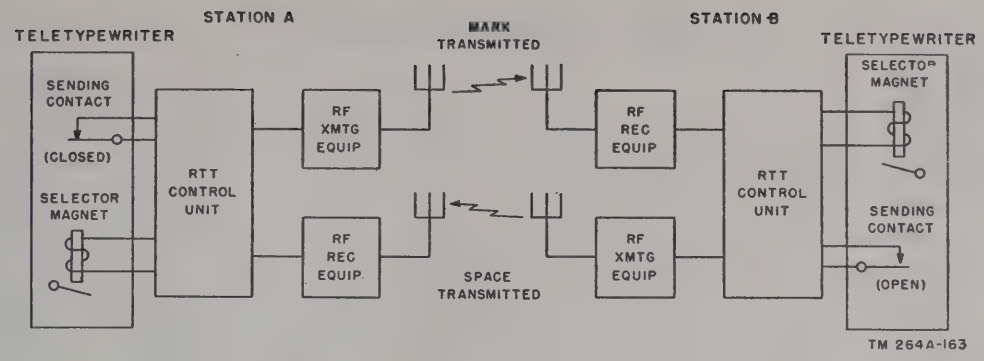


Figure 69. Basic RTT circuit, block diagram.

(2) *Receiving circuit.* The FS signals sent out by the transmitting station are picked up by the receiving equipment section of station B. The signals are interpreted and transformed into neutral d-c teletypewriter impulses which pass through the control unit and key the receiving teletypewriter selector magnet.

111. Impulse Distortion
(figs. 70 and 71)

Figure 67, showing the basic teletypewriter circuit, has the components connected for use in a *neutral* circuit. As previously explained, a neutral circuit is one in which a *mark* impulse transmits a pulse of current and a *space* an equal interval of no current. However, when the line circuits which interconnect the teletypewriter equipments are lengthened, various conditions arise which tend to alter the electrical characteristics of the lines. Increased line resistance reduces the series line current. In addition, line leakage, line capacity, and inductance are other factors which distort the waveshape of the signal impulse, precluding operation of the teletypewriter printer mechanism which depends on uniform impulse length (fig. 70). An ideal pulse is a square wave, but line capacity, line leakage, and resistance all tend to modify the square wave by decreasing its effective *length*. Since the receiving mechanism must be synchronized accurately with the transmitting equipment, any decrease in pulse length will cause errors in printed copy. To minimize such faults, *polar* operation is used whenever long lines are encountered. *Polar* operation requires that current flows in one direction for a mark and in the opposite direction for a space, the interval of flow for a mark being equal to that of the space (fig. 71). The use of polar circuits assures that a transmitted waveshape reaches its destination a practical duplicate of the original transmitted pulse.

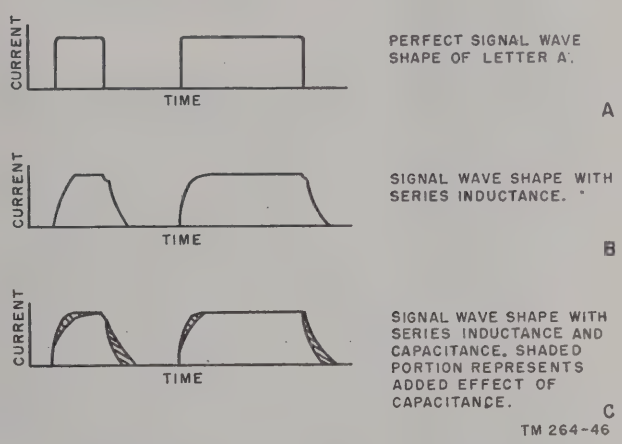


Figure 70. Neutral signal waveshapes.

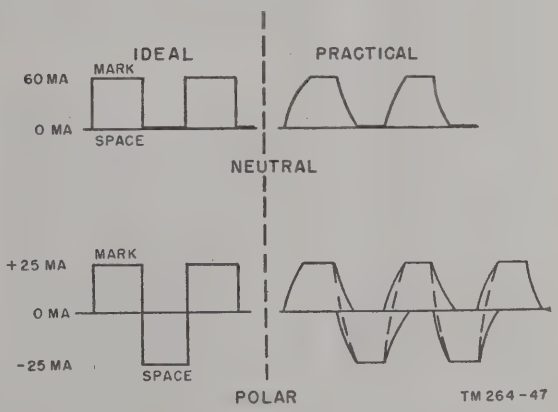


Figure 71. Neutral and polar waveshapes.

112. General

The transmitter is modulated by either audio, teletypewriter, or c-w signals. Normally, the frequency of the transmitter is controlled by the frequency-shift exciter. When two frequencies are available for use, the full-duplex basis of operation can be used, and receiver disabling is unnecessary. However, when only one frequency is available, the one-way basis of operation must be used. In this case, the transmitter must be disabled when receiving and the receivers must be disabled when transmitting. In the following discussion, the block diagram of the sending circuits is discussed first. Then the disabling circuits are explained, followed by a discussion of the signal path circuits.

113. Block Diagram
(fig. 72)

a. The character and paths of the signals from the initiating transmitting teletypewriter equipment to the transmitting radio antenna are shown in the upper portion of figure 72. The transmitter-distributor is used for transmission from prepared perforated tape of both the chad and chadless type. It initiates neutral signals which are fed directly to the control unit. While the transmitter distributor is used only for automatic transmission by tape, either teletypewriter can be switched into the circuit by the control unit when required to send manual keyboard signals. The transmitting teletypewriter also prepares page copy of signals sent by keyboard or, if desired, will prepare a page copy of any outgoing tape that is handled by the transmitter distributor.

b. The control unit accepts the neutral signals directly from the transmitting teletypewriter equipments and converts them into polar signals for operation of the frequency-shift exciter.

c. The frequency shift-exciter functions as a low-power exciter stage of the radio transmitter and has an adjustable mo for a frequency coverage of from 2 to 6 mc. Since its highest frequency output is 6 mc, frequency multiplication must take place in the radio transmitter when assigned frequencies of more than 6 mc are used. When the exciter is adjusted to drive the transmitter, initial tuning is accomplished so that the *normal* frequency is that frequency *assigned by the pertinent SOI (signal operating instructions).*

d. When a mark signal is received by the exciter input circuit, the r-f output frequency of the exciter is *higher* than the normal frequency by 106.125, 212.25, or 425 cps, the actual amount depending on the frequency multiplication factor used. A *space* signal arriving from the control unit shifts the exciter r-f signal *down* from the mark frequency by 212.25, 425, or 850 cps, the exact shift depending on the frequency multiplication factor used. For example, if the assigned frequency as listed in the SOI is 2,000 kc, then the exciter output frequency would be 2,000 kc and no frequency multiplication would take place. Therefore, the mark frequency of the exciter would be 425 cps above the assigned frequency, or 2,000.425 kc. The space signals will shift this frequency down to 1999.575 kc, or 850 cycles lower. In summation, the shift from mark to space of the actual transmitted signal is *always* 850 cps, while the shift of the exciter output can be any one of three values, depending on the frequency multiplication taking place in the radio transmitter. The output of the exciter is fed to the radio transmitter at the crystal socket of the particular tuning unit used.

Transmitter frequency (mc)	Multiplication factor	Exciter frequency (mc)	Exciter output frequency shift (cps)
2 to 4	1	2 to 4	850
4 to 12	2	2 to 6	425
12 to 18	4	3 to 4.5	212. 25

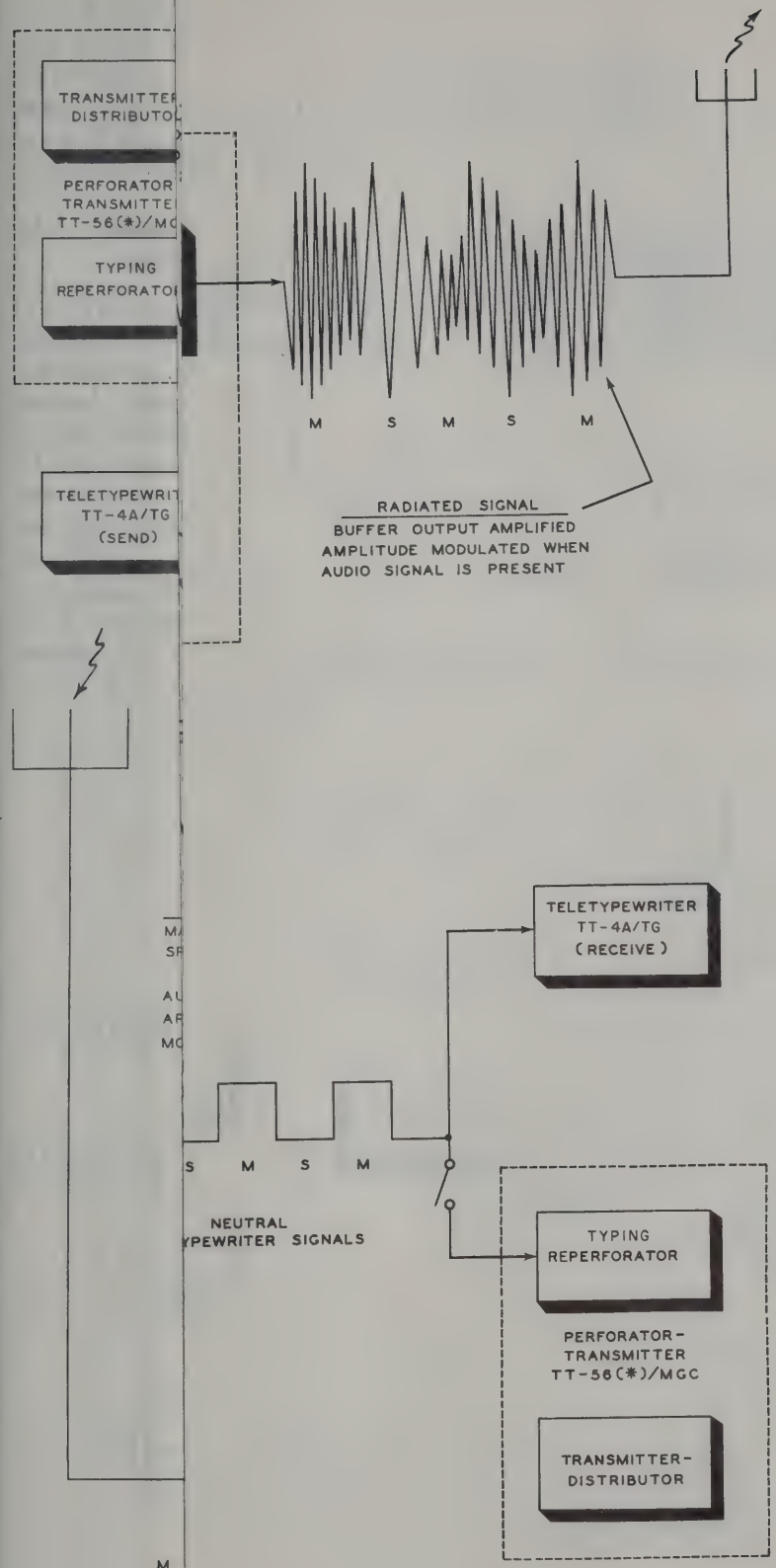
e. The r-f oscillator of the transmitter develops a frequency which is controlled by the frequency of the exciter output. Output from the oscillator is passed to a buffer amplifier and frequency multiplier stage. The output of the multiplier stage drives the intermediate amplifier which in turn supplies the proper r-f excitation for operating the class C p-a stage. The output of the p-a stage is link-coupled into the balanced doublet antenna system; or when a whip antenna is required, Antenna Tuning Unit BC–939–B provides the proper impedance match for efficiently transferring the r-f output of the transmitter to the vertical whip antenna.

f. The input circuit of Speech Amplifier BC–614–(*) provides for connecting either a carbon-type microphone or a dynamic-type microphone.

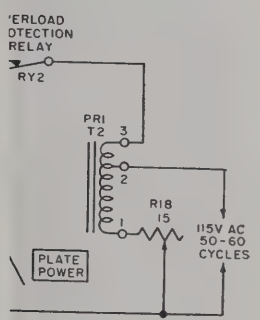
th switch S104 in the
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is completed through
y is energized) when
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closed. With switch
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74. The plate of
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TM 826-54



SMITTER
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TM 264A-263

112. General

The transmitter is modulated by either audio, teletypewriter, or c-w signals. Normally, the frequency of the transmitter is controlled by the frequency-shift exciter. When two frequencies are available for use, the full-duplex basis of operation can be used, and receiver disabling is unnecessary. However, when only one frequency is available, the one-way basis of operation must be used. In this case, the transmitter must be disabled when receiving and the receivers must be disabled when transmitting. In the following discussion, the block diagram of the sending circuits is discussed first. Then the disabling circuits are explained, followed by a discussion of the signal path circuits.

113. Block Diagram
(fig. 72)

a. The character and paths of the signals from the initiating transmitting teletypewriter equipment to the transmitting radio antenna are shown in the upper portion of figure 72. The transmitter-distributor is used for transmission from prepared perforated tape of both the chad and chadless type. It initiates neutral signals which are fed directly to the control unit. While the transmitter distributor is used only for automatic transmission by tape, either teletypewriter can be switched into the circuit by the control unit when required to send manual keyboard signals. The transmitting teletypewriter also prepares page copy of signals sent by keyboard or, if desired, will prepare a page copy of any outgoing tape that is handled by the transmitter distributor.

b. The control unit accepts the neutral signals directly from the transmitting teletypewriter equipments and converts them into polar signals for operation of the frequency-shift exciter.

c. The frequency shift-exciter functions as a low-power exciter stage of the radio transmitter and has an adjustable mo for a frequency coverage of from 2 to 6 mc. Since its highest frequency output is 6 mc, frequency multiplication must take place in the radio transmitter when assigned frequencies of more than 6 mc are used. When the exciter is adjusted to drive the transmitter, initial tuning is accomplished so that the *normal* frequency is that frequency *assigned by the pertinent SOI* (*signal operating instructions*).

d. When a mark signal is received by the exciter input circuit, the r-f output frequency of the exciter is *higher* than the normal frequency by 106.125, 212.25, or 425 cps, the actual amount depending on the frequency multiplication factor used. A *space* signal arriving from the control unit shifts the exciter r-f signal *down* from the mark frequency by 212.25, 425, or 850 cps, the exact shift depending on the frequency multiplication factor used. For example, if the assigned frequency as listed in the SOI is 2,000 kc, then the exciter output frequency would be 2,000 kc and no frequency multiplication would take place. Therefore, the mark frequency of the exciter would be 425 cps above the assigned frequency, or 2,000.425 kc. The space signals will shift this frequency down to 1999.575 kc, or 850 cycles lower. In summation, the shift from mark to space of the actual transmitted signal is *always* 850 cps, while the shift of the exciter output can be any one of three values, depending on the frequency multiplication taking place in the radio transmitter. The output of the exciter is fed to the radio transmitter at the crystal socket of the particular tuning unit used.

Transmitter frequency (mc)	Multiplication factor	Exciter frequency (mc)	Exciter output frequency shift (cps)
2 to 4	1	2 to 4	850
4 to 12	2	2 to 6	425
12 to 18	4	3 to 4.5	212. 25

e. The r-f oscillator of the transmitter develops a frequency which is controlled by the frequency of the exciter output. Output from the oscillator is passed to a buffer amplifier and frequency multiplier stage. The output of the multiplier stage drives the intermediate amplifier which in turn supplies the proper r-f excitation for operating the class C p-a stage. The output of the p-a stage is link-coupled into the balanced doublet antenna system; or when a whip antenna is required, Antenna Tuning Unit BC–939–B provides the proper impedance match for efficiently transferring the r-f output of the transmitter to the vertical whip antenna.

f. The input circuit of Speech Amplifier BC–614–(*) provides for connecting either a carbon-type microphone or a dynamic-type microphone.

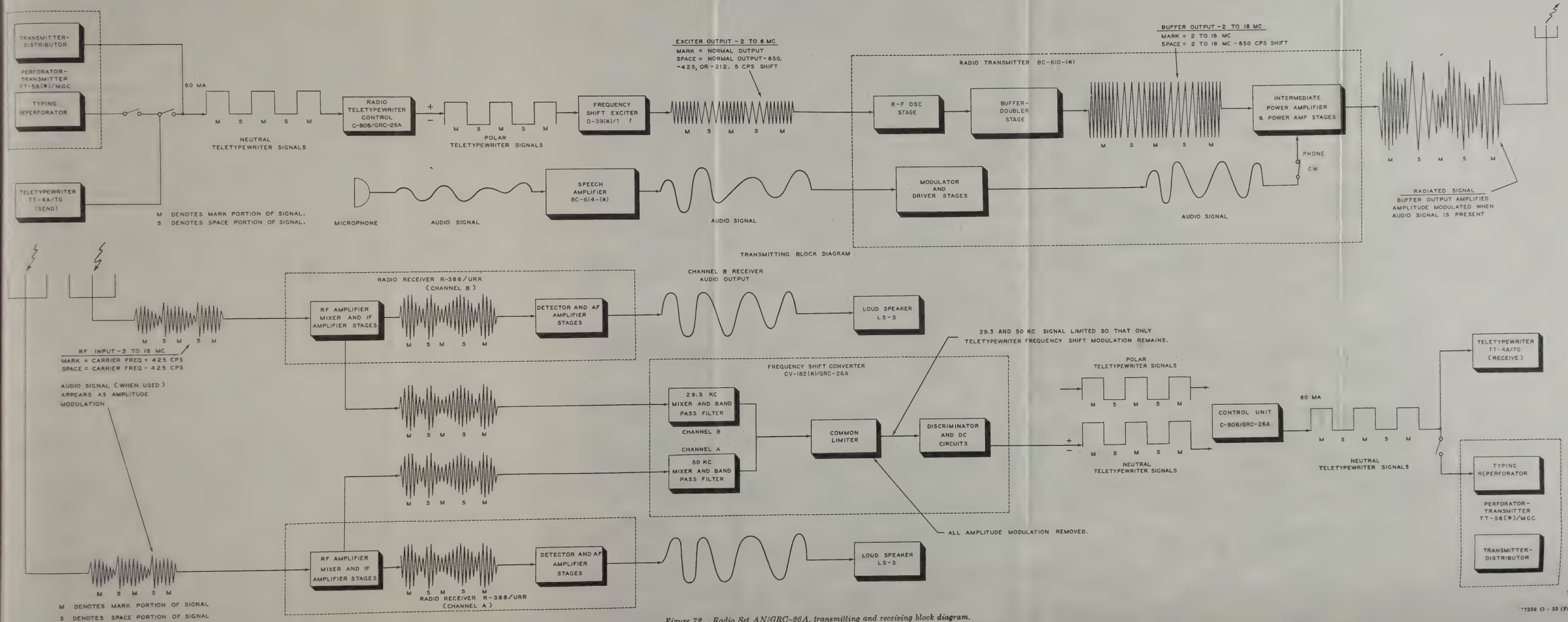


Figure 72. Radio Set AN/GRC-26A, transmitting and receiving block diagram.

112. General

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disabled when transr
discussion, the block
circuits is discussed
circuits are explained,
the signal path circuits

113. Block Diagram
(fig. 72)

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Audio frequencies developed by either microphone pass through three or four stages of amplification respectively and then through a cable to the a-f driver stage in the transmitter. The a-f driver stage furnishes sufficient a-f power to drive the grids of the class B modulator, which amplitude modulates the r-f carrier of the p a output.

114. Transmitter Enabling Circuits
(figs. 73 and 74)

a. The transmitter enabling circuits are shown in figure 73 in the enabled position (as required for sending). The components involved are the control unit, the frequency-shift exciter, the speech amplifier, and the radio transmitter. The speech amplifier serves only as a feedthrough device. The terminal and connector designations are shown but for the actual cabling arrangement (fig. 127).

b. Relay K101 in the frequency-shift exciter must be energized to enable the transmitter. It receives its d-c source voltage (across resistor R117) from the rectifier power supply in the frequency-shift exciter. With switch S104 in the NORMAL position and with no key inserted in jack J9, the relay circuit is completed through ground (and, hence, the relay is energized) when switch S5 is in the XMTR ON position. If a key then is inserted in jack J9, the relay will be energized only when the key is closed. With switch S104 in the MARK position, current limiting resistor R1 and switch S5 are shorted out and the relay will be energized only when the c-w key is closed.

c. When relay K101 is energized, it closes the contacts shown in figure 74. The plate of oscillator tube V101 is connected to its source of B+ voltage, the cathode circuit of buffer tube V102 is connected to ground through cathode resistor R105, and referring back to figure 73, the transmitter PLATE POWER switch SW6 is short-circuited.

d. When contacts 1 and 2 of relay K101 are closed, the energizing circuit of plate power relay RY1 in the transmitter is completed. Note that overload protection relay RY2 must be activated.

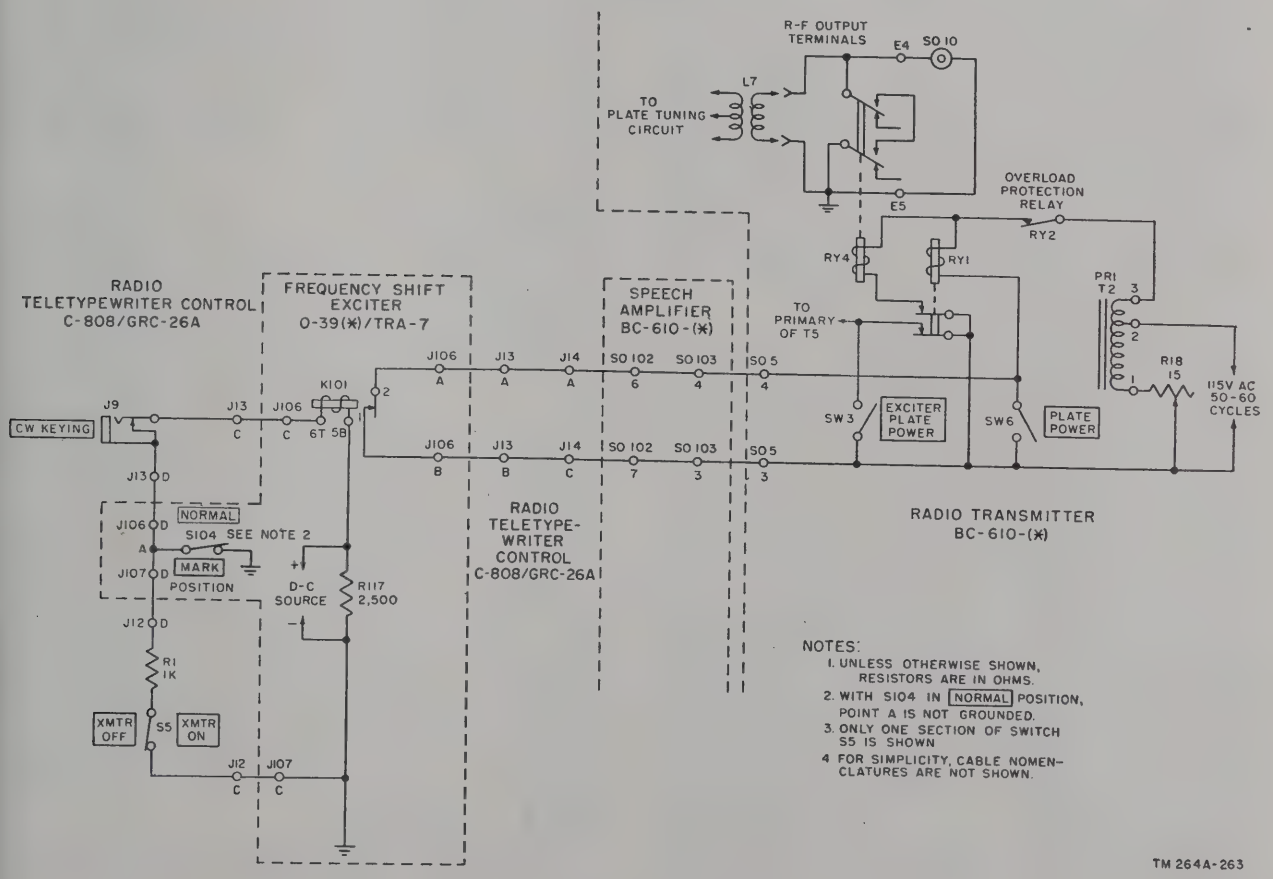


Figure 73. Transmitter enabling circuit.

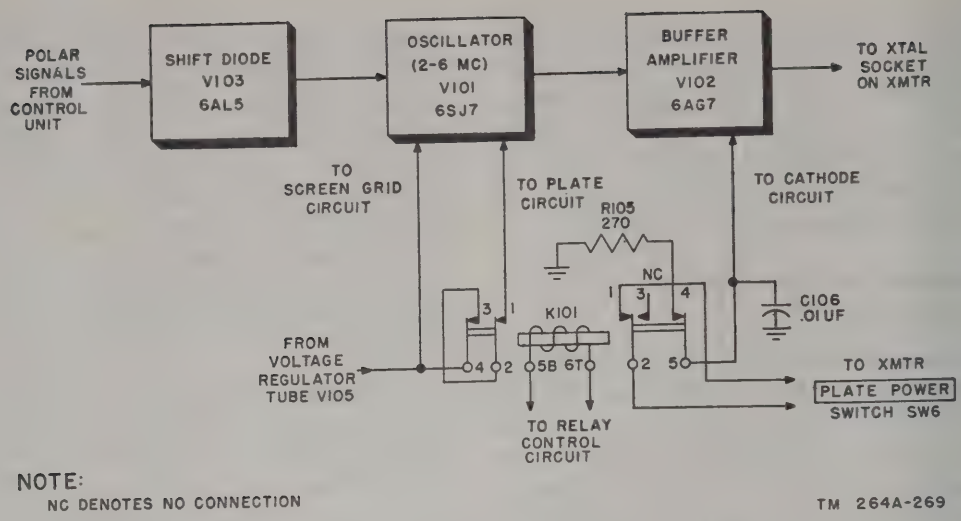


Figure 74. Operation of relay K101.

When relay RY1 is energized, it completes the circuit to the primary of T5, the plate transformer for the exciter power supply, and also energizes antenna shorting relay RY4 by completing the circuit to its a-c source. When RY4 is de-energized, the r-f output terminals of the transmitter are grounded; when RY4 is energized, the ground is removed.

e. For normal RTT and voice operations, the switches will be in the positions shown on figure 73. However, *for c-w operation at jack J9, PLATE POWER switch SW6 must be closed.* With SW6 open, relays RY1 and RY4 would be energized and then de-energized each time a dot or dash is transmitted. These relays are not designed for rapid interrupted operation.

115. Receiver Disabling Circuits

a. The receiver disabling circuits are shown in figure 75 in the disabled position. The components involved in this circuit are the control unit, the tone oscillator (part of the power supply), the frequency-shift converter, and the two radio receivers. For disabling to occur, relays K401 and K101 must be energized.

b. With switch S5 in the XMTR ON position (as shown) and switch S4 in the ONE WAY position, the d-c circuit to relay K401 is completed to the 150-volt regulated source through voltage-dropping resistor R409. Hence, K401 is energized. This action closes the relay contacts as shown and supplies relays K101 in the channels A and B receivers with a d-c voltage. The source of this voltage is rectifier CR401 in the tone oscillator; this rectifier cannot operate until K401 is energized. When energized, relay K101 grounds the receiving antenna input at jack J101.

c. The lower contact (4) of relay K401 grounds the plates of tubes V105 and V113 when the relay is operated. This insures that a steady marking condition is established on teletypewriter loops when the receiving circuits are cut off.

d. Receptacle J401 can be used for emergency receiver disabling if relay K401 will not operate. Connecting a 12-volt d-c source between terminals A and B on J401 will energize the receiver relays K101. Note that K401 *must* be in the de-energized position.

e. When switch S4 is in the FULL DX position, relay K401 is de-energized and the receivers are not disabled. The XMTR OFF-XMTR ON switch actually consists of two switches S5 and S6 which are joined mechanically so that they cannot operate independently of each other. When in the XMTR ON position, one section of the switch assembly completes the receiver disabling circuit as explained above, one section completes the transmitter enabling circuit as explained in paragraph 114, and the other section connects the TRANSMITTER lamp I 1 across the 6.3-volt a-c winding of transformer T1 (part of the control unit). This lamp will light when the XMTR ON-XMTR OFF switch is in the XMTR ON position. Note that ON OFF switch S7 in the control unit also must be in the ON position (par. 137). If S7 is not in the ON position, the disabling circuits will still operate but lamp I 1 will not light.

f. As used in Radio Set AN/GRC–26A, Radio Receiver R–388/URR has a short circuit placed

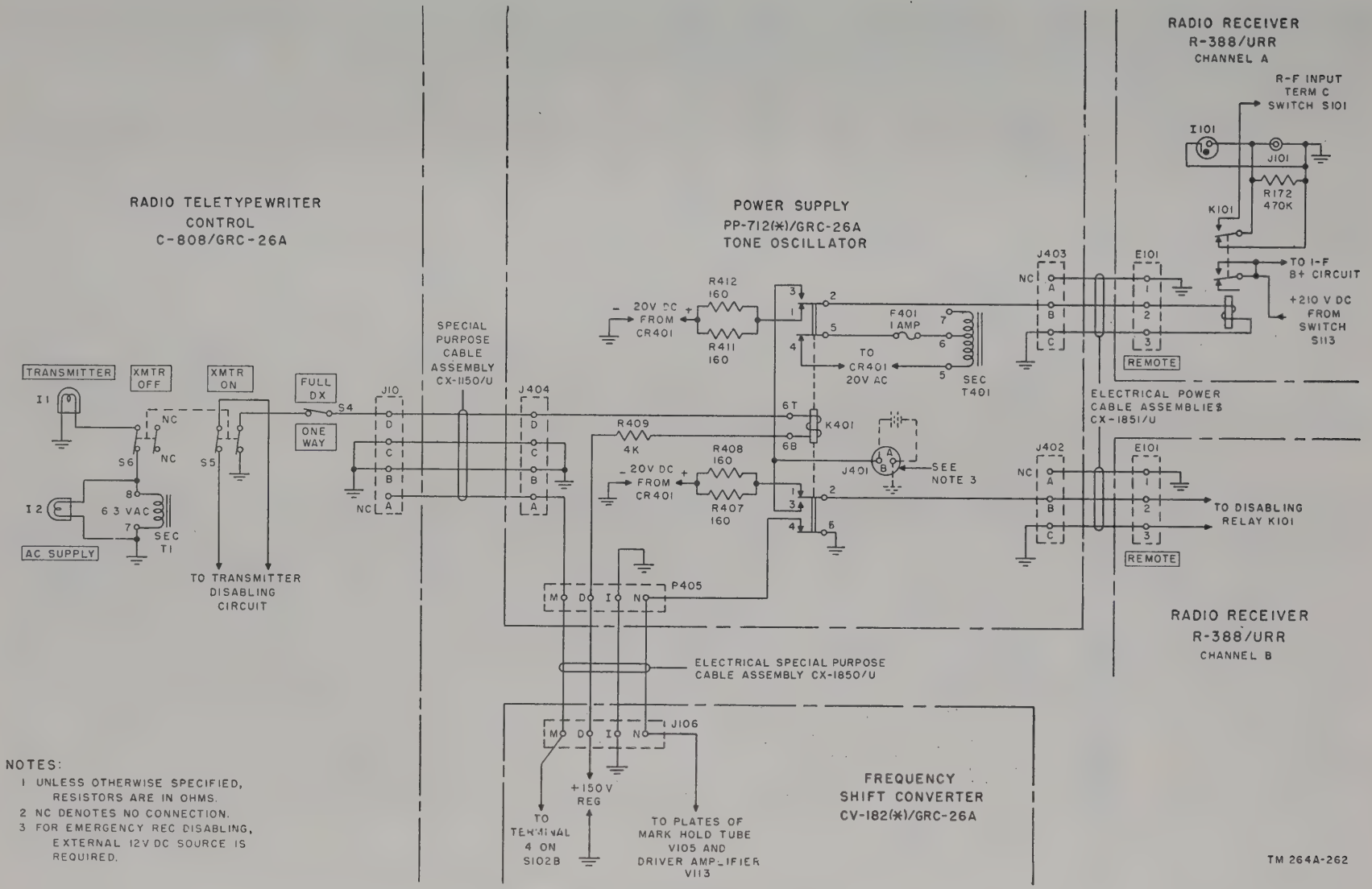


Figure 75. Receiver disabling circuits.

on the lower contacts of relay K101 as shown in figure 75. This permits continuous frequency monitoring when operating on the one-way reversible basis. The short across the relay terminals allows the i-f stages to remain energized at all times. Hence, the transmitter signal can be monitored on the converter because of leakage from the transmitter into the r-f and mixer stages of the receiver.

116. Radioteletypewriter Control C–808/GRC–26A, Sending Circuit

a. The sending circuit of Radioteletypewriter Control C–808/GRC–26A is shown in figure 76. In addition, the input circuit of Frequency Shift Exciter 0–39(*)/TRA–7 is shown. In the following discussion, TT TRANSPOSE switch S1 is in the LEFT REC-RIGHT SEND position. Changing the switch to the RIGHT REC-LEFT SEND position merely reverses the functions of the left and right teletypewriters but does not alter the theory of operation of the sending circuits. PERFORATOR OPERATION switch S2 is, of course, in the SEND TT position; NORMAL EXTENSION switch S3 is in the NORMAL position; and ON-OFF SWITCH S7 (fig. 94) is in the ON position. Teletypewriter messages may be sent from the right teletypewriter, the transmitter-distributor, or the typing reperforator. Because all this equipment is in series, simultaneous tape copy and page copy will be obtained from the typing reperforator and teletypewriter, respectively. Remote sending, voice, and c-w operation are discussed in paragraphs 134, 122, and 121, respectively.

b. The sending circuits of the teletypewriters, the transmitter-distributor, and the typing reperforator may be represented by an equivalent circuit which consists of a switch in series with a resistance. The magnitude of this resistance is determined by the d-c resistance of the various choke coils. The series switch closes when a mark signal is sent and opens when a space signal is sent. Any permanent break in this series circuit will prevent the transmission of mark signals and a continuous space will be sent. For a more detailed discussion of these circuits, refer to the technical manuals covering the specific equipment (par.1). It may be noted from figure 76 that the jacks provided for the insertion of teletypewriter equipment into the circuits are of the closed circuit type, and are wired so that the red and black cords of each machine are in series. Where a control circuit would appear to be interrupted by the insertion of a machine, it is actually completed through the machine itself. When a plug is removed from a jack in these circuits, the jack will maintain automatically an unbroken series circuit. The circuit has been wired so that the sending contacts of the teletypewriter selected to receive are removed from the receiving circuit so that accidental contact with the keyboard of the receiving teletypewriter will not interfere with the incoming signals (fig. 76).

c. All frequency-shift functions involving mark or space conditions are controlled by relay 0 1 which has two separate windings. The currents flowing through these windings determine the relative positions of relay contact 6. Contacts 4 and 6 are used to produce a mark current, and contacts 6 and 7 are used to produce a space current. D-c source No. 3 accomplishes two things. First, it supplies a continuous holding current of approximately 30 ma to coil 1–8 of the relay; this tends to hold contacts 6 and 7 in the closed position. Second, it supplies a continuous space current (in the direction shown) to resistor R108 in the frequency-shift exciter; this makes the plate of shift diode V103 positive with respect to the cathode and, hence, the tube conducts. (Points A and B of d-c source No. 3 are connected to similarly lettered points on figure 94.)

d. With switch S8 in the MARK position, as in normal operation, d-c source No. 1 is placed in operation. D-c source No. 1 supplies a current of 60 ma (adjusted by R12) to relay coil 2–3 when the series teletypewriter equipment circuit is unbroken. (Note that when teletypewriter equipment is plugged into the jacks, the line remains unbroken until a space signal is sent.) Since the latter current is greater than the current through relay coil 1–8, the holding force exerted by coil 1–8 is overcome and relay contacts 4 and 6 close. This action allows a current to flow (from d-c source No. 2) which is greater than and opposite to the space current delivered by d-c source No. 3. The resultant mark current of approximately 20 ma flows in the direction shown through resistor R108. The voltage drop across R108 now places the plate of V103 at a negative potential with respect to the cathode; hence, the diode does not conduct. (Points C, D, and E of d-c sources Nos. 1 and 2 are connected to similarly lettered points on figure 95.)

e. To summarize to this point, when the teletypewriter equipment sends a space signal, the mark current line is broken and tube V103 con-

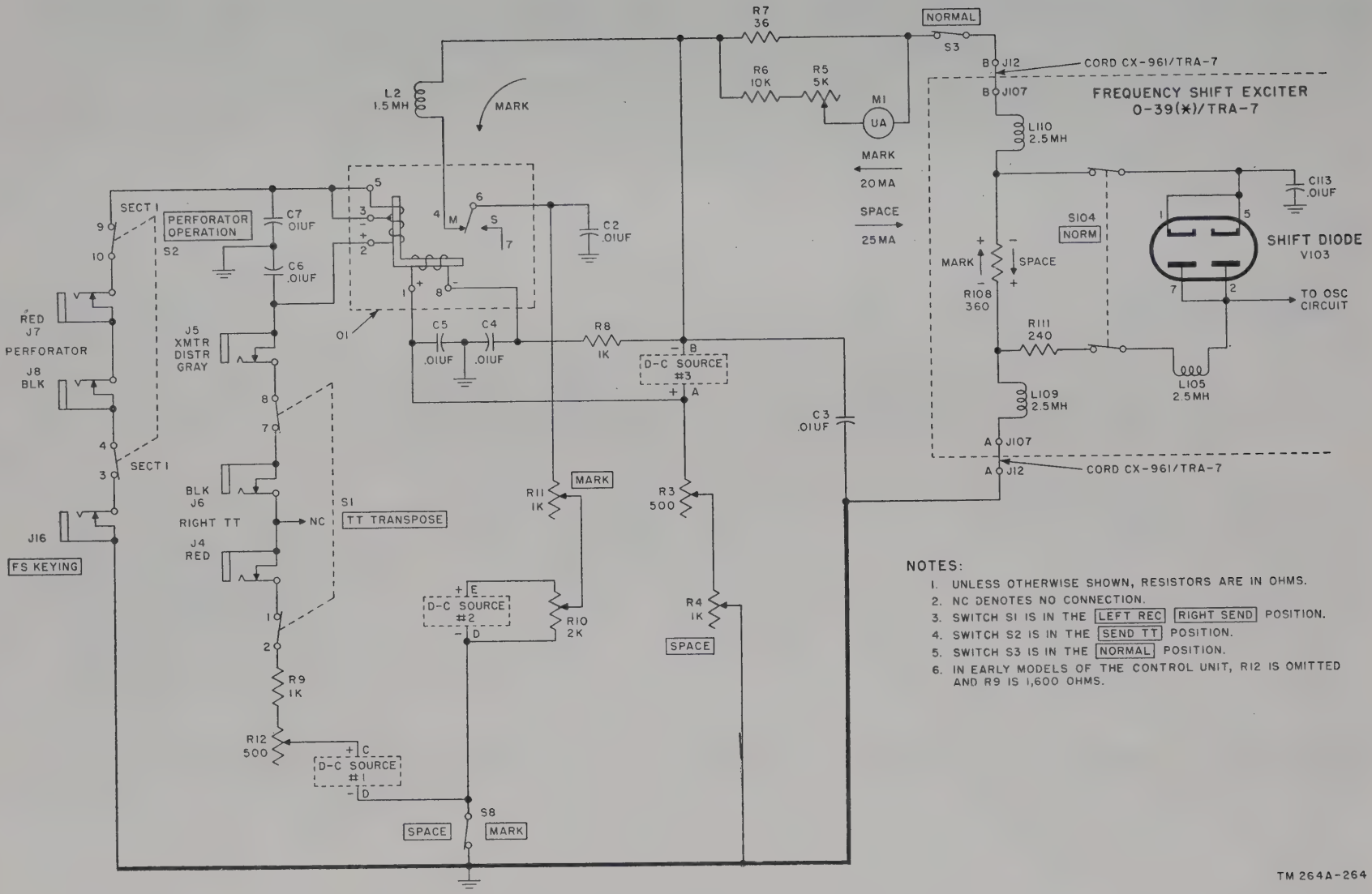


Figure 76. Radioteletypewriter Control C-808/GRC-26A, sending circuit.

ducts. When a mark signal is transmitted (or when the teletypewriter equipment is inoperative), V103 does not conduct. When V103 is inoperative, the oscillator of the frequency-shift exciter produces a mark frequency. When V103 conducts, the frequency of the oscillator is shifted down to the space frequency.

f. Resistor R9, in conjunction with variable resistor R12 (par. 9), limits the current through the teletypewriter equipment to approximately 60 ma. Resistor R10 serves a dual purpose; it acts as a bleeder for the vacuum-tube power supply (d-c source No. 2; par. 138) and as a variable resistor to allow R11 to be operated in the middle of its range. MARK potentiometer R11 provides for fine adjustment of the mark current. Similarly, variable resistor R3 acts as the coarse adjustment and SPACE potentiometer R4, as the fine adjustment for the space current when switch S8 is in the SPACE position. Resistor R8 limits the current flowing through coil 1–8 of the relay. Hash filtering for relay coils 2–3 and 1–8 is provided by bypass capacitors C6 and C7, and C5 and C4, respectively; hash filtering for relay contacts 4–6 is provided by L2, C3, and C2. Metering of mark and space currents is accomplished by the metering circuit which consists of R5, R6, R7, and M1. This circuit measures the current flow to terminal B of J12, the current returning to the control unit ground at terminal A of J12 after passing through the frequency-shift exciter. Resistor R7 acts as a shunt, thus providing a low-resistance path around the metering circuit. R6 is a voltage-dropping resistor, and R5 is the meter calibration resistor. The actual circuit current is $\frac{1000}{3}$ times the meter reading.

117. Frequency-shift Exciter, Block Diagram

Frequency Shift Exciter 0–39(*)/TRA–7 consists of an oscillator, a frequency shift circuit, a buffer amplifier, a monitoring circuit, and a power supply. Only the first three circuits are represented in figure 74, because they are directly involved with the signal path. The oscillator V101 generates a marking signal. The frequency of the marking signal is lowered for a spacing signal by the action of shift diode V103. The oscillator output is amplified by r-f buffer amplifier V102 and then is applied as excitation to the transmitter (par. 118).

118. Frequency-shift Exciter, Output Circuit

The r-f output of the buffer amplifier is applied to buffer output coil L104 (fig. 77). A portion of the r-f voltage developed across L104 is transferred to the transmitter tuning unit at the crystal socket through the coaxial cable and plug assembly. Actually L104 has serval taps which permit the frequency-shift exciter to be used with transmitters requiring excitation voltages higher than that obtained from NORMAL receptacle J101. (Refer to paragraph 22, TM 11–257.) Since L14 is short-circuited, the r-f oscillator (V8) in the transmitter no longer functions as an oscillator but serves as a buffer amplifier. Capacitor C131 serves as a coupling capacitor. Note that for tube V8 to conduct, the cathode circuit must be completed to ground through the keying circuit. This is accomplished by placing EXCITER PLATE POWER switch SW3 in the on (up) position (par. 121). The output of the r-f oscillator is fed to the buffer-doubler stage of the transmitter.

119. Radio Transmitter, Block Diagram (fig. 78)

a. Radio Transmitter BC–610–(*) has a frequency range of 2 to 18 mc which is covered by means of eight plug-in transmitter tuning units, seven plug-in coil units, and a plug-in vacuum capacitor. Each tuning unit and coil unit covers a portion of this range. The transmitter is equipped with an r-f section, a modulator section, and an h-v power supply.

b. Except when used for RTT communications, FS keying, or c-w keying through the frequency-shift exciter, the r-f oscillator stage (V8) operates as a Hartley oscillator. The frequency is controlled either by the mo or by a crystal depending on the setting of the M. O. XTAL switch. Oscillations generated by the oscillator are fed to the grid circuit of the buffer doubler, V9.

c. When the variable-frequency mo is used, the buffer-doubler stage (V9) operates as a frequency doubler for all frequencies up to 12 mc, and as a frequency quadrupler for frequencies from 12 to 18 mc. Under crystal control (or when used with the frequency-shift exciter) the buffer-doubler stage acts as a buffer (no multiplication) from 2 to 4 mc, a doubler from 4 to 12 mc, and as a quadrupler from 12 to 18 mc. The r-f output is fed to the grids of the ipa stage.

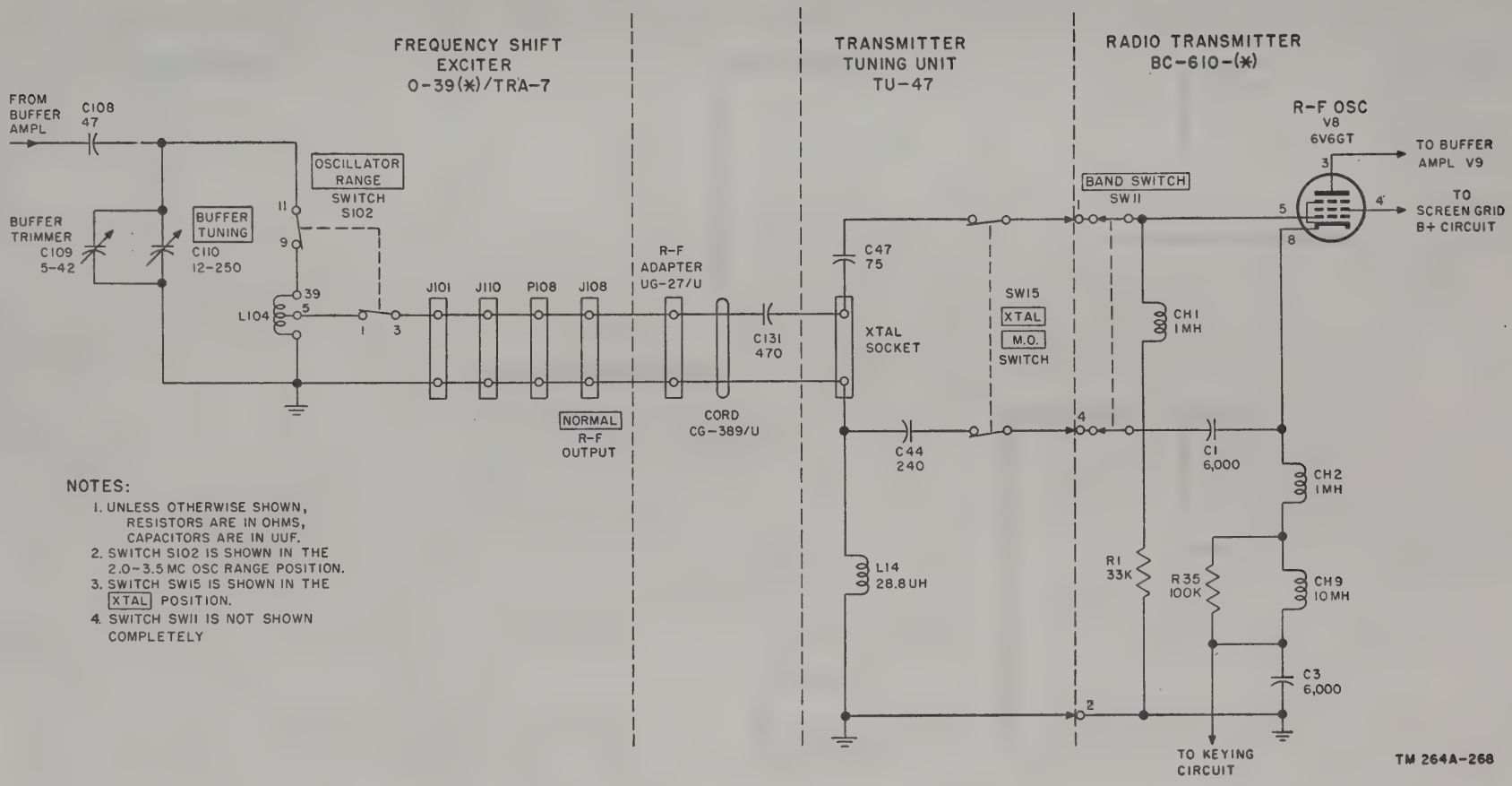


Figure 77. Frequency-shift exciter, output circuit.

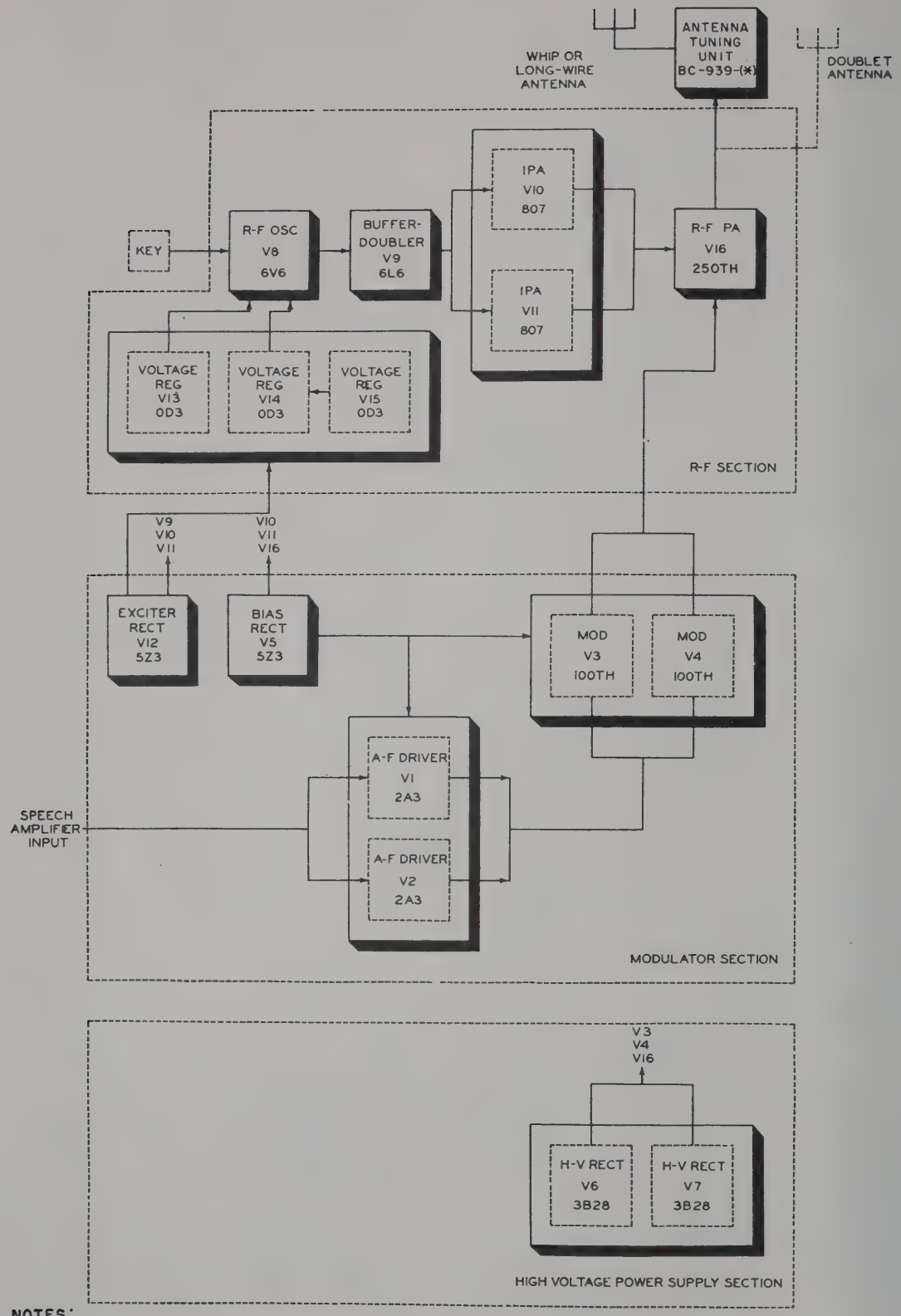


Figure 78. Radio transmitter BC–610–(*), block diagram.

d. The ipa stage consists of two tubes (V10 and V11) connected in parallel to a tuned-tank circuit located in the transmitter tuning unit. This stage amplifies the output of the buffer-doubler stage. The output is fed to the p-a stage, V16.

e. The p-a stage (V16) operates as a class C r-f amplifier. The r-f output power is taken from the plate tank circuit by a coupling coil; the coupling coil leads are short-circuited and grounded by a relay when the associated equipment is used for reception (par. 114). This eliminates absorption of r-f power at the transmitter frequency. The output power is fed to Antenna Tuning Unit BC–939–B when it is required to match a whip or long-wire antenna to the transmitter. When a doublet antenna is used and is cut to the proper length for the transmitting frequency, it is connected directly to the r-f output terminals of the transmitter.

f. For voice modulation, the audio frequencies from Speech Amplifier BC–614(*) (par. 122) are fed through the audio-driver stage (tubes V1 and V2) to the modulator section (tubes V3 and V4). The audio power output of the modulator stage modulates the final r-f p-a stage, thereby superimposing an a-f voice wave on the r-f carrier wave.

120. Transmitting Antennas

For dual diversity or fixed operation, Radio Set AN/GRC–26A uses a pair of doublet antennas (par. 35). For mobile operation, the radio set uses a whip antenna (par. 33).

a. Doublet Antenna.

(1) The doublet antenna is a half-wave antenna which consists of two quarter-wave sections terminated at the center by a special coaxial cable connector. The antenna can be operated at the fundamental frequency and at the odd harmonics. At the fundamental frequency, the field pattern of the transmitted signal is sufficiently broad to permit operation of the radio set in nets. At odd harmonic operating frequencies, the field pattern is in the form of elongated lobes which produce a more directive r-f radiation. The radiation tends to concentrate off the ends of the wire and radiates more power in its most favorable directions than a half-wave antenna does in its favorable directions. The free space patterns of a doublet antenna are shown in figure 79.

(2) The transmitted radiation can reach the receiving antenna via either the ground wave, the sky wave or both. While ground wave signal communications is relatively constant, the conditions affecting the reflection of the sky wave are subject to sudden and periodic changes. For further information on this subject, refer to TM 11–666 and TM 11–499. In general, the ground wave range for a horizontal doublet antenna is small. The point at which the sky wave returns to the earth (skip distance) depends in part on the frequency and on the height of the antenna. Since the height of the doublet used with Radio Set AN/GRC–26A is limited to 40 feet with the equipment supplied, the skip distance will depend mainly on the frequency. It can be increased by raising the frequency. Note that even though the transmitted signal is being received by a distant station, it might not be received by a nearby station if that station is in the skip zone.

b. Whip Antenna. The whip antenna transmits equally well in all directions mainly by use of the ground wave. The distance range is considerably shorter that with the doublet antenna and depends to a large degree on the surrounding terrain. The range of a ground wave is greater over terrain which has a high conductivity. The following terrain types are listed in the order of decreasing conductivity: sea water, fresh water, fertile ground, dry soil, rocky ground, and very dry soil. The whip antenna is noisier than the doublet because noise is vertically polarized and the whip receives signals from all directions.

121. Manual Keying

Manual keying of the radio transmitter is accomplished basically by either of two methods, i. e., FS keying or carrier wave keying.

a. FS Keying. For FS keying, it is only necessary to cause relay 0 1 in the control unit (fig. 76) to switch to the mark position when a dash or dot is sent and to the space position during the key-up condition. There are several methods of accomplishing this. The simplest method is to insert the hand key into FS KEYING jack J16. Opening and closing the hand key will cause relay 0 1

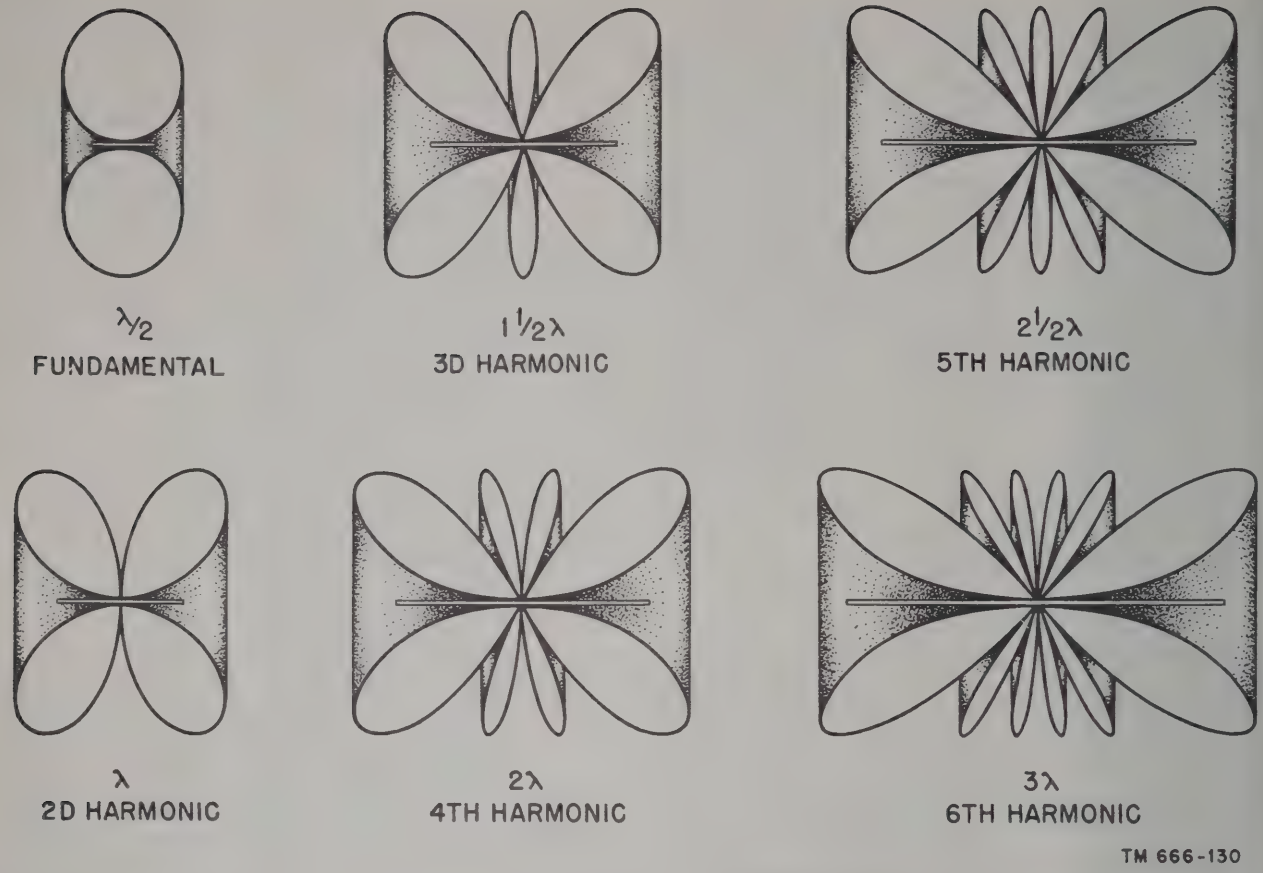


Figure 79. Radiation patterns for doublet antenna.

to operate as described in paragraph 116. Another method of emergency FS keying which uses the frequency-shift converter is described in TM 11–5062.

b. C-W Keying. For c-w keying, the carrier wave must be transmitted for a dash or dot and interrupted during the key-up condition.

(1) One method of accomplishing this is to insert a hand key in the cathode circuit of the r-f oscillator of the radio transmitter. The cathode must be grounded through resistor R35 and chokes CH2 and CH9 (fig. 80) for the tube to conduct. Hence, if a key is placed between terminals 2 and 8 on socket SO 5, the tube will conduct when the key is closed. Note that EXCITER PLATE POWER switch SW3 grounds the cathode circuit when it is in the closed position. Therefore, to key the transmitter by this method, switch SW3 must be in the NORMAL (open) position. (The path to the primary of T5 (the plate transformer of the exciter power supply) is completed by operating PLATE POWER switch SW6 to the ON position (fig. 73). Refer to paragraph 114 for the discussion of SW6.) Provision is made for the insertion of a hand key into this cathode circuit at the KEY jack (J101) on the speech amplifier. Depressing the key will ground the cathode circuit. However, if a fault develops in the speech amplifier, the transmitter can still be c-w keyed by grounding the cathode circuit of the oscillator at socket SO 5 as mentioned above.

(2) Another method of effecting c-w keying is to interrupt the r-f oscillations generated in the frequency-shift exciter stage. This is accomplished by inserting the hand key into C-W KEYING jack J9 on the control unit. Closing the key will energize relay K101 in the frequency-shift exciter (fig. 73). This action completes the circuits to the oscillator and buffer stages as described in figure 74 and in paragraph 114. When using this

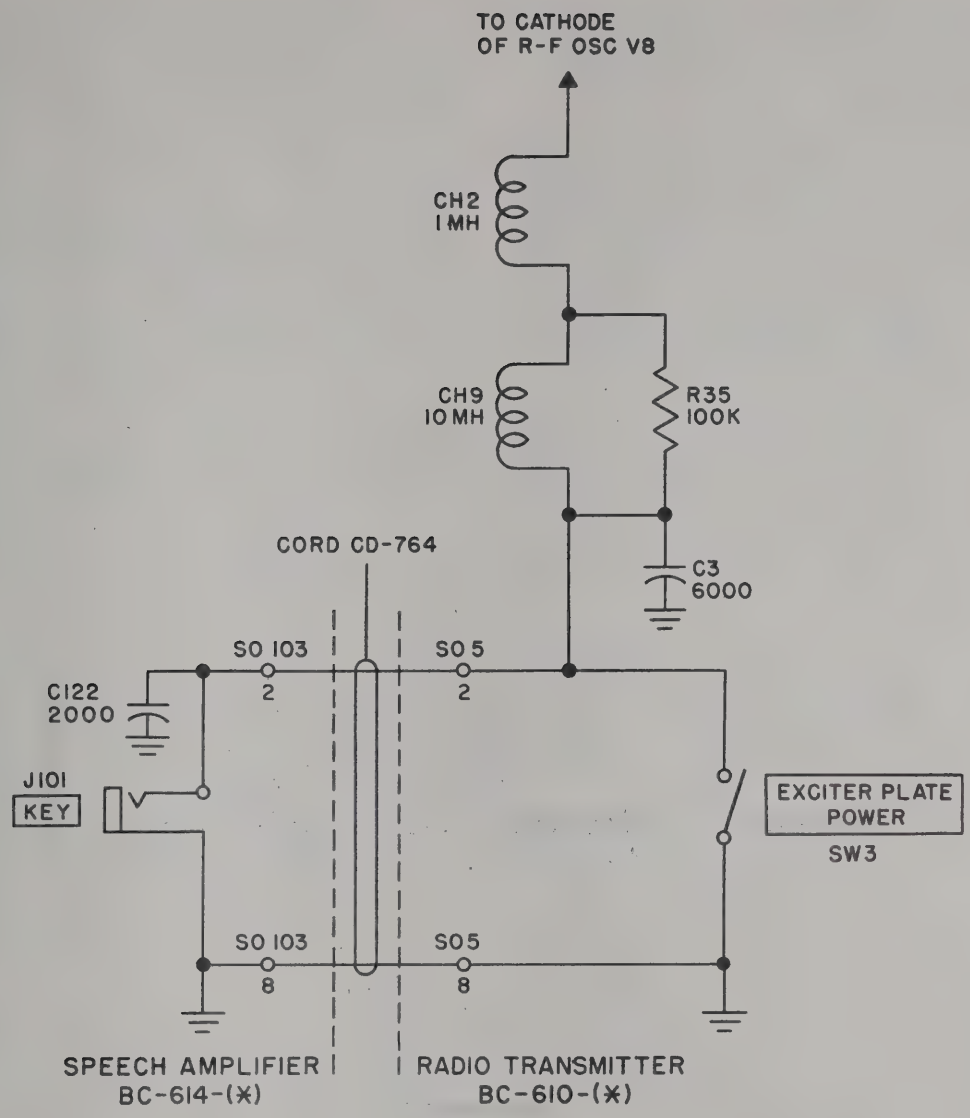


Figure 80. Radio transmitter BC–610–(*), c-w keying circuit.

method, however, EXCITER PLATE POWER switch SW3 must be in the closed (on) position to complete the cathode circuit of the r-f oscillator stage (now acting as a buffer) in the radio transmitter. In addition, PLATE POWER switch SW6 must be closed so that relays RY1 and RY4 in the transmitter are not actuated each time relay K101 is energized.

122. Voice Operation
(figs. 81 and 82)

The radio transmitter may be amplitude modulated by audio frequencies at the same time it is being FS keyed. Speech Amplifier BC–614–

(*) is used to raise the microphone output to a level suitable to drive the input of the audio circuit in the transmitter.

a. Block Diagram.

(1) The a-f voltage from a dynamic microphone or Telephone EE–8–(*) enters first a-f amplifier V101 (fig. 81) through Socket SO–101 marked *Dynamic Mic.* 2 and through an attenuating network which presents the correct impedance. The audio voltage is amplified by tube V101 and is coupled to the second a-f amplifier stage.

(2) The output from tube V101 is fed to second voltage amplifier V102. When the carbon microphone is in use, the input voltage is fed through jack J102 marked CARBON MIC. 1 to the input of V102. The amplified a-f voltages are fed to tube V103.

(3) The third audio-amplifier and phase inverter tube V103 further amplifies the a-f voltages in one section and in the other section, drives the grids of tube V104 which operates as a push-pull amplifier. The output from V104 is connected through a transformer to a low-impedance unbalanced line through which the amplified a-f voltages are fed to the transmitter.

(4) A portion of the voltage on one of the grids (pin 4) of V104 is fed back to the grid of tube V105 which is a modulation limiter. The output of tube V105 is applied as variable negative voltage to the grid of tube V102. The amplification factor of tube V102 as used in this application varies in accordance with the grid bias variations. A-c power is

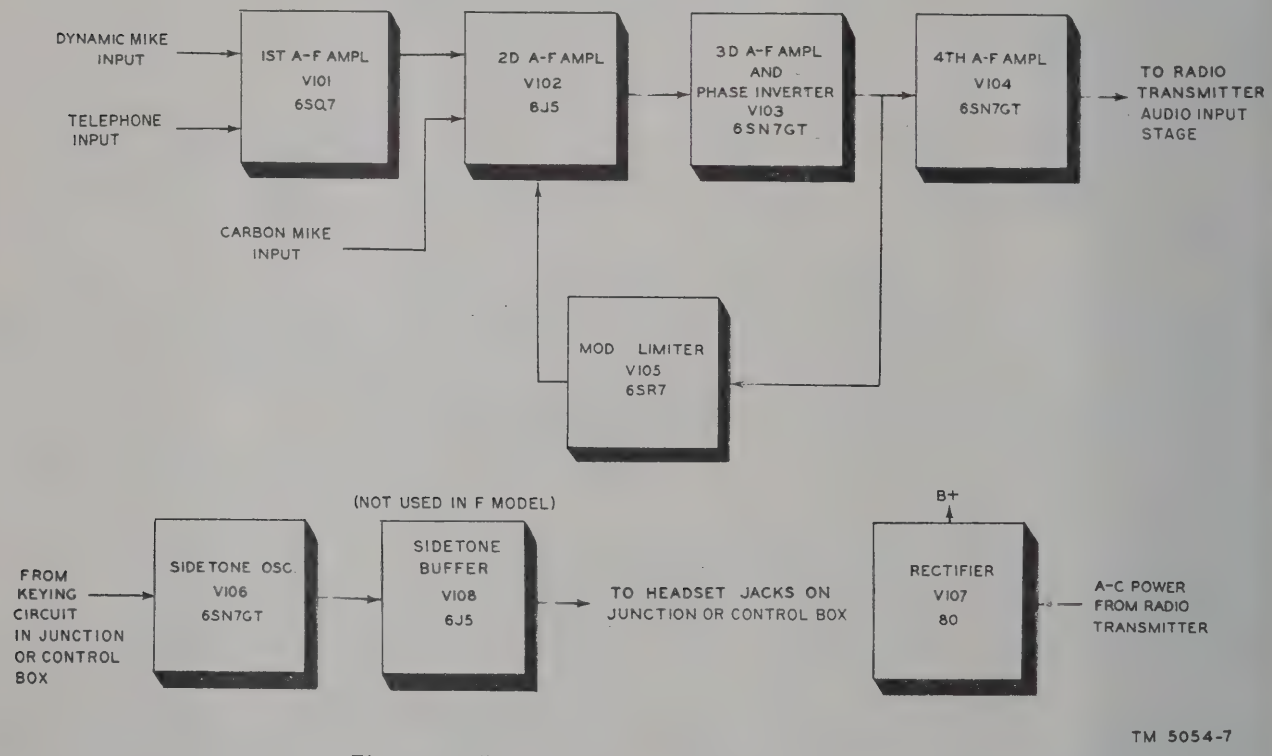


Figure 81. Speech amplifier BC–614–(*), block diagram.

supplied to the speech amplifier from the transmitter through Socket SO–103; this a-c voltage is stepped up by the h-v secondary winding.

b. Speech Amplifier Output Circuit. Output transformer T102 is designed to match the plate-to-plate impedance of tube V104 to a 500-ohm transmission line (fig. 82). The a-f output voltage appearing across the secondary winding of the output transformer is fed to the driver stage in the transmitter over a 500-ohm transmission line. The secondary winding of transformer T7 in the radio transmitters is connected to the grids of tubes V1 and V2.

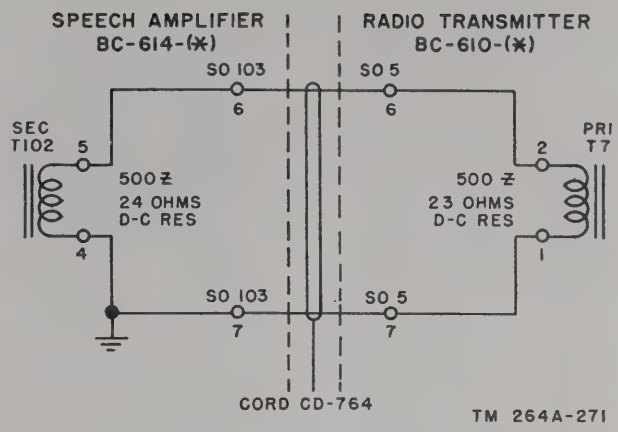


Figure 82. Speech amplifier BC–614–(*), output transformer.

Section III. RECEIVING CIRCUITS

123. General

a. The signals picked up by the receiving antennas may be either FS modulated by teletypewriter signals or amplitude modulated by audio signals or they may be both FS and amplitude-modulated simultaneously. Normally, two doublet antennas (dual diversity reception) are used.

b. In the following paragraphs, only FS reception is discussed because a-m and c-w receptions are discussed in TM 11–854.

124. Block Diagram

The receiving circuit (fig. 72) consists of two Radio Receivers R–388/URR, Frequency Shift Converter CV–182(*)/GRC–26A, Power Supply PP–712(*)/GRC–26A, Radioteletypewriter Control C–808/TRA–7, Teletypewriter Equipment TT–55/MGC or TT–4/TG and Perforator-Transmitter TT–56/MGC, two Loudspeakers LS–3, and Headset HS–30–(*).

a. The r-f signals picked up by the space diversity receiving antennas are applied to the input circuits of the radio receivers. The incoming r-f signals consist of a carrier which has been frequency-shifted by *mark* and *space* teletypewriter signals and, when required, amplitude-modulated by voice frequencies. The r-f signals are amplified and changed to a lower frequency in the receiver r-f amplifier and converter stages and the resulting i-f signal then is further amplified by three i-f stages and passed to the detector stage, where the a-f component is removed from the signal. The frequency-shifted i-f signals containing the mark-space component are not demodulated by the detector stage but are taken off at the output terminals of the last i-f stage and passed to the frequency-shift converter.

b. The frequency-shift converter has two identical input circuits each of which accepts the frequency-shifted i-f signals from one receiver channel. These signals are converted to lower frequency r-f signals (50 kc and 29.3 kc) which are passed into a common limiter circuit where all a-m components are removed. The discriminator network then separates the mark and space r-f components into mark and space d-c signals, and passes them to the output circuit which provides further d-c amplification and the polar termination for the neutral output signals. Polar signal output is also provided by the converter.

c. The control unit receives the neutral signals from the converter output and feeds them to the teletypewriter equipments. Switching facilities are provided so that the individual teletypewriter equipments can be selected as required.

125. Receiving Antennas

a. For dual diversity reception, the signal voltage is fed to the two receivers from two doublet antennas which are spaced a minimum of 3 wavelengths apart (or a maximum of 950 feet). These antennas are similar in both construction and directivity to the transmitting doublet antenna (par. 120). RF Cable Assembly CG–557A/U is used for the signal feed line between the antennas and the shelter. If possible, the radiation lobes

of the receiving antennas should not be directed across the local transmitting antenna (par. 30).

b. When whip antennas are used (as in mobile operation), the distance over which satisfactory reception can be achieved is generally shorter than with the doublet antenna. In addition, they are noisier than the doublet because noise is usually vertically polarized and because they receive equally well in all directions.

126. Receiver Block Diagram
(figs. 83 and 84)

The 2–18-mc r-f carrier, FS modulated by mark and space teletypewriter signals, is picked up by the two receiving antennas and applied to the input terminals of the channel A and channel B receivers simultaneously.

a. Although Radio Receiver R–388/URR uses the basic superheterodyne principle, it differs from the conventional types. It uses single, double, or triple conversion (mixing) when tuning over the entire frequency spectrum of .5 to 30.5 mc.

b. The tuning range is divided into thirty 1-mc steps by a system of switches and coils in the r-f amplifier, first mixer, crystal oscillator, and variable i-f circuits. Band changing 1-mc steps consists of moving powdered-iron slugs into selected coils. This shifts the L-C (inductance-capacitance) ratio of the tank circuits by varying the inductances, thus changing the resulting resonant frequencies. Fine tuning then is attained by a cam arrangement which controls the precise position of the powdered-iron slugs suspended from a common shaft. By changing coils and repeating the slug tuning procedure, a highly selective and stable system is attained.

c. When an incoming signal on bands 4 to 30 (3.5- to 30.5-mc) is mixed with the predetermined frequency of the crystal oscillator, V105, the first mixer output frequency (fig. 83) will always be either in the 2.5- to 1.5- or the 3.5-. to 2.5- mc range, depending on the variable i-f switch which selects the 2.5- to 1.5-mc pass for the even-numbered bands and the 3.5- to 2.5-mc pass for the odd-numbered bands. The signal then is fed to the second mixer, V106, and beats with a calibrated variable-frequency oscillator signal (V001, V002) to produce an i-f output frequency of 500 kc. This 500-kc output then is fed through a crystal filtering network, Y112. From then on the equipment follows a conventional pattern (fig. 83), with three stages of i-f amplification (V107, V108, and V109); and avc detector section, V110; bfo V114; avc amplifier and i-f output V111; noise limited and a-f voltage amplifier V112; and audio power amplifier V113 sections.

d. The only exceptions to the procedures as outlined above are when tuning in bands 1, 2, and 3 (fig. 84). Band 1 uses an intermediate mixer, V103, between the first and second mixers as described above. The 4-mc crystal will produce a crystal oscillator (V105) output signal of 12 mc (third harmonic) for the first mixer. The first mixer, V102, output to the intermediate mixer, V103, then will be in the order of 11.5 mc to 10.5 mc. At the same time, by means of split plate-tank-coil tuning, crystal oscillator V105 also will feed to the intermediate mixer, an 8-mc signal (second harmonic of 4 mc) which, when beat with the 11.5-mc to 10.5-mc to 10.5-mc input signal will cause the intermediate mixer to produce a signal in the 3.5- to 2.5-mc range. This signal then is applied to the second mixer, V106, where it is beat with the 3- to 2-mc output of the vfo to obtain an intermediate frequency of 500 kc. Since bands 2 and 3 correspond to the input frequencies of the second mixer (2.5- to 1.5- and 3.5- to 2.5-mc), incoming signals on these bands are fed directly from the r-f amplifier to the second mixer, V106.

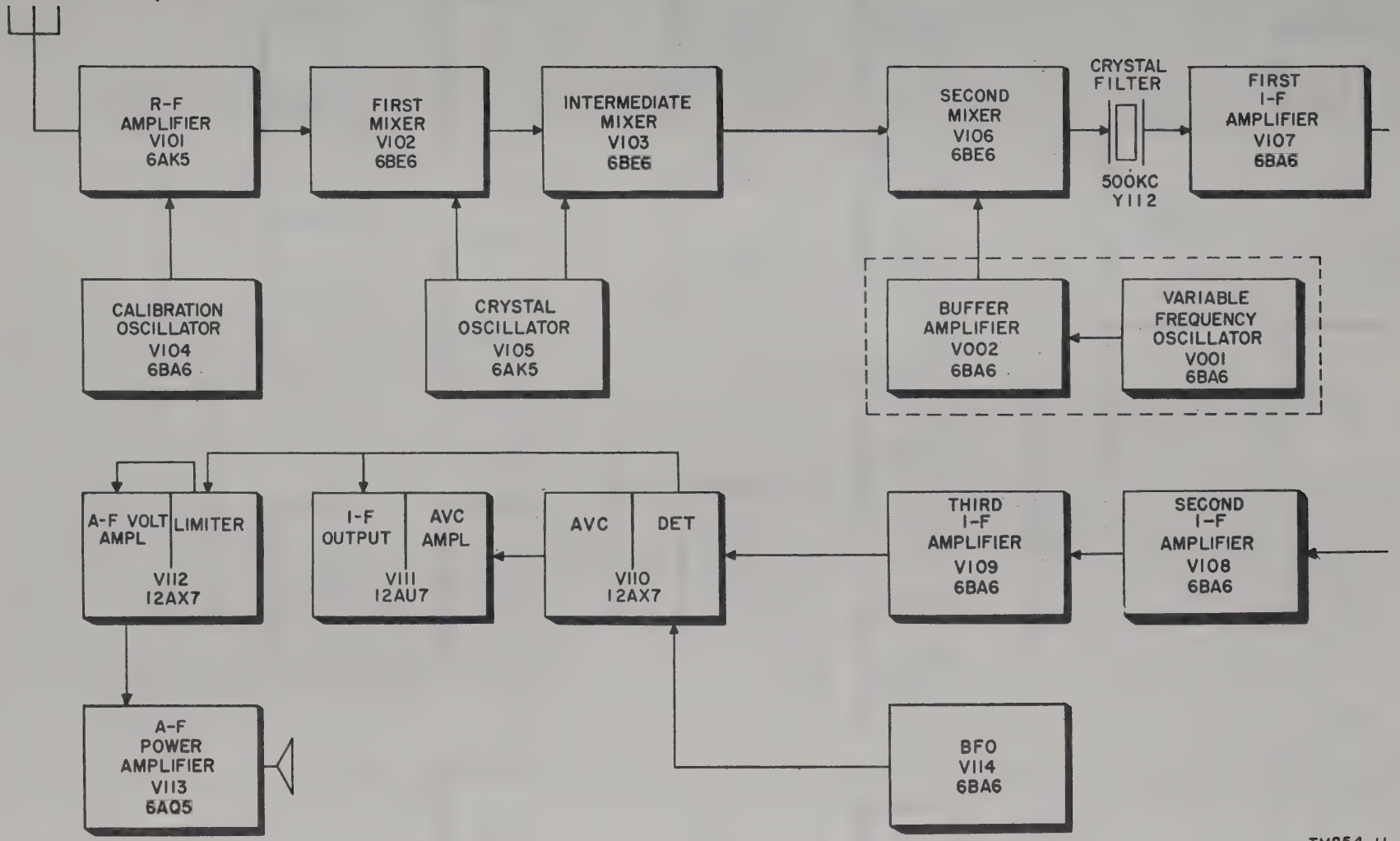
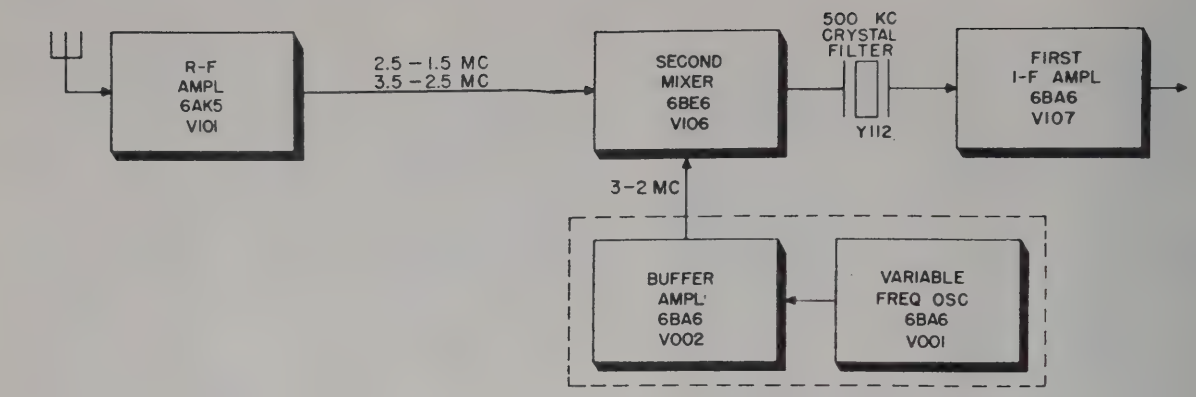
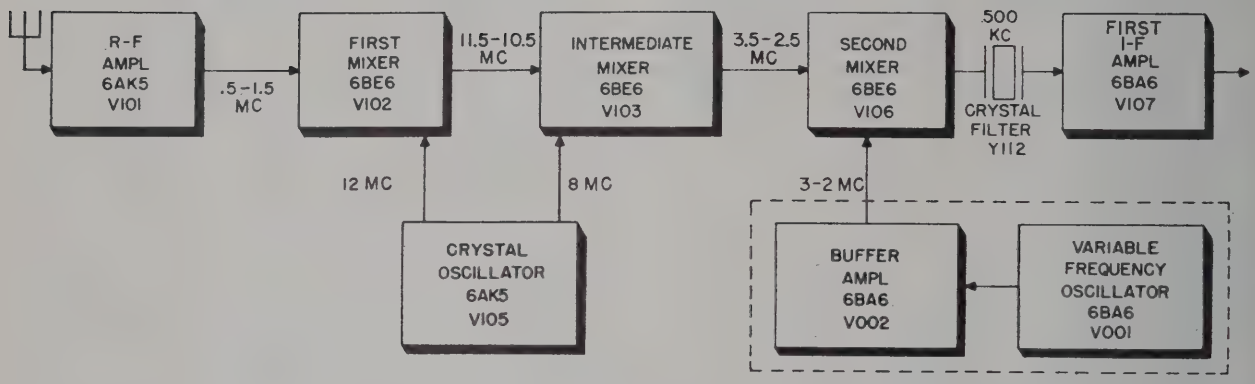


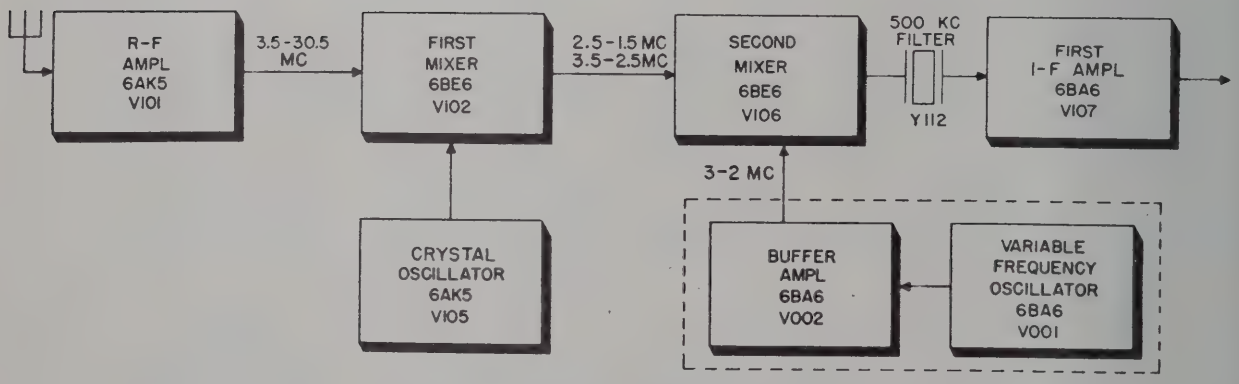
Figure 83. Radio Receiver R-388/URR, over-all block diagram.



BLOCK DIAGRAM BANDS 2-3



BLOCK DIAGRAM BAND 1



BLOCK DIAGRAM BANDS 4-30

TM854-12

Figure 84. Radio Receiver R-388/URR, significant block diagrams of bands.

127. Receiver I-F Output Circuit
(fig. 85)

a. The i-f output tube V111B functions as a cathode-follower to provide a low-impedance i-f output at coaxial connector J104. The i-f signal voltage across resistor R179 is coupled to the IF OUTPUT jack through capacitor C228. The i-f output (500 kc) then is fed through the cable assembly to input jack J101 on the frequency-shift converter.

b. The signal voltage from the channel A receiver is applied to jack J101 and from the channel B receiver to jack J102 (not shown). After the input signal is applied to the input jack, it is stepped up by the transformer action of input network Z103 to match the grid impedance level of tube V101. These networks are tunable through a range of 440 to 510 kc. Capacitor C101 (CHAN A INPUT) is adjustable and tunes Z103 for channel A. When once adjusted to the receiver intermediate frequency, no further adjustments are ordinarily required. From the input network, the signal is applied to pentigrid converter tube V101.

c. The input circuits of channel A and channel B are similar; for this reason, channel B is not shown in figure 85.

128. Frequency-Shift Converter, Block Diagram

The block diagram of the frequency-shift converter is shown in figure 86. The circuitry consists of frequency converters, limiter amplifiers and clippers, frequency discriminators, a frequency-drift compensating circuit, a mark-hold circuit, driver circuit, and d-c output circuit.

a. The i-f output of the radio receivers is sent through separate mixing channels, combined, sent through a peak-clipping limiter circuiter, and detected in a frequency discriminator circuit. The output of the discriminator circuit is coupled to output control stages of the control stages of the converter where the d-c neutral and polar signals are produced. The frequency-drift compensating circuit acts on the i-f signals of the converter to minimize the effects of frequency variations that are caused by changes in the carrier frequency. The mark-hold circuit maintains a steady marking condition automatically should the transmitter carrier fail.

b. Power Supply PP–712 (*)/GRC–26A which contains a tone oscillator subchassis, supplies all filament and plate voltages required by the frequency shift converter and the tone oscillator. The oscillator unit produces an audible tone in a

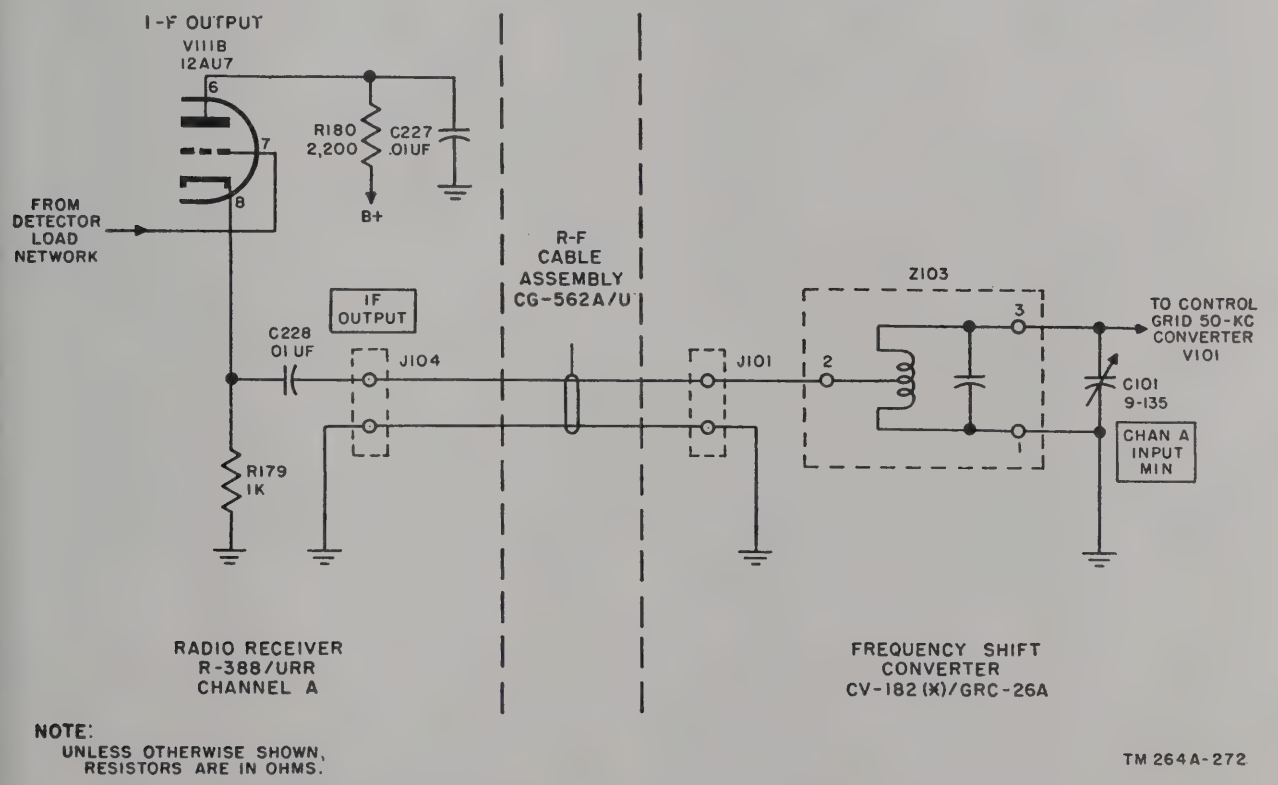


Figure 85. Radio Receiver R–388/URR, i-f output circuit.

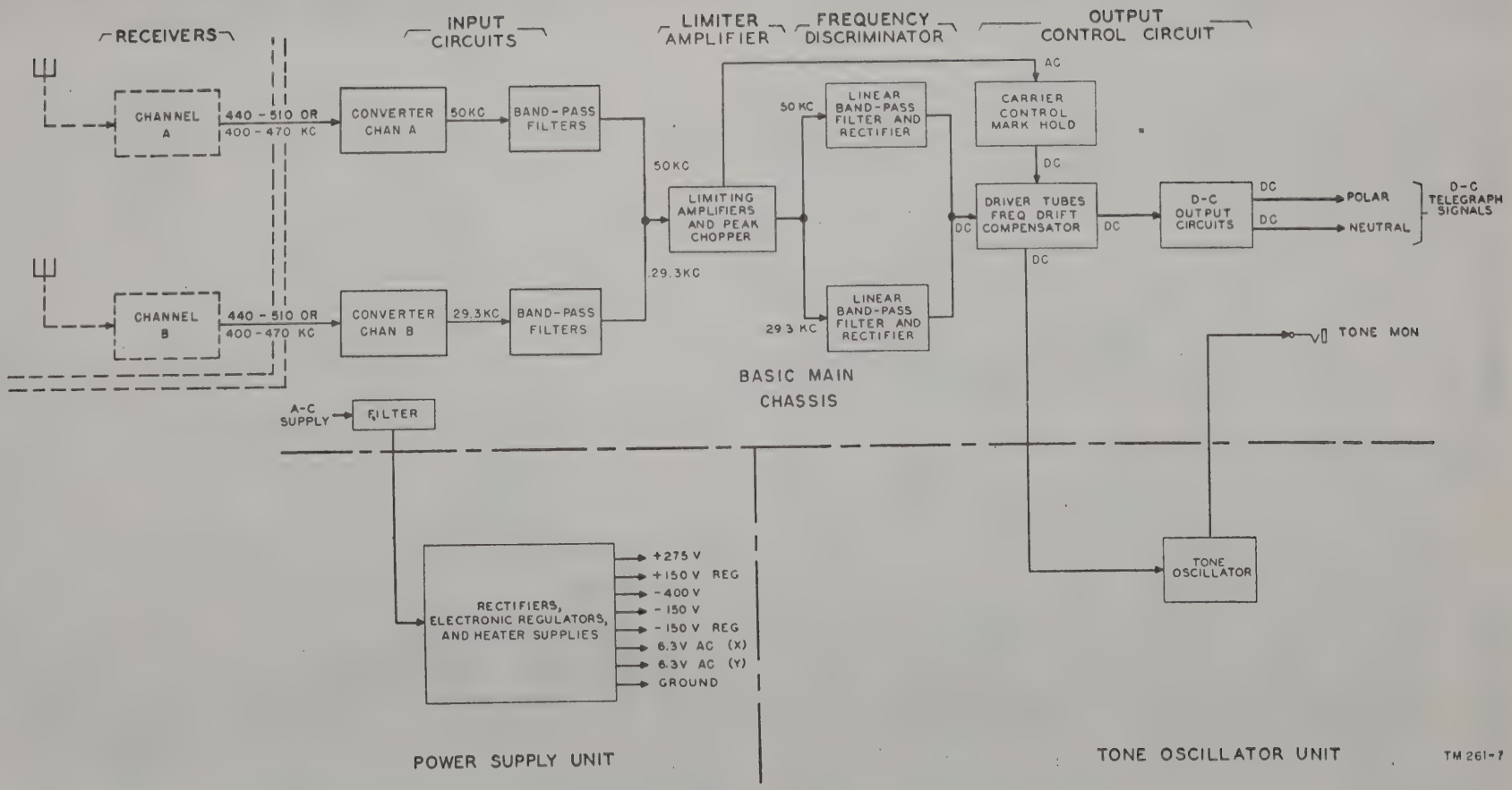


Figure 86. Frequency shift converter CV–182 (*)/GRC–26A, block diagram.

headset at the converter unit when a mark signal is being produced.

129. Radioteletypewriter Control, Receiving Circuit

a. The receiving circuit of Radioteletypewriter Control C–808/GRC–26A and the output circuit of Frequency Shift Converter CV–182 (*)/GRC–26A are shown in figure 87. In the following discussion, the TT TRANSPOSE switch S1 is in the LEFT REC-RIGHT SEND position; the same theory applies when S1 is in the RIGHT REC-LEFT SEND position. PERFORATOR APERATION switch S2 is in the RECEIVE TT position; switch S3 is in the NORMAL position; switch S7 is in the ON position; switch S8 is in the MARK position. Teletypewriter messages may be received from the left teletypewriter at jack J1 or from the typing reperforator at jack J7.

b. Two signals are fed to the control unit from the frequency-shift converter; one is a neutral signal for operation of the local teletypewriter equipment and the other is a polar signal for operation of remote teletypewriter equipment which is connected to terminals E1 and E2 (when switch S3 is in the EXTENSION position). When switch S3 is in the NORMAL position, the polar signals are grounded in the control unit and are unused. Neutral signals are fed to terminal D of jack J103 through filters Z111 and Z113 and resistors R184 through R188. The filters reduce any noise that may be picked up by the cable assembly between J103 and J11 of the control unit. D-c ammeter M102, in series with resistor R189, is connected across meter shunt resistor R188 to indicate the current (in ma) when METER B switch S105 on the converter is in the NEUTRAL position. Resistors R184 through R187 are not strapped out when the teletypewriter equipment is located within the operating shelter. However, by strapping out from one to four of these resistors, the teletypewriter equipment can be located at the end of a circuit with a resistance not exceeding 1,800 ohms (equivalent to about 1 mile of 19-gage cable). The correct neutral loop current is 60 ma as indicated on meter M102.

c. From terminal D of J103, the neutral signal is fed to terminal D of J11 in the contrcl unit and from there, to jack J1 of the left receiving teletypewriter and to jack J7 of the typing reperforator. The signal actuates the left (receiving) teletypewriter magnet and returns to ground through contacts 10 and 11 of switch S1. Simultaneously, tape copy of the received message is made on the typing reperforator. The signal supplied by the converter is of sufficient magnitude to operate all the teletypewriter magnets in the circuit simultaneously. In the absence of a carrier or a signal, the mark-hold feature of the converter provides a constant mark signal to the circuit outlined above. Jack J3 is disconnected from the circuit and jack J8 is short-circuited so that it is impossible to send from these jacks when switch S1 is in the LEFT REC-RIGHT SEND position. Any interruption of the series signal path will prevent the operation of the receiving teletypewriter and the typing reperforator.

d. To operate the right receiving teletypewriter, switch S1 is turned to the RIGHT REC-LEFT SEND position, the signal following the path previously outlined until it reaches S1. With S1 in the new position, switch contacts 5 and 6 are shorted, sending the signal through jack J4, returning to control unit ground through switch contacts 11 and 12. The incoming signal may be copied on either teletypewriter as selected by switch S1, and in the event of a failure of the receiving machine, copy may be continued on the remaining machine by operating switch S1 to place the sending machine in the receiving circuit. Full-duplex operation still may be obtained by turning switch S2 (PERFORATOR OPERATION) to the SEND TT position, and by using the perforator-transmitter as a sending machine (provided that tape copy of the incoming message is not required) or by sending from a prepared tape by using the transmitter-distributor.

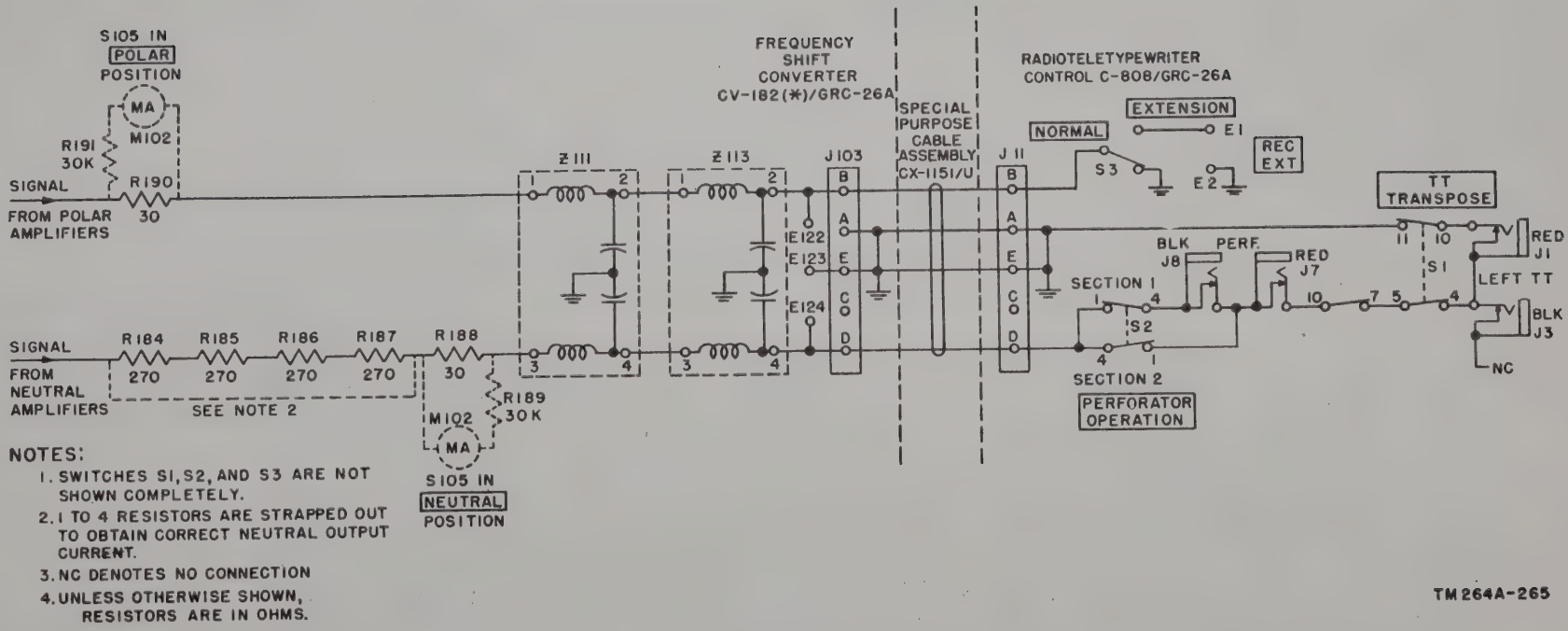


Figure 87. Radioteletypewriter control C-808/GRC-26A, receiving circuit.

Section IV. POWER DISTRIBUTION

130. General

The connections from the main power source to the individual units are shown in figure 127. This power source may be either a Power Unit PE–95–G or any other source (military or commercial) which is capable of delivering at least 6 KW. at 115 volts a-c, 50–60 cps. The main power line terminates in the power circuit breaker (fig. 88) which will interrupt the circuit automatically when more than 60 amperes pass through it. Five principal power distribution lines emanate from the circuit breaker and deliver power to specific components (par. 131). Several secondary lines exist also (par. 132).

131. Principal Lines

Line No. 1 delivers power through the 15-ampere lighting circuit breaker to the fluorescent lighting system. Line No. 2 delivers power to the blower, Frequency Shift Exciter 0–39(*)/TRA–7, and Radioteletypewriter Control C–808/GRC–26A. Line No. 3 delivers power to the two teletypewriters, Radio Receivers R–388/URR, and Frequency Shift Converter CV–182(*)/GRC–26A. Line No. 4 delivers power to the heater and to Rectifier RA–87–(*). Line No. 5 delivers power only to the transmitter. Several receptacles are provided for supplying 115 volts a-c to accessory equipment. If trouble such as an open occurs in one of the lines, the equipment in that line may be switched to another line until the trouble can be repaired.

132. Secondary Lines

a. Power Supply PP–712(*)/GRC–26A. Power Supply PP–712(*)/GRC–26A receives its power not directly from one of the principal power lines but indirectly through Frequency Shift Converter CV–182(*)/GRC–26A (fig. 89). Principal line No. 3 delivers 115 volts a-c to receptacle connector J104. The current then passes through electrical noise suppressor Z112 and the extension power cable to the power supply. For power to reach power transformer T302, the interlock switches

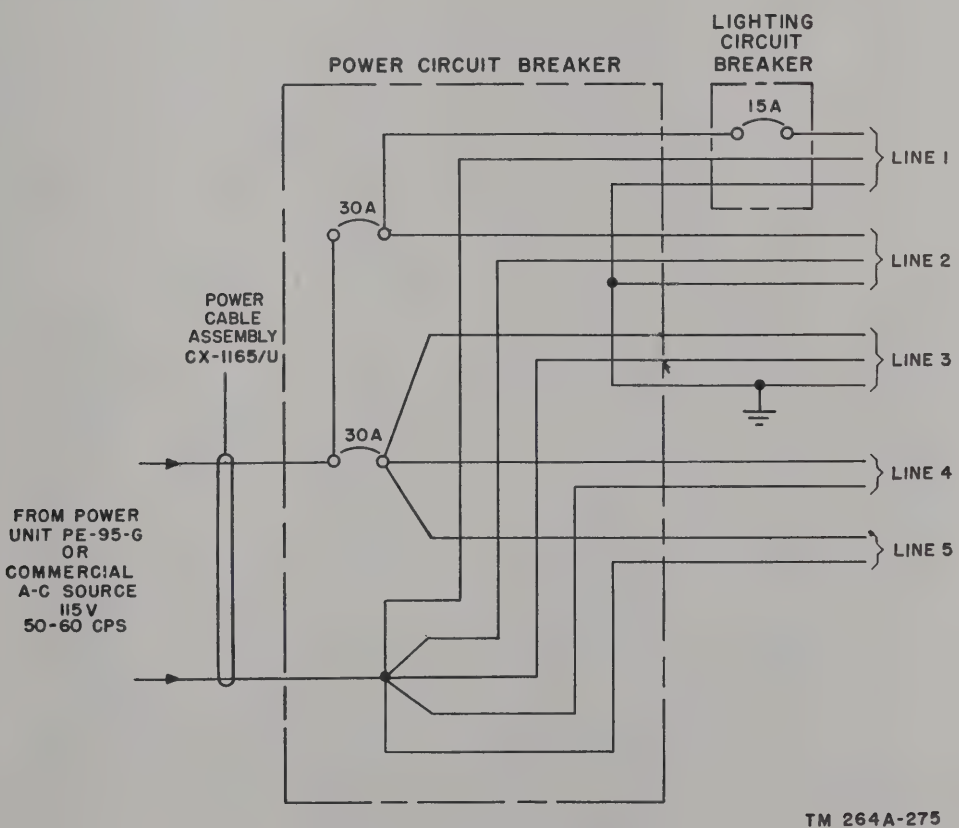


Figure 88. Power circuit breaker.

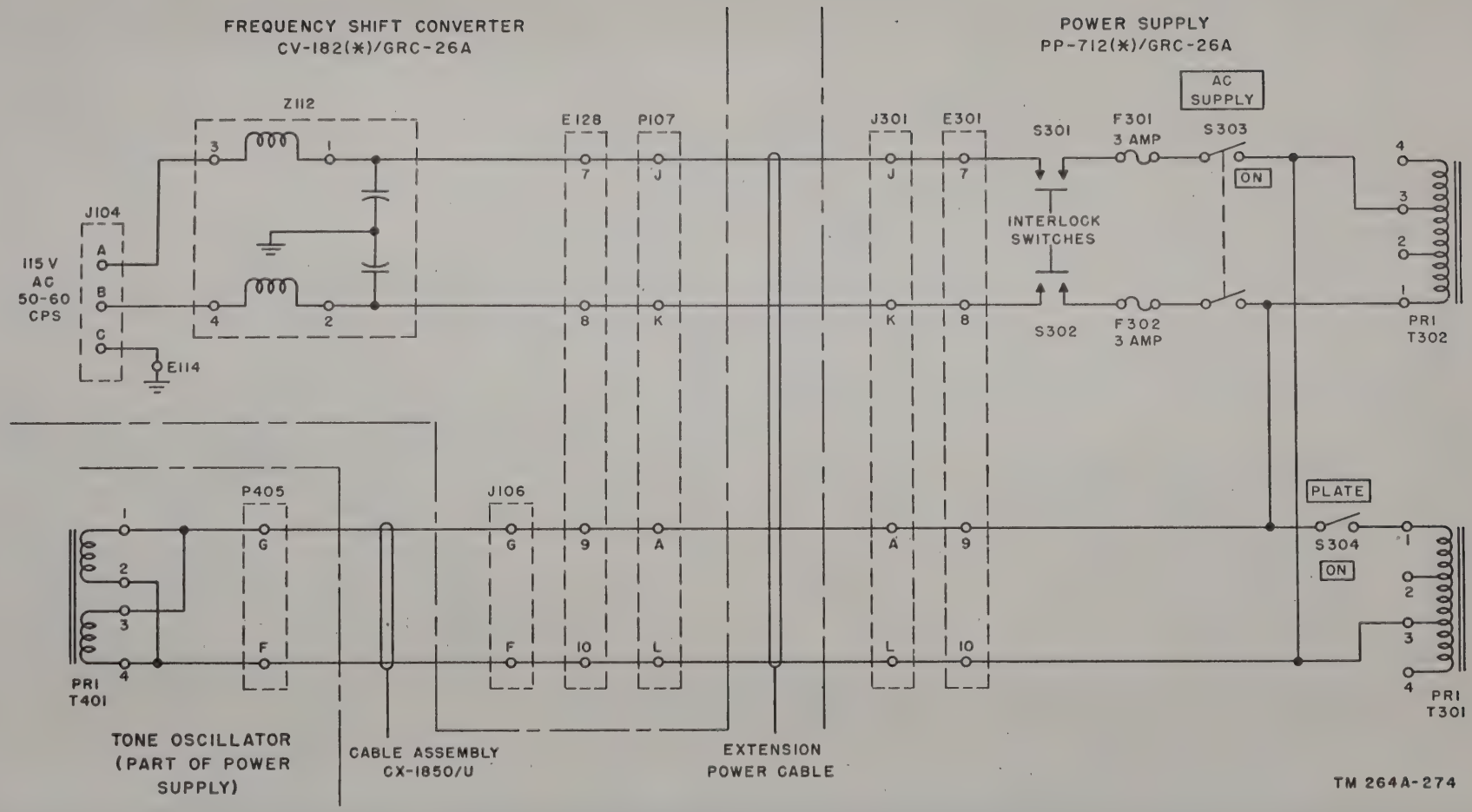


Figure 89. Power supply PP-712(*)/GRC-26A, power source.

must be closed, fuses F301 and F302 must be intact, and AC SUPPLY switch S303 must be in the ON position. With the switches in these positions, power also is supplied to power transformer T401 in the tone oscillator section of the power supply. In addition, when PLATE switch S304 is in the ON position, power is supplied to power transformer T301.

b. Perforator-Transmitter TT–56/MGC. The power for the operation of the perforator-transmitter is supplied by Rectifier RA–87–(*) (fig. 90). When the rectifier ON-OFF switch is in the ON

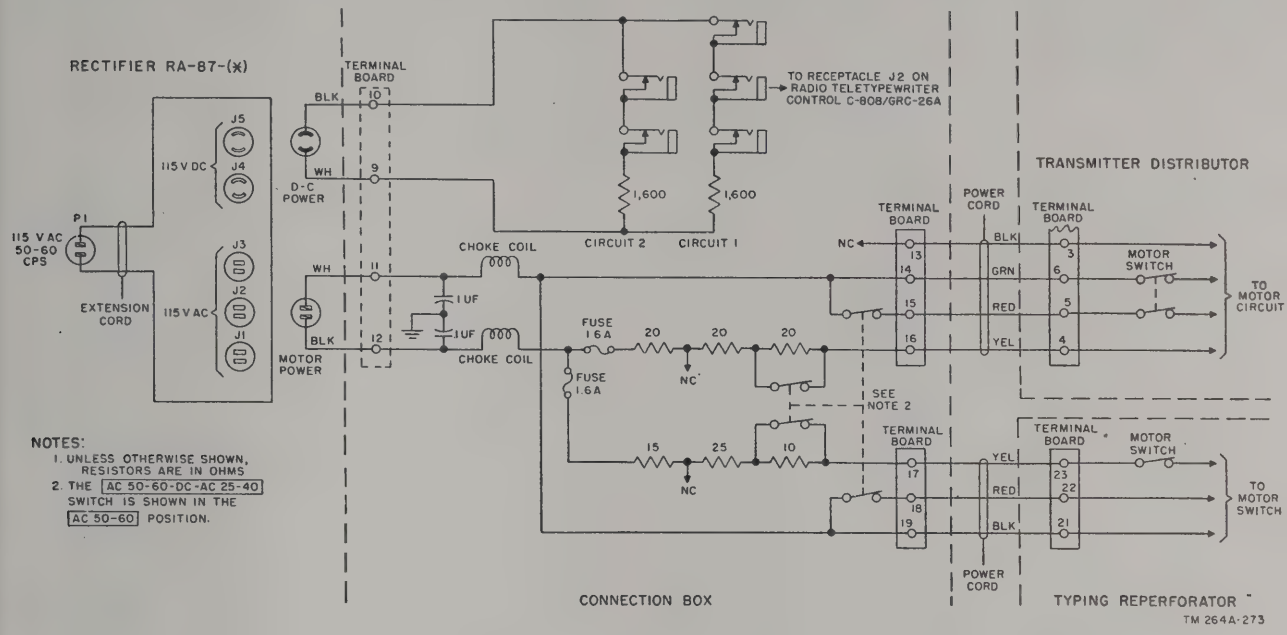


Figure 90. Perforator-transmitter TT–56/MGC, power source.

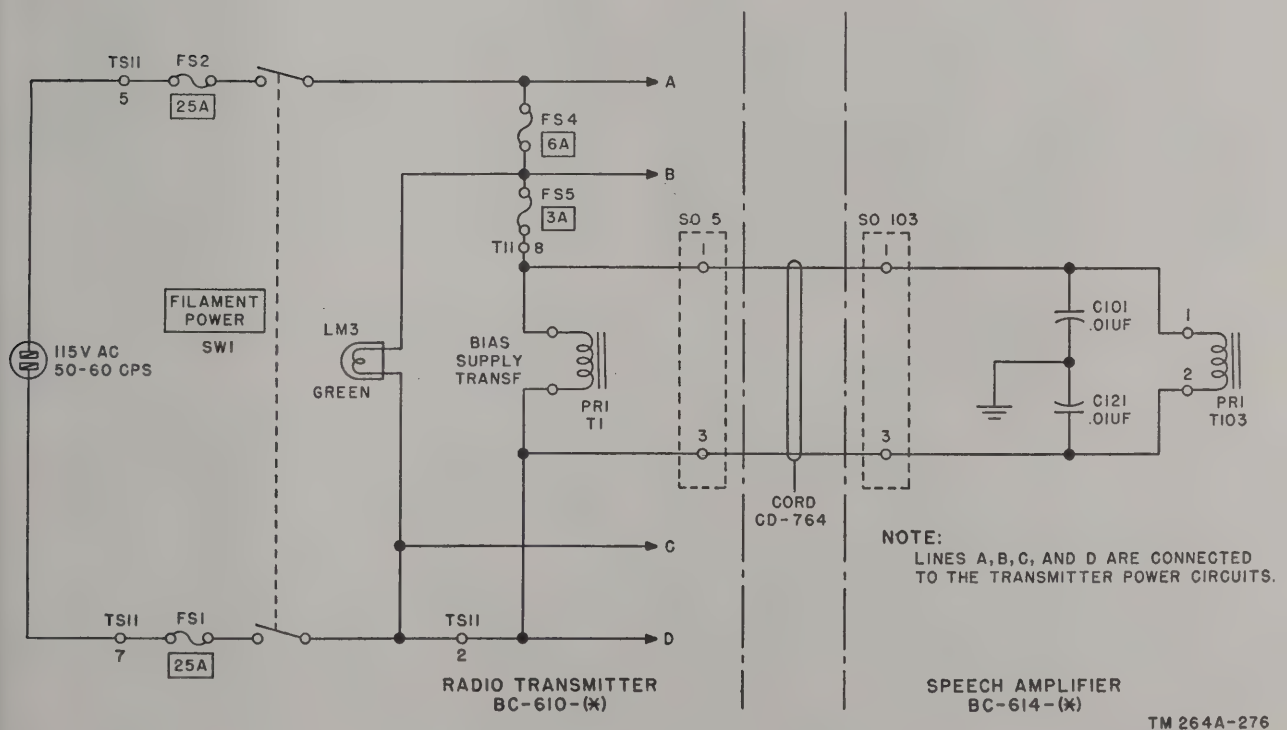


Figure 91. Speech amplifier BC–614–(*), power source.

position, the rectifier supplies 60-ma dc to the typing reperforator line circuit in the control unit (switch S2 in the control unit must be in the PUNCH TAPE position (par. 136)). In addition, an a-c voltage is supplied to the motor circuits of the transmitter-distributor and the typing reperforator as shown in figure 90. Note that the motor switches must be closed and that the 1.6-ampere fuse must be intact.

c. Speech Amplifier BC–614–(*). Power for the speech amplifier is supplied through the radio transmitter as shown in figure 91. FILAMENT POWER switch SW1 on the transmitter must be closed and fuses FS1, FS2, FS4, and FS5 must be intact. Lamp LM3 will light when switch SW1 is closed. But even if LM3 lights, the speech amplifier will not receive any power if fuse FS5 is open.

Section V. MISCELLANEOUS CIRCUITS

133. Frequency Monitoring Circuit

a. In Radio Set AN/GRC–26A, Radio Receiver R–388/URR is used as a frequency standard. The complete operating procedure is given in paragraph 63. Briefly, the frequency-shift exciter and the radio transmitter are first tuned to the approximate assigned frequency. The receiver then is tuned to the exact frequency by using the calibration circuits provided. The transmitter is turned on (with the top access door open to remove plate power from the final stage) and the oscillator in the exciter is tuned to obtain zero beat in the receiver speaker. The transmitter and frequency-shift exciter then are readjusted as described. This procedure insures that the carrier frequency is correct.

b. It is also necessary to insure that the carrier is shifted down exactly 850 cycles when a space signal is transmitted. To accomplish this, the monitoring circuit in the frequency-shift exciter is used (fig. 92). Essentially, the monitoring circuit permits the operator to compare the shifted frequency of a transmitted space signal against the 850-cycle monitor circuit oscillator and to adjust the frequency-shift exciter to obtain an exact 850-cycle transmitter carrier shift. The radio receiver is tuned to the frequency of the transmitted mark signal as described above. The transmitter carrier is shifted 850 cycles lower by sending a space signal. Since the carrier has been shifted, an audible tone will be heard in the receiver speaker. A portion of the audio output of the receiver is coupled to amplifier V109 where it is amplified and coupled to mixer stage V108. In addition, the output of the 850-cycle oscillator is coupled to the mixer stage. Therefore, if the frequency of the audio signal (which is the same as the carrier shift) is exactly 850 cycles, a zero beat will be heard in the frequency-shift exciter headset and the indicator (V110) pattern will remain stationary. If the carrier shift is close to 850 cycles, the indicator pattern will flutter slowly and a low audible beat will be heard in the headset. By observing the indicator pattern and listening to the audible beat on the headset, the operator can adjust the frequency-shift exciter until the transmitter shift is exactly 850 cps.

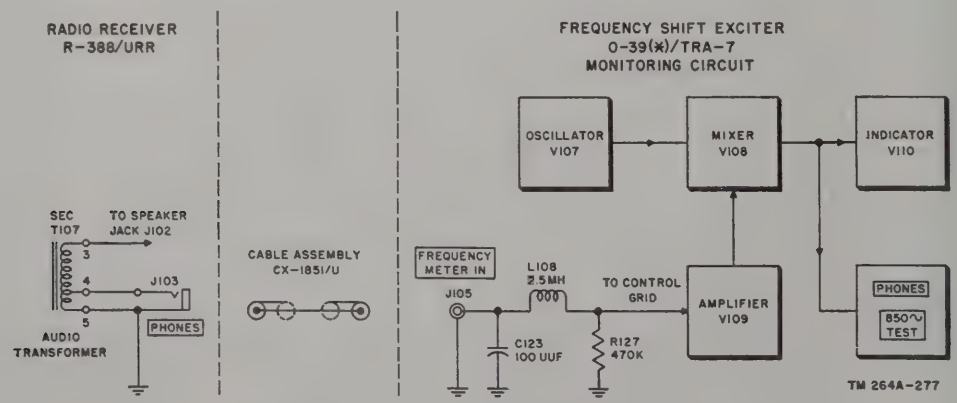


Figure 92. Frequency monitoring circuit.

134. Remote Operation

a. Radio Set AN/GRC–26A can be operated from a remote site by either voice, cw, or teletypewriter facilities. No special remote equipment is provided with the radio set for remote voice and cw operation. However, if regular remote control equipment such as Remote Control Unit RM–39 is not available, improvised arrangements sometimes can be made. Operation will not be satisfactory unless the transmission loss in the remote line is low enough to permit effective control of the radio set. Transmission loss results from the following factors:

(1) Attenuation loss in the field wire.
(2) Loss in the microphone output caused by the reduction in battery supply current through the microphone.
(3) Reflection losses at each end of the field wire. Several methods of compensating for these factors and some improvised remote control arrangements are described in TM 11–486, Electrical Communication Systems Engineering.

b. Remote operation for *neutral* teletypewriters is described in paragraphs 83 through 87. When *NORMAL-EXTENSION* switch S3 in the EXTENSION position, remote operation from the REC EXT and SEND EXT terminals of the control unit is possible with *polar* signals (pars. 116 and 129). Teletypewriter TT–55/MGC can send and receive only neutral signals. Teletypewriter TT–4/TG can transmit neutral as well as polar signals, provided additional equipment is used and wiring changes are made. However, it will receive only neutral signals unless connections are made to a polar line relay. For information on adapting Teletypewriter TT–4/TG for polar operation, refer to TM 11–2234.

Section VI. THEORY OF RADIOTELETYPEWRITER CONTROL C–808/GRC–26A

135. General

a. Radioteletypewriter Control C–808/GRC–26A is the key unit of Radio Set AN/GRC–26A because it directs the incoming and outgoing signals according to the settings of its controls. Although simplified to some extent, it combines the functions of Radioteletypewriter Control C–535/TRA–7 and Control Unit C–292B/TRA–7 which are used in Radio Set AN/GRC–26. Radioteletypewriter Control C–808/GRC–26A performs the following functions:

(1) Provides power for the operation of the sending teletypewriter equipment.
(2) Selects the particular teletypewriter machinery which is to be used.
(3) Initiates and supplies polar mark and space signals to the frequency-shift exciter.
(4) Receives incoming mark and space signals from the converter and applies them to the teletypewriter machinery selected.
(5) Selects type of service (full-duplex or one-way reversible) to be used.
(6) Provides extension circuits for remote operation.
(7) Provides jacks for c-w and frequency-shift keying.
(8) Furnishes perforator-transmitter services for the punching of prepared tapes.

b. The functions of most of the control unit parts are described in those paragraphs that cover the system circuits with which the parts are associated. An index to these paragraphs is given below. The remaining parts are described in this section.

Part	Paragraphs
TT TRANSPOSE switch S1	116
PERFORATOR OPERATION switch S2	116, 129
Relay 0 1	116
FULL DX-ONE WAY switch S4	115
Meter circuit	116
XMTR ON-XMTR OFF switch S5, S6	115
EXTENSION-NORMAL switch S3	134

136. Punch Tape Circuit

The perforator-transmitter sending and receiving circuits have been discussed in paragraphs 116 and 129. When the typing reperforator is to be used only to perforate tape, PERFORATOR OPERATION switch S2 is set to the PUNCH TAPE position. The normal sending and receiving functions of the teletypewriter equipment are unchanged because the typing reperforator now is isolated from the sending and receiving circuits (fig. 93). Jacks J7 and J8 are in series with a 60-ma d-c obtained from Rectifier RA–87–(*)

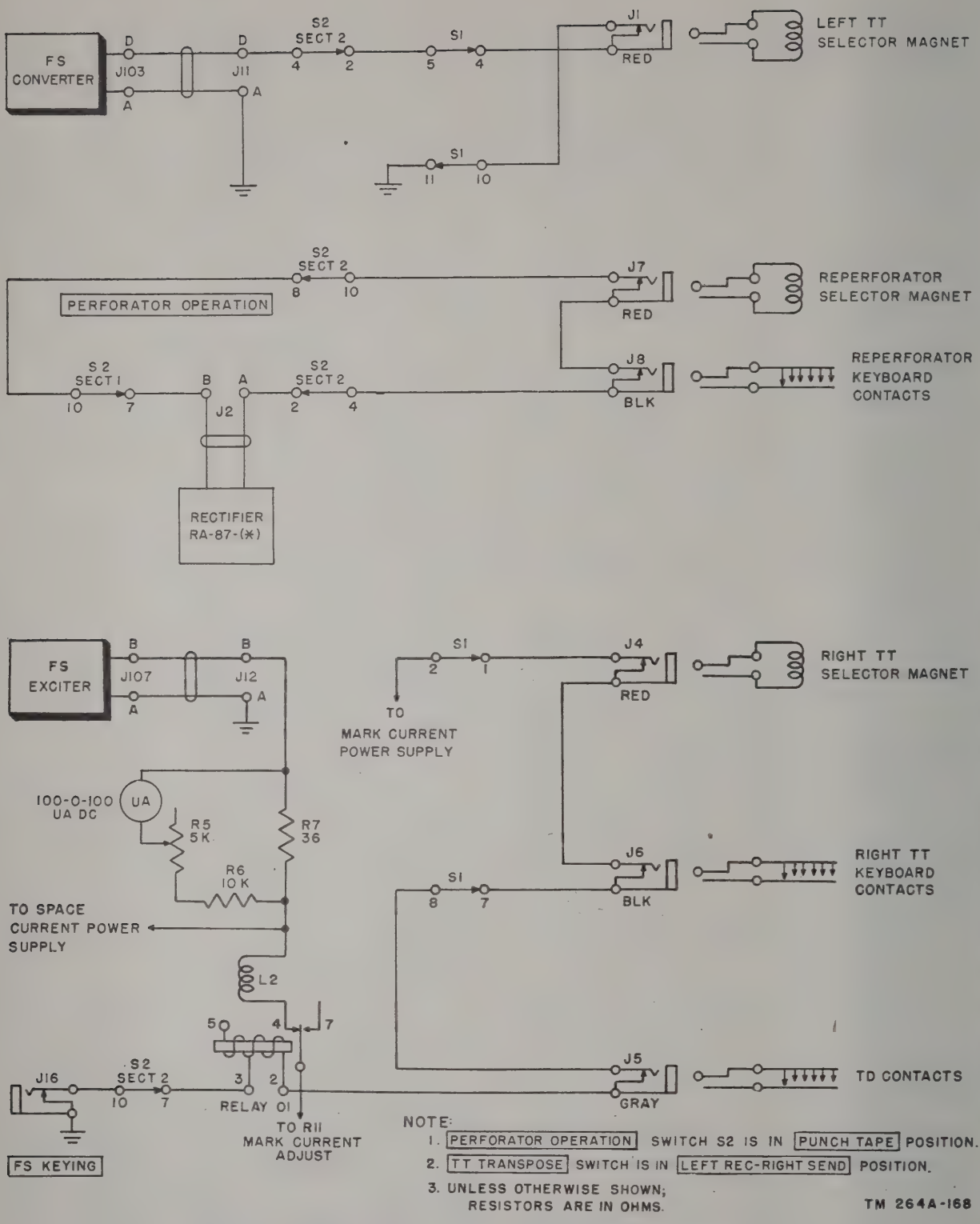


Figure 93. Radioteletypewriter control C–808/GRC–26A, punch tape circuit.

through any of the receptacles in either circuit 1 or circuit 2 of the connection box (fig. 90).

137. Space Current Power Supply

a. The space current power supply (fig. 94) is a conventional full-wave rectifier used to supply d-c to the space-sending circuit (par. 116). Points A and B are connected to similarly lettered points on figure 76.

b. The primary of T1 is connected to the 115-volt, 50- to 60-cycle, a-c source through receptacle J15, ON-OFF switch S7, and 1 AMP fuse F1 when S7 is in the ON position. The secondary consists of two windings. One supplies 6.3 volts at 2.0 amperes to AC SUPPLY indicator lamp I 2 and to TRANSMITTER indicator lamp I 1 (when S6 is in the XMTR ON position); the other supplies 29, 26.5, or 24 volts at 200 ma for the full-wave bridge rectifier. The 24-volt tap is used when the equipment is new, but as the rectifier ages it may be necessary to supply a higher a-c voltage to the rectifier in order to obtain a sufficient d-c output. The higher voltage can be obtained from the 26.5- or 29-volt tap.

c. The pulsating d-c output of selenium rectifier CR1 is filtered by choke L1 and dual capacitors C1A and C1B. Potentiometers R3 and R4 are bleeder resistors and are used for space current adjustment. Resistor R2, limits the peak current applied to capacitor C1A. Capacitor C3 provides an a-c path to ground for hash and ripple voltages.

138. Mark Current Power Supply

a. The mark current power supply (fig. 95) is a full-wave rectifier used to supply a dc to the mark sending circuit (par. 116). Points C, D, and E are connected to similarly lettered points on figure 76.

b. The primary of transformer T2 is connected to the 115-volt 50-to 60-cycle source through receptacle J15, switch S7, and 1 AMP fuse F1 when S7 is in the ON position. The secondary consists of two windings. One supplies 5.1 volts at 4.0 amperes to the filaments of the two parallel rectifier tubes V1 and V2; the other supplies 264 volts center-tapped at 150 ma to the plates of the two rectifier tubes.

c. The two rectifier tubes V1 and V2 are duodiodes operated as full-wave rectifiers. The elements of the two tubes are connected in parallel to provide additional current handling capacity. The pulsating d-c output from V1 and V2 is applied to the filter circuit which consists of choke L3 and dual filter capacitors C8A and C8B.

d. Potentiometer R10 serves both as a bleeder resistor for the power supply and as a coarse adjustment for the mark current. Fine adjustment is accomplished by variable resistor R11. In early models of the control unit, resistor R9 was 1,600 ohms and variable resistor R12 was omitted. In current models of the control unit, R12 in conjunction with R9 adjusts the current through the teletypewriter equipments to the normal value of 60 ma. Note from figures 94 and 95 that the primary windings of transformers T1 and T2 are connected in parallel. SPACE MARK switch S8 connects the negative side of the power supply to ground and must be in the MARK position for normal operation.

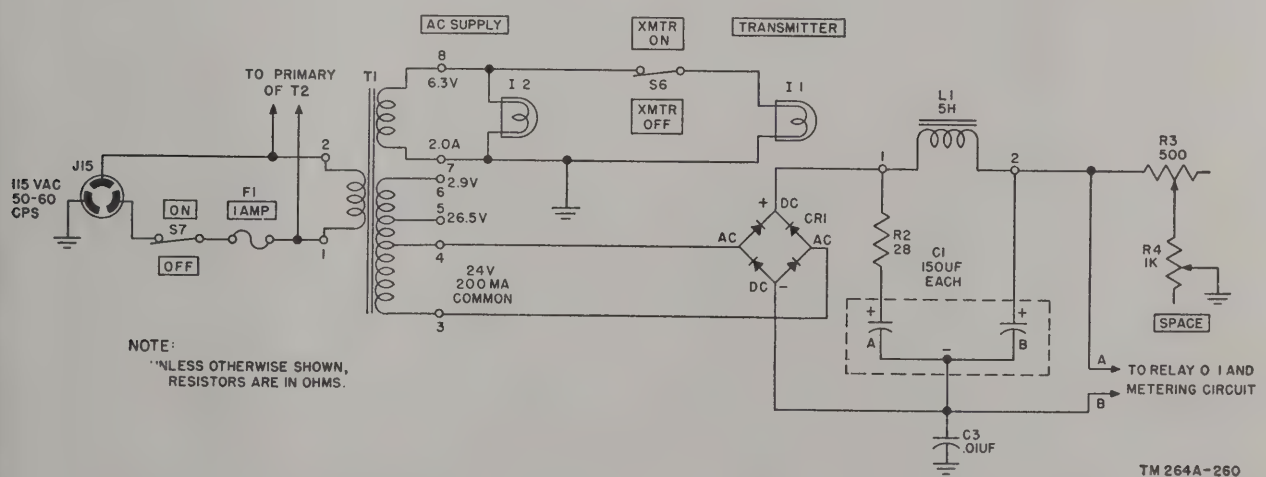


Figure 94. Radioteletypewriter control C–808/GRC–26A, space current power supply.

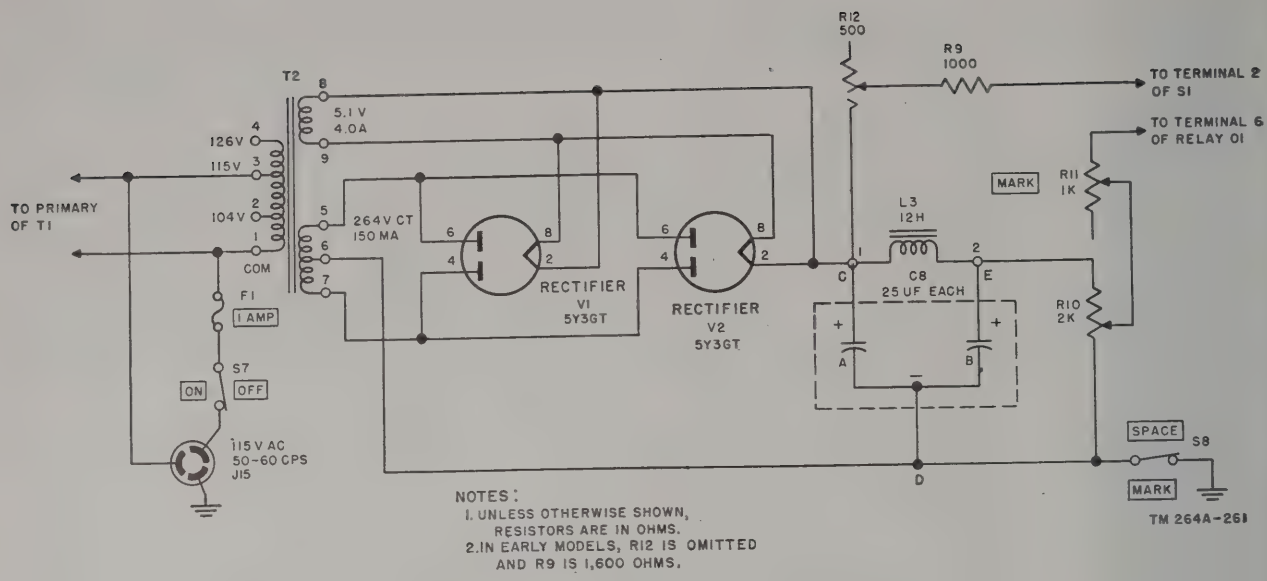


Figure 95. Radioteletypewriter control C-808/GRC-26A, mark current power supply.

CHAPTER 6

SYSTEM FIELD MAINTENANCE INSTRUCTIONS

Note. This chapter contains information for system field maintenance. The amount of repair that can be performed by units having field maintenance responsibility is limited by the tools and test equipment available, and by the skill of the repairman.

Section I. TROUBLE SHOOTING AT FIELD MAINTENANCE LEVEL

Warning: When servicing the radio transmitter, be extremely careful because of the high voltages exposed. Always throw the PLATE POWER switch to the OFF position and open the doors on the transmitter cabinet, before starting any testing. With the high voltage turned off, potentials as high as *1,000* volts are still present in the transmitter. Keep one hand in a pocket when measuring voltages with the probe. Before touching any part after the voltage is turned off, short the part to ground with a shorting stick (fig. 64). Read cautions of individual equipment technical manuals before attempting repair.

139. Trouble Shooting Procedures

a. General. The first step in servicing a defective radio set is to sectionalize the fault. Sectionalization means tracing the fault to the *major component* responsible for the abnormal operation of the radio set. The second step is to localize the fault. Localization means tracing the fault to the defective item responsible for the abnormal condition. This chapter will be concerned only with *system* maintenance; that is, with tracing a trouble to a particular component. When the trouble has been isolated, the repairman then should refer to the technical manual covering the faulty unit.

b. System Sectionalization. Radio Set AN/GRC–26A should be set up for operation, following the steps given in the starting procedure (par. 61). Check the operation of the components against the equipment performance checklist (par. 107) until an abnormal indication is noted. Refer to the system trouble-shooting chart (par. 145), which often will indicate quickly the item causing the trouble and the corrective measures to be taken. If the charts do not give sufficient information, the trouble must be localized within the defective component.

c. Localization. Localization is the tracing of an equipment fault to a particular item. Localization of trouble within a component of Radio Set AN/GRC–26A may be accomplished by following instructions in individual technical manuals which are furnished with the equipment. For example, a fault in Radio Transmitter BC–610–(*) may be located by following instructions in TM 11–826.

140. Trouble Shooting Data

Take advantage of the material supplied in this manual. It will help in the rapid sectionalization of faults. Consult the trouble-shooting data in the other technical manuals furnished and the following material in this manual.

Fig. or par. No.	Description
Fig. 60	Connection box, patching circuits.
Figs. 73, 75, 76, 87, 93, 94, and 95.	Radioteletypewriter Control C–808/GRC–26A, functional schematic diagrams.
Pars. 145 and 147	Trouble-shooting charts.
Fig. 105	Radioteletypewriter Control C–808/GRC–26A, voltage and resistance measurements.
Fig. 102	Radioteletypewriter Control C–808/GRC–26A, bottom view of chassis.
Figs. 103 and 104	Radioteletypewriter Control C–808/GRC–26A, top view of chassis.

Fig. or par. No.	Description
Fig. 107	Radioteletypewriter Control C–808/GRC–26A, tube location.
Fig. 118	Frequency Shift Converter CV–182(*)/GRC–26A, schematic diagram.
Fig. 96	Radio Transmitter BC–610–(*), tube locations
Fig. 97	Frequency Shift Exciter O–39(*)/TRA–7, tube locations.
Fig. 98	Radio Receiver R–388/URR, tube locations.
Fig. 99	Frequency Shift Converter CV–182(*)/GRC–26A, tube locations.
Fig. 100	Power Supply PP–712(*)/GRC–26A, tube locations.
Fig. 101	Speech Amplifier BC–614–(*), tube locations.
Fig. 108	Capacitor color codes.
Fig. 109	Resistor color codes.
Figs. 121 and 122	Power Supply PP–712(*)/GRC–26A and tone oscillator, schematic diagrams.
Fig. 120	Radioteletypewriter Control C–808/GRC–26A, schematic diagram.
Fig. 110	Power Unit PE–95–G, wiring diagram.
Fig. 111	Rectifier RA–87–(*), schematic diagram.
Fig. 123	Telephone EE–8–B, schematic diagram.
Fig. 115	Radio Receiver R–388/URR, schematic diagram.
Fig. 126	Radio Set AN/GRC–26A, wiring diagram.
Fig. 127	Radio Set AN/GRC–26A, cording diagram.
Fig. 112	Radio Transmitter BC–610–H, schematic diagram.
Fig. 113	Radio Transmitter BC–610–I, schematic diagram.
Fig. 110	Speech Amplifier BC–614–(*), schematic diagram.
Fig. 124	Antenna Tuning Unit BC–939–B, schematic diagram.
Fig. 114	Transmitter Tuning Units, schematic diagram.
Fig. 116	Teletypewriter TT–4A/TG, schematic diagram.
Fig. 117	Frequency Shift Exciter O–39(*)/GRC–26A, schematic diagram.

141. Test Equipment Required for Trouble Shooting

The test equipment required for testing components of Radio Set AN/GRC–26A is listed below. The technical manuals associated with the test equipment also are listed. Test equipment required for trouble shooting the teletypewriter equipment is specified in paragraph 118 of TM 11–2223; paragraph 51 of TM 11–2222; and in paragraph 104 of TM 11–352.

Test equipment	Technical manual
Multimeter TS–352/U, or equal	TM 11–5527
Tube Tester I–177–(*)	TM 11–2627

142. General Precautions

a. High Voltage Measurements. High voltages are dangerous and can be fatal. Certain precautions must be followed when measuring voltages above a few hundred volts. When measuring high voltages, observe the following rules:

(1) Connect the ground lead to the voltmeter.
(2) Ground the case or panel of test instruments.
(3) Place one hand in your pocket.
(4) Ground all high-voltage circuits with the shorting stick (par. 93).
(5) If the voltage is less than 300 volts, checks may be made with the power on by touching the probe of the test lead to the hot terminal.
(6) If the voltage is greater than 300 volts, shut off the power, connect the hot test lead, step away from the voltmeter, turn on the power, and note the readings on the voltmeter. *Do not touch any part of the voltmeter.*

b. Resistance Measurements.

(1) Before making any resistance measurements, disconnect the power source. An ohmmeter is essentially a low-range voltmeter and battery. If the ohmmeter is connected in a circuit which already has voltages in it, the needle will be knocked off scale and the voltmeter movement may be burned out.
(2) Capacitors always must be discharged before resistance measurements are made (par. 93).

c. Current Measurements.

(1) Current measurements other than those indicated by the panel meters ordinarily are not required in trouble shooting the r-f sections of the radio set. Under special circumstances, where the voltage and resistance measurements alone are

not sufficient to localize the trouble, a current measurement can be made by opening the circuit and connecting an ammeter in series with the circuit to be measured. Series measurements of currents in teletypewriter lines often are made for trouble location purposes.

(2) When the meter is inserted in a circuit to measure current, it always should be inserted away from the r-f end of the resistance. For example, when measuring plated current, do not connect the meter next to the plate of a tube, but insert it next to the end of the resistor which connects to the power source.

Caution: When measuring current, always set the meter at its highest range. Then, if necessary, decrease the range of the meter to obtain an accurate reading.

(3) In most cases, the current flows through a resistance which is either known or can be measured with an ohmmeter. The current flowing in the circuit can be determined by dividing the voltage drop across the resistor by its resistance value. This method is better than that in (1) above, because it does not subject the relatively delicate ammeter to damaging currents.

143. Tubes

a. Tube Failures. Tube failures are responsible for a large percentage of the faults which occur in a radio set. Do *not* attempt to find the source of trouble in Radio Set AN/GRC–26A by indiscriminately changing tubes. Do not resort to tube changing until the trouble has been traced to a particular stage.

b. Tube Checking. Tube checkers are used to check either the emission or the mutual conductance of a tube and to test for shorted elements within the tube. They will not test the performance of h-v tubes or rectifiers; however, they are useful for checking receiving type tubes and the tubes used in the low power stages in the transmitter. Remember that the results obtained from the tube checker are not obtained under the same conditions as those under which the tube operates in the set. For this reason, the final test of a tube must be its comparison *in the set* with a tube that is known to be good.

144. Operational Test

a. If the item of equipment being repaired is installed as part of Radio Set AN/GRC–26A, operate the equipment in accordance with the equipment performance checklist in paragraph 107. The checklist frequently indicates the general location of trouble. Refer to the trouble-shooting chart in paragraph 145 to locate a possible source of trouble. More detailed information can be obtained from equipment technical manuals.

b. If the equipment is being checked apart from Radio Set AN/GRC–26A, follow the trouble-shooting procedure described in individual equipment technical manuals (par. 1).

145. System Trouble-Shooting Chart

The following chart is supplied as an aid in locating trouble in Radio Set AN/GRC–26A. This chart lists the symptoms which the repairman may observe while operating the equipment. The starting procedure described in paragraphs 61 through 69 should be followed. The information in this paragraph is in the same sequence as the steps in the starting procedure. For troubles in components other than those described below, refer to individual equipment technical manuals as indicated in the chart.

Symptom	Probable trouble	Correction
1. Power Unit PE–95–G fails to start when START button is pressed.	1. MANUAL-REMOTE switch on power unit in MANUAL position. Discharged batteries in power unit. Defective power unit.	1. Set MANUAL-REMOTE switch to REMOTE position. Start power unit with hand crank (MANUAL-REMOTE switch must be in the MANUAL position). Charge batteries (par. 41). Refer to TM 11–904.

Symptom	Probable trouble	Correction
2. Power Unit PE–95–G is running but no power available at shelter.	2. Faulty connection at either end of Power Cable Assembly CX–1166/U.	2. Check connections at power unit and shelter.
	Circuit breaker on panel of power unit in OFF position.	Set circuit breaker on panel of power unit to ON position.
	Circuit breakers on shelter wall in OFF position.	Set to ON position.
3. Frequency shift exciter dial or AC SUPPLY lamps will not light when AC SUPPLY switch is set to ON.	3. Defective fuse	3. Replace fuse F101, F102, or both.
	Defective lamps	Replace dial or indicator lamp.
	No a-c power to exciter	Check connections to wall receptacles.
		Check Cord CX–962/TRA–7, replace if necessary.
		Refer to TM 11–257.
4. Frequency shift exciter OVEN indicator will not light when OVEN switch is turned ON.	4. No a-c power to exciter	4. Check Cord CX–962/TRA–7, replace if necessary.
		Check connection to wall socket.
	Defective lamp	Replace OVEN indicator lamp I104.
5. Exciter BUFFER INDICATOR will not light.	5. Exciter controls not adjusted properly.	5. Check settings of all controls in accordance with operating instructions, paragraphs 61 through 69.
	Open circuit in exciter control relay wiring.	Check for faulty connection in either end of Cord CX–961/TRA–7 (red).
		Disconnect key cord plug from CW KEYING jack on Radioteletypewriter Control C–808/GRC–26A.
	Defective BUFFER INDICATOR lamp, or lamp loose in socket.	Tighten or replace BUFFER INDICATOR lamp.
	Defective tube	Replace tube V101, V102, or V104.
		Refer to TM 11–257.
6. No beat note heard in loudspeaker when making final adjustments to frequency shift exciter OSCILLATOR TUNING dial.	6. Exciter, receiver, or transmitter improperly adjusted.	6. Check settings and readjust controls on exciter, receiver, and transmitter, in accordance with operating instructions, paragraphs 61 through 69.
	Defective tube in monitoring circuit	Replace tube V107, V108, V109, or V104.
	Defective Cord CG–390/U	Check connections or Cord CG–390/U. Repair or replace if necessary.
7. Audio tone from frequency shift exciter 850 ~ TEST jack not heard in headset.	7. Headset not connected to proper jack.	7. Connect plug from headset into PHONES 850 ~ TEST jack.
	Wrong setting of exciter controls	Check exciter controls in accordance with operating instructions, paragraphs 64 through 66.
	Defective tube	Replace tube V107, V108, V109, or V104.
		Refer to TM 11–257.
8. Frequency shift exciter 850 ~ TEST indicator does not function when audio beat is heard in headset.	8. Defective tube	8. Replace tube V110. Refer to TM 11–257.
9. Operating TEST key on frequency shift exciter from MARK to SPACE causes no change in transmitted frequency.	9. Defective tube	9. Replace tube V103. Refer to TM 11–257.

Symptom	Probable trouble	Correction
10. No filament power when radio transmitter FILAMENT POWER switch is set at on (up).	10. Defective fuse	10. Replace fuse FS1, FS2, or FS4.
	Faulty power cord connection	Check connections on power Cord CD–763.
		Refer to TM 11–826.
11. Transmitter PLATE POWER indicator lamp does not light when exciter TEST key is set at MARK or SPACE or when XMTR ON XMTR OFF switch on radioteletypewriter control is set at XMTR ON.	11. Transmitter overload relay open	11. Press transmitter OVERLOAD RESET switch.
	Defective lamp	Replace indicator lamp LM4.
	Defective fuse	Replace fuse FS5.
	Defective XMTR ON switch S5 in radioteletypewriter control.	Replace transmitter switch S5.
	Faulty control cable connection	Check connections at either end of Cord CX–961/TRA–7 (blue).
		Check connections at either end of Cord CX–961/TRA–7 (red).
		Check plug connections at either end of Special Purpose Cable Assembly CX–1152/U.
		Check connections at either end of Cord CD–764.
12. No current indication on radio transmitter EXCITATION METER when meter switch is set to INT. AMP. GRID position. (Transmitter PLATE POWER indicator lamp lighted).	12. Wrong tuning unit selected	12. Check to see that proper tuning unit is being used.
	Transmitter or controls not adjusted or set correctly.	Check BAND SWITCH for correct position.
		Check MO-XTAL switch on tuning unit (should be in XTAL position).
		Check adjustment of DOUB control in accordance with operating instructions (par. 65).
	Faulty connection on either end of Cord CG–389/U.	Check for faulty connection of either end of Cord CG–389/U.
		Transmitter end should be plugged into tuning unit being used.
	Defective tube	Replace tube V8, V9, or V12.
		Refer to TM 11–826.
13. No current indication on transmitter EXCITATION METER when meter switch is set to P. A. GRID position.	13. Tuning unit control nut adjusted correctly.	13. Check adjustment of INT. AMP. knob on tuning unit in accordance with operation instructions.
	Defective tube	Replace tube V9, V10, V11, V12, or V16.
		Refer to TM 11–826.
14. No indication of radio transmitter plate current on P. A. PLATE current meter (red light on).	14. Coil unit out or improperly installed in transmitter.	14. Check for proper installation of coil unit in transmitter.
	Defective tube in transmitter	Replace tube V16, V6, or V7.
		Refer to TM 11–826.
15. FILAMENT POWER switch on transmitter in on (up) position.	15. Transmitter fuse FS5 open	15. Replace fuse.
Speech Amplifier red lamp fails to light.	Lamp LM101 burned out	Replace lamp.
	Cord CD–764 defective	Repair or replace cord.
16. Transmitter cannot be voice modulated.	16. Cord CD–764 defective	16. Repair or replace cord.
	Tube V107 in exciter defective	Replace tube V107.
		Refer to TM 11–5054.
17. Transmitter can be modulated by one microphone but not by the other.	17. Microphone defective	17. Replace microphone.
	Microphone jack defective	Repair jack.
		Refer to TM 11–5054.

Symptom	Probable trouble	Correction
18. Transmitter cannot be keyed from KEY jack at speech amplifier.	18. Cord CD–764 defective	18. Repair or replace cord.
	Key jack defective	Repair jack.
		Refer to TM 11–5054.
19. Converter pilot lamps do not light.	19. Defective fuse	19. Replace fuse F301 or F302.
	Defective lamps I 301 or I 302	Replace indicator lamps.
	Defective switch S101, S102, S103, or S104.	Replace switch or switches.
	No a-c power to converter	Check Cord CX–954/TRA–7 and connections.
	Defective converter	Refer to TM 11–5062.
20. Receivers receive teletypewriter signal but converter meter B does not indicate with METER B in input position.	20. Defective RF Cable Assembly CG–562/U.	20. Check cords and connectors.
21. Dial lights on receiver light but no sound heard in speakers or headset.	21. Plugs not in proper jacks	21. Check Electrical Power Cable Assembly CX–1939/U and connections. Check to see that the cords are connected to the proper jack and terminals.
	Insufficient volume	See that RF GAIN controls on receivers are increased sufficiently.
	Defective receiver	Refer to TM 11–854.
22. Receiver seems operative but no signals can be heard.	22. Defective antenna Cord CG–67/MRQ–2.	22. Check cable and connectors.
	Defective antenna connection	Check antenna cord connections at mast base and receiver.
23. Receivers not disabled when operating one-way reversible.	23. Defective Electrical Special Purpose Cable Assembly CX–1150/U.	23. Check cords and connectors.
	Defective Electrical Special Purpose Cable Assembly CX–1851/U.	Check cords and connectors.
	Radioteletypewriter control XMTR ON XMTR OFF switch in XMTR OFF position.	Check to see that radioteletypewriter control transmitter switch is in XMTR ON position while transmitting.
		Refer to paragraph 150.
24. Teletypewriter motor does not run when MOTOR switch is set to ON position.	24. No a-c power to teletypewriter	24. Check a-c cord, plug, and outlet.
	Defective fuse	Replace fuse.
	Defective MOTOR switch	Replace switch.
	Defective teletypewriter	Refer to TM 11–352 or TM 11–2234.
25. Receiving typewriter runs open with converter OUTPUT switch on MARK.	25. Incorrect switch position on radioteletypewriter control.	25. Check that the SEND-REC-BREAK key (Teletypewriter TT–55/MGC only) of the right or left teletypewriter used as indicated by the TT TRANSPOSE switch in the radioteletypewriter control is in the REC position and EXTENSION NORMAL switch is in NORMAL Pposition.
	Teletypewriter red plugs (Teletypewriter TT–55/MGC only) not in proper jack.	Check that teletypewriter plugs are plugged into proper jacks on radioteletypewriter control.
		Refer to figure 127.
	Red plug or cord defective	Repair or replace defective cord or plugs.
	Defective teletypewriter	Refer to TM 11–352 or TM 11–2234.

Symptom	Probable trouble	Correction
26. Teletypewriter signal noted on meter B with METER B switch in NEUTRAL position but receiving teletypewriter does not receive copy.	26. Incorrect connections of teletypewriter red and black plugs. (Teletypewriter TT–55/MGC only.)	26. Check that plugs are correctly connected to radioteletypewriter control. Refer to figure 127.
	Incorrect switch position on radioteletypewriter control.	Check that the TT TRANSPOSE switch is in the proper position for the receiving teletypewriter in use.
27. Sending teletypewriter runs open.	27. SPACE MARK switch in SPACE position in radioteletypewriter control.	27. Place SPACE MARK switch in MARK position.
	Mark current power supply defective or relay 0 1 defective.	Refer to TM 11–5062.
	Teletypewriter plugs not in proper jacks.	Check that teletypewriter plugs are plugged into proper jacks on radioteletypewriter control.
	Cords or plugs defective	Repair or replace defective cords or plugs.
	Defective Special Purpose Cable Assembly CX–1151/U (blue).	Check cord and connectors.
	Defective red and black jacks on radioteletype writer control.	Replace or repair defective jacks. Refer to TM 11–352 or TM 11–2234. Refer to TM 11–5062.
28. Sending teletypewriter holds when BREAK key is depressed.	28. Sending teletypewriter cord with black plug not in proper jack.	28. Check to see that black plug is connected to proper jack on radioteletypewriter control. Refer to figure 127.
	Defective black cord or plug	Repair or replace defective cord or plug.
	Defective jack on radioteletypewriter control.	Repair or replace defective jack. Refer to TM 11–352 or TM 11–2234. Refer to TM 11–5062.
	Defective SEND-REC-BREAK switch on Teletypewriter TT–55/MGC only.	Repair or replace.
29. Typing reperforator motors do not run when switches are in ON position.	29. No a-c power	29. Check power cord, plug, and outlet.
	Defective fuse	Replace fuse.
	Defective motor switches	Replace switches.
30. Perforator runs with PERFORATOR OPERATION switch in PUNCH TAPE.	30. Cords not plugged in proper jacks	30. Check to see that the plugs are connected to proper jacks on radioteletypewriter control. Refer to figure 127.
	Defective cords or plugs	Repair or replace defective cord or plug.
	Defective jacks on radioteletypewriter control.	Repair or replace defective jacks.
	Defective d-c cord from connection box to Rectifier RA–87–(*).	Repair cord or plug.
	Defective Special Purpose Cable Assembly CX–1120/U or plug.	Repair or replace defective cord or plug.
	Special Purpose Cable Assembly CX–1120/U not properly connected.	Check that proper connections are made in connection box and radioteletypewriter control.
	Rectifier RA–87–(*) not on	Set switch to ON.
	Defective fuse in rectifier	Replace fuse.
	Defective rectifier a-c cord	Check and repair cord. Connect to a-c outlet.
	Defective rectifier switch	Repair or replace switch.
	Defective rectifier RA–87–A	Refer to TM 11–957.

Symptom	Probable trouble	Correction
31. Transmitter-distributor does not run when STOP SEND switch is in SEND position.	31. Stop rod stuck Defective switch Defective unit	31. Replace rod. Replace switch. Push clear button, located on lower right side near front of TD. (This button is labeled.) Refer to TM 11–2222.

146. Component Trouble Shooting

After the fault in Radio Set AN/GRC–26A has been localized, by means of system trouble shooting chart (par. 145), to one of the components, the particular item or component causing the fault must be localized further. The following paragraphs will aid the serviceman in locating the defective item in Radioteletypewriter Control C–808/GRC–26A. Detailed trouble shooting information for the other components of Radio Set AN/GRC–26A will be found in individual technical manuals (par. 1).

147. Radioteletypewriter Control C–808/GRC–26A, Trouble Shooting Chart

Condition and indication	Probable trouble	Correction
1. Set POWER switch to ON. White AC SUPPLY lamp fails to light.	Switch S7, jack J15, or transformer T1 (primary winding or windings between terminals 8 and 9) defective.	Check items and replace defective item or items.
2. Set XMTR ON-XMTR OFF switch to XMTR ON. Green TRANSMITTER lamp fails to light.	Switch S6 defective Lamp I1 defective	Check switch and repair or replace defective switch. Replace lamp.
3. Set SPACE-MARK switch to MARK. Meter indicates to left of center (with Cord CX961/TRA–7 (blue) connected to exciter).	Transformer T2, choke L3, capacitors C8A, C8B, resistors R11 or R9, switch S8 or S3; Relay O1.	Check circuit elements and replace defective item or items.
Note. Check resistor R108 in exciter for continuity first.		
4. Set SPACE-MARK switch to SPACE. Meter fails to indicate 60 to left of zero.	Transformer T1 (winding terminals 3 and 4) rectifier CR1, choke L1, capacitors C1 (A and B), C2, C3, C4, C5, resistors R3, R4, R2, R5, R6, R7, switches S8, S3, relay O1 (winding terminals 1 and 8) or meter M1 defective	Check circuit elements and replace defective item or items.
Note. Check resistors R108 in exciter for continuity first.		
5. Set XMTR ON-XMTR OFF switch to XMTR ON; FULL DX-ONE WAY to ONE WAY. Receivers are not disabled. (Receivers, tone oscillator, control unit connected.)	Switches S4, S5, or jack J10 defective Defective Power Supply PP–712(*)/GRC–26A or Radio Receiver R–388/URR.	Check switches and jack and repair or replace defective item or items. Refer to TM11–257 or TM11–854.

147. Radioteletypewriter Control C–808/GRC–26A, Trouble Shooting Chart—Continued

Condition and indication	Probable trouble	Correction
6. Set XMTR ON-XMTR OFF switch to XMTR OFF.		
Transmitter is not disabled. (Control unit, exciter, speech amplifier, and transmitter connected.)	Switch S5, resistor R1 or jacks J12, J13, J14, J9, defective.	Check switches, jack and resistors and repair or replace defective item or items.
	Defective Frequency Shift Exciter 0–39(*)/TRA–7, Speech Amplifier BC–614–(*), or Radio Transmitter BC–610–(*).	Refer to TM 11–257, TM 11–5054, or TM 11–826.

148. Radioteletypewriter Control, Voltage and Resistance Measurements

(fig. 105)

a. The voltage readings are taken with the cables connected between the control unit and the frequency shift converter, the frequency shift exciter, and the speech amplifier. The teletypewriter equipments are connected to the proper jacks on the control unit (fig. 127). Set the power switch to ON, the XMTR ON-XMTR OFF switch to XMTR ON, the FULL DX-ONE WAY switch to FULL DX, the SPACE-MARK switch to MARK and the EXTENSION-NORMAL switch to NORMAL. Refer to the over-all schematic diagram (fig. 120) and bottom chassis view of the unit (fig. 102) when taking voltage measurements.

b. The resistance readings are taken with all external cables disconnected. Refer to bottom view of chassis (fig. 102) before making resistance measurements.

149. Cord Resistances

The resistance of cords and cable assemblies used in Radio Set AN/GRC–26A is less than 1 ohm in all cases except Cord CG–389/U. This cord will indicate infinite resistance since it contains an integral capacitor (fig. 127).

150. Signal Substitution Notes

a. The defective component or defective stage often can be located by substituting a signal of the type that is normal to the input of the component or stage. Signal substitution requires a source of audio, i-f, r-f, and d-c teletypewriter signals. In addition, a headset (Headset HS–30–(*)) or a loudspeaker (Loudspeaker LS–3) and both a good transmitting teletypewriter signal source and a good printing are required.

b. A tube tester and Multimeter TS–352/U (included in Radio Set AN/GRC–26A) are needed to isolate the defective part after the faulty stage has been located by signal substitution.

c. Adjust the receiver volume, and listen for serious distortion from the loudspeaker or headset at the various points in the signal substitution procedure. When working back from the output to the input stages, decrease the output of the signal generator as much as possible. If possible, compare with the other Radio Receiver R–388/URR when it is known that the other receiver is in good condition.

d. Check the wiring and soldering in each stage during the procedure.

e. Do not remove the shield can of a tuned unit until the trouble has been traced definitely to that particular unit. Do not damage the wiring by pushing it back and forth during inspection. Be careful not to damage, in any way, the component that is being worked on.

f. Misalinement in one or more stages will cause reduced output. Misalinement of an oscillator may prevent any output.

g. When trouble is localized in a given stage, first test the tube, if such a test is indicated; then measure the voltage (current of teletypewriter series circuits) and, finally, measure the resistance at the tube socket of that stage.

h. Trouble in a circuit may not cause changes in voltage or resistance measurements at the tube socket. The instructions included in this paragraph are merely a guide and should suggest other procedures, such as voltage and resistance measurements on individual parts.

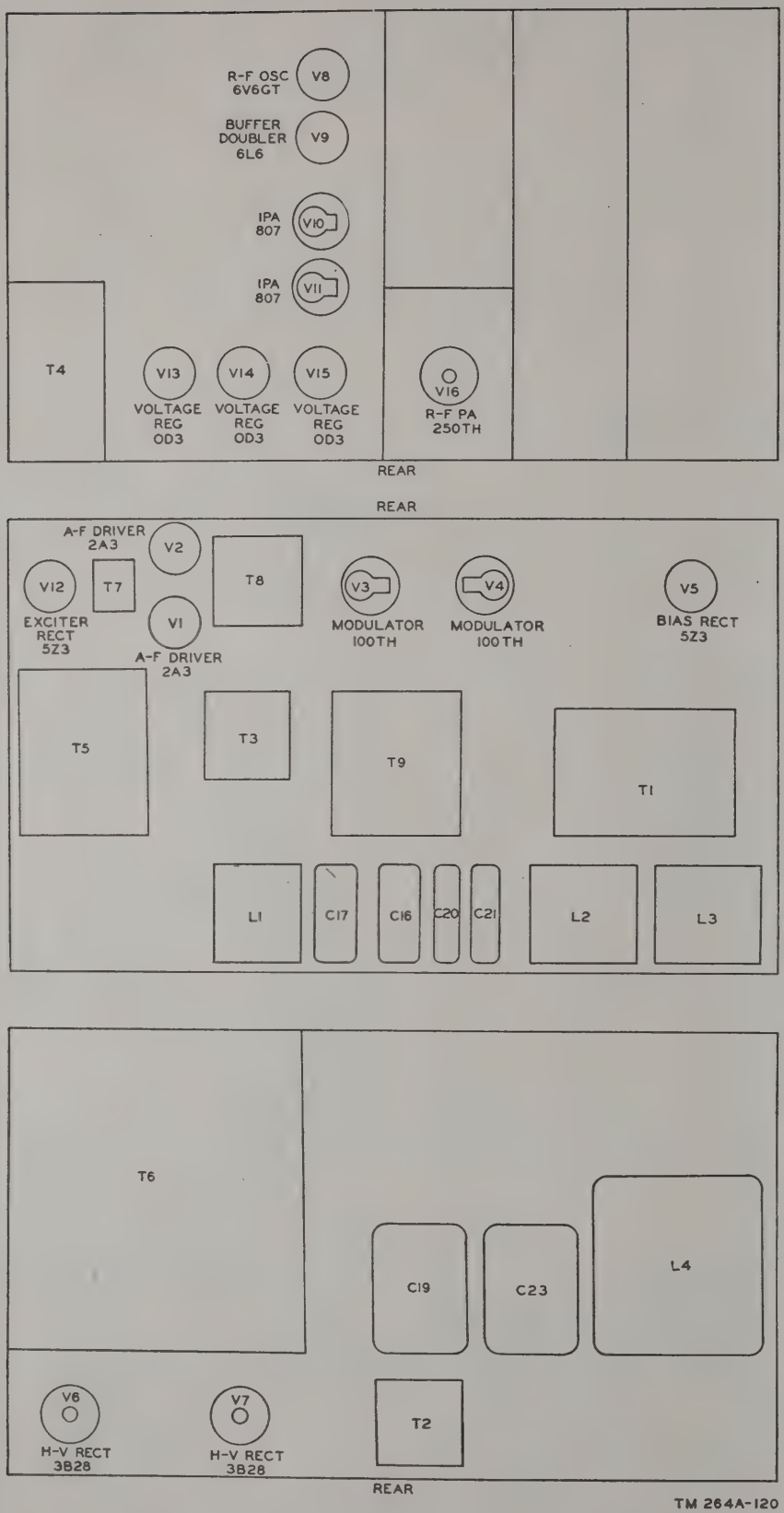


Figure 96. Radio Transmitter BC–610–(*), tube locations.

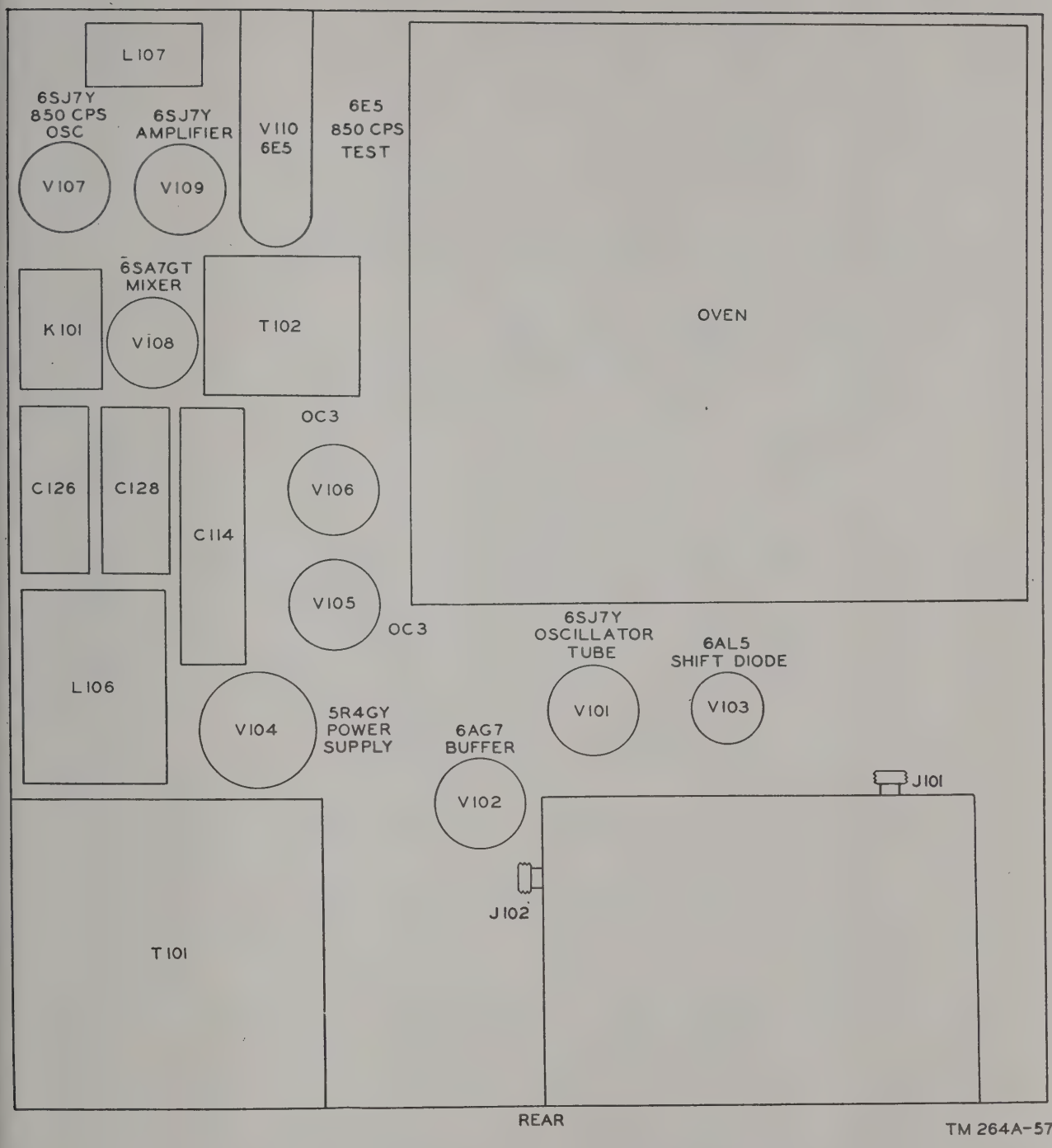


Figure 97. Frequency Shift Exciter O–39(*)/TRA–7, tube locations.

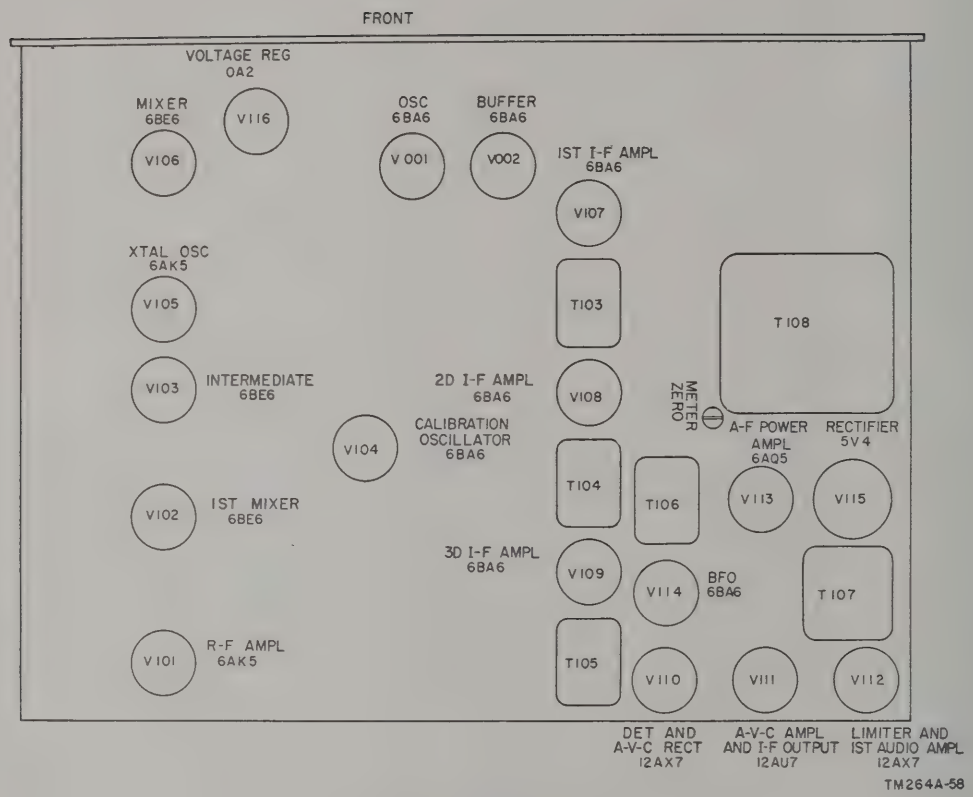


Figure 98. Radio Receiver R–388/URR, tube locations.

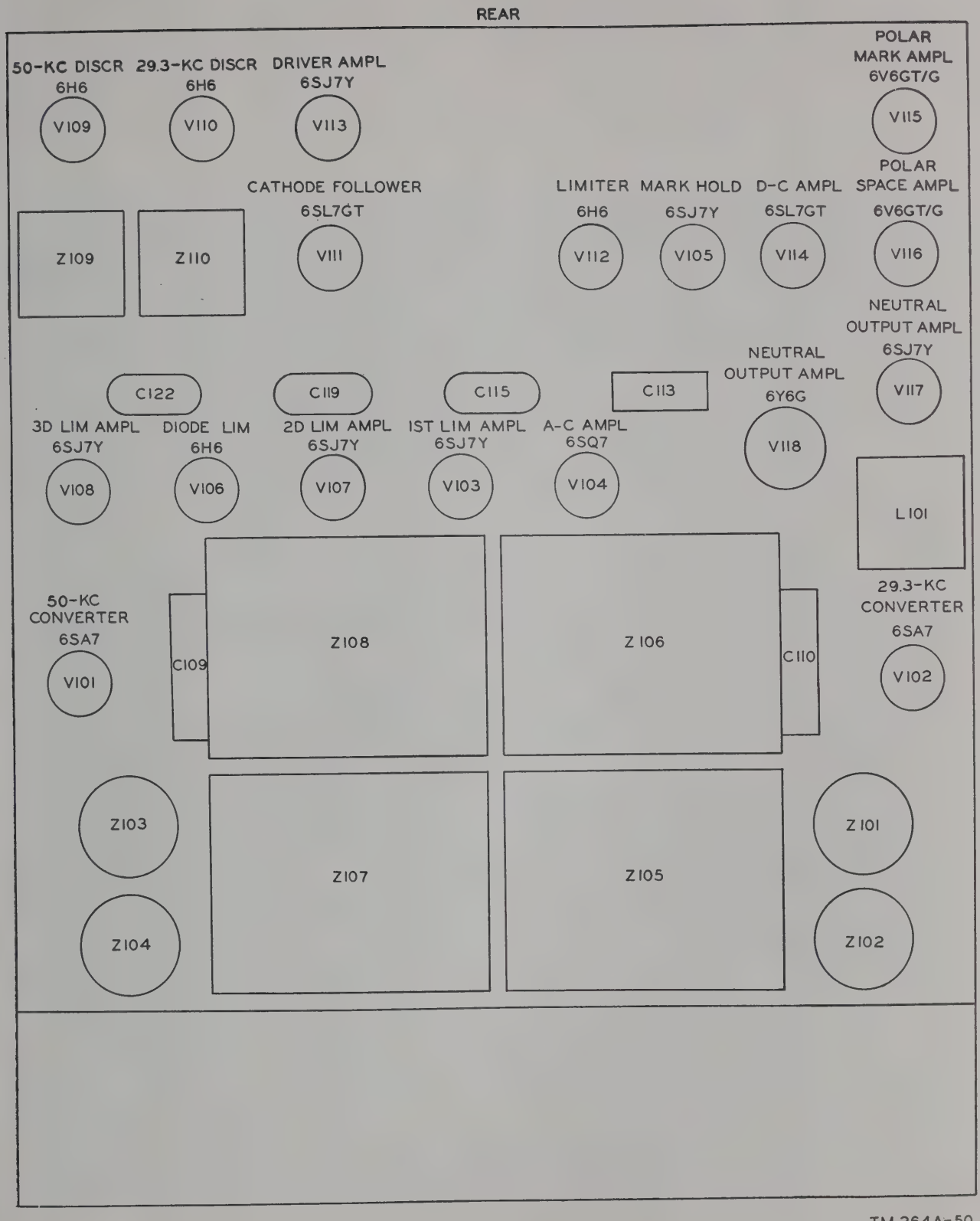


Figure 99. Frequency Shift Converter CV-182(*)/GRC-26A, tube locations.

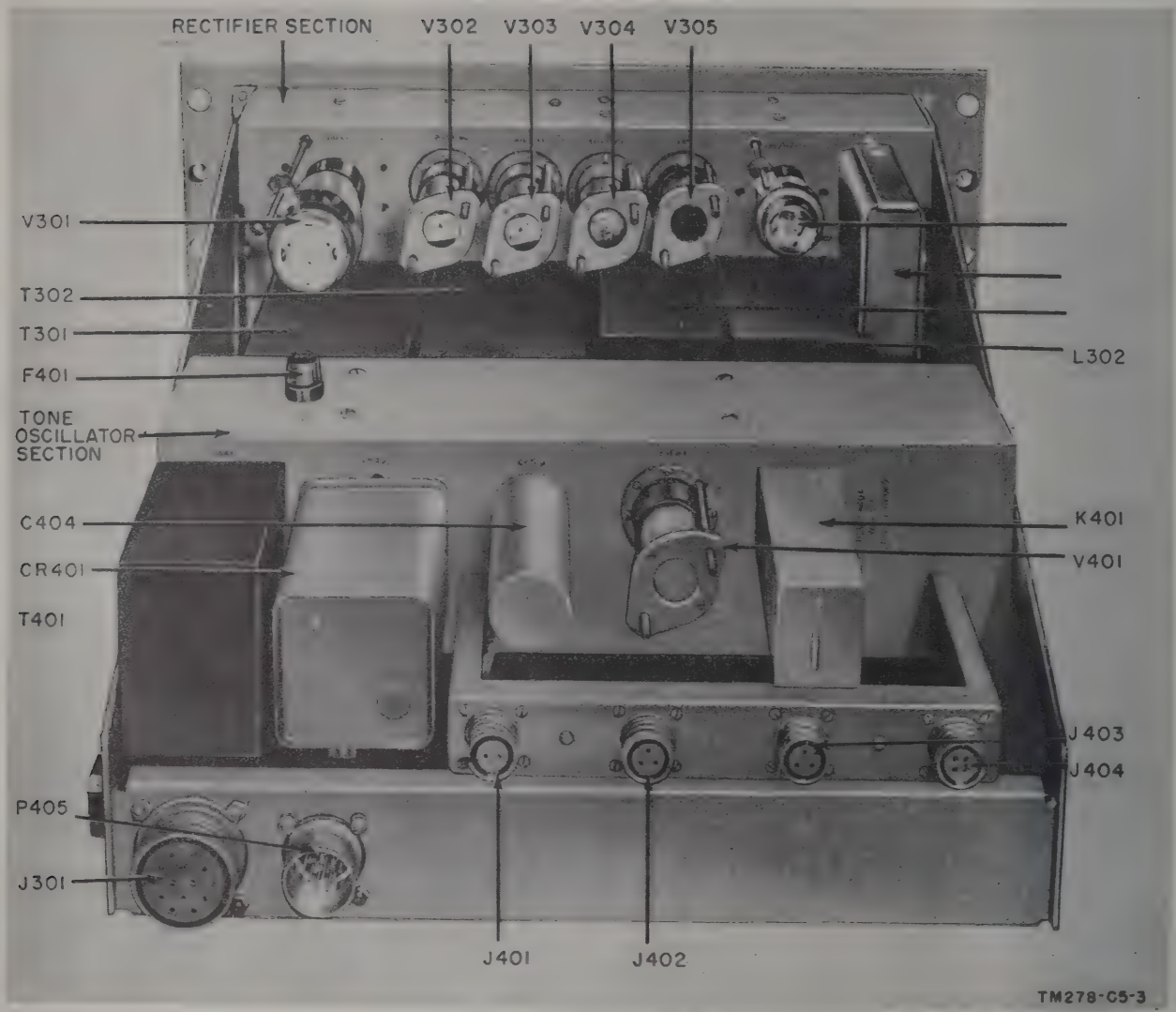


Figure 100. Power Supply PP–712(*)/GRC–26A, tube locations.

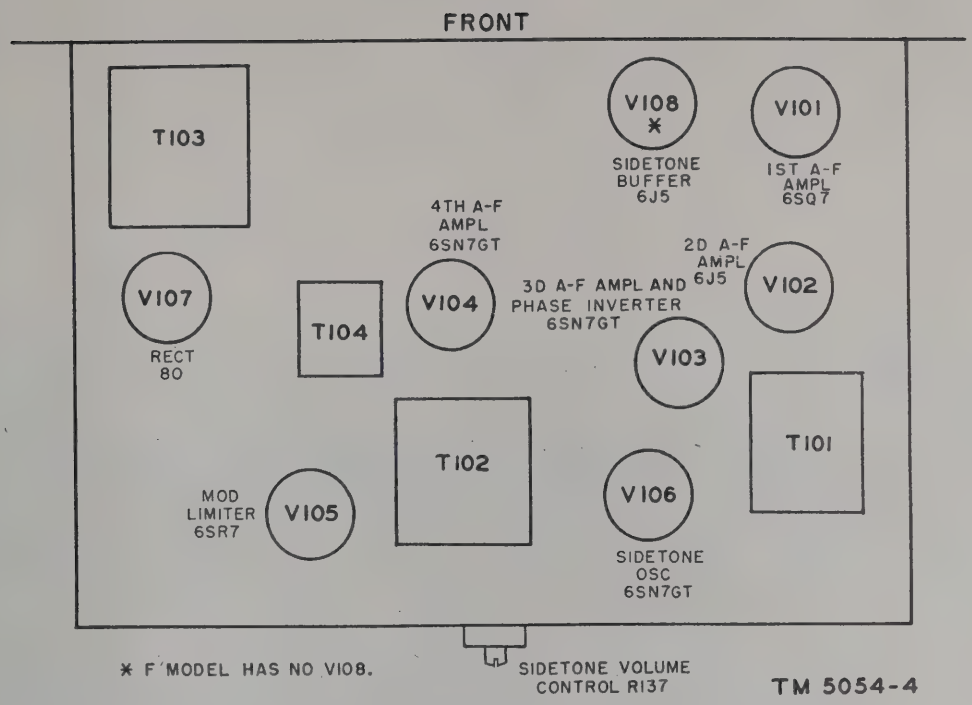


Figure 101. Speech Amplifier BC–614–(*), tube locations.

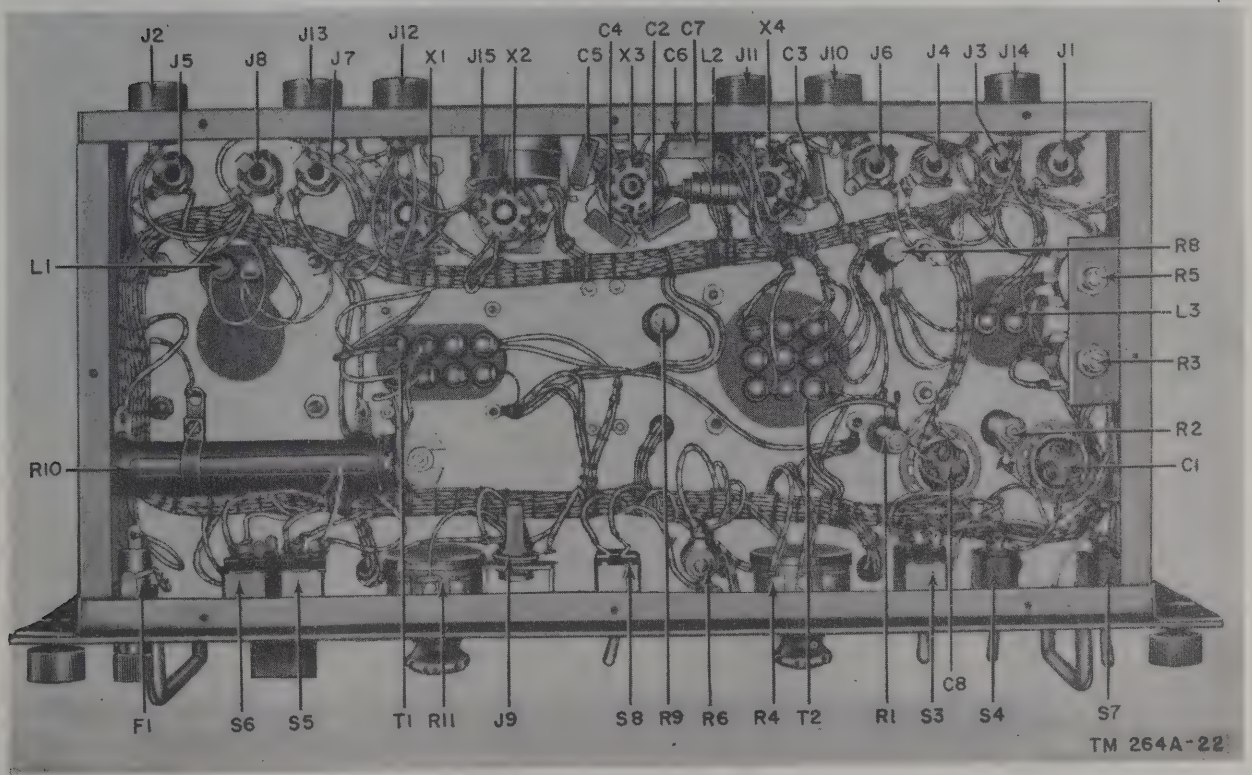


Figure 102. Radioteletypewriter Control C–808/GRC–26A, bottom view of chassis.

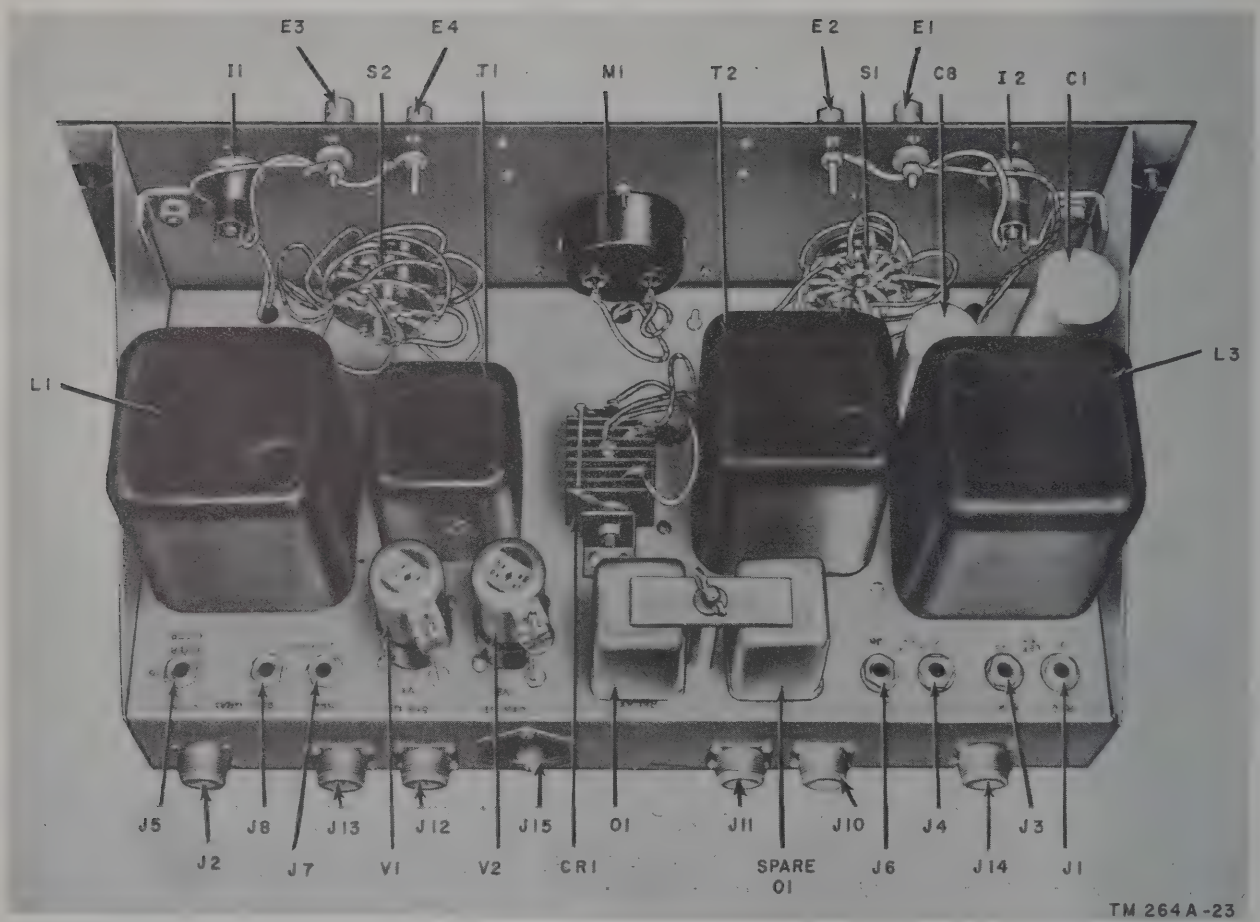


Figure 103. Radioteletypewriter Control C–808/GRC–26A (early models), top view of chassis.

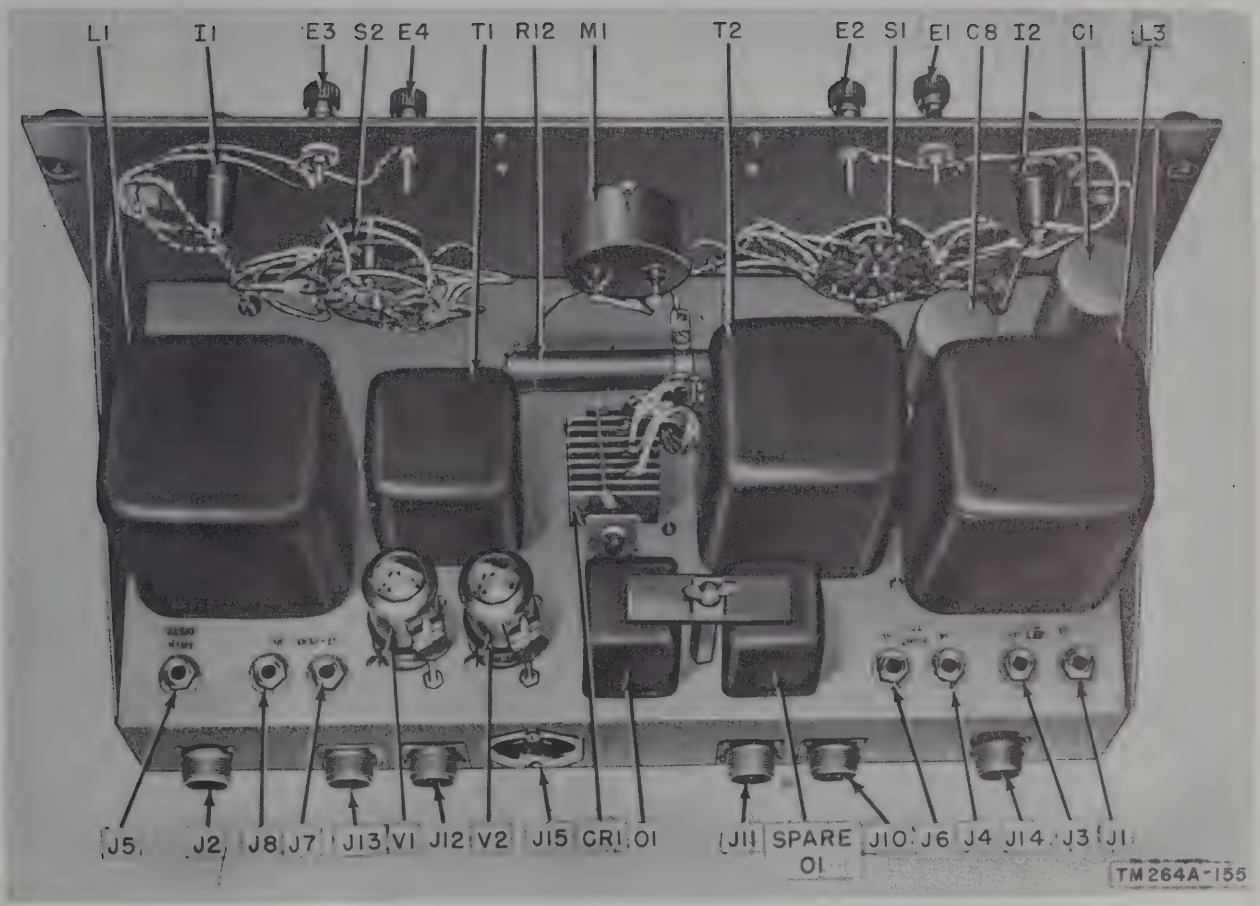


Figure 104. Radioteletypewriter Control C-808/GRC-26A (later models), top view of chassis.

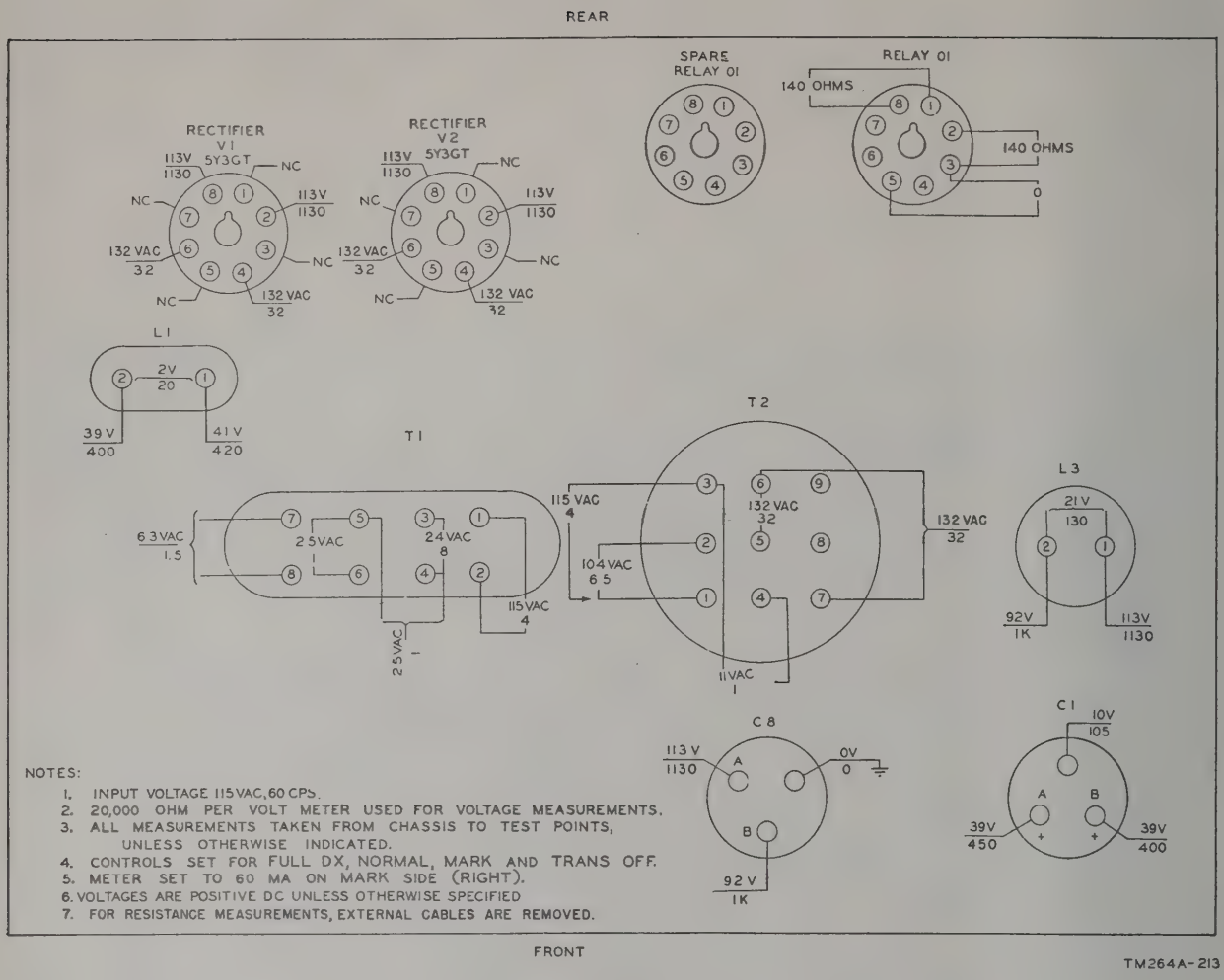


Figure 105. Radioteletypewriter Control C–808/GRC–26A, voltage and resistance measurements.

i. Remove only *one* tube at a time when testing. Check the number of the tube, test the tube, and if it is not defective, return it to its proper socket before another tube is removed. If no tube checker is available, replace tubes one at a time with tubes known to be good until the set operates.

Section II. REPAIRS

151. Replacement of Parts

a. When replacing defective parts, tag the leads so that the connections to the terminals of the replaced part will be made correctly. Do not use too much solder. If some of the solder runs off the connection, make sure that it is removed since a drop of solder may lodge between two adjacent terminals and cause a short circuit. Make sure that the terminals to be soldered are hot enough when the solder is applied. Cold solder connections make poor connections and may open. A high resistance connection also may result from a cold solder connection.

b. Most of the parts in Radioteletypewriter Control C–808/GRC–26A, which may need to be replaced, use standard mounting devices. No special knowledge is required to remove these parts. Relay 0 1 is a plug-in relay. To remove it, loosen the wingnut which holds the strap across the relay and swing the strap clear. Remove the relay from its socket and replace it with one that

is good. Replace the strap and tighten the wing-nut.

c. For replacement of parts of all other components, refer to the individual technical manuals (par. 1).

152. Refinishing

Instructions for the refinishing of badly marred panels, cabinets, and cases are available in TM 9–2851.

Section III. ALINEMENT AND ADJUSTMENT PROCEDURES

153. General

The alinement and adjustment procedures for Radioteletypewriter Control C–808/GRC–26A will be found in paragraph 154. The alinement and adjustment procedures for the other components of Radio Set AN/GRC–26A will be found in the individual technical manual (par. 1).

154. Adjusting Radioteletypewriter Control C–808/GRC–26A

a. Adjusting the control unit requires that a 360-ohm, 10-watt resistor be connected across terminals A and B of jack J12 and a milliammeter with a range of — 100 to 0 to +100 ma be connected in series between terminal B of jack J12 and one terminal of the resistor (fig. 106).

b. Connect the 115 volt a-c source to the control unit and set ON-OFF switch S7 to ON.

c. Set the MARK and SPACE controls to their midpositions.

d. Set the MARK-SPACE switch to MARK and adjust the slide on resistor R10, until the test milliammeter reads 20 ma to the right of zero. Adjust resistor R5 until Meter M1 in the control unit reads 60 to the right.

e. Set the MARK-SPACE switch to SPACE and adjust resistor R3, until the test meter reads 25 ma to the left of zero. Meter M1 should read 75 to the left.

f. Return the MARK-SPACE switch to MARK. The test meter should read 20 ma to the right. It may be necessary to repeat the procedures described in *c* and *d* above.

g. Resistor R12 (used in late models) is used to adjust the line current through the teletypewriter equipment to 60 ma when that current cannot be adjusted by using the teletypewriter line potentiometer.

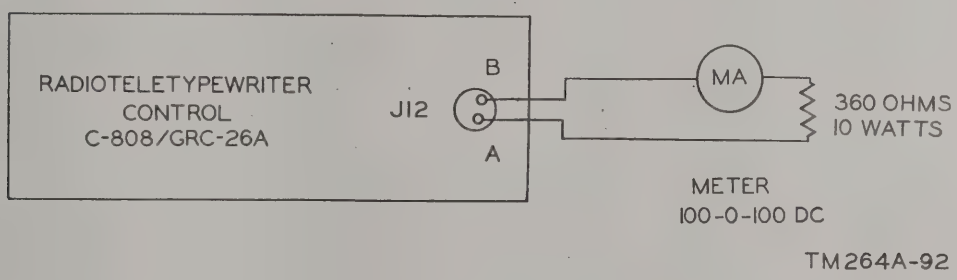


Figure 106. Radioteletypewriter Control C–808/GRC–26A, meter adjustment set up.

Section IV. FINAL TESTING

155. General

Each component of Radio Set AN/GRC–26A which has been repaired should be final tested in accordance with the final testing procedures given in the individual technical manuals (par. 1A Radioteletypewriter Control C–808/GRC–26). should be final tested as described in paragraph 156. Any component which passes the tests given is suitable for field use. Failure of the equipment to perform according to these tests indicates that more trouble shooting is necessary. The best final test for an assembled radio set is to operate it according to the equipment performance checklist (par. 107).

156. Radioteletypewriter Control C–808/GRC–26A, Final Tests

a. Test Equipment. Final testing of the control unit requires the use of Test Set TS–352/U, Test Set ME–6B/U, Distortion Test Set TS–383/GG,

the frequency shift exciter, and the frequency shift converter. To test the control unit for signal distortion and proper relay operation using Distortion Test Set TS–383/GG, refer to TM 11–2217.

b. Continuity Tests.

(1) The continuity tests are made with no external connections to the control unit. The volt-ohm-milliameter used is set to a range above 50,000 ohms.

(2) Connect the meter between D of jack J10 and ground.

(*a*) Set the FULL DX-ONE WAY switch to the FULL DX position. Set the transmitter switch to the XMTR ON position. The meter registers an open circuit.

(*b*) Set the FULL DX-ONE WAY switch to the ONE WAY position. Set the transmitter switch to the XMTR ON position. The meter indicates zero resistance.

(*c*) Set the FULL DX-ONE WAY switch to ONE WAY and the transmitter switch to XMTR OFF. The meter indicates an open circuit.

(3) Connect the meter between terminal C jack J10 and ground. The meter indicates zero resistance.

(4) Connect the meter between terminal B of jack J10 and ground. The meter indicates zero resistance.

(5) Connect the meter between terminal A of jack J11 to ground. The meter indicates zero resistance.

(6) Connect the meter between terminal E of jack J11 to ground. The meter indicates zero resistance.

(7) Connect the meter between terminal A of jack J12 to ground. The meter indicates zero resistance.

(8) Connect the meter between terminal D of jack J12 and terminal C of jack J12.

(*a*) Set the transmitter switch to XMTR ON. The meter indicates 1,000 ohms.

(*b*) Set the transmitter switch to XMTR OFF. The meter indicates zero resistance.

(9) Connect the meter between terminal C and terminal D of jack J13.

(*a*) The meter indicates zero resistance.

(*b*) Insert a dummy plug into the CW KEYING jack. The meter indicates an open circuit.

(10) Connect the meter between terminals C of jack J13. Remove the dummy plug from the CW KEYING jack. The meter indicates an open circuit.

(11) Connect the meter between terminal B of J13 and terminal C of J14. The meter indicates zero resistance.

(12) Connect the meter between terminal B of jack J11 and ground.

(*a*) Set the NORMAL-EXTENSION switch to NORMAL. The meter indicates zero resistance.

(*b*) Set the NORMAL-EXTENSION switch to EXTENSION. The meter indicates an open circuit.

(13) Connect the meter between terminal B of jack J11 and REC. EXT. terminal post E1. Set the NORMAL-EXTENSION switch to EXTENSION. The meter indicates zero resistance.

(14) Connect the meter between terminal B of jack J12 and SEND EXT. terminal post E3. Set the NORMAL-EXTENSION switch to EXTENSION. The meter indicates zero resistance.

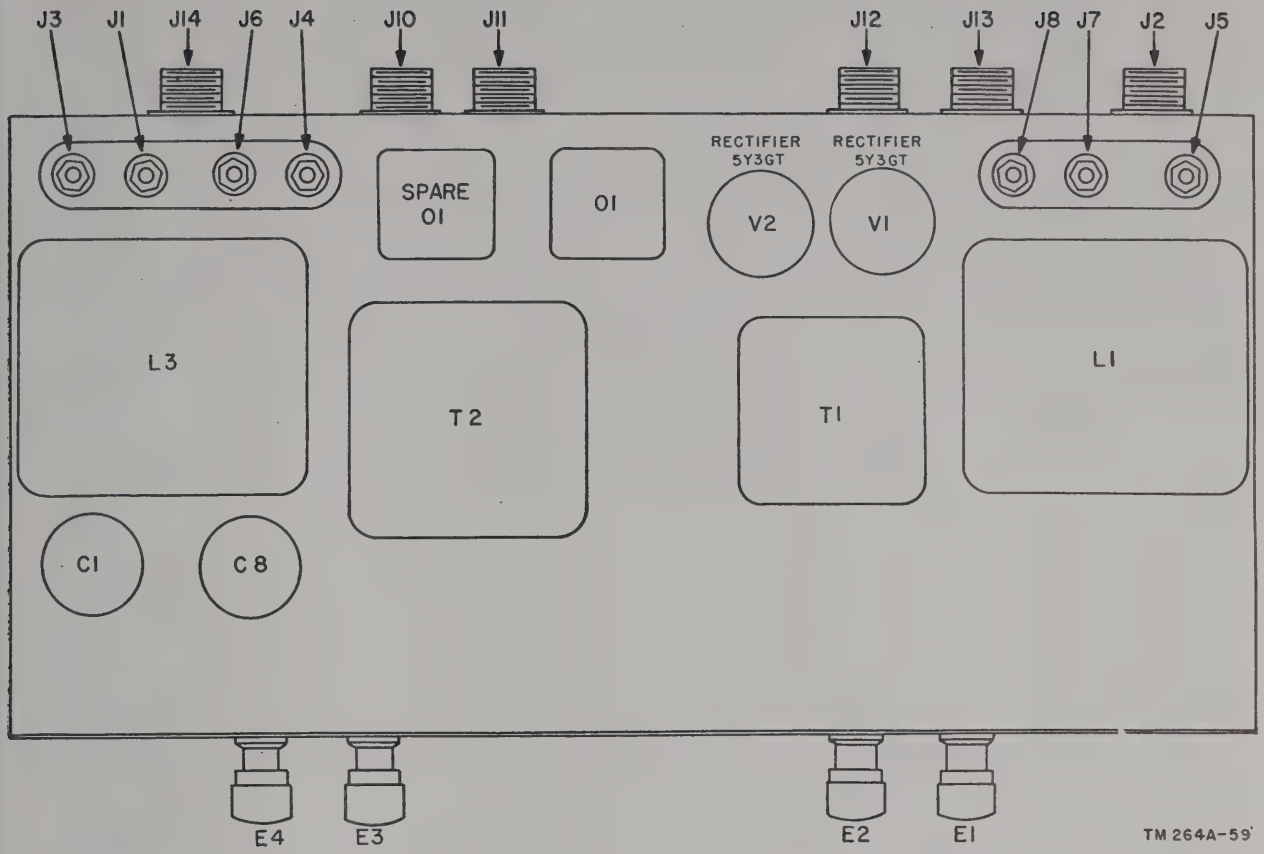


Figure 107. Radioteletypewriter control C–808/GRC–26A, tube location.

CHAPTER 7

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section 1. SHIPMENT AND LIMITED STORAGE

157. Disassembly

The following instructions are recommended as a guide for preparing the radio set for transportation and storage.

a. Disconnect any outside field lines. Disconnect power cord to Power Unit PE–95–G.

b. Roll up power cords and stow in shelter.

c. Take down doublet antennas, if used; disconnect coaxial cables. Repack antennas and replace cables on the reels provided.

d. Dismantle whip antennas and remove mast bases. Wrap the latter and place in a wall cabinet. Place mast sections in cabinet compartment.

e. Disconnect grounding braid, and stow braid and ground rod in shelter.

f. Remove coils and tuning unit from transmitter. Stow in compartment of wall cabinet.

g. Cover teletypewriters, perforator, and transmitter-distributor with canvas covers provided. Install S-hooks on carriage to prevent shifting.

h. See that all components are mounted securely and that snubbers are fastened tightly.

i. Remove fluorescent lamps from fixtures, wrap for protection, and stow within shelter. Be careful that none of the fluorescent powder from broken lamps enters cuts or breaks in the skin. It is a dangerous compound.

j. Stow all loose items such as headset, key, and technical manuals in compartments of wall cabinet.

k. Remove time stamp from bench, wrap thoroughly, and stow in bench compartment.

l. Pack empty spaces in cabinet to prevent shifting of contents. Close and lock cabinet doors.

m. Close all windows, roof-hatch, and feed through holes in shelter.

n. Stow coaxial cables and reels, antenna mast equipment, power cables, and Reel RL–31 in shelter to prevent their loss in the event the trailer becomes separated from the shelter. Secure all these components to prevent shifting during transportation.

158. Repacking for Shipment or Limited Storage

a. The exact procedure in repacking for shipment or limited storage depends on the material available and the conditions under which the equipment is to be shipped or stored.

b. In addition to steps given in paragraph 157, place protective wrappings around the heater, fire extinguisher, and other unprotected components.

c. Bags of silica gel should be placed inside the shelter and cabinets to act as a dehydrating agent.

d. Brace and shore-up interior of shelter if required material is available.

e. Close and lock shelter door. Close and secure blackout shields over the closed windows and skylight. Tape two lance poles together and fasten within the upper brackets of one side of the shelter. Fasten the remaining two poles on the other side of the shelter. Seal door, windows, roof hatch, and feedthrough holes with waterproof sealing tape and sealing compound.

f. For packing Power Unit PE–95–G, refer to TM 11–904.

Section II. DEMOLITION OF MATERIAL TO PREVENT ENEMY USE

159. General

The demolition procedures outlined in paragraph 160 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished *only* upon order of the commander.

160. Methods of Destruction

a. Smash. Smash the meters, plugs, tubes, tuning controls, capacitors, crystals, resistors, sockets, insulators, microphones, headsets, typing units, teletypewriter motors, bases, keyboards, covers, transmitter-distributor, typewriters, relays, transformers, connectors, and antenna gear, using sledges, axes, handaxes, pickaxes, hammers, crowbars, or heavy tools.

b. Cut. Cut cords, cables, guys, and halyards, using axes, handaxes, or machetes.

c. Burn. Burn circuit labels, technical manuals, papers, and records, using gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. Bend. Bend panels and cabinet chassis.

e. Explosives. If explosives are necessary, use firearms, grenades, or TNT.

f. Disposal. Bury the destroyed parts in slit trenches, fox holes, or throw them into streams.

g. Destroy Everything.

APPENDIX I

REFERENCES

Note. For availability of items listed, check SR 310–20–3, SR 310–20–4, and SR 310–20–5. Check Department of the Army Supply Catalog SIG 1 for Signal Corps Supply Catalogs.

1. Army Regulations

AR 380–5	Military Security (Safeguarding Military Information).
AR 750–5	Maintenance of Supplies and Equipment (Maintenance Responsibilities and Shop Operation).

2. Supply Bulletins

SB 11–6	Dry Battery Supply Data.
SB 11–47	Preparation and Submission of Requisitions for Signal Corps Supplies.
SB 11–76	Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment.

3. Auxiliary Equipment and Test Equipment

TM 11–257	Frequency Shift Exciters 0–39(*)/TRA–7.
TM 11–333	Telephones EE–8, EE–8–A, and EE–8–B.
TM 11–352	Printer TG–7–A and Teletypewriters TG–7–B and TG–37–B.
TM 11–472	Repair and Calibration of Electrical Measuring Instruments.
TM 11–826	Radio Transmitter BC–610–(*).
TM 11–854	Radio Receiver R–388/URR.
TM 11–904	Power Units PE–95–A, –B, –C, –F, –G, and –H.
TM 11–957	Rectifier RA–87.
TM 11–957A	Rectifier RA–87–A.
TM 11–2201	Reperforator Teletypewriter Sets TC–16 and TC–17.
TM 11–2208	Test Set TS–2/TG and TS–2A/TG (Teletypewriter Signal Distortion).
TM 11–2217	Distortion Test Set TS–383/GG and TS–383A/GG.
TM 11–2222	Transmitter Distributors Teletype Model 14.
TM 11–2223	Typing and Nontyping Reperforators, Teletype Model 14.
TM 11–2234	Teletypewriter TT–4/TG.
TM 11–2627	Tube Tester I–177 and I–177–A.
TM 11–5054	Speech Amplifier BC–614–(*).
TM 11–5062	Frequency Shift Converters CV–182/GRC–26A and CV–182A/GRC–26A and Power Supplies PP–712/GRC–26A and PP–712A/GRC–26A.
TM 11–5500	Multimeter TS–297/U.
TM 11–5527	Multimeter TS–352/U.

4. Painting, Preserving, and Lubrication

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 66	Winter Maintenance of Ground Signal Equipment.
TB SIG 69	Lubrication of Ground Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 212	Low Temperature Lubricants for Meteorological Equipment.
TM 9–2851	Painting Instructions for Field Use.

5. Camouflage, Decontamination, and Demolition

FM 5–20	Camouflage, Basic Principles.
FM 5–25	Explosives and Demolitions.
TM 3–220	Decontamination.

6. Other Publications

FM 24–18	Field Radio Techniques.
FM 72–20	Jungle Warfare.
SR 310–20–3	Index of Training Publications.
SR 310–20–4	Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
SR 700–45–5	Unsatisfactory Equipment Report (Reports Control Symbol CSGLD–247).
SR 745–45–5	Report of Damaged or Improper Shipment (Reports Control Symbols CSGLD–66
AFR 71–4	(Army), and AF–MC–U2 (Air Force))
TB SIG 4	Methods for Improving the Effectiveness of Jungle Radio Communication.
TB SIG 25	Preventive Maintenance of Power Cords.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.
TB SIG 178	Preventive Maintenance Guide for Radio Communication Equipment.
TB SIG 219	Operation of Signal Equipment at Low Temperatures.
TB SIG 223	Field Expedients for Wire and Radio.
TB 11–499–( )*	Basic Radio Propagation Predictions.
TM 9–2857	Storage Batteries Lead-Acid Type.
TM 11–314	Antennas and Antenna Systems.
TM 11–415	Dry Batteries.
TM 11–430	Batteries for Signal Communication. Except those pertaining to Aircraft.
TM 11–453	Shop Work.
TM 11–455	Radio Fundamentals.
TM 11–483	Suppression of Radio Noises.
TM 11–486	Electrical Communication Systems Engineering.
TM 11–499	(Preliminary), Radio Propagation Handbook.
TM 11–661	Electrical Fundamentals (Direct Current).
TM 11–666	Wave Propagation and Antennas.
TM 11–681	Electrical Fundamentals (Alternating Current).
TM 11–4000	Trouble Shooting and Repair of Radio Equipment.

*A new TB in this series is issued monthly which gives propagation predictions 3 months in advance.

APPENDIX II

IDENTIFICATION TABLE OF PARTS

Note. The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as a specific T/O & E, T/A, SIG 7 & 8, list of allowances of expendable material, or other authorized supply basis. The Department of the Army Supply Catalogs applicable to the equipment covered in this manual are SIG 7 & 8–AB–155/U and SIG 7 & 8–S–69/GRC. For an index of available supply catalogs, see SIG 1.

1. Identification Table of Parts for Radio Set AN/GRC–26A

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	RADIO SET AN/GRC–26A: gnd; am, cw, radio-teletypewriter freq shift; xmtr freq range 2 to 18 mc, rec .5 to 30.5 mc; 120 v ac 50/60 cyc, single ph, 5 kw max; installed and operated in Shelter S–69/GRC; provides facilities for transmission and reception of freq shift radioteletypewriter signals by means of full-duplex and one-way reversible operation.	Provides for transmission and reception of frequency-shift radioteletypewriter signals over the range of 2 to 18 mc.	2S2501–26A
	TECHNICAL MANUAL TM 11–264A.		Order through AGO
	ADAPTER M–359: male one end, female other end; single round male cont; 90 deg angle type.	Connects FR Cable Assembly CG–557A/U to BC–610–(*).	2Z299–359
	AMPLIFIER, AF: Speech Amplifier BC–614–H or I; power requirements, 115 v, 50 to 60 cyc, single ph, 40 w approx; 2 input channels; 500 ohms output impedance; incl in metal case, 16″ lg x 9½″ wd x 9⅜″ h o/a.	Raises microphone output voltage to drive modulator of Radio Transmitter BC–610–(*).	2C214I, 2C214–H
	ANTENNA TUNING UNIT: Antenna Tuning Unit BC–939–B; 2 to 18 mc; metal cabinet; screw type term. located on top of unit; 21¼″ lg x 9 3/32″ wd x 13 5/16″ h o/a; mtd by 4 holes on 10½″ x 17⅜″ mtg/c.	Provides for coupling transmitter output to whip- or long-wire antenna.	2C527–939B
	BASE, mast: Mast Base MP–47–A; steatite and steel; steel cad coated and cronak dipped.	Flexible mounting for transmitting whip antenna.	2A2088–47
	BASE, mast: Mast Base MP–65–C; for vehicular mtg of mast sections.	Flexible mounting for receiving whip antennas.	2A2088–65C
	BRACKET: Bracket MT–657/GRC; rectangular shape; 10″ lg x 10″ wd x 8½″ h o/a; mts by four 7/16″ dia mtg holes on 8⅜″ x 6¼″ mtg/c; one 6″ dia hole and six 7/16″ dia holes on 3⅞″ rad for mtg mast base.	Bracket for Mast Base MP–47–A	2A380–657
	BRACKET: Mast Base Bracket MP–50–A; inverted L shape, approx 65 deg between mtg surfaces; 8″ lg x 5¼″ wd x 5⅝″ d; mts by four 1 1/32″ holes on 3″ mtg/c.	Support bracket for Mast Base MP–65–C.	2A2090–50A
	BRACKET: T shape; CRS; ivory gloss enameled finish; 10⅜″ lg x 8⅛″ wd x 4⅛″ h o/a; mts by three .204″ dia holes ½″ from ea end.	Holds Telephone EE–8–(*)	4B5008B/B6
	BRACKET: U shape; steel, cad coated; 2⅛″ lg x ⅝″ wd x 9/16″ h o/a; mts by two 9/32″ dia holes spaced 1 7/16″ c to c.	Holds ground rod in place	

1. Identification Table of Parts for Radio Set AN/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	BRACKET: U shape; steel, cad coated; 3″ lg x 5/8″ wd x 1 3/8″ h o/a; mts by two 9/32″ dia holes spaced 2 3/8″ c to c.	Holds floor broom in place	
	BROOM, floor: flat; corn bristles; 55″ lg x 10″ wd x 2½″ thk; 16″ lg bristles set in twisted steel wire.	For sweeping shelter	6Z1301
	BRUSH, cleaning: oblong; hair bristles; 14½″ lg x 3¾″ wd x ¾″ thk o/a; 2½″ lg bristles staple set in hardwood.	Dusting operating benches	6Z1428
W1	CABLE ASSEMBLY, power: electrical; Cord CD–763; 2 cond, stranded, #12 AWG; 14 ft lg o/a; terminated ea end.	A-c power cable for transmitter	3E1763
	CABLE ASSEMBLY, power: electrical; Cord CX–954/TRA–7; c/o Cordage CO–145; 3 cond; stranded, #18 AWG; 500 v rms dielectric test; 6′ 5 9/32″ lg o/a; term. fittings ea end.	A-c power cable to converter jack J104.	3E6000–954–72
W107	CABLE ASSEMBLY, power: electrical; Cord CX–959/TRA–7; Cordage CO–145; 3 cond, stranded, #18 AWG, 3,000 v rms dielectric test; 6′ 4″ lg o/a; male connector 1 end, female connector other end.	Connects 115-volt a-c power to jack J107 on control unit.	3E6000–959–72
W106	CABLE ASSEMBLY, power: electrical; Cord CX–961/TRA–7; 4 cond, stranded, #22 AWG; 600 v rms max rated working voltage; 5′ 4 15/16″ lg o/a; male connector 1 end, female connector other end.	Connects J106 on frequency-shift exciter to red jack on control unit.	3E6000–961–48
W107	CABLE ASSEMBLY, power: electrical; Cord CX–961/TRA–7; 4 cond, stranded, #22 AWG; 600 v rms max rated working voltage; 5′ 4 15/16″ lg o/a; male connector 1 end, female connector other end.	Connects J107 on frequency-shift exciter to blue jack on control unit.	3E6000–961–48.1
W108	CABLE ASSEMBLY, power: electrical; Cord CX–962/TRA–7; c/o Cordage CO–145; 3 cond, stranded, #18 AWG; 3,000 v rms dielectric test; 4′ 3 7/8″ lg o/a; male conductor 1 end, female connector other end.	A-c input cable to J103 on frequency-shift exciter unit.	3E6000–962–48.
W2	CABLE ASSEMBLY, power: electrical; Power Cable Assembly CX–1165/U; 2 cond, stranded, #6 AWG; 3,500 v rms dielectric test; 12′ 11 23/32″ lg o/a; male connector 1 end, 2 solder lug term. other end.	Connects Power Cable Assembly CX–1166/U to shelter (power extension).	3E6000–1165.1
W3	CABLE ASSEMBLY, power: electrical; Power Cable Assembly CX–1166/U; 2 cond, stranded, #6 AWG; 3,500 v rms dielectric test; 50′ 8 29/32″ lg o/a; female connector 1 end, male connector other end.	Connects power unit to shelter or to Power Cable Assembly CX–1165/U.	3E6000–1166.1
W14	CABLE ASSEMBLY, RF: Cord CG–67/MRQ–2; c/o Radio Frequency Cable RG–11A/U; 5′ 6″ lg excluding term.	Transmission line from Mast Bases MP–65–C to receivers.	1F430–67.60.6
W101	CABLE ASSEMBLY, RF: Cord CG–389/U; c/o Radio Frequency Cable RG–63B/U, coax, 125 ohms nom impedance, 1,000 v rms max oper v; single cond, solid, #22 AWG, copperweld wire; polyethylene dielectric, .285″ OD; plasticized polyvinyl-chloride jacket .405″ OD; 6′ 4⅛″ lg o/a; terminated ea end.	Connects J112 on frequency-shift exciter to transmitter tuning unit crystal socket.	3E6015–389

1. Identification Table of Parts for Radio Set AN/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	CABLE ASSEMBLY, RF: Cord CG–390/U; c/o Radio Frequency Cable RG–58C/U; coax, 52 ohms nom impedance; 1,900 v rms max oper v; single cond, 7 strands, #29 AWG, copper wire; polyethylene dielectric, .116″ OD; .195″ dia plasticized polyvinyl-chloride jacket; assy 17′ 10 19/32″ lg o/a; terminated ea end.	Connects J105 on frequency-shift exciter to receiver.	3E5999A–2.9
W15	CABLE ASSEMBLY, RF: RF Cable Assembly CG–557A/U; c/o Radio Frequency Cable RG–11A/U; coax, 75 ohms characteristic impedance, 4,000 v rms max oper v; single cond, 7 strands, #26 AWG, copper wire; polyethylene dielectric, .285″ OD; .405″ dia synthetic resin jacket; assy 75′ 7½″ lg o/a; terminated ea end.	Transmission line from transmitter to doublet antenna.	3E6015–557.1
W16	CABLE ASSEMBLY, RF: RF Cable Assembly CG–557A/U; c/o Radio Frequency Cable RG–11A/U; coaxial, 75 ohms characteristic impedance, 4,000 v rms max oper v; single cond, 7 strands, #26 AWG, copper wire; polyethylene dielectric, .285″ OD; .405″ dia synthetic resin jacket; assy 500′ 8″ lg o/a; terminated ea end.	Doublet antenna lead-in to receivers.	3E6015–557.2
W17	CABLE ASSEMBLY, RF: RF Cable Assembly CG–558/U; coaxial, 75 ohms characteristic impedance; 4,000 v rms max oper v; single cond, 7 strands, #26 AWG, copper wire; polyethylene dielectric, .280″ OD; .340″ dia o/a; black vinyl jacket; assy 31 1/16″ lg o/a; terminated ea end.	Connects transmitter to Antenna Tuning Unit BC–939–B.	3E6015–588.1
W101, W102.	CABLE ASSEMBLY, RF: RF Cable Assembly CG–562A/U; c/o Radio Frequency Cable RG–58C/U; coax; 52 ohms nom impedance; 1,900 v rms max oper v; single cond, 7 strands, #29 AWG, copper wire; polyethylene dielectric, .116″ OD; .195″ dia plasticized polyvinyl-chloride jacket; assy 6′ 3½″ lg o/a; terminated.	W101: Connects receiver A to converter jack J101. W102: Connects receiver B to converter jack J102.	3E5999A–2.11
W5	CABLE ASSEMBLY, special purpose: Electrical Power Cable Assembly CX–1939/U; 2 cond, stranded, #18 AWG; 5′ 3¼″ lg o/a.	Audio cord, connects speaker outputs of receivers to Loudspeakers LS–3.	3E5999–3.14
	CABLE ASSEMBLY, special purpose: electrical; Cord CD–307; black; 2 cond, stranded, #20 AWG; 4′ 5 13/16″ lg o/a; terminated ea end.	Connects teletypewriters to J3 and J6, and connects perforator-transmitter to J8 of control unit.	3E1307–4
	CABLE ASSEMBLY, special purpose: electrical; Cord CD–307; gray; 2 cond, stranded, #20 AWG; 4′ 5 13/16″ lg o/a; terminated ea end.	Connects perforator-transmitter to J5 of control unit.	3E1307–4
	CABLE ASSEMBLY, special purpose: electrical; Cord CD–307; red, 2 cond, stranded, #20 AWG; 4′ 5 13/16″ lg o/a; terminated ea end.	Connect perforator-transmitter to J7 and J15, and connects teletypewriters to J1 and J4 of control unit.	3E1307–4
W7	CABLE ASSEMBLY, special purpose: electrical; Cord CD–764; 7 cond, stranded, #20 AWG; shielded cond; 15′ lg o/a; female plug 1 end, male plug other end.	Couples transmitter and speech amplifier (control cord for transmitter).	3E1764
	CABLE ASSEMBLY: Electrical Special Purpose Cable Assembly CX–1851/U; 3 cond, stranded, #22 AWG; 4′ 4¾″ lg o/a; terminated ea end.	Connects receiver disabling relay to oscillator in Power Supply PP–712(*)/GRC–26A.	3E5999–1.22

1. Identification Table of Parts for Radio Set AN/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	CABLE ASSEMBLY: Electrical Special Purpose Cable Assembly CX–1850/U; 8 cond, stranded, #20 AWG; 2 cond, stranded, #16 AWG; tinned copper braid shield around all cond; 3′ 5¾″ lg o/a; female connector 1 end, male connector other end.	Connects Power Supply PP–712 (*)/GRC–26A and converter.	3E5999–1.21
W8	CABLE ASSEMBLY, electrical: Special Purpose Cable Assembly CX–1120/U; c/o Cordage CO–144; 2 cond, stranded, #18 AWG; 4′ 11$^{13}/_{32}$″ lg o/a; terminated ea end.	Connects perforator-transmitter to control unit.	3E6000–1120.1
W9	CABLE ASSEMBLY, electrical: Special Purpose Cable Assembly CX–1150/U; 4 cond, stranded, #22 AWG; 15′ 10$^{2}/_{32}$″ lg o/a; female connector 1 end, male connector other end.	Connects converter to control unit	3E6000–1150.2
	CABLE ASSEMBLY, electrical: Special Purpose Cable Assembly CX–1200/U; two #18 AWG; stranded cond.	Teletypewriter control cable	3E6000–1200.1
	CABLE ASSEMBLY, electrical: Special Purpose Cable Assembly CX–1201/U; two #15 AWG; stranded cond.	Teletypewriter control cable	3E6000–1201.1
W10	CABLE ASSEMBLY, electrical: Special Purpose Cable Assembly CX–1151/U; 4 cond, stranded, #20 AWG; 13′ 10$^{15}/_{16}$″ lg o/a; male connector 1 end, female connector other end.	Connects converter to control unit	3E5999–3.13
W11	CABLE ASSEMBLY, electrical: Special Purpose Cable Assembly CX–1152/U; 2 cond, stranded, #18 AWG; 4′ 10$^{11}/_{32}$″ lg o/a; male connector 1 end, female connector other end.	Connection from speech amplifier to control unit.	3E6000–1152.1
W12	CABLE ASSEMBLY, special purpose: electrical; 1 cond, braided, #7 B&S; 10′ 2$^{15}/_{16}$″ lg x 1″ wd x .40″ thk; terminated ea end; c/o 832 strands, #36 B&S.	Grounding cable for shelter	3E3100–120
	CABLE, power: electrical; two #6 AWG copper cond.	Part of Power Cable Assemblies CX–1165/U and CX–1166/U.	1B3006–2.1
	CABLE, power: seven #20 AWG stranded cond	Part of Cord CD–764	1B3020–6.1
	CABLE, power: three #18 AWG stranded cond	Part of Cords CX–954/TRA–7 and CX–959/TRA–7.	1B3018–3.3
	CABLE, power: two #12 AWG stranded cond	Part of Cord CD–763	1B812.11.1
	CABLE, RF: Radio Frequency Cable RG–11A/U; coax; 75-ohm impedance.	Part of Cords CG–65/MRC–1 and CG–67/MRQ–2, and RF Cable Assemblies CG–557/AU and CG–558/U.	1F425–11A
	CABLE, RF: Radio Frequency Cable RG–58/U; coax; 52-ohm impedance.	Part of Cord CG–390/U and RF Cable Assembly CG–562/U.	1F425–58C
	CABLE, RF: Radio Frequency Cable RG–63B/U; coax; 125 ohm nom impedance.	Part of Cord CG–389/U	1F425–63B.
	CABLE, special purpose: Cordage CO–122–A; three #22 AWG stranded cond.	Part of Electrical Power Cable Assembly CX–1939/U.	3E2122A.
	CABLE, special purpose: Cordage CO–146; four #20 AWG stranded cond.	Part of Cord CX–961/TRA–7	3E2146
	CAPACITOR, fixed: mica dielectric; 470 $\mu\mu$f ±20%; 500 vdcw; JAN type CM20C471M.	Part of Cord CG–389/U	3K2047142
	CASE: Case CY–689/GRC–26; plywood, olive drab finish; 19$^{15}/_{16}$″ lg x 15$^{7}/_{16}$″ wd x 22$^{9}/_{16}$″ h o/a; 2 slots f/hand grip, 3¾″ lg x 1″ wd, located 1 ea side.	Bin for teletypewriter tape	6F300–689

1. Identification Table of Parts for Radio Set AN/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	CHAIR: tubular steel; leatherette covered, plywood seat and back; 33¾″ h x 14¾″ wd x 18″ d o/a; McElroy type OPC; Hallicrafters part/dwg #33–394.	Chair for radio operator	6M216–1
	CHAIR: wood, lacquer finish; 19½″ lg x 17⅛″ wd x 31″ h o/a; folding; Amer Seating #674; Hallicrafters part/dwg #33–393.	General purpose use	6M217
	CLAMP, electrical: aluminum; 1⅛″ lg x ⅞″ dia o/a; mts on plug by means of threaded cap on one end; designed to hold material ½″ dia; MIL spec No. MIL–C–5015 Amend #1; Amphenol type No. AN–3057–6; Hallicrafters part/dwg #76A664.	Part of Cords CX–961/TRA–7 (blue and red), Special Purpose Cable Assemblies CX–1120/U, CX–1150/U, CX–1151/U, CX–1152/U, and Electrical Special Purpose Cable Assembly CX–1851/U.	2Z1587–284
	CLAMP, electrical: aluminum; 1⅛″ lg x 1.0″ dia o/a; designed to hold material ⅝″ dia; MIL spec No. MIL–C–5015 Amend #1; Amphenol type No. AN–3057–8; Hallicrafters part/dwg #76B665.	Part of Cord CX–954/TRA–7, mounts on plug by means of threaded cap on end.	2Z2642.355
	CLAMP, electrical: aluminum; 1$\frac{3}{16}$″ lg x 1⅜″ dia o/a; designed to hold material ⅞″ dia; MIL spec No. MIL–C–5015; Amphenol type No. AN–3057–12; Hallicrafters part/dwg #76A771.	Part of Electrical Special Purpose Cable Assembly CX–1850/U; mounts on AN connector by 1$\frac{3}{16}$-inch threaded cap.	2Z2636–3
	CLIP, electrical: beryllium copper; dull nickel coat finish; $\frac{13}{16}$″ lg x ⅝″ wd x $\frac{19}{32}$″ h; ⅝″ jaw opening when fully spread; mts by one .203″ dia mtg hole in bottom of clip; Littelfuse #128003; Hallicrafters part/dwg #76B782.	Holds transmitter bolt wrench	2Z2712.304
	CLIP, electrical: beryllium copper; dull nickel coat finish; $\frac{13}{16}$″ lg x ⅝″ wd x $\frac{19}{32}$″ h; ⅝″ jaw opening when fully spread; mts by one .203″ dia mtg hole in bottom of clip; Littelfuse #128009; Hallicrafters part/dwg #76B783.	Holds transmitter bolt wrench	2Z2712.305
	CLIPBOARD: masonite, walnut brown finish; 12½″ lg x 9″ wd x ⅛″ thk; spring clip approx 5⅞″ lg; fastened to top of board and provided with hanger hole; Horders #F7–204.	Holds messages and documents	6M226
	CLOCK: mechanical; wall style; 2¼″ dia dial; 8-day movement; 2⅜″ h x 2⅜″ wd x 1½″ d o/a; two #6–32 mtg nuts spaced 2⅝″ dia c to c, 180 deg apart; black dial, luminous hands and numbers, sweep second hand; Longines-Wittnaeur #A–11.	Time indicator	6Z1958
	CLOTH, textile: cheese cloth; 3 yds lg 36″ wd o/a dimen; bleached, lintless.	Cleaning and maintenance of equipment.	8A805
	COMPASS, magnetic: moving needle type; 1 deg scale divisions from 0 to 360 deg with zero point at north position; black wrinkle-finished aluminum case; 3¾″ lg x 3⅜″ wd x ¾″ thk o/a; portable type; moisture resistant; cord 48″ lg attached to 1 end; Keuffel and Esser Co #5600–½.	Directional indicator to assist in orientation of antenna.	6Z2203
	CONNECTOR, adapter: Adapter UG–175/U; straight type.	Reduces cable opening of plug-type connectors.	2Z308–175
	CONNECTOR, plug: 4 round female pol cont; 90 deg angle type.	Part of Cords CX–961/TRA–7 (red and blue) and Special Purpose Cable Assembly CX–1150/U.	2Z7226–Q190

1. Identification Table of Parts for Radio Set AN/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	CONNECTOR, plug: Plug PL–259; single round male cont; straight type; 2 piece construction; Amphenol 83–1 SPD.	Part of Cords CG–65/MRC–1 and CG–67/MRQ–2 and RF Cable Assemblies CG–557A/U and CG–558/U.	2Z7226–259
	CONNECTOR, plug: Plug PL–259–A; single nonpol male cont; straight type; multiple piece construction; Amphenol 83–1SPN.	Part of RF Cable Assembly CG–562/U.	2Z7226–259A
	CONNECTOR, plug: Radio Frequency Plug UG–85/U; 1 round male cont; coas; straight type; Amphenol #82–21.	Part of Cord CG–390/U and RF Cable Assembly CG–562/U.	2Z7390–85
	CONNECTOR, plug: 1 round male banana type; straight cont; Hallicrafters part/dwg #35A018.	Part of Cord CG–389/U	2Z7227–4
	CONNECTOR, plug: 2 curved locking male cont; straight type; Hubbell #7238.	Part of Cord CD–763	6Z1734.1
	CONNECTOR, plug: 2 female curved cont; straight type; Hubbell #7224.	Part of Cord CD–763	6Z3150
	CONNECTOR, plug: 2 round female cont; pol straight type; Crouse-Hinds #BRM–70732.	Part of Power Cable Assembly CX–1166/U.	6Z7564–6
	CONNECTOR, plug: 2 round male cont; straight type; Crouse-Hinds #BP–8732.	Part of Power Cable Assemblies CX–1165/U and CX–1166/U.	6Z7564–5
	CONNECTOR, plug: 3 curved pol male cont; straight type; Hubbell #7572.	Part of Cords CX–954/TRA–7, CX–959/TRA–7 and CX–962/TRA–7.	6Z7591–12
	CONNECTOR, plug: 3 female curved pol cont; straight type; Hubbell #7555G.	Part of Cords CX–959/TRA–7 and CX–962/TRA–7.	2Z3064–88
	CONNECTOR, plug: 3 female round cont; 90 deg angle type; $2\frac{3}{32}$″ lg excluding protruding cont x 1⅛″ wd x $1\frac{23}{32}$″; 20 amp, 150 v ac, 200 v dc; molded bakelite insert; ½″ dia max cable opening; AN Connector type No. AN–3108B–14S–7S.	Part of Special Purpose Cable Assemblies CX–1120/U and CX–1152/U.	2Z3064–66
	CONNECTOR, plug: 3 male round cont; pol 90 deg angle type; 1¾″ lg excluding protruding cont x $1\frac{7}{16}$″ wd x 1¾″ h; mica filled phenolic insert; $\frac{9}{32}$″ dia max cable opening; AN Connector type No. AN–3108B–14S–1P; MIL spec No. MIL–C–5015.	Part of Electrical Special Purpose Cable Assembly CX–1851/U.	2Z7113.14
	CONNECTOR, plug: 3 round female pol cont; 90 deg angle type; AN Connector AN–3108–16S–6S.	Part of Cord CX–954/TRA–7	2Z3064–86
	CONNECTOR, plug: 3 round male pol cont; 90 deg angle type.	Part of Electrical Power Cable Assembly CX–1939/U.	2Z7113.14
	CONNECTOR, plug: 4 round male pol cont; 90 deg angle type; AN Connector AN–3108B–14S–2P.	Part of Cords CX–961/TRA–7 (red and blue) and Special Purpose Cable Assembly CX–1150/U.	2Z3024–64
	CONNECTOR, plug: 8 round female cont; straight type; pol; Amphenol 79–08F1.	Part of Cord CD–764	2Z8678.87
	CONNECTOR, plug: 8 round male cont; straight type; Amphenol 79–08M.	Part of Cord CD–764 and Special Purpose Cable Assembly CX–1152/U.	2Z7118.6
	CONNECTOR, plug: 5 female round cont; pol 90 deg angle type; 1¾″ lg excluding protruding cont, x $1\frac{7}{16}$″ wd x 1¾″ h; mica-filled phenolic insert; $\frac{5}{16}$″ dia max cable opening; type #AN–3108B–14S–5S; spec MIL–C–5015.	Part of Special Purpose Cable Assembly CX–1151/U.	2Z8675.53

1. Identification Table of Parts for Radio Set AN/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	CONNECTOR, plug: 5 male round cont; pol 90 deg angle type; 1¾″ lg excluding protruding cont x 1 7/16″ wd x 1¾″ h; mica-filled phenolic insert; 5/16″ dia max cable opening; type #AN–3108B–14S–5P; spec MIL–C–5015.	Part of Special Purpose Cable Assembly CX–1151/U.	2Z3025–12
	CONNECTOR, plug: 14 female round cont; pol 90 deg angle type; 2 3/32″ lg excluding protruding cont x 1 15/32″ wd x 2 7/32″ h; 20 amp 150 v ac, 200 v dc; molded bakelite insert; ⅞″ dia max cable opening; type #AN–3108B–20–27S.	Part of Electrical Special Purpose Cable Assembly CX–1850/U.	2Z3075–32
	CONNECTOR, plug: 14 male round cont; pol 90 deg angle type; 2 31/32″ lg excluding protruding cont x 1 15/32″ wd x 2 7/32″ h; 20 amp 150 v ac, 200 v dc; molded bakelite insert; ⅞″ dia max cable opening; type #AN–3108B–20–27P.	Part of Electrical Special Purpose Cable Assembly CX–1850/U.	2Z3034–38
	CONNECTOR, solderless: contact pressure type; copper alloy; 23/32″ lg x 7/16″ wd x 19/64″ thk o/a; c/o 5/16–28 thd x 7/16″ lg thd portion having 3/32″ wd x ½″ lg slot diametrically down its lg; w/hex. nut to match and captive tongue for securing cond; Burndy #KS–90; Hallicrafters part/dwg #11A217.	For connecting antenna conductors	6Z3191–5
	CONTAINER: galv steel; 5 gal; rectangular shaped; 13⅜″ lg x 6½″ wd x 17¾″ h o/a; thd top cap; fixed handles; Hallicrafters part/dwg #114A709.	For holding gasoline	6Z3654
	CONTROL, transmitter-teletypewriter: Radio-teletypewriter Control C–808/GRC–26A; power requirements, 115 v, 50 to 60 cyc. single ph; steel case, crackle finish; 19 3/16″ lg x 10¼″ d x 10 13/16″ h o/a; table mtd (on shocks).	Controls output of dual diversity receivers to operate teletypewriters and output of teletypewriters and perforator to operate frequency-shift exciter; provides suitable teletypewriter monitoring; supplies mark-hold currents for extension line.	20684–808
	CONVERTER, frequency shift: Frequency Shift Converter CV–182(*)/GRC–26A; 420 to 525 kc, 1 band, 2 channels, 50 kc and 29.3 kc; power requirements, 115 v, 50 to 60 cyc, single ph; 53.5 ohms input; steel cabinet; black crackle finish on cabinet; 20″ lg x 19″ wd x 10½″ h o/a; rack-mounted; provides facilities for establishing full-duplex, half-duplex, one-way reversible, or emergency operation.	Demodulates and combines signals from two radio receivers to provide dual diversity operation from modified standard radio receivers and converts the resulting signal to d-c pulses for operation of teletypewriters.	2C422–182 2C422–182A
W6	CORD: Cord CD–605; 6′ 10″ lg o/a	Cord for Headset HS–30–(*)	3E1605–6.5
	COUPLER, antenna: 2 eyebolt round cont; 5⅝″ lg excluding protruding cont x 3⅞″ wd x 1¼″ h; odd triangular shape, cast aluminum, olive drab enamel finish, split shell; 5/16″ dia max cable opening; eyebolts ins from shell; B&W # CC–51.	Part of RF Cable Assembly CG–557/U.	2A746–5
	COVER: Cover BG–199; olive drab #7 finish; 21¾″ lg x 17⅝″ wd x 13⅛″ h o/a.	Cover for perforator of Perforator-Transmitter TT–56/MGC.	4TFPR/1
	COVER: Cover BG–200; olive drab #7 finish; 17½″ lg x 9″ wd x 10¼″ h o/a.	Cover for transmitter-distributor	4TXD/1
	COVER: for feedthrough hole in shelter	Protective and waterproofing cable entrance cover.	2Z3351–271

1. Identification Table of Parts for Radio Set AN/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	EXCITER, RF: Frequency Shift Exciter 0–39(*)/TRA–7; 2- to 6-mc range, 1 band; power requirements, 115 v, 50 to 60 cyc, single ph, 185 w; integral power supply; integral coils; 21½'' lg x 16⅛'' wd x 13'' h o/a; mtd by four ¼''–28 thd hex. head bolts 2'' lg and spaced on 14⅜'' x 12$^{3}/_{16}$'' mtg/c.	Supplies FS r-f excitation for radio transmitter.	2C2710–39B 2C2710–39C
	EXTINGUISHER, fire: carbon dioxide charge; trigger operation; 4-lb capacity; 18½'' h x 4½'' OD, excluding handle and horn; 15' range; steel cylinder, red enameled finish; Randolph Lab #FF–4; Hallicrafters part/dwg #33A025.	Extinguishes accidental fires.	
	FITTING, conduit: conduit bushing; ½'' size; thd connection.	Prevents wire from abraiding on conduit ends.	6Z3858–22
	GUY: waterproofed; 10' and 1' lg ropes, 11' 3'' lg o/a; $^{5}/_{32}$'' to $^{11}/_{64}$'' dia; 180 lb min breaking strength.	Hold-down guy for receiving whip antenna.	2A1344–87
	GUY: waterproofed: 10' and 1' lg ropes, 11' 3'' lg o/a; $^{5}/_{32}$'' to $^{11}/_{64}$'' dia; 180 lb min breaking strength.	Hold-down guy for transmitting whip antenna.	2A1344–88
	HAMMER, hand: sledge, cross peen; 6-lb head, 6½'' lg and 2'' face dia; forged tool steel, black rust preventive finish, polished face; 32'' lg handle, hickory, straight grained; 2 hardwood wedges; Hallicrafters part/dwg #33A388.	Drives stakes into ground	6Q50201–6H
	HARDWARE KIT	Kit of hardware for replacement purposes.	6L80023
	HEADSET: Headset HS–30–U; magnetic type; 250-ohm impedance.	Changes a-f currents into sound waves for monitoring signals and setting up equipment for operation.	2B830U
	HEATER, air: 12½'' lg x 12½'' wd x 10¾'' h o/a; 110 v ac, 60 cyc, single ph, 1.5 kw; axial fin-ringed heating coil w/blower; max capacity 5,120 Btu; mts by four #5 cowl fastener studs on 7'' x 11'' ctr; selector switch allows blower to be operated independently of heat; adj thermostat and circuit breaker; Elec Air Htr Model No. AAT–15; Hallicrafters part/dwg #21C035.	Electric air heater for shelter	2Z5020
	HOOK: cast iron, black enamel finish; 3'' lg x 1¼'' wd x 2¼'' h o/a; mts by 2 holes spaced ⅞'' c to c; Hallicrafters part/dwg #33A434.	Holds clip board	
	INSULATION TAPE, electrical: Tape TL–83; cotton, black; adhesive; break-down 1,000 v min; roll ¾'' wd x 3¾'' dia.	General purpose use	6N8583
	INSULATION TAPE, electrical: Tape TL–192; rubber, black, adhesive; 10,000 v ac, 60 cyc for a period of 5 minutes; roll ¾'' wd x 4'' dia.	Waterproofing connections	6N8692
	INSULATOR, bowl: steatite, grade L–4, white glazed finish; round, flat shape; six $^{5}/_{16}$'' dia mtg holes equally spaced on a rad of 2$^{21}/_{64}$''; Natl Co. #XS–5; Hallicrafters part/dwg #8A1394.	Transmitting antenna lead-in wire feedthrough insulator.	3G90–11
	INSULATOR, spreader: glazed steatite; 4'' lg x ¾'' dia; 450 lb tensile strength; Hallicrafters part/dwg #8A1222.	Insulator for long-wire antenna	3G3552–24

1. Identification Table of Parts for Radio Set AN/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	JACK JK–26: for 2 cond plug, .250″ dia x .776″ lg; cont arrangement J1, MBCA ref dwg group 4; 2 $^{27}/_{32}$″ lg x ½″ dia o/a; 1 side stamped "JJ–026"; spec JAN–J–641, type #JJ–026; Hallicrafters part/dwg #36A055.	Part of Cord CD–307	2Z5526
	KEY, telegraph: Key J–45; steel, silver coated lever; 4 lever adj; 5⅝″ lg x 4½″ wd x 6″ h o/a; 2 term.; binding post type; top cont $^{5}/_{32}$″ dia, bottom cont $^{3}/_{16}$″ hex. head; coin silver cont; black plastic base.	For manual sending of code	3Z3445
	KNIFE TL–29: pocket electricians folding type	For general purpose electrical use	6Q60229
	LAMP, fluorescent: 20 w; medium bipin T–12 base; T12 frosted white bulb; 24″ lg.	Shelter lighting	6Z6871–1
	LAMP, incandescent: 115 to 125 v, 15 w; .13 amp; intermediate screw base; T–7 tubular clear bulb; 2⅝″ lg o/a.	Spare lamps for teletypewriters	6Z6820–2
	LAMP, incandescent: 120 v, 50 w, .42 amp; medium screw base; A–19 inside frosted white bulb, heavy duty; 3⅝″ max o/a.	Bulb for trouble lamp	6Z6820–1
	LEAD, electrical: wire braid, $1^{1}/_{16}$″ wd; 5′ lg excluding terminations; ends terminated w/ copper lugs 1″ lg x 1⅛″ wd, 1 lug having a .390″ dia mtg hole and other lug having a .640″ dia mtg hole.	Grounds radio set shelter to vehicle frame.	3E7998–60.1
	LIGHT, extension: 25′ lg excluding terminations; terminates w/parallel blade nonpolarized male plug 1 end, and medium screw socket w/cage type lamp protector other end; 50 w; w/reflector and hook; molded rubber handle; rigid extension arm w/rubber covered spring clamp, and ball and socket swivel joint; Hallicrafters part/dwg #33C095.	115-volt trouble light	6Z6897–2
	LOUDSPEAKER LS–3	Changes a-f currents into sound waves.	2Z6303.1
	MAST: Mast AB–155A/U; sectionalized construction; aluminum alloy; olive drab semigloss enamel; 1.6″ dia at bottom, 1.35″ dia at top, 40′ h o/a assembled; portable.	Provides support for doublet antenna	2A2065–155A
	MAST SECTION MS–49	Part of transmitting whip antenna	2A2349
	MAST SECTION MS–50	Part of transmitting whip antenna	2A2350
	MAST SECTION MS–51	Part of transmitting whip antenna	2A2351
	MAST SECTION MS–52	Part of transmitting whip antenna	2A2352
	MAST SECTION MS–53	Part of transmitting whip antenna	2A2353
	MAST SECTION MS–116–A	Part of receiving whip antenna	2A2416
	MAST SECTION MS–117–A	Part of receiver whip antenna	2A2417
	MAST SECTION MS–118–A	Part of receiving whip antenna	2A2418
	MICROPHONE, dynamic: Sig C Microphone T–50; 25,000–ohm impedance; 56 db below 6 mw for 10 dynes/cm 2 pressure output level; freq response, substantially flat, 100 to 6000 cps; unidirectional; terminated w/built-in cable connector; 4″ lg x 2¼″ wd x 2″ d o/a; 6′ lg, cable incl; push-to-talk type, switch incl; hand held; high impact phenolic case.	Changes sound waves into a-f currents.	2B1650
	MICROPHONE T–17: carbon; low impedance for 35- to 90-ohm circuit.	Changes sounds waves into a-f currents.	2B1617
	MODIFICATION KIT: Adapter Kit M–459	Insulated mounting for Mast Base MP–65–C (for receiving antennas).	2A2555–459

1. Identification Table of Parts for Radio Set AN/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	MOUNT, vibration: sq fl mtg; 3″ x 3″ x 1½″ h	Shock mounts and snubs converter-receiver cabinet assembly.	2Z8405–109
	MULTIMETER TS–352/U	Servicing and trouble shooting	3F4325–352
	PAPER, bond: 8½″ x 10½″; white, #1 sulphite; not ruled.	Typewriter paper	6M700
	PAPER, recording: 8½″ wd x 4½″ dia roll	Paper for teletypewriters	4T1
	PAPER, recording: 8½″ wd x 350′ lg; w/2 carbon inserts.	Paper for teletypewriters	4T3
	PERFORATOR-TRANSMITTER TT–56/MGC: 5 unit code arrangement; English communication characters, Gothic style; arrangement #226 type pallets; 72 characters per line; KH keyboard arrangement; chadless punch; accom paper roll 1 1/16″ wd x 8″ dia; operates on 115 to 110 v, 50 to 60 cyc; 24 to 40 cyc, single phase ac and 110 v dc; governed series motor adj for 368 or 404 operations per min; 20″ lg x 18″ wd x 12⅜″ h o/a.	Punches and prints message tapes; transmits taped messages by means of associated transmitter-distributor.	4TTT56
	PLIERS TL–103	For general service	6R4603
	PLIERS TL–370/U	For general service	6R4625A
	PLUG PJ–055–B: 2 cond	Part of Cords CD–307 and CG–390/U, and Special Purpose Cable Assembly CX–1120/U.	2Z7228A–55B
	POLE, lance: fir or hemlock, olive drab enameled; 11′ x 5″ lg o/a; 1⅝″ dia at bottom, 1⅜″ dia at top; 2½″ lg pointed bottom; incl aluminum alloy band at top, 1⅝″ lg x 1½″ dia, secured by 3/16″ dia aluminum alloy pin; hex.	Doublet antenna support	5A3211
	POWER SUPPLY: Power Supply PP–712/GRC–26A or PP–712A/GRC–26A; electronic type; one 5R4GY and two 5Y3GT tubes; full-wave and half-wave rectification; output data; +275 v dc, 80 ma, unregulated; −150 v dc, 10 ma, regulated; +150 v dc, 40 ma, regulated; −150 v dc, 85 ma, unregulated; −400 v dc, 3 ma, unregulated; 6.3 v ac, 6 amp, unregulated; 6.3 v ac, 2.5 amp, unregulated; input data, 115 v, 50 to 60 cyc, single ph; 17½″ wd x 19″ wd x 10½″ h o/a; filter incl; chassis mtd in frame assy which also houses tone osc; frame assy rack mtd by 4 fastening bolts having 6.5″ x 18⅜″ mtg/c; safety interlock switches on door of unit cover.	Power supply for Frequency Shift Converter CV–182(*)/GRC–26A.	3H4497–712
	POWER UNIT PE–95–G: 4 cyl, 1800 rpm; 10½ gal fuel cap; power output 10 kw, 120 v and 240 v, 60 cps ac, power factor 80%; fuel consumption 1.1 gal per hr.	Supplies a-c power to all components	3H4595G
	RACK: Cabinet CY–1050/GRC–26A; steel, black wrinkle finish; 20¼″ wd x 5″ 2½″ h x 20¼″ d o/a; 8 raceway guides incl; access plate on 1 side secured by 4 wing wall by special bracket on top; Hallicrafters part/dwg #114X1344.	Accommodates two radio receivers and converter and power supply.	
	RACK MT–655/GRC: kiln-dried oak or maple; steel; olive drab finish; 17″ lg x 7½″ wd x 2″ h o/a; cotton webbing strap to hold reel in place.	Rack for Reel DR–4	2Z7383–655

1. Identification Table of Parts for Radio Set AN/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	RACK MT–656/GRC: hardwood olive drab finish; 41⅛″ lg x 15¾″ wd x 17″ h o/a; divided by vertical partitions into 6 equal compartments; 6 cotton webbing straps to hold cans in place.	Rack for holding six 5-gallon gasoline cans.	2Z7383–656
	RECEIVER, radio: Radio Receiver R–388/URR: A1, A2, A3 reception; .5- to 30.5-mc range, 30 bands; 115 v or 230 v, 45 to 70 cps, single ph 85 w; "S" meter, 20 to 100 db signal level in 20-db steps; 10- to 6-db audio level (6-mw reference); rack mtd; 13¼″ lg x 19″ wd x 10½″ h o/a; 16 electron tubes; superheterodyne circuit; built-in crystal filter, bfo, anl, and single, double or triple conversion.	For mcw, c-w, or voice signal reception.	2C4180–388
	RECTIFIER RA–87 or RA–87–A: metallic disk type; output 115 v dc, 400 ma, 115 v ac, 500 va at 50 to 60 cyc; input 95 to 125 v or 190 to 250 v, 50 to 60 cyc, 600 w.	Supplies ac and dc for operation of teletypewriter circuits.	3H4699–87
	REEL RL–29	Reel for Wire W–1	2A3129
	ROD, ground: Ground Rod GP–26	Grounding rod for shelter	5B4426
	ROPE RP–5: cotton, braided; white; mildewproofed; 50′ lg.	General purpose use	6Z7926
	SCREWDRIVER TL–21: bit.032″; 2½″ lg	General purpose use	6R15310
	SCREWDRIVER TL–359/U: .046″ bit; 6″ lg	General purpose use	6R16013
	SHELTER S–69/GRC: rectangular shape; 11′ 7″ lg x 6′ 3″ wd x 6′ 4″ h o/a; steel walls outside.	Houses all components except power unit.	3Z7702–65
	SOLDER M–31: 60/40 lead tin; w/resin core; wire shape; .102″ dia max, 1 lb spool; noncorrosive flux; Hallicrafters part/dwg #33A139.	General purpose use	6N7531
	SOLDERING IRON TL–120: 250 w	General repair service	6R24620
	SPLICE, conductor: oval plotted head w/nut; for 2-cond. #.10 AWG solid.	For making solderless splices	5B4221
	STAMP, time: Stamp MC–181–A; black wrinkle finish; nonelec; 7″ lg x 6″ wd x 10½″ h o/a; table mtd; registers continental time, 24 hour, month, date, and year.	Records time of arrival on received messages.	6M1211A
	STARTER, fluorescent lamp: thermal glow switch type; u/w 15 w 18″ lamp or 20 w 24″ lamp; 2 term., standard bayonet, located on ins end; body dimen, excluding term. 1⅝″ lg x 1¾₁₆″ OD; aluminum case; socket mtd.	Starter for shelter fluorescent lamp.	6Z8378
	STRAP, retaining: olive drab cotton webbing; 15′ lg x 1½″ wd x ⅛″ thk o/a; 1 end terminates in footman loop #6407, black semigloss enamel finish; other end terminates w/brass tip 1½″ wd x ¾″ lg, black finish; water repellent mildew resistant; Hallicrafters part/dwg #114C1441.	Three straps to hold Mast AB–155A/U to Trailer K–52–(*).	2A3362–1
	STRAP, retaining: olive drab cotton webbing; 6¾″ lg x 1½″ wd x ⅛″ thk o/a; ea end terminates w/brass tip 1½″ wd x ¾″ lg, 1 lift-dot fastener w/clinch plate installed near 1 end; impr for tropical use.	Two straps to hold broom and hammer.	2A3362–2

1. Identification Table of Parts for Radio Set AN/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	STRAP, retaining: olive drab cotton webbing; 12″ lg x 1″ wd x ⅛″ thk o/a; 1 end terminates w/tongueless, double-bar, cast bronze, black finish buckle; other end term w/brass, black finish clip; mildew-proofed and water repellant.	Two straps to hold folding chair	6Z8567
	STRAP, retaining: olive drab cotton webbing; 18″ lg x 1½″ wd x ⅛″ thk o/a; 1 end terminates w/double bar tongueless cast bronze black finish buckle 1½″ wd x 1¼″ lg; other end terminates w/brass tip 1½″ wd x ¾″ lg; water repellant and mildew resistant.	Four straps to hold lance poles to Shelter S–69/GRC.	6Z8567–4
	STRAP, retaining: olive drab cotton webbing; 41″ lg x 1½″ wd x ⅛″ thk o/a; 1 end terminates w/double bar tongueless cast bronze black finish buckle 1½″ lg x 1¼″ wd; other end terminates w/footman loop standard for strap 1½″ wd; impr for tropical use.	Three straps to hold Mast AB–155A/U to Trailer K–52–(*).	2Z9052–117
	TAPE: blank recording; 11/16″ wd	Perforator tape	4A2702.2
	TAPE, measuring: hand-winding; 100′ lg extended; 4½″ dia by ¾″ thk o/a; ⅛″ graduations; ⅜″ wd x .010″ thk; steel, zinc coated; incl in leather covering; Lufkin #246.	Steel measuring tape for measuring long-wire antennas	6R36026.1
	TELEPHONE EE–8–B	For voice communication over wire or simplexed lines.	4B5008
	TELETYPEWRITER TT–4/TG: portable, std communications, page printing, English characters; 3 oper speeds: 368.1, 404, 600 opm; power requirements 105–125 v dc or ac at 50–60 cps; 5 unit code.	Receives and transmits teletype messages. (This equipment replaces Teletypewriter TT–55/MGC in some models of the radio set.)	4TTT4
	TELETYPEWRITER TT–55/MGC portable; standard communications keyboard; English characters; 72 characters per line; friction feed; governed series motor, 115 v 50 to 60 cyc or 25 to 40 cyc, 115 v dc; 368 or 404 operations per min oper speed; 5 unit code.	Receives and transmits teletypewriter messages.	4TTT55
	TIRE AND WHEEL ASSEMBLY: USA spec LP–91–901.	Part of 1-ton, 2-wheel trailer	6J1052D/T1
	TRAILER K–52; 1 ton; 2 wheel; cargo type	Transports Power Unit PE–95–G and Mast AB–155A/U sections.	2J952
	TRANSMITTER, radio: Radio Transmitter BC–610–H or BC–610–I; A1 and A3 type emission; 2 to 18 mc, 3 bands; crystal controlled or var freq osc, freq and output; 2 to 8 mc, cw 400, voice 300; 8 to 12 mc, cw 300, voice 250; 12 to 18 mc, cw 275, voice 200; power requirements, 115 v, 60 cyc, single ph, 1700 to 2000 w; metal cabinet; 32⅝″ lg x 21⅜″ lg x 39⅞″ h o/a.	Transmits frequency shift, a-m, and c-w signals in the 2- to 18-mc frequency range.	2C6300H or 2C6300I
	TUBING, flexible: galv iron; 1⅝″ size; ends fitted w/1″ dia and 1¼″ dia cast iron pipe w/inside thd.	Exhaust tube for Power Unit PE–95–G.	6Z8731
	TYPEWRITER MX–322/U	To type messages not received on teletypewriters.	6M1800
	WIRE BRAID: tinned copper; 13/16″ wd when flat x .047″ thk.	Material for equipment grounds	1A1020–7
	WIRE BRAID: tinned copper; 3/16″ wd x .032″ thk.	Material for equipment grounds	1A1018

1. Identification Table of Parts for Radio Set AN/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	WIRE, electrical: Wire W–1; bare, stranded, round cond; #14 AWG; c/o 7 strands, #22 AWG strands; soft copper; tinned finish on cond; 100 lb strength test.	Doublet antenna wire	1A1
	WIRE W–128: single #14 AWG stranded cond	Transmitting antenna lead-in wire	1B128
	WIRE WD–1/TT: ¼ m lg wnd on Spool DR–8	Field wire for telephone and other wire lines.	1B190–1.1
	WRENCH: special pipe T shape; socket built into wrench; ¾″ hex; 45″ lg approx, handle 7⅛″ lg; steel, cad coated, cronak dip; round T handle.	For removing mounting bolts of Radio Transmitter BC–610–I.	6R57691

2. Identification Table of Parts for Radioteletypewriter Control C–808/GRC–26A

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	RADIOTELETYPEWRITER CONTROL C–808/GRC–26A: oper on 115 v ac, 50/60 cyc 100 w.	Coordinates functions and operation of equipment in Radio Set AN/GRC–26A.	2C684–808
	TECHNICAL MANUAL TM 11–264A		Order through AGO channels.
	BAR, ACTUATOR, ELECTRICAL SWITCH: u/w locking bar.	Part of TRANS ON-OFF switch	2Z558–64
	CABLE, special purpose: Cordage CO–119–A; 2 cond.	Part of Cord CD–307	3E2119A
C2 through C7	CAPACITOR, fixed: mica; 10,000 μμf ± 10%; 300 vdcw; JAN type CM35C103K.	Hash suppressors	3K3510331
C8	CAPACITOR, fixed: electrolytic; 2 sect.; 25 μf ea sect.; 300 vdcw ea sect.; JAN type CE42C25ON.	Filter	3DB25–118
C1	CAPACITOR, fixed: electrolytic; 2 sect.; 150 μf ea sect.; 150 vdcw; JAN type CE42C151J.	Filter capacitor in bridge	3DB150–10
	RADIO TELETYPEWRITER CONTROL CASE CY–901/GRC–26: steel black, wrinkle enamel finish; 19½″ lg x 10¼″ wd x 9½″ h o/a; 4 louvers ea side.	Case for Radioteletypewriter Control C–808/GRC–26A.	
	CLIP	Retains tube in socket	2Z2642.442
L2	COIL, RF: unshielded; 1.5 mh, 80 ma	Noise suppressor in keying circuit	3C319P
J15	CONNECTOR, receptacle: 3 curved male cont, pol; straight.	A–c power receptacle	6Z7813–8
J2, J14	CONNECTOR, receptacle: 3 round male pol cont; straight.	J2: Connects Special Purpose Cable Assembly CX–1120/U to perforator. J14: Connects Special Purpose Cable Assembly CX–1152/U to BC–614–(*).	2Z3023–5
J10, J12, J13.	CONNECTOR, receptacle: 4 round male cont; straight; AN type AN–3102–14S–2P.	J10: Connects Special Purpose Cable Assembly CX–1150/U (red) to frequency-shift converter. J12: Connects Cord CX–961/TRA–7 (blue) to frequency-shift converter. J13: Connects Cord CX–961/TRA–7 (red) to frequency-shift converter.	2Z8799–220

2. Identification Table of Parts for Radioteletypewriter Control C–808/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
J11	CONNECTOR, receptacle: 5 round male pol cont; straight; AN type AN–3102–14S–5P.	Connects Special Purpose Cable Assembly CX–1151/U (blue) to frequency-shift converter.	2Z8799–180
	CORD CD–307: uses Cordage CO–119–A; 4′ lg excluding terminations.	Connects teletypewriters to radioteletype control unit.	3E1307–1
F1	FUSE FU–64: 1 amp	Primary circuit protection	3Z1961
E5	FUSEHOLDER: extractor post type; for 1 type 4AG fuse.	Fuseholder	3Z1939
	INSULATOR, disk: round; laminated phenolic sheet type ⅜″ OD x .149″ ID x 1/16″ thk.	Resistor mounting	3G280–35
	JACK JJ–026: tp; for 2 cond plugs .253″ dia	Part of Cord CD–307	2Z5526
J1, J3 through J9, J16.	JACK JJ–089: 1¼″ lg x .253″ dia	Connections for Cord CD–307 from teletypewriters.	2Z5598A–89
	KNOB: bar w/circular hub; black bakelite; for ¼″ dia shaft.	Switch knob	2Z5850–46
	KNOB: round; black bakelite; for ¼″ dia shaft; white indicator line.	Potentiometer adjustment knob	2Z5822–167
E5, E6	LAMP LM–52: 6.3 v, .15 amp; miniature bayonet base.	E5: Transmitter pilot E6: A-c supply.	2Z5952
	LENS, indicator light: amber	A-c power indicator	2Z6125–123
	LENS, indicator light: green	Transmitter indicator	2Z5991–78
I1	LIGHT, indicator: w/lens; bayonet base miniature type.	Transmitter switch on	2Z5991–213
I2	LIGHT, indicator: w/lens; bayonet base miniature type.	A-c supply on	2Z5991–214
M1	METER, ammeter: dc 100–0–100 ma; JAN type MR26W1H1DCUA.	Polar line current to frequency-shift converter.	3F910–63
	MOUNT, vibration: Shock Mount M–448; sq mtg; 2⅜″ wd x 2⅜″ lg x 1 1/16″ thk.	Cabinet shock mount	2Z8415–448
	PLATE, identification: front panel overlay	Name plate, panel	2Z7090.207
	PLUG PJ–055–B: tp; 2 cond	For Cord CD–307	2Z7228A–55B
E1 through E4.	POST, binding: Binding Post TM–149; screw type.	E1 and E2: Connecting terminals for receive extension. E3 and E4: Connecting terminals for send extension.	3Z249
	POST, binding: 2 7/64″ OD x 2 1/32″ h o/a	Retains #8 Allen wrench	3Z737–4.9
	POST, supporting	Supports tube retaining clip	2Z7259–85
	POST, supporting	Supports relay clamp	2Z7259–213
L3	REACTOR: min inductance 12 h at 150 ma, max dc cur. 275 ma; dc resistance 150 ohms; HS case.	Filter	3C547–34
L1	REACTOR: inductance 5 h at 110 ma, max dc 180 ma; max DC resistance 30 ohms; HS case.	Filter	3C547–35
CR1	RECTIFIER, metallic: selenium; input 25 v ac, 50/60 cyc; output 23 v dc, at .5 amp.	Rectifier	3H4860–161
O1	RELAY, armature: SPST; mts in std octal socket; HS case.	Frequency-shift keys exciter unit with teletypewriter signals.	2Z7599–110
R10	RESISTOR, adjustable; WW; 2000 ohms; 50 w	Mark calibration	3Z6200–220
R12	RESISTOR, adjustable; WW; 500 ohms; 50 w; (used in later models).	Teletypewriter current limiting resistor.	3Z6050–39
R2	RESISTOR, fixed: WW; 28 ohms ±5%; 8 w; JAN type RW30G280.	Surge limiting resistor	3RW15007
R7	RESISTOR, fixed: WW; 36 ohms ±1 ohm; ⅓ w; JAN type RB11B36ROOF.	Meter shunt	3RB3–3600.1
R1, R8	RESISTOR, fixed: WW; 1000 ohms ±5%; 8 w; JAN type RW29G102.	R1: Series-dropping resistor R8: Dropping resistor to relay K1.	3RW24359
R9	RESISTOR, fixed: WW; 1000 ohms ±10%; 25 w (used in later models).	Voltage-dropping resistor in teletypewriter loop circuit.	3Z6100–47

2. Identification Table of Parts for Radioteletypewriter Control C–808/GRC–26A—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R9	RESISTOR, fixed: WW; 1600 ohms ±5%; 12 w; JAN type RW32G162 (used in early models).	Voltage-dropping resistor in teletypewriter loop.	3RW25508
R6	RESISTOR, fixed: WW; 10,000 ohms ±1%; ⅓ w; JAN type RB11B10001F.	Voltage-dropping resistor to microammeter.	3RB6–1000.1
R3	RESISTOR, variable: WW; 500 ohms ±10%; 2 w; JAN type RA20A2SA501AK.	Space-current calibration	3RA5114
R4, R11	RESISTOR, variable: WW; 1000 ohms ±10%; 4w; JAN type RA30A1FK102AK.	R4: Mark current adjustment R11: Space current adjustment.	3RA5707
R5	RESISTOR, variable: WW; 5000 ohms ±10%; 2 w; JAN type RA20A2SA502K.	Meter calibration range	3RA6921
	RETAINER, electron tube: SS	Retains tube in socket	2Z1619–79
	RETAINER, spring	Supports rear of chassis	2Z7780–139
X1 through X4	SOCKET, tube; octal; 1 piece saddle mtg; JAN type TSB8T101.	X1 and X2: 5Y3G sockets X3 and X4: Relay sockets.	2Z8678.326
	STUD, threaded: 3¼″ lg	Support for tube retainer	2Z6820.368
S1	SWITCH, rotary: 4 pole, 2 position; locking type	TT TRANSPOSE switch	3Z9825–117.1
S2	SWITCH, rotary: 4 pole, 3 position; 2 sec; locking type.	RECEIVE TT PUNCH TAPE, and SEND TT switch.	3Z9825–117
S3	SWITCH, toggle: DPDT; JAN type ST52N	NORMAL-EXTENSION switch	3Z9863–52N.1
S4, S7, S8.	SWITCH, toggle: SPST; JAN type ST42A	S4: FULL DX-ONE WAY switch S7: A-c power input switch. S8: MARK-SPACE switch.	3Z9863–42A.1
S5, S6	SWITCH, toggle: DPST; JAN type ST52K	XMTR ON-XMTR OFF switch	3Z9863–52K.1
T1	TRANSFORMER, power: fil and plate type; input 115 v, 50/60 cyc, single ph; secd #1, 24 v at 200 ma, tapped at 26.5 v and 29 v; secd #2, 6.3 v at 2 amp; HS metal case.	Plate and filament supply	2Z9613.714
T2	TRANSFORMER, power: fil and plate type; pri wnd tapped at 104 v, 115 v, and 126 v, 50/60 cyc; secd #1, 132 v ea side of CT, at 175 ma; secd #2, 5.1 v at 4 amp; HS metal case.	Plate and filament supply	2Z9613.715
V1, V2	TUBE, electron: JAN type 5Y3GT	Rectifiers	2J5Y3GT
	THUMBSCREW: knurl hd; 7/16, #10–32 thread; 61/64″ o/a.	Front panel fastener	6L17010–15.8K1

3. Identification Table of Parts for Shelter S–69/GRC

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	SHELTER S–69/GRC: assembled; rectangular with bowed roof, 142″ lg x 83½″ wd x 79½″ h o/a.	Houses Radio Set AN/GRC–26A	3Z7702–65
	TECHNICAL MANUAL TM 11–264		Order through AGO channels
	BLOWER: motor ⅛ hp, 1725 rpm, 60 cyc, single ph 115 v ac, 2.5 amp; 630 cfm at 1725 rpm.	Ventilates shelter	3H382
	CABLE, power: indoor; single #8 AWG stranded cond.	Electric power feeder	1B3008–1.3
	CAPACITOR, fixed: paper; 100,000μμf ±10%; 600 v ac/dc; JAN type CP29A2EF104M.	Suppresses interference from fluorescent lamps.	3DA100–1084
	CATCH, fastener	Lower rear door fastener	6Z1747–32
	CIRCUIT BREAKER: thermal magnetic; 2-pole, 120/240 v a-c, 30 amp; 5⅞″ h x 3⅞″ wd x 2⅞″ d; Sg D type MO #161733S.	Protects external a-c power source from overloads.	3H900–30–13

3. Identification Table of Parts for Shelter S–69/GRC—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	CIRCUIT BREAKER: thermal magnetic; 1 pole, 120 v a-c, 15 amp, 5⅞″ h x 3⅞″ wd x 2⅞″ d; sg D type MO #151101S.	Protects external a-c power source from overloads.	3H900–15–49
	CLEANER ELEMENT, air: steel wire cloth; approx 11½″ h x 12½″ wd x ⅝″ thk o/a.	Ventilator filter	6Z3856–24
	CONNECTOR, receptacle: duplex double female 3 pol cont; straight.	A-c power receptacle	6Z7809–9
S1	CONNECTOR, receptacle: 2 curved oblong female cont; straight.	A-c power receptacle	6Z7808
S2	CONNECTOR, receptacle: 2 round female pol cont; straight.	A-c power receptacle for shelter	6Z3150A–1
	CONNECTOR, receptacle: duplex; 2 T-shaped female pol cont; straight.	A-c power receptacle	6Z7786–1
	DUCT: approx 7½″ lg x 3⅝″ wd x 5¼″ h	Exhaust for blower	6Z3660–5
	FASTENER, latch: 2″ lg x 1″ wd x 1⅜″ h o/a	Lower rear door fastener	6Z3810–107
	FASTENER, latch: 3 point rod type latch assy; 41½″ lg x 5¾″ wd x 8¼″ thk o/a.	Upper rear door fastener	6Z3810–106
	FIXTURE, lighting: ceiling type; for one 24″ lg, 20 w tube.	Shelter lighting	6Z3874–15
	FIXTURE, lighting: ceiling type; for two 24″ lg, 20 w tubes.	Shelter lighting	6Z3874–16
	GUARD: wire mesh mtg on ring; 7¾″ dia x ¼″ thk; Sig dwg SC–D–15874 Item 10.	Fan guard	3H2484–1
	GUARD: plexiglass; transparent; rectangular; 25″ lg x 3⅛″ wd x 3/16″ thk o/a.	Lamp guard for 1 lamp	6Z4921–2
	GUARD: plexiglass; transparent; rectangular; 25″ lg x 5¾″ wd x 3/16″ thk o/a.	Lamp guard for 2 lamps	6Z4921–1
	HANDLE: lever type door handle; approx 6¼″ lg x 2⅛″ wd x 2¼″ d o/a.	Outside upper rear door handle	6Z5012–3
	HANDLE: door, upper rear, inside; 8″ lg x 1¾″ wd x 1¾″ at opening.	Inside upper rear door handle	6Z5012–12
	HANDLE: door, lower rear inside; 5″ lg x 2⅛″ wd x ½″ thk o/a.	Inside lower rear door handle	6Z5012–11
	LATCH: 2″ lg x 1″ wd x 1⅜″ h	Latches air vent panel	6Z3810–107
	LATCH: upper rear door; 3 point red type	Latches rear door (upper)	6Z3810–106
	IMPELLER, centrifugal: wheel type	Circulates air	3H2565–2
	LOUVER, metal: stationary blade type		6Z6959
	MOTOR, AC: split ph 115 v, 60 cyc, single ph, 2.9 amp, 61% pf; ⅙ hp, 1,750 rpm, cw.	Blower motor	3H3000A16–12
	MOUNTING: cast iron; red enamel finish; 8¾″ h x 7″ wd x 6⅛″ dia.	For fire extinguisher	2Z1250.153
	SCREEN, blackout	For roof hatch	6Z8095A–2
	SCREEN, blackout	For rear door	6Z8095A–3
	SCREEN, blackout	For side windows	6Z8095A
	SCREEN, blackout	For ventilator	6Z8095A–1
	SCREEN, window, metal: steel frame; bronze wire; 18¼″ wd x 25¾″ h x ½″ thk; olive drab finish.		6Z2116–16S
	SCREEN, window, metal: steel frame; bronze wire; 26¼″ wd x 23¾″ h x 1⅛″ thk; ivory finish.		6Z2116–16S.1
	SCREEN, window, metal: steel frame; bronze wire; 14″ h x 12″ wd x ½″ thk; ivory finish.		6Z2116–16S.2
	TURNBUCKLE ASSEMBLY: adj, c/o 2 steel eyes; Sig dwg SC–D–15877.	Holds shelter to truck	6Z8781
	TERMINAL, lug: straight type; for #8 B&S gage wire.	Termination a-c power feeders	3Z12073–31.1

3. Identification Table of Parts for Shelter S–69/GRC—Continued

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	WINDOW, metal: 24″ wd x 21⅝″ lg x 1¼″ thk; OM Edwards dwg #18DG 11359, items 1, 5, 6, 7, and 8.	Light and ventilation window for roof hatch.	6Z9461–4
	WINDOW, metal: 13⅞″ lg x 11⅞″ wd x 1⅛″ thk; OM Edwards dwg #18DG 11609, items 1, 6, 7, and 8.	Light and ventilation window for side and front.	6Z9461–3
	WINDOW, metal: 24″ lg x 16½″ wd x 1¼″ thk; OM Edwards dwg #18DG 11613, items 1, 6, 7, and 8.	Light and ventilation window for rear door.	6Z9461–2

4. Identification Table of Parts for Mast AB–155A/U

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	MAST AB–155A/U: steel or aluminum mast, 40′ h assembled.	Doublet antenna support	2A2065–155A
	TECHNICAL MANUAL TM 11–264A		Order through AGO channels.
	ANTENNA EQUIPMENT: Halyard MX–516/GRA–4; antenna.	For hauling antenna wire to top of mast.	2A3180.1–516
	CARRYING DEVICE MX–387/GRA–4	Carrying frame for Mast Section MX–44.	2A950–387
	COVER CW–124/GRA–4	Serves as protection and means for carrying assembly.	2A790–124
	GUY FASTENER MX–379/U: snap; 5″ lg x 1¼″ wd o/a.	Secures guys to stakes	2A1050–379
	GUY PLATE MX–378/U	For fastening guys and halyard	2A2837–378
	GUY MX–381/GRA–4	Center guy	2A1348–381
	GUY MX–382/GRA–4	Lower guy	2A1348–382
	GUY MX–383/GRA–4	Upper guy	2A1348–383
	HAMMER HM–1	For driving stakes	6Q50201–6H
	MAST BASE AB–154/U	Holds mast sections	2A324–154
	MAST SECTIONS MS–44 and MS–44–A	Antenna	2A2344
	STAKE GP–101/U: aluminum; 15¾″ lg	For securing guys	2A3300–101
	STAKE, guy: hickory; 30″ lg	For securing guys	2A3330–15

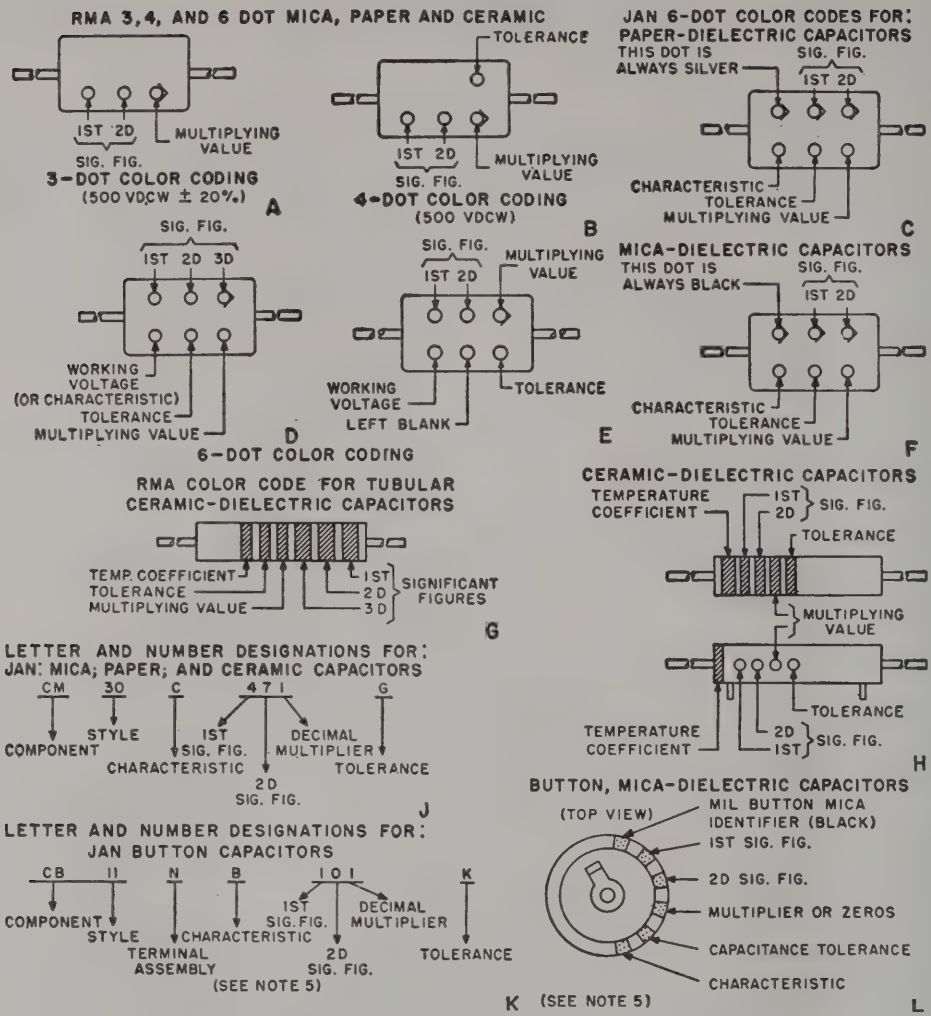
GLOSSARY

Abbreviations

a-c, A-c	alternating-current
adj, ADJ	adjustment, adjust
agc	automatic gain control
a-m	amplitude-modulated
amp	ampere
AMPL	amplifier
ANT	antenna
avc, AVC	automatic volume control
AWG	American Wire Gauge.
bfo, BFO	beat-frequency oscillator
C	centigrade
CHAN	channel
c/o	consists of
coef	coefficient
COMP	compensator
cond	conductor
cont	contact
cps	cycles per second
ctr	center
cu in	cubic inch
c-w	continuous-wave
cyc	cycle
d	deep
db	decibel
d-c	direct-current
dia	diameter
dimen	dimension
DOUB	doubler
dwg	drawing
Dx	duplex
E	enameled
ea	each
EMERG	emergency
EXT	extension
f-m	frequency-modulated
freq	frequency
FS	frequency shift
ft	foot
gal	gallons
galv	galvanized
gnd	ground
h	high
hdw	hardware
hex	hexagon
h-f	high-frequency
HS	hermetically sealed
h-v	high-voltage
ID	inside diameter
i-f	intermediate-frequency
impr	impregnated
in	inch
incl	including
INT	intermediate
kc	kilocycle
kw	kilowatt
kva	kilovolt-ampere
lb	pound
lg	long
LP	low pass
ma	milliampere
max	maximum
mc	megacycle
meg, MEG	megohm
MIC	microphone
min	minimum
mm	millimeter
MO	master oscillator
ms	millisecond
mtg	mounting
mtg/c	mounting centers
mts	mounts
MVC	manual volume control
mw	milliwatt
NORM	normal
o/a	over-all
OD	outside diameter
OSC	oscillator
oz	ounces
PA	power amplifier
pl	plated
psi	pounds per square inch
qt	quart
REC	receiver
r-f	radio-frequency
rpm	revolutions per minute
RTT	radioteletypewriter
sect	section
SIG	signal
SIG C	Signal Corps
SLC	straight line capacity
spec	specifications
SSE	single silk enameled
str	stranded
TD	transmitter-distributor
term	terminal
thd	thread
thk	thick
tol	tolerance
TT	teletypewriter
μf, UF	microfarad
UHF	ultra high frequency
μa	microamperes
μμf, UUF	micromicrofarad
v, V	volt
vdcw	direct current working volts
VOL	volume
w, W	watt
w/	with
wd	wide
wdg	winding
wnd	wound
w/o	without
wpm	words per minute
xmtr	transmitter
XTAL	crystal
yd	yard

Note. For explanation of the terms used in this manual, refer to TM 1–455 and TM 11–680.

CAPACITOR COLOR AND LETTER CODES



- STANDARDS -					JAN MICA-CM		JAN PAPER-CM		JAN CERAMIC-CC					
										CAP. TOL. FOR MORE THAN 10 UUF		CAP. TOL. FOR 10 UUF OR LESS		
COLOR	SIG. FIG.	DECIMAL MULTIPLIER	% TOL.	VDCW	LETTER TOL.	CHARAC-TERISTIC	LETTER TOL.	CHARAC-TERISTIC	DEC. MULT.	%	LETTER DESIG-NATION	UUF	LETTER DESIG-NATION	CHARAC-TERISTIC
BLACK	0	1	±20	500	M	A	M	A	1	±20	M	±2.0	G	C
BROWN	1	10	± 1	100	-	B	-	E	10	± 1	F	-	-	H
RED	2	100	± 2	200	G	C	-	H	100	± 2	G	-	-	L
ORANGE	3	1,000	± 3	300	-	D	N*	J	1,000	-	-	-	-	P
YELLOW	4	10,000	± 4	400	-	E	-	P	-	-	-	-	-	R
GREEN	5	100,000	± 5	500	-	F	-	R	-	± 5	J	±0.5	D	S
BLUE	6	1,000,000	± 6	600	-	G	-	S	-	-	-	-	-	T
VIOLET	7	10,000,000	± 7	700	-	-	-	T	-	-	-	-	-	U
GRAY	8	100,000,000	± 8	800	-	-	-	-	0.01	-	-	±0.25	C	B
WHITE	9	1,000,000,000	± 9	900	-	-	-	-	0.1	± 10	K	±1.0	F	SL
GOLD	-	0.1	± 5	1,000	J	-	-	-	-	-	-	-	-	A
SILVER	-	0.01	±10	2,000	K	-	K	-	-	-	-	-	-	-
NO COLOR	-	-	±20	500	-	-	-	-	-	-	-	-	-	-
* THE TOLERANCE OF THIS CAPACITOR IS ±30%, NOT ±3%														

NOTES

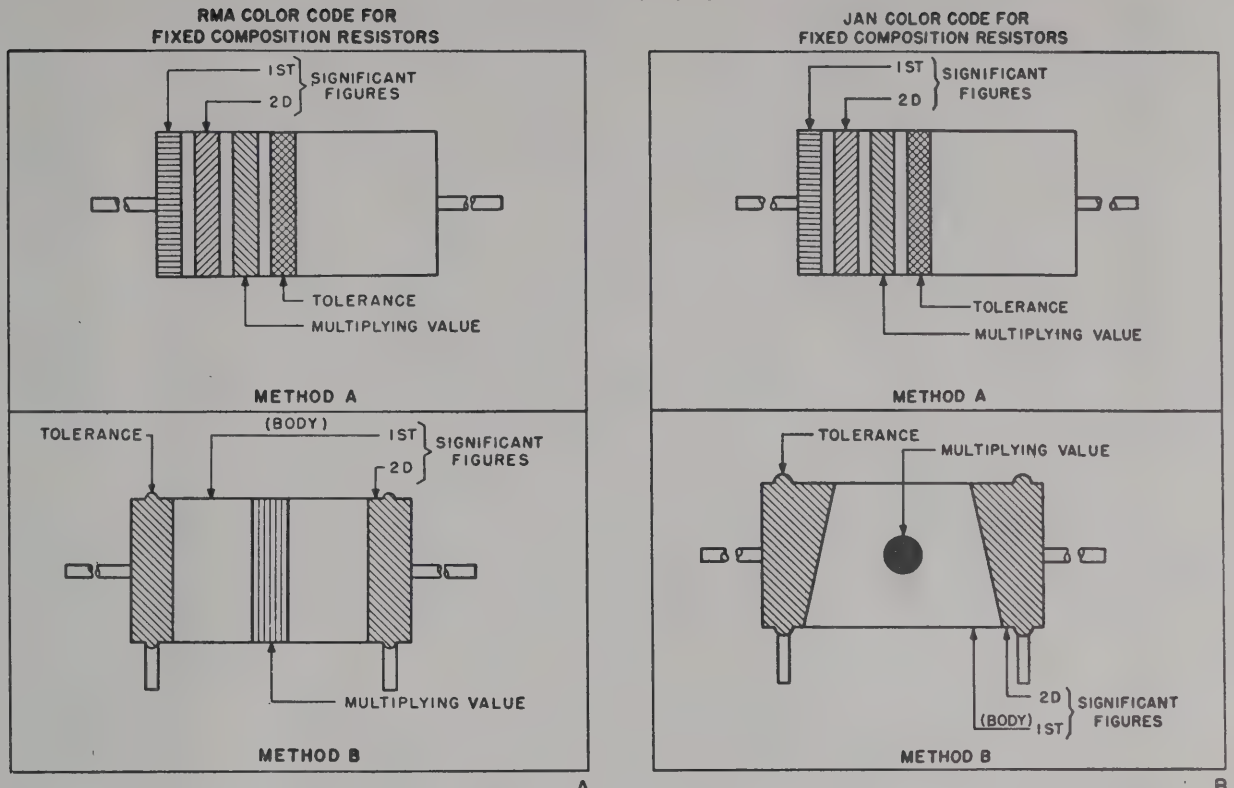
JAN: JOINT ARMY-NAVY
RMA: RADIO MANUFACTURERS ASSOCIATION

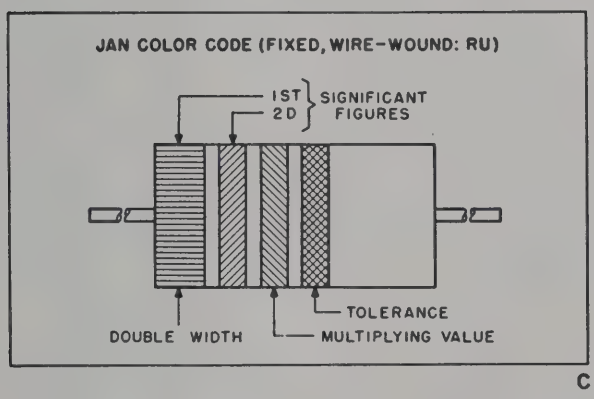
1. THESE COLOR AND LETTER CODES GIVE CAPACITANCES IN MICROMICROFARADS
2. THIS TABLE IS ADAPTED FOR JAN AND RMA COLOR AND JAN LETTER TYPE DESIGNATIONS
3. CERAMIC AND MICA CAPACITORS, BOTH JAN AND RMA, ARE GENERALLY 500 VDCW
4. BUTTON CAPACITORS ARE GENERALLY 300 VDCW
5. READ BUTTON CAPACITOR TOLERANCE UNDER CERAMICS OF MORE THAN 10 UUF
6. CHARACTERISTICS ARE AVAILABLE IN JAN CAPACITOR SPECIFICATION MANUALS
7. THE COMPONENTS USED ABOVE FOR JAN LETTER TYPE DESIGNATIONS ARE:
   CB MICA BUTTON: *CC* CERAMIC: *CM* MICA MOULDED: *CN* PAPER MOULDED

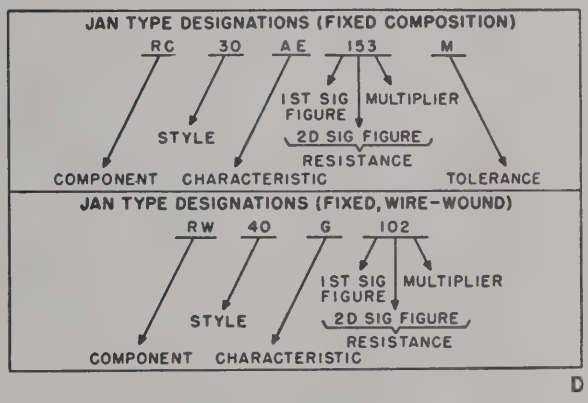
TM CC

Figure 108. Capacitor color codes.

RESISTOR COLOR AND LETTER CODE







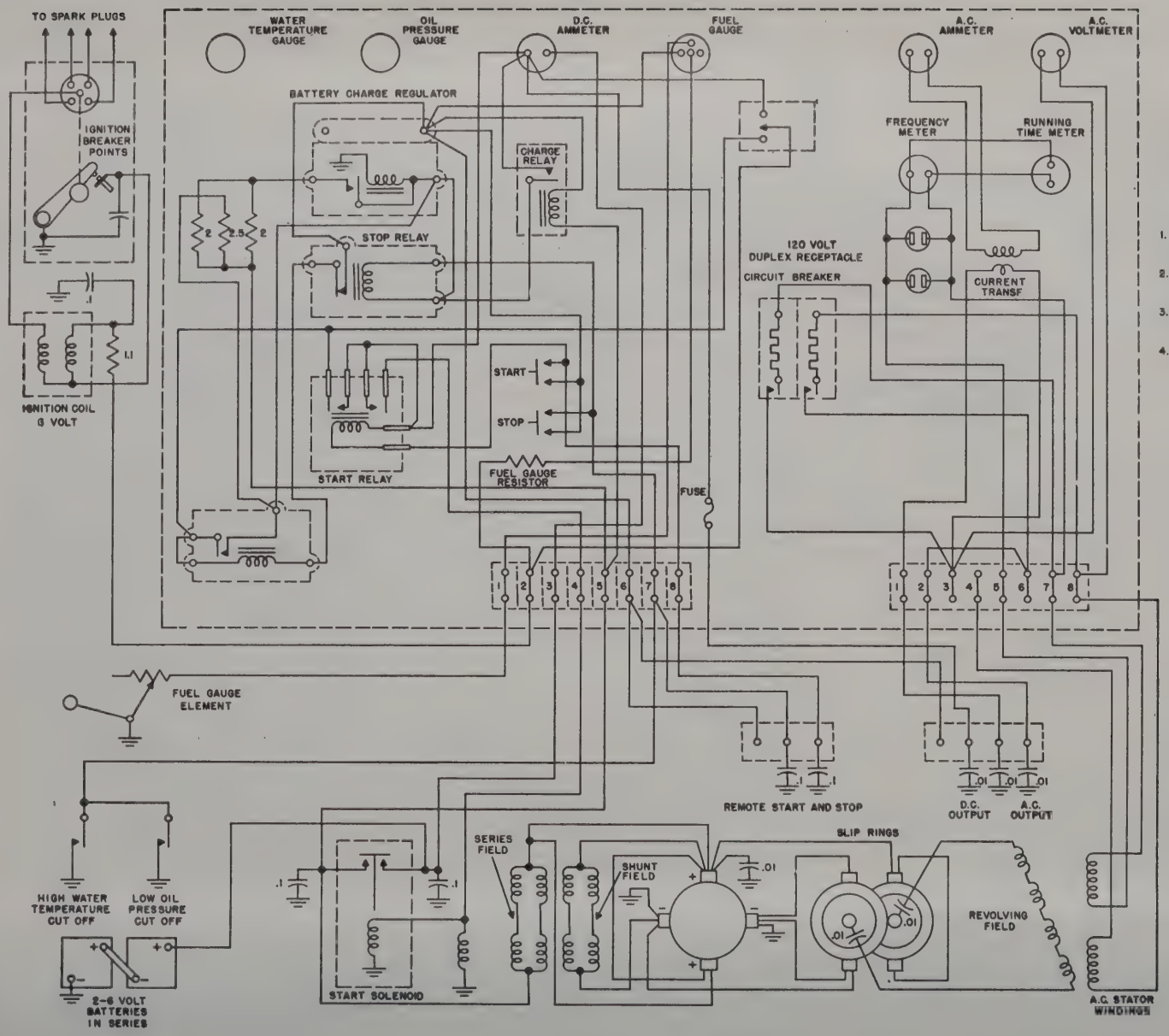
STANDARDS				
COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE	TOLERANCE (%)	JAN LETTER TOLERANCE
BLACK	0	1	–	–
BROWN	1	10	± 1	F
RED	2	100	± 2	G
ORANGE	3	1,000	± 3	–
YELLOW	4	10,000	± 4	–
GREEN	5	100,000	± 5	–
BLUE	6	1,000,000	± 6	–
VIOLET	7	10,000,000	± 7	–
GRAY	8	100,000,000	± 8	–
WHITE	9	1,000,000,000	± 9	–
GOLD	–	0.1	± 5	J
SILVER	–	0.01	±10	K
NO COLOR	–	–	±20	M

NOTES:

1. RESISTORS WITH AXIAL LEADS ARE INSULATED. RESISTORS WITH RADIAL LEADS ARE NON-INSULATED.
2. RMA: RADIO MANUFACTURERS ASSOCIATION.
3. JAN: JOINT ARMY - NAVY.
4. THESE COLOR AND NUMBER CODES GIVE ALL RESISTANCE VALUES IN OHMS.
5. RESISTIVE COMPONENTS USED FOR LETTER TOLERANCES ARE: RC, RN, AND RU.
6. WATTAGE FOR RW TYPES IS FOUND IN THE JAN SPECIFICATIONS UNDER CHARACTERISTICS.

TM RC

Figure 109. Resistor color codes.



NOTES:

1. FOR 120 VOLT OUTPUT JUMPER 3 AND 4, 5 AND 6 ON A-C TERMINAL BLOCK.
2. FOR 240 VOLT OUTPUT JUMPER 4 AND 5, ON A-C TERMINAL BLOCK.
3. UNLESS OTHERWISE NOTED, CAPACITORS ARE IN UF.
4. UNLESS OTHERWISE NOTED, RESISTORS ARE IN OHMS.

TM 264A-7

Figure 110. Power unit PE–95–G, wiring diagram.

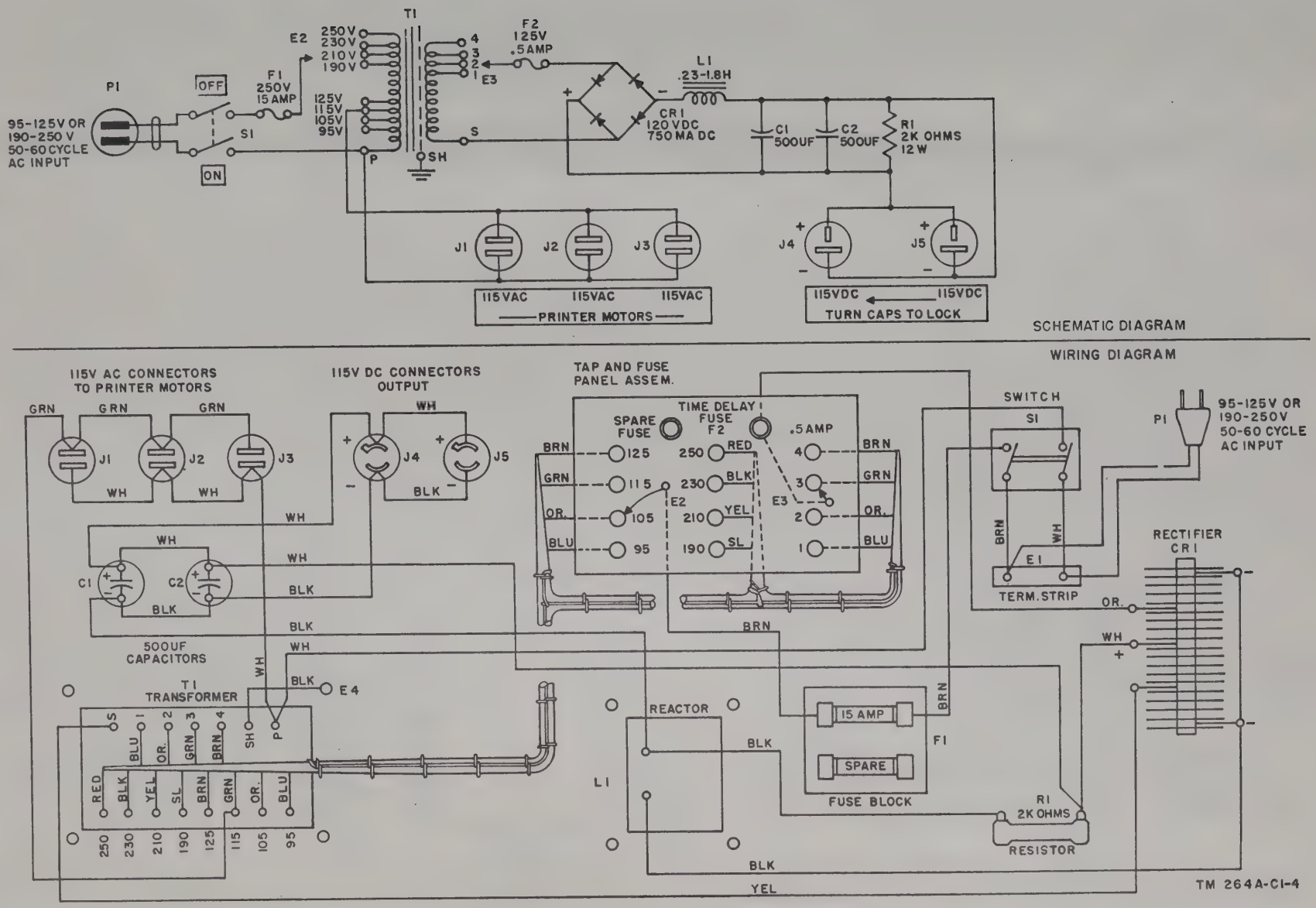


Figure 111. Rectifier RA–87–(*), schematic diagram.

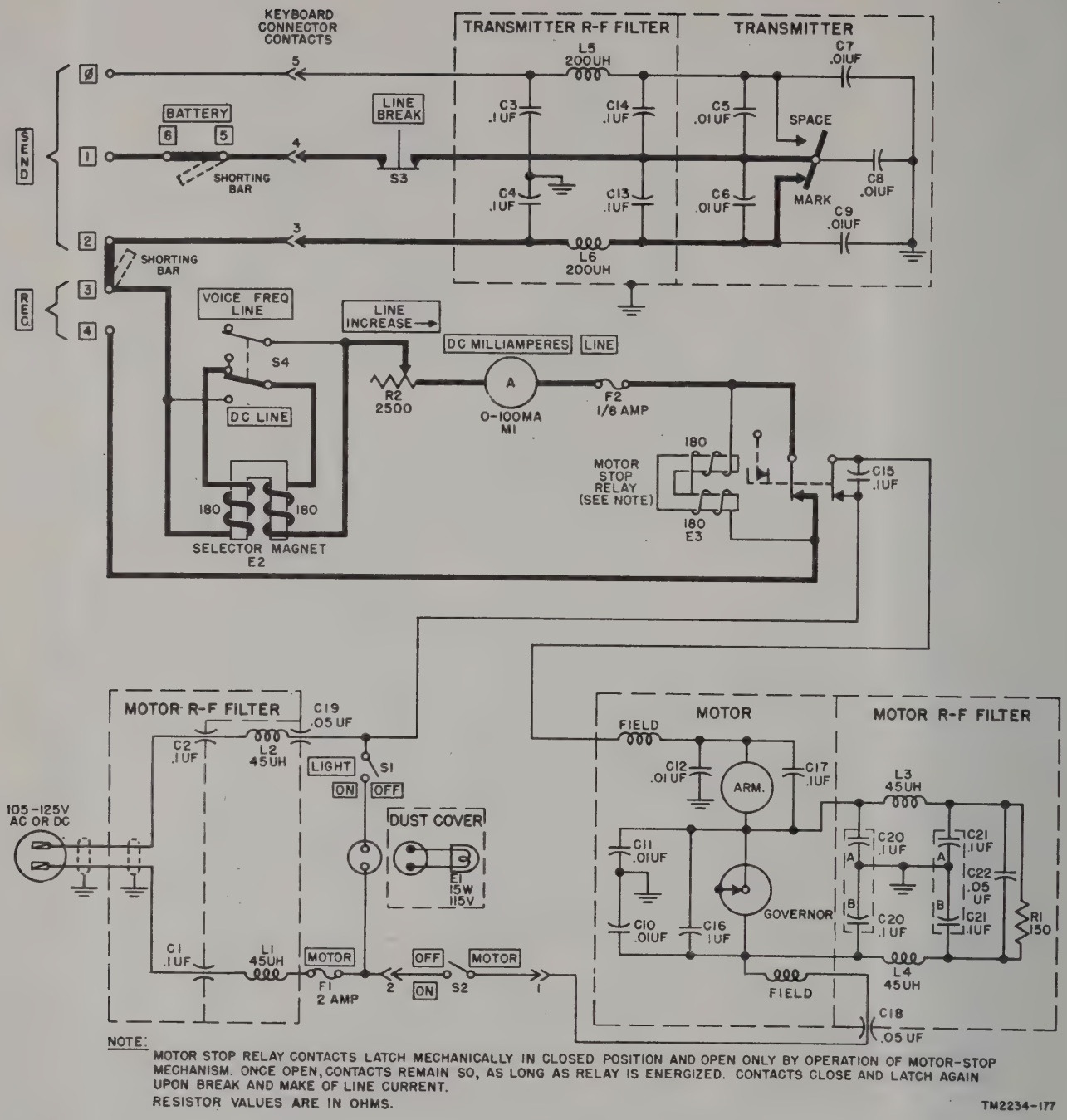
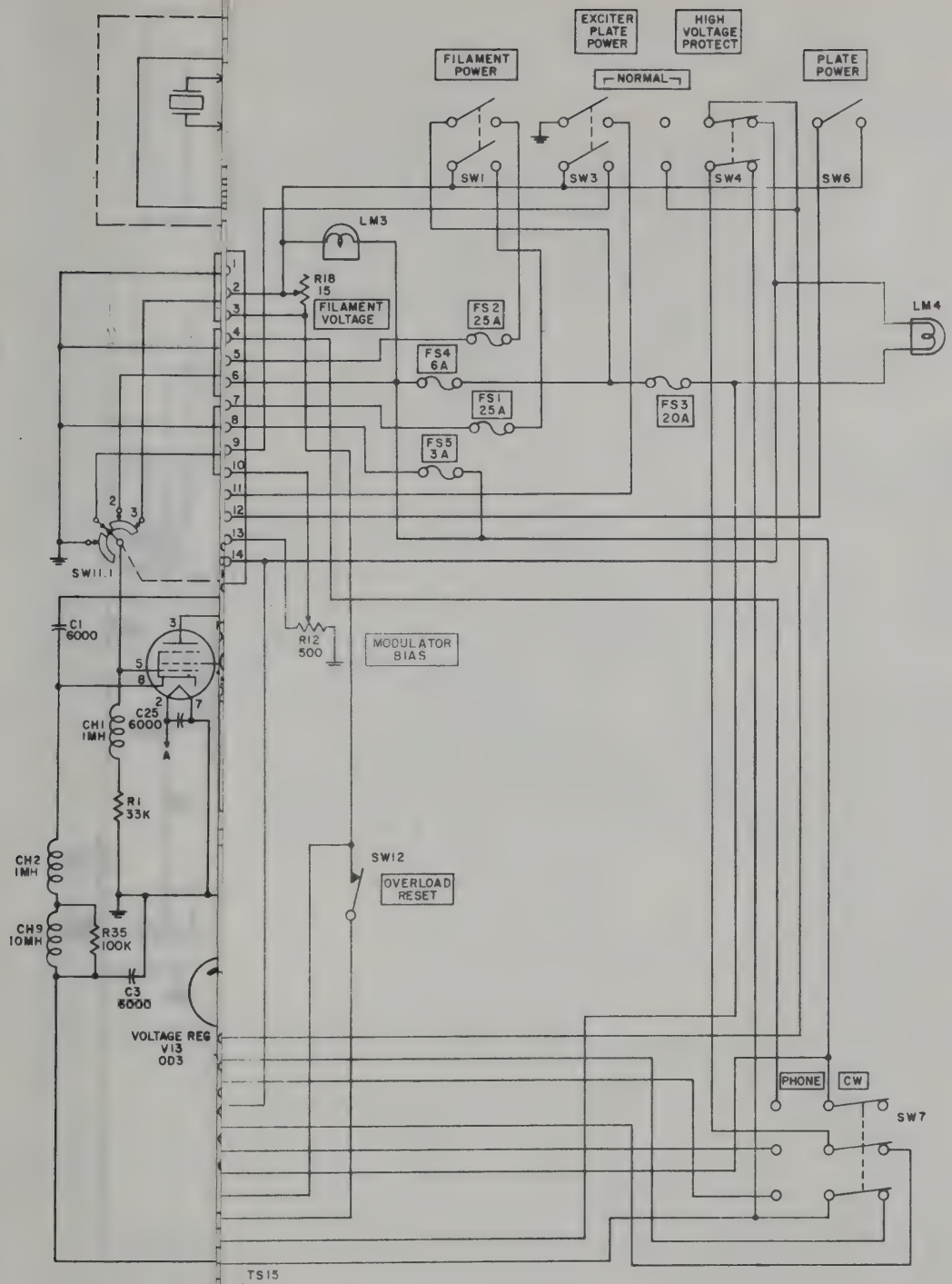
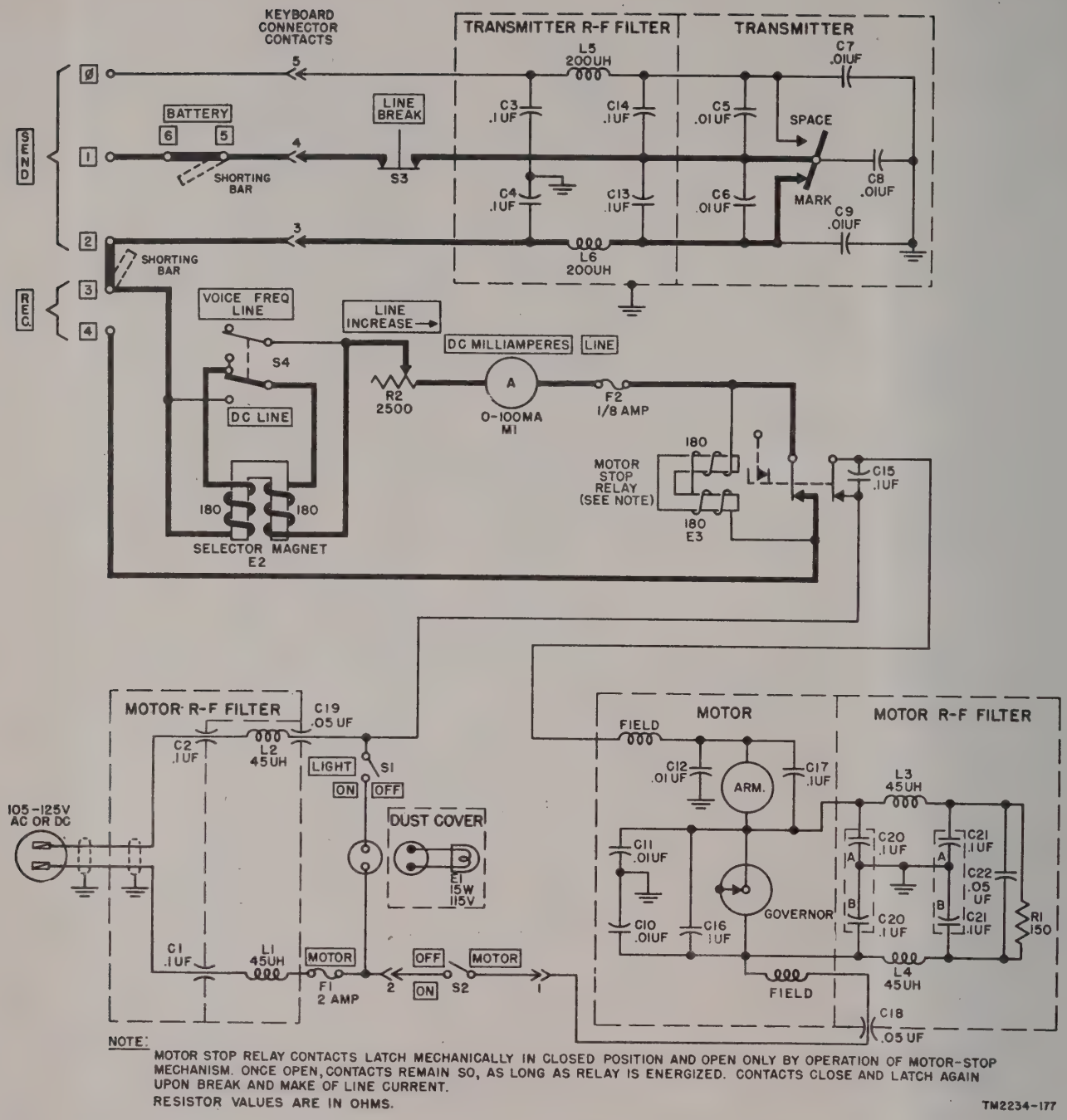


Figure 116. Teletypewriter TT-4A/TG, schematic diagram.



NOTES:

1. UNLESS OTHERW
CAPACITORS ARE
RESISTORS ARE
2. FOR CONVENTIONA
FOR REMOTE CON
3. THIS DIAGRAM A
ON ORDER NO. 1



NOTE:
MOTOR STOP RELAY CONTACTS LATCH MECHANICALLY IN CLOSED POSITION AND OPEN ONLY BY OPERATION OF MOTOR-STOP MECHANISM. ONCE OPEN, CONTACTS REMAIN SO, AS LONG AS RELAY IS ENERGIZED. CONTACTS CLOSE AND LATCH AGAIN UPON BREAK AND MAKE OF LINE CURRENT.
RESISTOR VALUES ARE IN OHMS.

TM2234-177

Figure 116. Teletypewriter TT-4A/TG, schematic diagram.

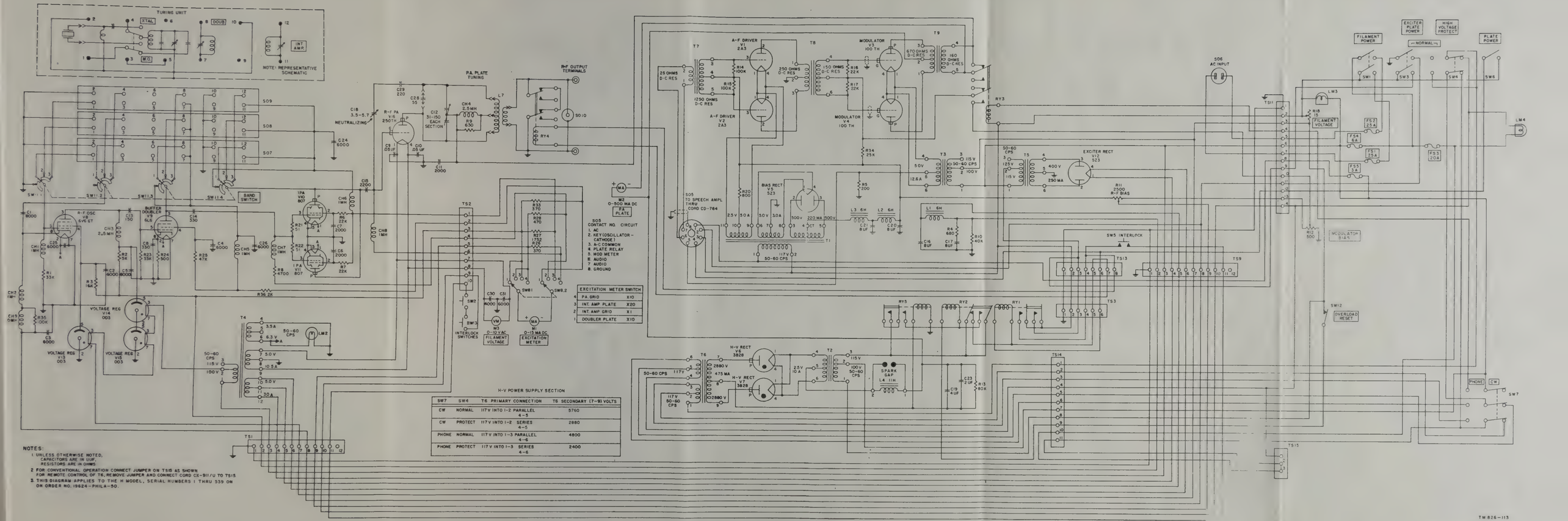
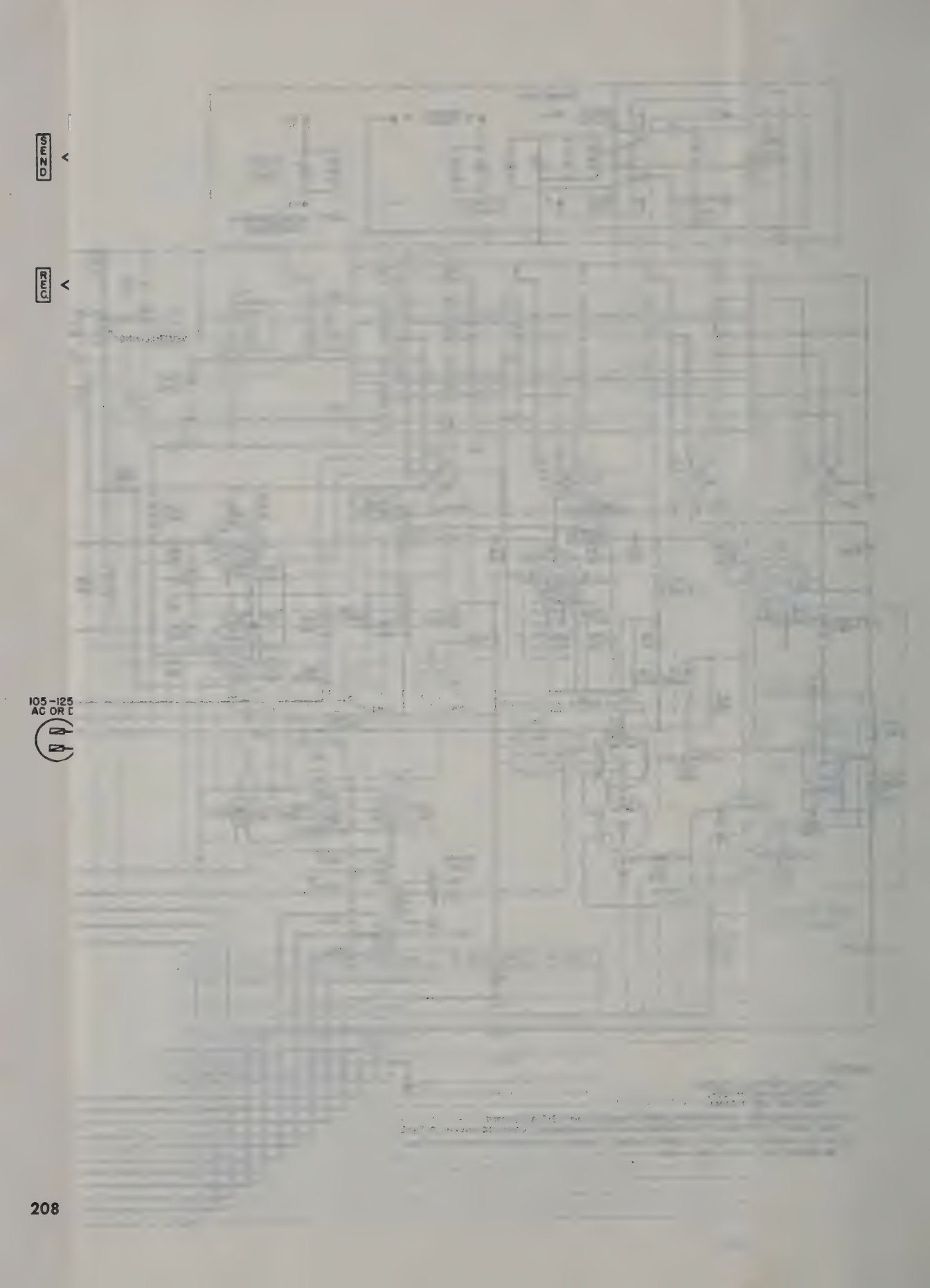
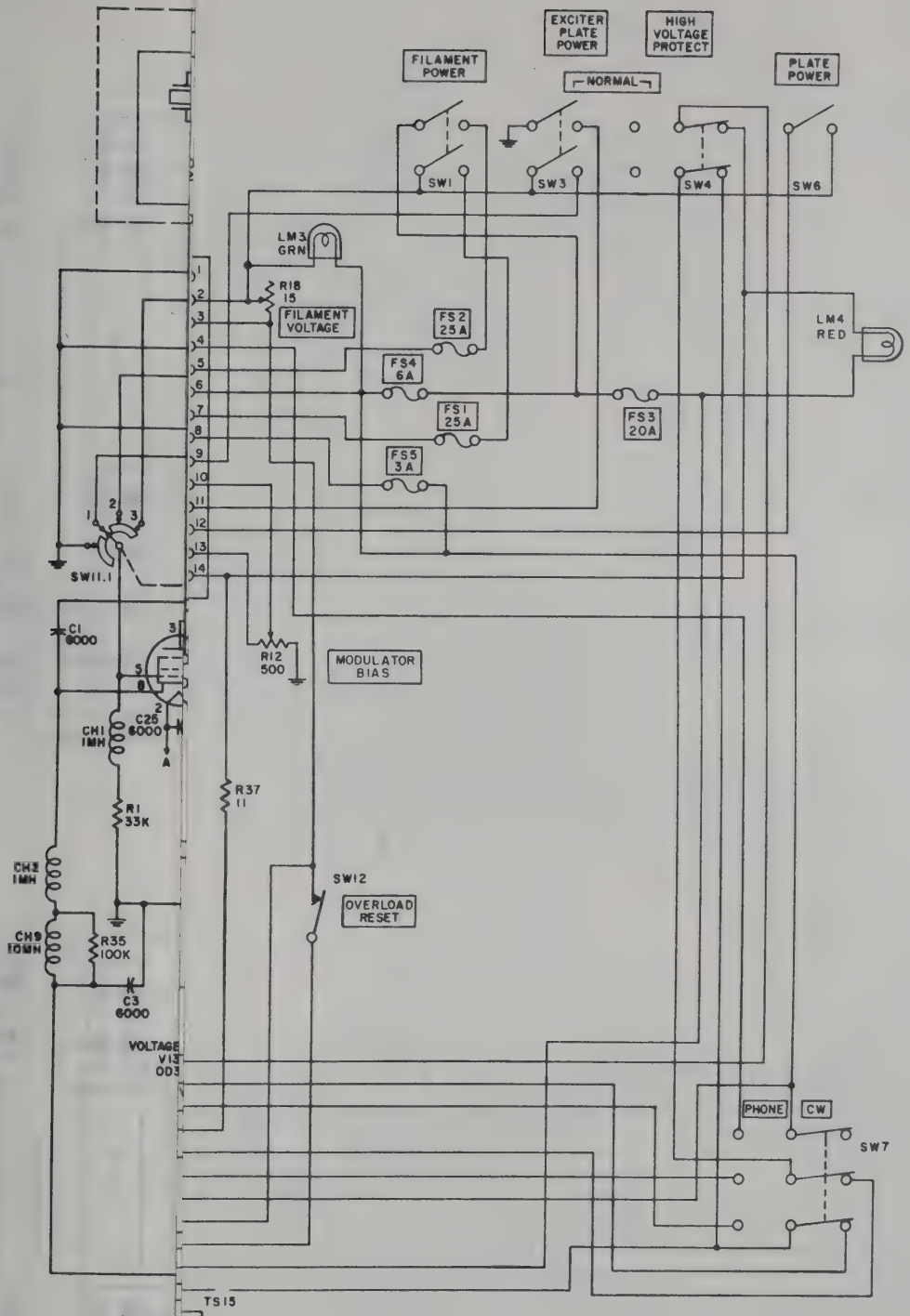


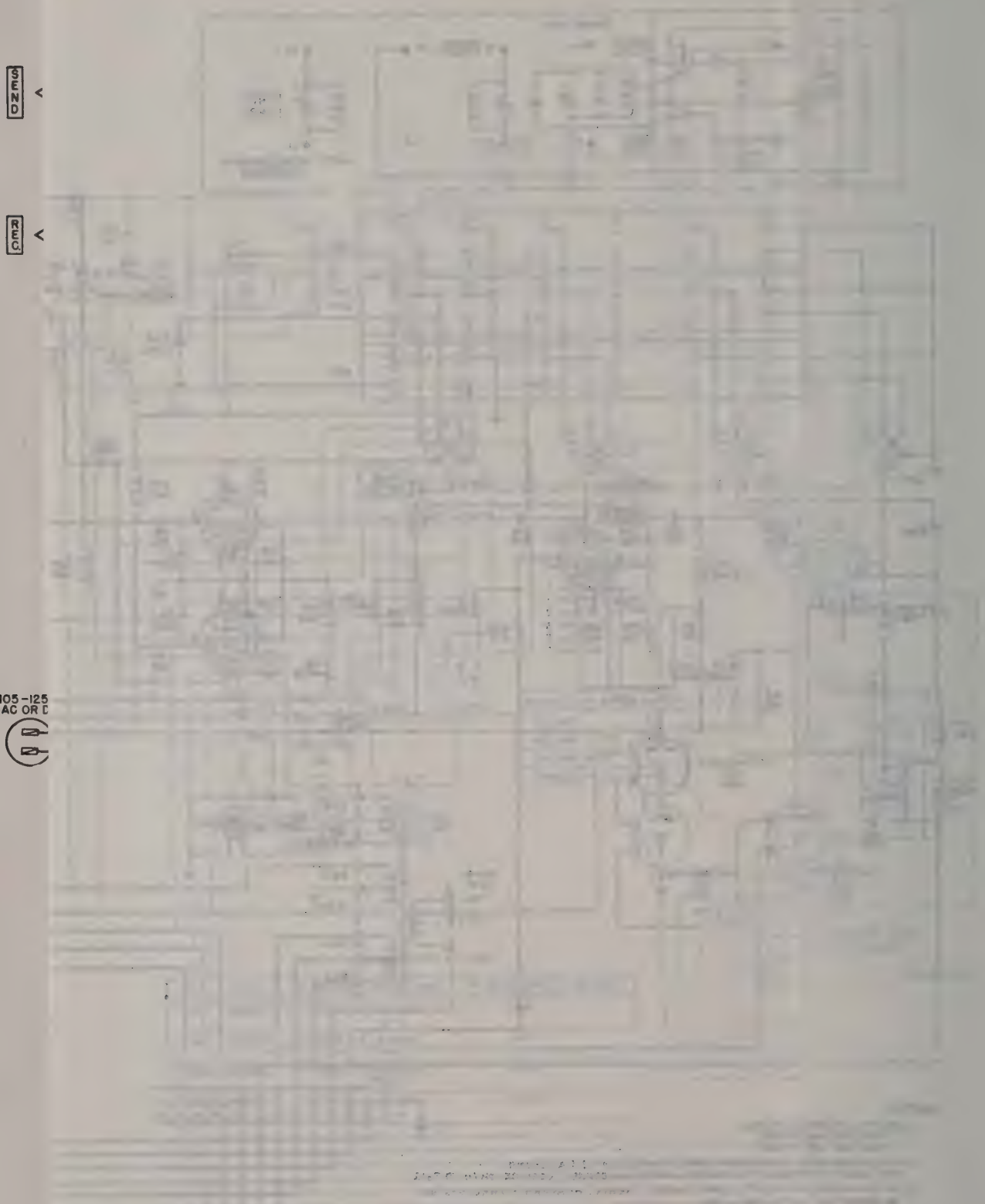
Figure 112. Radio Transmitter BC-610-H, schematic diagram.

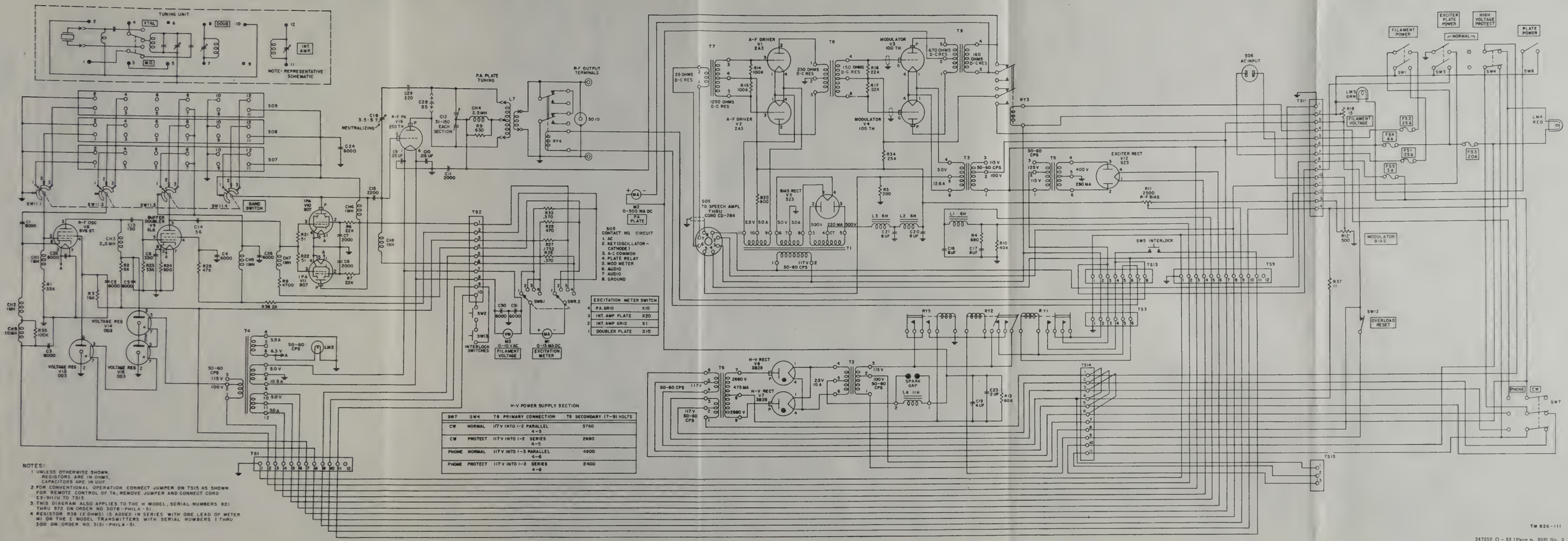
247250 O - 53 (Face p. 208) No. 1


SEND
REC.
105-125
AC OR D


EXCITER PLATE POWER
HIGH VOLTAGE PROTECT
FILAMENT POWER
NORMAL
PLATE POWER
SW1
SW3
SW4
SW6
LM3 GRN
R18 15
FILAMENT VOLTAGE
FS2 25A
FS4 6A
FS1 25A
FS5 3A
FS3 20A
LM4 RED
SW11.1
C1 6000
R12 500
MODULATOR BIAS
CH1 1MH
C25 6000
R1 33K
R37 11
CH2 1MH
CH9 10MH
R35 100K
C3 6000
SW12
OVERLOAD RESET
PHONE
CW
SW7
TS15
NOTES:
1. UNLESS OT
RESISTOL
CAPACITO
2. FOR CONVE
FOR REMO
CX-911/U T
3. THIS DIAG
THRU 972
4. RESISTOR
MI ON THE
300 ON O

TM 826-111


SEND
REC
105-125
AC OR D



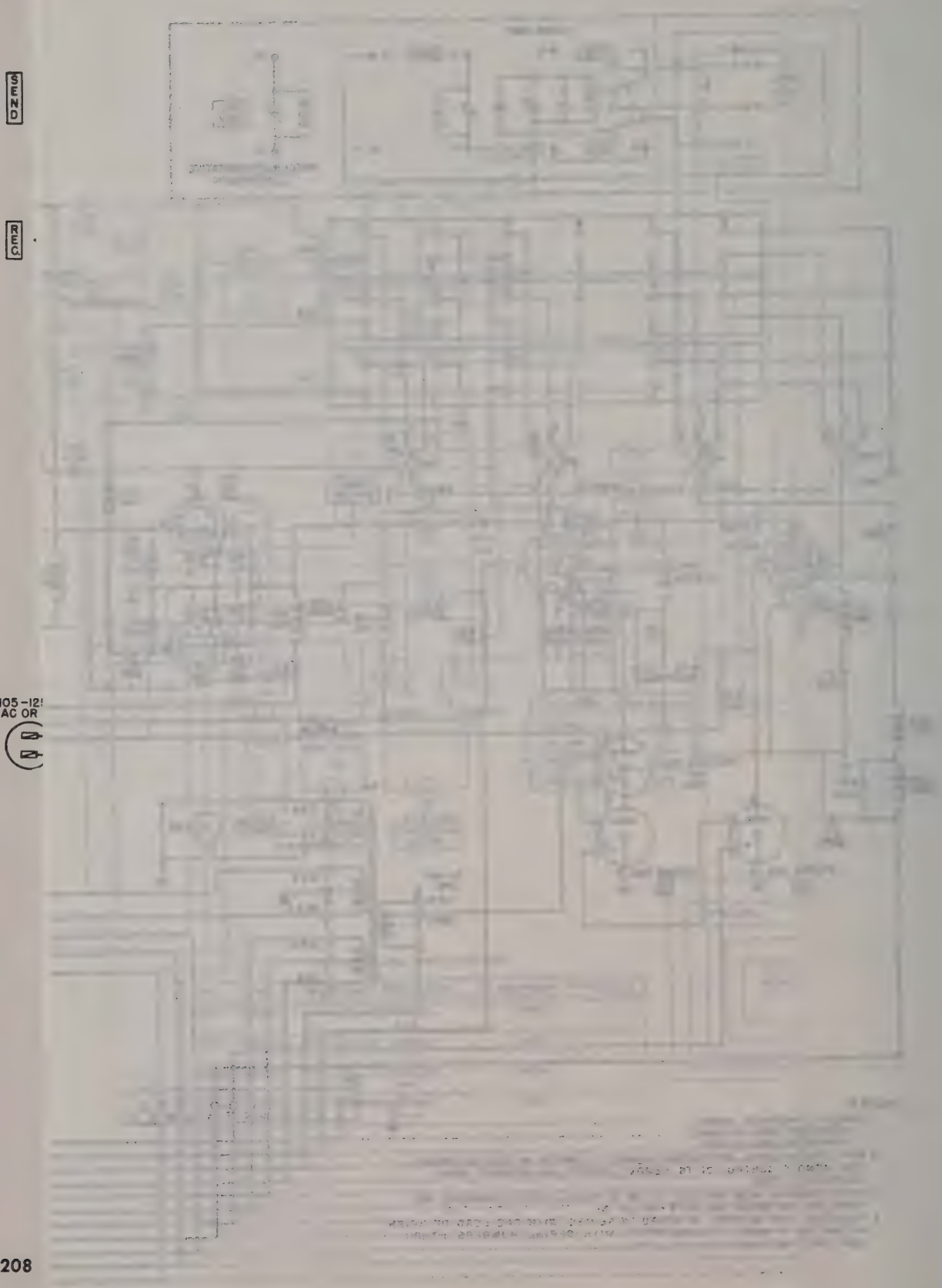
EXCITATION METER SWITCH	
4 P.A. GRID	X10
3 INT. AMP PLATE	X20
2 INT. AMP GRID	X1
1 DOUBLER PLATE	X10

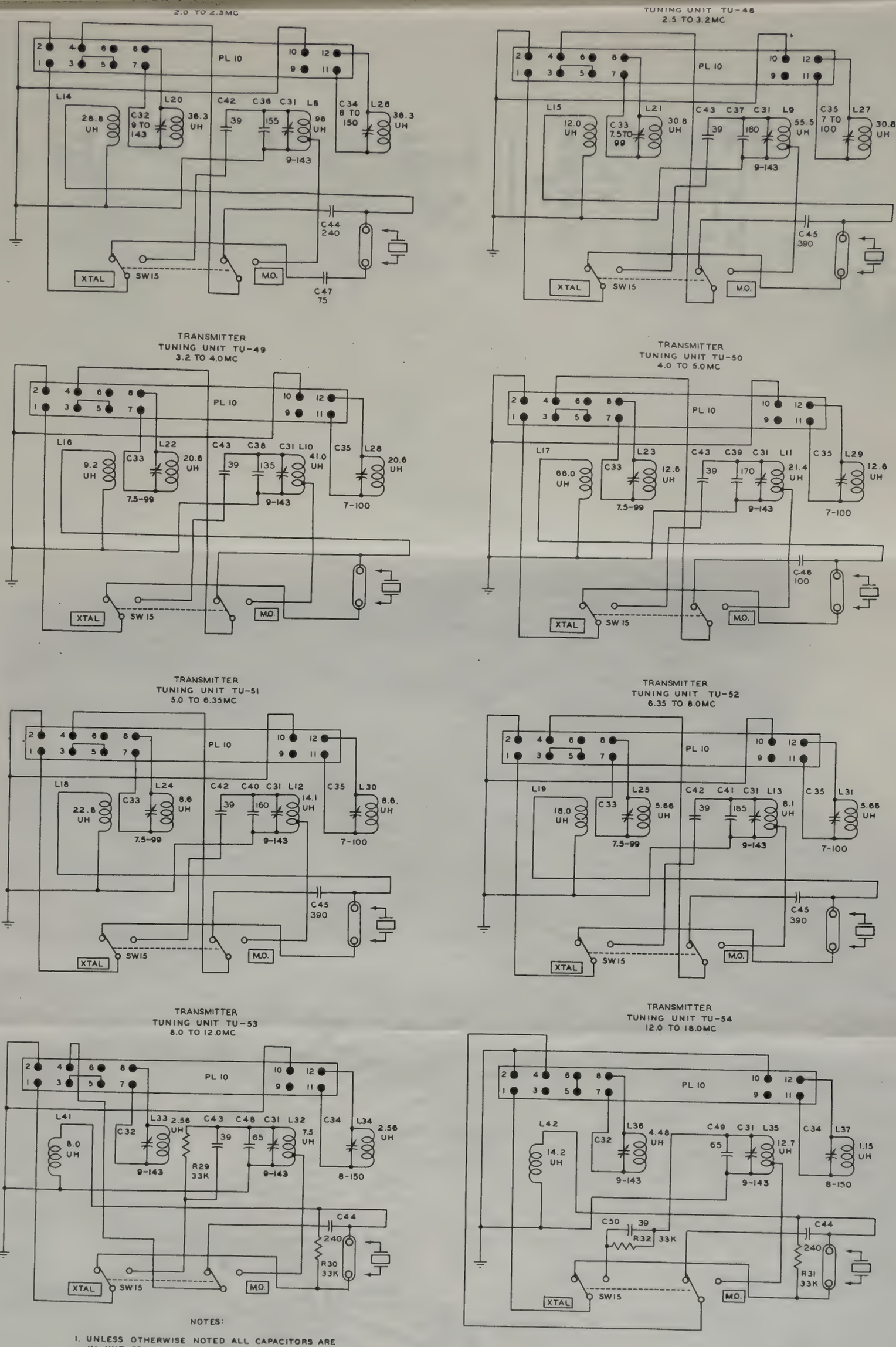
SW7	SW4	T6 PRIMARY CONNECTION	T6 SECONDARY (7–9) VOLTS
CW	NORMAL	117 V INTO 1–2 PARALLEL 4–5	5760
CW	PROTECT	117 V INTO 1–2 SERIES 4–5	2880
PHONE	NORMAL	117 V INTO 1–3 PARALLEL 4–6	4800
PHONE	PROTECT	117 V INTO 1–3 SERIES 4–6	2400

H-V POWER SUPPLY SECTION

NOTES:
1. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
2. FOR CONVENTIONAL OPERATION CONNECT JUMPER ON TS15 AS SHOWN FOR REMOTE CONTROL OF T6, REMOVE JUMPER AND CONNECT CORD CX-911/U TO TS15.
3. THIS DIAGRAM ALSO APPLIES TO THE H MODEL, SERIAL NUMBERS 821 THRU 972 ON ORDER NO. 3078-PHILA-51.
4. RESISTOR R38 (2 OHMS) IS ADDED IN SERIES WITH ONE LEAD OF METER M1 ON THE E MODEL TRANSMITTERS WITH SERIAL NUMBERS 1 THRU 300 ON ORDER NO. 3131-PHILA-51.

Figure 113. Radio Transmitter BC-610–I, schematic diagram.


SEND
REC.
105-12
AC OR



NOTES:

1. UNLESS OTHERWISE NOTED ALL CAPACITORS ARE IN UUF. ALL RESISTORS ARE IN OHMS.
2. PLUG STRIP PL 10 SHOWN ON PRONG SIDE.

Figure 114. Radio Transmitter BC-610-(*) tuning units, schematic diagram.

TM 828-45

SEND
REC
105-12
AC OR

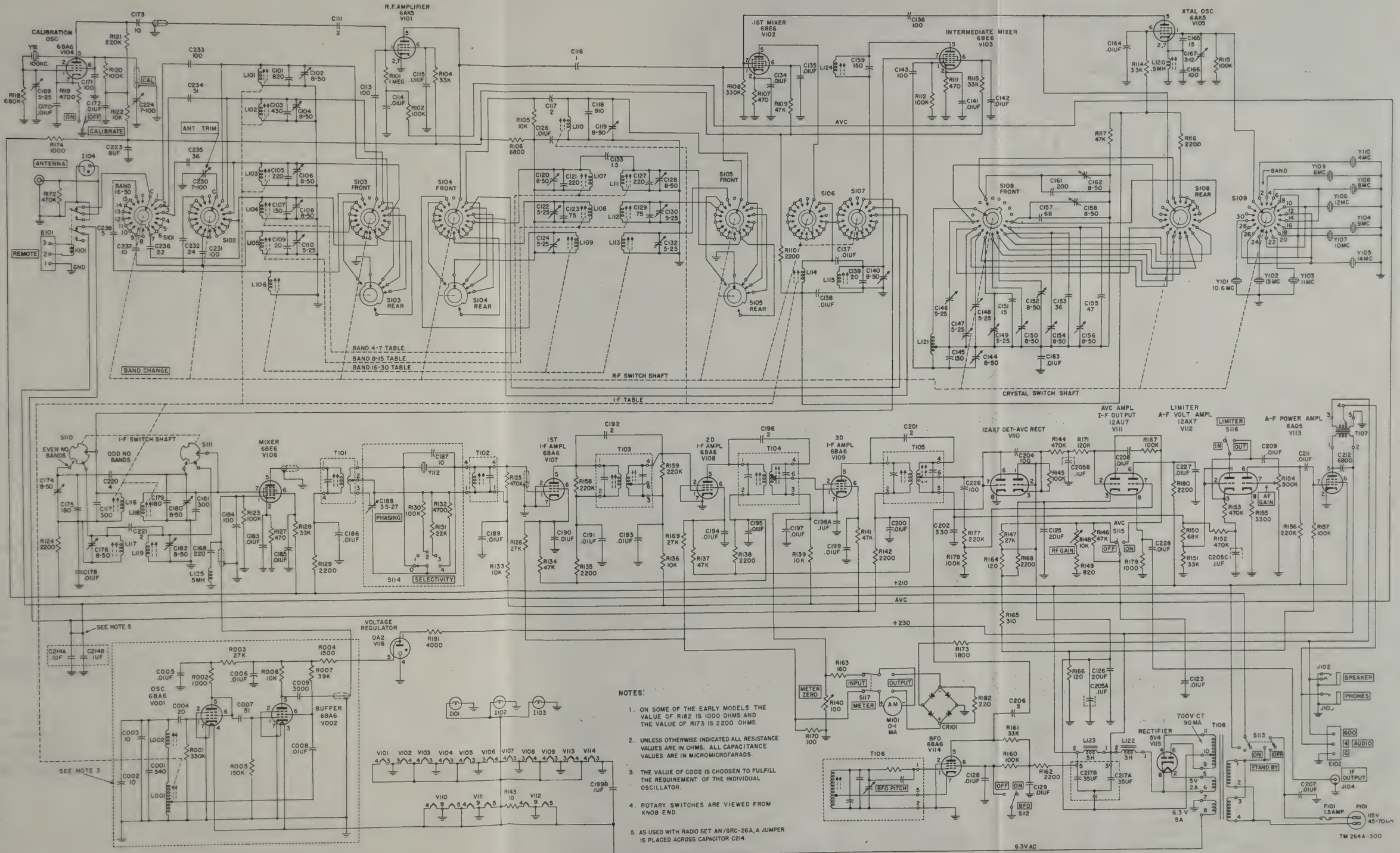
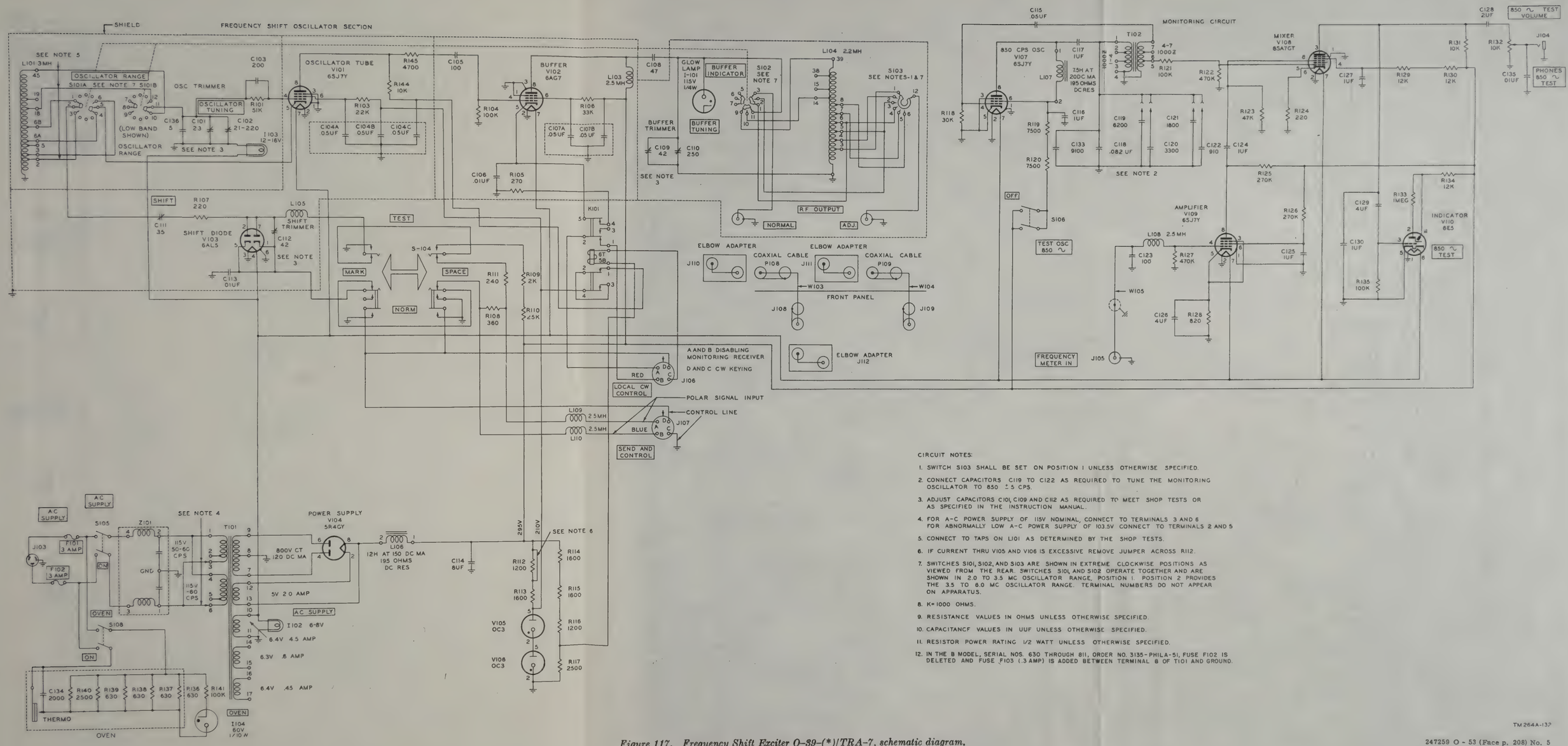


Figure 115. Radio Receiver R-388/URR, schematic diagram.


SEND
REC
105-12
AC OR

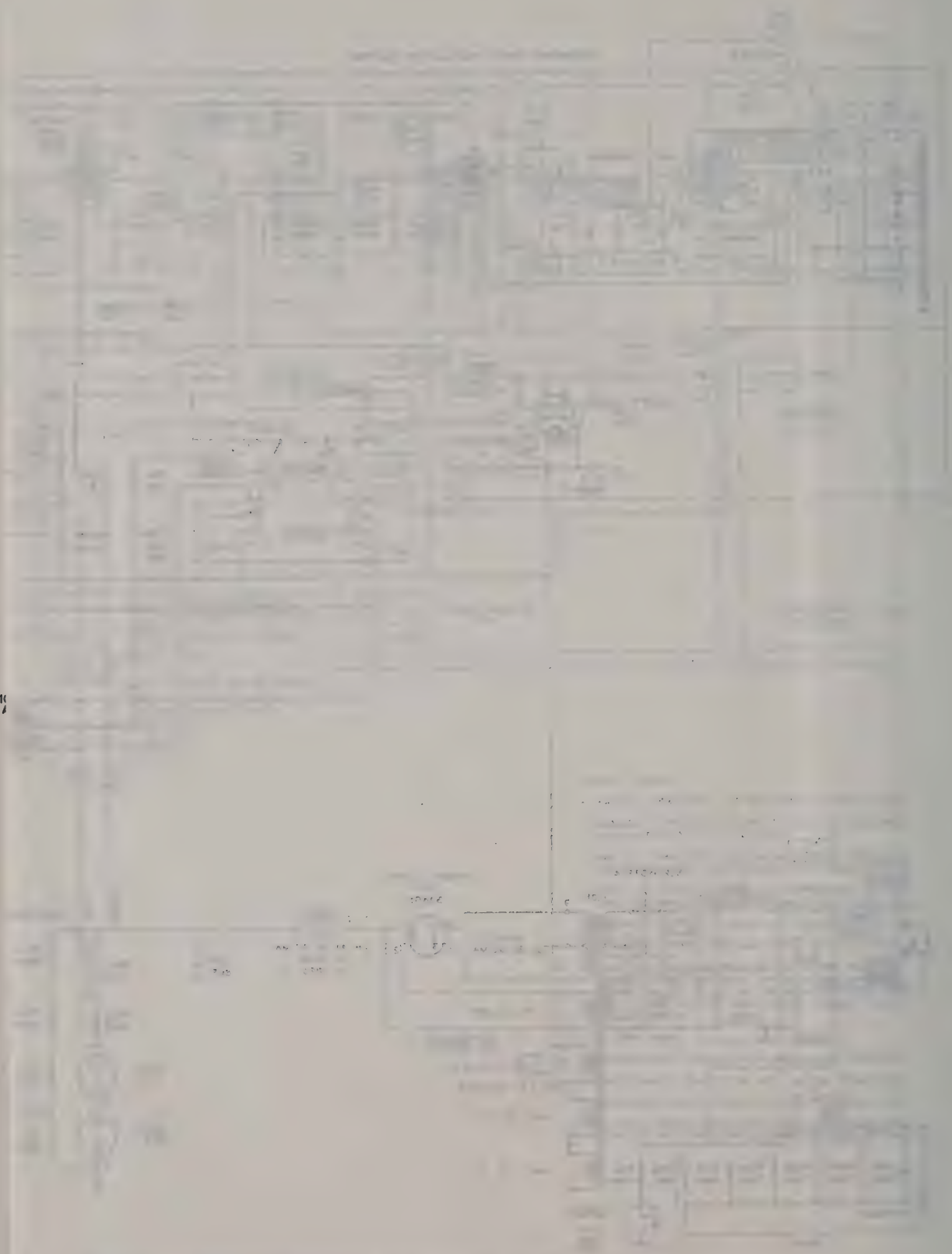


CIRCUIT NOTES:

1. SWITCH S103 SHALL BE SET ON POSITION 1 UNLESS OTHERWISE SPECIFIED.
2. CONNECT CAPACITORS C119 TO C122 AS REQUIRED TO TUNE THE MONITORING OSCILLATOR TO 850 ± 5 CPS.
3. ADJUST CAPACITORS C101, C109 AND C112 AS REQUIRED TO MEET SHOP TESTS OR AS SPECIFIED IN THE INSTRUCTION MANUAL.
4. FOR A-C POWER SUPPLY OF 115V NOMINAL, CONNECT TO TERMINALS 3 AND 6 FOR ABNORMALLY LOW A-C POWER SUPPLY OF 103.5V CONNECT TO TERMINALS 2 AND 5
5. CONNECT TO TAPS ON L101 AS DETERMINED BY THE SHOP TESTS.
6. IF CURRENT THRU V105 AND V106 IS EXCESSIVE REMOVE JUMPER ACROSS R112.
7. SWITCHES S101, S102, AND S103 ARE SHOWN IN EXTREME CLOCKWISE POSITIONS AS VIEWED FROM THE REAR. SWITCHES S101 AND S102 OPERATE TOGETHER AND ARE SHOWN IN 2.0 TO 3.5 MC OSCILLATOR RANGE, POSITION 1. POSITION 2 PROVIDES THE 3.5 TO 6.0 MC OSCILLATOR RANGE. TERMINAL NUMBERS DO NOT APPEAR ON APPARATUS.
8. K= 1000 OHMS.
9. RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
10. CAPACITANCF VALUES IN UUF UNLESS OTHERWISE SPECIFIED.
11. RESISTOR POWER RATING 1/2 WATT UNLESS OTHERWISE SPECIFIED.
12. IN THE B MODEL, SERIAL NOS. 630 THROUGH 811, ORDER NO. 3135-PHILA-51, FUSE F102 IS DELETED AND FUSE F103 (.3 AMP) IS ADDED BETWEEN TERMINAL 8 OF T101 AND GROUND.

Figure 117. Frequency Shift Exciter O-89-(*)/TRA-7, schematic diagram.

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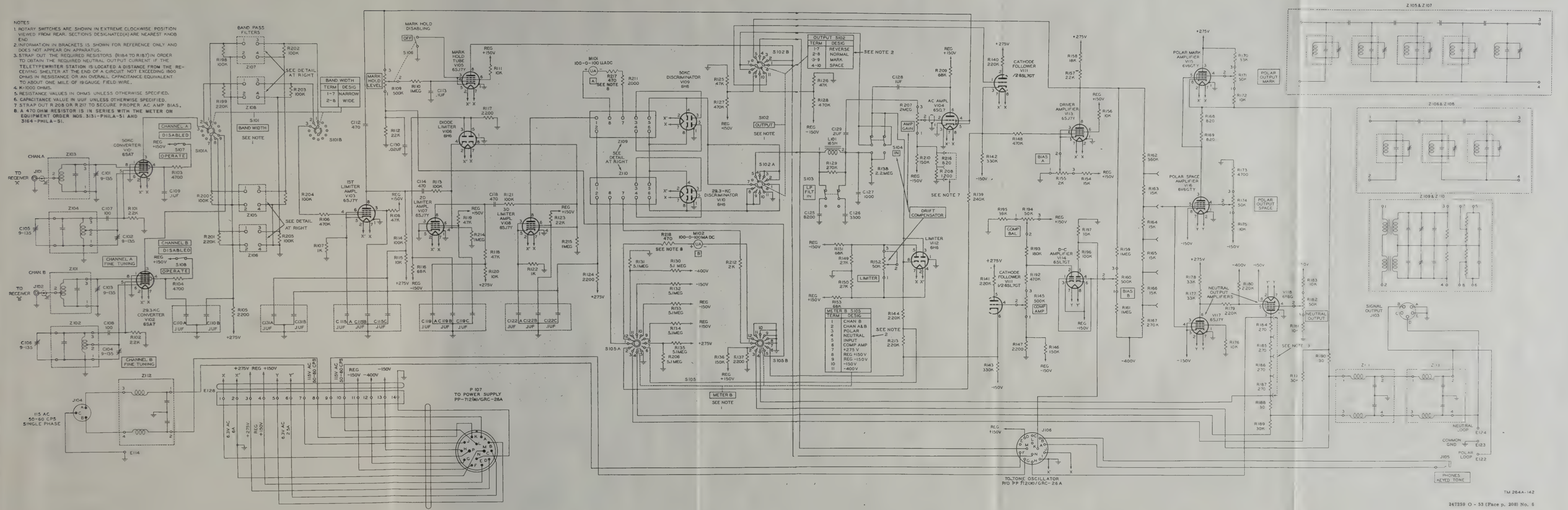
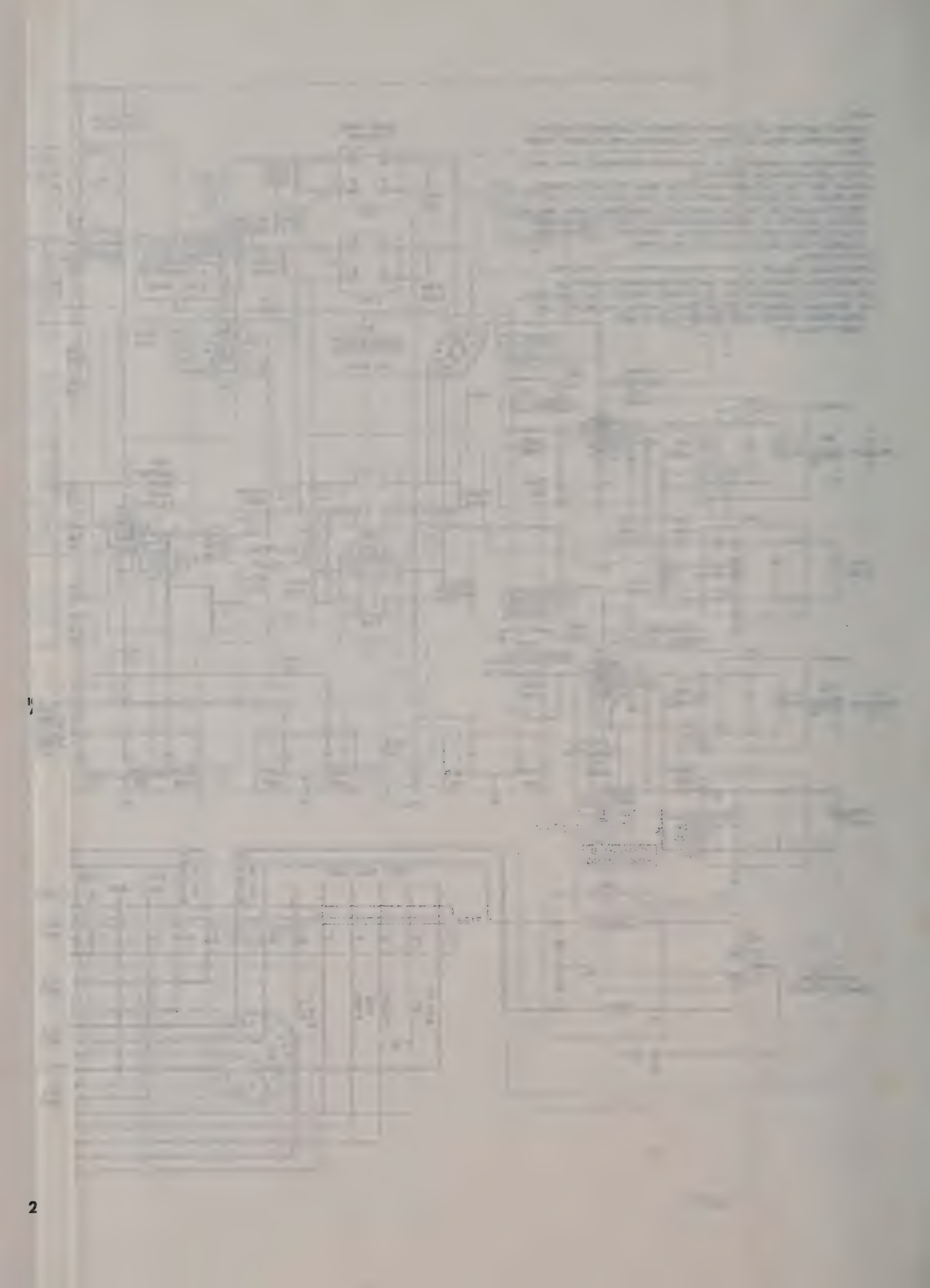


Figure 118. Frequency Shift Converter CV-132-(*)/GRC-26A, schematic diagram.



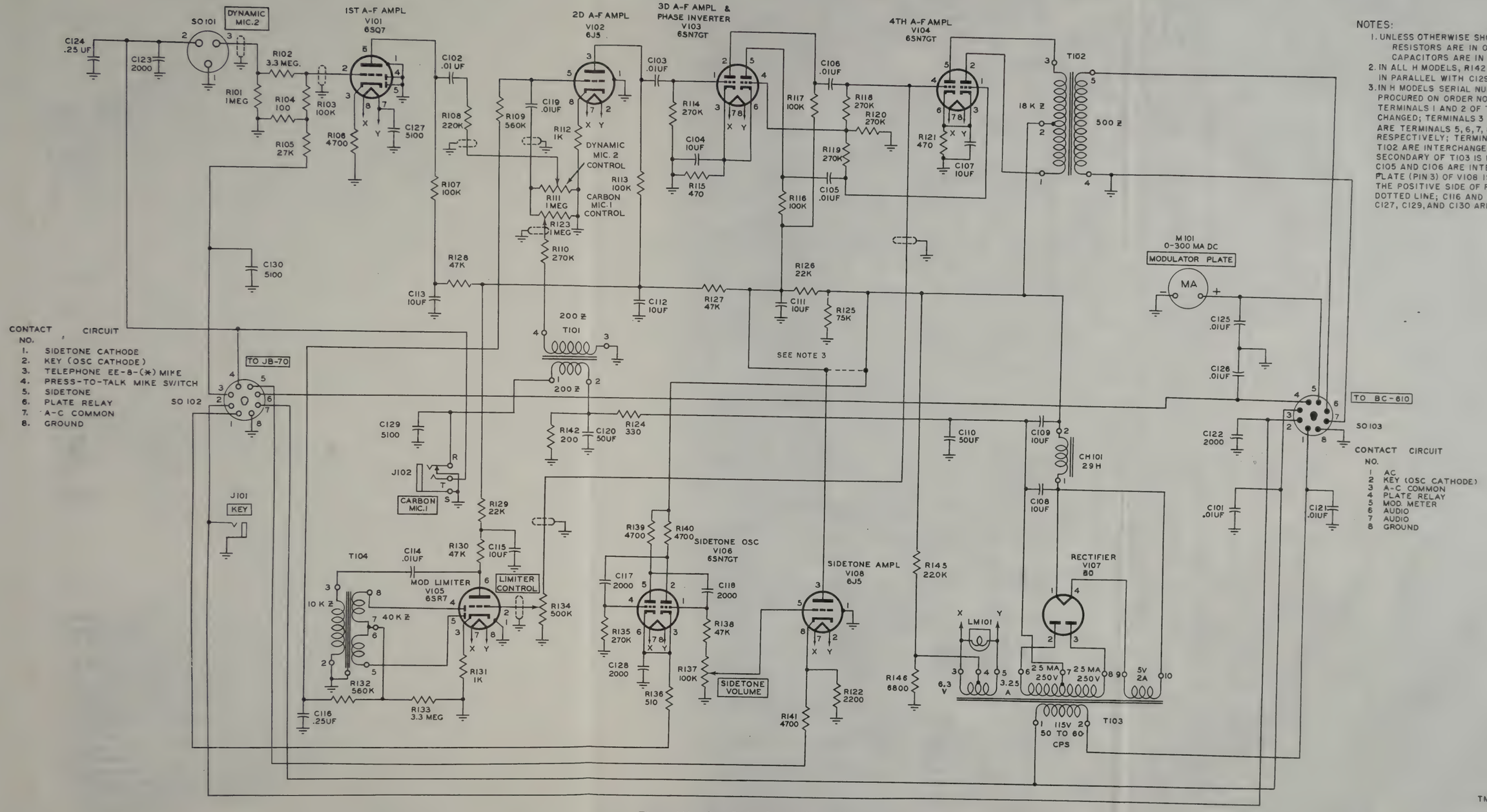
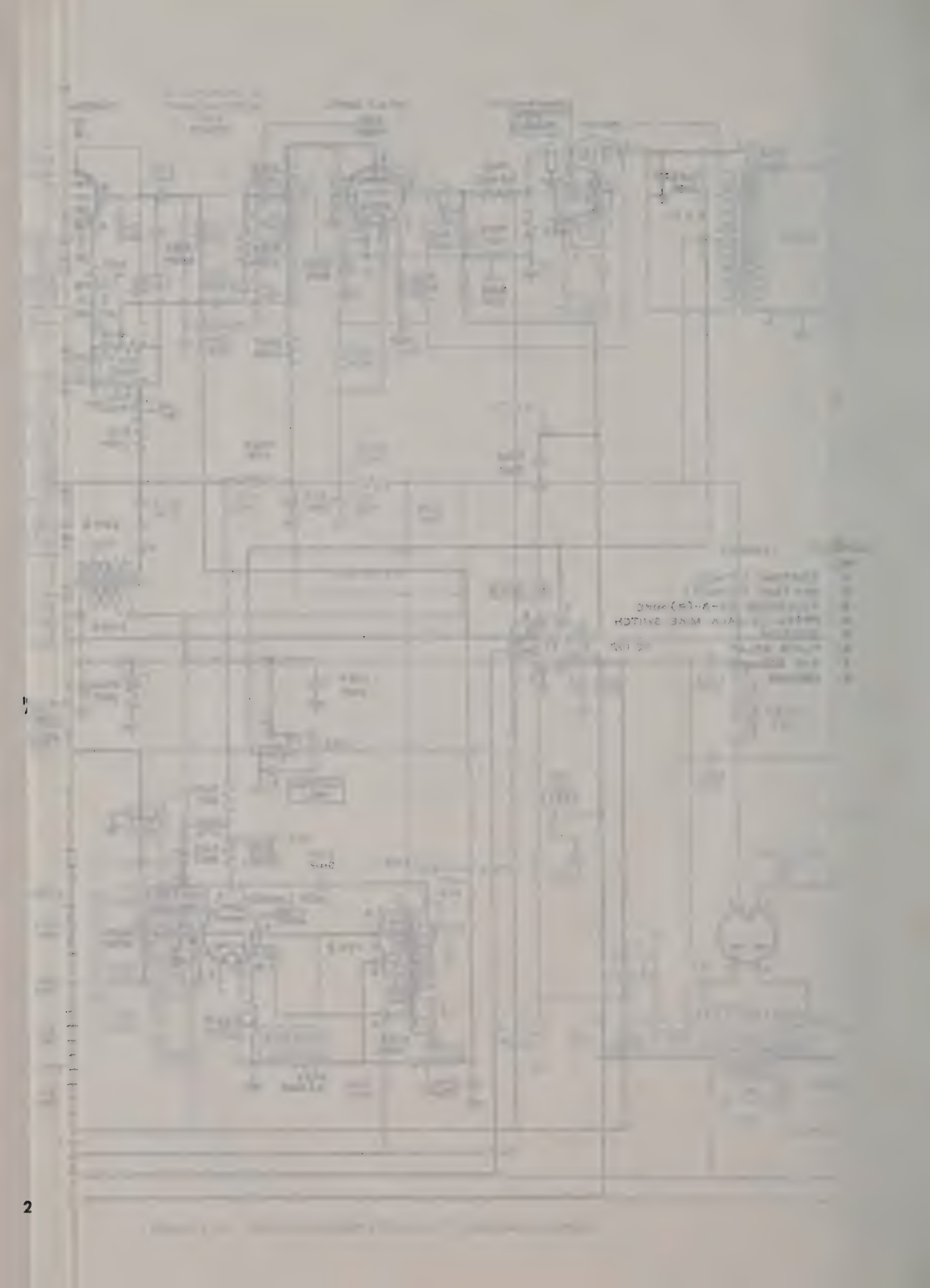


Figure 119. Speech Amplifier BC-614-(*), schematic diagram.

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TT TRANSPOSE S1	
TERM	DESIGNATION
1-4-7-11	LEFT REC RIGHT SEND
3-6-9-12	RIGHT REC LEFT SEND

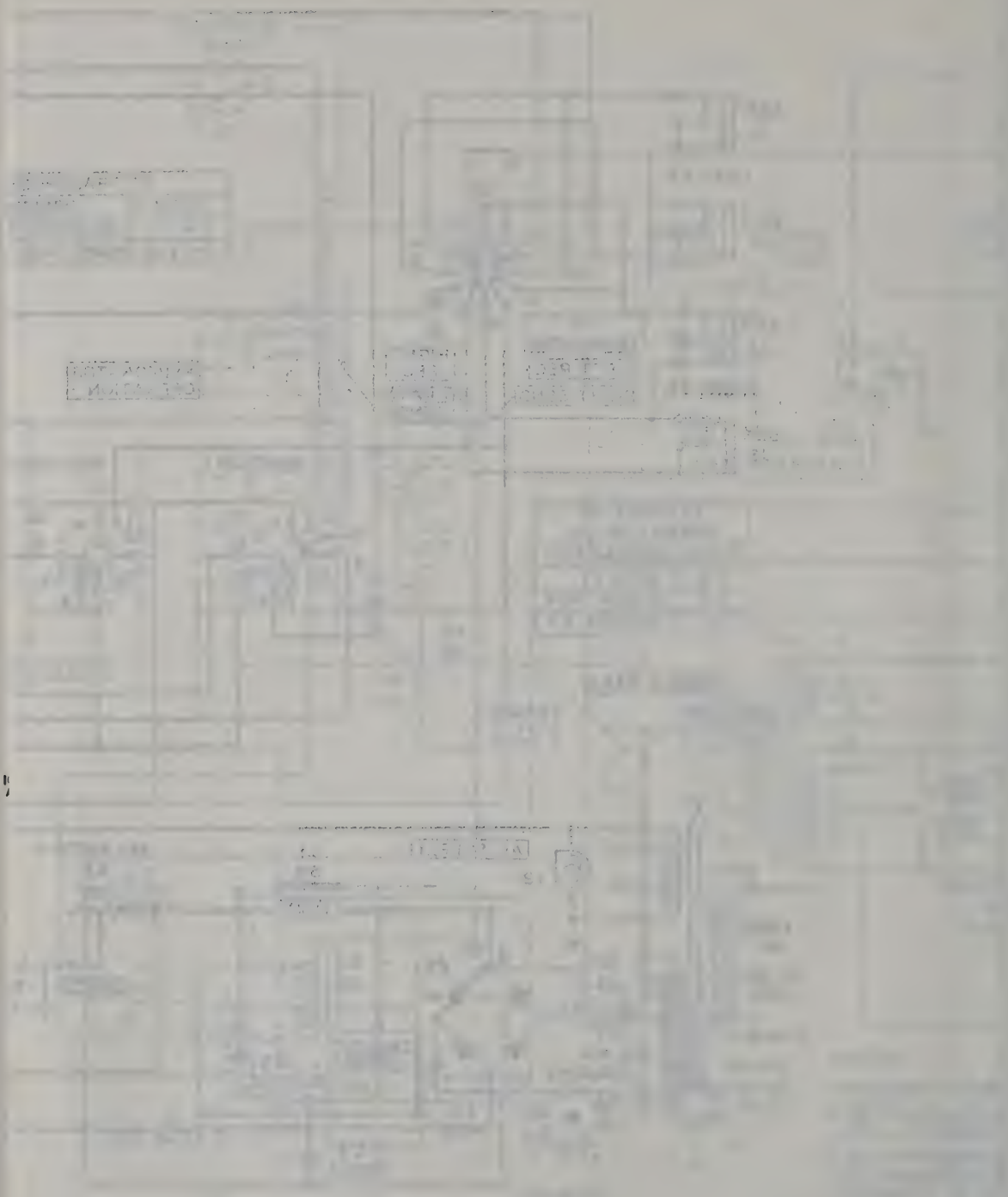
PERFORATOR OPERATION S2	
TERM	DESIGNATION
3-9	SEND TT
2-8	PUNCH TAPE
1-7	RECEIVE TT

NOTES

1. UNLESS OTHERWISE NOTED, RESISTORS ARE IN OHMS.
2. SWITCHES ARE VIEWED FROM END OPPOSITE THE CONTROL KNOB. SEC. 1 IS NEAREST KNOB END.
3. FOR ABNORMALLY LOW AC POWER SUPPLY CONNECT TO TERM 2 OF TRANSFORMER T2. FOR ABNORMALLY HIGH AC POWER SUPPLY CONNECT TO TERM 4 OF TRANSFORMER T2.
4. TO COMPENSATE FOR RECTIFIER CR1 AGING CONNECT TO TERM 5 OR 6 OF TRANSFORMER T1, AS REQUIRED.
5. ADJUST R10 & R3 TO SET FRONT PANEL CONTROLS, MARK & SPACE, RESPECTIVELY IN CENTER OF THEIR RANGE UNDER NORMAL OPERATING CONDITIONS.
6. R5 IS METER CALIBRATION CONTROL. METER READS $\frac{3}{1000}$ OF ACTUAL CIRCUIT CURRENT.
7. RELAY 01 SPACE CONDITION WINDING 1&8 ENERGIZED (30 MA) CONTACTS 6&7 CLOSED. MARKED CONDITION WINDING 2&3 ENERGIZED (60 MA) CONTACTS 4&6 CLOSED.
8. IN EARLY MODELS, R12 IS OMITTED AND R9 IS 1600 OHMS.

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Figure 120. Radioteletypewriter Control C-808/GRC-26A, schematic diagram.



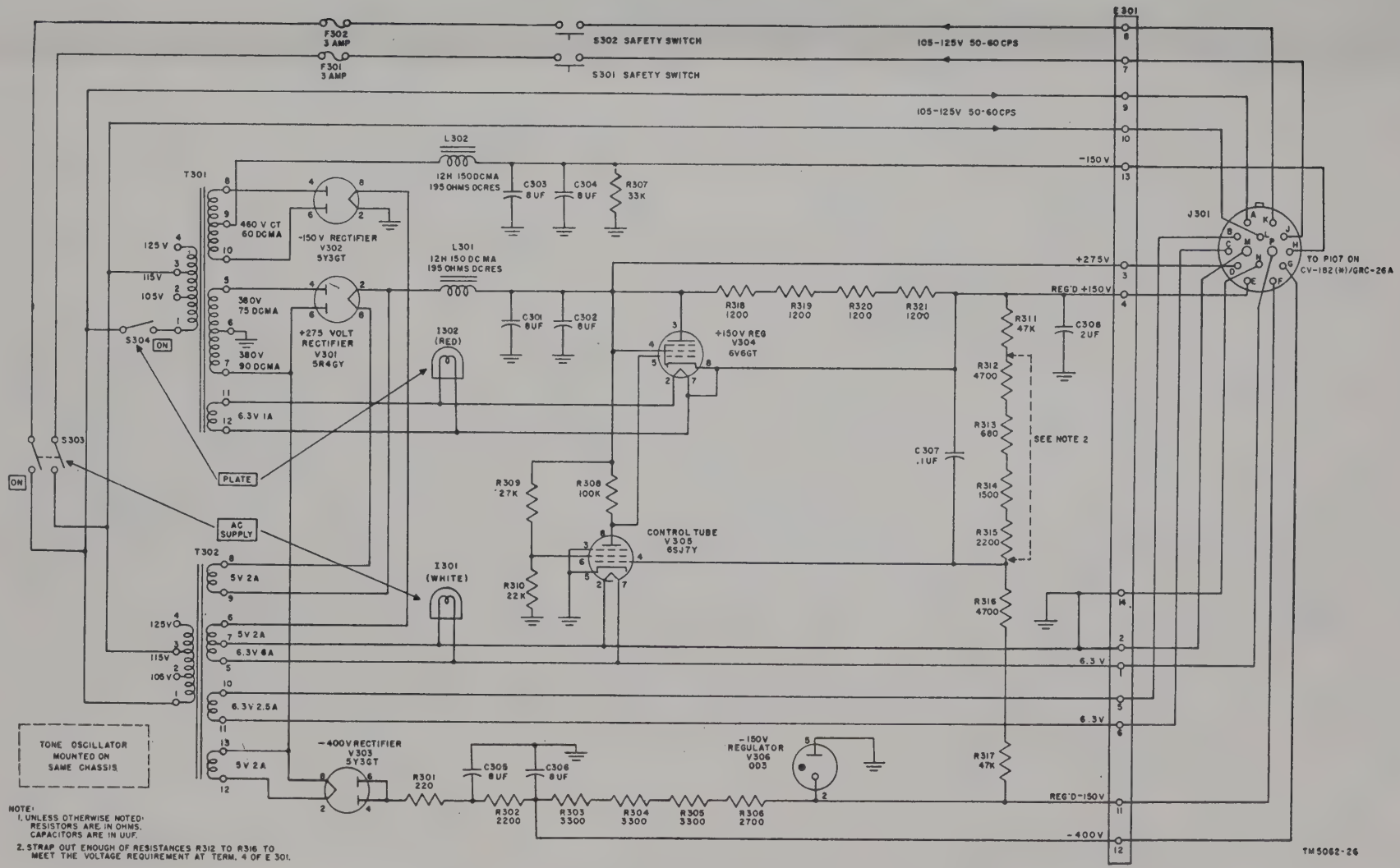


Figure 121. Power supply PP–712(*)/GRC–26A, schematic diagram.

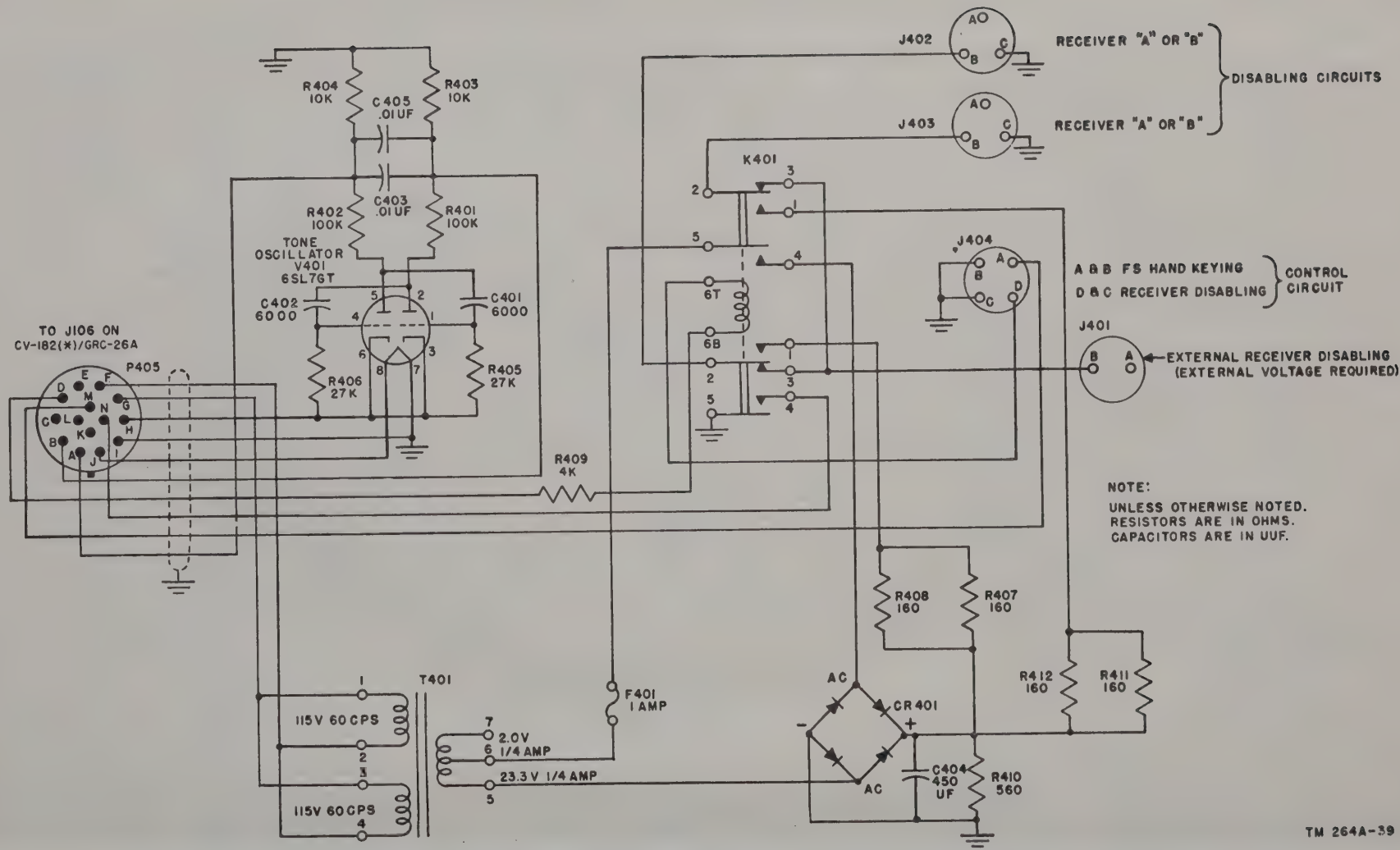


Figure 122. Power supply PP-712(*)/GRC-26A tone oscillator, schematic diagram.

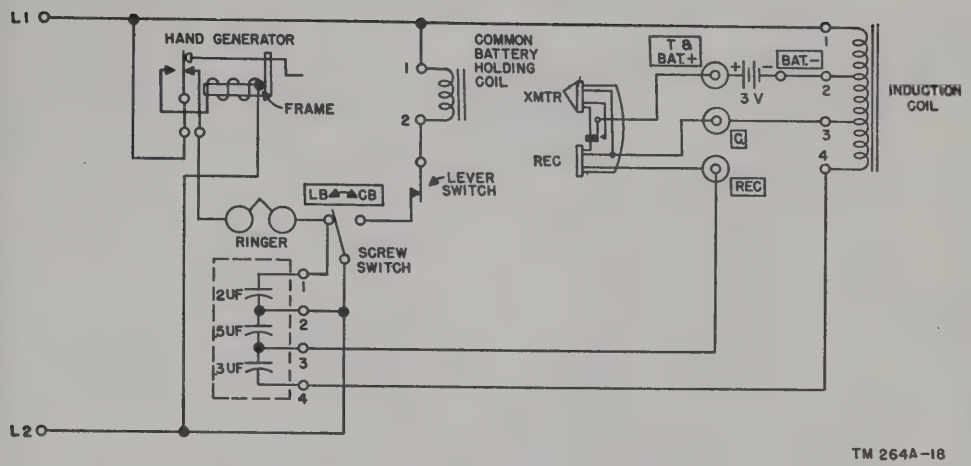


Figure 123. Telephone EE–8–B, schematic diagram.

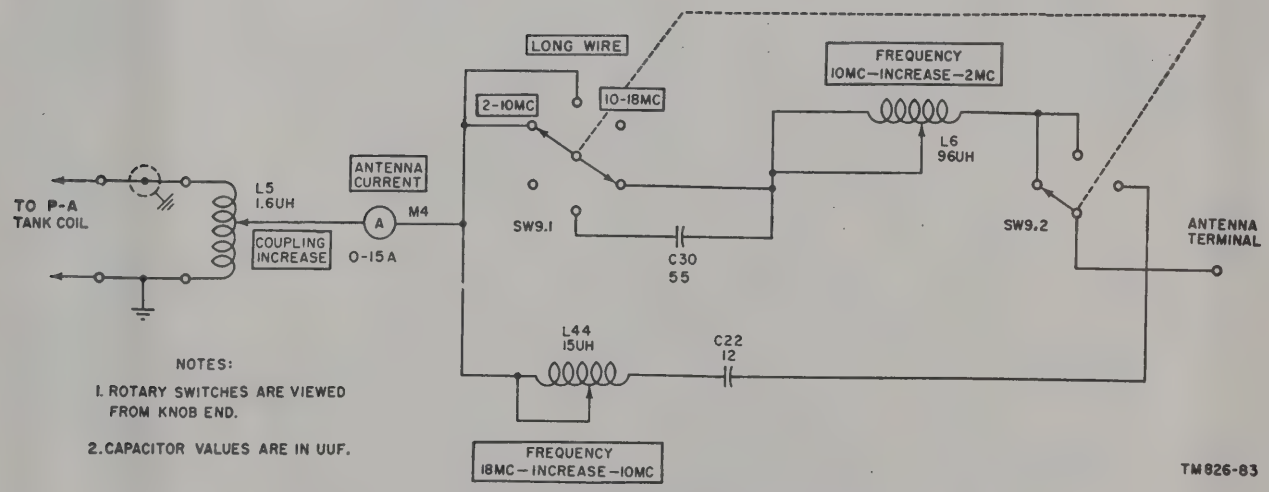


Figure 124. Antenna tuning unit BC–939–B, schematic diagram.

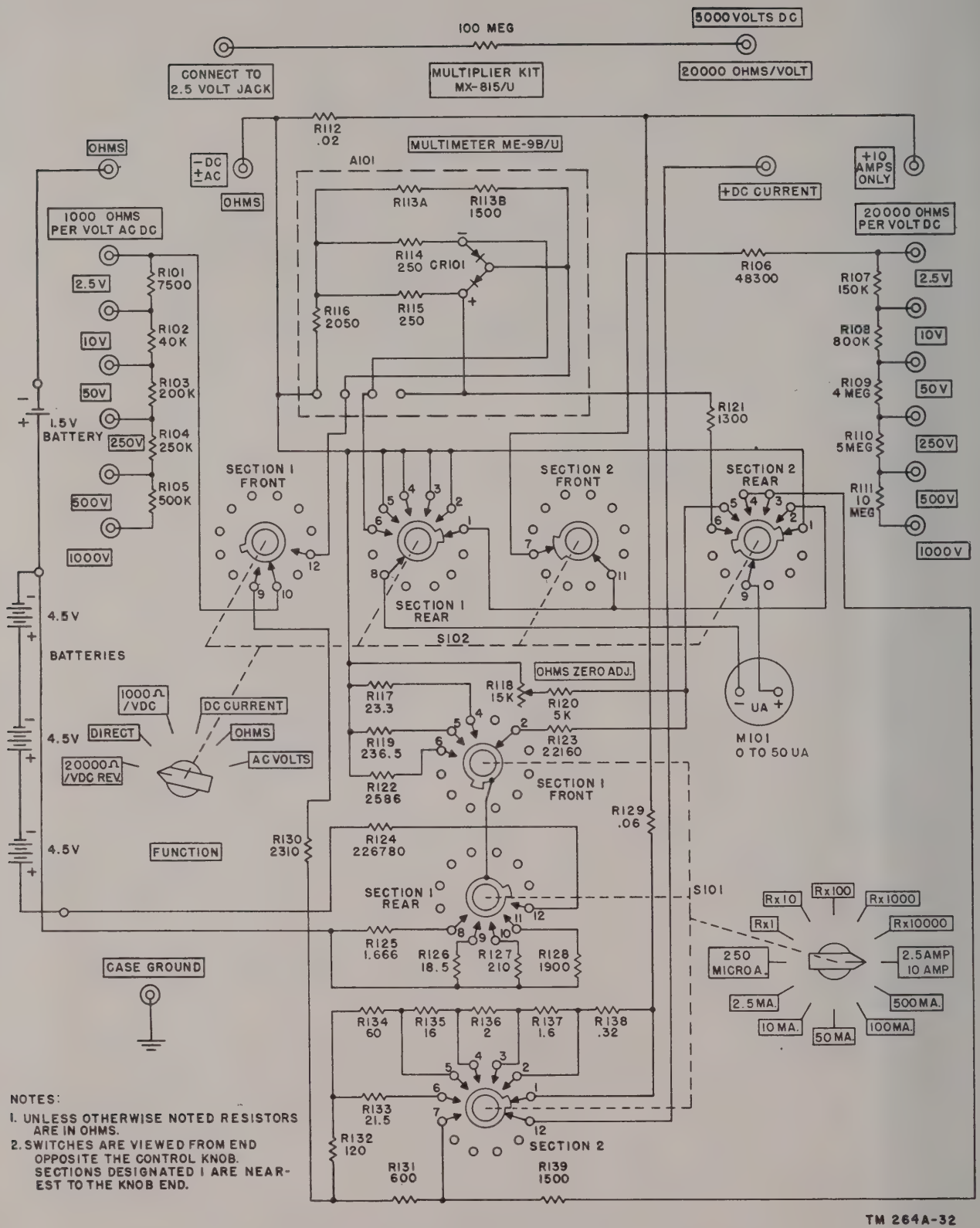
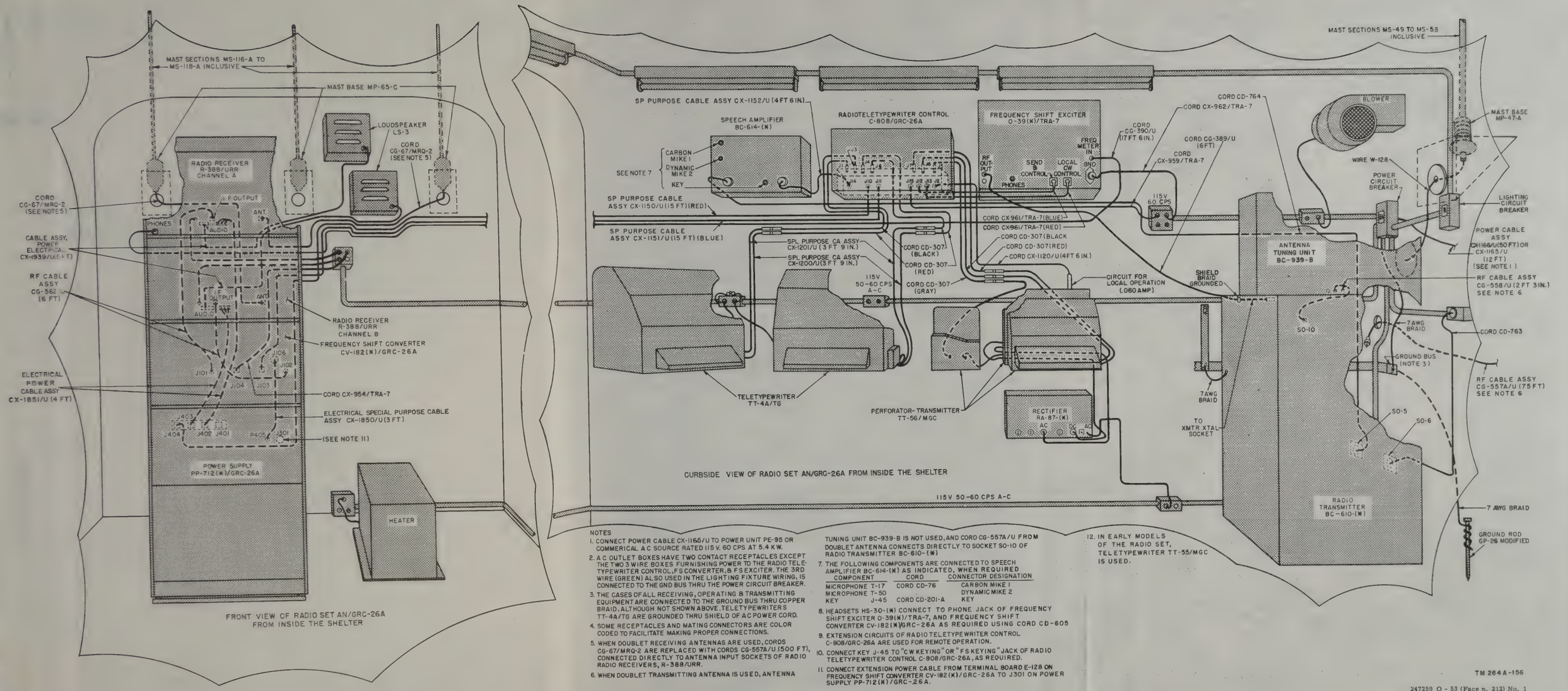


Figure 125. Multimeter TS-352/U, schematic diagram.



NOTES

1. CONNECT POWER CABLE CX-1165/U TO POWER UNIT PE-95 OR COMMERICAL A C SOURCE RATED 115 V. 60 CPS AT 5.4 KW.
2. A C OUTLET BOXES HAVE TWO CONTACT RECEPTACLES EXCEPT THE TWO 3 WIRE BOXES FURNISHING POWER TO THE RADIO TELETYPEWRITER CONTROL, FS CONVERTER, & FS EXCITER. THE 3RD WIRE (GREEN) ALSO USED IN THE LIGHTING FIXTURE WIRING, IS CONNECTED TO THE GND BUS THRU THE POWER CIRCUIT BREAKER.
3. THE CASES OF ALL RECEIVING, OPERATING & TRANSMITTING EQUIPMENT ARE CONNECTED TO THE GROUND BUS THRU COPPER BRAID, ALTHOUGH NOT SHOWN ABOVE. TELETYPEWRITERS TT-4A/TG ARE GROUNDED THRU SHIELD OF AC POWER CORD.
4. SOME RECEPTACLES AND MATING CONNECTORS ARE COLOR CODED TO FACILITATE MAKING PROPER CONNECTIONS.
5. WHEN DOUBLET RECEIVING ANTENNAS ARE USED, CORDS CG-67/MRQ-2 ARE REPLACED WITH CORDS CG-557A/U (500 FT), CONNECTED DIRECTLY TO ANTENNA INPUT SOCKETS OF RADIO RADIO RECEIVERS, R-388/URR.
6. WHEN DOUBLET TRANSMITTING ANTENNA IS USED, ANTENNA TUNING UNIT BC-939-B IS NOT USED, AND CORD CG-557A/U FROM DOUBLET ANTENNA CONNECTS DIRECTLY TO SOCKET SO-10 OF RADIO TRANSMITTER BC-610-(X)
7. THE FOLLOWING COMPONENTS ARE CONNECTED TO SPEECH AMPLIFIER BC-614-(X) AS INDICATED, WHEN REQUIRED

COMPONENT	CORD	CONNECTOR DESIGNATION
MICROPHONE T-17	CORD CD-76	CARBON MIKE 1
MICROPHONE T-50		DYNAMIC MIKE 2
KEY	J-45 CORD CD-201-A	KEY

8. HEADSETS HS-30-(X) CONNECT TO PHONE JACK OF FREQUENCY SHIFT EXCITER O-39(X)/TRA-7, AND FREQUENCY SHIFT CONVERTER CV-182(X)/GRC-26A AS REQUIRED USING CORD CD-605
9. EXTENSION CIRCUITS OF RADIO TELETYPEWRITER CONTROL C-808/GRC-26A ARE USED FOR REMOTE OPERATION.
10. CONNECT KEY J-45 TO "CW KEYING" OR "FS KEYING" JACK OF RADIO TELETYPEWRITER CONTROL C-808/GRC-26A, AS REQUIRED.
11. CONNECT EXTENSION POWER CABLE FROM TERMINAL BOARD E-128 ON FREQUENCY SHIFT CONVERTER CV-182(X)/GRC-26A TO J301 ON POWER SUPPLY PP-712(X)/GRC-26A.
12. IN EARLY MODELS OF THE RADIO SET, TELETYPEWRITER TT-55/MGC IS USED.

Figure 126. Radio Set AN/GRC-26A, cording diagram.

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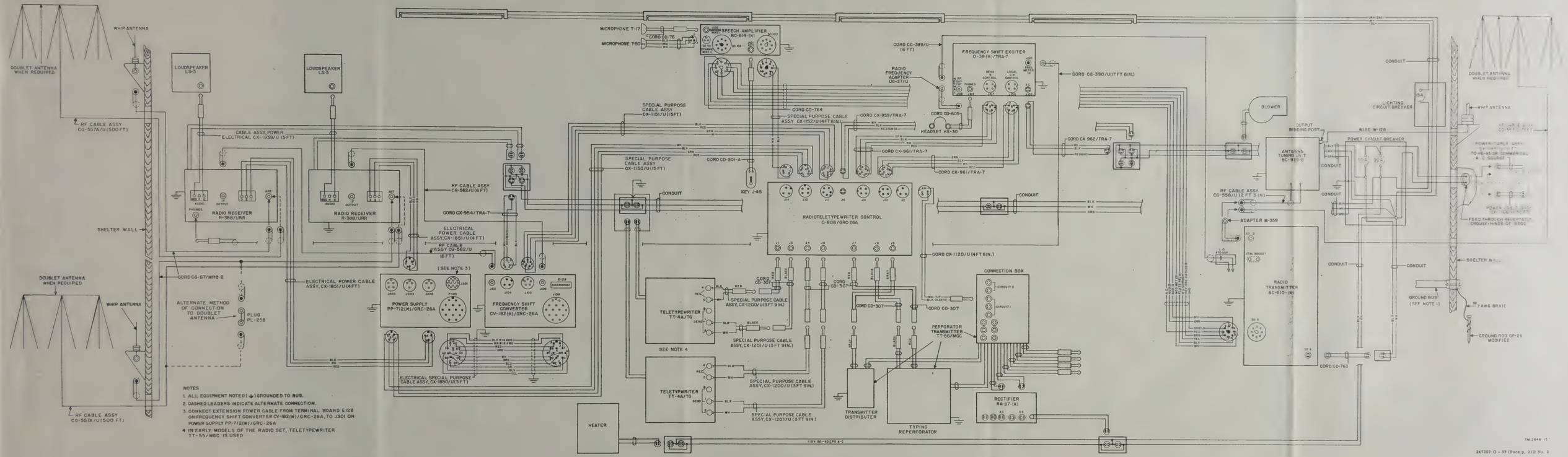
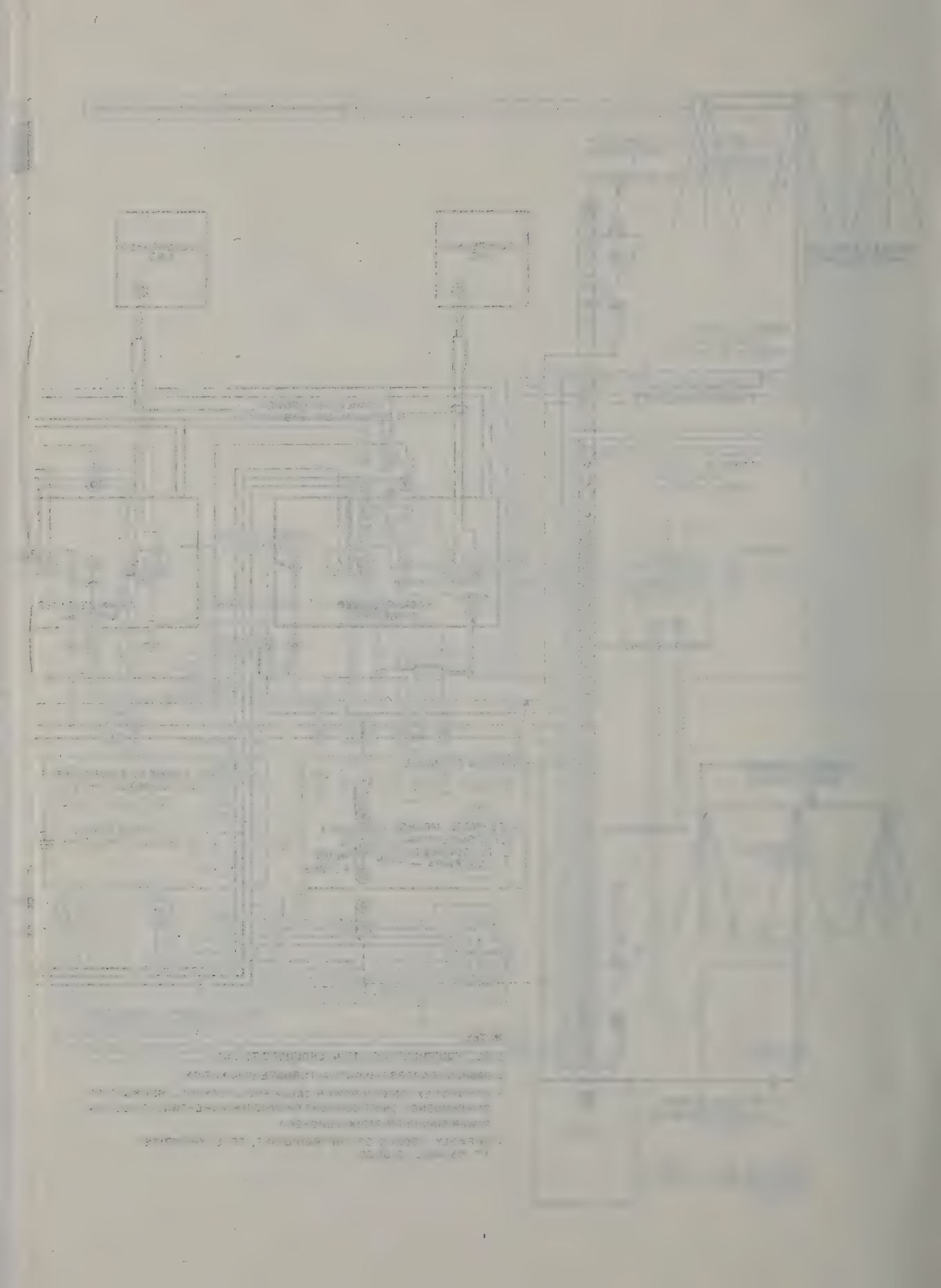


Figure 127. Radio Set AN/GRC-26A, schematic wiring diagram of interconnections.

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