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TM 11-630

WAR DEPARTMENT TECHNICAL MANUAL

RADIO SET

SCR-506-A

This is a reprint of TM 11-630, Radio Set SCR-506-A. No distribution will be made to personnel possessing the original publication.

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WAR DEPARTMENT

NOVEMBER 1944

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RADIO SET

SCR-506-A



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NOVEMBER 1944

WAR DEPARTMENT,
WASHINGTON 25, D. C., 1 November 1944.

TM 11-630, Radio Set SCR-506-A, is published for the information and guidance of all concerned.

[A. G. 300.7 (22 June 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

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

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Destruction Notice

Why

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

When

When ordered by your commander.

How

1. **SMASH**—Use sledges, axes, handaxes, pick-axes, hammers, crowbars, heavy tools.
2. **CUT**—Use axes, handaxes, machetes.
3. **BURN**—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
4. **EXPLOSIVES**—Use firearms, grenades, TNT.
5. **DISPOSAL**—Bury in slit trenches, fox holes, other holes. Throw in streams, scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT

What

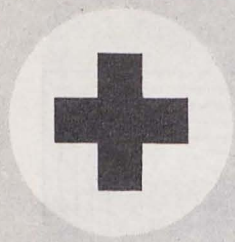
1. **SMASH**—Crystals, meters, plugs, tubes, tuning controls, capacitors, resistors, sockets, insulators, microphones, headsets, and relays.
2. **CUT**—Cords, wiring, and cables.
3. **BEND or BREAK**—Antenna sections, panels, mounting, and nameplates.
4. **BURN**—Circuit labels, technical manuals, all papers, cords, wiring, cables, dynamotors, capacitors, resistors, and nameplates.
5. **BURY or SCATTER**—All of the above pieces after breaking and burning.

• DESTROY EVERYTHING •

SAFETY NOTICE

- ▶ Voltages as high as 1,000 volts are used in the operation of this equipment. These voltages are dangerous to life.
- ▶ Do not change tubes or make adjustments inside the set with the high voltage supply on.
- ▶ All panels giving access to voltages above 200 volts are provided with interlocks to shut off the dynamotor when opened. A few service checks must be made inside the set with the high voltage on. When making these checks, always have the immediate presence and assistance of another person capable of rendering aid. Keep one hand in your pocket while making high-voltage measurements. This will prevent touching the electrical circuit with more than one part of the body at one time.
- ▶ Servicing should be done with the vehicular battery circuit open. Shorting this battery circuit will cause a flash and severe burns unless the power is turned off.
- ▶ Radio-frequency voltages as high as 4,000 volts may be developed on the antenna of this radio set. Do not touch the antenna while the set is turned on.

WARNING! Do not add gasoline to the vehicle fuel tank when the transmitter is on. Radio-frequency voltage present on the chassis of the vehicle may cause a spark resulting in an explosion. Turn off the radio transmitter and **KEEP** it off until refueling is finished.



First Aid for Electric Shock

TL 15339

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 non-conductor 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.

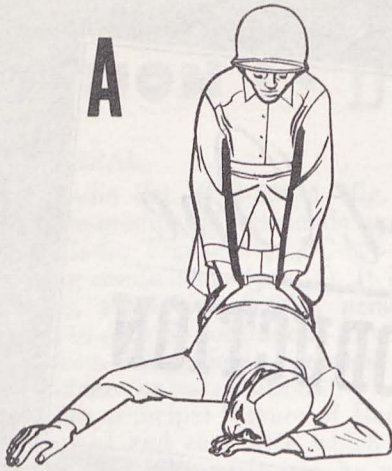
e. The resuscitating operator should straddle the victim's thighs, or one leg, in such a manner that:

- (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 on the heels.
- (3) After 2 seconds, rest, swing forward again positioning the hands, 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 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

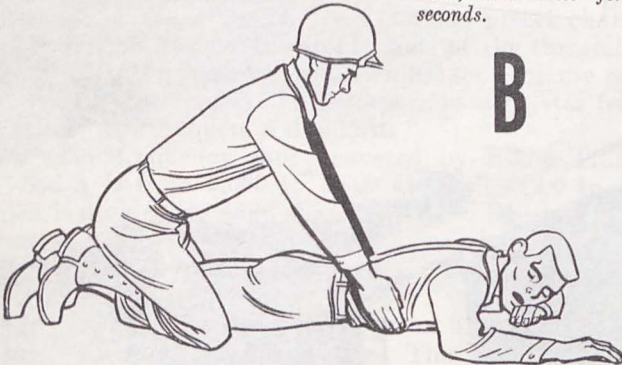
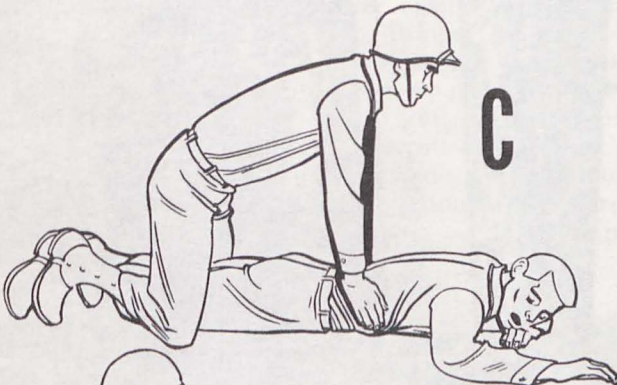
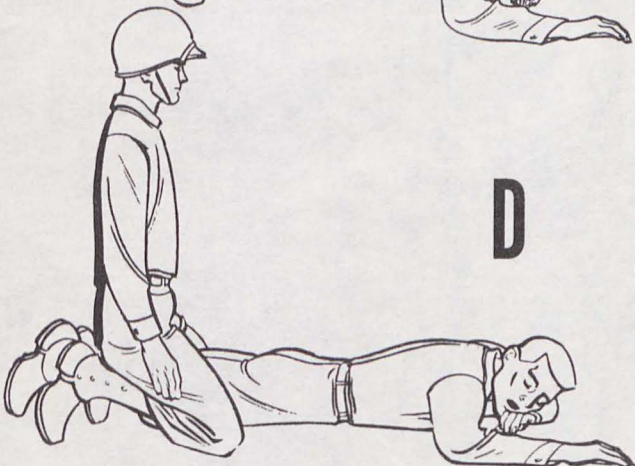
A

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.

B**C****D**

TL 15338

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.

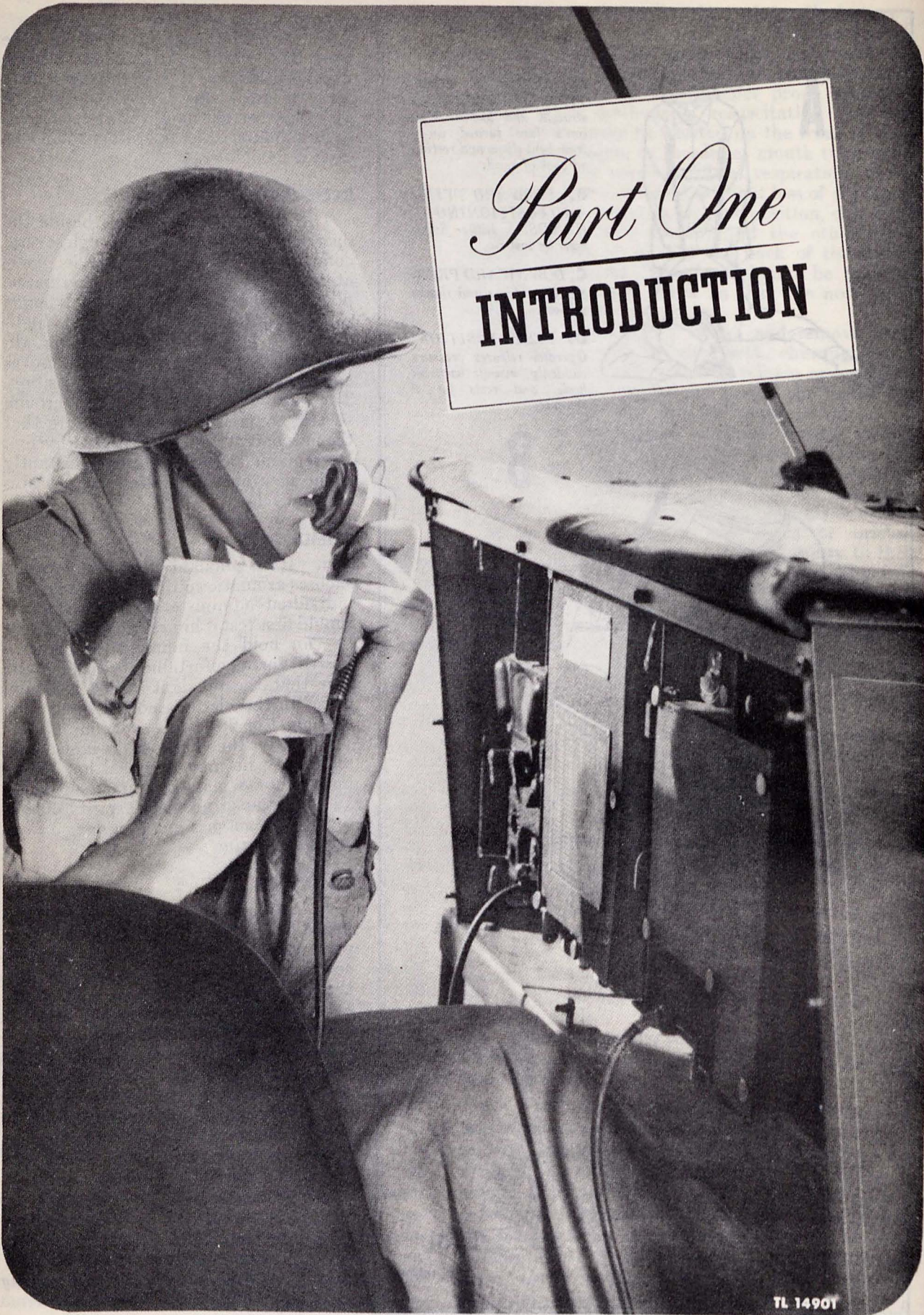
b. After the victim has regained consciousness, he may be given hot coffee, hot tea, or a glass of water containing $\frac{1}{2}$ teaspoon of aromatic spirits of ammonia. *Do not give any liquids to an unconscious victim.*

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.*



Part One
INTRODUCTION

TL 1490T

SECTION I • Description

1. GENERAL

a. Radio Set SCR-506-A (fig. 1) is a medium power, amplitude-modulated set made up of Radio Receiver BC-652-A, Radio Transmitter BC-653-A, and certain additional operating components (par. 4). It is designed for installation in tanks, amphibian trucks, personnel carriers, and other vehicles to provide continuous-wave (c-w) and voice communication from one vehicle to another or between these vehicles and airplanes or base stations.

b. The principal feature of Radio Transmitter BC-653-A is the speed and ease with which changes of frequency can be made. Five channels can be preset on the transmitter. The operator can select any one of these preset channels by means of a switch on the front panel of the transmitter.

c. Radio Receiver BC-652-A is designed for the reception of voice or c-w signals and incorporates a crystal frequency calibrator as a frequency standard.

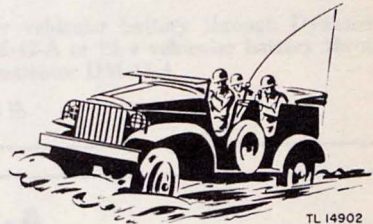
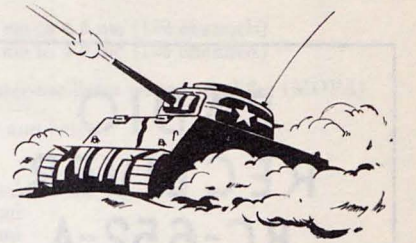
d. The frequency range covered by Radio Transmitter BC-653-A is from 2,000 to 4,500 kilocycles (2.0 to 4.5 mc), which is divided into 126 channels. Radio Receiver BC-652-A covers a range of 2,000 to 6,000 kilocycles (2.0 to 6.0 mc) which is divided into 201 channels. These channels are spaced 20 kilocycles apart.

e. The average distance range of the transmitter is 50 miles on cw and 20 miles on voice. This range will vary with the frequency, time of day, power output, type of antenna, terrain, and other operating conditions.

f. The power output of the transmitter is 50 to 90 watts on cw, with one-fourth as much power output on voice.

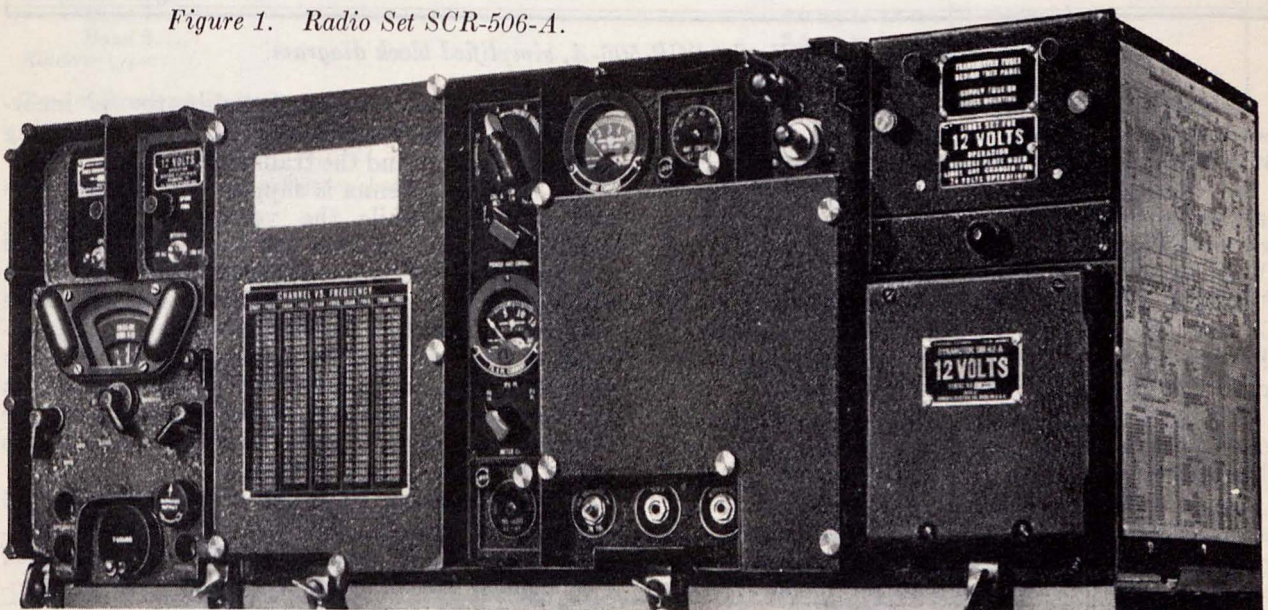
g. Radio Receiver BC-652-A and Radio Transmitter BC-653-A operate from either a 12-volt or a 24-volt vehicular storage battery. Each unit is made ready for use with either supply voltage by the installation of the correct dynamotor and by changing certain link connections (par. 28).

Radio Set SCR-506-A is designed for installation in tanks, amphibian trucks, personnel carriers, command cars, and many other vehicles.



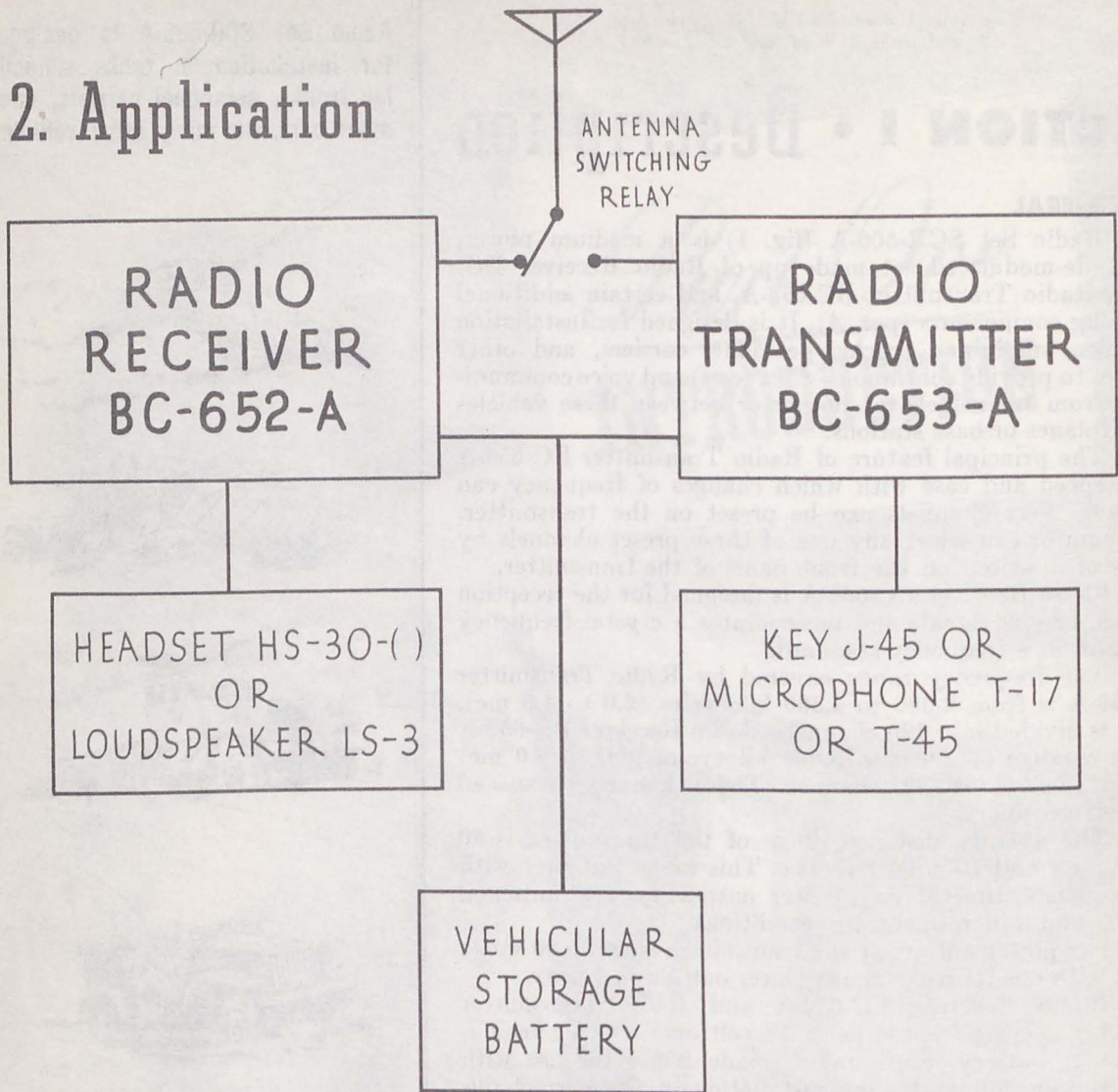
TL 14902

Figure 1. Radio Set SCR-506-A.



TL14903

2. Application



TL 14904

Figure 2. Radio Set SCR-506-A, simplified block diagram.

A system block diagram giving the relationship between the various components of Radio Set SCR-506-A is shown in figure 2.

a. Radio Transmitter BC-653-A generates a carrier wave which may be sent out as a continuous wave (CW) or as an amplitude-modulated wave (VOICE). The transmitter is equipped with four PRESET FREQUENCY channels marked A, B, C, and D, and one TUNABLE FREQUENCY channel marked LF-HF. The transmitter may be set on any frequency within its range.

b. Radio Receiver BC-652-A is an eight-tube superheterodyne receiver designed to receive amplitude-modulated signals over a frequency range of 2,000 to 6,000 kc. A noise limiter circuit in the receiver reduces the strength of static bursts and ignition interference. Sidetone from the transmitter is applied to the audio output of the receiver during transmission.

c. A crystal frequency calibrator is incorporated in Radio Receiver BC-652-A for calibrating both the receiver and the transmitter.

d. A whip antenna is supplied for transmission and reception while the vehicle is in motion. Additional mast sections are furnished to extend the height of the whip antenna to 25 feet when the vehicle is at a halt. A 22½-foot straight wire antenna is furnished to make possible the concealment of the vehicle when not in motion. Although the same antenna is used for both transmission and reception, a disabling circuit, operated by the transmitter, prevents radio reception while Radio Set SCR-506-A is transmitting.

e. Loudspeaker LS-3 and Headset HS-30-() are supplied with the receiver; either may be used.

f. Key J-45 is furnished for the transmission of c-w signals. Microphones T-17 and T-45 are supplied for use in voice transmission.

3. Technical Characteristics

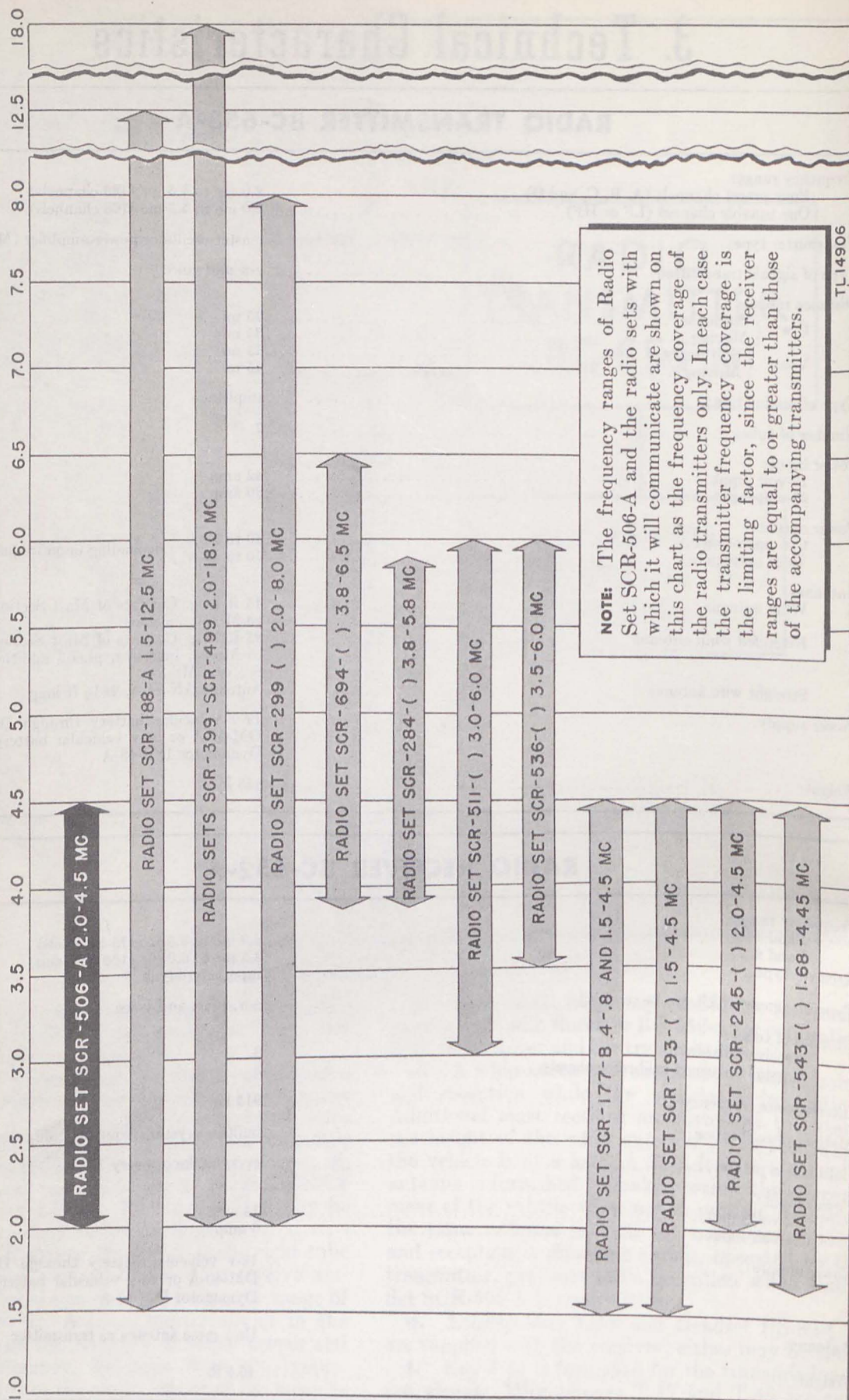
RADIO TRANSMITTER BC-653-A

Frequency range:		
Four preset channels (A, B, C, and D)	.....	2.0 mc to 4.5 mc (126 channels)
One tunable channel (LF or HF)	.....	2.0 mc to 4.5 mc (126 channels)
Transmitter type:	.....	master-oscillator power-amplifier (MOPA)
Type of signals transmitted:	.....	c-w and voice
Distance range:		
C-w	{ Stationary	75 mi
	Moving	35 mi
Voice	{ Stationary	25 mi
	Moving	15 mi
Type of modulation:	.....	amplitude
Number of tubes:	.....	7
Power input:		
12-volt input	.....	42 amp
24-volt input	.....	30 amp
Power output:		
C-w operation	.....	50 to 90 w
Voice operation	.....	10 to 25 w
		} depending upon frequency
Antennas:		
Whip antenna	.....	15 ft long. Consists of Mast Sections MS-49 to MS-53, inclusive
Extended whip antenna	.....	25 ft long. Consists of Mast Sections MS-49 to MS-53, inclusive, plus 3 additional Mast Sections MS-54
Straight wire antenna	.....	Antenna AN-24-A, 22½ ft long
Power supply:	.....	12-v vehicular battery through Dynamotor DM-42-A or 24-v vehicular battery through Dynamotor DM-43-A
Weight:	.....	143 lb

RADIO RECEIVER BC-652-A

Frequency range:		
Band 1	.....	2.0 mc to 3.5 mc (75 channels)
Band 2	.....	3.5 mc to 6.0 mc (126 channels)
Receiver type:	.....	superheterodyne
Type of signals which can be received	.....	c-w, tone, and voice
Number of tubes:		
Receiver chassis	.....	8
Crystal frequency calibrator chassis	.....	3
Intermediate frequency	.....	915 kc
Method of calibration:	.....	built-in crystal frequency calibrator
Calibration points:	.....	every 20 kc or every 100 kc
Power input:		
12-volt input	.....	14 amp
24-volt input	.....	6 amp
Power supply:	.....	12-v vehicular battery through Dynamotor DM-40-A or 24-v vehicular battery through Dynamotor DM-41-A
Antenna:	.....	Uses same antenna as transmitter
Weight:	.....	46.5 lb

FREQUENCY SPECTRUM: MEGACYCLES



TL 14906

Figure 3. Radio Set SCR-506-A, frequency spectrum.

4. List of Components

COMPONENTS	REQUIRED NUMBER	HEIGHT (inches)	DEPTH (inches)	LENGTH (inches)	DIAMETER (inches)	WEIGHT (pounds)
BOX NO. 1						
Radio Transmitter BC-653-A, less tubes and fuses.	1	12½	14⅝	25⅜		143
Carton of transmitter tubes.	1	12½	14⅝	10		7
TM 11-630.	2	½	10	8½		.5
BOX NO. 2						
Radio Receiver BC-652-A, with tubes, fuses, and lamps.	1	12½	14⅝	7⅝		46.5
BOX NO. 3						
Mounting FT-253-A, with 1 bag of fuses, 1 bag of hardware, and 2 Cords CD-280.	1	2	12¾	33		34
BOX NO. 4						
Antenna A-27	1	4½	3½	6		1.3
Antenna AN-24-A	1			540 (45 ft)		
Clamp MC-421	2			¾	.465	.04
Clamp MC-422	2			⅞	.530	.04
Clamp MC-423	2			1	.590	.05
Clamp MC-424	2			1⅛	.660	.06
Connector and bond nut	2			1¾	1¼	.27
Cord CD-314	1			34		.7
Cover BG-67-A	1			8	3	.2
Guy Set GY-40	1	5	8¼	39		
Insulator IN-86-A	3			4½	1	.78
Loudspeaker LS-3	1	8¼	4½	8¼		9.7
Key J-45	2	6	2	2½		1.
Mast Base MP-57	1	12½			7¼	10.3
Mast Section MS-49	2			38 ⁵ / ₁₆	¾	.16
Mast Section MS-50	2			39½	¾	.38
Mast Section MS-51	2			39½	¾	.5
Mast Section MS-52	2			39½	¾	.66
Mast Section MS-53	2			39 ⁵ / ₈	¾	.81
Roll BG-56-A	1	2	4	42		1.72
Rope RP-5	1			180 (15 ft)	¾	.36
Wire W-146	1			180 (15 ft)	.37	1.5

5. PACKAGING DATA.

a. Packaging and packing will vary with different order numbers. Box sizes may vary slightly from time to time. The data on the right was taken from specifications of Order No. 12025-Phila-44.

b. Domestic packaging and packing is the same as export packaging and packing, with the exception that moistureproof and vaporproof barriers, desiccant, and water-proof box liners and/or bags are not required.

Radio Set SCR-506-A is packed in four wooden boxes.			
Item	Outside dimensions (inches)	Cubic feet	Gross weight
Box No. 1	40½ x 18⅜ x 16¾	5.5	175
Box No. 2	18½ x 13¼ x 21⅜	3.2	80
Box No. 3	35¾ x 16¾ x 6⅜	2.2	60
Box No. 4	44½ x 14 x 15¼	5.2	62

6. Major Components of Radio Set SCR-506-A

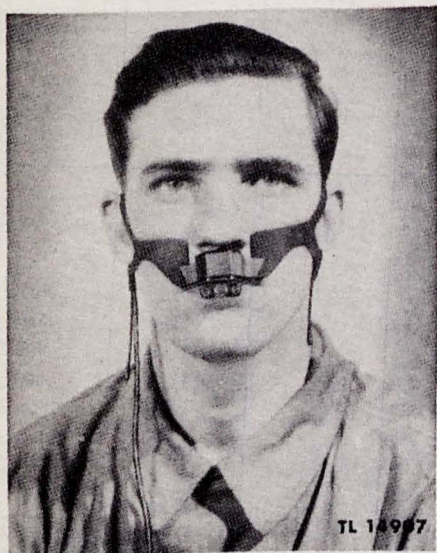


Figure 4. Microphone T-45 in operation.

The major components of Radio Set SCR-506-A are shown on this and the four following pages. Certain additional components are issued for the installation of the set in the particular vehicle in which it is to be operated. For a complete listing of the components required for the installation in a particular vehicle, refer to the technical manual of the TM 11-2700 series which covers the vehicle concerned.

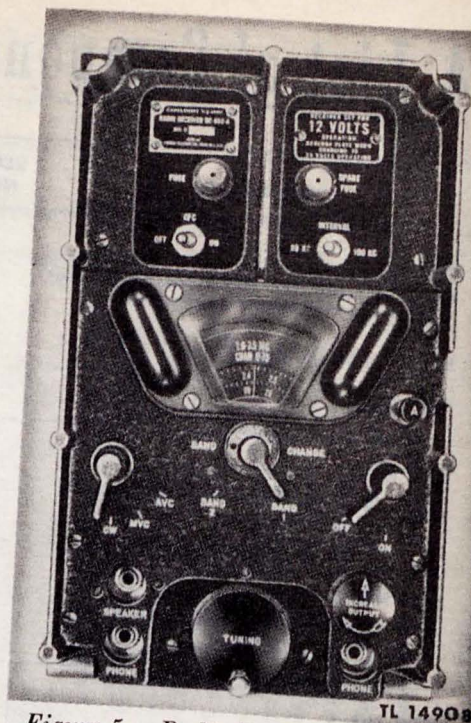


Figure 5. Radio Receiver BC-652-A, front view.

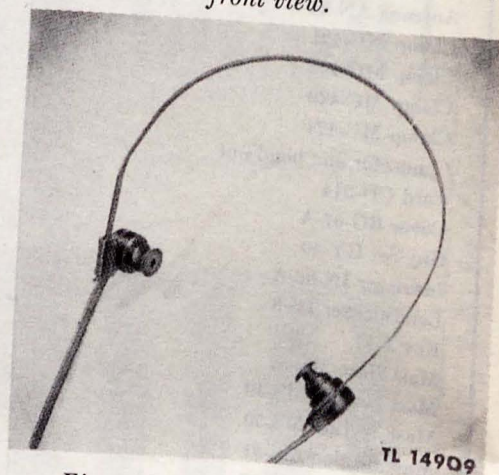


Figure 6. Headset HS-30-().



Figure 7. Loudspeaker LS-3 with Cord CD-314.

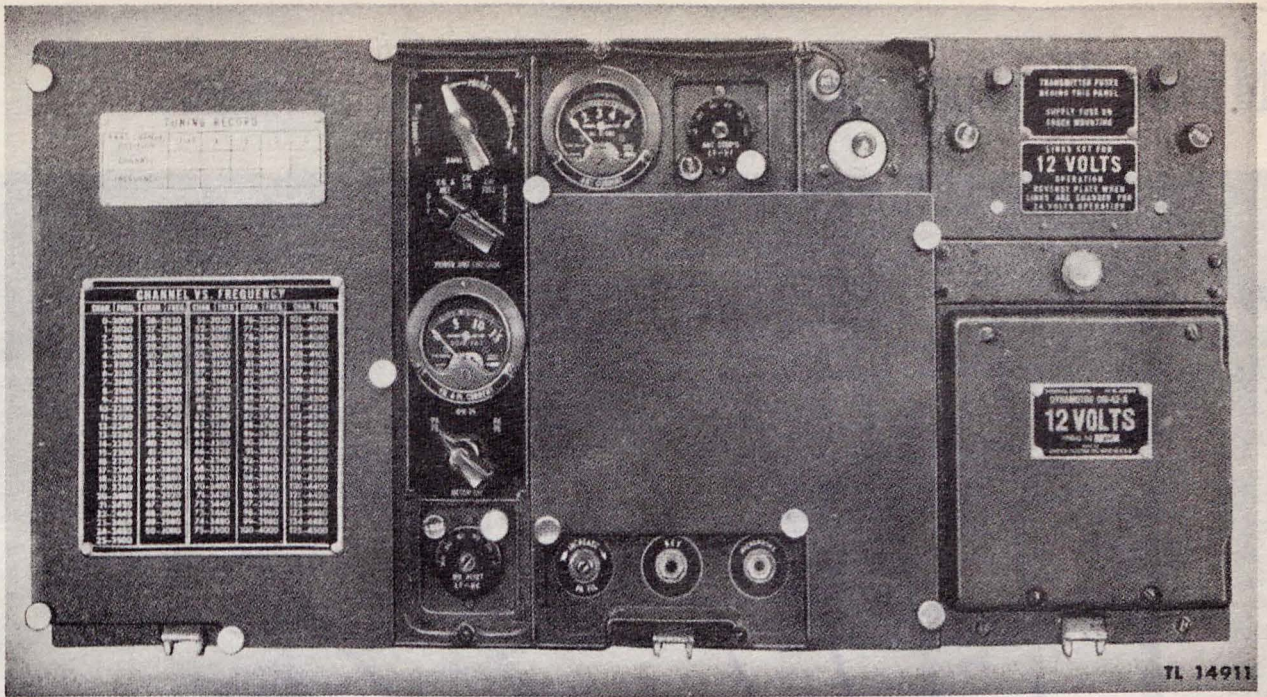


Figure 8. Radio Transmitter BC-653-A, front view.

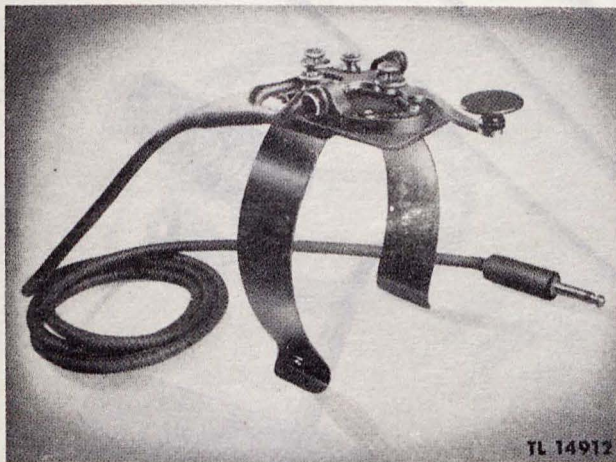


Figure 9. Key J-45.



Figure 10. Microphone T-17.



Figure 11. Dynamotor DM-40-A.

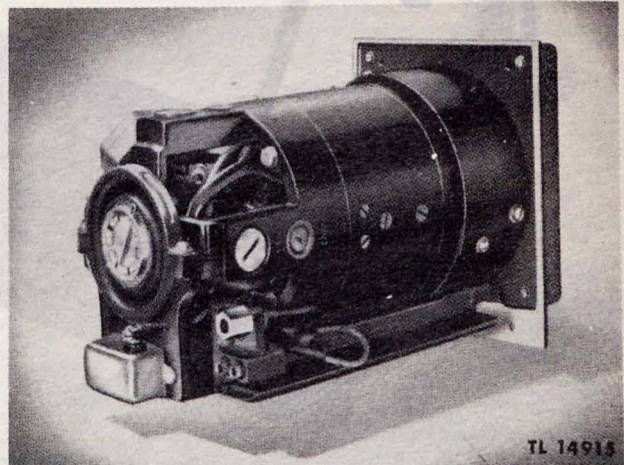
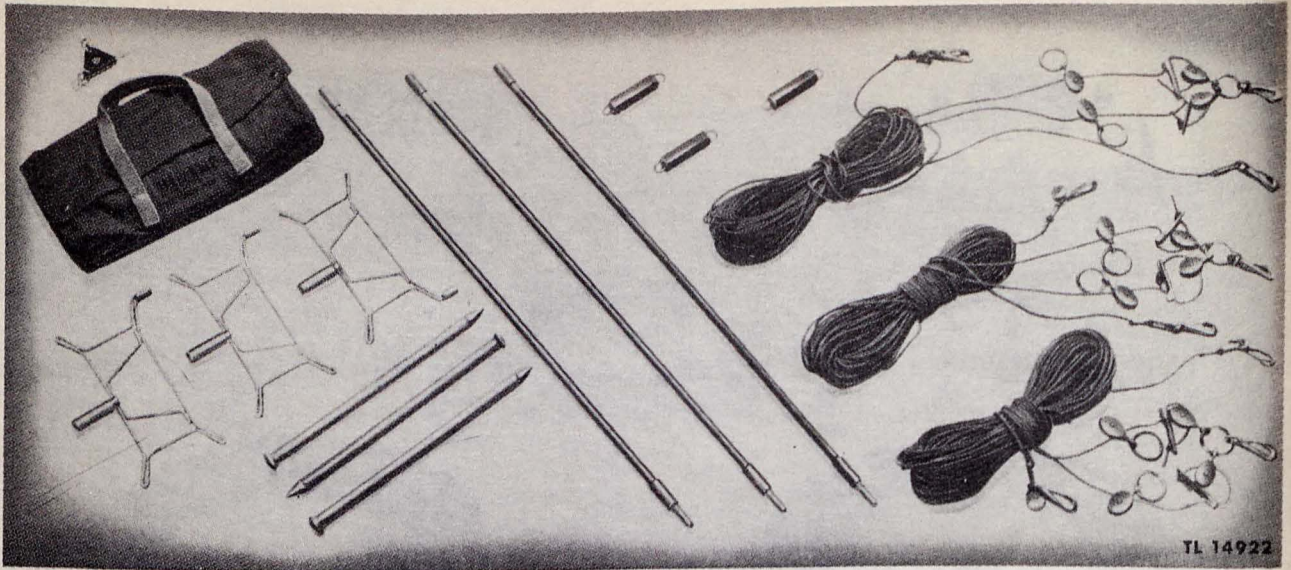
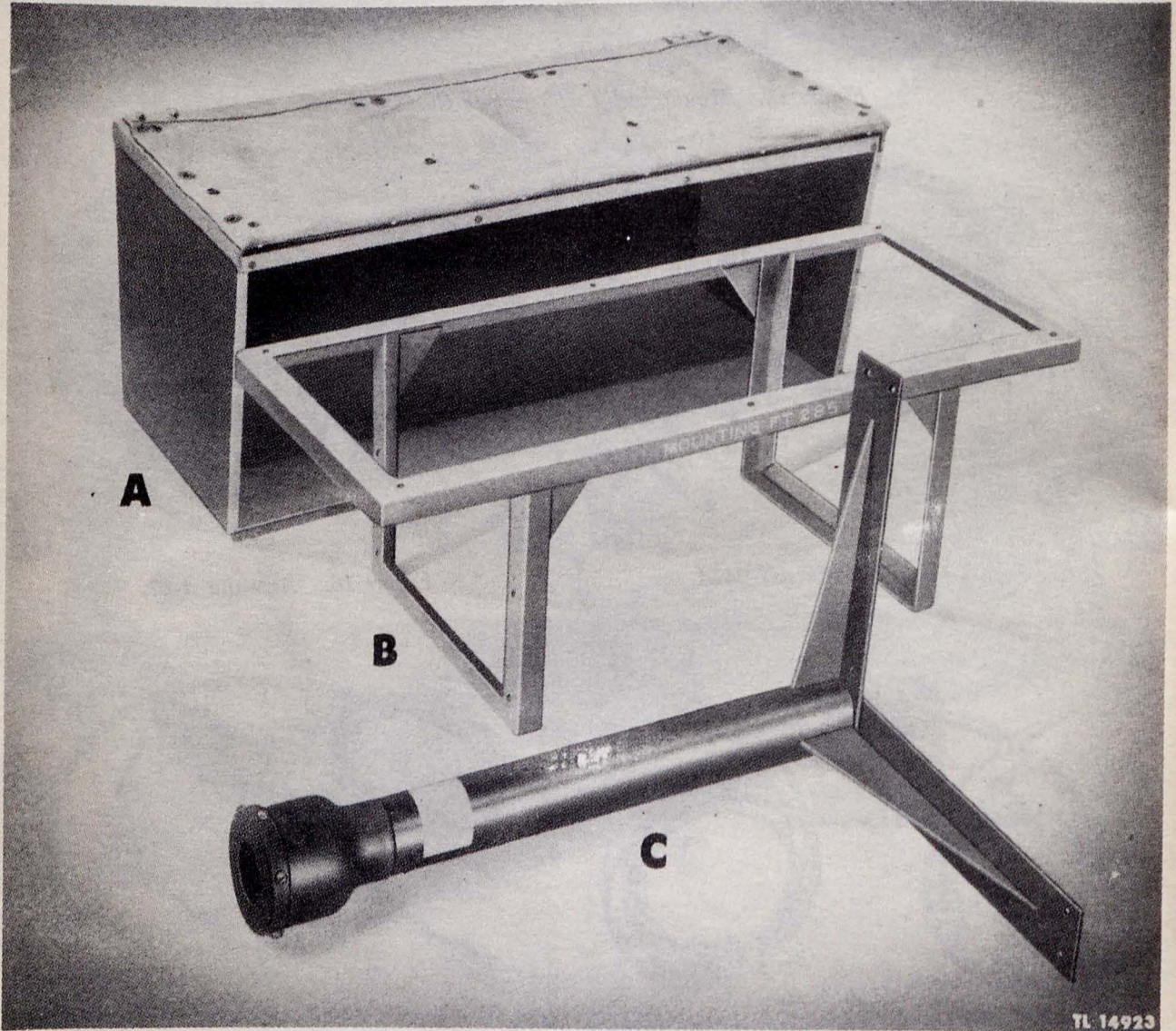


Figure 12. Dynamotor DM-42-A.



TL 14922

Figure 19. Guy Set GY-40.



TL 14923

Figure 20. **A** Cabinet CH-74-A. **B** Mounting FT-285. **C** Mast Base Bracket MP-52.

7. RADIO TRANSMITTER BC-653-A.

This transmitter contains a radio-frequency transmitter unit, a modulator, and a power supply. Three stages are used for cw: a master oscillator, an intermediate power amplifier, and two tubes in parallel as the power amplifier. On voice, a modulator stage is included in the circuit. The front panel of the transmitter is ribbed to protect the controls from damage. All connections between the transmitter and the mounting are made through multi-contact plugs and receptacles which are automatically engaged when the transmitter is placed on the mounting.

8. RADIO RECEIVER BC-652-A.

The receiver consists of an eight-tube super-heterodyne receiver and a crystal frequency calibrator mounted on two separate chassis combined in one case. The front panel of the receiver is ribbed to protect the controls from damage. All connections between the receiver and the mounting are made through multi-contact plugs and receptacles which are automatically engaged when the receiver is placed on the mounting.

9. DYNAMOTOR DM-40-A OR DM-41-A.

a. These dynamotors for the receiver are identical except for input voltage. Dynamotor DM-40-A is used with a 12-volt vehicular storage battery and Dynamotor DM-41-A is used with a 24-volt vehicular battery.

b. All connections from the dynamotor are made to the receiver circuits through plug P250.

c. The dynamotor is secured by four snap-slide catches to the crystal frequency calibrator chassis of Radio Receiver BC-652-A.

10. DYNAMOTOR DM-42-A OR DM-43-A.

a. The transmitter high voltages may be sup-

ELECTRICAL RATINGS FOR DYNAMOTOR DM-40-A AND DM-41-A		
<i>Voltage or Current</i>	<i>DM-40-A</i>	<i>DM-41-A</i>
Input voltage	12 volts	24 volts
Input current	3.0 amp	1.5 amp
Output voltage	147 volts	147 volts
Output current	118 ma	118 ma

ELECTRICAL RATINGS FOR DYNAMOTOR DM-42-A AND DM-43-A		
<i>Voltage or Current</i>	<i>DM-42-A</i>	<i>DM-43-A</i>
Input voltage	12 volts	24 volts
Input current	39 amp	20 amp
Output voltage (500 volts)	460 volts	460 volts
Output current (500 volts)	185 ma	185 ma
Output voltage (1,000 volts)	925 volts	925 volts
Output current (1,000 volts)	220 ma	220 ma
Sidetone voltage* (full)	7 volts	7 volts
Sidetone voltage* (tap)	2 volts	2 volts

* Into 500-ohm load.



Figure 21. Radio Receiver BC-652-A, showing Dynamotor DM-40-A.

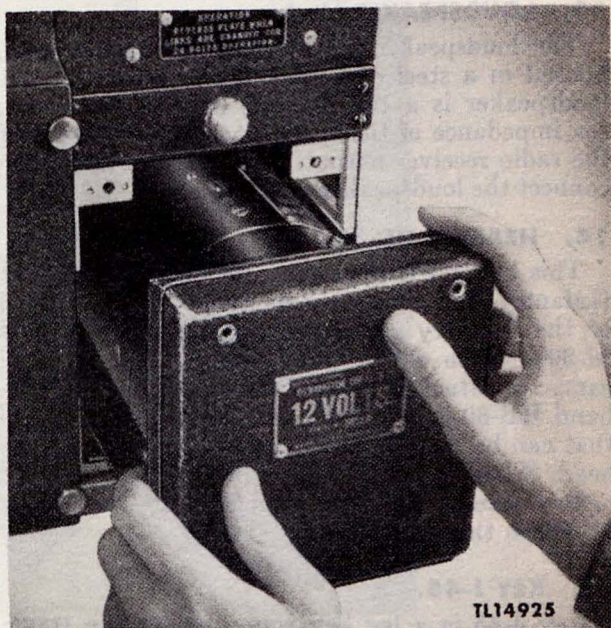


Figure 22. Radio Transmitter BC-653-A, showing Dynamotor DM-42-A.

plied by either of these dynamotors, depending upon the vehicle in which the set is to be installed. Dynamotor DM-42-A requires a power source of 12 volts and Dynamotor DM-43-A requires 24 volts for its operation.

b. Two 500-volt commutators are used in series, in either dynamotor, to supply the 1,000 volts required by the transmitter. One 500-volt commutator is located at the front of the dynamotor and the other at the rear.

c. A fixed winding on the stator of either dynamotor supplies 1,000-cycle voltage for c-w sidetone.

d. All connections to the transmitter are made through plugs P162 and P163, located at the rear of the dynamotor.

11. MOUNTING FT-253-A.

a. All wiring which interconnects the transmitter and the receiver, with the single exception of the antenna lead-in, is contained within Mounting FT-253-A.

b. On the rear of the mounting are jacks J161 and J302A. These jacks engage the transmitter plug P161 and the receiver plug P302.

c. Connection of the receiver and transmitter to the vehicular battery is made through Cords CO-280 from the battery to the mounting and through plugs on the transmitter and on the receiver to jacks on the mounting.

12. SWITCH BOX BC-658-A.

a. The switch box consists of a small steel box containing two jacks and a double-throw toggle switch. The toggle switch is marked RADIO-INTERPHONE. Using this switch, the operator can switch his microphone and headset from RADIO to INTERPHONE.

b. Four cords from the switch box make plug-in connections to the transmitter and to the receiver.

13. LOUDSPEAKER LS-3.

The loudspeaker is a permanent magnet type, housed in a steel case. Included as a part of this loudspeaker is a transformer, designed to match the impedance of the speaker voice coil to that of the radio receiver output. Cord CD-314 is used to connect the loudspeaker to the receiver.

14. HEADSET HS-30-().

This headset is issued for use with Helmet M-1 (Infantry) and crash helmets used by the personnel of the Infantry and Armored Command. Inserts M-300, which are of soft rubber and fit into the ears, are attached to two Receivers R-30. Headband HB-30 is a thin band of relatively soft steel that can be bent to fit the contour of the wearer's head. When the headband is properly shaped, the helmet exerts no additional pressure on Inserts M-300 in the wearer's ears.

15. KEY J-45.

Key J-45 is a leg key connected to the transmitter KEY jack by Cord CD-201.

16. MICROPHONE T-17.

Microphone T-17 is an anti-noise, carbon-button, hand microphone. The plug on the microphone cord plugs either into the switch box MICROPHONE jack or directly into the transmitter MICROPHONE jack if the switch box is not used. The press-to-talk button on the microphone handle controls the operation of the transmitter dynamotor relay and of the antenna changeover relay.

17. MICROPHONE T-45.

This is a single-button, carbon microphone worn on the upper lip. It cancels noise and may be worn under a gas mask. Face straps and adjustable ear loops place this microphone in front of the mouth. Plug PL-291 connects to the jack on Cord CD-318 which is equipped with Switch SW-141-W. This switch is the press-to-talk control for this microphone.

18. VEHICULAR ANTENNA.

a. Five mast sections make up the vehicular antenna for Radio Set SCR-506-A. Mast Sections MS-49 through MS-53 are required to make up this antenna. Two sets of these mast sections are carried in Roll BG-56-A.

b. Mast Section MS-49 forms the top of the antenna with the other sections below in the sequence of their type numbers. Mast Section MS-53 fits into the mast base which is mounted on the vehicle. Either Mast Base MP-37 or MP-57 may be used with this antenna.

c. The over-all length of the assembled antenna is approximately 15 feet.

d. Roll BG-56-A contains four additional Mast Sections MS-54. Three of these mast sections are used to extend the normally 15-foot whip antenna to a height of 25 feet. The fourth mast section is a spare.

e. The vehicle must be at a halt for the use of the 25-foot antenna. Guy ropes, a guy rope anchor plate, and ground stakes are provided in Guy Set GY-40 to hold the extended antenna in a vertical position.

19. ANTENNA AN-24-A.

Antenna AN-24-A will permit operation in concealment or under other circumstances where the use of the vehicular mast type of antenna may be impracticable. This antenna is intended to replace the vehicular mast antenna when the vehicle is run under trees and the whip antenna is partially or intermittently short-circuited to ground as it touches low-hanging branches. This 45-foot antenna should be doubled back to 22½ feet as the antenna tuning circuit will not accommodate the greater length at all frequencies.

20. ANTENNA A-27 (PHANTOM).

a. This dummy antenna is designed to approximate the characteristics of the vehicular mast antenna as far as the tuning and loading

of the transmitter are concerned. It is to be used to prevent radiation and resultant enemy detection when it is necessary to keep the transmitter on for extended periods of time, whether for pre-setting, alignment, or service work.

b. A chart on the side of this antenna box is used to log, for each 100-kc division, the setting of its control at which it offers the best loading to the radio transmitter.

c. Complete instructions for its installation and operation are furnished as a part of each Antenna A-27.

21. MAST BASE BRACKET MP-52.

Mast Base Bracket MP-52 is to be mounted either on top of Cabinet CH-74-A or on the vehicle in which the set is used. It supports Mast Base MP-37 or MP-57 and provides protection for Wire W-146 which runs through insulators within the pipe of the mast base bracket.

22. CABINET CH-74-A.

a. This cabinet houses the major components of Radio Set SCR-506-A when installed in vehicles other than tanks. This cabinet also serves as a support for Mast Base MP-37 or MP-57, and, in the case of some installations, Mast Base Bracket MP-52, which, in turn, supports Mast Base MP-37 or MP-57.

b. The power leads to the vehicular battery are brought in through the bottom of the cabinet to connect to the terminals of Mounting FT-253-A.

c. A sliding bracket is located inside the top

of Cabinet CH-74-A, above Radio Transmitter BC-653-A and Radio Receiver BC-652-A. When pulled out, this bracket provides partial protection for the equipment during operation. More complete protection against dust and weather is given by a canvas cover which is held in place by snap fasteners when the equipment is not being used.

23. CHEST CH-263.

This is a wooden chest with a hinged top cover and is approximately 17 inches long, 11 inches wide, and 7 inches high. The chest is divided into four compartments; two for storage of vacuum tubes, and two for storage of other spare parts. One of the vacuum tube storage compartments is filled with felt, punched to hold individual tubes; the other is lined with felt strips for points of contact with the glass envelope of each tube. The chest may be stored in any convenient location in the vehicle.

24. COVER BG-67-A.

Cover BG-67-A is made of canvas duck. It is to be placed over Mast Base MP-57 or MP-37 when the antenna is not in use. A leather strap secures the cover to the mast base.

25. ROLL BG-56-A.

Roll BG-56-A holds two sets of Mast Sections MS-49 through MS-53. The roll also accommodates the three Mast Sections MS-54 used for extending the antenna and the one spare Mast Section MS-54. Straps at one end along the side fasten the roll.



Figure 23. Chest CH-263.

26. UNPACKING, UNCRATING, AND CHECKING (fig. 24).

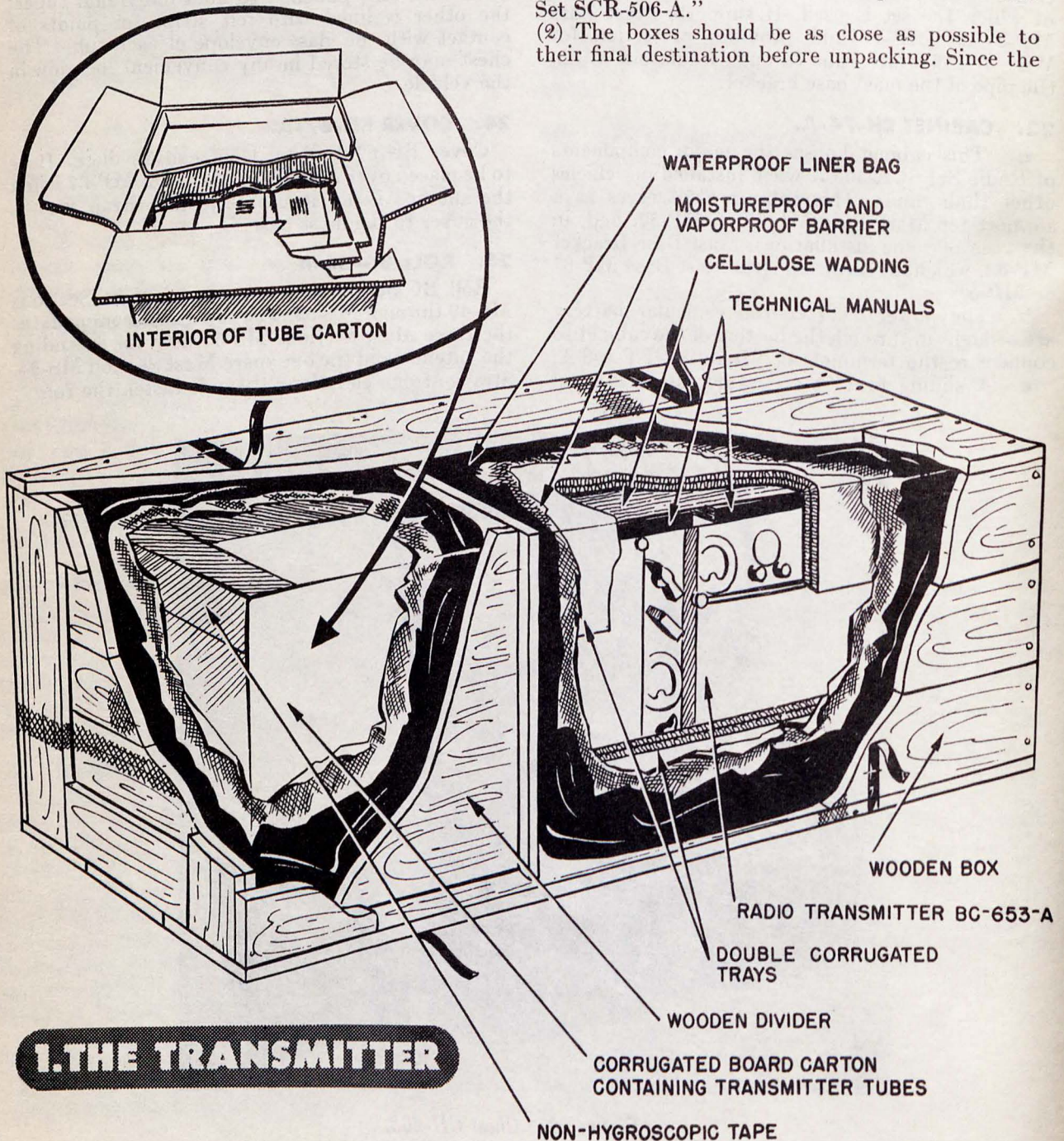
SECTION II

Assembly and Installation

a. General.

(1) The contents of all packages are stenciled directly on the box. A packing slip in a moistureproof enclosure is stapled to the box and is protected by a heavy black paper covering. An orange band painted around the center of the box and a stripe painted across each end indicates packaging for export. Export packing is labeled, "Packed with de-hydrating agent. DO NOT OPEN UNTIL READY FOR USE." An orange disc means that the box is a part of a shipment. One slant four ($\frac{1}{4}$) on box No. 1 is interpreted as, "this is box No. 1 of 4 boxes required to complete one Radio Set SCR-506-A."

(2) The boxes should be as close as possible to their final destination before unpacking. Since the



2. THE RECEIVER

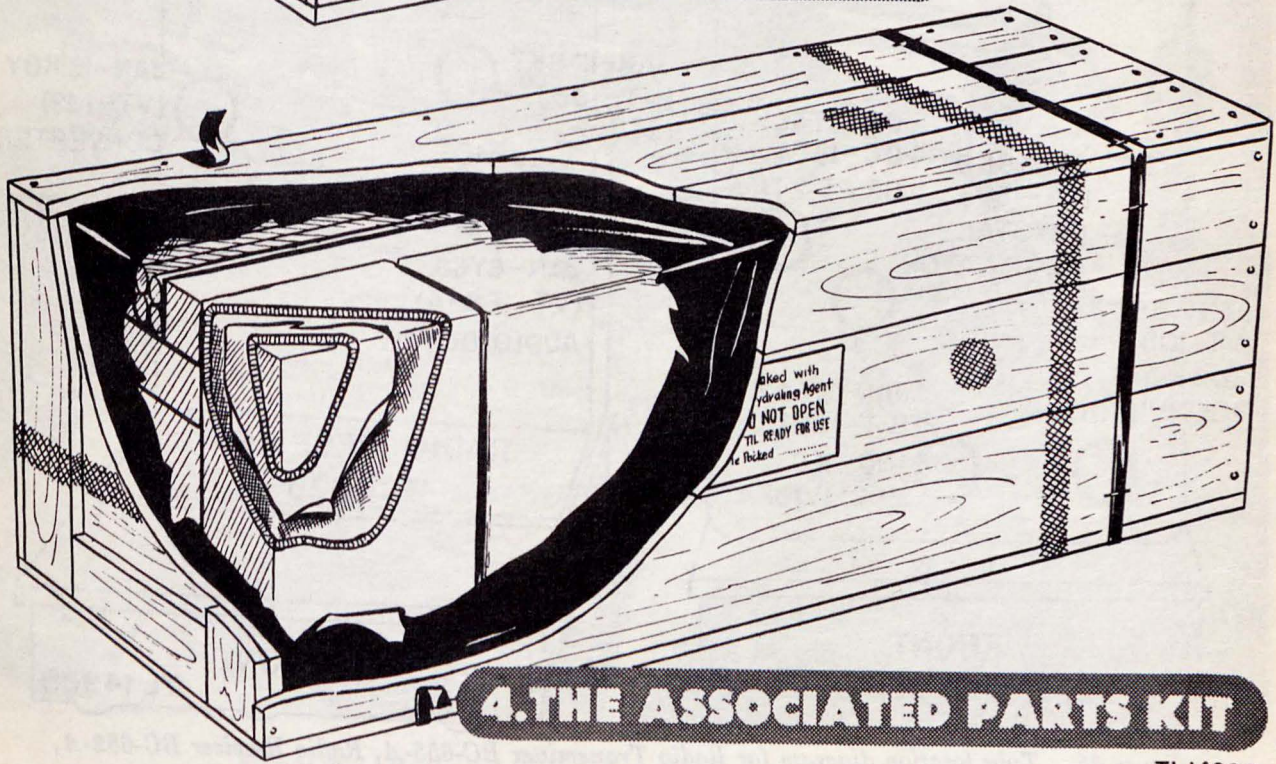
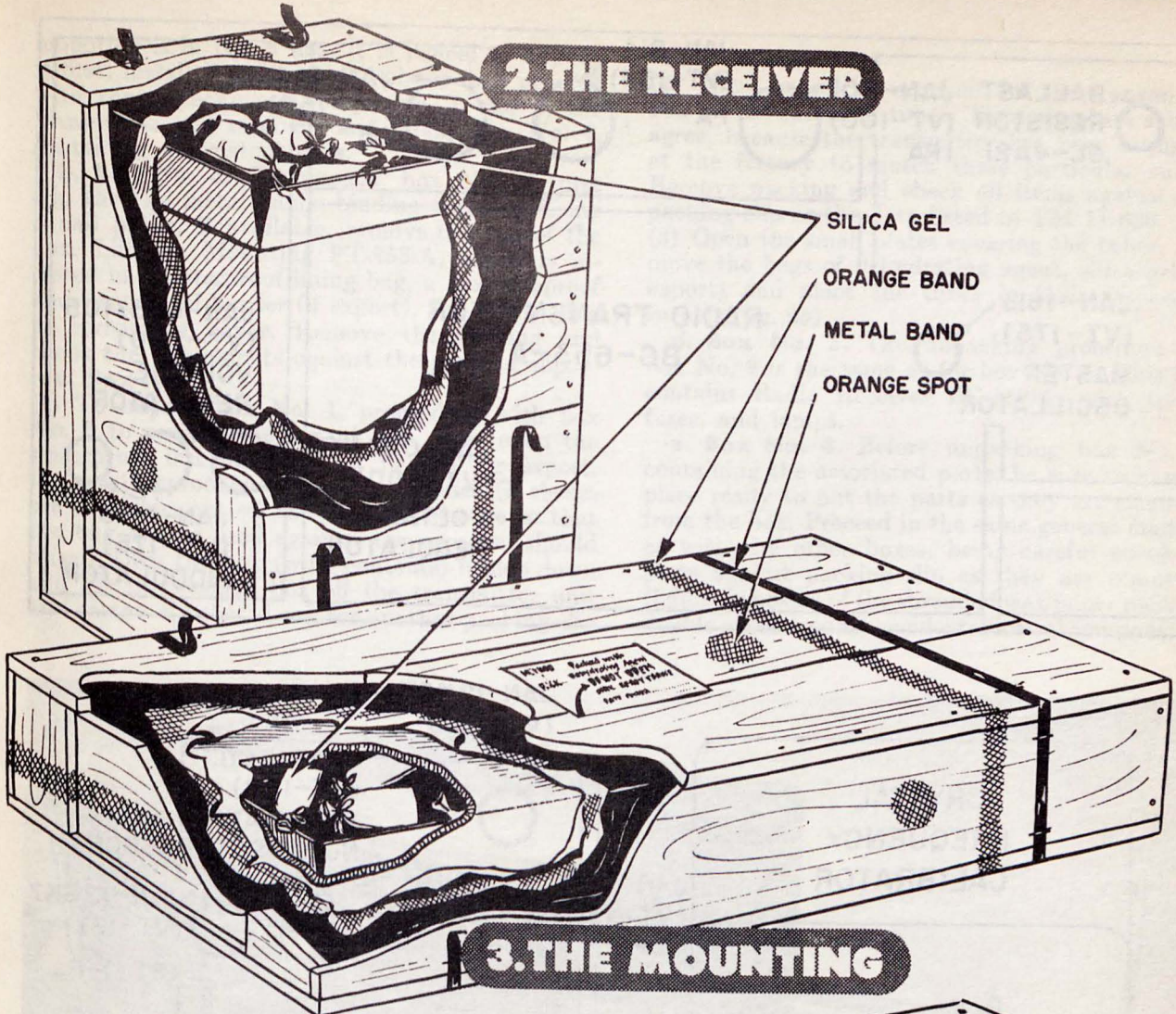


Figure 24. Radio Set SCR-506-A, packaging.

TL14926

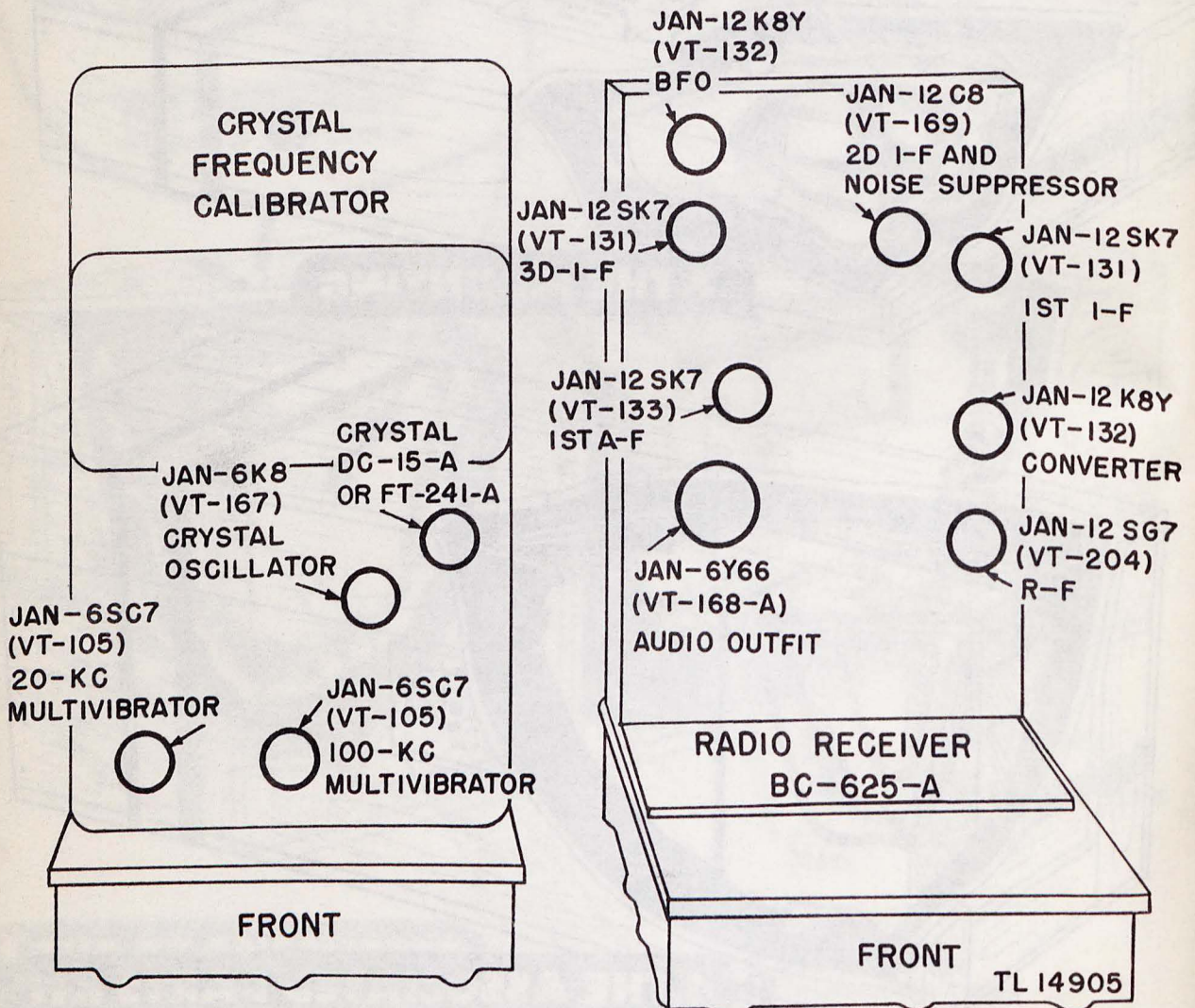
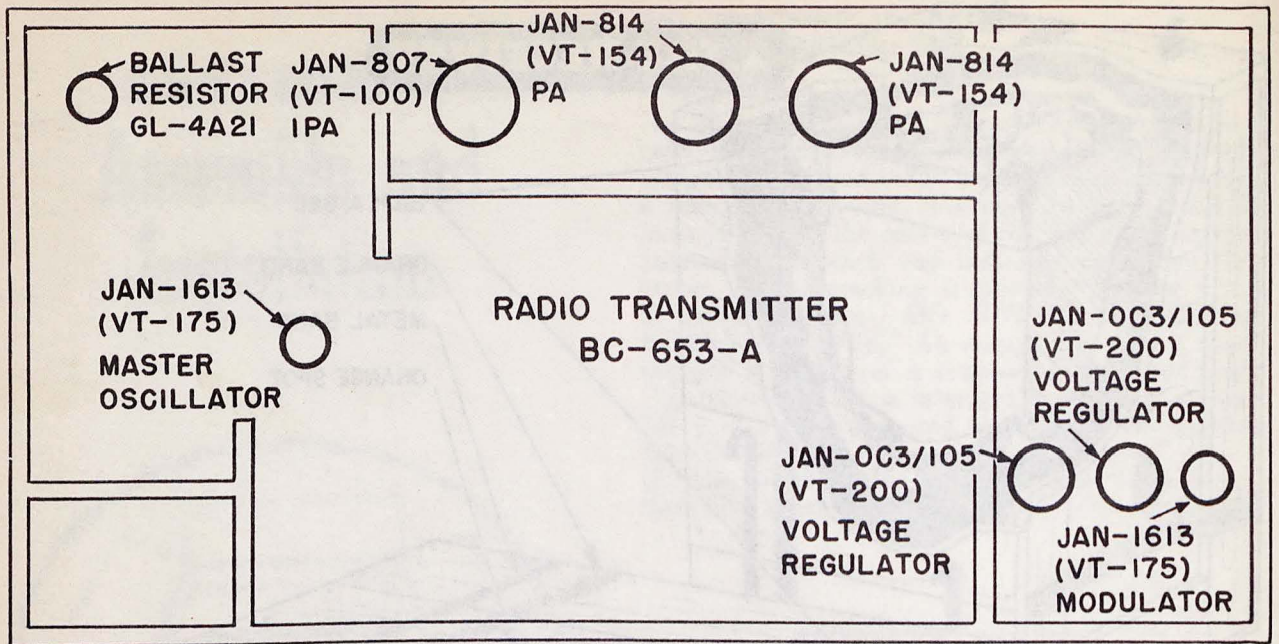


Figure 25. Tube location diagram for Radio Transmitter BC-653-A, Radio Receiver BC-652-A, and crystal-frequency calibrator.

mounting is in No. 3 box, it is logical to unpack it first, install it in its proper place, then proceed with the unpacking of boxes No. 1 and 2, the transmitter and receiver, and finally box No. 4, containing associated parts.

b. Box No. 3. To unpack box No. 3, first clip the two metal bands binding the box. Using a nail puller, if available, remove the top of the box. Lift out Mounting FT-253-A, which is enclosed in a waterproof lining bag, a moistureproof and vaporproof barrier (if export), and a wrapping of corrugated paper. Remove the packing and check the components against the packing slip.

c. Box No. 1.

(1) To unpack box No. 1, proceed as with box No. 3 to remove the top of box. Tear open the waterproof box liner and, if packed for export, the moistureproof and vaporproof barrier. (If shears are available, cut off the heat-sealed edge so that the bag can be used again if the occasion should arise.) Turn the box (with contents) upside down and lift the wooden box off the transmitter unit and carton of tubes. Look for another packing slip

inside the box.

(2) There are serial numbers on the transmitter and on the carton of tubes. These numbers should agree, because the transmitter has been adjusted at the factory to match these particular tubes. Remove packing and check all items against the packing slip or the data listed in TM 11-630.

(3) Open the small plates covering the tubes. Remove the bags of dehydrating agent, silica gel (if export) and place the tubes in their respective sockets (fig. 25).

d. Box No. 2. The unpacking procedure for box No. 2 is the same as for box No. 1. This box contains Radio Receiver BC-652-A, with tubes, fuses, and lamps.

e. Box No. 4. Before unpacking box No. 4, containing the associated parts, be sure to have a place ready to put the parts as they are removed from the box. Proceed in the same general manner as with the other boxes, being careful to check parts against packing slip as they are removed. Before disposing of the shredded wax paper packing double check against accidental loss of components.

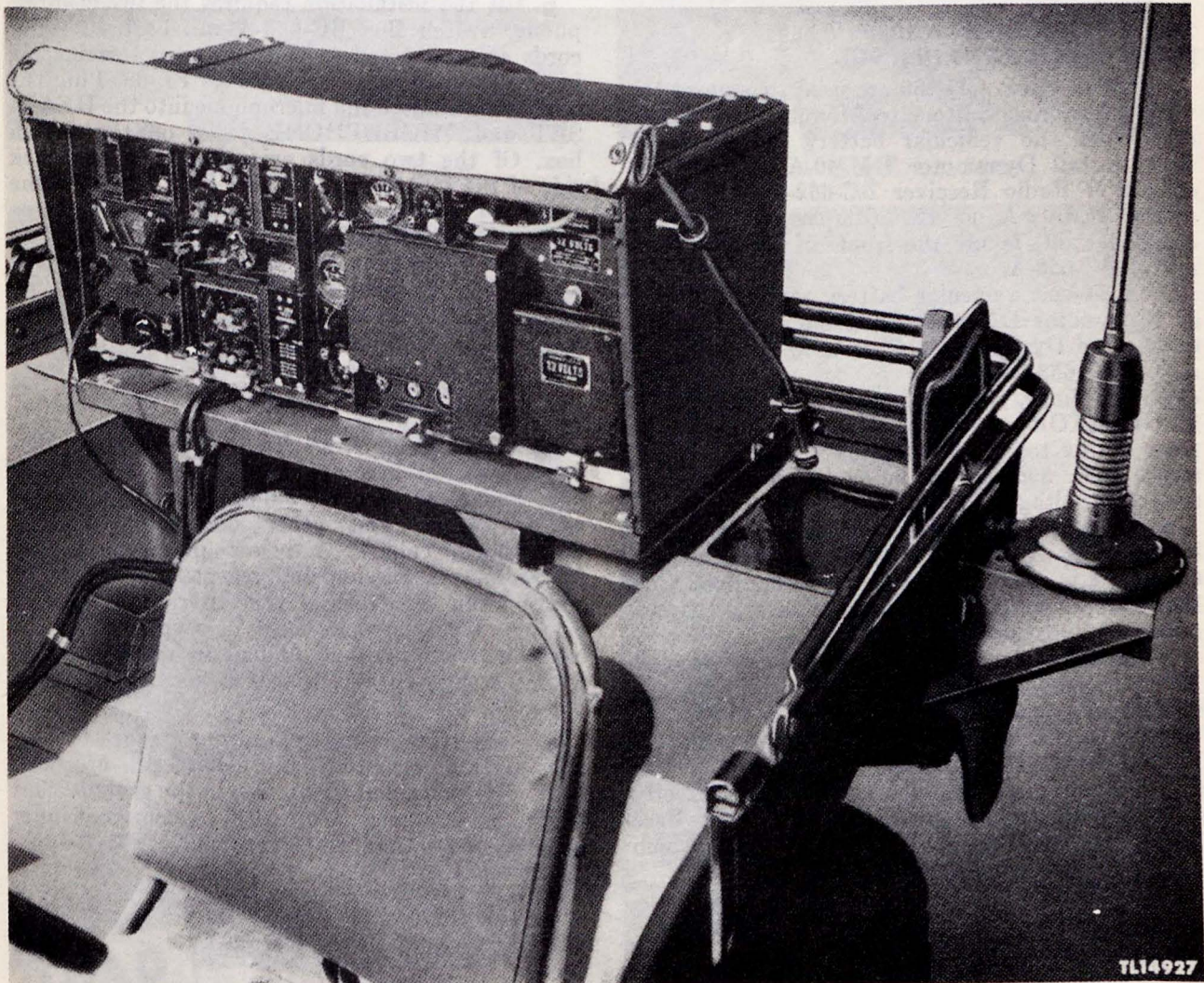


Figure 26. Radio Set SCR-506-A installed in Truck, $\frac{1}{4}$ -ton, 4 x 4.

27. INSTALLATION.

Radio Set SCR-506-A is a vehicular radio set. For complete installation instructions, refer to the technical manual of the TM 11-2700 series that pertains to the vehicle in which the installation is to be made.

a. Installations Using Cabinet CH-74-A. When Cabinet CH-74-A is required in the installation: (fig. 26) first, install Mounting FT-253-A on the floor of the cabinet with the five clamp fasteners facing the open front of the cabinet; then place Radio Transmitter BC-653-A on the right side of Mounting FT-253-A, facing the open front of the cabinet. Place Radio Receiver BC-652-A on the left side of Mounting FT-253-A in a like manner. The five clamp fasteners on the front of the mounting are used to secure the transmitter and receiver.

b. Installations Not Requiring Cabinet CH-74-A. When Cabinet CH-74-A is not used in the installation, bolt Mounting FT-253-A directly on a structural support of the vehicle or on special brackets furnished for the installation. Place Radio Transmitter BC-653-A and Radio Receiver BC-652-A on the mounting in the manner described in subparagraph **a**, above.

28. CONNECTIONS AND INTERCONNECTIONS (fig. 90).

a. Two Cords CD-280 are used to connect the vehicular storage battery to Mounting FT-253-A.

(1) When the vehicular battery voltage is 12 volts, install Dynamotor DM-40-A on the CFC chassis of Radio Receiver BC-652-A and Dynamotor DM-42-A in the compartment at the extreme right, facing the front, of Radio Transmitter BC-653-A.

(2) A 24-volt vehicular battery requires the use of Dynamotor DM-41-A in Radio Receiver BC-652-A, and Dynamotor DM-43-A in Radio Transmitter BC-653-A.

(3) The links, located under the VOLTAGE REGULATOR and MODULATOR tube cover plate at the top right of Radio Transmitter BC-653-A (par. 305) should be set to correspond to the input voltage.

b. Connect the antenna lead-in wire to the binding post A on Radio Transmitter BC-653-A. Connect a jumper wire between binding post A on Radio Receiver BC-652-A and the adjacent transmitter binding post.

(1) In installations where Mast Base Bracket MP-52 is mounted on Cabinet CH-74-A, run the antenna lead-in wire through the mast base bracket to the screw terminal at the bottom of Mast Base MP-37 or MP-57.

(2) In other installations, run the lead-in directly to the screw terminal at the bottom of Mast Base MP-37 or MP-57. For installations in which

holes for the antenna lead must be drilled in bulkheads or in the chassis of the vehicle, refer to the technical manual of the TM 11-2700 series that pertains to the vehicle concerned.

c. Cord CD-314 is equipped with a plug at either end. Plug PL-68, on one end, fits into Jack JK-33-A in Loudspeaker LS-3. Plug PL-55, on the other end, fits into SPEAKER Jack JK-34-A on Radio Receiver BC-652-A.

d. Cord CD-201 has two spade terminals on one end to connect to Key J-45. On the other end is a Plug PL-55 to connect to the KEY Jack JK-34-A on Radio Transmitter BC-653-A.

e. If the installation does not require the use of interphone, Microphone T-17 connects directly to the transmitter MICROPHONE Jack JK-33-A through Plug PL-68 on the microphone cord. If the lip Microphone T-45 is used in installations not requiring interphone, this microphone connects through Cord CD-318 to the MICROPHONE Jack JK-33-A on the transmitter.

f. Two PHONE jacks on Radio Receiver BC-652-A will accommodate two Plugs PL-55 to connect two Headsets HS-30().

g. If the installation requires the use of interphone, Switch Box BC-658-A will be used. Four cords are connected to this box, two terminating in Plugs PL-55 and two in Plugs PL-68. Plug the operator's headset and microphone into the HEADSET and MICROPHONE jacks on the switch box. Of the two cords emerging from the jack side of the switch box, connect Plug PL-55 to the receiver PHONE jack and Plug PL-68 to the transmitter MICROPHONE jack. Connect the two cords emerging from the switch side of the switch box to the interphone system. A 4-pole, double-throw switch on the switch box permits the operator to switch both microphone and headset from radio to interphone.

29. SITING.

a. The signals from Radio Transmitter BC-653-A have a greater range if the antenna is high and clear of hills, buildings, cliffs, densely wooded areas, and other obstructions. Dips, depressions, valleys, and low places are poor for radio transmission and reception because the surrounding high terrain absorbs radio-frequency energy. Weak signals may be expected if the radio set is operated under or close to steel bridges or underpasses or near power lines or power units.

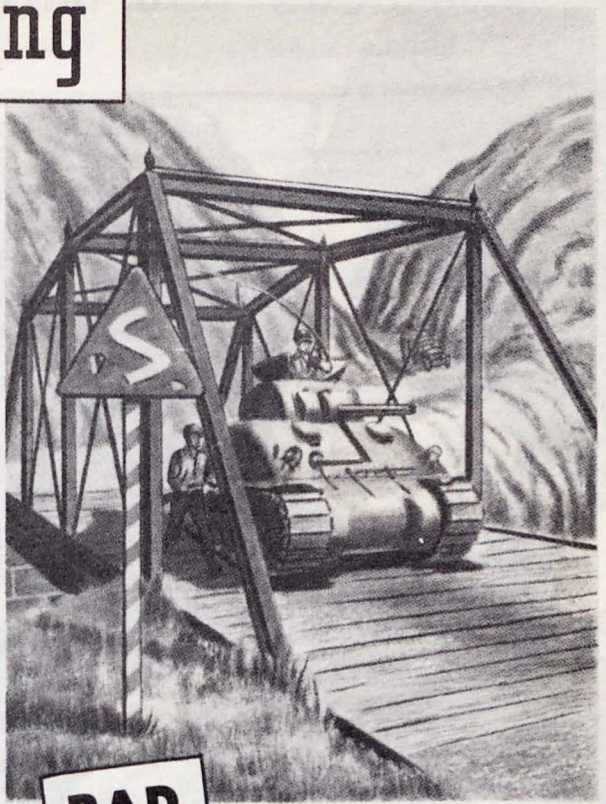
b. The most desirable locations, as far as transmission and reception are concerned, are hill-tops, elevations, and slight rises in the ground. Flat terrain is also good. Normally, transmission over water is better than that over land.

Siting



BAD

High tension lines



BAD

Steel bridges



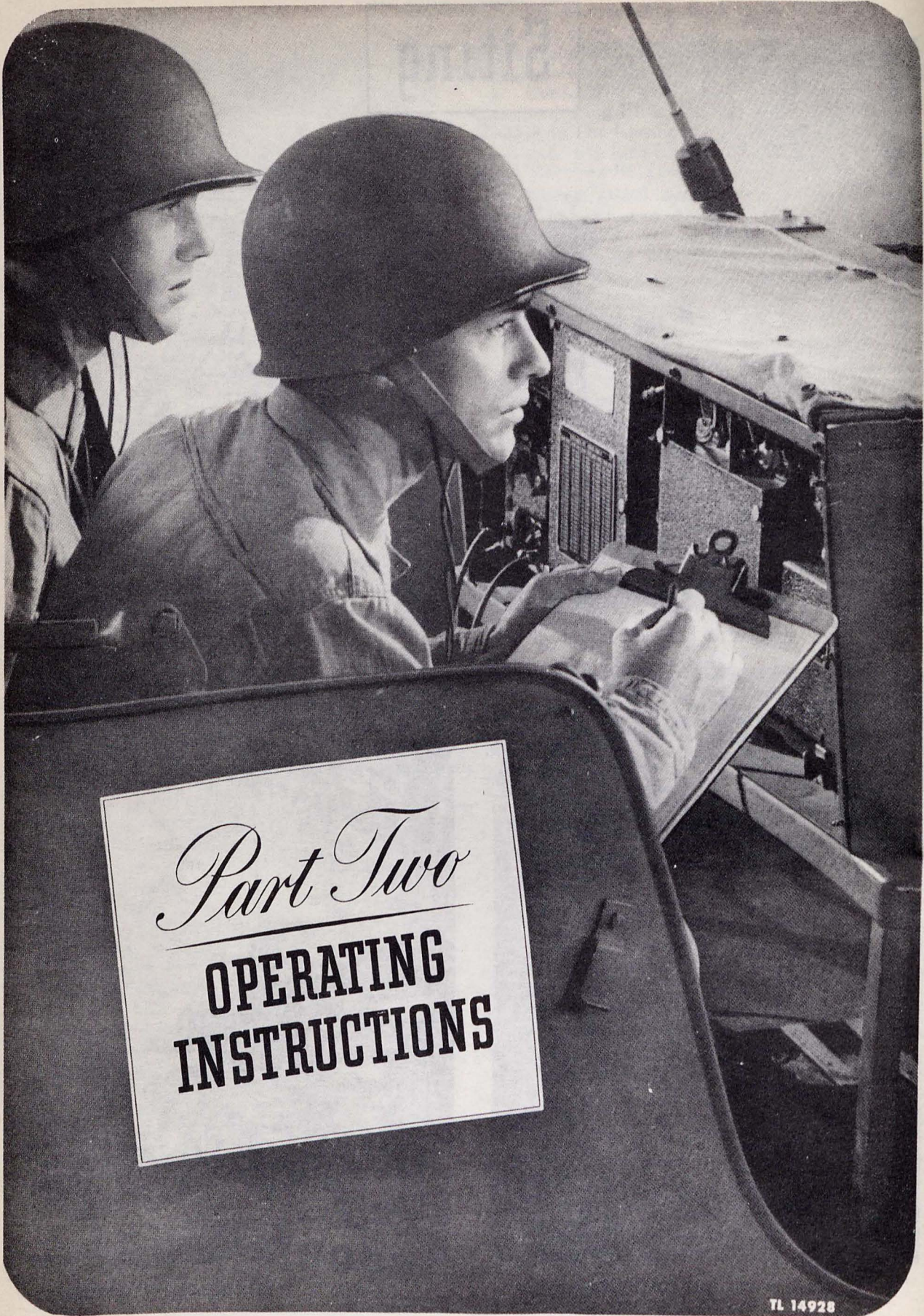
BAD

Valleys or depressions



GOOD

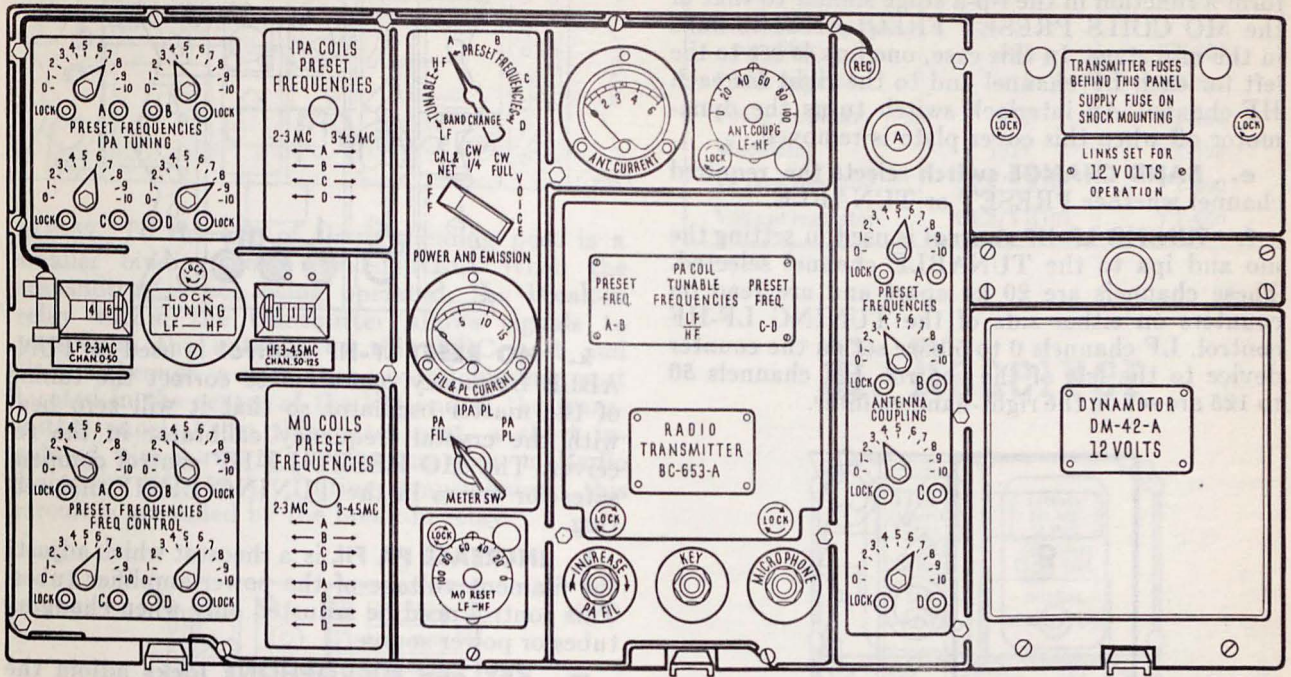
Hilltop or flat terrain



Part Two
**OPERATING
INSTRUCTIONS**

TL 14928

SECTION III • Controls and Their Use



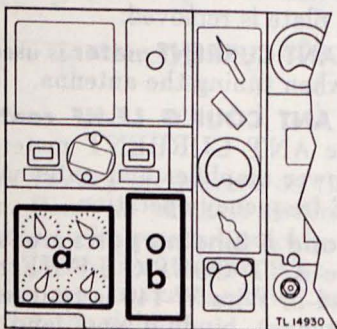
TL15424

Figure 27. Radio Transmitter BC-653-A, line drawing of front panel.

30. Transmitter

Radio Transmitter BC-653-A (fig. 8) is provided with two sets of controls which make it possible to pretune all transmitter stages to any five predetermined channels within the range of the set. One set of controls, marked **PRESET FREQUENCIES**, is used to tune all stages to four of the five preselected channels. The other set of controls, marked **TUNABLE FREQUENCIES**, tunes all of the stages to the fifth channel. Selection of any one of these five channels is accomplished by means of a **BAND CHANGE** switch on the transmitter.

The frequency range of the transmitter is divided into two bands marked **LF** (low frequency) and **HF** (high frequency). The **LF** band covers 2.0 to 3.0 mc and the **HF** band covers 3.0 to 4.5 mc.

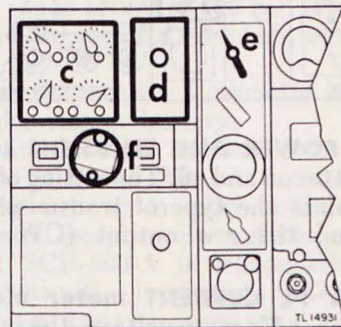


TL 14930

The following paragraphs are keyed alphabetically to the accompanying diagrams. For example, the preset frequency control described in subparagraph **a** is marked **a** on the illustration.

a. PRESET FREQUENCIES FREQ. CONTROL are four identical controls located on the lower left of the front panel of the transmitter. These four controls tune the master oscillator to the four preset frequencies.

b. MO COILS PRESET FREQUENCIES links located under the cover plate are associated with the master oscillator tuning controls. The position of the links determines the oscillator tank inductance. A pair of these links must be set to the left for each channel used in the **LF** band (2.0 to 3.0 mc) and to the right for the **HF** channels (3.0 to 4.5 mc).



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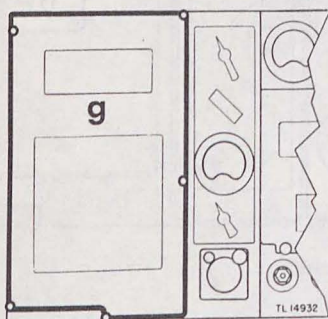
NOTE: Destruction notice for Radio Set SCR-506-A is located in the front of the technical manual.

c. **PRESET FREQUENCIES IPA TUNING controls** tune the intermediate-power-amplifier plate circuit to each of the four preset frequencies.

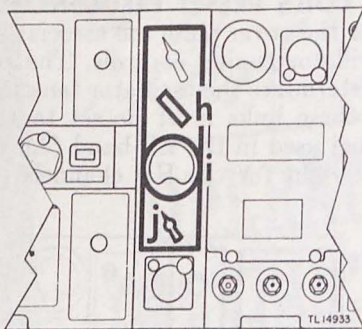
d. **IPA COILS PRESET FREQUENCIES links** perform a function in the i-p-a stage similar to that of the MO COILS PRESET FREQUENCIES links in the m-o stage. In this case, one link is set to the left for each LF channel and to the right for each HF channel. An interlock switch turns the dynamotor off when this cover plate is removed.

e. **BAND CHANGE switch** selects the required channel whether PRESET or TUNABLE.

f. **TUNING LF-HF control** is used in setting the mo and ipa to the TUNABLE channel selected. These channels are 20 kc apart and are read on counters on either side of the TUNING LF-HF control. LF channels 0 to 50 are set on the counter device to the left of the control. HF channels 50 to 125 are set on the right-hand counter.



g. **CHANNEL VS. FREQUENCY chart** gives the relationship between channel numbers and their corresponding frequencies. Within the transmitting range of 2.0 to 4.5 mc are 126 channels, numbered from 0 to 125. Spaced 20 kc apart, these channels start with channel 0 at 2.0 mc and end with channel 125 at 4.5 mc.

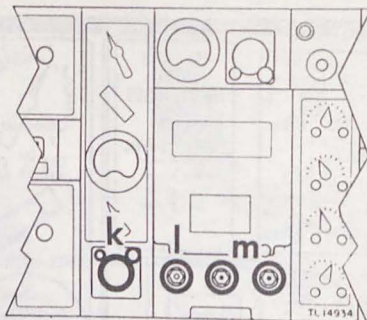


h. **The POWER AND EMISSION switch** turns the transmitter on and off. The setting of this switch also determines the type of transmission (CW or VOICE) and the c-w output (CW $\frac{1}{4}$ or CW FULL).

i. **FIL & PL CURRENT meter** measures the power-amplifier filament voltage, the intermediate-power-amplifier plate current, and the power-amplifier plate current.

j. **The METER SW**, directly below the FIL &

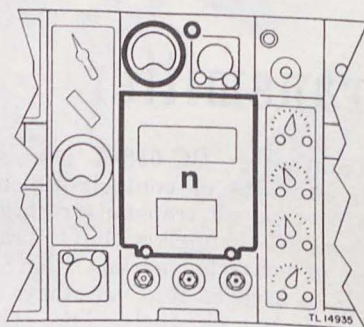
PL CURRENT meter, makes possible the selection of the three quantities which can be measured, PA FIL (voltage), IPA PL (current), and PA PL (current).



k. **MO RESET LF-HF control** is used in TUNABLE frequency operation to correct the tuning of the master oscillator so that it will zero beat with the crystal frequency calibrator in the receiver. The MO RESET LF-HF control compensates for errors in the TUNING LF-HF dial setting.

l. **INCREASE PA FIL** is a rheostat which adjusts the filament voltage of the power-amplifier tubes. This control need be adjusted only when changing tubes or power source.

m. **KEY and MICROPHONE jacks** adjoin the INCREASE PA FIL control.

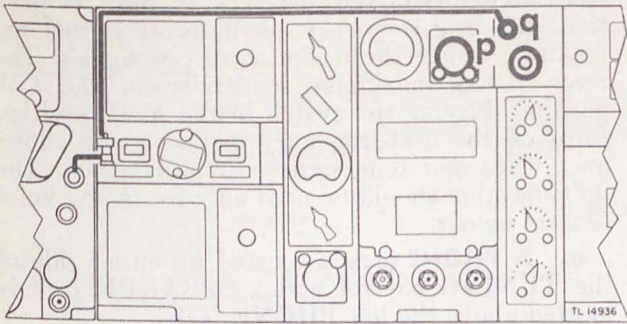


n. **PA COIL** is the power-amplifier tank coil, located directly above the KEY and MICROPHONE jacks. Two cover plates must be removed before it can be reached. There are five taps on this coil, marked A, B, T, C, and D, to correspond to the four PRESET and the one TUNABLE frequency controls. Two lamps light the coil compartment when the receiver is turned on. An interlock switch turns off the dynamotor when the inner cover plate is removed.

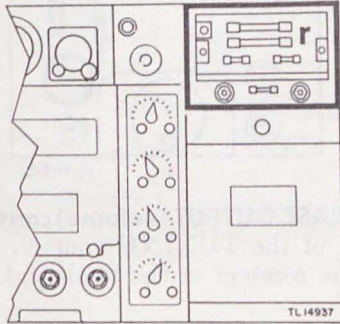
o. **The ANT CURRENT meter** is used to indicate resonance when tuning the antenna.

p. **The ANT COUP'G LF-HF control**, to the right of the ANT CURRENT meter, is used to tune the power amplifier and antenna circuits for TUNABLE frequency operation.

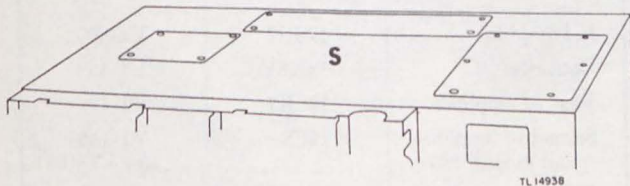
q. **REC and A binding posts** are located to the right of the ANT COUP'G LF-HF control. The antenna lead-in Wire W-146 is connected between the A (antenna) binding post and Mast Base



MP-57. To the left of the A binding post is a smaller binding post marked REC. When the transmitter is not being operated, the break-in relay within the transmitter allows signals to pass from the antenna to this REC post and thence through a wire to a second binding post located in the center of the left end of the transmitter panel. From this latter post, a short insulated wire is run to the antenna post on Radio Receiver BC-652-A. During transmission, this circuit is grounded by the break-in relay.



r. **Fuse panel** is a cover plate which can be removed to reach the transmitter fuses, the microphone volume control, and the modulator bias control. Spare fuses are contained in clips on the rear of the cover plate. The microphone volume control and the modulator bias control are factory-adjusted and seldom require adjustment in the field. Should replacement of fuses or adjustment become necessary, an interlock turns off the dynamotor when the cover plate is removed.



s. **Patch covers** are located on the top of the transmitter. Removal of these covers permits all vacuum tubes to be reached quickly without displacing the protective shields. The 12-volt and 24-volt links can be reached by removing the patch cover at the right.

RADIO TRANSMITTER BC-653-A TUBE CHART

Function	JAN Type	S-C Type
Master oscillator	1613	VT-175
Intermediate power amplifier	807	VT-100
Power amplifier	814	VT-154
Power amplifier	814	VT-154
Modulator	1613	VT-175
Voltage regulator	OC3/VR105	VT-200
Voltage regulator	OC3/VR105	VT-200

31. Receiver

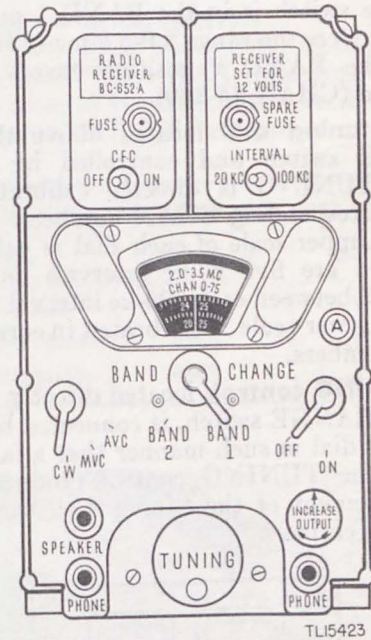


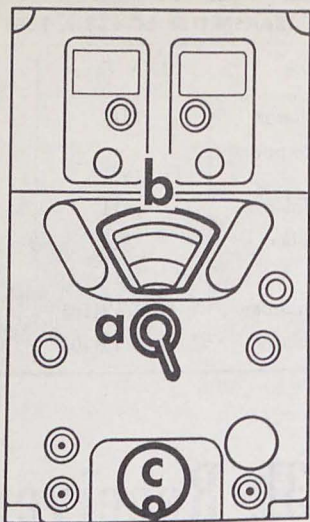
Figure 28. Radio Receiver BC-652-A, line drawing of front panel.

Radio Receiver BC-652-A (fig. 5) covers the frequency range of 2.0 to 6.0 mc. This frequency range is divided into 201 channels, numbered from 0 to 200.

Power for the receiver dynamotor is supplied by the vehicular storage battery.

A noise limiter which reduces static and ignition interference is used in this set. A disabling circuit, operated by a break-in relay in the transmitter, prevents radio reception through the receiver while Radio Set SCR-506-A is transmitting. Sidetone from the transmitter is applied to the audio output of the receiver during transmission.

a. **BAND CHANGE switch**, located in the center of the receiver panel, makes possible the selection of either of two bands, BAND 1 or BAND 2.



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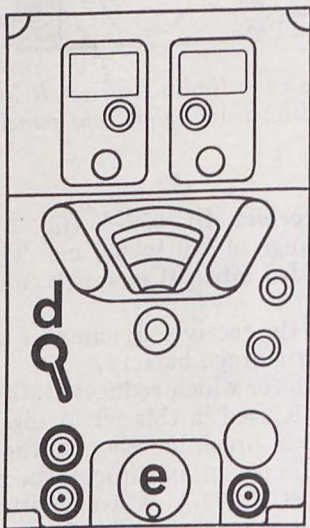
When the switch is in the BAND 1 position, the receiver covers the range 2.0-3.5 mc (CHAN 0-75); and in the BAND 2 position covers the range 3.5-6.0 mc (CHAN 75-200).

b. A tuning dial located above the BAND CHANGE switch and controlled by the knob marked TUNING is directly calibrated in mc and in corresponding CHAN numbers.

(1) The upper scale of each dial is calibrated in mc. There are five 20-kc intervals on the scale marked off between each 100-kc interval.

(2) The lower scale is calibrated in corresponding CHAN numbers.

c. TUNING control, located directly below the BAND CHANGE switch, is connected by gears to the tuning dial in such manner that a large movement of the TUNING control produces only a small movement of the tuning dial, thus making fine tuning easier.

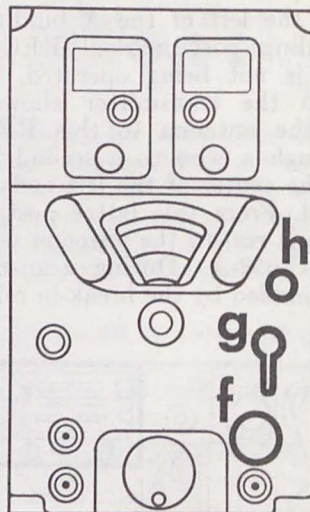


TL 14941

d. CW-MVC-AVC switch, located to the left of the BAND CHANGE switch, controls the beat-frequency oscillator and the automatic-volume-

control circuits of the receivers. In the CW position, the beat-frequency oscillator is turned on, making possible the reception of c-w signals. The receiver has maximum sensitivity in the CW position. Placing the switch in the MVC position turns off the beat-frequency oscillator and allows only voice and tone signals to be received. The AVC position should be used only for fading voice or tone signals.

e. A PHONE jack is located on either side of the TUNING control and a SPEAKER jack is located above the left PHONE jack.



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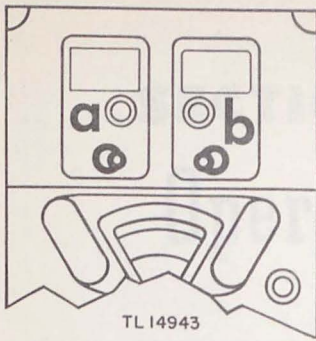
f. INCREASE OUTPUT (volume) control, located to the right of the TUNING control, adjusts the output of the receiver in the loudspeaker or headset.

g. OFF-ON switch, located above the INCREASE OUTPUT control, controls all power supplied to the receiver and the crystal frequency calibrator. In the ON position, this switch also supplies filament voltage to the master-oscillator and intermediate-power-amplifier tubes in the transmitter.

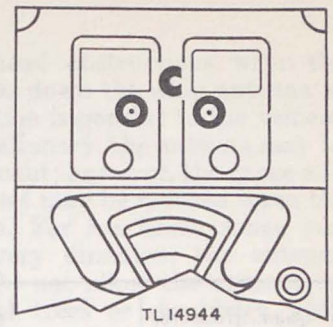
h. The spring-type binding post A on the receiver panel is used for connection to the antenna lead from the transmitter.

RADIO RECEIVER BC-652-A TUBE CHART

Function	JAN Type	S-C Type
R-f amplifier	12SG7	VT-209
Converter	12K8Y	VT-132
First i-f amplifier	12SK7	VT-131
Second i-f amplifier and noise limiter	12C8	VT-153 (or VT-169)
Third i-f amplifier	12SK7	VT-131
Beat-frequency oscillator	12K8Y	VT-132
Second detector and first a-f amplifier	12SR7	VT-133
Audio output	6Y6G	VT-168-A



32. Crystal-frequency Calibrator



The CFC (fig. 29) generates accurately calibrated crystal-controlled signals which may be heard in the receiver. These signals are used to calibrate the receiver and the transmitter.

a. The CFC OFF ON switch on the left panel of the calibrator controls the voltage applied to the plates of the tubes in the CFC.

b. The INTERVAL 20 KC-100 KC switch provides a choice of signals for calibrating purposes.

c. FUSE and SPARE FUSE receptacles are provided on the CFC panel for the protection of the power supply circuit from the battery to the dynamotor. Both fuses are rated at 20 amps, 25 volts. Failure of the fuse will cause the receiver and the CFC to be inoperative.

d. Two sets of signals are available from the CFC:

(1) With the INTERVAL 20 KC-100 KC switch in the 100 KC position, a signal will be emitted at every multiple of 100 kc in the range of the receiver.

(2) For the calibration of the receiver on frequencies not close to the frequencies covered by the 100 KC position, use of the INTERVAL switch in the 20 KC position causes the CFC to emit a signal on every multiple of 20 kc in the operating range.

e. Three important uses of the CFC are:

- (1) Calibration of the receiver.
- (2) Calibration of the transmitter oscillator stage for operation on TUNABLE frequencies.
- (3) Calibration of the transmitter oscillator stage for operation on PRESET frequencies.

CRYSTAL FREQUENCY CALIBRATOR TUBE CHART

Function	JAN Type	S-C Type
Crystal oscillator	6K8	VT-167
100-kc multivibrator	6SC7	VT-105
20-kc multivibrator	6SC7	VT-105

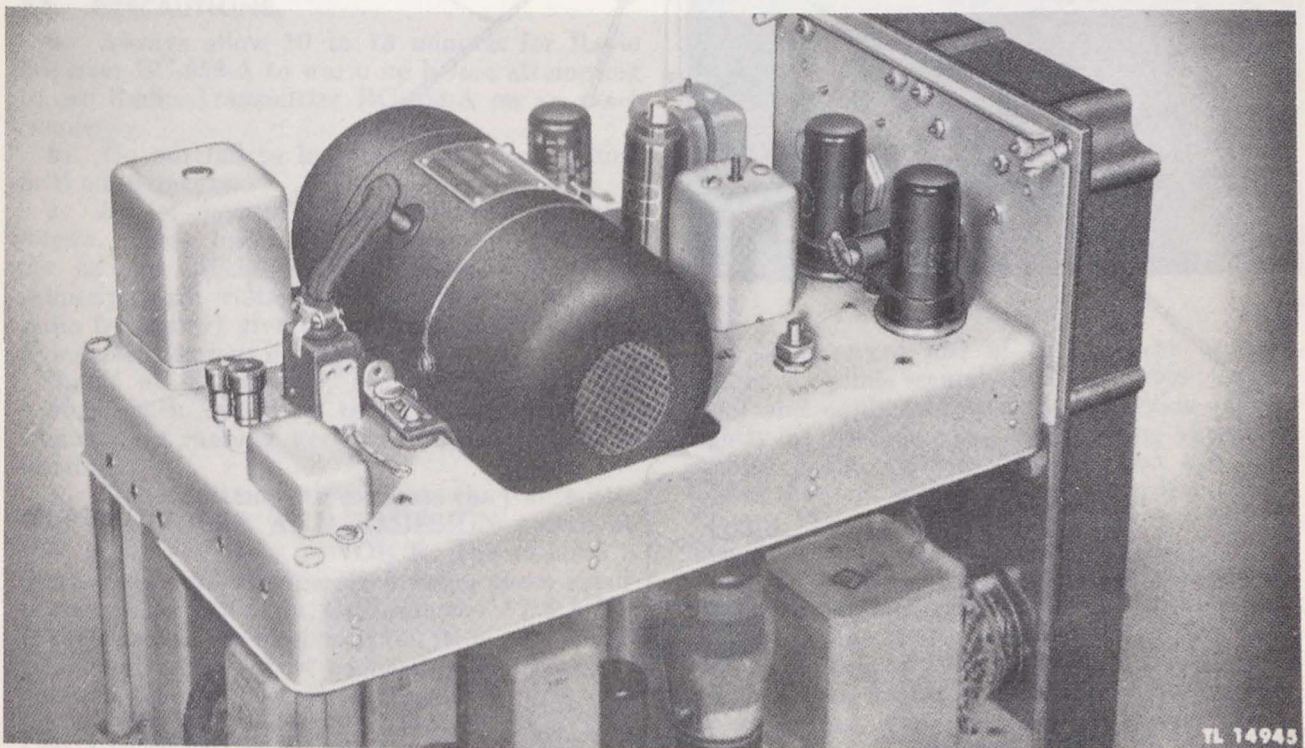


Figure 29. Crystal-frequency calibrator, left-side view.

Quan	Item No.	Component
1	1	Mast Base MP-37 or MP-57
1 ea	2	Mast Sections MS-49 through MS-53.
3	3	Mast Section MS-54.
1	4	Guy Plate FT-360.
3	5	Stakes GP-2.
3	6	Insulators IN-86.
3	7	Guy GY-22-A.
3	....	Reels RL-29.
1	....	Bag BG-125.

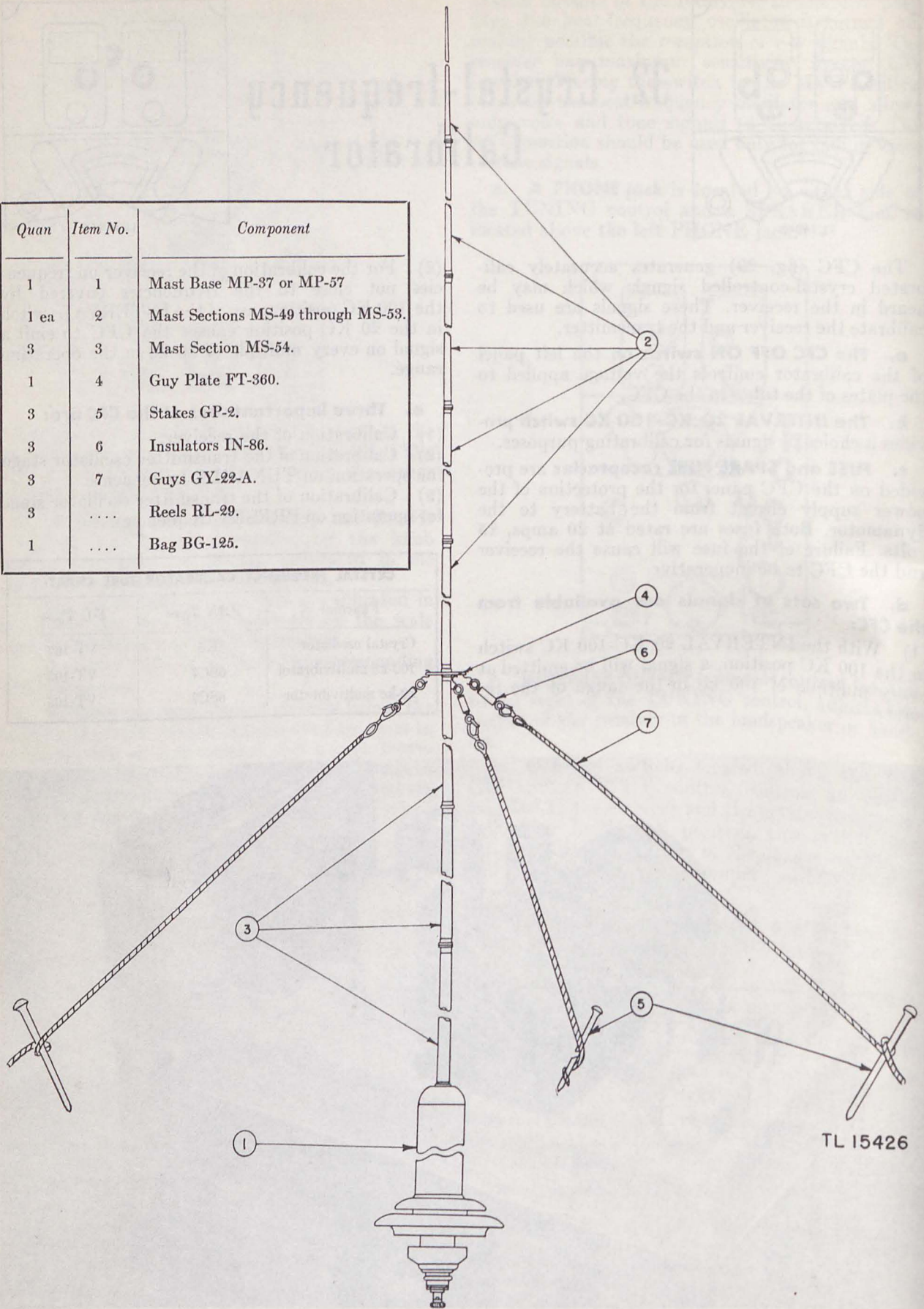


Figure 30. Radio Set SCR-506-A, installation of extended 25-foot whip antenna.

SECTION IV

Operation

33. NET OPERATION.

In the net operation, each set in the net must be accurately tuned to the same frequency. *Tune all sets within the same net under substantially the same conditions.* The positions and lengths of the antennas, the temperature, and the battery terminal voltages must be fairly uniform. If operation in transit is to be effected, tune sets with engines of the vehicles running. Lock all transmitter controls after net tuning operation. Refer to FM 24-18 for a more complete discussion of net operation.

34. INTERFERENCE.

- a. Interference is minimized by c-w operation.
- b. Avoid operation in the vicinity of power lines since they often are a source of interference.
- c. A form of interference called track static may be generated by track-laying vehicles. This form of interference must be cured at the source.
- d. Interference due to improper joining of metal parts of the vehicle may be prevented by care in grounding the radio equipment and careful bonding together (connecting) all metal parts of the vehicle.

35. PRECAUTIONS.

- a. Always allow 10 to 15 minutes for Radio Receiver BC-652-A to warm up before attempting to set Radio Transmitter BC-653-A on an exact frequency.
- b. Do not fail to lock the dials after making final adjustments.
- c. *Do not operate the safety interlocks with your fingers.* These interlocks are provided solely in the interest of the operator's safety. Use them properly. High voltages (either direct current or radio frequency) give no warning, and the shock or burns are serious if not fatal.
- d. If at all possible, run the engine of the vehicle when operating the transmitter. If the engine is not running, keep transmissions as brief as feasible.
- e. Do not attempt to calibrate the transmitter with the POWER AND EMISSION switch on CW $\frac{1}{4}$, CW FULL, or VOICE. The receiver is desensitized and nonoperative under these conditions with the key down. Calibrate on CAL & NET. If the signal in the receiver is too strong on CAL & NET, remove the short connecting wire from the antenna binding post on the receiver while calibrating. **DO NOT FORGET TO REPLACE THE CONNECTING WIRE WHEN THE CALIBRATION IS COMPLETED.**

36. ANTENNAS.

a. To clear overhead obstructions when the vehicle is in motion, tie down the whip antenna so that the top mast section is parallel to the vehicle. When the vehicle is stationary, the antenna may be tied down for concealment; however, the range and signal strength of the set may be reduced when the antenna is tied down. For maximum range and signal strength in every direction, the antenna should be released. Do not allow the antenna to touch the branches of trees or shrubbery while transmitting or receiving.

b. To tie the antenna down, use Rope RP-5 or equivalent and an insulator such as Insulator IN-86 or IN-87. Cut about $1\frac{1}{2}$ feet of rope and tie to one end of the insulator. Tie the other end of this piece of rope just above one of the mast section ferrules and secure it with tape. Tie another length of rope to the free end of the insulator, lower the antenna to the desired level, and tie the rope to any convenient part of the vehicle.



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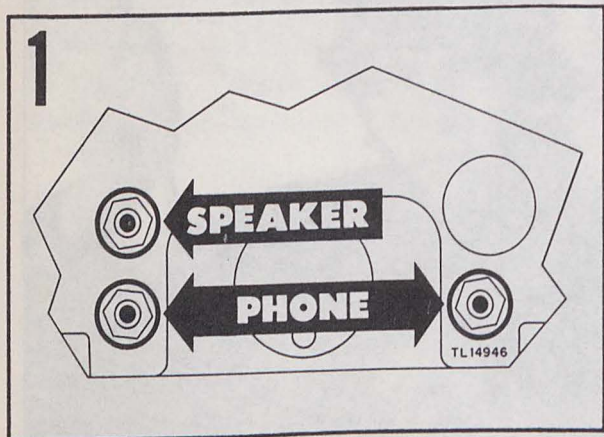
c. To prevent loss of the antenna sections, tighten the joints securely (with gas pliers, if available) and apply two servings of friction tape as tightly as possible. The first serving should be applied counterclockwise, starting on the lower half of the joint and winding upward. If available, Clamps MC-421, MC-422, MC-423, and MC-424 should be used instead of tape.

d. To increase the range and signal strength at a stationary location, add additional mast sections to increase the length of the vertical whip to 25 feet, or if concealment prohibits the use of the whip antenna, use the auxiliary Antenna AN-24-A. In either case, it is important to see that the antenna is clear of tree limbs and other vegetation to prevent the signal strength being reduced.

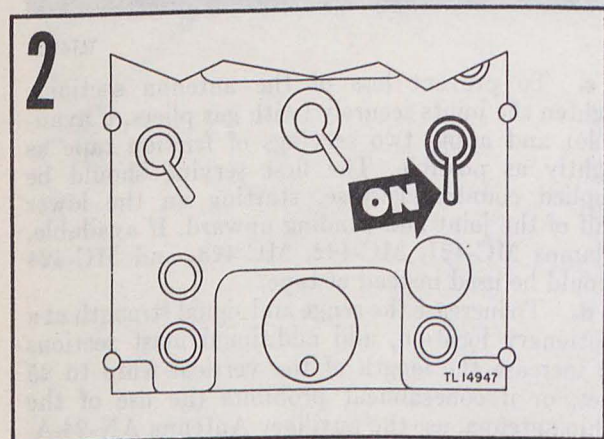
37. Continuous-wave Operation

After the transmitter has been preset (pars. 125 and 126), the following steps prepare the radio set for c-w operation.

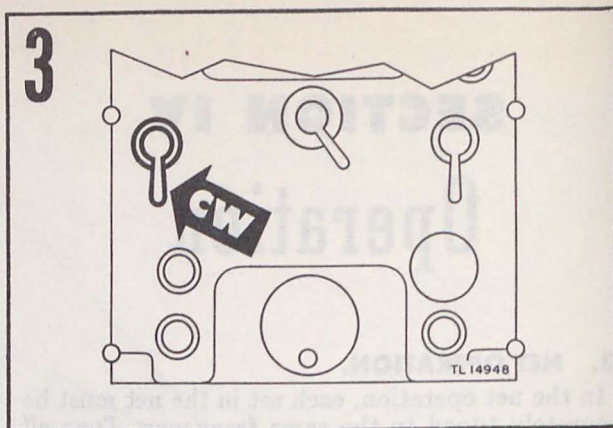
a. Radio Receiver BC-652-A



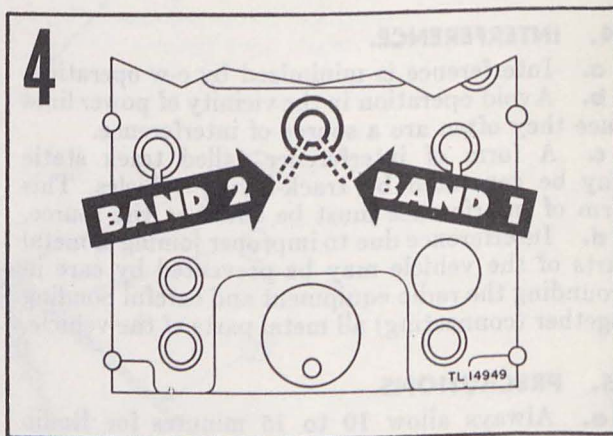
1. Plug Loudspeaker LS-3 into the **SPEAKER** jack or Headset HS-30-() into the **PHONE** jack on the receiver panel.



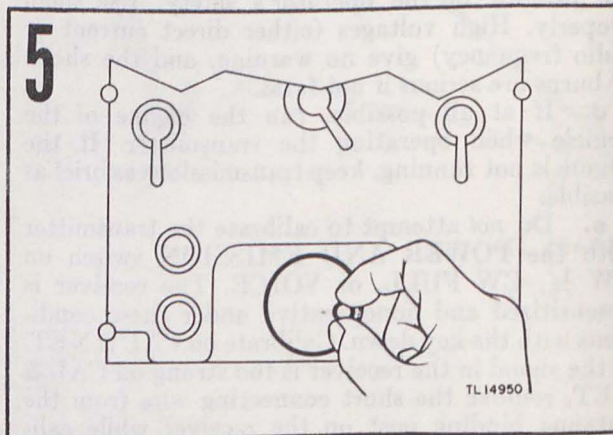
2. Turn the **OFF-ON** switch to the **ON** position.



3. Throw the **CW MVC AVC** switch to **CW**.

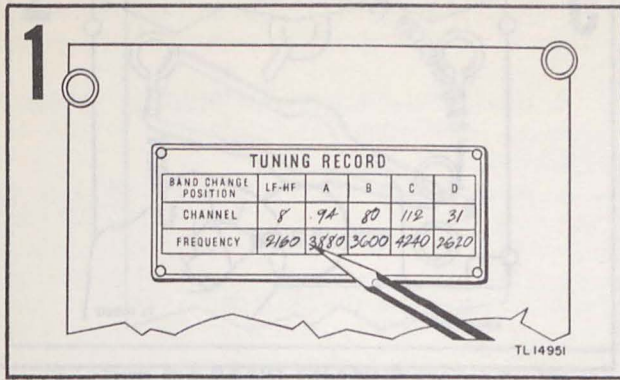


4. Set the **BAND CHANGE** switch to **BAND 1** for frequencies between 2.0 and 3.5 mc (**CHAN 0 to 75**), or to **BAND 2** for frequencies between 3.5 and 6.0 mc (**CHAN 75 to 200**).

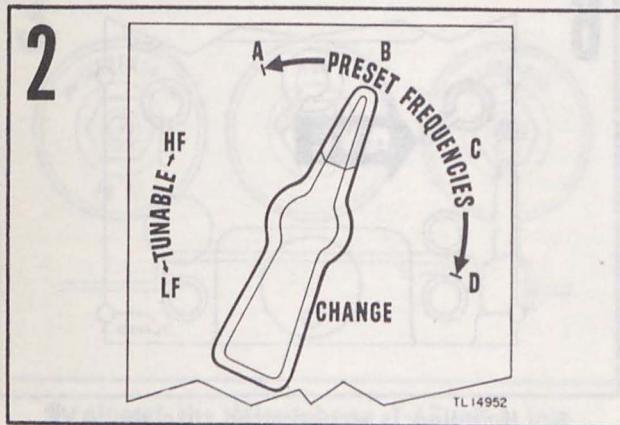


5. Adjust the **TUNING** control for the exact frequency desired.

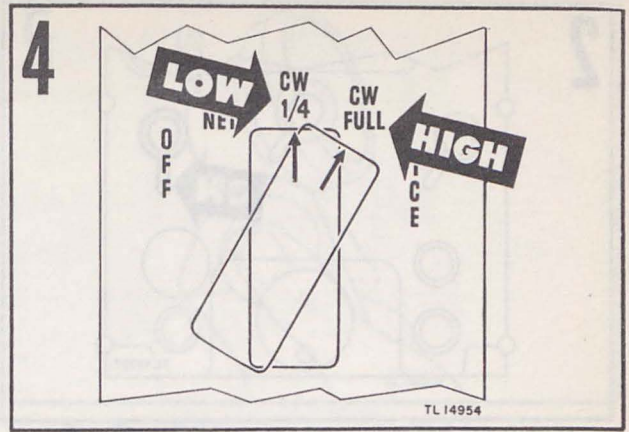
b. Radio Transmitter BC-653-A



1. Determine the frequencies to which the transmitter has been tuned from the chart on the left protective cover of the transmitter.



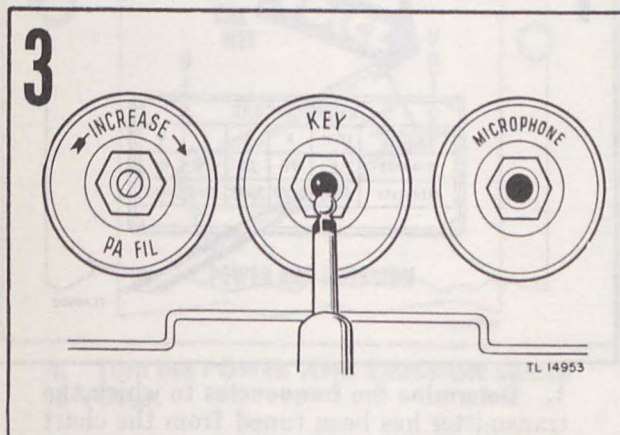
2. Turn the BAND CHANGE switch to the required channel.



4. Turn the POWER AND EMISSION switch to CW $\frac{1}{4}$ for low-power, short-distance, c-w communication; to CW FULL for maximum c-w range.

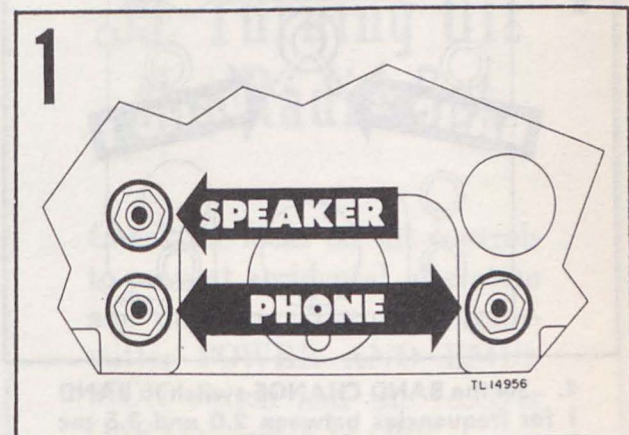
38. Voice Operation

After the transmitter has been preset (pars. 125 and 126), the following steps prepare the radio set for voice operation.

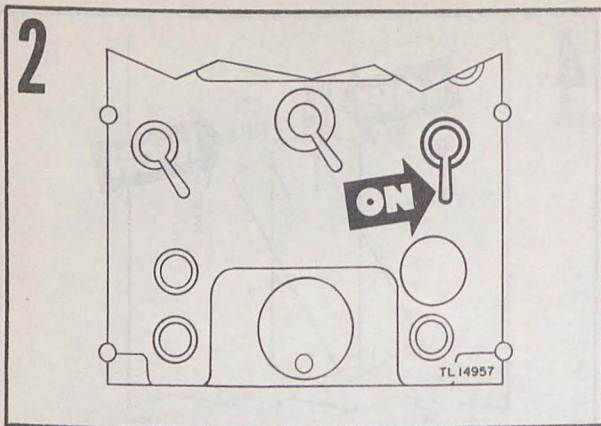


3. Plug Key J-45 into the KEY jack.

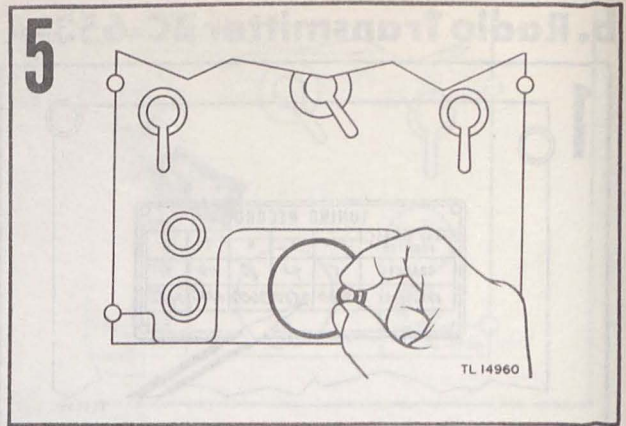
a. Radio Receiver BC-652-A



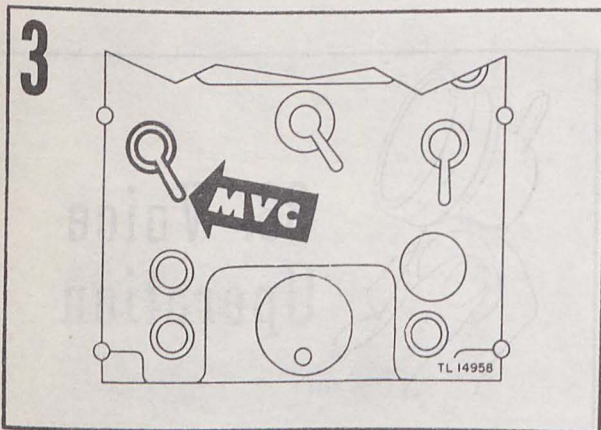
1. Plug Loudspeaker LS-3 into the SPEAKER jack or Headset HS-30-() into the PHONE jack on the receiver panel.



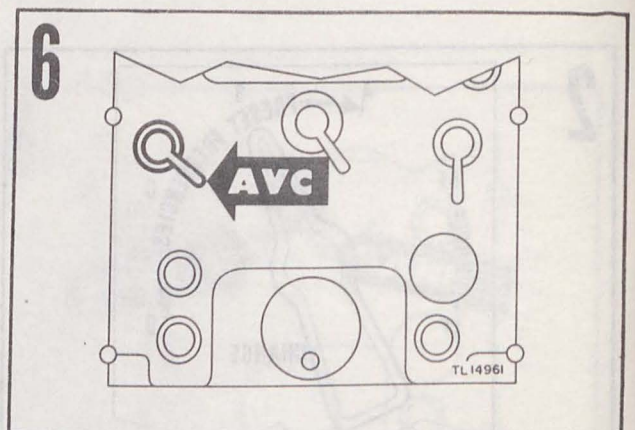
2. Turn the OFF-ON switch to the ON position.



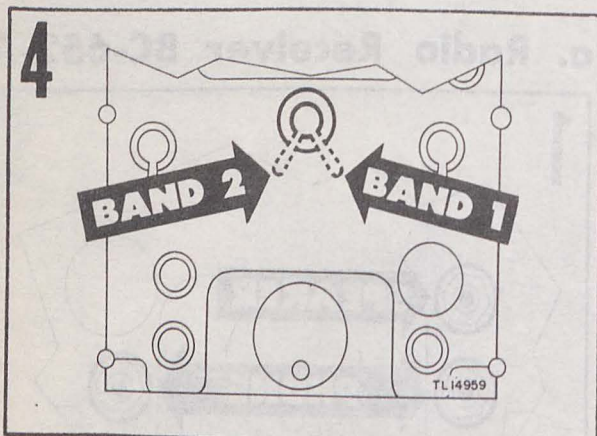
5. Adjust the TUNING control for the exact frequency desired.



3. Throw the CW MVC AVC switch to MVC.

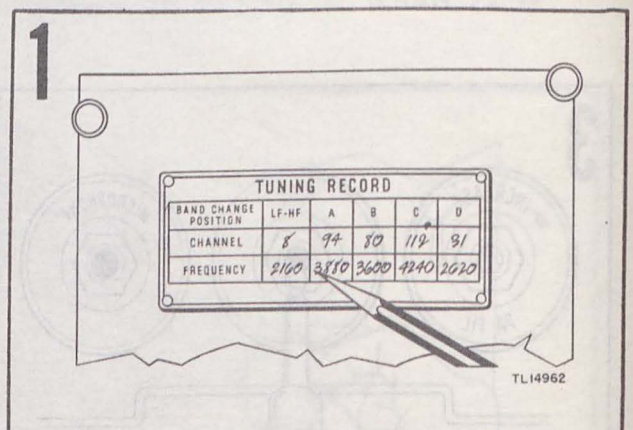


6. If fading is experienced, use the AVC position of the CW MVC AVC switch.

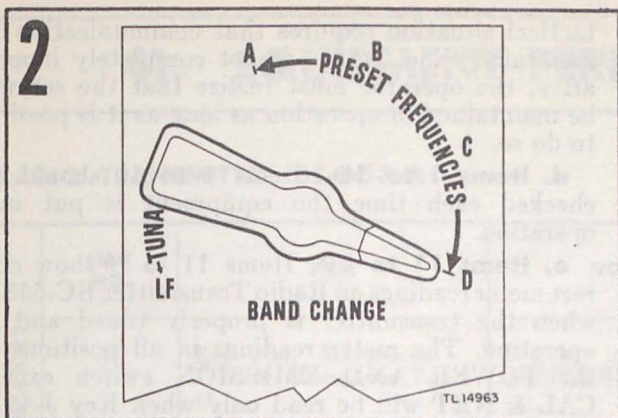


4. Set the BAND CHANGE switch to BAND 1 for frequencies between 2.0 and 3.5 mc (CHAN 0 to 75), or to BAND 2 for frequencies between 3.5 and 6.0 mc (CHAN 75 to 200).

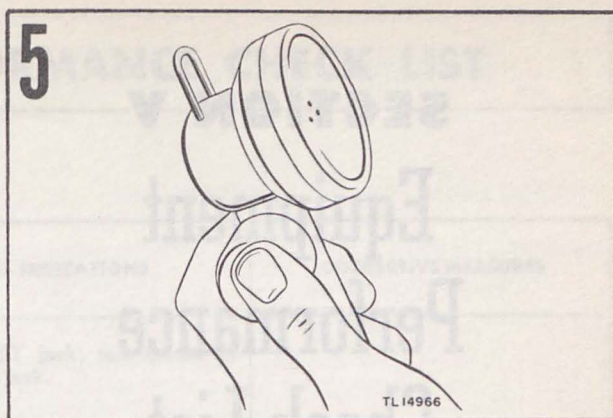
b. Radio Transmitter BC-653-A



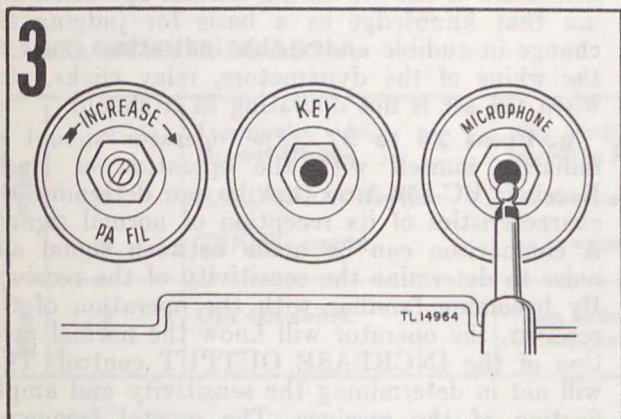
1. Determine the frequencies to which the transmitter has been tuned from the chart on the left protective cover of the transmitter.



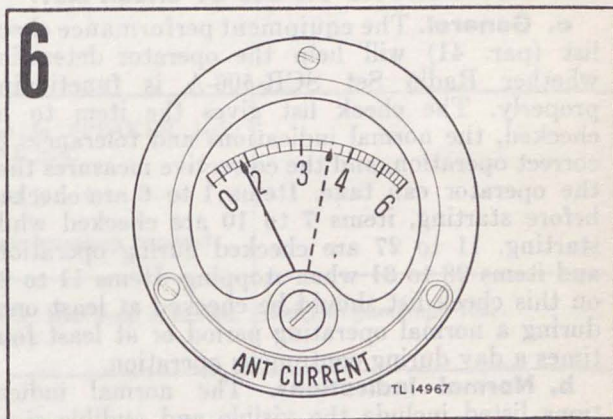
2. Turn the **BAND CHANGE** switch to the required channel.



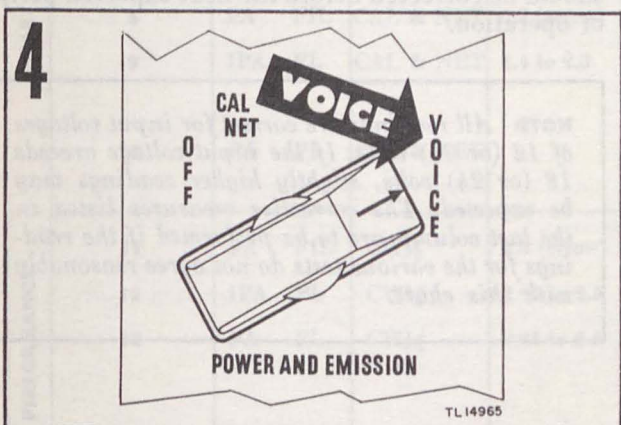
5. The dynamotor is controlled by means of the push-button on the handle of Microphone T-17 or by the hand switch of Microphone T-45.



3. Insert the Microphone T-17 plug into the **MICROPHONE** jack. If Microphone T-45 is to be used, its plug is inserted into the jack of Cord CD-318 and the Cord CD-318 plug is inserted into the **MICROPHONE** jack.



6. The **ANT CURRENT** meter should indicate approximately one-half the reading obtained on CW FULL operation. If this reading is not obtained, refer to paragraph 123 for necessary adjustments.



4. Turn the **POWER AND EMISSION** switch to **VOICE**.

39. Turning Off the Radio Set

Check the locks on all controls to prevent accidental alteration and detuning. Turn the transmitter **POWER AND EMISSION** switch and the receiver **OFF-ON** switch to **OFF**.

SECTION V

Equipment Performance Check List

40. INSTRUCTIONS ON USE OF CHECK LIST.

a. General. The equipment performance check list (par. 41) will help the operator determine whether Radio Set SCR-506-A is functioning properly. The check list gives the item to be checked, the normal indications and tolerances of correct operation, and the corrective measures that the operator can take. Items 1 to 6 are checked before starting, items 7 to 10 are checked while starting, 11 to 27 are checked during operation, and items 28 to 31 when stopping. Items 11 to 27 on this check list should be checked at least once during a normal operating period or at least four times a day during continuous operation.

b. Normal Indications. The normal indications listed include the visible and audible signs that the operator will perceive when he checks the items. In the case of meter readings, the allowable tolerances of the readings are given. When a meter reads between the limits specified, operation can be considered satisfactory. If the meter reads outside the limits given, it is a sign of impending trouble. If the indications are not normal, the operator should apply the corrective measures given in the next column.

c. Corrective Measures. The corrective measures listed are those that the operator can make without turning the equipment in for repairs. A reference to part five indicates that the correction of the trouble cannot be effected during operation and that trouble shooting by an experienced repairman is called for. If the set is completely inoperative or if the corrective measures given do not yield results, it is evident in all cases that trouble shooting is necessary. However, if the

tactical situation requires that communication be maintained and the set is not completely inoperative, the operator must realize that the set will be maintained in operation as long as it is possible to do so.

d. Items 1 to 10. Items 1 to 10 should be checked each time the equipment is put into operation.

e. Items 11 to 19. Items 11 to 19 show correct meter readings on Radio Transmitter BC-653-A when the transmitter is properly tuned and in operation. The meter readings in all positions of the POWER AND EMISSION switch except CAL & NET will be read only when Key J-45 is plugged into the correct jack on the transmitter and the key is closed.

f. Items 20 to 23. These items represent general operating characteristics of the transmitter. The operator must become familiar with the characteristics of the set during normal operation and use that knowledge as a basis for judging the change in audible and visible indications, such as the whine of the dynamotors, relay clicks, etc., when the set is not operating as it should.

g. Items 24 to 27. The operator should familiarize himself with the operation of Radio Receiver BC-652-A so that he can determine the characteristics of its reception of normal signals. A comparison can be made between signal and noise to determine the sensitivity of the receiver. By becoming familiar with the operation of the receiver, the operator will know the normal position of the INCREASE OUTPUT control. This will aid in determining the sensitivity and amplification of the receiver. The crystal frequency calibrator unit may be checked periodically against the receiver dial calibrations.

h. Items 28 to 31. Items 28 to 31 are checked whenever the station is taken out of operation. Any abnormal indications at this time are probably caused by trouble in the set and should be corrected before the next expected period of operation.

NOTE: All readings are correct for input voltages of 12 (or 24) volts. If the input voltage exceeds 12 (or 24) volts, slightly higher readings may be expected. The corrective measures listed in the last column are to be performed if the readings for the various tests do not agree reasonably with this chart.

41. EQUIPMENT PERFORMANCE CHECK LIST

RADIO TRANSMITTER BC-653-A

PREPARATORY	ITEM NO.	ITEM	NORMAL INDICATIONS	CORRECTIVE MEASURES
	1	Key J-45, Microphone T-17, or Microphone T-45.	Plug key in KEY jack; microphone in MICROPHONE jack.	
2	BAND CHANGE switch.	Set to correct channel (A, B, C, D, or TUNABLE).		
3	Antenna.	Connect lead-in wire. Check that insulator is clean and not cracked.		

RADIO RECEIVER BC-652-A

PREP.	ITEM NO.	ITEM	NORMAL INDICATIONS	CORRECTIVE MEASURES
	4	Loudspeaker LS-3 or Headset HS-30-().	Plug loudspeaker in SPEAKER jack; headset in PHONE jack.	
5	BAND CHANGE switch.	Set to correct band (1 or 2).		
6	TUNING control.	Set to approximate frequency required.		
START	7	OFF-ON switch.	When switch is ON: Dial lamp is lighted. Dynamotor is heard.	Refer to paragraph 102.

RADIO TRANSMITTER BC-653-A.

START	ITEM NO.	SWITCH POSITION		FIL & PL CURRENT METER	ANT CURRENT METER	TRANSMITTER DYNAMOTOR PILOT LAMP	CORRECTIVE MEASURES
		METER SW	POWER & EMISSION				
EQUIPMENT PERFORMANCE	8	PA FIL	CAL & NET	6.3 (arrow)	0	Lighted	Adjust INCREASE PA FIL.
	9	IPA PL	CAL & NET	2.4 to 2.6	0	Lighted	Adjust PRESET FREQUENCIES IPA TUNING or TUNING LF-HF (pars. 126 and 127).
	10	PA PL	CAL & NET	0	0	Lighted	Adjust resistor R177 (located under fuse cover plate). See fig. 31.
	11	PA FIL	CW 1/4	6.3 (arrow)	1.4 to 2.0	Lighted	Adjust INCREASE PA FIL.
	12	IPA PL	CW 1/4	2.25 to 2.5	1.4 to 2.0	Lighted	See item 9.
	13	PA PL	CW 1/4	2.25 to 2.5	1.4 to 2.0	Lighted	Adjust PRESET FREQUENCIES ANTENNA COUPLING OR ANT COUP'G LF-HF (pars. 126 and 127).
	14	PA FIL	CW FULL	6.3 (arrow)	3.0 or above	Lighted	Adjust INCREASE PA FIL.
	15	IPA PL	CW FULL	6.3 (arrow)	3.0 or above	Lighted	Refer to item 9.
	16	PA PL	CW FULL	4.5 to 5.5	3.0 or above	Lighted	Refer to item 13. Check PA COIL tap position (par. 126).

41. EQUIPMENT PERFORMANCE CHECK LIST (contd)

RADIO TRANSMITTER BC-653-A (contd)

EQUIPMENT PERFORMANCE	ITEM NO.	SWITCH POSITION		FIL & PL CURRENT METER	ANT CURRENT METER	TRANSMITTER DYNAMOTOR PILOT LAMP	CORRECTIVE MEASURES
		METER SW	POWER & EMISSION				
	17	PA FIL	VOICE	6.3 (arrow)	1.6 to 2.0	Lighted when microphone switch is closed. Off when microphone switch is open.	Adjust INCREASE PA FIL.
	18	IPA PL	VOICE	1.2 to 1.8	1.5 to 2.0	do.	Refer to items 9 and 12.
	19	PA PL	VOICE	2.2 to 2.5	1.5 to 2.0	do.	Refer to items 13 and 16.
EQUIPMENT PERFORMANCE	ITEM			NORMAL INDICATIONS		CORRECTIVE MEASURES	
	20	Antenna loading (ANT CURRENT METER).		See items 8 to 19 above.		(a) See items 8 to 19 above. (b) Check antenna lead and connections. (c) Remove objects which are touching antenna or move antenna. (d) Refer to paragraph 102.	
	21	Key (CW operation).		(a) Keying relay clicks are heard when key is depressed. (b) Dynamotor slows down slightly when key is held closed.		Refer to paragraph 102, part five.	
	22	Microphone (VOICE operation).		When microphone is closed: Keying relay clicks. Dynamotor pilot lamp lights. Dynamotor starts and runs.		(a) Check handset plug, cable, and jack. (b) Refer to paragraph 102.	
	23	Dynamotor (DM-42-A and DM-43-A).		Dynamotor starts and runs when POWER AND EMISSION switch is set for CAL & NET, CW $\frac{1}{4}$, or CW FULL operation, also in VOICE position if microphone switch is closed. Red pilot lamp lights when dynamotor is running.		See items 8 to 19. See trouble chart, table V. If pilot lamp does not light, yet dynamotor runs, replace lamp, repair open circuit, or refer to table V. Check vehicular battery.	

RADIO RECEIVER BC-652-A

EQUIPMENT PERFORMANCE	24	INCREASE OUTPUT control.	Output increases when control is turned in a clockwise direction.	Refer to paragraph 102.
	25	CW MVC AVC switch.	(a) In CW position, whistle is heard whenever receiver is tuned through a signal. (b) In MVC position with a fixed setting of INCREASE OUTPUT control, voice signal may vary in volume. When receiver is tuned over the band, signals will come in at different levels. (c) In AVC position, volume changes when INCREASE OUTPUT control is varied.	(a) Refer to paragraph 102. See table III. (b) Change position of INCREASE OUTPUT knob. (c) See table III.
	26	Headset or loudspeaker.	Signal is heard when plug is inserted completely in jack and receiver is operating and tuned to a station that is transmitting.	(a) Check plug and cable connections of headset and loudspeaker. (b) Tune receiver. See table III.

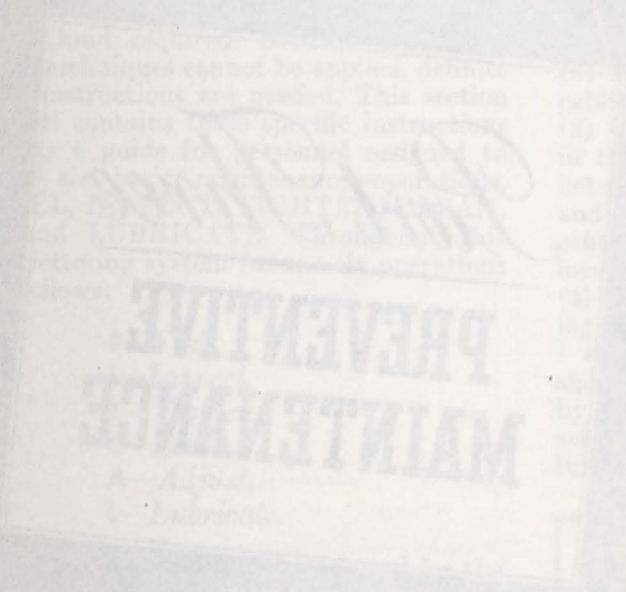
41. EQUIPMENT PERFORMANCE CHECK LIST (contd)

RADIO RECEIVER BC-652-A (contd)

EQUIP. PERF.	ITEM NO.	ITEM	NORMAL INDICATIONS	CORRECTIVE MEASURES
	27	Calibration.	Beat note heard every 20 kc when INTERVAL switch is in 20 KC position. Beat note heard every 100 kc when interval switch is in 100 KC position.	Refer to paragraph 102.
STOP	28	INCREASE OUTPUT control.	Extreme counterclockwise position. No signal heard.	
	29	OFF-ON switch.	In OFF position: Dial lamp not lighted. Dynamotor stopped.	

RADIO TRANSMITTER BC-653-A

STOP	30	All transmitter tuning controls.	Locked in position to prevent detuning.	
	31	POWER AND EMISSION switch.	In OFF position: Dynamotor pilot lamp out. Meters read zero.	





Part Three

**PREVENTIVE
MAINTENANCE**

TL 14968

SECTION VI

Preventive Maintenance Techniques

42. MEANING OF PREVENTIVE MAINTENANCE.

Preventive maintenance is a systematic series of operations performed at regular intervals on equipment, when turned off, to eliminate major break-downs, unwanted interruptions in service, and to keep it in top operating efficiency. To understand what is meant by preventive maintenance it is necessary to distinguish between preventive maintenance, trouble shooting, and repair. The prime function of preventive maintenance is to *prevent* break-downs and therefore the need for repair. On the other hand, the prime function of trouble shooting is to locate and correct *existing* defects. The importance of preventive maintenance cannot be overemphasized. The entire system of radio communication depends on each set being *on the air* when it is needed and also depends upon its *operating efficiency*. It is therefore vitally important that radio operators and repairmen maintain their radio sets properly.

43. DESCRIPTION OF MAINTENANCE TECHNIQUES.

a. Most of the electrical parts used in Radio Set SCR-506-A require routine preventive maintenance. Those requiring maintenance differ in the amount and kind required. Because hit-or-miss maintenance techniques cannot be applied, definite and specific instructions are needed. This section of the manual contains these specific instructions and serves as a guide for personnel assigned to perform the six basic maintenance operations, namely: FEEL, INSPECT, TIGHTEN, CLEAN, ADJUST, and LUBRICATE. Throughout this manual the lettering system for the six operations will be as follows:

- F—*Feel,*
- I—*Inspect,*
- T—*Tighten,*
- C—*Clean,*
- A—*Adjust,*
- L—*Lubricate.*

The first two operations establish the need for the other four. The selection of operations is based on a general knowledge of field needs. For example, the dust encountered on dirt roads during cross-country travel filters into the equipment no matter

how much care is taken to prevent it. Rapid changes in weather (such as heavy rain followed by blistering heat) excessive dampness, snow, and ice, all tend to cause corrosion of exposed surfaces and parts. Without frequent inspections and the necessary performance of tightening, cleaning, and lubricating operations, the equipment will become undependable, and subject to break-down when it is most needed.

b. Inspection is the most important operation in the preventive maintenance program. A careless observer will overlook the evidences of minor trouble. Although these defects may not interfere with the performance of the equipment, valuable time and effort can be saved if they are corrected before they lead to major break-downs. Make every effort to become thoroughly familiar with the indications of normal functioning. In this way, you will be able to recognize the signs of a defective set.

c. Inspection consists of carefully observing all parts of the equipment, noticing their color, placement, state of cleanliness, etc. Inspect for the following conditions:

(1) Overheating, as indicated by discoloration, blistering, or bulging of the parts or surface of the container; leakage of insulating compounds; and oxidation of metal contact surfaces.

(2) Placement, by observing that all leads and cabling are in their original positions.

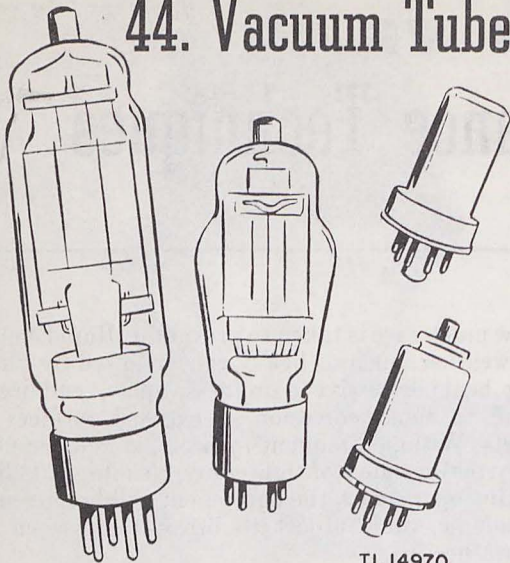
(3) Cleanliness, by carefully examining all recesses in the units for accumulation of dust, especially between connecting terminals. Parts, connections, and joints should be free of dust, corrosion, and other foreign matter. In tropical and high-humidity locations, look for fungus growth and mildew.

(4) Tightness, by testing any connection or mounting which appears to be loose.

d. Whenever a loose connection is tightened, it should be moistureproofed and fungiproofed again by applying the varnish with a small brush. See section IX for details of moistureproofing and fungiproofing.

NOTE: It is important that the feel operation be performed for signs of overheating as soon as possible after shut-down and always before any other maintenance is done.

44. Vacuum Tubes



a. Inspect (I).

(1) Inspect glass and metal tube envelopes, tube caps, and tube connector clips for accumulation of dirt and for corrosion. When tubes with loose plate or grid caps or envelopes are found, replace if possible.

(2) The spring clips that make contact with the grid caps must be examined for corrosion and for loss of tension with resulting looseness. Also, check the condition of the wires soldered to the spring clips. The wires should be free of frayed insulation or broken strands.

(3) Inspect the firmness of tubes in their sockets. This is accomplished by pressing the tubes down in the sockets and testing them in that position, and *not* by partially withdrawing the tubes and jiggling them from side to side. Movement of a tube tends to weaken the pins in the base and unnecessarily spread the contacts in the socket. It is desirable to inspect the sockets of the tubes at the time the tubes are removed.

(4) When it is necessary to remove a tube from its socket, especially if it is a high-power tube, great care must be used. Never jar a warm tube. Connections to the grid and plate caps must always be removed.

b. Tighten (T). If the connections to the tube sockets are dirty or corroded, clean before tightening. When tightening the locknuts that hold the tube sockets to the insulated bushings, do not apply excessive pressure. Too much pressure will crack the bushings.

c. Adjust (A). Adjust loose tube connector

NOTE: Avoid doing work on the tubes immediately after shut-down. Severe burns may result from contact with the envelopes of hot tubes.

clips. Do not flatten tube connector clips during adjustment. Flattened clips do not make adequate contact with the surface of the tube cap. If the clip is made of thin metal, it can be adjusted by gently compressing it with the fingers. If it is made of heavy-gauge metal, suitable pressure can be applied with a pair of long-nose pliers.

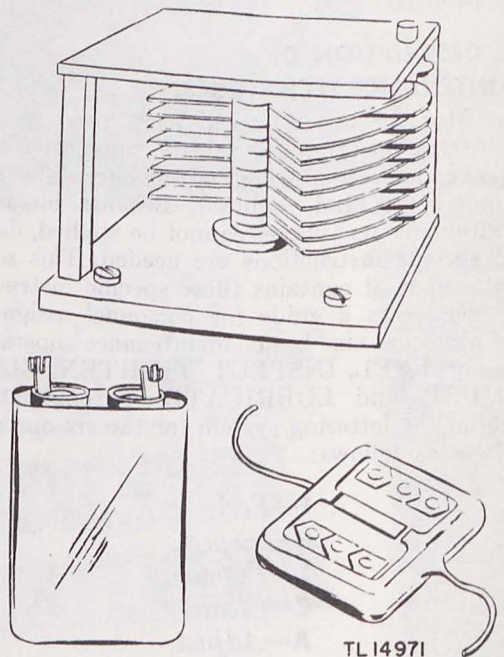
d. Clean (C).

(1) Clean the tubes, but only if inspection shows cleaning to be necessary. Tubes operated at high voltages and with exposed plate and grid connections must be kept free of dirt and dust because of possible leakage between grid and plate terminals. In contrast, tubes operating at low voltages and not having exposed grid and plate caps do not require frequent cleaning. However, do not permit dirt to accumulate on low-voltage tubes.

(2) Remove dust and dirt from the glass or metal envelopes with a clean, lint-free, dry cloth. If proper care is exercised, the grid and plate caps may be cleaned with a piece of #0000 sandpaper. Wrap the paper around the cap and *gently* run along the surface. Excessive pressure is not needed; neither is it necessary to grip the cap tightly. Wipe with a clean dry cloth.

(3) When tube sockets are cleaned and the contacts are accessible, fine sandpaper may be used to remove corrosion, oxidation, and dirt.

45. Capacitors



a. Inspect (I).

(1) Inspect the terminals of large fixed capacitors for corrosion and loose connections. Carefully inspect the mountings to discover loose mounting screws, studs, or brackets. Examine the leads for poor in-

sulation, for cracks, and for evidences of dry rot. Frayed strands on the insulation should be cut away. If the wire is exposed, wrap it with friction tape. The terminals of the capacitors should not be cracked or broken.

(2) Thoroughly inspect the case of each large fixed capacitor for leaks, bulges, and discoloration.

(3) Inspect the plates of variable capacitors for dirt, dust, or lint. Examine the movable set of plates for signs of damage or misalignment that would cause them to touch the fixed plates during tuning. Rotate the movable plates, using the panel tuning control, and thus check for proper operation of the capacitor.

CAUTION: Do not bend any plates of the tunable master-oscillator capacitor C105.

b. Tighten (T). Tighten loose terminals, mountings, and connections on the capacitors, whenever they are observed. Do not break the bushing or damage the gasket.

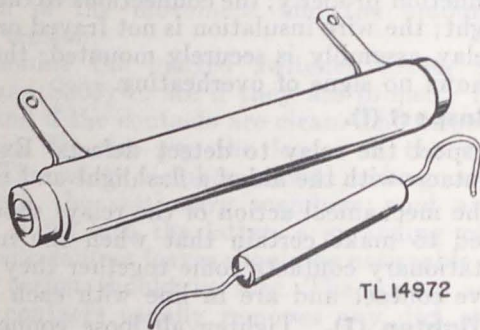
c. Clean (C).

(1) Clean the case of fixed capacitors, the insulating bushings, and connections that are dirty or corroded. The capacitor cases and bushings can usually be cleaned with a dry cloth, but if the deposit of dirt is hard to remove, moisten the cloth in a dry-cleaning solvent.

(2) Clean the plates of variable capacitors with a small brush, removing all dust and lint.

d. Lubricate (L). The bearings of variable capacitors are usually of the ball-bearing type, lubricated and sealed at the factory. These bearings will not need relubrication during the life of the equipment.

46. Resistors



a. General. Various types of resistors are used in Radio Set SCR-506-A. The connections to the various resistors are either of the pigtail or solder lug type.

b. Inspect (I). Inspect the coating of the vitreous-enameled resistors for signs of cracks and chipping, especially at the ends. Examine the bodies of all types of resistors for blistering, discoloration,

and other indications of overheating. Inspect leads and all other connections for corrosion, dirt, dust, looseness, and broken strands in the connecting wires. Check the security of all mountings. Do not attempt to move resistors with pigtail connections, because there is danger of breaking the connections at the point where they enter the body of the resistor. Such defects cannot be repaired.

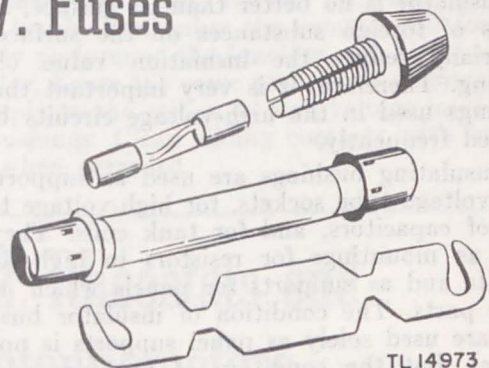
c. Clean (C).

(1) Clean all carbon resistors with a small brush.
 (2) The vitreous-enameled resistors must be kept clean to avoid leakage between the terminals. They will ordinarily be wiped with a dry cloth. However, if the dirt deposit is unusually hard to remove, use a dry-cleaning solvent.

(3) Resistors with discolored bodies cannot be cleaned. Discoloration indicates that there has been overloading and overheating at some time prior to the inspection. The discoloration is probably due to circuit trouble which requires analysis and correction. Trouble-shooting procedures are described in part five.

NOTE: When fungiproofed resistors are heated, a harmless brown stain may appear.

47. Fuses



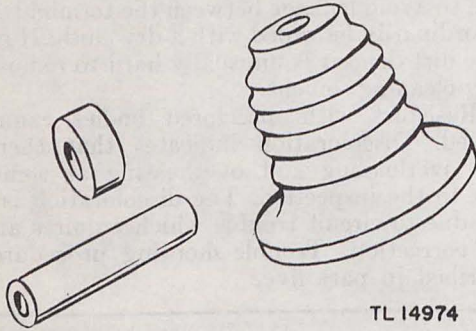
a. General. Fuses used in Radio Set SCR-506-A are of three kinds: those with a composition case (F163), those with a glass case (F161), and those without a case (F162). Fuses should be thrown away when they blow. The glass and composition case fuses are easily removed for inspection. See that the fuse ends and holding clips on large fuses are kept clean and tight. If they are not, arcing and burning will occur and make the replacement of the complete holder necessary. The strip type fuse can be removed only after the two screws that hold it in place have been taken out.

b. Inspect (I). Inspect the fuse caps for evidence of burning, charring, and corrosion; the fuse clips for dirt, loose connections, and proper tension.

c. Tighten (T). The tension of the fuse clips may be increased by pressing the sides closer together.

d. Clean (C). Clean fuse ends and fuse clips with emery cloth; then wipe them with a clean cloth.

48. Bushings and Insulators



a. Description.

(1) Insulated bushings are used in the high-voltage and radio-frequency (r-f) circuits. They are constructed of ceramic material with a glazed surface. An insulator is no better than its surface, so deposits of foreign substances on the surface will materially reduce the insulation value of the bushing. Therefore, it is very important that all bushings used in the high-voltage circuits be inspected frequently.

(2) Insulating bushings are used as supports for high-voltage tube sockets, for high-voltage terminals of capacitors, and for tank coils. They are used as mountings for resistors in high-voltage circuits and as supports for panels which mount other parts. The condition of insulator bushings that are used solely as panel supports is not too critical, but the condition of bushings used as high-voltage insulators is extremely important.

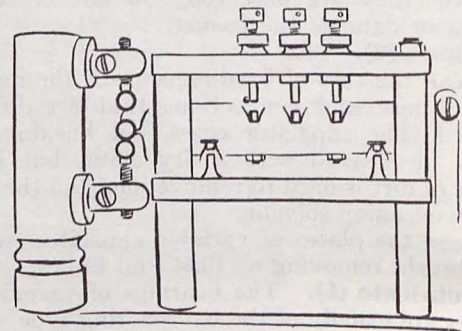
b. Inspect (I). Inspect the physical condition of the insulator bushings. They should be clean without cracks or chips. It is possible for a highly glazed insulator to develop fine-line surface cracks where moisture and dust will accumulate and eventually form a leakage for a high-voltage flash-over. Consequently, the surface of the bushings must be inspected to detect such cracks. As a rule, the bushings are held in position with nuts screwed onto the threaded conductors. These can be replaced very easily. If replacement is not possible because of a shortage of supplies, frequently clean the defective bushing thoroughly with dry-cleaning solvent. Sometimes it is difficult to see dust on a glazed surface. A satisfactory check can be made by sliding a clean finger across the bushing.

c. Tighten (T). The procedure to be used in tightening loose bushings is self-evident. However, one precaution must be observed. *Avoid forcing*

the nuts or screws down too tight. If excessive pressure is exerted on the bushings, damage is almost certain. Sometimes the threads on bushing stud bolts may be found stripped so they cannot be tightened. The only solution is replacement of the entire bushing.

d. Clean (C). Insulating bushings are easily cleaned. Never use abrasive materials because the glazed finish will be destroyed. A clean cloth is usually satisfactory. If deposits of grime or dirt on the surface of a bushing are hard to remove, use dry-cleaning solvent. After the surface has been cleaned with a solvent, it should be polished with a dry cloth. Otherwise, a thin film of the solvent will be left which will impair the effectiveness of the bushing as a high-voltage insulator.

49. Relays



Relay K161 is considered normal if: the exterior is free from dirt or dust; the contacts are not burned, pitted, or corroded; the contacts are lined up and correctly spaced; the moving parts travel freely and function properly; the connections to the relay are tight; the wire insulation is not frayed or torn; the relay assembly is securely mounted; the field coil shows no signs of overheating.

a. Inspect (I).

(1) Inspect the relay to detect defects. Examine the contacts with the aid of a flashlight and mirror.

(2) The mechanical action of the relays should be checked to make certain that when the moving and stationary contacts come together they make positive contact and are in line with each other.

b. Tighten (T). Tighten all loose connections and mounting screws, but do not apply enough force to damage the screw or to break the parts it holds.

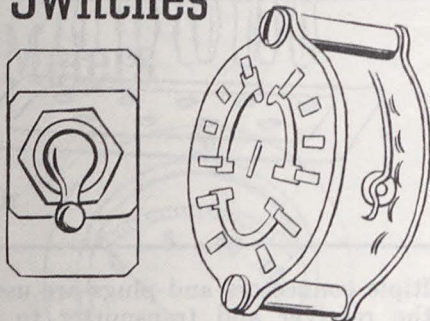
c. Clean (C).

(1) **RELAY EXTERIOR.** Brush the exterior of the relay with a soft brush. If it is very dirty, clean it with a brush dipped in dry-cleaning solvent. If loose connections are found, they should be inspected. If they are dirty or corroded, remove and clean them and replace carefully.

(2) **RELAY CONTACTS.** (a) Hard-alloy contacts (Contacts K, L, M, N, and R). Hard-alloy contacts are cleaned by drawing a strip of thin clean cloth or paper between them while holding them together. In some cases, it may be necessary to moisten the cloth with dry-cleaning solvent. Use a dry cloth or paper strip for polishing. Corroded, burned, or pitted contacts must be cleaned with the point file or burnishing tool and crocus cloth.

(b) Solid-silver contacts (contacts G and H). The solid silver spherical contacts on relay K161 are easily cleaned with a cloth or brush dipped in dry-cleaning solvent, or by rubbing lightly with crocus cloth. After cleaning, polish the contacts with a dry cloth.

50. Switches



TL 14976

a. Inspect (I).

(1) Inspect the mechanical action of each switch and, while so doing, look for signs of dirt or corrosion on all exposed elements. In some cases, it will be necessary to examine the elements of the switch visually; in others, the action of the switch is checked by flipping the control knob or toggle, or by pressing the switch button and noting the freedom of the movement and the amount of spring tension.

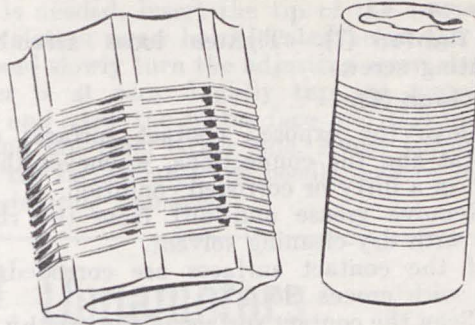
(2) Examine the ganged switches (S160, S301, S302, and S305) to see if they are properly lubricated and if the contacts are clean. The inspection is visual. Do not pry the leaves of the switch apart. The rotary members should make good contact with the stationary members; and as the former slides into the latter, a spreading of the stationary contact leaves should be noticeable. The switch action should be free. The wiping action of the contacts usually removes any dirt at the point of contact.

b. Clean (C). Clean the exterior surfaces of switches with a stiff brush moistened with dry-cleaning solvent.

c. Lubricate (L). If necessary, lubricate the wiping contacts with a light oil (par. 65).

CAUTION: Apply sparingly with a pipe cleaner or small brush. Wipe off the excess with a cloth.

51. Coils



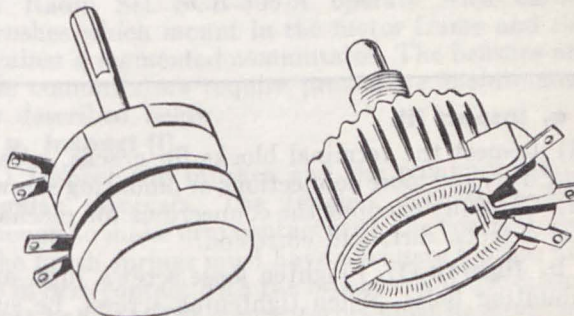
TL 14977

a. Inspect (I). Inspect the oscillator (L100 and L101), power-amplifier (L120 and L121), and antenna-coupling coils (L143) for cleanliness of the ceramic coil form and mounting supports. Check all connections and sliding clips for proper contact and spring tension.

b. Tighten (T). Tighten any coil mountings or connections found loose by resoldering wires or tightening screws.

c. Clean (C). Clean the coil form and coil with a soft brush. Remember the ceramic coil form is actually performing the function of a high-voltage insulator, hence the same preventive maintenance will apply to the coil as to high-voltage insulators and bushings. Clean sliding contacts with crocus cloth when corroded.

52. Rheostats and Potentiometers



TL 14979

a. Inspect (I).

(1) Inspect the mechanical condition of the rheostats (R302, R177, and R190). The arm should be keyed tightly to the shaft, and the shaft should turn easily in the bushing which supports it.

(2) Inspect the assembly and mounting screws, setscrews, and nuts.

(3) Examine the insulating body of the rheostat for dust, dirt, cracks, and chipped places.

(4) Examine all metallic parts for dust, dirt, and corrosion.

b. Tighten (T). Tighten loose assembly or mounting screws.

c. Clean (C).

(1) Clean the exposed contact surfaces of the rheostat and the connections, whenever they are found in a dirty or corroded condition.

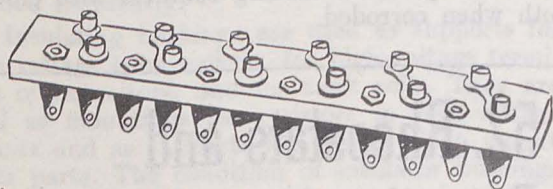
(2) Remove grease and dirt from the rheostat parts with dry-cleaning solvent.

(3) If the contact surfaces are corroded, clean them with crocus cloth.

(4) Clean the contact surface of the arm by inserting a strip of crocus cloth between the arm and the rheostat winding and drawing the cloth back and forth.

(5) Clean the body of the rheostat or potentiometer with a brush or cloth.

53. Terminal Blocks



TL 14980

a. Inspect (I).

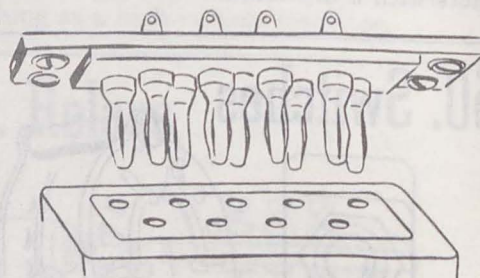
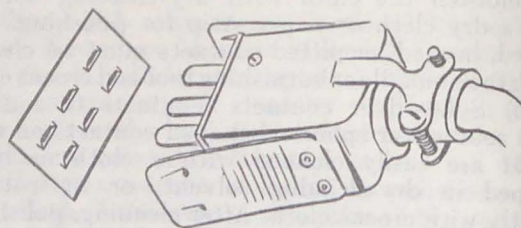
(1) Inspect the terminal blocks for cracks, breakage, dirt, and loose connections or mounting screws.

(2) Carefully examine the connections for mechanical defects, dirt, and corrosion.

b. Tighten (T). Tighten loose screws, lugs, and mounting bolts. When tightening screws, be sure to select a screwdriver of correct size; do not exert too much pressure. Remove loose connections and clean them when they are dirty or corroded.

c. Clean (C). Clean the terminal blocks, when they require it, with a dry brush. When necessary, use a cloth moistened with a dry-cleaning solvent. If a solvent is used, the block must be thoroughly wiped with a cloth; then brushed to remove lint.

54. Multiple Connectors



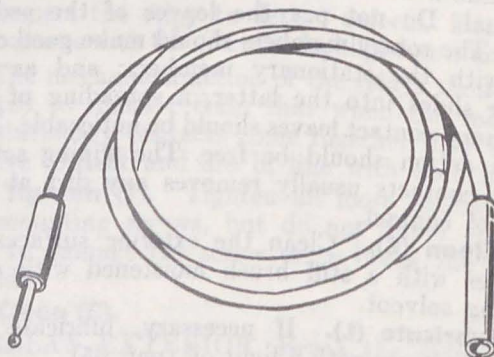
TL 14981

Multiple connectors and plugs are used to connect the receiver and transmitter to Mounting FT-253-A and to connect the dynamotors to their respective units (P302 and J302, P161 and J161).

a. Inspect (I). Inspect the female ends of the connectors for corrosion and collected dust. Inspect the mountings for cracks and loose connections. Inspect the male ends for loose and broken pins and for proper spring in the banana plugs.

b. Clean (C). Clean the male and female ends of the connectors with a brush moistened in dry-cleaning solvent. Remove corrosion with #0000 sandpaper, then wipe with a clean cloth.

55. Cords and Cables



TL 14982

The cables in Radio Set SCR-506-A can be regarded as the life lines of the equipment. The condition of the cabling must be closely observed.

Equipment operated in all kinds of weather and moved on all kinds of roads subjects cabling to a great deal of punishment.

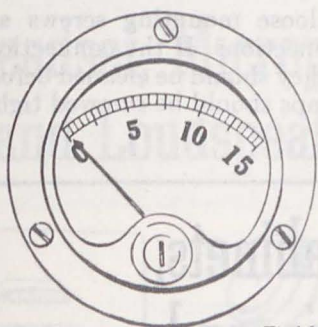
a. Inspect (I). Inspect the cables for cracked or deteriorated insulation, frayed or cut insulation at the connecting and supporting points, and improper placement which places the cables or connections under strain. Also watch for kinks and improper supports.

b. Tighten (T). Tighten loose cable clamps, coupling rings, and cable connections.

c. Clean (C). Clean connections on cables when they are dirty or corroded. Corroded connectors are cleaned with #0000 sandpaper. It is important that the entire surface of the connector be cleaned. No attempt should be made to remove individual prongs from cable plugs.

meter needs readjusting, tap the meter case *lightly* with the tip of one finger. This will help the needle to overcome the slight friction which sometimes exists at the bearings and prevents an otherwise normal unit from coming to rest at zero. If adjustment is needed, insert the tip of the screwdriver in the slotted screw head located below the meter glass and slowly turn the adjusting screw until the pointer is at zero. Lightly tap the meter case again and view the meter face and pointer "full on" and not from either side. Avoid turning the screw too far, because the needle may be bent or the hairspring damaged.

56. Meters



TL14983

Meters are extremely delicate instruments and must be handled very carefully. They require very little maintenance. They are precision instruments and ordinarily cannot be repaired in the field.

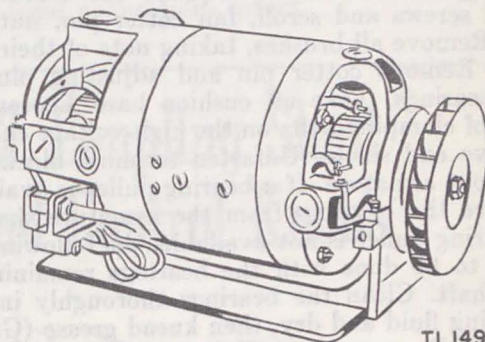
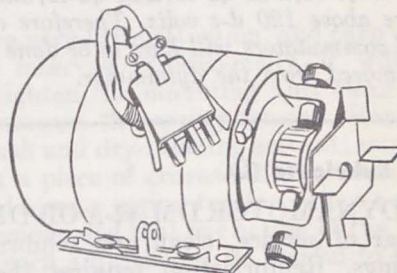
a. Inspect (I). Inspect the leads and connections to the meters. Look for loose, dirty, and corroded connections. Look for cracked or broken cover glasses. Since the movement of a meter is extremely delicate, its accuracy will be seriously affected if the glass is broken and dirt and water filter through.

b. Tighten (T). Tighten all connections found loose. Any loose meter wires should be inspected for dirt or corrosion before they are tightened. The tightening of meter connections requires a special technique because careless handling can easily crack the meter case.

c. Clean (C). Meter cases can usually be cleaned with a dry cloth. If cleaning is difficult, the cloth should be dampened with a dry-cleaning solvent. Dirty connections may be cleaned with a small brush dipped in dry-cleaning solvent or with a small piece of cloth dipped in the solvent.

d. Adjust (A). Normally, meters in Radio Set SCR-506-A should indicate zero when the equipment is turned off. The procedure for setting a meter to zero is not difficult. The tool required is the thinnest screwdriver. Before deciding that a

57. Dynamotors



TL14986

Dynamotors are essentially the same type of mechanism as motors, and are inspected and lubricated in the same manner. The two dynamotors in Radio Set SCR-506-A operate with carbon brushes which mount in the motor frame and ride against a segmented commutator. The brushes and the commutators require preventive maintenance as described below.

a. Inspect (I).

(1) Inspect the brushes and the commutators at regular intervals. The brushes should be long enough to make firm contact with the commutator. The brush springs must have adequate tension and be in firm contact with the brushes. The brush caps must be tight. The commutators must be clean and smooth. The covers and straps must be in place.

(2) The maintenance of brushes and the cleaning of commutators are both important tasks. Instructions that will enable the maintenance personnel to perform the tasks are included. The life of the average brush is estimated to be approximately 1,000 hours, but it will vary to some extent, depending upon climatic conditions.

b. Clean (C).

- (1) Remove the end plates or the brush-cover straps. Press a piece of canvas, folded to the exact width of the commutator, against the commutator and turn the armature by hand.
- (2) If the commutator has been burned or pitted, hold a piece of #0000 sandpaper against the commutator and turn it by hand.
- (3) If necessary, a cloth moistened in dry-cleaning solvent may be used to remove caked dirt and grease.
- (4) Polish the commutator with crocus cloth and wipe with a clean dry cloth.

CAUTION: *The voltages generated by Dynamotors DM-40-A, DM-41-A, DM-42-A, and DM-43-A are above 120 d-c volts. Therefore all cleaning of commutators will have to be done with power removed from the dynamotor.*

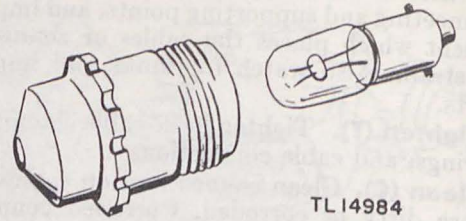
c. Lubricate (L).

- (1) DYNAMOTOR DM-42-A OR DM-43-A. After 1 year of service, clean and relubricate the ball bearings. Relubrication requires the removal of scroll screws and scroll, fan cotter pin, nut, and fan. Remove all brushes, taking note of their position. Remove cotter pin and adjusting plug for the bearings. Take off cushion base. Loosen stop nuts of clamping bolts on the high-voltage end and remove end shield. Unfasten terminal blocks and take out armature. If a bearing puller is available, remove the bearings from the armature shaft. If a bearing puller is not available, the following will have to be done with the bearings remaining on the shaft. Clean the bearings thoroughly in dry-cleaning fluid and dry, then knead grease (Grease, General Purpose, No. 2; U. S. Army Spec No. 2-108) into the bearings. Fill bearings one-half full. Replace bearings on shaft and reassemble dynamotor.
- (2) DYNAMOTOR DM-40-A OR DM-41-A. After 6 months of service, relubricate the ball bearings. Relubrication requires the removal of the end bells that are held on with screws; the shaft extension fan, held on with a screw inserted through the end of the shaft extension; and the circular plates on the end of the bearing housing. Remove the armature. Clean and relubricate the bearings following procedure outlined for Dynamotor DM-42-A or DM-43-A above.

NOTE: *Lubrication of these dynamotors should not be attempted except by trained maintenance personnel in an organization having the required tools.*

- d. Adjust (A).** Adjust end play by screwing up adjusting plug until tight; then back off one-eighth turn and replace cotter pin.

58. Pilot Lights



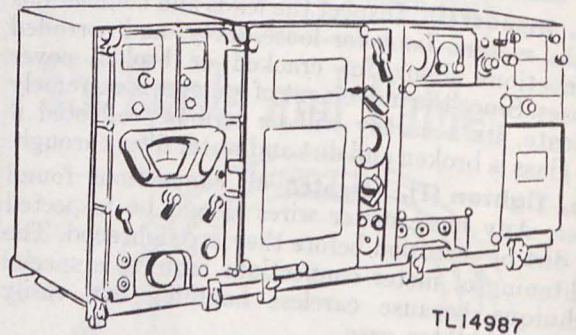
Pilot lights are used to indicate when power has been applied to a circuit. They are easily removed and replaced.

a. Inspect (I). Inspect the pilot-light assemblies for loose lamps, loose mounting screws, and loose, dirty, or corroded connections.

b. Tighten (T).

- (1) Tighten loose mounting screws and resolder any loose connections. If the connections are dirty or corroded, they should be cleaned before soldering.
- (2) Loose lamps should be screwed tightly into the sockets.

59. Cabinets, Chassis, and Mountings



The cabinets which house the various components of Radio Set SCR-506-A are constructed of sheet steel, coated with black or green crackle-finish paint.

a. Inspect (I). Inspect the outside and inside of each cabinet thoroughly, paying strict attention to every detail. Check the ventilator mountings, the panel screws, and the zero settings of the meters

(par. 56). Examine the pilot-light covers for cracks and breaks. Inspect the panels for loose knobs, switches, and jacks. Examine air filters for dirt.

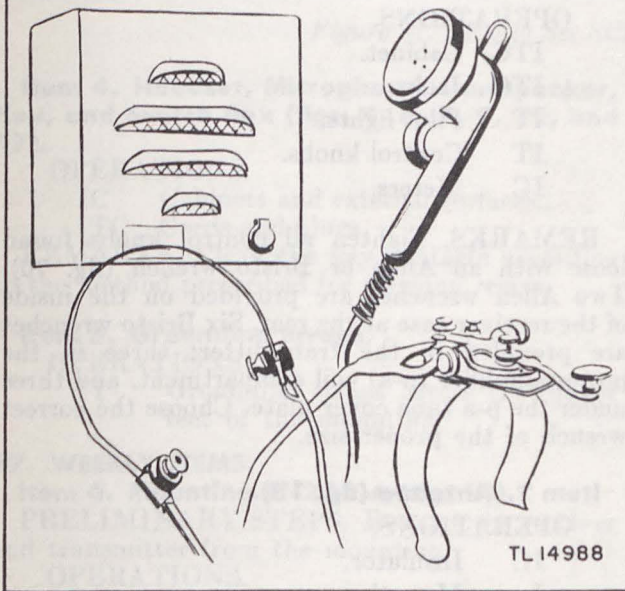
b. Clean (C). (1) Clean each cabinet, outside and in, with a clean dry cloth. Use dry compressed air to blow out all accumulated dirt and dust. If air filters cannot be cleaned with compressed air, replace them with clean filters.

CAUTION: Take care, when handling the spun-glass air filter, to prevent small splinters of glass from entering the fingers.

(2) Repaint any surface that is found scratched, rusted, or chipped.

c. Tighten (T). Tighten all mounting bolts, panel screws, plugs, and control knobs found loose.

60. Headset, Microphone, Key, and Loudspeaker



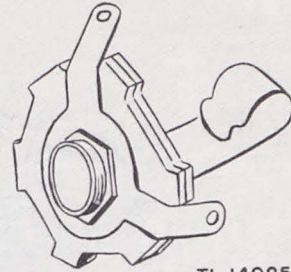
These auxiliary items of equipment are essential to the operation of the radio set, hence the operator must give them the same care as the radio set itself.

a. Inspect (I). Inspect all external surfaces for dirt and corrosion. See that all cable connections are tight and that plugs and jacks fit together properly. Inspect the key for proper operation.

b. Clean (C). Clean all items of the equipment in accordance with the instructions outlined previously for relays, cords, jacks, cabinets, etc.

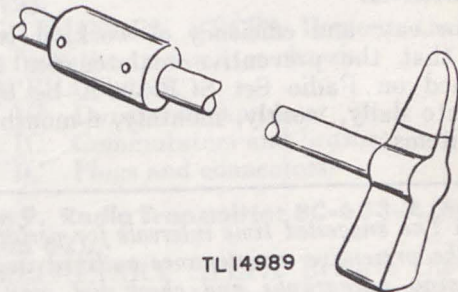
c. Lubricate (L). Lubricate Key J-45 bearings with light oil, if needed (U. S. Army Spec No. 2-120).

61. Jacks



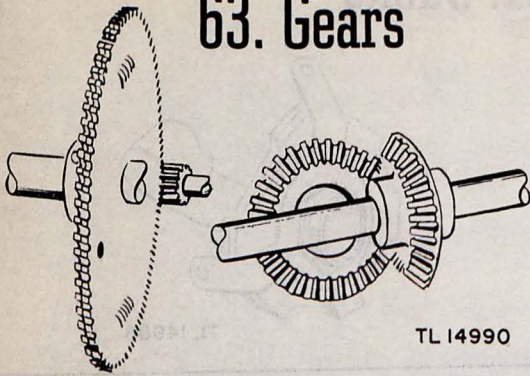
Jacks require very little attention, and then only at infrequent intervals. Occasionally it will be necessary to tighten the mounting nut, clean the contacts, or increase the spring tension. Remove dirt with a brush and dry-cleaning solvent; remove corrosion with a piece of crocus cloth followed by a clean cloth. Increase spring tension, when necessary. It is recommended that the action of the jack be tried after each adjustment. Be careful to keep all soldered connections intact.

62. Coupling Shaft and Control Knobs



The control of various capacitors, switches, and resistors, found throughout the set is effected through coupling shafts that connect these items to control knobs located on the front panels. It is important that these shafts and control knobs be kept tight at all times. Use the small Allen and Bristo wrenches located inside the equipment to tighten these items whenever they are found loose. Lubricate the bearings of these control shafts with light oil (U. S. Army Spec No. 2-120).

63. Gears



a. Inspect (I). Inspect the teeth of the gears on the variable capacitors and frequency channel switches for dirt or corrosion. Check the anti-backlash gears for proper operation by varying the panel tuning controls.

b. Clean (C). If the gears are dirty, clean them with a pipe cleaner or small brush dipped in dry-cleaning solvent.

SECTION VII Maintenance Items

64. GENERAL.

a. For ease and efficiency of work, it is suggested that the preventive maintenance to be performed on Radio Set SCR-506-A be broken down into daily, weekly, monthly, 6-month, and yearly items.

NOTE: The suggested time intervals for performing the preventive maintenance outlined in the following paragraphs and check list may be varied at any time by the local commander. However, for best performance of the equipment, it is recommended that the operations be performed at least as frequently as called for in the check list.

b. The general techniques involved, and the application of feel, inspect, tighten, clean, adjust, and lubricate operations in performing preventive maintenance on individual parts are discussed in section VI. These general instructions are not repeated in this section. The person performing preventive maintenance should refer to section VI whenever he wants more information on the items

listed in the following schedule. All of the items listed in the following schedule are to be performed with the power removed from the equipment. After the preventive maintenance has been performed on a given day, the equipment should be put into operation and checked to see whether it is performing satisfactorily as outlined in the equipment performance check list (par. 41).

65. MATERIALS.

The following materials will be needed in performing preventive maintenance:

Common hand tools (Tool Equipment TE-41 or equivalent).

Clean cloth.

#0000 sandpaper.

Crocus cloth.

Fine file or relay burnishing tool.

Mirror.

Oil, Lubricating, Preservative, Special, U. S. Army Spec No. 2-120. Symbol—PS.

Grease, General Purpose, No. 2, U. S. Army Spec No. 2-108. Symbol—WB2.

Solvent, Dry Cleaning, Federal Spec No. P-S-661a.

66. DAILY ITEMS.

Item 1. Exterior of the Radio Set (fig. 31).

OPERATIONS.

ITC Cabinet.

ITC Jacks.

IT Pilot lights.

IT Control knobs.

IC Meters.

REMARKS. Tighten all control knobs found loose with an Allen or Bristo wrench (fig. 76). Two Allen wrenches are provided on the inside of the receiver case at the rear. Six Bristo wrenches are provided in the transmitter; three in the power-amplifier (p-a) coil compartment, and three under the p-a tube cover plate. Choose the correct wrench of the proper size.

Item 2. Antenna (fig. 13).

OPERATIONS.

IC Insulator.

I Mounting.

ITC Mast sections.

REMARKS. Make sure that the lead-in wire is clear of all metal parts and that the insulation is not frayed.

Item 3. Batteries and Supply Cable (fig. 14).

OPERATIONS.

I Cable and connections.

REMARKS. Check the condition of the vehicular battery and charging rate as outlined in the technical manual which covers the vehicle in which the radio set is installed.

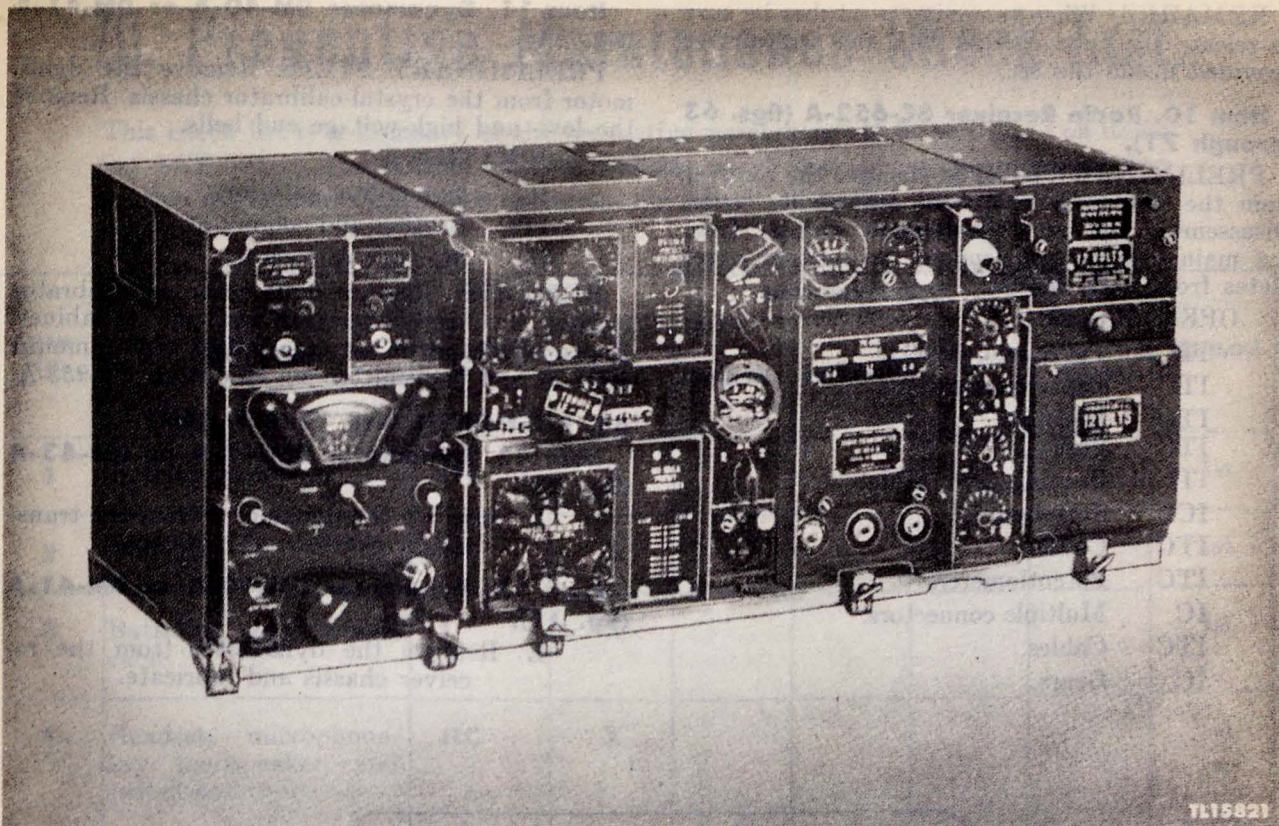


Figure 31. Radio Set SCR-506-A, front covers removed.

Item 4. Headset, Microphone, Loudspeaker, Key, and Switch Box (figs. 4, 6, 7, 9, 10, and 17).

OPERATIONS.

IC Cabinets and external surfaces.

ITC Cords and plugs.

REMARKS. Clean the key contacts according to the method prescribed for cleaning relays.

Item 5. Grounding Straps.

OPERATIONS.

IT Grounding straps across the rubber feet of the mounting.

67. WEEKLY ITEMS.

Item 6. Mounting FT-253-A (fig. 14).

PRELIMINARY STEPS. Remove the receiver and transmitter from the mounting.

OPERATIONS.

ITC Mounting FT-253-A.

IC Multiple connectors.

ITC Power cables.

ITC Fuses.

Item 7. Receiver and Transmitter Exterior (figs. 5 and 8).

OPERATIONS.

ITC Cabinets.

T Loose screws, nuts, and bolts.

IC Multiple connectors.

L Control knob bearings (if needed).

REMARKS. Remove the transmitter fuse panel and examine the fuses to see if they are firmly

seated. Wipe the end clips clean and rotate fuses one-quarter turn in the holder. Remount receiver and transmitter on Mounting FT-253-A.

68. MONTHLY ITEMS.

Item 8. Dynamotor DM-42-A or DM-43-A (fig. 12).

PRELIMINARY STEPS. Remove the dynamotor from the transmitter chassis.

OPERATIONS.

IC Dynamotor housing.

IC Commutators and brushes.

IC Plugs and connectors.

Item 9. Radio Transmitter BC-653-A (figs. 60, 61, and 62).

PRELIMINARY STEPS. Remove the transmitter from the rack. Remove all side panels, front inspection plates, and shield covers from the transmitter.

OPERATIONS.

ITCA Tubes and sockets.

ITC Capacitors.

ITC Resistors.

ITC Rheostats and potentiometers.

ITC Bushings and insulators.

ICL Switches.

I Cables.

ITC Relays.

ITL Couplings.

ITC Coils.

IC Gears.

IC Terminal blocks.

REMARKS. When removing p-a tubes be sure to release the tube clamps with the screwdriver provided inside the set.

Item 10. Radio Receiver BC-652-A (figs. 63 through 71).

PRELIMINARY STEPS. Remove the receiver from the mounting racks and remove its cover. Disassemble the crystal-calibrator chassis from the main chassis and remove the bottom cover plates from both chassis.

OPERATIONS.

- ITCA Tubes and sockets.
- ITC Capacitors.
- ITC Resistors.
- ITC Fuses.
- ITC Bushings and insulators.
- ICL Switches.
- ITC Coils.
- ITC Potentiometers.
- IC Multiple connectors.
- ITC Cables.
- IC Gears.

Item 11. Dynamotor DM-40-A or DM-41-A (fig. 11).

PRELIMINARY STEPS. Remove the dynamotor from the crystal-calibrator chassis. Remove the low- and high-voltage end bells.

OPERATIONS.

- IC Dynamotor exterior.
- ITC Brushes and commutators.
- IC Multiple connector.

REMARKS. Replace dynamotor on calibrator chassis. Reassemble receiver and put in cabinet. Replace side panel on transmitter and remount receiver and transmitter on Mounting FT-253-A.

69. SIX-MONTH AND YEARLY ITEMS.

Item 12. Dynamotor DM-42-A or DM-43-A (fig. 12).

- L Remove the dynamotor from the transmitter chassis and lubricate.

Item 13. Dynamotor DM-40-A or DM-41-A (fig. 11).

- L Remove the dynamotor from the receiver chassis and lubricate.

Feel
Inspect
Tighten
Clean
Adjust
Lubricate

TL14992

70. Preventive Maintenance Check List.

This check list is a summary of the preventive maintenance to be performed on Radio Set SCR-506-A. The echelon column indicates which operations are considered first echelon maintenance and which operations are considered second echelon maintenance.

ITEM NO.	DESCRIPTION	OPERATION	WHEN PERFORMED					ECHOLON
			DAILY	WEEKLY	MONTHLY	SIX MONTHS	YEARLY	
1	Exterior of radio set.	ITC	X					1st
2	Antenna.	ITC	X					1st
3	Batteries and supply cable.	I	X					1st
4	Headset, microphone, key, loudspeaker, and switch box.	ITC	X					1st
5	Grounding straps.	IT	X					1st
6	Mounting FT-253-A.	ITC		X				1st
7	Receiver & transmitter.	ITCL		X				2d
8	Dynamotor DM-42-A or DM-43-A.	IC			X			2d
9	Transmitter BC-653-A.	ITCAL			X			2d
10	Receiver BC-652-A.	ITCAL			X			2d
11	Dynamotor DM-40-A or DM-41-A.	ITC			X			2d
12	Dynamotor DM-42-A or DM-43-A.	L					X	2d
13	Dynamotor DM-40-A or DM-41-A.	L				X		2d
			F <i>Feel</i>	I <i>Inspect</i>	T <i>Tighten</i>	C <i>Clean</i>	A <i>Adjust</i>	L <i>Lubricate</i>

SECTION VIII

Lubrication

NOTE: *There is no lubrication order for this equipment. All lubrication instructions are included in section VI under the preventive maintenance of the various parts discussed there.*

SECTION IX

Moistureproofing and Fungiproofing

71. GENERAL.

The operation of Signal Corps equipment in tropical areas where temperature and relative humidity are extremely high requires special attention. The following items represent problems which may be encountered in operation:

a. Resistors, capacitors, coils, chokes, transformer windings, etc., fail.

b. Electrolytic action takes place in resistors, coils, chokes, transformer windings, etc., causing eventual break-down.

c. Hook-up wire and cable insulation break down. Fungus growth accelerates deterioration.

d. Moisture forms electrical leakage paths on terminal boards and insulating strips, causing flash-overs.

e. Moisture provides leakage paths between battery terminals.

72. TREATMENT.

A moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection against fungus growth, insects, corrosion, salt spray, and moisture. The treatment involves the use of a moisture- and fungi-resistant varnish applied with a spray gun or brush. Refer to TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment, for a detailed description of the varnish-spray method of moistureproofing and fungiproofing.

CAUTION: *Varnish spray may have toxic effects if inhaled. To avoid inhaling spray, use respirator if available; otherwise fasten cheesecloth or other cloth material over nose and mouth.*

73. STEP-BY-STEP INSTRUCTIONS FOR TREATING RADIO RECEIVER BC-652-A.

a. Preparation.

(1) Make all repairs and adjustments necessary for proper operation of the equipment.

(2) Clean all dirt, dust, rust, fungus, oil, grease, etc., from the equipment to be processed.

b. Disassembly.

(1) Release three Dzus fasteners which hold receiver to housing; remove receiver.

(2) Release four latches which hold dynamotor to chassis; remove dynamotor. (Do not treat.)

(3) Remove Crystal Unit DC-15-A. (Do not treat.)

(4) Disconnect antenna lead and remove top deck assembly by removing six screws from front panel and two screws holding assembly to lower deck.

(5) Remove ten screws holding bottom plate to top deck assembly; remove bottom plate.

(6) Remove sixteen screws holding bottom plate to lower deck assembly; remove bottom plate.

c. Masking Upper Deck Assembly.

(1) Mask the prongs of power plug, item A, figure 32.

(2) Mask terminal posts, item B, figure 32.

(3) Mask receptacle for dynamotor plug, item C, figure 32.

(4) Mask crystal socket, item D, figure 32.

(5) Mask antenna lead terminal, item A, figure 33.

(6) Mask variable capacitor, item B, figure 33.

d. Masking Lower Deck Assembly.

(1) Mask power plug receptacle, item A, figure 34.

(2) Mask contacts of CW-MVC-AVC switch, item B, figure 34.

(3) Mask gears of band change mechanism, item C, figure 34.

(4) Mask antenna lead terminal, item D, figure 34.

(5) Mask prongs of interconnecting plug, item A, figure 35.

(6) Mask tuning capacitor, item B, figure 35.

(7) Mask opening and contacts of phone and speaker jacks, item C, figure 35.

e. Drying.

(1) Place receiver in drying oven and bake from 2 to 3 hours at 160° F. Do not exceed 160° F.

(2) If wax should begin to melt on any of the components, lower temperature and increase baking time 1 hour for each 10° drop in temperature.

f. Varnishing.

(1) Spray three coats of moistureproofing and fungiproofing varnish on receiver components, allowing a 15 to 20 minute drying period between coats.

(2) Using a brush, apply varnish to those portions not reached by spray gun, making sure that all components to be treated are adequately protected by varnish.

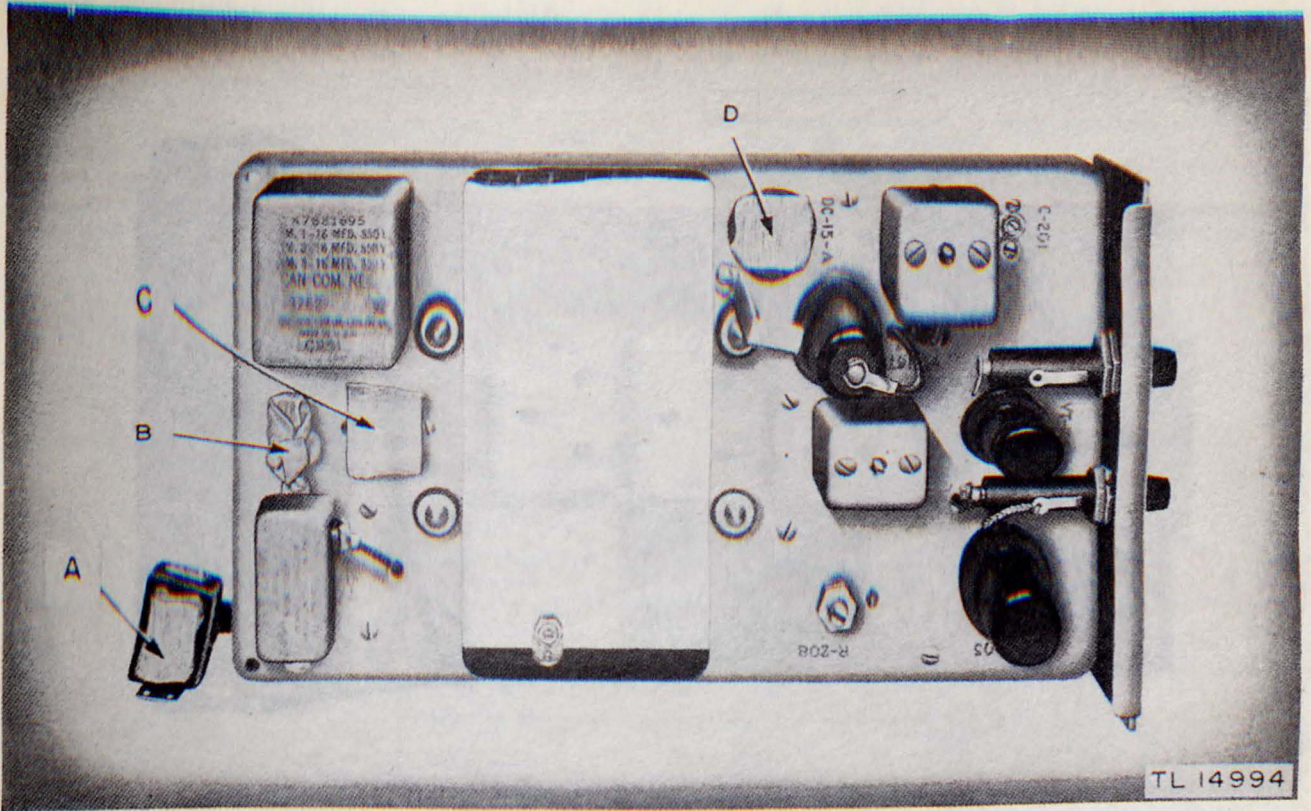


Figure 32. Radio Receiver BC-652-A, crystal-frequency calibrator chassis masked for moistureproofing and fungiproofing.

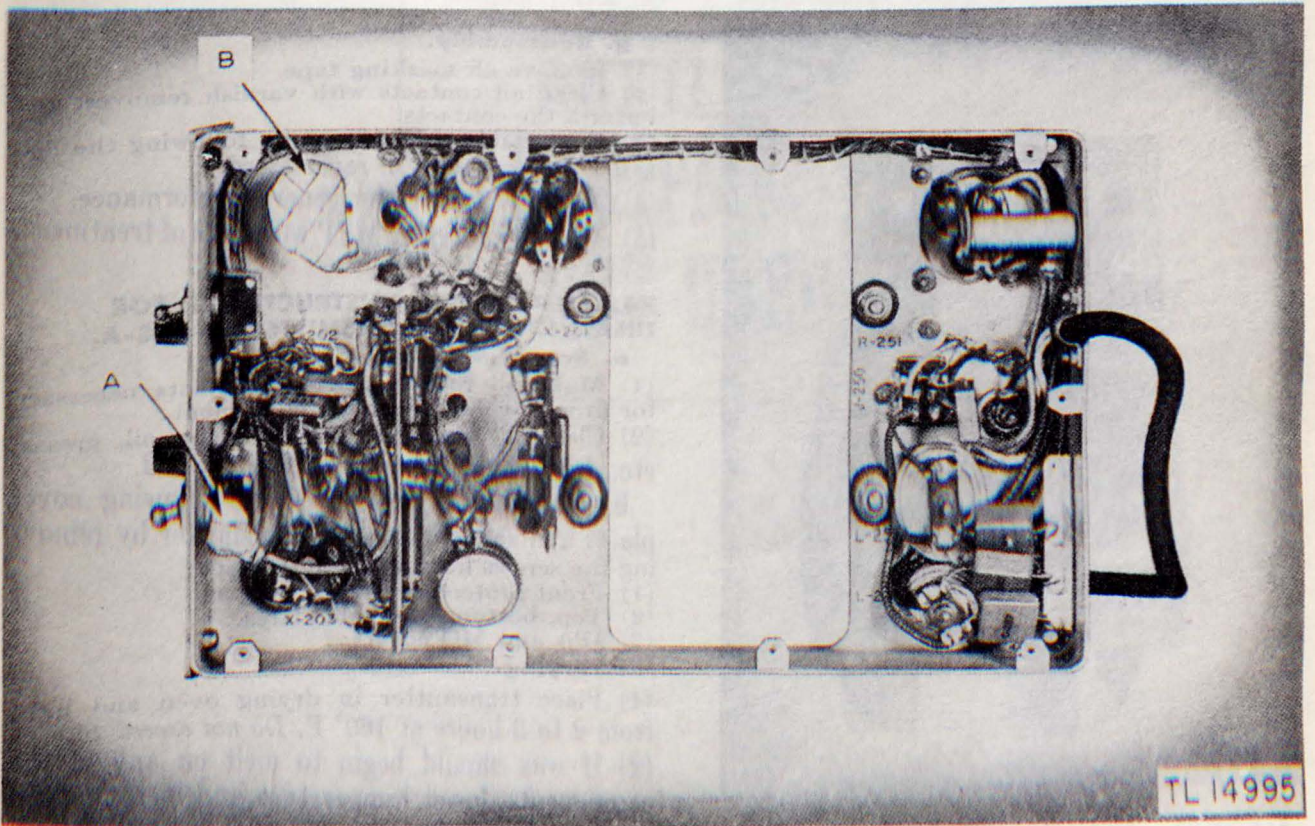


Figure 33. Radio Receiver BC-652-A, bottom view of crystal-frequency calibrator chassis masked for moistureproofing and fungiproofing.

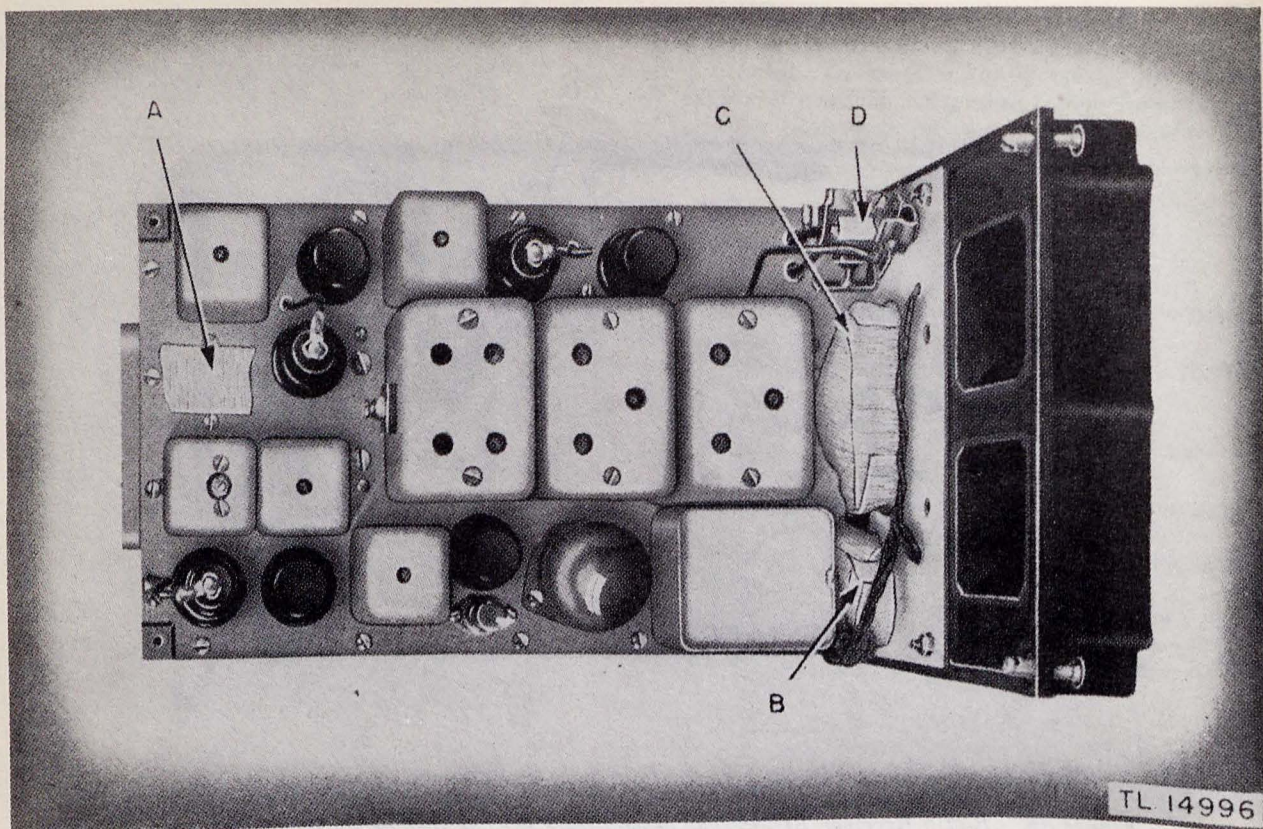


Figure 34. Radio Receiver BC-652-A, receiver chassis masked for moistureproofing and fungiproofing.

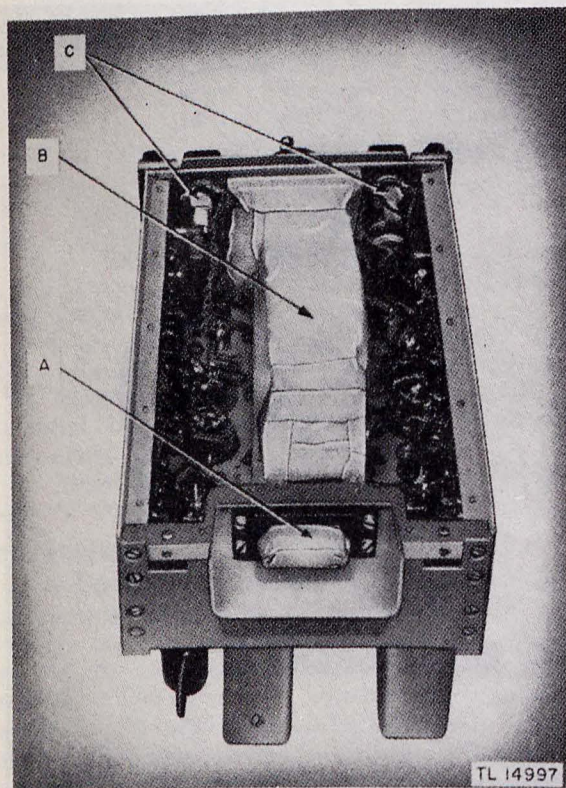


Figure 35. Radio Receiver BC-652-A, bottom view of receiver chassis masked for moistureproofing and fungiproofing.

g. Reassembly.

- (1) Remove all masking tape.
- (2) Clean all contacts with varnish remover, and burnish the contacts.
- (3) Reassemble the receiver by following the disassembly procedure in reverse order.
- (4) Test the receiver for general performance.
- (5) Mark the receiver MFP with date of treatment.

74. STEP-BY-STEP INSTRUCTIONS FOR TREATING RADIO TRANSMITTER BC-653-A.

a. Preparation.

- (1) Make all repairs and adjustments necessary for proper operation of the equipment.
- (2) Clean all dirt, dust, rust, fungus, oil, grease, etc., from the equipment to be processed.

b. Disassembly. Remove the following cover plates and shields from the transmitter by removing the screws holding them in place:

- (1) Front protective covers.
- (2) Top, bottom, and side plates.
- (3) IPA and MO covers.

c. Drying.

- (1) Place transmitter in drying oven and bake from 2 to 3 hours at 160° F. *Do not exceed 160° F.*
- (2) If wax should begin to melt on any of the components, lower temperature and increase baking time 1 hour for each 10° drop in temperature.

d. Varnishing. Apply a brush coat of varnish to following transmitter components. *Do not spray.*

(Care should be taken to avoid accidental application of varnish to switch contacts, variable resistors, etc., which would interfere with electrical continuity.)

- (1) All phenolic components such as terminal boards, capacitors, switches, etc.
- (2) All wires and cable forms.
- (3) All resistors *except* wire-wound potentiometers.
- (4) Back and case of meters, sealing all joints and

screws including the joint between the meter glass and case, but do not varnish the glass face.

e. Reassembly.

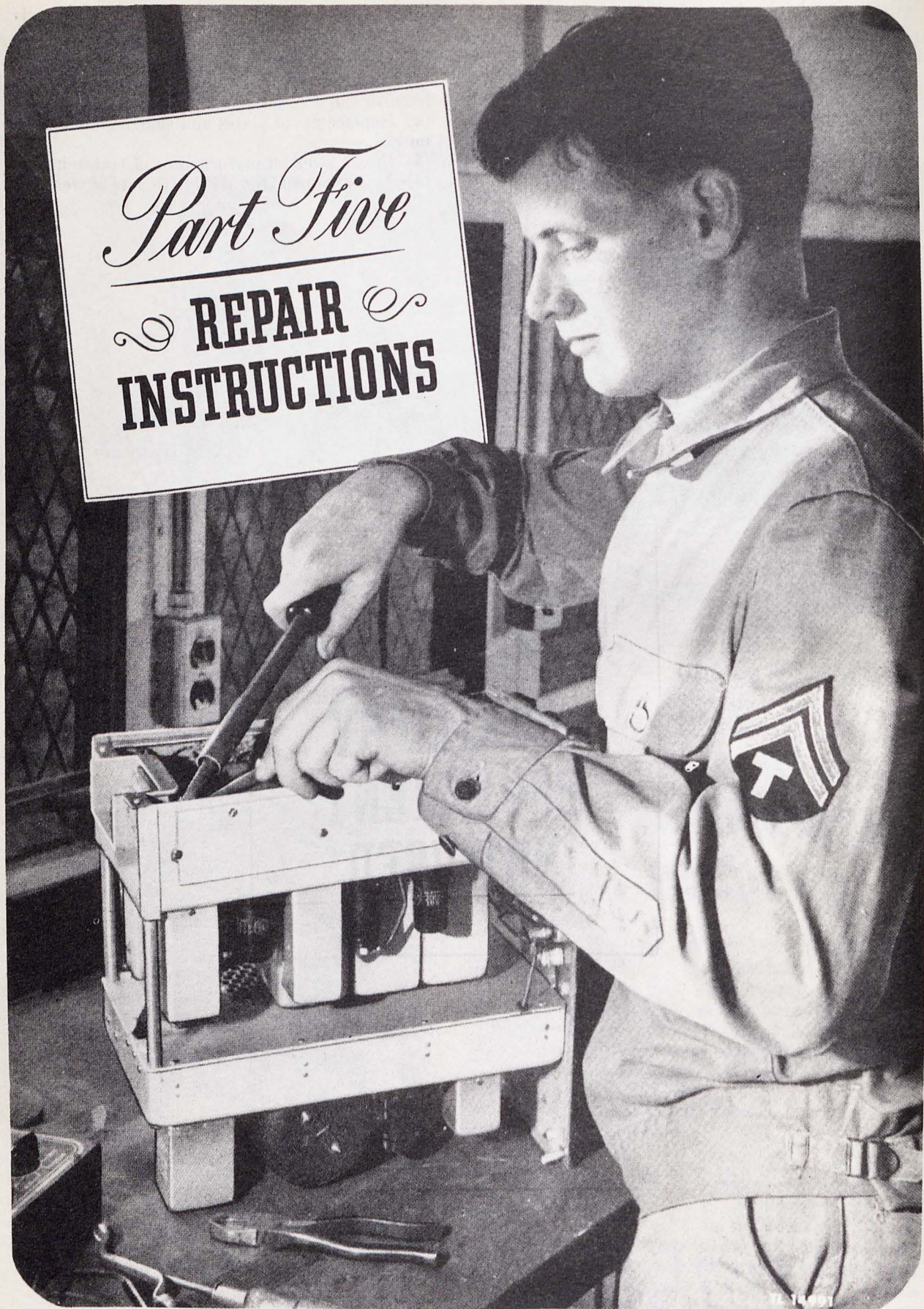
- (1) Clean all contacts with varnish remover, and burnish the contacts.
- (2) Replace cover plates and shields previously removed.
- (3) Check over-all performance of transmitter.
- (4) Mark transmitter MFP with date of treatment.

Part Four

**AUXILIARY
EQUIPMENT:
NOT USED**

Part Five

**REPAIR
INSTRUCTIONS**



SECTION X

Theory of Radio Receiver BC-652-A

NOTE: Failure or unsatisfactory performance of equipment will be reported on *W.D., A.G.O. Form No. 468 (par. 109)*. If this form is not available, see *TM 38-250*.

75. GENERAL.

Radio Receiver BC-652-A contains an eight-tube superheterodyne receiver designed to receive amplitude-modulated signals on a frequency range of 2.0 to 6.0 megacycles (mc). Two bands are used to cover the range: BAND 1 covers 2.0 to 3.5 mc and BAND 2 covers 3.5 to 6.0 mc. A three-tube crystal-frequency calibrator is incorporated in Radio Receiver BC-652-A for calibrating the transmitter to the proper frequency. A noise-limiter circuit in the receiver reduces static and ignition interference. A disabling circuit, operated by a break-in relay in the transmitter, prevents radio reception through the receiver while Radio Set SCR-506-A is transmitting. Sidetone from the transmitter is applied to the audio output of the receiver during transmission. The receiver will operate from either a 12- or 24-volt vehicular storage battery. Dynamotor DM-40-A is used with a 12-volt source, and Dynamotor DM-41-A is used with a 24-volt source. The output of the dynamotors is identical. The necessary receiver tube filament-circuit changes are made automatically by

jumpers on the dynamotor connection plug. Figure 86 is a complete schematic diagram of Radio Receiver BC-652-A.

76. BLOCK DIAGRAM OF RADIO RECEIVER BC-652-A.

Radio Receiver BC-652-A is shown in block diagram form in figure 36. The same antenna is used for both receiving and transmitting. The signal is picked up by the antenna and fed through the antenna switching relay to the radio-frequency (r-f) amplifier. After amplification, the signal is fed to the converter tube where it is mixed with the signal from the high-frequency (h-f) oscillator. The combination of the h-f oscillator signal and the amplified r-f signal produces the intermediate-frequency (i-f) signal. This signal is fed from the converter to the first of the three i-f amplifier stages. For voice reception, the amplified i-f signal is fed to the detector and first audio stage. The detector demodulates the signal and feeds the audio signal to the audio amplifier, where it is amplified and fed to the output stage. The output stage further amplifies the signal and feeds it to the loudspeaker and headsets. When c-w signals are being received, a beat-frequency oscillator generates a signal which is mixed with the amplified i-f signal being fed to the detector. The detector, in this case, demodulates the combined signals leaving the audible beat note which is amplified and fed to the loudspeaker or headsets.

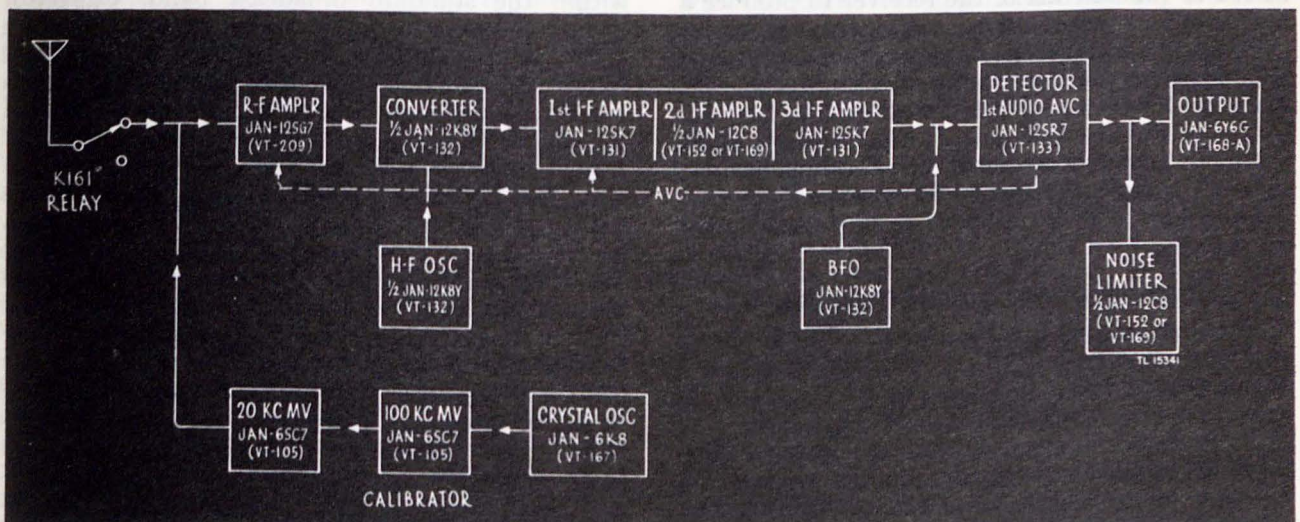


Figure 36. Radio Receiver BC-652-A, block diagram.

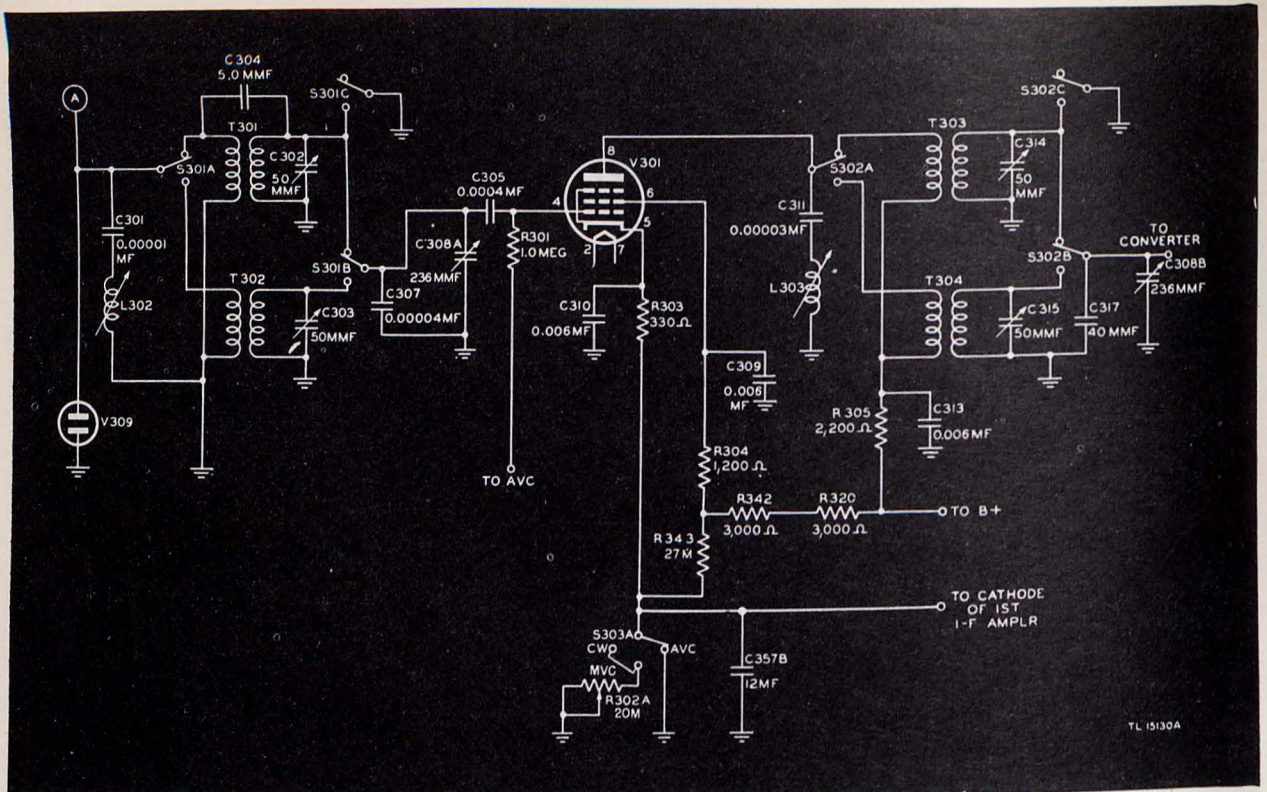


Figure 37. Radio Receiver BC-652-A, functional diagram of r-f amplifier stage.

Sudden appearances of high-voltage signals, such as those created by interference, are picked up at the output of the first audio stage and are fed to a noise limiter, which is one half of the second i-f amplifier tube. The noise limiter carries these noise signals to ground. A second chassis on Radio Receiver BC-652-A holds the crystal-frequency calibrator. This unit is composed of a crystal-frequency oscillator, a 100-kc multivibrator, and a 20-kc multivibrator. The crystal-frequency oscillator produces a 200-kc signal. This signal is used to stabilize the 100-kc multivibrator. The 100-kc signal may be fed to the antenna of the receiver to produce a beat note at each 100-kc calibration point for calibrating the receiver. If it is desired to check the frequency at closer intervals on the receiver dial, the 100-kc signal is fed to the 20-kc multivibrator to stabilize this unit. In this case, the 20-kc signal is then fed to the receiver antenna where it beats against the incoming r-f signal and produces a beat note at every 20-kc calibration point on the receiver dial.

77. RADIO-FREQUENCY AMPLIFIER (fig. 37).

The first stage of the receiver is an r-f amplifier and uses one Tube JAN-12SG7 (V301). The r-f signal received on the antenna is fed through antenna relay K161 (not shown on diagram) to antenna post A on the receiver. The antenna input is coupled to the r-f amplifier through an antenna transformer. Two antenna transformers are used, one for each of the two bands covered.

a. Safety glow Lamp LM-54 (V309) is connected between antenna terminal A and ground as a

protection against high r-f voltages. If the voltage across the input of the receiver exceeds a certain value, the difference of potential across the glow-lamp electrodes ignites the gas. The ignited gas forms a low resistance path across the receiver input, thus preventing high voltages (which might cause damage to the equipment) from building up across the receiver tuned circuits.

b. A wave trap is used in the receiver input circuit to eliminate unwanted signals of the same frequency as the receiver intermediate frequency. The receiver intermediate frequency of 915 kc is within the standard broadcast band. Capacitor C301 and coil L302 make up this wave trap, which shorts to ground any signal of the intermediate frequency reaching the receiver input. This series circuit, resonant at 915 kc, presents minimum impedance to the signals at the intermediate frequency, and passes them directly to ground.

c. The signal is fed through switch S301A to either transformer T301 or T302, depending upon the position of BAND CHANGE switch S301A. When the switch is in the low-frequency (BAND 1) position, as shown in figure 37, transformer T301 is connected in the circuit. The signal is inductively coupled to the secondary winding of transformer T301 and fed through switch S301B and coupling capacitor C305 to the grid (pin 4) of the r-f amplifier tube. Capacitor C304 acts as additional coupling between the primary and secondary windings of transformer T301. On the BAND 2 position, switch S301C shorts out the secondary of transformer T301. Variable capacitor C308A, one section of the three-gang main tuning capacitor,

tunes the secondary of the transformer. Capacitors C302 and C303 are trimmers for transformers T301 and T302, respectively.

d. Grid bias to r-f amplifier tube V301 is applied through grid resistor R301. The cathode and screen each utilize a capacitor, C310 and C309 respectively, to bypass r-f energy. The screen voltage is applied through voltage-dropping resistor R304. Cathode bias is furnished through resistor R303. Bleeder resistor R343 is connected between the screen-voltage line and ground when the switch is at AVC. The bleeder connects to ground through volume control R302A during c-w or m-v-c operation. The primary function of the bleeder is screen-voltage stabilization.

e. R302A is one section of the volume control and is connected in the cathode-bias circuit during c-w and m-v-c operation. This section of the volume control determines the amplification of the r-f amplifier and the first i-f amplifier. Capacitor C357B bypasses r-f voltages around the volume control. When operating on BAND 1, plate voltage to r-f amplifier tube V301 is applied through resistor R305 and the primary winding of transformer T303. Transformer T304 replaces transformer T303 when operating on BAND 2. Resistor R305 and capacitor C313 form a decoupling network which prevents radio frequencies from entering the power circuits. At the same time, the decoupling network prevents a signal from being coupled from one tube to another through the power circuits. The circuit function of the complete r-f transformer unit is identical with that of the antenna transformer unit, except that there is no capacitor for additional coupling between the primary and secondary winding of transformer T303 as there is on antenna transformer T301.

78. CONVERTER (fig. 38).

This stage uses Tube JAN-12K8Y (V302) to perform the function of frequency conversion. The tube consists of a triode oscillator and a hexode, or six-element mixer, in a single metal envelope.

a. The output of the r-f unit is fed to the signal grid of the hexode section of the converter tube through coupling capacitor C316. Capacitor C308B (fig. 37) is the tuning capacitor for this stage. Resistor R306 is the grid-return resistor for the hexode section of the tube. Grid bias for the tube is developed across cathode resistor R307 and filtered by capacitor C318.

b. Figure 39 is a functional diagram of the h-f oscillator circuit which uses the triode section of tube V302. Transformer T305 is the oscillator transformer for the BAND 1 position; transformer T306 is used for the BAND 2 position. Switching in this circuit is accomplished by switch sections S305A, S305B, and S305C of the BAND CHANGE switch. Resistor R309 supplies voltage to the plate (pin 6) of the triode section of the tube. On BAND 1, capacitor C325 couples the plate of the tube to transformer T305 through switch S305B. Capacitor C328 is an adjustable trimmer which insures correct tracking at the h-f end of BAND 1. The plate winding of the transformer has an adjustable

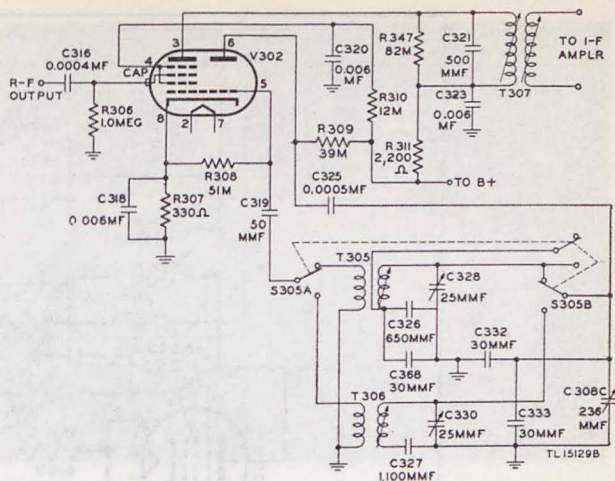


Figure 38. Radio Receiver BC-652-A, functional diagram of converter.

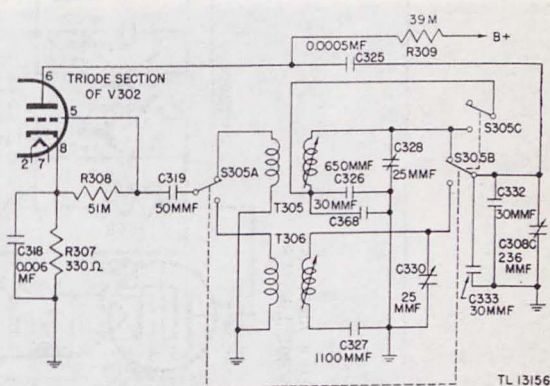
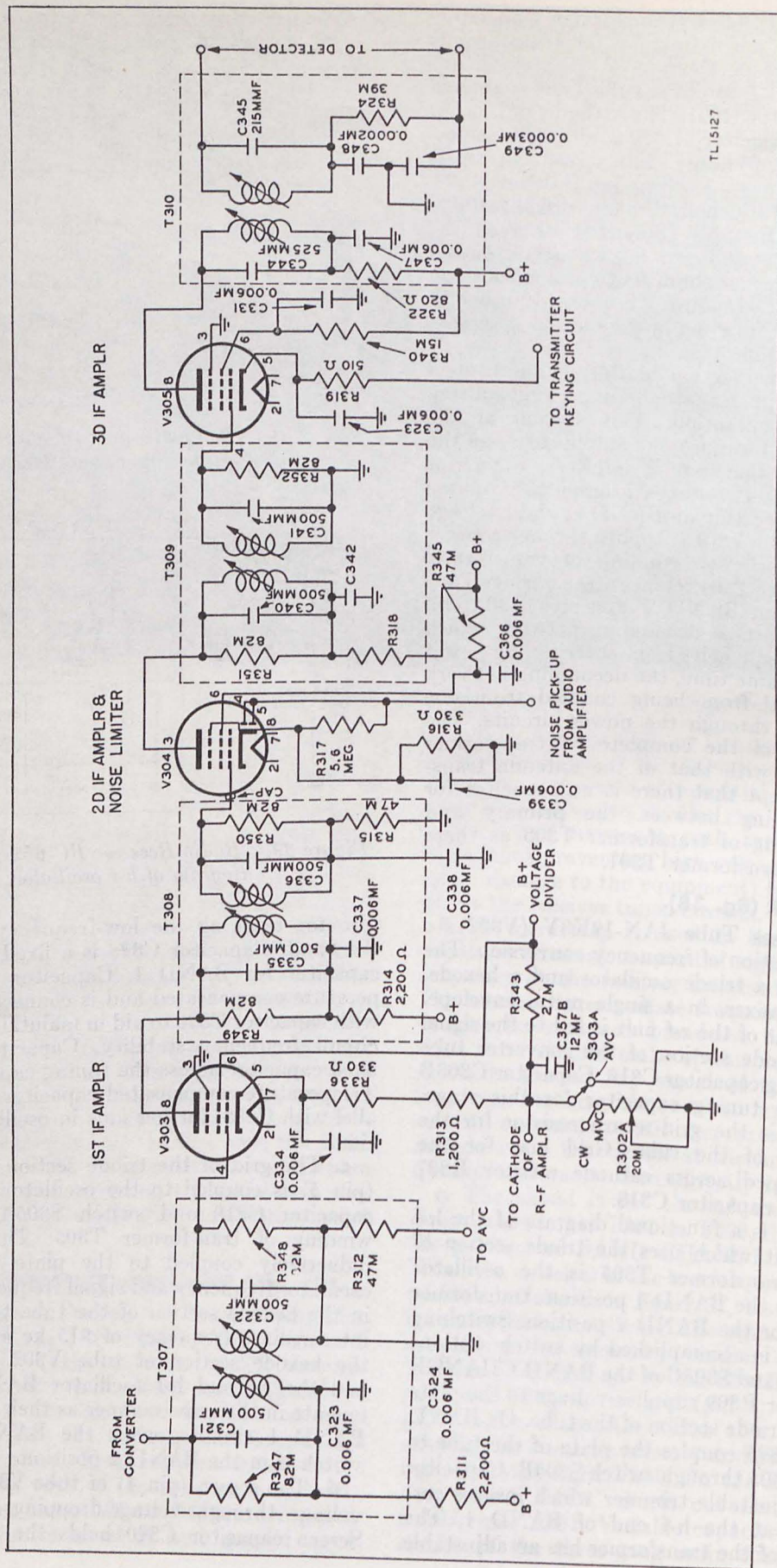


Figure 39. Radio Receiver BC-652-A, functional diagram of h-f oscillator.

core for tracking the low-frequency (l-f) end of the band. Capacitor C326 is a fixed series padder capacitor for BAND 1. Capacitor C368 is temperature compensated and is connected in parallel with capacitor C326 to aid in maintaining oscillator circuit frequency stability. Capacitor C333 is a fixed capacitor across the tuning capacitor C308C. Temperature-compensated capacitor C332, in parallel with C333, further aids in oscillator stabilization.

c. The grid of the triode section of tube V302 (pin 5) is coupled to the oscillator unit through capacitor C319 and switch S305A to the grid winding of transformer T305. This winding is inductively coupled to the plate winding. The oscillator frequency and signal frequency are mixed in the hexode section of the tube to produce the intermediate frequency of 915 kc at the plate of the hexode section of tube V302. The antenna and the r-f and h-f oscillator BAND 2 circuits operate in the same manner as their corresponding BAND 1 circuits, when the BAND CHANGE switch is in the BAND 2 position.

d. The screen (pin 4) of tube V302 receives its voltage through voltage-dropping resistor R310. Screen capacitor C320 holds the screen voltage



TL15127

Figure 40. Radio Receiver BC-652-A, functional diagram of i-f amplifier.

constant by preventing small r-f variations in screen current from changing the voltage drop across the screen-grid resistor.

79. INTERMEDIATE-FREQUENCY AMPLIFIER (Fig. 40).

The i-f amplifier is made up of three amplifier stages V303, V304, and V305, each fundamentally the same. The frequency of the i-f amplifier is 915 kc.

a. The 915-kc signal from the converter tube is fed to the primary winding of the first i-f transformer T307. Capacitor C321 is a fixed tuning capacitor across the primary winding of the transformer. The signal is inductively fed to the secondary winding, which in turn feeds the signal to the grid of the first i-f amplifier tube V303. Capacitor C322 is the fixed tuning capacitor for the secondary winding. Both primary and secondary windings are tuned by means of an adjustable core in the windings. Resistors R347 and R348 across the primary and secondary windings, respectively, broaden the frequency response of the circuit. Plate voltage at pin 3 of the converter tube is supplied through voltage-dropping resistor R311 and the parallel circuit composed of resistor R347 and the primary winding of transformer T307. Capacitor C323 is the r-f bypass capacitor for the plate of the converter tube. Resistor R312 is the grid decoupling resistor for the first i-f stage through which bias is applied to the grid from the a-v-c line. Together with capacitor C324 it forms a decoupling network to prevent feedback from a-v-c or power circuits. Cathode bias for the first i-f amplifier tube is obtained through resistors R336, R313 and switch S303A to ground when the switch is in the AVC position. The return to ground during c-w or m-v-c operation is through volume control R302A. In either case, the cathode bias is filtered through capacitor C334. The screen voltage on this tube is obtained through resistors R342 and R320, as shown in figure 86. These two resistors, together with resistors R321 and R343, make up a voltage-divider network. The screen also connects through resistor R343 and switch S303A to ground when the switch is in the AVC position. This circuit forms a bleeder for the screen in order to stabilize screen voltage. This bleeder is in series with volume control R302A during c-w or m-v-c operation.

b. Disregarding the noise-limiter action of the second i-f amplifier tube V304, the function of the second i-f stage is identical with the first i-f amplifier. Volume control R302A, however, is not in the circuit of any stages other than the first r-f and first i-f amplifier stages. A-v-c voltage is not applied to the second and third i-f amplifier stages. The noise-limiter portion of the second i-f amplifier tube V304 will be discussed in paragraph 81.

c. The only difference in the function of the third i-f stage from that of the first and second i-f stages is in the cathode circuit of the third i-f tube V305. To prevent application of too large a signal to the detector and to prevent audio feedback into the sidetone circuits during transmission,

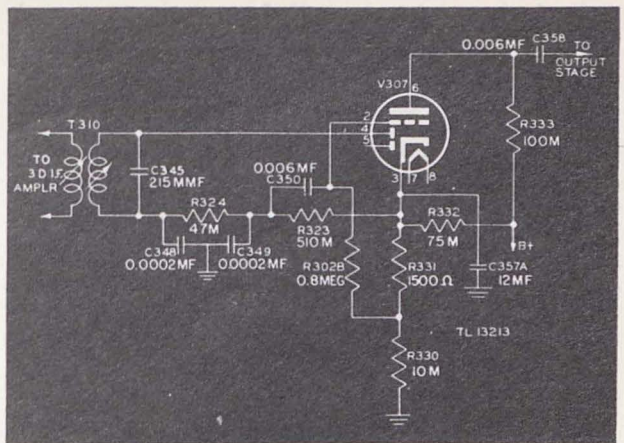


Figure 41. Radio Receiver BC-652-A, functional diagram of detector, c-w or m-v-c operation.

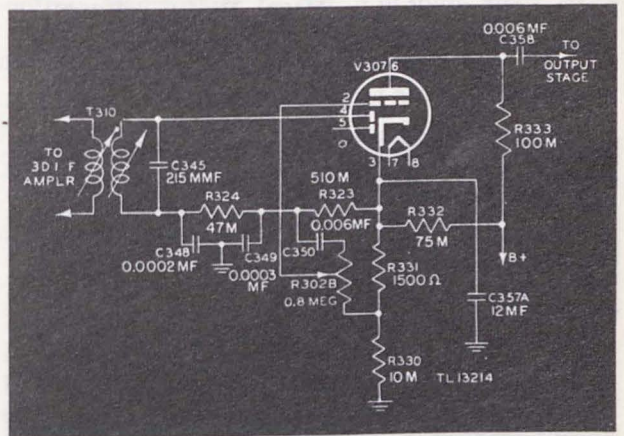


Figure 42. Radio Receiver BC-652-A, functional diagram of detector, a-v-c operation.

the receiver is killed during transmission by the opening of the third i-f cathode circuit. Cathode resistor R319 is connected to a switch contact on relay K161 on the transmitter. Resistor R319 is connected to ground through the relay contacts when the relay is in the receive position. Capacitor C343 is the cathode bypass, placing the cathode at r-f ground potential.

80. DETECTOR AND FIRST AUDIO.

The detector and first audio circuits use a duodiode triode Tube JAN-12SR7 (V307). The detector circuit also provides the a-v-c voltages for the first r-f and first i-f amplifier tubes V301 and V303. The detector circuit will first be discussed with switch S303 at CW or MVC, disregarding the a-v-c action. Figure 41 is a functional diagram of the circuit showing this type of operation.

a. The output of transformer T310 is fed to the diode plate (pin 4) of the diode section of tube V307 which functions as detector. Resistors R324 and R323 are the diode load resistors. Resistor R324 also acts as a filter to prevent radio frequencies from getting into the audio circuit. Capacitors C348 and C349 complete the filtering

action by bypassing the radio frequencies to ground. The audio voltage developed across resistor R323 is fed through blocking capacitor C350 to the grid (pin 2) of the triode section (a-f amplifier) of tube V307. The bias for the audio section of the tube is developed by the flow of cathode current through resistors R330 and R331 plus the flow of bleeder current through resistors R330, R331, and R332. The bias is tapped off at the proper point and applied through grid resistor R302B, the voltage drop across R331 being the actual bias on the tube. Capacitor C357A is the audio-frequency (a-f) bypass for the cathode circuit.

b. The diode detector circuit changes slightly when switch S303 is in the AVC position (fig. 42). Audio voltages are developed across resistor R302B since it is in series with capacitor C350 and is connected across diode load resistor R323 through R331. Resistor R302B is a potentiometer and feeds the audio voltage to the grid of the triode section (a-f amplifier) of tube V307. Resistor R302B is therefore an a-f volume control in this circuit. Resistor R302A is removed from the circuit during

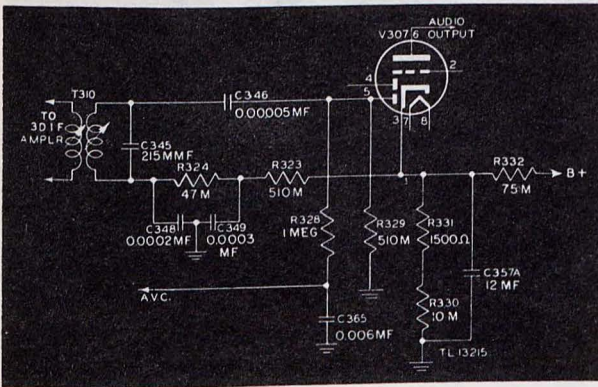


Figure 43. Radio Receiver BC-652-A, functional diagram of a-v-c circuit.

a-v-c operation. During c-w or m-v-c operation, Resistor R302A is the volume control; during a-v-c operation, R302B is the volume control. Capacitor C350 is the audio coupling capacitor. The amplified audio signal from the plate (pin 6) of the audio-amplifier section of tube V307 is fed through capacitor C358 (fig. 45) and resistors R334 and R354 to the grid of output tube V308. Resistor R333 is the triode plate-load resistor for V307, and capacitor C361 is the plate bypass. Resistor R332 is a bleeder resistor from the plate-load resistor to cathode.

c. Figure 43 is the functional diagram of the a-v-c circuit. A-v-c action is accomplished by using the second diode plate (pin 5) of the detector and first audio tube V307. This diode is coupled to the output of the i-f circuit through capacitor C346. Signals from the secondary of transformer T310 are rectified by the a-v-c diode section of the tube, and the rectified voltage is developed across diode load resistor R329. Resistor R328 and capacitor

C365 make up a filter network to furnish a smooth rectified voltage. This voltage is fed back to the control grids of the r-f amplifier tube and the first i-f amplifier tube to control their gain. The rectified voltage has a negative potential. The stronger the signal to the diode plate, the higher the negative voltage will be in the a-v-c circuit. This negative voltage, because it is applied as bias to the control-grid circuit of the r-f and first i-f tubes, will reduce their amplification on strong signals. The voltage developed across resistors R331 and R330 is fed to the diode plate through resistor R329 to prevent a-v-c action on weak signals. This is known as a *delayed a-v-c* circuit. The delay voltage is developed across resistors R331 and R330. These resistors are connected to the high-voltage line through bleeder resistor R332. The voltage drop across these resistors places the cathode at a positive potential with respect to the diode plate which is connected to ground through R329. A weak signal on the diode will have a voltage too low to make the diode positive with respect to the cathode, therefore the diode will not conduct and there will be no rectified voltage across R329. A strong signal will drive the diode positive with respect to cathode and the diode will conduct. The resultant negative voltage developed across resistor R329 will be applied through resistor R328 to the grid circuits of the r-f and first i-f amplifier tubes to reduce amplification in these stages.

81. NOISE LIMITER (fig. 44).

The noise-limiter circuit was designed to eliminate unwanted signals such as those caused by man-made or natural electrical interference. The noise-limiter circuit utilizes the diode section of the second i-f amplifier tube V304. Referring to

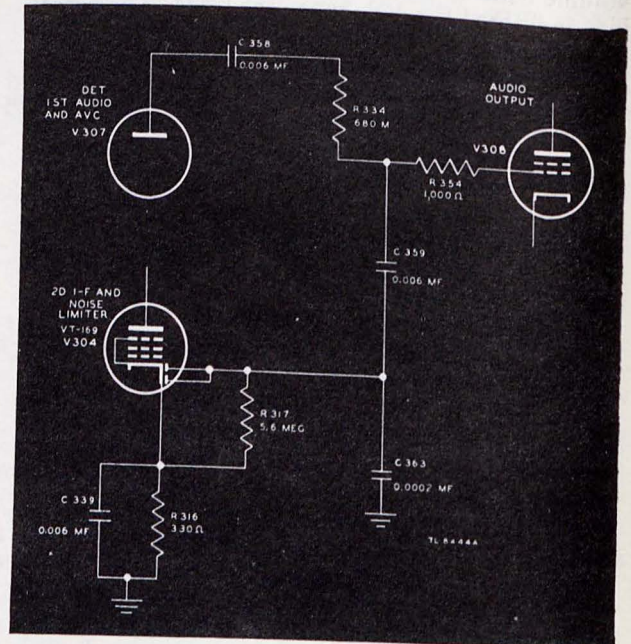


Figure 44. Radio Receiver BC-652-A, functional diagram of noise-limiter circuit.

figure 45, it will be seen that the output of first audio tube V307 is applied through capacitor C358 and series resistors R334 and R354 to the grid of audio output tube V308. The V308 input circuit lowers the amplitude of the applied signal but permits free passage of the higher-frequency noise impulses to the noise limiter through capacitor C359 to the diode plates of V304. Capacitor C363 becomes charged negative by the modulated voltage on the grid of output tube V308, and blocks the diode plates of noise limiter V304 with a negative voltage. Noise signals with greater amplitude than the average modulated voltage will drive the diodes positive, causing the diode section of tube V304 to conduct, effectively shunting to ground the high-amplitude noise signal. Resistor R317 is the leak resistor for capacitor C363. Cathode resistor R316 shunted by capacitor C339 presents a low-impedance signal path from ground to cathode, thus effectively placing the signal ground at the cathode.

82. AUDIO OUTPUT (fig. 45).

The output stage (V308) utilizes beam-power Tube JAN-6Y6G (VT-168-A), as final amplifier. The audio signal is fed to the grid of the tube through audio blocking capacitor C358 and resistors R334 and R354. Resistors R335 and R354 form the control-grid resistor network. Bias voltage is developed across cathode resistor R337. Capacitor C360 is the cathode bypass. Screen voltage is applied through voltage-dropping resistor R344. Capacitor C364 is the screen-voltage supply filter. The plate is directly connected to the primary of output transformer T312. Plate voltage is applied at the opposite end of the same winding. Capacitor C362, connected across the primary winding, limits the high-frequency response. The secondary of transformer T312 connects to loudspeaker jack J301. Tap 4 on the secondary feeds the output to the two headset jacks J302 and J303 through

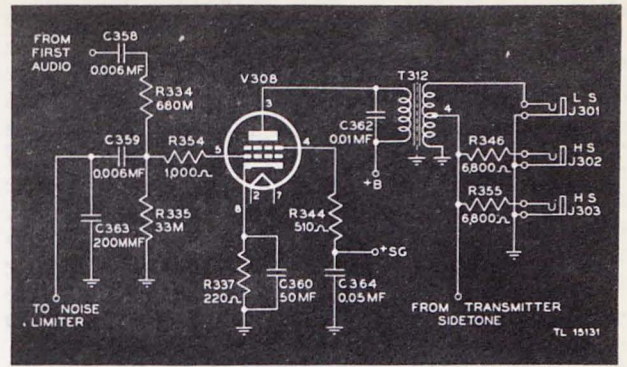


Figure 45. Radio Receiver BC-652-A, functional diagram of audio output circuit.

impedance-matching resistors R346 and R355, respectively. The connection from tap 4 of the output transformer to pin 7 of plug P302 is to provide sidetone while transmitting on VOICE position.

83. BEAT-FREQUENCY OSCILLATOR (fig. 46).

The beat-frequency oscillator (BFO) is a circuit designed to produce a signal which, when beat against the amplified c-w i-f signal, will produce an audible note in the headset or loudspeaker. This will enable the operator to hear c-w signals. The BFO utilizes a dual-purpose tube V306, Tube JAN-12K8Y (VT-132).

a. The plate (pin 6) of the triode section of this tube and the grid (pin 5) connect through capacitors C353 and C351, respectively, to the ends of coil T311; while the cathode (pin 8) connects to the center tap of the coil. This circuit is a parallel-fed Hartley oscillator. The circuit is tuned with capacitor C356. Capacitor C355 is a fixed trimmer which, when used with the temperature-compensated capacitor C354, gives stability to the circuit. Since zero bias is required to start an oscillator,

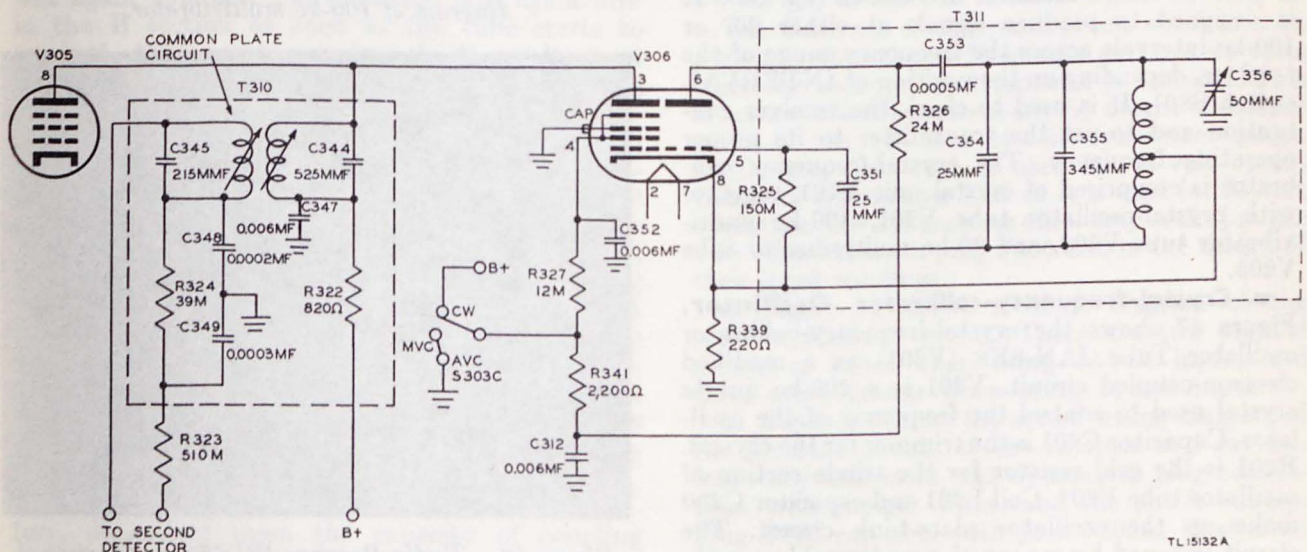


Figure 46. Radio Receiver BC-652-A, functional diagram of beat-frequency oscillator.

grid resistor R325 is connected directly to the cathode. Class C oscillator bias (two or three times beyond cut-off) is developed by the flow of rectified grid current through resistor R325 after oscillation starts. The bias on the hexode section of the tube is developed by the flow of the cathode current through resistor R339. The control grid is grounded and acts as a suppressor. Voltage is applied to the plate (pin 6) through voltage-dropping resistors R326 and R341 during c-w operation. No voltage is applied to the plate during a-v-c or m-v-c operation, therefore the BFO is inoperative.

b. The signal from the BFO is fed to the primary winding of transformer T310 from the plate (pin 3) of the pentode section of the BFO tube V306. During c-w operation, this signal beats against the amplified signal from the plate of the third i-f amplifier tube V305 to produce a heterodyne note. The oscillations are coupled to the pentode section of the tube through the electron stream. I-f transformer T310 is common to the plate circuits of the pentode section of the BFO and the third i-f amplifier. The outputs of both circuits are present in the transformer and are applied to the detector, producing an audible beat note in the headset or loudspeaker.

c. Capacitor C344 is a fixed tuning capacitor across the primary of transformer T310. The secondary winding is inductively coupled and feeds the signal to the diode plate (pin 4) of the second detector and first audio tube V307. Capacitor C345 is a fixed tuning capacitor for the secondary winding. Both primary and secondary windings of transformer T310 are tuned by means of adjustable cores within the windings. Plate voltage is supplied to both the third i-f amplifier and BFO tubes V305 and V306 through the primary winding of transformer T310 and voltage-dropping resistor R322.

84. CRYSTAL-FREQUENCY CALIBRATOR.

The crystal-frequency calibrator (marked CFC) is part of Radio Receiver BC-652-A (fig. 86). It is designed to produce signals at either 20- or 100-kc intervals across the frequency range of the receiver, depending on the position of INTERVAL switch S201. It is used to check the receiver calibration and to set the transmitter to its proper operating frequency. The crystal-frequency calibrator is comprised of crystal unit Y201, together with crystal-oscillator tube V201, 100-kc multivibrator tube V202, and 20-kc multivibrator tube V203.

a. Crystal-frequency-calibrator Oscillator.

Figure 47 shows the crystal-frequency-calibrator oscillator Tube JAN-6K8 (V201) as a modified electron-coupled circuit. Y201 is a 200-kc quartz crystal used to control the frequency of the oscillator. Capacitor C201 is the trimmer for the crystal. R201 is the grid resistor for the triode section of oscillator tube V201. Coil L201 and capacitor C230 make up the oscillator plate-tank circuit. The circuit is tuned by means of an adjustable core in coil L201. Plate voltage is applied to the oscillator

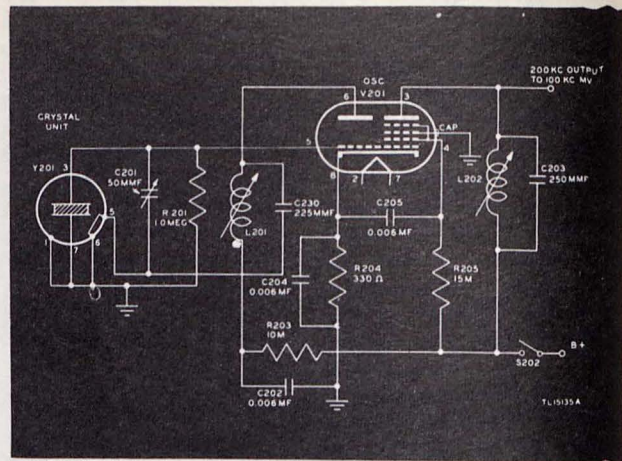


Figure 47. Radio Receiver BC-652-A, functional diagram of crystal oscillator.

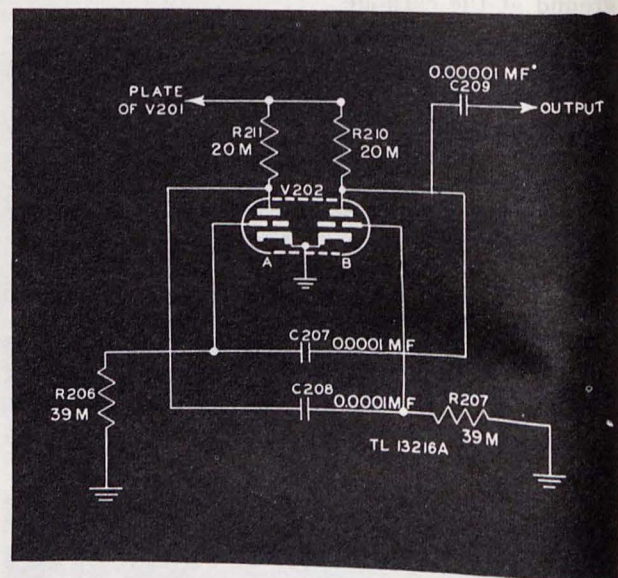


Figure 48. Radio Receiver BC-652-A, functional diagram of 100-kc multivibrator.

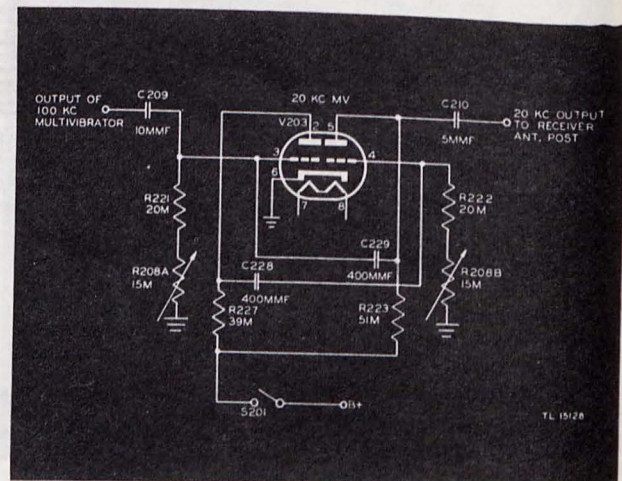


Figure 49. Radio Receiver BC-652-A, functional diagram of 20-kc multivibrator.

plate (pin 6) through coil L201 and decoupling resistor R203. Capacitor C202 is the plate bypass. The pentode section of tube V201 is used as an oscillator amplifier. The plate (pin 3) of the hexode section of crystal-oscillator tube V201 connects to a 200-kc parallel-resonant circuit made up of coil L202, tuned by an adjustable core, and capacitor C203, a fixed trimmer. Plate voltage is applied through coil L202 from the receiver B supply when switch S202 is closed. The grid cap is grounded and is therefore used as a suppressor. Screen voltage is applied through voltage-dropping resistor R205. Capacitor C205 is the screen bypass.

b. Multivibrator (100-kc). A multivibrator is an independent oscillator whose frequency is determined by the resistance and capacitance of the circuit. The voltage generated has many harmonics and the frequency is unstable. It is therefore desirable to inject a synchronizing signal from a stable oscillator circuit into the multivibrator circuit to stabilize its frequency. The 200-kc crystal oscillator is used for this purpose. The synchronizing signal from the crystal oscillator is fed to plate-load resistors R210 and R211.

(1) Figure 48 shows a simplified diagram of the 100-kc multivibrator circuit. Current flow to the plate of the A section of tube V202 will cause a voltage drop across plate-load resistor R211 causing a drop in voltage applied to the plate. This drop in voltage on coupling capacitor C208 will make the voltage more negative on the B section grid. The changed grid voltage reduces the current flow to the plate of the B section thus increasing the voltage at the plate. The resultant increased voltage on coupling capacitor C207 drives the A grid more positive, further increasing the plate current and dropping the voltage at the A plate. This action continues until the B grid is driven to cut-off and the B section ceases to conduct. At this time the A section is conducting and the B section is not conducting. Resistor R207 starts discharging capacitor C208 until the voltage on the B grid is again at a point where the B section will again conduct. Plate current will again flow in the B section as soon as the tube starts to conduct, thus causing a drop in the voltage at the B plate. This drop in voltage through coupling capacitor C207 will make the voltage more negative on the grid of the A section. The changed grid voltage reduces plate-current flow and increases the voltage at the A section plate. The increased voltage on coupling capacitor C208 makes the grid voltage more positive on the B section, further increasing plate-current flow and reducing plate voltage. This action continues until the A section is driven beyond cut-off. The B section will continue to conduct until resistor R206 discharges capacitor C207 sufficiently to allow the A section to conduct again. The output of the multivibrator is in the form of a squared or trapezoidal pulse which is rich in harmonics.

(2) The frequency of the multivibrator is, therefore, dependent upon the capacity of coupling capacitors C207 and C208, and grid resistors R206

and R207. A phase shift of 180 degrees exists between the A section and the B section of the tube. The output of each section is in phase with the signal on the grid of the opposite section, thus satisfying the conditions for an oscillator circuit. (3) A synchronizing signal fed into the multivibrator from the plate of V201 increases the voltage on the plate-load resistors, which in turn is fed through the coupling capacitors and keeps the multivibrator in step with the synchronizing signal. Capacitor C209 is the coupling capacitor between the 100-kc and the 20-kc multivibrators.

c. Multivibrator (20-kc). The 20-kc multivibrator (fig. 49) is fundamentally the same as the 100-kc multivibrator. The 20-kc frequency is determined by capacitors C229 and C228, and the grid resistors. Grid resistors R221 and R222 each have a variable resistor R208A and R208B, respectively, in series to adjust the circuit to the correct frequency. Plate voltage is applied through switch S201 and load resistors R227 and R223 to the two plates (pins 2 and 5). The output of the circuit is through capacitor C210 to the antenna post of the receiver. The 100-kc signal is fed to the receiver through capacitors C209, C229, and C210 when switch S201 is open. Switch S201 controls plate voltage to the 20-kc multivibrator. The filaments of the three tubes in this circuit are lighted when the receiver is turned on, keeping them hot for immediate use. The synchronized 100-kc signal is used to synchronize the 20-kc multivibrator. The frequency of the 20-kc multivibrator is one-fifth the frequency of the 100-kc multivibrator. Therefore, every fifth pulse of the 100-kc oscillator synchronizes the 20-kc oscillator. The fifth pulse occurs at the proper time to start conduction of grid (pin 3) of the 20-kc multivibrator. Since the 100-kc multivibrator is held in step by the 200-kc sine-wave oscillator, the interval between pulses is constant for both the 100-kc and 20-kc multivibrators.

85. RECEIVER FILAMENT, DYNAMOTOR, AND POWER-SUPPLY CIRCUITS.

The filaments of this receiver are wired in such a manner that they will operate on 12 or 24 volts when the appropriate dynamotor is installed. This is accomplished automatically by means of jumper wires in the 12- and 24-volt dynamotor plugs. Dynamotor DM-40-A is used for 12-volt operation, and Dynamotor DM-41-A is used for 24-volt operation. The dynamotors differ only in the jumper wire connections in plug P250 and in the design of their input windings.

a. Figure 50 shows a block diagram of the receiver filament circuit. There are two parallel groups of tubes when using 12-volt input, and three series groups when using 24-volt input.

b. Figure 85 shows the actual wiring diagram of the filament circuit of the receiver and crystal-frequency calibrator, the dynamotor plug connections with jumper wires, and the power supply. Plug P302 connects with jack J302A, located on Mounting FT-253-A. The 12- or 24-volt input is

applied, through the jack, between pins 1 and 2 and pin 5 of plug P302. Coil L301 is an r-f choke, and C370 is an r-f bypass capacitor for the input line. Switch S306 is the ON-OFF switch located on the front of the receiver.

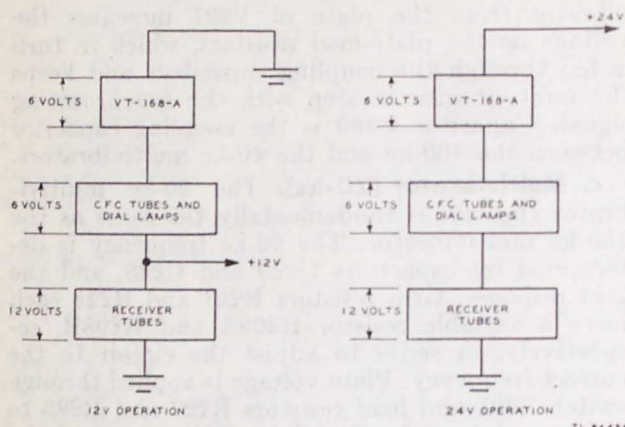


Figure 50. Radio Receiver BC-652-A, block diagram of filament connections.

(1) The voltage path to the filaments, when operating on 12-volt input is as follows: The negative side of the input voltage is connected to ground. The positive connection is made through choke L301 and switch S306 to pin 1 of jack J304, located on the receiver chassis. Jack J304 and plug P251, from the crystal-frequency calibrator, are connected. Connection is made between pin 1 of the jack and pin 1 of the plug. The circuit continues from pin 1, through fuse F251 and r-f choke L252, to pin 5 of jack J250 which is located on the crystal-frequency calibrator unit. Capacitors C253, C254, and C257 are r-f capacitors. Plug P250 from the 12-volt dynamotor D251 connects with jack J250, and contact is made with pin 5. A jumper from pin 5 to pin 3 in plug P250 places 12 volts on pin 3 of jack J250. Pin 3 is connected to one side of the parallel-connected filaments of the three tubes V201, V202, and V203 of the crystal-frequency calibrator unit. The other side of the filaments connects to pin 6 of plug P251. Pin 6 of the plug contacts pin 6 of jack J304. The jack, in turn, connects to one side of the filament of tube V308 in the receiver. The other side of the filament of V308 connects to pin 7 of jack J304, which in turn contacts pin 7 of plug P251. Pin 7 of this plug connects to pin 4 of jack J250. Pin 4 of the jack contacts pin 4 of plug P250. A jumper in plug P250 from pins 4 to 2 makes contact through the plug to the jack on pin 2, which is grounded, completing the circuit. Resistor R252 is connected across the parallel-connected filaments of V201, V202, and V203 as a ballast resistor. Resistor R251 from filament to ground is a further ballast. The three tubes in the crystal-frequency calibrator unit and output tube V308 in the receiver have 6-volt filaments. The series-parallel connection in this circuit insures correct

voltage for these tubes from a 12-volt input. Receiver tubes V301, V302, V303, V304, V305, V306, and V307 have 12-volt filaments, and are connected in parallel. One side of this parallel connection goes to ground; the other side goes to pin 4 of jack J304, which in turn contacts pin 4 of plug P251. Pin 4 of this plug connects to filter network made up of choke L253 and capacitors C255 and C256. The r-f filter network connected between the 12-volt supply and the filaments of the crystal-frequency calibrator unit. This connects the receiver tubes in parallel with the series-parallel circuit of V201, V202, V203, and V308. Pilot lamps V310 and V311 with their series ballast resistors R338 and R353 are connected in parallel. Voltage to the pilot lamps is made across pins 4 and 6 of jack J304, which places the lamp across the filament supply of the crystal-frequency calibrator filaments through coil L253.

(2) Dynamotor D252 is used with 24-volt input. The filament path, using this dynamotor is as follows: 24 volts is applied at pin 1 of plug P250 through coil L301 and switch S306, to pin 1 of jack J304. Pin 1 of the jack contacts pin 1 of plug P251, which is connected to fuse F251. The circuit continues from the fuse, through coil L252, to pin 5 of jack J250. Pin 5 contacts pin 5 of plug P250 of dynamotor D252. A jumper in this plug connects pin 5 to pin 4, which contacts pin 4 of jack J250. Pin 4 of this jack is connected to pin 4 of plug P251, which contacts pin 7 of jack J304. Pin 7 is connected to one side of the filament of tube V308 to start the series circuit. The circuit continues from pin 7 (filament) of tube V308 to pin 6 of jack J304, which contacts pin 6 of plug P251. Pin 6 of the plug connects to one side of the parallel filaments of tubes V201, V202, and V203 of the crystal-frequency calibrator unit. The other side of the filaments connects through coil L253 to pin 4 of plug P251, which contacts pin 4 of jack J304. Pin 4 of the jack connects to one side of the parallel filaments of receiver tubes V301 through V307. The other side of this group of tubes connects to ground, completing the series circuit. Pilot lamps V310 and V311 with their ballast resistors R338 and R353 are connected the same as for 12-volt operation, and they remain at a 6-volt potential.

(3) The high-voltage windings of the two dynamotors are identical, therefore the circuit of one will be discussed. Pin 1 of plug P250 is the negative side of the high voltage and contacts pin 1 of jack J250 to ground. The high-voltage positive connects to pin 6 of plug P250, which contacts pin 6 of jack J250. Pin 6 of this plug is connected to pin 10 of plug P251, which contacts pin 10 of jack J304. Pin 10 of this jack feeds high voltage to the primary winding of output transformer T312 of the receiver. Pin 10 of plug P251 also connects to voltage-dropping resistor R253. The resistor connects to pin 9 of plug P251, making contact with pin 9 of jack J304. This connection feeds high voltage to all remaining B+ circuits in the receiver. Voltage-dropping resistor R253

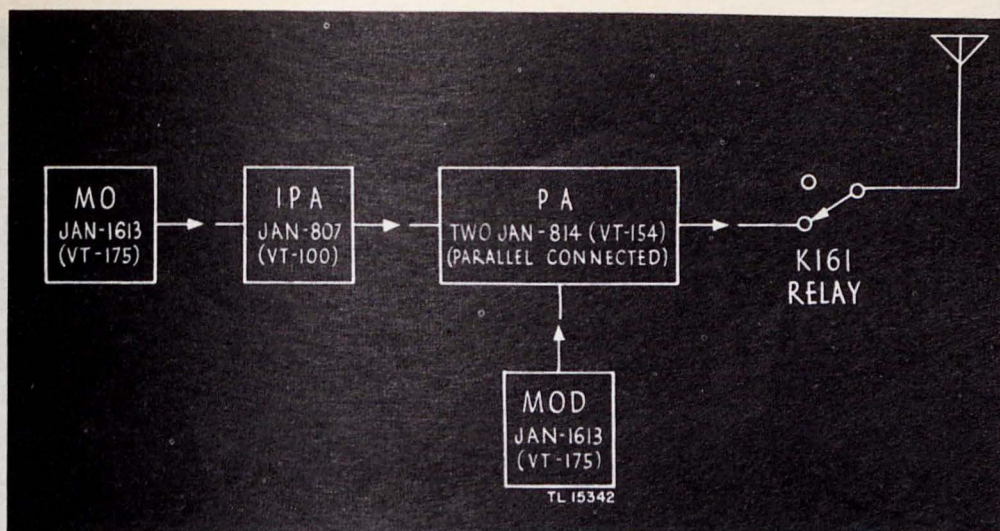


Figure 51. Radio Transmitter BC-653-A, block diagram.

also connected to switch S202, which controls high voltage to the crystal-frequency calibrator unit. Capacitors C251A, C251B, and C251C are high-voltage filters. Capacitor C258, across the dynamotor input, is a filter capacitor for reducing dynamotor noise.

SECTION XI

Theory of Radio Transmitter BC-653-A

86. GENERAL.

Radio Transmitter BC-653-A (fig. 87) consists of a master oscillator, an intermediate power amplifier, a power amplifier, and a modulator. The frequency range of the transmitter is 2,000 to 4,500 kc. The carrier is amplitude-modulated. The power output is 50 to 90 watts when the switch is at CW, and 15 to 25 when the switch is at VOICE. The transmitter will operate from a power source of 12 or 24 volts input. A dynamotor must be used which has an input voltage which agrees with the vehicular battery voltage, and the 12-volt/24-volt links must be set to correspond to that input voltage. The transmitter is equipped with four preset frequency channels marked PRESET FREQUENCIES A, B, C, and D, and one tunable channel marked TUNABLE LF-HF. Any channel may be set to any frequency over the entire range of 2,000 to 4,500 kc.

87. BLOCK DIAGRAM OF RADIO TRANSMITTER BC-653-A (fig. 51).

The master oscillator establishes the r-f signal on which the transmitter will operate. This signal is fed to an intermediate power amplifier, where it is amplified to a value sufficient to drive the power amplifier. The intermediate power amplifier also acts as a buffer between the oscillator and power amplifier, improving oscillator stability. The p-a stage utilizes two Tubes JAN-814 (VT-154), connected in parallel to give greater amplification with less load on the individual tubes. The modulator stage is used only during voice operation. The audio signal from the microphone is amplified by the modulator tube and is fed through the modulator transformer to the grid of the p-a tubes. The amplified audio signal modulates the p-a tube grid bias at an audio rate. The audio signal, therefore, varies the gain of the power amplifier. Since the r-f signal is applied to the same grids, the r-f power output of the power amplifier varies at an audio rate. The output of the p-a stage is fed through the antenna switching relay to the antenna, where the signal is radiated. During c-w operation, the modulator stage has no part in the circuit. The p-a tubes are normally biased beyond cut-off until the key is pressed. The key actuates a relay which removes the high negative bias, thus allowing the p-a tubes to function and causing the c-w carrier to be radiated.

88. MASTER OSCILLATOR.

Figure 52 is the schematic diagram of the master-oscillator (m-o) circuit, complete with the link connections to the m-o coils. This circuit uses an electron-coupled Hartley oscillator in which the screen grid of the tube is used as the oscillator plate. The output circuit (plate) of the electron-coupled oscillator is untuned, eliminating a tuning adjustment and improving oscillator stability. Two coils L100 and L101 are used in the tank circuit to cover the two frequency ranges. Coil L100

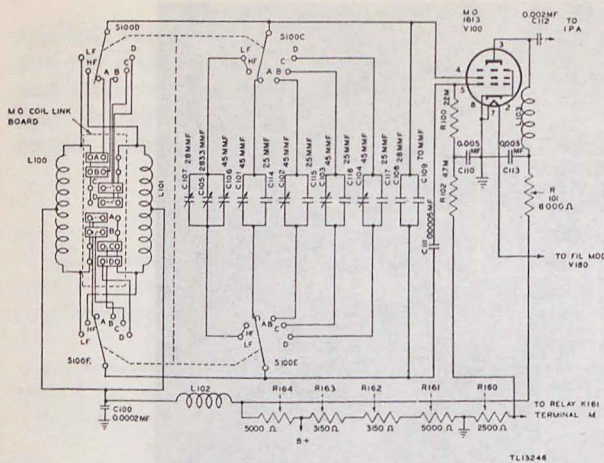


Figure 52. Radio Transmitter BC-653-A, functional diagram of master oscillator.

covers the low-frequency range of 2 to 3 mc. Switch sections S100C, S100D, S100E, and S100F are ganged to make up the channel-selector switch for the circuit. Switch sections S100D and S100F, together with the link connections, select the coil to be used in transmission (fig. 87). Assuming that channel A is in operation, the circuit is as follows:

a. Coil L100 is connected through the A links and switch sections S100D and S100F to switch sections S100C and S100E, respectively. Capacitors C101 and C114, connected in parallel, are switched into the circuit through switch sections S100C and S100E, as tuning capacitors for coil L100. Capacitor C109 is a fixed tuning capacitor which is connected in the circuit regardless of the position of the BAND CHANGE switch. Capacitor C108 is a temperature-compensated capacitor which, connected in parallel with capacitor C109, aids in maintaining stabilization of the tuned circuit because drift in frequency is due to change in temperature. The upper side of the tuned circuit is connected to the screen grid (pin 4) of m-o tube V100. The screen, in this case, is acting as oscillator plate. The lower side of the tuned circuit is connected through blocking capacitor C111 to the grid (pin 5) of m-o tube V100. Plate voltage to the circuit is applied to the center tap of coils L100 and L101 through choke L102 and voltage-regulator resistor R164. Two voltage-regulator tubes V160 and V161 (fig. 87) insure regulated voltage to further prevent frequency drift. Capacitor C100 is a bypass to keep r-f energy out of the high-voltage supply. Resistors R100 and R102 combine to make up the grid resistor and to supply grid bias to the tube. Resistor R160 supplies a high negative bias to prevent conduction in the tube and to prevent the m-o circuit from operating while receiving. During transmission, resistor R160 is shorted out of the circuit by relay K161 (terminal M to ground), thus removing the high bias and allowing the circuit to function. Capacitors C110 (fig. 52) and C171 (fig. 87) are grid bypass capacitors which shunt r-f energy to ground.

b. The plate (pin 3) of m-o tube V100 receives its voltage through r-f choke L103 and decoupling resistor R101. Resistor R164 is a starting resistor for the voltage-regulator tubes, and aids in applying a constant voltage regardless of variations in the vehicle generator voltage. Plate bypass capacitor C113 and choke L103 combine to form an r-f filter to keep r-f energy out of the high-voltage supply. Resistors R163, R162, R161, and R160 (fig. 52) and R176 and R177 (fig. 87) combine to make up a voltage-divider network across the 500-volt supply.

c. The PRESET FREQUENCIES FREQ. CONTROL on the front panel adjusts capacitors C101, C102, C103, and C104 for A, B, C, and D bands, respectively. Capacitors C107, C106, and C105 are the tuning capacitors for tunable frequency operation. Capacitor C105 is a section of the ganged main tuning capacitor for this band. The control marked TUNING LF-HF is used to adjust this capacitor and is located on the front panel. Capacitor C106 is used to align the master oscillator so that the m-o frequency corresponds to its dial calibrations. This capacitor is preset by the manufacturer and will not have to be touched by the repairman unless major repair work is done on the m-o circuit. Capacitor C107 is used to make m-o calibration corrections on the tunable range. Panel control MO RESET LF-HF adjusts this capacitor. The output of the master oscillator is through capacitor C112 to the grid circuit of the intermediate power amplifier.

89. INTERMEDIATE POWER AMPLIFIER.

Figure 53 is a schematic diagram of the intermediate-power-amplifier (i-p-a) circuit showing the link connections to the two i-p-a tank coils.

a. The i-p-a circuit is coupled to the output of the master oscillator through blocking capacitor C112. Resistor R123, in series with blocking capacitor C112 and the grid of i-p-a tube V120, is a suppressor to prevent parasitic oscillations. (Parasitic oscillations are unwanted oscillations.) Resistor R120 is the grid resistor. Resistor R160 supplies high negative voltage to the grid of tube V120 to bias the tube beyond cut-off and stop circuit operation while receiving. Resistor R160 is shorted out of the circuit while transmitting by terminal M of relay K161, thus removing the high negative bias and allowing the circuit to function. When the relay is in the transmit position, the grid-bias voltage is developed across grid resistor R120 and cathode-bias resistor R124. In normal operation, a much larger percentage of the bias is developed by the flow of rectified grid current through resistor R120. Failure of excitation from the master oscillator would cause the bias to fall off, and the plate current would become excessive. The presence of cathode resistor R124 prevents the plate current from becoming excessive with increasing bias and rising plate current. Capacitor C127 is the grid r-f bypass.

b. Resistor R121, connected to the plate (cap) of i-p-a tube V120, is a parasitic suppressor in the

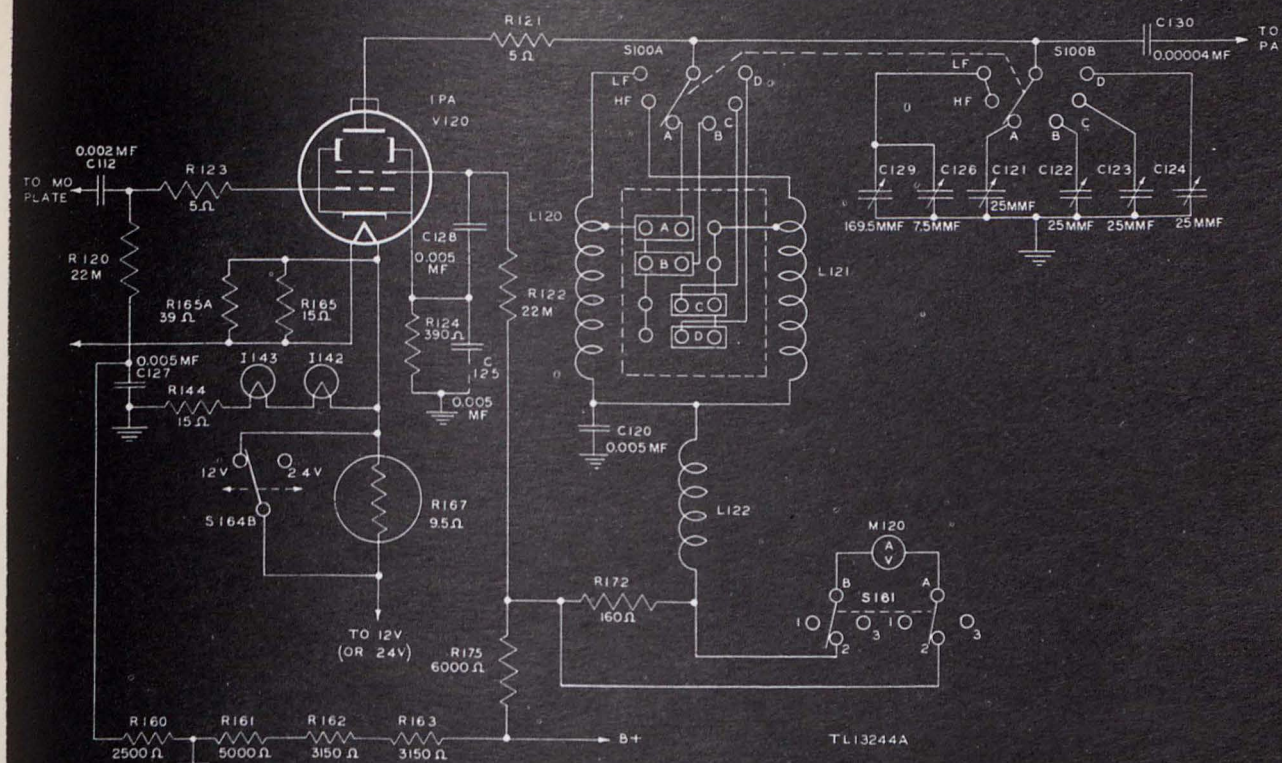


Figure 53. Radio Transmitter BC-653-A, functional diagram of i-p-a circuit.

plate circuit. Resistor R121 is connected to the rotor contact of switches S100A and S100B, which are ganged. Switch section S100A selects the proper coil for the plate-tank circuit, and switch section S100B selects the correct capacitors for tuning the tank coil. Four links aid in the selection of the tank coils, as shown in fig. 53. Coil L120 is the low-frequency coil covering a frequency range of 2 to 3 mc, and coil L121 covers the high-frequency range of 3 to 4.5 mc. The two coils are connected, and a connection from this junction is made to an r-f filter comprised of r-f choke L122 and capacitor C120. This filter network keeps r-f energy out of the power supply. When switch sections S100A and S100B are in the PRESET FREQUENCIES A position, coil L120 is connected in the circuit and capacitor C121 is the tuning capacitor for the coil. Capacitors C122, C123, and C124 are the tuning capacitors for bands B, C, and D, respectively. Capacitor C129 is one section of the ganged tuning capacitor for the tunable range. Capacitor C126 is a variable capacitor connected across C129 as a trimming capacitor.

c. Plate voltage to i-p-a tube V120 is applied through voltage-dropping resistors R175 and R172, r-f choke L122, plate-tank coil L120 or L121, switch section S100A, and suppressor R121. Screen-

grid voltage is applied through voltage-dropping resistors R175 and R122. C128 is the screen bypass, and C125 is the cathode bypass capacitor. The METER SW on the front of the transmitter panel is made up of ganged switch sections S161A and S161B. The switch has three positions so that the same meter may be used for measuring filament voltage, i-p-a plate current, and p-a current. Position 2, marked IPA PL, switches meter M120 across resistor R172 so that it will measure the voltage drop across this resistor. Since the voltage drop is proportional to the flow of plate current, the meter indicates plate-current flow and correct operation of the stage. Positions 1 and 3 of switch S161 will be discussed in paragraph 90.

d. The filament of i-p-a tube V120 is connected in series with the parallel-connected filaments of V100 and V180 when operating from a 12-volt battery. Resistors R165 and R165A are connected in parallel across the filament of tube V120 to compensate for the current difference of this tube and the parallel-connected filaments of V100 and V180. R167 is a ballast resistor for reducing the applied filament voltage to 12 volts when the equipment is connected to a 24-volt supply. Link B of the link board S164 shorts out resistor R167 when the equipment is operated from a 12-volt supply. Radio Transmitters BC-653-A bearing

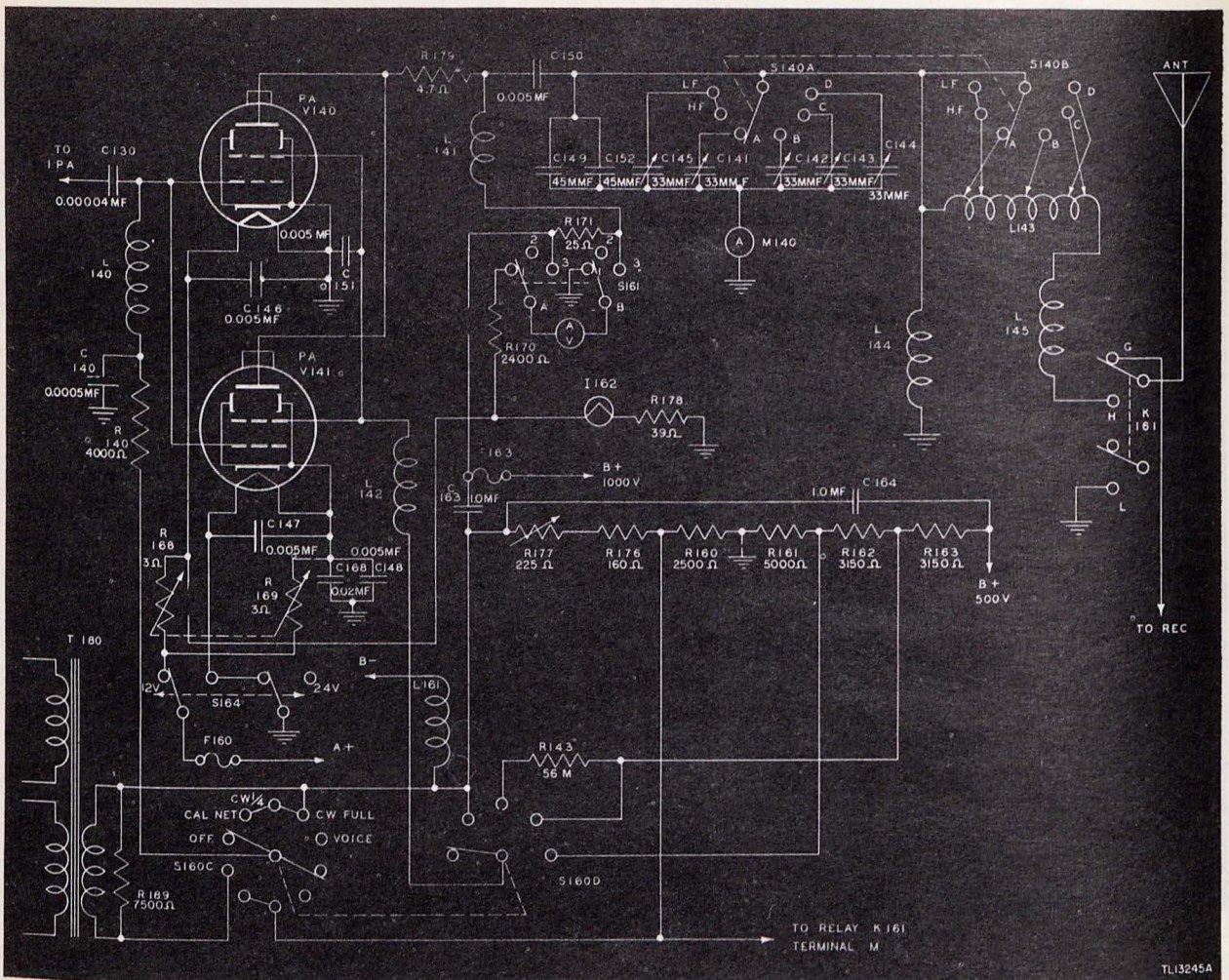


Figure 54. Radio Transmitter BC-653-A, functional diagram of p-a circuit.

serial numbers below 5766 and those between serial numbers 10500 and 11301 were manufactured with ballast resistor R166 instead of R167, and resistor R165A was omitted. MWO SIG 11-630-1 directs that these transmitters be modified to include these changes of later production.

90. POWER AMPLIFIER.

Figure 54 is the schematic diagram of the p-a circuit. The power amplifier uses two beam-power tetrode Tubes JAN-814 (VT-154), V140 and V141, connected in parallel. This stage is grid-modulated during voice operation.

a. The output of the intermediate power amplifier is coupled to the parallel-connected grids through blocking capacitor C130. R-f choke coil L140 prevents r-f energy from being shorted to ground. The grid-bias circuit consists of grid-leak resistor R140 and grid bypass capacitor C140, when the POWER AND EMISSION switch is at CW $\frac{1}{4}$ and CW FULL. Resistors R177 and R176 are added to the bias circuit when the switch is at CAL & NET. The same resistors are in the bias circuit through parallel-connected resistor R189 and the output winding of modulator

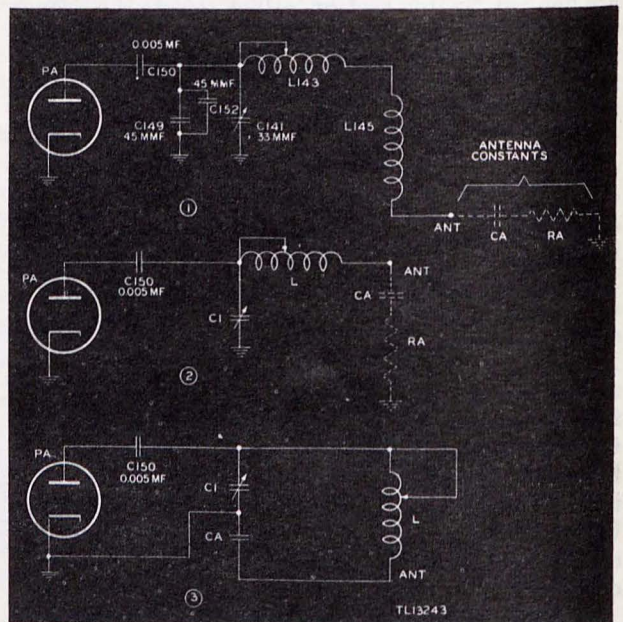


Figure 55. Radio Transmitter BC-653-A, functional diagram of p-a tank circuit.

transformer T180, when the switch is at VOICE. Terminal M of relay K161 shorts resistor R160 out of the bias circuit during transmission. During reception, resistor R160 adds further bias to the circuit to bias tubes V140 and V141 beyond cut-off and to prevent the function of the p-a circuit. Switch sections S160A, S160B, S160C, S160D, and S160E are ganged, and are operated by a single control marked POWER AND EMISSION on the front panel of the transmitter.

b. Switch section S160D selects the voltage for the screen grid of p-a tubes V140 and V141. The screen voltage is negative to prevent plate-current flow while operating with the POWER AND EMISSION switch in the CAL & NET position. Screen voltage is applied through voltage-dropping resistors R163 and R143, switch section S160D, and r-f choke L142, when operating with the switch in the CW $\frac{1}{4}$ position. Resistor R143 is eliminated from the screen-voltage circuit when operating with the switch in the CW FULL position. The screen-grid voltage path, when operating with the switch in the VOICE position, is through voltage-dropping resistors R162 and R163, switch section S160D, and r-f choke L142. R-f bypass capacitor C151 and r-f choke L142 make up an r-f filter to keep r-f energy out of the high-voltage supply.

c. Figure 55 is a functional diagram of the p-a plate-tank circuit. Resistor R179 is eliminated from this functional diagram since it is of low resistance value and is used only to eliminate parasitic oscillations. Capacitor C150 is a blocking capacitor used for coupling the plate to the tank circuit. Figure 55(1) shows capacitors C149, C152, and C141 connected in parallel, and coils L143 and L145 connected in series. Capacitor CA represents the antenna capacitance and resistor RA the antenna resistance. Figure 55(2) shows C1 as a combined capacitor C149, C152, and C141; and L as the combined inductance of L143 and L145. RA may be neglected with regard to tuning because the antenna resistance is very low compared with the capacitive reactance of CA. By rearranging the circuit and eliminating RA, figure 55(3) may be recognized as a parallel resonant circuit whose capacitance is C1 and CA in series, and whose inductance is L. Its capacitance consists of the tuning capacitor and the capacitance of the antenna. Its inductance is p-a tank coil L143 and antenna-loading coil L145.

d. Capacitors C149 and C152 are fixed capacitors connected to tank coil L143 regardless of the position of BAND CHANGE switch S140A and S140B (fig. 54). Capacitors C141, C142, C143, and C144 tune the p-a tank circuit to the four preset frequencies A, B, C, and D, respectively. These capacitors are adjusted by the controls on the panel marked PRESET FREQUENCIES ANTENNA COUPLING. Capacitor C145 is the tank circuit capacitor for tunable frequency operation. It is adjusted by the control marked ANT COUP'G LF-HF. Switch section S140B selects the correct tap on tank coil L143 through the sliding contacts on the coil. L145 is the antenna-loading coil. Relay

K161 is the keying relay. Relay contacts G and H connect the antenna to the receiver or transmitter, as required. Choke coil L144 is connected to the tank coil to shunt to ground the 1,000 volts on the plates of the p-a tubes if blocking capacitor C150 should short-circuit. It will also shunt to ground any unwanted charges on the antenna. High voltage is fed to the plates of p-a tubes V140 and V141 from the 1,000-volt positive side of the dynamotor through fuse F163, meter shunt resistor R171, choke L141, and suppressor R179. Choke L141 is used to keep r-f energy out of the dynamotor. Capacitor C163 is the high-voltage filter capacitor. Switch sections S161A and B connect voltmeter M120 through switch position 3, across meter resistor R171. The reading on the meter is the voltage drop across the resistor, which is a relative indication of the final amplifier plate current. Position 3 of the switch is marked PA PL on the transmitter panel.

e. P-a tubes V140 and V141 each have 10-volt filaments. They are wired through links C and D of link board S164 in such a manner that the filaments are in parallel with the links in the 12-volt position, and in series with the links in the 24-volt position. Variable resistor R168 regulates the filament voltage for V140, and variable resistor R169 regulates the voltage for V141. C146 and C147 are filament bypass capacitors for these tubes. The suppressor (pin 4) of each p-a tube is connected to its respective filament (pin 1). Pin 1 of V140 is connected to ground, thus grounding the suppressor. Filament (pin 1) of V141 is not connected to ground because V141 must be placed in series with the filament of V140 for 24-volt operation. Therefore, capacitors C168 and C148 are connected to pin 1 of V141, placing the suppressor at r-f ground potential. Resistor R170 is a voltage-dropping resistor connected in series with pin 5 (filament) of V140 and tap 1 of the meter selector switch section S161A. Tap 1 of switch section S161B is connected to ground. Therefore, meter M120 is connected in the filament circuit to read p-a filament voltage when switch S161 is in position 1, marked PA FIL on the transmitter panel. Ballast resistor R178 and pilot lamp I162 are in series between ground and the 12-volt filament line at pin 5 of V140. The lamp, therefore, indicates when filament voltage is applied to the filaments of the p-a tubes.

91. MODULATOR.

Figure 56 shows a schematic diagram of the modulator circuit. V180, Tube JAN-1613 (VT-175) is used as the modulator. Power output requirements from this stage are low because grid modulation of the final p-a stage is used.

a. A carbon microphone is connected to the grid of the modulator tube through microphone transformer T181. The input level is controlled by potentiometer R190. Microphone current is obtained from the filament supply, and flows through a filter consisting of choke L180 and capacitor C184. The secondary of microphone transformer

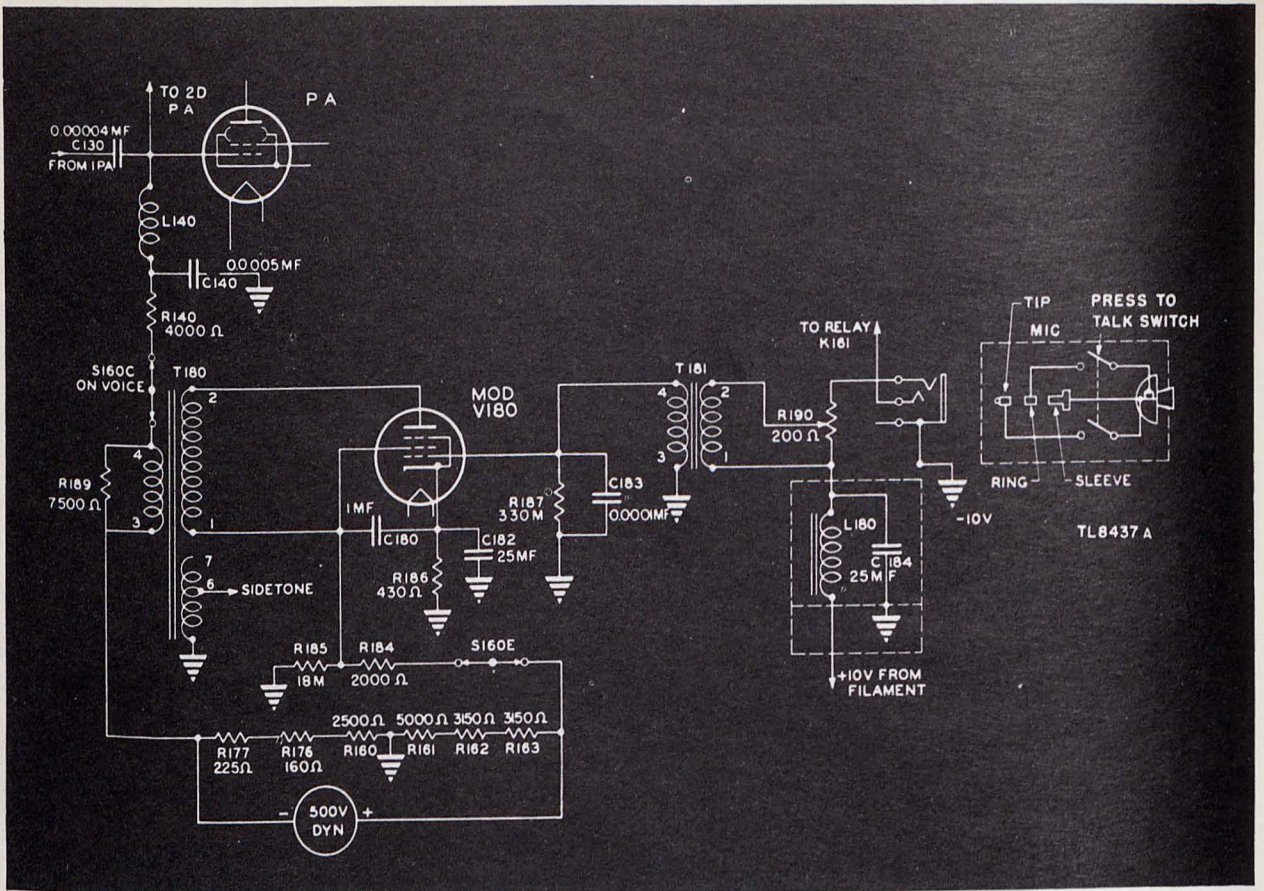


Figure 56. Radio Transmitter BC-653-A, functional diagram of modulator circuit.

T181 is shunted by tone-compensating resistor R187 and capacitor C183. Cathode-bias voltage is developed across resistor R186. Capacitor C182 is the cathode bypass.

b. The positive voltage from the dynamotor 500-volt supply is fed through switch section S160E (VOICE position) and voltage-dropping resistor R184 to the screen grid of tube V180. The voltage at the screen is also fed through the primary of modulation transformer T180 to the plate of the tube. Capacitor C180 is the plate bypass to cathode. Resistor R185 is a bleeder resistor, to hold the plate and screen high voltage constant. The output of the modulator is inductively fed to the secondary winding of modulation transformer T180. The secondary winding is connected to the grids of the two p-a tubes through switch section S160C (VOICE position), resistor R140, and r-f choke L140. The secondary winding of transformer T180 is shunted by load resistor R189. An additional winding on transformer T180 provides sidetone for voice operation. The filament of modulator tube V180 is connected in parallel with the filament of m-o tube V100 as shown in figure 57. These two tubes in parallel are connected in series with the filament of i-p-a tube V120 to make up a 12-volt circuit.

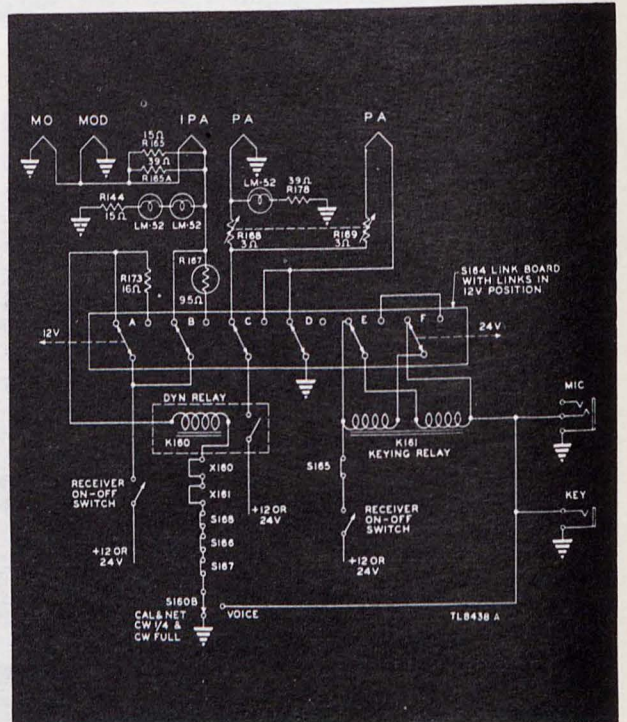


Figure 57. Radio Transmitter BC-653-A, functional diagram of link board, filament, and control circuits.

92. LINK BOARD, CONTROL CIRCUIT, AND FILAMENT CIRCUIT.

Figure 57 is a schematic diagram of link board S164 with the control and filament circuits included. The link board is used to adapt Radio Transmitter BC-653-A for use with either a 12- or 24-volt source. The six links change the filament, control, and keying circuits of the transmitter to compensate for the difference in voltages. The links are mounted on a link board which is found above the dynamotor when the modulator cover of the transmitter is removed.

a. Link A. This link connects the vehicular battery supply to the low-voltage control circuit when the receiver switch is on. When a 24-volt source is used, resistor R173 is used to drop it to 12 volts, the proper working voltage for this circuit.

(1) The control circuit consists of the following:

(a) Winding of dynamotor relay.

(b) Internal jumper in voltage-regulator tube V160.

(c) Internal jumper in voltage-regulator tube V161.

(d) Safety interlock switch S168 operated by fuse cover plate.

(e) Safety interlock switch S166 operated by i-p-a coil cover plate.

(f) Safety interlock switch S167 operated by p-a coil cover plate.

(g) Section S160B of POWER AND EMISSION switch.

(2) These components are all in series. Therefore, the voltage-regulator tubes must be in their sockets X160 and X161, and all interlocks must be closed before the dynamotor relay will operate. The circuit is completed to ground through S160B of the POWER AND EMISSION switch when operating with the switch on CAL & NET, CW $\frac{1}{4}$, and CW FULL.

b. Link B. Voltage is applied across the filaments of the m-o, i-p-a, and modulator tubes when the receiver ON-OFF switch is in the ON position. The m-o and modulator tubes are connected in parallel and are in series with the i-p-a filament. The i-p-a tube filament and the combination of the m-o and modulator filaments connected in parallel each have a 6-volt drop, therefore the series combination is connected to a 12-volt source. To compensate for the current differences in the filaments (two Tubes JAN-1613 in parallel draw 1.4 amperes, while Tube JAN-807 draws only 0.9 ampere), resistor R165 and R165A are used to shunt the additional current around the i-p-a tube. Two Lamps LM-52, connected in series with voltage-dropping resistor R144, illuminate the p-a coil compartment. Ballast resistor R167 drops the 24 volts to 12 volts when using a 24-volt input. Battery voltage is applied to the p-a filaments when the dynamotor relay is closed. The filaments are in parallel on 12-volt operation. Filament resistor R168 is in series with one filament and R169 is in series with the other; both resistors are variable and ganged. The filaments and resistors

are in series on 24-volt operation. Lamp LM-52, connected in series with voltage-dropping resistor R178, lights when the dynamotor is running. It is located just below the fuse panel plate and is covered by a red plastic translucent cap.

c. Link D. Link D is the ground return for the p-a filaments on 12-volt operation. This link has no part in the circuit on 24-volt operation.

d. Links E and F. Links E and F connect keying relay K161 to the battery when the receiver ON-OFF switch is ON and the key or the microphone switch is closed. The relay coils are connected in parallel on 12-volt operation, and in series on 24-volt operation. Interlock switch S165 is designed to prevent damage to the transmitter band-change switch in the event bands are changed with the key depressed. This interlock is operated by a cam on the band-change switch shaft and automatically opens the keying relay circuit between the switch positions.

93. KEYING RELAY K161.

Keying relay K161 performs seven functions when it is energized. Its action can be followed by referring to figure 58.

a. Contacts N provide sidetone to the receiver; contacts K disable the receiver during transmission; and contacts R disable an additional Receiver BC-652-A that might be used with the transmitter. Contacts L ground the receiver antenna post during transmission, and contacts H connect the antenna to the transmitter output when the transmitter is keyed. The antenna is connected to the receiver through contacts G on CW when the key is up, or on VOICE, when the press-to-talk switch on the microphone is released. Sparking at the key is prevented by capacitor C165 and resistor R174. Capacitor C172 is a hash filter.

b. Relay K161 has a definite sequence of closure for the relay contacts. This prevents transmitter antenna voltages from affecting the receiver. Contacts G, K, and R should open before contacts H, L, and N close, and contact M should close last.

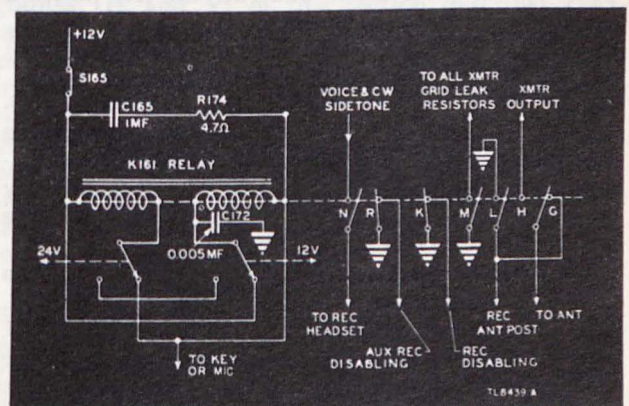


Figure 58. Radio Transmitter BC-653-A, functional diagram of keying relay K161.

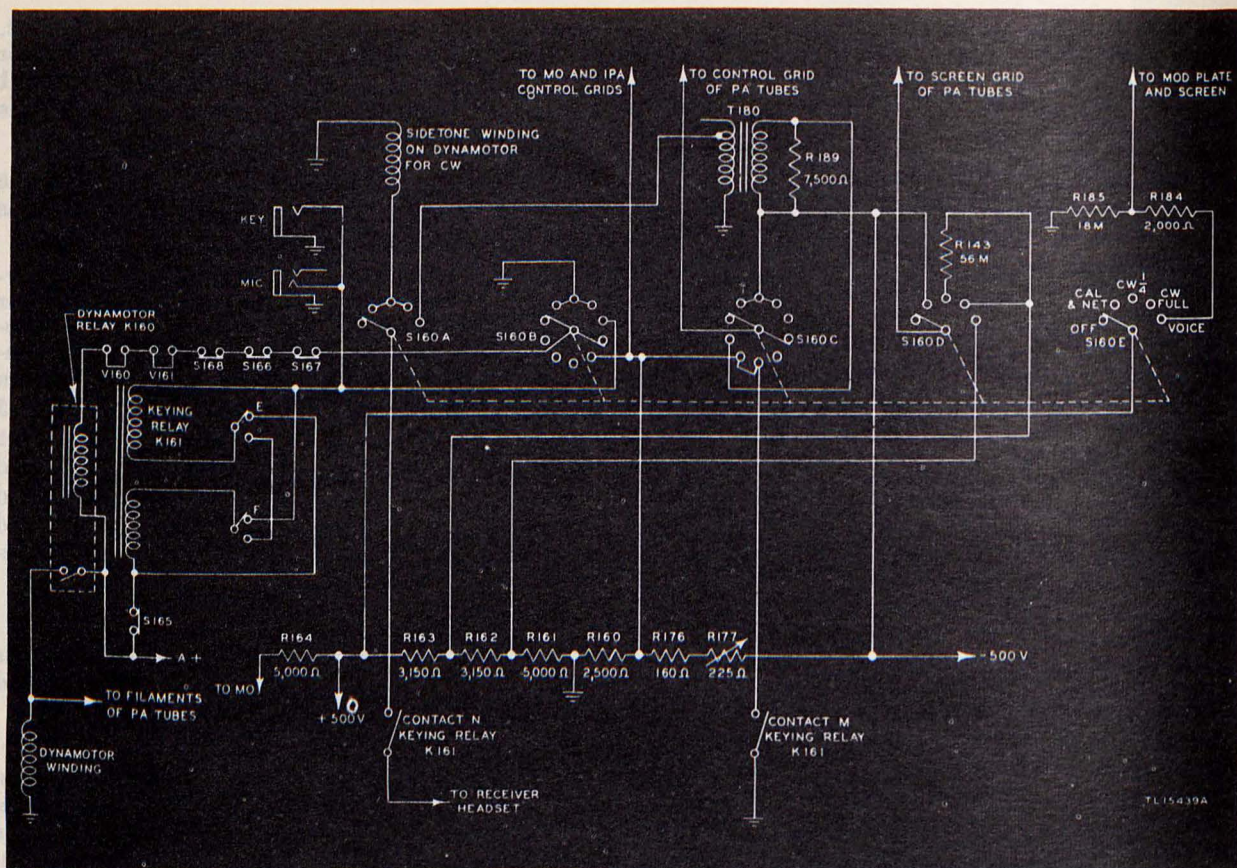


Figure 59. Radio Transmitter BC-653-A, functional diagram of POWER AND EMISSION switch circuit.

94. POWER AND EMISSION SWITCH.

Figure 59 is a functional diagram of the POWER AND EMISSION switch. This switch is a five-section, five-position, rotary switch which turns the transmitter on and off, and selects the type of transmission. The complete switch S160 is shown as five separate five-position switches with reference numbers S160A, S160B, S160C, S160D, and S160E. All sections are shown in the OFF position.

a. Switch Section S160A. Switch section S160A supplies sidetone to the receiver on all positions of the switch. The extreme left position (position 1) is OFF. Position 2 (CAL & NET), position 3 (CW $\frac{1}{4}$), and position 4 (CW FULL) are connected to furnish c-w sidetone to the receiver from the sidetone winding on the dynamotor. Position 5 (VOICE) supplies sidetone to the receiver from the sidetone winding of modulation transformer T180. Contacts N of keying relay K161 must be closed in all cases to complete the sidetone circuits to the receiver.

b. Switch Section S160B. Switch section S160B completes the interlock circuit to ground. This applies power through dynamotor relay K160, which in turn starts the dynamotor and lights the filaments of the p-a tubes. This action takes place with the switch in the CAL & NET, CW $\frac{1}{4}$, and CW FULL positions only. When the POWER AND EMISSION switch is in the VOICE position

the push-to-talk switch on the microphone is added between the interlock circuit and ground to accomplish the same purpose. This permits the operator to turn the transmitter on and off by operating the push-to-talk switch.

c. Switch Section S160C. Switch section S160C provides a high negative bias on the control grids of the p-a tubes by means of resistors R177, R176, and R160, when the switch is in the CAL & NET position. When the switch is in the CW $\frac{1}{4}$ or CW FULL position, resistors R177 and R176 are shorted out of the bias circuit through the switch contacts. When operating with the switch in VOICE position, the secondary of modulation transformer T180 is added to the circuit for modulation, and resistors R177 and R176 are again used for bias voltage. Resistor R160 is used as a grid-blocking resistor in all switch positions. This resistor is shorted to ground through contacts M of keying relay K161 when the transmitter is keyed.

d. Switch Section S160D. Section S160D varies the voltage to the screen grids of the p-a tubes. When the switch is in the CAL & NET position, a high negative blocking voltage is applied to the screen grids. When the switch is in CW $\frac{1}{4}$ position, a positive voltage is applied to the screen grids through voltage-dropping resistor R143. When the switch is in the CW FULL position, resistor R143 is removed from the circuit and full

operating voltage is applied. When the switch is in the VOICE position, the screen-grid voltage is reduced by the addition of bleeder resistor R162.

e. Switch Section S160E. Switch section S160E is used only when the switch is in the VOICE position. In this position, 500 volts are applied to the plate and screen of the modulator tube through resistor R184. Resistor R185 is a bleeder resistor to stabilize this voltage.

95. TRANSMITTER DYNAMOTORS DM-42-() AND DM-43-()

High voltages for the transmitter are supplied from either Dynamotor DM-42-() or DM-43-(). Dynamotor DM-42-() is used with a 12-volt input and Dynamotor DM-43-() is used with a 24-volt source. All connections are made to the transmitter by means of plugs P162 and P163 at the rear of the dynamotor, as shown in figure 87.

a. The dynamotor has two separate high-voltage windings connected in series to supply 1,000 volts to the power amplifier. The output of one 500-volt section of the dynamotor is used as the high-voltage source for all other tubes. A separate winding on the stator supplies a 1,000-cycle voltage for c-w sidetone.

b. Capacitor C162 is the high-voltage dynamotor bypass, and capacitor C169 is a hash filter connected across the input. Capacitor C167 serves the same purpose and is connected across the low-voltage brushes. Capacitor C170 and choke coil L161 are used as a hash filter in the B- lead, and L160 is a filter in the 500-volt B+ lead.

96. METERING CONSTANTS.

Since the FIL & PL CURRENT meter is used to measure current and voltage in three different circuits, it requires a group of multiplying constants to convert its indications into standard units. When the METER SW is turned to PA FIL, the meter reads d-c volts directly across the filament of one of the p-a tubes. In the IPA PL position, readings must be multiplied by 7 to obtain i-p-a plate current in milliamperes. P-a plate milliamperes are determined by multiplying the PA PL reading by 40.

SECTION XII

Trouble Shooting

97. TROUBLE-SHOOTING AIDS.

Use the material listed below to help in the rapid location of faults.

a. Block Diagram of Radio Receiver BC-652-A (fig. 36).

b. Block Diagram of Radio Transmitter BC-653-A (fig. 51).

c. Complete Schematic Diagrams (figs. 86 and 87).

d. Simplified and Partial Schematic Diagrams. These diagrams are particularly useful in trouble shooting because electrical functioning of the circuits can be followed more clearly than on regular schematics, thus speeding trouble location.

e. Voltage and Resistance Data at All Socket Connections (figs. 75 and 88).

f. Illustrations of Components. Front, top, and bottom views aid in locating and identifying parts.

g. Pin Connections. Pin connections on sockets, plugs, and receptacles are numbered or lettered on the various diagrams.

(1) Seen from the bottom, pin connections are numbered in a clockwise direction around the sockets. On octal sockets the first pin clockwise from the keyway is pin No. 1.

(2) Plugs and receptacles are numbered on the side to which the associated connector is attached. To avoid confusion, some individual pins are identified by letters which appear directly on the connector.

98. TROUBLE-SHOOTING STEPS.

The first step in servicing a defective radio set is to sectionalize the fault. The second step is to localize the fault. Some faults, such as burned-out resistors, r-f arcing, and shorted transformers, can usually be located by sight, smell, and hearing. The majority of faults, however, must be located by checking voltages and resistances.

a. Sectionalization. Sectionalization is the tracing of a fault to the component or circuit responsible for the abnormal operation of the set. By observing carefully the performance of the receiver and transmitter when the equipment is on, the fault is often sectionalized immediately as a transmitter or receiver fault. A careful observation of the meters on the transmitter front panel often determines which stage or circuit is at fault. Additional sectionalizing of the fault is discussed in paragraph 102 (tables I, II, and IV).

b. Localization. Localization is the tracing of the fault to a particular part. Paragraph 102 (tables III and V) of this section describes the method of localizing faults within the individual components. These paragraphs are accompanied by trouble-shooting charts which list trouble symptoms and their probable causes. The charts also give the procedure for determining which of the probable locations of the fault is the exact one. In addition, there are a number of drawings which show the resistance and the voltage at every socket-pin connection.

c. Voltage Measurements. Voltage measurements are an almost indispensable aid to the repairman, because most troubles either result from abnormal voltages or produce abnormal voltages. Voltage measurements are easily made because they are always made between two points in a circuit and the circuit need not be interrupted. (1) Unless otherwise specified, voltages listed on

the voltage charts (figs. 75 and 88) are measured between the indicated points and ground.

(2) Always begin by setting the voltmeter on the highest range so that the voltmeter will not be damaged. Then, if it is necessary to obtain increased accuracy, set the voltmeter to a lower range.

(3) In checking cathode voltage, remember that a reading can be obtained when the cathode resistor is actually open. The resistance of the meter may act as a cathode resistor. Thus, the cathode voltage may be approximately normal only so long as the voltmeter is connected between cathode and ground. Before the cathode voltage is measured, make a resistance check on a cold circuit to determine whether the cathode resistor is normal.

99. PRECAUTIONS AGAINST HIGH VOLTAGE.

Certain precautions must be followed when measuring voltages above a few hundred volts. High voltages are dangerous and can be fatal. When it is necessary to measure high voltages, observe the following rules:

- a. Connect the ground lead to the voltmeter.
- b. Place one hand in your pocket.
- c. If the voltage is less than 300 volts, connect the test lead to the hot terminal (which may be either positive or negative with respect to ground).
- d. If the voltage is greater than 300 volts, shut off the power temporarily, ground the terminal, connect the hot test lead, step away from the voltmeter, turn on the power, and note the reading on the voltmeter. Do not touch any part of the voltmeter, particularly when it is necessary to measure the voltage between two points which are above ground.

100. VOLTMETER LOADING.

It is essential that the voltmeter resistance be at least 10 times as high as the resistance of the circuit across which the voltage is measured. If the voltmeter resistance is approximately the same as the circuit resistance, the voltmeter will indicate a lower voltage than the actual voltage present when the voltmeter is removed from the circuit.

a. The resistance of the voltmeter on any range can always be calculated by the following simple rule: resistance of voltmeter equals the ohms-per-volt sensitivity multiplied by the full-scale range in volts.

EXAMPLE: The resistance of a 1,000-ohm-per-volt voltmeter on the 300-volt range is 300,000 ohms ($R = 1,000 \text{ ohms per volt} \times 300 \text{ volts} = 300,000 \text{ ohms}$).

b. To minimize the voltmeter loading in high-resistance circuits, use the highest voltmeter range. Although only a small deflection will be obtained

(possibly only 5 divisions on a 100-division scale), the accuracy of the voltage measurement will be increased. The decreased loading of the voltmeter will more than compensate for the inaccuracy which results from reading only a small deflection on the scale of the voltmeter.

c. When a voltmeter is loading a circuit, the effect can always be noted by comparing the voltage reading on two successive ranges. If the voltage readings on the two ranges do not agree, voltmeter loading is excessive. The reading (not the deflection) on the highest range will be greater than on the lowest range. If the voltmeter is loading the circuit heavily, the deflection of the pointer will remain nearly the same when the voltmeter is shifted from one range to another.

d. The ohm-per-volt sensitivity of the voltmeter used to obtain the readings recorded on the voltage and resistance charts in this manual is printed on each chart. Use a meter having the same ohm-per-volt sensitivity, otherwise it will be necessary to consider the effects of loading.

101. TEST EQUIPMENT.

Radio Set SCR-506-A does not require the use of special test equipment other than that which is commonly issued and used with other equipments.

102. TROUBLE-SHOOTING CHARTS.

The accompanying trouble-shooting charts, if properly used, simplify trouble shooting. The charts are grouped into five groups.

a. The first group (table I) covers sectionalizing trouble in Radio Set SCR-506-A. This group of charts lists the various symptoms which may be recognized easily, and gives the probable location of the existing trouble as well as the recommended correction. These charts will tell the operator whether the trouble is in the transmitter, receiver, mounting, antenna, dynamotors, or vehicle. By proper use of the charts, the operator will readily recognize troubles that may occur in the components of the equipment.

b. The second group (table II) shows the sectionalizing of trouble in Radio Transmitter BC-653-A. These charts will aid in determining which *stage* in the transmitter is at fault.

c. The third group (table III) is to be used to localize the trouble to the individual part in the circuit which is causing the abnormal condition.

d. The fourth group (table IV) is similar to the second except that it deals with sectionalizing the trouble in the receiver.

e. The fifth group (table V) localizes the trouble in the receiver to the individual part within the circuit.

Table I: SECTIONALIZING TROUBLE IN RADIO SET SCR-506-A

SYMPTOM	PROBABLE TROUBLE	CORRECTION
<p>1. Radio Receiver BC-652-A dead; pilot lamps on receiver dial not lighted; radio Transmitter BC-653-A operative.</p>	<p>Fuse F251 blown.</p> <p>Poor connection between plug P302 on the back of the receiver unit and receptacle J302A on Mounting FT-253-A, plug P251 from CFC unit and receptacle J304 on the receiver, or plug P250 from Dynamotor DM-40-A (or DM-41-A) and receptacle J250 on the CFC unit.</p>	<p>Replace fuse.</p> <p>Clean contacts or repair open circuit in plugs or receptacles.</p>
<p>2. Receiver dead; pilot lamps on receiver dial lighted; transmitter operative.</p>	<p>Keying relay K161 on transmitter not operating properly.</p> <p>Defective tubes in the receiver.</p> <p>Open connection in Headset HS-30-(), or Loudspeaker LS-3, or their connections to the receiver.</p> <p>No voltage from dynamotor.</p> <p>Major defect in receiver.</p>	<p>Clean and adjust relay contacts.</p> <p>Replace defective tubes.</p> <p>Replace defective headsets or loudspeaker; repair any open circuits.</p> <p>Replace dynamotor or repair if facilities and time permit.</p> <p>Refer to tables II and III.</p>
<p>3. All controls in correct position for operation of transmitter and receiver but neither operate; pilot lamps not lighted.</p>	<p>Main Fuse FU-44 on Mounting FT-253-A blown.</p> <p>Open power cable from vehicular battery.</p> <p>Vehicular battery dead.</p>	<p>Replace fuse.</p> <p>Repair open connection.</p> <p>Replace or recharge battery.</p>
<p>4. Transmitter inoperative; receiver normal; apparently no input voltage to the transmitter.</p>	<p>Fuse F161 blown.</p> <p>Poor connection between plug P161 on back of Radio Transmitter BC-653-A and receptacle J161 on Mounting FT-253-A.</p> <p>Major trouble in Radio Transmitter BC-653-A.</p>	<p>Replace fuse.</p> <p>Clean contacts on plug P161 and receptacle J161. Repair any open circuits on plug or receptacle.</p> <p>Refer to tables II and III.</p>
<p>5. Receiver operative; transmitter inoperative; transmitter filaments lighted; no sidetone when key is pressed.</p>	<p>Poor connection between plug P161 on transmitter and receptacle J161 on mounting.</p> <p>Keying relay K161 inoperative.</p> <p>Dynamotor DM-42-A (or DM-43-A) not operating.</p>	<p>Clean contacts on plug P161 and receptacle J161.</p> <p>Clean relay contacts and adjust.</p> <p>Repair any open connections.</p> <p>Check dynamotor input voltage; check brush condition and seating. Replace dynamotor if facilities or time prohibit repairs.</p>
<p>6. Receiver weak; transmitter apparently normal.</p>	<p>Antenna shielded because of poor selection of location.</p> <p>Weak tubes.</p> <p>Receiver misaligned.</p> <p>Major trouble in receiver.</p>	<p>Increase antenna length and height. (See par. 36.)</p> <p>Replace defective tubes.</p> <p>Align receiver. (See sec. XIV.)</p> <p>Refer to tables II and III.</p>
<p>7. Receiver normal; transmitter meter readings not normal.</p>	<p>Transmitter not properly tuned.</p> <p>Defective transmitter tubes.</p> <p>Major trouble in transmitter.</p>	<p>Retune transmitter presetting. See section XVI.</p> <p>Replace defective tubes.</p> <p>Refer to tables IV and V.</p>

Table II: SECTIONALIZING TROUBLE IN RADIO RECEIVER BC-652-A

(Receiver dead)

SYMPTOM	PROBABLE TROUBLE	CORRECTION
1. Slight rushing noise heard in headset; 915-kc signal from Signal Generator I-72 fed to grid cap of tube V302 is heard very strong in headset.	R-f amplifier tube V301. R-f amplifier stage. Poor connection at contact G of keying relay K161.	Replace tube. Refer to table III. Clean and adjust relay contacts.
2. No rushing noise heard in headset; 915-kc signal from Signal Generator I-72 fed to grid cap of tube V302 is heard very strong in headset.	H-f oscillator circuit. Converter tube V302.	Refer to table III. Replace tube.
3. Signal heard in headset when 915-kc signal from Signal Generator I-72 is fed to grid (pin 4) of tube V303 but not when signal is fed to grid cap of V302.	1st i-f amplifier stage. Converter tube V302.	Refer to table III. Replace tube.
4. Signal heard in headset when 915-kc signal from Signal Generator I-72 is fed to grid cap of tube V304 but not when signal is fed to grid (pin 4) of tube V303.	1st i-f amplifier tube V303. Input stage to 2d i-f amplifier tube V304.	Replace tube. Refer to table III.
5. Signal heard in headset when 915-kc signal from Signal Generator I-72 is fed to grid (pin 4) of 3d i-f amplifier tube V305 but not when signal is fed to grid cap of tube V304.	2d i-f amplifier tube V304. Input stage to 3d i-f amplifier tube V305.	Replace tube. Refer to table III.
6. Signal heard in headset when audio signal from Signal Generator I-72 is fed to diode (pin 4) of detector tube V307 but not when 915-kc signal is fed to grid (pin 4) of the 3d i-f amplifier tube V305.	3d i-f amplifier tube V305. Input stage to detector and 1st audio tube V307.	Replace tube. Refer to table III.
7. Signal heard in headset when audio signal from Signal Generator I-72 is fed to grid (pin 5) of output tube V308 but not when fed to diode (pin 4) of tube V307.	Detector and 1st audio tube V307. Input stage to output tube V308.	Replace tube. Refer to table III.
8. Reception heard in headset when using headset with test prods attached are connected to grid (pin 5) of the output tube V308 and ground, but not when headset is connected to its proper jack on the receiver panel.	Defective output tube. Output stage.	Replace tube. Refer to table III.
9. Carrier signal only heard in headset when operating on cw; no beat note.	Defective BFO tube V306. BFO circuit.	Replace tube. Refer to table III.

Table II: SECTIONALIZING TROUBLE IN RADIO RECEIVER BC-652-A

(Receiver dead)

SYMPTOM	PROBABLE TROUBLE	CORRECTION
10. No beat note from crystal frequency calibrator when interval switch is in 100-kc position.	Defective tube V202. 100-kc multivibrator circuit.	Replace tube. Refer to table III.
11. Crystal frequency calibrator not stable.	Defective tube V201. Defective Crystal Unit DC-15-A or FT-241-A. Crystal-frequency-oscillator circuit.	Replace tube. Clean or replace crystal. Refer to table III.
(Receiver weak)		
12. No beat note at 20-kc calibration points on dial.	Defective tube V203. 20-kc multivibrator circuit.	Replace tube. Refer to table III.
13. Weak reception with antenna connected; strong signal with Signal Generator I-72 connected to antenna post.	Open antenna lead. Poor contact in antenna switching relay.	Repair open circuit. Repair relay contact.
14. Weak signal in headset with signal generator connected to antenna post; strong signal with signal generator connected to grid (pin 4) of tube V301.	Antenna stage misaligned. Antenna stage defective.	Align stage (see sec. XIV). Refer to table III.
15. 915-kc signal from Signal Generator I-72 fed to grid cap of tube V302 produces strong signal in headset; weak signal only in headset from r-f signal fed from signal generator to grid (pin 4) of tube V301 and to antenna post on receiver.	Defective r-f stage. Misaligned r-f stage. Defective r-f amplifier tube V301.	Refer to table III. Realign r-f stage. Replace tube.
16. Audio system normal; weak signal in headset when 915-kc signal is fed from signal generator to grid cap of tube V302.	Weak i-f amplifier tubes. Misaligned i-f stages. Circuit trouble in i-f stages.	Replace defective tubes. Align i-f stages. Refer to table III.
17. Receiver weak regardless of alignment of r-f and i-f stages or replacement of weak r-f or i-f tubes.	Defective audio tube V307 or V308. Weak battery supplying input voltage. Defective audio circuit.	Replace defective tubes. Replace or recharge battery. Refer to table III.
18. Abnormal static or engine interference.	Defective 2d i-f and noise limiter tube V304.	Replace tube.
19. General frying noise in headset or loudspeaker.	Defective tubes in any stage. Defective dynamotor filter. Open carbon resistor.	Replace defective tubes. Refer to table III. Replace defective resistor.

Table III: LOCALIZING TROUBLE IN RADIO RECEIVER BC-652-A

SYMPTOM	PROBABLE TROUBLE	CORRECTION
<p>1. Voltages at all pins of tube V301 are normal except:</p> <p>a. No voltage at pin 8.</p> <p>b. No voltage at pin 6.</p> <p>c. No voltage at pin 5.</p> <p>d. No voltage at pin 4.</p> <p>e. No voltage at pin 2.</p>	<p>Open switch S302A.</p> <p>Open primary winding of transformer T303 (or T304).</p> <p>Open resistor R305.</p> <p>Shorted capacitor C313.</p> <p>Shorted capacitor C364.</p> <p>Shorted capacitor C311.</p> <p>Open resistor R304.</p> <p>Shorted capacitor C309, C329, or C251C.</p> <p>Open resistor R320 or R342.</p> <p>Open resistor R303.</p> <p>Shorted capacitor C310.</p> <p>Open resistor R301.</p> <p>Poor connection between plug P251 and receptacle J304 or plug P250 and receptacle J250.</p>	<p>Replace or repair switch.</p> <p>Replace or repair transformer T303 (or T304).</p> <p>Replace resistor.</p> <p>Replace capacitor.</p> <p>Replace capacitor.</p> <p>Replace capacitor.</p> <p>Replace resistor.</p> <p>Replace defective capacitor.</p> <p>Replace open resistor.</p> <p>Replace resistor.</p> <p>Replace capacitor.</p> <p>Replace resistor.</p> <p>Clean plug connections; repair open circuits.</p>
<p>2. Voltages at all pins of tube V302 are normal except:</p> <p>a. No voltage at pin 3.</p> <p>b. No voltage at pin 4.</p> <p>c. No voltage at pin 6.</p> <p>d. No voltage at pin 8.</p> <p>e. No voltage at pin 2.</p>	<p>Shorted capacitor C323 (part of transformer T307).</p> <p>Open resistor R311 (part of transformer T307).</p> <p>Open resistor R310.</p> <p>Shorted capacitor C320.</p> <p>Open resistor R309.</p> <p>Shorted capacitor C318.</p> <p>Open resistor R307.</p> <p>Poor connection between plug P251 and receptacle J304 or plug P250 and receptacle J250.</p>	<p>Replace transformer T307.</p> <p>Replace transformer T307.</p> <p>Replace resistor R310.</p> <p>Replace capacitor C320.</p> <p>Replace resistor.</p> <p>Replace capacitor.</p> <p>Replace resistor.</p> <p>Clean plug connections; repair open circuits.</p>
<p>3. Voltages at all pins of tube V303 are normal except:</p> <p>a. No voltage at pin 8.</p> <p>b. No voltage at pin 6.</p> <p>c. No voltage at pin 5.</p> <p>d. No voltage at pin 2.</p>	<p>Open resistor R314 (part of transformer T308).</p> <p>Shorted capacitor C337 (part of transformer T308).</p> <p>Open resistor R320 or R342.</p> <p>Shorted capacitor C329 or C251C.</p> <p>Open resistor R313 or R336.</p> <p>Shorted capacitor C334.</p> <p>Poor connection between plug P251 and receptacle J304 or plug P250 and receptacle J250.</p>	<p>Replace transformer T308.</p> <p>Replace transformer T308.</p> <p>Replace open resistor.</p> <p>Replace defective capacitor.</p> <p>Replace open resistor.</p> <p>Replace capacitor.</p> <p>Clean plug connections; repair open circuits.</p>
<p>4. Voltage at all pins of tube V304 are normal except:</p> <p>a. No voltage at pin 3.</p> <p>b. No voltage at pin 6.</p> <p>c. No voltage at pin 8.</p>	<p>Open resistor R318 (part of transformer T309).</p> <p>Shorted capacitor C342 (part of transformer T309).</p> <p>Open resistor R345.</p> <p>Shorted capacitor C366.</p> <p>Shorted capacitor C339.</p> <p>Open resistor R316.</p>	<p>Replace transformer T309.</p> <p>Replace transformer T309.</p> <p>Replace resistor.</p> <p>Replace capacitor.</p> <p>Replace capacitor.</p> <p>Replace resistor.</p>

Table III: LOCALIZING TROUBLE IN RADIO RECEIVER BC-652-A

SYMPTOM	PROBABLE TROUBLE	CORRECTION
<p>5. Voltages at all pins of tube V305 are normal except:</p> <p>a. No voltage at pin 8.</p> <p>b. No voltage at pin 6.</p> <p>c. No voltage at pin 5.</p>	<p>Open resistor R322 (part of transformer T310).</p> <p>Shorted capacitor C347 (part of transformer T310).</p> <p>Open resistor R340.</p> <p>Shorted capacitor C331.</p> <p>Shorted capacitor C323.</p> <p>Open resistor R319.</p>	<p>Replace transformer T310.</p> <p>Replace transformer T310.</p> <p>Replace resistor.</p> <p>Replace capacitor.</p> <p>Replace capacitor.</p> <p>Replace resistor.</p>
<p>6. Voltages at all pins of tube V306 are normal except:</p> <p>a. No voltage at pin 3.</p> <p>b. No voltage at pin 4 when CW MVC AVC switch is in the CW position.</p> <p>c. No voltage at pin 6 when CW MVC AVC switch is in the CW position.</p>	<p>Open resistor R322 (part of transformer T310).</p> <p>Shorted capacitor C347 (part of transformer T310).</p> <p>Shorted capacitor C352.</p> <p>Open resistor R327.</p> <p>Poor connection in switch S303C.</p> <p>Open resistor R326 (part of transformer T311).</p> <p>Shorted capacitor C312.</p> <p>Open resistor R341.</p> <p>Poor connection in switch S303C.</p>	<p>Replace transformer T310.</p> <p>Replace transformer T310.</p> <p>Replace capacitor.</p> <p>Replace resistor.</p> <p>Repair or replace switch.</p> <p>Replace transformer T311.</p> <p>Replace capacitor.</p> <p>Replace resistor.</p> <p>Repair or replace switch.</p>
<p>7. Voltages at all pins of tube V307 are normal except:</p> <p>a. No voltage at pin 6.</p> <p>b. No voltage at pin 3.</p>	<p>Shorted capacitor C361.</p> <p>Open resistor R333.</p> <p>Shorted capacitor C357A.</p>	<p>Replace capacitor.</p> <p>Replace resistor.</p> <p>Replace capacitor.</p>
<p>8. Voltages at all pins of tube V308 are normal except:</p> <p>a. No plate voltage at pin 3</p> <p>b. No voltage at pin 4.</p> <p>c. No voltage at pin 8.</p>	<p>Open primary of transformer T312.</p> <p>Open resistor R344.</p> <p>Shorted capacitor C364.</p> <p>Shorted capacitor C360.</p> <p>Open resistor R337.</p>	<p>Replace transformer.</p> <p>Replace resistor.</p> <p>Replace capacitor.</p> <p>Replace capacitor.</p> <p>Replace resistor.</p>
<p>9. Voltages at all pins of tube V201 are normal except:</p> <p>a. No voltage at pin 3.</p> <p>b. No voltage at pin 6.</p> <p>c. No voltage at pin 4.</p> <p>d. No voltage at pin 8.</p>	<p>Open coil L202.</p> <p>Open coil L201.</p> <p>Shorted capacitor C202.</p> <p>Open resistor R203.</p> <p>Open resistor R205.</p> <p>Shorted capacitor C204.</p> <p>Open resistor R204.</p>	<p>Replace coil.</p> <p>Replace coil.</p> <p>Replace capacitor.</p> <p>Replace resistor.</p> <p>Replace resistor.</p> <p>Replace capacitor.</p> <p>Replace resistor.</p>
<p>10. Voltages at all pins of tube V202 are normal except:</p> <p>a. No voltage at pin 2.</p> <p>b. No voltage at pin 5.</p> <p>c. High positive voltage at pin 3.</p> <p>d. High positive voltage at pin 4.</p>	<p>Open resistor R211.</p> <p>Open coil L202.</p> <p>Open resistor R210.</p> <p>Open coil L202.</p> <p>Shorted capacitor C207.</p> <p>Shorted capacitor C208</p>	<p>Replace resistor.</p> <p>Replace coil.</p> <p>Replace resistor.</p> <p>Replace coil.</p> <p>Replace capacitor.</p> <p>Replace capacitor.</p>

Table III: LOCALIZING TROUBLE IN RADIO RECEIVER BC-652-A

SYMPTOM	PROBABLE TROUBLE	CORRECTION
<p>11. Voltages at all pins of tube V203 are normal except:</p> <ul style="list-style-type: none"> a. No voltage at pin 2. b. No voltage at pin 5. c. High positive voltage at pin 3. d. High positive voltage at pin 4. e. No voltage at pin 3. f. No voltage at pin 4. 	<p>Open resistor R227. Open resistor R223. Shorted capacitor C209 or C229. Shorted capacitor C228. Open resistor R221 or R208A. Open resistor R222 or R208B.</p>	<p>Replace resistor. Replace resistor. Replace shorted capacitor. Replace capacitor. Replace open resistor. Replace open resistor.</p>
<p>12. Weak reception with normal connections to receiver; increased amplitude with antenna connected to stator plates of tuning capacitor C308A.</p>	<p>Defective switch S301A or S301B. Open primary or secondary of transformer T301 or T302. Open contact G on relay K161. Shorted capacitor C301. Open connection between switch S301B and stator plates of capacitor C308A.</p>	<p>Repair or replace defective switch section. Repair or replace defective transformer. Repair relay. Replace capacitor. Repair open circuit.</p>
<p>13. Receiver dead when connected normally; slight rushing noise heard in headset; dead when antenna is temporarily connected to stator plates of tuning capacitor C308A; very strong signal heard in headset when 915-kc signal from Signal Generator I-72 is fed to grid cap of tube V302.</p>	<p>Defective tube V301. Defective switch section S302A or S302B. Open primary or secondary of transformer T303 or T304. Shorted capacitor C317 or C308B.</p>	<p>Replace tube. Repair or replace defective switch. Replace or repair defective transformer. Replace defective capacitor.</p>
<p>14. Receiver dead; no rushing noise heard in headset; 915-kc signal from Signal Generator I-72 fed to grid cap of tube V302 is heard very strong in headset.</p>	<p>Defective converter tube V302. Open switch section S305A or 305B. Open transformer T305 or T306. Open resistor R308. Shorted capacitor C308C. Shorted capacitor C326, C332, C328, C319, C327, C330, or C333. Open resistor R309.</p>	<p>Replace tube. Replace switch section. Replace transformer. Replace resistor. Repair or replace capacitor. Replace defective capacitor. Replace resistor.</p>
<p>15. Dynamotor noise heard in headset.</p>	<p>Open capacitor C258. Shorted choke coil L252. Open capacitor C257, C254, or C253. Open capacitor C251B.</p>	<p>Replace capacitor. Replace choke. Replace capacitor. Replace capacitor.</p>

Table IV: SECTIONALIZING TROUBLE IN RADIO TRANSMITTER BC-653-A

SYMPTOM	PROBABLE TROUBLE	CORRECTION
<p>1. Transmitter cannot be turned on. Receiver OFF-ON switch in ON position.</p> <p>POWER & EMISSION switch in CAL & NET, CW 1/4, or CW FULL position. Red pilot light off. No PA filament voltage on meter. Key depressed. No sidetone.</p>	<p>Fuses F161 and F162. Poor connection of jack J302A and plug P302 or jack J161 and plug P161. Defective receiver ON-OFF switch S306. Defective relay K160. Open or grounded IPA filament circuit if IPA filaments not lit. Open or grounded control circuit if IPA filaments are lit.</p>	<p>Replace fuse. Repair or replace defective component. Repair or replace switch. Replace relay. Refer to table V. Refer to table V.</p>

Table IV: SECTIONALIZING TROUBLE IN RADIO TRANSMITTER BC-653-A

SYMPTOM	PROBABLE TROUBLE	CORRECTION
2. Red pilot light off. No PA filament voltage on meter. IPA current indication on meter. Key depressed. Sidetone heard.	Fuse F160. Defect in PA filament circuit.	Replace fuse. Refer to table V.
3. No IPA or PA current on meter. Red pilot light on. IPA filaments on. POWER & EMISSION switch in CW $\frac{1}{4}$ or CW FULL position. Key depressed. No sidetone.	Open or grounded connections to dynamotor. Defect in dynamotor.	Check connections. Refer to table V.
4. IPA current. No PA current. Red pilot light on. CW $\frac{1}{4}$ or CW FULL position. Key depressed. Sidetone heard.	Fuse F163. Poor contact of switch S160C. Poor contact of relay K161 terminal M. Defective PA tubes. Defective PA stage.	Replace fuse. Clean and adjust contacts. Clean and adjust contacts. Replace PA tube V140 or V141. Refer to table V.
5. IPA current. No PA current. Red pilot light on. CW $\frac{1}{4}$ or CW FULL position. Key depressed. No sidetone.	Defect in keying relay circuit.	Refer to table V.
6. PA current. No IPA current. Red pilot on. CW $\frac{1}{4}$ or CW FULL position. Key depressed.	Fuse F164. Open IPA filaments. Defect in IPA stage.	Replace fuse. Replace tube V120. Refer to table V.
7. Transmitter operates on all positions of POWER & EMISSION switch except VOICE position. With microphone operated, red pilot is off.	Faulty microphone contact. Poor contact of switch S160B.	If inserting and depressing the key turns on the red pilot light, clean and adjust the microphone contacts or jack J180. Replace if necessary. Clean contacts.
8. IPA and PA current on meter. Red pilot on. Microphone operated. VOICE position. Speech not heard in headset. Transmitter operates on CW position.	Defective microphone. Poor contact of jack J180. Defective modulator tube. Poor contact of switch S160A. Defect in modulator stage.	Repair or replace. Clean and adjust. Replace tube V180. Clean and adjust contacts. Refer to table V.
9. Excessive IPA current or burned out IPA tube.	Stage untuned. Defective IPA tubes. Defect in IPA stage. Shorted capacitor C112. Defective MO tube. Defect in MO stage.	Check tuning. Replace tube V120. Refer to table V. Replace capacitor. Replace MO tube V100. Refer to table V.
10. Low IPA current.	Defective IPA tubes. Defect in IPA stage. Defective dynamotor voltage divider. Leaky or shorted bypass capacitors C120 and C128.	Replace tube V120. Refer to table V. Replace defective resistor. Replace capacitors.
11. High PA current.	PA stage not properly tuned. Defective PA tubes. Shorted capacitor C130. Defect in PA stage.	Retune PA stage. Replace tube V140 or V141. Replace capacitor. Refer to table V.
12. Low PA current.	Defective PA tubes. Faulty dynamotor voltage divider. Defect in PA stage.	Replace tube V140 or V141. Repair or replace defective resistor. Refer to table V.

Table IV: SECTIONALIZING TROUBLE IN RADIO TRANSMITTER BC-653-A

SYMPTOM	PROBABLE TROUBLE	CORRECTION
13. Only one of the four PRESET FREQUENCIES FREQ. CONTROLS cannot be satisfactorily adjusted. Zero beat note cannot be obtained at this frequency.	Defective capacitor in associated MO tank circuit. Faulty contacts of switch section S100C or S100E.	Replace capacitor. Clean contacts.
14. Excessive IPA current in only one position of PRESET FREQUENCIES FREQ. CONTROLS. No IPA current dip obtained by tuning the associated PRESET FREQUENCIES IPA TUNING CONTROL. Other positions of PRESET FREQUENCIES FREQ. CONTROLS can be tuned for minimum IPA current dip.	Faulty capacitor in selected circuit. Poor contact of switch S100B.	Repair or replace capacitor. Clean contacts.
15. Only one position of PRESET FREQUENCIES FREQ. CONTROLS causes excessive PA current which can not be corrected by tuning the associated ANTENNA COUPLING control.	Tap on PA coil L143 incorrectly adjusted. Faulty contacts of switch S140A. Defective capacitor in selected circuit.	Adjust tap. Clean contacts. Repair or replace capacitor.

Table V: LOCALIZING TROUBLE IN RADIO TRANSMITTER BC-653-A

SYMPTOM	PROBABLE TROUBLE	CORRECTION
1. Open or grounded IPA filament circuit. IPA filaments off. Red pilot light off.	Fuses F161 and F162. Open filter choke L162. Poor contact, terminals 1 and 10 of plug P161 and jack J161. Defective receiver ON-OFF switch S306 Open link in switch S164B (12-v operation). Open series filament ballast resistor R167 (24-v operation). Any open or grounded lead in filament circuit.	Replace fuse. Replace or repair choke. Clean contacts. Repair or replace switch. Adjust link for proper operation. Refer to figure 57. Replace R167. Make necessary repairs.
2. Open or grounded control circuits. IPA filaments on. Red pilot light off.	Open dynamotor relay series resistor R173 (24-v operation). Defective or grounded switch S164A. Open or shorted dynamotor relay K160. Dirty contacts on dynamotor relay K160. Open voltage regulator tubes V160 or V161. Open or defective interlocks S166 or S168. Poor contact on switch S160B.	Replace R173. Repair or replace switch. Replace relay. Clean and adjust contacts. Replace tube. Repair or replace interlocks. Clean contacts.
3. Defective PA filament circuit.	Fuse F160. Open or grounded PA filament rheostat R168 (12-v operation). Open or grounded PA filament rheostats R169 or R168 (24-v operation). Open links in link board sections S164C or S164D.	Replace fuse. Replace rheostat or repair fault. Replace or repair. Adjust links for proper operation. Refer to figure 57.

Table V: LOCALIZING TROUBLE IN RADIO TRANSMITTER BC-653-A

SYMPTOM	PROBABLE TROUBLE	CORRECTION
4. Defect in dynamotor. IPA filaments on.	Open circuit in motor armature or field. Oil or dirt on brushes and commutators. Worn brushes.	Replace dynamotor. Wipe clean. Replace brushes.
5. Keying relay circuit inoperative. IPA current. No PA current or sidetone.	Open switch interlock S165. Open windings of keying relay K161. Links S164E and S164F incorrectly adjusted. Open circuit in key. Check by operating microphone.	Repair or replace. Replace relay. Adjust links. Refer to figure 57. Repair or replace key.
6. Voltage at all pins of tube V100 are normal except: a. No voltage at pin 3. b. No voltage at pin 4. c. Low or no voltage at pins 3 and 4. d. Positive voltage at pin 5.	Open plate choke L103. Shorted plate bypass capacitor C113. Open resistor R101. Faulty contacts of switch S100D. Open tank coil L100 or L101. Open r-f coil L102. Shorted capacitor C120. Leaky or shorted capacitors C100 and C113. Open resistor R164. Leaky capacitor C111.	Replace choke. Replace capacitor. Replace resistor. Clean contacts. Replace coil. Replace coil. Replace capacitor. Replace capacitor. Replace resistor. Replace capacitor.
7. No filament voltage at pin 2 of V100.	Shorted filaments of MO, MOD, or IPA tubes. Faulty IPA filament circuit.	Replace defective tube. Refer to symptom 1 above.
8. Voltage at all pins of tube V120 are normal except: a. No voltage at pin 2. b. No voltage at plate. c. Low or no voltage at pin 2 and plate. d. No voltage at pin 4. e. No voltage at pin 3.	Open screen resistor R122. Open resistor R121. Poor contact of switch S100A. Shorted capacitor C120. Open coil L120 or L121. Open choke L122. Shorted bypass capacitors C120 and C128. Open resistor R175. Shorted resistor R124. Shorted capacitor C125. Shorted resistor R120. Open resistor R123. MO not oscillating.	Replace resistor. Replace resistor. Clean contacts. Replace capacitor. Replace coil. Replace choke. Replace capacitor. Replace resistor. Replace resistor. Replace capacitor. Replace resistor. Replace resistor. Replace resistor. Check MO tube and MO stage.
9. No filament voltage at pins 1 and 5 of tube V120.	Shorted filaments.	Replace tube.
10. Positive voltage at pin 3 of tube V120.	Leaky capacitor C112.	Replace capacitor.
11. Voltage at all pins of tube V140 are normal except: a. No voltage at pin 2. b. No voltage at pin 3. c. Positive voltage at pin 3. d. No plate voltage.	Shorted bypass capacitor C151. Open screen choke L142. Poor contact of switch S160D. Defective MO or IPA tubes or stages. Leaky capacitor C130. Open fuse F163. Open resistor R179. Shorted capacitors C150 and C163. Open plate choke L141. Open resistor R171.	Replace capacitor. Replace choke. Clean and adjust contacts. Check tubes and stages. Replace capacitor. Replace fuse. Replace resistor. Replace capacitors. Replace choke. Replace resistor.

Table V: LOCALIZING TROUBLE IN RADIO TRANSMITTER BC-653-A

SYMPTOM	PROBABLE TROUBLE	CORRECTION
12. No filament voltage at pin 5 of tube V140.	Shorted filaments of tube V140. Shorted capacitor C146. Defective PA filament circuit.	Replace tube. Replace capacitor. Refer to symptom 3.
13. No filament voltage across pins 1 and 5 of tube V141.	Shorted filaments of tube V141. Shorted capacitor C147. Defective PA filament circuit.	Replace tube. Replace capacitor. Refer to symptom 3.
14. Voltage at all pins of tube V180 normal except: <ul style="list-style-type: none"> <li>a. No filament voltage at pin 2. <li>b. No voltage at pin 3. <li>c. No voltage at pin 3 and pin 4. <li>d. Positive voltage at pin 5. <li>e. No voltage at pin 8. <li>f. High voltage at pin 8. 	Shorted filaments. Defective IPA filament circuit. Open winding between terminals 1 and 2 of modulation transformer T180. Shorted resistor R185. Open resistor R184. Poor contact of switch S160E. Fuse F164. Shorted windings of transformer T181. Shorted resistor R186. Shorted capacitor C182. Leaky or shorted capacitor C180.	Replace tube. Refer to symptom 1. Replace transformer. Replace resistor. Replace resistor. Clean and adjust contacts Replace fuse. Replace T181. Replace resistor. Replace capacitor. Replace capacitor.

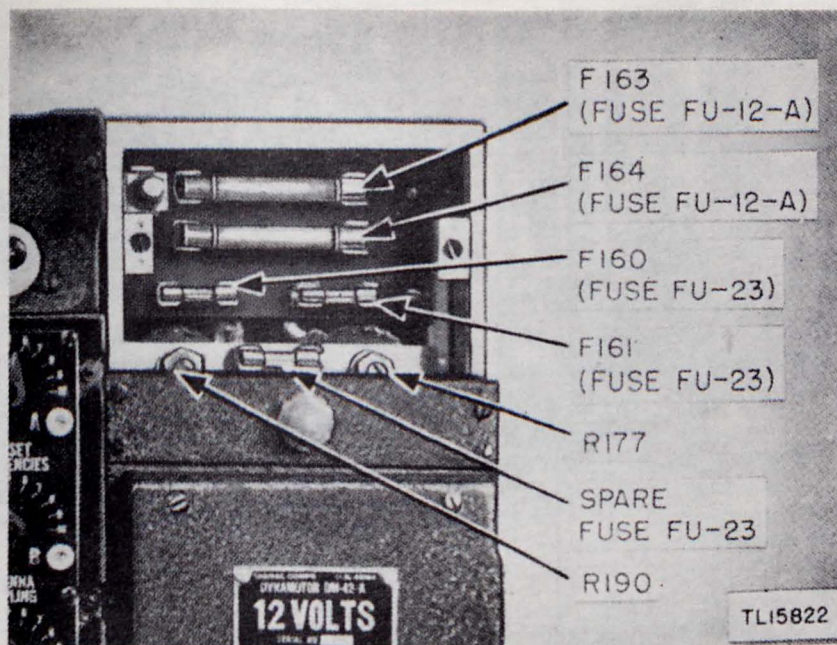


Figure 60. Radio Transmitter BC-653-A, fuse and coil covers removed

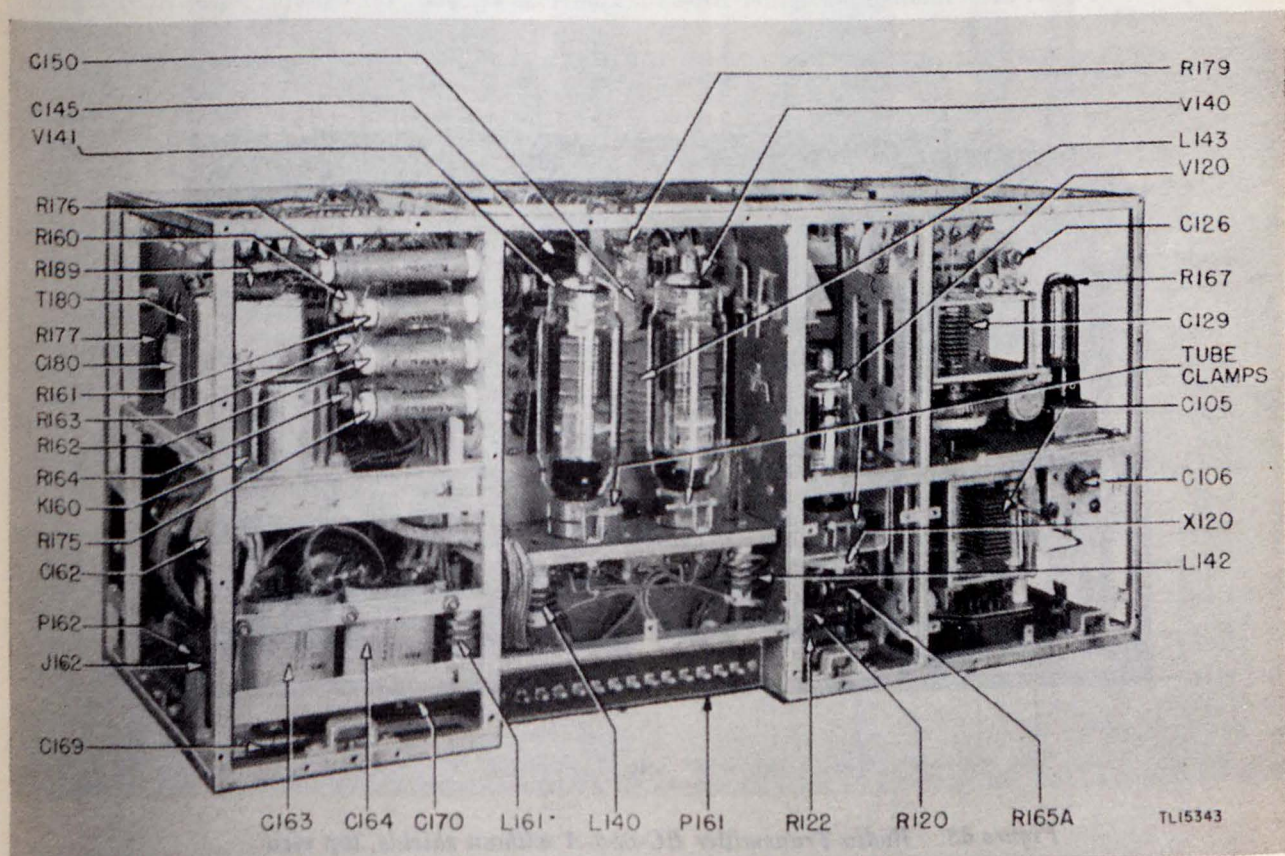


Figure 61. Radio Transmitter BC-653-A without shields, rear right-side view.

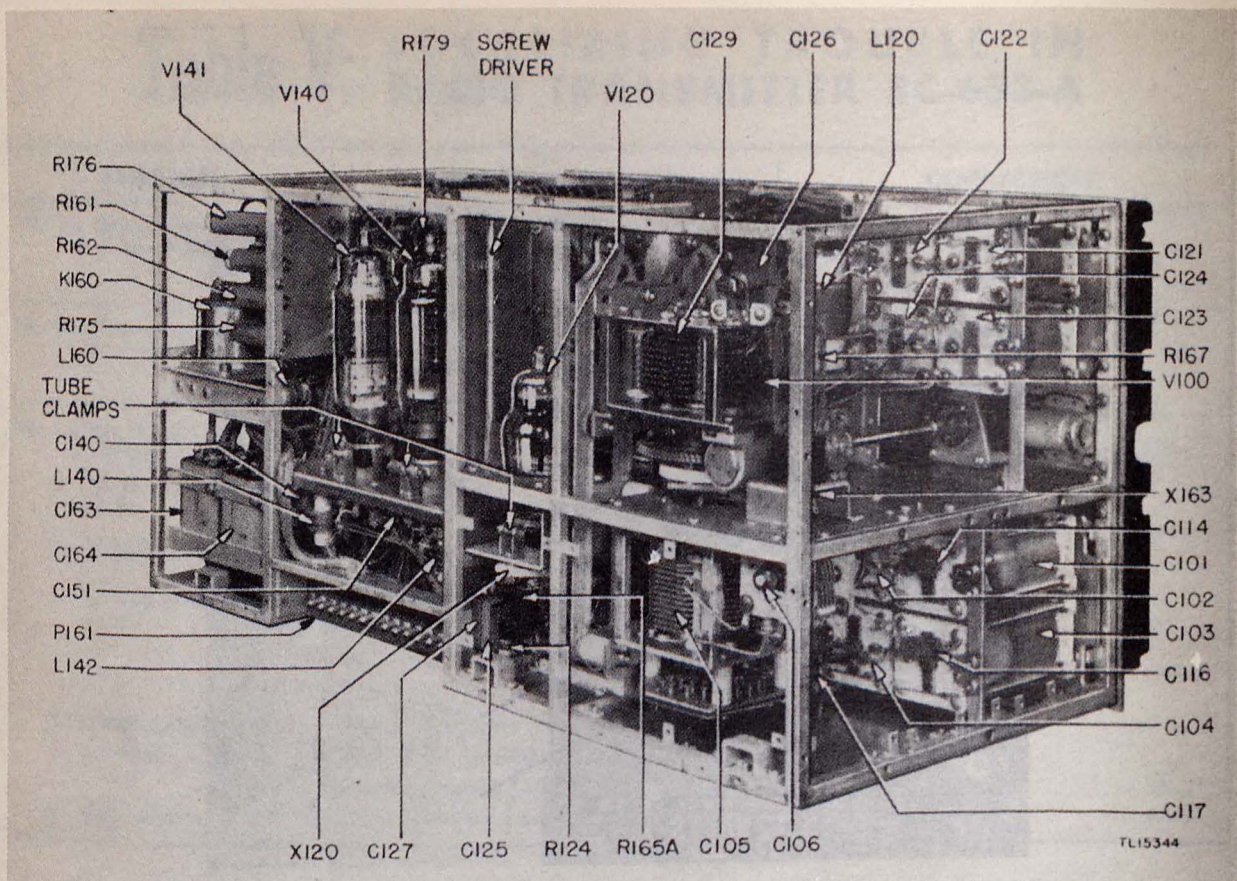


Figure 62. Radio Transmitter BC-653-A without shields, rear left-side view.

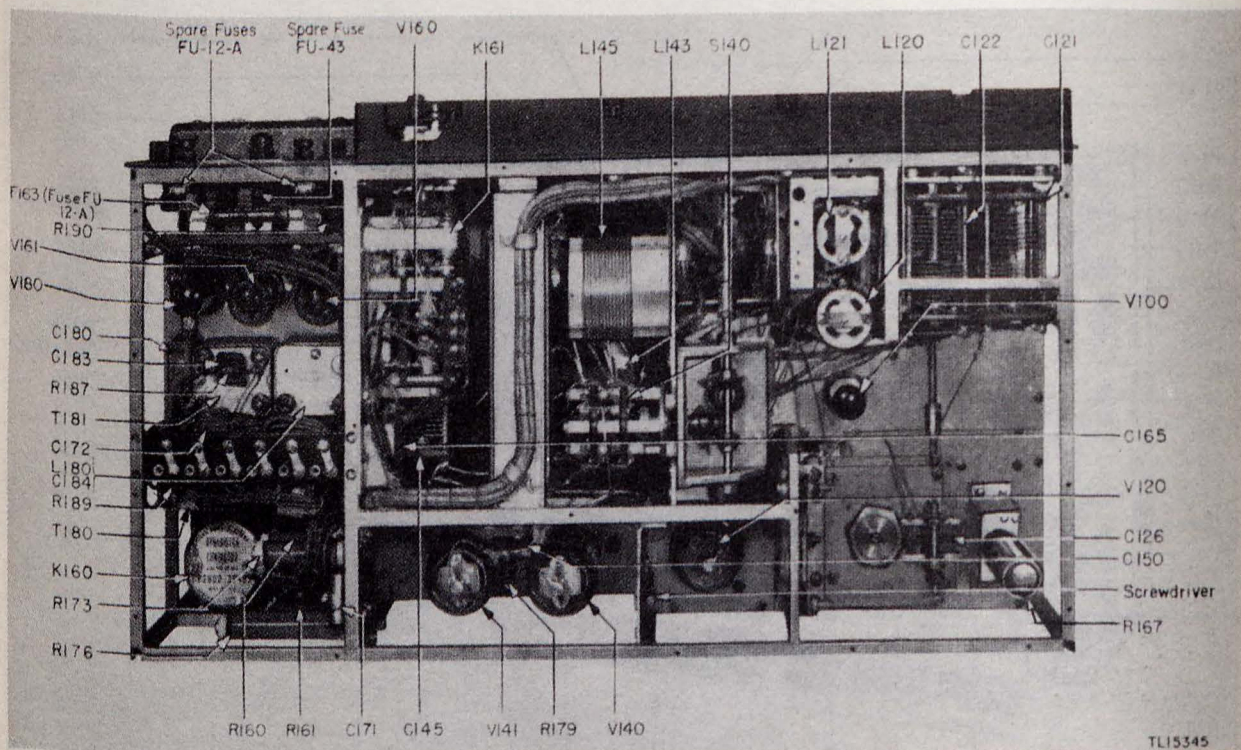


Figure 63. Radio Transmitter BC-653-A without shields, top view.

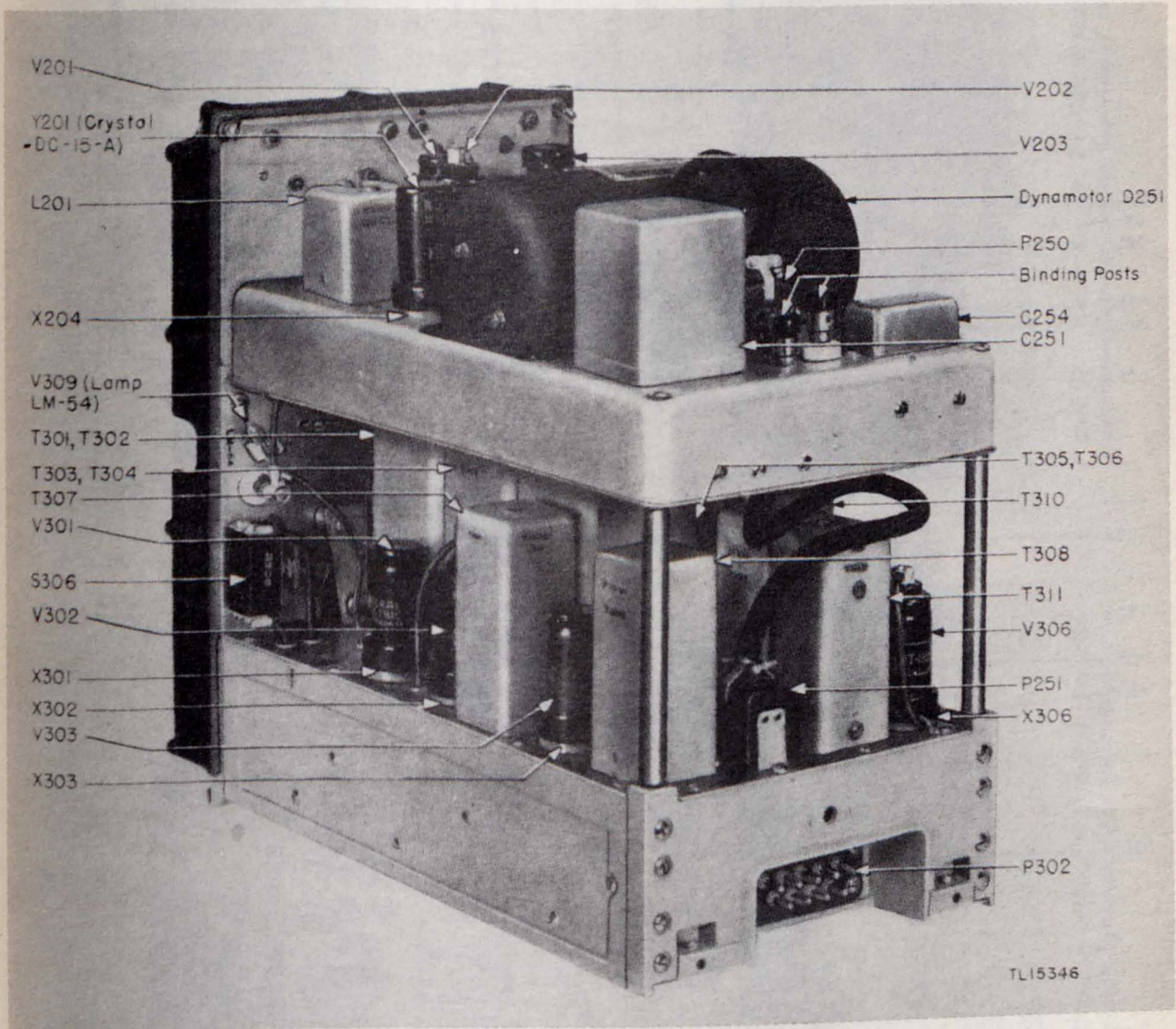


Figure 64. Radio Receiver BC-652-A without case, rear right-side view.

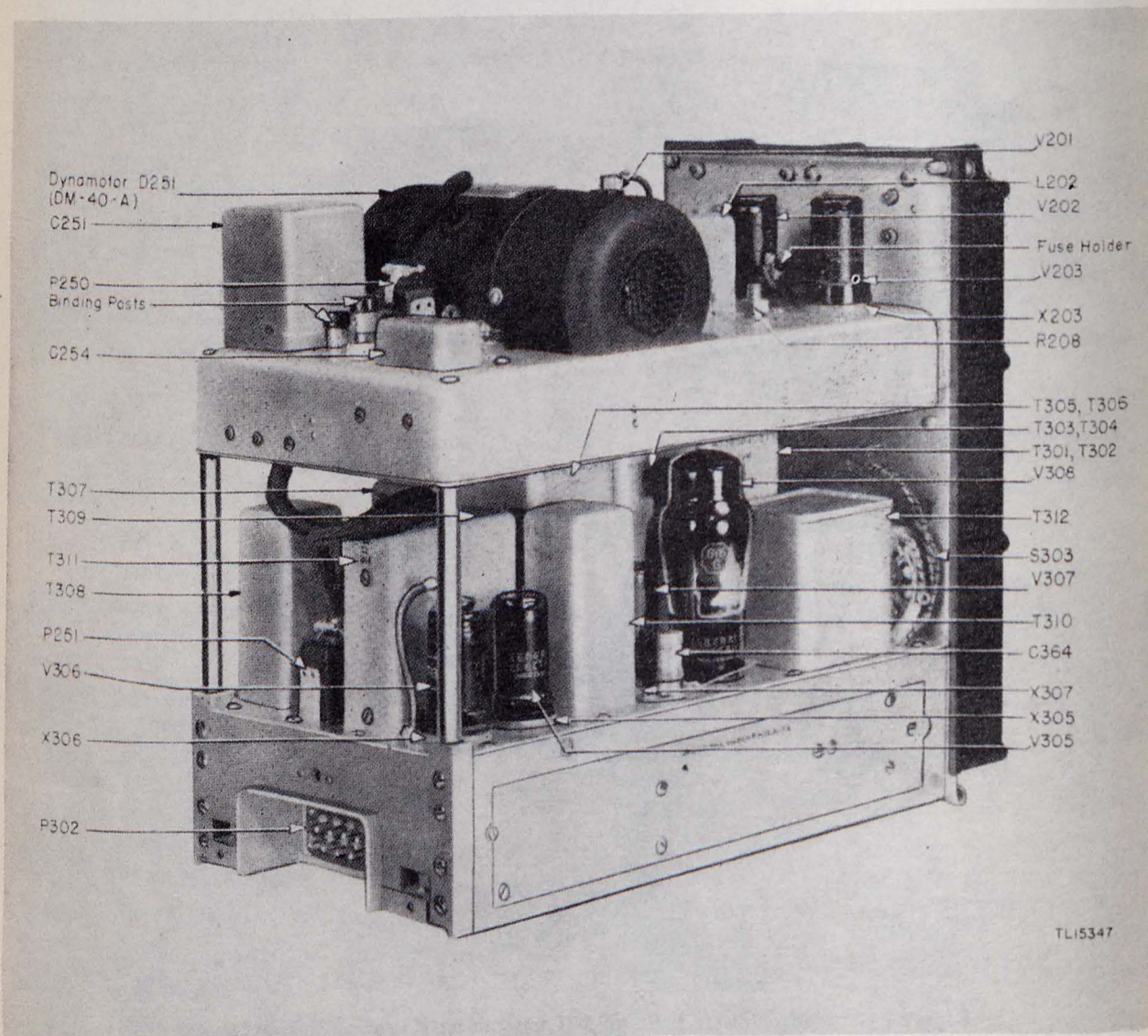


Figure 65. Radio Receiver BC-652-A without case, rear left-side view.

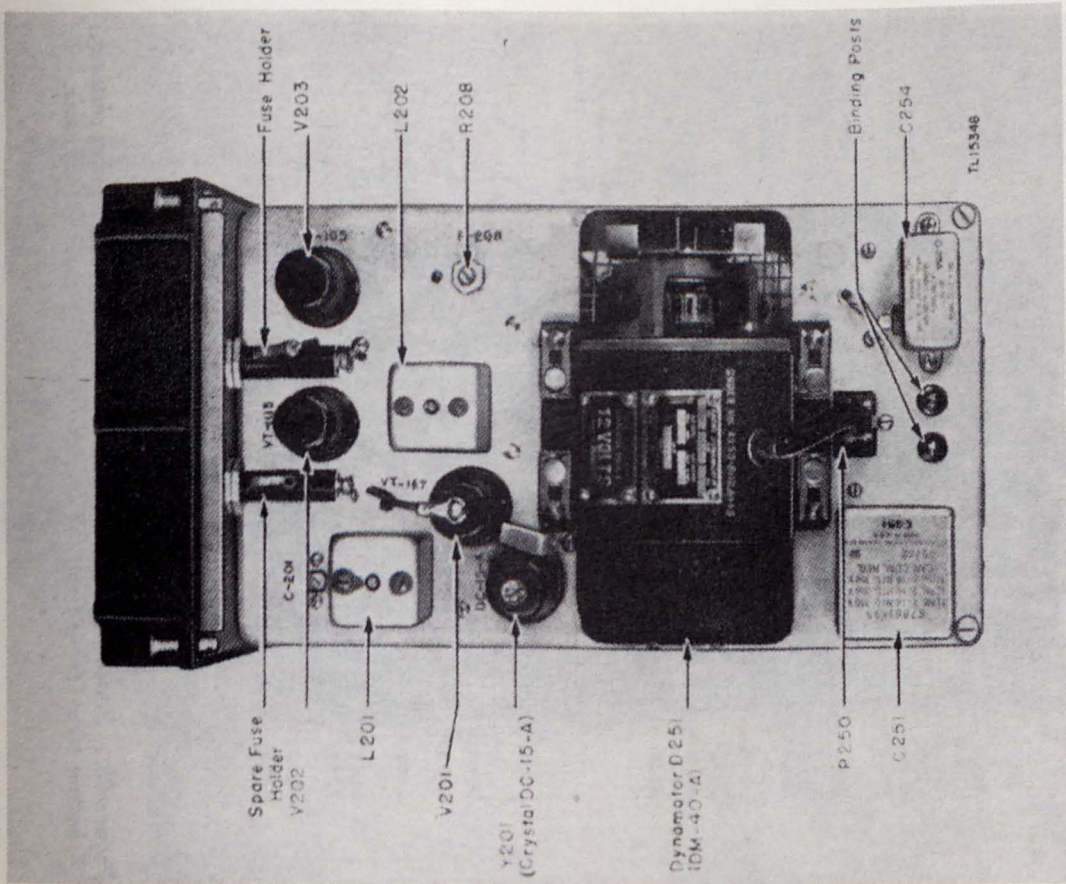


Figure 66. Radio Receiver BC-652-A without case, top view crystal-frequency calibrator chassis with dynamotor end bell removed.

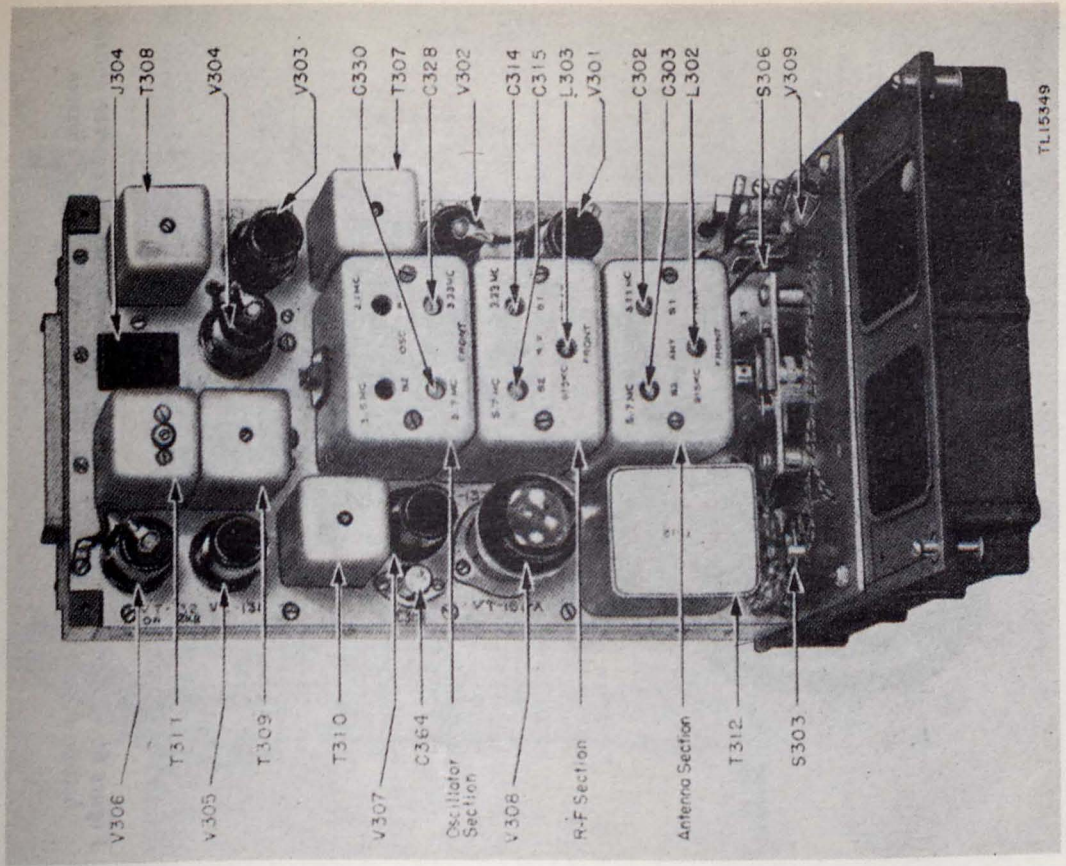


Figure 67. Radio Receiver BC-652-A without case or crystal-frequency-calibrator chassis, top view of receiver chassis.

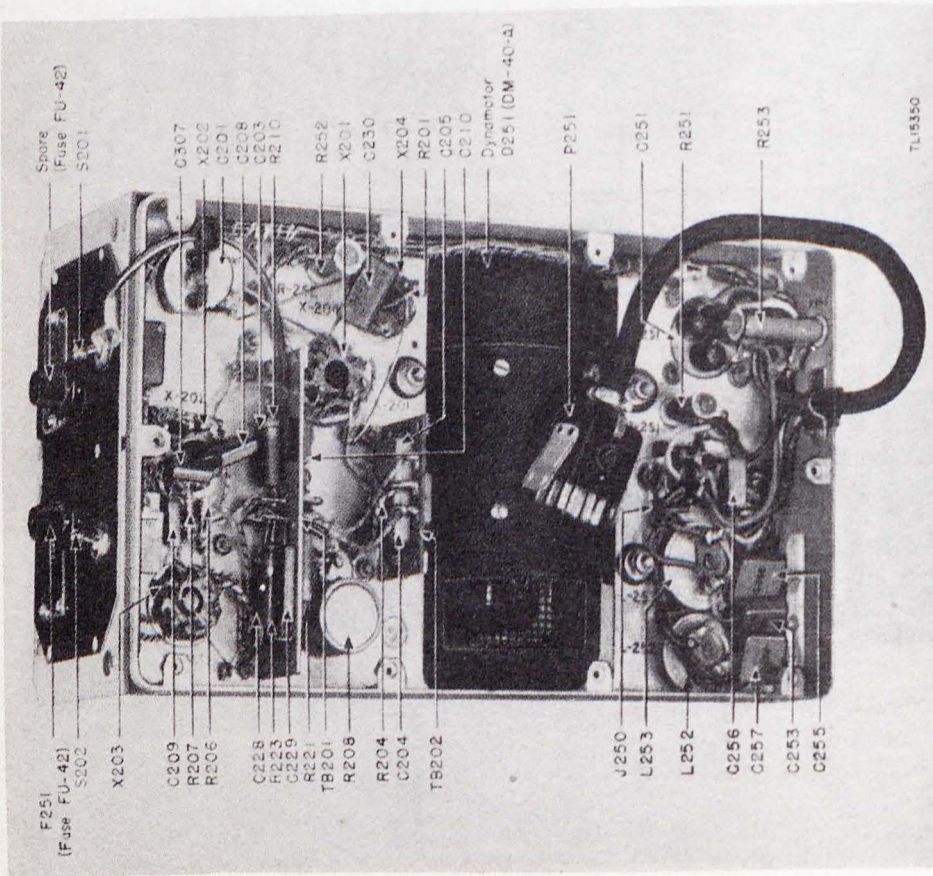


Figure 68. Radio Receiver BC-652-A without case or receiver chassis, bottom view (from front) of crystal frequency calibrator chassis.

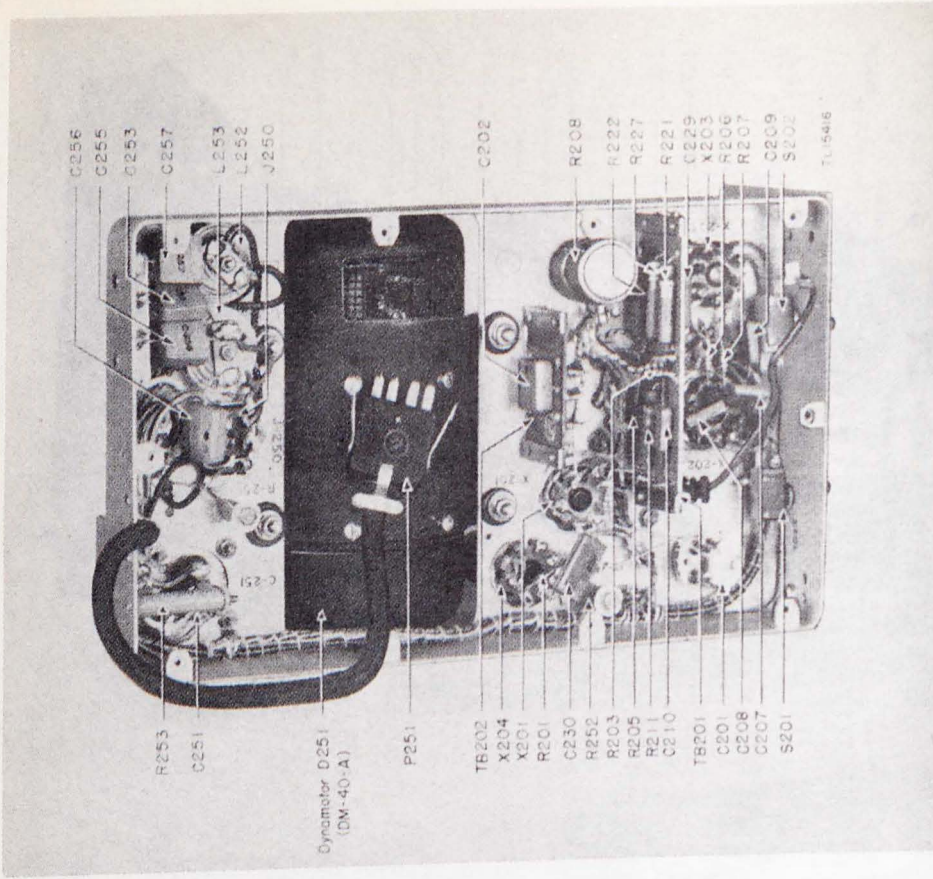


Figure 69. Radio Receiver BC-652-A without case or receiver chassis, bottom view (from rear) of crystal frequency calibrator chassis.

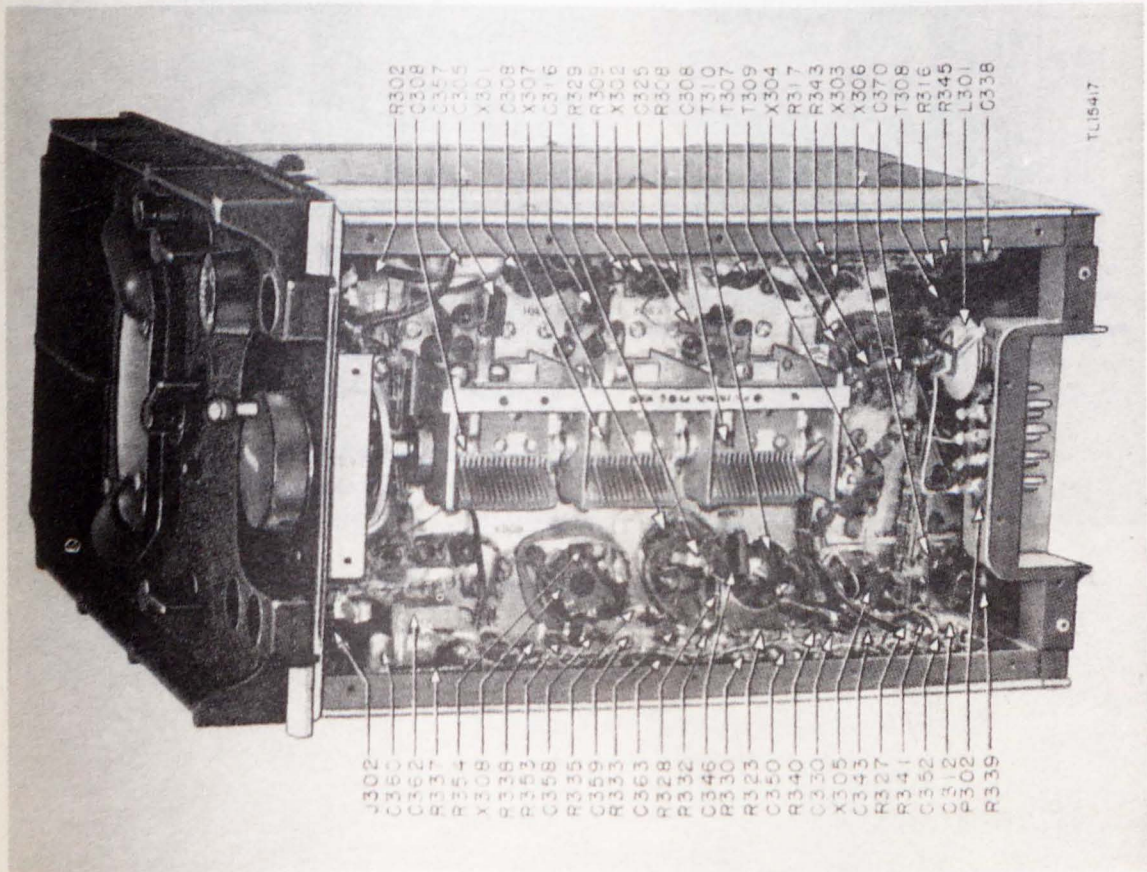


Figure 70. Radio Receiver BC-652-A without case, bottom right-side view.

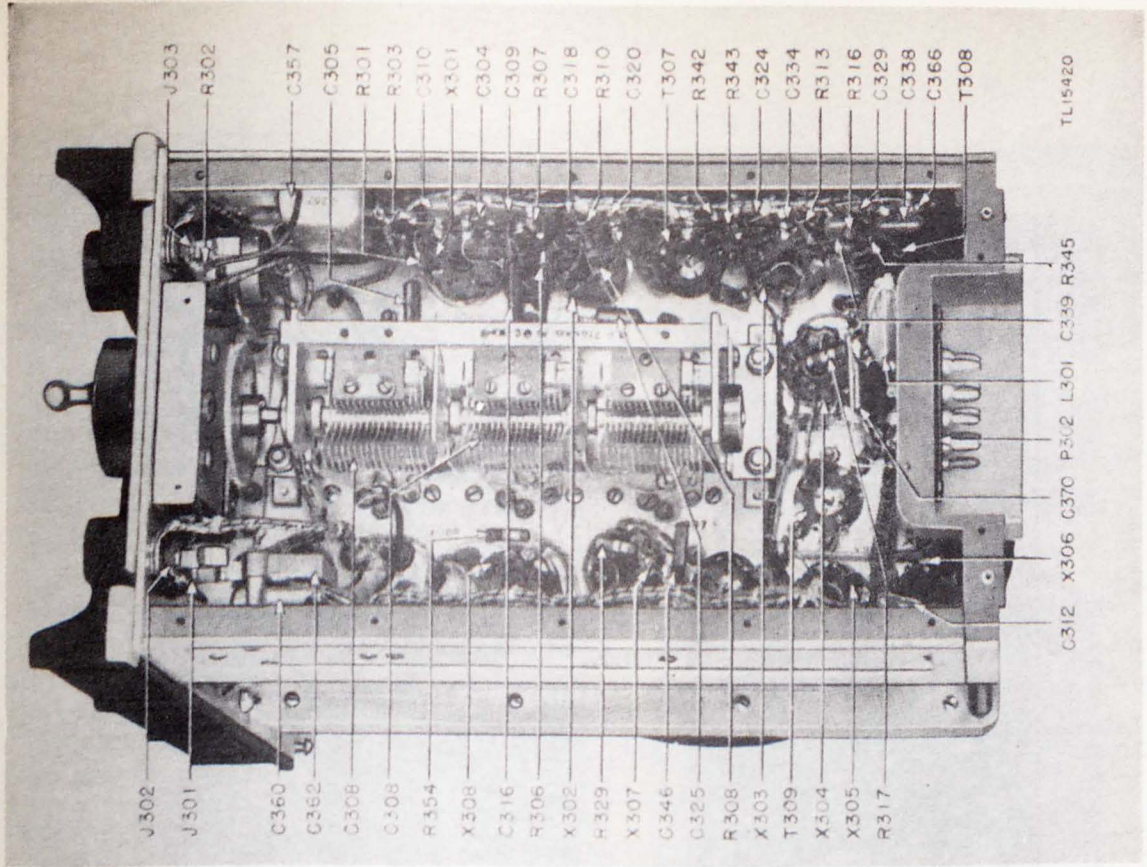


Figure 71. Radio Receiver BC-652-A without case, bottom left-side view.

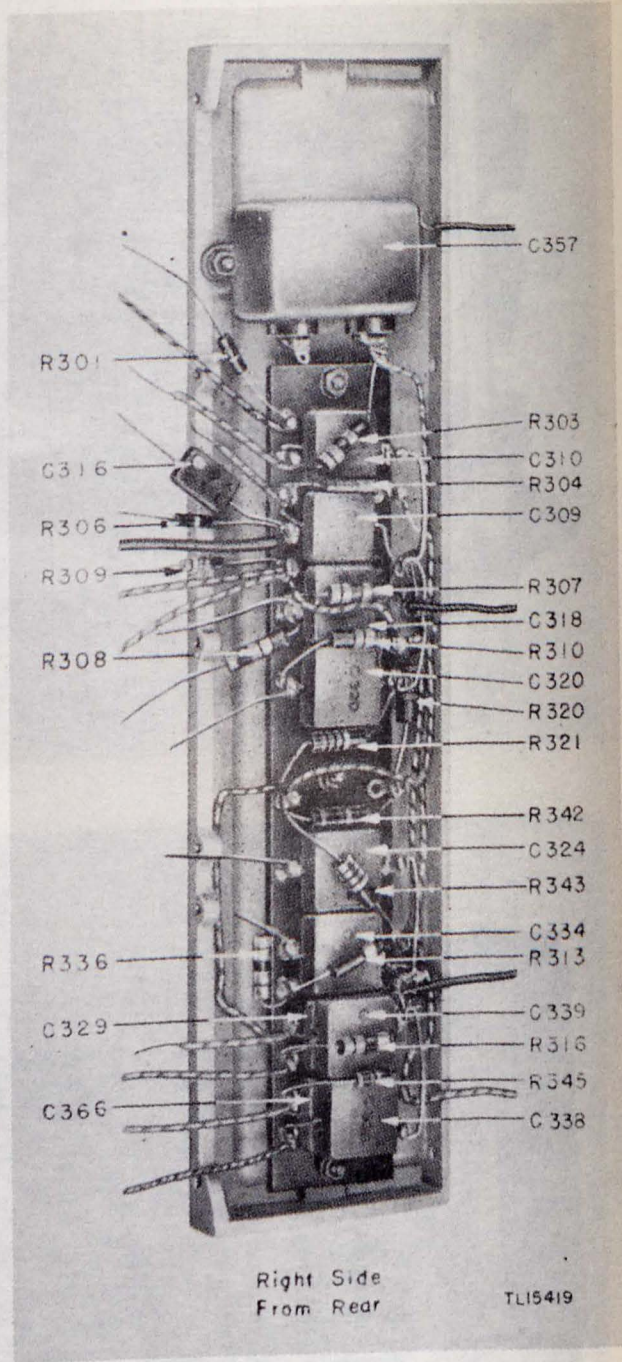
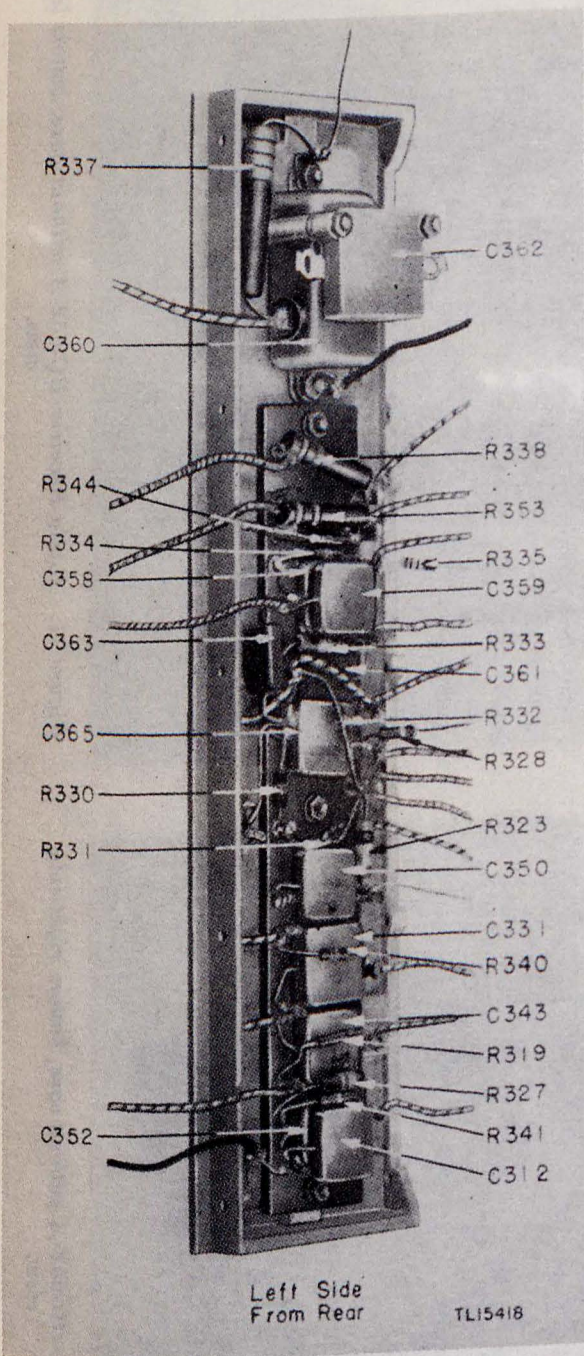


Figure 72. Radio Receiver BC-652-A disassembled, top view of lower side-panels.

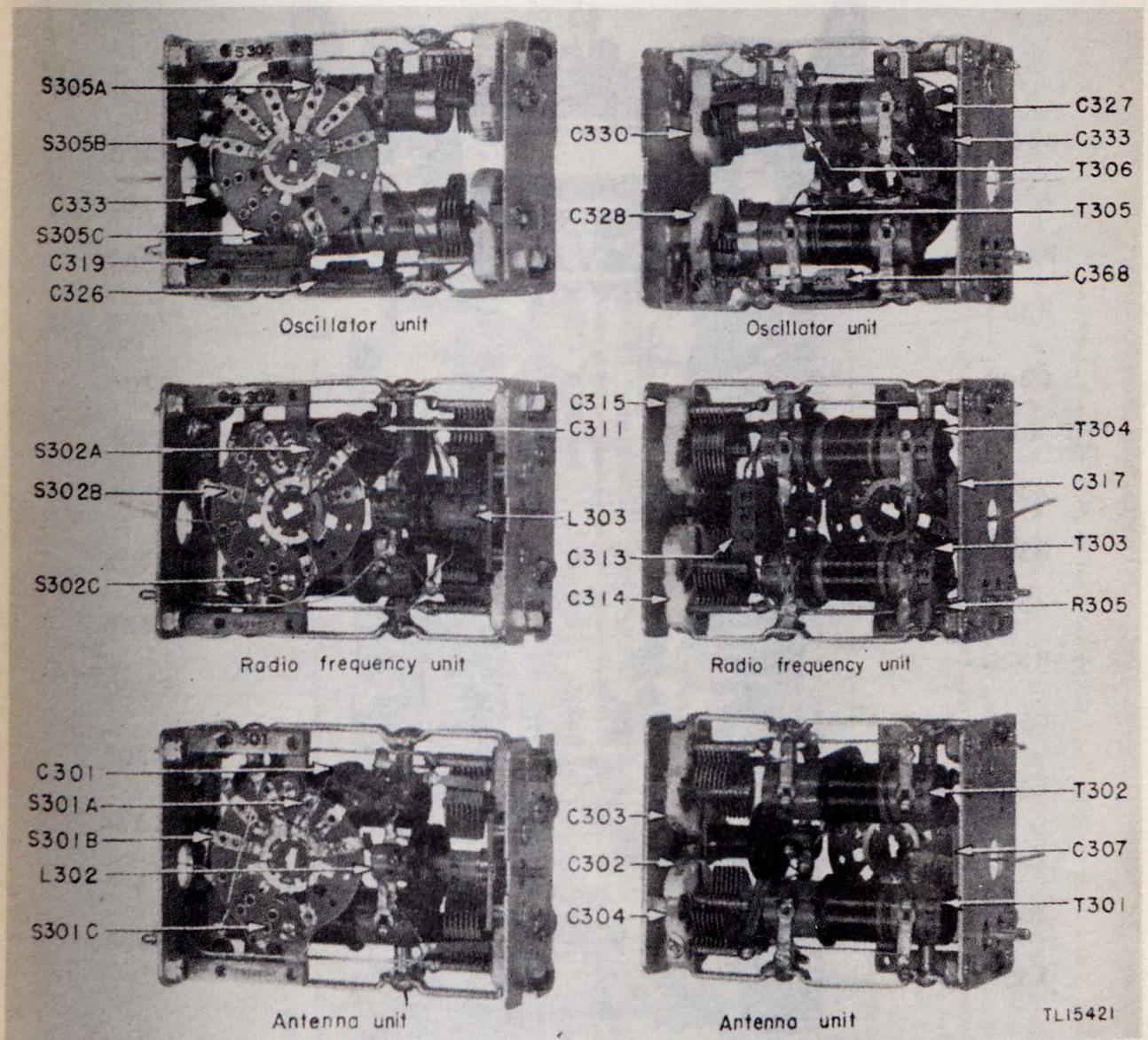


Figure 73. Radio Receiver BC-652-A, top and bottom views of coil units.

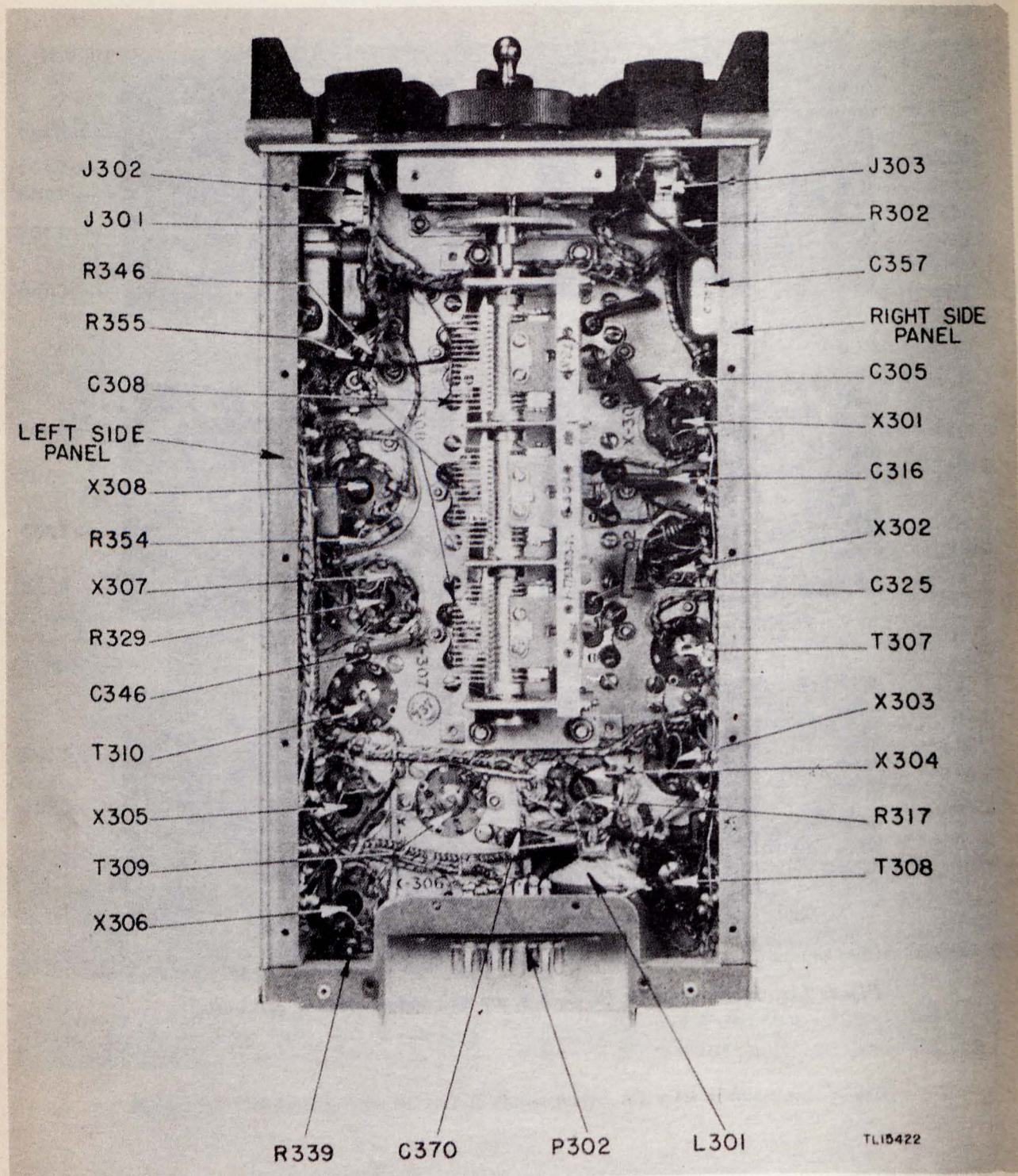
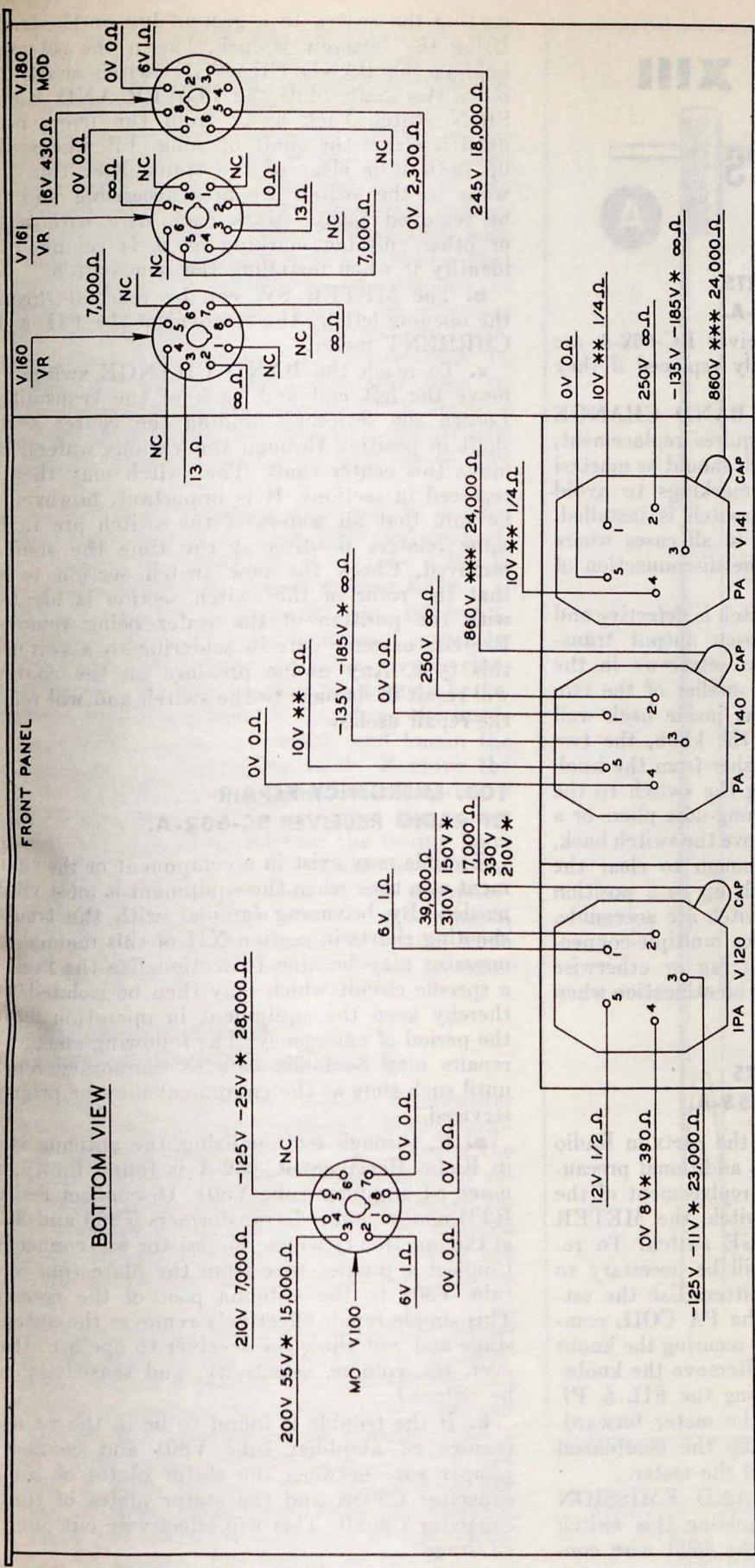


Figure 74. Radio Receiver BC-652-A without case, bottom view.



LEGEND

ALL VOLTAGES MEASURED TO GROUND WITH A 1,000 OHM-PER-VOLT METER.

ALL TUBES IN THEIR CORRECT SOCKETS.

POWER INPUT VOLTAGE 12 (OR 24) VOLTS.

PHANTOM ANTENNA AN-27-() CONNECTED TO THE TRANSMITTER.

POWER AND EMISSION SWITCH IN CW FULL POSITION EXCEPT FOR READING VOLTAGES FOR MODULATOR TUBE V180 IN WHICH CASE SWITCH IS IN VOICE POSITION.

ALL VOLTAGES TAKEN WITH KEY J-45 CONNECTED TO TRANSMITTER AND OPEN EXCEPT THOSE VOLTAGES MARKED *. ALL VOLTAGES MARKED * TAKEN WITH KEY J-45 CLOSED.

VOLTAGES MARKED ** INDICATE THE VOLTAGE VARIES WITH SETTING OF PA FIL INCREASE CONTROL.

***WARNING: DO NOT MEASURE VOLTAGES AT PA PLATE CAP WITH KEY CLOSED. R-F CURRENT WILL DAMAGE THE METER. WITH KEY CLOSED THE VOLTAGE MEASURED AT FUSE F163 IS 900 VOLTS.

ALL RESISTANCES MEASURED TO GROUND. RECEIVER, ON OFF SWITCH, AND TRANSMITTER POWER AND EMISSION SWITCH IN OFF POSITION.

Figure 75. Radio Transmitter BC-653-A, voltage and resistance charts.

SECTION XIII

Repairs

103. REPLACEMENT OF PARTS IN RADIO RECEIVER BC-652-A.

All the parts in Radio Receiver BC-652-A are readily accessible and are easily replaced if they are found to be defective.

a. In the event that the BAND CHANGE switch is found faulty and requires replacement, the wires connected to the switch should be marked carefully with tags or other markings to avoid misconnection when the new switch is installed. This practice is recommended in all cases where parts to be replaced require the disconnection of numerous wires.

b. If the CW-MVC-AVC switch is defective and requires replacement, first loosen output transformer T312. Loosen the two setscrews in the knob of the switch, using the smaller of the two setscrew wrenches found on the inside back wall of the receiver case. Remove the knob, the two felt washers, and the metal washer from the knob shaft. Remove the nut holding the switch to the front panel by using a pair of long-nose pliers or a hollow-shank socket wrench. Move the switch back, away from the front panel enough to clear the front panel, and lift the switch up to a position where all connections to the switch are accessible. Since this switch is a two-wafer multiple-connection switch, it is advisable to tag or otherwise mark each wire disconnected for identification when connecting the new switch.

104. REPLACEMENT OF PARTS IN RADIO TRANSMITTER BC-653-A.

The replacement of some of the parts in Radio Transmitter BC-653-A requires additional precautions. These parts include the replacement of the POWER AND EMISSION switch, the METER SW, and the BAND CHANGE switch. To replace any of these parts, it will be necessary to remove the top of the transmitter. Use the setscrew wrenches found inside the PA COIL compartment to loosen the setscrew securing the knobs for all three of these switches. Remove the knobs. Remove the three screws holding the FIL & PL CURRENT meter and slide the meter forward. Remove the four screws holding the escutcheon plate for the three switches and the meter.

a. To replace the POWER AND EMISSION switch, loosen the large nut holding this switch to the front frame. Unsolder the solid wire con-

necting the switch to a ground lug on the frame. Using the setscrew wrench, loosen the setscrews holding the BAND CHANGE switch shaft. Remove the shaft. Slide the POWER AND EMISSION switch back away from the front panel until it clears the shaft opening. Lift the switch up until it is clear of the transmitter top. The wires to the switch are now accessible and can be removed easily. Mark each wire with a tag or other suitable marking as it is removed, to identify it when installing the new switch.

b. The METER SW can be reached through the opening left by the removal of the FIL & PL CURRENT meter.

c. To reach the BAND CHANGE switch, remove the left end and back of the transmitter. Loosen the setscrews holding the center switch shaft in position through the various wafers. Remove this center shaft. The switch may then be replaced in sections. It is important, however, to be sure that all wafers of the switch are in the same relative position at the time the shaft is removed. Check the new switch section to see that the rotor of the switch section is identical with the position of the wafer being removed. Exercise extreme care in soldering to a switch of this type. Any undue pressure on the contacts will result in damage to the switch and will render the repair useless.

105. EMERGENCY REPAIR OF RADIO RECEIVER BC-652-A.

Trouble may exist in a component of the equipment at a time when the equipment is most vitally needed. By becoming familiar with the troubleshooting charts in section XII of this manual, the operator may be able to sectionalize the fault to a specific circuit which may then be isolated, and thereby keep the equipment in operation during the period of emergency. The following emergency repairs may be made *only* as temporary repairs until such time as the equipment may be properly serviced.

a. If, through sectionalizing, the antenna stage in Radio Receiver BC-652-A is found faulty, remove r-f amplifier tube V301. Disconnect resistor R305 and ground r-f transformers T303 and T304 at the junction to which the resistor was connected. Connect a jumper wire from the plate (pin 8) of tube V301 to the antenna post of the receiver. This simple repair effectively removes the antenna stage and will allow the receiver to operate. However, the volume, selectivity, and sensitivity will be reduced.

b. If the trouble is found to be in the r-f unit, remove r-f amplifier tube V301 and connect a jumper wire between the stator plates of tuning capacitor C308A and the stator plates of tuning capacitor C308B. This will effectively cut out the r-f stage.

c. The first i-f stage may be isolated in case of trouble by removing i-f tube V303 and connecting a jumper wire between pin 8 of tube V303 and pin 3 of tube V302. Disconnect resistor R311.

d. The second i-f stage may be isolated in case of trouble by removing the second i-f tube V304 and connecting a jumper wire from pin 8 of tube V303 to pin 3 of tube V304. Disconnect resistor R314. The noise limiter will be inoperative with this type of emergency repair. If it is known that the noise limiter is operative and that the i-f amplifier tube V304 is not faulty, an alternate method of isolation may be used and the noise-limiter action of the receiver will be retained. To use this method, disconnect the grid from its original connection to transformer T308. Remove i-f amplifier tube V303 and connect a jumper wire from pin 4 of tube V303 to the grid cap of tube V304.

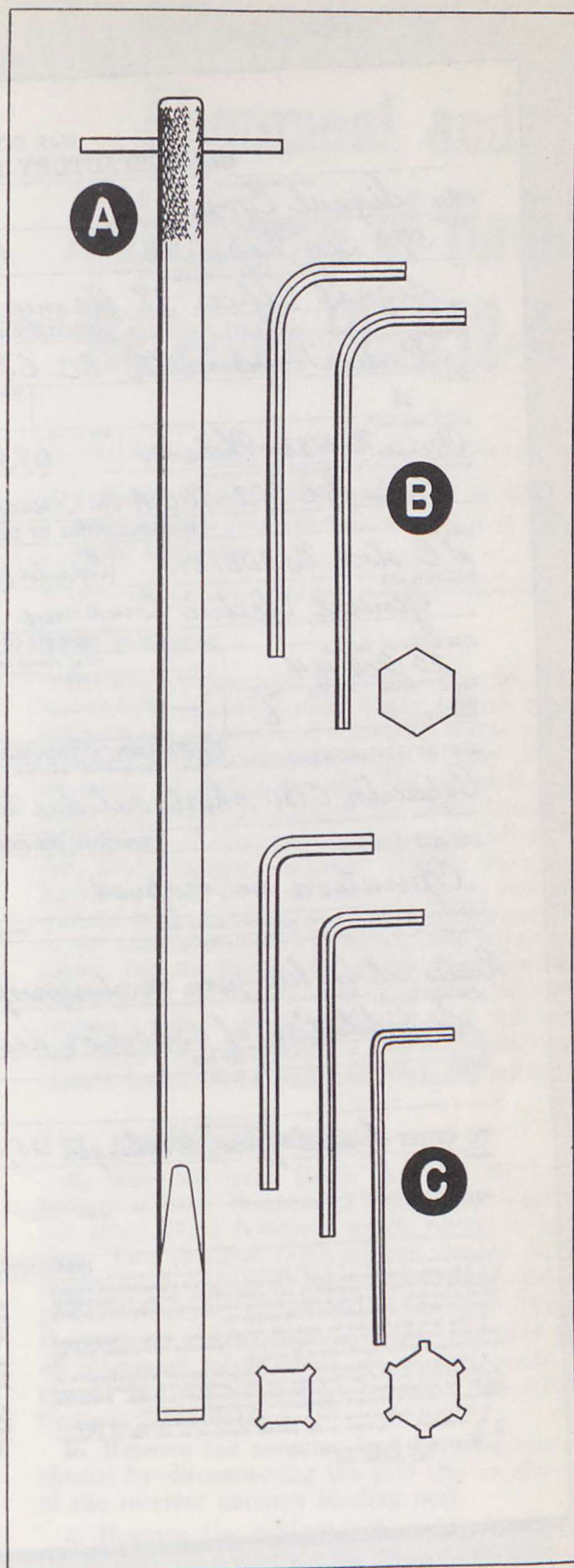
e. The third i-f amplifier stage may be isolated by removing i-f amplifier tube V305 and connecting a jumper wire from pin 8 of tube V305 to pin 3 of tube V304. Disconnect resistor R318.

f. Frequency shift of Radio Receiver BC-652-A, due to movement of the tuning control caused by vibration during vehicular operation, may be eliminated by proper adjustment of the friction brake. Select the correct setscrew wrench from the inside rear wall of the receiver cabinet, and loosen the two setscrews in the tuning knob. Remove the knob. Be sure that the phosphor-bronze spring is placed in the retainer holes and that the washer is placed on the spring. Replace the tuning knob on the shaft and push the knob back toward the panel, so as to obtain pressure on the phosphor-bronze spring. Tighten the setscrew on the knob, securing it to the shaft. Check the tuning knob for ease of tuning and sufficient frictional pressure.

106. EMERGENCY REPAIR OF RADIO TRANSMITTER BC-653-A.

a. Emergency repair of Radio Transmitter BC-653-A is impractical and difficult. If the equipment is operating from a 12-volt input, one of the p-a tubes V140 or V141 may be eliminated if replacements are not available. In this case, operation of the transmitter should be made on reduced power to prevent damage to the remaining p-a tube. The power may be reduced by operating on CW $\frac{1}{4}$.

b. If the antenna current meter becomes burned out or damaged to the extent that it is open-circuited, connect a jumper wire between the two meter connections to complete the circuit to ground and permit the transmitter to operate. Use a $\frac{1}{4}$ -watt neon lamp to check the loading of the antenna. A lamp of this type will glow in the presence of radio frequencies. Hold the lamp in your hand and touch the metal end to any circuit carrying r-f energy. The tuning of the stage to



TL14969A

Figure 76. Radio Set SCR-506-A, A Screw-driver, B Allen setscrew wrenches, C Bristo setscrew wrenches.

WAR DEPARTMENT
UNSATISFACTORY EQUIPMENT REPORT

FOR ^(Technical service) *Signal Corps* DATE *15 Mar 44*
 FROM ^(Organization) *579 Sig Repair Co.* MATERIEL *AP0 101* ^(Station) *San Francisco, Cal.*
 TO ^(Next superior headquarters) *Signal Officer IX Army* ^(Station) *AP0 101* ^(Technical service)

COMPLETE MAJOR ITEM

NOMENCLATURE *Radio Transmitter BC-653-A* TYPE *Ground, vehicular*
 MODEL *A* MANUFACTURER *General Electric Company*
 U. S. A. REG. NO. *Order No. 35924-Phila-43* SERIAL NO. *6954* DATE RECEIVED *2 Feb 44*

EQUIPMENT WITH WHICH USED (IF APPLICABLE) *Radio set SCR-506-A in Truck, 3/4 ton, 4x4, Command*

NOMENCLATURE OF DEFECTIVE COMPONENT

PART NO. *S.C. stock No. 3DB1.017* TYPE *Capacitor (ref. symbol C180): fixed; 1-mf; 500v dc (working)*
 MANUFACTURER *General Electric Company* DATE INSTALLED *14 Feb 44*

LENGTH OF SERVICE

DATE OF INITIAL TROUBLE *20 Feb 44*
 TOTAL PERIOD OF OPERATION BEFORE FAILURE (FILL IN WHERE APPLICABLE)

YEARS	MONTHS	DAYS	HOURS	MILES	ROUNDS
—	—	—	40	—	—

TOTAL YEARS MONTHS DAYS
 TIME INSTALLED 0 0 6

DESCRIPTION OF TROUBLE AND PROBABLE CAUSE

GIVE TYPE OF FAILURE, MECHANICAL, ELECTRICAL, WORKMANSHIP, MATERIAL, DESIGN
Capacitor C180 shorts out due to humid operating conditions

UNUSUAL SERVICE CONDITIONS

GIVE BRIEF DESCRIPTION
Operation in tropics

TRAINING OR SKILL OF USING PERSONNEL (CHECK ONE) POOR FAIR GOOD

DESCRIPTION OF ANY REMEDIAL ACTION TAKEN
Radio set has been given moistureproofing and fungusproofing treatment, 2 Mar 44.

RECOMMENDATIONS
Substitution of capacitor designed for tropical operation.

OFFICE	STATION	DATE	SIGNATURE
			<i>E. A. Wilson</i>
TO CHIEF ^(Technical service) <i>Signal Officer, Washington 25, D.C.</i>			NAME <i>E. A. WILSON</i>
			RANK AND TITLE <i>Capt., Sig. C.</i>
			ORGANIZATION <i>579 Sig Repair Co.</i>

INSTRUCTIONS

1. It is imperative that the Chief of Technical Service concerned be advised at the earliest practical moment of any constructional, design, or operational defect in material. This form is designed to facilitate such reports and to provide a uniform method of submitting the required data.
2. This form will be used for reporting manufacturing, design or operational defects in material with a view to improving and correcting such defects, and for use in recommending modifications of material.
3. This form will not be used for reporting failures, isolated material defects or malfunctions of matériel resulting from fair-wear-and-tear or accidental damage nor for the replacement, repair, or the issue of parts and equipment. It does not replace currently authorized operational or performance records.
4. Reports of malfunctions and accidents involving ammunition will continue to be submitted or directed in the manner described in AR 750-10 (Change No. 3).
5. It will not be practicable or desirable in all cases to fill all blank spaces of the report. However, the report should be as complete as possible in order to expedite necessary corrective action. Additional pertinent information not provided for in the blank spaces should be submitted as inclosures to the form. Photographs, sketches or other illustrative material are highly desirable.
6. When cases arise where it is necessary to communicate with a chief of service in order to assure safety to personnel, more expeditious means of communication are authorized. This form should be used to confirm reports made by more expeditious means.
7. This form will be made out by using or service organizations and forwarded in duplicate through command channels to the chief of technical service. The office of the chief of technical service receiving the report will forward an information copy to the Commanding General, Army Ground Forces or Army Air Forces, whichever is applicable, and to the Commanding General, Army Service Forces.
8. Necessity for using this form will be determined by the using or service troops.

W. D., A. G. O. Form No. 468
 1.D: October 1943

Figure 77. W.D., A.G.O. Form No. 468, blanks filled in.

resonance will be roughly indicated by the brilliance of the lamp.

107. RUSTPROOFING AND REPAINTING.

a. If the finish on the case is badly scarred or damaged, touch up the exposed surfaces in order to prevent rust and corrosion. Using #00 or #000 sandpaper, clean the surface down to the bare metal until the finish is bright and smooth. Apply paint with a small brush.

CAUTION: *The use of steel wool is not recommended. Although it removes rust rapidly, the small particles of the metal which often fall into the case cause internal electrical shorting or grounding of circuits.*

b. If a complete repainting job is necessary, proceed as follows:

- (1) Remove the receiver chassis from the case and the outside cover plates from the transmitter.
- (2) Clean corroded metal on case and plates with dry-cleaning solvent.
- (3) If the dry-cleaning solvent does not remove the rust, use sandpaper to complete the rust removal.
- (4) Spray-paint the entire case and the cover plates, using a paint which is authorized by existing regulations.

108. SPECIAL TOOLS.

The following special tools (fig. 76) are supplied with Radio Set SCR-506-A:

a. Transmitter Tools.

- (1) One screwdriver, 7 inches long, is located under the i-p-a tube cover plate. It is used for locking the tube clamps on Tube JAN-807 (VT-100) and on Tubes JAN-814 (VT-154).
- (2) Two identical sets of three setscrew wrenches are used for tightening the knobs and flexible shafts of the transmitter controls, and the couplings and gears inside the transmitter chassis. One set is located inside the p-a coil compartment, and the other under the cover plate of the p-a tubes.

b. **Receiver Tools.** Two setscrew wrenches are located on the inside back wall of the receiver case. These wrenches are used to tighten the setscrews in the knobs on the front panel of the radio receiver.

109. UNSATISFACTORY EQUIPMENT REPORT.

When trouble occurs in Radio Set SCR-506-A more often than the repair personnel feel is normal, W.D., A.G.O. Form No. 468 (fig. 77) should be filled out and sent to the Office of the Chief Signal Officer, Washington 25, D.C.

SECTION XIV

Alignment and Adjustment of Radio Receiver BC-652-A

CAUTION: *Realignment should never be undertaken without first determining that it is definitely necessary.*

110. GENERAL.

During manufacture, Radio Receiver BC-652-A is carefully adjusted and should seldom require realignment. However, if unusually severe use has resulted in lack of sensitivity, it may become necessary to realign the set. The complete alignment procedure includes, in the order listed, the adjustment of intermediate-frequency (i-f) amplifier, beat-frequency oscillator (BFO), wave trap, high-frequency (h-f) oscillator trimmer, radio-frequency (r-f) amplifier, and antenna trimmers. It is not recommended to make any one adjustment alone, but to follow the entire alignment and adjustment procedure. Use a visual indicating output meter, a signal generator that will cover the required frequencies, a 100-micromicrofarad (mmf) capacitor, an alignment tool, and a headset.

111. PRELIMINARY STEPS.

a. When servicing Radio Receiver BC-652-A, remove it from Mounting FT-253-A by loosening the three Dzus fasteners which secure it in its case. Two of these fasteners are located on the upper front corners of the receiver panel and one just below center at the rear of the case. Remove the receiver chassis from the case, and note that all alignment adjustments are located inside the chassis and are reached by removing the crystal-frequency calibrator.

b. Remove the coupling lead between the two chassis by disconnecting the grid clip on the rear of the receiver antenna binding post.

c. Remove the calibrator from the chassis by taking out six screws on the front panel and two screws projecting down through the vertical posts in the rear. Separate the two chassis, but leave plug P251 in socket J304 so that the dynamotor will remain connected.

d. Remove the bottom plate from the receiver.

e. Complete the disabling circuit by grounding pin 8 of plug P302.

f. Connect a storage battery to the A+ and A- posts at the rear of the calibrator.

NOTE: The voltage of the storage battery must correspond to the nameplates on the dynamotor and on the receiver panel.

g. The receiver is now ready for alignment.

112. INTERMEDIATE-FREQUENCY ALIGNMENT.

a. Turn on the signal generator and the receiver, and allow them to warm up for at least 15 minutes.

b. Connect the output meter to contacts 5 and 3 on output transformer T312, or plug the output meter into jack J301.

c. Set the signal generator for modulated output (400 cycles, 30 per cent) and calibrate it for 915 kc, the intermediate frequency of Radio Receiver BC-652-A.

d. Connect the output lead through a 100-mmf capacitor to the control grid (pin 4) of third i-f amplifier tube V305.

e. Set the receiver control to MVC, and the INCREASE OUTPUT control to *maximum*. During alignment, keep the signal generator attenuator adjusted for a *minimum* reading on the output meter.

f. Adjust the cores of the fourth i-f transformer T310 to give the *maximum* reading on the output meter. One of the adjustments is above the chassis, on top of the i-f transformer (fig. 67); the other is below the transformer, accessible from the bottom of the chassis (fig. 70).

g. Transfer the signal generator leads to the grid (tube cap) of second i-f amplifier V304, and reduce the signal input to avoid overloading.

h. Adjust the cores in third i-f transformer T309 in the same manner used for the fourth i-f alignment.

i. Repeat this procedure at the grids of first i-f amplifier V303 and converter tube V302. Once the stage has been aligned, and the signal input moved to the next preceding stage, it should not be necessary to readjust any of the aligned stages.

113. BEAT-FREQUENCY OSCILLATOR ADJUSTMENT.

a. Without changing the setting of the signal generator from 915 kc, feed the output into the grid converter tube V302.

b. Switch the signal generator to give an *unmodulated* signal.

c. Insert the headset plug into the PHONE jack.

d. Turn the CW-MVC-AVC control to CW.

e. Adjust capacitor C356, located in coil unit T311, until zero beat is obtained, then turn it either way until an audio note of desirable pitch is received.

f. Remove leads and replace shield onto the bottom of the chassis.

g. Remove headset.

h. The following alternate method of adjusting the BFO may be used. Adjust capacitor C356 until zero beat is obtained. At this point the BFO is exactly on the intermediate frequency. If this method of adjusting the BFO has been used during c-w operation, the TUNING dial must be slightly detuned from zero beat to obtain a suitable audio signal.

114. WAVE-TRAP ADJUSTMENT.

a. Without changing the setting of the signal generator, proceed with the wave-trap adjustment. Two wave traps are provided, one in the antenna section and a second in the r-f section.

b. Transfer the output of the signal generator to the antenna binding post, and adjust the attenuator control for two-thirds deflection on the output meter. (The INCREASE OUTPUT control is still at maximum.)

c. Switch the signal generator to give a *modulated* signal.

d. Adjust coil L302 in the antenna-shield can and coil L303 in the r-f shield can for *minimum* reading on the meter.

e. Check both adjustments for minimum readings at all dial positions.

115. HIGH-FREQUENCY OSCILLATOR ALIGNMENT.

The h-f oscillator requires alignment whenever the tuning-dial reading is not correct for either band.

CAUTION: If the dial readings are correct on both bands, do not realign the oscillator.

a. BAND 1.

(1) Set the receiver CW-MVC-AVC control to MVC.

(2) Set the BAND CHANGE switch to BAND 1.

(3) Tune the receiver to a quiet place on the dial between 3 and 3.5 megacycles.

(4) Connect the signal generator through a 100-mmf capacitor to the antenna post.

(5) Calibrate the signal generator to the same dial reading as the receiver.

(6) Turn the attenuator for a low reading on the output meter.

(7) Adjust oscillator trimmer C328, marked 3.33 MC, located in oscillator transformer T305, for *maximum* deflection on the output meter.

(8) Set the receiver TUNING dial to 2.1.

(9) Set the input signal generator frequency to the same frequency (2.1 mc).

(10) Adjust the tuning slug, marked 2.1 MC, for *maximum* deflection. It is located in oscillator transformer T305, and reached from the bottom of chassis.

(11) Return both dials to their former positions.

(12) Repeat operations (7) through (11) above.

b. BAND 2. Use the same procedure as for BAND 1 with the following exceptions:

- (1) Set the receiver BAND CHANGE switch to BAND 2.
- (2) Set the signal generator and receiver TUNING dials to 5.7.
- (3) Adjust oscillator trimmer C330, marked 5.7 MC, for maximum deflection. It is located in transformer T306.
- (4) Set the receiver TUNING dial and signal generator to 3.6 mc.
- (5) Adjust the tuning slug, marked 3.6 MC, for maximum deflection. It is located in transformer T306.
- (6) Return the receiver and signal generator dials to their former positions.
- (7) Repeat operations (2) through (5) above.

116. RADIO-FREQUENCY AMPLIFIER AND ANTENNA ADJUSTMENTS.

a. BAND 1.

- (1) With the signal generator and receiver controls set as before, change the receiver BAND CHANGE switch to BAND 1.
- (2) Adjust r-f trimmer capacitor C314, marked B1, for *maximum* deflection. It is located in transformer T303.
- (3) Adjust antenna trimmer capacitor C302, marked B1, located in transformer T301, for *maximum* deflection.

b. BAND 2. Follow the same procedure as for BAND 1, with the following exceptions:

- (1) Set BAND CHANGE switch to BAND 2.
- (2) Set the signal generator and receiver TUNING dials to 5.7.
- (3) Adjust r-f trimmer C315, marked B2, located in transformer T304, for *maximum* deflection.
- (4) Adjust antenna trimmer C303, marked B2, located in antenna transformer T302, for *maximum* deflection. This completes alignment procedure.
- (5) Remove output meter and signal generator.
- (6) Replace crystal-frequency calibrator.

117. CRYSTAL-FREQUENCY CALIBRATOR.

Should any of the tubes be replaced, it will be necessary to adjust the 20-kc multivibrator control R208. The control, a dual variable resistor, is located next to the dynamotor when viewing the calibrator from the top. (See fig. 66.)

a. Turn on the radio receiver and crystal-frequency calibrator for a warm-up period of 10 minutes.

b. Throw the INTERVAL switch to 100 KC. The CW-MVC-AVC switch is set at CW.

c. Tune Radio Receiver BC-653-A to the 2-mc crystal harmonic note. This note will be present even though the 20-kc multivibrator stage is inoperative. This applies also in the case of the 2.1-mc signal.

d. Throw the INTERVAL switch to 20 KC and turn the receiver dial between 2 and 2.1, counting

the number of beats between these two crystal points. There should be four beats, one every 20 kc. If more or less than four beats are present, adjust multivibrator control R208 until the desired four beats are heard.

e. Set the radio receiver to any one of these four intervening beats and rotate control R208 throughout its range, noting at which points the beat falls out. The correct setting for control R208 is midway between these fall-out points. If one point is found, but the second falls out of the control range, set the control midway into the operating region of the control. However, when the operating region is less than 120 degrees, check for faulty tubes.

f. When Crystal Unit DC-15-A is used, adjust trimmer capacitor C201 to set the crystal frequency at exactly 200 kc. However, if Crystal Unit FT-241-A is used, adjust capacitor C201 to *maximum* capacity. This is done by adjusting the shaft until the red portion of the screw is toward the rear of the chassis and the slot is in line with the mounting screws. (See fig. 66.)

g. Coil L201 and capacitor C230 constitute the crystal-oscillator tank circuit. When using Crystal Unit DC-15-A, the circuit is resonated to 235 kc; when using Crystal Unit FT-241-A, the circuit is resonated to 200 kc. Resonating is accomplished by adjusting an inductive slug within the coil. Use a vacuum-tube voltmeter connected across coil L201 as an indicator. Connect a signal generator, in series with a 75,000-ohm resistor across the tank circuit. (A cathode-ray oscilloscope may be substituted for the vacuum-tube voltmeter.) With the CFC ON-OFF switch at OFF position, vary the slug of coil L201 for *maximum* indication.

h. Coil L202 is the hexode plate-circuit choke and should be resonated to the crystal frequency. In this case, adjustment is best accomplished with the crystal-frequency calibrator operating. Connect the vacuum-tube voltmeter across coil L202 and adjust the slug until *maximum* voltage is indicated.

i. In an emergency, when neither a signal generator nor a vacuum-tube voltmeter is available, an approximate adjustment may be made by drawing the slugs all the way out, and then turning the adjusting screws six complete turns in.

118. MINIMUM TEST REQUIREMENTS FOR RADIO RECEIVER BC-652-A.

a. General. This paragraph is to be used as a guide in determining the quality of a repaired Radio Receiver BC-652-A. Radio equipment which passes the tests outlined below is suitable for field operation. If each repaired radio set is subjected to the tests described in this paragraph, uniform high-quality operation of each set is assured.

b. Electrical Check for Radio Receiver BC-652-A. Check the receiver electrically, using the chart shown in table VI (Page 163) as a guide.

SECTION XV

Alignment and Adjustment of Radio Transmitter BC-653-A

c. Moving Parts and Finish. In addition to the electrical tests described in the test chart, the receiver should be checked for smoothness of operation in moving or rotating parts, and for condition of the finish.

(1) Check the radio set for cleanliness inside and outside.

(2) Rotate all tuning and volume controls. These should be smooth in operation across the arc of rotation. There should be no appreciable backlash or slipping of controls.

(3) Try all switches, both rotary and toggle. They should snap firmly into each contact position.

(4) Insert the appropriate plugs into the proper jacks. They should seat firmly and make good contact.

(5) Check fuse holders to see that fuses may be removed easily, yet lock tightly when inserted.

(6) Observe the condition of the finish and plating. Both paint and plating should be free from corrosion, blisters, flaking, bare or worn spots, or deep scratches.

119. TEST INSTRUMENTS REQUIRED.

The following instruments are required to make the tests outlined in table VI (Page 163):

a. R-f Signal Generator With Metered Output. The signal generator should cover the range of frequencies from 2,000 to 6,000 kc. It should have provisions for modulating the output signal at audio frequencies ranging from 200 to 3,000 cycles. (If the r-f generator does not have internal modulation capabilities, a separate a-f generator may be used to modulate the r-f signal externally.)

b. Output Meter With 4,000-ohm Impedance. The output meter included with Test Equipment I-56- () or IE-9-C is of the proper type.

c. Volt-ohmmeter or Multimeter. The meter must have an a-c sensitivity of 1,000 ohms per volt or greater, and ranges covering from 0-10 volts to 0-150 volts. The Weston No. 772, RCA Voltohmyst (included in Test Equipment IE-9-C), or its equal is satisfactory.

d. Dummy Antenna Consisting of 100-micro-microfarad Mica Capacitor.

e. Output Load Resistors:

(1) 4,000-ohm, 5-watt, noninductive resistor.

(2) 8,000-ohm, 5-watt, noninductive resistor.

(3) 250-ohm, 5-watt, noninductive resistor.

f. Plug PL-55. The plug should be equipped with two 6-inch wires terminating in alligator clips.

CAUTION: When measuring output voltages, first set the meter to the highest available range and then adjust it to the appropriate range.

120. GENERAL.

All alignment adjustments for Radio Transmitter BC-653-A are located inside the transmitter chassis and can be reached by removing the top, back, end, and bottom covers and the set of internal protective shields. Stand the radio transmitter on its right end when checking and aligning the circuits.

121. MASTER-OSCILLATOR ALIGNMENT.

During normal operation of the transmitter it is not necessary to make any adjustments in the m-o circuit, except from the front panel. However, should any circuit elements be changed, it may become necessary to align this oscillator. The MO RESET LF-HF control is normally used at center scale. If it has to be turned more than 20 divisions from that position, it should be brought back to the center by adjusting capacitor C106. This capacitor will be found in the lower right-hand compartment as the transmitter is viewed from the rear (fig. 61). Should alignment be necessary, turn on the crystal-frequency calibrator and the receiver, and turn the transmitter POWER AND EMISSION switch to CAL & NET. After a warm-up period of 10 minutes, turn off the transmitter and proceed as follows:

a. Turn the receiver CW-MVC-AVC switch to CW, and the TUNING dial to 2.2 mc (channel 10).

b. Turn the CFC OFF-ON switch to ON, throw the INTERVAL switch to 100 KC, and zero beat the receiver to the calibrator. Turn the CFC OFF-ON switch to OFF.

c. With the transmitter BAND CHANGE switch at LF, switch to CAL & NET and rotate the TUNING LF-HF control to channel 10 on the LF counter. This corresponds to a frequency of 2.2 mc.

d. Adjust the transmitter for zero beat with the receiver by means of the MO RESET LF-HF control.

e. Rotate the transmitter TUNING LF-HF control and the receiver TUNING control to channel 40. If the master oscillator is covering the LF range correctly, channel 40 (2.8 megacycles)

will zero beat in the receiver without readjustment of the MO RESET LF-HF control. (It may be necessary to move the channel counter dial approximately $\frac{1}{8}$ of an inch to obtain zero beat.)

f. If the channel counter dial has to be moved more than $\frac{1}{8}$ of an inch, the transmitter needs further alignment. Should further alignment be necessary, proceed as follows:

(1) Turn off the transmitter and withdraw it from the mounting. Stand the transmitter on end and remove the bottom shield and the inner shield covering coils L100 and L101. This inner shield is located near the center toward the front of the transmitter.

(2) If zero beat occurs when the channel-counter-dial indicating line is above the fixed reference line, increase the inductance by turning the adjusting screw of coil L100 one full turn clockwise. To decrease the inductance when the channel-counter-dial indicating line falls below the fixed reference line at zero beat, turn the adjusting screw one full turn counterclockwise. Replace the shields (hold temporarily in place with two screws), and slide the transmitter back on the mounting.

(3) Turn on the transmitter and repeat steps **c** and **d**. The MO RESET LF-HF control should be readjusted to compensate for the change in inductance of L100.

(4) Repeat step **e** and check for error at channel 40. If the error is in excess of the $\frac{1}{8}$ -inch allowance, repeat steps (1) and (2) until the error has been reduced to a value within the allowable limit.

g. Check the HF band in the same manner (subpars. **c** through **f** above) except that the BAND CHANGE switch is in the HF position, coil L101 is to be adjusted, and channels 65 (3.3 megacycles) and 120 (4.4 megacycles) are used in place of channels 10 and 40.

h. Replace all shields and recheck the MO RESET LF-HF control. Turn the transmitter off.

122. INTERMEDIATE-POWER-AMPLIFIER ALIGNMENT.

This stage is adjusted after the alignment of the master oscillator so that the two stages track. The LF band is broadly tuned by means of a nonadjustable slug in coil L120 and will require no adjustment. The procedure to be used in determining the need for HF band alignment is as follows:

a. Switch the transmitter to CAL & NET, the BAND CHANGE switch to HF, and the METER SW to IPA PL.

b. Rotate the TUNING LF-HF control across the entire HF band from channel 50 to channel 125, noting the reading of the meter. If this reading is 3.5 or below, the intermediate power amplifier is correctly aligned on the HF band.

c. If the meter reading exceeds 3.5, turn the set off, remove the back and top covers, and proceed as follows:

(1) Inspect capacitor C126 (mounted on top of capacitor C129 at the rear of the i-p-a compart-

ment (fig. 62)) to determine whether it is a two-plate capacitor (one fixed and one movable plate).

(2) If it is a two-plate capacitor, adjust it for maximum capacitance by fully meshing the plates. Turn the set to CAL & NET and rotate the TUNING LF-HF control to channel 80. Adjust the slug screw of coil L121 (located on the base of the i-p-a compartment at the front of the transmitter (fig. 63)) for a minimum reading of the IPA PL meter. This will resonate the intermediate power amplifier to the master oscillator.

(3) If capacitor C126 is not a two-plate capacitor, turn the set to CAL & NET and rotate the TUNING LF-HF control to channel 80. Adjust capacitor C126 for a minimum reading on the meter.

(4) Rotate the tuning control toward the higher channels while observing the meter reading. If the reading remains below 3.5, no further adjustment is necessary.

(5) If the reading increases at the higher channels, adjust capacitor C126 for minimum meter reading at the channel where the reading exceeds 3.5.

(6) Turn back to channel 80 and adjust coil L121 for minimum reading of the IPA PL meter.

(7) Recheck the setting by rotating the tuning control from channel 80 to channel 125. If the meter reading exceeds 3.5 on the check, repeat steps (5) and (6) until the proper results are obtained. The intermediate power amplifier is now aligned and will track with the master oscillator.

123. POWER-AMPLIFIER BIAS AND MODULATION ADJUSTMENT.

The control marked R177, located behind the fuse panel (fig. 60), is used to set the bias voltage for the p-a tubes during voice operation. Under ordinary circumstances this control need not be touched as it has been properly set by the manufacturer. If for some reason this adjustment has been tampered with, the following steps are used to correct it:

a. Tune up the transmitter after it has been properly loaded into the vehicular antenna or to phantom Antenna AN-27-(). Set the POWER AND EMISSION switch to CW FULL. Note the reading of the ANT CURRENT meter.

b. Switch to VOICE and press the microphone switch. The reading on the ANT CURRENT meter should be approximately one-half that obtained on CW FULL.

c. If it is not, adjust R177 until such a change in reading occurs. This change in reading may not hold true across the whole range of frequencies, but slight variations from point to point may be disregarded.

d. Potentiometer R190, located to the left of R177 behind the fuse panel, controls the percentage of modulation. It is set for approximately 90 per cent modulation, and will rarely need changing. A sufficiently accurate setting may be obtained by rotating the shaft of R190 all the way to the left, and then turning it to the right one-third of a turn.

124. TEST INSTRUMENTS REQUIRED.

The following test instruments are required in the alignment and adjustment of Radio Transmitter BC-653-A:

a. Voltohmmeter of Test Set I-56(), used to make voltage and resistance tests in Radio Transmitter BC-653-A.

b. Tube tester of Test Set I-56(), used to determine the condition of the tubes in the transmitter:

NOTE: *TM 11-303, TM 11-2613, TM 11-2626, TM 11-2627, and TM 11-321 describe the use of Test Set I-56().*

SECTION XVI

Presetting

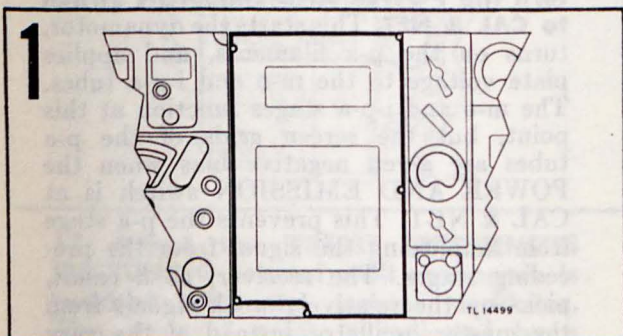
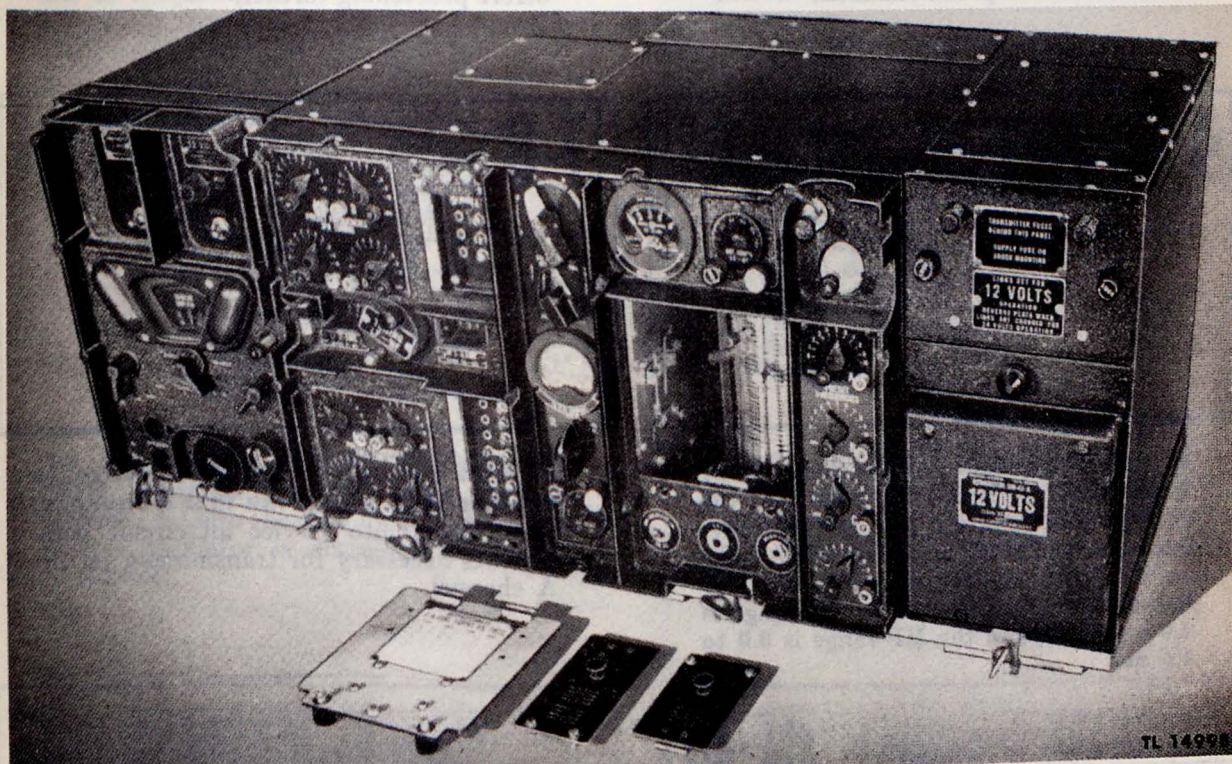
125. GENERAL

Radio Transmitter BC-653-A provides five operating channels or frequencies which can be quickly selected by turning a switch. Four channels are labeled A, B, C, and D; the fifth is labeled LF-TUNABLE-HF. Paragraph 126 describes the method of presetting channels A, B, C, and D; paragraph 127 describes the method of presetting the TUNABLE channel.

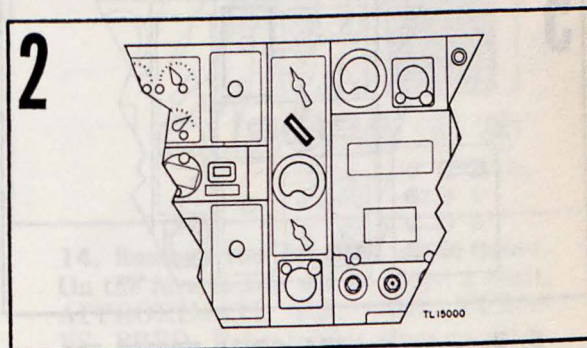
126. Presetting the Transmitter

(PRESET FREQUENCIES)

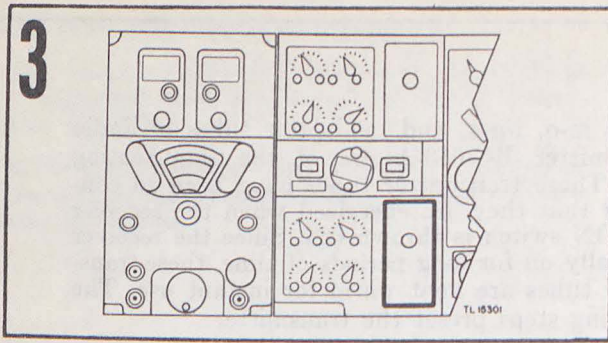
The m-o, i-p-a, and modulator tubes of Radio Transmitter BC-653-A are of the slow-heating type. These transmitter tubes have been so connected that they are energized when the receiver OFF-ON switch is thrown ON. Since the receiver is usually on for long periods of time, these transmitter tubes are kept warm for instant use. The following steps preset the transmitter:



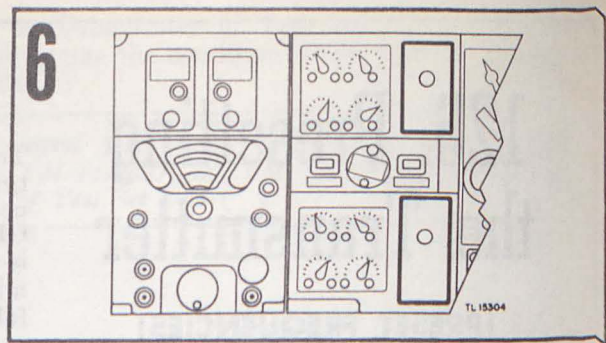
1. Select the four frequencies to be designated **A, B, C, and D**. Log these frequencies on the **TUNING RECORD**. This record plate is of white enamel, found on the left protective cover. Remove this cover.



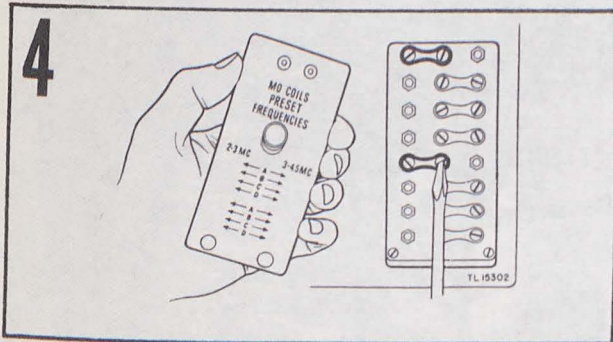
2. Turn the **POWER AND EMISSION** switch to **OFF**. Do this before adjusting the link assemblies.



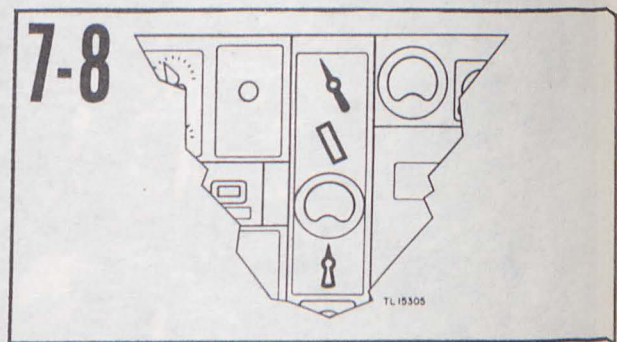
3. Remove the MO COILS PRESET FREQUENCIES cover plate to reach the m-o coil links. There are eight links, two for each of the four preset channels.



6. Replace the MO COILS PRESET FREQUENCIES cover plate and the IPA COILS PRESET FREQUENCIES cover plate before proceeding further.

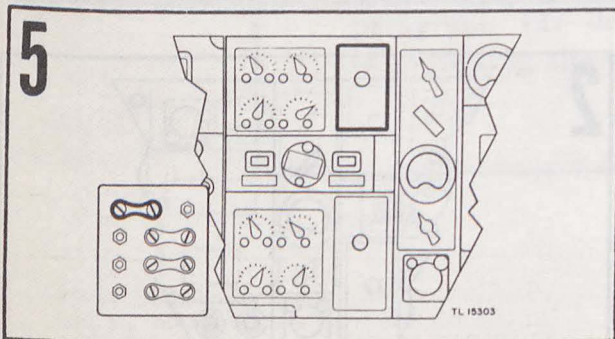


4. Adjust the eight links in pairs. If the A frequency is in the LF band, set the pair of A links to the left. If the A frequency is in the HF band, set the A links to the right. Repeat this procedure for link-pairs B, C, and D. The LF range is 2.0 to 3.0 mc and the HF range is 3.0 to 4.5 mc.

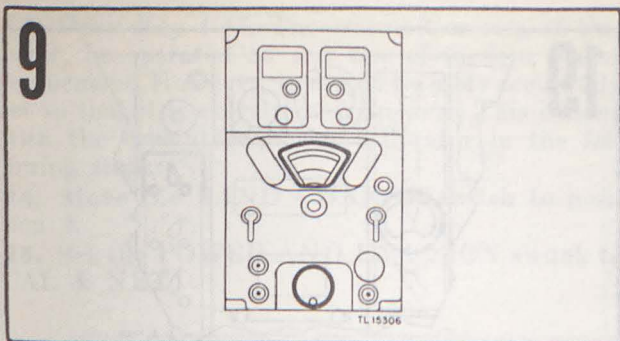


7. Turn the BAND CHANGE switch to position A to set up the first frequency. This places into service all circuit components necessary for transmission on the A channel.

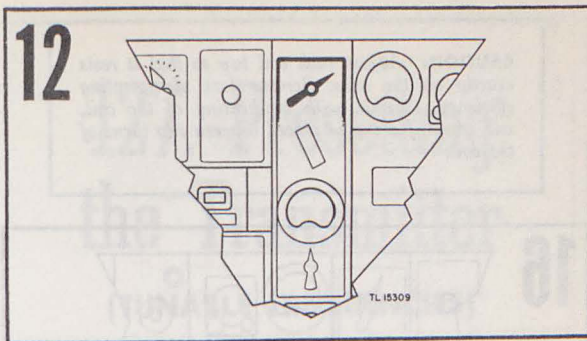
8. Throw the METER SW to IPA PL and turn the POWER AND EMISSION switch to CAL & NET. This starts the dynamotor, turns on the p-a filaments, and applies plate voltage to the m-o and i-p-a tubes. The m-o and i-p-a stages function at this point, but the screen grids of the p-a tubes are given negative bias when the POWER AND EMISSION switch is at CAL & NET. This prevents the p-a stage from amplifying the signal from the preceding stages. The receiver, as a result, picks up the relatively weak signals from the master oscillator instead of the very strong p-a signal.



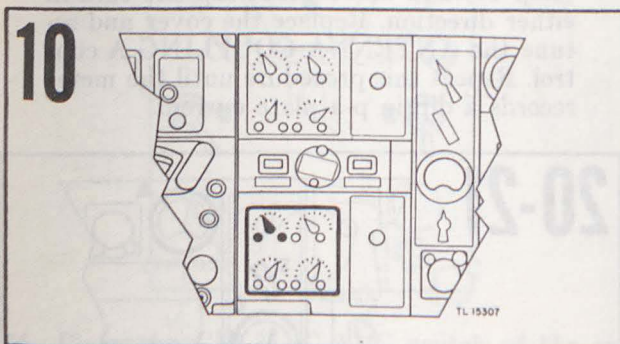
5. Remove the IPA COILS PRESET FREQUENCIES cover plate. There are four intermediate p-a coil links, marked A, B, C, and D, corresponding to the four preset frequencies. Adjust the four links in the i-p-a stage to match the LF or HF positions of the m-o coil links.



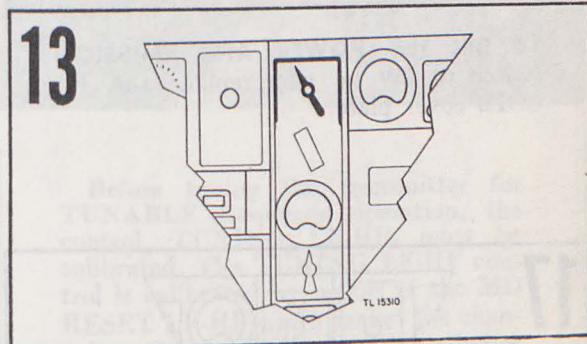
9. Adjust the receiver for c-w reception (par. 37). Set the receiver **TUNING** dial to the corresponding transmitter channel or frequency.



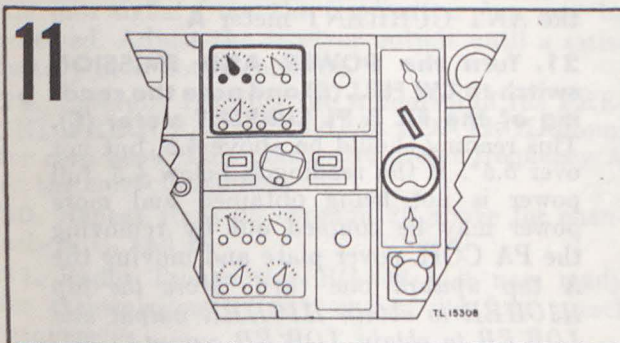
12. Repeat the m-o frequency setting (steps 7 to 11) and the i-p-a tuning for frequencies B, C, and D. Reset the **BAND CHANGE** switch for each channel.



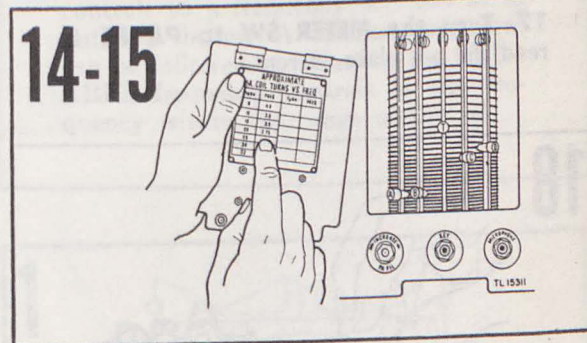
10. Rotate the PRESET FREQUENCIES FREQ. CONTROL A until zero beat is heard. A zero beat indicates that the master oscillator is correctly set to the A channel.



13. Set the BAND CHANGE switch to A as the first step in resonating the power amplifier and the antenna. These two circuits are combined (fig. 87).



11. Adjust the PRESET FREQUENCIES IPA TUNING control until resonance is reached with the master oscillator. This resonant point is indicated by a minimum **FIL & PL CURRENT** meter reading (**POWER AND EMISSION** switch in the **CAL & NET** position). The intermediate power amplifier is now tuned on the A channel.

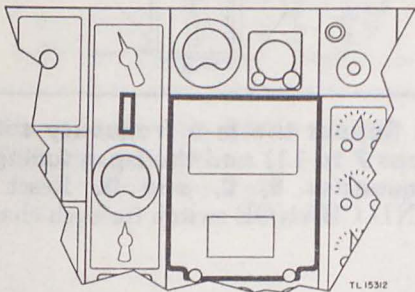


14. Remove the PA COIL cover plate. On the reverse side will be found a chart, **APPROXIMATE P.A. COIL TURNS VS. FREQ.** Refer to this chart in determining the approximate settings for the p-a coil taps.

15. Set only the four taps marked A, B, C, and D. In this preliminary setting, use the chart values. Pull the sliders toward you to release them.

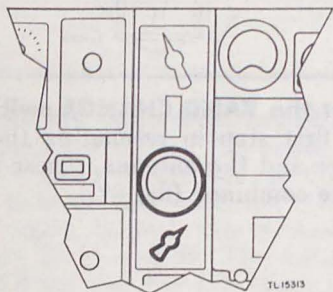
CAUTION: Adjust each coil tap so that it rests exactly on the wire. Serious loss of operating efficiency, together with overheating of the coil, will result if a tap is placed between two turns of the coil.

16



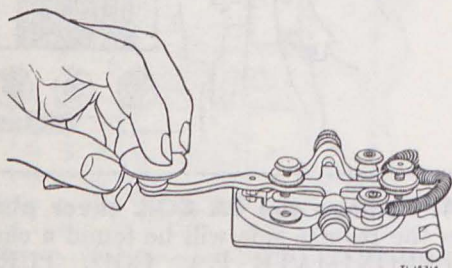
16. Set the **POWER AND EMISSION** switch to **CW 1/4** and replace the **PA COIL** cover plate.

17



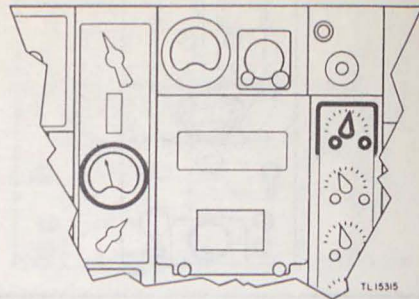
17. Turn the **METER SW** to **PA PL** to read the p-a plate current.

18



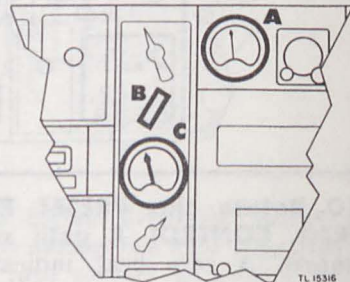
18. Insert the plug of **Key J-45** into the **KEY** jack, and close the key.

19



19. Adjust the **PRESET FREQUENCIES ANTENNA COUPLING** control **A** until a definite dip occurs in the reading of the **FIL & PL CURRENT** meter. If no dip occurs, remove the **PA COIL** cover plate (step 14) and move the **A** tap one turn in either direction. Replace the cover and return the **ANTENNA COUPLING A** control. Repeat this procedure until the meter records a dip in p-a plate current.

20-21



20. When **minimum plate current has been obtained**, the transmitter will emit a steady c-w signal which will register on the **ANT CURRENT** meter **A**.

21. Turn the **POWER AND EMISSION** switch to **CW FULL (B)** and note the reading of the **FIL & PL CURRENT** meter **(C)**. This reading should be above 4.5, but not over 5.5*. If the reading is below 4.5, full power is not being obtained and more power may be coupled out by removing the **PA COIL** cover plate and moving the **A** tap *upward* one turn. Move the tap **HIGHER** to obtain **HIGHER** output and **LOWER** to obtain **LOWER** output.

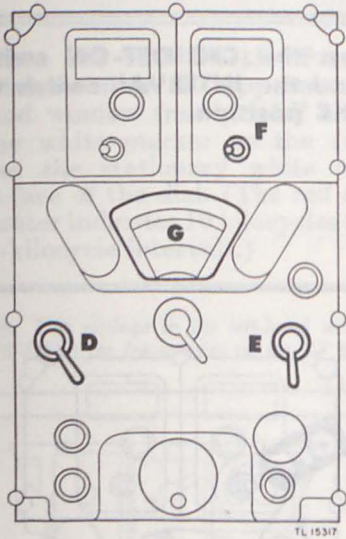
* These readings are based on an exact supply voltage of 12.0 or 24.0 volts. A slightly higher or lower supply voltage will cause a correspondingly higher or lower reading.

22. Repeat the tuning procedure (steps 13 to 21) for frequencies **B, C, and D**. Make the preliminary tap setting of the p-a coil at **CW 1/4**. Adjust the final coil tap positions at **CW FULL**.

23. Open Key J-45. The transmitter can, at this point, be operated on any one of its four preset frequencies. However, it should be more accurately set so that it is exactly on frequency. This is done with the crystal-frequency calibrator in the following steps:

24. Move the BAND CHANGE switch to position A.

25. Set the POWER AND EMISSION switch to CAL & NET.



26. Place the CW-MVC-AVC switch of the receiver at MVC **D**.

27. Throw the receiver CFC ON-OFF switch ON **E**, and set the INTERVAL SWITCH to 20 KC **F**.

28. Set the receiver tuning dial for the A frequency **G**. This frequency must be a multiple of 20, such as 2,500, 4,220, 4,400. Both the harmonic from the crystal-frequency calibrator and the m-o signal from the transmitter can now be received. Adjust the receiver output until a satisfactory beat note is audible.

29. Carefully readjust the A control of the PRESET FREQUENCIES FREQ. CONTROL group for zero beat. This places the preset frequency A on the correct channel.

30. Repeat steps 23 through 29 above for channels B, C, and D.

31. Radio Transmitter BC-653-A is now ready for transmission to any one of its four preset frequencies.

32. Check the operation of the transmitter. With Key J-45 closed, set the BAND CHANGE switch successively to A, B, C, and D*, noting the antenna current with the POWER AND EMISSION switch at CW FULL. Antenna current varies with the frequency and the type of vehicle in which the set is installed. However, the antenna current should be not less than 3 amperes on CW FULL.

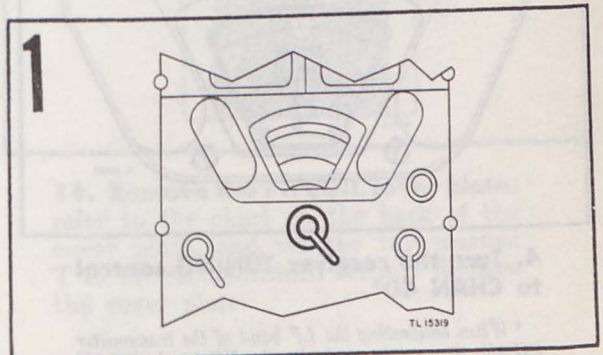
* No harm will be done to the controls of the BAND CHANGE switch when it is turned under full-power key-locked conditions. An interlock opens the keying relay circuit between switch positions.

127. Presetting the Transmitter

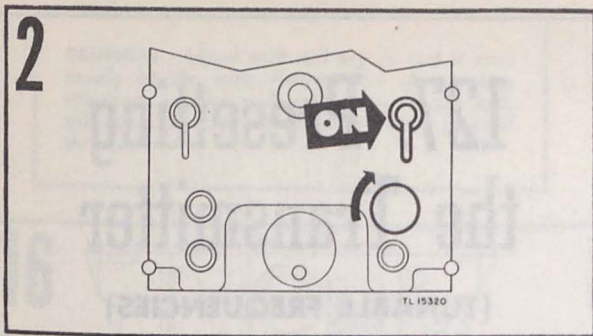
(TUNABLE FREQUENCIES)



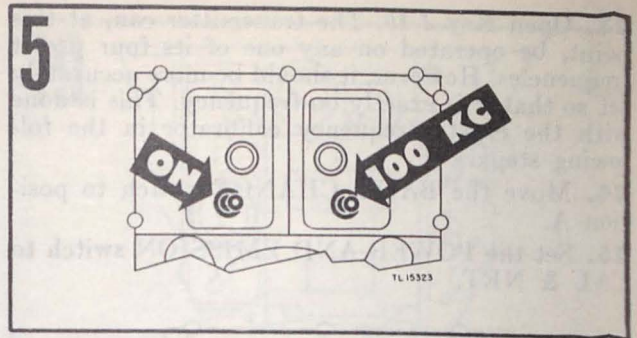
Before tuning the transmitter for TUNABLE frequency operation, the control, TUNING LF-HF, must be calibrated. The TUNING LF-HF control is calibrated by means of the MO RESET LF-HF which makes the channel number appearing in either window of the TUNING LF-HF control correspond to the exact frequency that the channel number represents. The crystal-frequency calibrator, the receiver, and the MO RESET LF-HF control are all used in the calibration of the TUNING LF-HF control. The procedure for correctly setting the TUNABLE frequency controls to a frequency of 2,500 kc is outlined below. A similar procedure can be followed in adjusting the TUNABLE frequency controls to any frequency within the range of the set.



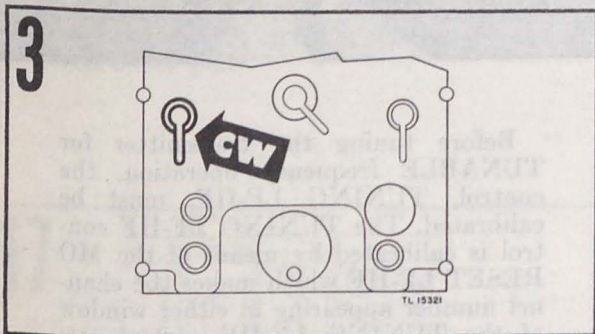
1. Turn the receiver BAND CHANGE switch to BAND 1.



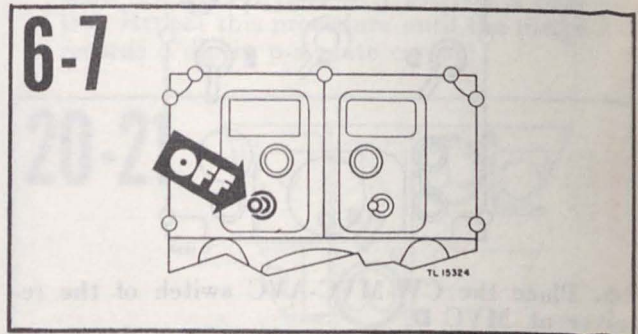
2. Turn the receiver OFF-ON switch to ON. Turn the INCREASE OUTPUT control clockwise to a maximum volume level.



5. Turn the CFC OFF-ON switch to ON and the INTERVAL switch to the 100 KC position.

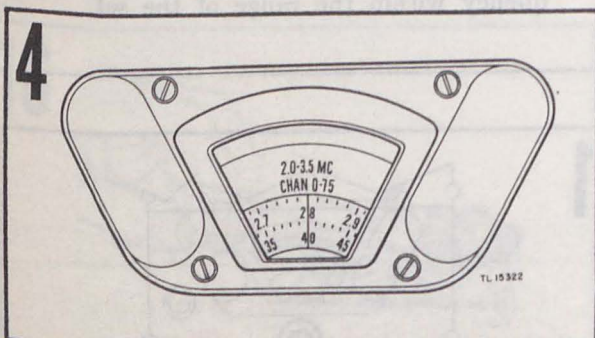


3. Set the CW-MVC-AVC switch at CW.



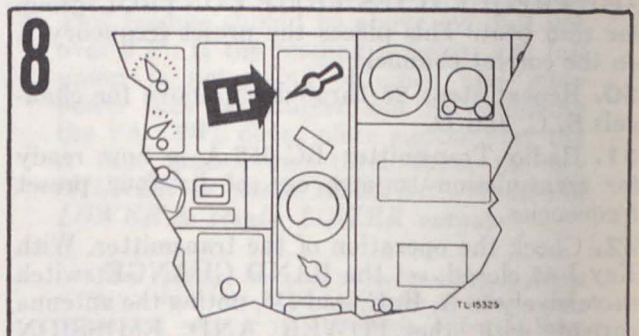
6. Zero-beat the receiver to the signal from the crystal-frequency calibrator.

7. Turn the CFC OFF-ON switch to OFF.



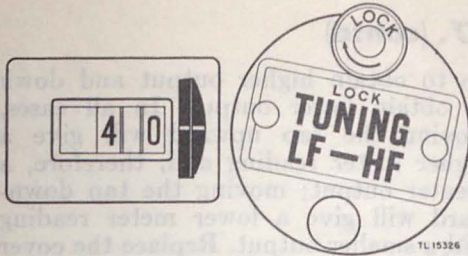
4. Turn the receiver TUNING control to CHAN 40*.

* When calibrating the LF band of the transmitter CHAN 40 must be used; for the HF band, CHAN 120 must be used. Do not attempt to calibrate the transmitter TUNING LF-HF controls on channels other than 40 and 120.



8. Set the BAND CHANGE switch on the transmitter to the LF position.

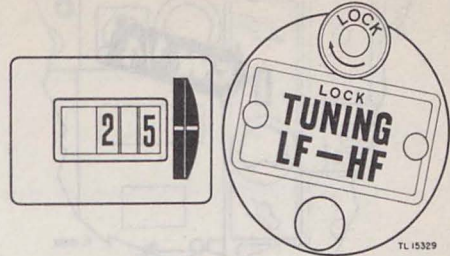
9



9. Rotate the **TUNING LF-HF** control until the number **40** appears in the left-hand window (marked LF 2-3MC) and the white marker on the counter matches the stationary white marker on the face of the dial. (The red dot on the counter indicates 10 kilocycles within the 20-kilocycle intervals.)

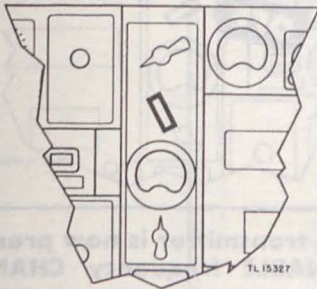
NOTE: Use settings in the left-hand window (LF 2-3MC) for frequencies in the LF band.

12



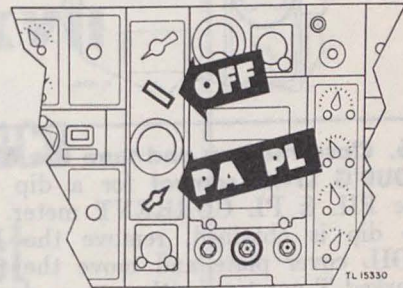
12. To operate on **2,500 kc (CHAN 25)**, rotate the **TUNING LF-HF** control until the number **25** appears in the left counter and the white indicating markers are lined up. This operation tunes both the master oscillator and the intermediate power amplifier, since in **TUNABLE** operation the capacitors for both of these stages are ganged.

10



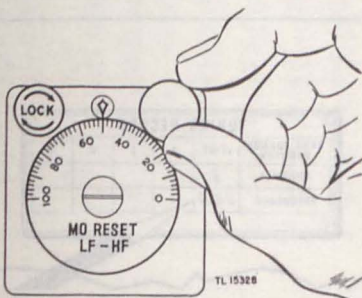
10. Set the **POWER AND EMISSION** switch to **CAL & NET**.

13



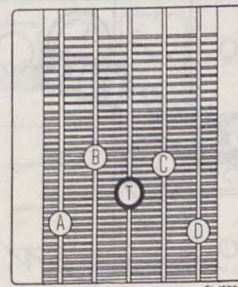
13. Turn the **POWER AND EMISSION** switch to **OFF**, set the **METER SW** to the **PA PL** position, and insert the plug for Key J-45 into the **KEY** jack.

11

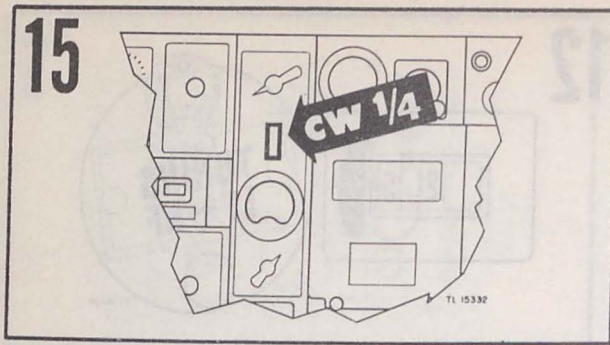


11. Rotate the **MO RESET LF-HF** control until the signal from the master oscillator zero-beats with the signal from the c-w oscillator in the receiver. This operation accurately calibrates the LF range of the **TUNING LF-HF** control. However, it is necessary to recalibrate on **CHAN 120** for frequencies in the HF band.

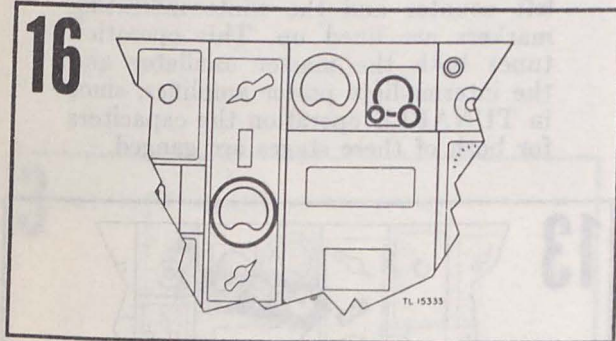
14



14. Remove the **PA COIL** cover plate, refer to the chart on the back of the cover plate, and set the tap marked **T** to the recommended setting. Replace the cover plate.



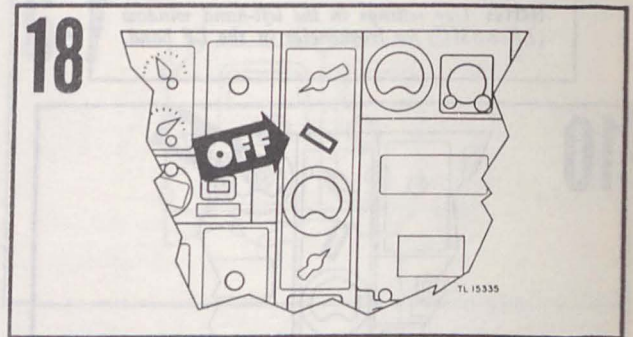
15. Turn the POWER AND EMISSION switch to CW 1/4.



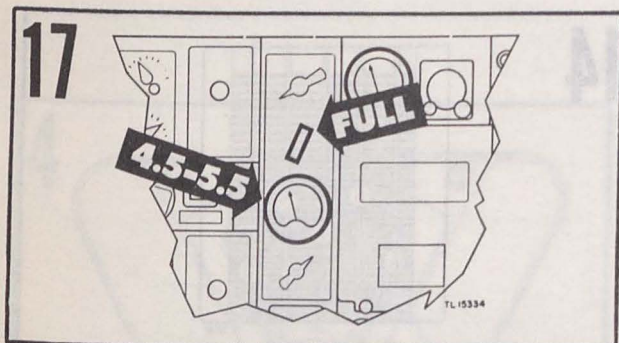
16. Close the key and tune the ANT COUP'G LF-HF control for a dip on the FIL & PL CURRENT meter. If no dip is obtained, remove the PA COIL cover plate and move the tap marked T one turn, either up or down. Replace the cover plate and again adjust the ANT COUP'G LF-HF control for a dip in PA PL current reading. Repeat the PA COIL tap and ANT COUP'G LF-HF setting procedure until a dip is observed.

17. (contd)

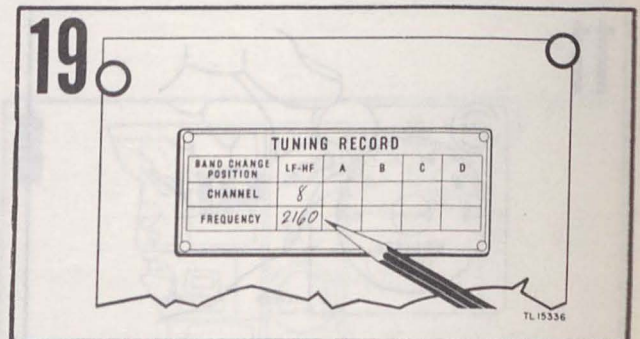
up to obtain higher output and down to obtain lower output. In all cases, moving the tap upward will give a higher meter reading and, therefore, a greater output; moving the tap downward will give a lower meter reading and a smaller output. Replace the cover and retune the ANT COUP'G LF-HF control for a dip on the FIL & PL CURRENT meter. Note whether the dip is within the limits of 4.5 to 5.5 on the FIL & PL CURRENT meter. The ANT CURRENT meter reading should have peaked as the other meter reading dipped; it should now be 3 amperes or more.



18. The transmitter is now preset on the TUNABLE frequency CHAN 25. Turn the POWER AND EMISSION switch to the OFF position.



17. Turn the POWER AND EMISSION switch to CW FULL and close the key. The reading on the plate-current meter should be between 4.5 and 5.5. If the meter reading is below 4.5, full power is not being obtained. Turn the POWER AND EMISSION switch OFF, remove the PA COIL cover plate and move the T tap up one turn. Move the tap



19. After Radio Transmitter BC-653-A has been completely preset and the dial controls are locked, place the two protective covers in position and screw them down. Fill out the TUNING RECORD chart on the front of the left protective cover.

Appendix

SECTION XVII

Maintenance Parts List

128. MAINTENANCE PARTS LIST FOR RADIO SET SCR-506-A.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2A224A	ANTENNA AN-24-A: (auxiliary).	1			*			*
	2A275-27	ANTENNA A-27-(): (phantom).	1			*	*	*	*
C258	3DA30-10	CAPACITOR: paper; 30,000-mm ² + 40% - 10%; 400 v dc (working); (for dynamotor).	1			*	*	*	*
C162	3DA15-7	CAPACITOR: mica; 15,000-mm ² = 10%; 2,500 v dc (working); (for dynamotor).	1			*	*	*	*
C167	3DB25-7	CAPACITOR: electrolytic; 25-mf + 200% - 10%; 50 v dc (working); (for dynamotor).	1			*	*	*	*
	2Z2651-421	CLAMP MC-421: (for Mast Section MS-49).	1	1	*	*			*
	2Z2651-422	CLAMP MC-422: (for Mast Section MS-50).	1	1	*	*			*
	2Z2651-423	CLAMP MC-423: (for Mast Section MS-51).	1	1	*	*			*
	2Z2651-424	CLAMP MC-424: (for Mast Section MS-52).	1	1	*	*			*
	3E1201	CORD CD-201: (for Key J-45).	1			*	*	*	*
	3E1307-5.5	CORD CD-307-A: 65" long; (for Headset HS-30).	2	1		*	*	*	*
	3E1314	CORD CD-314: (loudspeaker).				*	*	*	*
	3E1318	CORD CD-318: (control cord for Microphone T-45).				*	*	*	*
	3E1604	CORD CD-604: 6" long; (Headset HS-30-A).	2	1		*	*	*	*
	3E2076A	CORD CD-76-A: (Microphone T-17).	1			*			*
	6Z3147	CONNECTOR AND BOND NUT: (for power cord).	2			*			*
	2Z3367A	COVER BG-67-A: (for Mast Base Brackets MP-37 and MP-57).	1			*			*
	2B1567	COVER: Microphone M-367.	1	1		*	*	*	*
	3H1640	DYNAMOTOR DM-40-(): 12-volt; (for Radio Receiver BC-652).	1		*	*	*	*	*
	3H1642	DYNAMOTOR DM-42-(): 12-volt; (for Radio Transmitter BC-653).	1		*	*	*	*	*
	2A1355-40	GUY SET GY-40.	1		*	*	*	*	*
	2B830()	HEADSET HS-30-().	1		*	*	*	*	*

2B1900	INSERT M-300: (Headset HS-30-()).					*
2A224/1	INSTRUCTION BOOK: for installation of auxiliary Antenna AN-24-A.	1				*
3G586	INSULATOR IN-86.	3				*
2Z5533A	JACK JK-33-A: (loudspeaker).	1		*		*
3Z3445	KEY J-45.	1	1	*		*
2Z6303.1	LOUDSPEAKER LS-3.	1		*		*
2A2088-57	MAST BASE MP-57.	1		*		*
2A2349	MAST SECTION MS-49.	1	1	*		*
2A2350	MAST SECTION MS-50.	1	1	*		*
2A2351	MAST SECTION MS-51.	1	1	*		*
2A2352	MAST SECTION MS-52.	1	1	*		*
2A2353	MAST SECTION MS-53.	1	1	*		*
2B1617	MICROPHONE T-17.	1		*	*	*
2B1645	MICROPHONE T-45.	1		*	*	*
2Z6721-253	MOUNTING FT-253.	1		*		*
2C6530-653A	RADIO TRANSMITTER BC-653-A.	1		*		*
2Z8056A	ROLL BG-56-A: (for mast sections).	1		*		*
6Z7926	ROPE RP-5: (for auxiliary antenna and for tying down mast sections).	50 ft		*		*
2B1589/1	SHIELD: breath; (Microphone T-45).	1		*		*
3Z8109	SWITCH SW-109: (Microphone T-17).	1		*		*
2A3400	TERMINAL: antenna; (for Antenna AN-24-A).	1		*		*
2Z6303.1/2	TRANSFORMER: (used with Loudspeaker LS-3).	1		*		*
1B146	WIRE W-146: (for antenna ground leads).	15 ft		*		*
	ADD FOR INSTALLATION IN LIGHT TANK M3A3					
6D15325-V25	INSTRUCTIONS: installation.	1		*		*
3G598	INSULATOR IN-98: (stand-off).	2		*		*
2C7978B	SWITCH BOX BC-658-().	1		*	*	*

* Indicates stock available.

128. MAINTENANCE PARTS LIST FOR RADIO SET SCR-506-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
		ADD FOR INSTALLATION IN LIGHT TANK M5							
	6D15025-V4	INSTRUCTIONS: installation.	1						*
	3G598	INSULATOR IN-98: (stand-off).	2		*	*			*
	2C7978B	SWITCH BOX BC-658-().	1		*	*	*		*
		ADD FOR INSTALLATION IN LIGHT TANK M5A1							
	6D15200-V24	INSTRUCTIONS: installation.	1						*
	3G598	INSULATOR IN-98: (stand-off).	2		*	*			*
	2C7978A	SWITCH BOX BC-658-().	1		*	*	*		*
		ADD FOR INSTALLATION IN LIGHT ARMORED CAR M8 (T22)							
	2Z3400-103	COVER BG-103.	1		*	*			*
	6D15375-V17	INSTRUCTIONS: installation.	1						*
	3G598	INSULATOR IN-98.	2		*	*			*
	3G621	INSULATOR IN-121.	2		*	*			*
	2C7978	SWITCH BOX BC-658-().	1		*	*	*		*
		ADD FOR INSTALLATION IN CAR HALF TRACK M2							
	6Z3147	CONNECTOR AND BOND NUT.	2						*
	3E1307-5.5	CORD CD-307.	1		*	*	*	*	*
	3E1604	CORD CD-604.	1		*	*	*	*	*
	2Z3400-103	COVER BG-103.	1		*	*	*	*	*
	2B850	HEADSET HS-30.	1		*	*	*	*	*
	6D15050-V10	INSTRUCTIONS: installation	1						*
	3G598	INSULATOR IN-98.	2		*	*	*	*	*
	3G1350-28	INSULATOR: (used with Mast Base Bracket MP-52).	3				*	*	*
	2A2090-52	MAST BASE BRACKET MP-52: (2 in use).	1				*	*	*
	2Z6721-285	MOUNTING FT-285.	1		*	*	*	*	*

2B1300	INSERT M-300: (Headset HS-30-()).	2	*	*	*	*
6Z3147	ADD FOR INSTALLATION IN PERSONNEL CARRIER 1/2 TRACK M3 CONNECTOR AND BOND NUT.	2	*	*	*	*
3E1307-5.5	CORD CD-307.	1	*	*	*	*
3E1604	CORD CD-604.	1	*	*	*	*
2Z3400-103	COVER BG-103.	1	*	*	*	*
2B880	HEADSET HS-30.	1	*	*	*	*
6D15150-V12	INSTRUCTIONS: installation.	1	*	*	*	*
3G1350-28	INSULATOR: (used with Mast Base Bracket MP-52).	3	*	*	*	*
2B1300	INSERT M-300.	1	*	*	*	*
2A2090-52	MAST BASE BRACKET MP-52.	1	*	*	*	*
2Z6721-284	MOUNTING FT-284.	1	*	*	*	*
2Z1246-2	ADD FOR INSTALLATION IN SCOUT CAR M3A1 BRACKET: (for Cabinet CH-74-A); SC-A-8638.	1	*	*	*	*
3E1307A-4	CORD CD-307-A: 48" long; (for Headset HS-30).	1	*	*	*	*
3E1604	CORD CD-604	1	*	*	*	*
2Z3400-103	COVER BG-103.	1	*	*	*	*
2B880	HEADSET HS-30.	1	*	*	*	*
6D15275-V13	INSTRUCTIONS: installation.	1	*	*	*	*
3G1350-28	INSULATOR: (for Mast Base Bracket MP-52).	3	*	*	*	*
2A2090-52	MAST BASE BRACKET MP-52.	1	*	*	*	*
2Z6721-326	MOUNTING FT-326.	1	*	*	*	*
2B1300	INSERT M-300: (Headset HS-30-()).	2	*	*	*	*
3E1307A-4	ADD FOR INSTALLATION IN TRUCK 3/4-TON, 4 x 4 CARRYALL CORD CD-307-A.	1	*	*	*	*
3E1604	CORD CD-604.	1	*	*	*	*
2Z3400-103	COVER BG-103.	1	*	*	*	*
2Z4643	FRAME FM-43.	1	*	*	*	*

* Indicates stock available.

128. MAINTENANCE PARTS LIST FOR RADIO SET SCR-506-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
2B880		HEADSET HS-30.	1			*	*	*	*
2B1300		INSERT M-300: (Headset HS-30-()).	2		*	*	*	*	*
6D15100-V14		INSTRUCTIONS: installation.	1						
3G601		INSULATOR IN-101.	1						
		ADD FOR INSTALLATION IN TRUCK 3/4-TON 4 x 4 COMMAND CAR.							
2Z299-471		ADAPTER KIT MC-471	1		*	*	*	*	*
3E1307-4		CORD CD-307-A	1		*	*	*	*	*
3E1640		CORD CD-604.	1		*	*	*	*	*
2Z3400-103		COVER BG-103.	1		*	*	*	*	*
2B880		HEADSET HS-30.	1		*	*	*	*	*
2B1300		INSERT M-300: (Headset HS-30).	2		*	*	*	*	*
3G604		INSULATOR IN-104.	4		*	*	*	*	*
6D15175-V15		INSTRUCTIONS: installation.	1						
3G601		INSULATOR IN-101.	1		*	*	*	*	*
2S506A/S1		SCREWS, NUTS, AND LOCKWASHERS.	1 kit		*	*	*	*	*
2Z6721-285		MOUNTING FT-285.	1		*	*	*	*	*
		ADD FOR INSTALLATION IN TRUCK 1/4-TON 4 x 4 AMPHIBIAN							
3E1307A-4		CORD CD-307-A: 48" long; (for headset).	1		*	*	*	*	*
3E1604		CORD CD-604.	1		*	*	*	*	*
2Z3400-103		COVER BG-103	1		*	*	*	*	*
2B880		HEADSET HS-30.	1		*	*	*	*	*
2B1300		INSERT M-300: (Headset HS-30).	2		*	*	*	*	*
6D15300-V11		INSTRUCTIONS: installation.	1		*	*	*	*	*
2A2088-58		MAST BASE BRACKET MP-58.	1		*	*	*	*	*

ADD FOR INSTALLATION IN ARMORED UTILITY CAR M20

3E1307-5.5	CORD CD-307.	2	*	*	*	*
3E1604	CORD CD-604.	2	*	*	*	*
2B830	HEADSET HS-30.	1	*	*	*	*
6D15425-V63	INSTRUCTIONS: installation.	1	*	*	*	*
3G598	INSULATOR IN-98: (4 in use, 1 spare).	4	*	*	*	*
3G621	INSULATOR IN-121: (2 in use, 1 spare).	2	*	*	*	*
2B1300	INSERT M-300: (Headset HS-30).	2	*	*	*	*
	ADD FOR INSTALLATION IN CAR, HALF-TRACK M2A1					
6Z3147	CONNECTOR AND BOND NUT: (for power cord)	2	*	*	*	*
3E1307-5.5	CORD CD-307.	2	*	*	*	*
3E1604	CORD CD-604.	1	*	*	*	*
2B830	HEADSET HS-30.	1	*	*	*	*
2B1300	INSERT M-300: (Headset HS-30).	2	*	*	*	*
6D15110-V77	INSTRUCTIONS: installation.	1	*	*	*	*
3G1350-28	INSULATOR: (used with Mast Base Bracket MP-52).	3	*	*	*	*
2A2090-52	MASS BASE BRACKET MP-52.	1	*	*	*	*
2Z6721-285	MOUNTING FT-285.	1	*	*	*	*
	ADD FOR INSTALLATION IN CARRIER, PERSONNEL, HALF-TRACK M5					
2Z1250.21	BRACKET: (for Mounting FT-285).	1	*	*	*	*
3E1604	CORD CD-604.	1	*	*	*	*
3E1307-5.5	CORD CD-307.	1	*	*	*	*
2Z3400-103	COVER BG-103.	1	*	*	*	*
2B830	HEADSET HS-30.	1	*	*	*	*
2B1300	INSERT M-300: (Headset HS-30).	2	*	*	*	*
6D14200-V27	INSTRUCTIONS: installation.	1	*	*	*	*
3G1350-28	INSULATOR: (used with Mast Base Bracket MP-52).	3	*	*	*	*
2A2090-52	MASS BASE BRACKET MP-52.	1	*	*	*	*

* Indicates stock available.

128. MAINTENANCE PARTS LIST FOR RADIO SET SCR-506-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
2Z6721-284		MOUNTING FT-284. (for Cabinet CH-74-A).	1			*			*
		ADD FOR INSTALLATION IN CARRIER, PERSONNEL, HALF-TRACK M5A1							
3E1807-5.5		CORD CD-307.	1			*		*	*
3E1604		CORD CD-604.	1			*	*	*	*
2Z3400-103		COVER BG-103.	2			*	*	*	*
2B880		HEADSET HS-30.	1			*	*	*	*
2B1300		INSERT M-300: (Headset HS-30).	2		*	*	*	*	*
6D15105-V67		INSTRUCTIONS: installation	1			*			*
3G1350-28		INSULATOR: (used with Mast Base Bracket MP-52).	3			*	*	*	*
2A2090-52		MAST BASE BRACKET MP-52.	1			*	*	*	*
2Z6721-284		MOUNTING FT-284. (for Cabinet CH-74-A).	1			*			*
		ADD FOR INSTALLATION IN CAR, HALF-TRACK M9A1							
2Z1250.21		BRACKET: (for Mounting FT-285).	1			*			*
3E1807-5.5		CORD CD-307.	1			*		*	*
3E1604		CORD CD-604.	1			*	*	*	*
2Z3400-103		COVER BG-103.	2			*	*	*	*
2B880		HEADSET HS-30.	1			*	*	*	*
2B1300		INSERT: (Headset HS-30).	2		*	*	*	*	*
6D15600-V60		INSTRUCTIONS: installation.	1			*			*
3G1350-28		INSULATOR: (used with Mast Base Bracket MP-52).	3			*	*	*	*
3G621		INSULATOR IN-121.	2			*	*	*	*
2A2090-52		MAST BASE BRACKET MP-52.	1			*	*	*	*
2Z6721-285		MOUNTING FT-285.	1			*			*
		ADD FOR INSTALLATION IN CARRIER, PERSONNEL, HALF-TRACK M5A1							
3E1807-5.5		CORD CD-307.	1			*	*	*	*

3E1604	CORD CD-604.	1	*	*	*	*	*	*	*
2Z3400-103	COVER BG-103.	1	*	*	*	*	*	*	*
2B830	HEADSET HS-30.	1	*	*	*	*	*	*	*
2B1800	INSERT M-300; (Headset HS-30).	2	*	*	*	*	*	*	*
6D15105-V68	INSTRUCTIONS: installation.	1	*	*	*	*	*	*	*
3G1250-28	INSULATOR: (used with Mast Base Bracket MP-52).	3	*	*	*	*	*	*	*
2A2090-52	MAST BASE BRACKET MP-52.	1	*	*	*	*	*	*	*
2Z6721-284	MOUNTING FT-284. (for Cabinet CH-74-A).	1	*	*	*	*	*	*	*
SECTION II									
3H1640A/B10	BRUSH: (high- and low-voltage; Dynamotor DM-40).	2	*	*	*	*	*	*	*
3H1643A/B12	BRUSH: (high- and low-voltage; Dynamotor DM-42).	2	*	*	*	*	*	*	*
2Z5952	LAMP LM-52; Mazda No. 47.	5	*	*	*	*	*	*	*
2Z5954	LAMP LM-54; GE Co, No. NE2.	1	*	*	*	*	*	*	*
2J807	TUBE JAN-807; (VT-100).	1	*	*	*	*	*	*	*
2J6C7	TUBE JAN-6AC7; (VT-105).	2	*	*	*	*	*	*	*
2J12SK7	TUBE JAN-12SK7; (VT-131).	2	*	*	*	*	*	*	*
2J12K8	TUBE JAN-12K8; (VT-132).	2	*	*	*	*	*	*	*
2J12SR7	TUBE JAN-12SR7; (VT-133).	1	*	*	*	*	*	*	*
2J814	TUBE JAN-814; (VT-154).	2	*	*	*	*	*	*	*
2J6K8	TUBE JAN-6K8; (VT-167).	1	*	*	*	*	*	*	*
2J6Y6G	TUBE JAN-6Y6G; (VT-168A).	1	*	*	*	*	*	*	*
2J12C8	TUBE JAN-12C8; (VT-169).	1	*	*	*	*	*	*	*
2J1613	TUBE JAN-1613; (VT-175).	2	*	*	*	*	*	*	*
2JVR-105-30	TUBE JAN-VT-105-30; (VT-200)	2	*	*	*	*	*	*	*
2J12SG7	TUBE JAN-12SG7; (VT-209).	1	*	*	*	*	*	*	*

129. MAINTENANCE PARTS LIST FOR RADIO TRANSMITTER BC-653-A.

C100	3D9200-21	CAPACITOR: mica; 200-mmf \pm 10%; 500 v dc (working).	1	*	*	*	*	*	*
C101	3D9045V	CAPACITOR: variable; air; 250-mmf max, 45-mmf or less min; 1,750 v rms test; 60-cycle. See also C102, C103, and C104.	4	*	*	*	*	*	*

* Indicates stock available.

129. MAINTENANCE PARTS LIST FOR RADIO TRANSMITTER BC-653-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
C102		CAPACITOR: same as C101.							
C103		CAPACITOR: same as C101.							
C104		CAPACITOR: same as C101.							
C105	3D9015V-7	CAPACITOR: variable; air; 277.7- to 283.3-mmF max, 15- to 25-mmF min; 1,750 v rms test.	1				*		*
C106	3D9006V	CAPACITOR: 40- to 45-mmF max, 6- to 9-mmF min; 1,750 v rms test; 60-cycle.	1			*	*	*	*
C107	3D9004V-1	CAPACITOR: variable; air; 24- to 28-mmF max, 4- to 6-mmF min.	1			*	*	*	*
C108	3D9028	CAPACITOR: 28-mmF \pm 1 mmF.	1			*	*	*	*
C109	3D9070	CAPACITOR: silver mica; 70-mmF \pm 5%; 250 v dc (working).	1			*	*	*	*
C110	3DA5-22	CAPACITOR: mica; 5,000-mmF \pm 10%; 300 v dc (working). See also C146, C147, and C172.	4			*	*	*	*
C111	3D9500-45	CAPACITOR: mica; 500-mmF \pm 2%; 2,500 v dc (working).	1			*	*	*	*
C112	3DA2-57	CAPACITOR: mica; 2,000-mmF \pm 5%; 500 v dc (working).	1			*	*	*	*
C113	3DA5-23	CAPACITOR: mica; 5,000-mmF \pm 10%; 600 v dc (working). See also C125, C127, C128, and C148.	3			*	*	*	*
C114	3D9025-19	CAPACITOR: silver mica; 25-mmF \pm 5%; 250 v dc (working). See also C115, C116, and C117.	4			*	*	*	*
C115		CAPACITOR: same as C114.							
C116		CAPACITOR: same as C114.							
C117		CAPACITOR: same as C114.							
C120	3DA5-21	CAPACITOR: mica; 5,000-mmF \pm 10%; 600 v dc (working).	1			*	*	*	*
C121	3D9025V-13	CAPACITOR: variable; air; 180-mmF max, 25-mmF or less min. See also C122, C123, and C124.	4			*	*	*	*
C122		CAPACITOR: same as C121.							

129. MAINTENANCE PARTS LIST FOR RADIO TRANSMITTER BC-653-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
C165	SDB1.6100B	CAPACITOR: oil-filled; 1-mf; 600 v dc (working); (metal can).	1			*	*	*	*
C168	3DA20-21	CAPACITOR: mica; 20,000-mmf \pm 10%; 300 v dc (working).	1			*	*	*	*
C169	3DA25-5	CAPACITOR: paper; 25,000-mmf \pm 10%; 400 v dc (working).	1			*	*	*	*
C170	3DA50-25	CAPACITOR: paper; 50,000-mmf \pm 20% - 10%; 600 v dc (working). See also C171.	2			*	*	*	*
C171		CAPACITOR: same as C170.							
C172		CAPACITOR: same as C110.							
C180	SDB1.017	CAPACITOR: 1-mf; 500 v dc (working); (pyranol)	1			*	*	*	*
C182	SDB25-7	CAPACITOR: electrolytic; 25-mf \pm 200%. - 10%; 50 v dc (working).	1			*	*	*	*
C183	3D9100-50	CAPACITOR: mica; 100-mmf \pm 10%; 500 v dc (working).	1			*	*	*	*
F160	3Z1943	FUSE FU-43: 10-amp, 25-v. See also F161.	2		*	*	*	*	*
F161		FUSE FU-43: same as F160.							
F163	3Z1912A	FUSE FU-12A: 1/2-amp, 1,000-v. See also F164.	2		*	*	*	*	*
F164		FUSE FU-12A: same as F163.							
J160	2Z5534A	JACK JK-34-A: (for key).	1			*	*	*	*
J162	2C6530-653A/J9	JACK: dynamotor.	1			*	*	*	*
J163	2C6530-653A/10	JACK: dynamotor.	1			*	*	*	*
J180	2Z5533A	JACK JK-33-A: (microphone).	1			*	*	*	*
K160	2Z7648	RELAY: dynamotor.	1			*	*	*	*
K161	2C6530-653A/R1	RELAY: keying; (6-contact; antenna switching, and interlock relay).	1			*	*	*	*
L100	2C6530-653A/C15	COIL: and terminal board assembly; 8-link. See also L101.	1			*	*	*	*
L101		COIL: same as L100.							

L102	3C319	COIL: r-f choke. See also L103, L122, L140, L141, L142, L160, and L161.	8	*	*	*	*	*
L103		COIL: same as L102.						*
L120	2C6530-653A/C16	COIL: and terminal board assembly; 4-link. See also L121.	1					*
L121		COIL: same as L120.						*
L122		COIL: same as L102.						*
L140		COIL: same as L102.						*
L141		COIL: same as L102.						*
L142		COIL: same as L102.						*
L143	2C6530-653A/C6	COIL: tank; (power amplifier).	1					*
L144	2C6530-653A/C7	COIL: choke; (antenna drain).	1					*
L145	2C6530-653A/C8	COIL: loading; (antenna).	1					*
L160		COIL: same as L102.						*
L161		COIL: same as L102.						*
L180	2C6530-653A/C10	COIL: and capacitor; (microphone filter). See also L184.	1					*
L184	2C6530-653A/C15	COIL: same as L180.						*
M120	3F7383	VOLTMETER IS-183: 15-volt; d-c; 3,800-ohm; 2 1/2" flush mounting.	1					*
M140	3F382	AMMETER: IS-182: r-f; 0.6-amp; with internal thermocouple; 2 1/2" flush mounting; (substitute standard meter MR25W005RFAA with spacer B; stock number 3F3908-22).	1					*
P161	2C6530-653A/T3	PLUG: male; (terminal-board, transmitter; 13-prong; connects transmitter to mounting).	1					*
R100	3Z6622-1	RESISTOR: metallized; 22,000-ohm = 10%; 2-watt. See R120 and R122.	3					*
R101	3Z6580-4	RESISTOR: wire-wound; 8,000-ohm = 10%; 4-watt.	1					*
R102	3Z6470-3	RESISTOR: metallized; 4,700-ohm = 10%; 1-watt.	1					*
R120		RESISTOR: same as R100.						*
R121	3Z5995-6	RESISTOR: wire-wound; 5-ohm = 10%; 5-watt. See also R123 and R179.	3					*
R122		RESISTOR: same as R100.						*

* Indicates stock available.

129. MAINTENANCE PARTS LIST FOR RADIO TRANSMITTER BC-653-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
R123		RESISTOR: same as R121.							
R124	SZ6039-1	RESISTOR: wire-wound; 390-ohm \pm 10%; 2-watt.	1			*	*	*	*
R140	SZ6400-19	RESISTOR: wire-wound; 4,000-ohm \pm 5%; 4-watt.	1			*	*	*	*
R143	SZ6656-2	RESISTOR: metallized; 56,000-ohm \pm 10%; 2-watt.	1			*	*	*	*
R144	SZ6001E10	RESISTOR: wire-wound; 15-ohm \pm 10%; 1/2-watt.	1			*	*	*	*
R160	SZ5425-2	RESISTOR: wire-wound; 2,500-ohm \pm 5%; 25-watt.	1			*	*	*	*
R161	SZ5450-6	RESISTOR: wire-wound; 5,000-ohm \pm 5%; 25-watt. See also R164.	2			*	*	*	*
R162	SZ5431A5	RESISTOR: wire-wound; 3,150-ohm \pm 5%; 25-watt. See also R163.	2			*	*	*	*
R163		RESISTOR: same as R162.							
R164		RESISTOR: same as R161.							
R165	SZ4815-1	RESISTOR: wire-wound; 15-ohm \pm 5%; 5-watt.	1			*	*	*	*
R166	SZ4607	RESISTOR: wire-wound; 7-ohm \pm 2%; 20-watt.	1			*	*	*	*
R168	SZ7001-4	RHEOSTAT: dual; wire-wound; 1.3 ohm each \pm 10%; 4.2-amp. See also R169.	1			*	*	*	*
R169		RHEOSTAT: part of R168.							
R170	SZ6240-6	RESISTOR: wire-wound; 2,400-ohm \pm 5%; 1-watt	1			*	*	*	*
R171	SZ4825-2	RESISTOR: wire-wound; 25-ohm \pm 5%; 8-watt.	1			*	*	*	*
R172	SZ6016	RESISTOR: wire-wound; 160-ohm \pm 5%; 1-watt.	1			*	*	*	*
R173	SZ4816	RESISTOR: wire-wound; 16-ohm \pm 5%; 20-watt.	1			*	*	*	*
R174	SZ5994	RESISTOR: wire-wound; 4.7-ohm \pm 10%; 1-watt.	1			*	*	*	*
R175	SZ5460-1	RESISTOR: wire-wound; 6,000-ohm \pm 5%; 20-watt.	1			*	*	*	*
R176	SZ4960	RESISTOR: wire-wound; 160-ohm \pm 5%.	1			*	*	*	*
R177	SZ7222E5	RHEOSTAT: wire-wound; 225-ohm \pm 10%; 0.394-amp.	1			*	*	*	*
R178	SZ6003J1-1	RESISTOR: wire-wound; 30-ohm \pm 10%; 2-watt.	1			*	*	*	*

129. MAINTENANCE PARTS LIST FOR RADIO TRANSMITTER BC-653-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
T180	2C6530-653A/T4	TRANSFORMER: modulation.	1			*	*	*	*
T181	2C6530-653A/T3	TRANSFORMER: microphone.	1			*	*	*	*
X100	2C6530-653A/S1	SOCKET: tube (for VT-175).	1			*	*	*	*
X120	2Z8781	SOCKET: 5-prong; glazed; ceramic. See also X140 and X141.	3			*	*	*	*
X140		SOCKET: same as X120.							
X141		SOCKET: same as X120.							
X142	2C6530-653A/S5	SOCKET: pilot lamp; bayonette. See also X143.	2			*	*	*	*
X143		SOCKET: same as X142.							
X160	2Z8678.62	SOCKET: octal-tube. See also X161 and X180.	3			*	*	*	*
X161		SOCKET: same as X160.							
X162	2C6530-653A/S7	SOCKET: pilot light; (black moulded).	1			*	*	*	*
X180		SOCKET: same as X160.							
	2C6530-653A/M8	BINDING POST ASSEMBLY: (for connection between transmitter and receiver).	1			*	*	*	*
	2C4452A/B1	BINDING POST ASSEMBLY: (receiving antenna).	1			*	*	*	*
	3Z770-3	BINDING POST ASSEMBLY: (transmitter antenna).	1			*	*	*	*
	2Z2724	CAP: tube-plate; tube top cap connector.	1			*	*	*	*
	3H1642A/C1	CARTRIDGE: fiber glass, (air filter).	1			*	*	*	*
	2Z2642.20	CLAMP ASSEMBLY: left-hand; (tube locking).	2			*	*	*	*
	2Z2642.21	CLAMP ASSEMBLY: right-hand; (tube locking).	1			*	*	*	*
	3Z1023	CLIP: fuse; (for FU-43).	4			*	*	*	*
	3Z1013.1	CLIP: fuse; (for FU-12A*).	4			*	*	*	*
	2Z3270-11	COUPLING: steel; flexible.	1			*	*	*	*
	2C6530-653A/D2	DOOR: (covers intermediate power-amplifier coil links).	1			*	*	*	*
	2C6530-653A/D1	DOOR: (covers m-o coil links).	1			*	*	*	*

6G2190	GLYPHAL: can; 1/4 pint; No. 1153.	1	*	*	*	*	*
2C6530-653A/J8	INSULATOR: ceramic; (for receiver binding post).	2	*	*	*	*	*
2C6530-653A/J7	INSULATOR: ceramic; (for transmitter binding post).	1	*	*	*	*	*
2C6530-653A/J1	INSULATOR: ceramic post; (7/8" long x 3/8" square; capacitor mounting).	4	*	*	*	*	*
2C6530-653A/J2	INSULATOR: ceramic; post; (2 1/8" long x 3/8" square; marked R100 and C111; for capacitor and resistor mounting).	1	*	*	*	*	*
2C6530-653A/J4	INSULATOR: ceramic; glazed; post; (5/8" long x 1/2" diam; for mounting R140).	1	*	*	*	*	*
2C6530-653A/J3	INSULATOR: ceramic; post; (2 1/8" long x 3/8" square; marked R102; resistor mounting).	1	*	*	*	*	*
2C6530-653A/J5	INSULATOR: ceramic; glazed; shoulder type; (1/2" x 5/8" diam; (mounting for vitreous enamel resistors).	18	*	*	*	*	*
2C6530-653A/J6	INSULATOR: ceramic; glazed; shoulder type; (1/2" x 9/16" diam; mounting for resistor R185).	2	*	*	*	*	*
3G1200-32	INSULATOR: ceramic; ring; (2" OD by 1/4" thick).	1	*	*	*	*	*
3G1250-12.10	INSULATOR: ceramic; round post; (3/4" long x 5/8" diam; used to mount C105 capacitor).	3	*	*	*	*	*
3G1350-64	INSULATOR: ceramic; (9/16" ring diam x 5/16" ball diam; shaped like the planet Saturn; (for mounting C129 and C105 capacitor stators).	8	*	*	*	*	*
3G1250-13.1	INSULATOR: ceramic; glazed; round post; (7/16" diam; 27/32" long; holds trimmer capacitor plate to C105).	4	*	*	*	*	*
3G1250-37	INSULATOR: ceramic; glazed; post; (2-5/16" long x 21/32" diam; used as contact support for keying relay).	1	*	*	*	*	*
2Z5891-29	JEWEL: lamp; red plastic; GE K7879165-2.	1	*	*	*	*	*
2C6530-653A/K6	KNOB: main tuning capacitor mechanism; (M.O. grid tuning).	1	*	*	*	*	*
2B6530-653A/K9	KNOB: and clamp; (lock knob and clamp for main tuning capacitor mechanism).	2	*	*	*	*	*
2C6530-653A/K1	KNOB: (for main band change switch).	1	*	*	*	*	*
2C6530-653A/K3	KNOB: (for meter switch).	1	*	*	*	*	*
2C6530-653A/K5	KNOB: (tuning knob for M.O. reset and antenna coupling capacitor dials).	2	*	*	*	*	*
2Z573.1	KNOB: tuning; (for preset tuning capacitors).	12	*	*	*	*	*

* Indicates stock available.

129. MAINTENANCE PARTS LIST FOR RADIO TRANSMITTER BC-653-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2C6550-653A/K2	KNOB: (power switch).	1			*	*	*	*
	2C6550-653A/K4	KNOB: lock; (for preset tuning capacitors).	12			*	*	*	*
	2C6530-653A/L1	LINK: (for link boards).	18		*	*	*	*	*
	2C6550-653A/M4	MOUNTING BOARD: mycalex; No. 1364; (for capacitor C150).				*	*	*	*
	2C6550-653A/M5	MOUNTING BOARD: mycalex; No. 1364; (for capacitors C149 and C152).	1			*	*	*	*
	2C6530-653A/P1	MOUNTING BOARD: mycalex; No. 1364; (for fuses F160, F161, F163, and F164).	1			*	*	*	*
	2C6530-653A/P1	POINTER: (for preset frequency tuning capacitors).	12			*	*	*	*
	2C6550-653A/S19	SWITCH ASSEMBLY: rotary; 6-position; (wave change).	1			*	*	*	*
	2C6530-653A/W1	WRENCH: setscrew; Bristo No. 8.	1		*	*	*	*	*
	2C6530-653A/W2	WRENCH: setscrew; Bristo No. 4.	1		*	*	*	*	*
	2C6530-653A/W3	WRENCH: setscrew; Bristo No. 6.	1		*	*	*	*	*
TABLE OF NUTS, BOLTS, SCREWS, AND WASHERS									
	6L3106-32D	NUT: duraluminum; hex; elastic stop; No. 6-32, (cadmium-plated).	50			*	*	*	*
	6L3108-32.25	NUT: aluminum; hex; stop; No. 8-32; (cadmium-plated).	25			*	*	*	*
	6L6832-6.905	SCREW: set; Bristo; 6-point; No. 8-32 x 1/4"; (black nickel).	25			*	*	*	*
	6L6632-2.5C	SCREW: set; Bristo; 4-point; No. 6-32 x 1/8"; (cadmium-plated; cup-pointed).	20			*	*	*	*
	6L7959-2.41S	SCREW: set; Allen; 6-point; No. 4-40 x 1/8"; (cadmium-plated; cup-pointed).	50			*	*	*	*
	6L7960-4	SCREW: set; Allen; No. 8-32 x 3/16".	4			*	*	*	*
	2C6530-653A/S20	SCREW: fillister-head; 1-11/16" long x 1/8" diam; No. 6-32 x 3/8" thread; 3/16" high x 1/4" diam; slotted; 1/8" hole through head; (black enamel).	4			*	*	*	*

6L6832-17-1.8Z	SCREW: machine; iron; binding-head; No. 6-32 x 1-3/32"; (zinc-plated).	16	*	*	*	*	*
6L6832-5.11S	SCREW: machine; steel; binding-head; No. 6-32 x 3/8"; (cadmium).	10	*	*	*	*	*
6L6832-8.11S	SCREW: machine; steel; binding-head; No. 8-32 x 1/2"; (cadmium).	6	*	*	*	*	*
6L6832-8.12S	SCREW: machine; steel; fillister-head; No. 8-32 x 1/2"; (cadmium).	2	*	*	*	*	*
6L6832-28.14S	SCREW: machine; steel; binding-head; No. 8-32 x 1 3/4"; (black enamel).	2	*	*	*	*	*
6L7024-16.12S	SCREW: machine; iron; fillister-head; No. 10-32 x 1"; (cadmium).	2	*	*	*	*	*
6L6832-4.8Z	SCREW: machine; iron; binding-head; No. 6-32 x 1/4"; (chromate).	140	*	*	*	*	*
6L7024-29.58S	SCREW: machine; iron; fillister-head; No. 10-32 x 1-13/16"; (black enamel).	2	*	*	*	*	*
6L6832-64.87	SCREW: machine; iron; roundhead; No. 6-32 x 4"; (zinc-plated chromate).	1	*	*	*	*	*
6L6832-62.11S	SCREW: machine; steel; binding-head; No. 6-32 x 3 7/8"; (cadmium).	1	*	*	*	*	*
6L6832-48.87	SCREW: machine; iron; roundhead; No. 8-32 x 3"; (zinc-plated chromate).	8	*	*	*	*	*
6L31114	STUD: stainless steel; (5/16" hex. shoulder, 1 1/4" long).	3	*	*	*	*	*
6L31118	STUD: stainless steel; (5/16" hex. shoulder, 2 1/8" long).	5	*	*	*	*	*
6L31116	STUD: stainless steel; (5/16" drilled hex. shoulder, 2 1/8" long).	5	*	*	*	*	*
6L72206	WASHER: lock washer; Shakeproof No. 1206; steel; (internal teeth; for No. 6 screw).	170	*	*	*	*	*
6L72208	WASHER: lock washer; Shakeproof No. 1208; steel; (internal teeth; for No. 8 screw).	10	*	*	*	*	*
6L72210	WASHER: lock washer; Shakeproof No. 1210; steel; (internal teeth; for No. 10 screw).	10	*	*	*	*	*
2B1589/1	SHIELD: breath.	1	*	*	*	*	*
2B1589	UNIT MICROPHONE MC-419.	1	*	*	*	*	*

* Indicates stock available.

130. MAINTENANCE PARTS LIST FOR RADIO RECEIVER BC-652-A.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
C201	3D9050V-28	CAPACITOR: variable; air; single-section; 50-mmf. See also C303, C315, and C356.	4			*	*	*	*
C202	3DA6-47	CAPACITOR: paper; 6,000-mmf +30% -10%; 300 v dc (working); (moulded). See also C204, C205, C253, C255, C256, C257, C309, C310, C312, C313, C318, C320, C323, C329, C331, C334, C337, C338, C339, C342, C343, C347, C352, C366, and C370.	26			*	*	*	*
C203	3D9250-28	CAPACITOR: silver mica; 250-mmf \pm 5%; 250 v dc (working).	1			*	*	*	*
C204		CAPACITOR: same as C202.							
C205		CAPACITOR: same as C202.							
C207	CM20B101K	CAPACITOR: mica; 100-mmf \pm 10%; 500 v dc (working). See also C208.	2			*	*	*	*
C208		CAPACITOR: same as C207.							
C209	3D9010-16	CAPACITOR: mica; 10-mmf \pm 10%; 500 v dc (working).	1			*	*	*	*
C210	3D9005-15	CAPACITOR: mica; 5-mmf \pm 10%; 500 v dc (working).	1			*	*	*	*
C228	3D9400-13	CAPACITOR: silver mica; 400-mmf \pm 5%; 250 v dc (working). See also C229.	2			*	*	*	*
C229		CAPACITOR: same as C228.							
C250	3D9225	CAPACITOR: mica; 225-mmf \pm 5%; 250 v dc (working).	1			*	*	*	*
C251	3DB16-2	CAPACITOR: electrolytic; triple-section; 16-mf +75% -10%; 350 v dc (working). See also C251A, C251B, and C251C.	1			*	*	*	*
C251A		CAPACITOR: part of C251.							
C251B		CAPACITOR: part of C251.							
C251C		CAPACITOR: part of C251.							
C253		CAPACITOR: same as C202.							
C254	3DB25-9	CAPACITOR: electrolytic; 25-mf +100% -10%; 50 v dc (working).	1			*	*	*	*

130. MAINTENANCE PARTS LIST FOR RADIO RECEIVER BC-652-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
C323		CAPACITOR: same as C202.							
C317		CAPACITOR: same as C307.							
C318		CAPACITOR: same as C202.							
C319	3K2551042	CAPACITOR: mica; 50-mmf = 5%; 250 v dc (working); (moulded).	1			*	*	*	*
C320		CAPACITOR: same as C202.							
C323		CAPACITOR: same as C202.							
C324	3DA6-16	CAPACITOR: mica; 6,000-mmf = 10%; 300 v dc (working). See also C350, C358, C359, and C365.				*	*	*	*
C325	3D9500-42	CAPACITOR: mica; 500-mmf = 10%; 500 v dc (working); (included with T311). See also C361 and C358.	3			*	*	*	*
C326	3D9650	CAPACITOR: silver mica; 650-mmf = 0.5%; 250 v dc (working); (moulded silver).	1			*	*	*	*
C327	3DA1.100-1	CAPACITOR: silver mica; 1,100-mmf = 0.5%; 250 v dc (working).	1			*	*	*	*
C328	3D9025V-14	CAPACITOR: variable; air; single-section; 25-mmf.	1				*		*
C329		CAPACITOR: same as C202.							
C330	3D9025V-15	CAPACITOR: variable; air; single-section; 25-mmf.	1				*		*
C331		CAPACITOR: same as C202.							
C332	3D9030-11	CAPACITOR: 30-mmf + 10% - 0%.	1			*	*	*	*
C333	3D9030-7	CAPACITOR: silver mica; 30-mmf = 5%; 250 v dc (working); (moulded).	1			*	*	*	*
C334		CAPACITOR: same as C202.							
C337		CAPACITOR: same as C202.							
C338		CAPACITOR: same as C202.							
C339		CAPACITOR: same as C202.							
C342		CAPACITOR: same as C202.							
C343		CAPACITOR: same as C202.							

C346	3D9050-33	CAPACITOR: mica; 50-mmf $\pm 10\%$; 500 v dc (working).	1	*	*	*	*	*	*
C347		CAPACITOR: same as C202.							
C348	3K2020132	CAPACITOR: mica; 200-mmf $\pm 10\%$; 500 v dc (working).	2	*	*	*	*	*	*
C350		CAPACITOR: same as C324.							
C352		CAPACITOR: same as C202.							
C353		CAPACITOR: same as C325.							
C356		CAPACITOR: same as C201.							
C357	3DB12-11	CAPACITOR: electrolytic; dual-section; 12-mf $\pm 100\%$ - 10%; 50 v dc (working).	1	*	*	*	*	*	*
C357A		CAPACITOR: part of C357.							
C357B		CAPACITOR: part of C357.							
C358		CAPACITOR: same as C324.							
C359		CAPACITOR: same as C324.							
C360	3DB50-5	CAPACITOR: electrolytic; 50-mf $\pm 100\%$ - 10%; 25 v dc (working).	1	*	*	*	*	*	*
C361		CAPACITOR: same as C325.							
C362	3DA10-23	CAPACITOR: mica; 10,000-mmf $\pm 10\%$; 600 v dc (working).	1	*	*	*	*	*	*
C363		CAPACITOR: same as C348.							
C364	3DA50-53	CAPACITOR: paper; 50,000-mmf $\pm 10\%$; 400 v dc (working).	1	*	*	*	*	*	*
C365		CAPACITOR: same as C324.							
C366		CAPACITOR: same as C202.							
C368	3D9030-6	CAPACITOR: 30-mmf $\pm 5\%$.	1	*	*	*	*	*	*
C370		CAPACITOR: same as C202.							
F251	SZ1942	FUSE FU-42: 20-amp; 25 volt. See also F252.	2	*	*	*	*	*	*
F252		FUSE FU-42: same as F251.							
J250	2Z8639-16	RECEPTACLE: 6-contact; (for dynamotor plug).	1	*	*	*	*	*	*
J301	2Z5534A	JACK JK-34-A: see also J302 and J303.	3	*	*	*	*	*	*

* Indicates stock available.

130. MAINTENANCE PARTS LIST FOR RADIO RECEIVER BC-652-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
J302		JACK: same as J301.							
J303		JACK: same as J301.							
J304	2Z7403-3	RECEPTACLE: 12-contact; (for crystal-cable plug).	1			*	*	*	*
L201	2C4452A/C10	COIL: crystal-oscillator tank.	1			*	*	*	*
L202	2C4452A/C11	COIL: choke; variable; (crystal-oscillator plate).	1			*	*	*	*
L252	2C4452A/C1	COIL: r-f choke. See also L253, and L301.	3			*	*	*	*
L258		COIL: same as L252.							
L301		COIL: same as L252.							
L302	2C4452A/C2	COIL: wave-trap; (antenna).	1			*	*	*	*
L303	2C4452A/C3	COIL: wave-trap; (r-f plate).	1			*	*	*	*
P251	2Z7298-16	PLUG ASSEMBLY: 8-wire cable; and Jones plug P-312-CCT-L; (12-contact; connects calibrator to receiver).	1			*	*	*	*
P302	2C4452A/P2	PLUG: 9-prong; banana plugs; (connects receiver to mounting).	1			*	*	*	*
R201	3RC21BE105K	RESISTOR: metallized; 1-megohm \pm 10%; $\frac{1}{2}$ -watt; See also R301, R306, and R328.	4			*	*	*	*
R203	3RC21BE108J	RESISTOR: metallized; 10,000-ohm \pm 5%; $\frac{1}{2}$ -watt. See also R330.	2			*	*	*	*
R204	3RC21BE331J	RESISTOR: metallized; 330-ohm \pm 5%; $\frac{1}{2}$ -watt. See also R303, R307, R316, and R336.	5			*	*	*	*
R205	3RC31AE153K	RESISTOR: metallized; 15,000-ohm \pm 10%; 1-watt.	1			*	*	*	*
R206	3RC21BE393J	RESISTOR: metallized; 39,000-ohm \pm 5%; $\frac{1}{2}$ -watt. See also R207 and R309.	3			*	*	*	*
R207		RESISTOR: same as R206.							
R208	3Z7415	RHEOSTAT: two-section; 15,000-ohm \pm 20% each; (20-kc multivibrator adjustable grid).	1			*	*	*	*
R210	3RC31BE203J	RESISTOR: metallized; 20,000-ohm \pm 5%; 1-watt. See also R211, R221, and R222.	4			*	*	*	*

130. MAINTENANCE PARTS LIST FOR RADIO RECEIVER BC-652-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
R317	3RC21BE565K	RESISTOR: metallized; 5.6-megohm = 10%; 1/2-watt.	1			*	*	*	*
R318		RESISTOR: same as R305.							
R319	SZ6051	RESISTOR: metallized; 510-ohm = 5%; 1/2-watt.	1			*	*	*	*
R320	3RC31BE302J	RESISTOR: metallized; 3,000-ohm = 5%; 1-watt. See also R342.	2			*	*	*	*
R321	3RC31BE338K	RESISTOR: metallized; 33,000-ohm = 10%; 1-watt.	1			*	*	*	*
R323	SZ6751	RESISTOR: metallized; 510,000-ohm = 5%; 1/2-watt. See also R329.	2			*	*	*	*
R327	3RC21BE123K	RESISTOR: metallized; 12,000-ohm = 10%; 1/2-watt.	1			*	*	*	*
R328		RESISTOR: same as R201.							
R329		RESISTOR: same as R323.							
R330		RESISTOR: same as R203.							
R331	3RC21BE152K	RESISTOR: metallized; 1,500-ohm = 10%; 1/2-watt.	1			*	*	*	*
R332	3RC21BE753J	RESISTOR: metallized; 75,000-ohm = 5%; 1/2-watt.	1			*	*	*	*
R333	3RC21BE104K	RESISTOR: metallized; 100,000-ohm = 10%; 1/2-watt.	1			*	*	*	*
R334	SZ6768	RESISTOR: metallized; 680,000-ohm = 10%; 1/2-watt.	1			*	*	*	*
R335	SZ6733-1	RESISTOR: metallized; 330,000-ohm = 10%; 1/2-watt.	1			*	*	*	*
R336		RESISTOR: same as R204.							
R337	SZ6022-6	RESISTOR: wire-wound; 220-ohm = 10%; 2-watt.	1			*	*	*	*
R338	SZ6001E9	RESISTOR: wire-wound; 15-ohm = 10%; 1-watt. See also R353.	2			*	*	*	*
R339	SZ6022-7	RESISTOR: metallized; 220-ohm = 10%; 1/2-watt.	1			*	*	*	*
R340	SZ6615-1	RESISTOR: metallized; 15,000-ohm = 5%; 1/2-watt.	1			*	*	*	*
R341		RESISTOR: same as R305.							
R342		RESISTOR: same as R320.							
R343	3RC31BE273K	RESISTOR: metallized; 27,000-ohm = 10%; 1-watt.	1			*	*	*	*

130. MAINTENANCE PARTS LIST FOR RADIO RECEIVER BC-652-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
TS04	2C4452A/C7	COIL: r-f; band 2.	1			*	*	*	*
TS05	2C4452A/C8	COIL: osc; band 1.	1			*	*	*	*
TS06	2C4452A/C9	COIL: osc; band 2.	1			*	*	*	*
TS07	2C4452A/T7	TRANSFORMER: 1st i-f.	1			*	*	*	*
TS08	2C4452A/T8	TRANSFORMER: 2d i-f.	1			*	*	*	*
TS09	2C4452A/T9	TRANSFORMER: 3d i-f.	1			*	*	*	*
TS10	2C4452A/T10	TRANSFORMER: 4th i-f.	1			*	*	*	*
TS11	2C4452A/T11	TRANSFORMER: bfo.	1			*	*	*	*
TS12	2C4452A/T12	TRANSFORMER: audio output.	1			*	*	*	*
X201	2C6580-653A/S9	SOCKET: octal (tube). See also X202, X203, X204, X301, X302, X303, X304, X305, X306, and X307.	11			*	*	*	*
X202		SOCKET: same as X201.							
X203		SOCKET: same as X201.							
X204		SOCKET: same as X201.							
X301		SOCKET: same as X201.							
X302		SOCKET: same as X201.							
X303		SOCKET: same as X201.							
X304		SOCKET: same as X201.							
X305		SOCKET: same as X201.							
X306		SOCKET: same as X201.							
X307		SOCKET: same as X201.							
X308	2C6580-653A/S10	SOCKET: octal; (output tube).	1			*	*	*	*
Y201	2Z3541A-200	CRYSTAL HOLDER FT-241-A: with crystal; 200-kc.	1		*	*	*	*	*
	2C4452A/B1	BINDING POST ASSEMBLY: engraved A; (antenna).	1		*	*	*	*	*
	3Z748-5	BINDING POST ASSEMBLY: engraved A; (power supply).	1		*	*	*	*	*

8Z748-6	BINDING POST ASSEMBLY: engraved A; (power supply).	1	*	*	*	*	*
8Z1023	CLIP: fuse; Littelfuse No. 1217.	1	*	*	*	*	*
2Z4880-16	COVER AND GLASS ASSEMBLY: dial; bakelite; moulded; 5 $\frac{3}{4}$ " long, 2 $\frac{5}{8}$ " high by 13/16" deep over-all; with four 6-32 x 5/8" captive screws.	1	*	*	*	*	*
3Z1989-1	FUSE MOUNTING: Littelfuse No. 1212B (for 4AG fuse).	2	*	*	*	*	*
6Z4879	GROMMET: rubber; 7/16" diam, 5/13" thick (for 11/32 hole in 1/16" sheet metal); hole 3/16" ID.	4	*	*	*	*	*
3G1250-4.5	INSULATOR: ceramic; 5/8" diam by 1/4" thick; (for antenna binding post).	1	*	*	*	*	*
3C4452A/K2	KNOB: metal; (band switch).	1	*	*	*	*	*
2C4452A/K3	KNOB: metal; (power or c-w switch).	2	*	*	*	*	*
2C4452A/K4	KNOB: bakelite; (tuning).	1	*	*	*	*	*
2C4452A/K1	KNOB: bakelite; (volume control).	1	*	*	*	*	*
2C6550-653A/C18/1	PAD: receiver-case air filter.	2	*	*	*	*	*
2C4452A/A1	TUNING UNIT ASSEMBLY: (antenna).	1	*	*	*	*	*
2C4452A/P1	TUNING UNIT ASSEMBLY: (oscillator).	1	*	*	*	*	*
2C4452A/R2	TUNING UNIT ASSEMBLY: (r-f).	1	*	*	*	*	*
6L72206	WASHER: lock washer; steel; Shakeproof No. 1206 (internal teeth, No. 6 cadmium-plated).		*	*	*	*	*
6L50010	WASHER: brass; No. 10, or 7/16" OD.		*	*	*	*	*
6R57400	WRENCH: Allen No. 8; (for setscrew).		*	*	*	*	*
6R55496	WRENCH: Allen No. 10; (for setscrew).		*	*	*	*	*
TABLE OF NUTS, BOLTS, SCREWS, AND WASHERS							
6L3108-32.2S	NUT: aluminum; hex.; No. 10-32; (stop).	4	*	*	*	*	*
6L3108-32.2S	NUT: aluminum; hex.; No. 8-32; (stop).	4	*	*	*	*	*
6L3104-40	NUT: brass; hex.; No. 4-40; (cadmium-plated).	4	*	*	*	*	*
6L7024-99.9	SCREW: machine; brass; binding-head; No. 10-24 x 6-3/16"; (cadmium-plated).	2	*	*	*	*	*
6L6632-6.9	SCREW: machine; brass; binding-head; No. 6-32 x 3/8"; (nickel).	75	*	*	*	*	*

* Indicates stock available.

130. MAINTENANCE PARTS LIST FOR RADIO RECEIVER BC-652-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orign stock	3d ech	4th ech	5th ech	Depot stock
	6L6632-10.9B	SCREW: machine; brass; binding-head; No. 6-32 x 5/8"; (black nickel).	6			*	*	*	*
	6L6632-10.9	SCREW: machine; brass; binding-head; No. 6-32 x 5/8"; (nickeled).	10			*	*	*	*
	6L6632-18.57	SCREW: machine; brass; binding-head; No. 6-32 x 1 7/8"; (black-oxidized).	6			*	*	*	*
	6L6632-30-9	SCREW: machine; brass; binding-head; No. 6-32 x 1 1/8"; (nickeled).	5			*	*	*	*
	6L7032-16.49	SCREW: machine; steel; roundhead; No. 10-32 x 1"; (cadmium-plated).	4			*	*	*	*
	6L6440-5.5	SCREW: machine; brass; roundhead; No. 4-40 x 5/16"; (nickeled).	6			*	*	*	*
	6L7960-4	SCREW: set; No. 8-32 x 3/16"; Allenhead.	8			*	*	*	*
	6L7932-8.39	SCREW: set; No. 10-32 x 1/2"; Allenhead; (cadmium).				*	*	*	*
	2C4452A/S7	STRIP: clamping.				*	*	*	*
	3H1640A/S15	STUD: snapslide; steel; cadmium; No. 8-32 x 1"; (dynamotor mounting).	4			*	*	*	*
	6L53005	WASHER: flat; phosphor-bronze; 0.578".				*	*	*	*
	6L72206-Z	WASHER: lock washer; bronze; (internal teeth; 0.281" OD x 0.145" ID x 0.018" thick).				*	*	*	*
	6L72206C	WASHER: lock washer; steel; (internal teeth; No. 6; cadmium-plated).				*	*	*	*
	6L50010	WASHER: brass; No. 10.				*	*	*	*

131. MAINTENANCE PARTS LIST FOR MOUNTING FT-253-A.

	3E2280	CORD CO-280: 16 ft.	2			*			*
C173	3DA100-127	CAPACITOR: oil-filled; bathtub type; 100,000-mmf, ±10%; 600 v dc (working).	1			*			*
C166	3DB25-7	CAPACITOR: electrolytic; 25-mf, +20% -10%; 50 v dc test.	1				*		*

F162	2C6530-653A/C1	CLAMP: (holds transmitter and receiver to mounting).	5	*	*	*	*
	3Z1944	FUSE FU-44: 70-amp, 250-volt; (fuse link).	1	*	*	*	*
	2Z6721-253A/2	HARDWARE KIT: (mounting); consists of 2 clamps, cable; 1 x 1/2" over-all; 1/4" loop; (cadmium-plated). NUT: 12, hex.; 1/4" - 20 x 1/2"; (cadmium). NUT: 12, elastic stop; 1/4" - 20 x 1/2"; (cadmium). SCREW: 12; 3/8" hex.; 3/8"; 1/4" - 20 x 1 5/8"; (cadmium)	1	*	*	*	*
J302A	6L53005	WASHER: 12; split lock; 7/16" OD; 9/64" ID; (cadmium).					*
J161	2Z6721-253A/1	JACK: female; 9-contact; (connects receiver to mounting).	1	*	*	*	*
	2C6530-653A/T2	JACK: female; 13-spring contact; (connects transmitter to mounting).	1	*	*	*	*
	2C6530-653A/M6	MOUNTING: shock; rubber.	2	*	*	*	*
	2C6530-653A/M7	MOUNTING: shock; rubber.	4	*	*	*	*
	6L3108-32	NUT: brass; hex.; 8-32 x 5/16".	4	*	*	*	*
	6L3110-24	NUT: brass; hex.; 10-24 x 3/8".	3	*	*	*	*
	GL3504-20-106	NUT: steel; hex.; 1/4" - 20 x 7/16" (cadmium-plated).	12	*	*	*	*
	2C6530-653A/P2	PIN: steel; 3/4" x 3/16" diam; (for mounting clamp).	5	*	*	*	*
	6L7920-4-10.81CS	SCREW: iron; hex.; 1/4" - 20 x 5/8"; (cadmium-plated).	12	*	*	*	*
	6L6632-4.11A	SCREW: machine; brass; binding-head; 6-32 x 1/4"; (cadmium-plated).	18	*	*	*	*
	6L6632-8.9	SCREW: machine; brass; binding-head; 6-32 x 1/2"; (nickel-plated).	25	*	*	*	*
	6L6632-4.9	SCREW: machine; brass; binding-head; 8-32 x 1/4"; (nickel-plated).	16	*	*	*	*
	6L6832-14.11	SCREW: machine; brass; binding-head; 8-32 x 7/8"; (cadmium-plated).	6	*	*	*	*
	6L6832-32.11	SCREW: machine; brass; binding-head; 8-32 x 2"; (cadmium-plated).	2	*	*	*	*
	6L7024-5.49	SCREW: machine; brass; binding-head; 10-24 x 5/16"; (cadmium-plated).	10	*	*	*	*
	2C6530-653A/S12	SCREW: wing; (for mounting clamp).	5	*	*	*	*
	6L72206	WASHER: lock washer; Shakeproof 1206; steel; (inter-nal teeth; for No. 6 machine screw); (cadmium-plated).	50	*	*	*	*

* Indicates stock available.

131. MAINTENANCE PARTS LIST FOR MOUNTING FT-253-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
6L72208		WASHER: lock washer; Shakeproof 1208; steel; (internal teeth; for No. 8 machine screw); (cadmium-plated).	25		*	*	*		*
6L72210		WASHER: lock washer; Shakeproof 1208; steel; (internal teeth; for No. 10 machine screw); (cadmium-plated).	10		*	*	*		*
6172214		WASHER: lock washer; Shakeproof 1214; steel; (internal teeth; for $\frac{1}{4}$ " machine screw); (cadmium-plated).	15		*	*	*		*

132. MAINTENANCE PARTS LIST FOR MAST BASE MP-57.

2A2087/32		CONNECTOR CORD ASSEMBLY: $9\frac{1}{4}$ " long; with binding post TM-146.	1			*	*	*	*
SG1350-27.1		INSULATOR: porcelain; (lower) $3\frac{1}{4}$ " diam, $1\frac{1}{2}$ " long, $1\frac{1}{8}$ " ID.	1			*	*	*	*
2A2088-57/J1		INSULATOR: porcelain; (upper) $4\frac{1}{2}$ " diam x $1\frac{1}{8}$ " long; 1-25/32" ID.	1			*	*	*	*
2A2074/19		NUT: brass; hex.; special; (for attaching mast base to bracket).	2			*	*	*	*
		GENERAL HARDWARE							
6L7945-5.35P		SCREW: set; cone-pointed; $5/16$ "-24 x $9/32$ ".	2			*	*	*	*
2A2074/17		SCREW: set; steel; No. 10-32 x $15/16$ " long; dog point; slotted-head.	2			*	*	*	*
6L50146		WASHER: steel; 2" OD, $\frac{1}{8}$ " thick, 1-1/32" hole; (for protecting lower insulator).	1			*	*	*	*
6L50554		WASHER: fiber; $3\frac{3}{4}$ " diam, $3/32$ " thick, $2\frac{1}{8}$ " hole.	1			*	*	*	*
2A2087/28		WASHER: fiber; $3\frac{1}{4}$ " diam, $3/32$ " thick, $2\frac{1}{8}$ " hole.	1			*	*	*	*
2A2074/15		WASHER: treated fabric; $2\frac{1}{8}$ " diam, 1/32" thick, 1-13/16" hole.	1			*	*	*	*
2A2087/16		WASHER: treated fabric; 2" diam, 1/32" thick, 1-1/32" hole.	1			*	*	*	*
2A2074/20		WASHER: lock washer; steel; $1\frac{3}{8}$ " diam, 1/16" thick, 1-1/32" hole.	1			*	*	*	*

133. MAINTENANCE PARTS LIST FOR GUY SET GY-40.

2Z525	BAG BG-125.	1	*			*
2A1322A	GUY GY-22A.	3	*			*
2A1351	GUY PLATES FT-360.	1	*			*
2A1400-1	HOOK: snap; 5/8" oval eye; 2 7/8" long.	3	*			*
3G586	INSULATOR IN-86.	3	*			*
2A2354	MAST SECTION MS-54.	3	*			*
2A3129	REEL RL-29.	3	*			*
2A3302	STAKE GP-2.	3	*			*

134. MAINTENANCE PARTS LIST FOR SWITCH BOX BC-658-A.

2Z5533A	JACK JK-33-A: (microphone).	1	*			*
2Z5534A	JACK JK-34-A: (phone).	1	*			*
2Z7155	PLUG PL-55: (interphone and radio).	2	*			*
2Z7168	PLUG PL-68: (interphone and radio).	2	*			*
3Z8155	SWITCH SW-155: (interphone and radio).	1	*			*
3E2144	CORDAGE CO-144.	8 ft	*			*
3E2145	CORDAGE CO-145.	8 ft	*			*

135. MAINTENANCE PARTS LIST FOR HEADSET HS-30-().

2B1300	INSERT M-300.	2	*			*
3Z10161	TERMINAL TM-161: ring; tip-solderless.	4	*			*
3Z10163	TERMINAL TM-163: spade; tip-solderless.	2	*			*

136. MAINTENANCE PARTS LIST FOR MICROPHONE T-17-().

3E2076A	CORD CO-76-A: 5 ft; 3-conductor.	1	*			*
2Z7168	PLUG PL-68.	1	*			*

* Indicates stock available.

136. MAINTENANCE PARTS LIST FOR MICROPHONE T-17-() (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	SZ8109	SWITCH SW-109: (for all models except Microphone T-17-D).	1				*	*	*
	SZ8217	SWITCH SW-217: (for Microphone T-17-D).	1				*	*	*
	SZ10161	TERMINAL TM-161: (terminates cord at plug end).	3				*	*	*

137. MAINTENANCE PARTS LIST FOR MICROPHONE T-45.

	2B1589/1	SHIELD: breath.	1				*	*	*
	2B1589	UNIT MICROPHONE MC-419.	1				*	*	*

* Indicates stock available.

SECTION XVIII • Color Codes

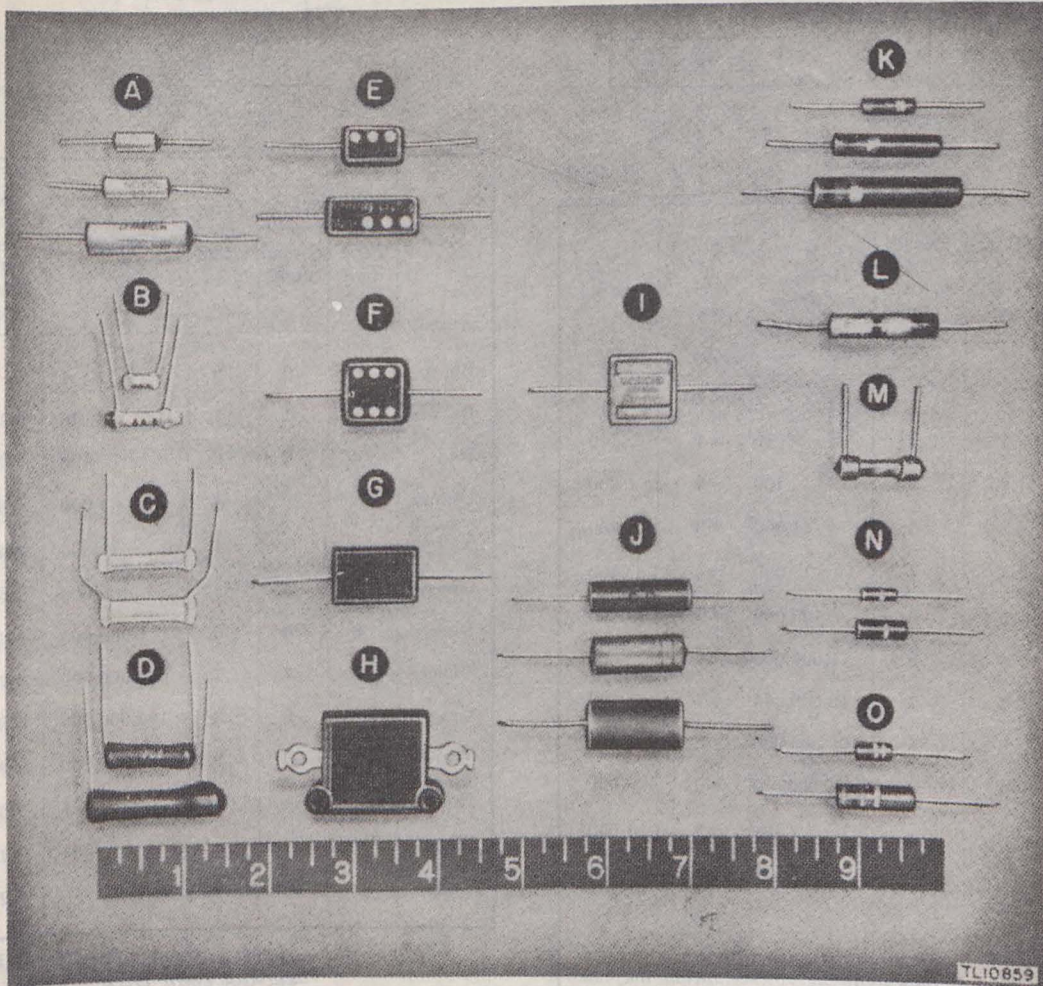


Figure 78. Types of capacitors and resistors.

138. TYPES OF CAPACITORS AND RESISTORS.

Most of the types of capacitors and resistors used in these radio sets are shown in figure 78. The first column (A-D) shows ceramic capacitors. The second (E-H) shows mica capacitors, and the third (I-J) shows oiled paper capacitors. In the fourth column (K-O), various resistors are shown. While figure 1 shows the range of types, it does not necessarily include all of the variations introduced by different manufacturers. Several systems are in use for marking the values of capacitance and resistance of components. Normally, colored dots and bands are used to mark values.

139. THREE-DOT COLOR CODE FOR MICA CAPACITORS (fig. 79).

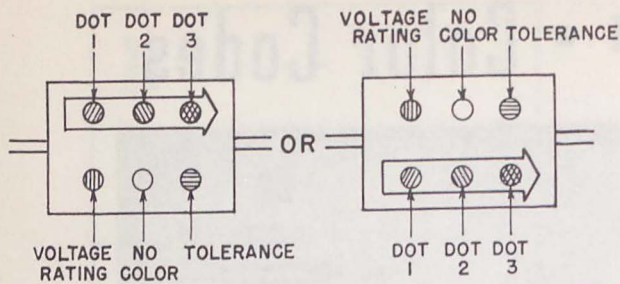
a. The basis of this code (fig. 79) is a series of three colored dots which indicate the capacitance in micromicrofarads. Two auxiliary colored dots indicating the voltage rating and capacitance tolerance are sometimes added. Usually an arrow is stamped

on the case of the capacitor to indicate the sequence in which the dots are to be read. Dots one and two show the first two digits of the capacitance in micromicrofarads, while dot three indicates the decimal multiplier. Example: A 0.006-microfarad capacitor ($6,000 \mu\mu\text{f}$) is marked by the three dots in sequence, as follows: blue (6), black (0), red (100).

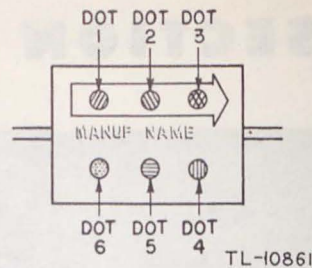
b. The tolerance dot, when used, is usually located above or below the third (decimal multiplier) dot. The color of the tolerance dot corresponds to tolerances between ± 1 percent and ± 20 percent. Therefore, a green tolerance dot is used on capacitors having a tolerance of ± 5 percent.

c. The voltage dot, when used, is located above or below the first (first digit) dot. The various colors denote the d-c working voltage.

d. Omission of both of the auxiliary dots is made for capacitors having a tolerance of ± 20 percent, and a d-c working voltage which is the lowest used for that type and size of capacitor.



TL-10860



TL-10861

Color	First dot First digit	Second dot Second digit	Third dot Decimal multiplier	Percent of tolerance	Voltage rating
Black	0	0	1	± 20	
Brown	1	1	10	± 1	100
Red	2	2	100	± 2	200
Orange	3	3	1,000	± 3	300
Yellow	4	4	10,000	± 4	400
Green	5	5	100,000	± 5	500
Blue	6	6	1,000,000	± 6	600
Violet	7	7	10,000,000	± 7	700
Gray	8	8	100,000,000	± 8	800
White	9	9	1,000,000,000	± 9	900
Gold	—	—	0.1	± 5	1,000
Silver	—	—	0.01	± 10	2,000
Body	—	—	—	± 20	*

* When no color is indicated, the voltage rating may be as low as 300 volts.

Figure 79. Molded mica capacitors, three-dot color code.

140. RMA COLOR CODE FOR MICA CAPACITORS (fig. 80).

The RMA (Radio Manufacturers Association) code is illustrated in figure 80. This code uses six colored dots with an arrow to show the sequence. The first three dots give the first three digits of the capacitance in micromicrofarads, the fourth dot (directly below the third) gives the decimal multiplier, the fifth indicates the tolerance in capacitance, and the sixth, the d-c working voltage. For example: a capacitor of 0.006 micromicrofarads (6,000 micromicrofarads) plus or minus 10 per cent, 800 volts d-c, working, would be marked: blue (6), black (0), black (0), brown (multiplier 10), silver (plus or minus 10 per cent), gray (800 volts), in that order.

Color	First dot First digit	Second dot Second digit	Third dot Third digit	Fourth dot Decimal multiplier	Fifth dot Percent of tolerance	Sixth dot Voltage
Black	0	0	0	1	—	—
Brown	1	1	1	10	± 1	100
Red	2	2	2	100	± 2	200
Orange	3	3	3	1,000	± 3	300
Yellow	4	4	4	10,000	± 4	400
Green	5	5	5	100,000	± 5	500
Blue	6	6	6	1,000,000	± 6	600
Violet	7	7	7	10,000,000	± 7	700
Gray	8	8	8	100,000,000	± 8	800
White	9	9	9	1,000,000,000	± 9	900
Gold	—	—	—	0.1	± 5	1,000
Silver	—	—	—	0.01	± 10	2,000
Body	—	—	—	—	± 20	500

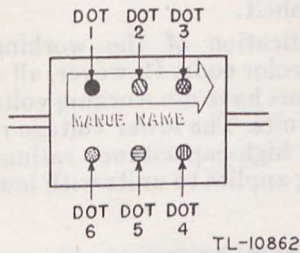
Figure 80. Molded mica capacitors, RMA six-dot color code.

141. AWS COLOR CODE FOR MICA CAPACITORS.

a. The AWS (American War Standard) code for molded mica capacitors is shown in figure 81. Like the RMA code, it makes use of six colored dots, but with somewhat different significance. The first four dots give the capacitance in micromicrofarads, as follows: first significant figure, second significant figure, third significant figure, and the decimal multiplier. It will be noted that this scheme makes provision for marking units with three significant figures. However, none of the capacitors standardized under the AWS code requires more than two significant digits to specify its capacitance. The first dot on all molded mica capacitors, marked with the AWS code, is black, and the two necessary significant figures are given by the second and third dots. As a result the black first dot becomes an important feature or identification symbol for a molded mica capacitor marked according to the AWS code. A few examples may serve to make this clear. A 120-micromicrofarad capacitor is marked as follows: black (0), brown

(1), red (2), brown (10); indicating a molded mica capacitor of 120 micromicrofarads. A 9,100-micro-microfarad capacitor will be marked black, white (9), brown (1), red (100), indicating a molded mica capacitor of 9,100 micromicrofarads. It will be noted that in each instance the first dot is black.

b. The fifth dot in the AWS color code indicates the capacitance tolerance in percent of rated capacitance. The sixth dot denotes characteristics



Color	First dot First digit	Second dot Second digit	Third dot Third digit	Fourth dot Decimal multiplier	Fifth dot Per- cent of Tol- erance	Sixth dot Char- acter- istics
Black	0	0	0	1	±20	A
Brown	1	1	1	10	—	B
Red	2	2	2	100	±2	C
Orange	3	3	3	1,000	—	D
Yellow	4	4	4	—	—	E
Green	5	5	5	—	—	F
Blue	6	6	6	—	—	G
Violet	7	7	7	—	—	—
Gray	8	8	8	—	—	—
White	9	9	9	—	—	—
Gold	—	—	—	0.1	±5	—
Silver	—	—	—	0.01	±10	—

- Legend:
- A. Ordinary mica bypass.
 - B. Same as A, low-loss case.
 - C. Bypass or silver-mica temperature coefficient: capacitor (temperature coefficient: ±200 parts/million/C°).
 - D. Silver-mica capacitor (temperature coefficient: ±100 parts/million/C°).
 - E. Silver-mica capacitor (temperature coefficient: 0 to +100 parts/million/C°).
 - F. Silver-mica capacitor (temperature coefficient: 0 to +50 parts/million/C°).
 - G. Silver-mica capacitor (temperature coefficient: 0 to -50 parts/million/C°).

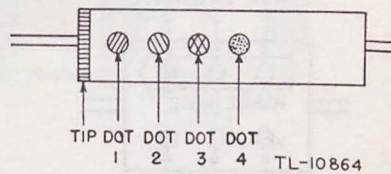
Figure 81. Molded mica capacitors, AWS six-dot color code.

of design. For example, a 0.006-microfarad (6,000 micromicrofarads) plus or minus 10 percent mica bypass capacitor would be marked: black (0), blue (6), black (0), red (100), silver (plus or minus 10 percent), black; (mica bypass, with no temperature coefficient specified).

c. It will be noted that this color code does not include the voltage rating. This is considered unnecessary since, with few exceptions, all capacitors marked with the AWS color code are rated at 500 d-c working volts. The exceptions, all of which are rated at 300 volts, are: AWS Type CM35 capacitors with capacitances of 6,800, 7,500, and 8,200 micromicrofarads; AWS Type CM40 capacitors with capacitances of 9,100 and 10,000 micromicrofarads.

142. RMA COLOR CODE FOR TUBULAR CERAMIC DIELECTRIC CAPACITORS.

Tubular ceramic dielectric capacitors are sometimes marked according to the RMA color code



Color	Tip *Tempera- ture coefficient	First dot First digit	Second dot Second digit	Third dot Decimal multiplier	Fourth dot † Tol- erance
Black	0	0	0	1	±20
Brown	0.00003 neg	1	1	10	±1
Red	0.00008 neg	2	2	100	±2
Orange	0.00015 neg	3	3	1,000	±3
Yellow	0.00022 neg	4	4	10,000	±4
Green	0.00033 neg	5	5	100,000	±5
Blue	0.00047 neg	6	6	1,000,000	±6
Violet	0.00075 neg	7	7	0.001	±7
Gray	—	8	8	0.01	±2.5
White	—	9	9	0.1	±10

* The abbreviation neg (negative) indicates that the capacitance varies with temperature.

The temperature coefficient is expressed in micromicrofarads per micromicrofarad per degree centigrade. Some capacitors are marked with a numeral instead of a color code; for example, N-030 represents 0.00003 neg.

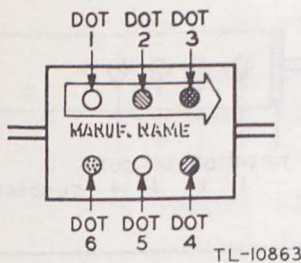
† Tolerances for capacitors of 10 micromicrofarads or less are expressed in tenths of a micromicrofarad instead of percentages.

Figure 82. Tubular ceramic capacitors, RMA color code.

shown in figure 82. The negative temperature coefficient is indicated by the color of the band or tips at one end of the unit; the capacitance in micromicrofarads is shown by the first three dots; the capacitance tolerance, either in percent or tenths of a micromicrofarad, depending upon the size of the unit, is indicated by the fourth and last dot. For example, a 30-micromicrofarad plus or minus 5 percent capacitor with a negative temperature coefficient of 80 parts per million per degree centigrade would be marked as follows: tip, red (-80); first dot, orange (3); second dot, black (0); third dot, black (1); fourth dot, green (plus or minus 5 percent).

143. AWS COLOR CODE FOR MOLDED PAPER CAPACITORS.

a. The AWS color code for molded paper dielectric capacitors is shown in figure 83. Like the code for mica capacitors, referred to above, it uses



Color	First dot	Second dot First digit	Third dot Second digit	Fourth dot Decimal multiplier	Fifth dot	Sixth dot Characteristics
Black	First dot silver to indicate AWS paper capacitor	0	0	1	Fifth dot silver to indicate AWS paper capacitor	A
Brown		1	1	10		B
Red		2	2	100		—
Orange		3	3	1,000		—
Yellow		4	4	—		—
Green		5	5	—		—
Blue		6	6	—		—
Violet		7	7	—		—
Gray		8	8	—		—
White		9	9	—		—
Gold	—	—	—	—	—	
Silver	—	—	—	—	—	

Legend: A. Operating temperature range: -67° to $+185^{\circ}$ F.
 B. Operating temperature range: -67° to $+167^{\circ}$ F.

Figure 83. Molded paper capacitors, AWS six-dot color code.

six colored dots, together with an arrow to indicate the sequence. Units marked according to this system can readily be identified by the fact that both the first and fifth dots are always silver. The other dots are used as follows: The second dot gives the first digit of the capacitance in micromicrofarads, the third dot gives the second significant figure, the fourth dot indicates the decimal multiplier, and the sixth shows whether the unit has a maximum operating temperature of 167° or 185° Fahrenheit.

b. No indication of the working voltage is given by this color code. However, all AWS molded paper capacitors have d-c working voltages between 300 and 800 volts. The lower voltage rating applies to units with high-capacitance ratings, the higher voltage rating applies to units with low-capacitance ratings.

144. RMA AND AWS COLOR CODES FOR FIXED RESISTORS.

a. Small fixed resistors, both composition type and wire-wound are frequently marked with colored bands and dots to indicate the resistance and tolerance. Two color codes are widely used, the RMA and the AWS. The two codes are not identical in all particulars, but they are similar in many respects. One chart, applicable to both, is shown in figure 84. It will be seen that in all cases the various combinations of body color, bands, and dots indicate the resistance to two significant figures (the first two digits), the decimal multiplier, and the percent tolerance in resistance.

b. As illustrated by figure 84, two methods are used for indicating the resistance and tolerance:

Method A. This method makes use of four colored bands, starting at one end of the unit, to show resistance and tolerance. The bands, reading from left to right, indicate: first significant figure, second significant figure, decimal multiplier, and percent tolerance. (The significance of the body color under this method will be explained later.)

Method B. Several variations of this method are in use (B1, B2, B3, of figure 84). With all of these, however, the interpretation of the code is practically the same in that the left end gives tolerance; body, first significant figure; right end, second significant figure; and the central dot or band, decimal multiplier.

To illustrate the basic schemes, consider a 5,600-ohm ± 10 percent fixed resistor. It would be marked:

Method A. First band, green (5); second band, blue (6); third band, red (100); Fourth band silver (± 10 percent).

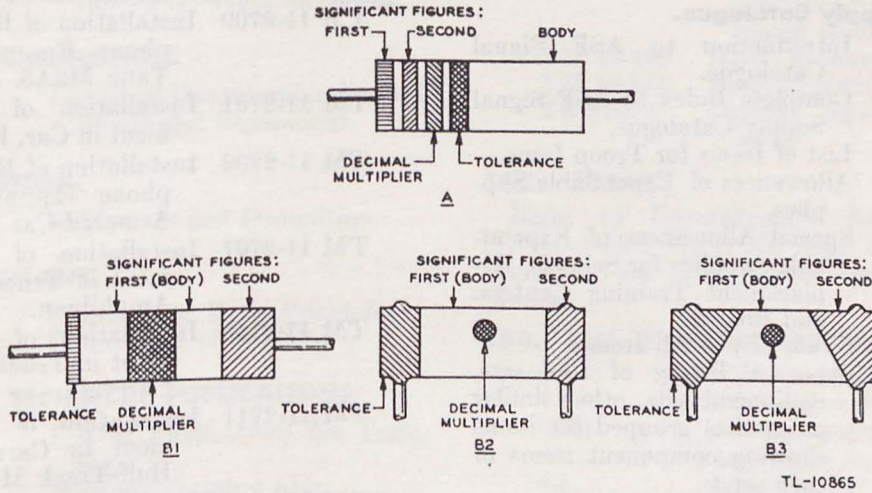
Method B. Left end, silver (± 10 percent); body, green (5); right end, blue (6); central band or dot, red (100).

In Method A, where the body color plays no

part in indicating resistance or tolerance, it may be used to indicate the type of resistor unit. Under the RMA code, a black body is frequently used to indicate an uninsulated composition unit while a tan, olive, or white body, usually has an insulated wire-wound unit. The AWS code requires that an uninsulated unit using Method A have a black body.

The body of an insulated unit may be any color, although a natural tan is preferred.

c. When there is doubt as to whether a particular resistor is composition or wire-wound, it is well to remember that any resistor of 100 ohms or less is most likely wire-wound, and is probably wound inductively.



TL-10865

Color	First significant figure	Second significant figure	Decimal multiplier	Per cent of tolerance
Black	0	0	1	—
Brown	1	1	10	±1
Red	2	2	100	±2
Orange	3	3	1,000	±3
Yellow	4	4	10,000	±4
Green	5	5	100,000	±5
Blue	6	6	1,000,000	±6
Violet	7	7	10,000,000	±7
Gray	8	8	100,000,000	±8
White	9	9	1,000,000,000	±9
Gold	—	—	0.1	±5
Silver	—	—	0.01	±10
No color	—	—	—	±20

Figure 84. Fixed resistors, RMA and AWS color codes.

SECTION XIX

References

145. PARTS LIST.

a. Signal Supply Catalogue.

- * SIG 1 Introduction to ASF Signal Catalogue.
- * SIG 2 Complete Index to ASF Signal Supply Catalogue.
- SIG 3 List of Items for Troop Issue.
- SIG 4-1 Allowances of Expendable Supplies.
- SIG 4-2 Special Allowances of Expendable Supplies for Schools, Replacement Training Centers, and Boards.
- SIG 5 Stock List of All Items.
- * SIG 6 Sets. (A listing of tool sets, equipment sets, other similar assemblies grouped for issue, showing component items of each set.)
- * SIG 7 Organizational Spare Parts.
- * SIG 8 Higher Echelon Spare Parts.

b. Supply Bulletin.

- SB 11-8 Chests for Running Spares.

146. TECHNICAL MANUALS ON AUXILIARY EQUIPMENT.

- TM 11-300 Frequency Meter Sets SCR-211- ().
- TM 11-303 Test Sets I-56-C, I-56-D, I-56-H, and I-56-J.
- TM 11-321 Test Set I-56-E.
- TM 11-472 Repair and Calibration of Electrical Measuring Instruments.

147. PREVENTIVE MAINTENANCE.

- TB SIG 25 Preventive Maintenance of Power Cords.
- TB SIG 66 Winter Maintenance of Ground Signal Equipment.
- TB SIG 72 Tropical Maintenance of Ground Signal Equipment.
- TB SIG 75 Desert Maintenance of Ground Signal Equipment.

148. PAINTING, PRESERVING, AND LUBRICATION.

- TB SIG 13 Moistureproofing and Fungiproofing Signal Corps Equipment.
- TB SIG 69 Lubrication of Ground Signal Equipment.

- SB 11-10 Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment.

149. INSTALLATION INSTRUCTIONS.

- TB SIG 21 Installation of Loudspeaker LS-3.
- TB SIG 33 Installation Instructions for Vehicular Radio Sets.
- TM 11-2700 Installation of Radio and Interphone Equipment in Light Tank M3A3.
- * TM 11-2701 Installation of Radio Equipment in Car, Half-Track, M2.
- TM 11-2702 Installation of Radio and Interphone Equipment in Light Armored Car M8.
- TM 11-2707 Installation of Radio Equipment in Truck, $\frac{1}{4}$ -ton, 4 x 4, Amphibian.
- TM 11-2710 Installation of Radio Equipment in Truck, $\frac{3}{4}$ -ton, 4 x 4, Carryall.
- TM 11-2711 Installation of Radio Equipment in Carrier, Personnel, Half-Track M5 and M5A1.
- * TM 11-2713 Installation of Radio and Interphone Equipment in Light Tank M3.
- * TM 11-2714 Installation of Radio Equipment in Carrier, Personnel, Half-Track M3.
- * TM 11-2715 Installation of Radio Equipment in Truck, $\frac{1}{4}$ -ton, 4 x 4.
- * TM 11-2716 Installation of Radio and Interphone Equipment in Armored Utility Car M20.
- * TM 11-2717 Installation of Radio Equipment in Scout Car M3A1.
- * TM 11-2718 Installation of Radio Equipment in Car, Half-Track, M2A1.
- * TM 11-2719 Installation of Radio Equipment in Car, Half-Track, M9A1.
- * TM 11-2720 Installation of Radio Equipment in Light Tank M5 and M5A1.
- * TM 11-2721 Installation of Radio Equipment in Carrier, Personnel, Half-Track, M3A1.
- * TM 11-2722 Installation of Radio, Interphone, and Facsimile Equipment in Car, Half-Track, M3A2.
- * TM 11-2726 Installation of Radio and Interphone Equipment in Truck, $\frac{3}{4}$ -ton, 4 x 4, Command and Reconnaissance.
- * TM 11-2733 Installation of Radio Equipment in Light Cargo Carrier M29.

*When published

* TM 11-2738 Installation of Radio and Inter-
phone Equipment in Heavy
Tank M6 Series.

* TM 11-2746 Installation of Radio Equip-
ment in Light Tank M3A1.

150. SHIPPING INSTRUCTIONS.

U.S. Army Army-Navy General Specifica-
Spec. No. tion for Packaging and Pack-
100-14A ing for Overseas Shipment.

151. DECONTAMINATION.

TM 3-220 Chemical Decontamination Ma-
terials and Equipment.

152. DEMOLITION.

FM 5-25 Explosives and Demolition.

153. CAMOUFLAGE.

FM 5-20 Camouflage, Basic Principles.
FM 5-20B Camouflage of Vehicles.

154. OTHER TECHNICAL PUBLICATIONS.

FM 21-6 List of Publications for Train-
ing.

FM 21-8 Military Training Aids.

FM 21-40 Defense Against Chemical At-
tack.

FM 24-5 Signal Communication.

FM 24-6 Radio Operator's Manual, Army
Ground Forces.

FM 24-9 Combined United States-British
Radio-telephone (R/T) Pro-
cedure.

FM 24-10 Combined Radiotelegraph
(W/T) Procedure.

FM 24-11 Combined Operating Signals.

FM 24-12 Army Extract of Combined Oper-
ating Signals.

FM 24-18 Radio Communication.

TM 1-455 Electrical Fundamentals

TM 11-227 Signal Communication Equip-
ment Directory, Radio Com-
munication Equipment.

**When published*

TM 11-310 Schematic Diagrams for Main-
tenance of Ground Radio
Communication Sets.

TM 11-314 Antennas and Antenna Systems.
TM 11-453 Shop Work.

TM 11-454 The Radio Operator.

TM 11-455 Radio Fundamentals.

TM 11-462 Reference Data.

* TM 11-483 Suppression of Radio Noises.

* TM 11-496 Training Text and Applicatory
Exercises for Amplitude Mod-
ulated Radio Sets.

TM 11-499 Radio Propagation.

TM 38-250 Basic Maintenance Manual.

TB SIG 5 Defense Against Radio Jam-
ming.

155. FORMS.

Refer to Unsatisfactory Equipment Report
(W.D., A.G.O. Form No. 468). If this form is not
available, see TM 38-250, Basic Maintenance
Manual.

156. LIST OF ABBREVIATIONS.

a-f. audio-frequency
a-v-c. automatic-volume-control
BFO. beat-frequency oscillator
c-w. continuous-wave
d-c. direct-current
h-f. high-frequency
i-f. intermediate-frequency
i-p-a. intermediate-power-amplifier
kc. kilocycle
l-f. low-frequency
mc. megacycle
mf. microfarad
mmf. micromicrofarad
m-o. master-oscillator
m-v-c. manual-volume-control
p-a. power-amplifier
r-f. radio-frequency

NOTE: Refer to appendix I of TM 11-455,
22 May 1944, for additional abbreviations of
radio terms.

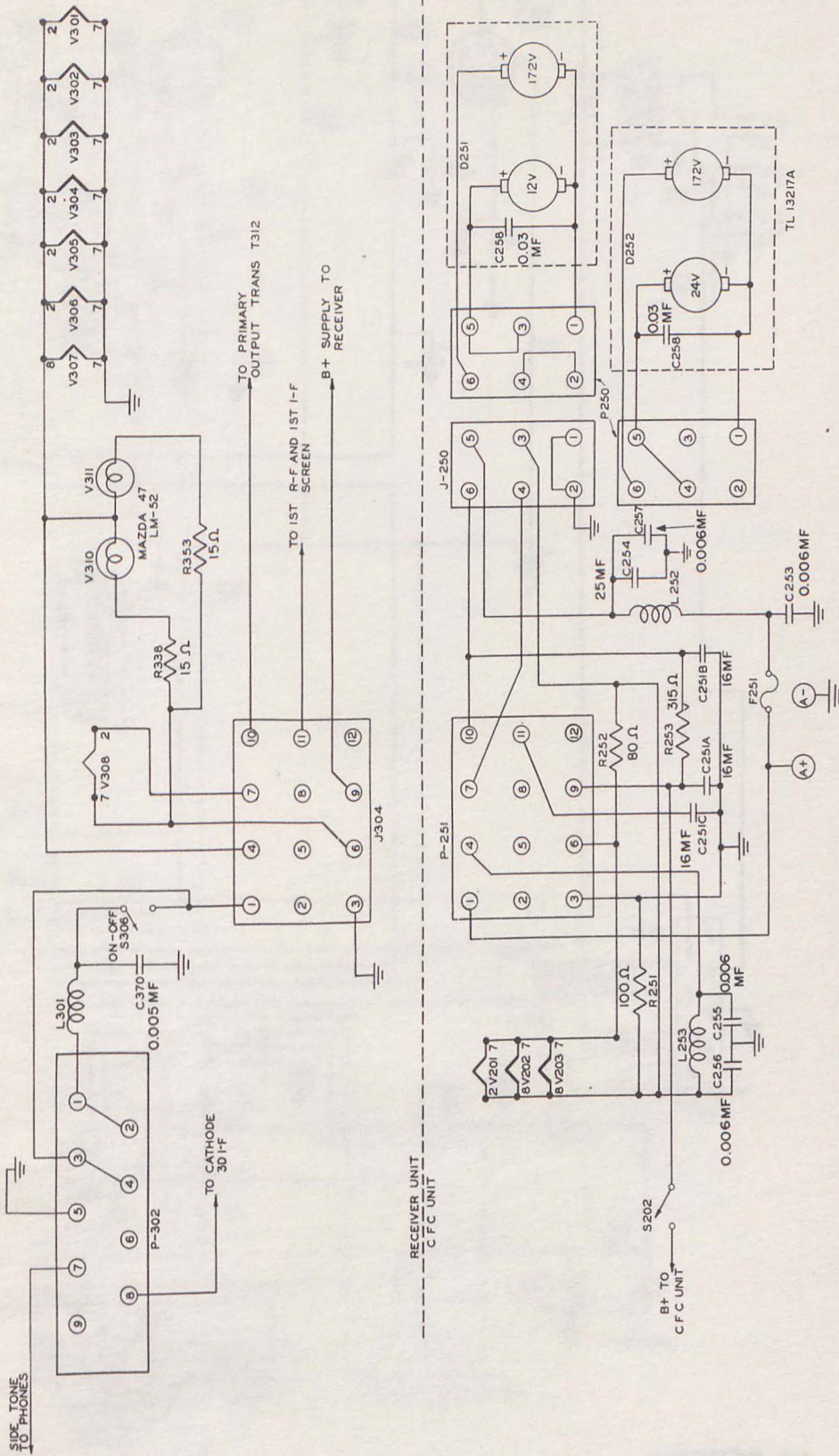
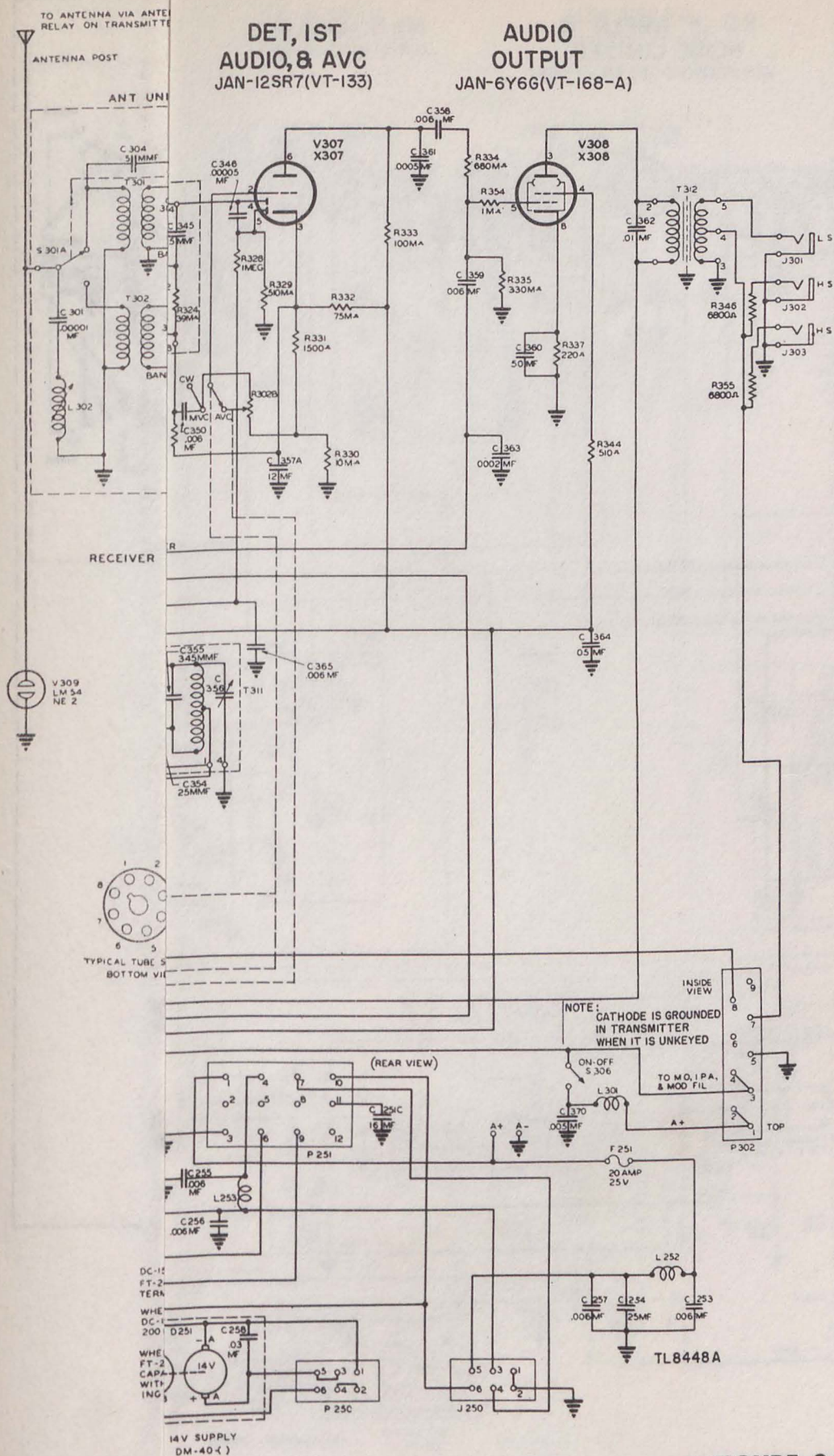


Figure 85. Radio Receiver BC-652-A, functional diagram of filament, dynamotor, and power-supply circuits.



810693 O-48

FIGURE 86

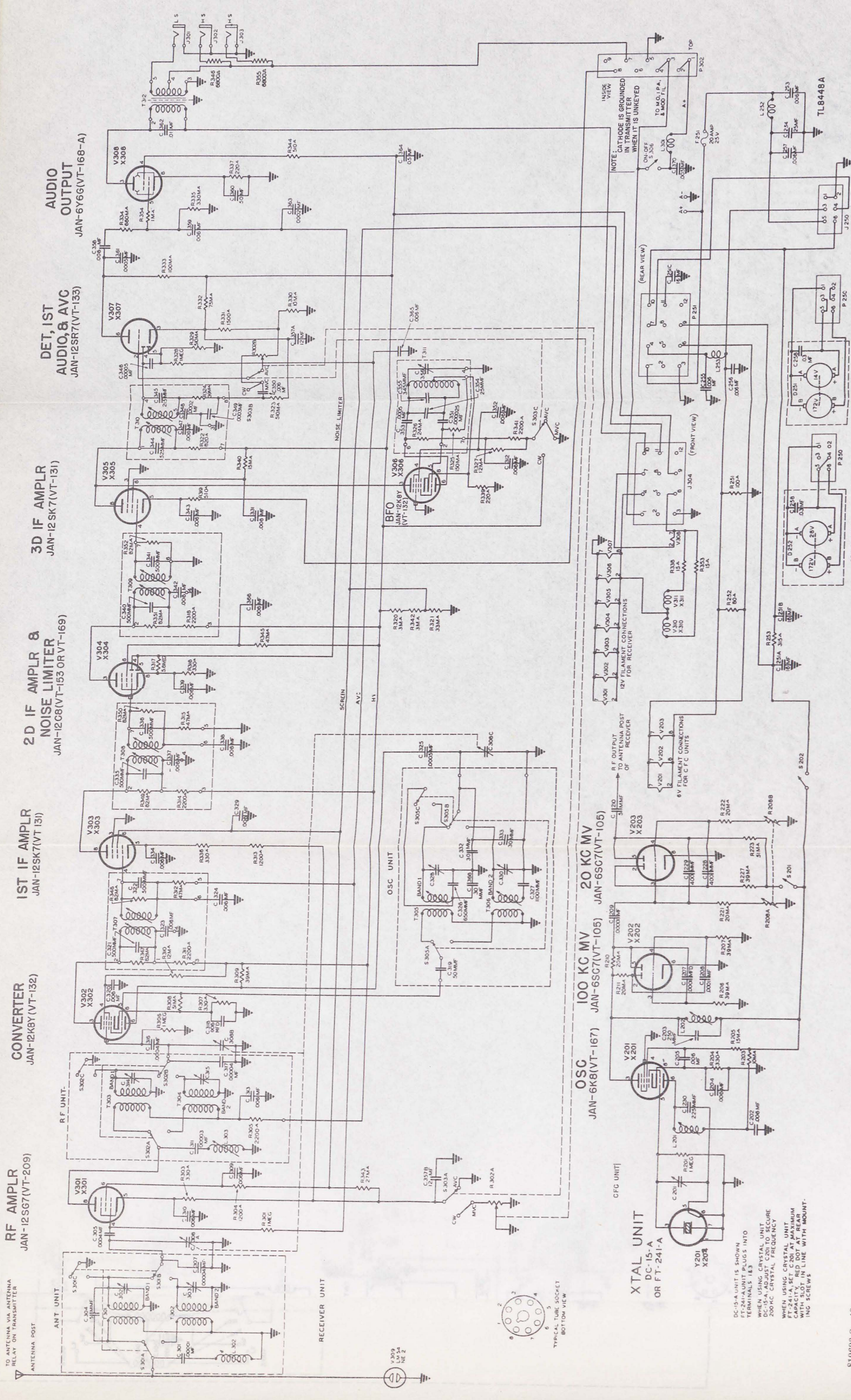


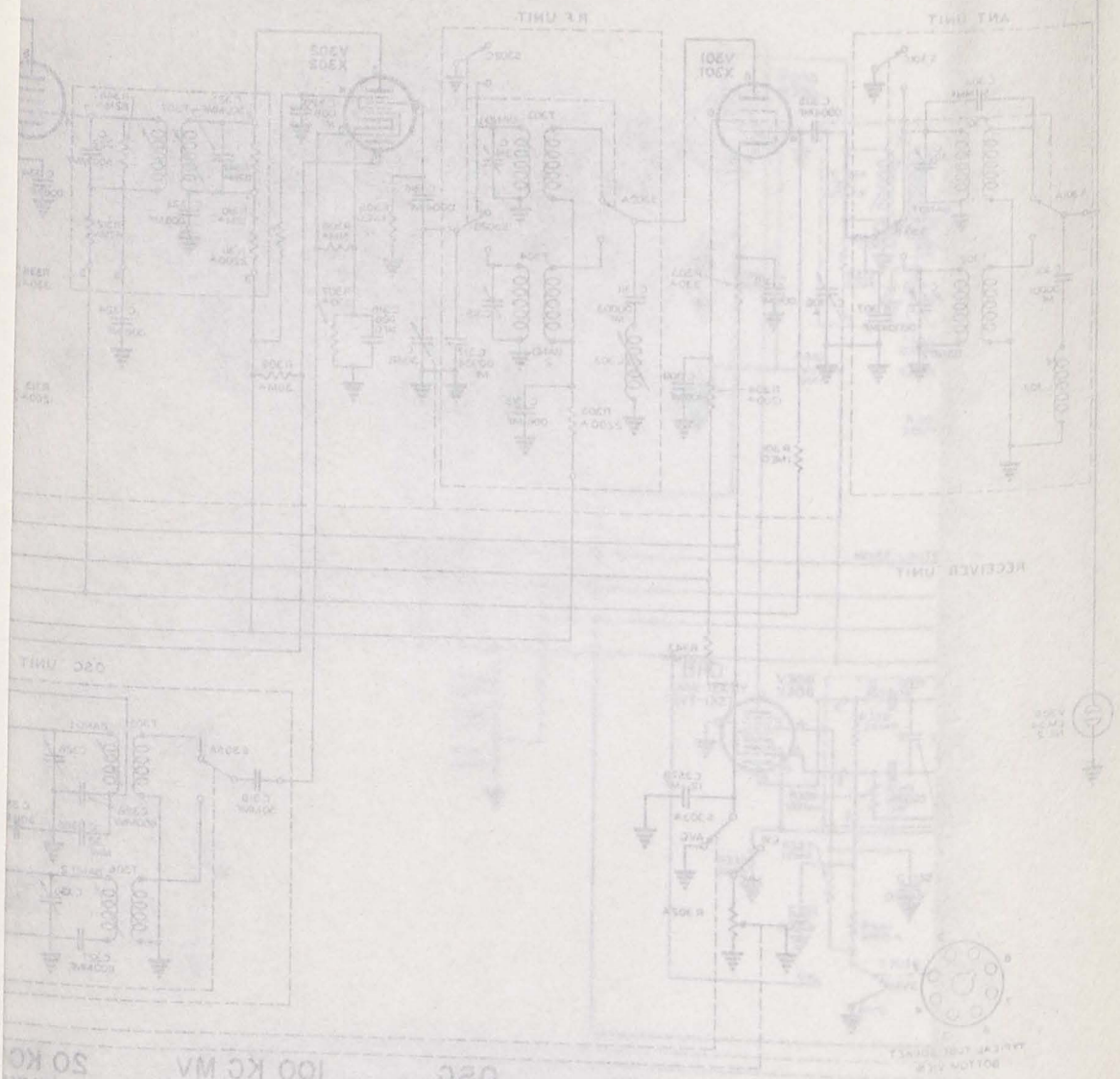
Figure 86. Radio Receiver EC-659-A, schematic diagram.

TO LOCATE THE POSITION OF
 EACH COMPONENT
 REFER TO THE
 ANTENNA LOG

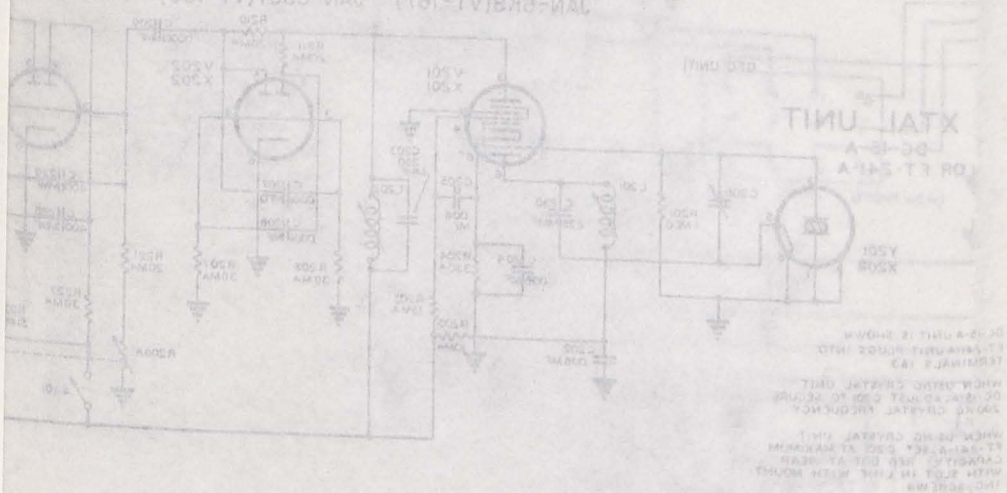
RF AMPLR
 JAN-1286(VT-209)

CONVERTER
 JAN-1285(VT-135)

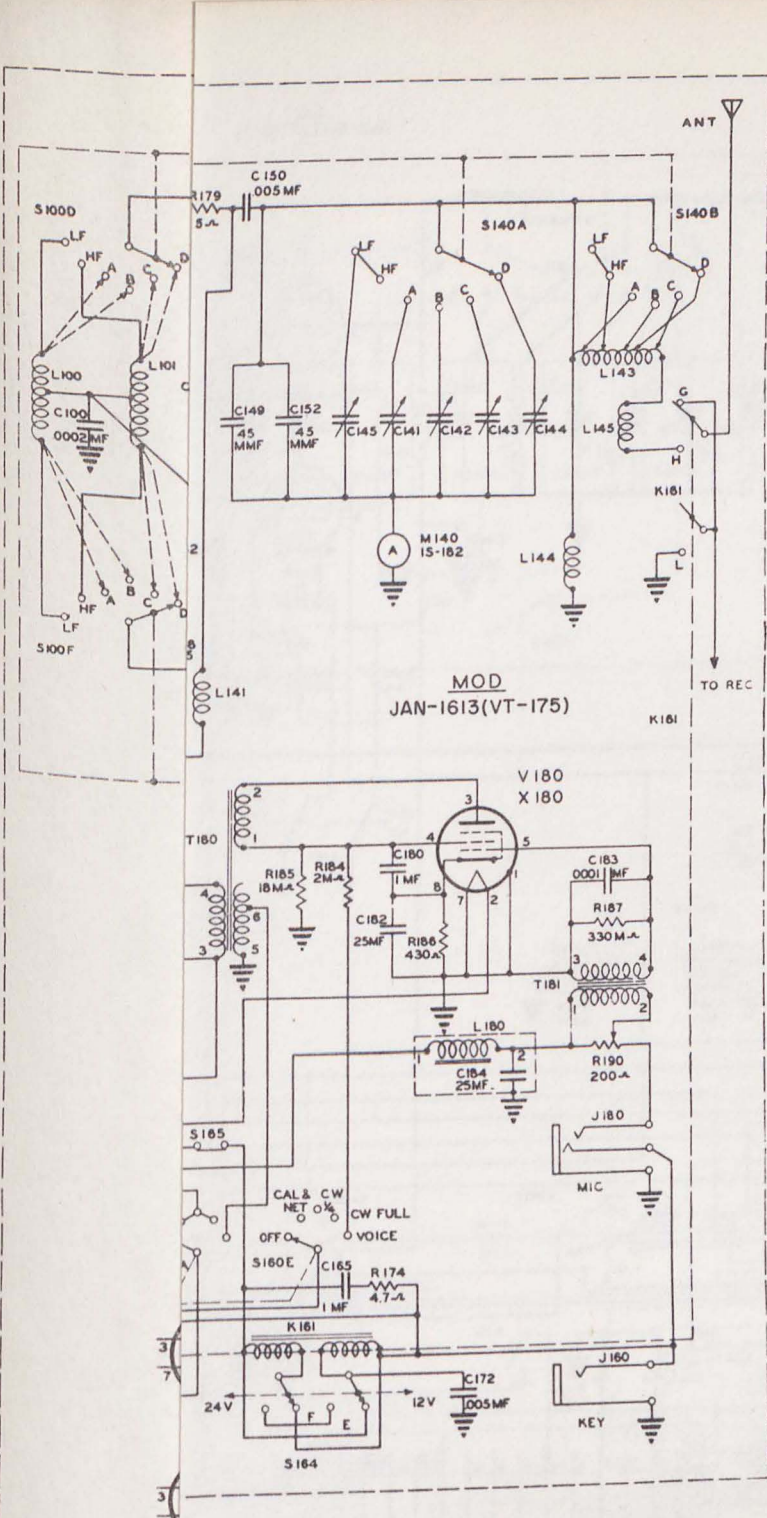
1ST IF A
 JAN-1283



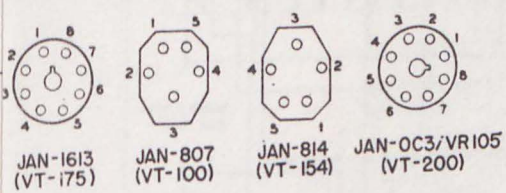
Osc
 JAN-883(VT-105) 100 KC MV 50 KC



XTAL UNIT
 DC-5-A
 OR FT-241-A
 X501
 DC-5 UNIT IS SHOWN
 FT-241-A UNIT IS SHOWN
 TERMINAL CA
 WHEN USING CRYSTAL UNIT
 DC-5-A UNIT USE TO SECURE
 200 KC CRYSTAL FREQUENCY
 WHEN USING CRYSTAL UNIT
 FT-241-A UNIT USE TO SECURE
 CRYSTAL FREQUENCY
 WITH LOG IN LINE WITH MOUNT
 THE POINTS



MOD
JAN-1613(VT-175)



TUBE SOCKETS

FIGURE 87

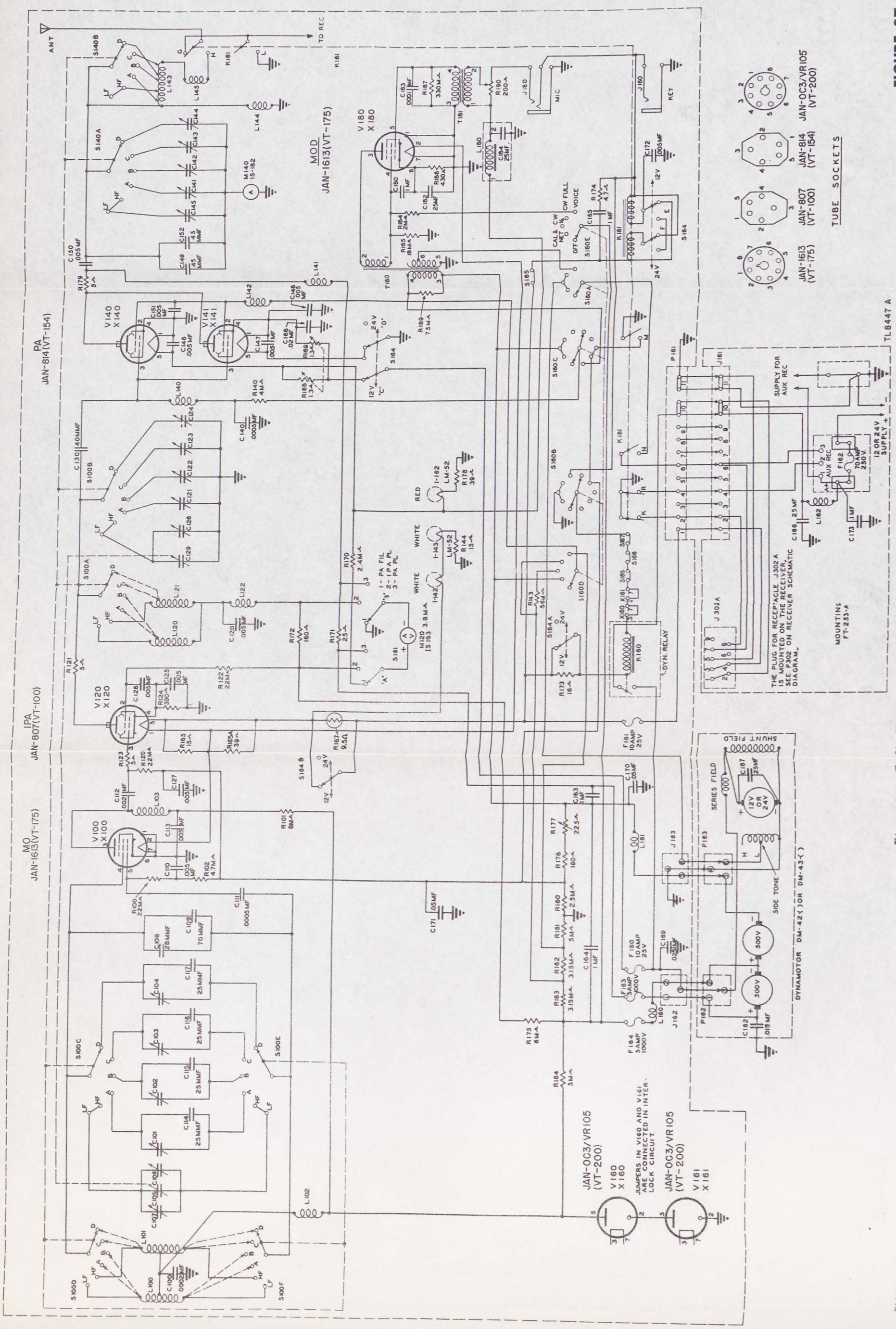


FIGURE 87

Figure 87. Radio Transmitter BC-653-A, schematic diagram.

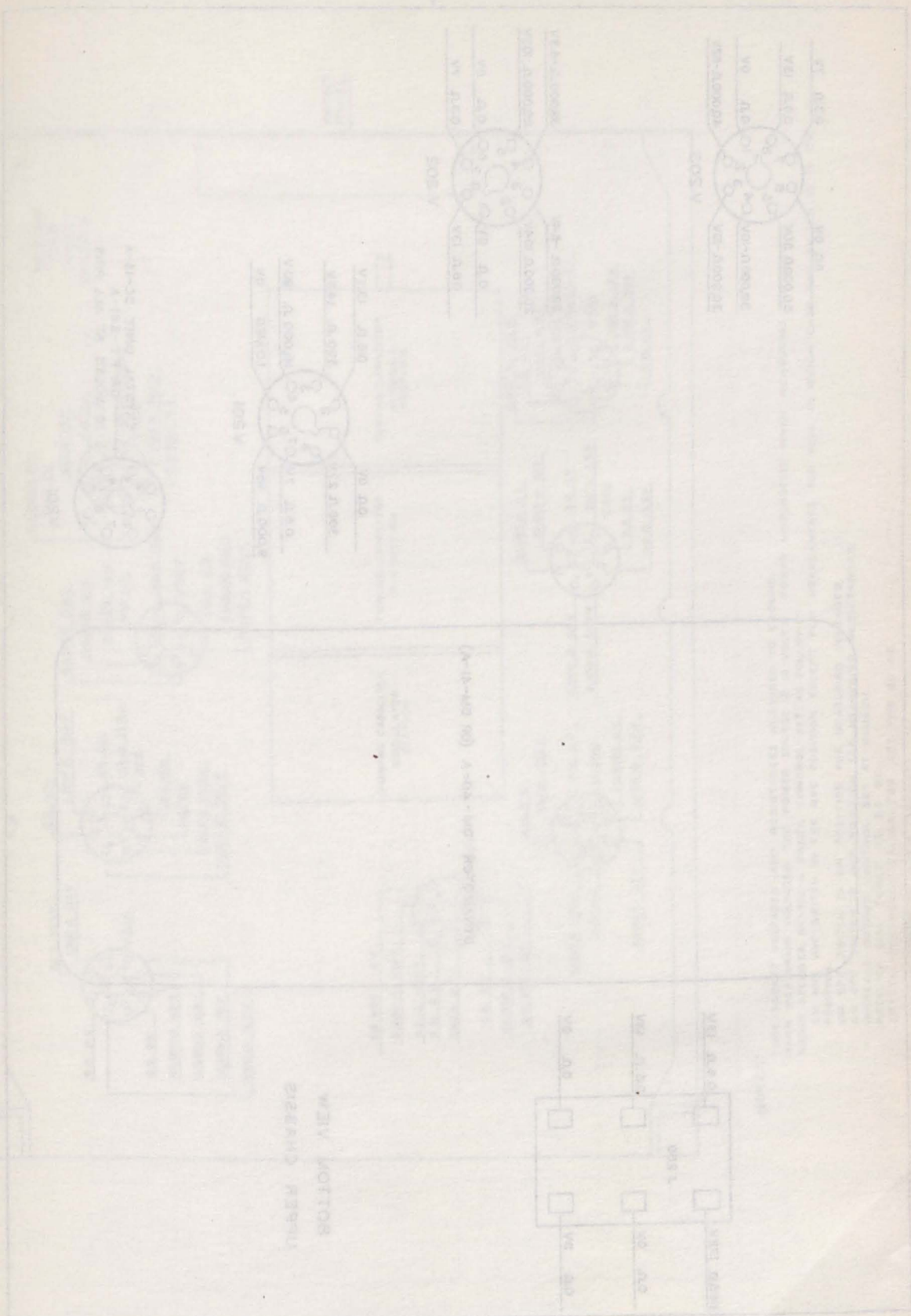


FIGURE 1 - Motor Assembly BC-200-A, Motor and Generator

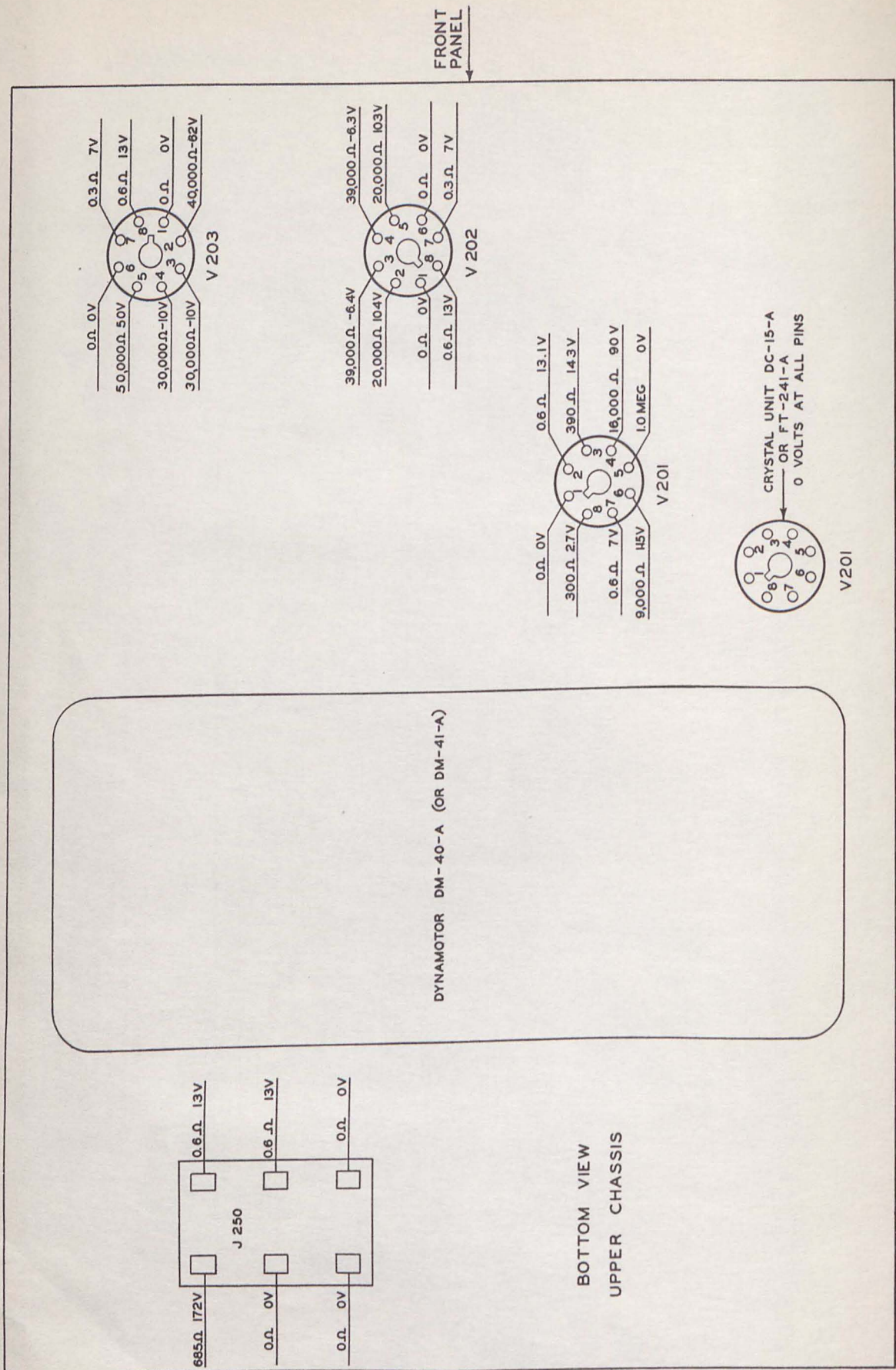
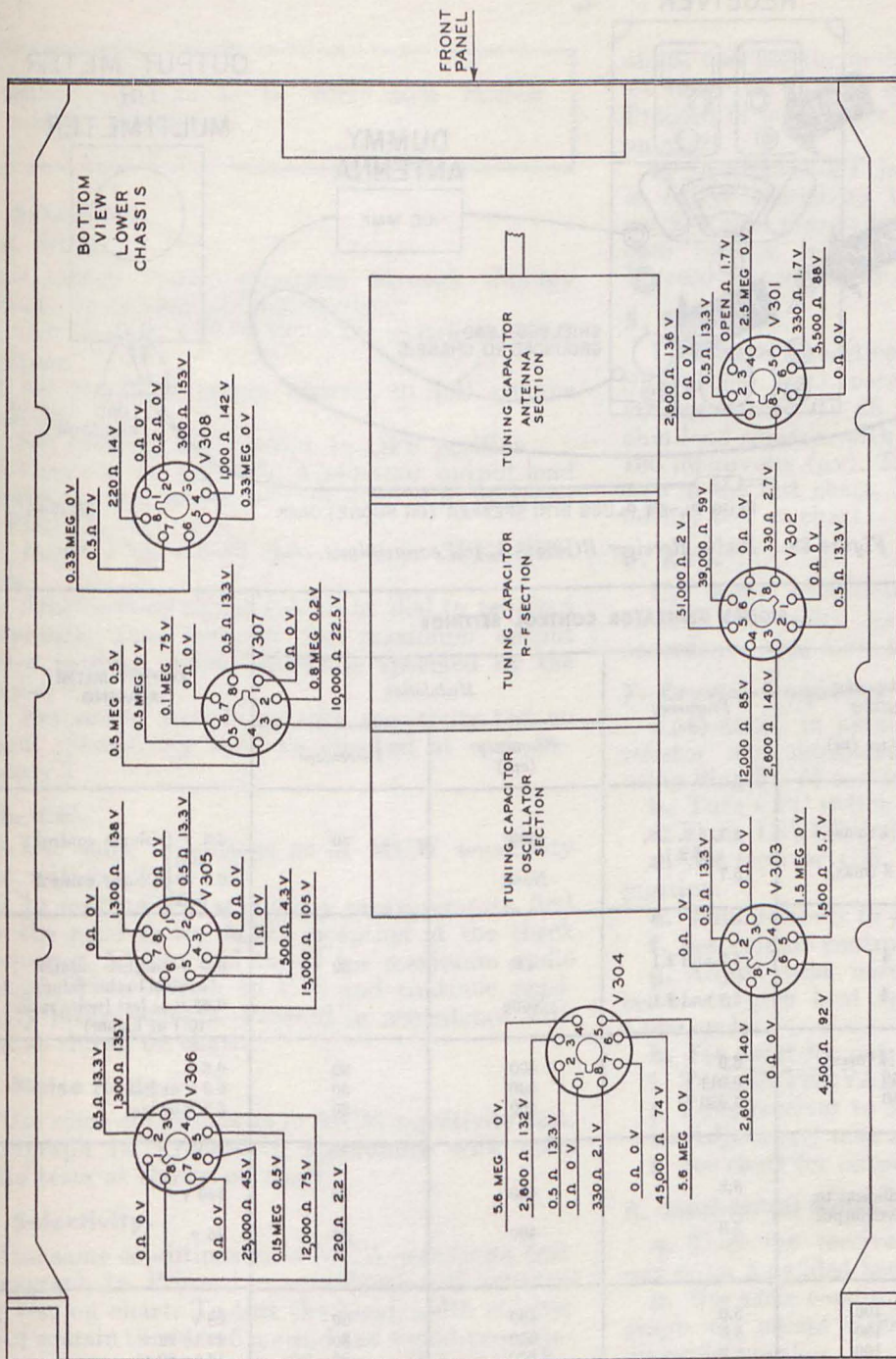


Figure 88. Radio Receiver BC-652-A, voltage and resistance charts.



NOTES:

- TUBE SOCKET VOLTAGES AND RESISTANCES MEASURED TO GROUND.
- WHEN MEASURING VOLTAGES THE POWER SOURCE IS 14 VOLTS. POWER DISCONNECTED WHEN MEASURING RESISTANCES.
- RADIO RECEIVER BC-652-A PANEL CONTROL SET AS FOLLOWS:
 - CW MVC AVC SWITCH IN THE MVC POSITION EXCEPT FOR MEASUREMENTS FOR V306, IN WHICH CASE THE SWITCH IS IN CW POSITION.
 - ON OFF SWITCH IN ON POSITION FOR MEASURING VOLTAGES.
 - ON OFF SWITCH IN OFF POSITION FOR MEASURING RESISTANCES.
 - INCREASE OUTPUT CONTROL SET AT MINIMUM.
 - RECEIVER DIAL TUNED TO 2.0 MC.
 - CRYSTAL-FREQUENCY CALIBRATOR SET FOR 20 KC
- ALL VACUUM TUBES IN THEIR SOCKETS.
- ALL MEASUREMENTS MADE WITH A 1,000-OHM-PER-VOLT METER (WESTON MODEL 665 ANALYZER, PART OF TEST SET 1-58-17).

Figure 88. Radio Receiver BC-652-A, voltage and resistance charts.

Table VI: MINIMUM TEST REQUIREMENTS FOR RECEIVER BC-652-A

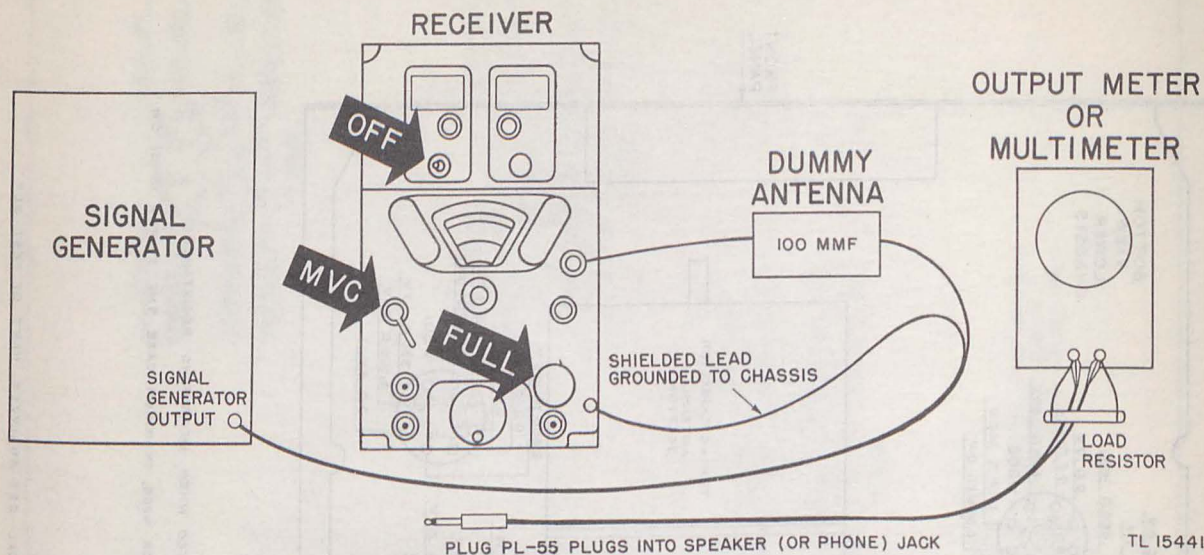


Figure 89. Radio Receiver BC-652-A, test connections.

TEST	SIGNAL GENERATOR CONTROL SETTINGS				OUTPUT METER READING
	Attenuator setting Voltage (μ v)	Frequency (mc)	Modulation		
			Frequency (cps)	Percentage	
<i>Sensitivity</i> a. MCW b. CW	4 (max) 2 (max)	5.7, 3.6, 3.3, and 2.1 5.7	400 None	30	6.3 v (volume control max) 6.3 v (volume control max)
<i>Noise Ratio</i> a. Signal modulated b. Signal unmodulated	4 4	5.7 and 2.1 5.7 and 2.1	400 None	30	6.3 v (adjust volume control to this value) 0.63 v or less (noise ratio 10:1 or higher)
<i>Selectivity</i>	4 (max) 40 40	6.0 6.011 * 5.089 *	400 400 400	30 30 30	6.3 v 6.3 v or less 6.3 v or less
<i>Output</i> a. 8,000-ohm load (speaker) b. 250-ohm load (headset)	Sufficient to give output	5.8 5.8	400 400	30 30	140 v 25 v
<i>Fidelity</i>	100 100 100	5.0 5.0 5.0	400 200 3,000	30 30 30	28 v 20 to 28 v 12 to 20 v
<i>AVC</i>	50 100,000	2.1 2.1	400 400	30 30	X volts Y volts (Y volts to be 3 times X or less)
<i>CFC power output</i>	See legend. Refer to item 8 for details.				140 v or more

* Receiver dial must remain tuned to 6.0-mc signal for all selectivity tests.

Legend

NOTE: All tests to be made with receiver mounted in case.

1. Sensitivity.

a. MCW.

- (1) Connect signal generator through dummy antenna to antenna post on receiver.
- (2) Set receiver CW MVC AVC switch to MVC position.
- (3) Set receiver volume control to full volume position.
- (4) Set receiver CFC switch to OFF position.
- (5) Connect in parallel, 4,000-ohm output-load resistor, output meter, and alligator clips attached to Plug PL-55.
- (6) Insert Plug PL-55 into receiver SPEAKER jack.
- (7) After setting signal generator dial to required frequency, tune receiver for maximum output meter reading, unless otherwise specified by the symbol *.
- (8) Proceed in accordance with sensitivity test on chart. (Sensitivity shall be checked at each frequency.)

b. CW.

- (1) Use same conditions as in MCW sensitivity test, paragraph 1a.
- (2) In making CW sensitivity measurements, first set the receiver for MVC reception at the check frequency 5.7 mc and tuned for maximum audio output. Then switch to CW and continue sensitivity measurements. Proceed in accordance with test as shown on chart.

2. Noise Ratio.

Use same conditions as in MCW sensitivity test, paragraph 1a. Proceed in accordance with noise ratio tests as shown on chart.

3. Selectivity.

Use same conditions as in MCW sensitivity test paragraph 1a. Proceed in accordance with selectivity test on chart. To test the band width receiver must remain tuned to 6 mc and the signal-generator frequency varied 11 kc to either side of 6 mc.

4. Output.

a. At SPEAKER jack use same conditions as in MCW sensitivity test, paragraph 1a, except change output-load resistor from 4,000 to 8,000

ohms, and use the multimeter (set for appropriate a-c range) in place of the 4,000-ohm output meter. Proceed in accordance with output test as shown on chart.

b. At HEADSET jack use same conditions as in MCW sensitivity test, paragraph 1a, except use 250-ohm output load resistor instead of 4,000-ohm resistor in parallel with the multimeter. Proceed in accordance with output test on chart.

5. Fidelity.

Use same conditions as in output test (at SPEAKER jack), paragraph 4a. Adjust receiver volume control to 28 volts output across 8,000-ohm load resistor, with a signal-generator input of 100 microvolts (μv). This corresponds to the first step in the test chart. Proceed in accordance with fidelity test on chart.

6. AVC.

Use same conditions as in output test (at SPEAKER jack), paragraph 4a. Proceed in accordance with AVC tests on chart.

7. Crystal-frequency Calibrator (CFC).

- a. Connect in parallel 8,000-ohm output load resistor and multimeter into SPEAKER jack, using Plug PL-55 and leads.
- b. Turn CFC switch to ON position.
- c. Turn INTERVAL switch to 20-kc position.
- d. Set receiver CW MVC AVC switch to CW position.
- e. Tune receiver to 5,760 kc.
- f. Set volume control at maximum.
- g. Adjust beat note by slightly detuning receiver to give beat frequency of approximately 1,000 cycles.
- h. See chart for output voltage reading.
- i. Turn INTERVAL switch to 100-kc position.
- j. Tune receiver to 5,800 kc.
- k. Adjust beat note as in step g.
- l. See chart for output voltage reading.

8. Mechanical Noise.

- a. Place the receiver on a soft rubber or felt pad or on a padded bench.
- b. Use same conditions as in output test, paragraph 4a, except 8,000-ohm load resistor is replaced by speaker.
- c. Tap receiver repeatedly in various places with a padded mallet, listening for extraneous noise indicative of loose contacts or microphonic conditions. (Tapping is to stimulate a vibration. Do not strike receiver hard enough to damage it.)

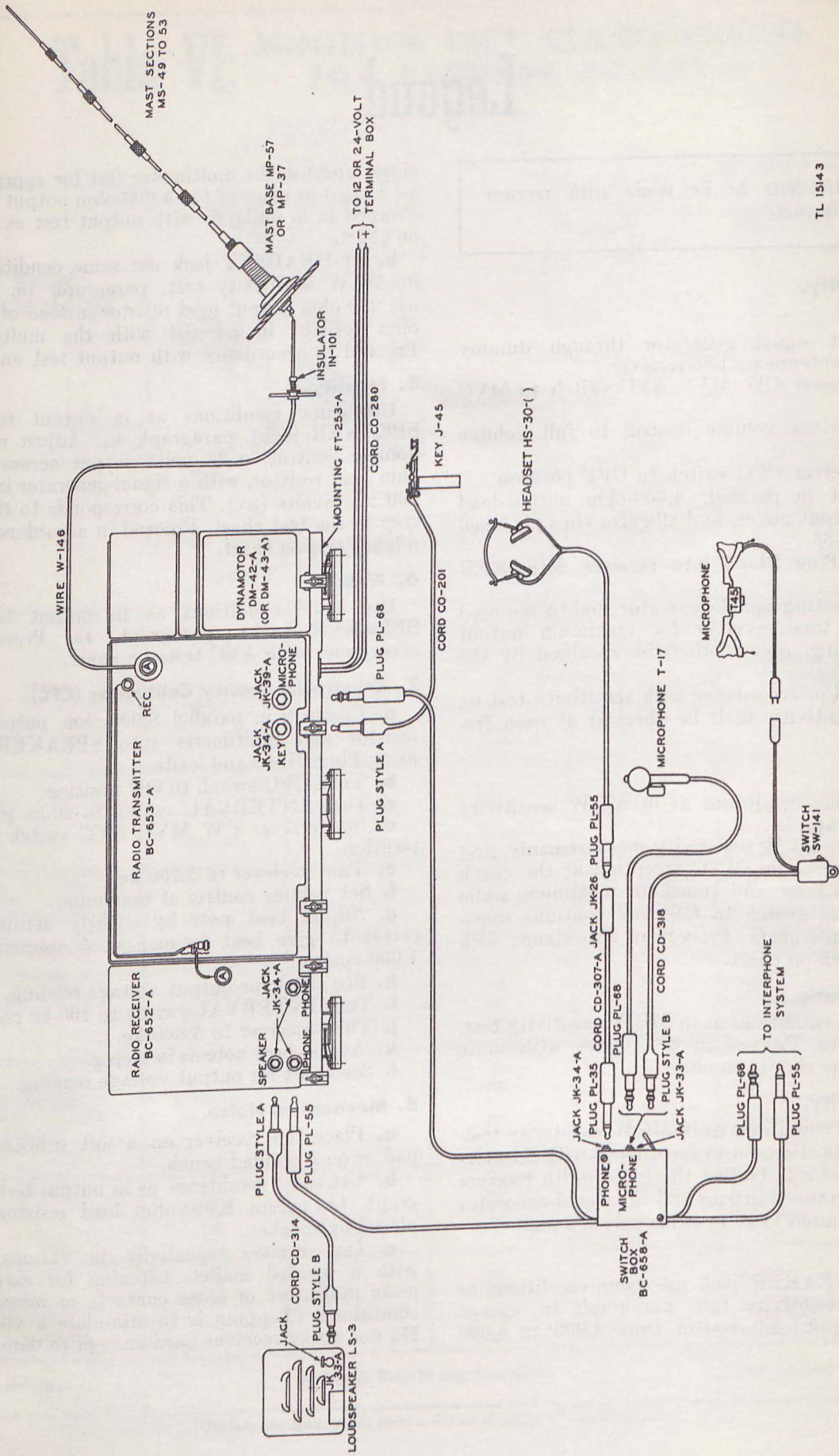


Figure 90. Radio Set SCR-506-A, cording diagram.

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