

# TM 11-850

WAR DEPARTMENT TECHNICAL MANUAL

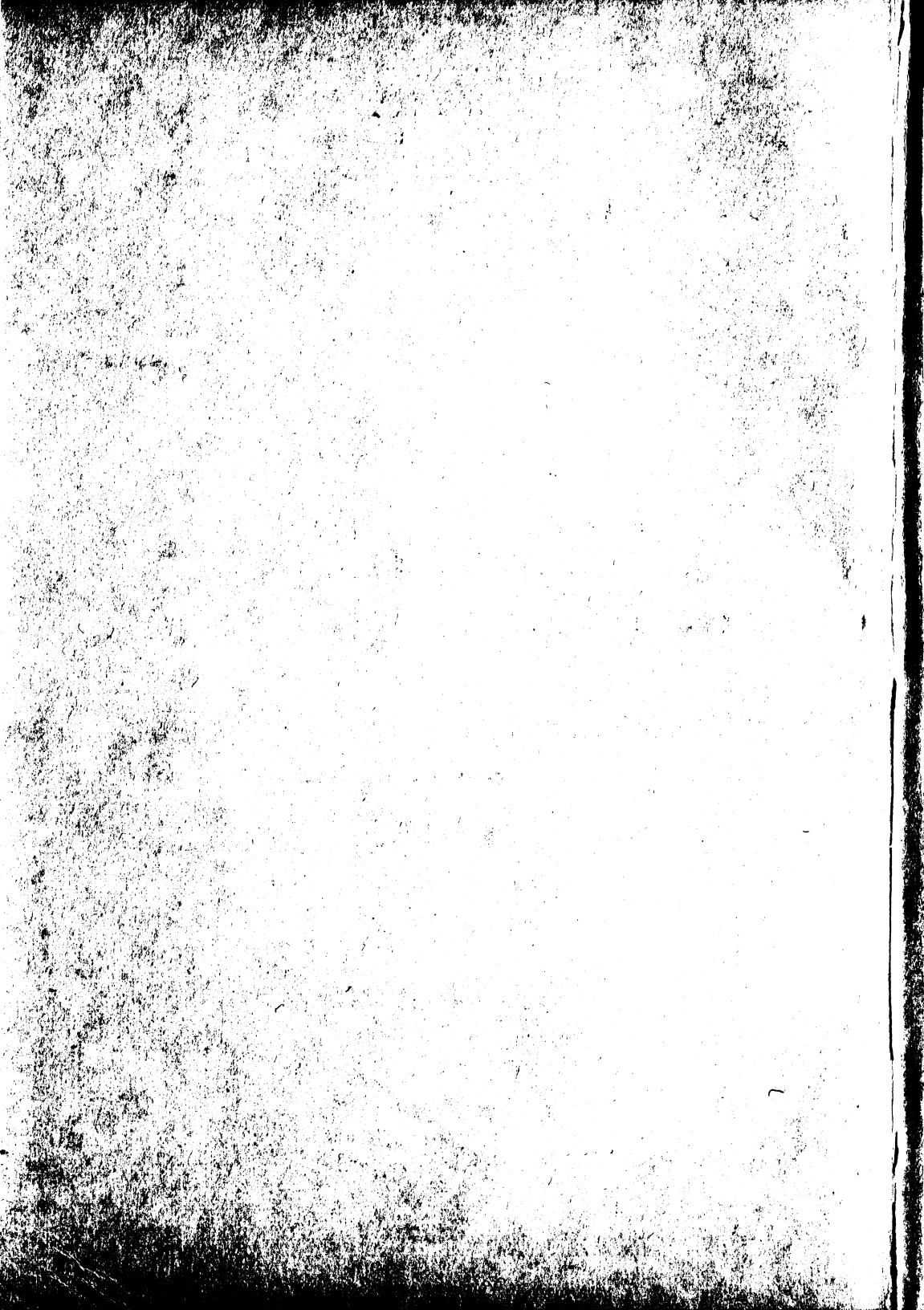
## RADIO RECEIVERS

BC-312, -A, -C, -D, -E, -F, -G, -J,  
-L, -M, -N, -HX, and -NX

BC-342, -A, -C, -D, -F, -J, -L, -M,  
and -N

BC-314, -C, -D, -E, -F, and -G

BC-344, and -D



*This manual supersedes TM 11-850, 15 March 1944, including C 1, 21 February 1945.*

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# RADIO RECEIVERS

BC-312, -A, -C, -D, -E, -F, -G, -J,  
-L, -M, -N, -HX, and -NX

BC-342, -A, -C, -D, -F, -J, -L, -M,  
and -N

BC-314, -C, -D, -E, -F, and -G

BC-344, and -D

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WAR DEPARTMENT • SEPTEMBER 1946

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WAR DEPARTMENT

WASHINGTON 25, D. C., 3 September 1946

TM 11-850, Radio Receivers BC-312, -A, -C, -D, -E, -F, -G, -J, -L, -M, -N, -HX, and -NX; BC-342, -A, -C, -D, -F, -J, -L, -M, and -N; BC-314, -C, -D, -E, -F, and -G; BC-344, and -D, is published for the information and guidance of all concerned.

[AG 300.7 (6 May 46)]

BY ORDER OF THE SECRETARY OF WAR:

OFFICIAL: DWIGHT D. EISENHOWER

EDWARD F. WITSELL *Chief of Staff*

*Major General*

*The Adjutant General*

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1-911; 1-977; 1-1077; 5-512; 5-526; 11-7; 11-16; 11-107;  
11-127; 11-247; 11-338; 11-500 (IT) (IU); 11-537;  
11-587; 11-592; 11-597.

For explanation of distribution formula, see FM 21-6.

## **SAFETY NOTICE**

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Voltages as high as 300 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 power supply ON.

No interlock circuits are provided in the radio receivers. A few service checks must be made inside the set with the voltage on. When making these checks, always have present another person capable of rendering aid. Keep one hand in your pocket while making high-voltage measurements. This precaution will prevent touching the electrical circuit with more than one part of the body at one time.

When servicing the equipment, open the vehicular battery circuit. Shorting this battery circuit will cause a flash and severe burns unless the power is turned off.

## 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, pickaxes, 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—Tubes, resistors, capacitors, coils, switches, tuning dials, dynamotors, crystals, and chassis.
  2. Cut—Chassis wiring and connecting cordage.
  3. Burn—All diagrams, instruction books, and Technical Manuals.
  4. Bury or scatter—Any or all of the above pieces after breaking.

**DESTROY EVERYTHING**

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# First Aid for Electric Shock

## RESCUE.

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

## SYMPTOMS.

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

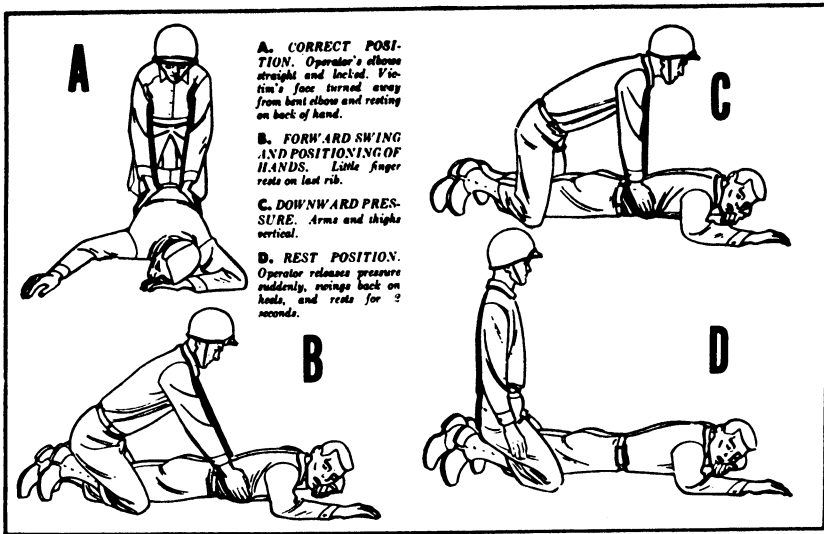
b. The victim is usually very white or blue. The pulse is very weak or entirely absent and unconsciousness is complete. Burns are usually present. The victim's body may become rigid or stiff in a very few minutes. This condition is due to the action of electricity and is not to be considered rigor mortis.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

## TREATMENT.

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

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

c. Open the victim's mouth and remove any foreign bodies, such as false teeth, chewing gum, or tobacco. The mouth should remain open,



with the tongue extended. Do not permit the victim to draw his tongue back into his mouth or throat.

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

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

- (1) the operator's arms and thighs will be vertical while applying pressure on the small of the victim's back;
- (2) the operator's fingers are in a natural position on the victim's back with the little finger lying on the last rib;
- (3) the heels of the hands rest on either side of the spine as far apart as convenient without allowing the hands to slip off the victim;
- (4) the operator's elbows are straight and locked.

f. The resuscitation procedure is as follows:

- (1) Exert downward pressure, not exceeding 60 pounds, for 1 second.
- (2) Swing back, suddenly releasing pressure, and sit on the heels.
- (3) After 2 seconds, swing forward again, positioning the hands exactly as before, and apply pressure for another second.

g. The forward swing, positioning of the hands, and the downward pressure should be accomplished in one continuous motion, which requires 1 second. The release and backward swing require 1 second. The addition of the 2-second rest makes a total of 4 seconds for a complete cycle. Until the operator is thoroughly familiar with the correct cadence

of the cycle, he should count the seconds aloud, speaking distinctly and counting evenly in thousands. Example: one thousand and one, one thousand and two, etc.

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

### **RELIEVING OPERATOR.**

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

### **STIMULANTS.**

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

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

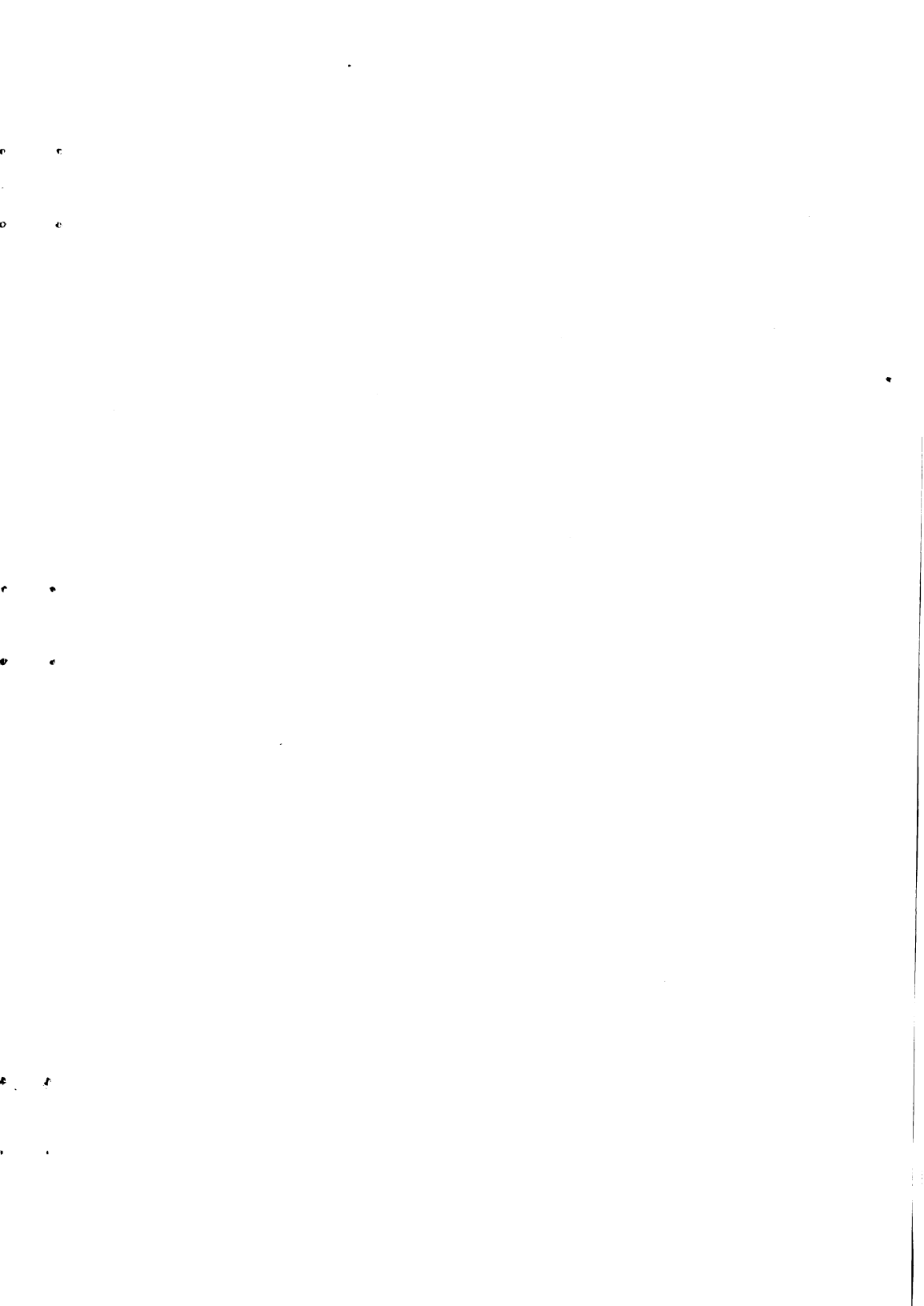
### **CAUTIONS.**

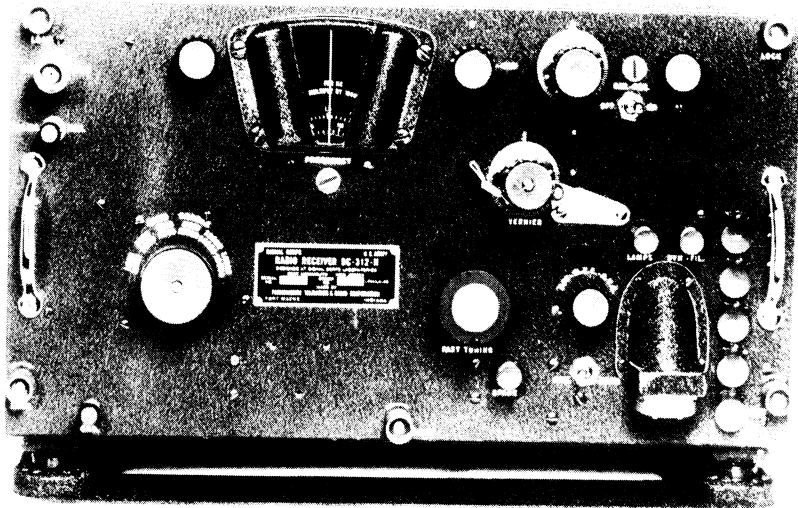
**a.** After the victim revives, keep him LYING QUIETLY. Any injury a person may have received may cause a condition of shock. Shock is present if the victim is pale and has a cold sweat, his pulse is weak and rapid, and his breathing is short and gasping.

**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.*

TL15338-C





*Figure 1. Radio Receiver BC-312-N.*

*This manual supersedes TM 11-850, 15 March 1944, including C 1, 21 February 1945.*

# PART 1

## INTRODUCTION

---

### Section I. DESCRIPTION

#### 1. General

a. The radio receivers described in this manual are of the superheterodyne type intended for general field usage. They are built ruggedly and are suitable for vehicular, portable, or fixed operation. The receivers are highly sensitive and selective and are designed for the reception of either continuous-wave (c-w) or amplitude-modulated (a-m) voice or tone signals. They may be divided into two main groups; the first group consisting of the receivers covering a frequency range from 1,500 to 18,000 kilocycles (kc) in six bands, and the second group consisting of the receivers covering a frequency range from 150 to 1,500 kc in four bands. Within each group are models for operation from either storage batteries or alternating-current (a-c) power sources. All receiver models are identical in size, in general external and internal construction and appearance, and in the fundamental arrangement of their electrical circuits. For purposes of identification in this manual, the first group will be referred to as the high-frequency (h-f) group, and the second group as the medium-frequency (m-f) group.

b. The h-f receiver group consists of Radio Receiver BC-312-(\*), a battery operated model, and Radio Receiver BC-342-(\*), an a-c operated model. The m-f receiver group consists of Radio Receiver BC-314-(\*), a battery operated model, and Radio Receiver BC-344-(\*), an a-c operated model. Throughout this manual, where descriptive matter applies equally to all receivers of a series, the suffix letter is omitted and the symbol (\*) is used instead. The full type number is used when a particular model must be identified for any reason. The table in paragraph 8 lists the differences between models.

## 2. Technical Characteristics

### a. RADIO RECEIVERS BC-312-(\*) AND BC-342-(\*)

#### Frequency range:

Band A.....	1,500 to 3,000 kc
Band B.....	3,000 to 5,000 kc
Band C.....	5,000 to 8,000 kc
Band D.....	8,000 to 11,000 kc
Band E.....	11,000 to 14,000 kc
Band F.....	14,000 to 18,000 kc

Receiver type.....Superheterodyne

Types of signals which can be received.....c-w, tone, and voice

#### Number of tubes:

Radio Receiver BC-312-(\*)..... 9

Radio Receiver BC-342-(\*)..... 10

Intermediate frequency..... 470 kc

#### Power input:

Radio Receiver BC-312..... 90 to 100 watts

Radio Receiver BC-312-(\*)..... 50 to 60 watts

Radio Receiver BC-342..... 100 watts

Radio Receiver BC-342-(\*)..... 75 watts

#### Power supply:

Radio Receiver BC-312 and BC-312-(\*).. 12 to 14 volts, dc

Radio Receiver BC-312-(\*) X..... 24 to 28 volts, dc

Radio Receiver BC-342 and BC-342-(\*).. 100 to 120 volts, ac

Antenna.....Whip or straight wire

### b. RADIO RECEIVERS BC-314-(\*) AND BC-344-(\*)

#### Frequency range:

Band A..... 150 to 260 kc

Band B..... 260 to 450 kc

Band C..... 450 to 820 kc

Band D..... 820 to 1,500 kc

Receiver type.....superheterodyne

Types of signals which can be received.....c-w, tone, and voice

#### Number of tubes:

Radio Receiver BC-314-(\*)..... 9

Radio Receiver BC-344-(\*)..... 10

Intermediate frequency..... 92.5 kc

#### Power input:

Radio Receiver BC-314-(\*)..... 50 to 60 watts

Radio Receiver BC-344-(\*)..... 75 watts

#### Power supply:

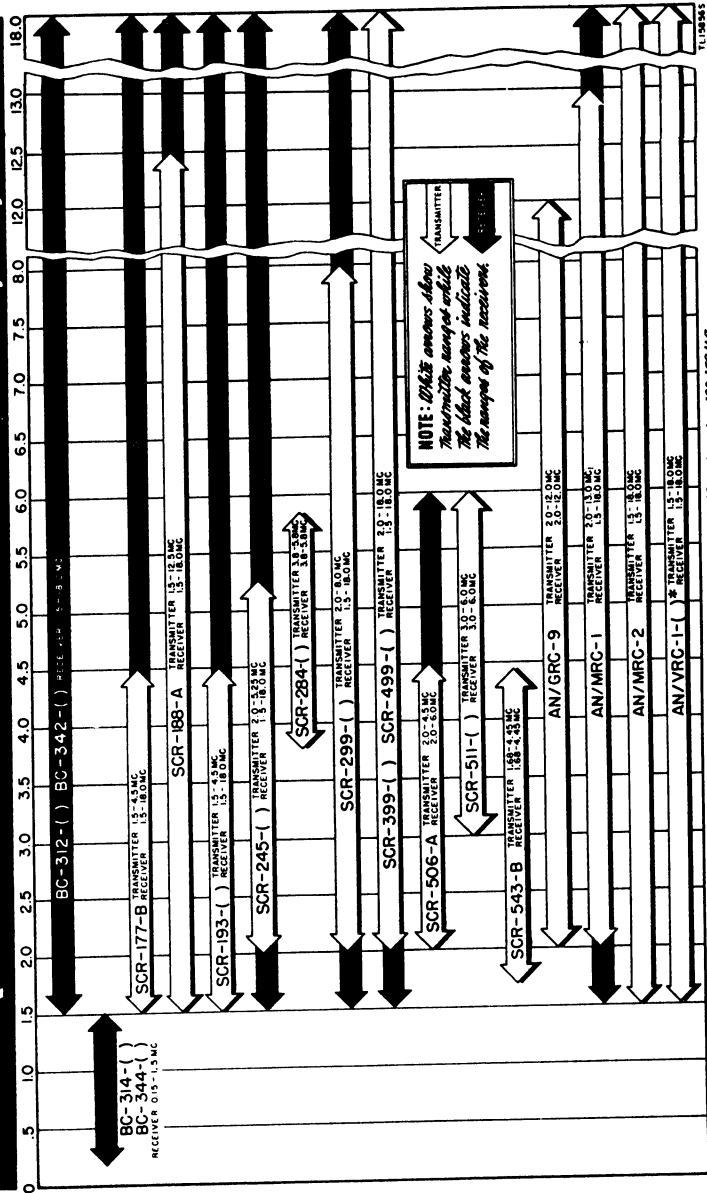
Radio Receiver BC-314-(\*)..... 12 to 14 volts, dc

Radio Receiver BC-344-(\*)..... 110 to 120 volts, ac

Antenna.....whip or straight wire



# FREQUENCY SPECTRUM: *Megacycles*



<sup>9</sup>Additional frequencies of the AN/VRC-1 are: transmitter 100-150 MC, and receiver 200-150 MC

Figure 2. Frequency spectrum chart.

### 3. Table of Components

Component	Required number	Height (in.)	Depth (in.)	Length (in.)	Volume (cu. ft.)	Weight (lb.)
Radio Receiver BC-312-(*).	1	10	9½ <sub>16</sub>	18½ <sub>16</sub>	1.0	58
Dynamotor DM-21-(*), or equivalent.	1	3¼	5½	6	0.06	7
Fuse FU-21-A	3					
Lamp LM-27	2					
Mounting FT-162.	1	1¼	6⅞	18	0.075	3¾
Radio Receiver BC-312-(*).X.	1	10	9½ <sub>16</sub>	18½ <sub>16</sub>	1.0	58
Dynamotor DM-21-CX, or equivalent.	1	3¼	5½	6	0.06	7
Fuse FU-25A	3					
Lamp LM-42	2					
Mounting FT-162.	1	1¼	6⅞	18	0.075	3¾
Radio Receiver BC-342-(*).	1	10	9½ <sub>16</sub>	18½ <sub>16</sub>	1.0	61.5
Rectifier RA-20	1	3¼	6⅞	6½	0.06	10½
Fuse FU-27	1					
Fuse FU-21-A	3					
Lamp LM-27	2					
Mounting FT-162.	1	1¼	6⅞	18	0.075	3¾
Radio Receiver BC-314-(*).	1	10	9½ <sub>16</sub>	18½ <sub>16</sub>	1.0	58
Dynamotor DM-21-(*), or equivalent.	1	3¼	5½	6	0.06	7
Fuse FU-21-A	3					
Lamp LM-27	2					
Mounting FT-162.	1	1¼	6⅞	18	0.075	3¾
Radio Receiver BC-344-(*).	1	10	9½ <sub>16</sub>	18½ <sub>16</sub>	1.0	61.5
Rectifier RA-20	1	3¼	6⅞	6½	0.06	10½
Fuse FU-27	1					
Fuse FU-21-A	3					
Lamp LM-27	2					
Mounting FT-162.	1	1¼	6⅞	18	0.075	3¾

Note. This list is for general information only. See appropriate publications for information pertaining to requisition of spare parts.

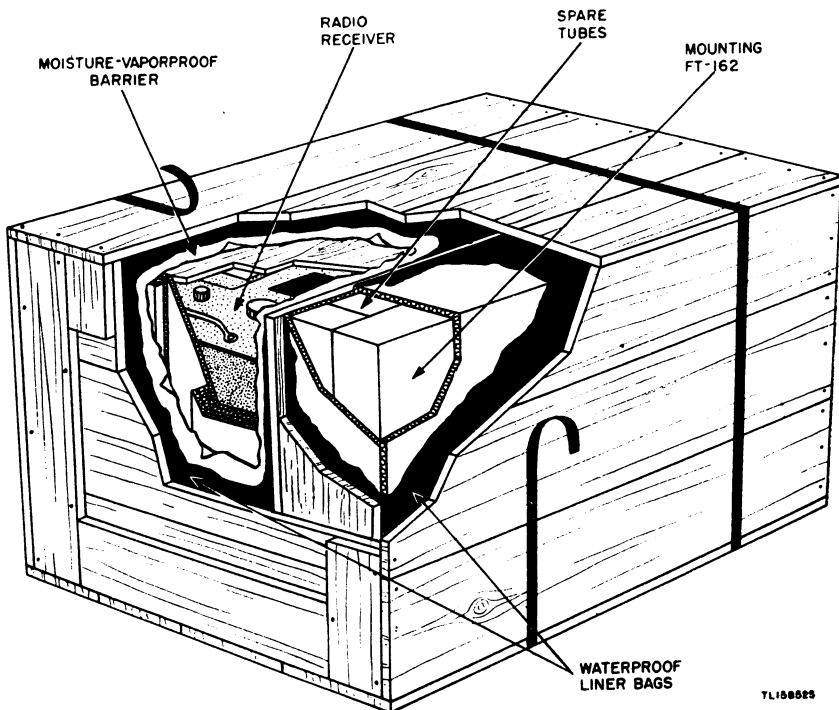


Figure 3. Radio receiver packed for export shipment.

#### 4. Packaging Data

*Note.* Items may be packed in a different manner from that shown, depending on supply channels.

Radio Receivers BC-312-(\*), BC-312-(\*X), BC-342-(\*), BC-314-(\*), and BC-344-(\* are shipped in wood crates approximately 25 $\frac{3}{8}$  by 21 $\frac{7}{8}$  by 14 $\frac{3}{8}$  inches in size, packed one receiver to a crate. Each crate weighs approximately 120 pounds and consists of two compartments (fig. 3); the larger compartment contains the radio receiver and two Technical Manuals, and the smaller compartment contains the following spare parts.

*a.* RADIO RECEIVER BC-312-(\*).

- Nine spare tubes.
- Four spare Fuses FU-21.
- Two spare Lamps LM-27.
- Four spare high-voltage brushes.
- Four spare low-voltage brushes.
- One Mounting FT-162.

*b.* RADIO RECEIVER BC-342-(\*).

- Ten spare tubes.

Four spare Fuses FU-21.  
Four spare Fuses FU-27.  
Two spare Lamps LM-27.  
One Mounting FT-162.

*c.* RADIO RECEIVER BC-314-(\*).

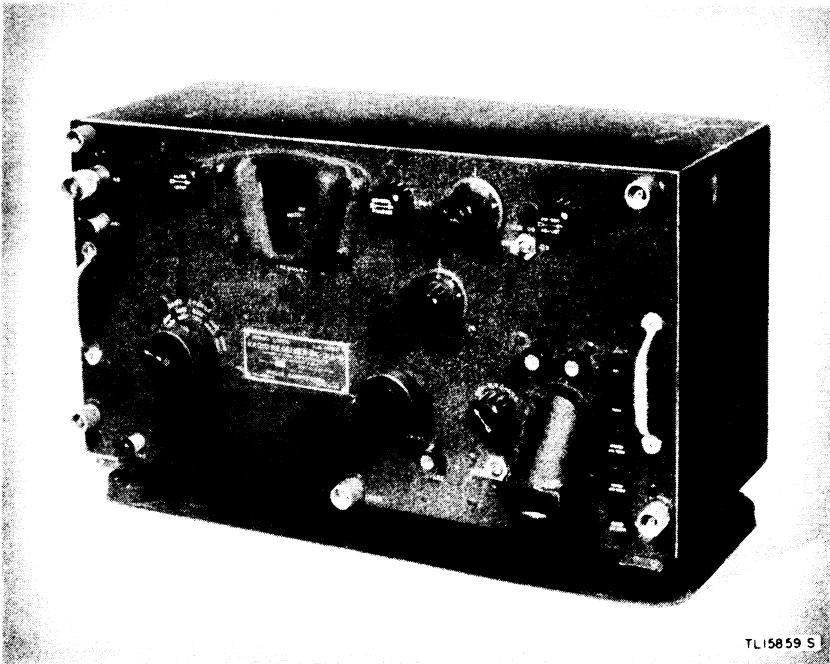
Six spare tubes.  
Four spare Fuses FU-21.  
Two spare Lamps LM-27.  
Four spare high-voltage fuses.  
Four spare low-voltage fuses.  
One Mounting FT-162.

*d.* RADIO RECEIVER BC-344-(\*).

Thirty-one spare tubes.  
Four spare Fuses FU-21.  
Four spare Fuses FU-27.  
Two spare Lamps LM-27.  
One Mounting FT-162.

## 5. Description of Radio Receiver

The four receiver types described in this manual are similar in outward general appearance. The receiver cabinet, front panel,

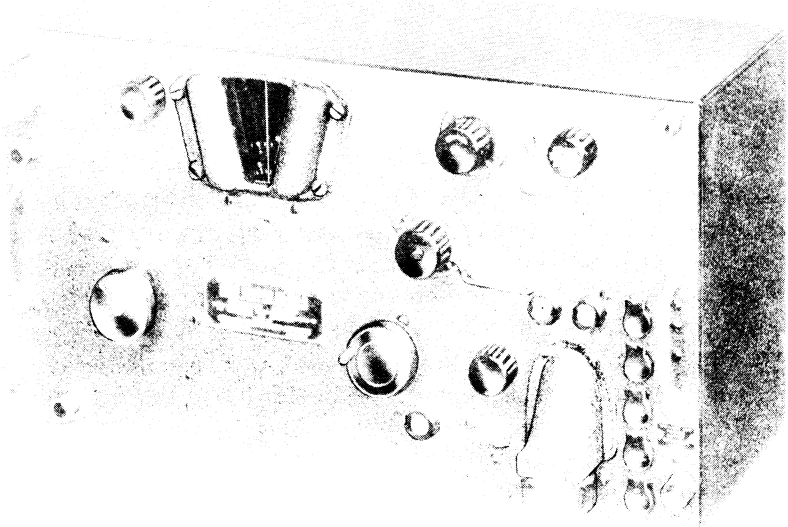


*Figure 4. Radio Receiver BC-312-G.*



FL 5860 S

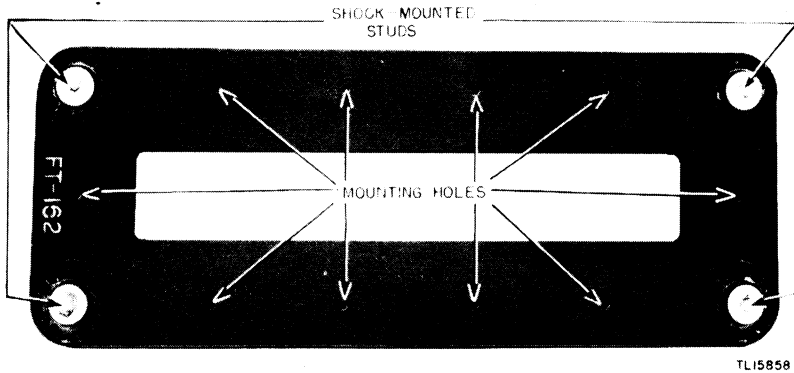
*Figure 5. Radio Receiver BC-342-N.*



*Figure 6. Radio Receiver BC-314-G.*

and inside chassis are made of metal. The internal parts of the receiver are thoroughly shielded by means of metal inclosures as shown in figure 9. The various compartments and shield cans are clearly marked and are easily identified. Aluminum was used in early models but substitutes have been used in later models. The outside surfaces of the cabinet and the front of the panel are finished in black. The whole panel-chassis assembly slides in and out of the cabinet readily and is locked firmly in place in the cabinet by means of five knurled locking screws of the captive type. Convenient handles are located on the vertical sides of the front panel. Front views of Radio Receivers BC-312-(\*), BC-342-(\*), and BC-314-(\*), are shown in figures 4, 5, and 6, respectively. The front panel of Radio Receiver BC-344-(\*), is identical to that of Radio Receiver BC-314-(\*). Due to minor variations in design, certain receiver models may vary slightly in appearance from those shown.

## 6. Description of Mounting



*Figure 7. Mounting FT-162.*

Mounting FT-162, shown in figure 7, consists of a metal-alloy mounting plate provided with holes for fastening in a vehicle or on a fixed table or bench. Short studs which engage holes in the bottom of the receiver cabinet are mounted on soft rubber pads in the four corners of the plate. The cabinet is held on the mounting by slides which can be pulled forward to release the cabinet. The mounting is provided to minimize the transmission of vibration and shock to the receiver.

## 7. Accessory Equipment

The following items are not necessarily included for shipment with the receivers but are required for proper operation.

- a. RADIO RECEIVERS BC-312-(\*), AND BC-314-(\*).

Quantity	Item
1.....	Power cord with Plug PL-114.
1.....	Headset HS-30-( ) with Cords CD-604 and CD-307-A, or Cord CD-605.
2.....	Tubes JAN-6C5 (VT-65).
1.....	* Tube JAN-6F6 (VT-66).
4.....	Tubes JAN-6K7 (VT-86).
1.....	Tube JAN-6L7G (VT-87).
1.....	Tube JAN-6R7 (VT-88).
1.....	Whip or long-wire antenna.

\* Tube JAN-12A6 (VT-134) is used in place of Tube JAN-6F6 in Radio Receiver BC-312-(\*)X.

*b.* RADIO RECEIVERS BC-342-(\*) AND BC-344-(\*).

Quantity	Item
1.....	Cord CD-370 or equivalent (a-c input).
1.....	Headset HS-30-( ) with Cords CD-604 and CD-307, or Cord CD-605.
2.....	Tubes JAN-6C6 (VT-65).
1.....	Tube JAN-6F6 (VT-66).
4.....	Tubes JAN-6K7 (VT-86).
1.....	Tube JAN-6L7G (VT-87).
1.....	Tube JAN-6R7 (VT-88).
1.....	Tube JAN-5W4 (VT-97).
1.....	Whip or long-wire antenna.

## 8. Differences in Models

*a.* GENERAL. It is advisable for all using personnel to become thoroughly familiar with the differences in the various receiver models. Much confusion in the requisitioning of complete receivers and of replacement parts for them arises from the fact that more than a dozen similar type numbers are listed for receivers that look alike. Some identical receivers within a series have type numbers with different suffix letters. These numbers identify equipment made to the same specification but on different orders, either by one or by several manufacturers. The following tables list all the various models procured to date and the differences between them.

b. HIGH-FREQUENCY MODELS (1,500 TO 18,000 KC).

Model	External voltage supply	Oscillator compartment heaters	Noise balancing system	Crystal filter circuit	Remarks
BC-312	12-14 v dc	Yes	Yes	Yes	<p>Uses Dynamotor DM-17-A.</p> <p>This and subsequent d-c models use Dynamotor DM-21-(*).</p> <p>Antenna noise-suppression circuit eliminated.</p> <p>Antenna noise-suppression circuit eliminated.</p> <p>Antenna noise-suppression circuit eliminated.</p> <p>Antenna noise-suppression circuit eliminated.</p> <p>Antenna noise-suppression circuit eliminated.</p> <p>First audio jack eliminated, 3-second audio jacks.</p> <p>Tube JAN-12A6 replaces Tube JAN-6F6 (BC-312-HX and NX models only).</p> <p>Antenna disabling relay also grounds first audio grid.</p> <p>Same as BC-312-HX.</p> <p>Oscillator compartment heat insulator removed.</p> <p>Same as BC-312-NX.</p> <p>Pilot light rheostat added (BC-312-(* models only.)</p> <p>Steel substituted for aluminum in chassis and boxes.</p> <p>Paper and ceramic capacitors substituted for mica.</p> <p>Same as BC-312-L.</p> <p>Same as BC-312-L.</p> <p>Refer to remarks for BC-312 having the same suffix number.</p> <p>Refer to remarks for BC-312 having the same suffix number.</p>
BC-312-A	12-14 v dc	No	Yes	Yes	
BC-312-C	12-14 v dc	No	Yes	Yes	
BC-312-D	12-14 v dc	No	No	Yes	
BC-312-E	12-14 v dc	No	No	Yes	
BC-312-F	12-14 v dc	No	No	Yes	
BC-312-G	12-14 v dc	No	No	Yes	
BC-312-J	12-14 v dc	No	No	Yes	
BC-312-HX	24-28 v dc	No	No	Yes	
BC-312-NX	24-28 v dc	No	No	No	
BC-312-L	12-14 v dc	No	No	No	
BC-312-M	12-14 v dc	No	No	No	
BC-312-N	12-14 v dc	No	No	No	
BC-342	10-120 v ac	Yes	Yes	Yes	
BC-342-A	10-120 v ac	Yes	Yes	Yes	
BC-342-C	10-120 v ac	No	Yes	Yes	
BC-342-D	10-120 v ac	No	No	Yes	
BC-342-F	10-120 v ac	No	No	Yes	





## Section II. INSTALLATION

### 9. Unpacking, Uncrating, and Checking

Use particular care when unpacking and handling these receivers. After removal from the shipping box or crate, examine the equipment carefully for damage that may have occurred during shipment. See the table of components (par. 3) or the packing slip that accompanies the equipment to check the contents of the shipping crate. If necessary, clean equipment with a soft brush or blower before installation.

### 10. Installation

If the radio receiver is used as an integral part of a radio set (such as Radio Set SCR-399), install the receiver according to instructions given in the Technical Manual accompanying the radio set. If the receiver is to be used by itself, use the following installation procedure:

a. Install Mounting FT-162 on a substantial support such as a desk or bench. Mounting dimensions are given in figure 8. If the receiver is installed in a vehicle, add Mounting FT-178 to prevent excessive horizontal movement.

b. Either a whip or a long-wire antenna may be used with the receiver. Better reception will be obtained by use of the long-wire antenna. Install the antenna as high as possible and keep it away from power and telephone lines, metal and metal-roofed buildings, trees, heavy foliage, and electrical devices. Insulate each end of the antenna from its support. For optimum high-frequency reception (10 mc and higher), use an antenna about 50 feet long including the lead-in wire. For optimum medium-frequency reception, use an antenna about 100 feet long including the lead-in wire. For optimum low-frequency reception (Radio Receiver BC-314-(\*) or BC-344-(\*)), use an antenna about 150 feet long including the lead-in wire.

c. If a shielded antenna lead-in wire is used, connect it to the shielded SIG. ANT. binding post in the upper left-hand corner of the receiver front panel. If an unshielded antenna lead-in wire is used, connect it to the unshielded ALT. SIG. ANT. binding post located directly below the SIG. ANT. connector.

### 11. Connections and Interconnections

a. Radio Receivers BC-312-(\*) and BC-314-(\*) require a 12- to 14-volt battery, and Radio Receiver BC-312-(\*)X requires a 24- to 28-volt battery. A two-conductor power cord

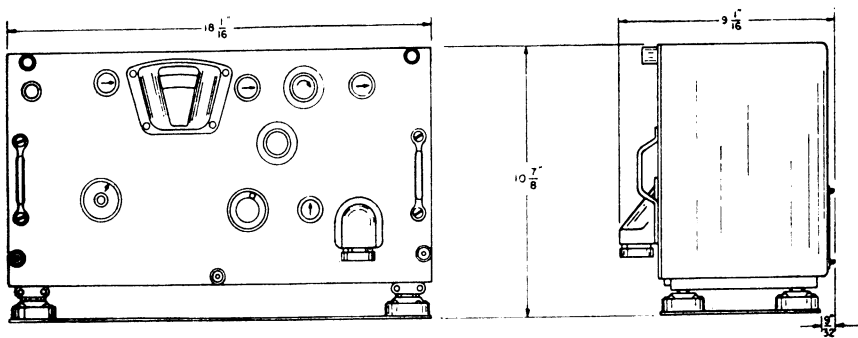


Figure 8. Radio receiver and mounting dimensions.

connected to the two heavy prongs on Plug PL-114 is also required. Insert Plug PL-114 into Socket SO-94 (SO1) on the receiver front panel and connect the other end of the power cord to the battery terminals. The negative battery connection is made to pin D and the positive connection is made to pin T of Socket SO1. Make certain that Plug PL-114 is pushed in all the way before tightening the knurled ring.

b. Radio Receivers BC-342-(\*) and BC-344-(\*) operate on 110- to 120-volt, 50- to 60-cycle, a-c power. Insert the power cord plug into the rectifier receptacle at the back of the receiver cabinet. This receptacle is normally covered by a plate which is held in place by two screws. When the plate is removed it may be refastened to the case next to the receptacle by means of the two screws. Socket SO1 on the a-c operated model is used only for control purposes.

c. Connect the GND. terminal in the lower left-hand corner of the receiver front panel to a good ground point.

d. Connect a headset to the receiver by inserting the headset plug into either of the PHONES 2ND AUDIO jacks on the receiver front panel.

e. The foregoing connections are all that are required to prepare the equipment for normal receiver operation. However,

additional connections may be made through socket SO1 in both the a-c and battery-operated models to provide special operating features when the receiver is used in conjunction with a radio transmitter for two-way communications. These special features consist of:

(1) A disabling circuit which disables the receiver when the transmitter is operating. Connections to the disabling relay are made through pins N and J of socket SO1.

(2) A sidetone circuit which amplifies a portion of the audio voltage from the transmitter to be used as sidetone in the receiver output. Connections to the sidetone circuit are made from pin H of socket SO1 to ground.

(3) A microphone and a keying jack are mounted on the receiver front panel for use with a microphone or key at the receiver location to modulate or key an associated radio transmitter. Connections to the MICRO jack are made through pins E and U in socket SO1. Connections to the KEY jack are made through pin N in socket SO1 to ground.

f. Before applying power to the receiver, carefully check the cording and wiring. (See pars. 15 and 16.)

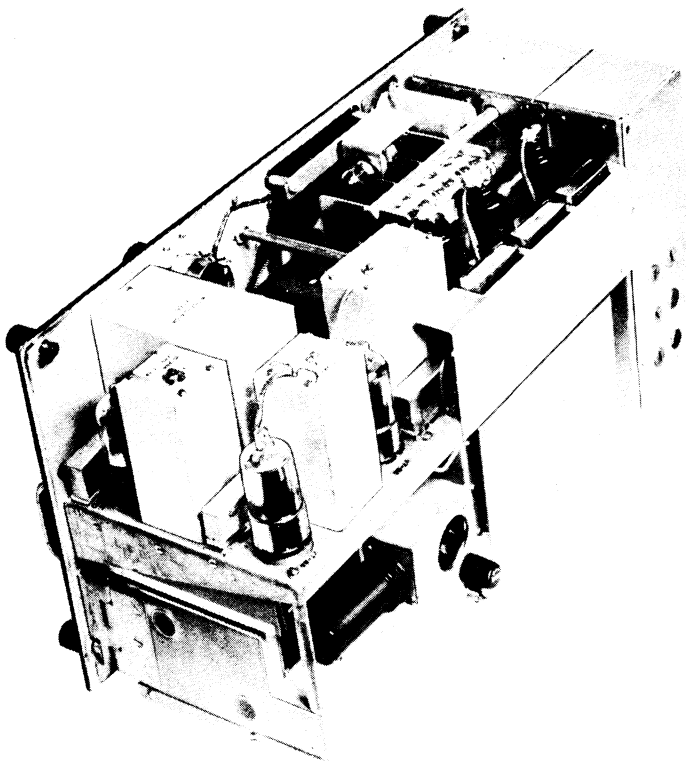
## 12. Preparation for Use

a. PILOT LAMPS. Install two pilot Lamps LM-27 in their sockets in Radio Receiver BC-312-(\*), BC-342-(\*), BC-314-(\*), or BC-344-(\*). In Radio Receiver BC-312-(\*X) install two pilot Lamps LM-42. The pilot lamps are located behind the reflector plate covering the FREQUENCY dial. To reach the sockets, remove the four knurled-head screws holding the reflector plate to the front panel.

b. VACUUM TUBES. (1) The receivers are ordinarily issued with tested radio tubes installed. The tubes should not be interchanged or removed unless they become defective; changing them may cause misalignment of the radio-frequency (r-f) circuits. Check that all tubes are in place and are firmly seated in their sockets. Except for the r-f oscillator and c-w oscillator tubes, all tubes are readily accessible when the chassis is removed from the receiver cabinet. (See fig. 9.)

(2) To reach the r-f oscillator tube socket, loosen the two screws near the top of the r-f oscillator compartment and lift the hinged cover over the rear third of this compartment.

(3) To reach the c-w oscillator tube socket, remove the screw at the top and the screw about halfway down the center of the right side of the oscillator compartment. *Loosen, but do not remove,* the screw at the bottom rear and the screw halfway down the left side of this compartment. Lift off the compartment cover.



TL15866S

*Figure 9. Radio receiver, top view, case removed.*

c. LINE VOLTAGE COMPENSATION (BC-342-(\*) AND BC-344-(\*) MODELS ONLY). Remove the receiver from the cabinet and turn it upside down so that the terminal strip near the rectifier is accessible. Measure the voltage across terminals 1 and 4 on the terminal strip. If this voltage is below 115 volts alternating current, change the input lead to the rectifier unit as follows: Loosen, but do not remove, the two screws at the inside edge of the rectifier cover; remove the two screws at the outside edge of the rectifier cover, and remove the cover. This will expose the rectifier terminal board and the line-voltage compensating taps. Unsolder the wire attached to the compensating tap marked 120V, and solder it to the tap marked 110V. After making this change, replace the rectifier cover.

d. FUSES. Check that two Fuses FU-21-A are in place in the fuse holders marked LAMPS and DYN.-FIL. on the receiver front panel. Check the continuity and rating (10 amperes (amp)) of these fuses. Use Fuses FU-25-A (5 amp) in Radio Receiver

BC-312-(\*)X. Check the Fuse FU-27 (2 amp) in Rectifier RA-20 located at the rear of Radio Receivers BC-342-(\*) and BC-344-(\*).

e. OUTPUT IMPEDANCE ADJUSTMENT. In later model receivers, provisions have been made for the connection of headsets having an impedance of either 4,000 or 250 ohms. The change in output impedance may be made by making a simple wiring change on a terminal strip inside the receiver. To change the output impedance, remove the phone tip from the 4,000-ohm jack and insert it into the 250-ohm jack on the terminal strip located on the underside of the receiver chassis adjacent to the first detector coil unit assembly. This circuit change connects the speaker jack and both phone jacks for the output impedance indicated on the chassis below the terminal strip. The output transformers in Radio Receivers BC-314-F and BC-314-M are wired for an output impedance of 4,000 ohms. If an output impedance of 250 ohms is required, remove the wire attached to terminal 4 and connect it to terminal 5.

## PART 2

# OPERATING INSTRUCTIONS

*Note.* For information on destroying the equipment to prevent enemy use, see the destruction notice at the front of the manual.

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### Section III. CONTROLS AND THEIR USE

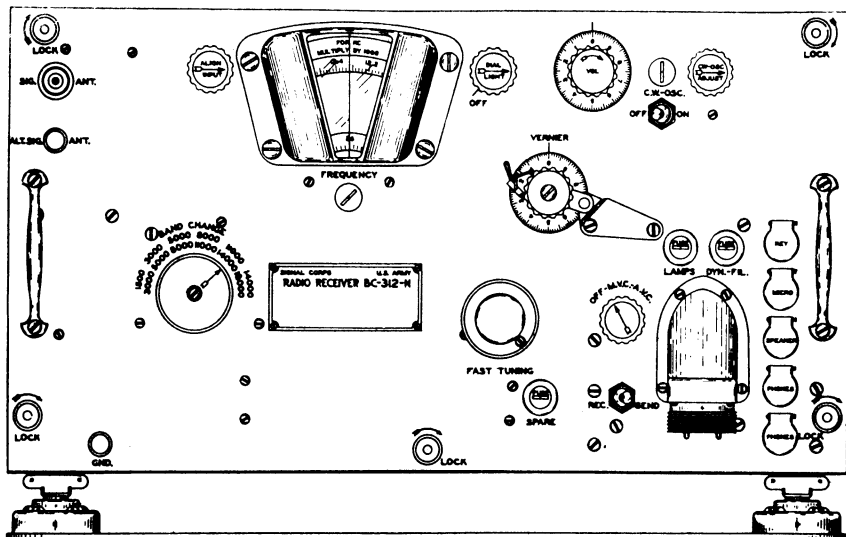
#### 13. Radio Receivers BC-312-(\*) and BC-342-(\*) (fig. 10)

*a.* SIG. ANT. AND ALT. SIG. ANT. CONNECTORS. Two antenna connectors are located in the upper left-hand corner of the receiver front panel. The SIG. ANT. connector is of the shielded type and is used to connect a shielded antenna lead-in wire to the receiver. The ALT. SIG. ANT. connector is a push type binding post and is used when connecting an unshielded antenna lead-in wire to the receiver. Both antenna connectors are wired in parallel. Earlier receiver models included a third antenna connector labeled NOISE ANT. This connector was used with a short noise antenna when the receiver is mounted in a vehicle to neutralize the vehicle ignition noise. This circuit has been eliminated on later models. (See par. 76.)

*b.* ALIGN INPUT CONTROL. The ALIGN INPUT control is a small variable capacitor connected in series with the antenna lead. By means of this control a 50- to 200-micromicrofarad ( $\mu\mu\text{f}$ ) antenna may be tuned to resonance to improve the signal gain.

*c.* BAND CHANGE SWITCH. The six-position BAND CHANGE switch selects the proper coils and capacitors in the radio-frequency (r-f) oscillator stage, first r-f amplifier stage, second r-f amplifier stage, and in the first detector stage to tune the desired frequency range. In addition, this control operates a masking plate over the FREQUENCY dial in order to expose only the scale of the particular frequency band selected.

*d.* FREQUENCY DIAL. The main tuning dial consists of a flat disk on which are engraved seven scales. Six of the scales are calibrated in kilocycles and the seventh scale is divided into 45 equal divisions. All but the frequency scale being used and the O-45 scale are covered by a masking plate as described in *c* above. Two dial lights are provided to illuminate the dial. Some receiver



NOTE-DIAL LIGHT CONTROL IS CRYSTAL PHASING CONTROL ON ALL BC-342-L1 MODELS & SOME BC-312-L1 MODELS. TL8402

Figure 10. Radio receiver, location of controls.

models BC-312-L, -N, and -NX are equipped with a DIAL LIGHT control mounted to the right of the FREQUENCY dial. By means of this control the intensity of the dial illumination can be controlled. A new improved rheostat R56 providing a definite OFF position is available.

e. CRYSTAL PHASING CONTROL. Radio Receivers BC-342-(\*) and BC-312 to BC-312-J, inclusive, incorporate a crystal filter circuit to improve the receiver selectivity. The filter is in the circuit at all settings of the CRYSTAL PHASING control except when this control is in the OUT position. The phasing control is mounted to the right of the FREQUENCY dial in place of the DIAL LIGHT control.

f. FAST TUNING AND VERNIER CONTROLS. The FAST TUNING and the VERNIER tuning controls are used to tune the receiver to the desired frequency. The controls are geared to the FREQUENCY dial and the dial may be rotated through 300° by either of these controls. The FAST TUNING control provides a 25- to -1 reduction while the VERNIER control provides a reduction of 90- to -1. The VERNIER control is also equipped with a scale marked with 100 equal divisions which can be used to interpolate the O-45 scale of the main tuning dial.

g. OFF-M.V.C.-A.V.C. SWITCH. The OFF-M.V.C.-A.V.C. switch permits the use of manual volume control or automatic volume control. With the switch in the OFF position, all power is disconnected from the receiver. In the battery operated models this switch is the only receiver power switch. In a-c operated models,



however, an additional power switch is mounted on Rectifier RA-20 at the back of the receiver.

*h. VOL CONTROL.* The VOL knob operates a dual potentiometer to control the receiver volume. With the receiver on M.V.C., the VOL knob controls the receiver sensitivity; with the receiver on A.V.C., it controls the audio-frequency gain.

*i. CW-OSC ADJUST CONTROL.* A c-w oscillator is provided in the receiver to enable the operator to receive an audible tone on c-w signals. The CW-OSC ADJUST control is provided to adjust the frequency of the c-w oscillator and thus the pitch of the audible tone. A CW-OSC toggle switch is located between the CW-OSC ADJUST and VOL controls to turn the c-w oscillator either on or off. The oscillator is turned on only during the reception of c-w signals.

*j. REC.-SEND SWITCH.* The REC.-SEND switch is provided for use when the receiver is used with an associated transmitter (as in Radio Set SCR-399). With this switch in the SEND position, the disabling relay in the receiver may be operated from the transmitter or from a remote point when the transmitter is operating, thereby disabling the receiver. Operating the switch to the REC. position opens the control circuit and releases the relay, thereby allowing the receiver to operate. The disabling relay is also connected through the KEY jack so that if the transmitter is keyed from the receiver location with the REC.-SEND switch in the SEND position, the relay will operate when the key closes.

*k. FUSES.* Fuse holders are mounted on the front panel so that the fuses may be easily replaced. The LAMPS fuse protects the dial lamps while the DYN-FIL. fuse protects the circuit supplying the tube filaments. On the battery models this circuit also supplies power for the dynamotor. The SPARE fuse may be used to replace either of the other two fuses when necessary. In addition to the above fuses, there is a 2-ampere fuse in Rectifier RA-20 at the rear of the cabinet in Radio Receivers BC-342-(\*) and BC-344-(\*) .

*l. PANEL JACKS.* (1) *KEY Jack.* A KEY jack is provided for connection of a telegraph key at the receiver location when the receiver is used with a transmitter as in Radio Set SCR-399.

(2) *MICRO Jack.* The MICRO jack is provided for connection of a microphone at the receiver location when the receiver is used with a transmitter as in Radio Set SCR-399.

(3) *SPEAKER 2nd AUDIO.* This jack is provided for the connection of a permanent-magnetic type loudspeaker to the output of the receiver.

(4) *PHONES 2nd AUDIO.* Two jacks, connected in parallel,

are provided for the connection of either one or two headsets to the output of the receiver.

*Note.* In Radio Receivers BC-312 through BC-312-J, BC-342 through BC-342-J, BC-314 through BC-314-D, and BC-344, one headset jack is marked PHONES 1ST AUDIO and connects to the output of the first audio stage. In later model receivers of all types, provisions have been made for connecting headsets having an impedance of either 4,000 or 250 ohms by making a wiring change to the phone jacks. This change can be made by operating personnel and a reversible tag is provided to indicate the correct output impedance.

*m.* **PANEL LOCKS.** Five knurled panel locks are provided to secure the chassis of the receivers in the cabinet. By turning the LOCK knobs clockwise, the receiver panel is pressed firmly against the rubber gasket. To remove the receiver from its cabinet, these lock-knobs must be turned counterclockwise as far as they will go.

#### **14. Radio Receivers BC-314-(\*) and BC-344-(\*)**

Except for the differences listed below, the front panel controls for Radio Receivers BC-314-(\*) and BC-344-(\*) are identical with the controls for Radio Receivers BC-312-(\*), and BC-342-(\*) described in paragraph 13.

*a.* **BAND CHANGE SWITCH.** The BAND CHANGE switch in the m-f receiver group is a four-position switch rather than a six-position switch as used in the h-f models.

*b.* **FREQUENCY DIAL.** Five scales are engraved on the main tuning dial, four of which are calibrated in kilocycles and the fifth is divided into 45 equal divisions. All but the scale for the selected frequency range and the O-45 scale are covered by a masking plate which is controlled by the BAND-CHANGE switch.

### **Section IV. OPERATION**

#### **15. Starting**

*a.* Turn the OFF-M.V.C.-A.V.C. switch on all receiver models to the M.V.C. position for c-w operation or to the A.V.C. position for the reception of voice signals.

*Note.* Radio Receivers BC-342-(\*) and BC-344-(\*) using Rectifier RA-20 are equipped with an additional power switch located at the rear of the receiver cabinet. This switch should be left in the ON position at all times.

*b.* Set the VOL control to its midposition.

*c.* Set the BAND CHANGE switch to the band which covers the frequency of the signal to be received. *Make certain that this control is turned until the contact points firmly engage for the desired band.*

d. Set the FREQUENCY dial approximately to the desired frequency by means of the FAST TUNING control and tune in the desired signal using the VERNIER control.

**Caution:** Unfasten the spring lock around the VERNIER control before attempting to turn the FAST TUNING knob. Failure to do this may result in damage to the tuning mechanism.

e. Adjust the ALIGN INPUT control to obtain maximum signal or noise level.

f. For c-w operation, throw the CW-OSC toggle switch to the ON position and adjust the pitch of the received signal by means of the CW-OSC ADJUST control.

g. Adjust the VOL control to obtain the desired signal volume.

## 16. Operating Instructions

a. RECEIVER SENSITIVITY. To obtain maximum receiver sensitivity, turn the OFF-M.V.C.-A.V.C. control to M.V.C. and turn the CRYSTAL PHASING control (on receivers so equipped) to OUT. Adjust the ALIGN INPUT control for maximum noise output and turn the VOL control as far to the right as possible. When reception is particularly noisy, weak signals may be read more easily if the VOL control is rotated to a lower setting.

b. RECEIVER SELECTIVITY. Radio Receivers BC-312 through BC-312-J, and BC-342-(\*) contain a crystal filter in the i-f amplifier circuit. Turning the CRYSTAL PHASING control away from the OUT position increases the selectivity of the receiver. (Increasing the receiver selectivity decreases the receiver sensitivity.) The CRYSTAL PHASING control is intended primarily for use in the reception of c-w signals. If used when receiving voice signals, it may increase the receiver selectivity to such a degree as to distort them. However, when receiving voice signals having a very heavy background noise or having a high degree of distortion, it may be found that proper operation of the CRYSTAL PHASING control will improve the clarity of the signal. Experiment with the use of this control on various types of signals to determine what may be expected from its operation.

## Section V. EQUIPMENT PERFORMANCE CHECK LIST

### 17. Purpose and Use of Check List

a. GENERAL. The equipment performance check list (par. 18) will help the operator determine whether the radio receiver is functioning properly. The check list gives the item to be checked,

the conditions under which the item is checked, the normal indications and tolerances of correct operation, and the corrective measures the operator can take. Check items 1 to 4 before starting (before turning the equipment on), item 4 when starting, items 5 to 9 during operation, and items 9 and 10 when stopping (when turning the equipment off). Items 5 to 8 of this list should be checked at least once during a normal operating period.

*b. ACTION OR CONDITION.* For some items, the information given in the action or condition column consists of the settings of various switches and controls under which the item is to be checked. For other items it represents an action that must be taken to check the normal indication given in the normal indication column.

*c. NORMAL INDICATIONS.* The normal indications listed include the visible and audible signs that the operator will perceive when he checks the items.

*d. CORRECTIVE MEASURES.* The correct measures listed are those the operator can make without turning the equipment in for repairs. When reference is made in the table to part five it indicates that the trouble cannot be corrected during operation and that trouble shooting by an experienced repairman is called for. If the set is completely inoperative or if the recommended corrective measures do not yield results, trouble shooting is necessary. However, if the tactical situation requires that communication be maintained and if the set is not completely inoperative, the operator must maintain the set in operation as long as it is possible to do so.

*e. ITEMS 1 TO 5.* Items 1 to 5 should be checked each time the equipment is put into operation.

*f. ITEMS 5 TO 8.* The operator should familiarize himself with the operation of the radio receiver so that he knows the characteristics of its reception of normal signals. By becoming familiar with the operation of the receiver, the operator will know the normal position of the VOL control. This will aid in an approximate determination of the sensitivity and amplification of the receiver.

*g. ITEMS 9 AND 10.* Items 9 and 10 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.

## 18. Equipment Performance Check List

Item No.	Item	Action or condition	Normal indications	Corrective measures
P R E P A R A T O R Y	1	Headset HS-30-( ) or loudspeaker.		
	2	BAND CHANGE switch	Headset plugged into PHONES 2D AUDIO jack. Set to correct band.	
	3	FREQUENCY dial	Set to approximate frequency using FAST TUNING control.	
S T A R T	4	OFF-M.V.C.-A.V.C. switch.	Turn to M.V.C. position for c-w operation or to A.V.C. position for voice reception.	Dial lamp lights Dynamotor starts and runs (BC-312-(*) and BC-314-(*) models only).  Check that power switch on Rectifier RA-20 is in ON position (BC-342-(*) and BC-344-(*) models only). See part five.
	5	VOL control	Rotate control in a clockwise direction.	Increased output will be heard in headset or loudspeaker.  See part five.

## 8. Equipment Performance Check List (Continued)

Item No.	Item	Action or condition	Normal indications	Corrective measures
6	CW-OSC ADJUST control.	Rotate control in either direction. (C-W operation only).	Beat note can be heard to pass through zero beat.	Retune signal using VERNIER control. See part five.
7	ALIGN INPUT control	Rotate control in either direction.	Maximum noise or signal peak can be obtained in headset.	Check antenna connection. See part five.
8	Headset or loudspeaker	Set operating normally. Plug inserted completely.	Signal is heard	Check plug and cable connections. Tune receiver.
9 10	VOL control OFF-M.V.C.-A.V.C. switch.	Turn to extreme counter-clockwise position. Turn to OFF position.	No signal heard Dial lamps go out. Dynamotor stops.	

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# PART 3

## MAINTENANCE INSTRUCTIONS

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### Section VI. PREVENTIVE MAINTENANCE TECHNIQUES

#### 19. Meaning of Preventive Maintenance

Preventive maintenance is a systematic series of operations performed at regular intervals on equipment, when turned off, to eliminate major breakdowns, unwanted interruptions in service, and to keep equipment operating at top 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 and repair is to locate and correct *existing* defects. The importance of preventive maintenance cannot be over-emphasized. A system of radio communication depends on the performance of every set. It must be *ready to go* on the air when it is needed, and it *must* operate efficiently. Therefore, it is vitally important that radio operators and repairmen maintain their radio sets properly.

*Note.* The operations in sections VI and VII are user maintenance operations (organization operators and repairmen) maintenance. Some operations in sections VIII and X are higher echelon maintenance.

#### 20. Description of Preventive Maintenance Techniques

*a. GENERAL.* Most of the electrical parts used in Radio Receivers BC-312-(\*), BC-312-(\* )X, BC-342-(\*), BC-314-(\*), and BC-344-(\* ) require routine preventive maintenance. This preventive maintenance varies. Some parts require a different kind of maintenance than others. Some require more, some less. Definite and specific instructions must be followed. Hit-or-miss techniques cannot be applied. This section of the manual contains these specific instructions to guide personnel assigned to perform the six basis maintenance operations: 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 show whether the other four are needed. Selection of operations is based on a knowledge of field needs. For example, dust encountered on dirt roads during cross-country travel filters into 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 tend to cause corrosion of exposed surfaces and parts. Without frequent inspections and the necessary tightening, cleaning, and lubricating operations, equipment becomes undependable and subject to breakdown when it is needed most.

b. FEEL. The feel operation is used most often to check rotating machinery, such as dynamotors, blower motors, and drive motors, also to determine whether electrical connections and bushings are overheated. Feeling will show the need for lubrication or the existence of other defects requiring correction. The maintenance man must become familiar with the normal operating temperatures of dynamotors, transformers, and other parts, to recognize signs of overheating.

*Note.* It is important to perform the feel operation as soon as possible after shut-down and always before any other maintenance is done.

c. INSPECT. Inspection is the most important operation in preventive maintenance. A careless observer will overlook evidences of minor trouble. Although these defects may not at the moment interfere with performance of the equipment, invaluable time and effort can be saved if they are corrected *before* they lead to major and costly break-downs. To be able to recognize the signs of a defective set, make every effort to become thoroughly familiar with the indications of *normal* functioning. Inspection consists of *carefully* observing all parts of the equipment, noticing their color, placement, stage 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



and binding posts. Parts, connections, and joints should be free of dust, corrosion, and other foreign matter. In tropical and high-humidity areas, look for fungus growth and mildew.

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

d. TIGHTEN, CLEAN, AND ADJUST. These operations explain themselves. Specific procedures to be followed in performing them are given wherever necessary throughout part three.

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

Whenever a loose connection is tightened, it should be moisture-proofed and fungiproofed again by applying the varnish with a small brush. See paragraphs 49 through 52 for details of moistureproofing and fungiproofing.

e. LUBRICATE. Lubrication refers to the application of grease or oil to the bearings of motors or rotating shafts. It may also mean the application of a light oil to door hinges or other sliding surfaces on the equipment. Where the need for lubrication is indicated, see paragraphs 46 through 48.

## 21. Vacuum Tubes

*Note.* Do not work on the tubes immediately after shut-down. Severe burns may result from contact with the envelopes of hot tubes.

a. INSPECT (I). (1) Inspect glass and metal tube envelopes, tube caps, and tube connector clips for accumulation of dirt and for corrosion. Tubes with loose plate caps, grid caps, or envelopes should be replaced if possible.

(2) Examine the spring clips that make contact with the grid caps for corrosion and for loss of tension with resulting looseness. Check the condition of 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. Make the inspection by pressing the tubes down in the sockets and testing them in that position, *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. Inspect the tube sockets at the time the tubes are removed.

(4) Be careful when removing a tube from its socket, especially if it is a high-power tube. Never jar a warm tube. Always remove connections to the grid caps and plate caps.

b. TIGHTEN (T). Tighten all loose connections to the tube

sockets or to the tubes. If the connections are dirty or corroded, clean them before tightening. When tightening locknuts that hold the sockets to the insulated bushings, do not apply excessive pressure. Too much pressure will crack the bushings.

c. ADJUST (A). Adjust loose tube connector 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 tube, if necessary. Tubes operated at high voltage 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 used, the grid and plate caps may be cleaned with a piece of #0000 sandpaper by wrapping the paper around the cap and *gently* rubbing the surface. Excessive pressure is not needed; nor is it necessary to grip the cap tightly. Wipe the cap 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.

## 22. Capacitors

a. INSPECT (I). (1) Inspect the terminals of fixed capacitors for corrosion and loose connections. Carefully inspect the mountings to discover loose mounting screws, studs, or brackets. Examine the leads for poor insulation, cracks, and evidences of dry rot. Cut away frayed strands on the insulation. If the wire is exposed, wrap it with friction tape. See that the terminals of the capacitors are not cracked or broken.

(2) Thoroughly inspect the case of each 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.

b. TIGHTEN (T). Tighten loose terminals, mountings, and con-

nections on the capacitors, when necessary. Do not break the bushing or damage the gasket.

c. CLEAN (C). (1) Clean the cases of fixed capacitors, the insulated bushings, and all connections that are dirty or corroded. The capacitor cases and bushings can usually be cleaned with a dry cloth. However, if the deposit of dirt is hard to remove, moisten the cloth in Solvent, Dry-cleaning.

(2) Clean the plates of variable capacitors with a small brush or pipe cleaner, removing all dust and lint. Dust, if present, may cause arcing.

d. LUBRICATE (L). See paragraphs 46 through 48.

## 23. Resistors

a. GENERAL. Various types of resistors are used in the radio receivers. 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. TIGHTEN (T). Tighten resistor connections and mountings whenever they are found loose. If a resistor is allowed to remain loose, vibration may break the connection or damage the body.

d. 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. Wipe them with a dry cloth. However, if the dirt deposit is unusually hard to remove, use dry-cleaning solvent (SD).

(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.

## 24. Fuses

a. GENERAL. Small glass-case fuses are used in the radio receivers. The fuses are easily removed for inspection. See that

the fuse ends and holding clips on the fuses and holders are kept clean and tight. If they are not, arcing and burning will occur and make the replacement of the complete holder necessary. Fuses should be thrown away when they blow.

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

c. TIGHTEN (T). The tension of the fuse clips may be increased by pressing the sides closer together. If necessary, use a pair of pliers to adjust the tension.

d. CLEAN (C). Clean fuse ends and fuse clips with emery cloth; then wipe them with a clean cloth. When using a file to remove deep pits on the clips, fuse ends, or contacts, always finish up with crocus cloth to leave a smooth contact surface. As a final step, wipe the surface with a clean, dry cloth.

## 25. Relays

A single relay RL1 is used in the radio receiver to ground the antenna and first audio grid, when transmitting, to protect the receiver input circuits. No attempt should be made to perform preventive maintenance on this relay except by higher echelon maintenance personnel.

## 26. Switches

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 pressing the switch button and noting the freedom of movement and amount of spring tension.

(2) Examine the ganged BAND CHANGE switch to see that the switch sections are properly lubricated and that the contacts are clean. 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 visible. Switch action should be free. Wiping action of 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 (SD).

c. LUBRICATE (L). See paragraphs 46 through 48.

## 27. Potentiometers

*a.* INSPECT (I). (1) Inspect the mechanical condition of the potentiometers. 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 all metallic parts for dust, dirt, and corrosion.

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

*c.* CLEAN (C). Clean the body of the potentiometer with a brush or cloth.

## 28. Terminal Blocks

*a.* INSPECT (I). (1) Inspect terminal blocks for cracks, breakage, dirt, loose connections, and loose mounting screws.

(2) Carefully examine 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 screw driver of correct size. Do not exert too much pressure. Tighten loose connections.

*c.* CLEAN (C). Clean terminal blocks, when they require it, with a dry brush. When necessary, use a cloth moistened with dry-cleaning solvent (SD). Thoroughly wipe the block with a cloth and then brush it to remove any lint.

## 29. Multiple Connectors

Multiple connectors and plugs are used to connect the receiver to the battery supply and to the control circuits when used.

*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 carbon tetrachloride. Remove corrosion with #0000 sandpaper, then wipe with a clean cloth.

## 30. Cords and Cables

The power and control cables are the life lines of the equipment. Condition of the cabling must be closely observed. Operating equipment in all kinds of weather, and moving it 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. Clean corroded connectors with #0000 sandpaper. Clean the entire surface of the connector. Make no attempt to remove individual prongs from cable plugs.

### **31. Dial Lamps**

Dial lamps are used to illuminate the main tuning dial. They are easily removed and replaced.

*a.* **INSPECT (I).** Inspect the dial lamp 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, clean them before soldering.

(2) Screw loose lamps tightly into their sockets.

### **32. Jacks and Plugs**

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 carbon tetrachloride; remove corrosion with a piece of crocus cloth followed by a clean cloth. Increase spring tension, when necessary. Try the action of the jack after each adjustment. Be sure to keep all soldered connections intact. To clean dirty or corroded telephone type plugs, use paste metal polish (Signal Corps stock No. 6G1516). After cleaning, remove all traces of polish remaining with carbon tetrachloride. Finish off with a clean, dry cloth.

### **33. Dynamotors**

Dynamotors are essentially the same type of mechanism as motors, and are inspected and lubricated in the same manner. The dynamotors in Radio Receivers BC-312-(\*), BC-312-(\*X), and BC-314-(\*) operate with carbon brushes which mount in the motor frame and ride against a segmented commutator. Brushes and commutators require the following preventive maintenance.

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. See that brush springs have adequate tension and are in firm contact with the brushes. Be sure brush caps are tight and that commutators are clean and smooth. See that covers and straps are in place.

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

b. CLEAN (C).

**Caution:** The voltage generated by Dynamotors DM-17-A, are DM-21-(\*), and DM-21-(\*X are 230 d-c volts. Always clean commutators with power removed from the dynamotor.

(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. *Never* use emery cloth. Its abrasive material is a conductor which may become imbedded in slots between commutator bars, causing short circuits in the armature.

(3) If necessary, uses a cloth moistened in carbon tetrachloride to remove caked dirt and grease.

(4) Polish the commutator with crocus cloth and wipe with a clean, dry cloth.

(5) Clean brushes with a clean, dry cloth. *Do not* use carbon tetrachloride. This solvent reacts chemically with materials commonly used in brushes, reducing their life.

c. ADJUST. If new brushes are installed or old brushes need fitting, proceed as follows:

(1) Cut a strip of #0000 sandpaper slightly wider than the brush.

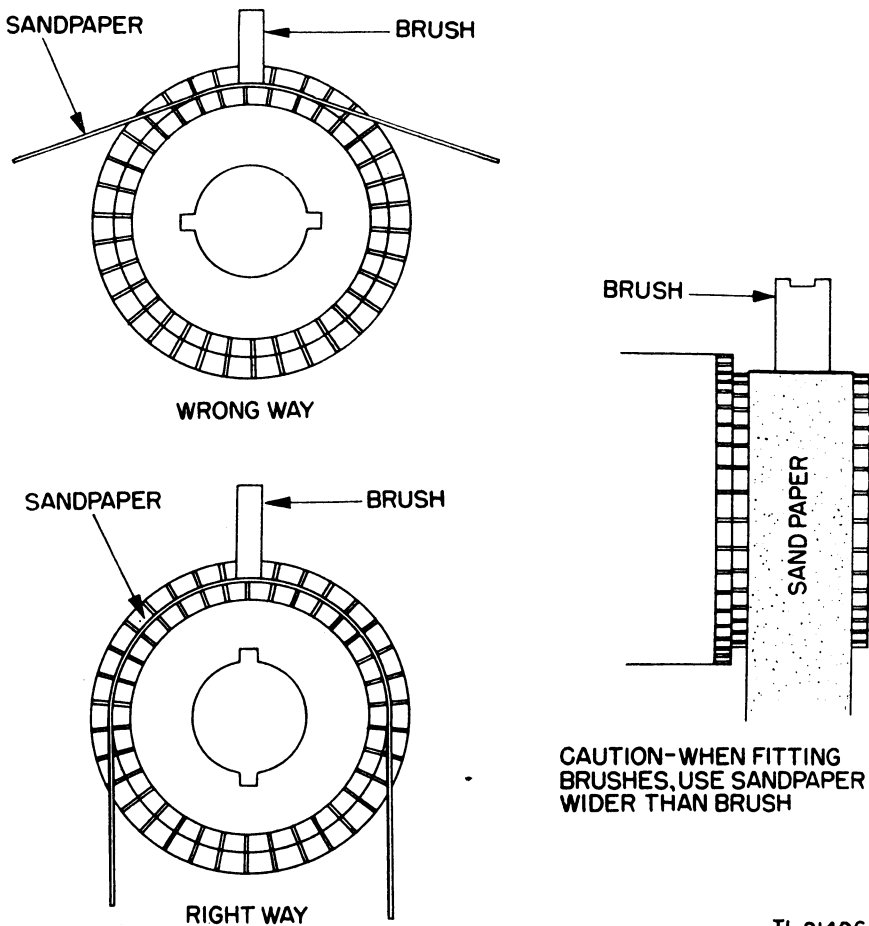
(2) Place the brush in its holder.

(3) Place the sandpaper under the brush with its *sanded surface next to the brush*. Make sure that the sandpaper contacts at least half of the circumference of the commutator. (See fig. 11.)

(4) Pull the sandpaper in the direction of commutator rotation following the curvature of the commutator.

(5) Lift the brush clear of the sandpaper and return the sandpaper to its original position. Repeat this operation as often as necessary to obtain a satisfactory seat. Do this for all brushes.

d. LUBRICATE. See paragraphs 46 through 48.



CAUTION-WHEN FITTING BRUSHES, USE SANDPAPER WIDER THAN BRUSH

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Figure 11. Correct and incorrect methods of fitting a brush.

### 34. Cabinets, Chassis, and Mountings

The cabinet which houses the receiver chassis is constructed of aluminum or sheet steel, coated with black crackle-finish paint.

a. **INSPECT (I).** Inspect the outside and inside of each cabinet thoroughly, paying strict attention to every detail. Check the panel locks and examine the dial cover for cracks and breaks. Inspect the panels for loose knobs, switches, and jacks.

b. **CLEAN (C).** Clean each cabinet, outside and in, with a clean, dry cloth. Use dry compressed air to blow out all accumulated dirt and dust. Repaint any surface that is found scratched, rusted, or chipped.

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



### **35. Headset, Microphone, Key, and Loudspeaker**

These auxiliary items of equipment are essential to the operation of the receiver. Therefore, the operator must give them the same care as the radio 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)**. See paragraphs 46 through 48.

### **36. Gears**

a. **INSPECT (I)**. Inspect the teeth of the gears on the **FAST TUNING** and **VERNIER** controls for dirt or corrosion. Check the antibacklash 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 (SD).

c. **LUBRICATE (L)**. See paragraphs 46 through 48.

### **37. Power Transformers, Filter Chokes, and Audio Transformers**

Since power transformers, filter chokes, and audio transformers used in the radio receivers are of similar potted construction, preventive maintenance for them is similar.

a. **FEEL (F)**. As soon as possible after shut-down, feel filter choke L35 (in Rectifier RA-20) for abnormal heating which may indicate an overload condition, or imminent failure due to moisture absorption or other causes. Likewise feel audio transformers T1 and T2 for abnormal heating. Power transformer T3 normally operates at a warm temperature. Feel for abnormal heating, but use care to avoid burns.

b. **INSPECT (I)**. Inspect power transformer T3, filter choke L35 and audio transformers T1 and T2, for signs of blistering, bulging, or leakage of tar or insulating compounds. Inspect for external signs of electrolytic action or corrosion.

c. **TIGHTEN (T)**. Tighten all mounting bolts or screws, but not to the point that threads are destroyed. The securing of such heavy parts as transformers and chokes to the chassis is very important in preventive maintenance. Should a heavy filter choke or transformer break loose from its mounting in vehicular use or in transit, it may smash tubes, variable capacitors, coils,

and resistors, and at the same time sever a large number of connections.

d. CLEAN (C). Clean power transformers, filter chokes, and audio transformers with a dry cloth. Be sure that no dirt, lint, threads, or foreign material is present between terminals. Dirt, lint, and thread absorb moisture which may provide a leakage path for high voltages between these terminals. Be sure that none are present.

## Section VII. ITEMIZED PREVENTIVE MAINTENANCE

### 38. Introduction

For ease and efficiency of performance, preventive maintenance on Radio Receivers BC-312-(\*), BC-312-(\*X), BC-342-(\*), BC-314-(\*), and BC-344-(\*)) will be broken down into operations that can be performed at different time intervals. In this section the preventive maintenance work to be performed on the receiver at the specified time intervals is broken down into units of work called items. The general techniques involved and the application of the FITCAL operations in performing preventive maintenance on individual parts are discussed in paragraphs 19 through 37. These general instructions are not repeated in this section. When performing preventive maintenance, see paragraphs 19 through 37, if more information is required for the following items. All work is to be performed with the power removed from the equipment. After preventive maintenance has been performed on a given day, the equipment should be put into operation and checked for satisfactory performance. (See par. 18.)

### 39. Preventive Maintenance Tools and Materials

The following preventive maintenance tools and materials will be needed:

Common hand tools.

Clean cloth.

#0000 sandpaper.

Crocus cloth.

File (WECO KS-2662, Signal Corps stock No. 6Q37104).

Switchboard contact burnishing tool (WECO 265C, Signal Corps stock No. 6R41065C).

Orange stick (Signal Corps stock No. 6Z7360).

Toothpicks (Signal Corps stock No. 6Z8666).

Paste metal polish (Signal Corps stock No. 6G1516).

Dry-cleaning solvent (SD).

Carbon tetrachloride (technical grade).

*Note.* Gasoline will not be used as a cleaning fluid for any purpose. Dry-cleaning solvent (SD) is available as a cleaning fluid through established supply channels. Oil, Fuel, Diesel, may be used for cleaning purposes when dry-cleaning solvent (SD) is not at hand. Carbon tetrachloride will be used as a cleaning fluid only in the following cases: where inflammable solvents cannot be used because of the fire hazard, and for cleaning electrical contacts including relay contacts, plugs, etc.

#### **40. Item 1, Exterior of Radio Receiver**

##### **OPERATIONS.**

ITC	Cabinet.
ITCA	Panel control knobs and knob assemblies.
IT	Switch controls.
ITC	Jacks.
ITC	Dial lamps.
ITC	Jack cover assemblies.
ITC	Binding posts.
ITC	Fuses and fuse holders.
ITC	Panel locks.
ITC	Power socket.

#### **41. Item 2, Interior of Radio Receiver, Top of Chassis**

##### **OPERATIONS.**

ITC	Tubes and tube sockets.
ITC	Transformer shields and tube shields.
ITCL	Tuning capacitor and gear assembly.
ITC	Neon lamp.
ITC	Volume control.

#### **42. Item 3, Interior of Radio Receiver, Bottom of Chassis**

##### **OPERATIONS.**

FIC	Resistors.
FIC	Capacitors.
ITC	Terminal boards and lugs.
ITC	Tube sockets.
I	Wiring.
IC	Switches.
ITCL	Band change assembly and drive gears.

#### **43. Item 4, Dynamotors DM-17 and DM-21-(\*)**

##### **OPERATIONS.**

FITCL	Dynamotor unit.
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## 44. Item 5, Rectifier RA-20

### OPERATIONS.

ITC	Transformer and choke.
ITC	Tube.
ITC	Fuse.
ITC	Capacitors.
ITC	Switch.
IC	Resistor.
IC	Terminal board.
IC	Power socket.
IC	Wiring.

## 45. Preventive Maintenance Check List

The following check list is a summary of the preventive maintenance operations to be performed on Radio Receivers BC-312-(\*), BC-312-(\*X), BC-342-(\*), BC-314-(\*), and BC-344-(\*). The time intervals shown on the check list may be reduced at any time by the local commander. For best performance of the equipment, perform operations at least as frequently as called for in the check list. The echelon column indicates which operations are first echelon maintenance and which operations are second echelon maintenance. Operations are indicated by the letters of the word FITCAL. For example, if the letters ITCA appear in the operations column, the item to be treated must be inspected (I), tightened (T), cleaned (C), and adjusted (A).

Item	Operations	Item	When performed				Echelon
			Daily	Weekly	Monthly	Yearly	
1	ITCA	Exterior of radio receiver	X				1st
2	ITC	Top of chassis		X			1st
2	L	Top of chassis			X		2d
3	FITC	Bottom of chassis		X			1st
3	L	Bottom of chassis			X		2d
4	FITC <sup>1</sup>	Dynamotor DM-17 or DM-21-(*)		X			1st
4	L <sup>1</sup>	Dynamotor DM-17 or DM-21-(*)				X	2d
5	ITC <sup>2</sup>	Rectifier RA-20		X			1st

Note. X indicates when operations are to be performed.

<sup>1</sup> Used in Radio Receivers BC-312-(\*), BC-314-(\*).

<sup>2</sup> Used in Radio Receivers BC-342-(\*), BC-344-(\*).

Feel	Inspect	Tighten	Clean	Adjust	Lubricate
F	I	T	C	A	L

## Section VIII. LUBRICATION

*Note.* For lubrication of Radio Receivers BC-312-(\*), BC-342-(\*), BC-314-(\*), and BC-344-(\*), and Dynamotors DM-17 and DM-21, see figures 12 and 13.

### 46. Approved Lubricants for Radio Receivers

The following table lists the lubricating materials necessary in servicing Radio Receivers BC-312-(\*), BC-342-(\*), BC-314-(\*), and BC-344-(\*), and Dynamotors DM-17 and DM-21.

Symbol	Standard nomenclature
DA .....	Oil, Fuel, Diesel.
WB .....	Grease, General-purpose No. 2.
GL .....	Grease, Lubricating, Special.
PS .....	Oil, Lubricating, Preservative, Special.
SD .....	Solvent, Dry-cleaning.

### 47. Lubrication of Dynamotors After Disassembly by Higher Echelon

a. Semiannually or more often if conditions warrant, disassemble the dynamotor and remove the armature. However, do not remove bearings from shaft. Thoroughly clean the bearings by immersing the bearings, mounted on the armature shaft, in a shallow pan of dry-cleaning solvent (SD). A small bristle brush will greatly aid the cleaning operation. Always use clean solvent for final rinsing of the bearings. Do not allow cleaning solvent to come into contact with commutators or armature windings. If accidentally splashed, wipe off immediately.

b. Wherever possible the bearing should be spun in clean, new oil until solvent has been completely removed. This is important, since lubricant applied has a tendency to slip from surfaces wet with solvents, leaving the surface unprotected and susceptible to corrosion.

c. The bearings may then be inspected by spinning or rotating by hand. When bearings are found to be pitted or damaged, replace with new ones.

d. After cleaning and inspecting, the bearings should be re-lubricated with recommended grease, and either assembled or covered until ready for use.

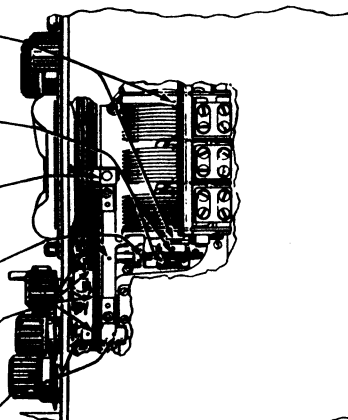
### 48. Preparing Dynamotor for Extreme Low Temperatures

a. It is impossible to replace high temperature grease in ball bearings by forcing in the grease prescribed for low temperature.

**Remove Case to Service**

LUBRICANT ● INTERVAL

- Capacitor Shaft Bearings 1 or 2 drops PS 3M
- Capacitor Control Worm and Gear Clean and coat teeth sparingly. GL 3M
- Tuning Control Shaft Bearing 1 or 2 drops PS 3M
- Capacitor Control Shaft Bearings 1 or 2 drops PS 3M
- Tuning Control Gears Clean and coat teeth sparingly, remove excess. GL 3M
- Tuning Control Shaft Bearings 1 or 2 drops each PS 3M

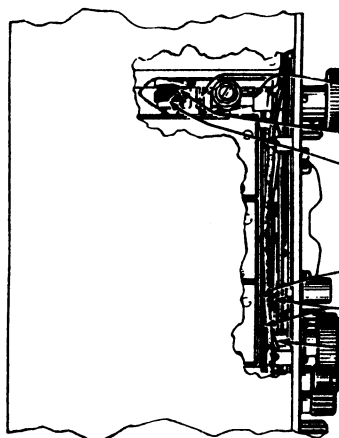


TOP VIEW

**Remove Case to Service**

INTERVAL ● LUBRICANT

- 3M PS Band Change Shaft Bearings 1 or 2 drops each
- 3M PS Worm Shaft Bearing 2 or 3 drops
- 3M GL Band Change Worm and Gear Clean and coat teeth sparingly.
- 3M PS Tuning Control Intermediate Gear Shaft 1 or 2 drops.
- 3M GL Tuning Control Gear and Intermediate Pinion Clean and coat teeth, remove excess.
- 3M PS Tuning Control Gear Shaft 1 or 2 drops



BOTTOM VIEW

Intervals given are maximums for normal 8-hour day operation. For abnormal conditions or activities, interval should be shortened to compensate.

**KEY**

LUBRICANTS		LOWEST EXPECTED AIR TEMPERATURE
PS—Oil, Lubricating, Preservative, Special		All Temperatures
GL—Grease, Lubricating, Special		All Temperatures
Interval 3M = 3 Months		

CLEAN parts with clean, lint-free cloth, lightly dampened with Solvent, Dry-cleaning. Allow parts to dry thoroughly before lubricating. Do not allow cleaning fluid to get on other parts of receiver.

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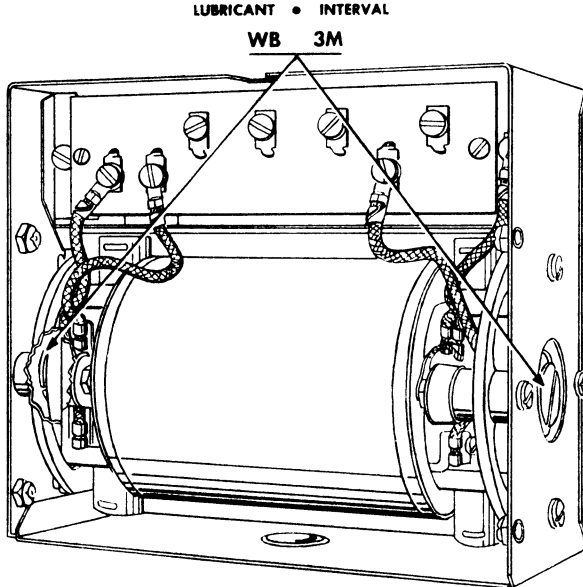
Figure 12. Radio Receiver lubrication chart.

## ARMATURE BEARINGS

To lubricate bearings, remove end plugs. Inspect bearings if grease is discolored (oxidized) or dried out through evaporation. Immerse the bearings with dynamotor inverted, in shallow pan of dry-cleaning Solvent (SD) to soften hardened grease; with small bristle brush, clean bearings. Rinse bearings in clean SD, and inspect for defects. Dry bearings thor-

oughly before lubricating. Knead WB into space between inner and outer races. Wipe off excess, do not pack bearing housing. Re-install plugs.

Below  $-30^{\circ}\text{F}$ , or when operated in unheated shelter, thoroughly clean bearings with SD. Coat ball bearings and races thoroughly with GL. Do not pack the bearings or bearing housing.



Intervals given are maximums for normal 8-hour day operation. For abnormal conditions or activities, interval should be shortened to compensate.

**CLEAN** parts with Solvent, Dry-cleaning, or Oil, Fuel, Diesel. Allow parts to dry thoroughly before lubricating.

**CAUTION:** Do not allow fluid to get on commutator brushes or electrical contacts.

### — KEY —

LUBRICANTS	LOWEST EXPECTED AIR TEMPERATURE		
	above $+32^{\circ}\text{F}$ .	$+32^{\circ}\text{F}$ . to $0^{\circ}\text{F}$ .	below $0^{\circ}\text{F}$ .
WB—Grease, General Purpose No 2	No 2	No. 2	GL
GL—Grease, Lubricating, Special	Interval 3M = 3 Months		
SD—Solvent, Dry cleaning			

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*Figure 13. Dynamotor lubrication chart.*

Attempts to do this result in overloading of the bearings with unsuitable lubricant which will solidify at low temperatures.

b. The bearings must be washed thoroughly in dry-cleaning solvent (SD) to remove all traces of heavy grease, dried, and then coated with special lubricating grease.

*Note.* The balls, races, and cages should be thoroughly coated, but the bearings and bearing housing should not be packed. Gasoline will not be used as a cleaning fluid for any purpose. Dry-cleaning solvent (SD) is available as a cleaning fluid through established supply channels. Diesel fuel oil may be used for cleaning purposes when dry-cleaning solvent (SD) is not available. Carbon tetrachloride will be used as a cleaning fluid only in the following cases: on electrical equipment where inflammable solvents cannot be used because of fire hazard, and for cleaning electrical contacts including relay contacts, plugs, commutators, etc.

## **Section IX. MOISTUREPROOFING AND FUNGIPROOFING**

### **49. General**

a. When equipment is operated in highly humid climates, excessive failure of parts and decreased operating efficiency are usually caused by the accumulated effects of moisture, rather than by inferior parts. Rapid temperature changes accompanied by fog, rain, dew, or high humidity promote such failures.

b. The effects of moisture on resistors, capacitors, coils, chokes, transformer windings, terminal boards, and insulating strips can be recognized in the form of corrosion, low insulation resistance, and flashovers. Moisture also accelerates fungus growth which increases these effects.

### **50. Reducing Failures**

a. A moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. The treatment consists of applying a film of moisture- and fungi-resistant varnish to all susceptible parts of the equipment. This film provides a nonwetting surface. Equipments which have been treated have been marked with the letters MFP and the date of treatment. Equipments not marked should be returned to third or higher echelon maintenance units for treatment.

b. TIG SIG 13 contains a detailed description of this treatment.

c. Retreatment may be required after a period of use. Need for this retreatment is indicated by excessive failures or by the effects listed in paragraph 49.



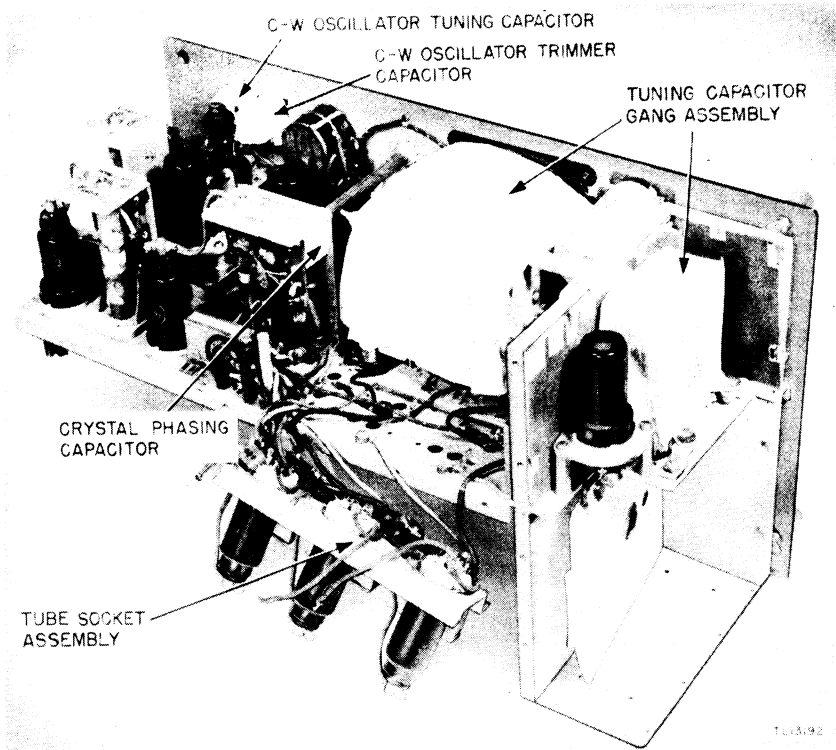


Figure 14. Up rear view of receiver chassis masked for moistureproofing and fungiproofing.

## 51. Treating Radio Receivers

a. PREPARATION. Make all repairs and adjustments necessary for the proper operation of the equipment.

b. DISASSEMBLY OF RADIO RECEIVERS BC-312-(\*) AND BC-314-(\*). (1) Loosen panel locks holding the receiver chassis to the case, and remove the chassis.

(2) Remove all screws holding Dynamotor DM-21-(\*), disconnect the four leads from the terminal strip in the dynamotor and remove the dynamotor.

(a) Remove Filter FL-6 from dynamotor case.

(b) Disengage the terminal plug to the filter unit and lift the terminal strip to extent of the wires.

(3) Remove the first r-f, second r-f, detector alignment screw shields, and the r-f wiring, first detector transformer, first i-f transformer, second i-f transformer, c-w oscillator, and r-f oscillator shields.

(4) Disengage the r-f tube socket assembly from the chassis and allow the assembly to hang freely on wiring. (See fig. 14.)

- (5) Remove the power plug shield.
- (6) Set BAND-CHANGE switch to band A, loosen setscrew, and remove the knob.
- (7) Remove setscrew in drive gear of band switching assembly and pull out shaft which interconnects switch sections.
- (8) Unsolder the 20 leads interconnecting the first r-f, second r-f, and first detector sections. Tag each lead so that it can be replaced properly.
- (9) Remove the first r-f, second r-f, and first detector sections and remove the cover plates from each section.
- (10) Unsolder the four leads from the r-f oscillator section and tag each lead respectively.
- (11) Remove the r-f oscillator section and remove the cover plate.

c. DISASSEMBLY OF RADIO RECEIVERS BC-342-(\*) AND BC-344-(\*). (1) Loosen the panel locks holding the receiver chassis to case, and remove chassis.

(2) Unsolder the six leads from the terminal strip adjacent to Rectifier RA-20, and remove rectifier.

(a) Unsolder switch wire from fuse holder.

(b) Remove the line plug.

(c) Remove the locknut holding line switch to case, and remove the line switch.

(d) Remove the chassis.

(3) Follow steps (3) through (9) in b above.

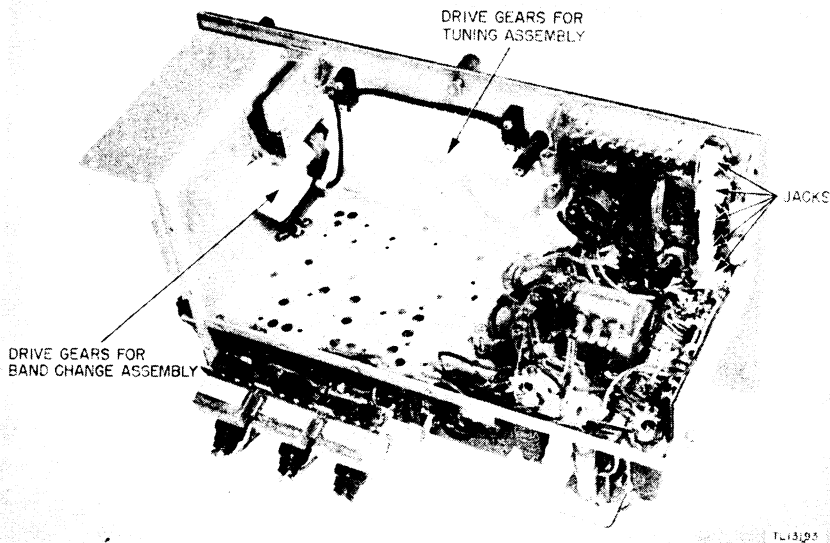


Figure 15. Bottom view of receiver chassis masked for moistureproofing and fungiproofing.

d. **CLEANING.** Clean all dirt, dust, rust, and fungus from the equipment to be processed. Clean all oil and grease from the surfaces to be varnished.

e. **MASKING.** Cover the following components with masking tape as shown in figures 14, 15, and 16.

(1) C-w oscillator tuning and c-w oscillator trimmer capacitors. (See fig. 14.)

(2) Crystal phasing capacitor. (See fig. 14.)

(3) Tuning capacitor gang assembly. (See fig. 14.)

(4) Five jacks along edge of panel. (See fig. 15.)

(5) Drive gears of tuning assembly. (See fig. 15.)

(6) Drive gears of band change assembly. (See fig. 15.)

(7) Interunit wiring. (See fig. 16.)

(8) Line plug contacts. (See fig. 16.)

f. **DRYING.** Place equipment in oven or under heat lamps and dry for 2 or 3 hours at 160° F.

g. **VARNISHING.** (1) Apply three coats of moistureproofing and fungiproofing varnish (Lacquer, Fungus-resistant, Signal Corps stock No. 6G1005.3, or equal). Allow each coat to air-dry for 15 or 20 minutes before applying the next coat.

(2) Apply varnish immediately after the equipment is dried. If varnish is not applied immediately, moisture condenses on the equipment. Varnish applied over the moisture peels off readily after the varnish has dried.

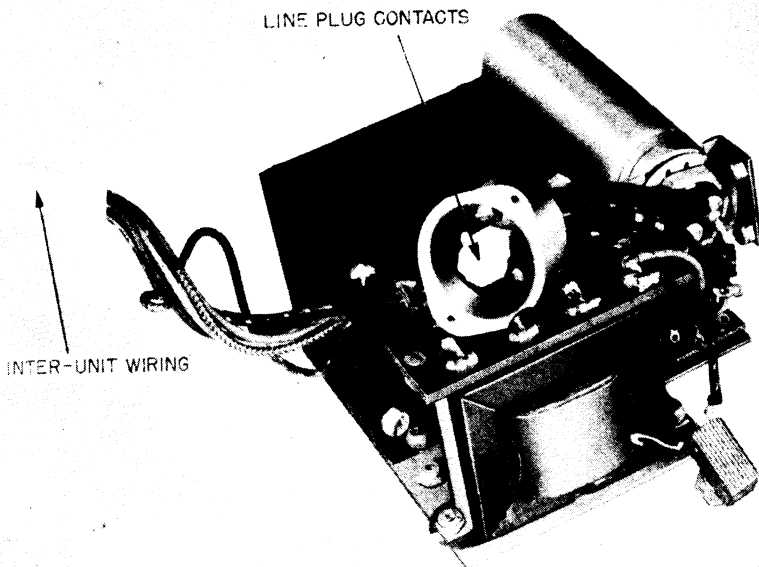


Figure 16. Rectifier RA-20 masked for moistureproofing and fungiproofing.

(3) Using a brush, apply varnish to the coil forms and wires in the first r-f, second r-f, first detector, and oscillator sections. Be careful not to get varnish on the plates of the variable capacitors or on the switch contacts.

(4) Using a brush, apply varnish to any portions of sprayed equipment not reached by the spray gun. Make sure all components are adequately protected by varnish.

*h. REASSEMBLY.* (1) Remove all masking tape, being careful not to peel varnish from nearby areas.

(2) Clean and burnish the switch contacts.

(3) Reassemble the set and test its operation.

*i. MARKING.* Mark the letters MFP and the date of the treatment about an inch or less below the nameplate of the receiver so that the marking will not become obliterated or rubbed off.

*Example:* MFP-31 Oct 45.

## **52. Moistureproofing and Fungiproofing After Repairs**

If, during repair, the coating of protective varnish has been punctured or broken, and if complete treatment is not needed to reseal the equipment, apply a brush coat to the affected part. Be sure the break is completely sealed.

**PART 4**  
**AUXILIARY EQUIPMENT**

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**(Not Used)**

# PART 5

## REPAIR INSTRUCTIONS

*Note.* Failure or unsatisfactory performance of equipment used by Army Ground Forces and Technical Services will be reported on WD AGO Form 468 (Unsatisfactory Equipment Report); by Army Air Forces, on Army Air Forces Form 54 (Unsatisfactory Report). If Army Air Forces Form 54 is not available, prepare the data according to the sample form shown in figure 40.

### Section X. THEORY OF EQUIPMENT

#### 53. Simplified Receiver Block Diagram

a. RADIO RECEIVERS BC-312-(\*), BC-342-(\*), BC-314-(\*), and BC-344-(\*) are similar in design with the exception of their frequency coverage and supply voltage. A simplified block diagram of the receivers is given in figure 17. The received signal from the antenna is applied to the first r-f amplifier stage, V1, where it is amplified before being fed to the second r-f amplifier stage, V2. The two r-f amplifier stages each use a Tube JAN-6K7 high-gain pentode to provide a high degree of selectivity and sensitivity while rejecting interfering signals at intermediate or image frequencies. The amplified r-f signal is then applied to the mixer or converter stage along with the output of the r-f oscillator stage, V4. The r-f oscillator signal beats against the

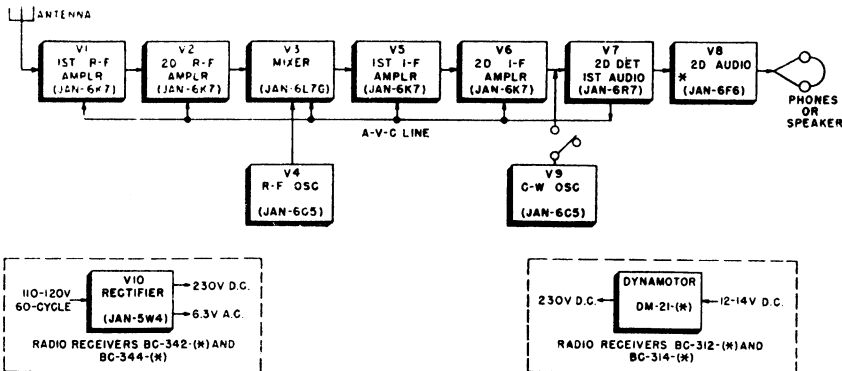


Figure 17. Receiver simplified block diagram.

incoming signal in mixer stage V3, a Tube JAN-6L7G, resulting in an i-f signal equal to the difference between the two frequencies.

b. The two i-f amplifier stages, V5 and V6, further amplify the i-f signal to provide additional selectivity and sensitivity. A Tube JAN-6K7 is used in both i-f amplifier stages. After amplification, the i-f signal is applied to second detector automatic volume control—first audio stage, V7. This stage demodulates the i-f signal producing the original audio signal, and provides one stage of audio amplification. In addition, Tube JAN-6R7 rectifies a portion of the i-f signal to provide a bias voltage for automatically controlling the receiver volume. This automatic volume-control (a-v-c) voltage is applied as a bias to the two r-f amplifier stages, to the mixer stage, and to the two i-f amplifier stages. The audio output from stage V7 is further amplified by second audio stage V8 to provide sufficient output to operate the headsets or a loudspeaker if provided.

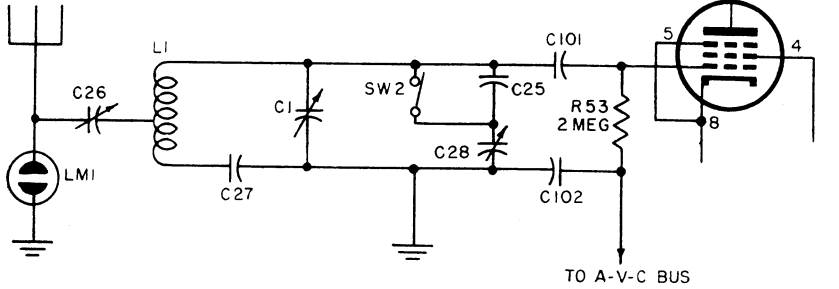
c. C-w oscillator stage V9 is provided for use when receiving c-w signals. The oscillator produces a c-w signal which differs in frequency from the received i-f signal by only a small amount, thereby producing an audio beat tone when the two signals are mixed in the second detector input circuit. The resulting audio beat note permits c-w reception.

d. Two sources of plate voltage are provided for the receiver circuits. (See fig. 17.) Radio Receivers BC-312-(\*) and BC-314-(\*) are designed for operation from a battery source and are equipped with a dynamotor to convert the 12- to 14-volt battery supply into 230 volts direct current. Radio Receivers BC-342-(\*) and BC-344-(\*) are designed for operation from a 110- to 120-volt, a-c supply and are equipped with a vacuum tube rectifier, V10, to convert the a-c supply voltage into direct current for operation of the receiver circuits.

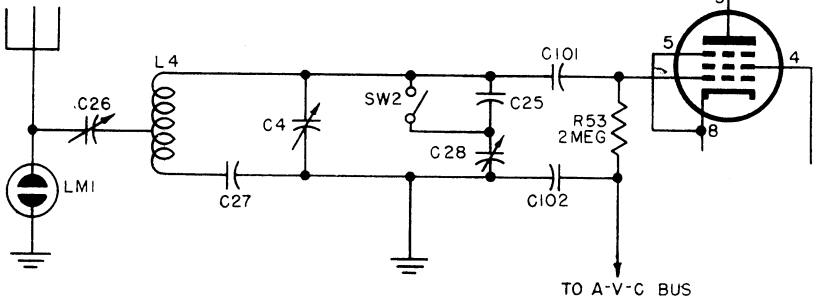
## 54. Antenna Circuit

a. The receiver antenna is coupled to the tuned grid circuit of the first r-f amplifier stage through variable capacitor C26 in the high-frequency models, and through C1 in the medium-frequency models. (See fig. 18.) These capacitors are brought out to the ALIGN INPUT knob on the receiver front panel which permits tuning the antenna circuit to resonance at the incoming signal frequency. A neon lamp, LM1, is connected between the antenna input and ground to protect the receiver input circuit against sudden high-voltage surges. The neon lamp normally has a very high resistance and will produce negligible shunting effect on the incoming signal. However, when a certain threshold voltage is exceeded, the gas in the lamp will ionize, thereby be-

BAND A CIRCUIT REFERENCES SHOWN  
BAND B AND C FUNCTIONS IDENTICAL

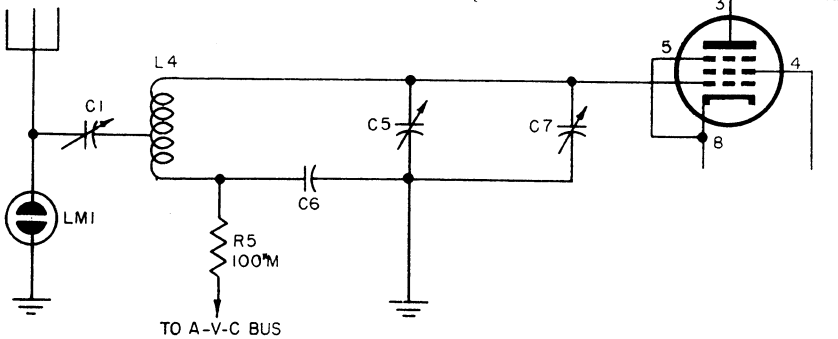


BAND D CIRCUIT REFERENCES SHOWN  
BAND E AND F FUNCTIONS IDENTICAL



**HIGH-FREQUENCY MODELS**

BAND A CIRCUIT REFERENCES SHOWN  
BAND B, C AND D FUNCTIONS IDENTICAL.



**MEDIUM FREQUENCY MODELS**

NOTE:

⊢ IS SYMBOL FOR FIXED CAPACITOR.

⊣ IS SYMBOL FOR VARIABLE CAPACITOR.

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Figure 18. Antenna circuit, all models.



coming a conductor and preventing a further rise in voltage by bypassing the current to ground. Neon lamp LM1 is a 1/25-watt lamp and was found to be incapable of carrying the high currents caused by operation of a transmitter in the vicinity of the receiver. Therefore, in later procurements of Radio Receivers BC-312-M and -N, and BC-342-M and -N, neon lamp LM1 was omitted and a neon lamp having a larger wattage rating was substituted in series with a 510-micromicrofarad ( $\mu\mu\text{f}$ ) capacitor. The new overload protector consisting of neon lamp LM4 and capacitor C107 is shown in figure 19.

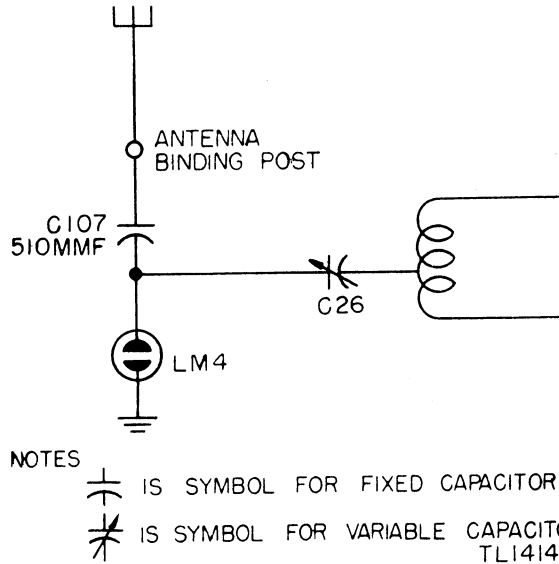


Figure 19. Antenna overload protector circuit.

b. A noise-suppression circuit is included in the antenna portion of Radio Receivers BC-312, BC-312-A, BC-342, and in earlier models of Radio Receivers BC-312-C and BC-342-C. The noise suppression circuit (fig. 20) is provided to reduce motor ignition interference when the receiver is mounted in a vehicle. This circuit consists of three coils, L25, L26, and L27. Coils L25 and L26 are separated by an electrostatic shield to insure that the coupling between them is entirely electromagnetic, while coils L26 and L27 are separated by an electromagnetic shield to insure that the coupling between them is primarily electrostatic. Both couplings are adjustable. A NOISE BALANCE control is provided on the front panel to adjust the coupling between coils L25 and L26 and serves to adjust the amount of noise introduced into the receiver circuits from a noise antenna located alongside of the vehicle engine. The coupling between L26 and

L27 is controlled by the NOISE ADJUST control and determines the phase relationship of the resultant noise voltage introduced into the receiver. The coupling between L25 and L26 is adjusted to produce minimum noise (not always zero). The coupling between L26 and L27 is then varied to reduce the noise to zero thereby insuring that the phase of the noise voltage fed by the separate antennas results in cancellation. Coil L27 also acts as an r-f choke between the antenna and ground. Coils L25, L26

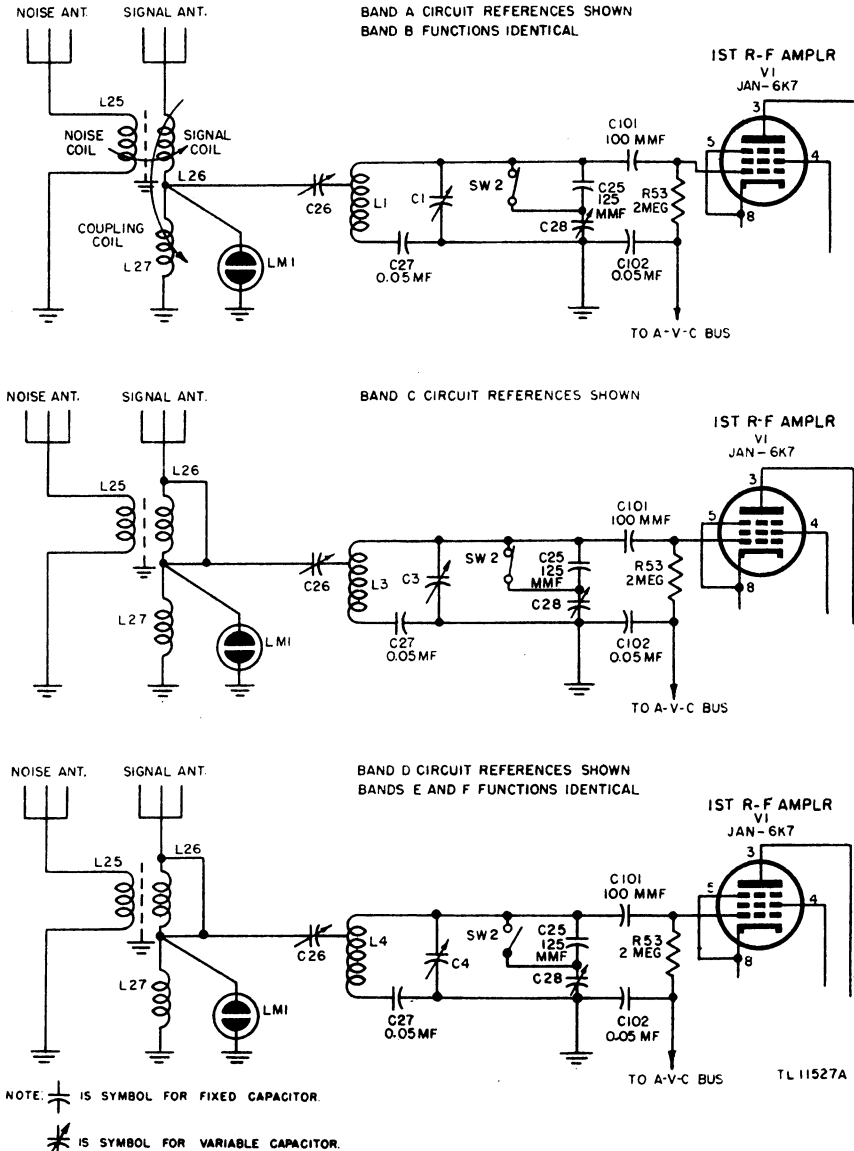


Figure 20. Antenna noise-suppression circuit.

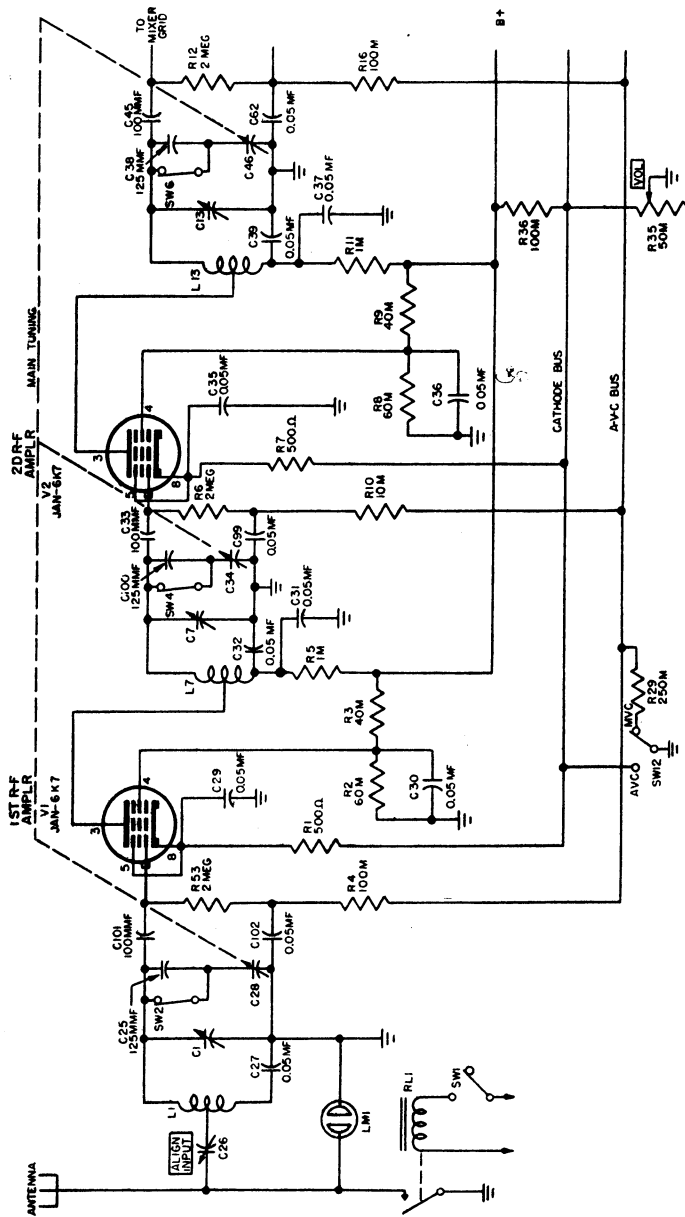
are no longer available as replacement parts. Therefore, when failure of any of the coils occurs, it is advisable to eliminate the noise-suppression circuit from the receiver. No new parts are required for this operation and complete instructions are given in paragraph 76.

## 55. R-F Amplifier Stages

a. GENERAL. Two stages of r-f amplification are provided in the radio receivers, each stage using a Tube JAN-6K7 high-gain pentode. To cover the required frequency range of the receiver, mechanical band switching is used in these stages as well as in the mixer and r-f oscillator stages. To simplify the theoretical analysis of these stages, only one band will be discussed. The operation on the other bands is identical unless otherwise stated.

b. RADIO RECEIVERS BC-312-(\*) AND BC-342-(\*). (1) A simplified schematic diagram of the r-f amplifier stages in the h-f receivers on Band A is given in figure 21. The first tuned circuit consists of coil L1, and capacitors C1 and C28. Capacitor C28 is the main tuning capacitor and is mechanically ganged with capacitors C34, C66, and C82 in the second r-f amplifier, mixer, and r-f oscillator stages respectively. Capacitor C1 is a small trimmer capacitor. The fixed capacitor, C25, is connected in series with C28 on the three higher frequency bands to obtain a greater frequency spread on the tuning dial. This capacitor is shorted out on Bands A, B, and C by switch SW2, a portion of the band change switch. Capacitors C27 and C101 are provided to prevent the tuned circuit from short circuiting the a-v-c voltage applied to the grid of tube V1. Resistor R53 is the grid resistor and returns the grid to the a-v-c bus through decoupling resistor R4 which is bypassed to ground by capacitor C102. On M.V.C., the a-v-c bus is shorted to ground through resistor R29.

(2) For m-v-c operation, cathode bias for the two r-f tubes is a combination of fixed and variable bias. The fixed bias for tube V1 is developed across resistor R1 and capacitor C29, while the variable bias is obtained by returning one end of resistor R1 to variable resistor R35. Resistors R35 and R36 are connected in series across the high-voltage plate supply so that a voltage exists across R35 whose value depends on the position of the variable arm. Increasing the resistance of R35 will change the value of bias on the grid from approximately -4 volts to -80 volts with respect to the cathode. Since the grids are grounded on manual-volume-control (m-v-c) operation, this negative potential at the grids is with respect to the cathode and not to ground. Screen





NOTE  
 IS SYMBOL FOR FIXED CAPACITOR  
 IS SYMBOL FOR VARIABLE CAPACITOR  
 M = 1,000 Ω

Figure 21. R-f amplifier stages, h-f models.

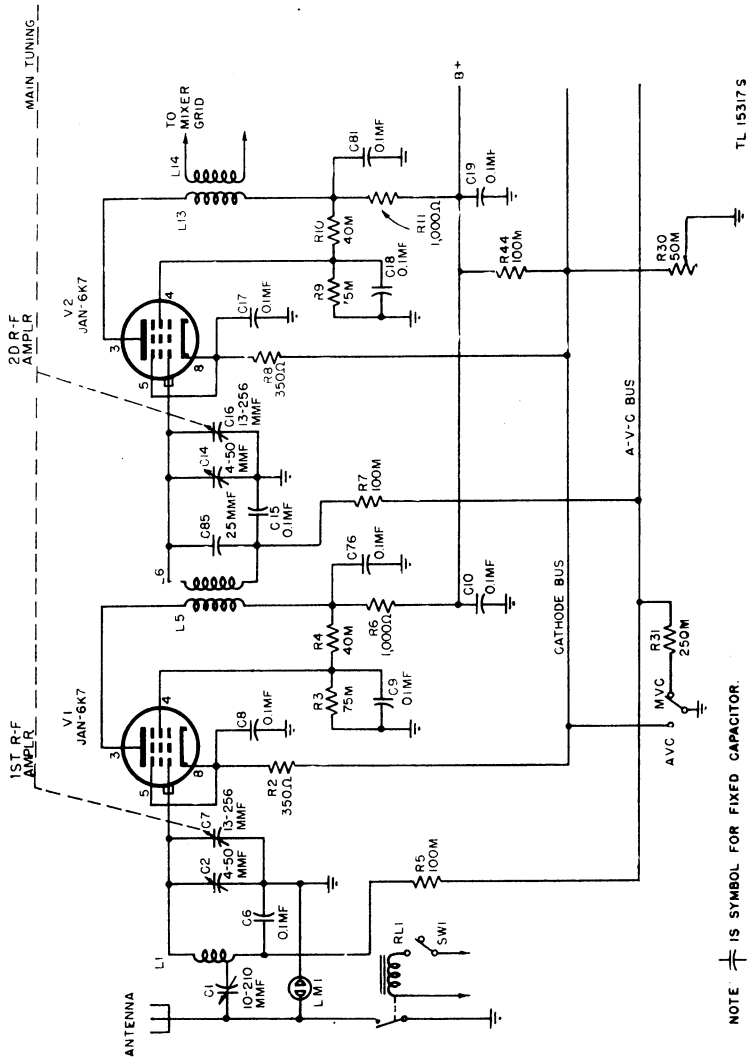
voltage for tube V1 is obtained from the junction of point resistors R2 and R3 which form a voltage divider across the high-voltage plate supply. Capacitor C30 bypasses the screen to ground.

(3) The second tuned circuit consisting of coil L7 and capacitors C7 and C34 serves as the tuned plate circuit for tube V1 and as the tuned grid circuit for tube V2. The plate of tube V1 is connected to a tap on coil L1 and plate voltage is obtained from the high-voltage bus through decoupling resistor R5 which is bypassed by capacitor C31. The circuit constants, with the exception of the reference symbols, and the operation of the second r-f stage is identical with that of the first stage. (See fig. 21.)

c. RADIO RECEIVERS BC-314-(\*) AND BC-344-(\*). (1) A simplified schematic diagram of the r-f amplifier stages in the m-f receivers on Band D is given in figure 22. The first tuned circuit consists of coil L1 and capacitors C2 and C7. Capacitor C7 is the main tuning capacitor and is mechanically ganged with capacitors C16, C46, and C67 in the second r-f amplifier, mixer, and r-f oscillator stages respectively. Trimmer capacitor C2 is provided to permit individual alignment of the tuned circuit. Capacitor C6 provides an r-f ground for coil L1 and prevents the d-c bias voltage applied to the grid from being shorted to ground. Capacitor C6 also functions in conjunction with resistor R5 to form a decoupling network in the a-v-c lead.

(2) For m-v-c operation, a combination of fixed and variable cathode bias is used for the two r-f tubes. The fixed bias for tube V1 is developed across resistor R2 and capacitor C8, while the variable bias is obtained by returning one end of resistor R2 to the junction point of resistors R44 and R30. By varying resistor R30, the grid bias can be varied from approximately -4 to -80 volts with respect to the cathode. The screen voltage for tube V1 is obtained from the voltage divider consisting of resistors R3 and R4 connected across the B+ supply. Capacitor C9 is the screen bypass capacitor. The plate load for tube V1 consists of coil L5. Plate voltage is obtained from the B+ supply through decoupling resistor R6, bypassed to ground by capacitor C10.

(3) The output of the first r-f amplifier stage is coupled from coil L5 to coil L6 in the grid circuit of the second r-f amplifier stage. Coil L6 is tuned by fixed capacitor C85 and variable capacitors C14 and C16. The circuit constants, with the exception of the reference symbols, and the operation of the second r-f amplifier stage is identical with that of the first stage. (See fig. 22.)



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Figure 22. R-f amplifier stages, m-f models.

## 56 Mixer and R-F Oscillator Stages

*a.* RADIO RECEIVERS BC-312-(\*) AND BC-342-(\*). (1) The amplified r-f signal developed across the tuned circuit consisting of coil L13, capacitor C13, and capacitor C46 (fig. 23) is applied to the grid of mixer tube V3, a Tube JAN-6L7 pentagrid converter. The grid is returned through resistors R12 and R16 to the a-v-c bus in a manner similar to that used for the two r-f stages. The tuned grid circuit also functions as the tuned plate circuit for the second r-f amplifier tube and functions the same as the tuned circuits previously described. (See par. 556.) Cathode bias for the mixer tube is developed across resistor R14 bypassed to ground by capacitor C48.

(2) An injector grid is provided in the mixer tube to which is applied a steady r-f voltage developed by r-f oscillator tube V4. The frequency of this r-f voltage is such that when this voltage beats against the incoming r-f signal applied to the mixer control grid, an intermediate frequency equal to the difference of these two signals will be produced. The resulting i-f signal will have the same modulation as the incoming r-f signal. The r-f oscillator circuit uses a triode Tube JAN-6C5 in a modified Hartley circuit with the plate end of the tank circuit operating at ground potential for radio frequencies. The tank circuit consists of inductor L19 (fig. 23), tuned by capacitor C82. Capacitor C82 is mechanically ganged with the main tuning capacitors C28, C34, and C46. Capacitor C40, in series with C82, is used on the three higher frequency bands to obtain a greater frequency spread. This capacitor is short circuited by switch SW8, ganged with switches SW2, SW4, and SW6, on the three lower frequency bands. Trimmer capacitor C19 is used to align the oscillator tank circuit so that it will track with the other tuned r-f circuits. Padder capacitor C44 is also used to insure proper tracking over the frequency range of the band.

(3) Plate voltage for the oscillator tube is supplied from the B+ supply through dropping resistor R41 bypassed to ground capacitor C83. Cathode bias for the oscillator is obtained by the voltage drop across resistor R46. This resistor is changed with each band to insure that the correct bias and thus the correct plate voltage for the oscillator is obtained on all bands. A portion of the r-f voltage developed across the tank circuit is applied to the injector grid of tube V3 through coupling capacitor C47. Resistor R13 is the injector grid return resistor.

(4) The heterodyne action of the mixer tube on the received signal and the oscillator signal produces an output signal of

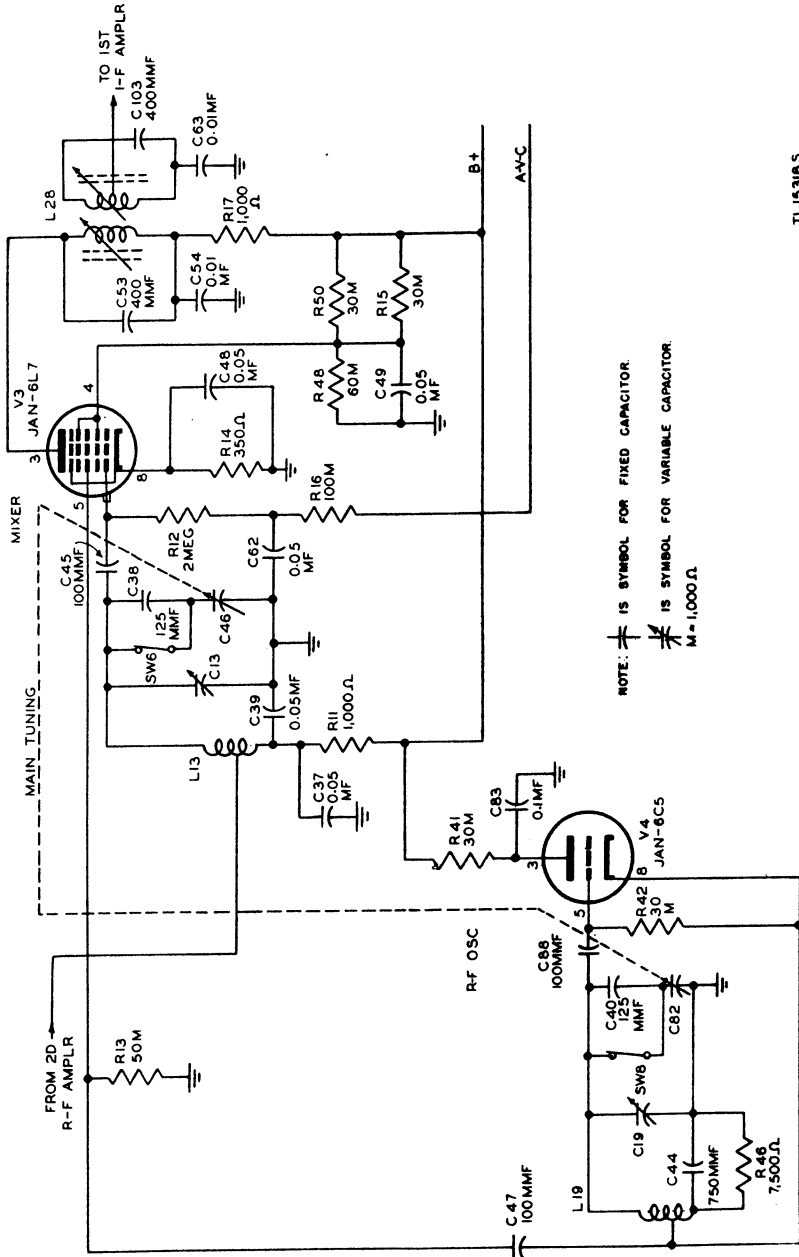


Figure 28. Mixer and r-f oscillator stages, h-f models.

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470 kc, the intermediate frequency. The plate load of the mixer tube consists of the tuned primary winding of transformer L28. The transformer winding is tuned to the intermediate frequency by fixed capacitor C53 and by a variable iron slug in the primary winding. Since this circuit is tuned to 470 kc, maximum amplification at that frequency will be produced and the other frequency components present in the mixer circuit will be negligible in comparison. Voltage for the screen grids of the mixer tube is obtained from a voltage divider consisting of resistors R48, R50, and R15 connected across the high-voltage supply. Capacitor C49 functions as the screen bypass capacitor. Plate voltage for the mixer tube is obtained from the high-voltage supply through the primary winding of transformer L28 in series with decoupling resistor R17 which is bypassed to ground by capacitor C54.

b. RADIO RECEIVERS BC-314-(\*) AND BC-344-(\*). (1) A simplified schematic diagram of the mixer stage and r-f oscillator stage in the m-f receiver models is shown in figure 24. The mixer stage is similar to the mixer stage in the h-f receiver models with the exception of the tuned grid input circuit. This circuit consists of inductor L14 and capacitors C27, C46, and C86 whose functions are identical to the corresponding elements in the r-f amplifier tuned circuits in the h-f receivers.

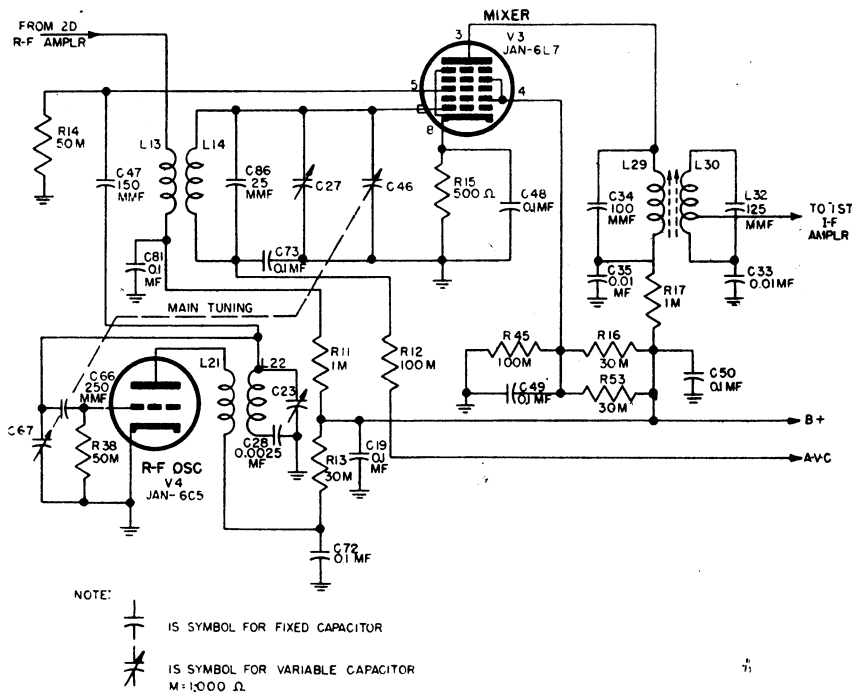


Figure 24. Mixer and r-f oscillator stages, m-f models.

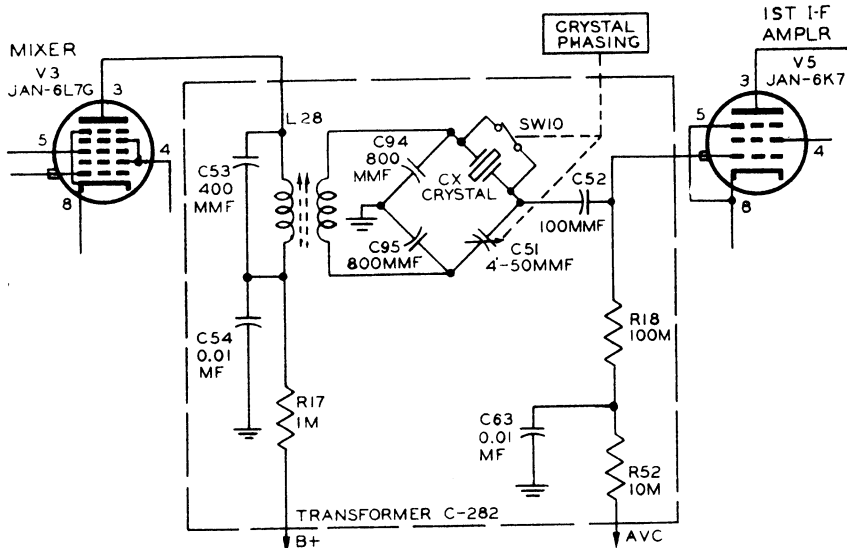
(2) The r-f oscillator circuit in the m-f receivers uses a Tube JAN-6C5 in a plate feed-back type circuit. The tank circuit consists of coil L22 tuned to resonance by capacitor C67 and trimmer C23. Fixed capacitor C28 in conjunction with the trimmer capacitor insures that the oscillator will track properly with the other tuned r-f circuits. Coil L21 is inductively coupled to coil L22 in the tuned grid circuit in the proper phase to sustain oscillations, and plate voltage is supplied through coil L21 and dropping resistor R13. Capacitor C72 bypasses the plate dropping resistor to ground. Capacitor C66 is the oscillator grid-blocking capacitor and resistor R38 returns the grid to ground. The oscillator voltage developed across the tank circuit is fed to the injector grid in the mixer tube through capacitor C47. Resistor R14 provides a d-c return to ground for the injector grid.



(3) The heterodyne action of the mixer produces an intermediate frequency of 92.5 kc, which is the difference between the oscillator frequency and the received signal frequency. The i-f signal carries the same modulation as the original signal and is developed across the tuned mixer plate circuit which consists of permeability-tuned transformer L29 and fixed capacitor C34. This circuit is tuned to an intermediate frequency of 92.5 kc instead of 470 kc as for the h-f receivers.

## 57. Crystal Filter

*a.* A crystal filter is incorporated in Radio Receivers BC-312 to BC-312-J, BC-312-HX, and BC-342-(\*). The output of the mixer stage is coupled to the grid of the first i-f amplifier through transformer L28. (See fig. 25.) Capacitor C53 and the primary winding of transformer L28 form a resonant circuit which is tuned to 470 kc by an adjustable iron core within the transformer coil. A bridge circuit consisting of capacitors C94, C95, and C51, and crystal CX is connected across the secondary winding of transformer L28. Switch SW10 is connected across the crystal. When this switch is closed, one-half of the voltage across the secondary winding of transformer L28 is impressed on the grid of the first i-f amplifier tube through blocking capacitor C52. When switch SW10 is open (the CRYSTAL PHASING control turned away from OUT), the signal is impressed on the grid of the first i-f amplifier tube through crystal CX and blocking capacitor C52. The crystal, which behaves as a sharply tuned resonant circuit, resonates at the intermediate frequency of 470 kc.

*b.* The crystal with its holder is one element of a bridge circuit consisting of capacitors C94, C95, and C51. Variable capacitor



NOTE  
 IS SYMBOL FOR FIXED CAPACITOR.  
 IS SYMBOL FOR VARIABLE CAPACITOR.  
 M = 1,000Ω

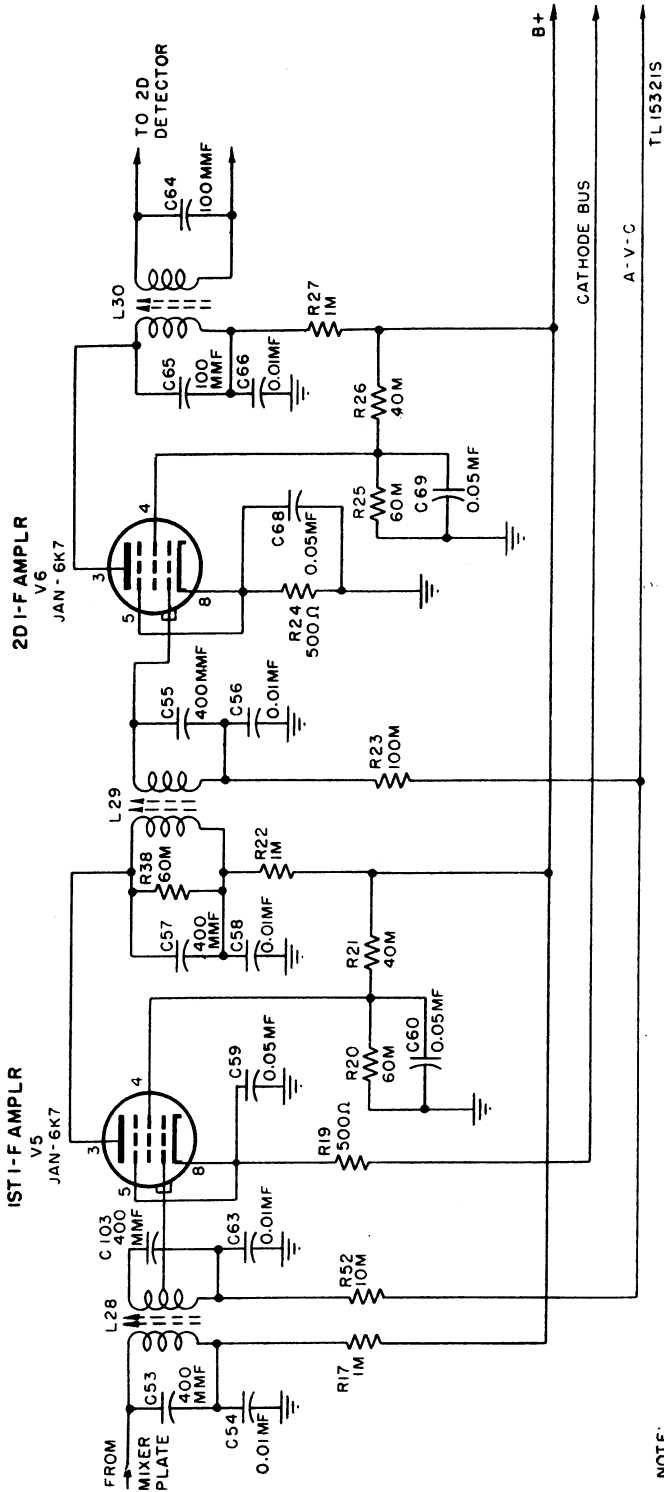
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Figure 25. Crystal filter circuit, h-f models.

C51, which is operated by the CRYSTAL PHASING knob, makes it possible to balance the bridge circuit so that the capacity of the crystal and holder is balanced out and undesired signals which are close to, and interfering with, the desired signal are discriminated against. The bridge circuit is required to insure that unwanted signals will not be coupled to the first audio grid through the capacity of the crystal and crystal holder. The variable capacitor control is referred to as the CRYSTAL PHASING control since its operation tunes the bridge circuit and consequently adjusts the phase relations of the voltage and currents. The sharpness of resonance of this crystal bridge greatly increases the effective selectivity of the receiver when the crystal is in the circuit.

## 58. I-F Amplifier Stages

a. RADIO RECEIVERS BC-312-(\*) AND BC-342-(\*). (1) A simplified diagram of the two i-f amplifier stages is given in figure 26. Both primary and secondary windings of the inter-stage i-f transformers, L28, L29, and L30, are tuned to the intermediate frequency by means of small fixed capacitors and movable iron cores within the coils. A-v-c voltage is applied to the tube grids from the a-v-c bus through decoupling resistor R52 for the first i-f amplifier tube, and R23 for the second i-f amplifier tube. Capacitors C63 and C56 bypass the coupling resistors to ground.




NOTE:  IS SYMBOL FOR FIXED CAPACITOR  
M = 1,000 Ω

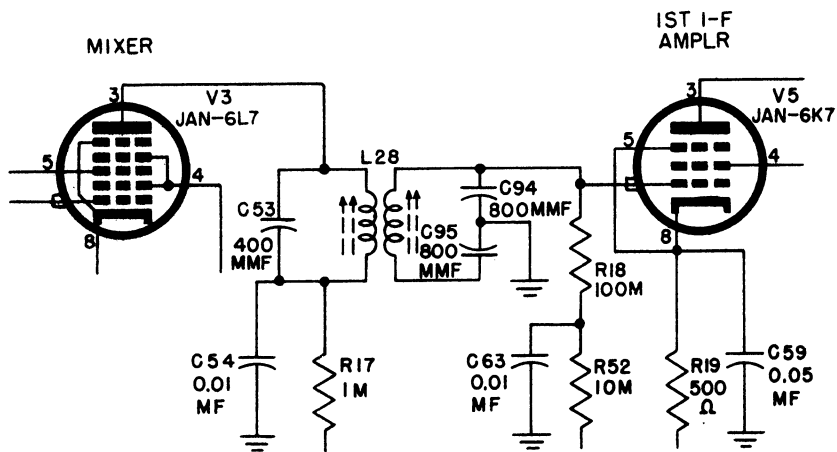
Figure 26. I-f amplifier stages, h-f models.


The bias for the first i-f amplifier tube is a combination of fixed and variable bias when on automatic volume control. The fixed bias is developed across resistor R19 bypassed by capacitor C59. Fixed bias is obtained by returning the cathode resistor to the cathode bus as previously described for the r-f amplifier circuits. Only fixed bias is used for the second i-f amplifier tube and is obtained across resistor R24 bypassed to ground by capacitor C68.

(2) Screen voltage for the two tubes is obtained from the high-voltage supply through voltage dividers consisting of resistors R20 and R21 for the first i-f amplifier tube and resistors R25 and R26 for the second i-f amplifier tube. The two screen grids are bypassed to ground by capacitors C60 and C69, respectively. Plate voltage for the two i-f amplifier tubes is obtained from the B+ supply through decoupling resistors R22 for the first i-f tube and R27 for the second i-f tube. Capacitors C58 and C66 bypass these resistors to ground. Resistor R38 is placed across the primary winding of transformer L29 to broaden the frequency response of this stage.

(3) In Radio Receivers BC-312-L and -M the secondary winding of transformer L28 is tuned by series capacitors C94 and C95 whose junction point is grounded. (See fig. 27.) The grid of tube V5 is returned to the a-v-c bus through grid resistor R18 and decoupling resistor R52 connected in shunt with the secondary winding of coil L28. Capacitor C63 bypasses resistor R52 to ground.

b. RADIO RECEIVERS BC-314-(\*) AND BC-344-(\*). The two i-f amplifier stages in the m-f receiver models function similarly



NOTE:  
 IS SYMBOL FOR FIXED CAPACITOR.  
 M=1,000 Ω

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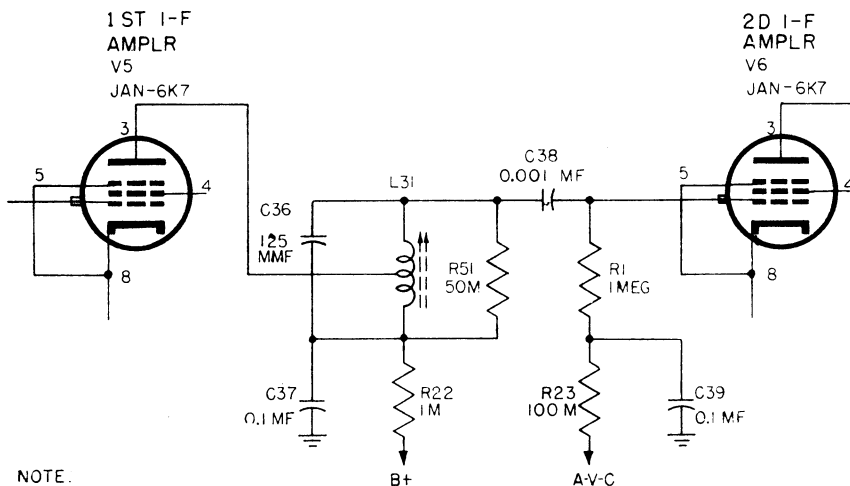
Figure 27. Mixer-first i-f amplifier coupling, Radio Receiver BC-312-L and -M Models.

to the corresponding stages in the h-f receivers with the exception of the intermediate frequency used. The resonant grid and plate circuits in the m-f receiver i-f stages are tuned to an intermediate frequency of 92.5 kc instead of 470 kc as in the h-f receiver i-f stages. (See *a* above.) A single-tuned i-f transformer, L31, is used between the first and second i-f amplifier stages in Radio Receivers BC-314-(\*) and BC-344-(\*). (See fig. 28.) The resonant circuit consisting of coil L31 and capacitor C36, is tuned to 92.5-kc by means of an adjustable iron core within coil L31. The plate of the first i-f amplifier tube is tapped into the lower part of the coil to provide the proper plate load impedance and plate voltage is supplied from the B+ supply through decoupling resistor R22 bypassed to ground by capacitor C37. Resistor R51 is connected across coil L31 to broaden the frequency response of this circuit. Grid return resistor R1 is connected to the a-v-c bus through decoupling resistor R23 which is bypassed to ground by capacitor C39.

## 59. Detector-A.V.C.-First Audio Stage

*a.* RADIO RECEIVERS BC-312-(\*) AND BC-342-(\*). (1) A duo-diode triode Tube JAN-6R7 is used as the second detector-a-v-c-first audio amplifier tube. (See fig. 29.) One diode section functions as the second detector while the other diode section is used to provide the a-v.c. voltage. The triode section of the tube serves as the first audio amplifier tube.

(2) The amplified i-f signal developed across the resonant cir-



NOTE.

⊕ IS SYMBOL FOR FIXED CAPACITOR.

M = 1,000 Ω

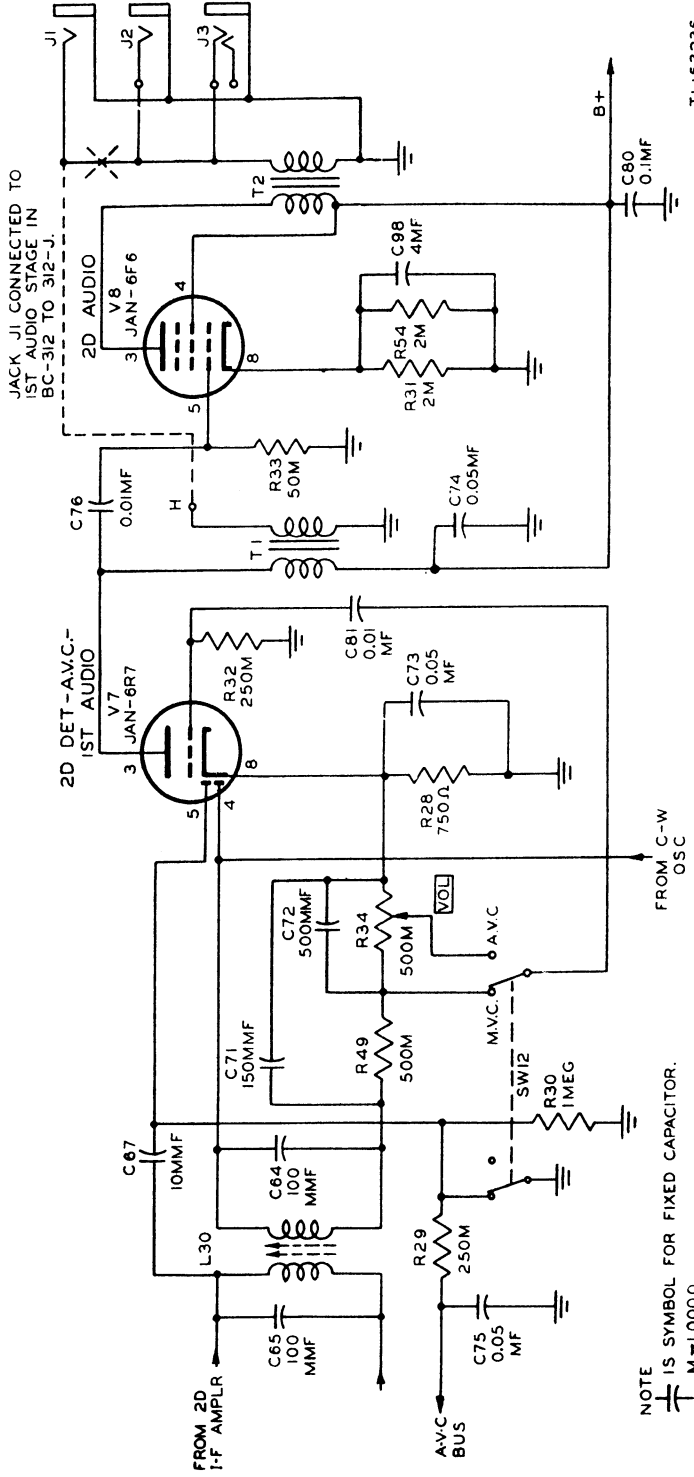
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Figure 28. I-f amplifier interstage coupling, m-f models.

cuit consisting of capacitor C64 and the secondary winding of transformer L30 is applied to the detector diode plate of tube V7. Resistors R34 and R49 form the detector load resistors and are bypassed at the intermediate frequency by capacitors C71 and C72. The detected audio signal appearing across resistor R34 is applied to the grid of the first audio amplifier tube through blocking capacitor C81. For m-v-c operation, the total voltage appearing across resistor R34 is applied to the audio amplifier and the receiver volume is controlled by varying the cathode voltage applied to the i-f and r-f amplifier tubes. (See par. 55.) For a-v-c operation, the amount of audio voltage applied to the audio amplifier grid is determined by the position of the slider on resistor R34. Resistor R34 is one section of a dual potentiometer controlled by the VOL knob located on the receiver front panel. The other section of the VOL control is resistor R35 used on m-v-c operation.

(3) The other diode plate of tube V7 is used to supply the a-v-c bias voltage. The output of the second i-f amplifier tube is applied to the a-v-c diode plate through coupling capacitor C67 so as not to overload the detector circuit. The rectified voltage developed across the a-v-c diode load resistor R30 is filtered by resistor R29 and capacitor C75 to provide a smooth d-c voltage which is applied as bias to the r-f, mixer, and i-f amplifier grids. A change in voltage across the a-v-c diode load resistor changes the bias and the resulting amplification of these tubes. The a-v-c system is designed to bias these tubes more negatively as the signal increases, thereby reducing their amplification and tending to maintain a constant voltage input to the second detector. With no signal present, the a-v-c diode plate will be negative with respect to the cathode since the diode plate is connected to ground through resistor R30 and the cathode is positive due to the voltage drop developed across cathode resistor R28. Thus, no rectified current will flow in the a-v-c circuit until the signal strength has reached a predetermined value, and weak signals will not be affected by the a-v-c action. This action provides what is referred to as delayed a-v-c operation. On m-v-c operation, switch SW12 shorts resistor R30 to ground, thereby grounding the a-v-c bus.

(4) The detected audio signal is applied to the grid of the triode section of tube V7 through capacitor C81. Resistor R32 is the grid return resistor and cathode bias for the first audio amplifier stage is developed across resistor R28 bypassed to ground by capacitor C73. The primary winding of transformer T1 serves as the plate load for the triode section and the amplified audio voltage is applied to the grid of the second audio amplifier tube



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Figure 29. Detector, a-v-c, and audio amplifier stages, h-f models.



through coupling capacitor C76. The plate voltage is bypassed by capacitor C74 to keep audio-frequency (a-f) currents out of the plate power supply.

b. RADIO RECEIVERS BC-314-(\*) AND BC-344-(\*). With the exception of the reference symbols and a few minor changes in component values, the second detector-a-v-c-first audio stage in Radio Receivers BC-314-(\*) and BC-344-(\*) is the same as the corresponding circuits in Radio Receivers BC-312-(\*) and BC-342-(\*) described in *a* above.

## 60. Second Audio Stage

a. RADIO RECEIVERS BC-312-(\*) AND BC-342-(\*) (1) The second audio amplifier stage uses a Tube JAN-6F6 pentode power amplifier. The output of the first audio amplifier is coupled to the grid of the second audio amplifier tube through capacitor C76. (See fig. 29.) Resistor R33 is the grid return resistor and cathode bias for the tube is developed across parallel resistors R31 and R54 bypassed to ground by capacitor C98. Screen voltage is obtained direct from the B+ supply. The primary winding of output transformer T2 forms the plate load for tube V8 and the amplified audio signal is coupled through the secondary winding to the headset and speaker jacks J1, J2, and J3. Two taps are provided on the secondary winding of transformer T2 to provide an output of 4,000 ohms or 250 ohms, depending on the input impedance of the phones or headset to be used.

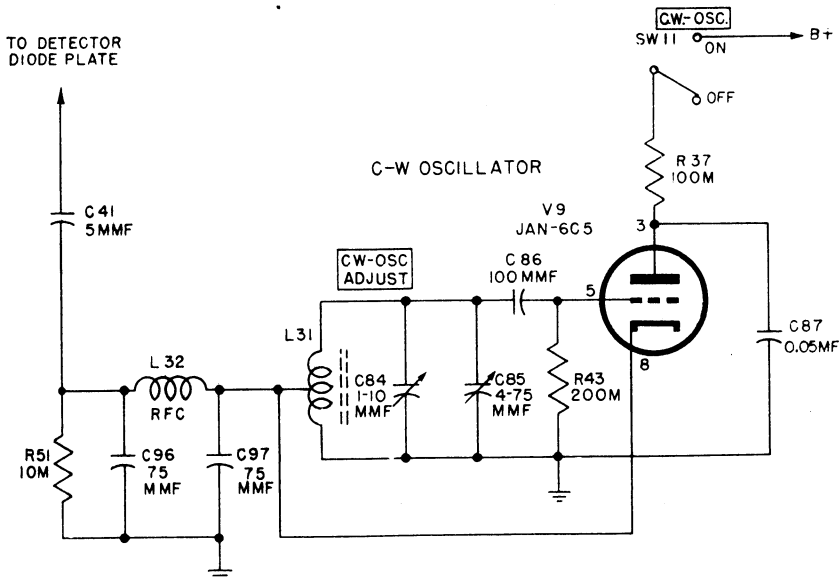
(2) In some earlier receiver models Jack J1 was connected to the secondary winding of transformer T1 and was labeled PHONES 1ST AUDIO. When the radio receiver is associated with a transmitter as in Radio Set SCR-399, sidetone for monitoring purposes generated in the transmitter may be introduced into the receiver audio system through the secondary winding of transformer T1. This point is connected to pin H in socket SO1 on the receiver front panel. The voltage introduced into the secondary winding of transformer T1 is amplified by the second audio amplifier stage producing a sidetone signal at the receiver output.



b. RADIO RECEIVER BC-314-(\*) AND BC-344-(\*). The second audio amplifier stage in Radio Receivers BC-314-(\*) and BC-344-(\*) functions in a manner similar to that of the second audio amplifier stage in the h-f receivers. (See *a* above.)

## 61. C-W Oscillator Stage

a. RADIO RECEIVERS BC-314-(\*) AND BC-342-(\*). The c-w oscillator stage in the h-f receivers consists of a Tube JAN-6C5 in a modified Hartley circuit. (See fig. 30.) The tank circuit

of this oscillator consists of inductor L31 tuned to the approximate intermediate frequency by capacitors C84 and C85. Capacitor C85 is an adjustable trimmer used to set the approximate oscillator frequency, and capacitor C84 is brought out to the CW-OSC ADJUST control on the receiver front panel. The oscillator cathode is connected to a tap on coil L31 and the top end of the coil is coupled to the grid through capacitor C86. The lower end of the coil is connected to ground and the r-f plate circuit is completed through capacitor C87. Resistor R43 is the grid return resistor and plate voltage is supplied from the B+ supply through switch SW11 and dropping resistor R37. Switch SW11 (the CW-OSC switch) permits turning the c-w oscillator on or off at will. A portion of the oscillator voltage developed across tank coil L31 is applied to the detector diode plate through a low-pass filter and coupling capacitor C41. The filter circuit consists of r-f choke L32 and resistor R51 bypassed to ground by capacitors C97 and C96. The filter is provided to prevent harmonics of the c-w oscillator from reaching the detector circuit. The output of the c-w oscillator is mixed with the i-f signal in the detector circuit producing an audio beat note equal to the difference between these two frequencies. The pitch of the resulting beat note may be varied either by the CW-OSC ADJUST control or by means of the main tuning control.



NOTES:  
 IS SYMBOL FOR FIXED CAPACITOR  
 IS SYMBOL FOR VARIABLE CAPACITOR  
 M = 1,000 Ω

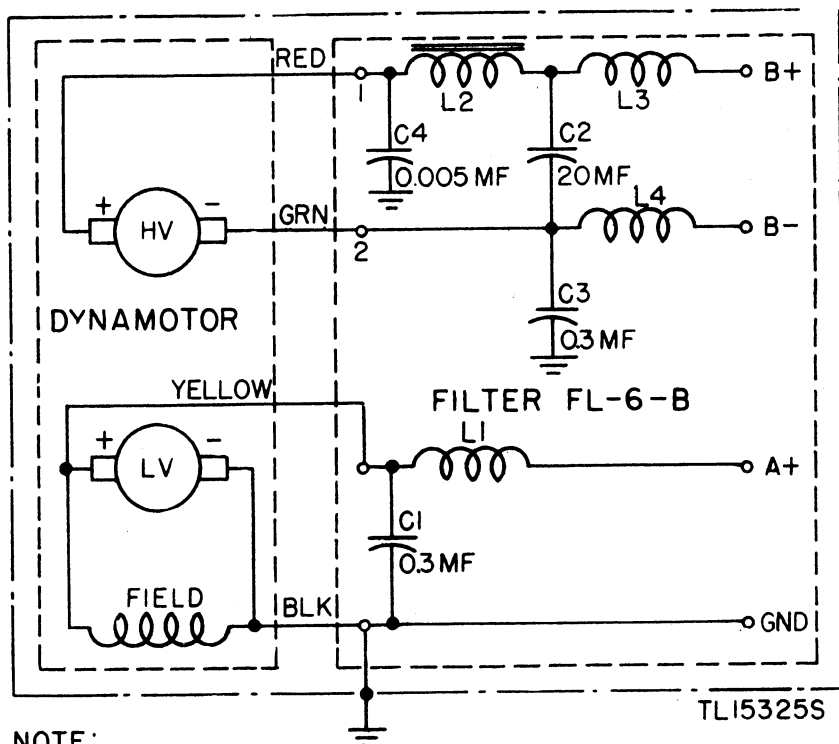
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Figure 30. C-w oscillator stage, h-f model.

b. RADIO RECEIVERS BC-314-(\*) AND BC-344-(\*) The c-w oscillator circuit in the m-f receivers is also a modified Hartley oscillator and functions similarly to the circuit described in a above. The tank circuit consisting of coil L82 and capacitors C68, C69, and C82 is tuned to the lower intermediate frequency of approximately 92.5 kc. The total voltage developed across coil L82 is applied to the detector diode plate through capacitor C44.

## 62. Dynamotor DM-21-(\*)

Dynamotor DM-21-(\*), used with Radio Receivers BC-312-(\*) and BC-314-(\*), operates on a d-c voltage of from 12 to 14 volts and produces the required plate voltage for operation of the receiver circuits. Under full load conditions the dynamotor requires an input of 2.7 amperes at 12 to 14 volts with an output of approximately 82 milliamperes at 260 volts direct current. R-f choke L1 and capacitor C1 (fig. 31) constitute a filter circuit to prevent r-f interference voltages from getting into the low-voltage supply circuit. Choke L2 and capacitor C2 in the high-



NOTE:

 IS SYMBOL FOR FIXED CAPACITOR.

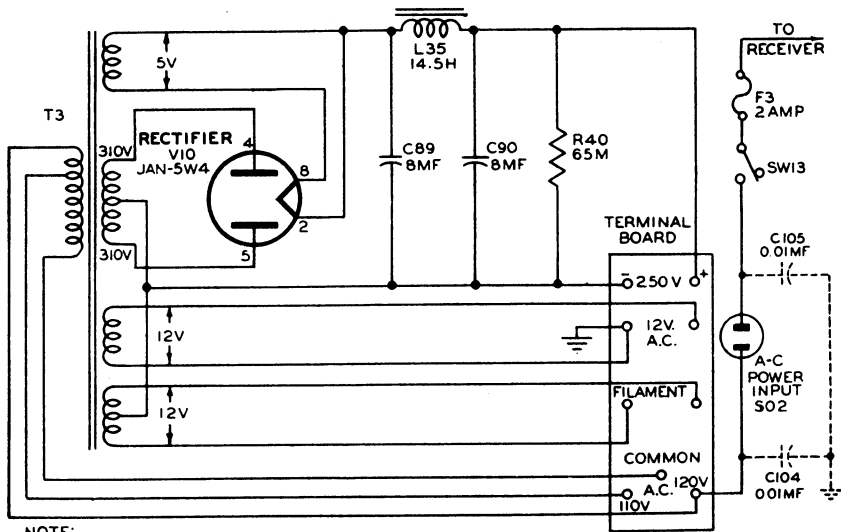
Figure 31. Dynamotor DM-21-(\*), schematic diagram.

voltage circuit provide an audio-frequency filter to reduce the commutator ripple to a value which will not be objectionable. R-f chokes L3 and L4 with capacitors C3 and C4 form an r-f filter to keep noise generated in the dynamotor out of the receiver circuits. Dynamotor DM-17-A, used with Radio Receiver BC-312, has the same characteristics as Dynamotor DM-21-(\*) and may be interchanged with it. Dynamotor DM-21-(\*)X, used with Radio Receivers BC-312-HX and BC-312-NX, is similar to Dynamotor DM-21-(\*), except that it requires an input of 24 to 28 volts direct current.

### 63. Rectifier RA-20

a. Rectifier RA-20, used with Radio Receivers BC-312-(\*) and BC-342-(\*), operates from a 110- to 120-volt, a-c supply and produces the required filament and plate voltage for the receiver circuits. The rectifier is secured to the underside of the receiver chassis in the same manner as the dynamotor in the battery operated models. Under full load conditions the rectifier draws approximately 0.7 amperes at 120 volts alternating current with a d-c output of approximately 95 milliamperes at 260 volts.

b. Power transformer T3 has a single primary winding and four secondary windings. (See fig. 32.) The primary winding is tapped to provide for an input of 110 or 120 volts. A Tube JAN-5W4 is used in a full-wave rectifier circuit and the resulting rectified voltage is filtered by choke L35 and capacitors C89 and C90 and



NOTE:  
 IS SYMBOL FOR FIXED CAPACITOR.  
 M=1,000Ω

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Figure 32. Rectifier RA-20, schematic diagram.

C90. Bleeder resistor R40 is connected across the filter to provide a minimum load and to discharge the capacitors when the supply is turned off. The 5-volt rectifier winding delivers 2 amperes to the rectifier tube, and the center-tapped filament winding delivers 2 amperes to the receiver tubes at 12 volts. An auxiliary 12-volt winding rated at 3 amperes is provided and is used to supply voltage to the dial lamps.

c. Connection to the a-c power source is made by means of a two-conductor cord, one end of which fits in a flush receptacle in the rectifier through the rear wall of the receiver cabinet. A toggle switch and a 2-ampere fuse are mounted below the a-c receptacle. With this switch, SW13, turned on, the receiver may be turned on or off by means of the OFF-M.V.C.-A.V.C. switch on the receiver front panel.

d. To prevent interference between receivers operating from a common a-c supply, capacitors C104 and C105 have been added to Rectifier RA-20 in later procurements of Radio Receivers BC-342-N and BC-344-D. These capacitors, shown dotted in figure 32, prevent the oscillator voltage from appearing on the a-c supply lines.

## 64. Tube Heater Circuits

All receiver tubes except the audio amplifier tube (Tube JAN-12A6) in Radio Receiver BC-312-(\*)X and the rectifier tube (Tube JAN-5W4) in Rectifier RA-20, require a heater voltage of approximately 6 volts per tube. Tube JAN-12A6 and Tube JAN-5W4 require 12.6 and 5 volts, respectively. To permit operation from a 12- or 24-volt power source, the tubes in the receiver proper are connected in series-parallel. (See fig. 80.)

## Section XI. TROUBLE SHOOTING

### 65. General Trouble-Shooting Information

No matter how well equipment is designed and manufactured, faults occur in service. When such faults occur, the repairman must locate and correct them as rapidly as possible. This section contains general information to aid personnel engaged in this highly important duty of trouble-shooting.

a. TROUBLE-SHOOTING DATA. Take advantage of the material supplied in this manual. It will help in the rapid location of faults. Consult the following trouble-shooting data:

- (1) Block diagram of radio receiver. (See fig. 17.)
- (2) Complete schematic diagram. (See figs. 80 and 81.)
- (3) Simplified and partial schematic diagrams. These diagrams are particularly useful in trouble shooting, because the

repairman can follow the electrical functioning of the circuits more quickly than on the regular schematics, thus speeding trouble location.

(4) Voltage and resistance data for all socket connections.

(5) Illustrations of components. Front, top, and bottom views which aid in locating and identifying parts.

(6) Pin connections. Pin connections on sockets, plugs, and receptacles are numbered or lettered on the various diagrams.

(a) 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 the No. 1 pin.

(b) 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 appearing directly on the connector.

b. TROUBLE-SHOOTING STEPS. The first step in servicing a defective radio set is to sectionalize the fault. Sectionalization means tracing the fault to the component or *circuit* responsible for the abnormal operation of the set. The second step is to localize the fault. Localization means tracing the fault to the defective *part* responsible for the abnormal condition. Some faults such as burned-out resistors, r-f arcing, and shorted transformers can often be located by sight, smell, and hearing. The majority of faults, however, must be located by checking voltage and resistance.

c. SECTIONALIZATION. Careful observation of the performance of the receiver on the different bands and while operating the various controls often sectionalizes the fault to the particular stage or circuit at fault. Additional sectionalizing of the fault will be discussed in paragraph 67.

d. LOCALIZATION. Paragraph 68 describes the method of localizing faults within the defective stage. This paragraph is accompanied by trouble-shooting charts which list abnormal symptoms and their probable causes. These charts also give 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 voltage at each socket pin connection.

e. VOLTAGE MEASUREMENTS. Voltage measurements are an almost indispensable aid, for most troubles either *result* from abnormal voltages or *produce* abnormal voltages. Voltage measurements are taken easily, because they are always made between two points in a circuit. The circuit need not be interrupted.

(1) Unless otherwise specified, voltages listed on the voltage charts 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 overloaded. Then, if it is necessary to obtain increased accuracy, set the voltmeter to a lower range.

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

f. 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:

(1) Connect the ground lead to the voltmeter.

(2) Place one hand in your pocket. This will eliminate the possibility of making accidental contact with another part of the circuit thus causing the electricity to travel from one hand to the other through the body.

(3) 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).

(4) If the voltage is greater than 300 volts, shut off the power, connect the hot 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.

g. VOLTMETER LOADING. Voltmeter resistance must be at least 10 times as large as the resistance of the circuit across which the voltage is measured. If the voltmeter resistance is nearly equal to the circuit resistance, the voltmeter will indicate a voltage *lower* than the actual voltage present when the voltmeter is removed from the circuit.

(1) The resistance of a voltmeter on any range can be calculated by this simple rule: Resistance of the voltmeter equals its ohm-per-volt rating multiplied by the full-scale range in volts. For example: The resistance of a 1,000-ohm-per-volt meter on the 300-volt range is 300,000 ohms ( $R = 1,000 \text{ ohms per volt times } 300 \text{ volts} = 300,000 \text{ ohms}$ ).

(2) To minimize 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 electrical accuracy of the voltage measurement will be increased. The decreased loading of the voltmeter will more than

compensate for the visual inaccuracy which results from reading only a small deflection on the voltmeter scale.

(3) Close observation of the meter when switching voltage ranges will show if the voltmeter is loading the circuit under test.

(a) *Extremely heavy loading* is indicated when the deflection of the pointer on the meter (not the voltage reading) is nearly the same for different ranges.

(b) *Appreciable loading* is indicated when the voltage readings (not the deflection) for different ranges do not agree.

(c) *Negligible loading* is indicated when the voltage readings (not the deflection) for different ranges do agree.

(4) 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 may be necessary to consider the effect of loading.

## 66. Trouble-Shooting Procedures

The accompanying trouble-shooting charts, if properly used, will simplify trouble shooting. The first chart is the sectionalization chart and will aid in determining which stage in the receiver is at fault. This chart lists the symptoms which may be observed either visually or audibly while making a few simple tests. When the defective stage has been located, the second chart should be referred to as an aid in determining which individual part is at fault within the stage. Each chart will apply to both the h-f and the m-f receiver models; however, when a reference is made to the voltage and resistance charts, the chart for the corresponding receiver model should be consulted.



## 67. Sectionalizing Trouble in Receiver

Symptoms	Probable trouble	Corrections
1. Weak reception and weak signal in headset with Signal Generator I-72-( ) connected to antenna binding post (OUT-PUT switch at MOD. position); strong signal with signal generator connected to grid (top cap) of 1st r-f amplifier tube.	1. Relay RL1 or Lamp LM1 shorted (fault occurs on all bands). Antenna stage misaligned (if fault occurs on one or two bands only). Antenna stage defective.	1. Check d-c continuity from antenna binding post to ground. If shorted, replace lamp or relay. Align antenna stage for defective band or bands. See paragraph 68.
2. Weak or no signal in headset with Signal Generator I-72-( ) connected to grid (top cap) of 1st r-f amplifier tube; strong signal with signal generator connected to grid (top cap) of 2d r-f amplifier tube.	2. 1st r-f amplifier stage misaligned (fault occurs on one or two bands only). BAND CHANGE switch contacts dirty. Tube V1 (1st r-f amplifier tube) defective. 1st r-f amplifier stage defective (fault occurs on all bands).	2. Realign defective stage. (See par. 88.) Clean switch contacts. Replace tube V1 (JAN-6K7). See paragraph 68.
3. Weak or no signal in headset with Signal Generator I-72-( ) connected to grid (top cap) of 2d r-f tube; strong signal with 470-kc signal* from signal generator fed to grid (top cap or mixer tube).	3. 2d r-f amplifier stage misaligned (fault occurs on one or two bands only). BAND CHANGE switch contacts dirty. Tube V2 (2d r-f amplifier tube) defective. 2d r-f amplifier stage defective (fault occurs on all bands).	3. Realign defective stage. (See par. 88.) Clean switch contacts. Replace tube V2 (JAN-6K7). See paragraph 68.
4. No signal in headset with Signal Generator I-72-( ) connected to grid (top cap) of 2d r-f amplifier tube and tuned to receiver frequency; strong signal heard with signal generator tuned to	4. R-f oscillator stage misaligned (fault occurs on one or two bands only). BAND CHANGE switch contacts dirty. Tube V4 (r-f oscillator tube) defective. R-f oscillator stage	4. Realign r-f oscillator stage. (See par. 87.) Clean switch contacts. Replace tube V4 (JAN-6C5). See paragraph 68.

## 67. Sectionalizing Trouble in Receiver (contd.)

Symptoms	Probable trouble	Corrections
<p>470-kc*.</p> <p>5. Weak or no signal in headset with 470-kc signal* from Signal Generator I-72-( ) fed to grid (top cap) of mixer tube; strong signal heard with 470-kc signal* fed to grid (top cap of 1st i-f amplifier tube).</p> <p>6. No signal in headset with 470-kc signal* from Signal Generator I-72-( ) fed to grid (top cap) of 1st i-f amplifier tube; strong signal heard with 470-kc signal* fed to grid (top cap) of 2d i-f amplifier tube.</p> <p>7. No signal in headset with 470-kc signal* from Signal Generator I-72-( ) fed to grid (top cap) of 2d i-f amplifier tube; strong signal heard with 400-cycle tone from the signal generator (O U T P U T switch in 400-cycle position, receiver and generator grounded) applied to grid (top cap) of 1st audio amplifier tube.</p> <p>8. No signal heard in headset with 400-cycle tone from Signal Generator I-72-( ) connected to grid (top cap) of 1st audio tube (ground receiver and signal</p>	<p>defective (fault occurs on all bands).</p> <p>5. Mixer stage misaligned (fault occurs on one or two bands only). B A N D C H A N G E switch contacts dirty. Tube V3 (mixer tube) defective. Mixer stage defective (fault occurs on all channels).</p> <p>6. 1st i-f amplifier stage misaligned. Tube V5 (1st i-f amplifier tube) defective. 1st i-f amplifier stage defective.</p> <p>7. 2d i-f amplifier stage misaligned. Tube V6 (2d i-f amplifier tube) defective. 2d i-f amplifier stage defective. 2d detector stage defective.</p> <p>8. Triode section of tube V7 defective. 1st audio amplifier stage defective.</p>	<p>5. Realign defective stage. (See par. 88). Clean switch contacts. Replace tube V3 (JAN-6L7). See paragraph 68.</p> <p>6. Realign stage. (See par. 84.) Clean switch contacts. Replace tube V5 (JAN-6K7). See paragraph 68.</p> <p>7. Realign stage. (See par. 84.) Replace tube V6 (JAN-6K7). See paragraph 68. Replace tube V7 (JAN-6R7). (See par. 68.)</p> <p>8. Replace tube V7 (JAN-6R7). (See par. 68.)</p>

## 67. Sectionalizing Trouble in Receiver (contd.)

Symptoms	Probable trouble	Corrections
<p>generator); strong signal heard with 400-cycle signal fed to grid (pin 5) of 2d audio amplifier tube.</p> <p>9. Strong signal heard in headset with modulated signal (OUTPUT switch at MOD.) from Signal Generator I-72-( ) connected to antenna binding post; no signal heard when OUTPUT switch is in UNMOD. position, C.W.-OSC. switch on receiver in ON position.</p>	<p>9. Tube V9 (c-w oscillator) defective. C-w oscillator stage defective</p>	<p>9. Replace tube V9 (JAN-6C5). (See par. 86 or 68.)</p>

\* Applies to h-f receiver models; use 92.5-kc signal for m-f receiver models.

## 68. Localizing Trouble in Receiver

Symptoms	Probable trouble	Corrections
<p>1. First r-f amplifier (tube V1).</p> <p>a. No filament voltage between pins 2 and 7.</p>	<p>a. Open filament in r-f oscillator tube V4 (V1 and V4 filaments are connected in series). Broken connection in filament circuit.</p>	<p>a. Replace tube V4 (JAN-6C5).</p> <p>Check d-c continuity of filament circuit and repair break.</p>
<p>b. No plate voltage at pin 3.</p>	<p>b. Rectifier or dynamotor supply defective.</p> <p>Shorted capacitor C31 or C32 (h-f model); C76 (m-f model). Open resistor R5 (h-f model) or R6 (m-f model). If plate voltage is not present on one band only, band switch or corresponding plate coil is open (L7, L8, L9, L10, L11, or L12 for h-f model; L5, L7, L9, or L11 for m-f model). Broken circuit in plate circuit of tube V1.</p>	<p>b. Check voltage at terminal 7 of connection strip in receiver next to dynamotor or rectifier unit (250 v, d.c.). Replace or repair dynamotor or rectifier if necessary. Replace defective capacitor.</p> <p>Replace defective resistor.</p> <p>Repair defective switch. Repair or replace defective coil.</p> <p>Repair break.</p>
<p>c. High plate voltage at pin 3.</p>	<p>c. Defective tube V1.</p> <p>Open resistor R1, R2, or R3 (h-f model); R2, R3, or R4 (m-f model). Broken connection in cathode or screen circuit of tube V1.</p>	<p>c. Replace tube V1 (JAN-6K7). Replace defective resistor.</p> <p>Repair broken connection.</p>
<p>d. No or low cathode voltage at pin 8.</p>	<p>d. Open resistor R1, or R36 (h-f model); R2 or R44 (m-f model).</p>	<p>d. Replace defective resistor.</p>

## 68. Localizing Trouble in Receiver (contd.)

Symptoms	Probable trouble	Corrections
	Shorted capacitor C29 (h-f model); C8 (m-f model). Defective tube V1. Broken connection in cathode circuit of tube V1.	Replace defective capacitor. Replace tube. Repair broken connection.
<i>c.</i> High cathode voltage at pin 8.	<i>e.</i> Tube V1 gassy or tube elements shorted. Switch SW12 defective or resistor R35 open (h-f model); switch SW11 or resistor R30 defective (m-f model). Excessive plate voltage.	<i>e.</i> Replace tube. Replace or repair defective switch or resistor. See symptom <i>c</i> above.
<i>f.</i> No screen voltage at pin 4.	<i>f.</i> Shorted capacitor C30 (h-f model) or C9 (m-f model). Open resistor R3 (h-f model) or R4 (m-f model).	<i>f.</i> Replace defective capacitor.
2. Second r-f amplifier (tube V2).		
<i>a.</i> No filament voltage between pins 2 and 7.	<i>a.</i> Open filament in mixer tube V3 (V2 and V3 filaments are connected in series). Broken connection in filament circuit.	<i>a.</i> Replace tube V3 (JAN-6L7). Check d-c continuity of filament circuit and broken connection.
<i>b.</i> No plate voltage at pin 3.	<i>b.</i> Rectifier or dynamotor supply defective. Shorted capacitor C37 or C39 (h-f model); C81 (m-f model). Open resistor R11 (h-f model and m-f model). If plate voltage is not	<i>b.</i> See corresponding correction for symptom 1 <i>b</i> above. Replace defective capacitor. Replace defective resistor. Repair defective

## 68. Localizing Trouble in Receiver (contd.)

Symptoms	Probable trouble	Corrections
	<p>present on one band only, band switch or corresponding plate coil is open (L13, L14, L15, L16, L17, or L18 for h-f model; L13, L15, L17, or L19 for m-f model). Broken connection in plate circuit of tube V2.</p>	<p>switch. Repair or replace defective coil.</p> <p>Repair broken connection.</p>
<p>c. High plate voltage at pin 3.</p>	<p>c. Defective tube V2. Open resistor R7, R8, or R9 (h-f model); R8, R9, or R10 (m-f model). Broken connection in cathode or screen circuit of tube V2.</p>	<p>c. Replace tube V2 (JAN-6K7). Replace defective resistor.</p> <p>Repair broken connection.</p>
<p>d. No or low cathode voltage at pin 8.</p>	<p>d. Open resistor R7 or R36 (h-f model); R8 or R44 (m-f model). Shorted capacitor C35 (h-f model); C17 (m-f model). Defective tube V2. Broken connection in cathode circuit of tube V2.</p>	<p>d. Replace defective resistor.</p> <p>Replace defective capacitor.</p> <p>Replace tube.</p> <p>Repair broken connection.</p>
<p>e. High cathode voltage at pin 8.</p>	<p>e. Tube V2 gassy or elements shorted. Switch SW12 defective or resistor R35 open (h-f model); switch SW11 or resistor R30 defective (m-f model). Excessive plate voltage.</p>	<p>e. Replace tube.</p> <p>Replace or repair defective switch or resistor.</p> <p>See symptom c above.</p>
<p>f. No screen voltage at pin 4.</p>	<p>f. Shorted capacitor C36 (h-f model) or C18</p>	<p>f. Replace defective capacitor.</p>

## 68. Localizing Trouble in Receiver (contd.)

Symptoms	Probable trouble	Corrections
<p>3. Mixer stage (tube V3).</p> <p>a. No filament voltage between pins 2 and 7.</p> <p>b. No plate voltage at pin 3.</p> <p>c. High plate voltage at pin 3.</p> <p>d. No cathode voltage at pin 8.</p> <p>e. No or low screen voltage at pin 4.</p>	<p>(m-f model). Open resistor R9 (m-f model) or R10 (m-f model).</p> <p>a. Open filament in second r-f amplifier tube V2 (V2 and V3 filaments are connected in series). Broken connection in filament circuit.</p> <p>b. Rectifier or dynamotor supply defective.  Shorted capacitor C54 (h-f model) or C35 (m-f model). Open resistor R17 or coil L25 (h-f model); R17 or L29 (m-f model). Broken connection in plate circuit of tube V3.</p> <p>c. Defective tube V3.  Open resistor R14, R15, R48, or R50 (h-f model); R15, R16, R45, or R53 (m-f model). Broken connection in cathode or screen circuit of tube V3.</p> <p>d. Open resistor R14 (h-f model) or R15 (m-f model). Shorted capacitor C48 (h-f or m-f model). Broken connection in cathode circuit of tube V3.</p> <p>e. Shorted capacitor C49 (h-f and m-f models).</p>	<p>Replace defective resistor.</p> <p>a. Replace tube V2 (JAN-6K7).  Check d-c continuity of filament circuit and repair broken connection.</p> <p>b. See corresponding correction for symptom 1b above. Replace defective capacitor.  Repair or replace defective coil or resistor.  Repair broken connection.</p> <p>c. Replace tube V3 (JAN-6L7). Replace defective resistor.  Repair broken connection.</p> <p>d. Replace defective resistor.  Replace defective capacitor. Repair broken connection.</p> <p>e. Replace defective capacitor.</p>

## 68. Localizing Trouble in Receiver (contd.)

Symptoms	Probable trouble	Corrections
	Open resistors R15 or R50 (h-f model); R16 or R53 (m-f model).	Replace defective resistor.
4. R-f oscillator stage (tube V4).		
a. No filament voltage between.	a. Open filament in first r-f amplifier tube V1 (V1 and V4 filaments are connected in series). Broken connection in filament circuit.	a. Replace tube V1 (JAN-6K7).  Check d-c continuity of filament circuit and repair broken connection.
b. No plate voltage at pin 3.	b. Rectifier or dynamotor supply defective.  Shorted capacitor C83 (h-f model) or C72 (m-f model). Open resistor R41 (h-f model) or R13 (m-f model). Broken connection in plate circuit of tube V4.	b. See corresponding correction for symptom 1b above. Replace defective capacitor.  Replace defective resistor.  Repair broken connection.
c. High plate voltage at pin 3.	c. Defective tube V4.  Open resistor R42 or defective switch SW9 (h-f model). Open resistor R44, R45, or R46 if high plate voltage is obtained on one band only (h-f model). Broken connection in cathode circuit of tube V4.	c. Replace tube V4 (JAN-6C5). Repair or replace defective switch or resistor. Replace defective resistor.  Repair broken connection.
d. No cathode voltage at pin 8 (h-f model).	d. Same as symptom 4c above.	d. Same as symptom 4c above.
5. First i-f amplifier stage (tube V5).		
a. No filament voltage between pins 2 and 7.	a. Open filament in second i-f amplifier tube V6 (V5 and V6 filaments are connected in series).	a. Replace tube V6 (JAN-6K7).



## 68. Localizing Trouble in Receiver (contd.)

Symptoms	Probable trouble	Corrections
	Broken connection in filament circuit.	Check d-c continuity of filament circuit and repair broken connection.
b. No plate voltage at pin 3.	b. Rectifier or dynamotor supply defective.  Shorted capacitor C58 (h-f model) or C37 (m-f model). Open resistor R22 or coil L29 (h-f model); R22 or coil L31 (m-f model).	b. See corresponding correction for symptom 1b above. Replace defective capacitor.  Repair or replace defective coil or resistor.
	Broken connection in plate circuit of tube V5.	Repair broken connection.
c. High plate voltage at pin 3.	c. Defective tube V5.  Open resistor R19, R20, or R21 (h-f or m-f models). Broken connection in cathode or screen circuit of tube V5.	c. Replace tube V5 (JAN-6K7). Replace defective resistor.  Repair broken connection.
	d. Open resistor R19 or R36 (h-f model); R19 or R44 (m-f model). Shorted capacitor C60 (h-f model) or C52 (m-f model). Defective tube V5.	d. Replace defective resistor.  Replace defective capacitor.  Replace tube.
	Broken connection in cathode circuit of tube V5.	Repair broken connection.
d. No or low cathode voltage at pin 8.	d. Open resistor R19 or R36 (h-f model); R19 or R44 (m-f model). Shorted capacitor C60 (h-f model) or C52 (m-f model). Defective tube V5.	d. Replace defective resistor.  Replace defective capacitor.  Replace tube.
	e. Tube V5 gassy or tube elements shorted.	e. Replace tube.
e. High cathode in voltage at pin 8.	Switch SW12 defective or resistor R35 open (h-f model); switch SW11 or resistor R30 defective (m-f model). Excessive plate voltage.	Replace or repair defective switch or resistor.  See symptom c above.
	f. Shorted capacitor C60 (h-f model) or C52 (m-f model).	f. Replace defective capacitor.
f. No screen voltage at pin 4.		

## 68. Localizing Trouble in Receiver (contd.)

Symptoms	Probable trouble	Corrections
6. Second i-f amplifier stage (tube V6).	Open resistor R21 (h-f or m-f models).	Replace defective resistor.
a. No filament voltage between pins 2 and 7.	a. Open filament in first i-f amplifier tube V5 (V5 and V6 filaments are connected in series). Broken connection in filament circuit.	a. Replace tube V5 (JAN-6K7).  Check d-c continuity of filament circuit and repair broken connection.
b. No plate voltage at pin 8.	b. Rectifier or dynamotor supply defective.  Shorted capacitor C66 or C70 (h-f model); C42 (m-f model). Open resistor R27 or coil L30 (h-f model); R27 or coil L32 (m-f model). Broken connection in plate circuit of tube V6.	b. See corresponding correction for symptom 1b above. Replace defective capacitor.  Repair or replace defective coil or resistor.  Repair broken connection.
c. High plate voltage at pin 3.	c. Defective tube V6.  Open resistor R24, R25, or R26 (h-f or m-f models). Broken connection in cathode or screen circuit of tube V6.	c. Replace tube V6 (JAN-6K7). Replace defective resistor.  Repair broken connection.
d. No or low cathode voltage at pin 8.	d. Open resistor R24 (h-f and m-f models). Shorted capacitor C68 (h-f and m-f models). Defective tube V6. Broken connection in cathode circuit of tube V6.	d. Replace defective resistor. Replace shorted capacitor.  Replace tube. Repair broken connection.
e. No screen voltage at pin 4.	e. Shorted capacitor C69 (h-f and m-f models). Open resistor R26 (h-f and m-f models).	e. Replace defective capacitor. Replace defective resistor.
7. Second detector-A.V.C.-first audio amplifier		

## 68. Localizing Trouble in Receiver (contd.)

Symptoms	Probable trouble	Corrections
stage (tube V7). a. No filament voltage between pins 2 and 7.	a. Open filament in second audio amplifier tube V8 (V7 and V8 filaments are connected in series). Broken connection in filament circuit.	a. Replace tube V8 (JAN-6F6).  Check d-c continuity of filament circuit and repair broken connection.
b. No plate voltage at pin 3.	b. Rectifier or dynamotor supply defective.  Shorted capacitor C74 (h-f model) or C57 (m-f model). Open primary winding in transformer T1.	b. See corresponding correction for symptom 1b above. Replace defective capacitor.  Check d-c continuity of transformer winding and replace transformer if necessary.
c. High plate voltage at pin 3.	c. Defective tube V7.  Open resistor R28 (h-f model) or R37 (m-f model). Broken connection in cathode circuit of tube V7.	c. Replace tube V7 (JAN-6R7) Replace defective resistor.  Repair broken connection.
d. No or low cathode voltage at pin 8.	d. Open resistor R28 (h-f model) or R37 (m-f model). Shorted capacitor C73 (h-f model) or C58 (m-f model). Defective tube V7. Broken connection in cathode circuit of tube V7.	d. Replace defective resistor.  Replace defective capacitor.  Replace tube. Repair broken connection.
8. Second audio amplifier (tube V8). a. No filament voltage between pins 2 and 7.	a. Open filament circuit in tube V7 (V7 and V8 filaments are connected in series). Broken connection in filament circuit.	a. Replace tube V7 (JAN-6R7).  Check d-c continuity of filament circuit and repair broken connection.

## 68. Localizing Trouble in Receiver (contd.)

Symptoms	Probable trouble	Corrections
b. No plate voltage at pin 3.	b. Rectifier or dynamotor supply defective.  Shorted capacitor C80 (h-f model) or C63 (m-f model).  Open primary winding in transformer T2.	b. See corresponding correction for symptom 1b above.  Replace defective capacitor.  Check d-c continuity of transformer winding and replace transformer if necessary.
c. High plate voltage at pin 3.	c. Defective tube V8.  Open resistor R31 or R54 (h-f model); R33 or R52 (m-f model).  Broken connection in cathode circuit of tube V8.	c. Replace tube V8 (JAN-6F6 or JAN-12A6).  Replace defective resistor.  Repair broken connection.
d. No or low cathode voltage at pin 8.	d. Open resistor R31 or R54 (h-f model); R33 or R52 (m-f model).  Shorted capacitor C29 (h-f model) or C36 (m-f model).  Defective tube V8.  Broken connection in cathode circuit of tube V8.	d. Replace defective resistor.  Replace defective capacitor.  Replace tube.  Repair broken connection.
e. High grid voltage at pin 5.	e. Shorted capacitor C16 (h-f model) or C43 (m-f model).	e. Replace defective capacitor.
9. C-w oscillator stage (tube V9).		
a. No filament voltage between pins 2 and 7.	a. Open filament in second audio amplifier tube V8 (V8 and V9 filaments are connected in series).  Broken connection in filament circuit.	a. Replace tube V8 (JAN-6F6 or JAN-12A6).  Check d-c continuity of filament circuit and repair broken connection.
b. No plate voltage at pin 3.	b. Switch SW11 (h-f model) or SW10 (m-f model) in OFF position or defective.	b. Check position of switch and repair or replace if necessary.

## 68. Localizing Trouble in Receiver (contd.)

Symptoms	Probable trouble	Corrections
	Shorted capacitor C87 (h-f model) or C65 (m-f model).	Replace defective capacitor.
	Open resistor R37 (h-f model) or R36 (m-f model).	Replace defective resistor.
	Broken connection in plate circuit of tube V <sub>9</sub>	Repair broken connection.

## 69. Stage Gain Charts

The stage gain charts given in this paragraph list the minimum and maximum input voltages required at each of the r-f and i-f stages of the receiver to produce a signal output of 10 milliwatts (equivalent to 6.3 volts across an output load of 4,000 ohms). These charts can be used as standards when trouble shooting to check the over-all gain of the receiver and the gain of each r-f or i-f stage or group of stages. When the receiver output is low, localize the defective stage by checking the signal-voltage level of each stage against the chart while using either the signal substitution or signal tracing method of trouble shooting, or by measuring the individual stage gain.

### a. RADIO RECEIVERS BC-312-(\*) AND BC-342-(\*), R-F STAGES.

Band	Freq (kc)	Signal generator output connection <sup>2</sup>								Volume control setting	Output meter reading
		Antenna binding post <sup>1</sup>		Control grid, 1st r-f stage		Control grid, 2d r-f stage		Control grid, 1st detector			
		Min	Max	Min	Max	Min	Max	Min	Max		
A	3,000	1.5	6.0	9.0	11	11	13	70	80	(See note)	6.3
B	5,000	1.1	4.2	7.5	9.5	11	13	75	85		6.3
C	8,000	1.0	4.0	6.5	6.5	11	13	90	100		6.3
D	11,000	1.0	4.0	4.5	6.5	25	27	80	90		6.3
E	14,000	0.5	4.0	3.5	6.5	20	22	70	80		6.3
F	18,000	1.0	4.8	3.5	5.5	29	31	85	95		6.3

<sup>1</sup> ALIGN INPUT control set for maximum output.

<sup>2</sup> Signal generator connected to receiver point through 50-mmf capacitor.

*Note.* Set VOL control to maximum and adjust signal generator output to produce a reading on the output meter. Turn off the signal generator modulation and turn VOL control counterclockwise until output meter reads 3.3 volts. If the output meter reads 3.3 volts or less, with the VOL control at maximum and the modulation of the generator off, leave the VOL control set at maximum. Turn modulation of signal generator on, and readjust generator output to produce 6.3 volts on output meter. Repeat this procedure until

the output meter readings remain at 3.3 volts or less, and at 6.3 volts when the generator modulation is repeatedly turned off and on.

**b. RADIO RECEIVERS BC-312- (\*) AND BC-342- (\*), I-F STAGES.**

Signal generator frequency (kc)	* Signal generator output connection	Signal generator output (microvolts)		Volume control setting	Output meter reading
		Min	Max		
470	1st detector control grid.	9	11	Maximum clockwise position	6.3
470	1st i-f stage control grid.	600	700		6.3
470	2d i-f stage control grid.	11,000	13,000		6.3

\* Signal generator connected to receiver point through 350-ohm resistor.

**c. RADIO RECEIVERS BC-314- (\*) AND BC-344- (\*), R-F STAGES.**

Band		Signal generator output connection *								Volume control setting	Output meter reading
		Antenna binding post <sup>1</sup>		Control grid, 1st r-f stage		Control grid, 2d r-f stage		Control grid, 1st detector			
		Signal generator output (microvolts)									
Band	Freq (kc)	Min	Max	Min	Max	Min	Max	Min	Max		
A	155	3.0	7.0	40	50	135	145	340	360	(See note after a above)	6.3
B	265	3.0	6.0	40	50	165	175	290	310		6.3
C	460	3.0	6.0	28	38	125	135	315	335		6.3
D	850	3.2	6.0	26	36	155	165	325	345		6.3

<sup>1</sup> ALIGN INPUT control set for maximum output.

\* Signal generator connected to receiver point through 250-mmf capacitor in parallel with 1-megohm resistor.

**d. RADIO RECEIVERS BC-314- (\*) AND BC-344- (\*), I-F STAGES.**

Signal generator frequency (kc)	* Signal generator output connection	Signal generator output (microvolts)		Volume control setting	Output meter reading
		Min	Max		
92.5	1st detector control grid.	145	155	Maximum clockwise position	6.3
92.5	1st i-f stage control grid.	540	560		6.3
92.5	2d i-f stage control grid.	11,000	13,000		6.3

\* Signal generator connected to receiver point through 350-ohm resistor.

**70. Signal Substitution**

**a. TEST AND INDICATION.** (1) Set the receiver OFF-M.V.C.-A.V.C. switch to M.V.C., the C.W.-OSC. switch to OFF, the CRYSTAL PHASING control switch to OUT, and the VOL control to the position indicated in the stage gain charts.

(2) Connect a 4,000-ohm, 1-watt ( $\pm 5$  percent) resistor across the 4,000-ohm output of transformer T2 (PHONES 2D AUDIO jack).

(3) Connect a vacuum-tube voltmeter across the 4,000-ohm resistor. (An output meter with a 4,000-ohm input impedance may be used in place of the vacuum tube voltmeter and 4,000-ohm resistor.)

(4) Using a signal generator with a measured output, feed a signal of the correct frequency for the stage, at the voltage specified in the stage gain charts, to the control grid of each stage in succession. Begin at the grid of the second i-f amplifier stage (V6) and work forward to the receiver input.

(5) If an output of 6.3 volts cannot be obtained when a signal voltage within the limits given in the chart is applied to the stage, that stage is defective.

b. LOCALIZATION. If the gain of a stage is abnormal, replace the tube and realign the stage. If the gain of the stage is still low, make a voltage and resistance check to locate the defective part. To trace the trouble to its origin, see the voltage and resistance charts and the trouble-shooting chart in paragraph 68.

## 71. Checking Crystal Filter Operation

a. TEST AND INDICATION. (1) Turn the OFF-M.V.C.-A.V.C. switch to M.V.C., the C.W.-OSC. switch to OFF, and the CRYSTAL PHASING switch to OUT.

(2) Connect an antenna and a headset to the receiver and tune in a weak signal.

(3) While listening to the weak signal, turn the CRYSTAL PHASING control to the point of lowest background noise.

(4) If the background noise level does not decrease, feed an unmodulated signal from a signal generator to the antenna of the receiver. With the CRYSTAL PHASING control arrow in a vertical position, turn the tuning dial of the receiver back and forth across the frequency at which the signal generator is set. A musical chirp should be heard in the headset; if this chirp is not heard it means that either the crystal or the crystal filter circuit is defective.

b. LOCALIZATION. When no response is heard, check resistance measurements throughout the filter circuit and replace the crystal if necessary.

## 72. Checking R-F Oscillator Operation

a. The r-f oscillator stage is dependable and rarely gives trouble. However, when the operation of the oscillator stage is doubtful, it

may be checked as follows. Remove the mixer tube from its socket and twist the bare end of an insulated wire, 2 to 3 feet long, around the injector grid pin of the tube (pin 5). Be careful not to short any other tube pins. Reinsert the tube in its socket, leaving the grid cap disconnected, and place the wire along the bench near a Frequency Meter SCR-211-( ). Check the oscillator operation on each receiver band by setting the frequency meter to the mid-frequency of the band and tune the receiver while listening for heterodyne signals in the frequency meter. If the heterodyne signals are heard, the r-f oscillator is present. Remove the wire and replace the mixer grid lead.

b. A quicker alternate method of checking the r-f oscillator operation is as follows. With the r-f oscillator tube in place in its socket, tap the grid connection (pin 5) with the point of a pencil while listening in the receiver headset. The oscillator is functioning if a popping noise is heard each time the grid is tapped with a pencil point. With the oscillator compartment shielding in place, the grid connection is not accessible; however, if the pencil point is touched to the rotor plates of the oscillator tuning capacitor, the results will be the same.

### **73. Voltage and Resistance Charts**

The voltage and resistance charts for the radio receivers are given in figures 33, 34, 35, 36, and 37. The voltage measurements were made from the top of the chassis with an adapter and a 1,000-ohm-per-volt meter. When no adapter is available, use a short length of insulated wire to make the voltage measurements. Strip the insulation from one end of the wire and wrap the end around the tube pin under test. Insert the tube in its proper socket and measure the voltage at the other end of the wire. Avoid shorting the wire to the chassis. Measure the resistance by removing the tubes from their sockets. When measuring resistances on Radio Receiver BC-342-(\*), disconnect the red wire leading from Rectifier RA-20 to terminal 7 on the group-6 terminal board.

## **Section XII. REPAIRS**

### **74. Replacement of R-F Unit Assembly**

Turn the BAND CHANGE switch to Band A and remove the set screw in the switch shaft sleeve. Remove the single plug in the side of the r-f oscillator shield at the end of the receiver. By means of long-nose pliers, draw out the switch shaft through the hole. Remove the shield behind the r-f tube shelf and the shield behind the coil boxes. Remove both roundhead screws at the



front, and the two spacer studs at the rear corners of the tube shelf. Raise the tube shelf as far off the mounting shelf as it will go. Make certain that the ganged tuning capacitor is closed; then unsolder the connections to the r-f units and remove the screws which hold the units to the mounting shelf. Tag each wire so that it may be replaced correctly. The r-f unit assembly may now be removed. When replacing the unit, be sure that the switches in the unit are in position for Band A before replacement. Be sure that all connections are correctly made before resoldering the wires.

## **75. Replacement of R-F Oscillator Unit Assembly**

Remove the screws holding the outer shield cover, which incloses the upper and lower oscillator compartments, and remove the outer cover. Unsolder the four leads from the terminal panel below the tube socket. Tag each wire so that it may be replaced properly. Remove the four screws holding the unit to the bottom of the shield compartment. The unit may now be withdrawn from the chassis without removing the band-change switch shaft. When replacing the unit, make sure that the switches in the unit are in the same position as the switch shaft.

## **76. Elimination of Noise-Suppression Circuit**

*a. GENERAL.* Early procurements of the radio receivers contained a noise-suppression circuit (par. 54) which has been eliminated in later models. The noise-suppression circuit consists of coils L25, L26, and L27 which are no longer available for replacement parts. Consequently, when failure of any of these coils occurs, it is advisable to eliminate the noise-suppression circuit from the receiver. When this is necessary, follow the procedure outlined below.

*b. PROCEDURE.* (1) Remove the receiver chassis from its case.

(2) Rotate the FAST TUNING control on the front panel counterclockwise until the tuning capacitors are at a position of maximum capacity (plates completely meshed).

(3) Remove the wire connected between the lug on antenna trimmer C26 and the lug on the insulated mounting on the chassis below. (The lug on the antenna trimmer is further identified as being connected to a neon lamp.)

(4) Disconnect the wire connecting the signal antenna post to the noise-suppression circuit at the noise-suppression unit housing. This housing is located on the bottom of the chassis near the front panel, between the oscillator and first r-f coil sections.

(5) Using a piece of stiff wire as a hook, take the lead just

disconnected (in accordance with directions given in (4) above) across the front of the oscillator section and below antenna trimmer C26 to the lug on the antenna trimmer. Cut off the excess wire and solder the lead to the lug on the antenna trimmer.

(6) With the noise-suppression circuit eliminated, the antenna circuit in the receiver will appear as in the diagram of figure 38.

(7) Check the receiver alignment and replace the chassis in its case. Check the over-all receiver performance.

## 77. Removal of Dynamotor or Rectifier

To remove the dynamotor or rectifier assembly from the receiver chassis, unscrew the two screws holding the assembly to the top of the chassis. One of the screws is located at the right-rear

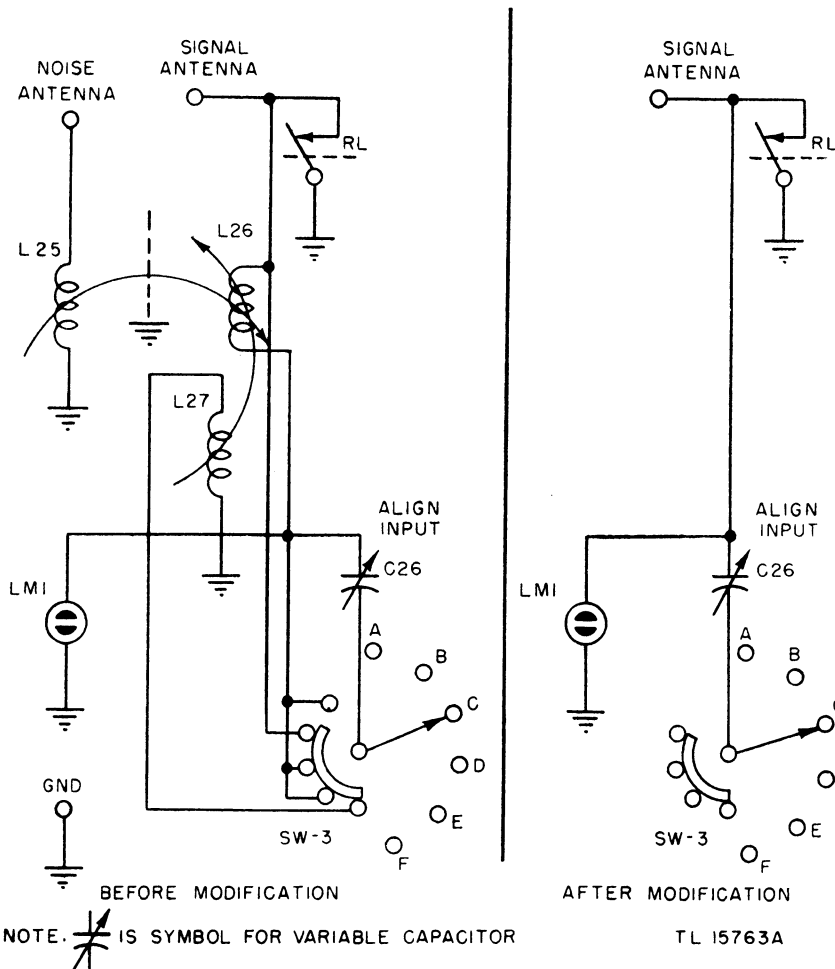


Figure 38. Elimination of noise-suppression circuit.

corner of the receiver chassis and the other screw is located to the left of the first i-f amplifier tube. Turn the chassis upside down and remove the screw-pin from the inner hinge (two hinges hold the assembly to the chassis). Swing the dynamotor or rectifier assembly away from the panel and disconnect the leads from the receiver terminal board. Remove the screw-pin from the outer hinge and lift the assembly from the chassis.

## 78. Emergency Repair

Trouble may exist in the radio receiver at a time when the receiver is most vitally needed. By becoming familiar with the troubleshooting charts in this manual, the operator may be able to sectionalize the fault to a specific circuit and immediately repair the fault. If, however, the necessary repair part is not immediately available and a spare receiver is not at hand, certain stages within the receiver may be bypassed temporarily during the emergency to retain the receiver in operation. *The following repairs should be attempted only in cases of emergency.*

a. **ANTENNA STAGE.** If an antenna coil in the receiver input circuit is defective and a replacement coil is not immediately available, the defective coil may be bypassed by connecting the antenna directly to the grid of the first r-f amplifier stage through a 100-mmf capacitor. Bypassing the antenna coil will reduce the receiver selectivity.

b. **R-F AMPLIFIER STAGES.** If trouble is found in the first r-f amplifier stage, bypass the first r-f amplifier stage. Remove the grid leads (top cap connections) from the first and second r-f amplifier tubes and connect the grid lead for the first r-f tube to the grid cap of the second r-f tube. The second r-f amplifier stage may be bypassed in a similar manner if a fault is isolated to this stage. To bypass the second r-f amplifier stage, remove the grid leads from the second r-f tube and from the mixer tube. Connect the grid lead for the second r-f tube to the grid cap of the mixer tube.

c. **I-F AMPLIFIER STAGES.** The first i-f amplifier stage may be bypassed in a manner similar to that used for the r-f amplifier tubes. If a fault is isolated to the first i-f amplifier stage and cannot be immediately repaired, remove the grid leads from the first and second i-f amplifier tubes and connect the grid lead for the first i-f tube to the grid cap of the second i-f tube. If the fault is isolated to the second i-f amplifier stage, remove the grid lead from the second i-f amplifier tube and connect it to pin 5 of the second detector tube (OFF-M.V.C.-A.V.C. switch in the A.V.C. position). Bypassing any of the r-f or i-f stages will effectively decrease the selectivity and sensitivity of the receiver.

d. **AUDIO AMPLIFIER STAGES.** If transformer T1 in the plate circuit of the first audio stage becomes defective and cannot be immediately replaced, it will be necessary to bypass the first audio stage. To bypass this stage, disconnect the grid lead from the top cap of the second detector tube and connect it to pin 5 of the second audio amplifier tube. Use a short length of insulated wire, bare both ends, and wrap one end around pin 5. Fasten the other end to the grid lead. If transformer T2 in the plate circuit of the second audio amplifier stage is defective, this stage may be eliminated by connecting the headset to the output of the first audio amplifier tube through pin H in socket SO1. In some earlier model receivers, the headset may be connected directly to the first audio stage through the PHONES 1ST AUDIO jack on the receiver front panel. Elimination in either audio stage will result in a decrease of the over-all receiver gain.

## 79. Rustproofing and Repainting

When the finish on the receiver case has been badly scarred or damaged, rust and corrosion can be prevented by touching up bared surfaces as follows:

a. Use #00 or #000 sandpaper to clean the surface down to the bare metal. Obtain a bright smooth finish.

**Caution:** The use of steel wool, although enabling removal of rust, is not recommended. Minute particles of steel wool frequently enter the case and cause harmful internal shorting or grounding of circuits.

b. When a touch-up job is necessary, apply paint with a small brush. When numerous scars and scratches warrant complete repainting, remove the receiver chassis and spray paint over the entire case. Remove rust from the case by cleaning corroded metal with Solvent, Dry-cleaning. In severe cases it may be necessary to use dry-cleaning solvent (SD) to soften the rust and sandpaper to complete the preparation for painting. Paint used will be authorized and consistent with existing regulations.

## 80. Error in Circuit Label of Radio Receivers BC-312-N and BC-342-N

a. In some production models of Radio Receivers BC-312-N and BC-342-N, the mounting board label located on the right-hand end of the receiver (shown as the left-hand mounting board in fig. 55) was in error. The label should be in accord with the circuit reference symbols as shown in figure 55.

b. The label in error will be found in the following receivers:

(1) Radio Receiver BC-312-N. Order No. 18993-Phila-44. serial Nos. 1 to 131, inclusive.

Order No. 16347-Phila-44, Serial Nos. 543 to 1,000, inclusive.

(2) Radio Receiver BC-342-N. Order No. 32767-Phila-44, Serial Nos. 1,238 to 1,445, inclusive.

Order No. 31915-Phila-43, Serial Nos. 1,476 to 2,127, inclusive.

Order No. 16133-Phila-43, Serial Nos. 1,781 to 2,086, inclusive.

c. When practical, the markings on this label should be corrected as these receivers pass through repair organizations.

## **81. Unsatisfactory Equipment Report**

a. When trouble in equipment used by Army Ground Forces or Technical Services occurs more often than repair personnel feel is normal, WD AGO Form 468 (War Department Unsatisfactory Equipment Report) should be filled out and forwarded through channels to the Office of the Chief Signal Officer, Washington 25, D. C.

b. When trouble in equipment used by Army Air Forces occurs more often than repair personnel feel is normal, Army Air Forces Form 54 should be filled out and forwarded to Commanding General, Air Matériel Command, Wright Field, Dayton, Ohio, in accordance with AAF Regulation No. 15-54. If form is not available, prepare the data according to sample form shown in figure 40.

**WAR DEPARTMENT  
UNSATISFACTORY EQUIPMENT REPORT**

<b>FOR</b>	TECHNICAL SERVICE Signal Corps	<b>MATERIEL</b>	<b>DATE</b> 1 Feb 45
<b>FROM</b>	ORGANIZATION 175 Signal Repair Co	<b>STATION</b>	APO 102
<b>TO</b>	NEAREST SUPERIOR : ADDRESS Supply Sec, Hq Fourth Army Sig Sv	<b>STATION</b> APO 110	TECHNICAL SERVICE Signal Corps

**COMPLETE MAJOR ITEM**

<b>NOMENCLATURE</b> Radio Transmitter BC-123-A	<b>TYPE</b> Ground, vehicular	<b>MODEL</b> A
<b>MANUFACTURER</b> American Radio Corp	<b>U. S. A. REG. NO. Order No.</b> 1234-Phila-45	<b>SERIAL NO.</b> 12345
<b>EQUIPMENT WITH WHICH USED (if applicable)</b> Radio Set SCR-456-A in Tank, Medium, M4		<b>DATE RECEIVED</b> 5 Jan 45

**DEFECTIVE COMPONENT—DESCRIPTION AND CAUSE OF TROUBLE**

<b>PART NO.</b> Sig C	<b>TYPE</b> Capacitor C20; fixed;	<b>MANUFACTURER</b> American Radio Corp	<b>DATE INSTALLED</b> When manufactured
<b>Stk No.</b> 3847-2	1-mf; 500 vdcw		

**DESCRIPTION OF FAILURE AND PROBABLE CAUSE (if additional space is required, see back of form)**  
Capacitor C20 shorts out due to humid operating conditions

<b>DATE OF INITIAL TROUBLE</b> 15 Jan 45	<b>TOTAL TIME INSTALLED</b>			<b>TOTAL PERIOD OF OPERATION BEFORE FAILURE</b>				
	<b>YEARS</b> -	<b>MONTHS</b> -	<b>DAYS</b> -	<b>YEARS</b> 0	<b>MONTHS</b> 0	<b>DAYS</b> 5	<b>HOURS</b> -	<b>MINUTES</b> -

**BRIEF DESCRIPTION OF USUAL SERVICE CONDITIONS AND ANY REMEDIAL ACTION TAKEN**  
Operation in tropics; heavy rainfall. Was replaced and set given moistureproofing and fungiproofing treatment, 20 Jan 45.

**TRAINING OR SKILL OF USUAL PERSONNEL**      **RECOMMENDATIONS (if additional space is required, see back of form)**

<b>POOR</b>	<b>FAIR</b>	<b>GOOD</b>	Substitute capacitor designed for tropical operation
		X	

**ORIGINATING OFFICER**

<b>TYPED NAME, GRADE, AND ORGANIZATION</b> E. A. Wilson, 1st Lt, Sig C 175 Signal Repair Co	<b>SIGNATURE</b> <i>E. A. Wilson</i>
---	---

**FIRST ENDORSEMENT**

<b>TO CHIEF</b>	<b>TECHNICAL SERVICE</b>	<b>OFFICE</b>
<b>NAME, GRADE, AND STATION</b>	<b>STATION</b>	<b>DATE</b>

*Instruction*

- 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.
- This form will be used for reporting manufacturing, design, or operational defects in material, petroleum fuels, lubricants, and preserving materials with a view to improving and correcting such defects, and for use in recommending modifications of material.
- This form will not be used for reporting failures, isolated material defects or malfunctions of material resulting from slip-swear-and-tear or accidental damage not for the replacement, repair or the issue of parts and equipment. It does not replace currently authorized operational or performance records.
- Reports of malfunctions and accidents involving ammunition will continue to be submitted as directed in the manner described in AR 700-10 (change No. 3).
- 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.
- When cases arise where it is necessary to communicate with a chief of service in order to ensure safety to personnel, more expeditious means of communication are indicated. This form should be used to confirm reports made by more expeditious means.
- This form will be made out in triplicate by using or service organization. Two copies will be forwarded direct to the technical service; one copy will be forwarded through command channels.
- Necessity for using this form will be determined by the using or service troops.

W. D., A. G. O. Form No 468  
20 August 1944

This form supersedes W. D., A. G. O. Form No 468, 1 December 1943, which may be used until existing stocks are exhausted.

U. S. GOVERNMENT PRINTING OFFICE 16-41560-1

TL19589C

Figure 39. WD AGO Form 468.



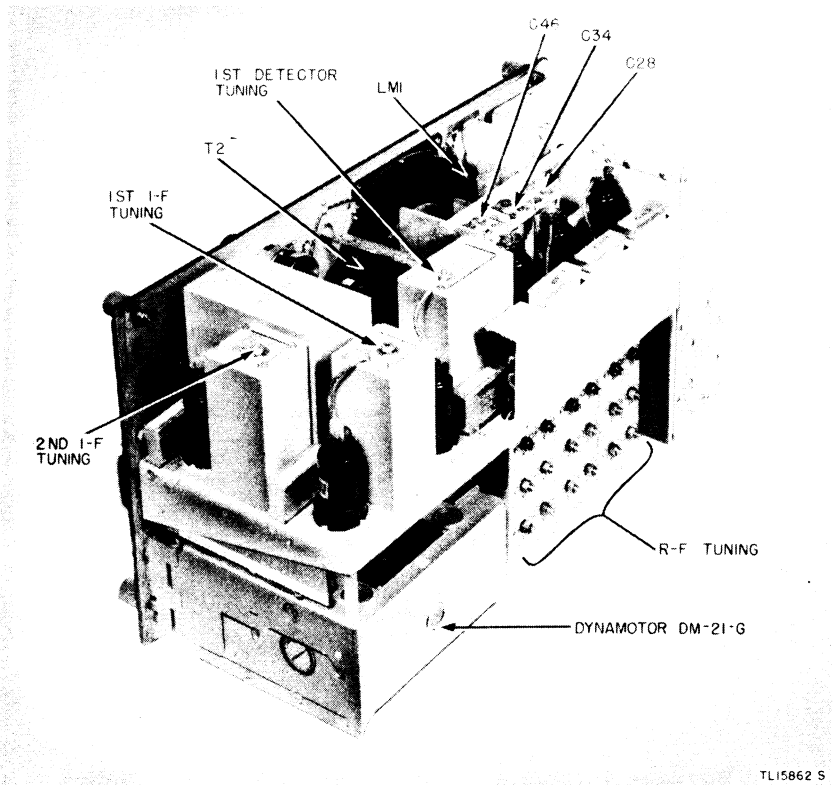
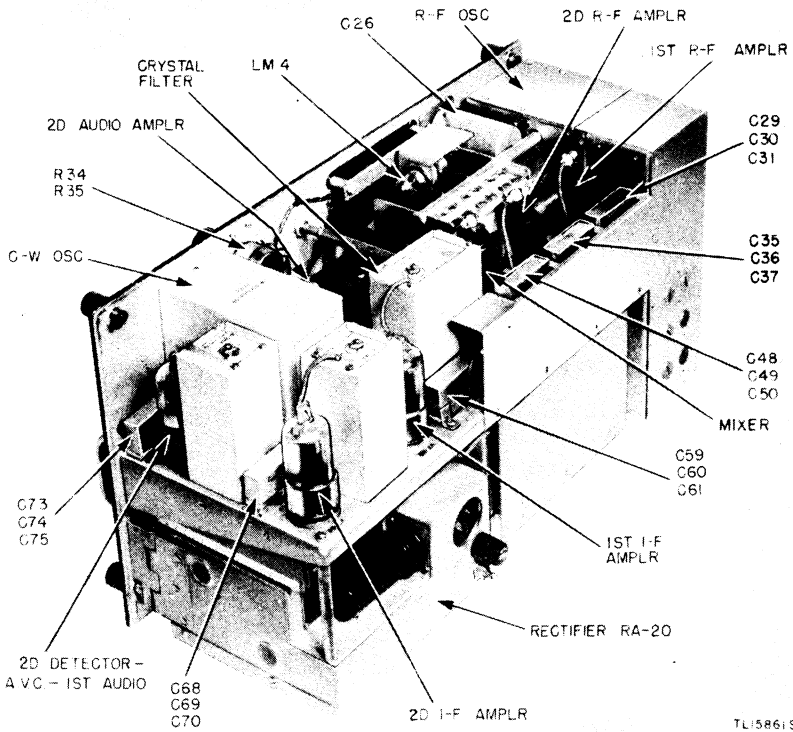
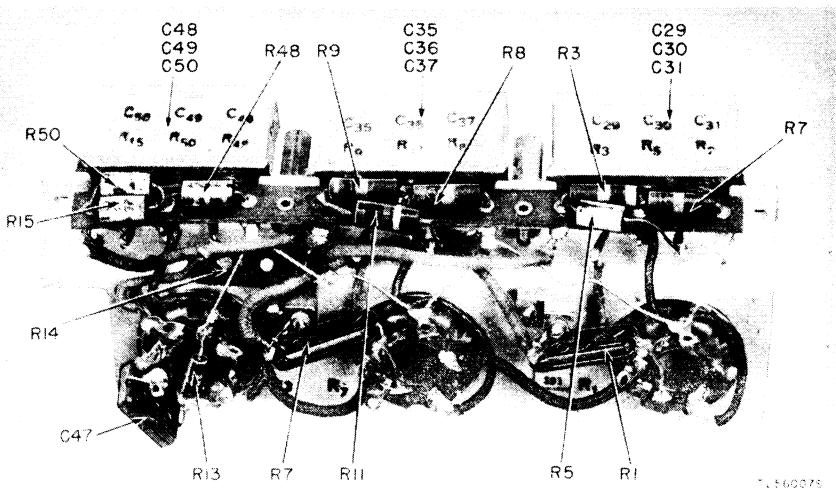


Figure 41. Radio Receiver BC-312-(\*), top view of chassis.





*Figure 42. Radio Receiver BC-342-(\*), top view of chassis.*



*Figure 43. Receiver tube shelf, h-f model.*

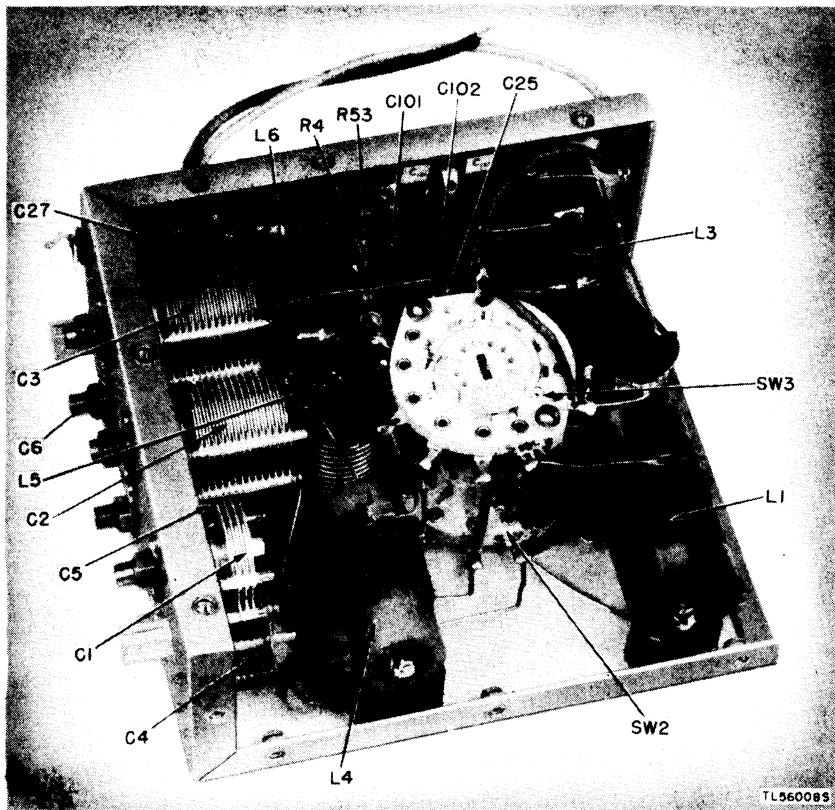


Figure 44. First r-f tuning unit, h-f model.

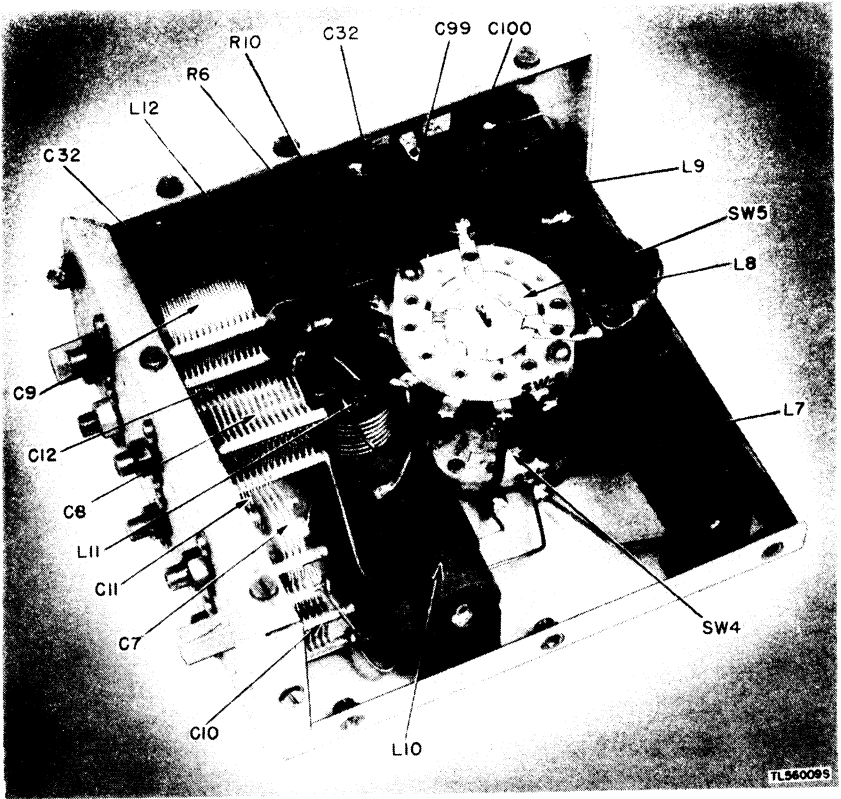
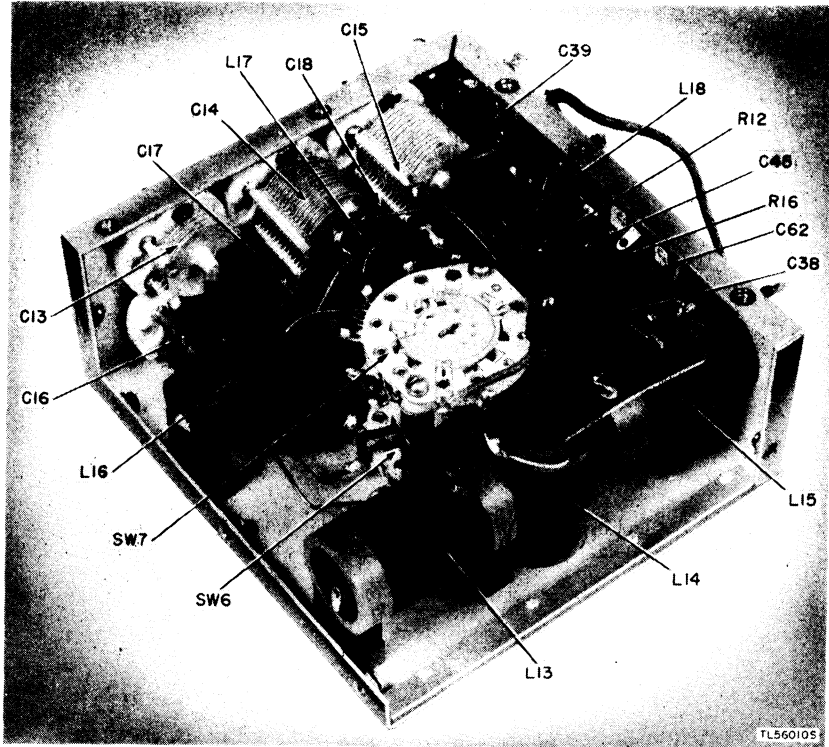
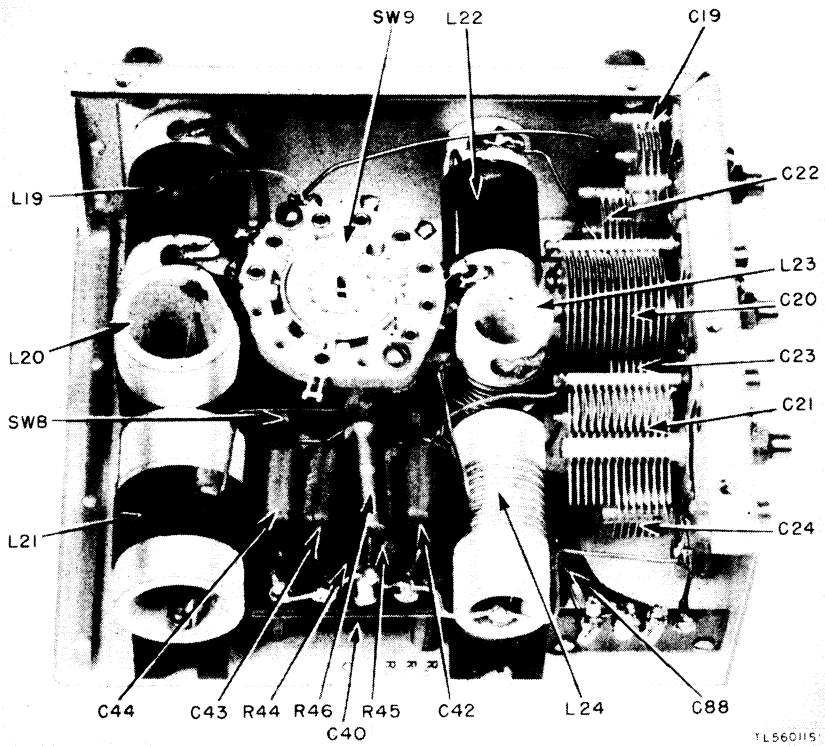


Figure 45. Second r-f tuning unit, h-f model.



*Figure 46. First detector tuning unit, h-f model.*



*Figure 47. R-f oscillator tuning unit, h-f model.*

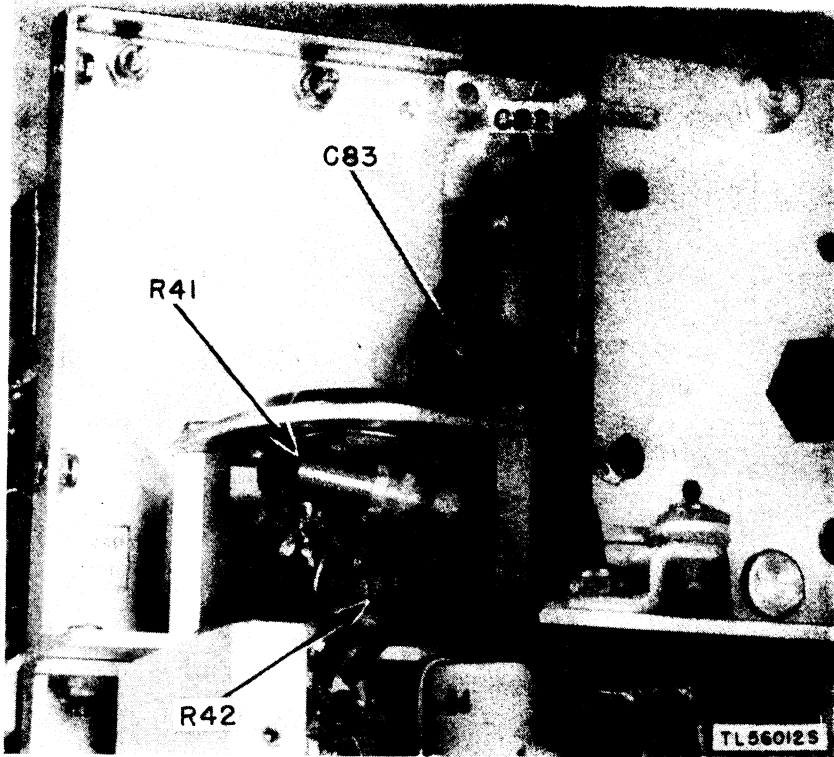


Figure 48. R-f oscillator compartment, h-f model.

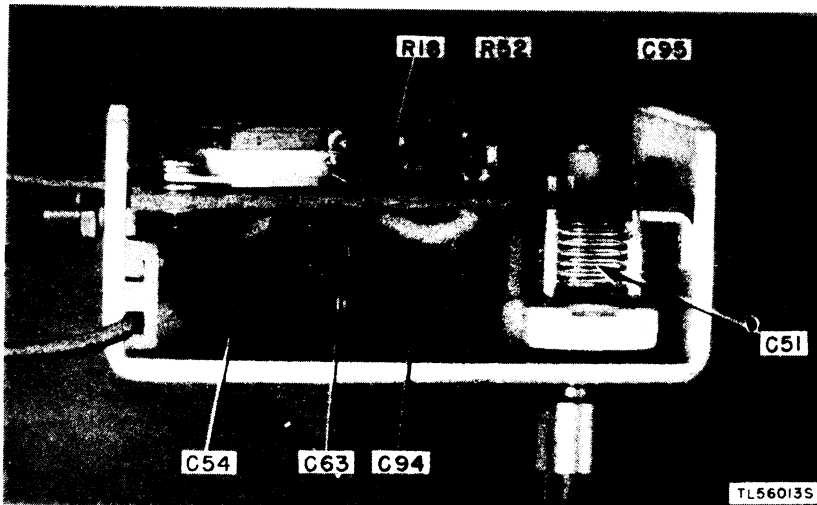
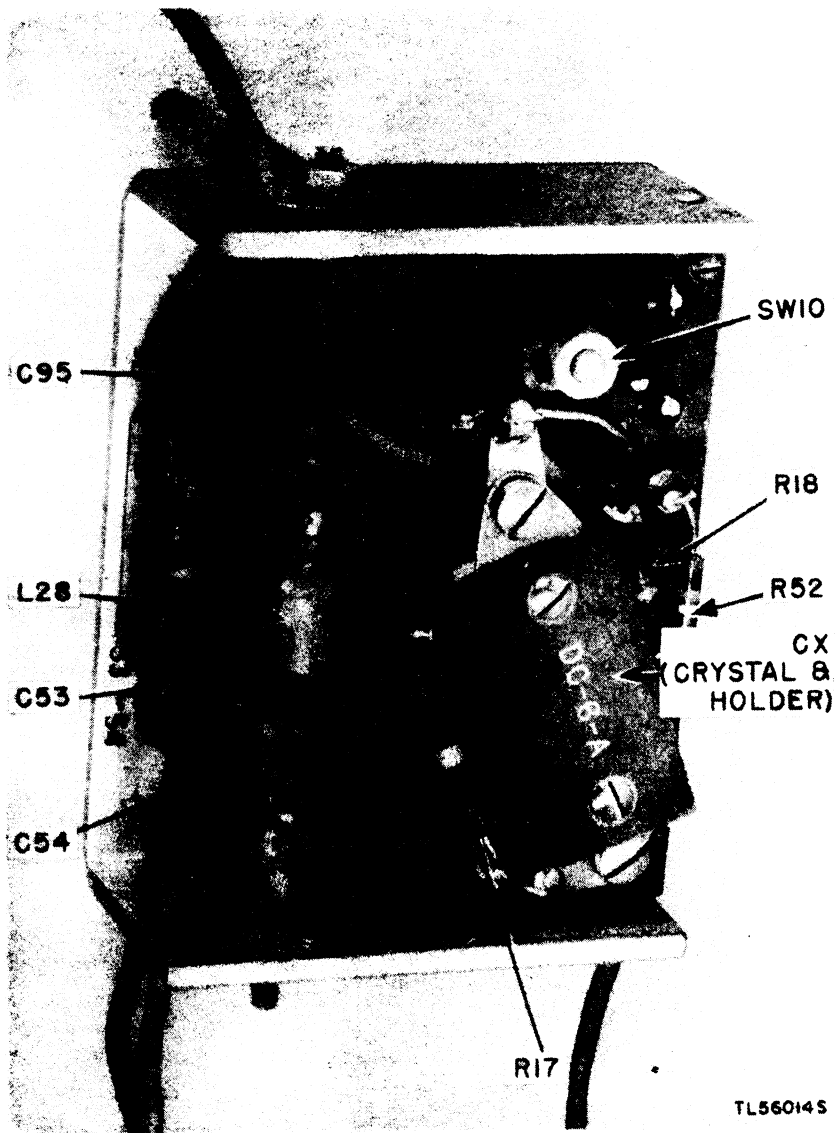


Figure 49. First detector coil unit containing crystal filter (h-f model), side view.



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*Figure 50. First detector coil unit containing crystal filter (h-f model), front view.*

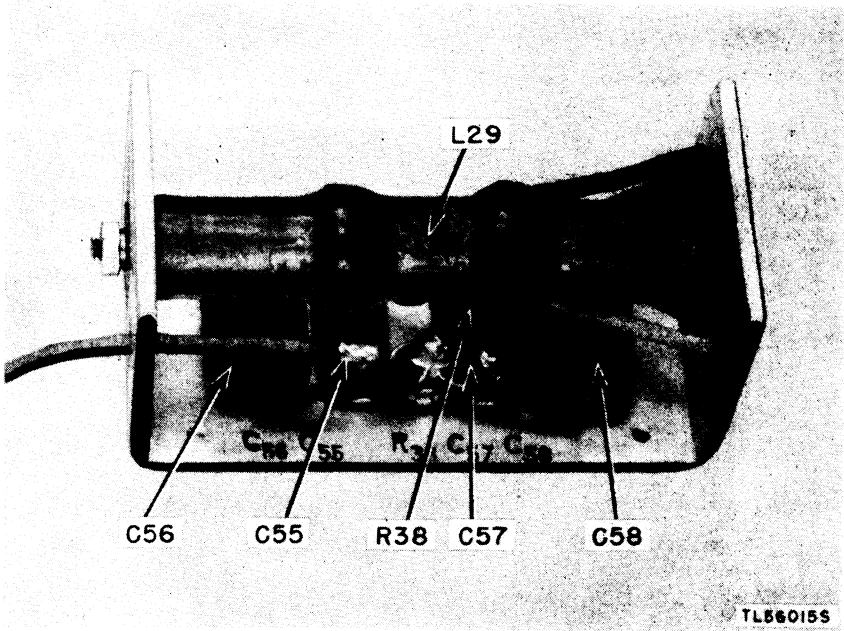


Figure 51. First i-f coil unit, h-f model.

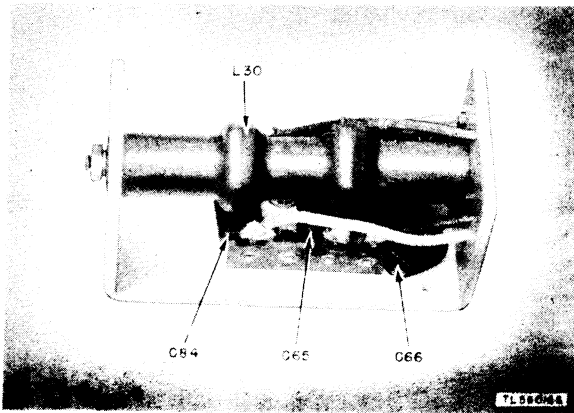
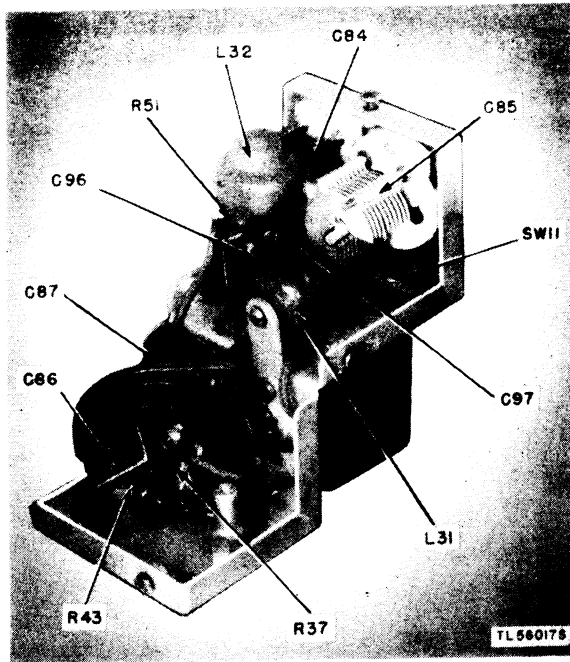


Figure 52. Second i-f coil unit, h-f model.





*Figure 53. C-w oscillator unit, h-f model.*

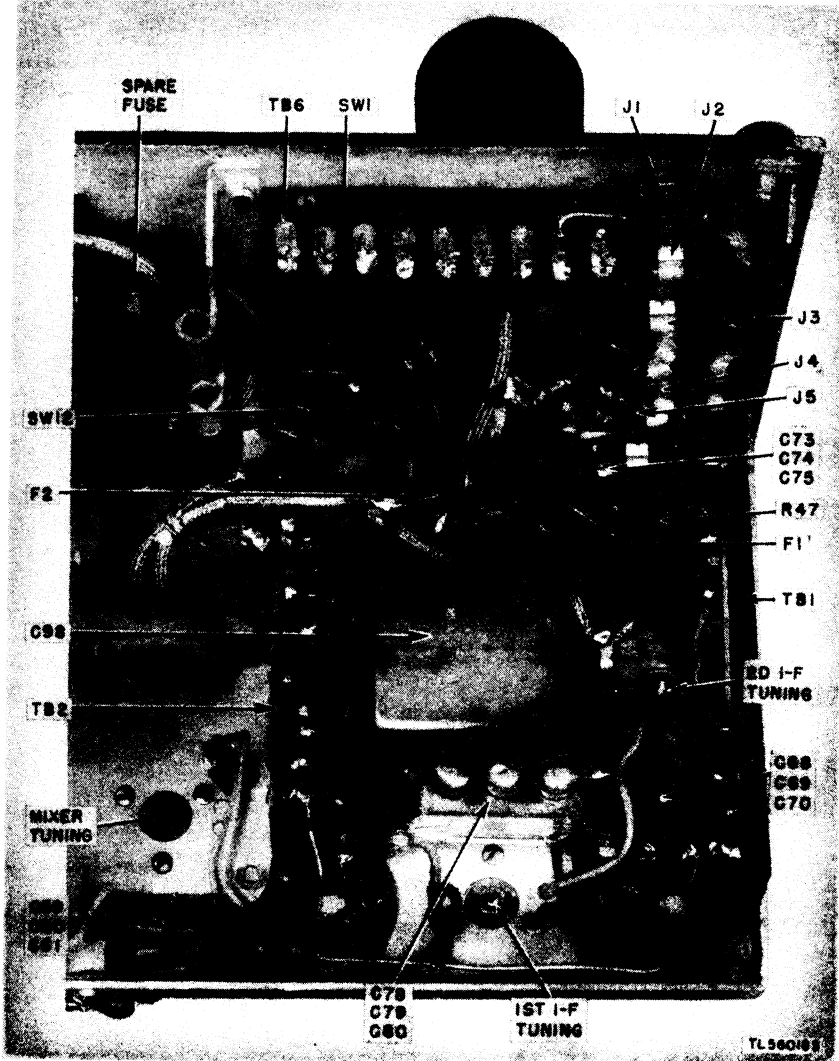
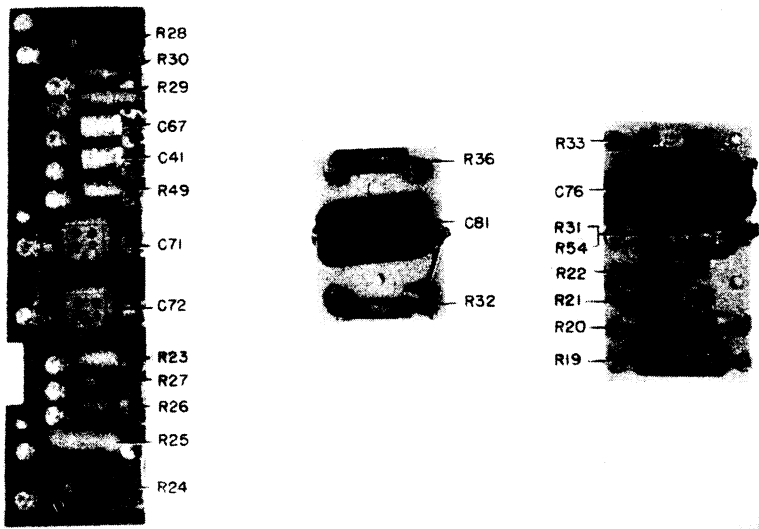


Figure 54. Chassis base parts location, h-f model.



*Figure 55. Terminal boards parts location, h-f model.*

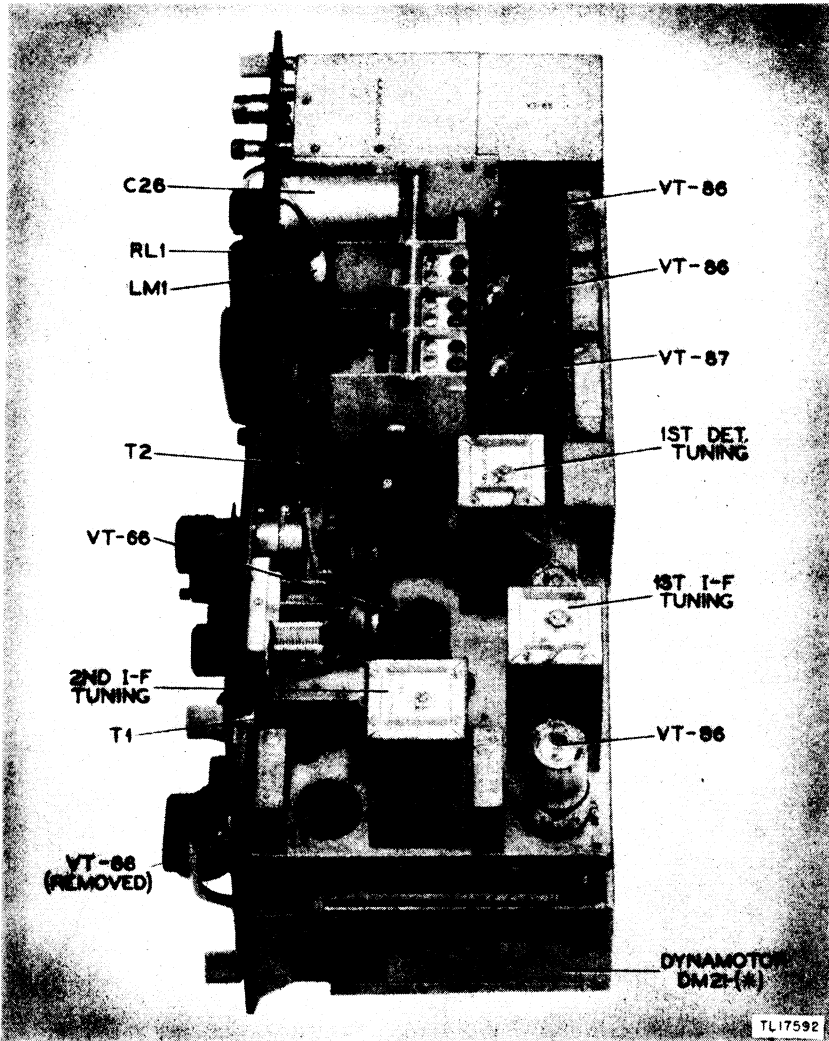
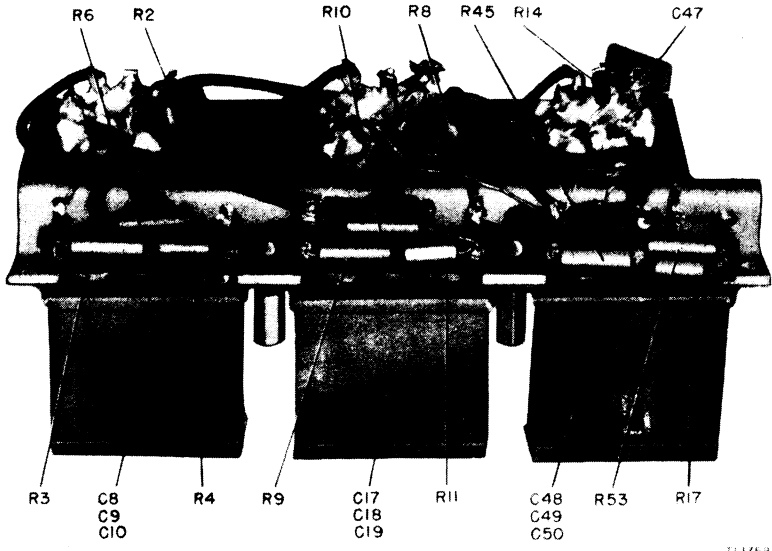
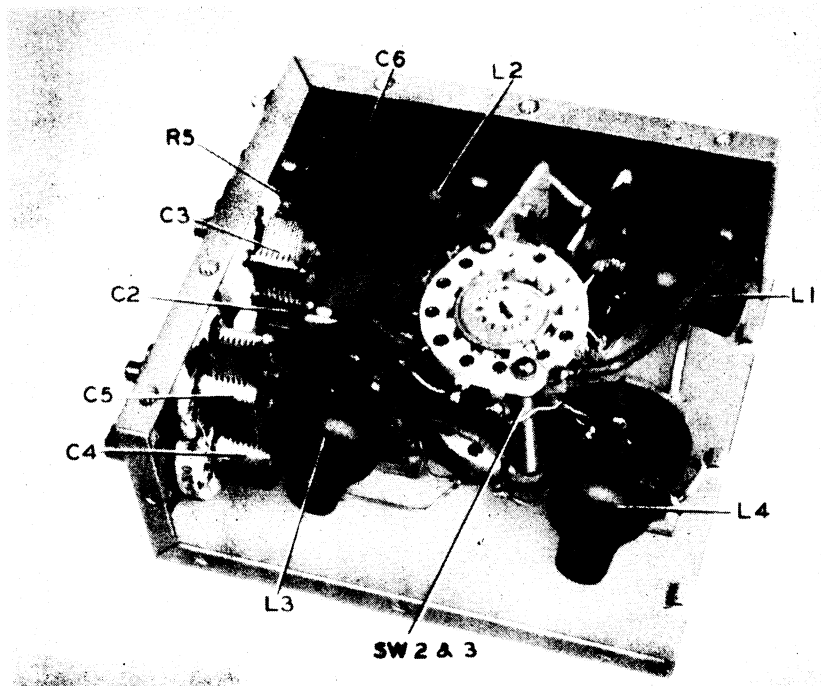


Figure 56. Radio Receiver BC-314-(\*), top view of chassis.



TL:7593

Figure 57. Receiver tube shelf, m-f model.



TL:7594

Figure 58. First r-f tuning unit, m-f model.

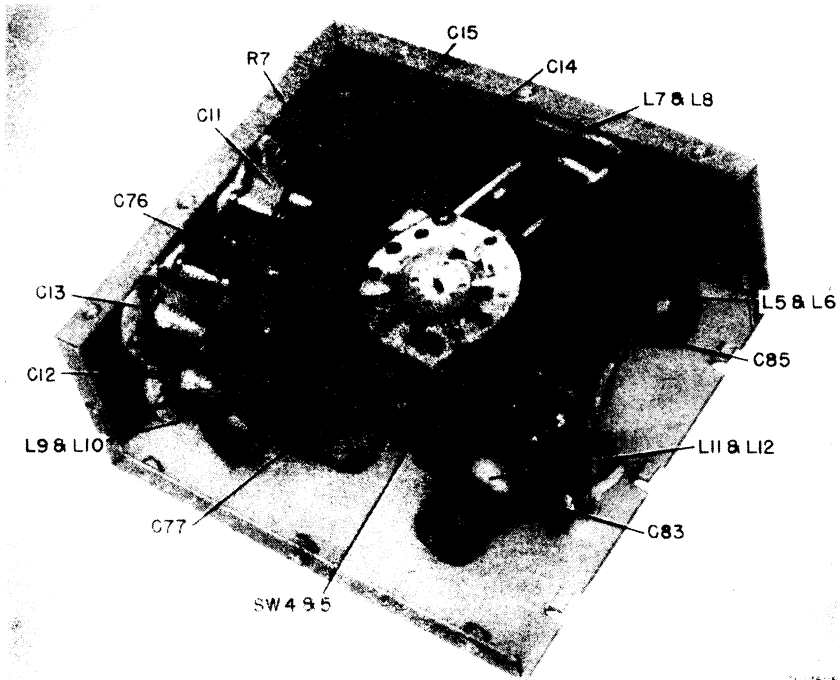


Figure 59. Second r-f tuning unit, m-f model.

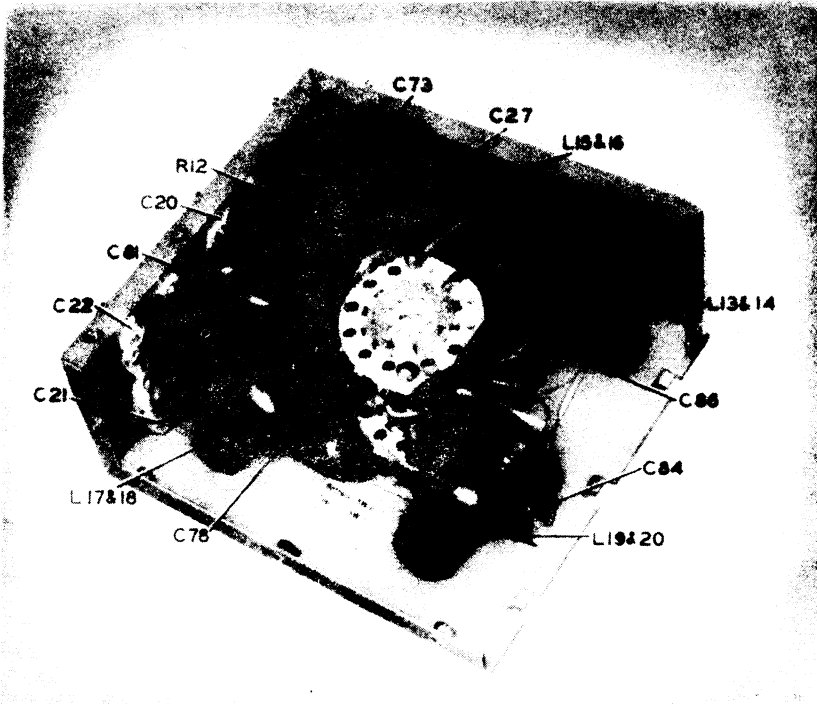


Figure 60. First detector tuning unit, m-f model.

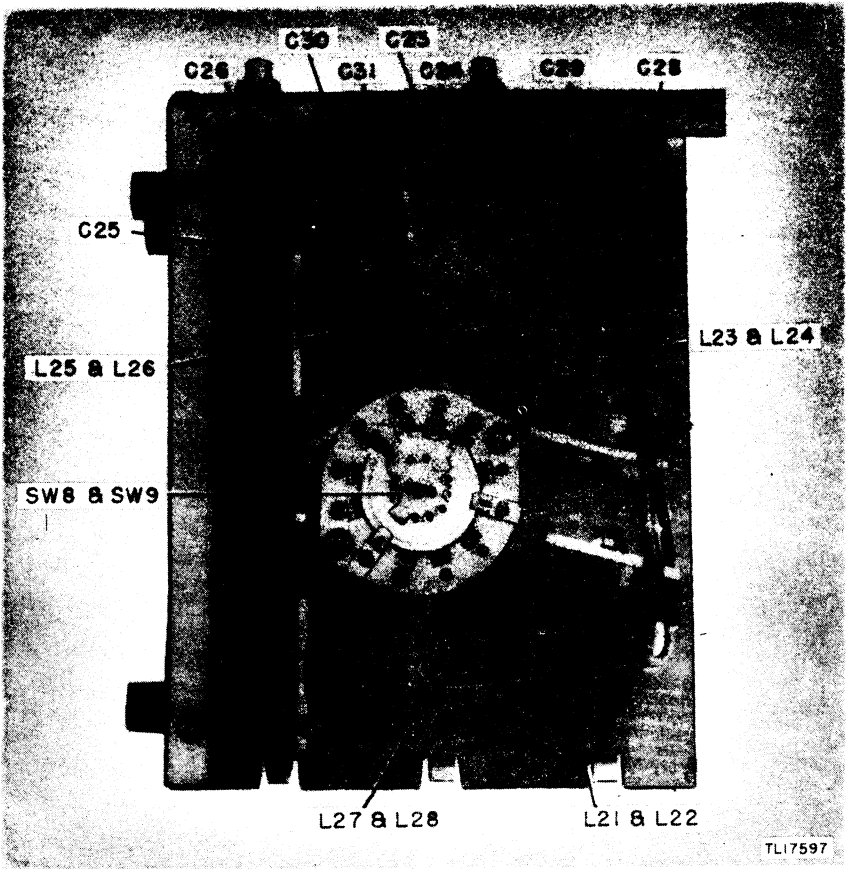


Figure 61. R-f oscillator tuning unit, m-f model.

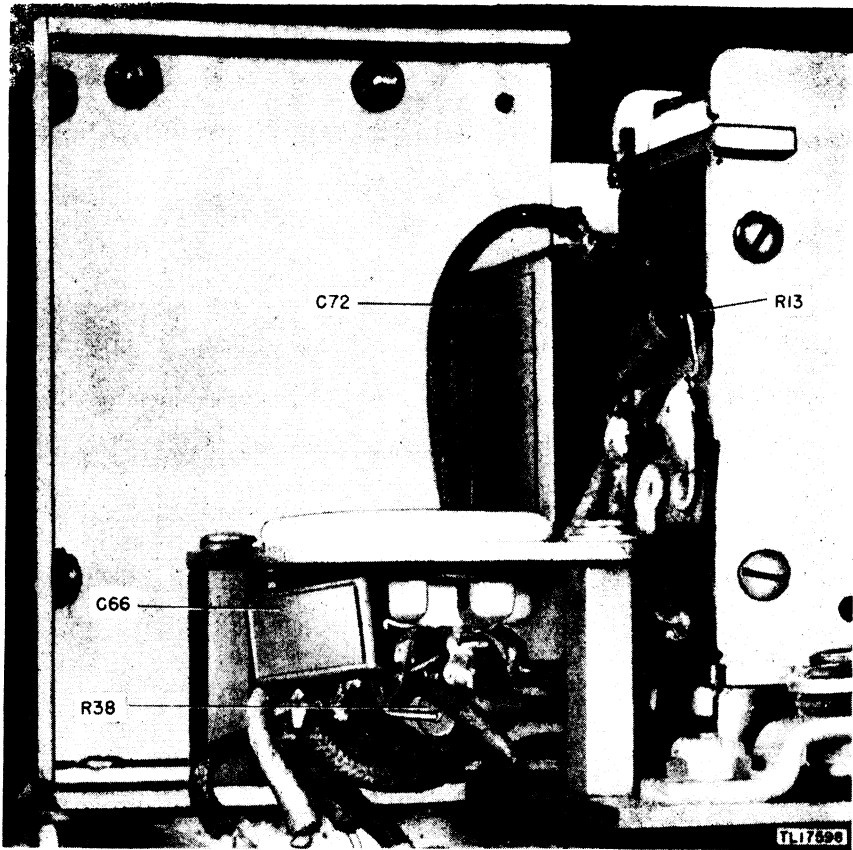


Figure 62. R-f oscillator compartment, m-f model.

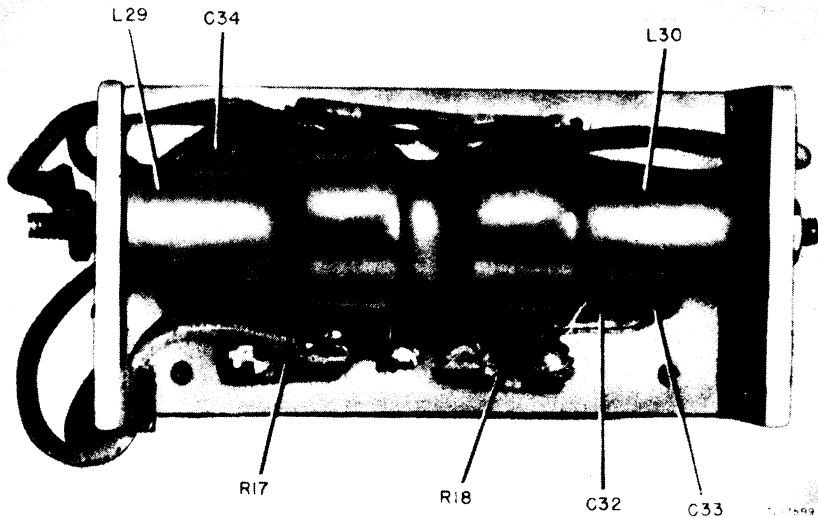


Figure 63. First detector coil unit, m-f model.



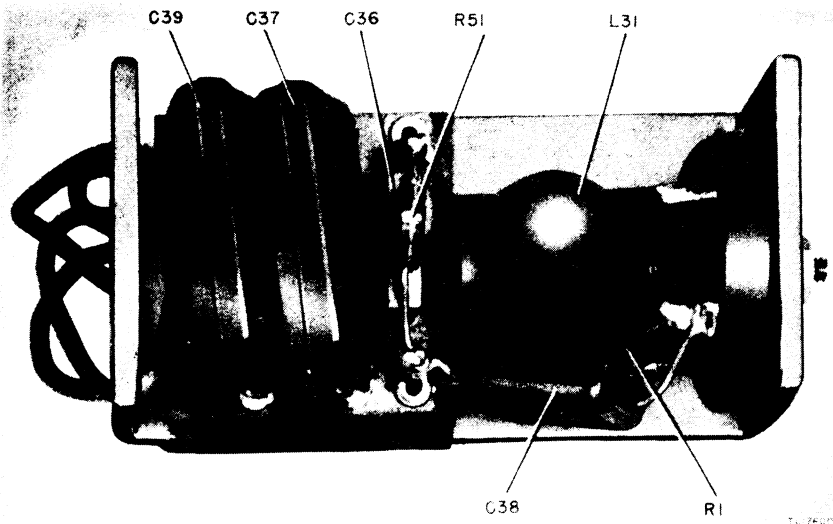


Figure 64. First i-f coil unit, m-f model.

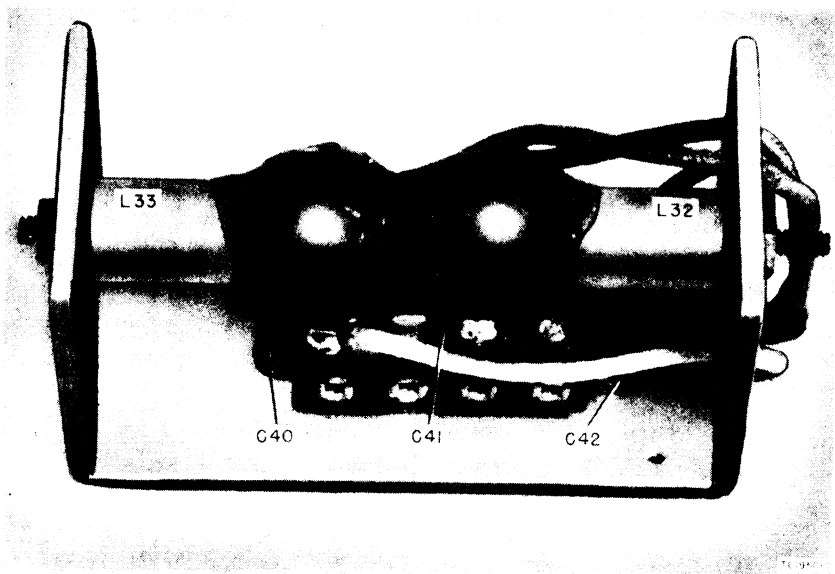


Figure 65. Second i-f coil unit, m-f model.

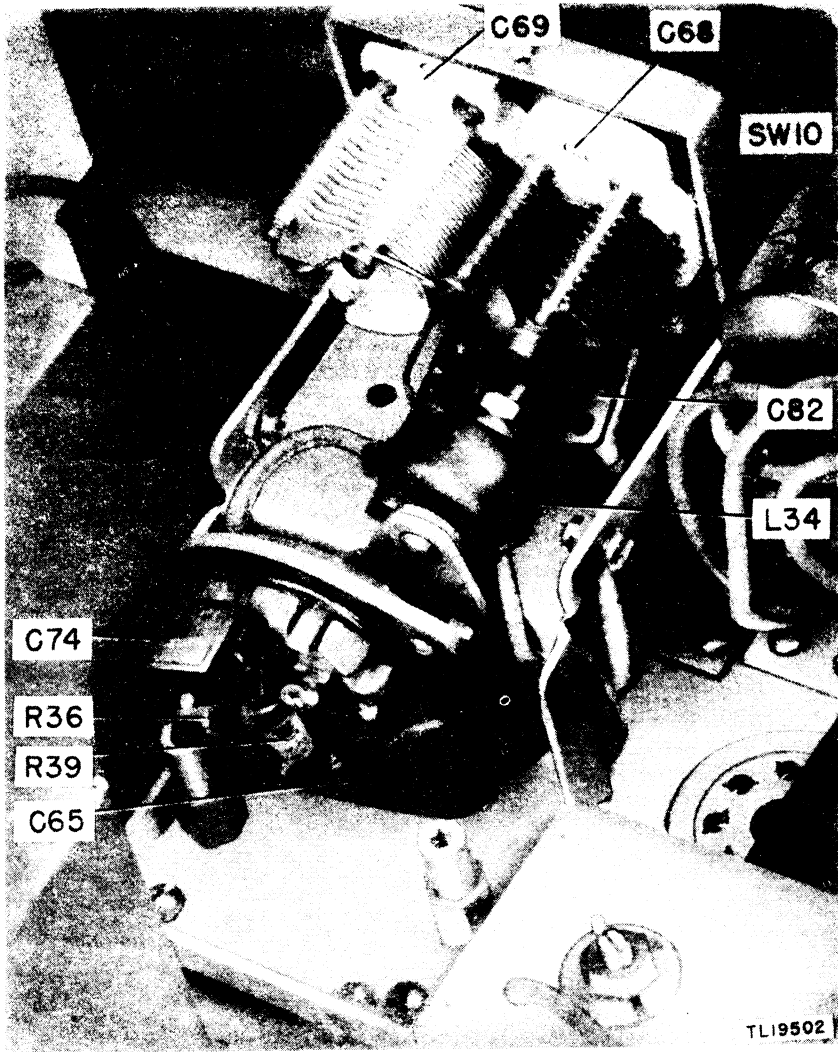


Figure 66. C-w oscillator unit, m-f model.

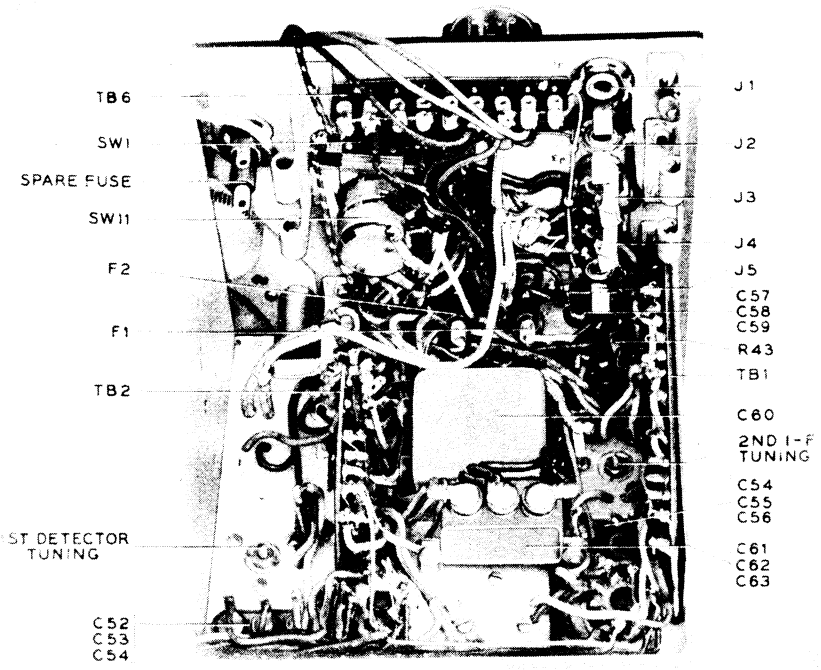


Figure 67. Chassis base parts location, m-f model.

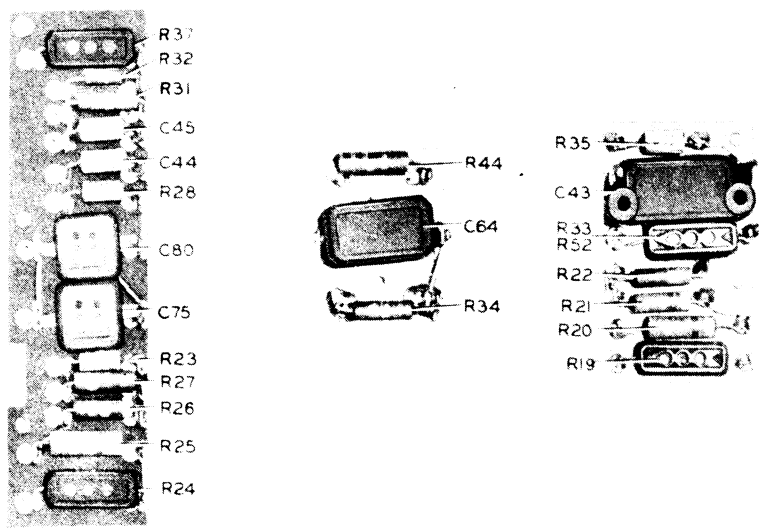
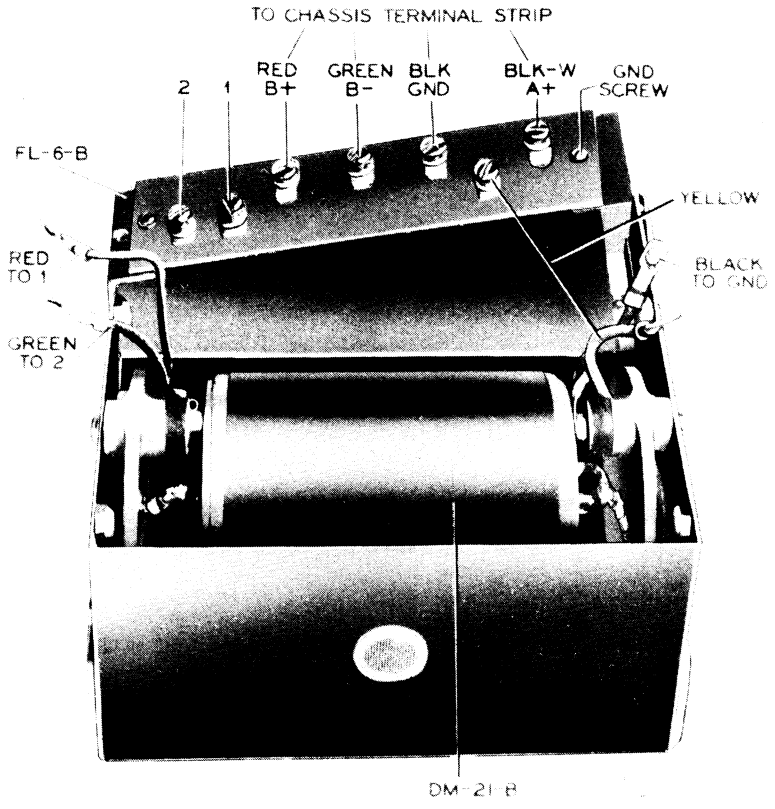
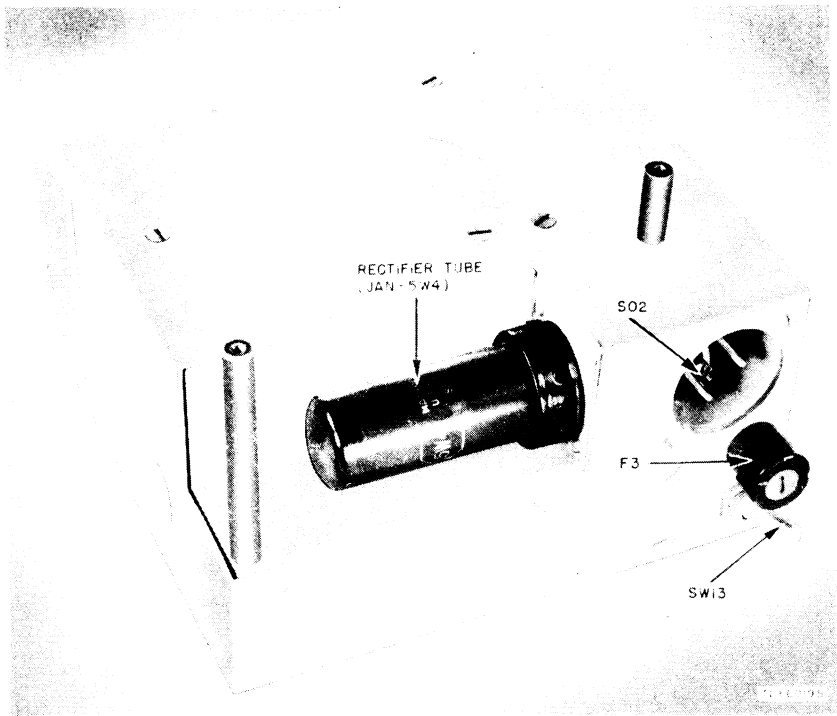


Figure 68. Terminal boards parts location, m-f model.



16324

Figure 69. Dynamotor DM-21-B and Filter FL-6-( ).



**Figure 70.** Rectifier RA-20, top view.

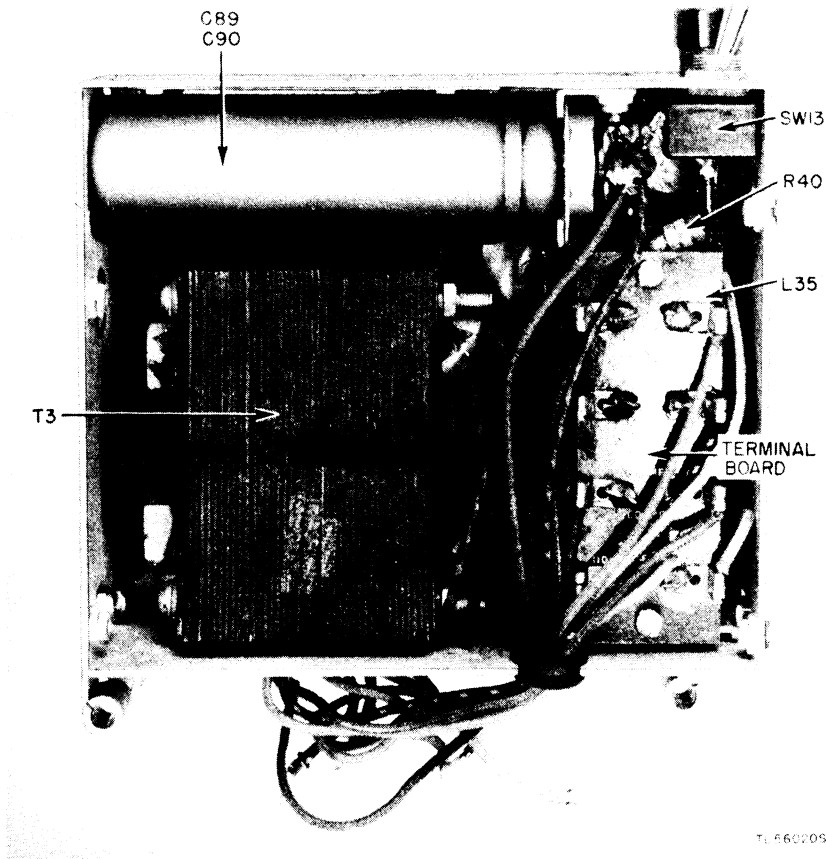


Figure 71. Rectifier RA-20, bottom view.

### Section XIII. ALIGNMENT AND ADJUSTMENT

#### 82. Test Equipment Required

The following test equipment will be required for the proper alignment and adjustment of Radio Receivers BC-312-(\*), BC-342-(\*), BC-314-(\*), and BC-344-(\*).

- a. Signal Generator I-72-( ) or equivalent.
- b. Frequency Meter SCR-211-( ).
- c. Output meter (Test Set I-56-( ) or equivalent).
- d. Headset or loudspeaker.
- e. Dummy antennas (50- $\mu\mu\text{f}$  capacitor for r-f alignment above 1,500 kc; 250- $\mu\mu\text{f}$  capacitor for r-f alignment below 1,500 kc; 300-ohm resistor for i-f alignment).
- f. Alignment tools (fiber screw driver).
- g. Plug PL-55 (or equivalent) for output meter.

### 83. Calibration of Test Equipment

To insure accuracy of alignment, use the frequency meter as a standard when setting the signal generator to the desired frequency. Check each setting of the signal generator against the frequency meter as follows: Place the signal generator and the frequency meter near each other. Turn both equipments on and allow them to warm up for at least 15 minutes. Attach a piece of wire to the signal generator output connection and place the wire near the frequency meter antenna. Calibrate the frequency meter according to instructions furnished with the meter. Set the frequency meter to the exact frequency at which the signal generator is to be used. While listening to the headset plugged into the frequency meter, tune the frequency meter to the approximate frequency until a zero beat is heard. The signal generator is now set for the exact frequency desired. Turn off the frequency meter and remove the wire attached to the signal generator output connection.

### 84. I-F Alignment Procedure

*a. PREPARATION.* Set up the receiver and alignment equipment as shown in figure 72. Calibrate the signal generator for a 470-kc signal (h-f receiver models) or for a 92.5-kc signal (m-f receiver models). Remove the two screws from the top of the chassis that hold the dynamotor or rectifier in place. Remove the screw from the dynamotor or rectifier inner mounting hinge and swing the power supply assembly upward, securing it in position with a rack or a block of wood. Set the OFF-M.V.C.-A.V.C. switch to M.V.C., the CRYSTAL PHASING control to OUT (h-f models), the SELECT CONTROL at maximum (m-f models), the C.W.-OSC. switch to OFF, and the VOL control to maximum. Loosen the i-f transformer screw locknuts.

*b. PROCEDURE.* (1) Attach the signal generator ground lead to the receiver chassis and connect the dummy antenna (300-ohm resistor) between the grid cap of the second i-f amplifier tube and the output lead from the signal generator.

(2) Connect the output meter to the PHONES 2D AUDIO jack and adjust the signal generator output (modulated) to give a small deflection on the output meter, using the smallest scale possible.

(3) Adjust the second i-f transformer adjustment screws located on the top and bottom of the transformer (figs. 73 and 74) for a maximum output indication. Reduce the signal generator output whenever necessary during alignment to avoid overloading the receiver.

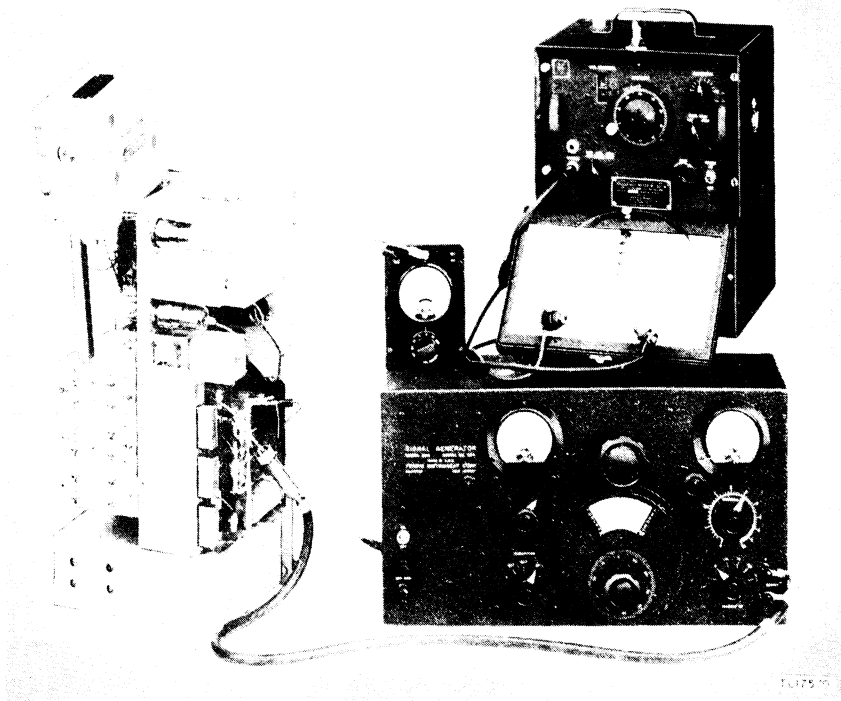


Figure 72. Typical test set up for receiver i-f alignment.

(4) Move the dummy antenna and signal generator connection to the grid cap of the first i-f amplifier tube. Adjust the first i-f transformer adjustment screws for maximum output indication.

(5) Move the dummy antenna and signal generator connection to the grid cap of the mixer tube. Adjust the mixer transformer adjustment screws for maximum output indication.

(6) Leaving the signal generator connected to the grid of the mixer tube, readjust the second i-f, first i-f, and mixer transformer adjustment screws in the order named for a maximum output indication.

(7) Carefully tighten the adjustment screw locknuts, avoiding any change in the settings of the screws. A change in the deflection of the output meter while a locknut is being tightened indicates that the adjustment screw has been moved and must be readjusted.

## 85. Alternate I-F Alignment Method

The intermediate frequency of Radio Receivers BC-314-(\*) and BC-344-(\*) is 92.5 kc. Since Signal Generator I-72-( ) will only go down to 100 kc, the alignment method given in paragraph



84 cannot be used unless a signal generator having a frequency of 92.5 kc is available. If such a signal generator is not available, the following alignment procedure can be used with a Signal Generator I-72-( ).

**a. PREPARATION.** Set up the receiver and alignment equipment as shown in figure 72. Remove the two screws from the top of the chassis that hold the dynamotor or rectifier in place. Remove the screw from the dynamotor or rectifier inner mounting hinge and swing the power supply assembly upward, securing it in position with a rack or a block of wood. Set the OFF-M.V.C.-A.V.C. switch to M.V.C., the SELECT CONTROL to maximum, the C.W.-OSC. switch to OFF, and the VOL control to maximum. Loosen the i-f transformer screw locknuts.

**b. PROCEDURE.** (1) Turn on the signal generator and the frequency meter and allow at least 15 minutes for them to warm up to insure frequency stability.

(2) Set the receiver tuning dial to any frequency on any band. For example: 200 kc.

(3) Plug the headset into the frequency meter and insert the end of a lead from the antenna post on the frequency meter into the receiver oscillator compartment (open hinged cover). Lay

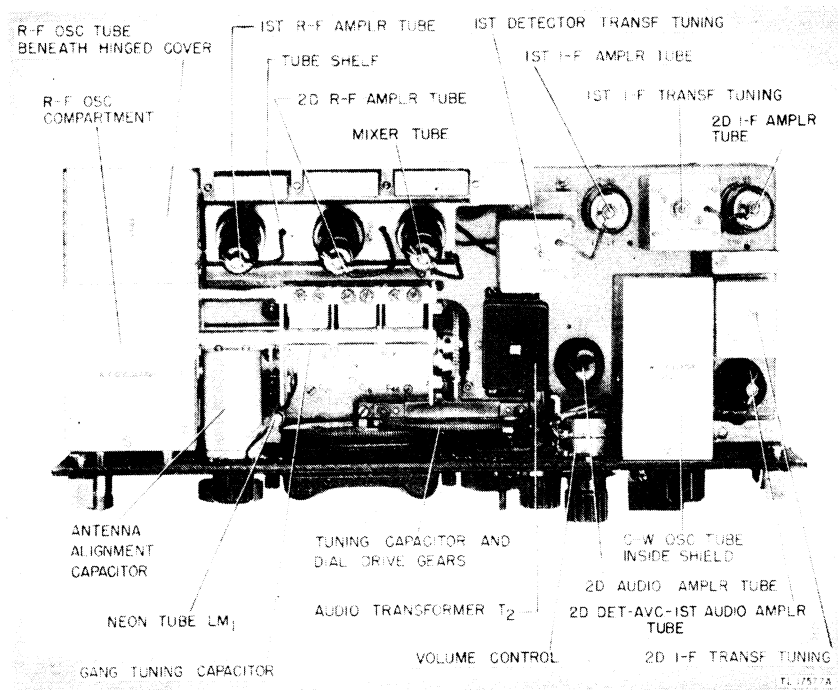


Figure 73. Receiver chassis, top view, showing alignment points.

the insulated wire close to the stator plates of the oscillator tuning capacitor.

(4) Tune the frequency meter to 92.5 kc above the frequency at which the receiver dial is set (200 + 92.5 or 292.5 kc if receiver is set at 200 kc). Then slowly tune the frequency meter dial back and forth, about 15 kc, until zero beat is heard in the headset.

(5) When zero beat is heard, check the frequency at which the frequency meter is set. If the frequency is not 92.5 kc above the frequency at which the receiver dial is set, adjust the receiver oscillator trimmer in small steps until a zero beat is heard in the frequency meter headset at *exactly* 92.5 kc above the receiver dial setting.

(6) When the r-f oscillator trimmer is finally adjusted to the desired frequency, tighten the locknut on this adjustment so that it cannot change. Disconnect the frequency meter but do not change the receiver dial setting.

(7) Calibrate the signal generator for the frequency at which the receiver dial is set (par. 83) and connect the output of the generator to the receiver antenna binding post through a 250- $\mu$ mf capacitor dummy antenna. Connect the output meter to the PHONES 2D AUDIO jack.

(8) With the signal generator frequency set in accordance with instructions in (7) above, and with the generator output 30-percent modulated at 400 cycles, adjust each i-f adjustment screw to obtain a maximum output indication on the output meter. Adjust the second i-f transformer first, then the first i-f transformer, and finally the mixer transformer. Repeat adjustments if necessary to obtain a maximum output indication.

(9) With the r-f oscillator and i-f stages adjusted properly, the r-f amplifier stages should be aligned as described in paragraph 88 below.

## 86. C-W Oscillator Alignment Procedure

a. PREPARATION. Set up the equipment as for the i-f alignment (fig. 72). Calibrate the signal generator for a 470-kc signal (h-f model) or for a 92.5-kc signal (m-f model). If a signal generator capable of producing a 92.5-kc signal is not available, proceed as outlined in paragraph 85 above to obtain the required intermediate frequency. Set the OFF-M.V.C.-A.V.C. switch to M.V.C. or A.V.C., and the C.W.-OSC. switch to ON. Turn the C.W.-OSC. ADJUST control so that the arrow is horizontal, pointing toward the right. Remove the capscrew above the C.W.-OSC. switch, permitting access to the c-w oscillator adjustment screw. Plug a headset or loudspeaker into the receiver output jack.

b. PROCEDURE. (1) Attach the signal generator ground lead to

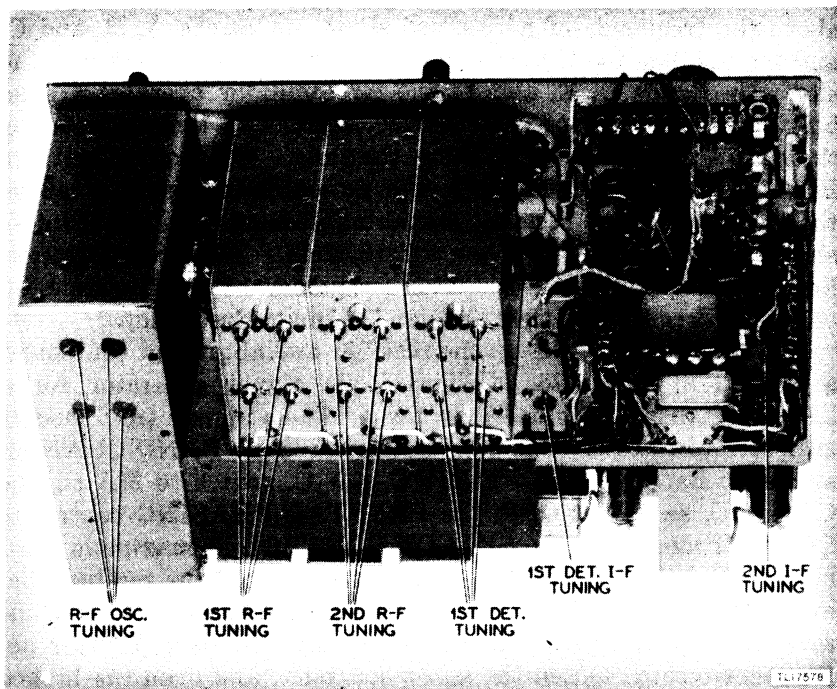


Figure 74. Receiver chassis, bottom view, showing alignment points.

the receiver chassis and connect the signal generator output lead to the grid cap of the mixer tube through a 300-ohm resistor.

(2) Adjust the c-w oscillator adjustment screw for zero beat in the headset or loudspeaker.

(3) Slowly turn the C.W.-OSC. ADJUST control 90° either clockwise or counterclockwise while listening in the headset. A beat note should be heard which gradually increases in pitch. Rotating the control another 90° in the same direction should gradually decrease the pitch to zero signal when the arrow is again horizontal, but pointing to the left.

## 87. R-F Oscillator Alignment Procedure

Each r-f adjustment screw controls a small variable capacitor within the oscillator compartment. The rotor of each capacitor is adjustable over an arc of 360°. A red dot on one side of the screw driver slot on each adjustment screw indicates the relative position of the rotor and stator of the variable capacitor. The capacitance is at maximum (plates fully meshed) when the red dot is beneath the slot, and at a minimum (plates completely unmeshed) when the red dot is above the slot. For Radio Receivers BC-312-(\*) and BC-342-(\*), the r-f oscillator operates 470 kc

above the frequency of a received signal on Bands A, B, and C, and the red dots for these adjustment screws should be above the slot. On Bands D, E, and F, the r-f oscillator operates 470 kc below the frequency of the received signal and the red dots for these adjustments should be below the slots. For Radio Receivers BC-314-(\*) and BC-344-(\*), the r-f oscillator operates above the frequency of the received signal on all bands and the red dots should all be above the screw driver slots. The procedure outlined below sets the r-f oscillator frequency at the fundamental or proper frequency rather than at the image frequency.

a. **PREPARATION.** Set up the receiver and alignment equipment as shown in figure 75. Calibrate the signal generator for a 2,900-kc signal (h-f model) or for a 255-kc signal (m-f model) as described in paragraph 83. Set the receiver BAND CHANGE switch to Band A, the OFF-M.V.C.-A.V.C. switch to M.V.C., the C.W.-OSC. switch at OFF, the CRYSTAL PHASING control to OUT (h-f model) or the SELECT CONTROL at maximum (m-f model), and the VOL control at maximum. Set the receiver dial at 2,900 kc (h-f model) or at 255 kc (m-f model). Remove the screw caps which permit access to the r-f oscillator trimmer adjustment screws, loosen the screw locknuts, and open the hinged cover of the r-f oscillator cover.

b. **PROCEDURE.** (1) Attach the signal generator ground lead to

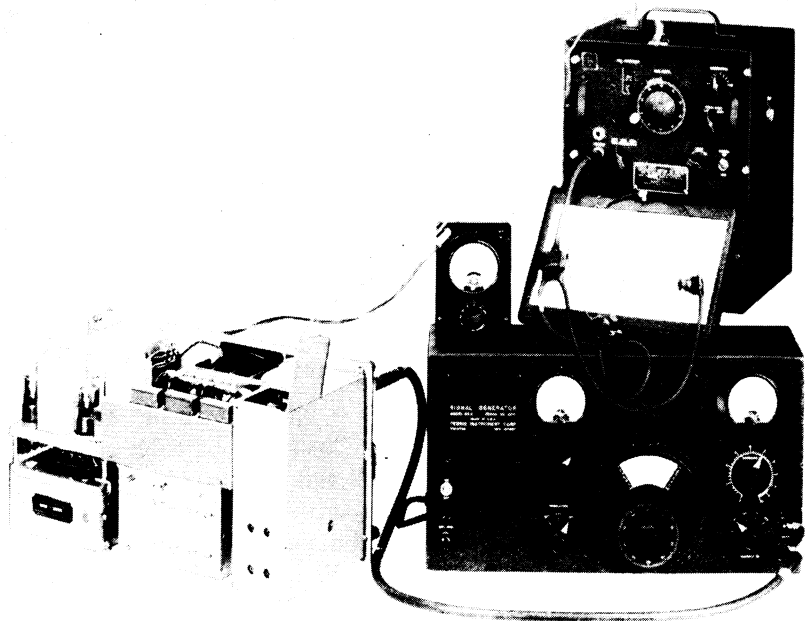


Figure 75. Typical test set-up for receiver r-f oscillator alignment.

the receiver chassis and connect the signal generator output lead to the grid cap of the mixer tube through the 50- $\mu\mu\text{f}$  capacitor (h-f model) or 250- $\mu\mu\text{f}$  capacitor (m-f model) dummy antenna.

(2) Connect the output meter to the PHONES 2D AUDIO jack and adjust the signal generator output (modulated) to produce a small deflection on the lowest possible scale of the output meter.

(3) Connect a short piece of insulated wire to the antenna connector of the frequency meter and insert the other end of the wire into the r-f oscillator compartment near the stator plates of the oscillator tuning capacitor. Calibrate the frequency meter for 3,370 kc (h-f model) or 347.5 kc (m-f model).

(4) Listen to the headset plugged into the frequency meter and adjust the oscillator trimmer for Band A to obtain a zero beat. Remove the wire from the r-f oscillator compartment and close the hinged cover.

(5) Slightly readjust the trimmer for Band A to obtain a maximum output indication, and tighten the locknut without disturbing the screw adjustment.

(6) Repeat the above procedure for each band using the frequencies listed in the following table.

*Radio Receivers BC-312-(\*) and BC-342-(\*)*

Band trimmer	Signal generator frequency (kc)	Dial reading (kc)	Frequency meter setting (kc)
A	2,900	2,900	3,370
B	4,900	4,900	5,370
C	7,850	7,850	8,320
D	11,000	11,000	10,530
E	13,750	13,750	13,230
F	17,700	17,700	17,230

*Radio Receivers BC-314-(\*) and BC-344-(\*)*

Band trimmer	Signal generator frequency (kc)	Dial reading (kc)	Frequency meter setting (kc)
A	255	255	347.5
B	400	400	492.5
C	800	800	892.5
D	1,450	1,450	1,542.5

## 88. R-F Alignment Procedure

a. The r-f amplifier and mixer adjustment screws, like those of the r-f oscillator, control similar small variable capacitors within the first and second r-f amplifier and the mixer compartments.

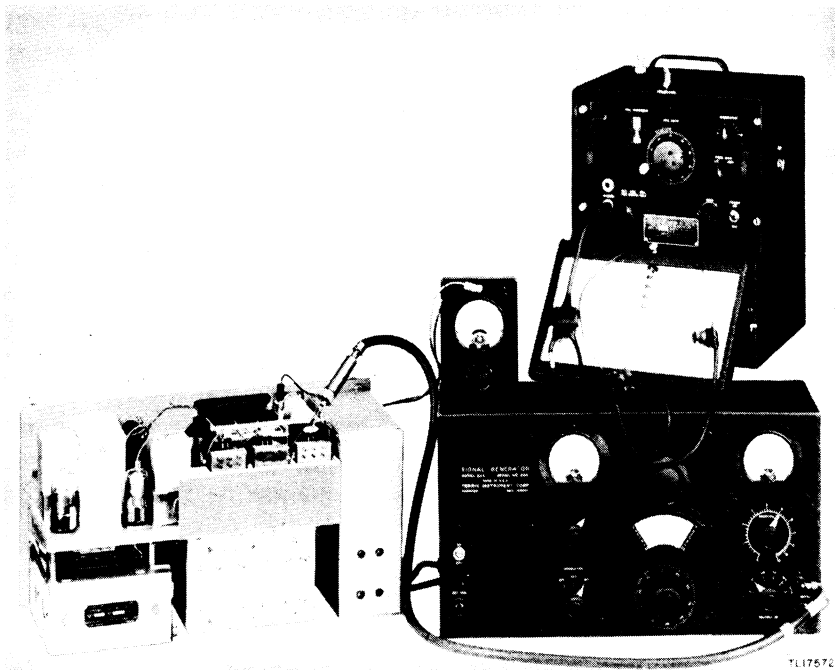


Figure 76. Typical test set-up for receiver r-f alignment.

The relative position of the rotor and stator of each capacitor is likewise indicated by a red dot.

b. **PREPARATION.** Set up the receiver and alignment equipment as shown in figure 76. Calibrate the signal generator for a 2,900-kc signal (h-f model) or for a 255-kc signal (m-f model) as described in paragraph 84. Set the receiver BAND CHANGE switch to Band A, the OFF-M.V.C.-A.V.C. switch to M.V.C., the C.W.-OSC. switch to OFF, the CRYSTAL PHASING control to OUT (h-f model), and the VOL control to maximum. Set the receiver dial to 2,900 kc (h-f model) or to 255 kc (m-f model). Remove the shield plate covering the r-f amplifier and mixer adjustment screws on the rear of the chassis, and loosen the adjustment screw locknuts.

## 89. Crystal Filter Alignment Procedure

a. **PREPARATION.** Set up the equipment the same as for the i-f stage alignment. (See fig. 72.) Calibrate the signal generator for a 470-kc signal. Set the OFF-M.V.C.-A.V.C. switch to M.V.C. and the C.W.-OSC. switch to ON. Connect a headset or loudspeaker and an output meter to the receiver output.

b. **PROCEDURE.** (1) Attach the ground lead of the signal generator to the receiver chassis and connect the signal generator

output lead to the grid cap of the mixer tube through a 300-ohm resistor.

(2) Feed an unmodulated 470-kc signal into the receiver and rotate the C.W.-OSC. ADJUST control until a sharp, shrill note is heard.

(3) Turn the CRYSTAL PHASING control counterclockwise (away from OUT) until a minimum or null signal response is heard. If the signal is too weak to be heard, advance the signal generator gain control until the signal is audible.

(4) Determine the operation frequency of the crystal by carefully varying the signal generator frequency slightly above and below 470 kc until a sharp increase in deflection is noted on the output meter and the volume increases noticeably in the headset or loudspeaker. (During this procedure it may be necessary to change the setting of the C.W.-OSC. ADJUST control to maintain the shrill note.)

(5) Leave the signal generator set at the operation frequency of the crystal, turn the c-w oscillator off, and turn the signal generator modulation on. Repeat the i-f and mixer transformer alignment for maximum output. (See par. 84.) Also realign the c-w oscillator at this new frequency. (See par. 85.)

(6) It may also be necessary to touch up the r-f oscillator alignment adjustment screws after the crystal filter alignment and i-f stages realignment to obtain maximum receiver sensitivity.

c. PROCEDURE. (1) Attach the signal generator ground lead to the receiver chassis and connect the signal generator output lead to the grid of the second r-f amplifier tube through the 50 $\mu\mu\text{f}$  capacitor (h-f model) or 250- $\mu\mu\text{f}$  capacitor (m-f model) dummy antenna.

(2) Connect the output meter to the PHONES 2D AUDIO jack and adjust the signal generator output (modulated) to give a small deflection on the lowest possible scale on the output meter.

(3) Adjust the mixer trimmer for Band A to obtain a maximum output indication. Reduce the signal generator output when necessary to avoid overloading the receiver.

(4) Move the signal generator connection and dummy antenna to the grid cap of the first r-f amplifier stage. Adjust the second r-f trimmers for Band A to obtain a maximum indication on the output meter.

(5) Connect the dummy antenna and signal generator output to the receiver antenna binding post and set the ALIGN INPUT control on the receiver front panel to the midposition (arrow straight up). Adjust the first r-f trimmers for Band A to obtain a maximum output indication.

(6) Check the adjustment of the three r-f trimmer adjustments

in the order given above and when maximum output is obtained, tighten the locknuts on the trimmer adjustment screws, avoiding any change in adjustment.

(7) Follow the same procedure as for Band A and align each band, using the following alignment frequencies:

*Radio Receivers BC-312-(\*) and BC-342-(\*)*

Band	Alignment freq (kc)	Band	Alignment freq (kc)
A	2,900	D	11,000
B	4,900	E	13,750
C	7,850	F	17,700

*Radio Receivers BC-314-(\*) and BC-344-(\*)*

Band	Alignment freq (kc)	Band	Alignment freq (kc)
A	255	C	800
B	440	D	1,450

(8) After aligning the receiver at the h-f end of each band, check the calibration at the low-frequency (l-f) end. If the error is great, that is, the r-f oscillator is not tracking properly across the band, it will be necessary to adjust the inductance of the oscillator coil for that band. To make the adjustment, remove the r-f oscillator unit (par. 75) and adjust the single turn of wire (h-f model) or the iron core (m-f model) inside the coil form. Moving the single turn of wire into, or the iron core out of, the coil decreases the inductance, thereby making the resonant frequency higher. Moving the single turn out of, or the iron core into, the coil increases the inductance, thereby making the resonant frequency lower.



**APPENDIX 1**  
**MAINTENANCE PARTS**  
**FOR RADIO RECEIVERS BC-312-(\*), BC-342-(\*), BC-314-(\*),**  
**AND BC-344-(\*)**

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**1. References**

The following information was compiled on 1 February 1946. The appropriate pamphlets of the Signal Supply Catalog for Radio Receivers BC-312-(\*), BC-342-(\*), BC-314-(\*), and BC-344-(\* ) are:

*Organizational spare parts:*

SIG 7-BC-312  
SIG 7-BC-342  
SIG 7-BC-314  
SIG 7-BC-344  
SIG 7-RA-20

*Higher Echelon spare parts:*

SIG 8-BC-312  
SIG 8-BC-342  
SIG 8-BC-314  
SIG 8-BC-344  
SIG 8-RA-20

For the index of available catalog sections, see the latest issue of Signal Supply Catalog SIG 2.

**2. List of Maintenance Parts**

The following list covers first-, second-, and third-echelon maintenance parts:

a. RADIO RECEIVERS BC-312-(\*) AND BC-342-(\*) .

Ref symbol	Signal Corps stock No.	Name
	2C4312	RADIO RECEIVER BC-312; BC-312-A, -C, -D, -E, -F, -G, -H, -HX, -J, -K, -L, -M, -N, -NX.
35	2Z1650/2	BALL, bearing.
	2Z1240-28	BRACKET: L-shape.
	2Z7091-3	BUTTON, plug: brass.
29.	2Z8794.1/C1	CAP, connector: cast aluminum alloy.
C41	3D278	CAPACITOR CA-278: fixed; mica.
C67	3K2010021	CAPACITOR, fixed: mica.
C96, 97	3K2075022	CAPACITOR, fixed: mica.
C52, 64, 65	3K2010133	CAPACITOR, fixed: mica, silver.
C33, 45, 47, 86, 88, 101.	3K2010122	CAPACITOR, fixed: mica.
C25, 38, 40, 100	3DEA125	CAPACITOR, fixed: mica.
C71	3K2015122	CAPACITOR, fixed: mica.
C53, 55, 57, 103	3K2039133	CAPACITOR, fixed: mica, silver.
C72	3K2051133	CAPACITOR, fixed: mica.
C107	3K4551122	CAPACITOR, fixed: mica.
C44	3K3075133	CAPACITOR, fixed: mica, silver.
C94, 95	3D298	CAPACITOR CA-298: fixed; mica.
C43	3K3016233	CAPACITOR, fixed: mica, silver.
C42	3K3030233	CAPACITOR, fixed: mica, silver.
C54, 56, 58, 63, 66, 76, 81.	3D371	CAPACITOR CA-371: fixed, mica.
C27, 32, 39, 62, 87, 99, 102.	3D284	CAPACITOR CA-284: fixed; mica.
C29, 30, 31, 35, 36, 37, 48, 49, 50.	3D195	CAPACITOR CA-195: fixed; paper.
C68, 69, 70, 73, 74, 75.	3D301	CAPACITOR CA-301: fixed; paper.
C59, 60, 61	3D302	CAPACITOR CA-302: fixed; paper, oil-filled.
C83	3D277	CAPACITOR CA-277: fixed; paper.
C78, 79, 80	3D276	CAPACITOR CA-276: fixed; paper, oil-filled.
C98	8D275	CAPACITOR CA-275: fixed; paper.
C84	3D383	CAPACITOR CA-383: variable; air.
C1, 7, 13, 19	3D289	CAPACITOR CA-289: variable; air.
C4, 5, 6, 10, 11, 12, 16, 17, 18, 22, 23, 24.	3D290	CAPACITOR CA-290: variable; air.
C51	3D323	CAPACITOR CA-323: variable; air.
C85	3D253	CAPACITOR CA-253: variable; air.
C2, 3, 8, 9, 14, 15, 20, 21.	3D291	CAPACITOR CA-291: variable; air.
C26	3D293	CAPACITOR CA-293: variable; air.
C28, 34, 46, 82	3D292	CAPACITOR CA-292: variable; air.

a. RADIO RECEIVERS BC-312-(\*) AND BC-342-(\*)—(Cont'd)

Ref symbol	Signal Corps stock No.	Name
	2Z2635.175	CLAMP: dial; rolled steel.
	2Z2708	CLIP, tube contact: brass, nickel pl.
4	2C4312/N1	CONNECTOR, female contact.
SO1	2Z8794.1	CONNECTOR, male contact.
	3Z1716-12	CONTACT, switch: beryllium copper.
7	2Z5650-K	COVER, telephone jack: aluminum.
8	2Z5650-M	COVER, telephone jack: aluminum.
10	2Z5650-P2A	COVER, telephone jack: aluminum.
9	2Z5650-S2A	COVER, telephone jack: aluminum.
CX	2X90-470	CRYSTAL DC-6-A: quartz.
	2Z5842-5	DIAL ASSEMBLY: vernier tuning.
DM	3H1621	DYNAMOTOR DM-21-B: plate supply.
DM	3H1621CX	DYNAMOTOR DM-21-CX: plate supply.
F1	3Z1921A	FUSE FU-21-A: cartridge.
F4	3Z1925	FUSE FU-25-A: cartridge.
22	3Z3275	HOLDER, fuse: extractor post.
37	3G1921-1	INSULATOR, feedthru: round.
36	3G1921	INSULATOR, feedthru: round.
J3, 4	2Z5533A	JACK JK-33-A: telephone.
J1, 2, 5	2Z5534	JACK JK-34-A: telephone.
	2Z5782	KNOB, round: aluminum alloy.
12	2Z5779	KNOB, round: black bakelite.
15	2Z5780	KNOB, round: black bakelite.
	2Z5777	KNOB, round: black bakelite.
57	2Z5777.1	KNOB, round: black bakelite.
13	2Z5773	KNOB, round: black bakelite.
14	2Z5753.22	KNOB, round: black bakelite.
11	2Z5783	KNOB, round: zinc alloy.
24	2Z5782.2	KNOB ASSEMBLY, round: fast tuning; black bakelite.
LM1	2Z5889-3	LAMP, glow.
LM2, 3	2Z5927	LAMP LM-27: incandescent.
LM4, 5	2Z5942	LAMP LM-42: incandescent.
X1	2Z5886-21	LAMPHOLDER: double cont bayonet type.
	2Z5986/1	LAMPHOLDER: miniature bayonet base
	2Z5986/2	LAMPHOLDER: miniature bayonet base
	2Z5988-28	LAMPHOLDER ASSEMBLY: neon.
	2Z5986	LAMPHOLDER ASSEMBLY: LH and RH mtg for dial lamp.
1	2Z6702	MOUNTING FT-162: vibration; oblong.
	2Z6931/1	PLUG, machine thread.
	2Z6931/2	PLUG, machine thread.
23A	3Z510	POST, binding: push type.

a. RADIO RECEIVERS BC-312-(\*) AND BC-342-(\*)—(Cont'd)

Ref symbol	Signal Corps stock No.	Name
23	3Z763	POST, binding: push type.
RL-1	2Z7613	RELAY BK-13: armature.
RL-2	2Z7641A	RELAY BK-41-A: antenna.
R47	3RC21BE620J	RESISTOR, fixed: composition.
R55	3Z4667	RESISTOR RS-267: fixed composition.
R14	3RC30BF331K	RESISTOR, fixed: composition.
R1, 7, 19, 24	3RC30BF511J	RESISTOR, fixed: composition.
R28	3RC30BF751J	RESISTOR, fixed: composition.
R5, 11, 17, 22, 27	3RC21BF102K	RESISTOR, fixed: composition.
R44	3RC30BF302J	RESISTOR, fixed: composition.
R45	3RC30BF512J	RESISTOR, fixed: composition.
R46	3RC30BF752J	RESISTOR, fixed: composition.
R51, 52	3RC21BF103K	RESISTOR, fixed: composition.
R15, 42, 50	3RC21BF303J	RESISTOR, fixed: composition.
R41	3RC30BF303J	RESISTOR, fixed: composition.
R3, 9, 21, 26	3RC20BF393K	RESISTOR, fixed: composition.
R13	3RC10BF513J	RESISTOR, fixed: composition.
R33	3RC21BF513J	RESISTOR, fixed: composition.
R2, 8, 38, 46	3RC21BF623J	RESISTOR, fixed: composition.
R20, 25	3RC30BF623J	RESISTOR, fixed: composition.
R4, 10, 16, 18	3RC20BF104K	RESISTOR, fixed: composition.
R23, 37	3RC21BF104K	RESISTOR, fixed: composition.
R36	3RC30BF104K	RESISTOR, fixed: composition.
R43	3RC21BF204J	RESISTOR, fixed: composition.
R29, 32	3RC21BF244J	RESISTOR, fixed: composition.
R49	3RC21BF514J	RESISTOR, fixed: composition.
R30	3RC10BF105K	RESISTOR, fixed: composition.
R6, 12, 53	3RC10BF205J	RESISTOR, fixed: composition.
R31, 54	3Z4623	RESISTOR RS-223: fixed.
R34, 35	2Z7289	RESISTOR, variable.
R56	3Z7256	RESISTOR, variable. (In L, M, N, and NX models only).
	6L6632-9.10	SCREW, machine.
	6L7949-4.89S	SCREW, set.
20	2Z8762.2	SOCKET, tube: std octal.
	2Z1650/46	SPRING: compression.
38	2Z1650/17.2	SPRING: compression.
	2Z1650/3	SPRING: detent; steel.
31	2Z1650/7.4	SPRING: extension.
30	?Z1650/7.3	SPRING: extension.
SW12	3Z8119	SWITCH SW-119: rotary; 3 positions; 3 sect.
SW1	3Z8131	SWITCH SW-131: toggle.
SW11	6C201C/S2	SWITCH SW-139: toggle.
T2	2Z9760A	TRANSFORMER C-160-A: AF, output.
T1	2Z9805	TRANSFORMER C-205: AF, inter-stage.

a. RADIO RECEIVERS BC-312- (\*) AND BC-342- (\*).—(Cont'd)

Ref symbol	Signal Corps stock No.	Name
	2Z9882	TRANSFORMER C-282: IF assembly.
	2Z9883	TRANSFORMER C-283: IF assembly.
	2Z9884	TRANSFORMER C-284: IF assembly.
	2Z9940-412	TRANSFORMER C-412: IF assembly.
VT65	2J6C5	TUBE JAN-6C5: electron.
VT66	2J6F6	TUBE JAN-6F6: electron; (used in all models except NX and HX).
VT86	2J6K7	TUBE JAN-6K7: electron.
VT87	2J6L7	TUBE JAN-6L7: electron.
VT88	2J6R7	TUBE JAN-6R7: electron.
VT134	2J12A6	TUBE JAN-12A6: electron; (used only in models NX and HX).
48	2C4342N/A2	TUNING UNIT, RF: 1st RF.
	2C4312M.1/T2	TUNING UNIT, RF: 1st RF.
49	2C4342N/A3	TUNING UNIT, RF: 2d RF.
	2C4312M.1/T3	TUNING UNIT, RF: 2d RF.
50	2C4342N/A1	TUNING UNIT, RF: 1st detector.
	2C4312M.1/T4	TUNING UNIT, RF: 1st detector.
51	2C4342N/A4	TUNING UNIT, RF: RF oscillator.
	2C4312M.1/T5	TUNING UNIT, RF: RF oscillator.
	2C2775	TUNING UNIT, RF: CW oscillator.
		MAINTENANCE PARTS FOR DY- NAMOTORS DM-21-B AND DM- 21-CX.
	2C4312/B50	BRACKET ASSEMBLY: straight; alu- minum.
56	2C4314G/B2	BRACKET ASSEMBLY: straight; alu- minum.
53	3H1621/B2	BRUSH, electrical contact: HV.
54	3H1621/B1	BRUSH, electrical contact: LV.
FL	3Z1890-6B	FILTER FL-6-B: DC power.
FL	3Z1890-6CX	FILTER FL-6-CX: 24 v.
	3H1621B/40	SHIM: aluminum alloy.

b. RADIO RECEIVERS BC-314- (\*) AND BC-344- (\*).

Ref symbol	Signal Corps stock No.	Name
	2C4314	RADIO RECEIVER BC-314; BC-314- A, -C, -D, -E, -F, -G.
	2C4344	RADIO RECEIVER BC-344; BC- 344-D.
	2Z1650/2	BALL, bearing: hardened steel.
	2Z1240-28	BRACKET: L-shape; steel.
	2Z7091-3	BUTTON, plug: brass.
C44	3K2010021	CAPACITOR, fixed; mica.
C-45	3D350	CAPACITOR CA-350: fixed; mica.
C77, 78, 83, 84, 85, 86.	3D341	CAPACITOR CA-341: fixed; mica.

b. RADIO RECEIVERS BC-314-(\*) AND BC-344-(\*)—(Cont'd)

Ref symbol	Signal Corps stock No.	Name
C74	3K2010122	CAPACITOR, fixed: mica.
C47	3K2015121	CAPACITOR, fixed: mica.
C66	3K2024122	CAPACITOR, fixed: mica.
C32, 34, 36, 40, 41	3D344	CAPACITOR CA-344: fixed; mica.
C75	3K3051122	CAPACITOR, fixed: mica.
C91	3K4551122	CAPACITOR, fixed: mica.
C31	3D345	CAPACITOR CA-345: fixed; mica.
C30, 82	3K2591143	CAPACITOR, fixed: mica.
C38	3K3010233	CAPACITOR, fixed: mica.
C80	3K3016233	CAPACITOR, fixed: mica.
C29	3K3020243	CAPACITOR, fixed: mica.
C28	3D348	CAPACITOR CA-348: fixed; mica.
C33, 35, 42, 43	3D371	CAPACITOR CA-371: fixed; mica.
C64	3D281	CAPACITOR, fixed: paper, oil-filled.
C6, 15, 37, 39, 65, 72, 73, 76, 81.	3D277	CAPACITOR CA-277: fixed; paper.
C8, 9, 10, 17, 18, 19, 48, 49, 50.	3D255	CAPACITOR CA-255: fixed; paper, oil-filled.
C51, 52, 53	3D339	CAPACITOR CA-339: fixed; paper, oil-filled.
C61, 62, 63	3D276	CAPACITOR CA-276: fixed; paper, oil-filled.
C54, 55, 56, 57, 58, 59.	3D338	CAPACITOR CA-338: fixed; paper, oil-filled.
C60	3D275	CAPACITOR CA-275: fixed; paper.
C2, 3, 4, 5, 11, 12, 13, 14, 20 to 27.	3D290	CAPACITOR CA-290: variable; air.
C68	3D253	CAPACITOR CA-253: variable; air.
C29	3D384	CAPACITOR CA-384: variable; air.
C1	3D293	CAPACITOR CA-293: variable; air.
C7, 16, 46, 67	3D340	CAPACITOR CA-340: variable; air.
	2Z2635.175	CLAMP: dial; rolled steel.
	2Z2708	CLIP, tube contact: brass nickel pl.
	2C4312/N1	CONNECTOR, female contact: nut and ferrule assembly.
SO1	2Z8794.1	CONNECTOR, male contact.
29	2Z8794.1/C1	COVER, connector: cast aluminum al- loy.
	2Z5650-K	COVER, telephone jack: aluminum.
8	2Z5650-M	COVER, telephone jack: aluminum.
9	2Z5650-S2A	COVER, telephone jack: aluminum.
10	2Z5650-P2A	COVER, telephone jack: aluminum.
	2Z5842-5	DIAL ASSEMBLY: vernier tuning.
DM	3H1621	DYNAMOTOR DM-21-B: plate supply.
F1, 2	3Z1921A	FUSE FU-21-A: cartridge.
	3Z3275	HOLDER, fuse: extractor post.
	3G1921	INSULATOR, feedthru: round; phe- nolic.

b. RADIO RECEIVERS BC-314-(\*) AND BC-344-(\*)—(Cont'd)

Ref symbol	Signal Corps stock No.	Name
J3, 4	2Z5533A	JACK JK-33-A: telephone.
J1, 2, 5	2Z5534	JACK JK-34: telephone.
	2Z5753.22	KNOB: round; black bakelite.
	2Z5779	KNOB: round; black bakelite.
	2Z5780	KNOB: round; black bakelite.
	2Z5773	KNOB: round; black bakelite.
	2Z5783	KNOB: round; zinc alloy die casting.
	2Z5782	KNOB: round; aluminum alloy.
	2Z5842-5	KNOB ASSEMBLY: round; black bakelite.
	2Z5782.2	KNOB ASSEMBLY: round; fast tuning; black bakelite.
LM1	2Z5889-3	LAMP, glow.
LM2, 3	2Z5927	LAMP LM-27: incandescent.
X1	2Z5886-21	LAMPHOLDER: double cont bayonet base.
	2Z5986/2	LAMPHOLDER: miniature; bayonet base.
	2Z5986/1	LAMPHOLDER: miniature; bayonet base.
	2Z5988-28	LAMPHOLDER ASSEMBLY: neon; inside use.
	2Z5986	LAMPHOLDER ASSEMBLY: LH and RH mtg for dial lamp.
	2Z6702	MOUNTING FT-162: vibration; oblong.
	2Z6931/1	PLUG, machine thread: RH; aluminum alloy.
	2Z6931/2	PLUG, machine thread: RH; nickel silver.
	3Z510	POST, binding: push type.
	3Z763	POST, binding: push type.
RL1	2Z7613	RELAY BK-13: armature; DPST normally open.
R43	3RC21BF620J	RESISTOR, fixed: composition.
R2, 8	3RC30BF331K	RESISTOR, fixed: composition.
R15, 19, 24	3RC30BF511J	RESISTOR, fixed: composition.
R37	3RC30BF751J	RESISTOR, fixed: composition.
R6, 11, 27, 22, 27	3RC21BF102K	RESISTOR, fixed: composition.
R16, 53	3RC21BF303J	RESISTOR, fixed: composition.
R13	3RC30BF303J	RESISTOR, fixed: composition.
R4, 10, 21, 26	3RC21BF393J	RESISTOR, fixed: composition.
R14	3RC10BF513J	RESISTOR, fixed: composition.
R28, 35, 38, 51	3RC21BF513J	RESISTOR, fixed: composition.
R20, 25	3RC30BF623J	RESISTOR, fixed: composition.
R3, 9, 45	3RC21BF753J	RESISTOR, fixed: composition.
R5, 7, 12, 18, 23	3RC21BF104K	RESISTOR, fixed: composition.
R44	3RC30BF104K	RESISTOR, fixed: composition.

b. RADIO RECEIVERS BC-314-(\*) AND BC-344-(\*)---(Cont'd)

Ref symbol	Signal Corps stock No.	Name
R39	3RC21BF204J	RESISTOR, fixed: composition.
R31, 34, 36	3RC21BF274J	RESISTOR, fixed: composition.
R1, 32	3RC10BF105K	RESISTOR, fixed: composition.
R33, 52	3Z4623	RESISTOR RS-223: fixed; wire-wound.
R29, 30	2Z7289	RESISTOR, variable.
	6L6632-9.10	SCREW, machine: F Fil H; brass.
	6L7949-4.89S	SCREW, set: headless pilot; steel par-kerized.
	2Z8677.27	SOCKET, tube: std octal; molded mica filled bakelite.
	2Z1650/17.2	SPRING: compression.
	2Z1650.7.4	SPRING: extension.
	2Z1650/7.3	SPRING: extension.
	2Z1650/8	SPRING ASSEMBLY: detent; steel.
SW11	3Z8119	SWITCH SW-119: rotary; single pole, 3 position; 3 sect.
SW1	3Z8131	SWITCH SW-131: toggle; SPST; metal body.
SW10	3Z8139	SWITCH SW-139: toggle; SPST.
T2	2Z9760A	TRANSFORMER C-160-A: AF; output.
T1	2Z9805	TRANSFORMER C-205: AF; inter-stage.
	2Z9892	TRANSFORMER C-292: IF.
	2Z9893	TRANSFORMER C-293: IF.
L32, 33	2Z9894	TRANSFORMER C-294: IF.
VT65	2J605	TUBE JAN-6C5: electron.
VT66	2J6F6	TUBE JAN-6F6: electron.
VT86	2J6K7	TUBE JAN-6K7: electron.
VT87	2J6L7	TUBE JAN-6L7: electron.
VT88	2J6R7	TUBE JAN-6R7: electron.
	2C8137	TUNING UNIT, RF: CW oscillator.
	2C4314G/A1	TUNING UNIT, RF: oscillator.
	2C4314G/A2	TUNING UNIT, RF: 1st detector.
	2C4314G/A4	TUNING UNIT, RF: 1st RF.
	2C4314G/A3	TUNING UNIT, RF: 2d RF.
		MAINTENANCE PARTS FOR DYNAMOTOR DM-21-B
	3H1621/B2	BRUSH, electrical contact: HV; carbon; dynamotor output.
	3H1621A/3	BRUSH, electrical contact: LV; carbon; dynamotor input.
FL	3Z1890-6B	FILTER RL-6-B: DC power; capacitors and chokes.
	6L20808-40.5	PIN, threaded: brass; nickel finish.
	3H1621B/40	SHIM: aluminum alloy; natural finish.
RA	2Z7512	RECTIFIER RA-20: electron tube; full wave.



c. RECTIFIER RA-20.

Ref Symbol	Signal Corps stock No.	Name
C89, 90	3D329	CAPACITOR CA-329: fixed; electrolytic.
SO <sup>2</sup>	6Z7589	CONNECTOR, male contact: 2 rectangular parallel cont.
F3	3Z1927	FUSE FU-27: cartridge.
	3Z3275	HOLDER, fuse: extractor post; for No. 3AG fuses.
R40	3RC40BF623J	RESISTOR, fixed: composition.
	2Z8678.262	SOCKET, tube: std octal.
SW13	3Z8105	SWITCH SW-105: toggle; SPST.
T3	2Z9828	TRANSFORMER C-228: power; plate and fl.
VT97	2J5W4	TUBE JAN-5W4; electron.

## **APPENDIX 2**

### **REFERENCES and ABBREVIATIONS**

*Note.* For availability of items listed, check FM 21-6 and Signal Supply Catalog SIG 2. Also see FM 21-6 for applicable Technical Bulletins, Supply Bulletins, and Modification Work Orders.

---

#### **1. Army Regulations**

AR 380-5, Safeguarding Military Information.

#### **2. Supply Publications**

SIG 1, Introduction to Signal Supply Catalog.

SIG 3, List of Items for Troop Issue.

SIG 4-1, Allowances of Expendable Supplies.

SIG 4-2, Allowances of Expendable Supplies for Schools, Training Centers, and Boards.

SIG 5, Stock List of All Items.

SIG 6, Sets of Equipment.

SIG 7, Organizational Spare Parts.

SIG 8, Higher Echelon Spare Parts.

SIG 10, Fixed Plant Maintenance Lists.

SB 11-6, Dry Battery Supply Data.

SB 11-76, Signal Corps Kit and Materials for Moisture and Fungi-Resistant Treatment.

SB 11-17, Electron Tube Supply Data.

#### **3. Technical Manuals on Auxiliary Equipment and Test Equipment**

TM 11-300, Frequency Meter Sets SCR-211-( ).

TM 11-303, Test Sets I-56-C, -D, -H, and -J.

TM 11-307, Signal Generators I-72-( ).

TM 11-321, Test Set I-56-E.

TM 11-472, Repair and Calibration of Electrical Measuring Instruments.

TM 11-2613, Voltohmmeter I-166.

TM 11-2626, Test Unit I-176.

TM 11-2627, Tube Tester I-177.

#### **4. Painting, Preserving, and Lubrication**

- TB SIG 6, A Method of Prolonging the Life of Dry Batteries.
- TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment.
- TB SIG 69, Lubrication of Ground Signal Equipment.

#### **5. Camouflage**

- FM 5-20, Camouflage, Basic Principles.

#### **6. Shipping Instructions**

- U. S. Army Spec. No. 100-14A, Army-Navy General Specification for Packaging and Packing for Oversea Shipment.

#### **7. Decontamination**

- TM 3-220, Decontamination.

#### **8. Demolition**

- FM 5-25, Explosives and Demolitions.

#### **9. Other Publications**

- FM 24-18, Radio Communication.
- FM 72-20, Jungle Warfare.
- TB SIG 4, Methods for Improving the Effectiveness of Jungle Radio Communication.
- TB SIG 5, Defense Against Radio Jamming.
- 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.
- TB SIG 123, Preventive Maintenance Practices for Ground Signal Equipment.
- TB SIG 178, Preventive Maintenance Guide for Radio Communication Equipment.
- TM 1-455, Electrical Fundamentals.
- TM 11-310, Schematic Diagrams for Maintenance of Ground Radio Communications Sets.
- TM 11-314, Antennas and Antenna Systems.
- TM 11-453, Shop Work.
- TM 11-455, Radio Fundamentals.
- TM 11-483, Suppression of Radio Noises.
- TM 11-486, Electrical Communication System Engineering.
- TM 11-496, Training Text and Applicatory Exercises for Amplitude-modulated Radio Sets.

TM 11-4000, Trouble Shooting and Repair of Radio Equipment.  
 TM 11-4001, Repair Instructions for Radio Receivers BC-312,  
 -A, -C, -D, -E, -F, -G, -J, -L, -M, -N, -HX, and -NX, and  
 BC-342, -A, -C, -D, -F, -J, -L, -M, and -N.  
 TM 11-4002, Radio Receivers BC-314, -C, -D, -E, and -G;  
 BC-344, and BC-344-D, Repair Instructions.  
 TM 37-250, Basic Maintenance Manual.

## 10. Forms

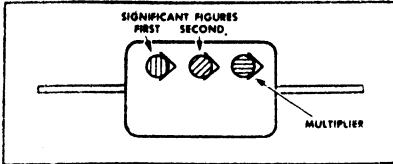
WD AGO Form 468 (Unsatisfactory Equipment Report).  
 Army Air Forces Form 54 (Unsatisfactory Report).

## 11. Abbreviations

a-c	.....	alternating-current
a-m	.....	amplitude-modulated
a-v-c	.....	automatic-volume-control
c-w	.....	continuous-wave
h-f	.....	high-frequency
kc	.....	kilocycle
m-f	.....	medium-frequency
m-v-c	.....	manual-volume-control
$\mu\mu\text{f}$	.....	micromicrofarad
r-f	.....	radio-frequency

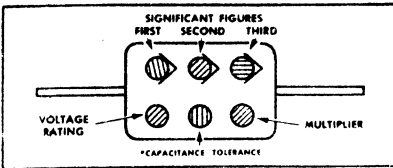
# CAPACITOR COLOR CODES

**RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS**

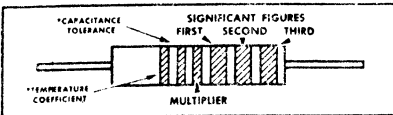


Capacitors marked with this code have a voltage rating of 500 volts.

**RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS**



**RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS**



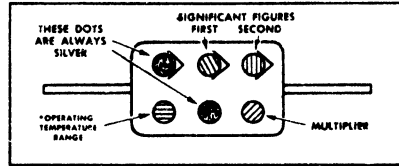
Capacitors marked with this code have a voltage rating of 500 volts.

RMA Radio Manufacturers Association JAN Joint Army-Navy

Note: These color codes give all capacitances in micromicrofarads.

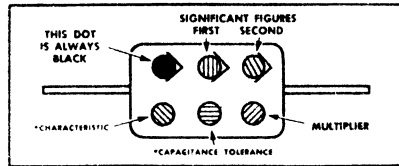
\*Items marked with an asterisk are of interest primarily to depot and higher echelon repair personnel.

**JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS**



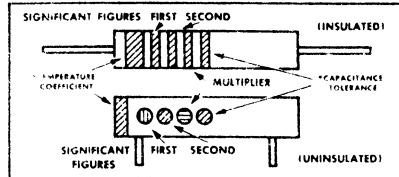
The silver dots serve to identify this marking. For working voltages see JAN type designation code.

**JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS**



The black dot serves to identify this code. For working voltages see JAN type designation code.

**JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS**



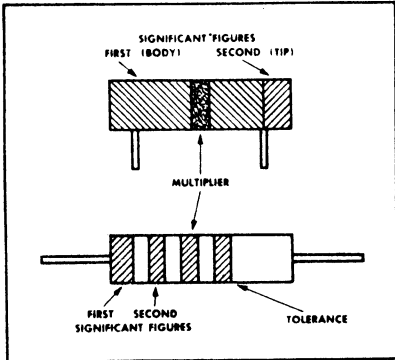
Capacitors marked with this code have a voltage rating of 500 volts. Either the band or dot code may be used.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER			RMA VOLTAGE RATING
		RMA MICA-AND CERAMIC-DIELECTRIC	JAN MICA-AND PAPER-DIELECTRIC	JAN CERAMIC-DIELECTRIC	
BLACK	0	1	1	1	100
BROWN	1	10	10	10	100
RED	2	100	100	100	200
ORANGE	3	1,000	1,000	1,000	300
YELLOW	4	10,000			400
GREEN	5	100,000			500
BLUE	6	1,000,000			600
VIOLET	7	10,000,000			700
GRAY	8	100,000,000		0.01	800
WHITE	9	1,000,000,000		0.1	900
GOLD		0.1	0.1		1,000
SILVER		0.01	0.01		2,000
NO COLOR					500

Figure 77. Capacitor color code.

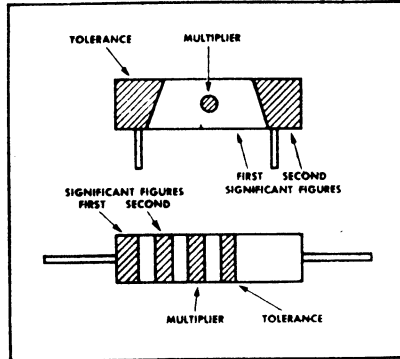
# RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS



Insulated fixed composition resistors with axial leads are designated by a natural tan background color. Non-insulated fixed composition resistors with axial leads are designated by a black background color.

JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS



Resistors with axial leads are insulated. Resistors with radial leads are uninsulated.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	
RED	2	100	
ORANGE	3	1 000	
YELLOW	4	10 000	
GREEN	5	100 000	
BLUE	6	1 000 000	
VIOLET	7	10 000 000*	
GRAY	8	100 000 000*	
WHITE	9	1 000 000 000*	
GOLD		0.1*	5
SILVER		0.01*	10
NO COLOR			70

NA-0917

Example: A 50 000-ohm resistor with a standard tolerance of 20 percent (no color) would be indicated by a green ring (5), a black ring (0), and an orange ring (1000).

RMA: Adapted from MIL-STD-883C  
JAN: from Army NAVY

Figure 78. Resistor color code.

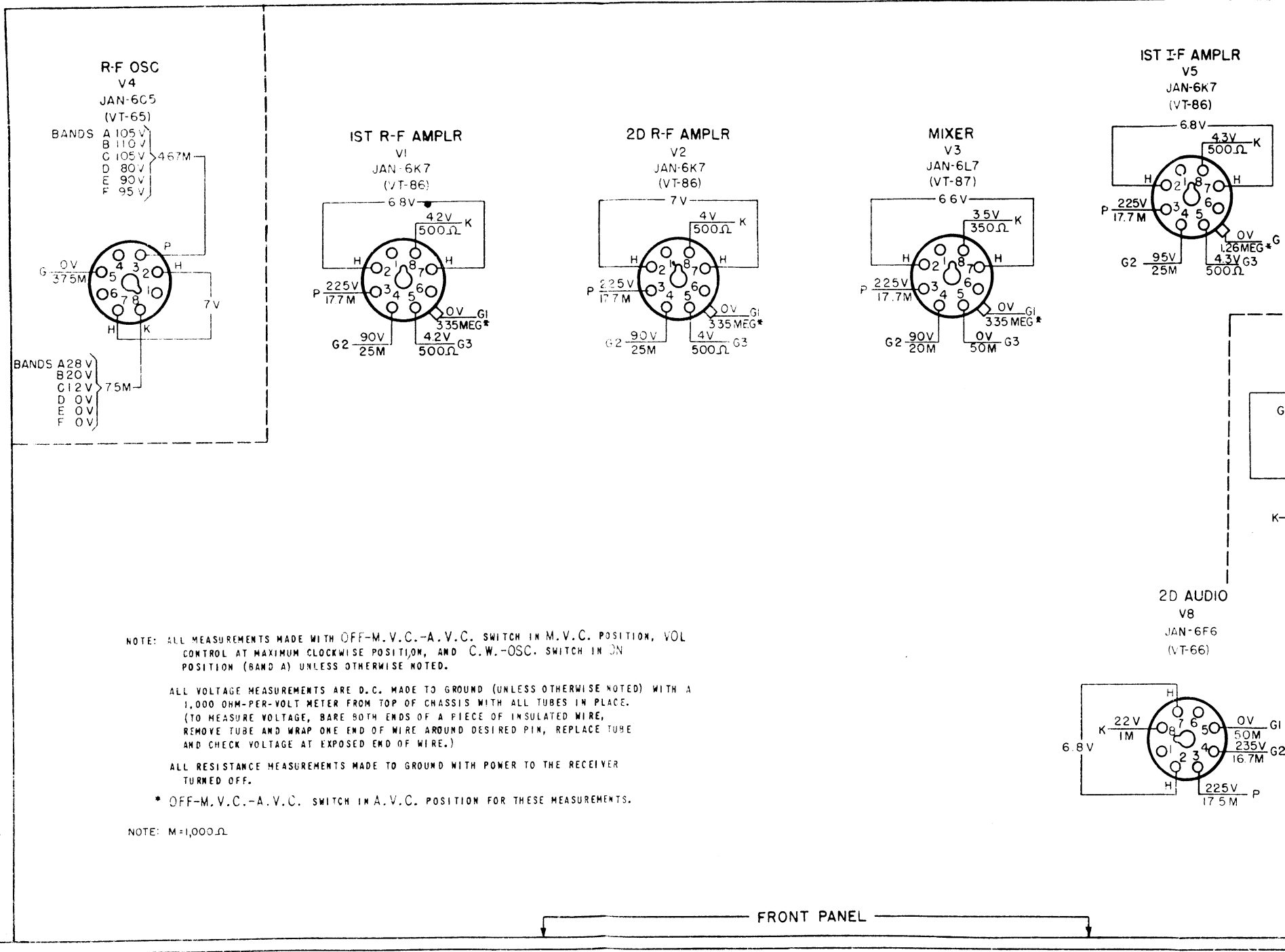
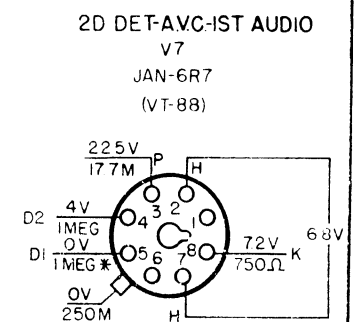
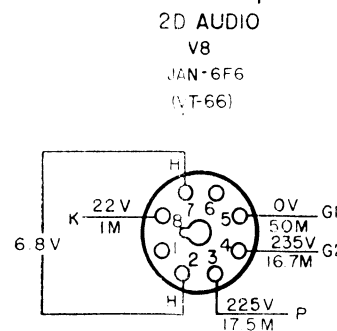
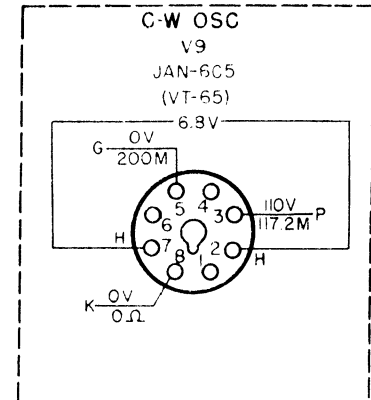
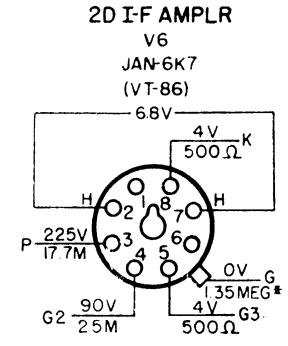
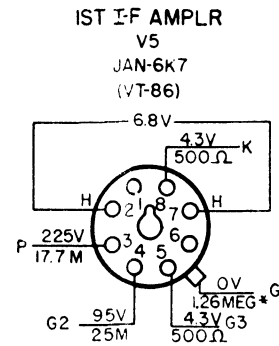
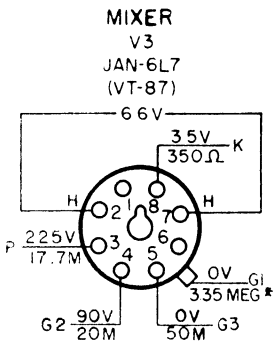
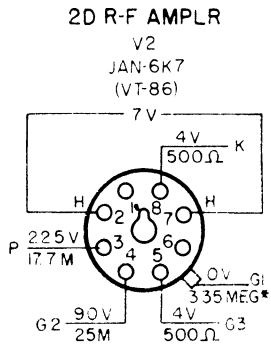
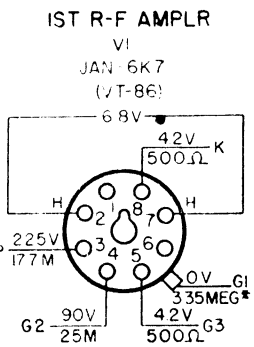


Figure 33. Radio Receiver BC-312-(\*), voltage and resistance chart.



WITH OFF-M.V.C.-A.V.C. SWITCH IN M.V.C. POSITION, VOL  
CLOCKWISE POSITION, AND C.W.-OSC. SWITCH IN ON  
LESS OTHERWISE NOTED.

IS ARE D.C. MADE TO GROUND (UNLESS OTHERWISE NOTED) WITH A  
TER FROM TOP OF CHASSIS WITH ALL TUBES IN PLACE.  
BARE BOTH ENDS OF A PIECE OF INSULATED WIRE,  
ONE END OF WIRE AROUND DESIRED PIN, REPLACE TUBE  
EXPOSED END OF WIRE.)

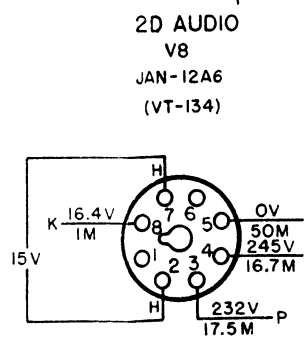
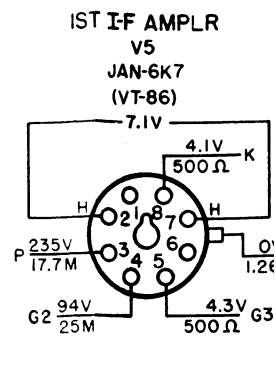
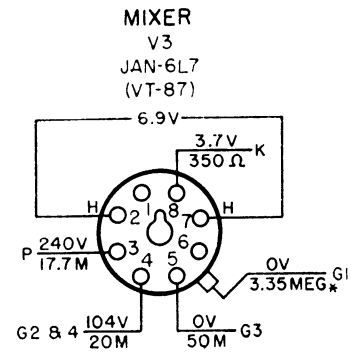
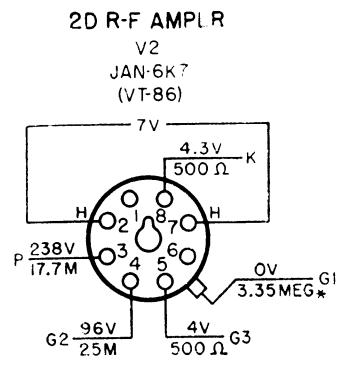
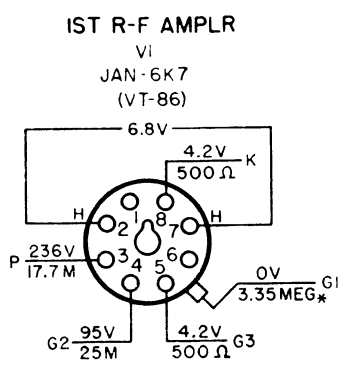
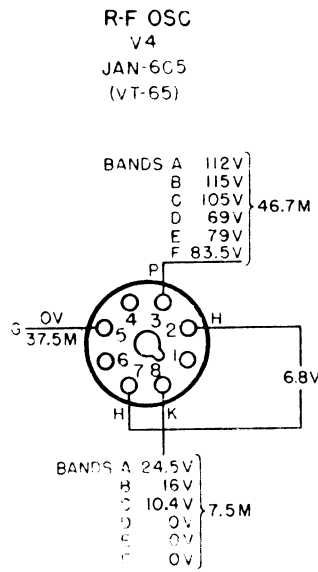
MENTS MADE TO GROUND WITH POWER TO THE RECEIVER

SWITCH IN A.V.C. POSITION FOR THESE MEASUREMENTS.



Figure 33. Radio Receiver BC-312-(\*), voltage and resistance chart.





NOTE: ALL MEASUREMENTS MADE WITH OFF-M.V.C.-A.V.C. SWITCH IN M.V.C. POSITION, VOL CONTROL AT MAXIMUM CLOCKWISE POSITION, AND C.W.-OSC. SWITCH IN ON POSITION (BAND A) UNLESS OTHERWISE NOTED.

ALL VOLTAGE MEASUREMENTS ARE D.C. MADE TO GROUND (UNLESS OTHERWISE NOTED) WITH A 1,000 OHM-PER-VOLT METER FROM TOP OF CHASSIS WITH ALL TUBES IN PLACE. (TO MEASURE VOLTAGE, BARE BOTH ENDS OF A PIECE OF INSULATED WIRE, REMOVE TUBE AND WRAP ONE END OF WIRE AROUND DESIRED PIN. REPLACE TUBE AND CHECK VOLTAGE AT EXPOSED END OF WIRE.)

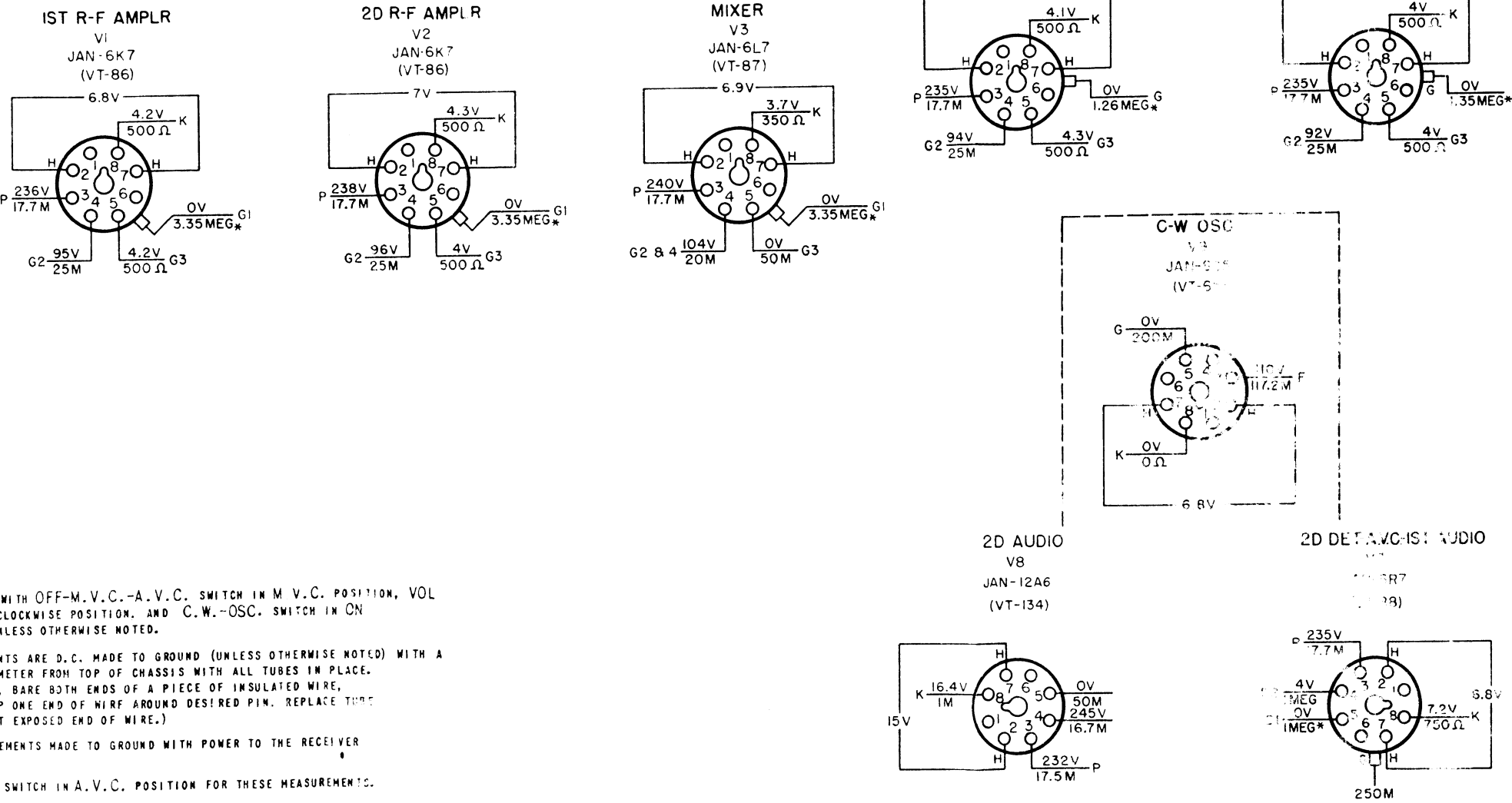
ALL RESISTANCE MEASUREMENTS MADE TO GROUND WITH POWER TO THE RECEIVER TURNED OFF.

\* OFF-M.V.C.-A.V.C. SWITCH IN A.V.C. POSITION FOR THESE MEASUREMENTS.

NOTE: M=1000Ω

FRONT PANEL

Figure 34. Radio Receiver BC-312-(\*)X, voltage and resistance chart.



WITH OFF-M.V.C.-A.V.C. SWITCH IN M.V.C. POSITION, VOL  
CLOCKWISE POSITION, AND C.W.-OSC. SWITCH IN ON  
UNLESS OTHERWISE NOTED.

POINTS ARE D.C. MADE TO GROUND (UNLESS OTHERWISE NOTED) WITH A  
METER FROM TOP OF CHASSIS WITH ALL TUBES IN PLACE.  
BARE BOTH ENDS OF A PIECE OF INSULATED WIRE,  
WOUND ONE END OF WIRE AROUND DESIRED PIN. REPLACE TUBE  
AT EXPOSED END OF WIRE.)

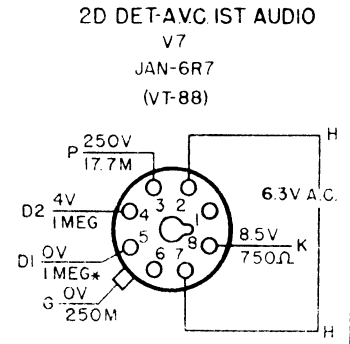
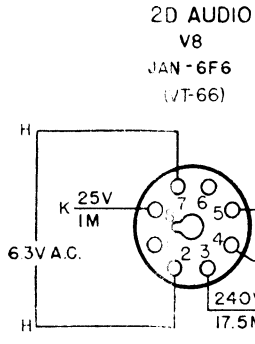
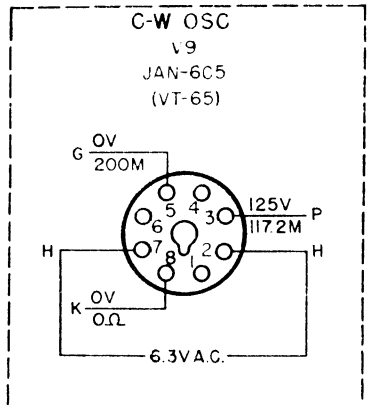
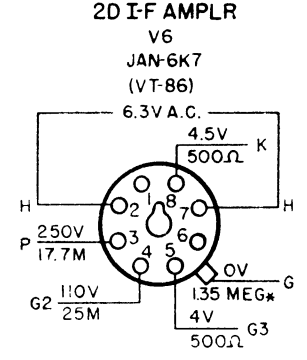
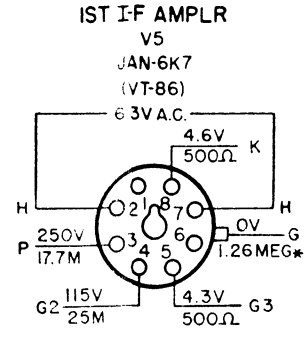
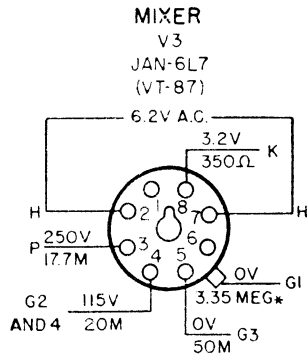
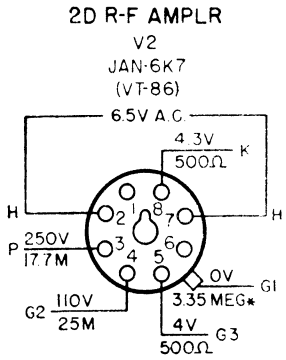
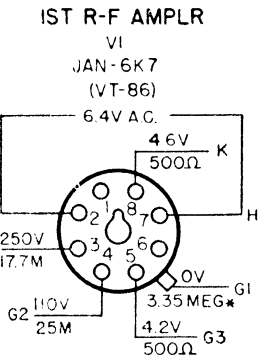
ELEMENTS MADE TO GROUND WITH POWER TO THE RECEIVER  
SWITCH IN A.V.C. POSITION FOR THESE MEASUREMENTS.

FRONT PANEL

TL15331S

Figure 34. Radio Receiver BC-312-(\*),X, voltage and resistance chart.





WITH OFF-M.V.C.-A.V.C. SWITCH IN M.V.C. POSITION, VOL  
CLOCKWISE POSITION, AND C.W.-OSC. SWITCH IN ON  
LESS OTHERWISE NOTED.

IS ARE D.C. MADE TO GROUND (UNLESS OTHERWISE NOTED) WITH A  
POWER FROM TOP OF CHASSIS WITH ALL TUBES IN PLACE.  
BARE BOTH ENDS OF A PIECE OF INSULATED WIRE,  
ONE END OF WIRE AROUND DESIRED PIN, REPLACE TUBE  
(EXPOSED END OF WIRE.)

MENTS MADE TO GROUND WITH POWER TO THE RECEIVER

ITCH IN A.V.C. POSITION FOR THESE MEASUREMENTS.

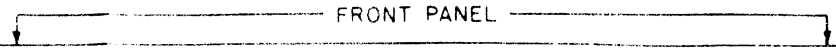
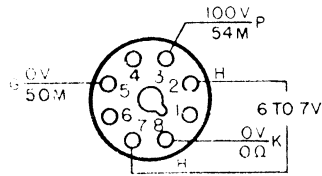


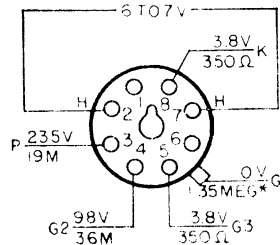
Figure 1. Radio Receiver PC-342-(\*), voltage and resistance chart.

R-F OSC  
V4  
JAN-6C5  
(VT-65)



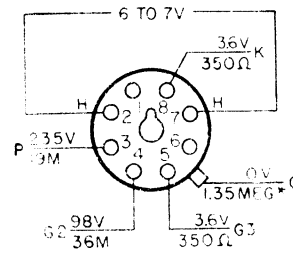
1ST R-F AMPLR

V1  
JAN-6K7  
(VT-86)



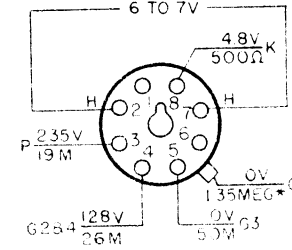
2D R-F AMPLR

V2  
JAN-6K7  
(VT-86)



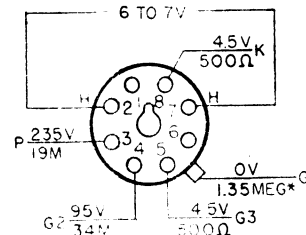
MIXER

V3  
JAN-6L7  
(VT-87)



1ST I-F AMPLR

V5  
JAN-6K7  
(VT-86)



NOTE: ALL MEASUREMENTS MADE WITH OFF-M.V.C.-A.V.C. SWITCH IN M.V.C. POSITION, VOL CONTROL AT MAXIMUM CLOCKWISE POSITION, AND C.W.-OSC. SWITCH IN ON POSITION (BAND A) UNLESS OTHERWISE NOTED.

ALL VOLTAGE MEASUREMENTS ARE D.C. MADE TO GROUND (UNLESS OTHERWISE NOTED) WITH A 1,000 OHM-PER-VOLT METER FROM TOP OF CHASSIS WITH ALL TUBES IN PLACE. (TO MEASURE VOLTAGE, BARE BOTH ENDS OF A PIECE OF INSULATED WIRE. REMOVE TUBE AND WRAP ONE END OF WIRE AROUND DESIRED PIN, REPLACE TUBE AND CHECK VOLTAGE AT EXPOSED END OF WIRE.)

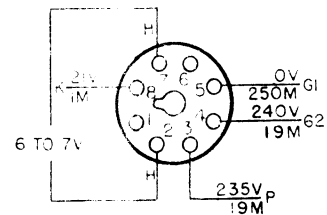
ALL RESISTANCE MEASUREMENTS MADE TO GROUND WITH POWER TO THE RECEIVER TURNED OFF.

\* OFF-M.V.C.-A.V.C. SWITCH IN A.V.C. POSITION FOR THESE MEASUREMENTS.

NOTE: M.F. 1000Z

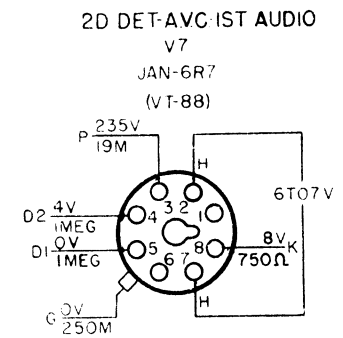
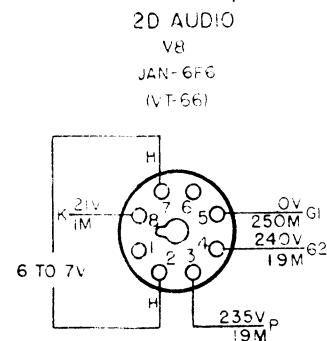
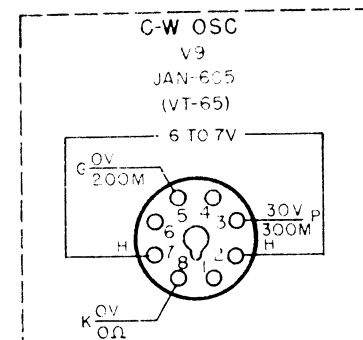
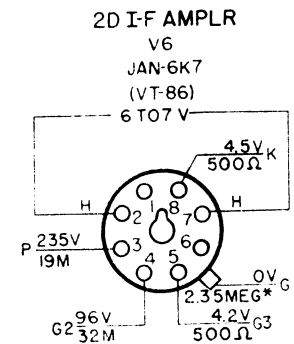
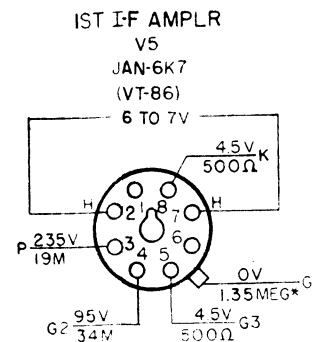
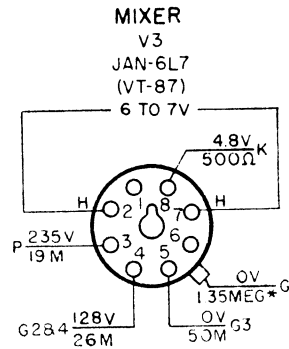
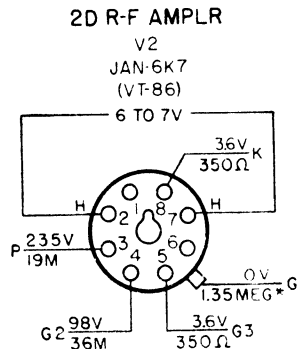
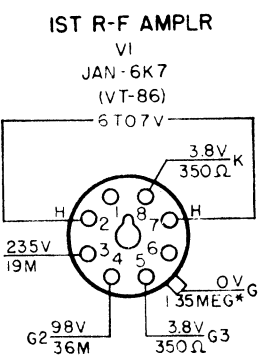
2D AUDIO

V8  
JAN-6FD  
(VT-88)



FRONT PANEL

Figure 26. Radio Receiver BC-314-(\*), voltage and resistance chart.



WITH OFF-M.V.C.-A.V.C. SWITCH IN M.V.C. POSITION, VOL LOCKWISE POSITION, AND C.W.-OSC. SWITCH IN ON LESS OTHERWISE NOTED.

TS ARE D.C. MADE TO GROUND (UNLESS OTHERWISE NOTED) WITH A ETER FROM TOP OF CHASSIS WITH ALL TUBES IN PLACE. BARE BOTH ENDS OF A PIECE OF INSULATED WIRE, ONE END OF WIRE AROUND DESIRED PIN, REPLACE TUBE EXPOSED END OF WIRE.)

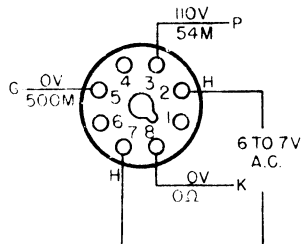
MENTS MADE TO GROUND WITH POWER TO THE RECEIVER

SWITCH IN A.V.C. POSITION FOR THESE MEASUREMENTS.

FRONT PANEL

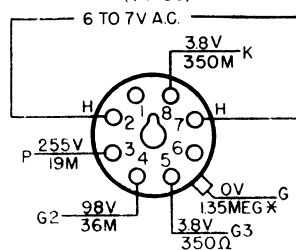
Figure 36. Radio Receiver BC-314-(\*), voltage and resistance chart.

R-F OSC  
V4  
JAN-6C5  
(VT 65)



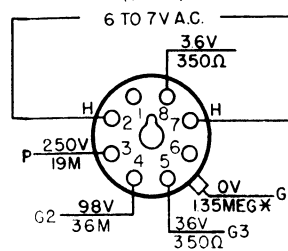
1ST R-F AMPLR  
V1

JAN-6K7  
(VT-86)



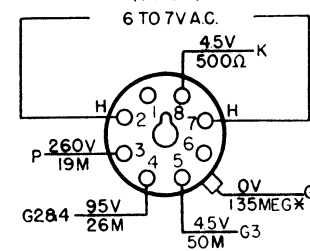
2D R-F AMPLR  
V2

JAN-6K7  
(VT-86)



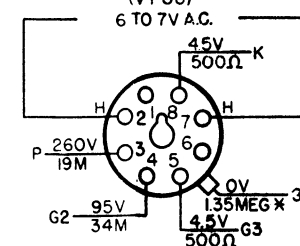
MIXER  
V3

JAN-6L7  
(VT-87)



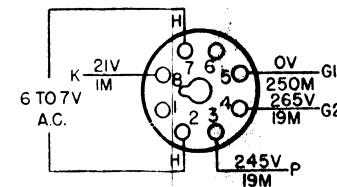
1ST I-F AMPLR  
V5

JAN-6K7  
(VT-86)



2D AUDIO  
V8

JAN-6F6  
(VT-66)



NOTE: ALL MEASUREMENTS MADE WITH OFF-M.V.C.-A.V.C. SWITCH IN M.V.C. POSITION, VOL CONTROL AT MAXIMUM CLOCKWISE POSITION, AND C.W.-OSC. SWITCH IN ON POSITION (BAND A) UNLESS OTHERWISE NOTED.

ALL VOLTAGE MEASUREMENTS ARE D.C. MADE TO GROUND (UNLESS OTHERWISE NOTED) WITH A 1,000 OHM-PER-VOLT METER FROM TOP OF CHASSIS WITH ALL TUBES IN PLACE. (TO MEASURE VOLTAGE, BARE BOTH ENDS OF A PIECE OF INSULATED WIRE, REMOVE TUBE AND WRAP ONE END OF WIRE AROUND DESIRED PIN, REPLACE TUBE AND CHECK VOLTAGE AT EXPOSED END OF WIRE.)

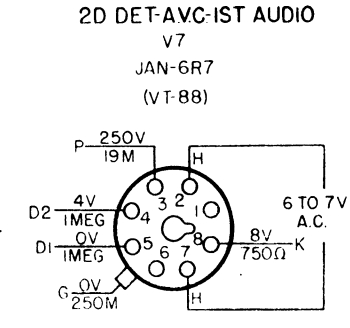
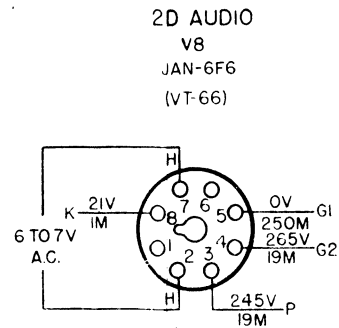
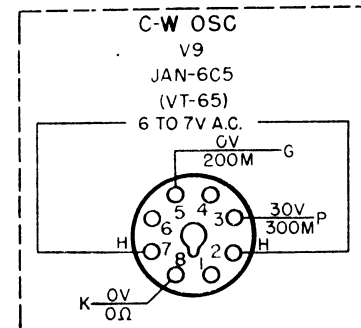
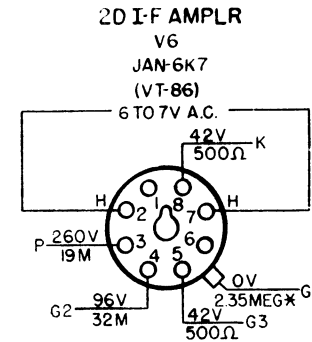
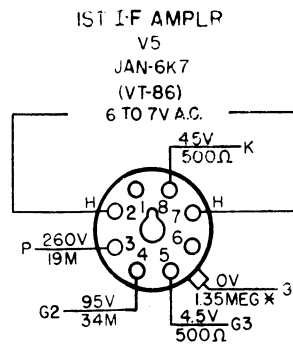
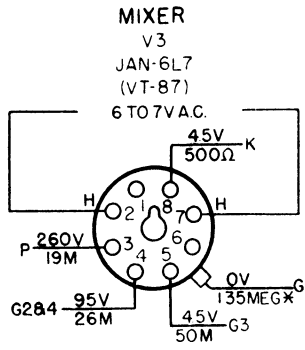
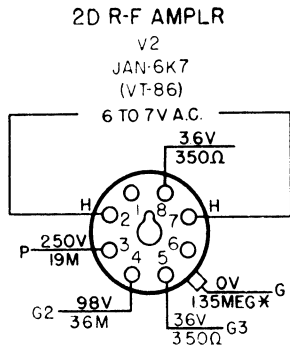
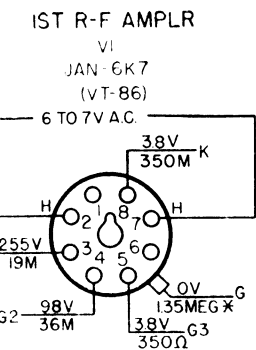
ALL RESISTANCE MEASUREMENTS MADE TO GROUND WITH POWER TO THE RECEIVER TURNED OFF.

\* OFF-M.V.C.-A.V.C. SWITCH IN A.V.C. POSITION FOR THESE MEASUREMENTS.

NOTE: M=1000Ω

FRONT PANEL

Figure 37. Radio Receiver BC-344-(\*), voltage and resistance chart.



SWITCH OFF-M.V.C.-A.V.C. SWITCH IN M.V.C. POSITION, VOL  
CLOCKWISE POSITION, AND C.W.-OSC. SWITCH IN ON  
POSITION OTHERWISE NOTED.

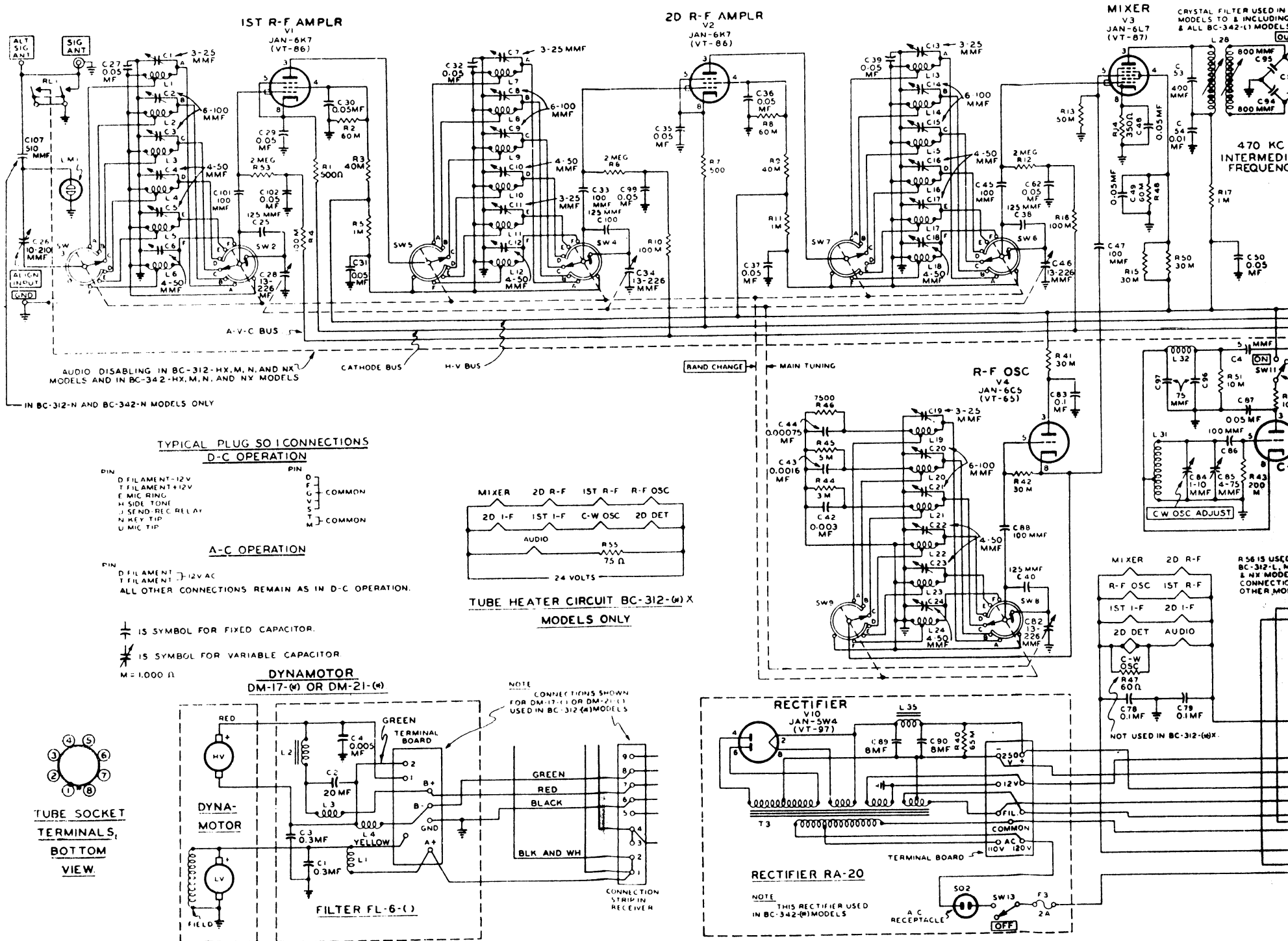
RESISTORS ARE D.C. MADE TO GROUND (UNLESS OTHERWISE NOTED) WITH A  
WIRE FROM TOP OF CHASSIS WITH ALL TUBES IN PLACE.  
RESISTORS ARE BOTH ENDS OF A PIECE OF INSULATED WIRE,  
WIND ONE END OF WIRE AROUND DESIRED PIN, REPLACE TUBE  
(EXPOSED END OF WIRE.)

RESISTORS MADE TO GROUND WITH POWER TO THE RECEIVER  
SWITCH IN A.V.C. POSITION FOR THESE MEASUREMENTS.

FRONT PANEL

Figure 37. Radio Receiver BC-344-(\*), voltage and resistance chart.





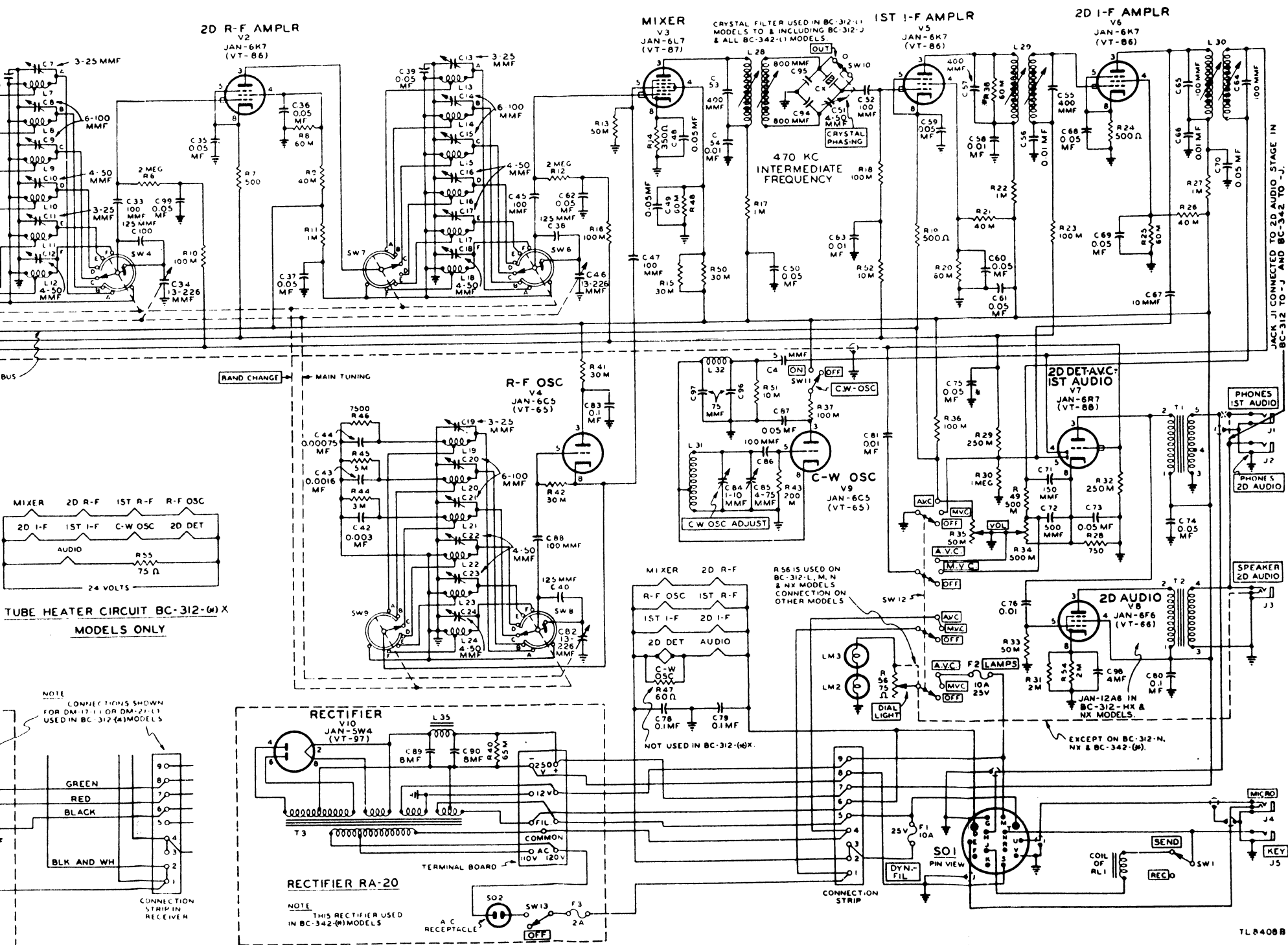
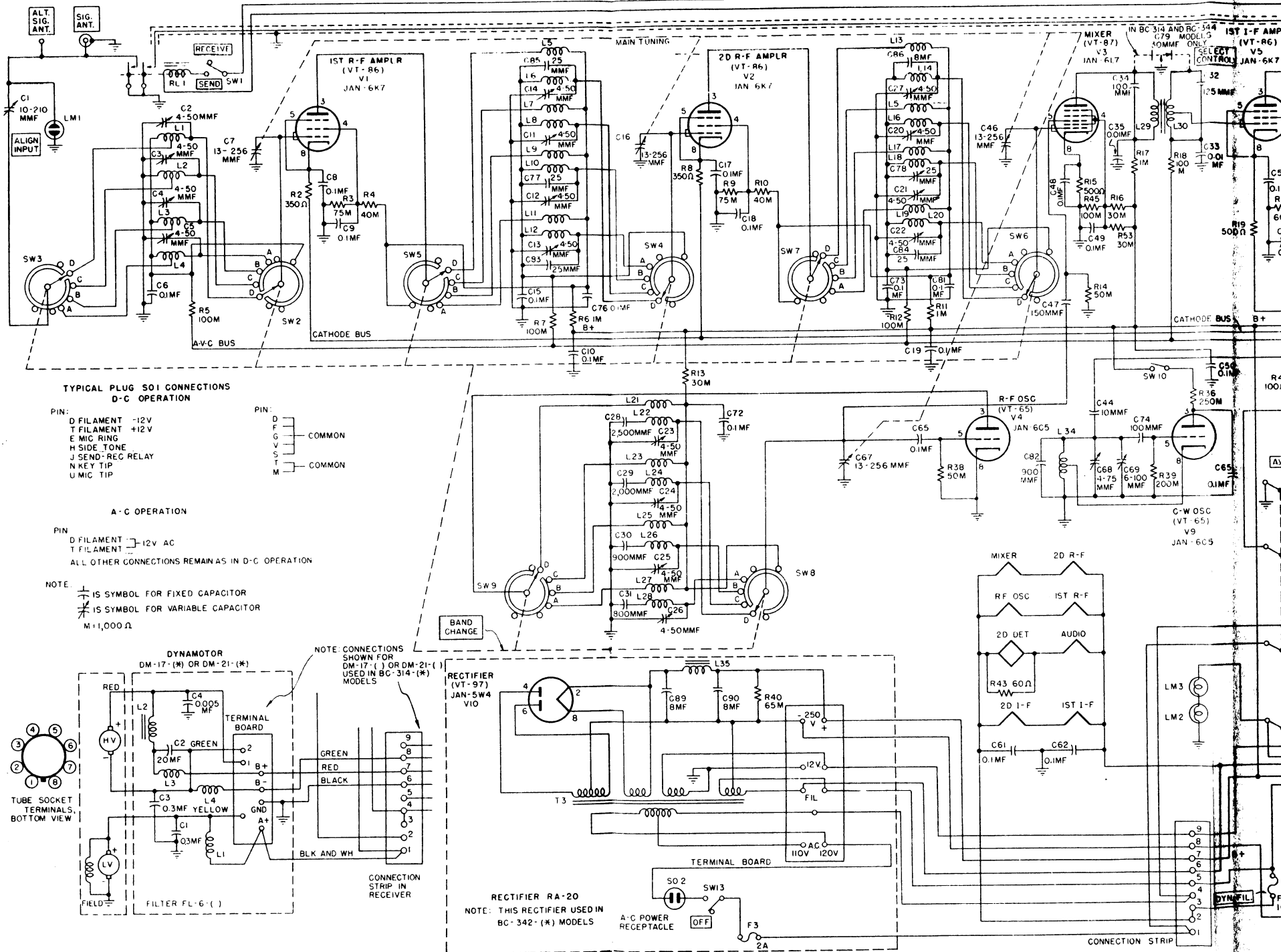


Figure 79. Radio Receivers BC-312-(\*) and BC-342-(\*), schematic diagram.



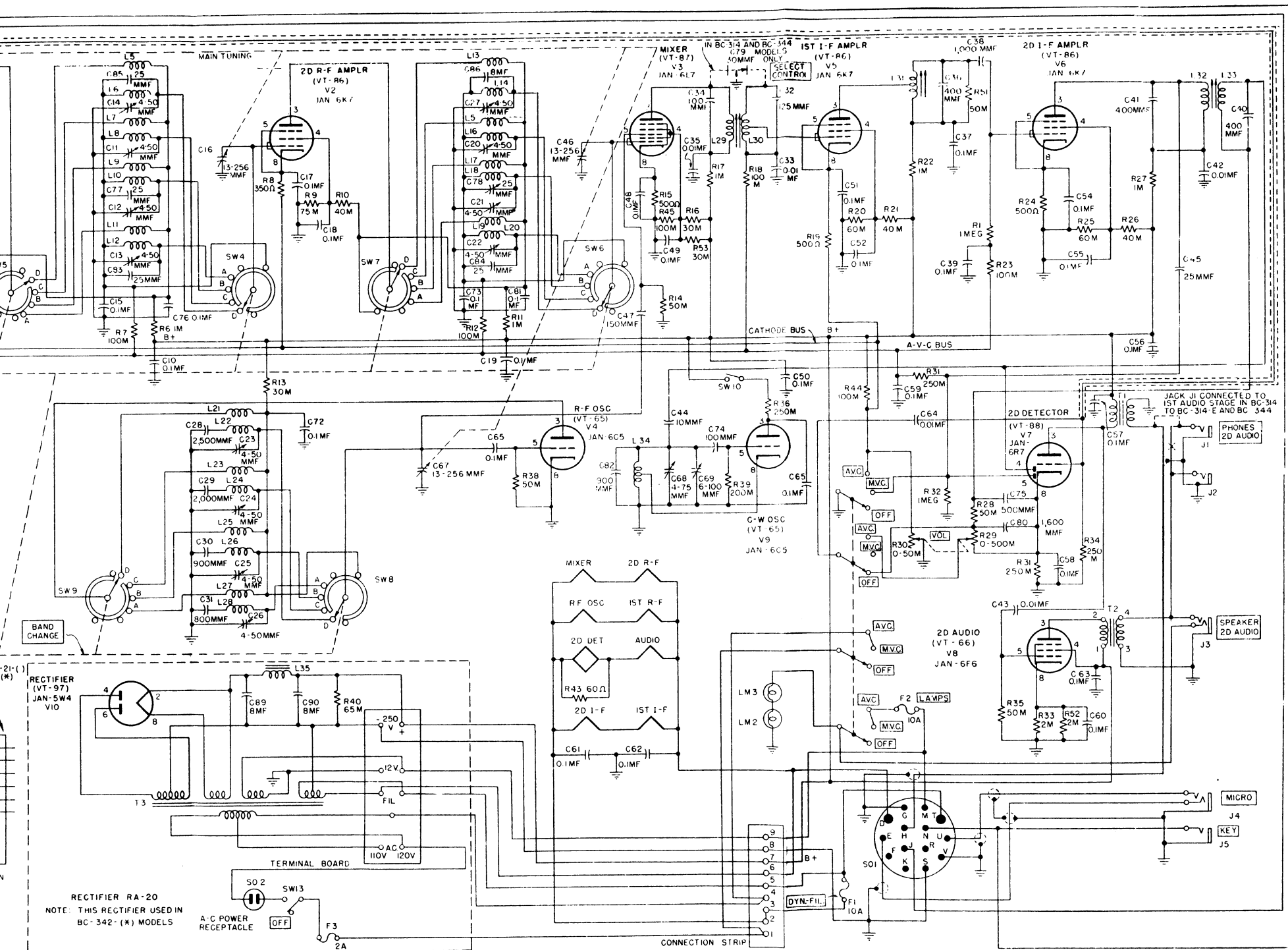


Figure 80. Radio Receivers BC-314-(\*) and BC-344-(\*), schematic diagram.

