AN 08-10-180

HANDBOOK OF MAINTENANCE INSTRUCTIONS

for

RADIO RECEIVERS

BC-224-F, BC-224-K, BC-348-H, BC-348-K, BC-348-L & BC-348-R

Approved 8 JUNE 1943
Revised 20 SEPTEMBER 1944

Published under joint authority of the United States War and Navy Departments and the Air Council of the United Kingdom.

SECURITY NOTICE

FOR U. S. PERSONNEL: This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, 50 U.S.C., 31 and 32, as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law. (AR 380-5) (ARTS 75½ & 76, U.S.N. REGS-1920.)

The information contained in restricted documents and the essential characteristics of restricted materiel will not be communicated to the public or to the press, but may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work.

FOR BRITISH PERSONNEL: For Official Use Only—Not to be communicated to anyone outside His Majesty's Service. Not to be published. The information given in this document is not to be communicated, either directly or indirectly, to the press or to any person not holding an official position in His Majesty's Service.

LIST OF REVISED PAGES ISSUED

NOTE: A heavy black vertical line, to the left of the text on revised pages, indicates the extent of the revision. This line is omitted where more than 50 percent of the page is revised.

Page No.	*Latest Revised Date*
Title page	20 September 1944
ii	20 September 1944
15	20 September 1944
16-16a . ..	20 September 1944

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED AS FOLLOWS:

AAF ACTIVITIES —Submit requisitions to the Commanding General, Fairfield Air Service Command, Patterson Field, Fairfield, Ohio, Attention: Publications Distribution Branch, in accordance with AAF Regulation No. 5-9. Also, for details of Technical Order distribution, see T. O. No. 00-25-3.

NAVY ACTIVITIES —Submit requests to the Chief, Bureau of Aeronautics, Navy Department, Washington, D. C.

BRITISH ACTIVITIES —Submit requirements on Form 294A, in duplicate, to the Air Publications and Forms Store, New College, Leadhall Lane, Harrogate, Yorkshire, England

UNSATISFACTORY REPORT

FOR U. S. ARMY AIR FORCE PERSONNEL:

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

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

FOR U. S. NAVY PERSONNEL:

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

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

FOR BRITISH PERSONNEL:

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

DESTRUCTION OF ABANDONED MATERIEL IN THE COMBAT ZONE

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

Means:

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

Procedure:

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

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS—Continued

TABLE OF CONTENTS

TABLE OF CONTENTS—Continued

SAFETY NOTICE

OPERATING PERSONNEL ARE WARNED NOT TO MAKE ANY ADJUSTMENTS INSIDE OF THIS EQUIPMENT UNTIL THE POWER SUPPLY HAS BEEN TURNED *OFF*.

FIRST AID

PERSONNEL ENGAGED IN THE INSTALLATION, OPERATION AND MAINTENANCE OF THIS EQUIPMENT OR SIMILAR EQUIPMENT ARE URGED TO BECOME FAMILIAR WITH THE FOLLOWING RULES, BOTH **IN THEORY AND IN THE PRACTICAL APPLICATION THEREOF.** IT IS THE DUTY OF EVERY RADIOMAN TO BE PREPARED TO GIVE ADEQUATE FIRST AID AND THEREBY PREVENT AVOIDABLE LOSS OF LIFE. YOUR OWN LIFE MAY DEPEND ON THIS.

Do These Three Things First in Any Emergency Requiring First Aid

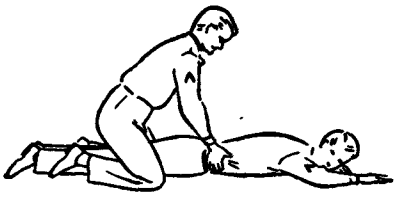
1. Send for a doctor or carry the victim to a doctor.
2. Keep victim warm and quiet and flat on his back.
3. If breathing has stopped, apply artificial respiration. Stop all serious bleeding.

When, from any cause whatever, breathing has stopped, apply artificial respiration immediately and continue WITHOUT STOPPING until normal breathing returns, or a doctor pronounces the victim dead. SPEED IN BEGINNING ARTIFICIAL RESPIRATION IS ESSENTIAL.

The Prone Pressure Method of Artificial Respiration

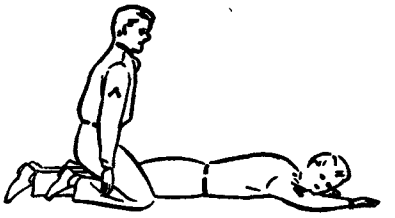
If Due to Electric Shock

1. PROTECT YOURSELF with DRY insulating material.
2. BREAK THE CIRCUIT by opening the power switch or pulling the victim free of the live conductor. DON'T TOUCH THE VICTIM WITH YOUR BARE HANDS UNTIL THE CIRCUIT IS BROKEN.
3. SPREAD DRY BLANKET ON THE GROUND, and roll victim to center of blanket with his arms extended over his head, so that he lies FACE DOWN on blanket.
4. BEND ONE OF THE VICTIM'S ARMS at the elbow and rest victim's cheek on the back of his hand.
5. REMOVE FALSE TEETH, gum, candy, tobacco, food, etc., from victim's mouth.
6. LOOSEN ALL TIGHT CLOTHING, as belts or collars.
7. COVER VICTIM LOOSELY by wrapping the ends of the blanket around him.
8. STRADDLE VICTIM across thighs.
9. PLACE THE PALMS OF YOUR HANDS ON VICTIM'S BACK so that the little fingers of each hand just touch the victim's lowest ribs.



(1) Straddle victim across thighs. Place the palms of your hands on the victim's back so that the little fingers of each hand just touch the victim's lowest ribs.

(2) Keep your arms stiff and straight and swing your body forward, allowing your weight to bear down on victim. DO NOT PUSH OR USE FORCE.



(3) Swing back at once to relieve pressure, and then continue the rhythmic application of alternate pressure and release.

Blanket is not shown in above drawings for the sake of clarity.

10. KEEP YOUR ARMS STIFF AND STRAIGHT and swing your body forward, allowing your weight to bear down on the victim.
11. DO NOT PUSH OR USE FORCE.
12. SWING BACK AT ONCE TO RELIEVE PRESSURE.
13. REPEAT Number 10.
14. REPEAT Number 12.
15. CONTINUE as above, maintaining a steady rhythm until victim regains consciousness or is pronounced dead by a doctor.
16. CONTINUE ARTIFICIAL RESPIRATION even after victim begins to breathe, and until he becomes conscious.
17. IF BREATHING STOPS AGAIN, continue artificial respiration at once.
18. DO NOT GIVE UP HOPE of reviving the victim. Four hours or more of continuous application of artificial respiration may be required before consciousness returns.
19. NEVER TRY TO FORCE LIQUIDS down an unconscious person's throat. He will drown.
20. ALWAYS WAIT UNTIL CONSCIOUSNESS RETURNS before administering liquid stimulants.
21. RECOMMENDED STIMULANTS ARE: Hot, black coffee. Strong, hot tea. Aromatic spirits of ammonia, one teaspoonful to a glass of water.
22. GIVE ONLY ONE STIMULANT, which should be sipped slowly.
23. ALCOHOLIC DRINKS are not recommended, unless absolutely nothing else is available.
24. WHEN VICTIM HAS RETURNED TO CONSCIOUSNESS, allow him to lie quietly where he is for at least one hour, taking care that he is well covered and free from worry.
25. IF POSSIBLE, CARRY, OR HAVE HIM CARRIED TO A DOCTOR.

WOUNDS

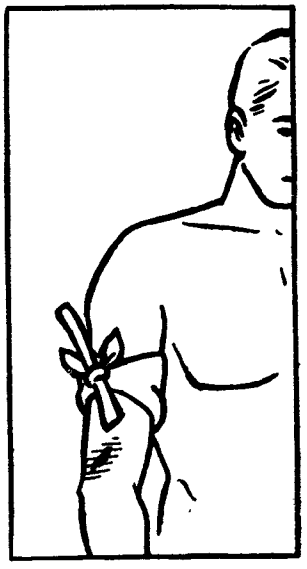
Neglected wounds can have serious consequences. Any break in the skin is a wound. Paint small cuts and scratches immediately with TINCTURE OF IODINE. Deep cuts and wounds should be KEPT CLEAN but DO NOT use Tincture of Iodine on them. Washing AROUND and AWAY FROM the wound with ordinary soap and water, if no other antiseptic is available, is recommended. Other antiseptics for use on deep wounds are: Violet gentian, Potassium permanganate, Tincture of Merthiolate, or ordinary baking soda and water. Cover the wound with a sterile gauze dressing and hold in place with adhesive tape or a strip of gauze.

In cases of serious bleeding, when an artery has been cut, firm pressure is necessary to stop the flow of blood. Arterial bleeding is BRIGHT RED and comes from the wound in SPURTS, with each beat of the heart. Bleeding from a vein is DARK RED and flows steadily. Pressure is not often needed for venous bleeding.

Pressure is applied ABOVE the wound, or between the WOUND AND THE HEART, to stop ARTERIAL BLEEDING. Pressure is applied BELOW the wound, or AWAY FROM THE HEART to stop VENOUS BLEEDING.

Pressure is best applied and maintained by means of a TOURNIQUET.

A TOURNIQUET is a strip of cloth, bandage, or other material, tied ABOVE the wound. Tie a simple, double knot in the cloth and place a strong



Tourniquet in position ABOVE wound.

stick or other rigid member in the loop thus made, then tighten the knot by pulling the ends of the cloth.

With the rigid member thus held firmly in place, twist it, until the bleeding stops.

DO NOT maintain such pressure longer than 15 minutes at a time.

IF BLEEDING CONTINUES after loosening tourniquet, allow the blood to flow for about 30 to 60 seconds and then re-apply pressure. Continue until bleeding stops.

AFTER BLEEDING HAS STOPPED, the wound should be carefully covered with a sterile dressing. DO NOT TOUCH WOUND OR DRESSING WITH DIRTY HANDS.

Keep the victim LYING FLAT ON HIS BACK, AND WELL COVERED. DO NOT LET HIM SEE HIS WOUND. Divert his thoughts from himself.

Obtain the services of a DOCTOR AS SOON AS POSSIBLE.

BURNS

Burns, whether caused by contact with high voltage electrical equipment, fire, or friction, require immediate attention.

1. Apply AT ONCE any one of the following:
   a. Tannic acid jelly.
   b. Butesin picrate.
   c. Paste made with baking soda and water.
   d. Very strong, cool tea.
2. Applications should be LIBERAL and the burned area covered with STERILE GAUZE.
3. If clothing sticks to the burned areas, DO NOT ATTEMPT TO REMOVE IT. Treat burn as above.
4. Keep the victim WELL COVERED and LYING FLAT ON HIS BACK. Soothe and reassure him.
5. Obtain the services of a DOCTOR AS SOON AS POSSIBLE.

Always obtain the services of a doctor as quickly as possible.

Figure 1—Radio Receiver BC-348-(*) or BC-224-(*)

HANDBOOK OF

MAINTENANCE INSTRUCTIONS

for

RADIO RECEIVERS BC-224-F, BC-224-K, BC-348-H, BC-348-K, BC-348-L & BC-348-R

SECTION I

GENERAL DESCRIPTION

SPECIAL NOTICE

Radio Receivers BC-224-F, 224-K, 348-H, 348-K, 348-L, 348-R are essentially alike. Therefore, reference will be made throughout the book to these Receivers as follows: "Radio Receiver BC-224-(*) or BC-348-(*)."

Reference to the dynamotors is mentioned in the same manner (Dynamotor DM-24-(*) and Dynamotor DM-28-(*), the asterisk indicating that these units are mentioned collectively.

1. GENERAL.

Radio Receivers BC-224-F, BC-224-K, BC-348-H, BC-348-K, BC-348-L and BC-348-R are locally controlled, 8-tube, 6-band superheterodyne receivers for use in U. S. Army aircraft. Each covers the frequency range .2 to .5 megacycles, and 1.5 to 18 megacycles. The receivers are not intended for remote control and no features or units have been provided for remote operation. These receivers are capable of voice, tone and c-w reception with manual or automatic volume control. The receivers, when equipped with headsets, tubes, dial lights and fuses, and with the antenna, ground and primary power source connections properly made, become complete and operative equipments. All coils and the high voltage power supply units are built in the receivers. The total power consumed by each receiver is 56 watts. The radio receivers are essentially alike. Electrically, the filament circuit and high voltage supply units differ to permit Radio Receiver BC-224-(*) to operate from a 14-volt power source and Radio Receiver BC-348-(*) from a 28-volt power source. A dowel pin fastened to the chassis of Radio Receiver BC-348-(*), prevents accidental installation of the 14-volt dynamotor in the 28-volt receivers. There are minor mechanical differences between the 12-volt receiver and the 28-volt receiver, incidental to supporting electrical parts.

2. COMPONENT UNITS.

The following is a list of the component units of Radio Receiver BC-348-(*) or BC-224-(*):

	Size in Inches	Weight in Pounds
1 Radio Receiver BC-348-(*) (Includes Dynamotor DM-28-(*)	18 x 10½ x 9½	35.5
or 1 Radio Receiver BC-224-(*) (includes Dynamotor DM-24-(*).		
1 Mounting FT-154-(*) (Does not include Plug PL-P103 or PL-Q103)	18 x 8½ x 1⅜	3.81
1 Plug PL-P103	2 15/16 x 2 5/32 x 1 9/16	.34
or Plug PL-Q103	3 x 2 5/32 x 2 1/16	.41
1 Set of 9 Tubes, 2 Pilot Lights, 1 Fuse		.563

3. CABINET.

The receiver cabinet is of spot-welded aluminum construction with black wrinkle finish and is embossed on the top and back to add rigidity and strength. The panel (front) end allows the removal of the receiver chassis, which runs on the stainless steel strips mounted in the end corners of the cabinet. Two tapped inserts are placed in the rear to receive the thumb screw rods which secure the chassis in the cabinet. A cutout in the rear bottom permits the entrance of Plug PL-P103 or PL-Q103. An aluminum casting is mounted over this cutout and acts as a seal between the cabinet and the chassis. The bottom of the cabinet is reinforced by a stainless steel plate to which are attached the four mounting studs for securing the cabinet on Mounting FT-154-(*). Two snap slides are mounted on the downward projection of the front of the stainless steel plate. A phosphor bronze spring clip is riveted to the rear inside face of the cabinet, providing a firm electrical connection between the cabinet and chassis. This connection acts as a low resistance shorting path for circulating ground currents, thus preventing electrical interference, from the dynamotor unit, from reaching the input circuits of the receiver.

4. CHASSIS.

The chassis consists of an aluminum casting mounted between two end plates of sheet aluminum, which serve as runners and guides when placing the chassis in the cabinet. The end plates are provided with cutouts to facilitate servicing.

5. PANEL.

The front panel is attached to the chassis and to the end plates by screws. Two handles are mounted on the panel. Two thumb screw rods, which secure the chassis in the cabinet, pass through the lower part of these handles. A cutout, covered by a plate, is provided to give access to the wiring under the r-f tube shelf for servicing and maintenance. The following panel items are mounted on the front of the panel:

Antenna and ground binding posts; antenna alignment control ANT. ALIGN; dial lights rheostat control; DIAL LIGHTS; tuning control, TUNING; band switch control, BAND SWITCH; dial window housing which covers the dial lights; beat frequency control, BEAT FREQ.; crystal filter control, OUT-CRYSTAL-IN; volume control, INCREASE VOL.; AVC-OFF-MVC control; C.W. OSC. control; and two telephone jacks, TEL.

6. DIAL AND MASK ASSEMBLY.

The dial and mask assembly is mounted on an aluminum casting which carries the gearing of the tuning condenser drive and the detent. This unit is attached to the front panel and connected to the band switch drive shaft through a coupling of the Oldham type. The dial is divided into six frequency bands. The dial and tuning condenser are so geared to the tuning control shaft that the tuning condenser covers the frequency range indicated on the dial for each band in approximately 90 revolutions of the tuning knob. Split gearing is used throughout to minimize backlash. A positive stop is provided to prevent undue pressure on the gears and to limit the travel of the dial and the tuning condenser.

A mask with suitably located and marked windows is mounted before the dial. The mask is controlled by the band change switch and is positioned by the detent.

7. R-F AND OSCILLATOR UNITS.

The antenna, r-f, first detector and oscillator subassemblies are mounted on the right rear portion of the chassis. Each subassembly consists of the r-f coils, trimmers and band switch wafers with the necessary fixed capacitors and resistors. Passing through all of these subassemblies is the band switch drive shaft which is pulled out from the right end of the receiver chassis before a subassembly is removed.

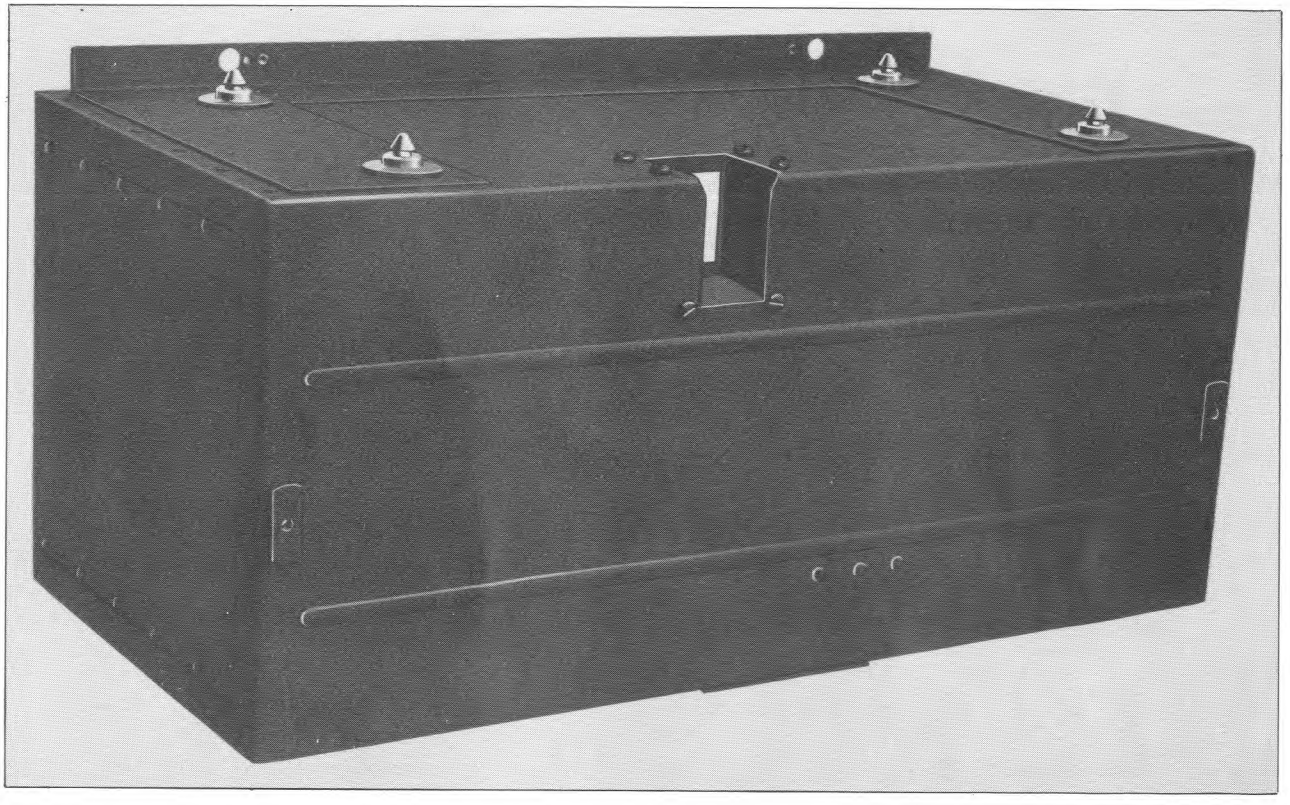


Figure 2—Bottom and Back View of Cabinet Radio Receiver BC-348(*) or BC-224-(*)

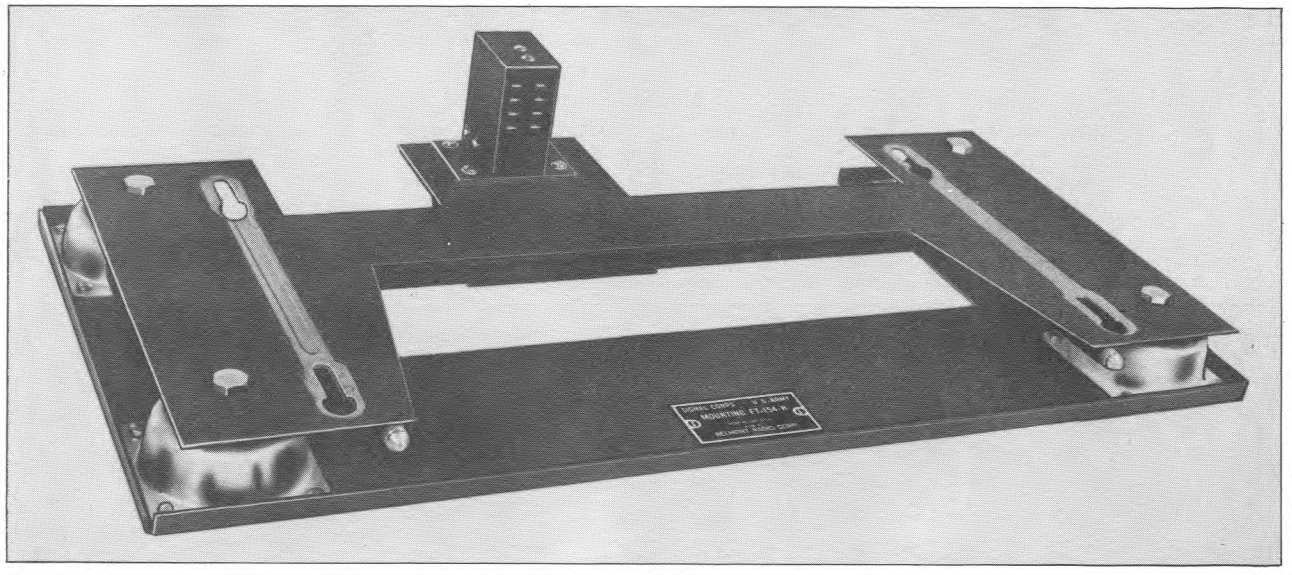


Figure 3—Mounting FT-154-L, FT-154-T, FT-154-H, or FT-154-K

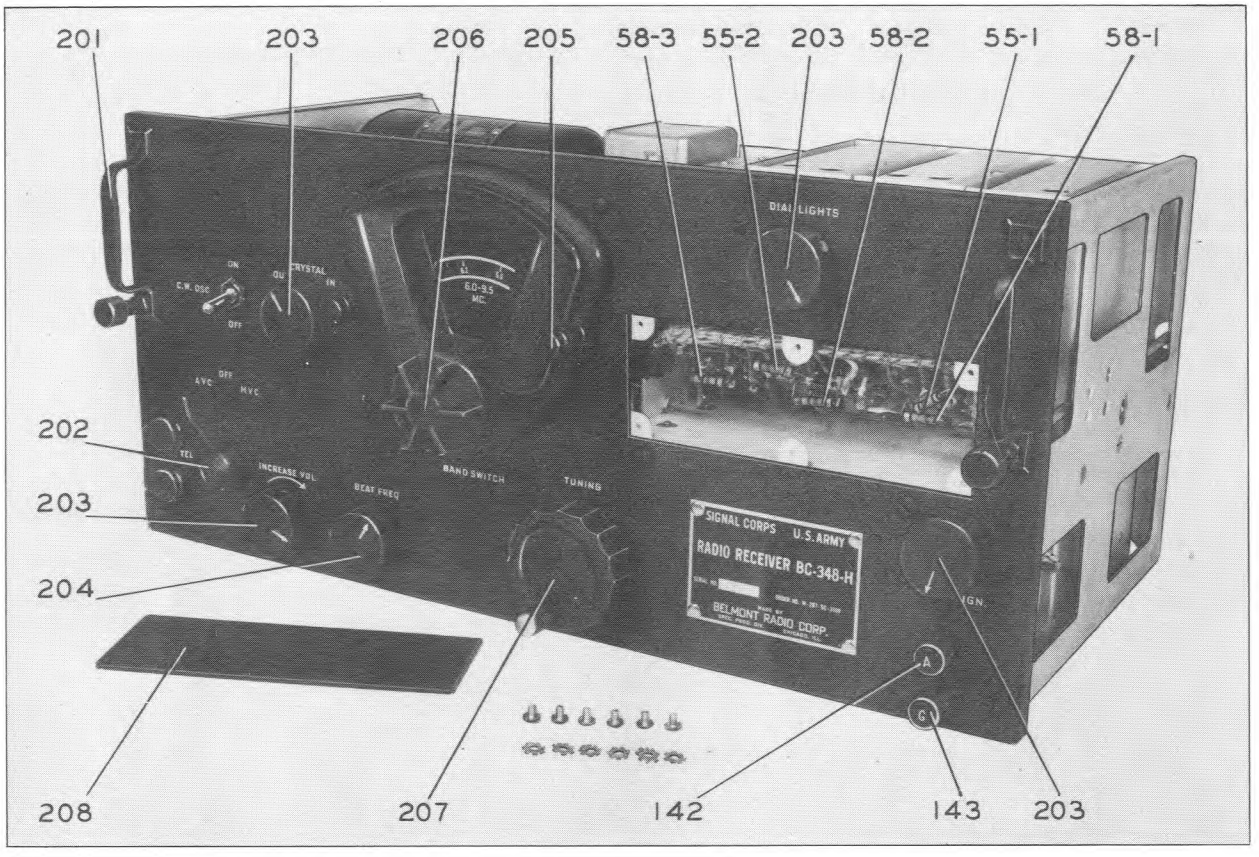


Figure 4—Radio Receiver BC-348-(*) or BC-224-(*), Front View of Chassis with the Tube Shelf Cover Removed

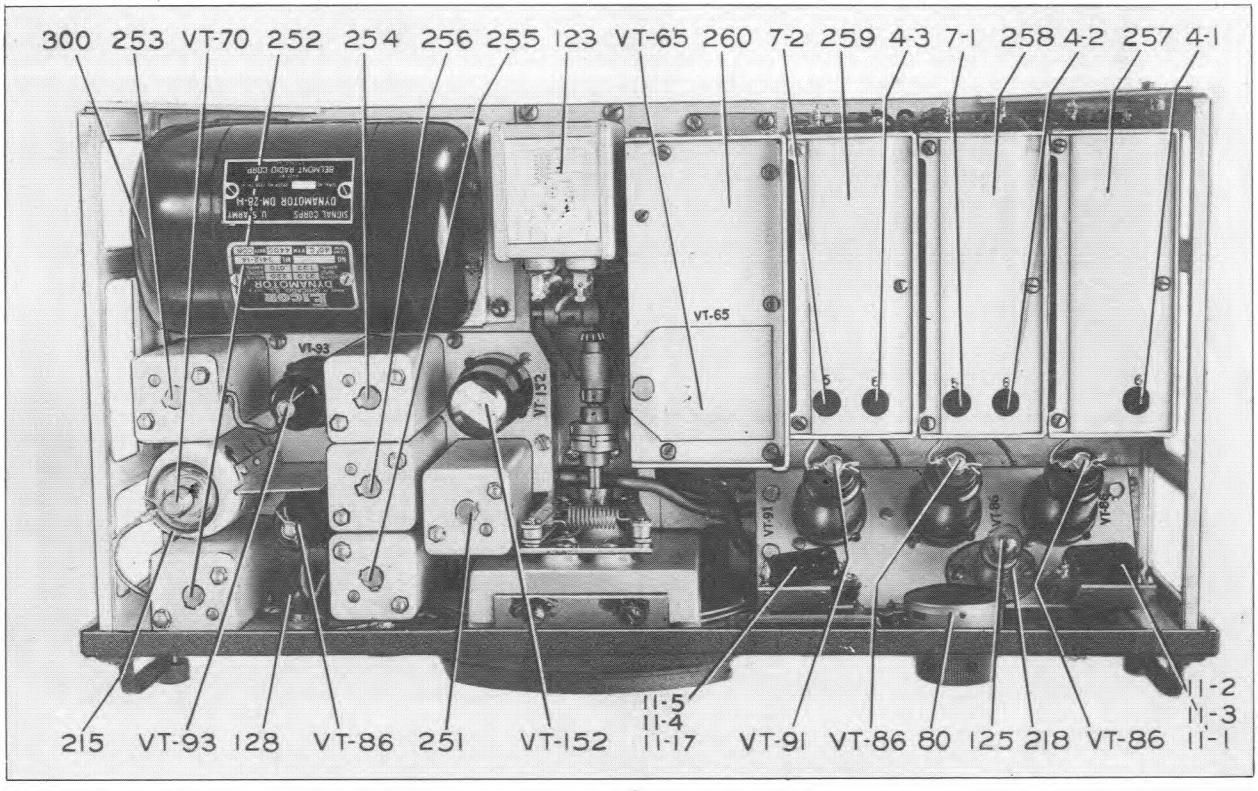


Figure 5—Radio Receiver BC-348-(*) or BC-224-(*), Top View of Chassis

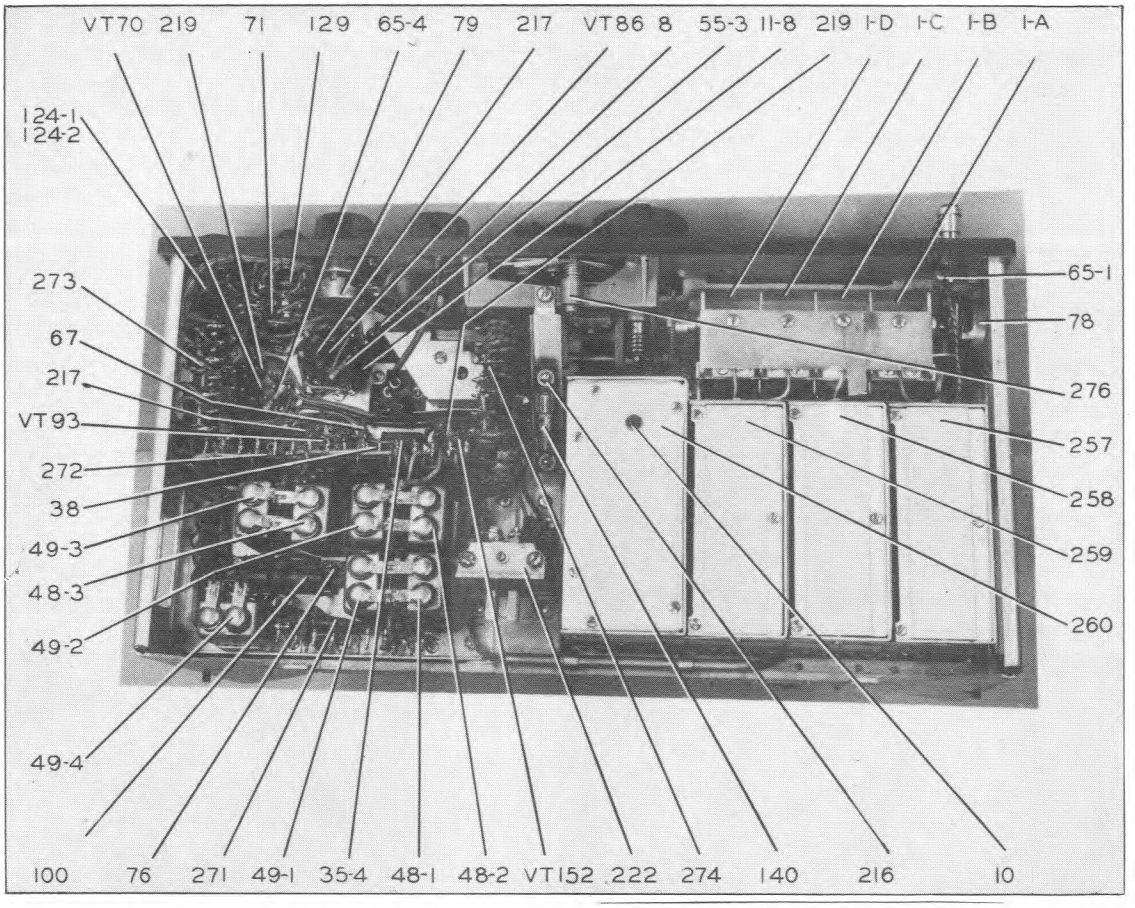


Figure 6—Radio Receiver BC-348-(*) or BC-224-(*), Bottom View of Chassis

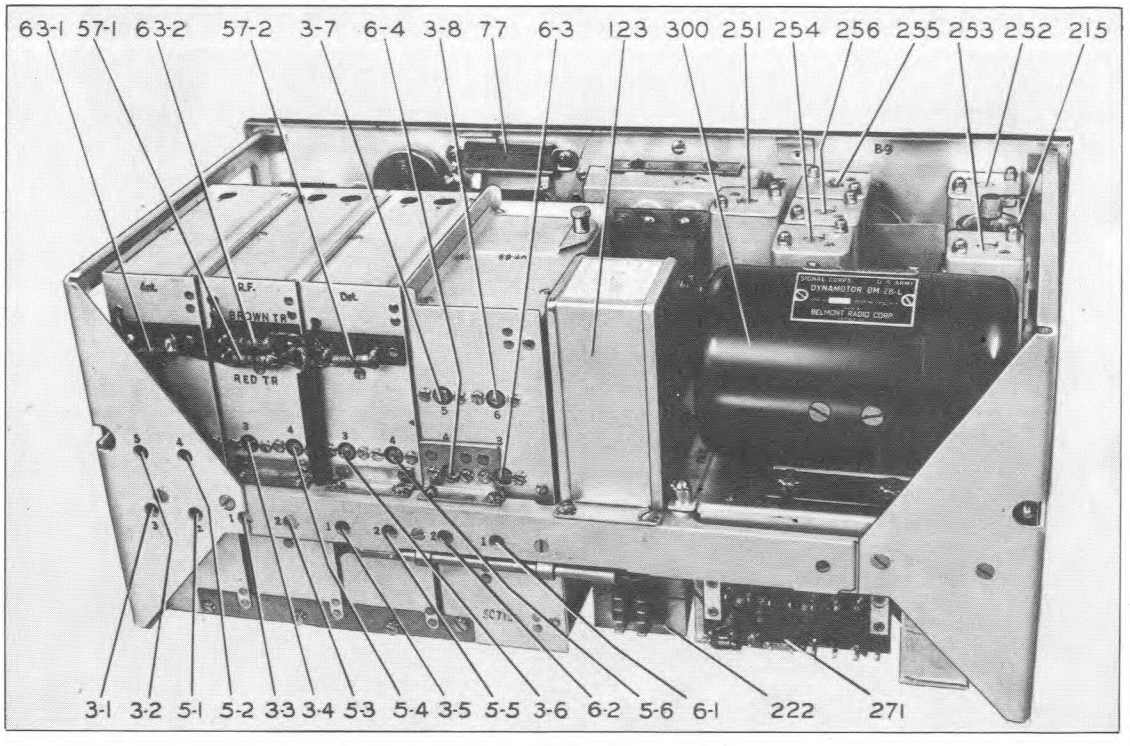


Figure 7—Radio Receiver BC-348-(*) or BC-224-(*), Rear View of Chassis

8. I-F TRANSFORMERS, BEAT FREQUENCY OSCILLATOR AND CRYSTAL FILTER.

These units are mounted on the left front portion of the chassis. The variable capacitor of the beat frequency oscillator is controlled through a flexible shaft from the front panel.

9. MOUNTING FT-154-(*).

The mounting is constructed of stainless steel except for the aluminum base which carries the mounting holes and the bases of four shock absorbers. To the top of the shock absorbers is fastened the stainless steel support, which provides for the attachment of the receiver cabinet by means of studs and snapslides. Grooves are provided in the stainless steel support to facilitate the engagement of the studs of the cabinet with the mounting.

10. PLUG PL-P103 AND PLUG PL-Q103.

The plug, attached to the mounting by screws, is provided with eight terminals which are accessible upon removal of the rear cover of the plug housing. Plug PL-P103 is provided with a straight outlet. A right angle outlet mounted in any of three positions, right, left or back, may be used with Plug PL-Q103. The positions and uses of these outlets with the plug are clearly shown on the outline dimensional drawing in Section VIII (Figure 37).

11. ILLUMINATION.

The receiver tuning dial is illuminated by means of two dial lights (Lamps LM-27) controlled by the DIAL LIGHTS rheostat. This rheostat has an off position when the illumination is not desired. The dial lights are located beneath a readily removable housing which permits the easy replacement of a dial lamp during flight.

SECTION II

INSTALLATION AND ADJUSTMENT

12. INSTALLATION.

a. **MOUNTING.**—Permanently attach mounting FT-154-(*) to the rigid members of the plane. Allow sufficient clearance on all sides to permit free action of the shock absorber mountings. See Figure 38 for mounting dimensions and drilling plan.

b. **POWER CONNECTIONS.**—Connect the leads to the primary power source as shown in Figure 8. The parellel connected leads from plug terminals 3 and 4 may be replaced by a single conductor with a cross section equivalent to the two separate leads. Similarly, the parallel connected leads from plug terminals 7 and 8 may be replaced by a single conductor of equivalent cross sectional area. The power source to which these leads are connected should be 28 volts for Radio Set SCR-348-(*) and 14 volts for Radio Set SCR-224-(*).

c. **TRANSMITTER CONNECTIONS.**—For protection of the receiver when the associated transmitter is being used, wire leads from plug terminals 2 and 6 to contacts on the transmitter relay. If the transmitter is removed from the installation, or if the receiver is being installed without an associated transmitter, the wires from plug terminals 2 and 6 must be connected together to have the receiver operate.

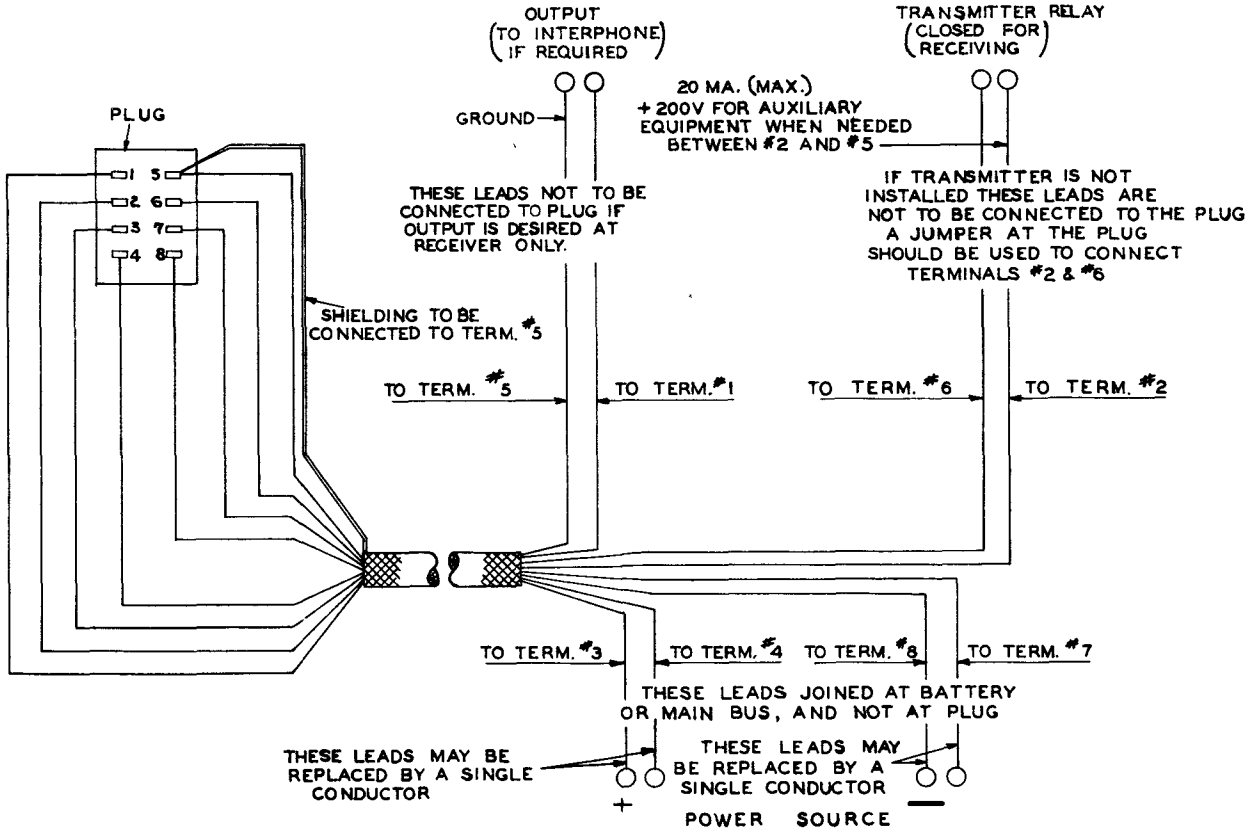


Figure 8—Plug Connections

d. **OUTPUT CONNECTIONS.**—The output of the receiver is accessible at terminals 1 and 5 and at the two front-panel jacks. Wire leads from these terminals to the interphone system or as otherwise desired. If the output is desired only at the receiver, it should be taken directly from the phone jacks and no connections made to plug terminals 1 and 5. As normally connected, the output is matched for a 4000 ohm load. To match the low impedance loads, around 300 ohms, change the taps on output transformer 123-A from HI to LO.

e. **BONDING AND SHIELDING.**—During installation, make sure the engine ignition system, generator, and other possible causes of disturbance are properly shielded and that bonding of metal parts is, or has been, carefully carried out.

f. **MOUNTING OF RECEIVER.**—When proper wiring connections have been made, place the receiver on its mounting with the studs on the bottom of the cabinet entering the slots of the mounting. See that the cabinet is well down on the mounting and that all four studs are fully seated. Push the cabinet towards the rear, making sure that the connector fits securely into the plug. Secure in place by the snapslides on the lower front corners of the cabinet.

g. **SAFETY WIRE.**—Safety wire the holes of the snapslide assemblies taking care not to twist the wires too tightly.

h. **GROUND.**—Connect the ground binding post G by a short, direct, low resistance lead to some grounded metal portion of the plane and solder at that point, if practicable. The lead should have enough slack to prevent vibration being transmitted to the receiver.

i. **ANTENNA.**—The antenna circuit aligning capacitor is such that the antenna circuit can be properly aligned with antennas ranging in effective capacitance from 50 to 200 micromicrofarads. Satisfactory performance can be obtained with practically any type of mast, fixed or trailing wire antenna. In extreme cases (with very short mast or very long training wire) optimum setting of the antenna alignment control may not be obtained. In general, the most effective antenna is one whose length away from the grounded metal fuselage is the greatest. Locate the receiver as near as possible to the lead-in insulator. Connect it from the insulator to the antenna binding post A by a copper wire, allowing enough slack to prevent vibration being transmitted to the receiver.

13. PREPARATION FOR USE.

The receiver is a self-contained unit, having its high voltage power supply and all coil sets built in. **Before installing the tubes, check them with the required tube checker. Be sure that the proper tubes are installed and are firmly seated in their sockets. Make sure that the tube shield is properly seated, and that grid caps fit tightly on the tubes.** Check dial lights and fuse. See that they are properly and securely placed. Make sure that the leads to the dynamotor unit are properly connected at the dynamotor terminal strip and that the screws holding them in place are tight. With the receiver AVC-OFF-MVC switch in the MVC position and the band switch on band 1, by means of the tuning control, tune in a signal of approximately 500 kilocycles to maximum signal strength. Reduce volume by means of INCREASE VOL. knob until signal is just audible. Adjust the ANTENNA ALIGN. control to give maximum volume.

SECTION III

OPERATION

14. PROCEDURE.

a. **POWER SWITCH.**—Power to the receiver is controlled by the receiver AVC-OFF-MVC switch. With this switch in the OFF position no power is supplied to the receiver. When switched to either the MVC or AVC position, power from the primary source is supplied to the tube heaters and dynamotor, placing the equipment in operation. The screen grid voltage supply leads are carried through the power plug to the keying relay of the associated transmitter where the circuit is opened when actually transmitting. (Refer to paragraph 12c.)

b. **OPERATING TEST.**—When the receiver has been completely installed, an operating test should be made as follows:

(1) Plug a headset into one of the jacks marked TEL. Set receiver switch to MVC. The dynamotor should start, and, after the tubes have warmed up (approximately 30 seconds), the INCREASE VOL. knob should be advanced until a slight background noise is heard. Set band switch to the frequency band in which test signals are available.

(2) Using the tuning knob and with reference to the calibrated scale on the dial, tune in the desired signal.

NOTE

All tuning should be done on MVC with the volume control advanced only enough to give the desired signal strength. In the absence of a signal, the setting of the volume control can be judged by the loudness of the background noise. On MVC, with the INCREASE VOL. control set at maximum, very strong carrier waves will block the receiver and intelligible signals cannot be received.

(3) Set the receiver switch to AVC. The desired signal should still be heard.

(4) With the BEAT FREQ. adjustment at zero beat position (arrow on knob pointing up), turn the C. W. OSC. switch to ON. An audible beatnote should be heard which should vary in pitch when the beat frequency adjustment is changed.

(5) With the C. W. OSC. still ON, throw the CRYSTAL switch to IN. Noise should be greatly reduced. The signal can be tuned out by a much smaller movement of the TUNING control knob than it can when the CRYSTAL switch is in the OUT position.

(6) Turn the DIAL LIGHTS rheostat and observe if control of illumination is secured with both dial lights functioning.

(7) Make a pre-flight check with the airplane engine running. An increase of background noise when the engine starts, indicates imperfect shielding, imperfect bonding, faulty generator regulator, faulty generator, open filter capacitors, or a combination of these faults.

(8) Always turn the receiver switch to the OFF position when the receiver is not being used.

c. **OPERATING ROUTINE.**

(1) CONTROLS.

(a) **Antenna and Ground Binding Posts.**—The antenna is connected to the binding post marked A, and the ground lead to the binding post marked G.

(b) **Ant. Align. Control.**—This control varies a capacitor for aligning the input circuit to a given antenna. This adjustment should be made with the receiver tuned to approximately 500 kilocycles.

(c) **Tuning Control.**—This control varies the setting of the 4-gang variable tuning capacitor.

(d) **Band Switch Control.**—This control selects the desired frequency band as indicated on the dial mask.

(e) **Dial Lights Control.**—This knob controls the intensity of dial illumination and is provided with an off position.

(f) **C. W. Osc. Switch.**—This toggle switch controls the operation of the c-w oscillator as well as the avc time constant for c-w reception.

(g) **Crystal Switch.**—This control permits the insertion of an i-f crystal filter when extreme selectivity is desired.

(h) **Beat Freq. Control.**—This control permits vernier adjustment of the c-w oscillator frequency. In tuning set it near the zero beat position (arrow on knob pointing up).

(i) **Increase Vol. Control.**—This control is for sensitivity adjustment on MVC operation and output level adjustment on AVC operation. When switching from MVC to AVC or vice versa, it will generally be necessary to readjust this control to maintain a given volume level. Only under certain conditions of signal strength will the volume level remain unchanged.

(j) **AVC-OFF-MVC Switch.**—This three-position switch in the OFF position removes all power from the receiver. In the MVC position the receiver is operative with manual volume control. In the AVC position the automatic volume control is functioning.

(k) **Tel. Jacks.**—These are open circuit jacks providing connections to the headset.

(2) MODULATED SIGNAL RECEPTION.

(a) Throw the AVC-OFF-MVC switch to MVC and set other switches and controls as follows: C. W. OSC—OFF; CRYSTAL—OUT; ANT. ALIGN. set as in Paragraph 13.

(b) Set the BAND SWITCH to the desired frequency band and adjust the TUNING control to the desired frequency. It is of great importance that this tuning be accomplished with the receiver switch in the MVC position.

NOTE

The AVC position should not be employed while tuning in a signal. Tuning should always be done in the MVC position and with the INCREASE VOL. control advanced only as far as required for a comfortable output level.

(c) Increase the INCREASE VOL. control until the desired signal is heard or the background noise attains a fair level.

(d) Adjust the TUNING control until maximum output from the desired signal is obtained. This insures correct alignment or proper tuning of the receiver.

(e) If automatic volume control is desired, switch to the AVC position and readjust the INCREASE VOL. control for the desired output level.

(3) C-W RECEPTION.

(a) The procedure is the same as outlined above with the exception that the C-W OSC. switch is ON and tuning accomplished with the BEAT FREQ. control set near the zero beat position (arrow on knob pointing up).

(b) After tuning in the desired signal the BEAT FREQ. control may be varied and the frequency of the beat note adjusted as desired.

(c) Automatic volume control may be employed for c-w reception by switching to the AVC position and readjusting the volume control.

(d) When extreme selectivity is desired to minimize interference, the CRYSTAL filter is switched IN. A slight readjustment of the tuning, beat frequency and volume controls may be required to secure the desired beatnote frequency and volume level.

NOTE

The crystal band pass filter is intended primarily for use in c-w reception. However, the added selectivity may at times prove helpful in receiving modulated signals through heavy interference.

SECTION IV

MECHANICAL AND ELECTRICAL CHARACTERISTICS

15. CIRCUITS.

Electrically the receiver comprises two stages of tuned radio frequency amplification preceding the first detector, a temperature compensated heterodyne oscillator, three intermediate frequency amplifier stages, a second detector and one stage of audio-frequency amplification with a transformer output circuit. A crystal band-pass filter and beat-frequency oscillator are also included. The former is for increasing selectivity and the latter for receiving c-w signals. The schematic and wiring diagrams are shown in Section VIII.

16. FREQUENCY RANGE AND FREQUENCY BANDS.

The frequency ranges of 200 to 500 kilocycles and 1.5 to 18.0 megacycles are covered in six bands which are under the control of a band change switch. The frequency range for each of the six bands is given in the following table:

Band	Frequency Range
1	200-500 KC
2	1.5- 3.5 MC
3	3.5- 6.0 MC
4	6.0- 9.5 MC
5	9.5-13.5-MC
6	13.5-18.0 MC

17. INPUT COUPLING.

The antenna input circuit is capacitively coupled to the first tuned grid circuit by means of the antenna alignment capacitor 2. Sufficient range is available in this capacitor to permit alignment for antenna capacities within the limits of 50 to 200 micromicrofarads. The antenna input circuit is designed for antennas whose resistances are between 1 and 5 ohms.

18. INPUT PROTECTION.

The resistor 65-1 provides a leakage path for static charges which may collect on the antenna. The input circuit will withstand the application of 250 volts d. c. without damage. For protection against the application of radio frequency voltages up to 30 volts rms, the input circuit provides for the overshooting of the grid of the first r-f tube and the building up of a protective negative grid bias across the grid filter resistor.

19. RADIO FREQUENCY AMPLIFIER.

The radio frequency preselector comprises three tuned circuits coupled by two super control pentode amplifier tubes, Tube VT-86. Separate inductances are employed for each frequency band. The r-f gain of each of the six bands is kept uniform by selection of the turn ratio between the grid and plate circuit for each of the respective bands. A relatively low signal level is maintained at the grid of the first detector tube, thus insuring freedom from cross modulation interference.

20. FIRST DETECTOR.

The first detector employes Tube VT-91 which has a sharp cutoff characteristic. The low signal level at the grid of the first detector, together with the r-f preselection, insures a minimum of undesired responses. The oscillator output is coupled into the cathode circuit of this tube, and separate cathode coupling coils provide optimum oscillator output for each frequency band.

21. HETERODYNE OSCILLATOR.

The heterodyne oscillator employs a tuned grid, plate feedback circuit, utilizing a triode Tube VT-65. Oscillator frequency stability over wide variations in ambient temperature under service conditions has been obtained by the use of temperature compensated ceramic fixed capacitors (40, 41, 42, 43, 44, 45 and 46). Individual inductances and trimmers are employed for each frequency band. The low impedance coupling to the cathode of the first detector insures frequency stability with load variations or detector circuit tuning. On the four lower frequency tuning bands the oscillator frequency is higher than the desired signal by the intermediate frequency. On the two higher frequency ranges, bands 5 and 6, the oscillator is on the low frequency side of the desired signal. The latter results in a more uniform tuning ratio over these bands and increases the image rejection ratio.

22. INTERMEDIATE FREQUENCY AMPLIFIER.

The intermediate frequency amplifier comprises three low gain amplifying stages coupled by four high selective, double-tuned circuit transformers. The intermediate frequency employed is 915 kilocycles. The i-f transformers are tuned by means of adjustable iron cores and fixed capacitors. The increased permeability resulting from the use of the iron cores contributes largely to the highly selective transformer characteristics. The lowered tuned circuit impedance, secured by the relatively large fixed tuning capacitors, provides an inherently stable amplifier. Tube VT-86 functions as the first i-f amplifier while the pentode section of Tube VT-70 is employed as the second i-f amplifier. Tube VT-93, as the third i-f amplifier, supplies a relatively high level signal to the diodes of this same tube.

23. C-W OSCILLATOR.

a. The c-w oscillator employs the triode section of Tube VT-70 (second i-f amplifier tube) in a tuned grid plate feedback circuit. The adjustable iron core in the grid inductance 121 is employed for rough frequency alignment. A small panel-operated beat frequency control permits fine adjustment of the beat frequency within a range of approximately 4,000 cycles each side of zero. The effects of ambient temperature variations are minimized by the use of a temperature compensated tuned circuit. The c-w oscillator operates at an extremely low level, minimizing harmonics and stray oscillator pickup. The output is capacitively coupled to the plate circuit of the second amplifier tube by the coupling lead connected to the oscillator grid. Amplification by the third i-f amplifier stage, whose gain is not controlled either by manual or a-v-c, provides sufficient output from the c-w oscillator to the diode detector. This value of oscillator output is somewhat below the level at which the a-v-c operates, thus permitting the use of automatic volume control even for c-w reception.

b. The C. W. OSC. switch 128 in the ON position supplies the oscillator plate voltage and increases the a-v-c time constant by connecting the additional capacitor 123-C. Switch 128 supplies the oscillator plate voltage by connection to the screen grids of the first and second i-f and first r-f tubes. The same

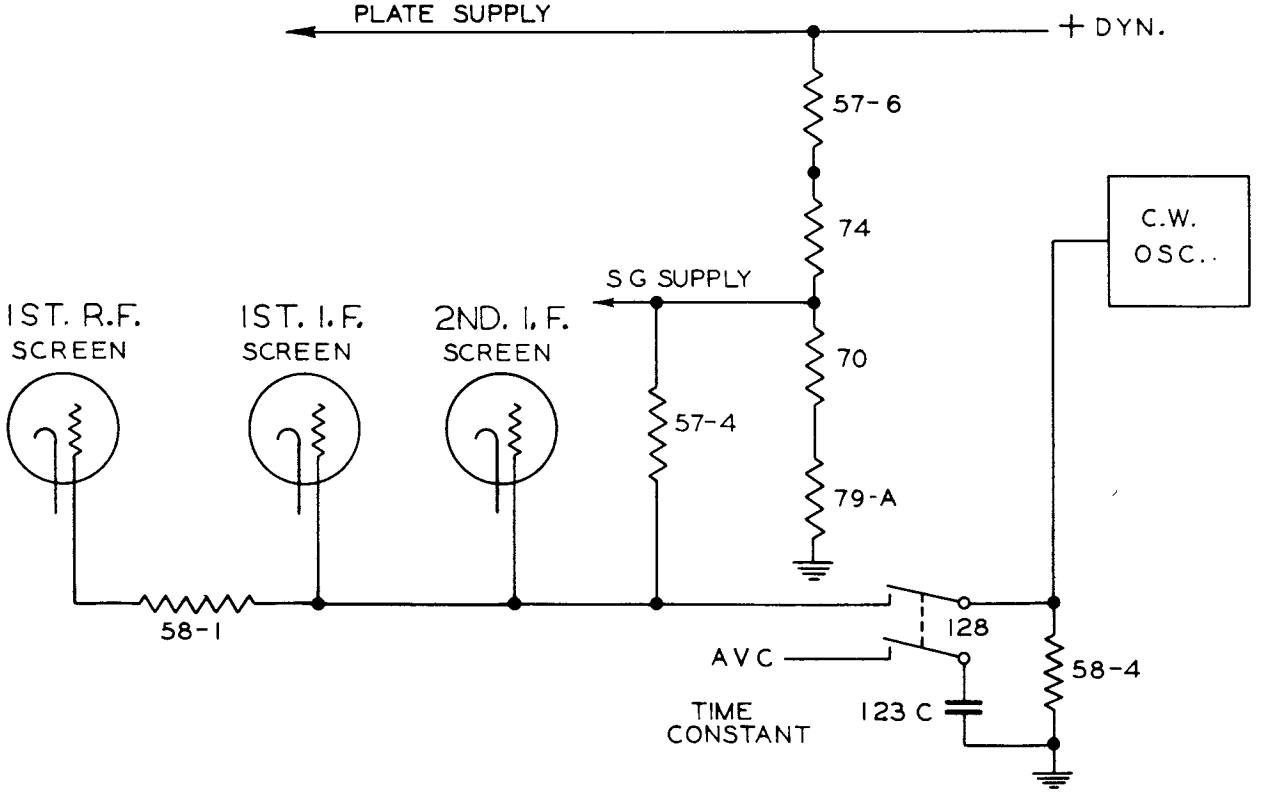


Figure 9—C-W Oscillator Switching

switching connects the loading resistor 58-4. This drops the screen voltage to the first and second i-f and first r-f tubes to a value that reduces the sensitivity sufficiently to keep the overall set noise essentially constant. This arrangement for supplying the c-w oscillator has added advantages which are not obvious. For sufficient oscillator excitation to handle high detector levels, encountered with a-v-c delay operation and strong signal inputs (while still keeping the no-signal c-w excitation below the a-v-c level), the c-w oscillator output should increase as a strong signal input raises the a-v-c bias. This circuit arrangement, Figure 9, accomplishes this result, since with switch 129 in the a-v-c position, resistors 57-6, 74, 70, and 79-A form a fixed bleeder supplying the screen grid voltage to r-f, first detector and i-f tubes. A strong input signal building up the a-v-c bias causes a considerable decrease in screen current and hence an increase in the screen supply voltage. This increases the voltage supplied to the c-w oscillator, and hence the excitation increases in proportion to signal level at the detector.

24. CRYSTAL BAND-PASS FILTER.

Additional selectivity is available by the use of the i-f crystal filter preceding the first i-f amplifier tube. This crystal filter comprises a balanced capacity bridge circuit which may be adjusted internally to provide a band width of 800 to 3,000 cycles at 10X down from resonance. The tapped tuned circuit (118 and 34-1) matches the impedance of the crystal bridge to the first i-f grid. The crystal filter may be switched in or out of the circuit by the CRYSTAL OUT-IN switch 127, actuated from the front panel. The symmetry of the resonance curve is adjustable by the balancing capacitor 8. The filter band width is adjustable by the secondary core of the first i-f transformer 117. As delivered by the manufacturer, the band width is set at approximately 2,000 cycles. For adjustment see Paragraph 35c (10).

25. SECOND DETECTOR.

Tube VT-93 also functions as the second detector. A relatively high level signal is supplied by the third i-f amplifier to the diodes of this tube. One diode functions as the signal linear detector, while the other diode is capacity coupled and provides high level, delayed a-v-c control bias.

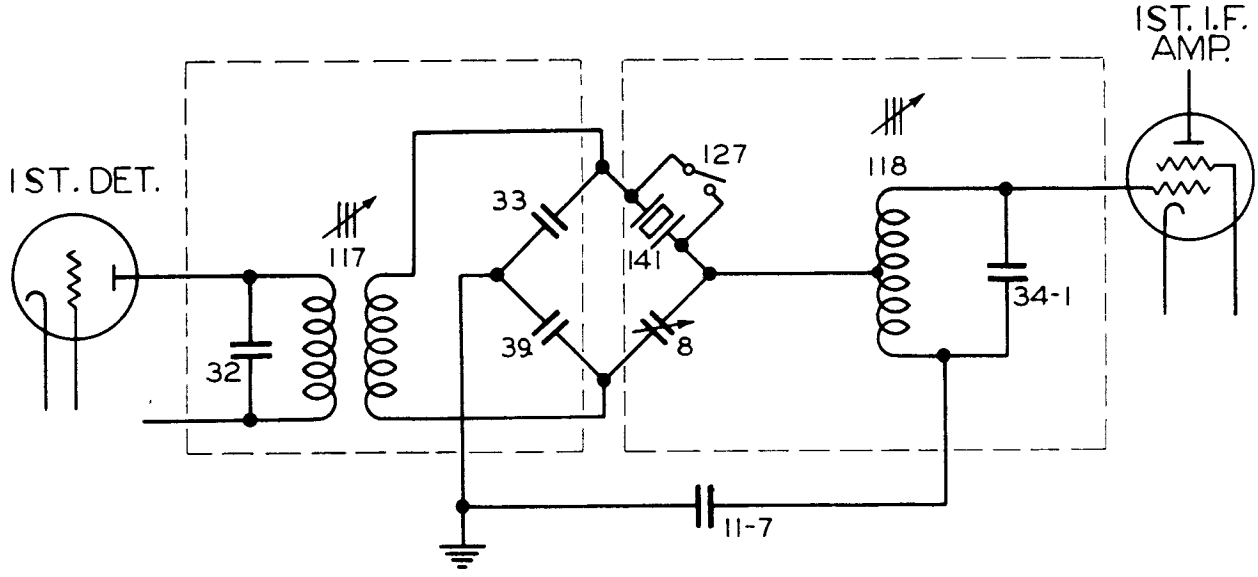


Figure 10—Details of Crystal Filter Circuit

26. OUTPUT.

a. **DESCRIPTION.**—The high level signal diode supplies audio output for driving the output tube, Tube VT-152, without additional audio amplification. The choice of three i-f amplifier stages and high level detection results in a number of operating advantages. The high level detection is relatively free from distortion, due to avoiding the characteristic curvature at the lower end of the diode curve. The direct drive of the output tube from the diode detector simplifies the dynamotor ripple filtering

and eliminates possible microphonics resulting from high audio amplification. The high diode level further provides relatively high bias voltage, insuring an unusually flat automatic volume control characteristic with the desired time delay. The dual volume control comprises potentiometers 79-A and 79-B. The latter, 79-B, functions only with the switch 129 in the AVC position, permitting the desired adjustment of the audio level to the output tube and load. For manual volume control with switch 129 in the MVC position, the potentiometer 79-A becomes the active control operating on the cathode bias of the r-f and the first and second i-f amplifier tubes. These potentiometers have two linear resistance tapers providing a smooth variation of sensitivity. Automatic load compensation is obtained by the method of biasing the output tube.

noise, when tuning from the low to the high frequency end of a band, has been corrected by means of the variable resistor 78. The function of this potentiometer can be more clearly understood by reference to Figure 11. Here the noise compensator resistor 78 is mechanically connected to the shaft of the ganged tuning capacitor with an electrical connection to give minimum resistance at the low frequency end of the band. The cathode return lead of the second r-f amplifier tube connects to the noise compensator resistor 78. The gain of this stage is thereby decreased proportionally as the r-f tuned circuit impedance increases (when tuning toward the higher frequency end of the frequency band). This arrangement tends to keep the noise level and receiver sensitivity essentially constant over the tuning ranges.

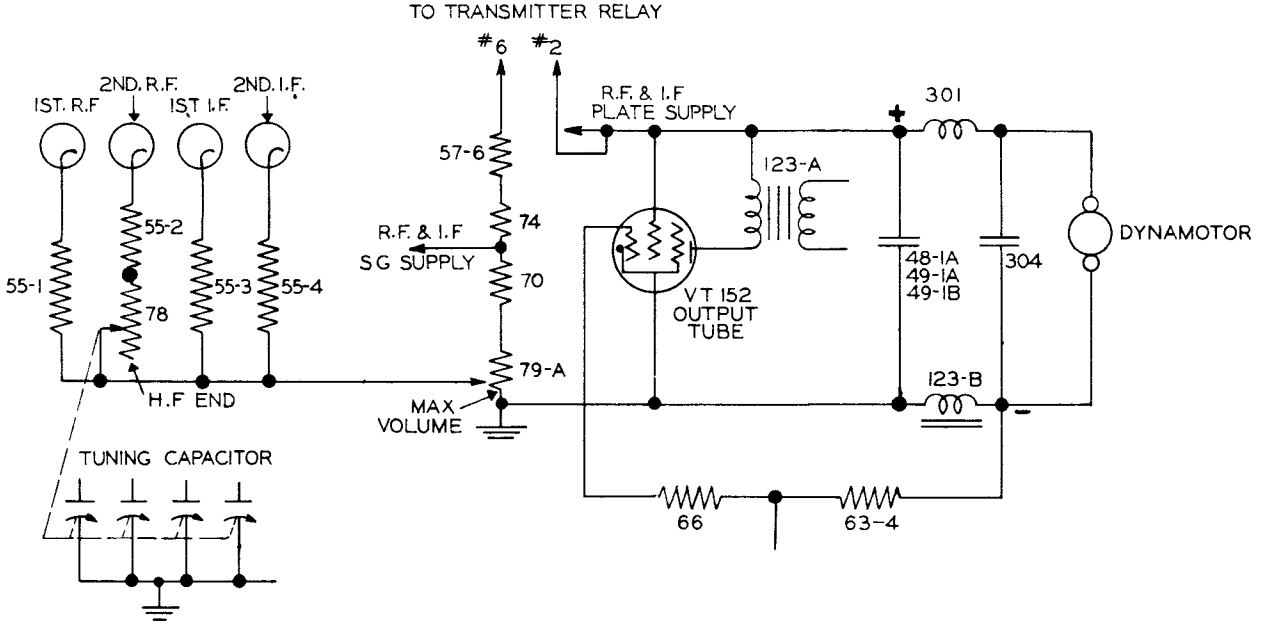


Figure 11—Load Compensator and Bleeder Circuit Diagram

Here, the grid bias is obtained from the resistance drop across the dynamotor filter reactor; thus, any tendency towards a decreasing load on the dynamotor results in a slight decrease in the bias of the output tube with a compensating increase in the load current. (See Figure 11.) Tube VT-152 provides more power than necessary to operate a number of headsets in parallel.

b. **CONSTANT INTERNAL RECEIVER NOISE.** The characteristic increase of internal receiver

27. DYNAMOTOR DM-28-(*) OR DM-24-(*).

The dynamotor and associated r-f filter circuits are assembled in one unit. The r-f filters are of the unbalanced type for use with a primary supply in which the negative side is grounded. This dynamotor supplies all of the high voltage direct current required for the operation of the receiver and, in addition, a maximum of 20 milliamperes for use in operating accessory equipment.

SECTION V
MAINTENANCE

NOTE

A standard signal generator, a phantom antenna, Test Set I-56-( ), or similar equipment should be used for alignment purposes and the instructions in this book carefully followed.

28. INSPECTION.

Periodic inspections prescribed below represent minimum requirements. If, because of local conditions, peculiarities of equipment or abnormal usage, they are found insufficient to attain satisfactory operation of equipment, authorized personnel should not hesitate to increase their scope or frequency.

a. PREFLIGHT INSPECTION.—The preflight inspection should be a rapidly performed visual and operating inspection of the radio receiver, as prescribed in section III, paragraph **14*b***.

b. DAILY INSPECTION.—The daily inspection should be a thorough visual and operating inspection, and should include a check of the antenna for proper security and tension, the condition of the shock links and antenna wire, and the insulators for cracks and chipping and surface cleanliness. Make a visual check for satisfactory securing of all components. Perform a thorough operational check as prescribed in section III, paragraph **14*b***.

c. 100-HOUR INSPECTION.

(1) General.—Remove the receiver chassis from the cabinet by loosening the two thumbscrew rods which secure the chassis in the cabinet. Remove all tubes. Clean out all the dust and dirt. If the tuning capacitors need cleaning, use a pipe cleaner dipped in carbon tetrachloride, working the pipe cleaner between the plates of the capacitors. Inspect the tube sockets and wire connections. Check all tubes in a tube checker, tapping each tube while testing, watching for indications of loose or shorted elements. Reinstall good tubes in the identical sockets from which they were removed and replace any defective tubes. Make sure that all tubes are firmly seated in their sockets and that the grid clips are firmly attached.

(2) Fuses.—Remove the fuse and inspect the fuse clips and the fuse ends for corrosion. Make sure the fuse clips have proper tension to hold the fuse securely in place and that the fuse is of specified rating, and that it is serviceable.

(3) Receiver Dynamotor.—Remove the five connector screws from the dynamotor terminals strip and withdraw the spade terminals. Loosen the four captive screws which hold the dynamotor unit to the chassis. Lift the dynamotor and filter assembly vertically from the receiver and make the following inspection:

(a) Remove the end-bells.

(b) Remove the carbon dust and dirt.

(c) Remove the brushes from the holders and examine the brushes for short, chipped, cracked or sticking condition. Brushes should be at least 3/8 inch long, and a minimum of 80 percent of the area of the brush ends should be in contact with the commutator surface. Examine the brushes to see that they have "worn in" properly and are free from hard spots on the contact surfaces.

(d) If the commutator shows signs of excessive wear, or if the brushes have hard spots or show excessive wear, exchange the dynamotor.

(e) Rotate the armature with the fingers observing freedom of rotation.

(f) Inspect for evidence of excessive or lack of bearing lubricant. If improperly lubricated, exchange the dynamotor.

(g) Replace the brushes, making sure that they are reinserted in the same holders from which they were removed, and with the same side up. Check that the pigtail connections inside the springs are secure, and that the brushes slide smoothly in their holders.

(h) Replace and safety the dynamotor end-bells. Reinstall the dynamotor in the receiver chassis. Reinstall the receiver chassis in the cabinet and hand tighten the two thumbscrew rods.

(i) Make a complete and thorough operational check as directed in section III, paragraph **14*b***.

29. CARE AND SERVICING OF DYNAMOTOR DM-28-(*) OR DM-24-(*).

a. The dynamotor and filter assembly is removable from the receiver chassis without disturbing other parts, provided the procedure outlined below is followed.

Loosen the two thumbscrews on the receiver panel, and draw the chassis from the cabinet. Lay the chassis with top upwards on a smooth, flat surface, with the rear toward the operator. Loosen the five connector screws on the dynamotor terminal strip and withdraw the spade terminals beneath them.

Loosen the four captive screws 211, Figure 12, which hold the dynamotor unit to the chassis. Remove the dynamotor and filter assembly from the receiver by grasping the dynamotor and lifting vertically.

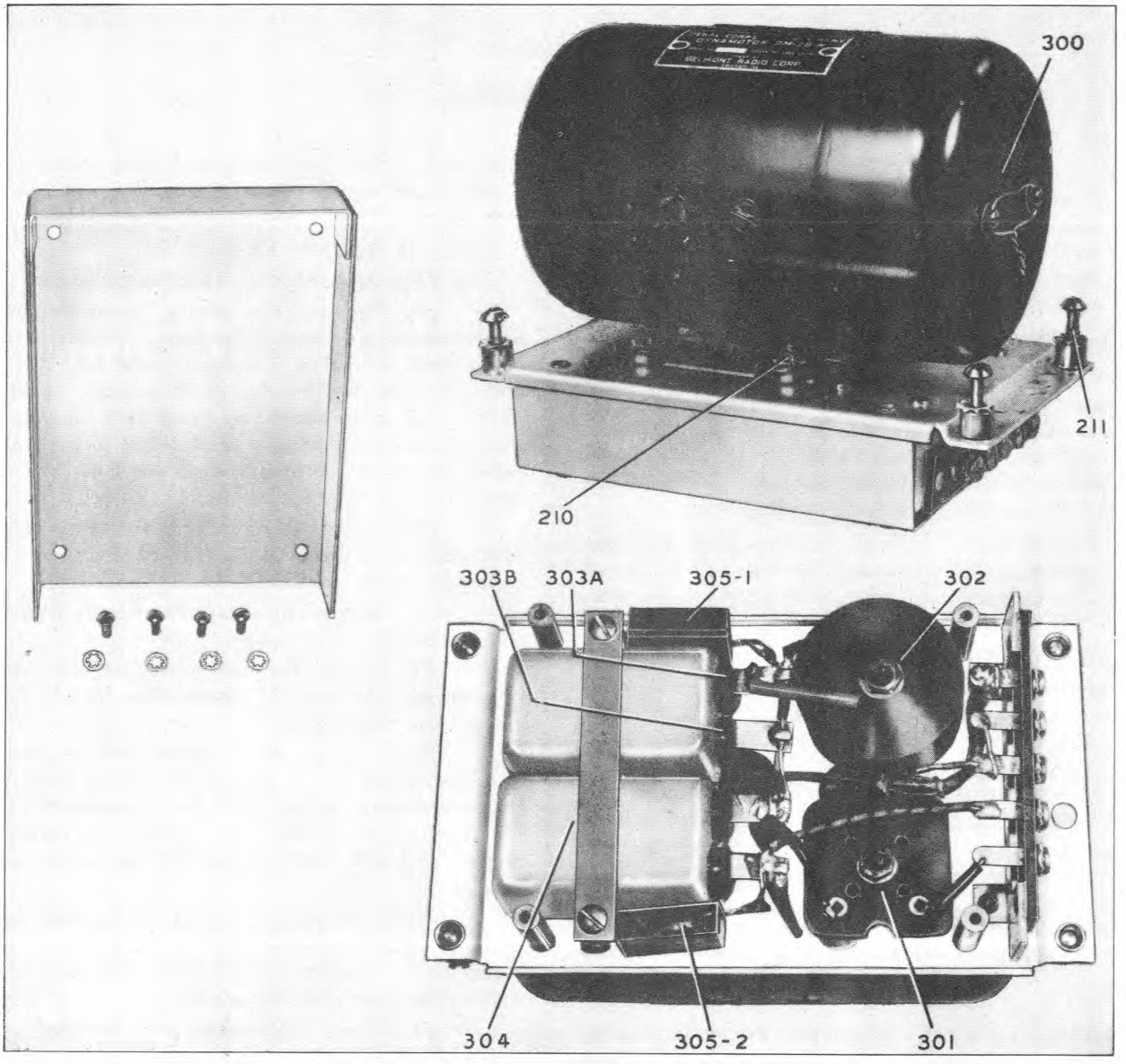


Figure 12—Dynamotor DM-28-(*) or DM-24-(*) and View Showing Filter Open

The filter portion of the dynamotor unit is made accessible by the removal of the filter unit cover located at the base of the dynamotor. See Figure 12.

This dynamotor requires lubricating after 1,000 hours or approximately 6 months of ordinary service. Lubricate it with Air Corps Grade 375 grease only. The directions for lubrication are stamped on the inside of the end-bell dust covers. To gain access to the dynamotor bearings, remove the dust covers after cutting the safety wires and removing the retaining screws, then unscrew the bearing end plates. Do not PACK the lubricant in these bearings.

b. When necessary to replace the ball bearings or turn down the commutators, first remove the brushes from their cartridges. Remove the nuts from the tie rods which hold the bearing end-bells, and pull the end-bells away from the field coil assembly. The armature can now be taken out. Examine the brushes to see that they have worn properly and are free from hard spots. Should such spots be apparent (they generally cause grooves in the commutator surface), replace the brush and smooth the commutator. The ball bearing retainers and the shaft are machined for very snug fits, but a slight tapping will loosen them. To remove the bearing retainers from the end-bells, use two small screwdrivers as wedges between the outer ball race and the end-bell. If the grease slinger becomes bent during removal, straighten it and replace it on the shaft before replacing the bearing.

c. To smooth down the commutator, rotate it in a lathe holding a fine grade of sandpaper (not coarser

than size 00), lightly against the commutator surface. Do not use emery cloth. Wipe away all residue of dust, sand and dirt to leave a clean, smooth, polished commutator surface. Never sand a commutator having a smooth or polished surface or turn it down simply because it is discolored. If the commutator is turned down in a lathe, the mica segment separators must be undercut.

d. Re-assemble the dynamotor in the reverse process of the disassembly procedure. The use of the screwdrivers as wedges is not necessary. In replacing the brushes, check to see that the + and — markings on the brushes correspond with those on the brush holder supports, and that the marked side of the brush is towards the top of the dynamotor. The commutator must be given a final inspection for free running, cleanliness and absence of grease or oil. Wipe the end-bells clean and dry them before replacing on the dynamotor.

e. The nominal ratings of Dynamotors DM-24-(*) are: Input, 2.45 amperes at 13.8 volts; output, 70 milliamperes, at 220 volts; regulation 12 per

cent. The nominal ratings of Dynamotors DM-28-(*) are: Input, 1.23 amperes at 27.9 volts; output, 70 milliamperes at 220 volts; regulation, 12 per cent.

30. REMOVAL OF FRONT PANEL.

a. For adjustment of dial or mask, or for servicing certain parts, it may be necessary to remove the panel. Take the chassis, with panel attached, completely out of the cabinet. Place it with the panel facing upwards. Unsolder the lead to the antenna binding post and the lead from the chassis to the dial lights. Remove the dial light housing cover, the two thumb screw rods, the handles, and all knobs and retaining nuts of all controls except the DIAL LIGHTS control. Remove the retaining nuts of the TEL jacks. The panel may be lifted off after the removal of the end plate holding screws, the chassis holding screws, and the dial casting holding screws.

b. In replacing the BEAT FREQ. control knob, turn the flexible shaft until the set screw in the coupling at the internal end, points away from the panel. Now mount the knob so that the arrow points vertically towards the top of the receiver. This knob has two set screws. In replacing the other knobs on the shafts, note that flats on the shafts provide for proper location. Tighten all set screws securely, and give a second tightening to the set screw on the band switch knob after the shaft has been rotated a few times.

31. DIAL AND MASK ASSEMBLY.

a. Attached to the front panel, and to the main frame or chassis casting, is an aluminum casting used

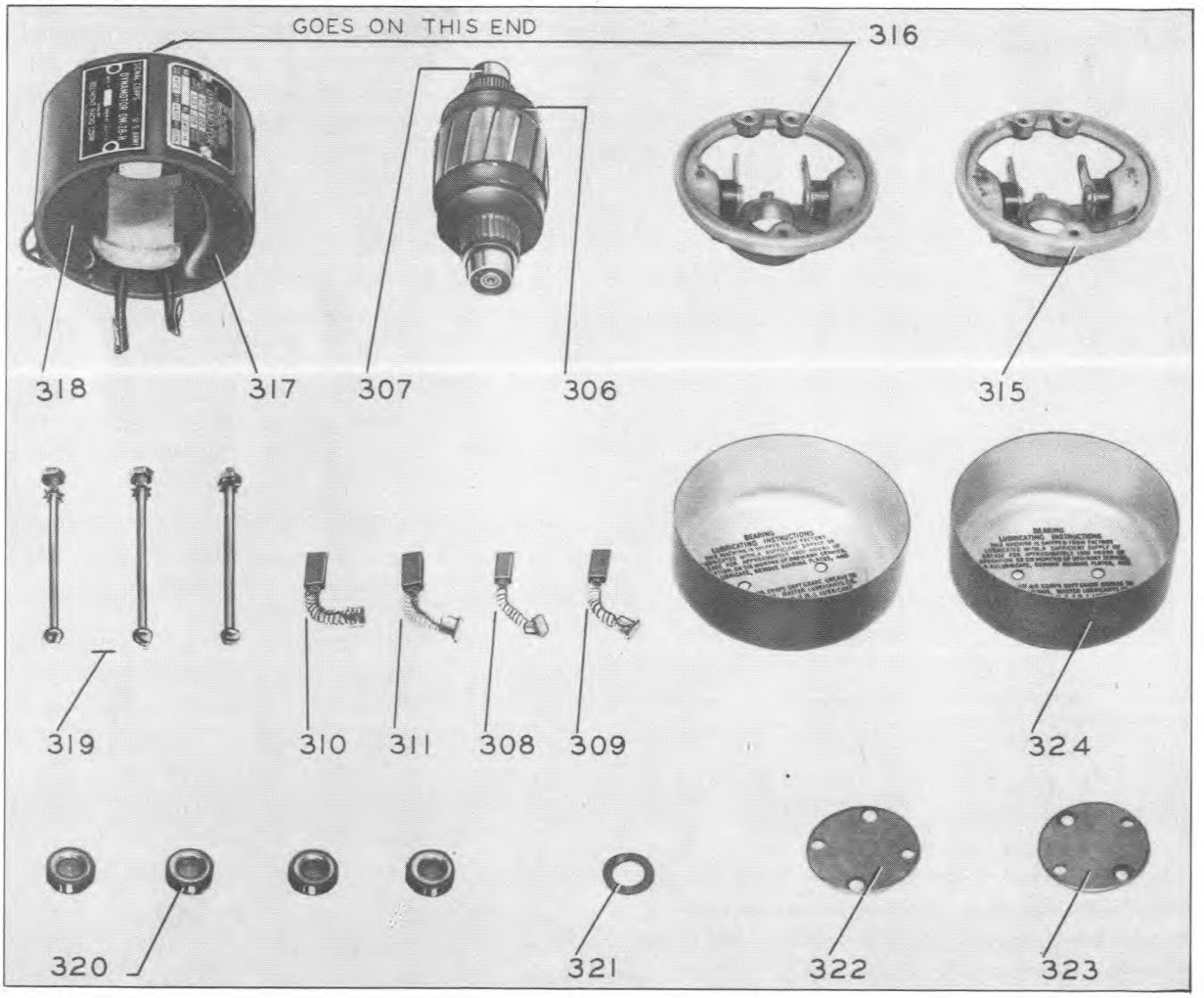


Figure 13—Dynamotor DM-28-(*) or DM-24-(*), Disassembled

as the frame for the switch drive shaft, dial mask and detent, for the tuning dial, tuning shaft, reduction gears, and stop. All of these parts are assembled, and can be moved as a unit.

b. The switch drive shaft passes through a hole in an adjustable plate, located in the dial lamp housing, and through a clearance hole in the panel. The hole in the adjustable plate is purposely given a larger clearance than bearing requirements would dictate. The bearing is used to support the shaft against forces which might spring it or damage the internal bearing. The shaft extends through a long bushing pressed in the dial housing. At the inside end of the shaft the detent (star wheel) and the driving portion of the coupling member are pinned in place by means of taper pins. The dial assembly runs on the outside surface of the long bushing referred to above. Just inside the panel, the hub of the mask is attached to the shaft by a taper pin.

c. A stop arm, on the back of the dial frame casting, engages a pin in the detent and limits its rotation to 6 positions spaced 60 degrees apart. Attached to the casting is the assembly, consisting of pivot pins, arms with rollers, and spring which positions the detent. This assembly is locked with two dowel pins after the correct location is made.

d. On the front (panel) end of the bushing (through which the switch shaft passes) there is a narrow shoulder which supports the lower end of the dial index plate. This index plate is attached to the casting at its upper end with means for removing any slack and keeping it straight and taut. The inner end of the mask hub and the outer end of the dial hub turn, and are held against opposite sides of the index plate.

e. The dial is attached to a flanged hub which runs on the outside surface of the bushing through which the switch drive shaft passes. This hub also carries a large gear driven by a pinion combined with a split idler gear. This split idler gear and pinion has adjustment in the clearance holes for the mounting screws to enable the backlash to be reduced to the smallest practicable amount between the pinion and the large dial gear.

f. The tuning shaft has, in addition to the pinion referred to above, a stop, and a worm which meshes with a split worm gear on a cross shaft at the back of the frame. Both this cross shaft and the tuning shaft run in bearings which are integral in the casting. Both shafts have spring thrust washers to remove end play. The cross shaft carries a pinion which is meshed with a split gear on the tuning capacitor shaft. The degree of mesh of this pinion and gear is adjustable by moving the tuning capacitor toward or away from the panel after it is placed in position and before the holding screws are finally tightened.

g. The overall gear ratio between the tuning shaft and the capacitor shaft is 200 to 1. The design of the tuning capacitor permits but a small amount of rotation at either end of its travel beyond the 180 degrees required to give its complete range in electrical capacity. However, means are provided to stop the tuning shaft at either end after a total of approximately 100 revolutions. This is accomplished by a cam on the outer edge of the tuning dial which operates an arm pivoted on a pin on the frame casting. One end of this arm has a roller which runs on the outer edge of the dial. The roller is held in contact with the dial by a spring. The dial edge is cut away in such a manner that when the end of the tuning scale is reached, the roller can move toward the center of the dial, being forced in that direction by the spring. Thus the opposite end of the stop arm is moved so that the hook at the end of the arm engages the rotating stop on the tuning shaft, and thereby prevents further rotation. When the direction of rotation of the tuning shaft is reversed, the roller and arm are pushed outward against the spring by the cam edge of the dial and the stop disengages.

h. Since a definite relation must be set and maintained between the dial position and the angular position of the rotor of the tuning capacitor, adjustment is provided at the pinion on the cross shaft at the rear of the frame. (This is the shaft which also carries the worm gear.) This pinion is held in place by two set screws which bear in a groove on the shaft. By loosening these two set screws, either the dial or the tuning capacitor can be rotated while the other part remains fixed. The correct relation between these is that the tuning capacitor rotor plates are fully meshed with the stator plates (maximum capacity) when the dial is set with the isolated index mark at the low frequency end of the 13.5 to 18.0 mc band.

32. REMOVAL AND REPLACEMENT OF DIAL MECHANISM.

a. To remove the dial mechanism from the chassis for servicing, first remove the front panel in

accordance with instructions given earlier in this book (Paragraph 30). The frame of the mechanism is attached to the chassis by the bracket holding the fuse, and by two slotted hexagon head screws through the flange on the under side of the chassis. One of these screws is beneath the removable shield which covers the terminal of the first i-f transformer. When these screws are removed, the complete unit can be removed. The center disc of the flexible coupling is loose and will drop out of engagement.

b. To remove the index and dial, remove the taper pin holding the mask hub to the switch drive shaft. Support the shaft when driving out this pin, so that excess stress will not be placed on the center bushing. After the removal of the mask and the index, the dial and its gear are free to slide off the bushing. In replacing these parts, the thrust washer behind the dial hub must be turned in the position to give maximum thrust, which is convex side outward.

c. If the dial is removed and replaced, it is possible that in meshing the dial gear with the idler gear the stop relationship may not be correct. In this case it may be necessary to change a tooth at a time to correct the relationship. The stop relationship must be such that the roller arm hook and the tuning shaft stop arm engage fully at the end of the last revolution. However, on the previous revolution the arm must not start to move until the rotating arm has passed under the roller arm hook. This adjustment can only be made by trial and inspection, but it can be secured in one or two trials. Substitution of a different stop arm may also require re-adjustment. In this case the adjustment should be made by lengthening or shortening the roller end of the arm. This is done by loosening the two nuts on the arm, and adjusting the arm by means of the slotted holes provided.

d. When the dial mechanism is replaced, the flexible coupling must be properly positioned so that the position of the mask corresponds to the switch position, since it is possible otherwise to get the band switches to an operative position. The correct relative positions are obtained when the mask is set to band 1 and the set screw, locking the flat switch shaft to the large bevel gear hub, is vertical.

e. If any of the gear trains including split gears have been unmeshed in disassembly, the split gears must be reset to put tension on the loose section when they are again meshed. Normally, a displacement of one tooth between the two sections is sufficient. Trial will show whether this will remove the backlash.

f. When the dial mechanism is re-assembled to the chassis, carefully adjust the relation between the dial and the tuning capacitor in order to maintain the calibration and prevent over-running the capacitor (refer to Paragraph 31h). This is done by loosening the two set screws in the pinion on the cross shaft on the back of the dial assembly. Before putting the mechanism in place, this pinion can be moved along the shaft toward the worm gear to clear the capacitor split gear. This facilitates assembly, since the gears can be meshed after the dial mechanism is bolted in place, making it easier to get the tension on the split gear in the capacitor assembly.

33. REMOVAL OF ANTENNA, R-F, DETECTOR AND OSCILLATOR UNITS.

In many cases servicing of these units will require only the removal of the top or bottom cover of a particular unit; however, any unit may be removed and replaced independently as follows:

a. Unsolder the lead to the main tuning capacitor at the capacitor by first removing the capacitor shield. Unsolder all other leads at the unit.

b. Disconnect the band switch drive shaft and withdraw same from the antenna unit end.

c. In case of antenna unit, disconnect the antenna alignment control shaft.

d. Remove screws holding unit to the tie strips at the bottom.

e. Remove screws holding the unit to the chassis.

f. Lift the unit from the receiver, taking care that it comes out freely.

When replacing a unit, reverse the above procedure. Do not screw the chassis holding screws tightly until the drive shaft has been replaced and the band change switch knob has been rotated a number of times. This will insure the self-alignment of the unit and the proper action of the detent.

34. TROUBLE LOCATION AND REMEDY.

a. **GENERAL.**—The normal sensitivity (number of microvolts input to produce 10 milliwatts output

in a 4,000 ohm resistance load) of the receiver is better than 9 microvolts when measured under the following conditions:

AVC-OFF-MVC switch at MVC; 28 volts input for Radio Receiver BC-348-(*) or 14 volts input for Radio Receiver BC-224-(*); c-w oscillator ON; crystal filter OUT; output load 4,000 ohms non-inductive resistance; pure c-w input from signal generator applied between antenna-ground terminals through a 100 mmf dummy antenna; volume control set to produce 0.3 milliwatt noise output.

This sensitivity will, of course, be subject to variation with time, due to tube aging, etc., Therefore, it is recommended that no attempt be made to retrim or realign the equipment unless the sensitivity is found to be worse than 17 microvolts with new average tubes. The receiving equipment has been carefully adjusted and aligned by the manufacturer before shipment and should maintain these adjustments over reasonably long periods of time. Major adjustments and repairs should be made only in an authorized repair shop equipped with the necessary servicing tools and equipment.

Any changes of the adjustments of the radio frequency circuits should be done by trained personnel only. The difficulties usually experienced are the result of external deteriorating influences, such as wornout vacuum tubes, improper operating voltage, blown fuse, external noises, etc. However, in order to permit the servicing of this equipment, the testing procedure shown should be followed in determining the sources of trouble. This has been divided into the following major divisions, with respect to the nature of the troubles being experienced:

Equipment required—See Paragraph 34b.

Weak or no signals on all bands—Modulated reception—See Paragraph 34c.

Weak or no signals on any one band—Modulated reception—See Paragraph 34d.

Weak or no signals on all bands—C-W reception (modulated reception normal)—See Paragraph 34e.

Figure 14 graphically outlines the procedure for trouble location, the numbers in each block referring to the paragraph numbering in the following discussion:

b. **EQUIPMENT REQUIRED.**—Few instruments other than those found in a standard set analyzer (Test Set I-56-A) are required in locating the most probable troubles in this receiver. The individual instruments are as follows:

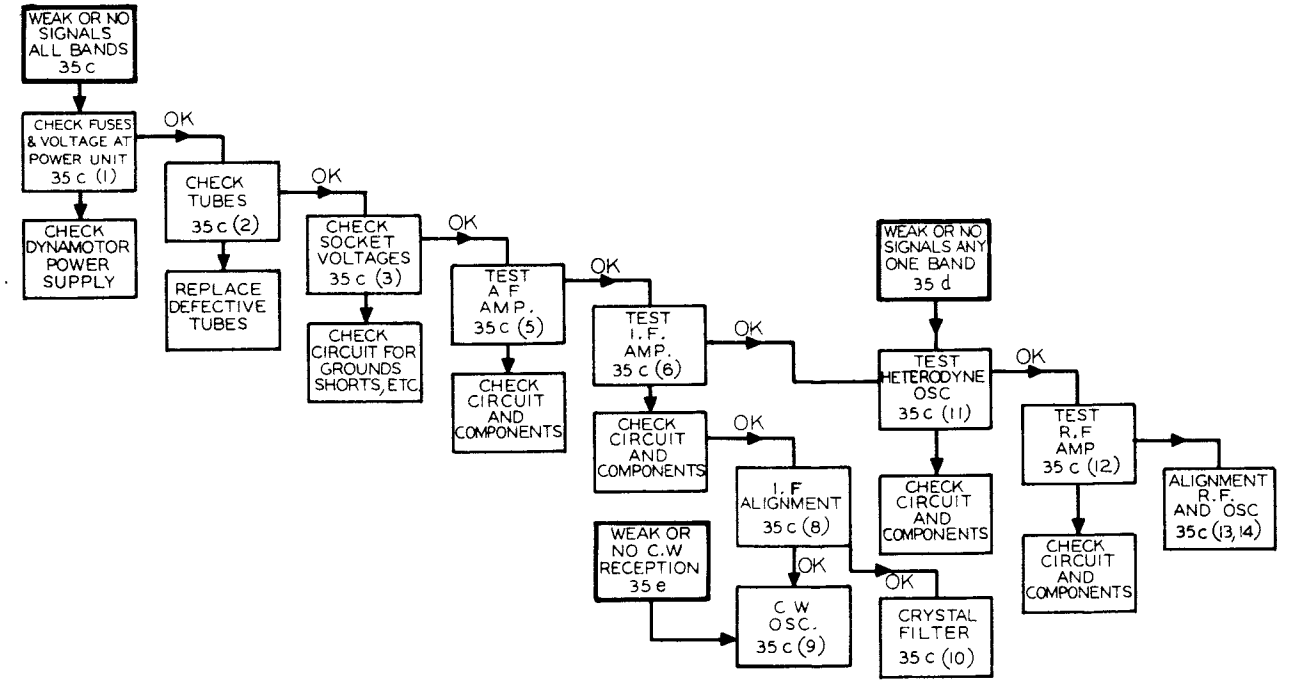


Figure 14—Trouble Location and Correction Chart

(1) A modulated test oscillator (standard signal generator) with a frequency range from 150 to 18,000 kc with provision for calibration accuracy better than 0.1% at aligning frequencies.

(2)* Voltmeter—1,000 ohms per volt, ranges 0-10; 0-100; 0-250 volts.

(3)* Continuity tester.

(4)* Output meter rectifier type, 0-15 volt, 4,000 ohms.

(5) Microammeter, 0-200.

(6) Audio frequency oscillator.

(7) Pair of telephone receivers.

(8) Adapter FT-211 consisting of an 8-prong octal plug, and an 8-prong octal socket connected together by a short length of 8-conductor cable, to permit use of the Test Set I-56-A analyzer on the r-f tubes on the tube shelf.

*Part of Test Set I-56-A.

c. **WEAK OR NO SIGNALS ON ALL BANDS, MODULATED RECEPTION.**

(1) CHECK OF DYNAMOTOR VOLTAGES.—When all signals on all bands are weak or no signals are heard even when known to be present, the procedure follows that shown in Figure 14. The voltages checked at the dynamotor terminal board should closely approximate the values shown in Figure 15. Conditions for measurement are as follows: Input 28 volts for Radio Receiver BC-348-(*) or 14 volts for Radio Receiver BC-224-(*); CRYSTAL OUT; MVC; Volume Max; C. W. OSC. OFF; Load 4,000 ohms resistance. If these readings do not approximate the values shown, check the fuse as well as the dynamotor and filter circuits, wiring and components.

(2) TUBE CHECK.—If the voltages at the dynamotor terminal board approximate the values given, check all tubes for emission and characteristics or replace all tubes with those of known average characteristics.

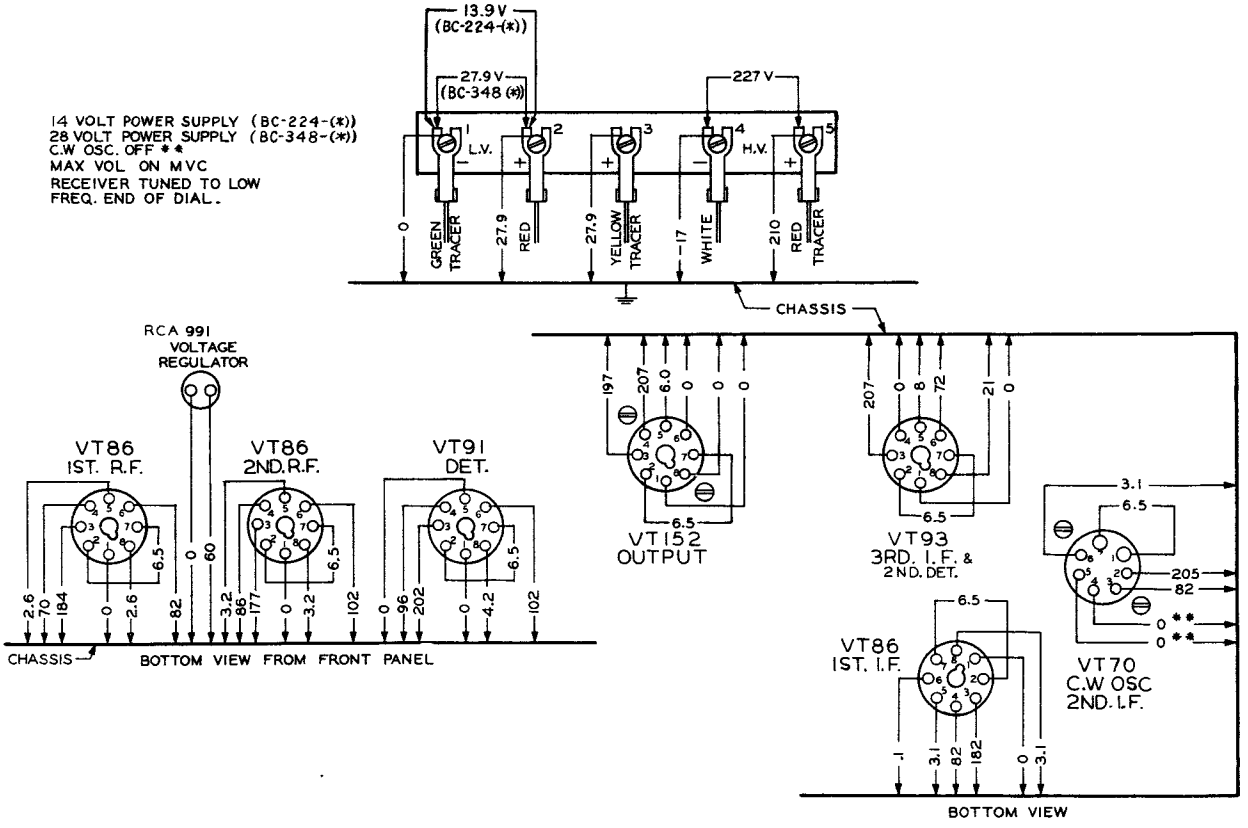


Figure 15—Radio Receiver BC-348-(*) or BC-224-(*), Dynamotor and Tube Socket Voltages

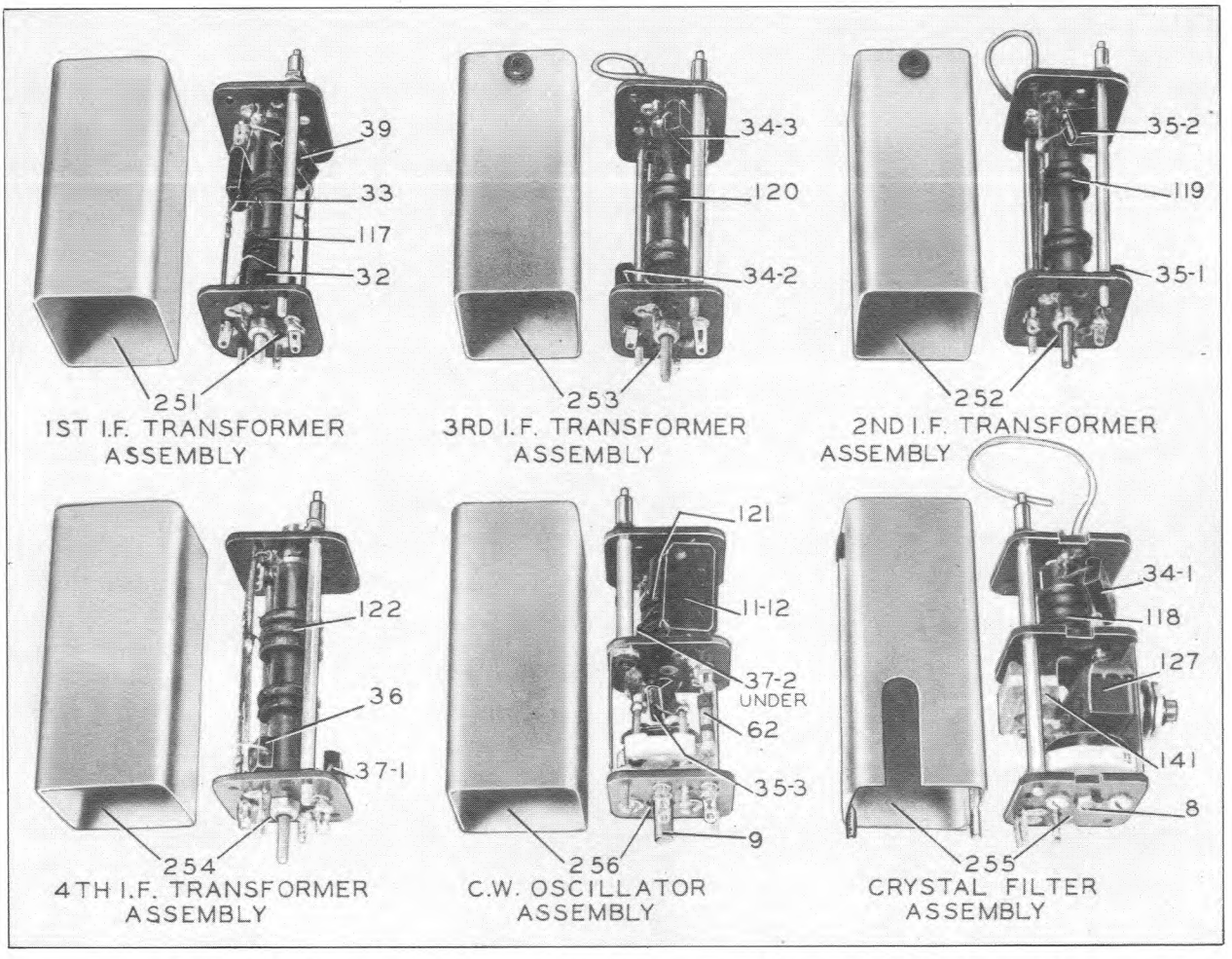


Figure 16—I-F Transformers, C-W Oscillator and Crystal Filter Assemblies

(3) CHECK OF SOCKET VOLTAGES.—If tubes check satisfactorily, or if, after replacing with tubes known to be good, the sensitivity is still low, check all tube socket voltages as outlined under Paragraph 34f with Test Set I-56-A. The average socket voltages are given in Figure 15.

(4) CHECK CIRCUIT WIRING AND COMPONENTS.—If the tube socket voltages do not approximate the values shown in Figure 15, check the associated circuits and components for grounds, shorts, and similar defects.

(5) TEST OF AUDIO-FREQUENCY AMPLIFIER.—Having checked all socket voltages and found the values to be correct, test the audio frequency amplifier. This can be checked by capacitively-coupling a 400-cycle voltage of approximately 2 volts rms from the detector diode socket prong to ground using a capacitor of 0.5 mfd. As an alternative, a modulated 915 kc signal of 2 volts may be coupled to this point and ground. Proper functioning of the audio amplifier will be indicated by an output well over 10 milliwatts for the 2 volt audio input or approximately 1 milliwatt output for 915 kc input. Check circuits, wiring and components if this order of response is not obtained.

(6) TEST OF INTERMEDIATE-FREQUENCY AMPLIFIER.—Following a satisfactory test of the audio amplifier, check the intermediate frequency amplifier by capacitively coupling the modulated test oscillator to the grid cap of the first detector tube through a 0.1 mfd capacitor, with the oscillator frequency being adjusted to 915 kc. A rough check of the proper functioning of the i-f amplifier is indicated by a comfortable headphone output level with low input from the test oscillator. (Approximately 30 microvolts input for 10 milliwatts output.)

(7) I-F AMPLIFIER CIRCUIT CHECK.—If the i-f amplifier does not respond as above or lacks sensitivity, a progressive check, stage by stage, should be made. The test oscillator, 915 kc (modulated 30% with 400 cycles), is connected through a 0.1 mfd capacitor to the second detector diode socket prong. A signal response indicates proper functioning. Coupling the test oscillator to the grid of the third i-f should indicate a decided gain in sensitivity. Proceeding similarly towards the first detector, each stage should show a decided gain. Circuit check a faulty stage for grounds, shorts, or defective components.

(8) ALIGNMENT OF I-F AMPLIFIER.—When all stages have been tested, check the i-f amplifier alignment by capacitively coupling a low level input signal of 915 kc (modulated 30% with 400 cycles) to the first detector grid. Adjust the i-f tuning cores of both primary and secondary windings of the first, second, third and fourth i-f transformers and the tuned circuit of the crystal filter assembly for maximum output. The fourth i-f transformer is slightly over-coupled with a resultant flat top.

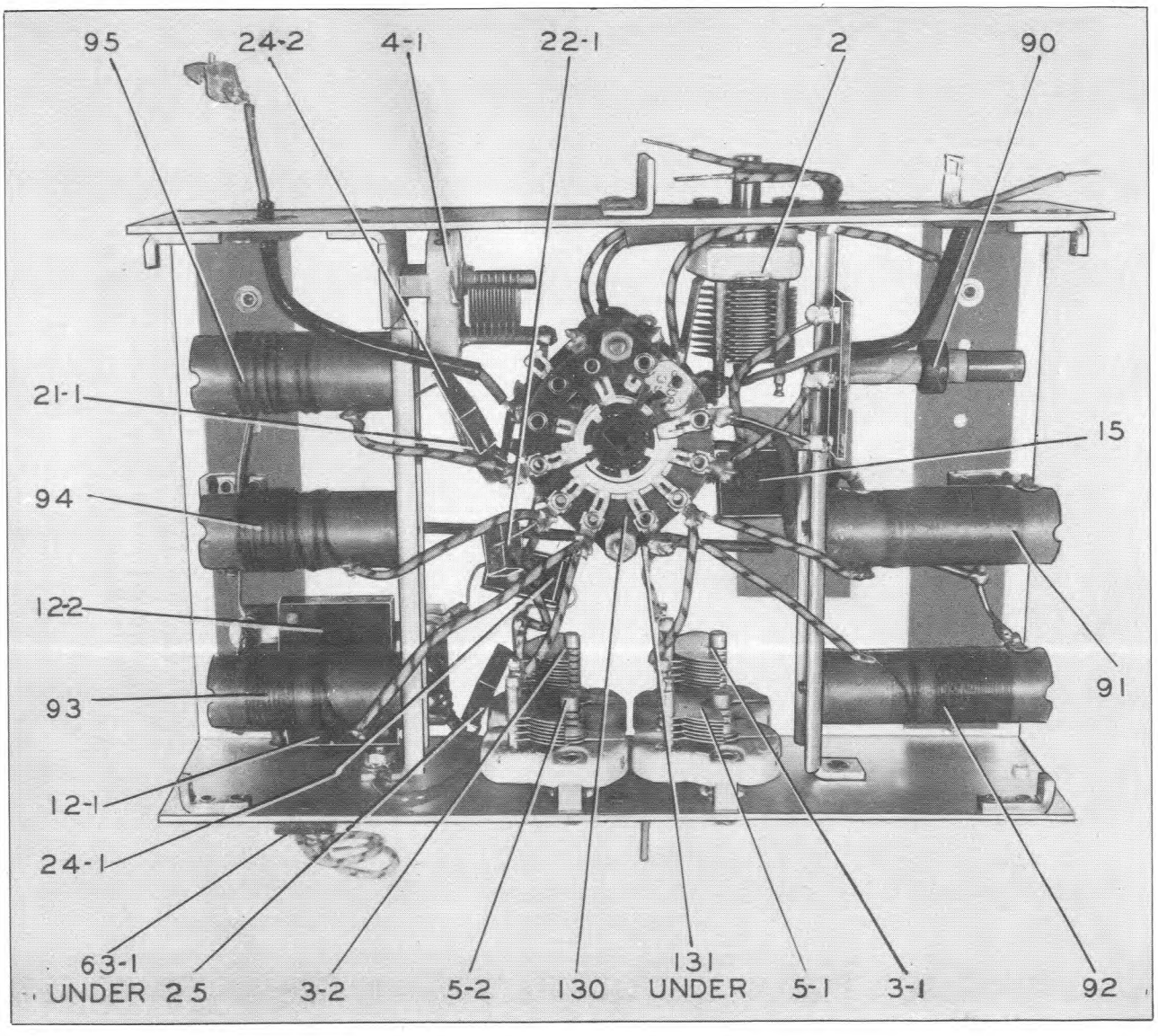


Figure 17—Antenna Unit

(9) CHECK AND ALIGNMENT OF C-W OSCILLATOR.—Check and adjust the c-w oscil-

lator by coupling the 915 kc input (modulation off) to the grid of the first detector tube and switch the c-w oscillator ON. With the beat frequency control set at mid-position, the oscillator inductance tuning core 121 is adjusted for zero beat. If no c-w beat can be heard, check the c-w oscillator circuit for grounds, shorts, or defective components. With the c-w oscillator ON the screen voltage at the first and second i-f sockets drops to approximately 45 volts (measured to ground).

from resonance. Test this filter by applying an unmodulated signal of approximately 915 kc connected through a 0.1 mfd capacitor to the grid of the first detector tube. The c-w oscillator should be off during this test. To adjust the band width of the crystal filter, a signal generator or microvolter having an expanded tuning scale in the vicinity of 915 kc and having also an attenuator with a multiplier of 10 times (20db) is required. The following procedure is recommended: Connect a

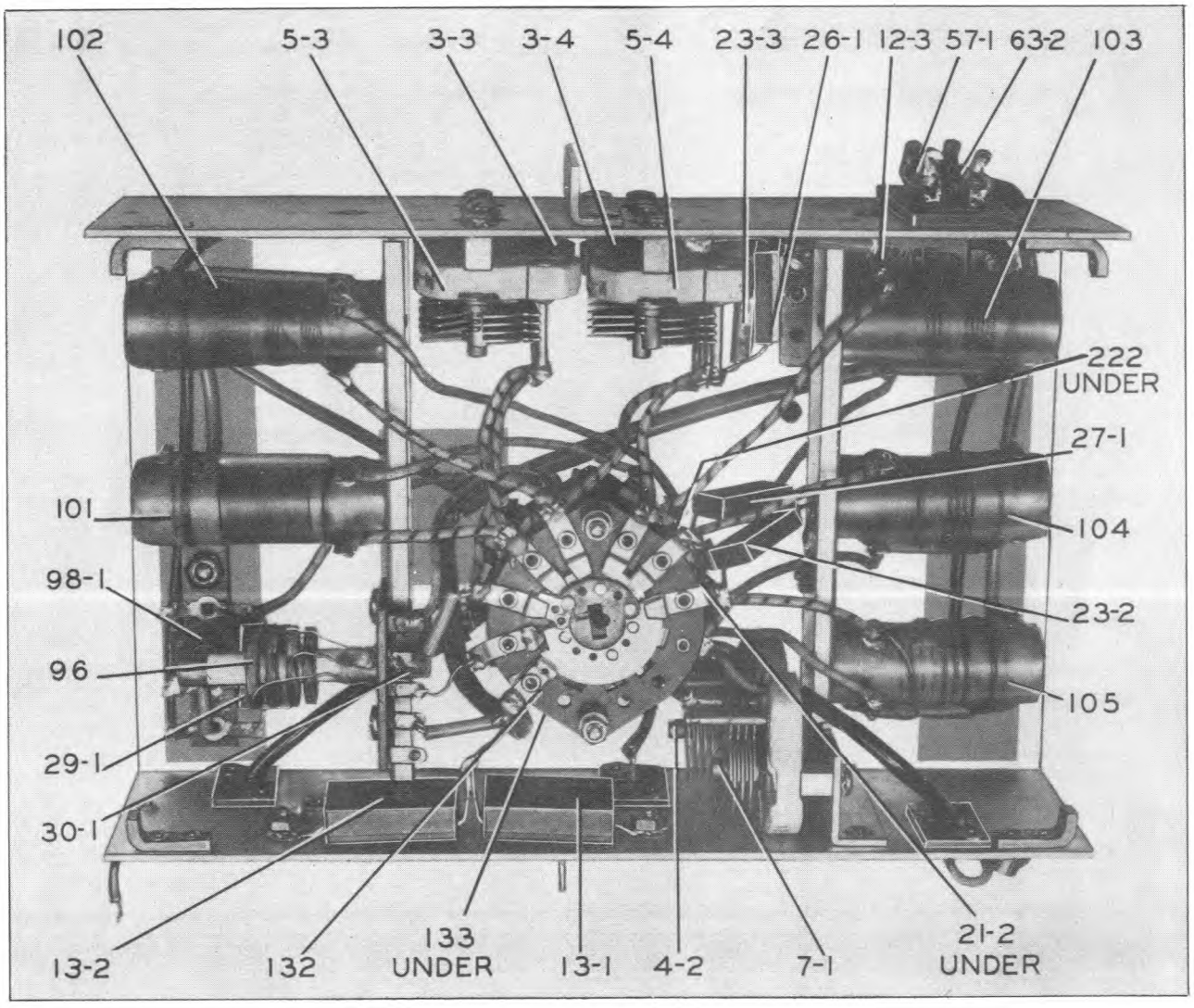


Figure 18—R-F Unit

(10) TEST AND ADJUSTMENT OF CRYSTAL BAND PASS FILTER.—Normally the crystal band pass filter is adjusted at the factory for a band width of 1500 to 2000 cycles at 10X down

microammeter with a range of approximately 200 microamperes in series with the cathode return of the AVC volume control (79-B white lead). Throw the crystal switch to the IN position. With the un-

modulated 915 kc input from the test oscillator, find the resonance peak of the crystal by slightly retuning the test oscillator until maximum deflection is indicated on the microammeter. Adjust the phasing control 8 until the resonance curve as indicated on the microammeter is symmetrical and free from dips

(11) CHECK OF HETERODYNE OSCILLATOR.—After checking the functioning of the i-f and audio amplifiers, if signals are still not heard on any band, check the heterodyne oscillator. This can be done by observing the cathode voltages at the socket of the first detector tube, Tube VT-91,

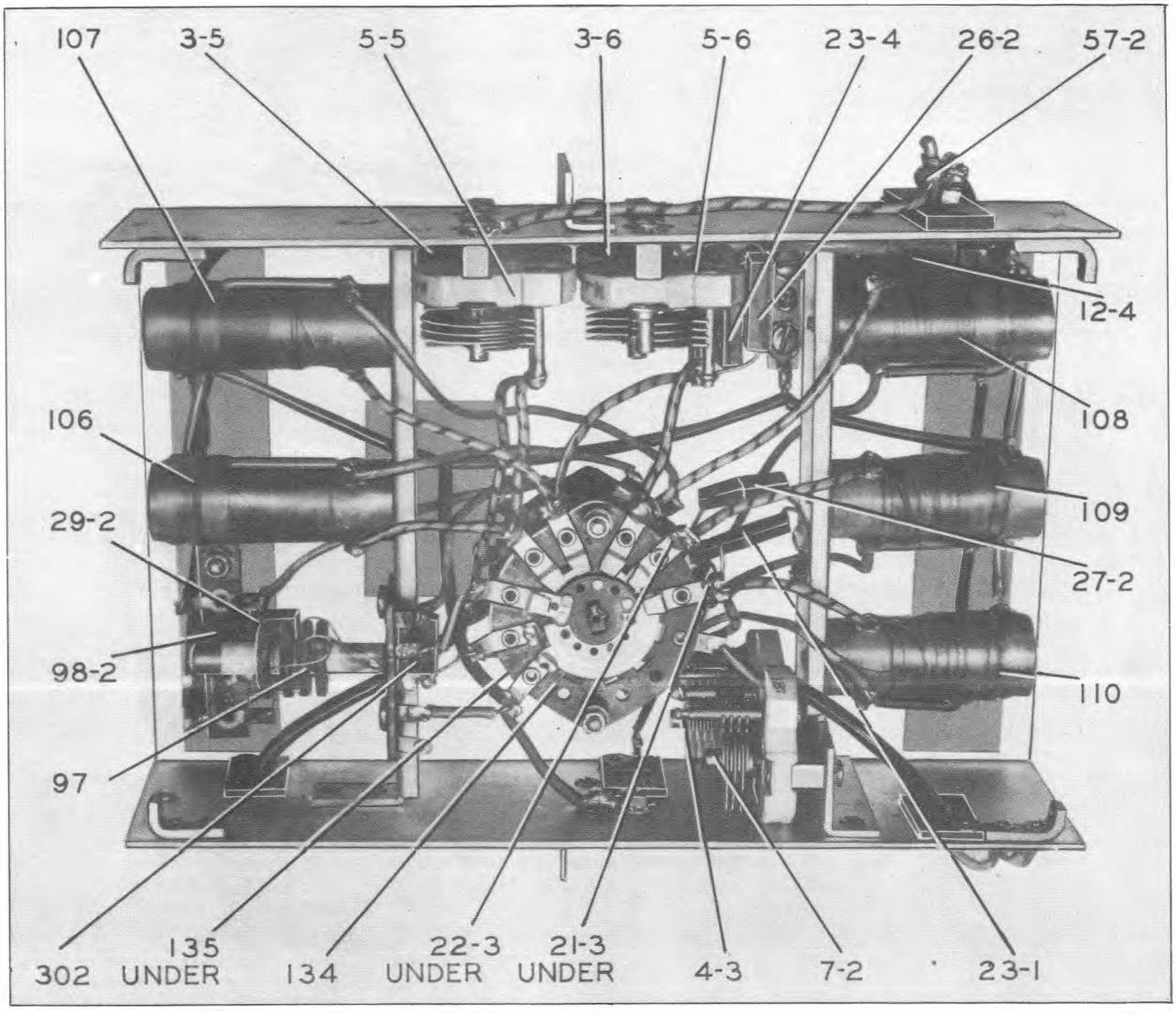


Figure 19—Detector Unit

or peaks except for the main resonance peak of the crystal. Adjust the band width with an input voltage ratio of 10X to approximately 2 kc by slight realignment of the secondary (top) tuning core of the first i-f transformer 251. After concluding the above described tests, remove the microammeter and restore the circuit to normal.

when grounding the stator of the oscillator section (I-D) of the tuning capacitor. If no change in voltage is noted with this test, check the oscillator circuit for grounds, shorts or defective components.

(12) TEST OF THE R-F AMPLIFIER.—Having completed the test and alignment of the

audio amplifier, i-f amplifier and heterodyne oscillator, test the r-f amplifier as follows:

With the band switch set on the band lacking sensitivity capacitively couple a modulated signal from the test oscillator through a 100 mmf dummy antenna to the antenna post. Set this input signal frequency accurately to the alignment frequency shown in the "Table of Alignment Data" for the band under test. With the tuning control set for the approximate alignment frequency, tune slowly around this point until the maximum response with the least signal input is obtained. Capacitively coupling the test oscillator to the grid of the first r-f and then to the second r-f tubes should show a progressive increase in output. This indicates the proper functioning of the preceding r-f stage or circuits. If a decrease in response is noted when the signal input is capacitively coupled progressively from the grid of the first detector to the second and first r-f grid caps and finally to the antenna post (with the 100 mmf dummy antenna capacitor), check the stage which indicates a decrease in response for circuit, ground, shorts or defective components.

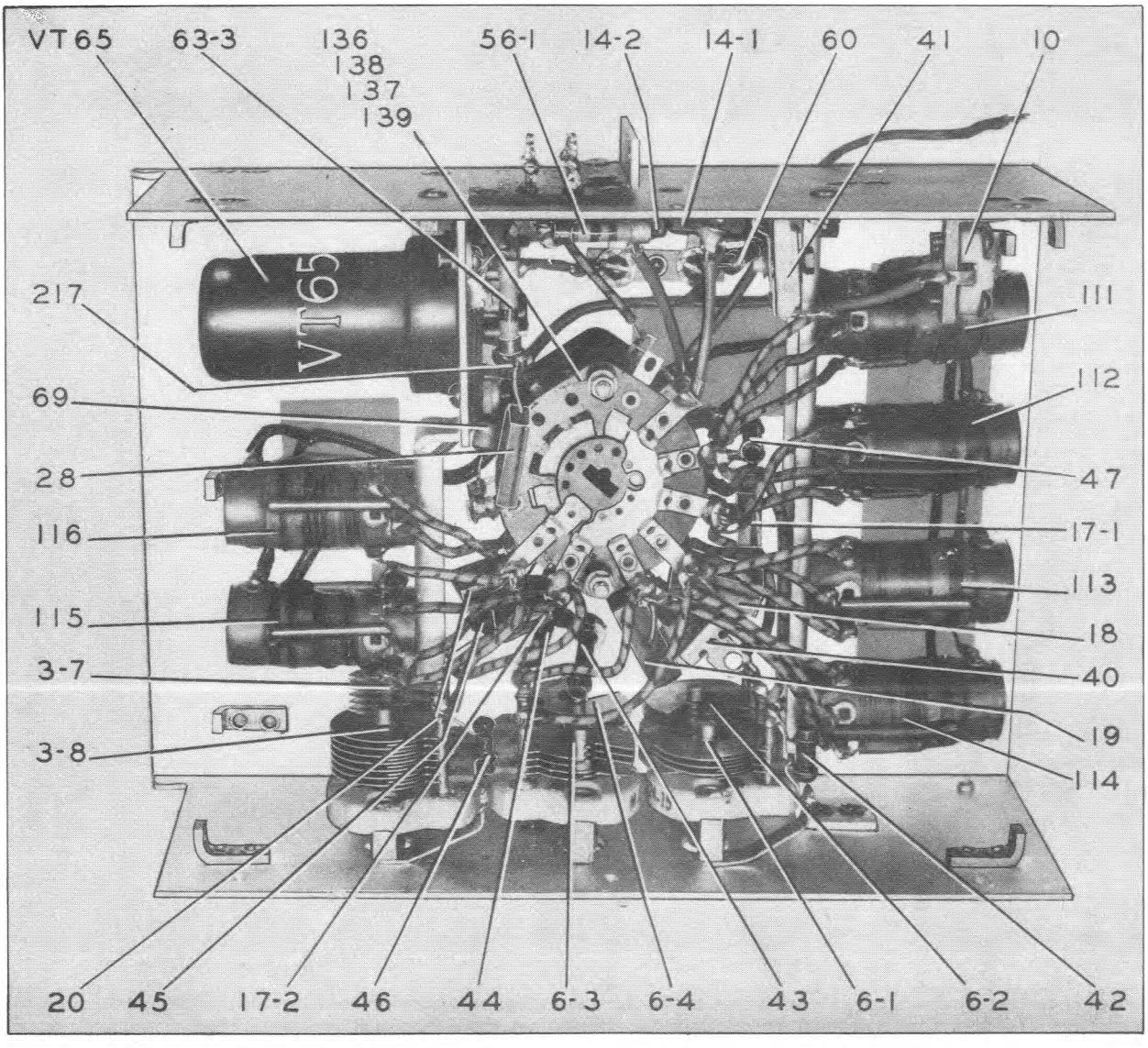


Figure 20—Oscillator Unit

(13) ALIGNMENT OF R-F AMPLIFIER.

NOTE

For a general alignment start with the 200-500 kc band No. 1.

for maximum audio output. Note that in band No. 1 there are two such adjustments one at the l-f and the other at the h-f end of the dial. A similar procedure is followed in the alignment of each band.

TABLE I—ALIGNMENT DATA

Band No.	Freq. Range	Alignment Frequency	Osc.	Trimmers* Det.	R-F	Ant.
1	200- 500 kc	500 kc 200 kc	6-1 10	3-5	3-3	2**
2	1.5- 3.5 mc	3.5 mc	6-2	5-5	5-3	5-1
3	3.5- 6.0 mc	6.0 mc	6-3	3-6	3-4	3-1
4	6.0- 9.5 mc	9.5 mc	6-4	5-6	5-4	5-2
5	9.5-13.5 mc	13.5 mc	3-7	7-2	7-1	3-2
6	13.5-18.0 mc	18.0 mc	3-8	4-3	4-2	4-1

* Refer to Schematic Diagram and marked photographs for location. The alignment controls for the various bands are numbered on the chassis adjacent to the control. Controls for band 1 are marked 1, those for 2 are marked 2, etc.

** Antenna alignment control.

In the r-f alignment for any particular band adjust the tuning control for the alignment frequency (Table of Alignment Data), and couple the modulated test signal at this alignment frequency from the test oscillator to antenna post through the 100 mmf dummy antenna. Adjust the three r-f trimmers (Ant.; R-F.; and Det.) for this band, for maximum output. A similar procedure is followed in the alignment of each band.

(14) ALIGNMENT OF HETERODYNE OSCILLATOR.

NOTE

For a general alignment start with the 200-500 kc band No. 1.

The alignment of the heterodyne oscillator is necessary only when the tuning dial frequency calibration is in error by more than 0.5 per cent. To align the oscillator follow the same general procedure described for the alignment of the r-f amplifier. With the BAND SWITCH on band No. 1 (200-500 kc) and the TUNING control set to the alignment frequency, couple the output of the modulated test oscillator (set at the alignment frequency) to the antenna post through the 100 mmf dummy antenna. Adjust the oscillator trimmer for this band

d. **WEAK OR NO SIGNALS ON ANY ONE BAND, MODULATED RECEPTION.**—The condition of satisfactory reception on several bands and weak or no signals on one or more bands, indicates correct functioning of the i-f and a-f amplifiers and requires checking only the r-f amplifier and heterodyne oscillator for the defective band or bands. The procedure outlined in Paragraphs 34*c* (11) to 34*c* (14) should be followed for the defective band or bands.

e. **WEAK OR NO SIGNALS ON ALL BANDS, C-W RECEPTION (MODULATED RECEPTION NORMAL).**—Weak or no signals on all bands for c-w reception with satisfactory modulated signal reception requires testing and alignment of the c-w oscillator. Proceed as outlined in Paragraphs 34*c* (8) and 34*c* (9).

f. **NOISY OPERATION.**—If during tuning, the receiver appears to be erratic or noisy, clean the rotor plates of the gang tuning capacitor with pipe cleaners or compressed air.

CAUTION

A strong blast of air will change the tracking of the capacitor.

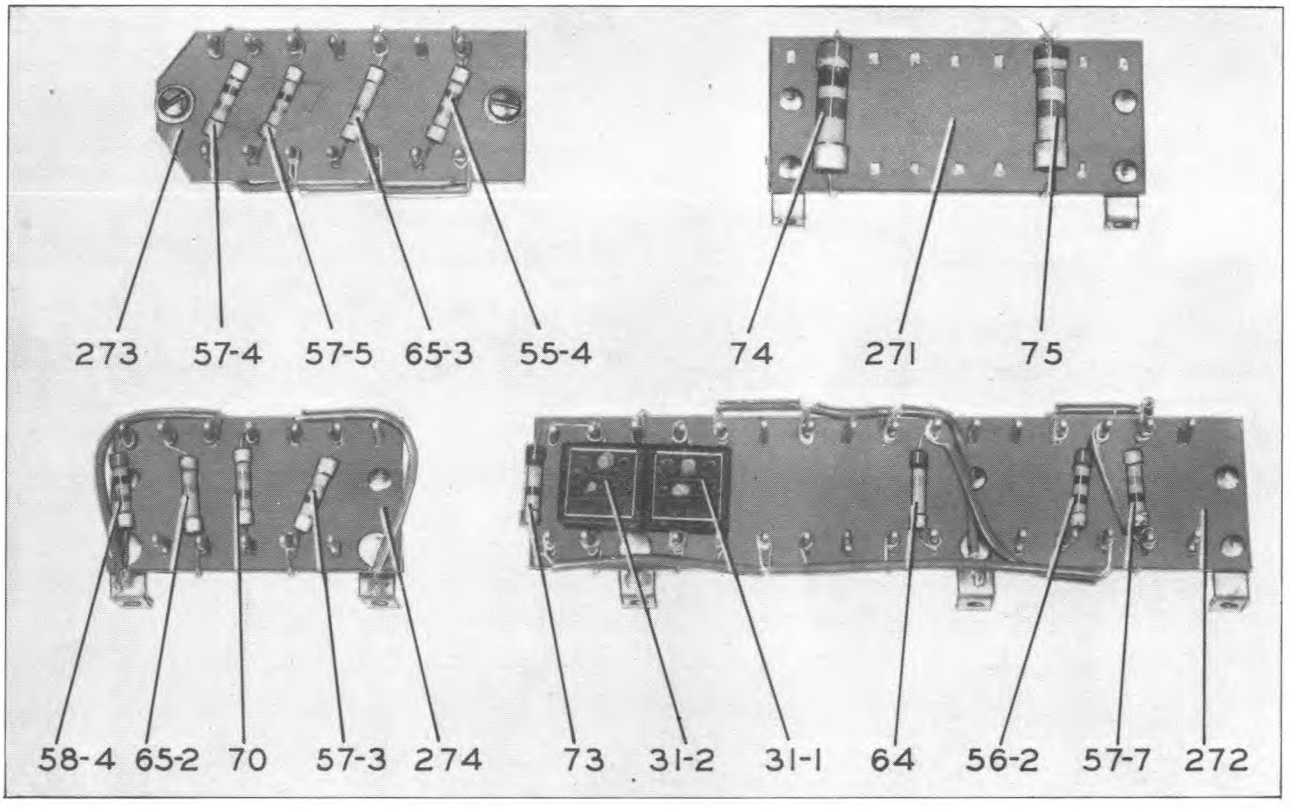


Figure 21—Radio Receiver BC-348-(*) or BC-224-(*)
Resistor Boards View A

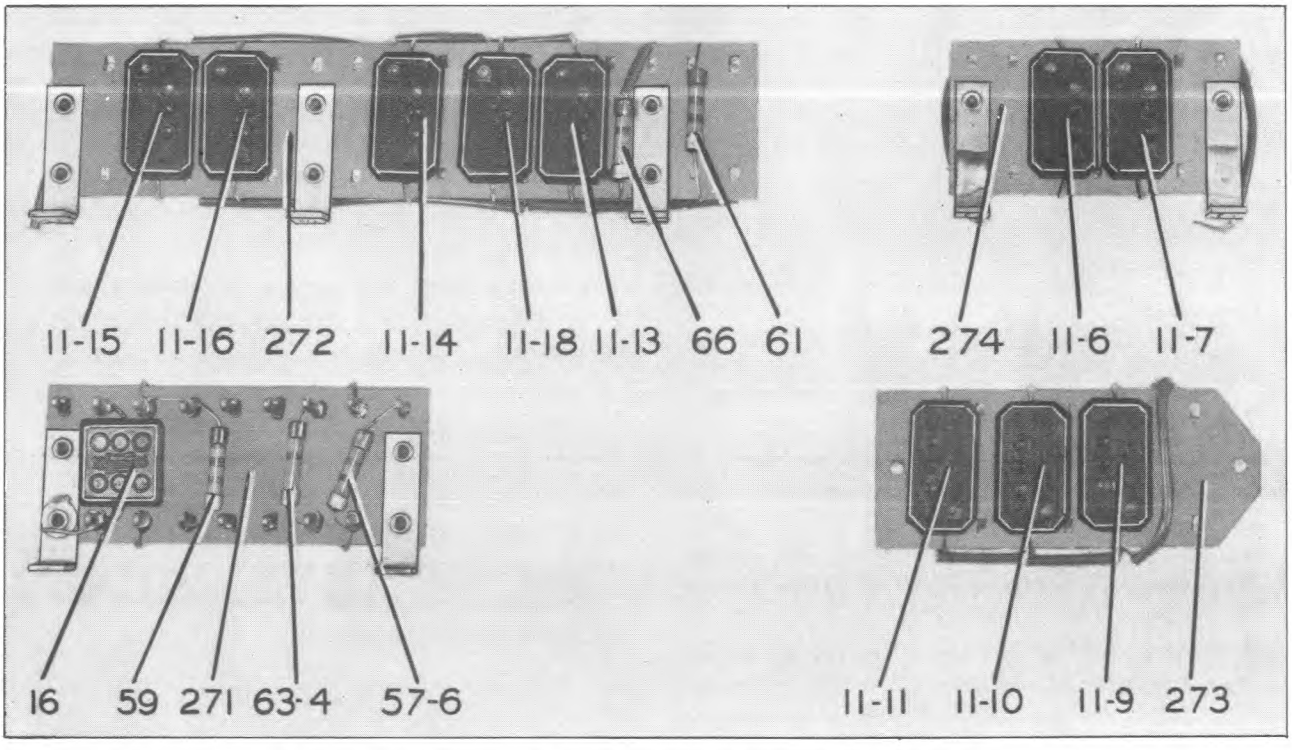


Figure 22—Radio Receiver BC-348-(*) or BC-224-(*),
Resistor Boards View B

TABLE II—TUBE VOLTAGE CHART

Test	Tube	Function	Block Terminal Number to	Analyzer Jacks
Plate Voltage	VT-86 VT-91 VT-93 VT-65 VT-152	R-F & I-F Ampl. 1st Det. 3rd I-F R-F Osc. Output	3 gnd	250 V ± V
	VT-70	2nd I-F	2 gnd	250 V ± V
Screen Voltage	VT-86 VT-91 VT-152	R-F & I-F Ampl. 1st Det. Output	4 gnd	250 V ± V
	VT-70	2nd I-F C-W Osc.	3 gnd	250 V ± V
	VT-93	3rd I-F	6 gnd	250 V ± V
Cathode Voltage	VT-86 VT-91 VT-65 VT-152	R-F & I-F Ampl. 1st Det. R-F Osc. Output	8 gnd	10 V ± V
	VT-70	2nd I-W C-W Osc.	6 gnd	10 V ± V
	VT-93	3rd I-F, 2nd Det.	8 gnd	25 V ± V
Heater Voltage	VT-65 VT-86 VT-91 VT-93	R-F Osc. 1st R-F, 2nd R-F 1st Det. 3rd I-F	7 2	10 V ± V
	VT-86	1st I-F	2 7	10 V ± V
	VT-70	2nd I-F	1 7	10 V ± V
	VT-152	Output	7 2	10 V ± V
Triode Voltage	VT-70	C-W Osc.	4 gnd	250 V ± V
Diode Voltage	VT-93	2nd Det.	5 gnd	100 V ± V
Plate Current	VT-86 VT-91 VT-65 VT-93	R-F & I-F Ampl. 1st Det. R-F Osc. 3rd I-F, 2nd Det.	3 Outside 3 Inside	10 ma. — ma.
	VT-152	Output	3 Outside 3 Inside	25 ma. — ma.
	VT-70	2nd I-F C-W Osc.	2 Outside 2 Inside	5 ma. — ma.
Screen Current	VT-86 VT-91 VT-152	R-F & I-F Ampl. 1st Det. Output	4 Outside 4 Inside	5 ma. — ma.
	VT-70	2nd I-F C-W Osc.	3 Outside 3 Inside	5 ma. — ma.
	VT-93	3rd I-F, 2nd Det.	6 Outside 6 Inside	1 ma. — ma.

g. **MEASUREMENTS WITH TEST SET I-56-A.**

GENERAL.—The following readings are typical values obtained on the Weston Model 665-2 Selective Analyzer (Test Set I-56-A). If all plugs seem to be securely in position with the dynamotor running and faulty or poor operation is obtained from the receiver, carefully check the cables and plugs using the Model 564 Volt-Ohmmeter as outlined under "Detailed Tests on Radio Sets," page 11 of the Instruction Book for Test Set I-56-A. If all plug-in cable connections seem to be functioning properly, test the tubes in the receiver, using the Model 685 tube tester as outlined in the paragraphs mentioned above. Should neither of these tests locate the difficulty, make voltage and current or resistance measurements as outlined in the following paragraphs:

(1) VOLTAGE AND CURRENT MEASUREMENTS.—Set up the receiver and a Model 665 analyzer for operation as outlined under general voltage and current measurements. To obtain the various readings, connect the jumper leads from the socket selector block to the analyzer pin jacks in accordance with the instructions given below.

PROCEDURE.

(a) Release the thumb screws and pull the complete chassis out of the case.

(b) Make power connections to the plug socket at the rear of the receiver chassis.

(c) Be sure the plug and tube top grid connections are secure when taking readings.

(d) Keep the analyzer AC—DC switch on DC.

(e) Place the analyzer left-hand toggle switch in the VOLTS-MA position.

(f) Connect the short jumper cables for the various tests as indicated in Table I.

(g) Connect jumper cable from black terminal GND to receiver chassis.

(h) Set the receiver control switch on the MVC position unless otherwise specified.

(i) Set the receiver with the volume control at the maximum position (extreme clockwise).

(j) Set the tuning control to 200 kc (L-F end of band 1); readings should deviate but slightly when switching to other bands with the tuning control remaining at the low frequency end of each band.

(k) The c-w oscillator should be OFF for the readings in Table II and ON for the readings in Table III.

(2) RESISTANCE AND CONTINUITY MEASUREMENTS.—Remove the chassis from the cabinet. Do not make any connections to the plug socket at the rear of the chassis. This procedure permits the operation of all switches without running the dynamotor and causing voltages to be built up across the various resistors and condensers. Any voltages set up by the dynamotor in the receiver would cause serious errors in reading on the ohmmeter ranges or might possibly damage the test instruments.

PROCEDURE.

(a) Set the receiver control switch to MVC unless otherwise specified.

(b) Set the receiver with the volume control at the maximum position (extreme clockwise).

(c) Set the tuning control to 200 kc (l-f end of band 1); readings should not deviate when switching to other bands with the tuning control remaining at the low-frequency end of each band.

(d) The c-w oscillator should be OFF for the readings in Table IV and ON for the readings in Table V.

(e) Shift the analyzer left-hand toggle switch to the ohms position.

Set up the Model 665 Analyzer for resistance and continuity measurements as outlined under "General Resistance and Continuity Tests" in the Test Set instruction book. Before taking a resistance reading on any range, short the two jumper leads plugged into the ohmmeter pin jacks and rotate the "battery adjustment" knob until the instrument pointer reads exactly full scale. Should it be found impossible to bring the pointer up to the top mark, refer to the paragraphs on battery replacement under the heading "Maintenance" in the Test Set instruction book. Plug the pin tip end of the 3 foot clip lead into the block hole marked GND and clip the other end to the chassis. Connect one of the jumper leads between the remaining ground jack and one of the ohmmeter jacks on the required range. Connect the other jumper lead from the re-

maining ohmmeter range jack to the tube element under test. In general, ohmmeter readings will be most accurate when taken on the upper $\frac{2}{3}$ of the scale. Wherever possible, the range should be chosen that will give indications in this area.

f. FAILURE OF DIAL LIGHTS.—The two dial lamps are connected in series; hence the failure of either lamp does not indicate failure of both lamps. Removal of the dial light housing gives ready access to the lamps.

Voltage to Ground

TABLE II—C-W OSC. OFF

Stage	Tube	Plate Volts	Screen Volts	Cathode Volts	Heater Volts	M. A. Plate Current	M. A. Screen Current
1 R-F	VT-86	184	70	2.6	6.3	4.1	1.0
2 R-F	VT-86	177	86	3.2	6.3	4.8	1.3
1 Det.	VT-91	.202	96	4.2	6.3	0.23	0.08
Osc.	VT-65	58	..	0.0	6.3	1.6	..
1 I-F	VT-86	182	82	3.1	6.5	4.7	1.2
2 I-F	VT-70	207	82	3.1	6.5	4.5	1.4
3 I-F	VT-93	207	72	21.0	6.5	2.5	0.6
Output	VT-152	197	207	0.0	6.5	18.0	3.2
2 Det.	VT-93 Diode	8.0					

Voltage to Ground

TABLE III—C-W OSC. ON

Stage	Tube	Plate Volts	Screen Volts	Cathode Volts	Heater Volts	M. A. Plate Current	M. A. Screen Current
1 R-F	VT-86	197	37	1.3	6.3	2.0	0.55
2 R-F	VT-86	188	65	2.3	6.3	3.7	1.0
1 Det.	VT-91	204	72	3.4	6.3	0.17	0.06
Osc.	VT-65	58	..	0.0	6.3	1.6	..
1 I-F	VT-86	195	44	1.6	6.5	2.3	0.5
2 I-F	VT-70	210	44	1.6	6.5	2.2	0.5
3 I-F	VT-93	210	72	21.0	6.5	2.5	0.6
Output	VT-152	198	210	0.0	6.5	23.5	3.6
C-W Osc.	VT-70 Triode	18.0					

NOTE

The readings given above are average values taken on receivers of this type using a 14-volt power supply or 28-volt power supply, depending on receiver use. Meter indications within $\pm 10\%$ of these values will in most cases indicate correct operations. The readings are taken with the tuning control set to the l-f end of the dial.

TABLE IV—C-W OSC. OFF Resistance to Ground (OHMS)

Stage	Tube	Cathode	Plate	Screen	"MVC" Grid	"AVC" Grid
1 R-F	VT-86	490	5,200	80,000	100,000	1.8 meg.
2 R-F	VT-86	480	5,200	75,000	100,000	1.8 meg.
1 Det.	VT-91	15,000	5,600	75,000	0	0
Osc.	VT-65	0	41,000	.....	100,000	100,000
1 I-F	VT-86	520	5,600	70,000	500,000	1.8 meg.
2 I-F	VT-70	470	500	70,000	500,000	2.25 meg.
3 I-F	VT-93	6,200	500	180,000	5,000	5,000
Output	VT-152	0	1,080	480	700,000	

TABLE V—C-W OSC. ON Resistance to Ground (OHMS)

Stage	Tube	Cathode	Plate	Screen	"MVC" Grid	"AVC" Grid
1 R-F	VT-86	490	5,200	20,000	100,000	1.8 meg.
2 R-F	VT-86	480	5,200	23,000	100,000	1.8 meg.
1 Det.	VT-91	15,000	5,600	23,000	0	0
Osc.	VT-65	0	41,000	.....	100,000	100,000
1 I-F	VT-86	520	5,600	9,200	500,000	1.8 meg.
2 I-F	VT-70	470	500	9,200	500,000	2.25 meg.
3 I-F	VT-93	6,200	500	180,000	5,000	5,000
Output	VT-152	0	1,080	480	700,000	.....
C-W Osc.	VT-70	....	82,000	.....	500,000	.....
Det. Diode	VT-93	....	180,000	.....	.....	.....
AVC Diode	VT-93	....	380,000	.....	.....	.....

NOTE

The readings tabulated above are average values taken on receivers of this type with the storage battery disconnected. Meter indications within plus or minus 10% of the values will in most cases indicate correct operation.

TABLE VI—CHARACTERISTICS OF TUBES, LAMPS, VOLTAGE REGULATOR AND FUSE

Tube Characteristics

Tube	Heater Volts	Heater Amps.	Screen Volts	Plate Volts	Grid Volts	Plate Ma	Screen Ma	Mu	Plate Resistance Ohms	Transconductance Micromhos
VT-86	6.3	0.3	100	250	–3	7.0	1.7	1,160	800,000	1,450
VT-91	6.3	0.3	100	250	–3	2.0	0.5	1,500	1,500,000	1,225
VT-70	6.3	0.3	100	250	–3	6.5	1.5	900	850,000	1,100
		Tri.	...	100	–3	3.5	..	8	16,000	500
VT-93	6.3	0.3	125	250	–3	10.	2.3	800	600,000	1,325
VT-65	6.3	0.3	...	250	–8	8.	..	20	10,000	2,000
VT-152	6.3	0.4	250	250	–18	32.	5.5	150	68,000	2,200

Dial Lamps

Type	Volts	Amps.
LM-27	6.3	0.25

Voltage Regulator

Type 991—Starting Supply Voltage	87	volts min.
Operating Voltage	60	volts
Operating Current	0.5 to 2	milliamperes

Fuse

Type	Amps.
FU-35	5
FU-23	10

SECTION VI

SUPPLEMENTARY DATA

TABLE VII—DYNAMOTOR PERFORMANCE DATA

Average performance data on dynamotor DM-24-D, DM-24-F, DM-28-O, DM-28-L, DM-28-H and DM-28-R is as follows: (dynamotor and filter disconnected from receiver and negative high voltage connections made to case of unit).

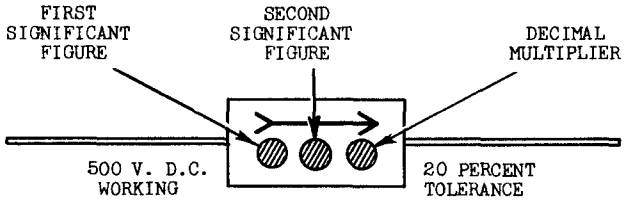
DR-24-(*)				DM-28-(*)			
Input		Output		Input		Output	
Volts	Amperes	Volts	Milliamperes	Volts	Amperes	Volts	Milliamperes
12	1.4	213	0.	24	0.7	215	0.
12	2.0	210	30.	24	1.1	210	30.
12	2.5	190	60.	24	1.3	202	60.
14	1.4	255	0.	28	0.8	258	0.
14	2.2	236	40.	28	1.1	246	40.
14	2.8	226	75.	28	1.5	236	75.

TABLE VIII—TUBE COMPLEMENT

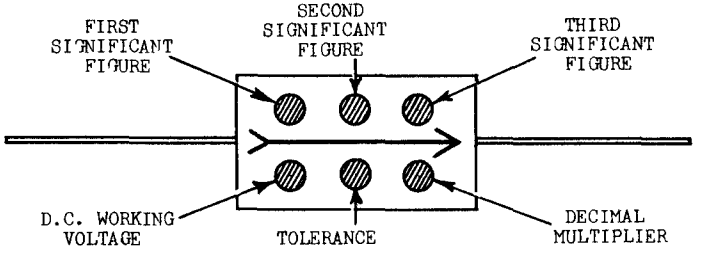
Part	Size in Inches	Weight in Pounds	Purpose
1 Tube VT-152	3 5/16 x 1 5/16 dia.	.07	Output
1 Tube VT-65	2 5/8 x 1 5/16 dia.	.08	Oscillator
1 Tube VT-70	4 1/2 x 1 9/16 dia.	.09	2nd I-F; C-W Oscillator
3 Tubes VT-86	3 1/8 x 1 5/16 dia.	.08	1st R-F, 2nd R-F, 1st I-F
1 Tube VT-91	3 1/8 x 1 5/16 dia.	.09	Converter
1 Tube Vt-93	3 1/8 x 1 5/16 dia.	.09	3rd I-F, 2nd DET., AVC
2 Lamps L-M-27	1 1/8 x 1/2 dia.	.01	Dial Lamps
1 Voltage Regulator Type 991	1 1/2 x 1 1/16 dia.	.02	Voltage Regulator
1 Fuse FU-35 or Fu-23	1 1/4 x 1/4 dia.	.01	Fuse

TABLE IX—COLOR CODING

RMA COLOR CODES FOR CAPACITORS (MMFD)



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



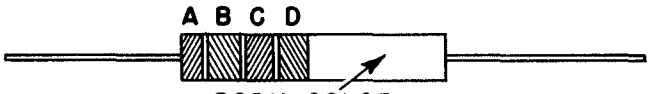
RMA COLOR CODE FOR RESISTORS (OHMS)

COLOR	A 1ST DIGIT	B 2ND DIGIT	C MULTIPLIER
SILVER			0.01
GOLD			0.1
BLACK		0	1.0
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
PURPLE	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	

D - TOLERANCE CODE:

GOLD = 5% SILVER = 10% NO COLOR = 20%

OLD COLOR ARRANGEMENT



NEW COLOR ARRANGEMENT

BODY COLOR (NEW COLOR ARRANGEMENT ONLY) INDICATES TYPE OF RESISTOR, AS FOLLOWS:-

BLACK - COMPOSITION, NON-INSULATED
TAN, OLIVE OR WHITE - COMPOSITION, INSULATED
DARK BROWN - WIRE-WOUND, INSULATED

COLOR CODES

SECTION VII

TABLE OF REPLACEABLE PARTS

35. NOTE: In the List of Replaceable Parts, those parts having identical part numbers followed by letters are constructed as common assemblies.

The following symbols are used in column 5 of the List of Replaceable Parts to indicate the part manufacturer. Where no manufacturer is indicated, the part is manufactured by the Belmont Radio Corporation.

Ordering of SPARE PARTS: Each Service using this list has established certain depots and service groups for the storage and issue of spare parts to its organizations requiring them. The regulations of each Service should be studied to determine the method and source for requisitioning spare parts. The information in this list, as to manufacturer's name, type, model or drawing number, is not to be interpreted as authorization to field agencies to attempt to purchase identical or comparable spare parts direct from the manufacturer or a wholesale or retail store except under emergency conditions as covered by existing regulations of the Service concerned.

36. LIST OF MANUFACTURERS.

Manufacturer	Symbol	Manufacturer	Symbol
American Steel Package	ASP	General Electric Co.	GE
Aladdin Radio Industries	AR	International Resistance Corp.	IRC
Allen Bradley Co.	AB	Littelfuse Laboratories, Inc.	LL
Arrow Hart & Hegeman Corp.	AH	P. R. Mallory Co.	PRM
American Radio Hardware Co.	ARH	Micamold Radio Corp.	MR
Bliley Electric Co.	BE	National Lock Co.	NL
Central Radio Laboratory	CRL	National Fabricated Products, Inc.	NF
Chicago Transformer Co.	CT	Oak Mfg. Co.	OM
H. Cole and F. C. Hersee Co.	CH	Radio Condenser Corp.	RC
Cornell Dubilier Corp.	CD	Radio Corporation of America	RCA
Crowe Nameplate Mfg. Co.	CN	Ross Mfg. Co.	RM
Drake Mfg. Co.	DM	Russell Electric Co.	RE
Eicor, Inc.	E	Solar Mfg. Co.	SM
Erie Resistor Corp.	ER	Sprague Specialties Corp.	SS
John E. Fast Co.	JF	Wincharger Corp.	WC

35. TABLE OF REPLACEABLE PARTS.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
1-A, 1-B, 1-C, 1-D	3D9016V-1	CAPACITOR: A Section, 16 to 241 mmfd; B Section, 16 to 241 mmfd; C Section, 16 to 241 mmfd; D Section, 16 to 241 mmfd.	Main Tuning	RC	C-8A-969
2	3D9075V	CAPACITOR: Air Trimmer 75 mmfd max.	Ant. Aligning	RC, OM, or ASP	A-8H-500
3-1	3D9050V-31	CAPACITOR: Air Trimmer 50 mmfd max.	Ant. Trimmer	RC, OM, or ASP	A-8H-495
3-2		CAPACITOR: Air Trimmer 50 mmfd max.	Ant. Trimmer	RC, OM, or ASP	A-8H-495
3-3		CAPACITOR: Air Trimmer 50 mmfd max.	R-F Trimmer	RC, OM, or ASP	A-8H-495
3-4		CAPACITOR: Air Trimmer 50 mmfd max.	R-F Trimmer	RC, OM, or ASP	A-8H-495
3-5		CAPACITOR: Air Trimmer 50 mmfd max.	Det. Trimmer	RC, OM, or ASP	A-8H-495
3-6		CAPACITOR: Air Trimmer 50 mmfd max.	Det. Trimmer	RC, OM, or ASP	A-8H-495
3-7		CAPACITOR: Air Trimmer 50 mmfd max.	Osc. Trimmer	RC, OM, or ASP	A-8H-495
3-8		CAPACITOR: Air Trimmer 50 mmfd max.	Osc. Trimmer	RC, OM, or ASP	A-8H-495
4-1	3D9050V-32	CAPACITOR: Air Trimmer 50 mmfd max.	Ant. Trimmer	RC, OM, or ASP	A-8H-496
4-2		CAPACITOR: Air Trimmer 50 mmfd max.	R-F Trimmer	RC, OM, or ASP	A-8H-496
4-3		CAPACITOR: Air Trimmer 50 mmfd max.	Det. Trimmer	RC, OM, or ASP	A-8H-496
5-1	3D9025V-4	CAPACITOR: Air Trimmer 25 mmfd max.	Ant. Trimmer	RC, OM, or ASP	A-8H-497
5-2		CAPACITOR: Air Trimmer 25 mmfd max.	Ant. Trimmer	RC, OM, or ASP	A-8H-497
5-3		CAPACITOR: Air Trimmer 25 mmfd max.	R-F Trimmer	RC, OM, or ASP	A-8H-497
5-4		CAPACITOR: Air Trimmer 25 mmfd max.	R-F Trimmer	RC, OM, or ASP	A-8H-497
5-5		CAPACITOR: Air Trimmer 25 mmfd max.	Det. Trimmer	RC, OM, or ASP	A-8H-497
5-6		CAPACITOR: Air Trimmer 25 mmfd max.	Det. Trimmer	RC, OM, or ASP	A-8H-497
6-1	3D9025V-5	CAPACITOR: Air Trimmer 25 mmfd max.	Osc. Trimmer	RC, OM, or ASP	A-8H-501
6-2		CAPACITOR: Air Trimmer 25 mmfd max.	Osc. Trimmer	RC, OM, or ASP	A-8H-501
6-3		CAPACITOR: Air Trimmer 25 mmfd max.	Osc. Trimmer	RC, OM, or ASP	A-8H-501
6-4		CAPACITOR: Air Trimmer 25 mmfd max.	Osc. Trimmer	RC, OM, or ASP	A-8H-501
7-1	3D9025V-6	CAPACITOR: Air Trimmer 25 mmfd max.	R-F Trimmer	RC, OM, or ASP	A-8H-716
7-2		CAPACITOR: Air Trimmer 25 mmfd max.	Det. Trimmer	RC, OM, or ASP	A-8H-716

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
8	3D9010V-3	CAPACITOR: Air Trimmer 10 mmfd max.	Crystal Filter Adjustment	RC, OM, or ASP	A-8H-499
9	3D9010V-4	CAPACITOR: Air Trimmer 10 mmfd max.	C-W Osc. Adjustment	RC, OM, or ASP	A-8H-498
10	3D9005V	CAPACITOR: Ceramic Trimmer 5 to 30 mmfd.	Osc. Series Pad.	ER	A-8G-738
11-1		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	1st R-F Cathode By-pass	MR	B-8J-696
11-2		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	1st R-F Screen By-pass	MR	B-8J-696
11-3		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	2nd R-F Cathode By-pass	MR	B-8H-696
11-4		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	2nd R-F Screen By-pass	MR	B-8J-696
11-5		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	1st DET. Screen By-pass	MR	B-8J-696
11-6		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	1st I-F Transformer By-pass	MR	B-8J-696
11-7		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	Crystal Transformer By-pass	MR	B-8J-696
11-8	3DA10-94	CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	1st I-F Cathode By-pass	MR	B-8J-696
11-9		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	1st I-F Plate By-pass	MR	B-8J-696
11-10		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	2nd I-F By-pass	MR	B-8J-696
11-11		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	2nd I-F Cathode By-pass	MR	B-8J-696
11-12		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	C-W Osc. Plate By-pass	MR	B-8J-696
11-13		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	Plug Terminal By-pass	MR	B-8J-696
11-14		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	AVC By-pass	MR	B-8J-696
11-15		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	3rd I-F Transformer By-pass	MR	B-8J-696

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
11-16	3DA10-94	CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	3rd I-F Cathode By-pass	MR	B-8J-696
11-17		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	Heater By-pass	MR	B-8J-696
11-18		CAPACITOR: Paper 500 volts DC .01 mfd ±10% with leads.	Battery By-pass	MR	B-8J-696
12-1	3DA10-50	CAPACITOR: Mica 500 volts DC .01 mfd ±10% with lugs.	Ant. Coil By-pass	CD or SM	B-8F-363
12-2		CAPACITOR: Mica 500 volts DC .01 mfd ±10% with lugs.	Ant. Coil By-pass	CD or SM	B-8F-363
12-3		CAPACITOR: Mica 500 volts DC .01 mfd ±10% with lugs.	1st R-F Plate By-pass	CD or SM	B-8F-363
12-4		CAPACITOR: Mica 500 volts DC .01 mfd ±10% with lugs.	2nd R-F Plate By-pass	CD or SM	B-8F-363
13-1	3DA10-99	CAPACITOR: Mica 500 volts DC .01 mfd ±10% with lugs.	R-F Coil By-pass	CD or SM	B-8F-737
13-2		CAPACITOR: Mica 500 volts DC .01 mfd ±10% with lugs.	R-F Coil By-pass	CD or SM	B-8F-737
14-1	3DA10-97	CAPACITOR: Mica 500 volts DC .01 mfd ±10% with lugs.	1st Det. Cathode By-pass	CD or SM	B-8F-741
14-2		CAPACITOR: Mica 500 volts DC .01 mfd ±10% with lugs.	Osc. Plate By-pass	CD or SM	B-8F-741
15	3DA10-95	CAPACITOR: Mica 500 volts DC .01 mfd ±10% with leads.	Antenna Series Pad	CD or SM	B-8F-506
16	3DA5-32	CAPACITOR: Mica 500 volts DC .005 mfd ±10% with leads.	Audio Frequency Secondary By-pass	MR or SM	B-8F-512
17-1	3D9500-52	CAPACITOR: Mica 500 volts DC 500 mmfd ±1½% with leads.	Osc. Series	MR or SM	B-8F-744
17-2		CAPACITOR: Mica 500 volts DC 500 mmfd ±1½% with leads.	Osc. Series	MR or SM	B-8F-744
18	3DA1.70-1	CAPACITOR: Mica 500 volts DC 1700 mmfd ±2% with leads.	Osc. Series	MR or SM	B-8F-745
19	3DA2.650	CAPACITOR: Mica 500 volts DC 2650 mmfd ±2% with leads.	Osc. Series	MR or SM	B-8F-746

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
20	3D9210	CAPACITOR: Mica 500 volts DC 210 mmfd ±1½% with leads.	Osc. Series	MR or SM	B-8F-747
21-1	3D9200-22	CAPACITOR: Mica 500 volts DC 200 mmfd ±3% with leads.	Ant. Series	MR or SM	B-8F-734
21-2		CAPACITOR: Mica 500 volts DC 200 mmfd ±3% with leads.	R-F Series	MR or SM	B-8F-734
21-3		CAPACITOR: Mica 500 volts DC 200 mmfd ±3% with leads.	Det. Series	MR or SM	B-8F-734
22-1	3D9400-14	CAPACITOR: Mica 500 volts DC 400 mmfd ±1½% with leads.	Ant. Series	MR or SM	B-8F-735
22-2		CAPACITOR: Mica 500 volts DC 400 mmfd ±1½% with leads.	R-F Series	MR or SM	B-8F-735
22-3		CAPACITOR: Mica 500 volts DC 400 mmfd ±1½% with leads.	Det. Series	MR or SM	B-8F-735
23-1	3D9040-8	CAPACITOR: Mica 500 volts DC 40 mmfd ±10% with leads.	Det. Shunt	MR or SM	B-8F-732
23-2		CAPACITOR: Mica 500 volts DC 40 mmfd ±10% with leads.	R-F Shunt	MR or SM	B-8F-732
23-3		CAPACITOR: Mica 500 volts DC 40 mmfd ±10% with leads.	R-F Shunt	MR or SM	B-8F-732
23-4		CAPACITOR: Mica 500 volts DC 40 mmfd ±10% with leads.	Det. Shunt	MR or SM	B-8F-732
24-1	3D9025-25	CAPACITOR: Mica 500 volts DC 25 mmfd ±10% with leads.	Ant. Shunt	MR or SM	B-8F-755
24-2		CAPACITOR: Mica 500 volts DC 25 mmfd ±10% with leads.	Ant. Shunt	MR or SM	B-8F-755
25	3D9065	CAPACITOR: Mica 500 volts DC 65 mmfd ±5% with leads.	Ant. Shunt	MR or SM	B-8F-756
26-1	3D9095	CAPACITOR: Mica 500 volts DC 95 mmfd ±5% with leads.	R-F Shunt	MR or SM	B-8F-733
26-2		CAPACITOR: Mica 500 volts DC 95 mmfd ±5% with leads.	Det. Shunt	MR or SM	B-8F-733
27-1	3D9070-3	CAPACITOR: Mica 500 volts DC 70 mmfd ±8% with leads.	R-F Shunt	MR or SM	B-8F-736
27-2		CAPACITOR: Mica 500 volts DC 70 mmfd ±8% with leads.	Det. Shunt	MR or SM	B-8F-736

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
28	3D9100-55	CAPACITOR: Mica 500 volts DC 100 mmfd ±5% with leads.	Osc. Grid	MR or SM	B-8F-743
29-1	3DA1.250-1	CAPACITOR: Mica 500 volts DC 1250 mmfd ±10% with leads.	R-F Primary Shunt	MR or SM	B-8F-776
29-2		CAPACITOR: Mica 500 volts DC 1250 mmfd ±10% with leads.	Det. Primary Shunt	MR or SM	B-8F-776
30-1	3D9002-7	CAPACITOR: Mica 500 volts DC 2 mmfd ±½ mmfd with leads.	R-F Coupling	MR or SM	A-8G-754
30-2	3D9002-7	CAPACITOR: Mica 500 volts DC 2 mmfd ±½ mmfd with leads.	Det. Coupling	MR or SM	A-8G-754
31-1	3DA1.500-1	CAPACITOR: Mica 500 volts DC 1500 mmfd ±10% with leads.	Audio Coupling	MR or SM	B-8F-514
31-2		CAPACITOR: Mica 500 volts DC 1500 mmfd ±10% with leads.	Audio Transformer Primary Shunt	MR or SM	B-8F-514
32	3D9200-23	CAPACITOR: Mica 500 volts DC 200 mmfd +5% -10% with leads.	1st I-F Primary Tuning	MR or SM	B-8F-828
33	3D9300-5	CAPACITOR: Mica 500 volts DC 300 mmfd +5% -10% with leads.	1st I-F Secondary Tuning	MR or SM	B-8F-829
34-1	3D9260-3	CAPACITOR: Mica 500 volts DC 260 mmfd +5% -10% with leads.	Crystal Transformer Tuning	MR or SM	B-8F-675
34-2		CAPACITOR: Mica 500 volts DC 260 mmfd +5% -10% with leads.	3rd I-F Primary	MR or SM	B-8F-675
34-3		CAPACITOR: Mica 500 volts DC 260 mmfd +5% -10% with leads.	3rd I-F Secondary Tuning	MR or SM	B-8F-675
35-1	3D9240-1	CAPACITOR: Mica 500 volts DC 240 mmfd +5% -10% with leads.	2nd I-F Primary Tuning	MR or SM	B-8F-692
35-2		CAPACITOR: Mica 500 volts DC 240 mmfd +5% -10% with leads.	2nd I-F Secondary Tuning	MR or SM	B-8F-692
35-3		CAPACITOR: Mica 500 volts DC 240 mmfd +5% -10% with leads.	C-W Osc. Tuning	MR or SM	B-8F-692
35-4		CAPACITOR: Mica 500 volts DC 240 mmfd +5% -10% with leads.	2nd Det. By-pass	MR or SM	B-8F-692
36	3D9047-3	CAPACITOR: Mica 500 volts DC 47 mmfd +5% -10% with leads.	4th I-F Primary Tuning	MR or SM	B-8F-827

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
37-1	3D9150-9	CAPACITOR: Mica 500 volts DC 150 mmfd +5% -10% with leads.	4th I-F Secondary Tuning	MR or SM	B-8F-674
37-2		CAPACITOR: Mica 500 volts DC 150 mmfd +5% -10% with leads.	C-W Osc. Grid	MR or SM	B-8F-674
38	3D9075-4	CAPACITOR: Mica 500 volts DC 75 mmfd ±5% with leads.	Diode Coupling	MR or SM	B-8F-693
39	3D9750-3	CAPACITOR: Mica 500 volts DC 750 mmfd +5% -10% with leads.	1st I-F Secondary Tuning	MR or SM	B-8F-830
40*	3D9006-3	CAPACITOR: Mica 500 volts DC 4.8 mmfd ±.2 mmfd with lugs.	Osc. Temperature Compensating	UE	A-8E-968
41*	3D9003E8	CAPACITOR: Mica 500 volts DC 3.5 mmfd ±.2 mmfd with lugs.	Osc. Temperature Compensating	UE	A-8E-967
42	3D9020-6	CAPACITOR: Ceramic 500 volts DC 20 mmfd ±5% with leads.	Osc. Temperature Compensating	CRL	A-8G-748
43	3D9065-1	CAPACITOR: Ceramic 500 volts DC 65 mmfd ±5% with leads.	Osc. Temperature Compensating	CRL	A-8G-749
44	3D9090-4	CAPACITOR: Ceramic 500 volts DC 90 mmfd ±3% with leads.	Osc. Temperature Compensating	CRL	A-8G-750
45	3D9035-2	CAPACITOR: Ceramic 500 volts DC 35 mmfd ±5% with leads.	Osc. Temperature Compensating	CRL	A-8G-751
46	3D9040-9	CAPACITOR: Ceramic 500 volts DC 40 mmfd ±5% with leads.	Osc. Temperature Compensating	CRL	A-8G-752
47	3D9085-1	CAPACITOR: Ceramic 500 volts DC 85 mmfd ±3% with leads.	Osc. Series	CRL	A-8G-753
48-1A		CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	4th I-F Transformer Filter	SM or SS	A-8B-516
48-1B		CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	Noise Compensator Filter	SM or SS	A-8B-516
48-2A	3DA500-47	CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	Screen Supply Filter	SM or SS	A-8B-516
48-2B		CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	Output Plate Filter	SM or SS	A-8B-516
48-3A		CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	Volume Control Filter	SM or SS	A-8B-515
48-3B		CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	3rd I-F Screen Filter	SM or SS	A-8B-515
49-1A	3DA500-42	CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	4th I-F Transformer Filter	SM or SS	A-8B-515

* Used only in BC-348-L and BC-348-R.

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
49-1B		CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	4th I-F Transformer Filter	SM or SS	A-8B-515
49-2A		CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	Output Grid Filter	SM or SS	A-8B-515
49-2B		CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	Screen Supply Filter	SM or SS	A-8B-515
49-3A	3DA500-42	CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	1st I-F Screen Filter	SM or SS	A-8B-516
49-3B		CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	1st I-F Screen Filter	SM or SS	A-8B-516
49-4A		CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	Battery Filter	SM or SS	A-8B-515
49-4B		CAPACITOR: Paper 250 volts DC .5 mfd ±15%.	Battery Filter	SM or SS	A-8B-515
55-1		RESISTOR: Insul. 470 ohms ±10% ½watt.	1st R-F Cathode	CRL	A-9B1-58
55-2	3Z6047-1	RESISTOR: Insul. 470 ohms ±10% ½watt.	2nd R-F Cathode	CRL	A-9B1-58
55-3		RESISTOR: Insul. 470 ohms ±10% ½watt.	1st I-F Cathode	CRL	A-9B1-58
55-4		RESISTOR: Insul. 470 ohms ±10% ½watt.	2nd I-F Cathode	CRL	A-9B1-58
56-1	3Z6100-49	RESISTOR: Insul. 1000 ohms ±10% ½ watt.	Osc. Plate	CRL	A-9B1-62
56-2		RESISTOR: Insul. 1000 ohms ±10% ½ watt.	3rd I-F Cathode	CRL	A-9B1-62
57-1		RESISTOR: Insul. 4700 ohms ±10% ½ watt.	1st R-F Plate	CRL	A-9B1-70
57-2		RESISTOR: Insul. 4700 ohms ±10% ½ watt.	2nd R-F Plate	CRL	A-9B1-70
57-3		RESISTOR: Insul. 4700 ohms ±10% ½ watt.	1st Det. Plate	CRL	A-9B1-70
57-4	3Z6470	RESISTOR: Insul. 4700 ohms ±10% ½ watt.	1st I-F Screen	CRL	A-9B1-70
57-5		RESISTOR: Insul. 4700 ohms ±10% ½ watt.	1st I-F Plate	CRL	A-9B1-70
57-6		RESISTOR: Insul. 4700 ohms ±10% ½ watt.	Bleeder	CRL	A-9B1-70
57-7		RESISTOR: Insul. 4700 ohms ±10% ½ watt.	3rd I-F Cathode	CRL	A-9B1-70
58-1		RESISTOR: Insul. 10,000 ohms ±10% ½ watt.	1st R-F Screen	CRL	A-9B1-74
58-2	3Z6610-49	RESISTOR: Insul. 10,000 ohms ±10% ½ watt.	2nd R-F Screen	CRL	A-9B1-74
58-3		RESISTOR: Insul. 10,000 ohms ±10% ½ watt.	1st Det. Screen	CRL	A-9B1-74
58-4		RESISTOR: Insul. 10,000 ohms ±10% ½ watt.	C-W Osc. Bleeder	CRL	A-9B1-84
59	3Z6612-7	RESISTOR: Insul. 12,000 ohms ±10% ½ watt.	Voltage Regulator Series	CRL	A-9B1-75
60	3Z6615-25	RESISTOR: Insul. 15,000 ohms ±10% ½ watt.	1st Det. Cathode	CRL	A-9B1-76

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
61	3Z6656-3	RESISTOR: Insul. 56,000 ohms ±10% ½ watt.	Output Loading	CRL	A-9B1-83
62	3Z6668-2	RESISTOR: Insul. 68,000 ohms ±10% ½ watt.	C-W Osc. Plate	CRL	A-9B1-84
63-1	3Z6700-44	RESISTOR: Insul. 100,000 ohms ±10% ½ watt.	1st R-F Grid	CRL	A-9B1-86
63-2		RESISTOR: Insul. 100,000 ohms ±10% ½ watt.	2nd R-F Grid	CRL	A-9B1-86
63-3		RESISTOR: Insul. 100,000 ohms ±10% ½ watt.	Osc. Grid	CRL	A-9B1-86
63-4		RESISTOR: Insul. 100,000 ohms ±10% ½ watt.	Output Grid Filter	CRL	A-9B1-86
64	3Z6718-2	RESISTOR: Insul. 180,000 ohms ±10% ½ watt.	3rd I-F Screen	CRL	A-9B1-89
65-1	3Z6747-4	RESISTOR: Insul. 470,000 ohms ±10% ½ watt.	Antenna protective	CRL	A-9B1-94
65-2		RESISTOR: Insul. 470,000 ohms ±10% ½ watt.	1st I-F Grid	CRL	A-9B1-94
65-3		RESISTOR: Insul. 470,000 ohms ±10% ½ watt.	2nd I-F Grid	CRL	A-9B1-94
65-4		RESISTOR: Insul. 470,000 ohms ±10% ½ watt.	C-W Osc. Grid	CRL	A-9B1-94
66	3Z6756-2	RESISTOR: Insul. 560,000 ohms ±10% ½ watt.	Output Grid	CRL	A-9B1-95
67	3Z6801A5-5	RESISTOR: Insul. 1.5 megohms ±10% ½ watt.	AVC Diode	CRL	A-9B1-100
68	3Z6722-3	RESISTOR: Insul. 220,000 ohms ±10% ½ watt.	AVC Filter	CRL	A-9B1-90
69	3Z6007E11	RESISTOR: Insul. 75 ohms ±10% ½ watt.	Osc. Compensating	CRL	A-9B-726
70	3Z6647-4	RESISTOR: Insul. 47,000 ohms ±10% ½ watt.	Bleeder	CRL	A-9B1-82
73	3Z6240-7	RESISTOR: Insul. 2400 ohms ±5% ½ watt.	Output Plate	CRL	A-9B1-168
74	3Z6610-48	RESISTOR: Insul. 10,000 ohms ±10% 1 watt.	Bleeder	CRL	A-9B2-74
75	3Z6627-4	RESISTOR: Insul. 27,000 ohms ±10% 1 watt.	Voltage Regulator	CRL	A-9B2-79
76-A*	3Z6019	RESISTOR: Insul. 3 ohms ±10% 1.5 watts.	Filament	IRC	A-9D-519
76-B*		RESISTOR: Insul. 190 ohms ±10% 1.9 watts.	Filament	IRC	A-9D-519
77*	3Z6006-5	RESISTOR: Insul. 60 ohms ±10% 3.7 watts.	Lamp Series 60¼ A	IRC	A-9D-517
78	3Z6350-6	RESISTOR: Variable 3500±10% to 10 ohms .1 watt.	Noise Compensator	IRC	A-9A-714
79-A	2C4348H/R1	RESISTOR: Volume Control Front Unit 20,000 ohms ±10% to 10 ohms .2 watt.	MVC	AB	B-10A-295
79-B		RESISTOR: Volume Control Back Unit 350,000 ohms ±10% to 50 ohms .2 watt.	AVC	AB	B-10A-295

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
80*	2C4348H/R2	RESISTOR: Variable 200 ohms ±10% 4 watts.	Dial Lamp Control	PRM	A-9A-304
90		INDUCTANCE: Antenna Band 1.	1st R-F Tuned Circuit		B-204-107
91		INDUCTANCE: Antenna Band 2.	1st R-F Tuned Circuit		C-204-75-1
92		INDUCTANCE: Antenna Band 3.	1st R-F Tuned Circuit		C-204-75-4
93		INDUCTANCE: Antenna Band 4.	1st R-F Tuned Circuit		C-204-75-7
94		INDUCTANCE: Antenna Band 5.	1st R-F Tuned Circuit		C-204-75-10
95		INDUCTANCE: Antenna Band 6.	1st R-F Tuned Circuit		C-204-75-13
96		INDUCTANCE: R-F Band 1.	1st R-F to 2nd R-F Coupling		B-204-109
97		INDUCTANCE: 1st Det. Band 1.	2nd R-F to 1st Det. Coupling		B-204-105
98-1		INDUCTANCE: R-F Band 1.	Plate Load 1st R-F		A-204-103
98-2		INDUCTANCE: Det. Band 1.	Plate Load 2nd R-F		A-204-103
100	2C4348H/C3	INDUCTANCE: R-F Choke.	Power Supply Filter		A-17A-718
101		TRANSFORMER: R-F Band 2.	1st R-F to 2nd R-F Coupling		C-204-75-2
102		TRANSFORMER: R-F Band 3.	1st R-F to 2nd R-F Coupling		C-204-75-5
103		TRANSFORMER: R-F Band 4.	1st R-F to 2nd R-F Coupling		C-204-75-8
104		TRANSFORMER: R-F Band 5.	1st R-F to 2nd R-F Coupling		C-204-75-11
105		TRANSFORMER: R-F Band 6.	1st R-F to 2nd R-F Coupling		C-204-75-14
106		TRANSFORMER: 1st Det. Band 2.	2nd R-F to Det. Coupling		C-204-75-3
107		TRANSFORMER: 1st Det. Band 3.	2nd R-F to Det. Coupling		C-204-75-5
108		TRANSFORMER: 1st Det. Band 4.	2nd R-F to Det. Coupling		C-204-75-9
109		TRANSFORMER: 1st Det. Band 5.	2nd R-F to Det. Coupling		C-204-75-12

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
110		TRANSFORMER: 1st Det. Band 6.	2nd R-F to Det. Coupling		C-204-75-15
111		TRANSFORMER: Osc. Band 1.	Osc. to 1st Det. Coupling		C-204-65-1
112		TRANSFORMER: Osc. Band 2.	Osc. to 1st Det. Coupling		C-204-65-2
113		TRANSFORMER: Osc. Band 3.	Osc. to 1st Det. Coupling		C-204-65-3
114		TRANSFORMER: Osc. Band 4.	Osc. to 1st Det. Coupling		C-204-65-4
115		TRANSFORMER: Osc. Band 5.	Osc. to 1st Det. Coupling		C-204-65-5
116		TRANSFORMER: Osc. Band 6.	Osc. to 1st Det. Coupling		C-204-65-6
117		TRANSFORMER: 1st I-F.	1st Det. to Crystal Coupling	AR	
118		TRANSFORMER: Crystal Filter.	Crystal to 1st I-F Coupling	AR	
119		TRANSFORMER: 2nd I-F.	1st I-F to 2nd I-F Coupling	AR	
120		TRANSFORMER: 3rd I-F.	2nd I-F to 3rd I-F Coupling	AR	
121		TRANSFORMER: C-W Osc.	Grid and Plate Coupling	AR	
122		TRANSFORMER: 4th I-F.	3rd I-F to 2nd Det. Coupling	AR	
123-A		TRANSFORMER: Audio.	Output	CT	D-206-17
123-B	2C4349H/C4	CHOKE: Audio Frequency.	Filter	CT	D-206-17
123-C		CAPACITOR: Paper 400 volts D-C .05 mfd ±10%.	C-W Osc. Time Constant	CT	D-206-17
124-1	2C4348H/J1	JACK: Single Circuit.	Headphone	PRM	A-44A-300
124-2		JACK: Single Circuit.	Headphone	PRM	A-44A-300
125	2V991	REGULATOR: Neon Bulb Type RCA 991.	Osc. Plate Voltage Regulator	RCA	
126	2Z5927	LAMP: 6 to 8 volts Type 44 (LM-27).	Dial Lights	GE	A-46A-314
127	2C4224F/S1	SWITCH: SPST Type.	Crystal Filter (in-out)	AH	A-20C-676
128	2C4224F/S2	SWITCH: DPST Type.	C-W Osc. (on-off)	AH	A-20C-303
129	2C4224F/S3	SWITCH: 3 position, 2 wafers type.	AVC-off-MVC	CRL or OM	B-20D-298

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
130	2C4224F/S4	SWITCH: 6 position, 1 wafer.	Band Switch Antenna Unit	CRL or OM	B-20A-611
131		SWITCH: 6 position, 1 wafer.	Band Switch Antenna Unit	CRL or OM	B-20A-611
132	2C4224F/S5	SWITCH: 6 position, 1 wafer.	Band Switch R-F Unit	CRL or OM	B-20A-585
133-A 133-B		SWITCH: 6 position, 1 wafer.	Band Switch R-F Unit	CRL or OM	B-20A-585
134		SWITCH: 6 position, 1 wafer.	Band Switch Det. Unit	CRL or OM	B-20A-585
135-A 135-B		SWITCH: 6 position, 1 wafer.	Band Switch Det. Unit	CRL or OM	B-20A-585
136	2C4224F/S6	SWITCH: 6 position, 1 wafer.	Band Switch Osc. Unit	CRL or OM	B-20A-537
137		SWITCH: 6 position, 1 wafer.	Band Switch Osc. Unit	CRL or OM	B-20A-537
138		SWITCH: 6 position, 1 wafer.	Band Switch Osc. Unit	CRL or OM	B-20A-537
139		SWITCH: 6 position, 1 wafer.	Band Switch Osc. Unit	CRL or OM	B-20A-537
140*	3Z1935	FUSE: 5 amp. 25 volt type FU-35.	Primary Protective.	LL	A-46B-315
141		CRYSTAL ASSEMBLY: 915 Kc Crystal Mounted in Case.	I-F Filter	BE	A-8K-690
142	2C4224F/P1	BINDING POST: Panel.	Antenna Connection	ARH	A-201-26
143		BINDING POST: Panel.	Ground Connection	ARH	A-7C-296
201	2C4348H/H1	HANDLE: Panel.	Carrying	NL	A-23A-301
202	2C4348H/L1	LEVER: Control.	AVC-OFF-MVC		A-4B-262
203		KNOB: Control.	Antenna Alignment Cond. Crystal Switch, Dial Lamp Control, and Volume Control.		A-4B-247
204	2C4348H/K3	KNOB: Control.	C-W Osc. Freq. Control.		A-4B-249
205	2C4348H/S7	THUMB SCREWS: Dial Window.	Holds Dial Window		A-3F-291
206	2C4348H/K4	KNOB: Control.	Band Change		A-4B-261
207		KNOB: Control.	Main Tuning Cond.		B-4B-260
208		COVER: Panel.	Permits Access to Tube Shelf		A-2E-550

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
209	2C4348H/S10	SPECIAL SCREW: Shouldered.	Main Tuning Cond.		A-3F-629
210	3H1624F/S1	SPECIAL SCREW: Shouldered Flathead.	Dynamotor Assem. to Mounting Plate		A-3F-378
211	3H1624F/S2	SPECIAL SCREW: Captive.	Dynamotor Assembly		A-3F-369
212	2C4348H/SH	SPECIAL SCREW: Slotted Hex Head.	Dial Assembly to Chassis		A-3F-321
213	2C4348H/S9	SPECIAL SCREW: Shouldered.	Secures Plug to Mounting Plate		A-3F-258
214		COVER: Plate with captive.	Covers Tube in Osc. Unit		A-202-72
215		SHIELD: Tube, Special.	Shield for Tube VT 70		B-202-97
216		FUSE CLIP ASSEMBLY: Lamenated Phenolic Strip with Fuse Clips.	Power Fuse	LL	A-26D-632
217	2C4348H/S17	SOCKET: Tube Octal Type.	For Tubes VT86 and VT152 VT91 and VT65 VT93	NF	A-15C-521
218	2C4348H/S18	SOCKET: Bayonet Type, Special.	For Voltage Regulator Tube	CH	A-27A-528
219	2Z8669	SOCKET: Tube, 7 Prong.	For Tube VT 70	NF	A-15C-639
221	2C4348H/S21	SOCKET: Lamp.	For Dial Lamp	DM	A-47A-402
222	2Z3048	FITTING: 8 Pole, Male (SO-104).	Power Connections		A-201-33
251	2C4348H/T21	1ST I-F TRANSFORMER ASSEMBLY: Complete with Shield Can. Includes 32, 33, 39 and 117.	1st Det. to 1st I-F Coupling	AR	B-13A-679
252	2C4348H/T22	2ND I-F TRANSFORMER ASSEMBLY: Complete with Shield Can. Includes 35-1, 35-2 and 119.	1st I-F to 2nd I-F Coupling	AR	B-13H-681
253	2C4348H/T23	3RD I-F TRANSFORMER ASSEMBLY: Complete with Shield Can. Includes 34-2, 34-3 and 120.	2nd I-F to 3rd I-F Coupling	AR	B-13H-682
254	2C4348H/T24	4TH I-F TRANSFORMER ASSEMBLY: Complete with Shield Can. Includes 36, 37-1 and 122.	3rd I-F to 2nd Det. Coupling	AR	B-13B-680

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
255	2C4348H/F1	CRYSTAL FILTER ASSEMBLY: Complete with Shield Can. Includes 8, 34-1, 118, 127 and 141.	I-F Selectivity	AR	B-13J-685
256	2C4348H/P5	C-W OSC. ASSEMBLY: Complete with Shield Can. Includes 9, 11-12, 35-3, 37-2, 62 and 121.	C-W Reception	AR	B-13D-683
257	2C4348H/A13	ANTENNA UNIT ASSEMBLY: Complete with Shield Can. Includes 2, 3-1, 3-2, 4-1, 5-1, 5-2, 12-1, 12-2, 15, 21-1, 22-1, 24, 25, 63-1, 72, 90, 96, 92, 93, 94, 95, 130 and 131.	Ant. to 1st R-F Tube Coupling	AR	C-204-13
258	2C4348H/F15	R-F UNIT ASSEMBLY: Complete with Shield Can. Includes 3-3, 3-4, 4-2, 5-3, 5-4, 7-1, 12-3, 13-1, 13-2, 21-2, 22-2, 23-2, 23-3, 26-1, 27-1, 29-1, 30-1, 57-1, 63-2, 91, 96, 98-1, 101, 102, 103, 104, 105, 132 and 133.	1st R-F to 2nd R-F Tube Coupling		C-204-15
259	2C4348H/D14	DET. UNIT ASSEMBLY: Complete with Shield Can. Includes 3-5, 3-6, 4-3, 5-5, 5-6, 7-2, 12-4, 21-3, 22-3, 23-1, 23-4, 26-2, 29-2, 27-2, 30-2, 57-2, 97, 98-2, 106, 107, 108, 109, 110, 134 and 135.	2nd R-F to 1st Det. Tube Coupling		C-204-14
260	2C4348H/P6	OSC. UNIT ASSEMBLY: Complete with Shield Can. Includes 3-7, 3-8, 6-1, 6-2, 6-3, 6-4, 10, 14-1, 14-2, 17-1, 17-2, 18, 19, 20, 28, 40, 41, 42, 43, 44, 45, 46, 47, 56-1, 60, 63-3, 69, 111, 112, 113, 114, 115, 116, 136, 137, 138, 139, 214 and 217.	Heterodyne Osc. to 1st Det. Coupling		C-204-16
271		RESISTOR BOARD: 17 Terminal.	Supports Parts 16, 57-6, 59, 63-4, 74 and 75.		B-201-58
272		RESISTOR BOARD: 32 Terminal.	Supports Parts 11-13, 11-14, 11-15, 11-16, 11-18, 31-1, 31-2, 57-7, 56-2, 61, 64, 66 and 73.		B-201-60
273		RESISTOR BOARD: 14 Terminal.	Supports Parts 11-9, 11-10, 11-11, 55-4, 57-4, 57-5 and 65-3.		B-201-20
274		RESISTOR BOARD: 14 Terminal.	Supports Parts 11-6, 11-7, 57-3, 58-4, 65-2 and 70.		B-201-36

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
		PARTS USED ONLY IN RADIO RECEIVERS BC-224-F AND BC-224-K			
40	3D9004E8	CAPACITOR: Fixed; Mica; 50 V. d-c; 6 mmfd ±0.2 mmfd; with lugs.	Oscillator Temperature compensating	UE	B-8F-740
41	3D9003E5	CAPACITOR: Fixed; Mica; 500 V. d-c; 3.8 mmfd ±0.2 mmfd; with lugs.	Oscillator Temperature compensating	UE	B-8F-739
76	3Z5985	RESISTOR: Insul.; 0.50 ohms; ±10%; 1 watt.	Filament	IRC	A-9B-854
77	3Z6006H3	RESISTOR: Insul.; 68 ohms; ±10%; 1 watt.	Filament	IRC	A-9B-853
80	2C4348H/R2	RESISTOR: Variable; 75 ohms; ±10%; 1.5 watts.	Dial Lamp Control	PRM	A-9A-304-2
140	3Z1923	FUSE: 10 amp.; 25 volt type; FU-23.	Primary Protective	LL	A-46B-315-2
300		DYNAMOTOR: 13.8 V., 2.45 amp., 220 V., 070 amp.; 4400 RPM; DM-24-F or DM-24-K.	Motor Generator	E or W C	A-216-348-2
304*	3DB1.361	CAPACITOR: Fixed; Paper; 400 volts d-c; 0.1 mfd, ±20%.	Dynamotor Filter	JF	A-8B-361
		PARTS USED ONLY IN RADIO RECEIVERS BC-348-H, BC-348-K, BC-348-L AND BC-348-R			
40c	3D9006-3	CAPACITOR: Fixed; Mica; 500 V. d-c; 6 mmfd, ±0.2 mmfd; with lugs.	Oscillator Temperature Compensating	UE	B-8F-740
41c	3D9003E8	CAPACITOR: Fixed; Mica; 500 V. d-c; 3.8 mmfd, ±0.2 mmfd; with lugs.	Oscillator Temperature Compensating	UE	B-8F-739
304*	3D	CAPACITOR: Fixed; Paper; 250 V. d-c; 0.01 mfd, ±10%.	Dynamotor Filter		
300		DYNAMOTOR: 27.9 V., 1.23 amps; 200 V. 0.070 amp; 4400 RPM; DM-28-H, DM-28-K, DM-28-O, DM-28-R.	Motor Generator	E or WC	A-21C-348

* BC-224-K only.
RADIO RECEIVER BC-348—(*) represents Radio Receivers BC-348-H, BC-348-K, BC-348-L and BC-348-R.
RADIO RECEIVER BC-224—(*) represents Radio Receivers BC-224-F and BC-224-K.
C-BC-348-K and BC-348-H only.

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
276		DIAL MECHANISM: Complete with Mask, Index Gear Drive, Stop and Detent Mechanism.	Frequency Indicator Tuning Condenser Drive		D-200-18
300*		DYNAMOTOR: 27.9 volts, 1.23 amp; 220 volts, .070 amp, 4400 R.P.M.	Motor Generator	E or WC	A-21C-348
301	2C4348H/C1	CHOKE: R-F.	Dynamotor Filter		B-207-41
302	2C4348H/C2	CHOKE: R-F.	Dynamotor Filter	RM	A-207-42
303-A	3DA500-43	CAPACITOR: Paper 250 volts D-C, .5 mfd, ±20%.	Dynamotor Filter	JF	A-8B-383
303-B		CAPACITOR: Paper 250 volts D-C, .5 mfd, ±20%.	Dynamotor Filter	JF	A-8B-383
304**	3DB1-361	CAPACITOR: Paper 400 volts D-C, 1.0 mfd, ±20%.	Dynamotor Filter	JF	A-8B-361
305-1	BDA10-50	CAPACITOR: Mica 500 volts D-C, .01 mfd, ±10%.	Dynamotor Filter	CD or SM	B-8F-363
305-2		CAPACITOR: Mica 500 volts D-C, .01 mfd, ±10%.	Dynamotor Filter	CD or SM	B-8F-363
306	3H1624H/A1	ARMATURE: Part of Ref. 300.	Dynamotor	E, WC, or RE	A-55A-814
307	3H1624F/B1	BEARING (SET OF 2): Part of Ref. 300.	Dynamotor	E, WC, or RE	A-55A-815
308	3H1624F/B3	BRUSH AND SPRING: Part of Ref. 300.	Pos. High Voltage	E, WC, or RE	A-55A-772
309	3H1624F/B4	BRUSH AND SPRING: Part of Ref. 300.	Neg. High Voltage	E, WC, or RE	A-55A-773
310	3H1624G/B3	BRUSH AND SPRING: Part of Ref. 300.	Pos. Low Voltage	E, WC, or RE	A-55A-770
311	3H1624H/B4	BRUSH AND SPRING: Part of Ref. 300.	Neg. Low Voltage	E, WC, or RE	A-55A-771
315		END BELL: Part of Ref. 300.	Low Voltage End bearing	E, WC, or RE	A-4A-835
316		END BELL: Part of Ref. 300.	High Voltage End Bearing	E, WC, or RE	A-4A-836
317		FIELD WINDINGS: Part of Ref. 300. Field Windings (available in pairs only).	Dynamotor	E, WC, or RE	A-16B-837
318					
319		TIE BARS: Part of Ref. 300.	Holds Items 315 and 316 to Frame	E, WC or RE	A-3F-838
320		BRUSH CAPS: Part of Ref. 300.	Holds Brushes	E, WC or RE	A-5B-839

** BC-348-L, BC-224-F, BC-348-H, BC-348-K only.
* BC-348-L, BC-348-K, BC-348-H, BC-348-R only.

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
321		GROMMET: Part of Ref. 300.	Protects Terminal Wires	E, WC or RE	A-41B-840
322		GASKET: Part of Ref. 300.	Prevents Leakage of Lubricant	E, WC or RE	A-41A-841
323		PLATE: Part of Ref. 300.	Bearing Retainer	E, WC or RE	A-2E-842
324		COVER: Part of Ref. 300.	Dust Cover	E, WC or RE	A-2E-843
350		BRACKET AND GEAR AND ASSEMBLY: Pair of Beveled Gears and Coupling.	Drives Band Change Switch		A-200-22
351		COUPLING: Flanged Collar with Rectangular Slot.	Coupling Band Change Knob Shaft to Item 350		A-3E-480
352		COUPLING SLIDE: Disk with Two Rectangular Keys.	Slide Between 2 or Item 351		A-3E-288
353		WINDOW FRAME ASSEMBLY: Removable Cast Housing Which Holds Dial Crystal.	Covers Dial Lamps		B-200-24
355		FRICTION SPREADER: Phosphorus Bronze Spring.	Prevents Controls from Turning Under Vibration		A-2J-404
356		JACK COVER ASSEMBLY: Spring Actuated Cover.	Seals Jack Openings	CN	A-23A-636
357		BUSHING: Threaded Bushing.	Holds Handle to Panel and Provides Bearing for Thumb Screw		A-3B-302
358		NUT: Special Locking Nut.	Holds Item 357		A-3G-625
359		THUMB SCREW ASSEMBLY: No. 10-24 x 9-9/32 Inches Long (Less Knob).	Holds Chassis in Cabinet		A-202-28
360		NUT: Special Locking Nut.	Holds Upper End of Handles		A-3G-626
361		FLEXIBLE SHAFT AND COUPLING: 5½ Inches Long, Including Couplings, Special.	Operates B.F.O. Control		A-200-29
362		EXTENSION SHAFT: Special Shaft 0.594 Inches Long.	Operates Crystal "On-Off" Switch		A-3A-305
363		SHAFT AND COUPLING ASSEMBLY: Flexible Shaft with Insulated Coupling.	Operates Antenna Trimmer		A-200-31
364		SWITCH SHAFT: Flat Shaft.	Operates Band Switch		A-2L-310
366		DIAL MASK ASSEMBLY: Plate with Cutouts.	Mask Undesired Dial Scales		B-200-44

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
367		DIAL ASSEMBLY: Calibrated Circular Dial with Hub and Large Spur Gear.	Gives Frequency Setting		B-200-45
368		STOP ARM ASSEMBLY: Lever with Roller and Pawl.	Stops Condenser at End of Travel		A-200-46
369		INDEX PLATE: Phosphorus Bronze Strip Painted Red.	Dial Scale Index		A-2G-432
370		STOP: Cast Bushing with Key.	Stops Stop Arm		A-4C-433
371		STUD: Shouldered Stud Threaded No. 4-40 One End.	Pivot Pin for Part 368		A-3C-434
372		GUIDE ASSEMBLY: Arm and Roller Assembly.	Engages Index Wheel for Switch Location		A-200-48
373		SPRING: Coiled Spring.	Operation of Indexing Arm Item 372		A-49A-442
374		GEAR AND PINION ASSEMBLY: Spur Gear and Pinion Assembly.	Idler Reduction Gear Between Tuning Shaft and Dial		A-200-50
375		PINION: Pinion (Pinned to Tuning Shaft).	Dial Drive Pinion Meshing with Item 374		A-3J-450
376		WORM: Worm, Single Pitch.	Drives Cross Shaft of Condenser Drive		A-3L-456
377		GEAR ASSEMBLY: Split Worm Wheel.	Part of Condenser Drive Train		A-200-51
378		PINION AND BUSHING ASSEMBLY: Pinion on Cross Shaft.	Drives Tuning Condenser Gear		A-200-54
379		SPRING: Torsion Spring.	Holds Item 368		A-49A-460
380		"C" WASHER: "C" Washer.	Against Dial Used to Retain Items 372 and 374		A-29C-474
399		FT-154-H, T, L, K: Mounting Base Assembly.	Supports Receiver		B-202-6
400		MOUNTING PLATE ASSEMBLY: Part of Reference 399.	Supports Item 401		B-202-7
401		BASE AND STIFFENER ASSEMBLY: Part of Reference 399.	Supports Receiver and Plug—Item 403 or 404		B-202-8
402		CAP SCREW: ¼—20 x 1-1/16 Long.	Holds Items 400 and 401 Together		B-3F-278
403		FITTING: 8 Pole Female Power Connector PL-P103.	Makes Connection to Exterior Equipment		SC-D-2131B SC-D-2129B

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
404		FITTING: 8 Pole Female Power Connector PL-Q103.	Makes Connection to Exterior Equipment		SC-D-2128B SC-D-2129B
405		JACK BLOCK: Part of Reference 403 and 404, Numbered 1 and 5.	Holds Contactors		B-5F-391-1
406		JACK BLOCK: Part of Reference 403 and 404, Numbered 2 and 6.	Holds Contactors		B-5F-391-2
407		JACK BLOCK: Part of Reference 403 and 404, Numbered 3 and 7.	Holds Contactors		B-5F-391-3
408		JACK BLOCK: Part of Reference 403 and 404, Numbered 4 and 8.	Holds Contactors		B-5F-391-4
409		JACK HOUSING ASSEMBLY: Part of Reference 403 and 404.	Houses Jack Blocks		B-202-2
410		FITTING (RIGHT ANGLE): Part of Reference 404.	Cable Protection and Shielding		B-4E-245
411		FITTING (STRAIGHT): Part of Reference 403.	Cable Protection and Shielding		B-4E-533
412		CONTACT SPRING ASSEMBLY: Part of Reference 403 and 404.	Contact		A-201-5
413		JACK HOUSING COVER: Part of Reference 403 and 404.	Covers Jack Block Terminals		A-202-3
414		COVER: Part of Reference 257.	Top		A-2E-574
415		COVER: Part of Reference 257.	Bottom		A-2E-575
416		SHIELD: Part of Reference 257.	Side and Ends		C-2H-608
417		COVER: Part of Reference 258.	Top		A-2E-573
418		COVER: Part of Reference 258.	Bottom		A-2E-575
419		SHIELD: Part of Reference 258.	Side and Ends		C-2H-568-1
420		COVER: Part of Reference 259.	Top		A-2E-573
421		COVER: Part of Reference 259.	Bottom		A-2E-575
422		SHIELD: Part of Reference 259.	Side and Ends		C-2H-568-2
423		COVER: Part of Reference 260.	Top		A-2E-549
424		COVER: Part of Reference 260.	Bottom		A-2E-547

35. TABLE OF REPLACEABLE PARTS—Continued.

RADIO RECEIVERS BC-348-(*) AND BC-224-(*)

Reference No.	Stock No.	Name of Part and Description	Function	Mfr. and Designation	Drawing No.
425		COVER: Part of Reference 260.	Side		C-202-71
426		SHIELD: Part of Reference 260.	Side and Ends		C-2H-534
433		TUBE GUIDE: Cylindrical Socket for Tube Base.	Supports Tube and Tube Shield VT 70		A-202-98
435		SHIELD CAN: Part of Reference 251.	1st I-F Transformer Assembly Shield	AR	A-208-125
436		SHIELD CAN: Part of Reference 252.	2nd I-F Transformer Assembly Shield	AR	A-208-126
437		SHIELD CAN: Part of Reference 253.	3rd I-F Transformer Assembly Shield	AR	A-208-126
438		SHIELD CAN: Part of Reference 254.	4th I-F Transformer Assembly Shield	AR	A-208-125
439		SHIELD CAN: Part of Reference 255.	Crystal Filter Assembly Shield	AR	A-208-128
440		SHIELD CAN: Part of Reference 256.	C-W Oscillator Assembly	AR	A-208-127

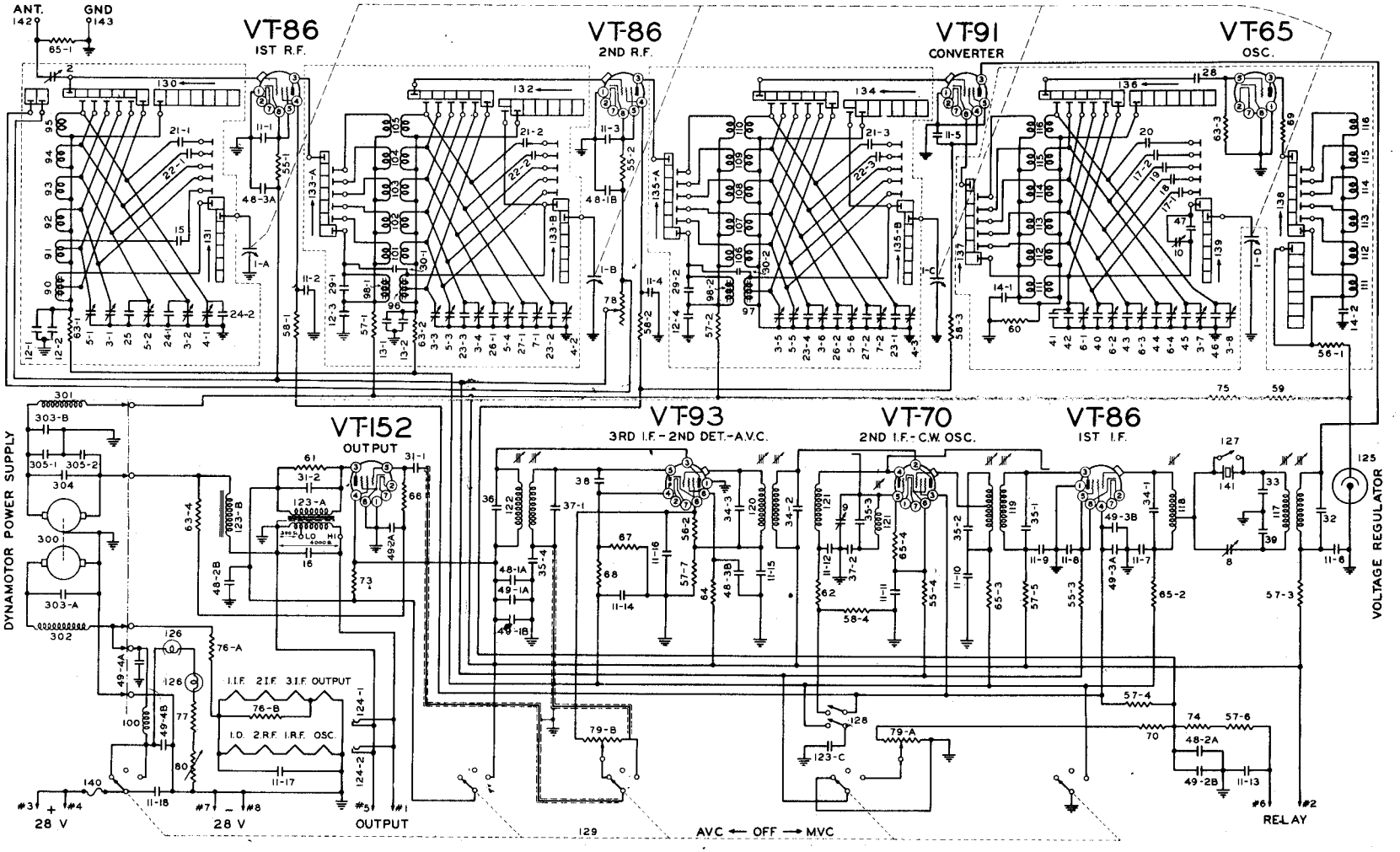


Figure 23—Radio Receiver BC-348-(*) or BC-224-(*),
Schematic Circuit Diagram

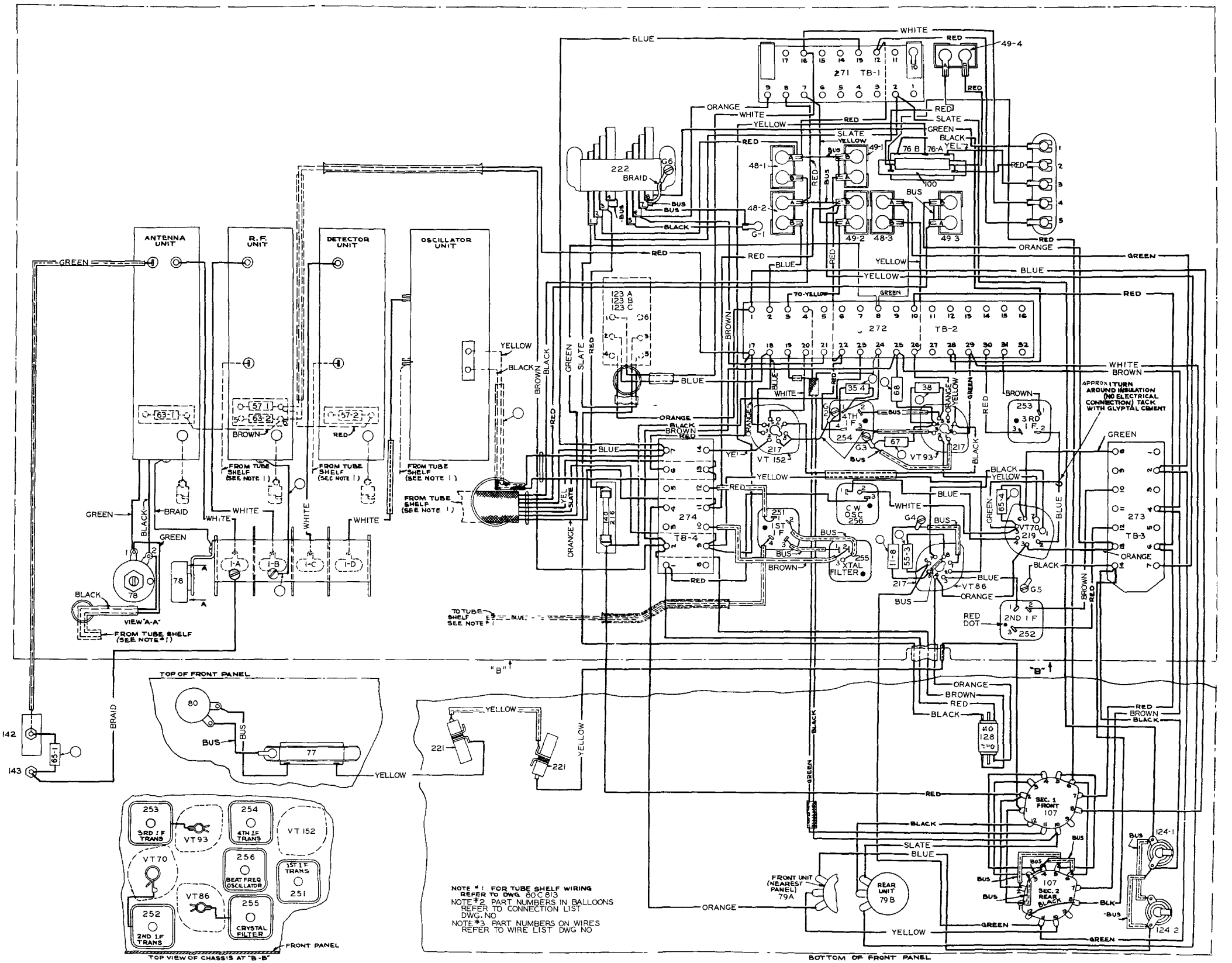


Figure 24—Radio Receiver BC-348-(*) or BC-224-(*), Wiring Diagram

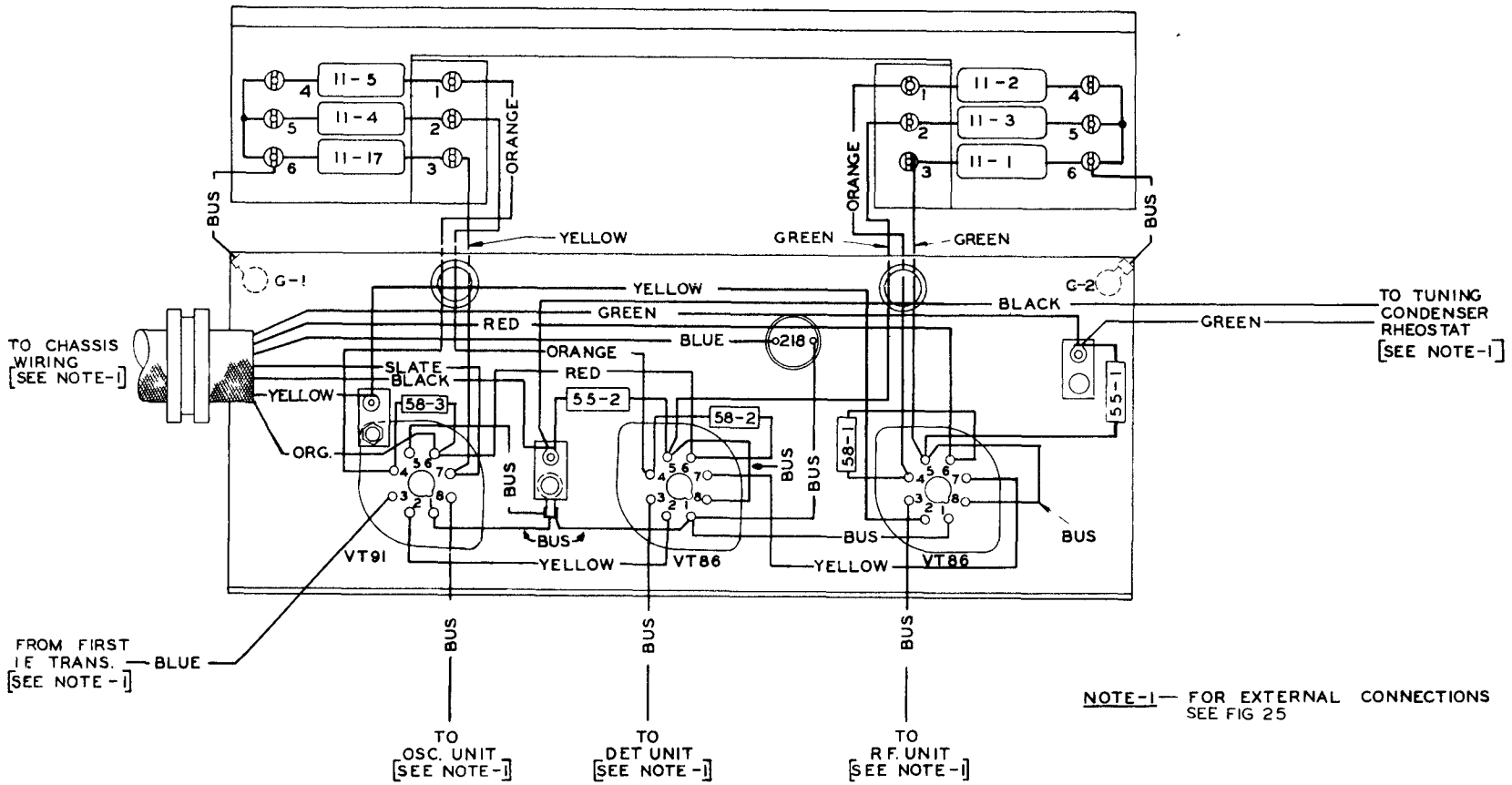


Figure 25—Radio Receiver BC-348-(*) or BC-224-(*), Wiring Diagram, Tube Shelf

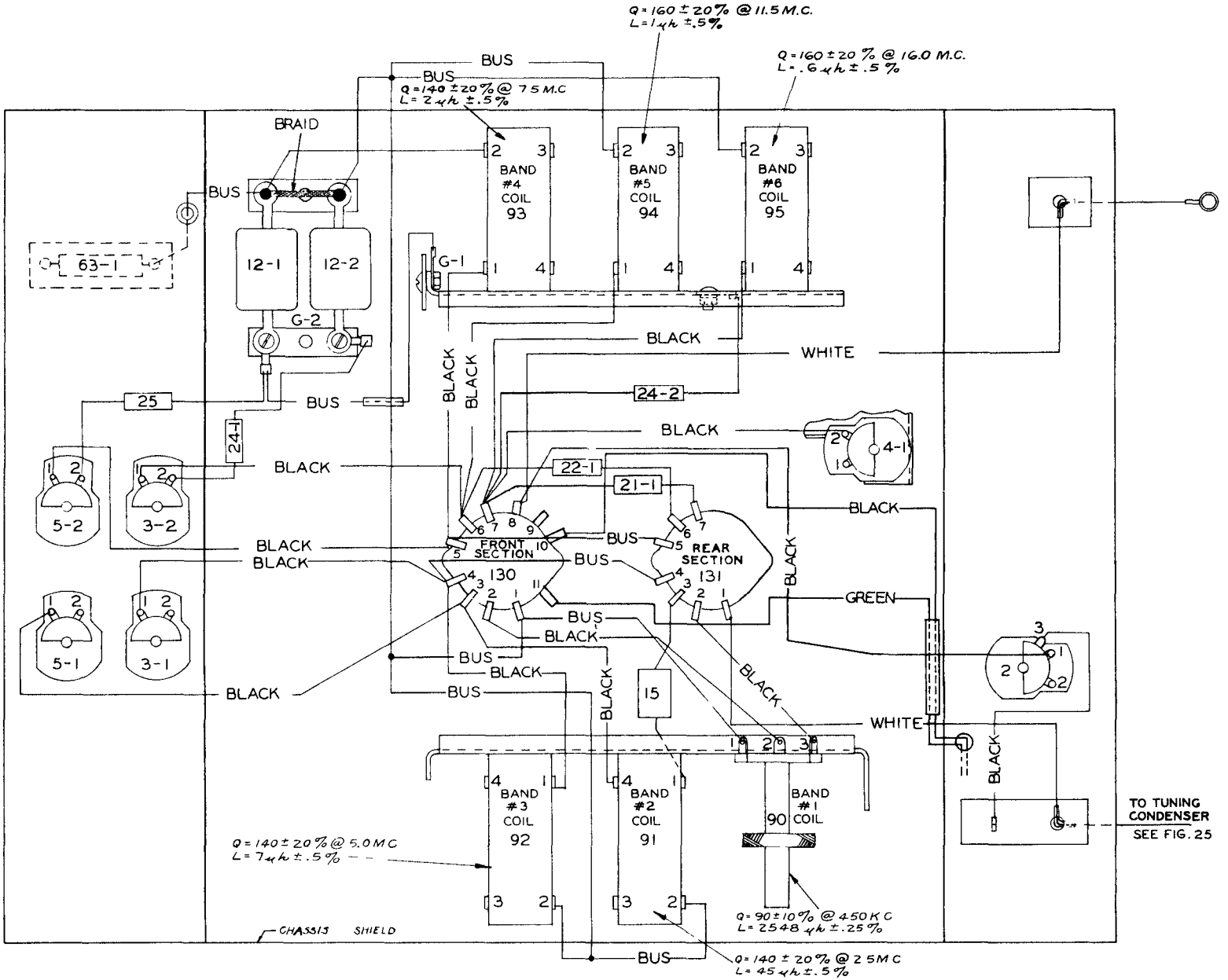


Figure 26—Radio Receiver BC-348-(*) or BC-224-(*), Wiring Diagram, Antenna Unit

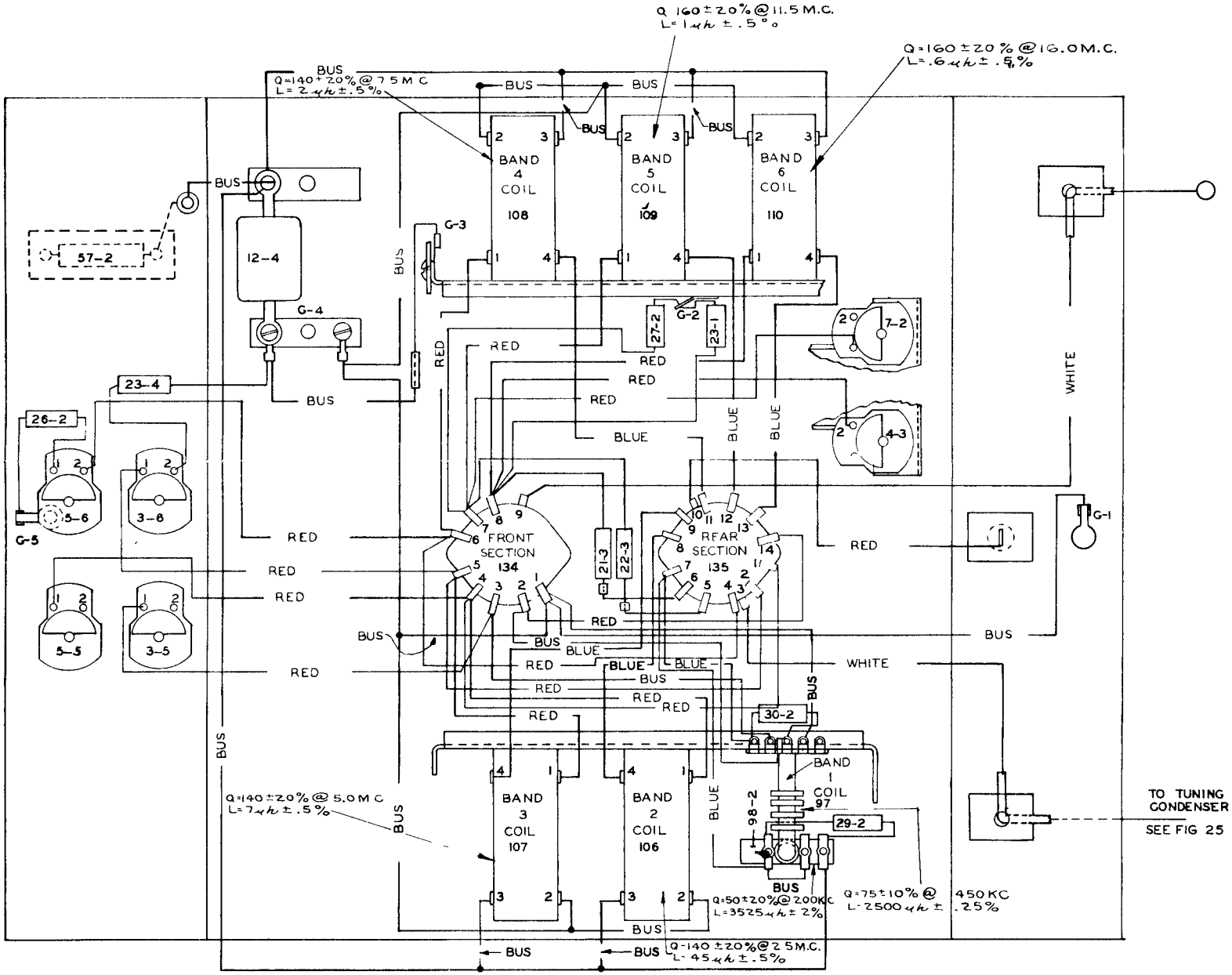


Figure 28—Radio Receiver BC-348-(*) or BC-224-(*), Wiring Diagram, Detector Unit

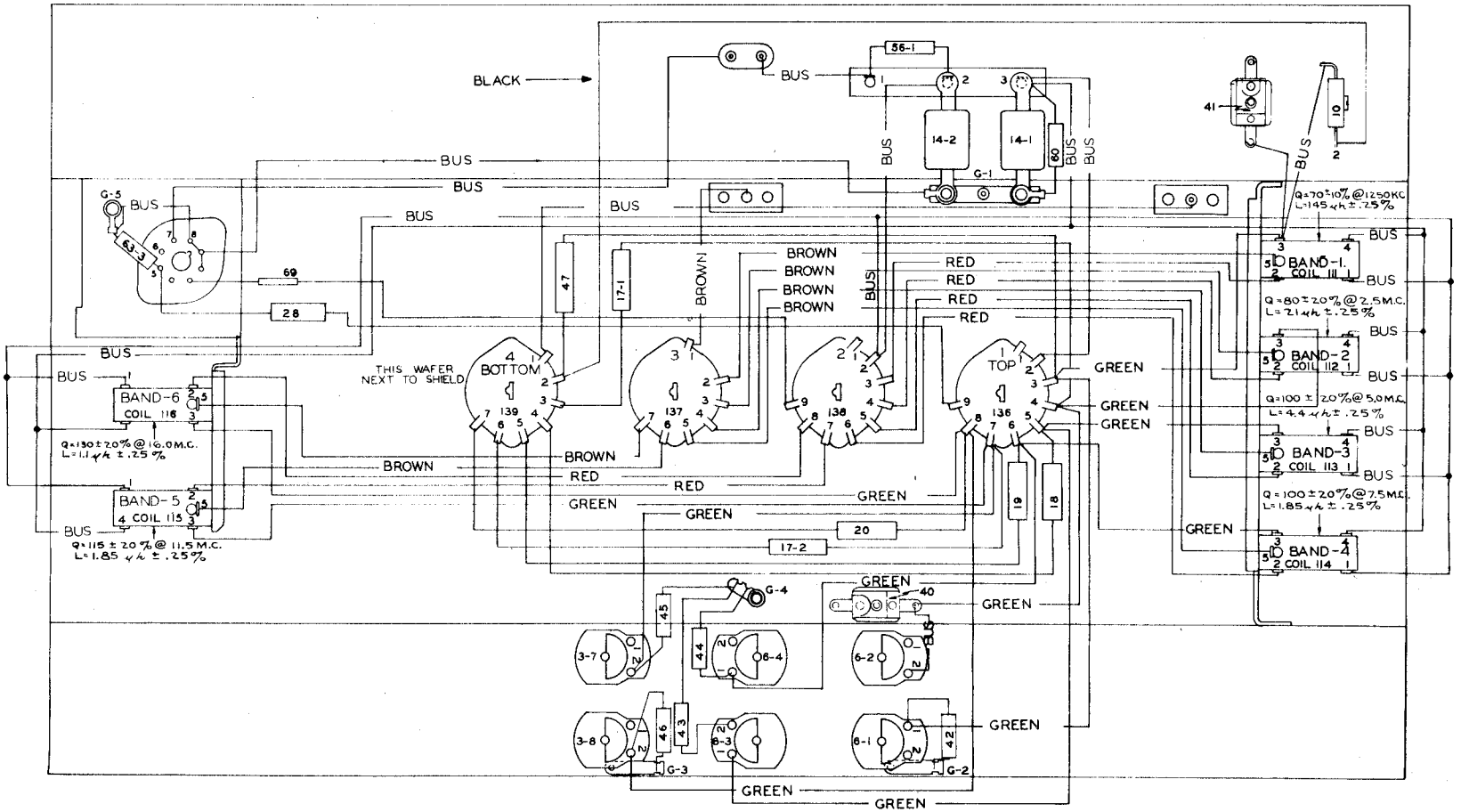


Figure 29—Radio Receiver BC-348-(*) or BC-224-(*), Wiring Diagram, Oscillator Unit

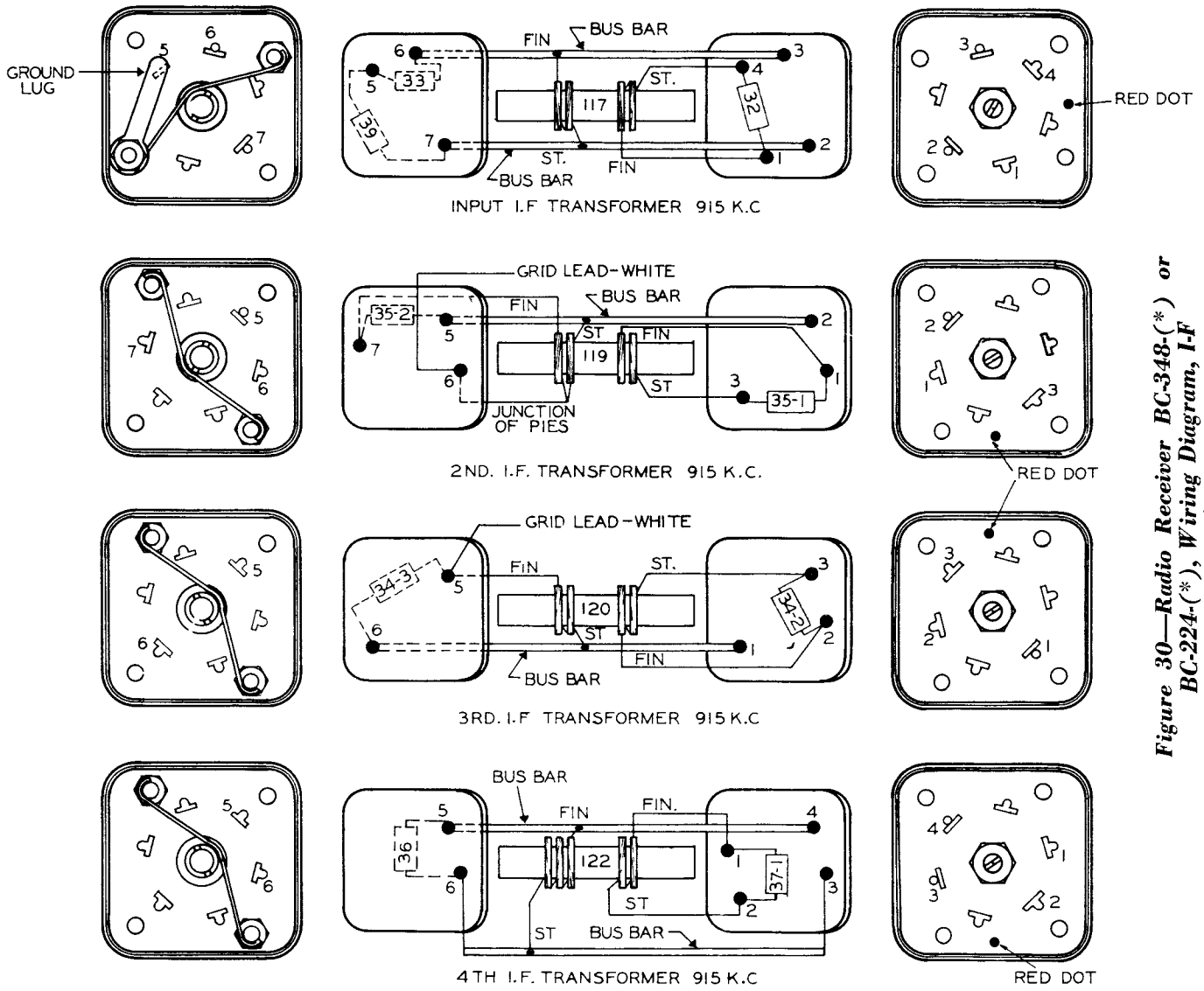
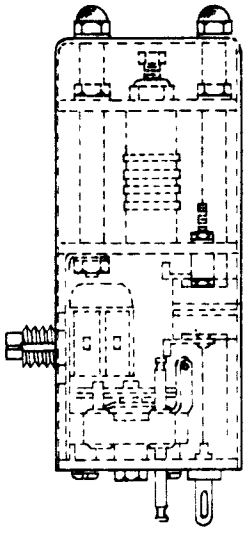


Figure 30—Radio Receiver BC-348-(*) or BC-224-(*), Wiring Diagram, I-F Transformers



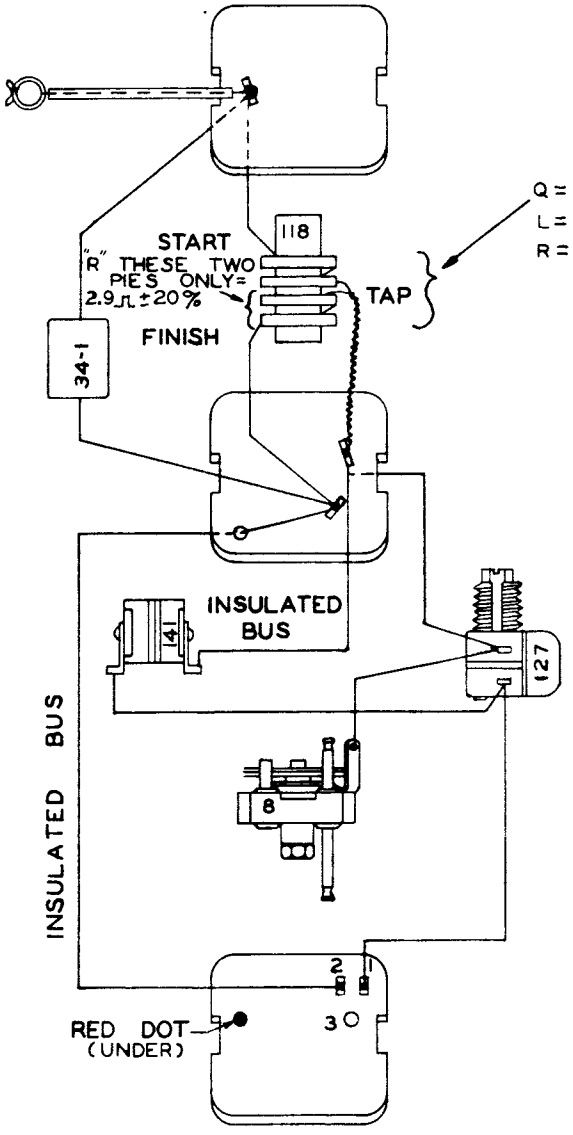


Figure 31—Radio Receiver BC-348-(*) or BC-224-(*), Wiring Diagram, Crystal Filter

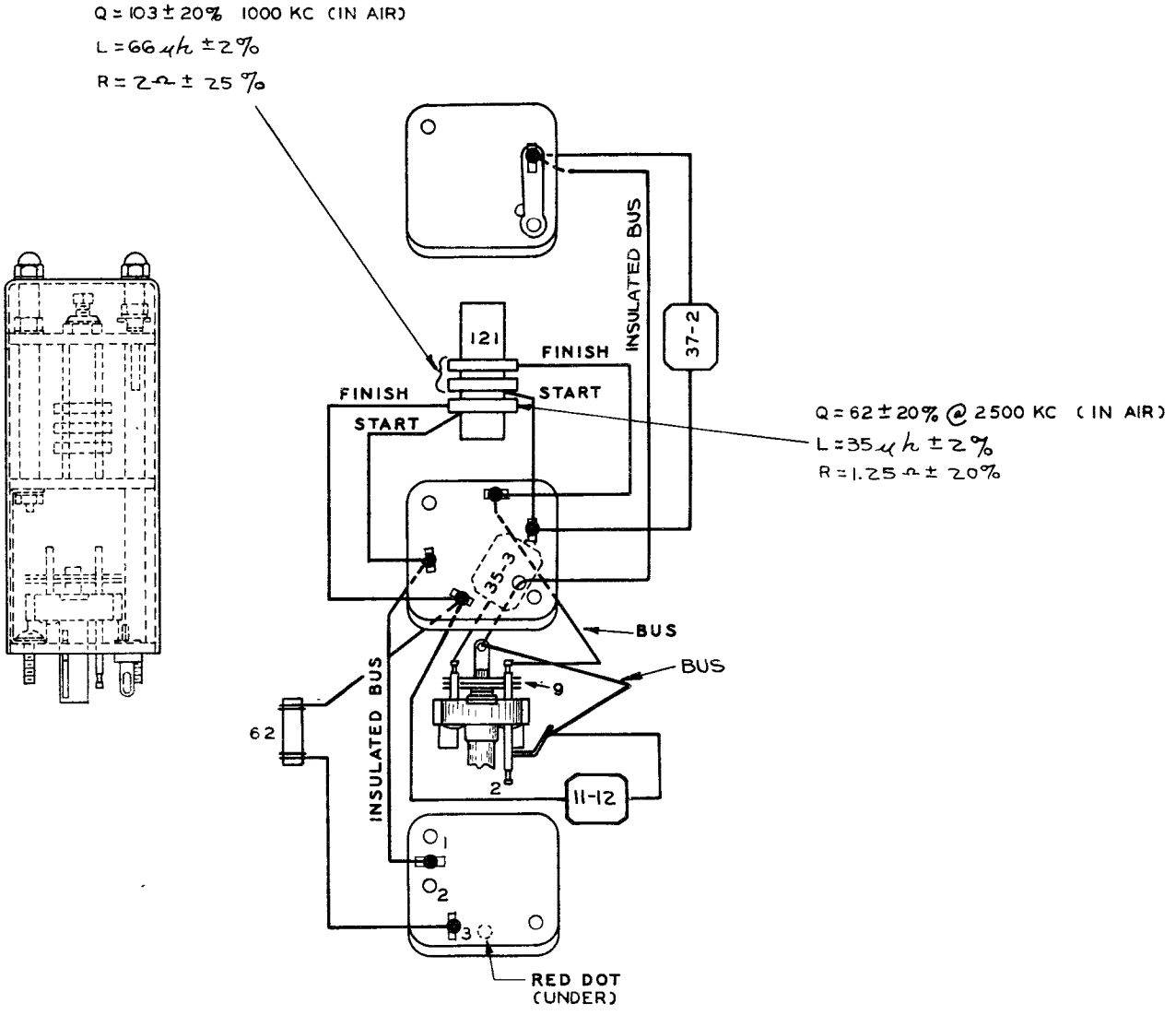


Figure 32—Radio Receiver BC-348-(*) or BC-224-(*), Wiring Diagram, Beat Frequency Oscillator

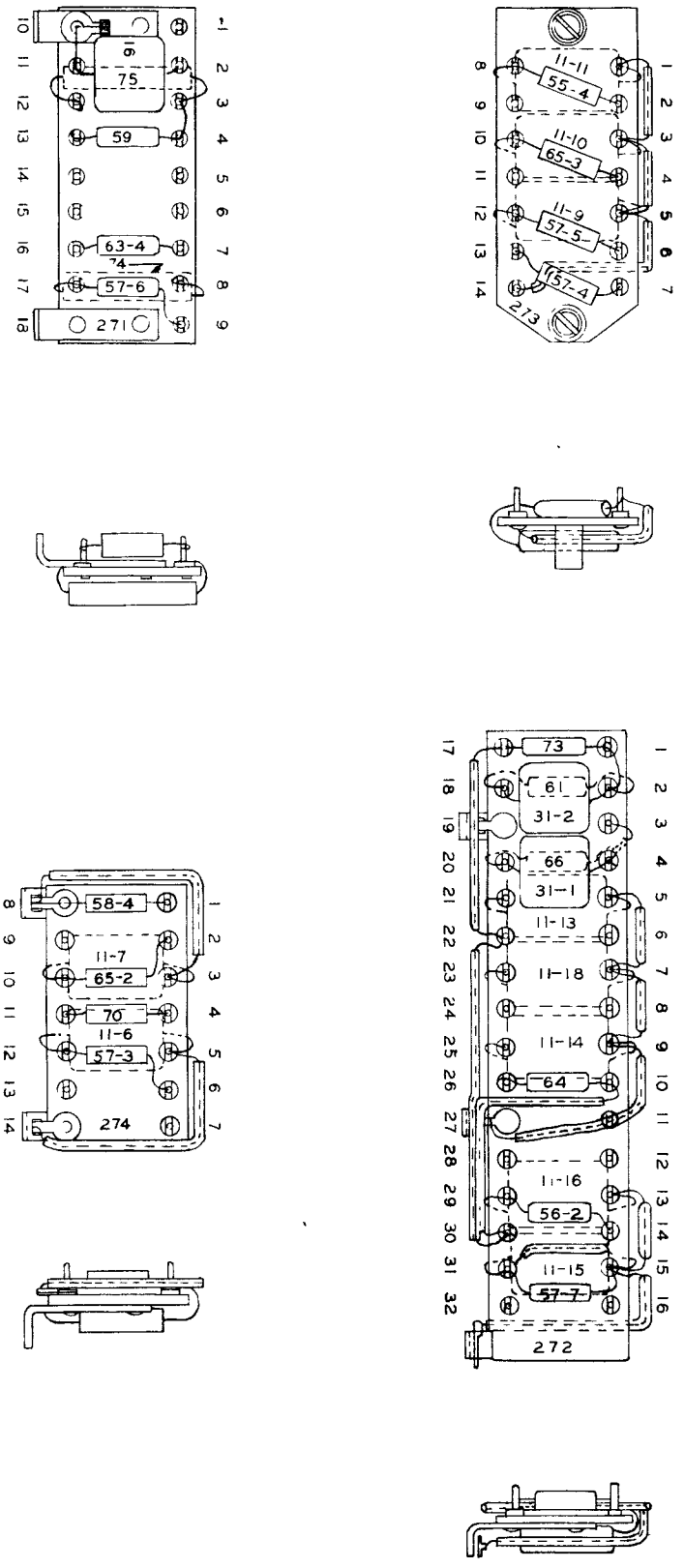


Figure 33—Radio Receiver BC-348-(*) or BC-224-(*), Wiring Diagram, Resistor Boards

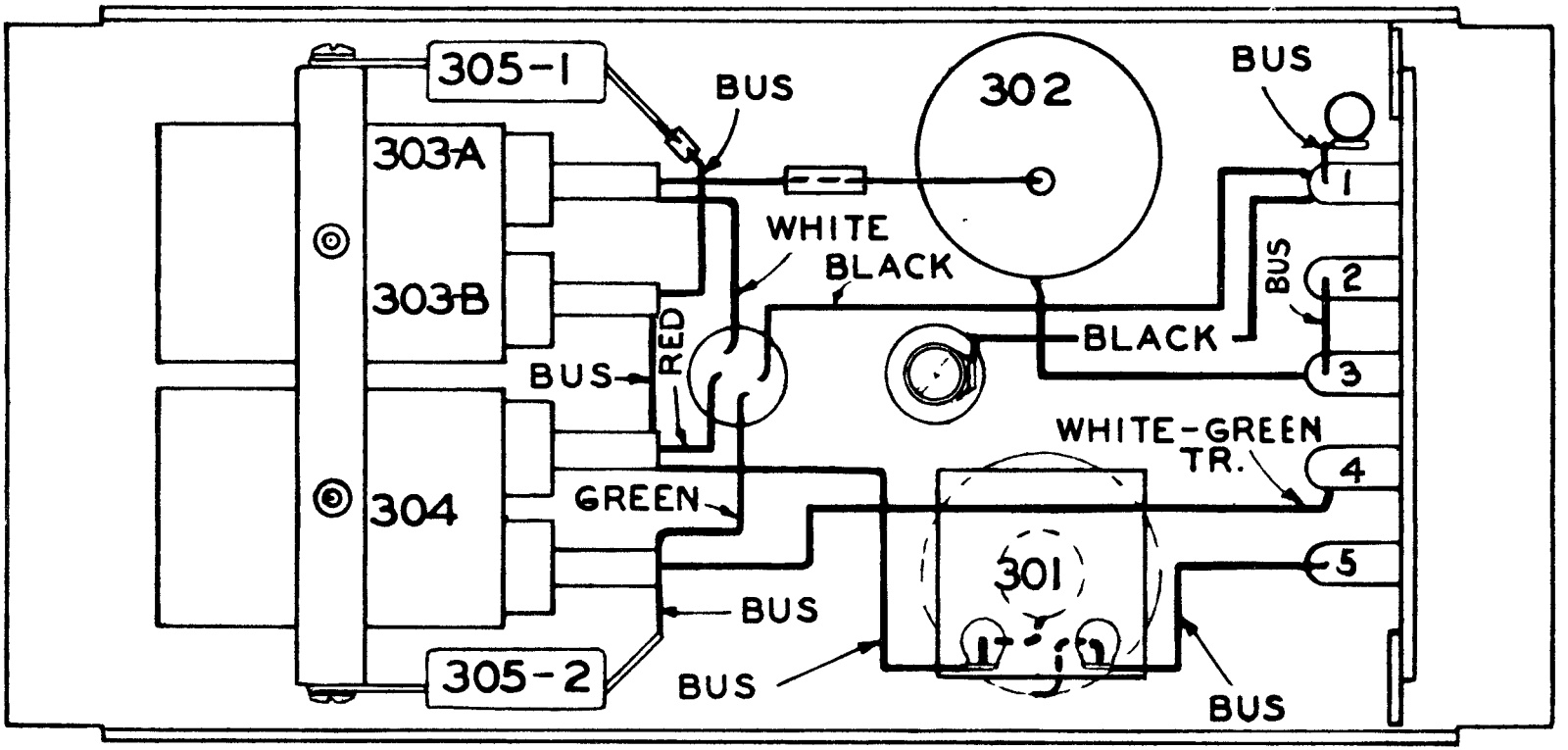


Figure 34—Radio Receiver BC-348-(*) or BC-224-(*), Wiring Diagram, Dynamotor Assembly

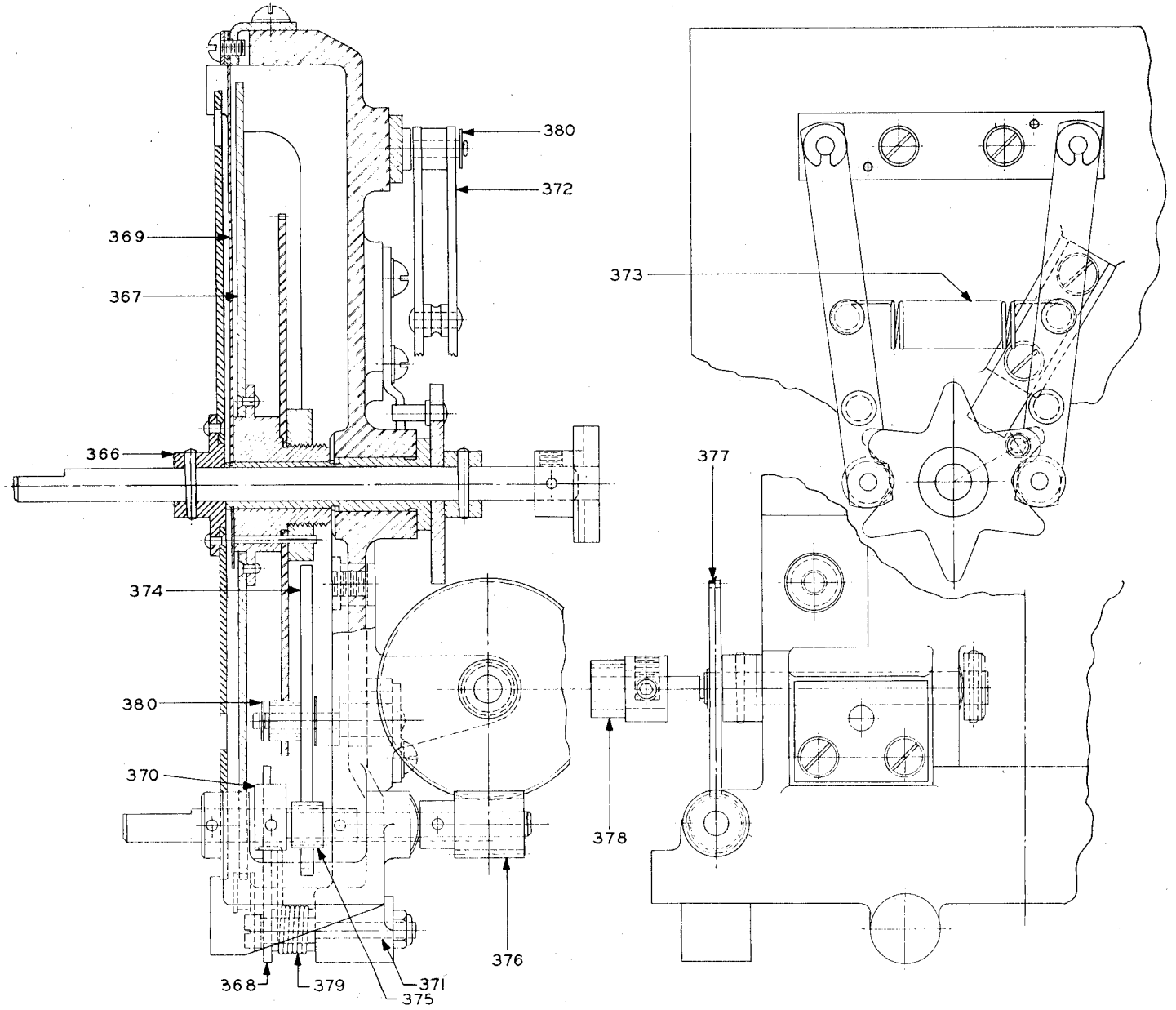


Figure 35—Radio Receiver BC-348-(*) or BC-224-(*), Dial and Mask Assembly

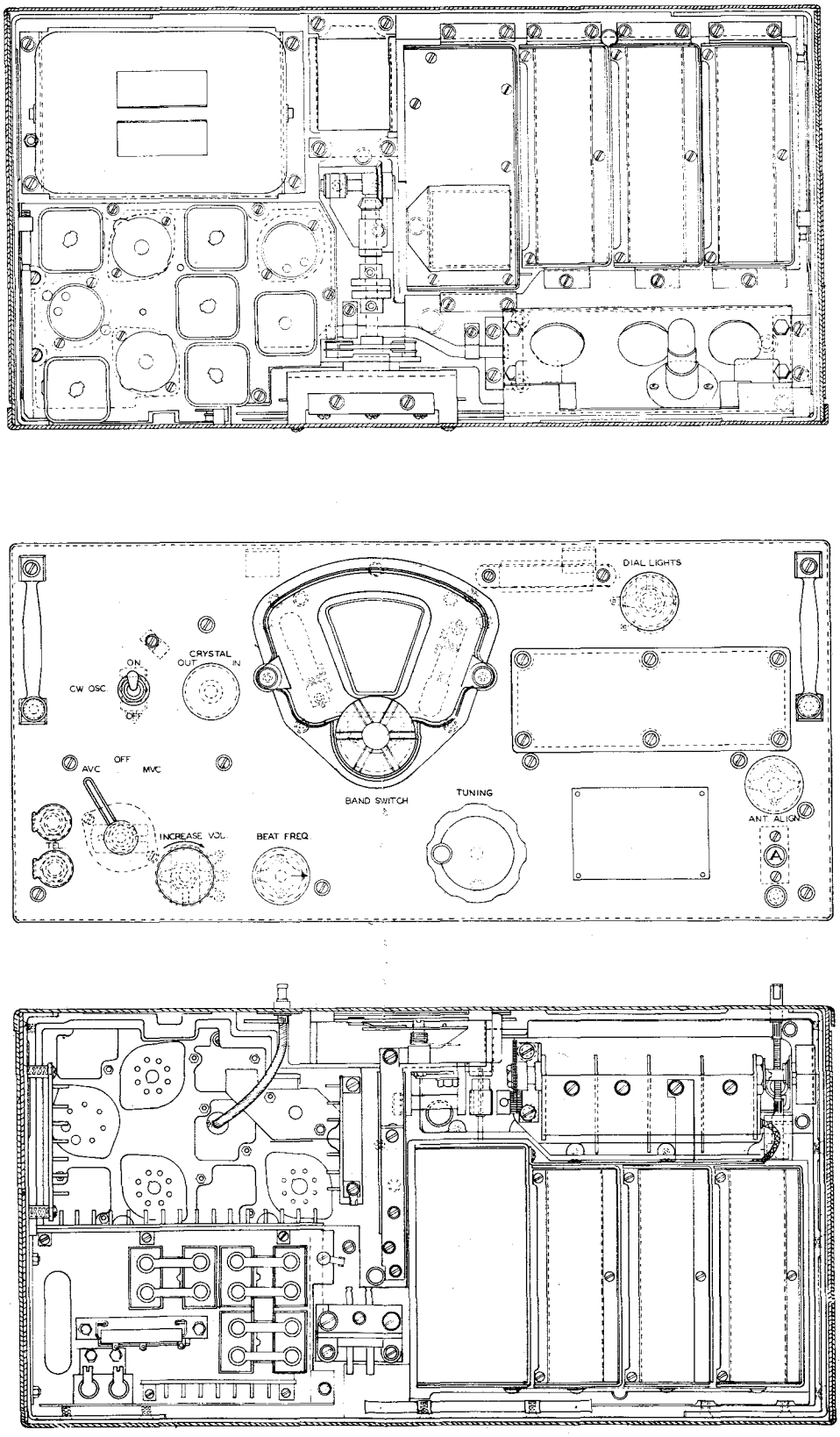


Figure 36—Radio Receiver BC-348-(*) or BC-224-(*), General View of Receiver

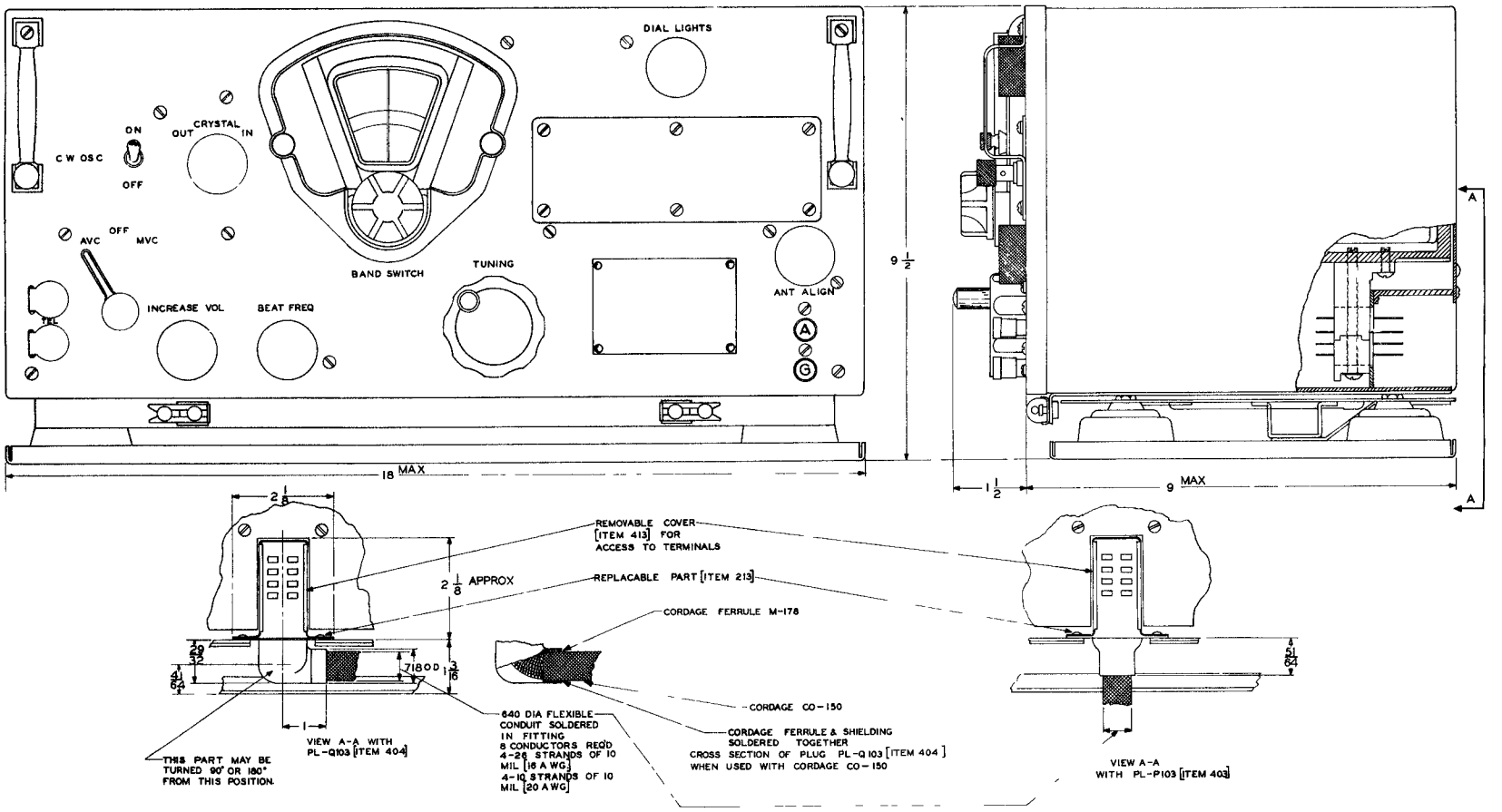


Figure 37—Radio Receiver BC-348-(*) or BC-224-(*), Outline Dimensional Drawing

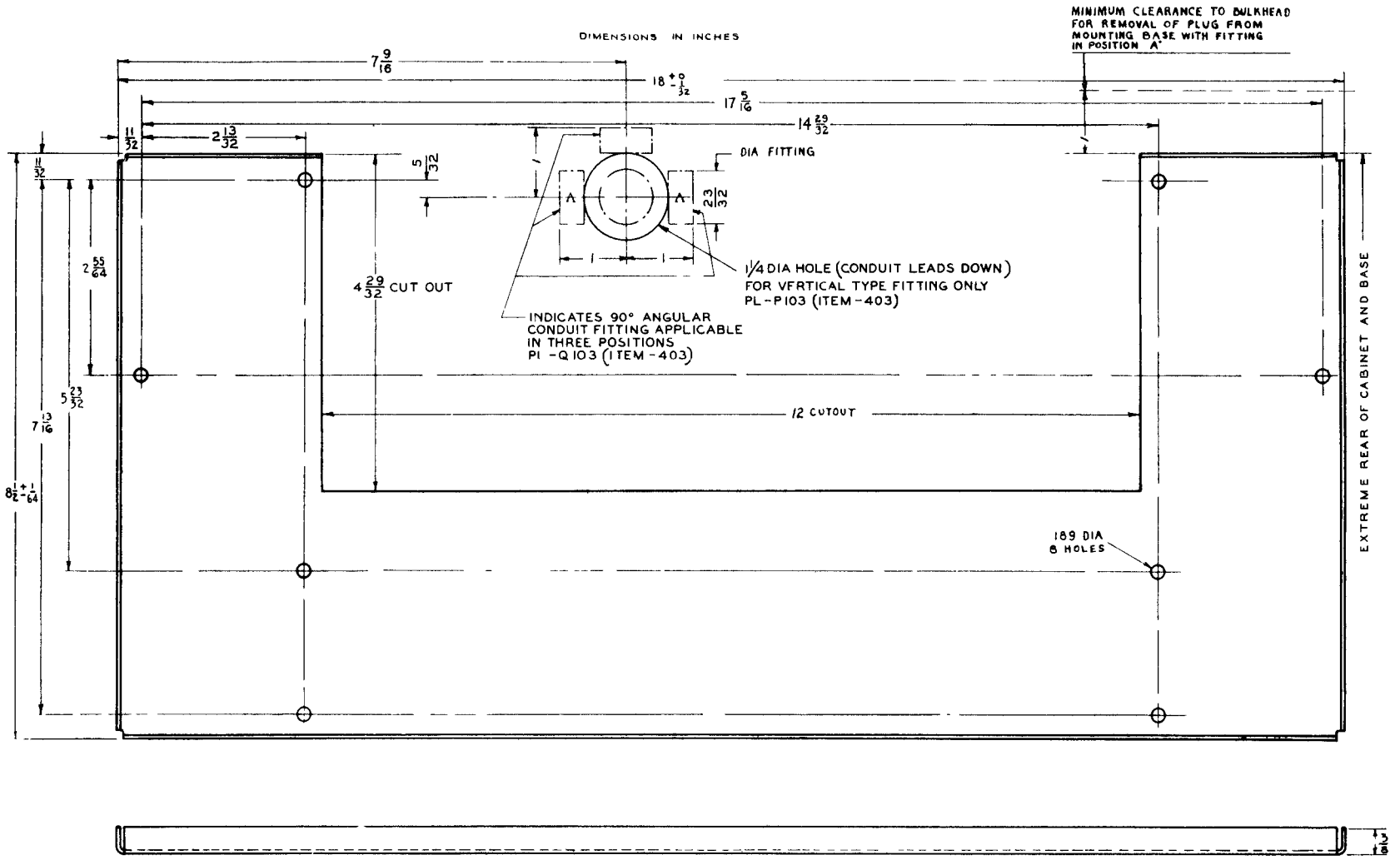


Figure 38—Radio Receiver BC-348-(*) or BC-224-(*), Drilling Plan