(48)

SERVICE AND MAINTENANCE INSTRUCTIONS (TEMPORARY)

FOR

RADIO SET SCR-522-A

RESTRICTED

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SAFETY NOTICE

Operation of this equipment involves the use of high voltages which are dangerous to life. Operating personnel must at all times observe all safety regulations. This particularly applies to changing tubes or making adjustments inside the equipment with any but the "Off" control-box push button depressed.

A dangerous potential exists on both the transmitter and receiver whenever the equipment is in either the transmit or receive condition.

Do not remove transmitter or receiver from Rack FT-244-A prior to consulting paragraph IV.F.1. as damage to the equipment will result if channel slides are not all released as directed.

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TABLE OF CONTENTS

SERVICE AND MAINTENANCE INSTRUCTIONS FOR RADIO SET SCR-522-A

I. INTRODUCTION

The following information, concerning service and maintenance of Radio Set SCR-522-A, is furnished in an effort to place data and instructions of a more or less general nature in the hands of service personnel until such time as a final instruction book is available.

No attempt is made here to explain the theoretical functions of the various circuits except where necessary in order to explain reasons for certain adjustments or measurements. Particular attention is paid to the components which experience to date has indicated have been perplexing, critical of adjustment or otherwise troublesome to Signal Corps and Air Forces personnel.

The approximate range of the equipment is given in the table below assuming the communication is between a ground station and aircraft over level country:

Altitude of Plane Above Terrain	*Approximate Range in Miles*
1,000 feet	30
3,000 feet	70
5,000 feet	80
10,000 feet	120
15,000 feet	150
20,000 feet	180

Line of sight between the two antennae is normally necessary for satisfactory communication and if, when flying in formation, any metal object is between the antennae, such as belly tank or propeller, communication may be unreliable or even impossible due to low signal strength or garbled reception. This does not indicate that the equipment is at fault but is due to the nature of radio waves at the frequencies used.

II. GENERAL

Before removing any component from an installation of Radio Set SCR-522-A in an aircraft, it is necessary to first analyze the cause of failure and isolate the trouble to a particular component or circuit of the equipment. The following list of troubles and probable causes will be of help in locating the faulty component or wiring:

SYMPTOM	*PROBABLE CAUSE*
1. Dynamotor in PE-94-A does not run.	Open fuse or wiring in 28 V. input circuit. Defective starting relay (321) or its associated control wiring. Defective dynamotor unit (307).
2. Dynamotor runs but no transmitter power output and either no receiver output or a very raucous noise in headset.	Improper seating or sticking of brushes at one or more of the dynamotor output commutators. Faulty interconnecting wiring. Remove shell from 6 contact plug connected to PE-94-A and check voltage to ground at pins 1 (-150 V.), 2 (+300 V.), and 4 (+13 V.). Water in Rack FT-244-A connector sockets or in Case CS-80-A.

SYMPTOM	*PROBABLE CAUSE*
3. Receiver unit operates properly, but no transmitter output on any channel.	Transmitter not tuned properly. Defective Antenna Relay (412). Locking Relay (411-1) jammed in operated position. Defective "T-R-REM" switch in Control Box BC-602-A. Ground on pin 17, in 18 pin socket (417) on Rack FT-244-A, or associated wiring connecting to that pin. Defective transmitter unit.
4. Transmitter unit operates properly, but receiver unit dead or only dynamotor ripple audible in headset.	Receiver not tuned properly. Defective wiring in audio output circuit - pin 3 in 18 pin socket (417) on Rack FT-244-A. Defective microphone-headset jack or plug. Defective Antenna Relay (412) or associated control wiring, including "T-R-REM" switch in Control Box BC-602-A. Receiver "Audio" or "Relay" controls rotated fully counterclockwise. Defective receiver unit.
5. Audible howl in headset, also modulation present on transmitter carrier.	Water or dirt between terminals or contacts of microphone-headset jack.
6. Equipment will turn "on" when any channel button on Control Box BC-602-A is depressed, but will not transfer from one channel to another.	Defective wiring between pin 16, in 18 pin socket (417) on Rack FT-244-A and switch 611 in Control Box BC-602-A. Open wiring between same pin 16 and Slow Release Relay (130) in Transmitter Unit. Open wiring to coil of Slow Release Relay (130) in Transmitter Unit or defective Contactor Relay (131) in Transmitter. Jammed Ratchet Motor (406) or channel shifting mechanism in Rack FT-244-A (especially true if all channel indicator lamps in Control Box BC-602-A are lighted). Defective Relay (411-2) in Rack FT-244-A or associated control wiring. Defective or improperly adjusted Motor Positioning Switch (427) contacts.
7. Impossible to select one particular channel (ratchet motor (406) in Rack FT-244-A does not operate when that channel button on BC-602-A is depressed), although operation on remainder of channels is normal.	Defective Switch (611) in Radio Control Box BC-602 A or associated control wiring between Control Box and Rack FT-244-A. Defective Motor Positioning Switch (427) in Rack FT-244-A.

SYMPTOM	*PROBABLE CAUSE*
8. Channel Selecting mechanism in Rack FT-244-A is operated when any channel selector button on Control Box BC-602-A is depressed, but one or two channels are inoperative for both transmitting and receiving.	Defective or maladjusted Motor Positioning Switch (427) in Rack FT-244-A, causing overtravel of Ratchet Motor and subsequent release of Receiver and Transmitter Unit channel selecting slides. This may also be due to sluggish Relay (411-2). Improper location of Ratchet Motor (406) in Rack.
9. Transmitter and Receiver both apparently properly tuned but communication is either very poor or impossible.	Defective Antenna Relay (412) in Rack FT-244-A. Open transmission line. Defective connection between Antenna Socket SO-153 and Antenna Mast. Water in Antenna Mast.
10. Receiver output will not squelch properly when "Relay" control in Rack is rotated counterclockwise, or set is very noisy when vibrated after output is squelched.	Coil of Squelch Relay (246) in Receiver is open or relay is out of adjustment. Contacts of same relay may be dirty.
11. Transmitter or Receiver will not stay in tune.	Tuning Control locknuts not sufficiently tightened. Defective coupling between tuning control and variable capacitor. Loose set screws fastening couplings to tuning control shaft or variable capacitor shaft. Broken mycalex or ceramic shaft in receiver gang condenser.
12. Equipment does not shift to channel D and transmit steady tone when Contactor Unit BC-608 is in operation.	Switch on Contactor Unit not in proper position. Defective Relay (131) in Transmitter Unit or dirty contacts on Relay (130) in Transmitter. Defective wiring between Contactor Unit and Relay (131). No radio frequency power output from Transmitter Unit on channel D.
13. Equipment transmits when "T-R-REM" switch in Control Box BC-602-A is in "R" or "REM" position although "press-to-talk" switch is not depressed.	Dirty contacts on "T-R-REM" switch. Dirty contacts on Relay (161) in Transmitter Unit. Open coil of Antenna Relay (412) in Rack FT-244-A. Open circuit in wiring between any of the above components.
14. Contact with tower impossible, noisy, or garbled with aircraft on ground although transmitter field strength is okay, receiver sensitivity is normal, and dynamotor is not noisy.	Position of aircraft on ground is such that buildings, trees, or parts of aircraft are between the two antennae.

SYMPTOM	*PROBABLE CAUSE*
15. Excessively high cockpit noise level or audio distortion interfering with intelligibility.	"Gain" control on Transmitter BC-625-A set at too high a level. Best initial setting of this control is between one third and one half of the way back from the maximum clockwise rotation position. Pilots should be instructed to raise their voices above conversational level when using their transmitter.

There are, of course, innumerable other troubles that can and may occur in any complex piece of radio equipment. It should be remembered that the ability to analyze radio equipment trouble and localize it to a particular sub-assembly or component without tearing everything out of the airplane always saves time. It is embarrassing, for example, to remove a major unit from the airplane only to later discover that the trouble had been caused by faulty wiring or some other unit of the installation. If the cause of trouble is unknown, a few minutes of thought and study of the schematic diagram, together with a mental tabulation of the various possible discrepancies in the equipment that might contribute to its failure may save several hours of haphazard labor. Once the identity of the defective unit has been established beyond reasonable doubt, it then should be removed and repaired or replaced by a good unit. Data for servicing and maintenance of the various components of the Radio Set SCR-522-A are given in the following paragraphs. A complete schematic circuit diagram will be found on the last page of this manual.

III. RADIO TRANSMITTER BC-625-A

A. *Transmitter Tuning - Using Test Set I-139-A*

1. Radio Transmitter BC-625-A, when being tuned, must be inside Case CS-80 with Radio Receiver BC-624-A connected. The tuning of transmitter without case is disturbed by the additional capacitance introduced by replacing the case, especially for the third tuning control.

2. If the receiver and transmitter covers are closed, loosen the Dzus fasteners pinning them to the center cover. Raise the covers slightly and draw them away from the center panel.

3. The crystal chosen for any transmitter channel should have a frequency 1/18 of the output frequency desired.

4. Install proper crystals in the crystal sockets. Plug the Test Set I-139-A cord into the two prong transmitter test meter socket located on the right of the "Meter Switch".

5. Turn Transmitter on by depressing channel button "D" on Radio Control Box BC-602-A. The dynamotor unit should start and the tuning mechanism operate, shifting to channel "D". Release mechanism by depressing release button (or squeezing motor armature once). This drops out all channels. Loosen the four locknuts slightly. Press channel "A" button on Radio Control Box BC-602-A.

   The warm up of tubes requires about one minute and can be observed by the indication of Test Meter with Switch in position 3.

6. Throw the key switch on Control Box to "Transmit", and with Test Meter Switch in position 1, tune control 1 for maximum meter reading. Repeat on switch positions 2 and 3 and controls 2 and 3 respectively, in consecutive order. Dial 4 is best tuned by indication of "dip" in meter reading switch #3. The amount of "dip" is inversely proportional to the antenna loading. Should the load be such as to indicate a "dip" no lower than to .75 the coupling should be reduced. Conversely, the coupling should be increased where the "dip" is to less than .6 to provide proper power output.

   Avoid tuning to improper harmonic by checking that dials all indicate approximately the required *output frequency*.

7. The coupling adjustment is made by means of a slotted hole mounting for the antenna coil and a knurled clamping nut located at the right of the transmitter tuning controls. The nut is loosened slightly and pushed to the right to loosen coupling, or left to increase same. Tighten the clamp nut when correct coupling is obtained.

8. The tuning controls are locked by releasing the tuning mechanism as in 5. and tightening the locknuts on the controls.

9. Whenever a channel is selected on Radio Control Box BC-602-A, the switching mechanism will select and release channels in the sequence "A", "B", "C", "D" until the desired channel is selected. For example, if channel "A" has already been selected and it is desired to select channel "D", channels "B" and "C" will be switched on and off before channel "D" is reached. If channels "B" and "C" are already aligned and the tuning control locknuts are loose when channel "D" button is pressed, channels "B" and "C" will probably be jarred out of adjustment by the impact of the shifter actuating slides. However, if tuning is done in the order "A", "B", "C", "D", it is not necessary to disturb previously aligned channels before reaching the channel to be tuned. For example, when channel "C" button is in the depressed position, channel "D" can be selected without actuating the slides for any other channel.

10. Where an antenna does not provide true resistive termination to the co-axial transmission line, a variable load condition will result for different channels. The coupling may be then adjusted for an average meter current (switch position 3) of .63, provided that the maximum does not exceed .75 as specified under paragraph 6.

11. The resonance of a secondary tuned circuit such as an antenna matching device may be indicated by the voltage rise thereon as shown by a small neon bulb, or the increase in current in this circuit (or a portion of same) either by means of a thermo meter or flashlight lamp bulb. An increase in brilliancy of either of these bulbs indicates correct adjustment of the secondary circuit.

12. As a precautionary measure after any adjustment of antenna coupling, the last two tuning controls should be readjusted for maximum grid drive (meter position 5 and second from the right control) and minimum or "dip" in power amplifier plate current (meter position 3 and right hand control).

B. *Significance of Meter Readings*

In general, a meter reading greater than 3/4 full scale on any position of the switch is indicative of improper adjustment somewhere or trouble. The one exception is position 5, which on some tubes may read full scale or even greater and is desirable. A simple way to remember the approximate readings is to memorize the numerals - 4, 5, 6 - for the respective meter readings on switch positions - 1, 2, 3. While these figures are typical and desirable, the "6" reading (position 3) cannot usually be held over various frequency channels due to antenna characteristics presenting a variable load. Therefore, loading (adjustable antenna coil) should be compromised to average around the above "6" meter reading for the four frequency channels set up.

Position 4 reading, R.F. diode current, is seldom used. This device is similar to the use of a neon bulb to determine the presence of R.F. voltage on the final amplifier tank coil, and is purely a relative meter reading having no significance as to absolute quantity.

Position 5 is another variable meter reading. Grid "drive" or grid current, as indicated in transmitting tube data sheets, is "approximate, subject to wide variations depending on the impedance of the load circuit". Sufficient to say, it is desirable to have this current as high as possible (even "off scale") but this is not possible with some tubes. The real criterion is whether "upward modulation" of the carrier is obtained. This is difficult to check without an antenna ammeter such as that on the phantom antenna of the I-96 test equipment. It can reasonably be expected that half scale reading, or greater, for meter switch position 5 will be satisfactory, although there are exceptions to this rule. If the I-95 Field Strength Meter is available, the fact that the meter deflects upward when modulation is applied to the transmitter is indicative of proper "upward" modulation.

It should be noted that there is an "idle" or standing plate current of about 4 on the meter in position 3, when the equipment is in "receive" condition. This is normal and correct and serves to keep a load on the modulator at all times. Should this current be abnormally high, this is an indication that the bias supply (150 volt) from the dynamotor is shorted or open. A small emission current will also be noted on position 4, the R.F. diode when in the "standby" condition.

Position 6 is an "off" or open switch point. The I-95 Field Strength Meter readings must be interpreted in a relative manner. It is necessary to always locate the instrument in the same relative position with respect to the transmitting antenna and surrounding objects. The meter reading then is to be compared to that obtained from an installation known to be satisfactory.

C. *Notes on Tubes*

The diagram of the tube heater circuits should be studied to familiarize one's self with the series parallel arrangement used. This is important to prevent the needless replacement of a tube for not "lighting" when the cause really exists in the other tube in the same series circuit. A mistake often made when servicing is to neglect to replace the R.F. diode VT-199 in its socket and as a consequence, the oscillator tube VT-198A will not light and the crystal will seem "dead". No other pairs of tubes are thus interdependent in the transmitter. A puzzling difficulty sometimes encountered, especially in the VT-118, is that the tube filament checks okay on a continuity meter and

lights (perhaps dimly) in the transmitter, but does not operate. This is known as an "air leaker" tube. The envelope is filled with air at normal pressure due to a crack or seal leak, and the filament will still glow without burning out. These tubes can usually be recognized by the white oxidization of the getter stain flash inside the tube except, of course, for metal tubes, which will run very hot from the filament alone.

Sometimes an "air leaker" VT-118 will be a slow leaker and go through an ionization period where an arc will strike within the structure. The great heat of this arc often melts the plate and grids. Tubes destroyed thus sometimes burn out the associated R.F. choke and modulation transformer.

Occasionally, the metal tubes will contain foreign matter which may be "weld flash" loosened under prolonged vibration. This causes interelectrode short circuits which are sometimes difficult to find because of their temporary nature.

Special care should be exercised in handling the VT-118 tubes because of their fragile nature and high cost.

1. The tube should be inserted and removed from the socket by pushing straight down, or pulling directly upward. A vigorous "rocking" motion is definitely detrimental. There is sufficient clearance on the ceramic base for the pins in a vertical direction and tolerances of the pin diameters are carefully controlled.

2. The final fraction of an inch of push is apt to cause trouble since the height of the glass seal around the pin may vary somewhat. The highest glass seal is the limiting or seating device, therefore, a "rocking" about this point is inevitable if the push is carried too far or too hard.

3. Instances have been noted where a socket contact has been rotated or distorted resulting in a cracked tube when attempt was made to use the socket. An investigation should be made of all cases where the tube fits unusually hard. Cracks may form later in the field from prolonged pressure strains.

When observing tubes under operation, do not confuse the fluorescent glow of the glass and getter stain with the gas ionization glow in and around the elements as characteristic of a "soft" or gassy tube. The latter are defective and should be replaced.

A quantity of equipments was manufactured before it was discovered a near resonance at about 130 mcs was possible of developing with some VT-118 tubes as harmonic amplifiers. This took the form of an apparently tuned up second dial control (despite its setting) and lack of grid drive after tuning up the rest of the stages. The removal of condenser, symbol 100, (from one end of the second tuned circuit to ground) breaks up the parasitic circuit and relieves the difficulty. This 15 mmf condenser is being omitted on all present manufacture with consequent improved performance.

D. *Relay Maintenance*

Relays of the telephone type as used in the SCR-522-A are best left untouched except for contact cleaning. The springs are never to be "bent" because this

may shift the fulcrum point. Factory adjusters "iron" the spring and give it a "bow" in the desired direction. This sort of adjustment is generally permanent, and any relay difficulties are usually a glaze, or dirt in the contact itself. Sandpaper or crocus cloth is not desirable as a cleaning medium, nor a file, be it a "contact file" or not. The operation is best described as a burnishing or polish, and may often be sufficiently done with a flat toothpick dipped in carbon tetrachloride. Commercially available contact burnishers consist of a thin flexible metal strip which is slightly roughened by sand blast or etching, or another type made of soft metal, such as nickel silver, milled like the edge of a coin. These are not designed to remove metal but only the dirt or glaze. Pressure to do the work should be only that supplied by the closed contact.

E. *Frequency Shifters*

NOTE - This information applies to the frequency shifting mechanism mounted on both Transmitter BC-625-A and Receiver BC-624-A.

1. Inspect for broken or damaged cams and springs (see Fig. 7).

2. Test for free action of slides and straighten if necessary.

3. Clean if necessary.

4. Relubricate with Pioneer Instrument oil #1 or Mobil Fluid HFW.

5. Check torque of each cam shaft when shifter is mounted on Transmitter or Receiver. (Check with torque checker for not more than 2 ounces-inch, or make certain that clip will reposition shaft when clip has been just unseated.)

F. *Socket Voltage Measurements*

See Figure 1 for the procedure of measurement and voltage values to be obtained.

IV. RADIO RECEIVER BC-624-A

A. *Receiver Tuning - Using Test Equipment IE-19-A*

1. Test Equipment IE-19-A and a head-set are required for Receiver tuning.

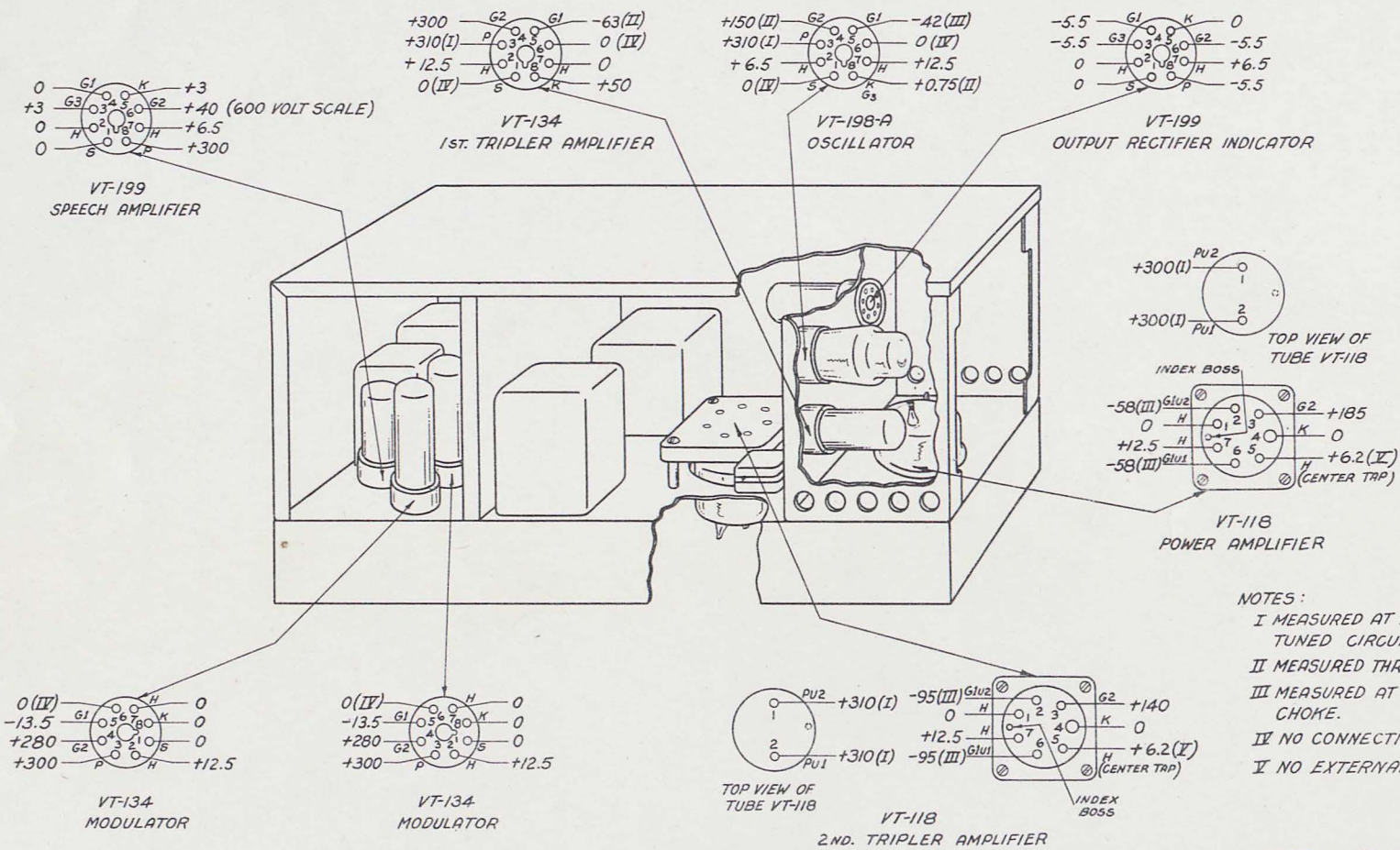
2. The following adjustments may be made either with the equipment in an operative condition on the test bench or properly installed in aircraft.

3. A receiver crystal is identified by the fundamental frequency in kilocycles which appears on the crystal holder.

To find the correct receiver crystal for a channel is, therefore, the same as finding the correct fundamental frequency (f = kilocycles) of the crystal to be used. The fundamental crystal frequency (f) may be determined from the expression

$$f = \frac{fr - 12 \text{ mcs}}{H} \times 1000$$

FIG. 1 - RADIO TRANSMITTER BC-625-A, TUBE SOCKET VOLTAGE DIAGRAM



NOTES:

I MEASURED AT B+ TERMINAL OF PLATE TUNED CIRCUIT.

II MEASURED THRU 2.5 MH CHOKE.

III MEASURED AT RETURN END OF GRID CHOKE.

IV NO CONNECTION TO TUBE.

V NO EXTERNAL CONNECTION.

BOTTOM VIEWS OF TUBE SOCKETS ARE SHOWN.

CONDITIONS OF MEASUREMENT
VOLTMETER SENSITIVITY-1000 OHMS PER VOLT.
INPUT TO DYNAMOTOR - 28 VOLTS.
FREQUENCY - 130 MCS
POWER OUTPUT -12.75 WATTS

66

8.

18 | 156

2 144

146 120

+ 88

12

8.66

8666

where fr is the frequency in megacycles to which the receiver is to be tuned and H is the receiver crystal harmonic used (see table below). The receiver crystal harmonic (H) used depends only on the frequency (fr) to be tuned in, and is given in the following table:

Frequency (fr)	*Receiver Crystal Harmonic (H)*
100 - 108 Mcs	11
108 - 116	12
116 - 124	13
124 - 132	14
132 - 140	15
140 - 148	16
148 - 156	17
156 -	18

4. Adjustment of Signal Generator I-130-A - Using Crystal

   a. Insert a transmitter crystal into the "Crystal" socket of the signal generator. This crystal should have a fundamental frequency 1/18 of the receiver frequency to be tuned.

   b. Connect Cord CD-477 to the "R.F. Output" socket on the signal generator and to the antenna Socket SO-153 on Rack FT-244-A.

   c. Connect Test Set I-139-A to the signal generator "Meter" socket.

   d. Plug the Battery Box BX-33-A cable into the signal generator four pin socket located to the left of the "Meter" socket. Throw the signal generator "Power On-Off" switch to "On".

   e. Set the signal generator "M.O.-Crystal" switch at "Crystal".

   f. Place the "Output Control" on "Max." (extreme clockwise position) and place the "Output Steps" control on step "5".

   g. After allowing about one minute for the tubes to warm up, adjust the "Crystal Tuning" control to the frequency to be tuned. If this adjustment is correct, a dip will be observed in the test milliammeter (Test Set I-139-A). Adjust the "Megacycles" dial control for additional dip (approximately at the same dial setting as the receiver channel frequency being tuned).

5. Tuning Adjustment for Channel "A"

   a. Install the proper crystal in the socket for Receiver channel "A".

   b. Press channel "D" button on Radio Control Box BC-602-A.

   c. Press the channel release button located on the rack.

   d. Loosen the two receiver tuning control locknuts by turning them counterclockwise. Tighten the two locknuts just enough to exert a slight pressure on the cam pile-up, otherwise vibration may change the position of the cam, introducing considerable set-up error.

e. Press channel "A" button on the radio control box. After allowing about one minute for the receiver vacuum tubes to warm up, throw the "T-R-REM" switch on the Radio Control Box BC-602-A to "R" or center position.

f. Turn R.F. and oscillator tuning controls to the desired frequency as indicated on the calibration plate.

g. Connect a suitable headset across terminals 1 and 3 of Socket 802 on Junction Box JB-29-A or to output jack. "Audio" and "Relay" controls should be in their maximum clockwise rotation position.

h. Back out the channel "A" oscillator plate coil tuning screw so that about three to five threads of the screw are protruding from the coil mounting insert. The higher the frequency of the crystal in use, the farther it will be necessary to turn out the plate coil screw, thus obtaining proper inductance to permit the oscillator to start.

When the oscillator starts, the signal should be heard. If not, simultaneously adjust the R.F. and oscillator tuning controls slightly until the signal is heard and also turn the channel "A" oscillator plate coil tuning screw still further counterclockwise, if necessary.

After the signal is heard, the oscillator plate coil tuning screw should be rotated clockwise until the signal suddenly stops altogether, then again rotated counterclockwise to a position at least three quarters of a turn past the point at which the signal is first heard (i.e., the position at which the oscillator starts). The extra three quarters of a turn is necessary for a stable adjustment of the crystal oscillator. If this results in an appreciable reduction of output, continue turning the screw counterclockwise until the output is increased as much as possible. This adjustment should be rechecked after completing the steps in i. and j. below.

i. Adjust the "Output Control" of the signal generator to "Min." position. Place the "Output Steps " control in position "1" or "2" and then turn the "Output Control" clockwise until the signal is just audible in the headset.

j. Readjust the receiver tuning controls and the signal generator "Crystal Tuning" control for maximum audio output, also rotating the "Output Control" counterclockwise if necessary to keep the peaked output at a low level.

If an output power meter or an A.C. voltmeter of suitable range is available, it will be helpful in making final tuning adjustments. The meter should be connected in place of, or in parallel with the headset. Test Set I-139-A may, of course, be plugged in to the receiver and all tuning adjustments made as above, except that instead of tuning for maximum audio output, tune for minimum reading or "dip" of milliammeter I-139-A. Signal generator output should be progressively reduced to the lowest level at which it is possible to get an indication of change of current on I-139-A as the receiver tuning controls are adjusted.

6. Adjustments for Remaining Channels

To adjust the remaining channels, press channel "B" button on Radio Control Box BC-602-A and follow the same tuning procedure as outlined for channel "A" in the paragraphs under 5. above.

NOTE: The tuning instructions for channel "A" will hold good for channel "B" only if the letter "B" is substituted for "A" wherever the crystal, the channel, or the oscillator plate coil tuning screw are mentioned. This note likewise applies when tuning channels "C" and "D". Tune channels "C" and "D" in like manner, after which press the channel release button and tighten the two receiver tuning control locknuts by turning them *tightly* clockwise.

NOTE: Whenever a channel is selected on Radio Control Box BC-602-A, the switching mechanism will select and release channels in the sequence "A", "B", "C", "D" until the desired channel is selected. For example, if channel "A" has already been selected and it is desired to select channel "D", channels "B" and "C" will be switched on and off before channel "D" is reached. If channels "B" and "C" are already aligned and the tuning control locknuts are loose when channel "D" button is pressed, channels "B" and "C" will probably be jarred out of adjustment by the impact of the shifter actuating slides. However, if tuning is done in the order "A", "B", "C", "D", it is not necessary to disturb previously aligned channels before reaching the channel to be tuned. For example, when channel "C" button is in the depressed position, channel "D" can be selected without actuating the slides for any other channel.

7. Procedure for Tuning One Channel Only

If one channel is out of adjustment, it may be tuned without disturbing the other channels.

a. Press the selector button (on Radio Control Box BC-602-A) corresponding to the channel preceding the desired channel in the sequence "A", "B", "C", "D".

b. Press the channel release button.

c. Loosen the receiver tuning control locknuts.

d. Press the channel selector button for the desired channel.

e. Tune the desired channel as described in paragraphs 5.f. to 5.j. inclusive, ignoring reference to channel "A" and substituting the applicable letter.

f. Press the channel release button.

g. Tighten the receiver tuning control locknuts.

h. Press the channel release button to select the channel just tuned.

B. *"Audio" Adjustment*

Three impedance taps are provided on the BC-624-A output transformer (296) as follows: No. 5 - 50 ohms, No. 6 - 300 ohms, No. 7 - 4000 ohms. Some equipments have the output lead connected to terminal No. 6 and others to terminal

No. 7. If the output connection is made to No. 7, a drop of yellow paint is put on the screw driver slot of the "Audio" control. The exact setting of the volume control depends upon the headphones being used and upon the volume desired by the pilot. However, using standard Army phones, the "Audio" control should be turned fully clockwise when No. 6 tap is used and about one third of a turn counterclockwise from the maximum clockwise position when tap No. 7 is used. This setting is only approximate and the pilot should be contacted and the volume increased or decreased as desired. If the pilot requires more volume and the audio output is on No. 6, it should be changed to No. 7.

C. *"Relay" Adjustment*

This is the last adjustment to be made on the receiver and should be done with the equipment operating on any channel which is tuned with the antenna connected but with no transmitter in operation on the frequency being used. The control is first turned to the extreme clockwise position and then turned slowly counterclockwise until a noticeable drop in noise results (approximately 20 db) and then continued for a very small fraction of a turn. This adjustment can normally be made without having the engines running. If, however, the adjustment has been checked and the pilot still complains of noise in the phones at all times, the control should be adjusted with the engines running.

D. *Service and Maintenance*

	SYMPTOM	*PROBABLE CAUSE*
1.	Set dead and no microphone sidetone audible in phones.	Defective VT-169 or VT-135. Defective resistor, condenser, transformer or wiring associated with these tubes.
2.	Set dead but sidetone is audible in phones.	Defective VT-209. Defective resistor, condenser or wiring associated with these tubes. Check alignment of I.F. transformers (see paragraph E).
3.	Set only operates on extremely strong signals.	Defective VT-202, VT-203, or VT-207. Defective resistor, condenser or wiring associated with these tubes. Check alignment of R.F. and oscillator assembly (see paragraph F).
4.	Set will not remain in tune although locknuts are tight.	Check all variable condenser coupling set screws and if found tight, examine the couplings themselves for slippage. Examine variable condensers for evidence of slippage between the rotor plates and the front end of the shaft, or cracked rotor shaft.
5.	Impossible to obtain proper adjustment of squelch relay by manipulation of "Relay" control.	Check contacts of Relay 246 for dirt (use a contact burnisher or draw a piece of paper through the contacts when closed). If this relay does not open and close when the "Relay" control is varied from maximum to minimum rotation, adjust the armature

SYMPTOM	*PROBABLE CAUSE*
	spring tension so that it will operate when the "Relay" control is varied through a point about one third of the way down from the maximum clockwise rotation stop. This adjustment should be made with the transmitter plugged into the rack, but no antenna or transmission line connected to Socket SO-153. If relay still does not operate properly, try replacing VT-207, check relay coil for open or short circuit, check all resistors and capacitors associated with this circuit.
6. Receiver operates properly on at least one channel, but not on one or more of the remaining channels.	Check associated oscillator plate resonating coil (227) and Crystal Unit DC-11-A. Check contacts of Switch (286) and associated wiring.
7. For miscellaneous troubles, check all receiver socket voltages and make continuity measurements as outlined in paragraphs G. and H.	

E. *I.F. Amplifier Transformer Alignment*

If it seems evident that one or more of the transformers of the I.F. amplifier of Radio Receiver BC-624-A are out of adjustment, the procedure outlined below should be used to realign these circuits. Any signal generator capable of producing an output of approximately one volt at a frequency of exactly twelve megacycles and having a *terminated transmission line output* is suitable. The radio frequency voltage should be modulated approximately 30%, 400 to 1000 cycles. If Test Equipment IE-12-A is available, Signal Generator I-96-A may be used and the Instruction Book accompanying this test equipment should be consulted for the proper procedure to be used for putting the twelve megacycle portion of Signal Generator I-96-A into operation. The most satisfactory tuning indicator is an output power meter or an A.C. voltmeter across a suitable load resistor. The load presented by either type of instrument should be adjusted for 4000 ohms if the yellow wire going to transformer 296 in the receiver unit is connected to terminal No. 7, or 300 ohms if the yellow wire is connected to terminal No. 6. This output meter load should be connected across terminals No. 1 and 3 of Socket 802 or No. 1 and 4 of Socket 804 in Junction Box JB-29-A. A pair of high impedance headphones should also be connected across the above terminals to give the operator an aural indication. If no output meter is available, the method of alignment outlined in the Instruction Book for Test Equipment IE-12-A may be followed using a D.C. meter plugged into the meter socket on the panel of the receiver unit as a tuning indicator, or the transformers may be adjusted as outlined below, for peak output to the headphones with the signal generator attenuator adjusted for comfortable headphone volume and readjusted, if necessary, as alignment progresses, to maintain that volume. "Audio" and "Relay" controls should be rotated to their maximum clockwise positions.

1. Remove the Transmitter-Receiver-Rack Assembly from Case CS-80-A.

2. Connect the "Ant." or "Output" terminal of the signal generator output to the grid of the Mixer Tube VT-203 and the ground terminal to the variable condenser frame as indicated in Figure 2. The leads must be kept *as short as possible* and in no case should they exceed a length of 1 1/2 inches, otherwise the I.F. amplifier may feed back and oscillate.

3. Operate any one of the channel buttons on Radio Control Box BC-602-A and allow the tube heaters to warm up for several minutes. The "T-R-REM" switch must be in the "R" position.

4. Adjust the signal generator output frequency to exactly twelve megacycles and set the attenuator, wherever necessary, for a reading of approximately 50 milliwatts as indicated by the output meter (or 15 volts R.M.S across 4000 ohm load; 4 volts R.M.S. across 300 ohm load).

5. Using a small screw driver, adjust the iron core tuning screws on top of transformer 294 for maximum audio output, likewise the screws for transformers 293, 292, and 291 (see figure 3) in that order, reducing the signal generator output, if necessary, to keep the receiver audio output approximately 50 milliwatts.

6. Repeat step 5. to see if any further improvement in alignment is possible.

7. Press the "Off" button on Radio Control Box BC-602-A, remove the leads from the mixer grid and the variable condenser frame and replace the assembly in Case CS-80-A.

F. *R.F. and Oscillator Alignment*

The following procedure is to be used when it becomes necessary to realign the tuned circuits of the R.F. Amplifier, Mixer, Harmonic Generator, and Harmonic Amplifier Stages of Radio Receiver BC-624-A. The equipment necessary for this operation includes a signal generator capable of producing a radio frequency output of approximately .01 volt modulated to a depth of approximately 30% with audio frequency of between 400 and 1000 cycles, frequency range between 100 and 156 megacycles, suitable attenuator capable of reducing the output voltage to 20 microvolts or less; an output power meter or an A.C. voltmeter across a suitable load resistor as explained in detail in paragraph E above; pair of high impedance headphones; non-metallic trimmer adjusting screw driver; a non-inductive (carbon) resistor of between 25 and 50 ohms resistance to be used as a dummy antenna. The output meter and headphones should be connected across the audio output circuit - terminals No. 1 and 3 of Socket 802 or terminals No. 1 and 4 of Socket 804 in Junction Box JB-29-A. The signal generator is connected to Socket SO-153 on Rack FT-244-A with the dummy antenna resistor connected between the center terminal of SO-153 and the output terminal of the signal generator. Dummy antenna resistor not required if using Signal Generators I-96-A or I-130-A. The ground terminal of the generator must be connected to the threaded shell of Socket SO-153 and all leads must be kept to an *absolute minimum length.*

1. Press channel "A" push button on Radio Control Box BC-602-A and note that the frequency shifting mechanism in Rack FT-244-A selects channel "A". Then press the release switch button in the rack and note that all frequency shifter actuating slides have returned to the unoperated position. It is now possible to remove the transmitter unit without damaging the shifter slides and mechanism.

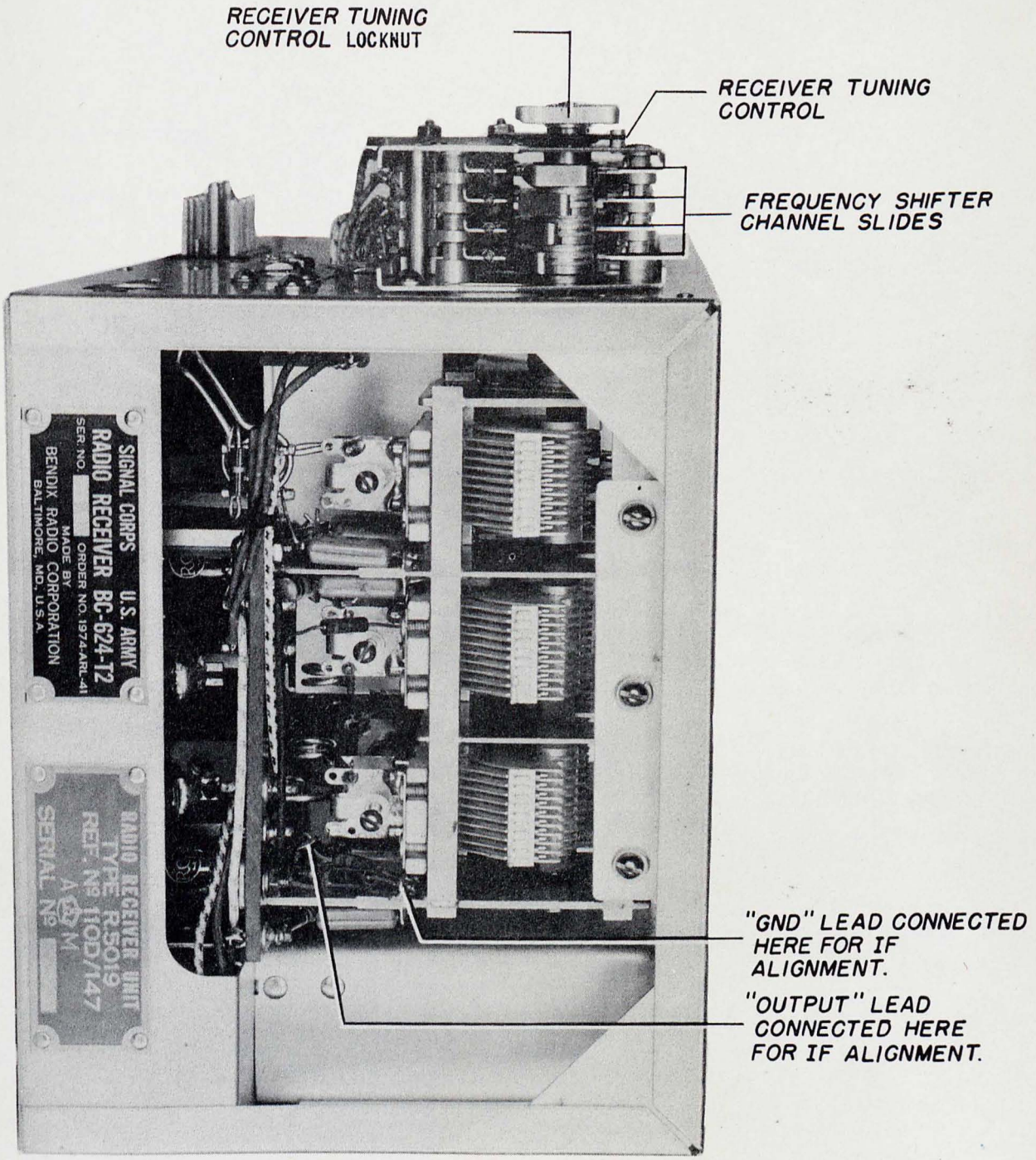


FIG. 2 - RADIO RECEIVER BC-624-A, RIGHT SIDE VIEW

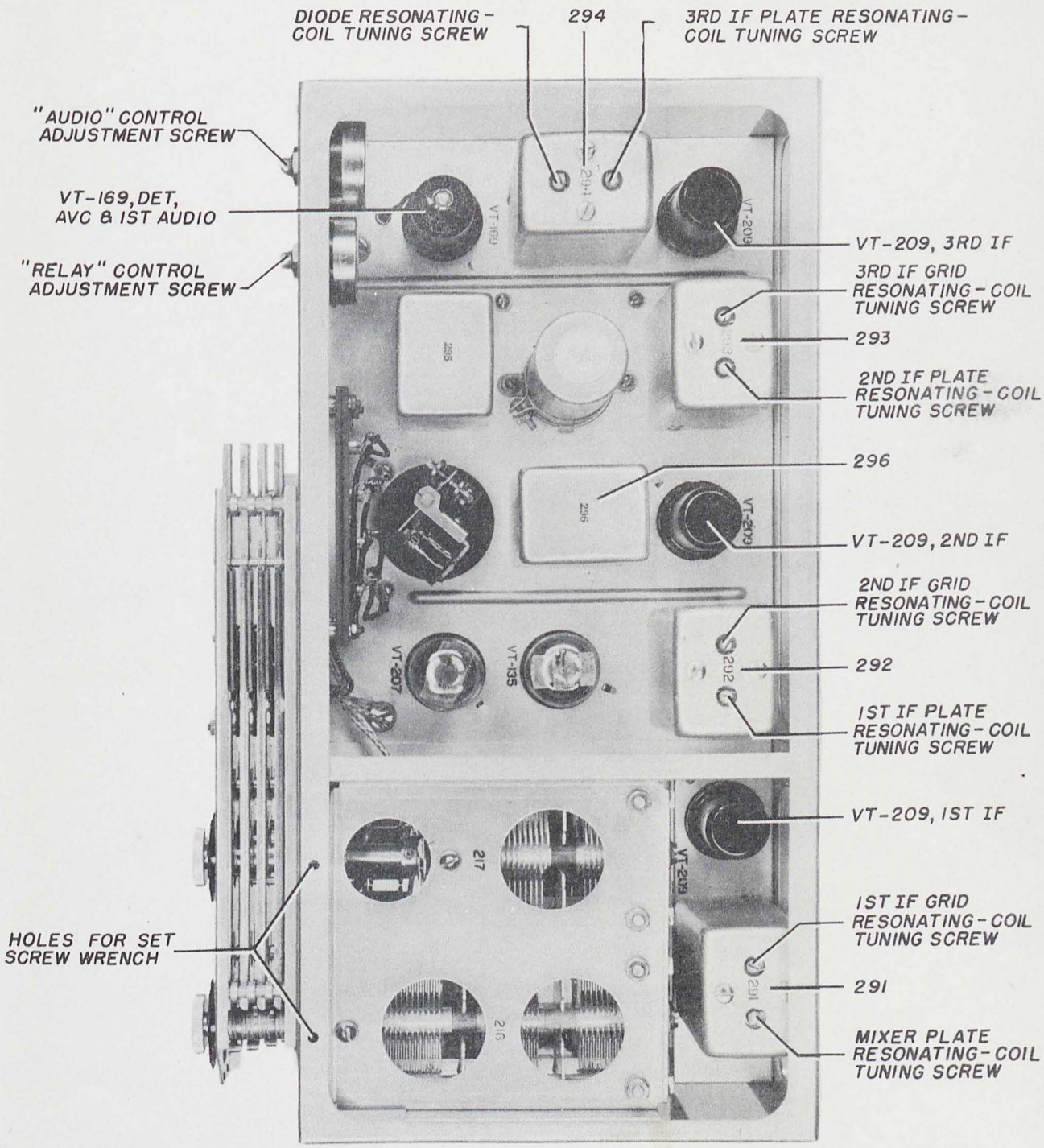


FIG. 3 - RADIO RECEIVER BC-624-A, REAR VIEW

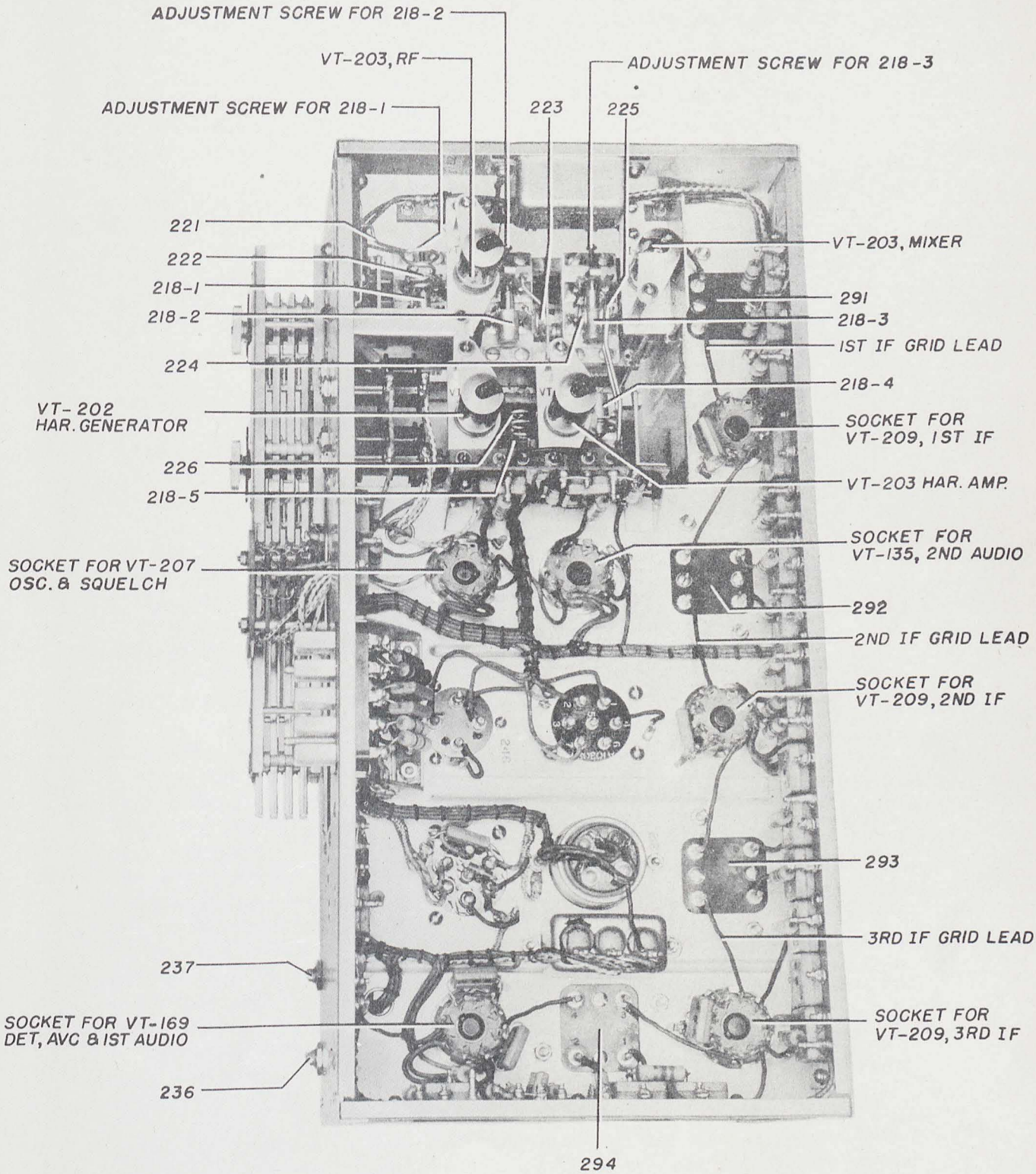


FIG. 4 - RADIO RECEIVER BC-624-A, FRONT VIEW

2. Turn the SCR-522-A equipment off and remove the Case CS-80-A. Also, remove the transmitter unit from Rack FT-244-A by removing the four red painted screws holding it in place.

3. Block Relay 411-1 (in the rack) in its energized position. This will energize Relay 412 and apply high voltage to the receiver unit when equipment is turned on.

4. Connect a jumper from terminal No. 4 on Socket 418-1 in Rack FT-244-A to any convenient point on the grounded rack frame. This will permit channel selection with the transmitter unit removed.

5. Loosen the two control locknuts on the receiver frequency shifter.

6. Set both receiver tuning controls at the dial marks below the 100 megacycle calibration points and see that the two variable gang capacitors are fully enmeshed. If not, loosen the shaft coupling set screws, set the capacitors properly and retighten all set screws, locking them with a drop of purple glyptal on the threads.

7. Install an 8.000 megacycle crystal in channel "D" crystal socket.

8. Press channel "D" push button on Radio Control Box BC-602-A, place "T-R-REM" switch in the "R" position, and permit the vacuum tube heaters to warm up for several minutes.

9. Set both tuning control dials to exactly 156 megacycles and set the signal generator to 156 megacycles, adjusting the attenuator to the point resulting in approximately 50 milliwatts of audio output (or 15 volts R.M.S. across a 4000 ohm load; 4 volts R.M.S. across a 300 ohm load). "Audio" and "Relay" control should be fully clockwise. It may be necessary to alter the position of the channel "D" oscillator plate tuning screw as explained in IV.A.5.h. (Receiver Tuning).

10. Using the non-metallic screw driver, adjust the five trimmer capacitor screws (see figures 2 and 4) 218-5, 218-4, 218-3, 218-2, and 218-1, in that order, for maximum indication of audio output, reducing the output from the signal generator as necessary to keep the output approximately 50 milliwatts. If the generator output is less than 10 microvolts, reduce the audio output by means of the "Audio" control. The signal generator frequency control should be checked from time to time to see that it is peaked to resonance at 156 megacycles with the receiver. Since the receiver is crystal controlled, the generator should be resonated to the receiver, rather than following the normal procedure of setting the generator to the exact desired frequency and resonating the receiver to that frequency.

11. Set both receiver tuning controls to exactly 100 megacycles, likewise setting the signal generator frequency control to that frequency, otherwise repeating the procedure outlined in 9. above.

12. Using the non-metallic screw driver, adjust the inductance of the five R.F. coils for maximum audio output in the following order (see figures 2 and 4): 226, 225, 224, 223, and 222, reducing the signal generator output as necessary to keep the audio output approximately 50 milliwatts. Check the frequency control of the signal generator for peak output for the same

reason explained in 10. above. Adjustment of inductance of the various circular coils may be accomplished by spreading the turns apart or compressing them together slightly or in the case of the harmonic amplifier plate coil 225 vary the gap between the parallel wire portion of the coil. Do not alter the spacing from a coil to any other coil unless they have obviously been displaced from their proper positions. Compare them with coil spacings in another BC-624-A which is known to be in good operating condition.

13. Repeat steps 9., 10., 11., and 12. until it is no longer possible to get an increase in audio output by adjustment of any trimmer or coil.

14. Press release button in Rack FT-244-A, turn equipment off, and reassemble Radio Transmitter BC-625-A to the rack and reinstall the complete assembly in Case CS-80-A.

G. *Continuity and Resistance Measurements*

All tubes should be in their respective sockets. Receiver Unit should be detached from Rack FT-244-A. "Audio" and "Relay" controls should be fully clockwise unless otherwise indicated.

Figure 5 shows positions of various terminal boards and terminal numbers.

Resistance values indicated should check within ±10% and variations greater than this should be investigated.

	FROM	*TO*	*RESISTANCE*
1	Jones Plug #3	T.B. 4 #1	.25
2	Jones Plug #3	T.B. 5 #8	.25
3	Jones Plug #3	T.B. 5 #1	.25
4	Jones Plug #3	T.B. 5 #9	.25
5	Jones Plug #3	T.B. 5 #15	.25
6	Jones Plug #3	T.B. 5 #17	.25
7	Jones Plug #3	T.B. 5 #23	.25
8	Jones Plug #3	T.B. 9 #11	.25
9	Jones Plug #3	T.B. 8 #17	.25
10	Jones Plug #3	T.B. 7 #2	.25
11	Jones Plug #3	T.B. 1 #1	.25
12	Jones Plug #3	T.B. 1 #5	.25
13	Jones Plug #3	T.B. 2 #3	.25
14	Jones Plug #3	T.B. 2 #2	.25
15	Jones Plug #3	T.B. 3 #2	.25
16	Jones Plug #3	T.B. 4 #4	.25
17	Jones Plug #3	Relay Terminal #1	.25
18	Jones Plug #4	Term. 6 on 296	0
19	Jones Plug #5	T.B. 4 #2	.25
20	Jones Plug #5	T.B. 4 #3	.25
21	Jones Plug #5	Term. 3 on 296	.25
22	Jones Plug #5	212B (red)	.25
23	Jones Plug #6	211C	0
24	Jones Plug #6	T.B. 9 #7	0

	FROM	TO	RESISTANCE
25	Jones Plug #6	T.B. 5 #11	0
26	Jones Plug #6	T.B. 5 #3	0
27	Jones Plug #6	T.B. 1 #3	0
28	Jones Plug #7	Ground	0
29	Jones Plug #8	213	0
30	Jones Plug #8	T.B. 1 #2	0
31	Jones Plug #8	T.B. 2 #1	0
32	Jones Plug #8	1st I.F. Pin #7	0
33	Jones Plug #8	2nd I.F. Pin #7	0
34	Jones Plug #8	3rd I.F. Pin #7	0
35	Jones Plug #8	2nd Det. Pin #7	0
36	Jones Plug #8	R.F. Osc. Pin #8	0
37	Jones Plug #8	2nd Audio #2	0
38	Jones Plug #8	Ground	1.5
39	Jones Plug #9	Term. 7 on 295	0
40	Jones Plug #9	T.B. 8 #9	0
41	Jones Plug #10	Term. 3 on 295	0
42	Jones Plug #10	Ground	3.5
43	Jones Plug #11	Term. 5 on 295	0
44	Jones Plug #12	Term. 4 on 295	0
45	Jones Plug #12	Ground	3.5
46	1st I.F. Tube Pin #1	Ground	0
47	1st I.F. Tube #2	Ground	0
48	2nd I.F. Tube #1	Ground	0
49	2nd I.F. Tube #2	Ground	0
50	3rd I.F. Tube #1	Ground	0
51	3rd I.F. Tube #2	Ground	0
52	2nd Det. #1	Ground	0
53	2nd Det. #2	Ground	0
54	2nd Det. #6	211B	0
55	2nd Det. #8	T.B. 8 #4	0
56	2nd Audio Tube #1	Ground	∞
57	2nd Audio Tube #7	Ground	0
58	R.F. Osc. Tube #7	Ground	0
* 59	R.F. Osc. Pin #5	Crystal Holders A,B,C,D	0
* 60	R.F. Osc. Pin #6	Plate Coils A,B,C,D	0
61	Jones Plug #4	Term. 7 on 296	350
62	Jones Plug #4	Term. 5 on 296	30
63	Jones Plug #4	Ground	45
64	Jones Plug #5	212A (blue)	340
65	Jones Plug #5	Term. 2 on 296	340
66	Jones Plug #5	T.B. 6 #7	340
67	Jones Plug #5	2nd Audio Pin #3	1200
68	Jones Plug #5	T.B. 9 #10	340
69	1st I.F. Tube Pin #5	Ground	390
70	1st I.F. Tube Pin #3	Ground	390
71	2nd I.F. Tube Pin #3	Ground	270
72	2nd I.F. Tube Pin #5	Ground	270
73	3rd I.F. Tube Pin #3	Ground	470
74	3rd I.F. Tube Pin #5	Ground	470
75	2nd Det. Pin #8	T.B. 8 #11 and #12	1800
76	R.F. Osc. Pin #4	Ground	2700
77	Jones Plug #3	3rd I.F. Tube #8	4700

	FROM	TO	RESISTANCE
78	Jones Plug #3	3rd I.F. Tube #6	82M
79	Jones Plug #3	2nd I.F. Tube #8	4700
80	Jones Plug #3	2nd I.F. Tube #6	62M
81	Jones Plug #3	1st I.F. Tube #8	4700
82	Jones Plug #3	1st I.F. Tube #6	62M
83	Jones Plug #3	Audio Squelch Tube #3	.5M
84	Jones Plug #3	R.F. Osc. Pin #6	10M
85	Jones Plug #3	Audio Squelch Pin #2	50M
86	Jones Plug #3	Ground	50M
87	2nd Det. Tube Pin #8	Ground	20M
88	T.B.8#11 and #12	Ground	18M
** 89	R.F. Osc. Pin #2	Ground	.5M
90	Jones Plug #5	2nd Det. Pin #3	270M
91	Jones Plug #5	2nd Det. Pin #6	2.2 Meg.
92	Jones Plug #5	Ground (30 sec)	80M
93	Jones Plug #6	Ground	740M
94	Jones Plug #6	2nd I.F. Tube Pin #4	100M
95	Jones Plug #6	1st I.F. Tube Pin #4	100M
96	Jones Plug #9	Ground	350M
97	Jones Plug #9	Term. 6 on 295	350M
98	Jones Plug #11	Ground	350M
99	1st I.F. Tube Pin #6	Ground	65M
100	2nd I.F. Tube Pin #6	Ground	65M
101	3rd I.F. Tube Pin #4	Ground	1 Meg.
102	3rd I.F. Tube Pin #6	Ground	130M
103	2nd Det. Tube Pin #4	Ground	300M
104	2nd Det. Tube Pin #5	Ground	470M
105	2nd Det. Tube Pin #6	Ground	2 Meg.
106	2nd Audio Tube Pin #5	Ground	680M
107	R.F. Osc. Pin #1	Term. 2 on 294	2.35 Meg.
108	R.F. Osc. Pin #5	Ground	270M
109	Term. 1 on 295	Term. 4 on relay	130M
110	T.B. 9 #4 and #15	211A	150M
111	T.B. 8 #4 and #15	212C	150M
*** 112	T.B. 9 #4 and #15	T.B. 8 #13	150M

* Operate corresponding channel slides for 59 and 60.
** 3M with "Relay" control fully counterclockwise.
*** Operate "Audio" control.

H. *Socket Voltage Measurements*

1. RELEASE THE RACK FREQUENCY SHIFTING MECHANISM and remove Radio Transmitter BC-625-A from the rack. Block Relay 411-1 in its energized position. This will close Relay 412 and apply high voltage to the receiver unit.

2. Connect a jumper from terminal No. 4 on Socket 418-1 to any convenient ground point on the rack chassis.

3. Operate any one of the channel push buttons on Radio Control Box BC-602-A and make sure that the proper channel is selected. "Audio" and "Relay" controls should be rotated fully clockwise.

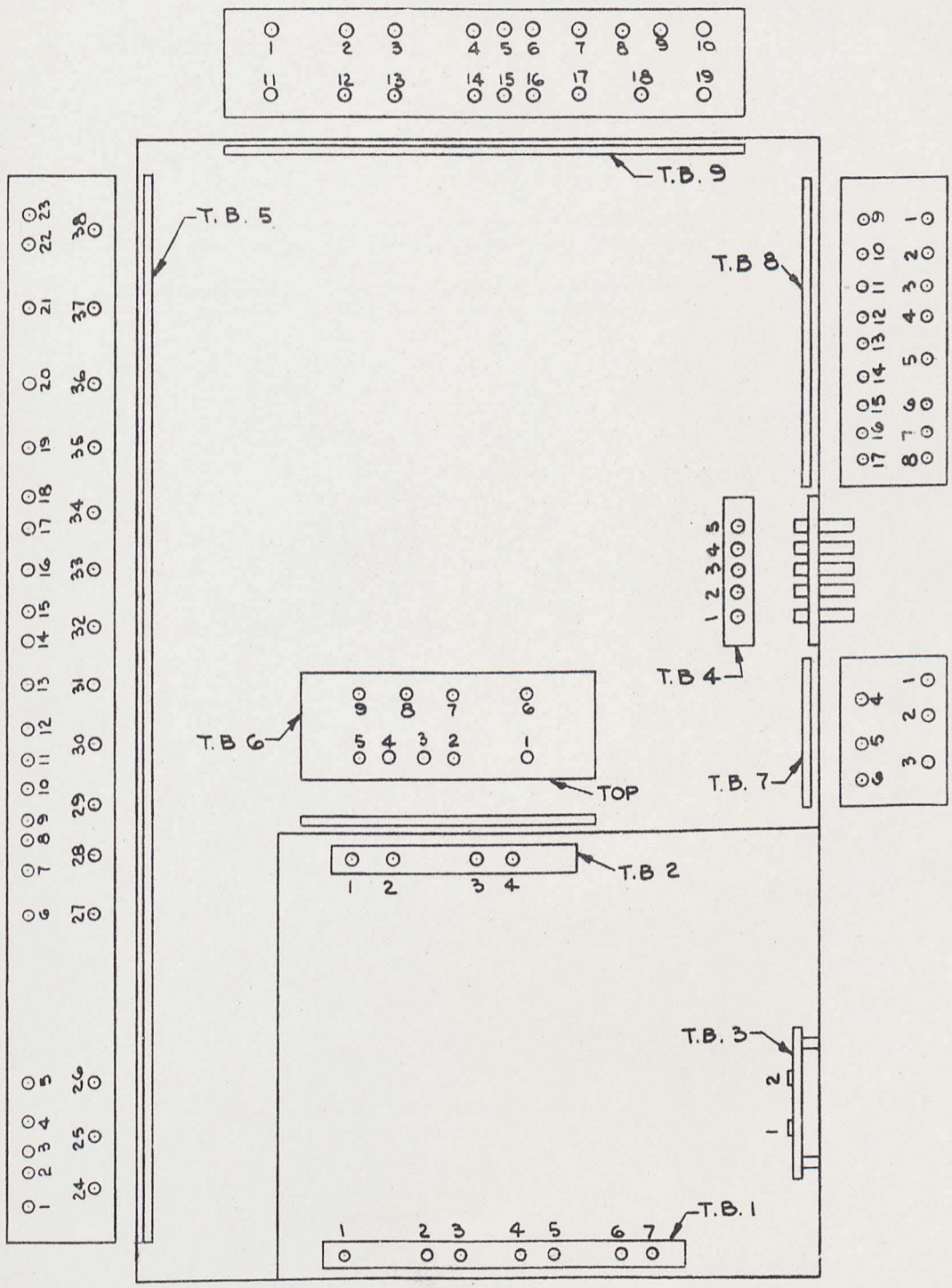
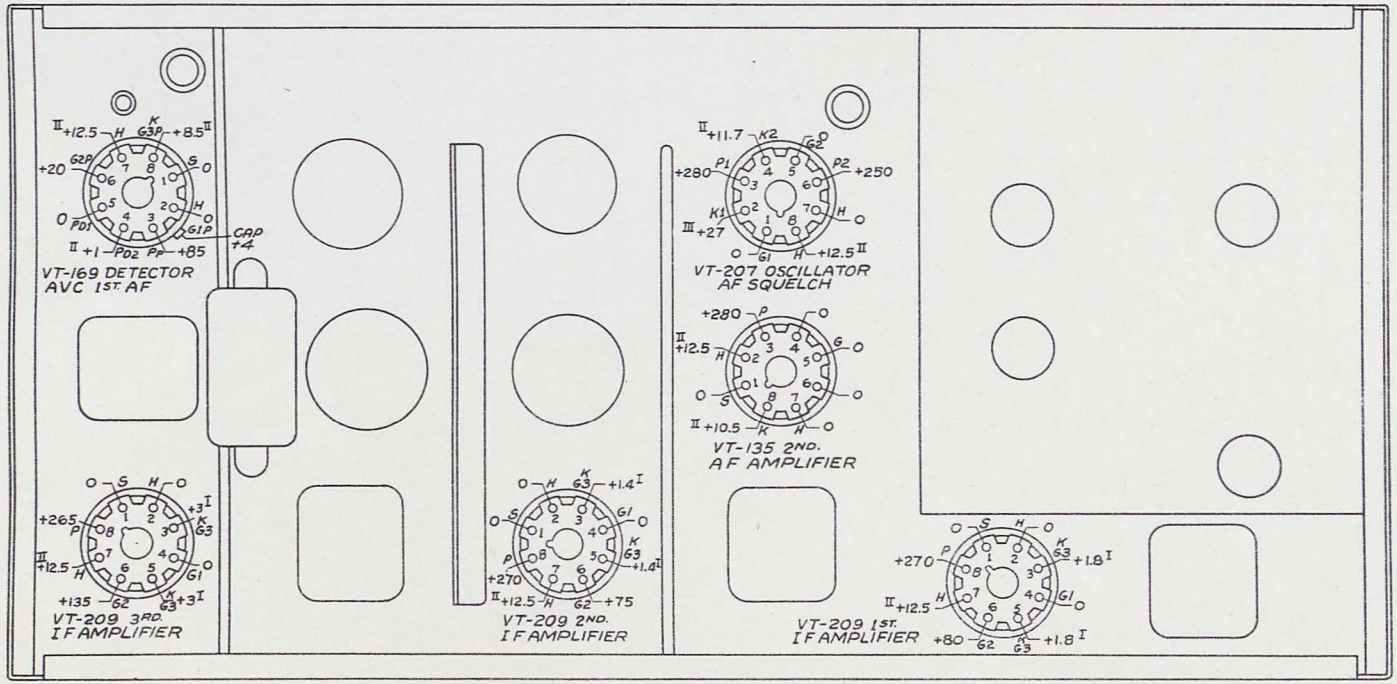


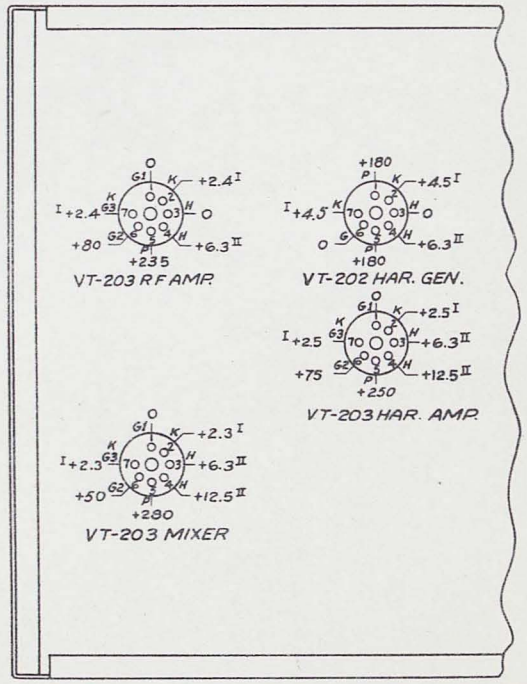
FIG. 5 - RADIO RECEIVER BC-624-A, FRONT VIEW, TERMINAL BOARD LOCATIONS

FIG. 6 - RADIO RECEIVER BC-624-A, TUBE SOCKET VOLTAGE DIAGRAM



BOTTOM VIEW OF RECEIVER CHASSIS

NOTE:
I = 5 VOLT SCALE.
II = 25 VOLT SCALE.
III = 250 VOLT SCALE.



BOTTOM VIEW OF HIGH FREQUENCY TUBE SOCKETS

4. Check socket voltages with 28.5 V. input to Dynamotor Unit PE-94-A and compare them with the values shown on Figure 6. Use a 1000 ohm-per-volt voltmeter, preferably one similar to the Model 665, Type 2 instrument furnished with a U.S. Signal Corps Test Set I-56-A. Use the 500 volt scale except as indicated otherwise by the note on Figure 6. If the scales on the meter being used are different from those given in this note, use scales most nearly approximating those shown. Variations in readings of more than plus or minus 15% from the values shown on Figure 6 should be considered as reason for further examination of components associated with the particular circuit in question.

V. RACK FT-244-A

A. *General*

Before attempting to make repairs to or adjustments of the ratchet motor or the frequency changing mechanism in Rack FT-244-A, service and maintenance personnel should first thoroughly familiarize themselves with the contents of paragraphs B. and C. below. If the trouble is purely of an electrical nature, refer to paragraph E. and make continuity measurements of the circuits in question. Reference to paragraph II may be helpful in determining the general nature of the trouble.

B. *Reassembly and Adjustment of Ratchet Motor*

In the event a motor has been disassembled for repairs or adjustments, the following should serve as a guide in reassembly and adjustment. Refer to Figure 7.

In all cases where the assembly of screws or nuts does not involve the use of lockwashers, the threads should be cemented with purple glyptal. Avoid excess glyptal.

The armature hinge and the associated adjustment screw should be assembled but not tightened securely. The solenoid assembly should be located and securely tightened with the dimension from the center of the open end to the hinge .765.

The upper core can be dropped into the open end of the solenoid and the armature then worked in place. This will require that the armature be started in slightly sideways in order to clear the armature stop screw. Make sure that the stop screw and locknut are in place before this operation is started. At the same time the armature is being assembled in place, the threaded stud of the upper core should be guided into the hole in the center of the armature. The locknut should be placed on the stud and tightened securely after threads have been glyptaled. The slot in the stud will allow it to be held while the nut is tightened. The armature springs should be assembled and the screws given a temporary tightening.

The hinge should be adjusted now to allow the cores to rest squarely together in the energized position. This can be gauged sufficiently by adjusting the height of the hinge until the armature is parallel with the edges of the sides of the motor frame. The armature hinge and adjusting screws should be secured permanently at this time.

The armature stop screw should be adjusted to provide .058 to .060 movement of the armature as gauged at this point with a thickness gauge. Secure nut tightly after application of glyptal to threads of screw.

Adjust armature spring tensions to provide a load of 6-3/4 pounds measured in line with the pawl spring. This tension should be measured with a push spring scale pressed against the pawl spring perch on the armature. The tension read should be that required to just start the armature moving.

In the absence of a push scale the adjustment can be approximated by setting the spring tensions to just allow the armature to pull in with 1.1 ampere D.C. passed through the solenoid coil. The spring load should be divided approximately evenly between the two springs.

The pawl stop block and ratchet wheel positioning spring assembly should be assembled in place at this time but not tightened.

Next, the ratchet wheel and arm assembly should be assembled with the shaft properly lubricated with Pioneer Instrument oil #1 or Mobil Fluid HFW.

The positioning spring assembly should be permanently set to engage the fourth or fifth tooth behind the pawl and bear against it with approximately two to four ounces pressure. To insure most satisfactory operation the lengthwise adjustment should be such that the overtravel of the pawl and the end play at the positioning spring are approximately equal.

The pawl stop block should be set up to within a few thousandths of the back of the pawl in the unenergized position. In fact, this setting should be about as close as the eccentricity of the ratchet wheel will allow. This may be judged by stepping the wheel around and determining that at no point is the back movement of the armature limited by the pawl stop block instead of the stop screw. This stop block is primarily to limit overshooting. With the armature in the unenergized position, it should not be possible to rotate the ratchet wheel and arm assembly more than a quarter of a tooth.

The interrupter switch assembly should be mounted and the screws tightened securely after the assembly has been aligned with the interrupter adjusting screw. This screw should be set to cause the interrupter contacts to open approximately .006 with the armature in the fully energized position. The exact adjustment of these contacts can be made only with the motor operating under a normal load and is reserved until the final check in the rack. The contact spring tension measured at the contacts should be from 3 to 6 ounces.

At this time, the running of the motor may be given a check. Connect a two microfarad capacitor across the solenoid coil and connect the interrupter contacts in series with the coil and 12 volts from a storage battery. The motor should operate smoothly if the adjustments are correct. The adjustment of the interrupter contacts will be found to have the most noticeable effect on running. These should be set to give best performance at this time.

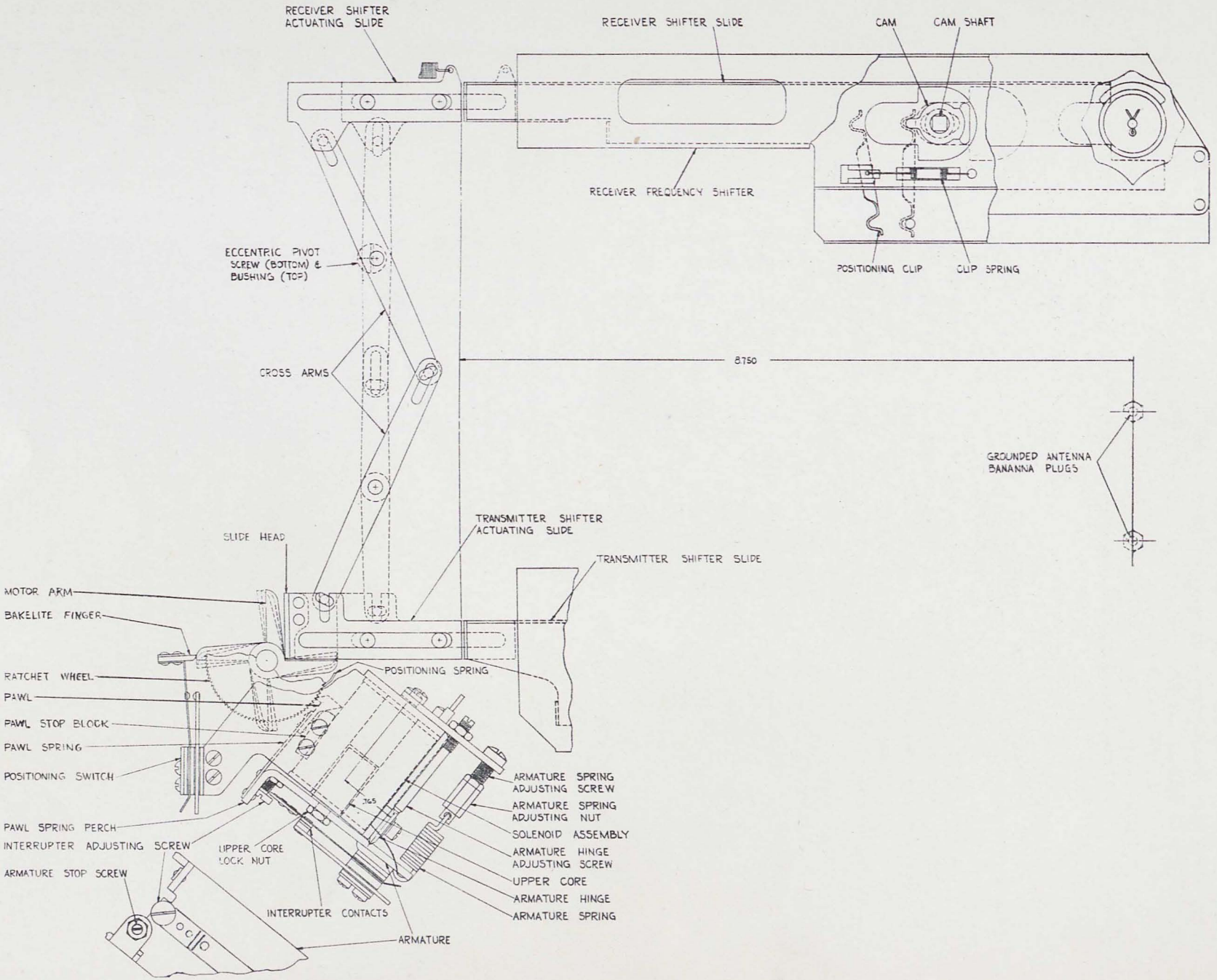


FIG. 7 - RACK MECHANISM AND RATCHET MOTOR

The positioning switch assembly can now be installed and adjusted. Mark a reference line at the radial face of the tooth parallel to the straight side of the upper motor arm (which falls between marks A and B on the side of the ratchet wheel). Count off ten additional faces in a clockwise direction and make a second reference mark at the tenth face. Step ratchet wheel around until straight side of pawl tooth aligns with second mark.

Adjust the positioning switch assembly to allow a clearance of approximately .010 to .015 between the bakelite fingers and the arms as they are cleared.

Step the ratchet wheel assembly around 22 teeth and adjust the lateral positioning of the switch assembly to allow a bakelite finger to just rest against the next motor arm to be engaged. One step further should open this switch and it should remain open for one additional step. One step beyond this should again close this switch and the clearance between it and the bakelite finger should not exceed .015.

If the motor arms are spaced exactly 90 degrees and the ends of the bakelite fingers properly aligned, all four motor arms should open the positioning switches for two positions only and should clear the fingers of the switches by not more than .015 when again released. This can be best determined only by trial and any necessary adjustments governed accordingly.

C. *Assembly and Adjustment of Ratchet Motor in Rack FT-244-A*

The motor should be installed in the rack with the mounting screws sufficiently loose to allow proper positioning.

With later production rack assemblies, the large clearance hole for the ratchet gear shaft has been omitted and in its place is a hole just large enough to receive the projection of the gear shaft. The location of this hole is placed accurately with respect to the transmitter mounting holes in the rack.

This automatically maintains the ratchet gear center in a position to provide 21/32 movement of the frequency shifter slides. The only adjustment required is to pivot the motor about this point until a slide operated by a motor arm is just released and that the clearance between the slide head and motor arm at the time of release is just sufficient to allow release when the slide is cocked sideways to cause this clearance to be at a minimum. Refer to Figure 7.

A .002 or .003 gauge may be used to check this clearance between the closest pair of arms and slides. However, it should be even more convenient to determine that the closest combination of arms and slides just clear when the slide is cocked sideways and secure the mounting screws with the motor in that position. There should be no further positioning required.

On earlier production rack assemblies which had the large clearance holes for the gear shaft, the positioning of the motor is more involved and must satisfy the following fundamental requirements:

1. With a motor arm maintaining a positioning switch in its first open position, the opposite motor arm should maintain its associated slide in the position of maximum travel. The positioning of the motor must be such that the end of the slide which engages the transmitter frequency shifter unit is 8.750 from a line passing through the transmitter and receiver grounded antenna banana plugs.

2. With any motor arm maintaining a positioning switch in its second open position, the opposite motor arm must have just released the slide held in the first open position. It should clear the side of the slide head by from .005 to .015, preferably by as small an amount as will still allow unfailing release of the slides in the four desired positions. Due to possible tolerance variations, it is necessary that the motor arm assembly be rotated and all four positions checked to ascertain which arm comes closest to not clearing its associated slide head. With the opposite end of this slide cocked sideways to cause the slide head to be nearest the motor arm, the clearance should be just sufficient to allow release. If desired, this may be gauged with .002 or .003 shim stock.

3. The positioning of the motor should be such that a radius line from the ratchet wheel assembly shaft center, passing through the radial face of an arm, will be parallel to a slide in the released position.

Naturally, these three conditions must be met simultaneously and the description of the required adjustments sound quite involved. However, if necessary, satisfactory assembly and adjustments can be made entirely without use of gauges or fixtures.

The adjustments for arm clearance and circular positioning required to satisfy conditions 2. and 3. can quite easily be determined by visual inspection and manual operational check. Without a special fixture to satisfy condition 1., it is not difficult to establish the proper position by trial.

To do this, actuate the motor armature until a slide has just been released. This will assure that all the slides are released. Place the rack assembly on a transmitter unit and check the clearance between the actuating slides and the slides of the shifter unit. This should be approximately 1/32 inch. The more desired check is to determine that a shifter slide is moved in for a distance of 21/32 inch when the motor is operated to a point where a positioning switch first opens.

After the positioning of the motor is correct, it is desirable that the operation of the slides on the receiver side of the rack be checked. The shifter actuating ends of these slides should measure 8.750 from a line running through the transmitter and receiver grounded antenna banana plugs. If adjustment is required, it can be effected by the eccentric screw which pivots the crossarms on the receiver side of the rack.

The adjustment of these slides can easily be checked with the receiver placed in the rack. The clearance between the actuating slides and the shifter slides should be approximately 1/32 inch in the released position. Here again it is more direct to ascertain that the shifter slides are operated a distance of 21/32 inch when positioned by the motor.

The lubrication of the rack assembly should be checked as follows:

> Beacon M285 grease on the pin and slot bearing surfaces at each end of the cross arms, on the heads of the transmitter shifter actuating slides operated by the motor arms and on the ratchet wheel gear teeth.
>
> Pioneer Instrument oil #1 or Mobil Fluid HFW on the pivot bearings of the cross arms, and the large slots and associated bushings for the transmitter and receiver shifter actuating slides.

This lubrication should be generous rather than slight, especially at points requiring grease.

A final adjustment of the motor interrupter contacts should be made with the transmitter and receiver mounted on the rack and operated from a regular power supply or a 12 volt storage battery. It will be noted that the motor will operate satisfactorily while the heavy interrupter contact spring is flexed in and out over a certain range. It is desirable that this heavy contact spring be set outward at a point just inside that which causes a noticeable change in motor performance. With this adjustment it will be noted that the spring can be flexed inward a greater amount than outward before erratic performance results. This adjustment provides a more nearly optimum setting for extremely low temperatures. The speed of the motor under normal load at room temperature should be at least 30 R.P.M. at 12 volts.

D. *Rack Mechanism Maintenance*

1. Inspect for free operation of all linkage parts. Note if any joints show lack of lubrication (evidenced by brass chips).

2. Relubricate all parts as follows:

> Beacon M285 lubricant on both ends of the cross arms, or on the heads of the actuating slides which engage the arms of the ratchet motor, and the teeth of the ratchet wheel. Pioneer Instrument oil #1 or Mobil Fluid HFW should be used on the long slots of the shifter actuating slides and on the center pivot bearings of the cross arms.

3. Cleaning of the motor interrupter contacts need not be attempted unless the build up of silver on the tungsten contact is excessive. A small deposit of silver on the tungsten contact is harmful only if the relative lateral positioning of the contacts is disturbed by disassembly or other cause. The cleaning operation, when necessary, should be confined to the removal of all silver which may be deposited on the tungsten. This should be done by using an extremely thin single faced contact file. A regular magneto point file which has one side ground off leaving the thickness approximately .010 to .015 should be satisfactory. After filing, the tungsten contact may be further

cleaned by dressing with fine sandpaper. The roughness of the surface of the silver contact is of no consequence because it is made up of cavities rather than protrusions.

4. The rack frequency shifting mechanism parts should require no attention other than occasional lubrication. However, if for any reason it has been necessary to disassemble these parts there is but one adjustment required upon assembly, that of the eccentric screw and bushing pivoting the upper cross arm group.

In resetting these eccentrics, the arrow on the head of the screw and on the bushing should be always kept pointing in the same direction and the pair adjusted to operate the shifter slides a distance of 21/32 inch. The gap between the receiver shifter actuating slides and the receiver shifter slides will be approximately 1/32 inch in the released position.

E. *Continuity Test Data*

In addition to the tests shown below, all connections other than "ground" wires shown, should indicate infinite resistance to "ground" or frame of rack. All Jones plug connections should indicate infinite resistance to any adjacent connections on the same plug.

In all cases, the terminology "inside" and "outside" refers to the center of the rack or the outer edges of the rack relative to the connections made to any part of the particular component under test.

The contact springs on Relay 412 have been numbered (in the following test data) from the outside contact toward the relay coil. Since eight springs are used, #8 is, therefore, the spring adjacent to the coil.

	FROM	*TO*	*RESISTANCE*
1	Pin 1 Connector 417	Ground	0
2	Pin 2 Connector 417	Pin 4 - Connector 420	0
3	Pin 2 Connector 417	Pin 2 - Jones Plug 418-2	0
4	Pin 2 Connector 417	Pin 8 - Jones Plug 419	0
5	Pin 2 Connector 417	Inside Connection Relay Coil 412	0
6	Pin 2 Connector 417	Outside Connection Relay Coil 411-1	0
7	Pin 2 Connector 417	Breaker Point on Ratchet Motor	0
8	Pin 2 Connector 417	Connection Outside Corner Switch 426	0
9	Pin 3 Connector 417	Pin 4 - Jones Plug 419	0
10	Pin 4 Connector 417	Moving Arm, Section A of Switch 427	0
11	Pin 5 Connector 417	Moving Arm, Section B of Switch 427	0
12	Pin 6 Connector 417	Pin #1 - Jones Plug 418-1	0
13	Pin 7 Connector 417	Pin 2 - Jones Plug 418-1	0
14	Pin 8 Connector 417	Moving Arm, Section C of Switch 427	0
15	Pin 9 Connector 417	Pin 5 - Jones Plug 418-1	0
16	Pin 9 Connector 417	Moving Arm, Section D of Switch 427	0
17	Pin 10 Connector 417	Pin 12 - Jones Plug 419	0
18	Pin 11 Connector 417	Pin 10 - Jones Plug 419	0
19	Pin 12 Connector 417	Pin 6 - Jones Plug 418-1	0
20	Pin 13 Connector 417	Pin 5 - Connector 420	0
21	Pin 14 Connector 417	Pin 6 - Connector 420	0
22	Pin 15 Connector 417	Pin 7 - Jones Plug 418-2	0

	FROM	TO	RESISTANCE
23	Pin 16 Connector 417	Pin 4 - Jones Plug 418-1	0
24	Pin 17 Connector 417	Outside Connection Relay Coil 412	0
25	Pin 17 Connector 417	Armature Contact Relay 411-1	0
26	Pin 18 Connector 417	Pin 3 - Jones Plug 418-1	0
27	Pin 2 Connector 420	Pin 10 - Connector 420	0
28	Pin 2 Connector 420	Connection Condenser 402	0
29	Pin 2 Connector 420	Pin 3 - Jones Plug 418-2	0
30	Pin 2 Connector 420	Armature 7 - Relay 412	0
31	Pin 2 Connector 420	Pin 5 - Jones Plug 419	0
32	Pin 1 Connector 420	Pin #1 - Jones Plug 418-2	0
33	Pin 3 Connector 420	Ground	0
34	Pin 7 Connector 420	Ground	0
35	Pin 12 Connector 420	Ground	0
36	Pin 8 Connector 420	Pin 6 - Jones Plug 419	0
37	Pin 4 Jones Plug 418-2	Connection Lower Inside #8 Relay 412	0
38	Pin 4 Jones Plug 418-2	Connection #7 Relay 412 Closed	∞
39	Pin 5 Jones Plug 418-2	Pin 9 - Jones Plug 419	0
40	Pin 6 Jones Plug 418-2	Pin 11 - Jones Plug 419	0
41	Pin 8 Jones Plug 418-2	Ground	0
42	Pin 3 Jones Plug 419	Connection Lower Inside #6 Relay 412	0
43	Pin 7 Jones Plug 419	Ground	0
44	Receiver Antenna Jack Terminal #1	Ground	0
45	Receiver Antenna Jack Terminal #2	Armature closed. Connection #1 Relay 412	0
46	Transmitter Antenna Jack Terminal #1	Ground	0
47	Transmitter Antenna Jack Terminal #2	Armature closed. Connection #3 Relay 412	0
48	Center Connector 416	Moving Contact 2 - Relay 412	0
49	Stator Contact 1,4,5 - Relay 412	Ground	0
50	Terminal 17 - Amphenol Plug 417	Terminal 2 - Amphenol Plug 417	200
51	Top Coil Contact Switch 417	Terminal Bottom on 406	0
52	Armature Contact on 406	Outside Contact - Switch 426	0
53	Armature Contact on 406	Outside Contact - Condenser 401	0
54	Top Coil Contact Switch 427	Outside Condenser 401	0
55	Inside Coil Contact 411-1	Bottom Outside Relay 411-2	0
56	Inside Connection Condenser 401	Upper Inside Switch 426	0
57	Bottom Coil Contact Switch 427	Inside Connection 401	0
58	Bottom Coil Contact Switch 427	Inside Upper Contact Relay 411-2	0
59	Armature Relay 411-2	Ground	0
60	Upper Outside Contact Relay 411-2	Lower Outside Contact 426	0
61	Bottom Outside 411-1	Lower Outside Contact 426	0
62	Upper Outside Relay 411-2	Top Coil 427	0

VI. DYNAMOTOR UNIT PE-94-A

A. *General Description*

The dynamotor unit is designed to provide power for the low voltage, bias, and high voltage of the transmitter, receiver, and control circuits, and includes a carbon pile type voltage regulator (314) which maintains the output voltages within quite close limits at any battery input voltage over the range of 21.8 to 29 volts.

1. Dynamotor (307)

The dynamotor has three generator commutators supplying 300 volts at 0.26 ampere (H.V.), -150 volts at 0.01 ampere (M.V.), and 14.5 volts at 4.9 amperes (L.V.) and one motor commutator making a total of four commutators. There are three fields operating from the battery voltage. A long shunt field and series field, which insures sufficient starting torque at low temperatures, are both assembled on the same pair of poles and act on all four armature windings. A second pair of poles is provided on which is wound the regulator field coils. This regulator field acts only on the motor winding and is so constructed that its flux induces a voltage in the motor winding that is in direct opposition to the counter e.m.f.

2. Regulator

The carbon pile regulator consists essentially of a stack of thin carbon washers (the carbon pile), a spring assembly which compresses the carbon pile and a coil and magnetic circuit which is energized by the L.V. output winding of the dynamotor and pulls on the spring assembly.

The spring assembly contains a six finger, three leaf spring. Attached to one side of this spring is the lower contact of the carbon pile and to the other side is a disc of steel which is a part of the magnetic circuit. The fingers of the spring rest upon a bi-metal washer which provides compensation for changes in temperature due to the fact that it distorts with changes in ambient temperature. A ceramic tube extending vertically from the spring assembly into the top casting contains the carbon pile. A screw on top above the pile adjusts the initial pile pressure, and the larger screw on the bottom adjusts the air gap of the magnetic circuit. Under ordinary circumstances, these adjustments should not be touched. However, if it is determined that adjustment is necessary it should be done carefully in accordance with the instructions given below.

The regulator field is connected across the battery voltage through the carbon pile. A resistor in series with the 14.5 volt commutator drops the voltage to the desired 13 volts. The regulator coil in series with an adjustable resistor is connected across the 13 volt output. This adjustable resistor is set for a L.V. output of 13 volts. At this setting, the current through the coil is nominally one ampere which reduces the available L.V. output current of the PE-94-A to 3.9 amperes.

The unit is started by shorting the two terminals marked "+SW" and "-SW". The coil of the control relay is energized and the battery voltage is applied to the motor commutator of the dynamotor.

3. Regulator Operation

The operation of the regulator depends upon the well known fact that the electrical resistance of carbon decreases with an increase of applied pressure. When the regulator coil is not energized, the spring applies maximum pressure to the carbon pile. Energizing the coil pulls the spring downward, thereby relieving pressure on the pile and increasing its resistance.

For the purpose of explaining the operation of the regulator, it will be assumed to begin with that for some reason the battery voltage to the dynamotor unit decreases. Under this condition, the dynamotor will momentarily tend to slow down and the L.V. output will tend to decrease causing a decrease in the current through the regulator coil. The resulting decrease in pull on the spring assembly increases the pressure on the carbon pile and, consequently, increases the current through the regulator field. The increase in regulator field current acts, as previously explained, to reduce the counter e.m.f. A reduction in counter e.m.f. tends to cause increased dynamotor input current resulting in an increase of speed and, consequently, an increase in the output voltages. An *increase* in battery voltage causes a sequence of operations in the opposite direction which results in a *decrease* in dynamotor speed. Therefore, the output voltages tend to remain very nearly constant for large variations of battery voltage.

B. *Adjustment of Output Voltages*

Should it be found that the output voltages are unreasonably high or low, or should a new Voltage Regulator (314) be installed in the dynamotor unit, the following procedure for setting the output voltages should be used.

Remove the 18 screws which secure the cover of the Dynamotor Unit PE-94-A (or PE-94-T2). Each end has 5 screws and 4 are located along the top of the front and rear of the unit. Lift off the cover.

Connect the dynamotor unit to the rest of a SCR-522-A equipment and a 30 volt bank of storage batteries. Turn the equipment on by pressing any one of the four channel selector buttons located on Radio Control Box BC-602-A. Place the "T-R-REM" switch in the "R" position. Be careful of the dynamotor fan!

After allowing the equipment to warm up for several minutes, measure the L.V. output by connecting an accurate voltmeter between the chassis and the terminal marked "L.V." located on top of the output filter box. With the battery cable tapped across enough battery cells to give a dynamotor input voltage as measured at the terminals of the input filter of 26 to 28 volts, the L.V. should measure between 13.0 and 13.2 volts. If the reading does not fall within this range, adjust the tap on the regulator coil series resistor (316) until it does. Be sure to tighten the screw on the tap sufficiently to prevent movement in service.

C. *Adjustment of the Carbon Pile Voltage Regulator*

There are three adjustments associated with the carbon pile type voltage regulator - a variable resistor in series with the regulator coil adjusts the coil current; a screw on top of the regulator unit under the cover varies the

initial compression of the carbon pile; and a large screw on the bottom of the assembly adjusts the length of the air gap.

Two items are to be considered in the adjustment of a regulator - regulation and stability. Any adjustment is necessarily a compromise considering both these factors.

When the dynamotor unit is operated from a source of power that has very poor regulation or from a power source with good regulation but connected by unusually long or high resistance leads, there is a tendency for the regulator-dynamotor combination to become unstable; that is, the speed of the dynamotor might begin to fluctuate.

To test the dynamotor unit, it should be connected to and operated with a SCR-522-A equipment as was described for adjustment of output voltages, except that a resistance should be connected in series with the leads from the dynamotor unit to the battery to simulate the resistance of aircraft wiring. This should be a resistance of 0.15 ohm divided in any convenient manner between the two leads. If a suitable resistor is not available 150 feet of #10 wire, for example, could be used.

To test for regulation, the input voltage, as measured at the terminals of the input filter can, should be varied over the range of approximately 21.8 to 29 volts by tapping the dynamotor unit input leads across portions of the battery. The L.V. output should remain within the limits of 12.61 to 13.52 volts.

To insure that the unit will be stable in actual operation, start it several times using 15 cells of the storage battery. Repeat using 14, 13, and 12 cells. In each case it should start without making more than two complete cycles of speed fluctuation.

If the unit exhibits tendencies of instability, it is very likely only necessary to adjust the compression screw on top of the regulator under the cover. First, loosen the three captive screws on top of the regulator and remove the cover. Loosen the small flat head screw which clamps the adjustment screw. Turning the compression adjustment screw in a clockwise direction increases the stability but decreases its ability to regulate. A counter-clockwise adjustment decreases the stability but increases its ability to regulate. This screw should be adjusted in increments of not more than 10 degrees until the performance of the unit satisfies the requirements of both stability and regulation. After each adjustment and before the unit is tested, the locking screw should be tightened.

If the regulator does not tend to work, the following procedure should be used:

1. Remove the +L.V. brush from the holder on the dynamotor and the 6 contact plug from the output filter socket. Connect an ohmmeter between the chassis and L.V. terminal on the output plug. Adjust the tap on the regulator coil series resistor (316) until the ohmmeter indicates 13.1 ohms. Insert the 6 contact plug and +L.V. brush. Replace the ohmmeter with an accurate voltmeter capable of reading up to 15 volts D.C. Connect a D.C. voltmeter across the input leads at the input filter terminals.

2. Turn the equipment on and check the L.V. output with an input voltage of 26 to 28 volts. If the meter does not read between 13.0 and 13.2 volts, an adjustment of the air gap is necessary. This adjustment is accessible through the hole in the bottom of the dynamotor unit chassis. Loosen the two small locking screws and turn the large screw until a minimum output voltage is obtained. Then, turn in a counterclockwise direction until the above voltage is obtained. If, when turning the air gap screw in a counterclockwise direction, the voltage jumps higher than 13 volts or sustained instability occurs, it will be necessary to turn the voltage regulator compression screw adjustment in a clockwise direction about 10 degrees and then repeat the air gap adjustment. Continue to adjust the compression screw and the air gap until the requirements of stability and regulation are satisfied.

If a satisfactory adjustment is not found when this procedure is followed carefully, it may be found advantageous to repeat the procedure using a lower resistance setting than described in step 1. The resistance, however, as indicated by the ohmmeter should not be set lower than 12 ohms.

D. *Noisy Dynamotors*

If a dynamotor unit be found objectionably noisy when substituted in an equipment for a dynamotor unit which gives a satisfactory noise level, the following suggestions may be helpful in determining the difficulty.

1. Inspect the springs on the brush holders to see that they are all in place and are not restricted in applying pressure to the brush.

2. Look for brushes which have been worn beyond usefulness.

3. With the unit operating with a Radio Set SCR-522-A, listen to the output in the headphones and apply slight additional pressure to each brush with an insulated rod or pencil. Should the additional pressure cause a marked decrease in the noise level, apply slightly additional pressure to the brush by properly bending the spring. Caution should be used so as not to increase the brush pressure too much so as to cause overheating of the commutator. Following this adjustment, the dynamotor unit should be operated for several hours and the commutator examined for evidence of throwing of solder or rainbow color effect of the segments, indicating an excessively high commutator temperature.

4. Examine the commutator for a dirty surface or material embedded between the segments. Do not confuse a dirty commutator with the normal dark chocolate brown color. Also, look for nicks or scratches on the segments. Clean commutator and polish with crocus cloth or very fine sandpaper (never emery cloth). Be very careful not to put ridges in the surface.

5. Inspect for restricted or sticking brushes. Remove the brushes and examine the inside surfaces of the holders and the brush for any foreign substance or high spot that might prevent the free movement of the brush in its holder.

6. Look for loose connections.

E. *Loss of Output Voltage*

Should one of the output voltages fail, look for the following causes:

1. Inspect the springs on the brush holders to see that they are all in place and are not restricted in applying pressure to the brush.

2. Look for worn out brushes and broken brush pig tails.

3. Inspect the inside surfaces of the brush holder and the brush for any foreign substance that might prevent the free movement of the brush in its holder.

If the source of trouble cannot be located after following the suggestions outlined above, the dynamotor unit should be sent to a repair depot.

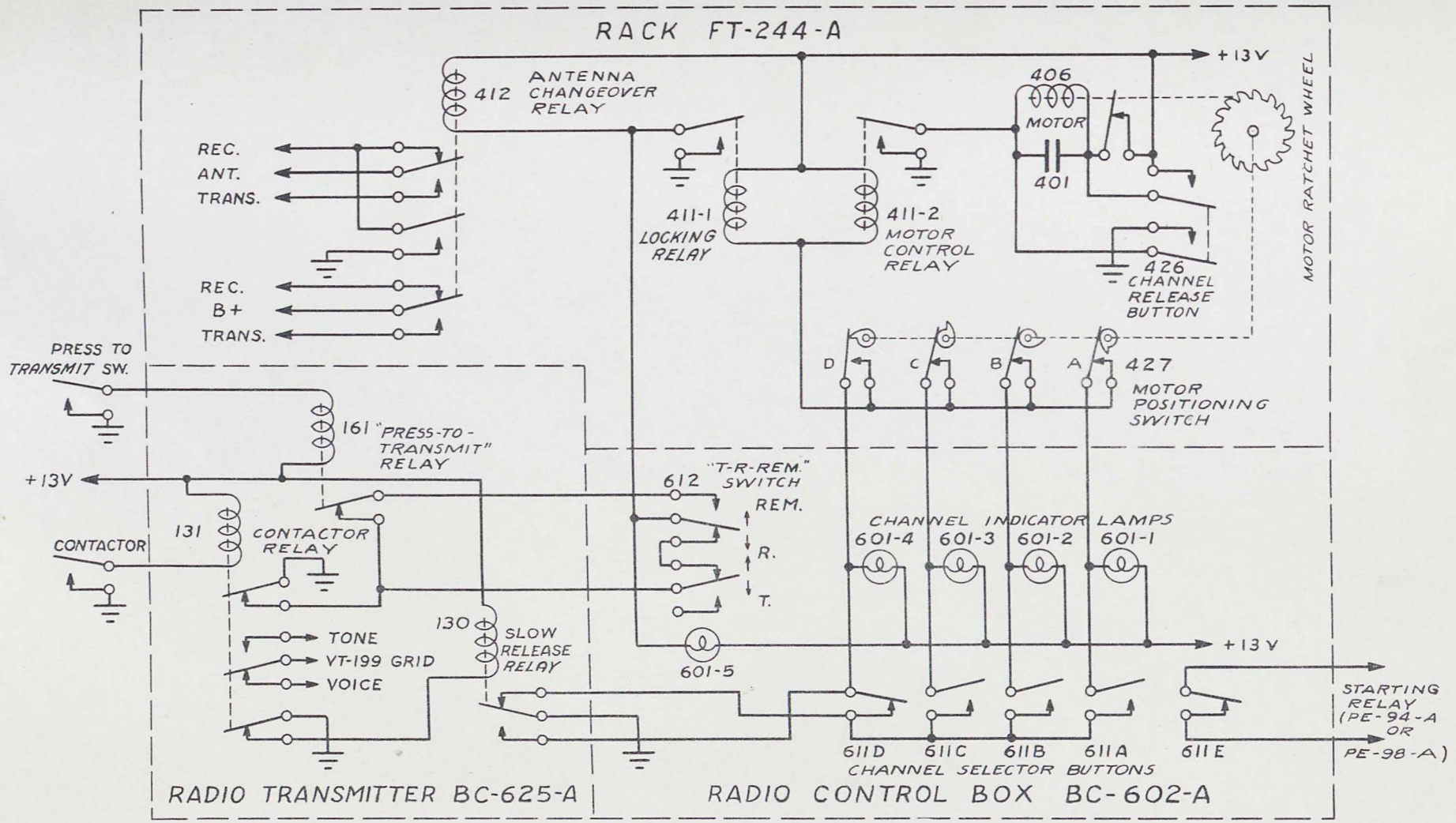
VII. RADIO CONTROL BOX BC-602-A

A. *General*

All electrical connections to Radio Control Box BC-602-A are made through the 12 contact plug socket 606 and the 5 contact plug socket 607 (used only when a motor driven, variable length antenna is employed).

With the "Off" button depressed, Contacts 611E are open and the dynamotor starting relay coil is de-energized. Depression of "A", "B", "C" or "D" channel buttons mechanically releases the "Off" button and the Contacts 611E close, starting the dynamotor unit, thus supplying power to the entire equipment. Assuming channel "A" button has been pressed, closing Contacts 611A, the channel shifter motor is energized by the closing of one pair of contacts and operates until channel "A" has been selected, at which time the Motor Positioning Switch (427A) opens and voltage is removed from the motor. However, since the Contacts 611A remain closed, voltage is supplied to Indicator Lamp 601-1 which will remain lighted until another channel button is pressed or the equipment turned off. The other pair of contacts on 611A energizes the variable length antenna motor if one is connected to the control box through plug socket 607. The remaining channel switch buttons function in exactly the same manner. Refer to Figure 8.

With the "T-R-REM" Switch 612 in the "R" position, voltage is supplied to the antenna relay coil in Rack FT-244-A operating it to the proper position for reception. Indicator Lamp 601-5 is also lighted. In the "T" position, the opening of one pair of contacts breaks the circuit to the antenna relay coil and its armature drops away, switching the equipment over to "transmit". Simultaneously, voltage is removed from Lamp 601-5. When placed in the "REM" position, Switch 612 relinquishes control of the antenna relay to a "throttle control button" which, when pressed, energizes the coil of the "press-to-talk" relay in the Transmitter Unit BC-625-A. Operation of the "press-to-talk" relay opens a pair of contacts which break the circuit to the antenna relay coil causing it to transfer the antenna and high voltage supply over to the Transmitter Unit BC-625-A. Voltage is also removed from Indicator Lamp 601-5. Releasing the "throttle control button" reverses the process, restoring the equipment to "receive" and lighting Lamp 601-5.



NOTE: EQUIPMENT SHOWN IN RECEIVE OPERATION ON BAND "D".

FIG. 8 - CONTROL CIRCUITS, SIMPLIFIED SCHEMATIC DIAGRAM

B. *Maintenance*

If the transmitter stays "On" although the "T-R-REM" switch is in either the "R" or "REM" position, the switch should be examined for dirty or bent contacts. Check for burnt out pilot lamps. See that Switch 611 contacts are not loose or intermittent in making contact. Check cams at back of this switch for a thin film of lubricant. Pioneer Instrument oil #1 or Mobil Fluid HFW should be used for relubrication. Check dimmer assembly for freedom of action. Examine wiring for evidences of fraying or wear.

VIII. MISCELLANEOUS

A. *Explanation of Control Circuits*

1. Frequency Changing Operation

Figure 8 shows the position of all relays and switches when the SCR-522-A equipment is operating normally as a receiver on channel "D". It is assumed that each channel of the transmitter and receiver units has been pretuned to one of the four desired frequencies. If channel "A" push button is pressed, Switch Contacts 611D are opened mechanically and Contacts 611A are closed, permitting a flow of current from the +13 volt supply through the coils of Relays 411-1 and 411-2, Motor Positioning Switch Contacts 427A, Push Button Switch Contacts 611A, and Relay 130 contacts to ground (-13 volts). Relays 411-1 and 411-2 immediately operate. The closing of contacts on 411-2 connects 13 volts across Ratchet Motor 406 causing it to rotate until Motor Positioning Switch 427A opens, at which time the transmitter and receiver channel "A" slides will be completely engaged. The opening of Contacts 427A breaks the circuit through Relays 411-1 and 411-2 stopping the motor instantly. Indicator Lamp 601-1 is lighted by current flow from +13 volt supply through Contacts 611A and Relay 130 contacts to ground. The operation of Relay 411-1 can be disregarded when the "T-R-REM" switch is in the "R" position, since Relay 412 is already energized by current flow from the +13 volt supply, through the "T-R-REM" switch contacts, and one pair of Contactor Relay 131 contacts to ground. However, if channel shifting had taken place while transmitting (Antenna Relay 412 de-energized), current would flow from the +13 volt supply through Relay 412 coil to ground through Relay 411-1, thus transferring the Antenna Relay 412 to the "receive" position until channel shifting was completed.

2. Transmit, Receive, and Remote Operation

When any channel push button except 611E is depressed, Contacts 611E close, energizing Dynamotor Starting Relay 321. Dynamotor Unit PE-94-A then furnishes the SCR-522-A equipment with all necessary operating voltages, namely, +13 V. D.C., -150 V. D.C., and +300 V. D.C. With the "T-R-REM" switch in the "R" position (center), Antenna Relay 412 is operated by the current from the +13 volt supply through its coil, contacts of the "T-R-REM" switch, and one pair of contacts on Relay 131 to ground. In its operated condition, Relay 412 connects the antenna to Radio Receiver BC-624-A and connects +300 volts to the R.F. circuits of the Receiver (see Figure 8). Indicator Lamp 601-5 is lighted by the current flow from +13 volts through the same combination of contacts to ground.

With the "T-R-REM" switch in the "T" position (left), the return circuit through its contacts to ground (through the contacts of Relay 131) is broken, cutting off Indicator Lamp 601-5 and de-energizing the coil of Antenna Relay 412. In this condition, the antenna is connected to the R.F. output terminal of Radio Transmitter BC-625-A, likewise +300 volts is transferred over to the plate circuits of the Oscillator Tube VT-198A and the 2nd Harmonic Amplifier VT-118 of the transmitter (see Figure 8).

Placing the "T-R-REM" switch in the "REM" position results in normal receiver operation (since the ground return for Relay 412 coil is then made through the contacts of Relays 161 and 131), unless the "press-to-transmit" switch (throttle switch) is pressed, resulting in operation of Relay 161. When Relay 161 contacts open, the ground return circuit for Antenna Relay 412 is broken and it returns to "transmit" position. Likewise, the ground return for Lamp 601-5 is broken and it goes out. Releasing the "press-to-transmit" switch restores the equipment to the "receive" condition.

3. Contactor Operation

Closing of the contactor switch contacts energizes the coil of Relay 131. Operation of this relay produces the following results:

a. The ground return for the Antenna Relay 412 coil is opened, thus putting the transmitter in operation (or *locking* it in "transmit", if already in that condition).

b. The grid of Speech Amplifier Tube VT-199 is transferred from the microphone input circuit to a source of audio feedback voltage from the modulator tubes, causing the transmitter to be 100% modulated by a steady tone of approximately 1200 cycles. Transmission of this tone occurs on whatever frequency channel was in operation at the time of closing the contactor switch.

c. The ground return for Relay 130 coil is opened with the result that, after a delay of something less than half a second (Relay 130 has a time delay drop-out characteristic), the ground return for Channel Control Switches 611A-B-C-D is opened and the ground transferred to Switch Contacts 611D. Figure 8 shows channel "D" already set up so in that case, of course, the channel shifting mechanism would not operate. However, if any other channel was set up prior to the closing of the contactor switch, the shifting mechanism would be energized, **Relay 411-1** would transfer Antenna Relay 412 to "Receive" operation (as explained in section 1), and these conditions would hold until channel "D" was engaged, at which time Relays 411-1 and 411-2 would be de-energized, stopping the ratchet motor and transferring Relay 412 back to "transmit". Continuous tone transmission on channel "D" frequency would continue until the contactor switch contacts were opened.

Since steps a. and b. above take place simultaneously and step c. lags by a fraction of a second, there will be a momentary burst of tone modulated carrier on whatever channel happens to be set up, before the process outlined in step c. causes the equipment to shift over to channel "D".

B. *Description of Microphone Mixing Circuit*

1. Pilot Microphone Circuit

Figure 9 shows a simplified schematic of all the microphone mixing circuits. An electro-magnetic microphone is connected to the primary winding of Transformer 158, the secondary of which is connected across Potentiometer 125. Audio voltage developed in the secondary of Transformer 158 appears across Potentiometer 125, and the amplitude of the voltage impressed on the grid of the Transmitter Speech Amplifier Tube VT-199 is regulated by the setting of the movable arm of the Potentiometer 125. The output of the speech amplifier is coupled to the modulator tubes of the transmitter.

Since Resistors 141-1, 141-2, 141-3 and 141-4 are of equal value, half the audio voltage developed across the secondary winding of Transformer 158 appears at the junction points of Resistors 141-1 to 141-4, and 141-2 to 141-3 with respect to the grounded end of the secondary winding. The voltages at these two points will, therefore, be equal and in phase. Likewise, the voltage at terminals No. 5 and 7 of Transformer 295 (Resistor 262-2 being connected to terminals No. 6 and 7 of this transformer) will be of the same amplitude and phase. Hence, half the audio voltage developed across the secondary winding of Transformer 158 is impressed on the grid of the Audio Amplifier Tube VT-169. The net results of the condition described above are modulation of the transmitter, and audible sidetone in headsets at pilot and crew stations with the transmitter carrier either on or off.

2. Crew Microphone Circuit

One or more electro-magnetic microphones are connected to the primary terminals No. 3 and 4 of Transformer 295. Approximately half of the audio frequency voltage induced in the secondary (terminals No. 5 and 6) of Transformer 295 by either of the two primaries will appear at the grid of the First Audio Amplifier VT-169 and the result will be an audible signal in the headphones. However, the voltage appearing at the junction point of Resistors 141-1 and 141-4 will be of equal amplitude but in phase opposition to that appearing at the junction point of Resistors 141-2 and 141-3. Since these four resistors are all of the same value, the two out of phase voltages will cancel each other and no voltage will appear across Potentiometer 125. This arrangement makes interphone communication possible at all times from the crew stations, but no modulation of the transmitter can result at any time. Voltage from the receiver detector impressed on primary terminals No. 1 and 2 of Transformer 295 produces exactly the same results.

3. General

Resistors 275-2 and 275-3 act as grid resistors for Tube VT-169, this method of connection being necessary to keep from unbalancing the bridge circuit. The midpoint of these resistors returns to the junction of Resistors 276 and 277. Proper audio bias voltage is developed across Resistor 277 and AVC delay voltage is developed across Resistors 276 and 277. Capacitors 211A and 212C serve as cathode bypasses for Vacuum Tube VT-169. To prevent D.C. grid voltage from returning to ground through the bridge circuit, thus upsetting the AVC delay circuit, Blocking Capacitors 102-14 and 102-15 are employed. Capacitor 214 is connected

to one side of the bridge circuit to balance out VT-169 grid input and wiring capacitance tending to unbalance the circuit. Resistor 262-2 is an audio level compensating resistor to maintain equilibrium between audio voltages impressed on the grid of VT-169 with equal voltage outputs from either crew or pilot microphones.

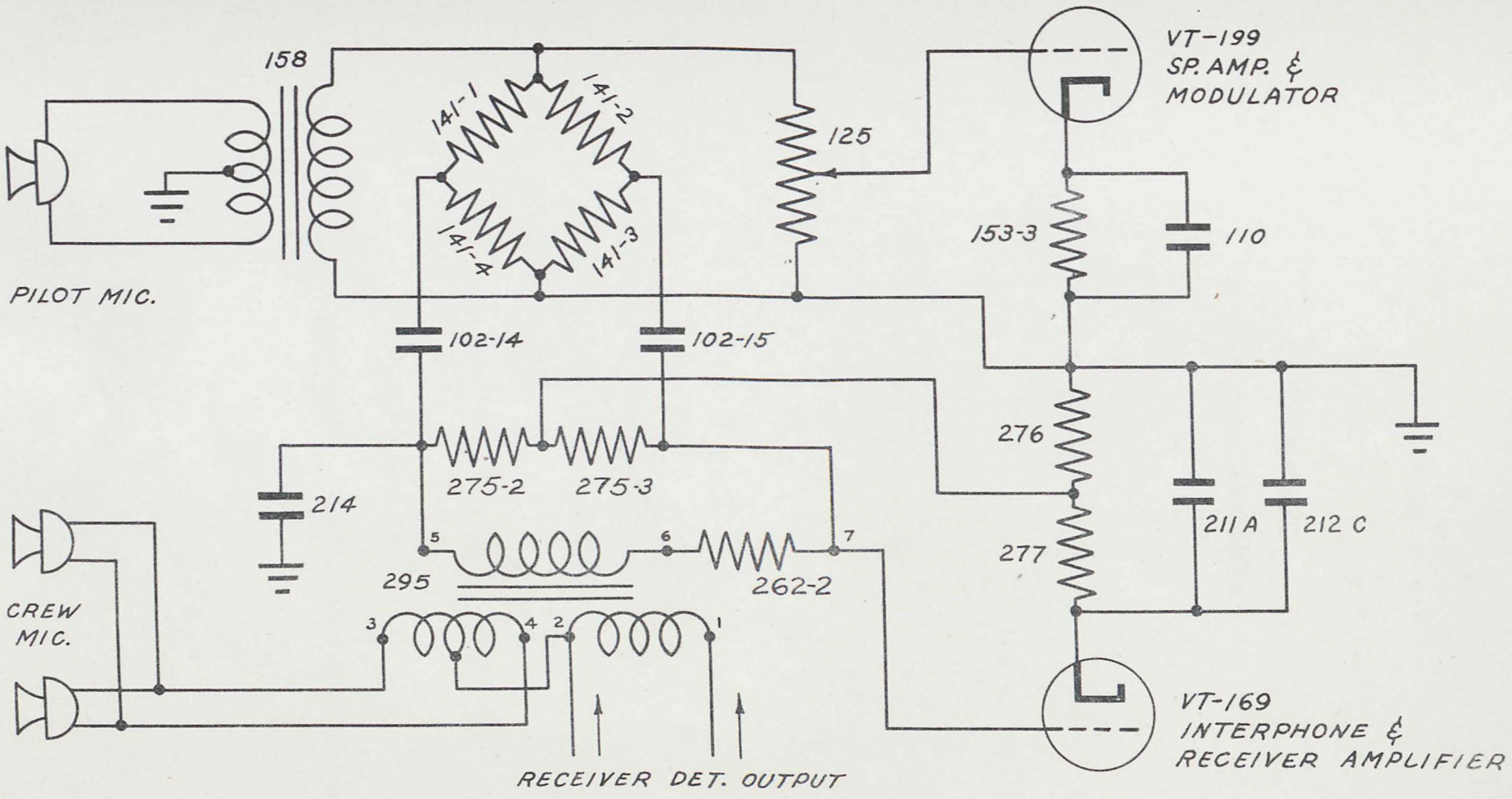


FIG. 9 - MICROPHONE MIXING CIRCUIT, TRANSMITTER-RECEIVER, SIMPLIFIED DIAGRAM

SUPPLEMENT

TABLE OF CONTENTS

ILLUSTRATION

SUPPLEMENT

1. TABLE OF REPLACEABLE PARTS

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
a. Radio Transmitter BC-625-A							
**100		Capacitor	15 mmf ±1 mmf, 500V DCW, ceramicon, Type NPOL	Balancing	Erie	A18182-17	
101		Capacitor	10 mmf ±0.5 mmf, 500V DCW, ceramicon, Type NPOK	Osc. Feedback	Erie	A18182-13	
*102-1		Capacitor	.006 mfd ±20%, 300V DCW, mica, Aero Type 1467, C. D. Type 1WL-3D6, mica Type W	Osc. Screen Coupling	Aero, Mica, C. D.	A102967-7	
*102-2			Same as 102-1	Osc. Plate Bypass			
*102-3			Same as 102-1	1st Harm. Amp. Grid Bypass			
*102-4			Same as 102-1	1st Harm. Amp. Filament Bypass			
*102-5			Same as 102-1	1st Harm. Amp. Screen Bypass			
*102-6			Same as 102-1	1st Harm. Amp. Cathode Bypass			
*102-7			Same as 102-1	1st Harm. Amp. Plate Bypass			
*102-8			Same as 102-1	2nd Harm. Grid Bypass			
*102-9			Same as 102-1	2nd Harm. Amp. Grid Bypass			
*102-10			Same as 102-1	2nd Harm. Amp. Filament Bypass			
*102-11			Same as 102-1	Meter Shunt Bypass			
*102-12			Same as 102-1	PA Grid Bypass			
*102-13			Same as 102-1	PA Grid Bypass			
*102-14			Same as 102-1	Bridge Blocking			
*102-15			Same as 102-1	Bridge Blocking			
103		Capacitor	50 mmf ±1%, 500V DCW, silver mica, Type MIJ	Osc. Cathode Bypass	Erie	A18253-1	
104		Capacitor	100 mmf ±5 mmf, 500V DCW, ceramicon, Type NPOD	1st Harm. Amp. Grid Coupling	Erie	A104485-1	
105-1		Capacitor	.001 mfd ±10%, 500V DCW, mica, C. D. Type 5WL, Aero Type 1468	PA Filament Bypass	C. D., Aero	C56315-102	
105-2			Same as 105-1	RF Indicator Bypass			
105-3			Same as 105-1	Speech Amp. Grid Bypass			
105-4			Same as 105-1	Meter Shunt Bypass			

* Any equivalent capacitor with a capacitance rating within the range .005 to .01 mfd is also suitable and may be used as an alternate part.
** Ref. No. 100 is not used in some transmitters.

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
106		Capacitor	.002 mfd ±5%, 800V DCW, mica, Type 1WPLS	PA Plate Bypass	C. D.	A18255-1	
107-1		Capacitor	0.1 mfd ±10%, 400V DCW, paper, Mica Type 345-21, Solar Type MPW-4147	Speech Amp. Screen Bypass	Mica, Solar	A18015-104	
108-2		Capacitor	.001 mfd ±5%, 500V DCW, mica, C. D. Type 1WL-5D1, Mica Type W, Aero Type 1467	Tone Feedback	Aero, Mica, C. D.	A102967-2	
109-1		Capacitor	20 mmf ±1 mmf, 500V DCW, ceramicon, Type NPOL	PA Grid Coupling	Erie	A18182-16	
109-2			Same as 109-1	PA Grid Coupling			
109-3			Same as 109-1	2nd Harm. Amp. Grid Coupling			
109-4			Same as 109-1	2nd Harm. Amp. Grid Coupling			
109-5			Same as 109-1	Mod. Grid Bypass			
110		Capacitor	1.0 mfd ±10%, 100V DCW, oil-paper	Speech Amp. Cathode Bypass	C. D., Aero	A104092-2	
*111		Capacitor	0.5 mfd ±10%, 400V DCW, oil-paper	Mod. Screen Bypass	C. D., Aero	A104092-1	
113		Capacitor	.0003 mfd ±5%, 500V DCW, mica, C. D. Type 1WL, Mica Type W, Aero Type 1467	Speech Amp. Plate Blocking	Aero, Mica, C. D.	A102967-3	
114		Capacitor	Stators in parallel, 11.0 ±1 mmf min, 65.5 ±1.5 mmf eff	Osc. Plate Tuning	G. Inst., Rad. Cond.	L72950	
115		Capacitor	Stators in series, 3.5 ±1 mmf min, 27.0 ±1 mmf eff	1st Harm. Amp. Pl. Tuning	G. Inst., Rad. Cond.	L72951	
116		Capacitor	Stators in series, 3.0 ±1 mmf min, 16.5 ±1 mmf eff	2nd Harm. Amp. Pl. Tuning	G. Inst., Rad. Cond.	L72949	
117		Capacitor	Stators in series, 2.8 ±1 mmf min, 11.0 ±1 mmf eff	PA Plate Tuning	G. Inst., Rad. Cond.	L72948	
118		Inductor	9½ turns #24 enamel wire, grooved form	Osc. Plate Tuning	Bendix	AC57998-1	
119		Inductor	15 turns #10 silver-plated SD copper wire, tapped at 8 turns, self-supporting	1st Harm. Amp. Plate Tuning	Bendix	AC57999-1	
120		Inductor	#10 silver-plated SD copper wire, distributed inductance line	2nd Harm. Amp. Pl. Tuning	Bendix	AC58149-1	
121		Inductor	2 turns—gap—2 turns, self-supporting, #10SD silver-plated copper wire	PA Plate Tuning	Bendix	AC58150-1	
122		Inductor	3 turns, self-supporting, #10 SP copper wire	Ant. Coupling	Bendix	AC58151-1	
123-1		Plug	8-contact male, Type P-408	Trans. Control CKT. Power Input	Jones	A102811	
123-2			Same as 123-1				

* Bendix Dwg. No. A104810 may be substituted for A104092-1 in Radio Transmitter BC-625-A only.

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
**125		Potentiometer	1 meg. ±20%, curve C, Type C	Audio "GAIN" Control	I. R. C.	A104470-2	
126		Reactor, AF	430 H, 1MA DC, 5000 Ω, Type XR-5B	Speech Amp. Plate	Bendix	A103034	
127-1		Reactor, RF	1 amp., 2½ meter, Type ZO	2nd Harm. Amp. Grid Choke	Ohmite	A104090	
127-2			Same as 127-1	2nd Harm. Amp. Grid Choke			
127-3			Same as 127-1	PA Grid Choke			
127-4			Same as 127-1	PA Grid Choke			
128-1		Reactor, RF	2.5 MH, 125 MA, 50Ω, 1 Mmf, Type R-100	Osc. Grid Choke	National	A10556	
128-2			Same as 128-1	Osc. Cathode Choke			
128-3			Same as 128-1	PA Plate Choke			
130		Relay	0.2 sec. release, 12V, 200-ohm coil, SPDT, Type EA-6487	Slow Release Relay	Clare	A18258	
131		Relay	200-ohm coil, 12V, DPDT & SPST, normally unenergized, Type B-6106	Contactor Relay	Clare	A18259	
132-1		Resistor	25,000Ω ±5%, ½W, ceramic	2nd Harm. Amp. Grid Bias	Erie	A18004-253	
132-2			Same as 132-1	2nd Harm. Amp. Grid Bias			
133-1		Resistor	40,000Ω ±5%, 1W, ceramic	PA Screen Dropping	Erie	A18158-403	
133-2			Same as 133-1	PA Screen Dropping			
134		Resistor	1.53Ω ±1%, WW, Type 181	1st Harm. Amp. Plate Shunt	Shall	A18254-2	
135-1		Resistor	0.76Ω ±1%, WW, Type 181	2nd Harm. Amp. Plate Shunt	Shall	A18254-1	
135-2			Same as 135-1	PA Plate Shunt			
138-3		Resistor	1 meg. ±5%, ½W, ceramic	Speech Amp. Screen Dropping	Erie	A18004-105	
140-2		Resistor	500,000Ω ±5%, ½W, ceramic	Tone Voltage Divider	Erie	A18004-504	
140-3			Same as 140-2	Tone Voltage Divider			
140-4			Same as 140-2	Tone Feedback Coupling			
141-1		Resistor	1 meg. ±5%, ¼W, ceramic	Input Bridge	Erie	A18001-105	
141-2			Same as 141-1	Input Bridge			
141-3			Same as 141-1	Input Bridge			
141-4			Same as 141-1	Input Bridge			
142		Resistor	5000Ω ±5%, ½W, ceramic	Speech Amp. Grid Bias	Erie	A18004-502	
143-1		Resistor	82Ω ±5%, 1W, ceramic	Speech Amp. Filament Dropping	Erie	A18158-820	
143-2			Same as 143-1	Speech Amp. Filament Dropping			

** Bendix Dwg. No. A105317 may be substituted for A104470 in Radio Transmitter BC-625-A.

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
106		Capacitor	.002 mfd ±5%, 800V DCW, mica, Type 1WPLS	PA Plate Bypass	C. D.	A18255-1	
107-1		Capacitor	0.1 mfd ±10%, 400V DCW, paper, Mica Type 345-21, Solar Type MPW-4147	Speech Amp. Screen Bypass	Mica, Solar	A18015-104	
108-2		Capacitor	.001 mfd ±5%, 500V DCW, mica, C. D. Type 1WL-5D1, Mica Type W, Aero Type 1467	Tone Feedback	Aero, Mica, C. D.	A102967-2	
109-1		Capacitor	20 mmf ±1 mmf, 500V DCW, ceramicon, Type NPOL	PA Grid Coupling	Erie	A18182-16	
109-2			Same as 109-1	PA Grid Coupling			
109-3			Same as 109-1	2nd Harm. Amp. Grid Coupling			
109-4			Same as 109-1	2nd Harm. Amp. Grid Coupling			
109-5			Same as 109-1	Mod. Grid Bypass			
110		Capacitor	1.0 mfd ±10%, 100V DCW, oil-paper	Speech Amp. Cathode Bypass	C. D., Aero	A104092-2	
*111		Capacitor	0.5 mfd ±10%, 400V DCW, oil-paper	Mod. Screen Bypass	C. D., Aero	A104092-1	
113		Capacitor	.0003 mfd ±5%, 500V DCW, mica, C. D. Type 1WL, Mica Type W, Aero Type 1467	Speech Amp. Plate Blocking	Aero, Mica, C. D.	A102967-3	
114		Capacitor	Stators in parallel, 11.0 ±1 mmf min, 65.5 ±1.5 mmf eff	Osc. Plate Tuning	G. Inst., Rad. Cond.	L72950	
115		Capacitor	Stators in series, 3.5 ±1 mmf min, 27.0 ±1 mmf eff	1st Harm. Amp. Pl. Tuning	G. Inst., Rad. Cond.	L72951	
116		Capacitor	Stators in series, 3.0 ±1 mmf min, 16.5 ±1 mmf eff	2nd Harm. Amp. Pl. Tuning	G. Inst., Rad. Cond.	L72949	
117		Capacitor	Stators in series, 2.8 ±1 mmf min, 11.0 ±1 mmf eff	PA Plate Tuning	G. Inst., Rad. Cond.	L72948	
118		Inductor	9½ turns #24 enamel wire, grooved form	Osc. Plate Tuning	Bendix	AC57998-1	
119		Inductor	15 turns #10 silver-plated SD copper wire, tapped at 8 turns, self-supporting	1st Harm. Amp. Plate Tuning	Bendix	AC57999-1	
120		Inductor	#10 silver-plated SD copper wire, distributed inductance line	2nd Harm. Amp. Pl. Tuning	Bendix	AC58149-1	
121		Inductor	2 turns—gap—2 turns, self-supporting, #10SD silver-plated copper wire	PA Plate Tuning	Bendix	AC58150-1	
122		Inductor	3 turns, self-supporting, #10 SP copper wire	Ant. Coupling	Bendix	AC58151-1	
123-1		Plug	8-contact male, Type P-408	Trans. Control CKT.	Jones	A102811	
123-2			Same as 123-1	Power Input			

* Bendix Dwg. No. A104810 may be substituted for A104092-1 in Radio Transmitter BC-625-A only.

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
**125		Potentiometer	1 meg. ±20%, curve C, Type C	Audio "GAIN" Control	I. R. C.	A104470-2	
126		Reactor, AF	430 H, 1MA DC, 5000 Ω, Type XR-5B	Speech Amp. Plate	Bendix	A103034	
127-1		Reactor, RF	1 amp., 2½ meter, Type ZO	2nd Harm. Amp. Grid Choke	Ohmite	A104090	
127-2			Same as 127-1	2nd Harm. Amp. Grid Choke			
127-3			Same as 127-1	PA Grid Choke			
127-4			Same as 127-1	PA Grid Choke			
128-1		Reactor, RF	2.5 MH, 125 MA, 50Ω, 1 Mmf, Type R-100	Osc. Grid Choke	National	A10556	
128-2			Same as 128-1	Osc. Cathode Choke			
128-3			Same as 128-1	PA Plate Choke			
130		Relay	0.2 sec. release, 12V, 200-ohm coil, SPDT, Type EA-6487	Slow Release Relay	Clare	A18258	
131		Relay	200-ohm coil, 12V, DPDT & SPST, normally unenergized, Type B-6106	Contactor Relay	Clare	A18259	
132-1		Resistor	25,000Ω ±5%, ½W, ceramic	2nd Harm. Amp. Grid Bias	Erie	A18004-253	
132-2			Same as 132-1	2nd Harm. Amp. Grid Bias			
133-1		Resistor	40,000Ω ±5%, 1W, ceramic	PA Screen Dropping	Erie	A18158-403	
133-2			Same as 133-1	PA Screen Dropping			
134		Resistor	1.53Ω ±1%, WW, Type 181	1st Harm. Amp. Plate Shunt	Shall	A18254-2	
135-1		Resistor	0.76Ω ±1%, WW, Type 181	2nd Harm. Amp. Plate Shunt	Shall	A18254-1	
135-2			Same as 135-1	PA Plate Shunt			
138-3		Resistor	1 meg. ±5%, ½W, ceramic	Speech Amp. Screen Dropping	Erie	A18004-105	
140-2		Resistor	500,000Ω ±5%, ½W, ceramic	Tone Voltage Divider	Erie	A18004-504	
140-3			Same as 140-2	Tone Voltage Divider			
140-4			Same as 140-2	Tone Feedback Coupling			
141-1		Resistor	1 meg. ±5%, ¼W, ceramic	Input Bridge	Erie	A18001-105	
141-2			Same as 141-1	Input Bridge			
141-3			Same as 141-1	Input Bridge			
141-4			Same as 141-1	Input Bridge			
142		Resistor	5000Ω ±5%, ½W, ceramic	Speech Amp. Grid Bias	Erie	A18004-502	
143-1		Resistor	82Ω ±5%, 1W, ceramic	Speech Amp. Filament Dropping	Erie	A18158-820	
143-2			Same as 143-1	Speech Amp. Filament Dropping			

** Bendix Dwg. No. A105317 may be substituted for A104470 in Radio Transmitter BC-625-A.

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
144		Resistor	250,000Ω ±5%, ¼W, ceramic	Speech Amp. Plate Load	Erie	A18001-254	
145		Resistor	15,000Ω ±5%, 1W, ceramic	Mod. Bias Bleeder	Erie	A18158-153	
146		Resistor	6000Ω ±5%, 1W, ceramic	Transformer Bias Bleeder	Erie	A18158-602	
147		Resistor	18,000Ω ±5%, 1W, ceramic	Transformer Bias Divider	Erie	A18158-183	
148		Resistor	75Ω ±5%, 1W, ceramic	PA Grid Shunt	Erie	A18158-750	
150		Resistor	50Ω ±5%, ½W, ceramic	1st Harm. Amp. Grid Coupling	Erie	A18004-500	
151-1		Resistor	50,000Ω ±5%, ½W, ceramic	Osc. Grid Bias	Erie	A18004-503	
151-2			Same as 151-1	1st Harm. Amp. Grid Bias			
152-1		Resistor	50,000Ω ±5%, 1W, ceramic	Osc. Screen Bias	Erie	A18158-503	
152-2			Same as 152-1	2nd Harm. Amp. Screen Dropping			
152-3			Same as 152-1	Mod. Bias Divider			
152-4			Same as 152-1	Mod. Bias Divider			
153-1		Resistor	2000Ω ±5%, 1W, ceramic	1st Harm. Amp. Cathode Bias	Erie	A18158-202	
153-2			Same as 153-1	RF Indicator Plate Shunt			
153-3			Same as 153-1	Speech Amp. Cathode Bias			
153-4			Same as 153-1	Sp. Amp. Grid Suppressor			
154-1		Resistor	5000Ω ±5%, 1W, ceramic	1st Harm. Amp. Screen Dropping	Erie	A18158-502	
154-2			Same as 154-1	Mod. Screen Dropping			
154-3			Same as 154-1	RF Indicator Load			
156A		Switch	4-section, 2-position, 1-pole	Crystal Selector, Channel A	Oak, Yaxley	AC56334-1	
156B				Crystal Selector, Channel B			
156C				Crystal Selector, Channel C			
156D				Crystal Selector, Channel D			
157		Switch	2-deck, 6-position, 1-pole, Type 10206-H2	"METER SWITCH"	Oak	C56333	
158		Transformer	Res. pri. 5.2Ω, CT; sec. 4000Ω; turns ratio 1:45.7; pri. imp. 200Ω, sec. 420,000Ω	Microphone	Bendix	A103014	
159		Transformer	Res. pri. 1050Ω, sec. 2750Ω, CT; turns ratio 1:2; pri. imp. 125,000Ω sec. 500,000Ω	Intrestage	Bendix	A103016	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
160		Transformer	Res. pri. 690Ω, CT; sec. 170Ω; turns ratio 2:1; pri. imp. 22,000Ω, sec. 5500Ω	Modulation	Bendix, Denyon	A103018	
161		Relay	200Ω coil, SPST normally open, Type G, catalogue #A10480	Press-to-Transmit Control	Clare	A107141	
*162		Reactor, RF	38 turns #28 enameled wire	Sp. Amp. Cathode Choke	Bendix	A104301-1	
163		Tube Clamp Assembly	Mycalex strip with spring clamp	For 2nd Har. Amp.	Bendix	AA102860-1	
164		Strip	Mycalex 1/8" x 1/2" x 2 3/8"	Part of 163	Bendix	A102452	
165		Knob	Bar knob, Type J-10829	Meter Switch	Weston	A11357	
166		Freq. Shifter Assembly	Frequency shifter channel slides and tuning controls	Channel Selection	Bendix	AC57991-1	
167		Shield Assembly	Shield, Dzus fasteners	PA Shield	Bendix	AC58596-1	
168		Socket	2-contact, antenna & gnd.	Transmitter Output	Bendix	AA102951-1	
169-1		Socket, Tube	Octal, Type S-8TM	For VT-198-A, Oscillator	Amph.	A104087	
169-2			Same as 169-1	For VT-134, 1st Harmonic Amp.			
169-3			Same as 169-1	For VT-134, Modulator			
169-4			Same as 169-1	For VT-134, Modulator			
169-5			Same as 169-1	For VT-199, Sp. Amp.			
169-6			Same as 169-1	For VT-199, RF Ind.			
170-1		Socket, Tube	7-contact, steatite	For VT-118, 2nd Harm. Amp.	Johnson	A31778	
170-2			Same as 170-1	For VT-118, Power Amp.			
171		Socket	2-contact	DC Meter Socket	Bendix	AA102954-1	
172		Plug Board	Crystal board assembly including 128-1 and 151-1	For Crystals	Bendix	AC58213-1	
173-1		Screw	1 3/4" long, #8-32 x 3/8, red-enameled, special	Mounting	Bendix	A102735	
173-2			Same as 173-1				
173-3			Same as 173-1				
173-4			Same as 173-1				
VT-118		Vacuum Tube	U. S. Army VT-118, push-pull RF beam power amp., Type 832	2nd Harm. Amp.	RCA, N. U., Ken.		
VT-118		Vacuum Tube	U. S. Army VT-118, push-pull RF beam power amp., Type 832	Power Amplifier	RCA, N. U., Ken.		
VT-134		Vacuum Tube	U. S. Army VT-134, beam power amplifier, Type 12A6	1st Harm. Amp.	RCA, Ken.		

* A few transmitters are without Ref. No. 162.

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
VT-134		Vacuum Tube	U. S. Army VT-134, beam power amplifier, Type 12A6	Modulator	RCA, Ken.		
VT-134		Vacuum Tube	U. S. Army VT-134, beam power amplifier, Type 12A6	Modulator	RCA, Ken.		
VT-198-A		Vacuum Tube	U. S. Army VT-198-A, power amplifier pentode, Type 6G6G	Oscillator	RCA, Ken.		
VT-199		Vacuum Tube	U. S. Army VT-199, triple-grid, super-control amplifier, Type 6SS7	Speech Amplifier	RCA, Ken.		
VT-199		Vacuum Tube	U. S. Army VT-199, triple-grid, super-control amplifier, Type 6SS7	RF Indicator Diode	RCA, Ken.		
b. Radio Receiver BC-624-A							
201		Capacitor	10 mmf ±20%, 500V DCW, mica, Aero Type 1468, C. D. Type 5LS, XM-262 case	RF Grid Coupling	Aero, C. D.	C58469-100	
202-1		Capacitor	.001 mfd ±20%, 600V DCW, mica, Aero Type 1468, C. D. Type 5LS, XM-262 case	RF Cathode Bypass	Aero, C. D.	C58469-102	
202-2			Same as 202-1	RF AVC Filter			
202-3			Same as 202-1	RF Screen Bypass			
202-4			Same as 202-1	RF Plate Bypass to Cathode			
202-5			Same as 202-1	RF Plate Bypass to Ground			
202-6			Same as 202-1	Mixer Cathode Bypass			
202-7			Same as 202-1	Mixer Screen Bypass			
202-8			Same as 202-1	Harm. Amp. B+ Filter			
202-9			Same as 202-1	Harm. Amp. Plate Bypass to Cathode			
202-10			Same as 202-1	Harm. Amp. Plate Bypass to Ground			
202-11			Same as 202-1	Harm. Amp. Cathode Bypass			
202-12			Same as 202-1	Harm. Amp. Screen Bypass			
202-13			Same as 202-1	Harm. Generator Plate Bypass			
202-14			Same as 202-1	Harm. Generator Plate Bypass			
202-15			Same as 202-1	Harm. Generator Cathode Bypass			
202-16			Same as 202-1	RF B+ Filter			
202-17			Same as 202-1	Audio B+ Filter			

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
202-18			Same as 202-1	RF Heater Bypass			
202-19			Same as 202-1	Mixer Heater Bypass			
202-20			Same as 202-1	Mixer Heater Bypass			
202-21			Same as 202-1	Harm. Amp. Heater Bypass			
202-22			Same as 202-1	Harm. Amp. Heater Bypass			
202-23			Same as 202-1	Harm. Generator Heater Bypass			
202-24			Same as 202-1	1st IF Suppressor Bypass			
202-25			Same as 202-1	2nd IF Suppressor Bypass			
202-26			Same as 202-1	3rd IF Suppressor Bypass			
202-27			Same as 202-1	Osc. Plate Choke Bypass			
203-1		Capacitor	50 mmf ±20%, 500V DCW, mica, Aero Type 1468, C. D. Type 5LS, XM-262 case	Mixer Grid Coupling	Aero, C. D.	C58469-500	
203-2			Same as 203-1	Harm. Amp. Grid Coupling			
203-3			Same as 203-1	AVC Diode Coupling			
203-4			Same as 203-1	1st Audio Plate RF Bypass			
204		Capacitor	15 mmf ±20%, 500V DCW, mica, Aero Type 1468, C. D. Type 5LS, XM-262 case	Osc. Plate Resonator	Aero, C. D.	C58469-150	
205		Capacitor	250 mmf ±20%, 500V DCW, mica, Aero Type 1468, C. D. Type 5LS, XM-262 case	Harm. Generator Grid Coupling	Aero, C. D.	C58469-251	
*206-1		Capacitor	.006 mfd ±20%, 300V DCW, mica, Aero Type 1467, C. D. Type 1WL-3D6, Mica Type W	Osc. Plate Bypass	Aero, Mica, C. D.	A102967-7	
*206-2			Same as 206-1	Osc. Cathode Bypass			
*206-3			Same as 206-1	Mixer Plate Bypass			
*206-4			Same as 206-1	1st IF AVC Filter			
*206-5			Same as 206-1	1st IF Cathode Bypass			
*206-6			Same as 206-1	1st IF Screen Bypass			
*206-7			Same as 206-1	1st IF Plate Bypass			
*206-8			Same as 206-1	2nd IF AVC Filter			
*206-9			Same as 206-1	2nd IF Cathode Bypass			
*206-10			Same as 206-1	2nd IF Screen Bypass			

* Any equivalent capacitor with a capacitance rating within the range .005 to .01 mfd is also suitable and may be used as an alternate part.

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
*206-11			Same as 206-1	2nd IF Plate Bypass			
*206-12			Same as 206-1	3rd IF Cathode Bypass			
*206-13			Same as 206-1	3rd IF Screen Bypass			
*206-14			Same as 206-1	3rd IF Plate Bypass			
*206-15			Same as 206-1	B+ Bypass			
*206-16			Same as 206-1	Audio Squelch Grid Bypass			
*206-19			Same as 206-1	1st IF Heater Bypass			
*206-20			Same as 206-1	2nd IF Heater Bypass			
*206-21			Same as 206-1	3rd IF Heater Bypass			
*206-22			Same as 206-1	Osc. and Audio Squelch Heater Bypass			
*206-23			Same as 206-1	3rd IF Grid Bypass			
207-1		Capacitor	60 mmf ±2%, 500V DCW, mica, C. D. Type 5R, Aero Type 1469, XM-262 case	Mixer Plate Resonator Part of 291	Aero, C. D.	C58495-600	
207-2			Same as 207-1, part of 291	1st IF Grid Resonator,			
207-3			Same as 207-1, part of 292	1st IF Plate Resonator,			
207-4			Same as 207-1, part of 292	2nd IF Grid Resonator,			
207-5			Same as 207-1, part of 293	2nd IF Plate Resonator,			
207-6			Same as 207-1, part of 293	3rd IF Grid Resonator,			
207-7			Same as 207-1, part of 294	3rd IF Plate Resonator,			
207-8			Same as 207-1, part of 294	Diode Resonator			
208-1		Capacitor	15 mmf ±5%, 500V DCW, Type N680K, part of 291	Mixer Plate Resonator	Erie	A25715-15	
208-2			Same as 208-1, part of 291	1st IF Grid Resonator,			
208-3			Same as 208-1, part of 292	1st IF Plate Resonator,			
208-4			Same as 208-1, part of 292	2nd IF Grid Resonator,			
208-5			Same as 208-1, part of 293	2nd IF Plate Resonator,			
208-6			Same as 208-1, part of 293	3rd IF Grid Resonator,			
208-7			Same as 208-1, part of 294	3rd IF Plate Resonator,			
208-8			Same as 208-1, part of 294	Diode Resonator			

* Any equivalent capacitor with a capacitance rating within the range .005 to .01 mfd is also suitable and may be use as an alternate part.

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
209		Capacitor	100 mmf ±20%, 500V DCW, mica, Aero Type 1468, C. D. Type 5LS, XM-262 case	Audio Diode Bypass	Aero, C. D.	C58469-101	
210		Capacitor	350 mmf ±20%, 500V DCW, mica, Aero Type 1468, C. D. Type 5LS, XM-262 case	Audio Diode Bypass	Aero, C. D.	C58469-351	
211A				1st Audio Cathode Bypass			
211B		Capacitor	3-section, per section .1 mfd +15%, —12%, 400V DCW, oil-paper, special	1st Audio Screen Bypass	Aero, Solar, Mallory, E. U.	A25096	
211C				AVC Filter			
212A			10 mfd ±10%, 350V DCW, electrolytic	Audio B+ Filter			
212B		Capacitor	20 mfd ±10%, 350V DCW, electrolytic	Audio B+ Filter	Aero, C. D.	L73073	
212C			5 mfd ±10%, 150V DCW, electrolytic	Audio Cathode Bypass			
212D			5 mfd ±10%, 150V DCW, electrolytic	2nd Audio Cathode Bypass			
213		Capacitor	1 mfd ±10%, 100V DCW, oil-paper	RF & Mixer Heater Bypass	Aero	A104484	
214		Capacitor	82 mmf ±2%, 500V DCW, mica, C. D. Type 5R, Aero Type 1469, XM-262 case	Bridge Balancing	Aero, C. D.	C58495-820	
215-1		Capacitor	.01 mfd ±10%, 500V DCW, mica, Aero Type 1467, C. D. Type 1WL, Solar Type MW, XM-262 case	Audio Coupling	Aero, Solar, C. D.	A25714-3	
215-2			Same as 215-1	2nd Audio Grid Coupling			
216A			Effective capacity per section	RF Grid Tuning			
216B		Capacitor	36.0 mmf, min. capacity 6 mmf, 3-section, variable	RF Plate Tuning	Bendix	L72799-1	
216C				Mixer Grid Tuning			
217A		Capacitor	Rear section, eff. cap. 36 mmf, min. cap. 6 mmf, variable	Harm. Amp. Plate Tuning	Bendix	L72798-1	
217B			Front section, eff. cap. 39.6 mmf, min. cap. 6.5 mmf, variable	Harm. Generator Plate Tuning			
218-1		Capacitor	Effective capacity 10 mmf, variable	RF Grid Trimmer for 216A	Bendix	Part of L72799-1	
218-2		Capacitor	Effective capacity 10 mmf, variable	RF Plate Trimmer for 216B	Bendix	Part of L72799-1	
218-3		Capacitor	Effective capacity 10 mmf, variable	Mixer Grid Trimmer for 216C	Bendix	Part of L72799-1	
218-4		Capacitor	Effective capacity 10 mmf, variable	Harm. Amp. Plate Trimmer for 217A	Bendix	Part of L72798-1	
218-5		Capacitor	Effective capacity 10 mmf, variable	Harm. Generator Plate Trimmer	Bendix	Part of L72798-1	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
221		Inductor	One turn #14 tinned copper wire	Antenna Coupling	Bendix	A104312	
222		Inductor	Two turns #14 tinned copper wire	RF Grid Resonator	Bendix	A104309	
223		Inductor.	Two turns #14 tinned copper wire	RF Plate Resonator	Bendix	A104308	
224		Inductor	Two turns #14 tinned copper wire	Mixer Grid Resonator	Bendix	A104313	
225		Inductor	One turn #12 tinned copper wire	Harm. Amp. Plate Resonator	Bendix	A104311	
226		Inductor	Two turns #14 tinned copper wire	Harm. Generator Plate Resonator	Bendix	A104310	
227-1		Inductor	23 turns #26 enameled wire, permeability tuned	Osc. Plate Resonator, Channel "A"	Bendix	AA104225-1	
227-2			Same as 227-1	Osc. Plate Resonator, Channel "B"			
227-3			Same as 227-1	Osc. Plate Resonator, Channel "C"			
227-4			Same as 227-1	Osc. Plate Resonator, Channel "D"			
228-1		Inductor	10 turns #22 enameled wire, permeability tuned, threaded form, part of 291	Mixer Plate Resonator,	Bendix	AA104206-1	
228-2			Same as 228-1, part of 291	1st IF Grid Resonator,			
228-3			Same as 228-1, part of 292	1st IF Plate Resonator,			
228-4			Same as 228-1, part of 292	2nd IF Grid Resonator,			
228-5			Same as 228-1, part of 293	2nd IF Plate Resonator,			
228-6			Same as 228-1, part of 293	3rd IF Grid Resonator,			
228-7			Same as 228-1, part of 294	3rd IF Plate Resonator,			
228-8			Same as 228-1, part of 294	Audio Diode Resonator,			
231		Plug	10-contact, similar to Type P-410-AB1/16" less angle brackets	Receiver Connector	Jones	A102813	
232		Plug Board Ass'y	2-contact, ant. & gnd.	Receiver Input	Bendix	AA104203-1	
236		Potentiometer	150,000Ω, special, Type CS, Curve "C"	"AUDIO" Volume Control	IRC	A102991	
237		Potentiometer	2000Ω, special, Type CS, Curve "A"	Audio Squelch "RELAY" Sens. Control	IRC	A102992	
241-1		Reactor, RF	38 turns #28 enameled wire	1st Audio Grid Choke	Bendix	AA104301-1	
241-2			Same as 241-1	B+ RF Choke			
241-3			Same as 241-1	B+ RF Choke			
243-1		Socket, Tube	Octal, bakelite base, Type S-8TM	For VT-207 Ocs. & Audio Squelch	Amph.	A104087	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
243-2			Same as 243-1	For VT-209, 1st IF			
243-3			Same as 243-1	For VT-209, 2nd IF			
243-4			Same as 243-1	For VT-209, 3rd IF			
243-5			Same as 243-1	For VT-169, Det., AVC, & 1st Audio			
243-6			Same as 243-1	For VT-135, 2nd Audio			
244-1		Socket, Tube	7-contact, bakelite base, Type 78-7PT	For VT-203, RF Amp.	Amph.	A102980	
244-2			Same as 244-1	For VT-203, Mixer			
244-3			Same as 244-1	For VT-203, Har. Amp.			
244-4			Same as 244-1	For VT-202, Har. Gen.			
246		Relay	SPST, 5000Ω ±10%, 4MA ±.5MA, operates with current change of .2MA, Sigma Type 4C1, Allied Type G	Squelch Circuit	Sigma, Allied	A102882 or A106405	
248		Freq. Shifter	Channel slide & tuning control assembly	Channel Selection	Bendix	AC57965-1	
249-1		Screw	1¾" long, #8-32 x ⅜, red-enameled, special	Mounting	Bendix	A102735	
249-2			Same as 249-1				
249-3			Same as 249-1				
249-4			Same as 249-1				
251		Resistor	470,000Ω ±5%, ½W, special, Type EB	RF Stage Grid Leak	Allen-B	A102975-474	
252		Resistor	100,000Ω ±5%, ½W, special, Type EB	RF Stage AVC Filter	Allen-B	A102975-104	
253-1		Resistor	330Ω ±5%, ½W, special, Type EB	RF Stage Cathode Bias	Allen-B	A102975-331	
253-2			Same as 253-1	Harm. Amp. Cathode Bias			
254-1		Resistor	6800Ω ±5%, ½W, special, Type EB	RF Stage Plate Filter	Allen-B	A102975-682	
254-2			Same as 254-1	Harm. Amp. Plate Filter			
255-1		Resistor	1.8 meg. ±5%, ½W, special, Type EB	Mixer Grid Leak	Allen-B	A102975-185	
255-2			Same as 255-1	Harm. Amp. Grid Leak			
256		Resistor	1000Ω ±5%, ½W, special, Type EB	Mixer Cathode Bias	Allen-B	A102975-102	
257		Resistor	330,000Ω ±5%, ½W, special, Type EB	Mixer Screen Dropping	Allen-B	A102975-334	
258		Resistor	680,000Ω ±5%, ½W, ceramic, special	2nd Audio Grid Leak	Erie	A18004-684	
259		Resistor	10Ω ±5%, ½W, special, Type EB	Test Meter Shunt	Allen-B	A102975-100	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
260		Resistor	27,000Ω ±5%, ½W, special, Type EB	Harm. Generator Plate Filter	Allen-B	A102975-273	
261		Resistor	1200Ω ±5%, ½W, special, Type EB	Harm. Generator Cathode Bias	Allen-B	A102975-122	
262-1		Resistor	560,000Ω ±5%, ½W, special, Type EB	Harm. Generator Grid Leak	Allen-B	A102975-564	
262-2			Same as 262-1	1st Audio Compensating			
263-1		Resistor	4700Ω ±5%, ½W, ceramic, special	Mixer Plate Filter	Erie	A18004-472	
263-2			Same as 263-1	1st IF Plate Filter			
263-3			Same as 263-1	2nd IF Plate Filter			
263-4			Same as 263-1	3rd IF Plate Filter			
264		Resistor	10,000Ω ±5%, ½W, ceramic, special	Osc. Plate Filter	Erie	A18004-103	
265		Resistor	2700Ω ±5%, ½W, ceramic, special	Osc. Cathode Bias	Erie	A18004-272	
266-1		Resistor	270,000Ω ±5%, ½W, ceramic, special	Osc. Grid Leak	Erie	A18004-274	
266-2			Same as 266-1	AVC Filter			
266-3			Same as 266-1	1st Audio Plate Load			
267-1		Resistor	100,000Ω ±5%, ½W, ceramic, special	1st IF AVC Filter	Erie	A18004-104	
267-2			Same as 267-1	1st IF Screen Voltage Divider			
267-3			Same as 267-1	1st IF Screen Voltage Divider			
267-4			Same as 267-1	2nd IF AVC Filter			
267-5			Same as 267-1	2nd IF Screen Voltage Divider			
267-6			Same as 267-1	2nd IF Screen Voltage Divider			
267-7			Same as 267-1	Harm. Amp. Screen Dropping			
267-8			Same as 267-1	RF Screen Dropping			
268		Resistor	390Ω ±5%, ½W, ceramic, special	1st IF Cathode Bias	Erie	A18004-391	
269		Resistor	270Ω ±5%, ½W, ceramic, special	2nd IF Cathode Bias	Erie	A18004-271	
270		Resistor	470Ω ±5%, ½W, ceramic, special	3rd IF Cathode Bias	Erie	A18004-471	
271		Resistor	82,000Ω ±5%, ½W, ceramic, special	3rd IF Screen Dropping	Erie	A18004-823	
272		Resistor	120,000Ω ±5%, ½W, ceramic, special	Audio Squelch Compensating	Erie	A18004-124	
273		Resistor	5600Ω ±5%, ½W, ceramic, special	Audio Squelch Compensating	Erie	A18004-562	
274-1		Resistor	2.2 megohms ±5%, ½W, ceramic, special	Audio Squelch Coupling	Erie	A18004-225	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
274-2			Same as 274-1	1st Audio Screen Dropping			
275-1		Resistor	470,000Ω ±5%, ½W, Ceramic, special	AVC Diode Load	Erie	A18004-474	
275-2			Same as 275-1	1st Audio Grid			
275-3			Same as 275-1	1st Audio Grid			
276		Resistor	18,000Ω ±5%, ½W, ceramic, special	AVC Delay	Erie	A18004-183	
277		Resistor	1800Ω ±5%, ½W, ceramic, special	1st Audio Cath. Bias	Erie	A18004-182	
278		Resistor	1500Ω ±5%, ½W, ceramic, special	2nd Audio Cath. Bias	Erie	A18004-152	
279-1		Resistor	47,000Ω ±5%, ½W, ceramic, special	Squelch Cath. Bleeder	Erie	A18004-473	
279-2			Same as 279-1	Squelch Cath. Bleeder			
280		Resistor	1 meg. ±5%, ½W, ceramic, special	3rd IF Grid Leak	Erie	A18004-105	
281		Resistor	150,000Ω ±5%, ½W, ceramic, special	Audio Diode Filter	Erie	A18004-154	
282		Resistor	3300Ω ±5%, ½W, ceramic, special	Audio Squelch Cathode Bias	Erie	A18004-332	
286A		Switch	Bakelite wafer	Channel "A" Crystal and Plate Coil Selector	Oak, Yaxley	AA102802-1	
286B				Channel "B" Crystal and Plate Coil Selector			
286C				Channel "C" Crystal and Plate Coil Selector			
286D				Channel "D" Crystal and Plate Coil Selector			
288		Socket	2-contact, plug-board assembly	Rec. Test-Milliammeter Socket	Bendix	AA102954-1	
289		Socket	12-contact, plug-board assembly	Crystal Sockets	Bendix	AC58428-1	
291		IF Transformer Assembly	12 Mcs, permeability tuned	Mixer to 1st IF Coupling	Bendix	AL73026-1	
292		IF Transformer Assembly	12 Mcs, permeability tuned	1st IF to 2nd IF Coupling	Bendix	AL73026-2	
293		IF Transformer Assembly	12 Mcs, permeability tuned	2nd IF to 3rd IF Coupling	Bendix	AL73026-3	
294		IF Transformer Assembly	12 Mcs, permeability tuned	3rd IF to Diode Coupling	Bendix	AL73028-1	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
295		Transformer	Pri. #1—920Ω, pri. #2—6.9Ω, sec.—2450Ω, pri. #1 imp. 250,000Ω—pri. #2 imp. 750Ω, sec. imp. 1 meg., pri. #1 to sec. 1:2, pri. #2 to sec. 1:36.4				
296A 296B		Transformer Assembly: Transformer	Pri. 870Ω, sec. 390Ω, pri. imp. 15,000Ω; sec. imp., term. 4-7 4000Ω, term. 4-6 300Ω, term. 4-5 50Ω	Audio Output	Bendix	A103024	
		Transformer Assembly: Reactor	6 henry, 340Ω, .05A	Audio B+ Filter			
VT-135		Vacuum Tube	U. S. Army VT-135, detector amplifier triode, Type 12J5GT	2nd Audio	RCA, Ken.		
VT-169		Vacuum Tube	U. S. Army VT-169, duplex-diode pentode, Type 12C8	Detector, AVC, and 1st Audio	RCA, Ken.		
VT-202		Vacuum Tube	U. S. Army VT-202, detector amplifier triode, Type 9002	Harmonic Generator	RCA, Ken.		
VT-203		Vacuum Tube	U. S. Army VT-203, supercontrol amplifier pentode, Type 9003	RF Amp.	RCA, Ken.		
VT-203		Vacuum Tube	U. S. Army VT-203, supercontrol amplifier pentode, Type 9003	Mixer	RCA, Ken.		
VT-203		Vacuum Tube	U. S. Army VT-203, supercontrol amplifier pentode, Type 9003	Harmonic Amplifier	RCA, Ken.		
VT-207		Vacuum Tube	U. S. Army VT-207, twin-triode, Type 12AH7GT	Oscillator and Audio Squelch	RCA, Ken.		
VT-209		Vacuum Tube	U. S. Army VT-209, HF amplifier pentode, Type 12SG7	1st IF	RCA, Ken.		
VT-209		Vacuum Tube	U. S. Army VT-209, HF amplifier pentode, Type 12SG7	2nd IF	RCA, Ken.		
VT-209		Vacuum Tube	U. S. Army VT-209, HF amplifier pentode, Type 12SG7	3rd IF	RCA, Ken.		

c. Dynamotor Unit PE-94-A

*301-1	Capacitor	.006 mfd ±20%, 300V DCW, mica, Aero Type 1467, C. D. Type 1WL-3D6, Mica Type W, XM-262 case	Hash Filter, MV—Lutput	Aero, C. D., Mica	A102967-7
*301-2		Same as 301-1	Hash Filter, HV+ Output		
*301-3		Same as 301-1	Hash Filter, LV+ Output		
*301-4		Same as 301-1	Hash Filter, SW+		
*301-5		Same as 301-1	Hash Filter, SW—		
*301-6		Same as 301-1	Hash Filter, — Input		
*301-7		Same as 301-1	Hash Filter, + Input		

* Any equivalent capacitor with a capacitance rating within the range .005 to .01 mfd is also suitable and may be used as an alternate part.

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
302-1		Capacitor	.001 mfd ±20%, 600V DCW, mica, Aero Type 1468, C. D. Type 5LS, XM-262 case	Hash Filter, MV— Output	Aero, C. D.	C58469-102	
302-2			Same as 302-1	Hash Filter, HV+ Output			
302-3			Same as 302-1	Hash Filter, LV+ Output			
307		Dynamotor	Outputs: LV, 14.5V 4.9A; MV, 150V 10 MA; HV, 300V 260 MA	Dynamotor, 28V Input	Bendix	L72938-2	
310-1		Choke	24½ turns #20 wire, phenolic form	Hash Filter, MV— Output	Bendix	AA102971-1	
310-2			Same as 310-1	Hash Filter, HV+ Output			
310-3			Same as 310-1	Hash Filter, LV+ Output			
310-4			Same as 310-1	Hash Filter, SW+			
310-5			Same as 310-1	Hash Filter, SW—			
311		Choke	10¾ turns #10 wire, phenolic form	Hash Filter, — Input	Bendix	AA102784-2	
312		Choke	10¾ turns #10 wire, phenolic form	Hash Filter, + Input	Bendix	AA102784-1	
314		Voltage Regulator	Variable resistance, automatic operation	Control of Output Voltage	Eclipse	C58131	
316		Resistor	15Ω ±10%, 35W, vitreous, Type 4⅛" T15, variable	Regulator Coil Control	Ward	A104005	
317		Resistor	0.3Ω +0%, —10%, 20W, vitreous, Type 2"	Dropping	Ward	A103999	
321		Relay	SPST, 22-32V	Starting	Price	A102837-2	
322		Receptacle	2-contact	Input	Amph.	A102876	
323		Receptacle	6-contact	Output	Amph.	A102974	
341		Armature	28V, includes bearings, Type D-1117	Armature for 307	Bendix	C58601-2	
342		Field Coil	28V, main field, Type D-1135-2	Field Coil for 307	Bendix	C58603-2	
343		Field Coil	28V, booster field, Type D-1136	Field Coil for 307	Bendix	C58605-2	
344		Bearing	Sealed ball bearing, Type WC-87039	Bearing for 307	N. D.	A105070	
345		Brush Holder	LV output, Type B-1105, for Type B-1081 brush	Brush Holder for 307	Bendix	A105071	
346		Brush Holder	MV output, Type B-1109, for Type B-1082 brush	Brush Holder for 307	Bendix	A105072	
347		Brush Holder	HV output, Type B-1108, for Type B-1082 brush	Brush Holder for 307	Bendix	A105073	
348		Brush Holder	28V input, Type B-1110	Brush Holder for 307	Bendix	A105075	
349		Brush	Input, 28V, Type B-1080	Brush for 307	Bendix	A105076	
350		Brush	LV output, Type B-1081	Brush for 307	Bendix	A105077	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
351		Brush	MV output & HV output, Type B-1082	Brush for 307	Bendix	A105078	
352-1		Shockmount	Type 150 PH 10	Shockproof Mtg.	Lord	C56354-9	
352-2			Same as 352-1	Shockproof Mtg.			
352-3			Same as 352-1	Shockproof Mtg.			
352-4			Same as 352-1	Shockproof Mtg.			
353-1		Screw	Cap screw, #¼—26 x 1$\frac{3}{32}$, B. S. F. thrds.	Shkmt-to-Dyn. Mtg.	Bendix	A102900-1	
353-2			Same as 353-1	Shkmt-to-Dyn. Mtg.			
353-3			Same as 353-1	Shkmt-to-Dyn. Mtg.			
353-4			Same as 353-1	Shkmt-to-Dyn. Mtg.			
354		Terminal Strip	5-contact	Output	Bendix	AC58120-1	
355		Terminal Strip	2-contact	Input	Bendix	AC58122-1	
356		Grommet	Rubber grommet	Cable Insulation	A. R. H.	A18131-25	
357		Cover	Brass, cad. pl.	For Output Filter Unit	Bendix	A102774	
358		Cover	Brass, cad. pl.	For Input Filter Unit	Bendix	C58121	
d. Dynamotor Unit PE-98-A (Same as Dynamotor Unit PE-94-A Except as Follows)							
306		Dynamotor	Outputs: HV, 300V 260 MA; MV, 150V 10 MA; LV, 13V 4.9A	Dynamotor, 14V Input	Bendix	L72938-1	
307		Dynamotor	Not used				
317		Resistor	Not used				
320		Relay	SPST, 11-16V	Starting, 14V	Price	A102837-1	
321		Relay	Not used				
e. Rack FT-244-A							
401		Capacitor	2 mfd +0.5 mfd, —0 mfd, 25V AC 60 cycle, oil-paper	Motor Solenoid Resonating	C. D., Aero	A102816	
402		Capacitor	0.5 mfd ±10%, 400V DCW, oil-paper	HV Bypass	C. D., Aero	A104092-1	
406		Motor	Ratchet Type, 12V, 1A	Automatic Tuning	Bendix, Col., G. Inst.	AC57992	
407		Armature	Armature & pawl assembly	Part of 406	Col., G. Inst.	AA102508-1	
408		Solenoid	975 ±5% turns #24 wire, 5.75Ω ±5%	Part of 406	Col., G. Inst.	AA102536-1	
409		Ratchet Wheel	Ratchet wheel and switching arms assembly	Part of 406	Col., G. Inst.	AA102519-1	
411-1		Relay	12V, SPST, Type AR	Locking Motor Control	Allied	A102817	
411-2			Same as 411-1				
412		Relay	12V, DPDT, Type A-7374	Antenna Changeover	Clare	C58180	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
416		Socket	Coaxial cable connector, SO-153	Antenna Connection	Amph.	AC58136-1	
417		Socket	18-contact	Control Circuit	Amph.	AA102399-1	
418-1		Socket	8-contact, Type S-408	Trans. Control Ckt.	Jones	A102812	
418-2			Same as 418-1	Power Input to Transmitter			
419		Socket	10-contact, Type S-410	Receiver Connection	Jones	A102814	
420		Socket	12-contact	Power Input to Rack	Amph.	AA102437-1	
421		Plug	Ass'y with #6—32 x ½ thrd, similar to G. R. Type 274-P	Gnd. Plug	G. R.	A102875-2	
422		Plug	Plug & board ass'y, special	Ant. Plug	Bendix	AA102718-1	
426		Switch	DPST push type, Type 3594-D	Tuning Release	H & H	A29843-1	
427A, 427B, 427C, 427D		Switch	4-pole, 4-position	Motor Positioning (Part of 406)	Bendix	AA102537	
431-1		Screw	#6—32 x 7/16, special head	Trans. Cover Retaining	Bendix	A102741	
431-2			Same as 431-1	Trans. Cover Retaining			
431-3			Same as 431-1	Rec. Cover Retaining			
431-4			Same as 431-1	Rec. Cover Retaining			
f. Radio Control Box BC-602-A							
601-1		Lamp	12V, ¼ dia., 1¾ long, W. E. Type 2F, G. E. Type 12A	Indicates Channel "A"	W. E., G. E.	A104012	
601-2			Same as 601-1	Indicates Channel "B"			
601-3			Same as 601-1	Indicates Channel "C"			
601-4			Same as 601-1	Indicates Channel "D"			
601-5			Same as 601-1	Indicates Transmit Condition			
606		Socket	12-contact	Connection to JB-29-A	Bendix	AA102437-1	
607		Socket	5-contact, Type AN3102-14S-5P, Army Type SO-180	Connection to Variable-length Antenna	Amph.	A106149	
611A				Selects Channel "A"			
611B				Selects Channel "B"			
611C		Switch	5-position, push-button type, Type 22506-80	Selects Channel "C"	Oak	C58192	
611D				Selects Channel "D"			
611E				Turns Equip't "OFF"			

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
612		Switch	3-position	"T-R-REM."	Bendix	AL72966-1	
616-1		Socket	3⅛" long, tinned lugs, Type #4925	For 601-1	Oak	A103987	
616-2			Same as 616-1	For 601-2			
616-3			Same as 616-1	For 601-3			
616-4			Same as 616-1	For 601-4			
616-5			Same as 616-1	For 601-5			
g. Junction Box JB-29-A							
801-1		Socket	18-contact	For Plug PL-P170 or PL-Q170	Amph.	AA102399-1	
801-2			Same as 801-1	For Dummy Plug			
802		Socket	4-contact	For Plug PL-P167 or PL-Q167	Amph.	AA102436-4	
803		Socket	2-contact	For Plug PL-P165 or PL-Q165	Amph.	AA102436-2	
804		Socket	6-contact	For Plug PL-P166 or PL-Q166	Amph.	AA102436-3	
805		Socket	6-contact	For Plug PL-P199 or PL-Q199	Amph.	AA102436-5	
806		Socket	12-contact	For Plug PL-P169 or PL-Q169	Amph.	AA102437-1	
807		Socket	2-contact	For Plug PL-P164 or PL-Q164	Amph.	AA102436-1	
h. Jack Box BC-629-A							
900		Grommet	Rubber grommet	Cable Insulating	A. R. H.	A18131-22	
901		Terminal Strip	6-contact	Mic. & Headset Connections	Bendix	AC58144-1	
902		Socket	4-contact	For Plug PL-P167 or PL-Q167	Amph.	AA102436-4	
i. Jack Box BC-630-A							
1000		Grommet	Rubber grommet	Cable Insulating	A. R. H.	A18131-22	
1001		Terminal Strip	6-contact	Mic., Headset, and Press-to-Transmit Connections	Bendix	AC58144-1	
1002		Socket	6-contact	For Plug PL-P166 or PL-Q166	Amph.	AA102436-3	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
j. Jack Box BC-631-A							
1100		Grommet	Rubber grommet	Cable Insulating	A. R. H.	A18131-22	
1101		Terminal Strip	6-contact	Mic., Headset, and Press-to-Transmit Connections	Bendix	AC58144-1	
k. Case CS-80-A							
1401-1		Shockmount	Type 150 PH 12	Shockproof Mtg.	Lord	C56354-10	
1401-2			Same as 1401-1	Shockproof Mtg.			
1401-3			Same as 1401-1	Shockproof Mtg.			
1401-4			Same as 1401-1	Shockproof Mtg.			
1402-1		Screw	#¼—26 x 1$^{3}/_{32}$, hex. hd., SS, B. S. F. thrds, cap screw, special	Shkmt-to-Case Mtg.	Bendix	A102900-1	
1402-2			Same as 1402-1	Shkmt-to-Case Mtg.			
1402-3			Same as 1402-1	Shkmt-to-Case Mtg.			
1402-4			Same as 1402-1	Shkmt-to-Case Mtg.			
1403-1		Screw	#¼—26 x $^{15}/_{32}$, hex. hd., SS, B. S. F. thrds, cap screw, special	Dyn. Unit-to-Case Mtg.	Bendix	A102900-2	
1403-2			Same as 1403-1	Dyn. Unit-to-Case Mtg.			
1403-3			Same as 1403-1	Dyn. Unit-to-Case Mtg.			
1403-4			Same as 1403-1	Dyn. Unit-to-Case Mtg.			
l. Cable Plugs and Sockets							
PL-P164		Plug PL-P164	2-contact, straight	Cable term't'n, Junction Box to Press-to-trans. Circuit	Amph.	AC57974-1	
PL-Q164		Plug PL-Q164	2-contact, right angled	Cable term't'n, Junction Box to Press-to-trans. Circuit	Amph.	AC57975-1	
PL-P165		Plug PL-P165	2-contact, straight	Cable term't',n Junction Box to Contactor	Amph.	AC57974-2	
PL-Q165		Plug PL-Q165	2-contact, right angled	Cable term't'n, Junction Box to Contactor	Amph.	AC57975-2	
PL-P166		Plug PL-P166	6-contact, straight	Cable term't'n, Junction Box to BC-630-A	Amph.	AC57974-3	
PL-Q166		Plug PL-Q166	6-contact, right angled	Cable term't'n, Junction Box to BC-630-A	Amph.	AC57975-3	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
PL-P167		Plug PL-P167	4-contact, straight	Cable term't'n, Junction Box to BC-629-A	Amph.	AC57974-4	
PL-Q167		Plug PL-Q167	4-contact, right angled	Cable term't'n, Junction Box to BC-629-A	Amph.	AC57975-4	
PL-P169		Plug PL-P169	12-contact, straight	Cable term't'ns, Junction Box to BC-602-A; Rack to PE-94-A	Amph.	AC57976-1	
PL-Q169		Plug PL-Q169	12-contact, right angled	Cable term't'ns, Junction Box to BC-602-A; Rack to PE-94-A	Amph.	AC57977-1	
PL-P170		Plug PL-P170	18-contact, straight	Dummy Plug; Cable term't'n, Junction Box to Rack	Amph.	AC57978-1	
PL-Q170		Plug PL-Q170	18-contact, right angled	Dummy Plug; Cable term't'n, Junction Box to Rack	Amph.	AC57979-1	
PL-P171		Plug PL-P171	6-contact, straight	Cable term't'n, Dyn. Unit to Rack	Amph.	AC57976-2	
PL-Q171		Plug PL-Q171	6-contact, right angled	Cable term't'n, Dyn. Unit to Rack	Amph.	AC57977-2	
PL-P172		Plug PL-P172	2-contact, straight	Cable term't'n, Dyn. Unit to Battery	Amph.	AC57963-1	
PL-Q172		Plug PL-Q172	2-contact, right angled	Cable term't'n, Dyn. Unit to Battery	Amph.	AC57982-1	
PL-P173		Plug PL-P173	1-contact, straight	Cord CD-477	Amph.	AC57983-1	
PL-Q173		Plug PL-Q173	1-contact, right angled	Cord CD-477	Amph.	AL72939-1	
SO-153		Socket SO-153	1-contact, for Plug PL-P173 or PL-Q173	Antenna Fitting	Amph.	AC58136-1	

2. TABLE OF INTERCHANGEABLE PARTS

111 402	Capacitor	0.5 mfd ±10%, 400V DCW, oil-paper	See Parts List	C. D., Aero	A104092-1
202-1 to 202-27 302-1 to 302-3	Capacitor	.001 mfd ±20%, 600V DCW, mica, Aero Type 1468, C. D. Type 5LS, XM-262 case	See Parts List	C. D., Aero	C58469-102

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
*102-1 to 102-15 *206-1 to 206-23 *301-1 to 301-7		Capacitor	.006 mfd ±20%, 300V DCW, mica, Aero Type 1467, C. D. Type 1WL-306, Mica Type W	See Parts List	Aero, Mica, C. D.	A102967-7	
138-3 280		Resistor	1 meg. ±5%, ½W, ceramic	See Parts List	Erie	A18004-105	
169-1 to 169-6 243-1 to 243-6		Socket, Tube	Octal, Type S-8TM	See Parts List	Amph.	A104087	
171 288		Socket	2-contact	See Parts List	Bendix	AA102954-1	
420 606 806		Socket	12-contact	See Parts List	Amph.	AA102437-1	
417 801-1 801-2		Socket	18-contact	See Parts List	Amph.	A102399-1	
802 902		Socket	4-contact	See Parts List	Amph.	A102436-4	
804 1002		Socket	6-contact	See Parts List	Amph.	A102436-3	
173-1 to 173-4 249-1 to 249-4		Screw	1¾" long, #8—32 x ⅜, red-enameled, special	See Parts List	Bendix	A102735	
353-1 to 353-4 1402-1 to 1402-4		Screw	#¼—26 x 1$^{3}/_{32}$, hex. hd., SS, B. S. F. thrds, cap screw, special	See Parts List	Bendix	A102900-1	
291 292 293		Transformer Ass'y, 1F	12 Mcs, permeability tuned	See Parts List	Bendix	AL73026-1 AL73026-2 AL73026-3	

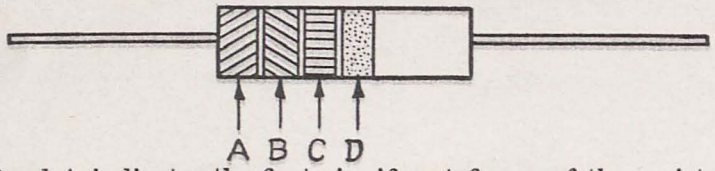
* Any equivalent capacitor with a capacitance rating within the range .005 to .01 mfd is also suitable and may be used as an alternate part.

3. RMA COLOR CODE FOR RESISTORS AND CAPACITORS

Color	*Significant Figure*	*Decimal Multiplier*	*Tolerance*	*Voltage Rating*
Black	0	1		
Brown	1	10	1%	100 Volts
Red	2	100	2%	200 "
Orange	3	1,000		300 "
Yellow	4	10,000		400 "
Green	5	100,000	5%	500 "
Blue	6	1,000,000		600 "
Violet	7	10,000,000		700 "
Gray	8	100,000,000		800 "
White	9	1,000,000,000		
Gold	—	0.1	5%	
Silver	—	0.01	10%	
No Color	—	—	20%	500 "

RESISTORS

The nominal resistance value of fixed composition resistors is indicated in two manners. The one in most common use indicates the value by bands of color as follows:



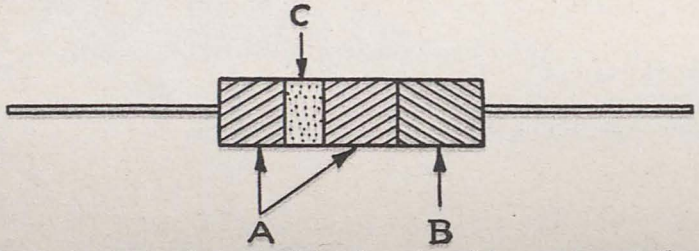
Band A indicates the first significant figure of the resistance of the resistor.

Band B indicates the second significant figure.

Band C indicates the decimal multiplier.

Band D, if any, indicates the tolerance limits about the nominal resistance value.

The least common system used for indicating nominal resistance value is as follows:

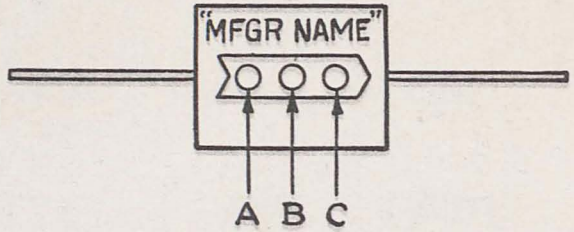


The body (A) of the resistor is colored to represent the first significant figure of the resistance value. One end (B) is colored to represent the second significant figure and a band, or dot (C) of color, located within the body color, indicates the decimal multiplier.

CAPACITORS

Two systems for color coding small fixed capacitors are in use. In either case, capacity is expressed in micromicrofarads and some means to avoid ambiguity in interpretation of colors provided. An arrow pointing from left to right or the manufacturer's name is generally used.

In general, capacitors having a working voltage of 500 volts are coded by means of three dots of color as follows:



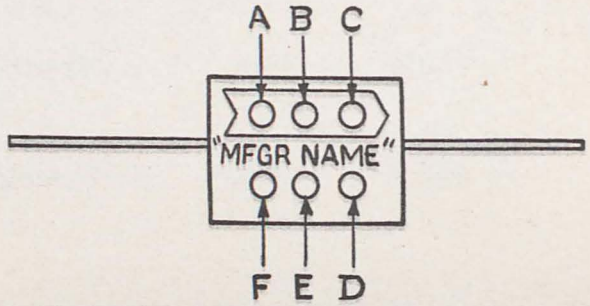
Dot A indicates the first significant figure of the capacitance of the capacitor.

Dot B indicates the second significant figure.

Dot C indicates the decimal multiplier.

An additional dot is sometimes shown when the working voltage is other than 500 volts. This dot indicates the voltage rating of the condenser.

A second system now coming into common use involves six dots of color as follows:



Dot A indicates the first significant figure of the capacitance of the capacitor.

Dot B indicates the second significant figure.

Dot C indicates the third significant figure.

Dot D indicates the decimal multiplier.

Dot E indicates the tolerance about the nominal capacitance value.

Dot F indicates the voltage rating of the capacitor.

SUPPLEMENT

4. ADDRESSES OF MANUFACTURERS

The following abbreviations have been used to indicate manufacturers of various parts.

Abbreviation	Manufacturer	Address
Aero	Aerovox Corporation	New Bedford, Mass.
Allen-B	Allen-Bradley Co.	Milwaukee, Wis.
Allied	Allied Control Co., Inc.	227 Fulton Street, New York, N. Y.
Amph.	American Phenolic Corp.	Chicago, Ill.
A.R.H.	American Radio Hardware Co.	476 Broadway, New York, N. Y.
Bendix	Bendix Radio Division of Bendix Aviation Corporation	Baltimore, Maryland
C.D.	Cornell-Dubilier Electric Corporation	1000 Hamilton Blvd., S. Plainfield, N. J.
Clare	C. P. Clare Company	4903 W. Lawrence Avenue, Chicago, Ill.
Col.	Colonial Radio Corporation	254 Rano Street, Buffalo, N. Y.
Denyon	Denyon Coil Company	Caledonia, N. Y.
Eclipse	Eclipse Aviation Corp. Div. Bendix Aviation Corporation	Bendix, N. J.
Erie	Erie Resistor Corporation	644 West 12th Street, Erie, Pennsylvania
E.U.	Electrical Utilities	2902 S. Michigan Avenue, Chicago, Ill.
G.E.	General Electric Corporation	Schenectady, N. Y.
G. Inst.	General Instrument Corporation	829 Newark Avenue, Elizabeth, N. J.
G.R.	General Radio Company	30 State Street, Cambridge, Mass.
H & H	Arrow-Hart & Hegeman Co.	Hartford, Conn.
I.R.C.	International Resistance Co.	401 N. Broad Street, Philadelphia, Penna.
Johnson	E. F. Johnson Company	Waseca, Minn.
Jones	Howard B. Jones Company	2300 Wabansia Avenue, Chicago, Ill.
Ken.	Ken-Rad Tube and Lamp Corp.	Owensboro, Ky.
Lord	Lord Manufacturing Co.	Erie, Penna.
Mallory	P. R. Mallory & Co., Inc.	Indianapolis, Ind.
Mica	Micamold Radio Corp.	1087 Flushing Avenue, Brooklyn, N. Y.
National	National Company, Inc.	61 Sherman Street, Malden, Mass.
N.D.	New Departure Division General Motors Sales	Bristol, Conn.
N.U.	National Union Radio	57 State Street, Newark, N. J.
Oak	Oak Manufacturing Co.	1260 S. Clybourne Avenue, Chicago, Ill.
Ohmite	Ohmite Manufacturing Co.	4835 Flournoy Street, Chicago, Ill.
Price	Price Brothers	Frederick, Maryland
Rad. Cond.	Radio Condenser Co.	Camden, New Jersey
RCA	RCA Radiotron Div. RCA Manufacturing Co., Inc.	401 Bergen Street, Harrison, New Jersey
Shall	Shallcross Manufacturing Co.	700 Parker Avenue, Collingdale, Penna.
Sigma	Sigma Instrument Co.	76-78 Freeport Street, Boston, Mass.
Solar	Solar Manufacturing Corp.	Bayonne, New Jersey
Ward	Ward Leonard Electric Co.	Mount Vernon, N. Y.
W.E.	Western Electric Co.	300 Central Avenue, Kearney, New Jersey
Weston	Weston Electrical Instrument Company	Frelinghuysen Avenue, Newark, New Jersey
Yaxley	Yaxley Mfg. Div. P. R. Mallory & Co., Inc.	3029 E. Washington St., Indianapolis, Ind.