RESTRICTED

FOR OFFICIAL USE ONLY

FILE: BHC

T. O. No. 08-10-105

INSTRUCTION BOOK

for

OPERATION AND MAINTENANCE

of

RADIO SET SCR-522-A
RADIO SET SCR-522-T2

RADIO SET SCR-542-A
RADIO SET SCR-542-T2

●

16 FEBRUARY 1943

Revised 4 SEPTEMBER 1943

RESTRICTED

FOR OFFICIAL USE ONLY

FILE: BHC

T. O. No. 08-10-105

INSTRUCTION BOOK

for

OPERATION AND MAINTENANCE

of

RADIO SET SCR-522-A
RADIO SET SCR-522-T2

RADIO SET SCR-542-A
RADIO SET SCR-542-T2

●

R. & R.

16 FEBRUARY 1943

Revised 4 SEPTEMBER 1943

LIST OF REVISED PAGES ISSUED

Page	*Latest Revised Date*
XII	4 September 1943
XIII	4 September 1943
32	4 September 1943
57	4 September 1943
58	4 September 1943
130	28 April 1943
131	28 April 1943
132	28 April 1943
133	28 April 1943
134	28 April 1943
136	28 April 1943
139	28 April 1943
147	28 April 1943
148	4 September 1943
149	28 April 1943
151	28 April 1943
152	4 September 1943
153	28 April 1943
156	28 April 1943
159	28 April 1943
160	28 April 1943
162	28 April 1943
181-182	4 September 1943
183-184	4 September 1943
185-186	4 September 1943
187-188	4 September 1943
189	4 September 1943
190	4 September 1943
191	4 September 1943

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

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 PUSHBUTTON 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 21b AS DAMAGE TO THE EQUIPMENT WILL RESULT IF ALL CHANNEL SLIDES ARE NOT RELEASED AS DIRECTED.

NEVER LEAVE THE SHIFTER SLIDES DISENGAGED AFTER TUNING HAS BEEN COMPLETED OR AFTER REPAIRS NECESSITATING REMOVAL OF TRANSMITTER OR RECEIVER FROM RACK HAVE BEEN MADE, AS THIS WILL RESULT IN FAILURE TO TURN ON THE TRANSMITTER AND RECEIVER IF ONE PARTICULAR CHANNEL PUSHBUTTON IS PRESSED ON RADIO CONTROL BOX BC-602-A (SEE PARAGRAPH 9).

REPORT OF MAJOR FAILURE

In the event of major failure of any of the component units of this equipment, a report shall be submitted in the form indicated below. Copies of this report shall be forwarded to the Chief of Signal Section, Air Service Command, Patterson Field, Fairfield, Ohio, and to the Director, Signal Corps Aircraft Signal Service, Wright Field, Ohio.

1. **Contract or order number.**
2. **Organization and station.**
3. **Nomenclature of equipment.**
4. **Nomenclature of component unit.**
5. **Date and nature of failure.**
6. **Type of airplane in which installed.**
7. **Recommendations.**

Destruction of Abandoned Materiel in the Combat Zone

In case it should become necessary to prevent the capture of this equipment and when ordered to do so,

DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:-

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

Procedure:-

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

TABLE OF CONTENTS

TABLE OF CONTENTS—Continued

TABLE OF CONTENTS—Continued

TABLE OF CONTENTS—Continued

SECTION V — APPENDIX

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Continued)

LIST OF ILLUSTRATIONS (Continued)

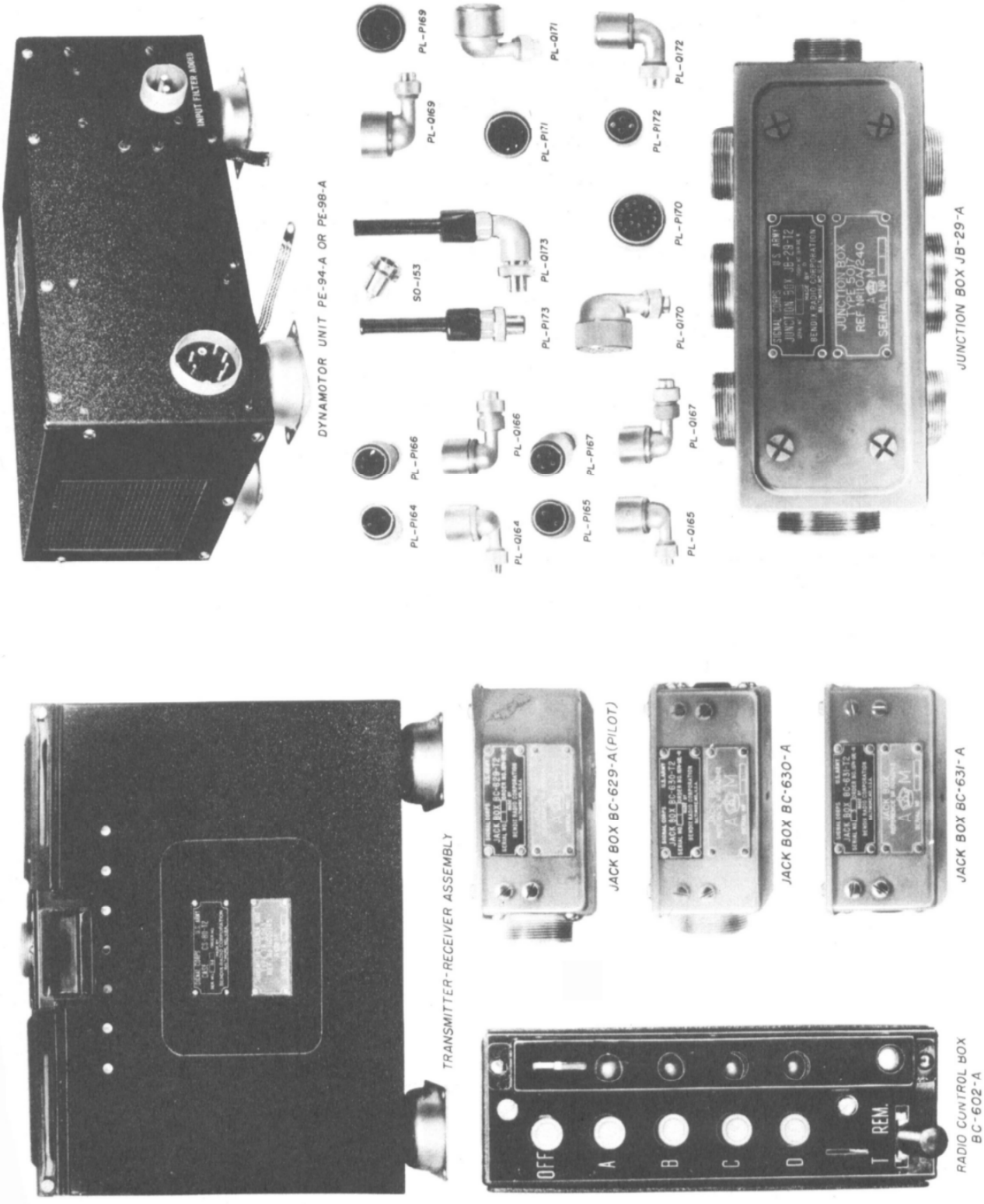


FIGURE 1 — RADIO SET SCR-522-A OR SCR-542-A, COMPONENTS

INSTRUCTION BOOK
For
OPERATION AND MAINTENANCE
Of
RADIO SET SCR-522-A
RADIO SET SCR-522-T2
RADIO SET SCR-542-A
RADIO SET SCR-542-T2

Restricted

SECTION I

GENERAL CHARACTERISTICS

1. GENERAL

Throughout this book, references to components of Radio Sets SCR-522-A and SCR-542-A apply also to similar components of Radio Sets SCR-522-T2 and SCR-542-T2, the only difference being that the issue letters "T2" are used in place of "A" on the nameplate. With the exception of nameplate designation, all components of Radio Sets SCR-522-T2 and SCR-542-T2 are identical with similar components of Radio Sets SCR-522-A and SCR-542-A respectively. Although several photographs in this book are of Radio Set SCR-522-*T2* or its components, the titles to illustrations refer to Radio Set SCR-522-*A*. This is done because all references in the text are made to Radio Set SCR-522-A. The nomenclature of the *principal* components of these sets is indicated in the following table:

RADIO SET SCR-522-A RADIO SET SCR-542-A	RADIO SET SCR-522-T2 RADIO SET SCR-542-T2
Case CS-80-A	Case CS-80-T2
Crystal Unit DC-11-A	Crystal Unit DC-11-T2
*Dynamotor Unit PE-94-A	*Dynamotor Unit PE-94-T2
**Dynamotor Unit PE-98-A	**Dynamotor Unit PE-98-T2
Jack Box BC-629-A (Pilot)	Jack Box BC-629-T2 (Pilot)
Jack Box BC-630-A (First Crew)	Jack Box BC-630-T2 (First Crew)
Jack Box BC-631-A (Other Crew)	Jack Box BC-631-T2 (Other Crew)
Junction Box JB-29-A	Junction Box JB-29-T2
Rack FT-244-A	Rack FT-244-T2
Radio Control Box BC-602-A	Radio Control Box BC-602-T2
Radio Receiver BC-624-A	Radio Receiver BC-624-T2
Radio Transmitter BC-625-A	Radio Transmitter BC-625-T2

* Used on Radio Set SCR-522-A or SCR-522-T2 only.
** Used on Radio Set SCR-542-A or SCR-542-T2 only.

GENERAL CHARACTERISTICS

These radio sets are intended for use in U. S. Army aircraft and will provide two-way radiotelephone communication between aircraft in flight and between aircraft and ground stations. Operation may take place on any one of four crystal-controlled channels lying within the frequency range 100-156 mc. Remote control only is provided. *Transmitter channel D is frequently used as a special frequency channel which is automatically selected at regular intervals by the action of Contactor Unit BC-608-A.* Radio Set SCR-522-A operates on 28 volts and uses Dynamotor Unit PE-94-A or PE-94-AM. (The nomenclature of Dynamotor Unit is now PE-94-AM, Dynamotor Unit PE-94-B). Radio Set SCR-542-A operates on 14 volts and uses Dynamotor Unit PE-98-A. Radio Set SCR-522-A differs from Radio Set SCR-542-A only in the primary power supply voltage and the dynamotor unit used. British Air Ministry nameplates as well as U. S. Signal Corps nameplates are affixed to each major component unit of these radio sets; this is not a customary procedure, however.

2. COMPONENTS, DIMENSIONS AND WEIGHTS

Radio Sets SCR-522-A and SCR-542-A consist of the following component units:

Quantity	*U. S. Signal Corps Description*	*British Air Ministry Description*	*British Ref. No.*	*Overall Dimensions (Inches)*	*Weight (Lbs.)*
1	*Case CS-80-A, Containing:	*Case, Type TR.5043, Including:	*110D/145	16 5/32 x 12 9/16 x 10 11/16	49
	1 Radio Transmitter BC-625-A	1 Radio Transmitter Unit, Type T.5017	110D/146		
	1 Radio Receiver BC-624-A	1 Radio Receiver Unit, Type R.5019	110D/147		
	1 Rack FT-244-A	1 Rack, Type 5009	110D/148		
	1 Set of Vacuum Tubes for Radio Transmitter BC-625-A, Consisting of the following U. S. Army types:				
	2 Tube VT-118	Amr. Commercial 832			
	3 Tube VT-134	Amr. Commercial 12A6			
	1 Tube VT-198-A	Amr. Commercial 6G6G			
	2 Tube VT-199	Amr. Commercial 6SS7			
	1 Set of Vacuum Tubes for Radio Receiver BC-624-A, Consisting of the following U. S. Army types:				
	1 Tube VT-135	Amr. Commercial 12J5GT			
	1 Tube VT-169	Amr. Commercial 12C8			
	1 Tube VT-202	Amr. Commercial 9002			
	3 Tube VT-203	Amr. Commercial 9003			
	1 Tube VT-207	Amr. Commercial 12AH7GT			
	3 Tube VT-209	Amr. Commercial 12SG7			
8	†Crystal Unit DC-11-A	Crystal Unit	110XN/	1 13/16 x 1 9/16 x 1 1/16	0.13 Ea.
1	**Dynamotor Unit PE-94-A	Dynamotor Unit, Type 5016	110K/248	12 25/32 x 8 27/32 x 6 15/64	37
1	***Dynamotor Unit PE-98-A	Dynamotor Unit, Type 5015	110K/247	12 25/32 x 8 27/32 x 6 15/64	37
1	****Jack Box BC-629-A (Pilot)	Jack Box	110A/241	4 27/64 x 2 29/64 x 1 61/64	0.60
1	Jack Box BC-630-A (First Crew)	Jack Box	110A/242	4 27/64 x 2 29/64 x 1 61/64	0.60
1	Jack Box BC-631-A (Other Crew)	Jack Box	110A/243	4 1/16 x 2 29/64 x 1 61/64	0.54
1	Junction Box JB-29-A	Junction Box, Type 5017	110A/240	8 15/32 x 4 1/8 x 2 7/16	2.19
1	Package of Maintenance Parts				

2. COMPONENTS, DIMENSIONS AND WEIGHTS (Continued)

Quantity	*U. S. Signal Corps Description*	*British Air Ministry Description*	*British Ref. No.*	*Overall Dimensions (Inches)*	*Weight (Lbs.)*
1	‡‡Package of Screws				
2	††Plug PL-P164 or ††Plug PL-Q164 | Junction Box to Press-to-Transmit Circuit	Socket, Type W147	10H/401	2¼ L., 1 19/64 Dia.	0.17
		Socket, Type W148	10H/402	2 1/64 H., 2⅜ L., 1 19/64 Dia.	0.21
2	††Plug PL-P165 or ††Plug PL-Q165 | Junction Box to Contactor Unit	Socket, Type W145	10H/399	2¼ L., 1 19/64 Dia.	0.18
		Socket, Type W146	10H/400	2 1/64 H., 2⅜ L., 1 19/64 Dia.	0.21
2	††Plug PL-P166 or ††Plug PL-Q166 | Junction Box to 1st Crew Jack Box	Socket, Type W151	10H/405	2⅝ L., 1 19/64 Dia.	0.25
		Socket, Type W152	10H/406	2 1/64 H., 2 49/64 L., 1 19/64 Dia.	0.27
2	††Plug PL-P167 or ††Plug PL-Q167 | Junction Box to Pilot Jack Box	Socket, Type W149	10H/403	2⅝ L., 1 19/64 Dia.	0.25
		Socket, Type W150	10H/404	2 1/64 H., 2 49/64 L., 1 19/64 Dia.	0.27
2	††Plug PL-P169 or ††Plug PL-Q169 | Junction Box to Radio Control Box	Socket, Type W161	10H/415	2¼ L., 1 21/32 Dia.	0.29
		Socket, Type W162	10H/416	2 1/64 H., 2 15/16 L., 1 21/32 Dia.	0.31
1	Plug PL-P169 or Plug PL-Q169 | Rack to Dynamotor Unit	Socket, Type W161	10H/415	2¼ L., 1 21/32 Dia.	0.29
		Socket, Type W162	10H/416	2 1/64 H., 2 15/16 L., 1 21/32 Dia.	0.31
2	††Plug PL-P170 or ††Plug PL-Q170 | Junction Box to Rack	Socket, Type W163	10H/417	2¼ L., 1 59/64 Dia.	0.34
		Socket, Type W164	10H/418	2 5/32 H., 3 13/64 L., 1 59/64 Dia.	0.56
1	§Plug PL-P170 or §Plug PL-Q170 | Junction Box	Socket, Type W163	10H/417	2¼ L., 1 59/64 Dia.	0.34
		Socket, Type W164	10H/418	2 5/32 H., 3 13/64 L., 1 59/64 Dia.	0.56

2. COMPONENTS, DIMENSIONS AND WEIGHTS (Continued)

Quantity	*U. S. Signal Corps Description*	*British Air Ministry Description*	*British Ref. No.*	*Overall Dimensions (Inches)*	*Weight (Lbs.)*
1	Plug PL-P171 or Plug PL-Q171 } Dynamotor Unit to Rack	Socket, Type W159	10H/413	2¼ L., $1^{21}/_{32}$ Dia.	0.30
		Socket, Type W160	10H/414	$2^{1}/_{64}$ H., $2^{15}/_{16}$ L., $1^{21}/_{32}$ Dia.	0.29
1	Plug PL-P172 or Plug PL-Q172 } Dynamotor Unit to Battery		110H/459	$2^{35}/_{64}$ L., $1^{19}/_{64}$ Dia.	0.28
		Socket, Type W165	10H/419	$2^{33}/_{64}$ H., $2^{19}/_{32}$ L., $1^{19}/_{64}$ Dia.	0.29
2	††Plug PL-P173 or ††Plug PL-Q173 } Rack to Antenna	Plug, Type 156	110H/584	‡$2^{29}/_{64}$ L., 1¼ Dia.	0.21
		Plug, Type 150	110H/507	‡$2^{51}/_{64}$ H., 2⅞ L., 1¼ Dia.	0.35
1	§§Plug PL-P199 or §§Plug PL-Q199 } Junction Box to Rack		10H/409	2⅝ L., $1^{19}/_{64}$ Dia.	
			10H/410	$2^{1}/_{64}$ H., $2^{49}/_{64}$ L., $1^{19}/_{64}$ Dia.	
1	§§§Plug PL-259 Rack to Antenna		110H/1257		
1	Radio Control Box BC-602-A	Controller, Type 5003	110J/71	5⅞ x $5^{9}/_{16}$ x 2½	2.41
1	Socket SO-153 (For Plug PL-P173 or PL-Q173)	Socket, Type 86	110H/585	$1^{9}/_{16}$ x 1⅛ x 1⅛	0.11
1	§§§Socket SO-239 (For Plug PL-259)		110H/1256		

NOTES:—

* The nomenclature, "Case CS-80-A", does not include the radio receiver, radio transmitter and rack. However, Case CS-80-A houses the radio transmitter, radio receiver and rack and is referred to throughout this book as "transmitter-receiver assembly". The British Air Ministry case, "British Type TR. 5043" (Reference Number 110D/145), includes the complete transmitter-receiver assembly.

** Used on Radio Set SCR-522-A only. Dynamotor Unit PE-94-AM has recently replaced Dynamotor Unit PE-94-A. The nomenclature of Dynamotor Unit PE-94-AM is now changed to Dynamotor Unit PE-94-B.

*** Used on Radio Set SCR-542-A only.

**** Jack Box BC-629-B has recently replaced Jack Box BC-629-A.

† One receiver and one transmitter crystal of the desired frequency is required for each of the four channels provided in the equipment.

†† Two straight plugs, two right-angled plugs or a combination of a straight plug and a right-angled plug, as required for each particular installation, may be used as terminations for the cable and the various cords.

‡ Less rubber sleeve.

‡‡ These four No. ¼-26 x 15/32 screws are in a small fabric bag attached to Case CS-80-A and have British Standard Fine Threads.

§ This plug is supplied for all installations and should be wired as indicated in Figure 27 when no British marker beacon equipment is used. This plug is not required if contactor operation is not desired.

§§ This plug is required when British marker beacon equipment is used but is normally not supplied as part of the equipment.

§§§ This plug and socket are to be used on future procurements. Two adapters will be issued: Adapter PL-271 for Plug PL-259 to Socket SO-153 and Adapter PL-272 for Plug PL-P173 or PL-Q173 to Socket SO-239. Another adapter, M-359, connects Plug PL-259 to a right-angled plug.

The U. S. Signal Corps type numbers for plugs include a ferrule and a nut for each type of plug for flexible conduit attachment. Ferrules and nuts, though a part of every plug supplied with Radio Sets SCR-522-A and SCR-542-A, are not covered by the British Type and Reference Numbers. The straight (P) plugs such as Plug PL-P164 and right-angled (Q) plugs such as Plug PL-Q164 are interchangeable. The types used will depend on the requirements of the installation.

3. ADDITIONAL EQUIPMENT REQUIRED

To complete the radio set, a suitable antenna, suitable microphones, headsets and a 14- or 28-volt d-c power source will be required. In addition, Contactor Unit BC-608-A is necessary. The following microphones and headsets, or their equivalents, are used:

	Electromagnetic Microphone	*Headset*
British Installations	Type 21, imped. approx. 250ohm, Ref. No. 10A/11994	Type 32, imped. 150ohm, Ref. No. 10A/13466
	Type 26, imped. approx. 250ohm, Ref. No. 10A/12571	Type B, imped. 24,000ohm, Ref. No. 110A/8542
*U. S. Installations**	T-34, imped. 200ohm	HS-23, imped. 8000ohm
	T-44, imped. 200ohm	HS-18, imped. 8000ohm

*Headset HS-33 may be used at a later date.

The wires and conduits needed for the required cables are supplied in bulk, and the cable lengths may vary with each particular airplane installation. Normally, all conduit and cable wiring will be installed at the airplane factory by the airplane contractor.

The following table lists the type of material supplied and the corresponding British Reference Numbers. For further information, consult the cable assembly drawings, Figures 18 to 26, inclusive.

Description	*British Ref. No.*
Wire, AWG No. 22	105E/105
Wire, AWG, No. 22, Shielded	105E/106
Wire, AWG, No. 22, Shielded, Twisted Pair	
Wire, AWG, No. 18	105E/107
Wire, AWG, No. 18, Shielded	105E/70
Wire, AWG, No. 10	105E/108
Wire, AWG, No. 10, Shielded	105E/69
Flex. Conduit, ½" ID	110H/466
Flex. Conduit, ⅜" ID	110H/465
Flex. Conduit, ¼" ID	110H/464
*Cable WC-543	105E/78

*Cable WC-549-E (British Type PT-5M) may be used in place of Cable WC-543 but is not shown in Figure 19.

4. POWER CONSUMPTION

The power input requirements for Radio Set SCR-522-A are as follows:

For transmission, the total input current is 11.5 amp at 28v; for reception, the total input current is 11.1 amp at 28v.

The power input requirements for Radio Set SCR-542-A are as follows:

For transmission, the total input current is 23.0 amp at 14v; for reception, the total input current is 22.2 amp at 14v.

5. DESCRIPTION OF PRINCIPAL COMPONENTS

a. *Transmitter-Receiver Assembly*

The transmitter-receiver assembly consists of Case CS-80-A containing Rack FT-244-A, Radio Transmitter BC-625-A and Radio Receiver BC-624-A (see Figures 2 and 3). When properly interconnected to the other components of Radio Set SCR-522-A, this assembly provides transmission or recep-

tion of amplitude-modulated r-f energy on any one of four crystal-controlled frequencies within the range 100-156 mc. Only voice communication facilities are available, but continuous audio - tone modulation is also provided. The a-f amplifier portion of Radio Receiver BC-624-A is so designed that interphone communication between two or more stations is possible. The average power output of the transmitter is 8 to 9 watts. The average sensitivity of the receiver is 3 to 4 microvolts for a 10-decibel signal-to-noise ratio. Both the transmitter and the receiver are simultaneously switched to any one of the four available pre-set crystal-controlled channels whenever the appropriate channel-selector pushbutton (located on Radio Control Box BC-602-A) is pressed. Remote control only is provided.

(1) *Case CS-80-A*

Case CS-80-A is the housing provided for the assembly of Rack FT-244-A, Radio Receiver BC-624-A and Radio Transmitter BC-625-A. The case is equipped with four shockmounts and a ground strap. If it is desired to assemble Dynamotor Unit PE-94-A or PE-94-AM to the case for common mounting to the aircraft, this may be done by means of mounting screws inserted through four

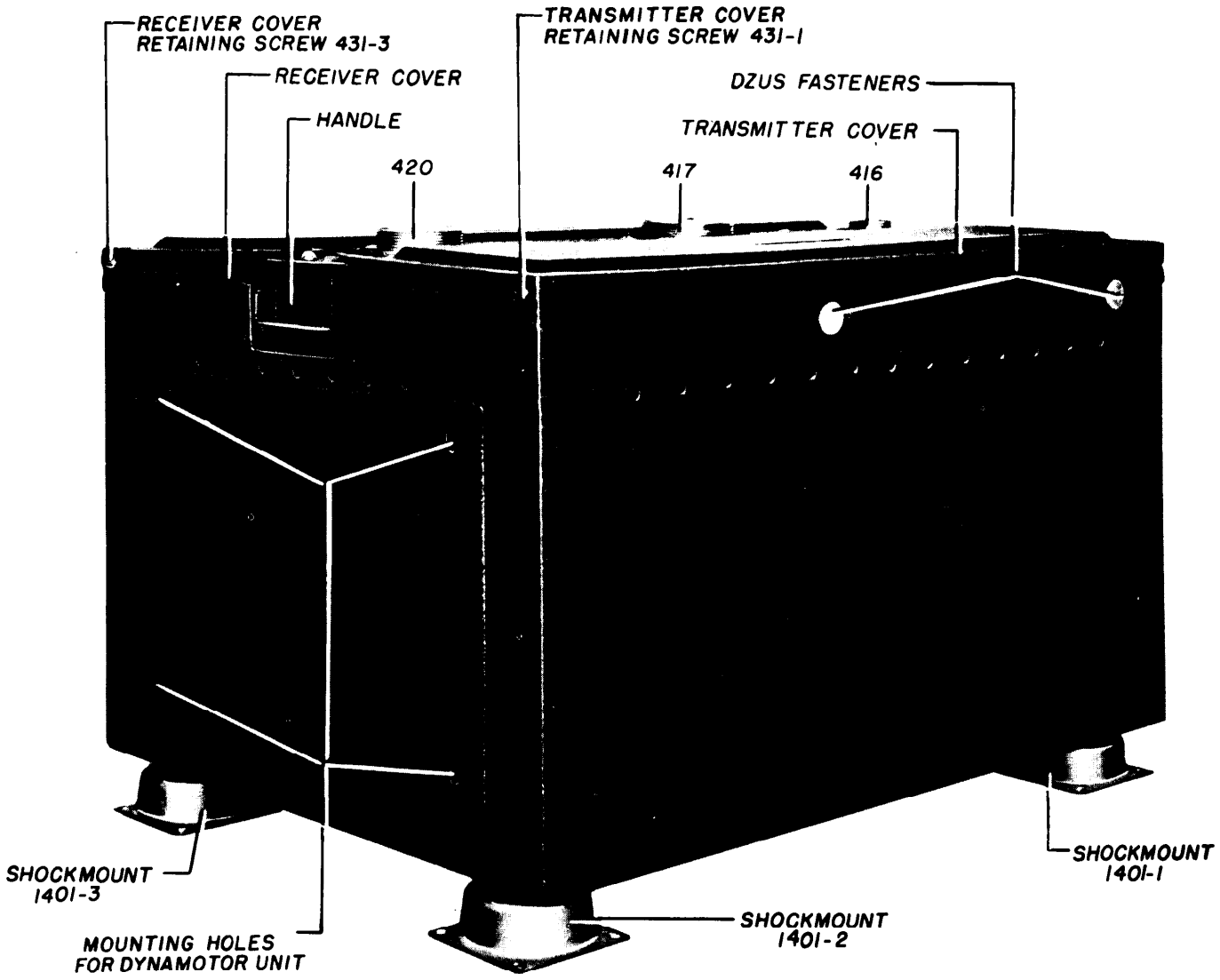


FIGURE 2 — TRANSMITTER — RECEIVER ASSEMBLY, FRONT OBLIQUE VIEW

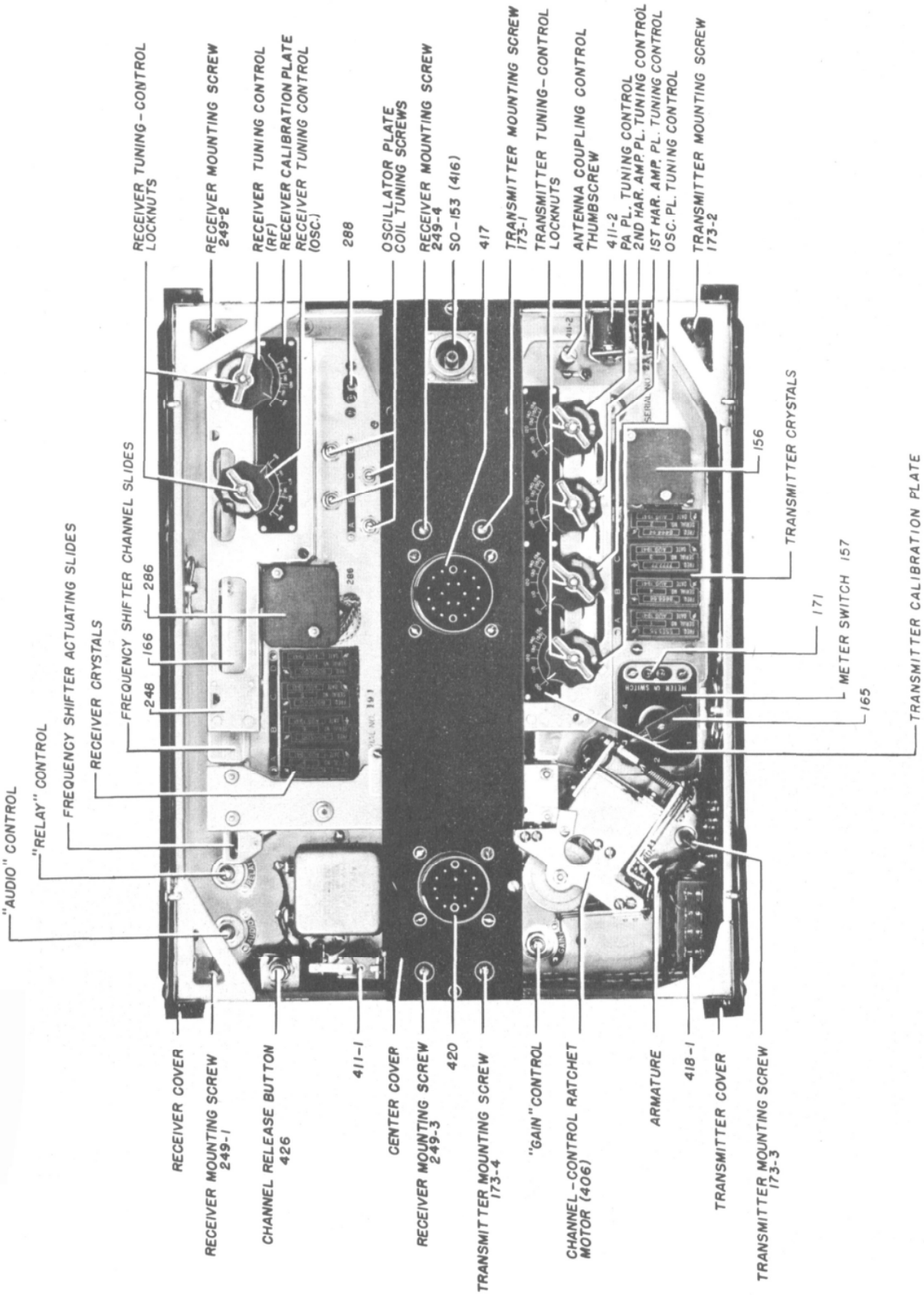


FIGURE 3 — TRANSMITTER — RECEIVER ASSEMBLY, COVERS OPEN, TOP VIEW

holes provided in one side of the case (see Paragraph 7a).

(2) *Rack FT-244-A*

Rack FT-244-A (see Figure 4) is a shallow tray which contains interconnecting wires for the receiver and transmitter plug sockets for the attachment of cables from other components of the equipment, the antenna-changeover relay, the channel-control motor and associated mechanisms, etc. The rack also serves as a mounting base for the transmitter and receiver (see Figures 2 and 3). All electrical connections between the rack and the transmitter or receiver are made through plugs and sockets mounted in these components. Eight red-painted, long-shank screws are employed to hold the transmitter and receiver units firmly in place.

The three sockets located in the center channel of the rack are for the attachment of plug-terminated cables from Dynamotor Unit PE-94-A or PE-94-AM, Junction Box JB-29-A and the antenna. Recessed handles at each end of the center channel are provided to facilitate removal of the rack, receiver and transmitter from Case CS-80-A.

Rack FT-244-A (see Figure 4) is provided with covers attached by means of a slot-and-screw arrangement which makes it possible to slide them away from over the controls of the transmitter and receiver and to let them drop alongside the front (transmitter side) and rear (receiver side) of the case.

(3) *Radio Transmitter BC-625-A*

Radio Transmitter BC-625-A employs a

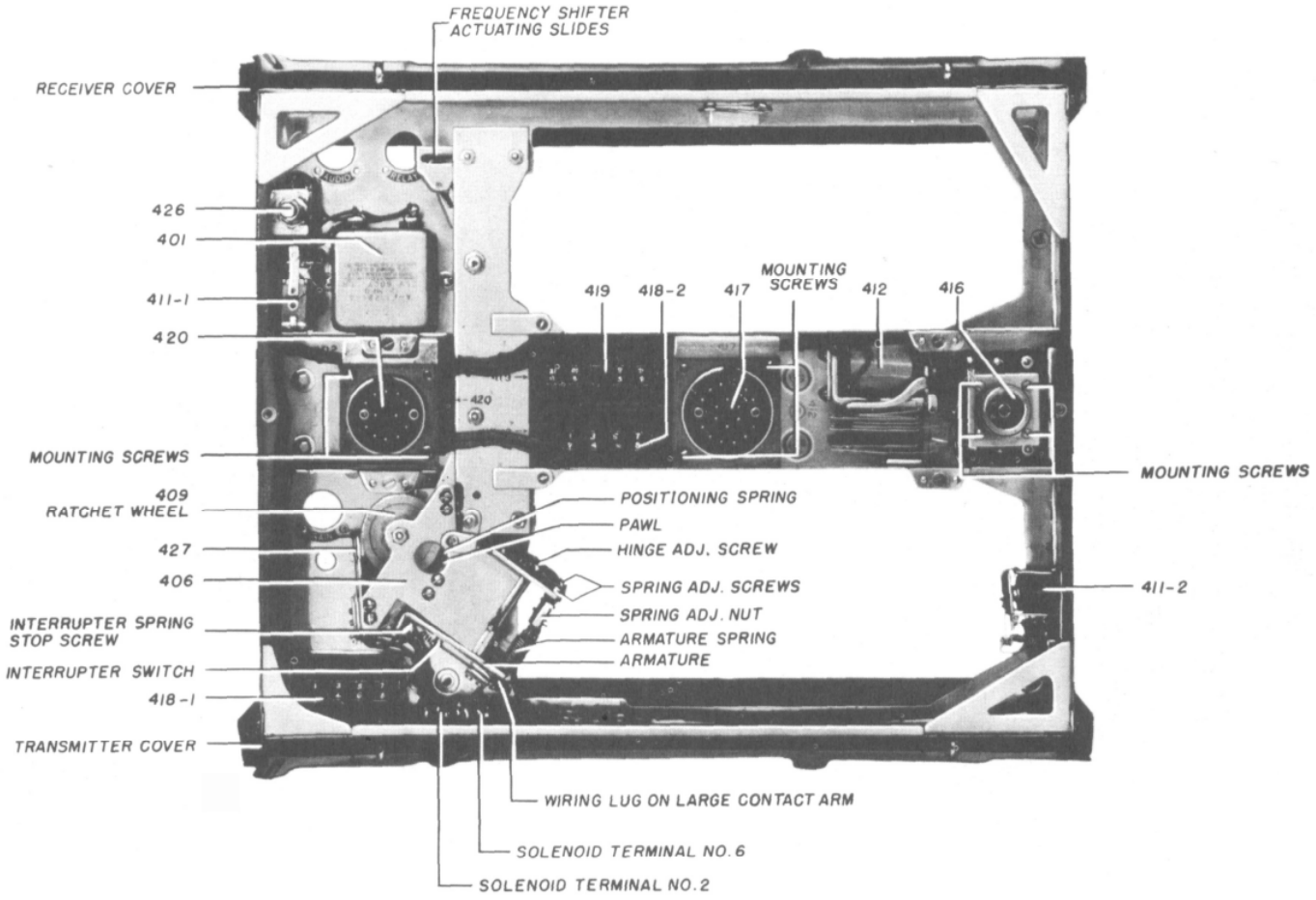


FIGURE 4 — RACK FT-244-A, CENTER COVER REMOVED, TOP VIEW

crystal - controlled oscillator circuit resembling a Pierce circuit in which the tank circuit is provided by the crystal constants. The transmitter operates in the frequency range 100-156 megacycles on any one of the four pre-set channels A, B, C and D. Channels are selected by remote control only.

The top of the transmitter (see Figure 3) is equipped with four tuning controls, a receptacle for the d-c meter cord and a METER SWITCH. The following table shows, for each of the five usable positions of the transmitter METER SWITCH, the particular current being measured by, and the amount of current which will cause full-scale deflection of, the 0-1 ma d-c test milliammeter which is part of Test Set I-139-A or Signal Generator I-96-A. Position 6 of this switch is not used.

Transmitter METER SWITCH Position	*D. C. METER*	
	Current	*Full Scale Deflection*
1	First Har. Amp. Plate	50 ma
2	Second Har. Amp. Plate	100 ma
3	Power-Amp. Plate	100 ma
4	R-F Indicator Diode	1 ma
5	Power-Amp. Grid	2 ma

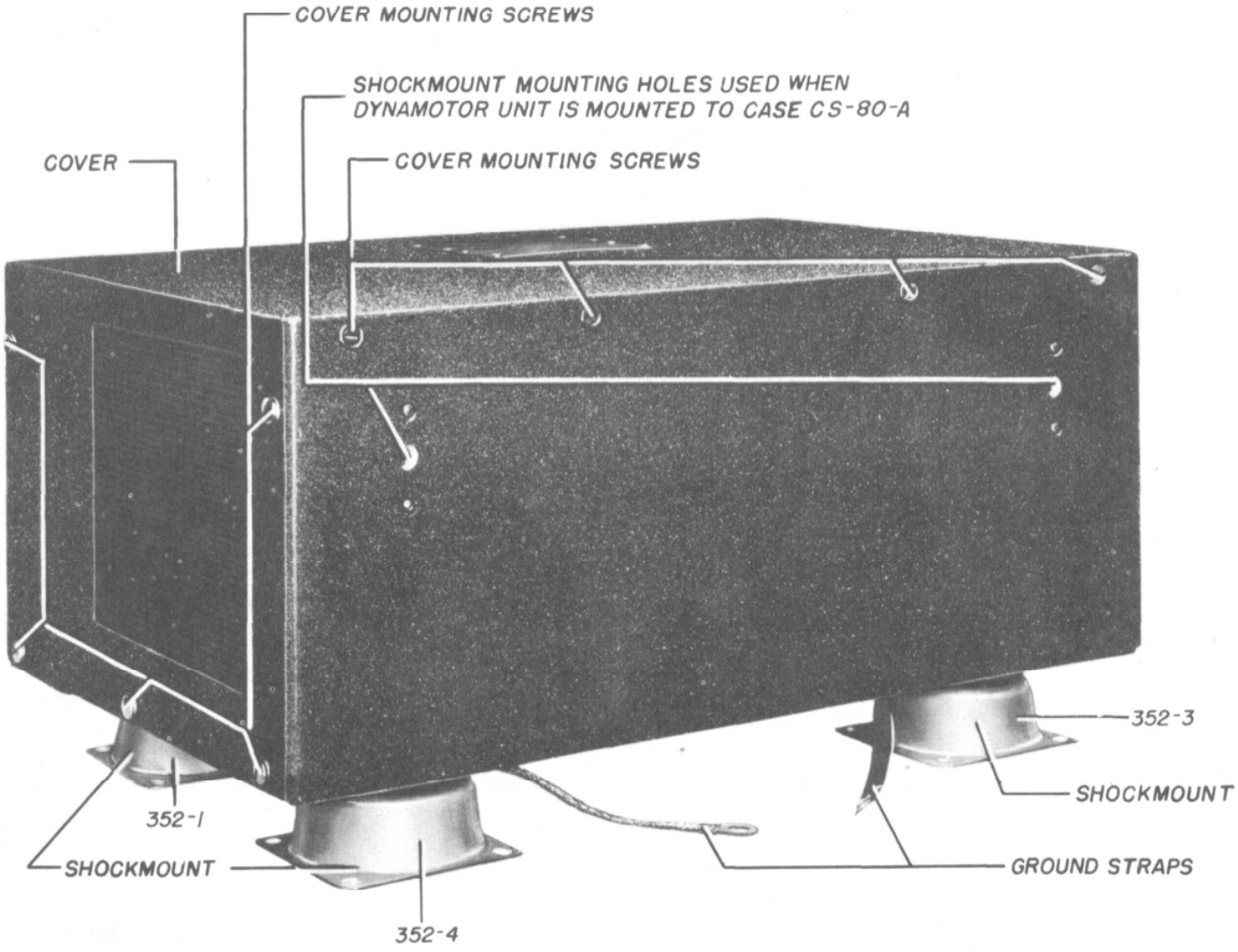


FIGURE 5 — DYNAMOTOR UNIT PE-94-A OR PE-98-A, OBLIQUE VIEW

The antenna-coupling control (see Figure 3) is located on the right side of the transmitter panel, and the GAIN control is on the left. The crystal sockets are to the right of the METER SWITCH and are identified by the channel letters A, B, C and D.

(4) *Radio Receiver BC-624-A*

Radio Receiver BC-624-A is a sensitive superheterodyne receiver employing a heterodyne oscillator whose frequency is controlled by any one of four quartz crystals. Thus, four crystal controlled channel frequencies anywhere within the range 100-156 mc are available for instantaneous selection at the remote control position (Radio Control Box BC-602-A) providing that these four receiver channels have been pretuned and the tuning controls locked. The audio amplifier portion of the receiver is used as an interphone communication and sidetone amplifier. A carrier-operated squelch circuit reduces extraneous receiver noises to a low level and prevents difficulties in interphone communication due to ignition noises, etc.

All tuning controls and installation-adjustment controls are located on the receiver panel and are easily accessible when the receiver is mounted on Rack FT-244-A (see Figure 3).

b. ***Dynamotor Units PE-94-A, PE-94-AM and PE-98-A***

A primary d-c source of between 22 and 32 volts is required to operate Dynamotor Unit PE-94-A. The dynamotor unit is the source of the three regulated voltages required for operation of the transmitter-receiver assembly: 300v d.c. for the plates and screens of the vacuum tubes in the transmitter and receiver, —150v d.c. for grid bias in the transmitter and 13v d.c. for all tube heaters, control relays, the channel-control motor, indicator lamps, etc. Lord shockmounts (see Figure 5) with ground straps attached are provided for mounting the dynamotor as a separate unit. Directions for assembling the dynamotor unit to Case CS-80-A as a composite unit are given in Paragraph 7a. Two sockets are provided: a 2-pin socket connecting with the dynamotor unit-to-battery cord and a 6-pin socket connecting with the dynamotor unit-to-rack cord.

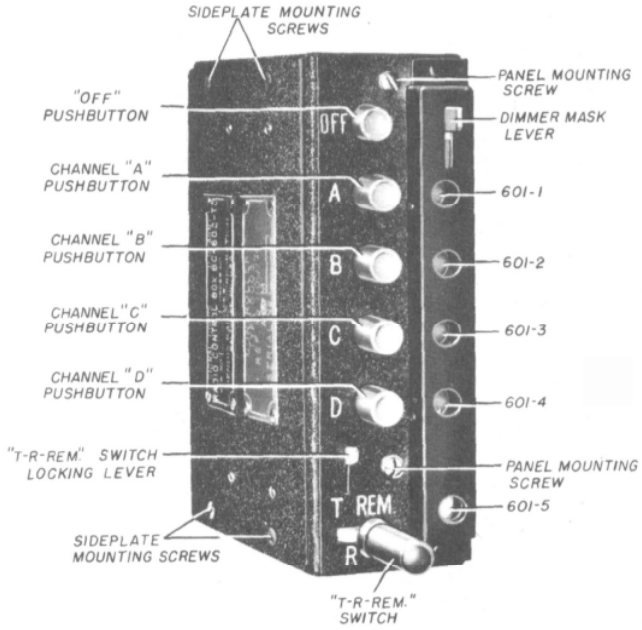


FIGURE 6 — RADIO CONTROL BOX BC-602-A, FRONT OBLIQUE VIEW

c. ***Radio Control Box BC-602-A***

Radio Control Box BC-602-A provides complete remote control of communications functions. With the T-R-REM. switch placed in REMote position (see Figure 6) press-to-talk operation may be obtained by means of a conveniently-located switch (usually located on the throttle in U. S. installations) which when depressed (closed), switches the equipment from *receive* to *transmit*.

The five red pushbuttons are the means by which channels are selected and the power turned on or off. When the OFF button is pressed, the dynamotor is stopped. These five pushbuttons are so interconnected that not more than one can be in the depressed position at any given time.

With the T-R-REM. switch in the T position, the transmitter is placed in continuous operation; in the R position the receiver is

placed in continuous operation, and in the REM. position, *transmit - receive* control is transferred to a press - to - talk (press - to - transmit) switch as explained above.

Interphone communication is available at all times as long as the OFF button is not in the depressed position.

When raised, the lever tab located directly above the T-R-REM. switch (see Figure 6) permits placing this switch in any one of its three positions; when lowered, the lever tab blocks the switch from REM. position and spring-loads the switch lever so that unless the switch lever is held in the T position, it will return to R.

The lamps behind the four green jewels indicate the channel in operation, and the lamp behind the white jewel opposite the T-R-REM. switch glows when the equipment is in the *receive* condition. All lamps are lighted during the process of channel selection. A dimmer-mask is provided to reduce lamp glare and is operated by means of the small lever tab opposite the OFF button.

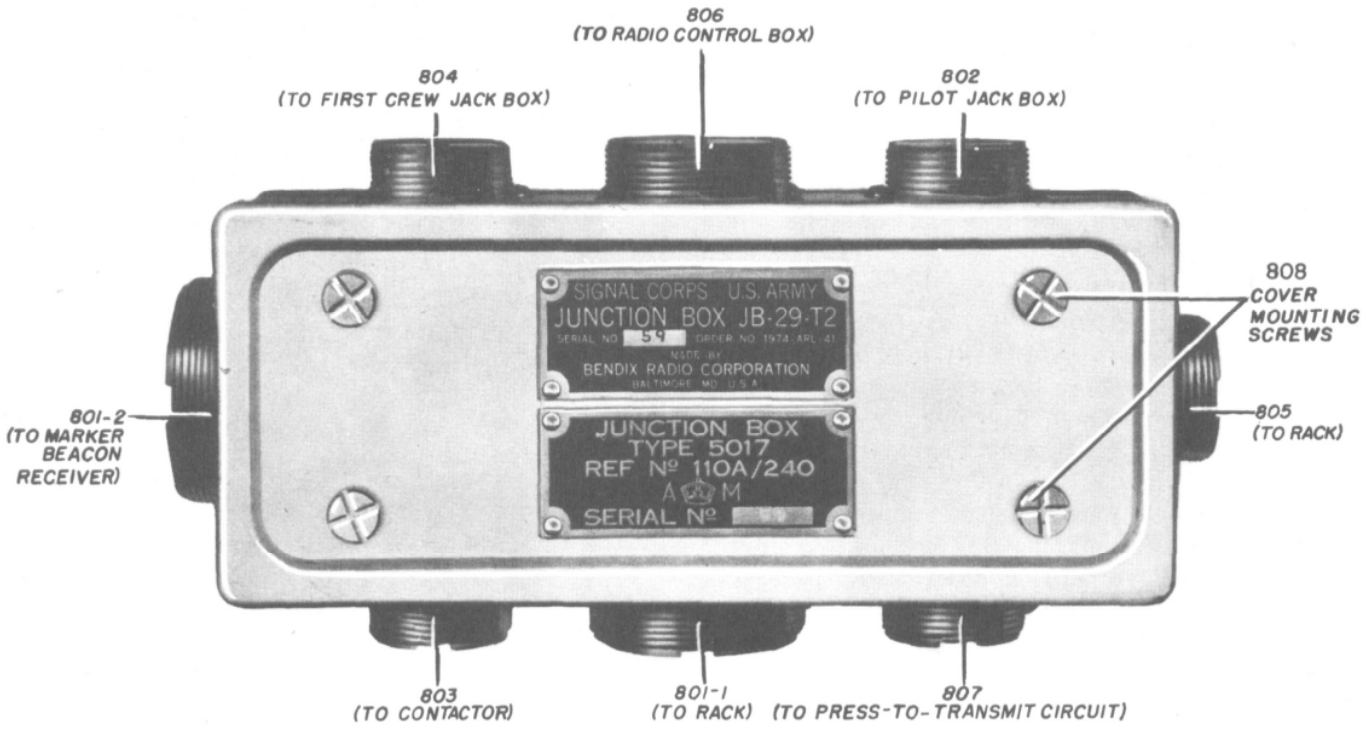


FIGURE 7 — JUNCTION BOX JB-29-A, TOP VIEW

d. *Junction Box JB-29-A*

Junction Box JB-29-A is equipped with eight sockets as shown in Figure 7 and functions as a link between several components of the radio set (see Figure 27). Mounting feet are provided on the bottom of the junction box.

e. *Jack Boxes BC- 629-A or BC-629-B (Pilot), BC-630-A (First Crew) and BC-631-A (Other Crew)*

In general, the jack boxes (see Figures 8, 9 and 10) provide for the connections between the junction box and the microphone, headset and gun-switch terminals. The gun-switch terminals are not used in U. S. installations. A terminal strip inside the jack boxes is equipped with the necessary lugs, and complete wiring information is etched on the inside of the jack-box covers. In British installations, the gun-switch terminals in the jack boxes are used for press-to-transmit (press - to - talk) connections. However, no gun-switch terminals are provided in Jack Box BC-629-A or BC-629-B. Jack Box BC-

631-A is equipped with a rubber grommet instead of a socket, and Jack Box BC-629-B is equipped with an audio volume control and a limiting resistor. Except for these differences, the three jack boxes are very similar in construction. Each jack box is provided with an anchor loop on the bottom (see Figures 8, 9 and 10). This loop is used to tie down the wires, to take up slack and to prevent strains in the electrical connections.

f. *Crystal Unit DC-11-A*

The fundamental frequency of each Crystal Unit DC-11-A appears on the crystal nameplate. Receiver and transmitter crystals are mechanically interchangeable but differ in frequency due to the receiver intermediate frequency of 12 mc. Crystal Unit DC-11-A will operate satisfactorily in any ambient temperature within the limits —40°C and +50°C.

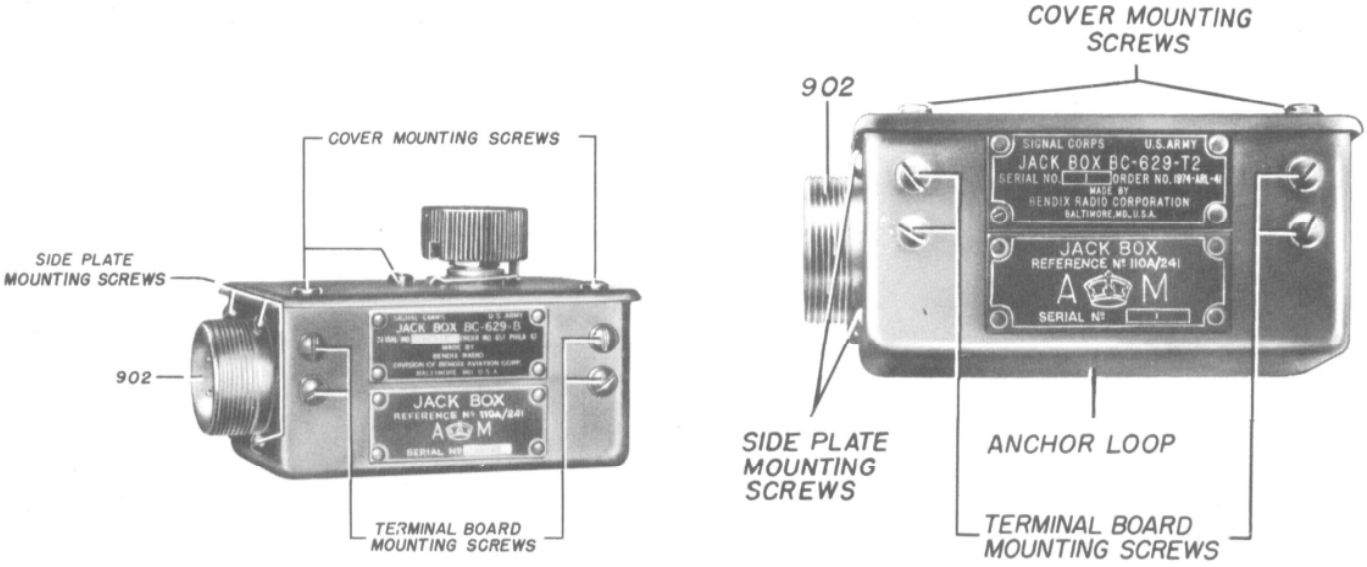


FIGURE 8 — JACK BOX BC-629-A AND BC-629-B, FRONT VIEW

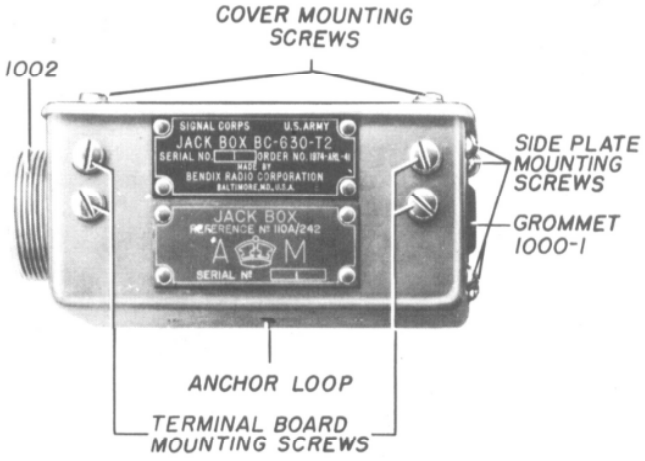


FIGURE 9 — JACK BOX BC-630-A, FRONT VIEW

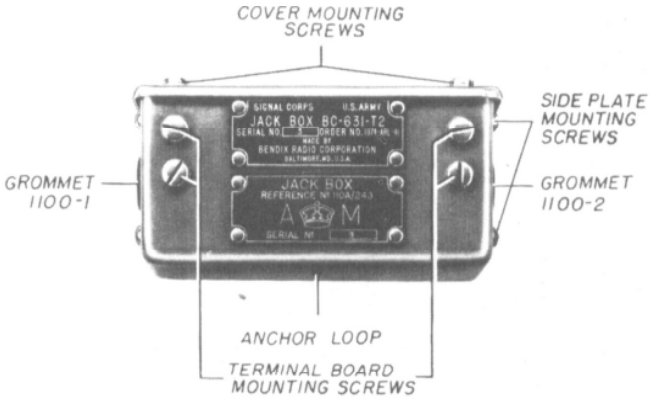


FIGURE 10 — JACK BOX BC-631-A, FRONT VIEW

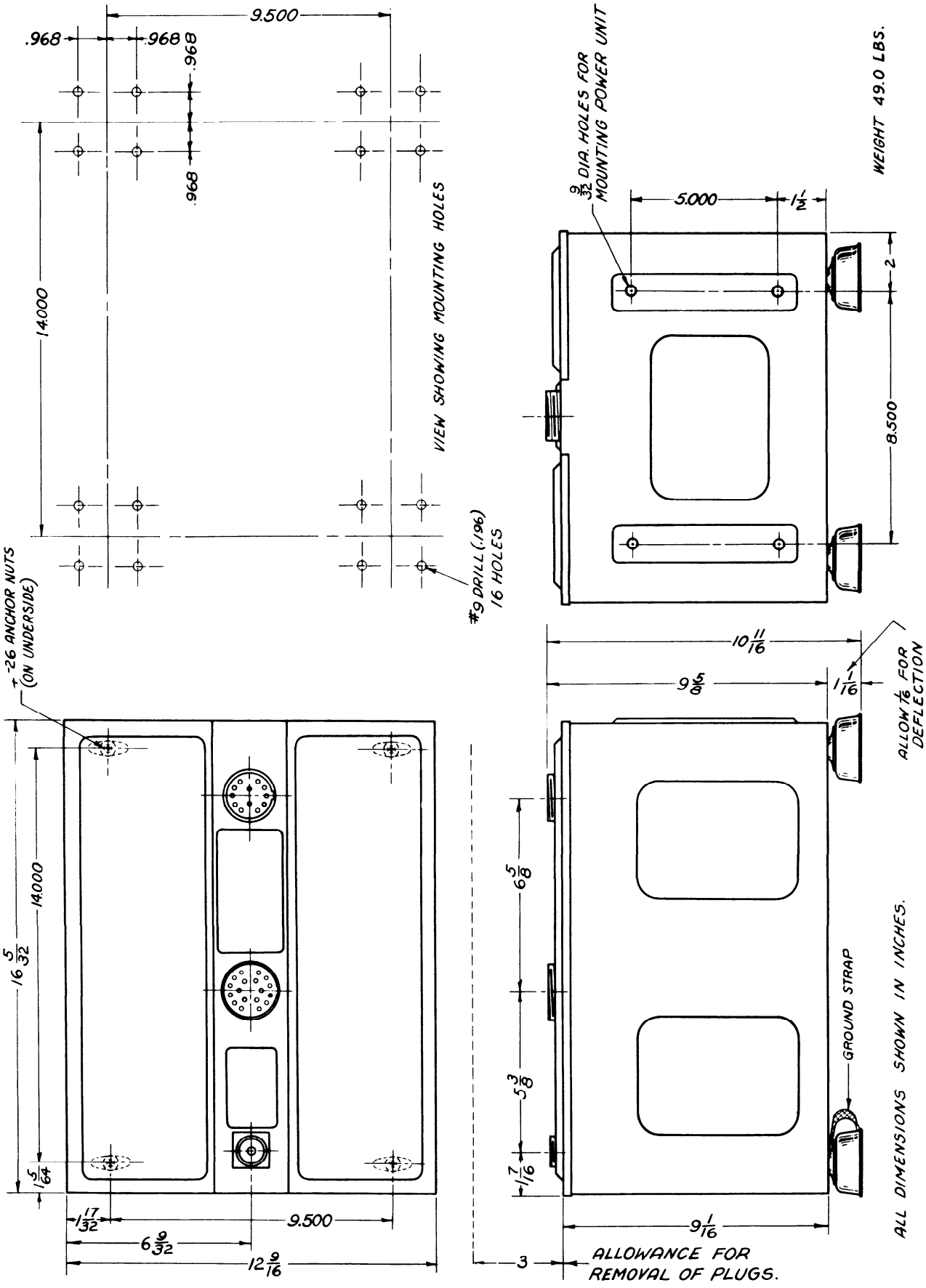


FIGURE 11 — TRANSMITTER—RECEIVER ASSEMBLY, OUTLINE AND MOUNTING DIMENSIONS

SECTION II

EMPLOYMENT

6. INITIAL PROCEDURE

After unpacking Radio Set SCR-522-A, thoroughly inspect all parts for possible damage during shipment. The radio set is normally shipped from the factory with all vacuum tubes installed in their respective sockets.

Before installing the transmitter-receiver assembly in an aircraft, set the assembly up on a test bench, apply power and check the operation of the frequency-shifter mechanism. When channel A pushbutton (on the control box) is depressed, the topmost channel slides on both the transmitter and receiver frequency shifter assemblies should be displaced $2\frac{1}{32}''$ ($\pm\frac{1}{64}''$) from the unoperated position. If the shifter mechanism does not operate when channel A pushbutton is pressed, press the channel-release pushbutton 426 once or twice because the motor may be stopped on an open contact position. A similar check should be made for channels B, C and D.

Check the transmitter on one frequency for power output and the receiver on one frequency for sensitivity [see Paragraphs 29c(6) and 29c(2)]. If for any reason it is necessary to remove the transmitter or receiver from the rack, do not do so before consulting Paragraphs 21b and c.

7. INSTALLATION

a. ***Case CS-80-A and Dynamotor Unit PE-94-A, PE-94-AM or PE-98-A***

Remove the bag containing the four mounting screws from Case CS-80-A.

The case and the dynamotor unit may be installed as separate units or they may be assembled together before installation (see Figures 11 and 12). Sufficient clearance should be allowed on all sides for free action of the shockmounts, for removing the rack and plugs and for access to the tuning and adjustment controls on the transmitter-receiver panel.

NOTE: Each ground strap (the case has one and the dynamotor unit four) should be attached to a shockmount mounting hole by means of a mounting screw inserted in the lug in the free end of the ground strap. This must be a *good* ground connection.

To assemble the dynamotor unit to the case, remove the four shockmounts from the dynamotor unit and install two of these shockmounts in the mounting holes located in the side opposite the sockets (see Figure 5).

Loosen four Dzus fasteners, two located on the top front and two on the top rear of Case CS-80-A. Grasp the rack by the handles on its upper left and right sides. Lift the rack (together with the transmitter and receiver) out of the case and set it down, control panels uppermost, on a flat surface.

Place the dynamotor unit against the side of the case (see Figure 2) in such a manner that the four mounting screws provided with the equipment may be inserted through the mounting holes from within the case and threaded into the holes (in the dynamotor unit) left by the removal of the four shockmounts. The dynamotor unit and the case, assembled together, will rest on a total of six shockmounts. No. 10 screws are recommended for securing all shockmounts used on Radio Set SCR-522-A or SCR-542-A.

b. ***Junction Box JB-29-A***

Loosen the four captive screws (see Figure 7) on the cover of Junction Box JB-29-A. Do not attempt to completely remove these screws; it is sufficient to separate them

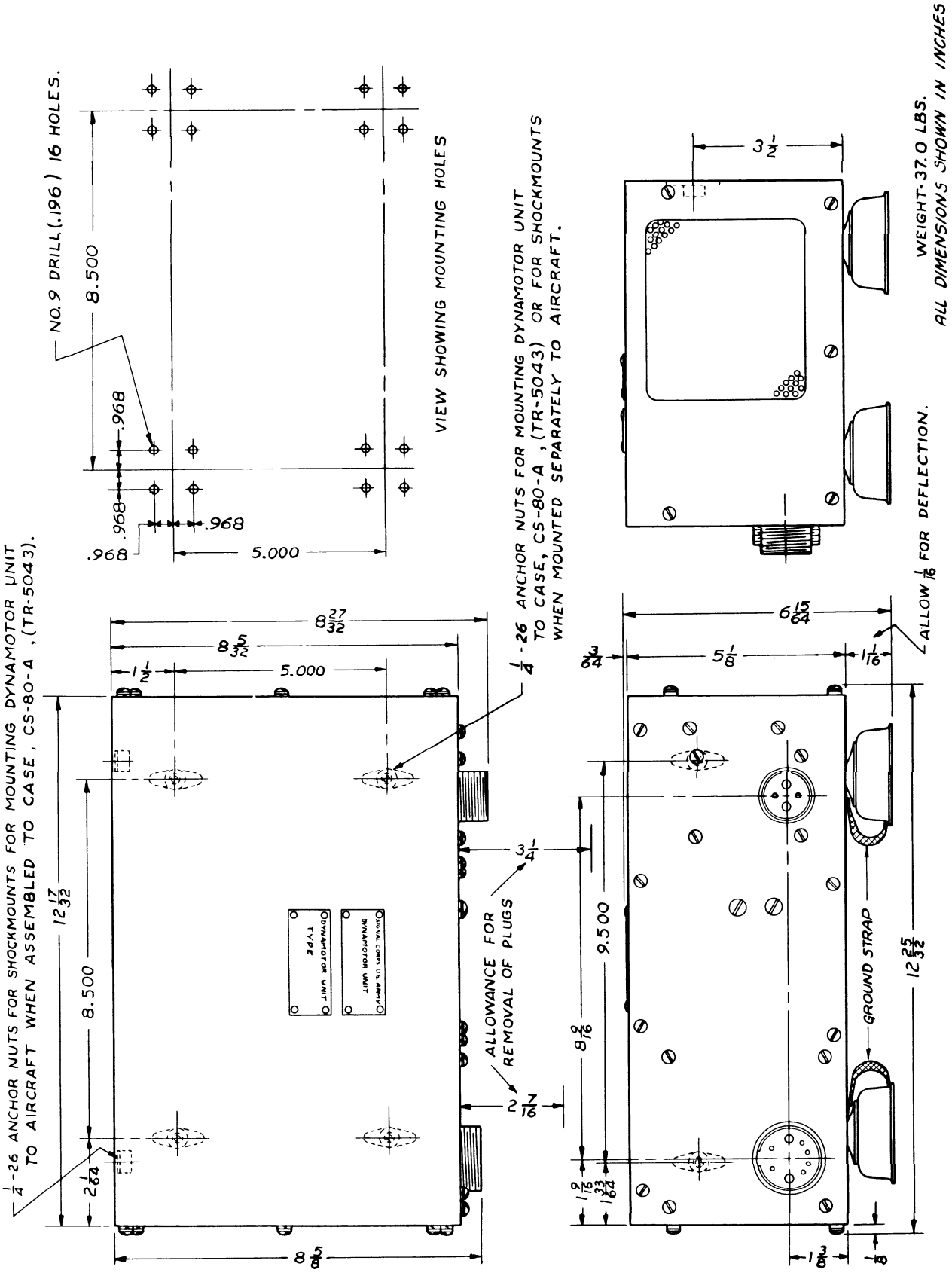


FIGURE 12 — DYNAMOTOR UNIT PE-94-A OR PE-98-A, OUTLINE AND MOUNTING DIMENSIONS

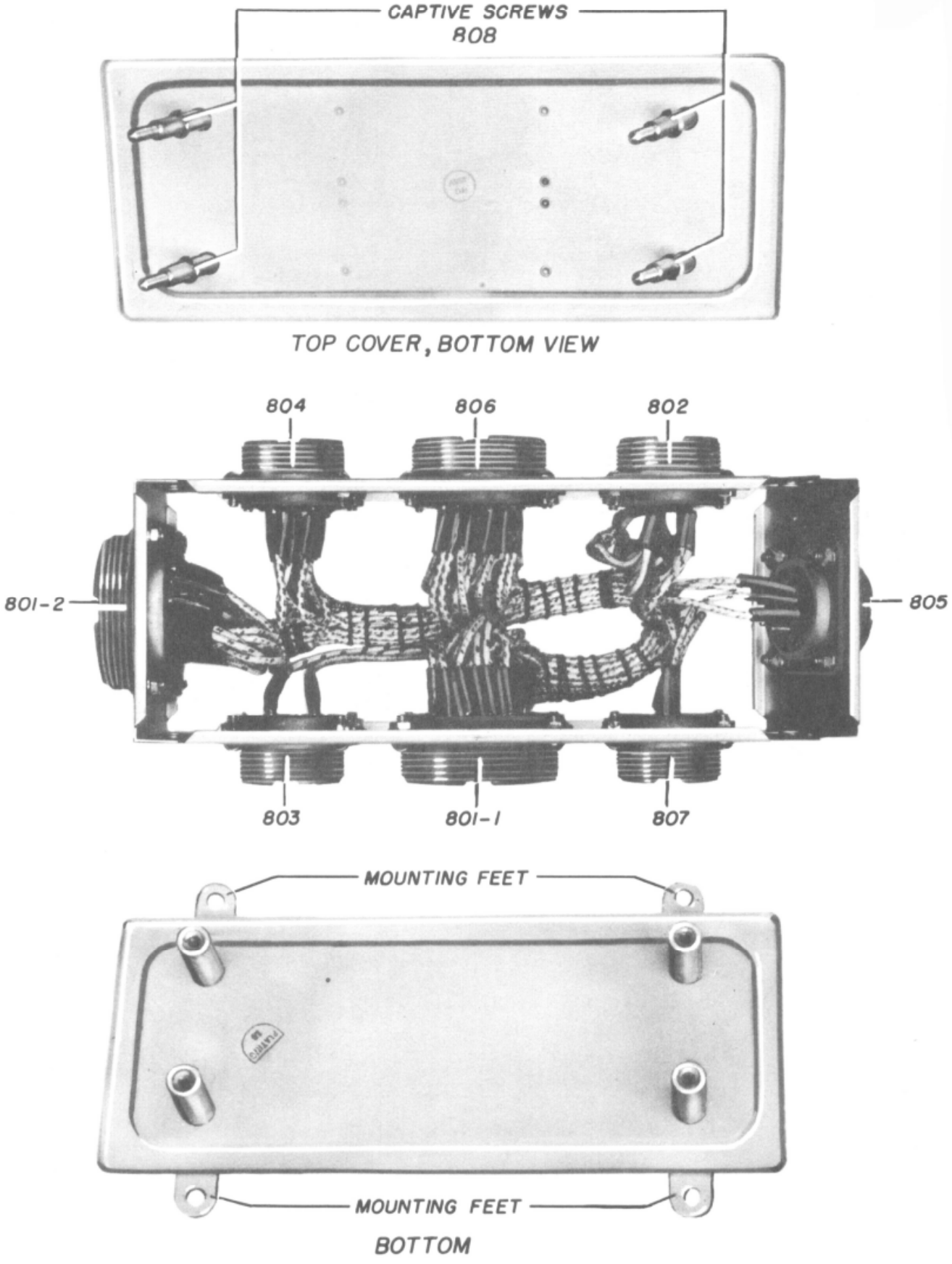


FIGURE 13 — JUNCTION BOX JB-29-A, DISASSEMBLED

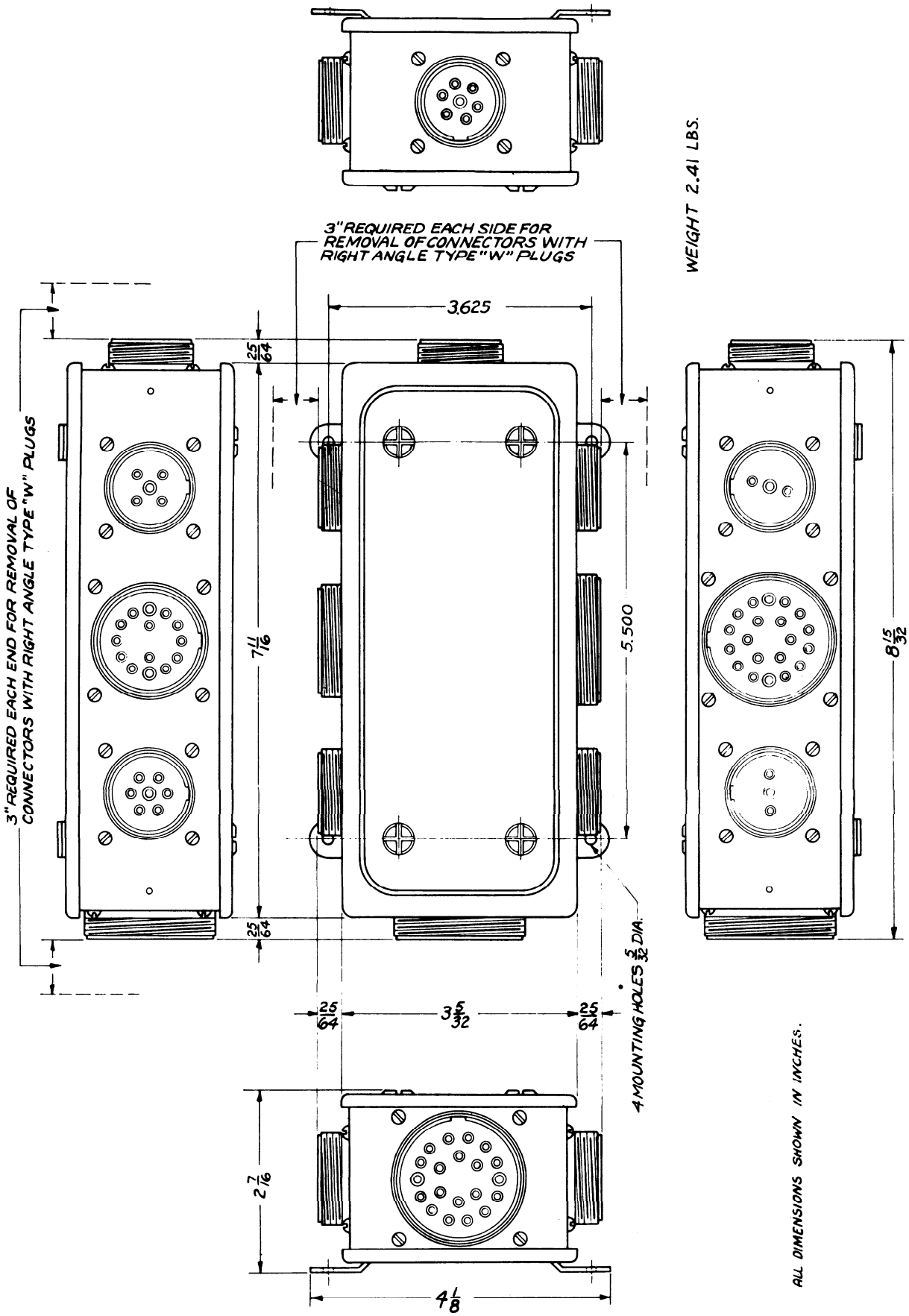


FIGURE 14 — JUNCTION BOX JB-29-A, OUTLINE AND MOUNTING DIMENSIONS

from the mounting posts inside the junction box. Remove the cover. Holding the four sides to prevent their becoming separated, lift the sides of the junction box away from the bottom. It is now possible to insert mounting screws into the holes in the mounting feet (see Figure 13). Note that with the junction box in the position shown in Figure 7, the sockets are located as follows: Upper left, first crew jack box; upper center, radio control box; upper right, pilot jack box; lower left, contactor; lower center, transmitter-receiver; lower right, press-to-transmit circuit; extreme left, marker beacon receiver and extreme right, transmitter - receiver. The position of the sides relative to the mounted bottom may be varied by inverting or rotating the complete assembly of the four sides and sockets. If no marker beacon receiver is being used, insert Plug PL-P170 or Plug PL-Q170 into junction box socket 801-2, as shown in Figure 27. Pins No. 8 and 14 of this plug should be connected by a jumper. This dummy plug is not required if contactor operation is not desired.

c. *Jack Boxes BC-629-A, BC-629-B, BC-630-A and BC-631-A*

Remove the three screws from the covers of the jack boxes and remove the covers (see Figures 8, 9 and 10). Drill mounting holes in the bottom of the jack boxes, being careful not to damage the wires or the soldering lugs. Remove all metallic chips to insure against short circuits.

If it is desired to change the location of the socket to the opposite end of Jack Box BC-629-A or BC-630-A, proceed as follows:

Remove the four screws from each end plate. Remove the end plate opposite the socket. Note the position of the grounding lug on the socket end plate. Transfer the complete socket-and-end-plate assembly to the desired side. Do not neglect to replace the grounding lug. Fasten the grommet end plate to the side on which the socket was formerly located.

d. *Radio Control Box BC-602-A*

Radio Control Box BC-602-A must be mounted with the control panel accessible and visi-

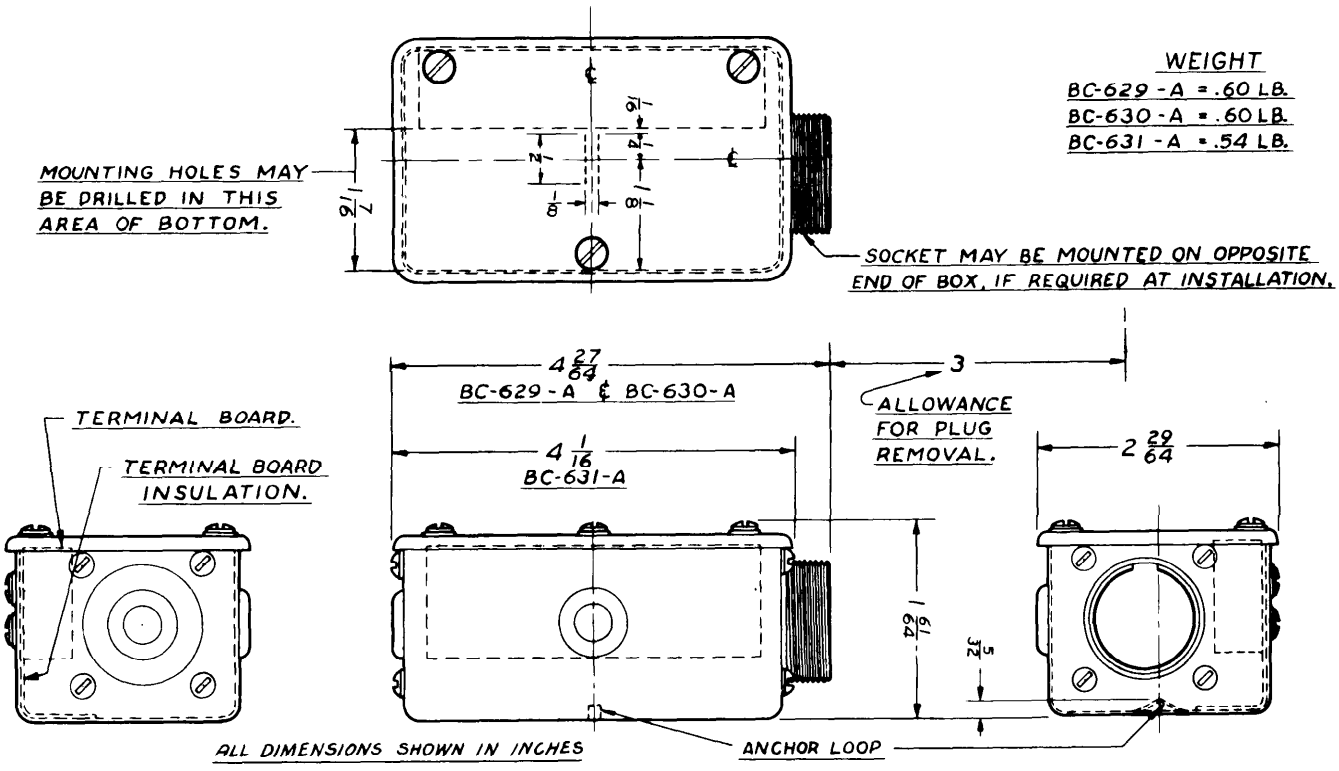


FIGURE 15 — JACK BOXES BC-629-A, BC-630-A, AND BC-631-A, OUTLINE AND MOUNTING DIMENSIONS

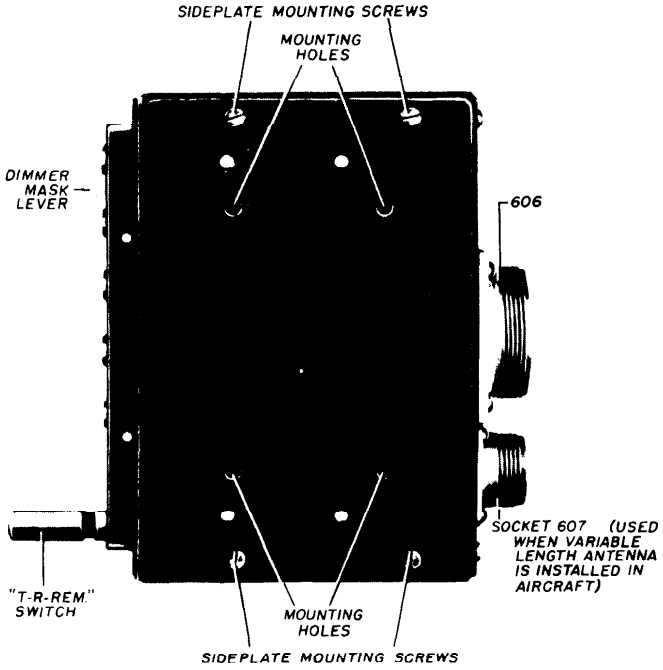


FIGURE 16 — RADIO CONTROL BOX BC-602-A, RIGHT SIDE VIEW

ble to the pilot (see Figures 16 and 17). The side plates are interchangeable and can be removed from the radio control box by loosening the four screws in each plate. One plate is supplied with four countersunk mounting holes and must have a suitable mounting bracket fastened to it before replacing it on the control box. Use flathead screws. These screws must be flush with the inside surface of the plate to prevent possible short circuits in some portion of the control-circuit wiring.

e. *Vacuum Tubes*

The equipment is usually furnished with all vacuum tubes installed. When exceptions occur, install the vacuum tubes by following the procedure given in Paragraphs 21d and f.

f. *Cable Assembling*

(1) Before cables can be constructed, the plugs must be taken apart for wiring. The disassembly procedure is the same

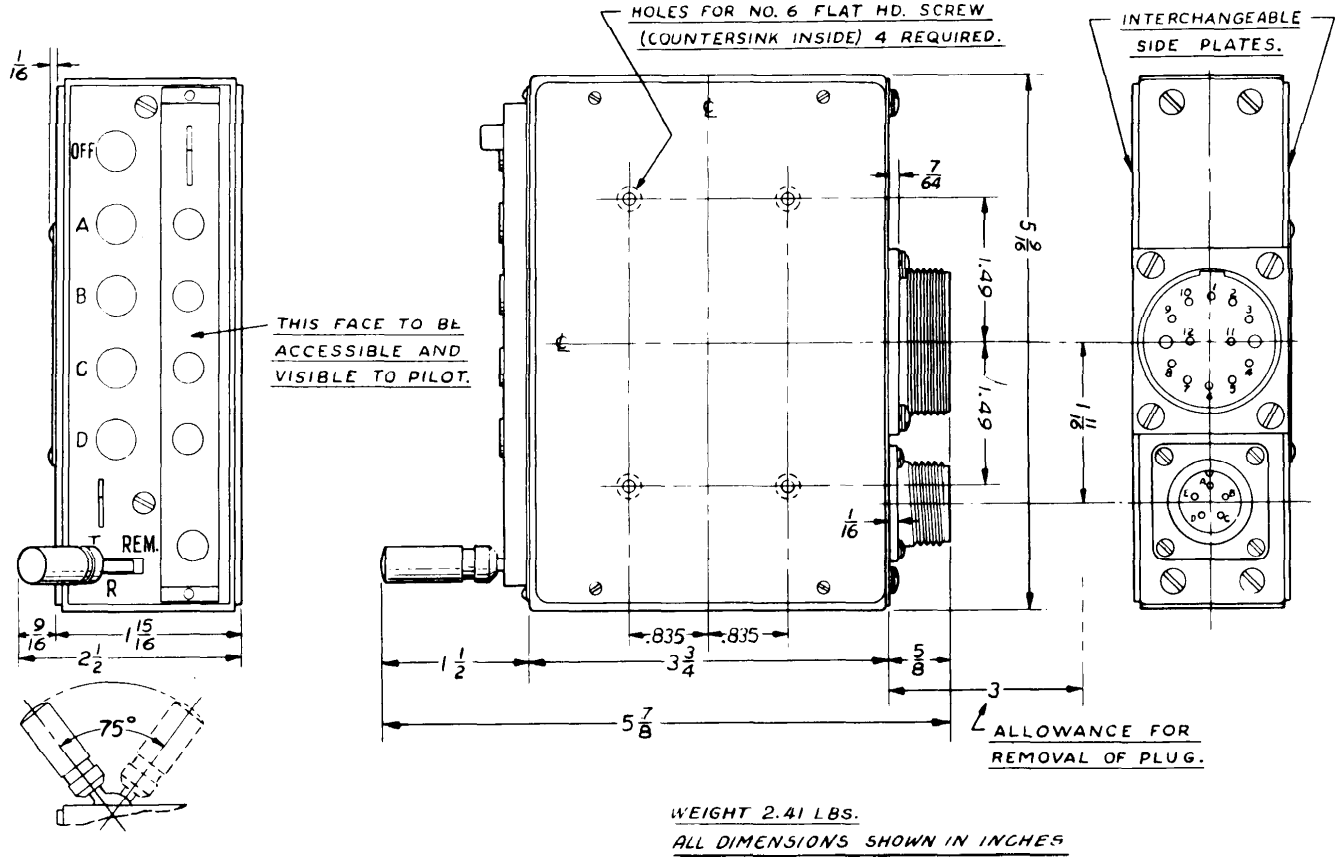


FIGURE 17 — RADIO CONTROL BOX BC-602-A, OUTLINE AND MOUNTING DIMENSIONS

for all types of plugs supplied with the radio set with the exception of Plug PL-P172 or PL-Q172, and Plug PL-P173 or PL-Q173.

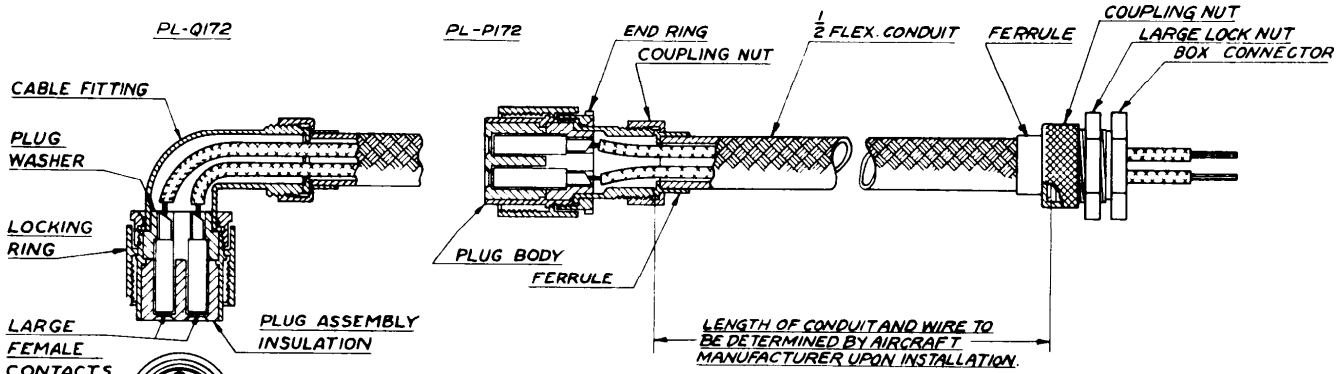
(2) Insert Plug PL-P172 or PL-Q172 into its corresponding socket, located on Dynamotor Unit PE-94-A or PE-98-A, or hold the plug body (metal shell containing the insulated insert) with a pair of pliers (see Figure 18). Turn the plug end ring counterclockwise, using a spanner wrench, if necessary. The ferrule, coupling nut, cable fitting, end ring and locking ring will come free and should be removed from the plug body. Carefully draw the plug body out of the socket. Remove the two screws from the plug-assembly insulation and remove the two large female contacts from the plug washer. The two No. 10 wires may now be soldered to the female contacts [see Paragraph 7f(5)].

(3) Remove the two screws from the clamp assembly of Plug PL-P173 or PL-Q173 (see Figure 19). Remove the smaller section of the clamp. Turn the larger clamp section counterclockwise to disassemble the plug.

(4) The remaining plugs are disassembled for wiring by inserting them into their corresponding sockets or by holding the plug bodies with a pair of pliers and turning their end rings counterclockwise until the ferrules, coupling nuts, cable fittings, end rings and locking rings can be removed. Draw the plug bodies out of their sockets. The small sockets (identified in Figure 20) can now be wired (see Figures 20 to 26, inclusive).

(5) Wiring and reassembling of plugs should be done as follows:

For Plug PL-P172 or PL-Q172 (see Figure 18), after cutting the required lengths of No. 10 tinned wire, lace the wires together and using a pilot wire, draw the laced wires through the proper length of ½-inch flexible conduit. Stretch the conduit and trim it sufficiently to prevent the occurrence of lumps in the completely assembled cable. Cut off about ½ inch of wire insulation at the end to be soldered and twist the



WIRE TABLE

PIN NO.	COLOR CODE	SIZE NO.	DESCRIPTION	BENDIX DWG. NO.
1	WHITE	10	BRAIDED GLASS COVERED WIRE	A104384-9
2	WHITE	10	BRAIDED GLASS COVERED WIRE	A104384-9

ALL DIMENSIONS IN INCHES

NOTES: 1 - IF OPEN AIRPLANE WIRING IS USED, THE PLUGS SHOWN ABOVE WILL BE REQUIRED BUT THE FLEXIBLE CONDUIT WILL NOT. HOWEVER, THE WIRE WILL HAVE TO BE PROVIDED TO ESTABLISH THE CIRCUITS AS SHOWN.
2 - USE A 3/4 INCH LENGTH OF PHENOFLEX TUBING OVER EACH SOLDERED JOINT.
3 - FOR ORDERING: APPROX. LENGTH OF WIRE REQUIRED IS EQUAL TO LENGTH OF CONDUIT PLUS 12.

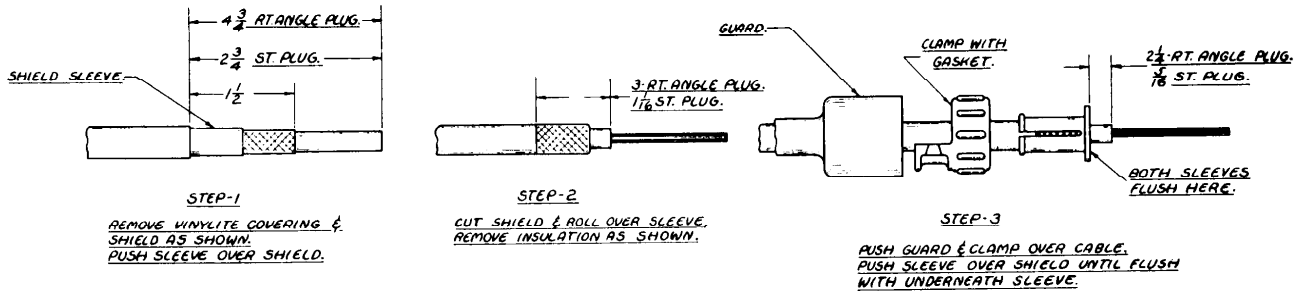
FIGURE 18 — CABLE, DYNAMOTOR UNIT TO BATTERY, ASSEMBLY DRAWING

strands of wire to insure good contact. Place about 3/4 inch of phenoflex tubing over each wire, leaving the ends bare until soldering is accomplished. Solder each wire to one of the large female contacts of Plug PL-P172 or PL-Q172, using sufficient solder to fill the cup. Test each connection. No tinning is necessary, since the contacts and wires are already tinned. Slip the phenoflex tubing over each soldered joint.

Slip the ferrule, coupling nut, cable fitting, end ring and locking ring over the conduit in the order in which these elements will have to be reassembled to the plug body. Insert the plug-assembly insulation into the plug body. Pass the female contacts through the center hole in the plug washer, inserting them far enough to make it possible to bring the contacts back to their grooves beside the center hole. Reinsert the plug washer with the female contacts into the plug body. Make certain that the pin numbers on the plug washer correspond to those on the face of the plug.

Re-insert and tighten the two screws in the plug-assembly insulation. Tighten the coupling nut so that the conduit will be securely fastened and able to take up strains in the cable. Fasten the box connector, locking nut and coupling nut on the free end of the cable and attach suitable lugs to the wires (see Figure 18).

(6) Complete instructions for assembling Plug PL-P173 or PL-Q173 to the coaxial antenna cable are given in Figure 19.



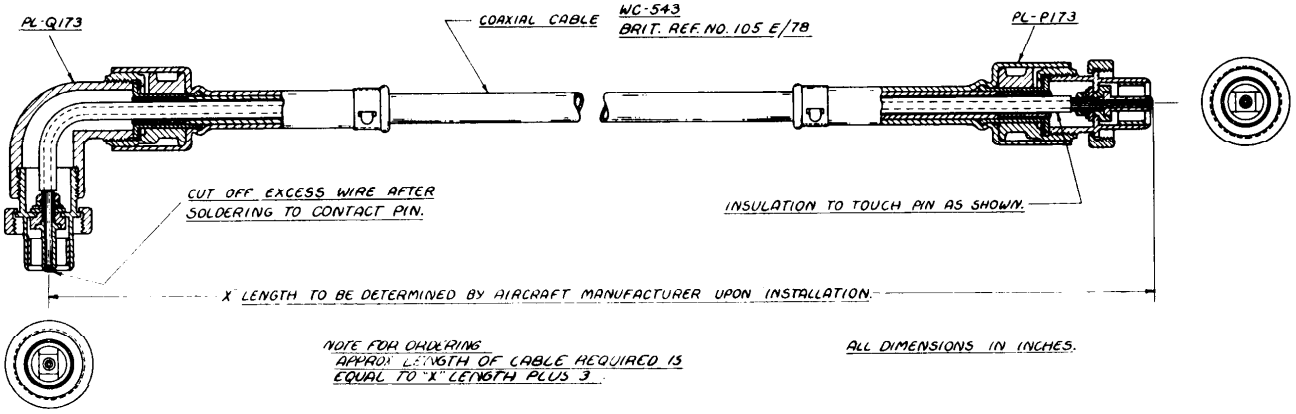


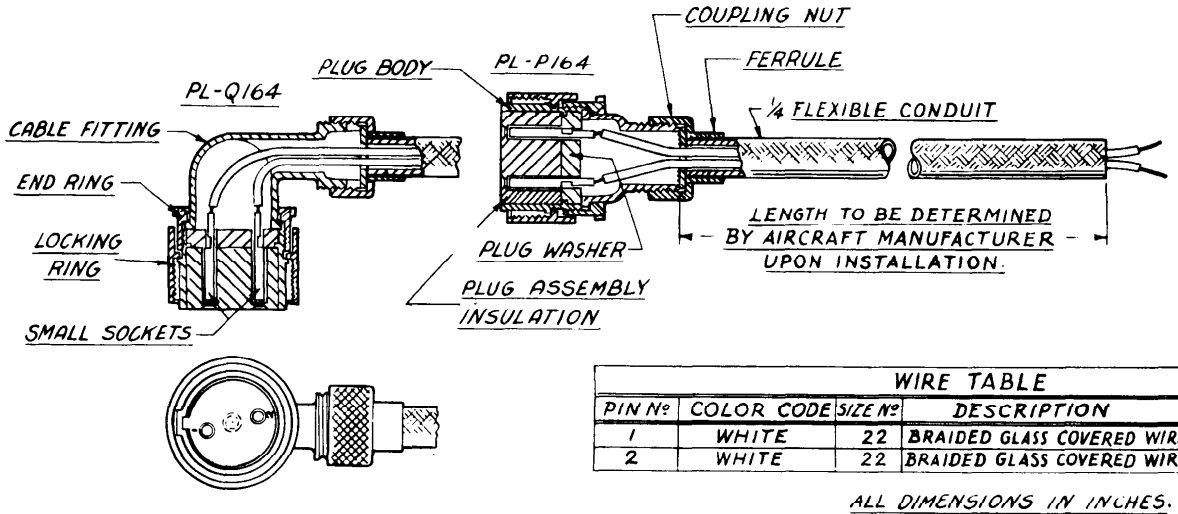
FIGURE 19 — CABLE, RACK TO ANTENNA, ASSEMBLY DRAWING

(7) For the remaining Plugs, PL-P164 or PL-Q164, PL-P165 or PL-Q165, PL-P166 or PL-Q166, PL-P167 or PL-Q167, PL-P169 or PL-Q169, PL-P170 or PL-Q170, and PL-P171 or PL-Q171, the procedure for cutting and lacing the required cable wires is the same as for Plug PL-P172 or PL-Q172 except that only ¼ inch of wire insulation should be removed. Refer to Paragraph 7f(5).

Cable assembly drawings, Figures 20 to 26, inclusive, include information on bonding, shielding and size of conduit. A wire table on each drawing lists the wires to be used on every plug pin. Before the wires are laced together and run through the conduit, push back the shielding, cut off a portion of the inner conductor, and then stroke the shield of any shielded wire in the cable until the shield extends about one inch beyond the end of the wire. Without breaking any strands, separate the strands in the shield with a sharp tool, making an opening at a point about one inch from the end, and extrude the wire through this opening in the shield. Stroke the shield in the direction away from the end until about one inch of wire is exposed. After the wires are soldered to the sockets, the one inch of shield which extends from the opening to the end of the shield is to be clamped between the ferrule and cable fitting and then trimmed. This is to insure a good grounding connection. This procedure must be applied to all shielded wires included in every cable assembly.

In addition, if more than one shielded wire is used in a cable, the braids of all such wires must be bonded together with solder as shown in the cable assembly drawings.

Slip a ⅜-inch length of phenoflex tubing over the bare end of each wire,



WIRE TABLE

PIN Nº	COLOR CODE	SIZE Nº	DESCRIPTION	BENDIX DWG. Nº
1	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
2	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9

ALL DIMENSIONS IN INCHES.

NOTES:
1 - DO NOT ALLOW EXCESS SOLDER TO RUN INTO THE SMALL SOCKETS. DO NOT INSERT THE WIRE BEYOND THE ¼ INCH OF STRIPPED LENGTH. USE A ⅜ INCH LENGTH OF PHENOFLEX TUBING ON EACH SOLDERED JOINT.

2 - IF OPEN AIRPLANE WIRING IS USED, THE PLUGS SHOWN ABOVE WILL BE REQUIRED BUT THE FLEXIBLE CONDUIT WILL NOT. HOWEVER, THE WIRE WILL HAVE TO BE PROVIDED TO ESTABLISH THE CIRCUITS AS SHOWN.

3 - SEE NOTE "A" ON FIGURE 27.

NOTE FOR ORDERING:
APPROX. LENGTH OF WIRE REQUIRED IS EQUAL TO LENGTH OF CONDUIT PLUS 6.

FIGURE 20 — CABLE, JUNCTION BOX TO PRESS-TO-TRANSMIT CIRCUIT, ASSEMBLY DRAWING

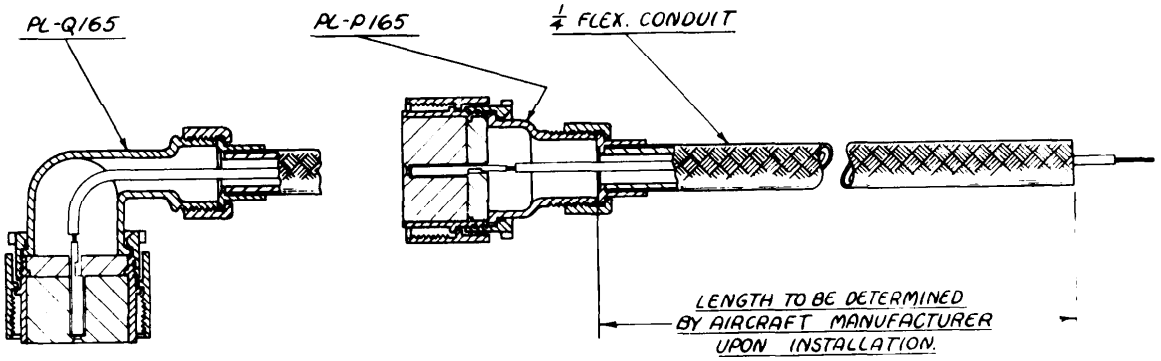
leaving the bare end exposed. After placing the necessary plug components on the cable in the correct order for reassembling to the plug body, solder each wire to the appropriate small tinned socket (metal insert). CAUTION: *Do not allow excess solder to run into the small sockets. Do not insert the wire beyond the ¼-inch of stripped length. Test the strength of each connection. Care must be taken not to burn the plug washer.*

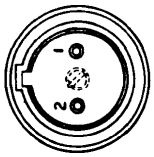
Many of the wires used in each cable are exactly alike; therefore, to make certain that each wire connects a given pin in one plug with the corresponding pin in another, all the connections must be electrically tested for correct continuity, using a dry-cell battery and a buzzer or ohmmeter.

After the wires are soldered to the small sockets, slip the phenoflex tubing over the sockets and ends of wires to insulate adjacent connections from each other. Reassemble the plugs and tighten the coupling nuts so that the wire braids and the cable conduits are securely fastened. If it is desired to remove a plug from a socket, it is sufficient merely to turn the locking ring counterclockwise. No pulling is required.

g. *Fuses*

No fuses are used in any component unit of the radio set. The total input current figures under operating conditions are given in Paragraph 4. The equipment will operate satisfactorily from an ungrounded power source, but a negative grounded power source





WIRE TABLE

PIN NO.	COLOR CODE	SIZE NO.	DESCRIPTION	BENDIX DWG. NO.
1	WHITE	22	BRAIDED GLASS COVERED WIRE	A 104386-9
2	WHITE	22	BRAIDED GLASS COVERED WIRE	A 104386-9

ALL DIMENSIONS IN INCHES.

NOTES:

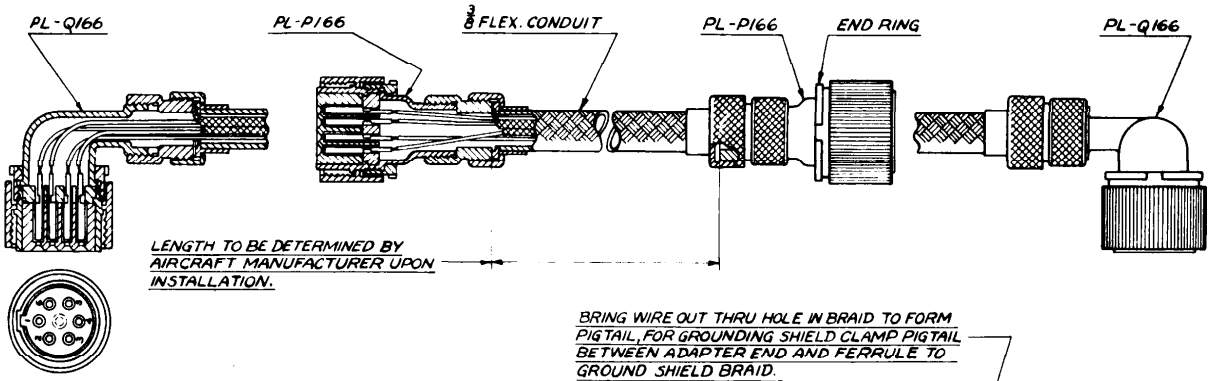
1-DO NOT ALLOW EXCESS SOLDER TO RUN INTO THE SMALL SOCKETS. DO NOT INSERT THE WIRE BEYOND THE ¼ INCH OF STRIPPED LENGTH. USE A 3/8 INCH LENGTH OF PHENOFLEX TUBING ON EACH SOLDERED JOINT.

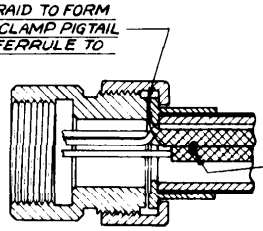
2-IF OPEN AIRPLANE WIRING IS USED, THE PLUGS SHOWN ABOVE WILL BE REQUIRED BUT THE FLEXIBLE CONDUIT WILL NOT. HOWEVER, THE WIRE WILL HAVE TO BE PROVIDED TO ESTABLISH THE CIRCUITS AS SHOWN.

3-SEE NOTES "B" & "C" ON FIGURE 27.

NOTE FOR ORDERING:
APPROX. LENGTH OF WIRE REQUIRED IS EQUAL TO LENGTH OF CONDUIT PLUS 6

FIGURE 21 — CABLE, JUNCTION BOX TO CONTACTOR, ASSEMBLY DRAWING





WIRE TABLE				
PIN Nº	COLOR CODE	SIZE Nº	DESCRIPTION	BENDIX DWG. Nº
1	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
2	WHITE	22	BRAIDED GLASS COVERED WIRE	C58418-1
6	WHITE, BLACK TR.	22	DUPLEX, SHIELDED	
3	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
4	WHITE	22	BRAIDED GLASS COVERED WIRE, SHIELDED	C58419-9
5	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9

ALL DIMENSIONS IN INCHES.

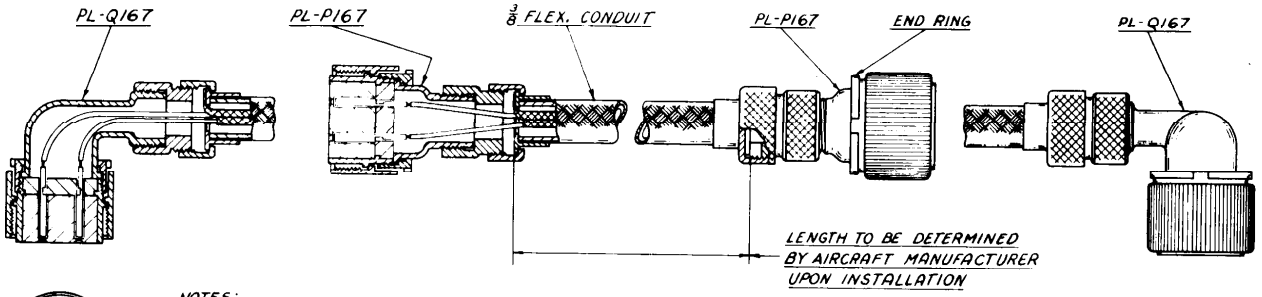
NOTES:

1- DO NOT ALLOW EXCESS SOLDER TO RUN INTO THE SMALL SOCKETS. DO NOT INSERT THE WIRE BEYOND THE 1/4 INCH OF STRIPPED LENGTH. USE A 3/8 INCH LENGTH OF PHENOFLEX TUBING ON EACH SOLDERED JOINT.

2- IF OPEN AIRPLANE WIRING IS USED, THE PLUGS SHOWN ABOVE WILL BE REQUIRED BUT THE FLEXIBLE CONDUIT WILL NOT. HOWEVER, THE WIRE WILL HAVE TO BE PROVIDED TO ESTABLISH THE CIRCUITS AS SHOWN.

NOTE FOR ORDERING:
APPROX. LENGTH OF WIRE REQUIRED IS EQUAL TO LENGTH OF CONDUIT PLUS 6

FIGURE 22 — CABLE, JUNCTION BOX TO JACK BOX BC-630-A, FIRST CREW, ASSEMBLY DRAWING



NOTES:

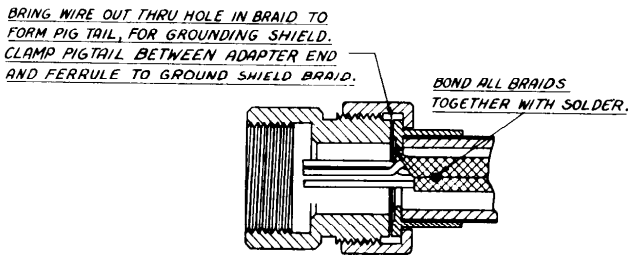
1- IF OPEN AIRPLANE WIRING IS USED, THE PLUGS SHOWN ABOVE WILL BE REQUIRED BUT THE FLEXIBLE CONDUIT WILL NOT. HOWEVER, THE WIRE WILL HAVE TO BE PROVIDED TO ESTABLISH THE CIRCUITS AS SHOWN.

2- DO NOT ALLOW EXCESS SOLDER TO RUN INTO THE SMALL SOCKETS. DO NOT INSERT THE WIRE BEYOND THE 1/4 INCH OF STRIPPED LENGTH. USE A 3/8 INCH LENGTH OF PHENOFLEX TUBING ON EACH SOLDERED JOINT.

WIRE TABLE				
PIN NO.	COLOR CODE	SIZE NO.	DESCRIPTION	BENDIX DWG. NO.
1	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
2	WHITE	22	BRAIDED GLASS COVERED WIRE	C58418-1
4	WHITE, BLACK TR.	22	DUPLEX. SHIELDED.	
3	WHITE	22	BRAIDED GLASS COVERED WIRE, SHIELDED	C58419-9

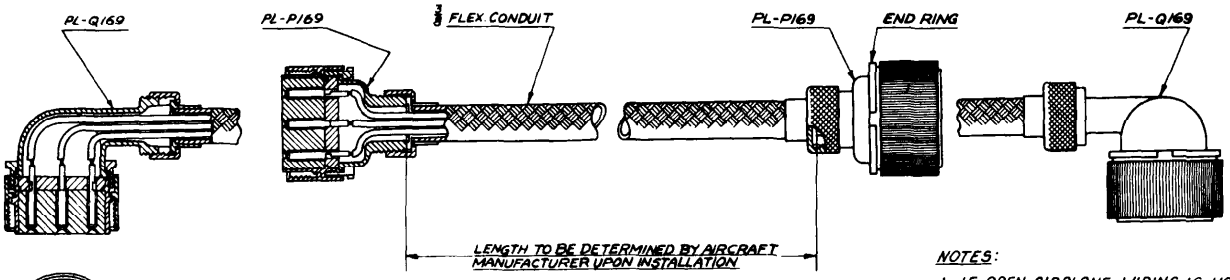
ALL DIMENSIONS IN INCHES.

NOTE FOR ORDERING:
APPROX. LENGTH OF WIRE REQUIRED IS EQUAL TO LENGTH OF CONDUIT PLUS 6.



METHOD OF GROUNDING SHIELD
SCALE 2"=1"

FIGURE 23 — CABLE, JUNCTION BOX TO JACK BOX BC-629-A (PILOT), ASSEMBLY DRAWING

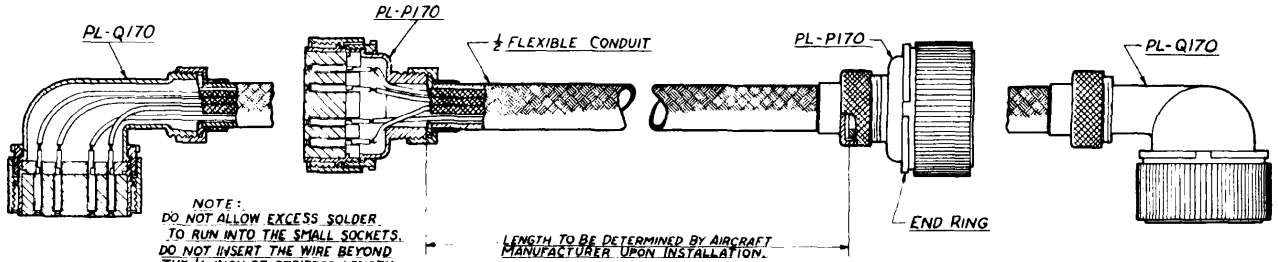


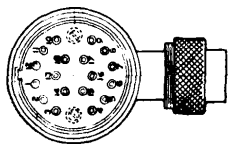
ALL DIMENSIONS IN INCHES.

WIRE TABLE				
PIN Nº	COLOR CODE	SIZE Nº	DESCRIPTION	BENDIX DWG. Nº
1	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
2	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
3	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
4	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
5	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
6	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
7	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
8	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
9	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
10	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
11	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9
12	WHITE	22	BRAIDED GLASS COVERED WIRE	A104386-9

NOTES:
1-IF OPEN AIRPLANE WIRING IS USED, THE PLUGS SHOWN ABOVE WILL BE REQUIRED BUT THE FLEXIBLE CONDUIT WILL NOT. HOWEVER, THE WIRE WILL HAVE TO BE PROVIDED TO ESTABLISH THE CIRCUITS AS SHOWN.
2-DO NOT ALLOW EXCESS SOLDER TO RUN INTO THE SMALL SOCKETS. DO NOT INSERT THE WIRE BEYOND THE ¼ INCH OF STRIPPED LENGTH. USE A ⅜ INCH LENGTH OF PHENOFLEX TUBING ON EACH SOLDERED JOINT.
3-FOR ORDERING APPROX. LENGTH OF WIRE REQUIRED IS EQUAL TO LENGTH OF CONDUIT PLUS 6.

FIGURE 24 — CABLE, JUNCTION BOX TO RADIO CONTROL BOX, ASSEMBLY DRAWING

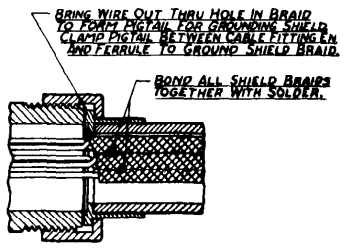




NOTE:
IF OPEN AIRPLANE WIRING IS USED, THE PLUGS SHOWN ABOVE WILL BE REQUIRED BUT THE FLEXIBLE CONDUIT WILL NOT. HOWEVER, THE WIRE WILL HAVE TO BE PROVIDED TO ESTABLISH THE CIRCUITS AS SHOWN.
FOR ORDERING: APPROX. LENGTH OF WIRE REQUIRED IS EQUAL TO LENGTH OF CONDUIT PLUS 6.

WIRE TABLE				
PIN NO.	COLOR CODE	SIZE NO.	DESCRIPTION	BENDIX DWG NO.
1	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9
2	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9
3	WHITE	22	BRAIDED GLASS COVERED WIRE SHIELD'D.	C58419-9
4	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9
5	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9
6	WHITE	22	BRAIDED GLASS COVERED WIRE DUPLEX, SHIELDED.	C58418-1
7	WHITE, BLACK TR.	22		
8	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9
9	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9
10	WHITE	22	BRAIDED GLASS COVERED WIRE DUPLEX, SHIELDED.	C58418-1
11	WHITE, BLACK TR.	22		
12	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9
13	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9
14	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9
15	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9
16	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9
17	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9
18	WHITE	22	BRAIDED GLASS COVERED WIRE.	A104386-9

ALL DIMENSIONS IN INCHES.



METHOD OF GROUNDING SHIELDS
SCALE: 2 • 1

FIGURE 25 — CABLE, JUNCTION BOX TO RACK, ASSEMBLY DRAWING

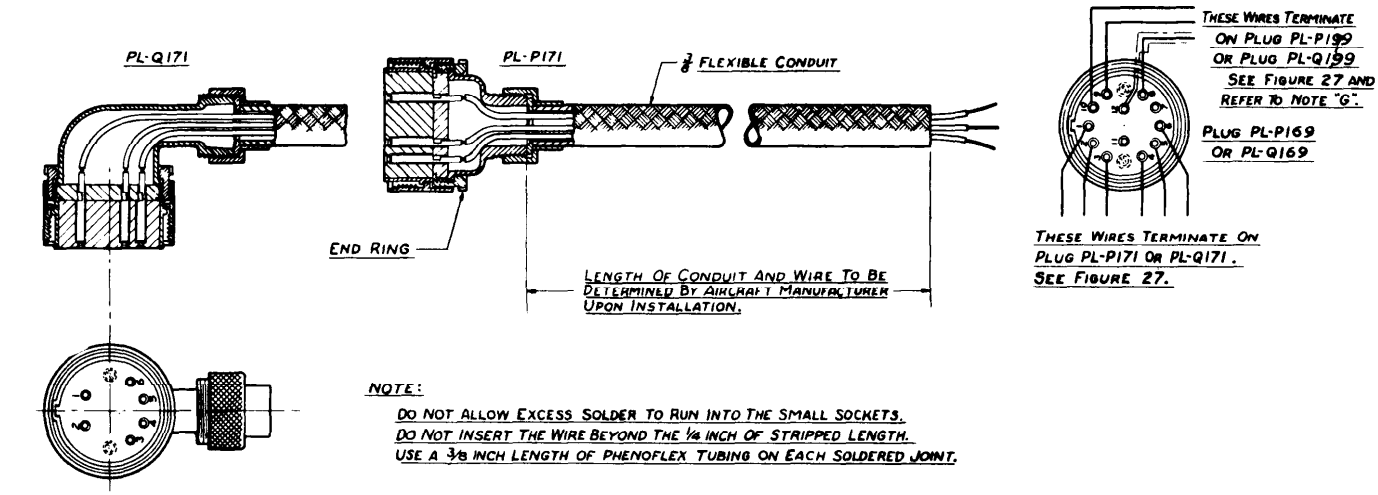
is preferable. If it is desired to fuse the aircraft primary power supply line to the set, a standard 40 amp. fuse is recommended for either the 14- or 28-volt power supply.

h. ***Connecting Jack Boxes BC-629-A or BC-629-B, BC-630-A and BC-631-A***

The schematic wiring diagram of the jack box and the purpose for which each terminal is to be used is etched on the inside of the jack box cover. This information simplifies the problem of connecting the microphone, telephone (headset) and gun switch (press-to-transmit) leads to the proper lugs in the jack boxes. The terminal lugs may be loosened and turned for soldering, if necessary, by loosening the appropriate screws on the terminal strip inside the jack box with an offset screwdriver. If this tool is not available, remove the terminal-strip mounting screws and remove the terminal strip. In British installations, the gun-switch terminals are press-to-transmit (press-to-talk) connections. In U. S. installations, a single wire connects pin No. 9 of Plug PL-P169 or PL-Q169 to one terminal of the press-to-transmit switch on the throttle, the other terminal of this switch being connected to ground. Note that this switch must be in the *closed* position for *transmission*. Consult the cording diagram, Figure 27, for information regarding the layout and distribution of cables for the entire radio set.

The AUDIO control of Jack Box BC-629-B may be locked in any desired position, as follows: Loosen the knob setscrews and remove the knob. Lift the locking-mechanism tab from the far hole and drop it into the near hole. Replace the knob, making certain that the knob slot engages the upright tab of the locking mechanism. Apply glyptal to, and tighten the setscrews. When this tab is in the far hole, the AUDIO control is unlocked and may be rotated at will.

After connecting the necesary cables and wires to the jack boxes, fasten the lacing on the cables and wires to the anchor loop on the bottom of the jack boxes. This should be done in a manner calculated to take up slack and relieve all electrical connections from mechanical strains.



PLUG PL-P171 OR PL-Q171 PIN NO.	WIRE TABLE COLOR CODE	SIZE NO.	DESCRIPTION	BENDIX DWG. NO.	PLUG PL-P169 OR PL-Q169 PIN NO.
1	WHITE	22	BRAIDED GLASS COVERED WIRE	A 104386-9	1
2	WHITE	22	BRAIDED GLASS COVERED WIRE	A 104386-9	2
3	WHITE	18	BRAIDED GLASS COVERED WIRE	A 104385-9	3
4	WHITE	18	BRAIDED GLASS COVERED WIRE	A 104385-9	4
5	WHITE	22	BRAIDED GLASS COVERED WIRE	A 104386-9	5
6	WHITE	22	BRAIDED GLASS COVERED WIRE	A 104386-9	6

ALL DIMENSIONS IN INCHES.

NOTE:
IF OPEN AIRPLANE WIRING IS USED, THE PLUGS SHOWN ABOVE WILL BE REQUIRED BUT THE FLEXIBLE CONDUIT WILL NOT. HOWEVER, THE WIRE WILL HAVE TO BE PROVIDED TO ESTABLISH THE CIRCUIT AS SHOWN.

FIGURE 26 — CABLE, DYNAMOTOR UNIT TO RACK, ASSEMBLY DRAWING

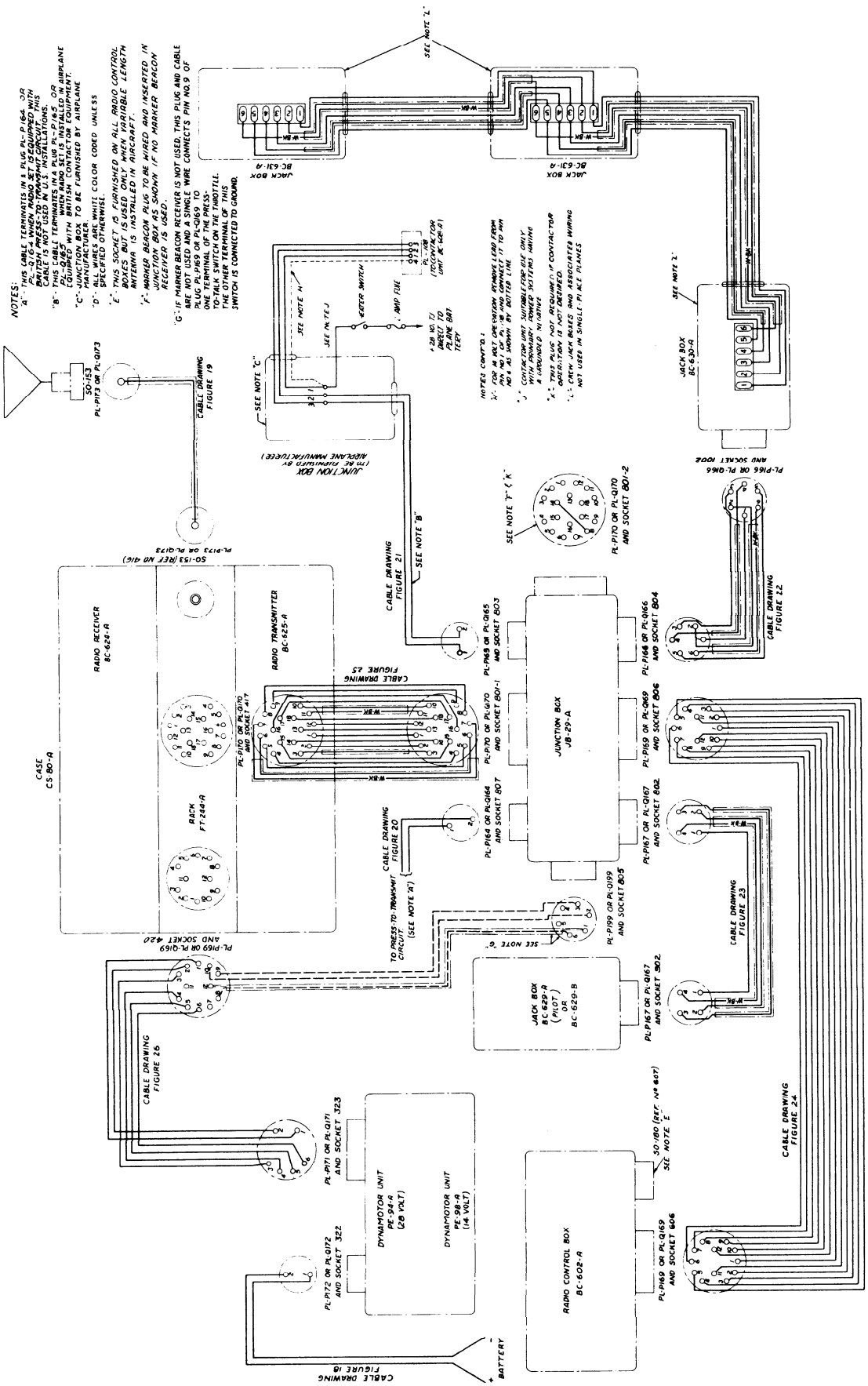
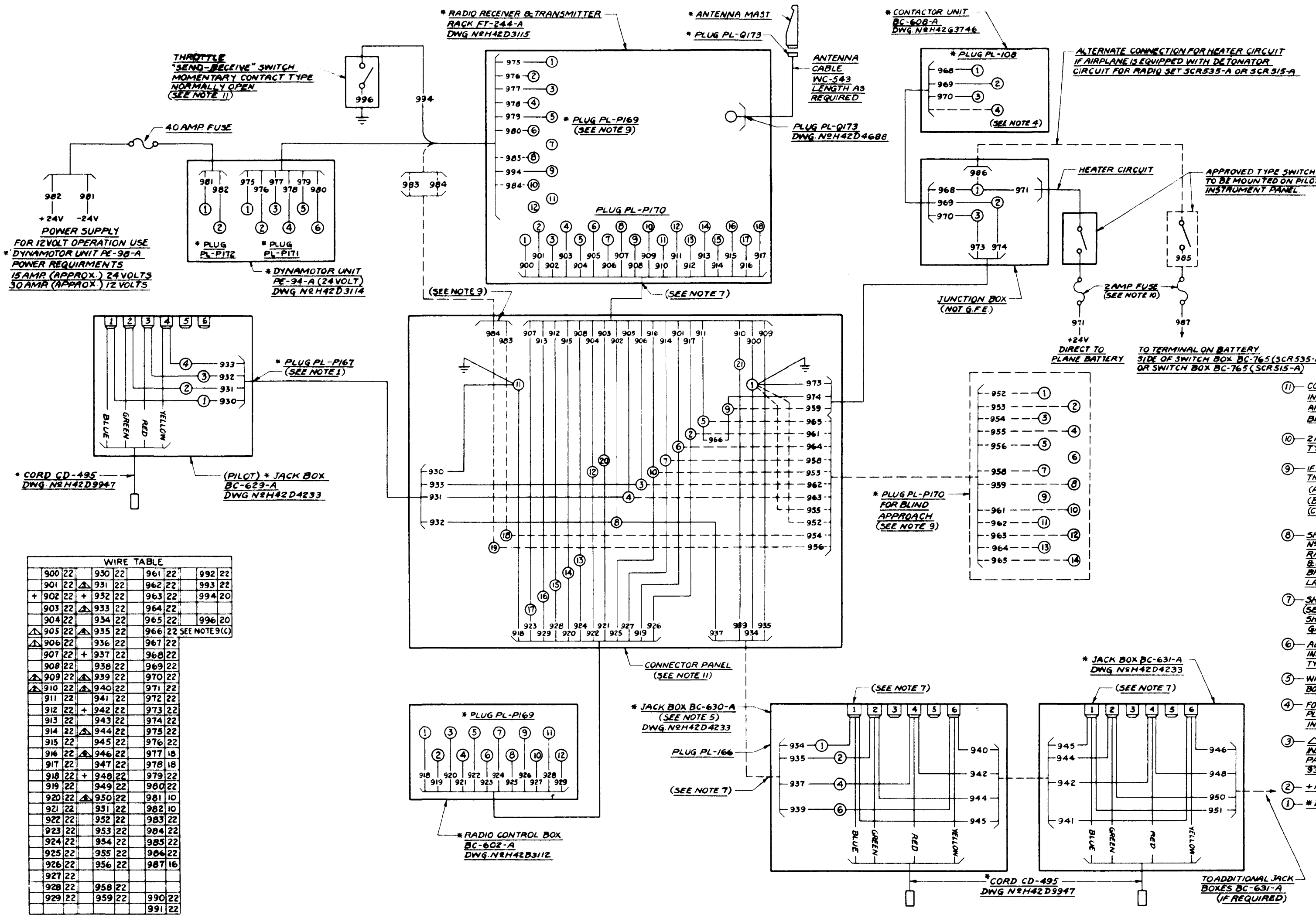


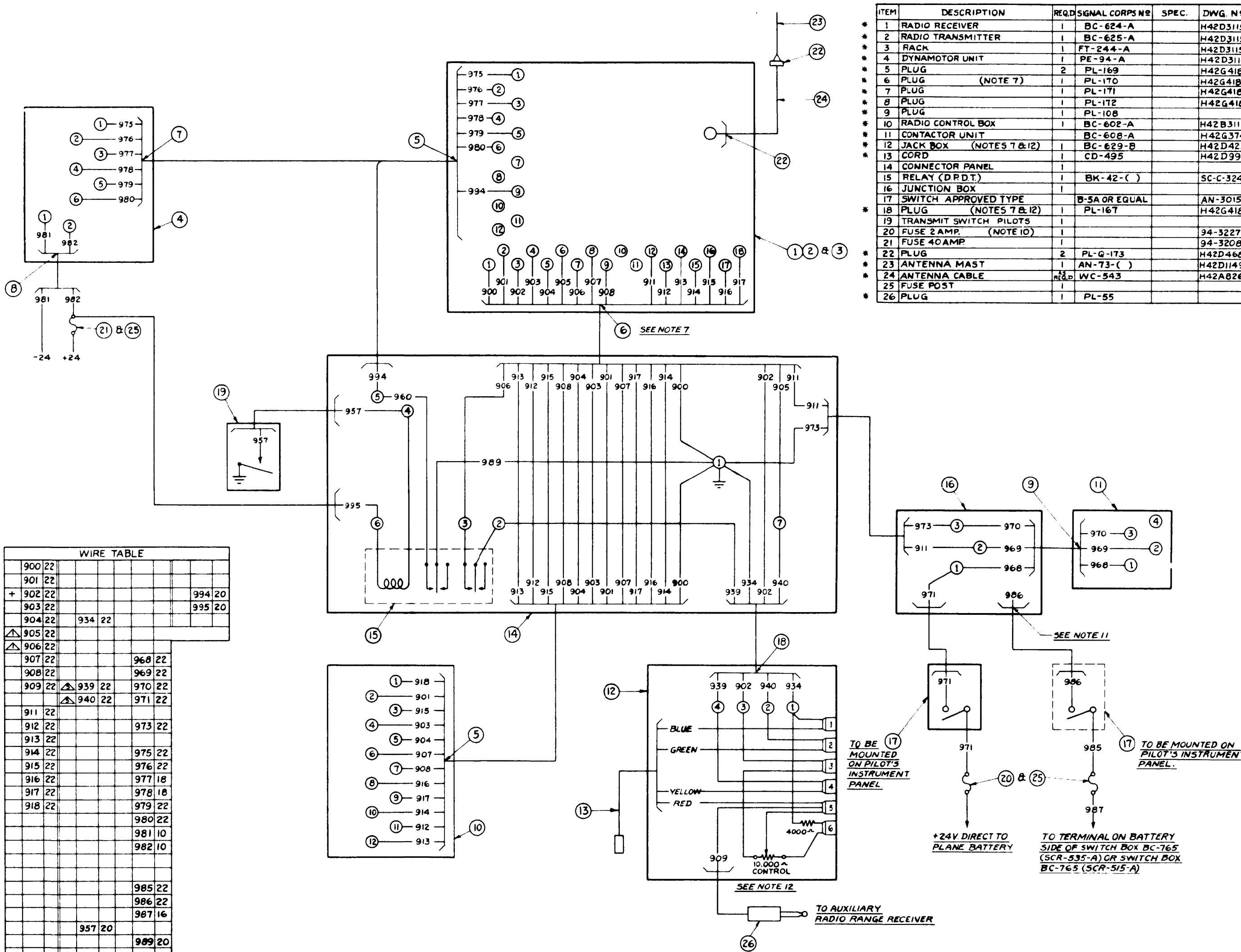
FIGURE 27 — RADIO SETS SCR-522-A AND SCR-542-A, CONDUIT AND CORDING DIAGRAM USING JUNCTION BOX JB-29-A



WIRE TABLE

	900	22		930	22		961	22		992	22
	901	22	△	931	22		962	22		993	22
+	902	22	+	932	22		963	22		994	20
	903	22	△	933	22		964	22			
	904	22		934	22		965	22		996	20
△	905	22	△	935	22		966	22	SEE NOTE 9(C)		
△	906	22		936	22		967	22			
	907	22	+	937	22		968	22			
	908	22		938	22		969	22			
△	909	22	△	939	22		970	22			
△	910	22	△	940	22		971	22			
	911	22		941	22		972	22			
	912	22	+	942	22		973	22			
	913	22		943	22		974	22			
	914	22	△	944	22		975	22			
	915	22		945	22		976	22			
	916	22	△	946	22		977	18			
	917	22		947	22		978	18			
	918	22	+	948	22		979	22			
	919	22		949	22		980	22			
	920	22	△	950	22		981	10			
	921	22		951	22		982	10			
	922	22		952	22		983	22			
	923	22		953	22		984	22			
	924	22		954	22		985	22			
	925	22		955	22		986	22			
	926	22		956	22		987	16			
	927	22									
	928	22		958	22						
	929	22		959	22		990	22			
							991	22			

FIGURE 28 — WIRING DIAGRAM, USING CONNECTOR PANEL IN PLACE OF JUNCTION BOX JB-29-A, FOR MULTI-PLACE AIRPLANES



ITEM	DESCRIPTION	REQ.D	SIGNAL CORPS Nº	SPEC.	DWG. Nº
* 1	RADIO RECEIVER	1	BC-624-A		H42D3115
* 2	RADIO TRANSMITTER	1	BC-625-A		H42D3115
* 3	RACK	1	FT-244-A		H42D3115
* 4	DYNAMOTOR UNIT	1	PE-94-A		H42D3114
* 5	PLUG	2	PL-169		H42G4184
* 6	PLUG (NOTE 7)	1	PL-170		H42G4184
* 7	PLUG	1	PL-171		H42G4184
* 8	PLUG	1	PL-172		H42G4184
* 9	PLUG	1	PL-108		
* 10	RADIO CONTROL BOX	1	BC-602-A		H42B3112
* 11	CONTACTOR UNIT		BC-608-A		H42G3746
* 12	JACK BOX (NOTES 7 & 12)	1	BC-629-B		H42D4233
* 13	CORD	1	CD-495		H42D9947
14	CONNECTOR PANEL	1			
15	RELAY (D.P.D.T.)	1	BK-42-( )		SC-C-324
16	JUNCTION BOX	1			
17	SWITCH APPROVED TYPE		B-5A OR EQUAL		AN-3015
* 18	PLUG (NOTES 7 & 12)	1	PL-167		H42G4184
19	TRANSMIT SWITCH PILOTS	1			
20	FUSE 2 AMP. (NOTE 10)	1			94-32271
21	FUSE 40 AMP.	1			94-32084
* 22	PLUG	2	PL-Q-173		H42D4688
* 23	ANTENNA MAST	1	AN-73-( )		H42D11490
* 24	ANTENNA CABLE	AS REQ.D	WC-543		H42A8261
25	FUSE POST	1			
* 26	PLUG	1	PL-55		

(12) JACK BOX BC-629-AM IS A JACK BOX BC-629-A THAT HAS BEEN MODIFIED TO CONFORM WITH AND USED AS A JACK BOX BC-629-B PLUG PL-167 SHALL BE USED, IF JACK BOX BC-629-A IS FURNISHED IT SHALL BE MODIFIED BY USE OF A KIT CONSISTING OF ONE (1) 10,000 OHM MANUAL VOLUME CONTROL, ONE (1) 4000 OHM FIXED RESISTOR, MOUNTING PARTS, AND KNOB MODIFY JACK BOX BC-629-A COVER FOR MOUNTING CONTROL AS SHOWN IN DRAWING H43D4233 AND MODIFIED JACK BOX SHALL BE MARKED BC-629-AM AT SOME FUTURE DATE JACK BOX BC-631-A MODIFIED TO A BC-631-AM (WIRED AS SHOWN ON THE PRESENT BC-629-AM OR B) OR BOX BC-631-B, WILL BE FURNISHED. JACK BOX BC-631-AM OR B SHALL BE WIRED DIRECT TO THE CONNECTOR PANEL; AND PLUG PL-167 WILL NOT BE USED.

(11) ALTERNATE CONNECTION FOR HEATER CIRCUIT IF AIRPLANE IS EQUIPPED WITH DETONATOR CIRCUIT FOR RADIO SET SCR-535-A OR RADIO SET SCR-515-A.

(10) 2 AMP. FUSE TO BE MOUNTED ADJACENT TO APPROVED TYPE SWITCH.

(8) SHIELDED TWISTED PAIR WIRES TO BE ROCKBESTOS, SAMPLE Nº A-3155, SIZE Nº 22, STRAND 7/30, TINNED COPPER CONDUCTOR RADIO HOOKUP WIRE, 2 CONDUCTOR TWISTED 6 VOLT PLIOFILM & WHITE FELTED ASBESTOS INSULATION, LACQUER FINISHED BRAID, ONE WHITE WITH BLACK STRIPER, TWISTED WITH $1\frac{1}{4}+\frac{1}{4}$ LAY & WITH TINNED COPPER SHIELD OVERALL, OR EQUAL

(7) SHIELDING ON WIRE TO BE CONNECTED TO GROUND TERMINAL IN CONNECTOR PANEL & TERMINAL Nº 1 IN PLUG, PL-170 & PL-167 SHIELDING ON WIRES BETWEEN JACK BOXES TO BE GROUNDED TO Nº 1 TERMINAL STRIP.

(6) ALL WIRES TO BE STRANDED TINNED COPPER, 600V. INSULATION. ROCKBESTOS GLASS INSULATED AIRCRAFT TYPE, OR EQUAL, UNLESS OTHERWISE NOTED.

(4) FOR 12 VOLT OPERATION CONNECT WIRE Nº 968 IN PLUG PL-108 CONTACTOR UNIT BC-608-A TO TERMINAL Nº 4 INSTEAD OF TERMINAL Nº 1

(3) △-INDICATES WIRES, SHIELDED, TWISTED PAIR, NUMBERS INSERTED IN TRIANGLES INDICATE WHICH WIRES TO BE PAIRED, E.G. △1 WIRE 905 SHOULD BE PAIRED WITH △1 WIRE 906.

(2) + INDICATES WIRES, SEPARATELY SHIELDED.

(1) * DESIGNATES GOVERNMENT FURNISHED EQUIPMENT.

WIRE TABLE

	900	22									
	901	22									
+	902	22								994	20
	903	22								995	20
	904	22		934	22						
△1	905	22									
△1	906	22									
	907	22					968	22			
	908	22					969	22			
	909	22	△5	939	22		970	22			
			△5	940	22		971	22			
	911	22									
	912	22					973	22			
	913	22									
	914	22					975	22			
	915	22					976	22			
	916	22					977	18			
	917	22					978	18			
	918	22					979	22			
							980	22			
							981	10			
							982	10			
							985	22			
							986	22			
							987	16			
				957	20						
							989	20			
				960	20						

FIGURE 29 — WIRING DIAGRAM, USING CONNECTOR PANEL IN PLACE OF JUNCTION BOX JB-29-A, FOR SINGLE-PLACE AIRPLANES

8. ASSEMBLING RADIO SET SCR-522-A OR SCR-542-A

With the desired crystals unpacked and installed in the crystal sockets located on the receiver and transmitter panels, place the transmitter-receiver assembly inside Case CS-80-A. Close the transmitter and receiver covers and connect all plugs to their corresponding sockets.

9. PREPARATION FOR USE

NOTICE:— DO NOT REMOVE THE TRANSMITTER OR RECEIVER FROM RACK FT-244-A PRIOR TO CONSULTING PARAGRAPH 21b. IT IS NOT NORMALLY NECESSARY TO REMOVE TRANSMITTER OR RECEIVER FROM RACK FOR TUNING.

If the transmitter and receiver fail to operate when a channel pushbutton is pressed on the radio control box, press another channel pushbutton then again press the pushbutton for the desired channel. Transmission and reception should now be possible.

Failure of the equipment to operate when the desired channel pushbutton is pressed the first time is due to the fact that the frequency shifter was in the released position for that channel when the pushbutton was pressed. That is, the channel had previously been selected, the release pushbutton 426 had been pressed once, and the equipment left in this condition. Any attempt to reselect this channel on the control box will result in starting the dynamotor unit without actuating the slides for this particular channel.

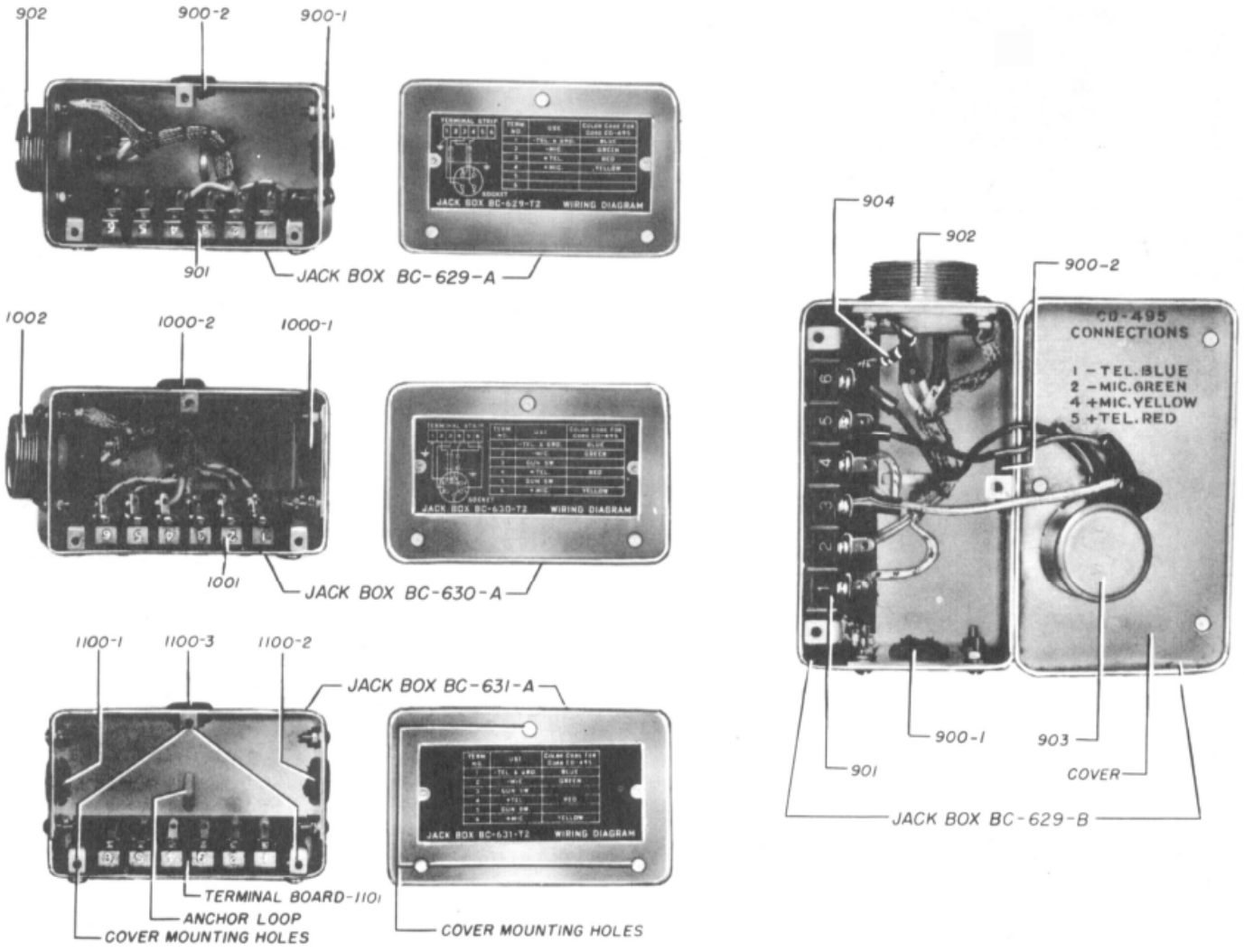


FIGURE 30 — JACK BOXES BC-629-A, BC-630-A AND BC-631-A, INTERIOR VIEW

a. ***Transmitter Channel Tuning***

(1) The following components of Test Equipment IE-19-A are required for transmitter tuning: Field Strength Meter I-95-A and Test Set I-139-A. The test set consists of a 0-1 ma d.c. milliammeter with a cord attached. Complete instructions for tuning the transmitter on the test bench are given in the Instruction Book for Operation and Maintenance of Test Equipment IE-12-A. In order to simplify test proeedure of Radio Set SCR-522-A by eliminating the necessity for control from the cockpit and substituting a means for control at the radio set, a cable harness may be prepared, permitting the use of a spare Control Box BC-602-A for this purpose. The method of preparation and employment of this equipment is as follows:

(a) Make up the cable harness in accordance with Figure 30A. Plugs PL-P169, PL-P170 and Jack JK-49, normally a part of organizational spares, may be employed for this purpose. If so employed, care must be taken to insure that their utility as spares is not impaired.

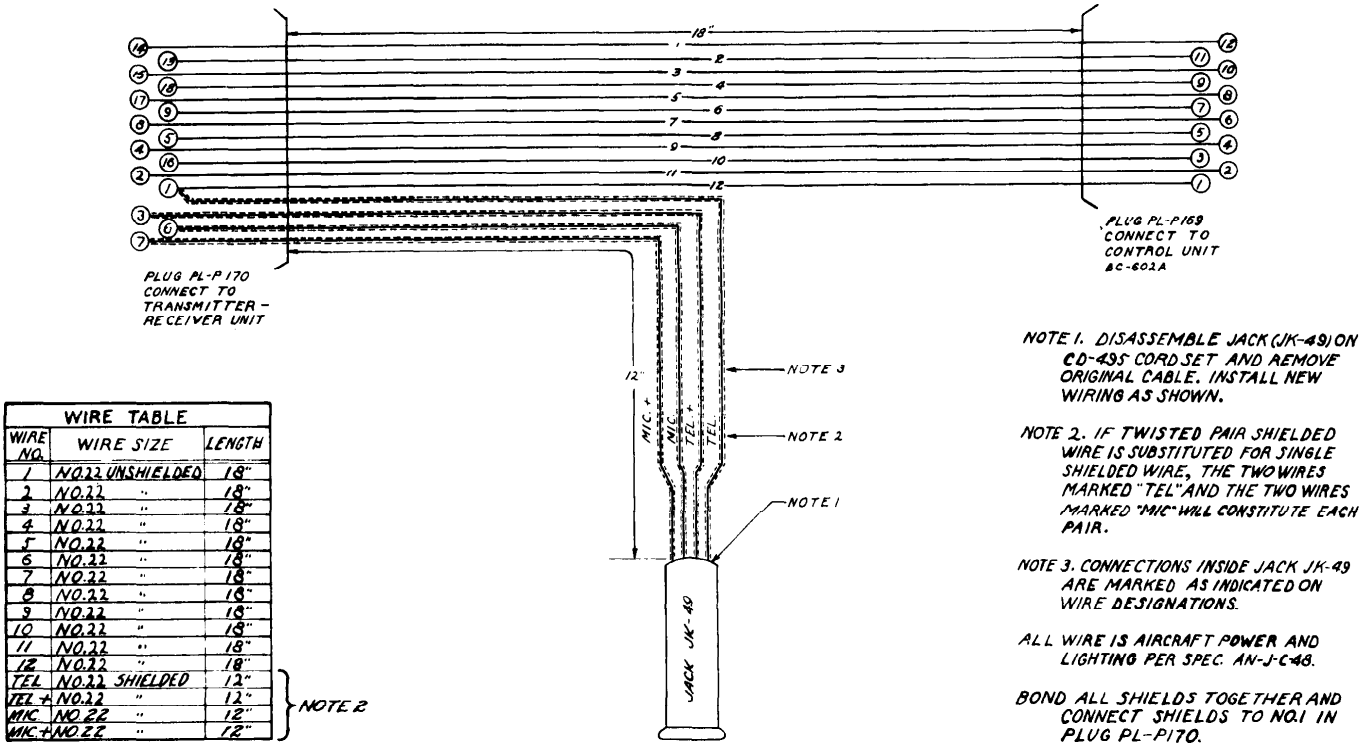
(b) Connect Control Box BC-602-A to the cable harness by means of Plug PL-P169 and connect this assembly by means of Plug PL-P170 to the Radio Set SCR-522-A being tested.

(c) When connected as indicated above, local control of channel switching, reception and transmission is possible. Jack JK-49 provides a means of connecting a microphone and headset.

(d) After use of this equipment and reconnection of cockpit controls, a test should be made to insure that cockpit controls function normally.

(e) In addition to the spares mentioned above, the following parts are required to make up one (1) test equipment:

(1) Fifteen feet of aircraft power and lighting cable No. 22 AWG, Army-Navy Aeronautical Specification No. AN-J-C-48.



WIRE TABLE

WIRE NO.	WIRE SIZE	LENGTH
1	NO.22 UNSHIELDED	18"
2	NO.22 "	18"
3	NO.22 "	18"
4	NO.22 "	18"
5	NO.22 "	18"
6	NO.22 "	18"
7	NO.22 "	18"
8	NO.22 "	18"
9	NO.22 "	18"
10	NO.22 "	18"
11	NO.22 "	18"
12	NO.22 "	18"
TEL	NO.22 SHIELDED	12"
TEL +	NO.22 "	12"
MIC	NO.22 "	12"
MIC +	NO.22 "	12"

NOTE 2

FIGURE 30A — WIRING HARNESS FOR PORTABLE TEST UNIT

(2) Four feet of aircraft power and lighting cable No. 22 AWG, Shielded, U. S. Army Specification No. 95-27273-G.

(2) When being tuned, Radio Transmitter BC-625-A must be inside Case CS-80-A with Radio Receiver BC-624-A connected. NOTE:—If the transmitter is tuned while removed from the case, the additional capacitances introduced by replacing the transmitter in the case will tend to upset the tuning adjustments. This is especially true in the case of the second harmonic amplifier plate circuit which is tuned by the third control from the left (see Figure 3).

(3) If the receiver and transmitter covers are closed, loosen the Dzus fasteners pinning them to the center cover. Raise the covers slightly and slide them away from the tuning controls as shown in Figure 3.

(4) The crystal chosen for any transmitter channel should have a rated fundamental frequency one-eighteenth of the desired final output frequency (fundamental frequencies appear on the crystal holders).

(5) With the airplane antenna plugged in, install crystals of the desired frequencies in the crystal sockets. Plug the test-set cord into the two-prong transmitter test-milliammeter socket 171 (see Figure 3).

(6) Turn the equipment on by pressing the channel pushbutton preceding the lowest frequency channel on the panel of Radio Control Box BC-602-A. The dynamotor unit should start and the frequency-shifter mechanism should operate, shifting the equipment to this channel. Release the frequency-shifter mechanism by pressing channel-release pushbutton 426 (or pressing motor 406 armature once). Refer to Figure 4. Loosen the four transmitter tuning-control locknuts slightly by turning them counterclockwise (see Figure 3). 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. Press the lowest frequency channel pushbutton on the radio control box and completely loosen all tuning control locknuts. Allow about one minute for the tubes to warm up (this can be observed by placing the transmitter METER SWITCH in position 3 and noting a rise of current in the test set). Throw the control box T-R-REM. switch to T.

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, 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 pushbutton is pressed, channels B and C will 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 pushbutton is in the depressed position, channel D can be selected without actuating the slides for any other channel.

(7) CAUTION:—*Avoid tuning to an undesired harmonic by making certain that all four tuning controls, when adjusted, indicate approximately the desired output frequency on the calibration plate.*

(8) Place the transmitter METER SWITCH in position 1 and adjust the oscillator plate tuning control (first tuning control at left, see Figure 3) for maximum reading of the test set. Repeat, using METER SWITCH positions 2 and 3 respectively and the second and third tuning controls respectively and in consecutive order.

(9) With the METER SWITCH in position 3, tune the *fourth* control for a test set dip. The test set reading must fall between 0.6 and 0.65.

(10) *Antenna Coupling*

CAUTION:—Extreme care must be taken when tightening the knurled thumbscrew which locks the antenna-coupling control. This nut must be securely tightened in order to preserve the correct adjustment. However, it is possible, by using a large screwdriver, to exert enough force to damage the coil-mounting parts. A medium sized screwdriver should be employed, with force just sufficient to insure adequate tightness.

(a) With the METER SWITCH in position 3, note the test milliammeter reading. The antenna-coupling control should be adjusted to obtain a reading of approximately 0.63. To increase the coupling, loosen the antenna coupling-control thumbscrew (see Figure 3), push it slightly toward the tuning controls, *retighten* it, and readjust the fourth tuning control for minimum current. To decrease the coupling, follow the same procedure but move the coupling control in the opposite direction, that is, away from the tuning controls. Repeat, retightening the thumbscrew, and readjusting the fourth tuning control until the correct meter reading is obtained. Do not consider a reading of more than 0.65 acceptable, since such an adjustment will result in early tube failure. Record the meter reading finally obtained for later reference.

(b) Following the adjustment of the antenna-coupling control on the channel having the lowest frequency, record the meter readings obtained on the other channels with the METER SWITCH in position 3 (for reference only) but do not make any further adjustments of the antenna-coupling control. These meter readings will normally become progressively lower in switching to a higher frequency channel. A meter reading as low as 0.50 on same channels is satisfactory. Adequate field strength will be obtained on all channels, providing the antenna-coupling adjustment on the lowest frequency channel is correctly made. NOTE:—*The antenna-coupling control must be adjusted after the radio set has been installed in the airplane and with the airplane antenna connected.*

(11) *Tuning of Remaining Channels*

To tune the next channel, press the corresponding pushbutton on the panel of Radio Control Box BC-602-A and completely loosen all tuning control locknuts. CAUTION:—Before depressing this pushbutton, hold the tuning controls with the fingers and tighten the locknuts just enough to exert a slight pressure on the campile-up. While doing this, make certain that the test set reading does not change. Follow the same tuning procedure outlined for the lowest frequency channel in Paragraphs 9a(7) to 9a(10), inclusive. After adjustment of tuning controls is completed, record the meter reading obtained on METER SWITCH position 3. Tune the remaining channels in like manner.

(12) With all channels tuned, press the channel - release pushbutton, then carefully tighten the tuning-control locknuts with the fingers. If necessary, additional tightening may be effected by a tool, but *avoid excessive tightening.* These locknuts must be fully tight or the tuning adjustments will not hold. Check the adjustments and determine if they are securely locked by switching to each channel several times, checking the meter readings on METER SWITCH position 3 against those recorded while making the tuning adjustments.

(13) With the tuning-control locknuts tightened and with the transmitter METER SWITCH in position 5, the meter reading for all channels should normally be full-scale or more. Any reading greater than half-scale is satisfactory. If this condition is not achieved for any channel, check the transmitter tubes.

Meter switch position 4 will give an indication of transmitter output. Do not use this switch position for tuning purposes. With the tuning control locknuts tightened, there is a positioning detent which makes it possible to turn the tuning control slightly, in either direction, against spring pressure. In some cases,

a large amount of torque is necessary to rotate the controls. With the transmitter METER SWITCH in position 4, all tuning controls on all channels can be checked by rotating them in both directions against the positioning detent and by noting a decrease in the meter reading as the tuning controls are rotated in either direction. If any appreciable increase in meter reading is noted for any particular tuning control for any channel, retune that particular channel in accordance with Paragraph 9a(16).

(14) Resonance of a secondary tuned circuit such as an antenna-matching device may be tested by a small neon bulb, a thermocouple milliammeter or a flashlight bulb, any one of which would indicate resonance in this circuit or a portion of it. Correct adjustment of the secondary circuit is indicated by an increase in brilliancy of either one of these above mentioned bulbs, or an increase in milliammeter current.

(15) After tuning has been completed, a sustained note in the microphone should result in modulation of the carrier. This can be checked by first tuning in the unmodulated carrier on Field Strength Meter I-95-A and then noting an increase in the peak reading of the RELATIVE FIELD STRENGTH milliammeter when the carrier is modulated. The same response may be observed on the Signal-Generator I-96-A DUMMY ANTENNA I milliammeter .

(16) If one channel is known to be out of adjustment, it may be tuned without disturbing other channels as follows:

(a) Press the channel-selector pushbutton (on the control box) corresponding to the channel *preceding* the desired channel in the sequence A, B, C, D. In other words, if retuning channel A, press pushbutton D; if retuning channel B, press pushbutton A, etc.

(b) Press the channel-release pushbutton (on the rack).

(c) Loosen all transmitter tuning-control locknuts, keeping slight pressure on the cam pile-up.

(d) Press the selector pushbutton corresponding to the desired channel and completely loosen all tuning control locknuts.

(e) Tune the desired channel [see Paragraphs 9a(7) to 9a(10)].

(f) Press the channel-release pushbutton.

(g) Tighten all transmitter tuning-control locknuts with the fingers. If a tool is used do not tighten locknuts excessively.

(h) Press the channel-release pushbutton to re-select the channel just tuned.

(i) Adjust the antenna-coupling control, if necessary [see Paragraph 9a(10)]. Check the meter reading on the lowest frequency channel. If this reading is approximately 0.63, no adjustment of the antenna coupling is necessary. If it is less than 0.60 or more than 0.65 readjust the coupling on this channel in accordance with the instructions in Paragraph 9a(10).

IMPORTANT: If the antenna-coupling control is readjusted, re-tune the fourth tuning control for minimum meter reading on METER SWITCH position 3 on all channels.

NOTE: Additional transmitter tuning adjustments to be made under conditions of normal operation are given in Paragraph 9a(17).

This completes the tuning of Radio Transmitter BC-625-A.

WARNING:—NEVER SHUT OFF THE EQUIPMENT WITH THE SHIFTER SLIDES DISENGAGED, AS THIS WILL RESULT IN FAILURE TO TURN ON THE TRANSMITTER AND RECEIVER IF ONE PARTICULAR CHANNEL PUSHBUTTON IS PRESSED ON RADIO CONTROL BOX BC-602-A.

Signal Generator I-96-A (part of Test Equipment IE-12-A) may also be used in transmitter tuning but is properly employed only in service depots, since this instrument is too large to be taken into an aircraft. The tuning procedure is essentially the same, the signal - generator D.C. METER replacing Test Set I-130-A.

(17) *GAIN Control Adjustment*

With any channel switched on, all channels tuned and the airplane engines running, adjust the GAIN control (see Figure 3) with a screwdriver for normal voice level under conditions of normal operation. A setting of one-half turn clockwise from the extreme counterclockwise position is usually satisfactory. Once made, this adjustment is good for all channels. With the airplane in normal flight, check the GAIN control setting by tuning in the transmitter on the ground or in another airplane. If the cockpit noise level is too high, the GAIN control should be turned slightly counterclockwise and the pilot should speak louder during transmission.

(18) *Significance of Milliammeter Readings*

In general, a meter reading greater than three - quarters full - scale with the METER SWITCH in any one of its positions indicates a defect in the equipment or improper adjustment. An exception to this generalization occurs when the METER SWITCH is in position 5, in which case some of the vacuum tubes used may cause a full-scale or even off-scale reading. This is a desirable condition. A simple method of remembering the approximate meter readings for various switch positions is suggested by the fact that for METER SWITCH positions 1, 2 and 3 respectively, the meter readings are respectively 4, 5 and 6. Although these figures are typical and desirable, the reading of 6 for switch position 3 cannot usually be retained for different frequency channels due to the variable load characteristic of the antenna. Therefore, the antenna - coupling inductor 122 should be adjusted for a load of approximately 0.63 (on the 0-1 ma d-c milliammeter scale) for the lowest frequency channel being used.

R-F diode current is measured with the METER SWITCH in position 4. This switch position is seldom used. The reading obtained is purely relative, equivalent to a neon-bulb indication of r-f voltage across the final amplifier tank inductor.

The meter reading obtained with the METER SWITCH in position 5 is another variable quantity. Transmitting tube data sheets describe grid "drive" or grid current as "approximate, subject to wide variations depending on the impedance of the load circuit." It is desirable that this current be as large as possible (even off-scale) but this is not possible with some of the tubes being used. The real test of satisfactory adjustment is whether or not "upward modulation" of the carrier results. This can easily be tested by means of Field Strength Meter I-95-A.

It is reasonable to assume that half-scale or higher D.C. METER reading with the METER SWITCH in position 5 is satisfactory although there are exceptions to this rule.

It should be noted that there is an "idle" or standing plate current resulting in a meter reading of approximately 0.4 when the METER SWITCH is in position 3 and the equipment is in the *receive* condition. This is normal and correct and indicates the existence of a load on the modulator at all times. If this current is abnormally high, an open or short circuit is indicated in the —150v bias supply from the dynamotor.

With the METER SWITCH in position 4, it should be noted that there is a small emission current in the r-f diode in the "standby" condition.

Position 6 is an "off" or open switch position.

The reading of Field Strength Meter I-95-A must be interpreted in a relative

sense only. 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 is then to be compared with a reading obtained from an installation known to be satisfactory.

b. *Receiver Channel Tuning*

If the transmitter and receiver fail to operate when a channel pushbutton is pressed on the radio control box, press another channel pushbutton, then again press the pushbutton for the desired channel. Transmission and reception should now be possible.

Failure of the equipment to operate when the desired channel pushbutton is pressed the first time is due to the fact that the frequency shifter was in the released position for that channel when the pushbutton was pressed. That is, the channel had previously been selected, release pushbutton 426 had been pressed once and the equipment left in this condition. Any attempt to reselect this channel on the control box will result in starting the dynamotor unit without actuating the slides for this particular channel.

(1) Test Equipment IE-19-A and a headset are required for receiver tuning. Complete instructions for tuning the receiver on the test bench are given in the Instruction Book for Operation and Maintenance of Test Equipment IE-12-A. If the receiver cover is shut, loosen the Dzus fasteners pinning it to the center cover, lift the receiver cover slightly and slide it away from the control panel.

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

Finding the correct receiver crystal for a particular receiver channel is therefore the same as finding the correct fundamental frequency (kc) of the crystal to be used. The fundamental crystal frequency (f) may be determined from the expression.

$$f = \frac{f_r - 12}{H} \times 1000$$

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

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

(3) *Adjustment of Signal Generator I-130-A (Using Crystal)*

(a) Insert a transmitter crystal into the CRYSTAL socket of Signal Generator I-130-A. This crystal should have a fundamental frequency one-eighteenth of the receiver frequency to be tuned. If no transmitter crystal is available, refer to Paragraphs 9b (6), 9b(7) and 9b(8).

(b) Connect Cord CD-477 to the signal-generator R.F. OUTPUT socket and to the antenna Socket SO-153 located on Rack FT-244-A. Connect Test Set I-139-A to the signal-generator METER socket.

(c) Plug the cable of Battery Box BX-33-A 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.

(d) Set the signal-generator M.O.-CRYSTAL switch at CRYSTAL.

(e) Place the OUTPUT CONTROL on MAX. (extreme clockwise position) and place the OUTPUT STEPS control on step 5.

(f) 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 small dip will be

observed in the test milliammeter (Test Set I-139-A). Adjust the MEGACYCLES dial control for an additional dip (approximately at the same dial setting as the receiver channel frequency being tuned).

(4) *Tuning Adjustments for Channel A (Using Crystal in Signal Generator)*

(a) Install the proper crystal in the socket for receiver channel A.

(b) Press channel D pushbutton of Radio Control Box BC-602-A [see note in Paragraph 9a(6)].

(c) Press the channel-release pushbutton 426 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 pushbutton of the radio control box and completely loosen all tuning control locknuts. After allowing about one minute for the receiver vacuum tubes to warm up, throw the radio control box T-R-REM. switch to R (center position).

(f) Turn the receiver r-f and oscillator tuning controls to the desired frequency on the calibration plate.

(g) Connect a suitable headset across terminals 1 and 3 of junction box socket 802 or audio output terminals on the jack boxes. Rotate the receiver AUDIO and RELAY controls to their maximum clockwise rotation positions.

(h) Starting from the extreme clockwise position, slowly turn the channel A oscillator plate-coil tuning screw counterclockwise so that about three to five threads of the screw protrude from the coil-mounting insert. The higher the crystal frequency the further the plate-coil screw must be backed out of the coil-mounting insert, thus obtaining the necessary inductance to permit the oscillator to start.

When the oscillator starts, a signal should be heard. If there is no audible signal, simultaneously adjust the receiver r-f and oscillator tuning controls slightly, and if necessary, turn the channel A oscillator plate-coil tuning screw still further counterclockwise until the signal is heard.

When the signal is heard, rotate the oscillator plate-coil tuning screw clockwise until the signal suddenly ceases, then rotate the screw counterclockwise to a position at least three-quarters of a turn past the point at which the signal again becomes audible (i.e., the position at which the oscillator starts). The additional three-quarters of a turn is required for a stable adjustment of the crystal oscillator. If the output is decreased appreciably by this extra rotation, continue turning the screw counterclockwise until the output is increased as much as possible. This adjustment should be rechecked after completing steps *(i)* and *(j)* below.

(i) Turn the signal-generator OUTPUT CONTROL to MINimum. Place the OUTPUT STEPS control in position 1 or 2 and then turn the OUTPUT CONTROL clockwise until the signal is just audible.

(j) Readjust the receiver tuning controls and the signal generator CRYSTAL TUNING control for maximum audio output. Rotate the OUTPUT CONTROL counterclockwise, if necessary, to keep the peaked output at low level in the headset. This may require repeated readjustments.

(k) If an output-power meter or an a-c voltmeter of suitable range is available, either one of these instruments would be helpful in making final tuning adjustments. Connect the meter in place of or in parallel with the headset. The load presented by either type of instrument should be adjusted for 4000 ohms if the yellow wire going to the receiver audio - output transformer 296 is connected to terminal No. 7, or 300 ohms if this

wire is connected to terminal No. 6. This output-meter load should be connected across terminals No. 1 and 3 of socket 802, or 1 and 4 of socket 804 of Junction Box JB-29-A.

Test Set I-139-A (part of Test Equipment IE-19-A) may be plugged into receiver socket 288 and the tuning procedure followed as before except that instead of tuning for maximum audio output, tune for a dip or minimum reading of the test set. The signal-generator output should be reduced to the lowest level at which it is possible to obtain an indication of change of current as the receiver tuning controls are adjusted.

(5) *Tuning of Remaining Channels (Using Crystal in Signal Generator)*

To adjust the remaining channels, press channel B pushbutton on Radio Control Box BC-602-A and completely loosen all tuning control locknuts. CAUTION:—Before depressing pushbutton B, hold the tuning controls with the fingers and tighten the locknuts just enough to exert a slight pressure on the cam pile-up. While doing this, make certain that the audio output level remains constant. Follow the same tuning procedure outlined for channel A in the paragraphs under 9b(4). *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, and 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 pushbutton and tighten the two receiver tuning-control locknuts by turning them *tightly* clockwise with the fingers. If using a tool do not tighten locknuts excessively. Recheck all channels for satisfactory receiver output.

(6) *Adjustment of Signal Generator I-130-A (Using Master Oscillator)*

The procedure for employing the signal-generator master oscillator is the same as the procedure for using the crystal oscillator except that the CRYSTAL TUNING control is not touched, the M.O.-CRYSTAL switch is set at M.O. and the signal generator is tuned by means of the MEGACYCLES dial control only. Allow about one minute for the tubes to warm up.

(7) *Tuning Adjustment for Channel A (Using Signal Generator Master Oscillator)*

NOTE:—The note in Paragraph 9a(6) applied equally well here.

(a) Press channel D pushbutton of Radio Control Box BC-602-A.

(b) Press channel-release pushbutton 426.

(c) Loosen the two receiver tuning-control locknuts by turning them counterclockwise. Tighten the locknuts just enough to exert a slight pressure on the cam pile-up.

(d) Press channel A pushbutton of the radio control box and completely loosen all tuning control locknuts. After allowing about one minute for the receiver vacuum tubes to warm up, throw the radio control box T-R-REM. switch to R (center position).

(e) Turn the receiver r-f and oscillator tuning controls to the desired frequency on the calibration plate.

(f) Using the alignment tool or a small screwdriver, turn the crystal oscillator plate-coil tuning screw for channel A to the position at which about 3 to 5 threads protrude from the coil-mounting insert. The higher the crystal frequency, the further the plate coil screw must be backed out of the coil-mounting insert, thus obtaining the necessary inductance to permit the oscillator to start.

(g) With a headset connected to junction box socket 802, terminals No. 1 and 3, or the audio output terminals in the jack boxes, place the signal-generator OUTPUT STEPS control on step 5 and set the OUTPUT CON-

TROL at MAX. (extreme clockwise position).

(h) Set the signal-generator MEGACYCLES dial control at the frequency being tuned and then adjust the receiver tuning controls until the modulated signal is heard in the headphones. This may require several readjustments.

(i) Turn the oscillator plate-coil tuning screw for channel A clockwise until the modulated signal suddenly ceases.

(j) Turn the crystal-oscillator plate-coil tuning screw counterclockwise until the signal is again heard. An additional three-quarters of a full turn in a counterclockwise direction is necessary for a stable adjustment of the crystal oscillator. If this results in reduced output, continue turning the screw counterclockwise until the output is increased as much as possible. Recheck after completing steps *(k)* and *(l)* below.

(k) Turn the signal-generator OUTPUT CONTROL to MINimum. Place the OUTPUT STEPS control in position 1 or 2 and then turn the OUTPUT CONTROL clockwise until the signal is just audible.

(l) Readjust the receiver tuning controls and the signal-generator MEGACYCLES dial control for maximum audio output. Rotate the OUTPUT CONTROL counterclockwise, if necessary, to keep the peaked output at a low level in the headset. The final setting of the receiver tuning controls should be near the calibrated settings for the desired frequency.

(8) *Tuning Adjustments for Remaining Channels (Using Signal-Generator Master Oscillator)*

To tune the remaining channels, press channel B pushbutton on Radio Control Box BC-602-A and completely loosen all tuning control locknuts. CAUTION:—Before depressing pushbutton B, hold the tuning controls with the fingers and tighten the locknuts just enough to exert a slight pressure on the cam pile-up. While doing this, make sure that the audio output level does not change. Follow the same tuning procedure outlined for channel A in Paragraphs 9b(6) and 9b(7). 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, and 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 pushbutton and tighten the two receiver tuning-control locknuts by turning them *tightly* clockwise with the fingers. If using a tool do not tighten locknuts excessively. Recheck all channels for satisfactory receiver output.

WARNING: — NEVER SHUT OFF THE EQUIPMENT WITH THE SHIFTER SLIDES DISENGAGED, AS THIS WILL RESULT IN FAILURE TO TURN ON THE TRANSMITTER AND RECEIVER IF ONE PARTICULAR CHANNEL PUSHBUTTON IS PRESSED ON RADIO CONTROL BOX BC-602-A.

This completes the tuning of the receiver with Test Equipment IE-19-A. However, if at any time it is necessary to tune one receiver channel only, the following procedure applies.

(9) *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 pushbutton (on Radio Control Box BC-602-A) corresponding to the channel *preceding* the desired channel in the sequence A, B, C, D. In other words, if retuning channel B, press pushbutton A; if retuning channel A, press pushbutton D, etc.

(b) Press the channel-release pushbutton.

(c) Loosen the receiver tuning - con-

trol locknuts, keeping a slight pressure on the cam pile-up.

(d) Press the channel-selector pushbutton for the desired channel and completely loosen all tuning control locknuts.

(e) Tune the desired channel [see Paragraphs 9b(1) to 9b(4), inclusive, or 9b(6) and 9b(7), depending on whether or not a crystal is used in the signal generator]. Ignore reference to channel A and substitute the applicable letter.

(f) Press the channel-release pushbutton.

(g) Tighten the receiver tuning - control locknuts with the fingers. If using a tool do not tighten locknuts excessively.

(h) Press the channel-release pushbutton to re-select the channel just tuned.

(i) Recheck all channels for satisfactory receiver output.

(10) *Receiver AUDIO Control Adjustment*

The receiver output transformer 296 is provided with three impedance taps: terminal No. 5, 50 ohms; No. 6, 300 ohms and No. 7, 4000 ohms. In some equipments, the output lead is connected to terminal No. 6 and in others to terminal No. 7. The exact setting of the AUDIO volume control (see Figure 3) depends on the headphones being used and the volume desired by the pilot. However, for standard low impedance Army phones, turn the AUDIO control fully clockwise when transformer terminal No. 6 is used and about one third of a turn counterclockwise from the extreme clockwise position when terminal No. 7 is used. This setting is only approximate and the pilot should be contacted and the volume increased or decreased as desired. If Jack Box BC-629-B is used, set the receiver AUDIO control in the extreme clockwise position and adjust the volume by means of the jack box AUDIO control. If the pilot desires more volume and the audio output is connected to terminal No. 6, transfer the output connection to terminal No. 7.

(11) *Receiver RELAY Control Adjustment*

This is the last adjustment to be made on the receiver and it should be done with the antenna connected, the equipment operating on any tuned channel and no signal being received. First rotate the RELAY control (see Figure 3) to the extreme clockwise position and then turn it slowly counterclockwise until a noticeable drop in noise results (approximately 20 db) and continue the counterclockwise rotation for a very small fraction of a turn. This adjustment can normally be made without having the engines running. However, if the adjustment has been checked and the pilot still complains of excessive noise in the phones at all times, adjust the RELAY control while the engines are running but omit the above-mentioned small fraction of a turn.

10. OPERATION

a. *Pre-Flight Tests*

Prior to take-off of aircraft, make certain that all plugs and cable leads are properly connected and that the AUDIO, RELAY, and GAIN controls are properly adjusted.

To insure that the airplane's storage battery will not be excessively drained, it is essential that the use of the radio set on the ground prior to take-off be reduced to the shortest possible time.

b. *Normal Operation*

NOTE:—All operating controls referred to in this paragraph, with the exception of the press-to-transmit switch, are located on the panel of Radio Control Box BC-602-A. The microphone switch should be closed. Before attempting to operate the radio control box, read the general description in Paragraph 5c.

(1) *Transmission*

(a) To start the equipment, press pushbutton A, B, C or D, depending on which channel is to be used.

(b) Allow approximately one minute for the vacuum tubes to warm up.

(c) Place the T-R-REM. switch in T position.

(d) Speak into the microphone.

(2) *Reception*

(a) Place the T-R-REM. switch in R position.

(b) To start the equipment, press pushbutton A, B, C or D.

(3) *Press-to-Transmit (press-to-talk) Operation*

(a) Place the T-R-REM. switch in REM. position.

(b) To start the equipment: Press pushbutton A, B, C or D.

(c) To receive: Under these conditions the receiver is normally in operation.

(d) To transmit: Depress the press-to-transmit switch and speak into the microphone. *Note that this switch must be closed for transmission.*

(e) To receive again: Release the press-to-transmit switch.

c. *Stopping the Equipment*

To stop the equipment, press the OFF pushbutton.

WARNING:—NEVER SHUT OFF THE EQUIPMENT WITH THE SHIFTER SLIDES DISENGAGED, AS THIS WILL RESULT IN FAILURE TO TURN ON THE TRANSMITTER AND RECEIVER IF ONE PARTICULAR CHANNEL PUSHBUTTON IS PRESSED ON RADIO CONTROL BOX BC-602-A.

11. PRECAUTIONS DURING OPERATION

If the transmitter and receiver fail to operate when a channel pushbutton is pressed on the radio control box, press another channel pushbutton, then again press the pushbutton for the desired channel. Transmission and reception should now be possible.

Failure of the equipment to operate when the desired channel pushbutton is pressed the first time is due to the fact that the frequency shifter was in the released position for that channel when the pushbutton was pressed. That is, the channel had previously been selected release pushbutton 426 had been pressed once and the equipment left in this condition. Any attempt to reselect this channel on the control box will result in starting the dynamotor unit without actuating the slides for this particular channel.

The equipment is designed to operate satisfactorily in the temperature range from —50° C to +50° C and a small percentage of all equipments manufactured have, as a type test, been subjected to 95% to 100% humidity with the temperature held at +50° Centigrade for a period of 24 hours and then checked for satisfactory operational characteristics. If the equipment has been turned off and standing idle for long periods under conditions of extreme humidity it may take several minutes of warm-up before optimum operation is possible. Under prolonged conditions of extreme humidity, inspect the brush holders in the dynamotor unit not less than once a week to make certain that no corrosion has set in. Corrosion will cause brushes to stick in the brush holders.

Line-of-sight communication is normally necessary for satisfactory performance of the radio set; therefore, when aircraft are flying in formation, any metal object between the transmitting and receiving antennae, such as a belly tank or propeller, may make communication difficult or impossible due to low signal strength or garbled reception. This is the result not of faulty operation but of the characteristics of radio waves at the frequencies used.

The following table lists the approximate range to be expected, assuming that communication is taking place between an aircraft and ground station over level country.

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

12. ADJUSTMENTS FOR FIELD UPKEEP

If vacuum tubes or indicator lamps have to be replaced, refer to Paragraphs 21d, e, f or 27b respectively. Repairs of a more serious nature should be made at repair depots by qualified personnel.

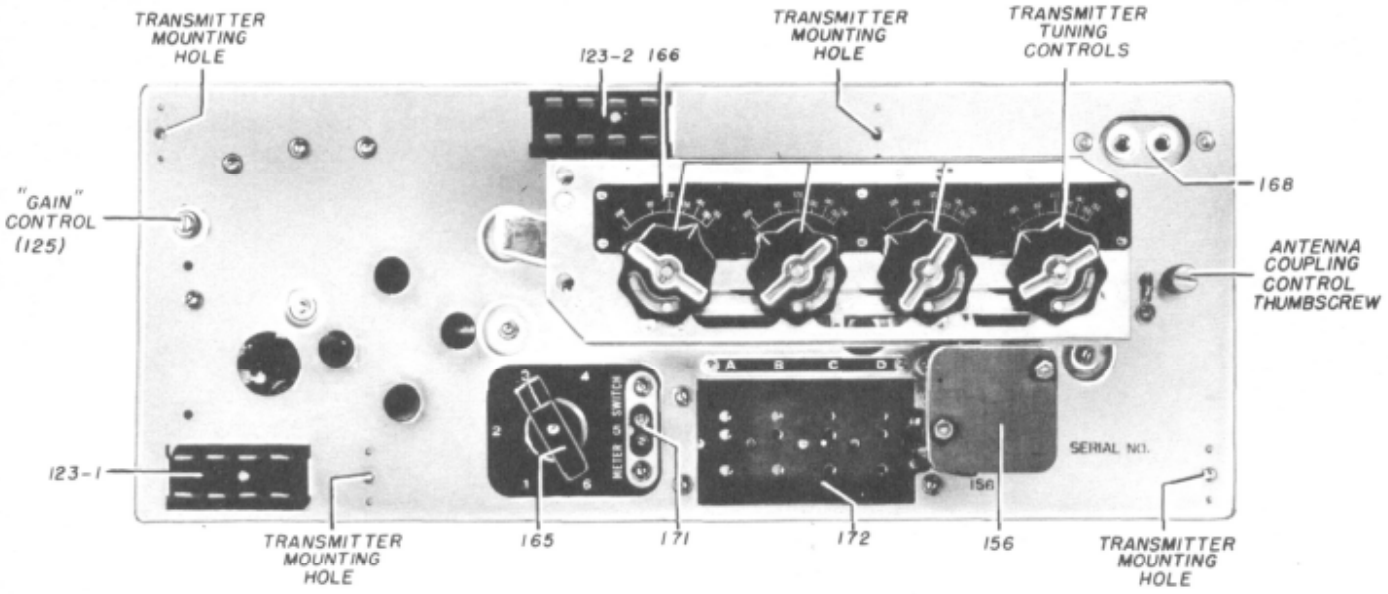


FIGURE 31 — RADIO TRANSMITTER BC-625-A, TOP VIEW

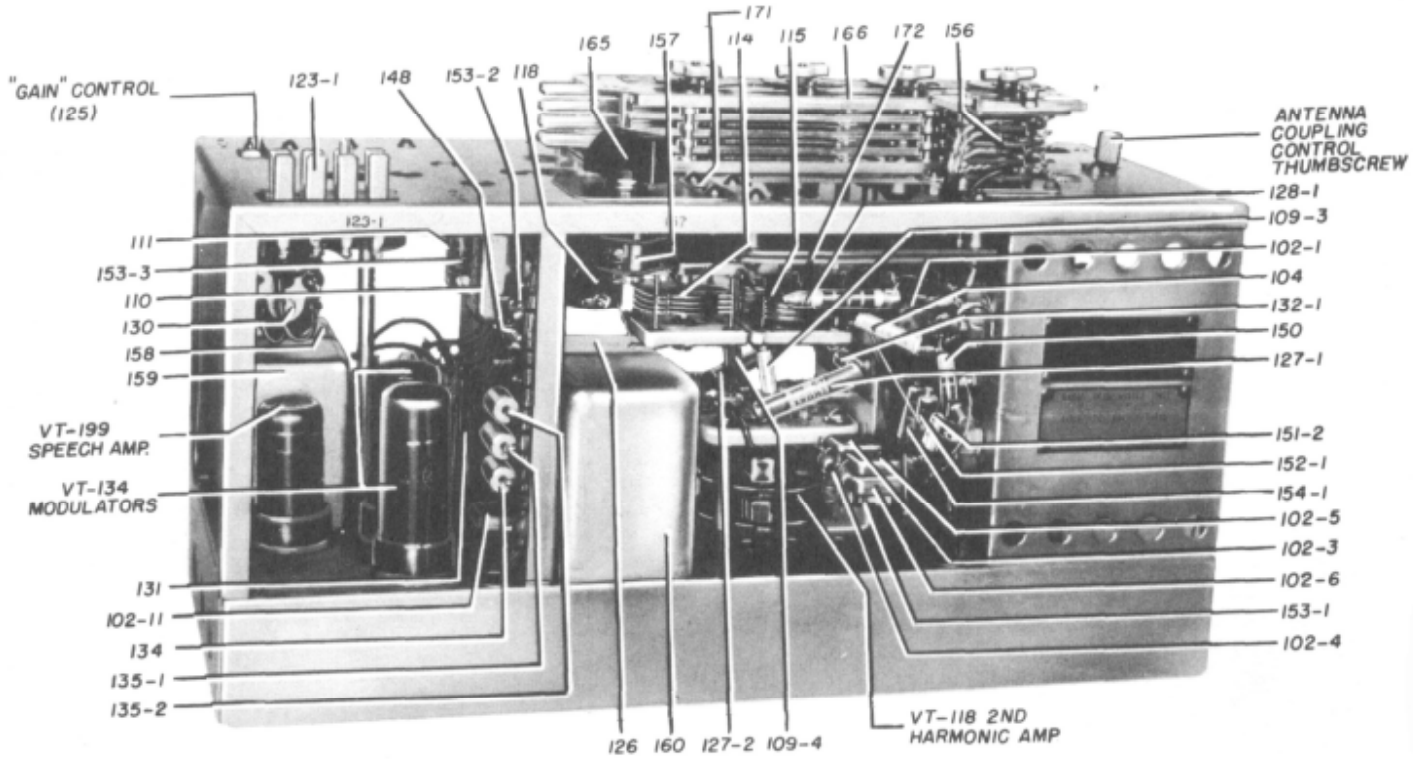


FIGURE 32 — RADIO TRANSMITTER BC-625-A, FRONT VIEW

SECTION III

FUNCTIONING OF PARTS

13. RADIO TRANSMITTER BC-625-A

a. *General*

Radio Transmitter BC-625-A employs a crystal-controlled oscillator circuit (refer to Figure 71), the plate circuit of which is tuned to the crystal's second harmonic. Two tripler stages follow the oscillator and precede the final amplifier, thus making the final output frequency greater than the crystal fundamental by a factor of 18. The final output stage is modulated by a push-pull modulator driven by a pentode voice amplifier. The transmitter operates on any 4 crystal-controlled channels lying within the frequency range 100-156 mc. Channels are selected by remote control only.

When a channel-control pushbutton is pressed on Radio Control Box BC-602-A, the dynamotor unit draws primary power and applies voltage to the transmitter vacuum tubes. The channel-control ratchet motor 406 located on Rack FT-244-A actuates a frequency-shifter slide which automatically selects the correct channel crystal and tunes the transmitter circuits to the desired frequencies. The crystal is chosen as the slide closes the appropriate section A, B, C or D of crystal switch 156. The transmitter circuits are tuned by means of a cam-and-shaft arrangement which enables the slide to adjust the crystal oscillator, the first and second harmonic amplifier, and the power amplifier plate - capacitors to a predetermined frequency setting.

b. *Oscillator*

The oscillator Tube VT-198-A is connected in a modified Pierce circuit in which the tank circuit is provided by the crystal constants. Oscillations will occur at the crystal fundamental regardless of the frequency to which the oscillator plate circuit is tuned. The tuned plate circuit comprises inductor 118 and variable capacitor 114 and is adjusted to resonate at the crystal's second harmonic. The Plate of oscillator Tube VT-198-A is electron-coupled to the oscillatory circuit comprising the control grid, the cathode, and the screen. Grid bias is supplied by resistor 151-1. The oscillations are sustained by the impedance in the cathode circuit consisting of inductor 128-2 and bypass capacitor 103. Capacitor 102-1 couples the screen to the cathode, and capacitor 101 supplements the control-grid-to-screen capacitance. The screen is biased by resistor 152-1.

c. *First Harmonic Amplifier*

The oscillator output is coupled to the first harmonic-amplifier Tube VT-134 by coupling capacitor 104 and the parasitic - suppressing resistor 150. The plate circuit of Tube VT-134 consists of variable capacitor 115 and the tapped inductor 119 and is tuned to the crystal's sixth harmonic. The output frequency of this stage is the third multiple of the oscillator output. The d-c plate voltage is applied at the tap of inductor 119. The voltages appearing at the termini of this inductor are in correct phase for alternately exciting the grids of the push-pull second harmonic-amplifier Tube VT-118.

d. *Second Harmonic Amplifier*

The output of the first harmonic amplifier is coupled to the grids of the second harmonic - amplifier through coupling capacitors 109-3 and 109-4. The rectified d-c grid current develops grid-bias voltage across r-f chokes 127-1 and 127-2 and resistors 132-1 and 132-2. R-F currents pass-

ing through these chokes are bypassed to ground by capacitors 102-8 and 102-9. The tank circuit consists of variable capacitor 116 and inductor 120 and is tuned to the third multiple of the first harmonic - amplifier output frequency, or the 18th multiple of the crystal fundamental. The d-c plate voltage is applied at the center tap of inductor 120. The voltages appearing at the termini of inductor 120 are in correct phase for alternately driving the grids of the push-pull power-amplifier Tube VT-118.

e. *Power Amplifier*

The output of the second harmonic - amplifier is coupled to the grids of the power amplifier through coupling capacitors 109-1 and 109-2. The power-amplifier input circuit resembles that of the second harmonic-amplifier except for the absence of the grid-bias resistors. The output circuit consists of variable capacitors 117 and the center-tapped inductor 121 and is tuned to the same frequency as the second harmonic-amplifier, namely, the 18th multiple of the crystal fundamental. D-C plate voltage is applied at the center tap of inductor 121, this arrangement serving to balance the push-pull output circuit. Coupling inductor 122 lies between the two sections of inductor 121. The degree of coupling between the power-amplifier output circuit and the antenna may be varied by moving inductor 122 by means of the antenna-coupling control (see Figure 35).

f. *Speech Amplifier*

The audio input originates from the microphone terminals of Jack Box BC-629-A, passes through the junction box and rack and enters the transmitter through terminals 1 and 2 of plug 123-1. The a-f input is then impressed on terminals 1 and 3 of the primary of input transformer 158. The secondary of this transformer is connected to a bridge cicuit comprising resistors 141-1, 141-2, 141-3 and 141-4. This circuit is so balanced as to allow voltages from the secondary of the audio-input transformer to excite the grid of the speech-amplifier. Tube VT-199 while at the same time preventing a-f voltages from the receiver or Jack Box BC-630-A (Crew) from also exciting the speech-amplifier grid (see Para-

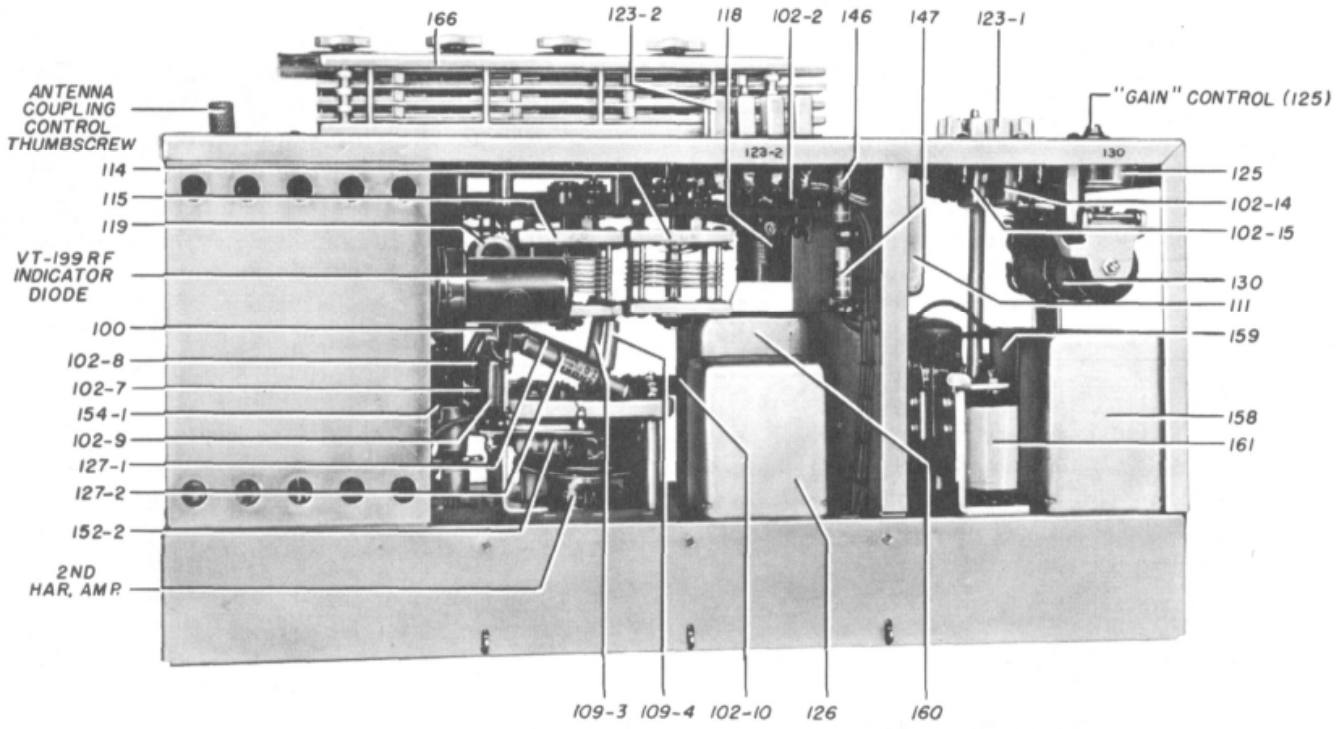


FIGURE 33 — RADIO TRANSMITTER BC-625-A, REAR VIEW

graph 14k for a more complete discussion). Potentiometer 125 serves as a GAIN control for transmitter modulation only. Tube VT-199 is cathode-biased by resistor 153-3 which is bypassed for audio frequencies by capacitor 110. Grid resistor 153-4 and cathode choke 162 block r-f energy from the sensitive speech amplifier. The plate is fed through audio choke 126 and is coupled to the primary of the interstage transformer 159 by capacitor 113. The frequency response is held to desirable values by plate-loading resistor 144 connected across the primary of transformer 159.

g. *Modulator*

The secondary of the interstage transformer 159 is connected to the grids of the push-pull modulator Tubes VT-134. Grid-bias voltage from the bias dividers 145, 152-3 and 152-4 is applied through the centertap terminal (No. 4) of the transformer secondary. Capacitor 109-5 is connected in parallel with the modulator grids and terminals 3 and 5 of the transformer 159 secondary and serves to reduce the high-frequency response and suppress oscillations in the modulator circuit. D-C plate voltage is applied through the centertap terminal (No. 2) of the primary of the modulator transformer 160. D-C screen voltage is obtained through terminal No. 2 of transformer 160 and dropping resistor 154-2. The audio voltage across the secondary terminals of transformer 160 modulates the plate input of power-amplifier Tube VT-118.

When the normally-open contactor relay 131 is energized, the output of the modulators is fed back to the speech-amplifier input circuit through resistors 140-2, 140-3, 140-4 and capacitor 108-2, thus producing audio oscillations of approximately 1000 cps, the frequency depending chiefly on the rate at which capacitor 105-3 discharges through resistor 142. This audio-frequency energy modulates the plate input of power-amplifier Tube VT-118 through modulator transformer 160.

h. *Contactor Circuit*

When the contactor switch is closed, contactor relay 131 is energized, and the slow-

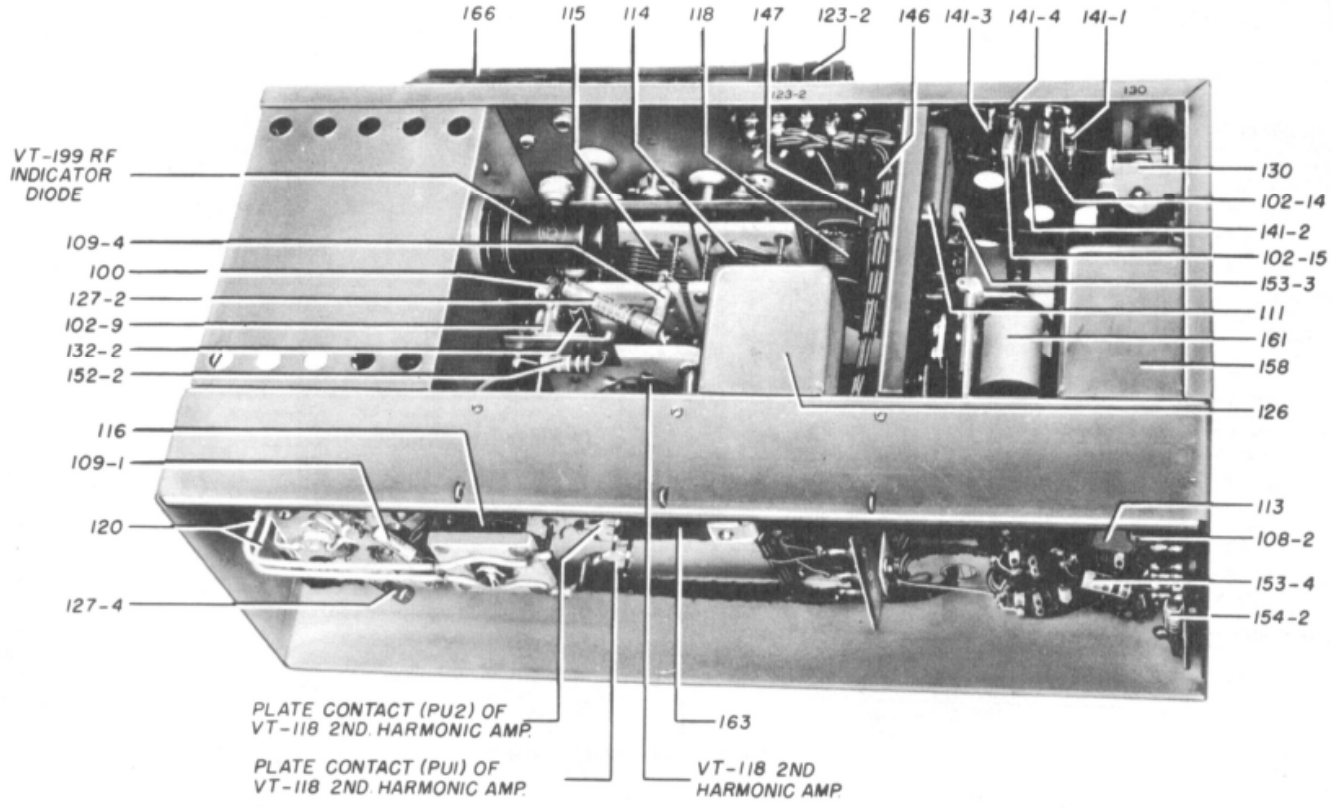


FIGURE 34 — RADIO TRANSMITTER BC-625-A, BOTTOM OBLIQUE VIEW

release relay 130 contacts remain unaffected for approximately 0.2 of a second. During this time a modulated c-w emission takes place on the transmitter channel which happens to be in use. Then relay 130 contacts are released, the radio set automatically shifts to channel D and the same m-c-w signal is emitted on channel D as long as the contactor switch remains closed. When the contactor switch is opened, the tone-modulated signal ceases and the radio set automatically shifts back to the channel which was in use before the m-c-w transmissions began. Contactor operation, as described above, occurs automatically at definite intervals and takes precedence over all other functions of the equipment.

i. *Meter Shunt Circuits*

The 6-position two-section METER SWITCH 157 is connected to a network of shunts [see Paragraph 5a (3)] which are listed here together with the currents they aid in measuring: shunt 134 for first harmonic-amplifier plate current, 135-1 for second harmonic-amplifier plate current and 148 for power-amplifier grid current. Switch position 6 is not used. The control grid, the screen, and the suppressor grid of the r-f indicator tube are connected together to form the diode plate which terminates through load resistor 154-3 and bypass capacitor 105-2, and the plate in turn is capacitively coupled to the power-amplifier tank circuit. The test milliammeter, when connected across shunt 153-2, measures the plate-to-cathode rectified current in the r-f indicator diode, and since the amplitude of the diode current depends on the r-f voltage developed in the power-amplifier plate circuit, the test milliammeter will indicate tuning of the power-amplifier plate.

14. RADIO RECEIVER BC-624-A

a. *General*

Radio receiver BC-624-A is a superheterodyne receiver (see Figure 71) which operates in the frequency range 100-156 mc on any of four pre-set crystal-controlled channels. The intermediate frequency is 12 mc. Channels are selected by remote control only. For a general description of the receiver refer to Paragraph 5a(4).

When a channel-control pushbutton is pressed on Radio Control Box BC-602-A,

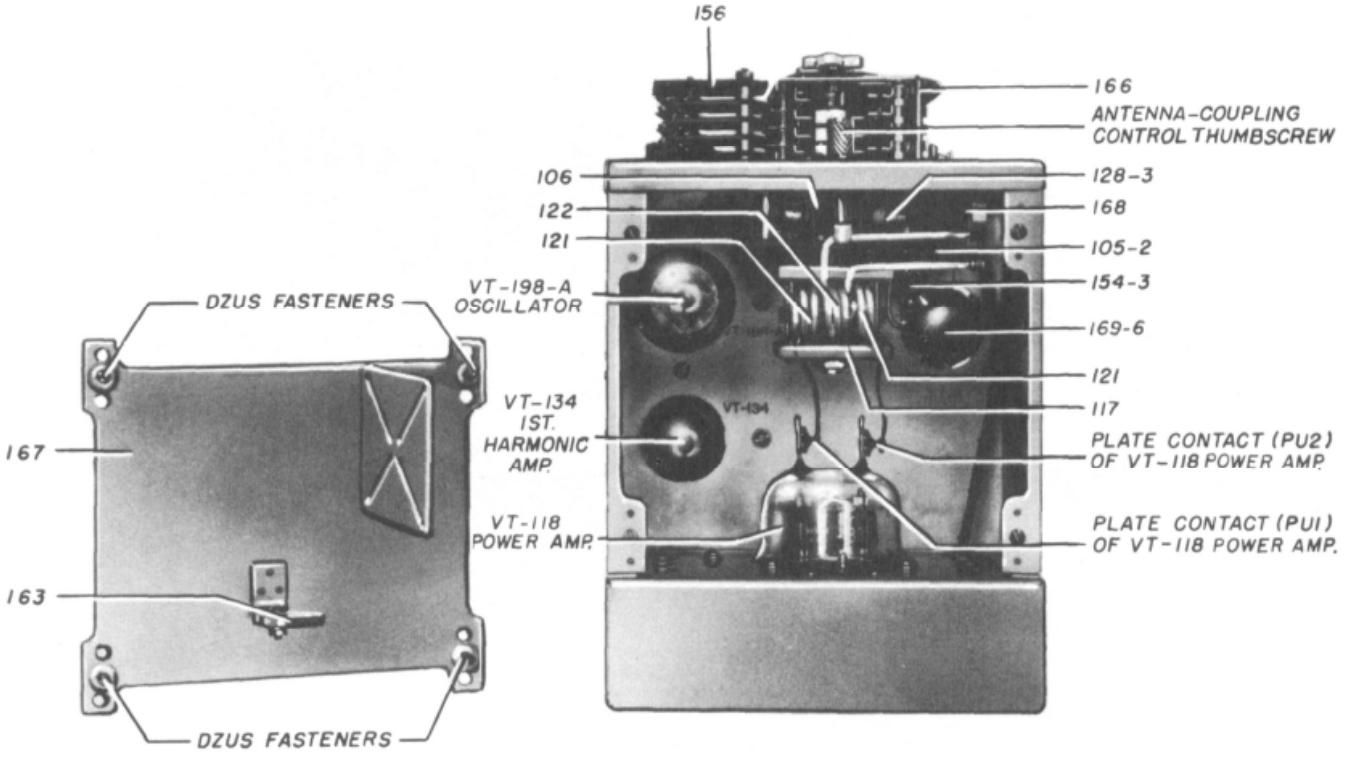


FIGURE 35 — RADIO TRANSMITTER BC-625-A, RIGHT SIDE VIEW

filament voltage is applied to the receiver vacuum tubes. The channel-control ratchet motor 406 located on Rack FT-244-A actuates a frequency-shifter slide which automatically selects the correct channel crystal and tunes the receiver circuits to the desired frequencies. The crystal is chosen as the slide closes the appropriate section, A, B, C or D of crystal switch 286. The receiver circuits are tuned by means of a cam-and-shaft arrangement enabling the slide to adjust the following variable capacitors to a predetermined frequency setting: 216A in the r-f grid circuit, 216B in the r-f plate circuit, 216C in the mixer grid circuit, 217A in the harmonic-amplifier plate circuit, and 217B in the harmonic-generator plate circuit.

b. *R-F Amplifier*

Inductor 221 couples the antenna to inductor 222 in the grid circuit of the r-f amplifier Tube VT-203. Inductor 222, variable capacitor 216A and trimmer capacitor 218-1 comprise the tuned grid circuit which is adjusted to resonate at the frequency of the received carrier. The grid is coupled to this tuned circuit through capacitor 201 which also serves to prevent the AVC voltage applied to the grid from grounding through inductor 222. The tuned plate circuit consists of inductor 223, variable capacitor 216B and trimmer capacitor 218-2. Meter-shunt resistor 259 is connected across the terminals of the receiver test-milliammeter socket 288. When the receiver is being tuned with a large signal voltage applied to the input circuit, the AVC voltage developed is impressed as additional bias on the control grid of r-f Tube VT-203. This additional bias reduces the plate current and causes a decrease in the reading indicated by Test Set I-139-A. For a constant signal input, the plate current decreases as the receiver circuits become better aligned.

c. *Crystal Oscillator*

The crystal oscillator operates in the frequency range 8-8.72 mc and utilizes one

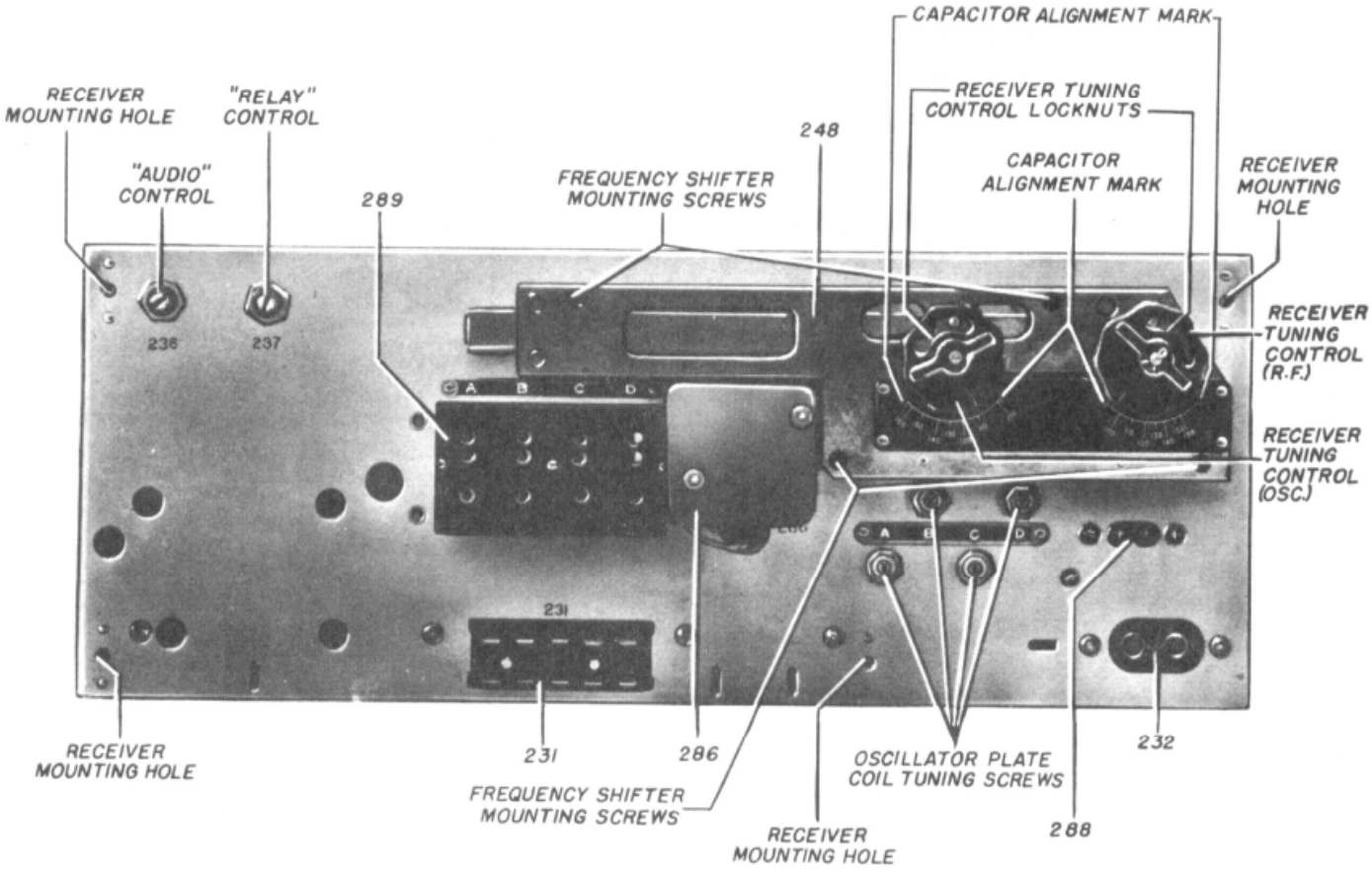


FIGURE 36 — RADIO RECEIVER BC-624-A, TOP VIEW

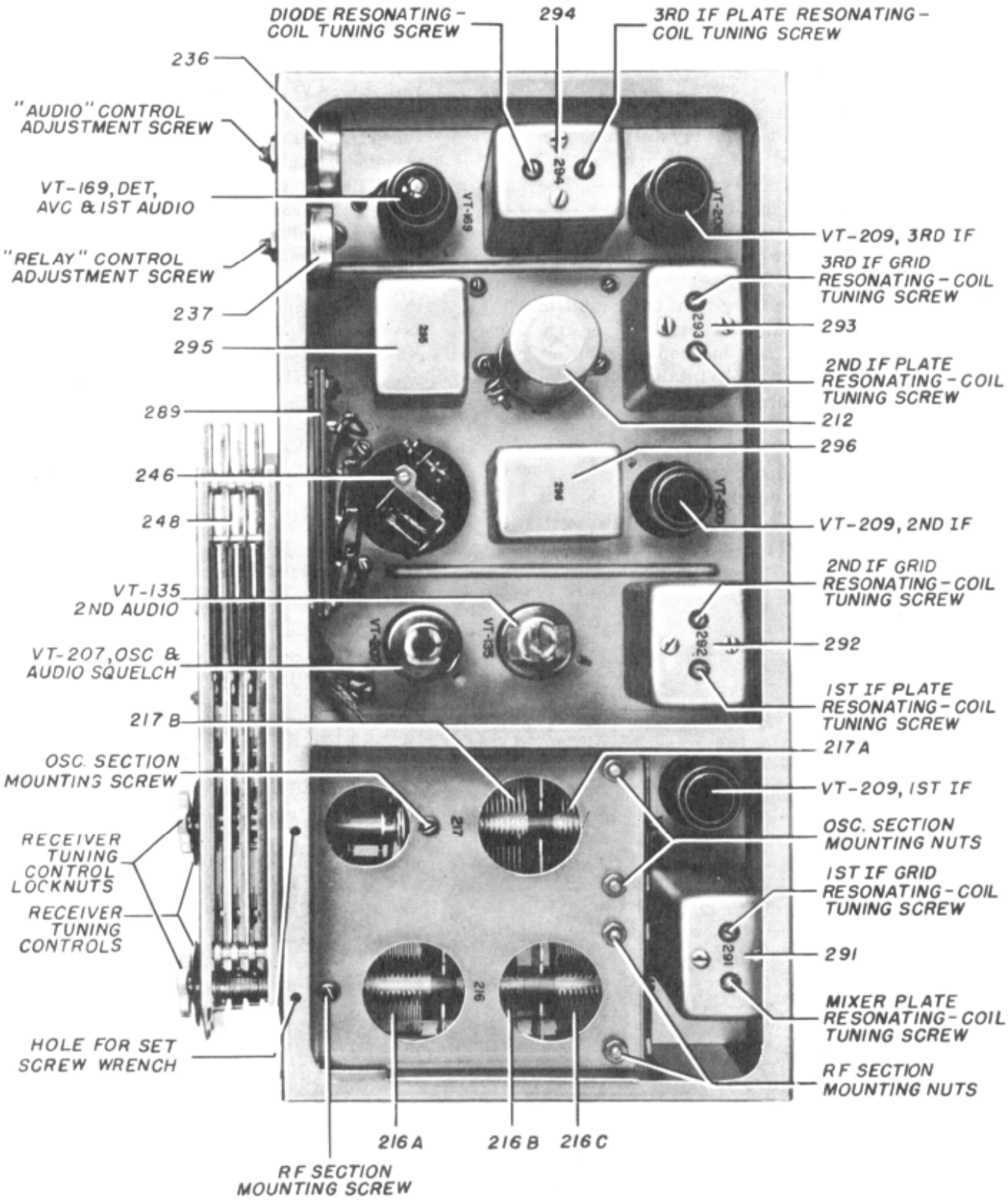


FIGURE 37 — RADIO RECEIVER BC-624-A, REAR VIEW

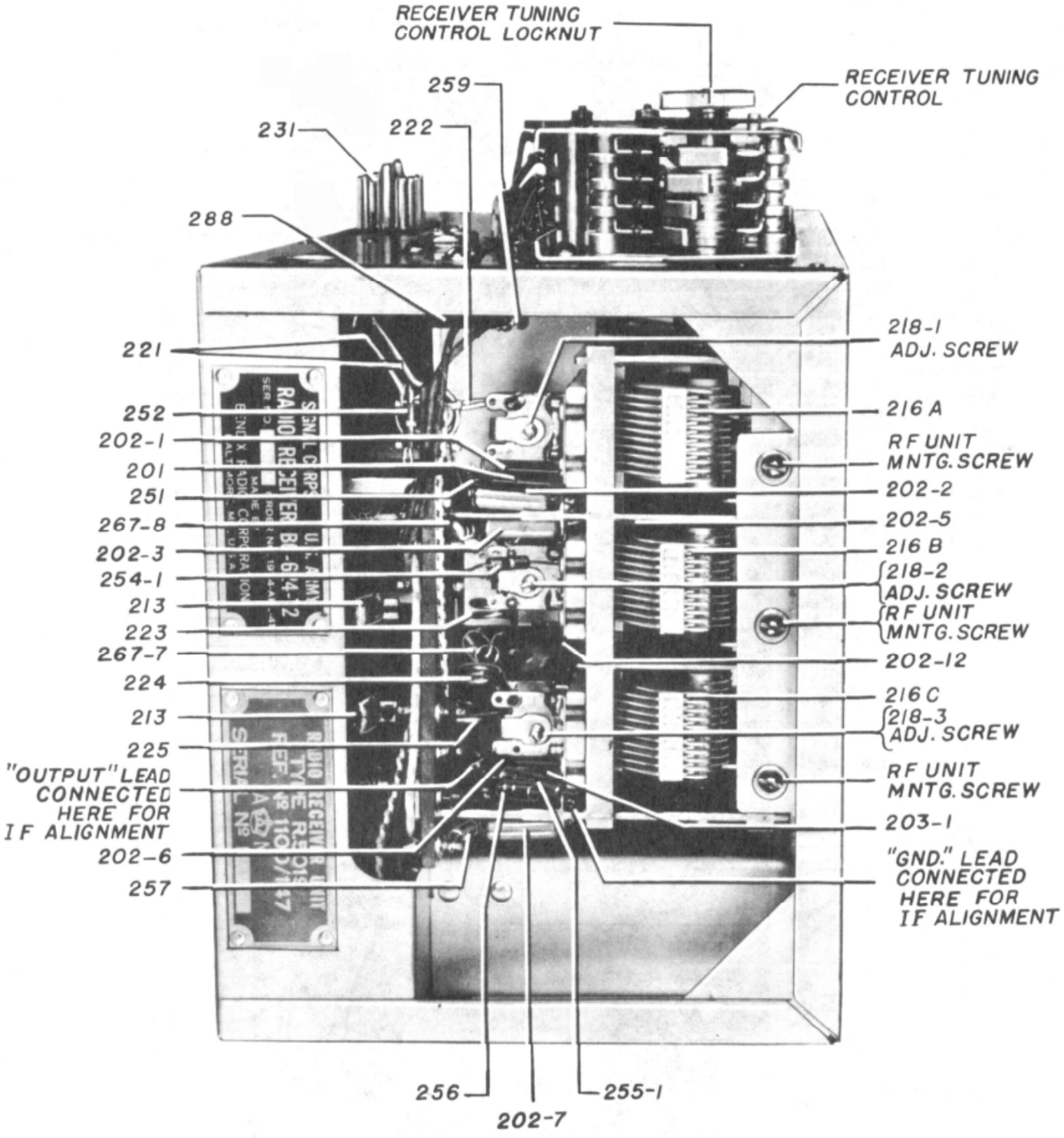


FIGURE 38 — RADIO RECEIVER BC-624-A, RIGHT SIDE VIEW

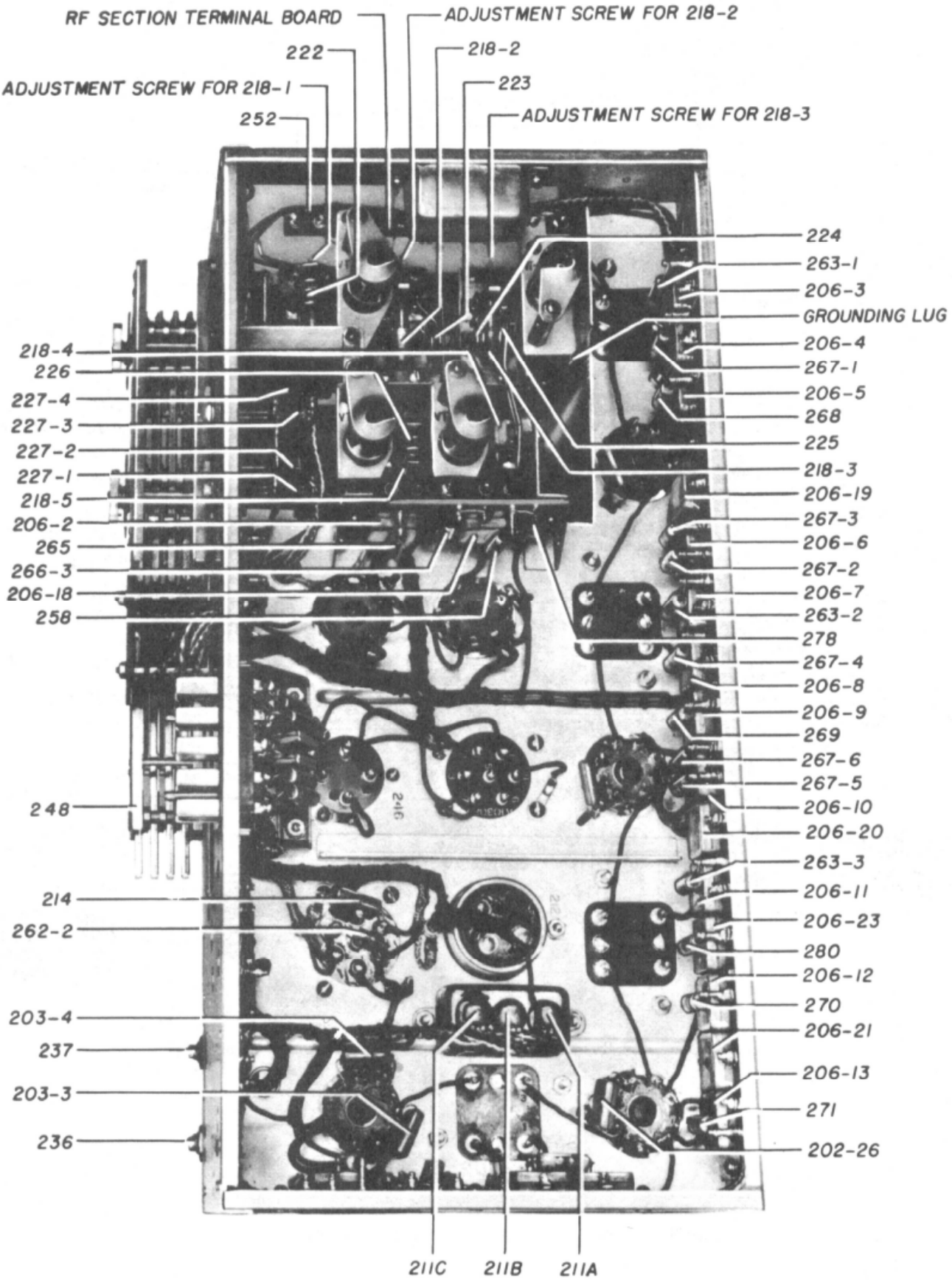


FIGURE 39 — RADIO RECEIVER BC-624-A, FRONT VIEW

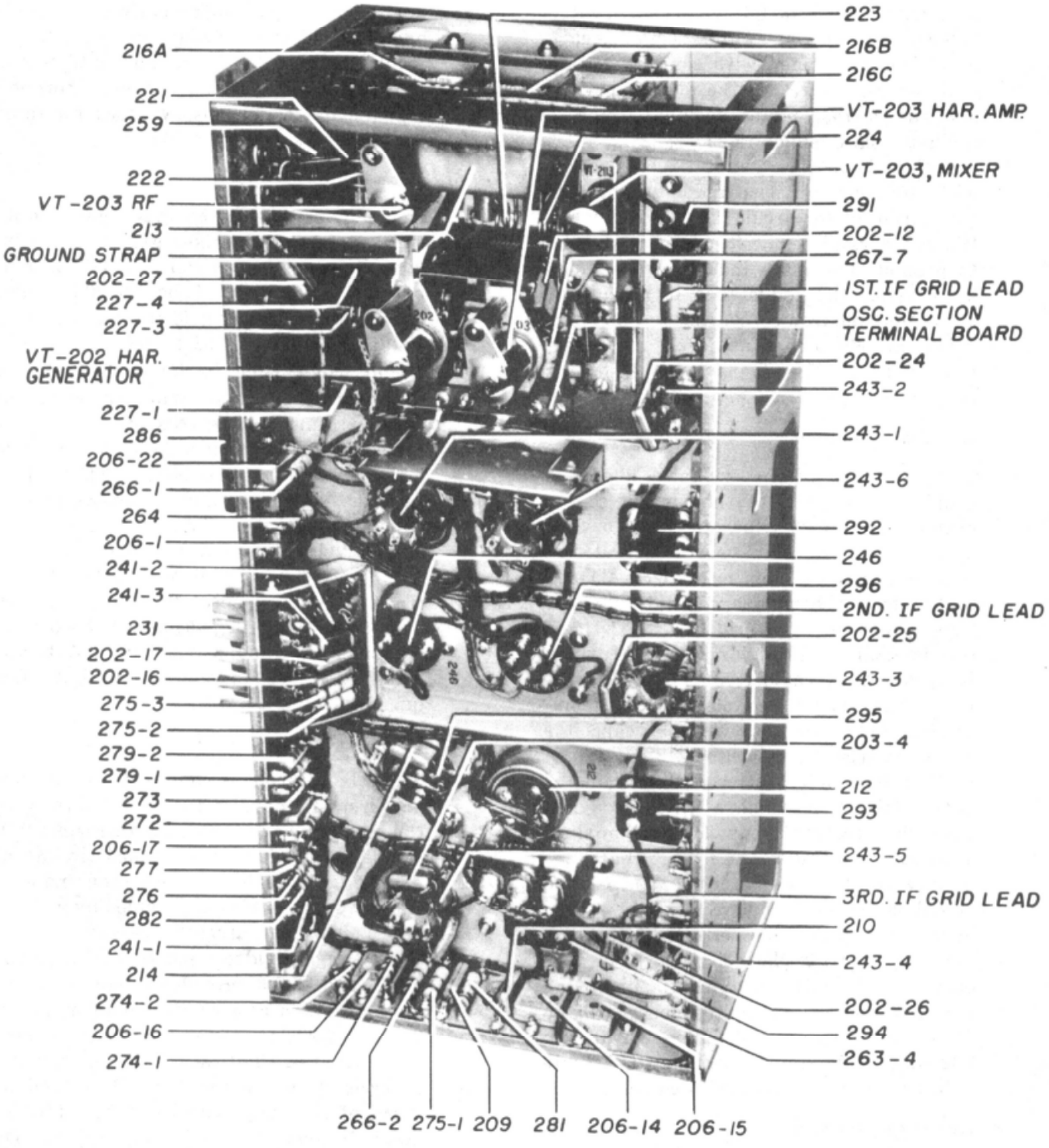


FIGURE 40 — RADIO RECEIVER BC-624-A, FRONT OBLIQUE VIEW

section of the twin-triode Tube VT-207. The crystal is connected in series between the control grid and ground and is in parallel with grid leak 266-1. Crystal switch 286 consists of four wafer sections, each of which is provided with contacts for simultaneously selecting the desired crystal and the corresponding variable iron-core oscillator plate inductors 227-1, 227-2, 227-3 or 227-4. Capacitors 204 and 205, together with any one of these inductors provide the tuned plate circuit of the oscillator. When a crystal is not in use it is shorted to ground. The plate inductors are tuned by varying the inductance by means of the adjustable iron cores. Resistor 265 provides cathode bias for the oscillator section of Tube VT-207 and is bypassed for radio frequency by capacitor 206-2.

d. *Harmonic Generator*

The r-f output of the crystal oscillator is coupled to the grid of the harmonic generator Tube VT-202 through capacitor 205. This grid-driving voltage is comparatively high and causes the output of Tube VT-202 to be rich in harmonic content. Resistor 262-1 provides a d-c grid return. Cathode bias is obtained through resistor 261 which is bypassed for radio frequency by capacitor 202-15. The tuned plate circuit, comprising inductor 226, variable capacitor 217B and trimmer capacitor 218-5, is tuned to that harmonic of the crystal-oscillator output frequency which when heterodyned with the received frequency will produce a frequency equal to the intermediate frequency of 12 mc. For example, if a 100-mc signal is received and an 8-mc crystal is employed for the channel in use, the harmonic - generator plate circuit will be tuned to the eleventh crystal harmonic, or 88 mc, and the difference frequency will be 12 mc. Plate bypass capacitors 202-13 and 202-14 provide stable operation. D-C plate voltage is supplied through resistor 260.

e. *Harmonic Amplifier*

Capacitor 203-2 couples the plate circuit of the harmonic generator to the grid of the harmonic-amplifier Tube VT-203. The plate circuit of Tube VT-203, comprising inductor 225, variable capacitor 217A and trimmer capacitor 218-4, is tuned to the same frequency as the output of the preceding stage. Harmonic - amplifier Tube VT-203 serves merely to amplify the harmonic-generator output sufficiently to provide adequate voltage for coupling to the mixer grid. Resistor 255-2 provides a d-c grid return, and cathode bias is supplied through resistor 253-2 which is bypassed for radio frequency by capacitor 202-11.

f. *Mixer*

Inductor 225 couples the harmonic - amplifier output to the mixer grid through inductor 224 and capacitor 203-1. The output of r-f amplifier Tube VT-203 is also coupled to the mixer grid through inductor 224 and capacitor 203-1. The mixer grid circuit, comprising inductor 224, variable capacitor 216C and trimmer capacitor 218-3, is tuned to the frequency of the received signal. Resistor 255-1 is the grid leak and resistor 256 is the cathode-bias resistor. D-C plate and screen voltage is supplied through resistors 263-1 and 257 respectively. The plate is connected to the inductance-tuned primary circuit of the i-f transformer assembly 291. This plate circuit, comprising the variable iron-core inductor 228-1 and capacitors 207-1 and 208-1, is tuned to the intermediate frequency, 12 mc.

g. *First, Second and Third I.F.*

The mixer output is coupled to the grid of the first i-f amplifier Tube VT-209 through the secondary circuit of i-f transformer 291. This circuit is inductance-tuned (by means of the adjustable iron core of inductor 228-2). Cathode bias is provided by resistor 268 which is bypassed by capacitor 206-5. The voltage divider consisting of resistors 267-2 and 267-3 provides a stable screen voltage. The second and third i-f amplifier Tubes VT-209 are connected in circuits similar to that of the first i-f tube except that a screen-dropping resistor 271 is used instead of a voltage divider in the third i-f stage. Transformer assembly 292 couples the first i-f plate to the second i-f grid, 293 couples the second i-f plate to the third i-f grid and 294 couples the third i-f plate to the detector diode. Plate voltage for all r-f circuits appears at terminal 3 of plug 231. Choke 241-2 and capacitor 202-16 filter any

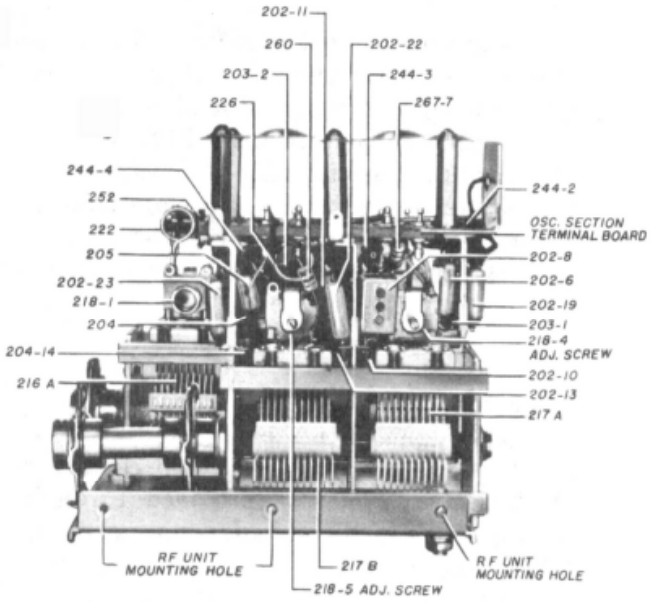


FIGURE 41 — R-F AND OSCILLATOR ASSEMBLY (1 OF 4)

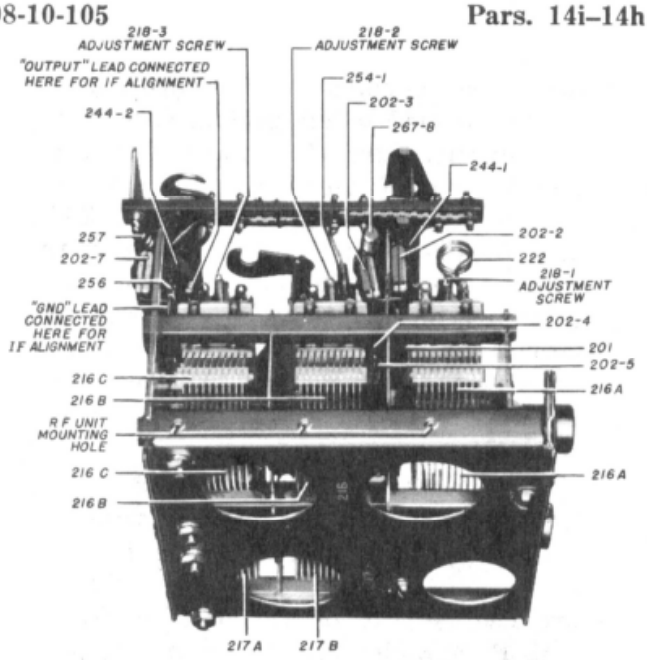


FIGURE 41 — R-F AND OSCILLATOR ASSEMBLY (2 OF 4)

extraneous r-f voltage from this high-voltage circuit. No voltage appears on terminal 3 of plug 231 when the transmitter is operating, thus leaving only the receiver audio circuits operative during transmission.

h. *Detector, AVC and First Audio*

In the case of the i-f transformer assembly 294, the voltage developed across the tuned circuit comprising the variable inductor 228-8 and the capacitors 208-8 and 207-8 is applied to one of the diode plates of detector Tube VT-169 (see Figure 43). Audio voltage is developed across resistor 281 and the AUDIO control potentiometer 236. Capacitor 203-3 couples the diode plates. The r-f voltage thus coupled is rectified through one of the diode plates and the cathode of Tube VT-169. The rectified voltage developed across resistor 275-1 is filtered by resistor 266-2 and capacitor 211C and, after overcoming the AVC delay volt-

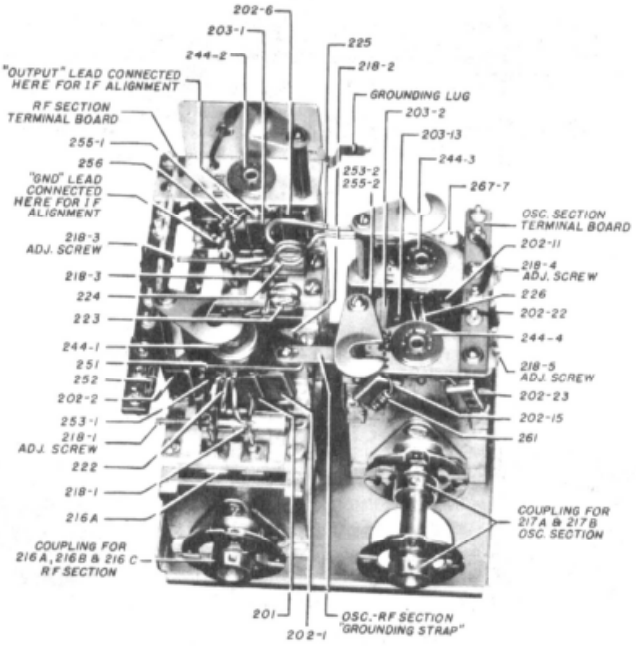


FIGURE 41 — R-F AND OSCILLATOR ASSEMBLY (3 OF 4)

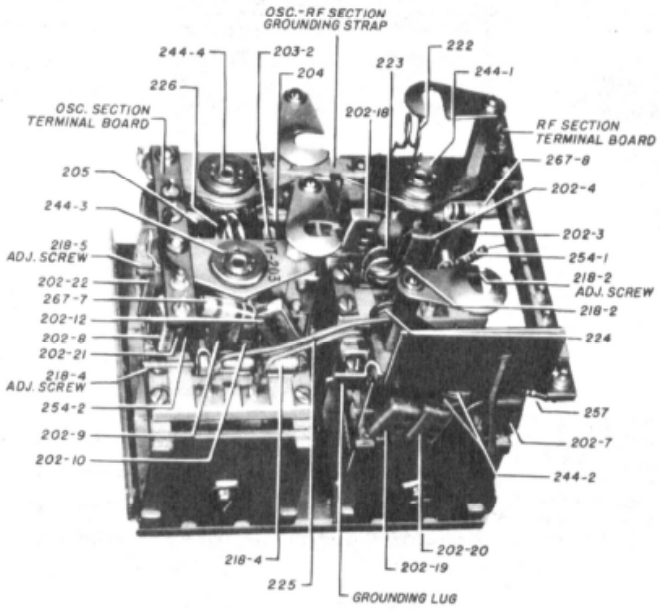


FIGURE 41 — R-F AND OSCILLATOR ASSEMBLY (4 OF 4)

age appearing across resistors 276 and 277, is then applied to the grid circuits of the r-f amplifier Tube VT-203 and to the first and second i-f amplifier Tubes VT-209 through the isolating resistors 252, 267-1 and 267-4 respectively. Resistor 251 is the r-f amplifier grid leak providing a d-c path to ground through the AVC circuits. Capacitor 202-2 prevents radio frequency from entering the AVC system. AVC voltage for external use is connected to terminal 6 of plug 231.

The circuits of the pentode section of Tube VT-169 provide the first stage of audio amplification (see Figure 71). The audio stages of Radio Receiver BC-624-A are also used for interphone amplification (see Paragraph 14k). The voltage appearing across AUDIO control potentiometer 236 is tapped off and coupled through capacitor 206-17 and transformer 291 to the grid of Tube VT-169. Bias voltage is supplied to the first a-f amplifier by cathode resistor 277 which is bypassed by capacitors 211A and 212C. R-F voltages from the transmitter are kept out of the audio circuits by means of grid choke 241-1 and plate-and-screen choke 241-3. Plate-and-screen voltage for the audio stages is provided through terminal 5 of plug 231 and is filtered by capacitors 212A, 212B and the choke 296B. Capacitor 203-4 bypasses any r-f voltages appearing in the plate circuit. A complete description of the function of the first audio amplifier is given in Paragraph 14k.

i. *Second Audio*

The second audio-amplifier Tube VT-135 is resistance-coupled to the first audio amplifier by resistors 266-3, 258 and capacitor 215-2. Cathode bias is provided through resistor 278 which is bypassed by capacitor 212D. The second audio-amplifier output is coupled to the load through transformer 296A, the secondary of which is tapped through terminals 7, 6 and 5 to supply impedances of 4000, 300 and 50 ohms respectively.

j. *Audio Squelch*

One triode section of Tube VT-207, a twin triode, is used to operate the audio squelch relay 246 (see Figure 44). A portion of

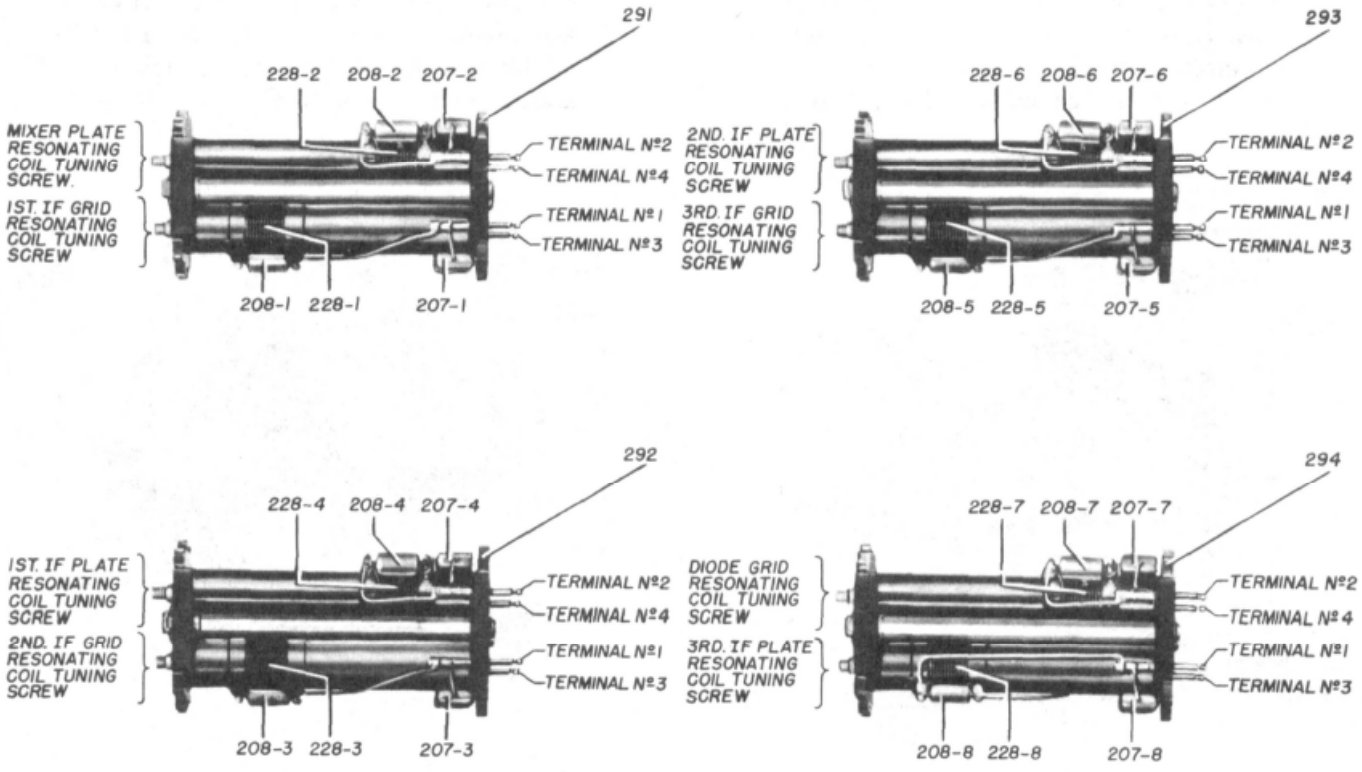


FIGURE 42 — I-F TRANSFORMERS, INTERIOR VIEW

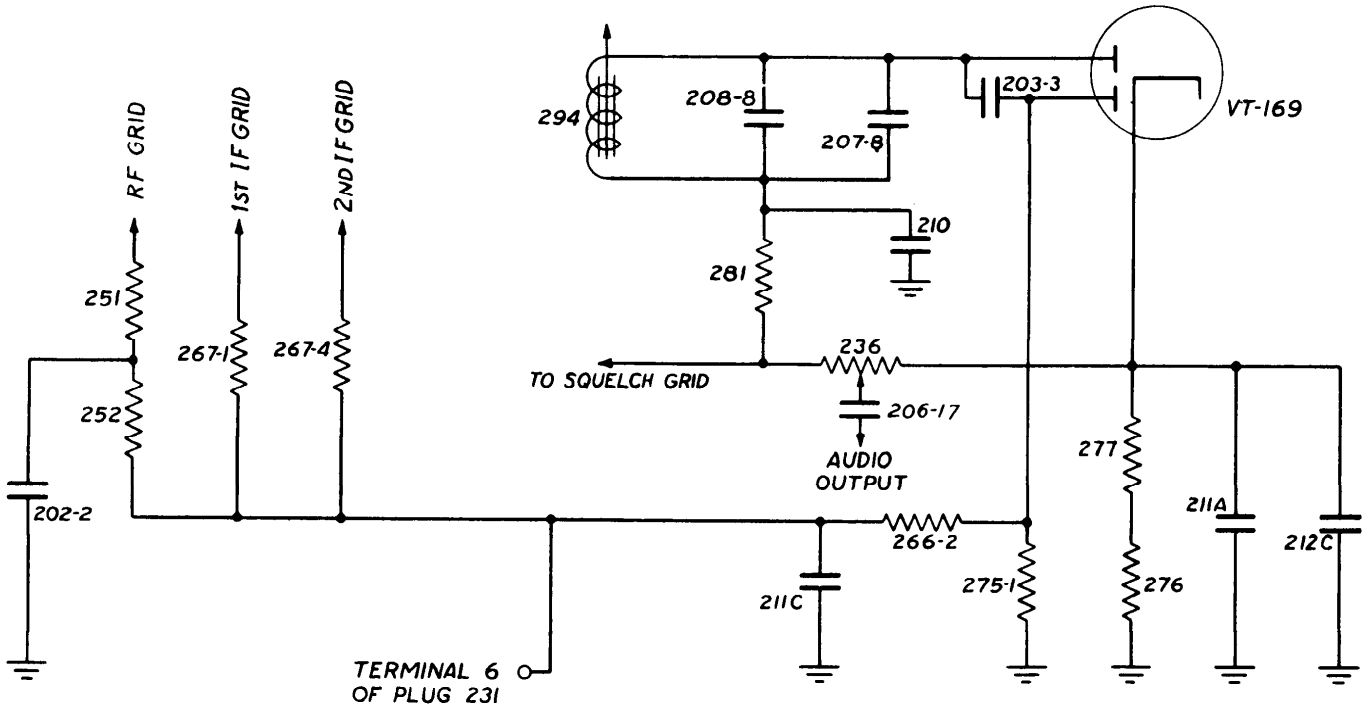


FIGURE 43 — DETECTOR, AVC AND 1ST AUDIO, SIMPLIFIED FUNCTIONAL DIAGRAM

the d-c component of the audio voltage developed at the audio diode of the second detector Tube VT-169 when an r-f carrier is being received, is coupled to the grid of Tube VT-207 through resistor 274-1.

Audio voltage is bypassed to ground through capacitor 206-16. The cathode of this triode section of Tube VT-207 is connected to a bleeder resistor network consisting of resistors 279-1, 279-2, 282 and potentiometer (RELAY control) 237. This network is connected between +300 volts and ground and serves to put a positive voltage on the cathode, the value of this positive voltage being determined by the position of the moveable arm of potentiometer 237.

Additional grid bias voltage is determined by the magnitude of the d-c component of the diode voltage and, therefore,

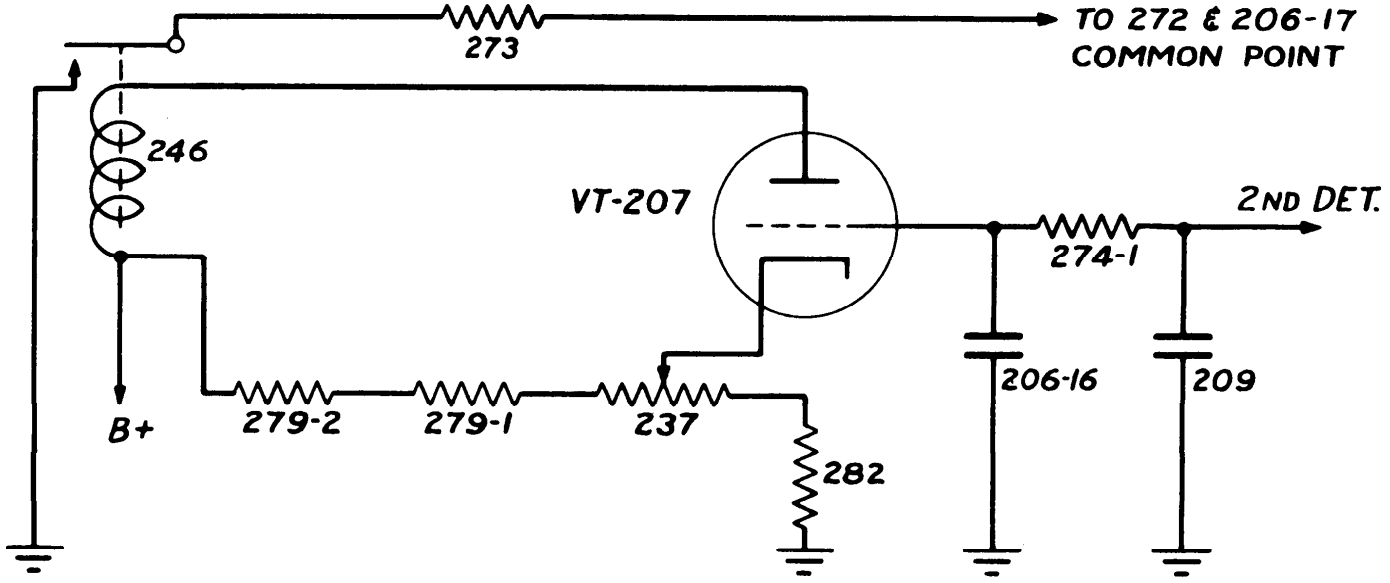


FIGURE 44 — ORIGINAL SQUELCH CIRCUIT, SIMPLIFIED FUNCTIONAL DIAGRAM

NOTE

The squelch circuit of Radio Receiver BC-624-A was modified in production beginning with serial number 40,000 (approximately). Figure 45 shows the wiring of the new squelch circuit.

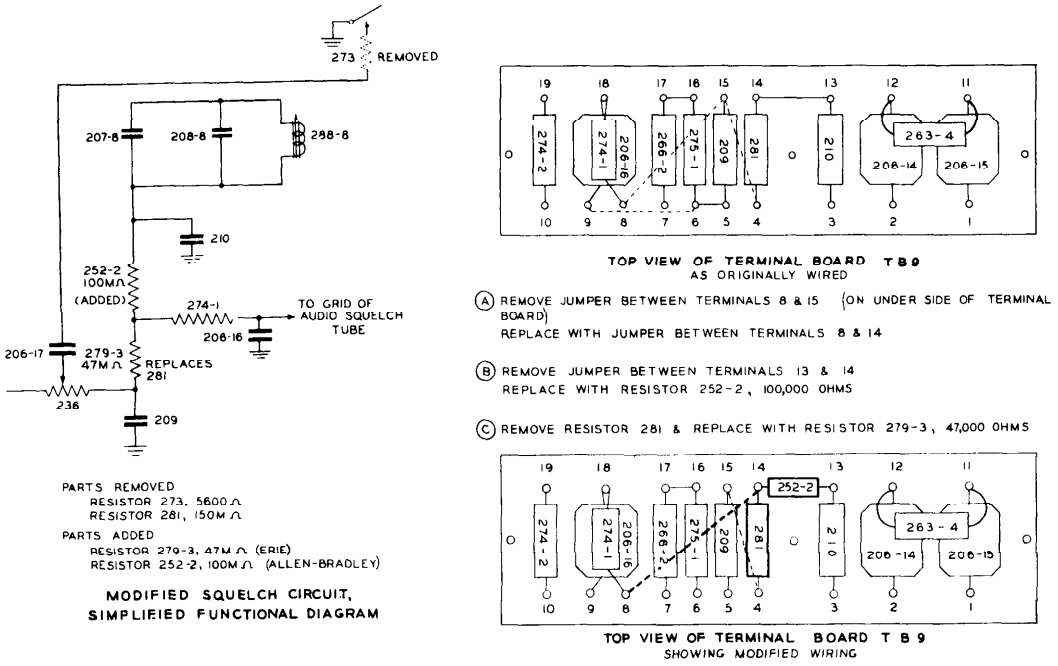


FIGURE 45 — MODIFICATION OF SQUELCH CIRCUIT, RADIO RECEIVER BC-624-A

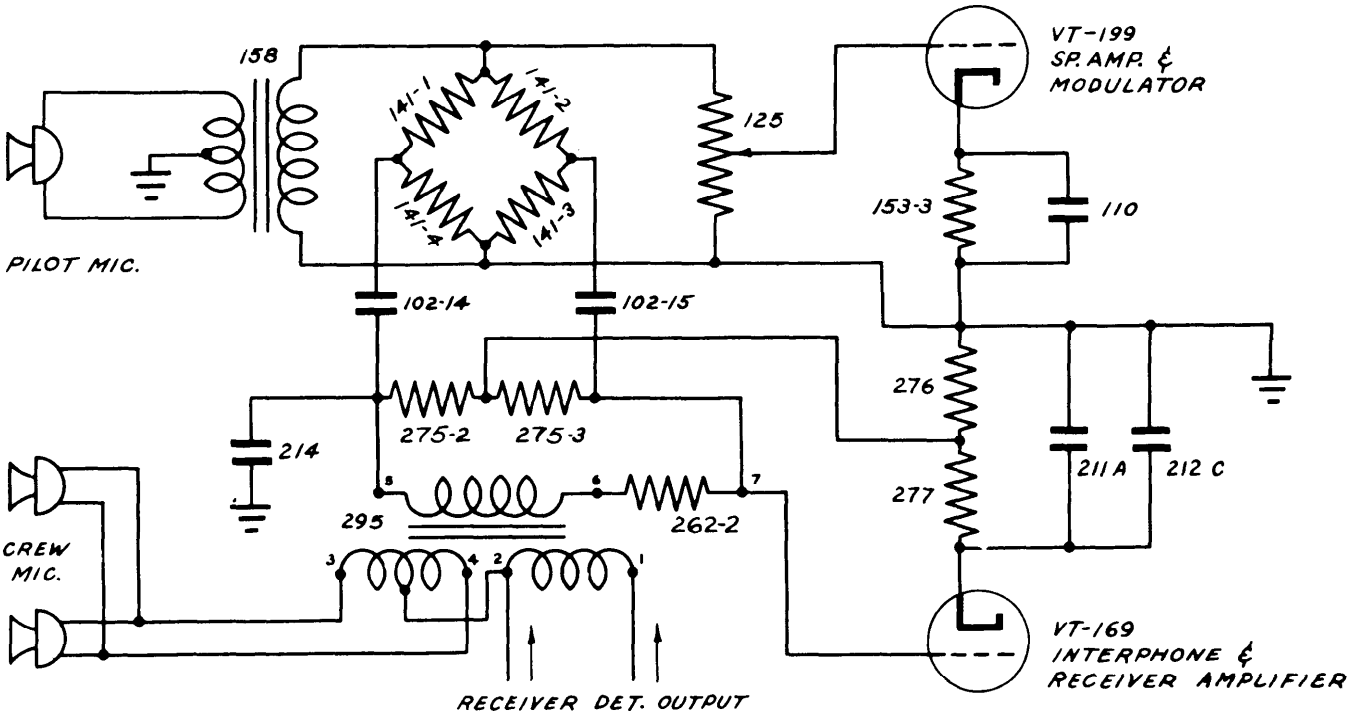


FIGURE 46 — MICROPHONE MIXING CIRCUIT, SIMPLIFIED FUNCTIONAL DIAGRAM

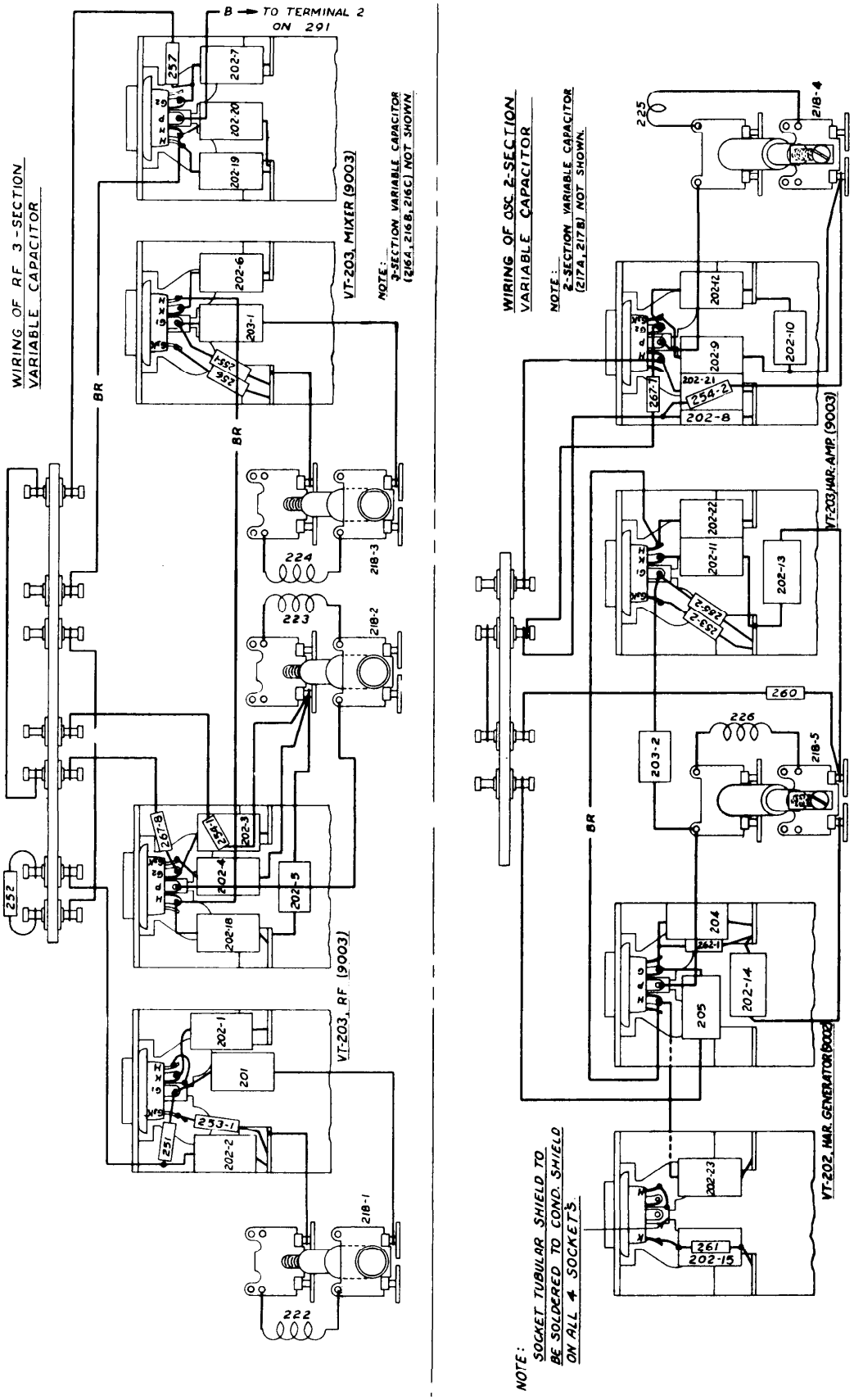


FIGURE 47 — RECEIVER R-F AND OSCILLATOR ASSEMBLY, WIRING DIAGRAM

varies with the strength of the incoming signal carrier. Depending upon the setting of the RELAY control, potentiometer 237, a carrier of sufficient strength will cause an increase in the triode's grid bias, resulting in a decrease in the flow of plate current through the coil of relay 246, and the relay contacts will open. With the relay contacts closed, resistor 273 shunts a portion of the audio voltage from the diode of Tube VT-169 to ground, reducing the receiver audio output by approximately 20 decibels. The opening of these contacts, therefore, restores the receiver audio output to normal level and this, as explained above, is what occurs whenever a carrier of sufficient strength is being received.

The purpose of this squelch circuit is to keep extraneous objectionable noise out of the interphone amplifier when no carrier is being received. A wide variation of the sensitivity of this relay to incoming carriers is provided by the RELAY control potentiometer 237.

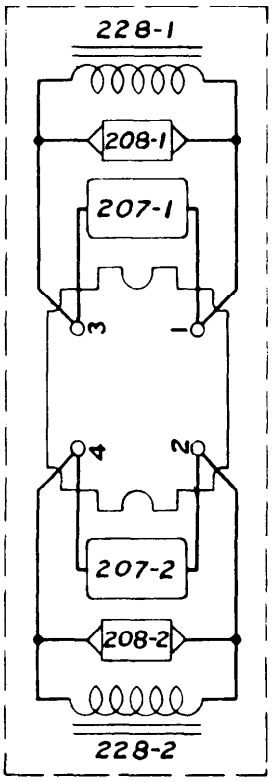
k. *Interphone and Sidetone*

Interphone communication is accomplished by combining the audio input circuits of the transmitter and receiver (see Figure 45). An electromagnetic (Pilot) microphone (not supplied with the equipment) is connected to the primary winding of transformer 158, the secondary of which is connected across potentiometer 125. Audio voltage developed across the secondary of 158 appears across the GAIN control potentiometer 125 by means of which it is possible to regulate the amplitude of the audio voltage impressed on the grid of the transmitter speech-amplifier Tube VT-199. The speech-amplifier output is coupled to the modulator tubes of the transmitter (see Figure 71).

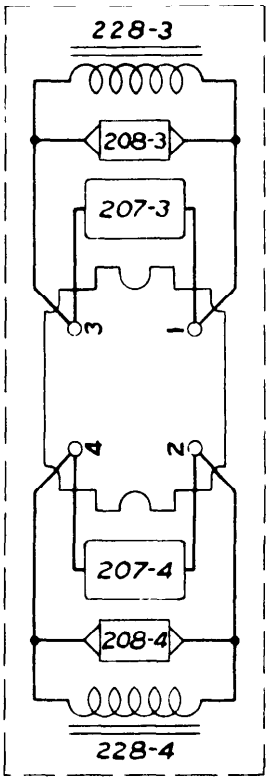
Since the bridge resistors 141-1, 141-2, 141-3 and 141-4 are equal, half of the audio voltage developed across the secondary winding of transformer 158 appears at the junction points of 141-1 and 141-4, and 141-2 and 141-3 with respect to the grounded end of the secondary winding (see Figure 45). The voltages at these two junction points are equal and in phase. Resistor 262-2 is connected between terminals 6 and 7 of transformer 295, and the voltages at terminals 5 and 7 are also equal and in phase. Therefore, half the audio voltage developed across the secondary winding of transformer 158 is impressed on the grid of the audio amplifier Tube VT-169. Thus it is possible to modulate the transmitter by means of the microphone (Pilot) connected in Jack Box BC-629-A and also to produce audible sidetone in the headsets connected in Jack Boxes BC-629-A or BC-629-B (Pilot), BC-630-A and BC-631-A (Crew) with the transmitter carrier either on or off.

One or more electromagnetic (Crew) microphones (not supplied with the equipment) are connected to primary terminals 3 and 4 of transformer 295 (see Figure 45). Approximately half of the a-f voltage induced in the secondary (terminals 5 and 6) by either of the two primaries appears at the grid of the first audio amplifier Tube VT-169 and the result is an audible signal in the headphones. However, the voltage appearing at the junction point of resistors 141-1 and 141-4 is equal in amplitude but opposite in phase to the voltage appearing at the junction point of resistors 141-2 and 141-3. Since these four resistors are all equal, the two out-of-phase voltages cancel each other and there is no resultant voltage across potentiometer 125. Receiver detector voltages impressed on primary terminals 1 and 2 of transformer 295 also cancel out in the same manner and have no effect on the speech-amplifier grid. This arrangement makes interphone communication possible by means of the microphone connected in Jack Box BC-630-A (Crew) or BC-631-A (Other Crew) while preventing modulation of the transmitter by a-f voltages from these sources. Interphone communication is always possible from the crew stations, but the transmitter can be modulated only from the pilot station.

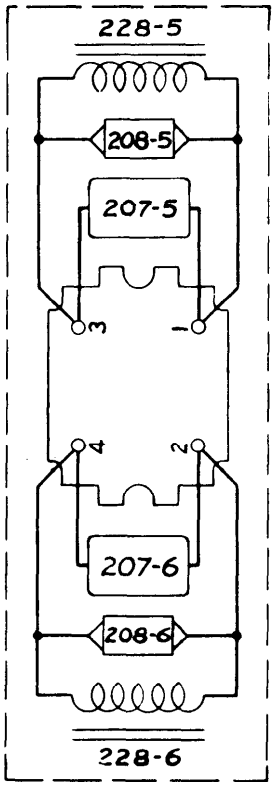
Resistors 275-2 and 275-3 are grid resistors for Tube VT-169, and this method of connecting them is necesary to prevent the bridge circuit from becoming unbalanced. The midpoint of these resistors is connected to the junction of resistors 276 and 277. Audio bias voltage is developed across resistor 277, and AVC delay voltage



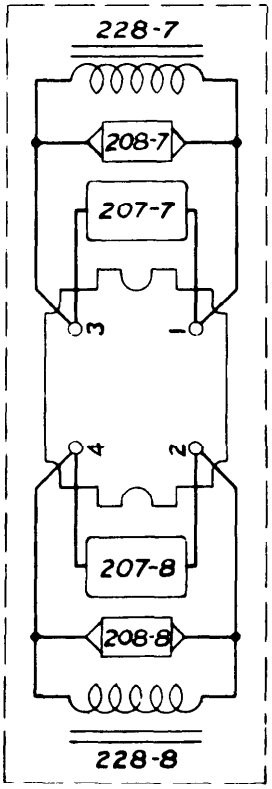
1ST. I F TRANSFORMER-291



2ND. I F TRANSFORMER-292



3RD. I F TRANSFORMER-293



4TH. I F TRANSFORMER-294

FIGURE 48 — RECEIVER I-F TRANSFORMERS, WIRING DIAGRAM

is developed across resistors 276 and 277. The cathode of Tube VT-169 is bypassed by capacitors 211A and 212C. Blocking capacitors 102-14 and 102-15 protect the AVC delay circuit by preventing d-c grid voltages from returning to ground through the bridge circuit. Capacitor 214 prevents the grid input capacitance of Tube VT-169 and wiring capacitances from unbalancing the bridge circuit. The audio - level compensating resistor 262-2 reduces the audio output from the crew microphones (see Figure 45) so that approximately equal voltages are impressed on the interphone-amplifier grid by the crew or pilot microphones.

15. RACK FT-244-A

Rack FT-244-A fits over the transmitter and receiver, and the complete assembly is mechanically held together by eight mounting screws [see Figure 3 and Paragraph 5a(2)]. All input and output connections to the transmitter and receiver are made through the rack (see Figure 4). The schematic circuit diagram is given in Figure 71. The filtered dynamotor unit output is applied to the transmitter and receiver through socket 420. Press-to-talk and marker-beacon-receiver connections are also made through socket 420. The radio control box, the jack boxes, and the contactor are connected through the junction box to socket 417. The transmitter r-f output or receiver signal input is made through socket 416.

Receiver plug 231 engages rack socket 419. Transmitter plugs 123-1 and 123-2, respectively, engage rack sockets 418-1 and 418-2. By means of these connections, the rack functions as a junction box which interconnects the transmitter and receiver and the other units of the equipment. The channel-control ratchet motor 406 and the antenna-changeover relay 412 are, respectively, the means by which it is possible to actuate the frequency-shifter mechanism and to alternate the mode of operation between reception and transmission.

The ratchet-wheel of the channel-control motor 406 is equipped with four arms spaced 90° apart. The motor is so positioned that a ratchet-wheel arm will release a frequency-shifter actuating slide when the ratchet wheel is displaced one tooth past the point where the opposite arm first opens a pair of positioning-switch contacts 427A, B, C or D. In this condition of the motor assembly, the contacts should remain open. When a channel-selector pushbutton is pressed on Radio Control Box BC-602-A, the dynamotor-starter relay is energized, the dynamotor is placed in operation and the solenoid of motor 406 receives operating

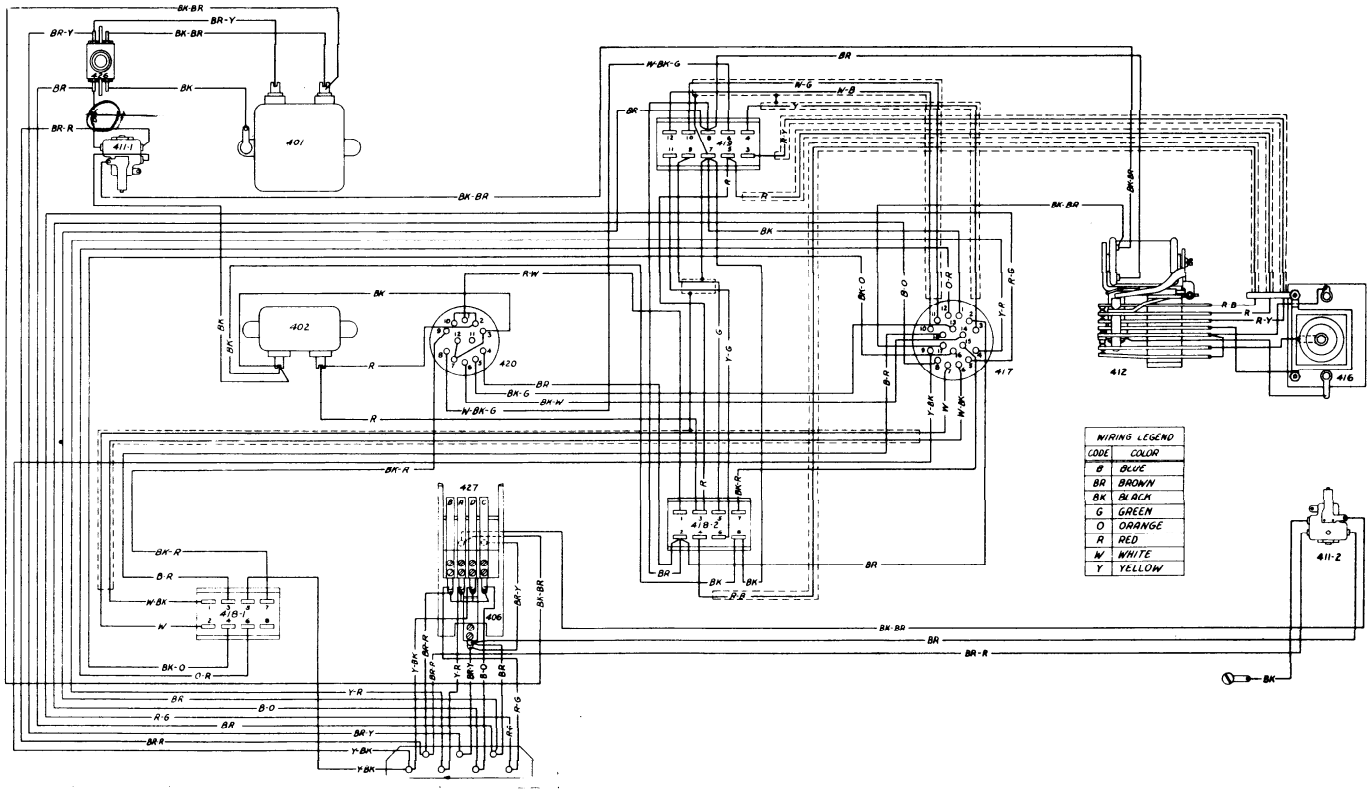


FIGURE 49 — RACK FT-244-A, WIRING DIAGRAM

power through terminal 4 of socket 420. The motor solenoid and the interrupter switch cause the armature to oscillate; and the pawl, which is part of the armature assembly, rotates the ratchet wheel. As this wheel rotates, the arms attached to it displace the frequency-shifter actuating slides in the order A, B, C, D and open the contacts of the positioning switch 427 in the same order. When the positioning switch contacts A, B, C, or D, which correspond to the channel selected on the radio control box, are opened, the motor circuit is broken and the process of channel-selection ceases. When this happens, the ratchet wheel arms will have displaced the actuating slide, and consequently the receiver and transmitter shifter slides for the desired channel to the position where the proper crystals are chosen and the circuits tuned. If the pushbutton switch 426 (the release button) is depressed while the channel-selector pushbutton on the control box is still in the depressed position, the motor solenoid will be energized and will attract the armature. When the armature is released, the pawl attached to it will displace the ratchet wheel one tooth which is just sufficient to cause the complete release of the channel slides. There will be no contact whatever between the actuating slides and the channel slides. This is the only condition of the frequency-shifter mechanism which permits removal of the transmitter or receiver from the rack without damaging the equipment. Now if release pushbutton 426 is pressed a second time, the ratchet-wheel is again displaced one tooth and the ratchet-wheel arm will be completely disengaged from the positioning-switch contacts for the channel in use. This closes the motor circuit again, and channels will be selected in the order A, B, C, D until the channel previously selected on the control box is reached. Therefore, the release pushbutton 426 makes it possible to release the frequency-shifter mechanism and to select a channel again without touching any controls on the control box.

Locking relay 411-1 is connected across the motor-voltage supply and is energized whenever the motor is energized. When the contacts of locking relay 411-1 are closed, the antenna-changeover relay 412 is energized and switches the antenna to *receive*. This prevents transmission while channel-selection takes place. With the antenna-changeover relay in the unenergized condition, the transmitter-receiver assembly is connected for transmission. This relay may be actuated either from the control box, the contactor or the press-to-transmit (press-to-talk) switch. Refer to Paragraph 19 for a detailed description of the control circuits and the B+ circuit switching effected by means of the antenna-changeover relay 412. The interphone system functions under all operating conditions.

16. DYNAMOTOR UNIT PE-94-A and PE-94-AM

Dynamotor Unit PE-94-A is designed to provide all necessary voltages for the transmitter, receiver and control circuits. The dynamotor is connected to a 28-volt battery through socket 322 (see Figures 27 and 71). When a channel-selector pushbutton is pressed on Radio Control Box BC-602-A, the coil of starter relay 321 is energized through contacts 5 and 6 of the output filter (see Figure 71). This closes the relay contacts and permits dynamotor 307 to draw primary d-c power through the hash filter consisting of capacitors 301-6, 301-7 and chokes 311 and 312. The dynamotor is provided with three field windings: a series field to insure rapid starting at low temperatures, a long shunt field mounted on the same pair of poles and a regulator field for changing the speed of rotation. The regulator field is mounted on a separate pair of poles. The armature is provided with four windings; a 14.5v, 4.9 amp. low-voltage winding for filament supply and control circuits, a —150v, 10 ma medium-voltage winding for grid bias, a 300v, 260 ma high-voltage winding for plate supply and a 28-volt motor winding. The shunt and series fields act on all four armature windings, but the regulator field acts only on the motor winding and is so constructed that its flux induces a voltage in the motor winding which is in direct opposition to the counter emf.

A voltage regulator 314 operates in conjunction with the dynamotor-regulator field to hold the output voltages constant over a wide range of input voltages. The voltage regulator consists of a carbon-pile resistor (connected between the stationary contact of relay 321 and the dynamotor regulator field) and a solenoid which is connected between ground and the +13 volts output through the variable resistor 316. The ballast resistor 317 drops the voltage of the low-voltage output winding from 14.5 to 13 volts. Both the carbon-pile resistor and the solenoid act against a common

spring. When the solenoid is not energized, the spring applies maximum pressure on the carbon pile. The spring assembly consists of a six-finger three-leaf spring, one end of which contains the lower contact of the carbon pile. The other end is connected to a steel disc which is part of the magnetic circuit. The fingers of the spring rest on a bi-metal washer which thermostatically compensates for variations in ambient temperature. The carbon pile is contained in a ceramic tube which extends vertically from the spring assembly into the top casting. The initial pile pressure is adjusted by means of a large adjustment screw located on top of the regulator (see Figure 59) and the air gap of the magnetic circuit is adjusted by means of a larger screw on the bottom (see Figure 61). These adjustments have been properly made in the factory and should not be tampered with under normal circumstances.

If the l-v output exceeds 13 volts, the solenoid applies less pressure on the carbon pile through the common spring. This increases the resistance of the carbon pile which reduces the current in the regulator field winding, retards the speed of rotation and restores the dynamotor l-v output to 13 volts. If the l-v output is less than 13 volts, the solenoid applies additional pressure on the carbon pile which lowers its resistance, increases the current in the regulator field, increases the speed of the dynamotor and restores the output to 13 volts. This process may go through several cycles before final equilibrium is obtained, but at no time does the dynamotor l-v output exceed the limits 12.35—13.52 volts. Note that the regulatory action affects every output voltage since the outputs depend on the dynamotor speed.

The current through the regulator solenoid may be varied by means of the adjustable resistor 316. Each of the dynamotor outputs is bypassed for radio frequency and filtered by separate filter networks contained in the output filter.

Dynamotor Unit PE-94-AM employs a different type dynamotor than Dynamotor Unit PE-94-A, although these two dynamotors are physically and electrically interchangeable. Refer to Figures 58 and 60 and Figures 74, 75 and 76, respectively, for views of the dynamotors.

The Type DA-3A dynamotor (part of Dynamotor Unit PE-94-AM) is provided with four field windings, namely, a series field for providing a rapid starting at low temperatures, a long shunt

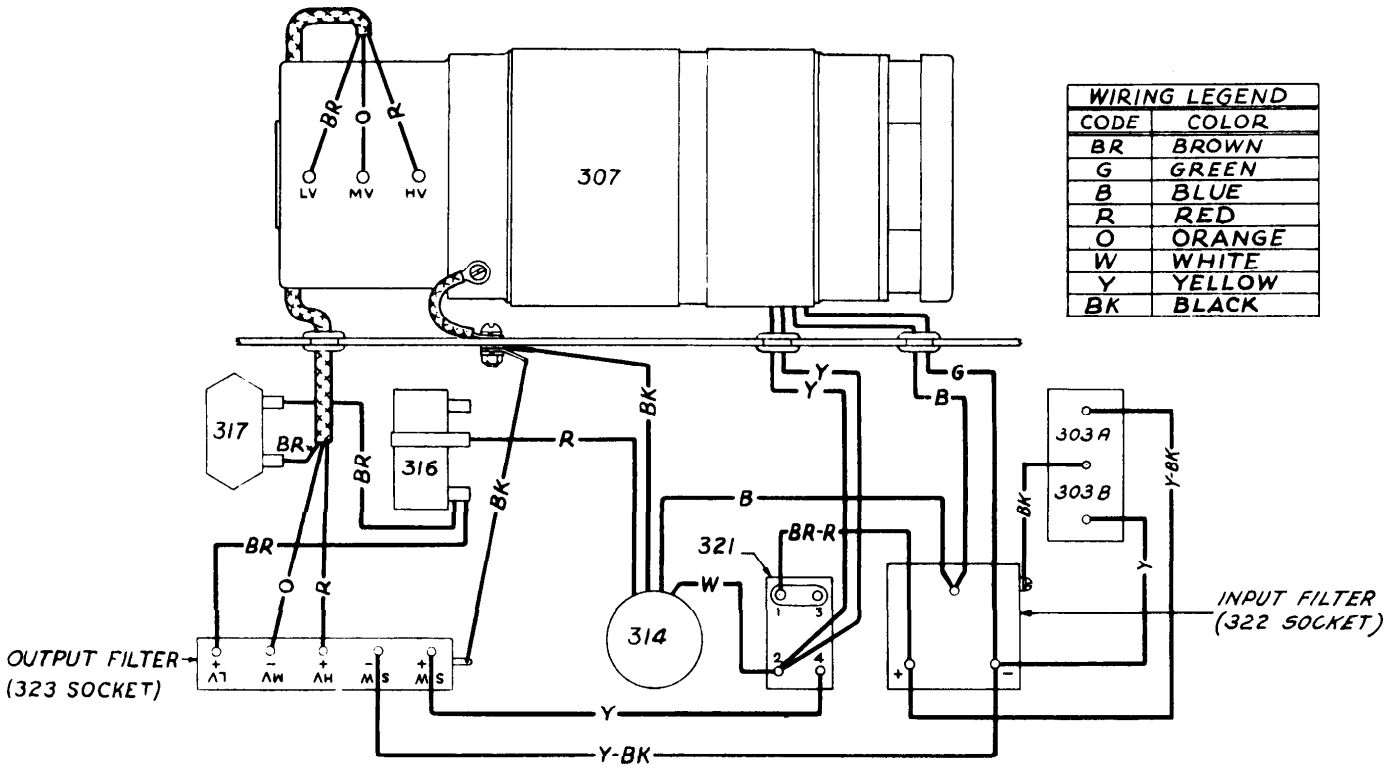


FIGURE 50 — DYNAMOTOR UNIT PE-94-A, WIRING DIAGRAM

field mounted on the same pair of poles, a regulator field for changing the flux density, and a demagnetizer field for aiding regulation of output. The regulator field is mounted on a pair of poles, on one of which the demagnetizer field is also mounted.

The Type DA-3A dynamotor armature has four windings, the motor winding being controlled by the shunt and series fields only. The three output windings are acted upon by all the fields, this being a major difference between the two dynamotors.

The regulator field keeps the output constant by changing the intensity of the magnetic flux acting on the output windings, this process being aided by the demagnetizer field which is in series with, and tends to oppose the action of, the shunt field.

A drop in dynamotor input results in lower output, thus increasing the pressure on the carbon pile, which reduces its resistance. A larger current then flows in the regulator field, increasing the flux, and increasing the output voltages. An *increase* in dynamotor input voltage causes a reversal of this process.

The Type DA-3A dynamotor does not exhibit the tendency toward instability which was inherent in the earlier dynamotor, and there is no difference in the adjustment procedure for the voltage regulator.

17. DYNAMOTOR UNIT PE-98-A

Dynamotor Unit PE-98-A is electrically and mechanically identical with Dynamotor Unit PE-94-A (see Paragraph 16) except for the following:

A 14-volt primary-power source is used. A 14-volt starter relay 320 is employed in place of the 28-volt relay 321. A 14-volt dynamotor 306 is used in place of the 28-volt dynamotor 307. Resistor 317 is not employed. (The low-voltage output of dynamotor 306 is 13.0 volts instead 14.5 volts, and therefore the dropping resistor 317 is not needed.)

18. RADIO CONTROL BOX BC-602-A

All electrical connections to Radio Control Box BC-602-A are made through the 12-contact socket

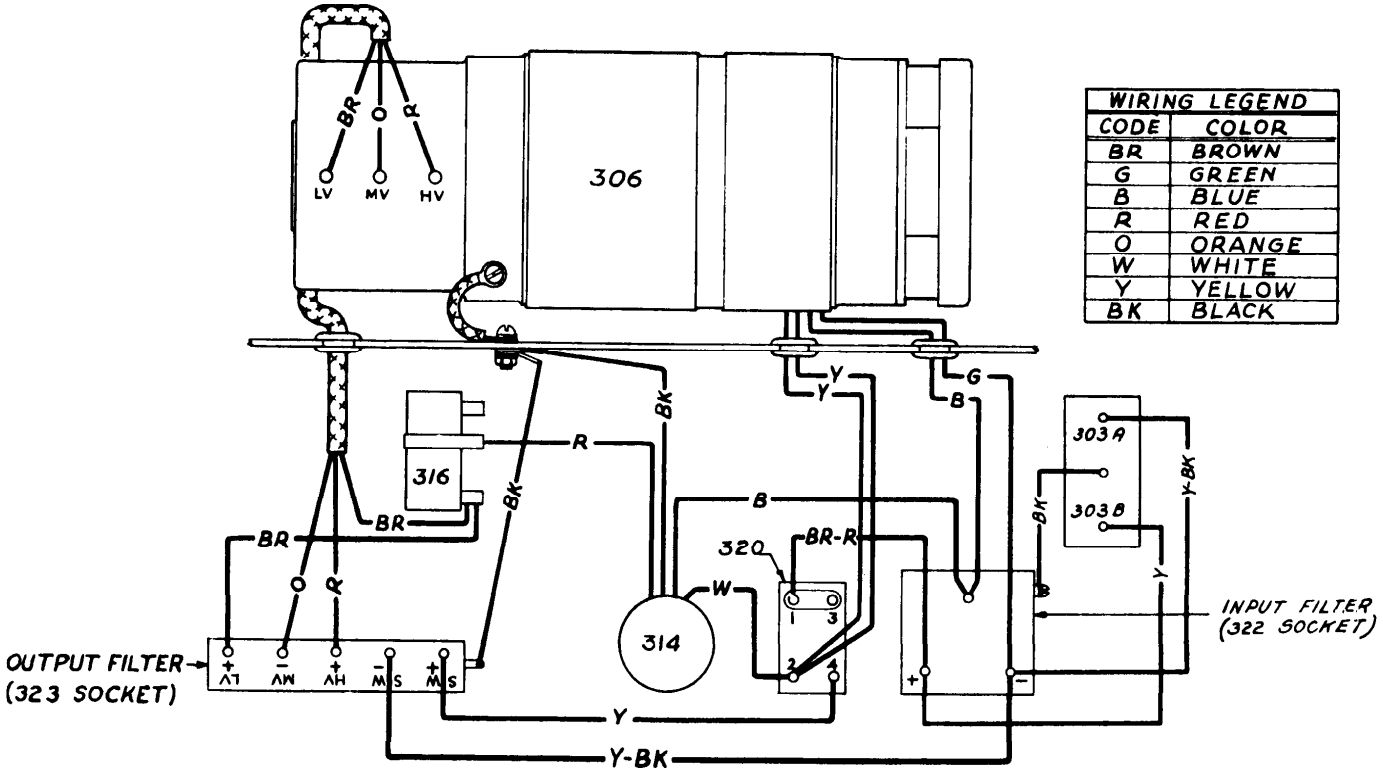


FIGURE 51 — DYNAMOTOR UNIT PE-98-A, WIRING DIAGRAM

606 and the 5-contact socket 607. Socket 607 is used only when a motor-driven variable-length antenna is employed in the complete installation of the equipment.

With the OFF pushbutton depressed (see Figure 6), contacts 611E are open and the dynamotor starting relay 321 is unenergized. When any channel-selector pushbutton A, B, C or D is pressed, the OFF pushbutton is automatically released and the contacts 611E are closed, thus starting the dynamotor unit and supplying power to the transmitter, receiver and control circuits. For example, if channel A pushbutton has been pressed, closing contacts 611A, the channel-control motor 406 (see Figure 55) will be energized through one pair of contacts of 611A, and the motor will operate until channel A is selected. At this time, the motor-positioning switch 427A opens, de-energizing the motor. However, since the contacts of 611A remain closed, voltage is supplied to indicator lamp 601-1 and this lamp will continue to glow until another channel-selector pushbutton is pressed or the equipment turned off. The other pair of contacts of switch 611A energizes the motor of the variable-length antenna if one is connected to the control box through plug socket 607. The remaining channel-selector pushbuttons function in the same manner (refer to Figure 55).

With T-R-REM. switch 612 in R position, voltage is applied to the coil of antenna relay 412 (in the rack) and this relay is switched to the *receive* position. Indicator lamp 601-5 is lighted. In T position, one pair of contacts of switch 612 are opened, breaking the circuit to the coil of antenna relay 412, causing the armature to fall away from the coil and switching the equipment to *transmit*. Simultaneously, lamp 601-5 goes out. In REM. position, control of the antenna relay 412 is effected by means of a press-to-transmit button (usually located on the throttle in the case of U. S. installations of Radio Set SCR-522-A). When pressed, this button energizes the coil of the press-to-transmit relay 161 located in Radio Transmitter BC-625-A. Operation of relay 161 opens a pair of contacts which breaks the circuit to the coil of antenna relay 412, switching the antenna and high-voltage supply to the transmitter. Indicator lamp 601-5 goes out. The release of the press-to-transmit (press-to-talk) button re-

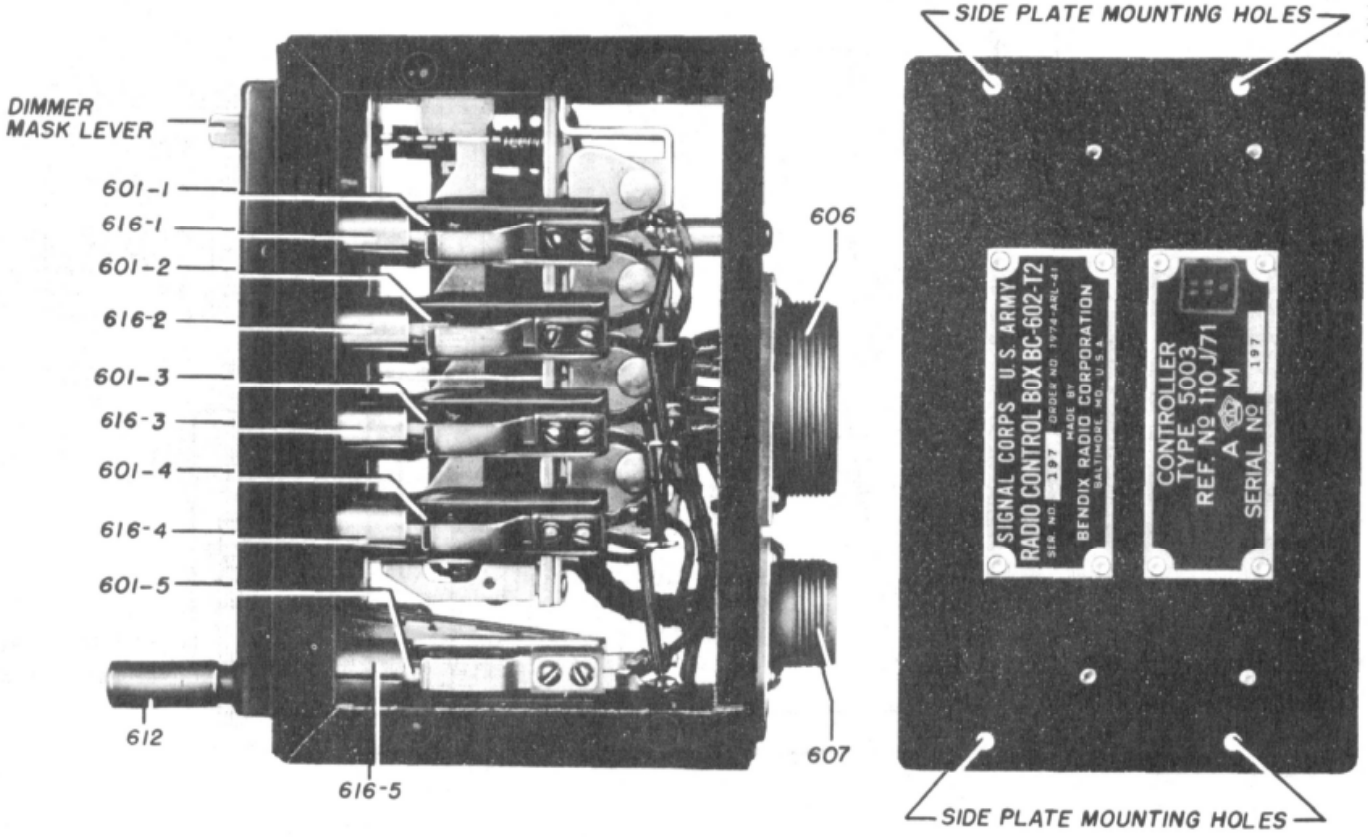


FIGURE 52 — RADIO CONTROL BOX BC-602-A, RIGHT INTERIOR VIEW

verses the process, restoring the equipment to *receive* and lighting lamp 601-5.

19. CONTROL CIRCUITS AND SUMMARY

a. *Frequency Changing Operation*

Figure 55 shows the position of all relays and switches when Radio Set SCR-522-A is operating normally as a receiver on channel "D". It is assumed that each transmitter and receiver channel has been pretuned to one of the four desired frequencies. If channel A pushbutton is pressed, the contacts of switch 611D are opened mechanically and contacts 611A are closed, permitting a flow of current from the +13v supply through the coils of relays 411-1 and 411-2, the contacts of motor-positioning switch 427A, switch 611A and the contacts of relay 130 to ground (—13 volts). Relays 411-1 and 411-2 immediately operate. When the contacts of relay 411-2 close, a potential of 13 volts is applied to ratchet motor 406, causing it to rotate until 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 flowing from the +13 volt supply through contacts 611A and relay 130 contacts to ground. The operation of relay 411-1 may be disregarded when the T-R-REM. switch is in R position, since relay 412 is already energized by current flowing 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 were to start while transmission was going on (antenna relay 412 de-energized), current

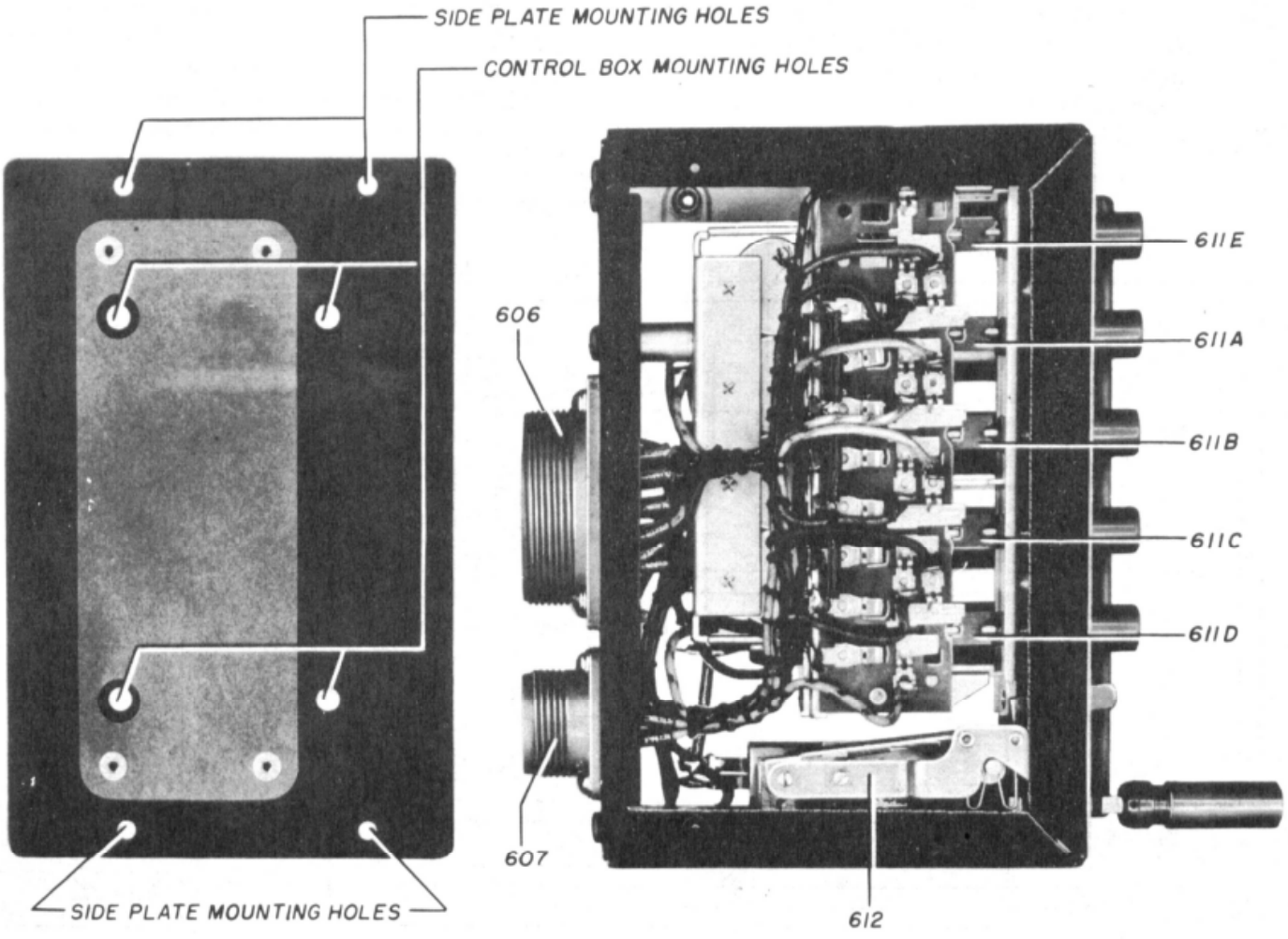


FIGURE 53 — RADIO CONTROL BOX BC-602-A, LEFT INTERIOR VIEW

would flow from the +13v supply through the coil of relay 412 and through relay 411-1 to ground, thus transferring the antenna relay 412 to the *receive* position until channel shifting was completed.

b. *Transmit, Receive and Remote Operation*

When any channel selector pushbutton except 611E is depressed, contacts 611E close, energizing the dynamotor starting relay 321. Dynamotor Unit PE-94-A then furnishes the radio set with all necessary operating voltages, namely, +13v d.c., —150v d.c., and +300v d.c. With the T-R-REM. switch in R position, the antenna relay 412 is operated by the current from the +13v supply through its coil, contacts of the T-R-REM. switch, and one pair of contacts on relay 131 to ground. In its operated position, relay 412 connects the antenna to Radio Receiver BC-624-A and connects +300v to the r-f circuits of the receiver (see Figure 55). Indicator lamp 601-5 is lighted by the current flow from the +13v source through the same combination of contacts to ground.

With the T-R-REM. switch in T position, the return circuit through its contacts to ground (through the contacts of relay 131) is broken, extinguishing lamp 601-5 and deenergizing the coil of antenna relay 412. With the antenna relay in this condition, the antenna is connected to the r-f output terminal of Radio Transmitter BC-625-A, and a potential of +300v is transferred to the plate circuits of the transmitter oscillator Tube VT-198-A and second harmonic amplifier Tube VT-118.

Placing the T-R-REM. switch in REM. position results in normal receiver operation (since the ground return for the coil of relay 412 is then made through the contacts of relays 161 and 131) unless the press - to - transmit (throttle) switch is pressed, resulting in operation of relay 161. When the contacts of relay 161 open, the ground return circuit of relay 412 is broken, and the relay returns to the *transmit* position. The ground return for lamp 601-5 is also broken and the lamp goes out. Releasing the press-to-transmit switch restores the equqipment to the *receive* condition.

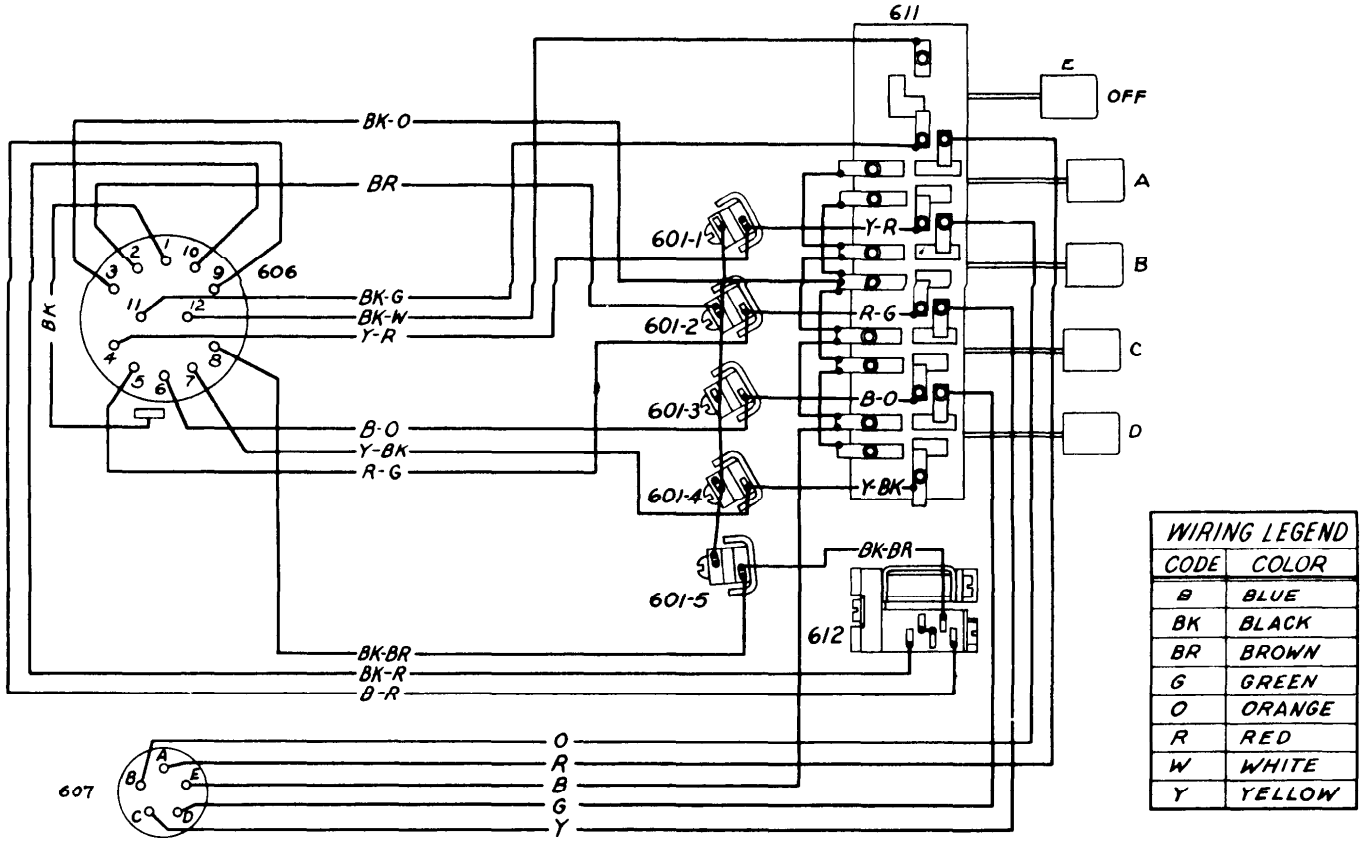


FIGURE 54 — RADIO CONTROL BOX BC-602-A, WIRING DIAGRAM

c. *Contactor Operation*

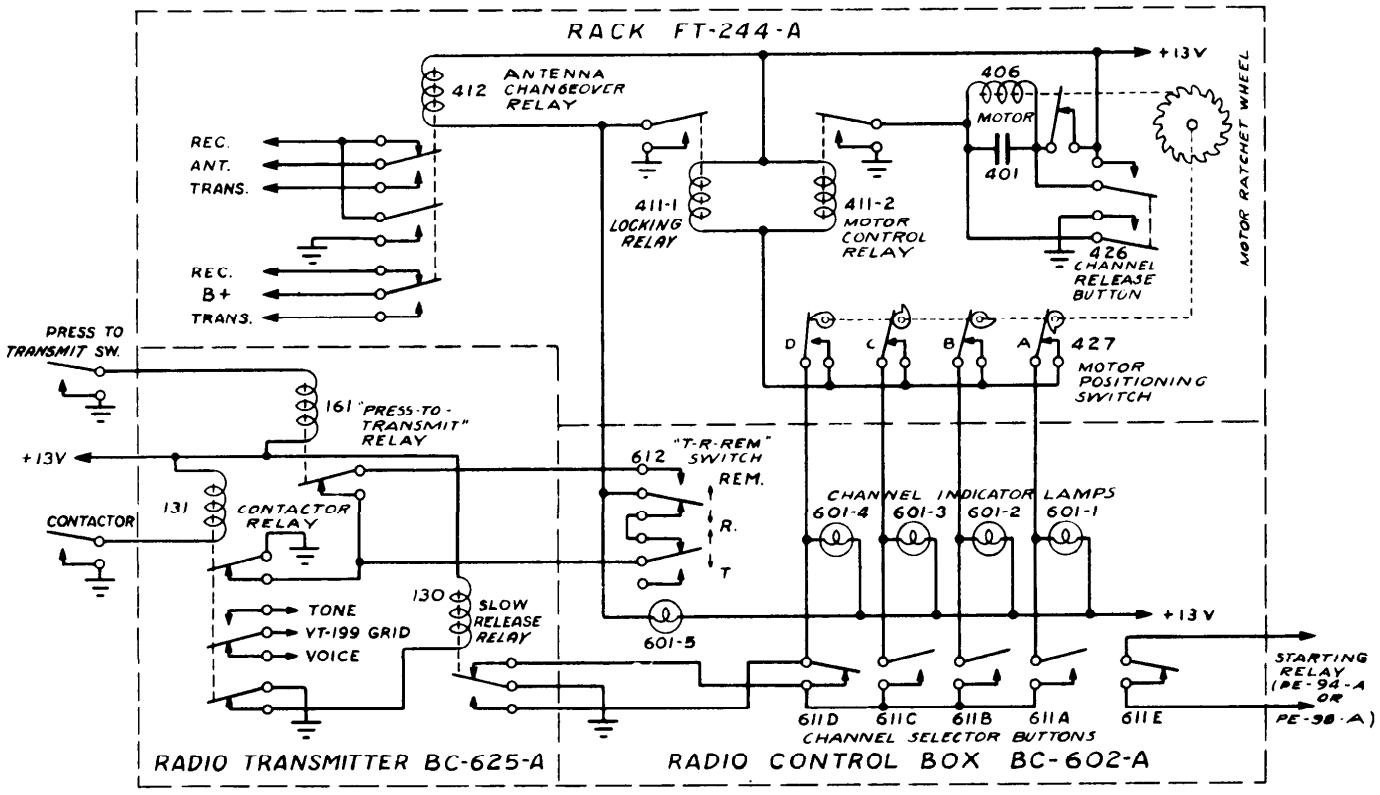
Closing the contactor switch or connecting together the wires of the junction box-contactor cord energizes the coil of relay 131. Operation of this relay produces the following results:

(1) The ground return for the coil of antenna relay 412 is opened, thus placing the transmitter in operation (or *locking* it in *transmit*, if it is already in that condition).

(2) The grid of the 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 steadv tone of approximately 1000 cycles per second. This tone is transmitted on the frequency channel which happens to be in use when the contactor switch is closed.

(3) The ground return for the coil of relay 130 is opened with the result that after a delay of less than half a second (relay 130 has a slow-release characteristic), the ground return for the channel selector switches 611A, B, C and D is opened, and the ground is transferred directly to one contact of motor-positioning switch 427D. Figure 55 shows channel D already selected and, in this case, of course, the channel-shifting mechanism would not operate. However, if any other channel were in use prior to closing the contactor switch, the shifting mechanism would be energized, relay 411-1 would transfer the antenna relay 412 to *receive* and these conditions would be maintained until channel D was selected, thus stopping ratchet motor 406 and returning relay 412 to the *transmit* condition. Continuous tone transmission on channel D frequency would continue until the contactor - switch contacts were opened.

Since the transfer to channel D occurs a fraction of a second after the contactor switch is closed, there is a momentary burst of tone - modulated carrier on the channel which is in use before the equipment switches to channel D



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

FIGURE 55 — CONTROL CIRCUITS, SIMPLIFIED SCHEMATIC DIAGRAM

SECTION IV

SERVICING AND REPAIR

20. RADIO SET TROUBLE LOCATION AND REMEDY

NOTICE: The test milliameter reading obtained on switch position 3 is an excellent indication of the overall functioning of the transmitter. Dynamotor or antenna system defects which will cause early failure of the transmitter will be reflected by this reading. A record of this reading (for the lowest frequency channel only) should be kept for all installations and the reading should be checked daily. Any deviation from normal will then be apparent, and the defect responsible may be determined and proper repairs effected before any damage is done. To insure keeping the drain on the plane battery to a minimum, the reading should be taken following a two minute warm-up period, and the total time consumed should be limited to five minutes. Whenever it is necessary to remove the radio set for servicing, the dynamotor should also be removed and checked.

Before removing any component from Radio Set SCR-522-A installed in an aircraft, determine the cause of failure and isolate the particular faulty circuit or component of the equipment. Look for the simple causes of trouble first.

Innumerable defects can and may develop in a complex piece of radio equipment. Remember that time can always be saved by analyzing the cause of trouble and by locating the defective subassembly or component without first tearing all the equipment out of the airplane. Do not be embarrassed by removing a major unit from an airplane only to discover that the failure was caused by defective wiring or some other unit of the installation.

A few moments of thought and study of the complete schematic circuit diagram, together with a mental tabulation of the various *possible* causes of failure, may save hours of haphazard labor. Once the identity of the defective unit has been established beyond reasonable doubt, remove and repair it or replace it with a good unit.

The following list of troubles and probable causes will assist in locating and remedying some of the more common faults in the radio set.

Symptom	*Probable Cause*
1. Dynamotor does not run.	Open fuse or wiring in 28v input circuit. Defective starting relay 321 or its associated control wiring. Defective dynamotor 307.
2. Dynamotor runs but no transmitter power output; 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 dynamotor unit and check voltage to ground at pins 1 (−150v), 2 (+300v), and 4 (+13v). Water in Rack FT-244-A connector sockets or in Case CS-80-A.

20. RADIO SET TROUBLE LOCATION AND REMEDY (Continued)

Symptom	*Probable Cause*
3. Receiver operates properly, but no transmitter output on any channel.	Transmitter not tuned properly. No crystal in socket. Defective antenna relay 412. Locking relay 411-1 jammed in operated position. Defective T-R-REM. switch in Radio 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.
4. Transmitter operates properly, but receiver dead or only dynamotor ripple audible in headset.	Receiver not tuned properly. No crystal in socket. Receiver AUDIO or RELAY controls rotated fully counterclockwise. Defective receiver. 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 Radio Control Box BC-602-A.
5. Audible howl in headset; also modulation present on transmitter carrier.	Water or dirt between terminals or contacts of microphone-headset jack. Improper jack-box connections.
6. Equipment will turn "on" when any channel pushbutton on Radio 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 Radio Control Box BC-602-A. Open wiring between same pin 16 and slow release relay 130 in transmitter. Open wiring to coil of slow release relay 130 in transmitter, 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 Radio 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 pushbutton on the control box is depressed) although operation on remaining 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.
8. Channel selecting mechanism in Rack FT-244-A is operated when any channel-selector pushbutton on Radio Control Box BC-602-A is depressed, but one or two channels are inoperative for both transmitting and receiving.	Defective or misadjusted motor positioning switch 427 in Rack FT-244-A, causing overtravel of ratchet motor and subsequent release of receiver and transmitter channel-selecting slides. This may also be due to sluggish relay 411-2. Improper location of ratchet motor 406 in rack.

20. RADIO SET TROUBLE LOCATION AND REMEDY (Continued)

Symptom	*Probable Cause*
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 receiver 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 capacitor.
12. Equipment does not shift to channel D and transmit steady tone when Contactor Unit BC-608-A is in operation.	Switch on contactor unit not in proper position. Defective relay 131 in transmitter or dirty contacts on relay 130 in transmitter. Defective wiring between contactor unit and relay 131. No radio-frequency power output from transmitter on channel D. No crystal in socket.
13. Equipment transmits when T-R-REM. switch in control box 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. 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 satisfactory, 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.
15. Excessively high cockpit noise level or audio distortion interfering with intelligibility.	GAIN control on Radio 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.

21. REMOVAL AND DISASSEMBLY OF PARTS

NOTICE:— Do not remove or disassemble any part of Radio Set SCR-522-A unless this is absolutely necessary for maintenance, repair or replacement. Needless tampering may lead to faulty operation or damage to equipment.

a. *Removal of Transmitter Receiver and Rack from Case CS-80-A*

Loosen the four Dzus fasteners, two located on the top front and two on the top rear of Case CS-80-A. Grasp the rack by its recessed handles. Lift the rack (together with the transmitter and receiver) out of

the case and set it down, control panels uppermost, on a flat surface.

b. *Removal of Transmitter from Rack*

If the equipment is turned on and one of the frequency-shifter slides is actuated (i.e., one of the four channels has previously been selected) press the channel-release pushbutton in Rack FT-244-A and note that this results in release of the frequency-shifter slide previously actuated. Turn the equipment off by pressing the OFF pushbutton on Radio Control Box BC-602-A. It is now possible to remove the transmitter or receiver from the rack without damaging the frequency-shifter mechanism. If the rack is disconnected from a power source it is possible to accomplish the same result by carefully operating the armature of the ratchet motor by hand.

NOTICE:—DAMAGE TO EQUIPMENT WILL RESULT IF ALL CHANNEL SLIDES ARE NOT RELEASED PRIOR TO REMOVING THE TRANSMITTER OR RECEIVER FROM RACK FT-244-A.

Loosen the Dzus fasteners pinning the transmitter cover to the center cover. Lift the transmitter cover slightly and slide it away from the top of the transmitter. Remove the four red mounting screws fastening the transmitter to the rack (see Figure 3). Lift the transmitter side of the rack slightly while pressing the top of the transmitter down with the thumbs. The transmitter will come free. Lift the rack, together with the receiver, away from the transmitter.

c. *Removal of Receiver from Rack*

The receiver is removed from the rack by removing the four red-painted receiver-mounting screws and following the same procedure as for the transmitter in Paragraph 21b. *Do not forget to release the frequency-shifting mechanism and do not let the rack drop.*

d. *Removal and Replacement of Transmitter Vacuum Tubes*

Before attempting to remove any transmitter vacuum tubes, become familiar with the notes concerning these tubes in Paragraph 21e.

Remove the transmitter from the rack (see Paragraph 21b).

Loosen the four Dzus fasteners from the end plate located on the right side of the transmitter chassis (see Figure 35). Remove the plate. Install the tubes (1 VT-118, 1 VT-198-A and 1 VT-134) belonging in the compartment made accessible by the removal of the end plate. Connect the two plate clamps (located on the tank-circuit leads) to the plate terminals on top of power-amplifier Tube VT-118. DO NOT CROSS THE TANK CIRCUIT LEADS.

NOTE:— When replacing the end plate, make certain that the Mycalex clamp on its inside surface holds Tube VT-118 firmly in its socket.

Place the transmitter on one of its sides. Loosen the knurled thumbscrew on tube clamp 163 for the second harmonic-amplifier Tube VT-118 in the bottom of the transmitter, and turn the clamp aside to make the tube socket accessible (see Figure 34). After inserting the tube in its socket, the clamp may be placed over the tube and the thumbscrew tightened. Care must be taken not to break the plate terminals. Connect the two output-circuit plate clamps to the plate terminals on top of the tube. DO NOT CROSS THE OUTPUT CIRCUIT LEADS.

Insert the remaining tubes into their respective sockets.

e. *Notes on Transmitter Vacuum Tubes*

Study the tube-heater circuits (see Figure 56) to become familiar 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 Tube VT-199 in its socket and, as a consequence, oscillator Tube VT-198-A does not light and the crystal seems "dead". No other pairs of transmitter tubes are interdependent in this manner. A puzzling difficulty sometimes encountered, especially in the case of Tube VT-118, is that the tube filament seems satisfactory when checked on a continuity meter and lights

(perhaps dimly) in the transmitter, but the tube 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 still glows without burning out. These tubes can usually be recognized by the white oxidization of the getter stain flash inside the tube except, of course, in the case of metal tubes which become very hot because of the filament temperature alone.

Sometimes an "air leaker" Tube VT-118 is a slow leaker and goes through an ionization period in which an arc strikes inside the tube. The great heat of this arc often melts the plate and grids. Tubes destroyed in this manner sometimes burn out the associated r-f choke and the modulation transformer.

Occasionally, the metal tubes 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 Tube VT-118 because of its fragile structure.

(1) Insert or remove tubes from sockets by pushing straight down or by pulling directly upward. A vigorous rocking motion is definitely harmful. There is sufficient vertical clearance on the ceramic base for the pins, 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 length of the glass seal around the pins may vary somewhat from pin to pin. The longest glass seal limits the depth to which the tube may be inserted into the socket; therefore the tube will "rock" around the end of the longest seal if pushed any further.

(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. Investigate all cases where the tube fits unusually hard because cracks may form later from prolonged pressure strains.

When observing tubes under operation, do not confuse the fluorescent glow of the

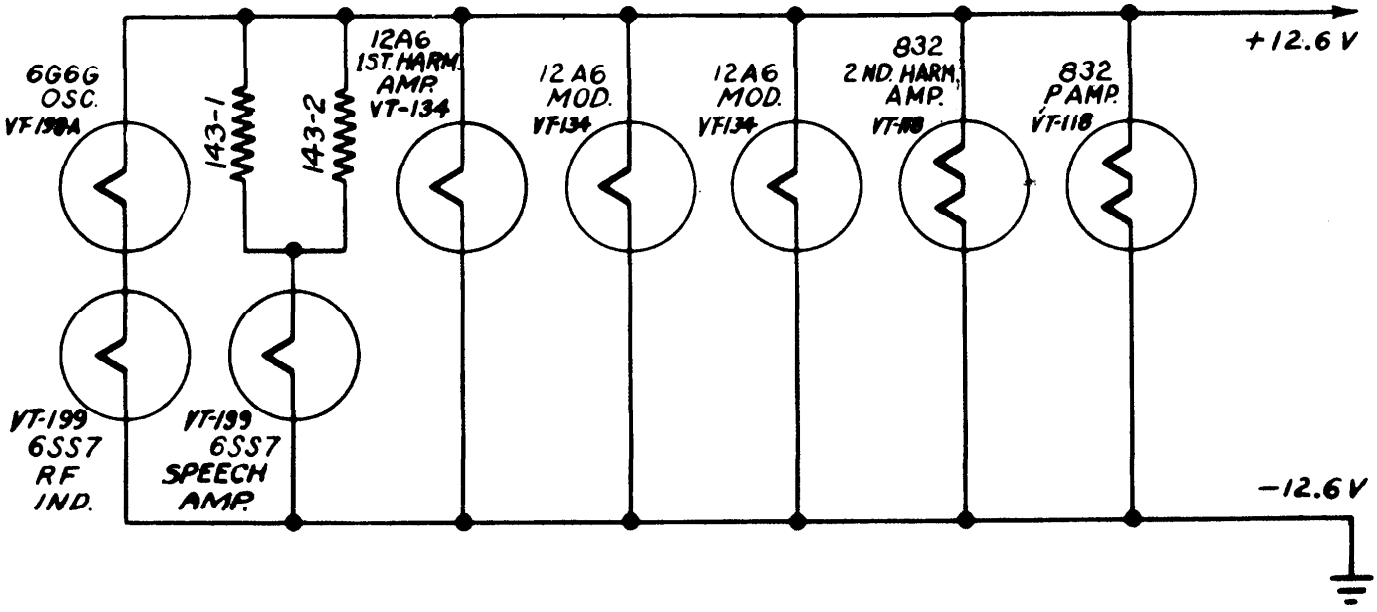


FIGURE 56 — TRANSMITTER TUBE HEATER CIRCUITS, SIMPLIFIED SCHEMATIC DIAGRAM

glass and getter stain with the gas ionization glow in and around the elements which is characteristic of a "soft" or gassy tube. Gassy tubes are defective and should be replaced.

f. *Removal and Replacement of Receiver Vacuum Tubes*

Remove the tranmitter-receiver assembly from Case CS-80-A (see Paragraph 21a).

Remove the receiver from the rack (see Paragraph 21c). Make certain that all tube-securing clamps are properly adjusted after the tubes have been inserted into their respective sockets. Tubes VT-202 and VT-203 will exhibit white oxides if there is an air leak due to a crack in the tube base. A tube showing signs of oxidation should be replaced immediately, otherwise any tube connected in series with it will glow very brightly and burn out.

g. *Removal of R-F and Oscillator Assembly from Receiver*

(1) *General*

The r-f and oscillator assembly of Radio Receiver BC-624-A consists of an r-f section and an oscillator section, this being clearly shown in the wiring diagram, Figure 47. The r-f and oscillator assembly may be removed as a complete unit, or the oscillator section may be removed separately. Removal of the r-f and oscillator assembly as a complete unit will be treated first.

(2) *Removal of R-F and Oscillator Assembly*

(a) Remove the receiver from the transmitter - receiver assembly (see Paragraphs 21a and c).

(b) Unsolder the black, white-blue, red, and brown leads from the oscillator section terminal board (see Figures 41 and 46).

(c) Unsolder the black-white-green, red-white, 2 red leads, and 2 brown leads from the r-f section terminal board (see Figures 41 and 46).

(d) Unsolder the blue lead from terminal No. 2 of the first i-f transformer 291 (see Figure 46).

(e) Unsolder the grounding lug (see Figure 41).

(f) Remove the r-f oscillator grounding strap (see Figure 41). This strap provides a good ground and ties both the r-f and oscillator sections to a shield in the receiver. The r-f and oscillator section cannot be removed unless this ground strap is completely free of the shield.

(g) Loosen the receiver tuning-control locknuts (see Figure 36) and set both receiver tuning controls at the alignment mark (high frequency) above the 156-mc division on the calibration plate.

(h) After softening the glyptal with glyptal thinner, acetone, or heat, insert a set-screw wrench into the holes provided in the rear of the receiver (see Figure 37) and loosen one set screw in each of the two variable capacitor couplings. Set-screw wrenches are provided in the special tool set (part of Test Equipment IE-19-A or IE-12-A).

(i) Set both receiver tuning controls at the alignment mark (low frequency) below the 100-mc division on the calibration plate and repeat the procedure of (h) above.

(j) Remove the two mounting screws (one near the channel D crystal-identification plate and one next to the "286" stencil mark) of the crystal-selector switch 286 and draw the switch *away* from the frequency-shifter mechanism thus disengaging the switch arms from the shifter slides. WARNING:— Do not remove the nuts on top of switch 286 (see Figure 36), as this may cause the switch to come apart.

(k) Remove the four frequency-shifter mounting screws (see Figure 36) and remove the frequency-shifter mechanism.

(l) Remove the six screws (three on the right and three on the left side of the r-f and oscillator assembly)

which secure the assembly to the receiver chassis. The three screws on the right side of the assembly are shown in Figure 38. WARNING:—Do not allow the r-f and oscillator to drop or to strike against any other component of the receiver.

(m) Lift the r-f and oscillator assembly out of the receiver.

(3) *Removal of Oscillator Section Only*

If it is desired to remove the oscillator section of the r-f and oscillator assembly:

(a) Follow the procedure of Paragraphs 21g(2)(a), (b), (f), (g), (h) and (i), with this exception: loosen only the screws in the coupling for the variable capacitor 217A and B.

(b) Remove the oscillator-section mounting screw and the two mounting nuts (see Figure 37). Do not allow the oscillator section to drop. Pull the oscillator section *away* from the tuning control and lift it out of the receiver.

(4) *Re-installing R-F and Oscillator Assembly*

To re-install the r-f and oscillator assembly, reverse the removal procedure. Make certain that the crystal-switch arms engage the pins of the frequency-shifter slides.

Set the receiver tuning controls at the dial mark below the 100-mc division. With the receiver tuning controls in this position, the rotors of the r-f and oscillator capacitors 216A, B and C, and 217A and B, respectively, should be fully meshed with their respective stators. If this is not the case, loosen the locknuts and turn the tuning controls to the alignment mark (high frequency) above the 156-mc calibration

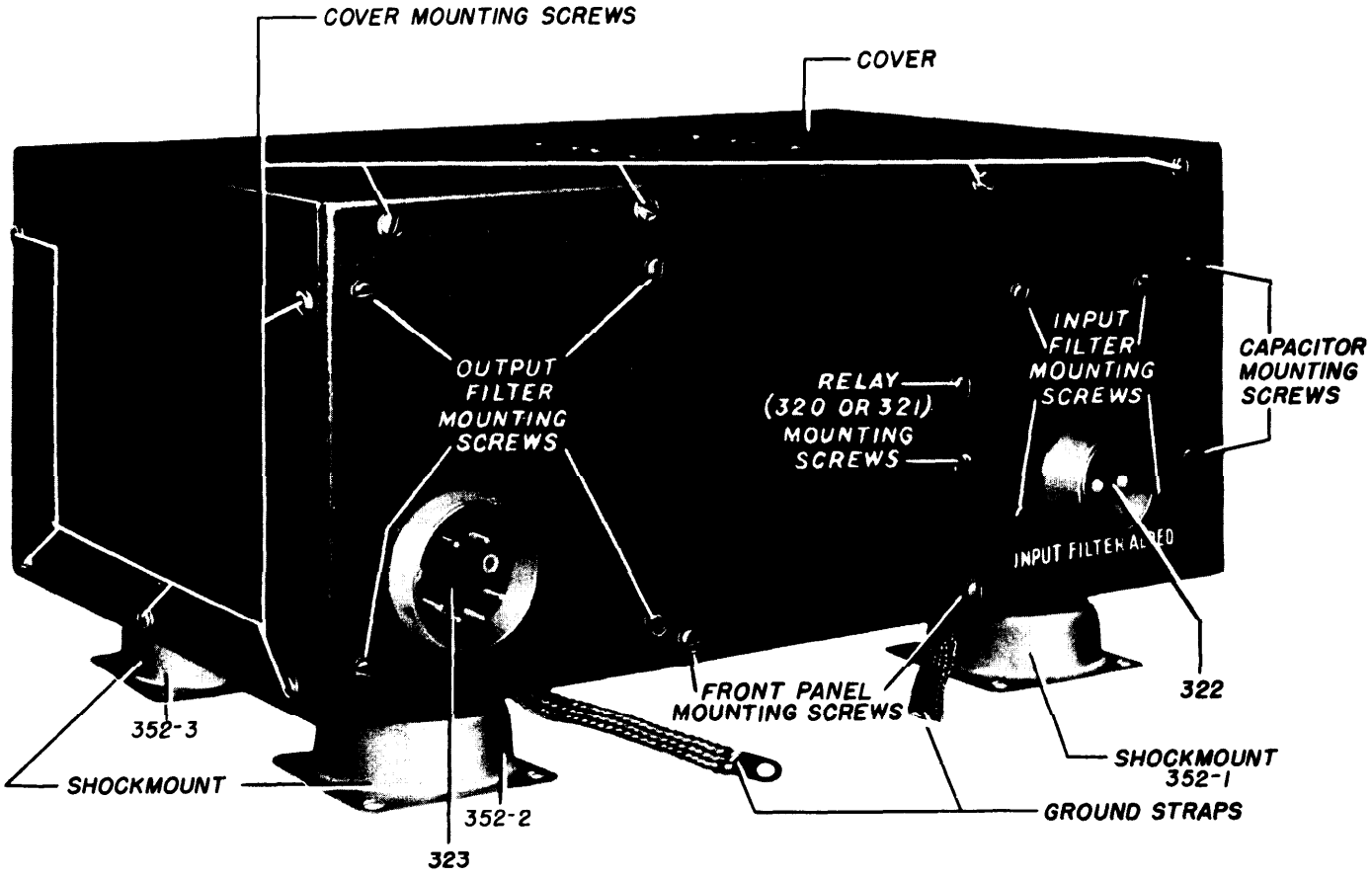


FIGURE 57 — DYNAMOTOR UNIT PE-94-A OR PE-98-A, FRONT OBLIQUE VIEW

division. Insert a set-screw wrench into the holes provided in the rear of the receiver chassis (see Figure 37) and loosen one set screw in each capacitor coupling shaft. Set-screw wrenches are provided in the special tool set (part of Test Equipment IE-19-A or IE-12-A).

Now turn the tuning controls to the alignment mark (low-frequency) below the 100-mc calibration division. Loosen the other set screw in each capacitor coupling shaft. With the tuning controls accurately set on the low-frequency alignment mark, completely mesh the capacitor plates and tighten one set screw in each coupling shaft after applying glyptal to the set-screw threads.

Turn the tuning controls to the high-frequency end of the band, apply glyptal to and tighten the remaining set screws.

h. ***Removal of Ratchet Motor from Rack***

Do not tamper with the ratchet motor unless absolutely necessary. The adjustments are delicate and will cost time and trouble if upset.

(1) Remove the transmitter and receiver from the rack (see Paragraphs 21a, b and c), and allow the frequency shifter-mechanism to remain released.

(2) Remove the small screw (next to the positioning spring) which connects the ratchet motor to the L-shaped bracket on top of the actuating slides.

(3) Remove the four motor-mounting screws on the bottom of the rack. The motor is now loose. To completely separate the motor from the rack, unsolder all wires attached to the motor.

(4) In replacing the motor in the rack, consult Paragraph 25c and the wiring diagram, Figure 49.

i. ***Disassembly of Dynamotor Unit***

(1) *Removal of Dynamotor Unit Cover*

Remove the eighteen cover screws (see Figures 5 and 57) and remove the cover.

(2) *Removal of Front Panel*

Disconnect all interconnecting leads from the front panel. Remove the two screws nearest the bottom and remove four screws, two on each end of this panel. Draw the front panel away from the dynamotor unit. The input filter, the output filter, the starting relay and capacitor 303A and B are mounted on the front panel (see Figure 59). Dynamotor units which are provided with capacitor 303A and B are stenciled INPUT FILTER ADDED below the two-contact socket.

(3) *Removal of Starting Relay*

The starting relay may be removed without first removing the front panel. Remove the interconnecting leads. Remove the two large binderhead screws (shown in Figure 57) which secure the relay to the front panel.

(4) *Removal of Input Filter*

(a) The input filter may be removed without first removing the front panel. Remove the interconnecting leads and remove the four binderhead screws which secure the input filter to the front panel (see Figure 57).

(b) To disassemble the input filter, remove the eight small binderhead cover screws and remove the cover. All the components of the filter are now accessible.

(5) *Removal of Output Filter*

(a) Remove the front panel as in (2) above. Remove the four binderhead screws (see Figure 57) which secure the output filter to the front panel.

(b) To disassemble the output filter, remove the four cover-mounting screws and remove the cover. This makes the components of the output filter accessible.

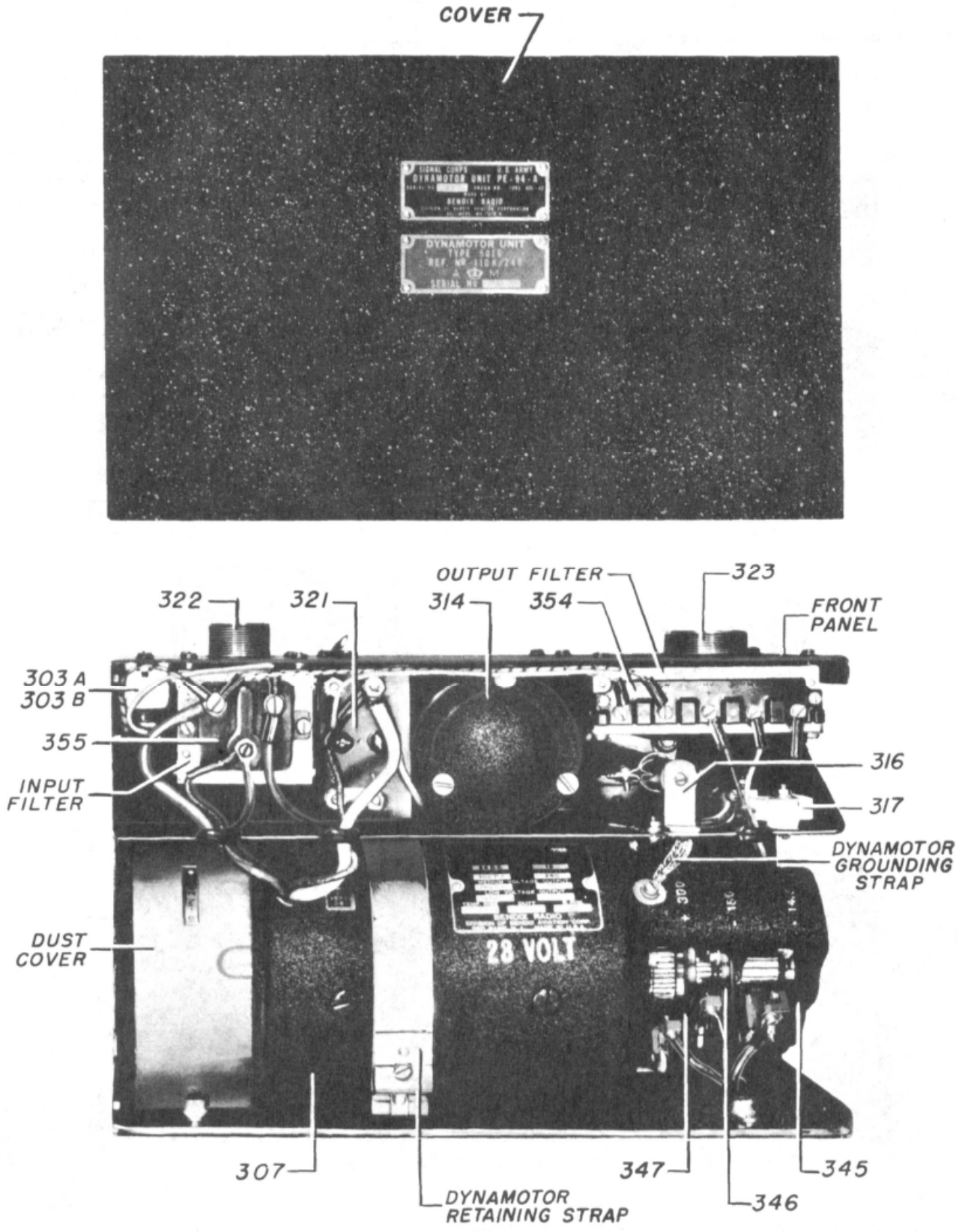


FIGURE 58 — DYNAMOTOR UNIT PE-94-A, COVER REMOVED

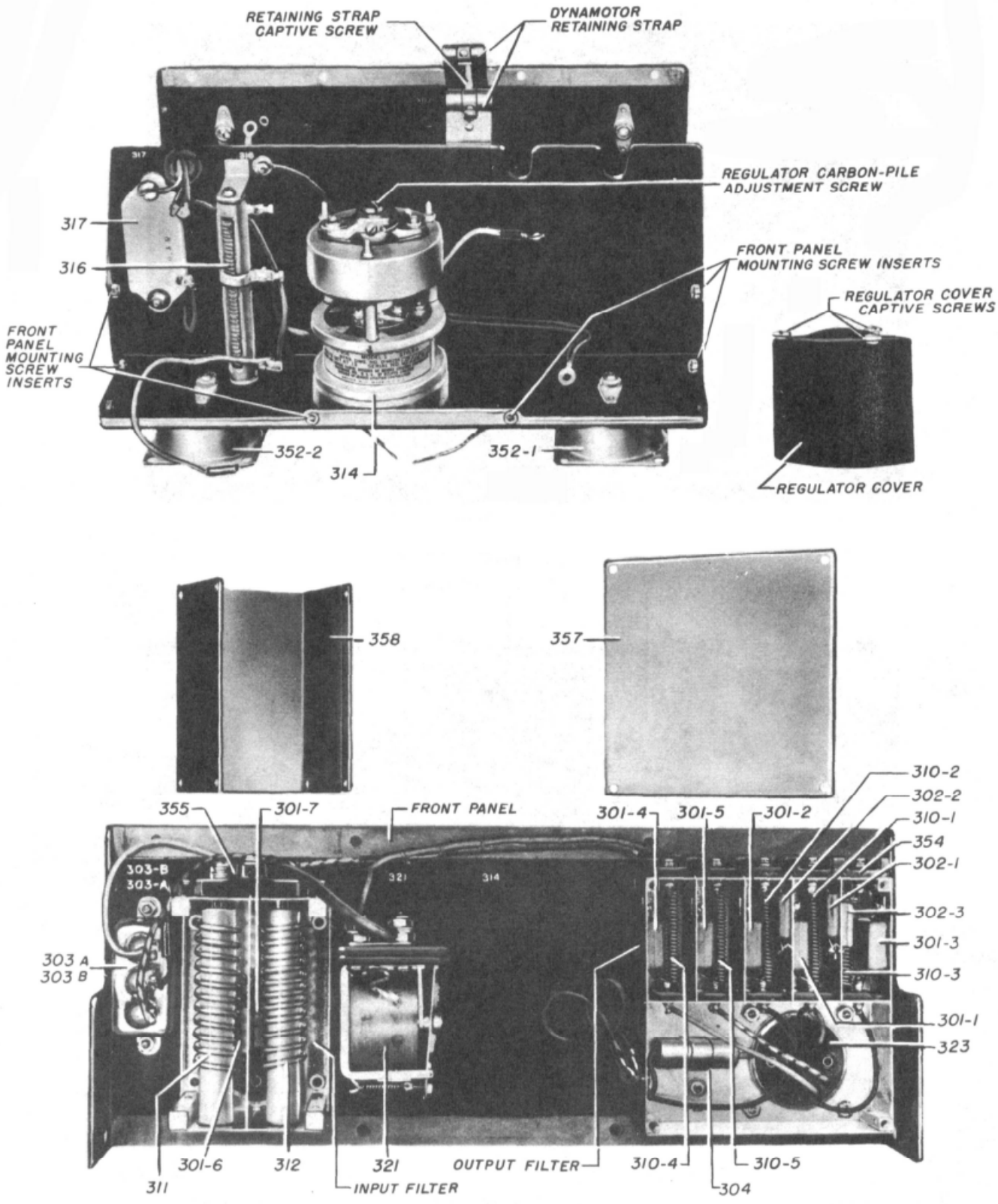


FIGURE 59 — DYNAMOTOR UNIT PE-94-A OR PE-98-(AM) DISASSEMBLED

(6) *Removal of Dynamotor*

Disconnect the dynamotor interconnecting leads (see Figures 58 and 60). Loosen the captive screw which connects together the ends of the dynamotor retaining strap. Carefully pull the dynamotor out of its compartment.

(7) *Disassembly of Dynamotor*

Remove the dust cover. Remove all brushes and leads to brush holders. Remove the four fillisterhead screws which secure the input end bracket to the dynamotor frame. Remove the input end bracket (together with the armature). Repeat for the output end bracket.

Remove the fan from the armature and draw the armature out of the input end bracket.

(8) *Replacement of Bearings*

The dynamotor bearings are sealed and cannot be lubricated. If bearings have to be replaced, remove the old ones carefully to prevent damage to the armature shaft. Press new bearings on the shaft. CAUTION:—When pressing bearings on the shaft, apply an even pressure on the inner race only, as pressure on the outer race will damage the bearing.

(9) *Replacement of Brush Holder Rings*

Remove armature [see Paragraph 21i (7)]. Remove the output brush ground cable. Remove the two hexhead screws mounting the brush holder ring to the end bracket and remove the ring. When remounting the brush holder ring, position it so that the screws are in the center of the slots.

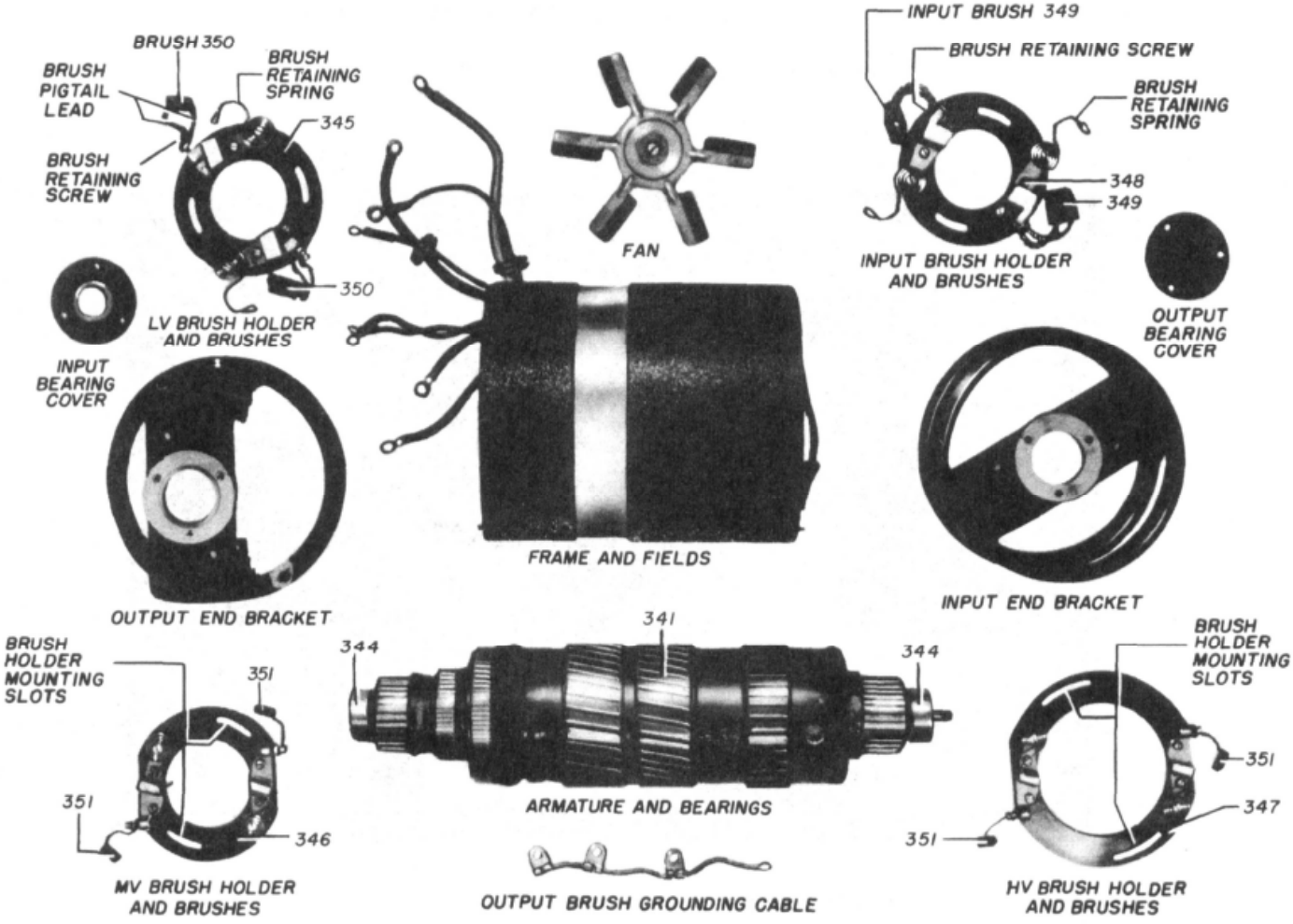


FIGURE 60 — DYNAMOTOR, DISASSEMBLED

(10) *Replacement of Brushes*

Brushes may be replaced without first disassembling the dynamotor. Remove the screw fastening the flexible lead to the brush holder, move the brush spring away from the brush, remove the old brush and replace with a new one. Do not forget to refasten the flexible lead to the brush screw after replacing the brush.

(11) *Replacement of Fields*

Remove the six large flathead screws which secure the pole pieces to the dynamotor frame. The fields are fastened to the frame by means of these pole pieces.

(12) *Removal of Voltage-Regulator Cover*

To remove the voltage-regulator cover, first remove the two wires from the SW+ and SW— terminals of the output filter. Loosen the three captive screws from the regulator cover and remove the cover. The front panel does not necessarily have to be removed.

(13) *Removal of Voltage Regulator*

Remove the front panel [see (2) above]. Remove the three flathead regulator-mounting screws on the bottom of the dynamotor unit (see Figure 61) and disconnect all wires going to the voltage regulator and remove the regulator.

(14) *Maintenance of Dynamotor Unit PE-94-AM*

Dynamotor Unit PE-94-AM is provided with one yellow dynamotor lead instead of two. The dynamotor must be removed before replacing brushes or lubricating bearings.

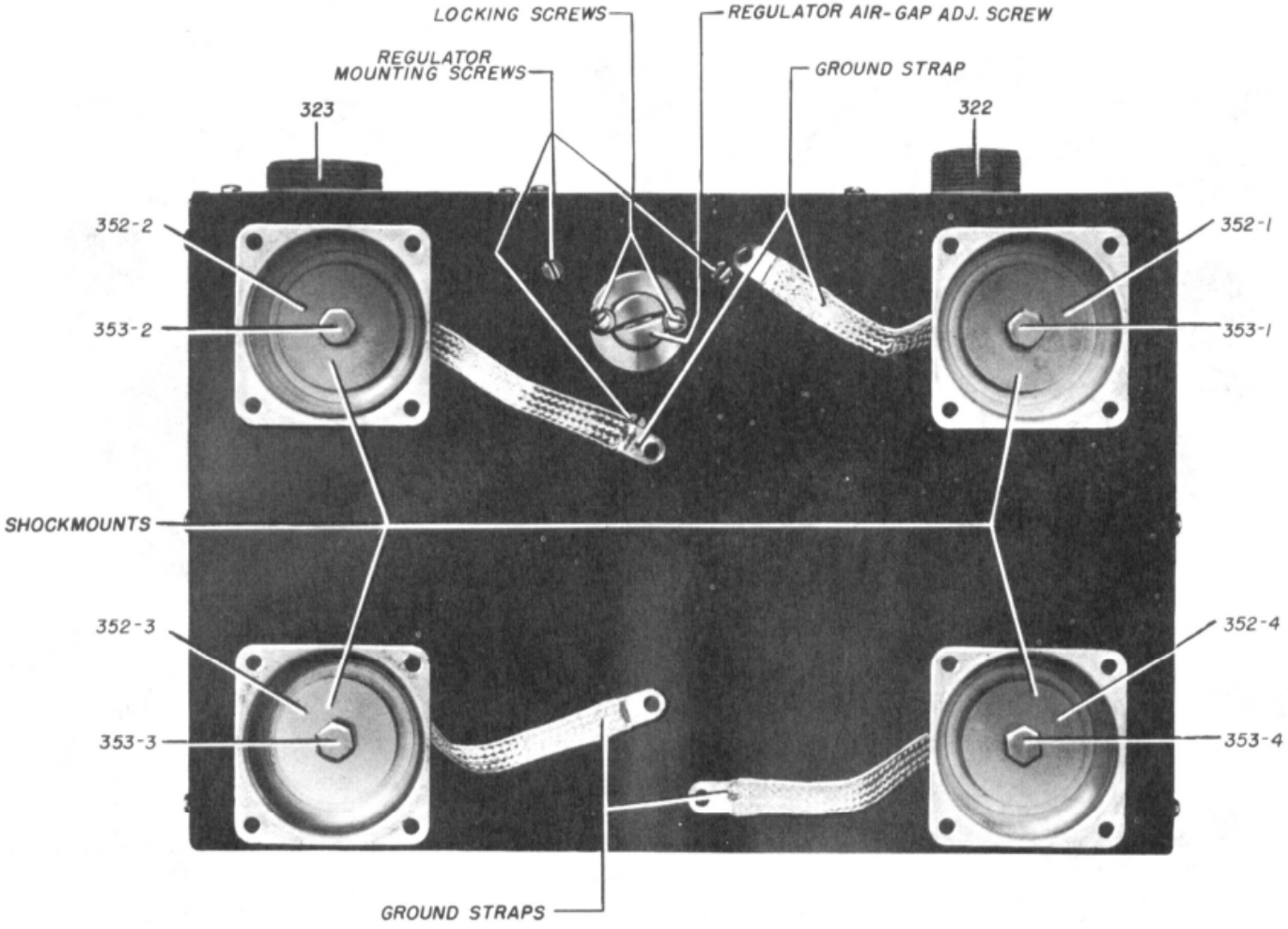


FIGURE 61 — DYNAMOTOR UNIT PE-94-A OR PE-98-A, BOTTOM VIEW

Brushes are stamped + and —. The stamped side of the brush must face the stamp on the end brackets.

The fan assembly is secured to the armature shaft by means of two Bristo set screws. The fan assembly and bearing shield must be removed to make one bearing accessible for lubrication, and the other bearing must have its shield removed. Clean and relubricate bearings moderately with Andok C grease approximately every 6 months or after 1000 hours of service.

Refer to Figures 75 and 76 for views of dynamotor unit.

22. RECEIVER MAINTENANCE

a. *Receiver I-F Amplifier Transformer Alignment*

(1) DO NOT attempt i-f alignment before checking tubes and making certain that the receiver sensitivity on all channels, with all channels properly tuned, is worse than the values given in Paragraph 29c(2). If a Ferris 18C signal generator is not available for performance tests, compare the sensitivity of the receiver under test with a receiver known to be in good condition by using Signal Generator I-96-A or I-130-A. Note whether or not the minimum attenuator setting for audible receiver output is considerably higher for the receiver under test than for the good receiver. Proceed only if this test indicates that i-f alignment is necessary.

Any signal generator capable of producing an output of approximately one volt at a frequency of exactly 12 mc, and having a *terminated transmission line output*, is suitable for use in receiver i-f alignment. Modulate the r-f voltage approximately 30% at 400 to 1000 cycles. These instructions are written on the assumption that Signal Generator I-96-A (part of Test Equipment IE-12-A) is employed, but if another type of generator is being used, simply make adjustments which are equivalent to those specified here for Signal Generator I-96-A.

(2) Remove the assembly comprising the transmitter, receiver and rack from Case CS-80-A (see Paragraph 21a).

(3) With Signal Generator I-96-A set up within 5 feet of the Radio Receiver BC-624-A to be tuned, plug one end of the signal-generator d-c meter cord into the receiver test-milliammeter socket 288 located on the receiver control panel (see Figure 3) and plug the other end into the D.C. METER socket located on the signal-generator meter panel. Plug the i-f test cord into the signal-generator I.F. OUTPUT socket marked HIGH. Connect the OUTPUT terminal of the i-f test cord to the mixer tube grid lead located on the right side of the receiver and connect the GND terminal to the variable capacitor frame as shown in Figure 38. These leads must be kept *as short as possible* and in no case should they exceed a length of 1½ inches, otherwise the i-f amplifier may feed back and oscillate or be difficult to tune properly. Do not allow the output lead to touch the plate terminal, No. 7, of the mixer socket, as this may burn out the resistor in the cable terminal box.

(4) Connect an output-power meter or an a-c voltmeter (if available) across terminals No. 1 and 3 of socket 802 or terminals No. 1 and 4 of socket 804 of Junction Box JB-29-A. A pair of high-impedance headphones also should be connected across the same terminals to give the operator an aural indication. The load presented by the output-power meter or the a-c voltmeter should be adjusted to 4000 ohms if the yellow wire going to the receiver audio-output transformer 296 is connected to terminal No. 7, or 300 ohms if this wire is connected to terminal No. 6. This arrangement provides a more satisfactory tuning indication than can be obtained by using the signal-generator D.C. METER. If no output meter is available, the signal-generator D.C. METER may be used as a tuning indicator or the transformers may be adjusted, as outlined below, for peak output in the headphones

with the signal-generator attenuator adjusted for comfortable headphone volume, and readjusted, if necessary, as alignment progresses, to maintain that volume.

(5) If a 110v - 115v, 50 - 60 cycle power-supply source is available, plug the a-c line cord into the power source and into the a-c socket on the upper right side of the A.C. POWER SUPPLY panel of Signal Generator I-96-A. Throw the signal-generator A.C. ON-OFF switch to ON, the D.C. ON-OFF switch to OFF, the A.C.-D.C. switch to A.C., and the I.F.-R.F. switch to I.F.

If no external a-c power source is available, throw the A.C. ON-OFF switch to OFF, the D.C. ON-OFF switch to ON, the A.C.-D.C. switch to D.C., and the I.F.-R.F. switch to I.F.

(6) It is not necessary to use receiver crystals for i-f alignment. With the transmitter, receiver and rack set up for operation by means of Radio Control Box BC-602-A (see Figure 27), press any channel-selector pushbutton A, B, C or D on the radio control box. Place the control box T-R-REM. switch in R (center) position. Allow about one minute for the receiver vacuum tubes to warm up. Set the receiver AUDIO and RELAY controls in their maximum clockwise rotation positions.

(7) If an output meter or a-c voltmeter is used, the signal-generator ATTENUATOR should be adjusted to the position which results in an audio output of approximately 50 milliwatts (or 15 volts rms across 4000-ohm load, or 4 volts rms across 300-ohm load). If using another type of generator, set the output frequency at exactly 12 mc and adjust the attenuator for an output-meter reading of 50 milliwatts, just as for Signal Generator I-96-A. As tuning progresses, it may be necessary continually to readjust the ATTENUATOR or even to transfer the i-f test cord to the LOW output socket to retain a receiver audio output of approximately 50 milliwatts. In some cases, it may be necessary to readjust the receiver AUDIO control if considerably more than 50 milliwatts output is obtained with the ATTENUATOR set at MINimum.

If the signal-generator D.C. METER is used as a tuning indicator, place the meter switch in TRANS-REC. TUNING position and initially set the ATTENUATOR at the point which results in a slight dip in the meter reading. As tuning progresses, reduce the signal-generator output by means of the ATTENUATOR to retain a meter reading of approximately the same value as that initially obtained, transferring the i-f test cord to the LOW output socket, if necessary.

(8) Using the alignment tool or a small screwdriver, adjust the iron core tuning screws on top of transformer 294 (see Figure 37) for maximum audio output (or minimum D.C. METER reading). Repeat for transformers 293, 292 and 291, in that order, reducing the signal-generator output, if necessary, as explained in Paragraph 22a(7).

(9) Repeat the procedure given in Paragraph 22a(8) to see if any further improvement in i-f alignment is possible.

(10) Press the OFF button of Radio Control Box BC-602-A, remove the leads from the mixer tube and the variable-capacitor frame and replace the rack, receiver and transmitter in Case CS-80-A.

However, if no output-power meter is available and if the i-f stages were out of adjustment to such an extent that it was impossible to obtain a D.C. METER indication, try the following method:

(11) Remove the transmitter from the rack (see Paragraph 21b). **CAUTION: — TO PREVENT DAMAGE TO EQUIPMENT, RELEASE FREQUENCY-SHIFTER MECHANISM BEFORE ATTEMPTING TO REMOVE TRANSMITTER OR RECEIVER FROM RACK. REFER TO PARAGRAPH 21b.**

(12) Using a short length of wire, ground terminal 4 of socket 418-1 (see Figure 4) to the rack chassis to permit channel selection by means of the radio control box. Insert a wedge between the armature and the back-stop of the locking relay 411-1 located on the left side of the rack (see Figure 4), thus blocking it in its energized position. This must be done to keep antenna relay 412 in the energized position so that plate and screen voltage is applied to the receiver r-f and i-f circuits.

(13) Plug the i-f test cord into the signal-generator I.F. OUTPUT socket marked HIGH and connect the OUTPUT terminal of the i-f test cord to the grid of the third i-f Tube VT-209 (see Figure 40), exercising the same precautions as in Paragraph 22a(3). Connect the i-f test cord GND terminal to the nearest point on the receiver chassis.

(14) With the control-box T-R-REM. switch set at R (center position), press any channel-selector pushbutton. Allow about one minute for the receiver vacuum tubes to warm up. Set the receiver AUDIO and RELAY controls in their maximum clockwise rotation positions.

(15) Place the signal-generator meter switch in TRANS.-REC. TUNING position and initially set the ATTENUATOR at the point which results in a slight dip in the D.C. METER reading. As tuning progresses, reduce the signal-generator output by means of the ATTENUATOR, as explained in Paragraph 22a(7).

(16) Using the alignment tool or a small screwdriver, adjust the iron core tuning screws of transformer 294 (see Figure 37) for minimum D.C. METER reading.

(17) Connect the OUTPUT terminal of the i-f test cord to the grid of the second i-f, first i-f and mixer tubes respectively (see Figure 40) and adjust the iron core tuning screws of transformers 293, 292 and 291 respectively (Figure 37) for minimum D.C. METER reading.

(18) With the OUTPUT terminal of the i-f test cord connected to the grid of the mixer tube and the GND terminal connected to the variable capacitor frame, readjust all the iron core tuning screws to see if better i-f alignment can be obtained.

(19) Press the OFF pushbutton of Radio Control Box BC-602-A, remove the leads from the mixer tube and the variable-capacitor frame and check the alignment of the r-f and oscillator assembly by following the instructions contained in the following paragraphs.

b. *Receiver R-F and Oscillator Alignment*

(1) DO NOT ATTEMPT r-f and oscillator alignment until it has first been determined that the i-f transformers are properly aligned or that the receiver has been badly handled or tampered with.

(2) The equipment necessary for r-f and oscillator alignment includes the following:

(a) A signal generator capable of producing an r-f output of approximately 0.01 volt modulated approximately 30% at 400 to 1000 cycles, having a frequency range between 100 and 156 mc, with a suitable attenuator capable of reducing the output voltage to 20 microvolts or less.

(b) An output meter or 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 is connected to terminal 7 of the receiver audio-output transformer 296, or 300 ohms if the yellow wire is connected to terminal No. 6. This output-meter load should be connected across terminals 1 and 3 of socket 802 or terminals 1 and 4 of socket 804 of Junction Box JB-29-A.

(c) A pair of high-impedance headphones connected across the same junction box terminals to give the operator an aural indication.

(d) A non-metallic trimmer-adjusting screwdriver.

(e) A non-inductive (carbon) resistor of between 25 and 50 ohms resistance to be used as a dummy antenna.

(3) Connect the signal generator to one end of Cord CD-477 with the dummy antenna resistor connected between the center terminal of Plug PL-P173 and the output terminal of the signal generator. This dummy-antenna resistor is not required if Signal Generator I-96-A or I-130-A is being used. Connect the ground terminal of the signal generator to the outside shell of Plug PL-P173 and keep all leads to an *absolute minimum length.*

(4) The instructions are written on the assumption that Signal Generator I-96-A is being used, but these instructions will apply equally well if another type of generator is employed, providing that equivalent operations are performed on this generator.

(5) If the transmitter has not been removed from the rack, remove it (see Paragraphs 21a and b).

(6) Loosen the receiver tuning-control locknuts, set both receiver tuning controls at the dial marks below the 100-mc calibration division and see if the two variable gang capacitors are fully meshed. If not, set the r-f and oscillator tuning controls on calibration, as described in Paragraph 21g(4).

(7) Using a short length of wire, ground terminal 4 of socket 418-1 (see Figure 4) to the rack frame to permit channel selection with the transmitter removed. Insert a wedge between the armature and the backstop of locking relay 411-1 located on the left side of the rack (see Figure 4), thus blocking it in its energized position. This is done to energize relay 412, thus connecting Cord CD-477 to the receiver and applying high voltage to the receiver when the equipment is turned on.

(8) Connect Cord CD-477 to the signal-generator R.F. OUTPUT socket and to the rack Socket SO-153. If using the signal-generator D.C. METER as a tuning indicator, connect the d-c meter cord to receiver socket 288 (see Figure 3) and to the signal-generator D.C. METER socket. If using an output-power meter or an a-c voltmeter, refer to Paragraph 22b(2).

(9) Place an 8666.666-kc crystal in the signal-generator CRYSTAL socket. If no crystal is available, refer to Paragraph 22b(12).

(10) If an a-c power-supply source is to be used, plug the a-c line cord into the source and into the signal-generator socket located in the upper right corner of the A.C. POWER SUPPLY panel. Throw the A.C. ON-OFF switch to ON, the D.C. ON-OFF switch to OFF, the A.C.-D.C. switch to A.C., and the I.F.-R.F. switch to R.F. If the signal-generator batteries are to be used, throw the A.C. ON-OFF switch to OFF, the D.C. ON-OFF switch to ON, the A.C.-D.C. switch to D.C., and the I.F.-R.F. switch to R.F. Allow about one minute for the signal-generator vacuum tubes to warm up.

(11) *R-F and Oscillator Alignment, Using Crystals in Signal Generator*

(a) Set the signal-generator M.O.-CRYSTAL switch at CRYSTAL and place the meter switch in CRYSTAL RESONANCE position.

(b) Place the OUTPUT STEPS control on step "5" and set the OUTPUT CONTROL on MAXimum. Place the CRYSTAL TUNING control on 156. A small dip should be observed in the D.C. METER. Adjust the MEGACYCLES dial control for an additional dip at a dial setting of approximately 156.

(c) Install an 8000.00-kc crystal in receiver crystal socket D. Set the receiver AUDIO and RELAY controls in their maximum clockwise rotation positions.

(d) With the receiver tuning-control locknuts loosened, press channel D pushbutton on Radio Control Box BC-602-A, place the T-R-REM. switch in R position and allow the receiver

vacuum tubes to warm up for several minutes.

(e) Set the r-f and oscillator tuning controls at exactly 156 mc. If the signal - generator D.C. METER is used as a tuning indicator, place the meter switch in TRANS.-REC. TUNING position and initially set the OUTPUT STEPS control and the OUTPUT CONTROL at the point which results in a slight dip in the meter reading. As alignment progresses, reduce the signal-generator output by adjusting these controls, and retain a meter reading of approximately the same value as that initially obtained.

(f) If an output - power meter or a-c voltmeter is used, set the OUTPUT STEPS control and the OUTPUT CONTROL at the point resulting in an audio output of approximately 50 milliwatts (or 15 volts rms across a 4000-ohm load, or 4 volts rms across a 300-ohm load).

(g) It may be necessary to turn the oscillator plate-coil tuning screw for channel D counterclockwise (see Figure 3) until three to five threads protrude from the coil-mounting insert, thus obtaining the necessary inductance to permit the oscillator to start which is indicated by a sudden increase in the output - power meter reading or by a sudden dip in the D.C. METER reading. Turn the screw clockwise until the oscillator stops and then rotate it counterclockwise three - quarters of a turn past the point at which it again starts. If an appreciable reduction of output (or increase in D.C. METER reading) results, continue turning the screw counterclockwise until the output is increased as much as possible.

(h) Using a non-metallic screwdriver, adjust the screws for trimmer capacitors 218-5, 218-4, 218-3, 218-2 and 218-1 (see Figures 39 and 41), in the order in which they are listed, for maximum indication of audio output (minimum D.C. METER reading), reducing the signal-generator output as necessary to keep the receiver output at approximately 50 milliwatts. If the signal - generator OUTPUT STEPS control and OUTPUT CONTROL are both in the minimum output position and the receiver output is still in excess of 50 milliwatts, reduce the receiver audio output by means of the AUDIO control (see Figure 3).

(i) Insert a 5555.555-kc crystal in the signal - generator CRYSTAL socket, set the receiver tuning controls exactly at 100 mc, tune the signal generator to resonance with the receiver and otherwise follow the same procedure outlined in Paragraphs 22b(11)(e), (f), and (g).

(j) Using a non-metallic screwdriver, adjust the inductance of the five r-f coils in the following order (see Figures 39 and 40): 226, 225, 224, 223 and 222. Adjust the coils for maximum audio output (or minimum D.C. METER reading), reducing the signal - generator output, as necessary, to keep the audio output at approximately 50 milliwatts. Adjust the inductance of the coils by slightly spreading or compressing the turns. In the case of the harmonic-amplifier plate coil 225, vary the spacing between the parallel wire portion of the coil. Do not alter the spacing between any two coils unless a coil has obviously been displaced from its proper position. Compare the coil spacing of the receiver under test with a receiver known to be in good operating condition.

(k) Repeat the procedure of Paragraphs 22b(11)(e) to (j), inclusive, until it is no longer possible to obtain an increase in audio output by further adjustment of any trimmer or coil.

(l) Press release pushbutton 426 (see Figure 4), turn the equipment

off by pressing the control-box OFF pushbutton, reassemble the transmitter to the rack, remove the ground from terminal 4 of socket 418-1 and remove the wedge from armature of relay 411-1. Re-install the complete assembly in Case CS-80-A.

(12) *R-F and Oscillator Alignment, Using Signal Generator Master Oscillator*

This procedure is essentially the same as described in Paragraph 22b(11) except that no signal-generator crystal is used, the CRYSTAL TUNING control is not touched, the M.O.-CRYSTAL switch is set at M.O. and the signal generator is tuned by means of the MEGACYCLES dial control only. Occasionally check the MEGACYCLES dial control to make certain that the signal generator is accurately tuned to resonance with Radio Receiver BC-624-A. Since the receiver is crystal controlled, greater accuracy is obtained by tuning the signal generator to resonance with the receiver than by following the normal procedure of setting the signal generator exactly at the desired frequency and tuning the receiver to resonance with the signal generator.

c. *Receiver Trouble Location and Remedy*

Symptom	*Probable Cause*
1. Set dead and no microphone sidetone audible in phones.	Defective Tube VT-169 or VT-135. Defective resistor, capacitor, transformer or wiring associated with these tubes. No crystal in socket.
2. Set dead but sidetone is audible in phones.	Defective Tubes VT-209. Defective resistor, capacitor or wiring associated with these tubes. Check alignment of i-f transformers (see Paragraph 22a).
3. Set operates only on extremely strong signals.	Defective Tubes VT-202, VT-203 or VT-207. Defective resistor, capacitor or wiring associated with these tubes. Check alignment of r-f and oscillator assembly (see Paragraph 22b).
4. Set will not remain in tune although locknuts are tight.	Check all variable-capacitor coupling setscrews and if found tight, examine the couplings themselves for slippage. Examine variable capacitors for cracked rotor shaft or evidence of slippage between the rotor plates and the front end of the 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 spring tension so that the relay 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 with no antenna or transmission line connected to Socket SO-153. If relay still does not operate properly, try replacing Tube VT-207; check relay coil for open or short circuit and check all resistors and capacitors associated with this circuit. See Paragraph 28b for adjustment of squelch relay.

c. ***Receiver Trouble Location and Remedy — Continued***

Symptom	*Probable Cause*
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 22d and 22e.	

d. ***Receiver Tube Socket Voltage Measurements***

Figure 62 is the vacuum tube layout and socket-voltage diagram for Radio Receiver BC-624-A. All readings are taken with the Weston Model 665 Type 2 Selective Analyzer which is part of Test Set I-56-A. The sensitivity of this meter is 1000 ohms per volt. The 500v scale is used unless otherwise specified. All voltages are measured to chassis ground unless otherwise stated. Additional conditions of measurement are given in the voltage diagram.

When voltages are found to vary appreciably (more than ±15%) from the typical values given in the following table, this is sufficient reason for further examination of components associated with the particular circuit in question.

With the assembly comprising the rack, transmitter and receiver removed from Case CS-80-A, detach the transmitter from the rack, block relay 411-1 in its energized position and connect a jumper from terminal No. 4 of socket 418-1 to any convenient ground point on the rack chassis (see Paragraphs 21a and 21b). Rotate the receiver AUDIO and RELAY controls to their extreme clockwise positions.

Press any one of the channel-selector pushbuttons on Radio Control Box BC-602-A and make certain that the proper channel is selected. The input to Dynamotor Unit PE-94-A should be 28.5 volts. If it so happens that a meter is employed with different scales from those shown in Figure 62, use the scales most nearly approximating those shown. The shells of Tubes VT-169, VT-209 and VT-207 are at ground potential (zero volts).

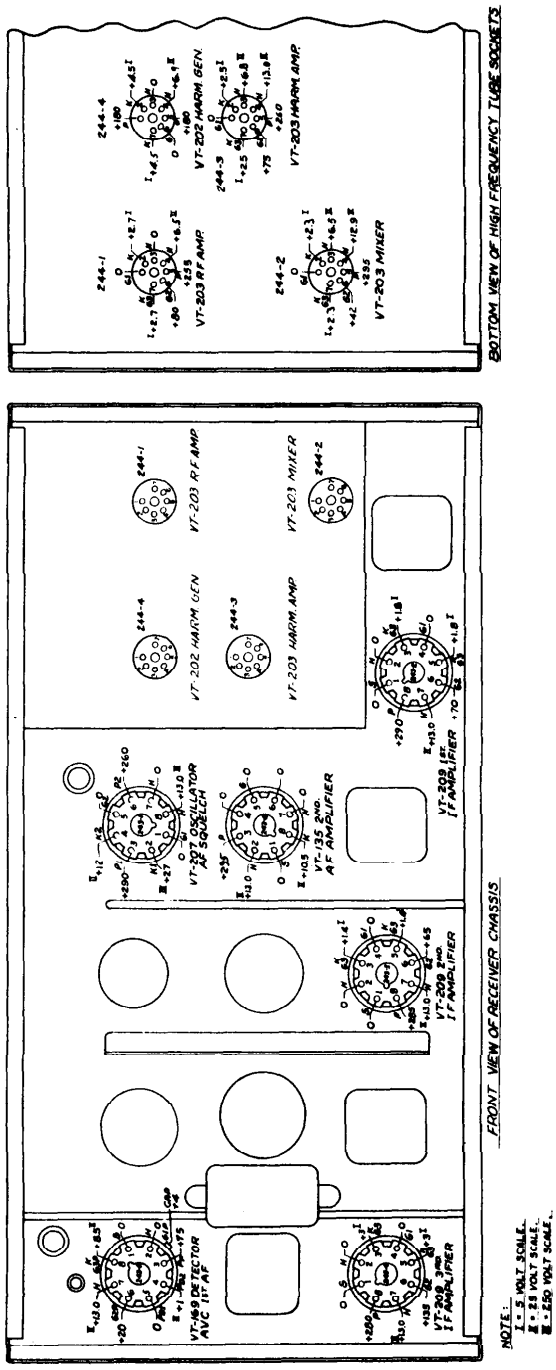


FIGURE 62 — RECEIVER TUBE SOCKET LAYOUT AND VOLTAGES

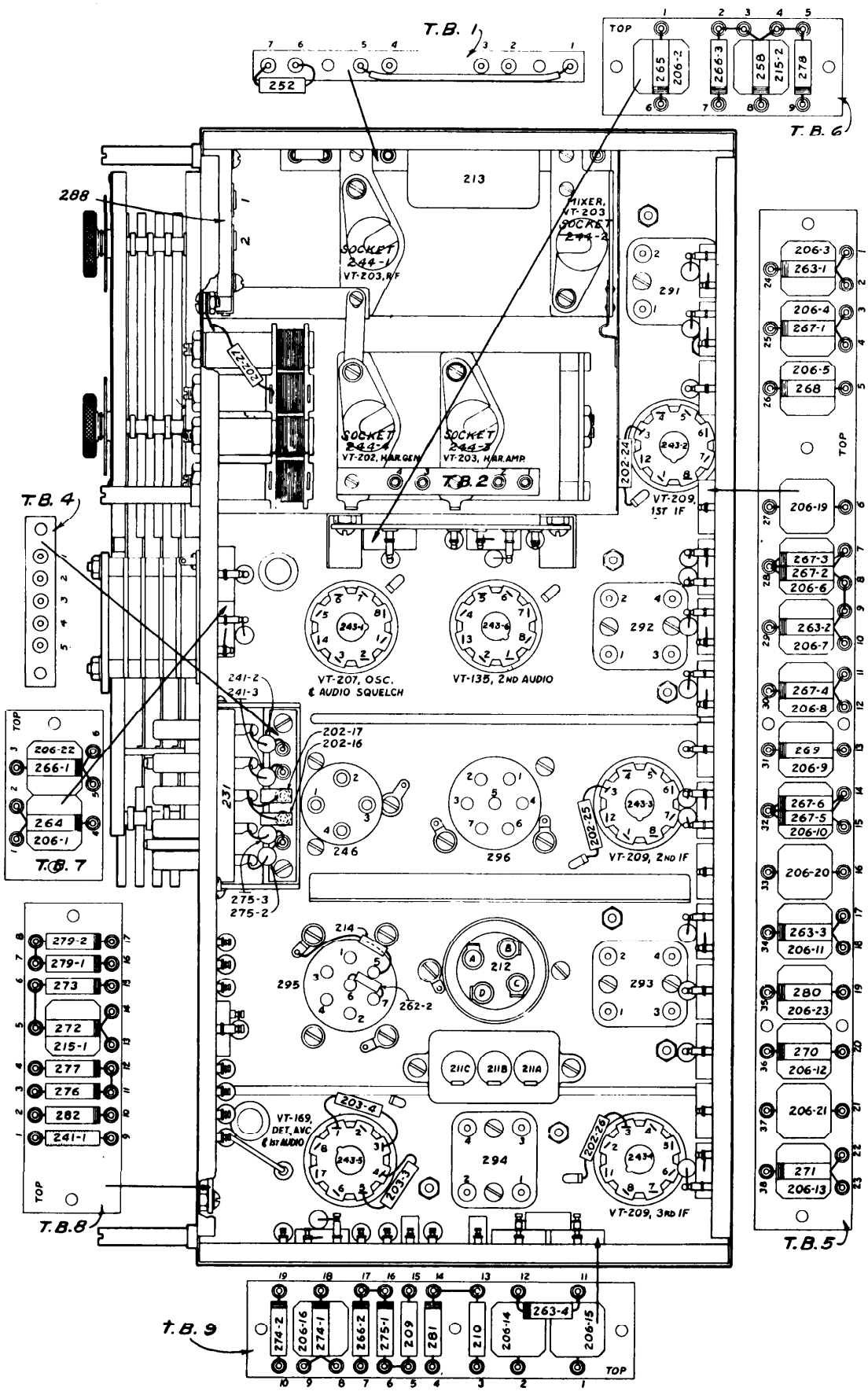


FIGURE 63 — RECEIVER CONTINUITY TEST DIAGRAM

RECEIVER VACUUM TUBE SOCKET VOLTAGES

Tube (Army Type)	*Function*	*VOLTS*						
		Plate	*Suppressor*	*Screen*	*Grid*	*Cathode*	*Heater*	*Heater*
VT-203	R-F Amp.	255	2.7	80	0	2.7	6.5	0
VT-203	Mixer	295	2.3	42	0	2.3	12.9	6.5
VT-203	Har. Amp.	260	2.5	75	0	2.5	13.0	6.8
VT-202	Har. Gen.	180	—	—	0	4.5	6.9	0
VT-209	1st I.F.	290	1.8	70	0	1.8	13.0	0
VT-209	2nd I.F.	285	1.4	65	0	1.4	13.0	0
VT-209	3rd I.F.	280	3	135	0	3	13.0	0
VT-169*	Detector	75	8.5	20	4	8.5	13.0	0
VT-135	2nd A-F Amp.	295	—	—	0	10.5	13.0	0
VT-207	Osc. Squelch	260 290	— —	— —	0 0	12.0 27	13.0	0

e. ***Receiver Continuity and Resistance Measurements***

All tubes must be in their respective sockets. Radio Receiver BC-624-A must be detached from Rack FT-244-A. AUDIO and RELAY controls must be rotated fully clockwise unless otherwise specified. Figure 63 shows the various terminal boards and terminal numbers. Resistance values indicated should check within ± 10% and variations greater than this should be investigated. Use Test Set I-56-A or equivalent.

Test No.	*From*	*To*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
1	231, Pin 3	T.B. 4, Term. 1	Direct	0.25	Defective B+ r-f reactor 241-2
2	231, Pin 3	T.B. 5, Term. 8	Direct	0.25	Defective B+ r-f reactor 241-2, or open on B+ bus.
3	231, Pin 3	T.B. 5, Term. 1	Direct	0.25	Same as 2.
4	231, Pin 3	T.B. 5, Term. 9	Direct	0.25	Same as 2.
5	231, Pin 3	T.B. 5, Term. 15	Direct	0.25	Same as 2.
6	231, Pin 3	T.B. 5, Term. 17	Direct	0.25	Same as 2.
7	231, Pin 3	T.B. 5, Term. 23	Direct	0.25	Same as 2.
8	231, Pin 3	T.B. 9, Term. 11	Direct	0.25	Same as 2.
9	231, Pin 3	T.B. 8, Term. 17	Direct	0.25	Same as 2.
10	231, Pin 3	T.B. 7, Term. 2	Direct	0.25	Same as 2.
11	231, Pin 3	T.B. 1, Term. 1	Direct	0.25	Same as 2.
12	231, Pin 3	T.B. 1, Term. 5	Direct	0.25	Same as 2.

*Note that this tube is a duplex diode-pentode. For diode voltages, refer to Figure 62.

e. *Receiver Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
13	231, Pin 3	T.B. 2, Term. 3	Direct	0.25	Same as 2.
14	231, Pin 3	T.B. 2, Term. 2	Direct	0.25	Same as 2.
15	231, Pin 3	288, Term. 2	Direct	0.25	Same as 2.
16	231, Pin 3	T.B. 4, Term. 4	Direct	0.25	Same as 2.
17	231, Pin 3	246, Term. 1	Direct	0.25	Same as 2.
18	231, Pin 4	296, Term. 7	Direct	0	Open audio-output wiring.
19	231, Pin 5	T.B. 4, Term. 2	Direct	0.25	Defective B+ reactor 241-3.
20	231, Pin 5	T.B. 4, Term. 3	Direct	0.25	Same as 19 or broken jumper on T.B. 4.
21	231, Pin 5	296, Term. 3	Direct	0.25	Defective reactor 241-3 or open B+ wiring.
22	231, Pin 5	212B (red)	Direct	0.25	Same as 21.
23	231, Pin 6	211C	Direct	0	Broken connection.
24	231, Pin 6	T.B. 9, Term. 7	Direct	0	Broken connection or open AVC bus.
25	231, Pin 6	T.B. 5, Term. 11	Direct	0	Same as 24.
26	231, Pin 6	T.B. 5, Term. 3	Direct	0	Same as 24.
27	231, Pin 6	T.B. 1, Term. 5	Direct	0	Same as 24.
28	231, Pin 7	Ground	Direct	0	Broken connection.
29	231, Pin 8	213	Direct	0	Broken connection or open heater wiring.
30	231, Pin 8	T.B. 1, Term. 2	Direct	0	Same as 29.
31	231, Pin 8	T.B. 2, Term. 1	Direct	0	Same as 29.
32	231, Pin 8	243-2, Pin 7	Direct	0	Same as 29.
33	231, Pin 8	243-3, Pin 7	Direct	0	Same as 29.
34	231, Pin 8	243-4, Pin 7	Direct	0	Same as 29.
35	231, Pin 8	243-5, Pin 7	Direct	0	Same as 29.
36	231, Pin 8	243-1, Pin 8	Direct	0	Broken connection or open heater wiring.
37	231, Pin 8	243-6, Pin 2	Direct	0	Same as 36.
38	231, Pin 8	Ground	Direct	1.5	Same as 36. Defective tube.
39	231, Pin 9	295, Term. 7	Direct	0	Broken connection.
40	231, Pin 9	T.B. 8, Term. 9	Direct	0	Same as 39.
41	231, Pin 10	295, Term. 3	Direct	0	Same as 39.

e. Receiver Continuity and Resistance Measurements—Continued

Test No.	*From*	*To*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
42	231, Pin 10	Ground	Direct	3.5	Broken connection or defective transformer 295.
43	231, Pin 11	295, Term. 5	Direct	0	Broken connection.
44	231, Pin 12	295, Term. 4	Direct	0	Broken connection.
45	231, Pin 12	Ground	Direct	3.5	Broken connection or defective transformer 295.
46	243-2, Pin 1	Ground	Direct	0	Broken lug or open ground bus.
47	243-2, Pin 2	Ground	Direct	0	Same as 46.
48	243-3, Pin 1	Ground	Direct	0	Same as 46.
49	243-3, Pin 2	Ground	Direct	0	Same as 46.
50	243-4, Pin 1	Ground	Direct	0	Same as 46.
51	243-4, Pin 2	Ground	Direct	0	Same as 46.
52	243-5, Pin 1	Ground	Direct	0	Same as 46.
53	243-5, Pin 2	Ground	Direct	0	Same as 46.
54	243-5, Pin 6	211B	Direct	0	Broken connection.
55	243-5, Pin 8	T.B. 8, Term. 4	Direct	0	Same as 54.
56	243-6, Pin 1	Ground	R x 1000	Open	Defective 2nd Audio Tube VT-135.
57	243-6, Pin 7	Ground	Direct	0	Broken lug or open ground bus.
58	243-1, Pin 7	Ground	Direct	0	Same as 57.
*59	243-1, Pin 5	Crystal-holders A, B, C, D	Direct	0	Broken connection or defective crystal switch 286.
*60	243-1, Pin 6	Plate inductors 227-1, -2, -3, -4	Direct	0	Same as 59.
61	231, Pin 4	296, Term. 6	R x 10	350	Defective transformer 296.
62	231, Pin 4	296, Term. 5	R x 10	375	Same as 61.
63	231, Pin 4	Ground	R x 10	400	Same as 61.
64	231, Pin 5	212A (Blue)	R x 10	340	Open reactor 241-3; defective transformer 296.
65	231, Pin 5	296, Term. 2	R x 10	340	Same as 64.
66	231, Pin 5	T.B. 6, Term. 7	R x 10	340	Same as 64.
67	231, Pin 5	243-6, Pin 3	R x 100	1200	Same as 64.

* Operate corresponding channel slides.

e. *Receiver Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
68	231, Pin 5	T.B. 9, Term. 10	R x 10	340	Same as 64.
69	243-2, Pin 5	Ground	R x 10	390	Shorted capacitor 202-24, 206-5; open resistor 268.
70	243-2, Pin 3	Ground	R x 10	390	Same as 69.
71	243-3, Pin 3	Ground	R x 10	270	Shorted capacitor 202-25, 206-9; open resistor 269.
72	243-3, Pin 5	Ground	R x 10	270	Same as 71.
73	243-4, Pin 3	Ground	R x 10	470	Shorted capacitor 202-26, 206-12; open resistor 270.
74	243-4, Pin 5	Ground	R x 10	470	Same as 73.
75	243-5, Pin 8	T.B. 8, Terms. 11, 12	R x 100	1800	Defective resistor 277.
76	243-1, Pin 4	Ground	R x 100	2700	Defective Tube VT-207, capacitor 206-2, resistor 265.
77	231, Term. 3	243-4, Pin 8	R x 100	4700	Defective transformer 294, capacitor 206-14, resistor 263-4, reactor 241-2.
78	231, Term. 3	243-4, Pin 6	R x 1000	82 M	Defective resistor 271, reactor 241-2, capacitor 206-13.
79	231, Term. 3	243-3, Pin 8	R x 100	4700	Defective transformer 293, resistor 263-3, reactor 241-2, capacitor 206-11.
80	231, Term. 3	243-3, Pin 6	R x 1000	62 M	Defective resistor 267 - 5, reactor 241-2, capacitor 206-10.
81	231, Term. 3	243-2, Pin 8	R x 100	4700	Defective transformer 292, resistor 263-2, reactor 241-2, capacitor 206-7.
82	231, Term. 3	243-2, Pin 6	R x 1000	62 M	Defective resistor 267-2, reactor 241-2, capacitor 206-6.
83	231, Term. 3	243-1, Pin 3	R x 1000	5 M	Open coil of relay 246; defective reactor 241-2.
*84	231, Term. 3	243-1, Pin 6	R x 1000	10 M	Open inductors 227-1, -2, -3, -4; defective switch 286; open resistor 264 or reactor 241-2; defective capacitors 206-1, 202-27 and 205.

* Operate corresponding channel slides.

e. *Receiver Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
85	231, Term. 3	243-1, Pin 2	R x 1000	50 M	Defective potentiometer 237, resistors 279 - 1, 279 - 2; open reactor 241-2, resistor 282.
86	231, Term. 3	Ground	R x 1000	50 M	Short on B+ bus to ground; defective resistor 279-1, 279-2, potentiometer 237, resistor 282, 267-5, 267-6, 267-2, 267-3.
87	243-5, Pin 8	Ground	R x 1000	20 M	Shorted capacitor 211A, 212C; defective resistor 276, 277.
88	T.B. 8, Terms. 11, 12	Ground	R x 1000	18 M	Same as 87.
**89	243-1, Pin 2	Ground	R x 1000	5 M	Defective potentiometer 237, resistor 282.
90	231, Term. 5	243-5, Pin 3	R x 1000	270 M	Defective transformer 296; open reactor 241-3 or defective resistor 266-3.
91	231, Term. 5	243-5, Pin 6		2.2 Meg.	Defective transformer 296, reactor 241-3, resistor 274-2.
92	231, Term. 5	Ground (30 seconds)	R x 1000	80 M	Shorted capacitor 202-17, 211B, 203-4, 206-18, 212A, 212B; defective Tube VT-169 or Tube VT-135.
93	231, Term. 6	Ground	R x 1000	740 M	Shorted capacitor 211C, 206-8, 206-4, 202-2 short on AVC bus.
94	231, Term. 6	243-3, Pin 4	R x 1000	100 M	Defective transformer 292 or resistor 267-4.
95	231, Term. 6	243-2, Pin 4	R x 1000	100 M	Defective transformer 291 or resistor 267-1.
96	231, Term. 9	Ground	R x 1000	350 M	Defective Tube VT-169 or open resistor 275-2, 275-3, 262-2, 276; open secondary of transformer 295; shorted capacitor 214.
97	231, Term. 9	295, Term. 6	R x 1000	350 M	Open resistor 262-2; same as 96.

** 3 M with RELAY control fully clockwise.

e. *Receiver Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
98	231, Term. 11	Ground	R x 1000	350 M	Defective transformer 295; shorted capacitor 214.
99	243-2, Pin 6	Ground	R x 1000	65 M	Defective resistor 267-3; shorted capacitor 206-6.
100	243-3, Pin 6	Ground	R x 1000	65 M	Defective resistor 267-6; shorted capacitor 206-10.
101	243-4, Pin 4	Ground	R x 1000	1 Meg.	Defective transformer 293 or resistor 280; shorted capacitor 206-23.
102	243-4, Pin 6	Ground	R x 1000	130 M	Shorted capacitor 206-13.
103	243-5, Pin 4	Ground	R x 1000	300 M	Defective transformer 294; ground in detector circuit wiring.
104	243-5, Pin 5	Ground	R x 1000	470 M	Ground in AVC wiring.
105	243-5, Pin 6	Ground		2 Meg.	Shorted capacitor 211B, 212A or 212B.
106	243-6, Pin 5	Ground	R x 1000	680 M	Defective resistor 258.
107	243-1, Pin 1	294, Term. 2		2.35 Meg.	Defective Tube VT-207; open resistor 274-1, 281; shorted capacitors 206-16, 209, 210.
108	243-1, Pin 5	Ground	R x 1000	270 M	Defective switch 286 or open resistor 266-1.
109	295, Term. 1	246, Term. 4	R x 1000	130 M	Readjustments required on relay 246 contacts; defective resistor 272 or 273.
110	T.B. 9, Terms. 4, 15	211A	R x 1000	150 M	Defective AUDIO control potentiometer 236.
111	T. B. 9, Terms. 4, 15	212C	R x 1000	150 M	Same as 110.
***112	T. B. 9, Terms. 4, 15	T.B. 8, Term. 13	R x 1000	150 M	Same as 110.

A defective capacitor 206-15 or 202-16 may be responsible for many incorrect readings involving plug 231, pin 3.

*** Resistance varies with setting of AUDIO control.

f. *Inputs for Standard Output*

The following table gives the approximate voltage input to the i-f and mixer stages of Radio Receiver BC-624-A for a standard output of 10 milliwatts. Remove the transmitter from the rack (see Paragraphs 21a and 21b). Block relay 411-1 in the energized position. This will energize relay 412 and apply high voltage to the receiver when the radio set is turned on. Rotate the receiver AUDIO and RELAY controls to the extreme clockwise position. The input signal must be exactly 12 megacycles, modulated approximately 30%, at 400 to 1000 cycles. Signal-to-noise ratio, 10 to 1, or greater, when signal source is connected to mixer grid.

INPUTS FOR STANDARD OUTPUT

Input To	*Measurement Point*	*Input Voltage*
3rd I.F.	Control Grid	40,000 μv
2nd I.F.	Control Grid	1,500 μv
1st I.F.	Control Grid	75 μv
Mixer	Control Grid	15 μv

23. TRANSMITTER MAINTENANCE

a. *Transmitter Trouble Location*

(1) Inspect capacitors for shorts, intermittent shorts or opens.

(2) Inspect resistors for opens or wrong values.

(3) Look for faulty connections or pieces of solder or wire which might cause short circuits.

(4) If the foregoing tests do not reveal the source of trouble, refer to the tube socket voltage tests in Paragraph 23b, and to the continuity tests in Paragraph 23c. Above all, look for the simple causes of failure first. Many good radio equipments have been damaged by needless disassembly and removal of parts, when the real cause of trouble was merely a broken lead or a faulty connection.

Refer to Paragraph 20 for general hints on the possible location of faults.

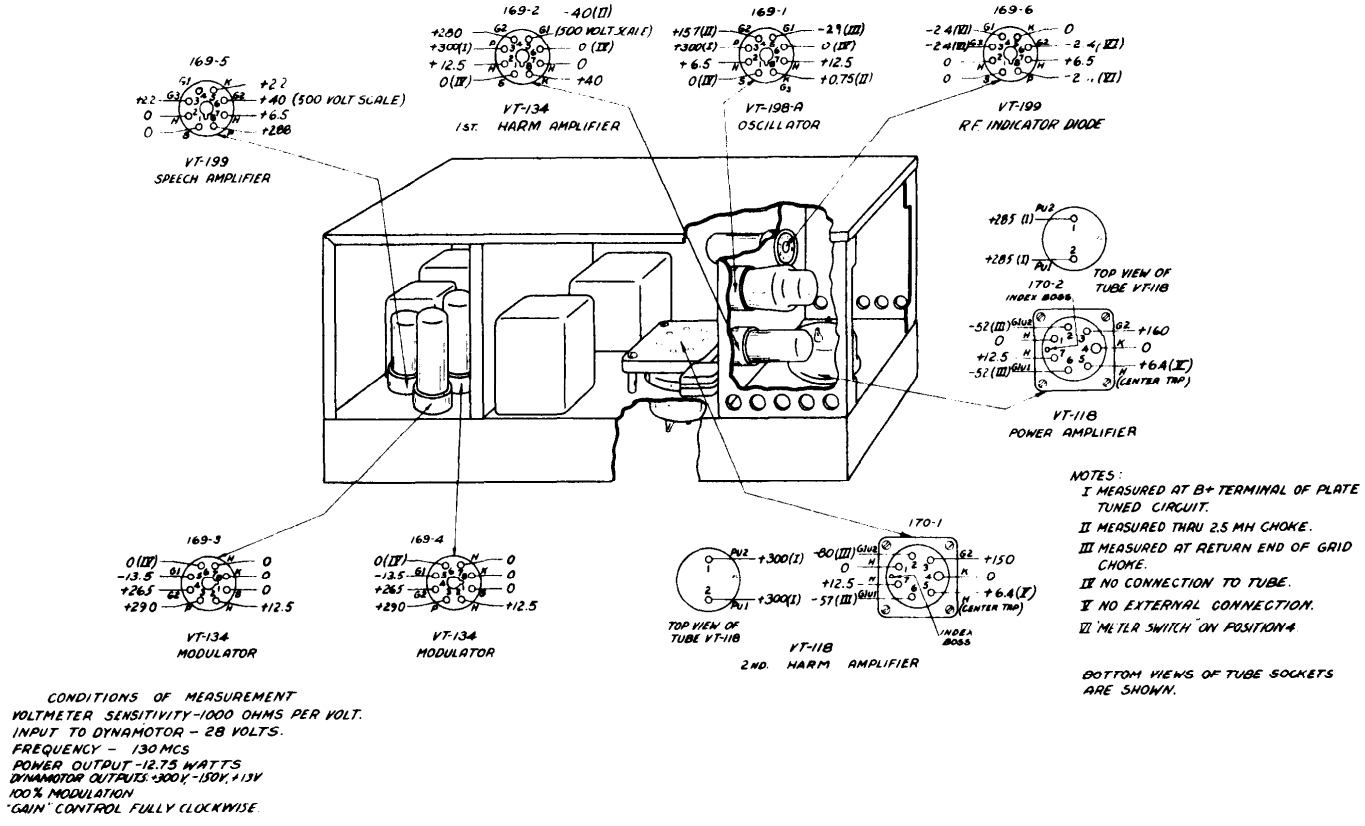


FIGURE 64 — TRANSMITTER TUBE SOCKET LAYOUT AND VOLTAGES

TUBE (Army Type)	*Function*	*VOLTS*							
		Plate	*Screen*	*GRID*		*Cathode*	*Heater*	*Heater*	*Sup-pressor*
				*G1U1**	*G1U2**				
VT-118	2nd Har. Amp.	300	150	−57	−80	0	12.5	6.4	—
VT-118	Power Amp.	285	160	−52	−52	0	12.5	6.4	—
VT-198-A	Oscillator	300	157	−29		—	12.5	6.5	0.75
VT-134	1st Har. Amp.	300	280	−40		40	12.5	0	—
VT-199	Speech Amp.	288	40	Varies		2.2	6.5	0	2.2
VT-134	Modulator	290	265	−13.5		0	12.5	0	—
VT-134	Modulator	290	265	−13.5		0	12.5	0	—
VT-199	R-F Ind. Diode	−2.4	−2.4	−2.4		0	6.5	0	−2.4

* Tubes VT-118 are push-pull amplifiers. The voltage on the first grid of the second harmonic amplifier varies from about −40 to −87 volts and the second grid varies from about −40 to −105 volts.

b. ***Transmitter Tube Socket Voltage Measurements***

Figure 64 is the vacuum tube layout and voltage diagram for Radio Transmitter BC-625-A. All readings are taken with the Weston Model 665, Type 2, Selective Analyzer which is part of Test Set I-56-A. Meter sensitivity is 1000 ohms per volt. The 500v scale is used unless otherwise specified. All voltages are measured to chassis ground unless otherwise stated. To avoid damage to meter, carefully follow the additional conditions of measurement and the notes given in the voltage diagram, Figure 64.

When voltages are found to vary appreciably (more than ±15% from the typical values given in the following table), this is sufficient reason for further examination of components associated with the circuit in question.

In the case of the R-F indicator diode, almost any voltage reading in the neighborhood of the reading shown is a satisfactory indication. If the reading is much too high, or zero, check resistor 154-3.

Note that these readings are taken with dynamotor outputs of exactly +300 volts, −150 volts and +13 volts. It has been found that the outputs of Dynamotor Unit PE-94-A are actually slightly higher, and this may result in slightly higher socket-voltage readings, especially for the plates and screens.

Note that pin 1 of socket 169-1 (for Tube VT-198-A, the crystal oscillator) is used as a junction point, one wire arriving from the plate of Tube VT-198-A through capacitor 104 and another wire arriving from the grid of the first harmonic amplifier. Pin 6 of one of the modulators, Tube VT-134, is also used as a junction point. One wire arrives from Pin 5 of the speech amplifier Tube VT-199 through reactor 162, and another wire arrives from capacitor 110 and resistor 153-3.

c. ***Transmitter Continuity and Resistance Measurements***

Remove Transmitter BC-625-A from Rack FT-244-A (see Paragraphs 21a and b). Rotate the GAIN control to its extreme clockwise position. All vacuum tubes must remain in their respective sockets unless otherwise specified. Deviations in resistance greater than ±10% should be investigated. Use Test Set I-56-A or equivalent. Refer to the wiring diagram, Figure 70, for terminal-board and terminal locations.

c. *Transmitter Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Control Positions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
1	123-1, Term. 4	Ground		R x 1000	Open	Dirty or shorted contacts on relay 130.
2	123-1, Term. 5	Ground	Relay 130 closed	R x 1000	Open	Same as 1.
3	123-2, Term. 3	Ground		R x 1000	Open	Shorted capacitor 102-5, 102-7, 102-11, 106, 107-1, 108-2, 111 or 113.
4	123-2, Term. 4	Ground		R x 1000	Open	Shorted capacitor 102-1, 102-2, or 105-4.
5	123-2, Term. 5	Ground		R x 1000	Open	Shorted capacitor 102-15.
6	123-2, Term. 6	Ground		R x 1000	Open	Shorted capacitor 102-14.
7	123-2, Term. 7	Ground	Relay 131 closed	R x 1000	Open	Dirty or shorted contacts on relay 131.
8	169-1, Pin 1 (jct. pt. 104 and 150)	Ground		R x 1000	50 M	Defective capacitor 102-3, 104, 102-12 or 102-13, 109-1, 109-2.
9	Same as 8	T.B. 9, Term. 2		R x 1000	60 M	Same as 8.
10	169-1, Pin 4	Ground		R x 1000	Open	Same as 4; shorted capacitor 101.
11	169-1, Pin 5	Ground		R x 1000	50 M	Defective crystal switch 156 or reactor 128-1; wrong value on resistor 151-1.
12	169-2, Pin 4	Ground		R x 1000	Open	Same as 3.
13	170-1, Pin 3	Ground		R x 1000	Open	Same as 3.
14	170-2, Pin 3	Ground		R x 1000	Open	Same as 3.
15	169-5, Term 6	Ground		R x 1000	Open	Same as 3.
16	169-5, Term. 8	Ground		R x 1000	Open	Same as 3.
17	169-3, (outside modulator), Pin 3	Ground		R x 1000	Open	Same as 3.
18	169-3, Pin 4	Ground		R x 1000	Open	Same as 3.

c. *Transmitter Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Control Positions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
19	169-4 (inside modulator), Pin 3	Ground		R x 1000	Open	Same as 3.
20	169-4, Pin 3	T.B. 7, Terms. 10, 11		R x 1000	265 M	Wrong value or open on resistor 140-2 or 140-3.
21	T.B. 8, Term 9	Ground		R x 1000	Open	Same as 4.
22	T.B. 8, Term 10	Ground		R x 1000	Open	Same as 3.
23	123-1, Term. 3	123-2, Term 7	Relay 161 contacts open	R x 1000	Open	Dirty or shorted contacts on relay 161.
24	123-2, Term. 1	Ground		R x 1000	20 M	Defective resistor 146, 147, 152-3, -4, 109-5 or 145; shorted capacitor 102-12 or 102-13, 102-3.
25	169-2, Pin 4	T.B. 1, Term. 1		R x 1000	5 M	Defective resistor 154-1.
26	170-1, Pin 2	Ground		R x 1000	31 M	Open in reactor 127-1 or 127-2; shorted capacitor 102-8 or 102-9; open resistor, 132-1, 2, or 146.
27	Same as 26	T.B. 8, Term. 11		R x 1000	26 M	Defective resistor 148.
28	170-1, Pin 3	160, Term. 5		R x 1000	54 M	Defective resistor 152-2.
29	170-1, Pin 6	Ground		R x 1000	31 M	Same as 26.
30	170-1, Pin 6	T.B. 8, Term. 11		R x 1000	26 M	Same as 27.
31	170-2, Pin 2	Ground		R x 1000	6 M	Defective reactor 127-3 or 127-4; open resistor 148 or 146; shorted capacitor 102-3, 102-12 or 102-13.
32	170-2, Pin 3	160, Term. 5		R x 1000	21 M	Defective resistor, 133-1 or 133-2.
33	170-2, Pin 6	Ground		R x 1000	6 M	Same as 31.
34	169-6, Pin 3	Ground		R x 1000	7 M	Shorted capacitor 105-2; defective resistor 154-3 or 153-2.

c. *Transmitter Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Control Positions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
35	169-6, Pin 3	T.B. 8, Term. 12		R x 1000	5 M	Same as 34.
36	169-5, Pin 4	158, Term. 5	Relay 131 closed	R x 1000	12 M	Defective resistor 153-4; dirty contacts on relay 131.
37	169-5, Pin 4	Ground	Relay 131 closed	R x 1000	6.5 M	Defective resistor 153-4 or 142.
38	169-3, Pin 4	T.B. 7, Term. 4		R x 1000	5 M	Defective resistor 154-2.
39	169-3, Pin 5	Ground		R x 1000	15 M	Defective resistor 145.
40	169-4, Pin 5	Ground		R x 1000	15 M	Same as 39.
41	123-1, Term. 6	123-2, Term. 2		R x 10	*150 or 200	Open or shorted relay 131.
42	123-2, Term. 2	Ground		R x 10	200	Open coil on relay 130; open or dirty contacts on relay 131.
43	169-1, Pin 1	169-2, Pin 5		R x 10	50	Defective resistor 150.
44	169-2, Pin 8	Ground		R x 10	2 M	Defective resistor 153-1 or capacitor 102-6.
45	169-5, Pin 3	Ground		R x 10	2 M	Open reactor 162; defective resistor 153-3 or capacitor 110.
46	169-5, Pin 4	131 (2nd contact from inside)		R x 10	2 M	Defective resistor 153-4.
47	T.B. 8, Term. 10	160, Term. 5		R x 10	180	Short ground or open on secondary of transformer 160.
48	T.B. 8, Term. 10	121		R x 10	210	Same as 47. Defective reactor 128-3.
49	123-1, Term. 1	158, Term. 1		Direct	0	No continuity.
50	123-1, Term. 1	123-1, Term. 2		Direct	5	Open or short in primary of transformer 158.
51	123-1, Term. 1	Ground		Direct	2.5	Same as 50. No ground on center tap of transformer 158.
52	123-1, Term. 2	Ground		Direct	2.5	Same as 51.
53	123-1, Term. 2	158, Term. 3		Direct	0	No continuity.

* Equipment may be provided either with a 150-ohm or 200-ohm relay 131.

c. *Transmitter Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Control Positions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
54	123-1, Term. 3	Ground		Direct	0	Open or dirty contacts on relay 131 or 161.
55	123-1, Term. 3	123-2 Term. 7		Direct	0	Open or dirty contacts on relay 161.
56	123-1, Term. 3	161 (outside contact)		Direct	0	Same as 55.
57	123-1, Term. 4	130 (outside contact)		Direct	0	No continuity. Defective relay 130.
58	123-1, Term. 4	Ground	Relay 130 energized.	Direct	0	No continuity. Defective relay 130.
59	123-1, Term. 5	Ground		Direct	0	No continuity. Defective relay 130.
60	123-1, Term. 5	130 (inside contact)		Direct	0	No continuity.
61	123-1, Term. 6	131 (outside lug)	Remove modulator tubes.	Direct	0	No continuity.
62	123-2, Term. 1	T.B. 5, Term. 2		Direct	0	No continuity.
63	123-1, Term. 1	T.B. 9, Term. 1		Direct	0	No continuity.
64	123-2, Term. 2	170-2, Pin 7		Direct	0	No continuity.
65	123-2, Term. 2	170-1, Pin 7		Direct	0	No continuity.
66	123-2, Term. 2	169-2, Pin 2		Direct	0	No continuity.
67	123-2, Term. 2	169-1, Pin 7		Direct	0	No continuity.
68	123-2, Term. 2	169-3, Pin 2		Direct	0	No continuity.
69	123-2, Term. 2	169-4, Pin 2		Direct	0	No continuity.
70	123-2, Term. 2	130 Coil (inside lug)		Direct	0	No continuity.
71	123-2, Term. 2	131 Coil (inside lug)	Modulator tubes removed.	Direct	0	No continuity.
72	123-2, Term. 2	Ground		Direct	200	Open or short in coil of relay 130; relay 131 contacts dirty or open.
73	123-2, Term. 3	160, Term. 2		Direct	0	No continuity.
74	123-2, Term. 3	126, Term. 1		Direct	0	No continuity.
75	123-2, Term. 3	T.B. 7, Terms. 4, 5, 6		Direct	0	No continuity.

c. *Transmitter Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Control Positions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
76	123-2, Term. 3	T.B. 8, Terms. 2, 4		Direct	0	No continuity.
77	123-2, Term 4	T.B. 8, Term. 3		Direct	0	No continuity.
78	123-2, Term. 4	118		Direct	0	No continuity.
79	123-2, Term. 4	114 (rotor)		Direct	0	No continuity.
80	123-2, Term. 4	T.B. 1, Term. 5		Direct	0	No continuity.
81	123-2, Term. 5	T.B. 4, Term. 5		Direct	0	No continuity.
82	123-2, Term. 6	T.B. 4, Term. 4		Direct	0	No continuity.
83	123-2, Term. 7	161 (inside contact)		Direct	0	No continuity.
84	123-2, Terms. 7, 8	Ground		Direct	0	No continuity. Open or dirty contacts on relay 131.
85	169-1, Pin 2	Ground		Direct	3	Same as 72.
86	169-1, Pin 2	169-6, Pin 7		Direct	0	No continuity.
87	169-1, Pin 3	114 (stator)		Direct	0	No continuity.
88	169-1, Pin 3	118 (inside lug)		Direct	0	No continuity.
89	169-1, Pin 4	T.B. 1, Term. 6		Direct	0	No continuity.
90	169-1, Pin 5	172, Term. 16	Operate A frequency shifter	Direct	0	No continuity.
91	172, Term. 16	Ground	Operate A frequency shifter	Direct	Open	Shorted switch 156.
92	169-1, Pin 5	172, Term. 12	Operate B frequency shifter	Direct	0	No continuity.
93	172, Term. 12	Ground	Operate B frequency shifter	Direct	Open	Short in switch 156.
94	169-1, Pin 5	172, Term. 9	Operate C frequency shifter	Direct	0	No continuity.
95	172, Term. 9	Ground	Operate C frequency shifter	Direct	Open	Short in switch 156.

c. *Transmitter Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Control Positions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
96	169-1, Pin 5	172, Term. 5	Operate D frequency shifter	Direct	0	No continuity.
97	172, Term. 5	Ground	Operate D frequency shifter	Direct	Open	Short in switch 156.
98	169-1, Pin 8	Ground		Direct	40	Open or shorted reactor 128-2; shorted capacitor 103.
99	169-1, Pin 8	T.B. 1, Term. 7		Direct	0	No continuity.
100	170-1, Pin 1	Ground		Direct	0	Same as 72.
101	170-1, Pin 4	Ground		Direct	0	No continuity.
102	169-2, Pin 1	Ground		Direct	0	No continuity.
103	169-2, Pin 3	115 (stator)		Direct	0	No continuity.
104	169-2, Pin 4	T.B. 1, Term. 2		Direct	0	No continuity.
105	169-2, Pin 7	Ground		Direct	0	No continuity.
106	170-2, Pin 1	Ground		Direct	0	No continuity.
107	170-2, Pin 4	Ground		Direct	0	No continuity.
108	170-2, Pin 2	T.B. 8, Term. 5		Direct	0	Open reactor 127-3.
109	170-2, Pin 6	T.B. 8, Term. 5		Direct	0	Open reactor 127-4.
110	169-6, Pin 1	Ground		Direct	0	No continuity.
111	169-6, Pin 2	Ground		Direct	0	No continuity.
112	169-6, Pin 5	Ground		Direct	0	No continuity.
113	169-6, Pin 3	169-6, Pins 4, 6, 8		Direct	0	No continuity.
114	169-5, Pin 1	Ground		Direct	0	No continuity.
115	169-5, Pin 2	Ground		Direct	0	No continuity.
116	169-5, Pin 3	110		Direct	0	Open reactor 162.
117	169-5, Pin 3	169-5, Pin 5		Direct	0	No continuity.
118	169-5, Pin 6	T.B. 7, Term. 14		Direct	0	No continuity.
119	169-5, Pin 7	123-2, Term. 2	Tube VT-199 speech amplifier removed	Direct	41	Defective resistor 143-1 or 143-2.

c. *Transmitter Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Control Positions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
120	169-5, Pin 7	Ground	Tube VT-199 speech amplifier, in socket	Direct	7	Defective Tube VT-199; wrong socket connections.
121	169-5, Pin 8	126, Term. 2		Direct	0	No continuity.
122	169-3, Pin 1	Ground		Direct	0	No socket connection.
123	169-3, Pin 3	160, Term. 3		Direct	0	No continuity.
124	169-3, Pin 4	169-4, Pin 4		Direct	0	No continuity.
125	169-3, Pin 4	111		Direct	0	No continuity.
126	169-3, Pin 5	159, Term. 3		Direct	0	No continuity.
127	169-3, Pin 7	Ground		Direct	0	No continuity.
128	169-3, Pin 8	Ground		Direct	0	No continuity.
129	169-4, Pin 1	Ground		Direct	0	No continuity.
130	169-4, Pin 3	160, Term.		Direct	0	No continuity.
131	169-4, Pin 3	T.B. 7, Term. 3		Direct	0	No continuity.
132	169-4, Pin 5	159, Term. 5		Direct	0	No continuity.
133	169-4, Pin 7	Ground		Direct	0	No continuity.
134	169-4, Pin 8	Ground		Direct	0	No continuity.
135	T.B. 8, Term. 10	160, Term. 4		Direct	0	No continuity.
136	T.B. 8, Term. 10	120		Direct	0	No continuity.
137	T.B. 8, Terms. 7, 8	119		Direct	0	No continuity.
138	T.B. 8, Term. 8	171, Outside contact	Meter switch position 1.	Direct	0	No connection.
139	T.B. 8, Term. 2	171, Inside contact	Meter switch position 1.	Direct	0	No connection.
140	T.B. 8, Term. 9	171, Outside contact	Meter switch position 2.	Direct	0	No connection.
141	T.B. 8, Term. 3	171, Inside contact	Meter switch position 2.	Direct	0	No connection.

c. *Transmitter Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Control Positions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
142	T.B. 8, Term. 10	171, Outside contact	Meter switch position 3	Direct	0	No connection.
143	T.B. 8, Term. 4	171, Inside contact	Meter switch position 3	Direct	0	No connection.
144	T.B. 8, Term. 12	171, Outside contact	Meter switch position 4	Direct	0	No connection.
145	T.B. 8, Term. 6	171, Inside contact	Meter switch position 4	Direct	0	No connection.
146	T.B. 8, Term. 5	171, Outside contact	Meter switch position 5	Direct	0	No connection.
147	T.B. 8, Term. 11	171, Inside contact	Meter switch position 5	Direct	0	No connection.
148	157, Outside contact	171, Inside contact	Position 1	Direct	1.5	Resistor 134 defective or disconnected.
			Position 2	Direct	0.75	Resistor 135-1 defective or disconnected.
			Position 3	Direct	0.75	Resistor 135-2 defective or disconnected.
			Position 4	R x 10	2 M	Resistor 153-2 defective or disconnected.
			Position 5	Direct	75	Resistor 148 defective or disconnected.
149	126, Term. 1	126, Term. 2		R x 1000	5 M	Reactor 126 open or shorted.

24. MAINTENANCE OF TRANSMITTER AND RECEIVER FREQUENCY SHIFTERS

The procedure for maintenance of the frequency-shifter mechanism mounted on Radio Transmitter BC-625-A and Radio Receiver BC-624-A is as follows: (See Figure 65)

a. Inspect for broken or damaged cams and springs.

b. Inspect for free action of slides. If necessary, straighten slides.

c. Clean, if necessary.

d. Relubricate with Pioneer Instrument Oil Number 1 or Mobil Fluid HFW. Lubrication should include cam-shaft assemblies and positioning clips as well as slides.

e. Check torque of each cam shaft when shifter is mounted on transmitter or receiver. Check with torque checker for not more than two inch-ounces, or make certain that clip will re-position shaft when clip has just been unseated.

25. RACK MAINTENANCE

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 full contents of Paragraphs 25b and 25c. If the trouble is purely of an electrical nature, refer to Paragraph 25e and make continuity tests of the circuit in question. Reference to Paragraph 20 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 65.

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

Assemble the armature hinge and the associated adjustment screw but do not tighten them securely. Locate and securely tighten the solenoid assembly, with the dimension from the center of the open end to the hinge .765.

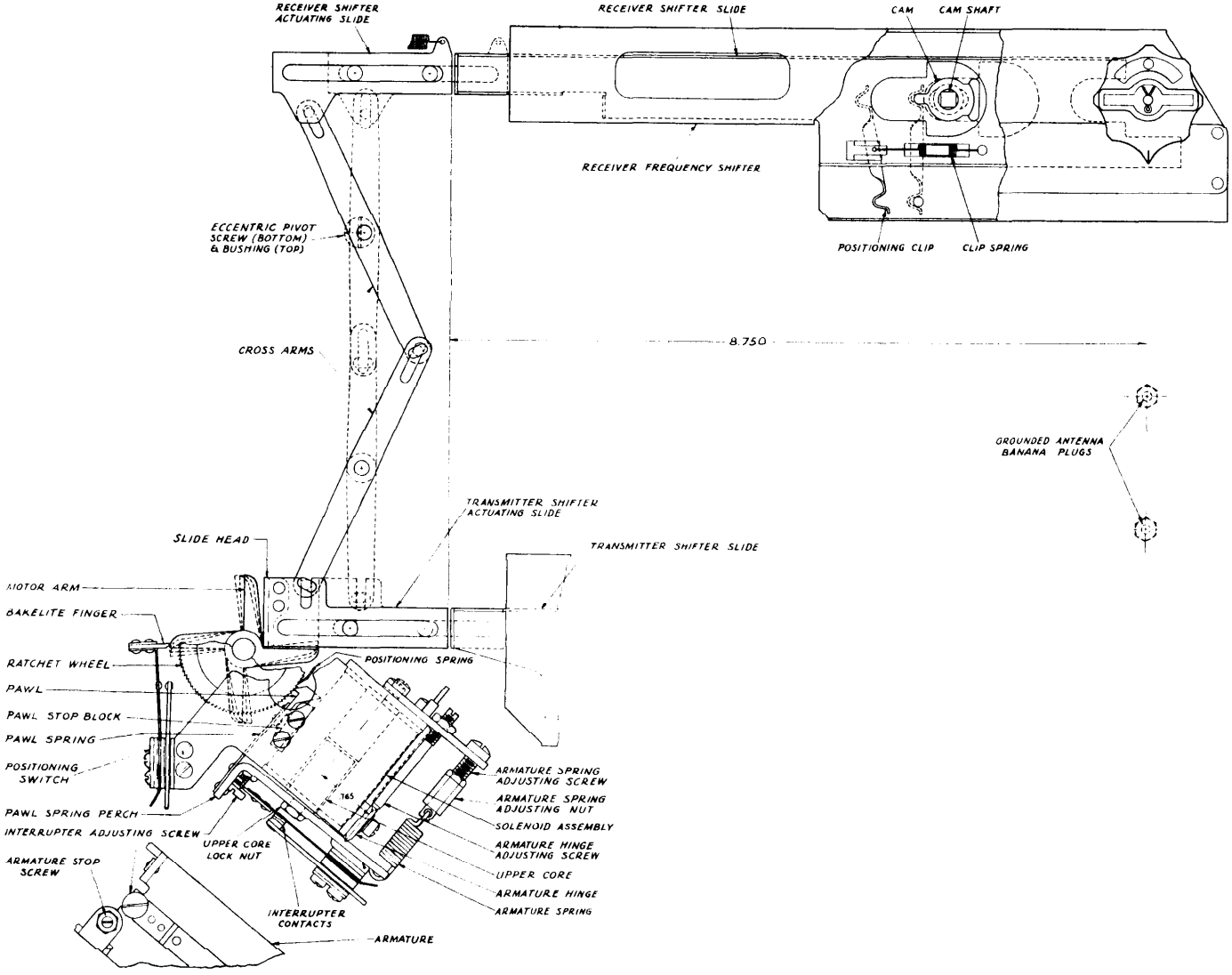


FIGURE 65 — RACK MECHANISM AND RATCHET MOTOR

On earlier motors, the pawl and pawl spring were riveted as an integral part of the armature assembly. Later motors were provided with armature assemblies in which the pawl was a rigid member with one end hinged to the armature and held in place by flat springs fastened to the armature. The assembly and operation of the two types of motor are identical, and the motors may be classified as interchangeable as far as explaining the assembly procedure is concerned. In servicing, lubricate the later type at the hinge and point of contact with the springs, using Beacon M-285 grease.

Before assembling the armature, lubricate the hinge with Beacon M-285. It is advisable also to apply some of this lubricant to the pole faces.

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, guide the threaded stud of the upper core into the hole in the center of the armature. Place the locknut on the stud and tighten securely after threads have been glyptaled. The slot in the stud will allow it to be held while the nut is tightened. Assemble the armature springs and temporarily tighten the screws.

Now adjust the hinge 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. Permanently secure the armature hinge and adjusting screws at this time.

Adjust the armature stop screw 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 6¾ 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. Divide the spring load approximately evenly between the two springs.

At this time, assemble in place but do not tighten the pawl stop block and ratchet-wheel positioning-spring assembly.

Next, assemble the ratchet wheel and arm assembly and shaft. Lubricate with Beacon M-285 grease.

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

Set the pawl stop block 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 used 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.

Mount the interrupter switch assembly and securely tighten the screws after the assembly has been aligned with the interrupter adjusting screw. Set this screw 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, check the running of the motor. 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 contacts should be set at this time to give best performance.

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*

(1) *Initial Procedure*

Install the motor 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 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 65.

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. No further positioning should be required.

(2) *Positioning of Motor on Earlier Production Rack Assemblies*

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:

(a) 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.

(b) 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.

(c) 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.

(3) *Assembly and Adjustments Without Use of Gauges or Fixtures*

The three conditions in (a), (b) and (c), above, must be met simultaneously, and the required adjustments may seem 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 (b) and (c) can quite easily be determined by visual inspection and manual operational check. Without a special fixture to satisfy condition (a), 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 clearance should be approximately $\frac{1}{32}$ inch. A more desirable check is to determine that a shifter slide is moved in for a distance of $2\frac{1}{32}$ inch when the motor is operated to a point where a positioning switch first opens.

(4) *Check of Operation of Slides*

After the positioning of the motor is correctly done, it is desirable to check the operation of the slides on the receiver side of the rack. 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 $\frac{1}{32}$ inch in the released position. Here again it is more direct to ascertain that the shifter slides are operated at a distance of $2\frac{1}{32}$ inch when positioned by the motor.

(5) *Lubrication of Rack Assembly*

Check to see that all bearing surfaces of the rack frequency-shifting mechanism are lubricated with Beacon M-285 grease.

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

(6) *Final Adjustments*

Make final adjustment of the motor interrupter contacts with the transmitter and receiver mounted on the rack and operated from a regular power supply or a 12-volt storage battery. Note that the motor will operate satisfactorily while the heavy interrupter contact spring is flexed in and out over a certain range. It is desirable to set this heavy contact spring outward to just within the point which causes a noticeable change in motor performance. With this adjustment, note that the spring can be flexed inward a greater amount than outward before erratic performance results. This ad-

justment 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 rpm at 12 volts.

Generously lubricate ratchet gear teeth and pawl bearing surfaces with Beacon B-285 grease.

d. *Maintenance of Rack Frequency-Shifter Mechanism*

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

(2) Relubricate all bearing surfaces of the rack frequency - shifting mechanism with Beacon M-285 grease.

(3) Do not attempt to clean the motor interrupter contacts 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 some other cause. The cleaning operation, when necessary, should be confined to the removal of all silver which may be deposited on the tungsten. Do this 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 additionally 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 parts of the rack frequency-shifting mechanism should require no attention other than occasional lubrication. However, if for any reason it has been necessary to disassemble these parts, the one adjustment required upon re-assembly involves the eccentric screw and bushing pivoting the upper cross arm group.

In resetting these eccentrics, always keep the arrow on the head of the screw and on the bushing pointing in the same direction, and adjust the pair to operate the shifter slides a distance of $2\frac{1}{32}$ inch. The gap between the receiver shifter actuating slides and the receiver shifter slides will be approximately $\frac{1}{32}$ inch in the released position.

e. *Rack Continuity and Resistance Measurements*

In addition to the tests shown below, all connections, other than "ground" wires shown, should indicate infinite resistance to ground (the rack frame). All Jones plug connections should indicate infinite resistance to 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.

In the following test data, the contact springs of relay 412 have been numbered from the outside contact toward the relay coil. Since eight springs are used, number 8 is therefore the spring adjacent to the coil.

e. *Rack Continuity and Resistance Measurements*

Test No.	*From*	*To*	*Control Positions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
1	417, Term. 1	Ground		Direct	0	Broken connection or wiring.
2	417, Term. 2	420, Term. 4		Direct	0	Same as 1.
3	417, Term. 2	418-2, Term. 2		Direct	0	Same as 1.
4	417, Term. 2	419, Term. 8		Direct	0	Same as 1.

e. *Rack Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Control Positions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
5	417, Term. 2	412, Inside coil connection		Direct	0	Same as 1.
6	417, Term. 2	411-1, Outside coil connection		Direct	0	Same as 1.
7	417, Term. 2	406, Breaker point		Direct	0	Same as 1.
8	417, Term. 2	426, Outside connection next to 411-1		Direct	0	Same as 1.
9	417, Term. 3	419, Term. 4		Direct	0	Same as 1.
10	417, Term. 4	427, Moving arm, section A		Direct	0	Same as 1.
11	417, Term. 5	427, Moving arm, section B		Direct	0	Same as 1.
12	417, Term. 6	418-1, Term. 1		Direct	0	Same as 1.
13	417, Term. 7	418-1, Term. 2		Direct	0	Same as 1.
14	417, Term. 8	427, Moving arm, section C		Direct	0	Same as 1.
15	417, Term. 9	418-1, Term. 5		Direct	0	Same as 1.
16	417, Term. 9	427, Moving arm, section D		Direct	0	Same as 1.
17	417, Term. 10	419, Term. 12		Direct	0	Same as 1.
18	417, Term. 11	419, Term. 10		Direct	0	Same as 1.
19	417, Term. 12	418-1, Term. 6		Direct	0	Same as 1.
20	417, Term. 13	420, Term. 5		Direct	0	Same as 1.
21	417, Term. 14	420, Term. 6		Direct	0	Same as 1.
22	417, Term. 15	418-2, Term. 7		Direct	0	Same as 1.
23	417, Term. 16	418-1, Term. 4		Direct	0	Same as 1.
24	417, Term. 17	412, Outside coil connection		Direct	0	Same as 1.
25	417, Term. 17	411-1, Outside contact		Direct	0	Same as 1.
26	417, Term. 18	418-1, Term. 3		Direct	0	Same as 1.
27	420, Term. 2	420, Term. 10		Direct	0	Same as 1.
28	420, Term. 2	402, Inside connection		Direct	0	Same as 1.

e. *Rack Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Control Positions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
29	420, Term. 2	418-2, Term. 3		Direct	0	Same as 1.
30	420, Term. 2	412, Armature 7		Direct	0	Same as 1.
31	420, Term. 2	419, Term. 5		Direct	0	Same as 1.
32	420, Term. 1	418-2, Term. 1		Direct	0	Same as 1.
33	420, Term. 3	Ground		Direct	0	Same as 1.
34	420, Term. 7	Ground		Direct	0	Same as 1.
35	420, Term. 12	Ground		Direct	0	Same as 1.
36	420, Term. 8	419, Term. 6		Direct	0	Same as 1.
37	418-2, Term. 4	412, Contact No. 8		Direct	0	Same as 1.
38	418-2, Term. 4	412, Contact No. 7	Relay 412 closed	Direct	0	Misadjustment of relay 412 or burned contacts.
39	418-2, Term. 5	419, Term. 9		Direct	0	Same as 1.
40	418-2, Term. 6	419, Term. 11		Direct	0	Same as 1.
41	418-2, Term. 8	Ground		Direct	0	Same as 1.
42	419, Term. 3	412, Contact No. 7		Direct	0	Same as 38.
43	419, Term. 7	Ground		Direct	0	Same as 1.
44	Receiver antenna jack, inside pin	Ground		Direct	0	Broken or loose plug.
45	Receiver antenna jack, outside pin	412, Contact No. 2	Armature closed	Direct	0	Broken connection or relay 412 misadjusted.
46	Transmitter antenna jack, inside pin	Ground		Direct	0	Broken or loose plug.
47	Transmitter antenna jack, outside pin	412, Contact No. 2		Direct	0	Broken connection or relay 412 misadjusted; burned contacts.
48	416, Center connector	412, Contact No. 3		Direct	0	Same as 47.
49	412, Contact 1, 4, 5	Ground		Direct	0	Misadjusted relay 412 or burned contacts.
50	417, Term. 17	417, Term. 2		Direct	200	Shorted low-voltage bus.

e. *Rack Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Control Positions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
51	406, Inside interrupter contact	406, Top terminal		Direct	0	Broken connection or open wiring.
52	406, Outside interrupter contact	426, Outside contact near 411-1		Direct	0	Misadjusted or defective ratchet-motor interrupter contacts.
53	406, Outside interrupter contact	401, Outside contact		Direct	0	Same as 52.
54	406, Inside interrupter contact	401, Outside contact		Direct	0	Same as 51.
55	411-1, Inside coil contact	411-2, Bottom outside contact		Direct	0	Broken connection or wiring.
56	401, Inside connection	426, Inside connection near AUDIO nameplate		Direct	0	Defective switch 426.
57	406, Bottom coil terminal	401, Inside connection		Direct	0	Broken connection or open wiring.
58	426, Inside connector near AUDIO nameplate	411-2, Outside upper contact		Direct	0	Broken connection.
59	411-2, Armature	Ground		Direct	0	Broken armature ground jumper.
60	411-2, Upper outside contact	406, Lower coil connection		Direct	0	Broken connection or open wiring.
61	411-1, Bottom outside contact	426, Outside contact near 411-1		Direct	0	Same as 60.
62	411-2, Upper outside contact	406, Top coil terminal		Direct	0	Same as 58.
63	420, Term. 2	Ground (30 seconds)		Direct	Open	Shorted capacitor 402.
64	406, Top coil term.	406, Bottom coil term.		Direct	7	Shorted capacitor 401; open coil of motor 406.
65	417, Term. 2	417, Term. 5	427B Closed	Direct	40	Open or shorted coils of relays 411-1, 411-2.

26. DYNAMOTOR UNIT MAINTENANCE

a. *Adjustment of Output Voltages*

(1) Do not attempt to adjust the output voltages or tamper with the interior of the dynamotor unit unless it has been definitely determined that adjustments are necessary.

(2) If it is found that the output voltages are unreasonably high or low or if a new voltage regulator or dynamotor has been installed in the dynamotor unit, set the output voltages according to the following procedure.

(3) Remove the cover of the dynamotor unit [see Paragraph 21i(1)].

(4) Connect the dynamotor unit to the rest of the equipment and a 30-volt bank of storage batteries. Turn the equipment on by pressing any one of the four channel-selector pushbuttons lolated on Radio Control Box BC-602-A. Place the T-R-REM. switch in R position. *Be careful of the dynamotor fan!*

(5) After allowing the equipment to warm up for several minutes, measure the low-voltage 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 of 26 to 28 volts, as measured at the terminals of the input filter, the low-voltage reading should be 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.*

b. *Adjustment of Carbon Pile Voltage Regulator*

(1) Three adjustments are associated with the carbon-pile 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 factors must be considered in the adjustment of a regulator: regulation and stability. Any adjustment is necessarily a compromise between these two 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, connect it to and operate it with Radio Set SCR-522-A, as described in Paragraph 26a, but connect a resistance in series with the leads (from the dynamotor unit to the battery) to simulate the resistance of aircraft wiring. This resistance should be 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 low-voltage output should remain within the limits of 12.35 to 13.52 volts.

To insure that the dynamotor 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, the dynamotor unit should start without making more than two complete cycles of speed fluctuation.

If the dynamotor 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 flathead screw which clamps the adjustment screw. A clockwise rotation of the compression adjustment screw increases the stability but decreases the ability to regulate. A counterclockwise adjustment decreases the stability but increases the ability to regulate. *Adjust this screw in increases 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, tighten the locking screw. If these adjustments have changed the value of the output voltage, readjust the variable resistor 316.

(2) If the regulator does not tend to work, apply the following instructions:

(a) Remove the +LV brush from the holder on the dynamotor [see Paragraph 21i(10)] and the 6-contact plug from the output-filter socket. Connect an ohmmeter between the chassis and the low-voltage terminal (4) on the output socket 323. Adjust the tap on the regulator-coil series resistor 316 until the ohmmeter indicates 13.1 ohms. Replace the 6-contact plug and +LV brush. Replace the ohmmeter with an accurate voltmeter capable of reading up to 15 volts d.c. Connect this d-c voltmeter across the input leads at the input-filter terminals of terminal strip 355.

(b) Turn the equipment on and check the low-voltage 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. The air-gap adjustment screw is accessible through the hole in the bottom of the dynamotor unit chassis (see Figure 61). Loosen the two small locking screws and turn the large adjustment screw until a minimum output voltage is obtained. Then turn the screw in a counterclockwise direction until a voltage of between 13.0 and 13.2 volts is obtained. If, when turning the air-gap adjustment 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 adjustment screw in a clockwise direction about 10 degrees and then repeat the air-gap adjustment. Continue to adjust the compression screw and the air-gap screw until the requirements of stability and regulation are satisfied.

(c) If a satisfactory adjustment is not found by carefully following this procedure, repeat, using a lower resistance setting than described in step (a) above. However, do not lower the resistance, as indicated by the ohmmeter, to less than 12 ohms.

c. *Dynamotor Unit Trouble Location and Remedy*

(1) *Noisy Dynamotors*

If a dynamotor unit is 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.

(a) 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.

(b) Look for brushes which have been worn beyond usefulness.

(c) With the dynamotor unit operating with Radio Set SCR-522-A, listen to the output in the headphones and apply slight additional pressure to each brush, using an insulated rod or pencil. Should the additional pressure cause a marked decrease in the noise level, applying slightly additional pressure to the brush by properly bending the spring. CAUTION: — Do not increase the

brush pressure sufficiently to cause overheating of the commutator. Following this adjustment, operate the dynamotor unit for several hours and examine the commutator for evidence of throwing of solder or rainbow-color effect of the segments, indicating excessively high commutator temperature.

(d) 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. Look for nicks or scratches on the segments. Clean commutator and polish with crocus cloth or very fine sandpaper *(never use emery cloth). Be very careful not to put ridges in the surface.*

(e) 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.

(f) Look for loose connections.

(2) *Loss of Output Voltage*

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

(a) 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.

(b) Look for worn out brushes and broken brush pig tails.

(c) 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, send the dynamotor unit to a repair depot.

d. ***Dynamtor Unit Continuity and Resistance Measurements***

Disconnect the dynamotor unit from the rest of Radio Set SCR-522-A. Remove the cover of the dynamotor unit [see Paragraph 21i(1)]. Use Test Set I-56-A. If resistance measurements vary more than ±10% from the values given in the table below, investigate the circuit components in question. These tests apply to Dynamotor Unit PE-94-A but may readily be adapted for a 14-volt dynamotor unit, if one is being used.

d. ***Dynamotor Unit Continuity and Resistance Measurements—Continued***

Test No.	*From*	*To*	*Test Conditions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
1	323, Term. 1	354, (—MV)		Direct	0	Open choke 310-1.
2	323, Term. 1	Ground	(—MV) Lead disconnected	RX1000	Open	Defective capacitor 301-1 or 302-1.
3	323, Term. 2	354 (+HV)		Direct	0	Open choke 310-2.
4	323, Term. 2	Ground	(+HV) Lead disconnected	RX1000	Open	Defective capacitor 301-2, 302-2.

d. *Dynamotor Unit Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Test Conditions if Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
5	323, Term. 3	Ground		Direct	0	Defective ground wiring; defective socket 323.
6	323, Term. 4	354 (+LV)		Direct	0	Open choke 310-3.
7	323, Term. 4	Ground		Direct	1.2	Open choke 310-3; defective resistor 317 or 316; defective regulator 314 or 14.5v generator.
8	323, Term. 4	Ground	(+LV) Lead disconnected	RX1000	Open	Defective capacitor 301-3 or 302-3.
9	323, Term. 5	354, (+SW)		Direct	0	Open choke 310-4.
10	323, Term. 5	Ground		RX1000	Open	Shorted or defective capacitor 301-4 or 301-7.
11	323, Term. 5	322, Term. 2		RX10	200	Open choke 310-4; open coil of starter relay; open choke 312.
12	323, Term. 5	Ground	(+SW) Lead disconnected	RX1000	Open	Defective capacitor 301-4, 303-B.
13	354, (+SW)	355 (+)		Direct	200	Open in coil of starter relay.
14	323, Term. 6	354, (—SW)		Direct	0	Open choke 310-5.
15	323, Term. 6	Ground	(—SW) Lead disconnected	RX1000	Open	Defective capacitor 301-5.
16	322, Term. 1	355, (—)		Direct	0	Open choke 311.
17	322, Term. 1	Ground	(—) Lead disconnected	RX1000	Open	Defective capacitor 301-6.
18	322, Term. 2	355 (+)		Direct	0	Open choke 312.
19	322, Term. 2	Ground	(+) Lead disconnected	RX1000	Open	Defective capacitor 301-7.
20	Blue dynamotor lead	Green dynamotor lead	All four dynamotor leads disconnected	Direct	7	Loose motor brushes; defective armature; open or defective regulator field.

d. *Dynamotor Unit Continuity and Resistance Measurements—Continued*

Test No.	*From*	*To*	*Test Conditions If Not Normal*	*Ohmmeter Scale Used*	*Resistance (Ohms)*	*Probable Cause of Incorrect Reading*
21	Thin yellow dynamotor lead	Blue dynamotor lead	All four dynamotor leads disconnected	Direct	16	Loose motor brushes; defective armature; open or defective regulator field. Open or defective shunt field.
22	Thick yellow dynamotor lead	Blue dynamotor lead		Direct	0	Loose motor brushes; defective armature; open or defective regulator field. Open or defective series field.
23	354, (—SW)	Ground		RX1000	Open	Shorted capacitor 303A, 301-5, 301-6.

27. MAINTENANCE OF RADIO CONTROL BOX

a. *Control Box Trouble Location and Remedy*

(1) If the transmitter stays on, although the T-R-REM. lever switch is in either the R or REM. position, examine the T-R-REM. switch for dirty or bent contacts.

(2) Check for burned-out pilot lamps. Lamp-replacement instructions are given in Paragraph 27b.

(3) Make certain that the contacts of switch 611 are not loose or making intermittent contact.

(4) Check cams at the rear of switch 611 for a thin film of lubricant. Use Pioneer Instrument Oil #1 or Mobil Fluid HFW for relubrication.

(5) Check dimmer assembly for freedom of action.

(6) Examine wiring for evidence of fraying or wear.

b. *Replacement of Control Box Pilot Lamps*

To remove a control-box pilot lamp, first remove the two panel-mounting screws from the panel of Radio Control Box BC-602-A (see Figure 6). Turn the handle of the T-R-REM. switch counterclockwise until the handle can be removed. Remove the panel of the control box.

Remove the lamp cap. A lamp-cap remover is supplied with Test Equipment IE-19-A. Slots are provided in the lamp sleeves to accommodate the lamp-cap remover. The lamp may now be removed with the special extracting tool which is part of the test equipment. Pull the lamp out. No turning is required. The extracting tool may also be used for inserting lamps in the radio control box. If no special tools are available, remove the right-side mounting plate and remove the lamps with a small screwdriver.

28. RELAY MAINTENANCE

a. *Telephone-Type Relays*

Servicing of telephone-type relays, such as are used in Radio Set SCR-522-A, is limited to contact cleaning. *Do not attempt any other kind of repair.*

Never bend the springs because this may shift the fulcrum point. Factory adjusters "iron" the spring and give it a "bow" in the desired direction. This kind of adjustment is generally permanent, and any

trouble with the relays is usually due to a glaze or dirt in the contacts. *Do not use sandpaper, crocus cloth, or a file (not even a "contact file")* to clean the relay contacts.

Burnish or polish the relay contacts. A flat toothpick dipped in carbon tetrachloride is usually satisfactory. Contact burnishers, consisting of a thin, flexible, metal strip slightly roughened by sand-blasting or etching (or made of soft metal such as nickel silver, milled like the edge of a coin), are commercially available. These burnishers are designed to remove only dirt and glaze, not metal. Pressure for the work must be provided only by the closed contacts.

b. *Adjustment of Squelch Relay 246*

The contacts of the squelch relay should be serviced exactly the same way as specified for the telephone-type relays in Paragraph 28a. If proper operation of the squelch relay cannot be obtained, check the spacing between contacts. This spacing should be between .0015" and .003". Adjust the spring tension to the point at which the relay closes when a current of approximately 4 ma flows through the coil. When properly adjusted, the squelch relay should open and close with a coil-current differential of not more than 0.2 ma (e.g., close at 4 ma, open at 3.8 ma). Make certain that the armature spring does not rub against any portion of the relay frame. Erratic, undependable operation will result if there is excessive play in the armature pivot bearings.

29. OVERALL PERFORMANCE TESTS

a. *General*

If the operation of the equipment is questionable or if major repairs or adjustments have been made, the performance of the equipment should be checked in accordance with the following procedure. The figures obtained as a result of these tests should agree approximately with the normal performance characteristics given in the following tables but in no case should be worse than the minimum performance characteristics.

b. *Standard Test Conditions*

Unless otherwise specified, the following standard test conditions must be maintained for all performance tests of Radio Receiver BC-624-A and Radio Transmitter BC-625-A.

(1) *Interconnecting Cords*.— The transmitter-receiver assembly must be connected for operation by means of Radio Control Box BC-602-A (refer to Figure 27). Radio Receiver BC-624-A, Radio Transmitter BC-625-A, Rack FT-244-A and Case CS-80-A must be properly assembled together.

(2) *Temperature*.— Prevailing ambient, 20°C to 30°C (60°F to 86°F).

(3) *Humidity*.— 25% to 90%.

(4) *Atmospheric Pressure*.— Normal.

(5) *Vibration*.— None.

(6) *Warm-up Period*.— Not exceeding 5 minutes.

(7) *Phantom (Dummy) Antenna*.— For receiver, a 50-ohm non-inductive resistor (including signal-generator output circuit) in series with Cord CD-477 (5 feet long). For transmitter, a 50-ohm non-inductive power resistor in series with a thermomilliammeter must be connected to the end of a 5 foot Cord CD-477.

(8) *Primary - Power Supply*.— The line voltage must be 28 volts (measured across the input terminals of the dynamotor unit).

(9) *Squelch Circuit and Audio Level Controls*.— The squelch circuit (RELAY) control (see Figure 3) must be set in the extreme clockwise position. This renders the squelch circuit inoperative. The AUDIO level control must be set in the extreme clockwise position for maximum output.

(10) *Output Load (Receiver Audio)*.—Non-reactive load of 4000 ohms (G.R. output meter), yellow lead connected to terminal No. 7 of audio transformer 296.

(11) *Power Amplifier Loading*.— Unless otherwise specified, the power amplifier must be resonated and loaded so that with the transmitter METER SWITCH in position 3, the 0-1 ma d-c test-milliammeter reading is 0.65, except that when maximum antenna current is obtained at values of plate current lower than 0.65 (on milliammeter scale) the transmitter must be tuned and adjusted for maximum antenna current.

(12) *Standard Modulated Signal*.— 30% at 400 cycles.

(13) *Standard Output*.— 10 mw, combined signal and noise.

Because of the high frequencies involved, special care must be taken with the various cables associated with the test-set-up. Before any measurements are made on a new set-up, the cables should be dressed so that with the signal-generator attenuator set at zero, the receiver output (except for noise) is actually zero.

For test purposes, it is desirable to space the four channels equally over the range 100-156 mc. Refer to Paragraph 9b for instructions on choosing receiver crystals for desired frequencies and for instructions on receiver channel alignment. All measurements should be made with a Ferris Microvolter Model 18C (or equivalent). It is not possible to use Signal Generator I-96-A for this purpose.

c. *Methods of Measurement*

To make performance tests, proceed as follows and record results on forms similar to the tables in the following paragraphs.

(1) *Selectivity*

Remove the receiver, transmitter and rack from Case CS-80-A and connect the output of a Ferris 18C signal generator (or equivalent) to the control grid of the receiver mixer Tube VT-203 and the frame of the r-f unit (see Figures 38 and 40). *Use the shortest possible leads.* Place the control-box T-R-REM. switch in R position. Set the signal generator for a 12-mc signal, 30 μv output. With a General Radio (or equivalent) output meter connected to the audio-output terminals of Junction Box JB-29-A (terminals No. 1 and 4 of socket 804, or 1 and 3 of socket 802), adjust the signal-generator tuning control for maximum receiver output and then adjust the receiver AUDIO control for 10 mw output. Increase the signal generator output to 60 μv and then adjust its frequency control above and below resonance (12 mc) to find the frequencies required to give 10 mw receiver output. Do not change the receiver tuning-control settings. The total bandwidth is the difference in kilocycles between the signal generator settings above and below resonance. Repeat for 10, 100, 1000 and 10,000 times 30 μv output and record the total bandwidths.

SELECTIVITY

Test Frequency		*Input In μv*	*Bandwidth*		
			Normal	*Minimum*	*Maximum*
12 mc		30			
Above	Below				
50 kc	60 kc	x 2	110 kc	60 kc	130 kc
87	96	x 10	181		200
129	136	x 100	265		290
179	176	x 1000	355		390
222	238	x 10,000	460		490

(2) *Normal Sensitivity*

(a) Place the transmitter, receiver and rack inside Case CS-80-A and connect the standard signal generator (Ferris 18C) through the phantom (dummy) antenna and Cord CD-477 to the antenna input socket 416 located on the rack.

(b) Connect the receiver audio output to the output-power meter as in Paragraph 29c(1). Set the meter impedance at 4000 ohms. Note that for 4000-ohm receiver-output impedance, the yellow wire must be con-

nected to terminal 7 of the receiver audio-output transformer 296.

(c) Set the signal-generator at the desired test frequency. Set the output at approximately 5 μv. Set the receiver AUDIO control at the extreme clockwise rotation position. Tune the signal generator for maximum receiver audio output. Turn the modulation off* and adjust the receiver AUDIO control for 1 mw noise output. Turn modulation on again and adjust signal generator output for 10 mw audio output (signal plus noise). Continue to adjust the receiver AUDIO control and the signal generator output until 10 mw audio output is obtained with the modulation on 1 mw with the modulation off, the receiver input and gain remaining constant. Record the signal-generator output setting. This is the sensitivity expressed in microvolts

RECEIVER NORMAL SENSITIVITY

Test Frequency	*Sensitivity*	
	Normal	*Minimum*
100 mc	3.4 μv	6 μv
124 mc	2.6 μv	6 μv
140 mc	3.1 μv	6 μv
156 mc	3.4 μv	6 μv

(3) *Image-Frequency Rejection*

(a) Operate the receiver in accordance with the instructions given in Paragraph 29b. For a given test frequency, follow the same instructions given in Paragraph 29c(2) for measuring normal sensitivity. Record the signal-generator output.

(b) Adjust the signal-generator frequency to the image frequency (signal frequency minus twice the intermediate frequency, or 24 mc).

(c) Increase the signal-generator output until 10 mw audio output is obtained from the receiver. Record the signal-generator output.

(d) Record the image rejection ratio as the microvolts obtained in *(c)* divided by the microvolts obtained in *(a)*. Repeat for each test frequency.

TEST FREQUENCY	*IMAGE-REJECTION RATIO*	
	Normal	*Minimum*
156 mc	5,000	1,000
148 mc	14,000	3,000
140 mc	24,100	10,000

(4) *Automatic Gain Characteristic*

(a) Operate the receiver in accordance with the instructions given in Paragraph 29b. Channel frequency, 100 mc.

(b) Set the signal-generator output at 20 μv, 30% modulated. Adjust the signal-generator tuning dial for maximum receiver output.

(c) Increase the signal-generator output to 100 μv and adjust the AUDIO control for 100-mw receiver output.

(d) Reset the signal generator for 20 μv output and record the receiver power output in milliwatts. Repeat for each receiver input listed in the table below.

(e) Calculate the output in db, referring to the output for 20 μv input as zero level.

*NOTE: With the modulation turned off, it is necessary to slightly retune the 18C signal generator for maximum receiver audio output since this generator shifts frequency slightly when the modulation is turned on or off, particularly at frequencies above 125 mc.

AUTOMATIC GAIN CONTROL CHARACTERISTIC

Input μv	*OUTPUT (db)*	
	Normal	*Maximum*
20	0	0
50	+1.7	
100	+1.8	+6
1,000	+3.9	
10,000	+5.4	
100,000	+5.8	+12

(5) *Audio-Frequency Power Output*

(a) Operate the receiver in accordance with the instructions given in Paragraph 29b. Channel frequency, 100 mc. Receiver AUDIO control at maximum (extreme clockwise position).

(b) Record microvolts input necessary for 75 mw and 300 mw receiver output.

RECEIVER A-F OUTPUT POWER

Test Frequency	*Receiver Output*	*RECEIVER INPUT*	
		Normal	*Maximum*
100 mc	75 mw	3.7 μv	7.5 μv
100 mc	300 mw	7.7 μv	15 μv

(6) *Radio Transmitter BC-625-A Power Output*

(a) Operate the equipment as in Paragraph 29b. Connect Cord CD-477 (5 feet long) to the PHANTOM ANT. socket on the meter panel of Signal Generator I-96-A and to antenna socket 416 on the rack. Connect the d-c meter cord to the signal generator D.C. METER socket and transmitter socket 171. The phantom antenna characteristics are given in Figure 66.

(b) If Signal Generator I-96-A is not being used, employ Cord CD-477 terminated by a phantom antenna and a 0-500 ma r-f milliammeter.

(c) Tune the transmitter on the channel frequencies listed in the table below. Antenna current may be read on the 0.500 ma r-f milliammeter.

(d) Record the milliammeter readings. Calculate the power output by applying the formula:

$$W = \frac{I^2 R}{10^6}$$

Where W is the power output in watts, I is the milliammeter reading and R is the phantom-antenna resistance in ohms (see Figure 66).

TRANSMITTER POWER OUTPUT

Test Frequency (mc)	*POWER OUTPUT (Watts)*	
	Normal	*Minimum*
100	7.7	6
110	8.9	6
120	9.7	6
130	9.9	6
140	8.8	6
150	8.1	6
156	7.4	6

(7) *Under Voltage and Over Voltage Test*

Tune the transmitter up on four channels (see Paragraph 9a) and vary the input voltage to the dynamotor from 22 to 32 volts. The transmitter power output should not fall below six watts at any dynamotor input voltage within the range 22-32 volts.

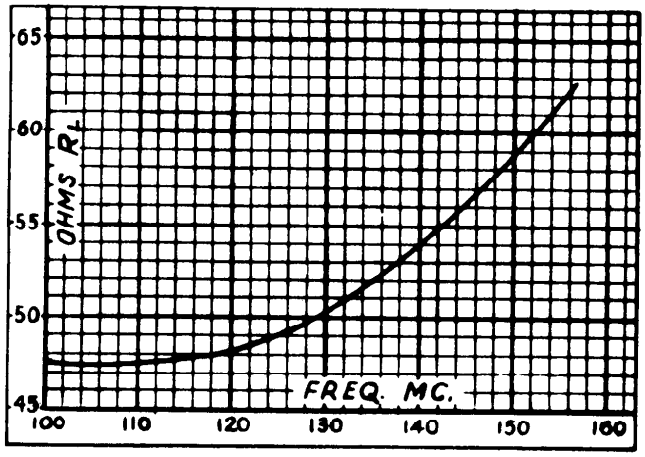


FIGURE 66 — TYPICAL CHARACTERISTICS OF PHANTOM ANTENNA

30. FUNCTION OF ALL WIRES IN INTERCONNECTING CABLES

Cable	*Plug Pin No.*	*Function*
Dynamotor Unit to Battery	1	−14v or −28v Input to dynamotor.
	2	+14v or +28v to dynamotor.
Dynamotor Unit to Rack	1	−150v Bias supply.
	2	+300v Plate and screen supply.
	3	−13v, +150v, −300v, Ground.
	4	+13v Heater and control-circuit supply.
*NOTE: The wires connected to pin nos. 8, 9, 10 and 12 of plug PL-P169 or PL-Q169 do not return to the dynamotor unit. See the schematic circuit diagram, Figure 71.	5	Dynamotor starting-relay control.
	6	Dynamotor starting-relay control.
	*8	Receiver AVC (used only when marker beacon receiver is installed.)
	*9	To press-to-talk switch on throtte (U. S. installations only) or to press-to-transmit circuit (British installations only).
	*10	+300v for marker beacon receiver.
	*12	−300v, Ground for marker beacon receiver.
Junction Box to Rack	1	Common ground.
	2	+13v Supply for BC-602-A indicator lamps.
	3	Receiver and interphone audio output.
	4	Ratchet motor control, Channel A.
	5	Ratchet motor control, Channel B.
	6	Pilot microphone.
	7	Pilot microphone.
	8	Ratchet motor control, Channel C.
	9	Ratchet motor control, Channel D: slow release relay 130.
	10	Crew microphone.
	11	Crew microphone.
	12	Contactor relay 131 control.
	13	Dynamotor starting relay control.
	14	Dynamotor starting relay control.
	15	Relay 161, press-to-transmit (press-to-talk) circuit.
	16	Ratchet motor channel controls, common return.
	17	Antenna relay 412 control.
	18	Relay 161.

30. FUNCTION OF ALL WIRES IN INTERCONNECTING CABLES—Continued

Cable	*Plug Pin No.*	*Function*
Junction Box to Radio Control Box	1	Common ground.
	2	+13v Supply for indicator lamps.
	3	Ratchet motor channel controls, common return.
	4	Ratchet motor control, Channel A.
	5	Ratchet motor control, Channel B.
	6	Ratchet motor control, Channel C.
	7	Ratchet motor control, Channel D.
	8	T-R-REM. switch ant. relay 412 control.
	9	
	10	
	11	Dynamotor starting relay control.
	12	Dynamotor starting relay control.
Junction Box to Jack Box BC-629-A (Pilot)	1	Ground.
	2	Pilot microphone.
	3	Rec. and interphone audio output.
	4	Pilot microphone.
Junction Box to Jack Box BC-630-A (First Crew)	1	Ground.
	2	Crew microphone.
	3	Gun switch. Press-to-transmit connection in British installations; not used in U. S. installations.
	4	Rec. and interphone audio output.
	5	Gun switch. Press-to-transmit connection in British installations; not used in U. S. installations.
	6	Crew microphone.
Jack Box BC-630-A (First Crew) to Jack Box BC-631-A (Other Crew)		All connections between these jack boxes are continuations of the wires connecting Junction Box JB-29-A and Jack Box BC-630-A.
Junction Box to Press-to-transmit Circuit	1	Ground.
	2	Press-to-transmit (Press-to-talk) relay 161.
Junction Box to Contactor	1	Ground.
	2	Contactor relay 131.

SECTION V

APPENDIX

As a result of shortages of critical materials, it may be necessary for the contractor to substitute less critical materials in some instances. The data supplied in this book regarding electrical parts is correct as of the date of publication.

To assure that adequate replacement parts are obtained, it is imperative that replacement parts be ordered not only by the contractor's drawing number as it appears in the instruction book but also by the circuit symbol assigned to a particular part.

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* *Bendix*	*Sig. Corps*	*British Ref. No.*
a. *Radio Transmitter BC-625-A*								
*100	3D9015-7	Capacitor	15 mmf ±1 mmf, 500v d.c.w. ceramicon, Type NPOL	Balancing, 1st harm. amp. plate	Erie	A18182-17		110C/2934
101	3D9010-15	Capacitor	10 mmf ±0.5 mmf, 500v d.c.w. ceramicon, Type NPOK	Osc. feedback	Erie	A18182-13		110C/2932
**102-1	3DA6-23	Capacitor	006 mfd ±20%, 300v d.c.w., mica, Aero Type 1467, C.D. Type 1WL, Mica Type W	Osc. screen coupling	Aero, Mica, C. D.	A102967-7		110C/2994
**102-2	3DA6-23		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. amp. 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	Power-amp. grid bypass				

* Ref. No. 100 is not used in some transmitters.

** 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. See Par. 35.

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	Sig. Corps	*British Ref. No.*
a. ***Radio Transmitter BC-625-A—Continued***								
**102-13			Same as 102-1	Power-amp. grid bypass				
**102-14			Same as 102-1	Bridge blocking				
**102-15			Same as 102-1	Bridge blocking				
103	3D9050-40	Capacitor	50 mmf ±1%, 500v d.c.w., silver mica, Type MIJ	Osc. cathode bypass	Erie	A18253-1		110C/2936
104	3D9100-51	Capacitor	100 mmf ±5 mmf, 500v d.c.w., ceramicon, Type NPOD	1st harm. amp. grid coupling	Erie	A104485-1		110C/3026
105-1	3DA1-55	Capacitor	.001 mfd ±10%, 500v d.c.w., mica, C.D. Type 5WL, Aero Type 1468	Power amp. filament bypass	C. D., Aero	C56315-102		110C/25
105-2	3DA1-55		Same as 105-1	R-F indicator bypass				
105-3	3DA1-55		Same as 105-1	Speech-amp. grid bypass				
***105-4	3DA1-55		Same as 105-1	Meter shunt bypass				
‡106	3DA2-63	Capacitor	.002 mfd ±5%, 800v d.c.w., mica, Type 1WPLS	Power-amp. bypass	C. D.	A18255-1		110C/2944
107-1	3DA100-78	Capacitor	0.1 mfd ±10%, 400v d.c.w., paper, Mica Type 345-21, Solar Type MPW-4147	Speech-amp. screen bypass	Mica, Solar	A18015-104		110C/43
108-2	3DA1-56	Capacitor	.001 mfd ±5%, 500v d.c.w., mica, C.D. Type 1WL, Aero Type 1467, Mica Type W	Tone feedback	Aero, Mica, C. D.	A102967-2		110C/2992

** 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. See Par. 35.
** A few equipments have Ref. No. 105-4.
‡ Some equipments do not have Ref. No. 106.

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	Sig. Corps	*British Ref. No.*
a. ***Radio Transmitter BC-625-A—Continued***								
109-1	3D9020-5	Capacitor	20 mmf ±1 mmf, 500v d.c.w., ceramicon, Type NPOL	Power-amp. grid coupling	Erie	A18182-16		110C/2933
109-2			Same as 109-1	Power-amp. 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	H-F bypass				
110	3DB1.092	Capacitor	1.0 mfd ±15%, 100v d.c.w., oil-paper	Speech-amp. cathode bypass	C. D. Aero	A104092-2		110C/3014
▮*111	3DA500-40	Capacitor	0.5 mfd +10% −3%, 400v d.c.w., oil-paper	Mod. screen bypass	C. D.	A104092-1		110C/3013
▮ 113	3D9300-4	Capacitor	0.0003 mfd ±5%, 500v d.c.w., mica, C.D. Type 5WL, Aero Type 1468, Erie Type N750M	Speech-amp. plate blocking	Aero, Mica, Erie	C56314-301		110C/2993
114	3D9065E5	Capacitor	Stators in parallel, 11.0 ±1 mmf min, 65.5 ±1.5 mmf eff.	Osc. plate tuning	G. Inst., Rad. Cond., Bendix	L72950 or AL74116-1		110C/2983
115	3D9027-3	Capacitor	Stators in series, 3.5 ±1 mmf min, 27.0 ±1 mmf. eff.	1st harm. amp. pl. tuning	G. Inst., Rad. Cond., Bendix	L72951 or AL74117-1		110C/2984
116	3D9016E5	Capacitor	Stators in series, 3.0 ±1 mmf min., 16.5 ±1 mmf eff.	2nd harm. amp. pl. tuning	G. Inst., Rad. Cond., Bendix	L72949 or AL74115-1		110C/2982

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

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	Sig. Corps	*British Ref. No.*
a. *Radio Transmitter BC-625-A—Continued*								
117	3D9011	Capacitor	Stators in series, 2.8 ±1 mmf min., 11.0 ±1 mmf eff.	Power-amp. plate tuning	G. Inst., Rad. Cond., Bendix	L72948 or AL74114-1		110C/2981
118	2C6525A/J6	Inductor	9½ turns #24 enameled copper wire, grooved form	Osc. plate tuning	Bendix	AC57998-1		110C/2958
119	2C6525A/J7	Inductor	15 turns #10 silver-plated SD copper wire, tapped at 7 turns, self-supporting	1st harm. amp. pl. tuning	Bendix	AC57999-1		110C/2959
120	2C6525A/J8	Inductor	#10 bare wire, distributed inductance line	2nd harm. amp. pl. tuning	Bendix	AC58149-1		110C/2960
121	2C6525A/J9	Inductor	2 turns — gap — 2 turns, self-supporting, #10 SD silver-plated copper wire	Power amp. plate tuning	Bendix	AC58150-1		110C/2961
122	2C6525A/J10	Inductor	3 turns, self-supporting #10 SD silver-plated copper wire, supplied with clamping screw	Ant. coupling	Bendix	AC59922-1		110C/3225
▮ 123-1	2Z7228.4	Plug	8-contact male, Type P-408	Trans. control circuit	Jones	A102811		110H/924
▮ 123-2			Same as 123-1	Power input from rack				
**125	2Z7298-2	Potentiometer	1 meg. ±20%, Curve C, Type C	Audio GAIN control	I.R.C.	A104470-2		110C/3024
126	2C6525A/R1	Reactor, a-f	430h, .001 amp. d.c., 5000 ohm, Type XR-5B	Speech-amp. plate	Bendix	A103034		110C/3009
127-1	2C6525A/R2	Reactor, r-f	1 amp., 2½ meter, Type ZO	2nd harm. amp. grid choke	Ohmite	A104090		110C/3012

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

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	Sig. Corps	*British Ref. No.*
a. ***Radio Transmitter BC-625-A—Continued***								
127-2			Same as 127-1	2nd harm. amp. grid choke				
127-3			Same as 127-1	Power-amp. grid choke				
127-4			Same as 127-1	Power-amp. grid choke				
128-1	2C6525A/R3	Reactor, r-f	2.5 mh, 125 ma, 50 ohm, 1 mmf, Type R-100	Osc. grid choke	National	A10556		110C/2895
128-2			Same as 128-1	Osc. cathode choke				
128-3			Same as 128-1	Power amp. plate choke				
130	2Z7650-EA	Relay	0.2 sec. release, 12v, 200-ohm coil, SPDT, Type EA-6487	Slow release relay	Clare	A18258		110F/489
▮*131	2Z7650-B6106	Relay	200-ohm coil, 12v DPDT & SPST, normally unenergized, Type B-6106	Contactor relay	Clare	A18259		110F/490
132-1	3Z6625-6	Resistor	25,000 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-2535	2nd harm. amp. grid bias	Erie, Speer, Allen-B	A18004-253		110C/1673
132-2			Same as 132-1	2nd harm. amp. grid bias				
133-1	3Z6640-13	Resistor	40,000 ohm ±5% 1w, ceramic	Power-amp. screen dropping	Erie	A18158-403		110C/2926
133-2			Same as 133-1	Power-amp. screen dropping				
133-3			Same as 133-1	Voltage divider				
133-4			Same as 133-1	Voltage divider				

* A 150-ohm relay is provided on later equipments.

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
a. *Radio Transmitter BC-625-A—Continued*								
▮ 134	3Z5991-9	Resistor	1.53 ohm ±1%, wire wound, Type 181, 5 watt	1st harm. amp. plate meter shunt	Shall	A18254-2		110C/2938
135-1	5Z5976	Resistor	0.76 ohm ±1%, wire wound, Type 181	2nd harm. amp. plate meter shunt	Shall	A18254-1		110C/2937
135-2			Same as 135-1	Power-amp. plate meter shunt				
▮ 138-3	3Z6801-25	Resistor	1 meg. ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-1055	Speech-amp. screen dropping	Erie, Speer, Allen-B	A18004-105		110C/1677
▮ 140-2	3Z6750-25	Resistor	500,000 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-5045	Tone voltage divider	Erie, Speer, Allen-B	A18004-504		110C/1671
140-3			Same as 140-2	Tone voltage divider				
140-4			Same as 140-2	Tone feedback coupling				
141-1	3Z6801-3	Resistor	1 meg. ±5% ½w, ceramic, Speer Type SI-½, Allen-B Type EB-1055	Input bridge	Erie, Speer, Allen-B	A18001-105		110C/1221
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	3Z6500-61	Resistor	5000 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-5025	Speech-amp. grid bias	Erie, Speer, Allen-B	A18004-502		110C/1669
▮ 143-1	3Z6008B2	Resistor	82 ohm ±5%, 1w, ceramic	Speech-amp. filament dropping	Erie	A18158-820		110C/2931

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* *Bendix*	*Sig. Corps*	*British Ref. No.*
a. ***Radio Transmitter BC-625-A—Continued***								
143-2			Same as 143-1	Speech-amp. filament dropping				
144	3Z6725-1	Resistor	250,000 ohm ±5%, ½w, ceramic, Speer Type SI-½, Allen-B Type EB-2545	Speech-amp. plate load	Erie, Speer, Allen-B	A18001-254		110C/1675
145	3Z6615-27	Resistor	15,000 ohm ±5%, 1w, ceramic	Mod. bias bleeder	Erie	A18158-153		110C/2923
146	3Z6560-8	Resistor	6000 ohm ±5%, 1w, ceramic	Transformer bias bleeder	Erie	A18158-602		110C/2929
147	3Z6618-13	Resistor	18,000 ohm ±5%, 1w, ceramic	Transformer bias divider	Erie	A18158-183		110C/2924
148	3Z6007E-13	Resistor	75 ohm ±5%, 1w, ceramic	Power-amp. grid shunt	Erie	A18158-750		110C/2930
150	3Z6005-22	Resistor	50 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-5005	1st harm. amp. grid coupling	Erie, Speer, Allen-B	A18004-500		110C/2902
151-1	3Z6650-38	Resistor	50,000 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-5035	Osc. grid bias	Erie, Speer, Allen-B	A18004-503		110C/1666
151-2			Same as 151-1	1st harm. amp. grid bias				
152-1	3Z6650-39	Resistor	50,000 ohm ±5%, 1w, ceramic	Osc. screen dropping	Erie	A18158-503		110C/2928
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	3Z6200-34	Resistor	2000 ohm ±5%, 1w, ceramic	1st harm. amp. cathode bias	Erie	A18158-202		110C/2925

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
a. *Radio Transmitter BC-625-A—Continued*								
153-2			Same as 153-1	R-F indicator plate shunt				
153-3			Same as 153-1	Speech-amp. cathode bias				
153-4			Same as 153-1	Speech-amp. grid suppressor				
154-1	3Z6500-62	Resistor	5000 ohm ±5%, 1w, ceramic	1st harm. amp. screen dropping	Erie	A18158-502		110C/2927
154-2			Same as 154-1	Mod. screen dropping				
154-3			Same as 154-1	R-F indicator load				
156A	3Z9827.27	Switch	4-section, 2 position, 1-pole	Crystal selector, channel A	Oak Yaxley	AC56334-1		110F/493
156B				Crystal selector, channel B				
156C				Crystal selector, channel C				
156D				Crystal selector, channel D				
157	3Z8306-2	Switch	2-deck, 6-position, 1-pole, Type 10206-H2	Meter Switch	Oak,	C56333		110F/492
158	2Z10000-14	Transformer	Res. pri., 5.2 ohm, center tap; sec., 4000 ohm; turns ratio 1:45.7; pri. imp. 200 ohm; sec. imp. 420,000 ohm	Microphone	Bendix	A103014		110K/709
159	2Z10000-16	Transformer	Res. pri. 1050 ohm, sec., 2750 ohm, center tap; turns ratio, 1:2; pri. imp. 125,000 ohm, sec. 500,000 ohm.	Interstage	Bendix	A103016		110K/710

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
a. *Radio Transmitter BC-625-A—Continued*								
▮ 160	2Z10000-18	Transformer	Res. pri. 690 ohm, center tap; sec. 170 ohm; turns ratio 2:1; pri. imp. 22,000 ohm, sec. 5500 ohm	Modulation	Bendix, Denyon	A103018		110K/711
161	2Z7650-G7	Relay	200 ohm coil, SPST normally closed, Type G, catalogue #A10480	Press-to-transmit control	Clare	A107141		110F/509
*162	2C6525A/R4	Reactor, r-f	38 turns #28 enameled wire	Speech-amp. cathode r-f choke	Bendix	A104301-1		110C/3017
163	2C6525A/T2	Tube clamp assembly	Mycalex Strip with spring clamp	For 2nd harm. amp.	Bendix	AA102860-1		110M/2327
164-1	2C6525A/T2/1	Strip	Mycalex 1/8" x 1/2" x 2 3/8"	Part of 163	Bendix	A102452		110M/2322
164-2			Same as 164-1	Power-amp. clamp				
165	2Z5799	Knob	Bar knob, Type J-10829	Meter switch	Weston	A11357		110M/1880
166	2C6525A/F1	Freq. shifter assembly	Frequency shifter channel slides and tuning controls	Channel selection	Bendix	AC57991-1		110L/6
167	2C6525A/S1	Shield	Shield, Dzus fasteners	Power-amp. shield	Bendix	AC58596-1		110M/2318
168	2C6525A/S2	Socket	2-contact	Transmitter output	Bendix	AA102951-1		110H/930
▮ 169-1	2Z8795.8	Socket, tube	Octal, Type S-8TM	For Tube VT-198-A, oscillator	Amph.	A104087		110H/935
169-2			Same as 169-1	For Tube VT-134, 1st harmonic amp.				
169-3			Same as 169-1	For Tube VT-134, modulator				
169-4			Same as 169-1	For Tube VT-134, modulator				
169-5			Same as 169-1	For Tube VT-199, sp. amp.				

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

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers*		*British Ref. No.*
						Bendix	*Sig. Corps*	
a. ***Radio Transmitter BC-625-A—Continued***								
169-6			Same as 169-1	For Tube VT-199, r-f ind.				
170-1	2Z8663-1	Socket, tube	7-contact, steatite, supplied with 2 clip and lead assemblies	For Tube VT-118, 2nd harm. amp.	Stand. Wind.	A31778		110H/940
170-2			Same as 170-1	For Tube VT-118, power amp.				
171	2C6525A/S3	Socket	2-contact	D-C meter socket	Bendix	AA102954-1		110H/931
172	2Z7523	Plug board	Crystal board assembly including 128-1 and 151-1	For crystals	Bendix	AC58213-1		110A/433
173-1	6L6832-28RE	Screw	1¾" long, #8-32 x ⅜, red-enameled, special	Mounting	Bendix	A102735		110M/2324
173-2			Same as 173-1					
173-3			Same as 173-1					
173-4			Same as 173-1					
174		Thumbscrew	Diamond knurl, #8-32x9/16 thrd, brass, NP, supplied with "C" washer	For 2nd harm. amp. tube clamp	Bendix	A102469		110M/2391
175-1	2F522A/C2	Coupling collar	Coupling collar assembly with cplg. stud and cplg. arm	Capacitor side of osc. tuning control	Bendix	AA106124-1		110M/2572
175-2			Same as 175-1	Capacitor side of 1st harm. amp. tuning control				
175-3			Same as 175-1	Capacitor side of power-amp. tuning control				

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
a. *Radio Transmitter BC-625-A—Continued*								
176-1	2F522A/C3	Coupling collar	Coupling collar assembly with spring and cplg. arm	Shifter side of osc. tuning control	Bendix	AA106125-1		110M/2573
176-2			Same as 176-1	Shifter side of 1st harm. amp. tuning control				
176-3			Same as 176-1	Shifter side of power-amp. tuning control				
177		Coupling and shaft assembly	Two coupling assemblies, setscrews, taper pins, and shaft	2nd harm. amp. tuning	Bendix	AC58647-1		110M/2574
VT-118	2T118	Tube VT-118	Push-pull r-f beam power amp., Type 832	2nd harm. amp.	RCA, N.U. Ken.			110E/183
VT-118	2T118	Tube VT-118	Push-pull r-f beam power amp., Type 832	Power amplifier	RCA, N.U. Ken.			
VT-134	2T134	Tube VT-134	Beam power amplifier, Type 12A6	1st harm. amp.	RCA, Ken.			110E/184
VT-134	2T134	Tube VT-134	Beam power amplifier, Type 12A6	Modulator	RCA, Ken.			
VT-134	2T134	Tube VT-134	Beam power amplifier, Type 12A6	Modulator	RCA, Ken.			
VT-198-A	2T198A	Tube VT-198-A	Power amplifier pentode, Type 6G6G	Oscillator	RCA, Ken.			110E/182
VT-199	2T199	Tube VT-199	Triple-grid, super-control amplifier, Type 6SS7	Speech amplifier	RCA, Ken.			110E/190
VT-199	2T199	Tube VT-199	Triple-grid super-control amplifier, Type 6SS7	R-F indicator diode	RCA, Ken.			

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	Sig. Corps	*British Ref. No.*
b. ***Radio Receiver BC-624-A***								
▮ 201	3D9010-19	Capacitor	10 mmf ±20%, 500v d.c.w., mica, Aero Type 1468, C. D. Type 5LS, XM-262 case	R-F grid coupling	Aero, C.D., Mica	C58469-100		110C/2964
202-1	3DA1-58	Capacitor	.00068 mfd ±20%, 300v, d.c.w., mica, Aero Type 1468, C.D. Type 5LS, XM-262 case	R-F cathode bypass	Aero, C.D., Mica	C58469-681		110C/2966
202-2			Same as 202-1	R-F AVC filter				
202-3			Same as 202-1	R-F screen bypass				
202-4			Same as 202-1	R-F plate bypass to cathode				
202-5			Same as 202-1	R-F 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				

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* *Bendix*	*Sig. Corps*	*British Ref. No.*
b. ***Radio Receiver BC-624-A—Continued***								
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	R-F B+ filter				
202-17			Same as 202-1	Audio B+ filter				
202-18			Same as 202-1	R-F 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 i-f suppressor bypass				
202-25			Same as 202-1	2nd i-f suppressor bypass				
202-26			Same as 202-1	3rd i-f suppressor bypass				
202-27			Same as 202-1	Osc. plate coil bypass				
203-1	3D9050-41	Capacitor	47 mmf ±20%, 500v d.c.w., mica, Aero Type 1468, C. D. Type 5LS, XM-262 case	Mixer grid coupling	Aero, C.D., Mica	C58469-470		110C/3742

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers*		*British Ref. No.*
						Bendix	*Sig. Corps*	
b. ***Radio Receiver BC-624-A—Continued***								
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 r-f bypass				
204	3D9015-8	Capacitor	15 mmf ±20%, 500v d.c.w., mica, Aero Type 1468, C. D. Type 5LS, XM-262 case	Osc. plate resonator	Aero, C.D., Mica	C58469-150		110C/2967
205	3D9250-27	Capacitor	220 mmf ±20%, 500v d.c.w., mica, Aero Type 1468, C.D. Type 5LS, XM-262 case	Harm. generator grid	Aero, C.D., Mica	C58469-221		110C/3726
*206-1	3DA6-23	Capacitor	.006 mfd ±20%, 300v d.c.w., mica, Aero Type 1467, C.D. Type 1WL, Mica Type W	Osc. plate bypass	Aero, C.D., Mica	A102967-8		110C/2994
*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 i-f AVC filter				
*206-5			Same as 206-1	1st i-f cathode bypass				
*206-6			Same as 206-1	1st i-f screen bypass				
*206-7			Same as 206-1	1st i-f plate bypass				
*206-8			Same as 206-1	2nd i-f AVC filter				
*206-9			Same as 206-1	2nd i-f cathode bypass				
*206-10			Same as 206-1	2nd i-f 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. See Paragraph 35.

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
b. *Radio Receiver BC-624-A—Continued*								
*206-11			Same as 206-1	2nd i-f plate bypass				
*206-12			Same as 206-1	3rd i-f cathode bypass				
*206-13			Same as 206-1	3rd i-f screen bypass				
*206-14			Same as 206-1	3rd i-f plate bypass				
*206-15			Same as 206-1	B+ bypass				
*206-16			Same as 206-1	Audio squelch grid bypass				
*206-17			Same as 206-1	Audio coupling				
*206-18			Same as 206-1	2nd audio grid coupling				
*206-19			Same as 206-1	1st i-f heater bypass				
*206-20			Same as 206-1	2nd i-f heater bypass				
*206-21			Same as 206-1	3rd i-f heater bypass				
*206-22			Same as 206-1	Osc. and audio squelch heater bypass				
*206-23			Same as 206-1	3rd i-f grid bypass				
207-1	3D9060-1	Capacitor	60 mmf ±20%, 500v d.c.w., mica, Aero Type 1469, C. D. Type 5R, XM-262 case, part of 291	Mixer plate resonator	Aero, C.D.	C58495-600		110C/2971

* 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. See Paragraph 35.

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	Sig. Corps	*British Ref. No.*
b. ***Radio Receiver BC-624-A—Continued***								
207-2			Same as 207-1, part of 291	1st i-f grid resonator				
207-3			Same as 207-1, part of 292	1st i-f plate resonator				
207-4			Same as 207-1, part of 292	2nd i-f grid resonator				
207-5			Same as 207-1, part of 293	2nd i-f plate resonator				
207-6			Same as 207-1, part of 293	3rd i-f grid resonator				
207-7			Same as 207-1, part of 294	3rd i-f plate resonator				
207-8			Same as 207-1, part of 294	Diode resonator				
208-1	3D9015-9	Capacitor	15 mmf ±5%, 500v d.c.w., Type N680K, ceramicon, part of 291	Mixer plate resonator	Erie	A25715-15		110C/2950
208-2			Same as 208-1, part of 291	1st i-f grid resonator				
208-3			Same as 208-1, part of 292	1st i-f plate resonator				
208-4			Same as 208-1, part of 292	2nd i-f grid resonator				
208-5			Same as 208-1, part of 293	2nd i-f plate resonator				
208-6			Same as 208-1, part of 293	3rd i-f grid resonator				
208-7			Same as 208-1, part of 294	3rd i-f plate resonator				
208-8			Same as 208-1, part of 294	Diode resonator				

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
b. *Radio Receiver BC-624-A—Continued*								
209	3D9100-56	Capacitor	100 mmf ±20%, 500v d.c.w., mica, Aero Type 1468, C.D. Type 5LS, XM-262 case	Audio diode bypass	Aero, C.D., Mica	C58469-101		110C/2965
210	3D9350-4	Capacitor	330 mmf ±20%, 500v d.c.w., mica, Aero Type 1468, C.D. Type 5LS, XM-262 case	Audio diode bypass	Aero, C.D., Mica	C58469-331		110C/2969
211A	3DA100-80	Capacitor	3-section, per section .1 mfd +15%, −12%, 400v d.c.w. oil-paper, special	1st audio cathode bypass	Aero, Solar, Mallory, E.U.	A25096		110C/1618
211B				1st Audio screen bypass				
211C				AVC filter				
212A	3DEB10	Capacitor	10 mfd ±10%, 350v d.c.w., electrolytic	Audio B+ filter	Aero, C.D.	L73073		110C/2986
212B			20 mfd ±10%, 350v d.c.w., electrolytic	Audio B+ filter				
212C			5 mfd ±10%, 150v d.c.w., electrolytic	Audio cathode bypass				
212D			5 mfd ±10%, 150v d.c.w., electrolytic	2nd audio cathode bypass				
213	3DB1.48A	Capacitor	1 mfd ±10%, 100v d.c.w., oil-paper	R-F and mixer heater bypass	Aero	A104484		110C/3025
214	3D9082	Capacitor	82 mmf ±2%, 500v d.c.w., C.D. Type 5R, Aero Type 1469, mica, XM-262 case	Bridge balancing	Aero, C.D.	C58495-820		110C/2972
216A	3D9036V	Capacitor	Effective capacitance per section 36.0 mmf, min. capacitance 6 mmf, 3-section, variable	R-F grid tuning	Bendix	L72799-1		110C/2980
216B				R-F plate tuning				
216C				Mixer grid tuning				

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* *Bendix*	*Sig. Corps*	*British Ref. No.*
b. ***Radio Receiver BC-624-A—Continued***								
217A			Rear section, eff. cap. 36 mmf, cap. 6 mmf, variable	Harm. amp. plate tuning				
217B	3D9036V-1	Capacitor	Front section, eff. cap. 39.6 mmf, min. cap. 6.5 mmf, variable	Harm. generator plate tuning	Bendix	L72798-1		110C/2979
218-1	3D9010V-5	Capacitor	Effective capacitance 10 mmf, variable	R-F grid trimmer for 216A	Bendix	Part of L72799-1		110C/2980
218-2		Capacitor	Effective capacitance 10 mmf, variable	R-F plate trimmer for 216B	Bendix	Part of L72799-1		
218-3		Capacitor	Effective capacitance 10 mmf, variable	Mixer grid trimmer for 216C	Bendix	Part of L72799-1		
218-4		Capacitor	Effective capacitance 10 mmf, variable	Harm. amp. plate trimmer for 217A	Bendix	Part of L72798-1		110C/2979
218-5		Capacitor	Effective capacitance 10 mmf, variable	Harm. generator plate trimmer for 217B	Bendix	Part of L72798-1		
221	2C4424A/J1	Inductor	One turn #14 tinned copper wire	Antenna coupling	Bendix	A104312		110C/3022
222	2C4424A/J2	Inductor	Two turns #14 tinned copper wire	R-F grid resonator	Bendix	A104309		110C/3019
223	2C4424A/J3	Inductor	Two turns #14 tinned copper wire	R-F plate resonator	Bendix	A104308		110C/3018
224	2C4424A/J4	Inductor	Two turns #14 tinned copper wire	Mixer grid resonator	Bendix	A104313		110C/3023
225	2C4424A/J5	Inductor	One turn #12 tinned copper wire	Harm. amp. plate resonator	Bendix	A104311		110C/3021
226	2C4424A/J6	Inductor	Two turns #14 tinned copper wire	Harm. generator plate resonator	Bendix	A104310		110C/3020

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
b. *Radio Receiver BC-624-A—Continued*								
227-1	2C4424A/J7	Inductor	23 turns #26 enameled wire, permeability tuned	Osc. plate resonator, channel A	Bendix	AA104225-1		110C/3016
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	2C4424A/J8	Inductor	10 turns #22 enameled wire, permeability tuned, threaded form, part of 291	Mixer plate resonator	Bendix	AA104206-1		110C/3015
228-2			Same as 228-1, part of 291	1st i-f grid resonator				
228-3			Same as 228-1, part of 292	1st i-f plate resonator				
228-4			Same as 228-1, part of 292	2nd i-f grid resonator				
228-5			Same as 228-1, part of 293	2nd i-f plate resonator				
228-6			Same as 228-1, part of 293	3rd i-f grid resonator				
228-7			Same as 228-1, part of 294	3rd i-f plate resonator				
228-8			Same as 228-1, part of 294	Audio diode resonator				
231	2Z7228.1	Plug	10-contact, similar to Type -410-AB $\frac{1}{16}$" less angle brackets	Receiver connector	Jones	A102813		110H/926

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	Sig. Corps	*British Ref. No.*
b. ***Radio Receiver BC-624-A—Continued***								
232	2C4424A/P1	Plug board assembly		Receiver input	Bendix	AA104203-1		110H/234
236	2Z7296-150M	Potentiometer	150,000 ohm, special, Type CS, Curve "C"	AUDIO volume control	I.R.C.	A102991		110C/3007
237	2Z7296-2M.1	Potentiometer	2000 ohm, special, Type CS, Curve "A"	Audio squelch RELAY sens. control	I.R.C.	A102992		110C/3008
■ 241-1	2C6525A/R4	Reactor, r-f	38 turns, #28 enameled wire, wound on a 1 meg., ½w resistor	1st audio grid choke	Bendix	AA104301-1		110C/3017
241-2			Same as 241-1	B+ r-f choke				
241-3			Same as 241-1	B+ r-f choke				
243-1	2Z8795.8	Socket, tube	Octal, bakelite base, Type S-8TM	For Tube VT-207, osc. audio squelch	Amph.	A104087		110H/935
243-2			Same as 243-1	For Tube VT-209, 1st i-f				
243-3			Same as 243-1	For Tube VT-209, 2nd i-f				
243-4			Same as 243-1	For Tube VT-209, 3rd i-f				
243-5			Same as 243-1	For Tube VT-169, det., AVC, and 1st audio				
243-6			Same as 243-1	For Tube VT-135, 2nd audio				
244-1	2Z8657-3	Socket, tube	7-contact, bakelite base, Type 78-7PT	For Tube VT-203, r-f amp.	Amph.	A102980		110H/933
244-2			Same as 244-1	For Tube VT-203, mixer				

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* *Bendix*	*Sig. Corps*	*British Ref. No.*
b. ***Radio Receiver BC-624-A—Continued***								
244-3			Same as 244-1	For Tube VT-203, harm. amp.				
244-4			Same as 244-1	For Tube VT-202, harm. gen.				
246	2Z7652G	Relay	SPST, 5000 ohm ±10%, 4 ma ±.5 ma, operates with current change of .2 ma, Sigma Type 4C1, Allied Type G	Squelch circuit	Sigma, Allied	A102882 A106405		110F/504 110F/508
248	2C4424A/F1	Freq. shifter	Channel slide and tuning control assembly	Channel selection	Bendix	AC57965-1		110L/51
249-1	6L6832-28RE	Screw	1¾" long, #8-32 x ⅜, red-enameled, special	Mounting	Bendix	A102735		110M/2324
249-2			Same as 249-1					
249-3			Same as 249-1					
249-4			Same as 249-1					
250		Spring	Phosphor-bronze, NP	For tube holder	Bendix	A103943		110M/2376
251	3Z6747-8	Resistor	470,000 ohm ±5%, ½w, special, Type EB-4745	R-F stage grid leak	Allen-B	A102975-474		110C/3004
252	3Z6700-46	Resistor	100,000 ohm ±5%, ½w, special, Type EB-1045	R-F stage AVC filter	Allen-B	A102975-104		110C/2998
▌252-2		Resistor	Same as 252					
253-1	3Z6033-5	Resistor	330 ohm ±5%, ½w, special, Type EB-3315	R-F stage cathode bias	Allen-B	A102975-331		110C/3002
253-2			Same as 253-1	Harm. amp. cathode bias				
254-1	3Z6568-3	Resistor	6800 ohm ±5%, ½w, special, Type EB-6825	R-F stage plate filter	Allen-B	A102975-682		110C/3006
254-2			Same as 254-1	Harm. amp. plate filter				

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	Sig. Corps	*British Ref. No.*
b. ***Radio Receiver BC-624-A—Continued***								
255-1	3Z6801A8	Resistor	1.8 meg. ±5%, ½w, special, Type EB-1855	Mixer grid leak	Allen-B	A102975-185		110C/3000
255-2			Same as 255-1	Harm. amp. grid leak				
■ 256	3Z6100-62	Resistor	1000 ohm ±5%, ½w, special, Type EB-1025	Mixer cathode bias	Allen-B	A102975-102		110C/2997
257	3Z6733-3	Resistor	330,000 ohm ±5%, ½w, special, Type EB-3345	Mixer screen dropping	Allen-B	A102975-334		110C/3003
258	3Z6768-1	Resistor	680,000 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-6845	2nd audio grid leak	Erie, Speer, Allen-B	A18004-684		110C/2919
259	3Z6001-14	Resistor	10 ohm ±5%, ½w, special, Type EB-1005	Test meter shunt	Allen-B	A102975-100		110C/2996
260	3Z6627-5	Resistor	27,000 ohm ±5%, ½w, special, Type EB-2735	Harm. generator plate filter	Allen-B	A102975-273		110C 3001
261	3Z6120-7	Resistor	1200 ohm ±5%, ½w, special, Type EB-1225	Harm. generator cathode bias	Allen-B	A102975-122		110C/2999
262-1	3Z6756-3	Resistor	560,000 ohm ±5%, ½w, special, Type EB-5645	Harm. generator grid leak	Allen-B	A102975-564		110C/3005
262-2			Same as 262-1	1st audio compensating				
263-1	3Z6470-5	Resistor	4700 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type EB-4725	Mixer plate filter	Erie, Speer, Allen-B	A18004-472		110C/2915
263-2			Same as 263-1	1st i-f plate filter				
263-3			Same as 263-1	2nd i-f plate filter				
263-4			Same as 263-1	3rd i-f plate filter				

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
b. *Radio Receiver BC-624-A—Continued*								
264	3Z6610-50	Resistor	10,000 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-1035	Osc. plate filter	Erie, Speer, Allen-B	A18004-103		110C/2903
*265	3Z6270-1	Resistor	2700 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-2725	Osc. cathode bias	Erie, Speer, Allen-B	A18004-272		110C/2910
266-1	3Z6727-4	Resistor	270,000 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-2745	Osc. grid leak	Erie, Speer, Allen-B	A18004-274		110C/2911
266-2			Same as 266-1	AVC filter				
266-3			Same as 266-1	1st audio plate load				
267-1	3Z6700-47	Resistor	100,000 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-1045	1st i-f AVC filter	Erie, Speer, Allen-B	A18004-104		110C/1667
267-2			Same as 267-1	1st i-f screen voltage divider				
267-3			Same as 267-1	1st i-f screen voltage divider				
267-4			Same as 267-1	2nd i-f AVC filter				
267-5			Same as 267-1	2nd i-f screen voltage divider				
267-6			Same as 267-1	2nd i-f screen voltage divider				
267-7			Same as 267-1	Harm. amp. screen dropping				
267-8			Same as 267-1	R-F screen dropping				

* 265 has recently been changed to 265-1.

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
b. *Radio Receiver BC-624-A—Continued*								
268	3Z6039-2	Resistor	390 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-3915	1st i-f cathode bias	Erie, Speer, Allen-B	A18004-391		110C/2913
▌269	3Z6027-3	Resistor	270 ohm ±5%, 1w, ceramic, special	2nd i-f cathode bias	Erie	A18004-271		110C/2909
▌270	3Z6047-2	Resistor	470 ohm ±5%, 1w, ceramic, special	3rd i-f cathode bias	Erie	A18004-471		110C/2914
▌271	3Z6682-2	Resistor	82,000 ohm ±5%, 1w, ceramic, special	3rd i-f screen dropping	Erie	A18004-823		110C/2920
272	3Z6712	Resistor	120,000 ohm ±5%, ½w, ceramic, special	Audio squelch compensating	Erie	A18004-124		110C/2904
273	3Z6505-2	Resistor	5600 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-5625	Audio squelch compensating	Erie, Speer, Allen-B	A18004-562		110C/2918
▌274-1	3Z6802A2-1	Resistor	2.2 megohms ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-2255	Audio squelch coupling	Erie, Speer, Allen-B	A18004-225		110C/2908
274-2			Same as 274-1	1st audio screen dropping				
275-1	3Z6747-7	Resistor	470,000 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-4745	AVC diode load	Erie, Speer, Allen-B	A18004-474		110C/2917
275-2			Same as 275-1	1st audio grid				
275-3			Same as 275-1	1st audio grid				
276	3Z6618-14	Resistor	18,000 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-1835	AVC delay	Erie, Speer, Allen-B	A18004-183		110C/2907

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
b. *Radio Receiver BC-624-A—Continued*								
277	3Z6180-2	Resistor	1800 ohm ±5%, 1w, ceramic Speer Type SI-1, Allen-B Type GB-1825	1st audio cathode bias	Erie, Speer, Allen-B	A18004-182		110C/2906
278	3Z6150-23	Resistor	1500 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-1525	2nd audio cathode bias	Erie, Speer, Allen-B	A18004-152		110C/2905
279-1	3Z6647-6	Resistor	47,000 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-4735	Squelch cath. bleeder	Erie, Speer, Allen-B	A18004-473		110C/2916
279-2			Same as 279-1	Squelch cath, bleeder				
279-3			Same as 279-1	Audio diode filter				
280	3Z6801-25	Resistor	1 meg. ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-1055	3rd i-f grid leak	Erie, Speer, Allen-B	A18004-105		110C/1677
281	3Z6715-15	Resistor	150,000 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-1545	Audio diode filter	Erie, Speer, Allen-B	A18004-154		110C/1664
*282	3Z6330-2	Resistor	3300 ohm ±5%, 1w, ceramic, Speer Type SI-1, Allen-B Type GB-3325	Audio squelch cathode bias	Erie, Speer, Allen-B	A18004-332		110C/2912
286A				Channel A crystal and plate coil selector				
286B	3Z9827.26	Switch	Bakelite wafer	Channel B crystal and plate coil selector	Oak, Yaxley	AA102802-1		110F/501
286C				Channel C crystal and plate coil selector				

* 282 has recently been changed to 265-2, resistance 2700 ohms.

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* *Bendix*	*Sig. Corps*	*British Ref. No.*
b. ***Radio Receiver BC-624-A—Continued***								
286D	3Z9827.26	Switch	Bakelite wafer	Channel D crystal and plate coil selector	Oak, Yaxley	AA102802-1		110F/501
288	2C6525A/S3	Socket	2-contact, plug-board assembly	Rec. test-milliammeter socket	Bendix	AA102954-1		110H/931
289	2C4424A/S2	Socket	12-contact plug-board assembly	Crystal sockets	Bendix	AC58428-1		110H/912
291	2C4424A/T2	I-F Transformer assembly	12 mc, permeability tuned	Mixer to 1st i-f coupling	Bendix	AL73026-1		110K/704
292	2C4424A/T3	I-F Transformer assembly	12 mc, permeability tuned	1st i-f to 2nd i-f coupling	Bendix	AL73026-2		110K/705
293	2C4424A/T4	I-F Transformer assembly	12 mc, permeability tuned	2nd i-f to 3rd i-f coupling	Bendix	AL73026-3		110K/706
294	2C4424A/T5	I-F Transformer assembly	12 mc, permeability tuned	3rd i-f to diode coupling	Bendix	AL73028-1		110K/707
▌295	2Z10000-22	Transformer	Pri #1 — 920 ohm, pri. #2 — 6.9 ohm, sec. 2450 ohm; #1 imp. 250,000 ohm, pri. #2 imp. 750 ohm, sec. imp. 1 meg.; pri. #1 to sec., 1:2; pri. #2 to sec., 1:36.4	Audio input	Bendix	A103022		110K/712
296A		Transformer	Pri. 870 ohm, sec. 390 ohm; pri. imp., 15,000 ohm; sec. imp. term. 4-7 4000 ohm, term. 4-6 300 ohm, term. 4-5 50 ohm	Audio output				
▌	2Z10000-24	Transformer assembly			Bendix	A103024		110K/713
296B		Reactor	6 henrys, 340 ohm, .05 amp.	Audio B+ filter				

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	Sig. Corps	*British Ref. No.*
b. ***Radio Receiver BC-624-A—Continued***								
297		Capacitor assembly	R-F and osc., variable capacitor assembly and associated circuit components		Bendix	AN90966-1		110C/3374
VT-135	2T135	Tube VT-135	Detector amplifier triode, Type 12J5GT	2nd audio	RCA, Ken.			110E/185
VT-169	2T169	Tube VT-169	Duplex-diode pentode, Type 12C8	Detector, AVC, and 1st audio	RCA, Ken.			110E/186
VT-202	2T202	Tube VT-202	Detector amplifier triode, Type 9002	Harmonic generator	RCA, Ken.			110E/188
VT-203	2T203	Tube VT-203	Super-control amplifier pentode, Type 9003.	R-F amp.	RCA, Ken.			110E/189
VT-203	2T203	Tube VT-203	Super-control amplifier pentode, Type 9003	Mixer	RCA, Ken.			110E/189
VT-203	2T207	Tube VT-203	Super-control amplifier pentode, Type 9003	Harmonic amplifier	RCA, Ken.			110E/189
VT-207	2T207	Tube VT-207	Twin triode, Type 12AH7GT	Osc. and audio squelch	RCA, Ken.			110E/193
VT-209	2T209	Tube VT-209	H-F amplifier pentode, Type 12SG7	1st i-f	RCA, Ken.			110E/191
VT-209	2T209	Tube VT-209	H-F amplifier pentode, Type 12SG7	2nd i-f	RCA, Ken.			110E/191
VT-209	2T209	Tube VT-209	H-F amplifier pentode, Type 12SG7	3rd i-f	RCA, Ken.			110E/191
c. ***Dynamotor Unit PE-94-A and PE-94-AM***								
*301-1	3DA6-23	Capacitor	.0068 mfd ±20%, 300v d.c. w., mica, Aero Type 1467, C.D. Type 1WL, Mica Type W, XM-262 case	Hash filter MV— output	Aero, C. D., Mica	A102967-8		110C/2994

* 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. See Paragraph 35.

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	Sig. Corps	*British Ref. No.*
c. *Dynamotor Unit PE-94-A and PE-94-AM —Continued*								
*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				
302-1	3DA1-58	Capacitor	.00068 mfd ±20%, 300v d.c. w., mica, Aero Type 1468, C.D. Type 5LS XM-262 case	Hash filter, MV− output	Aero, C. D., Mica	C58469-681		110C/2966
302-2			Same as 302-1	Hash filter, HV+ output				
302-3			Same as 302-1	Hash filter, LV+ output				
‡303A ‡303B		Capacitor	2-section, per section 0.5 mfd +15% −12%, 100v d.c.w.	Input filter	Aero, Solar, C. D.	A109504		110C/3674
‡304		Capacitor	5 mfd, 200v d.c.w., electrolytic	A-F filter, MV− output	C. D.	L74032		
‡‡307	3H1514	Dynamotor	Outputs: lv, 14.5v, 4.9 amp; mv, 150v, 10 ma; hv, 300v, 260 ma; Type MG-1A	Dynamotor, 28v input	Bendix	L72938-2		110K/703

* 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. See Paragraph 35.
‡ Some equipments do not have Ref. Nos. 303A, 303B and 304.
‡‡ Bendix part number AN91444-1 is used in Dynamotor Unit PE-94-AM only.

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	*Drawing Numbers* Sig. Corps	*British Ref. No.*
c. *Dynamotor Unit PE-94-A and PE-94-AM —Continued*								
310-1	3C336-3	Choke	24½ turns #20 wire, phenolic form	Hash filter, MV— output	Bendix	AA102971-1		110C/2995
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	3C336-1	Choke	10¾ turns #10 wire, phenolic form	Hash filter, — input	Bendix	AA102784-2		110C/2990
312	3C336-2	Choke	10¾ turns #10 wire, phenolic form	Hash filter, + input	Bendix	AA102784-1		110C/2989
■ 314	3H1894A/R1	Voltage regulator	Variable resistance, automatic operation	Control of output voltage	Eclipse	C58131		110F/510
■ 316	3Z6001E13	Resistor	15 ohm ±10%, 35w, vitreous, Type 4⅛″ T15, variable	Regulator coil control	Ward	A104005		110C/3011
317	3Z5983-2	Resistor	0.3 ohm +0% —10%, 20w, vitreous, Type 2″	Dropping	Ward	A103999		110C/3010
321	2Z7656-5	Relay	SPST, 22-32v	Starting	Price	A102837-2		110F/503
322	3H1894A/R5	Receptacle	2-contact	Input	Amph.	A102876		110H/929
323	3H1894A/R6	Receptacle	6-contact	Output	Amph.	A102974		110H/932
341	3H1894A/A1	Armature	28v, includes bearings, Type D-1117	Armature for 307	Bendix	C58601-2		110K/700
342	3C500	Field coil	28v, main field, Type D-1135-2, includes shunt and series fields.	Field coil for 307	Bendix	C58603-2		110K/701

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
c. *Dynamotor Unit PE-94-A and PE-94-AM —Continued*								
343	3C500-1	Field coil	28v, regulator field, Type D-1136	Field coil for 307	Bendix	C58605-2		110K/702
344	3H1894A/B2	Bearing	Sealed ball bearing, Type WC-87039	Bearing for 307	N.D.	A105070		110M/2337
345	3H1894A/B6	Brush holder	LV output, Type B-1105, for Type B-1081 brush	Brush holder for 307	Bendix	A105071		110K/716
346	3H1894A/B7	Brush holder	MV output, Type B-1109, for Type B-1082 brush	Brush holder for 307	Bendix	A105072		110K/717
347	3H1894A/B8	Brush holder	HV output, Type B-1108, for Type B-1082 brush	Brush holder for 307	Bendix	A105073		110K/718
348	3H1894A/B9	Brush holder	28v input, Type B-1110	Brush holder for 307	Bendix	A105075		110K/719
349	3H1894A/B3	Brush	Input, 28v, Type B-1080	Brush for 307	Bendix	A105076		110K/720
350	3H1894A/B4	Brush	LV output, Type B-1081	Brush for 307	Bendix	A105077		110K/721
351	3H1894A/B5	Brush	MV output and hv output, Type B-1082	Brush for 307	Bendix	A105078		110K/722
352-1	2Z8401-5PH10	Shockmount	Type 150 PH 10	Shockproof mtg.	Lord	C56354-9		110M/93
352-2			Same as 352-1	Shockproof mtg.				
352-3			Same as 352-1	Shockproof mtg.				
353-4			Same as 352-1	Shockproof mtg.				
353-1	6L4904-1.3	Screw	Cap screw, #¼ — 26x1$\frac{3}{32}$, B.S.F. threads	Shkmt-to-dyn. mtg.	Bendix	A102900-1		110M/2328
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.				

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
c. *Dynamotor Unit PE-94-A and PE-94-AM —Continued*								
354	3H1894A/T1	Terminal strip	5-contact	Output	Bendix	AC58120-1		110M/2312
355	3H1894A/T2	Terminal strip	2-contact	Input	Bendix	AC58122-1		110M/2314
356	3H1894A/G1	Grommet	Rubber grommet	Cable insulation	A.R.H.	A18131-25		110M/2310
357	3H1894A/C1	Cover	Brass, cad. pl.	For output filter unit	Bendix	A102774		110M/2326
358	3H1894A/C2	Cover	Brass, cad. pl.	For input filter unit	Bendix	C58121		110M/2313
d. *Dynamotor Unit PE-98-A (Same as Dynamotor Unit PE-94-A Except as Follows)*								
306	3H1894A	Dynamotor	Outputs: hv, 300v 260 ma; mv, 150v, 10 ma; 1v, 13v, 4.9 amp.	Dynamtor, 14v input	Bendix	L72938-1		
307	3H1514	Dynamotor	Not used					
317	3Z5983-2	Resistor	Not used					
320	2F522A/R1	Relay	SPST, 11-16v	Starting, 14v	Price	A102837-1		
321	2Z7656-5	Relay	Not used					
e. *Rack FT-244-A*								
401	3DB2.816	Capacitor	2 mfd +0.5 mfd, —0 mfd, 25v a.c. 60 cycle, oil-paper	Motor solenoid resonating	C.D., Aero	A102816		110C/2991
402	3DA500-40	Capacitor	0.5 mfd +10% —3%, 400v d.c.w., oil-paper	HV bypass	C.D.	A104092-1		110C/3013
406	3H3112	Motor	Ratchet type, 12v, 1 amp.	Automatic tuning	Bendix, Col., G. Inst.	AC57992		110K/699
407	3H3112/A1	Armature	Armature and pawl assembly	Part of 406	Col., G. Inst.	AA102508-1		110K/708
408	3H3112/S1	Solenoid	975 ±5% turns #24 wire, 5.75 ohm —5%	Part of 406	Col., G. Inst.	AA102536-1		110K/723

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. Corps	British Ref. No.
e. Rack FT-244-A—Continued								
409	3H3112/W1	Ratchet wheel	Ratchet wheel and switching arms assembly	Part of 406	Col., G. Inst.	AC5900-1 or AC59278-1		110M/2323
411-1	2Z7642R	Relay	12v, SPST, Type AR	Locking	Allied	A102817		110F/502
411-2			Same as 411-1	Motor control				
412	2Z7650-A7374	Relay	12v, DPDT and SPST, Type A-7374	Antenna change-over	Clare	C58180		110F/494
416	2Z8799-53	Socket SO-153	Coaxial cable connector	Antenna connection	Amph.	AC58136-1		110H/585
417	2Z7226-170.2/S1	Socket SO-151	18-contact	Control circuit	Amph.	AA102399-1		110H/916
418-1	2Z8639-3	Socket	8-contact, Type S-408	Trans. control ckt.	Jones	A102812		110H/925
418-2			Same as 418-1	Power input to transmitter				
419	2Z8639-4	Socket	10-contact, Type S-410	Receiver connection	Jones	A102814		110H/927
420	2Z7226-169.2/S1	Socket	12-contact	Power input to rack	Amph.	AA102437-1		110H/922
421	2Z7252	Plug	Assembly with #6-32 x ½ thrd, similar to C.R. Type 274-P	Ground plug	G.R.	A102875-2		110H/928
422	2Z7380-244A/P1	Plug	Plug and board assembly special	Antenna plug	Bendix	AA102718-1		110H/923
426	3Z9509-1	Switch	DPST push type, Type 3594-D	Tuning release	H & H	A29843-1		110/491
427A 427B 427C 427D	3Z8313-2	Switch	4-pole, 4-position	Motor positioning (Part of 406)	Bendix	AA102537		110F/500

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	*Drawing Numbers* Sig. Corps	*British Ref. No.*
e. ***Rack FT-244-A—Continued***								
*431-1	2Z7380-244A/S1	Screw	#6-32 x 7/16, special head	Trans. cover retaining	Bendix	A102741		110M/2325
*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	2Z5889-1	Lamp	12v, 1/4 dia., 1 3/4 long, W.E. Type 2F, G. E. Type 12A	Indicates channel A	W. E., G.E.	A104012		105L/
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	2Z7226-169.2/S1	Socket SO-147	12-contact	Connection to JB-29-A	Bendix	AA102437-1		110H/922
607	2Z8799-80	Socket SO-180	5-contact, Type AN3102-14S-5P	Connection to variable-length antenna	Amph.	A106149		110H/936
611A	3Z9824-263	Switch	5-position, pushbutton type, Type 22506-80	Selects channel A	Oak	C58192		110F/495
611B				Selects channel B				
611C				Selects channel C				
611D				Selects channel D				
611E				Turns equipment OFF				
▌612	3Z8313-3	Switch	3-position	T-R-REM.	Bendix	AL72966-1		110F/498

* Some equipments are provided with a #4-40 x 7/16 screw.

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	*Drawing Numbers* Sig. Corps	*British Ref. No.*
f. ***Radio Control Box BC-602-A—Continued***								
616-1	2Z8655	Socket	3⅛" long, tinned lugs, Type 4925	For 601-1	Oak	A103987		110H/934
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				
621	2F522A/K1	Knob	⅜" x 1¼", phenolic knob, #10-32 x ¾" tap	For T-R-REM. switch	Bendix	A102706		110M/2392
g. ***Junction Box JB-29-A***								
801-1	2Z7226-170.2/S1	Socket SO-151	18-contact	For Plug PL-P170 or PL-Q170	Amph.	AA102399-1		110H/916
801-2			Same as 801-1	For dummy plug				
802	2Z7226-167.2/S1	Socket SO-146	4-contact	For Plug PL-P167 or PL-Q167	Amph.	AA102436-4		110H/920
803	2Z7226-165.2/S1	Socket	2-contact	For Plug PL-P165 or PL-Q165	Amph.	AA102436-2		110H/918
804	2Z7226-166.2/S1	Socket SO-145	6-contact	For Plug PL-P166 or PL-Q166	Amph.	AA102436-3		110H/919
805	2Z7226-199.2/S1	Socket SO-179	6-contact	For Plug PL-P199 or PL-Q199	Amph.	AA102436-5		110H/921
806	2Z7226-169.2/S1	Socket SO-147	12-contact	For Plug PL-P169 or PL-Q169	Amph.	AA102437-1		110H/922
807	2Z7226-164.2/S1	Socket	2-contact	For Plug PL-P164 or PL-Q164	Amph.	AA102436-1		110H/917
808-1	2F522A/F1	Screw	#8-32 x $1\frac{1}{32}$ thrds, class 2, captive, supplied with "C" washer	Cover screw	Bendix	A102051		110M/2390

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	Sig. Corps	*British Ref. No.*
g. ***Junction Box JB-29-A—Continued***								
808-2			Same as 808-1	Cover screw				
808-3			Same as 808-1	Cover screw				
808-4			Same as 808-1	Cover screw				
h. ***Jack Box BC-629-A and BC-629-B***								
900-1	2C2229A/G1	Grommet	Rubber grommet	Cable insulating	A.R.H.	A18131-22		110M/1714
900-2			Same as 900-1					
901	2C2229A/T1	Terminal strip	6-contact	Mic. and headset connections	Bendix	AC58144-1		110M/2315
902	2Z7226-167.2/S1	Socket SO-146	4-contact	For Plug PL-P167 or PL-Q167	Amph.	AA102436-4		110M/920
*903		Potentiometer	10,000 ohm ±20%, Type J Bradleyometer.	AUDIO volume control	Allen-B	A109583		110C/3720
*904	3Z6100-58	Resistor	1000 ohm ±10%, ½w, Type EB-4021	Limiting	Allen-B	C60058-40		110C/3707
i. ***Jack Box BC-630-A***								
1000-1	2C2229A/G1	Grommet	Rubber grommet	Cable insulating	A.R.H.	A18131-22		110M/1714
1000-2			Same as 1000-1	Cable insulating				
1001	2C2229A/T1	Terminal strip	6-contact	Mic., headset, and press-to-transmit connections	Bendix	AC58144-1		110M/2315
1002	2Z7226-166.2/S1	Socket SO-145	6-contact	For Plug PL-P166 or PL-Q166	Amph.	AA102436-3		110M/919
j. ***Jack Box BC-631-A***								
1100-1	2C2229A/G1	Grommet	Rubber grommet	Cable insulating	A.R.H.	A18131-22		110M/1714

* Ref. Nos. 903 and 904 used in Jack Box BC-629-B only.

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	*Drawing Numbers* Sig. Corps	*British Ref. No.*
j. ***Jack Box BC-631-A—Continued***								
1100-2			Same as 1100-1					
1100-3			Same as 1100-1					
1101	2C2229A T1	Terminal strip	6-contact	Mic., headset, and press-to-transmit connections	Bendix	AC58144-1		110M 2315
k. ***Case CS-80-A***								
1401-1	2Z8401-5PH12	Shockmount	Type 150 PH 12	Shockproof mtg.	Lord	C56354-10		110M 125
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	6L4904-1.3	Screw	#¼-26 x $1\frac{3}{32}$, hex. hd., SS, B.S.F. thrds, cap screw, special	Shkmt-to-case mtg.	Bendix	A102900-1		110M 2328
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	6L4904.15	Screw	#¼-26 x $1\frac{5}{32}$, hex. hd., SS, B.S.F. thrds., cap screw, special	Dyn. unit-to-case mtg.	Bendix	A102900-2		110M 2329
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.				

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* *Bendix*	*Sig. Corps*	*British Ref. No.*
l. ***Cable Plugs and Sockets***								
PL-P164	2Z7226-164.2	Plug PL-P164	2-contact, straight	Cable term't'n, junction box to press-to-trans. circuit	Amph.	AC57974-1		10H/401
PL-Q164	2Z7226-164.1	Plug PL-Q164	2-contact, right angled	Cable term't'n, junction box to press-to-trans. circuit	Amph.	AC57975-1		10H/402
PL-P165	2Z7226-165.2	Plug PL-P165	2-contact, straight	Cable term't'n, junction box to contactor	Amph.	AC57974-2		10H/399
PL-Q165	2Z7226.165.1	Plug PL-Q165	2-contact, right angled	Cable term't'n, junction box to contactor	Amph.	AC57975-2		10H/400
PL-P166	2Z7226.166.2	Plug PL-P166	6-contact, straight	Cable term't'n, junction box to BC-630-A	Amph.	AC57974-3		10H/405
PL-Q166	2Z7226.166.1	Plug PL-Q166	6-contact, right angled	Cable term't'n, junction box to BC-630-A	Amph.	AC57975-3		10H/406
PL-P167	2Z7226-167.2	Plug PL-P167	4-contact, straight	Cable term't'n, junction box to BC-629-A	Amph.	AC57974-4		10H/403
PL-Q167	2Z7226-167.1	Plug PL-Q167	4-contact, right angled	Cable term't'n, junction box to BC-629-A	Amph.	AC57975-4		10H/404
PL-P169	2Z7226-169.2	Plug PL-P169	12-contact, straight	Cable term't'ns, junction box to BC-602-A; rack to PE-94-A	Amph.	AC57976-1		10H/415

31. TABLE OF REPLACEABLE PARTS—Continued

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers*		*British Ref. No.*
						Bendix	*Sig. Corps*	
l. *Cable Plugs and Sockets—Continued*								
PL-Q169	2Z7226-169.1	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		10H/416
PL-P170	2Z7226-170.2	Plug PL-P170	18-contact, straight	Dummy plug; cable term't'n, junction box to rack	Amph.	AC57978-1		10H/417
PL-Q170	2Z7226-170.1	Plug PL-Q170	18-contact, right angled	Dummy plug; cable term't'n, junction box to rack	Amph.	AC57979-1		10H/418
PL-P171	2Z7226-171.2	Plug PL-P171	6-contact, straight	Cable term't'n, dyn. unit to rack	Amph.	AC57976-2		10H/413
PL-Q171	2Z7226-171.1	Plug PL-Q171	6-contact, right angled	Cable term't'n, dyn. unit to rack	Amph.	AC57977-2		10H/414
PL-P172	2Z7226-172.2	Plug PL-P172	2-contact, straight	Cable term't'n, dyn. unit to battery	Amph.	AC57963-1		110H/459
PL-Q172	2Z7226-172.1	Plug PL-Q172	2-contact, right angled	Cable term't'n, dyn. unit to battery	Amph.	AC57982-1		10H/419
PL-P173	2Z7226-173.2	Plug PL-P173	1-contact, straight	Cord CD-477	Amph.	AC57983-1		110H/584
PL-Q173	2Z7226-173.1	Plug PL-Q173	1-contact, right angled	Cord CD-477	Amph.	AL72939-1		110H/507
SO-153	2Z8799-53	Socket SO-153	1-contact, for Plug PL-P173 or PL-Q173	Antenna fitting	Amph.	AC58136-1		110H/585

32. TABLE OF INTERCHANGEABLE PARTS

Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* *Bendix*	*Sig. Corps*	*British Ref. No.*
111 402	3DA500-40	Capacitor	0.5 mfd +10% −3%, 400v d.c.w., oil-paper	See Parts List	C.D.	A104092-1		110C/3013
202-1 to 202-27 302-1 to 302-3	3DA1-58	Capacitor	.00068 mfd ±20%, 300v d.c. w., mica, Aero Type 1468, C.D. Type 5LS, XM-262 case	See Parts List	C.D., Aero, Mica	C58469-681		110C/2966
*102-1 to *102-15 *206-1 to *206-23 301-1 to 301-7	3DA6-23	Capacitor	.0068 mfd ±20%, 300v d.c. w., mica, Aero Type 1467, C.D. Type 1W1, Mica Type W, XM-262 case	See Parts List	C.D., Aero, Mica	A102967-7 A102967-8		110C/2994
138-3 280	3Z6801-25	Resistor	1 meg. ±5%, 1w, Speer Type SI-1, Allen-B Type GB-1055	See Parts List	Erie, Speer, Allen-B	A18004-105		110C/1677
169-1 to 169-6 243-1 to 243-5	2Z8195.8	Socket, Tube	Octal, Type S-8TM	See Parts List	Amph.	A104087		110H/935
171 288	2Z8195.8	Socket	2-contact	See Parts List	Bendix	AA102954-1		110H/931
420 606 806	2Z7226-169.2/S1	Socket SO-147	12-contact	See Parts List	Amph.	AA102437-1		110H/922

* 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. See Paragraph 35.

32. TABLE OF INTERCHANGEABLE PARTS—Continued

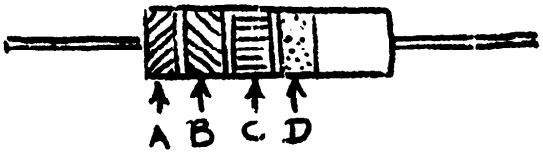
Circuit Ref. No.	*Stock No.*	*Name*	*Description*	*Function*	*Mfr.*	*Drawing Numbers* Bendix	Sig. Corps	*British Ref. No.*
417, 801-1, 801-2	2Z7226-170.2/S1	Socket SO-151	18-contact	See Parts List	Amph.	AA102399-1		110H/916
802, 902	2Z7226-167.2/S1	Socket SO-146	4-contact	See Parts List	Amph.	AA102436-4		110H/920
804, 1002	2Z7226-166.2/S1	Socket SO-145	6-contact	See Parts List	Amph.	AA102436-3		110H/919
173-1 to 173-4, 249-1 to 249-4	6L6832-28RE	Screw	1¾" long, #8-32 x ⅜, red-enameled, special	See Parts List	Bendix	A102735		110M/2324
353-1 to 353-4, 1402-1 to 1402-4	6L4904-1.3	Screw	#¼-26 x $1\frac{3}{32}$, hex. hd., SS, B.S.F. thrds, cap screw, special	See Parts List	Bendix	A102900-1		110M/2328
291	2C4424A/T2	Transformer assembly, i-f	12 mc, permeability tuned	See Parts List	Bendix	AL73026-1		110K/704
292						AL73026-2		110K/705
293						AL73026-3		110K/706
900-1 to 900-3, 1000-1 to 1000-2, 1100-1 to 1100-3	2C2229A/G1	Grommet	Rubber grommet	See Parts List	A.R.H.	A18131-22		110M/1714
901, 1001, 1101	2C2229A/T1	Terminal strip	6-contact	See Parts List	Bendix	AC58144-1		110M/2315

33. 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 volts
Orange	3	1,000		300 volts
Yellow	4	10,000		400 volts
Green	5	100,000	5%	500 volts
Blue	6	1,000,000		600 volts
Violet	7	10,000,000		700 volts
Gray	8	100,000,000		800 volts
White	9	1,000,000,000		
Gold	–	0.1	5%	
Silver	–	0.01	10%	
No Color	–	–	20%	500 volts

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:



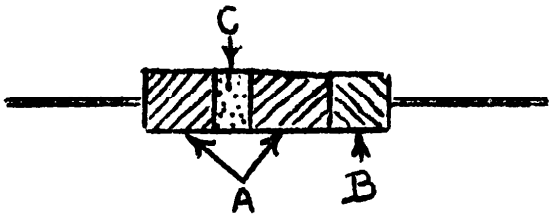
Band A indicates the first significant figure of the resistance of the resistor.

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:

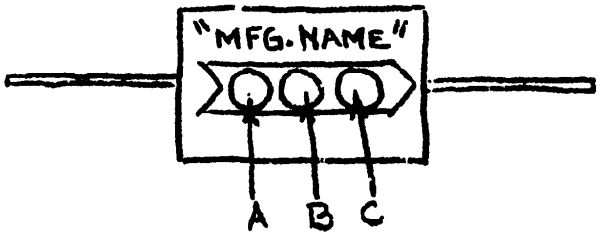


The body (A) of the resistor is colored to represent the first significant figure of the resistance value. One end (B) is colored to represent the second significant figure, and a band or dot (C) of color located within the body color indicates the decimal multiplier.

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 interpretations of colors is 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:



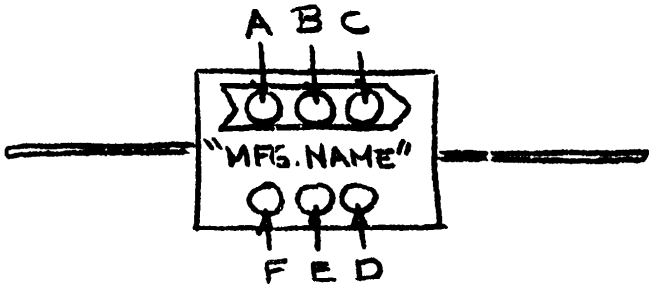
Dot A indicates the first significant figure of the capacitance of the capacitor.

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.

34. ADDRESSES OF MANUFACTURERS

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

Abbreviation	*Manufacturer*	*Address*
Aero	Aerovox Corporation	New Bedford, Massachusetts
Allen-B	Allen-Bradley Co.	Milwaukee, Wisconsin
Allied	Allied Control Co., Inc.	227 Fulton Street, New York, N. Y.
Amph.	American Phenolic Corp.	Chicago, Illinois
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, New York
Eclipse	Eclipse Aviation Corp. Div. Bendix Aviation Corporation	Bendix, New Jersey
Erie	Erie Resistor Corporation	644 West 12th Street, Erie, Penna.
E.U.	Electrical Utilities	2902 S. Michigan Avenue, Chicago, Ill.
G.E.	General Electric Corporation	Schenectady, New York
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, Connecticut
I.R.C.	International Resistance Co.	401 N. Broad St., Philadelphia, Penna
Jones	Howard B. Jones Company	2300 Wabansia Avenue, Chicago, Ill.
Ken.	Ken-Rad Tube and Lamp Corp.	Owensboro, Kentucky
Lord	Lord Manufacturing Co.	Erie, Pennsylvania
Mallory	P. R. Mallory & Co., Inc.	Indianapolis, Indiana
Muter	The Muter Co.	1255 S. Michigan Avenue, Chicago, Ill.
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, Connecticut
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

34. ADDRESSES OF MANUFACTURERS—Continued

Abbreviation	*Manufacturer*	*Address*
RCA	RCA Radiotron Div. RCA Manufacturing Co., Inc.	401 Bergen Street, Harrison, N. J.
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
Speer	Speer Resistor Corp.	St. Marys, Pennsylvania
Stand. Wind.	Standard Winding	4 John Street, Newburgh, N. Y.
Ward	Ward Leonard Electric Co.	Mount Vernon, New York
W.E.	Western Electric Co.	300 Central Avenue, Kearney, N. J.
Weston	Weston Electrical Instrument Company	Frelinghuysen Avenue, Newark, N. J.
Yaxley	Yaxley Mfg. Div. P. R. Mallory & Co., Inc.	3029 E. Washington St., Indianapolis, Indiana

35. ALTERNATE CAPACITORS AND RESISTORS LISTED IN ORDER OF PREFERENCE

Ref. No.	*Bendix Drawing Number*	*Sig. Corps Stock No.*	*Name of Part*	*Value*	*Tolerance*	*Rating*	*MATERIAL*		*Mfr. Type Number*	*Mfr.*
							Dielectric or Conductor	*Case*		
102-1 to 102-15 incl.	A102967-7	3DA6-23	Capacitor	.006 mfd	±20%	300v d.c.w.	Mica	Bakelite	1467	Aero
									W	Mica
									1WL	C.D.
	C60255-682			.0068 mfd	±20%	300v d.c.w.	Paper	BM-120	—	Mica
111	A104092-1	3DA500-4*	Capacitor	0.5 mfd	+10% −3%	400v d.c.w.	Oil-Paper	—	—	C.D.
	A104810			0.5 mfd	±10%	400v d.c.w.	Oil-Paper	—	—	—
113	C56314-301	3D9300-4	Capacitor	300 mmf	±5%	500v d.c.w.	Mica	—	5WL	C.D.
									1468	Aero
	A18182-23			300 mmf	±5%	500v d.c.w.	Ceramicon	—	N750M	Erie
201	C58469-100	3D9010-A	Capacitor	10 mmf	±20%	500v d.c.w.	Mica	XM-262	—	Mica
									1468	Aero
									5LS	C.D.
	C60329-100			10 mmf	±20%	500v d.c.w.	Ceramic	Ceramic	N750K	Erie
202-1 to 202-27 incl.	C58469-681	3DA1-58	Capacitor	680 mmf	±20%	300v d.c.w.	Mica	XM-262	—	Mica
									1468	Aero
									5LS	C.D.
	C60324-681			680 mmf	±20%	500v d.c.w.	Ceramic	—	—	Erie
	C60323-681			680 mmf	±20%	500v d.c.w.	Ceramic	—	—	Muter
203-1 to 203-4 incl.	C58469-470	3D9050-41	Capacitor	47 mmf	±20%	500v d.c.w.	Mica	XM-262	—	Mica
									1468	Aero
									5LS	C.D.
	C60329-470			47 mmf	±20%	500v d.c.w.	Ceramic	Ceramic	N750K	Erie
204	C58469-150	3D9015-8	Capacitor	15 mmf	±20%	500v d.c.w.	Mica	XM-262	—	Mica
									1468	Aero
									5LS	C.D.
	C60329-150			15 mmf	±20%	500v d.c.w.	Ceramic	Ceramic	N750K	Erie

35. ALTERNATE CAPACITORS AND RESISTORS LISTED IN ORDER OF PREFERENCE—Continued

Ref No.	Bendix Drawing Number	Sig. Corps Stock No.	Name of Part	Value	Tolerance	Rating	MATERIAL		Mfr. Type Number	Mfr.
							Dielectric or Conductor	Case		
206-1 to 206-23 incl.	A102967-8	3DA6-23	Capacitor	.0068 mfd	±20%	300v d.c.w.	Mica	Bakelite	1467	Aero
									W	Mica
									1WL	C.D.
	C60290-682			.0068 mfd	±20%	300v d.c.w.	Mica	Phen.		Aero, C.D., Mica, Solar
	C60255-682			.0068 mfd	±20%	300v d.c.w.	Paper	BM-120	—	Mica
	C60287-682			.0068 mfd	±20%	500v d.c.w.	Ceramic	—	—	Muter
209	C58469-101	3D9100-56	Capacitor	100 mmf	±20%	500v d.c.w.	Mica	XM-262	—	Mica
									1468	Aero
									5LS	C.D.
	C60329-101			100 mmf	±20%	500v d.c.w.	Ceramic	Ceramic	N750L	Erie
210	C58469-331	3D9350-4	Capacitor	330 mmf	±20%	500v d.c.w.	Mica	XM-262	—	Mica
									1468	Aero
									5LS	C.D.
	C60324-331			330 mmf	±20%	500v d.c.w.	Ceramic	—	—	Erie
	C60323-331			330 mmf	±20%	500v d.c.w.	Ceramic	—	—	Muter
251	A102975-474	3Z6500-62	Resistor	470,000 ohm	±5%	½ w	Molded	Bakelite	EB 4745	Allen-B
	C60068-474			470,000 ohm	±10%	½ w	Molded	Bakelite	EB 4741	Allen-B
	C60076-474			470,000 ohm	±10%	½ w	Ceramic	Phenolic	SI-½	Speer
252	A102975-104	3Z6747-8	Resistor	100,000 ohm	±5%	½ w	Molded	Bakelite	EB 1045	Allen-B
	C60068-104			100,000 ohm	±10%	½ w	Molded	Bakelite	EB 1041	Allen-B
	C60076-104			100,000 ohm	±10%	½ w	Ceramic	Phenolic	SI-½	Speer
254-1 and 254-2	A102975-682	3Z6568-3	Resistor	6800 ohm	±5%	½ w	Molded	Bakelite	EB 6825	Allen-B
	C60068-682			6800 ohm	±10%	½ w	Molded	Bakelite	EB 6821	Allen-B
	C60076-682			6800 ohm	±10%	½ w	Ceramic	Phenolic	SI-½	Speer

35. ALTERNATE CAPACITORS AND RESISTORS LISTED IN ORDER OF PREFERENCE—Continued

Ref. No.	Bendix Drawing Number	Sig. Corps Stock No.	Name of Part	Value	Tolerance	Rating	MATERIAL		Mfr. Type Number	Mfr.
							Dielectric or Conductor	Case		
255-1 and 255-2	A102975-185	3Z6801A8	Resistor	1.8 megohm	±5%	½ w	Molded	Bakelite	EB 1855	Allen-B
	C60068-185			1.8 megohm	±10%	½ w	Molded	Bakelite	EB 1851	Allen-B
	C60076-185			1.8 megohm	±10%	½ w	Ceramic	Phenolic	SI-½	Speer
257	A102975-334	3Z6733-3	Resistor	330,000 ohm	±5%	½ w	Molded	Bakelite	EB 3345	Allen-B
	C60068-334			330,000 ohm	±10%	½ w	Molded	Bakelite	EB 3341	Allen-B
	C60076-334			330,000 ohm	±10%	½ w	Ceramic	Phenolic	SI-½	Speer
259	A102975-100	3Z6001-14	Resistor	10 ohm	±5%	½ w	Molded	Bakelite	EB 1005	Allen-B
							Ceramic	Ceramic	—	Erie
	A18001-100			10 ohm	±5%	½ w	Ceramic	Phenolic	SI-½	Speer
							Molded	Bakelite	EB 1005	Allen-B
260	A102975-273	3Z6627-5	Resistor	27,000 ohm	±5%	½ w	Molded	Bakelite	EB 2735	Allen-B
	C60068-273			27,000 ohm	±10%	½ w	Molded	Bakelite	EB 2731	Allen-B
	C60076-273			27,000 ohm	±10%	½ w	Ceramic	Phenolic	SI-½	Speer
262-1	A102975-564	3Z6756-3	Resistor	560,000 ohm	±5%	½ w	Molded	Bakelite	EB 5645	Allen-B
	C60068-564			560,000 ohm	±10%	½ w	Molded	Bakelite	EB 5641	Allen-B
	C60076-564			560,000 ohm	±10%	½ w	Ceramic	Phenolic	SI-½	Speer
262-2	A102975-564	3Z6756-3	Resistor	560,000 ohm	±5%	½ w	Molded	Bakelite	EB 5645	Allen-B
							Ceramic	Ceramic	—	Erie
	A18001-564			560,000 ohm	±5%	½ w	Ceramic	Phenolic	SI-½	Speer
							Molded	Bakelite	EB 5645	Allen-B
263-1 to 263-4 incl.	A18004-472	3Z6470-5	Resistor	4700 ohm	±5%	1 w	Ceramic	Ceramic	—	Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 4725	Allen-B
	C60050-472			4700 ohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-472			4700 ohm	±10%	1 w	Molded	Bakelite	GB 4721	Allen-B
	C56342-472			4700 ohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer

35. ALTERNATE CAPACITORS AND RESISTORS LISTED IN ORDER OF PREFERENCE—Continued

Ref. No.	Bendix Drawing Number	Sig. Corps Stock No.	Name of Part	Value	Tolerance	Rating	MATERIAL		Mfr. Type Number	Mfr.
							Dielectric or Conductor	Case		
264	A18004-103	3Z6610-50	Resistor	10,000 ohm	±5%	1 w	Ceramic	Ceramic	—	Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 1035	Allen-B
	C60050-103			10,000 ohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-103			10,000 ohm	±10%	1 w	Molded	Bakelite	GB 1031	Allen-B
	C56342-103			10,000 ohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer
266-1 and 266-2	A18004-274	3Z6727-4	Resistor	270,000 ohm	±5%	1 w	Ceramic	Ceramic	—	Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 2745	Allen-B
	C60050-274			270,000 ohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-274			270,000 ohm	±10%	1 w	Molded	Bakelite	GB 2741	Allen-B
	C56342-274			270,000 ohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer
267-1 to 267-8	A18004-104	3Z6700-47	Resistor	100,000 ohm	±5%	1 w	Ceramic	Ceramic	—	Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 1045	Allen-B
	C60050-104			100,000 ohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-104			100,000 ohm	±10%	1 w	Molded	Bakelite	GB 1041	Allen-B
	C56342-104			100,000 ohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer
271	A18004-823	3Z6682-2	Resistor	82,000 ohm	±5%	1 w	Ceramic	Ceramic		Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 8235	Allen-B
	C60050-823			82,000 ohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-823			82,000 ohm	±10%	1 w	Molded	Bakelite	GB 8231	Allen-B
	C56342-823			82,000 ohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer

35. ALTERNATE CAPACITORS AND RESISTORS LISTED IN ORDER OF PREFERENCE—Continued

Ref. No.	Bendix Drawing Number	Sig. Corps Stock No.	Name of Part	Value	Tolerance	Rating	MATERIAL		Mfr. Type Number	Mfr.
							Dielectric or Conductor	Case		
272	A18004-124	3Z6712	Resistor	120,000 ohm	±5%	1 w	Ceramic	Ceramic	—	Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 1245	Allen-B
	C60050-124			120,000 ohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-124			120,000 ohm	±10%	1 w	Molded	Bakelite	GB 1241	Allen-B
	C56342-124			120,000 ohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer
273	A18004-562	3Z6505-2	Resistor	5600 ohm	±5%	1 w	Ceramic	Ceramic	—	Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 5625	Allen-B
	C60050-562			5600 ohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-562			5600 ohm	±10%	1 w	Molded	Bakelite	GB 5641	Allen-B
	C56342-562			5600 ohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer
274-1 and 274-2	A18004-225	3Z68024A2-1	Resistor	2.2 megohm	±5%	1 w	Ceramic	Ceramic	—	Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 2255	Allen-B
	C60050-225			2.2 megohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-225			2.2 megohm	±10%	1 w	Molded	Bakelite	GB 2251	Allen-B
	C56342			2.2 megohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer
275-1	A18004-474	3Z6747-7	Resistor	470,000 ohm	±5%	1 w	Ceramic	Ceramic	—	Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 4745	Allen-B
	C60050-474			470,000 ohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-474			470,000 ohm	±10%	1 w	Molded	Bakelite	GB 4741	Allen-B
	C56342-474			470,000 ohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer

35. ALTERNATE CAPACITORS AND RESISTORS LISTED IN ORDER OF PREFERENCE—Continued

Ref. No.	Bendix Drawing Number	Sig. Corps Stock No.	Name of Part	Value	Tolerance	Rating	MATERIAL		Mfr. Type Number	Mfr.
							Dielectric or Conductor	Case		
279-1 and 279-2	A18004-473	3Z6647-6	Resistor	47,000 ohm	±5%	1 w	Ceramic	Ceramic	—	Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 4735	Allen-B
	C60050-473			47,000 ohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-473			47,000 ohm	±10%	1 w	Molded	Bakelite	GB 4731	Allen-B
	C56342-473			47,000 ohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer
280	A18004-105	3Z6801-25	Resistor	1 megohm	±5%	1 w	Ceramic	Ceramic	—	Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 1055	Allen-B
	A60050-105			1 megohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-105			1 megohm	±10%	1 w	Molded	Bakelite	GB 1051	Allen-B
	C56342-105			1 megohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer
281	A18004-154	3Z6715-15	Resistor	150,000 ohm	±5%	1 w	Ceramic	Ceramic	—	Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 1545	Allen-B
	C60050-154			150,000 ohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-154			150,000 ohm	±10%	1 w	Molded	Bakelite	GB 1541	Allen-B
	C56342-154			150,000 ohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer
*282	A18004-332	3Z6330-2	Resistor	3300 ohm	±5%	1 w	Ceramic	Ceramic	—	Erie
							Ceramic	Phenolic	SI-1	Speer
							Molded	Bakelite	GB 3325	Allen-B
	C60050-332			3300 ohm	±10%	½ w	Ceramic	Ceramic	—	Erie
	C60072-332			3300 ohm	±10%	1 w	Molded	Bakelite	GB 3321	Allen-B
	C56342-332			3300 ohm	±10%	1 w	Ceramic	Phenolic	SI-1	Speer

* Where 282 has been changed to 265-2, the resistance should be given as 2700 ohms and the dash numbers should be —272 instead of —332.

35. ALTERNATE CAPACITORS AND RESISTORS LISTED IN ORDER OF PREFERENCE—Continued

Ref. No.	*Bendix Drawing Number*	*Sig. Corps Stock No.*	*Name of Part*	*Value*	*Tolerance*	*Rating*	*MATERIAL*		*Mfr. Type Number*	*Mfr.*
							Dielectric or Conductor	*Case*		
301-1 to 301-7 incl.	A102967-8	3DA6-23	Capacitor	.0068 mfd	±20%	300v d.c.w.	Mica	Bakelite	1467	Aero
									W	Mica
									1WL	C.D.
	C60290-682			.0068 mfd	±20%	300v d.c.w.	Mica	Phen.	—	Aero
										C.D.
										Mica
										Solar
	C60255-682			.0068 mfd	±20%	300v d.c.w.	Paper	BM-120	—	Mica
	A18015-682			.0068 mfd	±10%	400v d.c.w.	Paper	Phen.		Mica
										Solar
302-1 to 302-3 incl.	C58469-681	3DA1-58	Capacitor	680 mmf	±20%	300v d.c.w.	Mica	XM-262	—	Mica
									1468	Aero
									5LS	C.D.
	C60324-681			680 mmf	±20%	500v d.c.w.	Ceramic		—	Erie

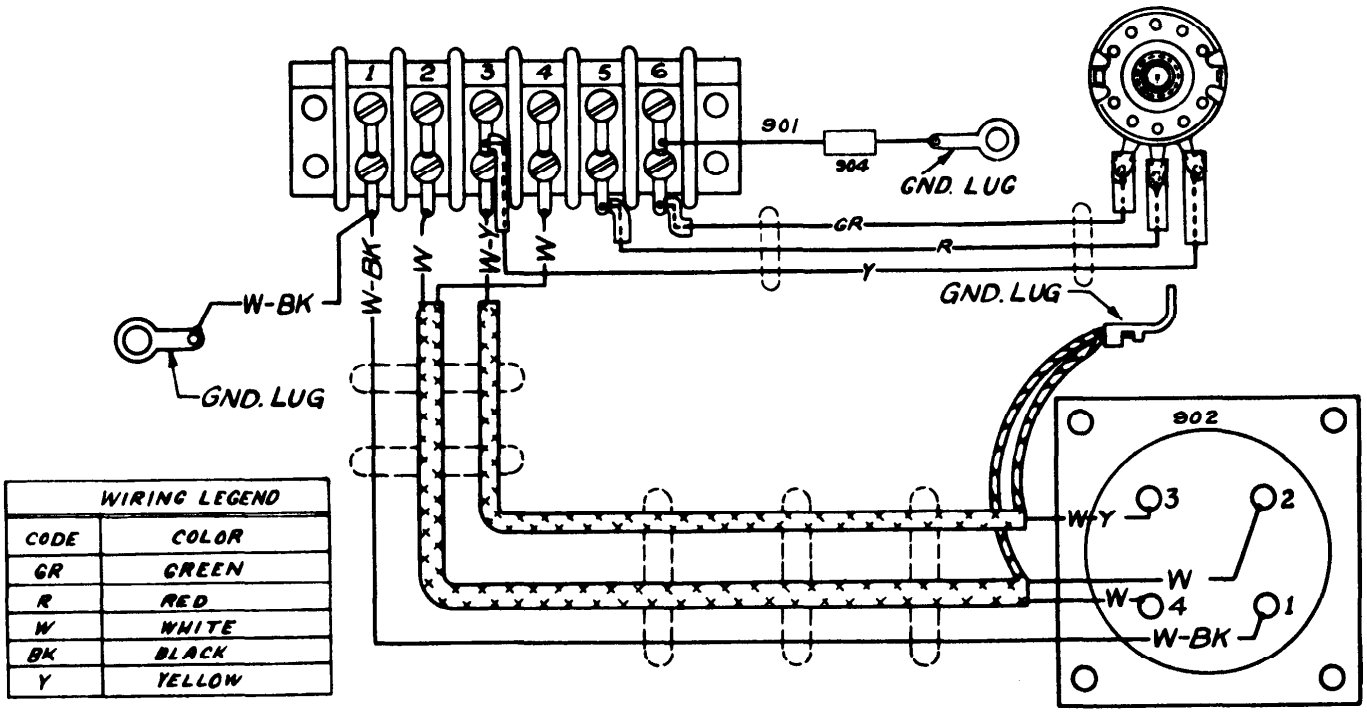


FIGURE 67 — JACK BOX BC-629-A, WIRING DIAGRAM

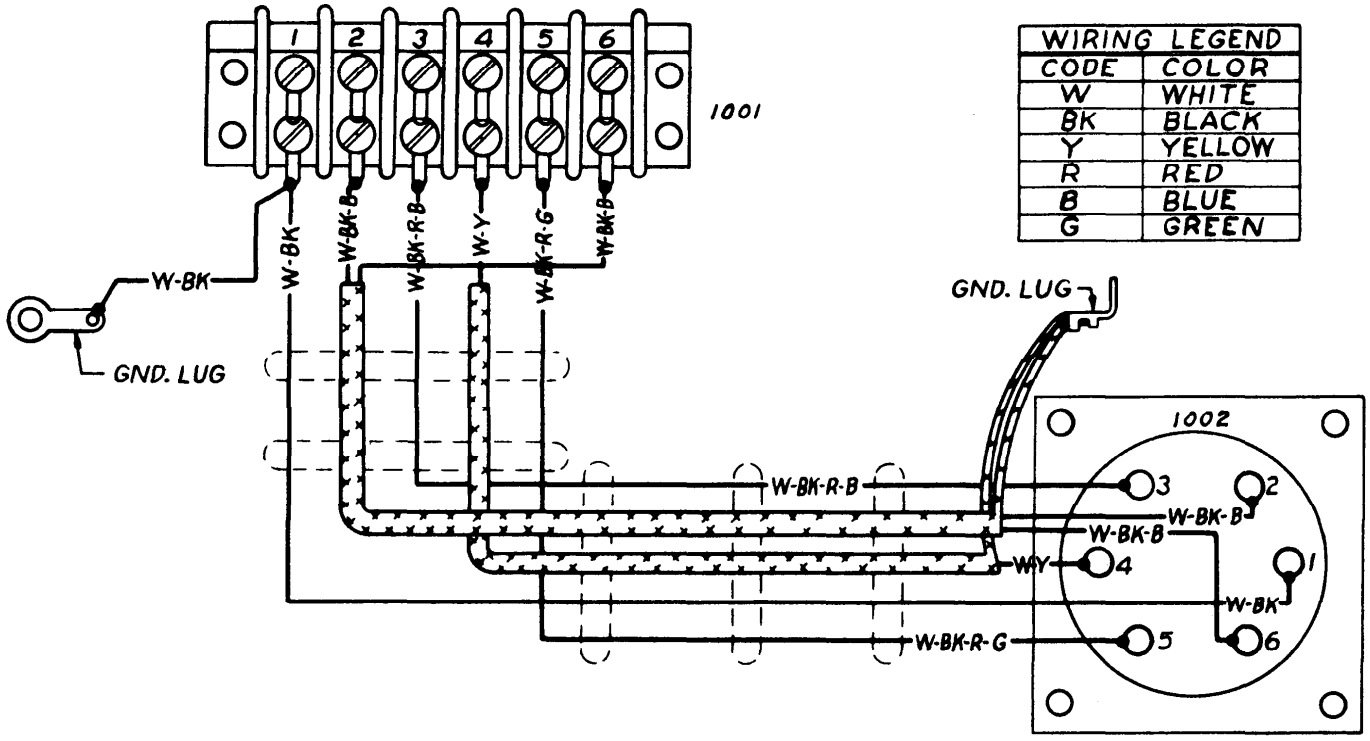


FIGURE 68 — JACK BOX BC-630-A, WIRING DIAGRAM

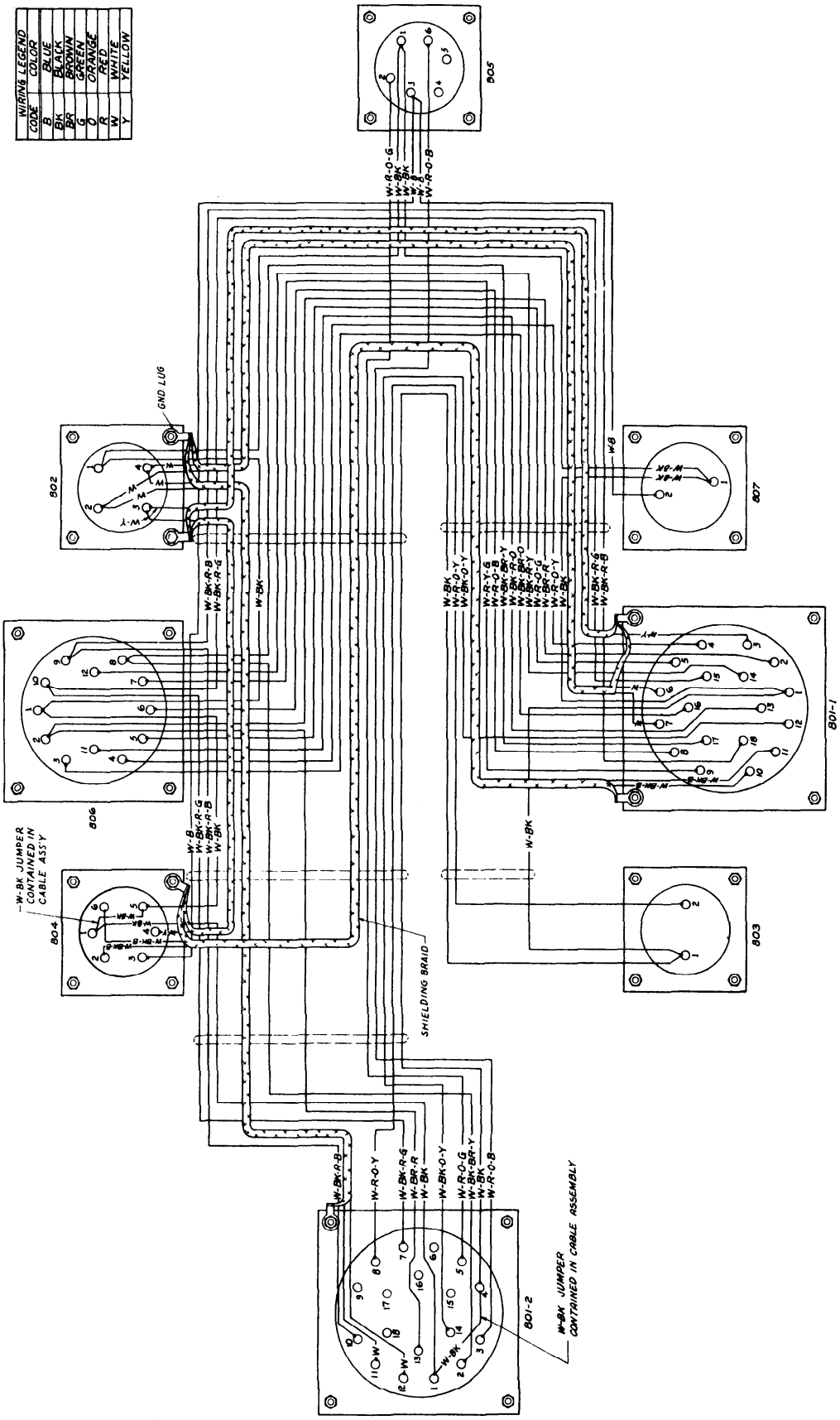
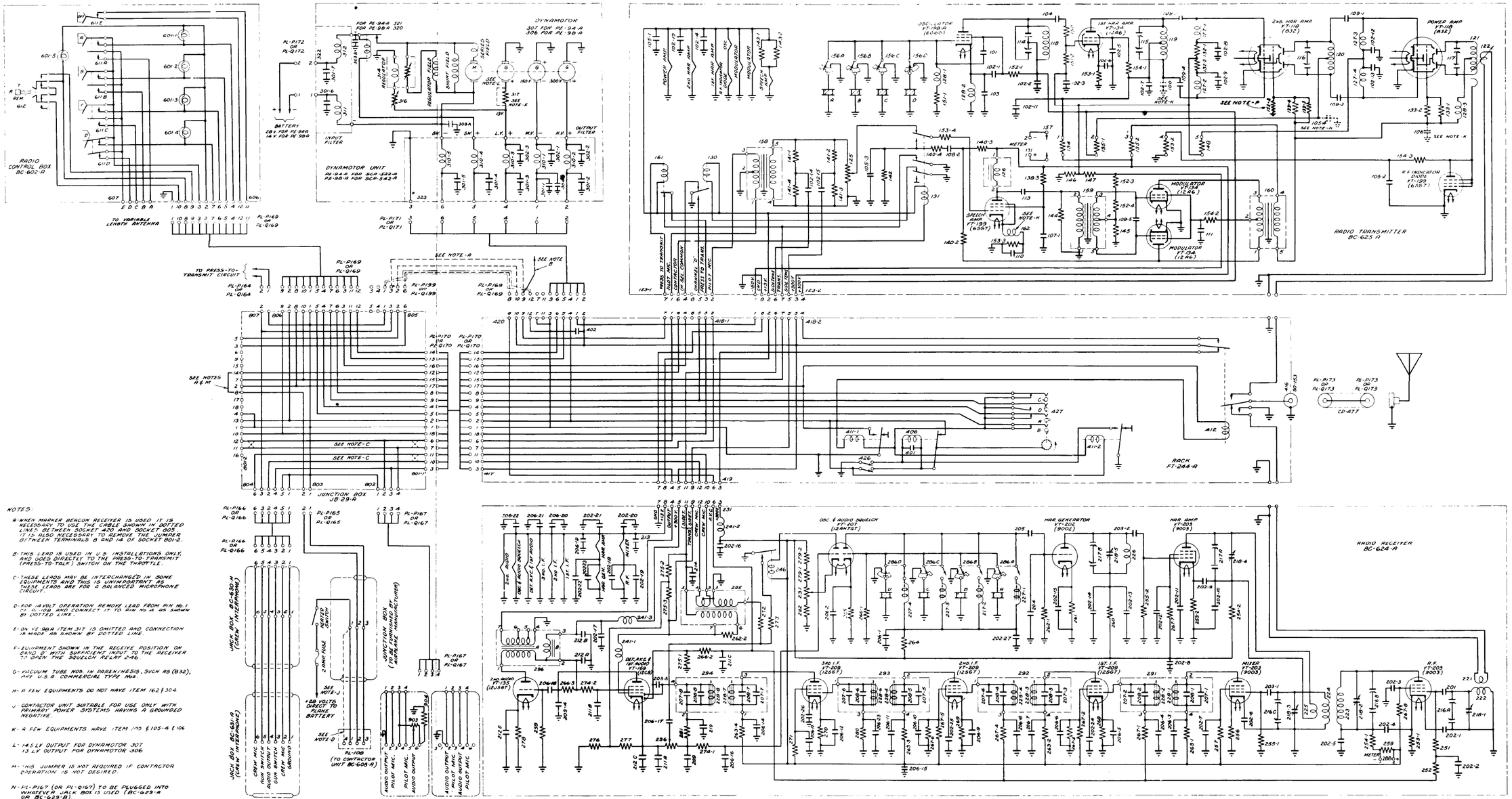


FIGURE 69 — JUNCTION BOX JB-29-A, WIRING DIAGRAM

FIGURE 70 — RADIO SET SCR-522-A, SCHEMATIC WIRING DIAGRAM

RESTRICTED
T. O. No. 08-10-105

RESTRICTED
T. O. No. 08-10-105



NOTES:

A- WHEN MARKER BEACON RECEIVER IS USED IT IS NECESSARY TO USE THE CABLE SHOWN IN DOTTED LINES BETWEEN SOCKET 420 AND SOCKET 805. IT IS ALSO NECESSARY TO REMOVE THE JUMPER BETWEEN TERMINALS 8 AND 14 OF SOCKET 801-2.

B- THIS LEAD IS USED IN U.S. INSTALLATIONS ONLY, AND GOES DIRECTLY TO THE PRESS-TO-TRANSMIT (PRESS-TO-TALK) SWITCH ON THE THROTTLE.

C- THESE LEADS MAY BE INTERCHANGED IN SOME EQUIPMENTS AND THIS IS UNIMPORTANT AS THESE LEADS ARE FOR A BALANCED MICROPHONE CIRCUIT.

D- FOR 14 VOLT OPERATION, REMOVE LEAD FROM PIN No. 1 OF SOCKET 801-2 AND CONNECT IT TO PIN No. 14 AS SHOWN BY DOTTED LINE.

E- ON PE-98A, ITEM 317 IS OMITTED AND CONNECTION IS MADE AS SHOWN BY DOTTED LINE.

F- EQUIPMENT SHOWN IN THE RECEIVE POSITION ON BAND 2, WITH SUFFICIENT INPUT TO THE RECEIVER TO OPEN THE SQUELCH RELAY 246.

G- VACUUM TUBE NOS. IN PARENTHESIS, SUCH AS (832), ARE U.S.A. COMMERCIAL TYPE NOS.

H- A FEW EQUIPMENTS DO NOT HAVE ITEM 162 & 304.

J- CONTACTOR UNIT SUITABLE FOR USE ONLY WITH PRIMARY POWER SYSTEMS HAVING A GROUNDED NEGATIVE.

K- A FEW EQUIPMENTS HAVE ITEM 100 & 105-A & 106.

L- 14.5 V. OUTPUT FOR DYNAMOTOR 307. 13 V. OUTPUT FOR DYNAMOTOR 306.

M- THIS JUMPER IS NOT REQUIRED IF CONTACTOR OPERATION IS NOT DESIRED.

N- PL-PI67 (OR PL-Q167) TO BE PLUGGED INTO WHATEVER JACK BOX IS USED (BC-629-A OR BC-629-B).

P- EARLIER EQUIPMENTS DID NOT USE ITEMS 133-3 & 133-4 AND ITEM 153-3 WAS CONNECTED BETWEEN THE UPPER END OF THE 2nd HAR. AMP. AND TERMINAL 3 OF ITEM 140.

FIGURE 70 — RADIO SET SCR-522-A, SCHEMATIC WIRING DIAGRAM

RESTRICTED

RESTRICTED

RESTRICTED
T. O. No. 08-10-105
RESTRICTED
T. O. No. 08-10-105
RESTRICTED
T. O. No. 08-10-105

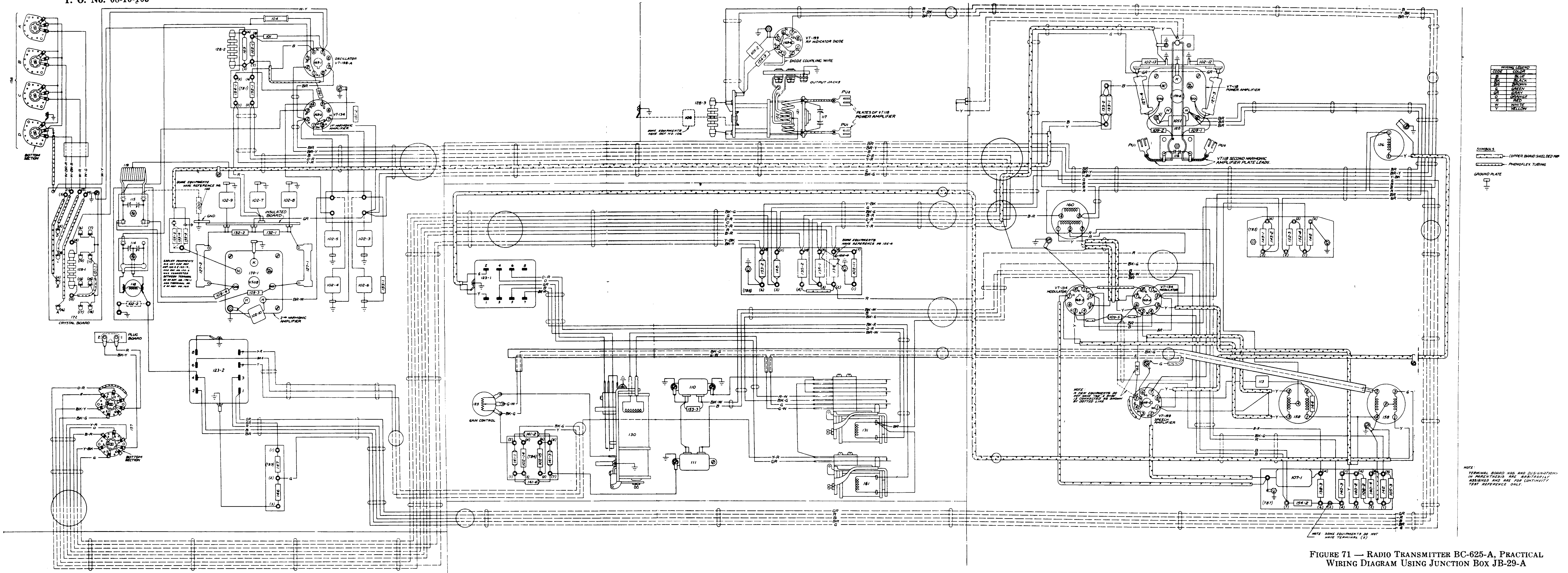


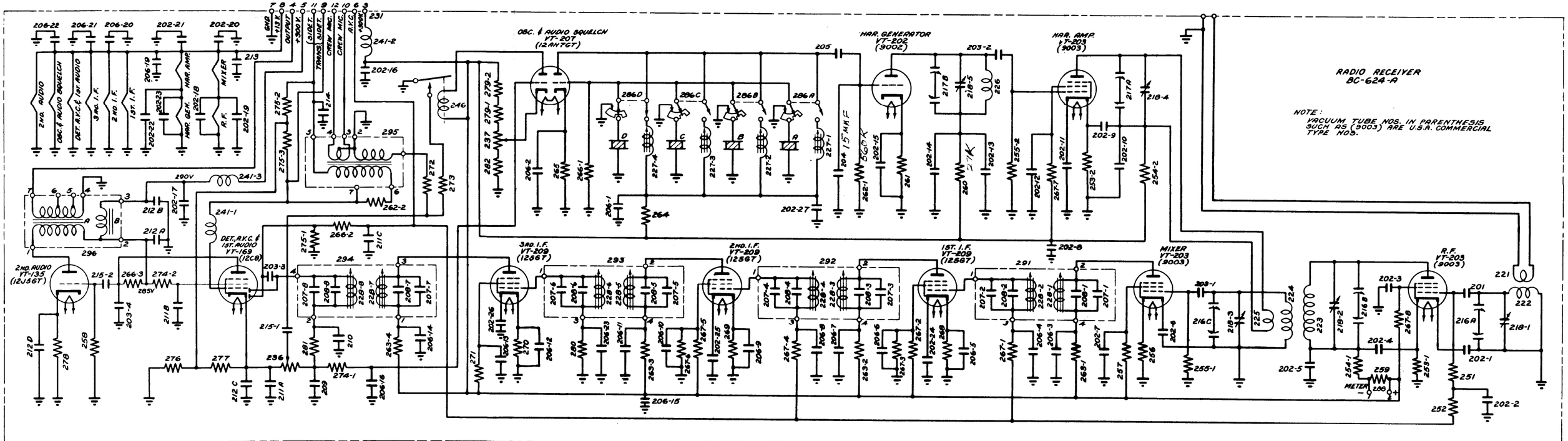
FIGURE 71 — RADIO TRANSMITTER BC-625-A, PRACTICAL WIRING DIAGRAM USING JUNCTION BOX JB-29-A

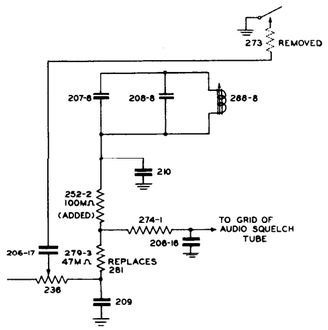
RESTRICTED
RESTRICTED
RESTRICTED

FIGURE 72 — RADIO RECEIVER BC-624-A SCHEMATIC CIRCUIT DIAGRAM

RESTRICTED
T. O. No. 08-10-105

RESTRICTED
T. O. No. 08-10-105





PARTS REMOVED
RESISTOR 273, 5600Ω
RESISTOR 281, 150MΩ
PARTS ADDED
RESISTOR 279-3, 47MΩ (ERIE)
RESISTOR 252-2, 100MΩ (ALLEN-BRADLEY)

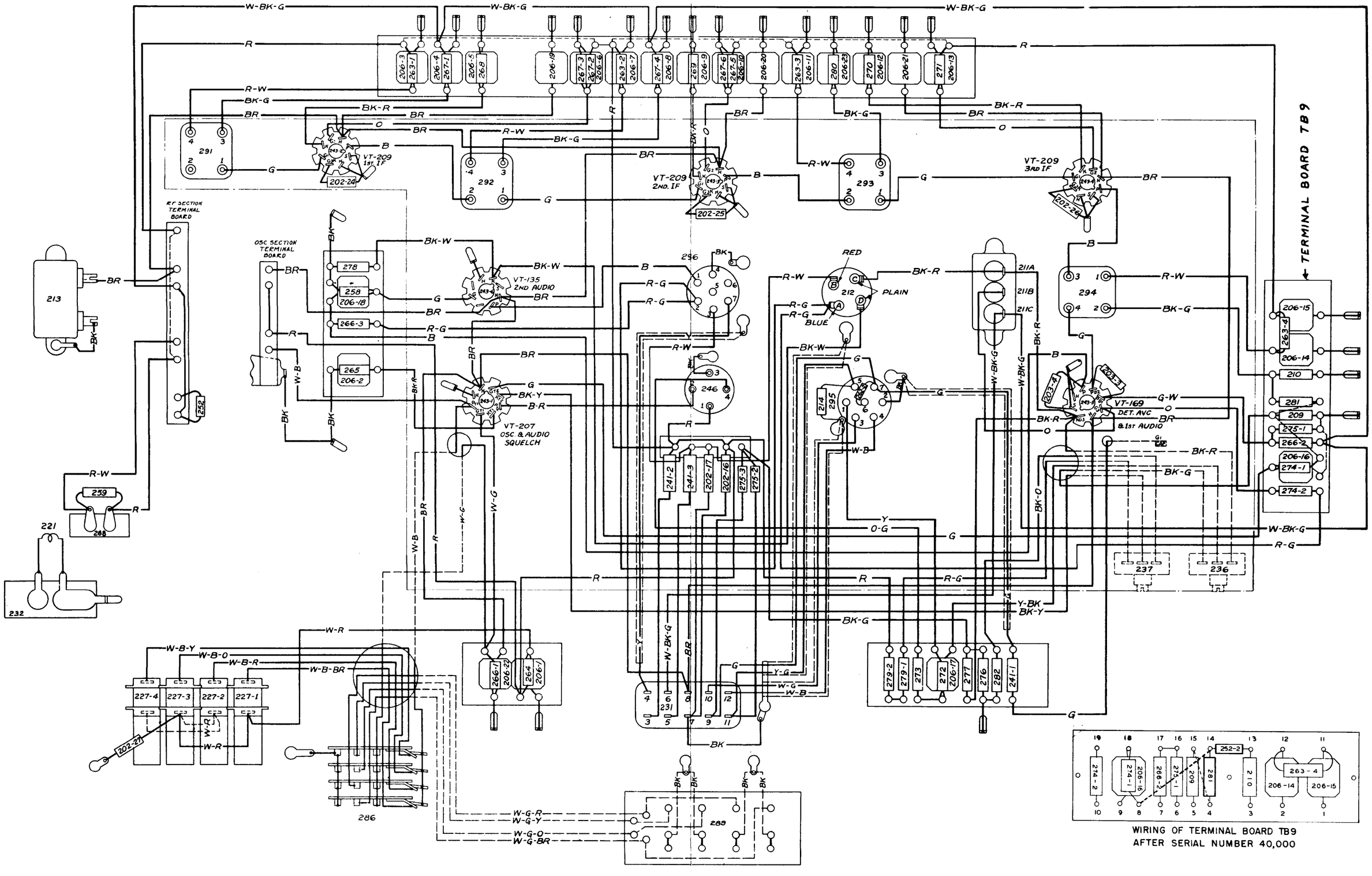
WIRING OF SQUELCH CIRCUIT AFTER SERIAL NUMBER 40,000

FIGURE 72 — RADIO RECEIVER BC-624-A SCHEMATIC CIRCUIT DIAGRAM

RESTRICTED

RESTRICTED

RESTRICTED
T. O. No. 08-10-105



WIRING OF TERMINAL BOARD TB9
AFTER SERIAL NUMBER 40,000

FIGURE 73 — RADIO RECEIVER BC-624-A, PRACTICAL WIRING DIAGRAM

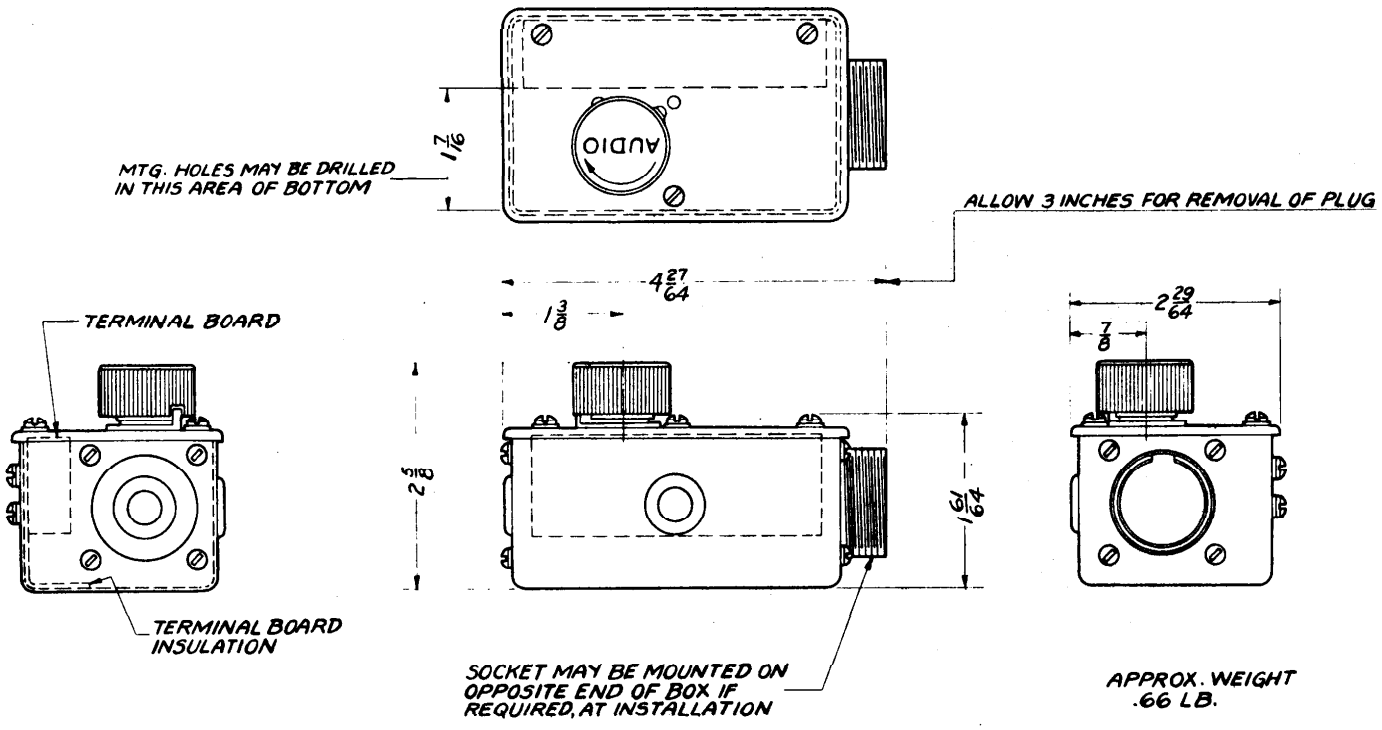


FIGURE 74 — JACK BOX BC-629-B, OUTLINE AND MOUNTING DIMENSIONS

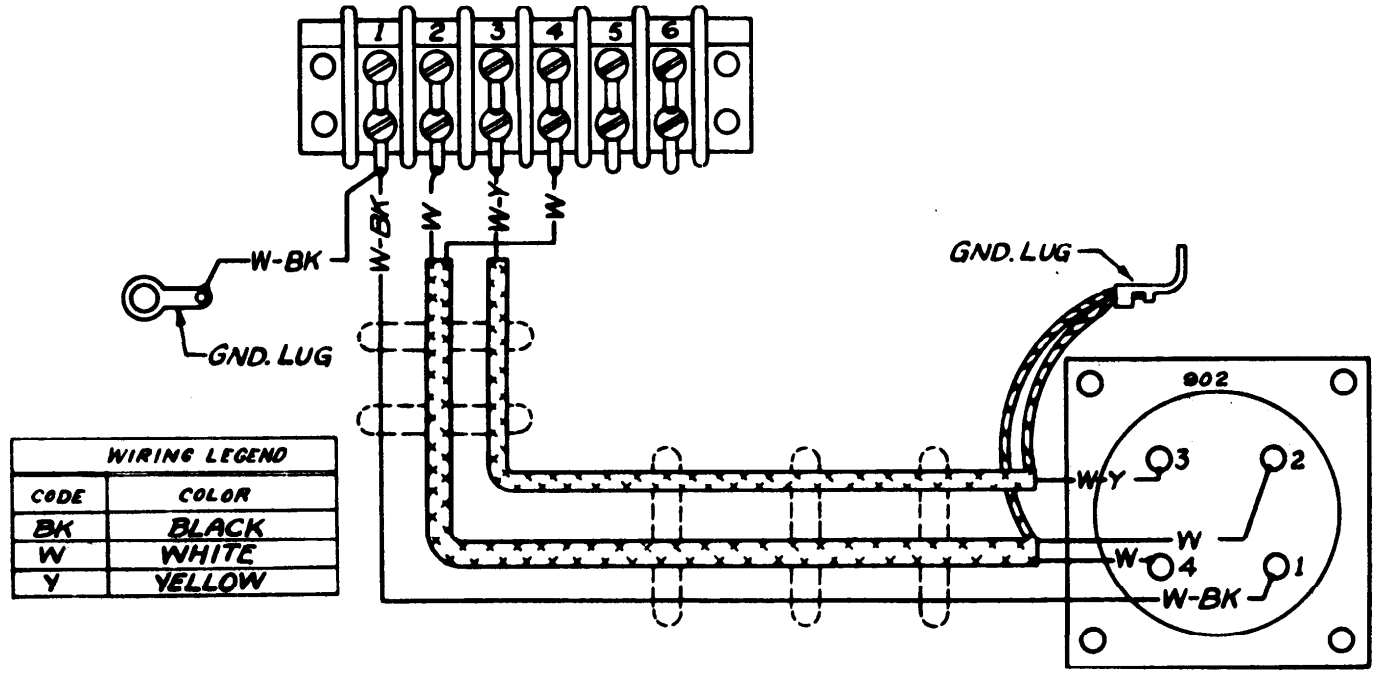


FIGURE 75 — JACK BOX BC-629-B, WIRING DIAGRAM

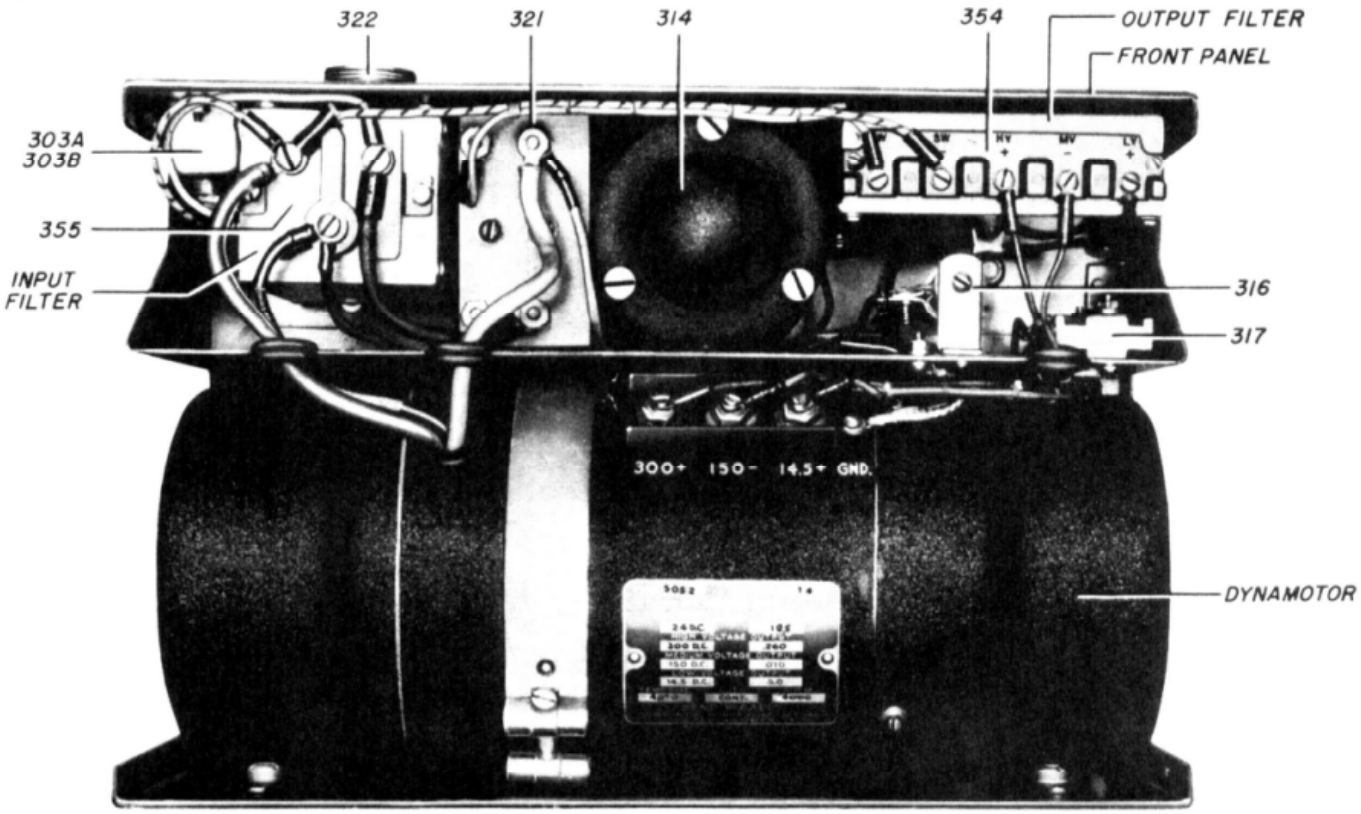


FIGURE 76 — DYNAMOTOR UNIT PE-94-AM, COVER REMOVED

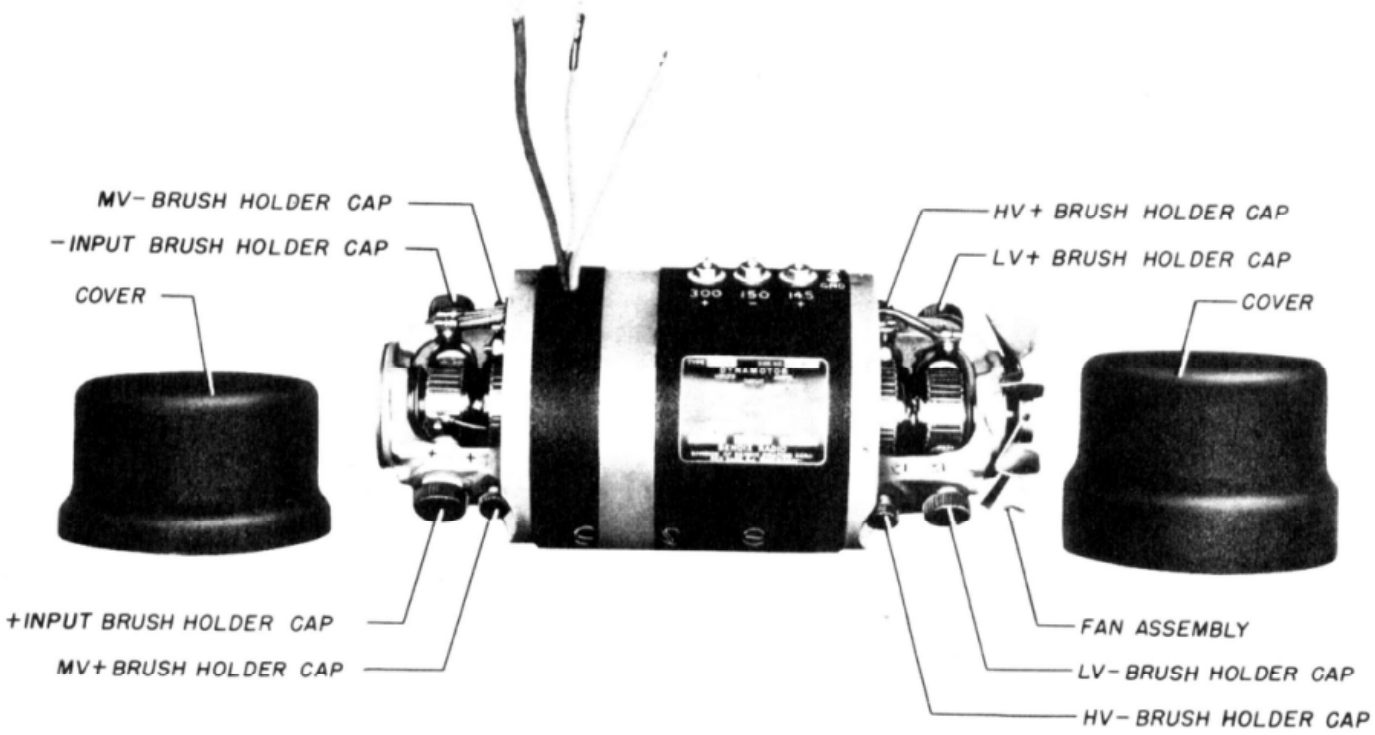


FIGURE 77 — DYNAMOTOR UNIT PE-94-AM, END BELLS REMOVED

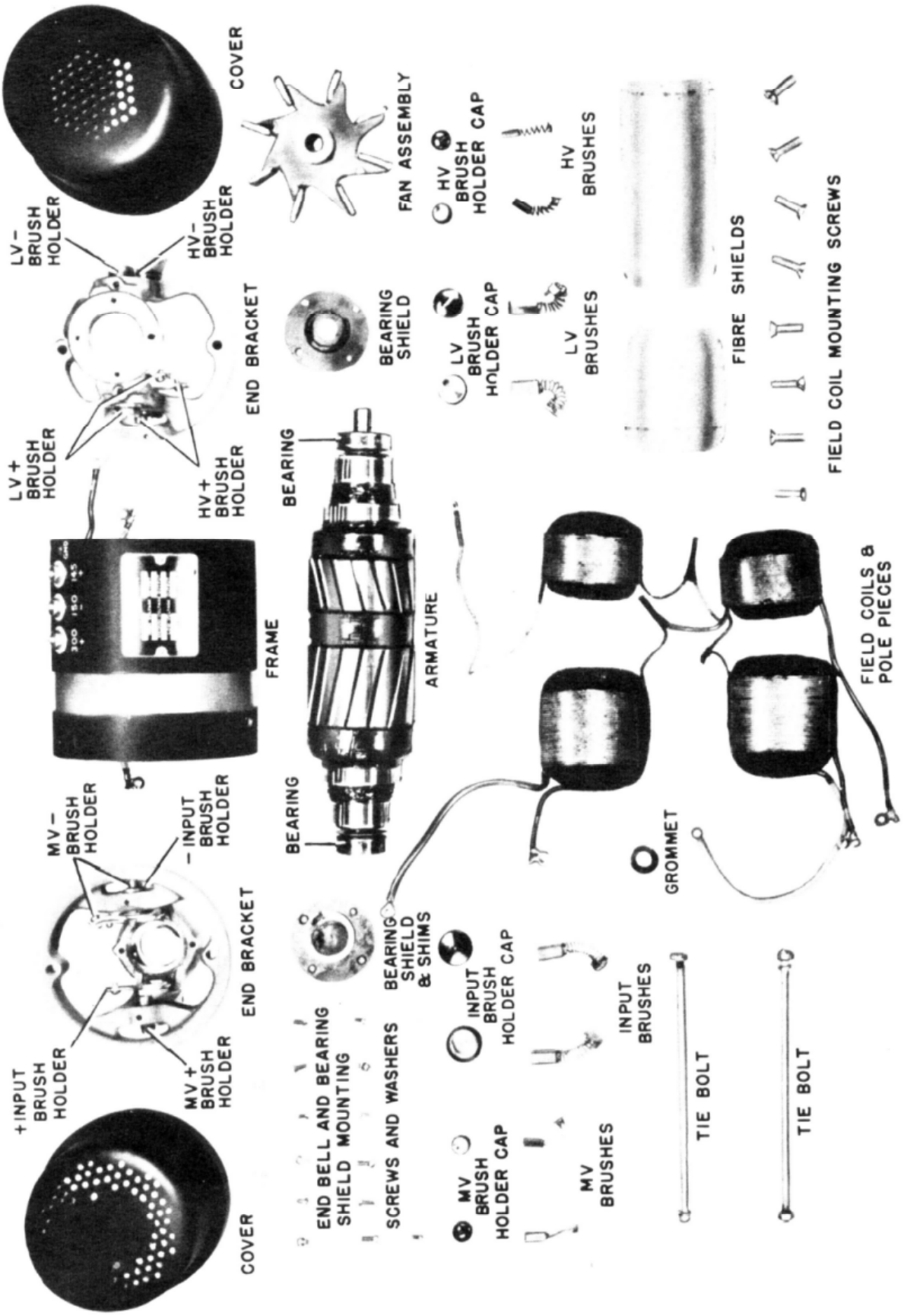


FIGURE 78 — DYNAMOTOR UNIT PE-94-AM, DISASSEMBLED