TM 11-4034

WAR DEPARTMENT TECHNICAL MANUAL

RADIO TRANSMITTERS

BC-604-A, -C, -D, -AM, -CM, and -DM

REPAIR INSTRUCTIONS

WAR DEPARTMENT · *OCTOBER 1945*

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BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL
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OFFICIAL:
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Refer to FM 21–6 for explanation of distribution formula.

WARNING

HIGH VOLTAGE

is used in the operation
of this equipment.

DEATH ON CONTACT

may result if safety precautions
are not observed.

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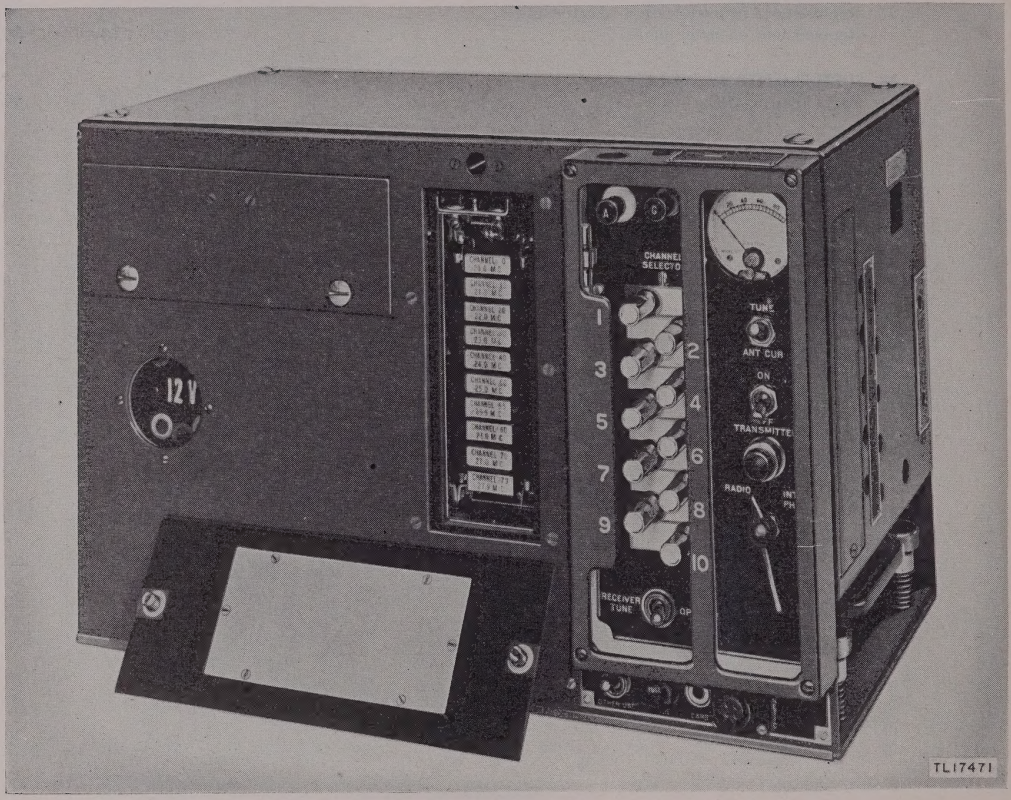


Figure 1. Radio Transmitter BC–604–A, front view with crystal compartment open.

SECTION I

DESCRIPTION OF RADIO TRANSMITTERS BC–604–A, –C, –D, –AM, –CM, and –DM*

1. General

Radio Transmitter BC–604–(*) is a component of Radio Sets SCR–508–(*), SCR–528–(*), SCR–538–(*) and AN/VRC–5. The transmitter provides frequency-modulated, radio-telephone transmitting facilities for antiaircraft and antitank warning and control nets, for base stations at battalion command posts for fire control and fire-direction nets, and for intrabattalion communication. The radio sets may be installed and operated in combat vehicles such as command cars, half-tracks, or any other authorized vehicle. Official nomenclature followed by (*) is used to indicate all models of the item of equipment included in this Technical Manual. Thus Radio Transmitter BC–604–(*) represents Radio Transmitters BC–604–A, –C, –D, –AM, –CM, and –DM, which are treated together in this manual.

2. Performance Characteristics

Nominal power output	30 w.
Nominal frequency deviation.	40 kc.
Crystal frequency	370.370 to 516.667 kc.
Transmitter frequency range.	20.0 to 27.9 mc.
Frequency multiplication	54.
Battery drain, 12-volt supply.	20 amp.
Battery drain, 24-volt supply.	12 amp.
Interphone output	3 w.

3. Simplified Circuit Analysis

a. A block diagram of Radio Transmitter BC–604–(*) is shown in figure 3. The gang-tuning control, operated by the push-button selector, selects any one of ten preselected crystals and connects it to the oscillator (V107) at the same time that it tunes all the amplifiers to produce the predetermined output frequency at the antenna. The oscillator output frequency (fx) is amplified by the first radio-frequency (r-f) amplifier (V101) and, along with the audio-frequency (a-f) signals, is impressed upon a parallel resonant circuit, one component of which is an iron core coil (mod coil L104).

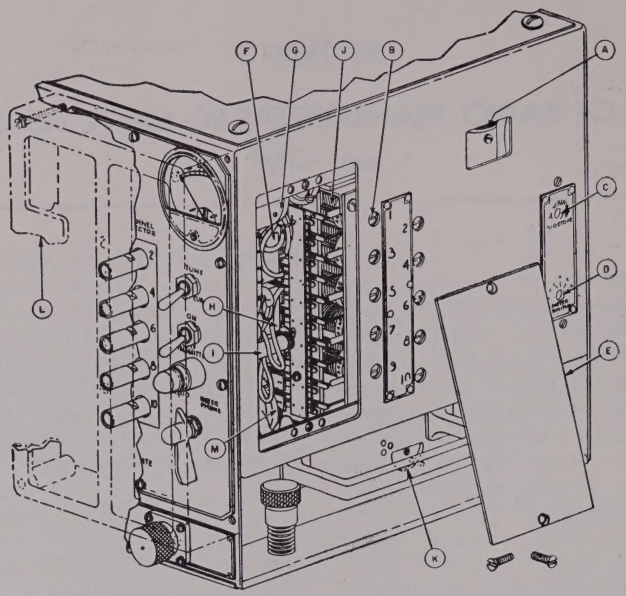
b. The output of the second audio-frequency amplifier (V106) is fed through an output transformer (T102) to the modulation coil (L104) which phase-modulates the signal from the first r-f amplifier (V101). The output of the modulation coil is rich in harmonics of the crystal frequency. After rectification by rectifier V102, the ninth harmonic of the crystal frequency (9 fx) is selected and impressed upon a frequency doubler (V108). The doubler output (54 fx) drives the power amplifier (V104) at the carrier frequency (fc=54 fx). The proper one of ten pretuned antenna coupling circuits is selected by the gang-tuning control and feeds a signal to the antenna.

c. Speech signals from a microphone associated with the transmitter are amplified by a two-stage a-f amplifier (V105 and V106).

d. A small amount of audio output from V106 is caused to pass through the headset circuit. This is called sidetone. It enables the commander to hear all that goes out from his radio transmitter and prevents confusion where two people have microphones for the same transmitting set. Also, when the operator's ears are covered by a headset he does not have the normal sensation of hearing himself talk unless sidetone is provided.

e. A block diagram of Radio Transmitter BC–604–(*) is shown in figure 3. The differences between models are described in section II.

*See TM 11–600 for installation, operation, and other maintenance data on this equipment.



PARTS LIST	
A	ANTENNA TUNING KNOB
B	ANTENNA TRIMMER SCREW
C	SIDETONE VOLUME CONTROL
D	METER SWITCH
E	SIDE ACCESS PANEL
F	TOGGLE SWITCH
G	METER
H	TOGGLE SWITCH
I	PILOT LIGHT
J	ANTENNA TRIMMER CAPACITORS
K	GANG TUNING CAPACITOR CRANK
L	PANEL GUARD
M	RADIO INTER-PHONE SWITCH

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Figure 2. Radio Transmitter BC–604–A, oblique right-end view.

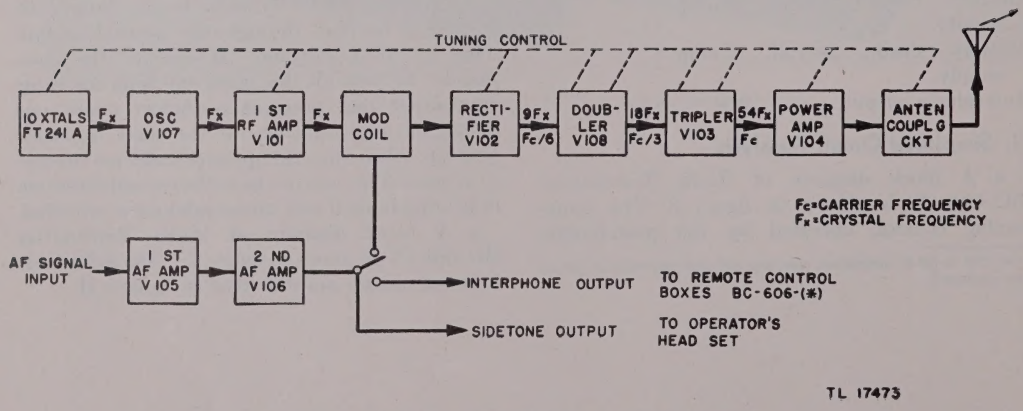


Figure 3. Radio Transmitter BC–604–(*) block diagram.

SECTION II
DIFFERENCES BETWEEN MODELS

4. Operational Differences

There are no operational differences between Radio Transmitters BC–604–A, –C, –D, –AM, –CM, or –DM.

5. Design Differences

The design differences between models of Radio Transmitter BC–604–(*) are covered in MWO SIG 11–600–9.

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SECTION III

INITIAL REPAIR PROCEDURES

Note. Before making any repairs or adjustments, all authorized modification work orders should be applied. See FM 21–6 for list of applicable MWO's.

6. General

a. A step-by-step procedure for the repair and maintenance of Radio Transmitter BC–604–(*) is presented in this manual beginning with this section and continuing through section VIII.

b. This section describes the removal, cleaning, and testing of the easily removable parts; and the cleaning, inspecting, and lubricating of the chassis, casing, and attached parts. All the tools and test equipment required are included in the list below. Each tool is mentioned in the procedure at the point where it is used.

Table I. Tool, test, and cleaning equipment

Item	Description
Audio-frequency oscillator.	50 to 5,000 cps, 0 to 5-volt output, such as General Radio type 608A, for modulation tests and measurement of audio stage gains, set for a 500-ohm output.
Oscilloscope	Modulation monitor oscilloscope, such as Dumont oscilloscope, for modulation capability test, or for measurement of audio stage gains.
Tube tester	Static or dynamic tester such as the one included in Test Set I–56–(*).
Sensitive precision wavemeter.	4 to 40 megacycles range.
Electronic voltohmmeter.	RCA Voltohmyst, or equivalent volt-ohmmeter multitester.
Output meter	0 to 15 volts with scales marked in db and volts, such as General Radio type 583A, for measuring the audio stage gains.
A-c voltmeter	0 to 5-volt rectifier type such as General Radio type 483F.
Input circuit attenuator.	0 to 30-db (500 ohms) such as Western Electric type 1A.
Dummy antenna	Phantom Antenna A–83–(*) or equivalent.
Distortion noise meter	General Radio type 732B, or equivalent.
D-c ammeter	0 to 30 amperes.
D-c voltmeter	0 to 30 volts.
R-f ammeter	0 to 1.0 amperes, such as Weston type 425.
Battery	12 volts, 26 amperes maximum.
Battery	24 volts, 18 amperes maximum.
Charging equipment	Battery charging equipment.
Auxiliary Cord CD–786 and Mounting FT–237–(*).	
Radio transmitter	A good transmitter, such as Radio Transmitter BC–604–(*) for testing the crystals.
Microphone	T–17, T–30, T–33, or T–45.
Burnishing tool	Any commercial type or a thin flat piece of metal.
Fine thin metal file	
Socket wrench	Insulated ¼-inch hexagonal.
Soldering iron	100 watt, medium tip.
Solder	Rosin core. *Note.* Never use acid cord solder in the repair of the equipment described in this manual.
Rule	6 inches by 1/10 inch.
Hand tools	Pliers, screw driver, etc.
Solvent, Dry-cleaning.	
Camel's-hair brush	½ inch round.
Heavy brushes	
Clean cloth	
Oil, Lubricating, Preservative, Special.	

7. Removal of Vaccum Tubes

The first step in servicing the transmitter is removal of the vacuum tubes.

a. Place the transmitter on a clean bench.

b. Unfasten the Dzus fasteners in the top cover by turning about one-quarter turn counterclockwise; then remove the top cover (fig. 1) from the transmitter casing.

c. Disengage the clip from the cap on power-amplifier (p-a) tube V104. (See fig. 4.) Loosen the holding clamp at the base of the tube with a screw driver and carefully remove the tube from its socket.

d. Loosen the locking tube at the other seven tubes with a screw driver; then carefully remove the tubes from their sockets.

8. Removal of Chassis Parts

a. CRYSTALS. (1) Unfasten the Dzus fasteners on the crystal storage drawer. (See fig. 1.) Pull out the drawer, rotating the front upward to disengage the flanges at the back from the casing.

(2) Unfasten the crystal oven cover (fig. 2) and remove it. Then remove each of the ten crystal holders.

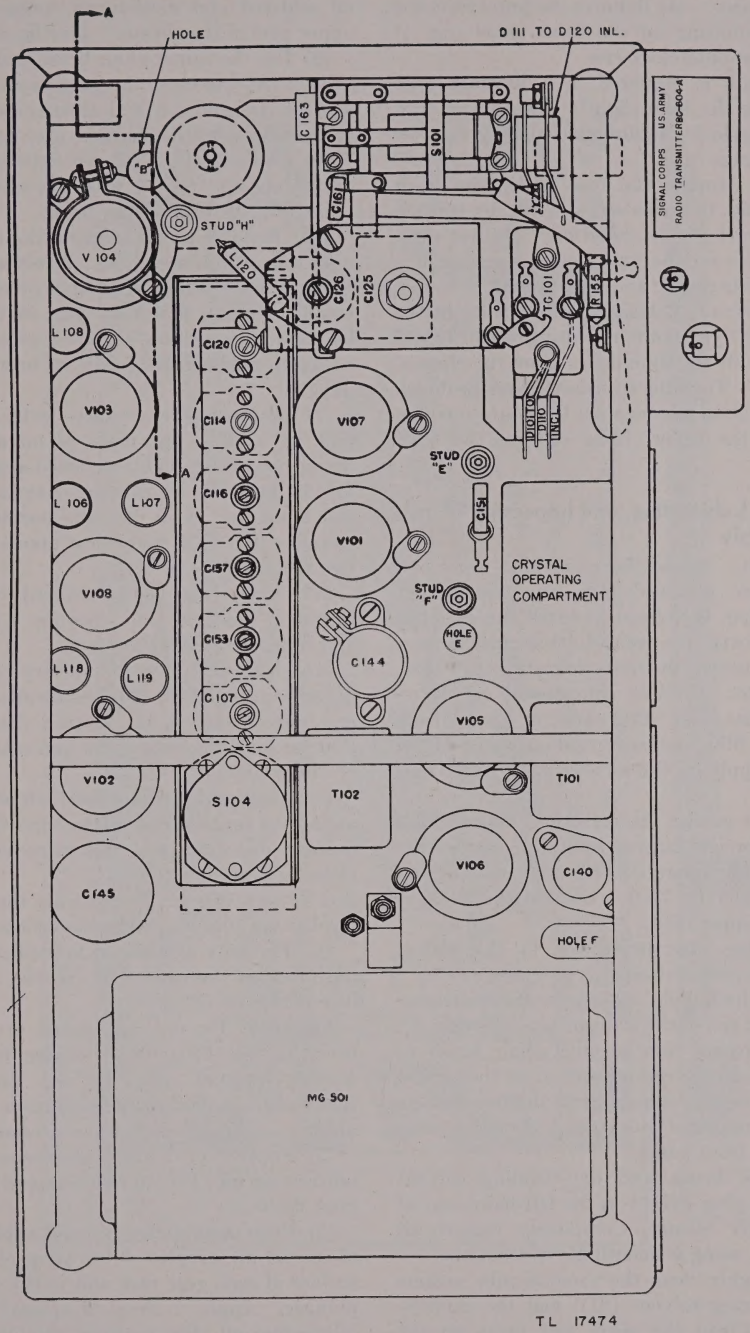


Figure 4. Radio Transmitter BC–604–(*), apparatus location diagram, top view.

b. PILOT LAMP. (1) Remove the jewel from the pilot-lamp mounting on the front panel (fig. 1) by turning it counterclockwise.

(2) The bulb is mounted in a bayonet type socket. Press the bulb slightly inward and turn it in a counterclockwise direction about a quarter turn to disengage it.

c. FUSES. Remove the fuse under the front panel guard (fig. 1) with a screw driver, by turning it in a counterclockwise direction. Do not exert too much force on the fuse holder because it is made of a brittle plastic and might break.

d. DYNAMOTOR. Release the four bolts in the corners of the dynamotor mounting plate (fig. 5) and carefully lift the dynamotor from the chassis.

e. COVERS. Turn the transmitter upside down, unfasten the Dzus fasteners on the bottom cover, and remove the cover. Also remove the back cover.

9. Cleaning, Lubricating, and Inspecting Chassis Assembly

a. GENERAL. While the removable parts and the covers are removed from the transmitter, clean the casing, the chassis, and all the attached parts. Lubricate the push-button mechanism, and visually inspect the parts as instructed below.

b. CLEANING. (1) Use compressed air to remove any loose dust, dirt, sand, or gravel from the chassis. Blow out any residual water in the hose before applying the air stream to the transmitter.

(2) Remove grease, oil, corrosion, and all hard deposits of foreign matter from the casing, the chassis, and the apparatus with a clean cloth and dry-cleaning solvent (SD). Discard the cloth as soon as it becomes dirty.

(3) Clean the front panel (fig. 1), the crystal oven, and the push buttons.

(4) Clean the handle, setscrews, and panels on the right-hand end of the transmitter. (See fig. 2.)

(5) Use a round ¼-inch camel's-hair brush to thoroughly clean the crystal sockets in the crystal oven (fig. 1), the microphone jacks and fuse sockets under the front panel guard, and the pilot lamp socket on the front panel.

(6) Use the brush and dry-cleaning solvent (SD) to clean plug PG101 in the left-hand end of the transmitter casing. Completely remove all hard deposits, using a smooth file if necessary.

(7) Thoroughly clean the vacuum-tube sockets with dry-cleaning solvent (SD) and the camel's-hair brush. Clean the gears and racks on the push-button assembly, the two Jones plugs, and all soldered and mechanical connections on the upper part of the chassis. (See fig. 6.)

(8) Use the camel's-hair brush and dry-cleaning solvent (SD) to clean the gang capacitor assembly and all the soldered and mechanical connections in the bottom of the chassis. (See fig. 5.)

(9) Clean relays S102 and S103 in the bottom of the chassis (fig. 5) with dry-cleaning solvent (SD) and the camel's-hair brush.

(10) Remove rough spots on the relay contacts with a fine, thin metal file. *Never use an abrasive on the relays.* Prepare a paper or cloth guard to catch the filings and make sure no filings become lodged in the apparatus. The contacts on relay S102 are particularly likely to burn and require filing.

(11) Burnish the contacts with a burnishing tool, or a thin, flat piece of metal, until they present a smooth highly polished appearance.

(12) Turn the transmitter over so that the top side is up, and clean, file, and burnish relay S101 contacts (fig. 4) as instructed above for the other two relays.

(13) Relay S104 can be reached with the transmitter in this position. (See fig. 4.) Clean, file, and burnish the relay contacts.

(14) Dirt on contacts is a very common cause of operating trouble. Make sure all sockets, plugs, and open contacts are clean. Also make sure that no hard deposits of foreign material are left on the contacts.

(15) Apply the compressed air stream to the apparatus again to remove any dirt that may have become dislodged and not removed during the cleaning procedure.

c. LUBRICATING. To lubricate the push-button mechanism (fig. 9), proceed as follows:

(1) The only authorized lubricating oil for the push-button assembly is special preservative lubricating oil (PS).

Caution: Do not get special preservative lubricating oil (PS) on the locking wedges or the friction washers. (See fig. 9.) Lubricating at these points will stop the operation of the mechanism. Lubricate only when necessary.

(2) Apply 1 or 2 drops of special preservative lubricating oil (PS) to the top and bottom gear rack shafts.

(3) Push each plunger in, and apply a light film of special preservative lubricating oil (PS) to the surface of each gear rack and to the surface of the plunger. Apply 1 drop of special preservative lubricating oil (PS) between each gear rack and spacer.

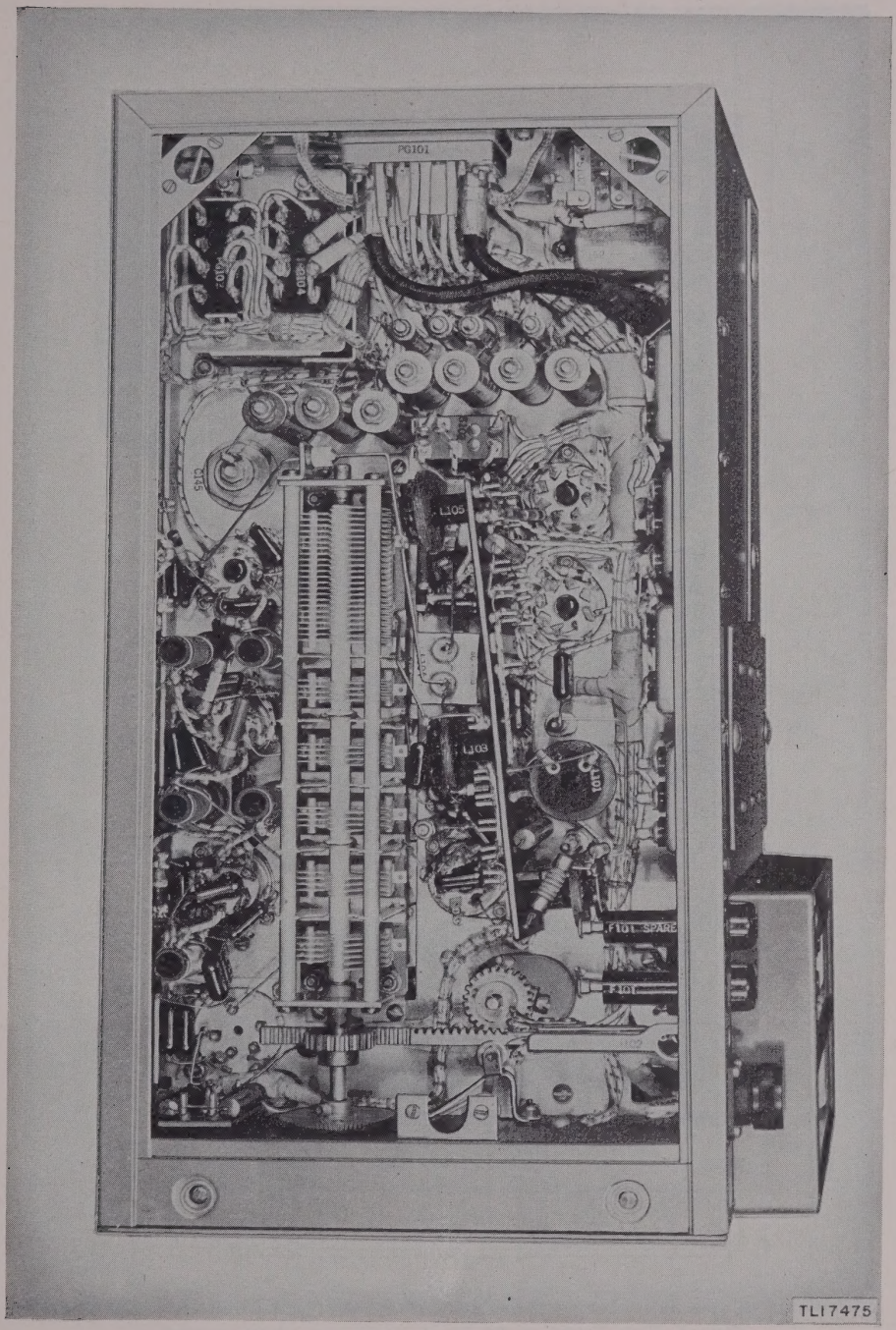


Figure 5. Radio Transmitter BC–604–A, interior view, bottom cover removed.

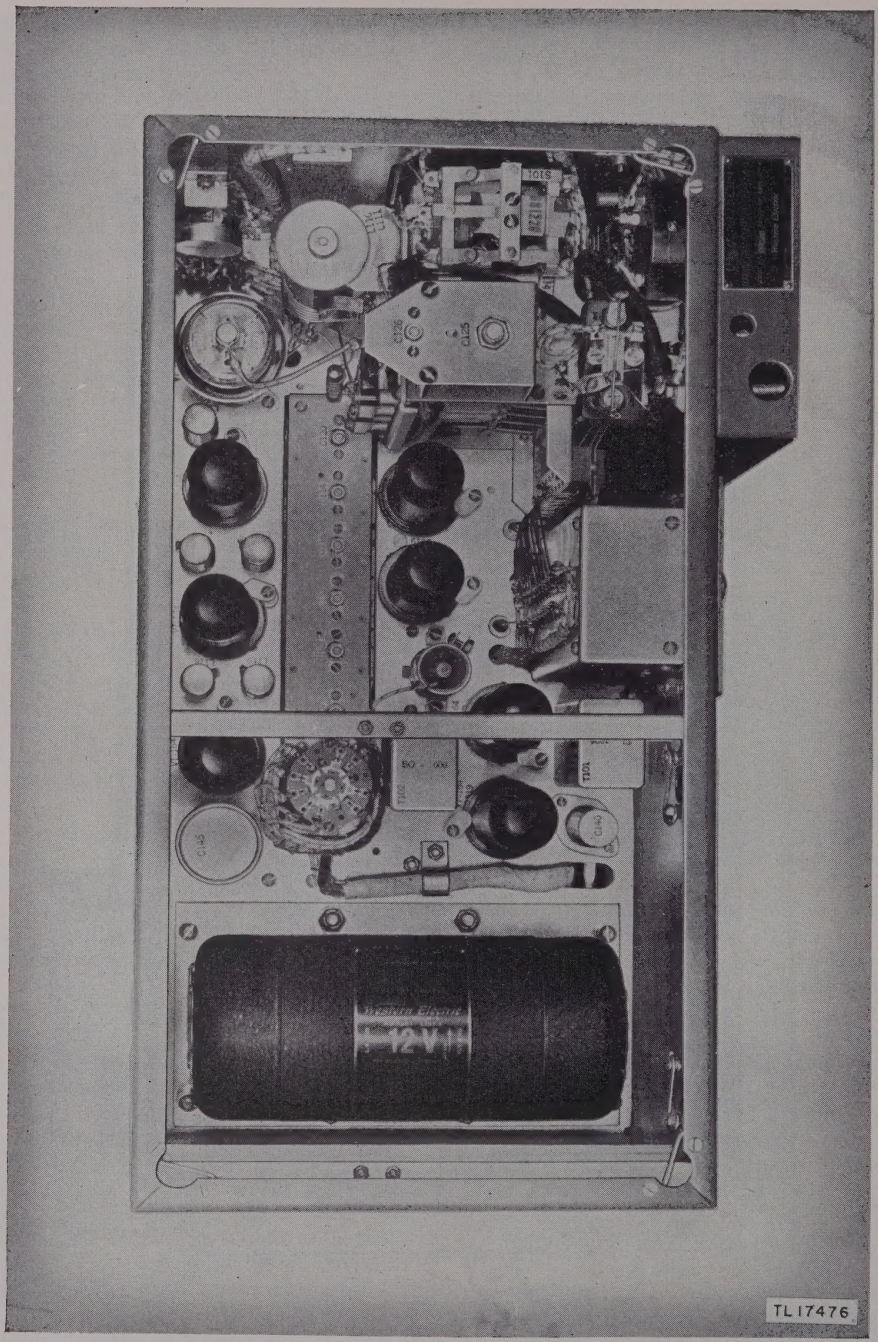


Figure 6. Radio Transmitter BC–604–A, interior view, top cover removed.

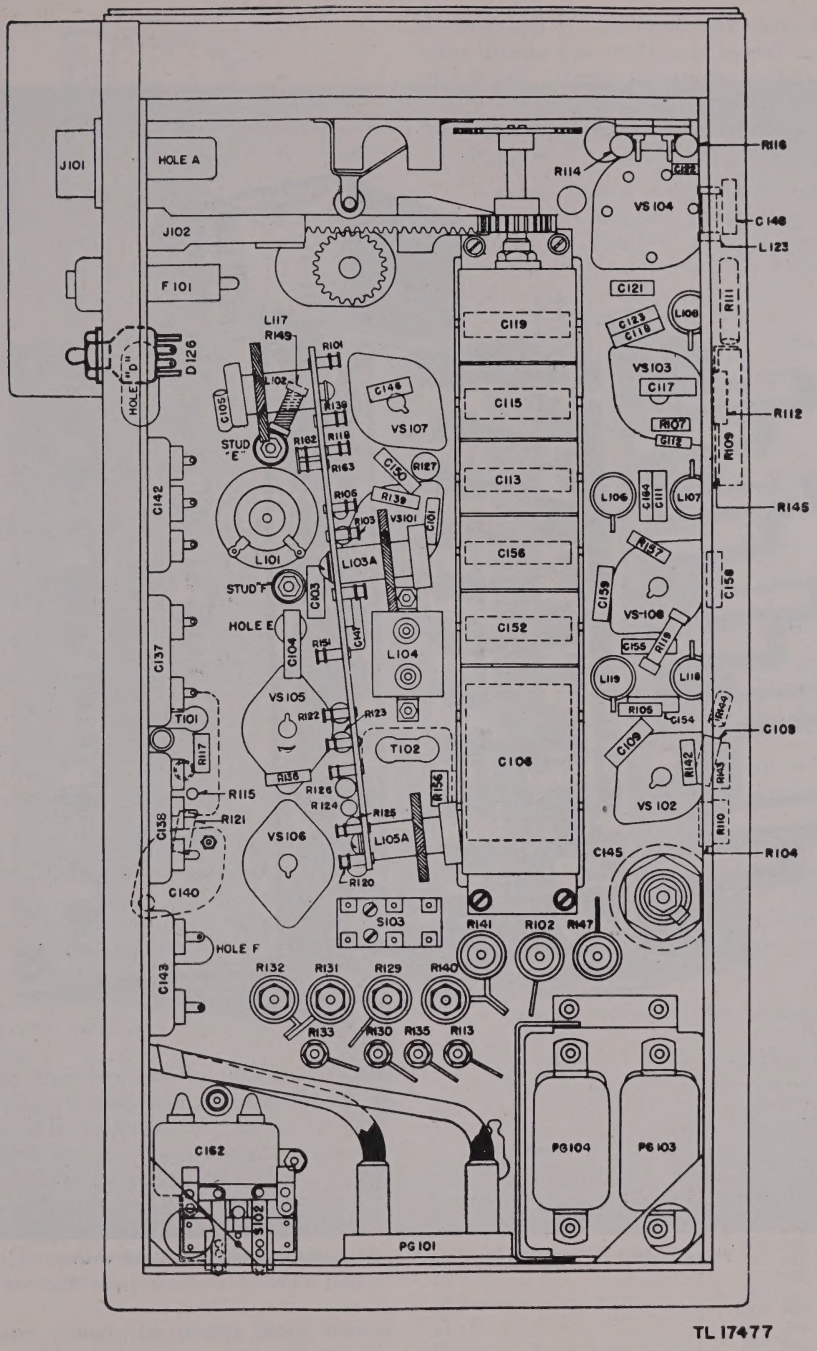


Figure 7. Radio Transmitter BC–604–(*), apparatus location diagram, bottom view.

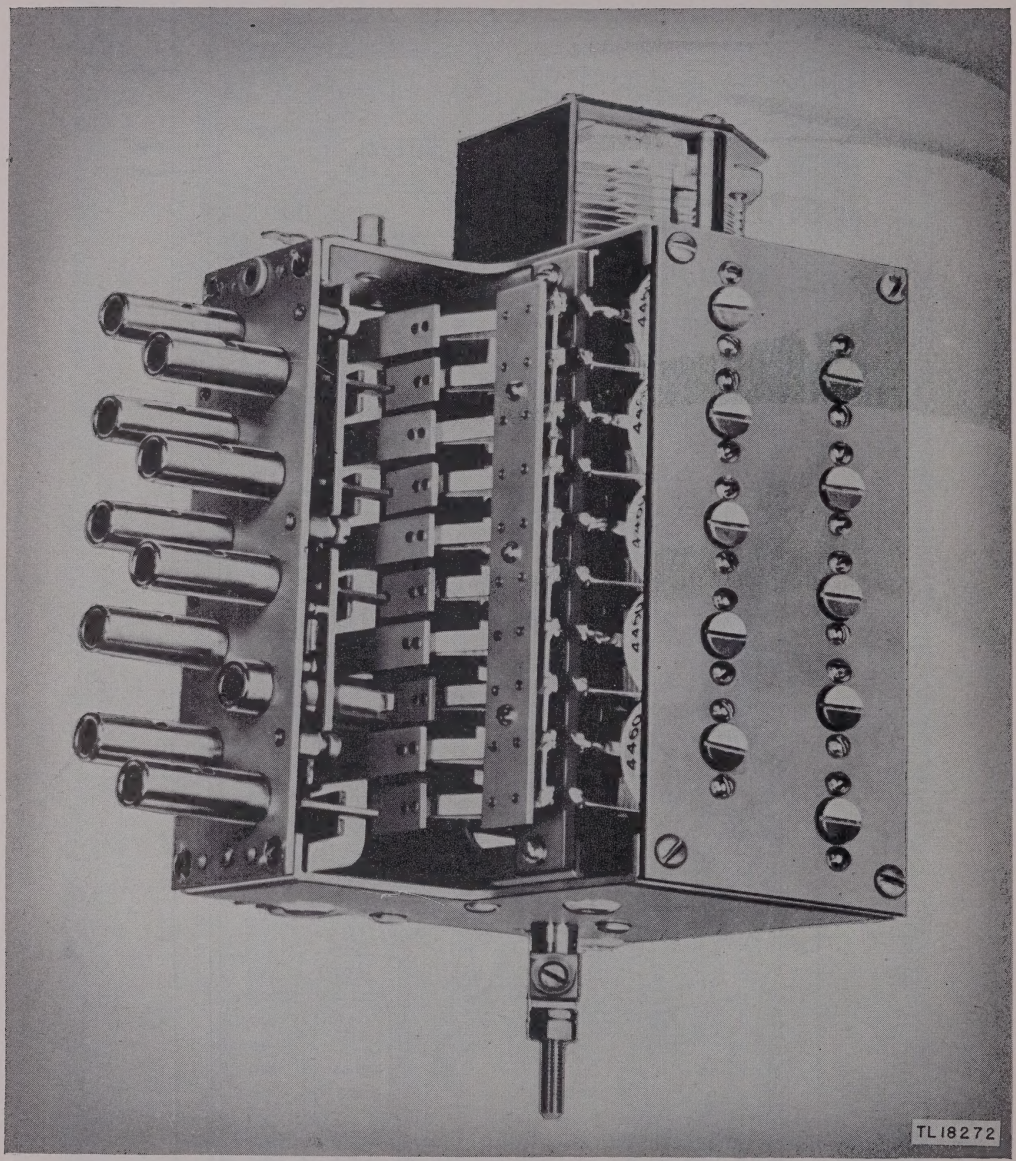
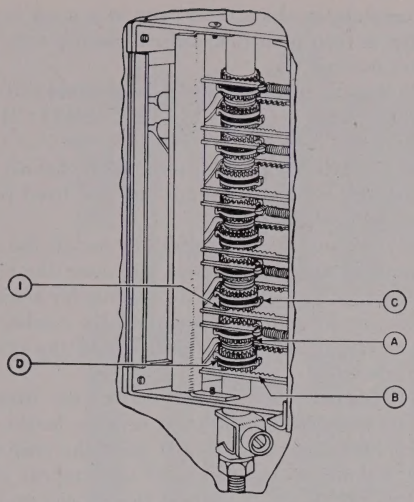


Figure 8. Radio Transmitter, BC–604–(*), push-button mechanism, right side view.



PARTS LIST	
A	GEAR
B	GEAR RACK
C	LOCKING WEDGE
D	FRICTION WASHER

SEQUENCE OF OPERATIONS	
STEP	OPERATION
I	APPLY ONE DROP OF OIL BETWEEN EACH OF THE TWENTY RACKS & GEARS

TL 18273

Figure 9. Radio Transmitter, BC–604–(*), lubrication of the push-button mechanism.

d. Inspecting. (1) Tighten all loose nuts, bolts, and screws in the apparatus. Tighten all loose mechanical connections, such as screw terminals.

(2) Inspect the alignment of the spring and roller guides that hold the gang capacitor gear rack in place. (See fig. 5.) There should be no play in the assembly. See section IX for detailed information on repairing this assembly.

(3) Inspect the alignment of the push-button gear racks and gears. The matching gear teeth must fit tightly together. Repair as directed in section VIII.

(4) Make sure the vacuum-tube sockets are tight. If pins are loose, replace the socket.

(5) Make sure the socket strip and heater units in the crystal oven are not damaged. Repair or replace as directed in section VIII.

(6) Replace broken panels.

(7) Plug PG101 should have some play. If it is too tight, loosen the holding bolts slightly. The bolt holes are somewhat oversized to allow play of the plug.

(8) Inspect visually for broken parts, burned out resistors, shorted or open capacitors, coils, etc. Before removing them test the circuit as described in paragraph 17, and locate any shorted wires or other defects that could have caused the affected part to fail. Repair all damage to the circuit.

10. Cleaning, Inspecting, and Testing Removed Parts

a. Vacuum Tubes. (1) *General.* The following chart shows the tube complement of Radio Transmitter BC–604–(*). One spare Tube JAN 1624 and four spare Tubes JAN 1619 must be provided with the transmitter.

Ref symbol	JAN–No.	VT No.	Function
V101	1619	VT–164	First r-f amplifier.
V102	1619	VT–164	Rectifier.
V103	1619	VT–164	Doubler.
V104	1624	VT–165	Power amplifier.
V105	1619	VT–164	First a-f amplifier.
V106	1619	VT–164	Second a-f amplifier.
V107	1619	VT–164	Oscillator.
V108	1619	VT–164	Tripler.

(2) *Cleaning.* Carefully clean each tube with dry-cleaning solvent (SD), and a ½-inch round camel's-hair brush. Remove all hard deposits of foreign material from the prongs.

(3) *Testing.* Test each tube in a suitable tube tester, such as the one included in Test Set I–56–(*). Examine the prongs; if they are loose, discard the tube.

b. Crystals. The crystals are contained in individual holders (FT–241–A) that *must not be opened.*

(1) *General.* One crystal must be supplied with the transmitter for each of the 80 channels in the frequency range. (See table II.) The channel and the transmitting frequency are clearly marked on each crystal holder. The crystal frequency is *not marked* on the holder.

Table II. Channel and crystal frequencies

Channel	Crystal frequency (kc)	Output frequency (mc)
0	370. 370	20. 0
1	372. 222	20. 1
2	374. 074	20. 2
3	375. 926	20. 3
4	377. 778	20. 4
5	379. 630	20. 5
6	381. 481	20. 6
7	383. 333	20. 7
8	385. 185	20. 8
9	387. 037	20. 9
10	388. 889	21. 0
11	390. 741	21. 1
12	392. 593	21. 2
13	394. 444	21. 3
14	396. 296	21. 4
15	398. 148	21. 5
16	400. 000	21. 6

Table II. Channel and crystal frequencies—Continued

Channel	Crystal frequency (kc)	Output frequency (mc)
17	401. 852	21. 7
18	403. 704	21. 8
19	405. 556	21. 9
20	407. 407	22. 0
21	409. 259	22. 1
22	411. 111	22. 2
23	412. 963	22. 3
24	414. 815	22. 4
25	416. 667	22. 5
26	418. 519	22. 6
27	420. 370	22. 7
28	422. 222	22. 8
29	424. 074	22. 9
30	425. 926	23. 0
31	427. 778	23. 1
32	429. 630	23. 2
33	431. 481	23. 3
34	433. 333	23. 4
35	435. 185	23. 5
36	437. 037	23. 6
37	438. 889	23. 7
38	440. 741	23. 8
39	442. 593	23. 9
40	444. 444	24. 0
41	446. 296	24. 1
42	448. 148	24. 2
43	450. 000	24. 3
44	451. 852	24. 4
45	453. 704	24. 5
46	455. 556	24. 6
47	457. 407	24. 7
48	459. 259	24. 8
49	461. 111	24. 9
50	462. 963	25. 0
51	464. 815	25. 1
52	466. 667	25. 2
53	468. 519	25. 3
54	470. 370	25. 4
55	472. 222	25. 5
56	474. 074	25. 6
57	475. 926	25. 7
58	477. 778	25. 8
59	479. 630	25. 9
60	481. 481	26. 0
61	483. 333	26. 1
62	485. 185	26. 2
63	487. 037	26. 3
64	488. 889	26. 4
65	490. 741	26. 5
66	492. 593	26. 6
67	494. 444	26. 7
68	496. 296	26. 8
69	498. 148	26. 9
70	500. 000	27. 0
71	501. 852	27. 1
72	503. 704	27. 2
73	505. 556	27. 3
74	507. 407	27. 4
75	509. 259	27. 5
76	511. 111	27. 6
77	512. 963	27. 7
78	514. 815	27. 8
79	516. 667	27. 9

(2) *Cleaning.* Clean the crystal holders, particularly the prongs, with dry-cleaning solvent (SD) and the camel's-hair brush. If the prongs are loose, hold the crystal for disposal. Clean the crystal storage drawer.

(3) *Testing.* (*a*) Select 10 good crystals marked with the first 10 channels given in table II. Install the crystals, in the crystal oven of a good transmitter, in their numerical order beginning with the socket marked 1.

(*b*) Set the push buttons to correspond with the crystals, and set the METER SWITCH in position 2.

(*c*) Operate the transmitter in each channel and record the reading obtained on the front panel meter for each crystal.

(*d*) Remove the good crystals, install the corresponding untested crystals, and note the meter readings for each one. If the reading for a crystal is zero, or substantially less than the reading for the corresponding good crystal, hold the crystal for disposal.

(*e*) Remove the crystals under test from the crystal oven and install good crystals for the next 10 channels listed on table II. Set the push buttons for the new frequencies and repeat steps (*c*) and (*d*) above. Continue this procedure until the 80 crystals have been tested.

c. Pilot Lamp Bulb and Jewel. (1) *General.* Lamp LM–38 (E101) is a 28-volt, 0.17-ampere, 651 base, T1–¾ light bulb. Two spare bulbs are furnished in a spare bulb container. The jewel is a protective cover and window for the bulb.

(2) *Cleaning.* Clean the bulb and the jewel with dry-cleaning solvent (SD).

(3) *Testing.* Test each bulb in a test socket to be sure it lights. Examine the jewel; if it is broken or damaged, discard it.

d. Fuses. (1) *General.* Fuse FU–64 (F101) is a 1,000-volt, ½-ampere, fuse. It is sealed in a plastic holder. The transmitter requires one fuse, and nine spares are supplied. One spare is installed in the transmitter casing and eight are stored in a spare fuse bag.

(2) *Cleaning.* Clean the fuses with dry-cleaning solvent (SD) and a camel's-hair brush. Remove all dirt from the contacts.

(3) *Testing.* Put an ohmmeter across each fuse. A very low (or zero) reading means the fuse is good. An infinite reading means the fuse is defective. Discard it.

e. Dynamotor. Clean, inspect, lubricate, and repair, when required, in accordance with instructions contained in TB SIG 134, or Repair Instructions for Dynamotors, section R–434.01 (the latter may be obtained from fourth and fifth echelon Signal Corps repair shops). Test the dynamotor for proper operation with Dynamotor Test Set I–199 (or equivalent). If the dynamotor is found defective, repair it or replace it with a good one.

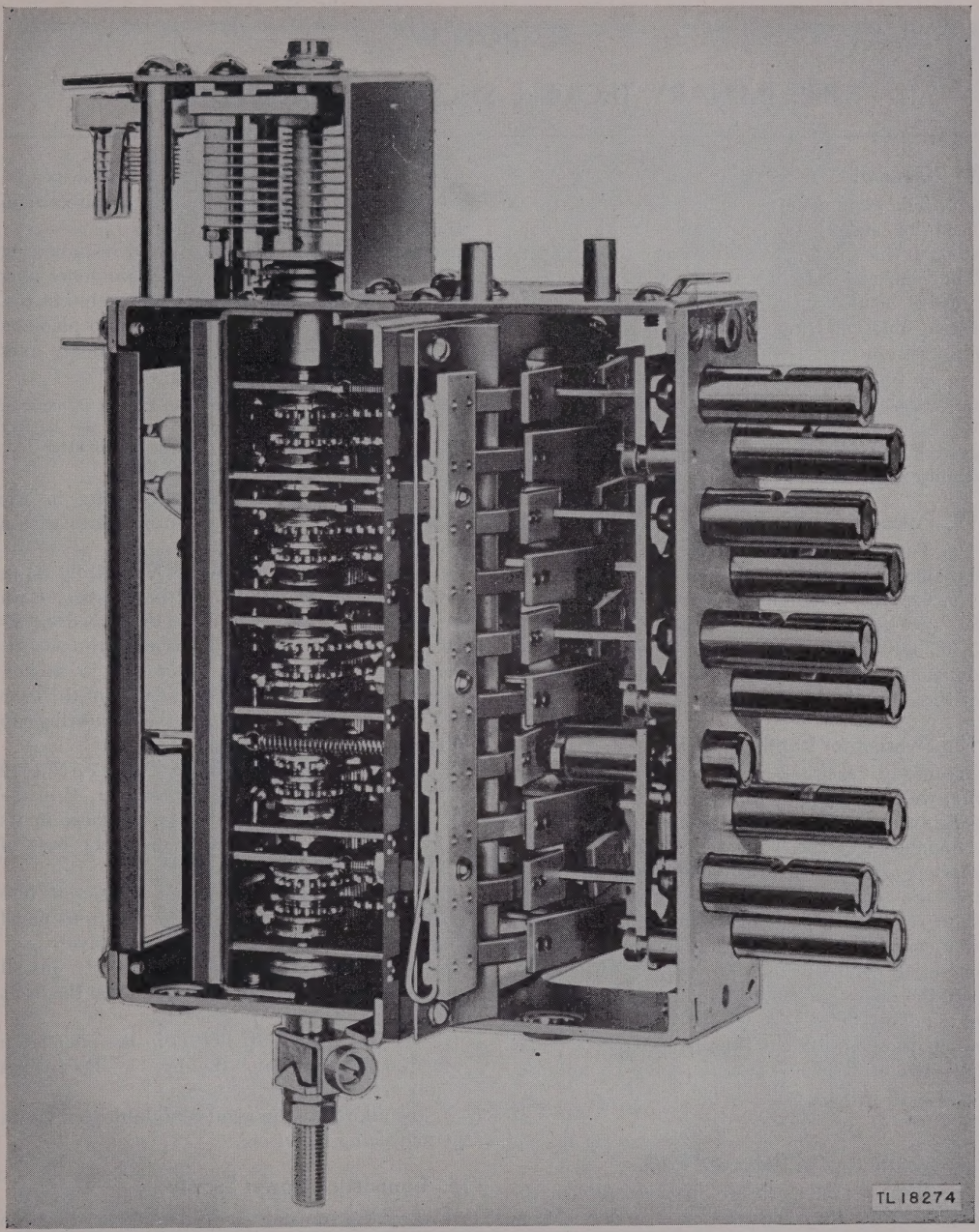


Figure 10. Radio Transmitter, BC–604–(*), push-button mechanism, left side view.

SECTION IV

PRELIMINARY TROUBLE-SHOOTING PROCEDURES

11. General

a. The alignment procedure (sec. V) is to be used for stage-by-stage trouble location. The steps in this section are preparatory to alignment. They include installing the parts previously removed, connecting the power supply, a look, listen, smell, and touch inspection, and a voltage and resistance test.

b. A test of the power input plug (PG103) is essential before turning the transmitter on, because the tubes and other replaced parts may be damaged if the plug is defective. Dynamotor continuity must also be checked.

12. Power Input Plug Continuity Test

a. Power input plug PG103 is located on the dynamotor mounting in the chassis. (See fig. 4.)

b. Connect an ohmmeter across terminals 4 and 8. (See fig. 5.) A reading between 4,500 and 5,500 ohms must be obtained. Do not install the dynamotor until the correct resistance is obtained at these terminals.

13. Dynamotor Continuity Test

Because of variations in methods of manufacturing, widely varying terminal-to-terminal internal resistance measurements are found in various dynamotors of the same type. In many cases shorted turns in choke coils and armature windings are not revealed by continuity tests. For these reasons the customary ohmmeter continuity test cannot be relied upon to indicate the true operation condition of a dynamotor. Therefore, test the operation of the dynamotor with Dynamotor Test Set I–199 (or equivalent) to determine its operating condition. Reference to TB SIG 134 or Repair Instructions for Dynamotor, Section R–434.01 will be helpful if repairs are required.

14. Installation of Removed Parts

a. Inspect each part and its receptacle in the chassis to be sure both are clean and free from mechanical defects before installing the part into the transmitter.

b. The transmitter is assumed to have its top, bottom, and back covers removed as directed in section III.

c. Hold the tested dynamotor over its mounting in the chassis (fig. 6), line up the two Jones plug jacks with the matching Jones plugs in the chassis, and carefully lower the dynamotor into place on its mounting. The jacks should fit snugly over the plugs.

Note. Either Dynamotor DM–35–(*) or Dynamotor DM–37–(*), whichever is appropriate for the battery available, should be used with Radio Transmitter BC–604–(*).

d. Tighten the four mounting bolts in the corners of the dynamotor mounting plate with a screw driver.

e. Install a good p-a tube (JAN 1624, fig. 4) in the socket marked VT–165 on the chassis. Both the Signal Corps designation and the JAN designation are marked on the chassis near the socket. Do not use the tube if it is loose in its socket. Tighten the holding clamp at the base of the tube with a screw driver, and attach the connecting clip to the cap of the tube.

f. Install seven good vacuum Tubes JAN 1619 in the seven remaining tube sockets (fig. 4) in the chassis. Do not use a tube if it is loose in its socket. Tighten the locking tab at the base of each tube with a screw driver.

g. Install one good ½-ampere, 1,000-volt fuse (F101) in the FUSE socket under the front panel guard. Do not tighten the fuse excessively.

h. On Radio Transmitter BC–604–(*), install the spare fuse in the SPARE socket under the front panel guard (See fig. 1).

i. Install a good bulb (E101) in the pilot lamp socket on the front panel (see fig. 1). Do not use a bulb that is loose in its socket.

j. Install a jewel, in good condition, securely in the pilot lamp mounting.

15. Connecting Power Supply

a. Lay the transmitter on its back so that the parts in the top and bottom of the chassis, as well as the meter on the front panel, are visible.

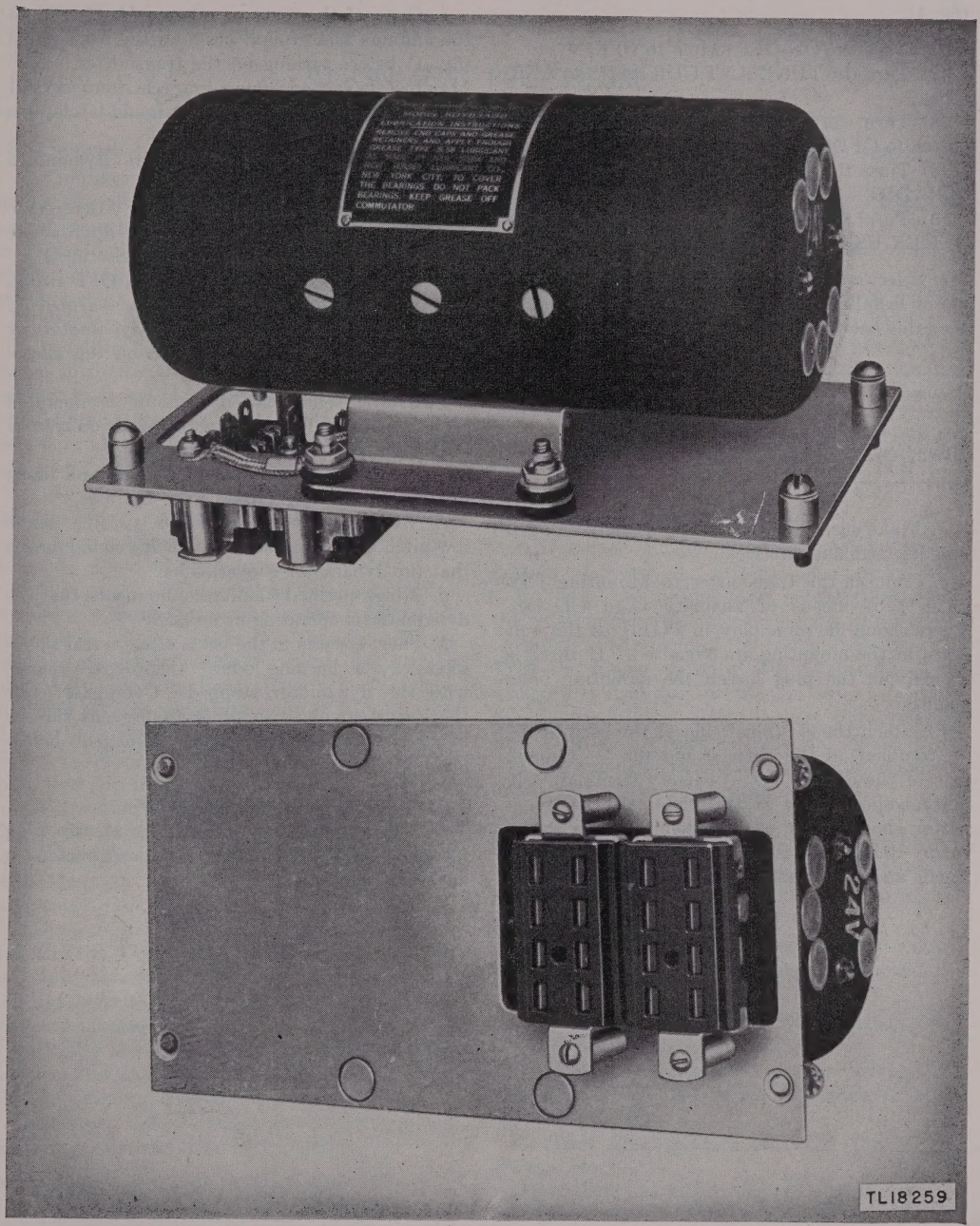


Figure 11. Dynamotor DM–35–(*) or DM–37–(*), side and subbase view.

b. Make the following switch adjustments (fig. 1):

(1) Turn the ON-OFF switch to OFF.
(2) Turn the TUNE-ANT CUR switch to ANT CUR.
(3) Turn the RECEIVER TUNE-OPERATE switch to OPERATE.
(4) Turn the RADIO-INTERPHONE switch to RADIO.
(5) Turn the TANK-OTHER USE switch to OTHER USE.

c. Select a battery to correspond with the dynamotor installed in the transmitter by referring to the table below.

Dynamotor	Battery
DM–35–(*)----	12 to 15 volts, 26 amperes maximum.
DM–37–(*)----	22 to 30 volts, 18 amperes maximum.

d. Make sure that the battery is fully charged and its terminals are clean.

e. Connect the transmitter to Mounting FT–237–(*) by means of auxiliary Cord CD–786. There should be some play in PG101 as the bolt holes in the mounting are oversized. If there is no play in the plug loosen the mounting bolts slightly.

f. Attach the + (plus) side of the cord to the + terminal on the battery and the — (minus) side of the cord to the — battery terminal. No current should flow at this time. If the dynamotor should start as the connection is being made, Relay S102 is stuck. See section VIII, for repair and replacement instructions for all relays.

16. Turning on Transmitter

a. Connect the dummy antenna (A–83–(*)) to the antenna and ground posts on the front panel (fig. 1) before turning on the transmitter.

b. Install a good 20.0 megacycle (mc) crystal in socket No. 1 in the crystal oven and latch push button No. 1.

Remember: Never start the dynamotor without latching a push button.

c. Plug a good microphone, either Microphone T–17, T–30, T–33, or T–45, into the appropriate jack under the front panel guard. (See fig. 1.)

d. Turn the TRANSMITTER ON-OFF switch to ON and after the transmitter has warmed up for at least 5 seconds, start the dynamotor by operating the press-to-talk switch on the microphone.

Caution: When the dynamotor is operated with the transmitter covers removed, dangerous voltages are exposed.

e. When the dynamotor starts, look and listen for arcing capacitor C125. (See fig. 6.)

f. Never overload a dynamotor. Listen for a low-pitched groaning sound. Such a sound means that the dynamotor is overloaded.

g. A high-pitched whining sound means that the dynamotor is operating at no load.

h. Short circuits in the parts often reveal themselves by a burning odor. Inspect the parts, with the dynamotor stopped. Completely test the circuit involved in order to prevent further damage. Replace the parts damaged before proceeding.

17. Voltage and Resistance Tests

Test the voltages and resistances at the plug terminals and tube socket pins as directed in figures 35 and 36.

SECTION V
ALIGNMENT PROCEDURE

18. General

a. Trouble in the r-f circuits is readily located during the alignment procedure because the required frequency and current cannot be obtained in a stage if the component parts do not function properly. All the data needed for locating trouble within a stage is given in section VIII.

b. The location of adjustable coils and capacitors provided for aligning the transmitter are shown in figure 37. The figure is printed on a pull-out page and should be unfolded for reference while reading the text below. The first time a part shown in the figure is mentioned in the text, reference should be made to the figure.

c. The panel meter is used during alignment to indicate circuit resonance. The meter needle deflects to a maximum reading at resonance and decreases either side of resonance.

d. The amount of current at resonance varies in different transmitters and in the same transmitter with different tubes, and crystals. Therefore, the values shown on the chart (fig. 37) are only rough approximations of the meter readings that may be expected in the circuits. The power output of a stage is satisfactory if the meter readings obtained during alignment approximate those found in the table of figure 37.

e. The actual meter readings obtained during alignment must be recorded, as directed in the text below, for use in locating trouble. Make a blank chart for this purpose similar to the chart in figure 37.

f. Operate the dynamotor by means of the RECEIVER TUNE-OPERATE switch. *Do not run the dynamotor for more than 5 minutes at a time and, after a 5-minute run, turn the dynamotor off for 15 minutes.*

g. During alignment, keep the battery voltage between 11.5 and 13.5 volts (23.5 and 25.5 volts when Dynamotor DM–37–(*) is used).

Caution: High voltages are present on all the tuning coils and trimmer capacitors.

19. Crystal and Switch Adjustments

a. Turn the TRANSMITTER ON-OFF switch to OFF.

b. Turn the TUNE-ANT CUR switch to TUNE.

c. Turn the RECEIVER TUNE-OPERATE switch to OPERATE.

d. Turn the RADIO-INTERPHONE switch to RADIO.

e. Turn the TANK-OTHER USE switch to OTHER USE.

f. Install the 20 mc crystal holder into socket No. 1 in the crystal oven, and install the 27.9 mc crystal holder into socket No. 10. If either of these crystals is unavailable, use a crystal whose frequency is within 0.5 mc of the above crystals. (See table II.)

20. Unlocking Channel Selector

a. If a push button is latched, release it by partially depressing an adjacent push button.

b. The selector locking screw is reached through the small circular opening just above the handle on the right-hand end of the casing. (See fig. 2.) Turn the tuning capacitor (fig. 37) as far as it will go in a clockwise direction in order to expose the selector locking screw. Loosen the screw by turning it in a clockwise direction. Then turn the gang tuning capacitor back as far as it will go in a counterclockwise direction.

21. Metering Circuit Test

a. A simple check of the meter and its associated circuits should be made at this point in the procedure.

b. If the transmitter is not too far out of alignment, the metering circuits may be checked as follows:

(1) Turn the TRANSMITTER switch to ON.

(2) Depress push button No. 10.

(3) Turn the dynamotor on by turning the RECEIVER TUNE-OPERATE switch to RECEIVER TUNE.

(4) Turn the METER SWITCH (fig. 2) to position No. 2.

(5) If there is a meter reading, turn the switch from position No. 1 through position No. 6.

c. The presence of a reading on all positions of

the switch indicates that the meter and its associated circuits are functioning properly.

d. If the meter should read on position No. 6 *only*, this may indicate that the transmitter is too far out of alignment.

e. In such a case, check the circuits as follows:

(1) Connect a vacuum-tube voltmeter to the two center terminals on the back of the meter positioning switch. (See fig. 2.)

(2) Change the TUNE-ANT CUR switch to ANT CUR. (Panel meter out of the circuit.)

(3) With the vacuum-tube voltmeter on the 0- to 30-volt scale, note the presence of a reading on positions No. 1 to 5. If none is obtained change to 0- to 10-volt scale or lower.

to ON and after the tubes have warmed up for at least 5 seconds, start the dynamotor by turning the RECEIVER TUNE-OPERATE switch to RECEIVER TUNE.

Caution: Dangerous voltages are exposed when the dynamotor is operated with the transmitter covers removed.

d. As soon as the dynamotor starts, the panel meter needle should deflect, showing current in the oscillator stage (V107).

e. Turn the METER SWITCH to position No. 3. The needle should again deflect, showing grid current in the rectifier (V101).

f. Align the first r-f amplifier as follows:

(1) With the push button No. 10 still latched

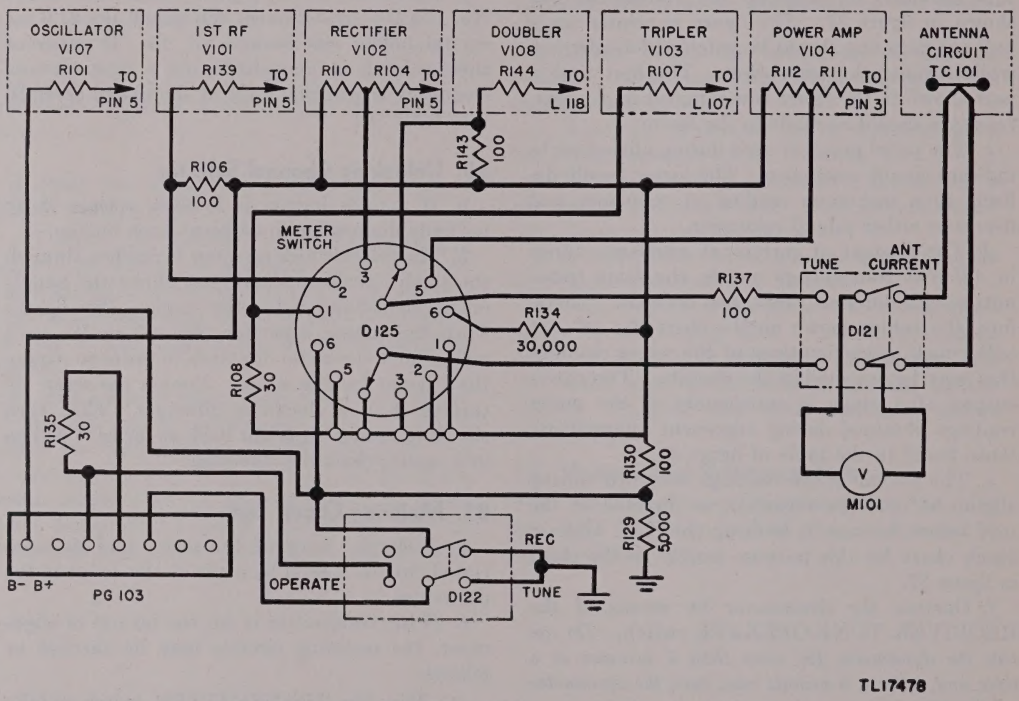


Figure 12. Radio Transmitter BC–604–(*), metering circuit diagram.

f. If neither of these tests is satisfactory, make a continuity test of the circuit with the aid of the metering circuit diagram. (See fig. 12.)

22. Alignment of First R-F Amplifier

a. Turn the METER SWITCH (fig. 2) to position No. 2.

b. Latch push button No. 10 by depressing it until it catches.

c. Turn the TRANSMITTER ON-OFF switch (pushed in), turn the gang tuning capacitor (fig. 37) slowly in a clockwise direction until resonance is reached. The rotor in the gang tuning capacitor should be near the *minimum* capacitance position.

(2) Latch push button No. 1 and continue turning the crank (fig. 37) until resonance is again reached. The rotor should now be near the *maximum* capacitance setting.

(3) Rotor travel between the two resonant

points must be at least 75 percent of the total possible travel.

(4) Stop the dynamotor and release push button No. 1. Then turn the gang tuning capacitor, as far as it will go in a clockwise direction, to expose the selector locking screw. Then lock the channel selector by turning the screw in a counterclockwise direction.

g. Latch push button No. 10 and start the dynamotor.

h. Check the push-button setting by turning the gang tuning capacitor slightly back and forth against the restoring force of the springs. The panel meter needle should dip (move back toward zero) as the crank is moved in either direction, showing that resonance occurs with the gang capacitor at the setting selected by the push button. If there is an increased reading when the capacitor is moved against the springs, repeat step *e* above. Record the meter reading for reference in locating trouble. Be careful not to rotate the capacitor more than a few degrees in either direction while making this check.

i. Latch push button No. 1 and repeat step *h* above.

j. Stop the dynamotor.

k. For trouble location see the voltage-resistance diagrams (figs. 35 or 36), the schematic (fig. 14), and paragraph 44.

23. Alignment of Rectifier

a. Insert a narrow blade, 6-inch rule into coil L118 (fig. 37), and measure the distance from the top of the coil to the top of the tuning slug. The distance should be 1 inch. Procure a ⅛-inch insulated screw driver or a long-handle insulated, hexagonal socket wrench to adjust the slug.

b. Adjust the tuning slug in coil L119 (fig. 37) to 1 inch from the top of the coil.

c. Adjust trimmer capacitors C153 and C157 (fig. 37) to the midcapacitance position, using the same tool.

d. Procure a sensitive precision wavemeter (4- to 40-mc range) and adjust it to 4.65 mc. This is the resonant frequency of the doubler circuit with the 27.9-mc crystal connected. If a different crystal has been installed in socket No. 10, set the wavemeter at one-sixth the frequency marked on the crystal holder actually installed in the socket.

e. Turn the METER SWITCH to position No. 4, latch push button No. 10, and start the dynamotor. The panel meter needle should deflect showing grid current in the tripler.

f. Using an insulated screw driver or wrench, trim C153 and C157 until resonance is obtained. Be careful of high voltage on capacitors.

g. Place the wavemeter pick-up coil within coupling distance of L118 and L119. Do not couple the wavemeter too closely with the coils, or the tuning of the coils will be affected.

h. As soon as the wavemeter is coupled with the coils, the panel meter needle should dip, showing that the wavemeter is drawing energy from the circuit. Trim C153 and C157 to obtain the greatest possible needle dip.

i. The circuit is nearly in resonance when the capacitors are set to give the greatest needle dip on the panel meter. It is necessary, however, to bring the circuit precisely to resonance by using the wavemeter as directed below.

(1) Adjust the wavemeter to a frequency a few hundredths of a megacycle above the resonant frequency of the circuit (one-sixth of the frequency marked on the crystal holder connected with the circuit). Couple the pick-up coil with coils L118 and L119 and note the dip of the panel meter needle. Then readjust the wavemeter to a frequency a few hundredths of a megacycle below the resonant frequency of the circuit, and note the needle dip when the coils are coupled.

(2) The maximum needle dip must occur with the wavemeter set at the resonant frequency of the circuit. Adjust C153, C157, L118, and L119 as required to obtain this condition. The circuit is then in resonance when in the No. 10 push button position.

j. Latch push button No. 1 and tune coils L118 and L119 until the circuit approaches resonance. Then use the wavemeter as above and bring the circuit into resonance by adjusting only the two coils (L118 and L119). The resonant frequency is 3.33 mc with the 20.0-mc crystal in socket No. 1, or one-sixth the frequency marked on the crystal holder actually installed in the socket.

k. The alignment on push button No. 10 may have been changed somewhat by the adjustments of L118 and L119 on push button No. 10, and adjusting only trimmer capacitors C153 and C157 until the circuit is again in resonance as checked by the wavemeter.

l. If it is impossible to obtain exactly the resonant frequency on either push button, divide the difference in meter reading equally between them by adjusting only the coils (L118 and L119) on push button No. 1 and only the capacitors (C153 and C157) on push button No. 10.

m. Record the current reading at the resonant

frequency on each push button for use in locating trouble.

n. In cases where the resonance cannot be obtained on push button No. 1 (step *j* above), resonate the circuit near the middle of the band, as directed below, in order to get the coils near their correct tuning positions.

(1) Install a crystal of a frequency, near the middle of the band (24 mc) in socket No. 5.

(2) Turn the METER SWITCH to position No. 3.

(3) Unlock the CHANNEL SELECTOR (par. 20), latch push button No. 5, and obtain resonances by adjusting L118, L119, C153, and C157. Then carefully release push button No. 5 by depressing an adjacent button and retarding push button No. 5 with one finger so that it does not snap back with enough force to disturb the setting of the gang tuning capacitor. After releasing the push button, lock the CHANNEL SELECTOR.

(4) Latch push button No. 5 and bring the circuit into resonance by adjusting L118, L119, C153, and C157, using the wavemeter as described above. The resonant frequency of the circuit with the 24-mc crystal is 4.00 mc or one-sixth the frequency marked on the crystal holder actually installed in socket No. 5.

(5) Latch push button No. 10 and bring the circuit into resonance by adjusting C153 and C157. The resonant frequency on push button 10 is 4.65 mc (one-sixth the frequency marked on the crystal holder in socket No. 10).

(6) If the exact resonant frequency cannot be obtained on either push button, divide the difference in meter readings equally between them by adjusting L118, L119, C153, and C157 on push button No. 5, and only C153 and C157 on push button No. 10.

(7) Turn the METER SWITCH back to position No. 4, and align on push buttons No. 1 and 10 as directed above in steps *j*, *k*, and *l*.

o. For trouble location refer to the voltage-resistance diagrams (fig. 35 or 36), the schematic (fig. 16), and paragraph 46.

24. Alignment of Doubler

a. Stop the dynamotor and set the METER SWITCH in position No. 1.

b. Adjust the tuning slugs in L106 and L107 (fig. 37) to 1 inch from the top of the coil.

c. Set C114 and C116 (fig. 37) in the midcapacitance position.

d. Latch push button No. 10 and start the dynamotor. The panel meter needle should deflect, showing current in the doubler circuit.

e. Trim C114 and C116 until resonance is obtained. Then couple the wavemeter pick-up coil with L106 and bring the circuit into resonance, using wavemeter at 9.3 mc (one-third the transmitting frequency of the crystal in socket No. 10) by adjusting L106, L107, C114, and C116.

f. Latch push button No. 1 and tune L106 and L107 for resonance. Then bring the circuit into resonance at 6.67 mc (one-third the output frequency of the crystal in socket No. 1) using the wavemeter and adjusting only L106 and L107. If this is impossible, realign the rectifier stage as directed in paragraph 23.

g. Latch push button No. 10 and again bring the frequency to the desired value by adjusting only C114 and C116. Then latch push button No. 1 and check the frequency to be sure it is still at the desired level. When the exact frequency desired cannot be obtained on both push buttons, divide the difference in meter reading equally between them by adjusting only L106 and L107 on push button No. 1, and C114 and C116 only on push button No. 10.

h. Record the meter reading on each push button.

i. For trouble location see the voltage-resistance diagrams (fig. 35 or 36), the schematic (fig. 17), and paragraph 47.

25. Alignment of Tripler

a. Stop the dynamotor and set the METER SWITCH on position No. 5.

b. Adjust the tuning slug in L108 (fig. 37) to 1 inch from the top of the coil.

c. Latch push button No. 10 and start the dynamotor. The panel meter needle should deflect, showing grid current in the power amplifier.

d. Frequency measurements with the wavemeter are not required in this stage of the alignment. Trim C120 (fig. 37) until resonance is obtained. If resonance cannot be obtained, change the adjustment of L108.

e. Latch button No. 1 and tune L108. Then adjust only C120 on push button No. 1 until resonance on each push-button position is found.

f. Record the meter reading at resonance on each push-button position.

g. For trouble location see the voltage resistance diagrams (fig. 35 or 36), the schematic (fig. 18), and paragraph 48.

26. Installation of Bottom Cover

a. Stop the dynamotor and install the bottom cover on the transmitter casing.

b. Repeat the alignment procedure above (pars. 22, 23, and 24) making the minor adjustments required to obtain maximum current in each stage. The bottom cover changes the circuit constants somewhat, so realignment of the stages is essential for the most satisfactory performance of the transmitter.

27. Alignment of Power Amplifier

a. Stop the dynamotor and turn the METER SWITCH to position No. 6.

b. Adjust the coupling between L110 and L111 by turning the knurled antenna-coupling finger wheel (fig. 37) until the center of L111 is opposite the top of L110, as viewed through the vertical slot in L110.

c. Latch push button No. 10, and plug a good microphone (T–17, T–30, T–33, or T–45) into the appropriate jack under the front panel guard. Start the dynamotor by operating the press-to-talk switch on the microphone and immediately trim C126 (fig. 37) for *minimum* deflection of the panel meter needle. The meter measures the screen and plate current of the rectifier, doubler, tripler, and power amplifier in position No. 6. Then turn the TUNE-ANT CUR switch (fig. 1) to ANT CUR and trim C136 (by means of antenna trimmer No. 10 (fig. 37)) for maximum needle deflection. The current in the antenna circuit is measured by the meter with the TUNE-ANT CUR switch at ANT CUR and the METER SWITCH in position No. 6.

d. With push button No. 10 still latched, turn the TUNE-ANT CUR switch to TUNE, and adjust the coupling between L110 and L111, by turning the antenna-coupling finger wheel, until maximum deflection of the panel meter needle is obtained. Then readjust the coupling to give about 60 percent of the maximum reading. Turn the TUNE-ANT CUR switch back to ANT CUR and trim C136, by means of antenna trimmer No. 10, for maximum needle deflection.

e. Latch push button No. 1 and turn the TUNE-ANT-CUR switch to TUNE. With an insulated screw driver operate the coil tuning wheel (fig. 37) to tune coil L110 for minimum current. Then turn the TUNE-ANT CUR switch back to ANT CUR and trim C127, by means of antenna trimmer No. 1 for maximum current.

f. Finish aligning the stage by shifting alternately from push button No. 1 to push button No. 10. Tune L110 for minimum current (TUNE-ANT CUR switch at TUNE) and trim C127 for maximum current (TUNE-ANT CUR switch at ANT CUR) on push button No. 1. Trim C126 for minimum current on push button No. 10 (TUNE-ANT CUR switch at TUNE), and trim C136 for maximum current on push button No. 10 (TUNE-ANT CUR switch at ANT CUR) until the same maximum current is obtained on both push buttons.

g. Record the maximum reading on each push button, and remove the microphone.

h. When the minimum meter readings are not well defined, it is often easier to trim C126 for minimum reading on both push buttons during the procedure given in *f* above. After obtaining minimum current by trimming C126, turn the tuning slug in L110 (by means of the coil tuning wheel) a few turns one way or the other on push button No. 1. Then find a position where minimum current is obtained with C126 in the same position on both push buttons.

i. For trouble location refer to the voltage-resistance diagrams (fig. 35 or 36), the schematic (fig. 19) and paragraph 49.

28. Presetting Push Buttons

a. The push button must be preset before coupling it to the antenna circuit. Select seven good crystals from the crystal storage drawer and install them in the crystal oven in numerical order of their frequencies beginning with socket No. 2. Leave the 27.0-, 33.0-, and 38.9-mc crystals in the sockets No. 1, 5, and 10.

b. Install the cover on the crystal oven.

c. If one of the push buttons is latched, release it.

d. Turn the gang tuning capacitor (fig. 37) as far as it will go in a clockwise direction. Insert a screw driver in the opening to the selector locking screw (fig. 37) and loosen the screw by turning it in a *clockwise* direction. Turn the gang capacitor crank back as far as it will go in a counterclockwise direction.

e. Set the TUNE-ANT CUR switch at TUNE, and latch push button No. 10.

f. Set the METER SWITCH at position No. 3, and start the dynamotor by turning the RECEIVER TUNE-OPERATE switch to RECEIVER TUNE.

Note. Make sure the TRANSMITTER switch has been set at ON for at least 5 minutes before presetting the push buttons. Frequency deviations as high as 1 mc occur

during operation, if the push buttons are preset before the transmitter has been properly warmed up.

g. Slowly turn the gang-tuning capacitor in a clockwise direction until resonance is reached. If more than one resonant point is located, set the crank for the highest one.

h. Turn the METER SWITCH to position No. 1 and again turn the gang-tuning capacitor until the resonance is found. The tuning adjustment here is very critical and the capacitor requires little or no change.

i. Stop the dynamotor and release push button No. 10. Retard the released push button so that it does not disturb the capacitor setting.

j. Repeat steps *f*, *g*, *h*, and *i* above on each push button beginning with No. 9 and going to the next lower frequency each time. After releasing the last push button, turn the gang-tuning capacitor as far as it will go in a clockwise direction, and tighten the selector locking screw.

k. Check each push button as follows:

(1) Turn the METER SWITCH to position No. 1.

(2) Latch the push button.

(3) Start the dynamotor.

(4) Move the gang-tuning capacitor slightly back and forth. Do not attempt to turn the crank more than a few degrees in either direction. Turning the crank in either direction should decrease the reading on the panel meter. If the reading increases as the crank is turned, reset the push button by repeating steps *c* through *j* above.

29. Coupling to Antenna Circuit

a. Set the METER SWITCH at position No. 6, the RECEIVER TUNE-OPERATE switch at OPERATE, and the TUNE-ANT CUR switch at ANT CUR.

b. Plug in the microphone, latch push button No. 1, and start the dynamotor by operating the press-to-talk switch at ANT CUR.

c. Trim C127 by means of the antenna trimmer No. 1 (fig. 37) until the maximum reading is obtained on the panel meter.

d. Adjust the knurled, antenna-coupling finger wheel (fig. 37) for maximum meter reading.

e. Readjust C127 for maximum meter reading.

f. Latch the remaining push buttons, one at a time, and adjust the antenna trimmer of corresponding number (fig. 37) for maximum current on each push button. Do not readjust the knurled, antenna-coupling finger wheel.

g. Remove the microphone and turn the TRANSMITTER switch to OFF.

h. For trouble location, see the voltage-resistance diagrams (fig. 35 or 36), the schematic (fig. 20), and paragraph 50.

SECTION VI
DETAILED TROUBLE-SHOOTING PROCEDURES

30. Signal Tracing in Audio Stages

Two methods of signal tracing, applicable to trouble location in the audio stages (V105 and V106), are given in this paragraph. Trouble in these stages may also be located by the use of the voltage-resistance diagrams (figs. 35 and 36) and the schematic diagrams of the audio stages (figs. 21 and 22) which are referred to below.

a. The first method of signal tracing for trouble location is as follows:

(1) Connect the test equipment to the transmitter as described in paragraph 33.

(2) Remove the leads connecting the output of the attenuator to the magnetic microphone jack, and substitute two test leads.

(3) Ground one test lead to the frame at the transmitter, and use the other as a probe.

(4) Turn the equipment on, and after a suitable warm-up time, proceed by working from the *output* of the audio towards the *input*.

(*a*) Touch the test probe to the following points (figs. 28 and 29): The output transformer (terminals 2, 3, and 6); the plate of V106 (terminal 3); the grid of V106 (terminal 5); both sides of capacitor C141; the plate of V103 (terminal 3); the grid of V105 (terminal 5); the input transformer (terminals 5 and 3); the magnetic microphone jack (terminal C), and the carbon microphone jack (ring).

(*b*) Note that the reading on the output meter increases as the attenuator probe is moved back towards the input of the audio section. The reading obtained at the grid of V106 should be approximately 10 times that obtained at the plate of V106. There should be little or no change in reading as the probe is moved from the grid of V106 across capacitor C141 to the plate of V105. The reading at the grid of V105 should be three times the reading at the plate of V105.

(5) If the above procedure is followed, trouble is readily located. At the point where the signal disappears (that is, there is no reading on the output meter) a voltage-resistance check (figs. 35 and 36) will quickly determine the faulty part.

b. Another alternative procedure, essentially the same as the procedure given in *a* above, involves the use of an oscilloscope in the following manner:

(1) Remove the output meter.

(2) Connect the output of the attenuator to the magnetic microphone jack.

(3) Trace the signal from the *input* towards the *output* with the oscilloscope as follows: Start at the output of the attenuator, adjust the vertical gain of the oscilloscope to give about a 1-inch deflection, then move the probe successively to the carbon microphone jack (ring), the input transformer (terminals 3 and 5), the grid of V105 (terminal 5), the plate of V105 (terminal 3), both sides of capacitor C141, the grid of V106 (terminal 5), the plate of V106 (terminal 3), the output transformer (terminals 6, 2, and 3), and terminals 20 and 21 on PG101.

(4) Note that the deflection on the oscilloscope screen varies in the same manner as the readings on the output meter in the first part of this paragraph.

(5) The oscilloscope also shows the distortion present in the amplifier. A fairly clean sine wave should be obtained at all points. Be careful not to overdrive the stages with too much signal input. Usually 0.2 and 0.4 volts (unattenuated) will be sufficient for the audio oscillator output.

SECTION VII
FINAL TESTING

31. General

a. After the transmitter has been properly aligned, and the antenna satisfactorily coupled to the power amplifier, test the performance characteristics as directed below. See the individual stage and circuit repair data in section VIII for the data needed to locate and repair any trouble found.

b. Before the tests can be made, the battery must be connected with the transmitter, and the phantom antenna must be connected with binding posts A and G on the front panel. The 20-, 24-, and 27.9-mc crystal holders must be placed in sockets No. 1, 5, and 10 respectively, and the push buttons must be preset.

c. At the beginning of the testing procedure the switches must be set as follows:

(1) TRANSMITTER ON-OFF switch at OFF.

(2) TUNE-ANT CUR switch at TUNE.

(3) RECEIVER TUNE-OPERATE switch at OPERATE.

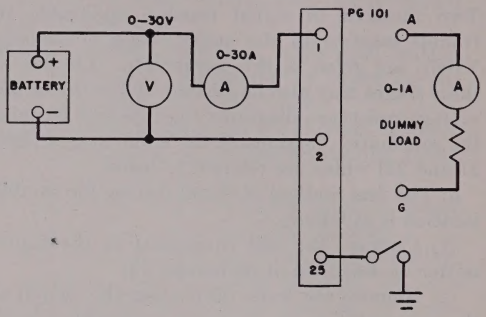
(4) METER SWITCH in position No. 6.

(5) RADIO-INTERPHONE switch at RADIO.

(6) TANK-OTHER USE switch at OTHER USE.

d. The text for the following tests is written as a step-by-step procedure; that is, the test equipment connected with the transmitter, and the switch adjustments at the beginning of a test are assumed to be the same as those at the end of the preceding test.

R. F. POWER OUTPUT-D. C. POWER INPUT TEST CONNECTIONS



TEST DATA

SELECTOR BUTTON	FREQ. MC	ANT. CUR	BATTERY CURRENT			POWER OUTPUT	POWER INPUT
			RADIO	INTERPHONE	FIL		
1	20	.65	22 A	12 A	5 A		
5	24	.65					
10	27.9	.65					

TL 51003 S

Figure 13. Radio Transmitter BC–604–(*), d-c power input (r-f power output) test diagram.

32. D-C Power Input (R-F Power Output) Test

a. The data required for making this test is given in figure 23.

b. Connect a direct current (d-c) ammeter (0 to 30 amperes) in series with the battery (fig. 23), observing polarity in making the connection.

c. Latch push button No. 1. Turn the TRANSMITTER ON-OFF switch to ON. After the tubes have warmed up for at least 5 seconds, start the dynamotor by turning the RECEIVER TUNE-OPERATE switch to RECEIVER TUNE.

d. Turn the TUNE-ANT CUR switch to ANT CUR and compare the readings obtained on the panel meter with those in the table of figure 23 for the three crystals as selected by push buttons No. 1, 5, and 10.

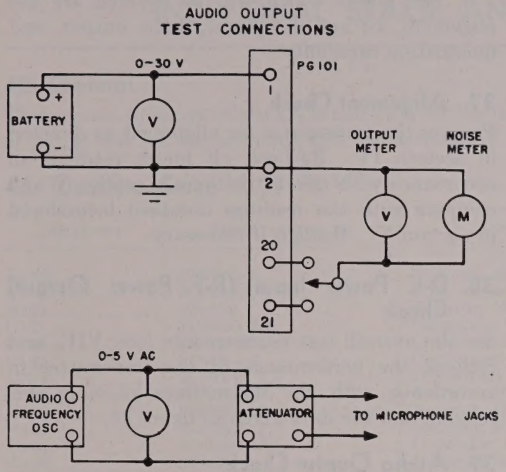
e. Note the input current value as read by the 0 to 30-ampere d-c ammeter with the dynamotor running, and compare this reading with that given for RADIO in the table on figure 23.

f. Turn the RADIO-INTERPHONE switch to INTERPHONE and note the ammeter reading with the dynamotor running. Compare it with the value given in figure 23 for battery drain on INTERPHONE.

g. Stop the dynamotor and again compare the reading with that given in the table of figure 23 for battery drain on FILAMENTS.

33. Audio Output Test

a. The data required for making this test are given in figure 24.



TEST DATA

AUDIO OUTPUT VOLTS	ATTENUATION DB	INTERPHONE			SIDETONE OUTPUT DB	TEST
		OUTPUT DB	NOISE %	DIST. DB		
1.73	−20	21	12	25	15	PART 1
4.0	0	22	12	25		PART 2

TL51004 S

Figure 14. Radio Transmitter BC-604-(*), audio output test diagram.

b. Procure the test equipment specified in table I. Turn the TRANSMITTER ON-OFF switch to OFF, and connect the equipment with the transmitter as follows:

(1) Connect the output of the audio oscillator with the input of the calibrated attenuator. Do not ground either lead of the audio oscillator.

(2) Connect the output of the attenuator with terminals C and D of the magnetic microphone jack (J–101) through a suitable plug (PL–118).

(3) Connect the alternating-current (a-c) voltmeter (0 to 5 volts) across the output of the audio oscillator.

(4) Adjust the load on the output meter to 8,000 ohms. Connect the meter with terminals No. 2 and 20 (or 21) on PG–101.

c. Test the audio output of the transmitter as follows:

(1) Turn the a-f oscillator on and set the frequency at 400 cycles per second (cps). Set the output control to give 1.73 volts as read by the 0 to 5-volt a-c meter.

(2) Set the calibrated attenuator to 20 decibels (db).

(3) Set the SIDETONE control (fig. 2) at maximum.

(4) Turn the transmitter on, latch push button No. 1, 5, or 10, and after the tubes have warmed up for at least 5 seconds, start the dynamotor.

(5) The output and noise and distortion meters should now indicate approximately the readings given in figure 24. Record the readings obtained.

(6) Stop the dynamotor.

d. Test the audio output of the transmitter (carbon microphone input jack) as follows:

(1) Change the attenuator connection from the magnetic microphone jack to carbon microphone jack J–102 using plug PL–68 instead of plug PL–118.

(2) Change the audio oscillator output to 4 volts, and change the attenuator to 0 db.

(3) Start the dynamotor. The output and noise and distortion meter readings should be approximately the same as those in the table of figure 24.

34. Modulation Capability Test

a. The data required for making this test are given in figure 25.

b. Stop the dynamotor and disconnect the output and the noise and distortion meters.

c. Change the audio oscillator output to the minimum setting. Leave the frequency at 400 cps.

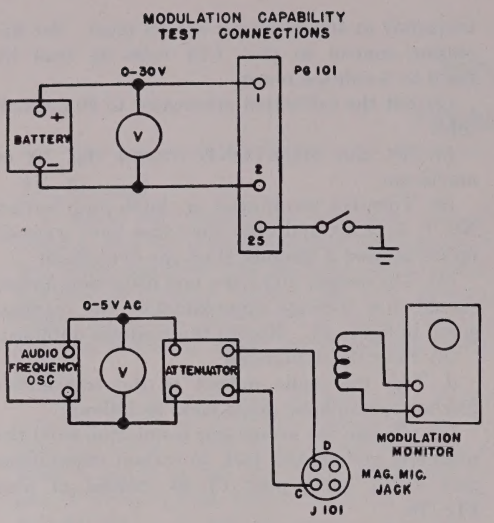
d. Turn on the modulation monitor and place its pick-up coil near transmitter antenna-coupling coil L–110. Latch push button No. 5 and start the dynamotor. Then adjust the coupling distance between L–110 and the pick-up coil to obtain about 2 inches deflection on the modulation monitor oscillograph.

e. Gradually increase the output of the audio oscillator until a series of dots just begins to appear along the zero carrier (base) line on the oscilloscope. The dots indicate 100 percent amplitude modulation.

f. Adjust the sweep frequency of the oscilloscope until the dots are clearly defined.

g. The correct audio oscillator voltage (as read by the 0- to 5-volt a-c meter) is that which just causes the dots to appear at the base line of the oscilloscope.

h. Compare this voltage with that given in the table of figure 25.



TEST DATA				
TRANSMITTER FREQ.	AUDIO FREQ.	% MOD	TRACE HEIGHT	AUDIO INPUT
24 MC	400 CPS	100	2 IN	1.5V-5V

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Figure 15. Radio Transmitter BC–604–(*), modulation capability test diagram.

35. Moistureproofing, Fungiproofing, and Refinishing

a. See TB SIG 13 for general information concerning moistureproofing and fungiproofing.

b. Specific instructions for moistureproofing and fungiproofing of Radio Transmitter BC–604–(*) are contained in C2, TM 11–600.

c. If the transmitter case has been scarred or chipped, remove any rough spots with #00 or #000 sandpaper, and apply paint to the spots with a small brush. If the case is sufficiently scarred or scratched to warrant complete refinishing, remove the transmitter chassis from its case, remove all nameplates, cover parts that are not to be painted, and remove all rust and dirt. Spray entire case with the properly authorized paint.

36. Operational Check

a. The purpose of the operational check of this manual is to recheck the alignment and over-all test requirements, in order to determine whether or not the moistureproofing and fungiproofing of the set has interfered with its functioning.

b. The points which will be covered are the alignment, r-f and d-c power, audio output, and modulation capability.

37. Alignment Check

Prepare the transmitter for alignment as directed in section IV. Recheck all meter readings in accordance with the instructions in section V and compare with the readings obtained beforehand in section V. Realign if necessary.

38. D-C Power Input (R-F Power Output) Check

See the over-all test requirements (sec. VII), and recheck the performance of the transmitter in accordance with the instructions given in this section, and the data given in figure 23.

39. Audio Ouptut Check

See the over-all test requirements (sec. VII), and recheck the audio output of the transmitter in accordance with the instructions given in that section, and the data given in figure 24.

40. Modulation Capability Check

See the over-all test requirements (sec. VII), and recheck the modulation capability of the transmitter in accordance with the instructions given in that section, and the data given in figure 25.

41. Operational Test

a. After the foregoing tests have been made, the transmitter should operate correctly. If any further trouble is found, such as reduced power output, poor modulation, frequency drift, low audio or sidetone output, or heavy power drain, see sections V and VII, for alignment instructions and performance characteristics. Recheck all the tests covered in section VI until satisfactory performance is obtained.

b. To determine whether or not the transmitter will operate properly with an associated receiver, it is necessary to check the operation at receiver disabling relay S103. (See fig. 7.) When the press-to-talk switch on the microphone is operated, the relay should close, grounding terminals No. 7 and 22 on PG101. Correct relay operation may be determined by placing an ohmmeter from terminals No. 7 and 22 to ground (frame of set).

SECTION VIII

INDIVIDUAL STAGE AND CIRCUIT REPAIR DATA

42. General

This section presents information and data for the repair of individual stages and circuits, for the location of parts, and for the servicing and replacement of parts requiring special techniques.

43. Oscillator Stage V107 (fig. 16)

Ref symbol	Signal Corps stock No.	Name of part and description	Function
R149	3Z6005–9	Resistor, 50-ohm, ±10%, 1 w with L117	Grid antising.
L117	2C6494A/C16	Coil, wound on R149	Grid antising.
R101	3Z4550	Resistor, 100,000-ohm, ±10%, ½ w	Grid return.
C151	3D9050–53	Capacitor, 0.0005-mf, ±5%, 800-volt	Grid bypass.
C150	3DA1–72	Capacitor, 0.001-mf, 800-volt	Plate coupling.
C105	3D9015–2	Capacitor, 15-mmf, ±10%	Plate tuning.
L102	2C6494A/C9	Duolateral coil, 1-mh	Plate choke.
R118	3Z6700–12	Resistor, 100,000-ohm, ±10%, 2 w	Plate supply.
R158	3Z6700–12	Resistor, 100,000-ohm, ±10%, 2 w	Plate supply.
R157	3Z6700–12	Resistor, 100,000-ohm, ±10%	Plate supply.
C104	3D9500–20	Capacitor, 0.0005-mf, 800-volt	Plate bypass.
R138	3Z4531	Resistor, 50,000-ohm, ±10%, ½ w	Screen supply.
C146	3ZA3–6	Capacitor, 0.003-mf, 800-volt	Screen bypass.

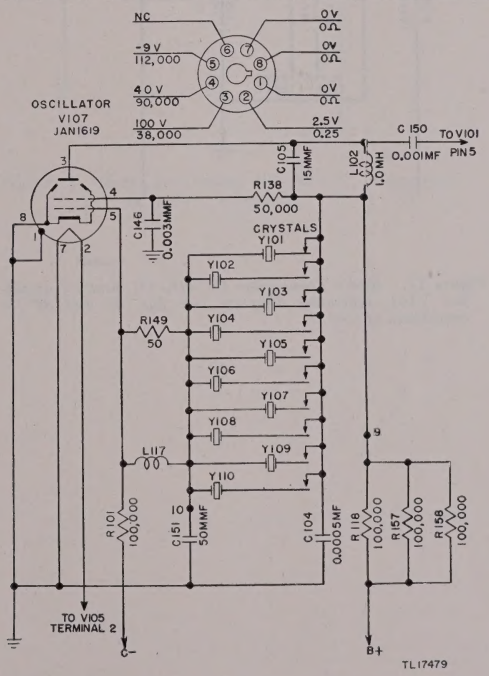


Figure 16. Radio Transmitter BC–604–(*), oscillator V107, schematic diagram (see figs. 35 and 36 for conditions of test).

44. First R-F Stage V101 (fig. 17)

Ref symbol	Signal Corps stock No.	Name of part and description	Function
R139	3Z4550	Resistor, 100,000-ohm, ±10%, ½ w	Grid return.
R127	3Z4801–1	Resistor, 1-ohm, ±5%, ¾ in	Filament dropping.
C103	3D9100–21	Capacitor, 0.001-mf, ±5%, 800-volt d-c	Plate coupling.
L101	2C6494A/C8	Coil, 2 mh, duolateral	Plate choke.
R103	3Z6725–5	Resistor, 250,000-ohm, ±10%, 1 w	Screen supply.
C101	3DA3–6	Capacitor, 0.003-mf, 800-volt d-c	Screen bypass.

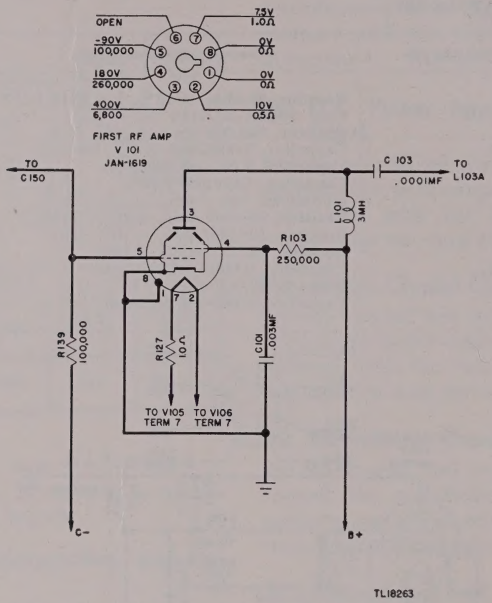


Figure 17. Radio Transmitter BC–604–(*), first r-f amplifier V101, schematic diagram (see figs. 35 and 36 for conditions of test).

45. Modulation Section (fig. 18)

Ref symbol	Signal Corps stock No.	Name of part and description	Function
L103	2C6494A/C10	Coil, 0.4 mh, duolateral	Plate tuning.
C106	See note	Variable air capacitor, 350-mmf; part of push-button tuner capacitor assembly.	Rectifier grid tuning.
C147	3D9175–5	Capacitor, 175-mmf, ± 2%, 800-volt, d-c	Plate padding.
C108	3D9500–20	Capacitor, 0.0005-mf, 800-volt d-c	Rectifier grid coupling.
L104	2C6494A/C11	Retardation coil (SC–1003)	Modulation coil.
L105	2C6494A/C12	Coil, 0.5-mh, duolateral	Second audio r-f choke.

Note. Capacitors 106, 113, 115, 119, 152, 156, 114, 116, 120, 153, 157, and 125–136 inclusive, furnished as part of tuner assembly.

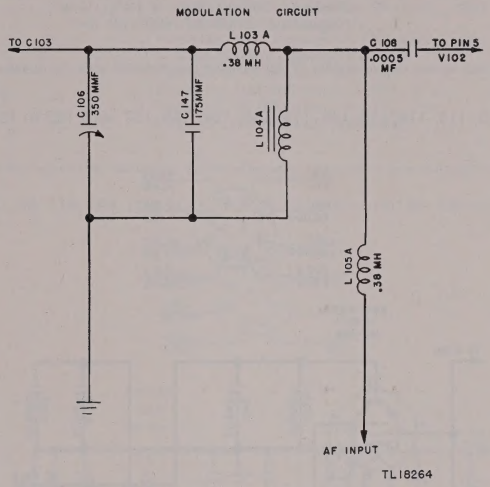


Figure 18. Radio Transmitter BC–604–(*), modulation section, schematic.

46. Rectifier Stage V102 (fig. 19) [1]

Ref symbol	Signal Corps stock No.	Name of part and description	Function
R104	3Z4531	Resistor, 50,000-ohm, ±10%, ½ w	Grid return.
R113	3Z4801–1	Resistor, 1-ohm, ±5%, 1¾ in	Filament dropping.
L119	2C6494A/C17	Coil, close-wound, solenoid	Plate tuning.
C153	See note	Variable air capacitor, 20-mmf; part of push-button tuner capacitor assembly.	Plate tuning.
C152	See note	Variable air capacitor, 60-mmf; part of push-button tuner capacitor assembly.	Plate trimmer.
R119	3Z6120–1	Resistor, 1,200-ohm, ±10%, ½ w	Rectifier plate supply.
C154	3DA3–6	Capacitor, 0.003-mf, 600-volt d-c	Plate bypass.
R105	3Z4562	Resistor, 250,000-ohm ±10%, ½ w	Screen supply.
R142	3Z4531	Resistor, 50,000-ohm, ±10%, ½ w	Screen shunt.
C109	3DA3–6	Capacitor, 0.003-mf, 800-volt d-c	Screen bypass.

[1] L118, C156, C157, C155, and R144 which appear on the rectifier (V102) schematic are repeated from the doubler schematic. These values will be found in paragraph 47.

Note.—Capacitors C106, 113, 115, 119, 152, 156, 114, 116, 120, 153, 157, and 125 to 136 inclusive furnished as part of tuner assembly.

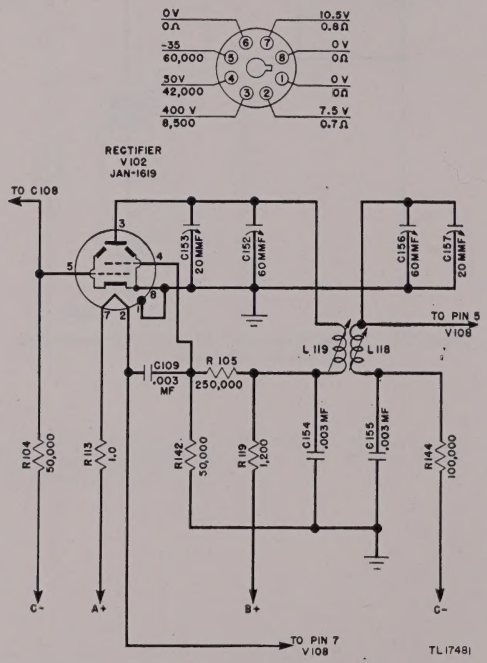


Figure 19. Radio Transmitter BC–604–(*), rectifier V102 schematic diagram (see figs. 35 and 36 for conditions of test).

47. Doubler Stage V108 (fig. 20) [1]

Ref symbol	Signal Corps stock No.	Name of part and description	Function
L118	2C6494A/C17	Coil, close-wound, solenoid	Grid tuning.
R144	3Z4550	Resistor, 100,000-ohm ± 10%, ½ w	Grid return.
C156	See note	Variable air capacitor, 60-mmf; part of push-button capacitor.	Grid tuning.
C157	See note	Variable air capacitor, 20-mmf; part of push-button capacitor.	Grid trimmer.
C155	3DA3–6	Capacitor, 0.003-mf, 800-volt d-c	Grid bypass.
C159	3DA10–48	Capacitor, 0.01-mf, 300-volt	Filament bypass.
L106	2C6494A/C13	Coil, close-wound, solenoid	Plate tuning.
C113	See note	Variable air capacitor, 60-mmf; part of push-button capacitor.	Plate tuning.
C114	See note	Variable air capacitor, 20-mmf; part of push-button capacitor.	Plate trimmer.
C111	3DA3–6	Capacitor, 0.003-mf, 800-volt	Plate bypass.
R145	3Z6700–12	Resistor, 100,000-ohm, ± 10%, 2 w	Screen supply.
R150	3Z6625–2	Resistor, 25,000-ohm, ± 10%, 1 w	Screen shunt.
C158	3DA3–6	Capacitor, 0.003-mf, 800-volt	Screen bypass.

[1] L107, C115, C116, C112, and R107, which appear on the doubler (V108) schematic, are repeated from the tripler schematic. These values will be found in paragraph 48.

Note. Capacitors 106, 113, 115, 119, 152, 156, 114, 116, 120, 153, 157, and 125–136 furnished as part of tuner assembly.

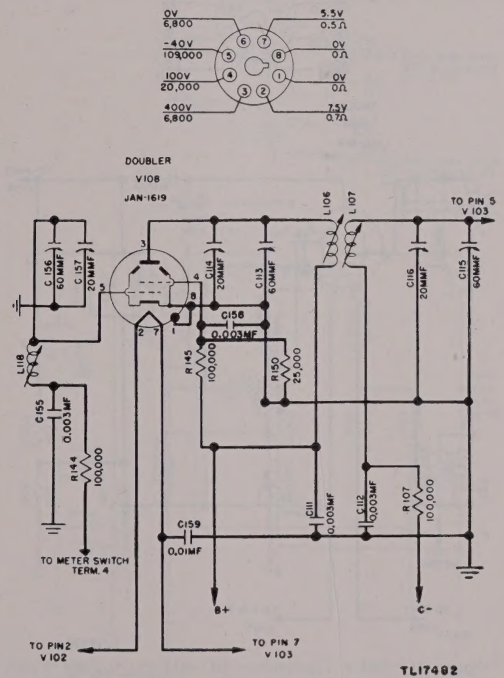


Figure 20. Radio Transmitter BC–604–(*), doubler V108, schematic diagram (see figs. 35 and 36 for conditions of test).

48. Tripler Stage V103 (fig. 21) [1]

Ref symbol	Signal Corps stock No.	Name of part and description	Function
L107	2C6494A/C13	Coil, close-wound, solenoid	Grid tuning.
R107	3Z4550	Resistor, 100,000-ohm, ±10%, ½ w	Grid return.
C116	See note	Variable air capacitor, 20-mmf, part of push-button tuner capacitor assembly.	Grid trimmer.
C115	See note	Variable air capacitor, 60-mmf, part of push-button tuner capacitor assembly.	Grid tuner.
C112	3DA3–6	Capacitor, 0.003-mf, 800-volt d-c	Grid bypass.
C123	3DA10–48	Capacitor, 0.01-mf, 300-volt d-c	Filament bypass.
C121	3DA3–6	Capacitor, 0.003-mf, 800-volt d-c	Plate coupling.
L108	2C6494A/C14	Coil, close-wound, solenoid	Plate tuning.
C118	3DA3–6	Capacitor, 0.003-mf, 800-volt d-c	Plate bypass.
R109	3Z6700–12	Resistor, 100,000-ohm, ±10%, 2 w	Screen supply.
C117	3DA3–6	Capacitor, 0.003-mf, 800-volt d-c	Screen bypass.

[1] C120, R111, R112, and C148 which appear on the tripler (V103) schematic are repeated from the power-amplifier schematic. These values will be found in paragraph 49.

Note. Capacitors 106, 113, 115, 119, 152, 156, 114, 116, 120, 157, 153, and 125 to 136 inclusive, furnished as part of tuner assembly.

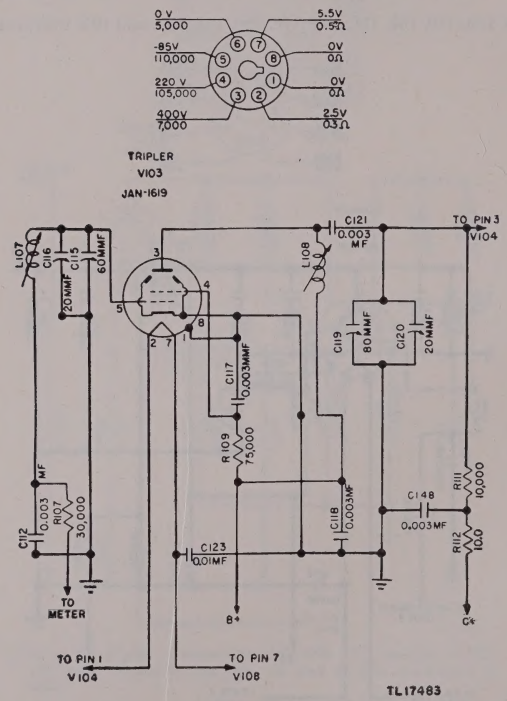


Figure 21. Radio Transmitter BC–604–(*), tripler V103, schematic diagram (see figs. 35 and 36 for conditions of test).

49. Power-Amplifier V104 Stage (fig. 22)

Ref symbol	Signal Corps stock No.	Name of part and description	Function
R111	3Z6610–11	Resistor, 10,000-ohm, ±10%, 1 w	Grid return.
R112	3Z6001–2	Resistor, 10-ohm, ±10%, ½ w	Grid metering.
C119	See note	Variable air capacitor, 80-mmf; part of push-button capacitor.	Tripler plate tuning.
C120	See note	Variable air capacitor, 20-mmf; part of push-button capacitor.	Plate tripler trimmer.
C148	3DA3–6	Capacitor 0.003-mf, 800-volt d-c	Grid bypass.
L110	2C6494A/C15	Coil, space-wound, solenoid	Output tuning.
C149	3DA1–21	Capacitor 0.001 mf, 1,200-volt d-c	Plate coupling.
C125	See note	Variable air capacitor, 60-mmf; part of push-button capacitor.	Plate tuning.
C126	See note	Variable air capacitor, 20-mmf; part of push-button capacitor.	Plate trimmer.
R146	3Z6005–9	Resistor, 50-ohm with L116	Plate antising.
L116	2C6494A/C16	Coil, wound on R146	Plate filter.
L120	2C6530–684A/C1	Coil, Z1 choke	Plate choke.
C124	3DA1–21	Capacitor, 0.001-mf, 1,200 volt d-c	Plate bypass.
R116	3Z6630–7	Resistor, 30,000-ohm, ±10%, 2 w	Screen supply.
C122	3DA3–6	Capacitor, 0.003-mf, 800-volt d-c	Screen bypass.
R114	3Z6630–7	Resistor, 30,000-ohm, ±10%, 2 w	Screen supply.

Note.—Capacitors 106, 113, 115, 119, 152, 156, 114, 116, 120, 157, 153, and 125 to 136, inclusive, furnished as part of tuner assembly.

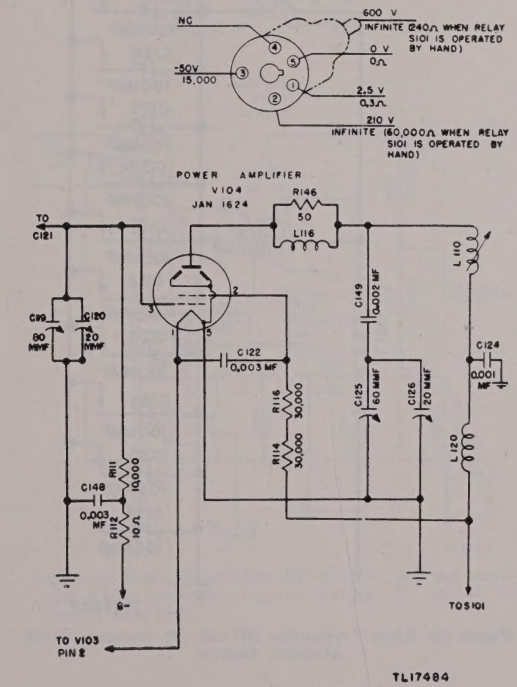


Figure 22. Radio Transmitter BC–604–(*), power-amplifier V104 schematic diagram (see figs. 35 and 36 for conditions of test).

50. Antenna Circuit (fig. 23)[1]

Ref symbol	Signal Corps stock No.	Name of part and description	Function
L111	2C6494A/C15	Coil, space-wound, solenoid	Antenna coupling.
C127; C136	See note	Capacitors, 100-mmf	Antenna tuning.

[1] L110, L120, and C124 which appear in the antenna circuit schematic are repeated from the power-amplifier schematic. These values will be found in paragraph 49.

Note.—Capacitors 127 to 136 inclusive, furnished as part of tuner assembly 1.

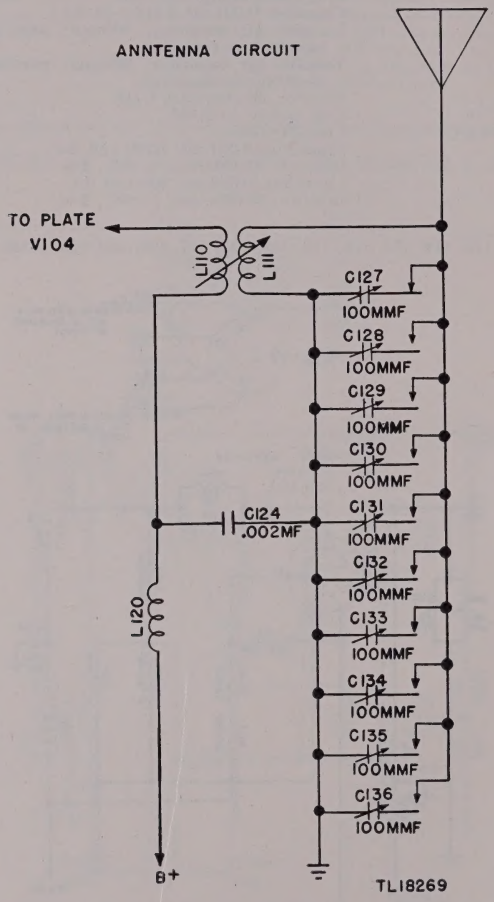
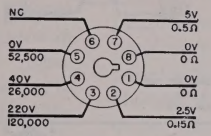


Figure 23. Radio Transmitter BC–604–), antenna circuit, schematic diagram.*

51. First A-F Amplifier Stage V105 (fig. 24)

Ref symbol	Signal Corps stock No.	Name of part and description	Function
T101	2C6494A/T2	Audio input transformer (Si—1005)	Microphone input.
R115	3Z4550	Resistor, 100,000 ±10%, ½ w	Grid loading.
C138	3DA100–28	Capacitor, two-section, each 0.1-mf, 600-volt d-c.	Carbon microphone coupling.
R117	3Z4531	Resistor, 50,000-ohm, ±10%, ½ w	Grid filter.
C137	3DA500–27	Capacitor, 0.5-mf, 600-volt d-c	Grid bypass.
R120	3Z6020–9	Resistor, 200-ohm, ±10%, 1 w	Carbon microphone series.
C140	2C6494A/C6	Electrolytic capacitor, 30-mf	Carbon microphone filter.
R121	3Z6010–18	Resistor, 100-ohm, ±10%, ½ w	Carbon microphone filter.
C141	3DA500–27	Capacitor, 0.5-mf, 600-volt d-c	Plate coupling.
R151	3Z608	Resistor, 100,000-ohm, ±10%, 1 w	Plate supply.
R123	3Z6610–11	Resistor, 10,000-ohm, ±10%, 1 w	Plate filter.
C145	3DB2.21	Capacitor, 2-mf, 1,000-volt	Plate supply filter.
C142.2	3DA100–28	Capacitor, two-section, 0.1-mf, 600 volt d-c	Plate bypass.
R122	3Z6725–5	Resistor, 250,000-ohm, ±10%, 1 w	Screen supply.
R136	3Z4540	Resistor, 30,000-ohm, ±10%, ½ w	Screen shunt.
C139	3DQ–500–27	Capacitor, 0.5-mf, 600-volt d-c	Screen bypass.



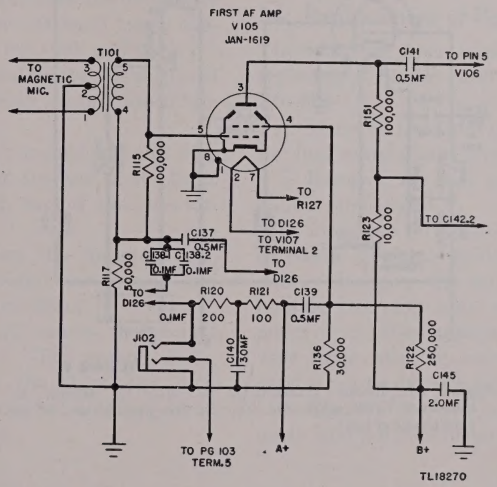
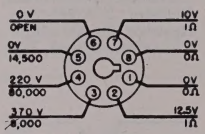


Figure 24. Radio Transmitter BC–604–(*), first a-f amplifier V105, schematic diagram (see figs. 35 and 36 for conditions of test).

52. Second A-F Amplifier Stage V106 (fig. 25) [1]

Ref symbol	Signal Corps stock No.	Name of part and description	Function
R125	3Z4549	Resistor, 40,000-ohm, ±10%, ½ w	Grid return.
R124	3Z4529	Resistor, 10,000-ohm, ±10%, ½ w	Grid filter.
C142.1	3DA100–28	Capacitor, 2-section, 0.1-mf, 600-volt, d-c	Grid bypass.
T102	2C6494A/T3	Audio output transformer (so-1006)	Audio output.
P101	2Z7288–3	Potentiometer	Sidetone control.
R156	3Z6004–1	Resistor, 40-ohm, ± 10%, 1 w	A-f load.
R128	3Z4529	Resistor, 10,000-ohm, ± 10%, ½ w	Sidetone fixed.
R126	3Z6675–10	Resistor, 75,000-ohm, ± 10%, 2 w	Screen supply.
C143	3DA500–27	Capacitor, 0.5-mf, 600-volt d-c	Screen bypass.
R148	3Z4528	Resistor, 5,000-ohm, ± 10%, ½ w	Audio gain.

[1] C142.2 which appears on the second a-f schematic is repeated from the first a-f schematic. This value will be found for the first a-f stage.



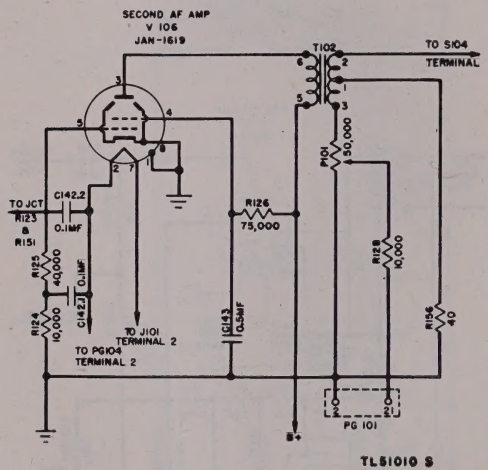


Figure 25. Radio Transmitter BC–604–(*), second a-f amplifier V106, schematic diagram (see figs. 35 and 36 for conditions of test).

53. Replacement of Push-Button Selector Unit

The following operations must be performed in replacing a push-button selector unit in Radio Transmitter BC–604–(*).

a. Unsolder the short and long coaxial cables at Antenna Post A on the rear of the front panel. Also unsolder R155 from this post. (See figs. 26a and 26b.)

b. Unsolder the short coaxial cable at antenna relay S101. (See figs. 26a and 26b.)

c. At relay S101 unsolder capacitor C161, which connects a long coaxial cable to this relay. (See figs. 26a and 26b.)

d. At the relay, unsolder the bare wire which connects the top of coil L111 to the antenna relay. (See figs. 26a and 26b.)

e. At the bottom of output coil L110 unsolder the bare wire (covered with varnished tubing) which leads to p-a screen resistor R114 located in the bottom compartment of the chassis. Also, unsolder the black-red wire leading from the coil to the local cable of the transmitter. (See figs. 26a and 26b.)

f. At insulated stud E, unsolder the bare wire leading to the bottom of the left-hand tuner contact spring assembly. (See figs. 26a and 26b).

g. At the crystal oven, unsolder the ten electrical connections to the tuner spring contact assembly. (See figs. 26a and 26b.)

h. To release the ground terminal lug and wire leading to Ground Post G on the rear of the front panel, remove the screw on top of the selector. (See figs. 26a and 26b.)

i. Remove six screws from the thermocouple, releasing it from its electrical connections and mounting. (See figs. 26a and 26b.)

j. Remove the screw which secures the ground lug to the top of the tuner. The ground wires, leading to the ferrules of the short and long coaxial cables, are also connected to the ground lugs. (See figs. 26a and 26b.)

k. Remove the screw from the top of the tuner, releasing the clamp that holds the long coaxial cable in place across the top of the unit. Carefully bend this cable to the left so that it will not interfere with the vertical movement of the tuner. (See figs. 26a and 26b.)

l. Remove four screws, releasing the antenna relay (S101) from its location. Rotate the relay upward and to the right. (See figs. 26a and 26b.)

m. Remove the gear from the bottom end of the tuner shaft by loosening the setscrew with the Bristo wrench, and remove the rack connecting the tuner to the 6-gang capacitor. (See fig. 26b).

n. Remove the three screws at the base of the tuner, releasing it from the chassis. (See fig. 26b.)

o. Remove the four screws in the panel guard and remove the guard. Unscrew the seven front panel screws and rotate the panel about its right-hand edge (where cables are located) to remove the panel apparatus from the panel opening. Lift the channel selector unit out through the top opening of the transmitter.

54. Replacement of Panel Meter

The following operations must be performed in replacing a panel meter in Radio Transmitter BC–604–(*).

a. Remove the front panel guard by removing the four panel guard screws. (See fig. 1.)

b. Remove the top cover plate and the side panel. (See fig. 2.)

c. There are three machine screws with associated elastic stop nuts holding the meter to the front panel. Remove the screws with a screw driver holding the stop nuts with a pair of long-nose pliers or an offset hexagon wrench. Since there is very little working room for this operation, be careful not to damage any of the adjacent parts.

d. Remove the two nuts on the meter binding posts, and pull the meter out of the panel.

SECTION IX
SUPPLEMENTARY DATA

55. Parts Identification

The following illustrations are provided to aid in identifying and servicing the various component parts of Radio Transmitters BC–604–A, –C, –D, –AM, –CM, and –DM.

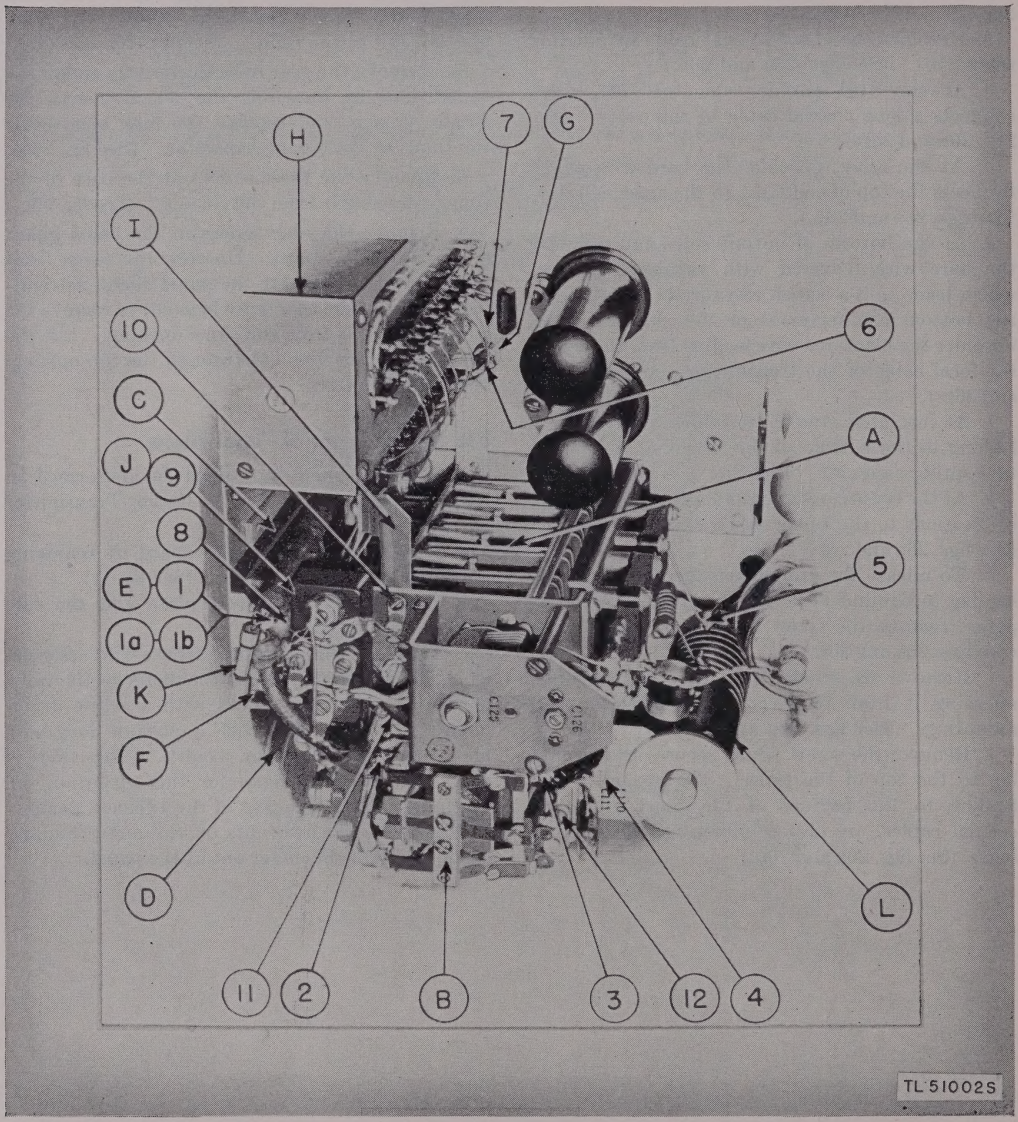
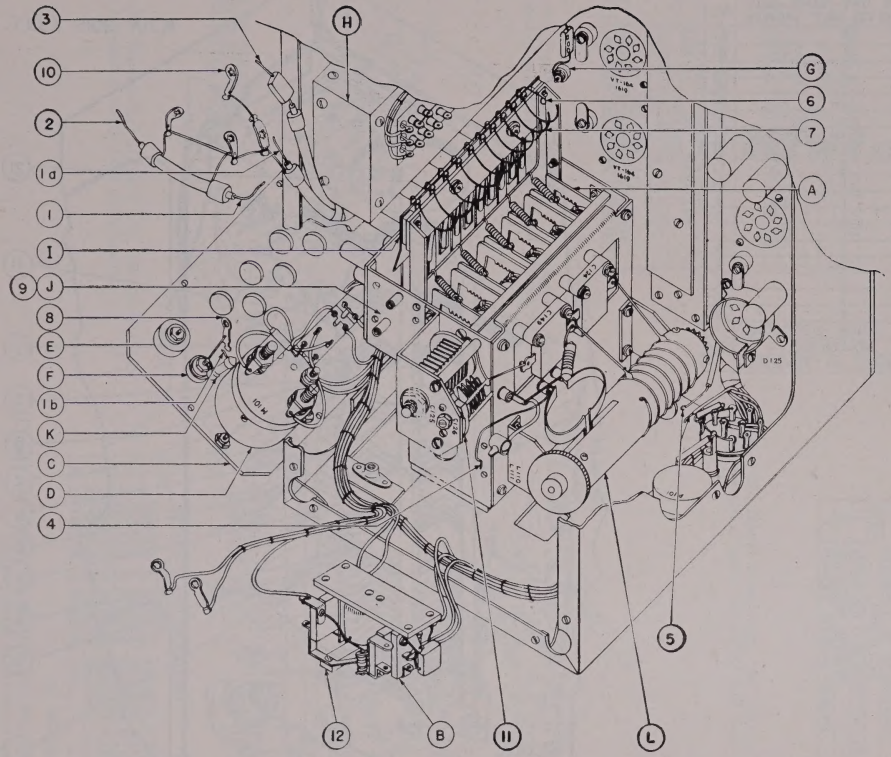
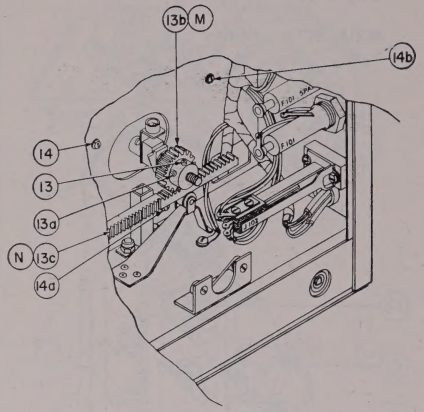


Figure 26a. Radio Transmitter BC–604–(*), push-button assembly.



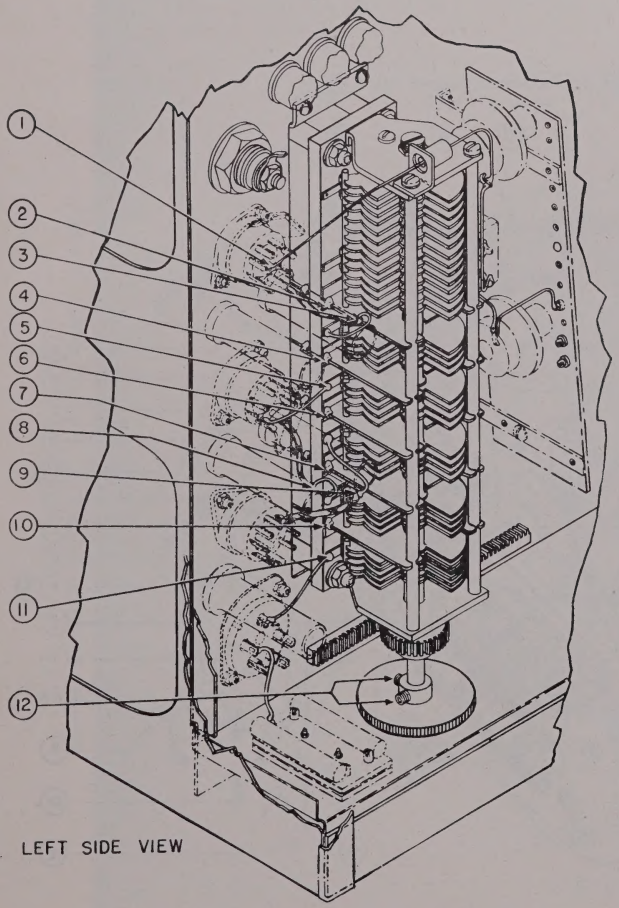


UNDER-CHASSIS VIEW

PARTS LIST	
A	PUSH BUTTON MECHANISM
B	SIOI ANTENNA RELAY
C	FRONT PANEL
D	MIOI METER
E	ANTENNA POST "A"
F	GROUND POST "G"
G	INSULATED STUD "E"
H	CRYSTAL OVEN
I	TUNER SPRING CONTACT ASSEMBLY
J	THERMOCOUPLE SEE FIGURE #31
K	RESISTOR 155
L	ANTENNA COUPLING UNIT
M	GEAR
N	RACK

TL 51009 S

Figure 26b. Radio Transmitter BC-604-(*), isometric showing removal of push-button assembly.



SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	UNSOLDER WIRE
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	REMOVE TWO (2) SET SCREWS
13	UNSOLDER WIRE
14	
15	
16	
17	
18	
19	
20	REMOVE TWO (2) ELASTIC STOP NUTS AND WASHERS
21	REMOVE TWO (2) ELASTIC STOP NUTS AND WASHERS.

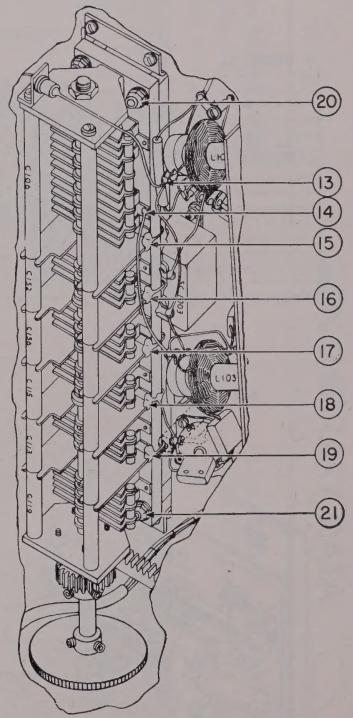
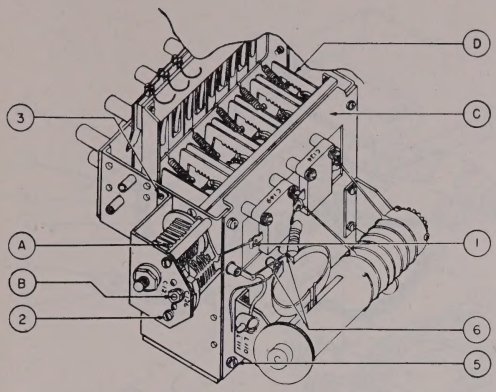


Figure 27. Radio Transmitter BC–604–(*), isometric showing removal of main gang capacitor.



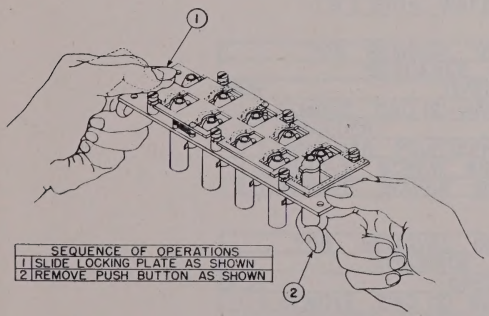
PARTS LIST	
A	POWER AMPLIFIER TUNING CAPACITOR
B	POWER AMPLIFIER TRIMMER CAPACITOR
C	ANTENNA COUPLING SUPPORT
D	PUSH BUTTON SELECTOR

REMOVAL OF POWER AMPLIFIER V103 TUNING CAPACITOR	
SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	UNSOLDER WIRE
2	REMOVE TWO (2) SCREWS & WASHERS
3	REMOVE TWO (2) SCREWS & WASHERS

REMOVAL OF ANTENNA COUPLING SUPPORT	
SEQUENCE OF OPERATIONS	
STEP	OPERATION
4	REMOVE PUSH BUTTON SELECTOR FROM CHASSIS AS DESCRIBED IN SECTION VIII - FIGURE 27
5	REMOVE FOUR (4) SCREWS & WASHERS
6	UNSOLDER TWO (2) WIRES BEHIND PART C

TL 51006 S

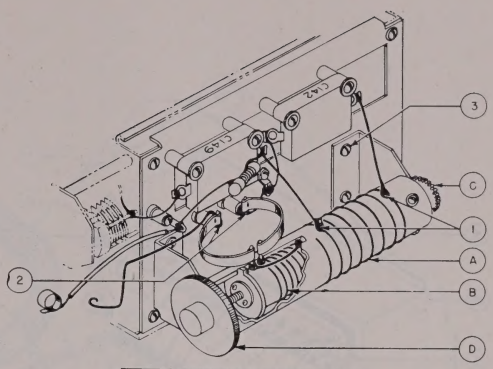
Figure 28. Radio Transmitter BC–604–(*), isometric showing removal of parts from push-button assembly.



SEQUENCE OF OPERATIONS	
1	SLIDE LOCKING PLATE AS SHOWN
2	REMOVE PUSH BUTTON AS SHOWN

TL 18210

Figure 29. Radio Transmitter BC–604–(*), isometric showing removal of individual pushbuttons.

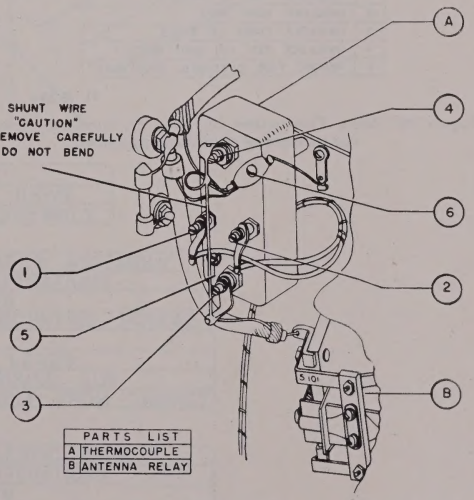


PARTS LIST	
A	POWER AMPLIFIER COIL
B	ANTENNA COUPLING COIL
C	GEAR FOR POWER AMPLIFIER SLUG UNIT
D	ANTENNA COIL TUNING KNOB

SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	UNSOLDER & REMOVE TWO (2) WIRES
2	UNSOLDER SPRINGS
3	REMOVE FOUR (4) SCREWS

TL 51007 S

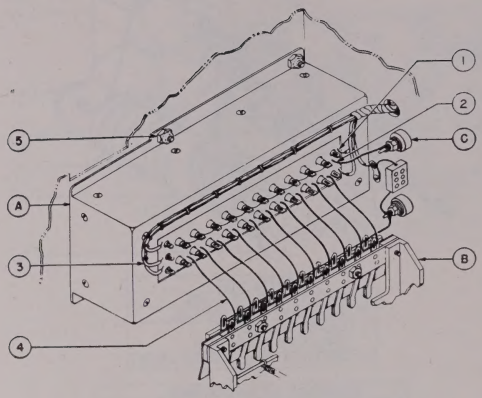
Figure 30. Radio Transmitter BC–604–(*), isometric showing removal of power amplifier and antenna-coupling coil.



SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	UNSCREW & REMOVE WASHERS & LUG
2	UNSCREW & REMOVE WASHERS & LUG
3	UNSCREW & REMOVE WASHERS & LUG
4	UNSCREW & REMOVE WASHERS & LUG
5	UNSCREW & REMOVE WASHER
6	UNSCREW & REMOVE LUG

TL 51008 S

Figure 31. Radio Transmitter BC–604–(*), isometric showing removal of thermocouple.

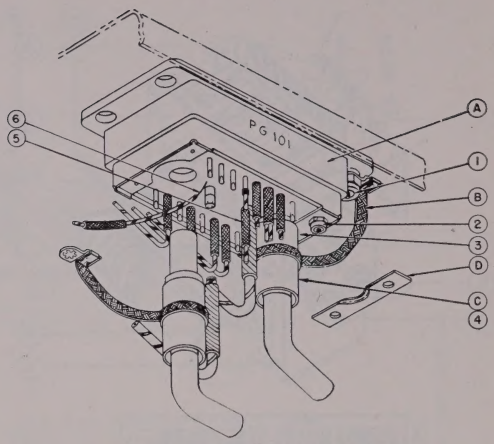


PARTS LIST	
A	CRYSTAL OVEN
B	PUSH BUTTON ASSEMBLY
C	INSULATED STUD

SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	UNSOLDER TWO (2) WIRES
2	UNSOLDER BARE WIRE
3	UNSOLDER THREE (3) WIRES
4	UNSOLDER TEN (10) BARE WIRES
5	REMOVE FIVE (5) ELASTIC STOP NUTS

TL 18284

Figure 32. Radio Transmitter BC–604–(*), isometric showing removal of crystal compartment.



PARTS LIST	
A	PG 101 CONNECTOR
B	GROUNDING LINE
C	COAXIAL LINE CONNECTOR
D	COAXIAL LOCKING PLATE

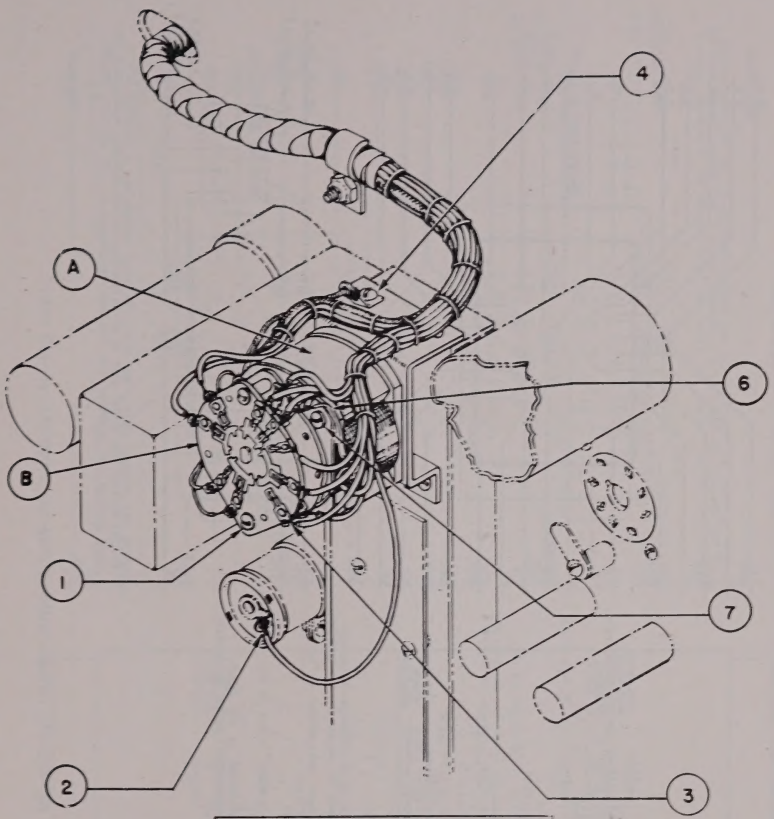
FOR REMOVAL OF PG 101 CONNECTOR SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	REMOVE FOUR (4) ELASTIC STOP NUTS AND SLEEVES

FOR REMOVAL OF COAXIAL CABLE SEQUENCE OF OPERATIONS	
STEP	OPERATION
2	REMOVE TWO (2) ELASTIC STOP NUTS
3	REMOVE COAXIAL CONNECTOR LOCKING PLATE
4	REMOVE COAXIAL CONNECTOR

FOR REMOVAL OF WIRES SEQUENCE OF OPERATIONS	
STEP	OPERATION
5	PULL BACK WIRE SLEEVING
6	UNSOLDER AS SHOWN

TL 18285

Figure 33. Radio Transmitter BC–604–(*), isometric showing removal of coaxial cables and wires from power input plug PG101.



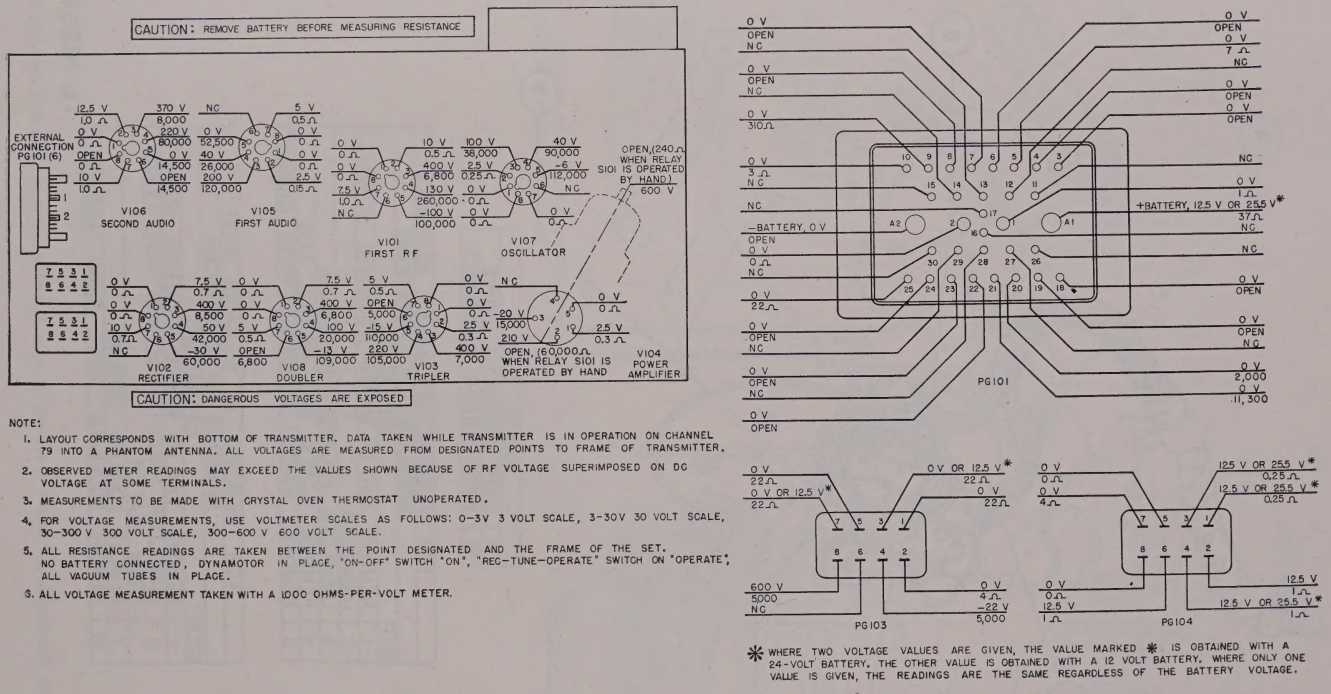
PARTS LIST	
A	S104 SOLENOID DRIVE
B	S104 WAFER ASSEMBLY

FOR REMOVAL OF WAFER ASSEMBLY SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	REMOVE TWO (2) WAFER MOUNTING SCREWS
2	UNSOLDER
3	UNSOLDER FOURTEEN (14) LEADS
4	REMOVE SCREW AND GROUND LUG
5	REMOVE WAFER ASSEMBLY FROM CABINET

FOR REMOVAL OF SOLENOID DRIVE SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	REMOVE TWO (2) WAFER MOUNTING SCREW
6	UNSOLDER THREE (3) SOLENOID COIL LEADS FROM WAFER
7	REMOVE FOUR (4) SCREWS
8	REMOVE SOLENOID DRIVE FROM CABINET

TL 18296

Figure 34. Radio Transmitter BC-604-(*), removal of water assembly and drive solenoid from relay S104.



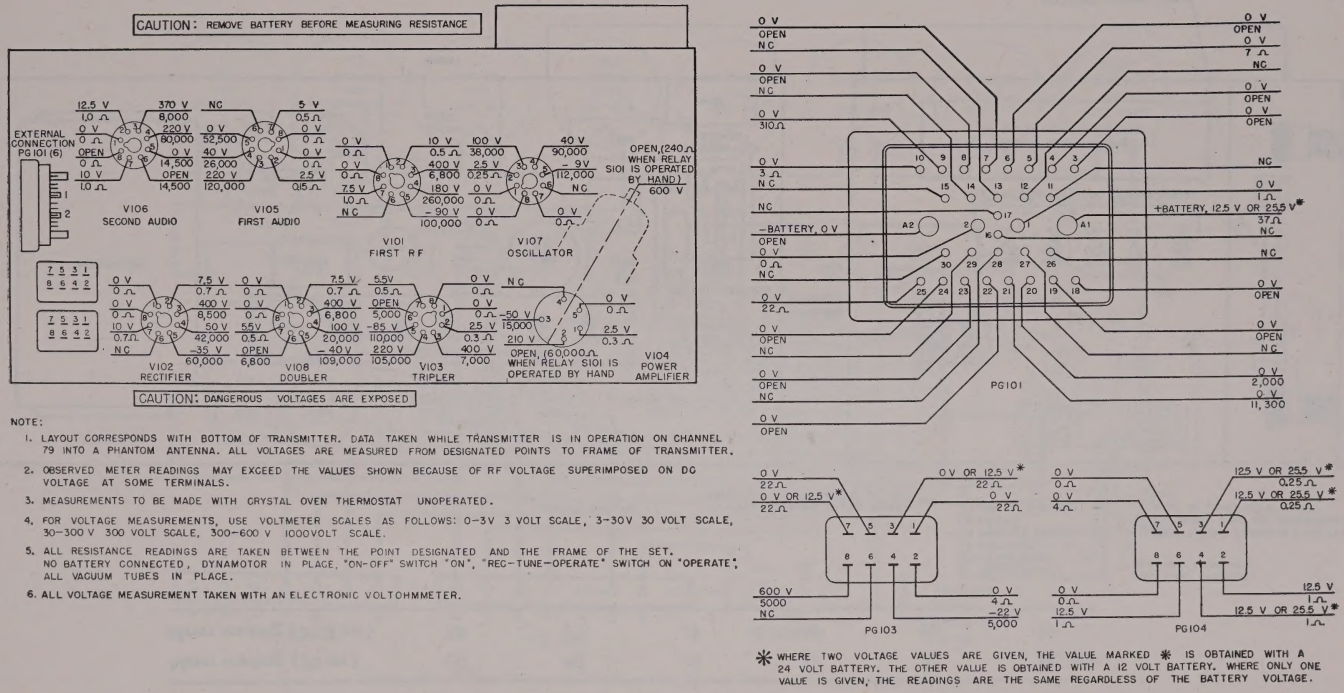
NOTE:

1. LAYOUT CORRESPONDS WITH BOTTOM OF TRANSMITTER. DATA TAKEN WHILE TRANSMITTER IS IN OPERATION ON CHANNEL 79 INTO A PHANTOM ANTENNA. ALL VOLTAGES ARE MEASURED FROM DESIGNATED POINTS TO FRAME OF TRANSMITTER.
2. OBSERVED METER READINGS MAY EXCEED THE VALUES SHOWN BECAUSE OF RF VOLTAGE SUPERIMPOSED ON DC VOLTAGE AT SOME TERMINALS.
3. MEASUREMENTS TO BE MADE WITH CRYSTAL OVEN THERMOSTAT UNOPERATED.
4. FOR VOLTAGE MEASUREMENTS, USE VOLTMETER SCALES AS FOLLOWS: 0-3V 3 VOLT SCALE, 3-30V 30 VOLT SCALE, 30-300 V 300 VOLT SCALE, 300-600 V 600 VOLT SCALE.
5. ALL RESISTANCE READINGS ARE TAKEN BETWEEN THE POINT DESIGNATED AND THE FRAME OF THE SET. NO BATTERY CONNECTED, DYNAMOTOR IN PLACE, "ON-OFF" SWITCH "ON", "REC-TUNE-OPERATE" SWITCH ON "OPERATE", ALL VACUUM TUBES IN PLACE.
6. ALL VOLTAGE MEASUREMENT TAKEN WITH A 1000 OHMS-PER-VOLT METER.

✱ WHERE TWO VOLTAGE VALUES ARE GIVEN, THE VALUE MARKED ✱ IS OBTAINED WITH A 24-VOLT BATTERY. THE OTHER VALUE IS OBTAINED WITH A 12 VOLT BATTERY. WHERE ONLY ONE VALUE IS GIVEN, THE READINGS ARE THE SAME REGARDLESS OF THE BATTERY VOLTAGE.

TL18300

Figure 35. Radio Transmitter BC-604-(*), voltage-resistance diagram (1,000-ohm-per-volt meter).



NOTE:

1. LAYOUT CORRESPONDS WITH BOTTOM OF TRANSMITTER. DATA TAKEN WHILE TRANSMITTER IS IN OPERATION ON CHANNEL 79 INTO A PHANTOM ANTENNA. ALL VOLTAGES ARE MEASURED FROM DESIGNATED POINTS TO FRAME OF TRANSMITTER.
2. OBSERVED METER READINGS MAY EXCEED THE VALUES SHOWN BECAUSE OF RF VOLTAGE SUPERIMPOSED ON DC VOLTAGE AT SOME TERMINALS.
3. MEASUREMENTS TO BE MADE WITH CRYSTAL OVEN THERMOSTAT UNOPERATED.
4. FOR VOLTAGE MEASUREMENTS, USE VOLTMETER SCALES AS FOLLOWS: 0–3 V 3 VOLT SCALE, 3–30 V 30 VOLT SCALE, 30–300 V 300 VOLT SCALE, 300–600 V 1000 VOLT SCALE.
5. ALL RESISTANCE READINGS ARE TAKEN BETWEEN THE POINT DESIGNATED AND THE FRAME OF THE SET. NO BATTERY CONNECTED, DYNAMOTOR IN PLACE, "ON-OFF" SWITCH "ON", "REC-TUNE-OPERATE" SWITCH ON "OPERATE", ALL VACUUM TUBES IN PLACE.
6. ALL VOLTAGE MEASUREMENT TAKEN WITH AN ELECTRONIC VOLTOHMMETER.

✱ WHERE TWO VOLTAGE VALUES ARE GIVEN, THE VALUE MARKED ✱ IS OBTAINED WITH A 24 VOLT BATTERY. THE OTHER VALUE IS OBTAINED WITH A 12 VOLT BATTERY. WHERE ONLY ONE VALUE IS GIVEN, THE READINGS ARE THE SAME REGARDLESS OF THE BATTERY VOLTAGE.

TL18293

Figure 36. Radio Transmitter BC-604-(*), voltage-resistance diagram (electronic voltohmmeter)

Meter Switch Positions	1	2	3	4	5	6
Circuit	Tripler Grid	1st R-F Grid	Rect. Grid	Doubler Grid	P. A. Grid	Total Plate and Screen
Meter reading (20 mc)	20	40	20	25	30	35
Meter reading (27.9 mc)	30	25	25	40	40	35

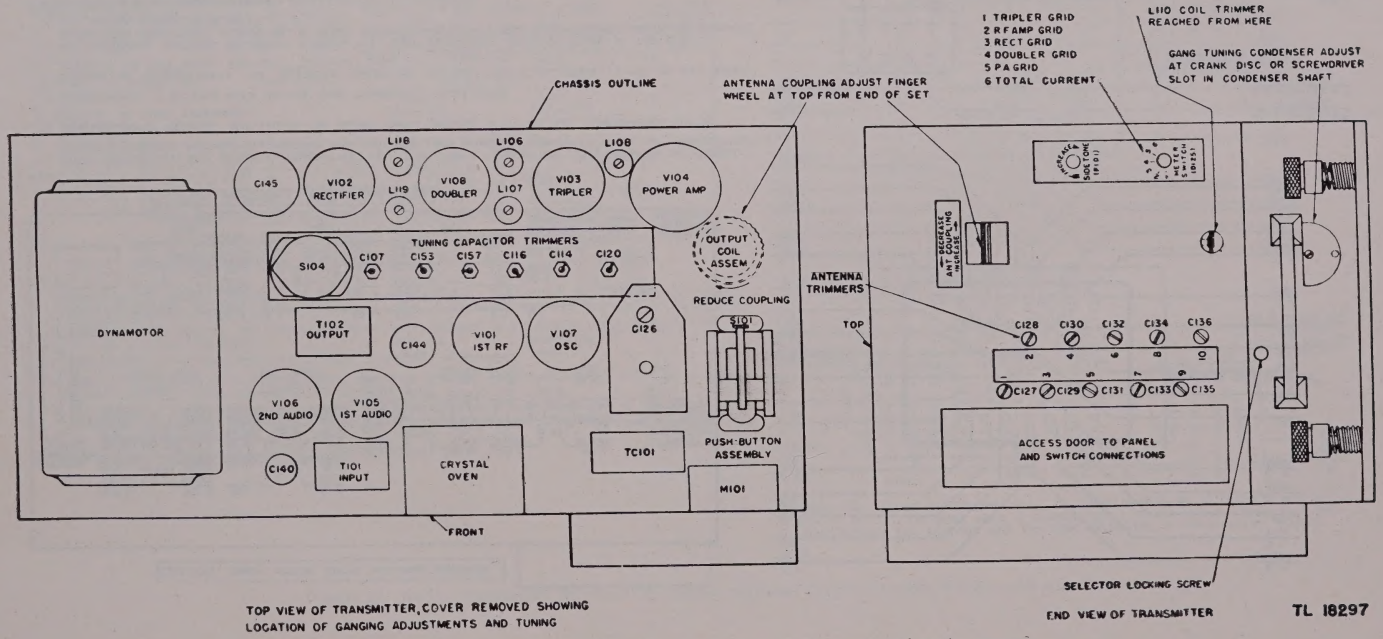


Figure 87. Radio Transmitter BC-604-(*), location of alignment and tuning controls.

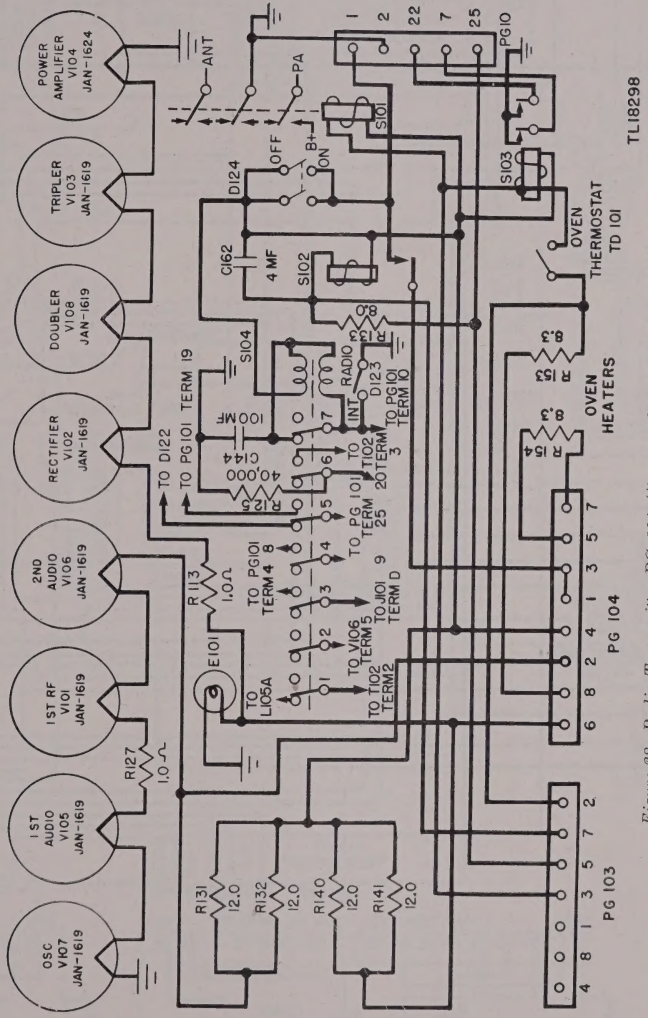
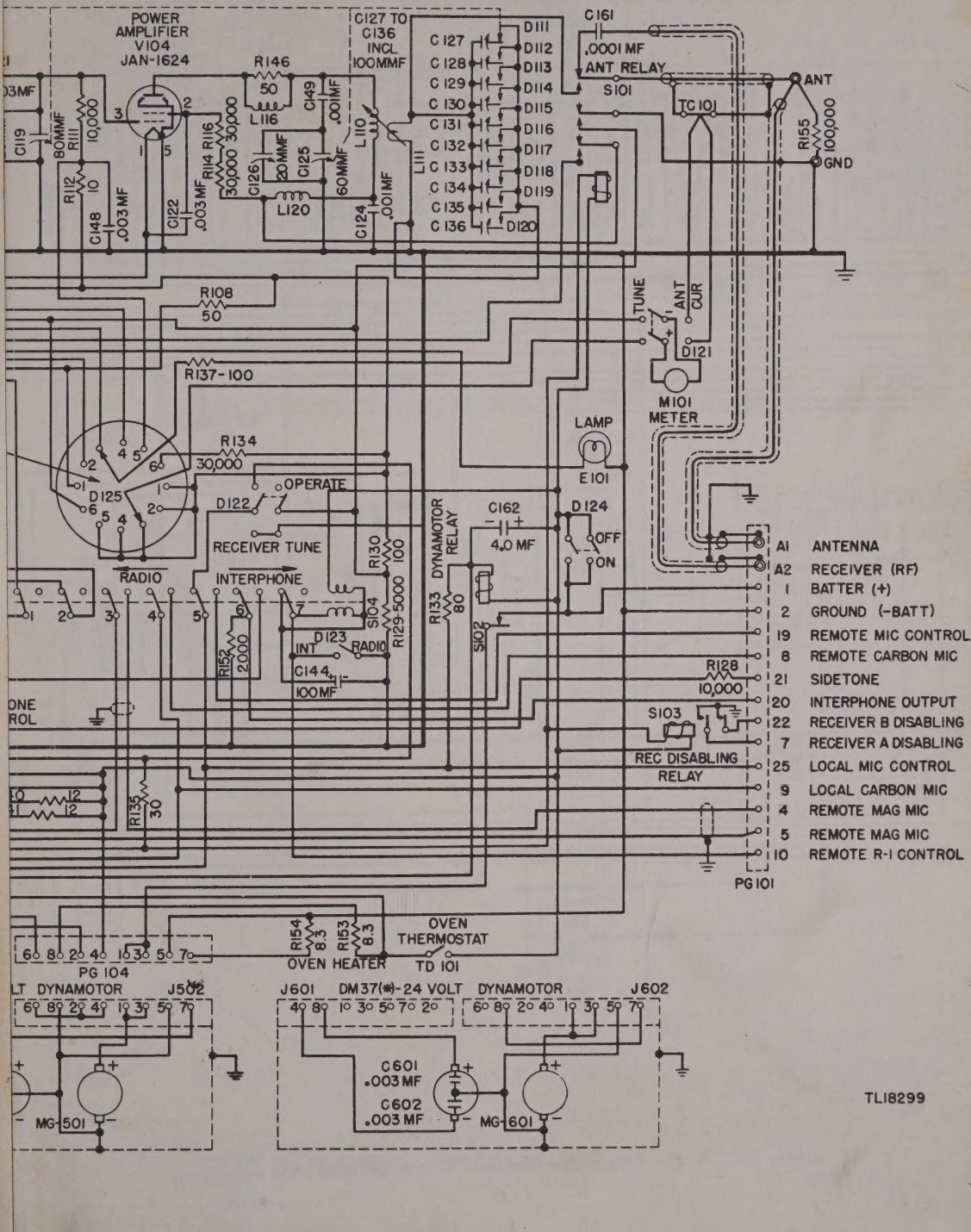


Figure 38. Radio Transmitter BC–604–(*), control circuit, schematic diagram.


POWER AMPLIFIER V104 JAN-1624
C127 TO C136 INCL 100MMF
C161 .0001 MF
ANT RELAY
S101
ANT
TC101
R155 100,000
GND
R146 50
L116
L110
L111
L120
C119 80MMF
R111 10,000
R112 10
C148 .003 MF
C122 .003 MF
R114 R116 30,000 30,000
C126 20 MMF
C125 60 MMF
C149 .001 MF
C124 .001 MF
C127 C128 C129 C130 C131 C132 C133 C134 C135 C136
D111 D112 D113 D114 D115 D116 D117 D118 D119 D120
R108 50
R137-100
TUNE
ANT CUR
D121
M101 METER
LAMP
E101
R134 30,000
D125
OPERATE
D122
RECEIVER TUNE
RADIO
INTERPHONE
R130 100
R129-5000
S104
R152 2000
D123
INT
RADIO
C144 100 MF
DYNAMOTOR RELAY
R133 80
S102
C162 4.0 MF
D124
OFF
ON
R128 10,000
S103
REC DISABLING RELAY
R135 30
R154 8.3
R153 8.3
OVEN HEATER
OVEN THERMOSTAT
TD 101
PG 104
PG 101
A1 ANTENNA
A2 RECEIVER (RF)
1 BATTER (+)
2 GROUND (-BATT)
19 REMOTE MIC CONTROL
8 REMOTE CARBON MIC
21 SIDETONE
20 INTERPHONE OUTPUT
22 RECEIVER B DISABLING
7 RECEIVER A DISABLING
25 LOCAL MIC CONTROL
9 LOCAL CARBON MIC
4 REMOTE MAG MIC
5 REMOTE MAG MIC
10 REMOTE R-I CONTROL
LT DYNAMOTOR J502
J601 DM37(*)-24 VOLT DYNAMOTOR J602
MG-501
C601 .003 MF
C602 .003 MF
MG-601
TL18299

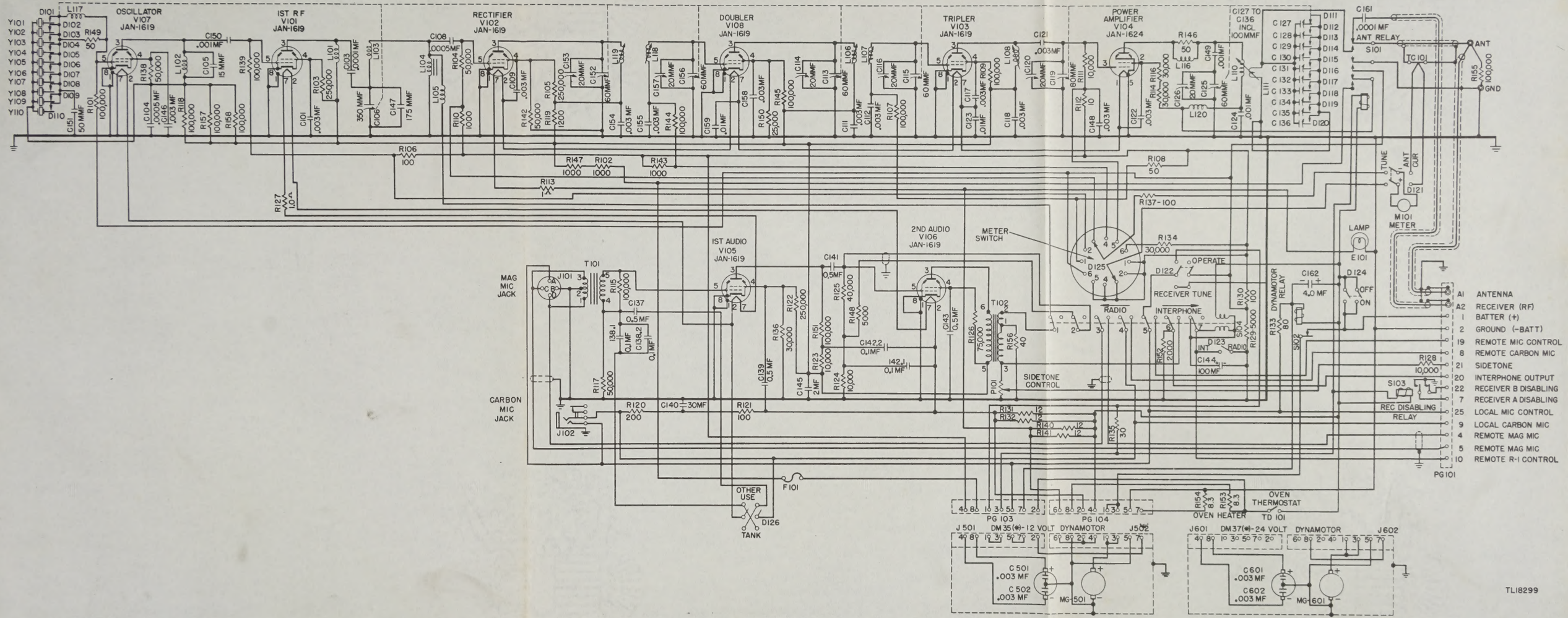
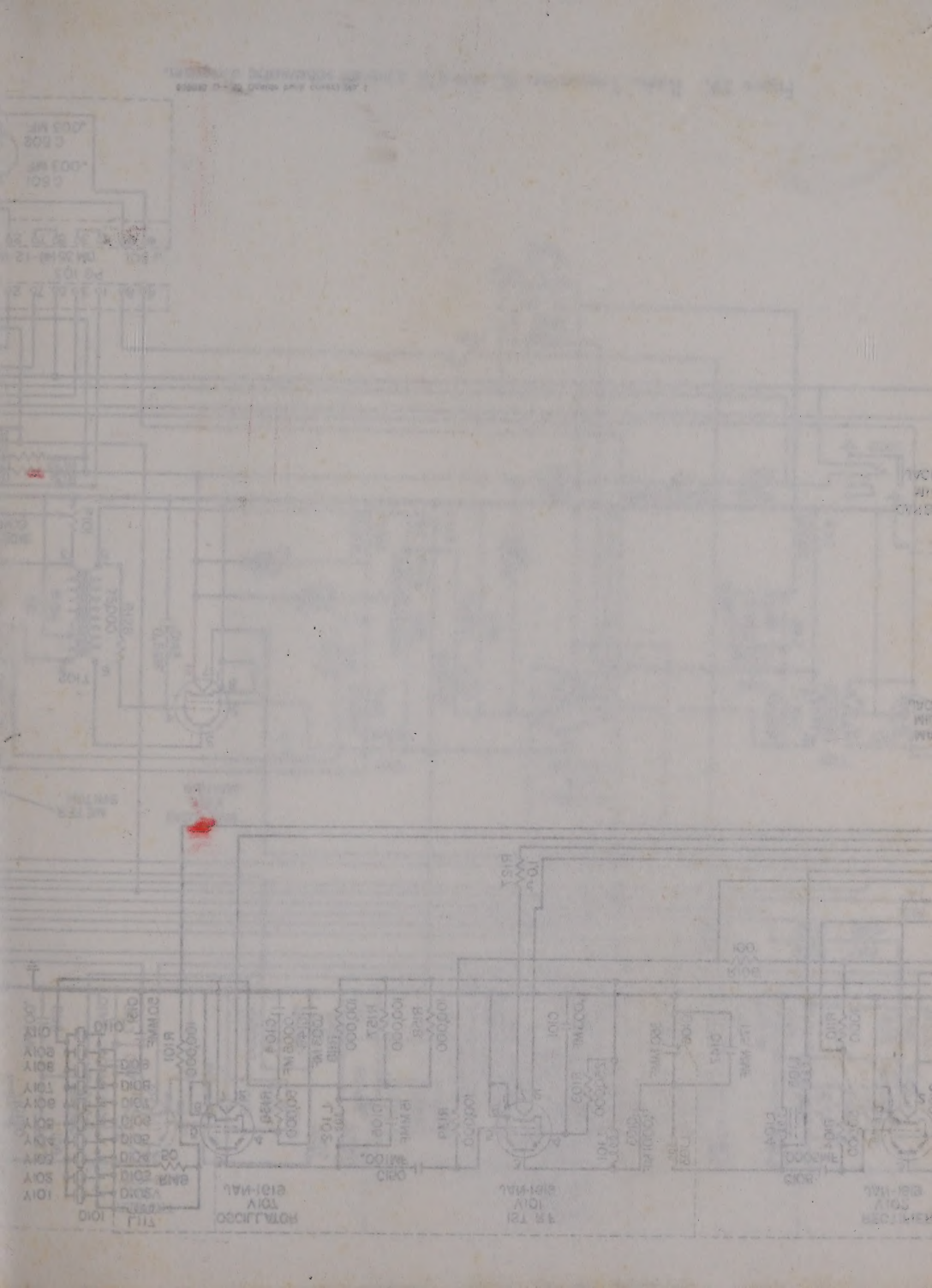
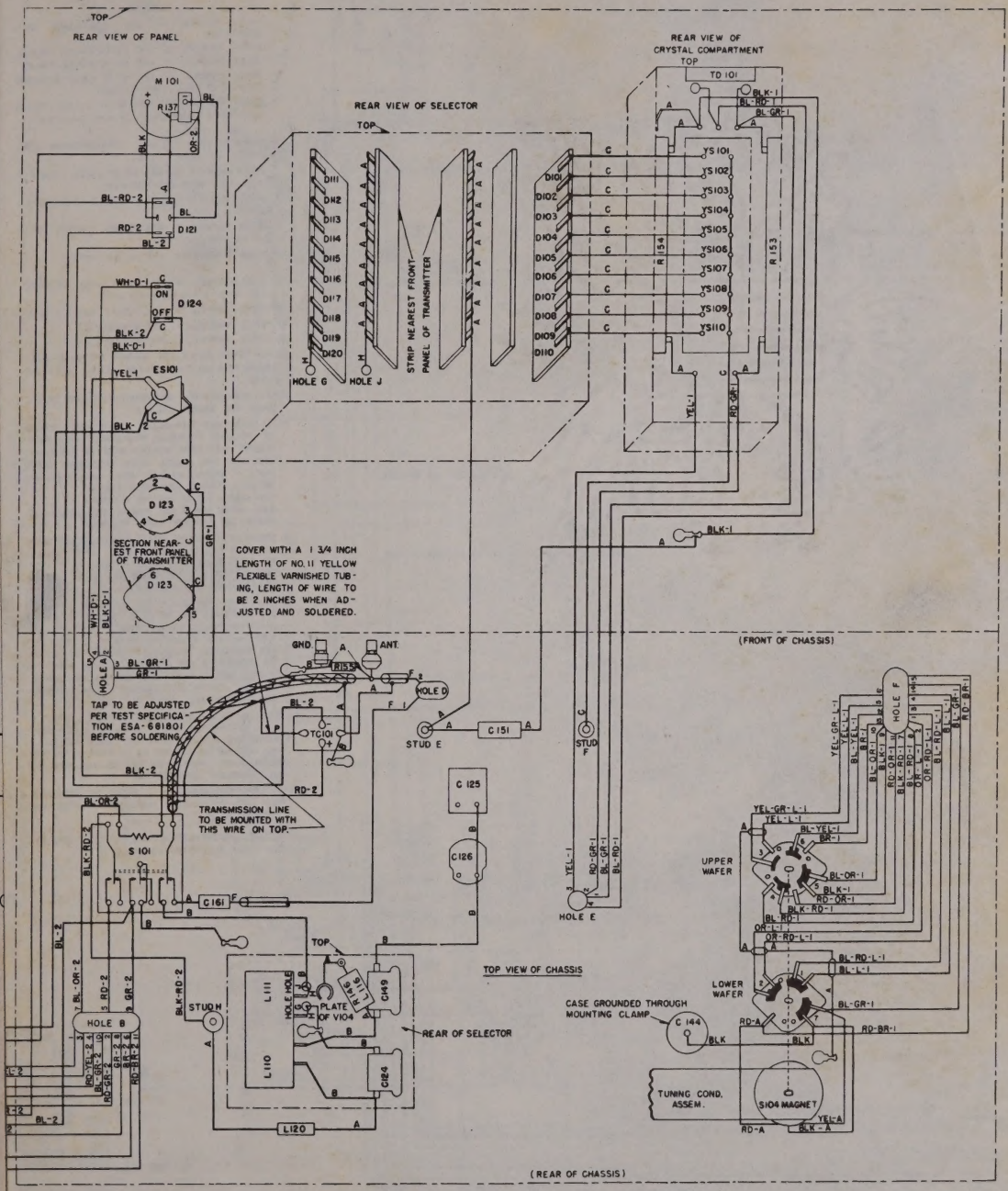
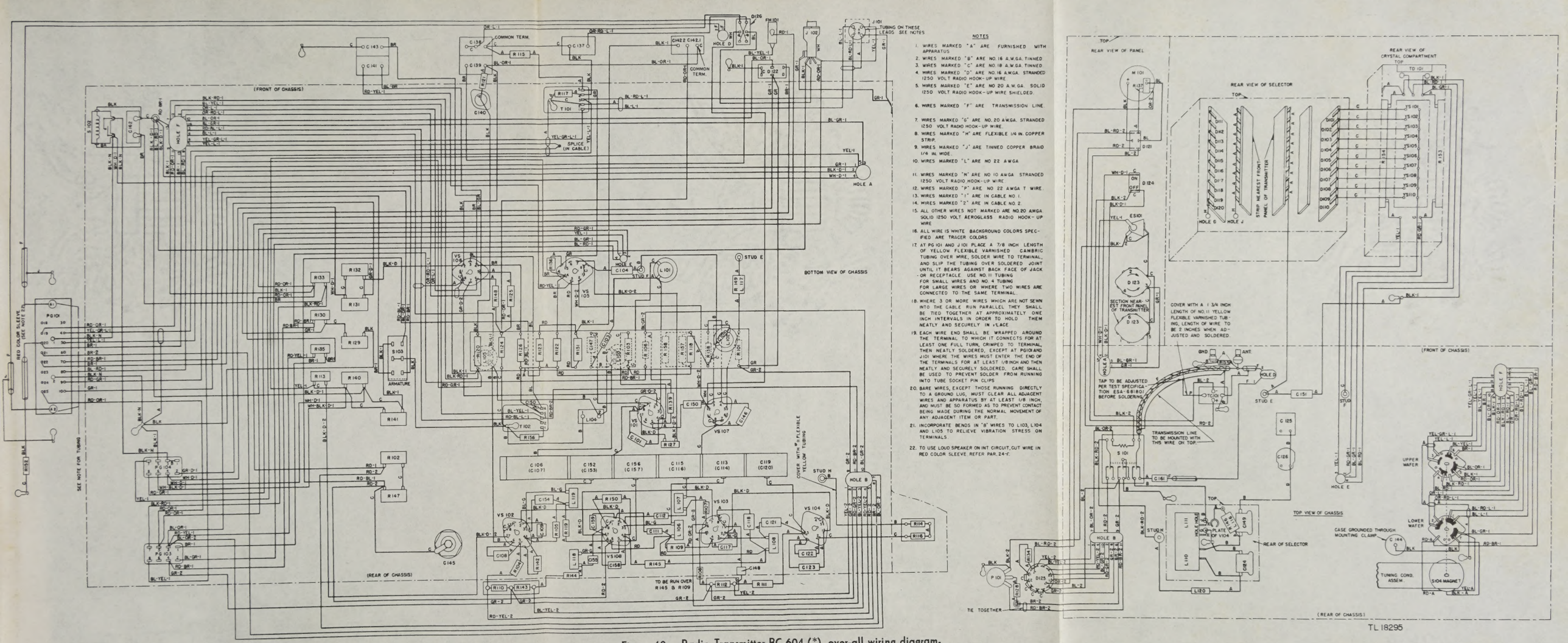


Figure 39. Radio Transmitter BC-604-(*), over-all schematic diagram.




TOP
REAR VIEW OF PANEL
M 101
R137
BL
BLK
OR-2
BL-RD-2
RD-2
BL-2
D 121
WH-D-1
D 124
BLK-2
BLK-D-1
YEL-1
ES101
BLK-2
D 123
SECTION NEAREST FRONT PANEL OF TRANSMITTER
D 123
WH-D-1
BLK-D-1
GR-1
BL-GR-1
GR-1
REAR VIEW OF SELECTOR
TOP
D111
D112
D113
D114
D115
D116
D117
D118
D119
D120
HOLE G
HOLE J
STRIP NEAREST FRONT PANEL OF TRANSMITTER
REAR VIEW OF CRYSTAL COMPARTMENT
TOP
TD 101
BLK-1
BL-RD-1
BL-GR-1
D101
D102
D103
D104
D105
D106
D107
D108
D109
D110
YS101
YS102
YS103
YS104
YS105
YS106
YS107
YS108
YS109
YS110
R154
R153
YEL-1
RD-GR-1
BLK-1
COVER WITH A 1 3/4 INCH LENGTH OF NO. 11 YELLOW FLEXIBLE VARNISHED TUBING, LENGTH OF WIRE TO BE 2 INCHES WHEN ADJUSTED AND SOLDERED.
GND
ANT.
R155
HOLE D
STUD E
C 151
STUD F
(FRONT OF CHASSIS)
TAP TO BE ADJUSTED PER TEST SPECIFICATION ESA-681801 BEFORE SOLDERING.
BL-2
TC101
BLK-2
RD-2
C 125
C126
BL-OR-2
S 101
BLK-RD-2
C 161
TRANSMISSION LINE TO BE MOUNTED WITH THIS WIRE ON TOP.
YEL-1
BL-GR-1
BL-RD-1
HOLE E
UPPER WAFER
LOWER WAFER
YEL-GR-L-1
YEL-L-1
BL-YEL-1
BR-1
BL-OR-1
BLK-1
RD-OR-1
BLK-RD-1
BL-RD-1
OR-L-1
OR-RD-L-1
BL-L-1
BL-RD-L-1
BL-GR-1
RD-BR-1
HOLE F
TOP
TOP VIEW OF CHASSIS
HOLE B
STUD H
L111
L110
L120
HOLE HOLE
PLATE OF V104
C149
C124
REAR OF SELECTOR
CASE GROUNDED THROUGH MOUNTING CLAMP
C 144
BLK
RD-A
BLK
TUNING COND. ASSEM.
S104 MAGNET
YEL-A
RD-A
BLK-A
(REAR OF CHASSIS)

TL 18295



NOTES

1. WIRES MARKED "A" ARE FURNISHED WITH APPARATUS.
2. WIRES MARKED "B" ARE NO.16 A.W.G.A. TINNED.
3. WIRES MARKED "C" ARE NO.18 A.W.G.A. TINNED.
4. WIRES MARKED "D" ARE NO.16 A.W.G.A. STRANDED 1250 VOLT RADIO HOOK-UP WIRE.
5. WIRES MARKED "E" ARE NO.20 A.W.G.A. SOLID 1250 VOLT RADIO HOOK-UP WIRE SHIELDED.
6. WIRES MARKED "F" ARE TRANSMISSION LINE.
7. WIRES MARKED "G" ARE NO.20 A.W.G.A. STRANDED 1250 VOLT RADIO HOOK-UP WIRE.
8. WIRES MARKED "H" ARE FLEXIBLE 1/4 IN. COPPER STRIP.
9. WIRES MARKED "J" ARE TINNED COPPER BRAID 1/4 IN. WIDE.
10. WIRES MARKED "L" ARE NO 22 AWGA.
11. WIRES MARKED "N" ARE NO 10 AWGA STRANDED 1250 VOLT RADIO HOOK-UP WIRE.
12. WIRES MARKED "P" ARE NO. 22 AWGA T WIRE.
13. WIRES MARKED "1" ARE IN CABLE NO. 1.
14. WIRES MARKED "2" ARE IN CABLE NO. 2.
15. ALL OTHER WIRES NOT MARKED ARE NO.20 AWGA SOLID 1250 VOLT AEROGLASS RADIO HOOK-UP WIRE.
16. ALL WIRE IS WHITE BACKGROUND COLORS SPECIFIED ARE TRACER COLORS.
17. AT PG 101 AND J 101 PLACE A 7/8 INCH LENGTH OF YELLOW FLEXIBLE VARNISHED CAMBRIC TUBING OVER WIRE, SOLDER WIRE TO TERMINAL, AND SLIP THE TUBING OVER SOLDERED JOINT UNTIL IT BEARS AGAINST BACK FACE OF JACK - OR RECEPTACLE. USE NO. 11 TUBING FOR SMALL WIRES AND NO. 4 TUBING FOR LARGE WIRES OR WHERE TWO WIRES ARE CONNECTED TO THE SAME TERMINAL.
18. WHERE 3 OR MORE WIRES WHICH ARE NOT SEWN INTO THE CABLE RUN PARALLEL THEY SHALL BE TIED TOGETHER AT APPROXIMATELY ONE INCH INTERVALS IN ORDER TO HOLD THEM NEATLY AND SECURELY IN PLACE.
19. EACH WIRE END SHALL BE WRAPPED AROUND THE TERMINAL TO WHICH IT CONNECTS FOR AT LEAST ONE FULL TURN, CRIMPED TO TERMINAL, THEN NEATLY SOLDERED, EXCEPT AT PG101 AND J101 WHERE THE WIRES MUST ENTER THE END OF THE TERMINALS FOR AT LEAST 1/8 INCH AND THEN NEATLY AND SECURELY SOLDERED. CARE SHALL BE USED TO PREVENT SOLDER FROM RUNNING INTO TUBE SOCKET PIN CLIPS.
20. BARE WIRES, EXCEPT THOSE RUNNING DIRECTLY TO A GROUND LUG, MUST CLEAR ALL ADJACENT WIRES AND APPARATUS BY AT LEAST 1/8 INCH, AND MUST BE SO FORMED AS TO PREVENT CONTACT BEING MADE DURING THE NORMAL MOVEMENT OF ANY ADJACENT ITEM OR PART.
21. INCORPORATE BENDS IN "B" WIRES TO L103, L104 AND L105 TO RELIEVE VIBRATION STRESS ON TERMINALS.
22. TO USE LOUD SPEAKER ON INT. CIRCUIT, CUT WIRE IN RED COLOR SLEEVE. REFER PAR. 24-F.

Figure 40. Radio Transmitter BC-604-(*), over-all wiring diagram.

