TM 11-4036

WAR DEPARTMENT TECHNICAL MANUAL

EMTO LIBRARY

RADIO RECEIVERS BC-683-A,-B, AND-BM

REPAIR INSTRUCTIONS

WARNING: The material forming the subject matter of this manual is the property of the United States Government and it is printed and distributed solely for the use of the military, naval, and civilian personnel of the War and Navy Departments, and may not be published or reproduced in whole or in part in any manner or form (except by lawful copyright holders who may reproduce their copyrighted material in its original form) except upon specific approval by authorized military public relations agencies.

WAR DEPARTMENT • OCTOBER 1945

WAR DEPARTMENT TECHNICAL MANUAL

TM 11-4036

RADIO RECEIVERS BC-683-A,-B, AND -BM

REPAIR INSTRUCTIONS

WARNING: The material forming the subject matter of this manual is the property of the United States Government and it is printed and distributed solely for the use of the military, naval, and civilian personnel of the War and Navy Departments, and may not be published or reproduced in whole or in part in any manner or form (except by lawful copyright holders who may reproduce their copyrighted material in its original form) except upon specific approval by authorized military public relations agencies.



WAR DEPARTMENT • OCTOBER 1945

United States Government Printing Office

Washington: 1945

WAR DEPARTMENT

Washington 25, D. C., 1 October 1945

TM 11–4036, Radio Receivers BC–683–A, –B, and –BM, Repair Instructions, is published for the information and guidance of all concerned.

[AG 300.7 (19 Jul 45)]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL
Chief of Staff

OFFICIAL:

EDWARD F. WITSELL
Major General
Acting The Adjutant General

DISTRIBUTION:

AAF (5); AGF (5); ASF (2); T of Opn (5); Dept. (5); Base Comd (5); Island Comd (5); Def Comd (2); Arm & Sv Bd (1); S Div ASF (1); Tech Sv (2); PC&S (1); PE (2); Dep 11 (2); Gen Oversea SOS Dep (2); Pro Dist 11 (2); Gen & Sp Sv Sch (5); USMA (10); WDGS Lib (5); Lab 11 (2); Rep Shop 11 (2); A (5); CHQ (2); Three (3) copies to each of the following T/O & E: 11-7; 11-15; 11-47; 11-107; 11-127; 11-147S; 11-587; 11-592; 11-597.

Refer to FM 21–6 for explanation of distribution formula.

CONTENTS

	Paragraph	Page
SECTION I. DESCRIPTION OF RADIO RECEIVERS BC–683–A, –B, AND –BM.		
General	1	
Performance characteristics	1	
Condensed circuit analysis.	2	
II. DIFFERENCES BETWEEN MODELS.		
Operational differences	3	
Design Differences	3	
III. INITIAL REPAIR PROCEDURES.		
General	4	
Removal of tubes	6	
Removal of chassis parts	6	
Cleaning, inspecting and lubricating chassis assembly	7	
Cleaning, inspecting, and testing removed parts	11	
IV. PRELIMINARY TROUBLE-SHOOTING PROCEDURES.		
Dynamotor continuity tests	13	
Receiver input resistance tests	13	
Replacement of removed parts	13	
Operational test	14	
Voltage and resistance check	15	
V. ALIGNMENT PROCEDURES.		
General	17	
Alignment procedures	17	
Alignment using f-m signal generator	18	
Alignment using a-m signal generator	21	
Alignment using good receiver	21	
Alignment using good transmitter	24	
VI. DETAILED TROUBLE-SHOOTING PROCEDURES.		
Signal sources	26	
Signal tracing using f-m signal generator	26	
Signal tracing using good receiver	29	
Signal tracing using good transmitter	30	
Signal tracing using a-m signal generator	30	
SECTION VII. FINAL TESTING.		
Over-all test requirements	31	
Moistureproofing, fungiproofing, and refinishing.	32	
Operational check	32	
VIII. INDIVIDUAL STAGE AND CIRCUIT REPAIR DATA.		
General	33	
Parts list for r-f amplifier stage, V1, for Radio Receiver BC–683–A	33	
Parts list for r-f amplifier stage, V1, for Radio Receiver BC–683–B	33	
Parts list for modulator stage, V2, for Radio Receiver BC–683–(*)	34	
Parts list for r-f oscillator stage, V3, for Radio Receiver BC–683–(*)	35	
Parts list for first i-f amplifier, V4, for Radio Receiver BC–683–(*)	35	
Parts list for second i-f amplifier stage, V5, for Radio Receiver BC–683–(*)	36	
Parts list for limiter stage, V6, for Radio Receiver BC–683–(*)	36	
Parts list for detector (discriminator) stage, V7, Radio Receiver BC–683–(*).	37	
Parts list for first audio-amplifier stage, V10′, Radio Receiver BC–683–(*)	37	
Parts list for second audio-amplifier stage, V8, Radio Receiver BC–683–(*)	38	
Parts list for delayed automatic-volume-control circuit, V9′, for Radio Receiver BC–683–(*)	39	
Parts list for squelch circuit, V9″, for Radio Receiver BC–683–A	39	
Parts list for squelch circuit, V9″, for Radio Receiver BC–683–B	40	
Parts list for i-f oscillator stage, V10″, for Radio Receiver BC–683–(*)	40	
IX. SUPPLEMENTARY DATA.		
Parts identification	41	

WARNING

HIGH VOLTAGE

is used in the operation of
this equipment.

DEATH ON CONTACT

may result if safety precautions
are not observed.

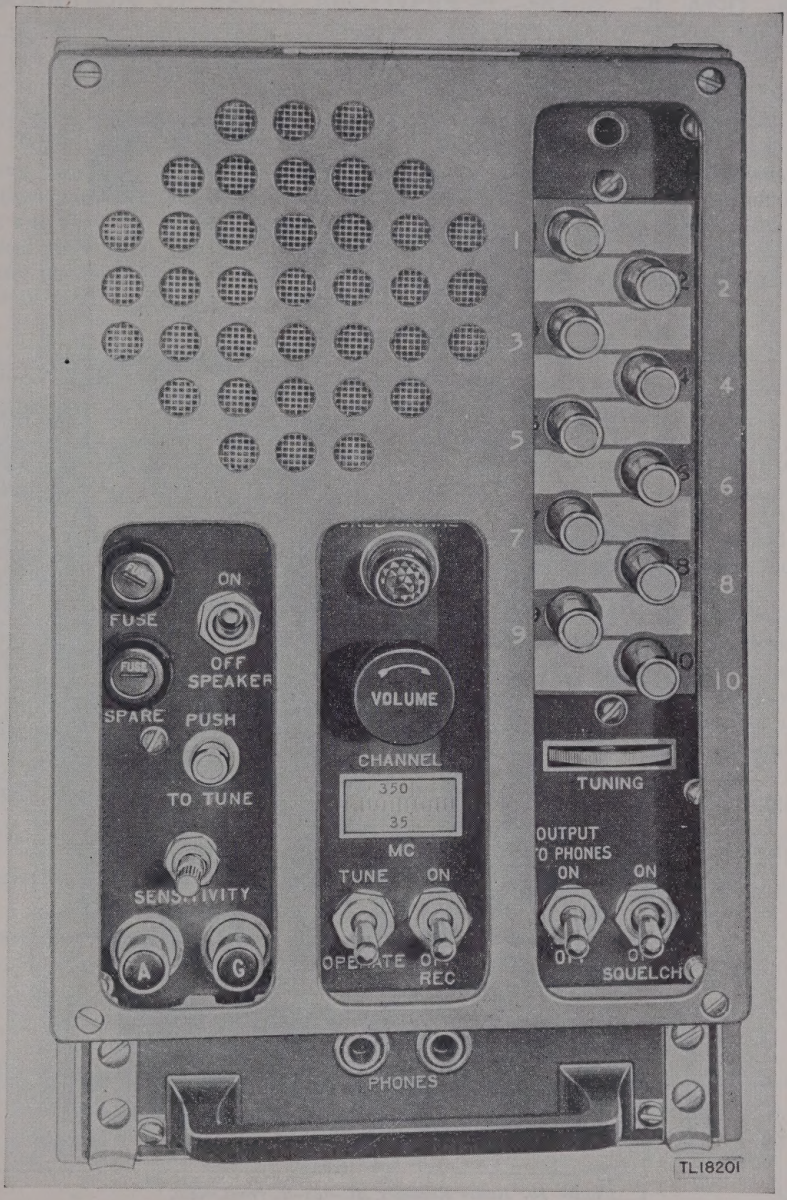


Figure 1a. Radio Receiver BC–683–A, front view.

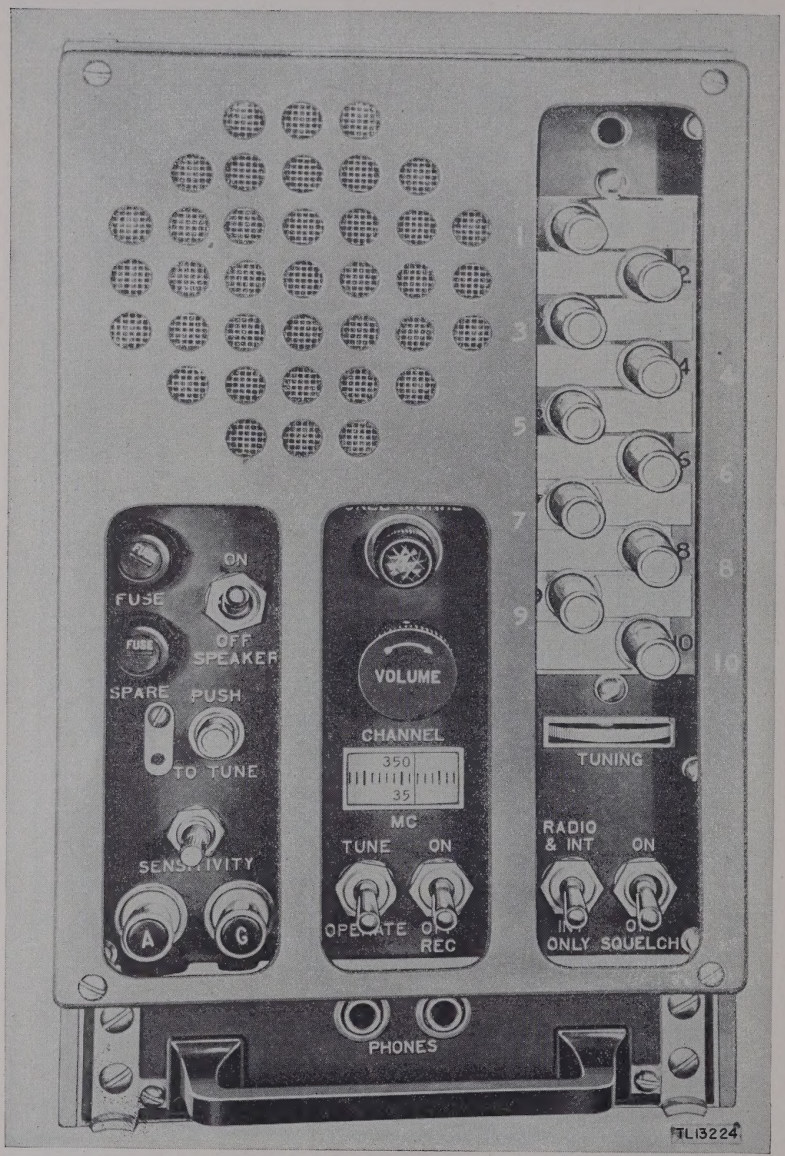


Figure 1b. Radio Receiver BC–683–B, front view.

SECTION I

DESCRIPTION OF RADIO RECEIVERS BC–683–A, –B, AND –BM[1]

1. General

Radio Receiver BC–683–(*) is a component of Radio Sets SCR–608–(*) and SCR–628–(*). The receiver provides frequency-modulated (f-m) radio-telephone reception 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 Receiver BC–683–(*) represents Radio Receivers BC–683–A, –B, and –BM, which are treated together in this manual.

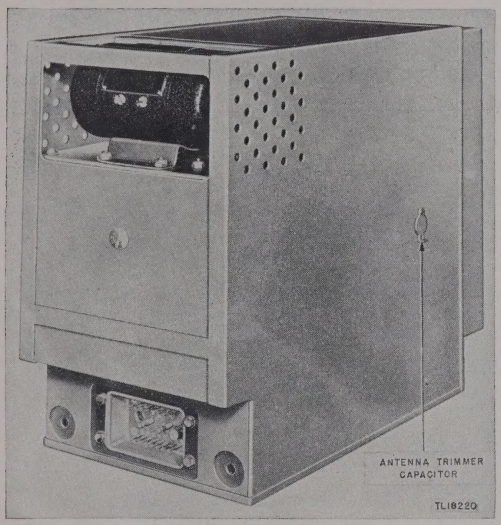


Figure 2. Radio Receiver BC–683–(*), oblique rear view.

2. Performance Characteristics

Frequency range	27.0 to 38.9 mc.
Number of preset channels	10.
Power supply	12- or 24-volt vehicular battery.
Control of channels	local only.
Sensitivity	1 microvolt.
Intermediate frequency (nominal)	2.65 mc.
Band width	80 kc.
Power output, speaker	2 watts.
Power output, headset	0.2 watt.
Call signal	lamp.
Noise suppression	"squelch."
Battery drain, 12-volt supply	4 amperes.
Battery drain, 24-volt supply	2 amperes.

[1] See TM 11–620 for installation, operation, and other maintenance data on this equipment.

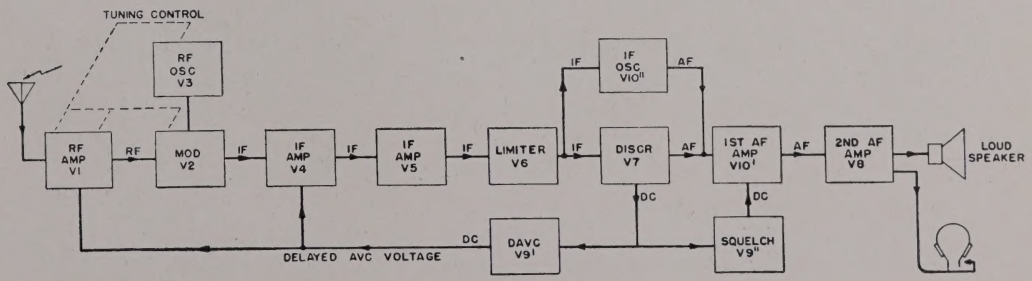


Figure 3. Radio Receiver BC–683–(*), block diagram.

3. Condensed Circuit Analysis

A block diagram of Radio Receiver BC–683–(*) is shown in figure 3. The receiver employs the superheterodyne principle of operation. The high-frequency circuits include one stage of tuned radio-frequency (r-f) amplification (V1), a modulator (V2), and a r-f oscillator (V3). The intermediate-frequency (i-f) amplifier comprises two stages (V4 and V5), the second of which (V5) provides some limiting action on strong signals. The limiter stage (V6) not only functions as a limiter on moderate signals, but it also reduces amplitude modulation. The detector, or discriminator (V7), is followed by two stages of audio-frequency (a-f) amplification (V10′ and V8). An i-f oscillator (V10″) permits checking of the receiver tuning. A single dual-purpose vacuum tube (V10) functions as the first audio stage (V10′) and the i-f oscillator (V10″). A second dual-purpose tube (V9) provides delayed automatic control (V9′) and "squelch" (V9″) which suppresses noise by disabling the receiver output when no signal is being received. A tube chart is shown below.

Circuit designation	JAN designation	VT No.	Function
V1	6AC7	VT–112	R-f amplifier.
V2	6AC7	VT–112	Modulator.
V3	6J5	VT–94	R-f oscillator.
V4	12SG7	VT–209	I-f amplifier.
V5	12SG7	VT–209	I-f amplifier.
V6	6AC7	VT–112	Limiter.
V7	6H6	VT–90	Detector (discriminator).
V8	6V6GT	VT–107–A	Second a-f amplifier.
V9	6SL7GT	VT–229	Avc and squelch.
V10	6SL7GT	VT–229	First a-f amplifier and i-f oscillator.

SECTION II

DIFFERENCES BETWEEN MODELS

4. Operational Differences

The only operational difference between Radio Receivers BC–683–A, –B, and –BM is that BC–683–B and –BM can be used with remote interphone control equipment, whereas BC–683–A cannot. In all other respects the performance capabilities of the two receivers are the same. Figures 1a and 1b illustrate the differences between the panels of the two models.

5. Design Differences

a. Differences exist in R1, R94, R95, and R96, which increase the sensitivity of the BC–683–B receiver at the minimum setting of the SENSITIVITY control and insure that the SQUELCH control is operative over the entire sensitivity range. Refer to diagram of squelch circuits, figures 36a and 36b.

b. Some Radio Receivers BC–683–A and all Radio Receivers BC–683–B and –BM have a pivoted latch (figs. 1a and 1b) to hold down the PUSH TO TUNE button when needed.

Caution: The latch MUST be disengaged and left free when the push-button selector is used; otherwise, the added friction may prevent accurate resetting of the tuning capacitor, and an abnormal strain will be put on the mechanism when the selector push button is pressed.

SECTION III

INITIAL REPAIR PROCEDURES

6. General

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

A step-by-step procedure is presented in this and the following sections for the repair and maintenance of Radio Receivers BC–683–A, –B, and –BM. The succeeding sections go into detail on shop procedures for alignment, trouble shooting, signal tracing, etc., and also provide all the necessary charts, diagrams, and information. The initial repair procedure describes the method of removal of tubes and other easily removable parts; the cleaning, inspecting, and testing of the chassis assembly; the cleaning, inspecting, testing and lubricating of removed parts; and the repair or replacement of parts found to be faulty. The test, tool, inspecting and cleaning equipment required for the repair of Radio Receiver BC–683–(*) is shown in table I below.

Table I. Tool, test, and cleaning equipment

Item	Description
ADAPTER FT–384–(*).	Switchbox for connecting various parts of receiver circuit to facilitate alignment procedure. (See figs. 20, 21, and 22.)
Output meter.	Input impedance of 5,000 ohms or more, 0- to 60-volt range, as well as several lower ranges; such as the output meter (fig. 21) from Test Set I–56–(*), or equivalent.
Volt-ohmmeter.	Resistance ranges up to 5 megohms; voltage ranges up to 300 volts in several scales (a-c and d-c); input resistance, dc at least 10 megohms. Use Volt-ohmmeter I-107–(*), or equivalent. If Volt-ohmmeter I–107–(*) is not available, make voltage measurements with a voltmeter having a sensitivity of at least 1,000 ohms per volt, and ranges up to 300 volts dc, such as the voltmeter from Test Set I–56–(*), or equivalent. It is still essential to have an ohmmeter having ranges up to 5 megohms.
Mounting FT–237–(*).	Connects Radio Receiver RC–683–(*) to a battery power supply, and ensures proper interconnections of the units when used in the complete radio sets. See figures 18 and 19 for view and schematic diagram of Mounting FT–237–(*).
Capacitor.	0.006 mf, 300 volts dc, with suitable clip connectors.
Resistor.	1,000 ohms, ½ watt, equipped with insulated clip connectors.
Tube Checker.	Unit of Test Set I–56–(*), or equivalent.
Cord CD–786.	Connects 12- or 24-volt battery to receiver.
Assorted hand tools.	
Brush.	Camel's-hair, ¼″ round.
Solvent, Dry-cleaning.	
Bellows.	Small, hand-operated.
Signal generator.	F-m, capable of operating in the 2- to 3-mc band, and in the 27.0- to 39.0-mc band. The audio frequencies available for modulation shall be 150, 400, 1,000, 2,500, and 5,000 cycles per second. The signal generator shall be capable of supplying the above audio frequencies directly. If an f-m signal generator is not available, one of the following substitutes, which are listed in the order of preference, may be used: Radio Receiver BC–683–(*) known to be in good condition or another f-m receiver known to be in good condition capable of operating in the frequency range from 27.0 to 39.0 mc and capable of supplying an i-f frequency of 2.65 mc. Radio Transmitter BC–684–(*) known to be in good condition or another f-m transmitter known to be in good condition and capable of operating in the frequency range from 27.0 to 39.0 mc and capable of a frequency deviation of at least 75 kc. An amplitude-modulated (a-m) signal generator capable of operating in the 2- to 3-mc band and in the 27.0- to 39.0- mc band.

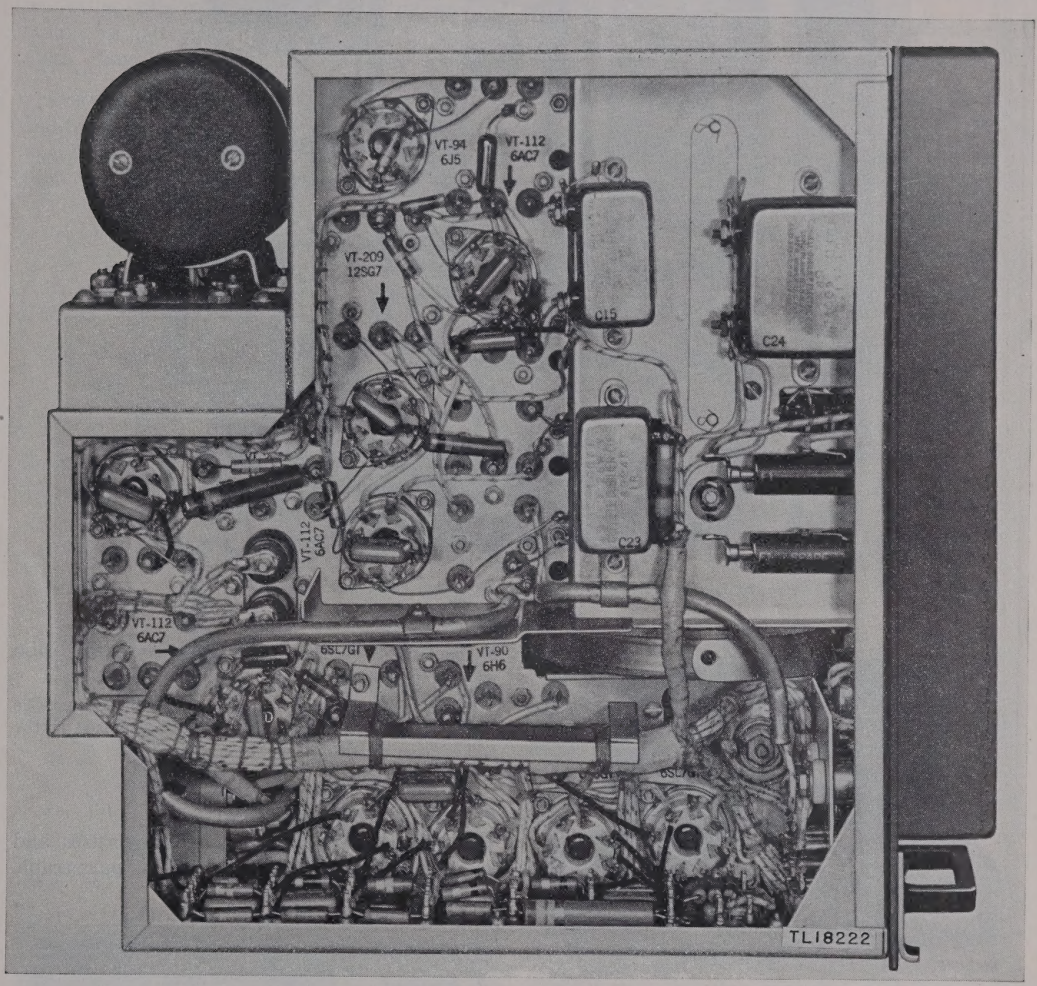


Figure 4. Radio Receiver BC–683–(*), left-side interior view.

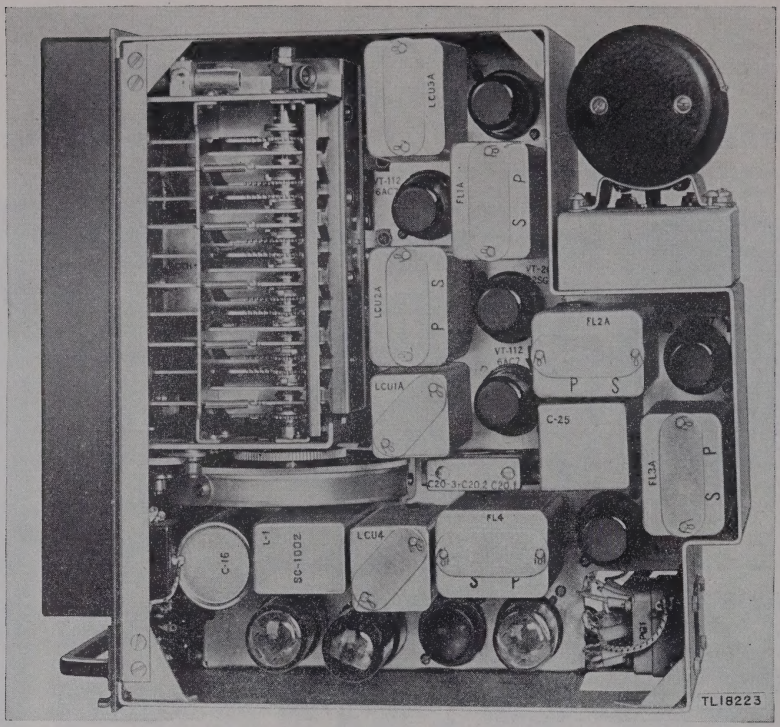


Figure 5. Radio Receiver BC–683–(*), right-side interior view.

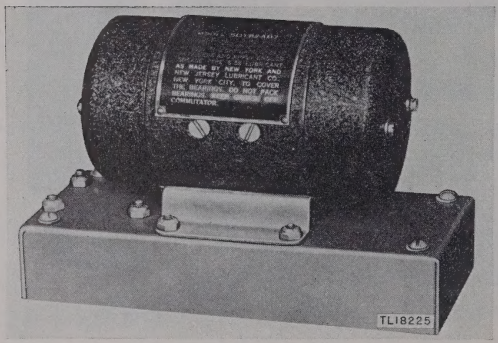


Figure 6. Dynamotor DM–34–(*) or Dynamotor DM–36–(*).

7. Removal of Tubes

a. Remove the dust cover as directed in paragraph 8 of this section.

b. Because the space around a vacuum tube is often limited (figs. 5 and 12), use a tube extractor or with the fingers rock the tube gently while pulling up.

Note. Each tube, immediately upon removal, must be clearly labeled so that it can later be replaced in the socket from which it was taken.

8. Removal of Chassis Parts

The removal of the cover, dynamotor, fuses, and call signal lamp is described in this paragraph.

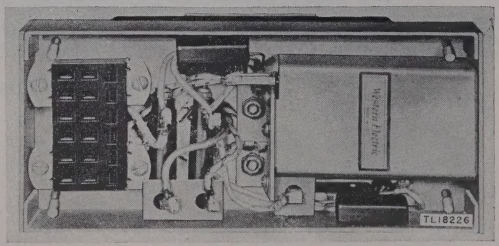


Figure 7. Dynamotor DM–34–(*) or Dynamotor DM–36–(*), subbase view.

a. Place the receiver, panel downward, on a smooth surface. Turn the Dzus fastener at the rear of the cover one-quarter revolution counterclockwise, and then slide the cover off.

b. DYNAMOTOR REMOVAL. Release the four mounting bolts in the corners of the dynamotor mounting plate (fig. 8) and lift the dynamotor (figs. 6 and 7) from the receiver.

c. FUSE REMOVAL. Two fuses, labeled FUSE and SPARE, are located within the panel guard (fig. 9), below the speaker (figs. 1, 4, and 11). Remove the fuses by inserting screwdriver in

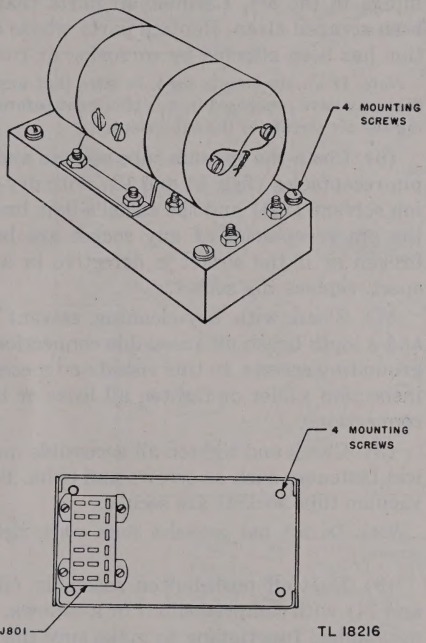


Figure 8. Dynamotor DM–34–(*) or Dynamotor DM–36–(*), location of mounting bolts.

the slotted fuse holders and turning counterclockwise. The fuses can easily be extracted from their holding sleeves.

d. CALL SIGNAL LAMP REMOVAL. Unscrew the jewel guard of the CALL SIGNAL lamp on the front panel (figs. 9 and 10), and remove the bayonet-base lamp by pushing in and turning counterclockwise.

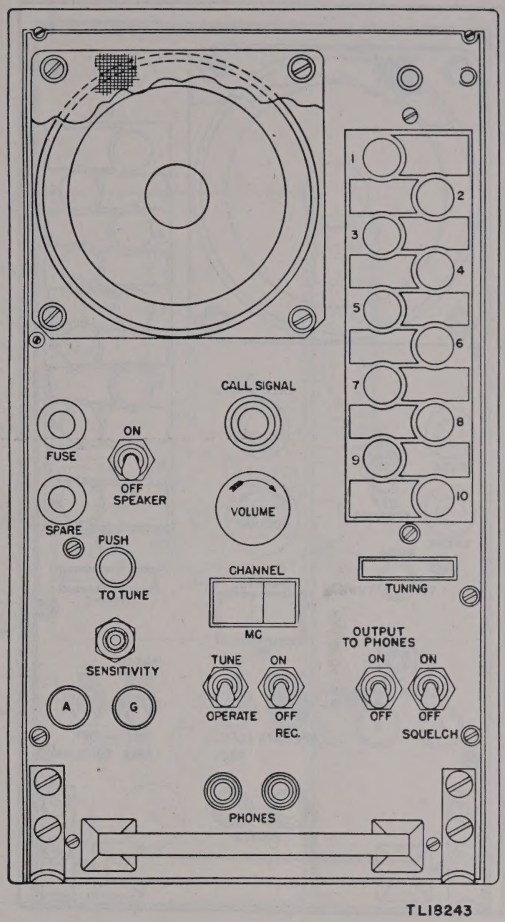


Figure 9. Radio Receiver BC–683–A, apparatus location diagram, front view of panel.

9. Cleaning, Inspecting, and Lubricating Chassis Assembly

a. GENERAL. While plug-in parts are out of the receiver, clean the receiver and its parts (other than the plug-in parts), and inspect for mechanical damage as directed in this paragraph. Repair or replace damaged parts. Where special procedures are necessary see section IX.

b. CLEANING AND INSPECTING. (1) Remove the dust cover and see that the circuit label is firmly secured to the bottom.

(2) Clean the dust cover (inside and out), and the front panel with Solvent, Dry-cleaning.

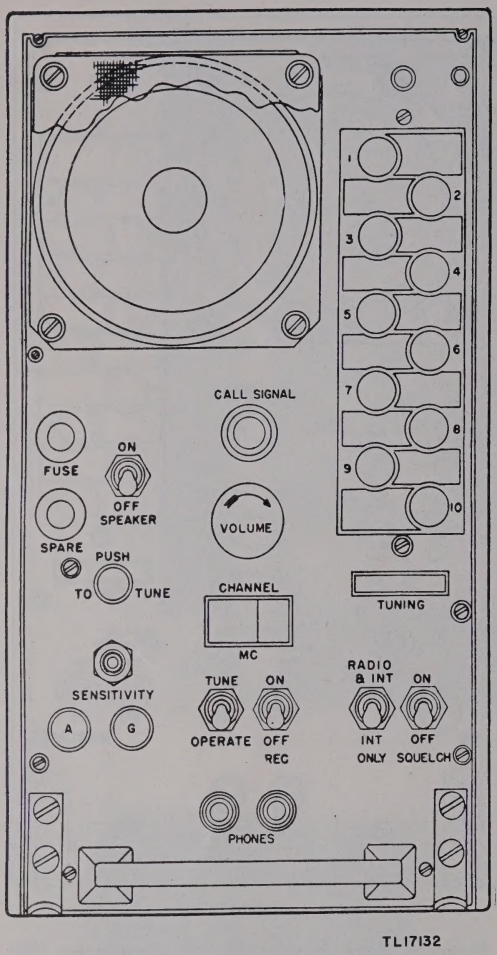


Figure 10. Radio Receiver BC–683–B, apparatus location diagram, front view of panel.

Scrape off mud, tar or any other adhering foreign matter. Touch up with paint or lacquer where necessary.

Caution: Do not use water or a water-moistened cloth on the panel or interior of the receiver.

(3) Clean and inspect plug PG1 (figs. 5, 11, and 12). Make sure there is slight play in the plug mounting. Clean the pins carefully with dry-cleaning solvent (SD) using the small camel's-hair brush. Use a small file to remove corrosion. Avoid scraping the bakelite insulation. If the plug is damaged or the pins are bent or broken, replace the plug as directed in section IX.

(4) Clean and inspect dynamotor plug PG2 (fig. 11) in the same manner as in subparagraph (3) above, with one exception; plug PG2 must be tight and requires no play in the mounting.

(5) Shake or blow out any dust, loose dirt, sand, or gravel from the interior of the receiver, and remove hardened mud or any other foreign matter. Do not wipe parts on the chassis with a rag as this might cause damage. If corrosion is found, clean as completely as possible, being careful not to leave rust, metal scrapings, or filings in the set. Lacquer all parts that have been scraped clean. Replace parts whose operation has been affected by corrosion or rust.

Note. If an air hose is used, be sure that any water that may have condensed in it is blown out before applying the air stream to the equipment.

(6) Clean the vacuum tube sockets and their pin receptacles (figs. 11 and 12) with dry-cleaning solvent (SD) and the camel's-hair brush. If the pin receptacles of any socket are bent or broken or if the socket is defective in any respect, replace the socket.

(7) Clean with dry-cleaning solvent (SD) and a tooth brush all accessible connections and grounding screws. In this visual and mechanical inspection solder or tighten all loose or broken connections.

(8) Check and tighten all accessible mechanical fasteners such as screws and bolts. Be sure vacuum tube sockets are secure.

Note. Do not use excessive force when tightening screws.

(9) Dust off push-button assembly (figs. 13 and 14) with compressed air or a bellows. Check mechanical functioning to make sure the mechanism is operating freely and properly. If the push-button assembly is defective, repair or replace as directed in section IX.

(10) Make sure all the vacuum tube sockets, plugs, and other parts specified above are thoroughly clean and no hard deposits remain. Then apply the compressed air stream to remove any remaining dirt or particles of foreign matter.

(11) Inspect for broken parts and evidence of excessive heating and overloading as indicated by burned resistors or melted wax. Look and smell for the latter troubles.

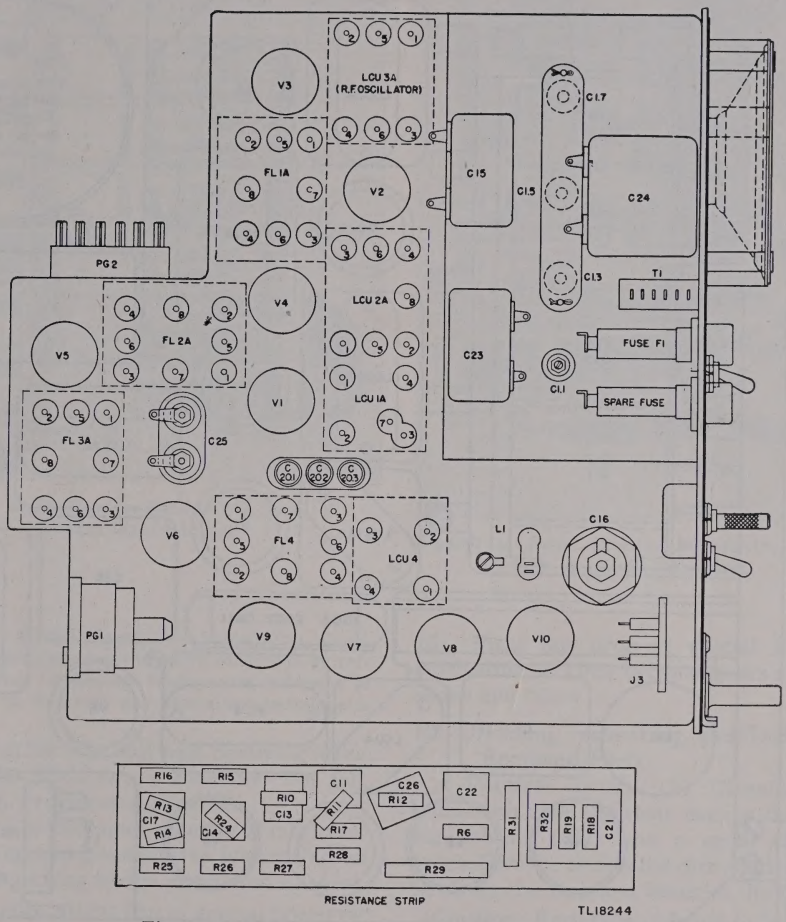


Figure 11. Radio Receiver BC–683–(*), apparatus location diagram, left-side view.

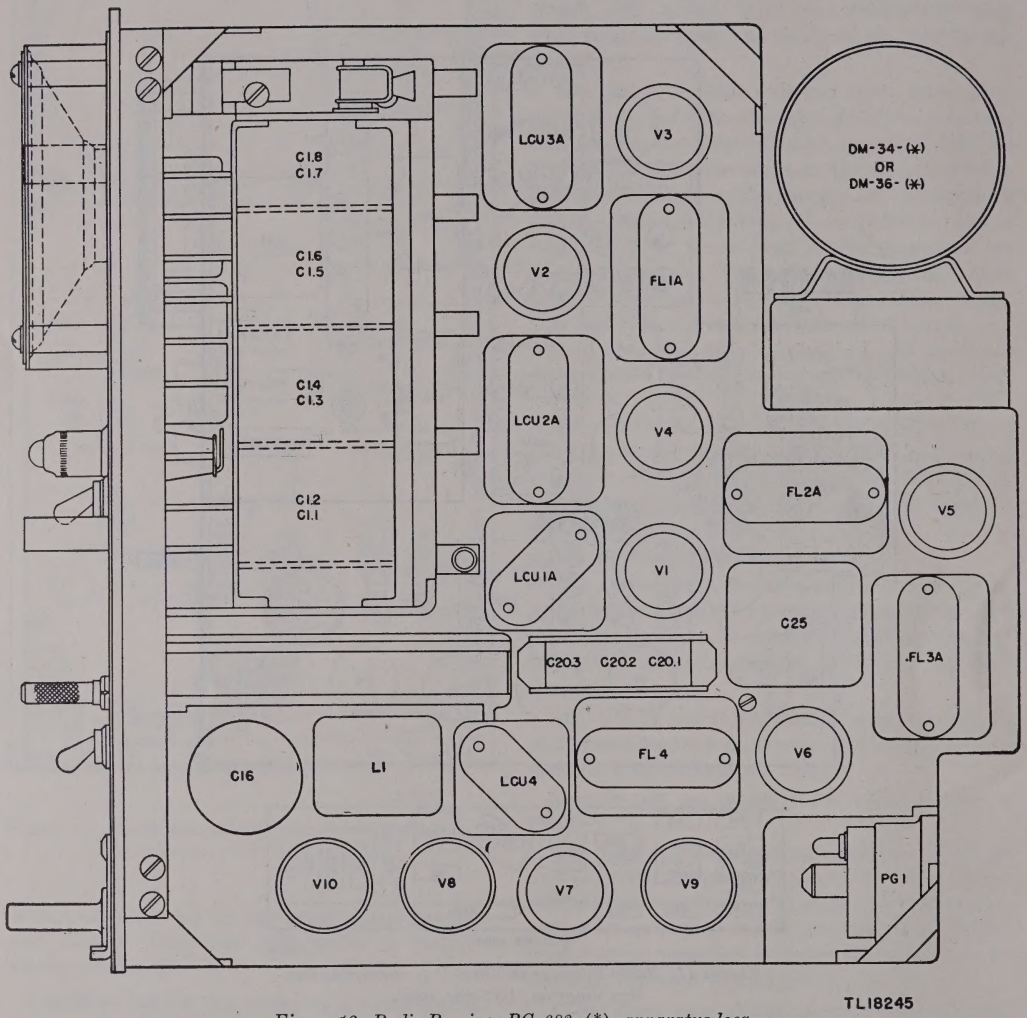


Figure 12. Radio Receiver BC–683–(*), apparatus location diagram, right-side view.

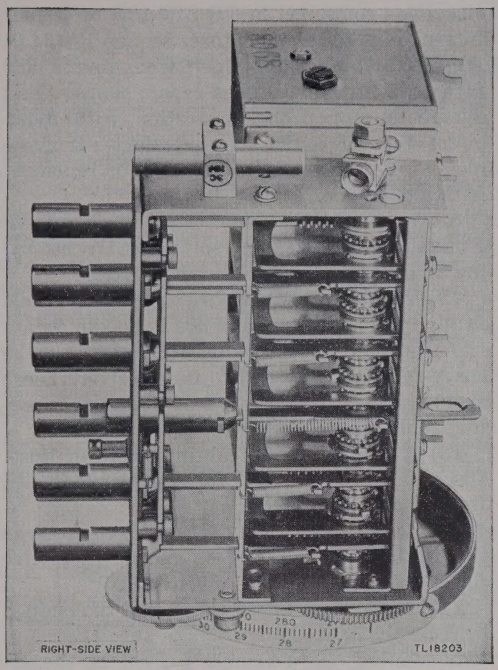


Figure 13. Radio Receiver BC–683–(*), push-button assembly, right-side view.

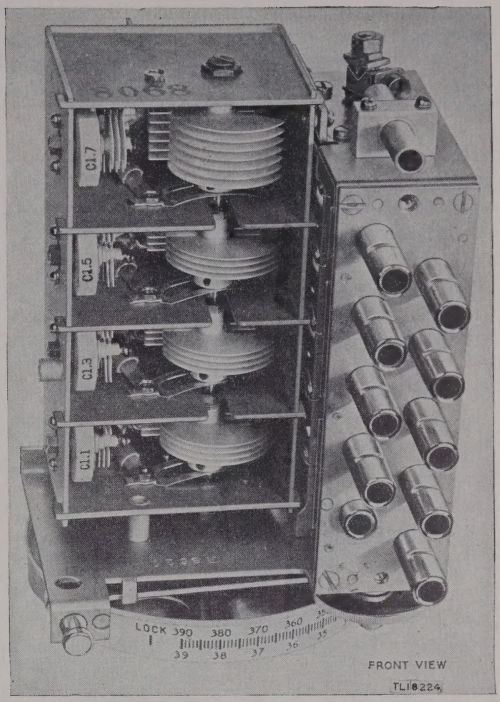


Figure 14. Radio Receiver BC–683–(*), push-button assembly, front view.

Note. If any defects are apparent in step (11), above, locate components causing the above conditions by reference to section IV. Replace faulty parts, referring to section VIII in the event any specialized technique is required.

c. LUBRICATION. The only part requiring lubrication is the push-button assembly. Use Oil, Lubricating, Preservative, Special.

Caution: Use minimum quantity of lubricant. Do not get special preservative lubricating oil (PS) on the locking wedge or friction washers.

(1) To apply a light film of special preservative lubricating oil (PS) to the 10 push-buttons (figs. 13 and 14), put one or two drops of oil on each button, push in and then release.

(2) Apply one or two drops of special preservative lubricating oil (PS) to the gear-rack shafts, top and bottom (fig. 15).

(3) Coat the 10 push-button gear racks with a light film of special preservative lubricating oil (PS).

(4) Lubricate the push-button gears (fig. 15). Place one drop of special preservative lubricating oil (PS) between gears and spacers, above and below.

10. Cleaning, Inspecting, and Testing Removed Parts

a. VACUUM TUBES. (1) *Cleaning.* Handle tubes with care and clean each with dry-cleaning solvent (SD) and a small camel's-hair brush. Remove remaining dirt and foreign matter from the pins and bases of the tubes.

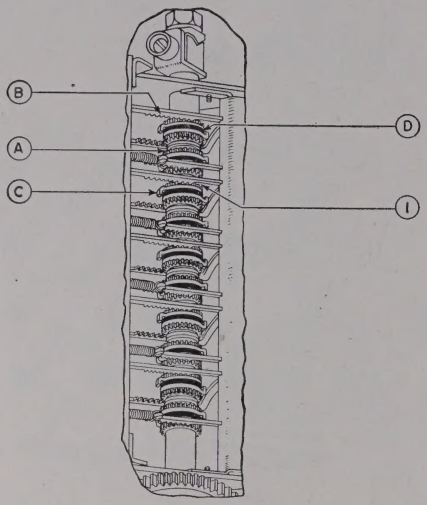
Caution: Each tube if found to be good must eventually be returned to the socket from which it was taken. It is important that tubes, even of the same type, shall not be interchanged.

(2) *Inspecting.* Check each tube for tightness in its socket, and inspect visually for mechanical and other obvious defects. Discard defective tubes. Make sure each tube is of the type specified.

(3) *Testing.* Test each tube in the tube checker unit of Test Set I–56–(*) in accord-

ance with instructions furnished with the tube checker. Do not neglect the short-circuit test.

b. 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 dynamotor for proper operation with dynamotor Test Set I–199 (or equivalent). If dynamotor is found defective, repair it or replace it with a good one.



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

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

TL 17104

Figure 15. Radio BC–683–(*), lubrication of push-button assembly.

c. FUSES. (1) *Cleaning.* Clean the two fuses FU–24 with dry-cleaning solvent (SD), removing all dirt and corrosion from contacts.

(2) *Inspecting.* Make sure the fuses are held firmly in their holders and are in good mechanical condition. Check the number of fuses in the spare-fuse bag attached to the receiver. There should be eight running spares; if any are missing, replenish the supply.

(3) *Testing.* Test the continuity of each fuse. Discard open or defective fuses and replace with fuses known to be good.

d. CALL SIGNAL LAMP. (1) *Cleaning.* Clean the call signal Lamp LM–63 and its protective jewel with dry-cleaning solvent (SD).

(2) *Inspecting.* Check to see that the lamp is held firmly in its socket. Make sure there are two running spare Lamps LM–63 in the attached bag.

(3) *Testing.* Test the lamp. The striking voltage is approximately 70 volts. Discard the lamp if the test shows it to be defective; for example, if the striking voltage varies considerably from 70 volts. Also, discard the jewel if it is damaged, chipped or broken.

SECTION IV

PRELIMINARY TROUBLE-SHOOTING PROCEDURES

11. Dynamotor Continuity Tests

Due to variations in methods of manufacturing, widely varying terminal to terminal internal resistance measurements are found in various dynamotors of the same type. For this reason the customary ohmmeter continuity tests cannot be depended upon to indicate the true operating condition of a dynamotor. Therefore, test the operation of DM–34–(*) or DM–36–(*) with a dynamotor Test Set I–199 (or equivalent) to determine its condition. If found defective repair it or replace it with a dynamotor known to be good. Reference to figures 16 or 17 will prove helpful when repairs are required.

12. Receiver Input Resistance Tests

a. Check the resistance from pin 1 of Plug PG1 to ground (fig. 25); this reading should indicate an open circuit.

b. Check the resistances between the terminals of plug PG2 and ground. These resistances should agree with the values shown in the voltage and resistance diagram (fig. 25).

c. If the resistances found in the above tests differ radically from the specified values, a fault, which must be located and eliminated, exists in the power wiring.

(1) To locate the fault, trace through the associated wiring starting with the pin at which an incorrect value is noted and check both visually and electrically for short circuits, open circuits, shorted capacitors, etc.

(2) When a faulty part is located, check to locate and eliminate the cause of the failure. After this, repair or replace the faulty part; if special instructions are needed see section IX.

13. Replacement of Removed Parts

a. CALL SIGNAL LAMP. Insert the CALL SIGNAL lamp in its socket and install its protective jewel (fig. 9 or fig. 10).

b. FUSES. Replace the fuses in their holder sleeves and turn them into place with a screwdriver (fig. 1a or fig. 1b).

c. VACUUM TUBES. Return the vacuum tubes to their respective sockets (figs. 5 and 12).

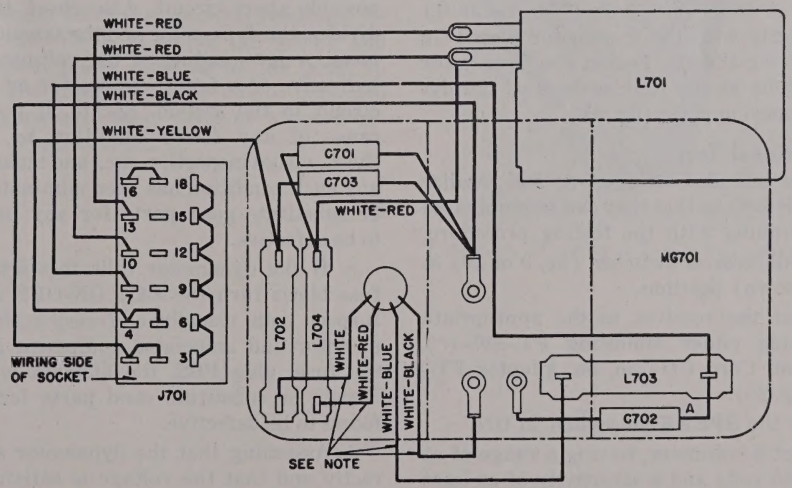


Figure 16. Dynamotor DM–34–(*), wiring diagram.

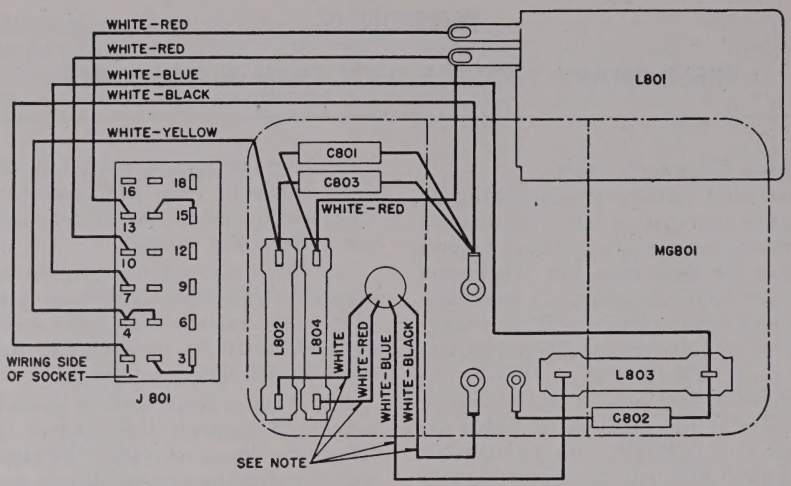


Figure 17. Dynamotor DM–36–(*), wiring diagram

Caution: Each tube, if found to be good, must be returned to the socket from which it was taken. It is important that tubes even of the same type shall not be interchanged.

d. DYNAMOTOR. Replace the dynamotor, making sure that dynamotor jack J701 (or J801) mates properly with the dynamotor plug PG2 on the receiver chassis. Fasten the dynamotor mounting bolts at the four corners of the dynamotor mounting plate (fig. 8).

14. Operational Test

This test is intended to discover and localize any major defects so that they can be eliminated before continuing with the testing procedure.

a. Turn all receiver switches (fig. 9 or 10) to the OFF (down) position.

b. Connect the receiver to the appropriate battery, using either Mounting FT–237–(*) (fig. 18) and Cord CD–786, on Adapter FT–384–(*) (fig. 20).

c. Throw the SPEAKER switch to ON.

d. Connect a voltmeter, having a range of at least 0 to 250 volts and a sensitivity of at least 1,000 ohms per volt, across C25 (figs. 11 and 25e or 25i) ; be sure to connect the positive side of the meter to the terminal to which the wire with the red tracer is attached. Throw the REC ON-OFF switch to ON. Note that the meter indication rises immediately to approximately 200 volts when the switch is turned on. If it does not, turn the set off quickly and check C25 and C16 (figs. 11 and 25e or 25i) for a possible short circuit. Also check the voltage divider, the dynamotor and the associated equipment. A low reading of the voltmeter may be indicative of a faulty dynamotor or of a short circuit in the system. Locate, if possible, the cause of any faulty condition by resistance check, visual inspection, etc., and make sure that any such condition has been eliminated. Repair or substitute good parts for any parts found to be defective.

e. If the dynamotor fails to start or if the fuse blows turn the REC ON-OFF switch off. Inspect both visually and electrically the dynamotor and associated equipment as well as the fuse, plug PG2, the filament wiring, etc. Repair or substitute good parts for all parts found to be defective.

f. Assuming that the dynamotor starts correctly and that the voltage is satisfactory, inspect the inside of the receiver while the dynamotor is running. See that no sparks occur, that there are no shorted wires, and that no part is burning or smoldering. Turn the set off im-

mediately and repair the fault if a trouble condition is indicated.

g. After the dynamotor has been running for a few moments, feel the tubes cautiously to see if they are all warm. No other tube should be as hot as V8 (figs. 5 and 12), which is a Tube JAN–6V6GT (VT–107A). No tube should remain cold. If a tube remains cold after the others have warmed up, examine the wiring associated with the tube socket in question, examine the socket contacts, and test the associated circuits in accordance with the procedure outlined in paragraph 16. If there is no wiring trouble and the tube does not warm up, test the tube, and substitute a good one in its place if it is found defective.

h. Check the voltages at each terminal of V6 (limiter) as shown in figure 25 or figure 31. The values should be reasonably close to those specified for V6. Approximate agreement with these values indicates that normal voltages are being supplied to the tube.

15. Voltage and Resistance Check

After the set has been tested in operation, check the voltage and resistance at each point shown on the voltage and resistance diagram, figure 25. The values obtained should agree with the information contained on the voltage and resistance diagram. If the readings at any point differ radically from the specified readings, localize the trouble by checking the wiring and the individual parts, starting at the point in question. The trouble may be due to defective wiring, drops of solder, open or shorted resistors or capacitors, etc.

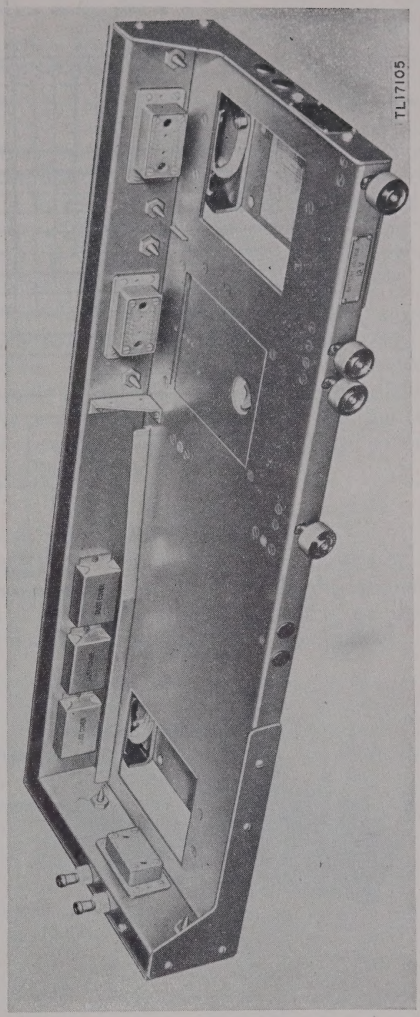
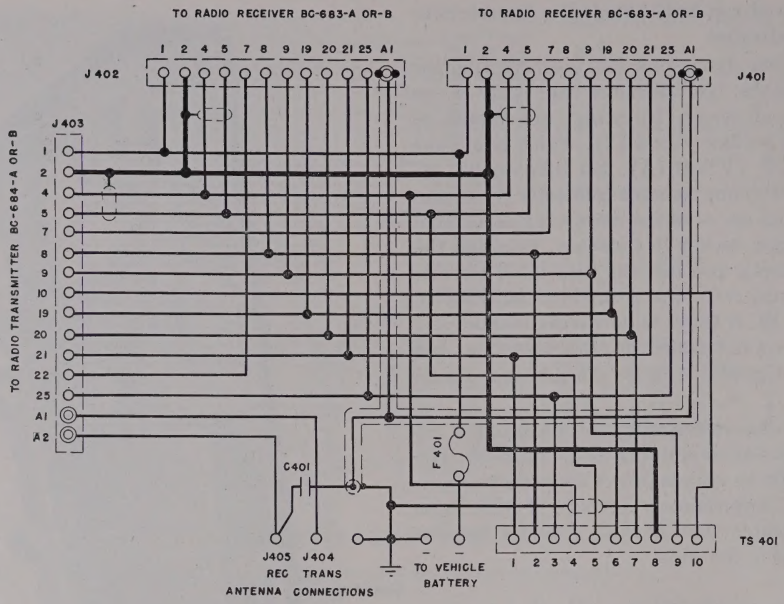


Figure 18. Mounting FT–237–(*), oblique front view.



		APPARATUS LEGEND	
C401	0.0001 MF 500V	J 402	RECEIVER B CONNECTION
		J 403	TRANSMITTER CONNECTION
F401	75 AMPERE FUSE (W.E.668)	J 404	TRANSMITTER ANT CONNECTION
		J 405	RECEIVER ANT CONNECTION
JACKS			
J 401	RECEIVER A CONNECTION	TS 401	TERMINAL STRIP

TL51013-S

Figure 19. Mounting FT-237-(*), schematic diagram.

SECTION V

ALIGNMENT PROCEDURES

16. General

This section describes complete procedures for alignment of the receiver and for signal tracing.

a. Several alignment procedures are listed below in the order of preference, and are detailed in succeeding paragraphs.

(1) The preferred method employs an f-m signal generator, with characteristics given in table I. This method permits alignment of all stages of the receiver.

(2) An amplitude-modulated (a-m) generator (table I) may also be used for alignment. This method permits alignment equal to that obtained with an f-m generator, but signal tracing *cannot* be accomplished with the a-m generator.

(3) Another receiver (table I) known to be in good condition may be used as a signal source when neither an a-m nor an f-m signal generator is available, or when a Voltmeter I–107–(*) is not available. This method permits alignment of all stages of the receiver. However, it is desirable to check the alignment against a signal generator as soon as possible.

(4) A transmitter (table I) known to be in good condition may be employed only when neither a signal generator nor a good receiver is available. Using this method, one or possibly two misaligned circuits in a receiver can be aligned with the remaining circuits. Alignment of the r-f oscillator should not be attempted by this method. Any alignment made by this method must be checked against a signal generator as soon as possible.

b. Detailed trouble location is accomplished by means of signal tracing. Several signal tracing procedures are listed below in order of preference, and are detailed in succeeding paragraphs.

(1) Employment of an f-m signal generator is the preferred method and permits signal tracing through all stages of the receiver.

(2) If no f-m signal generator is available, a receiver (table I) in good condition may be used as a source of test signals for all stages of the trouble receiver.

(3) If neither an f-m signal generator nor a second receiver is available, a transmitter (table I) in good operating order may be used as a source for signal tracing in the a-f and r-f stages; it does not, however, provide signals for tracing in the i-f stages.

(4) When none of the other signal sources is available, an a-m signal generator may be used for signal tracing through the discriminator stage, but not beyond. It permits a check of stage gains in the r-f and i-f stages, but cannot be used for those applications where a modulated signal is required.

17. Alignment Procedures

In the alignment procedure, regardless of the signal source used, align first the discriminator and i-f oscillator circuits, then the i-f amplifier, and last the r-f oscillator and r-f amplifier.

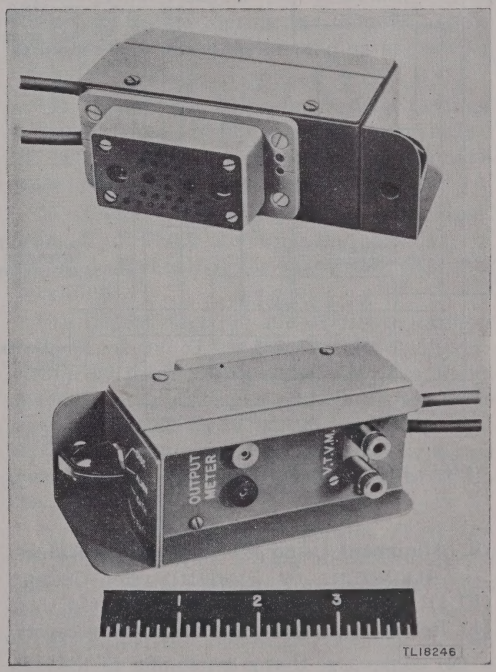


Figure 20. Adapter FT–384–(*), front and back views.

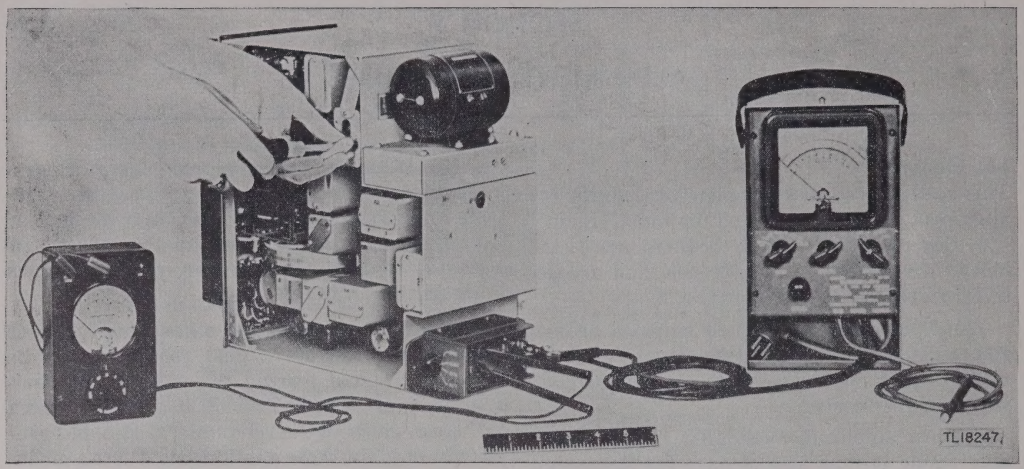


Figure 21. Adapter FT–384–(*), application to Radio Receiver BC–683–(*).

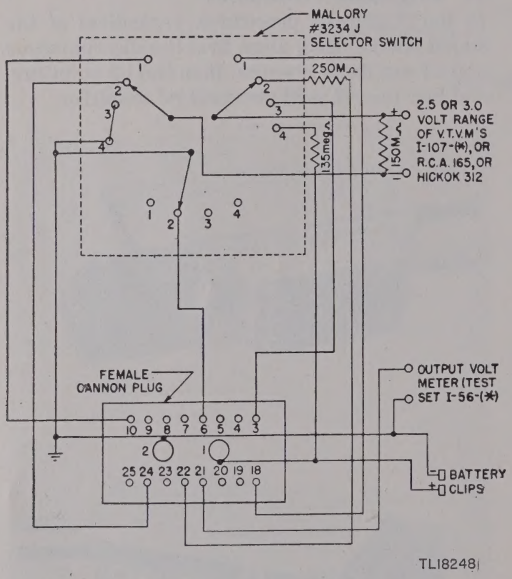


Figure 22. Adapter FT–384–(*), schematic wiring diagram.

18. Alignment Using F-m Signal Generator

a. Alignment of Discriminator Circuit (FL4) and I-f Oscillator Circuit (LCU4). (1) Remove the dust cover from the receiver.

(2) Make sure that a dynamotor of the correct primary voltage rating is in place.

(3) Loosen the cover plates from LCU1A, LCU2A, FL1A, FL2A, FL3A, FL4, and LCU4. (The plates may be loosened by removing the cotter pin at one end.)

Caution: Do not remove the cover from LCU-3A (in BC–683–A) or from LCU3C (in BC–683–B and –BM).

(4) Set the receiver controls as follows: The SPEAKER switch at ON, the SENSITIVITY and VOLUME controls to the extreme right, the TUNE-OPERATE switch at OPERATE, the REC switch at OFF (until ready), the SQUELCH switch at OFF, and in BC–683–A, the OUTPUT TO PHONES switch at ON; in BC–683–B and –BM, the RADIO & INT–INT ONLY switch at RADIO & INT.

(5) Prepare Volt-ohmeter I–107–(*) for use as follows: Connect the battery plug attached to the short cable at the bottom of the volt-ohmmeter to a Battery BA–40. Set the SELECTOR switch for –VOLTS and the RANGE switch for 3 volts direct current. Short the COMMON and D–C volts leads together and turn the ZERO ADJ knob for zero indication on the meter. It is advisable to leave Volt-ohmmeter I–107–(*) on for approximately 5 minutes before using it, to allow the zero adjustment of the meter to become stable. Connect the volt-ohmmeter leads to the V.T.V.M. posts of Adapter FT–384(*).

Note. When aligning the i-f amplifier or discriminator, if no shielded room is available and disturbing

interference from nearby electrical equipment is observed, this interference can be minimized by connecting a short strap lead from terminal 5 of V3 to C25 (the terminal to which blue-tracer wires are connected).

(6) Connect the high side of the signal generator output through the 0.006–microfarad (mf) capacitor to the limiter control grid (terminal 6 of FL3A) and connect the low side of the generator to the chassis.

(7) Adjust the generator for an output of between 1.0 and 2 volts at 2.65 megacycles (mc).

(8) Plug Adapter FT–384–(*) into receptacle PG1 of the receiver and connect to the battery. Turn the switch of the adapter to DISC. (discriminator output voltage).

(9) Turn the receiver to ON and, after allowing sufficient time for the vacuum tubes to heat, adjust the secondary tuning screw (S) in filter FL4 for zero current in the voltmeter. The meter should reverse polarity as S is varied to either side of the zero-current point. The selector switch of Volt-ohmmeter I–107–(*) can be turned from −VOLTS to +VOLTS to note this effect. This is an accurate indication of frequency and can be used as a check during the test. A check may be made from time to time to make sure that this meter still reads zero. If it does not, the signal generator should be readjusted to restore the reading to zero.

(10) Throw the TUNE-OPERATE switch to TUNE. Adjust the slug in tuning unit LCU4 to zero beat. Set the TUNE-OPERATE switch to OPERATE.

(11) Turn the switch of the adapter to ALIGN and adjust the P (primary) adjusting screw in FL4 for maximum indication on the volt-ohmmeter.

(12) Restore the adapter switch to DISC, and trim the S screw setting for zero meter current. Adjust the signal generator 50 kilocycles (kc) above and 50 kc below 2.65 mc, and make sure that the readings of the volt-ohmmeter are approximately the same (but of opposite polarity).

(13) Vary the signal generator frequency above 2.65 mc until the test meter deflection is greatest. Note the meter reading and the generator frequency. The frequency should be between 2.725 and 2.745 mc.

(14) Vary the signal generator frequency *below* 2.65 mc until the test meter deflection is greatest. Note the meter reading and generator frequency. The meter reading should be within 0.75 volts of the reading in (13) above, and the frequency should be between 2.560 and 2.580 mc.

(15) Place the switch of the adapter at CATH., with the signal generator set for 1.0-volt output at 2.65 mc and note the reading of the volt-ohmmeter for later use in testing the i-f amplifier.

b. ALIGNMENT OF I-F AMPLIFIER. (1) Reduce the signal generator output to zero and connect its shielded cord to the control grid of the modulator (terminal 4 of V2).

Note. Exposed unshielded wires are undesirable since they introduce unwanted pick-up and make alignment difficult if not impossible. They should be kept as short as possible, preferably less than 2 inches, including the clip.

(2) Adjust the generator to a small output at 2.65 mc. Make sure the output of the i-f oscillator is in zero beat with the signal generator when the TUNE-OPERATE switch is set at TUNE. Then restore the switch to OPERATE.

(3) With the switch of the adapter at CATH., increase the generator output sufficiently to cause a reading of 0.9 volts on the volt-ohmmeter. Adjust the generator output from time to time during the following alignment to maintain a meter reading of between 0.6 to 0.9 volt.

(4) Connect the 1000-ohm resistor between terminals 3 and 4 of filter unit FL3A and adjust the primary of FL3A, designated P, for maximum voltmeter indication.

(5) Connect the resistor between terminals 1 and 2 of FL3A and tune the secondary of F13A, designated S, for maximum voltmeter indication.

(6) Repeat steps (4) and (5) above for filter units FL2A and FL1A, respectively. Upon completion of these adjustments, note the signal generator output required to obtain the same meter deflection as in paragraph 18a(15). It should not be necessary to increase the signal generator output beyond 50 microvolts to obtain this reading.

(7) Vary the signal generator frequency through the 2.65-mc setting and note that the selectivity is approximately symmetrical about the midfrequency.

(8) Adjust the generator frequency to 2.65 mc and the generator output as required for a meter reading of 0.9 volt.

(9) Double the signal generator output voltage (6-decibel (db) increase) and determine the frequencies above and below 2.65 mc at which 0.9 volt is obtained. The band width between the two "6 db down" frequencies should be not less than 75 kc, and the midband frequency should be within 5 kc of 2.65 mc.

(10) Repeat steps (8) and (9) above for 1,000-fold voltage increase (60 db) of generator output. The band width between the two "60 db down" frequencies shall not exceed 350 kc.

(11) Remove the strap between C25 and terminal 5 of V3.

c. ALIGNMENT OF R-F OSCILLATOR (LCU3A OR LCU3C) AND R-F AMPLIFIER CIRCUITS (LCU1A AND LCU2A). (1) Reduce the signal generator output to zero and connect its shielded output cord with short leads directly to the A and G binding posts on the receiver.

Note. This is a test through the whole receiver except the connections from the front A and G binding posts to the regular A and G terminal in plug PG1. Check for continuity between these two sets of terminals.

(2) Rotate the tuning dial to the stop at the 27-mc end of the scale. The reference line on the dial should be in approximate alignment with the tuning index. If the error is ⅛ inch or more, repair the unit. This involves removing the front panel and adjusting the glass with the hairline on it. It should be done only if unavoidable.

(3) Adjust the dial and the signal generator to 39 mc.

(4) Loosen the cover plate (near C24) from C1.3, C1.5, and C1.7. If the r-f oscillator tuned unit is LCU3A, loosen its cover plate; if, however, the r-f oscillator tuned unit is LCU3C, then it should seldom be necessary to adjust the unit during the alignment procedure since LCU3C has been preset at the factory.

Caution: The LCU3C unit is sealed against moisture. Do not remove the cap unless absolutely necessary.

Should it be essential to make a slug adjustment on the LCU3C, proceed as follows:

(*a*) Find as dry a place as possible.

(*b*) Run the receiver about an hour with the dust cover in place to warm the unit.

(*c*) To remove the cap, heat the single point solder seal of the cap with a soldering iron while exerting a turning motion in the cap.

(*d*) Complete the alignment as quickly as possible.

(*e*) Replace the cap and resolder in place.

(*f*) If the cap was off for more than 5 minutes, run the receiver at least an hour with the dust cover in place and the cap off the unit.

(*g*) Remove dust cover, replace cap and resolder.

(5) Turn the switch of Adapter FT–384–(*) to DISC.

(6) Place the TUNE-OPERATE switch of the receiver at TUNE.

(7) Adjust trimmer C1.7 for zero beat in the loudspeaker. The (discriminator) voltmeter should read zero when the frequency is correct. This is an additional check on the frequency of the i-f oscillator.

(8) Set the signal generator and the receiver dial at 27 mc and adjust the slug in LCU3A or LCU3C for zero beat.

(9) Repeat steps (7) and (8) above until the oscillator tracks satisfactorily at both ends of the band.

(10) When the oscillator is satisfactory at both ends of the band, check the 36-, 33-, and 30-mc points also. Zero beat should be obtained within one-half dial division at each of these frequencies. If tracking at these frequencies is not satisfactory repeat step (7) above using 38 mc and step (8) above using 28 mc. After the dial tracking is regarded as satisfactory, take care to avoid touching C1.7 and the slug of LCU3A, when making further adjustments.

(11) Turn the switch of Adapter FT–384–(*) to CATHODE and restore the TUNE-OPERATE switch to OPERATE.

(12) Increase the signal generator output sufficiently to cause a meter reading of 0.9 volt. Adjust the generator during the course of the following procedure to maintain a reading of between 0.6 and 0.9 volt on the meter.

Note. During the final alignment adjustments it is usually impossible to keep the meter deflection below 0.9 volt by reducing generator output. Under these conditions modulate the generator with 400 cycles and a frequency swing of ± 15 kc. Connect the output meter of Test Set I–56–(*) to Adapter FT–384–(*), and supplement the test meter deflection by observing the output meter deflection.

(13) With the signal generator at 39 mc, tune the receiver dial for zero beat at 39 mc. Adjust,

in turn, trimmer capacitors C1.5, C1.3, and C1.1 for maximum test meter deflection.

(14) Adjust the generator and the receiver to 27 mc as in step (13) above.

(15) Adjust, in turn, the slugs in the LCU1A and LCU2A shield cans for maximum deflection of the meter.

(16) Readjust the trimmer capacitors at 39 mc and the inductance trimmers at 27 mc alternately until no further improvement can be obtained.

19. Alignment Using A-m Signal Generator

When only an a-m signal generator is available for alignment, the procedure is exactly as given in paragraph 18 for the f-m signal generator except that the procedure outlined in the note to paragraph 18c(12) cannot be carried out.

20. Alignment Using Good Receiver

When a Radio Receiver BC–683–(*) is found to be misaligned it can be put into serviceable condition if another receiver, either BC–683–(*) or one supplying the same r-f and i-f signals, is available. Alignment by this method must be checked as soon as possible in accordance with the procedure described in paragraph 18.

a. Preliminary Steps. The following steps in receiver alignment are divided functionally for convenience in description and understanding, but remember that in most cases a change in the alignment of any of the parts involves checking the adjustment of the other parts. The receiver under test will be referred to as the "trouble" receiver in the following discussion.

(1) Remove the covers from both receivers.

(2) Place all switches at OFF (or downward) in both sets.

(3) Secure the good receiver in the right-hand position of Mounting FT–237–(*), and apply power to the trouble receiver by means of Cord CD–786, or equivalent.

(4) Turn both sets on and set the TUNE-OPERATE switches at TUNE.

(5) Allow both sets 10 to 15 minutes to warm up.

(6) Connect both chassis together using one wire of the twisted pair as listed in table I. Use the wire which does *not* have the capacitor in series.

b. Alignment of I-f Oscillator and I-f Amplifier. (1) Short-circuit R14 of the trouble receiver. Also connect terminal 5 of V3 to C25 (the side of which blue-tracer wires are attached).

Note. It may be necessary to turn the SQUELCH switch to ON, and to adjust the SENSITIVITY control to obtain a usable reading on the voltmeter, when tuning the FL units.

(2) Short-circuit terminals 1 and 2 of FL3A of the good receiver with a short clip lead.

(3) Connect terminal 7 of FL4 in the good receiver, through the capacitor which is in series with the remaining wire of the twisted pair, to terminal 4 of V2 in the trouble receiver. The untwisted part at the ends of the pair of wires should be as short as possible, and the capacitor should be nearest to the good receiver.

(4) Place the SPEAKER switch of the trouble receiver at ON.

(5) Clip a voltmeter across L1 of the trouble receiver. Attach the minus side of the voltmeter to the ground lug (fig. 23). Use the 3-volt scale of voltmeter listed in table I.

(6) If the receiver is seriously misaligned, obtain a rough adjustment by adjusting the slugs in FL3A, FL2A, and FL1A, in that order, for maximum meter reading.

Note. If no change in meter reading is observed when the slugs of FL3A are adjusted, turn the good receiver off and on, and note the deflection of the meter. If this does not cause any change in deflection, the trouble receiver may be faulty and require service. If the deflection is too small for satisfactory reading, the connection at terminal 7 of FL4 (in the good receiver) should be moved to terminal 2 of FL4 to obtain a larger reading for the preliminary adjustment. After the preliminary adjustment it should be returned to terminal 7 of FL4 which gives a signal strength more appropriate for the subsequent test.

Caution: The lock washers on the tuning slugs of the tuned circuits may be damaged by turning the slugs in too far. When any adjustment of these units is made, make sure that the tuning slugs bind sufficiently to ensure permanency of setting. If they feel loose during adjustment, tighten the lock washers by turning them to the right with a small screw driver.

(7) Align LCU4 of the trouble receiver for zero beat and turn the TUNE-OPERATE switch to OPERATE.

(8) Clip a 1,000-ohm resistor across terminals 3 and 4 of FL3A. Adjust the primary slug (P) for maximum meter reading.

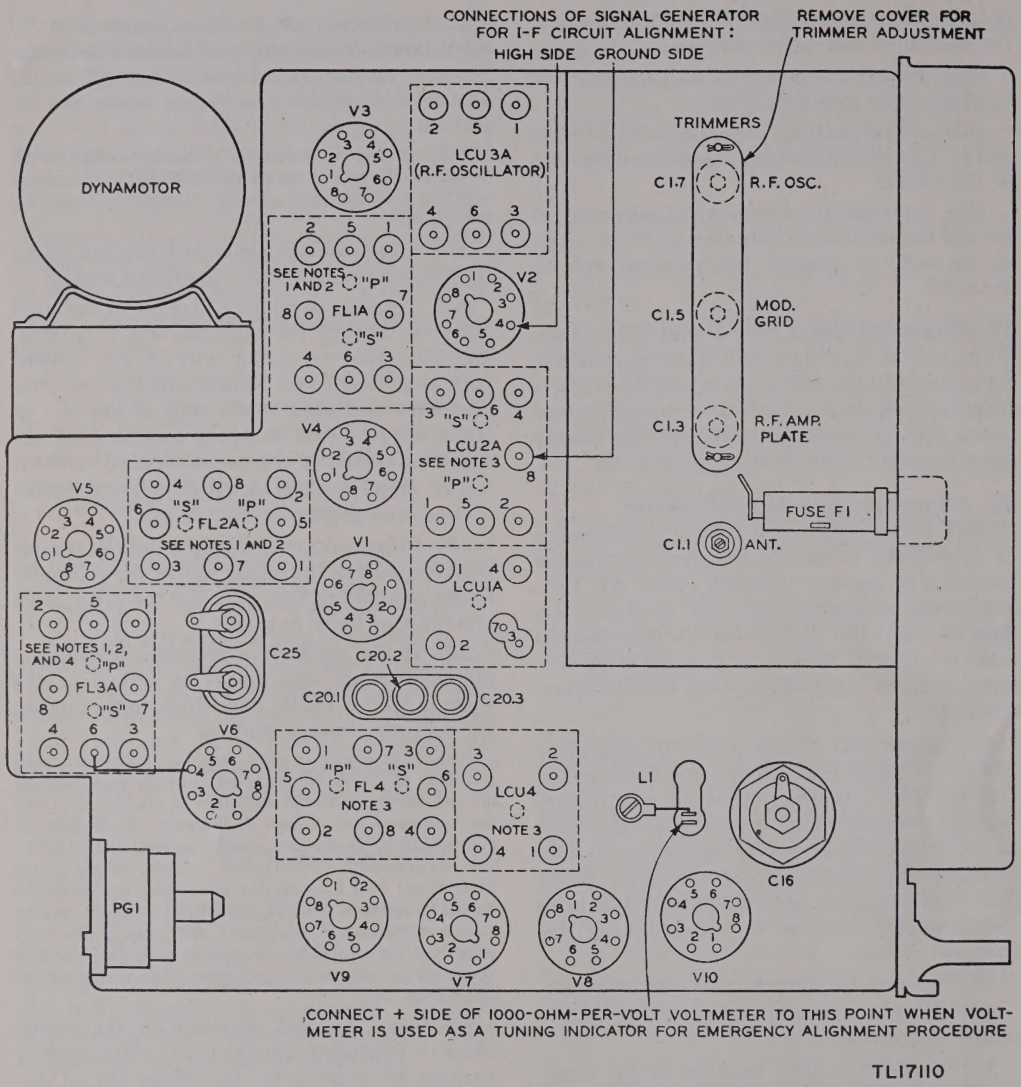


Figure 23. Radio Receiver BC–683–(*), location of alignment and tuning controls.

(9) Remove the 1,000-ohm resistor and clip it across terminals 1 and 2 of FL3A. Adjust the secondary slug (S) for maximum meter reading.

(10) Repeat step (8) above for FL2A.

(11) Repeat step (9) above for FL2A.

(12) Repeat step (10) above for FL1A.

(13) Repeat step (11) above for FL1A, and remove the 1,000-ohm resistor when the alignment is completed.

Note. Check all adjustments, especially that of LCU4.

c. ALIGNMENT OF DISCRIMINATOR CIRCUIT (FL4). (1) Remove the meter and bridge it across terminals 3 and 7 of FL4. Polarity of the meter cannot be specified as it will depend on the adjustment.

(2) Align the secondary of FL4 for zero reading. Note that as the slug is varied in either direction from the zero reading, the alignment meter should move *upscale* for one direction and *downscale* for the other.

(3) Remove the short from R14, and ground terminal 1 of FL4.

(4) Place the 1,000-ohm shunt between terminals 3 and 4 of FL1A.

(5) Remove the meter and connect it between terminals 2 and 3 of LCU2A, the positive lead going to terminal 3. It may be necessary to use the 30-volt scale.

(6) Align the primary of FL4 for minimum meter reading.

(7) Remove both the 1,000-ohm shunt and the meter.

(8) Remove the short between C25 and terminal 5 of V3.

(9) Remove the lead from terminal 4 of V2 of the trouble receiver, and from terminal 7 of FL4 of the good receiver.

(10) Remove the short between terminal 1 of FL4 and ground.

d. ALIGNMENT OF THE R-F OSCILLATER, ASSUMING THE INTERMEDIATE FREQUENCY TO BE EXACTLY 2.65 MC. The r-f oscillator of the good receiver is used to provide an r-f signal for testing the trouble receiver. The frequency of this r-f will be 2.65 mc above that indicated on the dial of the good receiver.

(1) Bridge the meter across L1, with the negative terminal connected to ground.

(2) Place a short across resistor R14.

(3) Place the TUNE-OPERATE switch of the trouble receiver at TUNE, and place the TUNE-OPERATE switch of the good receiver at OPERATE.

(4) Assuming the intermediate frequency to be 2.65 mc set the good receiver at 39 mc.

(5) Adjust the r-f oscillator trimmer capacitor C1.7 of the trouble receiver to give zero beat in the loudspeaker.

(6) Set the good receiver at 27 mc and the trouble receiver at (27+2.65) 29.65 mc. In the BC–683–A adjust the slug in LCU3A for zero beat; in the BC–683–B and –BM adjust the slug in LCU3C only if unavoidable.

(7) Repeat the preceding two steps until the r-f oscillator tracks at both ends of the band.

e. CHECK OF INTERMEDIATE FREQUENCY AND READJUSTMENT OF R-F OSCILLATOR. If the intermediate frequency of the good receiver is not exactly at 2.65 mc, a correction may readily be made.

Note. It may be necessary, in order to provide sufficient signal for these tests, to connect the bared end of a piece of insulated wire to the A post of the trouble receiver, and to extend the wire across the top of the good receiver to act as an antenna.

(1) Set the dial of the trouble receiver to 33 mc.

(2) Adjust the dial of the good receiver to give zero beat at approximately 30.35 mc, and note the dial reading at which it occurs.

(3) Leaving the trouble receiver tuned to 33 mc, retune the good receiver to obtain the (somewhat weaker) beat note between 35 and 36 mc. Note the dial reading.

(4) By subtraction, determine the difference between the two dial readings obtained in steps (2) and (3) above.

(5) Divide this difference by two.

(6) The value obtained in this way is the actual intermediate frequency.

(7) Repeat the alignment procedure, d(4) through (7) for the r-f oscillator, using this value in place of 2.65 mc.

(8) Make certain that the r-f oscillator tracks at both ends of the band.

(9) Remove the short from terminals 1 and 2 of FL3A in the good receiver.

(10) Replace the cover on the good receiver.

f. ADJUSTING LCU1A AND LCU2A. (1) In the trouble receiver, shunt a 1,000-ohm resistor between terminals 1 and 2 of FL1A. Connect the 3-volt meter across L1, with the negative side on the ground lug. Short R14.

(2) Connect terminals 2 and 3 of LCU1A to ground, using the shortest wires.

(3) Set the dial of the trouble receiver to 39 mc.

(4) Tune the good receiver at approximately 36.35 mc to give a beat note in the loudspeaker.

(5) Align C1.1, C1.3, and C1.5 for maximum reading on the meter.

(6) Set the dial of the good receiver at 27 mc.

(7) Tune the trouble receiver at approximately 29.65 mc to give a beat note.

(8) Adjust the slugs in both the primary and secondary of LCU2A and the slug in LCU1A for maximum reading of the meter.

(9) Repeat steps (3) through (8) above until the units track at both ends of the band.

Note. The rough adjustment is completed when the procedure of step (9) above is accomplished.

(10) Turn the power switch of the good receiver to OFF. Turn the SQUELCH switch of the good receiver to OFF. Remove the 1,000-ohm shunt from FL1A of the trouble receiver.

(11) Repeat the alignment steps for LCU1A and LCU2A using noise background alone for maximum meter reading at both ends of the dial (27 and 39 mc).

(12) Remove the short circuit from R14. Also remove the meter, and the short circuits from terminals 2 and 3 of LCU1A to ground.

(13) Replace all cover plates securely.

(14) Replace the dust cover.

21. Alignment Using Good Transmitter

In succeeding paragraphs a method is outlined using a BC–684–(*) transmitter to provide a signal of correct frequency when a standard signal source is not available.

a. I-F ALIGNMENT. (1) Mount a good BC–684–(*) transmitter on Mounting FT–237, remove the top plate and set up the crystal for channel 318. The fundamental frequency for this crystal is 441 kc, 666 kc, and its sixth harmonic is 2.65 mc which corresponds to the correct i-f of the receiver.

(2) Remove the cover from the receiver to be aligned and mount the receiver on Mounting FT–237.

(3) Set up the VTVM (vacuum-tube voltmeter) in accordance with instructions for measuring negative d-c (direct-current) voltage (30-volt range), and connect the d-c volts probe to the receiver limiter grid (prong 4 to V6) and the common lead to ground.

(4) Ground the grid of the receiver r-f oscillator stage (prong 5 of V3).

(5) Remove the transmitter rectifier tube (V102) from its socket and connect the rectifier grid (prong 5 of V102) to the receiver mixer grid (prong 4 of V2) through a series capacitor. If a capacitor is not available, use two insulated wires and twist together to obtain the effect of a capacitor.

(6) Turn the receiver power switch ON, SQUELCH switch OFF, and TUNE-OPERATE switch to OPERATE.

(7) Turn the transmitter power switch ON, depress the push button for channel 318, and turn the REC TUNE OPERATE switch to REC TUNE.

(8) After the receiver has warmed up, adjust the primary and secondary adjustment of FL3A, FL2A and FL1A, in turn, for maximum meter reading.

(9) Repeat (8) above two or three times, if necessary, to obtain maximum meter reading.

(10) If the meter reading exceeds 18 volts, the tuning of the stage will be quite broad. The set's response can be lowered by turning the SQUELCH switch ON and adjusting the SENSITIVITY control. However, do not allow the response to fall below 6 volts.

b. DISCRIMINATOR ALIGNMENT. (1) Set up the receiver to be aligned and a good transmitter as in subparagraph *a* above.

(2) Connect a VTVM to measure negative voltage at terminal No. 8 of FL4 with respect to terminal No. 7 (30-volt range).

(3) Adjust the primary of FL4 for maximum meter reading. This should be about 20 volts. Turn REC switch OFF.

(4) Adjust the VTVM to false zero at 1.2 volts on 3-volt range. Connect the VTVM to measure negative voltage at terminal No. 3 of FL4, with respect to terminal No. 7.

(5) Turn the REC switch ON, allow time to warm up, and adjust the secondary of FL4 until false zero is obtained when the alignment tool is removed. Vary the secondary adjustment above and below resonance and note that the meter reading changes in both directions from false zero.

c. I-F OSCILLATOR ALIGNMENT. After the alignment of the discriminator is completed, turn the TUNE-OPERATE switch to TUNE and adjust the trimmer of LCU4 to obtain zero beat.

d. R-F ALIGNMENT. (1) Mount a good BC–684–(*) transmitter on Mounting FT–237 and set up two crystals for channels near the high and low end of the band.

(2) Remove the cover from the receiver to be aligned and mount the receiver on Mounting FT–237.

(3) Set up the VTVM in accordance with instructions for measuring negative d-c voltage

(30-volt range) and connect the d-c volts probe to the receiver limiter grid (prong 4 to V6) and the common lead to ground.

(4) Press the receiver PUSH-TO-TUNE button and rotate the TUNING control manually to the channel corresponding to the transmitter crystal near the high end of the band. Turn the receiver ON.

(5) Depress the transmitter push button for the channel near the high end of the band; turn the REC-TUNE-OPERATE switch to REC TUNE.

(6) Adjust the receiver r-f oscillator trimmer (C1.7) and then the r-f amplifier trimmers (C1.4 and C1.5) for maximum meter reading.

(7) Tune the receiver and transmitter to the channel near the low end of the band as in (4) and (5) above.

(8) Adjust LCU2A and LCU1A for maximum meter reading. Adjust LCU3A only if tracking is off on the low end of the band.

(9) Repeat steps (4) through (8) above until meter readings are stabilized. If meter readings exceed 18 volts, the tuning will be quite broad and false peaks may be obtained. To reduce readings, operate the receiver from a separate mounting somewhat removed from the transmitter.

(10) After adjustments are completed, note that zero beat is obtained when the TUNE-OPERATE switch is turned to TUNE.

SECTION VI

DETAILED TROUBLE-SHOOTING PROCEDURES

22. Signal Sources

a. GENERAL. Any of the signal sources listed in paragraph 16*b* may be used for signal tracing.

Caution: When connecting or disconnecting a signal source, turn the receiver off each time to avoid shock or equipment damage.

b. SUPPLEMENTARY METERS. An output meter plugged into one of the phone jacks, or an alignment meter bridged across L1, helps greatly in judging the performance of the receiver.

(1) The output meter should be connected as follows: Connect the plug and cord assembly of Test Set I–56–(*) to the ± and voltmeter terminals of the output meter, adjust the meter for the 15-volt scale, and insert the plug into one of the phone jacks of the receiver.

(2) The alignment voltmeter is connected across the limiter cathode choke L1, with the minus terminal of the meter connected to ground.

23. Signal Tracing Using F-m Signal Generator

a. GENERAL. (1) At the beginning of the test, turn all switches to OFF (downward), and release all push buttons.

Caution: *Do not remove the shield can of a tuned unit until the trouble has been traced to that particular unit. Do not push the wiring back and forth during inspection, as this may damage it.*

(2) Place a dynamotor, known to be in good condition and of the correct voltage rating for the battery available, in the set before the test.

(3) Except as otherwise noted, ground one side of the signal generator and connect the other side to the receiver being tested.

(4) Note the volume, and listen for serious distortion from the loudspeaker at the various points in the signal tracing procedure. If possible, compare with a receiver known to be in good condition. Experience helps in judging the performance of a receiver in this fashion.

(5) Check the wiring and soldering in each stage. If repairs are necessary, complete them before proceeding.

(6) Misalignment of one or more stages of the receiver will cause reduced output. Misalignment of the r-f oscillator may, however, prevent any output.

(7) In this outline, "no signal" or "no beat note" means either no signal from the loudspeaker, a signal that is weaker than it should be, or a seriously distorted signal.

(8) When trouble is localized in a given stage, first test the tube if such a test is indicated in the procedure, then the voltage, and finally the resistance at the tube socket of that stage. For values see voltage and resistance diagram (fig. 25) and individual stage diagrams (figs. 26 to 37).

(9) Trouble in a circuit or a stage may not show in voltage and resistance measurements at the tube socket. Hints included in this section are merely a guide and should suggest other procedures, such as voltage and resistance measurements on individual parts.

(10) Remove only one tube at a time when testing. Check the number of the tube, test it, and return it to its proper socket before another tube is removed.

(11) It frequently helps to connect (with a clip lead) terminal 5 of V3 to the negative side of C25 (to which blue-tracer leads are attached) when performing the a-f and i-f tests. This stops the r-f oscillator and reduces interference. Be sure to remove this clip lead before proceeding with the r-f tests.

(12) After the previous steps have been satisfactorily completed, isolate and clear any trouble located before proceeding with the next step.

(13) When you have found all sources of trouble, check the receiver to see that it satisfies the over-all test requirements (sec. VII).

b. A-F TESTS. See table I for characteristics of the audio signal generator required.

(1) *Secondary of T1 (SPEAKER circuit).* Throw the SPEAKER switch to ON and connect an audio signal through a series capacitor

to the blue-brown tracer (fifth terminal counting from the front panel) on output transformer T1. Listen for noise output in the speaker. Notice that it is not necessary to remove the front panel in order to gain access to the terminals of transformer T1. The volume of noise will be very low. If no output is heard, check the circuit elements such as SPEAKER switch D3, the output transformer, the loudspeaker, etc.

Note. In replacing the front panel (if it has been removed) be sure that the wires are all pushed down beside potentiometers P1 and P2 and preferably tied in place.

(2) *Secondary of T1 (PHONES circuit).* In the BC–683–A, throw the OUTPUT TO PHONES switches to ON; in the BC–683–B and –BM, throw the RADIO & INT—INT ONLY switch to RADIO & INT, and connect the signal to the blue-green tracer on output transformer T1 (third terminal counting from the front panel). Try the headset in both PHONES jacks. Noise should be heard when the headset is plugged into either jack. If no signal is heard, remove the front panel and test (by resistance measurements if possible) such items as resistors R22, R23, and R33, switch D2, the jacks, and terminals 12, and 14 of PG3 and J3. Jacks and headsets may be at fault, or a permanent ground may exist on the receiver disabling lead.

(3) *Primary circuit of T1.* Place the audio signal on the blue-yellow tracer (second terminal counting from the front panel) on output transformer T1 and listen for the signal from the speaker or headset. If no signal is present, C33 may be shorted or terminals 16 and 17 of plug PG3 may not be making good contact.

(4) *Terminal 5 of V8 (grid of the second audio amplifier).* Turn the receiver on. Put the signal on terminal 5 of V8. Listen for output in the speaker. If there is no output, test the tube and the voltages at the socket terminals (fig. 25). C21, R19, or R18 may be faulty. Check continuity to terminals 5, 6, and 10 of PG3 or J3.

(5) *Terminal 2 of V10 (plate of the first audio amplifier).* Introduce the signal at terminal 2 of V10, and listen for a signal from the loudspeaker. If there is no signal, R18, C19, or C21 may be at fault. Check terminals 5, 6, and 10 of PG3 or J3 for continuity.

(6) *Terminal 1 of V10 (grid of the first audio amplifier).* Put the signal on terminal 1 of V10. Reduce the signal input. If there is no signal from the loudspeaker, test the tube. Circuit elements such as C11, C12, C13, C26, or R10 may be faulty. Note that when the SQUELCH switch is at OFF it should connect ground to R12, the side away from the tube.

(7) *Terminal 5 of V10 (plate of the i-f oscillator).* Place the signal on terminal 5 of V10. Throw the TUNE-OPERATE switch to OPERATE. If there is no signal from the loudspeaker, R6, C26, C10, or D5 may be faulty.

(8) *Junction of C11 and R10.* Put the signal at the junction of C11 and R10. If the signal is not heard from the speaker, R10 or C11 may be faulty.

(9) *Terminal 4 of V7 (output of the discriminator).* Place the signal across the output resistance (R81 in series with R83) of the discriminator (terminal 4 of V7). If there is no signal in the loudspeaker, check circuit elements such as V7, C81, C82, R81, R82, R83, or R84.

c. I-F TESTS. For reference to i-f test signal sources, see table I.

(1) *Terminal 8 of V6 (plate of the limiter).* With the i-f signal applied through a series capacitor to the plate of the limiter (terminal 8 of V6), place the SQUELCH switch at OFF and the TUNE-OPERATE switch at TUNE and listen for a beat note from the loudspeaker. If this beat note is not heard, note the setting and then vary the slug adjustment in LCU4 to obtain a beat note. If the beat note cannot be obtained, such circuit elements as C10, LCU4, FL4, or D5 may be faulty. Retune the slug in LCU4 for a beat note with the i-f source after the trouble has been cleared.

(2) *Terminal 4 of V6 (grid of the limiter).* Put the signal on terminal 4 of V6. If there is no beat note from the speaker, with the TUNE-OPERATE switch at TUNE, test V6 and other circuit elements. Voltage and resistance measurements at the tube socket terminals (fig. 25) may be useful.

(3) *Terminal 8 of V5 (plate of the second i-f amplifier).* With the signal on terminal 8 of V5 repeat the procedure given for the preceding stage. If there is no signal, FL3A may be misaligned or faulty. If the alignment is not at fault, test such elements as V5, R13, C14, C15, or C7. If the alignment has been altered, realign FL3A after the trouble has been corrected.

(4) *Terminal 4 or V5 (grid of the second i-f amplifier).* Place the signal on terminal 4 of V5. Repeat the procedure which was followed on the limiter stage. If the test of the tube is satisfactory, there may be trouble in circuit elements such as FL2A, C7, or R8.

(5) *Terminal 8 of V4 (plate of the first i-f amplifier).* Feed the signal to terminal 8 of V4. If no beat note is obtained from the speaker, test the tube. FL2A may be misaligned or faulty.

(6) *Terminal 4 of V4 (grid of the first i-f amplifier).* Introduce a signal on terminal 4 of V4. If no beat note is obtained and the tube is satisfactory, the trouble may be in FL1A, C6, or associated circuit elements.

(7) *Terminals 8 of V2 (plate of the modulator).* With the signal on terminal 8 of V2, listen for a beat note from the loudspeaker. If none is obtained, test the tube and make voltage and resistance measurements (fig. 25) : FL1A may be misaligned or faulty. Check the associated circuit elements.

(8) *Terminal 4 of V2 (grid of the modulator).* Place the signal on terminal 4 of V2. If a beat note is not obtained, test the tube. The trouble may be in LCU2A. Check for a short circuit of C1.5 or C1.6.

(9) *Terminal 4 of V2 (discriminator test).* With the i-f signal still on the grid of the modulator (terminal 4 of V2), measure the voltage across the series combination of R81 and R83 (between terminals 4 and 8 of V7, or between 3 and 7 of FL4). Turn off the i-f oscillator by setting the TUNE-OPERATE switch at OPERATE. Align the secondary of FL4 to obtain a zero reading on the voltmeter. As the alignment is varied either way from this point, the reading of the voltmeter should change polarity. In order to test the primary of FL4, connect the meter between terminals 3 and 8 of FL4. Adjust the primary slug of FL4 for maximum reading on the voltmeter. This is not an alignment but merely a check on the alignment capability of this circuit. Leave the circuit in approximate alignment after clearing any trouble that may have been present in FL4 or associated circuits. If a signal generator having a 1.0-volt output at 2.65 mc is used, the signal generator may be applied to the grid of the limiter (terminal 4 of V6) rather than to terminal 4 of V2; the procedure in this test is otherwise the same.

d. R-F TESTS. For reference to r-f test signal sources see table I.

(1) *Terminal 4 of V2 (grid of the modulator).* Apply an r-f signal through a capacitor to the grid of the modulator (terminal 4 of V2). Set the TUNE-OPERATE switch to TUNE. Manually set the dial of the trouble receiver to approximately the frequency of the r-f source and tune for a beat note. If it is impossible to obtain a beat note, either the source of radio frequency is not providing voltage on the grid of V2 or the r-f oscillator of the trouble receiver is not functioning. In the latter case check V3, LCU2, R4, R5, C5, and associated circuit elements. C1.7 and C1.8 may be shorted. Make resistance and voltage measurements at the tube socket terminals (fig. 25). In order to isolate the trouble in the oscillator stage, put the r-f signal on the suppressor grid of the modulator (terminal 3 of V2). If the characteristic no-signal rushing noise is heard from the loudspeaker with the test signal, but is not heard when the test signal is absent, then the oscillator stage is faulty. However, if the oscillator stage is operating but is not properly aligned, the rushing noise may be present, but a weak beat note may appear more than one channel away from the proper setting. A realignment of the oscillator is indicated.

Caution: Any attempt to vary the adjustment of the slug in LCU3A or LCU3C will result in a change in the tracking of the oscillator stage. This stage probably will then require careful alignment. This procedure is described in paragraph 18*c*. No adjustment of LCU3A (or LCU3C) and C1.7 should be attempted until the method is fully understood.

(2) *Terminal 8 of V1 (plate of the r-f amplifier).* Place the signal on terminal 8 of V1. If no beat note is heard in the speaker, test V1. It may be that LCU2A, C1.3, or C1.4 are shorted. Make voltage and resistance measurements.

(3) *Terminal 4 of V1 (grid of the r-f amplifier).* Place the signal on terminal 4 of V1 and listen for the beat note. If no beat note can be obtained and the tube is not at fault, check LCU1A, C1.1, and C1.2 for short circuits. LCU2A may be misaligned.

(4) *Antenna post.* Put the signal on the A (antenna) post. If there is no beat note, LCU1A may be misaligned or faulty. Test the antenna connections to LCU1A.

(5) *Squelch circuit and sensitivity control.* (*a*) Turn the SQUELCH switch to ON and adjust the SENSITIVITY control for maximum sensitivity (full right rotation). The CALL SIGNAL lamp should light when the signal is tuned in. If it does not go out when the signal is tuned out, turn the SENSITIVITY control to the left to reduce the sensitivity until it does. The noise from the loudspeaker should cease whenever the CALL SIGNAL lamp is extinguished. When the signal is tuned in again, the lamp should light.

(*b*) Reduce the signal, with conditions as above, just short of the frequency where the CALL SIGNAL lamp would go out. Turn the SENSITIVITY control to the left; the lamp should go out.

(*c*) If operation of the squelch circuit and sensitivity control is not normal, test V9. Circuit elements such as R15, R16, R17, C17, C18, C20.2, C12, R21, R24, R25, R26, R27, R28, R29, R31, R95 or R96 may be faulty.

(6) *Tuning.* When all troubles have been removed, the tuning for all channels should be checked. If an LCU or an FL unit has been repaired or replaced, or if its adjustment has been changed, that unit should be realigned. If several units have been changed, or there is any question of alignment, the whole receiver should be realigned.

e. SHORT CUTS. Signal tracing procedure may be simplified by determining at the outset whether the trouble is in the a-f, i-f, or r-f circuits. This may be determined in the following order:

(1) *A-f circuits.* Put an a-f signal on the output of the discriminator (terminal 4 of V7). If output from the speaker is missing or weak, the trouble is probably located in the a-f circuit.

Caution: Unless you are familiar with these sets, you may fail to recognize a loss of amplification in the set in these tests. It's a good idea to make a comparison with a receiver known to be in good condition.

(2) *I-f circuits.* Put an i-f signal on the grid of the modulator (terminal 4 of V2). When the TUNE-OPERATE switch is at TUNE, a beat note should be heard. If step (1) above gave a beat note but none is heard now, the trouble is probably in the i-f part of the circuit.

(3) *R-f circuits.* Place an r-f signal on the A (antenna) post. Tune the receiver to the frequency of the test signal. Throw the SQUELCH switch to ON. The squelch circuit should operate satisfactorily with the SENSITIVITY control near its minimum or extreme left position. Throw the SQUELCH switch to OFF; a beat note should be heard from the speaker. The tuning dial setting should agree approximately with the test signal frequency. Test the squelch and sensitivity control operation as described in *d* (5) above.

24. Signal Tracing Using Good Receiver

If no f-m signal generator is available, a second receiver may be used for signal tracing. Keep it in good operating condition at all times to use as a source of test signals. The a-f, i-f, and r-f signals may be obtained from appropriate points in the good receiver, as follows:

a. AUDIO FREQUENCY. A-f signals may be obtained from one of the PHONES jacks of the good receiver. The VOLUME control of this receiver may be adjusted to give a satisfactory level of no-signal noise for use in testing the audio stages of the trouble receiver. If the signal strength is too great, the audio stages of the trouble receiver may be overloaded, thereby giving deceptive results. Connect the *tip* of a plug to a capacitor of 0.001 mf or greater capacitance. Insert the plug into one of the PHONES jacks to obtain an a-f source. Connect the chassis of the two receivers together to complete the circuit. Throw the OUTPUT TO PHONES switch to ON in the BC-683-A receiver; in the BC-683-B and-BM, throw the RADIO & INT-INT ONLY switch to RADIO & INT.

b. INTERMEDIATE FREQUENCY. With the TUNE-OPERATE switch at TUNE, intermediate frequencies can be obtained from the good receiver at terminal 7 of FL4. A somewhat higher output is available at terminal 2 of FL4; use the former (lower level) point for all cases except where the circuits are badly misaligned. In all cases make the connection through a capacitor (preferably 0.001-mf or larger) located close to the source of test tone. If you have no capacitor, twist two insulated wires for about 18 inches, making sure that there is no metallic connection between the wires. These two wires (at the far end) form the two ends of the lead which carries the test frequencies. In order to prevent unwanted pick-up and singing, combine

this lead (in a twisted pair) with the ground wire which forms the circuit return. Mark each wire so it may be identified. Equip each wire of the pair with clips, and run it directly from the signal source to the point of use, preferably under the bottom of the good receiver (if it is at the left side). Leave the untwisted part as short as possible. This twisted pair for pick-up and test frequency will then consist of:

(1) An insulated wire about 3 feet long used for connecting the chassis of the trouble receiver to the chassis of the source.

(2) Another insulated wire about 4 feet long cut in the middle and with the two ends connected through a capacitor or wrapped together for about 18 inches where they overlap.

c. RADIO FREQUENCY. The radio frequency may be obtained from the good receiver at the suppressor grid of the modulator (terminal 3 of V2). For most alignment purposes, the stray pick-up between two receivers placed about 2 feet apart is sufficient. For signal tracing, more pick-up may be necessary. In this event, connection may be made by using a capacitor or two wires twisted together as described in subparagraph *b* above. This frequency will be about 2.65 mc above the frequency indicated by the dial. Therefore, tune the receiver being tested to a frequency which is approximately 2.65 mc above that to which the good receiver is tuned.

25. Signal Tracing Using Good Transmitter

A transmitter in good condition may be used as a source of signals in the a-f or r-f stages of a trouble receiver, if neither an f-m signal generator nor a good receiver is available.

a. AUDIO FREQUENCY. If the transmitter is in a mounting, an a-f tone can be obtained from terminal 1 of terminal strip TS401. This terminal is visible in the case of the mounting when the door in the mounting at the left receiver position is opened.

Caution: Use a 0.001- to 1.0-mf capacitor in series with the lead, as one side of the audio source is grounded.

If the receiver is placed in a Mounting FT-237-(*) with the transmitter, throw the OUTPUT TO PHONES switch to OFF in the BC-683-A receiver; in the BC–683–B and –BM, throw the RADIO & INT—INT ONLY switch to INT ONLY. Turn the transmitter on. Audio frequencies will be available if the operator presses the microphone button of the transmitter and whistles or hums into the microphone. A throat microphone may be used.

b. INTERMEDIATE FREQUENCY. Since no source of 2.65 mc is available in the transmitter, no direct method of signal tracing in the i-f section is available with the transmitter.

c. RADIO FREQUENCY. In general, no direct connection between transmitter and receiver is necessary for picking up test radio frequencies for alignment work. In signal tracing, where direct connection may be needed, use a shielded wire, with one end connected to the antenna terminal of the receiver and the other hung near the transmitter. Connect a capacitor in series with this wire to prevent accidental short circuits.

26. Signal Tracing Using A-m Signal Generator

Since signal tracing as outlined here requires the use of an f-m signal, an a-m signal generator is not suitable. The signal may be traced through the set to the discriminator circuit by the use of oscilloscopes, etc., but no provision is made here for the use of such instruments. If the a-m signal generator has an independent audio output it may be used for signal tracing in the audio stages in the same fashion as the audio output of the f-m signal generator.

* * *

	OUTPUT METER READING
	16 VOLTS (APPROX.) 400 CPS
)	16 VOLTS (APPROX.) 400 CPS
OX.)	16 VOLTS (APPROX.) 400 CPS
)	16 VOLTS (APPROX.) 400 CPS
OX.)	16 VOLTS (APPROX.) 400 CPS
OX.)	16 VOLTS (APPROX.) 400 CPS
OX.)	16 VOLTS (APPROX.) 400 CPS
) TE	
	11 VOLTS (APPROX.) 150 CPS 20 VOLTS (APPROX.) 400 CPS 20 VOLTS (APPROX.) 1000 CPS 11 VOLTS (APPROX.) 2500 CPS 4 VOLTS (APPROX.) 5000 CPS
	2 VOLTS (APPROX.) 1000 CPS
	18 VOLTS (APPROX.) 1000 CPS

THROUGH A 0.006 MF SERIES

LYING 2.65 MC AT 1 VOLT BETWEEN
LD FALL BETWEEN LIMITS OF
) BE MAINTAINED AT THIS VALUE
T OF THE SIGNAL GENERATOR.

LOCKWISE POSITION. A FREQUENCY
RED FOR OUTPUT MEASUREMENTS
E IN OFF POSITION WHEN

URCE IS AVAILABLE.

this lead (in a twisted pair) with the ground wire which forms the circuit return. Mark each wire so it may be identified. Equip each wire of the pair with clips, and run it directly from the signal source to the point of use, preferably under the bottom of the good receiver (if it is at the left side). Leave the untwisted part as short as possible. This twisted pair for pick-up and test frequency will then consist of:

(1) An insulated wire about 3 feet long used for connecting the chassis of the trouble receiver to the chassis of the source.

(2) Another insulated wire about 4 feet long cut in the middle and with the two ends connected through a capacitor or wrapped together for about 18 inches where they overlap.

c. RADIO FREQUENCY. The radio frequency may be obtained from the good receiver at the suppressor grid of the modulator (terminal 3 of V2). For most alignment purposes, the stray pick-up between two receivers placed about 2 feet apart is sufficient. For signal tracing, more pick-up may be necessary. In this event, connection may be made by using a capacitor or two wires twisted together as described in subparagraph *b* above. This frequency will be about 2.65 mc above the frequency indicated by the dial. Therefore, tune the receiver being tested to a frequency which is approximately 2.65 mc above that to which the good receiver is tuned.

25. Signal Tracing Using Good Transmitter

A transmitter in good condition may be used as a source of signals in the a-f or r-f stages of a trouble receiver, if neither an f-m signal generator nor a good receiver is available.

a. AUDIO FREQUENCY. If the transmitter is in a mounting, an a-f tone can be obtained from terminal 1 of terminal strip TS401. This terminal is visible in the case of the mounting when the door in the mounting at the left receiver position is opened.

Caution: Use a 0.001- to 1.0-mf capacitor in series with the lead, as one side of the audio source is grounded.

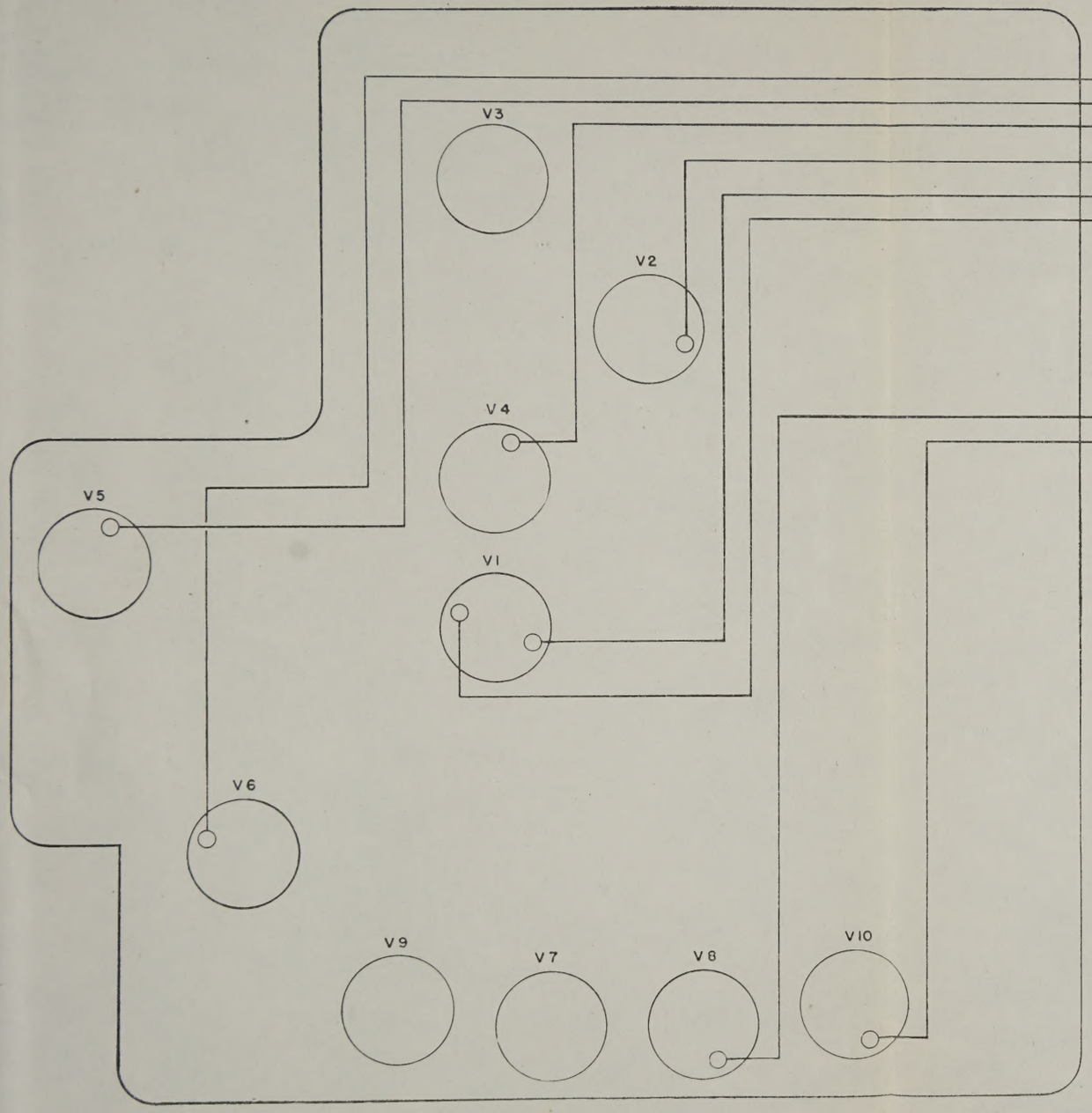
If the receiver is placed in a Mounting FT-237-(*) with the transmitter, throw the OUTPUT TO PHONES switch to OFF in the BC-683-A receiver; in the BC–683–B and –BM, throw the RADIO & INT—INT ONLY switch to INT ONLY. Turn the transmitter on. Audio frequencies will be available if the operator presses the microphone button of the transmitter and whistles or hums into the microphone. A throat microphone may be used.

b. INTERMEDIATE FREQUENCY. Since no source of 2.65 mc is available in the transmitter, no direct method of signal tracing in the i-f section is available with the transmitter.

c. RADIO FREQUENCY. In general, no direct connection between transmitter and receiver is necessary for picking up test radio frequencies for alignment work. In signal tracing, where direct connection may be needed, use a shielded wire, with one end connected to the antenna terminal of the receiver and the other hung near the transmitter. Connect a capacitor in series with this wire to prevent accidental short circuits.

26. Signal Tracing Using A-m Signal Generator

Since signal tracing as outlined here requires the use of an f-m signal, an a-m signal generator is not suitable. The signal may be traced through the set to the discriminator circuit by the use of oscilloscopes, etc., but no provision is made here for the use of such instruments. If the a-m signal generator has an independent audio output it may be used for signal tracing in the audio stages in the same fashion as the audio output of the f-m signal generator.



SIGNAL TEST POINTS	TEST FREQUENCY (MC)	INPUT REQUIRED FOR CORRECT CATHODE METER READING ✳✳	OUTPUT METER READING ✳✳✳
TERMINAL 4 OF V6 & CHASSIS	2.65	1 VOLT	16 VOLTS (APPROX.) 400 CPS
TERMINAL 4 OF V5 & CHASSIS	2.65	0.05 VOLT (APPROX.)	16 VOLTS (APPROX.) 400 CPS
TERMINAL 4 OF V4 & CHASSIS	2.65	1500 MICROVOLTS (APPROX.)	16 VOLTS (APPROX.) 400 CPS
TERMINAL 4 OF V2 & CHASSIS	2.65	50 MICROVOLTS (MAX.)	16 VOLTS (APPROX.) 400 CPS
TERMINAL 4 OF V2 & CHASSIS	39.0	300 MICROVOLTS (APPROX.)	16 VOLTS (APPROX.) 400 CPS
TERMINAL 8 OF V1 & CHASSIS	39.0	100 MICROVOLTS (APPROX.)	16 VOLTS (APPROX.) 400 CPS
TERMINAL 4 OF V1 & CHASSIS	39.0	1.5 MICROVOLTS (APPROX.)	16 VOLTS (APPROX.) 400 CPS
ANTENNA & GROUND TERMINALS	27.0	1.0 MICROVOLT (MAX.) REQUIRED TO OPERATE SQUELCH	
ANTENNA & GROUND TERMINALS	39.0	1.0 MICROVOLT	11 VOLTS (APPROX.) 150 CPS 20 VOLTS (APPROX.) 400 CPS 20 VOLTS (APPROX.) 1000 CPS 11 VOLTS (APPROX.) 2500 CPS 4 VOLTS (APPROX.) 5000 CPS
TERMINAL 5 OF V8 & CHASSIS	1000 CPS Δ	1 VOLT	2 VOLTS (APPROX.) 1000 CPS
TERMINAL 1 OF V10 & CHASSIS	1000 CPS Δ	1 VOLT	18 VOLTS (APPROX.) 1000 CPS

✳ THE SIGNAL GENERATOR CONNECTION SHALL ALWAYS BE MADE THROUGH A 0.006 MF SERIES CAPACITOR.

✳✳ CORRECT CATHODE METER READING CAN BE OBTAINED BY APPLYING 2.65 MC AT 1 VOLT BETWEEN TERMINAL 4 OF V6 AND CHASSIS. THIS METER READING SHOULD FALL BETWEEN LIMITS OF 0.6 VDC AND 0.9 VDC AS READ ON THE V.T.V.M. AND SHOULD BE MAINTAINED AT THIS VALUE WHILE TRACING THE SIGNAL BY ADJUSTMENT OF THE OUTPUT OF THE SIGNAL GENERATOR.

✳✳✳ SQUELCH SWITCH OFF AND VOLUME CONTROL IN MAXIMUM CLOCKWISE POSITION. A FREQUENCY MODULATED SIGNAL GENERATOR (±15 KC DEVIATION) IS REQUIRED FOR OUTPUT MEASUREMENTS INVOLVING RF AND IF INPUTS. SPEAKER SWITCH SHOULD BE IN OFF POSITION WHEN MEASUREMENTS ARE MADE.

Δ THIS MEASUREMENT IS TO BE MADE IF AN AUDIO FREQUENCY SOURCE IS AVAILABLE.

TL17112

Figure 24. Radio Receiver BC-683-(*), signal tracing chart.

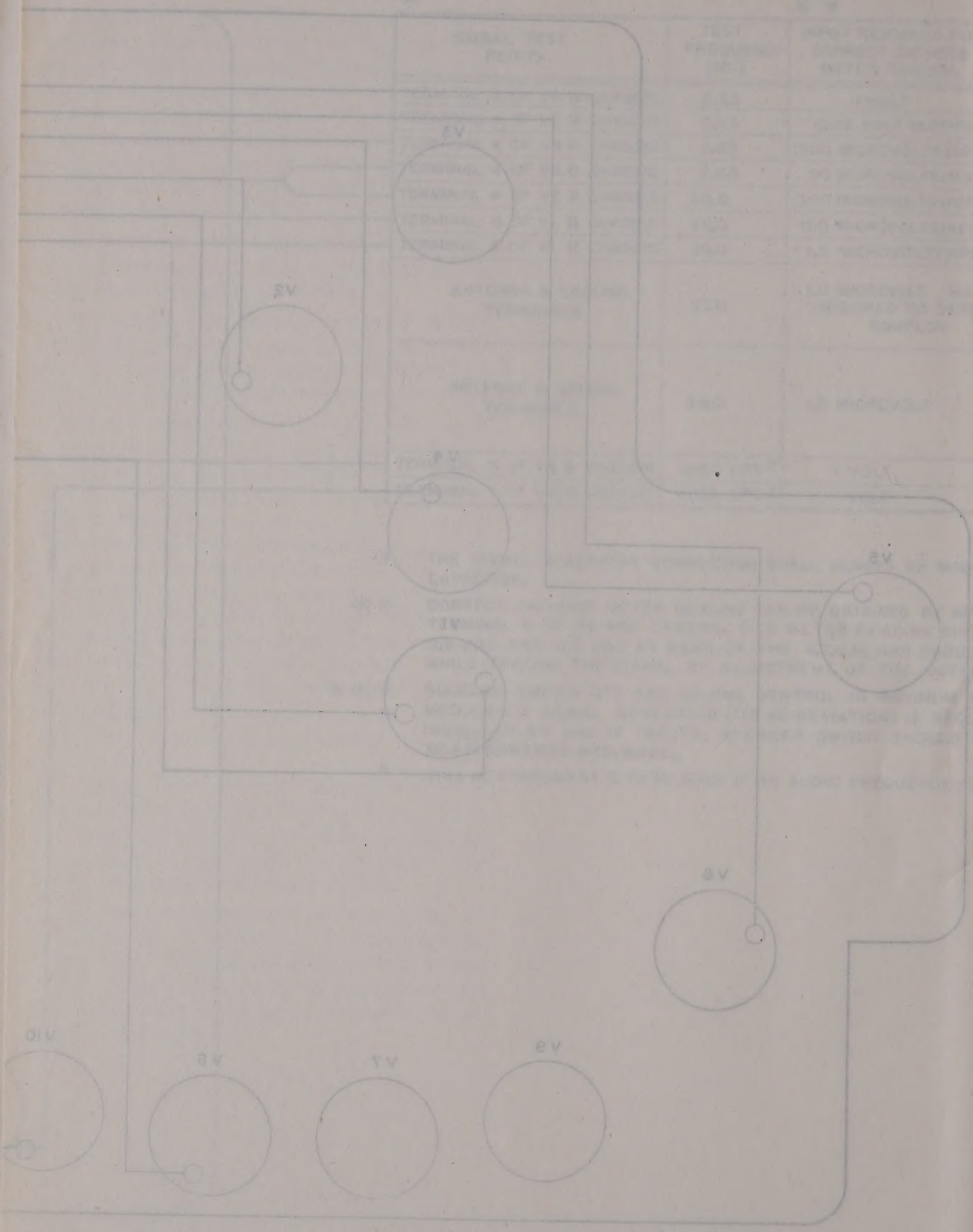

V5
V4
V1
V2
V8
V10
V6
V7
V9

FIGURE NUMBER		
	683-B AND-BM	
) OHMS :R VOLT	V.T.V.M.	1000 OHMS PER VOLT
:5 c	25 f	25 g
:5 e	25 h	25 i
:5 e	25 h	25 i
:5 e	25 h	25 i
:5 c	25 f	25 g
:5 e	25 h	25 i

EASUREMENTS

ED BETWEEN THE DESIGNATED TERMINAL AND THE RECEIVER CHASSIS.
PERATE AND THE ON-OFF SHOULD BE IN THE DOWNWARD POSITION.
DINGS. A RECEIVER WHICH IS OPERATING SATISFACTORILY NEED NOT
N READINGS DIFFER FROM THOSE GIVEN AS DIFFERENCES IN
ARIATIONS IN VOLTAGES.
R 24 VOLTS FROM THE BATTERY. FOR OTHER BATTERY VOLTAGES
DJUSTED IN PROPORTION.
SUREMENTS WITH A METER OF 1000 OHMS PER VOLT, THE FULL-SCALE
IIGHER THAN THE EXPECTED VOLTAGE.
EMENTS ARE BASED ON A VOLT-OHMMETER 1-107 OR EQUIVALENT.
S ON METER OF 1000 OHMS PER VOLT.
AS TWO VOLTAGES SEPARATED BY THE WORD "OR". THE FIRST READING
ECOND READING IS FOR A 24-VOLT BATTERY.

MEASUREMENTS

RE MEASURED BETWEEN THE RECEIVER CHASSIS AND DESIGNATED

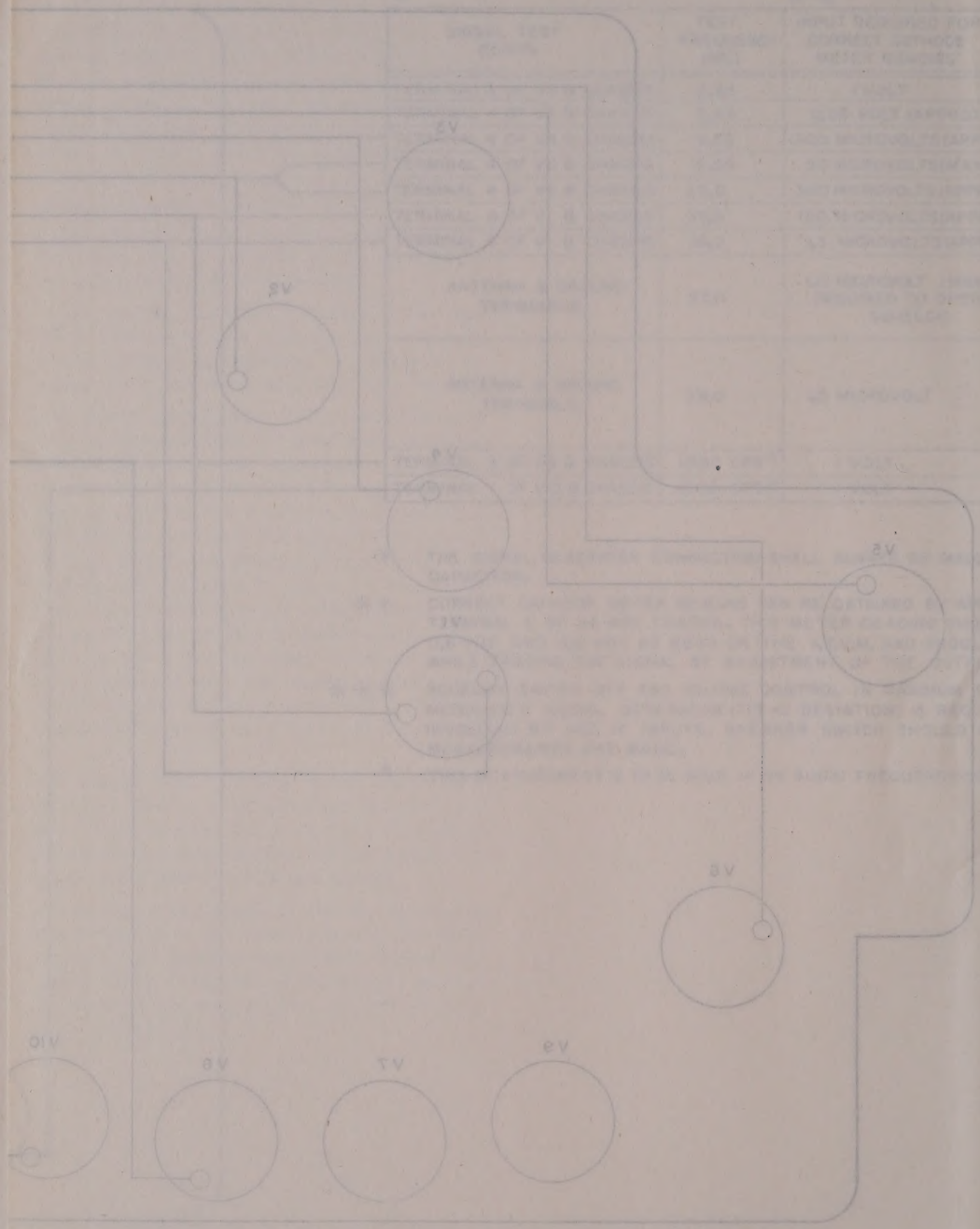
NDICATED VALUES SHOULD NOT BE REGARDED AS AN INDICATION OF A

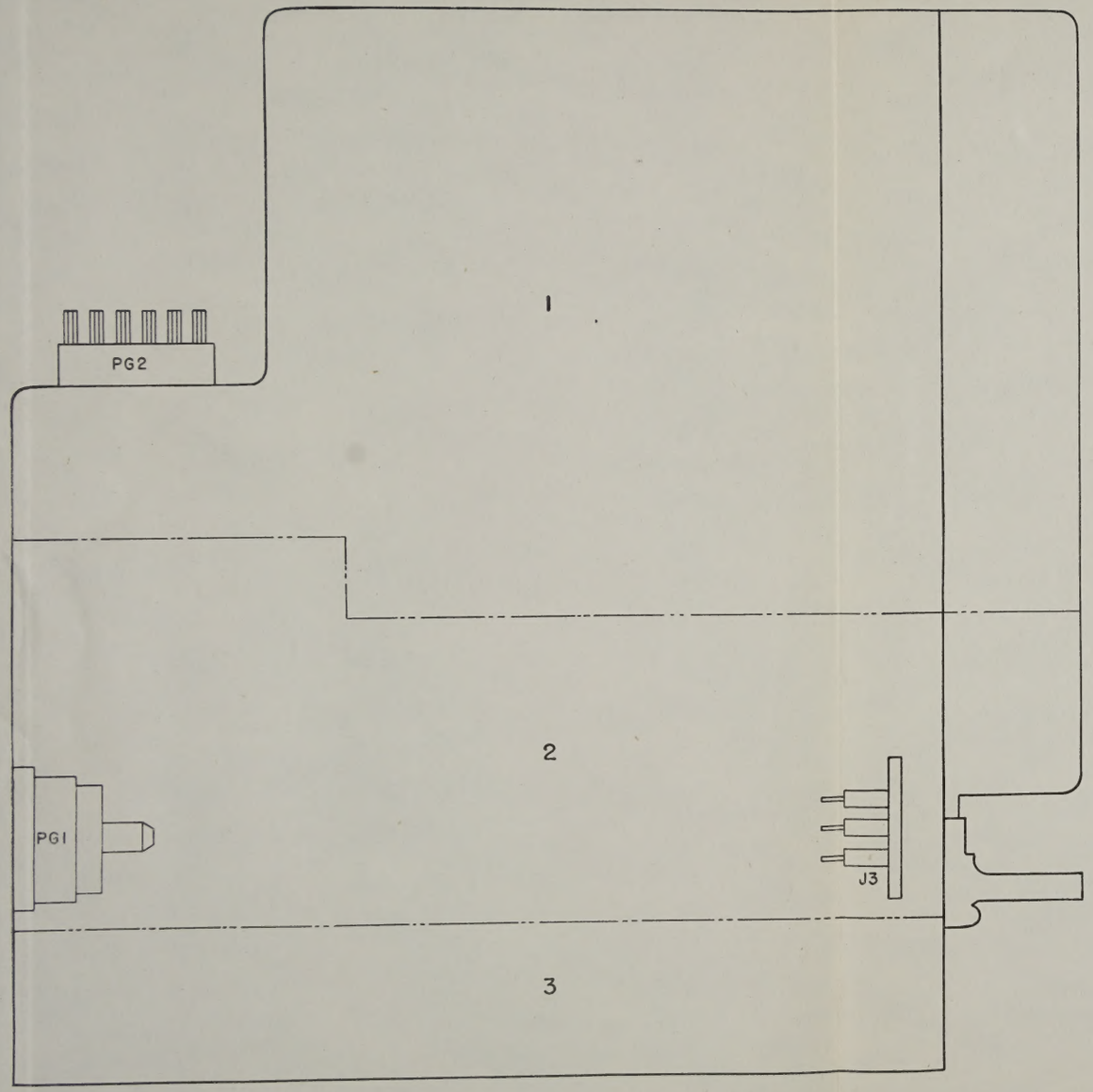
SERVED BETWEEN THE SCHEMATIC DRAWING CONTAINED IN THESE
EL APPEARING ON THE RECEIVER. THESE DISCREPANCIES ARE DUE TO
N SUCH CASES THE CIRCUIT LABEL APPLIES. NATURALLY, SUCH
ESISTANCE VALUES INDICATED.
ED BEFORE MAKING ANY RESISTANCE MEASUREMENTS.
OR DOWNWARD POSITION EXCEPT THE TUNE-OPERATE AND THE RADIO
H SHOULD POINT UP.
CONTROLS TO THEIR MAXIMUM CLOCKWISE ROTATION.
ONNECT THE OHMMETER TEST LEAD TO TERMINAL 5 OF J3. WITH THE
MEASURED RESISTANCE SHOULD BE APPROX. 100,000 OHMS AND
THE VOLUME CONTROL IS TURNED TO ITS EXTREME COUNTERCLOCK-

L MEASURE THE RESISTANCE FROM THE TERMINAL OF C25 TO WHICH
HE RESISTANCE AT THIS POINT SHOULD VARY BETWEEN 50 AND 250
L IS ROTATED. WHEN THIS CHECK IS MADE THE SQUELCH SWITCH MUST
ER CHECKS ARE MADE WITH THIS SWITCH OFF.

legend for voltage and resistance diagram.

TL17113





AREA	FIGURE NUMBER			
	683-A		683-B AND-BM	
	V.T.V.M.	1000 OHMS PER VOLT	V.T.V.M.	1000 OHMS PER VOLT
1	25 b	25 c	25 f	25 g
2	25 d	25 e	25 h	25 i
3	25 d	25 e	25 h	25 i
PG1	25 d	25 e	25 h	25 i
PG2	25 b	25 c	25 f	25 g
J3	25 d	25 e	25 h	25 i

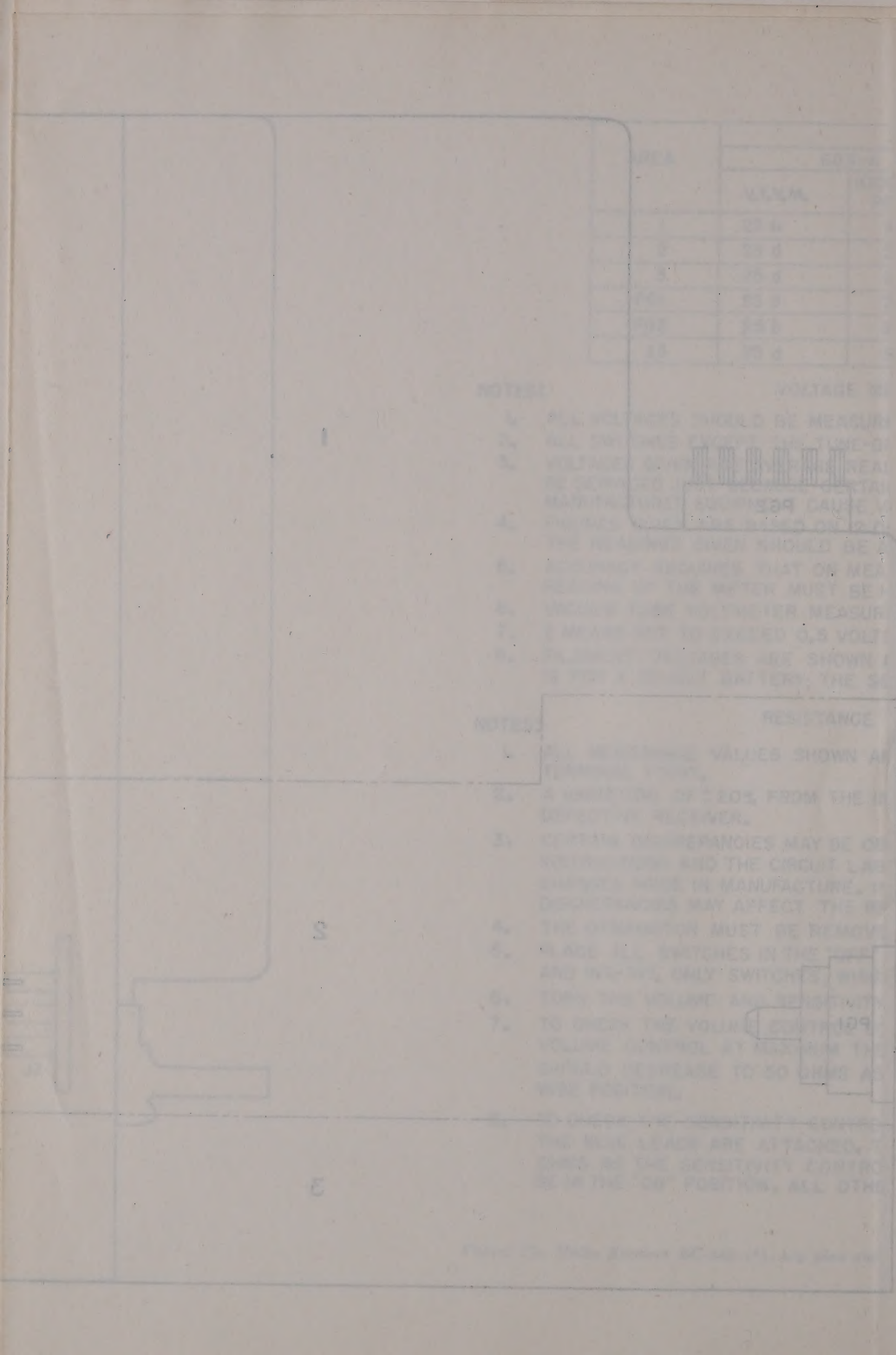
NOTES: VOLTAGE MEASUREMENTS

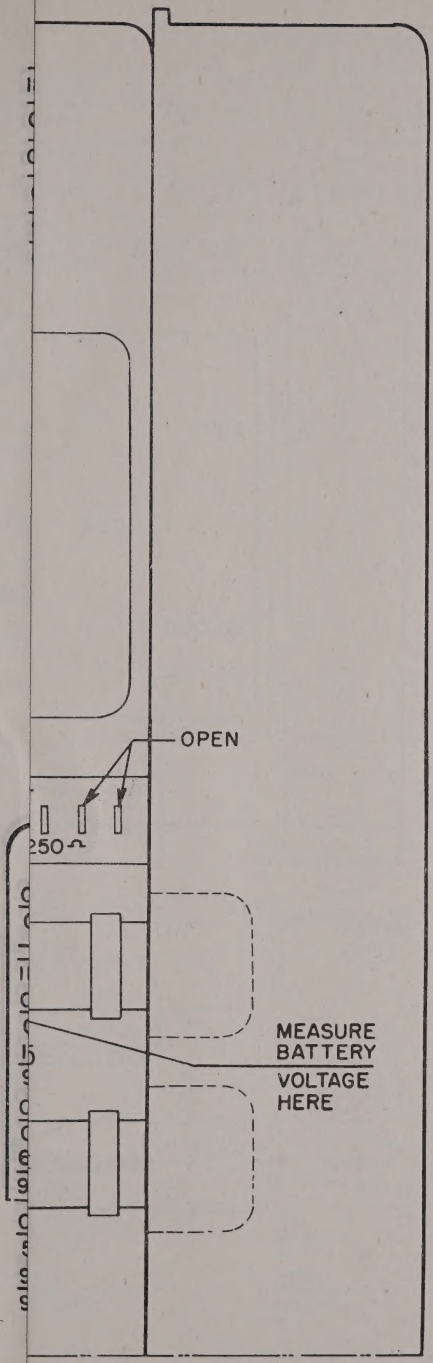
1. ALL VOLTAGES SHOULD BE MEASURED BETWEEN THE DESIGNATED TERMINAL AND THE RECEIVER CHASSIS.
2. ALL SWITCHES EXCEPT THE TUNE-OPERATE AND THE ON-OFF SHOULD BE IN THE DOWNWARD POSITION.
3. VOLTAGES GIVEN ARE AVERAGE READINGS. A RECEIVER WHICH IS OPERATING SATISFACTORILY NEED NOT BE SERVICED JUST BECAUSE CERTAIN READINGS DIFFER FROM THOSE GIVEN AS DIFFERENCES IN MANUFACTURED EQUIPMENT CAUSE VARIATIONS IN VOLTAGES.
4. FIGURES GIVEN ARE BASED ON 12 OR 24 VOLTS FROM THE BATTERY. FOR OTHER BATTERY VOLTAGES THE READINGS GIVEN SHOULD BE ADJUSTED IN PROPORTION.
5. ACCURACY REQUIRES THAT ON MEASUREMENTS WITH A METER OF 1000 OHMS PER VOLT, THE FULL-SCALE READING OF THE METER MUST BE HIGHER THAN THE EXPECTED VOLTAGE.
6. VACUUM TUBE VOLTMETER MEASUREMENTS ARE BASED ON A VOLT-OHMMETER I-107 OR EQUIVALENT.
7. ◊ MEANS NOT TO EXCEED 0.5 VOLTS ON METER OF 1000 OHMS PER VOLT.
8. FILAMENT VOLTAGES ARE SHOWN AS TWO VOLTAGES SEPARATED BY THE WORD "OR". THE FIRST READING IS FOR A 12-VOLT BATTERY; THE SECOND READING IS FOR A 24-VOLT BATTERY.

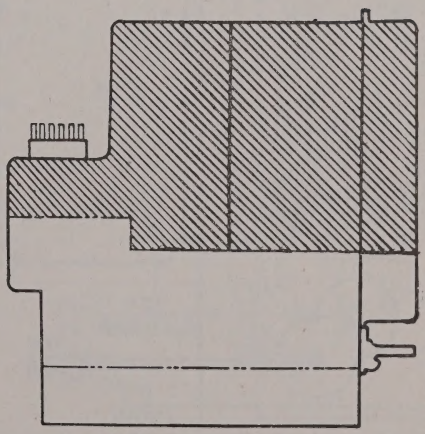
NOTES: RESISTANCE MEASUREMENTS

1. ALL RESISTANCE VALUES SHOWN ARE MEASURED BETWEEN THE RECEIVER CHASSIS AND DESIGNATED TERMINAL POINT.
2. A VARIATION OF ± 20% FROM THE INDICATED VALUES SHOULD NOT BE REGARDED AS AN INDICATION OF A DEFECTIVE RECEIVER.
3. CERTAIN DISCREPANCIES MAY BE OBSERVED BETWEEN THE SCHEMATIC DRAWING CONTAINED IN THESE INSTRUCTIONS AND THE CIRCUIT LABEL APPEARING ON THE RECEIVER. THESE DISCREPANCIES ARE DUE TO CHANGES MADE IN MANUFACTURE. IN SUCH CASES THE CIRCUIT LABEL APPLIES. NATURALLY, SUCH DISCREPANCIES MAY AFFECT THE RESISTANCE VALUES INDICATED.
4. THE DYNAMOTOR MUST BE REMOVED BEFORE MAKING ANY RESISTANCE MEASUREMENTS.
5. PLACE ALL SWITCHES IN THE "OFF" OR DOWNWARD POSITION EXCEPT THE TUNE-OPERATE AND THE RADIO AND INT.-INT. ONLY SWITCHES, WHICH SHOULD POINT UP.
6. TURN THE VOLUME AND SENSITIVITY CONTROLS TO THEIR MAXIMUM CLOCKWISE ROTATION.
7. TO CHECK THE VOLUME CONTROL CONNECT THE OHMMETER TEST LEAD TO TERMINAL 5 OF J3. WITH THE VOLUME CONTROL AT MAXIMUM THE MEASURED RESISTANCE SHOULD BE APPROX. 100,000 OHMS AND SHOULD DECREASE TO 50 OHMS AS THE VOLUME CONTROL IS TURNED TO ITS EXTREME COUNTERCLOCKWISE POSITION.
8. TO CHECK THE SENSITIVITY CONTROL MEASURE THE RESISTANCE FROM THE TERMINAL OF C25 TO WHICH THE BLUE LEADS ARE ATTACHED. THE RESISTANCE AT THIS POINT SHOULD VARY BETWEEN 50 AND 250 OHMS AS THE SENSITIVITY CONTROL IS ROTATED. WHEN THIS CHECK IS MADE THE SQUELCH SWITCH MUST BE IN THE "ON" POSITION. ALL OTHER CHECKS ARE MADE WITH THIS SWITCH OFF.

Figure 25a. Radio Receiver BC-683-(*), key plan and legend for voltage and resistance diagram. TL17113







TL17114



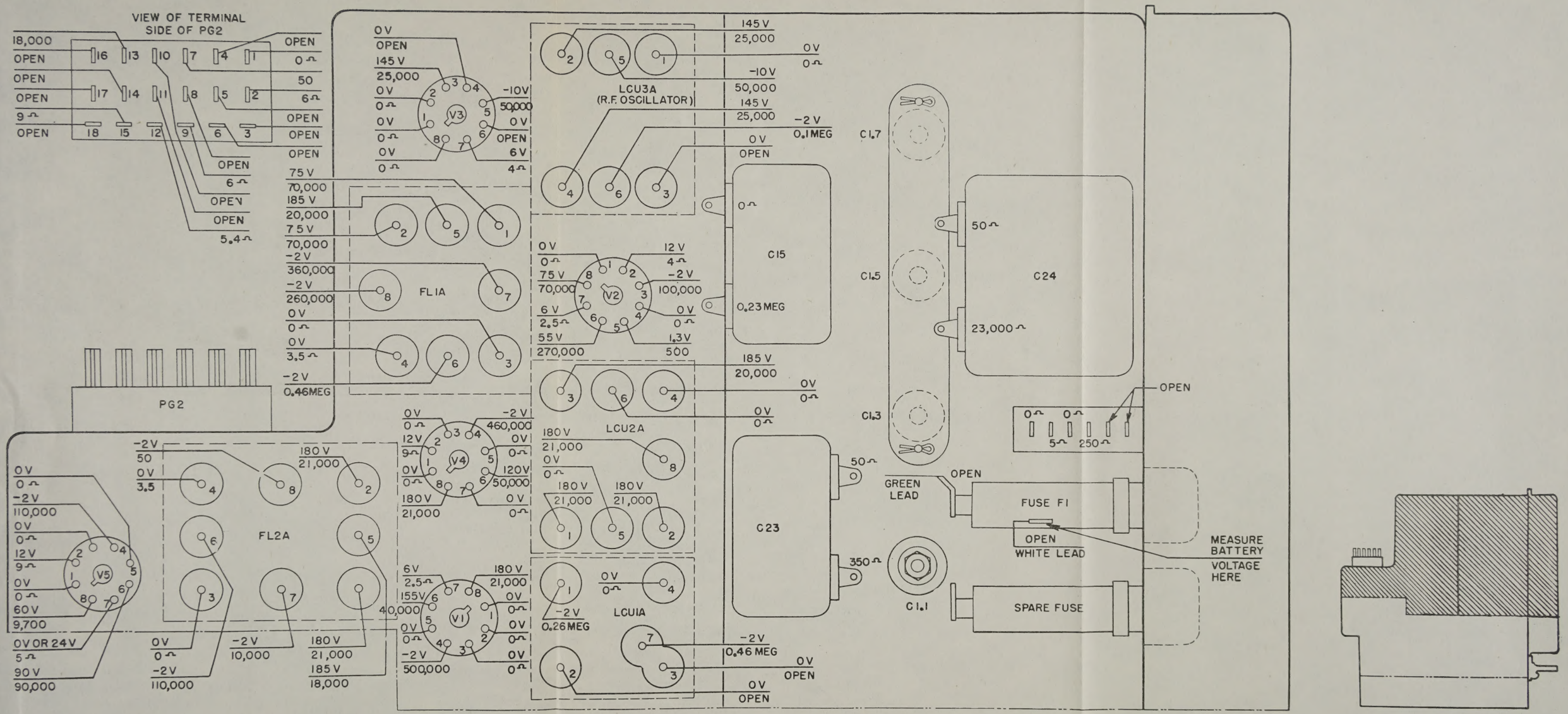
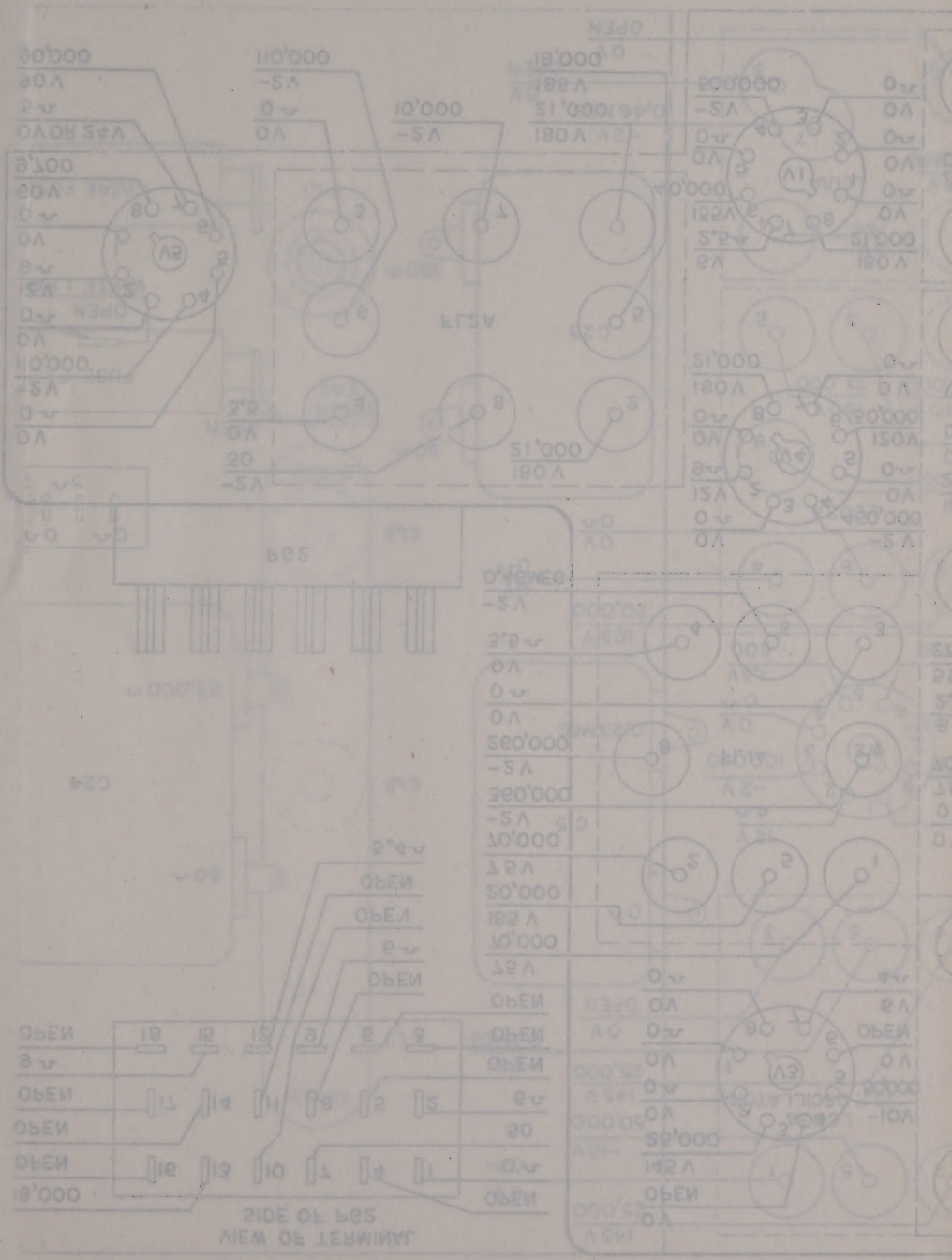
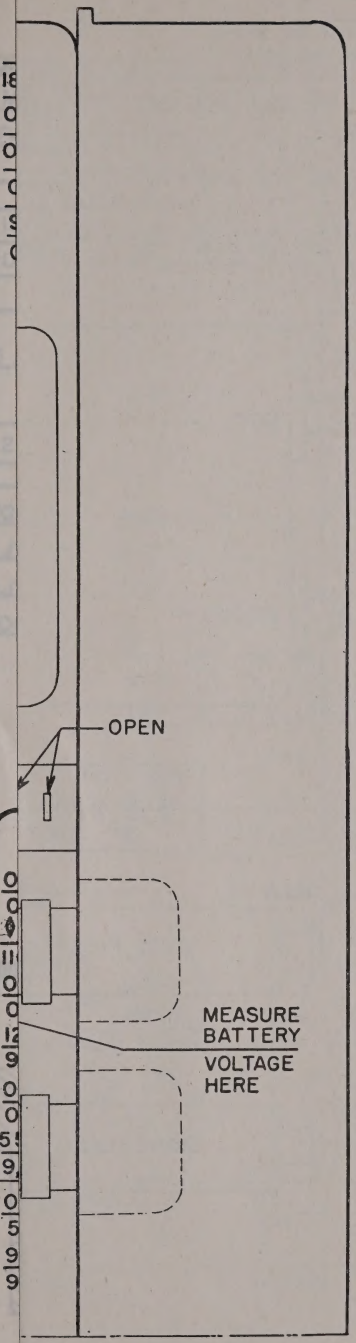
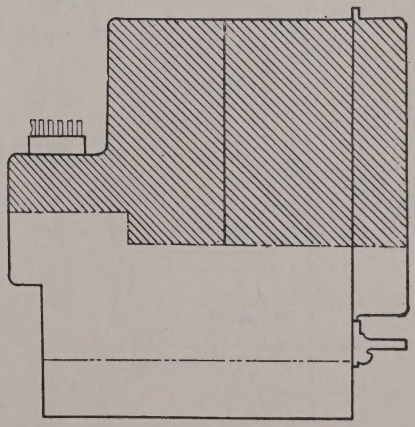


Figure 25b. Radio Receiver BC–683–A, voltage and resistance diagram using vacuum-tube voltmeter, area 1.


VIEW OF TERMINAL
SIDE OF P25





TL17115

VIEW OF TERMINAL
SIDE OF P82
OPEN
OPEN
OPEN

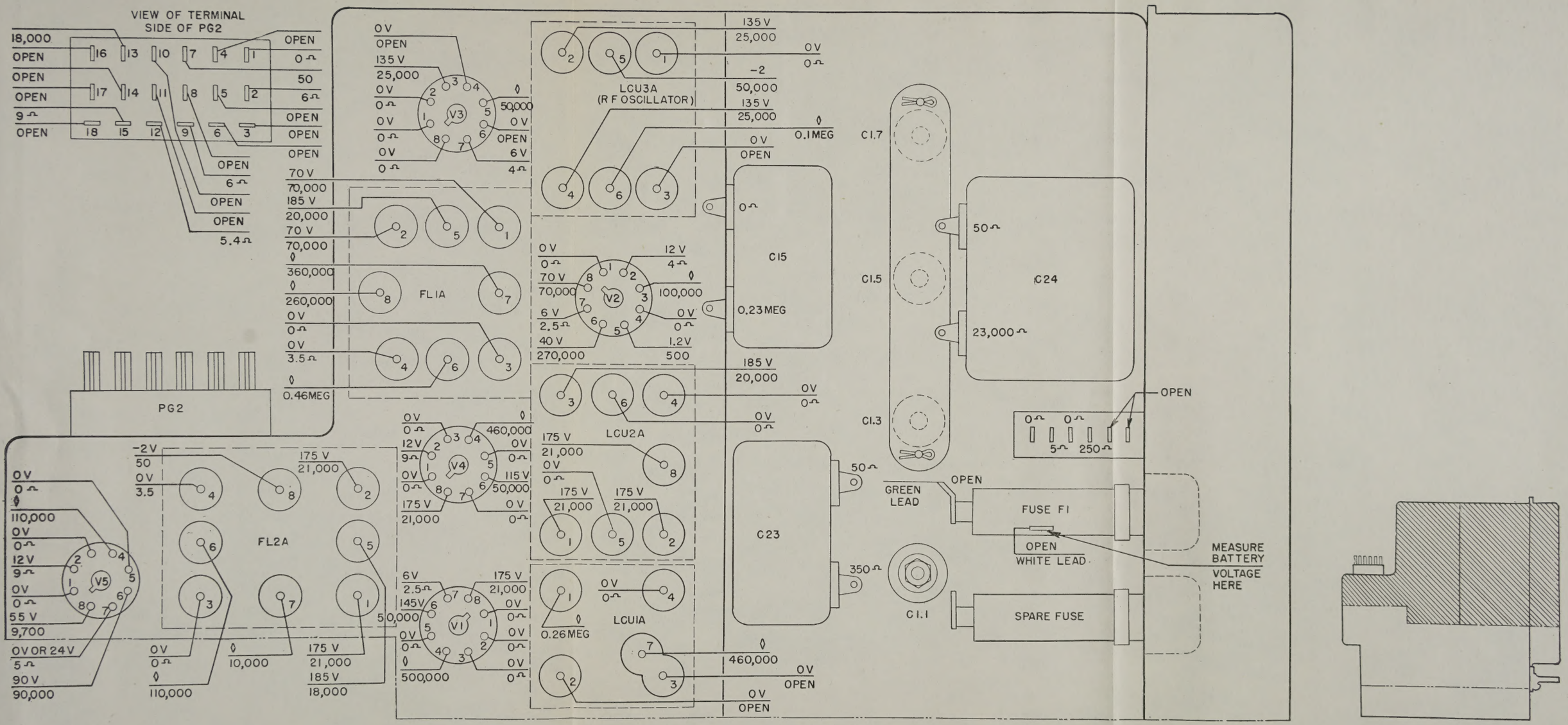
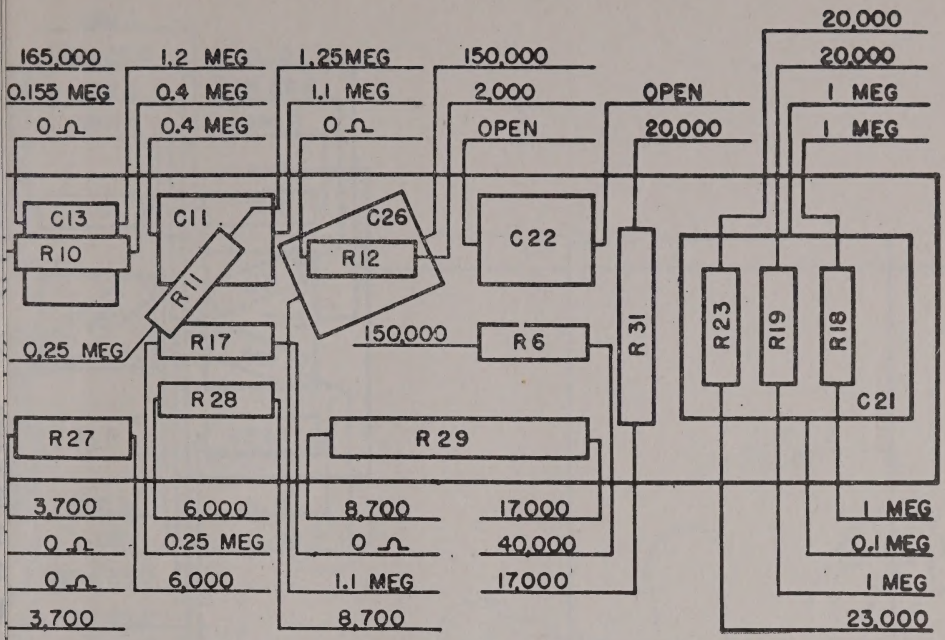
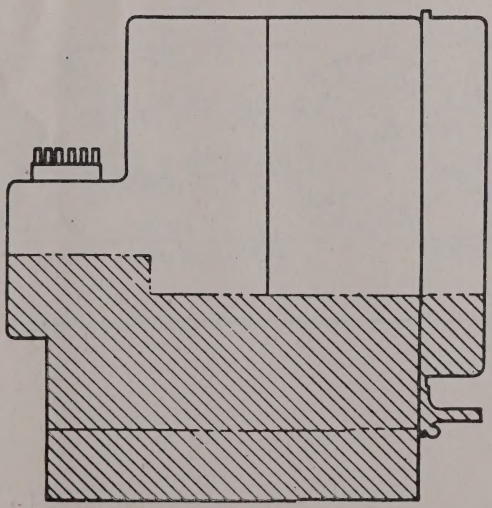


Figure 25c. Radio Receiver BC–683–A, voltage and resistance diagram using 1,000-ohm-per-volt voltmeter, area 1.

VIEW OF TERMINAL
SIDE OF P62
P62
FL2A


165,000
0.155 MEG
0
1.2 MEG
0.4 MEG
0.4 MEG
1.25MEG
1.1 MEG
0
150,000
2,000
OPEN
OPEN
20,000
20,000
20,000
1 MEG
1 MEG
C13
R10
C11
R11
C26
R12
C22
R31
R23
R19
R18
C21
0.25 MEG
R17
150,000
R6
R28
R27
R29
3,700
0
0
3,700
6,000
0.25 MEG
6,000
8,700
0
1.1 MEG
8,700
17,000
40,000
17,000
1 MEG
0.1 MEG
1 MEG
23,000



TL17116

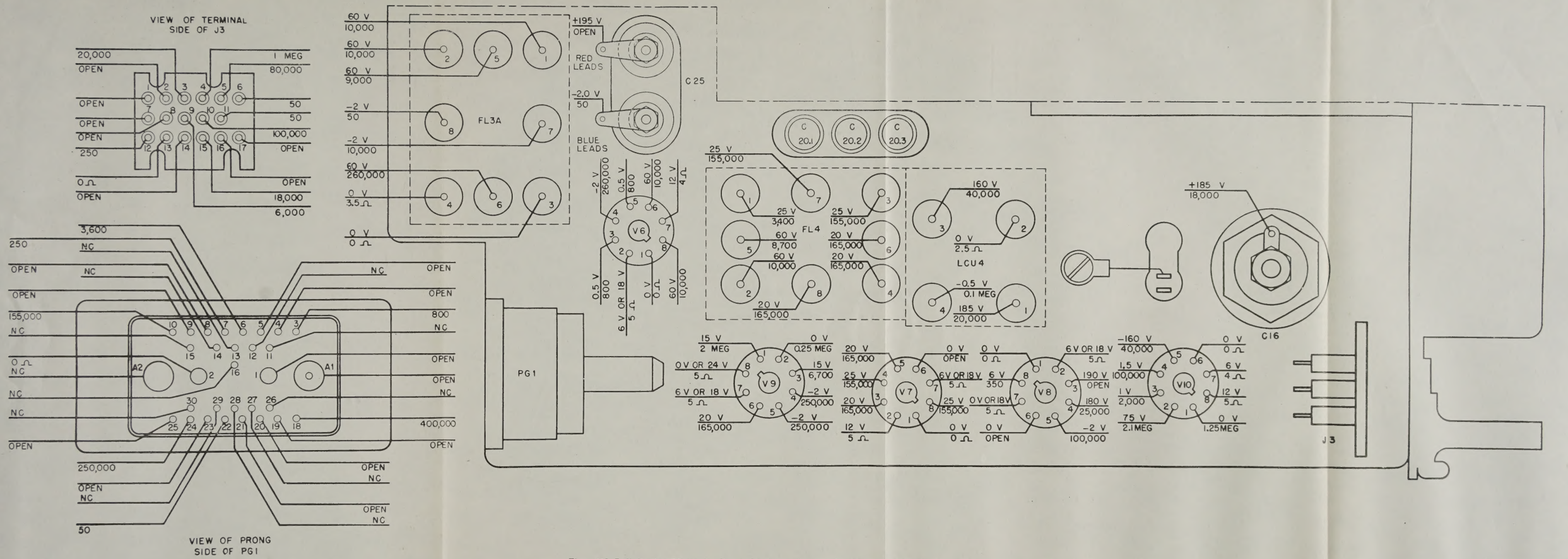
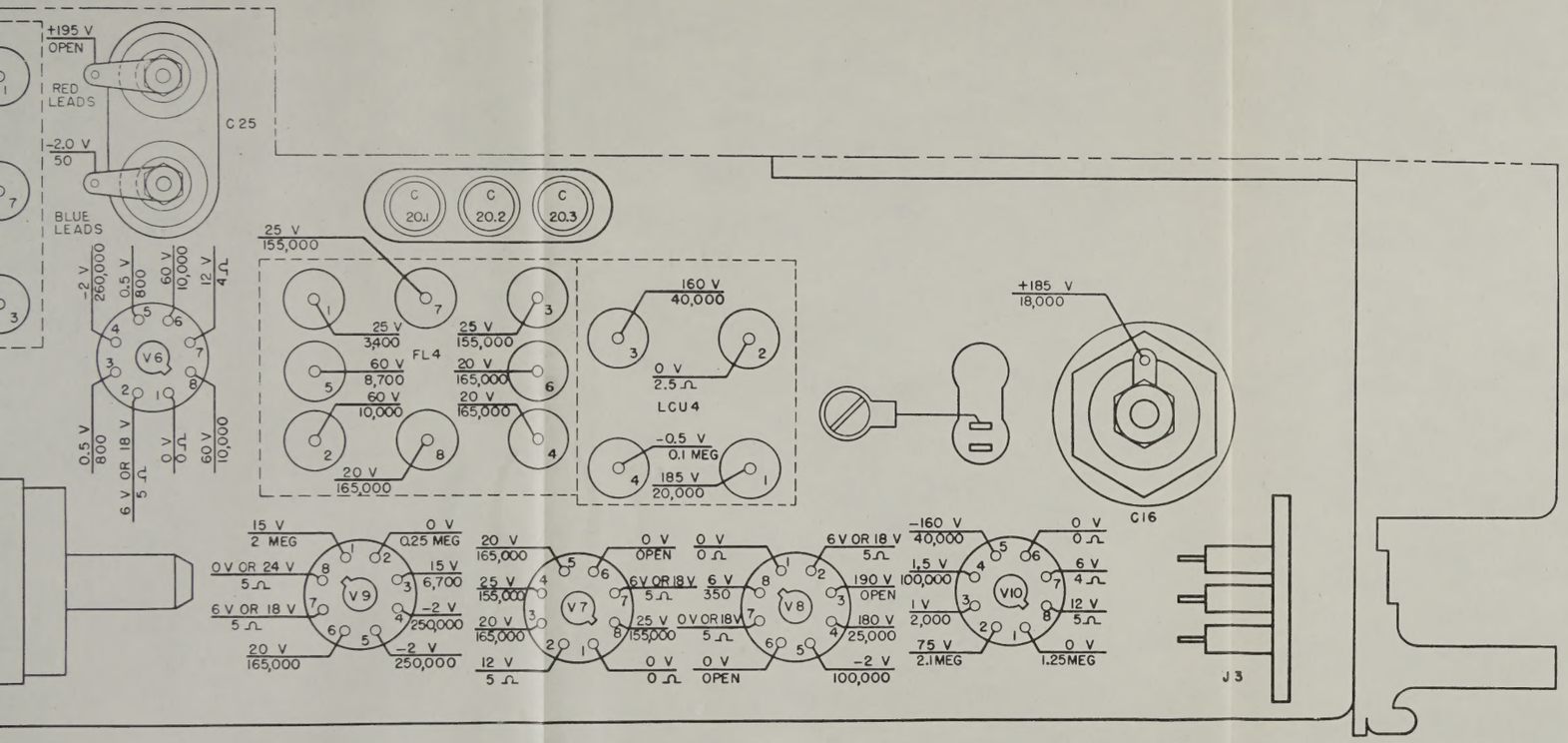
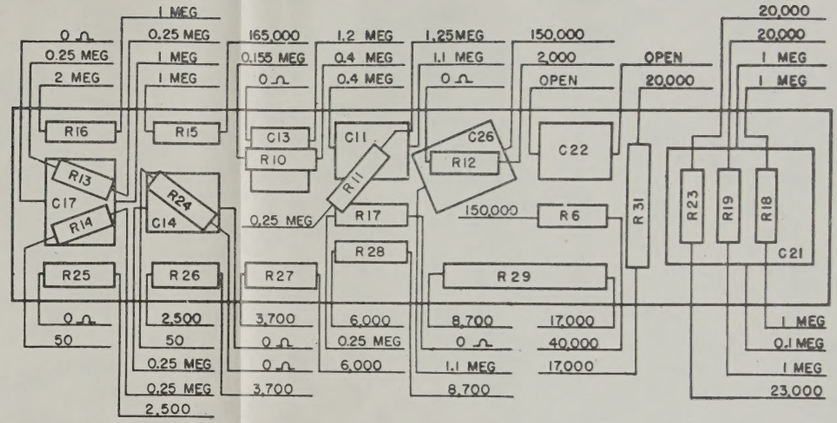
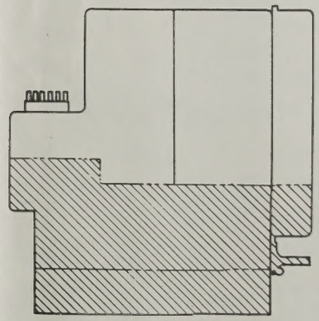


Figure 25d. Radio Receiver BC–683–A, voltage and resistance diagram using vacuum-tube voltmeter, areas 2 and 3.

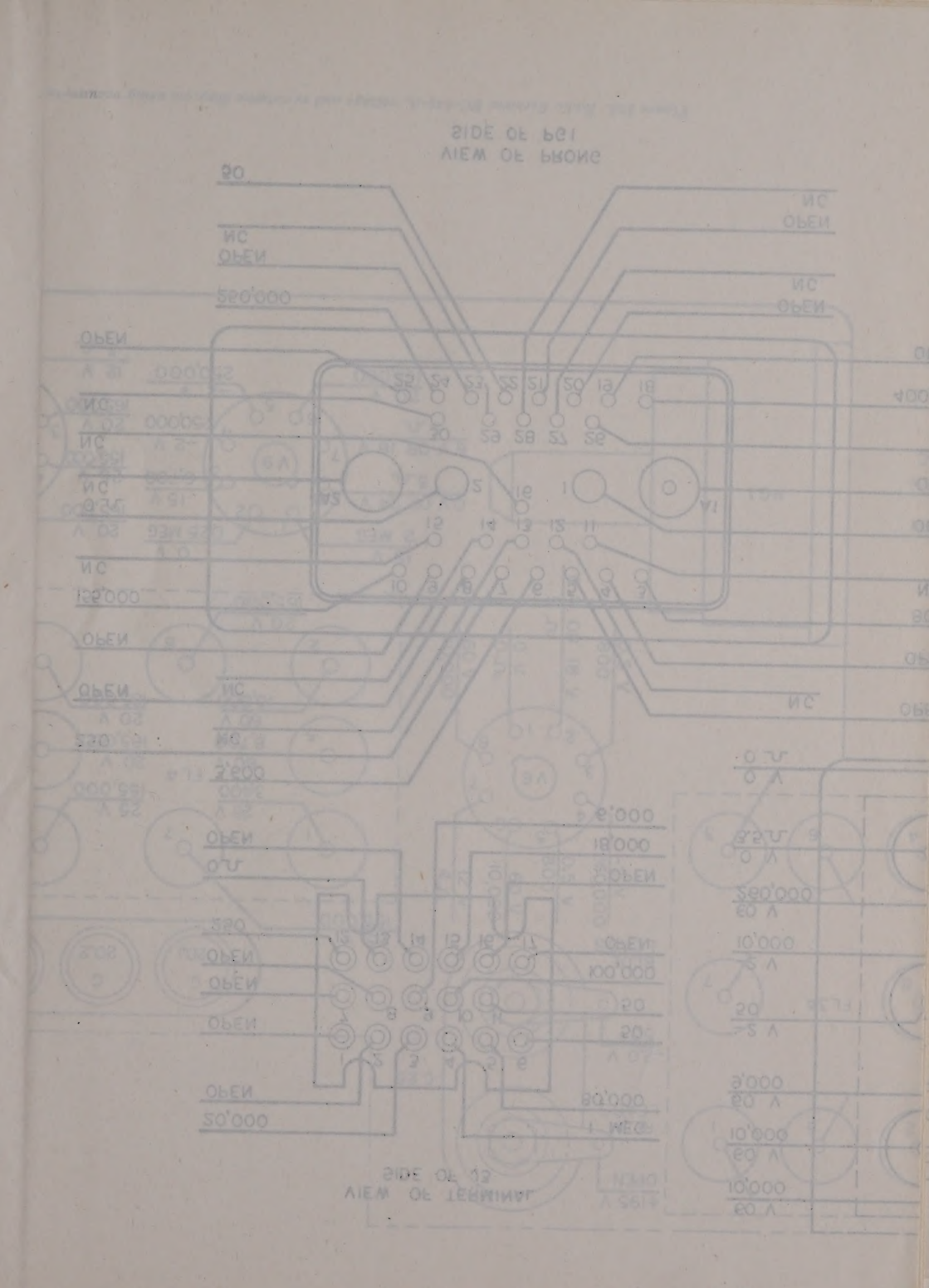


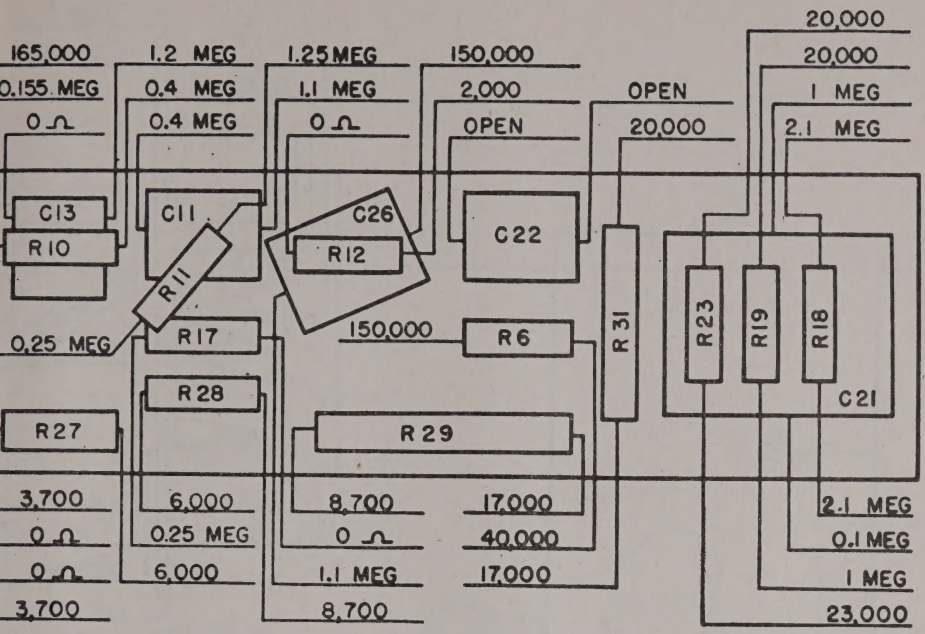


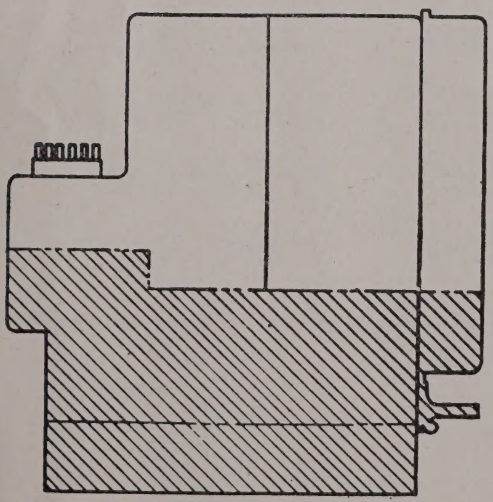


TL17116

Figure 25d. Radio Receiver BC-683-A, voltage and resistance diagram using vacuum-tube voltmeter, areas 2 and 3.




165,000
0.155 MEG
0
1.2 MEG
0.4 MEG
0.4 MEG
1.25 MEG
1.1 MEG
0
150,000
2,000
OPEN
OPEN
20,000
20,000
1 MEG
2.1 MEG
C13
R10
C11
R11
C26
R12
C22
R31
R23
R19
R18
C21
0.25 MEG
R17
150,000
R6
R28
R27
R29
3,700
0
0
3,700
6,000
0.25 MEG
6,000
8,700
0
1.1 MEG
8,700
17,000
40,000
17,000
2.1 MEG
0.1 MEG
1 MEG
23,000



TL17117

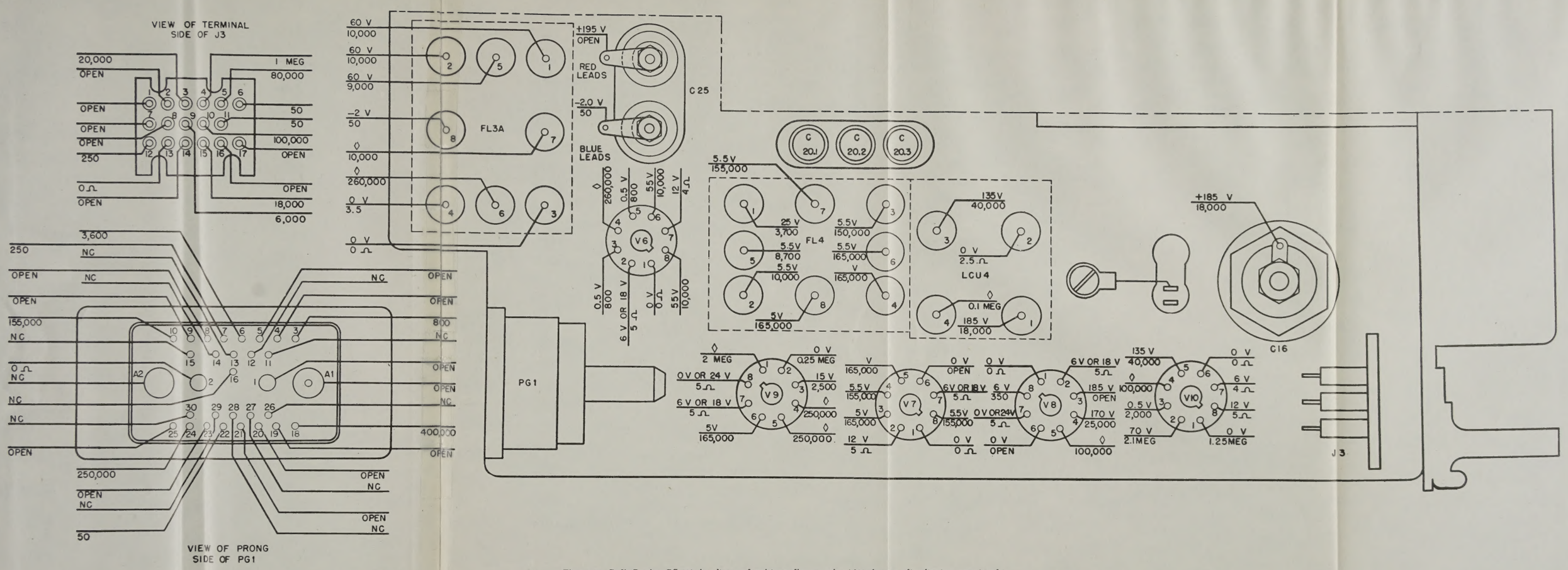
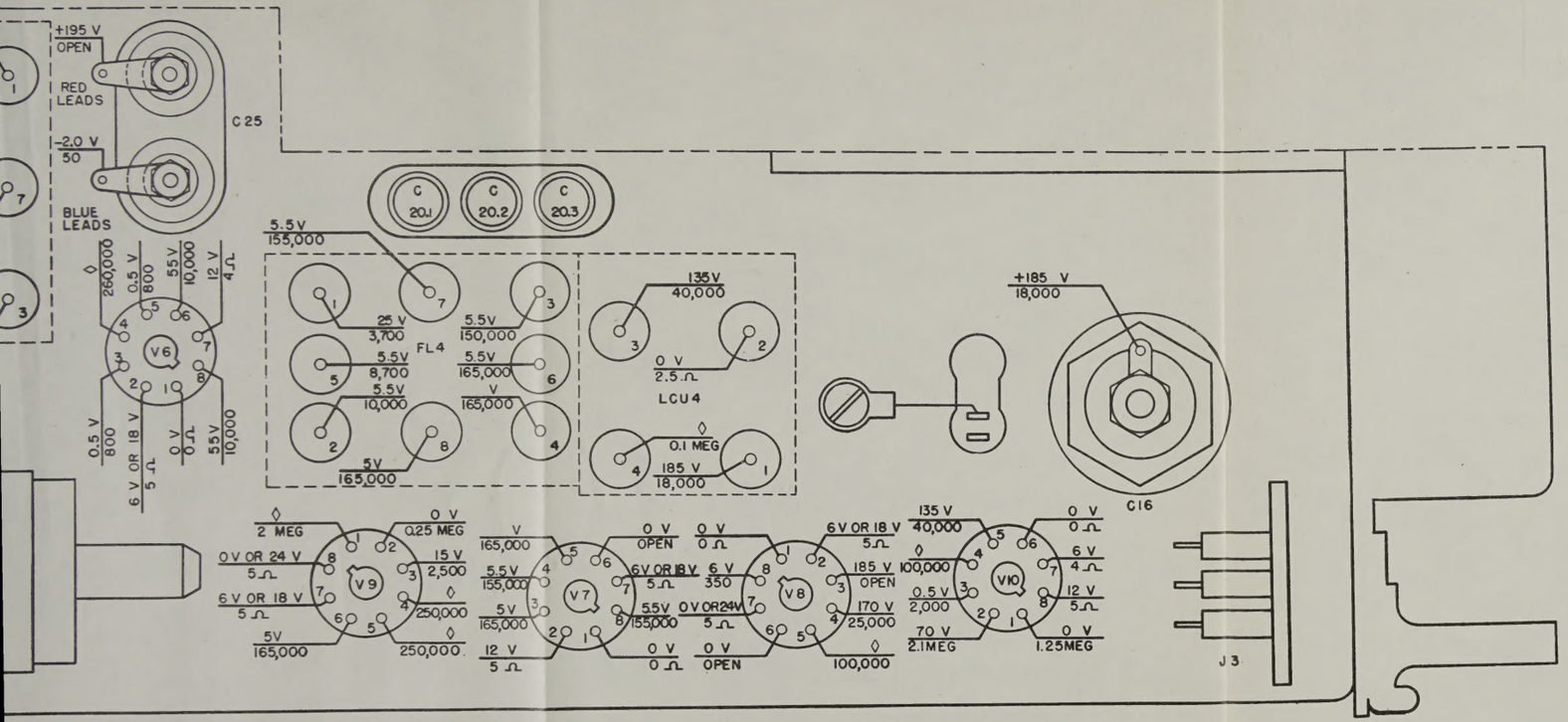
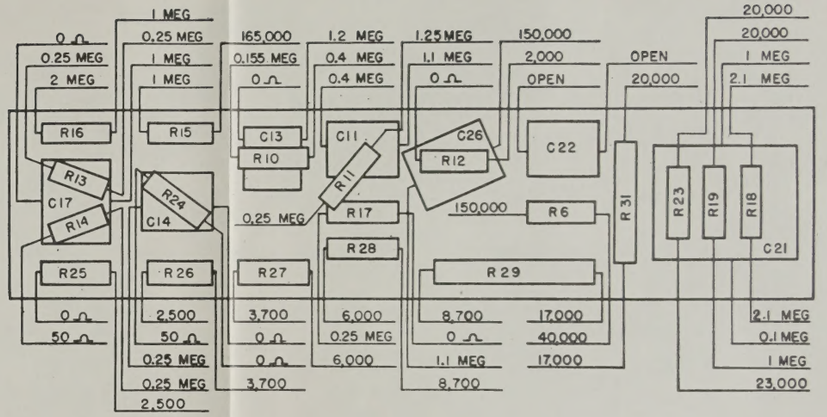
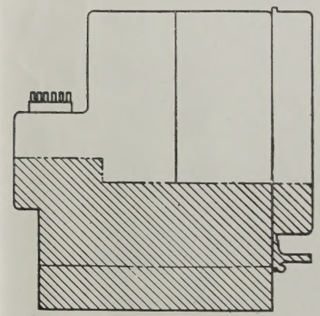


Figure 25e. Radio Receiver BC-683-A, voltage and resistance diagram using 1,000 ohm-per-volt voltmeter, areas 2 and 3.

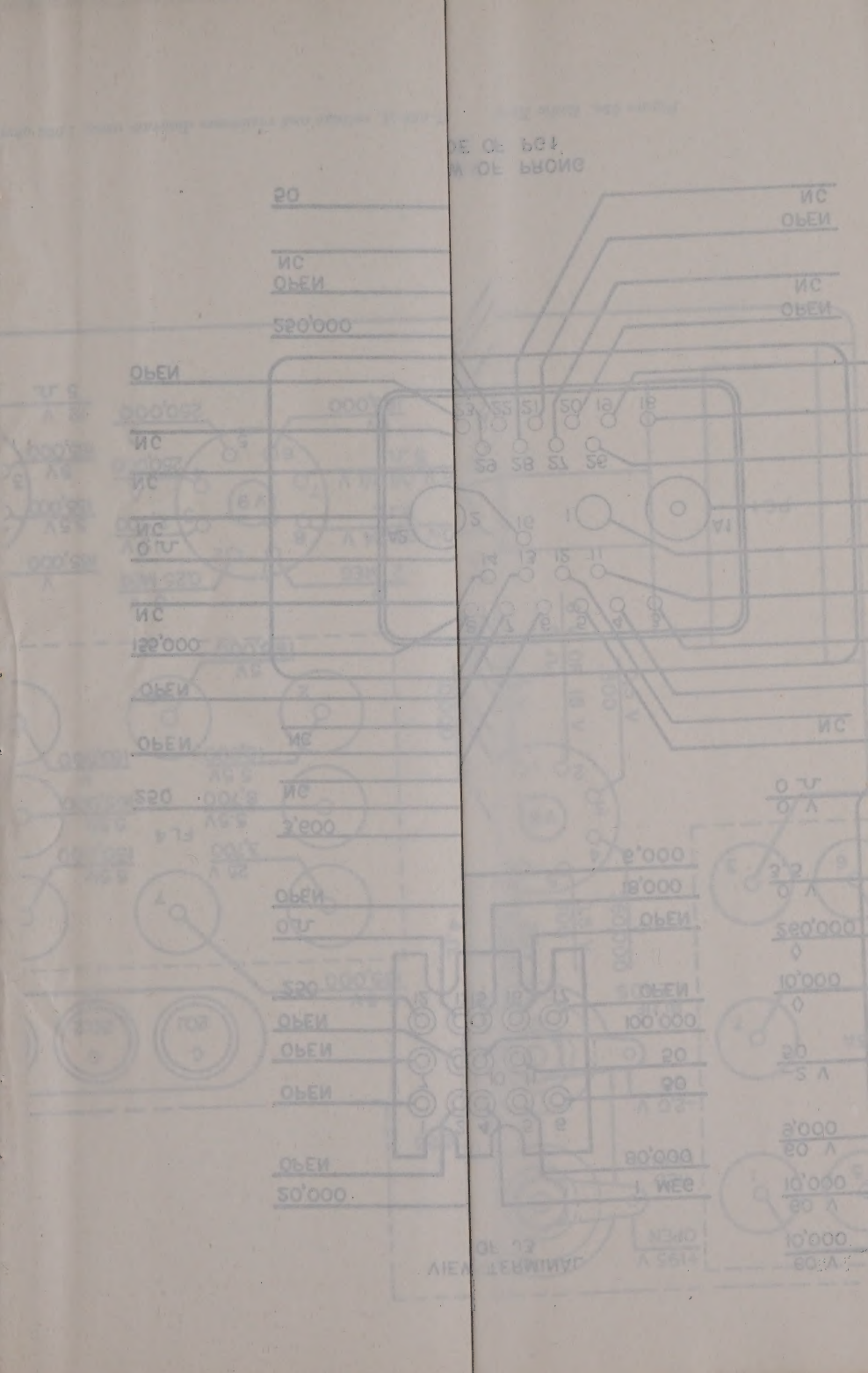


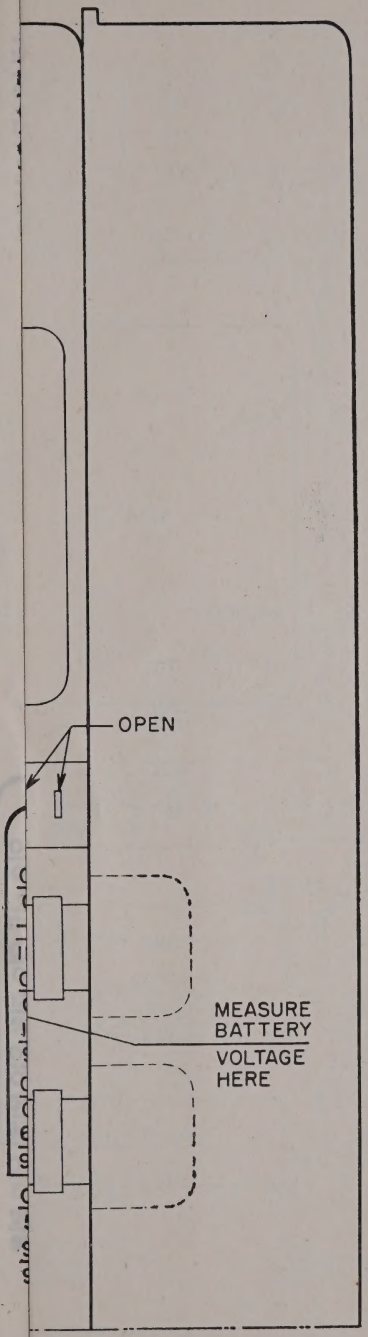


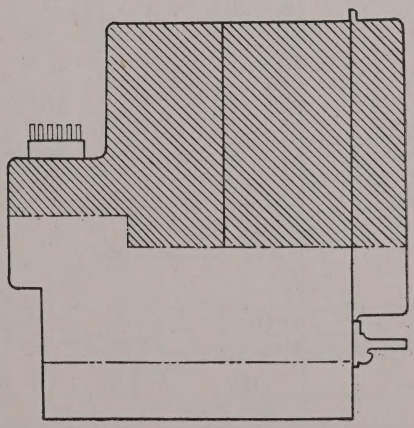


TL17117

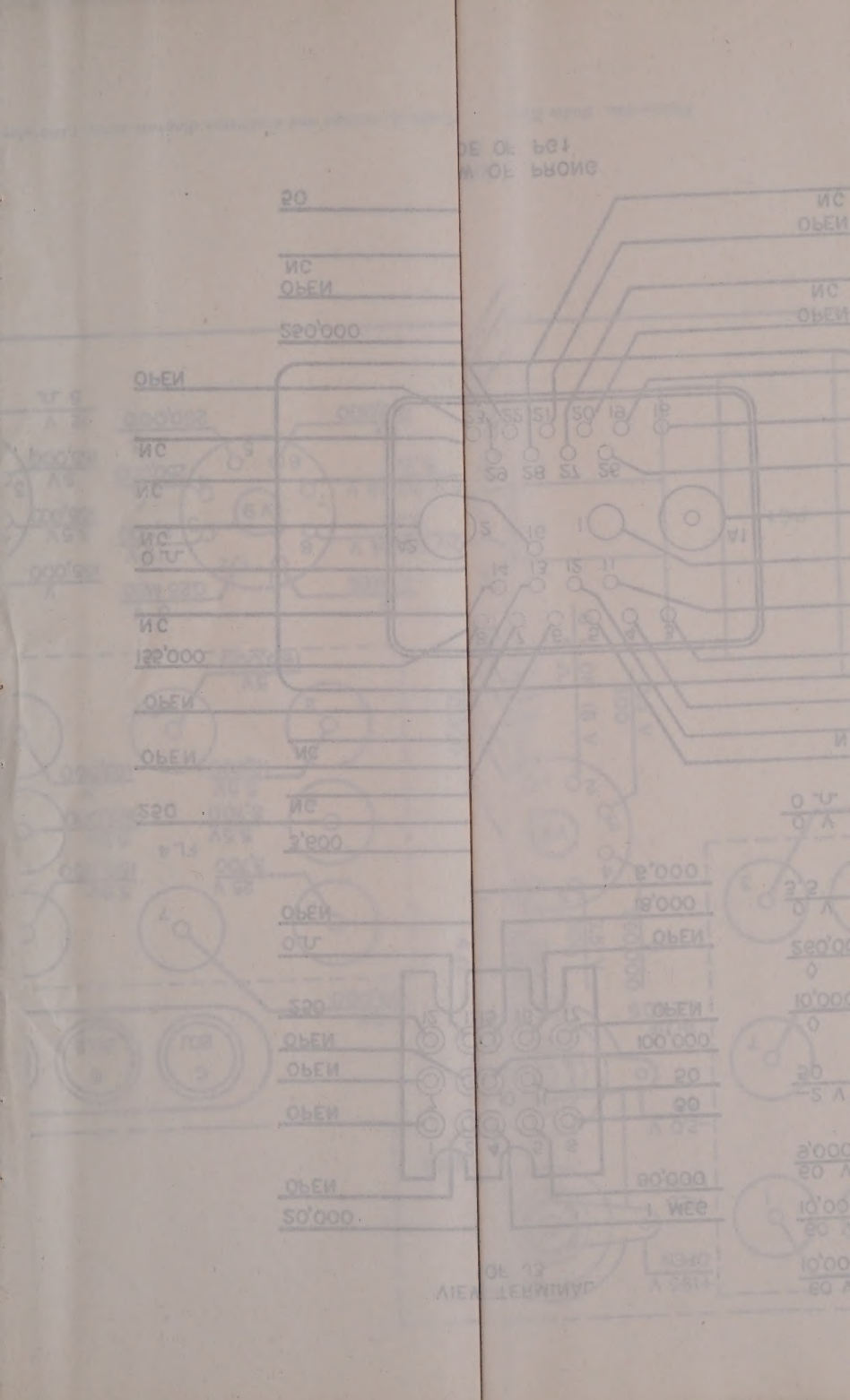
Figure 25c. Radio Receiver BC-683-A, voltage and resistance diagram using 1,000 ohm-per-volt voltmeter, areas 2 and 3.







TL17118



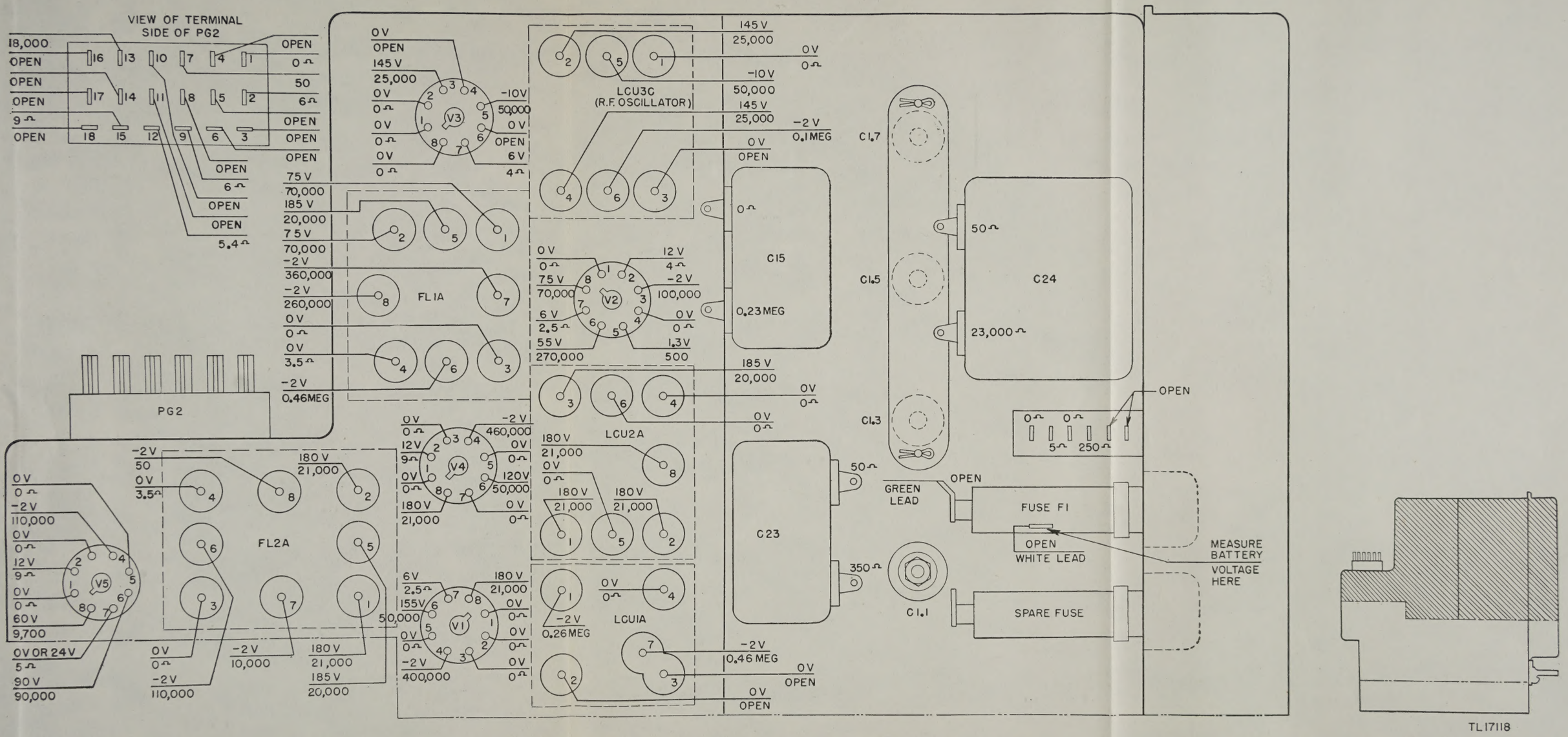
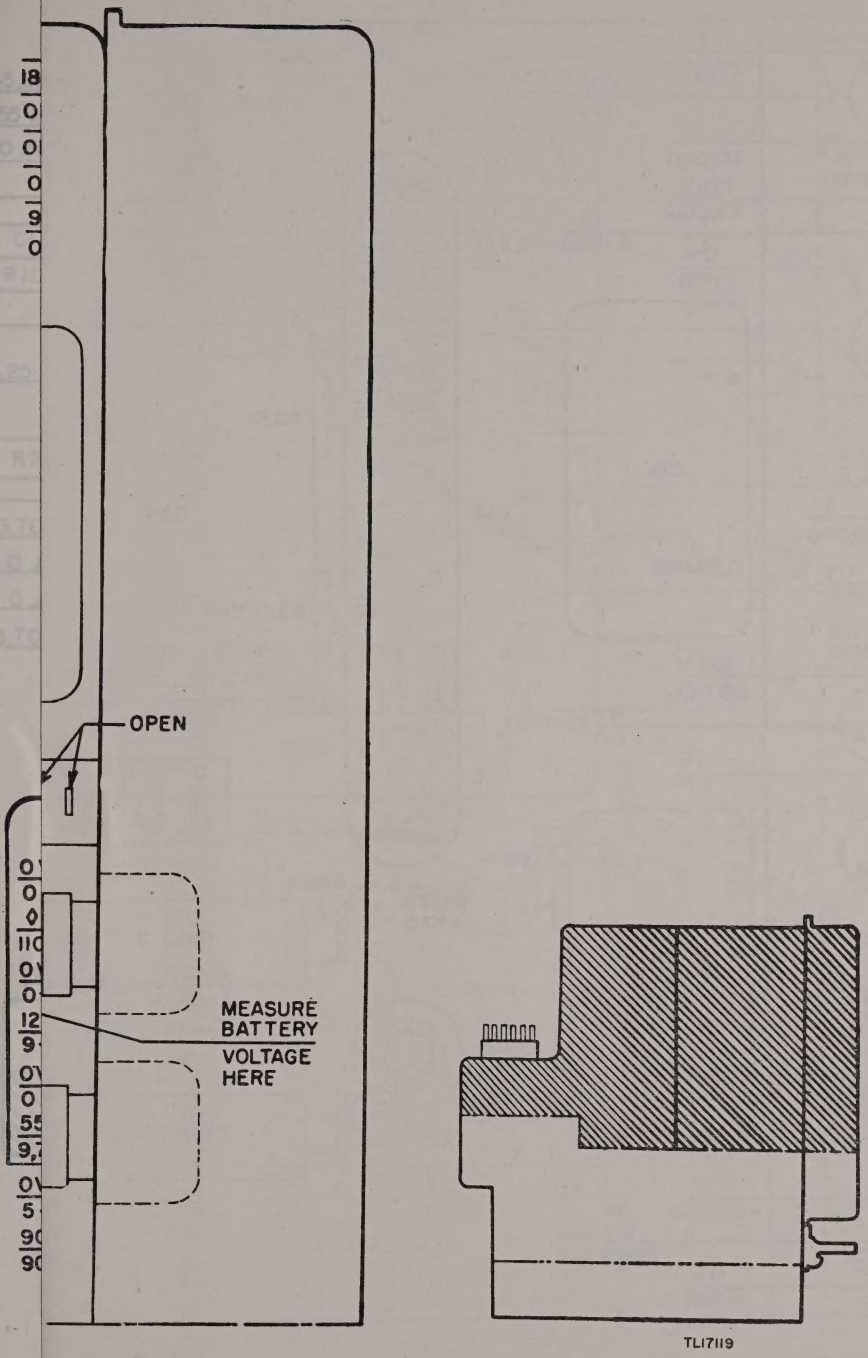


Figure 25f. Radio Receiver BC–683–B, voltage and resistance diagram using vacuum-tube voltmeter, area 1.

VIEW OF TERMINAL
SIDE OF P62
OPEN
OPEN
OPEN


OPEN
MEASURE
BATTERY
VOLTAGE
HERE
TLI7119

VIEW OF TERMINAL
SIDE OF P62
P62
OPEN
OPEN
OPEN

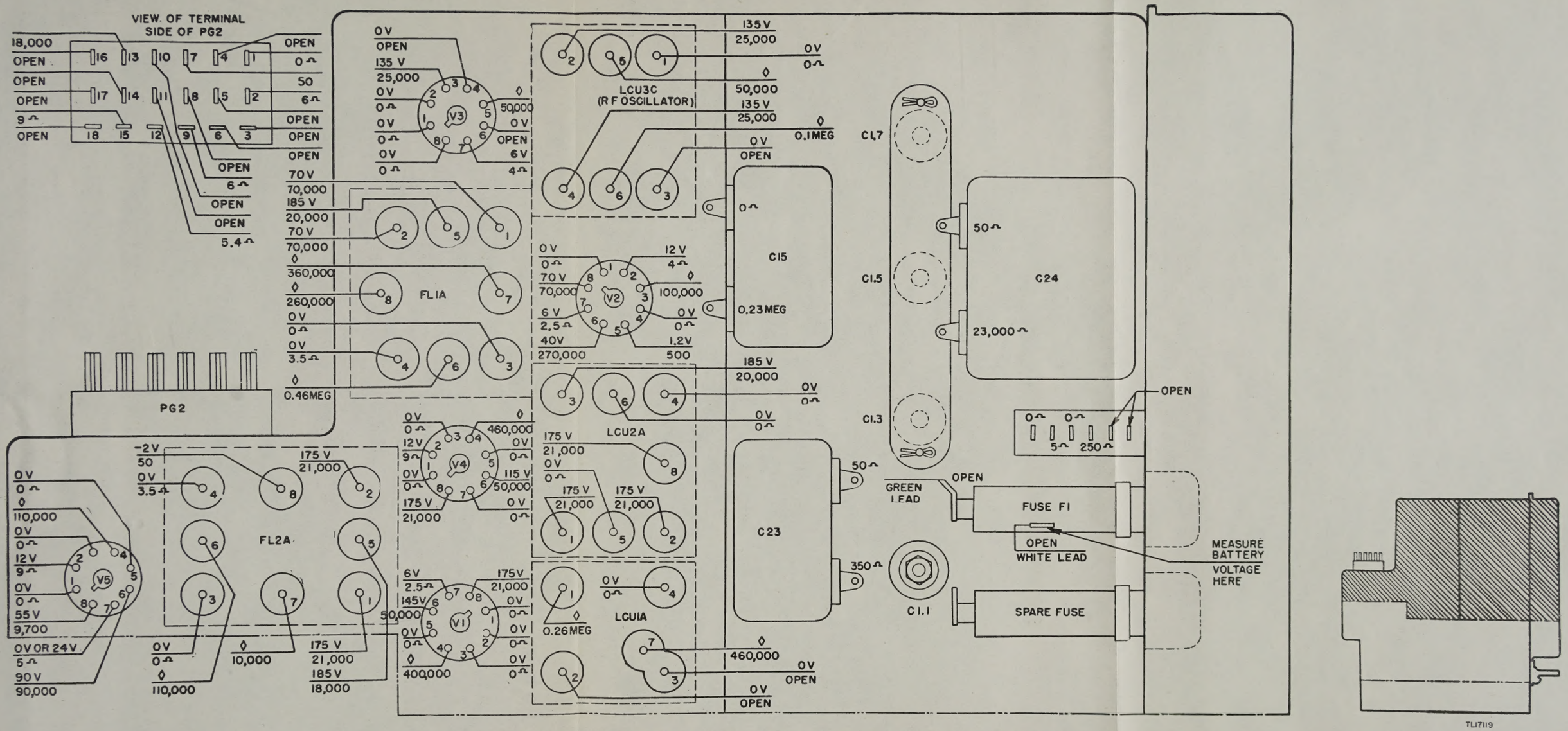
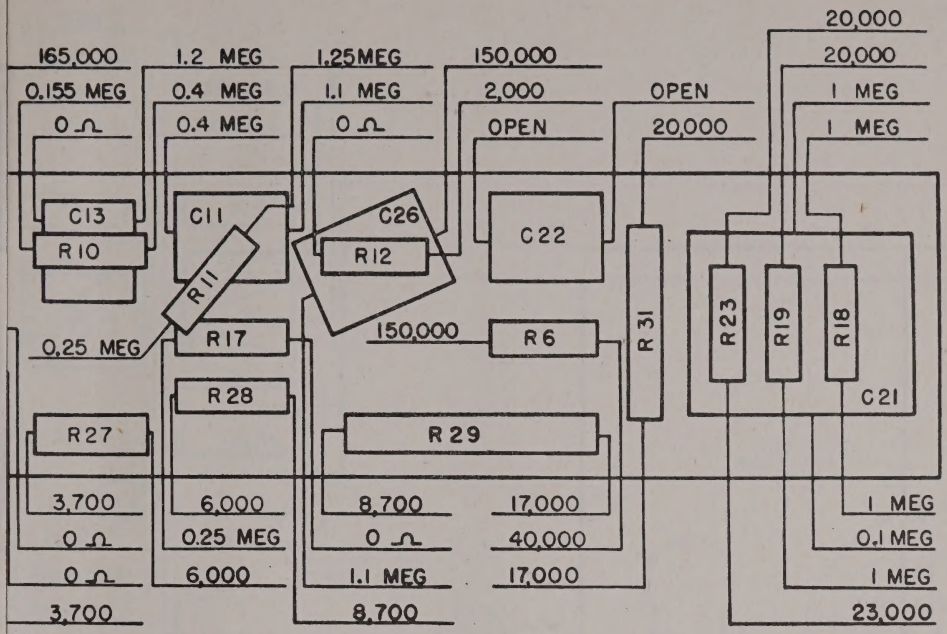
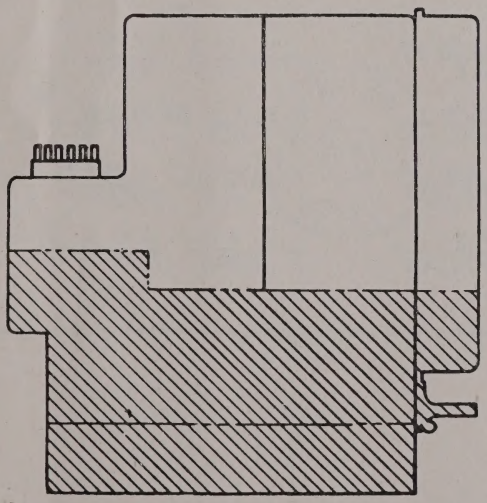


Figure 25g. Radio Receiver BC–683–B, voltage and resistance diagram using 1,000-ohm-per-volt voltmeter, area 1.

VIEW OF TERMINAL
SIDE OF P62
P62
FL2A


165,000
0.155 MEG
0
1.2 MEG
0.4 MEG
0.4 MEG
1.25MEG
1.1 MEG
0
150,000
2,000
OPEN
OPEN
20,000
20,000
20,000
1 MEG
1 MEG
C13
R10
C11
R11
C26
R12
C22
R31
R23
R19
R18
C21
0.25 MEG
R17
150,000
R6
R28
R27
R29
3,700
0
0
3,700
6,000
0.25 MEG
6,000
8,700
0
1.1 MEG
8,700
17,000
40,000
17,000
1 MEG
0.1 MEG
1 MEG
23,000



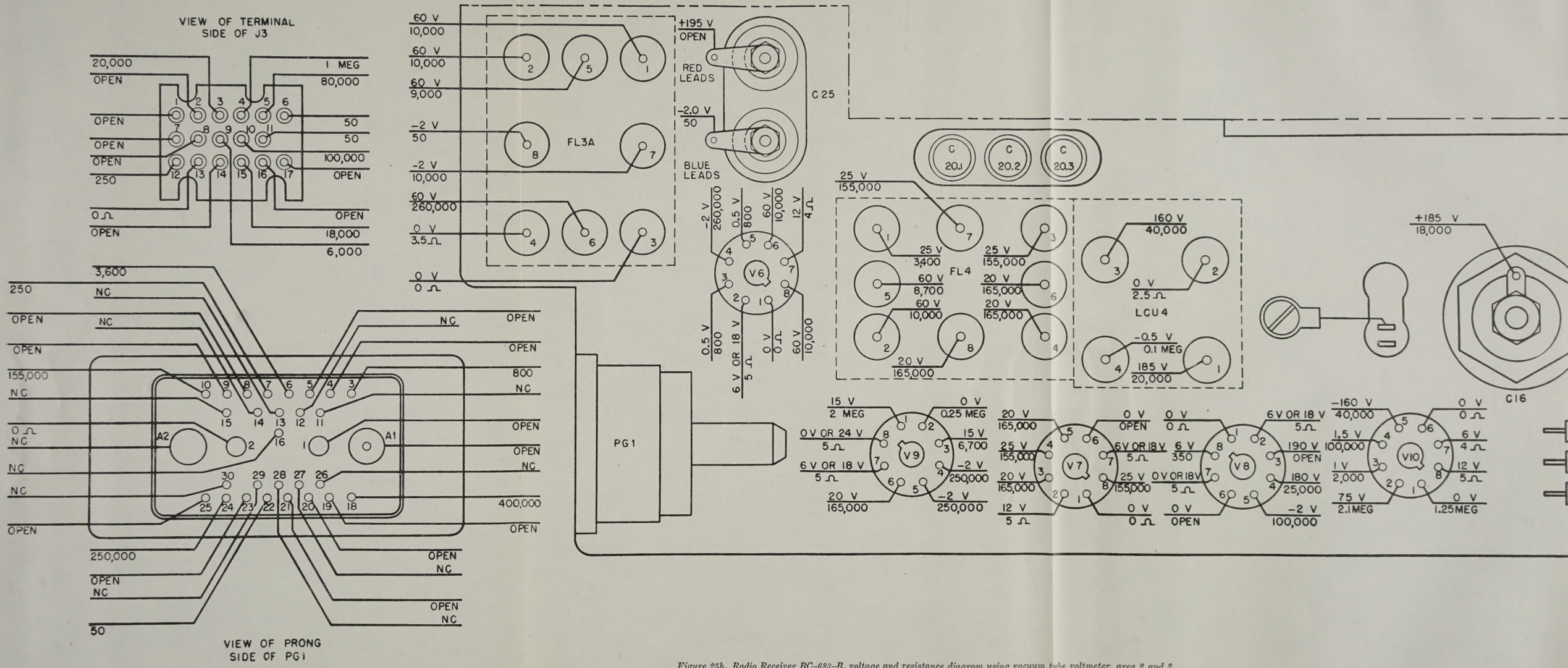
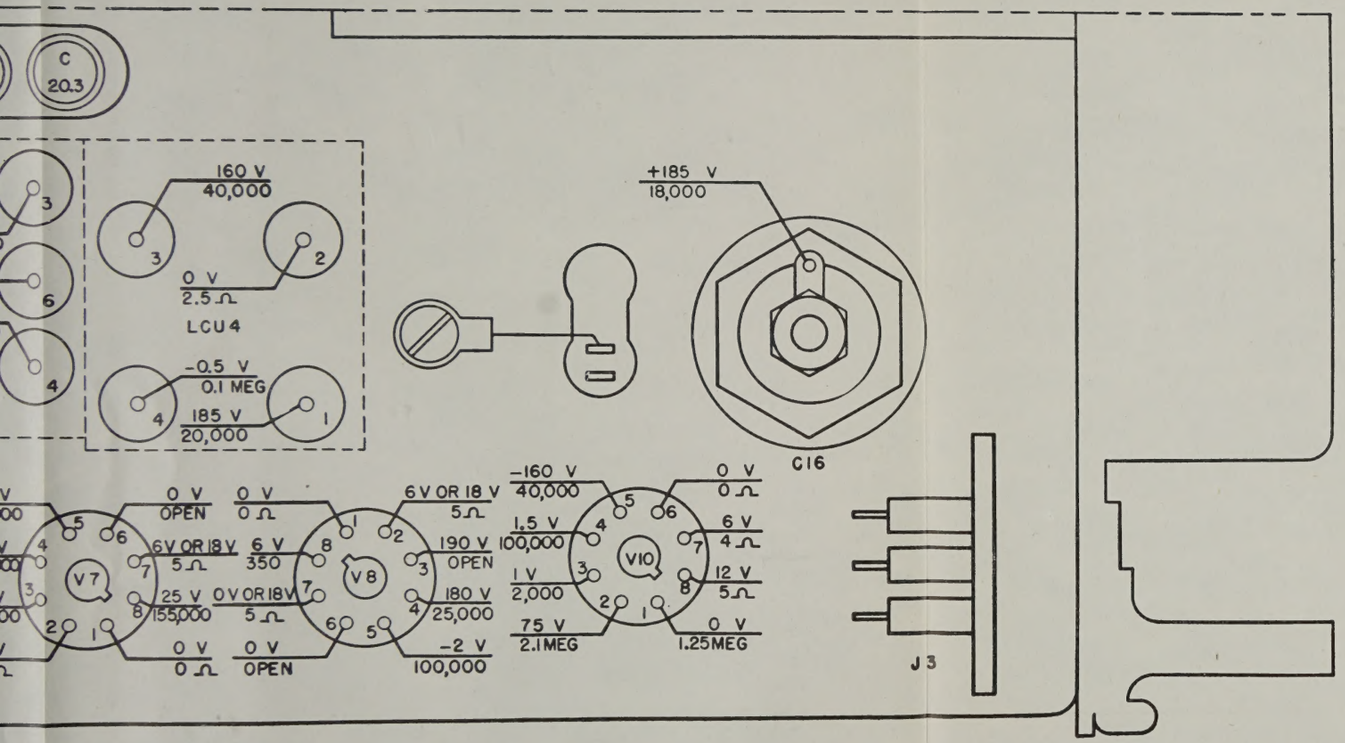
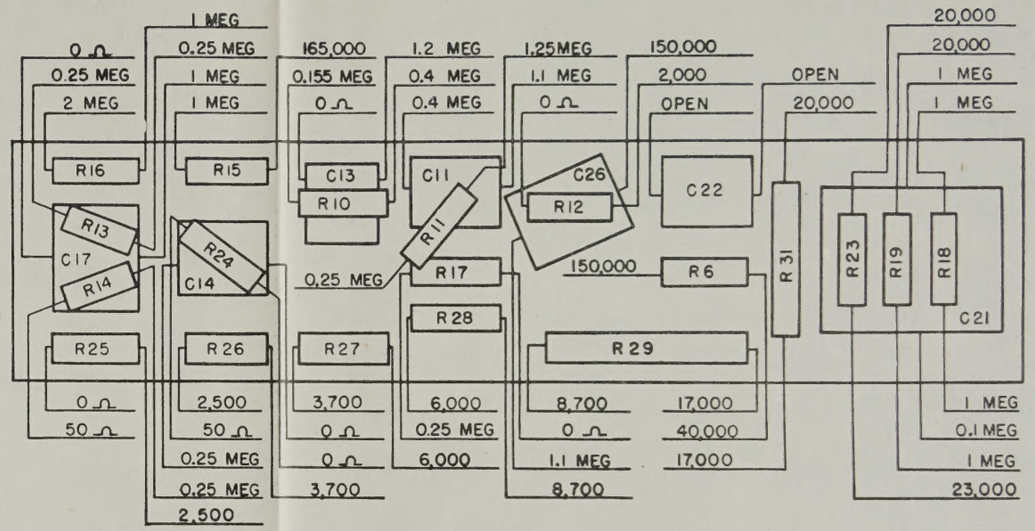
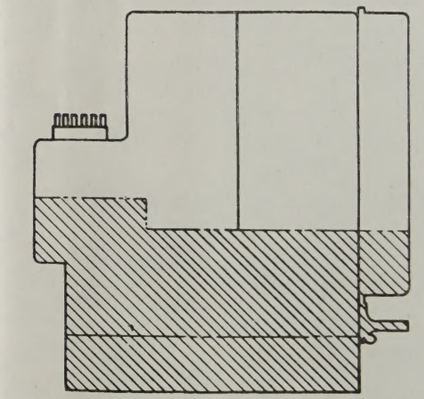


Figure 25h. Radio Receiver BC–683–B, voltage and resistance diagram using vacuum tube voltmeter, area 2 and 3.

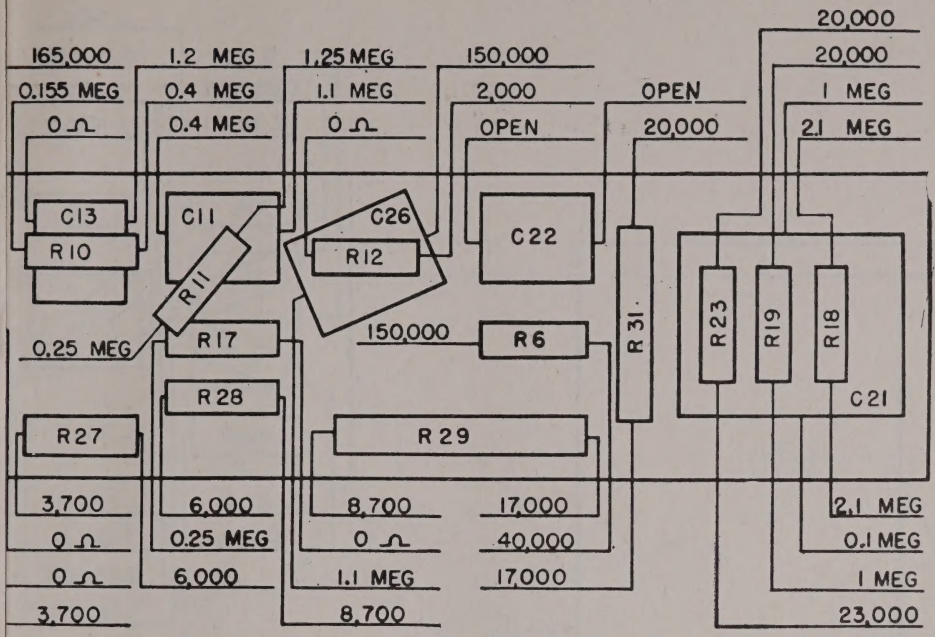


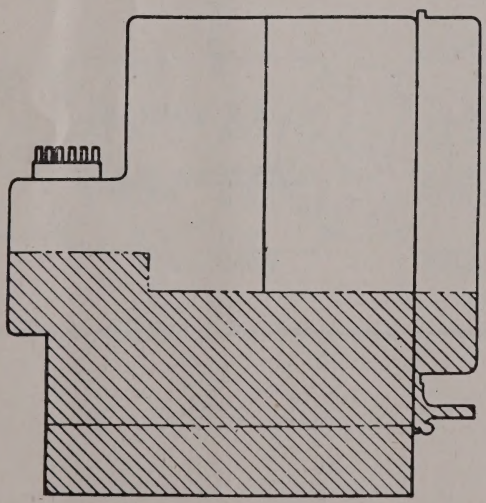




cuum tube voltmeter, area 2 and 3.

VIEW OF TERMINAL
SIDE OF J3
VIEW OF PRONG
SIDE OF P31


165,000
0.155 MEG
0
1.2 MEG
0.4 MEG
0.4 MEG
1.25 MEG
1.1 MEG
0
150,000
2,000
OPEN
OPEN
20,000
20,000
20,000
1 MEG
2.1 MEG
C13
R10
C11
R11
C26
R12
C22
R31
R23
R19
R18
C21
0.25 MEG
R17
150,000
R6
R28
R27
R29
3,700
0
0
3,700
6,000
0.25 MEG
6,000
8,700
0
1.1 MEG
8,700
17,000
40,000
17,000
2.1 MEG
0.1 MEG
1 MEG
23,000



TL17121

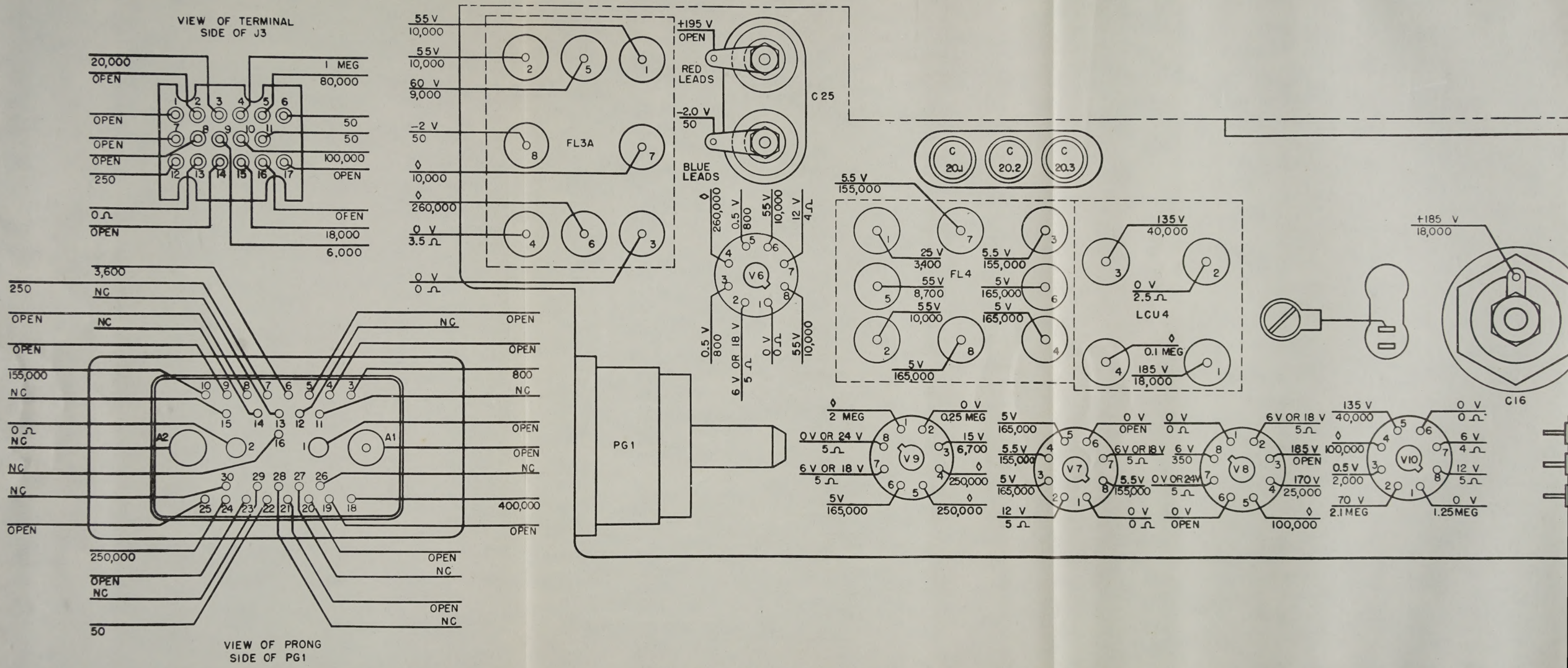
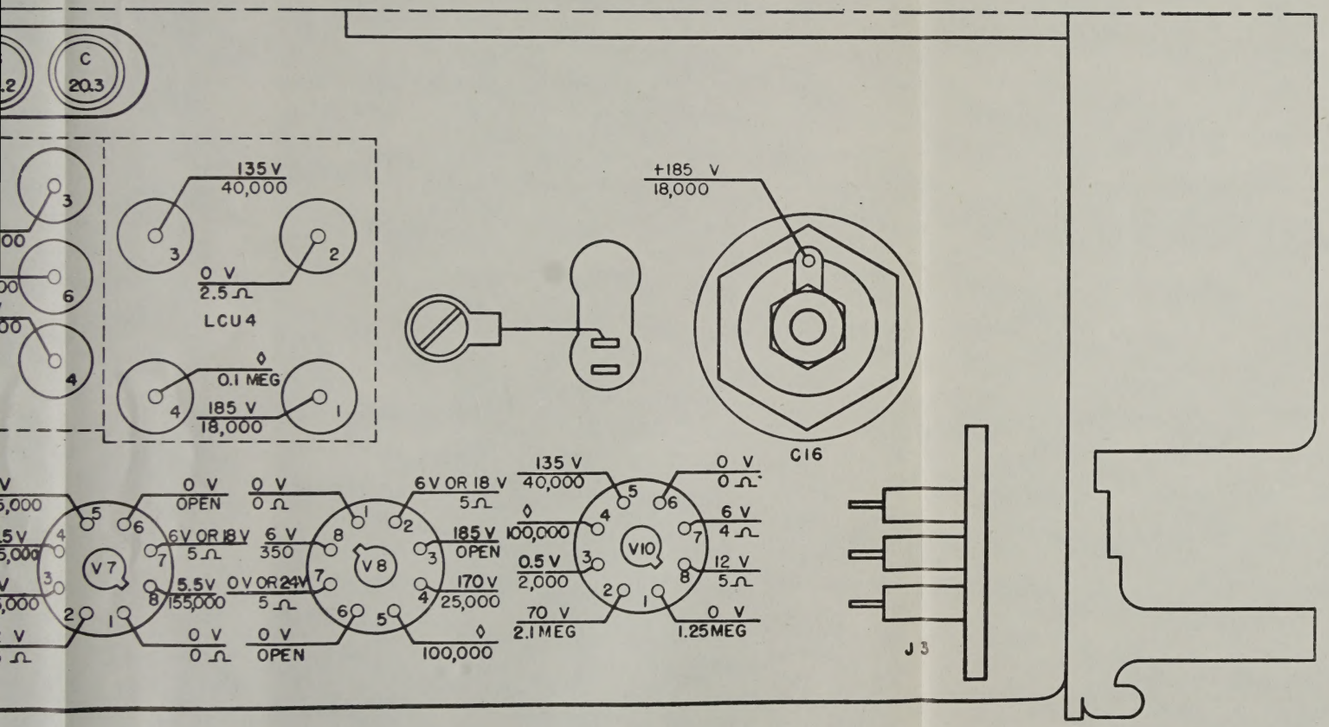
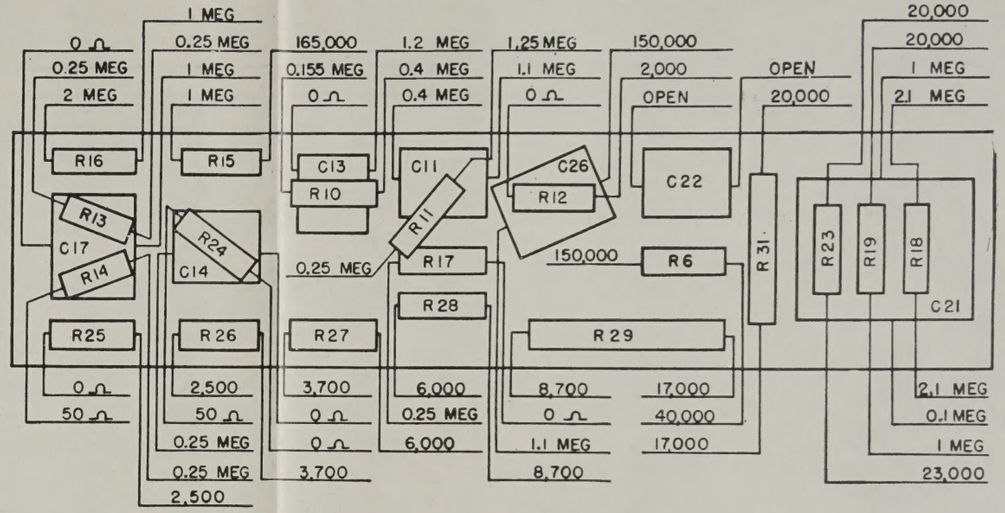
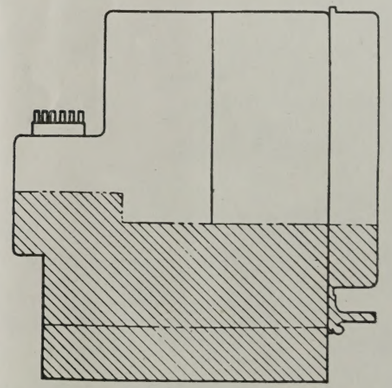


Figure 25i. Radio Receiver BC–683–B, voltage and resistance diagram using 1,000-ohm-per-volt voltmeter, areas 2 and 3.

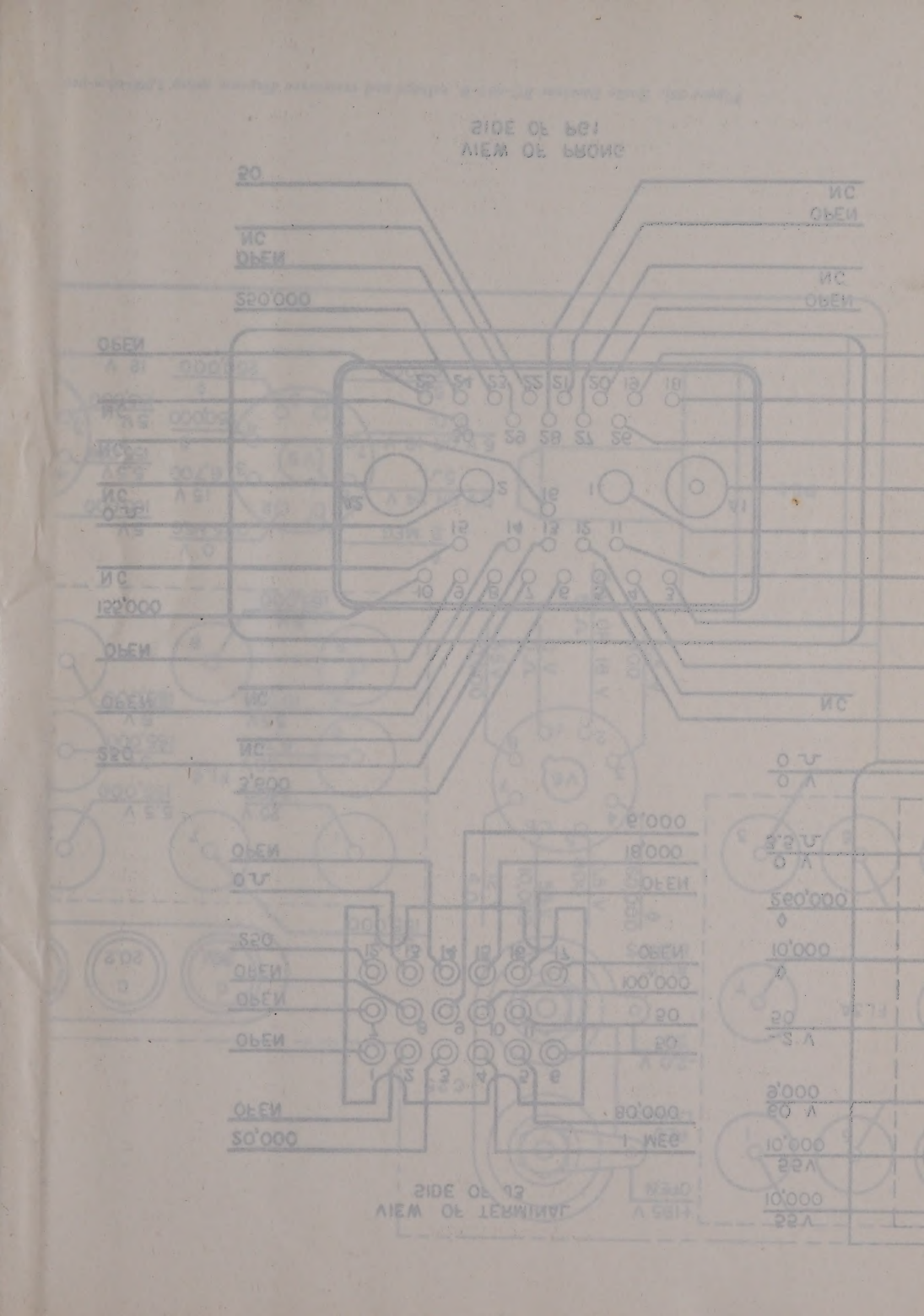






TL17121

0-ohm-per-volt voltmeter, areas 2 and 3.



SECTION VII

FINAL TESTING

27. Over-all Test Requirements

After the procedures of section V have been completed, the following test must be performed.

a. CHECK OF CIRCUIT ALIGNMENT. (1) Remove the receiver dust cover and connect the receiver to an appropriate power source.

(2) Turn the SPEAKER switch to ON, the TUNE-OPERATE switch to TUNE, and the SQUELCH switch to ON. Adjust the SENSITIVITY and VOLUME controls to the extreme right. Turn the receiver ON.

(3) Set the signal generator to 33 mc. Connect the signal generator to the A and G posts of the receiver. Manually tune the receiver to zero beat. Make sure that the CALL SIGNAL lamp lights. Read the setting of the receiver dial.

(4) Carefully adjust the tuning dial to each side of the zero-beat setting until the CALL SIGNAL lamp goes out. Note the two dial readings for which the lamp goes out. The lamp should remain lighted over approximately three channel divisions, and the zero-beat setting should be close to the center of this range.

(5) Set the SENSITIVITY control to the extreme left (minimum sensitivity) and carefully adjust the tuning dial to each side of the zero-beat setting. The lamp should remain lighted over approximately two channel divisions, and the zero-beat setting should be at the center of the tuning range.

(6) Repeat steps (3) to (5) above, setting the signal generator at 39 mc.

(7) Repeat steps (3) to (5) above, setting the signal generator at 28 mc.

(8) If the zero-beat setting in step (5) above is not centered, the receiver requires realignment.

b. CHECK OF SENSITIVITY AND STABILITY. (1) Set the f-m signal generator to 39 mc and adjust the receiver to zero-beat at 39 mc. Connect the signal generator to the A and G posts of the receiver. Then reduce the signal generator output to zero.

(2) Switch the SQUELCH control to ON and adjust the SENSITIVITY control so that the CALL SIGNAL lamp is barely extinguished.

(3) Increase the generator output sufficiently to illuminate the CALL SIGNAL lamp. A signal of 1.0 microvolt or less should be sufficient.

(4) Repeat steps (2) and (3) above at 27 mc.

(5) Set the signal generator to give 3 microvolts output at 39 mc. It should be possible to extinguish the CALL SIGNAL lamp by turning the SENSITIVITY control to the left. Repeat this test at 27 mc.

(6) Throw the TUNE-OPERATE switch to TUNE and adjust the tuning dial for a low-pitched beat note.

(7) Vary the signal-generator output from about 1.0 to 1,000 microvolts. The pitch of the beat note should remain within audibility over the entire range of signal voltage.

c. CHECK OF OUTPUT POWER. (1) Adjust the signal-generator frequency to 27 mc and 1.0-microvolt output.

(2) With the SPEAKER switch at ON, and the TUNE-OPERATE switch at TUNE, set the OUTPUT TO PHONES switch to ON in the BC–683–A receiver; in the BC–683–B and –BM receivers, set the RADIO & INT—INT ONLY switch at RADIO & INT. Set the SQUELCH switch to ON. Turn the SENSITIVITY and VOLUME controls to the extreme right.

(3) Tune to zero beat with the signal generator and turn the TUNE-OPERATE switch to OPERATE. Turn the SPEAKER switch to OFF.

(4) Modulate the signal generator with 400 cycles, with a frequency deviation of 15 kc, and read the output meter. The meter should read over 18 volts.

d. NOISE TEST. With the signal-generator output at 1.0 microvolt, remove the modulation from the signal. The output meter should read not more than one-fifth of the reading obtained in *c* (4) above.

e. CHECK OF LIMITER ACTION. (1) With conditions as in *c* above, increase the signal-gen-

erator output to 10 microvolts and observe the reading of the output meter.

(2) Increase the signal-generator output to 100, 1,000, and 10,000 microvolts successively. The voltmeter reading should stay within ±5 volts of the reading obtained in (1) above.

f. VOLUME CONTROL. Remodulate the signal with 400 cycles, with a frequency deviation of 15 kc. Apply 1.0-microvolt output to the receiver. Gradually rotate the VOLUME control to the left. The reading of the output meter should decrease progressively to less than 1.0 volt. After restoring the volume to maximum, turn the SPEAKER switch to ON. The output meter reading should remain approximately constant. Observe the tone from the loudspeaker as a check on its operation. A very weak response or a bad rattle indicates that the speaker cone has been damaged.

28. Moistureproofing, Fungiproofing, and Refinishing

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

b. If the receiver case has been scarred or chipped, remove any rough spots with #00 or #000 sandpaper and apply paint to spots with a small brush. If the case is sufficiently scarred and scratched to warrant complete refinishing, remove receiver chassis from case, and remove all dirt and rust with kerosene when necessary. Spray entire case with the proper paint authorized by existing regulations.

29. Operational Check

The moistureproofing, fungiproofing, and refinishing procedures of the preceding section may cause the alignment of the receiver to change and may also have ill effects on the performance characteristics. To determine whether the receiver is operating properly, retest to make sure it conforms with all the requirements of this section. Should the receiver not conform with these requirements, it will be necessary to realign it to counteract the effects of the deterioration in performance.

30. General

This section presents information and data for the repair of individual stages and circuits, for the location of parts, and for the replacement of parts requiring special technique. For all conditions of test for voltage and resistance measurements in this section, see figure 25a. Schematic diagrams are presented for each stage of Radio Receiver BC–683–A, and for those stages of Radio Receivers BC–683–B and BM which differ from the corresponding stages of BC–683–A. Each stage schematic is preceded by a parts list, which includes for each part reference symbol, stock number, name, value, and function.

31. Parts List for R-f Amplifier Stage, V1, for Radio Receiver BC–683–A (fig. 26a)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
L32	2C4460 683A/C1.	Coil, part of LCU1A	Antenna coupling.
Primary of LCU1A.		Coil, part of LCU1A	Antenna coil.
C1.2		Variable air capacitor, 62 mmf, part of push-button tuner assembly.	Tuning control.
C1.1		Trimmer capacitor, 16 mmf, part of push-button tuner assembly.	Trimming.
R37	3Z4562	Resistor, 0.25 meg± 10%, part of LCU1A.	R-f grid filter.
C1.4		Variable air capacitor, 62 mmf, part of push-button tuner assembly.	Tuning control.
C1.3		Trimmer capacitor, 16 mf, part of push-button tuner assembly.	Trimming.
C36	3D9010-b	Capacitor, 10±1 mmf, 500 v dc part of LCU2A.	R-f plate tuning and compensation.
L33	2C4460 683A/C2.	Coil, part of LCU2A	R-f plate tuned coupling.
L34	2C4460 683A/C2.	Coil, part of LCU2A	Coupling modulator grid tuned coupling.
C38	3D9010-13	Capacitor, 5±0.5 mmf, 500 v dc, part of LCU2A.	Modulator grid tuning and compensation.
C35	3DA6-10	Capacitor, 0.006 mmf, 300 v dc, part of LCU1A.	R-f grid filter.
C2	3DA6-10	Capacitor, 0.006 mf, 300 v dc.	R-f screen bypass.
R1	3Z4530	Resistor, 20,000 ohms± 10%.	R-f screen filter.
R38	3Z4525	Resistor, 1,000 ohms± 10%, part of LCU2A.	R-f plate filter.
C39	3DA6-10	Capacitor, 0.006 mf, 300 v dc, part of LCU2A.	R-f plate filter.

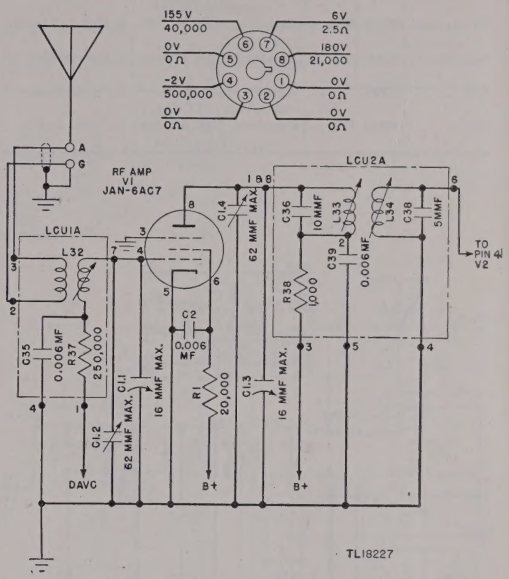


Figure 26a. Radio Receiver BC–683–A, r-f amplifier, V1, schematic diagram.

32. Parts List for R-f Amplifier Stage, V1, for Radio Receiver BC–683–B (fig. 26b)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
L32	2C4460	Coil, part of LCU1A	Antenna coupling.
Primary of LCU1A.		Coil, part of LCU1A	Antenna coil.
C1.2		Variable air capacitor, 62 mmf, part of push-button tuner assembly.	Tuning control.
C1.1		Trimmer capacitor, 16 mmf, part of push-button tuner assembly.	Trimming.
R37	3Z4562	Resistor, 0.25 meg± 10%, part of LCU1A.	R-f grid filter.
R94	3Z4542	Resistor, 2 meg± 10%	Voltage divider.
C1.4		Variable air capacitor, 62 mmf, part of push-button tuner assembly.	Tuning control.
C1.3		Trimmer capacitor, 16 mmf, part of push-button tuner assembly.	Trimming.
C36	3D9010-b	Capacitor, 10±1 mmf, 500 v dc, part of LCU29A.	R-f plate tuning and compensation.
L33	2C4460 683A/C2.	Coil, part of LCU2A	R-f plate tuned coupling.
L34	2C4460 683A/C2.	Coil, part of LCU2A	Coupling; modulator grid tuned coupling.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C38	3D9010-13	Capacitor, 5±0.5 mmf, 600 v dc, part of LCU2A.	Modulator grid tuning and compensation.
C35	3DA6-10	Capacitor,0.006mmf, 300 v dc, part of LCU1A.	R-f grid filter.
C2	3DA6-10	Capacitor, 0.006 mf, 300 v dc.	R-f screen bypass.
R1	3Z4530	Resistor, 20,000 ohms± 10%.	R-f screen filter.
R38	3Z4525	Resistor, 1,000 ohms ± 10%, part of LCU2A.	R-f plate filter.
C39	3DA6-10	Capacitor, 0.006 mf, 300 v dc, part of LCU2A.	R-f plate filter.

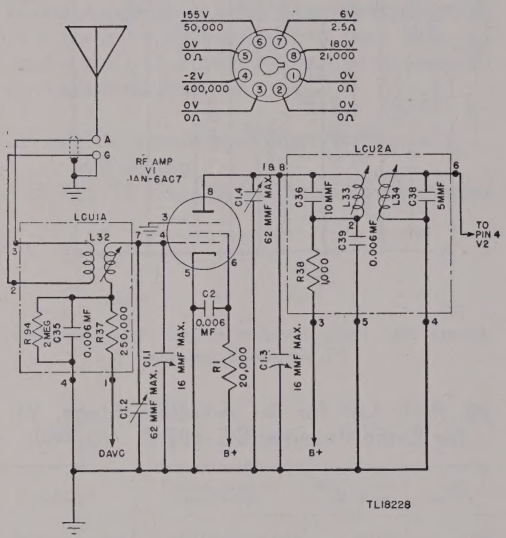


Figure 26b. Radio Receiver BC–683–B, r-f amplifier, V1, schematic diagram.

33. Parts List for Modulator Stage, V2, for Radio Receiver BC–683–(*) (fig. 27)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C1.6		Variable air capacitor, 62 mmf,partof push-button tuner assembly.	Tuning control.
C1.5		Trimmer capacitor, 16 mmf, partof push-button tuner assembly.	Trimming.
C53	3D9050-13	Capacitor, 50 mmf, 500 v dc, part of FL1A.	Modulator plate fixed tuning.
C54	3D9010-5	Capacitor, 10±1 mmf, 500 v dc, part of FL1A.	Temperature compensator for C53.
L52	3C4403A/C9	Coil, part of FL1A	Modulator plate tuned coupling.
L51	2C4403A/C9	Coil, part of FL1A	First i-f grid tuned coupling.
C55	3D9010-5	Capacitor, 10±1 mmf, 500 v dc, part of FL1A.	Temperature compensator for C56.
C56	3D9050-15	Capacitor, 50mmf,± 5%, 500 v dc, part of FL1A.	First i-f grid fixed tuning.
R52	3Z6643	Resistor, 43,000 ohms, ± 10%, part of FL1A.	First i-f input filter termination.
C51	3D9100-19A	Capacitor, 100 mmf, ± 5%, 500 v dc, part FL1A.	First i-f grid coupling.
R51	3Z4550	Resistor, 0.1 meg, ±10%, part of FL1A.	First i-f grid leak.
C3	3DA6-10	Capacitor, 0.006 mf, 300 v dc.	Modulator cathode bias.
R3	3Z4524	Resistor, 500 ohms ± 10%.	Modulator cathode bias.
C4	3DA6-10	Capacitor, 0.006 mf, 500 v dc.	Modulator screen bias.
R2	3Z4562	Resistor, 0.25 meg ± 10%.	Modulator screen filter.
R54	3Z4550	Resistor, 0.1 meg ± 10%, part of FL1A.	Modulator plate filter.
R55	3Z4550	Resistor, 0.1 meg ± 10%, part of FL1A.	Modulator plate filter.
C57	3DA6-10	Capacitor, 0.006 mf, 500 v dc, part of FL1A.	First i-f fixed grid tuning.
C52	3DA1-22	Capacitor, 0.001 mf, 500 v dc, part of FL1A.	First i-f grid filter.
R53	3Z4550	Resistor, 0.1 meg ± 10%, part of FL1A.	First i-f grid filter.

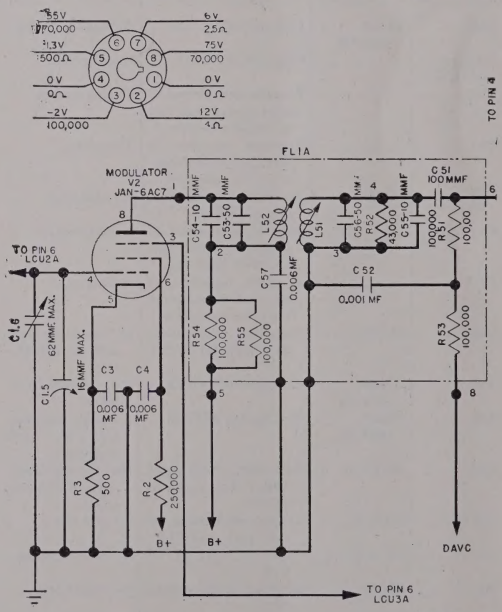


Figure 27. Radio Receiver BC–683–(*), modulator, V2, schematic diagram.

34. Parts List for R-f Oscillator Stage, V3, for Radio Receiver BC–683–(*) (fig. 28)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
L41	2C4460–683A/C3.	Coil, part of LCU3A	Beating oscillator tuning and feedback.
C1.8		Variable air capacitor, 62 mmf, part of push-button tuner assembly.	Tuning control.
C1.7		Trimmer capacitor, 16 mmf, part of push-button assembly.	Trimming.
C41	3D9700	Capacitor, 700 mmf ± 5%, 500 v dc, part of LCU3A.	Beating oscillator series padder.
C42	3D9200–6	Capacitor, 200 ± 10 mmf, 500 v dc, part of LCU3A.	Temperature compensation for C41.
C43	3D9100–19A	Capacitor, 100 mmf ± 5%, 500 v dc, part of LCU3A.	Beating oscillator grid blocking.
C44	3D9030–3	Capacitor, 30 ± 1.5 mmf, 500 v dc, part of LCU3A.	Beating oscillator plate coupling.
C46	3D9020–1	Capacitor, 20 ± 1 mmf, 500 v dc, part of LCU3A.	Beating oscillator plate temperature compensator.
R4	3Z4531	Resistor, 50,000 ohms ± 10%.	Beating oscillator grid leak.
L42		Coil, part of LCU3A	Choke coil.
R5	3Z6500–8	Resistor, 5,000 ohms ± 10%.	Beating oscillator plate filter.
C45	3D9100–19A	Capacitor, 100 mmf ± 5%, 500 v dc, part of LCU3A.	Oscillator modulator coupling.
R41	3Z4550	Resistor, 0.1 meg ± 10%, part of LCU3A.	Modulator suppressor grid leak.
C5	3DA6–10	Capacitor, 0.006 mf, 300 v dc.	Beating oscillator plate filter.

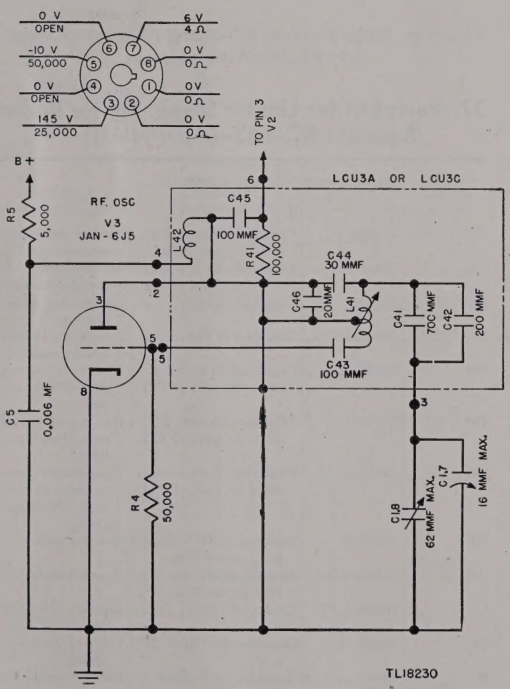
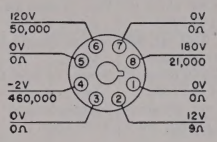


Figure 28. Radio Receiver BC–683–(*), r-f oscillator, V3, schematic diagram.



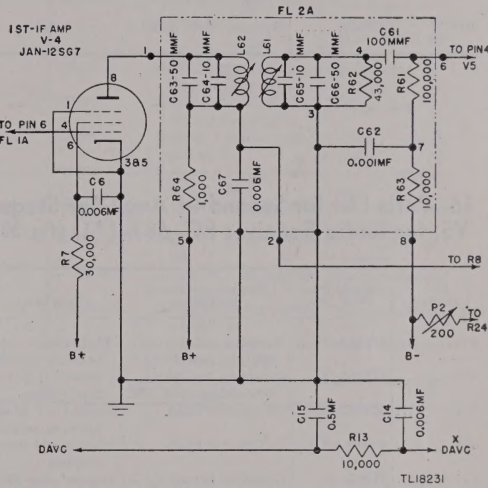


Figure 29. Radio Receiver BC–683–(*), first i-f amplifier, V4, schematic diagram.

35. Parts List for First I-f Amplifier, V4, for Radio Receiver BC–683–(*) (fig. 29)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C63	3D9050–13	Capacitor, 50 mmf ± 5%, 500 v dc, part of FL2A.	First i-f plate fixed tuning.
C64	3D9010–5	Capacitor, 10 ± 1 mmf, 500 v dc, part of FL2A.	Temperature compensator for C63.
L62	2C4403A/C9	Coil, part of FL2A	First i-f plate tuned coupling.
L61	2C4403A/C9	Coil, part of FL2A	Second i-f grid tuned coupling.
C65	3D9010–5	Capacitor, 10 ± 1 mmf, 500 v dc, part of FL2A.	Temperature compensator for C66.
C66	3D9050–13	Capacitor, 50 mmf ± 5%, 500 v dc, part of FL2A.	Second i-f grid fixed tuning.
R62	3Z6643	Resistor, 43,000 ohms ± 10%, part of FL2A	Second i-f input filter termination.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C61	3D9100-19A	Capacitor, 100 mmf ± 5%, 500 v dc, part of FL2A.	Second i-f grid coupling.
R61	3Z4550	Resistor, 0.1 meg ±10%, part of FL2A.	Second i-f grid leak.
C6	3DA6-10	Capacitor, 0.006 mf, 300 v dc.	First i-f screen bypass.
R7	3Z6630-8	Resistor, 30,000 ohms ± 10%.	First i-f screen filter.
C67	3DA6-10	Capacitor, 0.006 mf, 300 v dc, part of FL2A.	First i-f plate filter.
R64	3Z4525	Resistor, 1,000 ohms ± 10%, part of FL2A.	First i-f plate filter.
C62	3DA1-22	Capacitor, 0.001 mf, 500 v dc, part of FL2A.	Second i-f grid filter.
R63	3Z4529	Resistor, 10,000 ohms ± 10%, part of FL2A.	Second i-f grid filter.
P2	2Z7299	Potentiometer, 200 ohms.	Squelch control.
C15	3DA500-30	Capacitor, 0.5 mf, 600 v dc.	A-v-c filter.
C14	3DA6-10	Capacitor, 0.006 mf, 300 v dc.	I-f a-v-c filter.
R13	3Z4529	Resistor, 10,000 ohms ± 10%.	A-v-c filter.

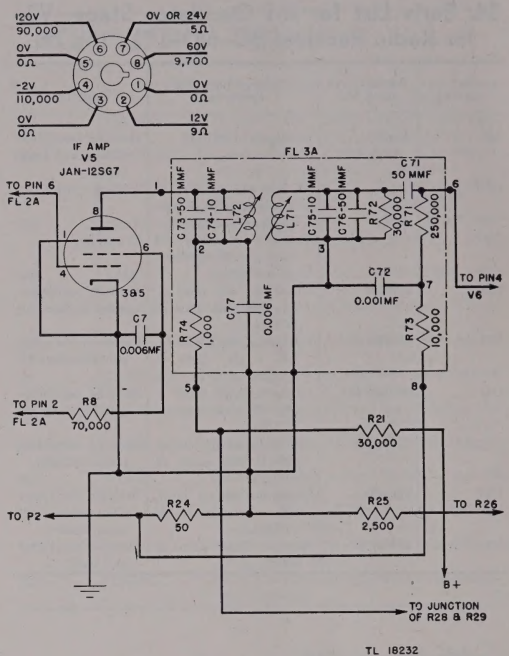


Figure 30. Radio Receiver BC–683–(*), second i-f amplifier, V5, schematic diagram.

36. Parts List for Second I-f Amplifier Stage, V5, for Radio Receiver BC–683–(*) (fig. 30)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C74	3D9010-5	Capacitor, 10 ±1 mmf, 500 v dc, part of FL3A.	Temperature compensator for C73.
C73	3D9050-13	Capacitor, 50 mmf ±5%, 500 v dc, part of FL3A.	Second i-f plate fixed tuning.
L72	2C4403A/C9	Coil, part of FL3A	Second i-f plate tuned coupling.
L71	2C4403A/C9	Coil, part of FL3A	Limiter grid tuned coupling.
C76	3D9050-13	Capacitor, 50 mmf ±5%, 500 v dc, part of FL3A.	Limiter grid fixed tuning.
R72	3Z4540	Resistor, 30,000 ohms ± 10%, part of FL3A.	Limiter input filter termination.
C75	3D9010-5	Capacitor, 10 ±1 mmf, 500 v dc, part of FL3A.	Temperature compensator for C76.
C71	3D9100-13	Capacitor, 50 mmf ±5%, part of FL3A.	Limiter input filter.
R71	3Z4562	Resistor, 250,000 ohms ± 10%, part of FL3A.	Limiter grid leak.
C7	3DA6-10	Capacitor, 0.006 mf, 300 v dc.	Second i-f screen bypass.
R8	3Z6670-1	Resistor, 70,000 ohms ± 10%.	Second i-f screen filter.
C77	3DA6-10	Capacitor, 0.006 mf, 300 v dc, part of FL3A.	Second i-f plate filter.
R74	3Z4525	Resistor, 1,000 ohms ± 10%, part of FL3A.	Second i-f plate filter.
C72	3DA122	Capacitor, 0.001 mf, 500 v dc, part of FL3A.	Limiter grid filter.
R73	3Z4529	Resistor, 10,000 ohms, ± 10%, part of FL3A.	Limiter grid filter.
R24	3Z6005-13	Resistor, 50 ohms ±5%.	Voltage dividing network.
R25	3Z6250-6	Resistor, 2,500 50 ohms ±5%.	Voltage dividing network.
R21	3Z-6630-7	Resistor, 30,000 ohms ± 10%.	Voltage divider shunt.

37. Parts List for Limiter Stage, V6, for Radio Receiver BC–683–(*) (fig. 31)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C87	3D9025-4	Capacitor, 25 mmf ±5%, 500 v dc, part of FL4.	Limiter plate fixed tuning.
C88	309010-5	Capacitor, 10 ±1 mmf, 500 v. dc, part of FL4.	Temperature compensator for C87.
L82	2C4403A/C9	Coil, part of FL4	Limiter plate tuned coupling.
L81	2C4403A/C10	Coil, part of FL4	Detector input tuned coupling.
C85	309050-13	Capacitor, 50 mmf ±2%, 500 v dc, part of FL4.	Half of slope circuit secondary tuning.
C86	309050-13	Capacitor, 50 mmf ±2%, 500 v dc, part of FL4.	Half of slope circuit secondary tuning.
C84	309005-13	Capacitor, 5 ±0.5 mmf, 500 v dc, part of FL4.	Temperature compensation for slope circuit secondary.
R81	3Z6670-1	Resistor, 70,000 ohms ± 10%, part of FL4.	Detector lead.
R83	3Z6670-1	Resistor, 70,000 ohms ± 10%, part of FL4.	Detector lead.
L1	2C4403A/C7	Choke, (5C–1002)	Limiter cathode choke.
C8	309500-18	Capacitor, 500 mmf, 500 v dc.	Limiter cathode bypass.
R9	3Z4525	Resistor, 1,000 ohms ± 10%.	Limiter screen filter.
C9	3DA6-10	Capacitor, 0.006 mf, 300 v dc.	Limiter screen bypass.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
R85	3Z4525	Resistor, 1,000 ohms ± 10%, part of FL4.	Limiter plate filter.
C83	3DA6–10	Capacitor, 0.006 mf, 300 v dc, part of FL4.	Limiter plate filter.
C81	3D9250–9	Capacitor, 250 mmf ± 10%, 500 v dc, part of FL4.	Detector r-f bypass.
R82	3Z4562	Resistor, 0.25 meg ± 10%, part of FL4.	Detector cathode bias.
R84	3Z4562	Resistor, 0.25 meg ± 10%, part of FL4.	Detector cathode bias.
C82	3DA6–10	Capacitor, 0.006 mf, 300 v dc, part of FL4.	Detector cathode filter.
C20.3	3DA100–27	Capacitor, 0.1 mf, 600 v dc.	Squelching voltage filter.
R21	3Z6630–7	Resistor, 30,000 ohms ± 10%.	Voltage divider shunt.
R26	3Z6120	Resistor, 1,200 ohms ± 5%.	Voltage dividing network.
R27	3Z6250–6	Resistor, 2,500 ohms ± 5%.	Voltage dividing network.
R28	3Z6250–6	Resistor, 2,500 ohms ± 5%.	Voltage dividing network.
R29	3Z6613	Resistor, 13,000 ohms ± 5%.	Voltage dividing network.
R31	3Z6563–1	Resistor, 6,800 ohms ± 5%.	Voltage dividing network.
C–10	3D8975	Capacitor, 0.75 ±0.25 mmf, 500 v dc.	I-f oscillator coupling.

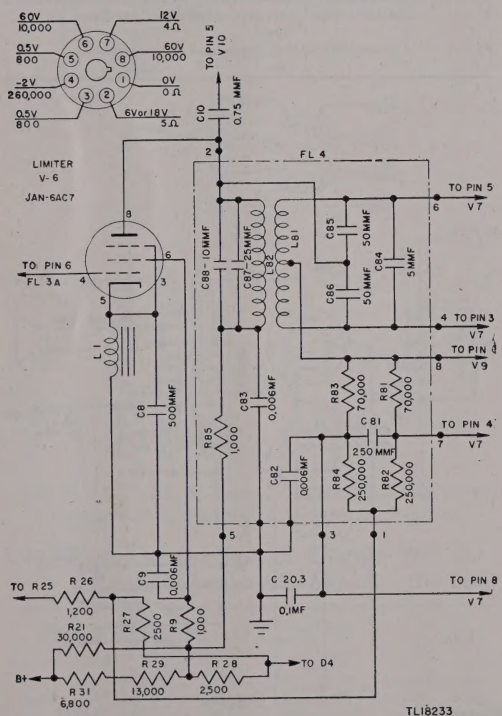


Figure 31. Radio Receiver BC–683–(*), limiter, V6, schematic diagram.

38. Parts List for Detector (Discriminator) Stage, V7, Radio Receiver BC–683–(*) (fig. 32)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C88	3D9010–5	Capacitor, 10 ±1 mmf, 500 v dc.	Temperature compensator for C87.
C87	3D9025–4	Capacitor, 25 mmf ±5%, 500 v dc.	Limiter plate fixed tuning.
L82	2C4403A/C9	Coil, part of FL4	Limiter plate tuned coupling.
L81	2C4403A/C10	Coil, part of FL4	Detector input tuned coupling.
C85	3D9050–13	Capacitor, 50 mmf ±2%, 500 v dc.	Half of slope circuit, secondary tuning.
C86	3D9050–13	Capacitor, 50 mmf ±2%, 500 v dc.	Half of slope circuit, secondary tuning.
C84	3D9050–13	Capacitor, 5 ±0.5 mmf, 500 v dc.	Temperature compensation for slope circuit secondary.
R81	3Z6670	Resistor, 70,000 ohms ± 10%, part of FL4.	Detector load.
R83	3Z6670	Resistor, 70,000 ohms ± 10%, part of FL4.	Detector load.
R82	3Z4562	Resistor, 0.25 meg ± 10%, part of FL4.	Detector cathode bias.
R84	3Z4562	Resistor, 0.25 meg ± 10%, part of FL4.	Detector cathode bias.
R10	3Z4562	Resistor, 0.25 meg ± 10%.	First audio grid coupling.
C11	3DA6–10	Capacitor, 0.006 mf, 300 v dc.	First audio grid coupling.
C82	3DA6–10	Capacitor, 0.006 mf, 300 v dc, part of FL4.	Detector cathode filter.
C20.3	3DA100–27	Part of capacitor, 3 x 0.1 mf, 600 v dc.	Detector cathode filter.
C83	3DA6–10	Capacitor, 0.006 mf, 300 v dc, part of FL4.	Limiter plate filter.
R85	3Z4525	Resistor, 1,000 ohms ± 10%, part of FL4.	Limiter plate filter.

39. Parts List for First Audio-amplifier Stage, V10', for Radio Receiver BC–683–(*) (fig. 33)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C20.2	3DA100–27	Capacitor, 0.1 mf, 600 v dc.	Squelching voltage filter.
R11	3Z4534	Resistor, 1 meg ± 10%	First audio grid leak.
R17	3Z4562	Resistor, 0.25 meg ± 10%.	Squelch plate load.
R12	3Z6200–17	Resistor, 2,000 ohms ± 10%.	First audio cathode bias.
R18	3Z4550	Resistor, 0.1 meg ± 10%	First audio plate.
R19	3Z4542	Resistor, 2 meg ± 10%	Indicator lamp shunt.
C21	3DA10–48	Capacitor, 0.01 mf, 300 v dc.	Second audio grid coupling.
C13	3D9500–18	Capacitor, 500 mmf, 500 dc.	H-f cutoff first audio grid.
C12	3DA10–48	Capacitor, 0.01 mf, 300 v dc.	First audio grid bias filter.
E1	2Z5893–1	Lamp, neon	Indicator lamp.

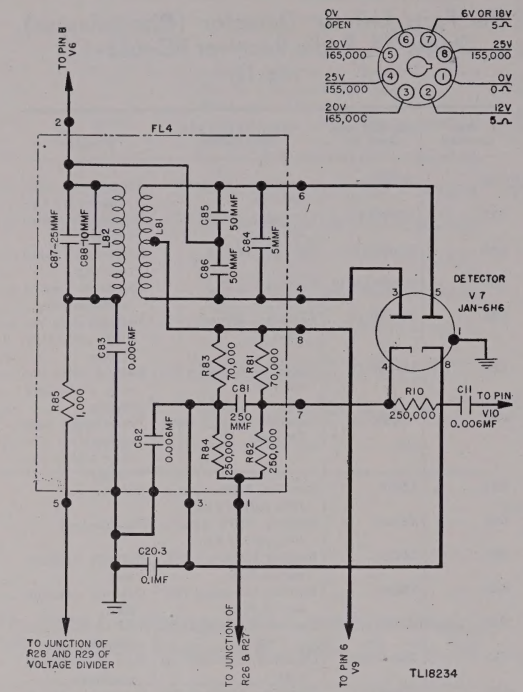


Figure 32. Radio Receiver BC–683–(*), detector (discriminator), V7, schematic diagram.

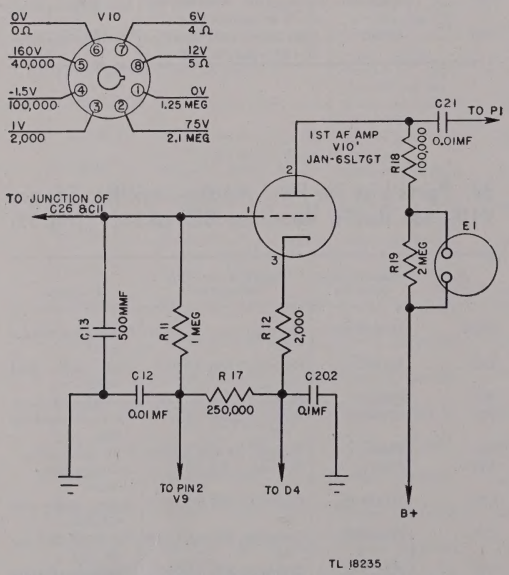


Figure 33. Radio Receiver BC–683–(*), first a-f amplifier, V10', schematic diagram.

40. Parts List for Second Audio-amplifier Stage, V8, Radio Receiver BC–683–(*)(fig. 34)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C21	3DA10–38	Capacitor, 0.01 mf, 300 v dc.	Second audio grid coupling.
P1	2Z7298–1	Potentiometer, 100,000 ohms, taper C.	Volume control.
C19	3DA2–16	Capacitor, 0.002 mf, 500 v dc.	H-f cutoff second audio grid.
C23	3DB40–1	Capacitor, 40 mf, 25 v dc.	Second audio cathode bypass.
R20	3Z6030–11	Resistor, 300 ohms ± 10%.	Second audio cathode bias.
C22	3DA5–8	Capacitor, 0.005 mf, 300 v dc.	H-f cutoff second audio plate.
T1	2C4403A/T3	Audio output transformer (so–1005).	Audio output.
R30	3Z4805	Resistor, 5 ohms ± 5%	Audio output dummy load.
R22	3Z4540	Resistor, 30,000 ohms ± 10%.	Phone series.
R32	3Z4540	Resistor, 30,000 ohms ± 10%.	Phone series.
R33	3Z4540	Resistor, 30,000 ohms ± 10%.	Phone series.
C24	3DB1.6100A	Capacitor, 1 mf, 600 v dc.	Second audio screen bypass.
R23	3Z4528	Resistor, 5,000 ohms ± 10%.	Second audio screen filter.
C25	3DB2.88A	Capacitor, 2 mf, 600 v dc.	Plate supply filter.
D2	2C4403A/S2	Switch, SPST	Headset.
D3	2C4403A/S4	Switch, SPST	Loud speaker.
D5	2C4403A/S2	Switch, SPST	TUNE-OPERATE.
J1	2C4403A/P3	Jack, part of jack assembly.	Headset.
J2	2C4403A/P3	Jack, part of jack assembly.	Headset.

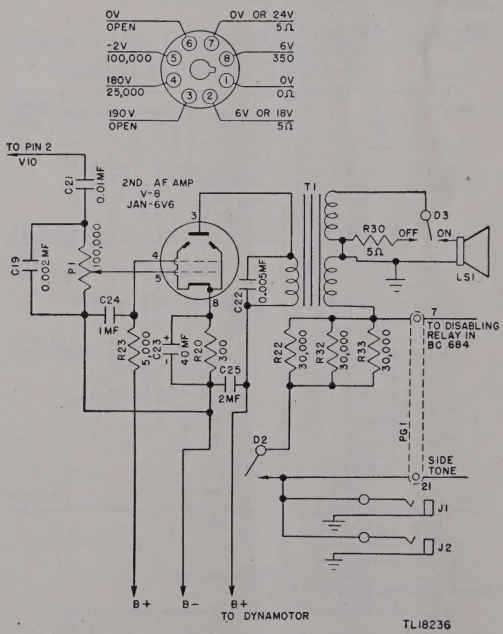


Figure 34. Radio Receiver BC–683–(*), second a-f amplifier, V8, schematic diagram.

41. Parts List for Delayed Automatic-volume-control Circuit, V9', for Radio Receiver BC–683–(*) (fig. 35)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
R14	3Z4562	Resistor, 0.25 meg ± 10%.	A-v-c bias.
P2	2Z7299	Potentiometer, 200 ohms.	Squelch control.
R24	3Z600–13	Resistor, 50 ohms ± 5%.	Voltage dividing network.
R15	3Z4534	Resistor, 1 meg ± 10%.	Squelch timing.
D4	2C4403A/S3	Switch, SPST and SPDT	Squelch.

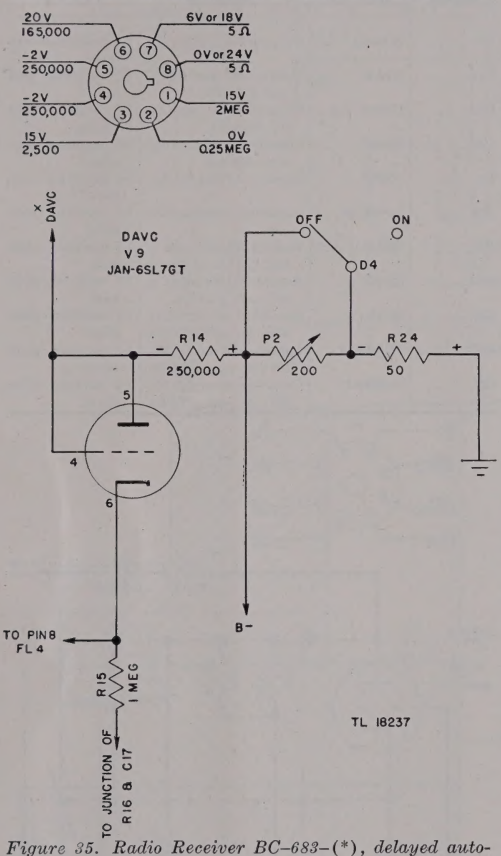


Figure 35. Radio Receiver BC–683–(*), delayed automatic volume control, V9', schematic diagram.

42. Parts List for Squelch Circuit, V9", for Radio Receiver BC–683–A (fig. 36a)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
R15	3Z4534	Resistor, 1 meg ± 10%.	Squelch timing.
R16	3Z4534	Resistor, 1 meg ± 10%.	Squelch timing.
R17	3Z4562	Resistor, 0.25 meg ± 10%.	Squelch plate load.
R12	3Z6200–17	Resistor, 2,000 ohms ± 10%.	First audio cathode bias.
R11	3Z4534	Resistor, 1 meg ± 10%.	First audio grid leak.
C12	3DA10–48	Capacitor, 0.01 mf, 300 v dc.	First audio grid bias filter.
C20.2	3DA10C–27	Capacitor, 0.1 mf, 600 v dc.	Squelching voltage filter.
C18	3DA10–48	Capacitor, 0.01 mf, 300 v dc.	Squelch timing.
R25	3Z6250–6	Resistor, 2,500 ohms ± 5%.	Voltage dividing network.
R26	3Z6120	Resistor, 1,200 ohms ± 5%.	Voltage dividing network.
R27	3Z6250–6	Resistor, 2,500 ohms ± 5%.	Voltage dividing network.
R28	3Z6250–6	Resistor, 2,500 ohms ± 5%.	Voltage dividin network.
R29	3Z6613	Resistor, 13,000 ohms ± 5%.	Voltage dividin network.
R31	3Z6568–1	Resistor, 6,800 ohms ± 5%.	Voltage dividing network.
R21	3Z6630–7	Resistor, 30,000 ohms ± 10%.	Voltage divider shunt.
C16	3DB2.6020	Capacitor, 2 mf, 600 v dc.	Plate supply filter.
P2	2Z7299	Potentiometer, 200 ohms.	Squelch control.
R24	3Z6005–13	Resistor, 50 ohms ± 5%.	Voltage dividing network.
C17	3DA10–48	Capacitor, 0.01 mf, 300 v dc.	Squelch timing.

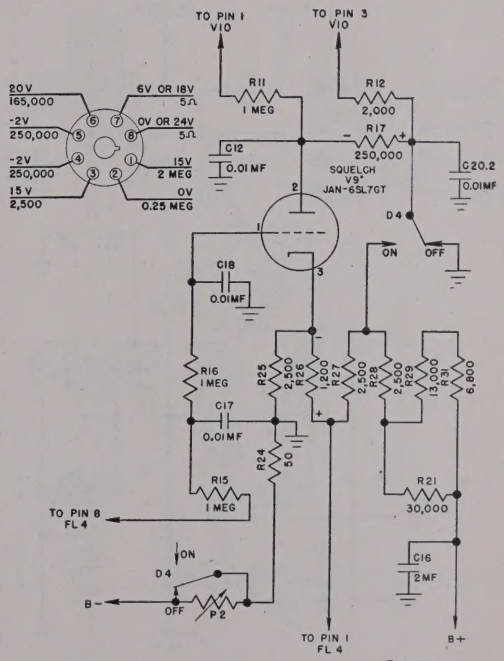


Figure 36a. Radio Receiver BC–683–A, squelch, V9", schematic diagram.

43. Parts List for Squelch Circuit, V9", for Radio Receiver BC–683–B (fig. 36b)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
R15	3Z4534	Resistor, 1 meg ±10%	Squelch timing.
R16	3Z4534	Resistor, 1 meg ±10%	Squelch timing.
R17	3Z4562	Resistor, 0.25 meg ±10%	Squelch plate load.
R12	3Z6200–17	Resistor, 2,000 ohms ± 10%.	First audio cathode bias.
R11	3Z4534	Resistor, 1 meg ±10%	First audio grid leak.
C12	3DA10–48	Capacitor, 0.01 mf, 300 v dc.	First audio grid bias filter.
C20.2	3DA100–27	Capacitor, 0.1 mf, 600 v dc.	Squelching voltage filter.
C18	3DA10–48	Capacitor, 0.01 mf, 300 v dc.	Squelch timing.
R25	3Z6250–6	Resistor, 2,500 ohms ± 5%.	Voltage dividing network.
R26	3Z6120	Resistor, 1,200 ohms ± 5%.	Voltage dividing network.
R27	3Z6250–6	Resistor, 2,500 ohms ± 5%.	Voltage dividing network.
R28	3Z6250–6	Resistor, 2,500 ohms ± 5%.	Voltage dividing network.
R29	3Z6613	Resistor, 13,000 ohms ± 5%.	Voltage dividing network.
R31	3Z6568–1	Resistor, 6,800 ohms ± 5%.	Voltage dividing network.
R21	3Z6630–7	Resistor, 30,000 ohms ± 10%.	Voltage divider shunt.
R95	3Z4614	Resistor, 5,000 ohms ± 10%.	Voltage divider.
R96	3Z4540	Resistor, 30,000 ohms ± 10%.	Voltage divider.
C16	3DB2.6020	Capacitor, 2 mf, 600 v dc.	Plate supply filter.
P2	2Z7299	Potentiometer, 200 ohms.	Squelch control.
R24	3Z6005–13	Resistor, 50 ohms ±5%	Voltage dividing network.
C17	3DA10–48	Capacitor, 0.01 mf, 300 v dc.	Squelch timing.

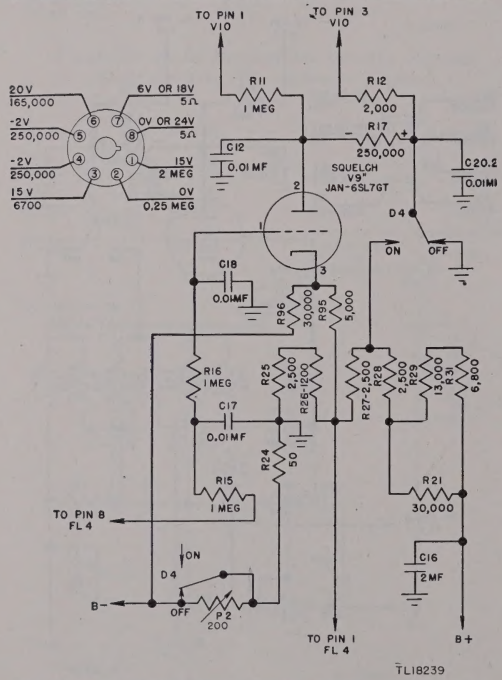


Figure 36b. Radio Receiver BC–683–B, squelch, V9", schematic diagram.

44. Parts List for I-f Oscillator Stage, V10", for Radio Receiver BC–683–(*) (fig. 37)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
L91	2C4403A/C14	Coil, part of LCU4	I-f oscillator inductance.
R91	2Z4550	Resistor, 0.1 meg ±10%, part of LCU4.	I-f oscillator grid leak.
C93	3D9100–19A	Capacitor, 100 mmf ± 5%, 500 v dc.	I-f oscillator fixed tuning.
C10	3D8975	Capacitor, 0.75 ±0.25 mmf, 500 v dc.	I-f oscillator coupling.
R6	3Z4550	Resistor, 0.1 meg ± 10%	I-f oscillator coupling.
C26	3D9500–60	Capacitor, 0.0005 mf, 500 v dc.	I-f oscillator coupling.
R92	3Z4549	Resistor, 40,000 ohms ± 10%, part of LCU4.	I-f oscillator plate load.
R93	3Z4549	Resistor, 40,000 ohms ± 10% part of LCU4.	I-f oscillator plate load.
C92	3D370	Capacitor, 50 ±2 mmf, 500 v dc, part of LCU4.	I-f oscillator plate shunt.
C94	3D9050–13	Capacitor, 50 mmf ± 5%, 500 v dc, part of LCU4.	I-f oscillator plate coupling.
C91	3D9050–13	Capacitor, 50 mmf ± 5%, 500 v dc, part of LCU4.	I-f oscillator plate shunt.

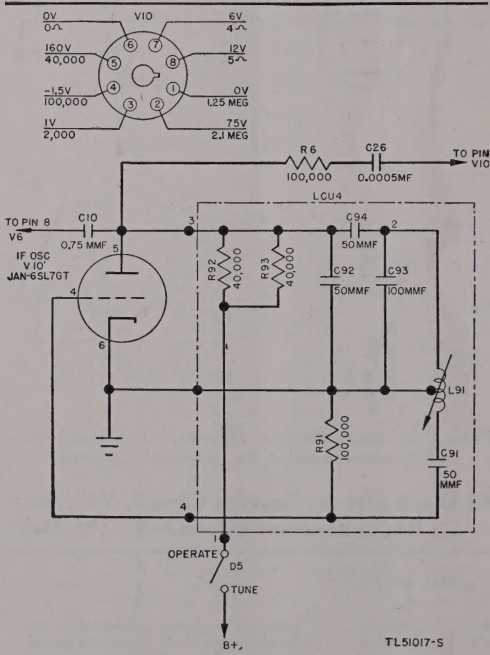


Figure 37. Radio Receiver BC–683–(*), i-f oscillator V10", schematic diagram.

SECTION IX

SUPPLEMENTARY DATA

45. Parts Identification

The following illustrations are provided to aid in identifying and servicing the various components parts of Radio Receiver BC–683–(*).

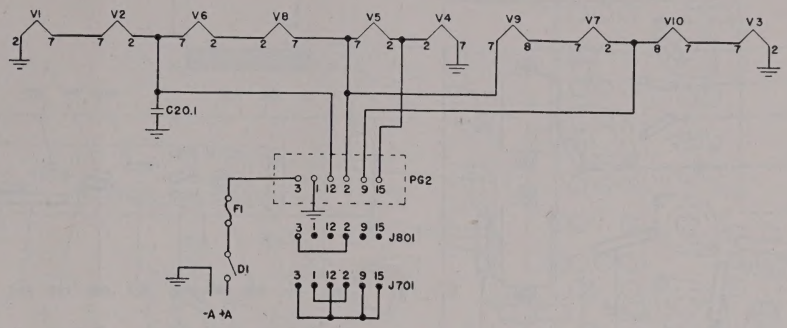
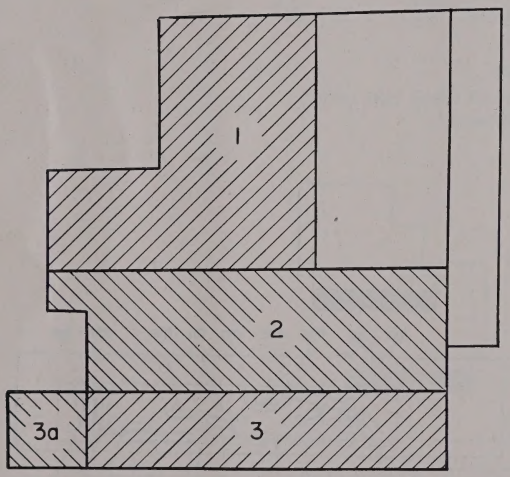


Figure 38. Radio Receiver BC–683–(*), functional diagram of vacuum-tube heater circuits. TL18240

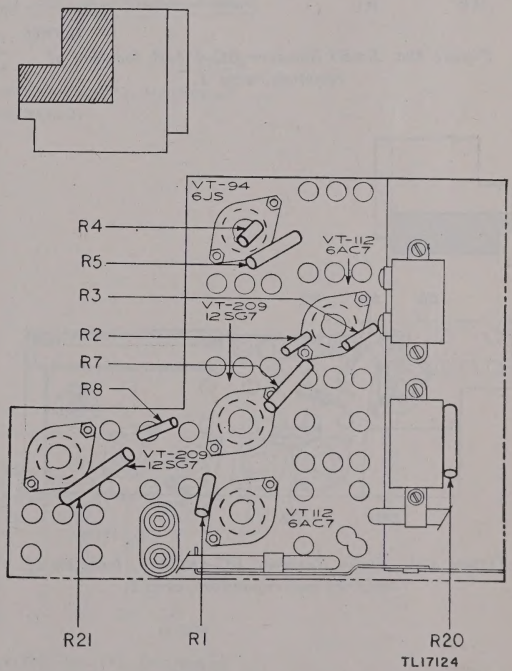


LOCATION OF RESISTORS	
AREA	REFER TO FIGURE
1	39b or 39c
2	39d
3	39e or 39f
3a	39e or 39f

LOCATION OF CAPACITORS	
AREA	REFER TO FIGURE
1	39g
2	39d
3	39h
3a	39h

TL 17123

Figure 39a. Radio Receiver BC–(*), key and legend for location of resistors and capacitors.



TL17124

Figure 39b. Radio Receiver BC–683–A, location of resistors, area 1.

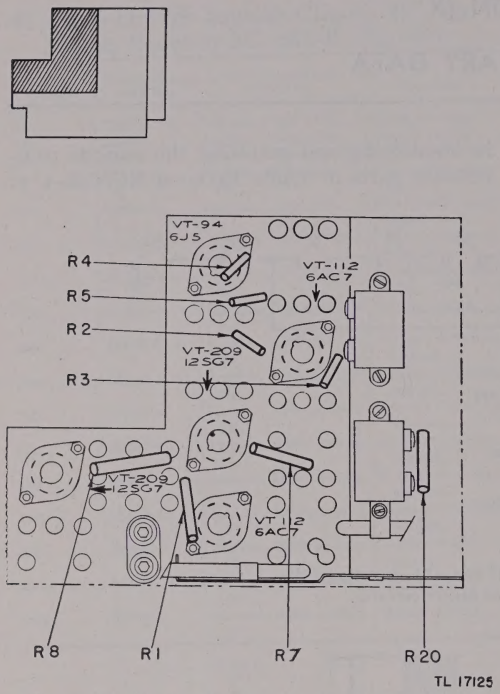


Figure 39c. Radio Receiver BC–683–B, location of resistors, area 1.

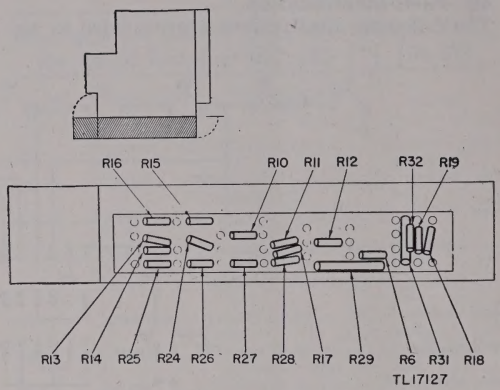


Figure 39e. Radio Receiver BC–683–A, location of resistors, area 3.

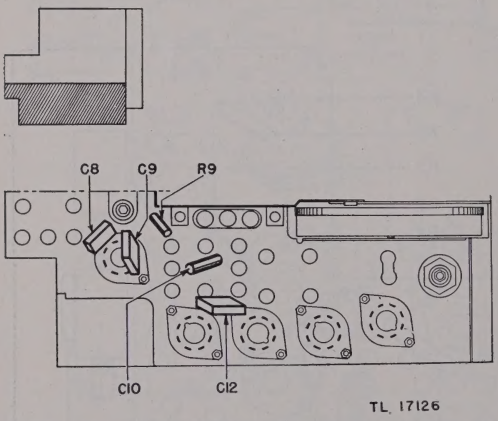


Figure 39d. Radio Receiver BC–683–(*), location of resistors and capacitors, area 2.

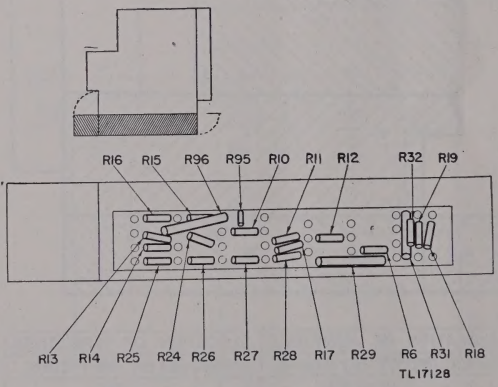


Figure 39f. Radio Receiver BC–683–B, location of resistors, area 3.

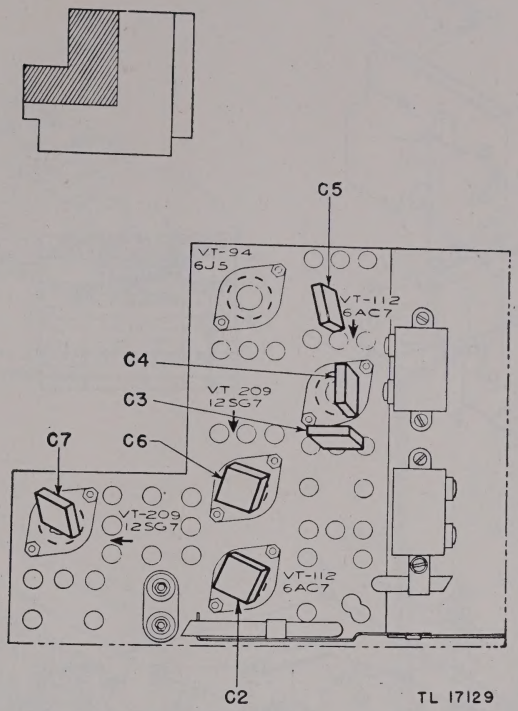


Figure 39g. Radio Receiver BC–683–(*), location of capacitors, area 1.

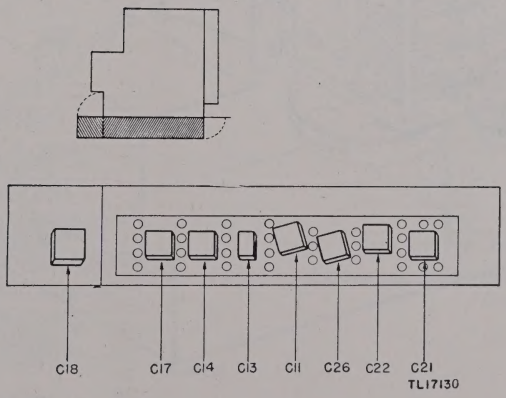
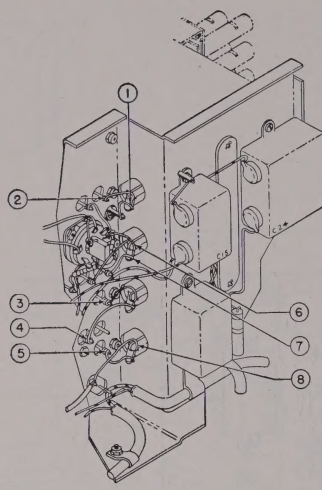


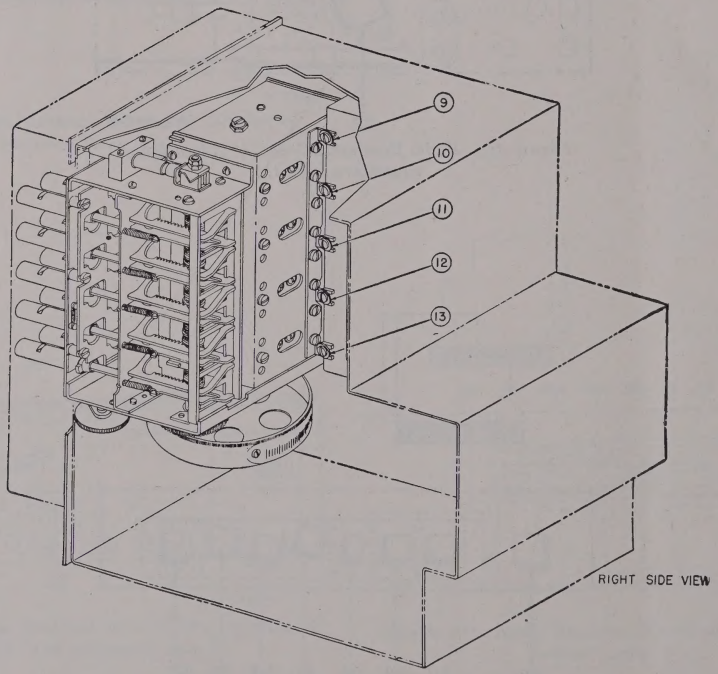
Figure 39h. Radio Receiver BC–683–(*), location of capacitors, area 3.



REMOVAL OF RECEIVER PUSH BUTTON SELECTOR SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	UNSOLDER WIRE
2	
3	
4	
5	
6	
7	
8	

REMOVAL OF RECEIVER PUSH BUTTON SELECTOR SEQUENCE OF OPERATIONS	
STEP	OPERATION
9	REMOVE SCREW & WASHER
10	
11	
12	
13	

LEFT SIDE VIEW



TL 17103

Figure 40. Radio Receiver BC–683–(*), removal of push-button assembly.

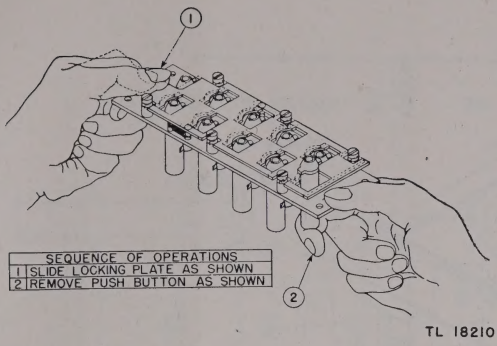
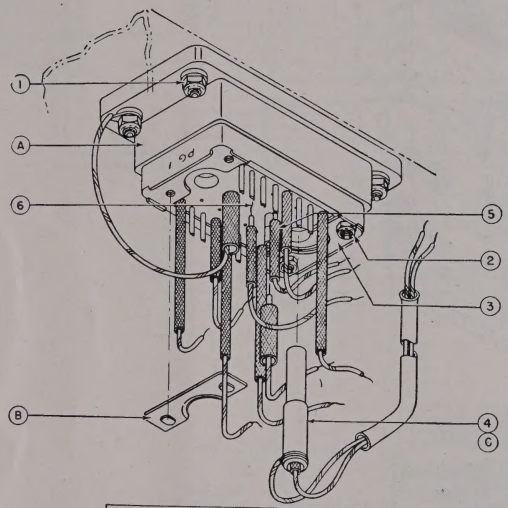


Figure 41. Radio Receiver BC–683–(*), removal of individual push buttons.



PARTS LIST	
A	PG 1 CONNECTOR
B	COAXIAL LOCKING PLATE
C	COAXIAL CONNECTOR

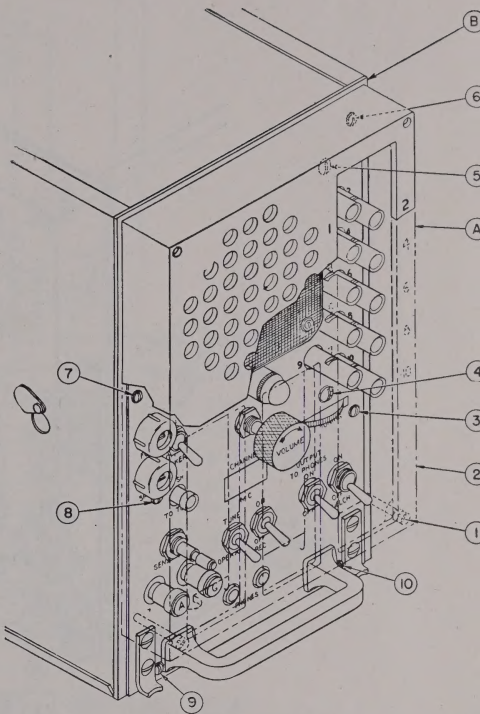
FOR REMOVAL OF PG 1 CONNECTOR SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	REMOVE FOUR (4) ELASTIC STOP NUTS AND SLEEVES

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

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

TL 18218

Figure 42. Radio Receiver BC–683–(*), removal of plug PG1.

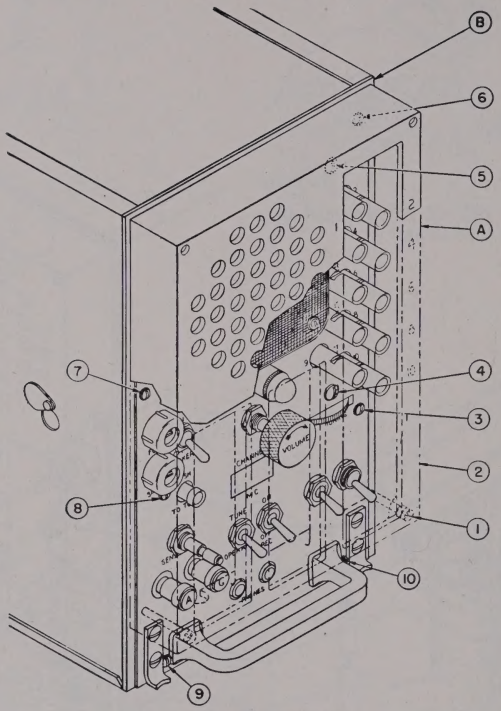


PARTS LIST	
A	PANEL GUARD
B	FRONT PANEL

SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	REMOVE 4 PANEL GUARD SCREWS
2	REMOVE GUARD
3	UNSCREW
4	
5	
6	
7	
8	
9	
10	

TL 18217

Figure 43a. Radio Receiver BC–683–A, removal of front panel.

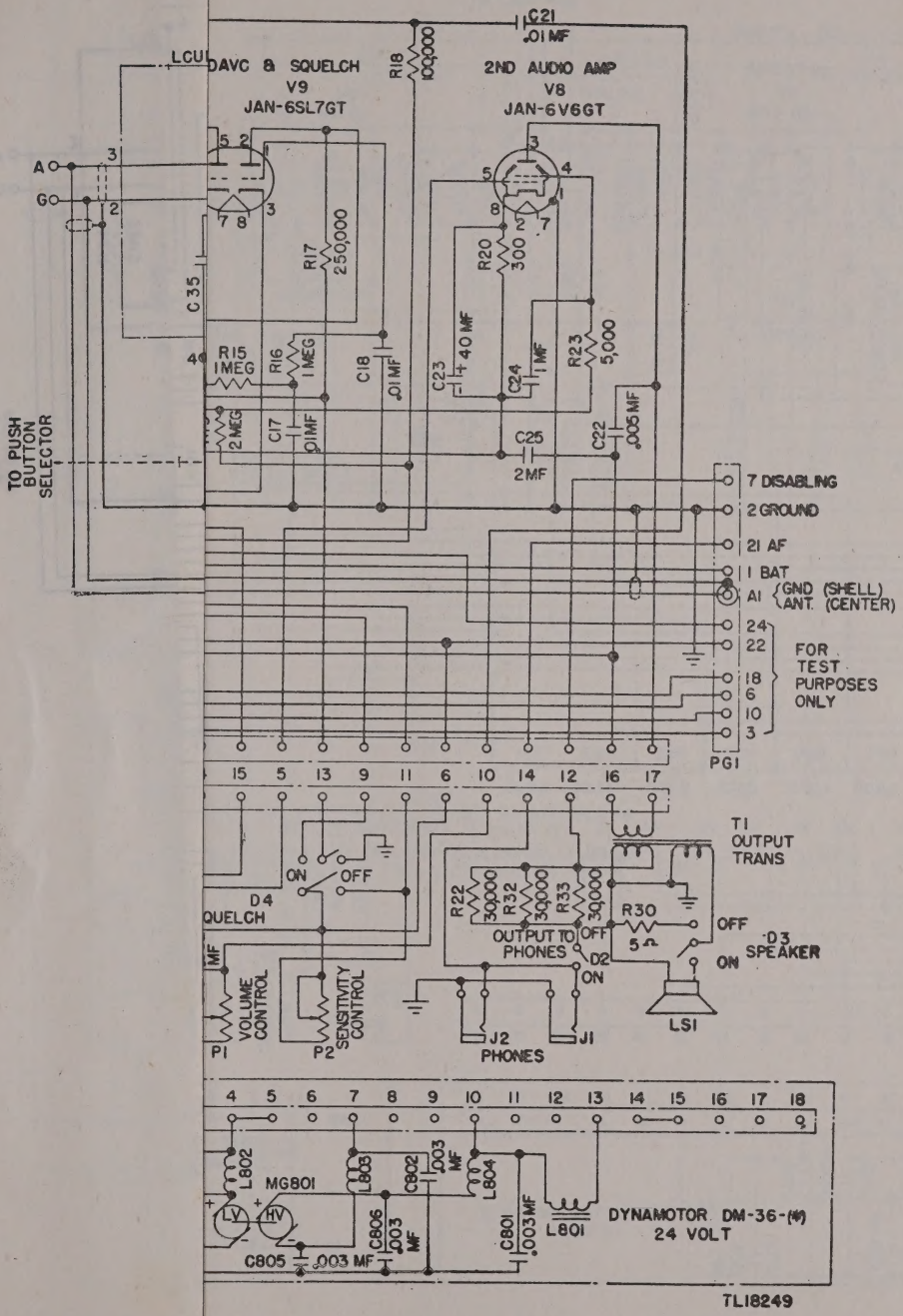


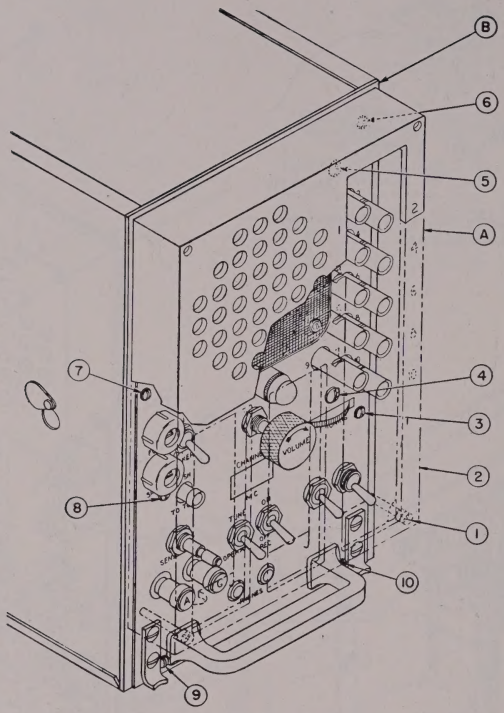
PARTS LIST	
A	PANEL GUARD
B	FRONT PANEL

SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	REMOVE 4 PANEL GUARD SCREWS
2	REMOVE GUARD
3	UNSCREW
4	↓
5	↓
6	↓
7	↓
8	↓
9	↓
10	↓

TL 17146

Figure 43b. Radio Receiver BC–683–B, removal of front panel.


LCU
DAVC & SQUELCH
V9
JAN-6SL7GT
2ND AUDIO AMP
V8
JAN-6V6GT
R18 100,000
C21 .01 MF
A
G
R17 250,000
C35
R15 1 MEG
R16 1 MEG
C18 .01 MF
R20 300
C23 40 MF
C24 1 MF
R23 5,000
C17 .01 MF
2 MEG
C25 2 MF
C22 .005 MF
TO PUSH BUTTON SELECTOR
7 DISABLING
2 GROUND
21 AF
1 BAT
A1 GND (SHELL) ANT. (CENTER)
24
22
18
6
10
3
FOR TEST PURPOSES ONLY
PG1
15 5 13 9 11 6 10 14 12 16 17
T1 OUTPUT TRANS
ON OFF
D4 QUELCH
R22 30000
R32 30000
R33 30000
R30 5Ω
OUTPUT TO PHONES
OFF
D2
ON
OFF
D3 SPEAKER
ON
LSI
MF
VOLUME CONTROL
SENSITIVITY CONTROL
P1
P2
J2 PHONES
J1
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
L802
MG801
LV
HV
C803
C802 .003 MF
C804
C806 .003 MF
C805 .003 MF
C801 .003 MF
L801
DYNAMOTOR DM-36-(1) 24 VOLT
TL18249

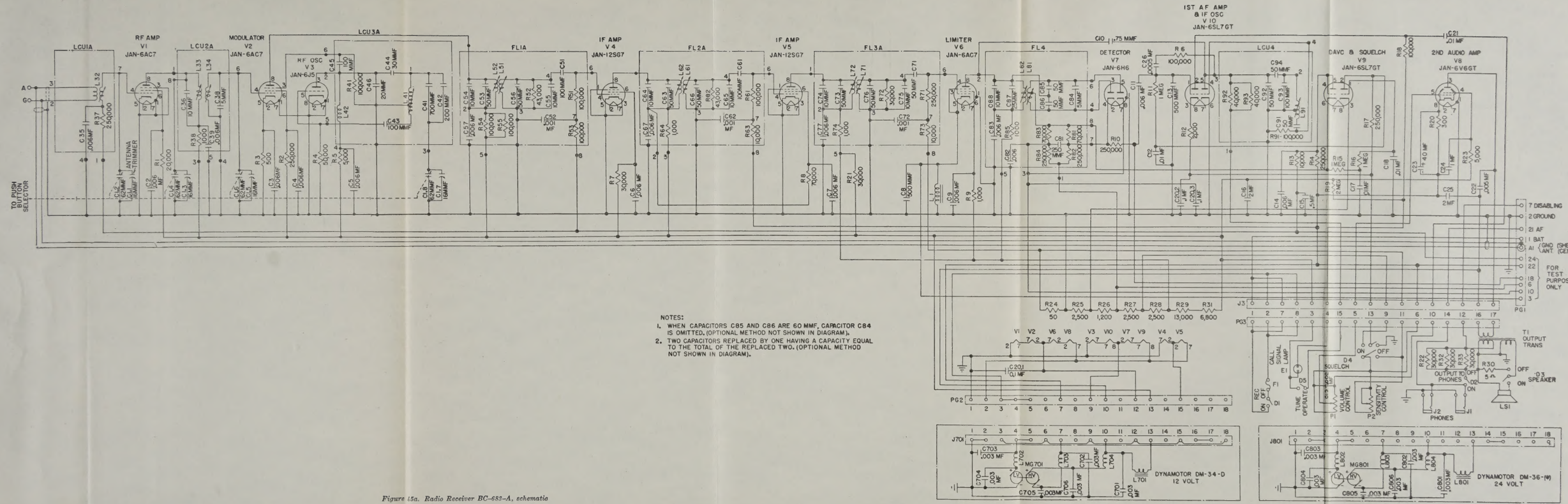


PARTS LIST	
A	PANEL GUARD
B	FRONT PANEL

SEQUENCE OF OPERATIONS	
STEP	OPERATION
1	REMOVE 4 PANEL GUARD SCREWS
2	REMOVE GUARD
3	UNSCREW
4	
5	
6	
7	
8	
9	
10	

TL 17146

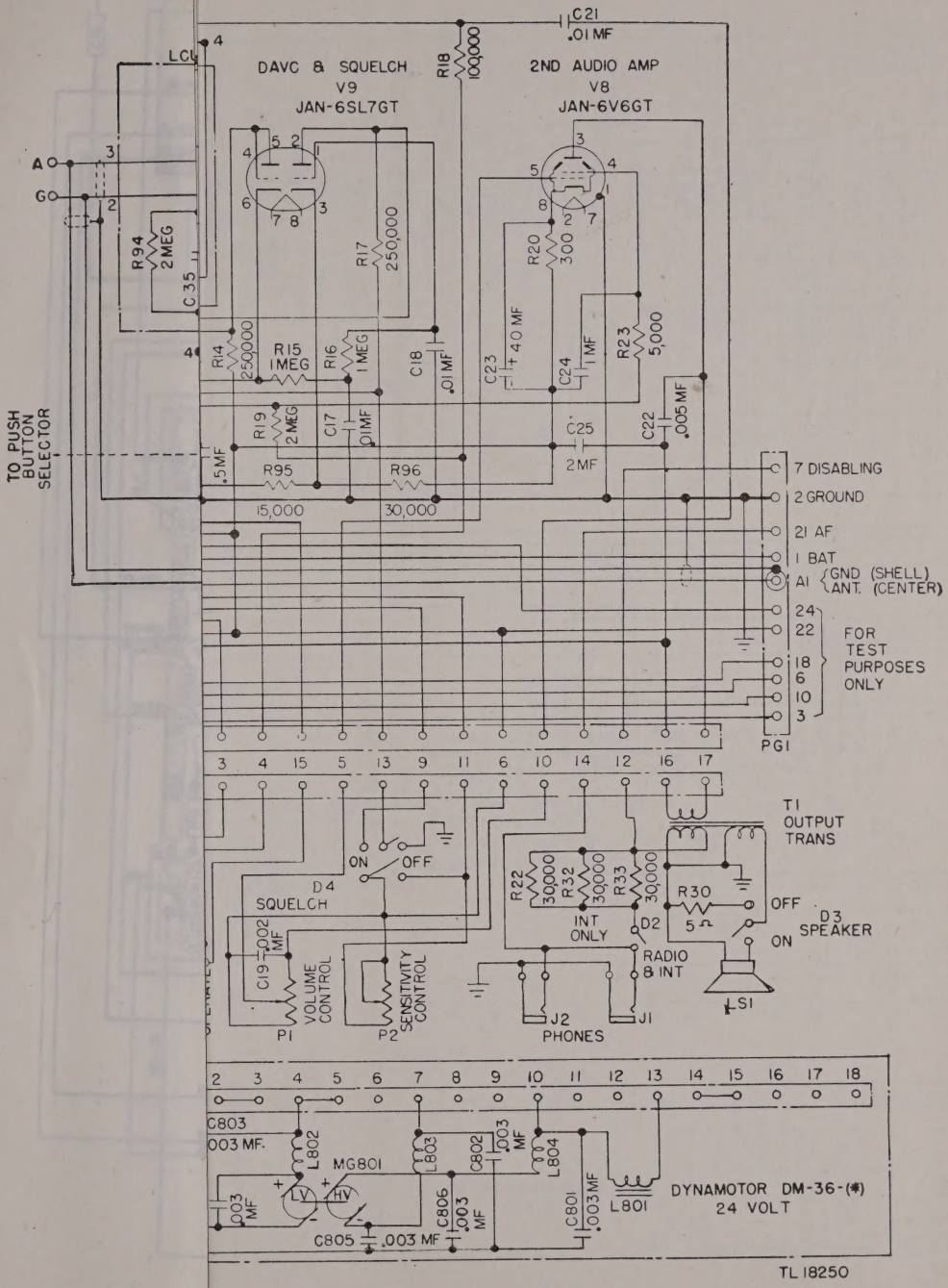
Figure 43b. Radio Receiver BC–683–B, removal of front panel.

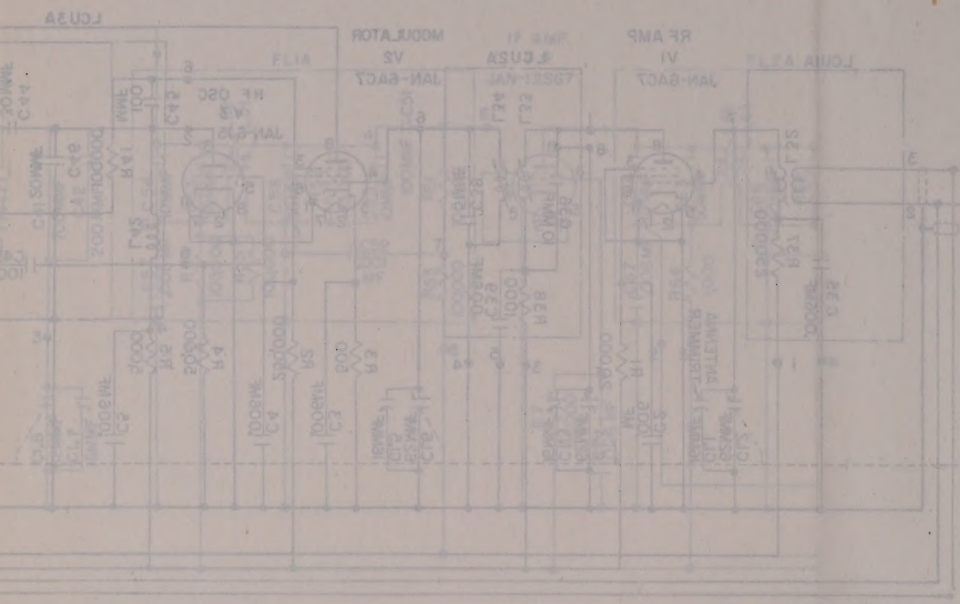


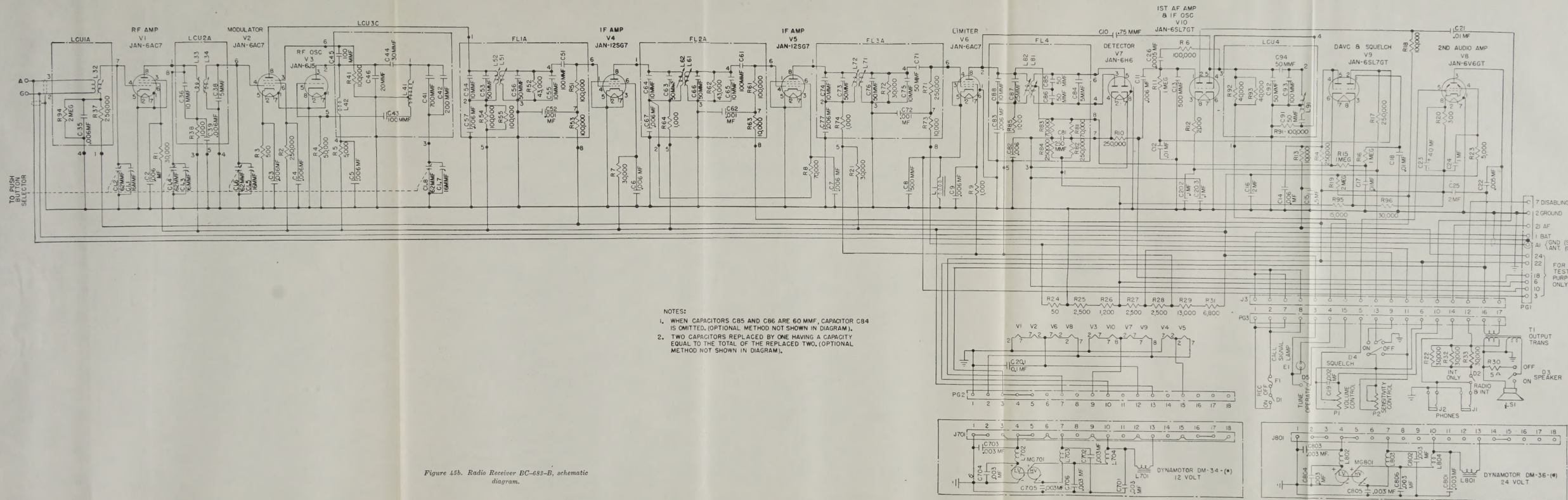
NOTES:

1. WHEN CAPACITORS C85 AND C86 ARE 60 MMF, CAPACITOR C84 IS OMITTED. (OPTIONAL METHOD NOT SHOWN IN DIAGRAM).
2. TWO CAPACITORS REPLACED BY ONE HAVING A CAPACITY EQUAL TO THE TOTAL OF THE REPLACED TWO. (OPTIONAL METHOD NOT SHOWN IN DIAGRAM).

Figure 15a. Radio Receiver BC-683-A, schematic diagram.


DAVC & SQUELCH
V9
JAN-6SL7GT
2ND AUDIO AMP
V8
JAN-6V6GT
R18 100000
C21 .01 MF
R94 2 MEG
C35
R17 250,000
R20 300
R23 5,000
R14 250000
R15 1MEG
R16 1MEG
C18 .01 MF
C23 40 MF
C24 1 MF
C22 .005 MF
R19 2MEG
C17 .01MF
C25 2MF
.5MF
R95 15,000
R96 30,000
TO PUSH BUTTON SELECTOR
7 DISABLING
2 GROUND
21 AF
1 BAT
A1 GND (SHELL) ANT. (CENTER)
24
22
18
6
10
3
FOR TEST PURPOSES ONLY
PG1
3 4 15 5 13 9 11 6 10 14 12 16 17
T1 OUTPUT TRANS
ON OFF
D4 SQUELCH
R22 30000
R32 30000
R33 30000
R30 5Ω
OFF
D3 SPEAKER
ON
INT ONLY
D2
RADIO & INT
C19 .002 MF
VOLUME CONTROL
SENSITIVITY CONTROL
P1
P2
J2 PHONES
J1
LS1
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
C803 .003 MF.
L802
MG801
LV
HV
L803
C802 .003 MF
L804
C806 .003 MF
C805 .003 MF
C801 .003MF
L801
DYNAMOTOR DM-36-(*) 24 VOLT
TL 18250

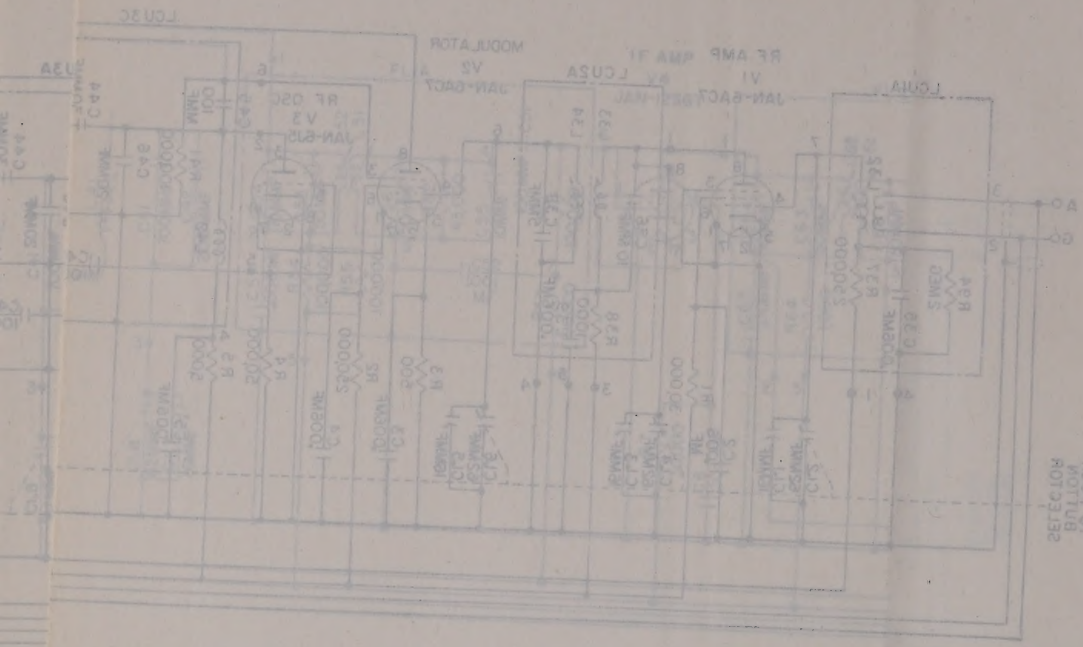


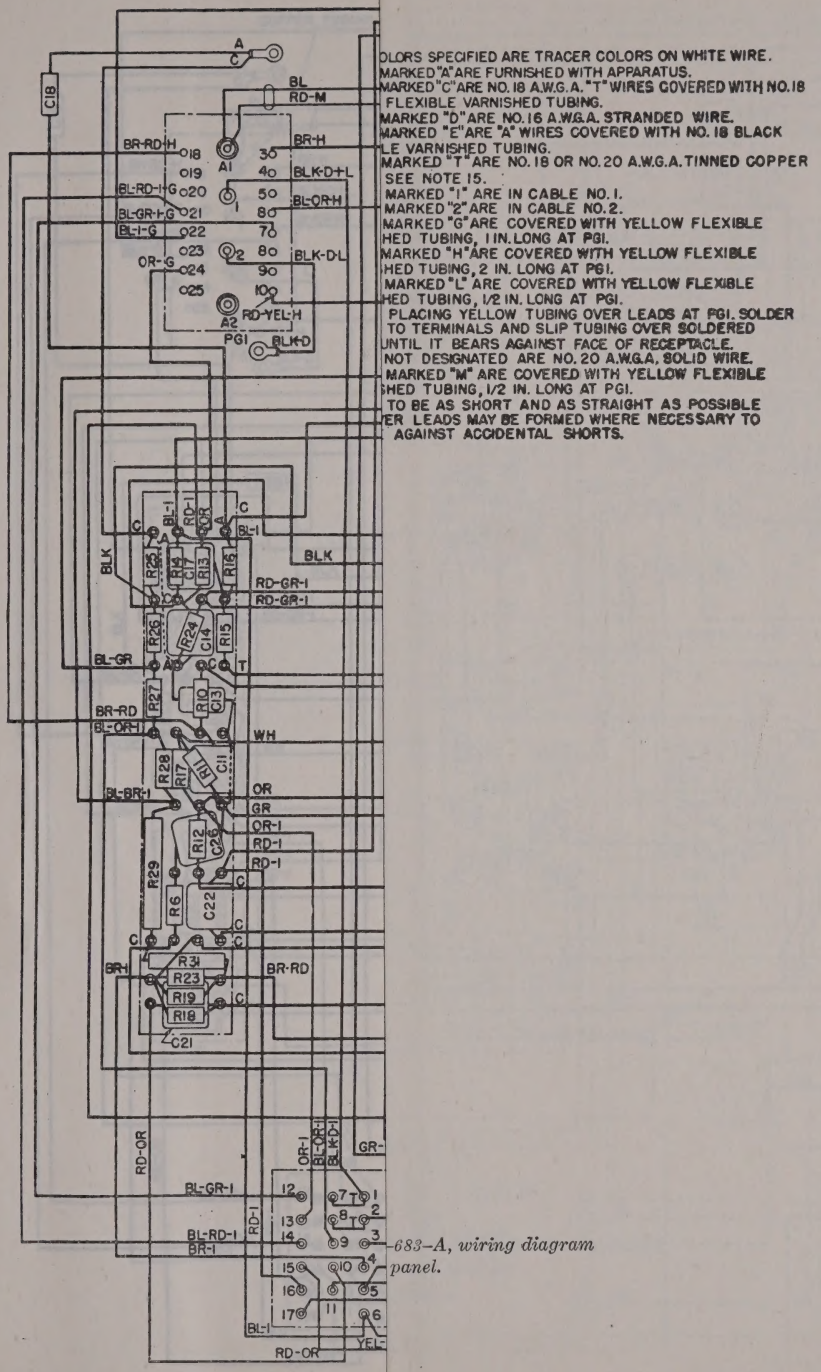


NOTES:

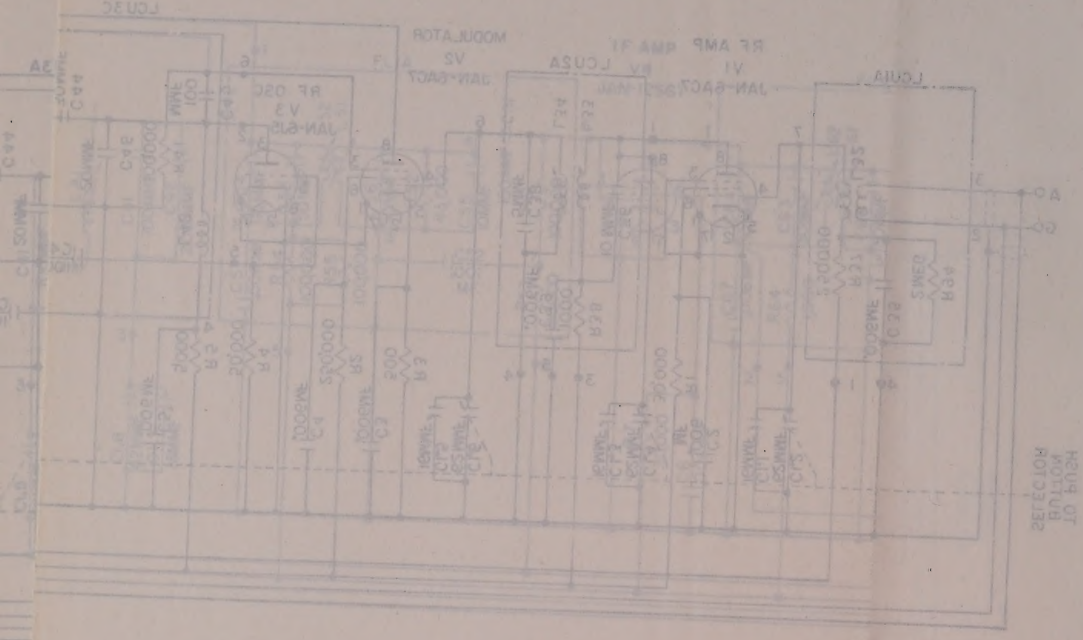
1. WHEN CAPACITORS C85 AND C86 ARE 60 MMF, CAPACITOR C84 IS OMITTED. (OPTIONAL METHOD NOT SHOWN IN DIAGRAM).
2. TWO CAPACITORS REPLACED BY ONE HAVING A CAPACITY EQUAL TO THE TOTAL OF THE REPLACED TWO. (OPTIONAL METHOD NOT SHOWN IN DIAGRAM).

Figure 45b. Radio Receiver BC-683-B, schematic diagram.





683–A, wiring diagram panel.



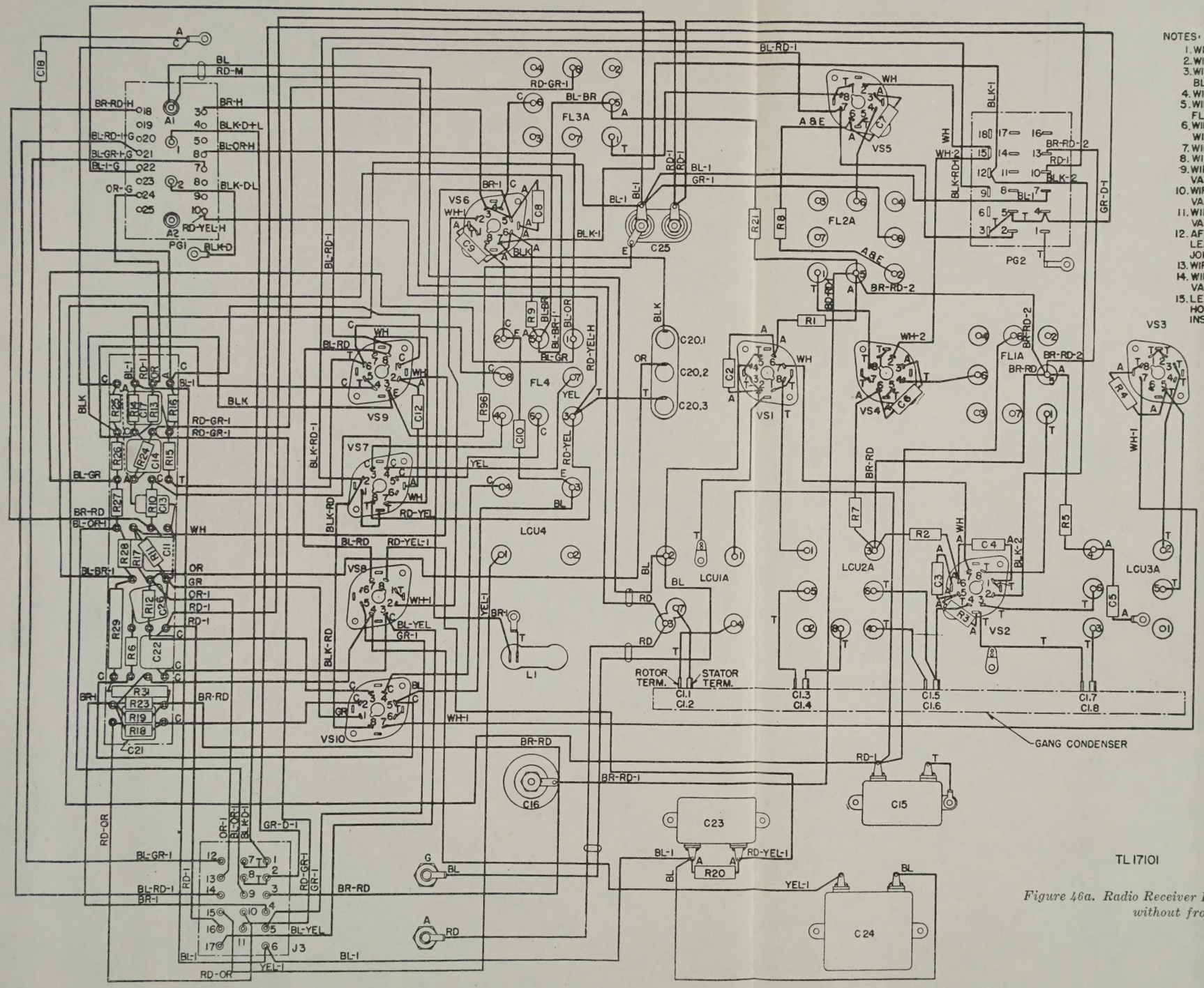
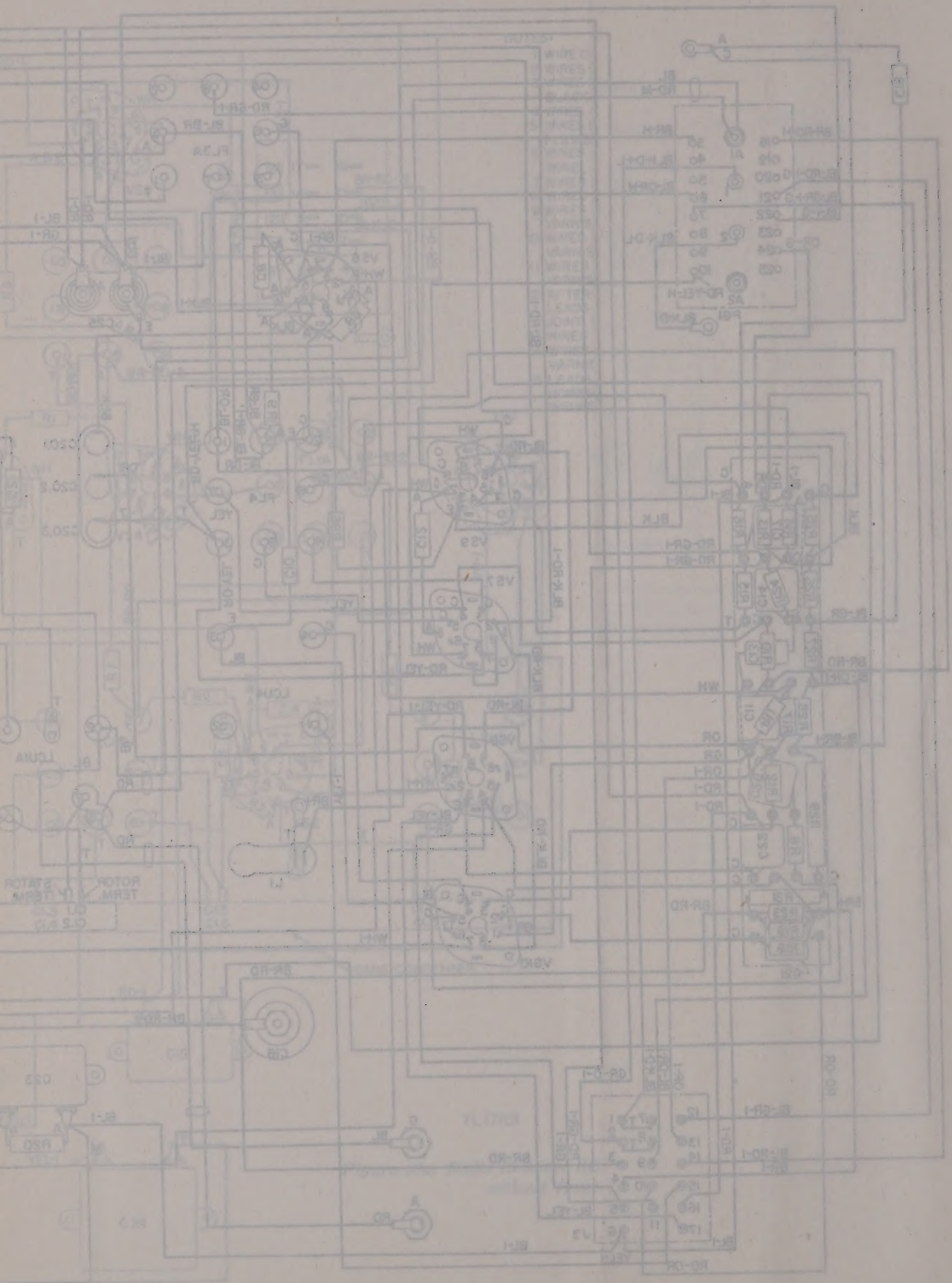
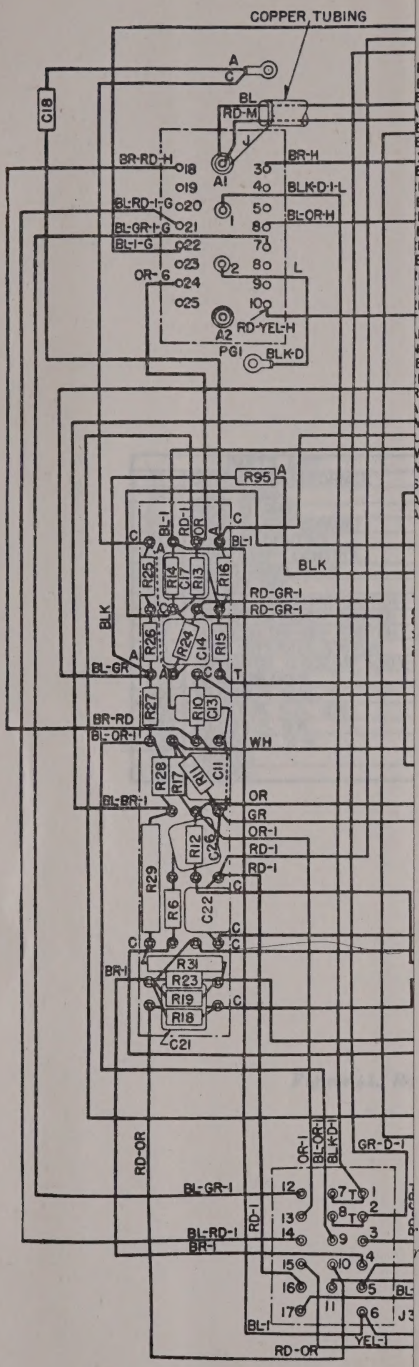


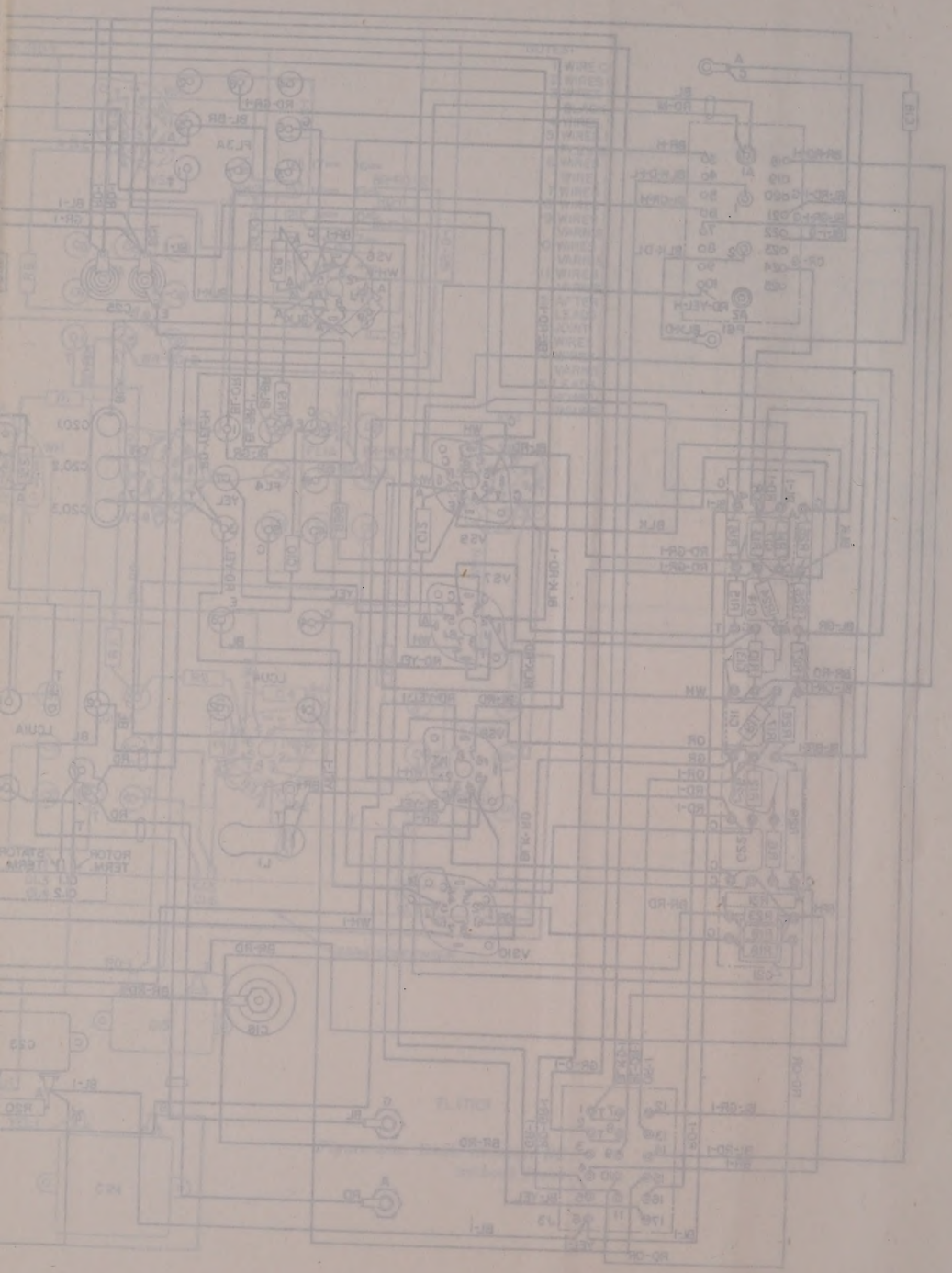
Figure 46a. Radio Receiver BC-683-A, wiring diagram without front panel.

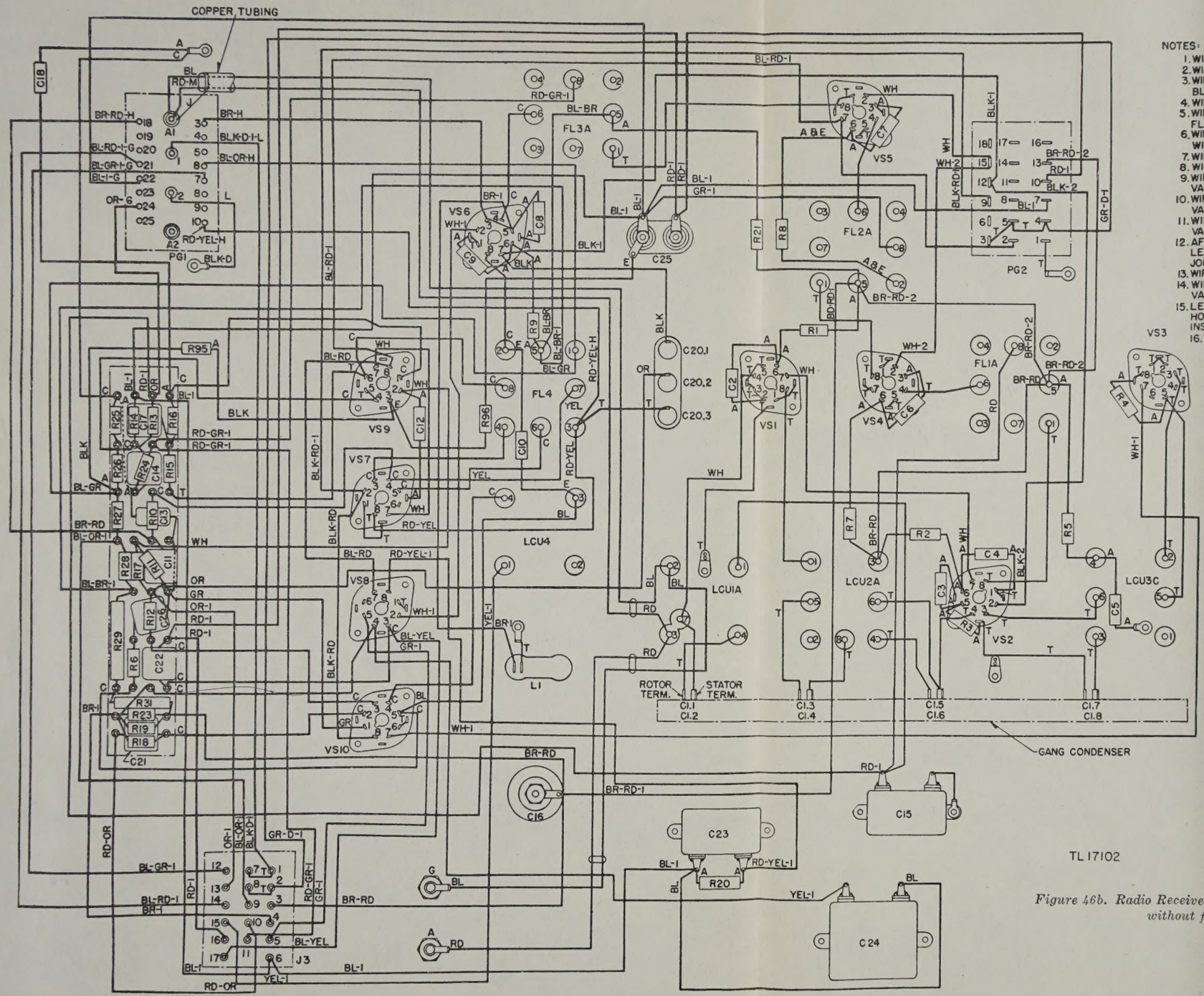




BC–683–B, wiring diagram
ront panel.

E COLORS SPECIFIED ARE TRACER COLORS ON WHITE WIRE.
ES MARKED "A" ARE FURNISHED WITH APPARATUS.
ES MARKED "C" ARE NO. 18 A.W.G.A. "T" WIRES COVERED WITH NO. 18
ACK FLEXIBLE VARNISHED TUBING.
ES MARKED "D" ARE NO. 16 A.W.G.A. STRANDED WIRE.
ES MARKED "E" ARE "A" WIRES COVERED WITH NO. 18 BLACK
XIBLE VARNISHED TUBING.
ES MARKED "T" ARE NO. 18 OR NO. 20 A.W.G.A. TINNED COPPER
E, SEE NOTE 15.
ES MARKED "I" ARE IN CABLE NO. 1.
ES MARKED "2" ARE IN CABLE NO. 2.
ES MARKED "G" ARE COVERED WITH YELLOW FLEXIBLE
NISHED TUBING, 1 IN. LONG AT PGI.
ES MARKED "H" ARE COVERED WITH YELLOW FLEXIBLE
NISHED TUBING, 2 IN. LONG AT PGI.
ES MARKED "L" ARE COVERED WITH YELLOW FLEXIBLE
NISHED TUBING, 1/2 IN. LONG AT PGI.
ER PLACING YELLOW TUBING OVER LEADS AT PGI, SOLDER
DS TO TERMINALS AND SLIP TUBING OVER SOLDERED
T UNTIL IT BEARS AGAINST FACE OF RECEPTACLE.
ES NOT DESIGNATED ARE NO. 20 A.W.G.A. SOLID WIRE.
ES MARKED "M" ARE COVERED WITH YELLOW FLEXIBLE
RNISHED TUBING, 1/2 IN. LONG AT PGI.
DS TO BE AS SHORT AND AS STRAIGHT AS POSSIBLE
WEVER LEADS MAY BE FORMED WHERE NECESSARY TO
URE AGAINST ACCIDENTAL SHORTS.
WIRE MARKED "J" IS NO. 16 A.W.G. BARE FLEXIBLE STRANDED
WIRE. THE WIRE SHALL BE WRAPPED AROUND THE COAXIAL
SLEEVE AND THE COPPER TUBE FOR AT LEAST ONE TURN
AND THEN SECURELY AND NEATLY SOLDERED TO OBTAIN
A GOOD GROUND.

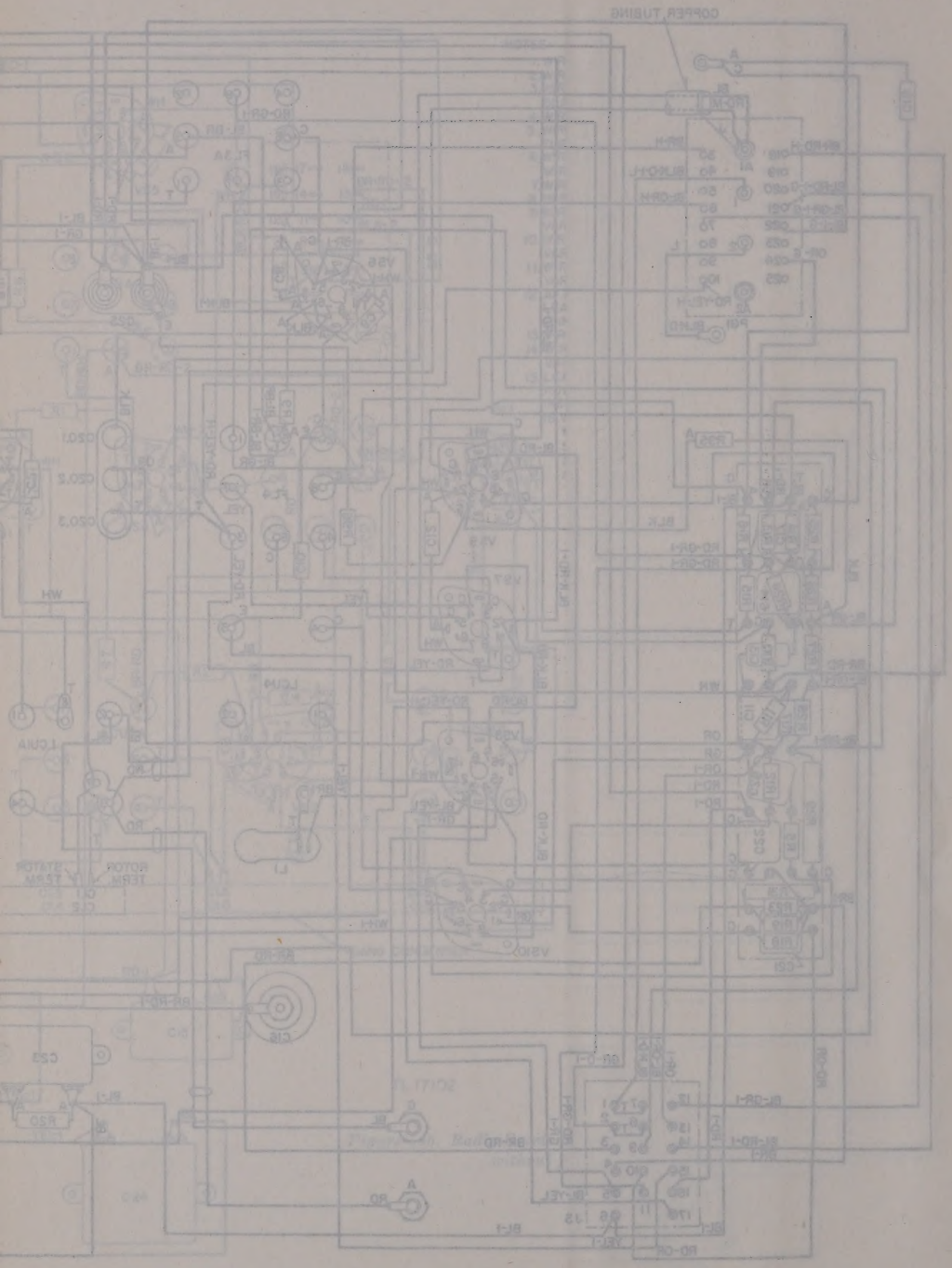




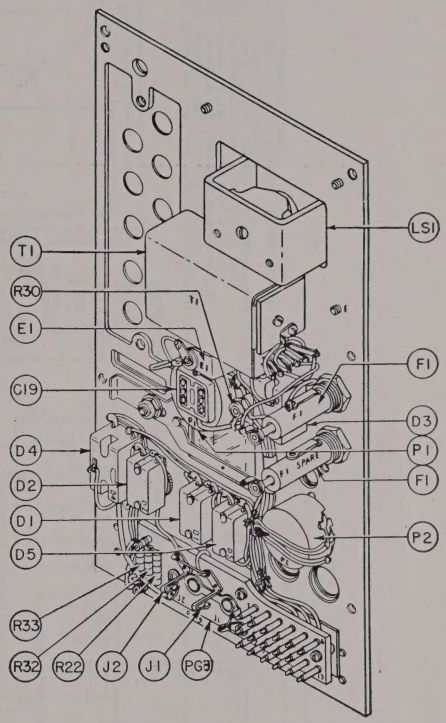
NOTES:

1. WIRE COLORS SPECIFIED ARE TRACER COLORS ON WHITE WIRE.
2. WIRES MARKED "A" ARE FURNISHED WITH APPARATUS.
3. WIRES MARKED "C" ARE NO. 18 A.W.G.A. "T" WIRES COVERED WITH NO. 18 BLACK FLEXIBLE VARNISHED TUBING.
4. WIRES MARKED "D" ARE NO. 16 A.W.G.A. STRANDED WIRE.
5. WIRES MARKED "E" ARE "A" WIRES COVERED WITH NO. 18 BLACK FLEXIBLE VARNISHED TUBING.
6. WIRES MARKED "T" ARE NO. 18 OR NO. 20 A.W.G.A. TINNED COPPER WIRE, SEE NOTE 15.
7. WIRES MARKED "1" ARE IN CABLE NO. 1.
8. WIRES MARKED "2" ARE IN CABLE NO. 2.
9. WIRES MARKED "G" ARE COVERED WITH YELLOW FLEXIBLE VARNISHED TUBING, 1 IN. LONG AT PG1.
10. WIRES MARKED "H" ARE COVERED WITH YELLOW FLEXIBLE VARNISHED TUBING, 2 IN. LONG AT PG1.
11. WIRES MARKED "L" ARE COVERED WITH YELLOW FLEXIBLE VARNISHED TUBING, 1/2 IN. LONG AT PG1.
12. AFTER PLACING YELLOW TUBING OVER LEADS AT PG1, SOLDER LEADS TO TERMINALS AND SLIP TUBING OVER SOLDERED JOINT UNTIL IT BEARS AGAINST FACE OF RECEPTACLE.
13. WIRES NOT DESIGNATED ARE NO. 20 A.W.G.A. SOLID WIRE.
14. WIRES MARKED "M" ARE COVERED WITH YELLOW FLEXIBLE VARNISHED TUBING, 1/2 IN. LONG AT PG1.
15. LEADS TO BE AS SHORT AND AS STRAIGHT AS POSSIBLE HOWEVER LEADS MAY BE FORMED WHERE NECESSARY TO INSURE AGAINST ACCIDENTAL SHORTS.
16. WIRE MARKED "J" IS NO. 16 A.W.G. BARE FLEXIBLE STRANDED WIRE. THE WIRE SHALL BE WRAPPED AROUND THE COAXIAL SLEEVE AND THE COPPER TUBE FOR AT LEAST ONE TURN AND THEN SECURELY AND NEATLY SOLDERED TO OBTAIN A GOOD GROUND.

Figure 46b. Radio Receiver BC–683–B, wiring diagram without front panel.


COPPER TUBING

PARTS LIST	
T1	OUTPUT TRANSFORMER
E1	CALL SIGNAL
F1	FUSE 15 AMP
F1	FUSE 15 AMP (SPARE)
P1	VOLUME CONTROL
P2	SENSITIVITY CONTROL
PG3	FRONT PANEL PLUG
D1	ON-OFF REC.
D2	OUTPUT TO PHONE SWITCH
D3	ON-OFF SPEAKER SWITCH
D4	SQUELCH ON-OFF SWITCH
D5	TUNE-OPERATE SWITCH
C19	CAPACITOR 0.002 MF 500 V.
LS1	LOUD SPEAKER
R22	30,000 Ω ½ W.
R30	RESISTOR 5 Ω 4 W.
R32	30,000 Ω ½ W.
R33	30,000 Ω ½ W.
J1	PHONES
J2	PHONES



TL 18211

Figure 44. Radio Receiver BC-683-A, rear view of front panel.

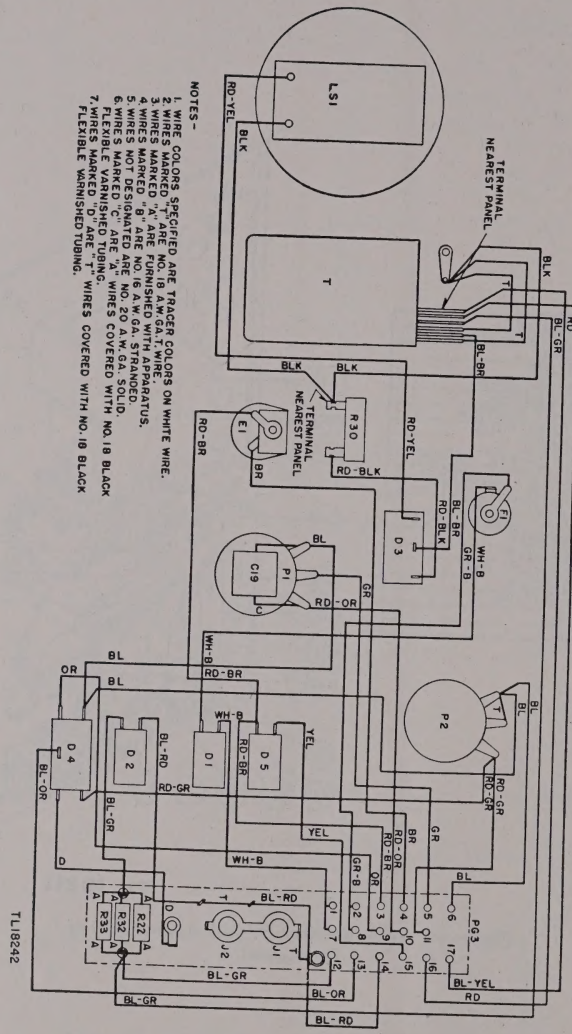


Figure 47. Radio Receiver BC–683–(*), front panel wiring diagram.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1945—661686



TM11-4036-1