TM 11-346

WAR DEPARTMENT TECHNICAL MANUAL

TEST SETS 1-61-A, 1-61-B, AND 1-61-C

WAR DEPARTMENT • 26 APRIL 1944

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WAR DEPARTMENT,
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TM 11-346, War Department Technical Manual, Test Sets I-61-A, I-61-B, and I-61-C, is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

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Chief of Staff.

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Major General,
The Adjutant General.

DISTRIBUTION: I Bn 11(5); IC 11(10).
(For explanation of symbols see FM 21-6.)

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DESTRUCTION NOTICE

WHY —To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

HOW —1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut—Use axes, handaxes, machetes.

3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. Explosives—Use firearms, grenades, TNT.

5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT—1. Smash—Power level indicator, gain controls, resistor strip.

2. Cut—Main wiring cable at several points along rear edge of chassis.

3. Burn—Technical manuals, circuit diagram from lid of chest.

4. Bend—Contact springs in key switches.

5. Bury or scatter—Any or all of the above pieces after breaking.

DESTROY EVERYTHING

SECTION I
DESCRIPTION

1. GENERAL.

a. Test Sets I-61-A, I-61-B, and I-61-C are portable, dry-battery operated transmission measuring sets used primarily to measure losses or gains in circuits or apparatus. The measuring equipment consists of an audio oscillator (sending) and receiving amplifier. The oscillator (sending) provides levels of —40 dbm, —20 dbm, or 0 dbm into a 600-ohm load. The receiving amplifier is calibrated to measure levels from a 600-ohm source between —50 dbm and +15 dbm in steps of 0.5 dbm over the frequency range of 100 to 10,000 cycles. The 0 dbm level referred to is one milliwatt in 600 ohms.

b. Test Set I-61-A sends a frequency of 1,000 cycles ±50 cycles. The output is rich in harmonics. The over-all dimensions are 15¼ inches by 10⅞ inches by 8¼ inches; the weight, complete with batteries, is 21 pounds. Figures 1, 4, and 5 show different views of Test Set I-61-A.

c. Test Sets I-61-B and I-61-C are supplied with a local battery telephone in addition to the oscillator and receiving amplifier. Three frequencies are available from the oscillator: 500, 1,000, and 2,500 cycles ±50 cycles. The output is practically free of harmonics. The over-all dimensions of Test Sets I-61-B and I-61-C are 18¼ inches long, 10⅛ inches wide, and 11 inches high. The weight, complete with batteries, is 47 pounds. Figures 2, 3, 6, 7, 8, and 9 show different views of Test Sets I-61-B and I-61-C.

2. LIST OF COMPONENTS.

a. Complete test equipment for Test Set I-61-A includes the following:

(1) Three vacuum tubes, including:

(*a*) Two VT-221 (3Q5-GT).

(*b*) One VT-146 (1N5-GT).

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(2) Eight batteries, including:

(*a*) Five Battery BA-30.

(*b*) Three Battery BA-56.

(3) Series battery connector.

(4) TM 11-346, Test Sets I-61-A, I-61-B, and I-61-C.

b. Complete test equipment for Test Sets I-61-B and I-61-C includes the following:

(1) Four vacuum tubes, including:

(*a*) One VT-179 (1LN5).

(*b*) One VT-221 (3Q5-GT).

(*c*) Two ——— (1G4-GT/G).

(2) One complete set of spare tubes.

(3) [1] Seven batteries, including:

(*a*) Two Battery BA-30 (for Telephone EE-8-B).

(*b*) Three Battery BA-35.

(*c*) Two Battery BA-36.

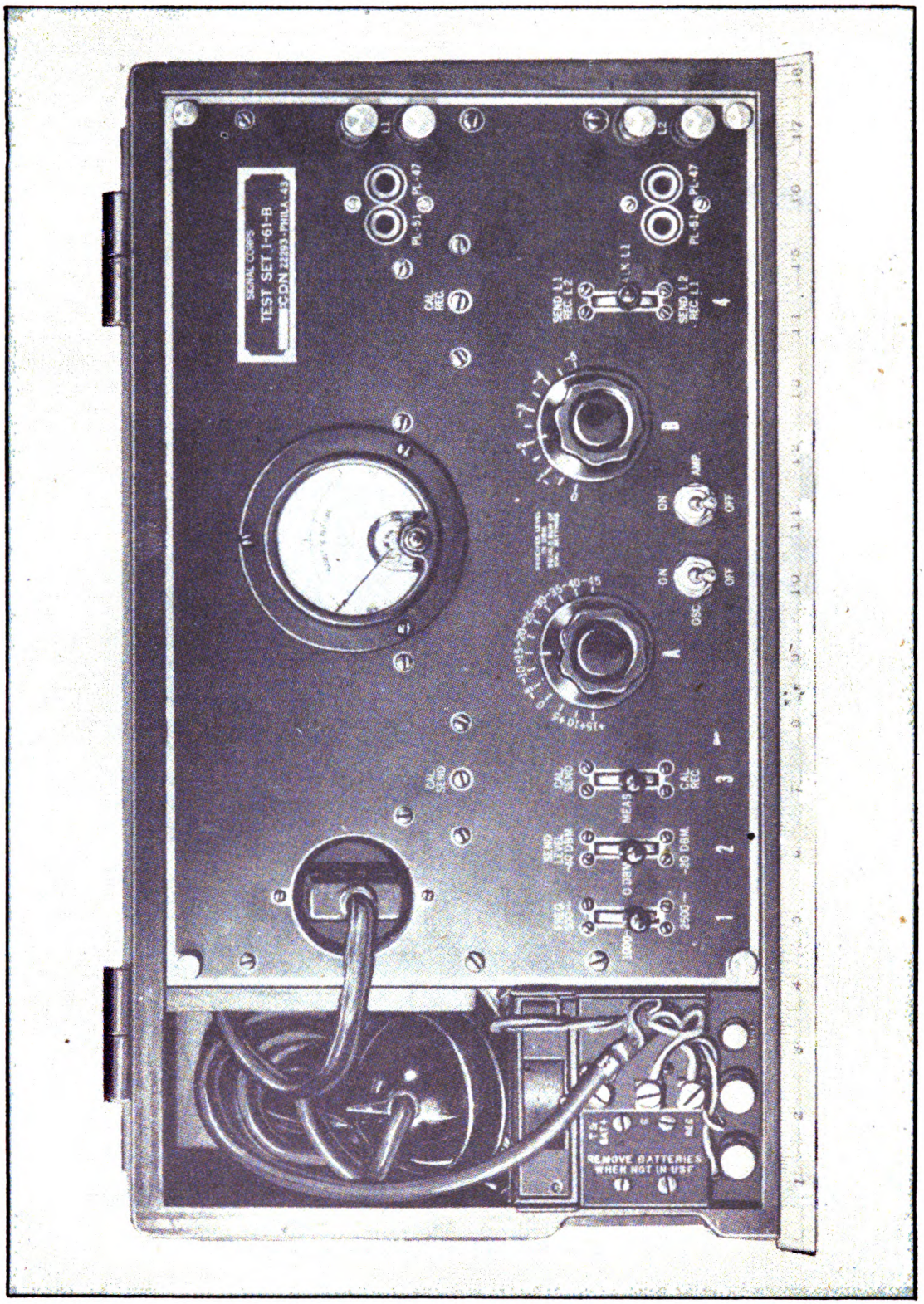
(4) Adapter and leads for connecting external batteries.

(5) Telephone EE-8-B (chassis and Handset TS-9- [2]).

(6) TM 11-346, Test Sets I-61-A, I-61-B, and I-61-C.

[1] Items not supplied as component parts of the equipment.
[2] Handset TS-9- as used in this technical manual refers to all models of the handset furnished with Telephone EE-8-B.

Figure 1. *Test Set I-61-A, top view, case open.*



TL-50746

Figure 2. Test Sets I-61-B and I-61-C, top view, case open.

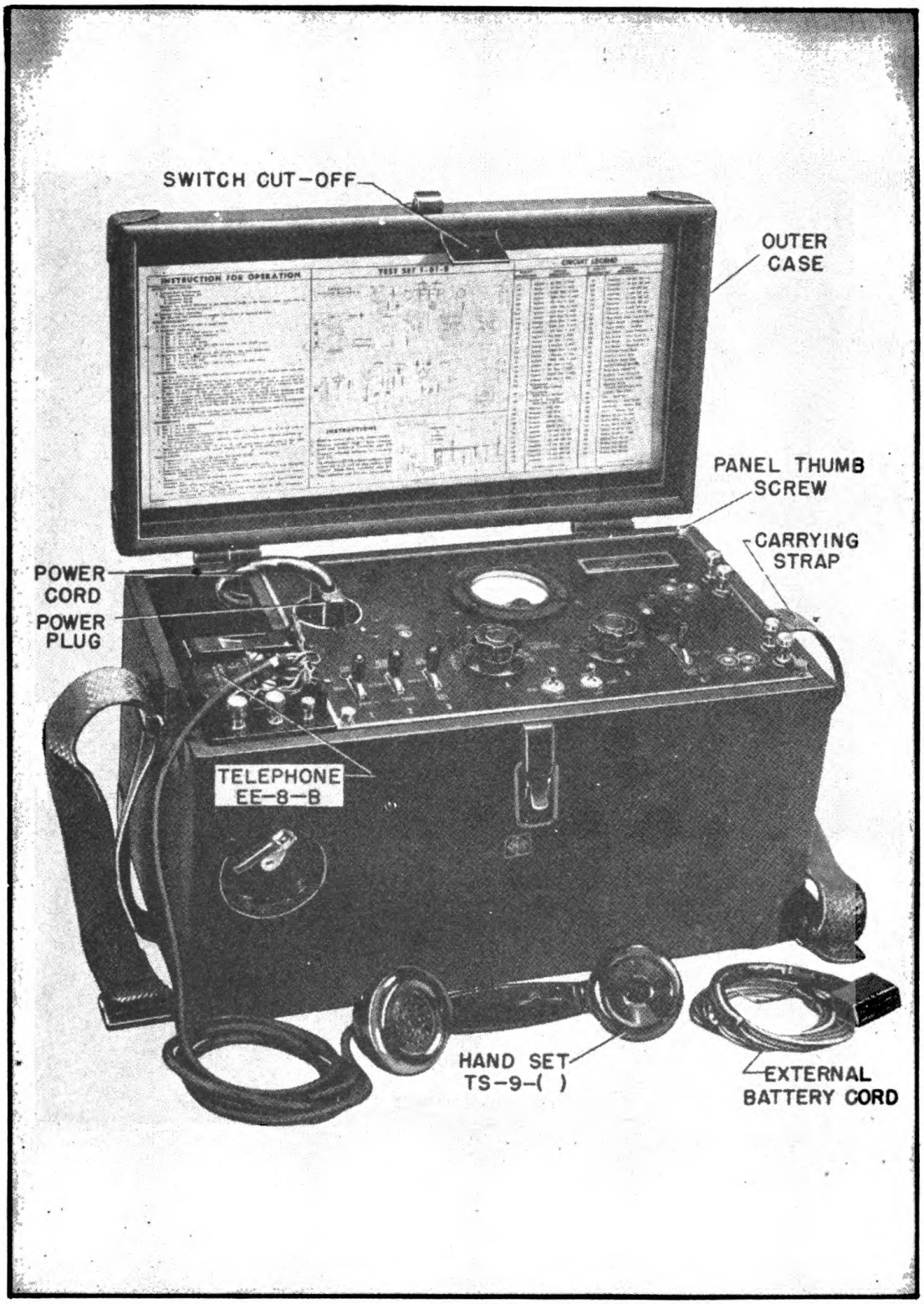


Figure 3. Test Sets I-61-B and I-61-C, assembled for operation.

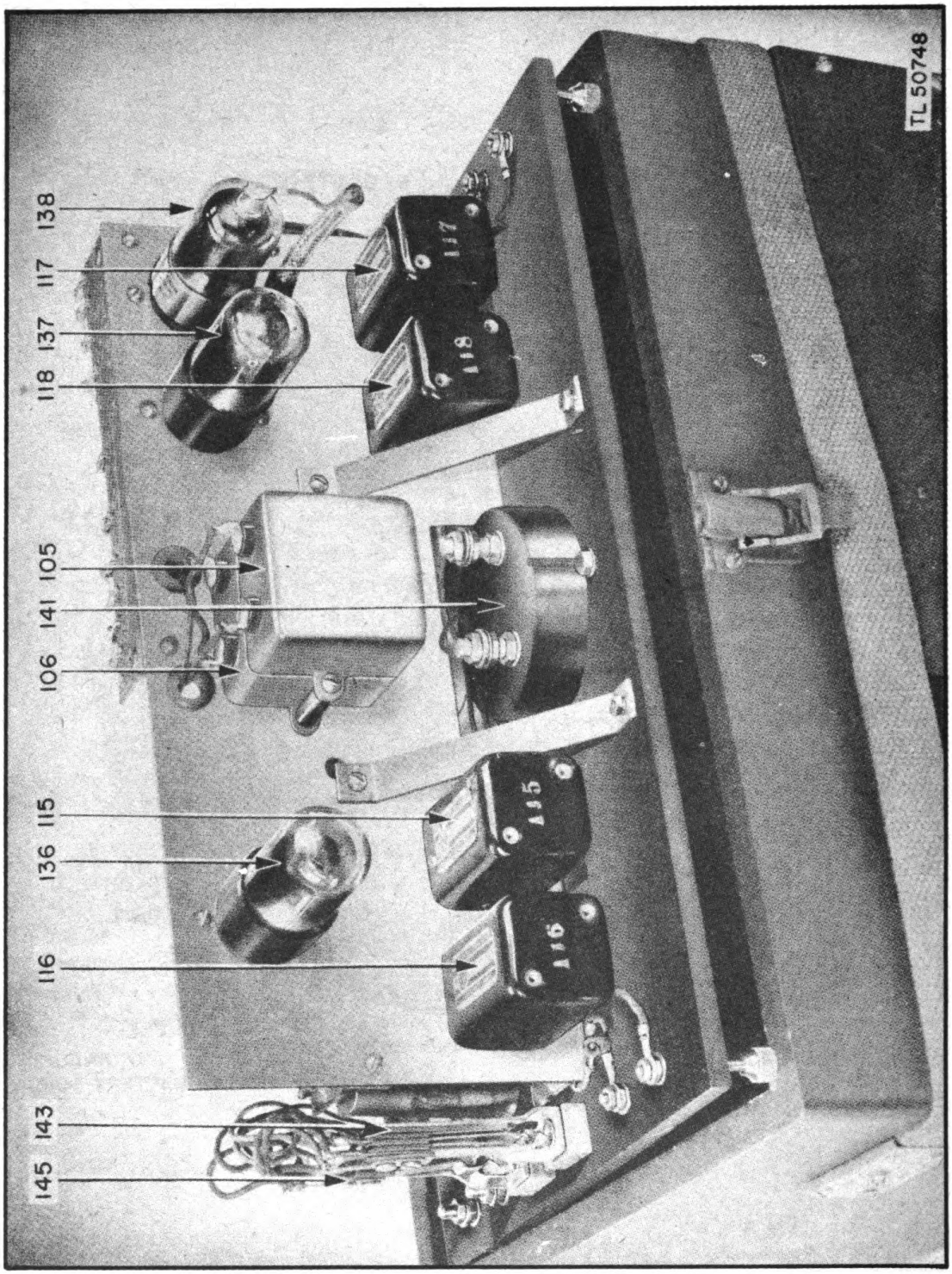


Figure 4. Test Set I-61-A, panel and chassis removed from case.

SECTION II

INSTALLATION AND OPERATION

3. INSTALLATION OF BATTERIES.

a. Test Set I-61-A. Release the two knurled slotted screws located on the right edge of the battery door. Install five Batteries BA-30 and three Batteries BA-56 in the battery compartment.

b. Test Sets I-61-B and I-61-C. Remove power plug in upper left corner of panel, release the four knurled panel mounting screws, and lift the panel and chassis out of the cabinet. Install three Batteries BA-35 and two Batteries BA-36 in the battery compartment (figs. 6 and 8). Connect the leads from the battery cable as indicated by the markings on the side of the case. Lock the batteries in place by means of the hinged holding bar. A knob is provided for operating this bar. Install two Batteries BA-30 in the battery compartment of Telephone EE-8-B, to the left of the test set front panel.

4. 1,000-CYCLE CALIBRATION OF OSCILLATOR. With batteries connected and tubes in proper sockets, place the test set so the panel is in a horizontal position. Set controls as follows (figs. 1 and 2):

a. Throw the OSC. ON-OFF switch to ON.

b. Throw key 1 to 1,000. (This step applies only to Test Sets I-61-B and I-61-C. Test Set I-61-A transmits only on 1,000 cycles.)

c. Set SEND LEVEL knob to ODBM.

d. Throw key 3 to CAL. SEND. (On Test Set I-61-A throw CAL. MEAS. key to CAL.)

e. Turn the CAL. SEND screw (OSC. ADJ. screw on Test Set I-61-A) until Power Level Indicator IS-188 is adjusted to the red line.

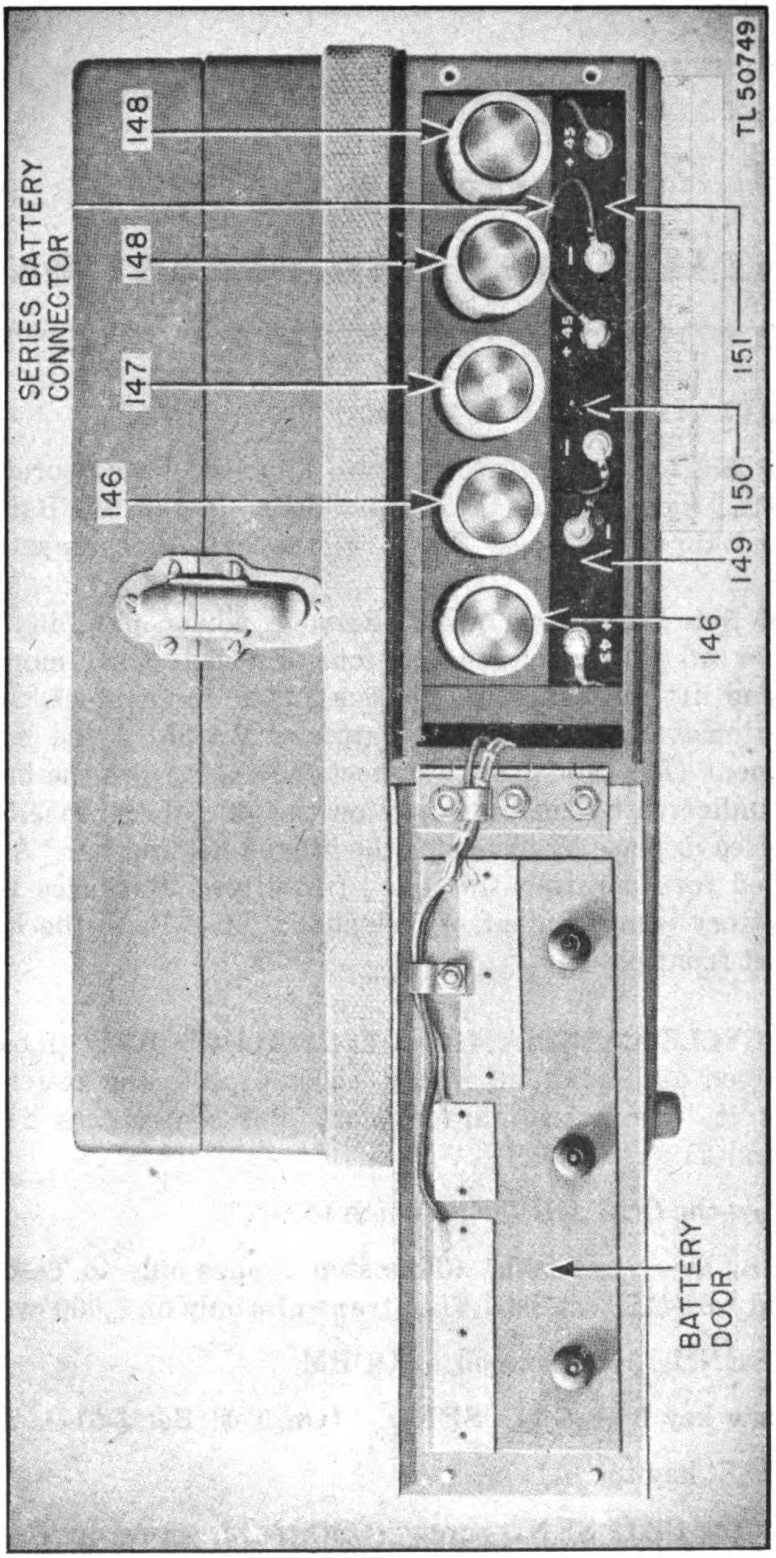
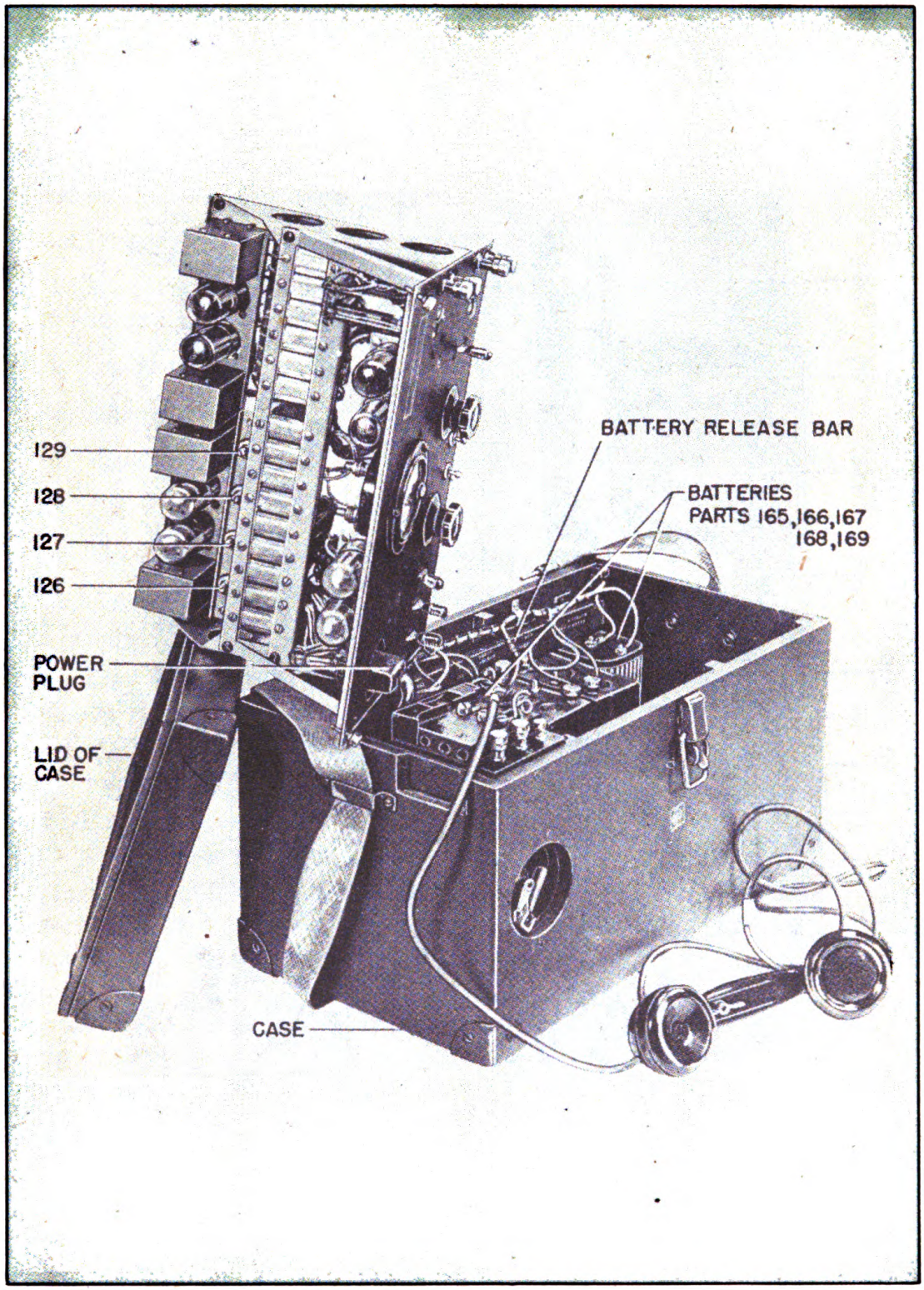


Figure 5. Test Set I-61-A, battery compartment.



TL-50750

Figure 6. Test Set I-61-B, panel and chassis removed from case.

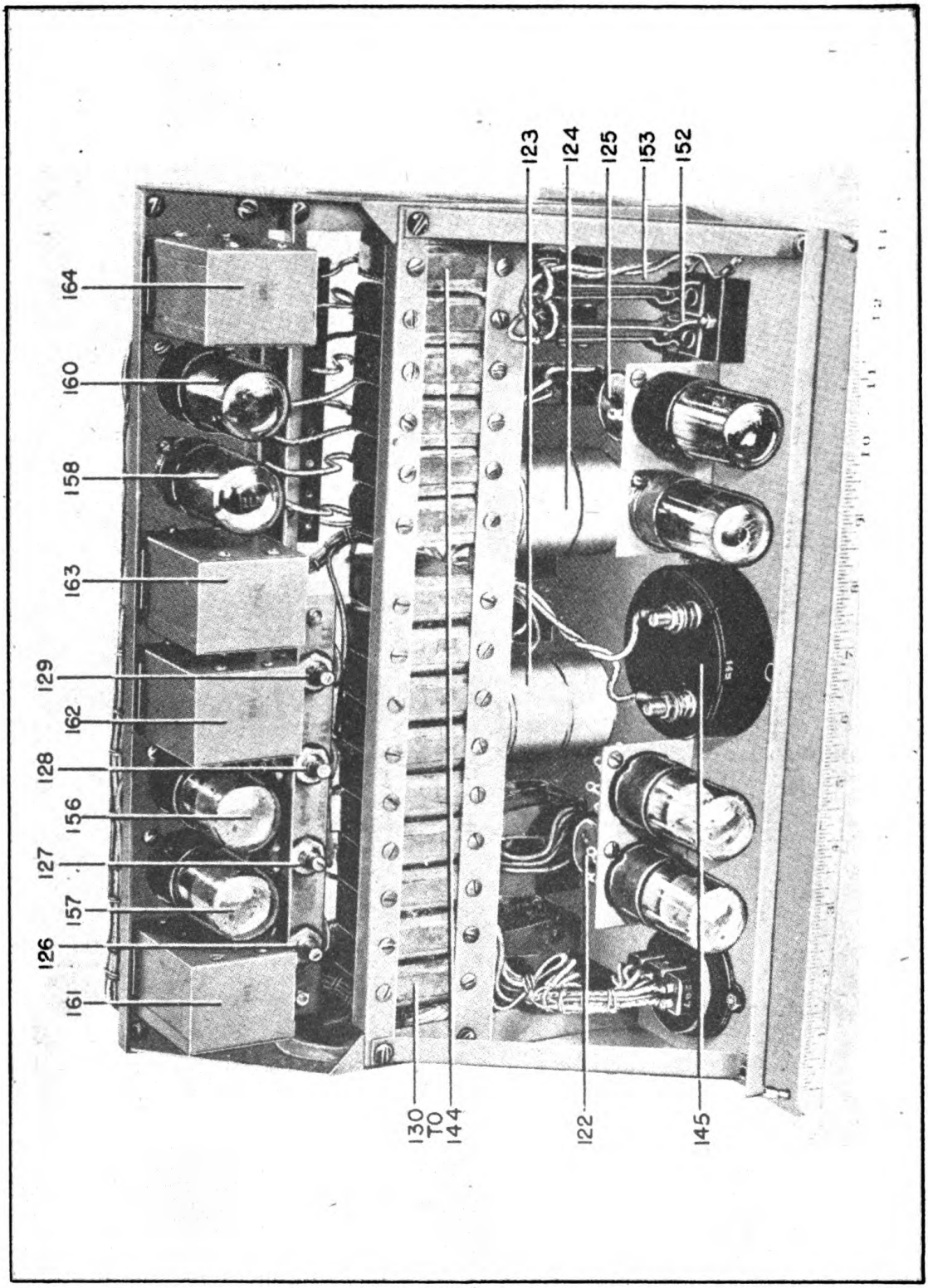


Figure 7. Test Set I-61-B, top rear view of panel and chassis.

5. 500-, 1,000-, and 2,500-CYCLE CALIBRATION OF OSCILLATOR ON TEST SETS I-61-B and I-61-C. Proceed as in paragraph 4, and then throw key 1 to 500, to 1,000 and to 2,500. The Power Level Indicator IS-188 should read on the red line for all three frequencies. If the indicator does not read on the red line for these frequencies, proceed as follows to equalize the output level of the oscillator (figs. 6, 7, 8, and 9).

a. Remove power plug (fig. 3) from left-hand side of panel.

b. Remove panel and chassis of test set from cabinet and place the panel in a vertical position (figs. 6 and 8).[1]

c. Insert power plug.

d. Throw the OSC. ON-OFF switch to ON.

e. Throw key 1 to 500.

f. Throw key 2 to ODBM.

g. Throw key 3 to CAL. SEND.

h. Adjust the CAL. SEND screw until Power Level Indicator IS-188 reads on the red line.

i. Throw key 1 to 1,000, and adjust screw control 126 on Test Set I-61-B, or screw control 326 on Test Set I-61-C (figs. 6 and 8) until power level indicator reads on the red line.

j. Throw key 1 to 2,500 and adust screw control 127 on Test Set I-61-B or screw control 327 on Test Set I-61-C (figs. 6 and 8) until power level indicator reads on the red line.

k. The output of the oscillator may decrease, especially for a short time after being turned on. Check it once in a while and recalibrate if necessary.

6. CALIBRATION OF RECEIVING AMPLIFIER. After calibration of the oscillator with OSC. ON-OFF switch at ON, and with key 1 at 1,000 cycles, calibrate the receiving amplifier as follows:

a. Throw AMP. ON-OFF switch to ON.

b. Set the RECEIVED LEVEL dials A and B to O.

c. Throw key 3 to CAL. REC. (on Test Set I-61-A connect SEND binding posts to RECEIVE binding posts).

[1] Until completion of operations described in paragraphs 6, 7, and 8, do not place the test set back in the cabinet but leave in the vertical position.

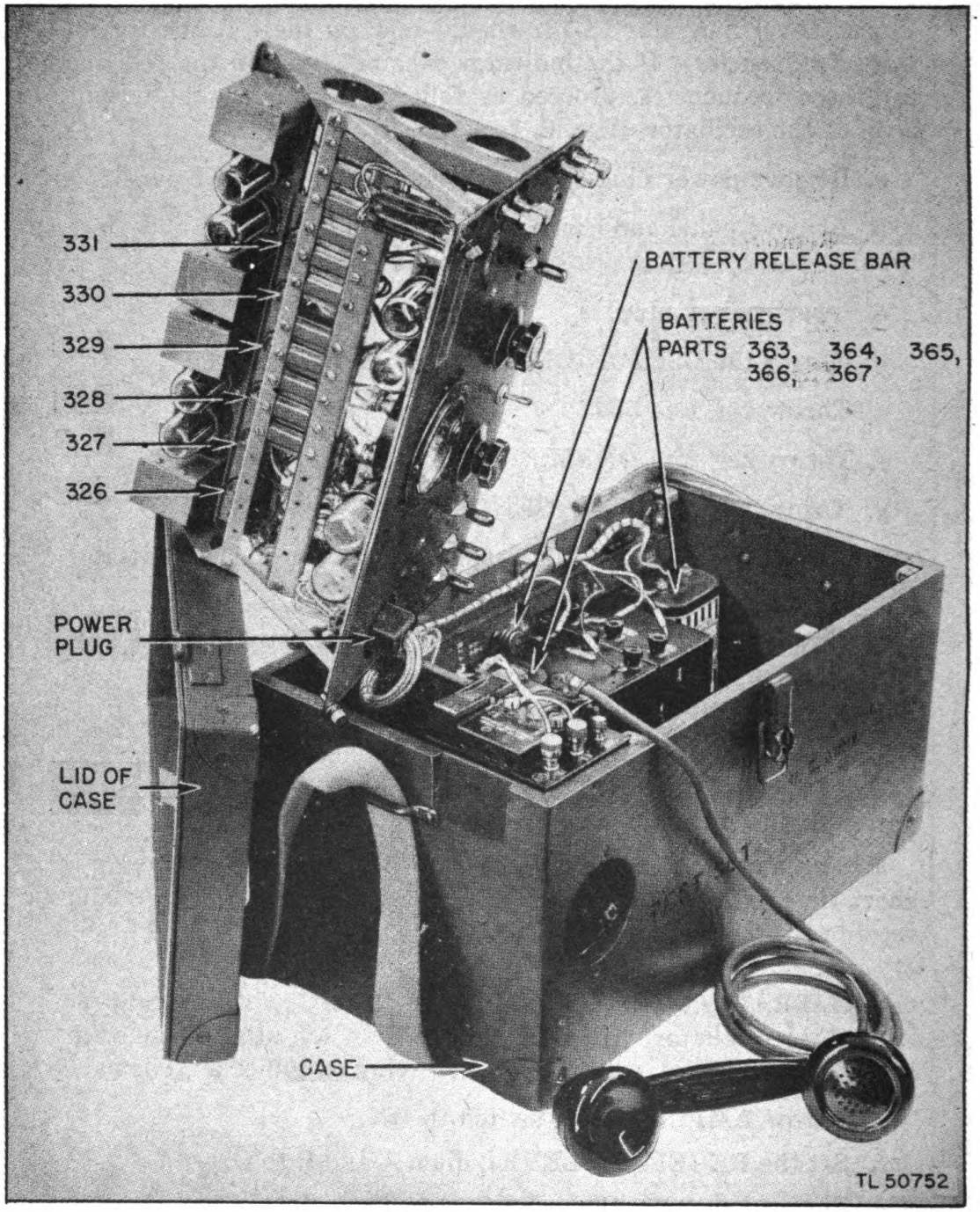


Figure 8. Test Set I-61-C, panel and chassis removed from case.

d. Turn the CAL. REC. screw (AMP. ADJ. screw on Test Set I-61-A) until the power level indicator is adjusted to the red line.

7. ALIGNMENT OF SEND LEVEL POSITIONS -20 DBM and -40 DBM ON TEST SETS I-61-B and I-61-C. Screw-type output adjustments are provided for calibrating the —20 DBM and —40 DBM positions on key 2 (128 and 129, fig. 7; 328 and 329, fig. 9). With these adjustments, the minus (—) levels on key 2 can be adjusted to correspond to the —20 DBM and —40 DBM points on the RECEIVED LEVEL dials. With key 3 on CAL. REC., set key 2 to —20 DBM, key 1 to 1,000 cycles, RECEIVED LEVEL dial A on —20, and REVEIVED LEVEL dial B on O. The power level indicator should read on the red line. Set key 2 to —40 DBM, dial A on —40, and dial B on O. The power level indicator should read on the red line. If the readings do not check, do the following (figs. 7 and 9):

a. Throw OSC. and AMP. ON-OFF switches to ON.

b. Throw key 1 to 1,000, key 2 to —20 DBM, and key 3 to CAL. REC.

c. Set dial A to —20 and dial B to O.

d. Adjust screw control 128 for Test Set I-61-B, or Screw Control 328 for Test Set I-61-C, until power level indicator reads on the red line.

e. Set key 2 to —40 DBM, dial A to —40, and dial B to O.

> **CAUTION:** In moving key 2 from —20 DBM to —40 DBM, the center position, 0 DBM must be passed. To prevent the power level indicator from being damaged in passing the O DBM position move key 3 to MEAS. before operating key 2.

f. Adjust screw control 129 for Test Set I-61-B, or Screw Control 329 for Test Set I-61-C, until power level indicator reads on the red line.

8. IMPEDANCE ADJUSTMENTS ON TEST SET I-61-C. On Test Set I-61-C, screw adjustments are provided for adjusting the oscillator ouput and receiving amplifier input impedances (330 and 331, fig. 9). The manufacturing tolerances on the transformers and resistors total ±8 percent.

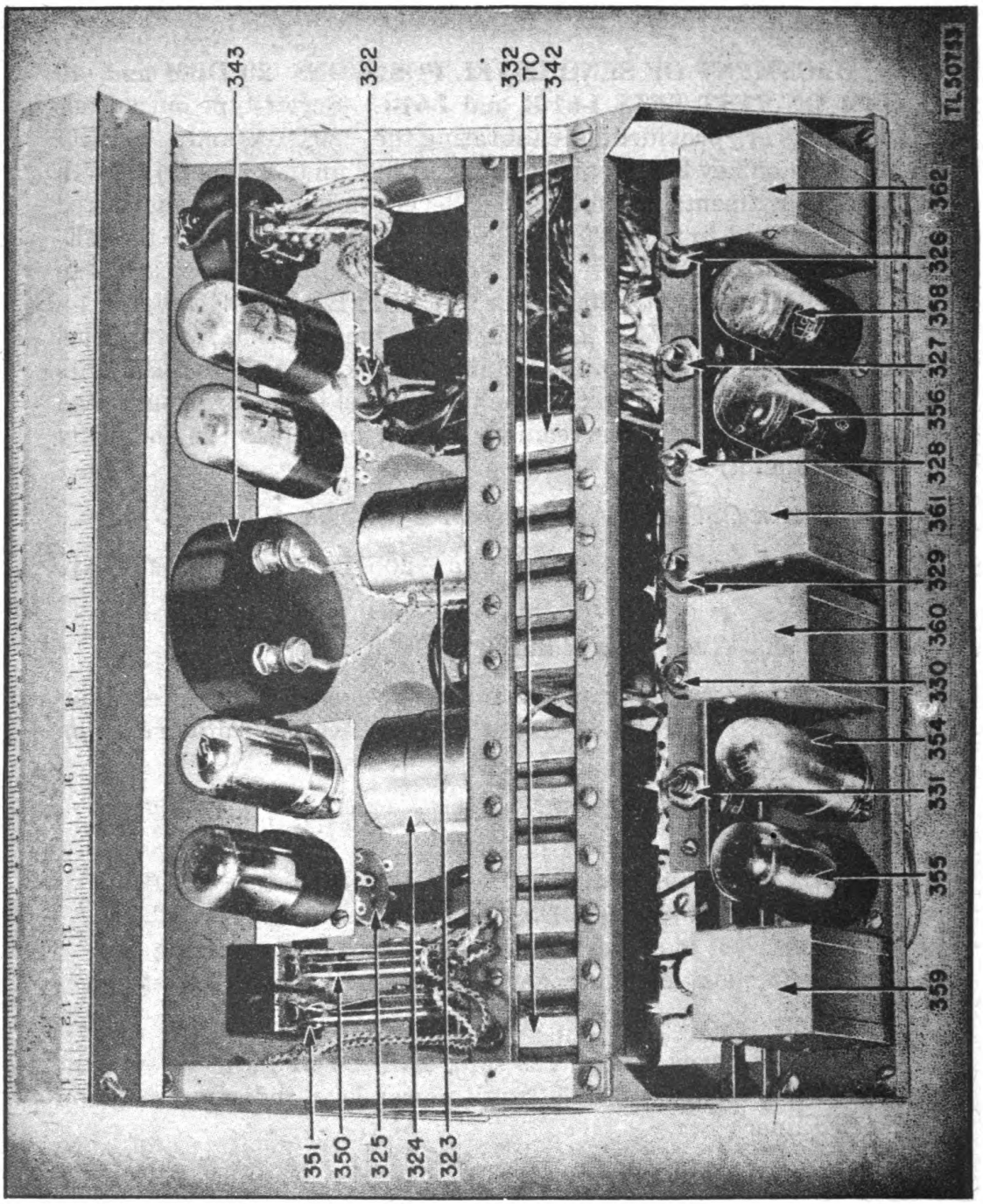


Figure 9. Test Set I-61-C, top rear view of panel and chassis.

CAUTION: These two controls have been accurately adjusted to obtain an impedance of 600 ohms ±1 percent. The adjustment should not be changed.

9. PANEL BINDING POSTS AND JACKS.

a. Test Set I-61-A. The output of the oscillator terminates in the SEND binding posts and jacks at the left of the panel, and the input of the receiving amplifier circuit terminates in the RECEIVE binding posts and jacks at the right. The jacks numbered 1 (tip and sleeve) are for Plug PL-47 (WE-47-B or equal) used in switchboards such as Switchboards BD-14, BD-74, and BD-78, and the jacks numbered 2 (tip, ring, and sleeve) are for Plug PL-51 (WE-110 or equal) used in common battery switchboard cord circuits. Only one of the three types of connections (binding posts, tip and sleeve jack, or tip, ring, and sleeve jack) should be used at one time. However, the same type of connection need not be made for both the SEND and RECEIVE terminations.

b. Test Sets I-61-B and I-61-C. The output of the oscillator, the input of the receiving amplifier, and the local battery telephone are terminated in the L1 and L2 binding posts and associated jacks, marked PL-51 and PL-47 (fig. 2). The connections of these binding posts and jacks are selected with key 4 as follows:

(1) SEND L1, REC. L2. The oscillator output is connected to L1 and the receiving amplifier input is connected to L2.

(2) TALK L1. The local battery telephone is connected to L1.

(3) SEND L2, REC. L1. The oscillator output is connected to L2 and the receiving amplifier input is connected to L1. Refer to figure 16 for simplified circuit operation. Jacks marked PL-47 are for Plug PL-47 (WE-47-B or equal) used in switchboards such as Switchboards BD-14, BD-74, and BD-78, and jacks marked PL-51 are for Plug PL-51 (WE-110 or equal) used in common battery switchboard and cord circuits.

10. CONNECTIONS FOR TRANSMISSION TESTS.

a. Loop Tests. For loop tests on lines or apparatus, connect to binding posts as indicated in figures 10 and 17.

b. Straightaway Line Tests. Connect line or lines to binding posts as indicated in figures 11, 18, and 19.

c. Transmission Measurements Through Switchboard Line Trunk or Cord Circuits. For these measurements refer to figures 12, 13, 20, and 21.

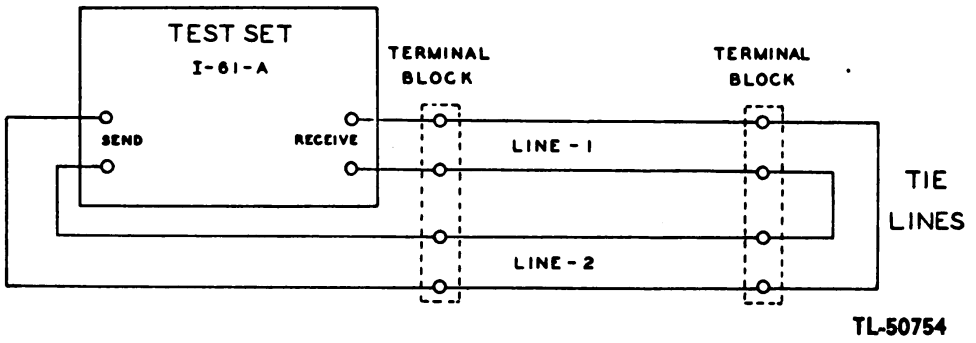


Figure 10. *Test Set I-61-A, schematic diagram for loop tests on telephone line.*

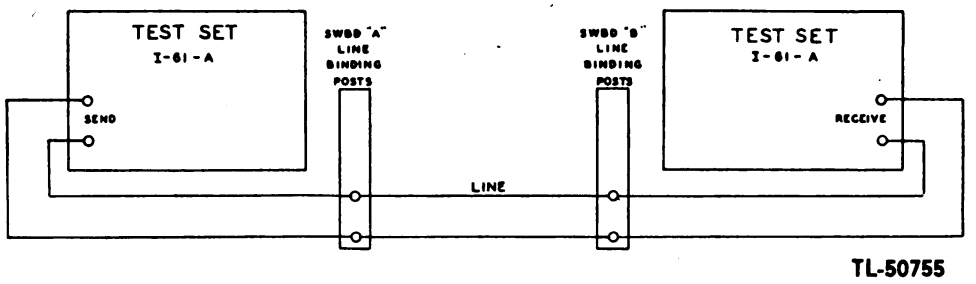


Figure 11. *Test Set I-61-A, schematic diagram for straightaway line measurements.*

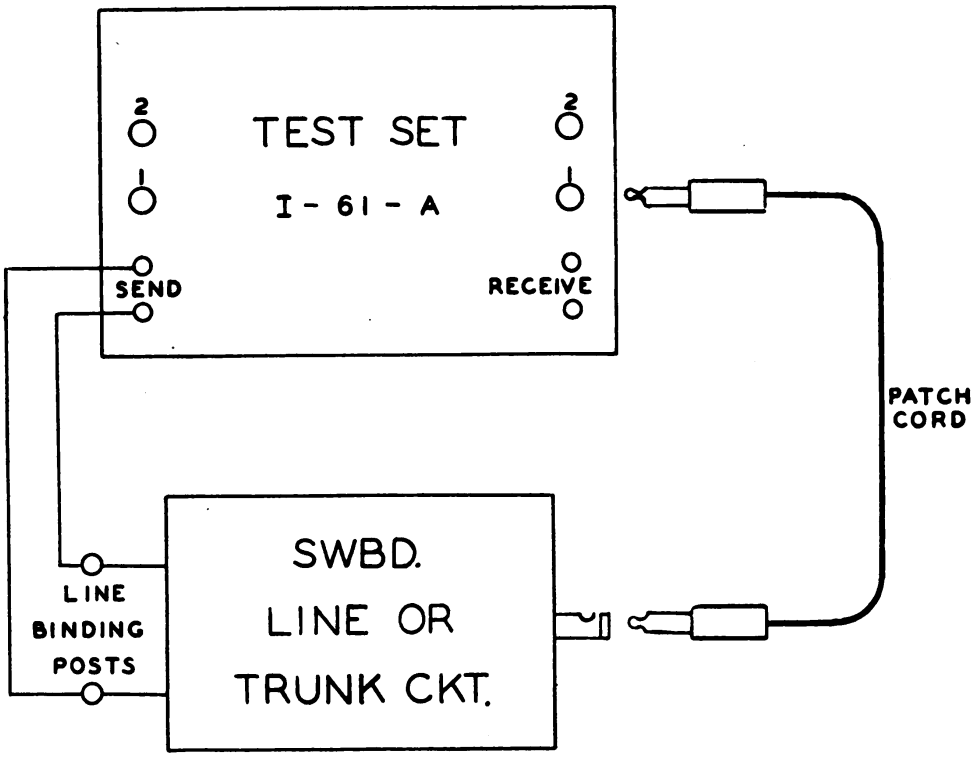


Figure 12. *Test Set I-61-A, schematic diagram for measuring transmission through a switchboard line or trunk circuit.*

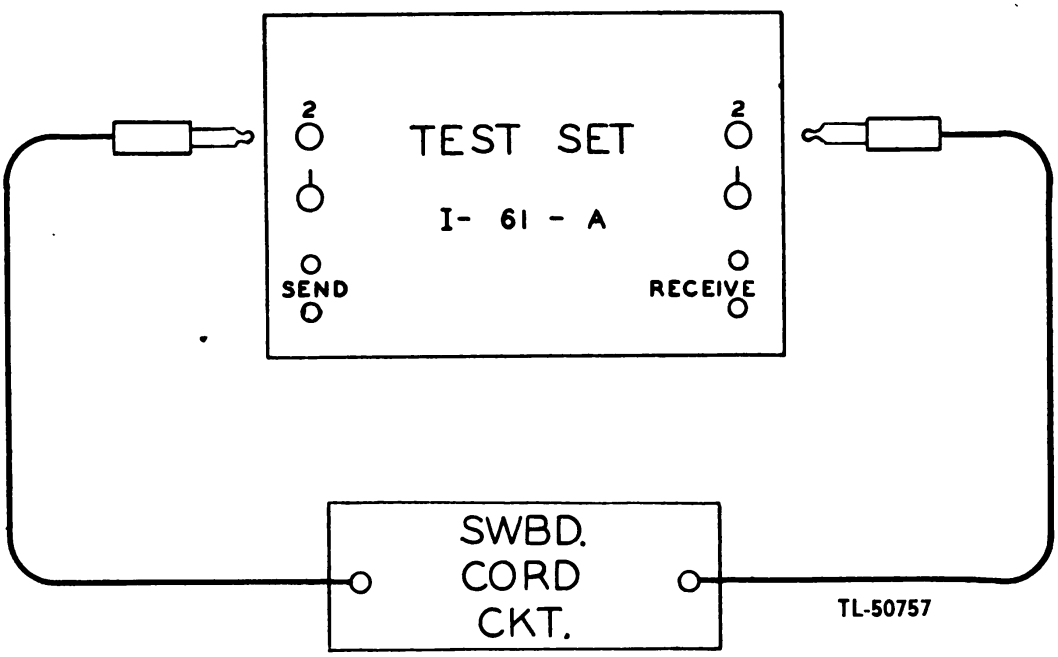


Figure 13. *Test Set I-61-A, schematic diagram for measuring transmission through a switchboard cord circuit.*

d. Transmission Measurements Through a Repeater or Amplifier (figs. 14 and 22). When measuring a 21-type repeater using Test Set I-61-A or I-61-B, the repeater may sing on full gain. Balanced H pads of approximately 10 db may be required on each side of the repeater under test to eliminate this singing. Test Set I-61-C does not require the use of pads when measuring the gain of a 21-type repeater such as Telephone Repeater EE-89-(&). Telephone Repeater EE-89-(&) refers to all such telephone repeaters, regardless of its model or procurement.

CAUTION: On Test Sets I-61-B and I-61-C, return key 4 to TALK L1 position after completing a test. If this is not done the operator will damage your power level indicator when ringing or talking from a distant station.

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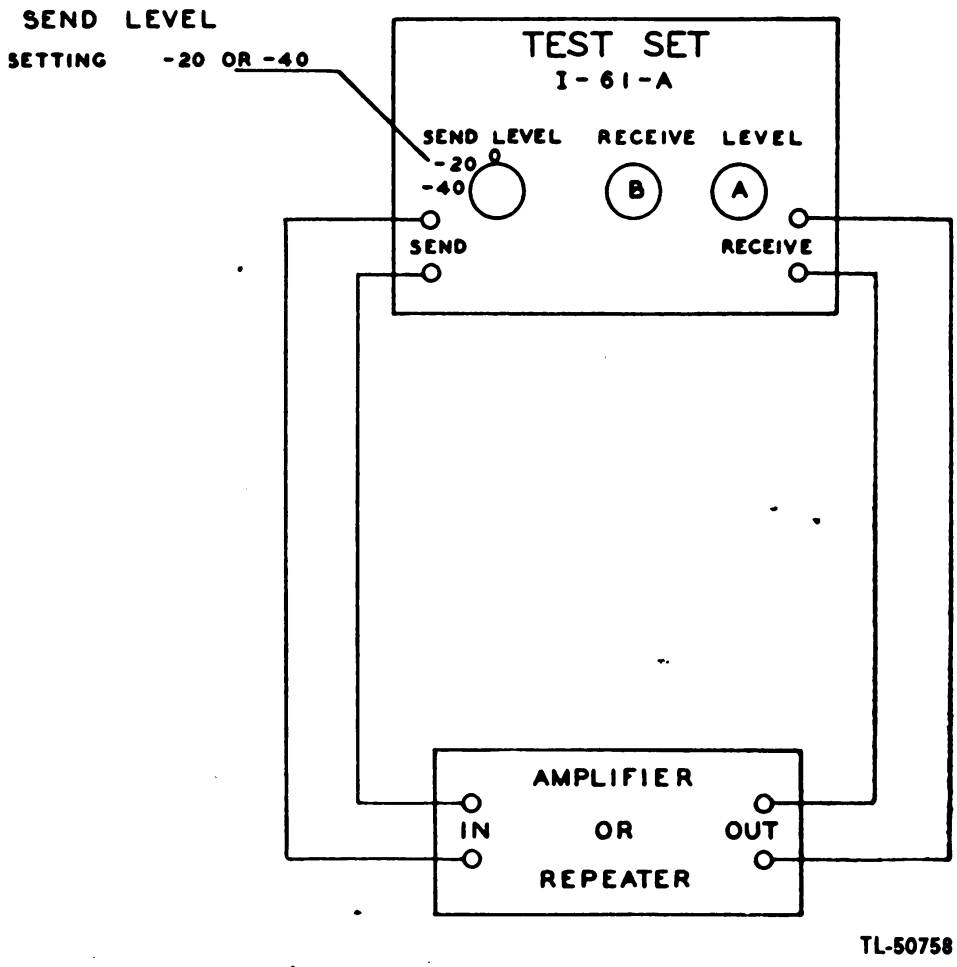

Figure 14. *Test Set I-61-A, schematic diagram for measuring gain of amplifier or repeater.*

11. TESTING REPEATING COILS. Test Sets I-61-A, I-61-B, and I-61-C can be used for testing repeating coils for impedance unbalance.

a. Coils C-161 and C-288. Connections for testing repeating coils C-161 and C-288 are shown in figures 15 and 24.

b. Defective Coils. Coils measuring less than —45 dbm have unsatisfactory balance and should be marked by scratching an X into the paint on the case just above the TELEG binding post.

12. MEASUREMENTS. The following steps are necessary in making measurements:

a. Throw CAL. MEAS. key to MEAS.

b. Set SEND LEVEL as follows:

(1) For measurement of apparatus (except repeaters or amplifiers) or circuits with no terminal repeaters, set on O DBM.

(2) For measurement of repeaters, amplifiers, etc., set on —20

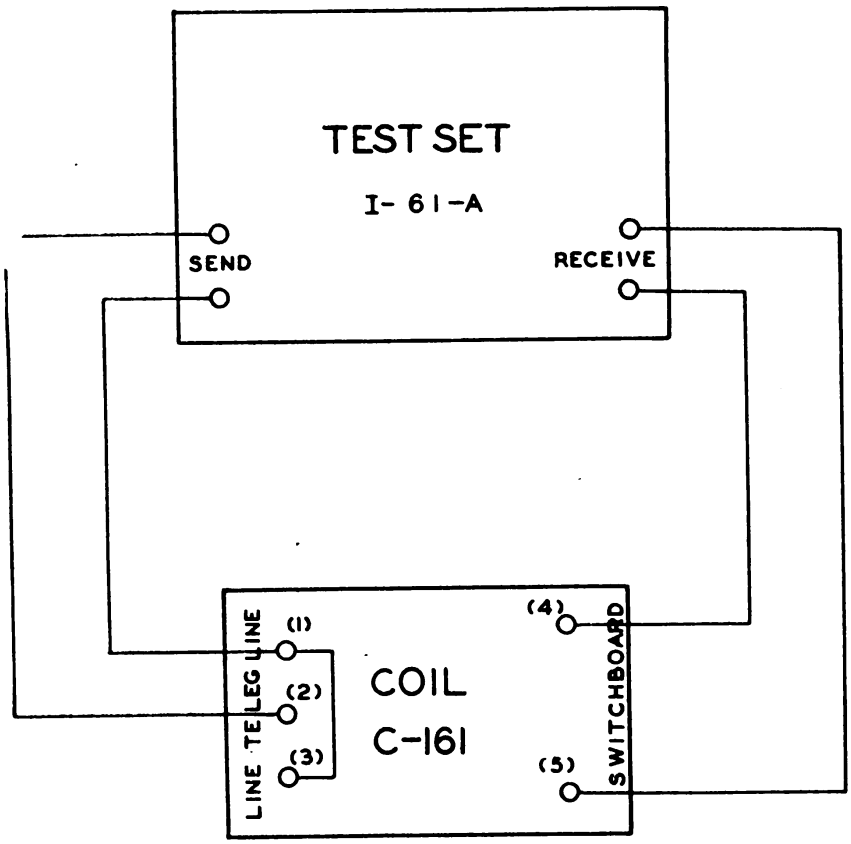

Figure 15. *Test Set I-61-A, schematic diagram for testing repeating coils.*

DBM or —40 DBM as required. Use setting which does not overload amplifier tubes.

c. Adjust RECEIVED LEVEL dials A and B until meter pointer rests on the red line, or not more than twice the pointer width on either side of the red line.

d. The following table gives the maximum gain and the maximum loss that can be measured by Test Sets I-61-A, I-61-B, and I-61-C for each setting of key 2:

Setting of key 2	*Maximum measurable gain*	*Maximum measurable loss*
0 dbm	+15 dbm	—50 dbm
—20 dbm	+35 dbm	—30 dbm
—40 dbm	+55 dbm	—10 dbm

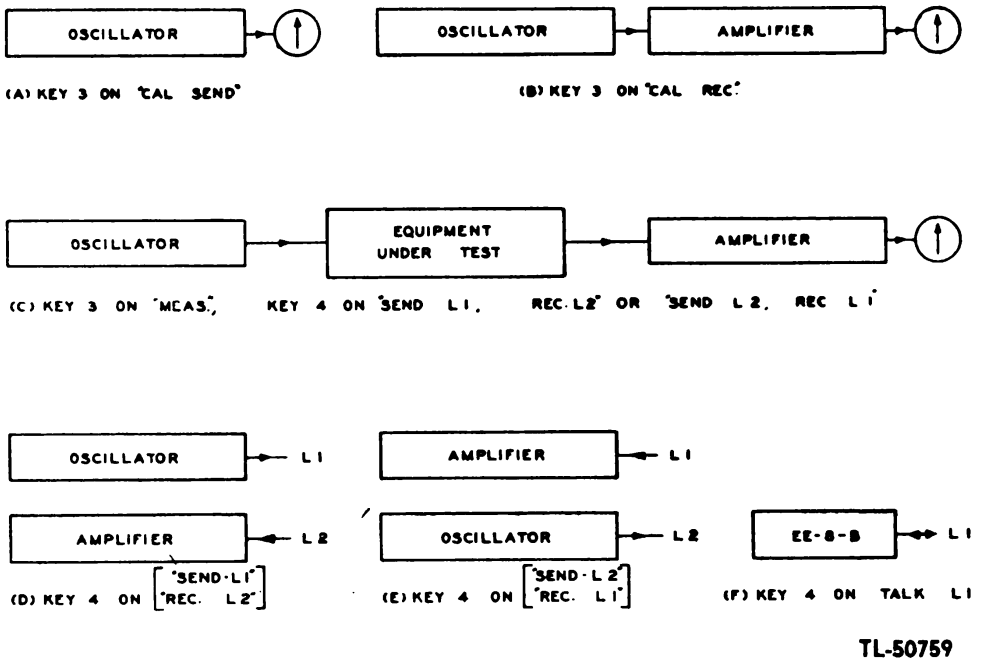

Figure 16. *Test Sets I-61-B and I-61-C, simplified circuit operation.*

e. **If it is not possible to make the meter pointer rest on or near the red line, the loss or gain of the circuits or apparatus under test is outside the range of this test set. If the meter pointer rests to left of the red line and cannot be brought to it by adjusting A and B with key 2 set at O DMB, then loss of circuits or apparatus under test is greater than —50 dbm. If the meter pointer rests to right of the red line and cannot be brought to it by adjusting A and B with key 2 set at —40 DBM, then gain of circuits or apparatus under test is greater than +55 dbm.**

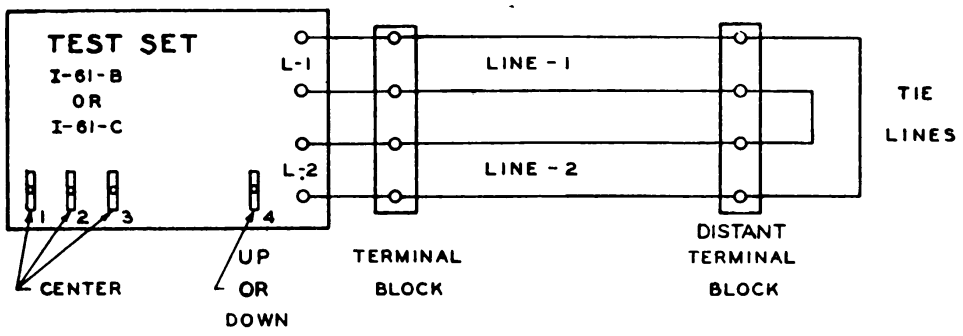

Figure 17. *Schematic diagram for loop test on telephone line.*

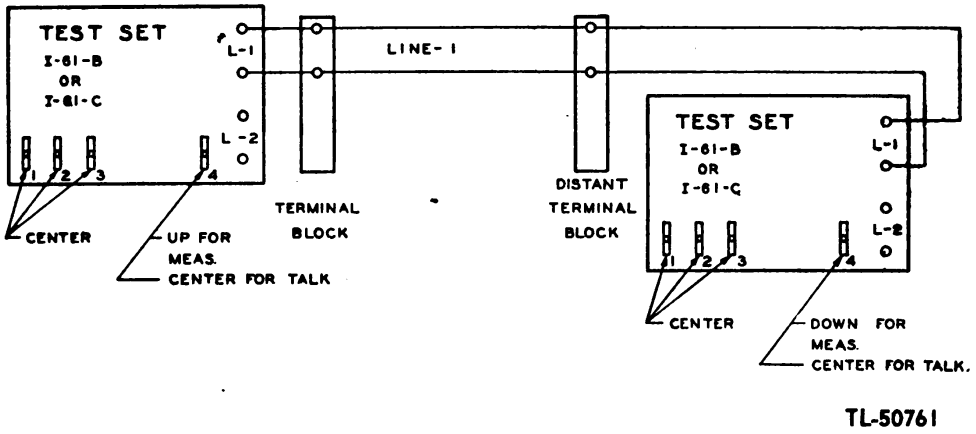

Figure 18. *Schematic diagram for straightaway line measurements, using one line.*

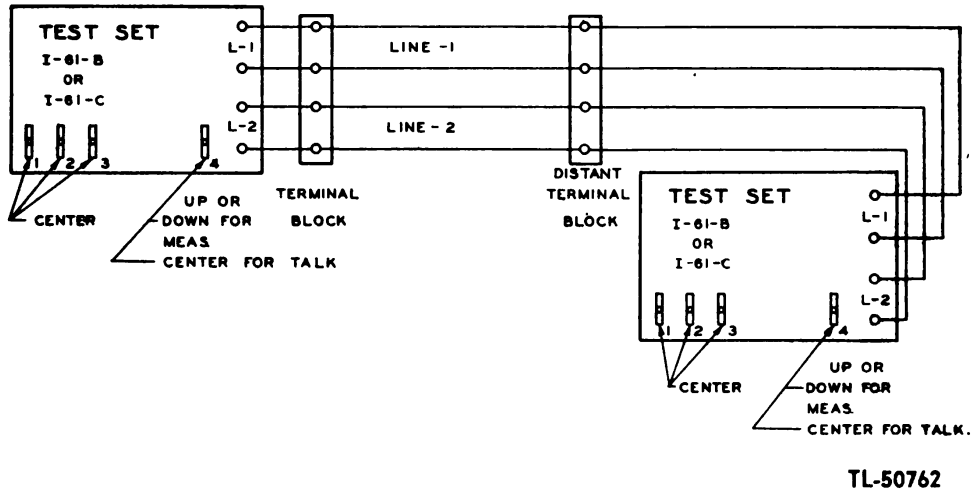

Figure 19. *Schematic diagram for straightaway line measurements, using two lines.*

13. CALCULATION. When the SEND LEVEL is set at 0 DBM. the transmission loss or gain is read directly from the RECEIVED LEVEL dial settings. However, if the SEND LEVEL is on —20 DBM or —40 DBM, the transmission loss or gain must be calculated using the equation:

Transmission loss or gain = received level — send level

A negative (—) result denotes transmission loss and a positive (+) result denotes tranmission gain.

a. Example 1.

SEND LEVEL = —20 DBM
RECEIVED LEVEL = —30 DBM
Transmission loss or gain = —30 — (—20)
= —30 + 20
= —10

Since the answer is negative, there is a transmission loss of 10 db.

b. Example 2.

SEND LEVEL = 0 DBM
RECEIVED LEVEL = +15 DBM
Transmission loss or gain = +15 — 0
= +15

Since the answer is positive, there is a transmission gain of 15 db.

c. Example 3.

SEND LEVEL = —40
RECEIVED LEVEL = —40
Transmission loss or gain = —40 — (—40)
= —40 + 40
= 0

Since the answer is zero, there is no transmission loss or gain.

14. LOSS DUE TO IMPEDANCE MISMATCH. Test Sets I-61-A, I-61-B, and I-61-C have a receiving amplifier input of 600 ohms. The loss due to impedance mismatch of a 2 to 1 ratio (for example, when measuring a 300— or 1200-ohm circuit) will be about 0.5 dbm. The actual loss due to mismatch may be obtained from the curve in figure 23. Any loss due to impedance mismatch at the oscillator or receiving amplifier terminals must be added to the measured gain or subtracted from the measured loss. For example, a 300-ohm line shows a loss of 10 dbm. Since the impedance ratio is 600/300, or 2, the loss is 0.5 dbm per junction, or 1.0 dbm, which must be subtracted from the total. The loss of the line, then, is 9.0 dbm.

15. ACCURACY OF MEASUREMENT. When adjustment screws are correctly set, the maximum error for large values of loss or gain is as follows:

a. Test Set I-61-A, ± 2.0 dbm.

b. Test Set I-61-B, ± 0.5 dbm.

c. Test Set I-61-C, ± 0.5 dbm.

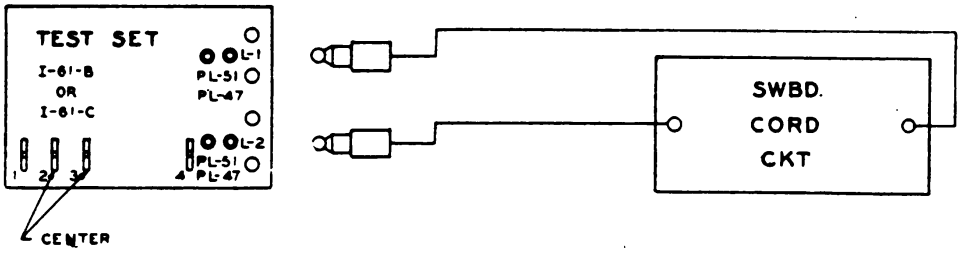

Figure 20. Schematic diagram for measuring transmission through a switchboard cord circuit.

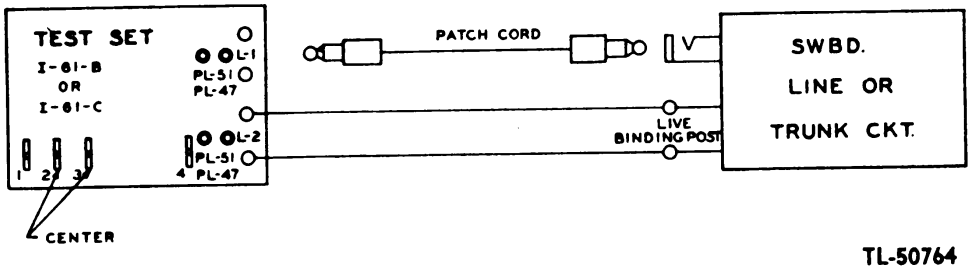

Figure 21. Schematic diagram for measuring transmission through a switchboard line or trunk circuit.

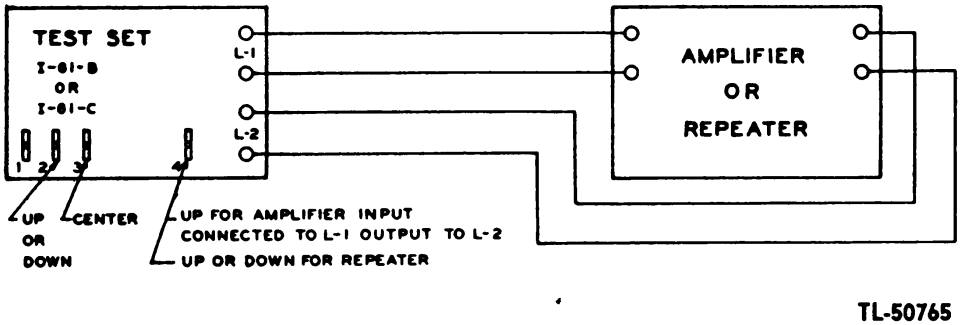

Figure 22. Schematic diagram for measuring gain of amplifier or repeater.

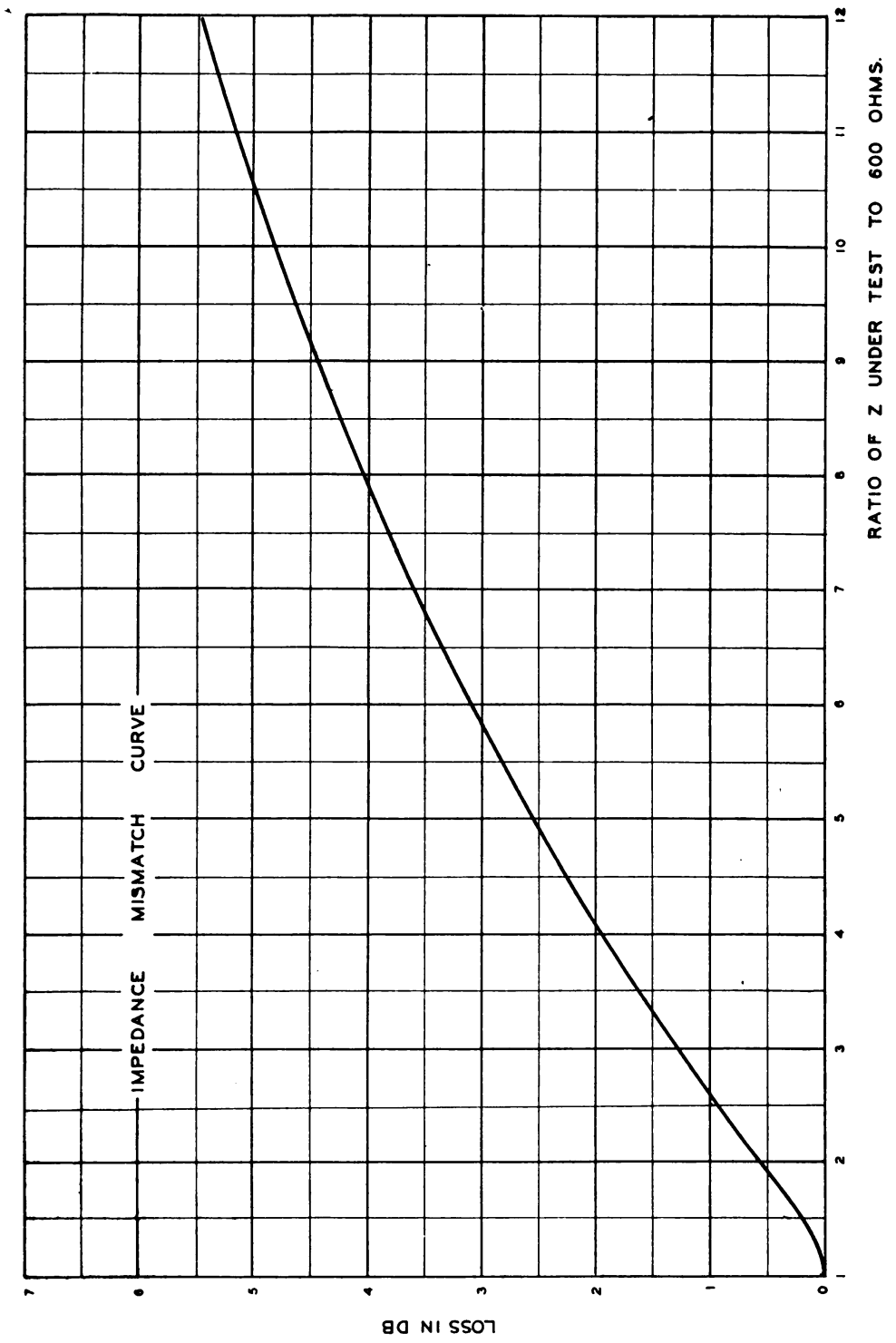

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Figure 23. Impedance mismatch curve.

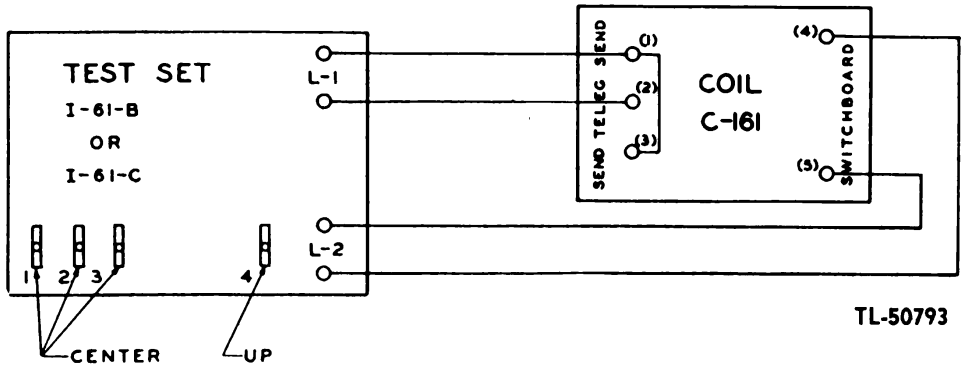
16. USE OF EXTERNAL OSCILLATOR.

a. General. The receiving amplifier in Test Sets I-61-A, I-61-B, or I-61-C may be used at frequencies other than those supplied by the test set oscillator. An external oscillator will be required in obtaining the frequency response at various levels of amplifiers, repeaters, and filter networks. The output of this external oscillator should be held constant over the frequency band, and the characteristic input impedance should be inserted between the oscillator and the device under test.

b. With Test Set I-61-A. Binding posts (EXT. OSC.) are provided for the use of an external oscillator. The internal oscillator (OSC. ON-OFF) must be turned OFF when using the test set in this manner. There is a loss of approximately 6.0 dbm between the EXT. OSC. binding posts and the SEND terminals when the SEND LEVEL dial is set at O, so the output of the external oscillator must be + 6.0 dbm in order to obtain an output of 0 dbm at the SEND terminals. If an oscililator with a 600-ohm output impedance is used, the loss due to impedance mismatching will be so small that it can be disregarded. The power level meter and the SEND LEVEL attenuator may be operated and measurements made in the same manner as when using the internal oscillator.

c. With Test Sets I-61-B and I-61-C. Binding posts for use of an external oscillator are not provided on Test Sets I-61-B and I-61-C. However, the receiving amplifier may be connected to the output of the equipment under test and used as a calibrated output meter. Connect output of equipment to binding posts L1 if key 4 is in SEND L2, REC. L1 position, or connect to binding posts L2 if key 4 is in SEND L1, REC. L2 position. Sufficient attenuation must be connected between the output of the oscillator and the input of the equipment under test to keep within the range limitations of both the equipment and the test set.

17. USE OF MONITOR WINDING IN TEST SET I-61-A. Binding posts (MONITOR) are provided for monitoring the receiving amplifier circuit of Test Set I-61-A. To avoid affecting the measurements through the use of the monitor winding, either high-impedance phones must be used or else the phones must be disconnected from the binding posts while taking measurements.



NOTE - THE NUMBERS (1),(2),(3),(4),AND(5) REPRESENT THE CORRESPONDING LUGS ON COIL C-288

Figure 24. *Test Sets I-61-B and I-61-C, schematic diagram for testing repeating coils.*

SECTION III

FUNCTIONING OF PARTS

18. OSCILLATOR CIRCUIT.

a. Test Set I-61-A. The oscillator uses Tube VT-221 (3Q5-GT) in an electron-coupled Colpitts oscillator circuit. The output is taken from the plate circuit through a plate-to-600-ohm transformer to a variable attenuator which reduces the relatively high output power of the oscillator to 1 milliwatt (O DBM on dial), or to values of either 20 dbm (—20 DBM on dial) or 40 dbm (—40 DBM on dial) below 1 milliwatt. The zero taps on the attenuator are connected to the EXT. OSC. binding posts so that an external oscillator can be used.

b. Test Sets I-61-B and I-61-C. The osciillator utilizes a resistance feed-back oscillator, buffer amplifier circuit. The oscillator and buffer each use a tube 1G4-GT/G. In the plate circuit of the buffer is a variable attenuator which reduces the relatively high output power to 1 milliwatt (O dbm), or to values of either —20 dbm or —40 dbm.

c. Test Set I-61-C. This test set is provided with a screw adjustment for accurately setting the oscillator impedance at 600 ohms. This control is a 50,000-ohm rheostat, part 330 shunted across the output transformer part 360 (par. 8).

19. METER CIRCUIT. A copper-oxide rectifier power level meter is used for standardizing the oscillator output, the receiving amplifier gain, and measuring circuit transmission characteristics.

a. Test Set I-61-A. A transfer key (CAL. MEAS.) is used either to connect the meter circuit across the output of the oscillator (CAL.) or to connect the meter in the output circuit of the receiving amplifier (MEAS.). When the CAL. MEAS. transfer key is at CAL., the SEND binding posts and jacks are disconnected from the circuit; but when this key is at MEAS., the oscillator output is connected to the SEND binding posts and jacks.

b. Test Sets I-61-B and I-61-C. Key 3 is used to connect the

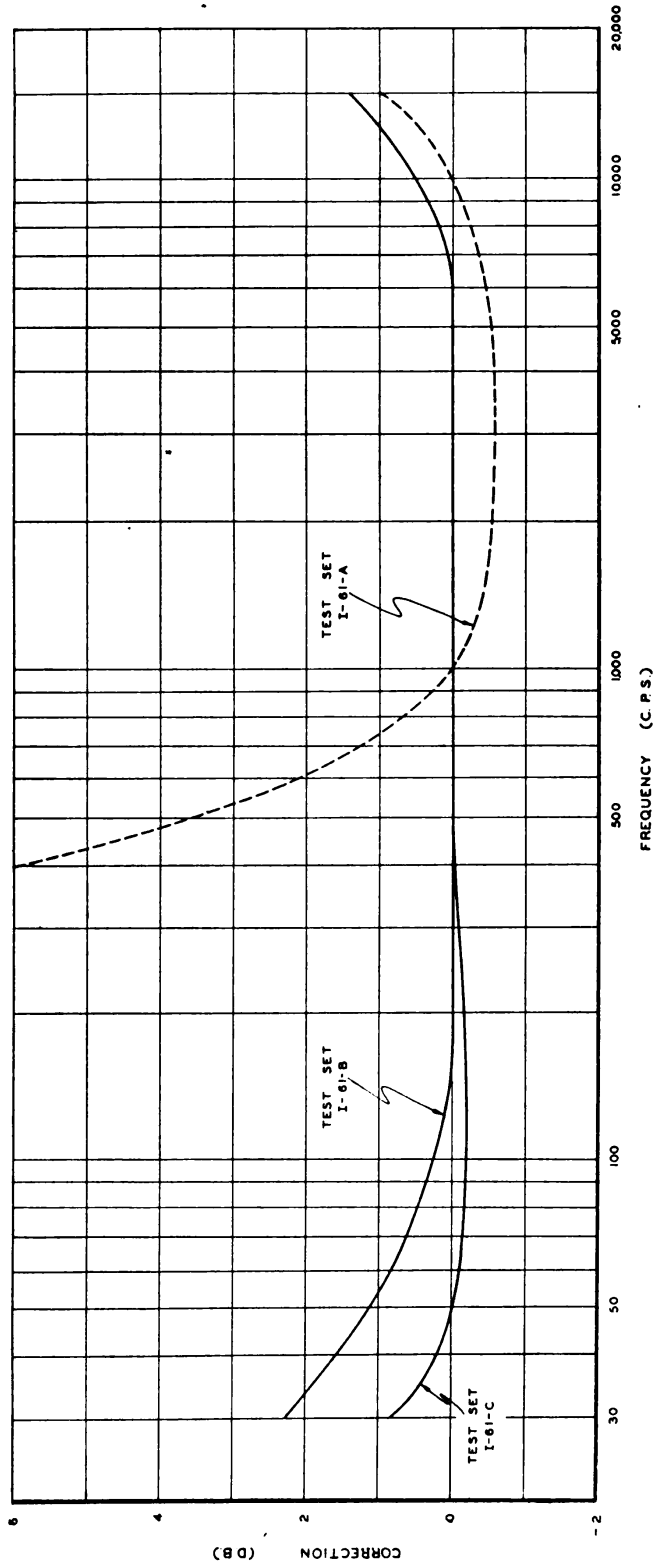


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Figure 25. Frequency response curves.

meter circuit across the output of the oscillator (CAL.SEND), or across the output of the receiving amplifier (MEAS. and CAL. REC.). In the CAL. REC. position the output of the oscillator is connected to the input of the receiving amplifier. In the MEAS. position the input of the receiving amplifier is connected to the binding posts L1 or L2, depending upon whether key 4, is at SEND L1-REC.L2 or at SEND L2-REC.L1.

20. RECEIVING AMPLIFIER CIRCUIT. The calibrated receiving amplifier consists of a 2-stage, resistance-capacity coupled amplifier using negative feed-back for stabilization. The gain controls allow measurement of received power over the range +15 dbm to —50 dbm in steps of 0.5 dbm.

a. Test Set I-61-A. This attenuation range is obtained by using a high impedance potentiometer as the 5.0 dbm-per-step control in the grid circuit of the first stage and an L pad as the 0.5 dbm-per-step control in the output of the last stage. Tube VT-146 (1N5-GT) is used in the first stage and Tube VT-221 (3Q5-GT) is used in the output stage. The input circuit is designed to provide attenuation at frequencies below 1,000 cycles in order to prevent low-frequency interference from materially affecting the readings (fig. 25). The secondary of the output transformer is used to provide a small amount of the amplifier output voltage to the MONITOR binding posts so the character of the incoming signal may be ascertained.

b. Test Set I-61-B. The attenuation range is obtained by using a high impedance T network as the 0.5 dbm-per-step control and a grid potentiometer as the 5 dbm-per-step control. Tube VT-179 (1LN5) is used in the first stage and Tube VT-221 (3Q5-GT) is used in the output stage. The input impedance is 600 ohms ±5 percent from 100 to 10,000 cycles. Blocking capacitors are provided in the input circuit to prevent the passage of direct current through the input transformer windings. The output of the amplifier is loaded with the power level indicator and fixed calibrating resistor (fig. 25).

c. Test Set I-61-C. The receiving amplifier circuit used in Test Set I-61-C is the same as that used in Test Set I-61-B with the following exceptions:

(1) Blocking capacitors have been removed from the input circuit.

(2) The input impedance has been accurately adjusted to within ±1 percent by a screw adjustment (par. 8.)

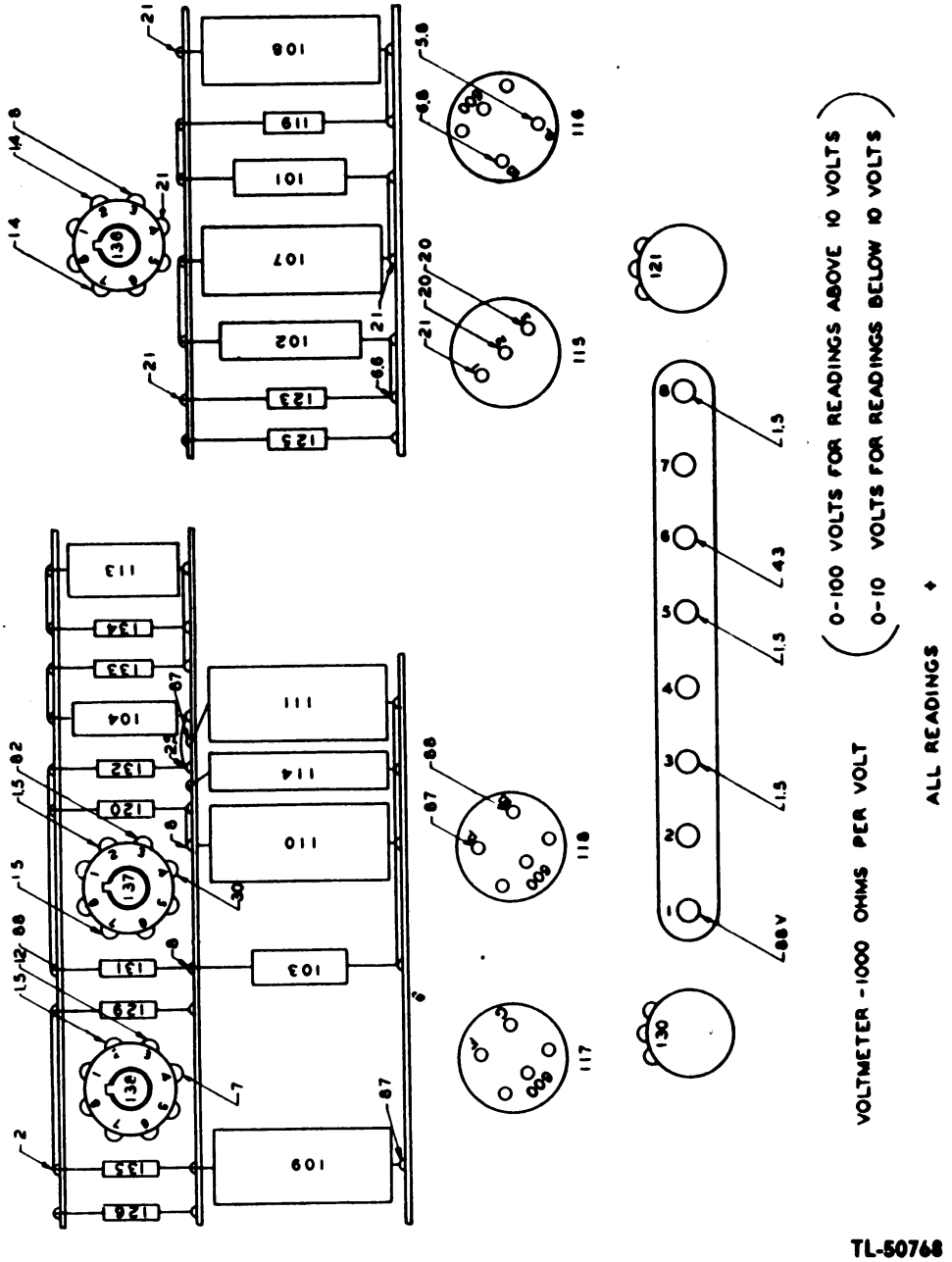


Figure 26. Test Set I-61-A, actual point-to-point d-c voltages from set chassis.

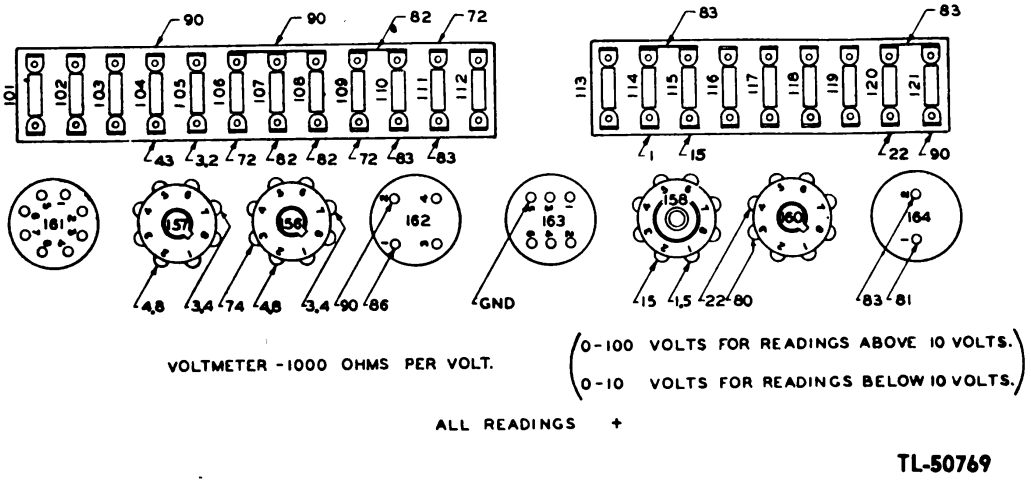


Figure 27. Test Set I-61-B, actual point-to-point d-c voltages from set chassis.

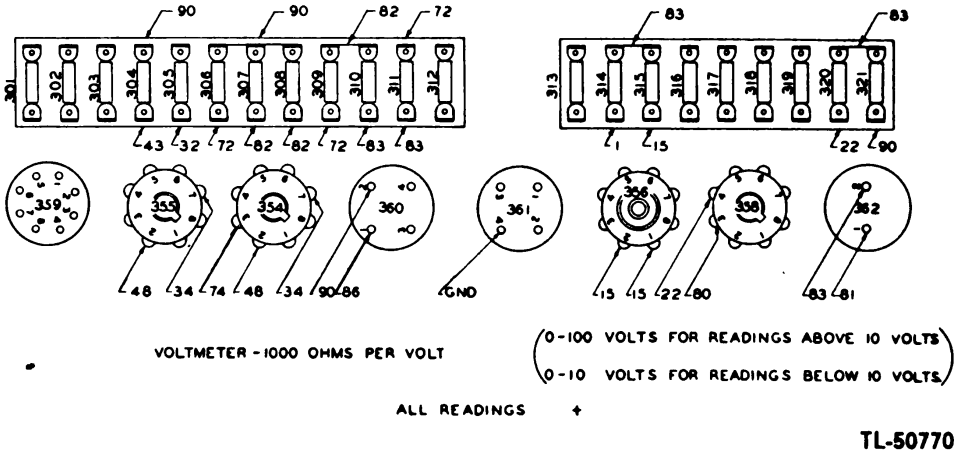


Figure 28. Test Set I-61-C, actual point-to-point d-c voltages from set chassis.

SECTION IV
MAINTENANCE

NOTE: Unsatisfactory performance of this equipment will be reported immediately on W.D., A.G.O. Form No. 468. If form is not available, see TM 38-250.

21. BATTERIES.

a. Test Set I-61-A. Replace the oscillator batteries (146 and 149, fig. 5) whenever the output of the oscillator is not enough to calibrate the set. The receiving amplifier batteries (147, 148, 150, and 151, fig. 5) must be replaced whenever the gain of the receiving amplifier is not enough for the adjustment of the meter pointer to the red line with A and B dials set at O, and with a 1,000-cycle input of O dbm at the RECEIVE terminals or jacks. Because of the effect of battery voltage on oscillator output, the oscillator batteries will have to be replaced more frequently than the receiving amplifier batteries.

b. Test Sets I-61-B and I-61-C. Battery BA-35 (169 for Test Set I-61-B, 367 for Test Set I-61-C) supplies filament power for the oscillator. Batteries BA-36 (167 and 168 for Test Set I-61-B, 365 and 366 for Test Set I-61-C) supply plate power for both the oscillator and receiving amplifier. Replace these batteries whenever the receiving amplifier cannot be calibrated by turning the CAL. REC. screw. In Test Set I-61-B, leads for Battery BA-35 (169) are marked for connecting the — and + terminals of the battery to the — and + connections of the tube filaments as called for in the tube manual. With reduced plate supply voltage it has been found that tubes 1G4-GT/G (RCA Radiotron) operate better by reversing the Battery BA-35 leads and connecting the — lead from the tube to the +lead of the battery, etc. In Test Set I-61-B, reverse the leads to Battery BA-35 (169), connecting the + lead from the tube to the — lead of the battery, etc.

22. TUBES. Test the tubes once a month, using Test Set I-177, or any other mutual-conductance type vacuum tube test set.

23. TROUBLE SHOOTING. Wiring diagrams (figs. 32, 33, 34, 38, 39, and 40) and schematic diagrams (figs. 29, 30, and 31) are included in this technical manual to aid in checking through the circuit. Following are a few of the more common troubles:

a. Test Set I-61-A. (1) If the test set cannot be calibrated, but the output meter gives some reading, replace the batteries (par. 21). If the replacement of batteries does not remedy trouble, inspect the Battery BA-35 contaçts and springs for corrosion, and test the tubes.

(2) If turning the OSC. ADJ. rheostat or turning the receiving AMP. ADJ. rheostat causes the output to vary in jumps instead of varying smoothly, the contact area between the rheostat shaft and the flexible shaft contactor is probably dirty and should be cleaned. If this does not correct the trouble, replace the rheostat.

(3) Check the flexible leads from Batteries BA-35 to the plates on the battery compartment door. These may have broken because of opening or closing the battery compartment door.

b. Test Sets I-61-B and I-61-C. Schematic diagrams (figs. 30 and 31) and wiring diagrams (figs. 39 and 40) will aid in checking through the ciricuit. Following are a few of the more common troubles:

(1) If the test set cannot be calibrated but the output meter gives some reading, replace batteries (par. 21). If the replacement of batteries does not correct the trouble, check polarity of batteries carefully. Press power plug firmly into socket to break corrosion. Test tubes.

(2) If turning the CAL. SEND screw or CAL. REC. screw causes power level indicator to vary in jumps instead of varying smoothly, the contact between rheostate shaft and contactor is probably dirty and should be cleaned. If this does not correct the trouble, replace the rheostat.

(3) If steps on RECEIVED LEVEL dials do not attenuate properly, check the polarity of Batteries BA-35.

(4) If power level indicator pointer fluctuates rapidly with key 3 in the MEAS. and CAL. REC. positions, the receiving amplifier is oscillating. Check for open ground lead (black wire in Test Sets I-61-A and I-61-B or white-black wire in Test Set I-61-C.

c. Additional Checks on Test Sets I-61-A, I-61-B, and I-61-C. If subparagraphs *a* and *b* above do not seem to cover the trouble found, remove test set from the cabinet and place in the position as shown in figures 4, 6, or 8. Place power plug in its socket and turn on AMP. and OSC. power switches. Using Test Set I-166, or any other 1,000 ohm-per-volt d-c voltmeter, check for voltage as indicated in figures 26, 27, and 28.

24. MOISTUREPROOFING AND FUNGIPROOFING TEST SETS I-61-B and I-61C.

a. General. Communication failures commonly occur when Signal Corps equipment is operated in tropical areas where temperature and relative humidity are extremely high. The following problems are typical:

(1) Resistors and capacitors fail.

(2) Electrolytic action takes place in coils, chokes, transformer windings, etc., causing eventual break-down.

(3) Hook-up wire and cable insulation break down. Fungus growth accelerates deterioration.

(4) Moisture forms electrical leakage paths on terminal boards and insulating strips, causing flash-overs and crosstalk.

(5) Moisture provides leakage paths between battery terminals.

b. Treatment. A moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection against fungus growth, insects, corrosion, salt spray, and moisture. The treatment involves the use of a moisture-resistant and fungi-resistant varnish applied with a spray gun and brush. A brief description of the method of application follows:

(1) Make all repairs and adjustments necessary for the proper operation of the equipment.

(2) Clean thoroughly all dirt, dust, rust, fungus, oil, grease, etc., from the equipment to be processed.

(3) Partially disassemble the equipment and cover certain points, such as relay contacts, open switches, air capacitors, sockets, bearings, etc., with masking tape.

(4) Dry equipment thoroughly by heat to dispel moisture which the circuit elements have absorbed.

(5) Spray or paint all circuit elements and all parts of the equipment with three coats of moistureproofing and fungiproofing varnish.

(6) Give the equipment a final operational check.

c. Step-by-step Instructions.

(1) DISASSEMBLY. (*a*) Remove the power plug from the left-hand side of the panel.

(*b*) Disengage the four mounting screws (at the corners of the panel) and remove the test set from its case.

(*c*) Disconnect the wires from the line binding posts of Telephone EE-8-B.

(*d*) Remove the two screws next to the ringer crank cut-out in the front of the case and a third screw near the top edge of the case.

(*e*) Remove Telephone EE-8-B.[1]

(*f*) Disconnect and remove the batteries (not to be treated).

(*g*) Unclamp and remove the running power cable (to be treated).

(*h*) Remove the external battery connector (to be treated).

(*i*) Remove the cover pins and push back the covers of the multiconnector plugs of the running power cable and the external battery connector.

(*j*) Remove all vacuum tubes (not to be treated).

(*k*) Remove key 1 if there is not enough room for masking (do not disconnect the wires).

(*l*) Remove the two attenuator dust covers (to be treated).

(2) MASKING. Mask with tape only the following items:

[1] Instructions for moistureproofing and fungiproofing Telephone EE-8-B are not contained in this manual. Complete instructions are contained in a technical bulletin covering moistureproofing and fungiproofing Telephones EE-8, EE-8-A, and EE-8-B.

(*a*) The tops of the running tube sockets and the locating pin openings in the bottom of the sockets.

(*b*) The rear side of key 1 panel cut-out when this key has been removed from its mounting.

(*c*) The shafts and bushings of all potentiometers mounted directly behind the capacitor strip assembly.

(*d*) The spade tips, wire ends, and the front and sides of the plug block (not the cover) of both power cables.

(3) COVERING. (*a*) Cover the following items with paper or cloth and seal with masking tape.

1. The complete face of the front panel and its mounting screws.
2. All transfer keys and jacks so that the operating mechanisms and/or spring contacts are covered and the insulating spacers and soldering lugs are exposed.
3. The rear switch and the sides of each of the two attenuators down to the bead of the shield can.

(*b*) Enclose the following items in a single bag. Seal the edges of the bag to the panel.

1. The CAL. SEND potentiometer and the spare tube bracket immediately above it.
2. The CAL. REC. potentiometer and the spare tube bracket immediately above it.

(4) DRYING. Dry the following items for 2 to 3 hours at 160° F:

(*a*) The test set chassis.

(*b*) The power cable and the external battery connector.

(*c*) The attenuator dust covers.

(5) VARNISHING. Apply three coats of moistureproofing and fungiproofing varnish.

(*a*) Spray all exposed parts and wiring of the test set chassis.

(*b*) Brush or spray the power cables, whichever is more convenient.

(*c*) Brush the top outer ring of the tube sockets for Tube VT-179. Do not allow the varnish to enter the socket holes.

(*d*) Brush the front and rear insulating washers of the front panel binding posts.

(*e*) Brush the *inner surface of the bottom* of each attenuator dust cover.

(*f*) Using a full brush, seal the following parts of the meter:

1. The small hole in the center of the back plate.
2. The joint between the back plate and the case shell.
3. The three small screws which fasten the back plate to the case.
4. The edge of the meter glass.
5. The zero-set adjustment.

(6) REASSEMBLY. Reassemble in reverse order to disassembly (subpar. (1) above) and test operation.

(7) MARKING. Mark MFP and date of treatment on test set.

d. Reference. Refer to TB SIG 13 for a full description of the varnish spray method of moistureproofing and fungiproofing.

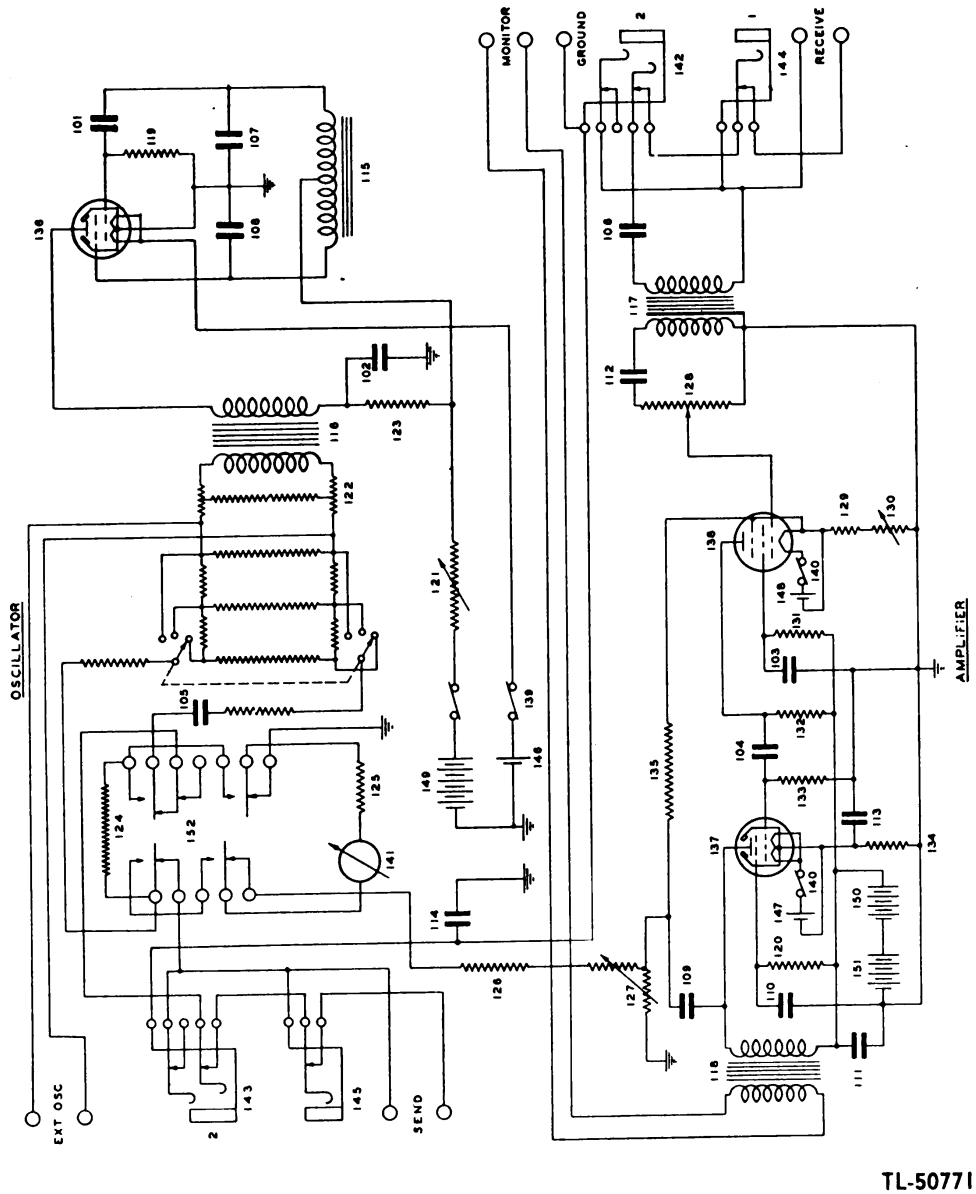


Figure 29. Test Set I-61-A, schematic diagram.

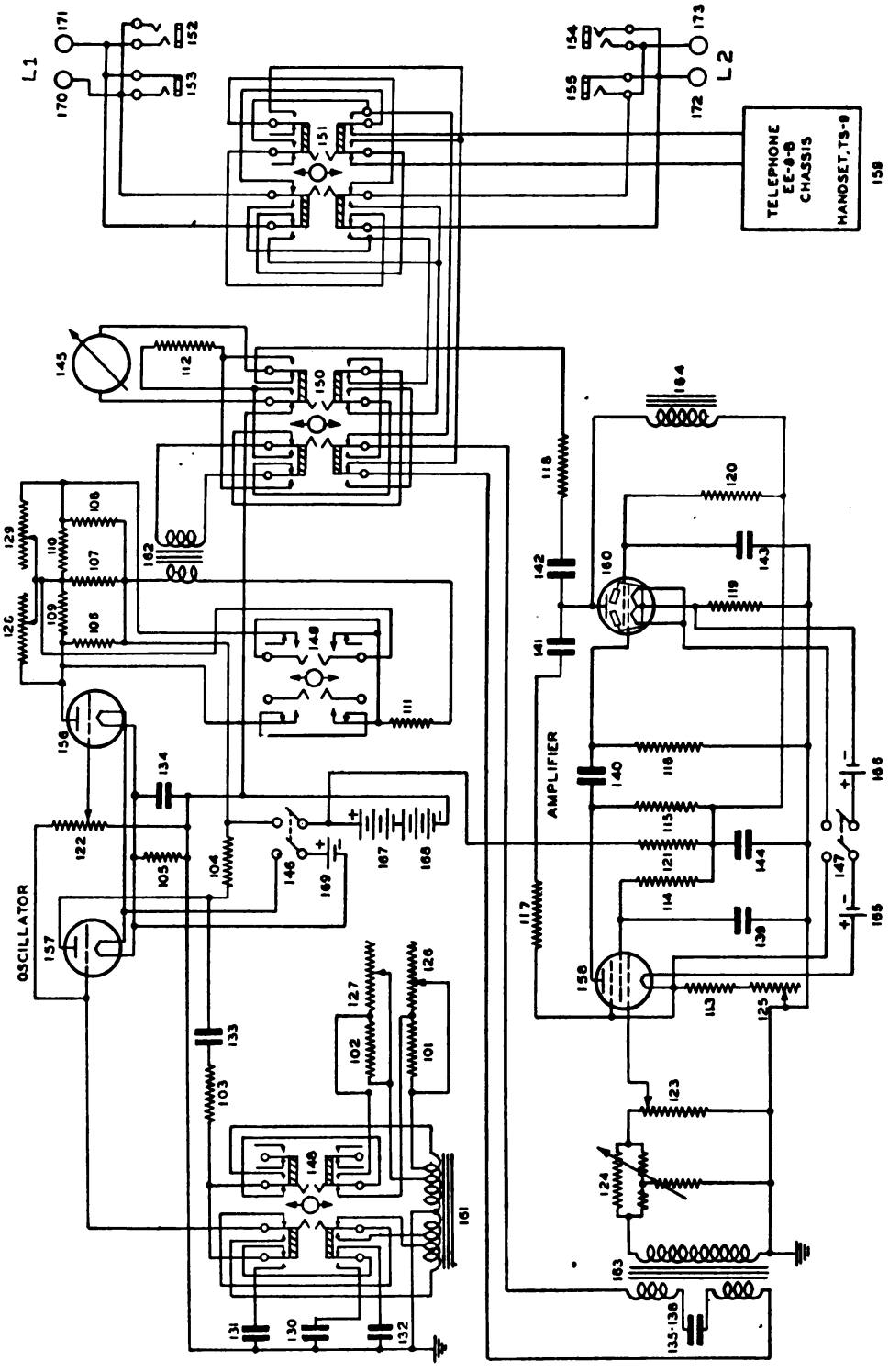


Figure 30. *Test Set I-61-B, schematic diagram.*

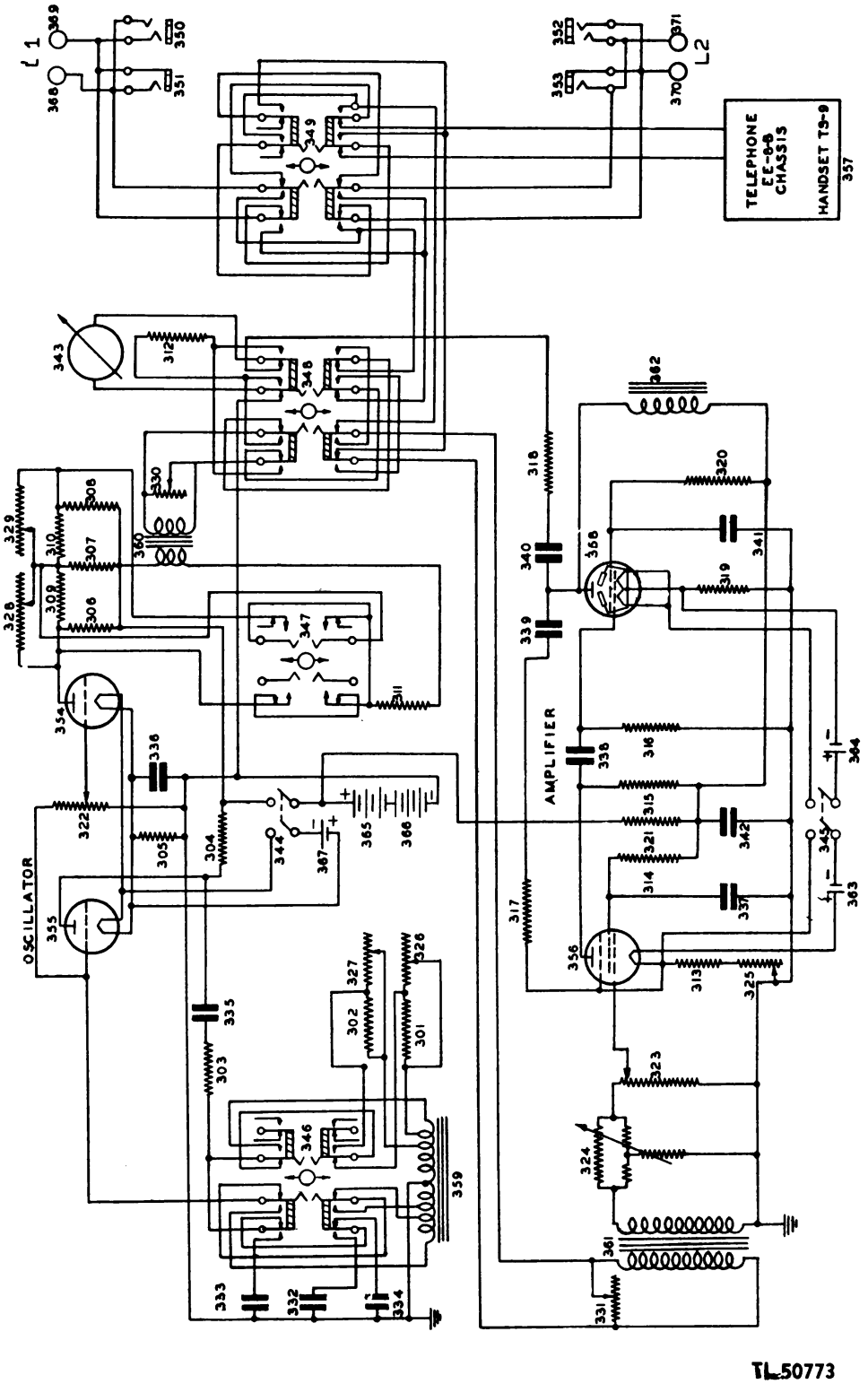


Figure 31. *Test Set I-61-C, schematic diagram.*

SECTION V
Supplementary Data

25. CHARACTERISTICS OF OPEN WIRE AT 1,000 CYCLES, 8-INCH SPACING.

Wire	Attenuation (db per loop mile) Dry	Attenuation (db per loop mile) Wet	Characteristic impedance (ohms) Dry	Characteristic impedance (ohms) Wet
0.080" H.D. copper	0.112	0.127	719	705
0.104" H.D. copper	0.0735	0.0813	626	623
8 A.W.G. 0.1285" H.D. copper	0.0513	0.0584	587	579
8 A.W.G. 0.165" H.D. copper	0.0335	0.0400	559	540
0.080" 40% copper-steel	0.232	0.252	946	913
0.104" 40% copper-steel	0.164	0.174	751	741
0.128" 40% copper-steel	0.120	0.128	654	646
0.104" 30% copper-steel	0.205	0.216	835	824
8 A.W.G. 0.1285" 30% copper-steel	0.120	0.128	654	646

26. CHARACTERISTICS OF OPEN WIRE AT 1,000 CYCLES, 12-INCH SPACING

Wire		*Loading*	*Attenuation (db per loop mile)*		*Characteristic impedance (ohms)*	
			Dry	*Wet*	*Dry*	*Wet*
12 N.B.S. (0.104″)	Side	Nonloaded	0.068	0.075	700	700
" " "	Phantom	Nonloaded	0.057	0.064	410	410
8 A.W.G. (0.1285″)	Side	Nonloaded	0.047	0.052	700	700
" " "	Phantom	Nonloaded	0.039	0.044	400	400
8 A.W.G. (0.165″)	Side	Nonloaded	0.031	0.033	670	670
" " "	"	W-250-150	0.016	0.018	1900	1900
" " "	Phantom	Nonloaded	0.025	0.027	375	375

27. CHARACTERISTICS OF CABLE (PHYSICAL CIRCUIT) AT 1,000 CYCLES.

Cable	*Loading*	*Attenuation (db per loop mile) Dry or Wet*	*Characteristic impedance (ohms) Dry or Wet*
13 A.W.G. (0.072")	Nonloaded	0.5	240
16 A.W.G. (0.051")	Nonloaded	0.75	320
" " "	H-44-25 (note)	0.25	800
" " "	H-88-50 (note)	0.20	1120
19 A.W.G. (0.136")	Nonloaded	1.2	500
" " "	H-44-25 (note)	0.48	800
" " "	H-88-50 (note)	0.35	1130
22 A.W.G. (0.025")	Nonloaded	1.7	600
" " "	M-135 (note)	1.3	1000
24 A.W.G. (0.020")	Nonloaded	2.1	800
" " "	M-88 (note)	1.5	1000

NOTE: The loading designation consists of a letter designating the approximate loading-coil spacing, followed by a figure designating the number of millihenries of inductance in the coil, where two figures are given, the first indicates the millihenries in each side-circuit coil and the second, the millihenries in the phantom-circuit coil of a quad or phantom group. The letters designating spacing are as follows.

H = 6000′; M = 9000′.

28. CHARACTERISTICS OF WIRE AND CABLE AT 1,000 CYCLES.

Wire or Cable	*Loading*	*Attenuation (db per loop mile)* Dry	Wet	*Characteristic impedance (ohms)* Dry	Wet
W-110-B	Nonloaded	1.7	2.8	655	409
W-110-B	5280-44	1.0	1.7	850	550
W-110-B	5280-88	0.8	1.3	1187	785
W-130	Nonloaded	3.1	5.0	1170	546
W-143	Nonloaded	1.2	1.2	174	174
CC-345 (5-pair cable)	Nonloaded	1.7	1.7	325	325
CC-355 (10-pair cable)	Nonloaded	1.7	1.7	325	325
CC-358 (spiral-4, side)	1320-6	0.75	0.75	486	486
CC-358 (spiral-4, phantom)	Nonloaded (6)	1.3	1.3	156	156

NOTE: Loading figures shown above indicate first, spacing of load coils in feet, and second, inductance of load coils in millihenries.

29. GAIN AND IMPEDANCE OF REPEATERS AT 1,000 CYCLES.

Repeater	*Equalizer position*	*Use*	*Impedance (ohms)*	*Max. gain (db)*
W.E.-22-A1	—	Intermediate repeater	600	19 ± 2
W.E.-44-A-1	—	Intermediate repeater	600	42 ± 2
EE-89-(&) (note)	—	Intermediate repeater	600	24 ± 1
EE-89-T3 (note)	—	Intermediate repeater	600	24 ± 1
EE-99-T3 either amplifier	1		300 or 1200	44 ± 2
	2	As an intermediate repeater	300 or 1200	38 ± 2
	3		300 or 1200	34 ± 2
EE-99-T5 either amplifier	Any position	As an intermediate repeater	300 or 1200	35 ± 2
EE-99-A either amplifier	Any position		300	65 ± 2
EE-99-T3	1	Terminal repeater	2W-600, 4W out	
		2W in—4W out	300 or 1200	42 ± 2
	1	Terminal repeater	4W in—300 or	
		4W in—2W out	1200, 2W-600	42 ± 2
	2		4W out—300	35.5 ± 2
	3			31.75 ± 2
EE-99-T5	1	Terminal repeater	2W-600; 4W-300	
			or 1200	31 ± 2
EE-99-A	Any position	Terminal repeater	4W-300; 2W-600	31 ± 2

NOTE: If Telephone Repeaters EE-89-T3 or EE-89-A sing when set at maximum gain, make a measurement at reduced gain or connect according to directions in section II, paragraph 10*d*.

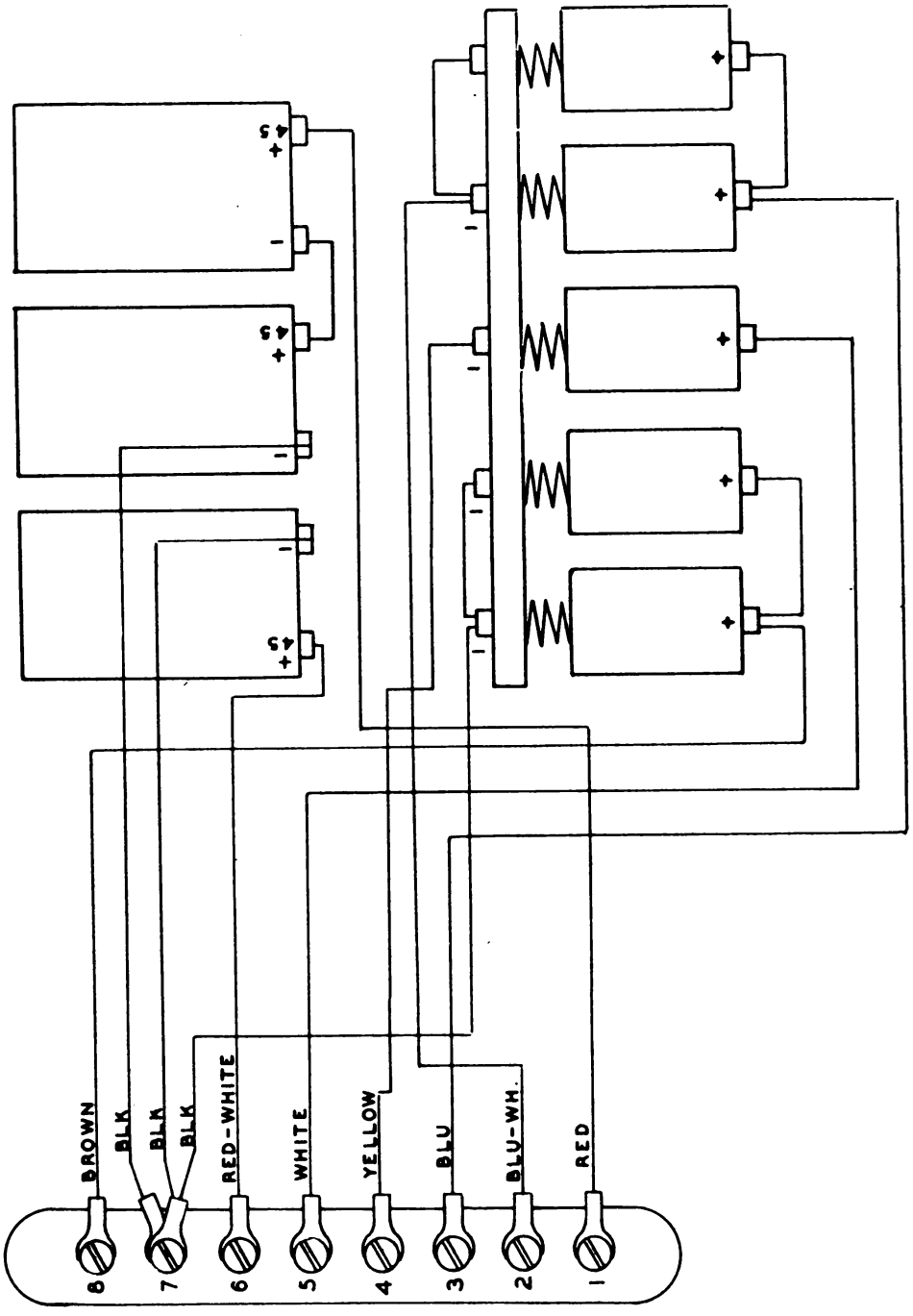


Figure 32. Test Set I-61-A, wiring diagram of cabinet.

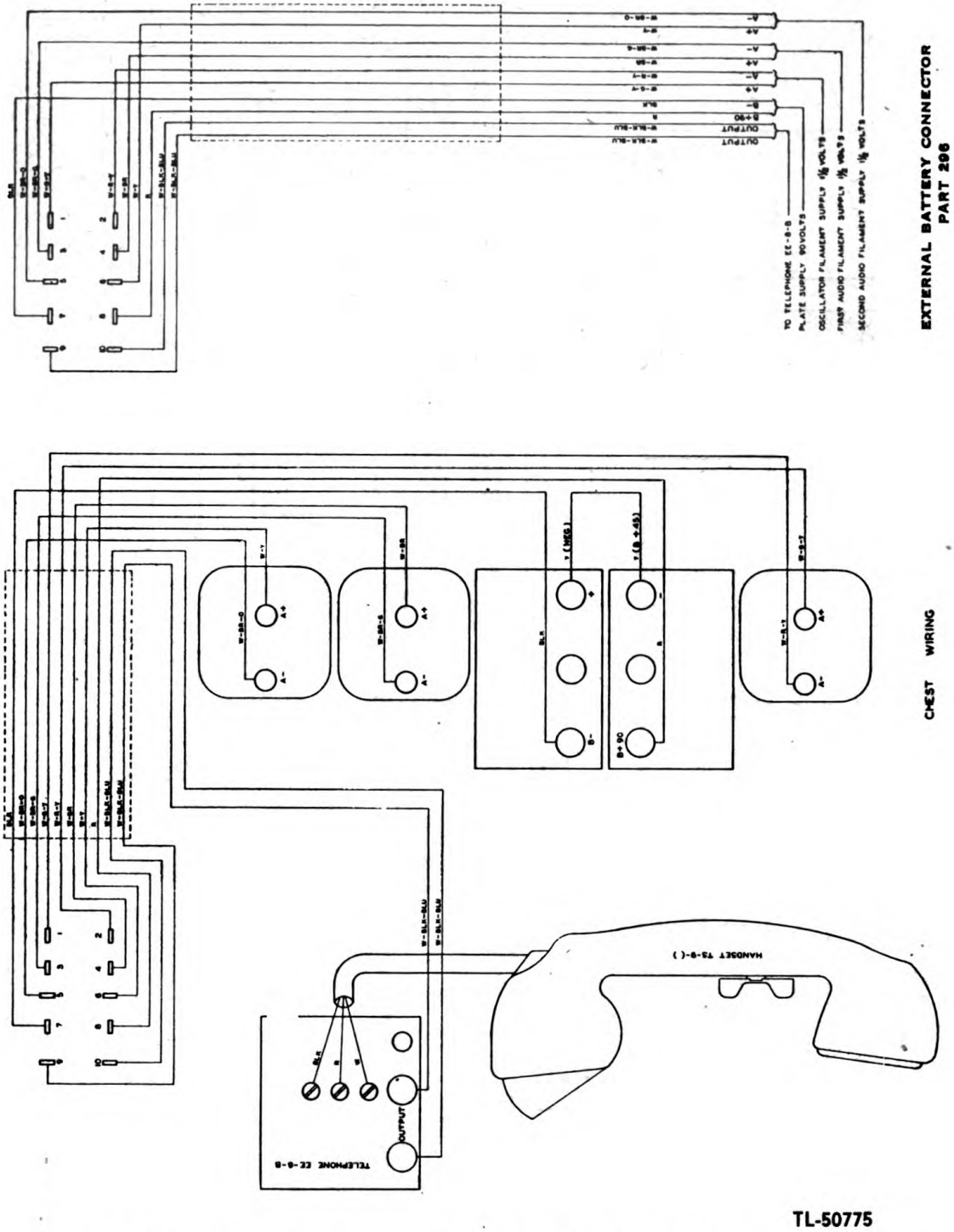


Figure 33. Test Set I-61-B, wiring diagram of cabinet and external battery connector.

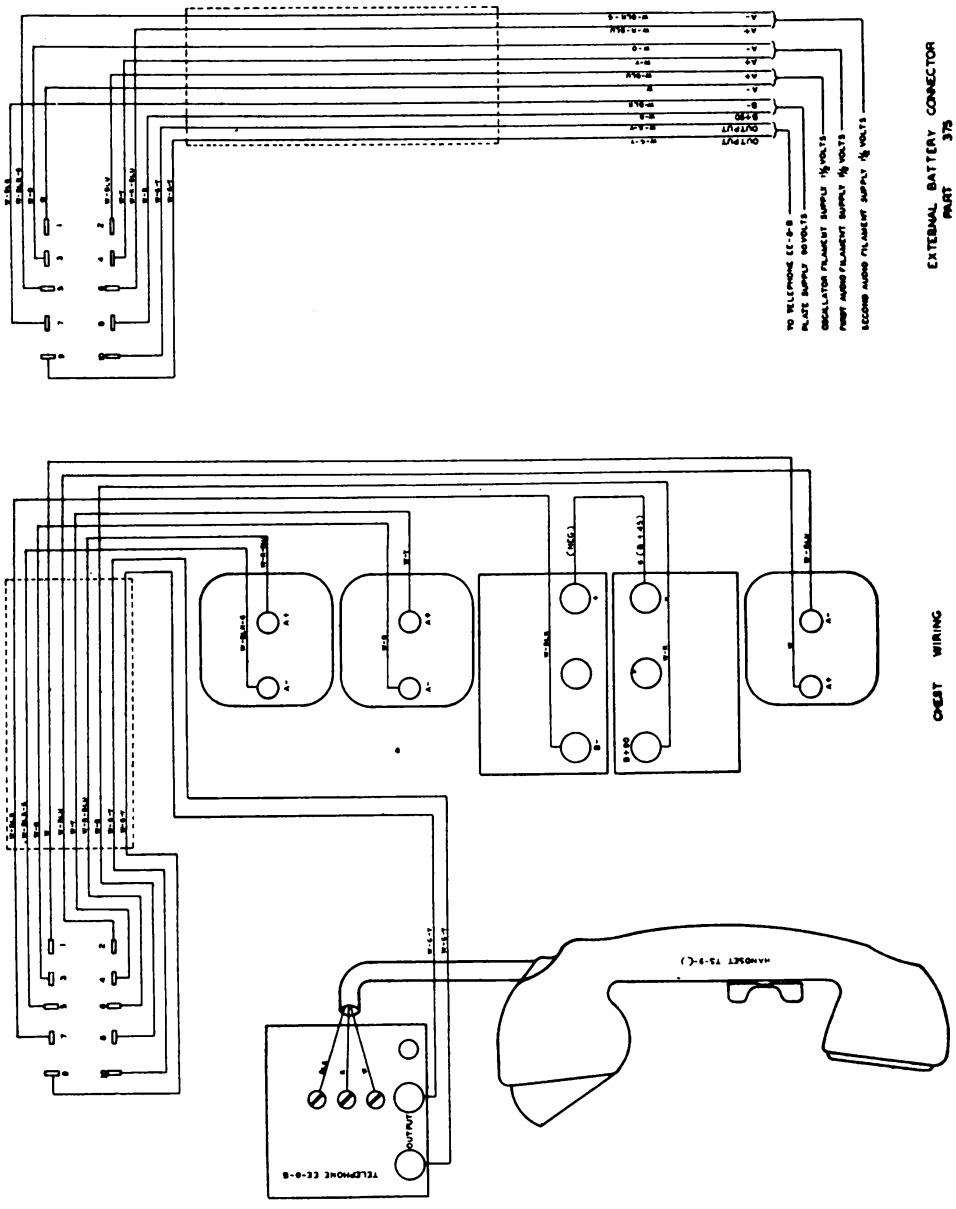


Figure 34. Test Set I-61-C, wiring diagram of cabinet and external battery connector.

30. COMPOSITE LIST OF MAINTENANCE PARTS FOR TEST SET I-61-A.

NOTE: Order replacement parts by stock number, name, and description.

Ref. symbol	*Signal Corps stock No.*	*Name of part and description*	*Quan. per assembly*	*Orgn. stocks*	*3rd echelon*	*4th echelon*	*5th echelon*	*Depot stocks*
128	2Z395.3	ATTENUATOR: coarse, 80,000-ohm, ± percent (0.5 per step), 12 steps, 5db per step; Spec. 1380, Daven Co. CP-800.	1		*	*	*	*
	4C9895/1	HANDLE: key lever, black.	1		*	*	*	*
	2Z5822-36	KNOB: 1¾ inch skirt, Friedman Co., s-381-64 BBL.	2		*	*	*	*
141	3F3768	METER IS-188: power level indicator.	1		*	*	*	*
130	2Z7268.22	RESISTOR: carbon, variable, 2,000-ohm; IRC type D, taper A.	1		*	*	*	*
136	2T221	TUBE VT-221: 3Q5-GT.	2		*	*	*	*
137								
138	2T146	TUBE VT-146: 1N5-GT.	1		*	*	*	*

31. COMPOSITE LIST OF MAINTENANCE PARTS FOR TEST SET I-61-B.

NOTE: Order replacement parts by stock number, name, and description.

Ref. symbol	*Signal Corps stock No.*	*Name of part and description*	*Quan. per assembly*	*Orgn. stocks*	*3rd echelon*	*4th echelon*	*5th echelon*	*Depot stocks*
123	2Z395.15	ATTENUATOR: coarse, 50,000-ohm ± 5 percent (0.5 per step), 12 steps, 5 db per step; Spec. 1489, Daven Co. CP-800.	1		*	*	*	*
124	2Z395.11	ATTENUATOR: fine, "T" network, 50,000-ohm ± 1 percent (0.1 per step), 10 steps, 0.5 db per step; Spec. 1490, Daven Co. T-800.	1		*	*	*	*
	4C9895/1	HANDLE: key lever, black.	4		*	*	*	*
	2Z5822-36	KNOB: 1¾ inch skirt; Friedman Co., s-381-64BBL.	2		*	*	*	*
145	3F3768	METER IS-188: power level indicator.	1		*	*	*	*
297	2Z7120.5	PLUG: 10 prong, bakelite insulation, 45-volt, 5-amp; H.B. Jones P-310-RP.	1		*	*	*	*

31. COMPOSITE LIST OF MAINTENANCE PARTS FOR TEST SET I-61-B *(contd)*.

Ref. symbol	*Signal Corps stock No.*	*Name of part and description*	*Quan. per assembly*	*Orgn. stocks*	*3rd echelon*	*4th echelon*	*5th echelon*	*Depot stocks*
126 127	2Z7268.21	RESISTOR: carbon, variable, 1,000-ohm; IRC type D, taper A.	2		*	*	*	*
125	2Z7268.22	RESISTOR; carbon, variable, 2,000-ohm; IRC type D, taper A.	1		*	*	*	*
122 128 129	2Z7269.36 2Z8680-2	RESISTOR: carbon, variable, 250,000-ohm; IRC type D, taper A.	3		*	*	*	*
295 296		SOCKET: 10 contact, bakelite insulation, 45-volt, 5-amp; H. B. Jones S-310-FHT.	2		*	*	*	*
159	4B5008B	TELEPHONE EE-8-B: LB, field.	1		*	*	*	*
156 157	2V1G4GT/G	TUBE: 1G4GT/G.	2		*	*	*	*
158	2T179	TUBE VT-179: 1LN5.	1		*	*	*	*
160	2T221	TUBE VT-221: 3Q5GT.	1		*	*	*	*

32. COMPOSITE LIST OF MAINTENANCE PARTS FOR TEST SET I-61-C.

NOTE: Order replacement parts by stock number, name and description.

Ref. symbol	*Signal Corps stock No.*	*Name of part and description*	*Quan. per assembly*	*Orgn. stocks*	*3rd echelon*	*4th echelon*	*5th echelon*	*Depot stocks*
323	2Z395.15	ATTENUATOR: course, 50,000-ohm ± 5 percent (0.5 per step), 12 steps, 5 db per step; Spec. 1489, Daven Co. CP-800.	1		*	*	*	*
324	2Z395.11	ATTENUATOR: fine, "T" network, 50,000-ohm ± 1 percent (0.1 per step), 10 steps, 0.5 db per step; Spec. 1490, Daven Co. T-800.	1		*	*	*	*
	4C9895/1	HANDLE: key lever, black.	4		*	*	*	*
	2Z5822-36	KNOB: 1¾ inch skirt; Friedman Co., s-381-64BBL.	2		*	*	*	*
343	3F3768	METER IS-188: power level indicator.	1		*	*	*	*
376	2Z7120.5	PLUG: 10 prong, bakelite insulation, 45-volt, 5-amp; H.B. Jones P310-RP.	1		*	*	*	*

32. COMPOSITE LIST OF MAINTENANCE PARTS FOR TEST SET I-61-C *(contd)*.

Ref. symbol	*Signal Corps stock No.*	*Name of part and description*	*Quan. per assembly*	*Orgn. stocks*	*3rd echelon*	*4th echelon*	*5th echelon*	*Depot stocks*
326 327	2Z7268.21	RESISTOR: carbon, variable, 1,000-ohm; IRC type D, taper A.	2		*	*	*	*
325	2Z7268.22	RESISTOR: carbon, variable, 2,000-ohm; IRC type D, taper A.	1		*	*	*	*
322 328 329	2Z7269.36	RESISTOR: carbon, variable, 250,000-ohm; IRC type D, taper A.	3		*	*	*	*
374 375	2Z8680-2	SOCKET: 10 contact, bakelite insulation, 45-volt, 5-amp; H. B. Jones S-310-FHT.	2		*	*	*	*
357	4B5008B	TELEPHONE EE-8-B: LB, field.	1		*	*	*	*
355 354	2V1G4GT/G	TUBE: 1G4GT/G.	2		*	*	*	*
356	2T179	TUBE VT-179: 1LN5.	1		*	*	*	*
358	2T221	TUBE VT-221: 3Q5GT.	1		*	*	*	*

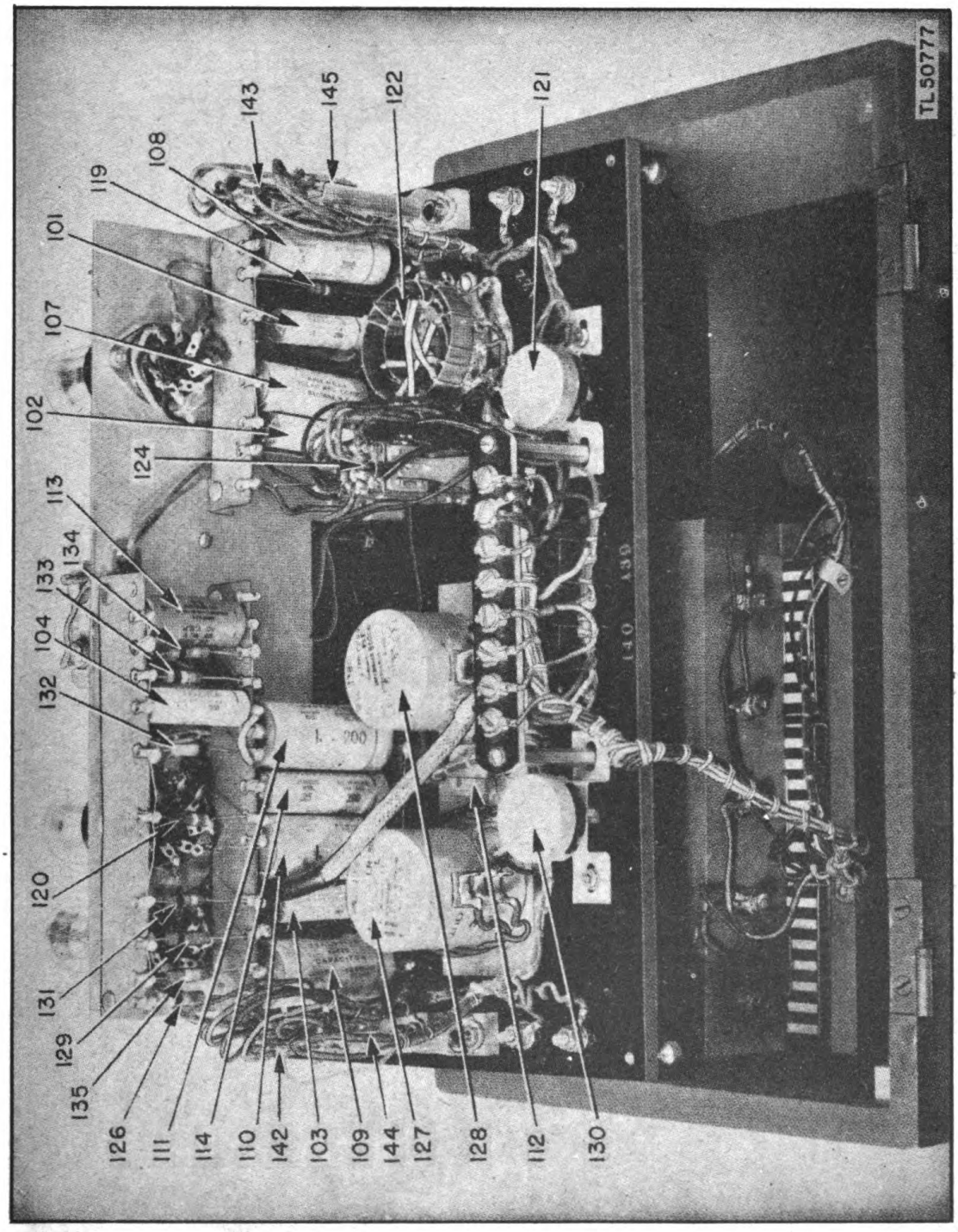


Figure 35. Test Set I-61-A, bottom rear view of chassis and panel.

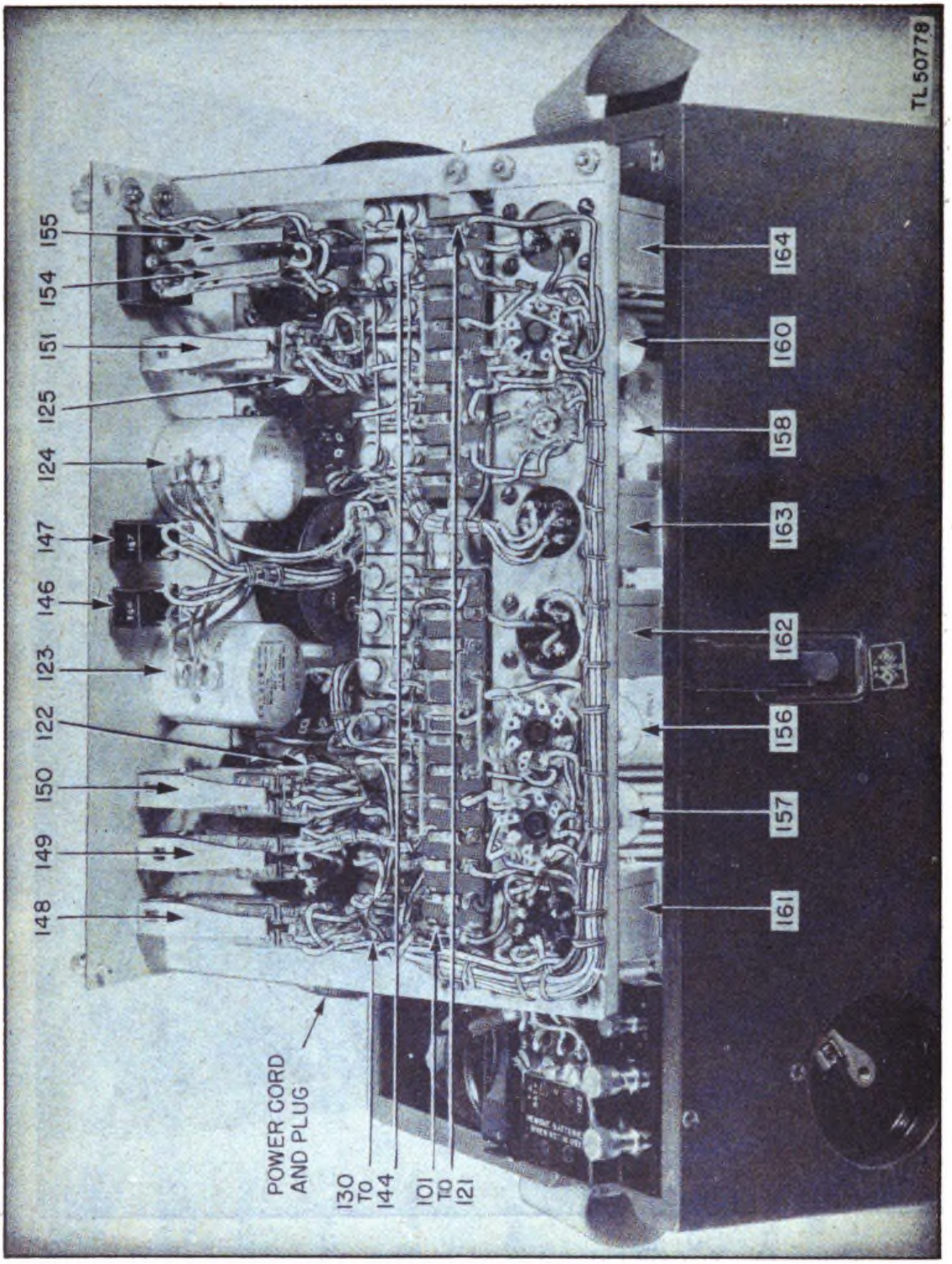


Figure 36. Test Set I-61-B, bottom rear view of chassis and panel.

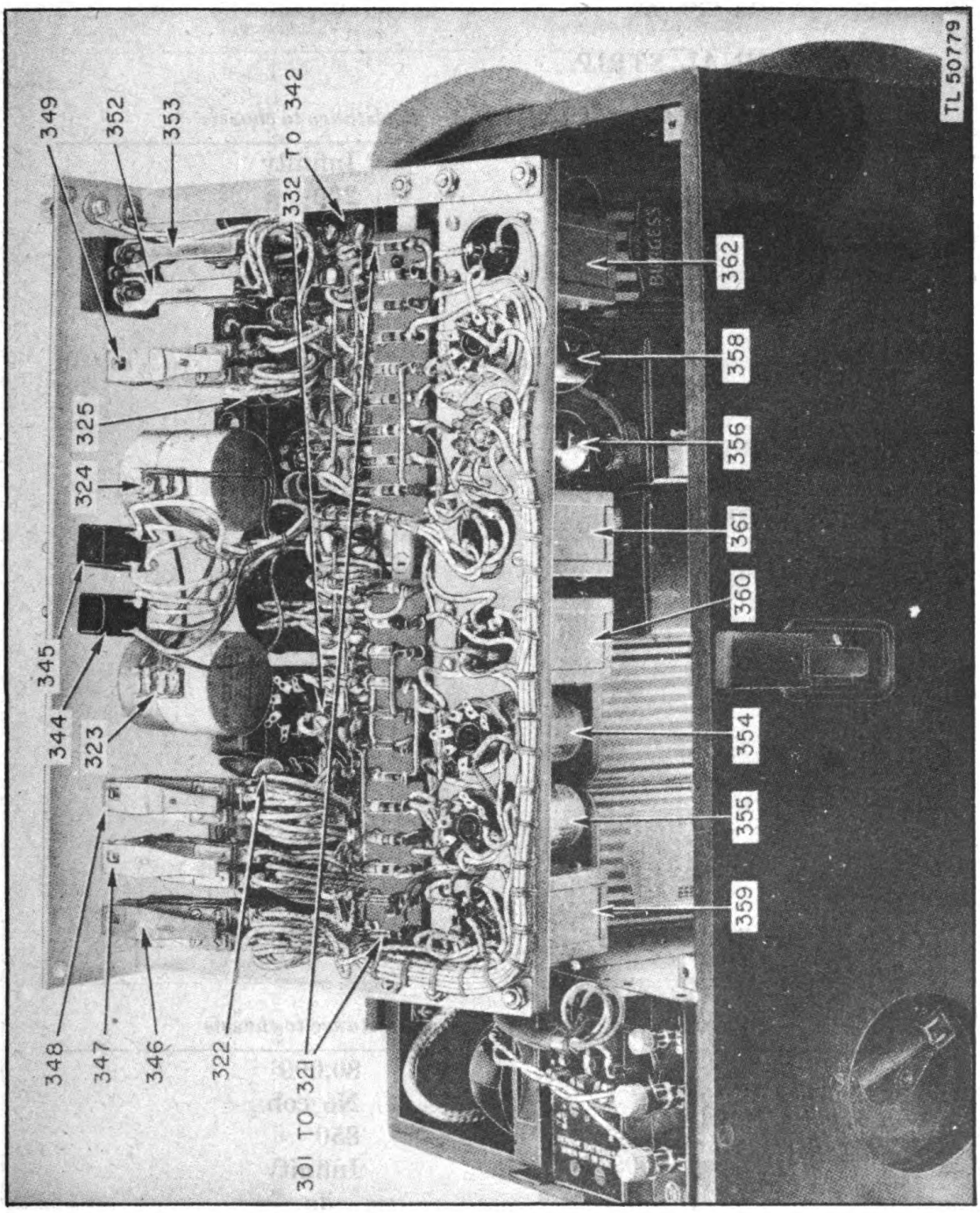


Figure 37. Test Set I-61-C, bottom rear view of chassis and panel.

33. CONTINUITY TEST TABLES.

a. Test Set I-61-A.

(1) TERMINAL STRIP.

Terminal No.	*Resistance to chassis*
1	Infinity
2	200
3	200
4	825
5	840
6	Infinity
7	0
8	9.5

(2) TUBE SOCKET, TUBE VT-221 (3Q5-GT) PART 136, OSCILLATOR.

Terminal No.	*Resistance to chassis*
1	No con.
2	9.5
3	Infinity
4	do.
5	100,000
6	No con.
7	9.5
8	0

(3) TUBE SOCKET, TUBE VT-146 (1N5-GT) PART 138, AMPLIFIER

Terminal No.	*Resistance to chassis*
Cap.	80,000
1	No con.
2	850
3	Infinity
4	do.
5	No con.
6	No con.
7	850
8	No con.

(4) TUBE SOCKET, TUBE VT-221 (3Q5-GT) PART 137, AMPLIFIER.

Terminal No.	*Resistance to chassis*
1	No con.
2	200
3	Infinity
4	do.
5	500,000
6	No con.
7	200
8	200

(5) TRANSFORMER TERMINAL TO CHASSIS.

Part No.	*Terminal*	*Resistance to chassis*
116	P	Infinity
do.	B	do.
do.	600	do.
115	1	do.
do.	2	do.
do.	3	do.
118	P	do.
do.	B	do.
do.	600	do.
117	G	1750
do.	F	0
do.	600	Infinity

b. Test Set I-61-B.

(1) POWER PLUG PART 297.

Terminal No.	*Resistance to chassis*
1	800
2	800
3	310-2,300 (note).
4	310-2,300 (note).
5	210
6	200
7	0
8	Infinity
9	do.
10	do.

NOTE: Readings depend upon position of part 125.

(2) TUBE SOCKET, TUBE 1G4-GT/G PART 157, OSCILLATOR.

Terminal No.	*Resistance to chassis*
1	No con.
2	800
3	Infinity
4	No con.
5	700-400-240 (note).
6	No con.
7	800
8	No con.

NOTE: Readings with key 2 in positions 500, 1,000 and 2,500.

(3) TUBE SOCKET, TUBE 1G4-GT/G PART 156, BUFFER.

Terminal No.	*Resistance to chassis*
1	No con.
2	800
3	Infinity
4	No con.
5	Variable (note).
6	No con.
7	800
8	No con.

NOTE: Readings depend upon setting of parts 122 and 148.

(4) TUBE SOCKET, TUBE VT-179 (1LN5) PART 158, AMPLIFIER.

Terminal No.	*Resistance to chassis*
1	Variable (note 1).
2	Infinity
3	do.
4	320-2,300
5	320-2,300
6	Variable (note 2).
7	No con.
8	320-2,300

NOTE: 1. Readings depend upon setting of part 125.

2. Readings depend upon setting of parts 123 and 124.

(5) TUBE SOCKET, TUBE VT-221 (3Q4-GT) PART 160, AMPLIFIER.

Terminal No.	*Resistance to chassis*
1	No con.
2	210
3	Infinity
4	do.
5	1 meg.
6	No con.
7	210
8	210

(6) TRANSFORM0R TERMINALS TO GROUND.

Part No.	*Terminal*	*Resistance to chassis*
161	1	230
do.	2	150
do.	3	90
do.	4	0
do.	5	700
do.	6	400
do.	7	240
do.	8	0
162	1	Infinity
do.	2	do.
do.	3	do.
do.	4	do.
163	1	Infinity
do.	2	do.
do.	3	do.
do.	4	do.
do.	5	0
do.	6	1,300
164	1	Infinity
do.	2	do.

c. Test Set I-61-C.

(1) POWER PLUG PART 376.

Terminal No.	*Resistance to chassis*
1	750
2	750
3	320-2,300 (note).
4	320-2,300 (note).
5	200
6	200
7	0
8	Infinity
9	do.
10	do.

NOTE: Readings with 2 key in 500, 1,000 and 2,500 positions.

(2) TUBE SOCKET, TUBE 1G4-GT/G, PART 355, OSCILLATOR.

Terminal No.	*Resistance to chassis*
1	No con.
2	750
3	Infinity
4	No con.
5	700-400-240 (note).
6	No con.
7	750
8	No con.

NOTE: Readings with 2 key in 500, 1,000 and 2,500 positions.

(3) TUBE SOCKET, TUBE 1G4-GT/G PART 354, BUFFER.

Terminal No.	*Resistance to chassis*
1	No con.
2	750
3	Infinity
4	No con.
5	Variable (note).
6	No con.
7	750
8	No con.

NOTE: Readings depend upon setting of parts 322 and 346.

(4) TUBE SOCKET, TUBE VT-179 (1LN5) PART 356, AMPLIFIER.

Terminal No.	*Resistance to chassis*
1	320-2,300
2	Infinity
3	do.
4	320-2,300
5	320-2,300
6	Variable (note 1).
7	No con.
8	320-2,300 (note 2).

NOTE: 1. Readings depend upon setting of parts 323 and 324.

2. Readings depend upon setting of part 325.

(5) TUBE SOCKET, TUBE VT-221 (3Q5-GT) PART 358.

Terminal No.	*Resistance to chassis*
1	No con.
2	210
3	Infinity
4	do.
5	1 meg.
6	No con.
7	210
8	210

(6) TRANSFORMER TO CHASSIS.

Part No.	*Terminal*	*Resistance to chassis*
159	1	220
do.	2	150
do.	3	90
do.	4	0
do.	5	700
do.	6	420
do.	7	250
do.	8	0

(6) TRANSFORMER TO CHASSIS (Cont'd.).

Part No.	*Terminal*	*Resistance to chassis*
160	1	Infinity
do.	2	do.
do.	3	do.
do.	4	do.
161	1	do.
do.	2	do.
do.	3	1,400
do.	4	0
162	1	Infinity
do.	4	do.

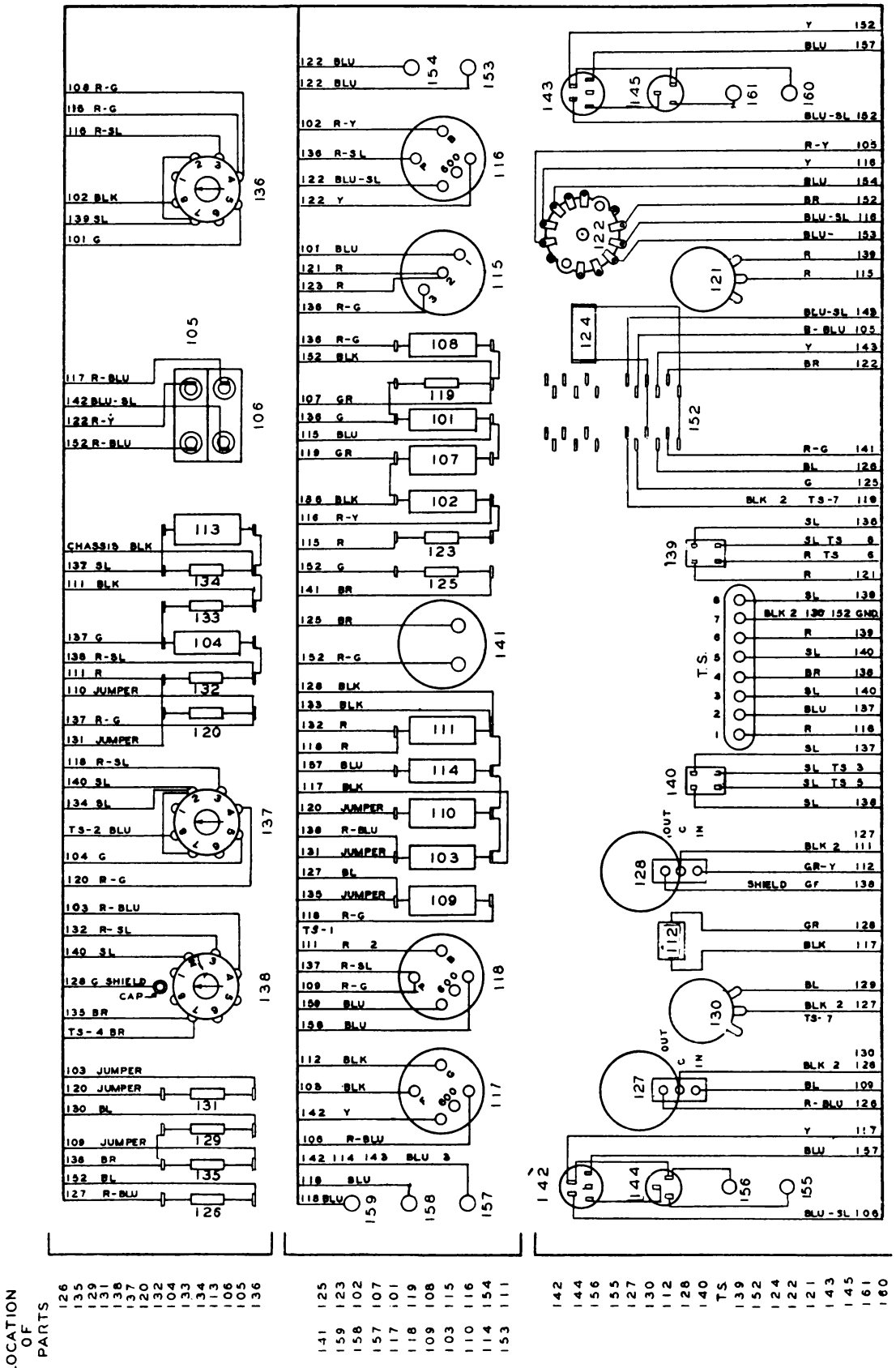


Figure 38. Test Set I-61-A, wiring diagram.

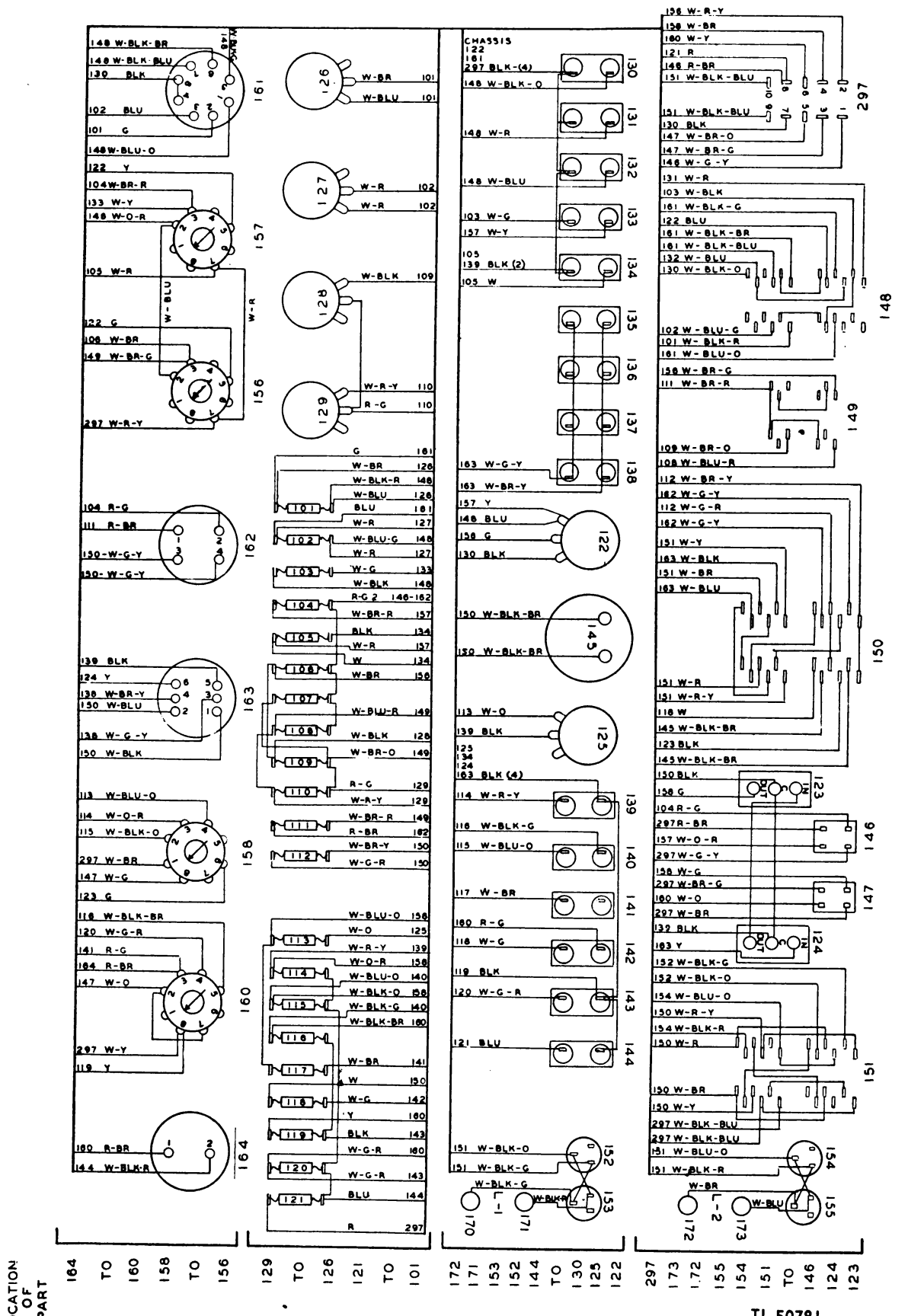


Figure 39. Test Set I-61-B, wiring diagram.

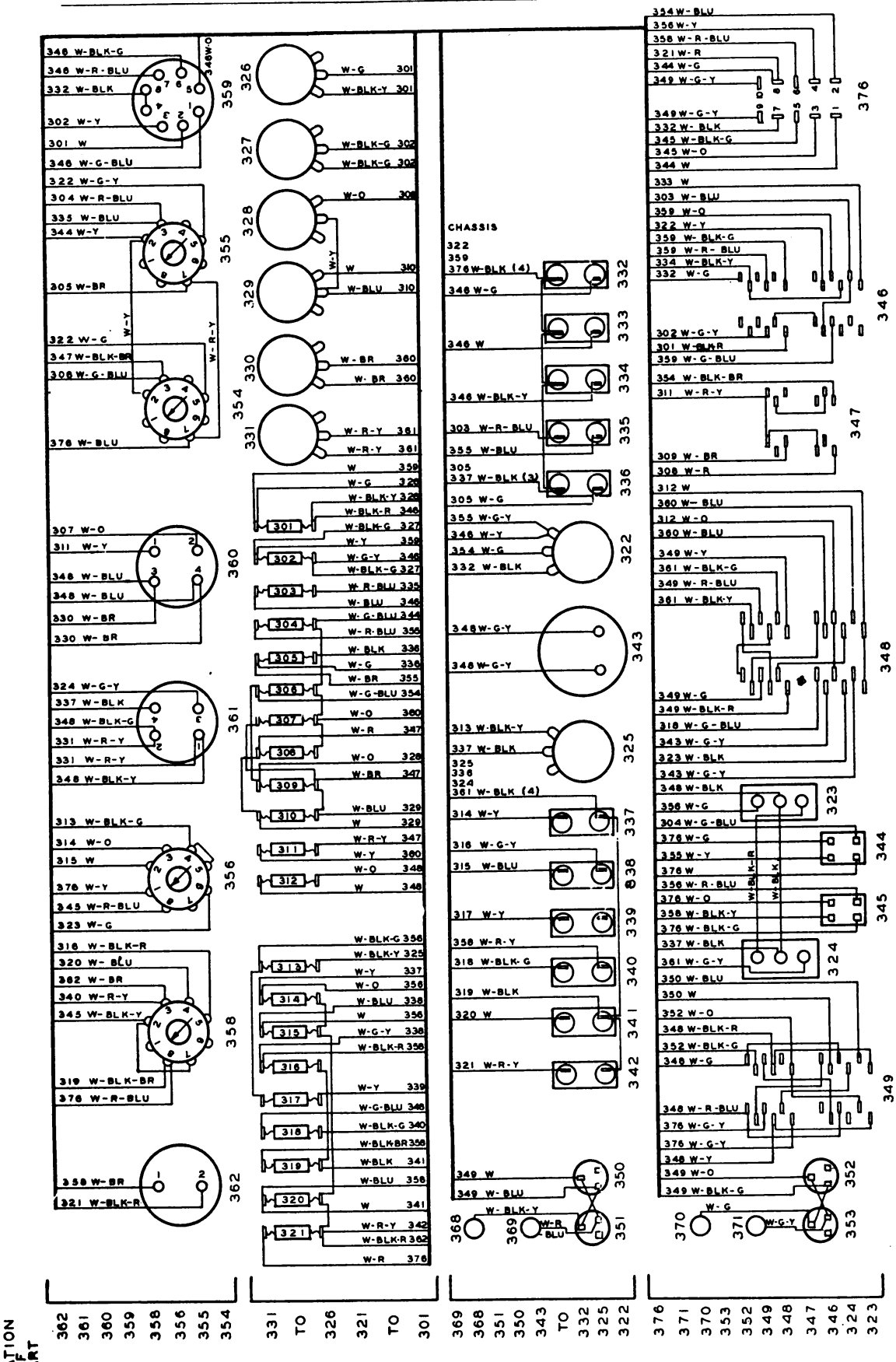
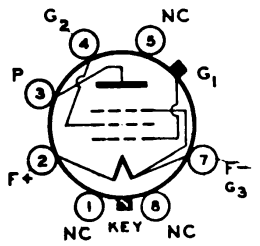
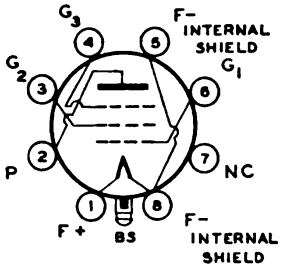


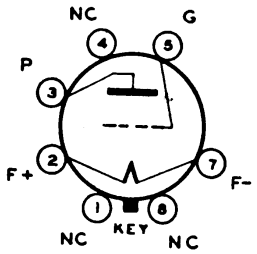
Figure 40. Test Set I-61-C, wiring diagram.



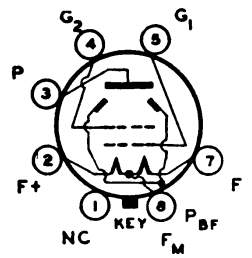
IN 5—G	IN 5—GT
Filament voltage (dc)	1.4 v
Filament current	0.05 amp
Plate voltage	90 max v
Screen voltage	90 max v
Grid voltage	0
Plate current	1.2 ma
Screen current	0.3 ma
Plate resistance (approx.)	1.5 meg
Transconductance	750 μmhos
Transconductance (at -4 v bias)	5 μmhos



ILN 5	
Filament voltage (dc)	1.4 v
Filament current	0.05 amp
Plate voltage	110 max v
Screen voltage	110 max v
Grid voltage	0
Plate current	1.6 ma
Screen current	0.35 ma
Plate resistance (approx.)	1.1 meg
Transconductance	800 μmhos
Transconductance (at -4.5 v bias)	10 μmhos



1 G4—G	
Filament voltage (dc)	1.4 v
Filament current	0.05 amp
Plate voltage	90 max
Plate resistance	2.3 ma
Plate current	10700 ohms
Amplification factor	8.8
Transconductance	825 μmhos



3 Q5—GT	Filament in parallel
Filament voltage (dc)	1.4 v
Filament current	0.1 amp
Plate voltage	90 max v
Screen voltage (G 2)	90 max v
Screen voltage (G 1)	-4.5 v
Plate current	9.5 ma
Screen current	1.6 ma
Plate resistance (approx.)	0.1 meg
Transconductance	2100 μmhos
Load resistance	8000 ohms
Total harmonic distortion	7.5 percent
Maximum signal power output	270 mw

TL-50783

Figure 41. Tube data.

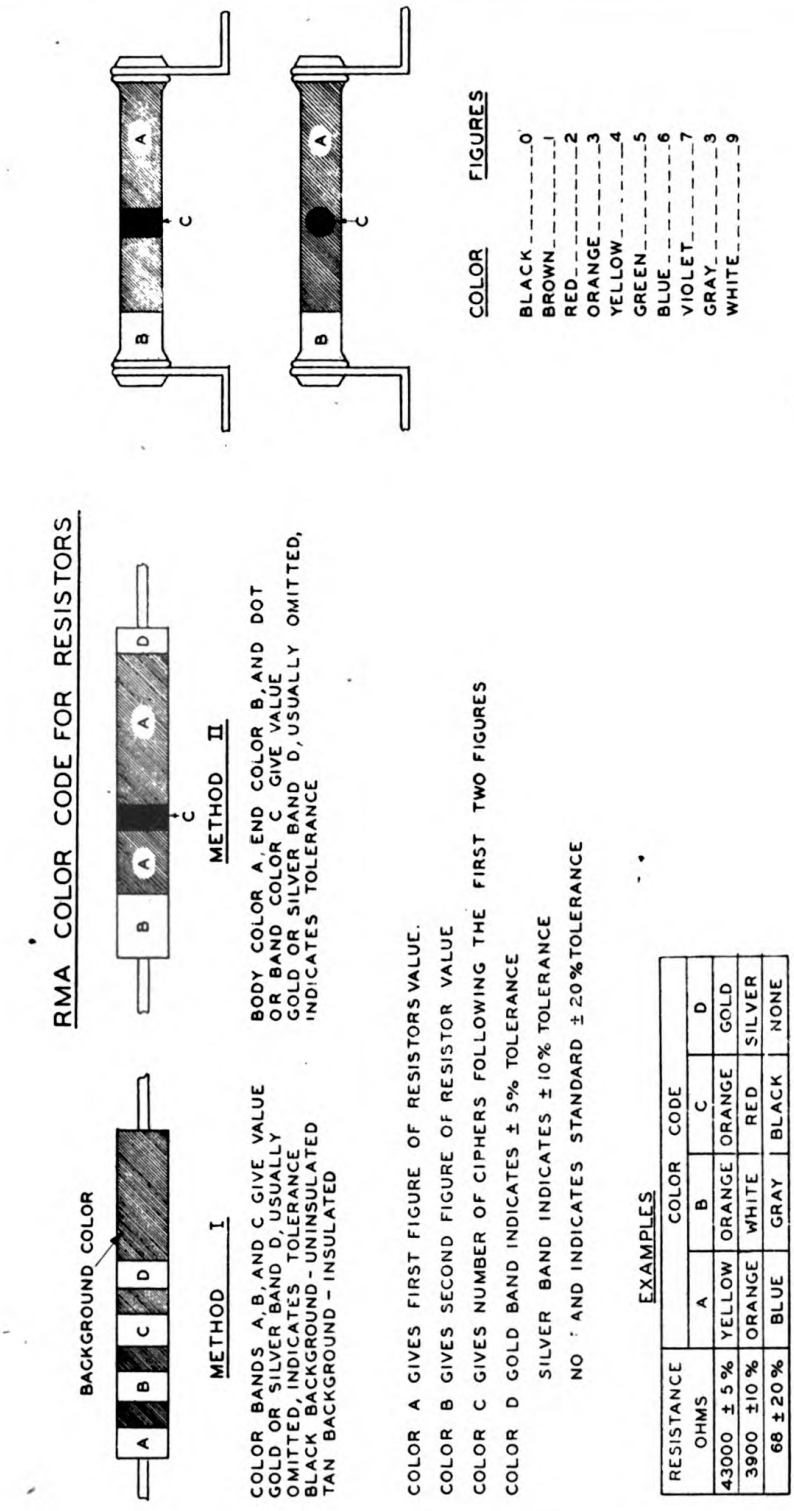


Figure 42. R.M.A. color code for resistors.

(22293-Phila-43, 29230-Phila-43, 10008-Phila-44, 5,200, April 1944)