NAVSHIPS 91747 UNCLASSIFIED

INSTRUCTION BOOK

for

TUBE TESTER

TV-3B/U

Manufactured by

THE HICKOK ELECTRICAL INSTRUMENT COMPANY

10514 Dupont Avenue Cleveland 8, Ohio

for

BUREAU OF SHIPS U. S. NAVY DEPARTMENT

NObsr 52672 Approved by BuShips 5 September 1952

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LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
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DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.

IN REPLY REFER TO
Code 993-100
5 September 1952

From: Chief, Bureau of Ships
To: All Activities Concerned with the Installation, Operation and Maintenance of the Subject Equipment

Subj: Instruction Book for Tube Test TV-3B/U
NAVSHIPS 91747

1. This is the instruction book for the subject equipment and is in effect upon receipt.

2. When superseded by a later edition, this publication shall be destroyed.

3. Extracts from this publication may be made to facilitate the preparation of other Department of Defense Publications.

4. All Navy requests for NAVSHIPS Electronics Publications should be directed to the nearest District Publications and Printing Office. When changes or revised books are distributed, notice will be included in the Bureau of Ships Journal and in the Index of Bureau of Ships General and Electronics Publications, NAVSHIPS 250-020.

H. N. WALLIN
Chief of Bureau

RECORD OF CORRECTIONS MADE

CHANGE NO.	DATE	SIGNATURE OF OFFICER MAKING CORRECTION

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CONTRACTURAL GUARANTEE

The Contractor guarantees that at the time of delivery thereof the articles provided for under this contract will be free from any defects in material or workmanship and will conform to the requirements of this contract. Notice of any such defect or nonconformance shall be given by the Government to the Contractor within one year of the delivery of the defective or nonconforming article, unless a different period of Guaranty is specified in the schedule. If required by the Government within a reasonable time after such notice, the Contractor shall, with all possible speed, correct or replace the defective or nonconforming article or part thereof. When such correction or replacement requires transportation of the article or part thereof, shipping costs, not exceeding the usual charges, from the delivery point to the Contractor's plant and return, shall be borne by the Contractor; the Government shall bear all other shipping costs. This Guaranty shall then continue as to corrected or replacing articles or, if only parts of such articles are corrected or replaced, to such corrected or replacing parts, until one year after the date of redelivery, unless a different period of Guaranty is specified in the schedule. If the Government does not require a correction or replacement of a defective or nonconforming article, the Contractor, if required by the contracting officer, within a reasonable time after the notice of defect or nonconformance, shall repay such portion of the contract price of the article as is equitable in the circumstances.

INSTALLATION RECORD

Contract Number NObsr 52672 Date of Contract 25 June, 1951

Serial Number of Equipment. . . . . .

Date of Acceptance by the Navy. . . . . .

Date of Delivery to Contract Destination. . . . . .

Date of Completion of Installation. . . . . .

Date Placed In Service . . . . . .

Blank spaces in this table shall be filled in at time of installation.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire service life, shall be made to the Bureau of Ships in accordance with current regulations, using form NAVSHIPS NBS 383 (revised). The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failure see Chapter 67 of the BUREAU OF SHIPS MANUAL or superseding instructions.

ORDERING PARTS

All requests or requisitions for replacement material should include the following data:

1. Standard Navy Stock number or, when ordering from a Marine Crops or Signal Corps supply depot, the Signal Corps stock number.
2. Name and short description of part.

If the appropriate stock number is not available the following shall be specified:

1. Equipment model or type designation, circuit symbol, and item number.
2. Name of part and complete description.
3. Manufacturer's designation.
4. Contractor's drawing and part number.
5. JAN or Navy type number.

SAFETY NOTICE

The attention of officers and operating personnel is directed to Chapter 67 of the BUREAU OF SHIPS MANUAL or superseding instructions on the subject of radio-safety precautions to be observed.

The use of this equipment involves voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working on equipment employing high voltages.

While every practicable safety precaution has been incorporated in ship and shore electronic equipment, the following rules must be strictly observed:

KEEP AWAY FROM LIVE CIRCUITS.

Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustment inside equipment with high voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors. To avoid casualties always remove power and discharge and ground circuits prior to touching them.

DON'T SERVICE OR ADJUST ALONE.

Under no circumstances should any person reach within or enter the enclosure for the purpose of servicing or adjusting the equipment without the immediate presence or assistance of another person capable of rendering aid.

DON'T TAMPER WITH INTERLOCKS.

Do not depend upon door switches or interlocks for protection but always shut down motor generators or other power equipment. Under no circumstances should any access, gate, door, or safety interlock switch be removed, short-circuited, or tampered with in any way, by other than authorized maintenance personnel, nor should reliance be placed upon the interlock switches for removing voltages from the equipment.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR, OR SONAR ENCLOSURE. POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY.

DESTRUCTION OF ABANDONED MATERIAL IN THE COMBAT ZONE

In case it should become necessary to prevent the capture of this equipment, and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper or wood.
4. Grenades and shots from available firearms.
5. Burying all debris, when possible and when time permits.
6. Throwing overboard or disposing of in streams or other bodies of water.

Procedure:

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

DESTROY EVERYTHING!

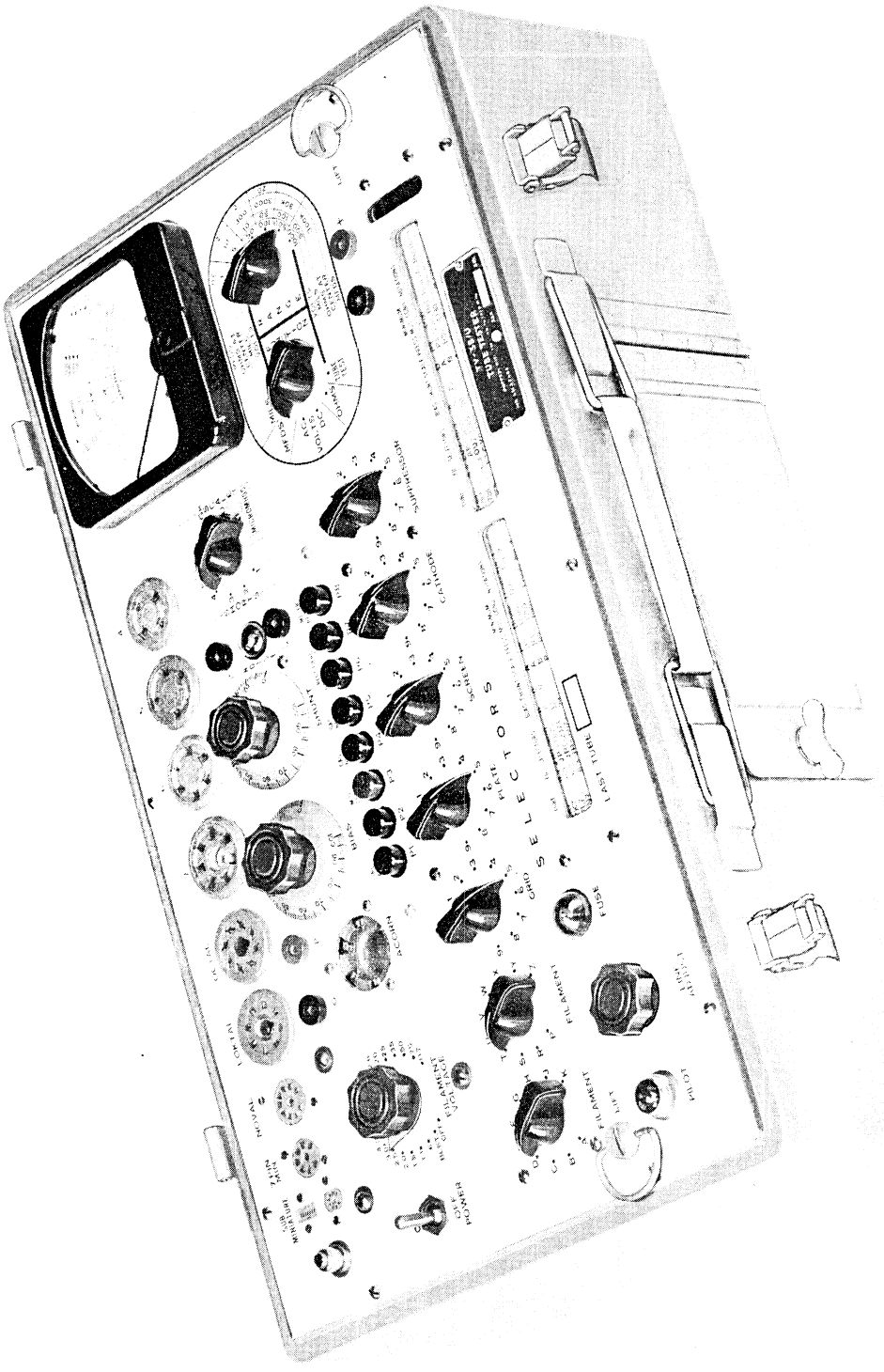


Figure 1-1. Tube Tester TV-3B/U

SECTION 1
GENERAL DESCRIPTION

1. *PURPOSE.*

This handbook is intended for use with the Tube Tester TV-3B/U (see Figure 1-1) described in the following paragraphs and contains information essential to the operation and maintenance of the equipment.

a. GENERAL—Tube Tester TV-3B/U is a portable Tube Tester of the dynamic mutual conductance type designed to test and measure the mutual conductance values of electron tubes of the receiving types and many of the smaller transmitting types. A multimeter section, using the same indicator, is also incorporated in the equipment permitting measurements of ac and dc volts, dc mils, resistance and capacity in the ranges listed in paragraph 2j of this section. The entire equipment is enclosed in an aluminum carrying case with a built-in compartment for accessories and operating or running spare parts. The cover of the case is secured by means of two draw bolts. Two slip hinges permit the removal of the cover if desired. Instruction sheets for the Tube Tester section and the Multimeter section are mounted on the inside surface of the cover for ready reference. A suitable carrying handle is provided. An interlock switch automatically shuts off the equipment when the lid is closed.

2. REFERENCE DATA.

a. Nomenclature: Tube Tester TV-3B/U.

b. Contact Number: NObsr 52672.

c. Contractor: The Hickok Electrical Instrument Co.

d. Cognizant Naval Inspector: Inspector of Naval Material, Cleveland, Ohio.

e. Number of Packages Involved per Complete Shipment of One Equipment Including Equipment Spare Parts: One.

f. Total Cubical Contents Including Equipment Spares:

Crated: 2.8 Cu. Ft.
Uncrated: 1.07 Cu. Ft.

g. Total Weight Including Equipment Spares:

Crated: 52 Lbs.
Uncrated: 35 Lbs.

h. Characteristics of Power Supply Required for Operation: 105 to 125 Volts ac at 50 to 1000 cycles, Single Phase, 75 Watts at 60 cycles minimum.

i. Current Drain: 0.5 Amps.

j. Meter Ranges:

(1) Micromhos: 0 to 3000, 0 to 6000, 0 to 15,000 0 to 30,000

(2) AC and DC Volts: 0 to 5, 0 to 10, 0 to 50, 0 to 100, 0 to 500, 0 to 1000

Sensitivity on all AC ranges 1000 ohms per volt.

Sensitivity on all DC ranges 20,000 ohms per volt.

(3) DC Milliamperes: 0 to 1, 0 to 5, 0 to 10, 0 to 50, 0 to 100, 0 to 500

(4) Resistance:

0 to 1000----------3. ohms center scale
0 to 10,000----------30. ohms center scale
0 to 100,000----------300. ohms center scale
0 to 1 Megohm,-------3000 ohms center scale
0 to 10 Meghoms ---30,000 ohms center scale
0 to 100 Megohms--300,000 ohms center scale

(5) Capacity: 0 to 0.02 Microfarads, 0 to 0.2 Microfarads, 0 to 2 Microfarads, 0 to 20. Microfarads

k. Accuracy:

(1) DC Ranges: Plus or minus 3% of full scale deflection at plus 25 deg. C.

(2) AC Ranges: Plus or minus 5% of full scale deflection at plus 25 deg. C.

(3) Resistance Ranges: Within 3% of full scale arc in degrees at 25 deg. C.

(4) Micromhos: Plus or minus 10% on all ranges.

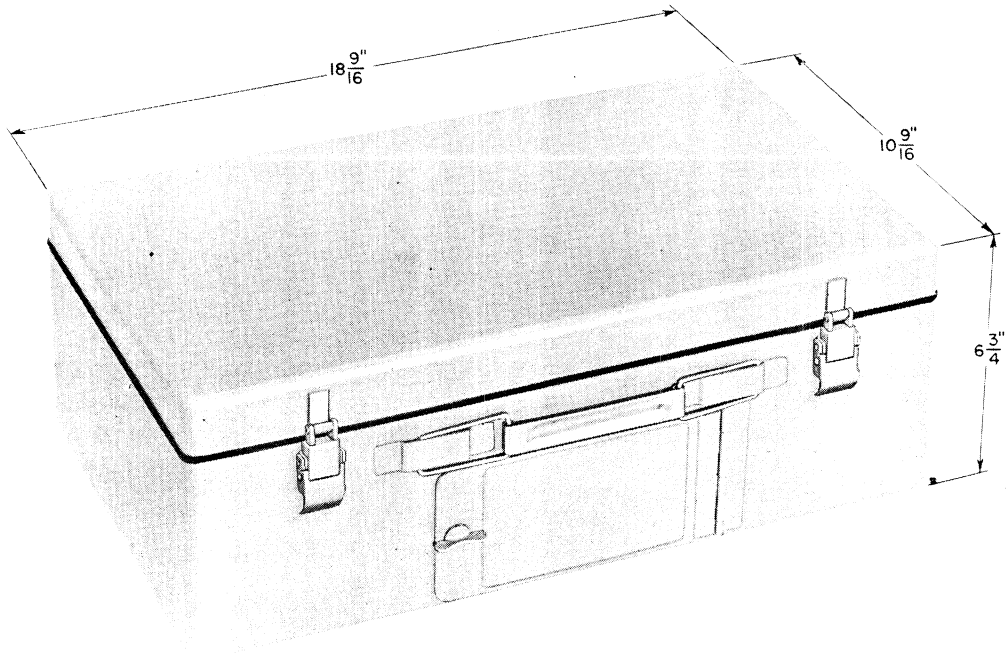


Figure 1-2. Tube Tester TV-3B/U With Cover Closed

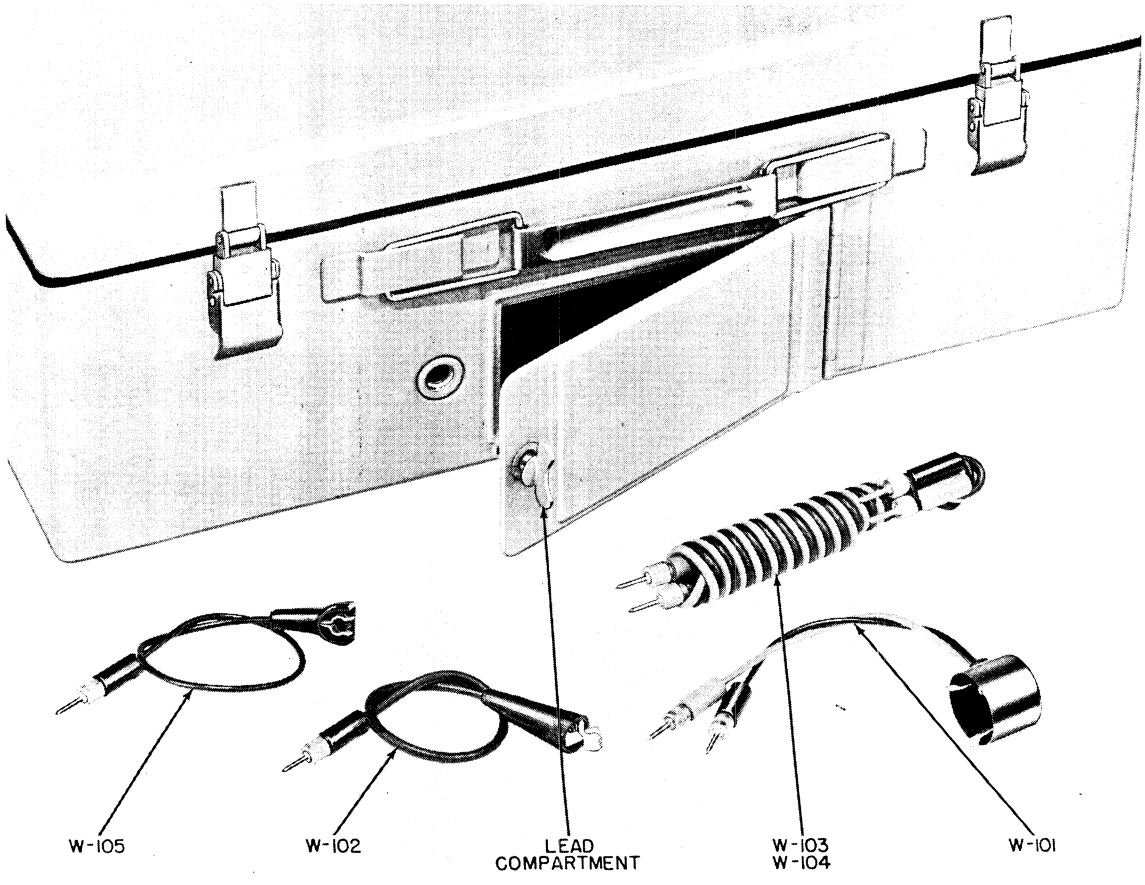


Figure 1-3. Tube Tester TV-3B/U Lead Compartment and Test Leads

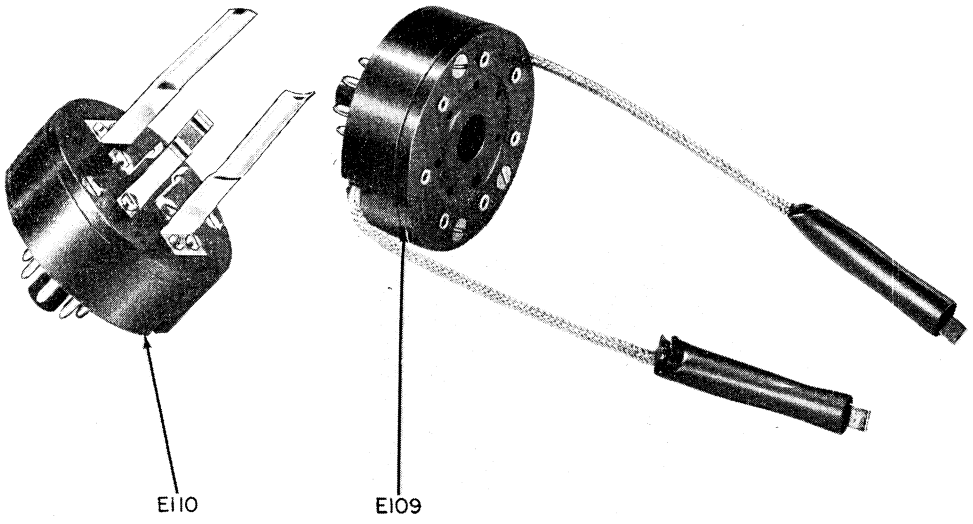


Figure 1-4. Tube Socket Adapters Used With Tube Tester TV-3B/U

3. EQUIPMENT LISTS.

TABLE 1-1. EQUIPMENT SUPPLIED

QUANTITY	DESCRIPTION	ARMY NAVY TYPE DESIG.	SYMBOL DESIG. NATION	OVERALL DIMENSIONS			VOLUME	WEIGHT
				H	W	D		
1	TUBE TESTER	TV-3B/U		6-3/4"	18-9/16"	10-9/16"	.73 Cu. Ft.	23 lbs.
2	INSTRUCTIONS BOOK, NAVSHIPS 91747							
1	LEAD; Grid & Plate, for Lightouse Tubes		W-101					
1	LEAD; Plate Connector		W-102					
1	LEAD; Red Test Prod for Multimeter		W-103					
1	LEAD; Black Test Prod for Multimeter		W-104					
1	LEAD; Grid Connector		W-105					
1	ADAPTER FOR 829A TUBES		E-109					
1	ADAPTER FOR 2C39 TUBES		E-110					
1	*PILOT LAMP		E-102					
1	*FUSE LAMP		E-103					
1	*NEON LAMP		E-101					

*EQUIPMENT SPARES

TABLE 1-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

QUANTITY	NAME OF UNIT	REQUIRED CHARACTERISTICS
	AC Power Source	Capable of supplying 50 to 1000 cycles, 115 volts p/m 10% AC, single phase, sine wave.

4. ELECTRON TUBE COMPLEMENT.

The Tube Tester TV-3B/U includes one each of the following type electron tubes for operation:

ELECTRON TUBE TYPE	QUANTITY
JAN-5Y3GT	1
JAN-83	1

5. DIFFERENCES AND SIMILARITIES IN EQUIPMENT

The TV-3B/U differs from the original TV-3/U Tube Tester and the TV-3A/U as outlined below:

TABLE 1-4. DIFFERENCES IN EQUIPMENT

DIFFERENCES	TV-3B/U	TV-3A/U	TV-3/U
Size of Case.	18-9/16" long x 10-9/16" wide x 6-3/4" deep.	18-3/4" long x 10-7/8" wide x 6-7/8" deep.	16-3/4" long x 10-7/8" wide x 6-7/8" deep.
Lead Compartment.	Located in center of case below carrying handle.	Located in center of case below carrying handle.	Located in end of case.
Meter.	4-1/2" rectangular.	4-1/2" rectangular.	3-1/2" round.
Method of Selecting Micromhos Ranges.	Selection of Micromhos Ranges and Short Test position are accomplished by means of a single rotary switch S-109.	Has separate micromhos switch with ranges marked to correspond with meter scales.	The SHUNT control dial must be adjusted to one of four red dots imprinted in its surface to select the range in MICROMHOS.
Selection of Single Voltage.	Automatically accomplished by setting the combination SHORTS-MICROMHOS Switch S-109 to the desired range.	Automatically accomplished by setting MICROMHOS switch to the desired range.	Selected manually by means of a separate toggle switch.
Meter Reversing Switch.	Push-button type.	Push-button type.	Toggle type.
Interlock Switch.	Opens when cover is closed shutting off power to the equipment.	Opens when cover of equipment is closed shutting off power.	None provided.
AC Power Supply Cable.	Enters through and is stowed in lead compartment.	Enters through and is stowed in lead compartment.	Enters through equipment panel and is stowed in cover.
Sub-Miniature Incline Tube Socket.	Mounted on Panel.	Mounted on panel.	None provided.
Selection of Multimeter Ranges and Functions.	Functional circuits are selected by a separate switch S-114 and Ranges are selected by switch S-113.	Accomplished by means of a single MASTER switch.	Same as TV-3A/U.
Multimeter Ranges AC and DC Volts.	0 to 1000 volts in 6 steps.	0 to 1000 volts in 4 steps.	0 to 1000 volts in 4 steps.
DC Milliamperes.	0 to 500 MA in 6 steps.	0 to 200 MA in 2 steps.	0 to 200 MA in 2 steps.
Resistance.	0 to 100 Megs. in 6 steps.	0 to 100 Megs. in 2 steps.	0 to 100 Megs in 2 steps.
Capacity.	0 to 20 Mfd in 4 steps.	0 to 50 Mfd in 2 steps.	0 to 50 Mfd in 2 steps.
Micromhos Ranges.	0 to 30,000 in 4 steps.	0 to 30,000 in 4 steps.	0 to 15,000 in 3 steps.
Sensitivity of Multimeter Section.	1000 ohms per volt on AC ranges. 20,000 ohms per volt on DC ranges.	1000 ohms per volt on both AC and DC ranges.	1000 ohms per volt on both AC and DC ranges.
Pilot Indicator Light.	Green Jewel.	Red Jewel.	Red Jewel.
Adapter for 829A, 832A and 2C39 Tubes.	Provided as accessories.	None supplied but construction drawings and circuit diagrams were included in instruction book.	None.

In other respects the equipments are similar. They perform the same functions and are equipped with the same accessories.

SECTION 2
THEORY OF OPERATION

1. TUBE TESTER REQUIREMENTS.

a. Electron tubes supplied to the Armed Forces are in nearly all cases procured under either JAN Specifications or other military specifications, which impose rigid controls on the processes of manufacturing, handling, and transportation of the tubes to insure delivery of the highest possible quality tubes to the Services

b. It is necessary however to provide some means of determining the condition of new replacement tubes and also the condition of tubes which have been in service for some time.

c. The TV-3B/U Tester employs the Dynamic Mutual Conductance test method. The mutual conductance of the tube under test is indicated on the meter scale directly in micromhos.

NOTE

The terms mutual conductance and transconductance are used interchangeably. Either term may be defined as the ratio of a small change in plate current to the corresponding change in control grid voltage which produced it. Values of mutual conductance are expressed in Micromhos. The symbol Gm is used to represent mutual conductance or transconductance in various mathematical representations of tube characteristics and their relationships.

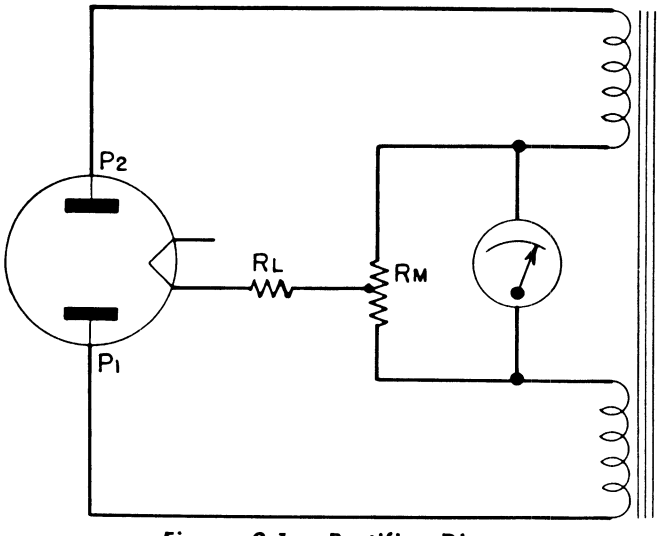


Figure 2-1. Rectifier Diagram Illustrating Theory

d. In addition to the mutual conductance test it is essential that the tube tester provides adequate means of testing for shorted elements and excessive gas content.

e. In the case of tubes of the diode type, tubes having no grid, a straight emission test must be employed rather than the mutual conductance test.

f. Some means of adjusting the voltage input to the tube tester must be provided to maintain the proper test potentials at all elements under varying conditions of line voltage.

2. THEORY OF OPERATION OF TUBE TESTER SECTION. (See figures 2-1 and 2-2)

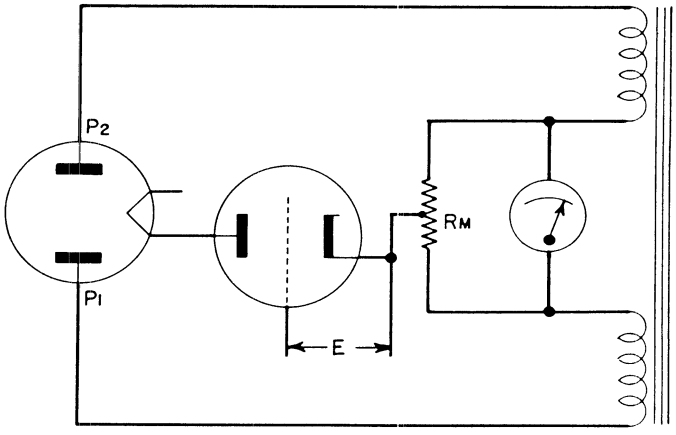


Figure 2-2. Basic Mutual Conductance Circuit Illustrating Theory

a. Examine first the simple full-wave rectifier circuit shown in figure 2-1. The two power transformer secondary windings have their inner ends connected to a direct-current milliammeter. Across the milliammeter is a center-tapped resistor R_M. The load is shown as a resistance R_L, connected between the center tap and the rectifier filament as in any full-wave rectifier circuit. When rectifier plate P_2 is positive, electron flow is through the upper half of R_M, and the meter tends to deflect in one direction. When P_1 is positive, electron flow is through the lower half of R_M, and the meter tends to deflect in the other direction. With the load resistance fixed and equal forces acting on the meter in both cases, the meter stays at zero because it cannot follow variations at the power line frequency.

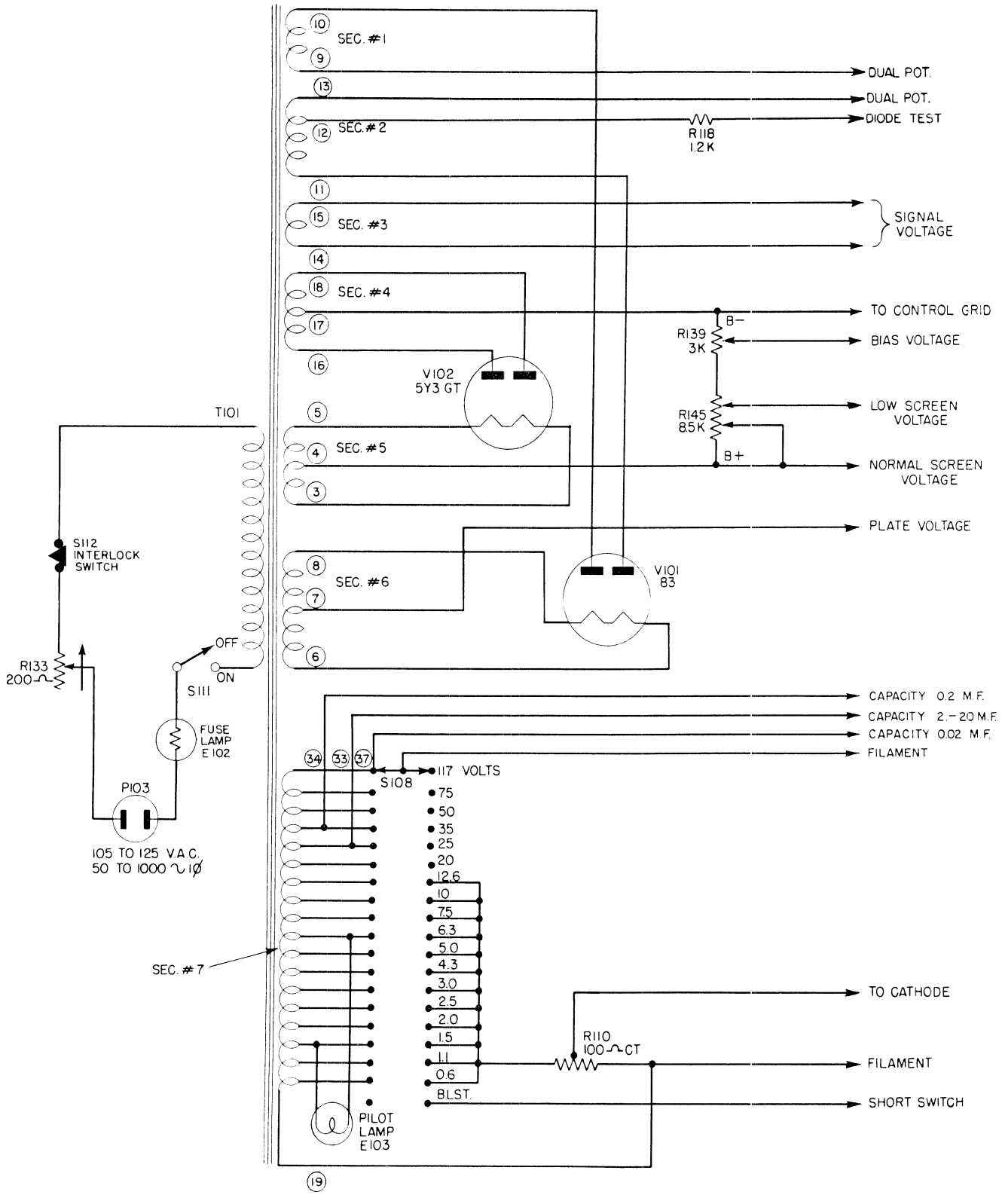


Figure 2-3. Simplified Power Supply Circuit

b. If the electron tube to be tested is substituted for the fixed load resistance, and a fixed bias E is applied to the tube as in figure 2-2, the meter will still read zero because an electron tube under steady-state conditions acts like a fixed resistance.

c. If an ac potential is applied to the grid of the tube under test in addition to the dc bias, the circuit becomes equivalent to that employed for quality and mutual conductance tests in Tube Tester TV3B/U. When this ac potential swings the grid positive, the plate current of the tube is increased, and when the plate-cathode resistance is correspondingly lowered, more current flows through R_M and the deflecting force on the meter is greater than before. When the grid swings negative on the other half-cycle, the resistance of the tube under test is increased and the deflecting force on the meter is less. With unbalanced currents on adjacent half-cycles and consequent unequal forces on the meter, the meter reading becomes porportional to the difference in currents. Since this difference is created by the ac grid potential, the meter indicates the plate-current changes produced by the applied grid voltage change, or in other words, the meter indicates mutual conductance.

3. POWER SUPPLY.
(See Figure 2-3)

a. The power transformer, T-101, is supplied with primary voltage from a 105 to 125 volt 50 to 1000 cycle line through power ON - OFF switch S-111, INTERLOCK SWITCH S-112, LINE ADJUST control R-133, and FUSE lamp E-102. The LINE ADJUST control, when operated in conjunction with the line test circuit, standardizes the voltage across the primary of T-101 at 93 volts. The INTERLOCK SWITCH S-112 will open automatically and shut off the equipment when the lid of the case is closed.

b. Secondary #7 of power transformer T-101 consists of a multi-tapped winding designed to supply the various filament or heater voltages for the tubes under test. Voltages shown on figure 2-3 are measured under load. No load voltages will be somewhat higher. For example: no load voltage measured from point 19 to point 37 will be approximately 121 volts with 93 volts on the primary. Secondary #7 also supplies voltage for rectifier emission tests.

c. Secondaries #1 and #2 supply approximately 154 volts ac to the plates of the type 83 tube V-101, which supplies plate voltage to the tube under test. Secondary #2 is also tapped at 20 volts to supply voltage for diode emission tests.

d. Secondary #6, a center tapped 5 volt winding, supplies filament voltage for the type 83 rectifier tube V-101.

e. Secondary #3 supplies the signal voltage for mutual conductance tests, 5 volts ac. A voltage divider network across this winding also provides signal voltage of 1 volt and 0.5 volt.

f. Secondary #4, 320 volts center tapped, supplies the plates of the screen voltage rectifier V-102, a type 5Y3GT tube, a voltage divider system consisting of BIAS control R-139 and adjustable resistor R-145 across the output of V-102 provide the bias voltage for mutual conductance tests.

g. Secondary #5, 5 volts center tapped, supplies the filament of the type 5Y3 tube, V-102.

4. LINE VOLTAGE TEST.
(See Figure 2-4)

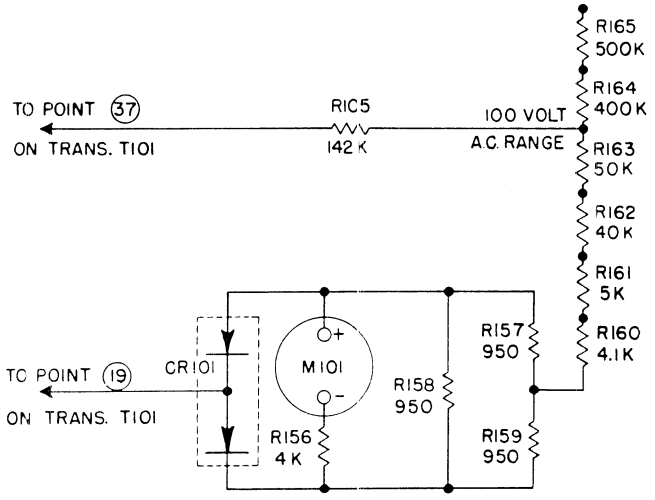


Figure 2-4. Simplified Line Voltage Test Circuit

a. Pressing the LINE ADJ. push button P-1 connects the 100 volt ac range of the multimeter section through series resistor R-105 to points 19 and 37 of the power transformer.

b. The value of series resistor R-105, is such that 121 volts RMS across 19 and 37 of the power supply will cause the METER M-101 to read at LINE TEST.

c. The design of the power transformer T101 is such that 93 volts applied to the primary winding will induce 121 volts across the total secondary #7 winding or across points 19 and 37.

d. Therefore if, with the LINE ADJ. push button P-1 pressed down, the LINE ADJUST CONTROL R132 is turned until the pointer of the METER, M101, is exactly over the LINE TEST mark a standard voltage of 93 volts RMS will be established across the primary winding of T101.

5. SHORT TEST.
(See Figure 2-5 & 2-15)

a. An ac potential of approximately 154 volts RMS from secondary #2 of T101 is applied to voltage divider resistors R-108 and R-107 developing a voltage of approximately 90 volts RMS across R-107. This voltage is applied to the elements of the tube under test through the capacitor C-102 and the neon short test lamp E-101 which is shunted by R-109.

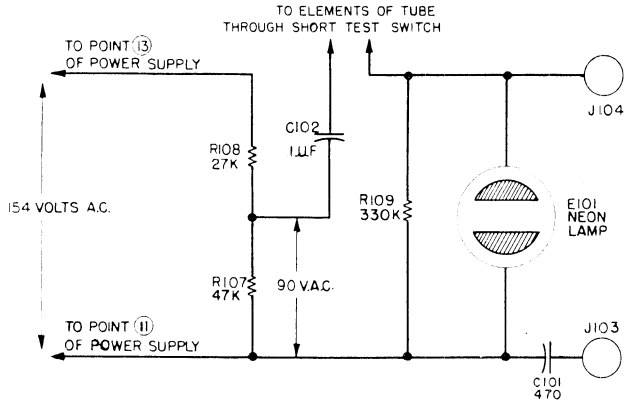


Figure 2-5. Simplified Short Test Circuit

b. Turning the SHORTS test switch S-109 through positions 1, 2, 3, 4, and 5 connects the various elements of the tube under test between the neon lamp E-101 and capacitor C-102. The SELECTORS must, of course, be set correctly for the particular tube. Any shorts between the elements will complete the circuit from capacitor C-102 to the neon E-101 causing it to glow.

6. NOISE TEST.
(See Figure 2-5)

a. The short test circuit may also be used for making a noise test of electron tubes.

b. Connect the NOISE TEST jacks, J-103 and J-104, to the antenna and ground posts of any radio receiver.

c. Turn the SHORTS test switch S-109 through positions 1, 2, 3, 4, and 5, meanwhile tapping the tube under test with a finger, or the eraser on a pencil. Intermittent disturbances between the electrodes too brief to register on the neon lamp will cause a momentary short, permitting the alternating voltage from the power supply to be applied to the neon lamp causing a brief oscillation. This oscillation will be reproduced by the loud speaker or headphones as an audible signal similar to static.

7. RECTIFIER TEST.
(See Figure 2-6)

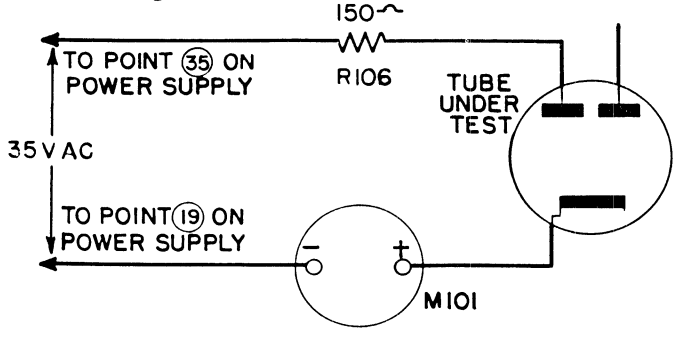


Figure 2-6. Simplified Rectifier Test Circuit

a. Rectifier tubes and diode detector tubes can only be tested for emission. The test circuit is therefore quite simple.

b. Pressing button P-7 applies an ac potential of 35 volts between the cathode and plate of the tube under test through resistor R-106 and the METER M-101 causing the tube to rectify. This test is used for power rectifiers such as the 5Y3 or 83 types.

c. The rectifying action of the tube under test will cause a direct current to flow through the meter. Since the current indicated by the meter is proportional to the electron emission of the tube, the meter reading may be taken as a measure of the tube's efficiency.

d. A line on the meter scale marked RECTIFIER OK indicates the point above which rectifier tubes are considered satisfactory. Tubes reading below this line should be rejected.

e. Pressing the button P-6 sets up a circuit similar to figure 2-6, but a higher voltage is applied, 330 volts ac, for testing rectifiers of the cold cathode type such as the OZ4 type.

f. Pressing button P-2 also establishes a circuit similar to figure 2-6, but a lower voltage, 20 volts ac, is used to protect the delicate cathodes of diode detector types such as the 6H6.

8. MUTUAL CONDUCTANCE TEST.
(See Figure 2-7)

a. The mutual conductance (G_m) of an amplifier-type vacuum tube, also called the grid-plate transconductance, is an expression representing the efficiency of performance of a tube as indicated by the change in plate current ($\triangle I_p$) divided by the change in grid voltage ($\triangle E_g$). The relation is generally written $G_m = i_p/e_g$. The value is expressed in micromhos and is a performance indication because it shows how effective a tube is in converting a small change in grid voltage (grid signal) to a large change in plate current.

b. For the measurement of the mutual conductance value directly, the proper dc grid voltage for the tube under test is supplied by a full-wave rectifier circuit using a 5Y3G, tube V-102. Setting BIAS control potentiometer R-139 at the value called for on the test data roll chart adjusts this negative bias voltage to the correct value for the particular tube under test.

c. Alternating signal voltage from a separate secondary winding (Sec. #3) on the power transformer, T-101, acts in series with the grid bias as required for this type of test. This voltage alternately swings the grid in positive and negative directions from the dc bias value, thereby producing the grid-voltage ($\triangle E_g$) required for a dynamic test.

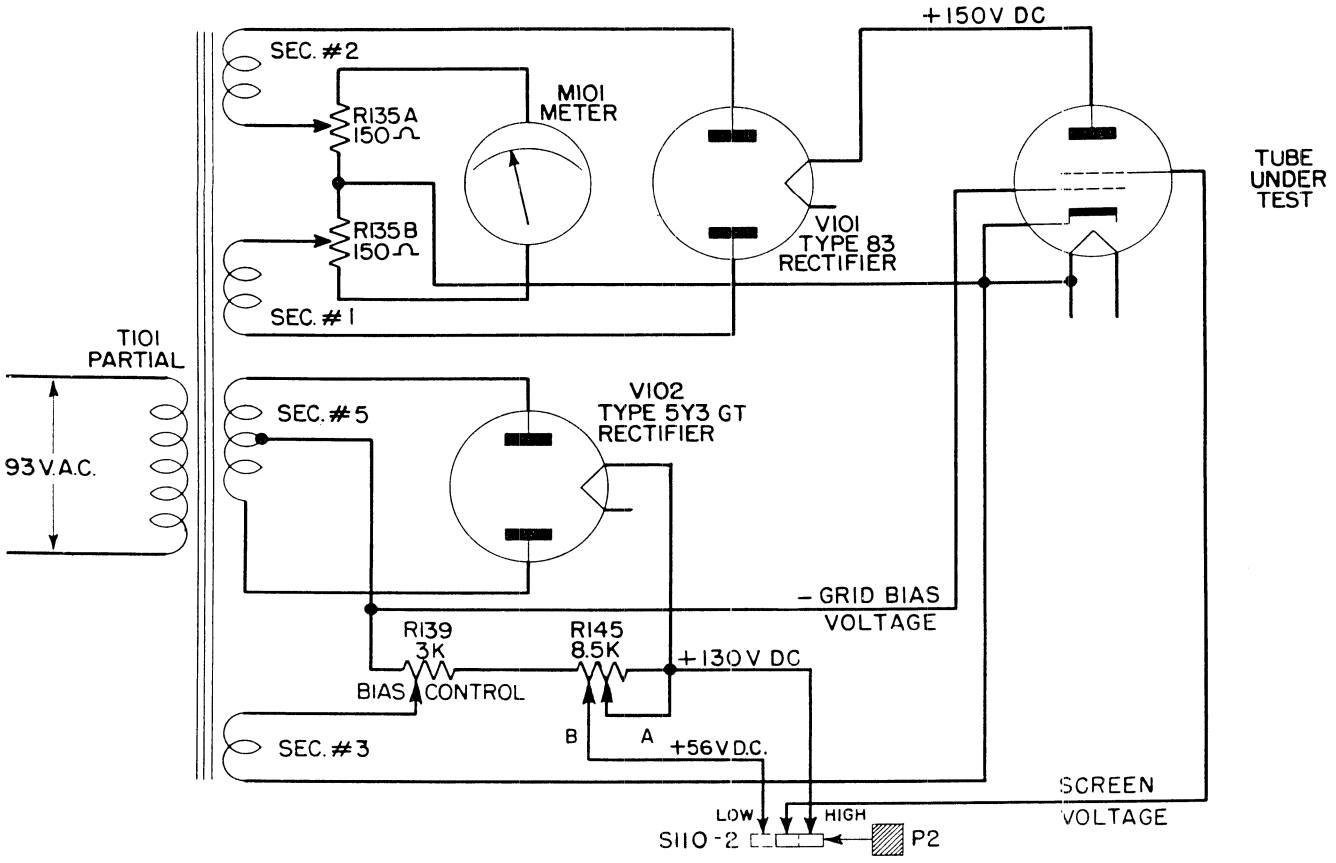


Figure 2-7. Simplified Mutual Conductance Test Circuit

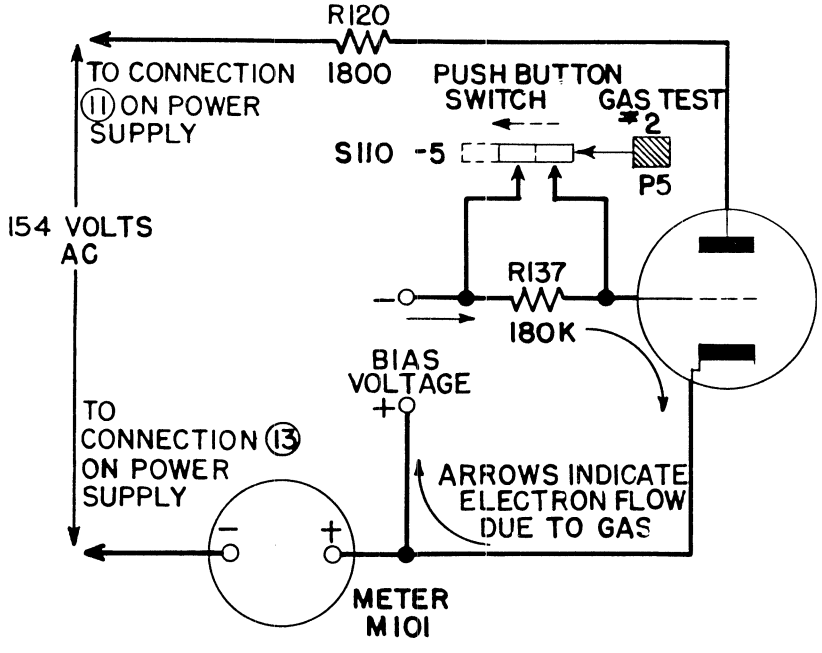


Figure 2-8. Simplified Gas Test Circuit

d. The plate voltage for the tube under test is supplied by another full-wave rectifier circuit, using a type 83 tube, V-101. The return lead contains the meter circuit which serves to measure the plate-current change ($\triangle I_p$).

e. The mutual conductance test circuit is actuated by push-button P-3.

f. The normal screen voltage of 130 volts is excessive for testing certain tubes such as type 1R5. In such cases it is necessary to press push-button P-2 before pressing the red push-button P-3. Pressing P-2 operates switch S-110-2 and reduces the screen voltage to approximately 56 volts as illustrated by Figure 2-7.

9. GAS TEST.
(See Figure 2-8)

a. Pressing GAS-1 push-button P-4 applies definite values of plate voltage and grid bias voltage to the tube under test, causing a definite value of plate current to flow. This current is indicated on the METER M-101.

b. Pressing GAS-2 push-button P-5 inserts a 180,000 ohms resistor, R-137, in the grid circuit. If grid current is flowing from the bias voltage source through the grid circuit to the cathode due to gas in the tube, this current will develop a voltage drop across resistor R-137. This voltage drop will reduce the negative bias on the grid, causing a corresponding increase in the plate current being measured by the METER M-101.

c. If the tube contains gas the pointer of the meter will move up the scale. This increase in meter reading should not exceed one scale division.

10. MULTIMETER SECTION.

a. VOLTS DC (See figure 2-9)

(1) The dc voltmeter circuit consists of the METER M-101 and a series of multiplier resistors, R-148 through R-153. Resistor R-156 raises the basic resistance of the meter circuit to the value necessary for operation in the multimeter circuits.

(2) With the FUNCTION selector switch S-114 in the DC VOLTS position test jacks J-105 and J-106 are connected to the meter circuit through RANGE selector switch S-113 which selects the proper tap in the multiplier resistor series for the voltage to be measured.

(3) The sensitivity on the dc ranges is 20,000 ohms per volt.

b. VOLTS AC (See Figure 2-10)

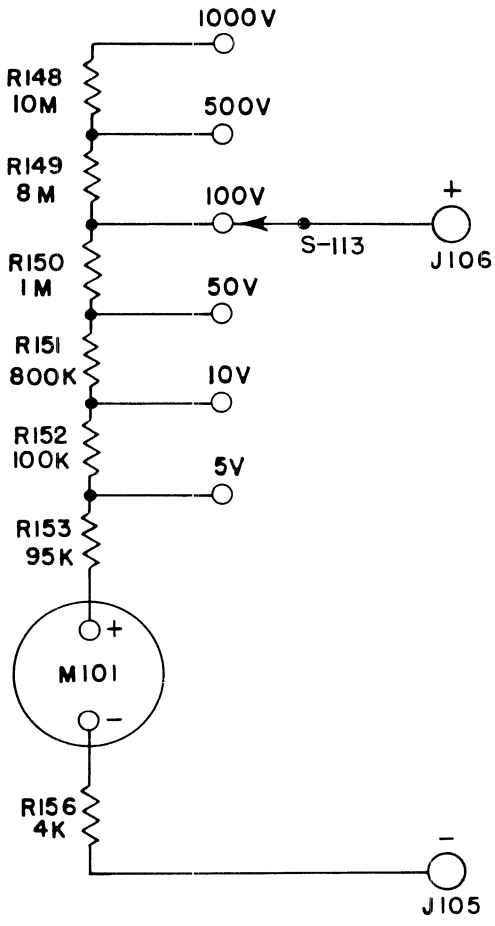


Figure 2-9. Simplified DC Voltmeter Circuit

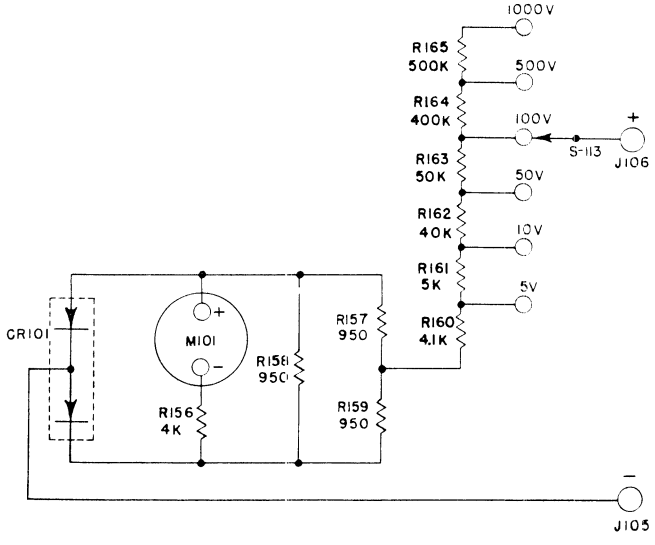


Figure 2-10. Simplified AC Voltmeter Circuit

(1) The circuit for ac voltage measurements consist of the METER M-101, copper oxide rectifier CR-101, and resistors, R-156 through R-159, wired as a bridge circuit as shown in Figure 2-10.

(2) When the FUNCTION selector switch is set at the AC VOLTS position the potential to be measured is connected to the bridge circuit through the RANGE selector switch S-113 which is used to select the proper tap on the series of multiplier resistors, R-160 through R-165.

(3) The sensitivity of the multimeter on the ac ranges is 1000 ohms per volt.

c. OHMS (See Figures 2-11, 2-12 and 2-13)

(1) The low range, 3 OHMS AT CENTER SCALE.

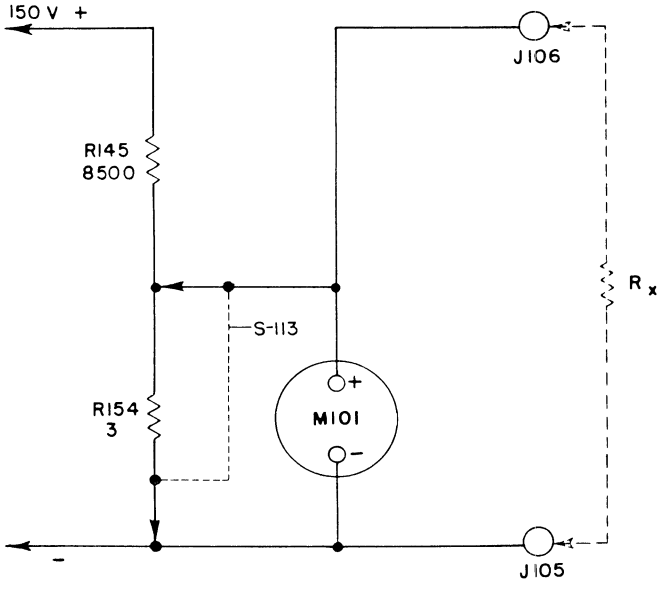


Figure 2-11. Simplified Low Range Ohmmeter Circuit

(a) With the FUNCTION selector set for OHMS and the RANGE selector set for 3 OHMS CENTER SCALE the circuit shown in Figure 2-11 is established.

(b) A potential of approximately 150 volts dc is applied across the series resistors R-145 and R-154. This voltage is adjusted by means of the LINE ADJUST control, R-132, until the pointer rests at full scale over the line marked INF. (infinity).

(c) When an unknown resistance R_X is connected between the test jacks J-105 and J-106 in shunt with the meter M-101, the current through the meter will be reduced causing the pointer to move down scale and indicate the value of R_X in ohms. Resistances up to 1000 ohms may be read on the low scale, however, more accurate readings can always be obtained by selecting a range which will permit taking readings at or close to mid-scale where the markings are more easily read.

(2) The Medium ranges, 30, 300 and 3000 OHMS AT CENTER SCALE.

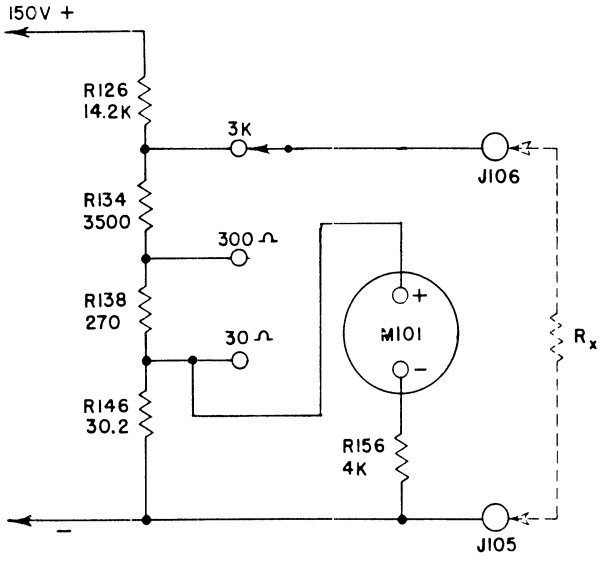


Figure 2-12. Simplified Medium Range Ohmmeter Circuit

(a) The circuit established when the FUNCTION selector is set for OHMS and the RANGE selector is in one of the three medium resistance positions is shown in Figure 2-12.

(b) A dc potential of approximately 150 volts is applied across a voltage divider consisting of R-126, R-134, R-138 and R-146 connected in series.

(c) After setting the RANGE selector S-113 to the desired position the meter is set to INF. using the LINE ADJUST control R-132.

(d) An unknown Resistance R_X connected between the test jacks J-105 and J-106 acts as a shunt across the meter circuit causing the meter to move down scale as a result of decreased current flow and thus indicate the value of R_X on the calibrated scale.

(3) The high resistance ranges 30,000 OHMS AT CENTER SCALE and 300,000 OHMS AT CENTER SCALE.

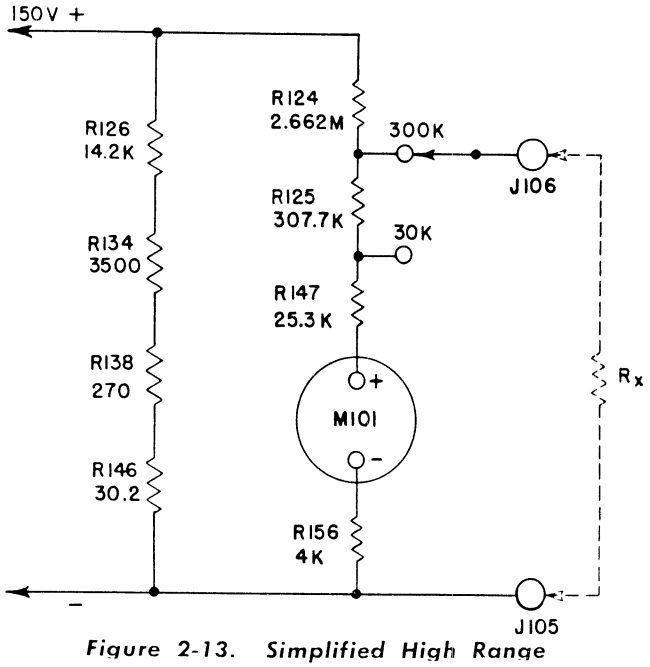


Figure 2-13. Simplified High Range Ohmmeter Circuit

(a) Setting the FUNCTION selector for OHMS and the RANGE selector at either of the high resistance ranges sets up a circuit illustrated by Figure 2-13.

(b) In this case, due to the higher values of resistance to be measured, it is necessary to insert resistors R-124, R-125 and R-147 in series with the meter this series circuit is in turn paralleled by resistors R-126, R-134, R-138 and R-146 also connected in series.

(c) The 150 volt dc potential is applied across this series - parallel network and adjusted to INF. by means of the LINE ADJUST control.

(d) With the RANGE selector set for 30 K OHMS AT CENTER SCALE the unknown resistance R_X, when connected between the test jacks J-105 and J-106, acts as a shunt across R-147, M-101 and R-156 causing the meter to indicate the value of R_X.

(e) On the 300 K OHMS AT CENTER SCALE range R_X shunts R-125 in addition to R-147, M-101 and R-156. On this range values up to 1000 megohms may be read directly on the meter scale.

d. MILLIAMPERES (See Figure 2-14)

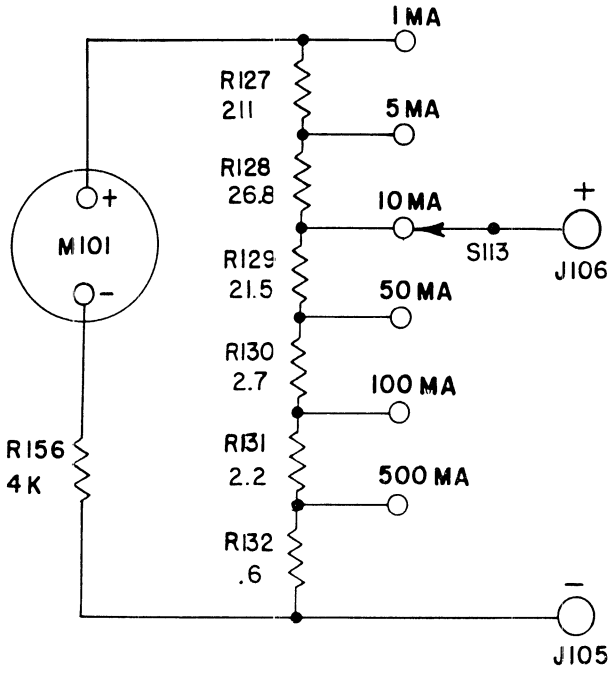


Figure 2-14. Simplified Milliammeter Circuit

(1) When the FUNCTION selector switch is turned to the MILS position the basic circuit illustrated by Figure 2-14 is set up. Meter M-101 in series with resistor R-156 is paralleled by the series of calibrated resistors R-127 through R-132.

(2) Adjustment of the RANGE selector switch applies the current to be measured to the proper tap on the series of resistors.

e. CAPACITY (See Figure 2-15)

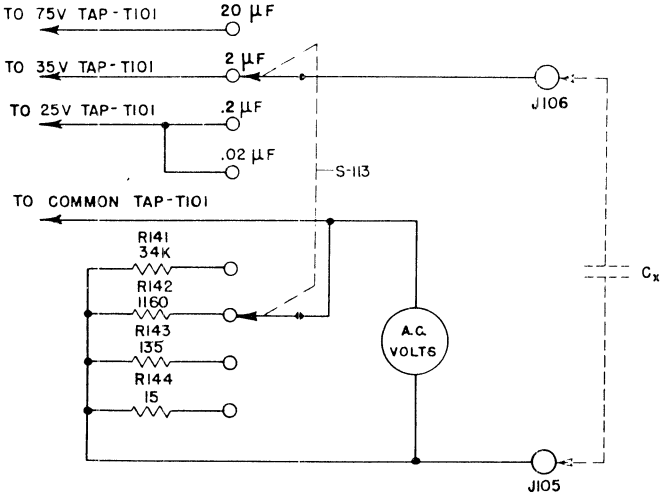


Figure 2-15. Simplified Capacity Meter Circuit

(1) With the FUNCTION selector set at CAP. the test circuit illustrated by Figure 2-15 is established.

(2) Adjustment of the RANGE switch S-113 permits selection of the four ranges of capacity.

(3) A standard ac voltage, determined by the setting of RANGE switch S-113, is applied across the unknown capacity C_X through one of four accurately calibrated resistors R-141, R-142, R-143 or R-144, also selected by the setting of S-113.

(4) The voltage drop across the series resistor, R-141, R-142, R-143 or R-144, is proportional to the reactance of the capacitor under test and is measured by the meter in terms of capacity in microfarads based on a line frequency of 60 cycles.

(5) Due to the fact that the reactance of any capacitor varies with frequency it is necessary to apply corrections to the basic meter readings for line frequencies other than 60 cycles. Refer to Figure 4-4 Conversion Chart For Capacity Measurements At Frequencies Other Than 60 Cycles.

11. FUNCTIONS OF COMPONENT PARTS.

The individual functions of components not specifically referred to in this section as applied to theory of operation will be found in the third column of Table 8-2 Parts and Spare Parts List by Symbol Designation.

12. SPECIAL SWITCHING CIRCUITS.

a. The SELECTOR switches FILAMENT S-107 and S-106, GRID S-105, PLATE S-104, SCREEN S-103, CATHODE S-102 and SUPPRESSOR S-101 are so constructed and interconnected as to eliminate the possibility of applying more than one voltage to any tube pin at the same time or shorting out any voltage by accidental mis-adjustment of the switches. The basic principle of this interlocking circuit is illustrated by Figure 2-16.

b. Conductors from the socket contacts 1 through 9 enter the switching circuit from the left and progress toward the right through the FILAMENT SELECTORS AND the GRID, PLATE, SCREEN, CATHODE and SUPPRESSOR SELECTORS. In order to simplify the illustration only portions of the first four selectors have been shown.

(1) The first FILAMENT SELECTOR is set to apply voltage to pin #1. This switch setting automatically breaks the conductor from pin #1 at point "A" making it impossible for any other voltage to reach pin #1 regardless of where the succeeding selectors are set.

(2) Setting the second FILAMENT SELECTOR to apply voltage to pin #2 breaks the conductor from this pin at point "B" making it impossible for any other voltage to reach pin #2.

(3) With the GRID SELECTOR set to deliver grid voltage to pin #3 the conductor from this pin is broken at point "C" preventing the application of any other voltage to the pin.

(4) Setting the PLATE SELECTOR to deliver plate voltage to pin #4 breaks the conductor from pin #4 at "D".

(5) With the first four SELECTORS set in this manner a condition has been established where filament voltage is applied across pins #1 and #2, grid voltage to pin #3 and plate voltage to pin #4 but the application of any other voltage to these pins is rendered impossible.

c. The operation of the SHORTS switch portion of S-109 is illustrated by figure 2-17 which shows the short test section in the number 1 position. In this position the cathode, filament and suppressor of the tube under test are in contact with segment #1 and the screen, plate and grid are in contact with segment #2. Any short between the elements on segment #1 and those on segment #2 will complete the circuit between points X and Y causing the neon lamp E-101 to glow. Rotating the switch through position 2, 3, 4 and 5 changes the grouping of the elements on the two segments. Different types of shorts will cause the neon lamp to glow on different positions of the switch, e.g. a screen to suppressor short will cause the lamp to glow in all five switch positions while a grid to plate short will only cause a glow on position #4. By referring to the SHORT TEST CHART, TABLE 4-1, the various types of shorts can be readily identified.

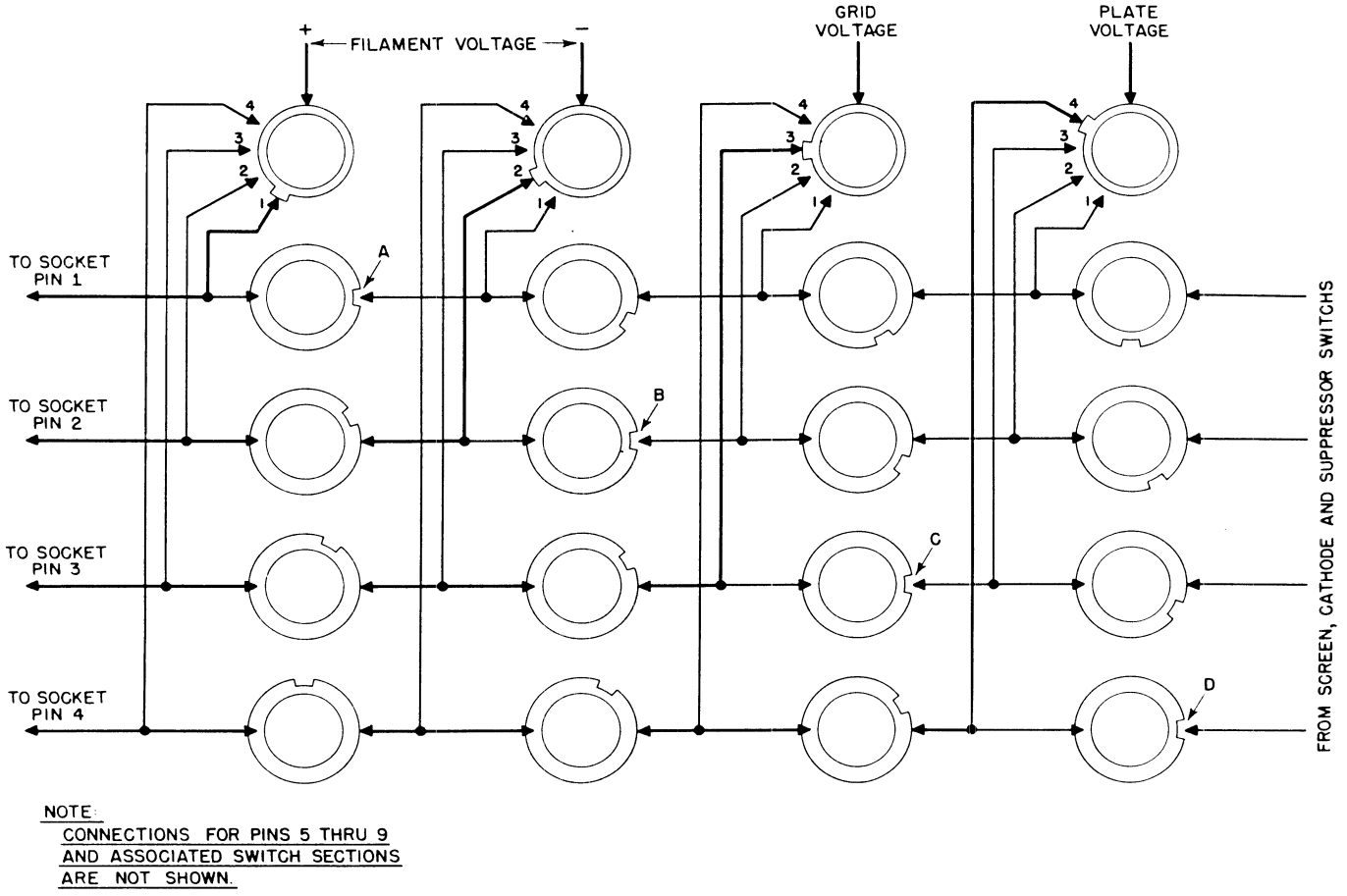


Figure 2-16. Simplified Selector Switch Diagram

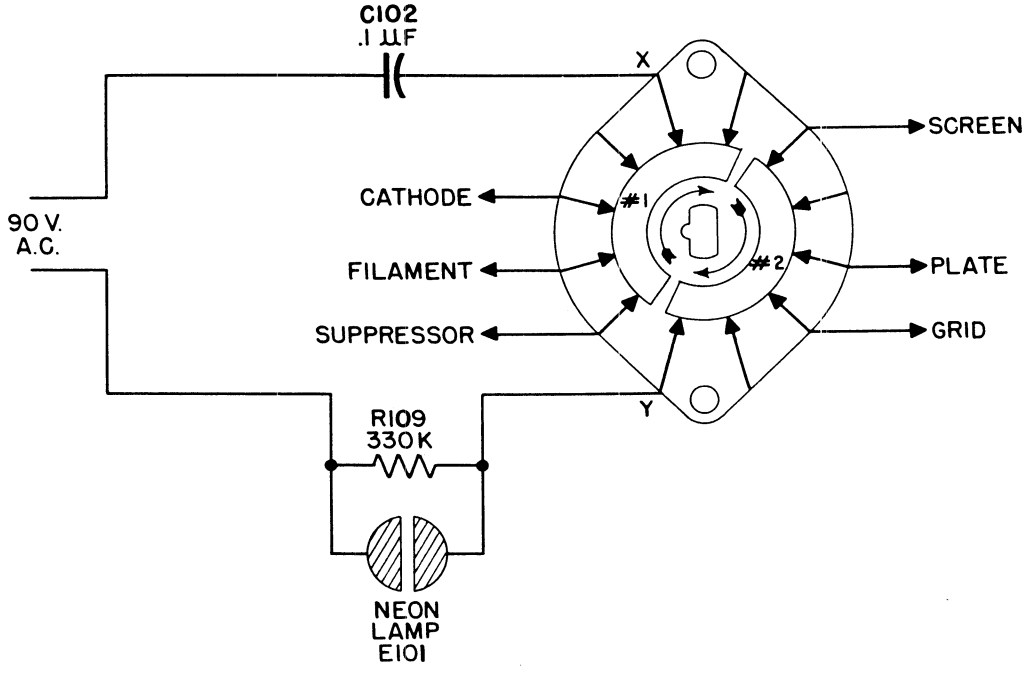


Figure 2-17. Simplified Short Test Switch Diagram

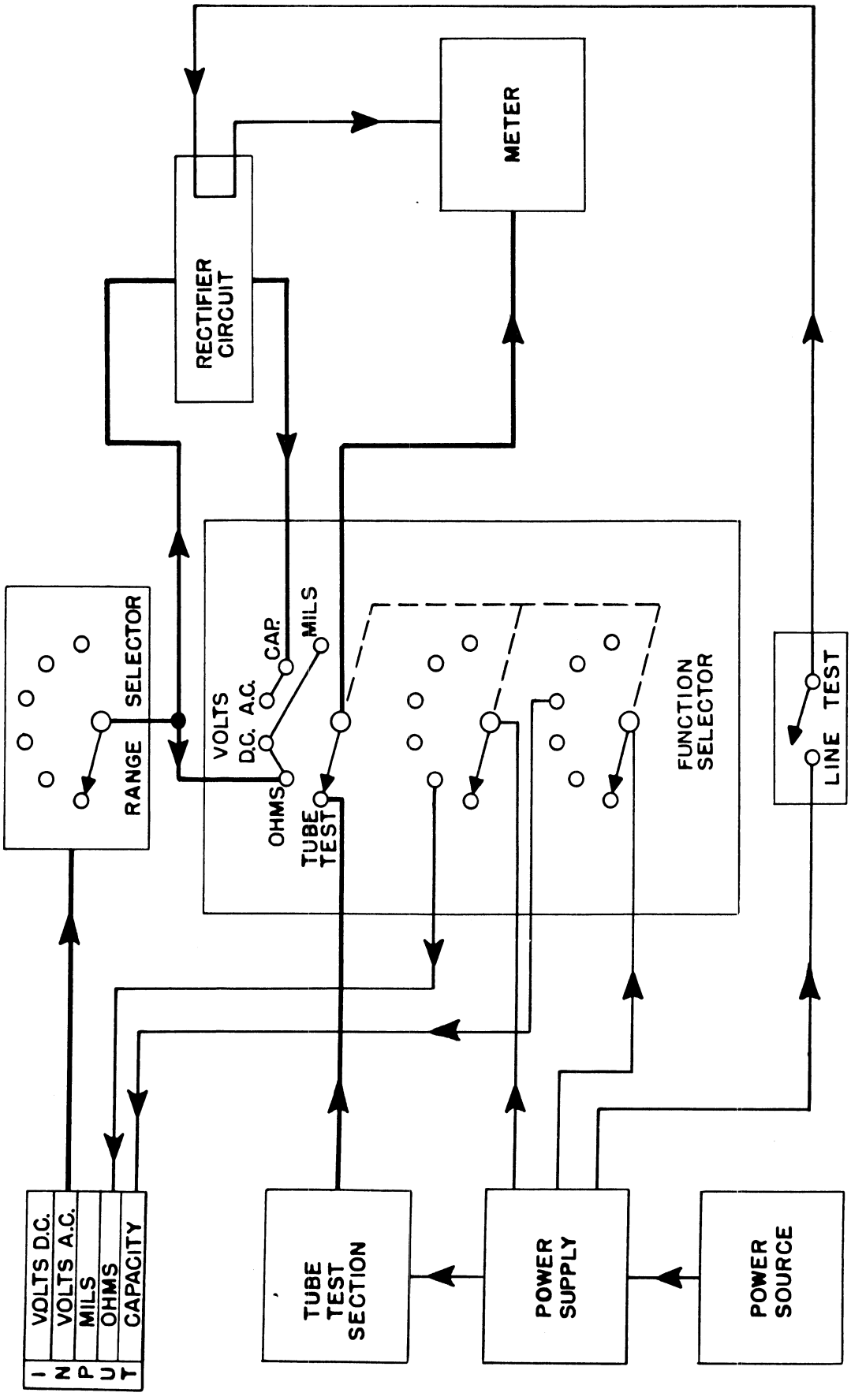


Figure 2-18. Basic Block Diagram of Tube Tester TV-3B/U

SECTION 3
INSTALLATION AND INITIAL ADJUSTMENTS

1. TUBE TESTER SECTION.

a. After carefully removing the TUBE TESTER TV-3B/U from its shipping container, set the Tester up near a 105 to 125 Volt 50-1000 cycle ac outlet.

NEVER CONNECT THIS EQUIPMENT TO A DC POWER SOURCE.

b. Open the cover and uncoil the line cord. Check the FUSE lamp E-102 and the neon lamp E-101 to make sure they are properly seated in their sockets.

c. Open the lead compartment in front of the case and check the lead complement using Table 1-3 and Figure 1-3. In addition to the leads, adapters and line cord, a set of operating spares consisting of one FUSE lamp, one neon lamp, and one pilot lamp is also stowed in this compartment.

d. Plug the line cord into a 105 to 125 volt 50-1000 cycle ac outlet, and throw the POWER switch S-111 to the ON position. The green PILOT indicator I-103 should light. If it does not, unscrew the green jewel cover of indicator I-103 and make sure that the pilot lamp E-103 is properly seated in its socket. Should the indicator still fail to light, check pilot lamp E-103 and the FUSE lamp E-102 for open filaments; and, if necessary, replace from operating spares which will be found in the lead compartment.

e. Press the LINE ADJ. button P-1 and be sure that the pointer of meter M-101 can be set to LINE TEST by turning the LINE ADJUST knob. If this adjustment can be accomplished, the tube tester section is ready for operation. If this adjustment cannot be accomplished refer to section 5, paragraph 1c.

2. MULTIMETER SECTION.

a. With the line cord connected to a 105 to 125 volt 50 to 1000 cycle ac source and the line switch S-111 in the ON position, turn the FUNCTION switch S-114 to the OHMS position. Turn the RANGE switch S-113 to the lowest ohms range.

b. The pointer of the meter M-101 should move up scale to the right.

c. Turn LINE ADJUST knob of R-132 until the pointer rests exactly over the end of the scale marked INF. (infinity.)

d. Insert the red and black Test leads W-103 and W-104 in the test jacks J-105 and J-106 located directly below the FUNCTION and RANGE switches.

e. Short the ends of the test leads together. This should cause the pointer of the meter to return to zero.

f. Repeat the steps outlined in paragraphs 2a through 2e above for the other ohms ranges. If proper meter indications and adjustments are obtained, as in steps "a" through "e" above, on these ranges, the multimeter section is ready for operation.

SECTION 4

OPERATION

IMPORTANT

Read these instructions thoroughly before attempting to operate the Tube Tester TV-3B/U

1. GENERAL.

a. Refer to the photograph of the Tube Tester TV-3B/U, Figure 4-1, or preferably to the tester itself.

(1) The tube sockets are grouped along the top edge and in the upper left hand section of the panel as follows: Along the top edge reading from left to right are test sockets for SUBMINIATURE tubes, 7 PIN MINIATURE tubes, 9 pin NOVAL base miniature tubes, LOKTAL and OCTAL tubes, a combination large and small radius socket for standard 7 pin tubes which also provides a pilot lamp test receptacle and, sockets for standard 6, 5 and 4 pin tubes. An acorn tube socket designed to accomodate all tubes of this type now in use is located at the right of the FILAMENT voltage switch.

(2) For tubes having top grid connections, top plate connections, or both, use grid and plate leads, W-105 and W-102, Figure 1-3. For lighthouse type tubes use W-101, Figure 1-3.

(3) Leads supplied for use with the analyzer section are also illustrated in Figure 1-3. They are red and black test leads 48" long, W-103 and W-104, used for VOLTS-MILS-OHMS and MICROFARADS measurements.

(4) All leads referred to in the preceding paragraphs are kept in the lead compartment in the front of the case, as are the two adapters E-109 and E-110.

(5) The FUSE lamp serves both as a protective fuse and an overload indicator. This lamp will flash brightly when an over-load is placed on the tube tester or the tube under test. When this occurs turn off the equipment immediately. A continued or excessive overload will, of course, burn out the FUSE lamp, and a replacement will be necessary. The PILOT light serves only as a ON - OFF indicator for the equipment.

2. THE CONTROLS.

a. Power input to the TV-3B/U is controlled by the POWER switch, S-111.

b. The LINE ADJUST, R-133, controls the input voltage to the power transformer, T-101, for proper standardization of the tube tester section, and also the resistance and capacity measuring circuits.

c. The FUNCTION switch S-114, located in the lower right hand section of the panel, sets up the proper internal circuit connections for using the TV-3B/U equipment for TUBE TEST, or for testing OHMS, VOLTS (AC or DC), MICROFARADS or MILS in the ranges provided by RANGE switch S-113.

d. INDEX ROLL CHART I-104, located at the bottom of the panel, is operated by a phenolic gear which protrudes through the panel in the lower right hand corner. Appropriate column headings on the panel just above the index window provide easy reference to tube test data printed on the roll chart.

e. The FILAMENT VOLTAGE switch, S-108, provides a selection of filament or heater voltages from 0.6 volts through 117 volts ac in eighteen steps. Another position on this switch, marked BLST., provides for testing ballast tubes. An OFF position is also provided.

f. SELECTORS: FILAMENT S-107, FILAMENT S-106, GRID S-105, PLATE S-104, SCREEN S-103, CATHODE S-102, and SUPPRESSOR S-101 provide proper switching of the internal circuits to apply correct test voltages to the various pins of the tube under test.

g. BIAS control R-139 is used to adjust the bias voltage applied to the tube under test to the proper value.

h. SHUNT control, a dual potentiometer R-135, controls the sensitivity of the meter circuit to the proper level for testing rectifier and diode type tubes.

i. SHORTS-MICROMHOS Switch, S-109, selects the proper range of mutual conductance in micromhos for the tube under test as indicated on the roll chart. When this switch is set in the "A" or SHUNT position the SHUNT potentiometer R-135 is connected into the circuit and must be set as indicated by the chart. This position of the switch is used when testing rectifier and diode type tubes. The letters "A", "B", "C", "D", and "E" at the five positions of the MICROMHOS switch indicate the meter scale on which the reading is to be made In positions "B", "C", "D", and "E" fixed shunt resistors are connected across the meter as required by the four ranges of

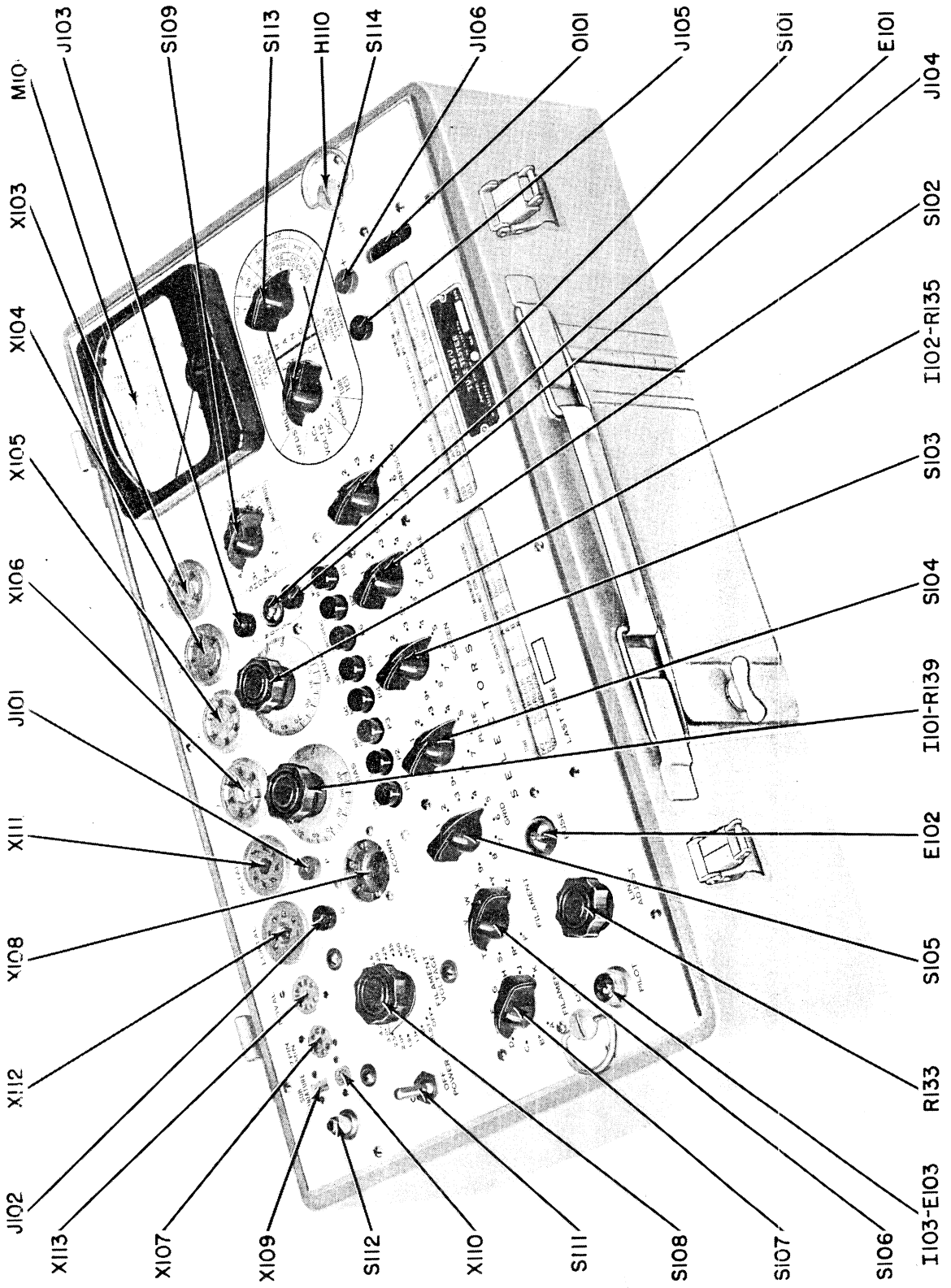


Figure 4-1. Front View of Tube Tester TV-3B/U Showing Controls by Symbol Designation

micromhos. This switch also has five short test positions which connect the various elements of the tube under test to the short test circuit containing the neon indicator lamp E-101.

j. Push button switches located in the center of the panel actuate the final circuit selector switches for the type of test to be made as follows:

(1) P1: LINE ADJUST test button.

(2) P2: Test button for low power diodes such as type 6H6.

(3) P3: RED test button for mutual conductance test of amplifier tubes only. NEVER USE THIS BUTTON WHEN TESTING RECTIFIER TUBES.

(4) P4 and P5: Test buttons for gas test.

(5) P6: Test button for cold cathode rectifiers such as type OZ4.

(6) P7: Test button for rectifiers such as types 5Y3, 6X4, 83 etc.

(7) P8: Test button for reversing polarity of voltage applied to the meter when testing certain types of tubes.

m. METER M101.

(1) The mutual conductance, MICROMHOS, ranges are printed in black and are identified by the small letters "B", "C", "D", and "E" at the right hand end of the scale. These letters correspond with the SCALE letters at the positions of the MICROMHOS switch S-109: Scale "B" 0 to 3000 micromhos, scale "C" 0 to 6000 micromhos, scale "D" 0 to 15,000 micromhos, and scale "E" 0 to 30,000 micromhos.

(2) The "A" scale is for checking rectifiers and diodes, and is used when the MICROMHOS switch is in the SHUNT or "A" position.

(3) The green OHMS scale is read by applying the multiplying factor indicated by the "OHMS AT CENTER SCALE" value selected by the RANGE switch S-113. For example multiply the scale reading by 10 for the 30 ohms center scale position, by 100 for the 300 ohms center scale position etc.

(4) The black VOLTS & MILS scale covers the six dc and ac voltage ranges as well as the six dc milliampere ranges.

(5) The orange MFDS. scale is used in making capacity measurements, and is read in microfarads by applying the multiplying factor indicated by the range in use.

3. TUBE TEST DATA.

a. All information necessary for properly setting the tube test controls for the various tube types is tabulated on the roll chart in nine columns under the following headings, reading from left to right:

(1) TUBE TYPE: All currently available type numbers which the TV-3B/U is designed to test are listed numerically in this column starting with type OOA and continuing through type 38142. Tubes having type letters only instead of numbers, such as XXB, are listed at the end of the numerical listings.

(2) FILAMENT: Correct filament or heater voltages for the tube types listed are shown in this column. FILAMENT VOLTAGE switch must be adjusted accordingly BEFORE inserting a tube in any of the test sockets.

(3) SELECTORS: In this column are listed the correct settings for the two FILAMENT selector switches, and the GRID, PLATE, SCREEN, CATHODE, and SUPPRESSOR selector switches.

The settings follow the same order in which the switches appear on the panel reading from left to right.

(4) BIAS: This column lists the proper settings for the BIAS dial which controls the bias voltage applied to the tube under test.

(5) SHUNT: This column lists the settings for the SHUNT dial, which controls the sensitivity of the meter circuit. Setting of this dial is only required when the MICROMHOS switch is set to the SCALE "A" SHUNT position.

(6) SCALE: In this column are listed the proper settings for the MICROMHOS switch, The letters "A", "B", "C", "D", and "E" also correspond with the meter scale on which readings are to be taken.

(7) PRESS: Under this heading are listed the correct test PUSH BUTTONS to be used for the various tube types and their individual sections in the case of multipurpose tubes.

(8) MUT. COND.: In this column are the MINIMUM, not average, mutual conductance values for amplifier tubes and amplifier sections of multipurpose tubes. Any tube showing a G_m or mutual conductance reading less than the value indicated in this column should be discarded. Clas-

ses of tubes, or sections of multipurpose tubes, other than amplifiers having no mutual conductance rating are indicated in this column by the following designations:

Rect. ---------- Rectifier (power type)
Volt. Reg. ---------- Voltage regulator
Diode ------- Detector type diode rectifier
Thyr. ---------- Thyratron
Eye ---------- Tuning eye

(9) NOTATIONS: Under this heading is listed special information pertaining to particular tube types.

b. The roll chart is divided into left and right hand sections. The left hand section covering the tube type numbers from 00A through 12SA7 and the right hand section covering type numbers from 12SC7 through XXL.

c. All data shown on the roll chart originally accompanying the equipment is also contained in TABLE 4-2 of this section.

4. OPERATIONAL PROCEDURE.

a. When the TV-3B/U is used as a tube tester:

(1) Remove the line cord W-106 from the lead compartment, uncoil and plug it into an outlet supplying 105 and 125 volts ac at 50 to 1000 cycles. NEVER CONNECT THIS EQUIPMENT TO A DC POWER SOURCE.

CAUTION

DO NOT INSERT TUBE IN TEST SOCKET UNTIL CORRECT SETTINGS OF ALL CONTROLS HAVE BEEN MADE IN ACCORDANCE WITH THE FOLLOWING STEPS:

(2) Turn the FUNCTION switch to the TUBE TEST position.

(3) Operate the phenolic gear which turns the roll chart mechanism until the type number of the tube to be tested appears in the window and just above the red index line.

(4) Turn the knob of FILAMENT VOLTAGE switch to the voltage indicated on the chart under FIL.

(5) Set the SELECTORS: The operation of setting these seven KNOBS is somewhat similar to dialing a telephone number. On the roll chart, below the word SELECTORS, are listed the dialing numbers. These numbers consist of two letters and five figures. It is only necessary to turn the knobs of the seven SELECTOR switches, (FILAMENT No. 1, FILAMENT No. 2, GRID, PLATE, SCREEN, CATHODE, and SUPPRESSOR) until the letters and numbers indicated by the pointer knobs are the same, reading from left to right, as those indicated on the roll chart.

EXAMPLE: The roll chart indicates JR-6-2375 under SELECTORS. Starting at the left, turn the knob of the FILAMENT No. 1 SELECTOR switch knob to the letter J. Turn the FILAMENT No. 2 SELECTOR switch knob to the letter R. Turn the GRID SELECTOR knob to the number 6, The PLATE SELECTOR to number 2, SCREEN to No. 3, CATHODE to No. 7 and SUPPRESSOR to No. 5. The sequence of letters and numbers thus selected by the pointer knobs should now be identical with those indicated on the roll chart. (JR 6-2375).

The seven SELECTORS are electrically interconnected in such a way that it is impossible to connect two different voltages to the same tube pin at the same time. Accidental shorts are thus avoided.

(6) Set the BIAS dial to the point indicated on the roll chart under BIAS.

(7) Set the SHUNT dial to the position indicated on the roll chart under SHUNT. If no setting is indicated disregard this operation and proceed with the following adjustments:

(8) Set the SHORTS-MICROMHOS switch to the No. 1 position.

(9) Insert the tube to be tested in the proper test socket and if necessary make top connections to the tube caps by means of test leads W-101, W-102, or W-105 as required.

(10) Throw the POWER toggle switch to the ON position. The PILOT indicator should light.

NOTE

IF THE TUBE IS OF THE HEATER CATHODE TYPE, ALLOW ENOUGH TIME FOR THE CATHODE TO REACH OPERATING TEMPERATURE BEFORE PROCEEDING.

(11) Press the LINE ADJ. Push Button, P1, which will cause the pointer of the METER, M-101, to move up scale to the right.

(12) While still holding down Push Button P1, turn the knob of LINE ADJUST control until the meter pointer rests exactly on the LINE TEST mark at the center of the meter scale. This establishes standard voltages for the tube test circuits.

(13) Turn the SHORTS-MICROMHOS switch from position number 1 through position number 5, mean-

while tapping the tube lightly with a finger or the eraser on a pencil and watching the neon short indicator lamp E-101 on each switch position. Tubes having shorted elements will cause the lamp to glow. Tubes may be tested either hot or cold. A short is indicated by a steady glow on both plates of the neon lamp. A momentary glow when the switch is turned from one position to another should be disregarded, as this flashing is caused by the charging of a condenser in the short test circuit. Intermittent flashing as a result of tapping the tube indicates loose elements which might cause noisy or erratic operation.

Tubes having more than one section such as the 6J6 should be tested for shorts on each section.

A shorted tube should be discarded without further test.

NOTE

Some tubes will show a shorted condition on certain positions of the switch even though they are good tubes. These positions are noted in the "NOTATIONS" column e. g. "SHORT on 1 and 2" means that a short indication on positions 1 and 2 is normal.

(14) LOCATING SHORTED ELEMENTS. In the following table (X) under any SHORT switch position indicates that the neon lamp glows in that position.

TABLE 4-1. SHORT TEST CHART.

KIND OF SHORT		SWITCH POSITION 1	2	3	4	5
SCREEN	TO SUPPRESSOR	X	X	X	X	X
GRID	TO CATHODE	X	X	X		X
FIL.	TO PLATE	X	X		X	X
FIL.	TO GRID	X	X			X
FIL.	TO SCREEN	X		X	X	X
PLATE	TO SUPPRESSOR	X			X	X
GRID	TO SUPPRESSOR	X				X
GRID	TO SCREEN		X	X	X	
PLATE	TO SCREEN		X	X		
FIL.	TO SUPPRESSOR		X			
FIL.	TO CATHODE			X		
GRID	TO PLATE				X	

NOTE

Multi section tubes must be tested for shorts by individual sections. Table 4-1 applies to the elements of these sections.

(15) If the tube passes the short test OK, turn the SHORTS-MICROMHOS switch to the position indicated on the roll chart under the heading SCALE.

(16) Press the test push button indicated on the Roll Chart in the column headed PRESS.

P2 for DIODES.
P3 for mutual conductance test of AMPLIFIERS.
P6 for OZ4 rectifiers.
P7 for standard rectifiers.

NOTE

When testing Voltage Regulator Tubes, Thyratrons, Tuning Eye tubes and other special types the push button to be used may vary with the individual tube type number involved. Always refer to the data chart for the correct button.

(17) With the proper test push switch depressed, the METER will indicate the condition of the tube.

(18) RECTIFIER TUBE TEST: Rectifier tubes, including diode tubes and diode sections of multipurpose tubes, are tested for emission only since they have no mutual conductance characteristic.

CAUTION

NEVER PRESS THE RED MUTUAL CONDUCTANCE PUSH BUTTON P-3 WHEN TESTING RECTIFIER TUBES.

(a) The push button P2 is used when testing detector DIODES. It applies a low voltage which will not injure the delicate cathode. Good diodes will cause the pointer of the METER to indicate on scale "A" above the point marked DIODES OK.

(b) The push button P6 is used when checking cold cathode rectifiers such as the OZ4. This applies a voltage sufficiently high to ionize the tube and start conduction. Good tubes will cause the pointer of the meter to indicate to the right of the line on scale "A" marked RECTIFIERS OK.

(c) The push button P7 is used when testing regular power rectifiers such as the 5Y3. Depressing this button applies a medium voltage which is best suited to reveal defects in this type of tube. Good tubes will read above the line on scale "A" marked RECTIFIERS OK.

(d) For multi-section tubes having more than one diode section, or for full wave power rectifiers, each section must be tested separately as indicated on the Roll Chart.

(e) Push button P8 is used to reverse polarity of the meter when testing the rectifier section of certain tube types such as the 117N7. These types will cause the meter to deflect backwards (to the left) when the normal push button P7 is pressed. It is therefore necessary to hold down P8 and then push P7 to obtain a normal reading.

(19) MUTUAL CONDUCTANCE TEST: In the case of amplifier tubes an emission test is not sufficient, and a mutual conductance test must be employed. Be sure that the controls are properly set in accordance with the Roll Chart as outlined in paragraph 4a(1) through 4a(12) of this section, and also that the tube has been checked for shorts in accordance with paragraphs 4a(13), (14) and (15) of section. Then proceed as follows:

(a) Turn the SHORTS-MICROMHOS switch to the position indicated under the SCALE column heading of the roll chart. This selects the correct range in micromhos 0 to 3000, 0 to 6000, 0 to 15,000 or 0 to 30,000 for the tube under test.

(b) Check the line voltage adjustment as in paragraphs 4a(11) and 4a(12) of this section and reset the LINE ADJUST control if necessary.

(c) Press the amplifier test button P3. The METER will indicate the mutual conductance, G_m, of the tube directly in micromhos on the scale corresponding to the setting of the SHORTS-MICROMHOS switch.

(d) Compare the mutual conductance in micromhos as indicated on the meter with the value shown on the roll chart. Since the figures shown on the chart are the MINIMUM acceptable values of mutual conductance any tube which reads below this value should be rejected and replaced.

(20) RESERVE LIFE TEST: After making the mutual conductance test in the usual manner, press P3 again and turn the FILAMENT VOLTAGE control switch to the next lower voltage position. If the mutual conductance indicated by the METER with this reduced filament voltage applied to the tube, remains within 20% of the original reading, the tube has a large reserve life or cathode emission power. A tube which passes this test will in all probability operate satisfactorily under adverse conditions due to low filament voltage, such as described in Paragraph 4a(25) of this section.

(21) GAS TEST. The push switches P4 and P5 are used to test an amplifier tube for gas content.

(a) Turn the SHORTS-MICROMHOS switch to the position indicated under "SCALE" on the roll chart.

(b) Push button P4 and hold down while adjusting the BIAS dial until the pointer of the meter indicates 100 micromhos on the 0 to 3000 scale.

(c) Hold down P4 and press P5.

(d) If the tube contains gas the pointer of the meter will move UP the scale. If the pointer movement is not more than one division of the scale, the gas content is satisfactory.

NOTE

With some tubes, such as the type 45, the micromhos reading cannot be brought down to 100 micromhos by turning the BIAS dial. In such cases turn the BIAS dial to 100 and test for gas by noting whether the pointer moves more than one division up scale when P4 is held down and P5 is pressed.

(e) Some tubes develop gas after being heated for a period of time. If a tube is suspected, allow it to heat for a few minutes.

(22) TOP CAPS. Two jacks in the upper center of the control panel marked G (grid), J-102, and P (plate), J-101, are used when making connection to the top cap of the tube being tested. On the data chart in the NOTATIONS column, opposite tube types having top caps, is the notation CAP-G or CAP-P. G means that the top cap must be connected to the G jack, and P that it must be connected to the P jack. Test leads W-102 and W-105 are used in making these connections.

(23) NOISE TEST. The short test circuit is also used in making noise tests on electron tubes. Connections are made from the noise test jacks J-103 and J-104 to the antenna and ground posts of any radio receiver. The tube under test is tapped with the finger as the SHORTS-MICROMHOS switch is turned through positions 1-2-3-4-5. Intermittent disturbances, which are too brief to register on the neon lamp, will be reproduced by the loud speaker as static.

(24) PILOT LAMP TEST. The center of the large 7-pin socket is used to check pilot lamps. Set the filament selector switches on JR. Set the filament voltage switch to the proper voltage for the lamp being tested.

(25) SPECIAL TUBE TYPES.

(a) Voltage Regulator tubes are tested by applying a voltage sufficiently high to ionize the gas and cause the tube to conduct. Refer to the roll chart for the proper test button and control settings. The condition of the tube is indicated on the "A" scale of the meter. A good tube will cause the meter to read to the right of the line marked "RECTIFIERS OK".

(b) Thyratrons are tested in the following way: Set the controls as indicated by the roll chart, press the push button indicated and adjust the BIAS control dial until the tube strikes as indicated by a glow between the elements and a sharp rise of the meter pointer. The bias limits between which the tubes should strike are noted on the roll chart. After the tube strikes its condition is read on the "A" scale of the meter as a rectifier.

(c) Tuning Eye tubes are tested by applying suitable standard test voltages to the control elements and noting the resulting effect on the eye. Refer to the roll chart for proper test button and control settings.

(26) TESTING SUB-MINIATURE TUBES.

(a) Sub-miniature tubes of the round type having wire leads instead of pins are tested in the TV-3B/U by means of a special socket X-110, (See Figure 4-1). This socket has 8 contacts, numbers for which are shown by Figure 4-2.

There are several basing arrangements used for these tubes as illustrated by Figure 4-3.

The numbered leads of the tubes are inserted in the corresponding contacts of the socket X-110. A good way to handle the leads is to grasp each lead about 1/8" from its end with the tips of a pair of long nose pliers, and insert the leads in their proper socket contacts.

Sub-miniature type tubes are indentified on the Roll Chart and in Table 4-3 by a star beside the type number. The applicable basing for the various round types is indicated under the column headed NOTATIONS. The basing designation letter refers to the diagram shown in Figure 4-3.

(b) Sub-miniature tubes of the flat or in-line contact type having either pins or leads are tested in the flat socket (X-109 in Figure 4-1) also illustrated by Figure 4-2. The tube pins or leads must be inserted with the dot on the base of the tube directly in line with the small molded dot on the socket.

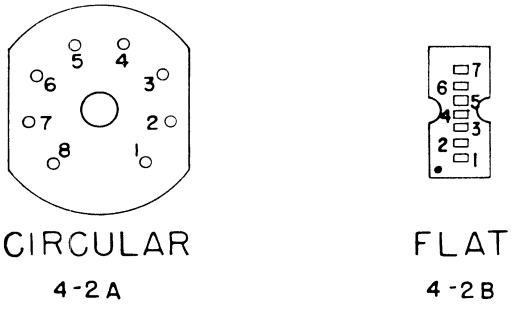


Figure 4-2. Top View of Socket X-109 and X-110

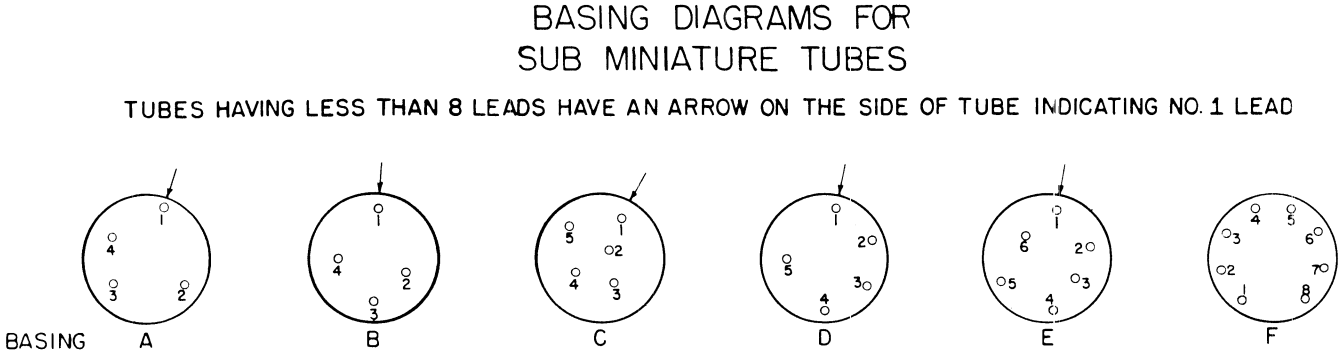


Figure 4-3. Basing Sub-Miniature Tubes **(Bottom View)**

(27) ADAPTERS: Due to special bases or unusual contact arrangement, tube types 829A, 832A and 2C39 cannot be tested directly in the regular test sockets of the TV-3B/U equipment. Tube Socket Adapters E-109 and E-110 are provided for use in testing these tubes.

(28) SPECIAL NOTES. Power line voltage varies in different localities and may also vary somewhat aboard ship.

While a national survey indicates that the average voltage for the U. S. A. is about 117 volts, it does not mean that every locality maintains a constant voltage at that level.

Occasionally there is the complaint that a used tube will test GOOD, but will not work in the equipment; but when a NEW tube is substituted, the equipment will operate correctly. In a case of this kind check the line voltage being supplied to the equipment. The used tube that would not perform may not have been receiving its specified filament voltage, due to low line voltage. The new tube performed because of its initial reserve capacity. The used tube may have performed if it had received its specified filament voltage.

Tube failure frequently occurs in ac - dc sets where several tubes are connected with their heaters or filaments in series. Sometimes, even though the power line voltage is normal, a series tube with abnormally high filament resistance will rob its companion tube of its normal filament voltage. The robbed tube apparently fails; but when tested under specified conditions, the tube will test GOOD.

(29) PRECAUTIONARY NOTES.

(a) DON'T connect the TV-3B/U into a dc power supply line. Be sure the power line to be used supplies 105 to 125 volts ac at a frequency between 50 and 1000 cycles.

(b) DON'T insert a tube in any of the test sockets without first properly adjusting the controls.

(c) DON'T attempt to test tubes for emission, or mutual conductance without first checking for shorted elements.

(d) DON'T press the RED mutual conductance push button P3 when testing rectifier tubes.

(e) DON'T fail to turn off the equipment and return all leads and adapters to the lead compartment when through using it.

TABLE 4-2. TUBE TEST DATA CHART

NOTE: Mutual Conductance values are minimum. Discard tubes which read lower.

Wherever a crosshatch (#) or a double dagger (‡) appears refer to the notations.

★ For Subminiature tube basing diagrams see Fig. 4-3 of instructions.

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
00A	5.0	JR3-2000	33	....	B	P3	420	
01A	5.0	JR3-2000	48	....	B	P3	460	
0A2	BLST	KR0-3020	0	42	A	P4	Volt. Reg.	Read As Rectifier
0A3	.....	JP0-5010	0	67	A	P4	Volt. Reg.	Read As Rectifier
0A4G	.....	KS0-5810	100	87	A	P4	Volt. Reg.	Read As Rectifier
0B2	.....	JP0-5020	0	42	A	P4	Volt. Reg.	Short on 3 Read As Rectifier
0B3	.....	JP0-5010	0	69	A	P4	Volt. Reg.	Read As Rectifier
0C3	.....	JP0-5010	0	65	A	P4	Volt. Reg.	Read As Rectifier
0D3	.....	JP0-5010	0	46	A	P4	Volt. Reg.	Read As Rectifier
0Y4	BLST	JX3-5020	0	50	A	P6	Rect.	Short on 1-2
0Z4	.....	JR0-5070	0	70	A	P6	Rect.	Hold Button Down For 5 Seconds. Plate No. 1
0Z4	.....	JR0-3070	0	70	A	P6	Rect.	Hold Button Down For 5 Seconds. Plate No. 2
0Z4A	.....	JR0-5070	0	70	A	P6	Rect.	Hold Button Down For 5 Seconds. Plate No. 1
0Z4A	.....	JR0-3070	0	70	A	P6	Rect.	Hold Button Down For 5 Seconds. Plate No. 2
1A3	1.5	HT0-2010	0	0	A	P2	Diode	
1A4	2.0	JR0-2300	18	....	B	#	470	Cap = G # Hold Down P2 And Press P3
1A5	1.5	JR5-3400	43	....	B	P3	500	
1A6	2.0	JR0-2504	24	....	B	#	315	Pent. Sect. # Cap = G. Hold Down P2 And Press P3
1A6	2.0	JR4-3502	24	....	B	#	190	Osc. Sect. # Hold Down P2 And Press P3
1A7	1.5	JR0-3465	0	....	B	#	410	Pent. Sect. # Cap = G. Hold Down P2 And Press P3
1A7	1.5	JR5-6430	28	....	B	#	315	Osc. Sect. # Hold Down P2 And Press P3
1AB5	1.1	JR6-2300	0	....	B	P3	900	
1AC5★	1.1	EV2-7800	22	....	B	#	250	F Basing # Hold Down P2 And Press P3
1AD4	1.1	DV4-1200	28	....	B	P3	880	
1AD5★	1.1	EV2-7800	0	....	B	#	410	F Basing # Hold Down P2 And Press P3
1AE4	1.1	DX6-2100	22	....	B	P3	600	
1AF4	1.5	DX6-2100	21	....	B	P3	440	
1AF5	1.5	DX6-5800	0	....	B	#	380	Pent. Sect. # Hold Down P2 And Press P3
1AF5	1.5	HT0-1000	0	0	A	P2	Diode	Diode Sect. OK Over 250 On 3000 Scale
1B3	1.1	JR0-0000	0	67	A	P4	Rect.	Cap = P
1B4	2.0	JR0-2300	18	....	B	#	410	Cap = G # Hold Down P2 And Press P3
1B5	2.0	JR5-2000	23	....	B	P3	360	Triode Sect.
1B5	2.0	BY5-4000	0	0	A	P2	Diode	Diode No. 1
1B5	2.0	JR5-3000	0	0	A	P2	Diode	Diode No. 2
1B7	1.5	JR0-3405	0	....	B	#	570	Pent. Sect. # Cap = G. Hold Down P2 And Press P3
1B7	1.5	JR5-6403	20	....	B	#	440	Osc. Sect. # Hold Down P2 and Press P3
1C3	1.5	DX8-2000	37	....	B	P3	480	
1C5	1.5	JR5-3400	37	....	B	P3	480	
1C6	2.0	JR0-2534	0	....	B	#	410	Ampl. Sect. # Cap = G. Hold Down P2 And Press P3
1C6	2.0	JR4-3520	20	....	B	#	250	Osc. Sect. # Hold Down P2 And Press P3
1C7	2.0	JR0-3465	0	....	B	#	410	Pent. Sect. # Cap = G. Hold Down P2 And Press P3
1C7	2.0	JR5-6430	20	....	B	#	250	Osc. Sect. # Hold Down P2 And Press P3
1C8★	1.1	EV8-6702	45	....	B	P3	250	F Basing
1C21	BLST	JP8-5010	0	85	A	P4	Rect.	
1D5	2.0	JR0-3400	18	....	B	#	470	Cap = G. # Hold Down P2 And Press P3
1D7	2.0	JR0-3465	24	....	B	#	315	Pent Sect. # Cap = G. Hold Down P2 And Press P3
1D7	2.0	JR5-6430	24	....	B	#	190	Osc. Sect. # Hold Down P2 and Press P3
1D8	1.5	JR5-3460	50	....	B	P3	580	Pent. Sect.
1D8	1.5	JR5-6430	11	....	B	P3	360	Triode Sect. Cap = G
1D8	1.5	JR5-7430	0	0	A	P2	Diode	Diode Sect.
1E4	1.5	JR5-3000	37	....	B	P3	520	
1E5	2.0	JR0-3400	18	....	B	#	410	Cap = G # Hold Down P2 And Press P3
1E7	2.0	JR5-6734	10	....	D	P3	900	Pent. No. 1
1E7	2.0	JR4-3765	10	....	D	P3	900	Pent. No. 2

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
1F4	2.0	**JR**3-2400	23	....	**B**	P3	880	
1F5	2.0	**JR**5-3400	23	....	**B**	P3	880	
1F6	2.0	**JR**0-2300	8	....	**B**	#	410	Pent. Sect.
	# Cap = G. Hold Down P2 And Press P3							
1F6	2.0	**JR**0-5300	0	0	**A**	P2	Diode	Diode No. 1
	OK Above 500 On 3000 Scale							
1F6	2.0	**JR**0-4300	0	0	**A**	P2	Diode	Diode No. 2
	OK Above 500 On 3000 Scale							
1F7	2.0	**JR**0-3600	8	....	**B**	#	410	Pent. Sect.
	# Cap = G. Hold Down P2 And Press P3							
1F7	2.0	**JR**0-4630	0	0	**A**	P2	Diode	Diode No. 1
	OK Above 500 On 3000 Scale							
1F7	2.0	**JR**0-5630	0	0	**A**	P2	Diode	Diode No. 2
	OK Above 500 On 3000 Scale							
1G4	1.5	**JR**5-3000	49	....	**B**	P3	520	
1G5	2.0	**JR**5-3400	37	....	**B**	P3	950	
1G6	1.5	**JR**5-6000	16	....	**B**	P3	420	Triode No. 1
1G6	1.5	**JR**4-3000	16	....	**B**	P3	420	Triode No. 2
1H4	2.0	**JR**5-3000	40	....	**B**	P3	570	
1H5	1.5	**JR**0-3000	16	....	**B**	P3	175	Triode Sect. Cap = G
1H5	1.5	**JR**0-5000	0	0	**A**	P2	Diode	Diode Sect.
1H6	2.0	**JR**6-3000	23	....	**B**	P3	360	Triode Sect.
1H6	2.0	**BY**6-5000	0	0	**A**	P2	Diode	Diode No. 1
1H6	2.0	**JR**6-4000	0	0	**A**	P2	Diode	Diode No. 2
1J5	2.0	**JR**5-3400	45	....	**B**	P3	600	
1J6	2.0	**JR**5-6000	15	....	**B**	P3	630	Triode No. 1
1J6	2.0	**JR**4-3000	15	....	**B**	P3	630	Triode No. 2
1L4	1.5	**HT**6-2100	19	....	**B**	P3	650	
1L6	1.5	**DX**6-2518	0	....	**B**	#	410	Pent. Sect.
	# Hold Down P2 And Press P3							
1L6	1.5	**DX**8-1526	28	....	**B**	#	190	Osc. Sect.
	# Hold Down P2 And Press P3							
1LA4	1.5	**JR**6-2300	43	....	**B**	P3	500	
1LA6	1.5	**JR**6-2534	0	....	**B**	#	380	Pent. Sect.
	# Hold Down P2 And Press P3							
1LA6	1.5	**JR**4-3526	32	....	**B**	#	190	Osc. Sect.
	# Hold Down P2 And Press P3							
1LB4	1.5	**JR**6-2300	51	....	**B**	P3	580	
1LB6	1.5	**JR**6-2437	0	....	**B**	P3	250	Heptode Sect.
1LB6	1.5	**JR**6-3574	20	....	**B**	P3	950	Osc. Sect.
1LC5	1.5	**JR**6-2340	0	....	**B**	#	470	# Hold Down
	P2 And Press P3							
1LC6	1.5	**JR**6-2534	30	....	**B**	P3	440	Pent. Sect.
1LC6	1.5	**JR**4-3526	30	....	**B**	P3	240	Osc. Sect.
1LD5	1.5	**JR**6-2300	0	....	**B**	#	380	Pent. Sect.
	# Hold Down P2 And Press P3							
1LD5	1.5	**JR**6-4300	0	0	**A**	P2	Diode	Diode Sect.
	OK Over 500 On 3000 Scale							
1LE3	1.5	**JR**6-2050	0	....	**B**	P3	820	
1LF3	1.5	**JR**6-2050	20	....	**B**	P3	760	
1LG5	1.5	**JR**6-2340	25	....	**B**	P3	660	
1LH4	1.5	**JR**6-2000	16	....	**B**	P3	175	Triode Sect.
1LH4	1.5	**JR**6-4000	0	0	**A**	P2	Diode	Diode Sect.
1LN5	1.5	**JR**6-2340	11	....	**B**	P3	480	
1N5	1.5	**JR**0-3400	11	....	**B**	P3	480	Cap = G
1N6	1.5	**JR**5-3400	43	....	**B**	P3	500	Pent. Sect.
1N6	1.5	**JR**0-6000	0	0	**A**	P2	Diode	Diode Sect.
	OK Over 250 On 3000 Scale							
1P5	1.5	**JR**0-3400	11	....	**B**	P3	500	Cap = G
1Q5	1.5	**JR**5-3400	37	....	**B**	P3	1320	
1Q6★	1.1	**EV**2-7800	0	....	**B**	#	190	F Basing
	# Pent. Sect. Hold Down P2 And Press P3							
1Q6★	1.1	**EV**0-6000	0	0	**A**	P2	Diode	F Basing
	Diode Sect. OK Over 250 On 3000 Scale							
1R4	1.5	**JR**0-4070	0	0	**A**	P2	Diode	
1R5	1.5	**DX**8-2160	0	....	**B**	#	250	No. 1 Grid
	# Hold Down P2 And Press P3							
1R5	1.5	**DX**6-2180	0	....	**B**	#	220	No. 3 Grid
	# Hold Down P2 And Press P3							
1S4	1.5	**DX**1-2800	31	....	**B**	#	950	# Hold Down
	P2 And Press P3							
1S5	1.5	**DX**6-5800	13	....	**B**	#	330	Pent. Sect.
	# Hold Down P2 And Press P3							
1S5	1.5	**DX**0-1800	0	0	**A**	P2	Diode	Diode Sect.
1S6★	1.1	**EV**3-1806	0	....	**B**	#	220	F Basing
	# Pent. Sect. Hold Down P2 And Press P3							
1S6★	1.1	**EV**0-6000	0	0	**A**	P2	Diode	F Basing
	Diode Sect. OK Over 250 On 3000 Scale							
1SA6	1.5	**JR**4-7630	0	....	**B**	#	500	# Hold Down
	P2 And Press P3							
1SB6	1.5	**JR**7-3400	0	....	**B**	#	410	Pent. Sect.
	# Hold Down P2 And Press P3							
1SB6	1.5	**JR**7-5000	0	0	**A**	P2	Diode	Diode Sect.
	OK Over 500 On 3000 Scale							
1T4	1.5	**DX**6-2100	0	....	**B**	#	470	# Hold Down
	P2 And Press P3							
1T5	1.5	**JR**5-3400	45	....	**B**	P3	725	
1T6★	1.1	**EV**3-1860	0	....	**B**	#	125	F Basing.
	# Pent. Sect. Hold Down P2 And Press P3							
1T6★	1.1	**EV**0-6000	0	0	**A**	P2	Diode	F Basing
	Diode Sect. OK Over 250 On 3000 Scale							
1U4	1.5	**DX**6-2100	14	....	**B**	P3	565	
1U5	1.5	**DX**6-2100	34	....	**B**	P3	330	Pent. Sect.
1U5	1.5	**DX**6-8100	0	0	**A**	P2	Diode	Diode Sect.
1U6	1.5	**DX**6-2581	23	....	**B**	P3	470	Heptode Sect.
1U6	1.5	**DX**8-1562	0	....	**B**	P3	315	Osc. Sect.
1V	6.3	**JR**0-2030	0	44	**A**	P7	Rect.	
1V2	0.6	**EV**0-9000	0	25	**A**	P4	Rect.	
1V5★	1.1	**EV**2-7800	24	....	**B**	#	440	F Basing
	*Hold Down P2 And Press P3							
1W4	1.5	**DX**6-2100	49	....	**B**	P3	580	
1W5★	1.1	**EV**2-7800	27	....	**D**	P3	410	F Basing

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
1X2	1.5	JR0-0000	0	70	A	P4	Rect.	Cap=P Short on 3
1Z2	1.5	DS0-0000	0	72	A	P4	Rect.	Cap=P
2A3	2.5	JR3-2000	67	....	C	P3	1900	
2A4	2.5	JR5-3000	#	59	A	P7	Thyr.	
	# Should Strike Between 77 and 67. Read As Rectifier.							
2A5	2.5	JR4-2350	29	....	B	P3	1260	
2A6	2.5	JR0-2050	11	....	B	P3	470	Triode Sect. Cap=G
2A6	2.5	JR0-4050	0	0	A	P2	Diode	Diode No. 1
2A6	2.5	JR0-3050	0	0	A	P2	Diode	Diode No. 2
2A7	2.5	JR0-2365	22	....	B	P3	630	Pent. Sect. Cap=G
2A7	2.5	JR5-4360	30	....	B	P3	250	Osc. Sect.
2B4	2.5	JR3-2040	#	92	A	P4	Thyr.	
	# Should Strike Between 77 and 67. Read As Rectifier.							
2B6	2.5	JR4-2360	15	....	B	P3	950	
2B7	2.5	JR0-2360	30	....	B	P3	630	Pent. Sect. Cap=G
2B7	2.5	JR0-5360	0	0	A	P2	Diode	Diode No. 1
2B7	2.5	JR0-4360	0	0	A	P2	Diode	Diode No. 2
2B22	6.3	JR0-0070	0	46	A	P7	Diode	Cap=P
2B23	6.3	JR0-3070	0	51	A	P6	Rect.	
2C4	2.5	HT1-5080	#	92	A	P4	Thyr.	
	# Should Strike Between 75 and 65. Read As Rectifier.							
2C21	6.3	JR4-5060	38	....	B	P3	860	Triode No. 1
2C21	6.3	JR0-3020	38	....	B	P3	860	Triode No. 2 Cap=G
2C22	6.3	JR0-0070	13	....	C	P3	1900	Upper Cap=G Lower Cap=P
2C26	6.3	JR0-0070	18	....	B	P3	950	Upper Cap=P Lower Cap=G
2C39	6.3	JR6-5070	18	....	E	P3	12600	See Sect. 4. Par. 4a (29)
2C40	6.3	JR0-0070	17	....	C	P3	1760	Cap=P. Ring=G
2C43	6.3	JR0-0070	17	....	C	P3	2800	Cap=P. Ring=G
2C45	7.5	JR3-2000	37	....	B	P3	1380	
2C50	12.6	JX2-1030	41	....	B	P3	1130	Triode No. 1
2C50	12.6	JX4-5060	41	....	B	P3	1130	Triode No. 2
2C51	6.3	KR3-4028	17	....	D	P3	3300	Triode No. 1
2C51	6.3	KR7-6082	17	....	D	P3	3300	Triode No. 2
2C52	12.6	JX4-5061	15	....	B	P3	630	Triode No. 1
2C52	12.6	JX2-1035	15	....	B	P3	630	Triode No. 2
2C53	6.3	JR5-0070	0	....	B	P3	250	Cap=P
2D21	6.3	JR3-6025	#	92	A	P4	Thyr.	
	# Should Strike Between 35 and 25. Read As Rectifier.							
2E5	2.5	JR5-4030	0	100	A	P3	Eye	Eye Open
2E5	2.5	JR5-4230	0	100	A	P3	Eye	Eye Closed
2E22	6.3	JR3-0240	0	....	C	P3	2500	Cap=P
2E24	6.3	JR5-0300	35	....	C	P3	2000	Cap=P Short on 3
2E25	6.3	JR5-0470	0	....	C	P3	1900	Cap=P
2E26	6.3	JR5-0327	37	....	C	P3	2200	Cap=P
2E30	6.3	JR3-5602	20	....	C	P3	1900	
2E31	1.1	DV4-1200	0	....	B	#	250	# Hold Down P2 And Press P3
2E32	1.1	DV4-1200	0	....	B	#	250	# Hold Down P2 And Press P3
2E35	1.1	DV4-1200	18	....	B	#	380	# Hold Down P2 And Press P3
2E36	1.1	DV4-1200	18	....	B	#	380	# Hold Down P2 And Press P3
2E41	1.1	EW5-1200	20	....	B	#	250	Pent. Sect. # Hold Down P2 And Press P3
2E41	1.1	EW0-3000	0	0	A	P2	Diode	Diode Sect. OK Over 150 On 3000 Scale
2E42	1.1	EW5-1200	20	....	B	#	250	Pent. Sect. # Hold Down P2 And Press P3
2E42	1.1	EW0-3000	0	0	A	P2	Diode	Diode Sect. OK Over 150 On 3000 Scale
2V3	2.5	JR0-0000	0	70	A	P4	Rect.	Cap=P
2W3	2.5	HR0-4000	0	0	A	P7	Rect.	
2X2A	2.5	JR0-0000	0	80	A	P4	Rect.	Cap=P
2Z2	2.5	JR0-2000	0	0	A	P7	Rect.	
3A4	2.5	DX8-2100	33	....	B	P3	1260	
3A5	3.0	DX5-6000	32	....	B	P3	1260	Triode No. 1
3A5	3.0	HT1-2000	32	....	B	P3	1260	Triode No. 2
3A8	2.5	JR0-3400	12	....	B	P3	470	Pent. Sect. Cap=G Short on 3
3A8	2.5	JR5-6400	12	....	B	P3	315	Triode Sect. Short on 3
3A8	2.5	JR0-7400	0	0	A	P2	Diode	Diode Sect. Short on 3
3B4	2.5	JV1-7300	55	....	B	P3	1070	Short on 3
3B5	2.5	JR5-3400	60	....	B	P3	950	
3B7	2.5	BY6-7000	25	....	B	P3	950	Triode No. 1
3B7	2.5	JR3-2000	25	....	B	P3	950	Triode No. 2
3B24	2.5	JR0-0000	0	85	A	P4	Rect.	Cap=P Short on 3
3B24	2.5	CR0-0000	0	85	A	P4	Rect.	Cap=P
3B25	2.5	JR0-0000	0	90	A	P4	Rect.	Cap=P
3B28	2.5	JR0-0000	0	90	A	P4	Rect.	Cap=P
3B29	3.0	JR0-0000	0	89	A	P4	Rect.	Cap=P
3C6	2.5	BY5-6000	10	....	B	P3	700	Triode No. 1
3C6	2.5	JR4-3000	10	....	B	P3	700	Triode No. 2
3C22	6.3	JR0-0050	13	....	D	P3	3150	Radiating Fins=P Center Ring=G Short on 3
3C24	6.3	JR0-0000	0	....	B	P3	630	Top Cap=P Side Cap=G
3D6	2.5	JR6-2300	37	....	B	P3	1320	
3E5	2.5	DX6-2150	29	....	B	#	750	# Short On 3 Hold Down P2 And Press P3
3E6	3.0	JR6-2340	15	....	B	P3	1000	
3E29	6.3	JR4-5620	0	....	D	P3	2500	Plate No. 1. See Sect. 4, Par. 4a (29).
3E29	6.3	JR4-7620	0	....	D	P3	2500	Plate No. 2. See Sect. 4, Par. 4a (29).

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
3LE4	2.5	JR6-2374	55	....	B	P3	700	Short on 3
3LF4	2.5	JR6-2300	30	....	B	P3	1200	
3Q4	3.0	HT1-2800	24	....	B	P3	1340	
3Q5	2.5	JR5-3400	38	....	B	P3	1130	
3S4	2.5	HT1-2800	28	....	B	#	940	
	# Hold Down P2 And Press P3							
3V4	3.0	DX6-2100	31	....	B	P3	1040	
4A6	3.0	JR5-6000	16	....	B	P3	630	Triode No. 1
4A6	3.0	BY4-3000	16	....	B	P3	630	Triode No. 2
5A6	5.0	EV7-1603	46	....	C	P3	1900	
5AX4	5.0	HR0-6000	0	35	A	P7	Rect.	Plate No. 1
5AX4	5.0	HR0-4000	0	27	A	P7	Rect.	Plate No. 2
5AZ4	5.0	JS0-4006	0	0	A	P7	Rect.	Plate No. 1
5AZ4	5.0	JS0-6004	0	0	A	P7	Rect.	Plate No. 2
5R4	5.0	HR0-6000	0	17	A	P7	Rect.	Plate No. 1
5R4	5.0	HR0-4000	0	11	A	P7	Rect.	Plate No. 2
5T4	5.0	HR0-6000	0	43	A	P7	Rect.	Plate No. 1
5T4	5.0	HR0-4000	0	34	A	P7	Rect.	Plate No. 2
5U4	5.0	HR0-6000	0	35	A	P7	Rect.	Plate No. 1
5U4	5.0	HR0-4000	0	27	A	P7	Rect.	Plate No. 2
5V4	5.0	HR0-6000	0	59	A	P7	Rect.	Plate No. 1
5V4	5.0	HR0-4000	0	59	A	P7	Rect.	Plate No. 2
5W4	5.0	HR0-6000	0	0	A	P7	Rect.	Plate No. 1
5W4	5.0	HR0-4000	0	0	A	P7	Rect.	Plate No. 2
5X3	5.0	JR0-3000	0	0	A	P7	Rect.	Plate No. 1
5X3	5.0	JR0-2000	0	0	A	P7	Rect.	Plate No. 2
5X4	5.0	JX0-5000	0	35	A	P7	Rect.	Plate No. 1
5X4	5.0	JX0-3000	0	27	A	P7	Rect.	Plate No. 2
5Y3	5.0	HR0-6000	0	0	A	P7	Rect.	Plate No. 1
5Y3	5.0	HR0-4000	0	0	A	P7	Rect.	Plate No. 2
5Y4	5.0	JX0-5000	0	0	A	P7	Rect.	Plate No. 1
5Y4	5.0	JX0-3000	0	0	A	P7	Rect.	Plate No. 2
5Z3	5.0	JR0-3000	0	35	A	P7	Rect.	Plate No. 1
5Z3	5.0	JR0-2000	0	27	A	P7	Rect.	Plate No. 2
5Z4	5.0	HR0-6000	0	57	A	P7	Rect.	Plate No. 1
5Z4	5.0	HR0-4000	0	57	A	P7	Rect.	Plate No. 2
6A3	6.3	JR3-2000	67	....	C	P3	1900	
6A4	6.3	JR3-2400	28	....	B	P3	1260	
6A5	6.3	JR5-3000	67	....	C	P3	1900	
6A6	6.3	JR5-6040	12	....	B	P3	950	Triode No. 1
6A6	6.3	JR3-2040	12	....	B	P3	950	Triode No. 2
6A7	6.3	JR0-2365	22	....	B	P3	630	Pent. Sect. Cap=G
6A7	6.3	JR5-4362	30	....	B	P3	190	Osc. Sect.
6A8	6.3	JR0-3475	22	....	B	P3	630	Pent. Sect. Cap=G
6A8	6.3	JR5-6473	30	....	B	P3	190	Osc. Sect.
6AB4	6.3	JR6-3070	14	....	D	P3	2500	
6AB5	6.3	JR5-4030	0	100	A	P3	Eye	Eye Open
6AB5	6.3	JR5-4230	0	100	A	P3	Eye	Eye Closed
6AB6	6.3	JR5-3470	0	....	B	P3	920	
6AB7	6.3	JR4-7653	0	....	C	P3	2200	
6AB8	6.3	EV9-6837	24	....	C	P3	1750	Pent. Sect.
6AB8	6.3	EV2-1030	35	....	B	P3	500	Triode Sect.
6AC5	6.3	JR5-3070	0	....	B	P3	530	
6AC6	6.3	JR5-3470	0	....	B	P3	1500	
6AC7	6.3	JR4-7653	10	....	D	P3	3800	
6AD4★	6.3	DU2-1050	15	....	D	P3	1325	C Basing
6AD6	6.3	JR4-3570	0	100	A	P3	Eye	Eye 1 Open Eye 2 Closed
6AD6	6.3	JR3-4570	0	100	A	P3	Eye	Eye 2 Open Eye 1 Closed
6AD7	6.3	JR5-3476	29	....	B	P3	1260	Pent. Sect.
6AD7	6.3	JR2-6073	0	....	B	P3	380	Triode Sect.
6AE5	6.3	JR5-3070	68	....	B	P3	750	
6AE6	6.3	JR5-4073	0	....	B	P3	540	Triode No. 1
6AE6	6.3	JR5-3074	0	....	B	P3	470	Triode No. 2
6AE7	6.3	JR6-3074	33	....	B	P3	950	Triode No. 1
6AE7	6.3	JR4-3056	33	....	B	P3	950	Triode No. 2
6AF4	6.3	JR2-3050	36	....	D	P3	2840	
6AF5	6.3	JR5-3070	51	....	B	P3	950	
6AF6	6.3	JR4-3570	0	100	A	P3	Eye	Eye 1 Open Eye 2 Closed
6AF6	6.3	JR3-4570	0	100	A	P3	Eye	Eye 2 Open Eye 1 Closed
6AG5	6.3	JR3-5620	10	....	D	P3	2500	
6AG7	6.3	JR4-7652	10	....	D	P3	3800	
6AH4	6.3	JR2-5070	47	....	C	P3	2840	
6AH5	6.3	JR6-4270	23	....	D	P3	3150	
6AH6	6.3	JR3-5672	10	....	D	P3	3800	
6AH7	6.3	JX5-6040	20	....	D	P3	1510	Triode No. 1
6AH7	6.3	JX2-3010	20	....	D	P3	1510	Triode No. 2
6AJ5	6.3	JR3-5620	12	....	D	#	1730	
	# Hold Down P2 And Press P3							
6AJ7	6.3	JR4-7653	10	....	D	P3	3800	
6AK5	6.3	JR3-5620	10	....	D	P3	2780	
6AK6	6.3	JR3-5672	23	....	B	P3	1320	
6AK7	6.3	JR4-7652	10	....	D	P3	3800	
6AL5	6.3	JR0-7030	0	67	A	P2	Diode	Diode No. 1
6AL5	6.3	JR0-2050	0	67	A	P2	Diode	Diode No. 2
6AL6	6.3	JR5-0470	23	....	C	P3	3150	Cap=P
6AL7	6.3	JR6-3570	Vary	100	A	P3	Eye	Bias Controls Left Pattern
6AL7	6.3	JR5-3470	Vary	100	A	P3	Eye	Bias Controls Both Patterns
6AL7	6.3	JR4-3570	Vary	100	A	P3	Eye	Bias Controls Right Pattern
6AN5	6.3	JR3-5670	0	....	D	#	3800	
	# Hold Down P2 And Press P3							
6AQ5	6.3	JR3-5620	21	....	C	P3	2320	

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
6AQ6	6.3	JR3-7020	6	....	B	P3	725	Triode Sect.
6AQ6	6.3	JR0-6020	0	0	A	P2	Diode	Diode No. 1
6AQ6	6.3	JR0-5020	0	0	A	P2	Diode	Diode No. 2
6AQ7	6.3	JX4-5016	13	....	B	P3	630	Triode Sect.
6AQ7	6.3	JX4-2016	0	35	A	P2	Diode	Diode No. 1
6AQ7	6.3	JX4-3016	0	35	A	P2	Diode	Diode No. 2
6AR5	6.3	JR3-5620	34	....	B	P3	1000	
6AR6	6.3	GX8-3520	34	....	C	P3	3400	
6AS5	6.3	JR2-7630	25	....	D	P3	3530	
6AS6	6.3	JR3-5627	10	....	D	P3	1540	
6AS7	6.3	JX4-5061	100	....	C	P3	1800	Triode No. 1
6AS7	6.3	JX2-1035	100	....	C	P3	1800	Triode No. 2
6AT6	6.3	JR3-7020	18	....	B	P3	750	Triode Sect.
6AT6	6.3	JR0-6020	0	0	A	P2	Diode	Diode No. 1
6AT6	6.3	JR0-5020	0	0	A	P2	Diode	Diode No. 2
6AU5	6.3	JR2-5730	41	....	C	P3	1780	
6AU6	6.3	JR3-5672	10	....	D	P3	2050	
6AV5	6.3	JR2-5730	50	....	C	P3	2450	
6AV6	6.3	JR3-7025	12	....	B	P3	800	Triode Sect.
6AV6	6.3	JR3-6025	0	0	A	P2	Diode	Diode No. 1
6AV6	6.3	JR3-5027	0	0	A	P2	Diode	Diode No. 2
6AW7	6.3	JX1-6020	8	....	B	P3	570	Triode Sect.
6AW7	6.3	JX1-3050	0	65	A	P2	Diode	Diode No. 1
6AW7	6.3	JX1-4020	0	65	A	P2	Diode	Diode No. 2
6AX4	6.3	JX0-5030	0	46	A	P7	Rect.	
6AX5	6.3	JR0-5073	0	0	A	P7	Rect.	Plate No. 1
6AX5	6.3	JR0-3075	0	0	A	P7	Rect.	Plate No. 2
6AX6	6.3	JR0-5070	0	62	A	P7	Rect.	Plate No. 1
6AX6	6.3	JR0-3040	0	62	A	P7	Rect.	Plate No. 2
6B4	6.3	JR5-3000	67	....	C	P3	1900	
6B5	6.3	JR4-2350	0	....	B	P3	950	
6B6	6.3	JR0-3070	15	....	B	P3	470	Triode Sect. Cap=G
6B6	6.3	JR0-5070	0	0	A	P2	Diode	Diode No. 1
6B6	6.3	JR0-4070	0	0	A	P2	Diode	Diode No. 2
6B7	6.3	JR0-2360	30	....	B	P3	630	Pent. Sect. Cap=G
6B7	6.3	JR0-5360	0	0	A	P2	Diode	Diode No. 1
6B7	6.3	JR0-4360	0	0	A	P2	Diode	Diode No. 2
6B8	6.3	JR0-3672	24	....	B	P3	720	Pent. Sect. Cap=G
6B8	6.3	JR0-5672	0	0	A	P2	Diode	Diode No. 1
6B8	6.3	JR0-4672	0	0	A	P2	Diode	Diode No. 2
6BA5★	6.3	EW3-1520	15	....	D	P3	2080	E Basing
6BA6	6.3	JR3-5672	9	....	C	P3	2700	
6BA7	6.3	EV7-9132	17	....	B	P3	470	Ampl. Sect.
6BA7	6.3	EV2-9137	25	....	B	P3	470	Osc. Sect.
6BC5	6.3	JR3-5620	0	....	C	P3	2000	
6BC7	6.3	EV0-8090	0	67	A	P2	Diode	Diode No. 1
6BC7	6.3	EV0-6070	0	67	A	P2	Diode	Diode No. 2
6BC7	6.3	EV0-2010	0	67	A	P2	Diode	Diode No. 3
6BD5	6.3	JR2-5730	18	....	D	P3	3150	
6BD6	6.3	JR3-5672	13	....	D	P3	1260	
6BE6	6.3	JR7-5623	11	....	B	P3	900	Ampl. Sect.
6BE6	6.3	JR3-5627	0	....	B	P3	1000	Osc. Sect.
6BE7	6.3	EV7-1639	29	....	B	P3	630	
6BF5	6.3	JR3-5620	49	....	C	P3	2140	
6BF6	6.3	JR3-7020	18	....	B	P3	1200	Triode Sect.
6BF6	6.3	JR3-6020	0	0	A	P2	Diode	Diode No. 1
6BF6	6.3	JR3-5020	0	0	A	P2	Diode	Diode No. 2
6BF7★	6.3	DW7-8050	22	....	C	P3	1575	F Basing Triode No. 1
6BF7★	6.3	DW2-1040	22	....	C	P3	1575	F Basing Triode No. 2
6BG6	6.3	JR5-0730	18	....	D	P3	3800	Cap=P
6BG7★	6.3	DW7-8050	22	....	C	P3	1575	F Basing Triode No. 1
6BG7★	6.3	DW2-1040	22	....	C	P3	1575	F Basing Triode No. 2
6BH6	6.3	JR3-5627	15	....	B	P3	1260	
6BJ6	6.3	JR3-5627	0	....	C	P3	2400	
6BK6	6.3	JR3-7025	6	....	B	P3	790	Triode Sect.
6BK6	6.3	JR0-6025	0	0	A	P2	Diode	Diode No. 1
6BK6	6.3	JR0-5027	0	0	A	P2	Diode	Diode No. 2
6BK7	6.3	EV7-6089	8	....	D	P3	5350	Triode No. 1
6BK7	6.3	EV2-1039	8	....	D	P3	5350	Triode No. 2
6BL7	6.3	JX2-1030	24	....	D	P3	3150	Triode No. 1
6BL7	6.3	JX4-5060	24	....	D	P3	3150	Triode No. 2
6BN6	6.3	JR2-7536	0	....	B	P3	440	Limiter Grid
6BN6	6.3	JR6-7532	0	....	B	P3	570	Quadrature Grid
6BQ6	6.3	JR5-0470	50	....	C	P3	2800	Cap=P
6BQ7	6.3	EV7-6080	17	....	D	P3	3300	Triode No. 1
6BQ7	6.3	EV2-1030	17	....	D	P3	3300	Triode No. 2
6BT6	6.3	JR3-7020	13	....	B	P3	820	Triode Sect.
6BT6	6.3	JR3-6020	0	35	A	P2	Diode	Diode No. 1
6BT6	6.3	JR3-5020	0	35	A	P2	Diode	Diode No. 2
6BU6	6.3	JR3-7020	34	....	B	P3	940	Triode Sect.
6BU6	6.3	JR3-6020	0	25	A	P2	Diode	Diode No. 1
6BU6	6.3	JR3-5020	0	25	A	P2	Diode	Diode No. 2
6BX6	6.3	EV2-7819	13	....	C	P3	1900	
6BY5	6.3	JR0-5070	0	38	A	P7	Rect.	Plate No. 1
6BY5	6.3	JR0-4020	0	38	A	P7	Rect.	Plate No. 2
6C4	6.3	JR6-3070	24	....	B	P3	1380	
6C5	6.3	JR5-3070	21	....	B	P3	1260	
6C6	6.3	JR0-2354	21	....	B	P3	770	Cap=G
6C7	6.3	JR0-2060	29	....	B	P3	780	Triode Sect. Cap=G
6C7	6.3	JR0-5060	0	0	A	P2	Diode	Diode No. 1
6C7	6.3	JR0-4060	0	0	A	P2	Diode	Diode No. 2
6C8	6.3	JR5-6070	17	....	B	P3	630	Triode No. 1
6C8	6.3	JR0-3040	17	....	B	P3	630	Triode No. 2 Cap=G
6CB6	6.3	JR3-5627	11	....	D	P3	3500	
6CD6	6.3	JR5-0730	42	....	D	P3	4100	Cap=P
6D4	6.3	JR3-7050	#	40	A	P7	Thyr.	

Should Strike Between 75 and 65. Read As Rectifier.

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
6D5	6.3	JR5-3070	57	....	B	P3	1260	
6D6	6.3	JR0-2354	21	....	B	P3	1000	Cap=G
6D7	6.3	JR0-2364	24	....	B	P3	770	Cap=G
6D8	6.3	JR0-3475	22	....	B	P3	630	Pent. Sect. Cap=G
6D8	6.3	JR5-6473	30	....	B	P3	190	Osc. Sect.
6E5	6.3	JR5-4030	0	100	A	P3	Eye	Eye Open
6E5	6.3	JR5-4230	0	100	A	P3	Eye	Eye Closed
6E6	6.3	JR5-6040	54	....	B	P3	880	Triode No. 1
6E6	6.3	JR3-2040	54	....	B	P3	880	Triode No. 2
6E7	6.3	JR0-2364	24	....	B	P3	950	Cap=G
6F4	6.3	JR2-3060	30	....	D	P3	3800	
6F5	6.3	JR0-4072	12	....	B	P3	630	Cap=G
6F6	6.3	JR5-3472	29	....	B	P3	1260	
6F7	6.3	JR0-2365	28	....	B	P3	700	Pent. Sect. Cap=G
6F7	6.3	JR5-4362	28	....	B	P3	315	Triode Sect.
6F8	6.3	JR5-6070	23	....	B	P3	1260	Triode No. 1
6F8	6.3	JR0-3040	23	....	B	P3	1260	Triode No. 2 Cap=G
6G5	6.3	JR5-4030	0	100	A	P3	Eye	Eye Open
6G5	6.3	JR5-4230	0	100	A	P3	Eye	Eye Closed
6G6	6.3	JR5-3470	12	....	D	P3	1450	
6G7S	6.3	JR0-2354	36	....	B	P3	940	Pent. Sect. Cap=G
6G7S	6.3	JR0-6030	0	62	A	P2	Diode	Diode No. 1
6G7S	6.3	JR0-4030	0	62	A	P2	Diode	Diode No. 2
6H4	6.3	JR0-4070	0	62	A	P2	Diode	
6H5	6.3	JR5-4030	0	100	A	P3	Eye	Eye Open
6H5	6.3	JR5-4230	0	100	A	P3	Eye	Eye Closed
6H6	6.3	JR0-5070	0	62	A	P2	Diode	Diode No. 1
6H6	6.3	JR0-3040	0	62	A	P2	Diode	Diode No. 2
6H7M	6.3	JR5-3476	29	....	B	P3	1260	Pent. Sect.
6H7M	6.3	JR0-6073	0	....	B	P3	100	Triode Sect. Cap=G
6J4	6.3	JR3-7020	15	....	D	P3	5700	
6J5	6.3	JR5-3070	22	....	D	P3	1640	
6J6	6.3	JR5-2070	15	....	D	P3	2800	Triode No. 1
6J6	6.3	JR6-3070	15	....	D	P3	2800	Triode No. 2
6J7	6.3	JR0-3475	22	....	B	P3	770	Cap=G
6J8	6.3	JR5-3476	18	....	B	P3	630	Heptode Sect Cap=G
6J8	6.3	JR5-6473	30	....	B	P3	315	Triode Sect.
6K4★	6.3	DU2-1050	31	....	D	P3	2000	C Basing
6K5	6.3	JR0-3070	21	....	B	P3	630	Cap=G
6K6	6.3	JR5-3470	34	....	B	P3	1000	
6K7	6.3	JR0-3475	19	....	B	P3	910	Cap=G
6K8	6.3	JR5-3476	11	....	B	P3	630	Hexode Sect. Cap=G
6K8	6.3	JR5-6473	0	....	C	P3	1500	Triode Sect.
6L4	6.3	JR2-3060	25	....	D	P3	3150	
6L5	6.3	JR5-3070	27	....	B	P3	950	
6L6	6.3	JR5-3472	23	....	D	P3	3150	
6L7	6.3	JR0-3475	23	....	B	P3	410	Cap Grid. Cap=G
6L7	6.3	JR5-3472	27	....	B	P3	410	Pin Grid
6N4	6.3	JR3-5020	18	....	D	P3	3800	
6N5	6.3	JR5-4030	0	100	A	P3	Eye	Eye Open
6N5	6.3	JR5-4230	0	100	A	P3	Eye	Eye Closed
6N6	6.3	JR5-3470	0	....	B	P3	950	
6N7	6.3	JR5-6073	12	....	B	P3	950	Triode No. 1
6N7	6.3	JR4-3076	12	....	B	P3	950	Triode No. 2
6N8	6.3	EV2-6139	17	....	B	P3	1380	Pent. Sect.
6N8	6.3	EV2-7139	0	0	A	P2	Diode	Diode No. 1
6N8	6.3	EV2-8139	0	0	A	P2	Diode	Diode No. 2
6P5	6.3	JR5-3070	29	....	B	P3	910	
6P7	6.3	BT0-4576	28	....	B	P3	700	Pent. Sect. Cap=G
6P7	6.3	BT8-6074	28	....	B	P3	315	Triode Sect.
6Q4	6.3	EV1-9030	0	....	D	P3	6300	Short on 1-2-3-5
6Q5	6.3	JR5-3070	#	92	A	P4	Thyr.	
	# Should Strike Between 60 and 50. Read As Rectifier.							
6Q6	6.3	JR0-3070	17	....	B	P3	630	Triode Sect. Cap=G
6Q6	6.3	JR0-5070	0	0	A	P2	Diode	Diode No. 1
6Q6	6.3	JR0-4070	0	0	A	P2	Diode	Diode No. 2
6Q7	6.3	JR0-3072	17	....	B	P3	500	Triode Sect. Cap=G
6Q7	6.3	JR0-5073	0	0	A	P2	Diode	Diode No. 1
6Q7	6.3	JR0-4073	0	0	A	P2	Diode	Diode No. 2
6R4	6.3	EV1-8030	23	....	C	P3	2500	
6R7	6.3	JR0-3072	18	....	B	P3	1200	Triode Sect. Cap=G
6R7	6.3	JR0-5073	0	0	A	P2	Diode	Diode No. 1
6R7	6.3	JR0-4073	0	0	A	P2	Diode	Diode No. 2
6R8	6.3	EV8-9072	13	....	B	P3	1200	Triode Sect.
6R8	6.3	EV0-1078	0	67	A	P2	Diode	Diode No. 1
6R8	6.3	EV0-6078	0	67	A	P2	Diode	Diode No. 2
6R8	6.3	EV0-2039	0	67	A	P2	Diode	Diode No. 3
6S4	6.3	EV6-9020	17	....	C	P3	2600	
6S7	6.3	JR0-3475	27	....	B	P3	1100	Cap=G
6S8	6.3	JX0-6010	10	....	B	P3	570	Triode Sect. Cap=G
6S8	6.3	JX0-4010	0	0	A	P2	Diode	Diode No. 1
6S8	6.3	JX0-2010	0	0	A	P2	Diode	Diode No. 2
6S8	6.3	JX0-3050	0	0	A	P2	Diode	Diode No. 3
6SA7	6.3	JR7-3465	21	....	B	P3	470	Ampl. Sect.
6SA7	6.3	JR5-3467	21	....	B	P3	470	Osc. Sect.
6SB7	6.3	JR7-3465	16	....	B	P3	470	Ampl. Sect.
6SB7	6.3	JR5-3467	40	....	B	P3	190	Osc. Sect.
6SC7	6.3	JX4-5061	10	....	D	P3	840	Triode No. 1
6SC7	6.3	JX3-1065	10	....	D	P3	840	Triode No. 2
6SD7	6.3	JR4-7653	10	....	D	P3	1900	
6SF5	6.3	JX3-5012	10	....	D	P3	940	
6SF7	6.3	JX1-6432	0	....	B	P3	1260	Pent. Sect.
6SF7	6.3	JX0-5436	0	0	A	P2	Diode	Diode Sect.
6SG7	6.3	JR4-7652	0	....	C	P3	2100	
6SH7	6.3	JR4-7652	0	....	C	P3	2150	
6SJ7	6.3	JR4-7653	20	....	D	P3	1040	
6SK7	6.3	JR4-7653	10	....	D	P3	1260	

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
6SL7	6.3	JX4-5061	7	....	D	P3	1000	Triode No. 1
6SL7	6.3	JX2-1035	7	....	D	P3	1000	Triode No. 2
6SN7	6.3	JX4-5061	22	....	D	P3	1650	Triode No. 1
6SN7	6.3	JX2-1035	22	....	D	P3	1650	Triode No. 2
6SQ7	6.3	JX1-6032	11	....	D	P3	700	Triode Sect.
6SQ7	6.3	JX0-5036	0	0	A	P2	Diode	Diode No. 1
6SQ7	6.3	JX0-4036	0	0	A	P2	Diode	Diode No. 2
6SR7	6.3	JX1-6032	18	....	B	P3	1200	Triode Sect.
6SR7	6.3	JX0-5036	0	0	A	P2	Diode	Diode No. 1
6SR7	6.3	JX0-4036	0	0	A	P2	Diode	Diode No. 2
6SS7	6.3	JR4-7653	19	....	B	P3	1160	
6ST7	6.3	JX1-6032	15	....	B	P3	1200	Triode Sect.
6ST7	6.3	JX0-5036	0	0	A	P2	Diode	Diode No. 1
	OK Above 500 On 3000 Scale							
6ST7	6.3	JX0-4036	0	0	A	P2	Diode	Diode No. 2
	OK Above 500 On 3000 Scale							
6SU7	6.3	JX4-5061	7	....	D	P3	1000	Triode No. 1
6SU7	6.3	JX2-1035	7	....	D	P3	1000	Triode No. 2
6SV7	6.3	JX1-6430	12	....	B	P3	1320	Pent. Sect.
6SV7	6.3	JX1-5430	0	62	A	P2	Diode	Diode Sect.
6SZ7	6.3	JX1-6032	10	....	B	P3	760	Triode Sect.
6SZ7	6.3	JX0-5032	0	0	A	P2	Diode	Diode No. 1
	OK Above 500 On 3000 Scale							
6SZ7	6.3	JX0-4032	0	0	A	P2	Diode	Diode No. 2
	OK Above 500 On 3000 Scale							
6T5	6.3	JR5-4030	0	100	A	P3	Eye	Eye Open
6T5	6.3	JR5-4230	0	100	A	P3	Eye	Eye Closed
6T7	6.3	JR0-3070	17	....	B	P3	630	Triode Sect. Cap=G
6T7	6.3	JR0-5070	0	0	A	P2	Diode	Diode No. 1
6T7	6.3	JR0-4070	0	0	A	P2	Diode	Diode No. 2
6T8	6.3	EV8-9076	11	....	B	P3	760	Triode Sect.
6T8	6.3	EV0-6071	0	67	A	P2	Diode	Diode No. 1
6T8	6.3	EV0-2037	0	67	A	P2	Diode	Diode No. 2
6T8	6.3	EV0-1078	0	67	A	P2	Diode	Diode No. 3
6U4	6.3	JX0-5030	0	56	A	P7	Rect.	
6U5	6.3	JR5-4030	0	100	A	P3	Eye	Eye Open
6U5	6.3	JR5-4230	0	100	A	P3	Eye	Eye Closed
6U6	6.3	JR5-3470	30	....	D	P3	3900	
6U7	6.3	JR0-3475	21	....	B	P3	1000	Cap=G
6U8	6.3	EV2-6370	15	....	B	P3	1420	Pent. Sect.
6U8	6.3	EV9-1080	16	....	C	P3	2840	Triode Sect.
6V3	6.3	EV0-0020	0	51	A	#	Rect.	Cap=P
	# Hold Down P8 And Press P7							
6V4	6.3	EV0-7031	0	0	A	P7	Rect.	Plate No. 1
6V4	6.3	EV0-1037	0	0	A	P7	Rect.	Plate No. 2
6V5	6.3	JX5-3400	31	....	C	P3	2600	
6V6	6.3	JR5-3472	21	....	C	P3	2320	
6V7	6.3	JR0-3070	39	....	B	P3	610	Triode Sect. Cap=G
6V7	6.3	JR0-5070	0	0	A	P2	Diode	Diode No. 1
6V7	6.3	JR0-4070	0	0	A	P2	Diode	Diode No. 2
6V8	6.3	EV6-1038	11	....	B	P3	760	Triode Sect.
6V8	6.3	EV0-9032	0	13	A	P2	Diode	Diode No. 1
6V8	6.3	EV0-7086	0	71	A	P2	Diode	Diode No. 2
6V8	6.3	EV0-2038	0	71	A	P2	Diode	Diode No. 3
6W4	6.3	JX0-5030	0	56	A	P7	Rect.	
6W5	6.3	JR0-5070	0	23	A	P7	Rect.	Plate No. 1
6W5	6.3	JR0-3070	0	23	A	P7	Rect.	Plate No. 2
6W6	6.3	JR5-3470	56	....	C	P3	1900	
6W7	6.3	JR0-3475	22	....	B	P3	770	Cap=G
6X4	6.3	JR0-6070	0	14	A	P7	Rect.	Plate No. 1
6X4	6.3	JR0-3070	0	14	A	P7	Rect.	Plate No. 2
6X5	6.3	JR0-5072	0	23	A	P7	Rect.	Plate No. 1
6X5	6.3	JR0-3072	0	23	A	P7	Rect.	Plate No. 2
6X8	6.3	EV7-9861	9	....	D	P3	2900	Pent. Sect.
6X8	6.3	EV2-3861	15	....	D	P3	2840	Triode Sect.
6Y5	6.3	JR0-5040	0	56	A	P7	Rect.	Plate No. 1
6Y5	6.3	JR0-3040	0	56	A	P7	Rect.	Plate No. 2
6Y6	6.3	JR5-3470	33	....	D	P3	3800	
6Y7	6.3	JR5-6073	15	....	B	P3	630	Triode No. 1
6Y7	6.3	JR4-3076	15	....	B	P3	630	Triode No. 2
6Z4	6.3	JR0-3040	0	35	A	P7	Rect.	Plate No. 1
6Z4	6.3	JR0-2040	0	35	A	P7	Rect.	Plate No. 2
6Z5	12.6	JS0-5040	0	20	A	P7	Rect.	Plate No. 1
6Z5	12.6	JS0-3040	0	20	A	P7	Rect.	Plate No. 2
6Z7	6.3	JR5-6070	0	....	B	P3	760	Triode No. 1
6Z7	6.3	JR4-3070	0	....	B	P3	760	Triode No. 2
6ZY5	6.3	JR0-5070	0	9	A	P7	Rect.	Plate No. 1
6ZY5	6.3	JR0-3070	0	9	A	P7	Rect.	Plate No. 2
7A4	6.3	JR6-2070	22	....	D	P3	1640	
7A5	6.3	JR6-2370	25	....	D	P3	3800	
7A6	6.3	JR0-6075	0	62	A	P2	Diode	Diode No. 1
7A6	6.3	JR0-3025	0	62	A	P2	Diode	Diode No. 2
7A7	6.3	JR6-2374	27	....	B	P3	1100	
7A8	6.3	JR6-2574	24	....	B	P3	630	Ampl. Sect.
7A8	6.3	JR4-3576	26	....	B	P3	315	Osc. Sect.
7AB7	6.3	HS5-3140	10	....	B	P3	1140	
7AD7	6.3	JR6-2374	0	....	D	P3	3900	
7AF7	6.3	JR5-6070	21	....	C	P3	1640	Triode No. 1
7AF7	6.3	JR4-3020	21	....	C	P3	1640	Triode No. 2
7AG7	6.3	JR6-2374	0	....	C	P3	1900	
7AH7	6.3	JR6-2374	0	....	C	P3	2100	
7AJ7	6.3	JR6-2374	0	....	D	P3	1430	
7AK7	6.3	JR6-2374	0	....	C	P3	2500	
7B4	6.3	JR6-2070	10	....	D	P3	940	
7B5	6.3	JR6-2370	34	....	B	P3	1000	
7B6	6.3	JR3-2070	11	....	D	P3	700	Triode Sect.
7B6	6.3	JR0-6072	0	0	A	P2	Diode	Diode No. 1
7B6	6.3	JR0-5072	0	0	A	P2	Diode	Diode No. 2
7B7	6.3	JR6-2374	27	....	B	P3	1070	

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
7B8	6.3	JR6-2574	18	....	B	P3	950	Pent. Sect.
7B8	6.3	JR4-3576	18	....	B	P3	410	Osc. Sect.
7C4	6.3	JR0-4070	0	51	A	P2	Diode	
7C5	6.3	JR6-2370	30	....	C	P3	1900	
7C6	6.3	JR3-2070	10	....	B	P3	380	Triode Sect.
7C6	6.3	JR0-6072	0	0	A	P2	Diode	Diode No. 1
7C6	6.3	JR0-5072	0	0	A	P2	Diode	Diode No. 2
7C7	6.3	JR6-2374	22	....	B	P3	820	
7E5	6.3	JS1-3040	15	....	C	P3	1900	
7E6	6.3	JR3-2070	12	....	B	P3	1380	Triode Sect.
7E6	6.3	JR0-6072	0	0	A	P2	Diode	Diode No. 1
7E6	6.3	JR0-5072	0	0	A	P2	Diode	Diode No. 2
7E7	6.3	JR6-2570	22	....	B	P3	820	Pent. Sect.
7E7	6.3	JR0-4072	0	0	A	P2	Diode	Diode No. 1
7E7	6.3	JR0-3072	0	0	A	P2	Diode	Diode No. 2
7F7	6.3	JR5-6073	0	....	B	P3	820	Triode No. 1
7F7	6.3	JR4-3026	0	....	B	P3	820	Triode No. 2
7F8	6.3	HS8-6050	10	....	C	P3	3150	Triode No. 1
7F8	6.3	HS1-3040	10	....	C	P3	3150	Triode No. 2
7G7	6.3	JR6-2374	18	....	B	P3	1260	
7G8	6.3	JR5-7362	10	....	B	P3	1320	Tetrode No. 1
7G8	6.3	JR4-2367	10	....	B	P3	1320	Tetrode No. 2
7H7	6.3	JR6-2374	10	....	D	P3	2400	
7J7	6.3	JR6-2574	18	....	B	P3	500	Heptode Sect.
7J7	6.3	JR4-3576	18	....	B	P3	630	Triode Sect.
7K7	6.3	JR4-3020	10	....	D	P3	1000	Triode Sect.
7K7	6.3	JR0-5070	0	0	A	P2	Diode	Diode No. 1
7K7	6.3	JR0-6070	0	0	A	P2	Diode	Diode No. 2
7L7	6.3	JR6-2374	12	....	B	P3	1260	
7N7	6.3	JR5-6073	29	....	B	P3	1260	Triode No. 1
7N7	6.3	JR4-3026	29	....	B	P3	1260	Triode No. 2
7Q7	6.3	JR6-2374	21	....	B	P3	500	Ampl. Sect.
7Q7	6.3	JR4-2376	21	....	B	P3	500	Osc. Sect.
7R7	6.3	JR6-2570	10	....	C	P3	1900	Pent. Sect.
7R7	6.3	JR0-4072	0	0	A	P2	Diode	Diode No. 1
7R7	6.3	JR0-3072	0	0	A	P2	Diode	Diode No. 2
7S7	6.3	JR6-2574	18	....	B	P3	950	Heptode Sect.
7S7	6.3	JR4-3576	0	....	B	P3	950	Triode Sect.
7T7	6.3	JR6-2374	9	....	C	P3	1900	
7V7	6.3	JR6-2374	6	....	C	P3	2500	
7W7	6.3	JR6-2375	10	....	D	P3	2200	
7X6	6.3	JR0-6075	0	51	A	P7	Rect.	Plate No. 1
7X6	6.3	JR0-3025	0	51	A	P7	Rect.	Plate No. 2
7X7	6.3	JR3-2040	10	....	D	P3	630	Triode Sect.
7X7	6.3	JR0-5040	0	67	A	P2	Diode	Diode No. 1
7X7	6.3	JR0-6070	0	67	A	P2	Diode	Diode No. 2
7Y4	6.3	JR0-6070	0	28	A	P7	Rect.	Plate No. 1
7Y4	6.3	JR0-3070	0	28	A	P7	Rect.	Plate No. 2
7Z4	6.3	JR0-6070	0	0	A	P7	Rect.	Plate No. 1
7Z4	6.3	JR0-3070	0	0	A	P7	Rect.	Plate No. 2
10	7.5	JR3-2000	39	....	B	P3	790	
10Y	7.5	JR3-2000	12	....	B	P3	950	
12A	5.0	JR3-2000	44	....	B	P3	1040	
12A4	12.6	EV2-9010	25	....	D	P3	4900	
12A5	12.6	JR4-2350	51	....	B	P3	1130	
12A6	12.6	JR5-3472	12	....	C	P3	1900	
12A7	12.6	JR0-2365	48	....	B	P3	610	Pent. Sect. Cap=G
12A7	12.6	JR0-5042	0	35	A	P7	Rect.	Rect. Sect.
12A8	12.6	JR0-3475	22	....	B	P3	630	Pent. Sect. Cap=G
12A8	12.6	JR5-6473	37	....	B	P3	190	Osc. Sect.
12AH7	12.6	JX5-6043	20	....	B	P3	1260	Triode No. 1
12AH7	12.6	JX2-3016	20	....	B	P3	1260	Triode No. 2
12AL5	12.6	JR0-7030	0	67	A	P2	Diode	Diode No. 1
12AL5	12.6	JR0-2050	0	67	A	P2	Diode	Diode No. 2
12AT6	12.6	JR3-7020	18	....	B	P3	750	Triode Sect.
12AT6	12.6	JR3-6020	0	0	A	P2	Diode	Diode No. 1
12AT6	12.6	JR3-5020	0	0	A	P2	Diode	Diode No. 2
12AT7	12.6	EV7-6080	14	....	D	P3	2500	Triode No. 1
12AT7	12.6	EV2-1030	14	....	D	P3	2500	Triode No. 2
12AU6	12.6	JR3-5672	10	....	D	P3	2050	
12AU7	12.6	EV7-6080	24	....	B	P3	1400	Triode No. 1
12AU7	12.6	EV2-1030	24	....	B	P3	1400	Triode No. 2
12AV6	12.6	JR3-7025	12	....	B	P3	790	Triode Sect.
12AV6	12.6	JR3-6025	0	0	A	P2	Diode	Diode No. 1
12AV6	12.6	JR3-5026	0	0	A	P2	Diode	Diode No. 2
12AV7	12.6	EV7-6082	18	....	D	P3	2580	Triode No. 1
12AV7	12.6	EV2-1037	18	....	D	P3	2580	Triode No. 2
12AW6	12.6	JR3-5627	10	....	D	P3	2500	
12AX4	12.6	JX0-5030	0	46	A	P7	Rect.	
12AX7	12.6	EV7-6080	8	....	D	P3	950	Triode No. 1
12AX7	12.6	EV2-1030	8	....	D	P3	950	Triode No. 2
12AY7	12.6	EV7-6080	15	....	D	P3	1100	Triode No. 1
12AY7	12.6	EV2-1030	15	....	D	P3	1100	Triode No. 2
12AZ7	12.6	EV7-6080	14	....	D	P3	2500	Triode No. 1
12AZ7	12.6	EV2-1030	14	....	D	P3	2500	Triode No. 2
12B4	12.6	EV2-9010	50	....	D	P3	4100	
12B7	12.6	JR6-2374	22	....	B	P3	1200	
12B8	12.6	JR0-3420	22	....	B	P3	1140	Pent. Sect. Cap=G
12B8	12.6	JR7-5060	0	....	B	P3	1260	Triode Sect.
12BA6	12.6	JR3-5672	9	....	C	P3	2700	
12BA7	12.6	EV7-9132	17	....	B	P3	470	Ampl. Sect.
12BA7	12.6	EV2-9137	25	....	B	P3	470	Osc. Sect.
12BD6	12.6	JR3-5672	13	....	D	P3	1260	
12BE6	12.6	JR7-5623	11	....	B	P3	900	Ampl. Sect.
12BE6	12.6	JR3-5627	0	....	B	P3	1000	Osc. Sect.
12BF6	12.6	JR3-7020	14	....	B	P3	1200	Triode Sect.
12BF6	12.6	JR3-6020	0	0	A	P2	Diode	Diode No. 1
12BF6	12.6	JR3-5020	0	0	A	P2	Diode	Diode No. 2
12BH7	12.6	EV7-6082	29	...	C	P3	1500	Triode No. 1
12BH7	12.6	EV2-1037	29	....	C	P3	1500	Triode No. 2

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
12BK6	12.6	JR3-7025	6	....	B	P3	790	Triode Sect.
12BK6	12.6	JR0-6025	0	0	A	P2	Diode	Diode No. 1
12BK6	12.6	JR0-5027	0	0	A	P2	Diode	Diode No. 2
12BN6	12.6	JR2-7536	0	....	B	P3	440	Limiter Grid
12BN6	12.6	JR6-7532	0	....	B	P3	570	Quadrature Grid
12BT6	12.6	JR3-7020	13	....	B	P3	820	Triode Sect.
12BT6	12.6	JR3-6020	0	35	A	P2	Diode	Diode No. 1
12BT6	12.6	JR3-5020	0	35	A	P2	Diode	Diode No. 2
12BU6	12.6	JR3-7020	34	....	B	P3	940	Triode Sect.
12BU6	12.6	JR3-6020	0	25	A	P2	Diode	Diode No. 1
12BU6	12.6	JR3-5020	0	25	A	P2	Diode	Diode No. 2
12BY7	12.6	EV2-7813	9	....	D	P3	5700	
12BZ7	12.6	EV7-6080	8	....	D	P3	2200	Triode No. 1
12BZ7	12.6	EV2-1030	8	....	D	P3	2200	Triode No. 2
12C8	12.6	JR0-3672	24	....	B	P3	725	Pent. Sect. Cap=G
12C8	12.6	JR0-5073	0	0	A	P2	Diode	Diode No. 1
12C8	12.6	JR0-4073	0	0	A	P2	Diode	Diode No. 2
12F5	12.6	JR0-4070	10	....	D	P3	950	Cap=G
12H6	12.6	JR0-5072	0	62	A	P2	Diode	Diode No. 1
12H6	12.6	JR0-3042	0	62	A	P2	Diode	Diode No. 2
12J5	12.6	JR5-3072	22	....	D	P3	1640	
12J7	12.6	JR0-3475	22	....	B	P3	770	Cap=G
12K7	12.6	JR0-3475	19	....	B	P3	920	Cap=G
12K8	12.6	JR5-3476	11	....	B	P3	630	Heptode Sect. Cap=G
12K8	12.6	JR5-6473	0	....	C	P3	1500	Triode Sect.
12L8	12.6	JW2-7513	10	....	B	P3	1340	Pent. No. 1
12L8	12.6	JW3-4512	10	....	B	P3	1340	Pent. No. 2
12Q7	12.6	JR0-3070	17	....	B	P3	500	Triode Sect. Cap=G
12Q7	12.6	JR0-5070	0	0	A	P2	Diode	Diode No. 1
12Q7	12.6	JR0-4070	0	0	A	P2	Diode	Diode No. 2
12S8	12.6	JX0-6010	10	....	B	P3	570	Triode Sect. Cap=G
12S8	12.6	JX0-3050	0	0	A	P2	Diode	Diode No. 1
12S8	12.6	JX0-4010	0	0	A	P2	Diode	Diode No. 2
12S8	12.6	JX0-2010	0	0	A	P2	Diode	Diode No. 3
12SA7	12.6	JR7-3465	21	....	B	P3	470	Ampl. Sect.
12SA7	12.6	JR5-3467	21	....	B	P3	470	Osc. Sect.
12SC7	12.6	JX4-5061	10	....	D	P3	840	Triode No. 1
12SC7	12.6	JX3-1065	10	....	D	P3	840	Triode No. 2
12SF5	12.6	JX3-5010	10	....	D	P3	950	
12SF7	12.6	JX1-6432	0	....	B	P3	1260	Pent. Sect.
12SF7	12.6	JX0-5036	0	0	A	P2	Diode	Diode Sect.
12SG7	12.6	JR4-7652	0	....	C	P3	2100	
12SH7	12.6	JR4-7652	0	....	C	P3	2150	
12SJ7	12.6	JR4-7653	20	....	D	P3	1050	
12SK7	12.6	JR4-7653	10	....	D	P3	1260	
12SL7	12.6	JX4-5061	7	....	D	P3	1000	Triode No. 1
12SL7	12.6	JX2-1035	7	....	D	P3	1000	Triode No. 2
12SN7	12.6	JX4-5061	22	....	D	P3	1650	Triode No. 1
12SN7	12.6	JX2-1035	22	....	D	P3	1650	Triode No. 2
12SQ7	12.6	JX1-6032	11	....	D	P3	700	Triode Sect.
12SQ7	12.6	JX0-5036	0	0	A	P2	Diode	Diode No. 1
12SQ7	12.6	JX0-4036	0	0	A	P2	Diode	Diode No. 2
12SR7	12.6	JX1-6032	18	....	B	P3	1200	Triode Sect.
12SR7	12.6	JX0-5036	0	0	A	P2	Diode	Diode No. 1
12SR7	12.6	JX0-4036	0	0	A	P2	Diode	Diode No. 2
12SW7	12.6	JX1-6032	14	....	B	P3	1200	Triode Sect.
12SW7	12.6	JX0-5036	0	0	A	P2	Diode	Diode No. 1
12SW7	12.6	JX0-4036	0	0	A	P2	Diode	Diode No. 2
12SX7	12.6	JX4-5061	21	....	D	P3	1640	Triode No. 1
12SX7	12.6	JX2-1035	21	....	D	P3	1640	Triode No. 2
12SY7	12.6	JX7-3465	21	....	B	P3	470	Ampl. Sect.
12SY7	12.6	JX5-3467	21	....	B	P3	470	Osc. Sect.
12Z3	12.6	JR0-2030	0	46	A	P7	Rect.	
12Z5	12.6	JR0-6050	0	25	A	P7	Rect.	Plate No. 1
12Z5	12.6	JR0-2030	0	25	A	P7	Rect.	Plate No. 2
14A4	12.6	JR6-2070	17	....	C	P3	1650	
14A5	12.6	JR6-2370	12	....	C	P3	1900	
14A7	12.6	JR6-2374	22	....	B	P3	1200	
14AF7	12.6	JR5-6070	0	....	C	P3	1570	Triode No. 1
14AF7	12.6	JR4-3020	0	....	C	P3	1570	Triode No. 2
14B6	12.6	JR3-2070	11	....	D	P3	700	Triode Sect.
14B6	12.6	JR0-6072	0	0	A	P2	Diode	Diode No. 1
14B6	12.6	JR0-5072	0	0	A	P2	Diode	Diode No. 2
14B8	12.6	JR6-2574	27	....	B	P3	630	Pent. Sect.
14B8	12.6	JR4-3576	18	....	B	P3	315	Osc. Sect.
14C5	12.6	JR6-2370	23	....	C	P3	2330	
14C7	12.6	JR6-2374	20	....	D	P3	990	
14E6	12.6	JR3-2070	12	....	B	P3	1380	Triode Sect.
14E6	12.6	JR0-6072	0	0	A	P2	Diode	Diode No. 1
14E6	12.6	JR0-5072	0	0	A	P2	Diode	Diode No. 2
14E7	12.6	JR6-2570	24	....	B	P3	820	Pent. Sect.
14E7	12.6	JR0-4072	0	0	A	P2	Diode	Diode No. 1
14E7	12.6	JR0-3072	0	0	A	P2	Diode	Diode No. 2
14F7	12.6	JR5-6073	0	....	B	P3	1000	Triode No. 1
14F7	12.6	JR4-3026	0	....	B	P3	1000	Triode No. 2
14F8	12.6	HS8-6050	10	....	D	P3	3150	Triode No. 1
14F8	12.6	HS1-3040	10	....	D	P3	3150	Triode No. 2
14H7	12.6	JR6-2374	10	....	D	P3	2400	
14J7	12.6	JR6-2574	18	....	B	P3	500	Heptode Sect.
14J7	12.6	JR4-3576	18	....	B	P3	630	Triode Sect.
14N7	12.6	JR5-6073	20	....	D	P3	1640	Triode No. 1
14N7	12.6	JR4-3026	20	....	D	P3	1640	Triode No. 2
14Q7	12.6	JR6-2374	21	....	B	P3	500	Pent. Sect.
14Q7	12.6	JR4-2376	21	....	B	P3	500	Osc. Sect.
14R7	12.6	JR6-2570	10	....	C	P3	1900	Pent. Sect.
14R7	12.6	JR0-4072	0	0	A	P2	Diode	Diode No. 1
14R7	12.6	JR0-3072	0	0	A	P2	Diode	Diode No. 2

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
14S7	12.6	JR6-2574	18	....	B	P3	950	Heptode Sect.
14S7	12.6	JR4-3576	0	....	B	P3	950	Triode Sect.
14V7	12.6	JR6-2374	6	....	C	P3	2500	
14W7	12.6	JR6-2375	10	....	D	P3	2200	
14X7	12.6	JR3-2040	10	....	D	P3	630	Triode Sect.
14X7	12.6	JR0-5040	0	67	A	P2	Diode	Diode No. 1
14X7	12.6	JR0-6070	0	67	A	P2	Diode	Diode No. 2
14Y4	12.6	JR0-6070	0	0	A	P7	Rect.	Plate No. 1
14Y4	12.6	JR0-3070	0	0	A	P7	Rect.	Plate No. 2
14Z3	12.6	JR0-2030	0	46	A	P7	Rect.	
15	2.0	JR0-2340	10	....	B	#	390	Cap = G
	# Hold Down P2 And Press P3							
15A6	12.6	EV2-7136	7	....	D	P3	6300	
19	2.0	JR4-5000	15	....	B	P3	630	Triode No. 1
19	2.0	JR3-2000	15	....	B	P3	630	Triode No. 2
19BG6	20.0	JR5-0730	18	....	D	P3	3800	Cap = P
19C8	20.0	EV8-9070	12	....	D	P3	790	Triode Sect.
19C8	20.0	EV8-6070	0	67	A	P2	Diode	Diode No. 1
19C8	20.0	EV8-2030	0	67	A	P2	Diode	Diode No. 2
19C8	20.0	EV8-1070	0	67	A	P2	Diode	Diode No. 3
19J6	20.0	JR5-2076	17	....	D	P3	3350	Triode No. 1
19J6	20.0	JR6-3075	17	....	D	P3	3350	Triode No. 2
19T8	20.0	EV8-9076	11	....	B	P3	760	Triode Sect.
19T8	20.0	EV0-6071	0	67	A	P2	Diode	Diode No. 1
19T8	20.0	EV0-2037	0	67	A	P2	Diode	Diode No. 2
19T8	20.0	EV0-1078	0	67	A	P2	Diode	Diode No. 3
19V8	20.0	EV6-1038	11	....	B	P3	760	Triode Sect.
19V8	20.0	EV0-9032	0	13	A	P2	Diode	Diode No. 1
19V8	20.0	EV0-7086	0	71	A	P2	Diode	Diode No. 2
19V8	20.0	EV0-2038	0	71	A	P2	Diode	Diode No. 3
20	3.0	JR3-2000	77	....	B	P3	330	
RK20A	7.5	JR3-0240	0	....	C	P3	1600	Cap = P
VX21	1.1	CX0-4000	0	0	A	P2	Diode	Pins: F- = 2, F+ = 7, P = 4. OK Above 250 On 3000 Scale
21A6	20.0	EV2-0839	45	....	D	P3	3800	Cap = P
22	3.0	JR0-2300	20	....	B	#	315	Cap = G
	# Hold Down P2 And Press P3							
24	2.5	JR0-2340	12	....	B	P3	630	Cap = G
24A	2.5	JR0-2340	12	....	B	P3	630	Cap = G
VT25A	7.5	JR3-2000	30	....	B	P3	1260	
25A6	25.0	JR5-3470	43	....	B	P3	1450	
25A7	25.0	JR5-3476	50	....	B	P3	1130	Pent. Sect.
25A7	25.0	JR0-6023	0	51	A	P7	Rect.	Rect. Sect.
25AC5	25.0	JR5-3070	0	....	B	P3	950	
25AV5	25.0	JR2-5730	50	....	C	P3	2450	
25B5	25.0	JR4-2350	0	....	B	P3	1570	
25B6	25.0	JR5-3470	52	....	C	P3	2500	
25B8	25.0	JR0-3420	22	....	B	P3	1260	Pent. Sect. Cap = G
25B8	25.0	JR7-5060	10	....	B	P3	950	Triode Sect.
25BQ6	25.0	JR5-0470	50	....	C	P3	2800	Cap = P
25C6	25.0	JR5-3470	33	....	D	P3	3800	
25D8	25.0	JR0-3420	18	....	B	P3	1200	Pent. Sect. Cap = G
25D8	25.0	JR5-6020	0	....	B	P3	700	Triode Sect.
25D8	25.0	JR5-7020	0	25	A	P2	Diode	Diode Sect
25L6	25.0	JR5-3472	10	....	D	#	5650	
	# Hold Down P2 And Press P3							
25N6	25.0	JR5-3470	0	....	B	P3	1570	
25T	6.3	JR3-0000	0	....	B	P3	630	Cap = P
25W4	25.0	JX0-5030	0	56	A	P7	Rect.	
25Y5	25.0	JR0-5040	0	0	A	P7	Rect.	Plate No. 1
25Y5	25.0	JR0-2030	0	0	A	P7	Rect.	Plate No. 2
25Z5	25.0	JR0-5040	0	51	A	P7	Rect.	Plate No. 1
25Z5	25.0	JR0-2030	0	51	A	P7	Rect.	Plate No. 2
25Z5MG	25.0	JR0-5070	0	51	A	P7	Rect.	Plate No. 1
25Z5MG	25.0	JR0-3040	0	51	A	P7	Rect.	Plate No. 2
25Z6	25.0	JR0-5072	0	51	A	P7	Rect.	Plate No. 1
25Z6	25.0	JR0-3042	0	51	A	P7	Rect.	Plate No. 2
26	1.5	JR3-2000	43	....	B	P3	725	
26A6	25.0	JR3-5672	9	....	C	P3	2500	
26A7	25.0	JW2-7513	11	....	D	#	3450	Pent. No. 1.
	# Hold Down P2 And Press P3							
26A7	25.0	JW3-4512	11	....	D	#	3450	Pent. No. 2
	# Hold Down P2 And Press P3							
26BK6	25.0	JR3-7025	6	....	B	P3	790	Triode Sect.
26BK6	25.0	JR0-6025	0	0	A	P2	Diode	Diode No. 1
26BK6	25.0	JR0-5027	0	0	A	P2	Diode	Diode No. 2
26C6	25.0	JR3-7020	18	....	B	P3	1200	Triode Sect.
26C6	25.0	JR3-6020	0	0	A	P2	Diode	Diode No. 1
26C6	25.0	JR3-5020	0	0	A	P2	Diode	Diode No. 2
26D6	25.0	JR7-5623	11	....	B	P3	900	Ampl. Sect.
26D6	25.0	JR3-5627	0	....	B	P3	1000	Osc. Sect.
27	2.5	JR3-2040	41	....	B	P3	630	
27S	2.5	JR3-2040	41	....	B	P3	630	
28D7	25.0	JR7-5362	20	....	D	#	2140	Pent. No. 1
	# Hold Down P2 And Press P3							
28D7	25.0	JR2-4367	20	....	D	#	2140	Pent. No. 2
	# Hold Down P2 And Press P3							
30	2.0	JR3-2000	40	....	B	P3	570	
31	2.0	JR3-2000	65	....	B	P3	580	
32	2.0	JR0-2300	19	....	B	#	400	Cap = G
	# Hold Down P2 And Press P3							
32L7	35.0	JR5-3470	34	....	C	P3	3000	Ampl. Sect.
32L7	35.0	JR0-6023	0	51	A	P7	Rect.	Rect. Sect.
33	2.0	JR3-2400	35	....	B	P3	900	
RK33	6.3	JR4-5060	38	....	B	P3	860	Triode No. 1
RK33	6.3	JR0-3020	38	....	B	P3	860	Triode No. 2 Cap = G
34	2.0	JR0-2300	17	....	B	#	380	Cap = G
	# Hold Down P2 And Press P3							

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
RK34	6.3	JR3-0040 Right Cap = P	18	....	B	P3	1670	Triode No. 1
RK34	6.3	JR5-0040 Left Cap = P	18	....	B	P3	1670	Triode No. 2
35	2.5	JR0-2340	24	....	B	P3	650	Cap = G
35A5	35.0	JR6-2370	33	....	D	P3	3700	
35B5	35.0	JR3-5620	32	....	D	P3	2830	
35C5	35.0	JR2-7630	32	....	D	P3	2830	
35L6	35.0	JR5-3470	33	....	D	P3	3700	
35W4	BLST	JR0-3670	....	....	....	....	.....	Short on 1-2-3-4-5
35W4	35.0	JR0-5070	0	56	A	P7	Rect.	Rect. Sect.
35Y4	BLST	JR0-2470	....	....	....	....	.....	Short on 1-2-3-4-5
35Y4	35.0	JR0-2070	0	56	A	P7	Rect	Rect. Sect.
35Z3	35.0	JR0-2070	0	56	A	P7	Rect.	
35Z4	35.0	JR0-5070	0	56	A	P7	Rect.	
35Z5	BLST	JR0-5370	....	....	....	....	.....	Short on 1-2-3-4-5
35Z5	35.0	JR0-5070	0	56	A	P7	Rect.	Rect. Sect.
35Z6	35.0	JR0-5070	0	56	A	P7	Rect.	Plate No. 1
35Z6	35.0	JR0-3040	0	56	A	P7	Rect.	Plate No. 2
36	6.3	JR0-2340	24	....	B	P3	660	Cap = G
37	6.3	JR3-2040	41	....	B	P3	570	
38	6.3	JR0-2340	39	....	B	P3	660	Cap = G
39/44	6.3	JR0-2340	28	....	B	P3	630	Cap = G
T40	7.5	JR3-0000	0	....	B	P3	760	Cap = P
40	5.0	JR3-2000	32	....	B	P3	125	
40Z5	BLST	JR0-5370	....	....	....	....	.....	Short on 1-2-3-4-5
40Z5	50.0	JR0-5070	0	56	A	P7	Rect.	
41	6.3	JR4-2350	34	....	B	P3	1000	
42	6.3	JR4-2350	29	....	B	P3	1260	
43	25.0	JR4-2350	43	....	B	P3	1450	
45	2.5	JR3-2000	61	....	B	P3	1170	
45Z3	50.0	HT0-2080	0	51	A	P7	Rect.	
45Z5	BLST	JR0-5370	....	....	....	....	.....	Short on 1-2-3-4-5
45Z5	50.0	JR0-5070	0	56	A	P7	Rect.	Rect. Sect.
46	2.5	JR3-2400	30	....	B	P3	1260	
47	2.5	JR3-2400	22	....	B	P3	1260	
48	25.0	JR4-2350	58	....	B	P3	1260	
49	2.0	JR3-2400	49	....	B	P3	710	
50	7.5	JR3-2000	61	....	B	P3	950	
50A5	50.0	JR6-2370	10	....	D	#	5650	# Hold Down P2 And Press P3
50B5	50.0	JR3-5620	10	....	D	#	5650	# Hold Down P2 And Press P3
50C5	50.0	JR2-7630	10	....	D	#	5650	# Hold Down P2 And Press P3
50C6	50.0	JR5-3472	33	....	D	P3	3800	
50L6	50.0	JR5-3472	10	....	D	#	5650	# Hold Down P2 And Press P3
50X6	50.0	JR0-6075	0	51	A	P7	Rect.	Plate No. 1
50X6	50.0	JR0-3025	0	51	A	P7	Rect.	Plate No. 2
50Y6	50.0	JR0-5070	0	51	A	P7	Rect.	Plate No. 1
50Y6	50.0	JR0-3040	0	51	A	P7	Rect.	Plate No. 2
50Y7	BLST	JR0-0600	....	....	....	....	.....	Short on 1-2-3-4-5
50Y7	50.0	JR0-5070	0	51	A	P7	Rect.	Plate No. 1
50Y7	50.0	JR0-3040	0	51	A	P7	Rect.	Plate No. 2
50Z7	BLST	JR0-0600	....	....	....	....	.....	Short on 1-2-3-4-5
50Z7	50.0	JR0-5070	0	51	A	P7	Rect.	Plate No. 1
50Z7	50.0	JR0-3040	0	51	A	P7	Rect.	Plate No. 2
HD51	BLST	KR0-3020	0	42	A	P4	Volt. Reg.	Read As Rectifier
51/51S	2.5	JR0-2340	24	....	B	P3	640	Cap = G
52	6.3	JR3-2400	33	....	C	P3	1500	
53	2.5	JR5-6042	12	....	B	P3	950	Triode No. 1
53	2.5	JR3-2046	12	....	B	P3	950	Triode No. 2
55	2.5	JR0-2050	39	....	B	P3	610	Triode Sect. Cap = G
55	2.5	JR0-4050	0	0	A	P2	Diode	Diode No. 1
55	2.5	JR0-3050	0	0	A	P2	Diode	Diode No. 2
56	2.5	JR3-2040	29	....	B	P3	920	
57	2.5	JR0-2354	21	....	B	P3	770	Cap = G
57A	6.3	JR0-2354	21	....	B	P3	770	Cap = G
58	2.5	JR0-2354	24	....	B	P3	900	Cap = G
58A/58AS	6.3	JR0-2354	24	....	B	P3	900	Cap = G
59	2.5	JR4-2365	22	....	B	P3	1260	
HY65	6.3	JR5-0407	0	....	C	P3	1900	Cap = P
VT67	2.0	JR3-2000	40	....	B	P3	570	
HY69	6.3	JR3-0240	0	....	C	P3	1900	Cap = P
70A7	75.0	JR5-3470	50	....	C	P3	1900	Pent. Sect.
70A7	75.0	JR0-2000	0	56	A	#	Rect.	Rect. Sect.
		# Hold Down P8 And Press P7						
70L7	75.0	JR5-3460	41	....	C	P3	3150	Pent. Sect.
70L7	75.0	JR0-7023	0	56	A	P7	Rect.	Rect. Sect.
71A	5.0	JR3-2000	73	....	B	P3	1040	
72	2.5	JR0-0000	0	86	A	P4	Rect.	Cap = P
75	6.3	JR0-2050	11	....	B	P3	470	Triode Sect. Cap = G
75	6.3	JR0-4052	0	0	A	P2	Diode	Diode No. 1
75	6.3	JR0-3052	0	0	A	P2	Diode	Diode No. 2
75MG	6.3	JR0-4070	11	....	B	P3	470	Triode Sect. Cap = G
75MG	6.3	JR0-5070	0	0	A	P2	Diode	Diode No. 1
75MG	6.3	JR0-6070	0	0	A	P2	Diode	Diode No. 2
76	6.3	JR3-2040	29	....	B	P3	900	
77	6.3	JR0-2354	21	....	D	P3	770	Cap = G
78	6.3	JR0-2354	24	....	B	P3	900	Cap = G
79	6.3	JR0-5040	15	....	B	P3	630	Triode No. 1 Cap = G
79	6.3	JR3-2040	15	....	B	P3	630	Triode No. 2
80	5.0	JR0-3000	0	0	A	P7	Rect.	Plate No. 1
80	5.0	JR0-2000	0	0	A	P7	Rect.	Plate No. 2
81	7.5	JR0-2000	0	35	A	P6	Rect.	
82	2.5	JR0-3000	0	46	A	P7	Rect.	Plate No. 1
82	2.5	JR0-2000	0	46	A	P7	Rect.	Plate No. 2
83	5.0	JR0-3000	0	64	A	P7	Rect.	Plate No. 1
83	5.0	JR0-2000	0	51	A	P7	Rect.	Plate No. 2

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
83V	5.0	JR0-3000	0	59	A	P7	Rect.	Plate No. 1
83V	5.0	JR0-2000	0	59	A	P7	Rect.	Plate No. 2
84	6.3	JR0-3040	0	35	A	P7	Rect.	Plate No. 1
84	6.3	JR0-2040	0	35	A	P7	Rect.	Plate No. 2
85	6.3	JR0-2050	39	....	B	P3	620	Triode Sect. Cap=G
85	6.3	JR0-4052	0	0	A	P2	Diode	Diode No. 1
85	6.3	JR0-3052	0	0	A	P2	Diode	Diode No. 2
85AS	6.3	JR0-2050	28	....	B	P3	700	Triode Sect. Cap=G
85AS	6.3	JR0-4052	0	0	A	P2	Diode	Diode No. 1
85AS	6.3	JR0-3052	0	0	A	P2	Diode	Diode No. 2
89/89Y	6.3	JR0-2354	37	....	B	P3	980	Cap=G
99	3.0	JR3-2000	55	....	B	P3	270	
101D	4.3	JR3-2000	55	....	B	P3	700	
101F	4.3	JR3-2000	53	....	B	P3	700	
102D	2.0	JR3-2000	25	....	B	P3	315	
102F	2.0	JR3-2000	25	....	B	P3	365	
104D	4.3	JR3-2000	75	....	B	P3	700	
CK108	6.3	JR0-2354	21	....	D	P3	770	Cap=G
112A	5.0	JR3-2000	44	....	B	P3	1040	
CK113	50.0	JR5-3476	48	....	B	P3	1130	Pent. Sect.
CK113	50.0	JR0-6020	0	46	A	P7	Rect.	Rect. Sect.
HY114	1.5	JR0-0000	19	....	B	P3	700	Right Cap=P Left Cap=G
117L7	117.0	JR4-3570	37	....	C	P3	2500	Pent. Sect.
117L7	117.0	JR0-6020	0	56	A	P7	Rect.	Rect. Sect.
117M7	117.0	JR4-3570	37	....	C	P3	2500	Pent. Sect.
117M7	117.0	JR0-6020	0	56	A	P7	Rect.	Rect. Sect.
117N7	117.0	JR4-3560	37	....	D	P3	3150	Pent. Sect.
117N7	117.0	JR0-7000	0	56	A	#	Rect.	Rect. Sect. # Hold Down P8 And Press P7
117P7	117.0	JR4-3560	37	....	C	P3	2500	Pent. Sect.
117P7	117.0	JR0-7000	0	67	A	#	Rect.	Rect. Sect. # Hold Down P8 And Press P7
117Z3	117.0	JR0-5060	0	56	A	P7	Rect.	
117Z4	117.0	JR0-5070	0	56	A	P7	Rect.	
117Z6	117.0	JR0-5070	0	56	A	P7	Rect.	Plate No. 1
117Z6	117.0	JR0-3040	0	56	A	P7	Rect.	Plate No. 2
C182	5.0	JR3-2000	83	....	B	P3	630	
C182A	5.0	JR3-2000	79	....	B	P3	950	
182B	5.0	JR3-2000	58	....	B	P3	950	
183	5.0	JR3-2000	79	....	B	P3	950	
205F	5.0	JR3-2000	34	....	B	P3	920	
231D	3.0	JR3-2000	49	....	B	P3	340	
244A	2.0	JR3-2040	42	....	B	P3	570	
245A	2.0	JR0-2340	55	....	B	P3	460	Cap=G
247A	2.0	JR3-2040	33	....	B	P3	580	
TS251	50.0	JR5-3476	50	....	B	P3	1130	Pent. Sect.
TS251	50.0	JR0-6023	0	51	A	P7	Rect.	Rect. Sect.
257A	3.0	JR0-2000	49	....	B	P3	340	Cap=G
259A	2.0	JR0-2340	33	....	B	P3	700	Cap=G
262B	10.0	JR0-2030	31	....	B	P3	630	Cap=G
264B	1.5	JR3-2000	49	....	B	P3	365	
264C	1.5	JR3-2000	54	....	B	P3	365	
271A	5.0	JR3-2040	32	....	C	P3	1830	
272A	10.0	JR3-2040	51	....	B	P3	600	
274A	5.0	JR0-2000	0	0	A	P7	Rect.	Plate No. 1
274A	5.0	JR0-3000	0	0	A	P7	Rect.	Plate No. 2
274B	5.0	HR0-6000	0	14	A	P7	Rect.	Plate No. 1
274B	5.0	HR0-4000	0	14	A	P7	Rect.	Plate No. 2
275A	5.0	JR3-2000	68	....	C	P3	1700	
283A	2.0	JR0-2340	28	....	B	P3	630	Cap=G
285A	2.0	JR0-2304	40	....	B	P3	570	Cap=G
290A	10.0	JR0-2354	31	....	B	P3	640	Cap=G
291A	10.0	JR0-2365	21	....	B	#	440	Ampl. Sect. # Cap=G. Hold Down P2 And Press P3
291A	10.0	JR5-4362	47	....	B	P3	315	Osc. Sect.
292A	10.0	JR0-2050	36	....	B	P3	410	Triode Sect. Cap=G
292A	10.0	JR0-4052	0	0	A	P2	Diode	Diode No. 1
292A	10.0	JR0-3052	0	0	A	P2	Diode	Diode No. 2
293A	10.0	JR4-2350	43	....	B	P3	660	
294A	10.0	JR0-2340	43	....	B	P3	660	Cap=G
300B	5.0	JR3-2000	60	....	C	P3	2900	
303A	2.0	JR0-2050	36	....	B	P3	400	Triode Sect. Cap=G
303A	2.0	JR0-4052	0	0	A	P2	Diode	Diode No. 1
303A	2.0	JR0-3052	0	0	A	P2	Diode	Diode No. 2
307A	5.0	JR3-0204	32	....	B	P3	1600	Cap=P
309A	10.0	JR0-2340	31	....	B	P3	570	Cap=G
310A	10.0	JR0-2354	19	....	D	P3	1130	Cap=G
310B	10.0	JR0-2354	26	....	B	P3	750	Cap=G
311A	10.0	JR0-2340	38	....	B	P3	1500	Cap=G
313CA	.....	AP8-2010	0	72	A	P4	Rect.	
328A	7.5	JR0-2354	19	....	D	P3	1130	Cap=G
329A	7.5	JR0-2340	38	....	C	P3	1550	Cap=G
336A	10.0	JR4-2350	10	....	D	P3	1950	
337A	10.0	JR0-2354	21	....	D	P3	1070	Cap=G
339A	5.0	JR3-0240	0	....	C	P3	2000	Cap=P
347A	6.3	JR0-4070	30	....	B	P3	570	Cap=G
348A	6.3	JR0-3475	19	....	D	P3	1130	Cap=G
349A	6.3	JR5-3470	10	....	D	P3	2500	
350A	6.3	JR3-0240	21	....	D	P3	4000	Cap=P
350B	6.3	JR5-3470	25	....	D	P3	3900	
351A	6.3	JR0-5072	0	46	A	P7	Rect.	Plate No. 1
351A	6.3	JR0-3072	0	46	A	P7	Rect.	Plate No. 2
352A	10.0	JR0-2050	36	....	B	P3	410	Triode Sect. Cap=G
352A	10.0	JR0-4050	0	25	A	P2	Diode	Diode No. 1
352A	10.0	JR0-3050	0	25	A	P2	Diode	Diode No. 2
367A	6.3	JV6-1470	24	....	D	P3	3800	
373A	2.0	JR4-7603	17	....	D	P3	850	

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
374A	3.0	JR4-7602	40	....	D	P3	1700	
375A	20.0	JR5-3470	53	....	C	P3	2330	
381A	6.3	HR0-5020	0	67	A	P2	Diode	
383A	6.3	HR4-6020	25	....	D	P3	1770	
385A	6.3	HR5-0328	15	....	D	P3	1480	Cap=P
387A	6.3	HR5-0328	15	....	D	P3	2000	Cap=P
396A	6.3	KR3-4028	17	....	D	P3	3300	Triode No. 1
396A	6.3	KR7-6082	17	....	D	P3	3300	Triode No. 2
398A	6.3	JR4-7603	35	....	D	P3	3350	
399A	1.1	DX6-2100	9	....	B	#	440	
	# Hold Down P2 And Press P3							
400A	1.1	DX6-2185	35	....	B	P3	315	Pent. Sect.
400A	1.1	DX8-2165	35	....	B	P3	315	Osc. Sect.
401A	6.3	JR3-5670	12	....	B	#	1260	
	# Hold Down P2 And Press P3							
403A	6.3	JR3-5620	10	....	D	P3	2750	
409A	6.3	JR3-5627	10	....	D	P3	1540	
412A	6.3	EV0-9073	0	49	A	P7	Rect.	Plate No. 1
412A	6.3	EV0-1037	0	49	A	P7	Rect.	Plate No. 2
420	2.5	JR0-3000	0	56	A	P7	Rect.	Plate No. 1
420	2.5	JR0-2000	0	56	A	P7	Rect.	Plate No. 2
420A	12.6	EV6-8073	0	....	B	P3	630	Triode No. 1
420A	12.6	EV3-1026	0	....	B	P3	630	Triode No. 2
421A	6.3	JX4-5061	63	....	D	P3	5000	Triode No. 1
421A	6.3	JX2-1035	63	....	D	P3	5000	Triode No. 2
422A	5.0	HR0-6000	0	54	A	P7	Rect.	Plate No. 1
422A	5.0	HR0-4000	0	54	A	P7	Rect.	Plate No. 2
446A	6.3	JR0-0070	0	....	C	P3	1510	Cap=P Ring=G
482A	5.0	JR3-2000	79	....	B	P3	950	
482B	5.0	JR3-2000	57	....	B	P3	950	
483	5.0	JR3-2000	79	....	B	P3	850	
484	3.0	JR3-2040	37	....	B	P3	820	
484A	3.0	JR3-2040	37	....	B	P3	820	
485	3.0	JR3-2040	37	....	B	P3	820	
486	3.0	JR3-2040	43	....	B	P3	280	
GL502	6.3	JR5-3670	#	51	A	P7	Thyr.	
	# Should Strike Between 70 and 60. Read As Rectifier.							
CK502AX	1.1	DV4-1200	18	....	B	#	380	
	# Hold Down P2 And Press P3							
CK503AX	1.1	DV4-1200	30	....	B	#	150	
	# Hold Down P2 And Press P3							
CK505AX	0.6	DV4-1200	0	....	B	#	100	
	# Hold Down P2 And Press P3							
CK506AX	1.1	DV4-1200	33	....	B	#	315	
	# Hold Down P2 And Press P3							
CK510AX	0.6	EX1-2300	0	0	A	P4	‡	
	‡ Section No. 1 OK Above 100 On 3000 Scale							
CK510AX	0.6	EX6-5300	0	0	A	P4	‡	
	‡ Section No. 2 OK Above 100 On 3000 Scale							
CK512AX	0.6	DV4-1200	30	0	A	P4	‡	
	‡ OK Above 500 On 3000 Scale							

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
CK518AX	1.1	DV4-1200	43	0	A	P4	#	#OK over Diodes OK
CK522AX	1.1	DV4-1200	38	0	A	P4	#	#OK over Diodes OK
CK523AX	1.1	DV4-1200	46	0	A	P4	#	#OK over Diodes OK
CK524AX	1.1	DV4-1200	73	0	A	P4	#	#OK over Diodes OK
CK525AX	1.1	DV4-1200	48	0	A	P4	#	#OK over Diodes OK
CK526AX	1.1	DV4-1200	59	0	A	P4	#	#OK over Diodes OK
CK527AX	1.1	DV4-1200	32	0	A	P4	#	
	# OK Over 500 On 3000 Scale							
CK528AX	1.1	DV4-1200	37	0	A	P4	#	#OK over Diodes OK
CK529AX	1.1	DV4-1200	64	0	A	P4	#	#OK over Diodes OK
CK543DX	0.6	DV4-2100	0	0	A	P2	‡	
	‡OK Over 275 On 3000 Scale.							
CK544DX	1.1	DV4-1200	30	0	A	P4	#	
	# OK Over 500 On 3000 Scale							
GL546	6.3	JR3-7520	#	46	A	P7	Thyr.	
	# Should Strike Between 70 and 60. Read As Rectifier.							
CK551AX	1.1	EW5-1200	20	....	B	#	250	Pent. Sect.
	# Hold Down P2 And Press P3							
CK551AX	1.1	EW0-3000	0	0	A	P2	Diode	Diode Sect.
	OK Over 150 On 3000 Scale							
CK553AX	1.1	DV4-1200	0	....	B	#	250	
	# Hold Down P2 And Press P3							
CK556AX	1.1	ES3-1000	31	....	D	P3	1000	
559	6.3	JR0-0070	0	62	A	P2	Diode	Cap=P
CK568AX	1.1	ES3-1000	40	....	B	P3	280	
CK569AX	1.1	DV4-1200	18	....	D	P3	630	
CK571AX	1.1	DU7-1200	92	....	B	P3	100	
CK573AX	1.1	CU3-1000	34	....	B	P3	1260	
CK574AX	0.6	DV4-2100	0	0	A	P2	‡	
	‡ OK Over 275 On 3000 Scale							
CK605CX	6.3	DU7-1265	10	....	D	P3	2780	
CK606BX	6.3	CT0-1040	0	67	A	P2	Diode	
CK608CX	6.3	DU5-1060	21	....	D	P3	3150	
CK619CX	6.3	CT4-1050	8	....	D	P3	2500	
629	2.5	JR3-2040	#	92	A	P4	Thyr.	
	# Should Strike Between 35 and 25. Read As Rectifier.							
713A	6.3	JR4-7630	0	....	C	P3	2200	
717A	6.3	JR4-7630	0	....	C	P3	2200	
801A	7.5	JR3-2000	0	....	B	P3	950	
802	6.3	JR4-0365	22	....	B	P3	1260	Cap=P
807	6.3	JR3-0240	33	....	C	P3	2400	Cap=P
809	6.3	JR3-0000	0	....	B	P3	1050	Cap=P
811	6.3	JR3-0000	0	....	B	P3	900	Cap=P
812	6.3	JR3-0000	0	....	B	P3	1400	Cap=P
814	10.0	JR3-0240	0	....	C	P3	1900	Cap=P
815	12.6	HS8-0430	40	....	C	P3	2500	Left Cap=P
815	12.6	HS1-0430	35	....	C	P3	2500	Right Cap=P
816	2.5	JR0-0000	0	62	A	P7	Rect.	Cap=P
SD828A★	6.3	EW3-1520	18	....	D	P3	2080	E Basing

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
829	6.3	JR4-5620	0	....	D	P3	2500	Plate No. 1
	See Sect. 4. Par. 4a (29)							
829	6.3	JR4-7620	0	....	D	P3	2500	Plate No. 2
	See Sect. 4. Par. 4a (29)							
829A	6.3	JR4-5620	0	....	D	P3	2500	Plate No. 1
	See Sect. 4. Par. 4a (29)							
829A	6.3	JR4-7620	0	....	D	P3	2500	Plate No. 2
	See Sect. 4. Par. 4a (29)							
829B	6.3	JR4-5620	0	....	D	P3	2500	Plate No. 1
	See Sect. 4. Par. 4a (29)							
829B	6.3	JR4-7620	0	....	D	P3	2500	Plate No. 2
	See Sect. 4. Par. 4a (29)							
832	6.3	JR4-5620	0	....	C	P3	2200	Plate No. 1
	See Sect. 4. Par. 4a (29).							
832	6.3	JR4-7620	0	....	C	P3	2200	Plate No. 2
	See Sect. 4. Par. 4a (29)							
832A	6.3	JR4-5620	0	....	C	P3	2200	Plate No. 1
	See Sect. 4. Par. 4a (29)							
832A	6.3	JR4-7620	0	....	C	P3	2200	Plate No. 2
	See Sect. 4. Par. 4a (29)							
834	7.5	JR0-0000	0	....	B	P3	1140	Near Cap=G Far Cap=P
836	4.3	JR0-0000	0	40	A	P7	Rect.	Cap=P
837	12.6	JR4-0365	0	....	C	P3	2500	Cap=P
SN838E★	6.3	EW3-0512	17	....	D	P3	1825	
	E Basing Top Lead=P							
841	7.5	JR3-2000	0	....	B	P3	630	
842	7.5	JR3-2000	61	....	D	P3	750	
843	2.5	JR3-2040	12	....	B	P3	1050	
864	1.1	JR3-2000	45	....	B	P3	410	
865	7.5	JR3-0200	34	....	B	P3	390	Cap=P
866A	2.5	JR0-0000	0	51	A	P7	Rect.	Cap=P
871	2.5	JR0-0000	0	51	A	P7	Rect.	Cap=P
874	....	AP0-3010	0	62	A	P4	Volt Reg.	Read As Rectifier
879	2.5	JR0-0000	0	80	A	P4	Rect.	Cap=P
884	6.3	JR5-3070	#	92	A	P4	Thyr.	
	# Should Strike Between 77 and 67. Read As Rectifier.							
885	2.5	JR3-2040	#	92	A	P4	Thyr.	
	# Should Strike Between 77 and 67. Read As Rectifier.							
SD917A★	6.3	DU2-1050	17	....	D	P3	950	C Basing
SN944 ★	6.3	EW3-0512	15	....	D	P3	1500	
	E Basing Top Lead=P							
SN946 ★	6.3	CT0-1040	0	67	A	P2	Diode	A Basing
SN947C★	6.3	CU6-1350	54	....	C	P3	1900	E Basing
SN947D★	6.3	DW1-5782	54	....	C	P3	1900	F Basing
SN948 ★	6.3	FT4-1020	16	....	D	P3	950	D Basing
SN949C★	6.3	DW7-1250	#	56	A	P7	Thyr.	F Basing
	# Should Strike Between 70 and 60. Read As Rectifier.							
950	2.0	JR3-2400	45	....	B	P3	600	
951	2.0	JR0-2300	18	....	B	#	410	Cap=G
	# Hold Down P2 And Press P3							
SN953D★	6.3	DW1-5720	25	....	D	P3	2650	F Basing
954	6.3	JR7-0364	21	....	B	P3	700	Cap=P
SN954★	6.3	ES0-1030	0	20	A	P7	Rect.	B Basing
SN954B★	6.3	DW0-2050	0	20	A	P7	Rect.	F Basing
955	6.3	JR4-3060	22	....	B	P3	1200	
SN955B★	6.3	DW1-7084	16	....	D	P3	2200	F Basing Triode No. 1
SN955B★	6.3	DW2-5084	16	....	D	P3	2200	F Basing Triode No. 2
956	6.3	JR7-0364	17	....	B	P3	950	Cap=P
SN956B	1.1	BS0-0000	0	0	A	P7	Rect.	Top Lead=P
	OK Over 100 On 3000 Scale							
957	1.5	JR4-3000	28	....	B	P3	400	
SN957A★	6.3	FT4-1020	29	....	D	P3	1380	D Basing
958	1.5	JR4-3000	41	....	B	P3	750	
959	1.5	JR7-0300	25	....	B	#	380	
	# Cap=P Hold Down P2 And Press P3							
SN972D★	6.3	DW1-5740	21	....	B	P3	1260	F Basing
SN973B★	6.3	GT1-5740	21	....	D	P3	1900	F Basing
SN976C★	6.3	DW1-5740	49	....	C	P3	2500	F Basing
SD993C★	6.3	DW1-8050	20	....	D	P3	3660	F Basing
SD995B★	6.3	DW1-5740	21	....	B	P3	1260	F Basing
FM1000	6.3	JR2-4536	12	....	B	P3	950	No. 1 Grid
FM1000	6.3	JR6-4532	12	....	B	P3	950	No. 2 Grid
1003	....	JR0-5070	0	70	A	P6	Rect.	Plate No. 1
	Hold Button Down For 5 Seconds							
1003	....	JR0-3070	0	70	A	P6	Rect.	Plate No. 2
	Hold Button Down For 5 Seconds							
CK1005	6.3	GX0-3050	0	92	A	P4	Rect.	Plate No. 1
CK1005	6.3	GX0-5030	0	92	A	P4	Rect.	Plate No. 2
SN1006★	6.3	FT4-1020	28	....	B	P3	300	D Basing
1007	1.1	JX0-3020	0	40	A	P6	Rect.	Plate No. 1
1007	1.1	JX0-5020	0	40	A	P6	Rect.	Plate No. 2
CK1027	....	AP0-8070	0	85	A	P4	Rect.	Cap=P
E1148	6.3	JR0-0070	14	....	B	P3	1390	Upper Cap=P Lower Cap=G
1201	6.3	JS1-3040	18	....	D	P3	1900	
1203	6.3	JR0-4070	0	51	A	P2	Diode	
1204	6.3	HS5-3140	10	....	D	P3	1150	
1206	6.3	JR5-7362	10	....	B	P3	1320	Tetrode No. 1
1206	6.3	JR4-2367	10	....	B	P3	1320	Tetrode No. 2
1229	2.0	JR0-2300	19	....	B	#	400	
	# Cap=G Hold Down P2 And Press P3							
1230	2.0	JR3-2000	40	....	B	P3	570	
1231	6.3	JR6-2374	0	....	C	P3	1600	
1232	6.3	JR6-2374	18	....	B	P3	1250	
1237	2.5	JR0-3000	0	73	A	P7	Rect.	Plate No. 1
	Short On 1-2-4-5							
1237	2.5	JR0-6000	0	73	A	P7	Rect.	Plate No. 2
	Short On 1-2-4-5							

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
1247★	0.6	EV0-0000	0	0	A	P2	Diode	F Basing Top Lead = P Cap = P
HY1269	12.6	JR3-0240	0	....	C	P3	2500	
1273	6.3	JR6-2374	11	....	B	P3	1450	
1280	12.6	JR6-2374	11	....	B	P3	1450	
1282	6.3	JR6-2375	10	....	D	P3	2200	
1284	12.6	JR6-2374	28	....	B	P3	1250	
1285	25.0	JR5-3470	36	....	D	P3	3650	
1291	2.5	BY6-7000	25	....	B	P3	950	Triode No. 1
1291	2.5	JR3-2000	25	....	B	P3	950	Triode No. 2
1293	1.5	JR6-2000	30	....	B	P3	820	
1294	1.5	JR0-4070	0	0	A	P2	Diode	
1299	2.5	JR6-2300	37	....	B	P3	1300	
SR1553D	6.3	JR2-3050	0	....	D	P3	4700	
1602	7.5	JR3-2000	39	....	B	P3	790	
1603	6.3	JR0-2354	21	....	B	P3	770	Cap = G
1609	1.1	JR3-2400	0	....	B	#	440	
	# Hold Down P2 And Press P3							
1610	2.5	JR3-2400	22	....	B	P3	1260	
1611	6.3	JR5-3472	29	....	B	P3	1260	
1612	6.3	JR0-3475	23	....	B	P3	410	Cap Grid Cap = G
1612	6.3	JR5-3472	27	....	B	P3	410	Pin Grid
1613	6.3	JR5-3470	0	....	B	P3	1400	
1614	6.3	JR5-3472	23	....	D	P3	3150	
1616	2.5	JR0-0000	0	40	A	P6	Rect.	Cap = P
1619	2.5	JR5-3407	12	....	C	P3	2150	
1620	6.3	JR0-3475	22	....	B	P3	770	Cap = G
1621	6.3	JR5-3470	29	....	B	P3	1250	
1622	6.3	JR5-3470	23	....	D	P3	3150	
1623	6.3	JR3-0000	0	....	B	P3	1400	Cap = P
1624	2.5	JR3-0200	17	....	C	P3	2500	Cap = P
1625	12.6	JR4-0360	33	....	C	P3	2000	Cap = P
1626	12.6	JR5-3070	52	....	B	P3	1325	
1629	12.6	JR5-4070	0	100	A	P3	Eye	Eye Open
1629	12.6	JR5-4370	0	100	A	P3	Eye	Eye Closed
1631	12.6	JR5-3472	23	....	D	P3	3150	
1632	12.6	JR5-3470	10	....	D	#	5650	
	# Hold Down P2 And Press P3							
1633	25.0	JX4-5060	23	....	D	P3	1650	Triode No. 1
1633	25.0	JX2-1030	23	....	D	P3	1650	Triode No. 2
1634	12.6	JX4-5062	0	....	B	P3	650	Triode No. 1
1634	12.6	JX3-1062	0	....	B	P3	650	Triode No. 2
1635	6.3	JR4-3070	0	....	B	P3	540	Triode No. 1
1635	6.3	JR5-6070	0	....	B	P3	540	Triode No. 2
1642	6.3	JR4-5060	38	....	B	P3	875	Triode No. 1
1642	6.3	JR0-3020	38	....	B	P3	875	Triode No. 2 Cap = G
1644	12.6	JW2-7513	10	....	B	P3	1350	Pentode No. 1
1644	12.6	JW3-4512	10	....	B	P3	1350	Pentode No. 2
1650	6.3	JR4-3060	22	....	B	P3	1200	
1654	1.5	DX0-0000	0	56	A	P4	Rect.	Cap = P Short on 3
1655	6.3	JX4-5061	10	....	D	P3	840	Triode No. 1
1655	6.3	JX3-1065	10	....	D	P3	840	Triode No. 2
1657	6.3	JR5-3670	#	90	A	P4	Thyr.	
	# Should Strike Between 50 and 40. Read As Rectifier.							
1658	2.0	JR3-2000	40	....	B	P3	570	
1659	2.5	JR0-2050	11	....	B	P3	470	Triode Sect. Cap = G
1659	2.5	JR0-4050	0	0	A	P2	Diode	Diode No. 1
1659	2.5	JR0-3050	0	0	A	P2	Diode	Diode No. 2
1662	2.5	DX8-2100	33	....	B	P3	1260	
1851	6.3	JR0-3475	10	....	D	P3	3150	Cap = G
1852	6.3	JR4-7653	10	....	D	P3	3800	
1853	6.3	JR4-7653	0	....	C	P3	2200	
2050	6.3	JR5-3670	#	90	A	P4	Thyr.	
	# Should Strike Between 50 and 40. Read As Rectifier.							
2051	6.3	JR5-3670	#	90	A	P4	Thyr.	
	# Should Strike Between 40 and 30. Read As Rectifier.							
5516	6.3	JR5-0320	20	....	C	P3	2500	Cap = P Short on 3
5517	BLST	AP0-8070	0	51	A	P6 Volt. Reg.		Cap = P
	Read As Rectifier.							
5556	4.3	JR3-2000	26	....	B	P3	625	
5590	6.3	JR3-5670	12	....	B	#	1260	
	# Hold Down P2 And Press P3							
5591	6.3	JR3-5620	10	....	D	P3	2650	
5603	6.3	JR4-7603	35	....	D	P3	3350	
5608A	2.5	JR5-6042	12	....	B	P3	950	Triode No. 1
5608A	2.5	JR3-2046	12	....	B	P3	950	Triode No. 2
5610	6.3	JR6-3020	27	....	C	P3	2500	
5618	6.3	DX6-2180	24	....	C	P3	1900	
5633★	6.3	EW3-0512	15	....	D	P3	1500	
	E Basing Top Lead = P							
5634★	6.3	EW3-0512	17	....	D	P3	1825	
	E Basing Top Lead = P							
5635★	6.3	DW1-7084	16	....	D	P3	2200	
	F Basing Triode No. 1							
5635★	6.3	DW2-5084	16	....	D	P3	2200	
	F Basing Triode No. 2							
5637★	6.3	DU2-1050	17	....	D	P3	950	C Basing
5638★	6.3	EW3-1520	18	....	D	P3	2080	E Basing
5639★	6.3	DW1-5720	25	....	D	P3	2650	F Basing
5640★	6.3	DW1-5782	54	....	C	P3	1900	F Basing
5641★	6.3	ES0-1030	0	20	A	P7	Rect.	B Basing
5642	1.1	BS0-0000	0	0	A	P7	Rect.	Top Lead = P
	OK Over 100 On 3000 Scale							
5643★	6.3	DW7-1250	#	56	A	P7	Thyr.	F Basing.
	# Should Strike Between 70 and 60. Read As Rectifier.							
5644★	6.3	FT4-1020	16	....	D	P3	950	D Basing
5645★	6.3	FT4-1020	29	....	D	P3	1380	D Basing
5646★	6.3	FT4-1020	28	....	B	P3	300	D Basing
5647★	6.3	CT0-1040	0	67	A	P2	Diode	A Basing
5651	....	AP0-3070	0	56	A	P4 Volt. Ref.		Read As Rectifier

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
5654	6.3	JR3-5620	10	....	D	P3	2700	
5659	12.6	JR5-3470	22	....	C	P3	1900	
5660	12.6	JR0-3670	8	....	B	P3	840	Pent. Sect. Cap=G
5660	12.6	JR0-5670	0	0	A	P2	Diode	Diode No. 1
5660	12.6	JR0-4670	0	0	A	P2	Diode	Diode No. 2
5661	12.6	JR4-7653	21	....	B	P3	1250	
5662	6.3	JR3-7050	#	92	A	P4	Thyr.	
	# Should Strike Between 35 and 25. Read As Rectifier.							
5663	6.3	JR3-7520	#	56	A	P7	Thyr.	
	# Should Strike Between 70 and 60. Read As Rectifier.							
5670	6.3	KR7-6080	17	....	D	P3	3300	Triode No. 1
5670	6.3	KR3-4020	17	....	D	P3	3300	Triode No. 2
5672	1.1	DV4-1200	55	....	B	P3	350	
5676	1.1	ES3-1000	31	....	D	P3	1000	
5677	1.1	ES3-1000	40	....	B	P3	280	
5678	1.1	DV4-1200	18	....	D	P3	630	
5679	6.3	JR0-6075	0	62	A	P2	Diode	Diode No. 1
5679	6.3	JR0-3025	0	62	A	P2	Diode	Diode No. 2
5686	6.3	EV2-7630	18	.	C	P3	1950	
5687	12.6	EV7-9061	23	....	D	P3	4800	Triode No. 1
5687	12.6	EV2-1039	23	....	D	P3	4800	Triode No. 2
5691	6.3	JX4-5061	7	....	D	P3	1000	Triode No. 1
5691	6.3	JX2-1035	7	....	D	P3	1000	Triode No. 2
5692	6.3	JX4-5061	22	....	D	P3	1650	Triode No. 1
5692	6.3	JX2-1035	22	....	D	P3	1650	Triode No. 2
5693	6.3	JR4-7653	20	....	D	P3	1040	
5694	6.3	JR4-3020	0	....	D	P3	1500	Triode No. 1
5694	6.3	JR5-6070	0	....	D	P3	1500	Triode No. 2
5696	6.3	JR3-6025	#	56	A	P7	Thyr.	
	# Should Strike Between 70 and 60. Read As Rectifier.							
5702	6.3	DU7-1265	10	....	D	P3	2780	
5703	6.3	DU5-1060	21	....	D	P3	3150	
5704	6.3	CT0-1040	0	67	A	P2	Diode	
5718★	6.3	DW1-8057	22	....	D	P3	3460	F Basing
5719★	6.3	DW1-8057	23	....	B	P3	500	F Basing
5725	6.3	JR3-5627	10	....	D	P3	1540	
A5726	6.3	JR7-5623	20	....	B	P3	760	Ampl. Sect.
A5726	6.3	JR3-5627	10	....	B	P3	940	Osc. Sect.
5726	6.3	JR0-7030	0	67	A	P2	Diode	Diode No. 1
5726	6.3	JR0-2050	0	67	A	P2	Diode	Diode No. 2
5727	6.3	JR3-6025	#	90	A	P4	Thyr.	
	# Should Strike Between 40 and 30. Read As Rectifier.							
5731	6.3	JR4-3060	20	....	D	P3	1400	
5742	4.3	JR3-2000	10	....	B	P3	530	
5744	6.3	CT4-1050	8	....	D	P3	2500	
5749	6.3	JR3-5672	9	....	C	P3	2700	
5750	6.3	JR7-5623	11	....	B	P3	900	Ampl. Sect.
5750	6.3	JR3-5627	0	....	B	P3	1000	Osc. Sect.
5751	12.6	EV7-6080	8	....	D	P3	950	Triode No. 1
5751	12.6	EV2-1030	8	....	D	P3	950	Triode No. 2
5755	12.6	EV6-8073	0	....	B	P3	630	Triode No. 1
5755	12.6	EV3-1026	0	....	B	P3	630	Triode No. 2
5763	6.3	EV9-1673	8	....	D	P3	4400	
5783	.....	AP0-3050	0	72	A	P4	Volt. Ref.	Read As Rectifier
5784	6.3	DU7-1265	20	....	B	P3	1130	
5785	1.1	GX0-1000	0	0	A	P2	Rect.	
	OK Over 500 On 3000 Scale							
5787	BLST	JP0-3010	0	67	A	P4	Volt. Ref.	Read As Rectifier
5812	6.3	JR3-5602	34	....	C	P3	2700	
5814	12.6	EV7-6080	24	....	B	P3	1400	Triode No. 1
5814	12.6	EV2-1030	24	....	B	P3	1400	Triode No. 2
5823	BLST	AP8-3010	100	87	A	P4	Volt. Reg.	Read As Rectifier
5824	25.0	JR5-3470	52	....	C	P3	2500	
5825	1.5	JR0-0000	0	0	A	P4	Rect.	Cap=P
	OK Above 250 On 3000 Scale							
5829	6.3	DV0-6070	0	67	A	P2	Diode	Diode No. 1
5829	6.3	DV0-1020	0	67	A	P2	Diode	Diode No. 2
5840★	6.3	DW1-5740	22	....	C	P3	1575	F Basing
5844	6.3	JR5-2070	26	....	C	P3	1900	Triode No. 1
5844	6.3	JR6-3070	26	....	C	P3	1900	Triode No. 2
5879	6.3	EV1-8739	21	....	B	P3	630	
5881	6.3	JR5-3472	23	....	D	P3	3150	
5897★	6.3	DW1-8050	20	....	D	P3	3660	F Basing
5899★	6.3	DW1-5740	21	....	B	P3	1260	F Basing
5900★	6.3	DW1-5740	21	....	B	P3	1260	F Basing
5902★	6.3	DW1-5720	43	....	C	P3	2650	F Basing
5903★	25.0	DW0-5074 Plate No. 1	0	48	A	P7	Rect.	F Basing
5903★	25.0	DW0-1024 Plate No. 2	0	48	A	P7	Rect.	F Basing
5904★	25.0	DW1-8050	43	....	B	P3	630	F Basing
5906★	25.0	DW1-5720	6	....	D	P3	3150	F Basing
5907★	25.0	DW1-5720	12	....	D	#	1900	F Basing
	# Hold Down P2 And Press P3							
5915	6.3	JR7-5623	20	....	B	P3	760	Ampl. Sect.
5915	6.3	JR3-5627	10	....	B	P3	950	Osc. Sect.
5916★	25.0	DW1-5724	22	....	B	P3	820	F Basing
5963	12.6	EV1-6080	30	....	B	P3	1260	Triode No. 1
5963	12.6	EV2-1030	30	....	B	P3	1260	Triode No. 2
5977★	6.3	DW1-8053	29	....	D	P3	2840	F Basing
5987★	6.3	DW1-2050	74	....	B	P3	1160	F Basing
5998	6.3	JX4-5061	63	....	D	P3	5000	Triode No. 1
5998	6.3	JX2-1035	63	....	D	P3	5000	Triode No. 2
6005	6.3	JR3-5620	21	....	C	P3	2320	
6026★	6.3	EV7-8030	21	....	D	P3	3700	F Basing
6055★	25.0	DW1-8050	43	....	B	P3	630	F Basing
6146	6.3	JR5-0327	30	....	D	P3	4400	Cap=P

TABLE 4-2 (Cont.) TUBE TEST DATA CHART

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
6159	25.0	**JR**5-0327	30	....	**D**	P3	4400	Cap = P
6169★	6.3	**DW**1-2040	12	....	**D**	P3	3800	F Basing
7193	6.3	**JR**0-0070	13	....	**C**	P3	1900	Upper Cap = G Lower Cap = P
8005	10.0	**JR**3-0000	22	....	**B**	P3	1260	Cap = P
8016	1.1	**JR**0-0000	0	67	**A**	P4	Rect.	Cap = P
9001	6.3	**JR**3-5670	21	....	**B**	P3	700	
9002	6.3	**JR**6-3070	22	....	**B**	P3	1200	
9003	6.3	**JR**3-5620	17	....	**B**	P3	950	
9004	6.3	**JR**0-3040	0	67	**A**	P2	Diode	
9005	4.3	**JR**0-4030	0	51	**A**	P2	Diode	
9006	6.3	**JR**0-3070	0	51	**A**	P2	Diode	
38142	7.5	**JR**3-2000	37	....	**B**	P3	1400	
XXB	2.5	**BY**5-6000	10	....	**B**	P3	700	Triode No. 1
XXB	2.5	**JR**4-3000	10	....	**B**	P3	700	Triode No. 2
XXD	12.6	**JR**5-6070	13	....	**D**	P3	1575	Triode No. 1
XXD	12.6	**JR**4-3020	13	....	**D**	P3	1575	Triode No. 2
XXFM	6.3	**JR**3-2040	10	....	**D**	P3	630	Triode Sect.
XXFM	6.3	**JR**0-5040	0	67	**A**	P2	Diode	Diode No. 1
XXFM	6.3	**JR**0-6070	0	67	**A**	P2	Diode	Diode No. 2
XXL	6.3	**JR**6-2070	18	....	**D**	P3	1900	

Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations

(30) TESTING BALLAST TUBES.

(a) Turn the tester ON.

(b) Set FILAMENT voltage switch S-108 to BLST.

(c) Set SHORTS test switch on position 1.

(d) Refer to TABLE 4-3. Set first FILAMENT SELECTOR No. 1 switch S-107 (lettered A to K) to letter in column headed "First Selector". Set all numbered SELECTORS on zero.

(e) Rotate second FILAMENT SELECTOR switch S-106 (lettered P to Z) from P to Z. Neon lamp, E-101, should light on positions noted in Table 4-3.

TABLE 4-3. TEST DATA FOR BALLAST TUBES

TUBE TYPE	First Selector	Neon lamp should light in these positions.						
1A1-1B1-1C1-1E1-1F1-1G1-1J1-1K1-1L1-1N1-1P1-1Q1-1R1G-1S1G-1T1G-1U1G-1V1-1Y1-1Z1-2	J	R						
2UR224	J			T				X
2LR212	H	R	S		U			
3	J	R						
O3G	J			T				
4-5	J	R						
6-133	J			T				
6-6AA	J	R						
7-8-9	J	R						
10A-10AG	J			T				

TABLE 4-3. TEST DATA FOR BALLAST TUBES (Cont'd)

TUBE TYPE	FIRST SELECTOR	NEON LAMP SHOULD LIGHT IN THESE POSITIONS						
10AB	J			T				X
K17B-M17C-BM17C	J			T				X
M17HG-M17H	J		S					X
	D	R						
M23B-K23C-KX23B-KX30C	J			T				X
M30H	J		S					X
	D	R						
30A-K30A	J			T				
K30D	J	R		T				X
33A-33AG	J			T				
K34B	J			T				X
36A	J			T				
K36B-BK36B-L36B-BM-L36C-KX36C	J			T				X
KX36A	J	R						
36D-L36D	J	R		T				X
L36DJ	J	R		T	U			X
K36H-M36H-M36HG	J		S					X
	D	R						
L40S1-L40S2	J	R		T		V		
42A	J			T				
42A1	H				U			
42A2-42B2	H		S		U			
K42B-L42B-M42B-KX42B-LY42B-L42BX-K42C-L42C-M42C	J			T				X
KB42D-K42D-L42D	J	R		T				X
LX42D-L42DX	J	R	S	T				
K42E-L42E	J			T				X
L42F	J							X
	D	R						
42HA-K42HJ-M42H-M42HG	J		S					X
	E	R		T				
KX42C	J			T				X

TABLE 4-3. TEST DATA FOR BALLAST TUBES (Cont'd)

TUBE TYPE	FIRST SELECTOR	NEON LAMP SHOULD LIGHT IN THESE POSITIONS						
L42S1	J	R		T		V		
49A-49AJ-K49AJ	J			T				
KX49A	J			T				X
49A1	H				U			
49A2-49B2	H		S		U			
K49B-L49B-M49B-BM49B-K49C-M49C-BM49C-BK49C-K49E-L49E	J			T				X
K49D-BK49D-L49D	J			T				X
L49F	J							X
	D	R						
M49H-M49HG	J		S					X
	D	R						
KZ49B-KZ49C	J	R				V		
K49BJ-L49BJ	J			T	U			X
L49S2	J	R		T		V		
49AJ-K49AJ	J			T				
KX49B-LX49B-LX49C	J			T				X
L49DJ	J	R		T	U			X
L49S3	J	R		T		V		
50A2	J	R		T				
50A2MG-50B2	J	R				V		
50X3	J	R						
K52H-M52H	J		S					X
	D	R						
K54B	J			T				X
55A-K55A	J			T				
55A1	H				U			
KX55A	J	R						
55B-K55B-M55B-BM55B-L55BG-LX55B	J			T				X
55A2-55B2	H		S		U			
K55C-L55C-KX55C	J			T				X
K55CP	J			T		V		X

TABLE 4-3. TEST DATA FOR BALLAST TUBES (Cont'd)

TUBE TYPE	FIRST SELECTOR	NEON LAMP SHOULD LIGHT IN THESE POSITIONS						
K55D-L55D	J	R		T				X
L55E-M55E	J			T				X
L55F-M55F-BL55F	J							X
	D	R						
K55H-M55H-M55HG	J		S					X
	D	R						
L55S1-L55S2	J	R		T		V		X
60R30G	J	R		T				
64.23	J			T				
67A	J			T				
K67B-L67B	J			T				X
L73B-K74B-L74B-CX74C	J			T				X
80A	J			T				
K79B-K80B-M80B-K80C-KX80B-L80B	J			T				X
K80F	J							X
	D	R						
KX87B-LX87B-L90B	J			T				X
K90F-M90F-K92F-M92F	J							X
	D	R						
92A	J			T				
L92B-95K2	J			T				X
L99D	J	R		T				X
100R8	J			T				X
120R	J	R						
120RS-135K1	J			T				X
135K1A	J			T	U			X
140L4-140L8-140R4-140R8	J	R		T				
140R	J	R						
140L44-140R44	J	R	S	T				
165L4-165R4-165R8	J	R		T				
165R	J	R						
165L44-165R44	J	R	S	T				
185L4-185L8-185R4-185R8	J	R		T				
185R	J	R						
185L44-185R44	J	R	S	T				
200R-250R	J	R						
250R8-290L4	J			T				X
300R4-320R4	J			T				X
340	J	R						
808-1	J			T	U			X
E14980-W43357-W4588-3613	J			T				X
3334-3334A	J	R		T				X
8593-8598-8601-8664	J			T				X
3ER248	J	R		T	U			X
3CR241	J	R		T				X

TABLE 4-3. TEST DATA FOR BALLAST TUBES (Cont'd)

TUBE TYPE	FIRST SELECTOR	NEON LAMP SHOULD LIGHT IN THESE POSITIONS							
B9M15822	B			T					
	E					V			
	G							X	Y
B9M16067	J	R		T		V	W	X	
B9M16275	B			T	U	V	W	X	Y
B9M16534	J	R		T		V	W	X	
B9M17571	H	R		T					
	J				U	V		X	
B9M18941	B		S	T					
	E					V			
	G							X	Y
17A470303	J	R	S			V			
	D				U				
	G							X	
17A485459	J	R	S				W		
	D				U				
TBR102D	B		S	T	U	V			
	G							X	Y
TBR103D	B		S		U	V			
	G							X	Y
TBR104D	B		S	T	U	V			
	G							X	Y
397021	B		S	T					
397022	E					V	W		
397023	J							X	
397036	C					V			
407100	J	R	S			V			
408100	J	R	S			V			
	D				U				
SW507300	J	R		T		V	W	X	
571606	B		S	T					
	E					V	W		
	J							X	

b. When the TV-3B/U equipment is used as a Multimeter.

CAUTION

AVOID DAMAGE TO THE EQUIPMENT. When making voltage or current measurements always use the high ranges first to avoid possible damage to the equipment due to excessive overload. Then if necessary switch to one of the lower ranges. The lowest multimeter range which can be used will give the greatest accuracy.

(1) Insert the tip plugs of W-103 and W-104 in test jacks J-105 and J-106 located below the FUNCTION and RANGE SWITCHES. These leads are used for all multimeter measurements. The red lead and red jack are positive when polarity is involved.

(2) D.C. VOLTS. Potentials up to 1000 volts dc may be measured in six ranges. The circuit sensitivity is 20,000 ohms per volt.

(a) Set the FUNCTION selector at VOLTS D.C.

(b) Turn the RANGE selector to the proper range.

(c) Make contact with the voltage to be measured by means of the insulated test prods.

(3) VOLTS A.C. Alternating current voltages up to 1,000 volts may be measured in six ranges. The sensitivity of the ac circuit is 1000 ohms per volt.

(a) Set the FUNCTION selector switch for A.C. VOLTS.

(b) Turn the RANGE switch to the proper range.

(c) Apply the prod tips to the points between which measurements are to be taken.

(4) OHMS. Resistance may be measured in six ranges as follows:

0 to 1,000----------3 ohms center scale
0 to 10,000----------30 ohms center scale
0 to 100,000----------300 ohms center scale
0 to 1 megohm----------3000 ohms center scale
0 to 10 megohms----------30,000 ohms center scale
0 to 100 megohms----------300,000 ohms center scale

(a) Plug the line cord of the tester into a 115 volt ac outlet and turn the POWER switch to the ON position.

(b) Set the FUNCTION selector at OHMS.

(c) Turn the RANGE selector to the desired range.

(d) Operate the LINE ADJUST control until the pointer of the meter rests exactly over the line at the end of the scale marked INF. (Infinity.)

(e) Touch the prod tips of the test leads to the terminals of the resistance to be measured. The meter will indicate the value of the resistance in ohms. In measuring resistance elements be sure that no parallel current paths in the form of other resistors or circuit components are included between the contacts.

(f) The most accurate results will be obtained by selecting the range whose center scale value most closely corresponds to that of the resistor being measured.

(5) MFDS. Capacities may be measured from 0 to 20 microfarads in four ranges.

(a) Connect the equipment to a 115 volt ac power source. A line frequency of 60 cycles is required if direct meter readings are to be obtained. For other line frequencies it will be necessary to apply a corrective factor to the meter reading by using the conversion chart figure 4-7.

(b) Turn the FUNCTION switch to MILS.

(c) Press LINE ADJ. push button P1 and operate the LINE ADJUST control until the pointer of the meter rests exactly over the LINE ADJ mark at the center of the scale.

(d) Turn the FUNCTION selector to MFDS.

(e) Set the RANGE selector for the desired range.

(f) Touch the prod tips of the test leads to the terminals of the capacitor under test, after first making sure that no parallel current paths exist between the points of measurement.

(g) If the power supply frequency is 60 cycles the meter will indicate the value of the capacitor directly in microfarads. For other power line frequencies the meter reading must be corrected using the Conversion Chart for Capacity Measurements at Frequencies Other Than 60 Cycles, Figure 4-7.

(6) MILS. Current measurements may be made from 0 to 500 milliamperes dc in 6 ranges.

(a) Turn the FUNCTION selector to MILS.

(b) Set the RANGE selector for the desired range.

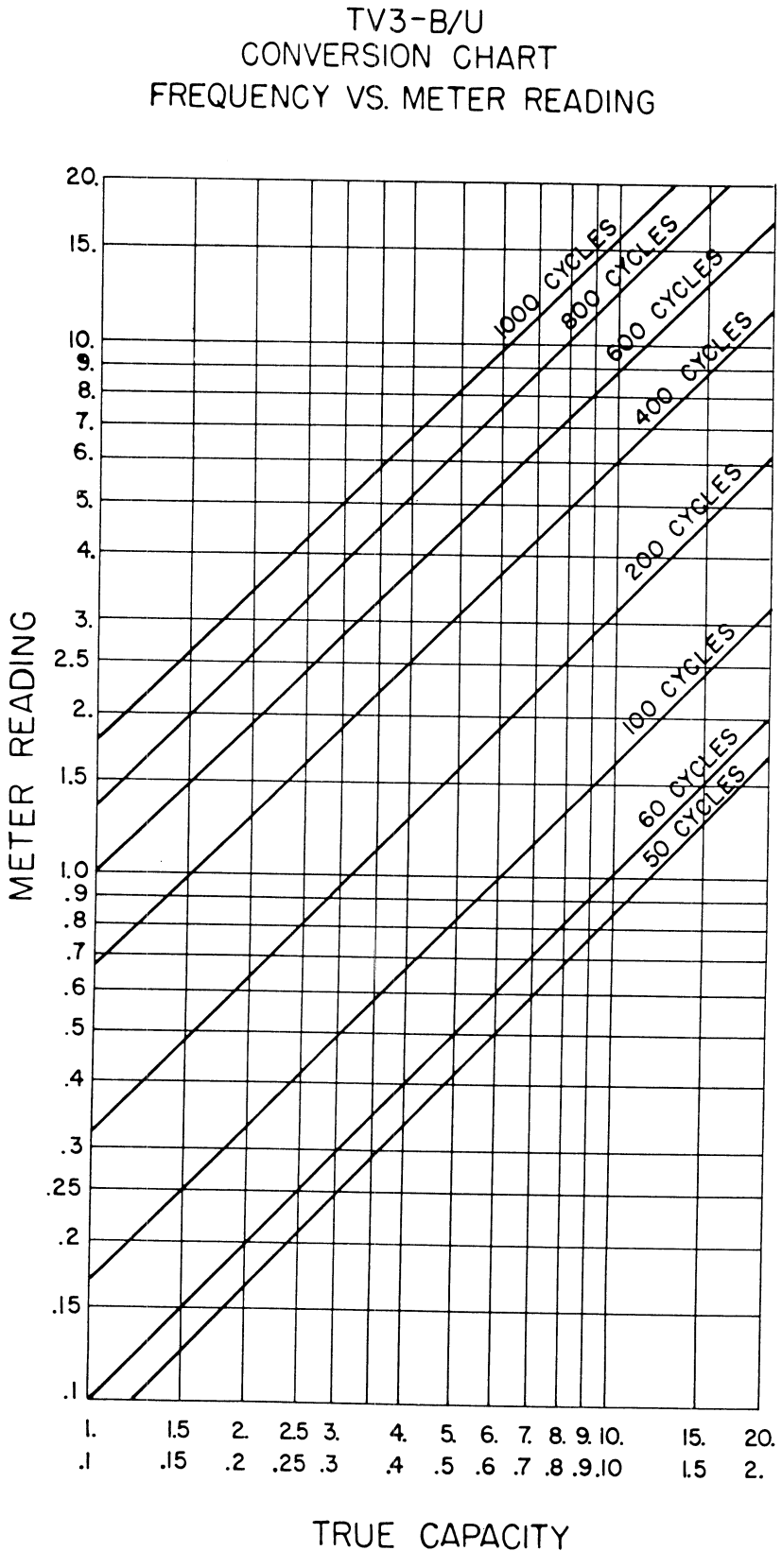


Figure 4-4. Conversion Chart for Capacity Measurements at Frequencies Other Than 60 Cycles

CAPACITY READING M. F.	INDUCTANCE HENRIES
.1	70.4
.2	35.2
.3	23.4
.4	17.6
.5	14.1
.6	11.7
.7	10.1
.8	8.8
.9	7.8
1.0	7.0
1.1	6.4
1.2	5.9
1.3	5.4
1.4	5.0
1.5	4.7
1.6	4.4
1.7	4.1
1.8	3.9
1.9	3.7
2.0	3.5

TABLE 4-4. CONVERSION FROM CAPACITY READING TO INDUCTANCE AT 50 CYCLES.

(c) Make connection to the points between which current is to be measured by means of the test leads.

(7) INDUCTANCE: In addition to the regular multimeter measurements it is possible to make inductance measurements of choke coils with the TV-3B/U equipment.

(a) Make the same preliminary adjustments and switch settings as for capacity measurements. (See paragraph 4b(5) of this section.)

(b) Connect the test leads to the terminals of the inductance to be measured, and note the reading on the capacity scale of the meter.

(c) Divide the reading in microfarads into 7.04 to obtain the inductance value in henries at 60 cycles power supply frequency.

(d) Table 4-4 provides a conversion chart for quickly estimating inductance values for capacity meter radings at 60 cycles.

(e) For any line frequency the inductance can be calculated by applying the following formula: Inductance in Henries =

$$\frac{422}{\text{Meter Reading in Microfarads X Frequency}}$$

Example (a): The line frequency is 120 cycles.
The meter reading is 0.5 Mfd.
Applying the formula:

$$\text{Inductance in Henries} = \frac{422}{0.5 \times 120} = 7.04$$

Example (b): The line frequency is 800 cycles.
The meter reading is 0.1 Mfd.
Applying the formula:

$$\text{Inductance in Henries} = \frac{422}{0.1 \times 800} = 5.28$$

SECTION 5
OPERATOR'S MAINTENANCE

1. LINE CORD AND PLUG.

a. Inspect cord for cuts or breaks in the insulation. Minor damage to the outer jacket may be repaired with friction tape. If, however, the break or cut is deep enough to expose either of the conductors, the cord should be replaced.

b. If the PILOT indicator I-103 does not light when the Tube Tester TV-3B/U is connected to a live 105-125 volt ac 50-1000 cycle outlet (See paragraph c below), check the FUSE lamp E-102 for possible burn out or loose socket connection. If FUSE lamp is OK unscrew the green jewel of indicator I-103 and check pilot lamp E-103 for loose socket connection, or burn out.

c. Check the ac voltage source using the 500 volt ac range of the Multimeter section. Low line voltage may render it impossible to adjust the meter to LINE TEST and impair the accuracy of the equipment.

2. TEST LEADS.

a. Inspect test leads for worn or broken insulation, also check all leads for continuity using the 30 OHM range of the Multimeter section. If leads are badly damaged or open they should be replaced.

3. FUSE LAMP.

E-102, a type 81, Mazda lamp is used as a fuse and overload indicator. A spare lamp is supplied with the equipment spares which are stowed in the lead compartment.

4. PILOT LAMP.

a. A number 47 lamp 6.3 volts at .15 amps, E-103, serves as a pilot lamp in panel indicator I-103. A spare lamp is supplied with the equipment spares in the lead compartment.

5. NEON LAMP.

a. The neon lamp E-101 used as a short indicator should be checked as follows:

(1) Be sure lamp is firmly screwed into its socket.

(2) With the tester plugged in, and the power switch ON, but with no tube in test sockets, set the FUNCTION switch S-114 to TUBE TEST.

(3) Set SELECTORS to JR 1-1111.

(4) Turn the SHORTS test switch S-109 through positions 1, 2, 3, 4, and 5. The neon lamp should glow in positions 2 and 3.

b. If the neon lamp is defective replace it from the equipment spares in the lead compartment.

NOTE

Do not deplete the supply of equipment spares furnished with the tester without taking the necessary steps to secure replacements.

6. TUBES.

a. Two full wave rectifier tubes are used in the TV-3B/U. One type 83, V-101, used in the mutual conductance test circuit to supply dc plate voltage for the tube under test and dc voltage for the ohmmeter portion of the Multimeter The type 5Y3, V-102, supplies screen and bias voltages to the tube under test.

b. Failure of the 83 tube V-101 is indicated if, with no tube in the test sockets but the controls set for tube test, the pointer of the Meter M-101 moves sharply off scale to the right when the RED push button P-3 is pressed.

c. Failure of the type 5Y3GT tube would result in lack of voltage on the screen, and bias circuits of the tube under test. To check plate and screen voltages refer to Section 7, Paragraph 7.

d. To remove rectifier tubes V-101 and V-102 for test or replacement:

(1) Remove the ten mounting screws around the edge of the panel.

(2) Carefully lift the entire unit out of its case and turn face down on the test bench or other flat surface.

(3) Slide the spring clamps holding the tubes in place away from the top of the tube, and to the side.

NOTE

After tubes are replaced in their sockets, BE SURE THE TUBE CLAMPS ARE IN PLACE BEFORE THE EQUIPMENT IS RETURNED TO ITS CASE.

SECTION 6
PREVENTIVE MAINTENANCE

NOTE

"THE ATTENTION OF MAINTENANCE PERSONNEL IS INVITED TO THE REQUIREMENTS OF CHAPTER 67 OF THE 'BUREAU OF SHIPS MANUAL' OF THE LATEST ISSUE."

Because of the nature and design of the TV-3B/U equipment, no special preventive maintenance procedures are required.

FAILURE REPORTS

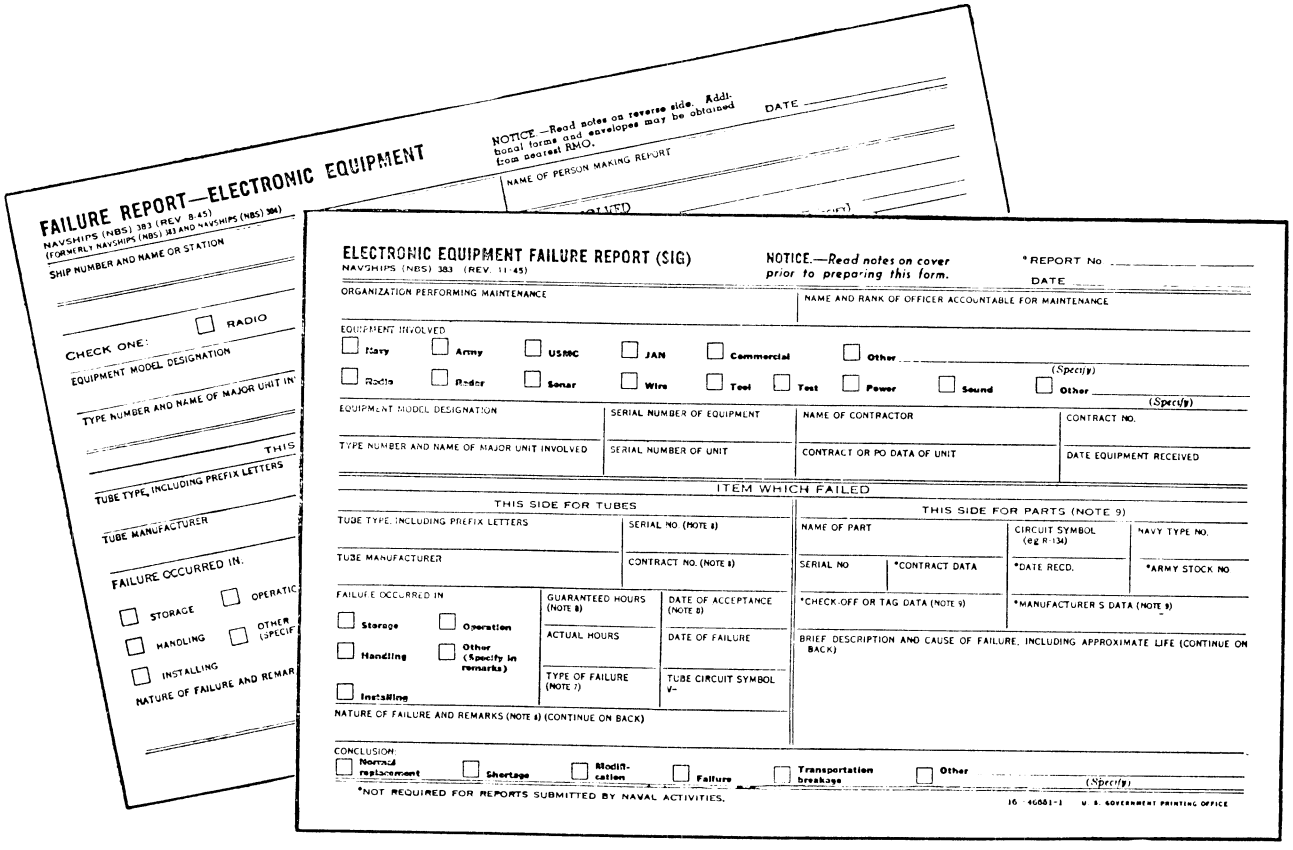
A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form NBS-383, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS in the franked envelope which is provided. Full instructions are to be found on each card.

Use great care in filling the card out to make certain it carries adequate information. For example, under "Circuit Symbol" use the proper circuit identification taken from the schematic drawings, such as T-803, in the case of a transformer, or R-207, for a resistor. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause of failure and attach an extra piece of paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships, furnish a store of information permitting the Bureau to keep in touch with the performance of the equipment of your ship and all other ships of the Navy.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards and envelopes on board. They may be obtained from the nearest district printing and publication office.



FAILURE REPORT—ELECTRONIC EQUIPMENT
NAVSHIPS (NBS) 383 (REV. 8-45)
(FORMERLY NAVSHIPS (NBS) 383 AND NAVSHIPS (NBS) 384)
SHIP NUMBER AND NAME OR STATION
CHECK ONE: RADIO
EQUIPMENT MODEL DESIGNATION
TYPE NUMBER AND NAME OF MAJOR UNIT IN
THIS
TUBE TYPE, INCLUDING PREFIX LETTERS
TUBE MANUFACTURER
FAILURE OCCURRED IN:
STORAGE OPERATIC
HANDLING OTHER (SPECIF
INSTALLING
NATURE OF FAILURE AND REMAR
NOTICE.—Read notes on reverse side. Addl. blank forms and envelopes may be obtained from nearest RMO.
DATE
NAME OF PERSON MAKING REPORT

ELECTRONIC EQUIPMENT FAILURE REPORT (SIG)
NAVSHIPS (NBS) 383 (REV. 11-45)
NOTICE.—*Read notes on cover prior to preparing this form.*
*REPORT No
DATE
ORGANIZATION PERFORMING MAINTENANCE
NAME AND RANK OF OFFICER ACCOUNTABLE FOR MAINTENANCE
EQUIPMENT INVOLVED
Navy Army USMC JAN Commercial Other
Radio Radar Sonar Wire Test Test Power Sound Other
(Specify)
EQUIPMENT MODEL DESIGNATION
SERIAL NUMBER OF EQUIPMENT
NAME OF CONTRACTOR
CONTRACT NO.
TYPE NUMBER AND NAME OF MAJOR UNIT INVOLVED
SERIAL NUMBER OF UNIT
CONTRACT OR PO DATA OF UNIT
DATE EQUIPMENT RECEIVED
ITEM WHICH FAILED
THIS SIDE FOR TUBES
TUBE TYPE, INCLUDING PREFIX LETTERS
SERIAL NO. (NOTE 8)
TUBE MANUFACTURER
CONTRACT NO. (NOTE 8)
FAILURE OCCURRED IN
Storage Operation
Handling Other (Specify in remarks)
Installing
GUARANTEED HOURS (NOTE 8)
ACTUAL HOURS
TYPE OF FAILURE (NOTE 7)
DATE OF ACCEPTANCE (NOTE 8)
DATE OF FAILURE
TUBE CIRCUIT SYMBOL V-
NATURE OF FAILURE AND REMARKS (NOTE 8) (CONTINUE ON BACK)
THIS SIDE FOR PARTS (NOTE 9)
NAME OF PART
CIRCUIT SYMBOL (eg R-134)
NAVY TYPE NO.
SERIAL NO
*CONTRACT DATA
*DATE RECD.
*ARMY STOCK NO
*CHECK-OFF OR TAG DATA (NOTE 9)
*MANUFACTURER'S DATA (NOTE 9)
BRIEF DESCRIPTION AND CAUSE OF FAILURE, INCLUDING APPROXIMATE LIFE (CONTINUE ON BACK)
CONCLUSION:
Normal replacement Shortage Modification Failure Transportation breakage Other
(Specify)
*NOT REQUIRED FOR REPORTS SUBMITTED BY NAVAL ACTIVITIES.
16 - 46881-1 U. S. GOVERNMENT PRINTING OFFICE

SECTION 7
CORRECTIVE MAINTENANCE

1. FUSE LAMP

a. The Tube Tester TV-3B/U is protected by a combination FUSE lamp and overload indicator, E-102, in the primary circuit of power transformer, T-101. If the PILOT indicator I-103 does not glow when the tester is connected to a live ac line of proper voltage, remove FUSE lamp E-102 from its socket, and check for continuity using a low range ohmmeter. If FUSE is open replace from spares found in the lead compartment.

b. Line voltage of the power source may be checked by using the 500 volt ac range of the TV-3B/U Multimeter section. Low line voltage may make it impossible to adjust the meter to LINE TEST and impair the accuracy to the equipment.

2. PILOT LAMP

a. The type 47, 6.3 volt bayonet base pilot lamp E-103 should light when the TV-3B/U is plugged into a live 115 volt ac outlet, and the power switch S-111 is turned ON. If the lamp does not light, but FUSE lamp E-102 checks OK, unscrew the green jewel cover of the PILOT indicator I-103 and check the lamp for continuity and looseness in the socket.

b. A burned out pilot lamp should be replaced with one from the equipment spares found in the lead compartment.

3. NEON LAMP

a. The neon lamp E-101 used as a short indicator should be checked as follows:

(1) Be sure lamp is firmly screwed into its socket.

(2) With the tester plugged in and the power switch ON, but with no tube in test sockets, set the FUNCTION switch S-114 to TUBE TEST.

(3) Set SELECTORS to JR-1-1111.

(4) Turn the SHORTS-MICROMHOS test switch S-109 through positions 1, 2, 3, 4, and 5. The neon lamp should glow in positions 2 and 3.

b. If the neon lamp is defective replace it from the equipment spares in the lead compartment.

NOTE

Do not deplete the supply of equipment spares furnished with the equipment without taking the necessary steps to secure replacements.

4. TUBES.

a. Two full wave rectifier tubes are used in the TV-3B/U. One type 83, V-101, used in the mutual conductance test circuit to supply plate voltage and to supply dc voltage for the ohmmeter circuit of the Multimeter section. The 5Y3GT, V-102, supplies dc screen and bias voltages for the tube under test.

b. Failure of the 83 tube V-101 is indicated if, with no tube in the test sockets but the controls set for tube test, the pointer of the METER M-101 moves sharply off scale to the right when the RED push button P-3 is pressed.

c. Failure of the type 5Y3GT tube would result in lack of voltage on the screen and plate circuits of the tube under test. To check plate and screen voltages refer to paragraph 7 of this section.

d. To remove rectifier tubes V-101 and V-102 for test, or replacement:

(1) Remove the ten mounting screws around the edge of the panel.

(2) Carefully lift the entire unit out of its case, and turn face down on the test bench or other flat surface.

(3) Slide the spring clamps holding the tubes in place, away from the top of the tube and to one side.

NOTE

After the tubes are replaced in their sockets BE SURE THE TUBE CLAMPS ARE IN PLACE BEFORE THE EQUIPMENT IS RETURNED TO ITS CASE.

5. TEST LEADS

a. Inspect all test leads for defective insulation and test for continuity. Make any minor repairs nec-

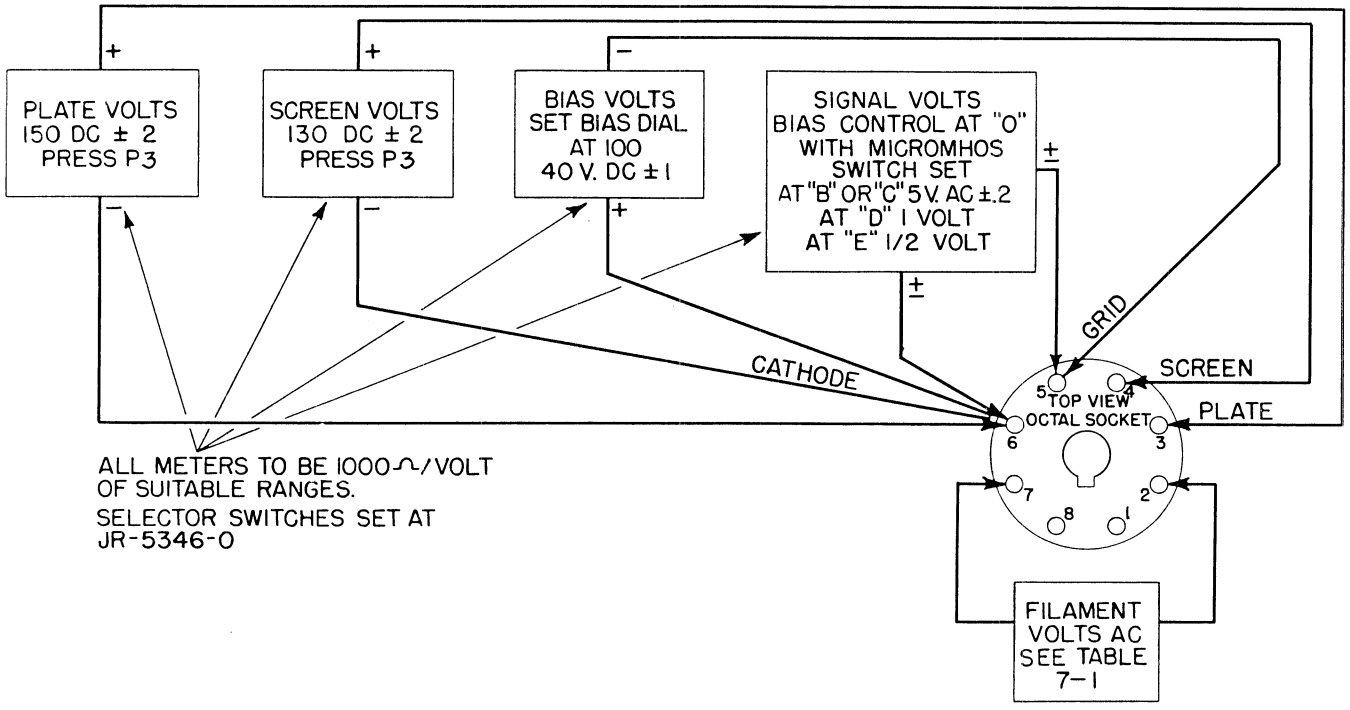


Figure 7-1. Voltage Calibration Check Diagram

essary, but if leads are in poor condition, or beyond repair, requisition replacements immediately.

6. SCHEMATIC WIRING DIAGRAM.

a. Refer to schematic diagram figure 7-6 and internal views figure 7-2, 7-3, 7-4, and 7-5 for correct wiring and placement of parts in the TV-3B/U.

7. VOLTAGE AND CALIBRATION CHECK.

a. The tube tester section of the TV-3B/U may be checked for proper voltages and for correct calibration of the SHUNT and BIAS control dials as outlined in the following steps:

(1) Set the FUNCTION switch, S-114, and the SHORTS-MICROMHOS switch, S-109, to TUBE TEST. Set the SELECTORS, S-107, S-106, S-105, S-104, S-103, S-102, and S-101 to JR 5-3460. Turn POWER switch, S-111, ON. Press LINE ADJ. push button P1 and turn LINE ADJUST control R-133 until the METER pointer is set at LINE TEST.

NOTE

Voltage tests must be made with an external multimeter, or individual meters of 1000 ohms per volt sensitivity having suitable ranges of ac and dc connected as illustrated by Figure 7-1. The Multimeter section of the TV-3B/U cannot be used for these tests. If the voltages are not in accordance with the following paragraphs 7a(2) through 7a(6), refer to paragraph 8 and Table 7-2 of this section for probable causes.

(2) PLATE VOLTAGE CHECK (150 vdc.)

(a) Connect the positive (+) terminal of the voltmeter to contact No. 3 of the OCTAL test socket, X-111, and the negative (-) terminal to contact No. 6 of the same socket. (See figure 7-1.)

(b) Press RED push button P3. The voltmeter should read approximately 150 volts dc plus or minus 2 volts.

(3) SCREEN VOLTAGE CHECK (130 vdc.)

(a) Connect the positive (+) terminal of the voltmeter to contact No. 4 of the OCTAL test socket X-111, and the negative (-) terminal to contact No. 6. Set BIAS control to zero. (See figure 7-1).

(b) Press RED push button P3. The voltmeter should read approximately 130 volts dc plus or minus 2 volts.

(4) BIAS VOLTAGE CHECK (40 vdc.)

(a) Set the BIAS dial, I-101 of bias control R-139, at 100.

(b) Connect the positive (+) terminal of the voltmeter to contact No. 6 of the OCTAL test socket X-111 and the negative (-) terminal to the No. 5 contact. (See figure 7-1.)

(c) The voltmeter should read 40 volts dc plus or minus 1 volt.

(5) SIGNAL VOLTAGE CHECK (0.5, 1, and 5 vac).

(a) Set BIAS dial I-101 of bias control R-139 at zero.

(b) Connect the terminals of the ac voltmeter to contacts 5 and 6 of the OCTAL test socket X-111. (See figure 7-1.)

(c) With the SHORTS-MICROMHOS switch S-109 set at "B" or "C" the meter should read 5 volts ac plus or minus 0.2 volt.

(d) With the SHORTS-MICROMHOS switch set at "D" the meter should read approximately 1 volt ac.

(e) With the SHORTS-MICROMHOS switch set at "E" the meter should read approximately 0.5 volt.

(6) FILAMENT VOLTAGE CHECK (1.1 to 117 vac).

(a) Set FILAMENT VOLTAGE switch S-108 to the desired voltage.

(b) Connect the terminals of an ac voltmeter or a multimeter of suitable range between contacts 2 and 7 of OCTAL test socket X-111.

(c) The meter should read within the limits indicated in Table 7-1 for the various nominal settings of the FILAMENT VOLTAGE switch S-108.

TABLE 7-1. FILAMENT VOLTAGE CHART FOR TUBE TESTER TV-3B/U

NOMINAL	MIN.	MAX.
0.6	.65	.72
1.1	1.06	1.16
1.5	1.28	1.42
2.0	1.9	2.1
2.5	2.58	2.85
3.0	3.25	3.6
4.3	4.3	4.75
5.0	5.15	5.68
6.3	6.2	6.8
7.5	7.32	8.1
10.0	9.8	10.8
12.6	12.3	13.5
20.0	19.	21.
25.0	25.3	28.
35.0	35.2	39.
50.0	51.5	57.
75.	74.	82.
117.	116.	128.

(7) BIAS dial I-101 and SHUNT dial I-102 should indicate zero when they are in full counter clockwise positions. If they do not, loosen the set screws and reset the dials on the shafts.

8. SUGGESTIONS FOR LOCATING TROUBLE.

If proper voltages are not present in the tube tester section the following suggestions are offered for locating and correcting the trouble.

a. If all voltages are found to be either high or low it is possible that the trouble is in the line test circuit. Check resistor R-105 for correct value. An excessively high or low resistance at this point would result in improper adjustment of the line voltage causing high or low test voltages at the points covered in paragraph 7 of this section. Also check rectifier CR-101 as outlined in paragraph 10 of this section. A faulty rectifier would cause an erroneous meter reading which would result in high secondary voltages from the transformer T-101.

b. Incorrect Plate Voltage.

(1) High plate voltage can only result from the application of incorrect voltage to the primary of T-101, see paragraph (a) above.

(2) Low plate voltage will result from a defective 83 tube V-101.

c. Probable causes of incorrect voltages in the tube tester section are listed in Table 7-2.

d. Replacement of Resistor R-145.

After replacement of this resistor it will be necessary to adjust the two sliding contacts "A" and "B" to establish proper voltage distribution.

(1) Turn on the equipment and set all controls in accordance with paragraph 7a(1) of this section.

(2) Connect a voltmeter between pins 5 and 6 of OCTAL socket X-111 as illustrated by figure 7-1.

(3) Set BIAS control R-139 at 100.

(4) Adjust slider "A" of R-145 until the meter reads 40 volts dc.

(5) Connect a voltmeter between pins 4 and 6 of OCTAL socket as in figure 7-1.

(6) Press buttons P3 and P2 and adjust slider "B" of R-145 until the meter reads 56 volts dc.

(7) Tighten the slider screws and recheck the voltages.

TABLE 7-2. VOLTAGE TROUBLE CHART FOR TUBE TEST CIRCUIT

CONDITION	PROBABLE CAUSE	REMEDY
High Plate Voltage	See Paragraph 8a and 8b section 7.	
Low Plate Voltage	Defective 83 tube V-101. Shorted capacitor C-104. Open winding secondary 1 or 2.	Replace Replace Replace T-101
Zero Plate Voltage	Defective 83 tube V-101. Open winding secondary 1, 2 or 6 of T-101.	Replace Replace T-101
High Screen Voltage	BIAS control R-139 open at positive end. Resistor R-145 open.	Replace Replace
Low Screen Voltage	5Y3 tube V-102 weak. Open winding secondary 3 or 4.	Replace Replace T-101.
Zero Screen Voltage	Defective 5Y3 tube V-102. BIAS control R-139 open at negative end. Open winding secondary 3 and 4 or 5 of T-101.	Replace Replace Replace T-101
High Bias Voltage	BIAS control R-139 open at negative end.	Replace
Low Bias Voltage	Weak 5Y3 tube V-102. Open winding secondary 3 or 4.	Replace Replace T-101.
Zero Bias Voltage	BIAS control R-139 open at positive end. Resistor R-145 open. Defective 5Y3 tube V-102. Open winding secondary 3 and 4 or 5 of T-101.	Replace Replace Replace Replace T-101
High Signal Voltage	BIAS control R-139 not set at zero. Defective resistor R-121, R-122, or R-123.	Re-adjust Replace
Low Signal Voltage	Defective resistor R-121, R-122, or R-123.	Replace
Zero Signal Voltage	Defective resistor R-121, R-122, or R-123. Open winding secondary 3 of T-101.	Replace Replace T-101

9. RESISTANCE CHECK FOR MULTIMETER SECTION.

a. TABLE 7-2 is intended as an aid in localizing trouble in the Multimeter section of the TV-3B/U.

b. An ohmmeter or multimeter having suitable ranges should be connected to the test jacks, J-105 and J-106.

CAUTION

DISCONNECT POWER CORD BEFORE STARTING RESISTANCE MEASUREMENTS.

TABLE 7-3. POINT TO POINT RESISTANCE CHECK FOR MULTIMETER SECTION.

POSITION OF FUNCTION SWITCH	POSITION OF RANGE SWITCH	RESISTANCE ACROSS PIN JACKS J-105 and J-106	COMPONENT PARTS BY SYMBOL DESIGNATION WHICH SHOULD BE CHECKED FOR POSSIBLE FAILURE IF PROPER RESISTANCE READING ACROSS PIN JACKS IS NOT OBTAINED
OHMS	3 OHMS AT CENTER	3 OHMS	R154
	30 " " "	30.2 OHMS	R146
	300 " " "	301 OHMS	R138, R146
	3000 " " "	3800 OHMS	R134, R138, R146
	30K " " "	30,300 OHMS	R124, R125, R126, R134, R138, R146, R147, R156
	300K " " "	338,000 OHMS	R124, R125, R126, R134, R138, R146, R147, R156
VOLTS DC	5 VOLTS	100,000 OHMS	R153, R156
	10 "	200,000 OHMS	R152, R153, R156
	50 "	1 MEGOHM	R151, R152, R153, R156
	100 "	2 MEGOHMS	R150, R151, R152, R153, R156
	500 "	10 MEGOHMS	R149, R150, R151, R152, R153, R156
	1000 "	20 MEGOHMS	R148, R149, R150, R151, R152, R153, R156
VOLTS AC	5 VOLTS	5230 OHMS	CR101, R156, R157, R158, R159 R160
	10 "	10,500 OHMS	CR101, R156, R157, R158, R159, R160, R161
	50 "	51,700 OHMS	CR101, R156, R157, R158, R159, R160, R161, R162
	100 "	104,000 OHMS	CR101, R156, R157, R158, R159, R160, R161, R162, R163
	500 "	510,000 OHMS	CR101, R156, R157, R158, R159, R160, R161, R162, R163, R164
	1000 "	1 MEGHOM	CR101, R156, R157, R158, R159, R160, R161, R162, R163, R164 R165
CAP	.02 MFD.	4570 OHMS	CR101, R141, R155, R156, R157, R158, R159, R160
	.2 "	980 OHMS	CR101, R142, R155, R156, R157, R158, R159, R160
	2 "	142 OHMS	CR101, R143, R155, R156, R157, R158, R159, R160
	20 "	24.7 OHMS	CR101, R144, R155, R156, R157, R158, R159, R160
MILS	1	250 OHMS	R127, R128, R129 R130, R131, R156
	5	52 OHMS	
	10	26.2 OHMS	
	50	5.38 OHMS	
	100	2.75 OHMS	
	500	0.64 OHMS	

10. COPPER OXIDE RECTIFIER.

a. Failure of meter rectifiers of the type used in the TV-3B/U seldom occurs in normal use.

b. A defective rectifier CR-101 will cause a considerable drop in sensitivity on the ac ranges only. If the dc voltage circuits check out properly, but an appreciable error is found when measuring ac voltages; it is a definite indication that the rectifier CR-101 is defective and should be replaced.

CAUTION

DURING FUNGUS PROOFING OPERATIONS BE SURE THAT NONE OF THE COATING COMPOUND IS USED ON OR PERMITTED TO COME IN CONTACT WITH THE COPPER OXIDE RECTIFIER. CHEMICALS USED IN THESE COATING COMPOUNDS MAY CAUSE DAMAGE TO METALLIC RECTIFIER ELEMENTS.

c. The rectifier CR-101, may be tested with an ohmmeter in the following way:

(1) Disconnect the rectifier leads at the ends farthest from the rectifier, taking care to note the original position of the lead connections.

(2) Measure the resistance between the red and yellow rectifier leads with the positive ohmmeter lead in contact with the red rectifier lead. A high resistance reading in excess of 20,000 ohms should be obtained.

(3) Reverse the polarity of the ohmmeter leads and again measure the resistance between the red and yellow rectifier leads. A low resistance reading from approximately 75 ohms to 500 ohms should be obtained.

(4) If, when the polarity of the ohmmeter leads is reversed, both readings are low resistance or zero resistance, the rectifier is defective and should be replaced.

(5) Measure the resistance between the yellow and black leads in the same way as in paragraphs (2), (3) and (4) above. Similar readings should be obtained.

TABLE 7-4
CROSS REFERENCE LIST FOR LOCATION OF PARTS BY SYMBOL DESIGNATION

SYMBOL DESIG.	LOCATION OF COMPONENT OR ILLUSTRATION ON WHICH IT IS CALLED OUT
C-101	Mounted on the side of "short" test Lamp Holder, J-107
C-102	Figures 7-4 and 7-5
C-103	Figures 7-3, 7-4, and 7-5
C-104	Figure 7-4
CR-101	Mounted on underside of terminal board E-111, beneath resistor R-158 (See figure 7-2 for R-158)
E-101	Figure 4-1
E-102	Figures 4-1 and 7-3
E-103	Figures 4-1 and 7-3
E-109	Figure 1-4
E-110	Figure 1-4
E-111	Figure 7-3
E-112	Figure 7-3
H-101	Figure 7-5
H-110	Figure 4-1
H-111	Figure 7-5
H-112	Figure 7-5
I -101	Figure 4-1
I -102	Figure 4-1
I -103	Figures 4-1 and 7-3
J-101	Figure 4-1
J-102	Figure 4-1
J-103	Figure 4-1
J-104	Figure 4-1
J-105	Figure 4-1
J-106	Figure 4-1
J-107	Mounted on the underside of the main panel between resistor R-135 and switch S-109
J-108	Figure 7-3
M-101	Figures 4-1, 7-3, 7-4, and 7-5
O-101	Figures 4-1, 7-3, and 7-5
O-116	Figure 7-4
R-101	Mounted across top deck of CATHODE switch, S-102
R-102	Mounted between deck 1 and deck 5 of SCREEN switch, S-103
R-103	Mounted between deck 1 and deck 5 of PLATE switch, S-104
R-104	Mounted between deck 1 and deck 5 of GRID switch, S-105
R-105	Mounted on the top side of switch S-110 between push buttons 1 and 2.
R-106	Figure 7-5
R-107	Mounted between deck 3 and deck 4 of SHORT TEST switch, S-109
R-108	Mounted on the under side of deck 3 of SHORT TEST switch, S-109
R-109	Mounted across bottom of "short test Lamp Holder, J-107
R-110	Figure 7-4
R-111	Mounted between deck 3 and deck 4 of SHORT TEST switch, S-109

TABLE 7-4 (Continued)
CROSS REFERENCE LIST FOR LOCATION OF PARTS BY SYMBOL DESIGNATION

SYMBOL DESIG.	LOCATION OF COMPONENT OR ILLUSTRATION ON WHICH IT IS CALLED OUT
R-112	Figure 7-2
R-113	Figure 7-4
R-114	Figure 7-2
R-115	Figure 7-2
R-116	Figure 7-2
R-117	Mounted on top of switch S-110 between push button 2 and 3
R-118	Figure 7-4
R-119	Figure 7-2
R-120	Figure 7-4
R-121	Figure 7-2
R-122	Figure 7-2
R-123	Figure 7-2
R-124	Figure 7-2
R-125	Figure 7-2
R-126	Figure 7-2
R-127	Figure 7-2
R-128	Figure 7-2
R-129	Figure 7-2
R-130	Figure 7-2
R-131	Figure 7-2
R-132	Figure 7-2
R-133	Figures 4-1, 7-3, and 7-4
R-134	Figure 7-2
R-135	Figure 4-1 and 7-5
R-136	Not Assigned
R-137	Mounted on top of switch S-110 between push buttons 4 and 5
R-138	Figure 7-2
R-139	Figures 4-1 and 7-5
R-140	Figure 7-2
R-141	Mounted across top deck of FUNCTION switch, S-114
R-142	Figure 7-2
R-143	Figure 7-2
R-144	Figure 7-2
R-145	Figure 7-4
R-146	Figure 7-2
R-147	Figure 7-2
R-148	Figure 7-6
R-149	Figure 7-6
R-150	Figure 7-6
R-151	Figure 7-6
R-152	Figure 7-6
R-153	Figure 7-6
R-154	Figure 7-2
R-155	Mounted across the top deck of FUNCTION switch, S-114

TABLE 7-4 (Continued)
CROSS REFERENCE LIST FOR LOCATION OF PARTS BY SYMBOL DESIGNATION

SYMBOL DESIG.	LOCATION OF COMPONENT OR ILLUSTRATION ON WHICH IT IS CALLED OUT
R-156	Mounted across the top deck of FUNCTION switch, S-114
R-157	Figure 7-2
R-158	Figure 7-2
R-159	Figure 7-2
R-160	Figure 7-6
R-161	Figure 7-6
R-162	Figure 7-6
R-163	Figure 7-6
R-164	Figure 7-6
R-165	Figure 7-6
S-101	Figures 4-1, 7-3, and 7-4
S-102	Figures 4-1, 7-3, and 7-4
S-103	Figures 4-1, 7-3, 7-4 and 7-5
S-104	Figures 4-1, 7-3, 7-4 and 7-5
S-105	Figures 4-1, 7-3 and 7-5
S-106	Figures 4-1, 7-3 and 7-5
S-107	Figures 4-1 and 7-3
S-108	Figure 4-1
S-109	Figures 4-1 and 7-5
S-110	Figures 7-3 and 7-4
S-111	Figures 4-1, 7-3 and 7-4
S-112	Figures 4-1, 7-3, 7-4 and 7-5
S-113	Figures 4-1, 7-3 and 7-5
S-114	Figures 4-1, 7-3 and 7-5
T-101	Figures 7-3, 7-4 and 7-5
V-101	Figure 7-5
V-102	Figure 7-5
W-101	Figure 1-3
W-102	Figure 1-3
W-103	Figure 1-3
W-104	Figure 1-3
W-105	Figure 1-3
W-106	Stowed in lead compartment
X-101	Figure 7-2
X-102	Figure 7-2
X-103	Figures 4-1, 7-4 and 7-5
X-104	Figures 4-1, 7-4 and 7-5
X-105	Figures 4-1, 7-4 and 7-5
X-106	Figures 4-1, 7-4 and 7-5
X-107	Figures 4-1, 7-4 and 7-5
X-108	Figure 4-1
X-109	Figures 4-1, 7-4 and 7-5
X-110	Figures 4-1 and 7-4
X-111	Figures 4-1, 7-4 and 7-5
X-112	Figures 4-1, 7-4 and 7-5
X-113	Figures 4-1, 7-4 and 7-5

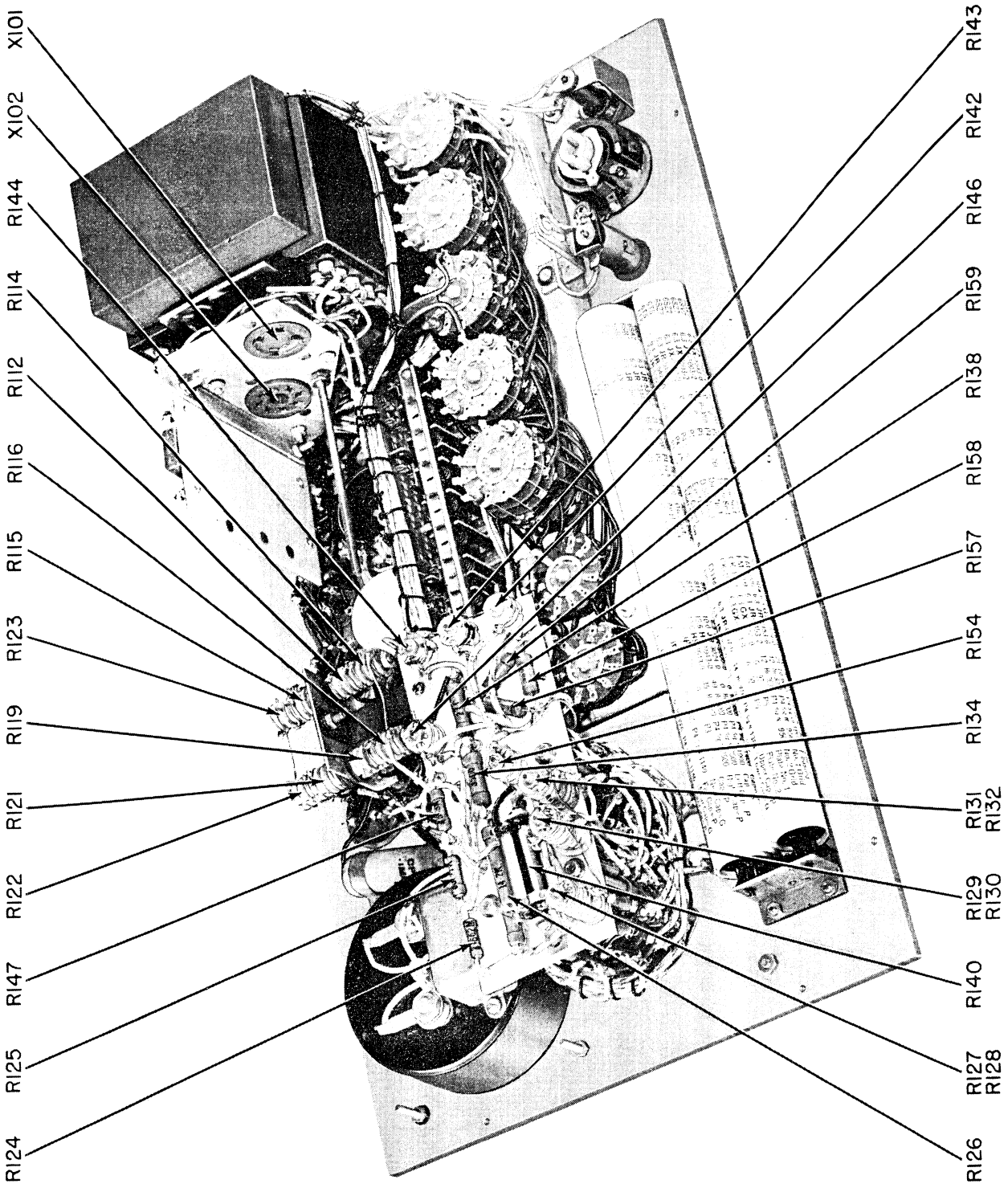


Figure 7-2. Internal View of Tube Tester TV-3B/U Front Left Oblique

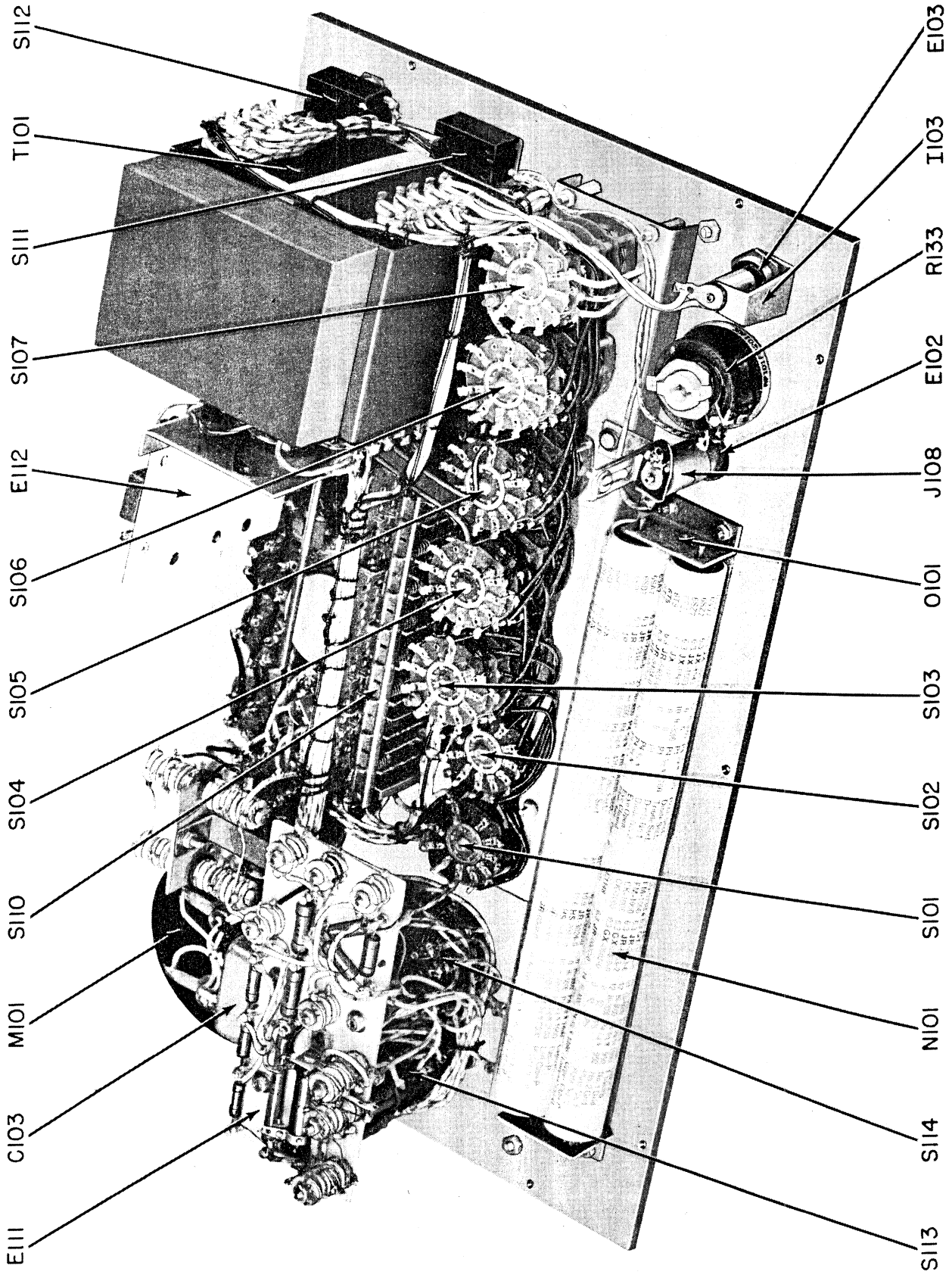


Figure 7-3. Internal View of Tube Tester TV-3B/U Front Right Oblique

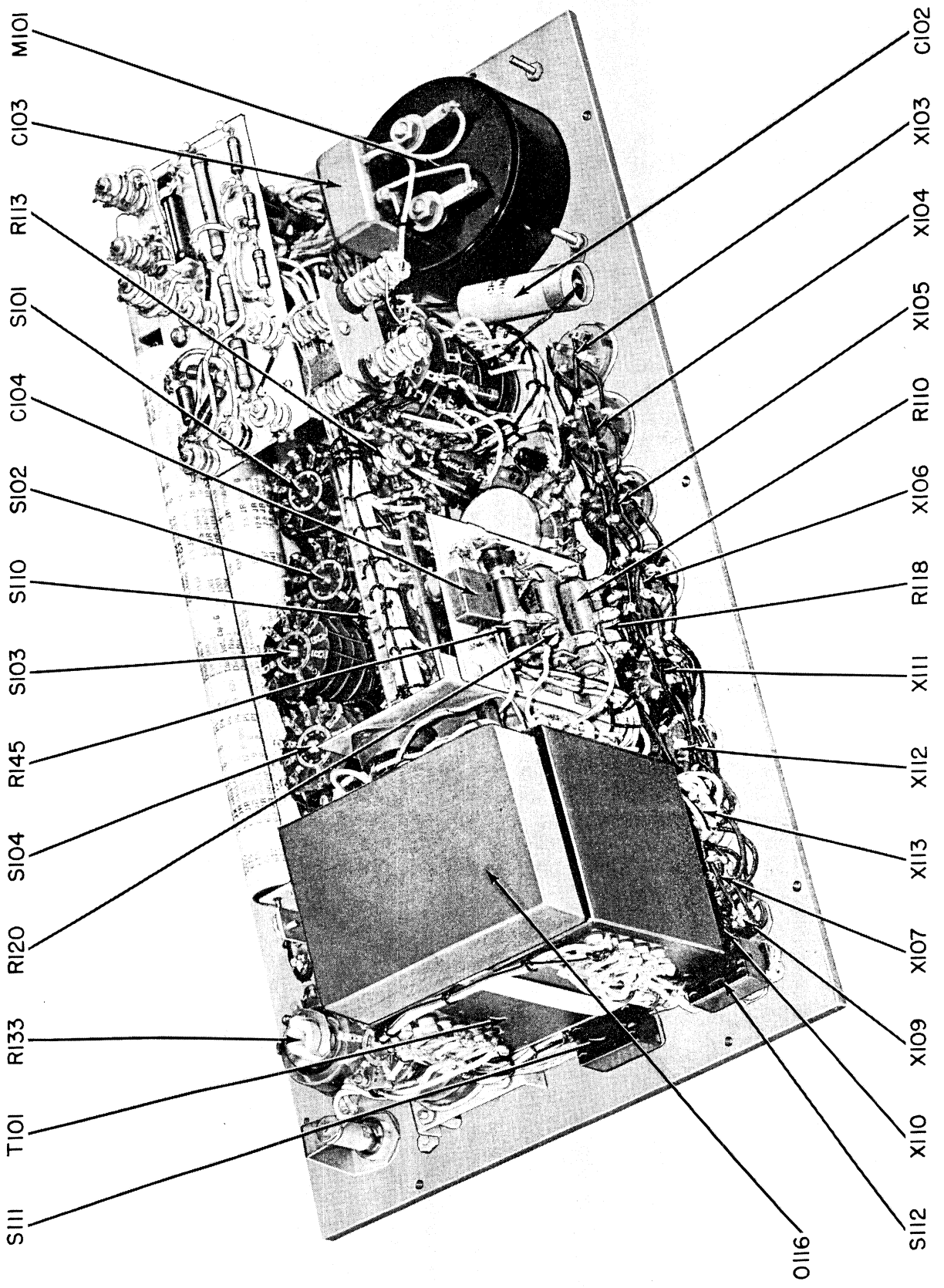


Figure 7-4. Internal View of Tube Tester TV-3B/U Rear Left Oblique

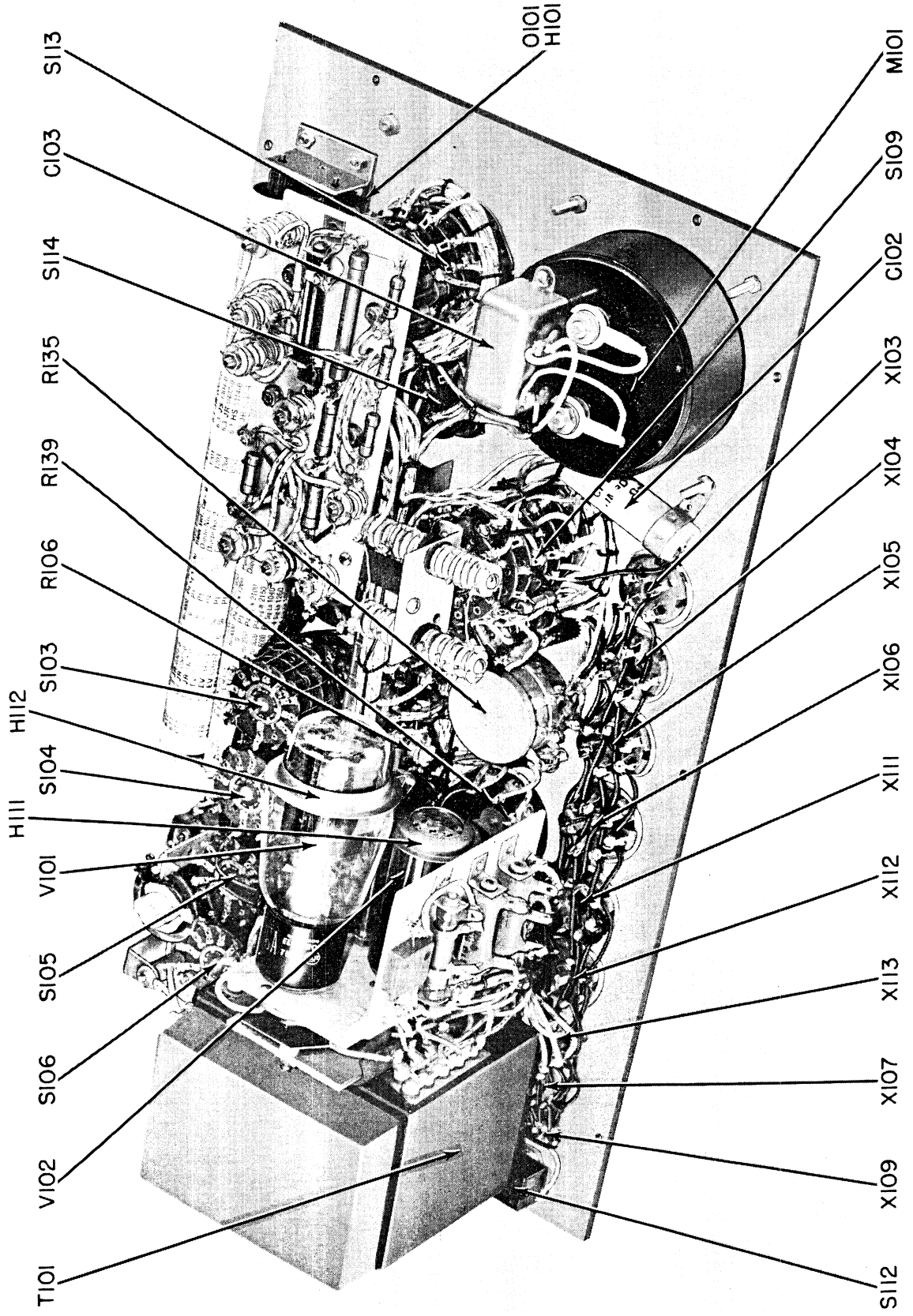


Figure 7-5. Internal View of Tube Tester TV-3B/U Rear Right Oblique

SWITCH S-113 AND ASSOCIATED RESISTORS

VIEWED FROM REAR

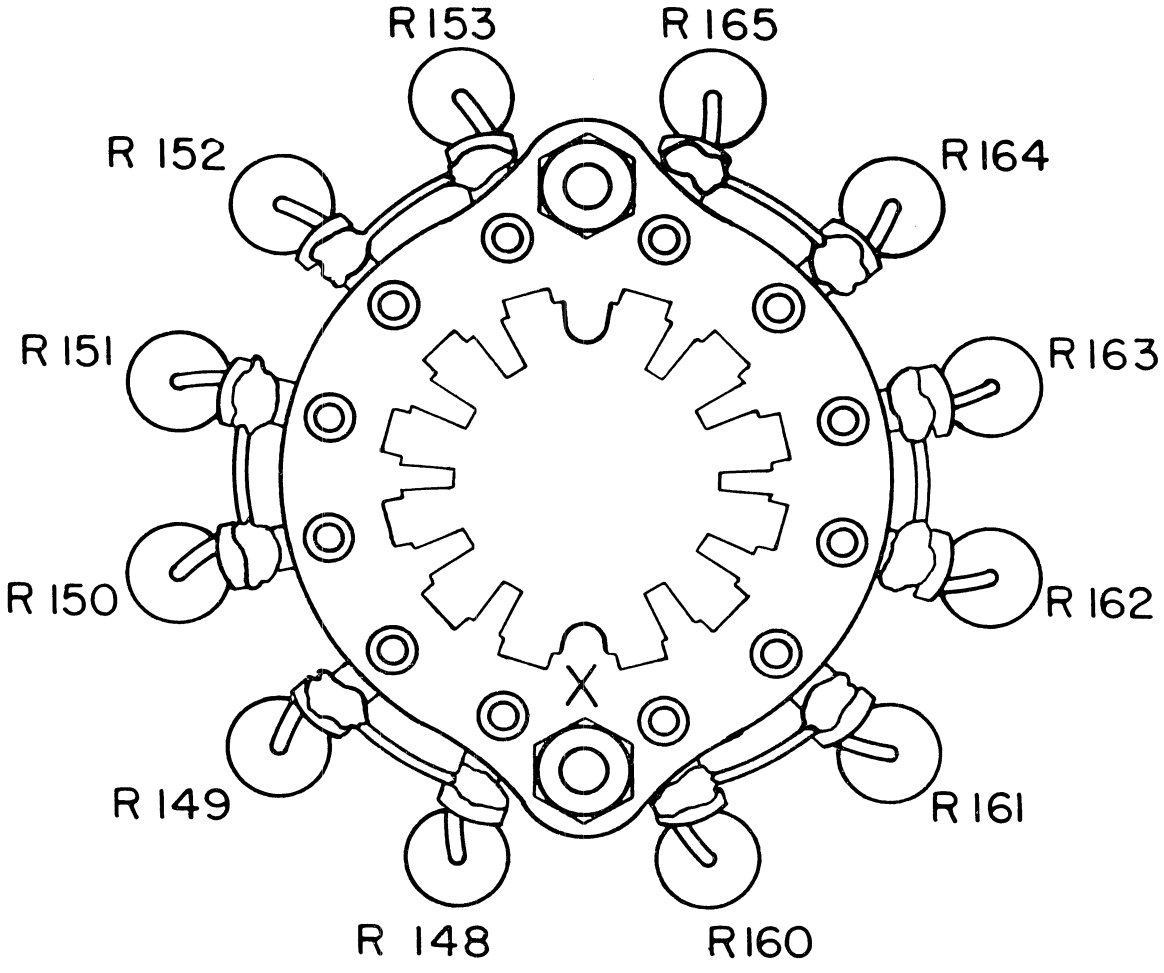
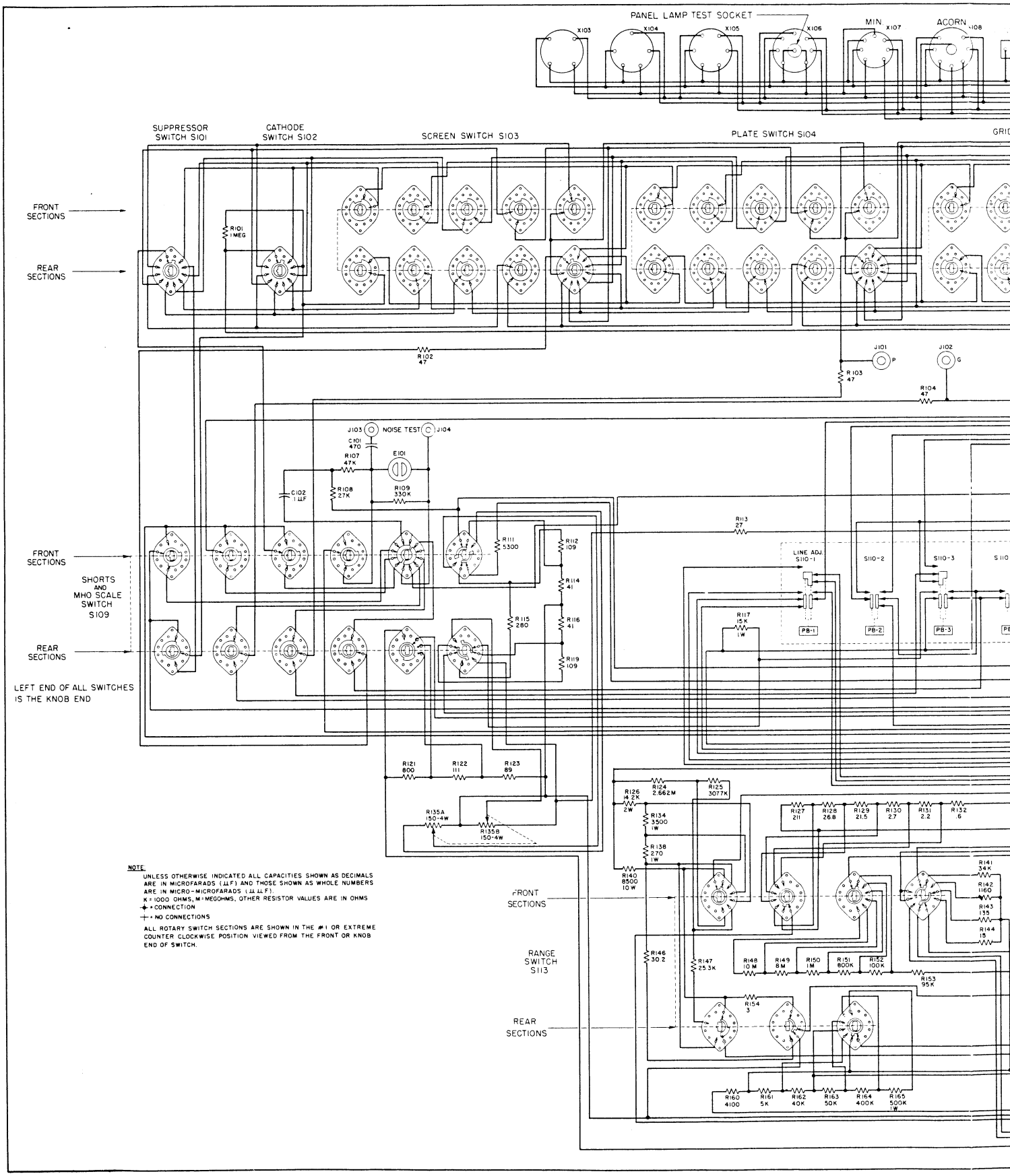


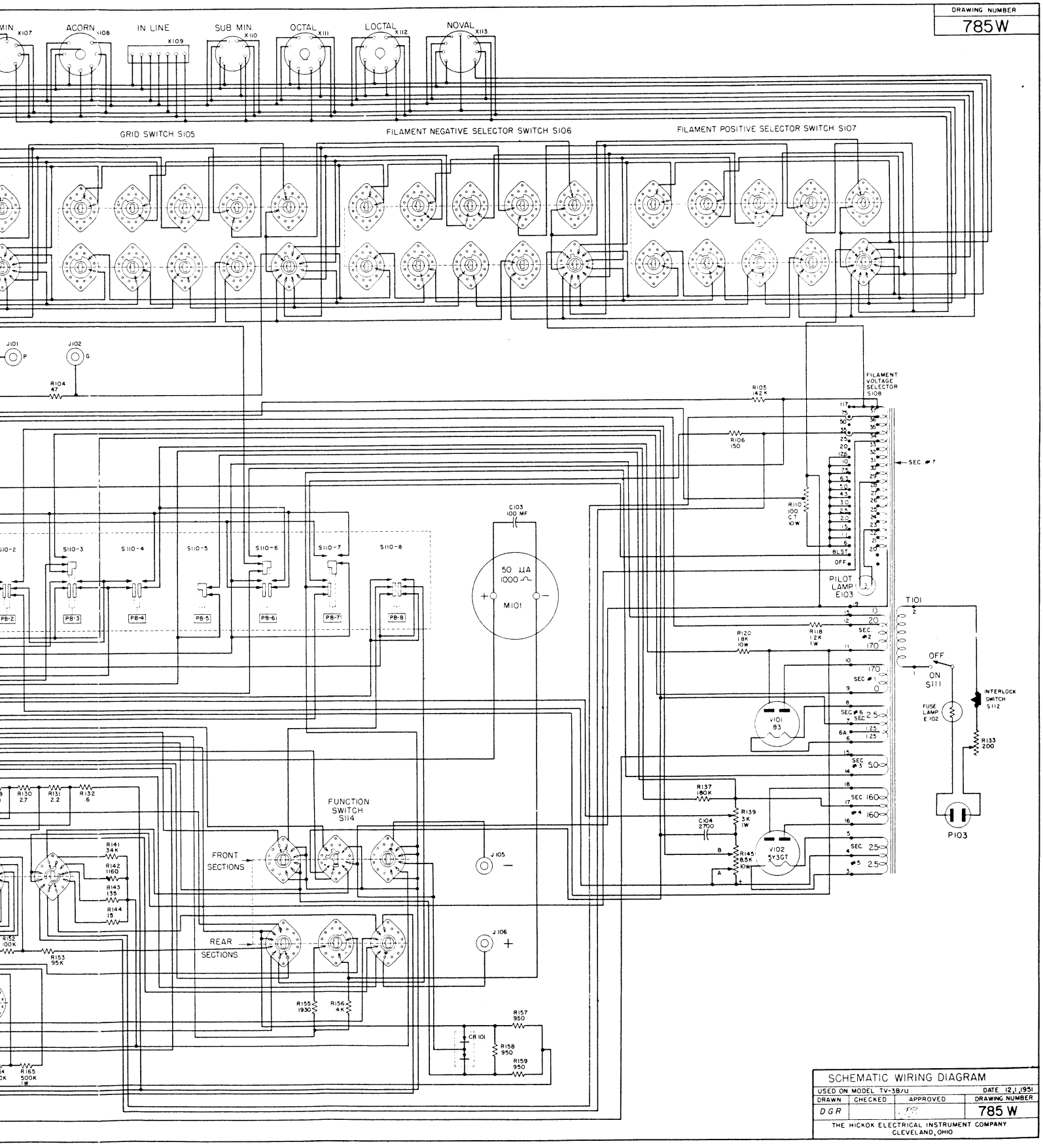
Figure 7-6. Location of Resistors on Range Switch S-113

NOTES



NOTE:
UNLESS OTHERWISE INDICATED ALL CAPACITIES SHOWN AS DECIMALS ARE IN MICROFARADS (μF) AND THOSE SHOWN AS WHOLE NUMBERS ARE IN MICRO-MICROFARADS (μμF).
K = 1000 OHMS, M = MEGOHMS, OTHER RESISTOR VALUES ARE IN OHMS
+ = CONNECTION
+ = NO CONNECTIONS
ALL ROTARY SWITCH SECTIONS ARE SHOWN IN THE #1 OR EXTREME COUNTER CLOCKWISE POSITION VIEWED FROM THE FRONT OR KNOB END OF SWITCH.

Figure 7-7. Schematic Dia



SCHEMATIC WIRING DIAGRAM

USED ON MODEL TV-3B/U			DATE 12,1,1951
DRAWN	CHECKED	APPROVED	DRAWING NUMBER
DGR			785 W

THE HICKOK ELECTRICAL INSTRUMENT COMPANY
CLEVELAND, OHIO

. Schematic Diagram for Tube Tester TV-3B/U

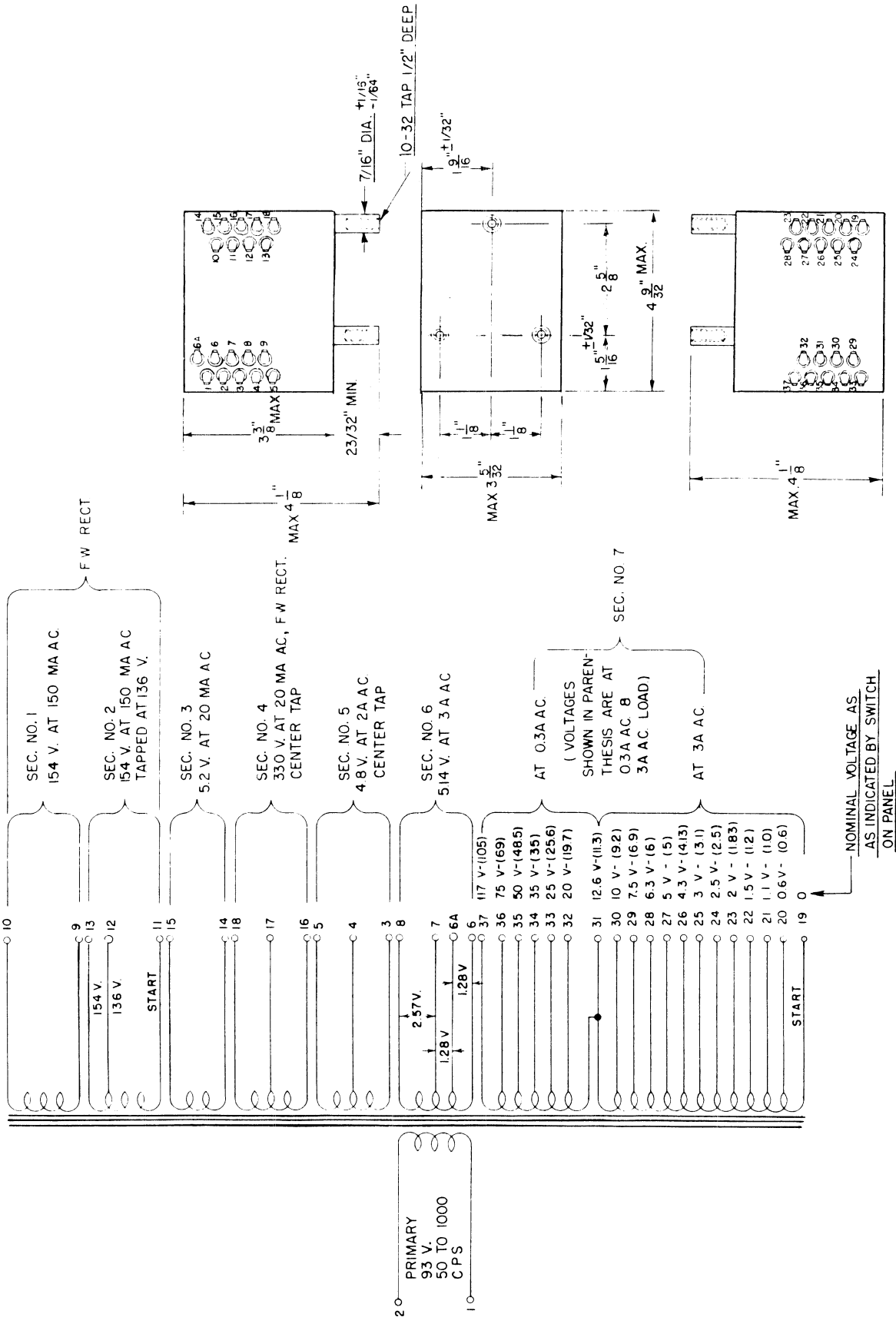


Figure 7-8. Transformer Diagram

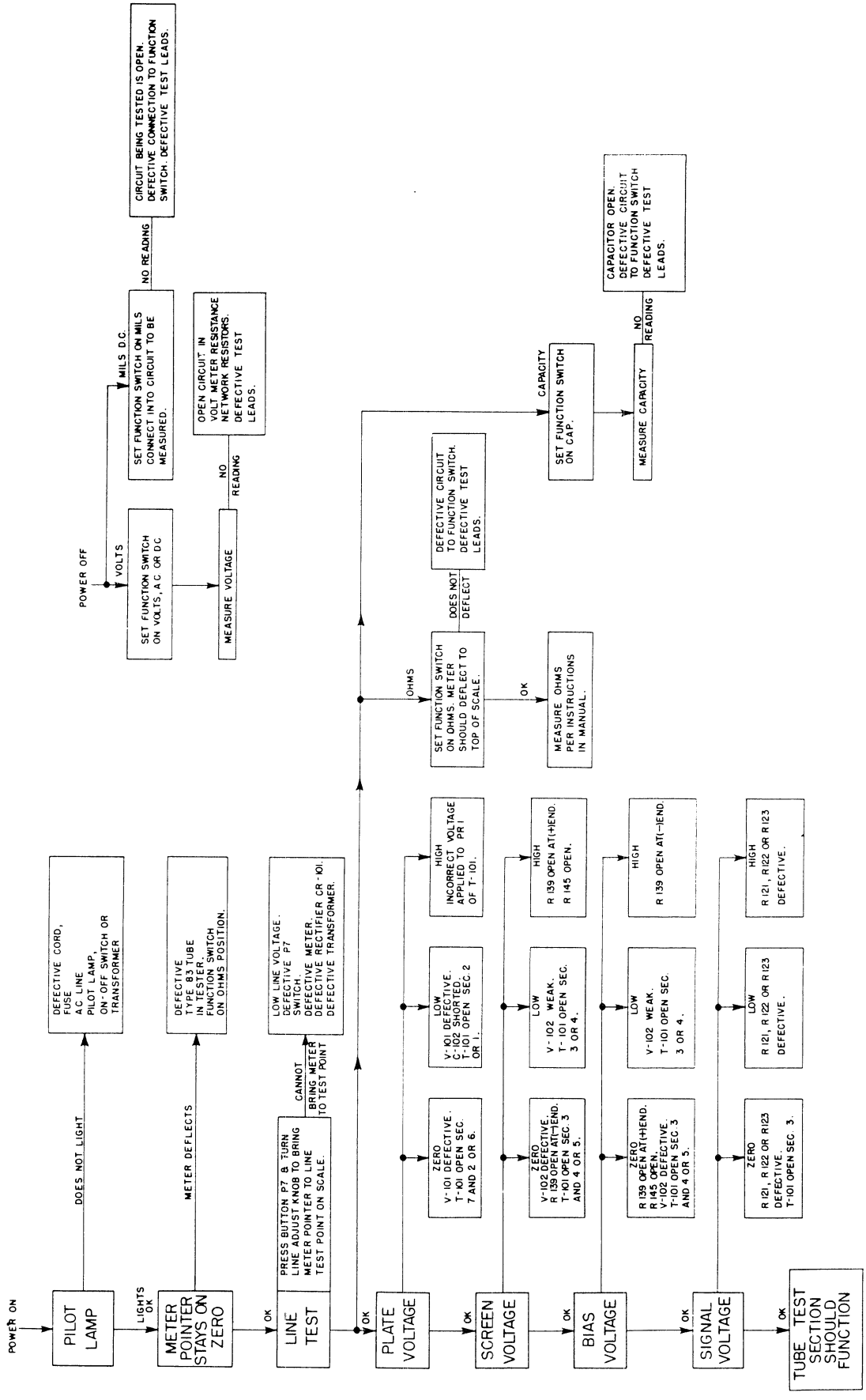


Figure 7-9. Trouble Shooting Diagram

TABLE 8-1. LIST OF MAJOR UNITS

SYMBOL GROUP	QUANTITY	NAME OF MAJOR UNIT	NAVY TYPE	DESIGNATION
100	1	Tube Tester	TV-3B/U	

Standard Navy Stock No. F16-T-21412-9961
Signal Corps Stock No. 3F4337-3A

TABLE 8-2 COMBINED PARTS AND SPARE PARTS LIST

		PARTS							
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
C-101	CAPACITOR, fixed: mica; 470 mmf p/m 10%; Spec. JAN-C-5.	Isolating capacitor noise test. Prevent shorting when making noise test.	CM20B471K	N16-C-30114-4276	3K2047121	Cornell Dubilier	X3095-8	C-101	1
C-102	CAPACITOR, fixed: paper; 100,000 mmf p/m 10%; 600 vdcw; Spec. JAN-C-25.	Isolating capacitor short test. Blocks flow of direct current.	CP26A1EF-104K	N16-C-45777-4137	3DA100-730	Cornell Dubilier	3105-114	C-102	1
C-103	CAPACITOR, fixed: electrolytic; 100 mfd; 15 vdcw; JAN-C-62.	Filter capacitor across meter.	CE63C101E	N16-C-20179-5441	3BD100-45	Cornell Dubilier	3085-35	C-103	1
C-104	CAPACITOR, fixed: mica; 2700 mmf p/m 10%; Spec JAN-C-5.	Neutralizing capacitor. Prevents oscillation in tube under test.	CM30B272K	N16-C-32145-5164	3K3027221	Cornell Dubilier	X3095-41	C-104	1
CR-101	RECTIFIER, metallic: copper oxide; input 4.5 V.A.C.; output 3 V.D.C. X 5 ma; 7/16" lg. x 3/8" wd. x 1/4" h o/a excluding term; .116" d. mtg. holes on 5/32" mtg/c; 3 wire leads 1 red, 1 yellow and 1 black 3" lg.	Meter rectifier to permit measurement of ac voltages.		N17-R-50882-2332	3H4956-77	Bradley Type #CX2E	Part/dwg #X18150-24	CR-101	1
E-101	LAMP, glow: 115v 1/4 w; striking voltage AC65, DC90; T-4-1/2 clear; 1-1/2" o/a length; candelabra screw base; P-3 electrode; burn any position; neon gas.	Short test indicator.		N17-L-6807	3F4056A/L2	G.E. Catalog #NE 45	#X12270-1	E-101	1
E-102	LAMP, incandescent: caps 6 to 8 v; 6 cp; type G6 clear; 1-7/16"; miniature bayonet base; C-2R filament; burn any position.	Fuse and overload indicator in primary circuit of transformer T101.		G17-L-6686	6Z6806.14	Tungsol #81	#X12270-2	E-102	1
E-103	LAMP, incandescent: caps 6 to 8 volts @ .15 amps; bulb T-3-1/4 clear; 1-1/8" lg. overall; miniature bayonet base; C-2 filament; burn any position.	Pilot lamp.		G17-L-6297	2Z5952	Sylvania Prod. Type #47	#12270-12	E-103	1

E-105	COVER, for clip: conical shaped black polyvinyl acetate; 1-45/64" lg. x 19/32" OD x 29/64" ID max.	Replacement - test clip cover, part of W-102.		N17-C-945001-299	3GK1087-3	Mueller #87 Black	Part #9720-12 Dwg. #9720-11	E-105	1
E-107	PROD, TEST: .080 diam. phone tip with black plastic handle; 3" lg; wire secured in tip by knurled nut; dimen. approx 4" long x 11/32" diam. o/a; Sig. Corp Dwg. No. SC-C-6879.	Replacement-prod part of W-104.		N17-P-84919-9409	3F3705-12.3		Part/dwg. #X-16975-33	E-107	1
E-108	PROD, test: .080 diameter phone tip with red plastic handle; wire secured in tip by knurled nut; dimen. approximately 4" lg. x 11/32" diam. o/a; Sig. Corps. Dwg. No. SC-C-6879.	Replacement part for W-103.		N17-P-84919-9404	3F3705-12.4				
E-109	ADAPTER, TUBE SOCKET: adapts 829A tube base to standard octal socket; phenolic body, silver plated phosphor bronze socket contacts; o/a dim. excluding contacts 7/8" lg. x 2" diam.; o/a length including contacts 1-7/16"; plugs into octal socket; two 6" leads with clips for connection to top tube contacts.	Provides means of testing special base tubes in standard test socket.		*See Note N16-A-22620-7391	2Z307-153		Part/dwg. 1050-33	E-109	1
E-110	ADAPTER, TUBE SOCKET: adapts 2C39 tube to standard octal socket; phenolic body nickel plated phosphor bronze contacts; o/a dim. excluding contacts 7/8" lg. x 2" diam; o/a length including contacts 1-7/16"; plugs into octal socket.	Provides means of testing special contact tube in standard and test socket.		*See Note N16-A-22604-5321	2Z307-157		Part/dwg. 1050-34	E-110	1
E-111	TERMINAL BOARD: laminated plastic, glass cloth base, 3/32" thk., 11 miniature swaged stud type terminals, 2 resistor mtg. brackets; 6" lg. x 2-1/2" wd. x 9/16" high o/a including terminals and resistor brackets.			*See Note N17-B-77963 7715	3Z770-11.34		Part/dwg. 2420-157	E-111	1

*NOTE: "Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated."

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS

SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
E-112	TERMINAL BOARD: laminated plastic, glass cloth base, 3/32" thk., 4 miniature swaged stud type terminals, 6 resistor mtg. brackets; 3-5/8" lg. x 2-3/4" wd. x 9/16" high o/a including terminals and resistor brackets.			*See Note N17-B-77639-5256	3Z770-4.165		Part/dwg. 2420-152	E-112	1
H-101	PLATE, index guide marker: cellulose acetate clear; 11-5/8" lg. x 1-1/2" wd. x .020 thk; four 3/16" diam. mtg. holes on 11-1/4" x 1" mtg/c; single red indicator line 1/32" wd. printed lengthwise on center line; 5/16" x 1-1/4" cut out at one end to clear roller index knob.	Protective cover and index line for roll chart.		*N16-P-403561-112 *See Note	2Z7091-225		Part/dwg. #23800-19	H-101	1
H-102	BUTTON, push: p/o Navy Tube tester Model TV-3A/U; phenolic; black; 15/32" lg. x 7/16" dia. push on type to fit .052" x 3/16" flat shaft, with spring; no dimension greater than 1".	Operating button for S-110 Section #3.		N17-B-840101-117	2Z1480.47	Friedman #S-330-30	Part/dwg. #X2920-7	H-102, H-103, H-104, H-105, H-106, H-107, H-108.	7
H-103	Same as H-102	Operating button for S-110 Section #2.							
H-104	Same as H-102	" #4							
H-105	Same as H-102	" #5							
H-106	Same as H-102	" #6							
H-107	Same as H-102	" #7							
H-108	Same as H-102	" #8							

*NOTE: "Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated."

H-109	BUTTON, push: p/o Navy Tube Tester Model TV-3A/U; phenolic, red; 15/32" long x 7/16" dia. push on type to fit .052" x 3/16" flat shaft, with spring; no dimension larger than 1".	Operating button for S-110 Section #3.		N17-B-840101-118	2Z1480.48	Friedman Co. #S-330-30	Part #X2920-8 Dwg. #2920-7	H-109	1
H-110	RING "D": finger grip p/o Test Set TV-3B/U; assembly composed of "D" ring and bolt machined to accomodate ring; approx. 1" h. x 1-1/4" lg. x 9/16" wd. o/a; mounted by bolt, 3/8-32 thread x 3/8" lg.	Lift ring for removing equipment from case.		N42-R-1447	6Z7857-10		Part/dwg. 18825-77	H-110	2
H-111	CLAMP, ELECTRON TUBE: for tubes having max. top diam. of 1-3/16" such as 5Y3GT, stainless steel; 2-1/32" lg. x 1-7/16" wd. x 23/32" high o/a; single mounted clip attached to 8-32 threaded post located on chassis 15/16" from center of tube.	Locks 5Y3GT rectifier in socket.		N16-R-503580-212	6Z1619-79	Times Facsimile #2-HAT	Part No. 3275-118	H-111	1
H-112	CLAMP, ELECTRON TUBE: for tubes having max. top diam. of 1-9/16", such as type 83; 2-9/16" lg. x 2-1/8" wd. x 3/4" high o/a; single mounting clip attaches to 8-32 threaded post located on chassis 1-1/4" from center of tube.	Locks type 83 rectifier in socket.		N16-R-503580-226	2Z7780-109	Times Facsimile #3-HAT	Part No. 3275-119	H-112	1
I-101	DIAL: bias control; knob type; 0-100 cw, 100 non-uniform divisions, 300° arc; direct drive, molded-in brass mtg. bushing; 1" high, by 1-13/16" dia. o/a; mounts on 1/4" dia. shaft by 2 set screws; phenolic knob with aluminum skirt etched markings filled in black.	Adjustment dial of Bias voltage control.		N16-D-46345-4886	2Z3723-427		Part No. 4160-94	I-101, 102	2
I-102	Same as I-101.	Adjustment dial of shunt control.							

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
I-103	LIGHT, indicator: with lens; 1/2" frosted green jewel lens; for miniature bayonet base T-3 1/4 lamp; open frame; brass nickle pl; 1-11/16" x 7/8" x 1-1/16" h. o/a behind mtg. sur; jewel extends approx. 1/2" in front of mtg. sur; mounts in 11/16" mtg. hole, 1/4" max panel thickness; lamp mounted horiz., removable from front; threaded jewel; two solder lug terminals.	ON-OFF indicator and socket for E-102		N17-L-76773-4336	2Z5991-6	Drake type #40	#19350-115	I-103	1
J-101	CONNECTOR, RECEPTACLE: Single round female contact; straight type; for .080" diam. tip plug, red phenolic head; o/a dimensions excluding solder lug terminal 3/4" lg. x 1/2" diam., cylindrical brass body;nickel plated, threaded 5/16-40:supplied with 5/16-40 hex mtg. nut and insulating washers.	Panel connection for insertion of plate cap lead.		N17-C-73108-1985	2Z3055-3	Eby type 7417 Red	#10300-25	J-101,J-106	2
J-102	CONNECTOR, RECEPTACLE: Single round female contact; straight type; for .080 diam. tip plug; black phenolic head; o/a dimensions excluding solder lug terminal 3/4" lg. x 1/2" diam.; cylindrical brass body; nickel plated,threaded 5/16-40; supplied with 5/16-40 mtg. nut and insulating washers.	Panel connection for insertion of grid cap lead.		N17-C-73108-1984	2Z3070-60	Eby type 7417 Black	#10300-26	J-102,J-103 J-104,J-105	4
J-103	Same as J-102	Panel connection for noise test.							

J-104	Same as J-102	Panel connection for noise test.							
J-105	Same as J-102	Panel connection for black, negative multimeter test lead.							
J-106	Same as J-101	Panel connection for red, positive, multimeter test lead.							
J-107	LAMPHOLDER: candelabra screw; brass shell body; 115v, 75w; 1-3/4" lg. x 1" wd. x 5/8" h. excluding terminals and mtg. bracket; one elongated mtg. hole 3/16" x 7/8" in bracket; mtg. bracket extends 1-1/4" behind base of socket; two solder lug term on opposite sides.	Socket for neon short indicator lamp E-101.		N17-L-50844-4672	2Z5884-47	Drake Type #414-L-CH-LT	#X19350-2	J-107	1
J-108	LAMPHOLDER: candelabra bayonet; steel shell body; 115v, 75w; 2" lg. x 1" wd. x 11/16" h. excluding terminals and mtg. bracket; one elongated mtg. hole 3/16" x 7/8" in bracket; mtg. bracket extends 1-1/4" behind base of socket; two solder lug term on opposite sides.	Socket for fuse lamp E-102.		N17-L-51678-5660	6Z8332	DRAKE #614L-CH-LT	#X19350-1	J-108	1
M-101	METER, ELECTRON TUBE TESTER: sensitivity 50 microamps for full scale deflection; scale ranges 0 to 3000/6000/15,000/30,000 micromhos, 0 to 5/10 volts and mils, 0 to 1000 ohms, 0 to 2 microfarads; rectangular plastic case, flange 4" lg. x 3-3/4" wd. x 5/8" thk. body 3-1/2" dia. x 1-1/2" deep from mtg. surface; scale colors micromhos, volts and mils black, ohms green, microfarads orange, background white; four mtg. studs 6-32 x 5/8" lg. on 3-3/4" x 3-3/8" mtg. centers; two stud type terminals 10-32 thread x 1/2" lg.			N17-M-29372-2601	3F3299-7.7		Part No. 480-933	M-101	1

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
O-101	DRIVE, chart: p/o Navy Tube Tester Model TV-3A/U, dual fibre rollers, 3/4" diam. mounted and geared on cad. pl. welded panel assembly; rectangular; 1-1/2" wide x 11-5/8" long x 1-1/2" deep; 4 mounting holes 3/16" d on 1" x 11-1/4" mtg/c.	Mechanism for mounting and rotation of roll chart.		N16-D-900201-101	2Z3876.108		Part/dwg. #X9600-7	O-101	1
O-102	CLIP: electron tube contact; connector for grid or plate caps 1/4" to 3/8" diam. spring brass, cad. pl; 1-1/4" lg. x 23/32" wd. x 29/64" h. over-all; black phenolic insulation; one solder connection.	Replacement tube cap portion of W-105.		N17-C-800828-601	2Z2712.120	Amphenol #63-1 black	Part/dwg. #3075-12	O-102	1
O-103	CLIP: test; steel cad plate; 1-1/2" lg. x 5/16" wd. x 1/2" h over-all; one pierced hole for solder connection; (See note) 3/8" maximum jaw opening; supplied less terminal screw; solder connection required. (See Note) NOTE: Clips used on original equipment are not tapped for terminal screw. Standard Mueller #45 clip with terminal screw is suitable replacement part.	Replacement-Test clip, part of W-102		N17-C-801899-101	3ZK1087-4	Mueller #45 Pee Wee	#3300-3	O-103	1
O-104	KNOB: pointer type; black phenolic; for round shaft 1/4" diam. shaft hole 1/2" deep, single 8-32 set screw; brass insert; white indicator line; dimensions 1-1/4" lg. x 3/4" wd. x 5/8" high o/a.	Control Knob for SHORTS - MICROMHOS selector switch.		N16-K-730065-901	2Z5838	Kurz-Kasch S-292-3L	Part No. 11505-55	O-104 through O-113	10

O-105	Same as O-104	Control knob for FILAMENT No. 1 SELECTOR switch.								
O-106	Same as O-104	Control knob for FILAMENT No. 2 SELECTOR switch.								
O-107	Same as O-104	Control knob for GRID SELECTOR switch.								
O-108	Same as O-104	Control knob for PLATE SELECTOR switch.								
O-109	Same as O-104	Control knob for SCREEN SELECTOR switch.								
O-110	Same as O-104	Control knob for CATHODE SELECTOR switch.								
O-111	Same as O-104.	Control knob for SUPPRESSOR SELECTOR switch.								
O-112	Same as O-104.	Control knob for FUNCTION SELECTOR switch.								
O-113	Same as O-104.	Control knob for RANGE SELECTOR switch.								
O-114	KNOB: round black phenolic; for ground shaft 1/4" diam. shaft hole 7/16" deep, two 8-32 set screws; brass insert; 1-1/8" diam. x 5/8"h. o/a.	Control knob for LINE ADJUST rheostat.	N16-K-700314-484	2Z5822-94	Kurz-Kasch S-308-64-B-BB	Part No. 11505-59	O-114	1		
O-115	KNOB: round w/pointer; plastic; black; brass insert accommodates shaft, 7/16 in. deep, 1/4 in. dia. two 8-32 set screws; metal pointer extends 3/4" from knob center; 5/8" high by 1/8" dia. o/a.	Control knob for FILAMENT VOLTAGE switch.	N16-K-700314-533	2Z5822-764	Kurz-Kasch S-308-64-BB-40281	Part No. 11505-58	O-115	1		
O-116	CUSHION: Part of Tube Tester TV-3B/U, solid gum rubber; rectangular 4" lg. x 3" x 1" thk; cements to bottom surface of power transformer.		N17-C-965001-400	2Z142-15		Part/Dwg. 19200-5	O-116	1		

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
O-117	CLIP: electron tube contact; grid and plate connector for lighthouse tubes; used with Tube Tester TV-3B/U; one 1/4" diam. plate clip and one special grid clip mounted in and insulated from metal shell; blued steel shell; cylindrical; 1-1/8" diam. x 1" lg.	Replacement part, cap portion of W-101.		N17-C-800730-881	2Z2737-4	Ucinite Co. J-1348-1-2	Part/dwg. 3075-13	O-117	1
P-101	CONNECTOR, PLUG: one round male contact .080" diam; straight; phone tip type with red phenolic head; dimen. 2" lg. x 11/32" diam.; will accomodate #18 AWG wire; knurled nut for connecting wire to tip; Sig. Corps Dwg. No. SC-C-6879-2.	Replacement part for W-101 and W-103.		N17-P-84912-7674	3F3705-12.2		Part/Dwg. #X-16525-109	P-101	2
P-102	CONNECTOR, PLUG: one round male contact .080" diam. straight; phone tip type with black phenolic head; dimen. 2" lg. x 11/32" diam; will accomodate #18 AWG wire; knurled nut for connecting wire to tip; Sig. Corps. Dwg. No. SC-C-6879-4.	Replacement part for W-102, W-104, and W-105.		N17-P-84912-7679	3F3705-12.5		Part/DWG. #X-16525-110	P-102	3
P-103	CONNECTOR, PLUG: two flat parallel blades; straight 1-3/8" diam. x 1-5/16" lg. over-all excluding terminals; 15 amps 125 volts, 10 amps 250 volts; round rubber body; molded rubber insert; cable opening .260" to .312".	Replacement-plug for W-106.		N17-C-71425-4054	6Z7560-5	Bryant type HRB	Part No. 16525-58	P-103	1

R-101	RESISTOR, FIXED, COMPOSITION: 1 megohm; p/m 10%; 1/2 watt; insulated; axial wire leads; Spec JAN-R-11.	Grid Resistor for converter Tubes	RC20BF-105K	N16-R-50975-811	3RC20BF-105K	Allen-Bradley EB-1051	Part No. X-18415-102	R-101	1
R-102	RESISTOR, FIXED, COMPOSITION: 47 ohms; p/m 10%; 1/2 watt; insulated; axial wire leads; Spec. JAN-R-11.	Neutralizing Resistor Oscillation Suppressor	RC20BF-470K	N16-R-49427-811	3RC20BF-470 K	Allen-Bradley EB-4701	Part No. X-18410-472	R-102, R-103, R-104.	3
R-103	Same as R-102.								
R-104	Same as R-102								
R-105	RESISTOR, FIXED, COMPOSITION: 142,000 ohms total resistance; p/m 1%, 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Dropping Resistor Line Test Circuit		N16-R-73207-5201	3Z6714B2	Wilkor Products CP 1/2-2A	Part No. X-18525-504	R-105	1
R-106	RESISTOR, FIXED, WIRE WOUND: 150 ohms p/m 1%; 1/2 watt; ceramic body; 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Load Resistor Rectifier Test		N16-R-81199-9799	3Z6015-131		Part No. X-18673-318 (150) Dwg. No. 19430-33	R-106	1
R-107	RESISTOR, FIXED, COMPOSITION: 47,000 ohms; p/m 5%; 1/2 watt; insulated; axial wire leads; Spec. JAN-R-11.	Limiting Resistor Short Test	RC20BF-473J	N16-R-50479-431	3RC20BF-473J	Allen-Bradley EB-4735	Part No. X-184 13-471	R-107	1
R-108	RESISTOR, FIXED, COMPOSITION: 27,000 ohms; p/m 5%; 1/2 watt; insulated; axial wire leads; Spec. JAN-R-11.	Limiting Resistor Short Test	RC20BF-273J	N-16-R-50398-431	3RC20BF-273J	Allen-Bradley EB-2735	Part No. X-18413-271	R-108	1
R-109	RESISTOR, FIXED, COMPOSITION: 330,000 ohms; p/m 10%; 1/2 watt; insulated; axial wire leads; Spec. JAN-R-11.	Shunt for Neon Lamp	RC20BF-334K	N16-R-50759-811	3RC20BF-334K	Allen-Bradley EB-3341	Part No. X-18414-332	R-109	1

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
R-110	RESISTOR, FIXED WIRE WOUND: 100 ohms; p/m 5%; center tapped; 10 watts; insulated; three radial tab terminals; Spec JAN-R-26A.	Provides center tap for Filament Type tubes Prevents injection of filament voltage into grid signal.	RW31G101T	N16-R-67393-2596	3RW18326	Ohmite 29108A	Part No. X-18575-19	R-110	1
R-111	RESISTOR, FIXED, COMPOSITION: 5300 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads;coated with mica filled phenolic enamel.	Series resistor for meter when used in tube test circuit.		N16-R-73048-9901	3Z6505C3	Wilkor Prod. CP 1/2-2A	Part No. X-18525-505	R-111	1
R-112	RESISTOR, FIXED, WIRE WOUND: 109 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. X 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Part of shunt network for micromho measurements.		N16-R-81167-8529	3Z6010J9		Part No. X-18673-317 (109) Dwg. No. 19430-33	R-112, R-119	2
R-113	RESISTOR, FIXED, WIRE WOUND: 27 ohms p/m 1%; 1/2 watt; ceramic body; 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Meter Shunt rectifier circuit.		N16-R-81055-6419	3Z6002G7-14		Part No. X-18673-309 (27) Dwg. No. 19430-33	R-113	1

R-114	RESISTOR, FIXED, WIRE WOUND: 41 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Part of Shunt network for micromho measurements.		N16-R-81079-9824	3Z6004A1-3		Part No. X-18673-312 (41) Dwg. No. 19430-33	R-114, R-116	2
R-115	RESISTOR, FIXED, WIRE WOUND; 280 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Meter Shunt for 6000 micromho range		N16-R-81233-8399	3Z6027E5-1		Part No. X-18673-321 (280) Dwg. No. 19430-33	R-115	1
R-116	Same as R-114	Same as R-114							
R-117	RESISTOR, FIXED, COMPOSITION: 15,000 ohms, p/m 5%; 1 watt; insulated; axial wire leads; Spec. JAN-R-11.	Limiting resistor tube test, plate circuit.	RC30BF-153J	N16-R-50335-751	3RC30BF153J	Allen-Bradley GB-1535	Part No. X-18423-151	R-117	1
R-118	RESISTOR, FIXED, COMPOSITION: 1200 ohms; p/m 10%; 1 watt; insulated; axial wire leads; Spec. JAN-R-11.	Limiting Resistor diode test circuit.	RC30BF-122K	N16-R-49941-231	3RC30BF122K	Allen-Bradley GB-1221	Part No. X-18422-122	R-118	1
R-119	Same as R-112.	Part of Shunt Network for Micromho measurements.							
R-120	RESISTOR, FIXED, WIRE WOUND: 1800 ohms p/m 5%; 10 watt; insulated; two radial tab terminals; Spec JAN-R-26A.	Limiting Resistor OZ4 Test circuit.	RW31G182	N16-R-66094-5706	3RW25819	Ohmite RW31F182	Part No. X-18575-12	R-120	1
R-121	RESISTOR, FIXED, WIRE WOUND: 800 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Part of voltage divider for signal volts.		N16-R-81311-2465	3Z6080-72		Part No. X-18673-326 (800) Dwg. No. 19430-33	R-121	1

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
R-122	RESISTOR, FIXED, WIRE WOUND: 111 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.			N16-R-81169-7296	3Z6011A1-5		Part No. X-18673-317 (111) Dwg. No. 19430-33	R-122	1
R-123	RESISTOR, FIXED, WIRE WOUND: 89 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.			N16-R-81152-6029	3Z6008J9.2		Part No. X-18673-316 (89) Dwg. No. 19430-33	R-123	1
R-124	RESISTOR, FIXED, COMPOSITION: 2,662 meghoms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of ohmmeter voltage divider.		N16-R-73336-5631	3Z6802F6-2	Wilkor Prod. CP 1/2-2A	Part No. X-18525-498	R-124	1
R-125	RESISTOR, FIXED, COMPOSITION: 307,700 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of ohmmeter voltage divider.		N16-R-73244-6871	3Z6730G7-1	Wilkor Prod. CP 1/2-2A	Part No. X-18525-497	R-125	1

R-126	RESISTOR, FIXED, COMPOSITION: 14,200 ohms total resistance; p/m 1%; 2 watt; temp. characteristic F; body dimen. 2" lg. x .293" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of ohmmeter voltage divider		N16-R-73103 4601	3Z6614B2	Wilkor Prod. CP 2-2A	Part No. X18575-107	R-126	1
R-127	RESISTOR, FIXED, WIRE WOUND: 211 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg. one axial mtg. hole 5/32" dia.	Part of Meter shunt for mils ranges.		N16-R-81212-7199	3Z6021A1-1		Part No. X-18673-320 (211) Dwg. No. 19430-33	R-127	1
R-128	RESISTOR, FIXED, WIRE WOUND: 26.8 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.			N16-R-81054-6299	3Z6002F6-3		Part No. X-18673-309 (26.8) Dwg. No. 19430-33	R-128	1
R-129	RESISTOR, FIXED, WIRE WOUND: 21.5 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Part of Meter Shunt for Mils Ranges.		N16-R-81040-2864	3Z6002A1-18		Part No. X-18673-308 (21.5) Dwg. No. 19430-33	R-129	1
R-130	RESISTOR, FIXED, WIRE WOUND: 2.7 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Part of Meter Shunt for Mils Ranges.		N16-R-80894 7019	3Z5992G7		Part No. X-18673-303 (2.7) Dwg. No. 19430-33	R-130	1

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
R-131	RESISTOR, FIXED, WIRE WOUND: 2.2 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg. one axial mtg. hole 5/32" dia.	Part of Meter Shunt for Mils Ranges		N16-R-80885-2819	3Z5992B2-5		Part No. X-18673-302 (2.2) Dwg. No. 19430-33	R-131	1
R-132	RESISTOR, FIXED, WIRE WOUND: 0.6 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Part of Meter Shunt for Mils Ranges		N16-R-80818 9419	3Z5986-8		Part No. X-18673-301 (0.6) Dwg. No. 19430-33	R-132	1
R-133	RESISTOR, VARIABLE, WIRE WOUND: 200 ohms p/m 10%; 25 watts; 3 solder lug terminals; open case; 1/4" diam. metal shaft 7/8" lg. FMS; linear taper; ins. contact arm, no off position; 3/8-32 mtg. bushing 3/8" lg; Spec. JAN-R-22.	Line adjust Rheostat.	RP101FD-201KK	N16-R-90301 2675	3RP6007	Ohmite 32948	Part No. X-18750-13	R-133	1
R-134	RESISTOR, FIXED, COMPOSITION: 3500 ohms total resistance; p/m 1%; 1 watt; temp. characteristic F; body dimen. 7/8" lg. x .293" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of ohmmeter voltage divider.		N16-R-73028-5251	3Z6350-71	Wilkor Prod. CP 1-2A	Part No. X-18550-124	R-134	1

R-135	RESISTOR, VARIABLE, WIRE WOUND: two sections; 150 ohms each section; 4 watt; 3 solder lug terms each section; enclosed metal case 1 3/4" diam. x 1 7/16" d. o/a; round metal shaft 1/4" diam. x 7/8" lg. FMS; linear taper both sections; ins. contact arm, no off position; normal torque; 3/8-32 mtg. bushing 1/4" lg. FMS each section adjusted to within 1% of other section.	Shunt Potentiometer controls meter sensitivity for rectifier and diode tests.		N16-R-92231-4291	3Z7150-9		Part No. 16926-4 Dwg. No. 16925-90	R-135A, R-135B.	1
R-135A	Part of R-135								
R-135B	Part of R-135								
R-136	Not Assigned								
R-137	RESISTOR, FIXED, COMPOSITION: 180,000 ohms; p/m 10%; 1/2 watt; insulated; axial wire leads; Spec. JAN-R-11.	Series Grip Resistor gas test circuit.	RC20BF-184K	N16-R-50696-811	3RC20BF184K	Allen-Bradley EB-1841	Part No. X-18414-182	R-137	1
R-138	RESISTOR, FIXED, COMPOSITION: 270 ohms total resistance; p/m 1%; 1 watt; temp. characteristic F; body dimen. 7/8" lg. x .293" diam. excluding terminals; uninsulated; moisture resistant, two axial wire leads; coated with mica filled phenolic enamel.	Part of Ohmmeter voltage divider.		N16-R-72926-4501	3Z6027-36	Wilkor Prod. CP 1-2A	Part No. X-18550-123	R-138	1
R-139	RESISTOR, VARIABLE, WIRE WOUND: 3000 ohms p/m 10%; 1 watt; 3 solder lug terminals; open phenolic case 1 11/16" diam. x 55/64" d; round metal shaft 1/4" diam. x 1" lg. FMS; special taper, contact arm grounded to mtg. bushing; no off position; normal torque; mtg. bushing 3/8-32 x 13/32" FMS.	Bias Potentiometer controls Bias Voltage.		N16-R-90900-5961	3Z7330-23		Part/Dwg. No. 16926-5	R-139	1

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
R-140	RESISTOR, ADJUSTABLE, WIRE WOUND: 8500 ohms p/m 10%; 10 watts; two adjustable sliding contacts; 5/16" diam. x 1 3/4" lg; vitreous enamel coating,two fixed radial tab terminals, 2 sliding terminals.	Part of Ohmmeter voltage divider.		N16-R-43688-3689	3Z6585-10	P. R. Mallory 1AV8500	Part No. X-18575-89	R-140, R-145.	2
R-141	RESISTOR, FIXED, COMPOSITION: 34,000 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant, two axial wire leads; coated with mica filled phenolic enamel.	Meter shunt for 20 MFD capacity range.		N16-R-73129-9101	3Z6634-2	Wilkor Prod. CP 1/2-2A	Part No. X-18525-495	R-141	1
R-142	RESISTOR, FIXED, WIRE WOUND: 1160 ohms; p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Meter shunt for 2 MFD capacity range.		N16-R-81338-4499	3Z6116-1		Part No. X-18673-328 (1160) Dwg. No. 19430-33	R-142	1
R-143	RESISTOR, FIXED, WIRE WOUND: 135 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" dia. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Meter shunt for .2 MFD capacity range.		N16-R-81185-7999	3Z6013E5-5		Part No. X-18673-318 (135) Dwg. No. 19430-33	R-143	1

								1
R-144	RESISTOR, FIXED, WIRE WOUND: 15 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Meter shunt for .02 MFD capacity range.	N16-R-81024-8169	3Z6001E5-74		Part No. X-18673-306 (15) Dwg. No. 19430-33	R-144	1
R-145	Same as R-140.	Part of voltage divider used for cablibrating bias and low screen voltage.						
R-146	RESISTOR, FIXED, WIRE WOUND: 30.2 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Part of Ohmmeter voltage divider.	N16-R-81063-3858	3Z6003-86		Part No. X-18673-310 (30.2) Dwg. No. 19430-33	R-146	1
R-147	RESISTOR, FIXED, COMPOSITION: 25,300 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of Ohmmeter voltage divider.	N16-R-73120-7551	3Z6625C3-1	Wilkor Prod. CP 1/2-2A	Part No. X-18525-494	R-147	1
R-148	RESISTOR, FIXED, COMPOSITION: 10 megohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" diam. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of D. C. voltmeter multiplier network.	N16-R-73377-7580	3Z6810-46	Wilkor Prod. CPL-2A	Part No. X-18525-500	R-148	1

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DES.G.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
R-149	RESISTOR, FIXED, COMPOSITION: 8 megohms total resistance p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of D. C. voltmeter multiplier network.		N16-R-73371-8326	3Z6801-143	Wilkor Prod. CPL-2A	Part No. X-18525-499	R-149	1
R-150	RESISTOR, FIXED, COMPOSITION: 1 megohm total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of D. C. voltmeter multiplier network.		N16-R-73308-3062	3Z6801-144	Wilkor Prod. CP 1/2-2A	Part No. X-18525-371	R-150	1
R-151	RESISTOR, FIXED, COMPOSITION: 800,000 ohms total resistance p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of D. C. voltmeter multiplier network.		N16-R-73293-4701	3Z6870-7	Wilkor Prod. CP 1/2-2A	Part No. X-18525-383	R-151	1
R-152	RESISTOR, FIXED, COMPOSITION: 100,000 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of D. C. voltmeter multiplier network.		N16-R-73191-7771	3Z6700-229	Wilkor Prod. CP 1/2-2A	Part No. X-18525-408	R-152	1

R-153	RESISTOR, FIXED, COMPOSITION: 95,000 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of D. C. voltmeter multiplier network.	N16-R-73186 9901	3Z6695-4	Wilkor Prod. CP 1/2-2A	Part No. X-18525-496	R-153	1
R-154	RESISTOR, FIXED, WIREWOUND: 3 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; impregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.	Part of ohmmeter voltage divider.	N16-R-80897 1399	3Z5993-78		Part No. X-18673-303 (3) Dwg. No. 19430-33	R-154	1
R-155	RESISTOR, FIXED, COMPOSITION: 1930 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Used for paralleling meter multiplier for capacity measurements.	N16-R-73009-4551	3Z6193	Wilkor Prod. CP 1/2-2A	Part No. X-18525-493	R-155	1
R-156	RESISTOR, FIXED, COMPOSITION: 4000 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Meter multiplier for multimeter section.	N16-R-73035-7161	3Z6400-133	Wilkor Prod. CP 1/2-2A	Part No. X-18525-394	R-156	1
R-157	RESISTOR, FIXED, COMPOSITION: 950 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of A. C. voltmeter multiplier network.	N16-R-72990-4502	3Z6095-4	Wilkor Prod. CP 1/2-2A	Part No. X-18525-423	R-157, R-158, R-159.	3

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
R-158	Same as R-157.	Part of A. C. voltmeter multiplier network.							
R-159	Same as R-157.	Part of A. C. voltmeter multiplier network.							
R-160	RESISTOR, FIXED, COMPOSITION: 4100 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of A. C. voltage multiplier network.		N16-R-73036-5931	3Z6410-2	Wilkor Prod. CP 1/2-2A	Part No. X-18525-492	R-160	1
R-161	RESISTOR, FIXED, COMPOSITION: 5000 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding; terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of A. C. voltage multiplier network.		N16-R-73045-6146	3Z6500-292	Wilkor Prod. CP 1/2-2A	Part No. X-18525-471	R-161	1
R-162	RESISTOR, FIXED, COMPOSITION: 40, 000 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding; terminals; uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of A. C. voltage multiplier network.		N16-R-73139-7674	3Z6640-108	Wilkor Prod. CP 1/2-2A	Part No. X-18525-373	R-162	1

R-163	RESISTOR, FIXED, COMPOSITION: 50,000 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of A. C. voltage multiplier network.		N16-R-73149-6865	3Z6650-231	Wilkor Prod. CP 1/2-2A	Part No. X-18525-380	R-163	1
R-164	RESISTOR, FIXED, COMPOSITION: 400,000 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two axial wire leads; vinyl protective sleeve.	Part of A. C. voltage multiplier network.		N16-R-73261-2374	3Z6740-31	Wilkor Prod. CP 1/2-2A	Part No. X-18525-364	R-164	1
R-165	RESISTOR, FIXED, COMPOSITION: 500,000 ohms total resistance; p/m 1%; 1 watt; temp. characteristic F; body dimen. 7/8" lg. x .293" dia. excluding terminals, uninsulated; moisture resistant; two axial wire leads; coated with mica filled phenolic enamel.	Part of A. C. voltage multiplier network.		N16-R-73271-3601	3Z6750-131	Wilkor Prod. CP 1-2A	Part No. X-18550-96	R-165	1
S-101	SWITCH, ROTARY: one section 10 positions; one pole; brass contacts, silver plated; bakelite wafer sections; 3/4" lg. x 1-1/4" wd. x 1-5/16" h; 3/8-32 mtg. bushing 1/4" lg. round metal shaft with flat for set screw, 1-5/16" lg. x 1/4" diam; non-shorting contacts; solder lug terminals; Spec. 16-S-19 (SHIPS).	Connects suppressor voltage to selected socket contact.		N17-S-60522-7869	3Z9825-62.717	Oak Type G	Part/Dwg. X-19912-250	S-101, S-102.	2
S-102	Same as S-101.	Connects Cathode voltage to selected socket contact.							

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DES.G.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
S-103	SWITCH, ROTARY: 5 sections, 10 positions, 10 poles; brass contacts, silver plated; bakelite wafer sections; 2-1/8" lg. x 1-1/4" wd. x 1-5/16" h; 3/8-32 mtg. bushing 1/4" lg; round metal shaft with flat for set screw, 1-5/16" lg. x 1/4" diam; non-shorting contacts; solder lug terminals. Spec. 16-S-19 (SHIPS).	Connects Screen voltage to selected socket contact.		N17-S66623-3964	3Z9825-62.712	Oak Type G	Part/Dwg. X-19912-249	S-103, S-104, S-105, S-106, S-107.	5
S-104	Same as S-103.	Connects plate voltage to selected socket contact.							
S-105	Same as S-103.	Connects grid voltage to selected socket contact							
S-106	Same as S-103.	Connects one side of filament voltage to selected socket contact.							
S-107	Same as S-103.	Connects one side of filament voltage to selected socket contact.							
S-108	SWITCH, ROTARY: one section, 20 positions two poles; brass contacts, silver plated bakelite wafer section; 13/16" lg. x 1-15/16" wd. x 2-5/16" h; 3/8-32 mtg. bushing 1/4" lg; round metal shaft with flat for set screw, 7/8" lg. x 1/4" diam; solder lug terminals, non-shorting contacts; Spec. 16-S-19 (SHIPS).	Selects proper filament voltage for tube under test.		N17-S-59441-8914	3Z9825-62.716	Oak Mfr. Type MF-1	Part/dwg. X-19912-248	S-108	1

S-109	SWITCH, ROTARY: 6 sections; 10 positions; brass contacts, silver plated; bakelite wafer sections; 3" lg. x 1-5/8" wd. x 1-7/8" h; 3/8-32 mtg. bushing 1/4" lg; round metal shaft with flat for set screw, 3/4" lg. x 1/4" diam; solder lug terminals; non - shorting contacts; Spec. 16-S-19 (SHIPS).	Short test switch.		N17-S-68877-5081	3Z9825-62.713	Oak Mfr. Type H	Part/dwg. X-19912-232	S-109	1
S-110	SWITCH, push: (for contact arrangement refer to Hickok dwg. 19910-66); 8 sections each of which is operated by a separate push button independently of the other sections; metal frame with phenolic insulation; body dimensions 6-9/32" lg. x 15/16" high x 1-15/16" deep behind mtg. surface excluding push rods and terminals; shorting type contacts on sections 6 and 7 only as indicated on Hickok dwg. #19910-66; momentary action; solder lug term; two .140" diam. mtg. holes on 6" mtg/c; seven push rods .052" thk. x 3/16" wd, extend 7/8" from mtg. surface.	Selects proper test voltage for various tube types.		N17-S-58847-7001	3Z9824-6	Oak Mfr. Type 130	Part/dwg. #19910-66	S-110	1
S-111	SWITCH, TOGGLE: single-pole, single-throw; 6 amps 125 volts, phenolic body, 1-9/32" lg. x 23/32" wd. x 23/32" d., bat handle 11/16" lg; locking action; two solder lug terminals on 15/32" -32 threaded mtg. bushing 1/4" lb; Spec. JAN-S-23.	Power ON-OFF switch.	JAN-ST17A	N17-S-70778-4209	3Z9863-17A	Arrow, Hart & Hageman	Part No. X-19911-41	S-111	1
S-112	SWITCH, interlock; SPST; 6 amp @ 125 v; phenolic body; 1-3/4" lg. x 11/16" wd. x 11/16" d. behind mtg. surface; push button type normally closed; solder lug term; 15/32-32 threaded bushing x 1/2" lg. from mtg. surface; metal button with over-travel device to prevent damage to contacts.	Turns off equipment when cover is closed.		N17-S-56830-7741	3Z9824-31.63	Arrow, Hart & Hageman Type No. 81075	Part No. 19910-70	S-112	1

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
S-113	SWITCH, ROTARY: 6 sections, 6 positions; brass contacts, silver plated; bakelite wafer section; 3-11/16" lg. x 1-5/8" wd. x 1-7/8" h; 3/8-32 mtg. bushing 1/4" lg. round metal shaft with flat for set screw; 3/4" lg. x 1/4" diam; solder lug terminals; nonshorting contacts; Navy Spec. 16-S-19 (SHIPS)	Range selector for multimeter circuit.		N17-S-66877-4501	3Z9825-62.715	Oak Mfr. Type H	Part/Dwg. #X-19912-236	S-113	1
S-114	SWITCH, ROTARY: 5 sections, 6 positions; brass contacts, silver plated; 3-11/16" lg. x 1-5/8" wd. x 1-7/8" h; 3/8-32 mtg. bushing 1/4" lg; round metal shaft with flat for set screw, 3/4" lg. x 1/4" dia solder lug terminals; nonshorting contacts Navy Spec. 16-S-19 (SHIPS.)	Function selector for multimeter circuit.		N17-S-66623 5020	3Z9825-62.714	Oak Mfr. Type H	Part/Dwg. #X-19912-235	S-114	1
T-101	TRANSFORMER, POWER, FILAMENT AND PLATE: hermetically sealed metal case; input 93 volts ac, 50 to 1000 cycles, single phase; Output No. 1 secondary 154V @ 150 ma; No. 2 secondary 154V @ 150 ma tapped at .36v; No. 3 secondary 5.2v @ 20 ma; No. 4 secondary 330V @ 20 ma center tapped at .36V; No. 5 secondary 4.8 @ 2 amps center tapped; No. 6 secondary 5.14 @ 3 amps center tapped; No. 7 secondary 117 volts tapped at 0.6/1.1/1.5/2/2.5/3/4.3/5/6.3/7.5/10/12.6/20/25/35/50/75/ volts, 3 amps	Supplies AC voltages to filament and rectifier circuit.		N17-T-73489 5351	2Z9621-472	R.C.A.	Part/Dwg. 20800-125	T-101	1

	from 0.6 volts through 12.6 volts, 0.3 amp from 20 volts through 117 volts; dimensions excluding terminals and mtg. posts 4-9/32" lg. x 3-5/32" wd. x 3-3/8" h; 37 solder lug terminals on sides of case; three mtg. posts 23/32" x 7/16" diam. tapped for 10-32 screw, located on bottom of case; Spec. MIL-T-27.								
V-101	TUBE, electron: full wave mercury vapor rectifier; Spec. JAN-1A.	Rectifier, plate voltage supply.	JAN #83	N16-T-60830	2J83		#X20875-28	V-101	1
V-102	TUBE, electron: full wave rectifier; Spec. JAN-1A.	Rectifier, screen voltage and bias supply.	JAN 5Y3GT/G	N16-T-55735	2J5Y3GT/G		#X20875-6	V-102	1
W-101	LEAD, grid and plate for lighthouse tubes: two #18 AWG stranded copper conductors; rubber insulation; one red & one black; 5-1/4" lg. excluding term; both leads terminated one end in special grid and plate connector for lighthouse tubes Hickok Part No. 3075-13, other end red lead terminated in Hickok Part No. 16525-109 red tip plug, other end of black lead terminated in X-16525-110 black tip plug. Listed for reference only, consists of O-117; P-101, P-102, W-108 and W-109.	Adapter for making contact to grid and plate of lighthouse tubes.		N17-L-63201-2527	3E4017.1		Part/Dwg. #X-12450-241	W-101	1
W-102	LEAD, test: one #18 AWG stranded copper conductor, 65#36 AWG strands .043" black rubber; 8-1/4" long excluding term; Hickok Part No. X-16525-110 black tip plug on one end and Mueller Electric numbers 87 insulator and 45 battery clip on other end. Listed for reference only, consists of E-105, O-103, P-102 and W-109.	Connects top cap of tubes to plate jack.		N17-L-63201-5782	3E4017		Part/Dwg. #X12450-236	W-102	1

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
W-103	LEAD, test: #18 AWG stranded copper conductor, 65 #36 AWG strands, cotton wrap, .043" red rubber insulation; 4 ft. long excluding terminations; Hickok Part No. X-16975-32 red test prod on one end and Hickok Part #X-16525-109 red tip plug on other end. Listed for reference only, consists of E-108, P-101 and W-108.	Positive test lead for multimeter section.		N17-L-63205-7781	3E4017.2		Part/Dwg. #X12450-239	W-103	1
W-104	LEAD, test: #18 AWG stranded copper conductor, 65 #36 AWG strands, cotton wrap, .043" black rubber insulation; 4 ft long excluding termination; Hickok Part No. 16975-33 black test prod on one end and black tip plug on other end. Listed for reference only, consists of E-107, P-102 and W-109.	Negative test lead for multimeter		N17-L-63205-7782	3E4017.3		Part/Dwg. #X-12450-240	W-104	1
W-105	LEAD, test: one #18 AWG stranded tinned copper conductor, 65#36 AWG strands .043" rubber black; 10" lg. excluding term; one Hickok Part #X-16525-110 black tip plug at one end and one Amphenol #63-1 grid cap at other end. Listed for reference only, consists of O-102, P-102 and W-109.	Connects top caps of tubes to grid jack.		N17-L-63201-7876	3E4017.4		Part/Dwg. #X-12450-237	W-105	1
W-106	CABLE ASSEMBLY, power: underwriters type SVO, two #18 AWG stranded conductors, 300 volts working; 7 ft. long excluding terminations; Cords Limited #M8	Connects equipment to ac supply line outlet.		N17-C-48234-4017	3E7350-846	Cords Limited #3675-19		W-106	1

	two contact male appliance plug on one end, other end stripped 3/4" and tinned; u/w Listed for reference only.								
W-108	WIRE, electrical: insulated .140" OD overall; one #18 AWG conductor; tinned copper; stranded, 65 strands #36 AWG cotton wrap, rubber insulation .043" thk; rated 5000 volts; red.	Replacement-test lead wire, part of W-101 and W-103		N15-W-2195-5200	1B818.151	Belden Mfg. Co. Code TESTER Red	#23900-289	W-108	9 ft.
W-109	WIRE, electrical: insulated .140" OD overall; one #18 AWG conductor; tinned copper; stranded, 65 strands #36 AWG cotton wrap, rubber insulation .043" thk; rated 5000 volts; black.	Replacement-test lead wire, part of W-101, W-102, W-104 and W-105.		N15-W-2195-5100	1B818.175	Belden Mfg. Co. Code TESTER Black	#23900-288	W-109	8 ft.
X-101	SOCKET, ELECTRON TUBE: 4 silver plated phosphor bronze contacts; oval shaped 1-7/8" lg. x 19/32" wd. x 31/64" h. excluding terminals; molded mica filled phenolic body; molded in plate for mounting below chassis, 1-9/32" chassis hole required, two 5/32" diam. mounting holes spaced 1-1/2" C to C.	Socket for type 83 rectifier tube, V-101.		N16-S-60852-2111	2Z8674.159	Amphenol Part No. 77M1P4TM	#X-19350-80	X-101	1
X-102	SOCKET, ELECTRON TUBE: 8 silver plated beryllium copper contacts oval shaped 1-13/16" lg. x 1-3/8" wd. x 21/32" h. excluding terminals; molded mica filled phenolic body; saddle mounted below chassis; 1-9/32" chassis hole required; two 5/32" diam. mounting holes spaced 1-1/2" C to C.	Socket for type 5Y3GT rectifier tube, V-102	JAN TS101P01	N16-S-63451-1901	2Z8670.33	Cinch Part No. 16203	#X-19350-158	X-102	1
X-103	SOCKET, ELECTRON TUBE: 4 silver plated phosphor bronze contacts; round; 1-1/4" diam. x .420" h. excluding terminals; molded mica filled phenolic body; retainer ring mounting; 1-11/64" diam. keyed chassis hole required.	Test Socket for four pin tubes.		N16-S-60841-4271	2Z8674.158	Amphenol Part No. 78S4TM	#X-19350-68	X-103	1

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
X-104	SOCKET, ELECTRON TUBE: 5 silver plated phosphor bronze contacts; round; 1-1/4" diam. x .420" h. excluding terminals; molded mica filled phenolic body; retainer ring mounting; 1-11/64" diam. keyed chassis hole required.	Test socket for five pin tubes.		N16-S-61703-9581	2Z8675.92	Amphenol Part No. 78S5TM	#X-19350-69	X-104	1
X-105	SOCKET, ELECTRON TUBE: 6 silver plated phosphor bronze contacts; round; 1-1/4" diam. x .420" h. excluding terminals; molded mica filled phenolic body; retainer ring mounting; 1-11/64" diam. keyed chassis hole required.	Test socket for six pin tubes.		N16-S-62152-2626	2Z8676.96	Amphenol Part No. 78S6TM	#X-19350-70	X-105	1
X-106	SOCKET, ELECTRON TUBE: 7 silver plated phosphor bronze contacts; round; 1-3/8" diam. x .420" d. excluding terminals; molded mica filled phenolic body; retainer ring mounting; 1-21/64" diam. keyed chassis hole required; has special pilot lamp test socket in center.	Test socket for large and small radius seven pin tubes. Also provides test socket for miniature bayonet or screw base pilot light bulbs.		N16-S-62762-2635	2Z8677.140	Amphenol 78-7CDTM	#X-19350-71	X-106	1
X-107	SOCKET, ELECTRON TUBE: 7 silver plated phosphor bronze contacts; miniature with center shield; oval shape; 1-1/8" lg. x 3/4" wd. x 11/32" h. excluding terminals; molded mica filled phenolic body; saddle mounting below chassis; 5/8" diam. chassis hole required; two 1/8" diam. mounting holes spaced 7/8" C to C.	Test socket for seven pin miniature tubes.		N16-S-62603-6918	2Z8677.196	Cinch Part No. 14558 or ELCO #105PHSPTD	#X-19350-159	X-107	1

X-108	SOCKET, ELECTRON TUBE: 7 silver plated phosphor bronze contacts; for acorn type tube with either 5 or 7 radial contacts; round; 1-7/8" diam. x 1-1/2" deep o/a excluding terminals; molded phenolic body; five 1/8" diam. mtg. holes in flange for below chassis mtg; 1-3/16" diam. chassis hole required; one round silver plated plunger type contact in base for end pin contact.	Test socket for acorn tubes.		N16-S-62646-8291	2Z8677.139	Alden #457V-1	Part/Dwg. #19350-74	X-108	1
X-109	SOCKET, ELECTRON TUBE: 7 silver plated beryllium copper contacts; subminiature inline type; rectangular; 3/4" lg. x 9/16" wd. x 9/32" d. o/a excluding terminals; molded mica filled phenolic body; saddle mounting below chassis; two .140 diam. mtg. holes spaced 1/2" C to C; panel hole 1/4" x 15/32" required.	Test socket for sub-miniature tubes with inline contacts or lead.		N16-S-62597-1028	2Z8677.174	Cinch No. EXP-8736-B1	Part/Dwg. #19350-119	X-109	1
X-110	SOCKET, ELECTRON TUBE: 8 silver plated phosphor bronze contacts; subminiature type; oval shaped; 7/8" lg. x 1/2" wd. x 9/32" d. o/a excluding terminals; molded mica filled phenolic body; saddle mounting below chassis; two 1/8" diam. mtg. holes spaced 5/8" C to C; 25/64" diam. panel hole required.	Test socket for sub-miniature tubes with sound base.		N16-S-63656-2460	2Z8678.331	Cinch No. 8694	Part/Dwg. #19350-101	X-110	1
X-111	SOCKET, ELECTRON TUBE: 8 silver plated phosphor bronze contacts; octal type; round; 1-1/4" diam. x .490" h. excluding terminals; molded mica filled phenolic body; retainer ring mounting; 1-11/64" diam. keyed chassis hole required.	Test socket for octal base tubes.		N16-S-63462-8245	2Z8678.318	Amphenol No. 78-S8TM	Part/Dwg. #X-19350-73	X-111	1

TABLE 8-2 (Cont.) COMBINED PARTS AND SPARE PARTS LIST

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRACTOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNATIONS INVOLVED	TOTAL NO. PER EQUIP.
X-112	SOCKET, ELECTRON TUBE: 8 silver plated phosphor bronze contacts; loktal type; round; 1-1/4" diam. x .490" h. o/a excluding terminals; molded mica filled phenolic body; retainer ring mounting; 1-11/64" dia. keyed chassis hole required.	Test socket for loktal base tube.		N16-S-63579-2635	2Z8678.35	Amphenol No. 78-8LTM	Part/Dwg. #X-19350-72	X-112	1
X-113	SOCKET, ELECTRON TUBE: 9 silver plated phosphor bronze contacts noval type with center shield; oval shape 1-11/32" lg. x .940" wd. x 11/32" h. excluding terminals; molded mica filled phenolic body; saddle mounting below chassis; 3/4" panel hole required; two 1/8" diam. mtg. holes spaced 1-1/8" C to C.	Test socket for noval tubes.		N16-S-64063-6227	2Z8679.25	Cinch No. 53F12884 or ELCO No. 271PHSPTD	X-19350-58	X-113	1

TABLE 8-3 CROSS REFERENCE PARTS LIST

JAN TYPE DESIGNATION	KEY SYMBOL
CE63C-101E	C-103
CM20B-471K	C-101
CM30B-272K	C-104
CP26A1EF104K	C-102
RC20BF-105K	R-101
RC20BF-184K	R-137
RC20BF-273J	R-108
RC20BF-334K	R-109
RC20BF-470K	R-102
RC20BF-473J	R-107
RC30BF-122K	R-118
RC30BF-153J	R-117
RP101FD-201KK	R-133
RW31F101T	R-110
RW31F182	R-120
ST17A	S-111
TS101P01	X-102
5Y3GT/G	V-102
83	V-101

STD. NAVY STOCK NO.	KEY SYMBOL
G17-L-6297	E-103
G17-L-6686	E-102
N15-W-2195-5100	W-109
N15-W-2195-5200	W-108
N16-A-22604-5321	E-110
N16-A-22620-7391	E-109
N16-C-20179-5441	C-103
N16-C-30114-4276	C-101
N16-C-32145-5164	C-104
N16-C-45777-4137	C-102
N16-C-46345-4886	I-101
N16-D-900201-101	O-101
N16-K-700314-484	O-114
N16-K-700314-533	O-115
N16-K-7300065-901	O-104
N16-P-403561-112	H-101
N16-R-43688-3689	R-140
N16-R-49427-811	R-102
N16-R-49941-231	R-118
N16-R-50335-751	R-117
N16-R-503580-212	H-111
N16-R-503580-226	H-112
N16-R-50398-431	R-108
N16-R-50479-431	R-107
N16-R-50696-811	R-137
N16-R-50759-811	R-109
N16-R-50975-811	R-101
N16-R-66094-5706	R-120

STD. NAVY STOCK NO.	KEY SYMBOL
N16-R-67393-2596	R-110
N16-R-72926-4501	R-138
N16-R-72990-4502	R-157
N16-R-73009-4551	R-155
N16-R-73028-5251	R-134
N16-R-73035-7161	R-156
N16-R-73036-5931	R-160
N16-R-73045-6146	R-161
N16-R-73048-9901	R-111
N16-R-73103-4601	R-126
N16-R-73120-7551	R-147
N16-R-73129-9101	R-141
N16-R-73139-7674	R-162
N16-R-73149-6865	R-163
N16-R-73186-9901	R-153
N16-R-73191-7771	R-152
N16-R-73207-5201	R-105
N16-R-73244-6871	R-125
N16-R-73261-2374	R-164
N16-R-73271-3601	R-165
N16-R-73293-4701	R-151
N16-R-73308-3062	R-150
N16-R-73336-5631	R-124
N16-R-73371-8326	R-149
N16-R-73377-7580	R-148
N16-R-80818-9419	R-132
N16-R-80885-2819	R-131
N16-R-80894-7019	R-130
N16-R-80897-1399	R-154
N16-R-81024-8169	R-144
N16-R-81040-2864	R-129
N16-R-81054-6299	R-128
N16-R-81055-6419	R-113
N16-R-81063-3858	R-146
N16-R-81079-9824	R-114
N16-R-81152-6029	R-123
N16-R-81167-8529	R-112
N16-R-81169-7296	R-122
N16-R-81185-7999	R-143
N16-R-81199-9799	R-106
N16-R-81212-7199	R-127
N16-R-81233-8399	R-115
N16-R-81311-2465	R-121
N16-R-81338-4499	R-142
N16-R-90301-2675	R-133
N16-R-90900-5961	R-139
N16-R-92231-4291	R-135
N16-S-60841-4271	X-103
N16-S-60852-2111	X-101
N16-S-61703-9581	X-104
N16-S-62152-2626	X-105

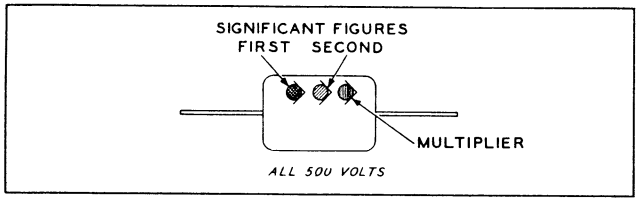
STD. NAVY STOCK NO.	KEY SYMBOL
N16-S-62597-1028	X-109
N16-S-62603-6918	X-107
N16-S-62646-8291	X-108
N16-S-62762-2635	X-106
N16-S-63451-1901	X-102
N16-S-63462-8245	X-111
N16-S-63579-2635	X-112
N16-S-63656-2460	X-110
N16-S-64063-6227	X-113
N16-T-55735	V-102
N16-T-60830	V-101
N17-B-77639-5256	E-112
N17-B-77963-7715	E-111
N17-B-840101-117	H-102
N17-B-840101-118	H-109
N17-C-48234-4017	W-106
N17-C-71425-4054	P-103
N17-C-73108-1984	J-102
N17-C-73108-1985	J-101
N17-C-800730-881	O-117
N17-C-800828-601	O-102
N17-C-801899-101	O-103
N17-C-945001-299	E-105
N17-C-965001-400	O-116
N17-L-50844-4672	J-107
N17-L-51678-5660	J-108
N17-L-63201-2527	W-101
N17-L-63201-5782	W-102
N17-L-63201-7876	W-105
N17-L-63205-7781	W-103
N17-L-63205-7782	W-104
N17-L-6807	E-101
N17-L-76773-4336	I-103
N17-M-29372-2601	M-101
N17-P-84912-7674	P-101
N17-P-84912-7679	P-102
N17-P-84919-9404	E-108
N17-P-84919-9409	E-107
N17-R-50882-2332	CR-101
N17-S-56830-7741	S-112
N17-S-58847-7001	S-110
N17-S-59441-8914	S-108
N17-S-60522-7869	S-101
N17-S-66623-3964	S-103
N17-S-66623-5020	S-114
N17-S-66877-4501	S-113
N17-S-68877-5081	S-109
N17-S-70778-4209	S-111
N17-T-73489-5351	T-101
N42-R-1447	H-110

TABLE 8-3 CROSS REFERENCE PARTS LIST

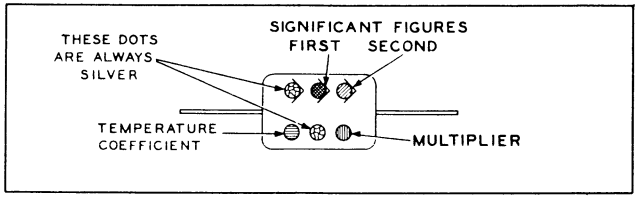
SIGNAL CORPS STOCK NO.	KEY SYMBOL	SIGNAL CORPS STOCK NO.	KEY SYMBOL	SIGNAL CORPS STOCK NO.	KEY SYMBOL
1B818.151	W-108	3E4017.3	W-104	3Z6095-4	R-157
1B818.175	W-109	3E4017.4	W-105	3Z6116-1	R-142
2J5Y3GT/G	V-102	3E7350-84.6	W-106	3Z6193	R-155
2J83	V-101	3F3299-7.7	M-101	3Z6350-71	R-134
2Z142-15	O-116	3F3705-12.2	P-101	3Z6400-133	R-156
2Z1480.47	H-102	3F3705-12.3	E-107	3Z6410-2	R-160
2Z1480.48	H-109	3F3705-12.4	E-108	3Z6500-292	R-161
2Z1619-79	H-111	3F3705-12.5	P-102	3Z6505C3	R-111
2Z2712.120	O-102	3F4056A/L2	E-101	3Z6585-10	R-140
2Z2737-4	O-117	3GK1087-3	E-105	3Z6614B2	R-126
2Z307-153	E-109	3H4956-77	CR-101	3Z6625C3-1	R-147
2Z307-157	E-110	3K2047121	C-101	3Z6634-2	R-141
2Z3055-3	J-101	3K3027221	C-104	3Z6640-108	R-162
2Z3070-60	J-102	3RC20BF105K	R-101	3Z6650-231	R-163
2Z3723-427	I-101	3RC20BF184K	R-137	3Z6695-4	R-153
2Z3876.108	O-101	3RC20BF273J	R-108	3Z6700-229	R-152
2Z5822-94	O-114	3RC20BF334K	R-109	3Z6714B2	R-105
2Z5822-764	O-115	3RC20BF470K	R-102	3Z6730G7-1	R-125
2Z5838	O-104	3RC20BF473J	R-107	3Z6740-31	R-164
2Z5884-47	J-107	3RC30BF122K	R-118	3Z6750-131	R-165
2Z5952	E-103	3RC30BF153J	R-117	3Z6801-143	R-149
2Z5991-6	I -103	3RP6007	R-133	3Z6801-144	R-150
2Z7091-225	H-101	3RW18326	R-110	3Z6802F6-2	R-124
2Z7780-109	H-112	3RW25819	R-120	3Z6810-46	R-148
2Z866.196	X-107	3Z5986-8	R-132	3Z6870-7	R-151
2Z8670.33	X-102	3Z5992B-5	R-131	3Z7150-9	R-135
2Z8674.158	X-103	3Z5992G7	R-130	3Z7330-23	R-139
2Z8674.159	X-101	3Z5993-78	R-154	3Z770-4.165	E-112
2Z8675.92	X-104	3Z6001E5-74	R-144	3Z770-11.34	E-111
2Z8676.96	X-105	3Z6002A1-18	R-129	3Z9824-6	S-110
2Z8677.139	X-108	3Z6002F6-3	R-128	3Z9824-3163	S-112
2Z8677.140	X-106	3Z6002G7-14	R-113	3Z9825-62.712	S-103
2Z8677.174	X-109	3Z6003-86	R-146	3Z9825-62.713	S-109
2Z8678.35	X-112	3Z6004A1-3	R-114	3Z9825-62.714	S-114
2Z8678.318	X-111	3Z6008J9.2	R-123	3Z9825-62.715	S-113
2Z8678.331	X-110	3Z6010J9	R-112	3Z9825-62.716	S-108
2Z8679.25	X-113	3Z6011A1-5	R-122	3Z9825-62.717	S-101
2Z9621-472	T-101	3Z6013E5-5	R-143	3Z9863-17A	S-111
3BD100-45	C-103	3Z6015-131	R-106	3ZK1087-4	O-103
3DA100-730	C-102	3Z6021A1-1	R-127	6Z6806.14	E-102
3E4017	W-102	3Z6027-36	R-138	6Z7560-5	P-103
3E4017.1	W-101	3Z6027E5-1	R-115	6Z7857-10	H-110
3E4017.2	W-103	3Z6080-72	R-121	6Z8332	J-108

CAPACITOR COLOR CODES

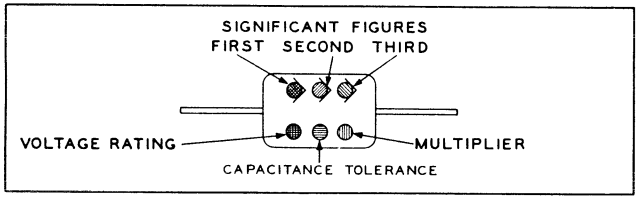
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



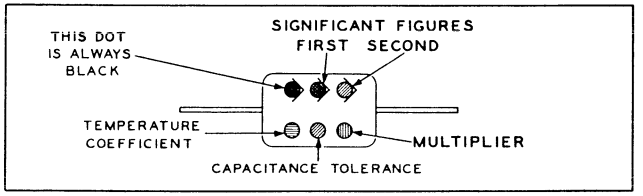
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



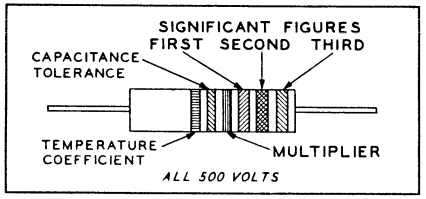
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

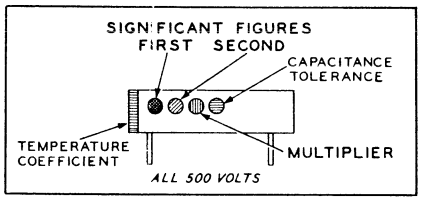


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

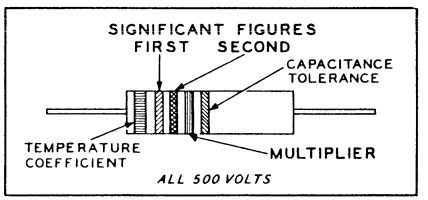


JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



AXIAL TYPE INSULATED



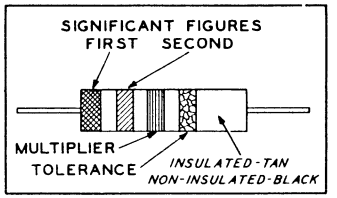
RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

RESISTORS				CAPACITORS				
				MULTIPLIER				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1,000	3	ORANGE	1,000	1000	1000	300	D
	10,000	4	YELLOW	10,000			400	E
	100,000	5	GREEN	100,000			500	F
	1,000,000	6	BLUE	1,000,000			600	G
	10,000,000	7	VIOLET	10,000,000			700	
	100,000,000	8	GRAY	100,000,000		0.01	800	
	1,000,000,000	9	WHITE	1,000,000,000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

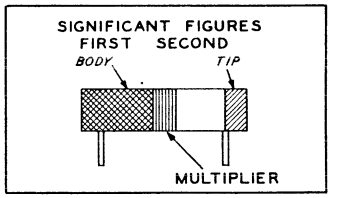
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

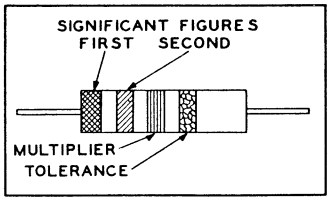


RADIAL TYPE



JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED

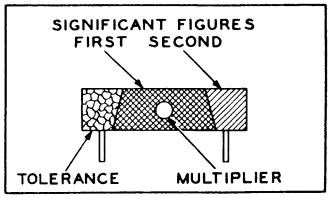


Table 8-4 Applicable Color Codes

TABLE 8-5. LIST OF MANUFACTURERS

ABBREVIATIONS	MFR'S PREFIX	NAME	ADDRESS
Alden	CYA	Alden Products Co.	117 N. Main St., Brockton 64, Mass.
American Radio	CMH	American Radio Hardware Co., Inc.	476 Broadway Ave., New York, N. Y.
Amphenol	CPH	American Phenolic Corp.	1830 S. 54th Ave., Chicago 50, Ill.
A H & H	CHH	Arrow-Hart & Hegeman Elect. Co.	102 Hawthorne St., Hartford, Conn.
Belden	CQG	Belden Mfg. Co.	P. O. Box 5070A, Chicago, Ill.
Bradley		Bradley Laboratories Inc.	80 Meadow St., New Haven 10, Conn.
Bryant	CYD	Bryant Electric Co.	14121 State St., Bridgeport 2, Conn.
Cinch	CMG	Cinch Mfg. Co.	2335 W. Van Burn, Chicago 12, Ill.
Continental Carbon	CCC	Continental Carbon Co.	13900 Lorain Ave., Cleveland, Ohio
Cornell Dubilier	CD	Cornell Dubilier Elec. Corp.	333 Hamilton Blvd., S. Plainfield, N. J.
Cornish		Cornish Wire Co.	Room 1010, 15 Park Row, New York, N. Y.
Drake	CAYS	Drake Mfg. Co.	1713 W. Hubbard St., Chicago 22, Ill.
Eby	CEB	Hugh H. Eby Inc.	18 W. Chelten Ave., Phila. 44, Penna.
Friedman		Friedman Co.	220 West 23 St., New York, N. Y.
G. E.	CG	General Electric Co.	1 River Road, Schenectady, N. Y.
Mallory	CMA	P. R. Mallory & Co.	3029 E. Washington St., Indianapolis, Ind.
Mueller	CBIT	Mueller Electric Co.	1597 E. 31st St., Cleveland, Ohio
Oak Mfg. Co.	COC	Oak Mfg. Co.	1260 Clybourne Ave., Chicago 10, Ill.
Sylvania	CHS	Sylvania Elec. Prod. Inc.	500 Fifth Ave., New York 18, N. Y.
Tung-Sol	CTL	Tung-Sol Lamp Works Inc.	100 - 8th Ave., Newark 4, N. J.
Ucinite	CUF	The Ucinite Co.	1 Nevada St., Newtonville, Mass.
Wilkor	CBIQ	Wilkor Products Co.	3835 W. 150th St., Cleveland, Ohio