

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

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 When superseded by a later edition, this publication shall be destroyed.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

FROM BUREAU OF SHIPS

ORIGINAL

B



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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 Corps 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!

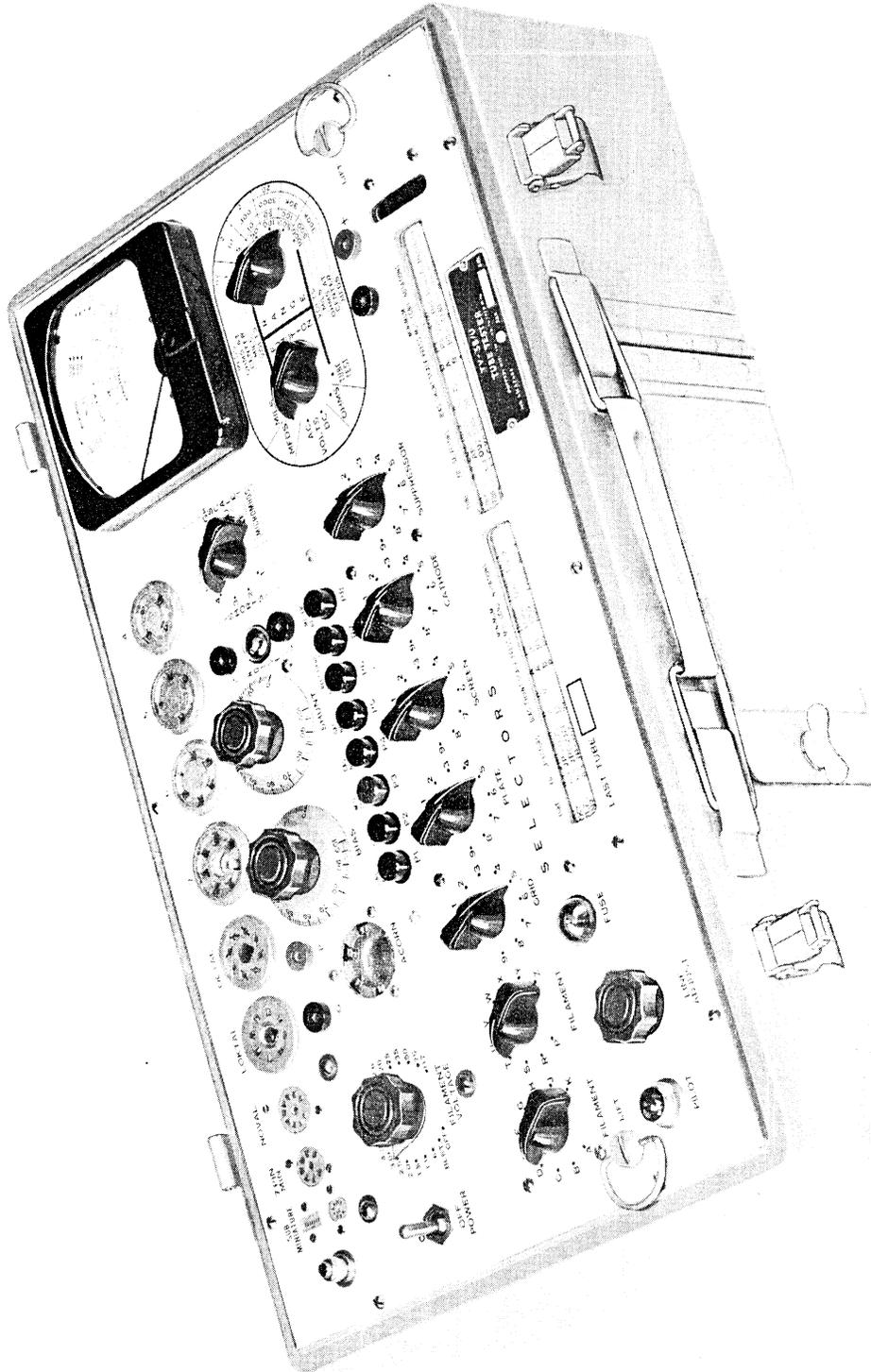


Figure 1-1. Tube Tester TV-3B/U

## SECTION I 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 Megohms ---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.

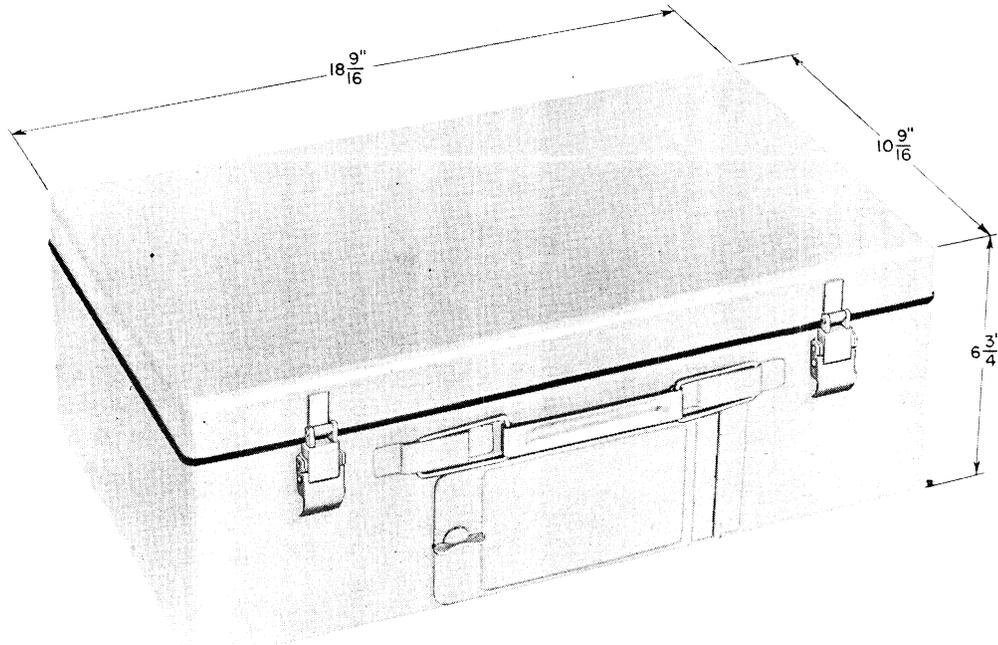


Figure 1-2. Tube Tester TV-3B/U With Cover Closed

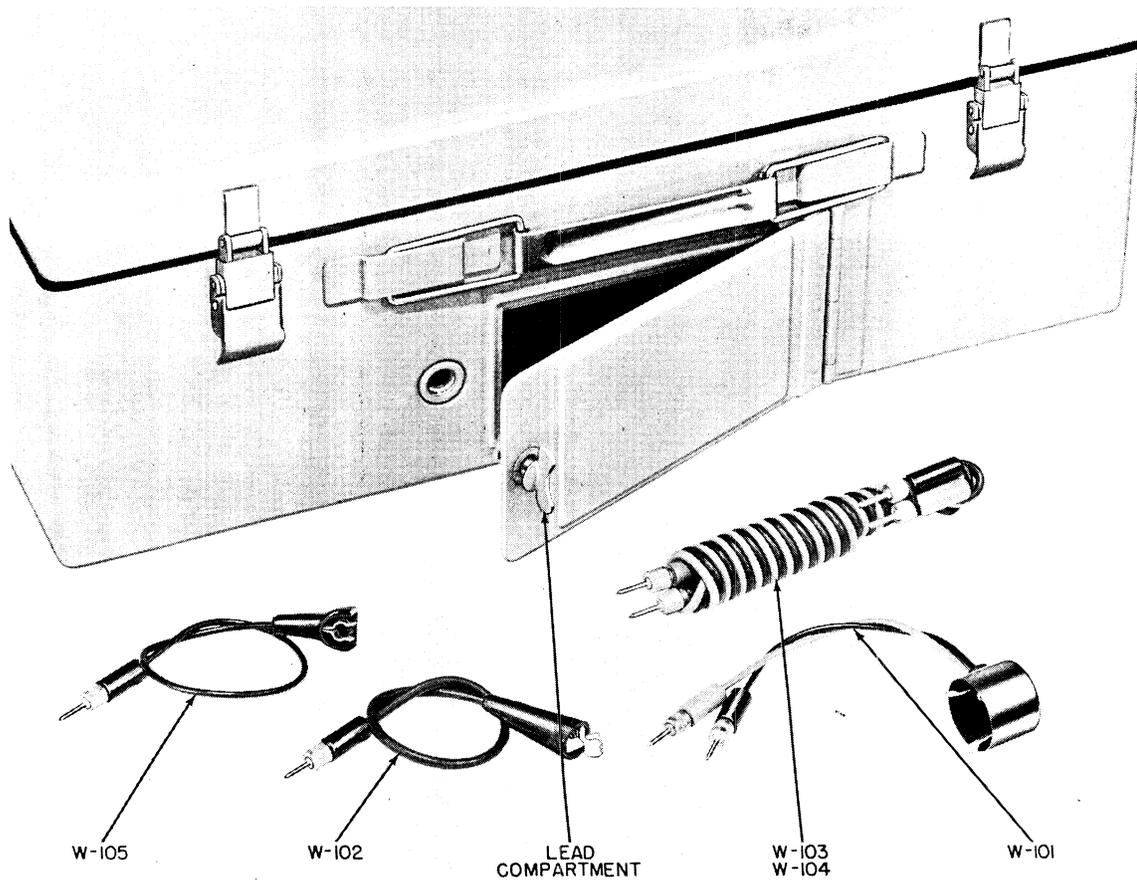


Figure 1-3. Tube Tester TV-3B/U Lead Compartment and Test Leads

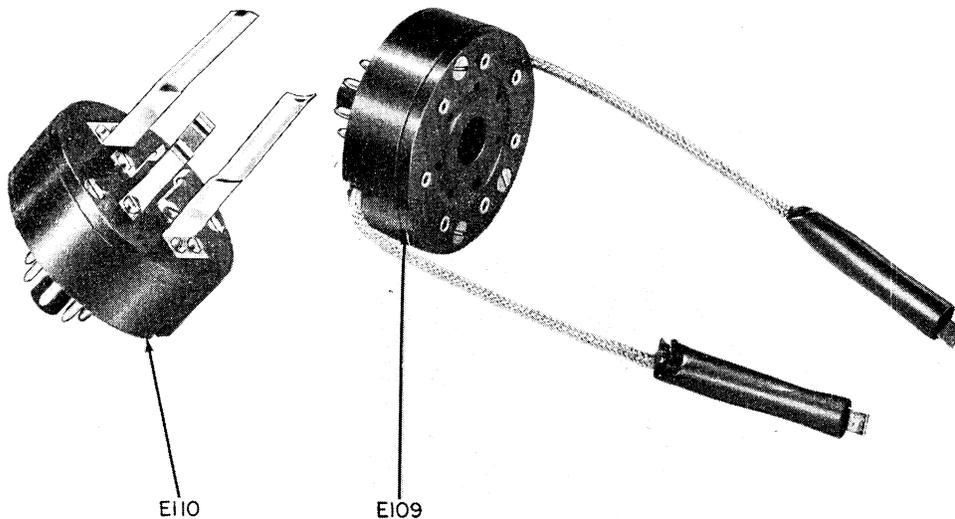


Figure 1-4. Tube Socket Adapters Used With Tube Tester TV-3B/U

3. EQUIPMENT LISTS.

TABLE 1-1. EQUIPMENT SUPPLIED

QUAN- TITY	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 Milliampere.	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.

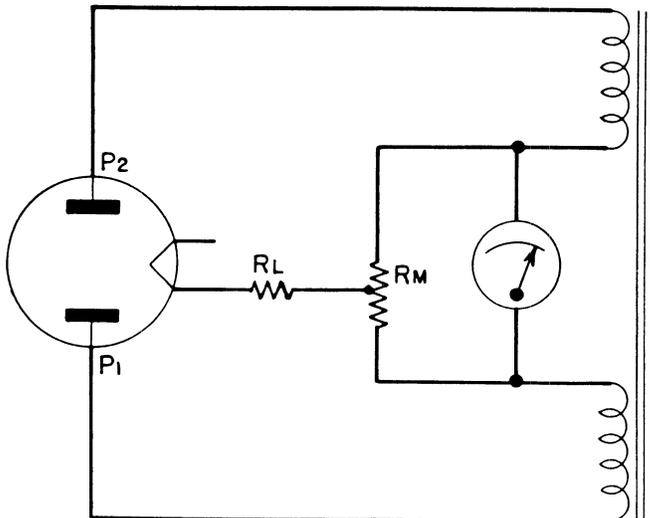
a. Electron tubes supplied to the Armed Forces are in nearly all cases procured under either JAN Specifications or other military specifications, which impose rigid controls on the processes of manufacturing, handling, and transportation of the tubes to insure delivery of the highest possible quality 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  $G_m$  is used to represent mutual conductance or transconductance in various mathematical representations of tube characteristics and their relationships.



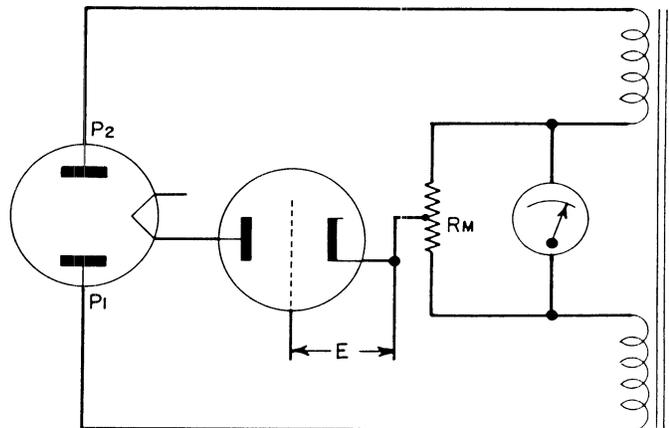
**Figure 2-1. Rectifier Diagram  
Illustrating Theory**

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.

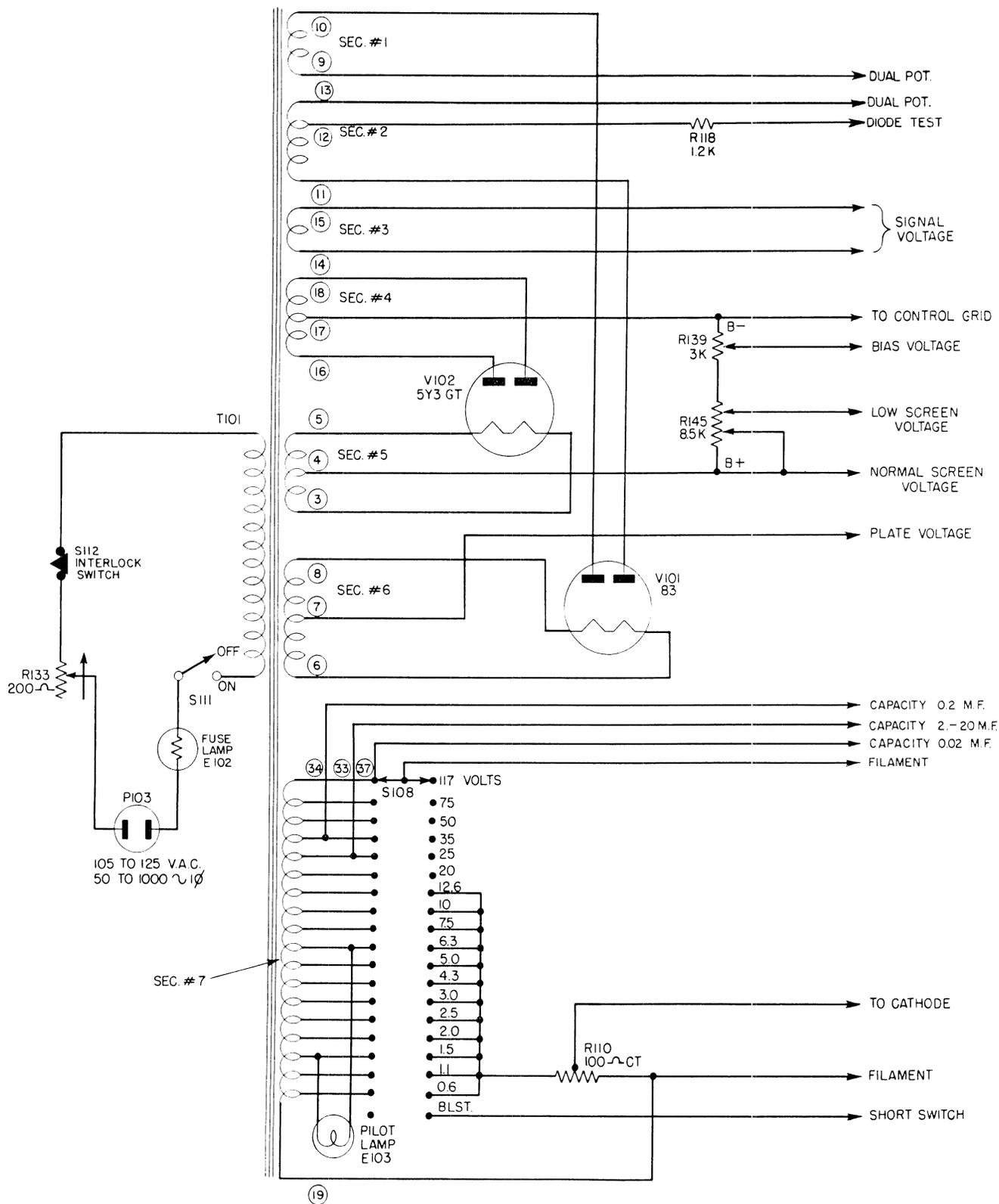


Figure 2-3. Simplified Power Supply Circuit

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 proportional 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 recifier 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)

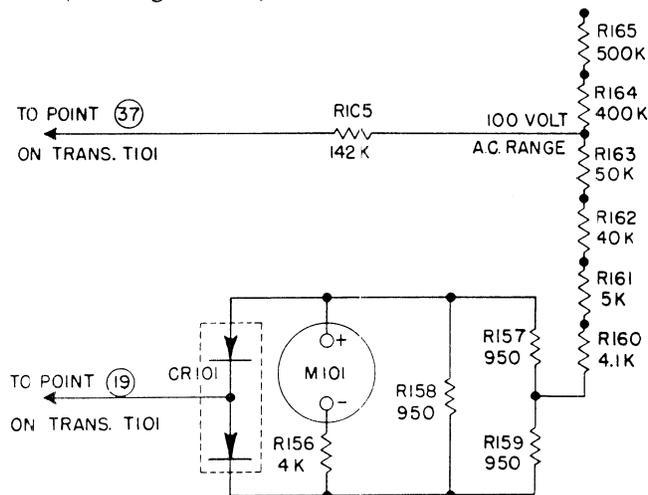


Figure 2-4. Simplified Line Voltage Test Circuit

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.

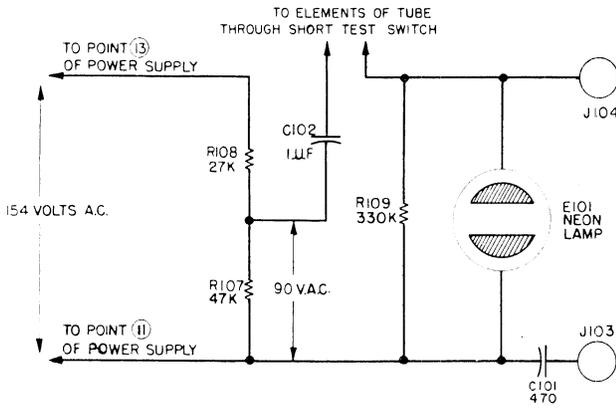


Figure 2-5. Simplified Short Test Circuit

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)

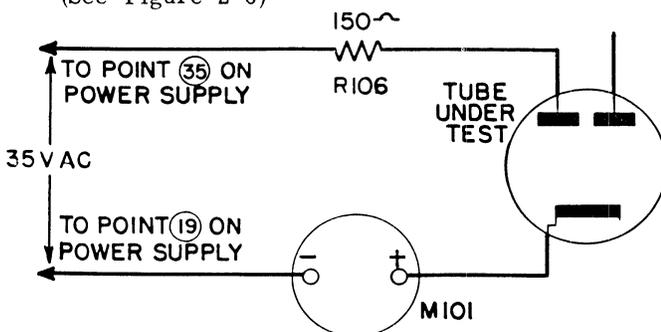


Figure 2-6. Simplified Rectifier Test Circuit

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 ( $\Delta I_p$ ) divided by the change in grid voltage ( $\Delta E_g$ ). 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 ( $\Delta E_g$ ) required for a dynamic test.

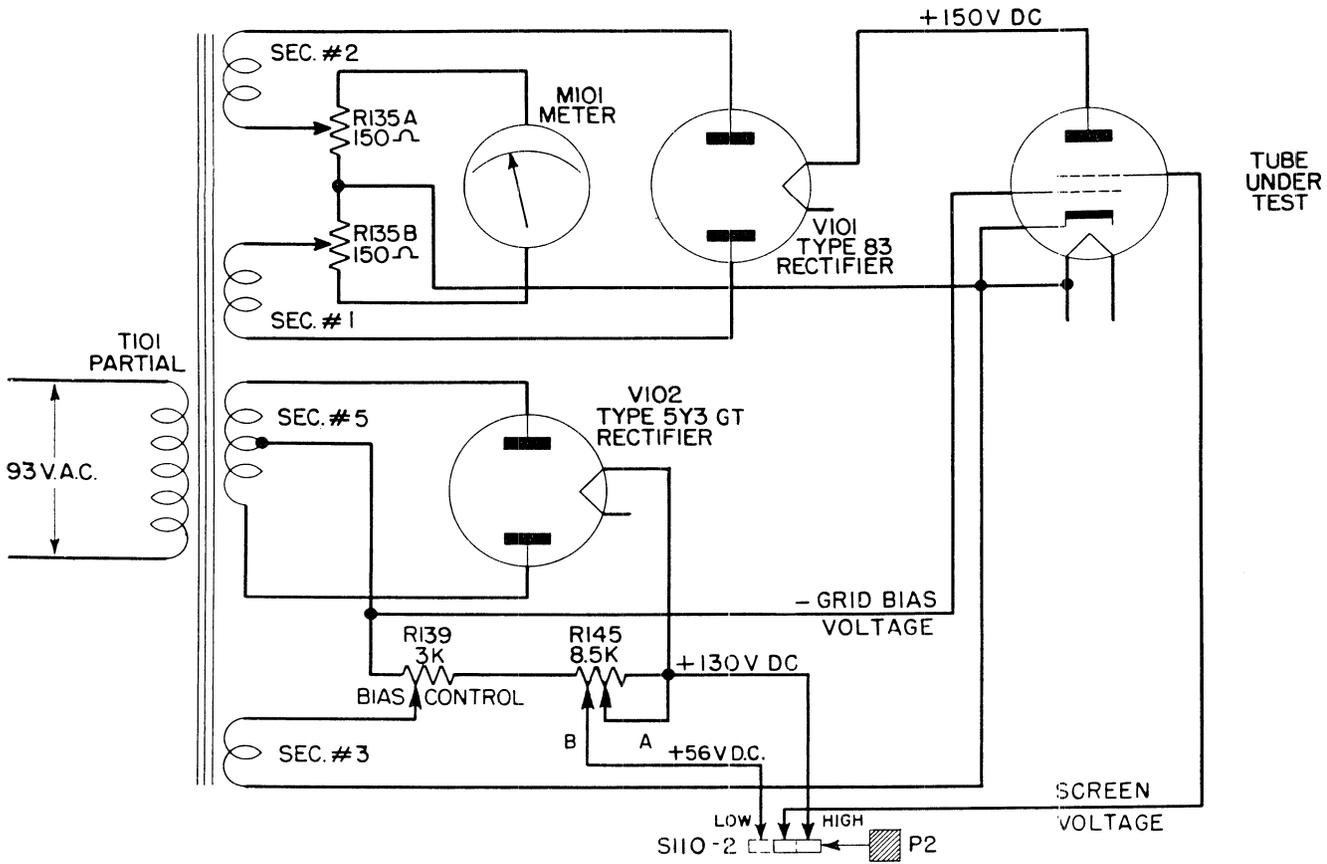


Figure 2-7. Simplified Mutual Conductance Test Circuit

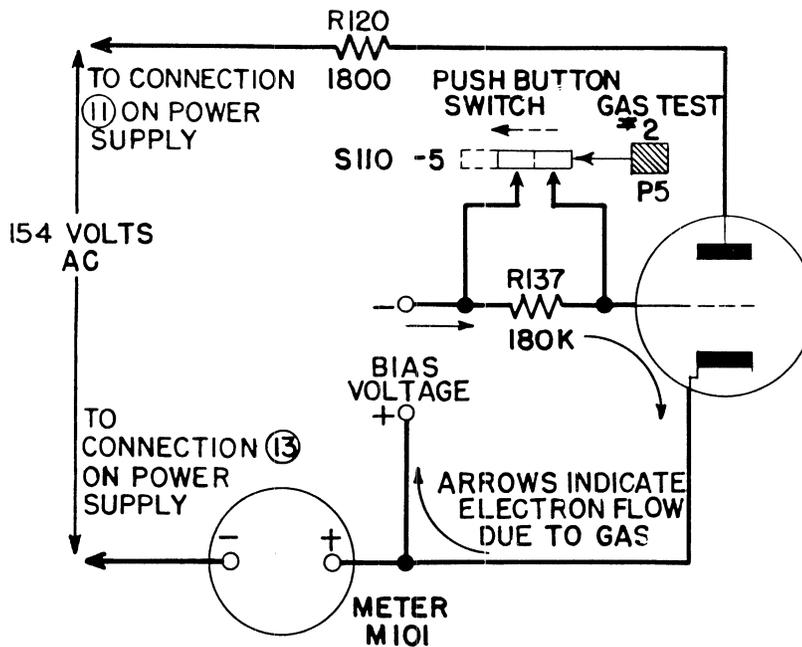


Figure 2-8. Simplified Gas Test Circuit

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 ( $\Delta I_p$ ).

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)

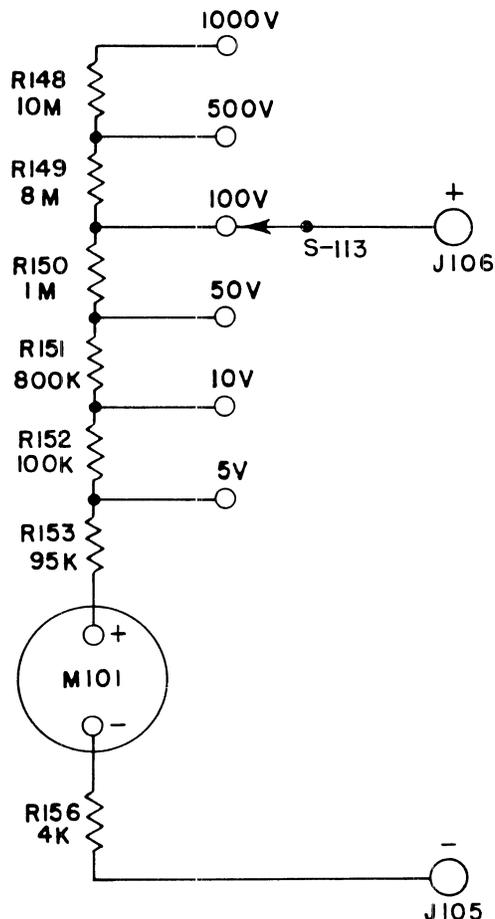


Figure 2-9. Simplified DC Voltmeter Circuit

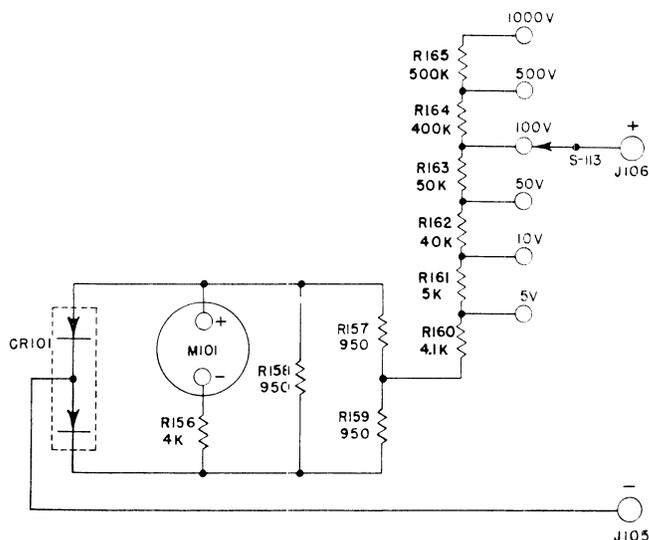


Figure 2-10. Simplified AC Voltmeter Circuit

- (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.

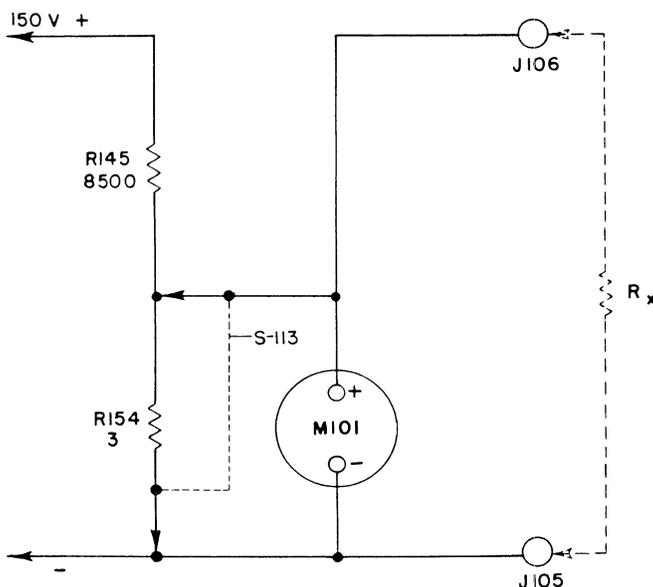


Figure 2-11. Simplified Low Range Ohmmeter Circuit

- (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.

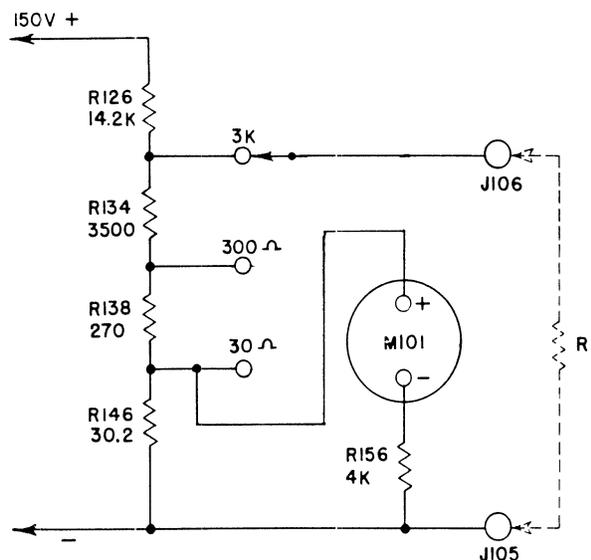


Figure 2-12. Simplified Medium Range Ohmmeter Circuit

- (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.

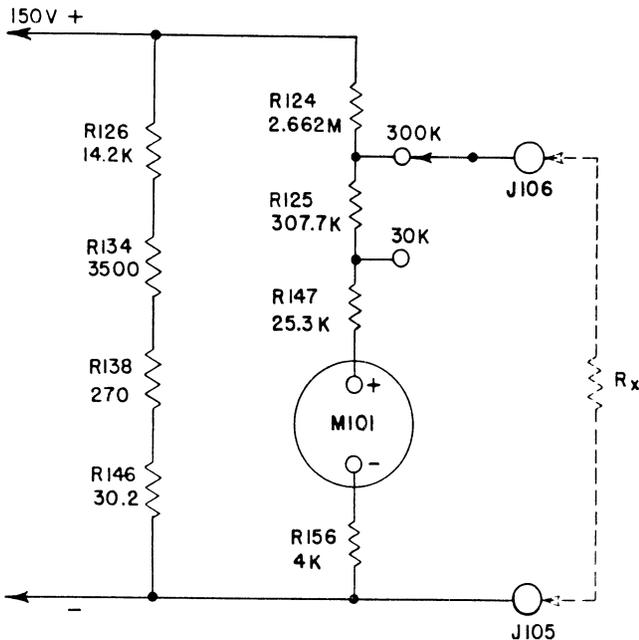


Figure 2-13. Simplified High Range Ohmmeter Circuit

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

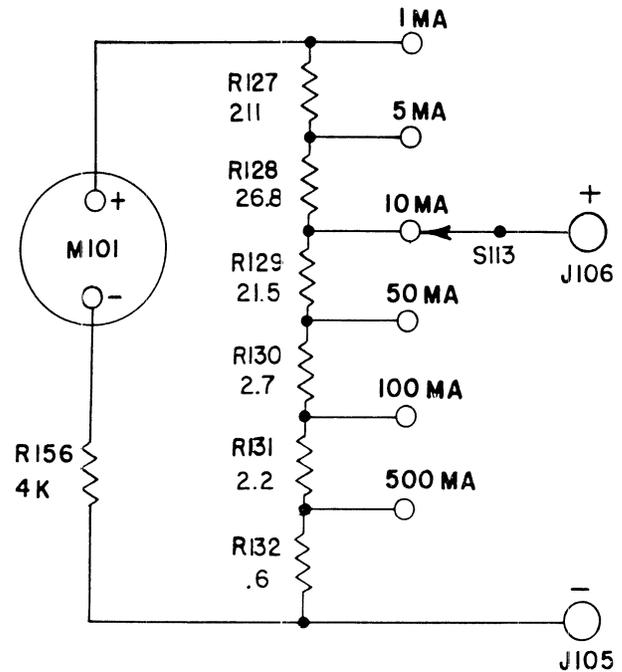


Figure 2-14. Simplified Milliammeter Circuit

- 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.
- 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)

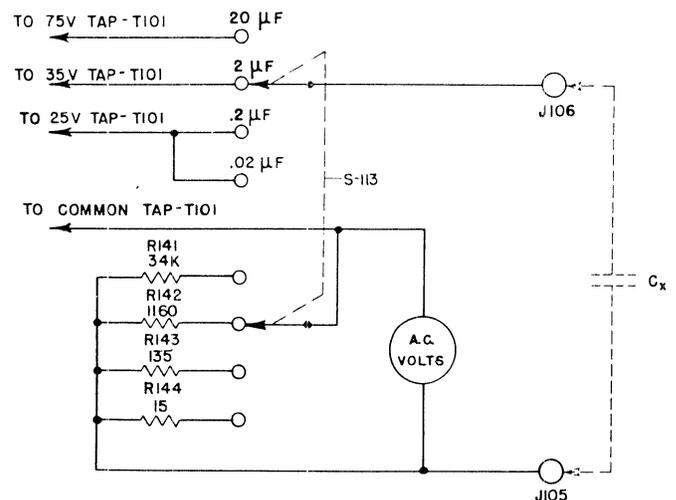


Figure 2-15. Simplified Capacity Meter Circuit

- (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.

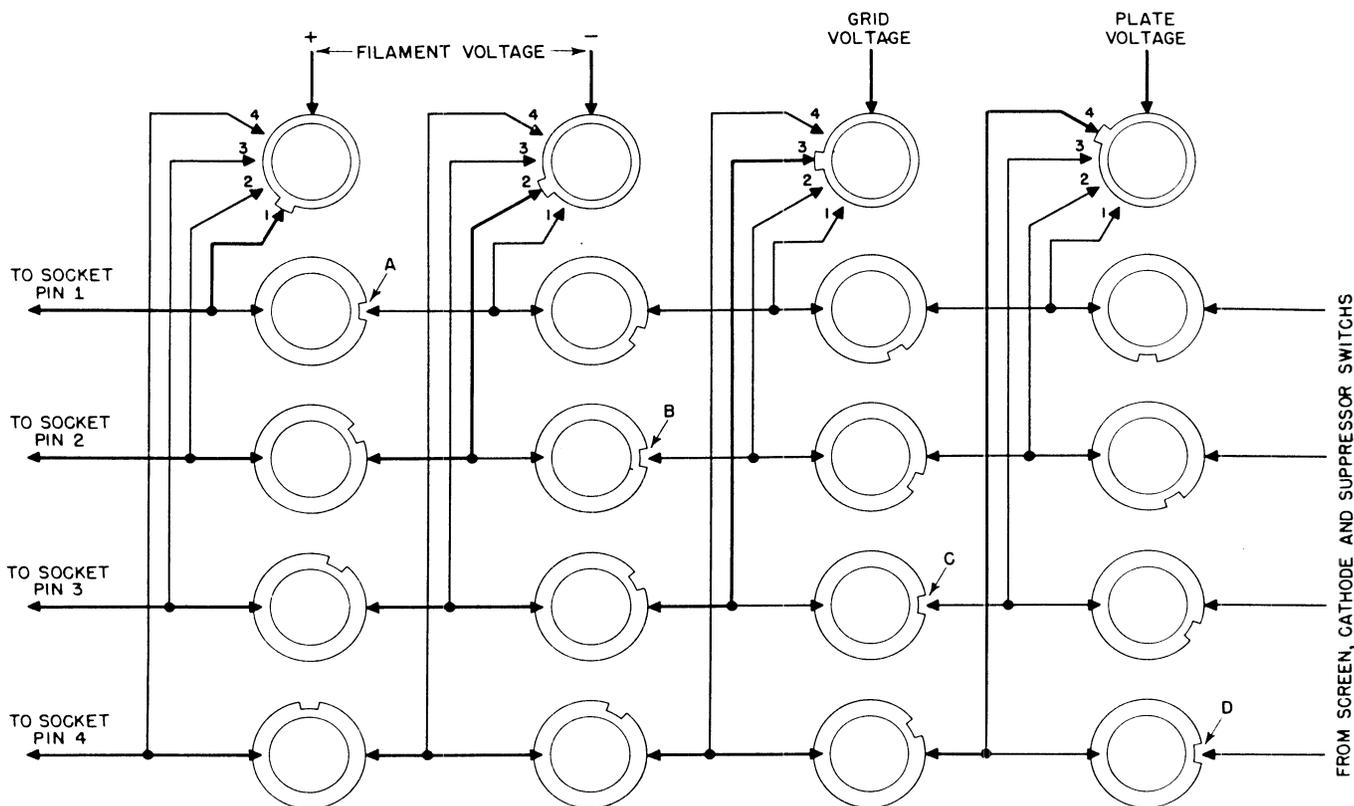
a. The SELECTOR switches FILAMENT S-107 and S-106, GRID S-105, PLATE S-104, SCREEN S-103, CATHODE S-102 and SUPPRESSOR S-101 are so constructed and interconnected as to eliminate the possibility of applying more than one voltage to any tube pin at the same time or shorting out any voltage by accidental 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, CATH-

ODE 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.



NOTE:  
CONNECTIONS FOR PINS 5 THRU 9  
AND ASSOCIATED SWITCH SECTIONS  
ARE NOT SHOWN.

Figure 2-16. Simplified Selector Switch Diagram

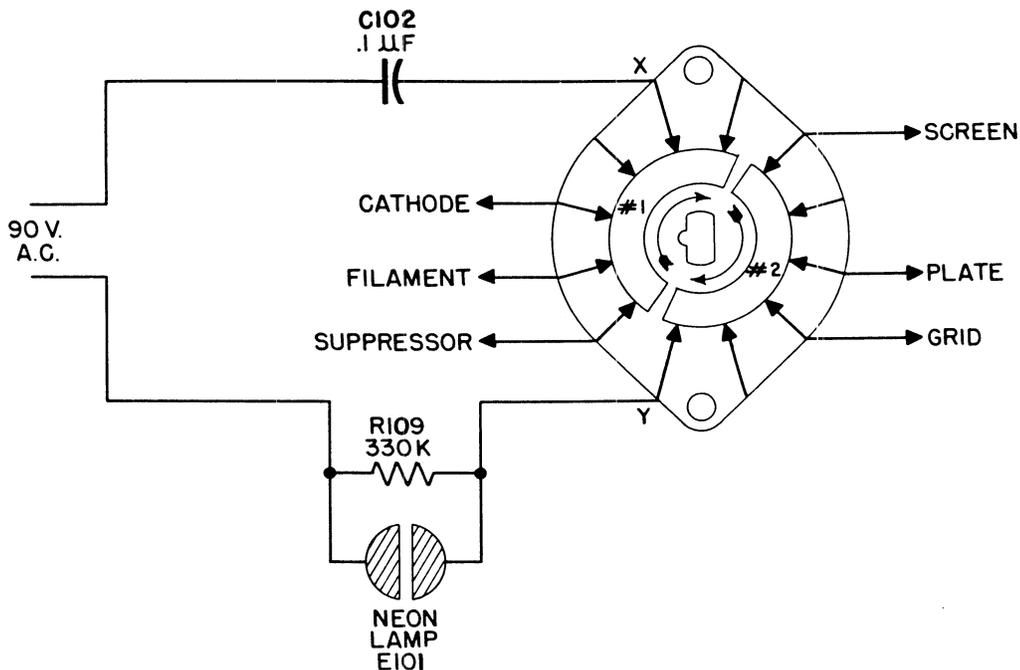


Figure 2-17. Simplified Short Test Switch Diagram

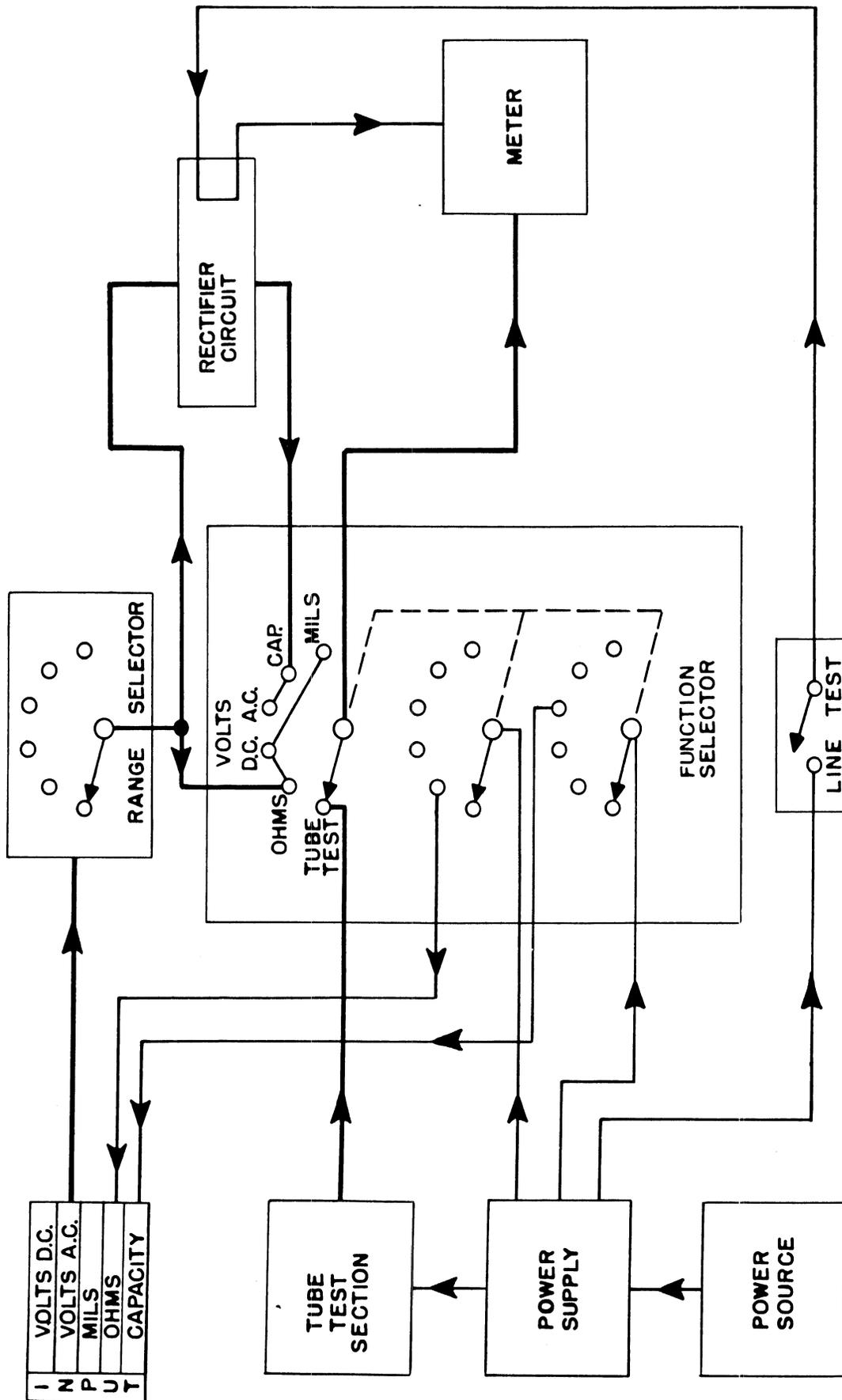


Figure 2-18. Basic Block Diagram of Tube Tester TV-3B/U

## 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 accommodate 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 MICRO-FARADS 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

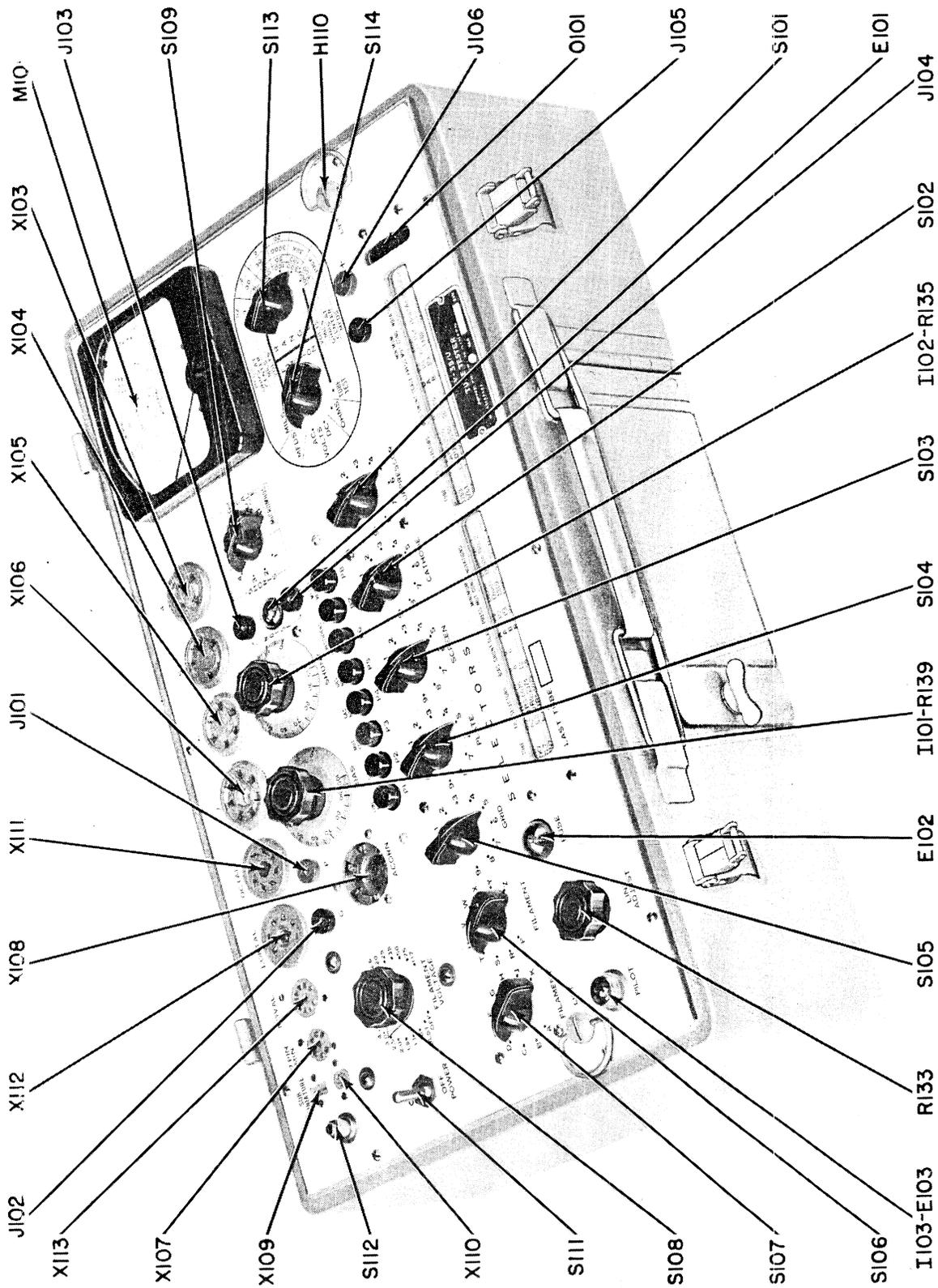


Figure 4-1. Front View of Tube Tester TV-3B/U Showing Controls by Symbol Designation

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. ----- Thyatron  
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 multi-purpose 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.

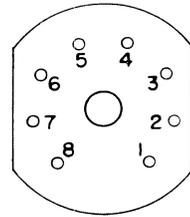
(a) Sub-miniature tubes of the round type having wire leads instead of pins are tested in the TV-3B/U by means of a special socket X-110, (See Figure 4-1). This socket has 8 contacts, numbers for which are shown by Figure 4-2.

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 identified 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.



CIRCULAR  
4-2 A



FLAT  
4-2 B

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

BASING DIAGRAMS FOR  
SUB MINIATURE TUBES

TUBES HAVING LESS THAN 8 LEADS HAVE AN ARROW ON THE SIDE OF TUBE INDICATING NO. 1 LEAD

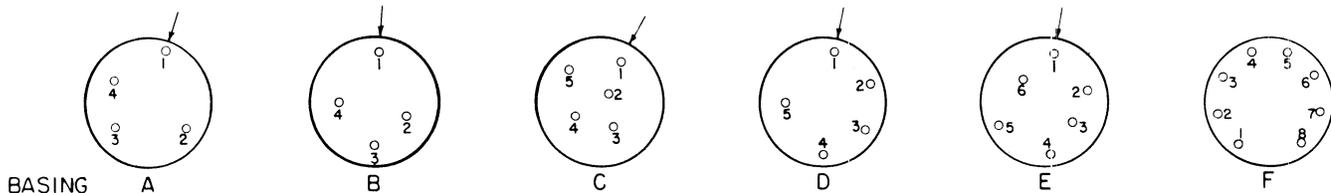


Figure 4-3. Basing Sub-Miniature Tubes (Bottom View)

(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	File Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations	Tube Type	File Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations	
00A	5.0	JR3-2000	33	...	B	P3	420		{1AF5	1.5	DX6-5800	0	...	B	#	380	Pent. Sect.	
01A	5.0	JR3-2000	48	...	B	P3	460		{1AF5	#	Hold Down P2 And Press P3	0	0	A	P2	Diode	Diode Sect.	
0A2	BLST	KR0-3020	0	42	A	P4	Volt. Reg.	Read As Rectifier		OK	Over 250 On 3000 Scale	0	67	A	P4	Rect.	Cap = P	
0A3	.....	JP0-5010	0	67	A	P4	Volt. Reg.	Read As Rectifier		1.1	JR0-0000	0	67	A	P4	#	410	Cap = G
0A4G	.....	KS0-5810	100	87	A	P4	Volt. Reg.	Read As Rectifier		2.0	JR0-2300	18	...	B	#	360	Triode Sect.	
0B2	.....	JP0-5020	0	42	A	P4	Volt. Reg.	Short on 3		#	Hold Down P2 And Press P3	0	...	B	#	480	Diode No. 1	
		Read As Rectifier														570	Pent. Sect.	
0B3	.....	JP0-5010	0	69	A	P4	Volt. Reg.	Read As Rectifier		1.5	JR5-2000	23	...	B	P3	440	Osc. Sect.	
0C3	.....	JP0-5010	0	65	A	P4	Volt. Reg.	Read As Rectifier		2.0	BY5-4000	0	0	A	P2	360	Triode Sect.	
0D3	.....	JP0-5010	0	46	A	P4	Volt. Reg.	Read As Rectifier		2.0	JR5-3000	0	0	A	P2	480	Diode No. 2	
0Y4	BLST	JX3-5020	0	50	A	P6	Rect.	Short on 1-2		1.5	JR0-3405	0	...	B	#	410	Ampl. Sect.	
{0Z4	.....	JR0-5070	0	70	A	P6	Rect.	Hold Button		#	Cap = G. Hold Down P2 And Press P3	0	...	B	#	250	Osc. Sect.	
		Down For 5 Seconds. Plate No. 1								1.5	JR5-6403	20	...	B	#	480	Osc. Sect.	
0Z4	.....	JR0-3070	0	70	A	P6	Rect.	Hold Button		#	Hold Down P2 and Press P3	0	...	B	#	480	Osc. Sect.	
{0Z4A	.....	Down For 5 Seconds. Plate No. 2								1.5	DX8-2000	37	...	B	P3	480	Osc. Sect.	
		Down For 5 Seconds. Plate No. 1								1.5	JR5-3400	37	...	B	P3	410	Osc. Sect.	
0Z4A	.....	JR0-5070	0	70	A	P6	Rect.	Hold Button		2.0	JR0-2534	0	...	B	#	250	Osc. Sect.	
1A3	.....	Down For 5 Seconds. Plate No. 2								#	Cap = G. Hold Down P2 And Press P3	0	...	B	#	315	F Basing	
1A4	.....	JR0-3070	0	70	A	P6	Rect.	Hold Button		2.0	JR4-3520	20	...	B	#	470	Cap = G.	
		Down For 5 Seconds. Plate No. 1								#	Hold Down P2 And Press P3	0	...	B	#	315	Pent. Sect.	
1A5	.....	JR0-2010	0	0	A	P2	Diode	Cap = G		2.0	JR0-3465	0	...	B	#	410	Pent. Sect.	
{1A6	.....	JR0-2300	18	...	B	#	470	Cap = G		#	Cap = G. Hold Down P2 And Press P3	0	...	B	#	250	Osc. Sect.	
		Hold Down P2 And Press P3								2.0	JR5-6430	20	...	B	#	250	Osc. Sect.	
1A5	.....	JR5-3400	43	...	B	P3	500			#	Hold Down P2 And Press P3	0	...	B	#	250	Osc. Sect.	
{1A6	.....	JR0-2504	24	...	B	#	315	Pent. Sect.		1.1	EV8-6702	45	...	B	P3	250	F Basing	
		Cap = G. Hold Down P2 And Press P3								BLST	JP8-5010	0	85	A	P4	Rect.	Cap = G.	
1A6	.....	JR4-3502	24	...	B	#	190	Osc. Sect.		2.0	JR0-3400	18	...	B	#	470	Cap = G.	
{1A7	.....	Hold Down P2 And Press P3								#	Hold Down P2 And Press P3	0	...	B	#	315	Pent. Sect.	
		JR0-3465	0	...	B	#	410	Pent. Sect.		2.0	JR0-3465	24	...	B	#	190	Osc. Sect.	
1A7	.....	Cap = G. Hold Down P2 And Press P3								#	Cap = G. Hold Down P2 And Press P3	0	...	B	#	315	Osc. Sect.	
{1A7	.....	JR5-6430	28	...	B	#	315	Osc. Sect.		2.0	JR5-6430	24	...	B	#	190	Osc. Sect.	
		Hold Down P2 And Press P3								#	Hold Down P2 and Press P3	0	...	B	#	580	Pent. Sect.	
1AB5	.....	JR6-2300	0	...	B	P3	900			1.5	JR5-3460	50	...	B	P3	360	Triode Sect. Cap = G	
1AC5★	.....	EV2-7800	22	...	B	#	250	F Basing		1.5	JR5-6430	11	...	B	P3	520	Diode	
1AD4	.....	Hold Down P2 And Press P3								1.5	JR5-7430	0	0	A	P2	410	Cap = G	
1AD5★	.....	DV4-1200	28	...	B	P3	880	F Basing		1.5	JR5-3000	37	...	B	P3	410	Cap = G	
		EV2-7800	0	...	B	#	410	F Basing		2.0	JR0-3400	18	...	B	#	900	Pent. No. 1	
1AE4	.....	Hold Down P2 And Press P3								#	Hold Down P2 And Press P3	0	...	B	#	900	Pent. No. 2	
1AF4	.....	DX6-2100	22	...	B	P3	600			2.0	JR5-6734	10	...	D	P3	900	Pent. No. 2	
		DX6-2100	21	...	B	P3	440			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	Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
1F4	2.0	JR3-2400	23		B	P3	880		1LH4	1.5	JR6-2000	16		B	P3	175	Triode Sect.
1F5	2.0	JR5-3400	23		B	P3	880		1LH4	1.5	JR6-4000	0	0	A	P2	Diode	Diode Sect.
1F6	2.0	JR0-2300	8		B	#	410	Pent. Sect.	1LN5	1.5	JR6-2340	11		B	P3	480	
		# Cap = G. Hold Down P2 And Press P3							1N5	1.5	JR0-3400	11		B	P3	480	Cap = G
1F6	2.0	JR0-5300	0	0	A	P2	Diode	Diode No. 1	1N6	1.5	JR5-3400	43		B	P3	500	Pent. Sect.
		OK Above 500 On 3000 Scale							1N6	1.5	JR0-6000	0	0	A	P2	Diode	Diode Sect.
1F6	2.0	JR0-4300	0	0	A	P2	Diode	Diode No. 2		OK Over 250 On 3000 Scale							
		OK Above 500 On 3000 Scale							1P5	1.5	JR0-3400	11		B	P3	500	Cap = G
1F7	2.0	JR0-3600	8		B	#	410	Pent. Sect.	1Q5	1.5	JR5-3400	37		B	P3	1320	
		# Cap = G. Hold Down P2 And Press P3							1Q6★	1.1	EV2-7800	0		B	#	190	F Basing
1F7	2.0	JR0-4630	0	0	A	P2	Diode	Diode No. 1		# Pent. Sect. Hold Down P2 And Press P3							
		OK Above 500 On 3000 Scale							1Q6★	1.1	EV0-6000	0	0	A	P2	Diode	F Basing
1F7	2.0	JR0-5630	0	0	A	P2	Diode	Diode No. 2		Diode Sect. OK Over 250 On 3000 Scale							
		OK Above 500 On 3000 Scale							1R4	1.5	JR0-4070	0	0	A	P2	Diode	
1G4	1.5	JR5-3000	49		B	P3	520		1R5	1.5	DX8-2160	0		B	#	250	No. 1 Grid
1G5	2.0	JR5-3400	37		B	P3	950			# Hold Down P2 And Press P3							
1G6	1.5	JR5-6000	16		B	P3	420	Triode No. 1	1R5	1.5	DX6-2180	0		B	#	220	No. 3 Grid
1G6	1.5	JR4-3000	16		B	P3	420	Triode No. 2		# Hold Down P2 And Press P3							
1H4	2.0	JR5-3000	40		B	P3	570		1S4	1.5	DX1-2800	31		B	#	950	# Hold Down
1H5	1.5	JR0-3000	16		B	P3	175	Triode Sect. Cap = G		P2 And Press P3							
1H5	1.5	JR0-5000	0	0	A	P2	Diode	Diode	1S5	1.5	DX6-5800	13		B	#	330	Pent. Sect.
1H5	2.0	JR6-3000	23		B	P3	360	Triode Sect.		# Hold Down P2 And Press P3							
1H6	2.0	BY6-5000	0	0	A	P2	Diode	Triode Sect.	1S5	1.5	DX0-1800	0	0	A	P2	Diode	Diode Sect.
1H6	2.0	JR6-4000	0	0	A	P2	Diode	Diode No. 1	1S6★	1.1	EV3-1806	0		B	#	220	F Basing
1H6	2.0	JR5-3400	45		B	P3	600	Diode No. 2		# Pent. Sect. Hold Down P2 And Press P3							
1J5	2.0	JR5-6000	15		B	P3	630	Triode No. 1	1S6★	1.1	EV0-6000	0	0	A	P2	Diode	F Basing
1J6	2.0	JR4-3000	15		B	P3	630	Triode No. 2		Diode Sect. OK Over 250 On 3000 Scale							
1L4	1.5	HT6-2100	19		B	P3	650		1SA6	1.5	JR4-7630	0		B	#	500	# Hold Down
1L6	1.5	DX6-2518	0		B	#	410	Pent. Sect.		P2 And Press P3							
		# Hold Down P2 And Press P3							1SB6	1.5	JR7-3400	0		B	#	410	Pent. Sect.
1L6	1.5	DX8-1526	28		B	#	190	Osc. Sect.		# Hold Down P2 And Press P3							
		# Hold Down P2 And Press P3							1SB6	1.5	JR7-5000	0	0	A	P2	Diode	Diode Sect.
1LA4	1.5	JR6-2300	43		B	P3	500			OK Over 500 On 3000 Scale							
1LA6	1.5	JR6-2534	0		B	#	380	Pent. Sect.	1T4	1.5	DX6-2100	0		B	#	470	# Hold Down
		# Hold Down P2 And Press P3								P2 And Press P3							
1LA6	1.5	JR4-3526	32		B	#	190	Osc. Sect.	1T5	1.5	JR5-3400	45		B	P3	725	
		# Hold Down P2 And Press P3							1T6★	1.1	EV3-1860	0		B	#	125	F Basing.
1LB4	1.5	JR6-2300	51		B	P3	580			# Pent. Sect. Hold Down P2 And Press P3							
1LB6	1.5	JR6-2437	0		B	P3	250	Heptode Sect.	1T6★	1.1	EV0-6000	0	0	A	P2	Diode	F Basing
1LB6	1.5	JR6-3574	20		B	P3	950	Osc. Sect.		Diode Sect. OK Over 250 On 3000 Scale							
1LC5	1.5	JR6-2340	0		B	#	470	# Hold Down	1U4	1.5	DX6-2100	14		B	P3	565	
		P2 And Press P3								1.5	DX6-2100	34		B	P3	330	Pent. Sect.
1LC6	1.5	JR6-2534	30		B	P3	440	Pent. Sect.	1U5	1.5	DX6-8100	0	0	A	P2	Diode	Diode Sect.
1LC6	1.5	JR4-3526	30		B	P3	240	Osc. Sect.	1U6	1.5	DX6-2581	23		B	P3	470	Heptode Sect.
1LD5	1.5	JR6-2300	0		B	#	380	Pent. Sect.	1U6	1.5	DX8-1562	0		B	P3	315	Osc. Sect.
		# Hold Down P2 And Press P3							1V	6.3	JR0-2030	0	44	A	P7	Rect.	
1LD5	1.5	JR6-4300	0	0	A	P2	Diode	Diode Sect.	1V2	0.6	EV0-9000	0	25	A	P4	Rect.	
		OK Over 500 On 3000 Scale							1V5★	1.1	EV2-7800	24		B	#	440	F Basing
1LE3	1.5	JR6-2050	0		B	P3	820			# Hold Down P2 And Press P3							
1LF3	1.5	JR6-2050	20		B	P3	760		1W4	1.5	DX6-2100	49		B	P3	580	
1LG5	1.5	JR6-2340	25		B	P3	660		1W5★	1.1	EV2-7800	27		D	P3	410	F Basing

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

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

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

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

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

Tube Type	Flt Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations	Tube Type	Flt Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
{6AQ6	6.3	JR3-7020	6	...	B	P3	725	Triode Sect.	{6BE6	6.3	JR7-5623	11	...	B	P3	900	Ampl. Sect.
{6AQ6	6.3	JR0-6020	0	0	A	P2	Diode	Diode No. 1	{6BE6	6.3	JR3-5627	0	...	B	P3	1000	Osc. Sect.
{6AQ6	6.3	JR0-5020	0	0	A	P2	Diode	Diode No. 2	6BE7	6.3	EV7-1639	29	...	B	P3	630	
{6AQ7	6.3	JX4-5016	13	...	A	P3	630	Triode Sect.	6BF5	6.3	JR3-5620	49	...	C	P3	2140	
{6AQ7	6.3	JX4-2016	0	35	B	P2	Diode	Diode No. 1	{6BF6	6.3	JR3-7020	18	0	B	P3	1200	Triode Sect.
{6AQ7	6.3	JX4-3016	0	35	A	P2	Diode	Diode No. 2	{6BF6	6.3	JR3-6020	0	0	A	P2	Diode	Diode No. 1
6AR5	6.3	JR3-5620	34	...	B	P3	1000		{6BF6	6.3	JR3-5020	0	0	A	P2	Diode	Diode No. 2
6AR6	6.3	GX8-3520	34	...	C	P3	3400		{6BF7★	6.3	DW7-8050	22	...	C	P3	1575	F Basing
6AS5	6.3	JR2-7630	25	...	D	P3	3530		Triode No. 1								
6AS6	6.3	JR3-5627	10	...	D	P3	1540		{6BF7★	6.3	DW2-1040	22	...	C	P3	1575	F Basing
6AS7	6.3	JX4-5061	100	...	C	P3	1800	Triode No. 1	Triode No. 2								
{6AT6	6.3	JX2-1035	100	...	C	P3	1800	Triode No. 2	6BG6	6.3	JR5-0730	18	...	D	P3	3800	Cap=P
{6AT6	6.3	JR3-7020	18	...	B	P3	750	Triode Sect.	{6BG7★	6.3	DW7-8050	22	...	C	P3	1575	F Basing
{6AT6	6.3	JR0-6020	0	0	A	P2	Diode	Diode No. 1	Triode No. 1								
{6AT6	6.3	JR0-5020	0	0	A	P2	Diode	Diode No. 2	{6BG7★	6.3	DW2-1040	22	...	C	P3	1575	F Basing
6AU5	6.3	JR2-5730	41	...	C	P3	1780		Triode No. 2								
6AU6	6.3	JR3-5672	10	...	D	P3	2050		6BH6	6.3	JR3-5627	15	...	B	P3	1260	
6AV5	6.3	JR2-5730	50	...	C	P3	2450		6BJ6	6.3	JR3-5627	0	...	B	P3	2400	
{6AV6	6.3	JR3-7025	12	...	B	P3	800	Triode Sect.	{6BK6	6.3	JR3-7025	6	...	B	P3	790	Triode Sect.
{6AV6	6.3	JR3-6025	0	0	A	P2	Diode	Diode No. 1	{6BK6	6.3	JR0-6025	0	0	A	P2	Diode	Diode No. 1
{6AV6	6.3	JR3-5027	0	0	A	P2	Diode	Diode No. 2	{6BK6	6.3	JR0-5027	0	0	A	P2	Diode	Diode No. 2
{6AW7	6.3	JX1-6020	8	...	B	P3	570	Triode Sect.	{6BK7	6.3	EV7-6089	8	...	D	P3	5350	Triode No. 1
{6AW7	6.3	JX1-3050	0	65	A	P2	Diode	Diode No. 1	{6BK7	6.3	EV2-1039	8	...	D	P3	5350	Triode No. 2
{6AW7	6.3	JX1-4020	0	65	A	P2	Diode	Diode No. 2	{6BL7	6.3	JX2-1030	24	...	D	P3	3150	Triode No. 1
6AX4	6.3	JX0-5030	0	46	A	P7	Rect.		{6BL7	6.3	JX4-5060	24	...	D	P3	3150	Triode No. 2
{6AX5	6.3	JR0-5073	0	0	A	P7	Rect.	Plate No. 1	{6BN6	6.3	JR2-7536	0	...	B	P3	440	Limiter Grid
{6AX5	6.3	JR0-3075	0	0	A	P7	Rect.	Plate No. 2	{6BN6	6.3	JR6-7532	0	...	B	P3	570	Quadrature Grid
{6AX6	6.3	JR0-5070	0	62	A	P7	Rect.	Plate No. 1	6BO6	6.3	JR5-0470	50	...	C	P3	2800	Cap=P
{6AX6	6.3	JR0-3040	0	62	A	P7	Rect.	Plate No. 2	{6BQ7	6.3	EV7-6080	17	...	D	P3	3300	Triode No. 1
6B4	6.3	JR5-3000	67	...	C	P3	1900		{6BQ7	6.3	EV2-1030	17	...	D	P3	3300	Triode No. 2
6B5	6.3	JR4-2350	0	...	B	P3	950		6BT6	6.3	JR3-7020	13	...	B	P3	820	Triode Sect.
{6B6	6.3	JR0-3070	15	...	B	P3	470	Triode Sect. Cap=G	6BT6	6.3	JR3-6020	0	35	A	P2	Diode	Diode No. 1
6B6	6.3	JR0-5070	0	0	A	P2	Diode	Diode No. 1	6BT6	6.3	JR3-5020	0	35	A	P2	Diode	Diode No. 2
6B6	6.3	JR0-4070	0	0	A	P2	Diode	Diode No. 2	6BU6	6.3	JR3-7020	34	...	B	P3	940	Triode Sect.
6B7	6.3	JR0-2360	30	...	B	P3	630	Pent. Sect. Cap=G	{6BU6	6.3	JR3-6020	0	25	A	P2	Diode	Diode No. 1
6B7	6.3	JR0-5360	0	0	A	P2	Diode	Diode No. 1	6BU6	6.3	JR3-5020	0	25	A	P2	Diode	Diode No. 2
6B7	6.3	JR0-4360	0	0	A	P2	Diode	Diode No. 2	6BX6	6.3	EV2-7819	13	...	C	P3	1900	
6B8	6.3	JR0-3672	24	...	B	P3	720	Pent. Sect. Cap=G	{6BY5	6.3	JR0-5070	0	38	A	P7	Rect.	Plate No. 1
6B8	6.3	JR0-5672	0	0	A	P2	Diode	Diode No. 1	{6BY5	6.3	JR0-4020	0	38	A	P7	Rect.	Plate No. 2
6B8	6.3	JR0-4672	0	0	A	P2	Diode	Diode No. 2	6C4	6.3	JR6-3070	24	...	B	P3	1380	
6B8★	6.3	EW3-1520	15	...	D	P3	2080	E Basing	6C5	6.3	JR5-3070	21	...	B	P3	1260	
6BA6	6.3	JR3-5672	9	...	C	P3	2700		6C6	6.3	JR0-2354	21	...	B	P3	770	Cap=G
{6BA7	6.3	EV7-9132	17	...	B	P3	470	Ampl. Sect.	{6C7	6.3	JR0-2060	29	...	B	P3	780	Triode Sect. Cap=G
{6BA7	6.3	EV2-9137	25	...	B	P3	470	Osc. Sect.	6C7	6.3	JR0-5060	0	0	A	P2	Diode	Diode No. 1
6BC5	6.3	JR3-5620	0	...	C	P3	2000		6C7	6.3	JR0-4060	0	0	A	P2	Diode	Diode No. 2
{6BC7	6.3	EV0-8090	0	67	A	P2	Diode	Diode No. 1	{6C8	6.3	JR5-6070	17	...	B	P3	630	Triode No. 1
{6BC7	6.3	EV0-6070	0	67	A	P2	Diode	Diode No. 2	6CB6	6.3	JR3-5627	11	...	D	P3	630	Triode No. 2 Cap=G
{6BC7	6.3	EV0-2010	0	67	A	P2	Diode	Diode No. 3	6CD6	6.3	JR5-0730	42	...	D	P3	3500	
6BD5	6.3	JR2-5730	18	...	D	P3	3150		6D4	6.3	JR3-7050	#	40	A	P7	4100	Cap=P
6BD6	6.3	JR3-5672	13	...	D	P3	1260		# Should Strike Between 75 and 65. Read As Rectifier.								

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

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

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

Tube Type	File Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations	Tube Type	File Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
{6SL7	6.3	JX4-5061	7	...	D	P3	1000	Triode No. 1	{6V8	6.3	EV6-1038	11	...	B	P3	760	Triode Sect.
{6SL7	6.3	JX2-1035	7	...	D	P3	1000	Triode No. 2	{6V8	6.3	EV0-9032	0	13	A	P2	Diode	Diode No. 1
{6SN7	6.3	JX4-5061	22	...	D	P3	1650	Triode No. 1	{6V8	6.3	EV0-7086	0	71	A	P2	Diode	Diode No. 2
{6SN7	6.3	JX2-1035	22	...	D	P3	1650	Triode No. 2	{6V8	6.3	EV0-2038	0	71	A	P2	Diode	Diode No. 3
{6SQ7	6.3	JX1-6032	11	...	D	P2	700	Triode Sect.	6W4	6.3	JX0-5030	0	56	A	P7	Rect.	
{6SQ7	6.3	JX0-5036	0	0	A	P2	Diode	Diode No. 1	{6W5	6.3	JR0-5070	0	23	A	P7	Rect.	Plate No. 1
{6SQ7	6.3	JX0-4036	0	0	A	P2	Diode	Diode No. 2	{6W5	6.3	JR0-3070	0	23	A	P7	Rect.	Plate No. 2
{6SR7	6.3	JX1-6032	18	...	B	P3	1200	Triode Sect.	6W6	6.3	JR5-3470	56	...	C	P3	1900	
{6SR7	6.3	JX0-5036	0	0	A	P2	Diode	Diode No. 1	6W7	6.3	JR0-3475	22	...	B	P3	770	Cap = G
{6SR7	6.3	JX0-4036	0	0	A	P2	Diode	Diode No. 2	{6X4	6.3	JR0-6070	0	14	A	P7	Rect.	Plate No. 1
{6SS7	6.3	JR4-7653	19	...	B	P3	1160	Triode Sect.	{6X4	6.3	JR0-3070	0	14	A	P7	Rect.	Plate No. 2
{6ST7	6.3	JX1-6032	15	...	B	P3	1200	Diode	{6X5	6.3	JR0-5072	0	23	A	P7	Rect.	Plate No. 1
{6ST7	6.3	JX0-5036	0	0	A	P2	Diode	Diode No. 1	{6X5	6.3	JR0-3072	0	23	A	P7	Rect.	Plate No. 2
{6ST7	OK	Above 500	On 3000	Scale	A	P2	Diode	Diode No. 2	{6X8	6.3	EV7-9861	9	...	D	P3	2900	Pent. Sect.
{6ST7	6.3	JX0-4036	0	0	A	P2	Diode	Diode No. 2	{6X8	6.3	EV2-3861	15	...	D	P3	2840	Triode Sect.
{6SU7	6.3	JX4-5061	7	...	D	P3	1000	Triode No. 1	{6Y5	6.3	JR0-5040	0	56	A	P7	Rect.	Plate No. 1
{6SU7	6.3	JX2-1035	7	...	D	P3	1000	Triode No. 2	{6Y5	6.3	JR0-3040	0	56	A	P7	Rect.	Plate No. 2
{6SV7	6.3	JX1-6430	12	...	B	P3	1320	Pent. Sect.	6Y6	6.3	JR5-3470	33	...	D	P3	3800	
{6SV7	6.3	JX1-5430	0	62	A	P2	Diode	Diode Sect.	{6Y7	6.3	JR5-6073	15	...	B	P3	630	Triode No. 1
{6SZ7	6.3	JX1-6032	10	...	B	P3	760	Triode Sect.	{6Y7	6.3	JR4-3076	15	...	B	P3	630	Triode No. 2
{6SZ7	6.3	JX0-5032	0	0	A	P2	Diode	Diode No. 1	{6Z4	6.3	JR0-2040	0	35	A	P7	Rect.	Plate No. 1
{6SZ7	OK	Above 500	On 3000	Scale	A	P2	Diode	Diode No. 2	{6Z5	12.6	JSO-5040	0	20	A	P7	Rect.	Plate No. 1
{6SZ7	6.3	JX0-4032	0	0	A	P2	Diode	Diode No. 2	{6Z5	12.6	JSO-3040	0	20	A	P7	Rect.	Plate No. 2
{6T5	6.3	JR5-4030	0	100	A	P3	Eye	Eye Open	{6Z7	6.3	JR5-6070	0	...	B	P3	760	Triode No. 1
{6T5	6.3	JR5-4230	0	100	A	P3	Eye	Eye Closed	{6Z7	6.3	JR4-3070	0	...	B	P3	760	Triode No. 2
{6T7	6.3	JR0-3070	17	...	B	P3	630	Triode Sect. Cap = G	{6ZY5	6.3	JR0-5070	0	9	A	P7	Rect.	Plate No. 1
{6T7	6.3	JR0-5070	0	0	A	P2	Diode	Diode No. 1	{6ZY5	6.3	JR0-3070	0	9	A	P7	Rect.	Plate No. 2
{6T7	6.3	JR0-4070	0	0	A	P2	Diode	Diode No. 2	7A4	6.3	JR6-2070	22	...	D	P3	1640	
{6T8	6.3	EV8-9076	11	...	B	P3	760	Triode Sect.	7A5	6.3	JR6-2370	25	...	D	P3	3800	
{6T8	6.3	EV0-6071	0	67	A	P2	Diode	Diode No. 1	{7A6	6.3	JR0-6075	0	62	A	P2	Diode	Diode No. 1
{6T8	6.3	EV0-2037	0	67	A	P2	Diode	Diode No. 2	{7A6	6.3	JR0-3025	0	62	A	P2	Diode	Diode No. 2
{6T8	6.3	EV0-1078	0	67	A	P2	Diode	Diode No. 3	7A7	6.3	JR6-2374	27	...	B	P3	1100	
{6U4	6.3	JX0-5030	0	56	A	P3	Rect.	Eye Open	{7A8	6.3	JR6-2574	24	...	B	P3	630	Ampl. Sect.
{6U5	6.3	JR5-4030	0	100	A	P3	Eye	Eye Closed	{7A8	6.3	JR4-3576	26	...	B	P3	315	Osc. Sect.
{6U5	6.3	JR5-4230	0	100	A	P3	Eye	Eye Closed	7AB7	6.3	HS5-3140	10	...	B	P3	1140	
{6U6	6.3	JR5-3470	30	...	D	P3	3900	Cap = G	7AD7	6.3	JR6-2374	0	...	D	P3	3900	
{6U7	6.3	JR0-3475	21	...	B	P3	1000	Pent. Sect.	{7AF7	6.3	JR5-6070	21	...	C	P3	1640	Triode No. 1
{6U8	6.3	EV2-6370	15	...	B	P3	1420	Triode Sect.	{7AF7	6.3	JR4-3020	21	...	C	P3	1640	Triode No. 2
{6U8	6.3	EV9-1080	16	...	C	P3	2840	Triode Sect.	7AG7	6.3	JR6-2374	0	...	C	P3	1900	
{6V3	6.3	EV0-0020	0	51	A	#	Rect.	Cap = P	7AH7	6.3	JR6-2374	0	...	C	P3	2100	
{6V4	#	Hold Down	P8	And Press	P7				7AJ7	6.3	JR6-2374	0	...	D	P3	1430	
{6V4	6.3	EV0-7031	0	0	A	P7	Rect.	Plate No. 1	7AK7	6.3	JR6-2374	0	...	C	P3	2500	
{6V5	6.3	EV0-1037	0	0	A	P7	Rect.	Plate No. 2	7B4	6.3	JR6-2070	10	...	D	P3	940	
{6V6	6.3	JX5-3400	31	...	C	P3	2600		7B5	6.3	JR6-2370	34	...	B	P3	1000	
{6V6	6.3	JR5-3472	21	...	C	P3	2320		{7B6	6.3	JR3-2070	11	...	D	P3	700	Triode Sect.
{6V7	6.3	JR0-3070	39	...	B	P3	610	Triode Sect. Cap = G	{7B6	6.3	JR0-6072	0	0	A	P2	Diode	Diode No. 1
{6V7	6.3	JR0-5070	0	0	A	P2	Diode	Diode No. 1	{7B6	6.3	JR0-5072	0	0	A	P2	Diode	Diode No. 2
{6V7	6.3	JR0-4070	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	File Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations	Tube Type	File Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
{7B8	6.3	JR6-2574	18	...	B	P3	950	Pent. Sect.	10	7.5	JR3-2000	39	...	B	P3	790	
{7B8	6.3	JR4-3576	18	...	B	P3	410	Osc. Sect.	10Y	7.5	JR3-2000	12	...	B	P3	950	
7C4	6.3	JR0-4070	0	51	A	P2	Diode		12A	5.0	JR3-2000	44	...	B	P3	1040	
7C5	6.3	JR6-2370	30	...	C	P3	1900		12A4	12.6	EV2-9010	25	...	D	P3	4900	
{7C6	6.3	JR3-2070	10	...	B	P3	380	Triode Sect.	12A5	12.6	JR4-2350	51	...	B	P3	1130	
{7C6	6.3	JR0-6072	0	0	A	P2	Diode	Diode No. 1	12A6	12.6	JR5-3472	12	...	C	P3	1900	
7C7	6.3	JR0-5072	0	0	A	P2	Diode	Diode No. 2	{12A7	12.6	JR0-2365	48	...	B	P3	610	Pent. Sect. Cap=G
7C7	6.3	JR6-2374	22	...	B	P3	820		{12A7	12.6	JR0-5042	0	35	A	P7	Rect.	Rect. Sect.
7E5	6.3	JS1-3040	15	...	C	P3	1900		12A8	12.6	JR0-3475	22	...	B	P3	630	Pent. Sect. Cap=G
{7E6	6.3	JR3-2070	12	...	B	P3	1380	Triode Sect.	12A8	12.6	JR5-6473	37	...	B	P3	190	Osc. Sect.
{7E6	6.3	JR0-6072	0	0	A	P2	Diode	Diode No. 1	{12AH7	12.6	JX5-6043	20	...	B	P3	1260	Triode No. 1
7E6	6.3	JR0-6072	0	0	A	P2	Diode	Diode No. 2	{12AH7	12.6	JX2-3016	20	...	B	P3	1260	Triode No. 2
{7E7	6.3	JR6-2570	22	...	B	P3	820	Pent. Sect.	{12AL5	12.6	JR0-7030	0	67	A	P2	Diode	Diode No. 1
{7E7	6.3	JR0-4072	0	0	A	P2	Diode	Diode No. 2	{12AL5	12.6	JR0-2050	0	67	A	P2	Diode	Diode No. 2
{7E7	6.3	JR0-3072	0	0	A	P2	Diode		{12AT6	12.6	JR3-7020	18	...	B	P3	750	Triode Sect.
{7F7	6.3	JR5-6073	0	...	B	P3	820	Triode No. 1	{12AT6	12.6	JR3-6020	0	0	A	P2	Diode	Diode No. 1
{7F7	6.3	JR4-3026	0	...	B	P3	820	Triode No. 2	{12AT6	12.6	JR3-5020	0	0	A	P2	Diode	Diode No. 2
{7F8	6.3	HS8-6050	10	...	C	P3	3150	Triode No. 1	{12AT7	12.6	EV7-6080	14	...	D	P3	2500	Triode No. 1
{7F8	6.3	HS1-3040	10	...	C	P3	3150	Triode No. 2	{12AT7	12.6	EV2-1030	14	...	D	P3	2500	Triode No. 2
7G7	6.3	JR6-2374	18	...	B	P3	1260		{12AW6	12.6	EV3-5672	10	...	D	P3	2050	
{7G8	6.3	JR5-7362	10	...	B	P3	1320	Tetrode No. 1	{12AU7	12.6	EV7-6080	24	...	B	P3	1400	Triode No. 1
{7G8	6.3	JR4-2367	10	...	B	P3	1320	Tetrode No. 2	{12AU7	12.6	EV2-1030	24	...	B	P3	1400	Triode No. 2
7H7	6.3	JR6-2374	10	...	D	P3	2400		{12AV6	12.6	JR3-7025	12	...	B	P3	790	Triode Sect.
{7J7	6.3	JR6-2574	18	...	B	P3	500	Heptode Sect.	{12AV6	12.6	JR3-6025	0	0	A	P2	Diode	Diode No. 1
{7J7	6.3	JR4-3576	18	...	B	P3	630	Triode Sect.	{12AV6	12.6	JR3-5026	0	0	A	P2	Diode	Diode No. 2
{7K7	6.3	JR4-3020	10	...	D	P3	1000	Triode Sect.	{12AV7	12.6	EV7-6082	18	...	D	P3	2580	Triode No. 1
{7K7	6.3	JR0-5070	0	0	A	P2	Diode	Diode No. 1	{12AV7	12.6	EV2-1037	18	...	D	P3	2580	Triode No. 2
{7K7	6.3	JR0-6070	0	0	A	P2	Diode	Diode No. 2	{12AW6	12.6	JR3-5627	10	...	D	P3	2500	
7L7	6.3	JR6-2374	12	...	B	P3	1260		12AX4	12.6	JX0-5030	0	46	A	P7	Rect.	
{7N7	6.3	JR5-6073	29	...	B	P3	1260	Triode No. 1	{12AX7	12.6	EV7-6080	8	...	D	P3	950	Triode No. 1
{7N7	6.3	JR4-3026	29	...	B	P3	1260	Triode No. 2	{12AX7	12.6	EV2-1030	8	...	D	P3	950	Triode No. 2
{7O7	6.3	JR6-2374	21	...	B	P3	500	Ampl. Sect.	{12AY7	12.6	EV7-6080	15	...	D	P3	1100	Triode No. 1
{7O7	6.3	JR4-2376	21	...	B	P3	500	Osc. Sect.	{12AY7	12.6	EV2-1030	15	...	D	P3	1100	Triode No. 2
{7R7	6.3	JR6-2570	10	...	C	P3	1900	Pent. Sect.	{12AZ7	12.6	EV7-6080	14	...	D	P3	2500	Triode No. 1
{7R7	6.3	JR0-4072	0	0	A	P2	Diode	Diode No. 1	{12AZ7	12.6	EV2-1030	14	...	D	P3	2500	Triode No. 2
{7R7	6.3	JR0-3072	0	0	A	P2	Diode	Diode No. 2	12B4	12.6	EV2-9010	50	...	D	P3	4100	
{7S7	6.3	JR6-2574	18	...	B	P3	950	Heptode Sect.	12B7	12.6	JR6-2374	22	...	B	P3	1200	Pent. Sect. Cap=G
{7S7	6.3	JR4-3576	0	...	B	P3	950	Triode Sect.	12B8	12.6	JR0-3420	22	...	B	P3	1140	Triode Sect.
7T7	6.3	JR6-2374	9	...	C	P3	1900		12B8	12.6	JR7-5060	0	...	B	P3	1260	
7V7	6.3	JR6-2374	6	...	C	P3	2500		12BA6	12.6	JR3-5672	9	...	C	P3	2700	
7W7	6.3	JR6-2375	10	...	D	P3	2200		{12BA7	12.6	EV7-9132	17	...	B	P3	470	Ampl. Sect.
{7X6	6.3	JR0-6075	0	51	A	P7	Rect.	Plate No. 1	{12BA7	12.6	EV2-9137	25	...	B	P3	470	Osc. Sect.
{7X6	6.3	JR0-3025	0	51	A	P7	Rect.	Plate No. 2	12BD6	12.6	JR3-5672	13	...	D	P3	1260	
{7X7	6.3	JR3-2040	10	...	D	P3	630	Triode Sect.	{12BE6	12.6	JR7-5623	11	...	B	P3	900	Ampl. Sect.
{7X7	6.3	JR0-5040	0	67	A	P2	Diode	Diode No. 1	{12BE6	12.6	JR3-5627	0	...	B	P3	1000	Osc. Sect.
{7X7	6.3	JR0-6070	0	67	A	P2	Diode	Diode No. 2	12BF6	12.6	JR3-7020	14	...	B	P3	1200	Triode Sect.
{7Y4	6.3	JR0-6070	0	28	A	P7	Rect.	Plate No. 1	12BF6	12.6	JR3-6020	0	0	A	P2	Diode	Diode No. 1
{7Y4	6.3	JR0-3070	0	28	A	P7	Rect.	Plate No. 2	12BF6	12.6	JR3-5020	0	0	A	P2	Diode	Diode No. 2
{7Z4	6.3	JR0-6070	0	0	A	P7	Rect.	Plate No. 1	12BH7	12.6	EV7-6082	29	...	C	P3	1500	Triode No. 1
{7Z4	6.3	JR0-3070	0	0	A	P7	Rect.	Plate No. 2	12BH7	12.6	EV2-1037	29	...	C	P3	1500	Triode No. 2

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

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

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

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

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

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

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

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

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

Tube Type	File Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations	File Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
374A	3.0	JR4-7602	40	...	D	P3	1700		1.1	DV4-1200	43	0	A	P4	#	#OK over Diodes OK
375A	20.0	JR5-3470	53	...	C	P3	2330		1.1	DV4-1200	38	0	A	P4	#	#OK over Diodes OK
381A	6.3	HR0-5020	0	67	A	P2	Diode		1.1	DV4-1200	46	0	A	P4	#	#OK over Diodes OK
383A	6.3	HR4-6020	25	...	D	P3	1770		1.1	DV4-1200	73	0	A	P4	#	#OK over Diodes OK
385A	6.3	HR5-0328	15	...	D	P3	1480	Cap=P	1.1	DV4-1200	48	0	A	P4	#	#OK over Diodes OK
387A	6.3	HR5-0328	15	...	D	P3	2000	Cap=P	1.1	DV4-1200	59	0	A	P4	#	#OK over Diodes OK
{396A	6.3	KR3-4028	17	...	D	P3	3300	Triode No. 1	1.1	DV4-1200	32	0	A	P4	#	#OK over Diodes OK
{396A	6.3	KR7-6082	17	...	D	P3	3300	Triode No. 2	#	OK Over 500 On 3000 Scale						
398A	6.3	JR4-7603	35	...	D	P3	3350		1.1	DV4-1200	37	0	A	P4	#	#OK over Diodes OK
399A	1.1	DX6-2100	9	...	B	#	440		1.1	DV4-1200	64	0	A	P4	#	#OK over Diodes OK
{400A	1.1	DX6-2185	35	...	B	P3	315	Pent. Sect.	0.6	DV4-2100	0	0	A	P2	†	
{400A	1.1	DX8-2165	35	...	B	P3	315	Osc. Sect.	†	OK Over 275 On 3000 Scale.						
401A	6.3	JR3-5670	12	...	B	#	1260		1.1	DV4-1200	30	0	A	P4	#	
{403A	6.3	JR3-5620	10	...	D	P3	2750		#	OK Over 500 On 3000 Scale						
409A	6.3	JR3-5627	10	...	D	P3	1540		6.3	JR3-7520	#	46	A	P7	Thyr.	
{412A	6.3	EV0-9073	0	49	A	P7	Rect.	Plate No. 1	#	Should Strike Between 70 and 60.						
{412A	6.3	EV0-1037	0	49	A	P7	Rect.	Plate No. 2	1.1	EW5-1200	20	...	B	#	250	Read As Rectifier.
{420	2.5	JR0-3000	0	56	A	P7	Rect.	Plate No. 1	#	Hold Down P2 And Press P3						
{420	2.5	JR0-2000	0	56	A	P7	Rect.	Plate No. 2	1.1	EW0-3000	0	0	A	P2	Diode	Diode Sect.
{420A	12.6	EV6-8073	0	...	B	P3	630	Triode No. 1	1.1	EW0-3000	0	0	A	P2	Diode	Diode Sect.
{420A	12.6	EV3-1026	0	...	B	P3	630	Triode No. 2	1.1	DV4-1200	0	...	B	#	250	Thyr.
{421A	6.3	JX4-5061	63	...	D	P3	5000	Triode No. 1	#	Hold Down P2 And Press P3						
{421A	6.3	JX2-1035	63	...	D	P3	5000	Triode No. 2	1.1	ES3-1000	31	...	D	P3	1000	Diode
{422A	5.0	HR0-6000	0	54	A	P7	Rect.	Plate No. 1	6.3	JR0-0070	0	62	A	P2	Diode	Cap=P
{422A	5.0	HR0-4000	0	54	A	P7	Rect.	Plate No. 2	1.1	ES3-1000	40	...	B	P3	280	Diode
446A	6.3	JR0-0070	0	...	C	P3	1510	Cap=P Ring=G	1.1	DV4-1200	18	...	B	P3	630	Diode
482A	5.0	JR3-2000	79	...	B	P3	950		1.1	DU7-1200	92	...	B	P3	100	Diode
482B	5.0	JR3-2000	57	...	B	P3	950		1.1	CU3-1000	34	...	B	P3	1260	Diode
483	5.0	JR3-2000	79	...	B	P3	850		0.6	DV4-2100	0	0	A	P2	†	
484	3.0	JR3-2040	37	...	B	P3	820		†	OK Over 275 On 3000 Scale						
484A	3.0	JR3-2040	37	...	B	P3	820		6.3	DU7-1265	10	...	D	P3	2780	Diode
485	3.0	JR3-2040	37	...	B	P3	820		6.3	CT0-1040	0	67	A	P2	Diode	Diode
486	3.0	JR3-2040	43	...	B	P3	280		6.3	DU5-1060	21	...	D	P3	3150	Diode
GL502	6.3	JR5-3670	#	51	A	P7	Thyr.		6.3	DU5-1060	8	...	D	P3	2500	Diode
CK502AX	#	Should Strike Between 70 and 60.			B	#	380	Read As Rectifier.	2.5	JR3-2040	#	92	A	P4	Thyr.	Read As Rectifier.
CK503AX	1.1	DV4-1200	30	...	B	#	150		#	Should Strike Between 35 and 25.						
CK505AX	0.6	DV4-1200	0	...	B	#	100		6.3	JR4-7630	0	...	C	P3	2200	Cap=P
CK506AX	1.1	DV4-1200	33	...	B	#	315		6.3	JR4-7630	0	...	C	P3	2200	Cap=P
{CK510AX	0.6	EX1-2300	0	0	A	P4	†	Section No. 1 OK Above 100 On 3000 Scale	7.5	JR3-2000	0	...	B	P3	950	Cap=P
{CK510AX	0.6	EX6-5300	0	0	A	P4	†	Section No. 2 OK Above 100 On 3000 Scale	6.3	JR4-0365	22	...	B	P3	1260	Cap=P
{CK512AX	0.6	DV4-1200	30	0	A	P4	†	OK Above 500 On 3000 Scale	6.3	JR3-0240	33	...	C	P3	2400	Cap=P
									6.3	JR3-0000	0	...	B	P3	1050	Cap=P
									6.3	JR3-0000	0	...	B	P3	900	Cap=P
									6.3	JR3-0000	0	...	B	P3	1400	Cap=P
									10.0	JR3-0240	0	...	C	P3	1900	Cap=P
									12.6	HS8-0430	40	...	C	P3	2500	Left Cap=P
									12.6	HS1-0430	35	...	C	P3	2500	Right Cap=P
									2.5	JR0-0000	0	62	A	P7	Rect.	Cap=P
									6.3	EW3-1520	18	...	D	P3	2080	E Basing
									SD828A★							

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

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

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

Tube Type	File Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations	Tube Type	File Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
1247★	0.6	EV0-0000	0	0	A	P2	Diode	(F Basing Top Lead = P	1655	6.3	JX4-5061	10	...	D	P3	840	Triode No. 1
HY1269	12.6	JR3-0240	0	...	C	P3	2500	Cap = P	1655	6.3	JX3-1065	10	...	D	P3	840	Triode No. 2
1273	6.3	JR6-2374	11	...	B	P3	1450		1657	6.3	JR5-3670	# 90	...	A	P4	Thyr.	Read As Rectifier.
1280	12.6	JR6-2374	11	...	B	P3	1450		1658	2.0	JR3-2000	40	...	B	P3	570	Read As Rectifier.
1282	6.3	JR6-2375	10	...	D	P3	2200		1659	2.5	JR0-2050	11	...	B	P3	470	Triode Sect. Cap = G
1284	12.6	JR6-2374	28	...	D	P3	1250		1659	2.5	JR0-4050	0	0	A	P2	Diode	Diode No. 1
1285	25.0	JR5-3470	36	...	D	P3	3650		1659	2.5	JR0-3050	0	0	A	P2	Diode	Diode No. 2
1291	2.5	BY6-7000	25	...	B	P3	950	Triode No. 1	1662	2.5	DX8-2100	33	...	B	P3	1260	Cap = G
1291	2.5	JR3-2000	25	...	B	P3	950	Triode No. 2	1851	6.3	JR0-3475	10	...	D	P3	3150	
1293	1.5	JR6-2000	30	...	B	P3	820		1852	6.3	JR4-7653	10	...	D	P3	3800	
1294	1.5	JR0-4070	0	0	A	P2	Diode		1853	6.3	JR4-7653	0	...	C	P3	2200	
1299	2.5	JR6-2300	37	...	A	P3	1300		2050	6.3	JR5-3670	# 90	...	A	P4	Thyr.	Read As Rectifier.
SRI553D	6.3	JR2-3050	0	...	D	P3	4700		2051	6.3	JR5-3670	# 90	...	A	P4	Thyr.	Read As Rectifier.
1602	7.5	JR3-2000	39	...	B	P3	790	Cap = G	5516	6.3	JR5-0320	20	...	C	P3	2500	Cap = P Short on 3
1603	6.3	JR0-2354	21	...	B	P3	770		5517	BLST	AP0-8070	0	51	A	P6	Volt. Reg. Cap = P	
1609	1.1	JR3-2400	0	...	B	#	440										
1610	2.5	JR3-2400	22	...	B	P3	1260										
1611	6.3	JR5-3472	29	...	B	P3	1260		5556	4.3	JR3-2000	26	...	B	P3	625	
1612	6.3	JR0-3475	23	...	B	P3	410	Cap Grid Cap = G	5590	6.3	JR3-5670	12	...	B	#	1260	
1612	6.3	JR5-3472	27	...	B	P3	410	Pin Grid									
1613	6.3	JR5-3470	0	...	B	P3	1400		5591	6.3	JR3-5620	10	...	D	P3	2650	
1614	6.3	JR5-3472	23	...	D	P3	3150		5603	6.3	JR4-7603	35	...	D	P3	3350	
1616	2.5	JR0-0000	0	40	A	P6	Rect.	Cap = P	5608A	2.5	JR5-6042	12	...	B	P3	950	Triode No. 1
1619	2.5	JR5-3407	12	...	A	P3	2150	Cap = P	5608A	2.5	JR3-2046	12	...	B	P3	950	Triode No. 2
1620	6.3	JR0-3475	22	...	B	P3	770	Cap = G	5610	6.3	JR6-3020	27	...	C	P3	2500	
1621	6.3	JR5-3470	29	...	B	P3	1250		5618	6.3	DX6-2180	24	...	C	P3	1900	
1622	6.3	JR5-3470	23	...	D	P3	3150		5633★	6.3	EW3-0512	15	...	D	P3	1500	
1623	6.3	JR3-0000	0	...	B	P3	1400	Cap = P									
1624	2.5	JR3-0200	17	...	C	P3	2500	Cap = P	5634★	6.3	EW3-0512	17	...	D	P3	1825	
1625	12.6	JR4-0360	33	...	C	P3	2000	Cap = P									
1626	12.6	JR5-3070	52	...	B	P3	1325	Cap = P	5635★	6.3	DW1-7084	16	...	D	P3	2200	
1629	12.6	JR5-4070	0	100	A	P3	Eye	Eye Open									
1629	12.6	JR5-4370	0	100	A	P3	Eye	Eye Closed	5635★	F Basing	Triode No. 1	16	...	D	P3	2200	
1631	12.6	JR5-3472	23	...	D	P3	3150										
1632	12.6	JR5-3470	10	...	D	#	5650		5637★	6.3	DU2-1050	17	...	D	P3	950	C Basing
1633	25.0	JX4-5060	23	...	D	P3	1650	Triode No. 1	5638★	6.3	EW3-1520	18	...	D	P3	2080	E Basing
1633	25.0	JX2-1030	23	...	D	P3	1650	Triode No. 2	5639★	6.3	DW1-5720	25	...	D	P3	2650	F Basing
1634	12.6	JX4-5062	0	...	B	P3	650	Triode No. 1	5640★	6.3	DW1-5782	54	...	C	P3	1900	F Basing
1634	12.6	JX3-1062	0	...	B	P3	650	Triode No. 2	5641★	6.3	ES0-1030	0	20	A	P7	Rect.	B Basing
1635	6.3	JR4-3070	0	...	B	P3	540	Triode No. 1	5642	1.1	BS0-0000	0	0	A	P7	Rect.	Top Lead = P
1635	6.3	JR5-6070	0	...	B	P3	540	Triode No. 2									
1642	6.3	JR4-5060	38	...	B	P3	875	Triode No. 1	5643★	6.3	DW7-1250	# 56	...	A	P7	Thyr.	F Basing.
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	5644★	6.3	FT4-1020	16	...	D	P3	950	D Basing
1644	12.6	JW3-4512	10	...	B	P3	1350	Pentode No. 2	5645★	6.3	FT4-1020	29	...	D	P3	1380	D Basing
1650	6.3	JR4-3060	22	...	B	P3	1200	Cap = P Short on 3	5646★	6.3	FT4-1020	28	...	B	P3	300	D Basing
1654	1.5	DX0-0000	0	56	A	P4	Rect.		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	Fill Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations	Tube Type	Fill Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
5654	6.3	JR3-5620	10	...	D	P3	2700		{5751	12.6	EV7-6080	8	...	D	P3	950	Triode No. 1
5659	12.6	JR5-3470	22	...	C	P3	1900		{5751	12.6	EV2-1030	8	...	D	P3	950	Triode No. 2
{5660	12.6	JR0-3670	8	...	B	P3	840	Pent. Sect. Cap=G	{5755	12.6	EV6-8073	0	...	B	P3	630	Triode No. 1
5660	12.6	JR0-5670	0	0	A	P2	Diode		{5755	12.6	EV3-1026	0	...	B	P3	630	Triode No. 2
{5660	12.6	JR0-4670	0	0	A	P2	Diode		5763	6.3	EV9-1673	8	...	D	P3	4400	
5661	12.6	JR4-7653	21	...	B	P3	1250		5783	...	AP0-3050	0	72	A	P4	Volt. Ref. Read As Rectifier	
5662	6.3	JR3-7050	#	92	A	P4	Thyr.		5784	6.3	DU7-1265	20	...	B	P3	1130	
	#	Should Strike	Between 35 and 25.		A	P7	Read As Rectifier.		5785	1.1	GX0-1000	0	0	A	P2	Rect.	
5663	6.3	JR3-7520	#	56	A	P7	Thyr.			OK	Over 500	On 3000 Scale					
	#	Should Strike	Between 70 and 60.		A	P7	Read As Rectifier.		5787	BLST	JP0-3010	0	67	A	P4	Volt. Ref. Read As Rectifier	
{5670	6.3	KR7-6080	17	...	D	P3	3300	Triode No. 1	5812	6.3	JR3-5602	34	...	C	P3	2700	
{5670	6.3	KR3-4020	17	...	D	P3	3300	Triode No. 2	{5814	12.6	EV7-6080	24	...	B	P3	1400	Triode No. 1
5672	1.1	DV4-1200	55	...	B	P3	350		{5814	12.6	EV2-1030	24	...	B	P3	1400	Triode No. 2
5676	1.1	ES3-1000	31	...	D	P3	1000		5823	BLST	AP8-3010	100	87	A	P4	Volt. Reg. Read As Rectifier	
5677	1.1	ES3-1000	40	...	B	P3	280		5824	25.0	JR5-3470	52	...	C	P3	2500	
5678	1.1	DV4-1200	18	...	D	P3	630		5825	1.5	JR0-0000	0	0	A	P4	Rect. Cap = P	
{5679	6.3	JR0-6075	0	62	A	P2	Diode	Diode No. 1		OK	Above 250	On 3000 Scale					
{5679	6.3	JR0-3025	0	62	A	P2	Diode	Diode No. 2	{5829	6.3	DV0-6070	0	67	A	P2	Diode	
5686	6.3	EV2-7630	18	...	C	P3	1950		{5829	6.3	DV0-1020	0	67	A	P2	Diode	
{5687	12.6	EV7-9061	23	...	D	P3	4800	Triode No. 1	5840★	6.3	DW1-5740	22	...	C	P3	1575	F Basing
{5687	12.6	EV2-1039	23	...	D	P3	4800	Triode No. 2	{5844	6.3	JR5-2070	26	...	C	P3	1900	Triode No. 1
{5691	6.3	JX4-5061	7	...	D	P3	1000	Triode No. 1	{5844	6.3	JR6-3070	26	...	C	P3	1900	Triode No. 2
{5691	6.3	JX2-1035	7	...	D	P3	1000	Triode No. 2	5879	6.3	EV1-8739	21	...	B	P3	630	
{5692	6.3	JX4-5061	22	...	D	P3	1650	Triode No. 1	5881	6.3	JR5-3472	23	...	D	P3	3150	
{5692	6.3	JX2-1035	22	...	D	P3	1650	Triode No. 2	5897★	6.3	DW1-8050	20	...	D	P3	3660	F Basing
5693	6.3	JR4-7653	20	...	D	P3	1040		5899★	6.3	DW1-5740	21	...	B	P3	1260	F Basing
{5694	6.3	JR4-3020	0	...	D	P3	1500	Triode No. 1	5900★	6.3	DW1-5740	21	...	B	P3	1260	F Basing
{5694	6.3	JR5-6070	0	...	D	P3	1500	Triode No. 2	5902★	6.3	DW1-5720	43	...	C	P3	2650	F Basing
5696	6.3	JR3-6025	#	56	A	P7	Thyr.		{5903★	25.0	DW0-5074	0	48	A	P7	Rect. F Basing	
	#	Should Strike	Between 70 and 60.		A	P7	Read As Rectifier.		5903★	25.0	DW0-1024	0	48	A	P7	Rect. F Basing	
5702	6.3	DU7-1265	10	...	D	P3	2780			Plate No. 2							
5703	6.3	DU5-1060	21	...	D	P3	3150		5904★	25.0	DW1-8050	43	...	B	P3	630	F Basing
5704	6.3	CT0-1040	0	67	A	P2	Diode		5906★	25.0	DW1-5720	6	...	D	P3	3150	F Basing
5718★	6.3	DW1-8057	22	...	D	P3	3460	F Basing	5907★	25.0	DW1-5720	12	...	D	#	1900	F Basing
5719★	6.3	DW1-8057	23	...	B	P3	500	F Basing		#	Hold Down P2 And Press P3						
5725	6.3	JR3-5627	10	...	D	P3	1540		{5915	6.3	JR7-5623	20	...	B	P3	760	Ampl. Sect.
{A5726	6.3	JR7-5623	20	...	B	P3	760	Ampl. Sect.	{5915	6.3	JR3-5627	10	...	B	P3	950	Osc. Sect.
{A5726	6.3	JR3-5627	10	...	B	P3	940	Osc. Sect.	5916★	25.0	DW1-5724	22	...	B	P3	820	F Basing
{5726	6.3	JR0-7030	0	67	A	P2	Diode	Diode No. 1	{5963	12.6	EV1-6080	30	...	B	P3	1260	Triode No. 1
{5726	6.3	JR0-2050	0	67	A	P2	Diode	Diode No. 2	{5963	12.6	EV2-1030	30	...	B	P3	1260	Triode No. 2
5727	6.3	JR3-6025	#	90	A	P4	Thyr.		5977★	6.3	DW1-8053	29	...	D	P3	2840	F Basing
	#	Should Strike	Between 40 and 30.		A	P4	Read As Rectifier.		5987★	6.3	DW1-2050	74	...	B	P3	1160	F Basing
5731	6.3	JR4-3060	20	...	D	P3	1400		{5998	6.3	JX4-5061	63	...	D	P3	5000	Triode No. 1
5742	4.3	JR3-2000	10	...	B	P3	530		{5998	6.3	JX2-1035	63	...	D	P3	5000	Triode No. 2
5744	6.3	CT4-1050	8	...	D	P3	2500		6005	6.3	JR3-5620	21	...	C	P3	2320	
5749	6.3	JR3-5672	9	...	D	P3	2700		6026★	6.3	EV7-8030	21	...	D	P3	3700	F Basing
{5750	6.3	JR7-5623	11	...	B	P3	900	Ampl. Sect.	6055★	25.0	DW1-8050	43	...	B	P3	630	F Basing
{5750	6.3	JR3-5627	0	...	B	P3	1000	Osc. Sect.	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	Tube Type	Fil Volts	Selectors	Bias	Shunt	Scale	Press	Mut. Cond.	Notations
6159	25.0	JR5-0327	30	...	D	P3	4400	Cap = P									
6169★	6.3	DW1-2040	12	...	D	P3	3800	F Basing									
7193	6.3	JR0-0070	13	...	C	P3	1900	{ Upper Cap = G Lower Cap = P									
8005	10.0	JR3-0000	22	...	B	P3	1260	Cap = P									
8016	1.1	JR0-0000	0	67	A	P4	Rect.										
9001	6.3	JR3-5670	21	...	B	P3	700	Cap = P									
9002	6.3	JR6-3070	22	...	B	P3	1200										
9003	6.3	JR3-5620	17	...	B	P3	950										
9004	6.3	JR0-3040	0	67	A	P2	Diode										
9005	4.3	JR0-4030	0	51	A	P2	Diode										
9006	6.3	JR0-3070	0	51	A	P2	Diode										
38142	7.5	JR3-2000	37	...	B	P3	1400										
{	2.5	BY5-6000	10	...	B	P3	700	Triode No. 1									
XXB	2.5	JR4-3000	10	...	B	P3	700	Triode No. 2									
XXD	12.6	JR5-6070	13	...	D	P3	1575	Triode No. 1									
{	12.6	JR4-3020	13	...	D	P3	1575	Triode No. 2									
XXFM	6.3	JR3-2040	10	...	D	P3	630	Triode Sect.									
{	6.3	JR0-5040	0	67	A	P2	Diode	Diode No. 1									
XXFM	6.3	JR0-6070	0	67	A	P2	Diode	Diode No. 2									
{	6.3	JR6-2070	18	...	D	P3	1900										

## (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.					
		R	S	T	U	V	X
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					
		R		T		V	
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					
		R		T			X
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.

TV3-B/U  
CONVERSION CHART  
FREQUENCY VS. METER READING

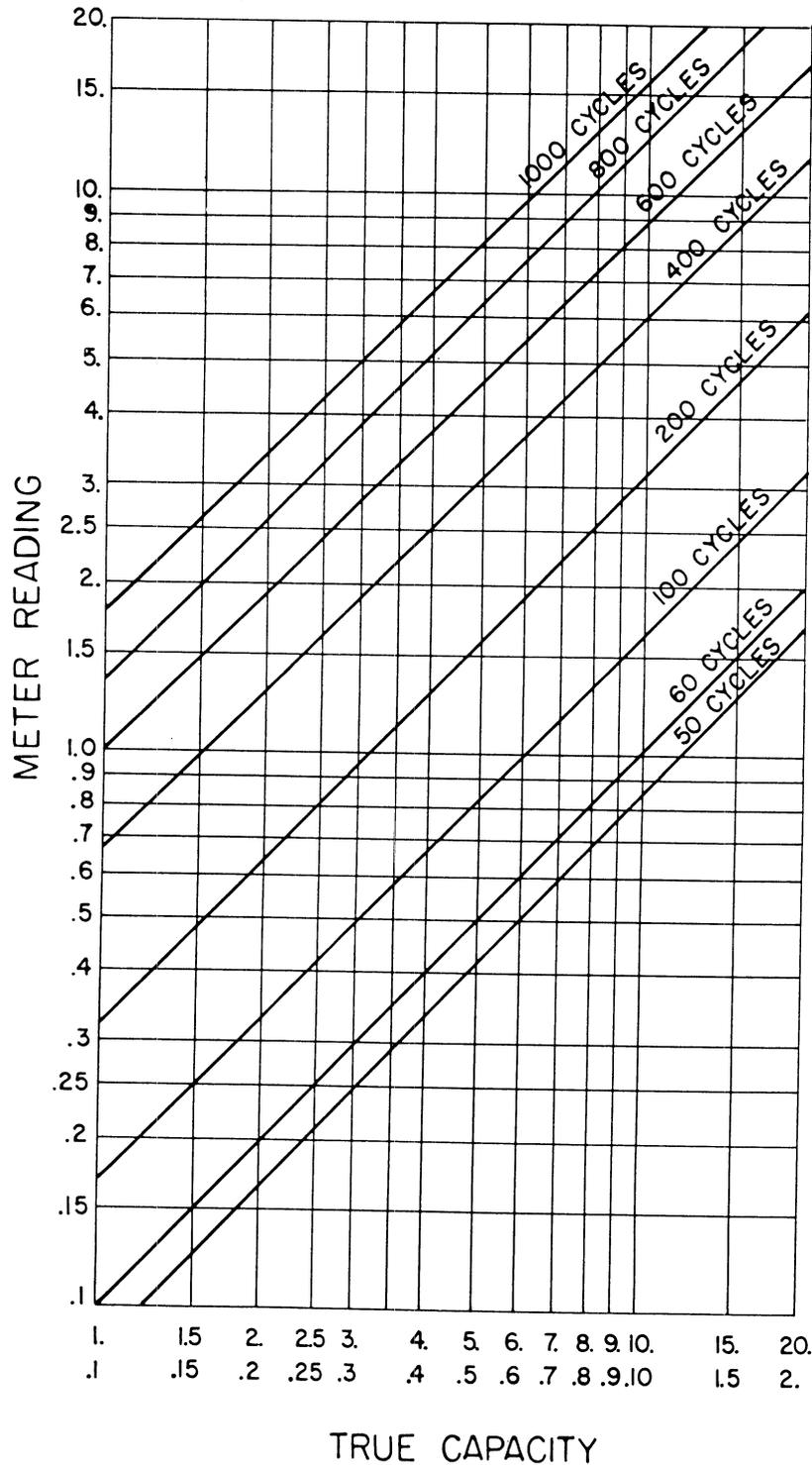


Figure 4-4. Conversion Chart for Capacity Measurements at Frequencies Other Than 60 Cycles

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 readings at 60 cycles.

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

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

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. 8-43)  
(FORMERLY NAVSHIPS (NBS) 31 AND NAVSHIPS (NBS) 304)

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. Additional forms and envelopes may be obtained from nearest BMO.

DATE \_\_\_\_\_

NAME OF PERSON MAKING REPORT \_\_\_\_\_

---

**ELECTRONIC EQUIPMENT FAILURE REPORT (SIG)**  
NAVSHIPS (NBS) 383 (REV. 11-45)

ORGANIZATION PERFORMING MAINTENANCE \_\_\_\_\_

EQUIPMENT INVOLVED

Navy  Army  USMC  JAN  Commercial  Other \_\_\_\_\_ (Specify)

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 \_\_\_\_\_

THIS SIDE FOR TUBES

TUBE TYPE, INCLUDING PREFIX LETTERS \_\_\_\_\_ SERIAL NO. (NOTE 8) \_\_\_\_\_

TUBE MANUFACTURER \_\_\_\_\_ CONTRACT NO. (NOTE 9) \_\_\_\_\_

FAILURE OCCURRED IN:

Storage  Operation

Handling  Other (Specify in remarks)

Installing

NATURE OF FAILURE AND REMARKS (NOTE 8) (CONTINUE ON BACK)

CONCLUSION:

Normal replacement  Shortage  Modification  Failure  Transportation breakage  Other \_\_\_\_\_ (Specify)

\*NOT REQUIRED FOR REPORTS SUBMITTED BY NAVAL ACTIVITIES.

NOTICE—Read notes on cover prior to preparing this form.

\*REPORT No. \_\_\_\_\_ DATE \_\_\_\_\_

NAME AND RANK OF OFFICER ACCOUNTABLE FOR MAINTENANCE \_\_\_\_\_

ITEM WHICH FAILED

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)

## 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-

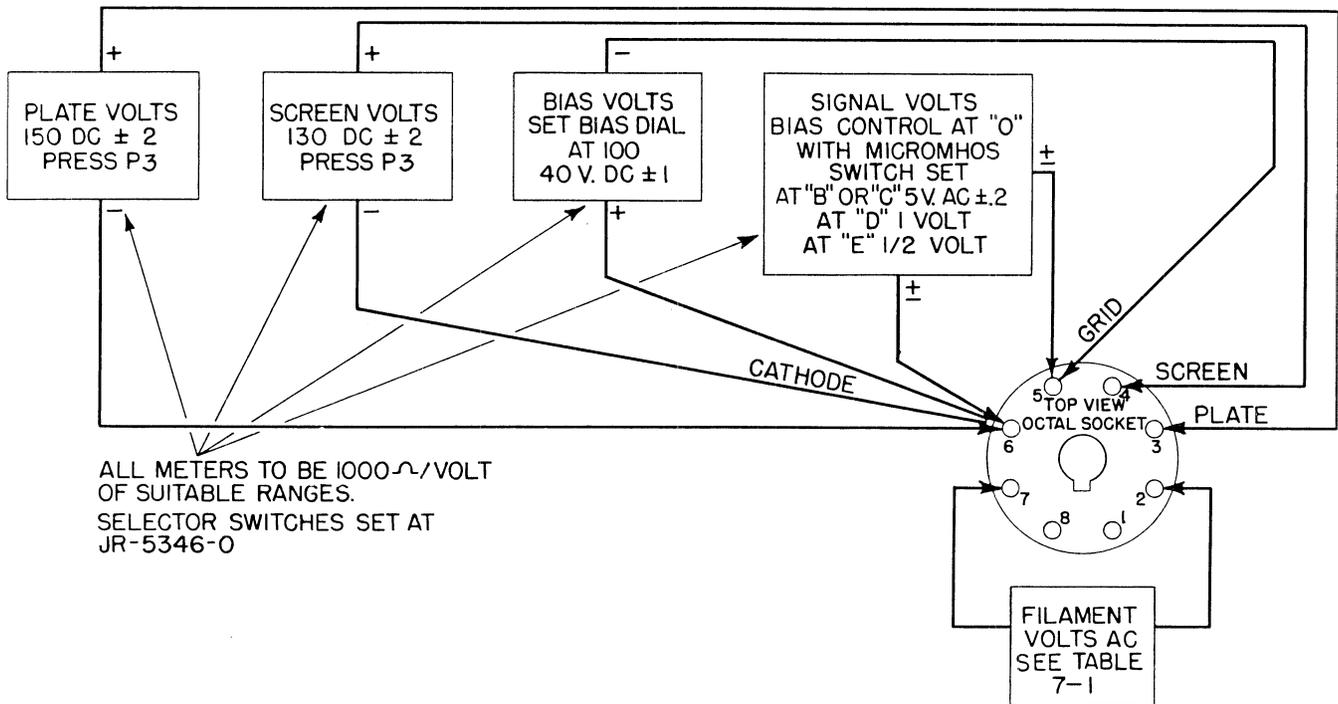


Figure 7-1. Voltage Calibration Check Diagram

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 Multi-meter 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.

ranges should be connected to the test jacks, J-105 and J-106.

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

CAUTION

DISCONNECT POWER CORD BEFORE STARTING RESISTANCE MEASUREMENTS.

b. An ohmmeter or multimeter having suitable

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 MEGOHM	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

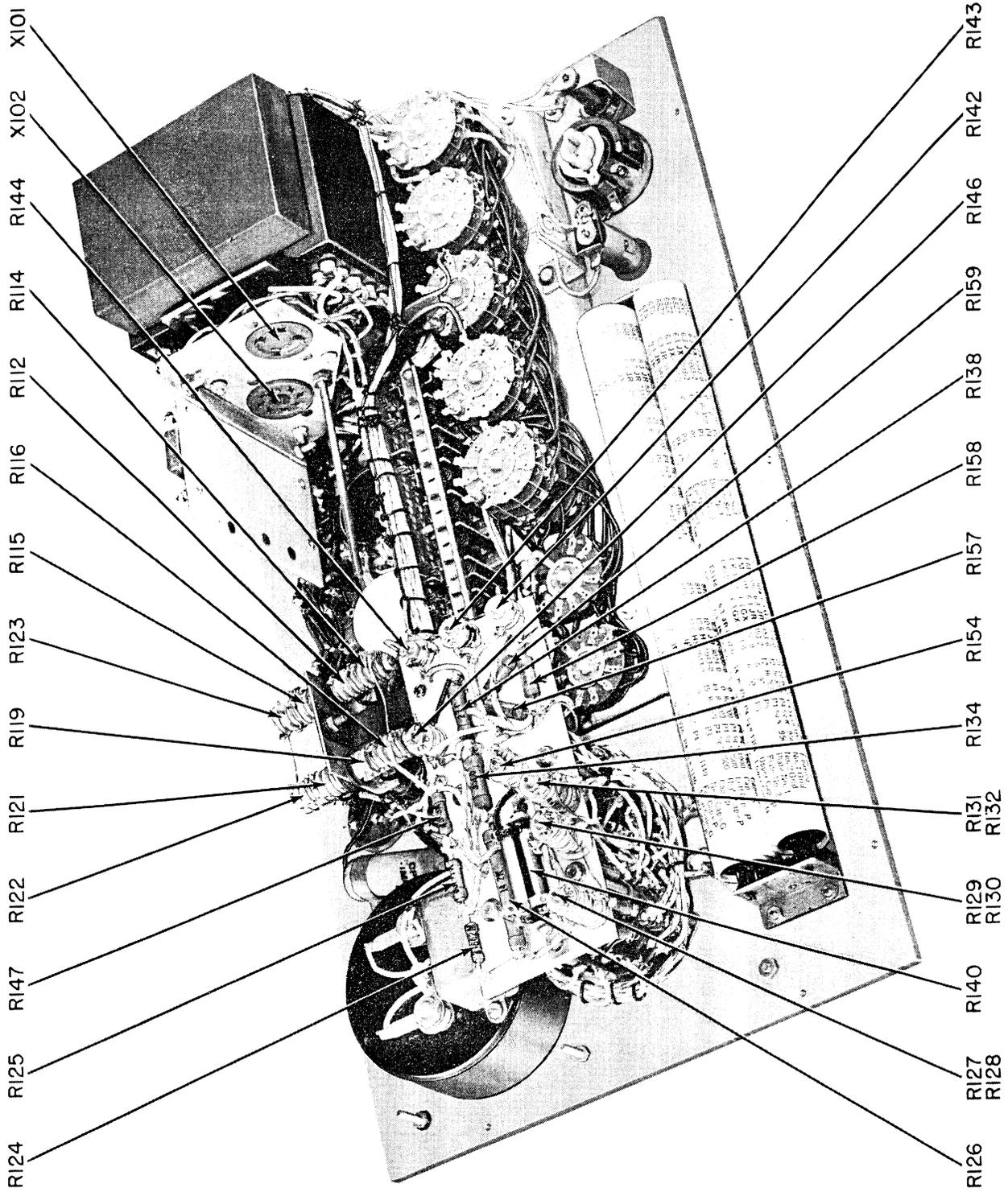


Figure 7-2. Internal View of Tube Tester TV-3B/U Front Left Oblique

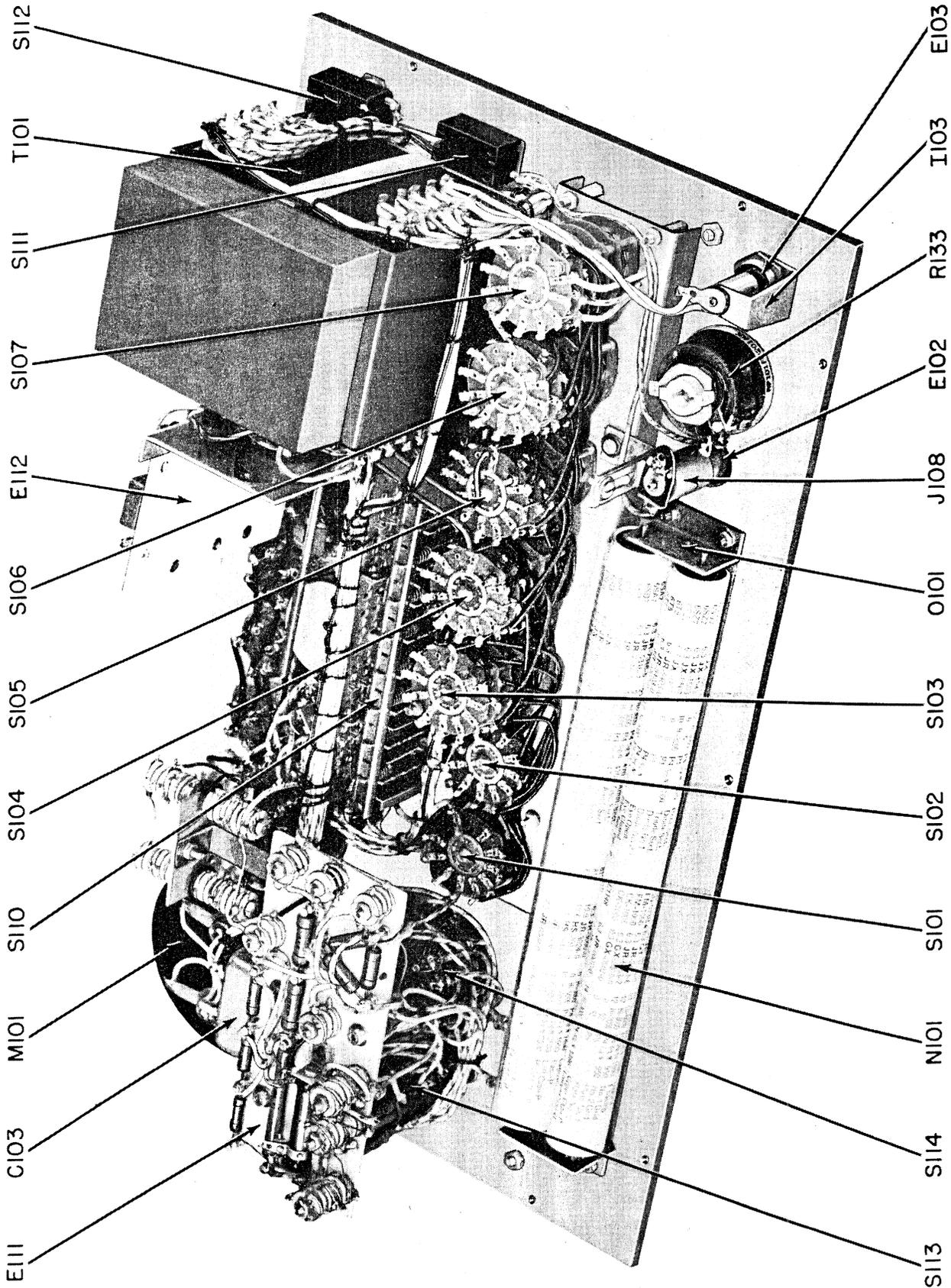


Figure 7-3. Internal View of Tube Tester TV-3B/U Front Right Oblique

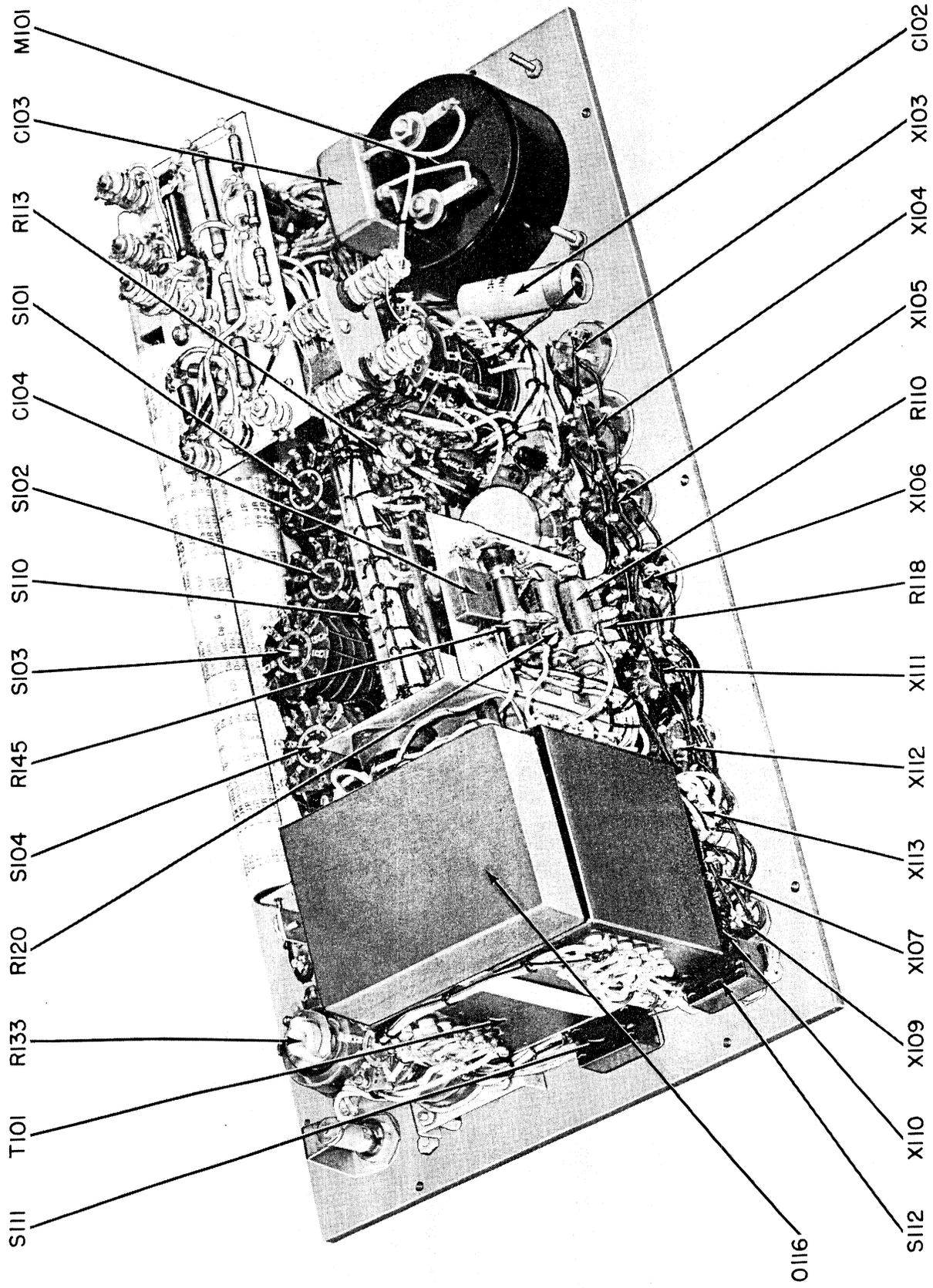


Figure 7-4. Internal View of Tube Tester TV-3B/U Rear Left Oblique



SWITCH S-113 AND ASSOCIATED RESISTORS  
VIEWED FROM REAR

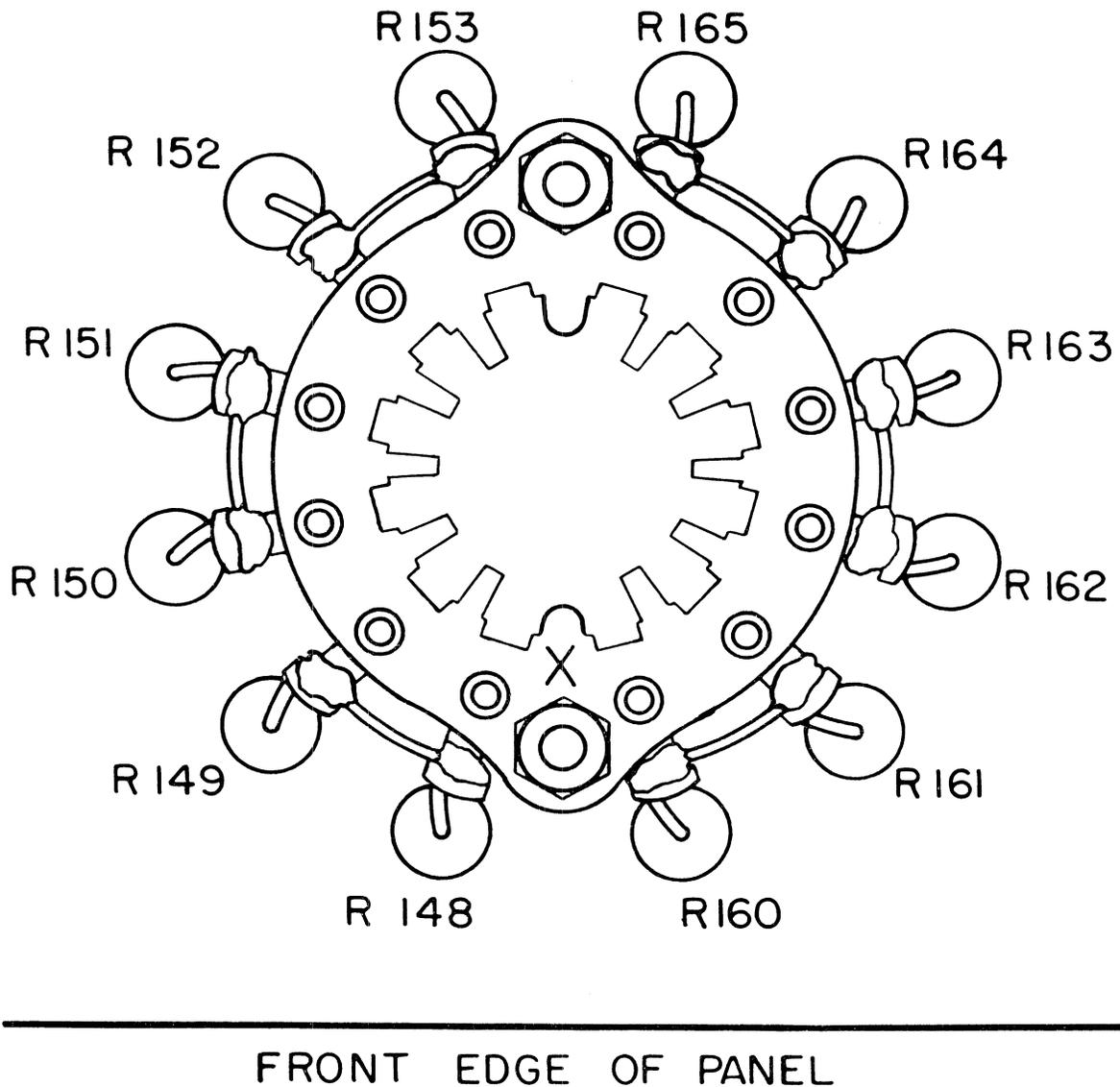
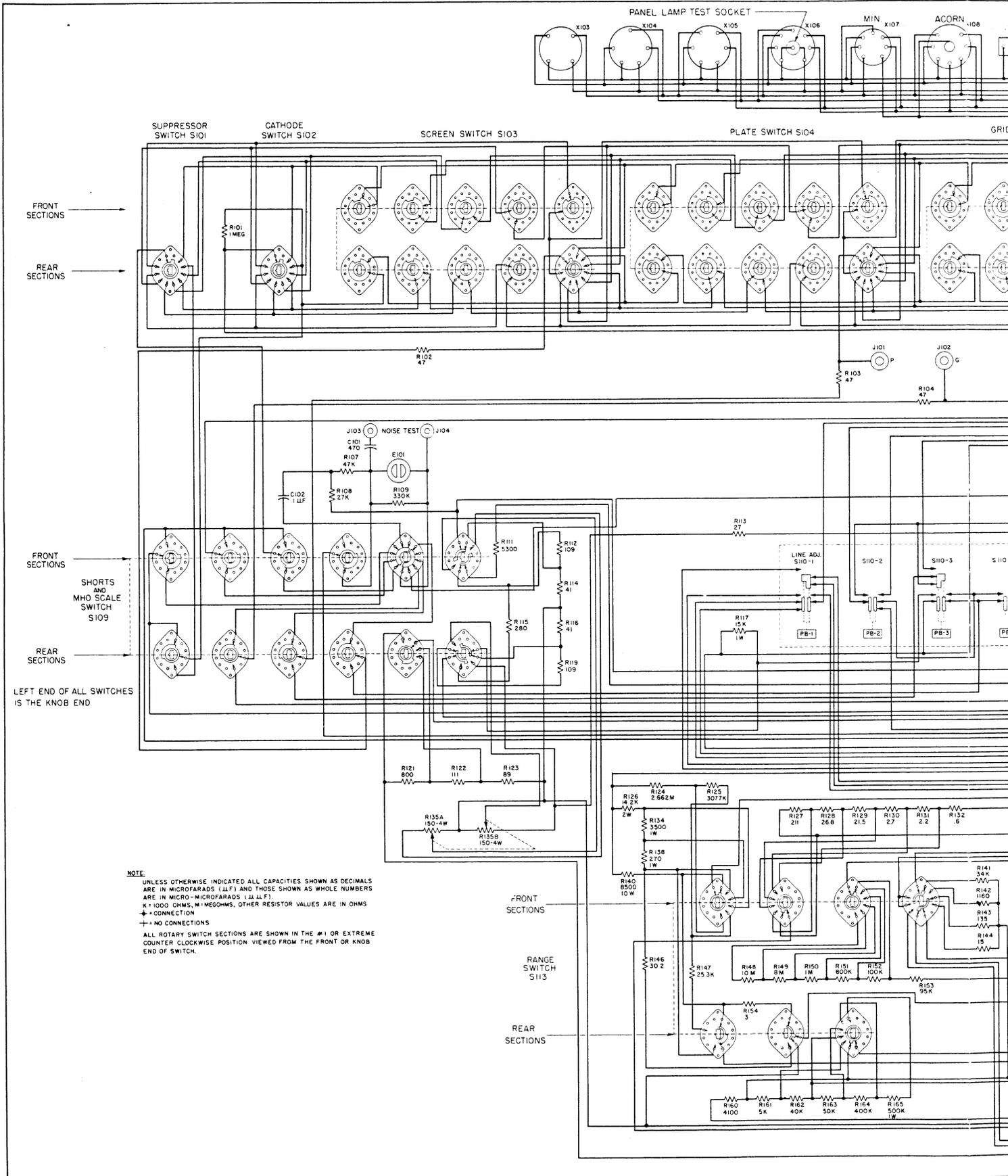


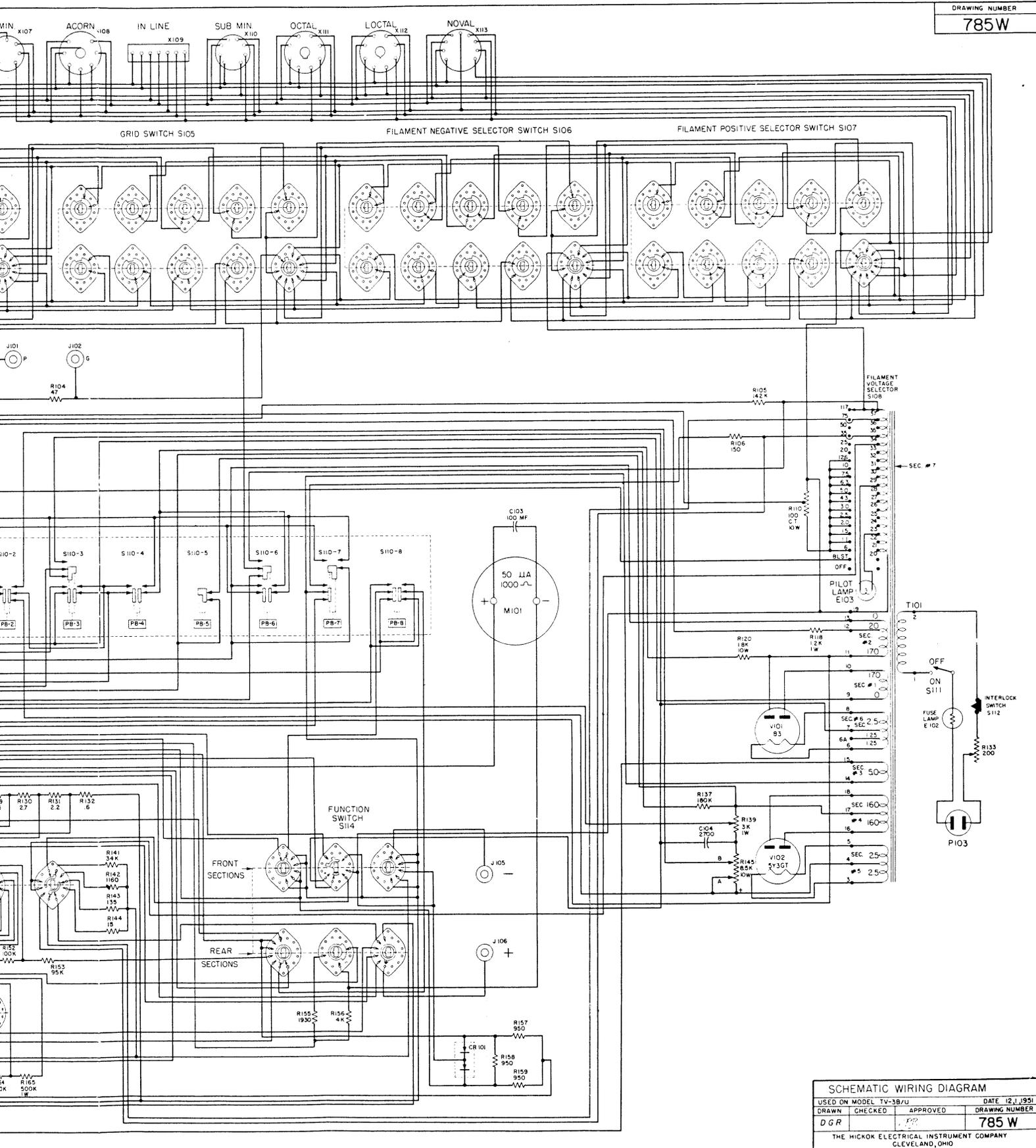
Figure 7-6. Location of Resistors on Range Switch S-113

**NOTES**



**Figure 7-7. Schematic Diagram**

DRAWING NUMBER  
785W



SCHEMATIC WIRING DIAGRAM			
USED ON MODEL	TV-3B/U	DATE	12, 1951
DRAWN	CHECKED	APPROVED	DRAWING NUMBER
DGR			785 W
THE HICKOK ELECTRICAL INSTRUMENT COMPANY CLEVELAND, OHIO			

Schematic Diagram for Tube Tester TV-3B/U

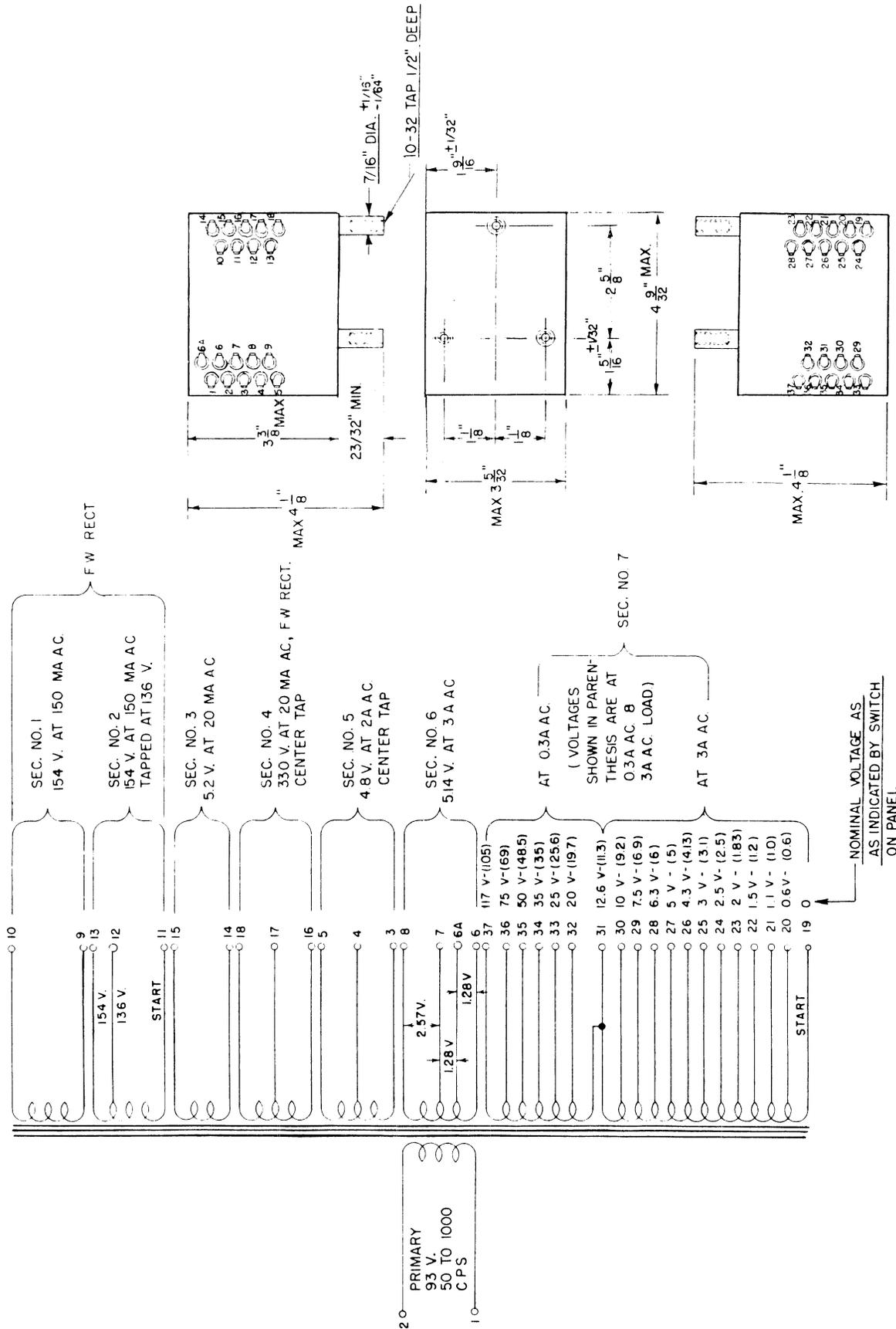


Figure 7-8. Transformer Diagram



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

SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	PARTS						TOTAL QUANTITY
			AWS JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRAC- TOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNA- TIONS INVOLVED	
C-101	CAPACITOR, fixed; mica; 470 mmf p/m 10%; Spec. JAN-C-5.	Isolating capacitor noise test. Pre- vent 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 cur- rent.	CP26A1EF- 104K	N16-C-45777- 4137	3DA100-730	Cornell Dubilier	3105-114	C-102	1
C-103	CAPACITOR, fixed; elec- trolytic; 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 cap- acitor. Prevents oscillation in tube under test.	CM30B272K	N16-C-32145- 5164	3K3027221	Cornell Dubilier	X3095-41	C-104	1
CR-101	RECTIFIER, metallic; cop- per 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 mea- surement 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 in- dicator.		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 pri- mary 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 bay- onet 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 min.ature 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 Tubetester 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, 7 H-104, H-105, H-106, H-107, H-108.	
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 accommodate 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 re-moving 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 nickel 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.							



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

PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS OR 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)	Replacement-Test clip, part of W-102		N17-C-801899-101	3ZK1087-4	Mueller #45 Pee Wee	#3300-3	O-103	1
O-104	NOTE: Clips used on original equipment are not tapped for terminal screw. Standard Mueller #45 clip with terminal screw is suitable replacement part.  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 - MICROM-HOS 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.	N16-K-700314-484	2Z5822-94	Kurz-Kasch S-308-64-B-BB	Part No. 11505-59	O-114	1
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-700314-533	2Z5822-764	Kurz-Kasch S-308-64-BB-40281	Part No. 11505-58	O-115	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 VOLT-AGE switch.						
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 QTY.
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 accommodate #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 accommodate #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, COM- POSITION: 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, COM- POSITION: 47 ohms; p/m 10%; 1/2 watt; insulated; axial wire leads; Spec. JAN- R-11.	Neutralizing Re- sistor 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, COM- POSITION: 142,000 ohms total resistance; p/m 1%, 1/2 watt; temp. character- istic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two ax- ial 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; im- pregnated 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, COM- POSITION: 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, COM- POSITION: 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, COM- POSITION: 330,000 ohms; p/m 10%; 1/2 watt; insula- ted; 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, COM-POSITION: 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, COM-POSITION; 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, COM-POSITION; 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 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 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	3Z6730C7-1	Wilkor Prod. CP 1/2-2A	Part No. X-18525-497	R-125	1

R-126	RESISTOR, FIXED, COM- POSITION: 14,200 ohms total resistance; p/m 1%; 2 watt; temp. characteris- tic F; body dimen. 2" lg. x .293" dia. excluding ter- minals; uninsulated; mois- ture resistant; two axial wire leads; coated with mi- ca filled phenolic enamel.	Part of ohmmeter voltage divider	NI6-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; im- pregnated 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 mills ranges.	NI6-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; im- pregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.		NI6-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; im- pregnated 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 Mills Ranges.	NI6-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; im- pregnated 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 Mills Ranges.	NI6-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 QUANTITY
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 Mills 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 Mills 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.		NI6-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, COM- POSITION; 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	NI6-R-50696-811	3RC20BF184K	Allen-Bradley EB-1841	Part No. X-18414-182	R-137	1
R-138	RESISTOR, FIXED, COM- POSITION; 270 ohms total resistance; p/m 1%; 1 watt; temp. characteristic F; body dimen. 7/8" lg. x .293" diam. excluding terminals; unisolated; moisture resistant, two axial wire leads; coated with mica filled phenolic enamel.	Part of Ohmmeter voltage divider.		NI6-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.		NI6-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.	CONTRAC- TOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNA- TIONS INVOLVED	TOTAL NO. PER QUIP.
R-140	RESISTOR, ADJUSTABLE, WIRE WOUND: 8500 ohms p/m 10%; 10 watts; two ad- justable 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, COM- POSITION: 34,000 ohms total resistance; p/m 1%; 1/2 watt; temp. character- istic 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; im- pregnated 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. ex- cluding terminals; impreg- nated and coated with fungi- cidal 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

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; im- pregnated and coated with fungicidal lacquer; resistant to humidity; two radial wire stub terminals 1/8" lg; one axial mtg. hole 5/32" dia.  Same as R-140.	Meter shunt for .02 MFD capacity range.	N16-R-81024- 8169	3Z6001E5-74	Part No. X-186673-306 (15) Dwg. No. 19430-33	R-144	1
R-145	Part of voltage divider used for cablibrating bias and low screen voltage.	Part of Ohmmeter voltage divider.	N16-R-81063- 3858	3Z6003-86	Part No. X-186673-310 (30.2) Dwg. No. 19430-33	R-146	1
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; im- pregnated 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-73120- 7551	3Z6625C3-1	Part No. X-18525-494	R-147	1
R-147	RESISTOR, FIXED, COM- POSITION: 25,300 ohms total resistance; p/m 1%; 1/2 watt; temp. character- istic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two ax- ial wire leads; coated with mica filled phenolic enamel.	Part of D. C. voltmeter multi- plier network.	N16-R-73377- 7580	3Z6810-46	Part No. X-18525-500	R-148	1
R-148	RESISTOR, FIXED, COM- POSITION: 10 megohms to- tal resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" diam. excluding terminals; uninsulated; moisture resistant; two ax- ial wire leads; coated with mica filled phenolic enamel.						

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 QTY PER EQ'Y
R-149	RESISTOR, FIXED, COM- POSITION: 8 megohms total resistance p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding ter- minals; uninsulated; mois- ture resistant; two axial wire leads; coated with mi- ca filled phenolic enamel.	Part of D. C. voltmeter multi- plier network.		N16-R-73371- 8326	3Z6801-143	Wilkor Prod. CPL-2A	Part No. X-18525-499	R-149	1
R-150	RESISTOR, FIXED, COM- POSITION: 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 ax- ial wire leads; coated with mica filled phenolic enamel.	Part of D. C. voltmeter multi- plier 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, COM- POSITION: 800,000 ohms total resistance p/m 1%; 1/2 watt; temp. character- istic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two ax- ial wire leads; coated with mica filled phenolic enamel.	Part of D. C. voltmeter multi- plier 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, COM- POSITION: 100,000 ohms total resistance; p/m 1%; 1/2 watt; temp. character- istic F; body dimen. 11/16" lg. x .230" dia. exclus- ing terminals; uninsulated; moisture resistant; two ax- ial wire leads; coated with mica filled phenolic enamel.	Part of D. C. voltmeter multi- plier 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, COM- POSITION: 95,000 ohms total resistance; p/m 1%; 1/2 watt; temp. character- istic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two ax- ial wire leads; coated with mica filled phenolic enamel.	Part of D. C. voltmeter multi- plier 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, WIRE WOUND: 3 ohms p/m 1%; 1/2 watt; ceramic body, 1/2" diam. x 15/32" lg. excluding terminals; im- pregnated 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	Wilkor Prod. CP 1/2-2A	Part No. X-18673-303 (3) Dwg. No. 19430-33	R-154	1
R-155	RESISTOR, FIXED, COM- POSITION: 1930 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding ter- minals; uninsulated; mois- ture resistant; two axial wire leads; coated with mi- ca filled phenolic enamel.	Used for paral- leling meter multiplier for capacity mea- surements.	N16-R-73009- 4551	3Z6193	Wilkor Prod. CP 1/2-2A	Part No. X-18525-493	R-155	1
R-156	RESISTOR, FIXED, COM- POSITION: 4000 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding ter- minals; uninsulated; mois- ture resistant; two axial wire leads; coated with mi- ca 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, COM- POSITION: 950 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding ter- minals; uninsulated; mois- ture resistant; two axial wire leads; coated with mi- ca filled phenolic enamel.	Part of A. C. voltmeter multi- plier 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.	CONTRAC- TOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNA- TIONS INVOLVED	TOTAL NO. PER EQUIP.
R-158	Same as R-157.	Part of A. C. voltage multi- plier network.							
R-159	Same as R-157.	Part of A. C. voltage multi- plier network.							
R-160	RESISTOR, FIXED, COM- POSITION: 4100 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding ter- minals; uninsulated; mois- ture resistant; two axial wire leads; coated with mi- ca 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, COM- POSITION: 5000 ohms total resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding ter- minals; uninsulated; mois- ture resistant; two axial wire leads; coated with mi- ca 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, COM- POSITION: 40,000 ohms to- tal resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding ter- minals; uninsulated; mois- ture resistant; two axial wire leads; coated with mi- ca 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, COM- POSITION: 50, 000 ohms to- tal resistance; p/m 1%; 1/2 watt; temp. characteristic F; body dimen. 11/16" lg. x .230" dia. excluding ter- minals; uninsulated mois- ture resistant; two axial wire leads; coated with mi- ca 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, COM- POSITION: 400, 000 ohms total resistance; p/m 1%; 1/2 watt; temp. character- istic F; body dimen. 11/16" lg. x .230" dia. excluding terminals; uninsulated; moisture resistant; two ax- ial wire leads; vinyl pro- tective 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, COM- POSITION: 500, 000 ohms total resistance; p/m 1%; 1 watt; temp. characteristic F; body dimen. 7/8" lg. x .293" dia. excluding ter- minals, uninsulated; mois- ture resistant; two axial wire leads; coated with mi- ca 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 sec- tions; 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 suppres- sor 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.	CONTRAC- TOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNA- TIONS INVOLVED	TOTAL NO PER EQUIP.
S-103	SWITCH, ROTARY: 5 sec- tions, 10 positions, 10 poles; brass contacts, silver pla- ted; 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 me- tal shaft with flat for set screw, 1-5/16" lg. x 1/4" diam; non-shortening contacts; solder lug terminals. Spec. 16-S-19 (SHIPS).	Connects Screen voltage to selected socket contact.		N17-566623- 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 sec- tion, 20 positions two poles; brass contacts, silver pla- ted 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-shortening 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.	NI7-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.	NI7-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.	NI7-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.	NI7-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.
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; non-shorting 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; non-shorting contacts. Navy Spec. 16-S-19 (SHIPS.)	Function selector for multimeter circuit.		N17-S-66823-5020	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

V-101	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.	JAN #83	N16-T-60830	2J83	#X20875-28	V-101	1
V-102	TUBE, electron: full wave mercury vapor rectifier; Spec. JAN-1A.	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.		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.		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	QUANTITY FOR EACH ITEM
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. #X-12450-239	W-103	1
W-104	LEAD, test: #18 AWG stranded copper conductor, 65 #86 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

W-108	two contact male appliance plug on one end, other end stripped 3/4" and tinned; u/w Listed for reference only. 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; 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	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; sub-miniature 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; sub-miniature 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

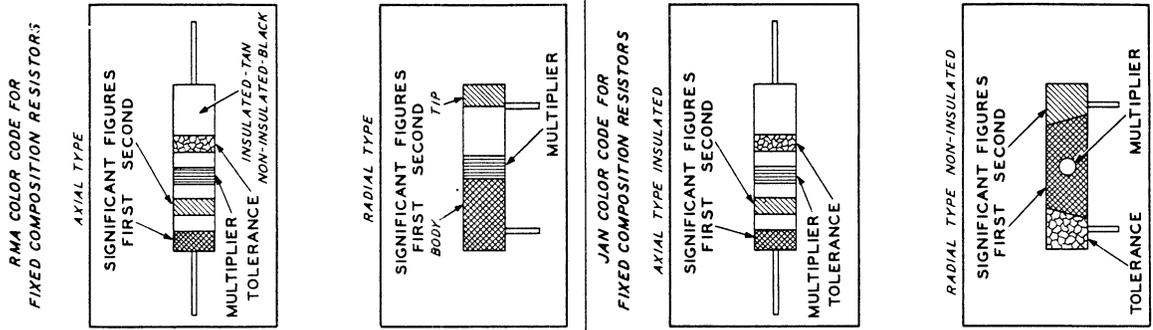
PARTS									
SYMBOL DESIG.	NAME OF PART AND DESCRIPTION	FUNCTION	AWS, JAN OR NAVY TYPE DESIG.	NAVY STOCK NO.	ARMY STOCK NO.	MFR AND MFR'S DESIG.	CONTRAC- TOR'S DWG. AND PART NO.	ALL SYMBOL DESIGNA- TIONS INVOLVED	TOTAL QUANTITY
X-112	SOCKET, ELECTRON TUBE; 8 silver plated phos- phor bronze contacts; 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 phos- phor bronze contacts noval type with center shield; oval shape 1-11/32" lg. x .940" wd. x 11/32" h. ex- cluding terminals; molded mica filled phenolic body; saddle mounting below chas- sis; 3/4" panel hole re- quired; 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



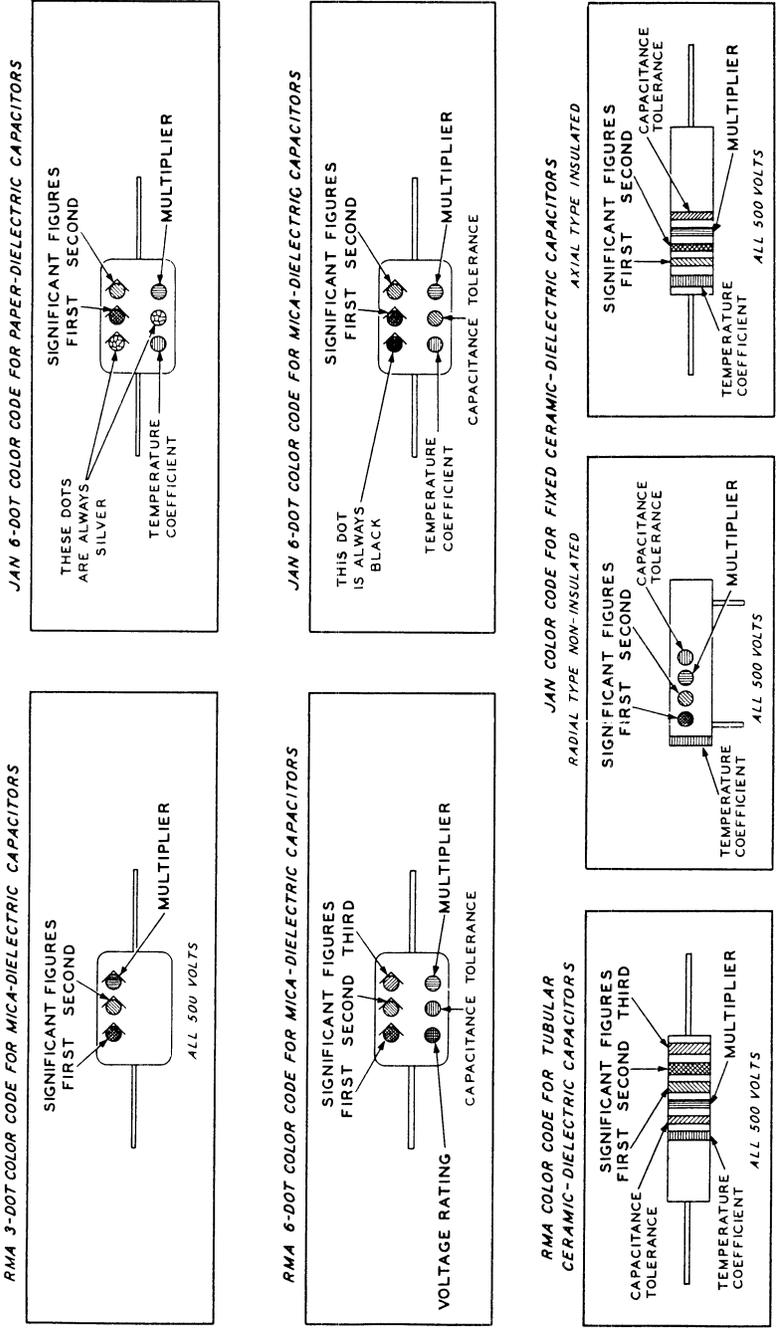
TABLE 8-3 CROSS REFERENCE PARTS LIST

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-117	3Z6750-131	R-165		
2Z5952	E-103	3RC30BF153J	R-118	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		
2Z8675.92	X-101	3Z5993-78	R-154	3Z770-4.165	E-112		
2Z8676.96	X-104	3Z6001E5-74	R-144	3Z770-11.34	E-111		
2Z8677.139	X-105	3Z6002A1-18	R-129	3Z9824-6	S-110		
2Z8677.140	X-108	3Z6002F6-3	R-128	3Z9824-3163	S-112		
2Z8677.174	X-106	3Z6002G7-14	R-113	3Z9825-62.712	S-103		
2Z8678.35	X-112	3Z6003-86	R-146	3Z9825-62.713	S-109		
2Z8678.318	X-111	3Z6004A1-3	R-114	3Z9825-62.714	S-114		
2Z8678.331	X-110	3Z6008J9.2	R-123	3Z9825-62.715	S-113		
2Z8679.25	X-113	3Z6010J9	R-112	3Z9825-62.716	S-108		
2Z9621-472	T-101	3Z6011A1-5	R-122	3Z9825-62.717	S-101		
3BD100-45	C-103	3Z6013E5-5	R-143	3Z9863-17A	S-111		
3DA100-730	C-102	3Z6015-131	R-106	3ZK1087-4	O-103		
3E4017	W-102	3Z6021A1-1	R-127	6Z6806.14	E-102		
3E4017.1	W-101	3Z6027-36	R-138	6Z7560-5	P-103		
3E4017.2	W-103	3Z6027E5-1	R-115	6Z7857-10	H-110		
		3Z6080-72	R-121	6Z8332	J-108		

**RESISTOR COLOR CODES**



**CAPACITOR COLOR CODES**



RMA: RADIO MANUFACTURERS ASSOCIATION  
JAN: JOINT ARMY-NAVY

RESISTORS		CAPACITORS						
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	B	
	100	2	RED	100	100	100	C	
	1000	3	ORANGE	1000	1000	1000	D	
	10000	4	YELLOW	10000	10000		E	
	100000	5	GREEN	100000			F	
	1000000	6	BLUE	1000000			G	
	10000000	7	VIOLET	10000000				
	100000000	8	GRAY	100000000		0.01		
5	0.1	9	WHITE	1000000000		0.1		
10	0.01		GOLD	0.1				
20			SILVER	0.01				
			NO COLOR				2000	
							500	

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. Cheltenham 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



