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NAVSHIPS 93021

TECHNICAL MANUAL

FOR

ELECTRON TUBE

TEST SET TV-10/U

JETRONIC INDUSTRIES, INC.

4312 MAIN ST.

PHILA., PA.

DEPARTMENT OF THE NAVY

BUREAU OF SHIPS

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Contract: NObsr-75157

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LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT
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7-1 to 7-10	Original



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From: Chief, Bureau of Ships
To: All Activities concerned with the Installation,
Operation, and Maintenance of the Subject Equipment
Subj: Technical Manual for Electron Tube Test Set, TV-10/U,
NAVSHIPS 93021

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A. G. MUMMA
Chief of Bureau

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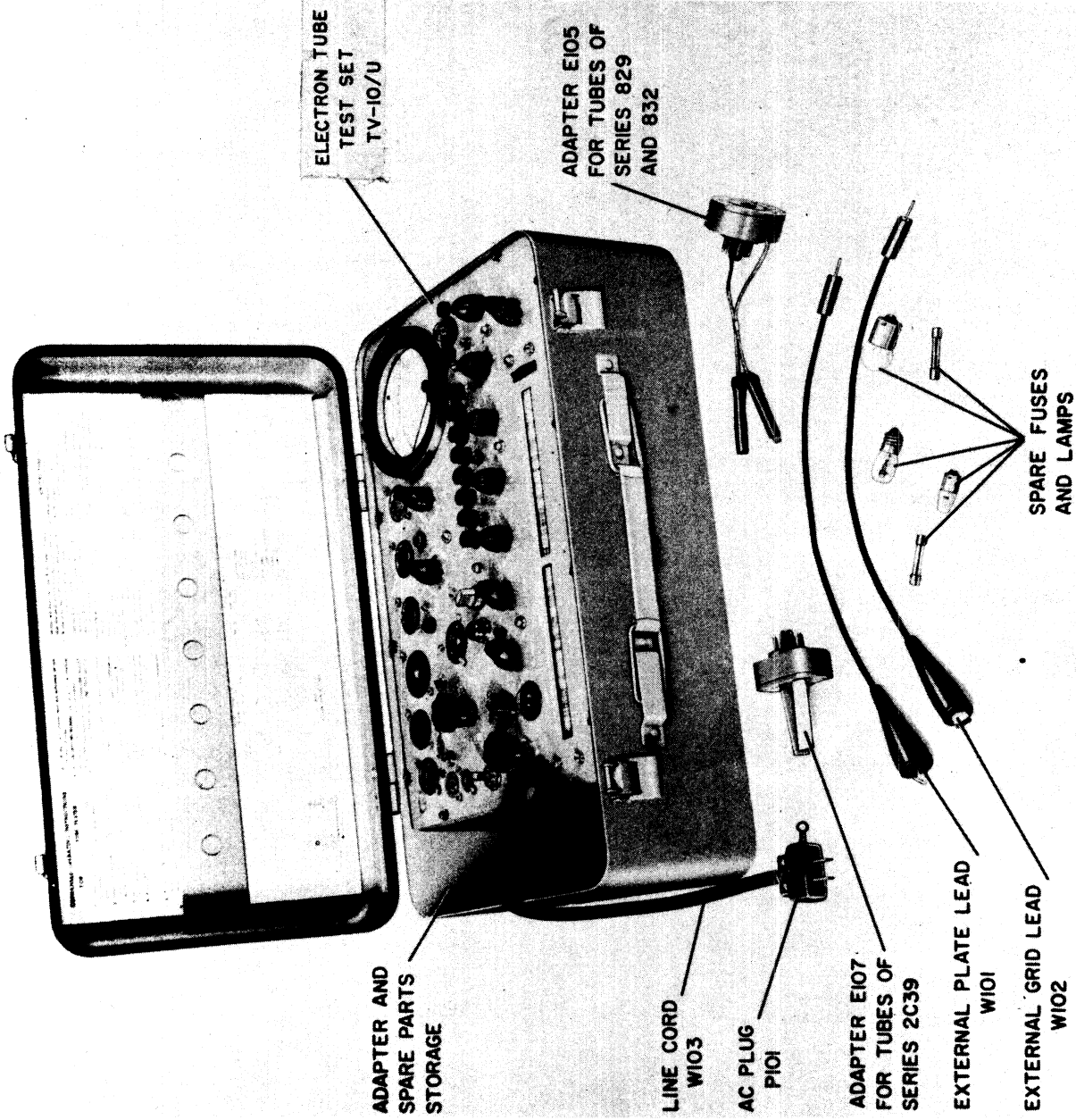


Figure 1-1. Electron Tube Test Set TV-10/U

SECTION 1

GENERAL INFORMATION

1-1. SCOPE.

This technical manual contains information essential to the operation and maintenance of Electron Tube Test Set TV-10/U (figure 1-1).

1-2. PURPOSE AND USE.

Electron Tube Test Set TV-10/U is a portable tube tester of the dynamic mutual conductance type. The TV-10/U is used to test and measure the performance capabilities and rejection limits of receiving-type and low-power transmitting-type electron tubes. The test set operates from a power source delivering 105-125 vac at 50-1,000 cps.

1-3. DESCRIPTION.

a. The tube test set is enclosed in a watertight aluminum carrying case with handle. The removable cover is attached to the case by-slip hinges and is secured by two pull-down catches. The cover is provided with means for securing the accompanying instruction material.

b. Inside the case at the left, two compartments are provided. The front compartment is used to store the a-c line cord when the test set is not in use. The rear compartment includes tow brackets for securing Adapters E105 and E107, and provides storage space for spare parts and for Test Leads W101 and W102. The tube tester panel occupies the remaining available area.

c. Adapters E105 and E107 permit the testing of certain tubes with special bases or contacts in the standard OCTAL socket of the test set. Adapter E105 is used to test tubes of type 829 and 832; Adapter E107 is used for tubes of the 2C39 type. Test leads W101 and W102 are used to connect external plate or grid caps on the tube under test to the panel jacks marked P and G, respectively.

d. All operating controls, indicators, and test sockets are located on the test set panel. Necessary tube test data is contained in a roll chart mounted beneath the panel for protection. By means of a drive gear, the roll chart can be indexed so that the control settings and rejection limits for the specific tube under test are visible through cut-outs in the panel.

e. The illustrations shown in Section 5 are given as an aid in trouble-shooting. The photographic illustrations of Figures 5-1, 5-2, and 5-3 show the actual physical components and locations. In some Test Sets, variations in location may be expected due to changes made in the terminal boards and brackets. In these cases, refer to the reference markings for the components.

1-4. QUICK REFERENCE DATA.

a. NOMENCLATURE — Electron Tube Test Set TV-10/U.

b. CONTRACT NUMBER AND DATE — NObsr 64838, dated 30 June, 1955.

c. CONTRACTOR — Forway Industries, Inc., Woodbury, New Jersey.

d. COGNIZANT NAVAL INSPECTOR — Inspector of Naval Material, Camden, New Jersey.

e. NUMBER OF PACKAGES PER COMPLETE EQUIPMENT — One.

f. TOTAL CUBICAL CONTENTS INCLUDING EQUIPMENT SPARES —

Uncrated: 0.47 cubic feet. (estimated).

Crated: 1.22 cubic feet. (estimated).

g. TOTAL WEIGHT INCLUDING EQUIPMENT SPARES —

Uncrated: 18 pounds. (estimated).

Crated: 27 pounds. (estimated).

h. POWER SOURCE REQUIREMENTS.

(1) VOLTAGE — 103.5 to 126.5 vac (115 vac plus or minus 10%), single phase.

(2) FREQUENCY — 50 to 1,000 cps.

i. POWER CONSUMPTION — 45 watts at 115 volts, 50 cps minimum.

j. ELECTRON TUBE COMPLEMENT —

1 type 83 (plate supply rectifier).

1 type 5Y3WGT/A (screen and bias supply rectifier.)

k. TESTS THAT CAN BE MADE ON TV-10/U —

Shorts test.

Emission test (for rectifier and other diode-type tubes).

Dynamic mutual conductance test (for amplifier-type tubes).

Reserve life test (for tubes with filament or heater).

Gas test (for amplifier-type tubes).

Continuity test (for ballast tubes).

Noise test.

Pilot lamp test.

Tuning eye test (for tuning eye tubes).

l. METER RANGES —

0 to 3,000 micromhos (B).

0 to 6,000 micromhos (C).

0 to 15,000 micromhos (D).

0 to 30,000 micromhos (E).

m. ACCURACY — Plus or minus 10% on all ranges.

1-5. EQUIPMENT SUPPLIED

TABLE 1-1. ELECTRONIC TUBE TEST SET TV-10/U, EQUIPMENT SUPPLIED

QUANTITY PER EQUIPMENT	NOMENCLATURE		OVERALL DIMENSIONS INCHES			VOLUME (CU FT)	WEIGHT (LB)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Electron Tube Test Set	TV-10/U	6-1/6	15-5/8	8-3/8	0.47	18
1	Adapter, 829 and 832 types	E105					
1	Adapter, 2C39 type	E107					
2	Test Leads, external plate and grid connectors	W101, W102					
2	Instruction Books						
1	*PILOT lamp, type 47	E102					
1	*FUSE lamp, type 81	E103					
1	*BIAS FUSE, 1/8 amp, AGC	F102					
1	*Neon SHORTS lamp, type NE-45	E101					
1	*Fuse, 1 amp, type 3AG	F101					

*Equipment spares

1-6. SHIPPING DATA.

TABLE 1-2. TV-10/U, SHIPPING DATA.

BOX NO.	NOMENCLATURE		OVERALL DIMENSIONS INCHES			VOLUME (CU FT)	WEIGHT (LB)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Electron Tube Test Set	TV-10/U				1.22	27

*Equipment crated and ready for shipment. All items listed in Table 1-1 included.

1-7. ELECTRON TUBE COMPLEMENT.

TABLE 1-3. ELECTRONIC TUBE TEST SET TV-10/U, ELECTRONIC TUBE COMPLEMENT

QUANTITY	TUBE TYPE	FUNCTION
1	83	Plate supply rectifier
1	5Y3WGT/A	Screen and bias supply rectifier

SECTION 2 INSTALLATION

2-1. UNPACKING AND HANDLING.

CAUTION

BE CAREFUL WHEN UNPACKING OR HANDLING THE EQUIPMENT. MISHANDLING MAY RENDER THIS PRECISION INSTRUMENT INACCURATE OR INOPERATIVE.

Step 1. — Carefully remove Electron Tube Test Set TV-10/U from its packing containers. Save the packing material for use in reshipment or storage of the equipment.

Step 2. Open the cover of the test set and check the contents against the master packing slip.

Step 3. — Inspect the test set for obvious damage which may have occurred during shipment. Make certain that the E101, E102, E103 panel indicator lamps are not broken and are firmly seated in their respective sockets. Replace any damaged lamps from the spares furnished with the test set.

2-2. INSTALLATION.

No elaborate installation procedures are necessary. Place the test set on a flat bench or firm surface near an a-c outlet supplying 115 vac \pm 10% at 50 to 1,000 cps.

CAUTION

DO NOT USE ANY OTHER POWER SOURCE.

2-3. PRE-OPERATIONAL CHECKS.

Step 1. — Plug the test a-c line cord into the power source outlet. Set the POWER switch to the ON position. The PILOT lamp should light, indicating that the power transformer is energized.

Step 2. — Depress and hold the LINE ADJUST push-button P1. Rotate the LINE ADJUST control knob until the meter needle rests over the LINE TEST mark at center scale. When this adjustment is accomplished, the power transformer receives standard input voltage from the source,

and proper output test voltages are delivered from the secondary windings of the transformer.

Step 3. — Set the left-hand FILAMENT selector at J, the right-hand FILAMENT selector at R, and the GRID, PLATE, SCREEN, CATHODE, and SUPPRESSOR selectors at 1. Rotate the FUNCTION SWITCH through SHORTS positions 1 through 5. The neon SHORTS lamp should glow at positions 2 and 3 to indicate that the shorts test circuit is functioning.

Step 4. — Set the POWER switch to the OFF position. Study Section 4 of this manual thoroughly before attempting to test tubes.

The TV-10/U Test Set was calibrated and checked at the factory prior to initial shipment. The pre-operational checks outlined above do not constitute a complete check of equipment operation; however, if the results obtained in Steps 2 through 4 above are satisfactory, TV-10/U may be presumed ready for operation. For a thorough over-all operational check, refer to Table 3-6, Electron Tube Test Set TV-10/U Performance Checklist.

2-4. PREPARATION FOR RESHIPMENT.

a. Although Electron Tube Test Set TV-10/U is a precision instrument containing electron tubes, it is built ruggedly and can be packaged for shipment or storage with all components in place. Before packaging, make certain that the indicator lamps, electron tubes and tube clamps are firmly seated, and that the adapters, test leads, spare parts and instruction books are secured properly.

b. The exact procedures to be used in repacking for shipment or storage will depend upon the material available and the conditions under which the equipment is to be shipped or stored. If available and adequate, utilize the original packaging material.

c. Whenever possible, place a dehydrating agent such as silica gel inside the equipment. Protect the equipment with a waterproof paper barrier, and seal the seams of the paper barrier with a waterproof sealing compound or tape. Pack the protected equipment in a padded fiberboard box. Mark the box containing the technical manuals "TECHNICAL MANUALS INSIDE".

SECTION 3

OPERATOR'S SECTION

3-1. FUNCTIONAL OPERATION.

1. Electron Tube Test Set TV-10/U is a portable test set used to measure the performance capabilities and rejection limits of receiving-type and low-power transmitting-type electron tubes. The following types of tests can be performed on the TV-10/U Test Set:

- (1) Shorts test.
- (2) Emission test. (For rectifiers, diodes, voltage regulators and thyratrons).
- (3) Dynamic mutual conductance test. (For amplifier-type tubes).
- (4) Reserve life test. (For tubes having a filament or heater).
- (5) Gas test. (For amplifier-type tubes).
- (6) Noise test.
- (7) Pilot lamp test.
- (8) Tuning eye test. (For tuning eye tubes.)
- (9) Ballast continuity test. (For ballast tubes.)

2. Input voltage from a nominal 115-volt, 50-1000-cps power source is adjusted to a standard value for testing as indicated on the test set meter. Proper test voltages derived from internal power supplies are selected by means of pushbutton switches, rotary switches and potentiometers, and are applied to selected elements of the tube under

test by means of rotary selector switches. Proper control settings for each tube type are listed in a roll chart contained in the equipment. Tube condition is indicated either by the neon SHORTS lamp, the test set meter, by the tube itself in the case of tuning eye tubes, by the tube and the meter combined in the case of voltage regulators, or by the tube, the meter and BIAS control settings combined in the case of thyratrons. The measured values or indications compared with minimum standards listed in the roll chart form the basis for acceptance or rejection of the tube.

3-2. PREPARATION FOR USE.

Place the test set on a work bench or firm surface near a power outlet delivering 115 vac \pm 10% at 50 to 1000 cps. Open the cover of the test set, remove and uncoil the a-c line cord, and plug the line cord into the a-c outlet.

CAUTION

DO NOT USE ANY OTHER POWER SOURCE.

3-3. DESCRIPTION OF CONTROLS.

Table 3-1 gives the name, reference designation and function of all controls, indicators and accessories used in normal operation. Refer to figure 3-1 for the locations of all items on the panel of the test set.

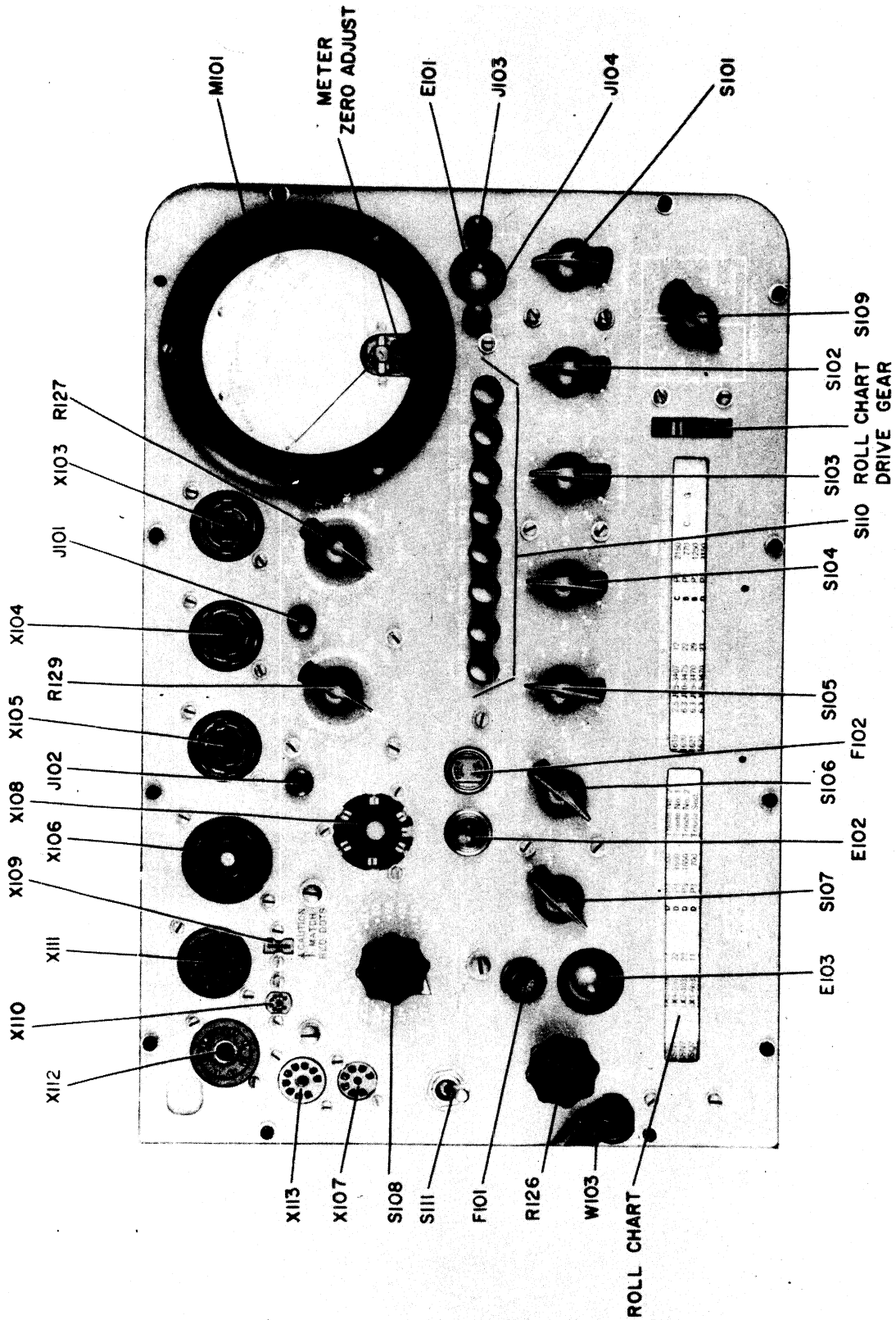


Figure 3-1. Electron Tube Test Set TV-10/U, Control Panel

TABLE 3-1. ELECTRON TUBE TEST SET TV-10/U, OPERATING CONTROLS, INDICATORS, AND ACCESSORIES

NAME	REFERENCE DESIGNATIONS	FUNCTION
A-c line cord		Connects test set to a-c power source.
POWER ON-OFF switch	S111	Controls power input to test set.
PILOT lamp	E102	Indicates when power is applied to test set.
Fuse	F101	Protects test set from overloads.
FUSE lamp	E103	Indicates overloads. Protects test set and tube under test.
LINE ADJUST rheostat	R126	Adjusts input voltage to standard test value.
FILAMENT VOLTAGE switch	S108	Provides 18-step selection of proper filament voltage for tube under test. Has OFF position. Has BLST position to permit testing of ballast tubes.
Selector switches:		Connect proper test voltages to selected socket contacts. Each switch effectively has an off position (A, P, or 0), and positions 1-9 for selection of any terminal on test sockets.
FILAMENT (A through K)	S107	Connects one side of filament voltage.
FILAMENT (P through Z)	S106	Connects one side of filament voltage.
GRID (0 through 9)	S105	Connects grid voltage.
PLATE (0 through 9)	S104	Connects plate voltage.
SCREEN (0 through 9)	S103	Connects screen voltage.
CATHODE (0 through 9)	S102	Connects cathode voltage.
SUPPRESSOR (0 through 9)	S101	Connects suppressor voltage.
BIAS control (0 to 100)	R129	Controls bias voltage applied to tube under test.
SHUNT control (0 to 100)	R127	Controls meter sensitivity for tests involving rectifiers, diodes, voltage regulators and thyratrons. Has effect only when FUNCTION SWITCH is at RANGES A SHUNT position.
FUNCTION SWITCH	S109	Selects SHORTS positions or meter and signal RANGES. SHORTS 1-5: Connects various combinations of elements of the tube under test to the shorts test circuit. RANGES A: Connects SHUNT control into circuit. Permits testing of rectifier, diode, voltage regulator, thyratron and tuning eye tubes. RANGES B-E: Connects meter network for micromho measurements into circuit. Permits testing of amplifier-type tubes.
SHORTS lamp	E101	Indicates inter-electrode shorts in tube under test and continuity of ballast tubes.
BIAS FUSE	F102	Indicates overloads. Protects bias supply and tube under test. Neon lamp indicates when fuse has blown.
Pushbutton switches:	S110	Select proper test voltages for various tube types.
P1 LINE ADJUST	-1	Permits meter to indicate input voltage to test set.
P2 DIODE	-2	Permits testing of low-power diodes such as type 6H6. Provides reduced screen voltage for testing amplifiers such as type 1R5.
P3 MUT. COND. (red)	-3	Permits testing of amplifier-type tubes and tuning eyes.

TABLE 3-1. ELECTRON TUBE TEST SET TV-10/U, OPERATING CONTROLS, INDICATORS, AND ACCESSORIES (CONT.)

NAME	REFERENCE DESIGNATIONS	FUNCTION
P4 GAS NO. 1	-4	Permit testing of amplifier-type tubes for gas content.
P5 GAS NO. 2	-5	
P6 OZ4) RECTIFIERS	-6	Permit testing of cold cathode rectifiers such as type OZ4.
P7 STD)	-7	Permit testing of power rectifiers such as types 5Y3, 6X4, 83, etc.
P8 METER REVERSE	-8	Reverses polarity of meter for testing certain tubes such as type 117N7.
Meter	M101	Indicates standard test voltage and condition of tube under test. Has the following marks and scales: LINE TEST mark: Indicates that input voltage is properly adjusted. Scale A: RECTIFIERS & DIODES mark indicates minimum acceptable emission for rectifiers, diodes, voltage regulators, and thyratrons. Scale B: 0 to 3,000 micromhos.) Scale C: 0 to 6,000 micromhos.) Scale D: 0 to 15,000 micromhos.) Indicate dynamic mutual conductance of amplifier-type tubes. Scale E: 0 to 30,000 micromhos.)
Plate jack P (red)	J101	Provides connection for tubes requiring external plate lead.
Grid jack G (black)	J102	Provides connection for tubes requiring external grid lead.
NOISE jacks (black)	J103, J104	Provide for connecting radio receiver to make noise test.
Test sockets:		Receive tubes and panel lamps to be tested.
4	X103	Test socket for standard 4-pin tubes.
5	X104	Test socket for standard 5-pin tubes.
6	X105	Test socket for standard 6-pin tubes.
7	X106	Test socket for large and small radius 7-pin tubes, and miniature-base pilot lamps.
7 PIN MIN	X107	Test socket for 7-pin miniature tubes.
ACORN	X108	Test socket for acorn tubes.
(Flat SUB MIN (	X109	Test socket for subminiature tubes with inline contacts or leads.
(Round	X110	Test socket for subminiature tubes with round bases.
OCTAL	X111	Test socket for standard octal tubes.
LOKTAL	X112	Test socket for standard loktal tubes.
NOVAL	X113	Test socket for noval (9-pin miniature) tubes.
External plate test lead	W101	Connects top plate caps of tubes to red plate jack P.
External grid test lead	W102	Connects top grid caps of tubes to black grid jack G.
Adapter for 829 and 832-type tubes	E105	Provides means of testing special-base tubes in standard OCTAL socket.

TABLE 3-1. ELECTRON TUBE TEST SET TV-10/U, OPERATING CONTROLS, INDICATORS, AND ACCESSORIES (CONT.)

NAME	REFERENCE DESIGNATIONS	FUNCTION
Adapter for 2C39-type tubes	E107	Provides means of testing special-contact tube in standard OCTAL socket.
Roll chart		Provides tube test control settings and rejection limits.
Roll chart drive gear		Indexes roll chart to selected tube data.

TABLE 3-2. TUBE TYPES AND ASSOCIATED TESTS

TUBE TYPES	TESTS								
	SHORTS (3-5c)	EMISSION (3-5d)	MUTUAL CONDUCTANCE (3-5e)	RESERVE LIFE (3-5f)	GAS (3-5g)	NOISE (3-5h)	PILOT LAMP (3-5i)	TUNING EYE (3-5j)	BALLAST CONTINUITY (3-5k)
Power Rectifier	X	X		X		X			
Detector Diode	X	X		X		X			
Thyratron	X	X		X		X			
Cold Cathode Rectifier	X	X				X			
Voltage Regulator	X	X				X			
Voltage Reference	X	X				X			
Amplifier	X		X	X	X	X			
Ballast									X
Tuning Eye								X	
Pilot Lamp							X		

TABLE 3-3. ELECTRON TUBE TEST SET TV-10/U, SHORTS TEST CHART

SHORTED ELEMENTS	FUNCTION SWITCH SHORTS POSITIONS AT WHICH SHORTS LAMP GLOWS				
	1	2	3	4	5
Filament-Suppressor	---	X	---	---	---
Screen-Suppressor	X	X	X	X	X
Screen-Filament	X	---	X	X	X
Screen-Cathode	X	---	---	X	X
Screen-Grid	---	X	X	X	---
Screen-Plate	---	X	X	---	---
Plate-Suppressor	X	---	---	X	X
Plate-Filament	X	X	---	X	X
Plate-Cathode	X	X	X	X	X
Plate-Grid	---	---	---	X	---
Grid-Suppressor	X	---	---	---	X
Grid-Filament	X	X	---	---	X
Grid-Cathode	X	X	X	---	X
Cathode-Suppressor	---	X	X	---	---
Cathode-Filament	---	---	X	---	---

3-4. TUBE TEST DATA.

a. All information necessary for properly setting the controls to test various tube types is tabulated on the roll chart. Test data for multipurpose tubes (tubes having more than one group of elements housed in the same envelope) are listed by tube sections. The roll chart is divided into left-hand and right-hand sections. The listings are such that the left-hand section is filled before the right-hand section is used. To locate the column containing the desired data, note the marking LAST TUBE and the rectangle etched into the panel below the left-hand section of the roll chart. The number of the last tube listed in the left-hand section is to be noted in this rectangle. Data for tubes having higher type numbers will be found in the right-hand section.

b. Each section of the roll chart is divided into nine columns. Read the headings from left to right as follows:

(1) TUBE: All currently available type numbers which the TV-10/U Test Set is designed to test are listed numerically in this column. The listing starts with type OOA and continues through type 38142. Tubes such as type XXB having type letters only and no numbers are listed at the end of the numerical listings. Below the last entry in the right-hand section, blank lines are provided to list future additions. A star directly following the type number indicates a round subminiature-type tube. A bracket preceding identical type number listings indicates that the data on each line apply to a separate section of a multipurpose tube.

(2) FIL.: Correct filament or heater voltages for the listed tube types are shown in this column. The FILAMENT VOLTAGE switch must be set to the position indicated before a tube is inserted into any of the test sockets.

(3) SELECTORS: Listed in this column are the proper settings for the two FILAMENT selector switches, and the GRID, PLATE, SCREEN, CATHODE, and SUPPRESSOR selector switches. The settings are shown in 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 control. The BIAS potentiometer controls the bias voltage applied to the tube under test.

(5) SHUNT: This column lists the settings for the SHUNT control, which varies the sensitivity of the meter circuit when rectifiers, diodes, voltage regulators, or thyratrons are tested. Setting of this dial is required only when the FUNCTION SWITCH is in the RANGES—A SHUNT position.

(6) SCALE: Proper RANGES settings for the FUNCTION SWITCH and the correct meter scale on which to take the readings are indicated in this column.

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

(8) MINIMUM MUT. COND.: In this column are the MINIMUM mutual conductance values for amplifier tubes and amplifier sections of multipurpose tubes. Tube mutual conductance readings on the meter less than the values indicated in this column generally indicate an unsatisfactory tube. Classes of tubes, or sections of multipurpose tubes which are not amplifiers and therefore have

no mutual conductance ratings are indicated in this column by the following designations:

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

(9) NOTATIONS: Special information pertaining to particular tube types is listed under this heading. When a crosshatch (#) or a double dagger (††) appears in any column, check for remarks both in the NOTATIONS column and on the line directly below the data for the tube under test.

3-5. OPERATING PROCEDURES.

a. PRE-OPERATIONAL CHECKS — Prior to testing tubes, check the basic operation of the TV-10/U Test Set as indicated in paragraph 2-3.

b. SEQUENCE OF OPERATION — The operational steps outlined below apply to both single section tubes and multipurpose tubes (tubes having more than one group of elements housed in the same envelope). Test data for multipurpose types is listed by sections, and the tube sections are joined by a bracket in the TUBE column of the roll chart.

NOTE

TEST EACH SECTION OF MULTIPURPOSE TUBES INDIVIDUALLY.

CAUTION

DO NOT INSERT A TUBE INTO A TEST SOCKET UNTIL ALL CONTROLS HAVE BEEN PROPERLY SET.

Step 1.—Operate the roll chart drive gear until the data for the tube to be tested appears in the window.

Step 2.—Set the FILAMENT VOLTAGE switch to the position indicated in the column headed FIL.

Step 3.—Set the SELECTORS. Setting these seven rotary switches is comparable to dialing a telephone number. In the roll chart column headed SELECTORS are listed the dialing figures consisting of two-letters and five numbers. Turn the knobs of the seven SELECTORS until the letters and numbers indicated by the pointer knobs are the same, if read from left to right, as those indicated in the roll chart.

EXAMPLE — The roll chart indicates JR6-2375 under the heading SELECTORS. Starting at the left, set the knob of the left-hand FILAMENT selector to the letter J. Set the knob of the right-hand FILAMENT selector to the letter R. Set the GRID selector knob to number 5, the PLATE selector knob to number 2, the SCREEN selector knob to number 3, the CATHODE selector knob to number 7, and the SUPPRESSOR selector knob to number 5. The sequence of letters and numbers thus selected is identical to that listed in the roll chart. To avoid accidental shorts, the seven SELECTORS are electrically interconnected so that two different test voltages cannot be applied to a given tube pin at the same time. Step 4.—Rotate the BIAS control knob to the setting indicated in the BIAS Column of the roll chart.

Step 5.—Rotate the SHUNT control knob to the setting indicated in the column headed SHUNT. If no setting is indicated, disregard this operation and proceed with subsequent adjustments.

Step 6.—Set the FUNCTION SWITCH to the SHORTS 1 position.

Step 7.—Insert the tube to be tested in the proper test socket. If the instructions listed in the NOTATIONS column require it, make connections from the panel jacks G or P to the tube top caps with the test leads supplied.

Step 8.—Set the POWER ON-OFF switch to the ON position. The PILOT indicator should light.

NOTE

FOR TUBES OF THE HEATER-CATHODE TYPE ALLOW SUFFICIENT TIME FOR THE CATHODE TO REACH OPERATING TEMPERATURE BEFORE PROCEEDING WITH THE TESTS.

Step 9.—Depress and hold the LINE ADJUST pushbutton P1. The meter needle will move upscale. Rotate the LINE ADJUST control knob until the meter needle rests over the LINE TEST mark at center scale. Standard voltages for the test circuits are thus established.

Step 10.—Refer to Table 3-2, which lists various tube types and the tests that can be made on each. If required, perform first a shorts test on the tube in the manner described in subparagraph *c*. If the tube fails the shorts test, discard it immediately. If the tube passes the shorts test, proceed with additional tests as follows.

c. SHORTS TEST — Tubes can be tested for shorted elements while hot or cold.

(1) Rotate the FUNCTION SWITCH slowly through SHORTS positions 1 through 5 while tapping the tube lightly with a finger or the eraser end of a pencil. Watch the neon SHORTS indicator lamp at each switch position. Intermittent flashing which results from tapping the tube indicates loose elements which might cause noisy or erratic operation. Disregard momentary flashes caused by switching. Tubes with shorted elements will cause the neon to glow steadily.

NOTE

CERTAIN GOOD TUBES WILL NORMALLY GIVE A SHORTS INDICATION AT CERTAIN SWITCH POSITIONS. AN ENTRY SUCH AS "SHORTS ON 1-2-3-4-5" IN THE NOTATIONS COLUMN OF THE ROLL CHART MEANS THAT A SHORTS INDICATION AT THESE SWITCH POSITIONS IS NORMAL AND SHOULD BE OBTAINED.

(2) If the test reveals a short not indicated as normal in the roll chart, discard the tube immediately without further test.

(3) Test each section of a multipurpose tube separately for shorts.

(4) At times it is desirable to determine which elements of a tube or tube section are shorted. Table 3-3 lists the possible combinations of shorted elements. The corresponding FUNCTION SWITCH positions at which the neon SHORTS lamp will glow are denoted by the letter "X".

d. EMISSION TEST — Voltage regulators and reference tubes, thyratrons, rectifiers, diodes, and diode sections of multipurpose tubes are tested for emission because they have no mutual conductance characteristic. After all controls are set according to roll chart instructions and the proper pushbutton is pressed, good tubes of any type named above will cause the meter needle to indicate above the RECTIFIERS & DIODES mark on scale A. Discard tubes having lower emission.

CAUTION

NEVER ATTEMPT TO TEST TUBES FOR EMISSION WITHOUT FIRST CHECKING FOR SHORTED ELEMENTS (Paragraph 3-5*c*).

(1) DETECTOR DIODES — DIODE pushbutton P2 is used for testing low-power detector diodes such as type 6H6. It applies a low voltage which will not injure the delicate cathodes of such tubes.

(2) COLD CATHODE RECTIFIERS — OZ4 pushbutton P6 is used when checking cold cathode rectifiers such as type OZ4. It applies a voltage of sufficient amplitude to ionize the tube and cause conduction.

(3) POWER RECTIFIERS — STD pushbutton P7 is used when testing standard power rectifiers such as type 5Y3. It applies a medium voltage which is best suited to reveal defects in this type tube.

(4) VOLTAGE REGULATORS AND REFERENCE TUBES — Voltage regulators and voltage reference tubes are tested by applying a voltage of sufficient amplitude to ionize the gas and cause conduction. Refer to the roll chart for the proper test button and control settings.

(5) THYRATRONS—Set the controls as indicated by the roll chart and set the BIAS control to determine and insert proper value (100). Insert tube, hold down the push-button indicated under column headed PRESS, and slowly rotate the BIAS control counterclockwise until the tube strikes as indicated by a sharp rise of the meter pointer and by a glow between the elements of the thyratron. Do not rotate the BIAS control past the point at which the tube strikes as this may cause excessive grid current to flow and may permanently damage the tube. A good tube will strike within the limits given on the roll chart. After a tube strikes, its condition is read on the "A" scale of the meter as a rectifier.

(6) RECTIFIERS REQUIRING REVERSE METER POLARITY — METER REVERSE pushbutton P8 is used to reverse polarity of the meter when testing rectifier section of certain tubes such as type 117N7. These types cause the meter to deflect downscale when the STD pushbutton P7 is pressed. To obtain a normal reading it is therefore necessary to press P8 first, then press P7.

CAUTION

NEVER PRESS THE RED MUT. COND. PUSH-BUTTON P3 WHEN TESTING TUBES OF THESE TYPES.

e. MUTUAL CONDUCTANCE TEST — In the case of amplifier-type tubes, an emission test is not sufficient, and a mutual conductance test must be employed. Proceed as follows:

CAUTION

NEVER ATTEMPT TO TEST TUBES FOR MUTUAL CONDUCTANCE WITHOUT FIRST PERFORMING A SHORTS TEST (Paragraph 3-5c).

Step 1.—Check the line voltage adjustment as outlined in paragraph 3-5b, Step 9. If necessary, reset the LINE ADJUST control.

Step 2.—Be certain that all controls are properly set in accordance with the roll chart data.

Step 3.—The red MUT. COND. pushbutton P3 is used for testing amplifier-type tubes. If the tube is a type requiring reduced screen voltage, the roll chart will indicate that DIODE pushbutton P2 is to be pressed before P3 is pressed. Press the proper test buttons. The meter will then indicate the dynamic mutual conductance of the tube directly in micromhos on the meter scale corresponding to the RANGES setting of the FUNCTION SWITCH.

Step 4.—Compare the meter reading with the value given in the MINIMUM MUT. COND. column of the roll chart. Tube mutual conductance readings generally indicate an unsatisfactory tube.

f. RESERVE LIFE TEST — Any tube having a filament or heater can be given a reserve life test. The test basically consists of applying a reduced filament voltage, and comparing the emission or mutual conductance of the tube under this condition with the value obtained when normal filament voltage is applied. If the reduced reading remains within 20% of the normal reading, the tube has a large reserve life or cathode emission power. A tube which passes this test will probably operate satisfactorily under adverse conditions resulting in low filament voltage. To make the test proceed as follows:

Step 1.—Make an emission test or a mutual conductance test in the normal manner. Note the meter reading.

Step 2.—Set the FILAMENT VOLTAGE switch to the next lower voltage and press the proper pushbutton again. Again note the meter reading.

Step 3.—Compare the two meter readings as noted above.

g. GAS TEST — GAS NO. 1 pushbutton P4 and GAS NO. 2 pushbutton P5 are used to test the gas content of amplifier tubes.

Step 1.—With all controls except the BIAS knob in the positions given in the roll chart, press and hold GAS NO. 1 pushbutton P4 and adjust the BIAS control knob until

the meter needle indicates 250 micromhos on the 0 to 3,000 scale. If the meter needle cannot be brought to the 250 micromho mark, set the BIAS control knob to 100 and note the meter reading.

Step 2.—Hold P4 down and press GAS NO. 2 pushbutton P5. If the meter needle moves upscale more than one small division, the tube may be gassy.

b. NOISE TEST — In making noise tests on electron tubes the shorts test circuit is used. Proceed as follows:

Step 1.—Connect NOISE test jacks J103 and J104 to the antenna and ground posts, respectively, of any radio receiver.

Step 2.—Tap the tube under test while rotating the FUNCTION SWITCH through SHORTS positions 1 through 5. Intermittent disturbances too brief to register on the neon SHORTS lamp will be reproduced as static by the loudspeaker of the receiver.

i. PILOT LAMP TEST.

Step 1.—Set the FILAMENT VOLTAGE switch to the proper voltage for the lamp being tested.

Step 2.—Set the FILAMENT selectors to JR.

Step 3.—Insert the lamp in the receptacle at the center of the large 7-pin socket. Hold the lamp so that the center terminal makes firm contact with the receptacle button and so that the metal shell of the lamp contacts the rim of the receptacle. The lamp should light. Discard any lamp that does not light.

j. TUNING EYE TEST — Tuning eye tubes are tested by applying suitable standard test voltages to the control elements and noting the resulting effect on the eye. The MUT. COND. pushbutton P3 is used for these tests. Refer to the roll chart for proper control settings.

k. BALLAST CONTINUITY TEST — Test ballast tubes for continuity as follows:

Step 1.—Set the FILAMENT VOLTAGE switch to the BLST position.

Step 2.—Set the FUNCTION SWITCH to the SHORTS 1 position.

Step 3.—Set all SELECTORS with numbered positions to "O".

Step 4.—Refer to Table 3-4 and locate the type number of the tube to be tested. Set the FILAMENT selectors to the positions noted. The neon SHORTS lamp should light for these positions. Discard defective tubes.

TABLE 3-4. ELECTRON TUBE TEST SET TV-10/U, FILAMENT SELECTOR
SETTING FOR BALLAST CONTINUITY TEST

TUBE TYPE	FILAMENT SELECTOR SETTINGS		TUBE TYPE	FILAMENT SELECTOR SETTINGS	
	LEFT-HAND (A-K)	RIGHT-HAND (P-Z)		LEFT-HAND (A-K)	RIGHT-HAND (P-Z)
1A1-1B1-1C1- 1E1-1F1-1G1- 1J1-1K1-1L1- 1N1-1P1-1Q1- 1R1G-1S1G- 1T1G-1U1G-1V1- 1Y1-1Z1-2	J	R	42A	J	T
2UR224	J	T, X	42A1	H	U
2LR212	H	R, S, U	42A2-42B2	H	S, U
3	J	R	K42B-L42B- M42B-KX42B- LY42B-L42BX- K42C-L42C- M42C	J	T, X
O3G	J	T	KB42D, K42D L42D	J	R, T, X
4-5	J	R	LX42D-L42DX	J	R, S, T
6-133	J	T	K42E-L42E	J	T, X
6-6AA	J	R	L42F	J	X
7-8-9	J	R		D	R
10A-10AG	J	T	42HA-K42HJ- M42H-M42HG	J	S, X
10AB	J	T, X		E	R, T
K17B-M17C- BM17C	J	T, X	KX42C	J	T, X
M17HG-M17H	J	S, X	L42S1	J	R, T, V
	D	R	49A-49AJ- K49AJ	J	T
M23B-K23C- KX23B-KX30C	J	T, X	KX49A	J	T, X
M30H	J	S, X	49A1	H	U
	D	R	49A2-49B2	H	S, U
30A-K30A	J	T	K49B-L49B- M49B-BM49B- K49C-M49C- BM49C-BK49C- K49E-L9E	J	T, X
K30D	J	R, T, X	K49D-BK49D- L49D	J	T, X
33A-33AG	J	T	L49F	J	X
K34B	J	T, X		D	R
36A	J	T	M49H-M49HG	J	S, X
K36B-BK36B- L36B-BM-L36C- KX36C	J	T, X		D	R
KX36A	J	R	KZ49B-KZ49C	J	R, V
36D-L36D	J	R, T, X	K49BJ-L49BJ	J	T, U, X
L36DJ	J	R, T, U, X	L49S2	J	R, T, V
K36H-M36H- M36HG	J	S, X	49AJ-K49AJ	J	T
	D	R	KX49B-LX49B- LX49C	J	T, X
L40S1-L40S2	J	R, T, V			

TABLE 3-4. ELECTRON TUBE TEST SET TV-10/U, FILAMENT SELECTOR
SETTING FOR BALLAST CONTINUITY TEST (CONT.)

TUBE TYPE	FILAMENT SELECTOR SETTINGS		TUBE TYPE	FILAMENT SELECTOR SETTINGS	
	LEFT-HAND (A-K)	RIGHT-HAND (P-Z)		LEFT-HAND (A-K)	RIGHT-HAND (P-Z)
L49DJ	J	R, T, U, X		D	R
L49S3	J	R, T, V	KX87B-LX87B- L90B	J	T, X
50A2	J	R, T	K90F-M90F- K92F-M92F	J	X
50A2MG-50B2	J	R, V		D	R
50X3	J	R	92A	J	T
K52H-M52H	J	S, X	L92B-95K2	J	T, X
	D	R	L99D	J	R, T, X
K54B	J	T, X	100R8	J	T, X
55A-K55A	J	T	120R	J	R
55A1	H	U	120RS-135K1	J	T, X
KX55A	J	R	135K1A	J	T, U, X
55B-K55B-M55B- BM55B-L55BG- LX55B	J	T, X	140L4-140L8- 140R4-140R8	J	R, T
55A2-55B2	H	S, U	140R	J	R
K55C-L55C- KX55C	J	T, X	140L44-140R44	J	R, S, T
K55CP	J	T, V, X	165L4-165R4- 165R8	J	R, T
K55D-L55D	J	R, T, X	165R	J	R
L55E-M55E	J	T, X	165L44-165R44	J	R, S, T
L55F-M55F- BL55F	J	X	185L4-185L8- 185R4-185R8	J	R, T
	D	R	185R	J	R
K55H-M55H- M55HG	J	S, X	185L44-185R44	J	R, S, T
	D	R	200R-250R	J	R
L55S1-L55S2	J	R, T, V, X	250R8-290L4	J	T, X
60R30G	J	R, T	300R4-320R4	J	T, X
64, 23	J	T	340	J	R
67A	J	T	808-1	J	T, U, X
K67B-L67B	J	T, X	E14980-W43357- W4588-3613	J	T, X
L73B-K74B- L74B-CX74C	J	T, X	3334-3334A	J	R, T, X
80A	J	T	8593-8598-8801- 8664	J	T, X
K79B-K80B- M80B-K80C- KX80B-L80B	J	T, X	3ER248	J	R, T, U, X
K80F	J	X	3CR241	J	R, T, X

TABLE 3-4. ELECTRON TUBE TEST SET TV-10/U, FILAMENT SELECTOR
SETTING FOR BALLAST CONTINUITY TEST (CONT.)

TUBE TYPE	FILAMENT SELECTOR SETTINGS		TUBE TYPE	FILAMENT SELECTOR SETTINGS	
	LEFT-HAND (A-K)	RIGHT-HAND (P-Z)		LEFT-HAND (A-K)	RIGHT-HAND (P-Z)
B9M15822	B	T	TBR103D	G	X, Y
	E	V		B	S, U, V
	G	X, Y		G	X, Y
B9M16067	J	R, T, V, W, X	TBR104D	B	S, T, U, V
B9M16275	B	T, U, V, W, X, Y		G	X, Y
B9M16534	J	R, T, V, W, X	397021	B	S, T
B9M17571	H	R, T	397022	E	V, W
	J	U, V, X	397023	J	X
B9M18941	B	S, T	397036	C	V
	E	V	407100	J	R, S, V
	G	X, Y	408100	J	R, S, V
17A470303	J	R, S, V		D	U
	D	U	SW507300	J	R, T, V, W, X
	G	X	471606	B	S, T
17A485459	J	R, S, W		E	V, W
	D	U		J	X
TBR102D	B	S, T, U, V			

1. SUBMINIATURE TUBE BASING

(1) Subminiature tubes of the flat or inline-contact type with pins or leads are tested in the flat SUB. MIN 7-pin socket X109 (see figure 3-2).

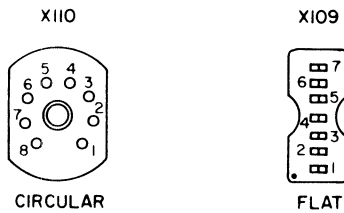
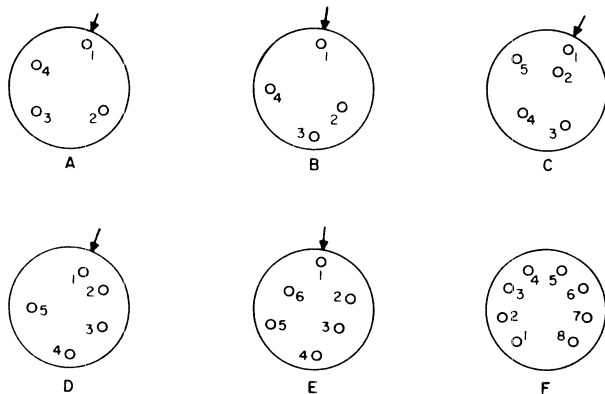


Figure 3-2. Subminiature tube sockets X109 (flat) and X110 (round), top view.

CAUTION

INSERT THE TUBE PINS OR LEADS SO THAT THE DOT ON THE BASE OF THE TUBE IS DIRECTLY IN LINE WITH THE SMALL MOLDED DOT ON THE SOCKET. THAT IS, MATCH THE RED DOTS.

(2) Subminiature tubes of the round type with wire leads or pins are tested in the round SUB MIN 8-pin socket X110 (see figure 3-2). There are several basing arrangements used for these tubes as illustrated in figure 3-3. Examine the tube and identify the basing. Insert the numbered leads or pins of the tube into the corresponding contacts of the socket. Subminiature tubes of the round type are identified in the roll chart by a star following the type number. The applicable basing designation letter listed in the NOTATIONS column refers to the diagram of figure 3-3.



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

Figure 3-3. Basing diagrams for round subminiature tubes, bottom view.

CAUTION

SUBMINIATURE TUBES ARE VERY FRAGILE. BE CAREFUL NOT TO DAMAGE THE LEADS OR ENVELOPE OF THE TUBE.

m. USE OF ADAPTERS — Because of special base design or unusual contact arrangement, tubes of the 829, 832 and 2C39 series cannot be tested directly in the regular test sockets of Electron Tube Test Set TV-10/U. Two adapters are provided to permit these tubes to be tested in the standard OCTAL socket of the test set. When the adapters are not in use, secure them in their mounting brackets in the rear compartment of the test set.

(1) ADAPTER E105 — Adapter E105 permits tubes of series 829 and 832 to be tested in the OCTAL socket of the TV-10/U Test Set. Insert the tube into the adapter and connect the shielded adapter leads to the two external plate caps on the tube. These leads do not have to be connected to a specific cap. Insert the adapter into the OCTAL socket of the TV-10/U Test Set and proceed with the tests.

(2) ADAPTER E109 — Adapter E109 permits tubes of the 2C39 series to be tested in the TV-10/U OCTAL socket. Seat the tube firmly in the adapter, and plug the adapter into the OCTAL socket of the test set.

n. SPECIAL NOTES

(1) A used tube may pass all tests administered, but not function properly in the equipment. This may occur because the line voltage to the equipment is low and the resulting filament voltage applied to the tube is also low. A new tube may function properly under the same conditions because of its initial reserve capacity. If results of this type are experienced, check the line voltage applied to the equipment.

(2) Where the input voltage is normal, check the filament or heater circuits. In equipment where several tube filaments are connected in series, any tube having an abnormally high filament resistance will rob its companion tubes of normal filament voltage. The suspect tube, in this case, will test good but will not operate efficiently.

(3) When 7-pin or 9-pin miniature tubes are to be tested, inspect the base for bent pins before inserting the tube into the test socket. If any pins are bent, insert the tube into an appropriate pin straightener and press the tube firmly in place. The hardened steel die in the pin straightener will align the pins so that the tube may be inserted into the test socket without damage.

o. SUMMARY OF PRECAUTIONS

(1) Do not connect Electron Tube Test Set TV-10/U into a d-c supply line. Be certain that the power source supplies 115 vac $\pm 10\%$ at 50 to 1,000 cps.

(2) Do not insert a tube into any test socket before properly adjusting all controls.

(3) Do not attempt to test tubes without first checking for shorted elements.

(4) Do not press the red MUT. COND. pushbutton P3 when testing rectifiers or other tubes requiring an emission test.

(5) After use, do not fail to turn off the equipment, return all leads and adapters to their proper places, close the cover, and store the test set where it is not likely to be dropped or damaged.

3-6. OPERATOR'S MAINTENANCE

a. ROUTINE PREVENTIVE MAINTENANCE — To keep Electron Tube Test Set TV-10/U operating at

peak efficiency, routine preventive maintenance is required. Table 3-5 lists the procedures to be followed daily, monthly, and semiannually.

b. OPERATING CHECKS AND ADJUSTMENTS — Failure of the TV-10/U Test Set is most likely to be caused by one or more of the following faults:

- (1) Incorrect voltage from power source.
- (2) Defective test leads.
- (3) Worn, broken, or disconnected line cord.
- (4) Defective fuse F101.
- (5) Defective FUSE lamp E103.
- (6) Defective PILOT lamp E102.
- (7) Defective SHORTS lamp E101.
- (8) Defective BIAS FUSE F102.
- (9) Defective plate supply rectifier tube V101.
- (10) Defective screen and bias supply rectifier tube V102.

Table 3-6 is an equipment performance checklist which will help the operator to locate trouble in the equipment. The list gives the item to be checked, the procedure to follow, the normal indications and tolerance of correct operation, and simple corrective measures the operator can take. If the set is completely inoperative or if the recommended corrective measures do not yield results, troubleshooting is necessary (Section 5). If the set is functioning but the voltages are improper, calibration may be necessary (Section 6).

c. REMOVAL OF PLUCK-OUT COMPONENTS

(1) FUSE — To remove fuse F101, unscrew the extractor fuseholder cap by rotating counterclockwise. Remove the 1-ampere, cartridge-type fuse from the cap.

(2) FUSE LAMP — Remove FUSE lamp E103 by pressing down on the lamp and rotating counterclockwise to disengage the prongs of the bayonet base from the socket.

(3) SHORTS LAMP — Neon SHORTS lamp E101 has a screw base. To remove, rotate counterclockwise.

(4) PILOT LAMP — To remove PILOT lamp E102, first unscrew the green jewel by rotating counterclockwise. Press down on the lamp and twist counterclockwise to disengage the bayonet base.

(5) BIAS FUSE — Remove the 1/8-ampere fuse F102 by turning neon lamp 90° counterclockwise and extracting fuse.

(6) ELECTRON TUBES — To remove plate supply rectifier tube V101 or screen and bias supply rectifier tube V102, proceed as follows: Remove the cover of the test set. Remove the 12 mounting screws and washers around the edge of the control panel. While holding the test set in the case, carefully turn the equipment over and place it face down on a work bench or another clean, flat surface. Lift the case away from the test set. Disengage tube clamp by pressing the locking lug, and lift the clamp clear of the threaded support post. Remove the tubes by pulling directly away from the socket. Do not rock or jiggle the tubes more than absolutely necessary.

NOTE

MAKE CERTAIN THAT TUBES ARE PROPERLY SEATED IN THEIR SOCKETS AND TUBE CLAMPS ARE IN PLACE BEFORE REMOUNTING TEST SET IN CASE.

TABLE 3-5. ELECTRON TUBE TEST SET TV-10/U, PREVENTIVE
MAINTENANCE CHECK CHART

STEP	WHAT TO CHECK	DAILY PROCEDURES AND PRECAUTIONS
DAILY		
1	Completeness of equipment.	See that adapters, test leads, instruction books, and spare fuses and lamps are available.
2	External cleanliness.	Clean the control panel and case with a clean, dry, lint-free cloth or a dry brush.
3	Inspect line cord and test leads for worn or broken wires or insulation.	Repair minor insulation damage with friction tape; replace cord or test lead if conductors are exposed. Check test leads for continuity with an ohmmeter.
4	Check seating of indicator lamps and fuseholder caps.	Neon SHORTS lamp and fuseholder caps have screw bases; other indicator lamps have bayonet bases.
5	Inspect controls for binding, positive action, loose knobs.	BIAS and SHUNT control knobs should indicate "O" at full counterclockwise rotation. If they do not, loosen the set screws and reset the knobs. Align other control knobs so that set screw opposes flat on control shaft, then tighten set screw.
6	Check PILOT lamp, line voltage adjustment, and SHORTS lamp for normal operation.	Refer to Table 3-6, Steps 3, 4, 5.
MONTHLY		
7	Internal cleanliness.	Disconnect equipment from power source. Remove TV-10/U from case (see paragraph 3-6c (6) below). a. Clean interior of case and all accessible components with a clean, dry, lint-free cloth or a dry brush. b. Clean dust, sand and dirt from inaccessible places with an air hose or blower. Be careful not to cause damage with the air blast. c. Clean electrical contacts with trichlorethylene, per Specification MIL-T-7003 and wipe dry with a dry cloth. Provide adequate ventilation.
8	Visually inspect internal components.	Look for mechanical damage or looseness, discoloration due to overheating, broken or loose connections, frayed insulation. Inspect test sockets and jacks for broken contacts. See that tubes are properly seated in their sockets and that tube clamps are firmly in place.
9	Overheating of the power transformer or resistors.	Operate the equipment. The power transformer and resistors should not be too hot to touch.
SEMIANNUALLY		
10	Remove and test the electron tubes.	Replace tubes if necessary. Be sure tube clamps are in place before returning equipment to case.
11	Check rotary and pushbutton switches for corrosion, loose contacts and unsatisfactory mechanical action.	Clean contacts with trichlorethylene, per Specification MIL-T-7003. Replace mechanically faulty components.
12	Check all visible terminals and connections for looseness or corrosion.	Use No. 0000 sandpaper to remove corrosion. Tighten or solder loose electrical connections.
13	Check finish for scratches and bare spots.	Clean scarred surface down to bare metal. Use solvent dry cleaning (SD) Federal Specification P-S-661 to soften corrosion and No. 000 sandpaper to complete preparation. Apply authorized regulation paint with a small brush.
14	Check moisture and fungi-proofing coatings for breaks.	If necessary retouch with authorized coating.

TABLE 3-6. ELECTRON TUBE TEST SET TV-10/U, PERFORMANCE CHECK LIST

STEP	ITEM	PROCEDURE	NORMAL INDICATION	CORRECTIVE MEASURES
1	Power source.	Check voltage and frequency.	Source provides 115 vac $\pm 10\%$ at 50 to 1000 cps.	Provide suitable source.
2	Test leads.	Check for continuity with ohmmeter.	Leads are continuous.	Replace test leads.
3	PILOT lamp, fuse, and FUSE lamp.	Insert line cord into socket of a-c source. Set POWER ON-OFF switch to ON position.	PILOT lamp lights.	Check for defective line cord or plug. Check seating and continuity of fuse F101, FUSE lamp E103, PILOT lamp E102. Refer to Section 5 for troubleshooting.
4	Line voltage adjustment.	Press LINE ADJUST pushbutton P1 and rotate LINE ADJUST control until meter needle rests over LINE TEST mark at mid-scale.	Meter needle should adjust to LINE TEST mark.	Refer to Section 5 for troubleshooting.
5	Neon SHORTS lamp.	Set SELECTORS at JR1-1111. Rotate FUNCTION SWITCH through SHORTS positions 1 through 5.	Neon SHORTS lamp lights at positions 2 and 3.	Check seating of SHORTS lamp E101. Replace lamp.
6	Plate voltage.	Set SELECTORS at JS 5-3460. Connect d-c voltmeter to NOVAL test socket terminals 3 (+) and 6 (-). Press MUT. COND. pushbutton P3.	TV-10/U meter needle remains at zero. Test meter indicates 150 ± 2 vdc on 150-volt scale.	Test or replace type 83 plate supply rectifier tube V101. Refer to Section 5 for troubleshooting; Section 6 for calibration.
7	Screen voltage.	Set SELECTORS at JS5-3460. Connect d-c voltmeter to NOVAL test socket terminals, 4 (+) and 6 (-). a. Press pushbutton P3. b. Press P2 and P3.	Test meter indicates: a. 130 ± 2 vdc on 150-volt scale. b. 56 ± 1.5 vdc on 150-volt scale.	Test or replace type 5Y3WGT/A screen and bias supply rectifier tube V102. Refer to Section 5 for troubleshooting; Section 6 for calibration.
8	Bias voltage.	Set SELECTORS at JS5-3460. Connect d-c voltmeter to NOVAL test socket terminals 6 (+) and 5 (-). Set BIAS control knob to: a. 100 b. 75 c. 50 d. 22	Test meter indicates: a. 40 ± 1 vdc on 50-volt scale. b. 25 ± 1.4 vdc on 50-volt scale. c. 13.4 ± 1 vdc on 50-volt scale. d. 3 ± 0.2 vdc on 10-volt scale.	Check seating and continuity of BIAS FUSE F102. Test or replace type 5Y3WGT/A screen and bias supply rectifier V102. Refer to Section 5 for troubleshooting; Section 6 for calibration.
9	Signal voltage.	Set SELECTORS at JS5-3460. Connect a-c voltmeter to NOVAL test socket terminals 5 and 6. Set BIAS control knob to zero. Set FUNCTION SWITCH to: a. RANGES B and C. b. RANGES D. c. RANGES E.	Test meter indicates: a. 5 ± 0.25 vac on 15-volt scale. b. 0.95 ± 0.1 vac on 3-volt scale. c. 0.5 ± 0.03 vac on 3-volt scale.	Refer to Section 5 for troubleshooting; Section 6 for calibration.
10	Filament voltage	Set SELECTORS at JS5-3460. Connect a-c voltmeter to NOVAL test socket terminals 2 and 8. Set FILAMENT VOLTAGE switch to each position in turn.	Test meter indicates approximate voltage corresponding to FILAMENT VOLTAGE switch setting.	Refer to Section 5 for troubleshooting; Section 6 for calibration.

TABLE 3-7 TUBE TEST DATA CHART

NOTE: Mutual Conductance values are minimum. Discard tubes which **★** For Subminiature tube basing diagrams see figure 3-2, 3-3 of instructions. Wherever a crosshatch (*) or a double dagger (‡) appears refer to the notations.

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

Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	
00A	5.0	JR3-2000	33	...	B	P3	420	{1AJ5	1.1	EW5-1203	16	...	B	#	270	Pent. Sect.
01A	5.0	JR3-2000	48	...	B	P3	460	{1AJ5	#	Hold Down P2 And Press P3						
0A4G	...	KS0-5810	100	87	A	P4	Thyr.	1AK4	1.1	EW0-3000	0	18	A	P2	Diode	Diode Sect.
0Y4	BLST	JX3-5020	0	50	A	P6	Rect.		1.1	FT4-1200	33	0	A	P4	‡	
{0Z4	...	JR0-5070	0	70	A	P6	Rect.	{1AK5	‡	OK Above Diodes OK						
{0Z4	Down For 5 Seconds.	JR0-5070	0	70	A	P6	Rect.	{1AK5	‡	OK Above 500 on 3000 Scale						
{0Z4A	Down For 5 Seconds.	JR0-5070	0	70	A	P6	Rect.	{1AK5	‡	OK Above 500 on 3000 Scale						
{0Z4A	Down For 5 Seconds.	JR0-3070	0	70	A	P6	Rect.	1AX2	1.5	BS0-0000	0	25	A	P4	Rect.	Cap=P
1A3	1.5	HT0-2010	0	0	A	P2	Diode	1B3	1.1	JR0-0000	0	67	A	P4	Rect.	Cap=P
1A4	2.0	JR0-2300	18	...	B	#	470	1B4	2.0	JR0-2300	18	...	B	#	410	Cap=G
1A5	#	Hold Down P2 And Press P3			B	#	500	{1B5	2.0	JR5-2000	23	...	B	P3	360	Triode Sect.
1A6	1.5	JR5-3400	43	...	B	P3	315	1B5	2.0	BY5-4000	0	0	A	P2	Diode	Diode No. 1
{1A6	2.0	JR0-2504	24	...	B	#	190	{1B5	2.0	JR5-3000	0	0	A	P2	Diode	Diode No. 2
{1A6	#	Cap=G. Hold Down P2 And Press P3			B	#	410	1B7	1.5	JR0-3405	0	...	B	#	570	Pent. Sect.
1A7	1.5	JR0-3465	0	...	B	#	410	{1B7	#	Cap=G. Hold Down P2 And Press P3						
1A7	1.5	JR5-6430	28	...	B	#	315	1C3	1.5	JR5-6403	20	...	B	#	440	Osc. Sect.
1AB5	1.1	JR6-2300	0	...	B	P3	900	1C5	1.5	DX8-2000	37	...	B	P3	480	
1AC5★	1.1	EV2-7800	22	...	B	#	250	1C6	1.5	JR5-3400	37	...	B	P3	480	
1AD4	1.1	DV4-1200	28	...	B	P3	880	{1C6	2.0	JR0-2534	0	...	B	#	410	Ampl. Sect.
1AD5★	1.1	EV2-7800	0	...	B	#	410	1C6	#	Cap=G. Hold Down P2 And Press P3						
1AE4	1.1	DX6-2100	22	...	B	P3	600	{1C7	2.0	JR4-3520	20	...	B	#	250	Osc. Sect.
1AF4	1.5	DX6-2100	21	...	B	P3	440	1C7	2.0	JR0-3465	0	...	B	#	410	Pent. Sect.
{1AF5	1.5	DX6-5800	0	...	B	#	380	{1C7	#	Cap=G. Hold Down P2 And Press P3						
{1AF5	#	Hold Down P2 And Press P3			B	#	250	1C8★	1.1	EV8-6702	45	...	B	P3	250	F Basing
1AG4	1.5	HT0-1000	0	0	A	P2	Diode	1C21	BLST	JP8-5010	0	85	A	P4	Rect.	Cap=G.
{1AG5	OK Over 250. On 3000 Scale	JR0-1000	0	0	A	P2	Diode	1D5	2.0	JR0-3400	18	...	B	#	470	
{1AG5	#	Hold Down P2 And Press P3			B	#	440	{1D7	#	Hold Down P2 And Press P3						
1AG5	1.1	EW5-1203	40	0	A	P4	‡	1D7	#	Cap=G. Hold Down P2 And Press P3						
1AG5	‡	OK Above 500 on 3000 Scale			B	#	440	{1D8	1.5	JR5-3460	50	...	B	P3	580	Pent. Sect.
{1AH4	1.1	EW0-3000	0	0	A	P2	‡	1D8	1.5	JR5-6430	11	...	B	P3	360	Triode Sect. Cap=G
{1AH4	‡	OK Above 500 on 3000 Scale			B	#	440	1D8	1.5	JR5-7430	0	0	A	P2	Diode	Diode Sect.
{1AH4	1.1	FT4-1200	33	0	A	P4	‡	1DN5	1.5	DX6-2100	31	...	B	P3	400	Pentode Sect.
	‡	OK Above Diodes OK			B	#	440	{1DN5	1.5	HT0-8000	0	0	A	P2	{	OK Above 500 Diode Sect. on 3000 Scale

TABLE 3-7 (Cont.) TUBE TEST DATA CHART

Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	
1E3	1.1	EV1-8000	20		D	P3	2200	1LC6	1.5	JR6-2534	30		B	P3	440	Pent. Sect.
1E4	1.5	JR5-3000	37		B	P3	520	1LC6	1.5	JR4-3526	30		B	P3	240	Osc. Sect.
1E5	2.0	JR0-3400	18		B	#	410	1LD5	1.5	JR6-2300	0		B	#	380	Pent. Sect.
		# Hold Down P2 And Press P3								# Hold Down P2 And Press P3						
1E7	2.0	JR5-6734	10		D	P3	900	1LD5	1.5	JR6-4300	0	0	A	P2	Diode	Diode Sect.
1E7	2.0	JR4-3765	10		D	P3	900		OK Over 500 On 3000 Scale							
1F4	2.0	JR3-2400	23		B	P3	880	1LE3	1.5	JR6-2050	20		B	P3	760	
1F5	2.0	JR5-3400	23		B	P3	880	1LF3	1.5	JR6-2050	20		B	P3	760	
1F6	2.0	JR0-2300	8		B	#	410	1LG5	1.5	JR6-2340	25		B	P3	660	
		# Cap=G. Hold Down P2 And Press P3						1LH4	1.5	JR6-2000	16		B	P3	175	Triode Sect.
1F6	2.0	JR0-5300	0	0	A	P2	Diode	1LH4	1.5	JR6-4000	0	0	A	P2	Diode	Diode Sect.
		OK Above 500 On 3000 Scale						1LN5	1.5	JR6-2340	11		B	P3	480	
1F6	2.0	JR0-4300	0	0	A	P2	Diode	1N5	1.5	JR0-3400	11		B	P3	480	Cap=G
		OK Above 500 On 3000 Scale						1N6	1.5	JR5-3400	43		B	P3	500	Pent. Sect.
1F7	2.0	JR0-3600	8		B	#	410	1N6	1.5	JR0-6000	0	0	A	P2	Diode	Diode Sect.
		# Cap=G. Hold Down P2 And Press P3							OK Over 250 On 3000 Scale							
1F7	2.0	JR0-4630	0	0	A	P2	Diode	1P5	1.5	JR0-3400	11		B	P3	500	Cap=G
		OK Above 500 On 3000 Scale						1Q5	1.5	JR5-3400	37		B	P3	1320	
1F7	2.0	JR0-5630	0	0	A	P2	Diode	1Q6★	1.1	EV2-7800	0		B	#	190	F Basing
		OK Above 500 On 3000 Scale							# Pent. Sect. Hold Down P2 And Press P3							
1G3	1.1	JR0-0000	0	67	A	P4	Rect.	1Q6★	1.1	EV0-6000	0	0	A	P2	Diode	F Basing
1G4	1.5	JR5-3000	49		B	P3	520		Diode Sect. OK Over 250 On 3000 Scale							
1G5	2.0	JR5-3400	37		B	P3	950	1R4	1.5	JR0-4070	0	0	A	P2	Diode	
1G6	1.5	JR5-6000	16		B	P3	420	1R5	1.5	DX8-2160	0		B	#	250	No. 1 Grid
1G6	1.5	JR4-3000	16		B	P3	420		# Hold Down P2 And Press P3							
1H4	2.0	JR5-3000	40		B	P3	570	1R5	1.5	DX6-2180	0		B	#	220	No. 3 Grid
1H5	1.5	JR0-3000	16		B	P3	175		# Hold Down P2 And Press P3							
1H5	1.5	JR0-5000	0	0	A	P2	Diode	1S4	1.5	DX1-2800	31		B	#	950	# Hold Down
1H6	2.0	JR6-3000	23		B	P3	360		P2 And Press P3							
1H6	2.0	BY6-5000	0	0	A	P2	Diode	1S5	1.5	DX6-5800	13		B	#	330	Pent. Sect.
1H6	2.0	JR6-4000	0	0	A	P2	Diode		# Hold Down P2 And Press P3							
1J3	1.1	JR0-0000	45		B	P3	600	1S5	1.5	DX0-1800	0	0	A	P2	Diode	Diode Sect.
1J5	2.0	JR5-3400	15		B	P3	630	1S6★	1.1	EV3-1806	0		B	#	220	F Basing
1J6	2.0	JR5-6000	15		B	P3	630		# Pent. Sect. Hold Down P2 And Press P3							
1L4	1.5	HT6-2100	19		B	P3	650	1S6★	1.1	EV0-6000	0	0	A	P2	Diode	F Basing
1L6	1.5	DX6-2518	0		B	#	410		Diode Sect. OK Over 250 On 3000 Scale							
		# Hold Down P2 And Press P3						1SA6	1.5	JR4-7630	0		B	#	500	# Hold Down
1L6	1.5	DX8-1526	28		B	#	190		P2 And Press P3							
		# Hold Down P2 And Press P3						1SB6	1.5	JR7-3400	0		B	#	410	Pent. Sect.
1LA4	1.5	JR6-2300	43		B	P3	500		# Hold Down P2 And Press P3							
1LA6	1.5	JR6-2534	0		B	#	380	1SB6	1.5	JR7-5000	0	0	A	P2	Diode	Diode Sect.
		# Hold Down P2 And Press P3						1T4	OK Over 500 On 3000 Scale							
1LA6	1.5	JR4-3526	32		B	#	190		1.5	DX6-2100	0		B	#	470	# Hold Down
		# Hold Down P2 And Press P3						1T5	P2 And Press P3							
1LB4	1.5	JR6-2300	51		B	P3	580		1.5	JR5-3400	45		B	P3	725	
1LB6	1.5	JR6-2437	0		B	P3	250	1T6★	1.1	EV3-1860	0		B	#	125	F Basing
1LB6	1.5	JR6-3574	20		B	P3	950		# Pent. Sect. Hold Down P2 And Press P3							
1LC5	1.5	JR6-2340	0		B	#	470	1T6★	1.1	EV0-6000	0	0	A	P2	Diode	F Basing
		P2 And Press P3							Diode Sect. OK Over 250 On 3000 Scale.							
								1U4	1.5	DX6-2100	14		B	P3	565	

TABLE 3-7 (Cont.) TUBE TEST DATA CHART

Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations
{1U5	1.5 DX6-2100	34	...	B	P3	330	Pent. Sect.	2C39	6.3 JR6-5070	18	...	E	P3	12600	Use adapter.
{1U5	1.5 DX6-8100	0	0	A	P2	470	Diode Sect.	2C40	6.3 JR0-0070	17	...	C	P3	1760	Cap=P. Ring=G
{1U6	1.5 DX6-2581	23	...	B	P3	315	Heptode Sect.	2C43	6.3 JR0-0070	5	...	D	P3	3800	Cap=P. Ring=G
{1U6	1.5 DX8-1562	0	...	B	P3	315	Osc. Sect.	2C45	7.5 JR3-2000	37	...	B	P3	1380	
1V	6.3 JR0-2030	0	44	A	P7	Rect.		{2C50	12.6 JX2-1030	41	...	B	P3	1130	Triode No. 1
1V2	0.6 EV0-9000	0	25	A	P4	Rect.	F Basing	{2C51	12.6 JX4-5060	41	...	B	P3	1130	Triode No. 2
1V5★	1.1 EV2-7800	24	...	B	#	440		{2C51	6.3 KR3-4028	17	...	D	P3	3300	Triode No. 1
{1V6	# Hold Down P2 And Press P3			A	P4	†	Pent. Sect.	{2C52	12.6 JX4-5061	15	...	B	P3	3300	Triode No. 2
{1V6	1.1 EX3-1206	30	0	A	P4	†	Triode Sect.	{2C52	12.6 JX2-1035	15	...	B	P3	630	Triode No. 1
{1V6	† OK Above 500 on 3000 Scale			A	P4	†		2C53	6.3 JR5-0070	0	...	B	P3	630	Triode No. 2
{1V6	† OK Above 500 on 3000 Scale			A	P4	†		2CY5	2.5 JR3-5620	11	...	D	#	250	Cap=P
1W4	1.5 DX6-2100	49	...	B	P3	580			# Hold Down P2 And Press P3			D	#	3150	
1W5★	1.1 EV2-7800	27	...	D	P3	410	F Basing	2D21	6.3 JR3-6025	# 92	A	P4		Thyr.	
1X2	1.1 BS0-0000	0	65	A	P4	Rect.	Cap=P	{2E5	# Should Strike Between 35 and 25.			A	P3	Read As Rectifier.	
1Z2	1.5 DS0-0000	0	72	A	P4	Rect.	Cap=P	{2E5	2.5 JR5-4030	0	100	A	P3	Eye	
2A3	2.5 JR3-2000	67	...	C	P3	1900		{2E2	2.5 JR5-4230	0	100	A	P3	Eye	
2A4	2.5 JR5-3000	# 59	...	A	P7	Thyr.		2E22	6.3 JR3-0240	0	...	C	P3	2500	Cap=P
{2A5	# Should Strike Between 77 and 67.			A	P7	Read As Rectifier		2E24	6.3 JR5-0300	35	...	C	P3	2000	Cap=P. Short on 3
{2A6	2.5 JR4-2350	29	...	B	P3	1260		2E25	6.3 JR5-0470	0	...	C	P3	2200	Cap=P
{2A6	2.5 JR0-2050	11	...	B	P3	470	Triode Sect. Cap=G	2E26	6.3 JR5-0327	37	...	C	P3	1900	Cap=P
{2A6	2.5 JR0-4050	0	0	A	P2	Diode	Diode No. 1	2E30	6.3 JR3-5602	20	...	C	P3	1900	Cap=P
{2A7	2.5 JR0-3050	0	0	A	P2	Diode	Diode No. 2	2E31	1.1 DV4-1200	0	...	B	#	250	# Hold Down
{2A7	2.5 JR0-2365	22	...	B	P3	630	Pent. Sect. Cap=G	2E32	P2 And Press P3			B	#	250	
{2A7	2.5 JR5-4360	30	...	B	P3	2840	Osc. Sect.	2E35	1.1 DV4-1200	0	...	B	#	380	
2AF4	2.5 JR2-3050	36	...	D	P3	2840		2E36	1.1 DV4-1200	18	...	B	#	380	
2B3	1.5 JR0-0000	0	67	A	P4	Rect.	Cap=P. Short on 3	{2E41	# Hold Down P2 And Press P3			B	#	250	Pent. Sect.
2B4	2.5 JR3-2040	# 92	...	A	P4	Thyr.		2E41	1.1 EW0-3000	0	0	A	P2	Diode	Diode Sect.
{2B6	# Should Strike Between 77 and 67.			A	P4	Read As Rectifier.		{2E42	OK Over 150 On 3000 Scale			A	P4	†	Heptode Sect.
{2B7	2.5 JR4-2360	15	...	B	P3	950		{2E42	1.1 EW5-1200	20	...	B	#	250	Pent. Sect.
{2B7	2.5 JR0-2360	30	...	B	P3	630	Pent. Sect. Cap=G	2E41	# Hold Down P2 And Press P3			B	#	250	Pent. Sect.
{2B7	2.5 JR0-5360	0	0	A	P2	Diode	Diode No. 1	2E41	1.1 EW0-3000	0	0	A	P2	Diode	Diode Sect.
{2B7	2.5 JR0-4360	0	0	A	P2	Diode	Diode No. 2	{2G21	OK Over 150 On 3000 Scale			A	P4	†	Heptode Sect.
2B22	6.3 JR0-0070	0	46	A	P7	Diode	Cap=P	2G21	1.1 EX3-2651	46	0	A	P4	†	Heptode Sect.
2B23	6.3 JR0-3070	0	51	A	P6	Rect.		2G21	† OK Above Diodes OK			A	P4	†	Triode Sect.
2BN4	2.0 JR2-5030	15	...	D	P3	4300		2G22	1.1 EX3-1000	48	0	A	P4	†	Triode Sect.
2C4	2.5 HT1-5080	# 92	...	A	P4	Thyr.		2G22	† OK Above Diodes OK			A	P4	†	Heptode Sect.
{2C21	# Should Strike Between 75 and 65.			A	P4	Read As Rectifier.		2G22	1.1 EX3-2651	46	0	A	P4	†	Heptode Sect.
{2C21	6.3 JR4-5060	38	...	B	P3	860	Triode No. 1	2G22	† OK Above Diodes OK			A	P4	†	Triode Sect.
2C22	6.3 JR0-3020	38	...	B	P3	860	Triode No. 2 Cap=G	2T4	1.1 EX3-1000	48	0	A	P4	†	Triode Sect.
2C22	6.3 JR0-0070	13	...	C	P3	1900	{Upper Cap = P {Lower Cap = P	2V2	† OK Above Diodes OK			A	P4	†	Triode Sect.
2C26	6.3 JR0-0070	18	...	B	P3	950	{Upper Cap = P {Lower Cap = G	2V3	1.1 EX3-1000	48	0	A	P4	†	Triode Sect.
{2C34	6.3 JR3-0040	17	...	D	P3	1510	Plate #1 Cap	2V3	1.1 EX3-2651	46	0	A	P4	†	Heptode Sect.
{2C34	6.3 JR3-0040	17	...	D	P3	1510	Adj. to Pin 3	2V3	1.1 EX3-1000	48	0	A	P4	†	Triode Sect.
2C37	6.3 JR3-5000	20	0	B	P3	930	Plate #2 Cap Adj. to Pin 5. {Top Ring = P {Use adapter	2V3	2.5 JR2-3050	37	...	D	P3	3150	Cap=P. Short on 3
				B	P3	930		2V2	2.5 JR0-0050	0	50	A	P4	Rect.	Cap=P
				B	P3	930		2V3	2.5 JR0-0000	0	70	A	P4	Rect.	Cap=P

TABLE 3-7 (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
2W3	2.5	HR0-4000	0	0	P7	Rect.	Cap=P	3C22	6.3	JR0-0050	13	D	P3	3150	
2X2A	2.5	JR0-0000	0	80	P4	Rect.	Cap=P	3C24	Radiating Fins=P Center Ring=G Short on 3						
2Z2	2.5	JR0-2000	0	0	P7	Rect.	Cap=P		6.3	JR0-0000	0	B	P3	630	Top Cap=P
3A2	3.0	BS0-0000	0	75	P4	Rect.	Cap=P		Side Cap=G						
3A3	3.0	JR0-0000	0	60	P4	Rect.	Cap=P	3CB6	3.0	JR3-5627	11	D	P3	3500	
3A4	2.5	DX8-2100	33	...	P3	1260	Triode No. 1	3CE5	3.0	JR3-5620	11	D	P3	3500	
3A5	3.0	DX5-6000	32	...	P3	1260	Triode No. 2	3CF6	3.0	JR3-5627	11	D	P3	3500	
3A5	3.0	HT1-2000	32	...	P3	1260	Triode No. 2	3CS6	3.0	JR3-5627	20	B	#	190	Grid No. 1
3A8	2.5	JR0-3400	12	...	P3	470		3CS6	# Hold Down P2 And Press P3						
3A8	Pent. Sect. Cap=G		Short on 3					3CY5	3.0	JR7-5623	0	B	#	315	Grid No. 3
3A8	2.5	JR5-6400	12	...	P3	315		3CY5	# Hold Down P2 And Press P3						
3A8	Triode Sect.		Short on 3					3D6	3.0	JR3-5620	11	D	#	3150	
3A8	2.5	JR0-7400	0	0	P2	Diode		3DK6	# Hold Down P2 And Press P3						
3AF4A	Diode Sect.		Short on 3					3DT6	2.5	JR6-2300	37	B	P3	1320	
3AL5	3.0	JR2-3050	36	...	P3	2840		3DT6	3.0	JR3-5627	8	D	P3	4100	
3AL5	3.0	JR0-7036	0	67	P2	Diode	Diode No. 1	3DT6	3.0	JR3-5627	22	B	P3	380	Grid No. 1
3AL5	3.0	JR0-2056	0	67	P2	Diode	Diode No. 2	3DT6	3.0	JR7-5623	0	B	#	250	Grid No. 3
3AU6	3.0	JR3-5672	10	...	P3	2050		3E5	# Hold Down P2 And Press P3						
3AV6	3.0	JR3-7025	12	...	P3	800	Triode Sect.	3E5	2.5	DX6-2150	29	B	#	750	
3AV6	3.0	JR3-6025	0	0	P2	Diode	Diode No. 1	3E6	# Short On 3 Hold Down P2 And Press P3						
3AV6	3.0	JR3-5027	0	0	P2	Diode	Diode No. 2	3E29	3.0	JR6-2340	15	B	P3	1000	
3B2	3.0	JR0-0000	0	55	P4	Rect.	Cap=P. Short on 3	3E29	6.3	JR4-5620	0	D	P3	2500	Plate No. 1
3B4	2.5	JV1-7300	55	...	P3	1070	Short on 3	3E29	Use adapter						
3B5	2.5	JR5-3400	60	...	P3	950		3E29	6.3	JR4-7620	0	D	P3	2500	Plate No. 2.
3B7	2.5	BY6-7000	25	...	P3	950	Triode No. 1	3LE4	Use adapter.						
3B7	2.5	JR3-2000	25	...	P3	950	Triode No. 2	3LF4	2.5	JR6-2300	55	B	P3	700	
3B24	2.5	JR0-0000	0	85	P4	Rect.	Cap=P. Short on 3	3Q4	2.5	JR6-2300	30	B	P3	1200	
3B24	2.5	CR0-0000	0	85	P4	Rect.	Cap=P	3Q5	3.0	HT1-2800	24	B	P3	1340	
3B25	2.5	JR0-0000	0	90	P4	Rect.	Cap=P	3S4	2.5	JR5-3400	38	B	P3	1130	
3B26	2.5	JR0-0000	0	0	P6	Diode	Cap=P	3V4	2.5	HT1-2800	28	B	#	940	
3B28	2.5	JR0-0000	0	90	P4	Rect.	Cap=P	3V4	# Hold Down P2 And Press P3						
3B29	2.5	JR0-0000	0	89	P4	Rect.	Cap=P	4A6	3.0	DX6-2100	31	B	P3	1250	
3BA6	4.3	JR0-0000	0	89	P4	Rect.	Cap=P	4A6	3.0	JR5-6000	16	B	P3	630	Triode No. 1
3BC5	3.0	JR3-5672	9	...	P3	2070		4A6	3.0	BY4-3000	16	B	P3	630	Triode No. 2
3BE6	3.0	JR3-5620	0	...	P3	2000		4AU6	4.3	JR3-5672	10	D	P3	2050	
3BE6	3.0	JR7-5623	11	...	P3	900	Ampl. Sect.	4BA6	4.3	JR3-5672	9	C	P3	2070	
3BE6	3.0	JR3-5627	0	...	P3	1000	Osc. Sect.	4BC5	4.3	JR3-5620	0	C	P3	2000	
3BN4	3.0	JR2-5030	15	...	P3	4300		4BC8	4.3	EV7-6089	15	D	P3	3900	Triode No. 1
3BN6	3.0	JR2-7536	0	...	P3	440	Limiter Grid	4BC8	4.3	EV2-1039	15	D	P3	3900	Triode No. 2
3BN6	3.0	JR6-7532	0	...	P3	570	Quadrature Grid	4BE6	4.3	JR7-5623	11	B	P3	900	Ampl. Sect.
3BU8	3.0	EV7-8219	0	...	P3	820	Pent. No. 1	4BE6	4.3	JR3-5627	0	B	P3	1000	Osc. Sect.
3BU8	3.0	EV7-3216	0	...	P3	820	Pent. No. 2	4BN6	4.3	JR2-7536	0	B	P3	440	Limiter Grid
3BY6	3.0	JR3-5627	21	...	P3	750	Grid No. 1	4BN6	4.3	JR6-7532	0	B	P3	570	Quadrature Grid
3BY6	3.0	JR7-5623	21	...	P3	315	Grid No. 3	4BQ7A	4.3	EV7-6089	14	D	P3	4000	Triode No. 1
3BY6	# Hold Down P2 and Press P3							4BQ7A	4.3	EV2-1039	14	D	P3	4000	Triode No. 2
3BZ6	3.0	JR3-5627	20	...	P3	1575	Cap=P	4BS8	4.3	EV7-6089	17	D	P3	4500	Triode No. 1
3C2	3.0	JR0-0000	0	75	P4	Rect.		4BS8	4.3	EV7-6089	17	D	P3	4500	Triode No. 2
3C4	2.5	DX6-2100	44	...	P3	700		4BU8	4.3	EV2-1039	17	D	P3	4500	Triode No. 1
3C6	2.5	BY5-6000	10	...	P3	700	Triode No. 1	4BU8	4.3	EV7-8219	0	B	P3	820	Pent. No. 1
3C6	2.5	JR4-3000	10	...	P3	700	Triode No. 2	4BU8	4.3	EV7-3216	0	B	P3	820	Pent. No. 2

TABLE 3-7 (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
{4BX8	4.3	EV7-6089	24	...	P3	3150	Triode No. 1	{5BQ7A	5.0	EV7-6089	14	...	P3	4000	Triode No. 1
{4BX8	4.3	EV2-1039	24	...	P3	3150	Triode No. 2	{5BQ7A	5.0	EV2-1039	14	...	P3	4000	Triode No. 2
{4BZ7	4.3	EV7-6089	17	...	P3	4300	Triode No. 1	{5BR8	5.0	EV9-6780	15	...	P3	1420	Pent. Sect.
{4BZ8	4.3	EV2-1039	17	...	P3	4300	Triode No. 2	{5BR8	5.0	EV1-2030	16	...	P3	2840	Triode Sect.
{4BZ8	4.3	EV7-6089	14	...	P3	3800	Triode No. 1	{5BS8	5.0	EV7-6089	17	...	P3	4500	Triode No. 1
{4BZ8	4.3	EV2-1039	14	...	P3	3800	Triode No. 2	{5BT8	5.0	EV2-1039	17	...	P3	4500	Triode No. 2
{4CB6	4.3	JR3-5627	11	...	P3	3500		{5BT8	5.0	EV8-6790	11	...	P3	3500	Pent. Sect.
{4CE5	4.3	JR3-5620	11	...	P3	3500		{5BT8	5.0	EV0-1030	0	30	P2	Diode	
{4CY5	4.3	JR3-5620	11	...	P3	3500		{5BT8	5.0	EV0-2030	0	30	P2	Diode	
{4C22/	# Hold Down P2 And Press				#			{5BZ7	5.0	EV7-6089	17	...	P3	4300	Triode No. 1
{HF100	10.0	JR0-0000	22	0	P3	620	{Top Cap=P {Side Cap=G	{5BZ7	5.0	EV2-1039	17	...	P3	4300	Triode No. 2
{4DT6	4.3	JR3-5627	22	...	P3	380	Grid No. 1	{5CG8	5.0	EV9-6780	9	...	P3	2900	Pent. Sect.
{4DT6	4.3	JR7-5623	0	...	#	250	Grid No. 3	{5CG8	5.0	EV1-2030	15	...	P3	2840	Triode Sect.
{4D22	# Hold Down P2 And Press				P3			{5CL8	5.0	EV9-6780	8	...	P3	2500	Tetrode Sect.
{4D32	25.0	DY5-7420	31	0	D	4340	Cap=P	{5CL8	5.0	EV1-2030	12	...	P3	4400	Triode Sect.
{4-65	6.3	DY2-7400	31	0	B	1240	Cap=P	{5CM6	5.0	EV3-9170	15	...	P3	2320	Pent. Sect.
{5A6	5.0	EV7-1603	46	...	C	1900	Cap=P	{5CM8	5.0	EV2-6730	11	...	P3	3500	Triode Sect.
{5AM8	5.0	EV2-6319	7	...	D	3150	Pent. Sect.	{5CM8	5.0	EV9-1080	18	...	P3	630	Triode Sect.
{5AM8	5.0	EV0-8070	0	70	A	Diode	Diode Sect.	{5CZ5	5.0	EV3-9170	15	...	P3	3000	Pent. Sect.
{5AN8	5.0	EV8-6791	7	...	D	3900	Pent. Sect.	{5DH8	5.0	EV9-6738	10	...	P3	3100	Pentode Sect.
{5AO5	5.0	EV2-1736	21	...	C	2100	Triode Sect.	{5DH8	5.0	EV1-2030	26	...	P3	950	Triode Sect.
{5AS4	5.0	HR0-6000	0	35	A	Rect.	Plate No. 1	{5J6	5.0	JR5-2070	15	...	P3	2800	Triode No. 1
{5AS4	5.0	HR0-4000	0	27	A	Rect.	Plate No. 2	{5J6	5.0	JR6-3070	15	...	P3	2800	Triode No. 2
{5AS8	5.0	EV2-9137	11	...	D	3530	Pent. Sect.	{5R4	5.0	HR0-6000	0	17	A	Plate No. 1	
{5AS8	5.0	EV0-6087	0	70	A	Diode	Diode Sect.	{5R4	5.0	HR0-4000	0	11	A	Plate No. 2	
{5AT8	5.0	EV9-6738	9	...	D	2900	Pent. Sect.	{5T4	5.0	HR0-6000	0	43	A	Plate No. 1	
{5AT8	5.0	EV1-2038	15	...	D	2840	Triode Sect.	{5T4	5.0	HR0-4000	0	34	A	Plate No. 2	
{5AU4	6.3	HR0-6000	0	60	A	Rect.	Plate No. 1	{5T8	5.0	EV8-9076	11	...	P3	760	Triode Sect.
{5AU4	6.3	HR0-4000	0	55	A	Rect.	Plate No. 2	{5T8	5.0	EV0-6071	0	67	A	Diode No. 1	
{5AV8	5.0	EV6-9870	7	...	D	3900	Pent. Sect.	{5T8	5.0	EV0-2037	0	67	A	Diode No. 2	
{5AV8	5.0	EV2-3010	21	...	C	2100	Triode Sect.	{5U4	5.0	EV0-1078	0	67	A	Diode	
{5AW4	5.0	HR0-6004	0	52	A	Rect.	Plate No. 1	{5U4	5.0	HR0-6000	0	35	A	Plate No. 1	
{5AW4	5.0	HR0-4006	0	47	A	Rect.	Plate No. 2	{5U4	5.0	HR0-4000	0	27	A	Plate No. 2	
{5AX4	5.0	HR0-6000	0	35	A	Rect.	Plate No. 1	{5U8	5.0	EV2-6370	15	...	P3	1420	Pent. Sect.
{5AX4	5.0	HR0-4000	0	27	A	Rect.	Plate No. 2	{5U8	5.0	EV9-1080	16	...	P3	2840	Triode Sect.
{5AZ4	5.0	J50-4006	0	0	A	Rect.	Plate No. 1	{5V3	5.0	HR0-6004	0	55	A	Plate No. 1	
{5AZ4	5.0	J50-6004	0	0	A	Rect.	Plate No. 2	{5V3	5.0	HR0-4006	0	50	A	Plate No. 2	
{5B8	5.0	EV6-9871	7	...	D	3900	Triode Sect.	{5V4	5.0	HR0-6000	0	59	A	Plate No. 1	
	Pent. Sect. Short on 2-3				P3			{5V4	5.0	HR0-4000	0	59	A	Plate No. 2	
{5B8	5.0	EV2-3019	24	...	C	2100	Triode Sect.	{5V6	5.0	JR5-3472	21	...	P3	2320	Plate No. 1
{5BE8	5.0	EV9-6783	15	...	B	1420	Triode Sect.	{5W4	5.0	HR0-6000	0	0	A	Plate No. 1	
	Pent. Sect. Short on 2-3				P3			{5W4	5.0	HR0-4000	0	0	A	Plate No. 2	
{5BE8	5.0	EV1-2030	16	...	C	2840	Triode Sect.	{5X3	5.0	JR0-3000	0	0	A	Plate No. 1	
{5BK7A	5.0	EV7-6089	8	...	D	5350	Triode No. 1	{5X3	5.0	JR0-2000	0	0	A	Plate No. 2	
{5BK7A	5.0	EV2-1039	8	...	D	5350	Triode No. 2	{5X4	5.0	JX0-5000	0	35	A	Plate No. 1	
					P3			{5X4	5.0	JX0-3000	0	27	A	Plate No. 2	
					P3			{5X8	5.0	EV7-9861	9	...	P3	2900	Pent. Sect.
					P3			{5X8	5.0	EV2-3861	15	...	R3	2840	Triode Sect.

TABLE 3-7 (Cont.) TUBE TEST DATA CHART

Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations
{5Y3	5.0	HR0-6000	0	0	P7	Rect.	Plate No. 1	6AH5	6.3	JR6-4270	23	...	P3	3150	
{5Y3	5.0	HR0-4000	0	0	P7	Rect.	Plate No. 2	6AH6	6.3	JR3-5672	10	...	P3	3800	
{5Y4	5.0	JX0-5000	0	0	P7	Rect.	Plate No. 1	{6AH7	6.3	JX5-6040	20	...	P3	1510	Triode No. 1
{5Y4	5.0	JX0-3000	0	0	P7	Rect.	Plate No. 2	{6AH7	6.3	JX2-3010	20	...	P3	1510	Triode No. 2
{5Z3	5.0	JR0-3000	0	35	P7	Rect.	Plate No. 1	6AJ4	6.3	JX1-5020	9	...	P3	6300	
{5Z3	5.0	JR0-2000	0	27	P7	Rect.	Plate No. 2	6AJ5	6.3	JR3-5620	12	...	#	1730	
{5Z4	5.0	HR0-6000	0	57	P7	Rect.	Plate No. 1	# Hold Down P2 And Press P3							
{5Z4	5.0	HR0-4000	0	57	P7	Rect.	Plate No. 2	6AJ7	6.3	JR4-7653	0	...	#	3800	
6A3	6.3	JR3-2000	67	...	P3	1900									
6A4	6.3	JR3-2400	28	...	P3	1260									
6A5	6.3	JR5-3000	67	...	P3	1900									
{6A6	6.3	JR5-6040	12	...	P3	950	Triode No. 1	6AK4★	6.3	DW1-8057	24	...	P3	2400	F Basing
{6A6	6.3	JR3-2040	12	...	P3	950	Triode No. 2	6AK5	6.3	JR3-5620	10	...	P3	2780	
{6A7	6.3	JR0-2365	22	...	P3	630	Pent. Sect. Cap=G	6AK6	6.3	JR3-5672	23	...	P3	1320	
{6A7	6.3	JR5-4362	30	...	P3	190	Osc. Sect.	6AK7	6.3	JR4-7652	10	...	P3	3800	
{6A8	6.3	JR0-3475	22	...	P3	630	Pent. Sect. Cap=G	{6AL5	6.3	JR0-7030	0	67	A	P2	Diode
{6A8	6.3	JR5-6473	30	...	P3	190	Osc. Sect.	{6AL5	6.3	JR0-2050	0	67	A	P2	Diode
6AB4	6.3	JR6-3070	14	...	P3	2500		6AL6	6.3	JR5-0470	23	...	P3	3150	Cap=P
{6AB5	6.3	JR5-4030	0	100	P3	Eye	Eye Open	{6AL7	6.3	JR6-3570	Vary 100	...	A	P3	Eye
{6AB5	6.3	JR5-4230	0	100	P3	Eye	Eye Closed	6AL7	6.3	JR5-3470	Vary 100	...	A	P3	Eye
6AB6	6.3	JR5-3470	0	...	P3	920		6AL7	6.3	JR4-3570	Vary 100	...	A	P3	Eye
6AB7	6.3	JR4-7653	0	...	P3	2200									
{6AB8	6.3	EV9-6837	24	...	P3	1750	Pent. Sect.	6AM4	6.3	JX1-5020	10	...	P3	4400	
{6AB8	6.3	EV2-1030	35	...	P3	500	Triode Sect.	{6AM8	6.3	EV2-6319	7	...	P3	3150	Pent. Sect.
6AC5	6.3	JR5-3070	0	...	P3	530		6AM8	6.3	EV0-8070	0	70	A	P2	Diode
6AC6	6.3	JR5-3470	0	...	P3	1500		6AN4	6.3	JR2-3050	6	...	P3	5000	
6AC7	6.3	JR4-7653	0	...	#	3800		6AN5	6.3	JR3-5670	0	...	#	3800	
# Hold Down P2 And Press P3								# Hold Down P2 And Press P3							
6AD4★	6.3	DU2-1050	15	...	P3	1325	C Basing	{6AN6	6.3	HT0-5060	0	25	A	P2	Diode
{6AD6	6.3	JR4-3570	0	100	P3	Eye	{Eye 1 Open	6AN6	6.3	HT0-8060	0	25	A	P2	Diode
{6AD6	6.3	JR3-4570	0	100	P3	Eye	{Eye 2 Closed	6AN6	6.3	HT0-1060	0	25	A	P2	Diode
{6AD7	6.3	JR5-3476	29	...	P3	1260	{Eye 2 Open	6AN6	6.3	HT0-2060	0	25	A	P2	Diode
6AD7	6.3	JR2-6073	0	...	P3	380	{Eye 1 Closed	6AN8	6.3	EV8-6791	7	...	D	P3	3900
6AE5	6.3	JR5-3070	68	...	P3	750	Pent. Sect.	{6AN8	6.3	EV2-1736	21	...	C	P3	2100
{6AE6	6.3	JR5-4073	0	...	P3	540	Triode Sect.	6AQ5	6.3	JR3-5620	21	...	C	P3	2320
{6AE6	6.3	JR5-3074	0	...	P3	470	Triode No. 1	{6AQ6	6.3	JR3-7020	6	...	B	P3	725
{6AE7	6.3	JR6-3074	33	...	P3	950	Triode No. 2	6AQ6	6.3	JR0-6020	0	0	A	P2	Diode
{6AE7	6.3	JR4-3056	33	...	P3	950	Triode No. 1	6AQ6	6.3	JR0-5020	0	0	A	P2	Diode
6AF4	6.3	JR2-3050	36	...	P3	2840	Triode No. 2	6AQ7	6.3	JX4-5016	13	...	B	P3	630
6AF5	6.3	JR5-3070	51	...	P3	950		{6AQ7	6.3	JX4-2016	0	35	A	P2	Diode
{6AF6	6.3	JR4-3570	0	100	P3	Eye	{Eye 1 Open	6AQ7	6.3	JX4-3016	0	35	A	P2	Diode
{6AF6	6.3	JR3-4570	0	100	P3	Eye	{Eye 2 Closed	6AR5	6.3	JR3-5620	34	...	B	P3	1000
{6AG5	6.3	JR3-5620	10	...	P3	2500	{Eye 2 Open	6AR6	6.3	GX8-3520	34	...	C	P3	3400
6AG7	6.3	JR4-7652	10	...	P3	3800	{Eye 1 Closed	{6AR8	6.3	EV6-9371	25	...	B	P3	880
6AH4	6.3	JR2-5070	47	...	P3	2840		6AR8	6.3	EV6-8371	25	...	B	P3	880
								6AS5	6.3	JR2-7630	25	...	D	P3	3530
								6AS6	6.3	JR3-5627	10	...	D	P3	1540

TABLE 3-7 (Cont.) TUBE TEST DATA CHART

Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations
{6AS7	6.3	JX4-5061	100	...	C	1800	Triode No. 1	{6B8	6.3	JR0-3672	24	...	P3	720	Pent. Sect. Cap=G
{6AS7	6.3	JX2-1035	100	...	C	1800	Triode No. 2	{6B8	6.3	JR0-5672	0	0	P2	Diode	Diode No. 1
{6AS8	6.3	EV2-9137	11	...	D	3530	Pent. Sect.	{6B8	6.3	JR0-4672	0	0	P2	Diode	Diode No. 2
{6AT6	6.3	EV0-6087	0	70	A	Diode	Diode Sect.	{6BA5★	6.3	DW1-5780	16	...	P3	1350	F Basing
{6AT6	6.3	JR3-7020	11	...	A	750	Triode Sect.	{6BA6	6.3	JR3-5672	9	...	P3	2070	Ampl. Sect.
{6AT6	6.3	JR0-6020	0	0	B	Diode	Diode Sect.	{6BA7	6.3	EV7-9132	17	...	P3	470	Osc. Sect.
{6AT6	6.3	JR0-5020	0	0	A	Diode	Diode No. 1	{6BA7	6.3	EV2-9137	25	...	P3	3800	Pent. Sect.
{6AT8	6.3	EV9-6738	9	...	D	2900	Pent. Sect.	{6BA8	6.3	EV7-9860	11	...	P3	1700	Triode Sect.
{6AU4	6.3	EV1-2038	15	...	D	2840	Triode Sect.	{6BA8	6.3	EV2-3010	29	...	P3	6300	
{6AU5	6.3	JX0-5030	0	60	A	Rect.		{6BC4	6.3	EV2-1060	10	...	P3	2000	
{6AU6	6.3	JR2-5730	41	...	C	3275		{6BC5	6.3	JR3-5620	0	...	P3	Diode	Diode No. 1
{6AU7	6.3	JR3-5672	10	...	D	2050		{6BC7	6.3	EV0-8090	0	67	P2	Diode	Diode No. 2
{6AU7	6.3	EV7-6080	24	...	B	1400	Triode No. 1	{6BC7	6.3	EV0-6070	0	67	A	Diode	Diode No. 3
{6AU8	6.3	EV2-1030	24	...	B	1400	Triode No. 2	{6BC7	6.3	EV0-2010	0	67	A	Diode	Triode No. 1
{6AU8	6.3	EV7-9860	10	...	D	3800	Pent. Sect.	{6BC8	6.3	EV7-6089	15	...	P3	3900	Triode No. 2
{6AV5	6.3	EV2-3010	9	...	D	3100	Triode Sect.	{6BC8	6.3	EV2-1039	15	...	P3	3900	
{6AV6	6.3	JR2-5730	50	...	C	2450		{6BD5	6.3	JR2-5730	18	...	P3	3150	
{6AV6	6.3	JR3-7025	12	...	B	800	Triode Sect.	{6BD6	6.3	JR3-5672	13	...	P3	1260	
{6AV6	6.3	JR3-6025	0	0	A	Diode	Diode No. 1	{6BE6	6.3	JR7-5623	11	...	P3	900	Ampl. Sect.
{6AV6	6.3	JR3-5027	0	0	A	Diode	Diode No. 2	{6BE6	6.3	JR3-5627	0	...	P3	1000	Osc. Sect.
{6AW7	6.3	JX1-6020	8	...	B	570	Triode Sect.	{6BE7	6.3	EV7-1639	29	...	P3	630	
{6AW7	6.3	JX1-3050	0	65	A	Diode	Diode No. 1	{6BE8	6.3	EV9-6783	15	...	P3	1420	Pent. Sect.
{6AW7	6.3	JX1-4020	0	65	A	Diode	Diode No. 2	{6BE8	6.3	Short on 2-3	...	...	P3	2840	Triode Sect.
{6AW8	6.3	EV7-9863	14	...	D	4700	Pent. Sect.	{6BE8	6.3	EV1-2030	16	...	P3	2140	
{6AW8	6.3	EV2-3019	9	...	D	2500	Triode Sect.	{6BF5	6.3	JR3-5620	49	...	P3	1200	Triode Sect.
{6AX4	6.3	JX0-5030	0	46	A	Rect.		{6BF6	6.3	JR3-7020	18	...	P3	Diode	Diode No. 1
{6AX5	6.3	JR0-5073	0	0	A	Rect.	Plate No. 1	{6BF6	6.3	JR3-6020	0	0	P2	Diode	Diode No. 2
{6AX5	6.3	JR0-3075	0	0	A	Rect.	Plate No. 2	{6BF6	6.3	JR3-5020	0	0	P2	Diode	F Basing
{6AX6	6.3	JR0-5070	0	62	A	Rect.	Plate No. 1	{6BF7★	6.3	DW7-8050	22	...	P3	1575	
{6AX6	6.3	JR0-3040	0	62	A	Rect.	Plate No. 2	{6BF7★	6.3	Triode No. 1	...	...	P3	1575	F Basing
{6AX7	6.3	EV7-6080	8	...	D	950	Triode No. 1	{6BF7★	6.3	DW2-1040	22	...	P3	3800	Cap=P
{6AX7	6.3	EV2-1030	8	...	D	950	Triode No. 2	{6BF7★	6.3	Triode No. 2	...	...	P3	1575	F Basing
{6AX8	6.3	EV2-6370	15	...	B	1420	Pent. Sect.	{6BG6	6.3	JR5-0730	18	...	P3	3800	Cap=P
{6AX8	6.3	EV9-1080	16	...	C	2840	Triode Sect.	{6BG7★	6.3	DW7-8050	22	...	P3	1575	F Basing
{6AZ5★	6.3	DW0-8070	0	60	A	Diode	F Basing Diode No.1	{6BG7★	6.3	Triode No. 1	...	...	P3	1575	F Basing
{6AZ5★	6.3	DW0-1020	0	60	A	Diode	F Basing Diode No.2	{6BG7★	6.3	DW2-1040	22	...	P3	1575	F Basing
{6AZ6★	6.3	DW0-2048	0	70	A	Diode	F Basing Diode No.1	{6BH6	6.3	JR3-5627	15	...	P3	1260	Pent. Sect.
{6AZ6★	6.3	DW0-7058	0	70	A	Diode	F Basing Diode No.2	{6BH8	6.3	EV7-9860	8	...	P3	3800	Triode Sect.
{6AZ8	6.3	EV6-1230	7	...	D	3800	Pent. Sect.	{6BH8	6.3	EV2-3010	29	...	P3	2100	
{6AZ8	6.3	EV9-8070	21	...	C	2100	Triode Sect.	{6BJ6	6.3	JR3-5627	0	...	P3	2400	Diode No. 1
{6B4	6.3	JR5-3000	67	...	C	1900		{6BJ7	6.3	EV0-8093	0	70	A	Diode	Diode No. 2
{6B5	6.3	JR4-2350	0	...	C	950	Triode Sect. Cap=G	{6BJ7	6.3	EV0-6073	0	70	A	Diode	Diode No. 2
{6B6	6.3	JR0-3070	15	...	B	470	Diode No. 1	{6BJ7	6.3	EV0-2013	0	70	A	Diode	Diode No. 3
{6B6	6.3	JR0-5070	0	0	A	Diode	Diode No. 2	{6BJ8	6.3	EV8-7090	24	...	P3	1750	Triode Sect.
{6B7	6.3	JR0-4070	0	0	A	Diode	Pent. Sect. Cap=G	{6BJ8	6.3	EV0-6030	0	70	A	Diode	Diode No. 1
{6B7	6.3	JR0-2360	30	...	B	630	Diode No. 1	{6BJ8	6.3	EV0-1020	0	70	A	Diode	Diode No. 2
{6B7	6.3	JR0-5360	0	0	A	Diode	Diode No. 1	{6BK5	6.3	EV3-1860	0	...	P3	3450	
{6B7	6.3	JR0-4360	0	0	A	Diode	Diode No. 2								

TABLE 3-7 (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
{6BK6	6.3	JR3-7025	6		P3	790	Triode Sect.	{6BY6	6.3	JR3-5627	21		P3	750	Grid No. 1
{6BK6	6.3	JR0-6025	0	0	P2	Diode	Diode No. 1	{6BY6	6.3	JR7-5623	21		#	315	Grid No. 3
{6BK6	6.3	JR0-5027	0	0	P2	Diode	Diode No. 2	{6BY8	# Hold Down P2	And Press P3					
{6BK7	6.3	EV7-6089	8		P3	5350	Triode No. 1	{6BZ6	6.3	EV1-7892	10		P3	2050	Pent. Sect.
{6BK7	6.3	EV2-1039	8		P3	5350	Triode No. 2	{6BZ6	6.3	EV0-6030	0	70	P2	Diode	Diode Sect.
{6BL4	6.3	JX0-2030	0	65	P7	Rect.		{6BZ7	6.3	JR3-5627	20		P3	1575	
{6BL7	6.3	JX2-1030	24		P3	3150	Triode No. 1	{6BZ7	6.3	EV7-6089	17		P3	4300	Triode No. 1
{6BL7	6.3	JX4-5060	24		P3	3150	Triode No. 2	{6BZ8	6.3	EV2-1039	17		P3	4300	Triode No. 2
{6BN4	6.3	JR2-5030	15		P3	4300		{6BZ8	6.3	EV7-6089	14		P3	3800	Triode No. 1
{6BN6	6.3	JR2-7536	0		P3	440	Limiting Grid	{6C4	6.3	EV2-1039	14		P3	3800	Triode No. 2
{6BN6	6.3	JR6-7532	0		P3	570	Quadrature Grid	{6C5	6.3	JR6-3070	24		P3	1380	
{6BN8	6.3	EV8-7090	15		P3	1600	Triode Sect.	{6C6	6.3	JR5-3070	21		P3	1260	
{6BN8	6.3	EV0-6030	0	70	P2	Diode	Diode No. 1	{6C7	6.3	JR0-2354	21		P3	770	Cap=G
{6BN8	6.3	EV0-1020	0	70	P2	Diode	Diode No. 2	{6C7	6.3	JR0-2060	29	0	P2	780	Triode Sect. Cap=G
{6BQ6	6.3	JR5-0470	50		P3	2800	Cap=P	{6C7	6.3	JR0-5060	0	0	P2	Diode	Diode No. 1
{6BQ7	6.3	EV7-6080	17		P3	3300	Triode No. 1	{6C7	6.3	JR0-4060	0	0	P2	Diode	Diode No. 2
{6BQ7	6.3	EV2-1030	17		P3	3300	Triode No. 2	{6C8	6.3	JR5-6070	17		P3	630	Triode No. 1
{6BQ7A	6.3	EV7-6089	14		P3	4000	Triode No. 1	{6C8	6.3	JR0-3040	17		P3	630	Triode No. 2
{6BQ7A	6.3	EV2-1039	14		P3	4000	Triode No. 2	{6CA5	6.3	JR2-7630	25		P3	3800	
{6BR8	6.3	EV9-6780	15		P3	1420	Pent. Sect.	{6CA7	6.3	JR5-3472	25		P3	3800	
{6BR8	6.3	EV1-2030	16		P3	2840	Triode Sect.	{6CB5	7.5	JR4-0230	39		P3	4400	Cap=P
{6BS8	6.3	EV7-6089	17		P3	4500	Triode No. 1	{6CB6	6.3	JR3-5627	11		P3	3500	Cap=P
{6BS8	6.3	EV2-1039	17		P3	4500	Triode No. 2	{6CD6	6.3	JR5-0730	42		P3	4100	Cap=P
{6BT6	6.3	JR3-7020	13		P3	820	Triode Sect.	{6CE5	6.3	JR3-5620	11		P3	3500	
{6BT6	6.3	JR3-6020	0	35	P2	Diode	Diode No. 1	{6CF6	6.3	JR3-5627	11		P3	3500	
{6BT6	6.3	JR3-5020	0	35	P2	Diode	Diode No. 2								
{6BT8	6.3	EV8-6790	11		P3	3500	Pent. Sect.	{6CG7	6.3	EV7-6089	22		P3	1650	Triode No. 1
{6BT8	6.3	EV0-1030	0	30	P2	Diode	Diode No. 1	{6CG7	6.3	EV2-1039	22		P3	1650	Triode No. 2
{6BT8	6.3	EV0-2030	0	30	P2	Diode	Diode No. 2	{6CG8	6.3	EV9-6780	9		P3	2900	Pent. Sect.
{6BU6	6.3	JR3-7020	34		P3	940	Triode Sect.	{6CG8	6.3	EV1-2030	15		P3	2840	Triode Sect.
{6BU6	6.3	JR3-6020	0	25	P2	Diode	Diode No. 1	{6CH7	6.3	EV7-6080	17		P3	4300	Triode No. 1
{6BU6	6.3	JR3-5020	0	25	P2	Diode	Diode No. 2	{6CH7	6.3	EV2-1030	17		P3	4300	Triode No. 2
{6BU8	6.3	EV7-8219	0		P3	820	Pent. No. 1	{6CH8	6.3	EV7-2360	7		P3	3900	Pent. Sect.
{6BU8	6.3	EV7-3216	0		P3	820	Pent. No. 2	{6CH8	6.3	EV8-9010	21		P3	2100	Triode Sect.
{6BV8	6.3	EV2-3010	18		P3	3500	Triode Sect.	{6CJ6	6.3	EV2-0731	54		P3	2900	Cap=P
{6BV8	6.3	EV0-9070	0	67	P2	Diode	Diode No. 1	{6CK6	6.3	EV2-7136	5		P3	6300	
{6BV8	6.3	EV0-6080	0	67	P2	Diode	Diode No. 2	{6CL6	6.3	EV2-6317	10		P3	3800	
{6BW4	6.3	EV0-7091	0	0	P7	Rect.	Plate No. 1	{6CL8	6.3	EV9-6780	8		P3	2500	Tetrode Sect.
{6BW4	6.3	EV0-1097	0	0	P7	Rect.	Plate No. 2	{6CL8	6.3	EV1-2030	12		P3	4400	Triode Sect.
{6BW8	6.3	EV6-9870	15		P3	1420	Pentode Sect.	{6CM6	6.3	EV3-9170	21		P3	2320	
{6BW8	6.3	EV0-3020	0	70	P2	Diode	Diode No. 1	{6CM7	6.3	EV7-6030	24		P3	1260	Triode No. 1
{6BW8	6.3	EV0-1020	0	70	P2	Diode	Diode No. 2	{6CM7	6.3	EV8-1090	22		P3	2800	Triode No. 2
{6BX6	6.3	EV2-7819	13		P3	1900		{6CM8	6.3	EV2-6730	11		P3	3500	Pentode Sect.
{6BX7	6.3	JX4-5061	33		P3	4800	Triode No. 1	{6CM8	6.3	EV9-1080	18		P3	630	Triode Sect.
{6BX7	6.3	JX2-1035	33		P3	4800	Triode No. 2	{6CN7	6.3	EV7-8060	11		P3	760	Triode Sect.
{6BX8	6.3	EV7-6089	24		P3	3150	Triode No. 1	{6CN7	6.3	EV0-2030	0	70	P2	Diode	Diode No. 1
{6BX8	6.3	EV2-1039	24		P3	3150	Triode No. 2	{6CN7	6.3	EV0-1030	0	70	P2	Diode	Diode No. 2
{6BY5	6.3	JR0-5070	0	38	P7	Rect.	Plate No. 1	{6CQ8	6.3	EV2-6370	16		P3	1900	Tetrode Sect.
{6BY5	6.3	JR0-4020	0	38	P7	Rect.	Plate No. 2	{6CQ8	6.3	EV9-1080	32		P3	2200	Triode Sect.

TABLE 3-7 (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
{6CR6	6.3	JR7-5632	12	...	P3	1225	Pent. Sect.	{6E6	6.3	JR5-6040	54	...	P3	880	Triode No. 1
{6CR6	6.3	JR0-2030	0	0	P2	Diode	Diode Sect.	{6E6	6.3	JR3-2040	54	...	P3	880	Triode No. 2
{6CS6	6.3	JR3-5627	20	...	#	190	Grid No. 1	6E7	6.3	JR0-2364	24	...	P3	950	Cap=G
{6CS6	#	Hold Down P2	And Press	P3	#	315	Grid No. 3	6F4	6.3	JR2-3060	30	...	P3	3800	Cap=G
{6CS6	6.3	JR7-5623	0	...	#	315	Grid No. 3	6F5	6.3	JR0-4072	12	...	P3	630	Cap=G
{6CS7	#	Hold Down P2	And Press	P3	#	315	Grid No. 3	6F6	6.3	JR5-3472	29	...	P3	1260	Cap=G
{6CS7	6.3	EV7-6080	17	...	C	1400	Triode No. 1	{6F7	6.3	JR0-2365	28	...	P3	700	Pent. Sect. Cap=G
{6CS7	6.3	EV3-1090	26	...	D	2840	Triode No. 2	{6F7	6.3	JR5-4362	28	...	P3	315	Triode Sect.
{6CU5	6.3	JR2-7630	10	...	D	5650	Triode No. 2	{6F8	6.3	JR5-6070	23	...	P3	1260	Triode No. 1
{6CU5	#	Hold Down P2	And Press	P3	#	3150	Triode No. 2	{6F8	6.3	JR0-3040	23	...	P3	1260	Triode No. 2 Cap=G
6CU6	6.3	JR5-0470	50	...	C	2800	Cap=P	{6G5	6.3	JR5-4030	0	100	P3	Eye	Eye Open
{6CU8	6.3	EV7-2361	7	...	D	3900	Pentode Sect.	{6G5	6.3	JR5-4230	0	100	P3	Eye	Eye Closed
{6CU8	6.3	EV8-9010	21	...	C	2100	Triode Sect.	6G6	6.3	JR5-3470	12	...	P3	1450	Eye
{6CX8	6.3	EV7-9860	11	...	D	3800	Pentode Sect.	{6G7S	6.3	JR0-2354	36	...	P2	940	Pent. Sect. Cap=G
{6CX8	6.3	EV2-3010	24	...	B	1260	Triode Sect.	{6G7S	6.3	JR0-6030	0	62	P2	Diode	Diode No. 1
6CY5	6.3	JR3-5620	11	...	D	3150	Triode Sect.	{6G7S	6.3	JR0-4030	0	62	P2	Diode	Diode No. 2
{6CY7	#	Hold Down P2	And Press	P3	#	3150	Triode Sect.	6H4	6.3	JR0-4070	0	62	P2	Diode	Diode
{6CY7	6.3	EV7-6080	21	...	B	440	Triode No. 1	{6H5	6.3	JR5-4030	0	100	P3	Eye	Eye Open
6CZ5	6.3	EV2-1090	63	...	C	2500	Triode No. 2	{6H5	6.3	JR5-4230	0	100	P3	Eye	Eye Closed
6D4	6.3	EV3-9170	15	...	C	3000	Triode No. 2	6H6	6.3	JR0-5070	0	62	P2	Diode	Diode No. 1
6D5	6.3	JR3-7050	#	40	A	Thyr.	Triode No. 1	{6H6	6.3	JR0-3040	0	62	P2	Diode	Diode No. 2
6D6	#	Should Strike	Between 75 and 65.	...	D	Read As Rectifier.	Triode No. 1	{6H7M	6.3	JR5-3476	29	...	P3	1260	Pent. Sect.
6D7	6.3	JR5-3070	57	...	B	1260	Triode No. 1	{6H7M	6.3	JR0-6073	0	...	P3	100	Triode Sect. Cap=G
6D8	6.3	JR0-2354	21	...	B	1000	Cap=G	6J4	6.3	JR3-7020	15	...	P3	5700	Triode Sect. Cap=G
{6D8	6.3	JR0-3475	22	...	B	770	Cap=G	6J5	6.3	JR5-3070	22	...	P3	1640	Triode Sect. Cap=G
{6D8	6.3	JR5-6473	30	...	B	630	Pent. Sect. Cap=G	{6J6	6.3	JR5-2070	15	...	P3	2800	Triode No. 1
6DA6	6.3	EV2-7839	15	...	D	1900	Osc. Sect.	{6J6	6.3	JR6-3070	15	...	P3	2800	Triode No. 2
6DB5	6.3	EV3-9120	10	...	D	5650	Osc. Sect.	6J7	6.3	JR0-3475	22	...	P3	770	Cap=G
{6DB6	#	Hold Down P2	And Press	P3	#	380	Grid No. 1	{6J8	6.3	JR5-3476	18	...	P3	630	Heptode Sect. Cap=G
{6DB6	6.3	JR3-5627	14	...	B	380	Grid No. 3	{6J8	6.3	JR5-6473	30	...	P3	315	Triode Sect.
6DC6	6.3	JR3-5627	11	...	D	2840	Grid No. 3	6K4★	6.3	DU2-1050	31	...	P3	2000	C Basing
6DE6	6.3	JR3-5627	11	...	D	3500	Grid No. 3	6K5	6.3	JR0-3070	21	...	P3	630	Cap=G
{6DE7	6.3	EV7-6080	31	...	B	1260	Triode No. 1	6K6	6.3	JR5-3470	34	...	P3	1000	Cap=G
{6DE7	6.3	EV2-1090	55	...	D	4100	Triode No. 2	6K7	6.3	JR0-3475	19	...	P3	910	Cap=G
6DG6	6.3	JR5-3470	10	...	D	5000	Triode No. 2	{6K8	6.3	JR5-3476	11	...	P3	630	Hexode Sect. Cap=G
6DK6	#	Hold Down P2	And Press	P3	#	4100	Triode No. 2	{6K8	6.3	JR5-6473	0	...	P3	1500	Triode Sect.
6DN6	6.3	JR3-5627	8	...	D	4100	Cap=P	6L4	6.3	JR2-3060	25	...	P3	3150	Triode Sect.
6DQ6	6.3	JR5-0730	28	...	D	5650	Cap=P	6L5	6.3	JR5-3070	27	...	P3	950	Cap=G
6DS5	#	Hold Down P2	And Press	P3	#	3800	Cap=P	6L6	6.3	JR5-3472	23	...	P3	3150	Cap Grid. Cap=G
{6DT6	6.3	JR3-5620	16	...	D	3800	Cap=P	{6L7	6.3	JR0-3475	23	...	P3	410	Pin Grid
{6DT6	6.3	JR3-5627	22	...	B	380	Cap=P	{6L7	6.3	JR5-3472	27	...	P3	410	Cap=P.
{6DT6	6.3	JR7-5623	0	...	B	250	Cap=P	6M3	6.3	HR0-0030	0	64	#	Rect.	{Short on 3
{6E5	#	Hold Down P2	And Press	P3	#	3800	Cap=P	6N4	#	Hold Down P8	And Press	P7	#	3800	Cap=P.
{6E5	6.3	JR5-4030	0	100	A	3800	Cap=P	{6N5	6.3	JR3-5020	18	...	P3	3800	{Short on 3
{6E5	6.3	JR5-4230	0	100	A	3800	Cap=P	{6N5	6.3	JR5-4030	0	100	P3	3800	Eye Open
								{6N6	6.3	JR5-4230	0	100	P3	Eye	Eye Closed
								{6N7	6.3	JR5-3470	0	...	P3	950	Eye Open
								{6N7	6.3	JR5-6073	12	...	P3	950	Eye Closed
								{6N7	6.3	JR4-3076	12	...	P3	950	Triode No. 1
								{6N7	6.3	JR4-3076	12	...	P3	950	Triode No. 2

TABLE 3-7 (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
{6N8	6.3	EV2-6139	17	---	P3	1380	Pent. Sect.	{6SR7	6.3	JX1-6032	18	---	P3	1200	Triode Sect.
{6N8	6.3	EV2-7139	0	0	P2	Diode	Diode No. 1	{6SR7	6.3	JX0-5036	0	0	P2	Diode	Diode No. 1
{6N8	6.3	EV2-8139	0	0	P2	Diode	Diode No. 2	{6SR7	6.3	JX0-4036	0	0	P2	Diode	Diode No. 2
6P5	6.3	JR5-3070	29	---	P3	910		6SS7	6.3	JR4-7653	19	---	P3	1160	
{6P7	6.3	BT0-4576	28	---	P3	700	Pent. Sect. Cap=G	{6ST7	6.3	JX1-6032	15	---	P3	1200	Triode Sect.
{6P7	6.3	BT8-6074	28	---	P3	315	Triode Sect.	6ST7	6.3	JX0-5036	0	0	P2	Diode	Diode No. 1
6Q4	6.3	EV1-9030	0	---	P4	6300	Short on 1-2-3-5	{6ST7	OK Above 500 On 3000 Scale						
6O5	6.3	JR5-3070	#	92	P4	Thyr.		{6ST7	OK Above 500 On 3000 Scale						
							Read As Rectifier.								
{6O6	6.3	JR0-3070	17	---	P3	630	Triode Sect. Cap=G	{6SU7	6.3	JX4-5061	7	---	P3	1000	Triode No. 1
{6O6	6.3	JR0-5070	0	0	P2	Diode	Diode No. 1	{6SU7	6.3	JX2-1035	7	---	P3	1000	Triode No. 2
{6O6	6.3	JR0-4070	0	0	P2	Diode	Diode No. 2	{6SV7	6.3	JX1-6430	12	---	P3	1320	Pent. Sect.
{6O7	6.3	JR0-3072	17	---	P3	500	Triode Sect. Cap=G	{6SV7	6.3	JX1-5430	0	62	P2	Diode	Diode Sect.
{6O7	6.3	JR0-5073	0	0	P2	Diode	Diode No. 1	{6SZ7	6.3	JX1-6032	10	---	P3	760	Triode Sect.
{6O7	6.3	JR0-4073	0	0	P2	Diode	Diode No. 2	6SZ7	6.3	JX0-5032	0	0	P2	Diode	Diode No. 1
6R4	6.3	EV1-8030	23	---	P3	2500		{6SZ7	OK Above 500 On 3000 Scale						
{6R7	6.3	JR0-3072	18	---	P3	1200	Triode Sect. Cap=G	{6SZ7	6.3	JX0-4032	0	0	P2	Diode	Diode No. 2
{6R7	6.3	JR0-5073	0	0	P2	Diode	Diode No. 1								
{6R7	6.3	JR0-4073	0	0	P2	Diode	Diode No. 2								
{6R8	6.3	EV8-9072	13	---	P3	1200	Triode Sect.								
{6R8	6.3	EV0-1078	0	67	P2	Diode	Diode No. 1								
{6R8	6.3	EV0-6078	0	67	P2	Diode	Diode No. 2								
{6R8	6.3	EV0-2039	0	67	P2	Diode	Diode No. 3								
6S4	6.3	EV6-9020	17	---	P3	2600									
6S7	6.3	JR0-3475	27	---	P3	1100	Cap=G								
6S8	6.3	JX0-6010	10	---	P3	570	Triode Sect. Cap=G								
6S8	6.3	JX0-4010	0	0	P2	Diode	Diode No. 1								
6S8	6.3	JX0-2010	0	0	P2	Diode	Diode No. 2								
6S8	6.3	JX0-3050	0	0	P2	Diode	Diode No. 3								
6SA7	6.3	JR7-3465	21	---	P3	470	Ampl. Sect.								
6SA7	6.3	JR5-3467	21	---	P3	470	Osc. Sect.								
6SB7	6.3	JR7-3465	16	---	P3	470	Ampl. Sect.								
{6SR7	6.3	JR5-3467	40	---	P3	190	Osc. Sect.								
{6SC7	6.3	JX4-5061	10	---	P3	840	Triode No. 1								
{6SC7	6.3	JX3-1065	10	---	P3	840	Triode No. 2								
6SD7	6.3	JR4-7653	10	---	P3	1900									
6SF5	6.3	JX3-5012	10	---	P3	940									
{6SF7	6.3	JX1-6432	0	---	P3	1260	Pent. Sect.								
{6SF7	6.3	JX0-5436	0	0	P2	Diode	Diode Sect.								
6SG7	6.3	JR4-7652	0	---	P3	2100									
6SH7	6.3	JR4-7652	0	---	P3	2150									
6SJ7	6.3	JR4-7653	20	---	P3	1040									
6SK7	6.3	JR4-7653	10	---	P3	1260									
6SL7	6.3	JX4-5061	7	---	P3	1000	Triode No. 1								
6SL7	6.3	JX2-1035	7	---	P3	1000	Triode No. 2								
6SN7	6.3	JX4-5061	22	---	P3	1650	Triode No. 1								
6SN7	6.3	JX2-1035	22	---	P3	1650	Triode No. 2								
6SQ7	6.3	JX1-6032	11	---	P3	700	Triode Sect.								
6SQ7	6.3	JX0-5036	0	0	P2	Diode	Diode No. 1								
{6SO7	6.3	JX0-4036	0	0	P2	Diode	Diode No. 2								

TABLE 3-7 (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
{6W5	6.3	JR0-5070	0	23	A	P7	Rect.	7C5	6.3	JR6-2370	30	C	P3	1900	Triode Sect.
{6W5	6.3	JR0-3070	0	23	A	P7	Rect.	{7C6	6.3	JR3-2070	10	B	P3	380	Diode No. 1
6W6	6.3	JR5-3470	10	...	D	#	5650	{7C6	6.3	JR0-6072	0	A	P2	Diode	Diode No. 2
	#	Hold Down P2	And P3					{7C6	6.3	JR0-5072	0	A	P2	Diode	Diode No. 2
6W7	6.3	JR0-3475	22	...	B	P3	770	7C7	6.3	JR6-2374	22	B	P3	820	Triode Sect.
{6X4	6.3	JR0-6073	0	16	A	P7	Rect.	7E5	6.3	JS1-3040	15	C	P3	1900	Triode Sect.
{6X4	6.3	JR0-3076	0	16	A	P7	Rect.	{7E6	6.3	JR3-2070	12	B	P2	1380	Diode No. 1
{6X5	6.3	JR0-5072	0	23	A	P7	Rect.	{7E6	6.3	JR0-6072	0	A	P2	Diode	Diode No. 2
{6X5	6.3	JR0-3072	0	23	A	P7	Rect.	{7E6	6.3	JR0-5072	0	A	P2	Diode	Diode No. 2
{6X8	6.3	EV7-9861	9	...	D	P3	2900	{7E7	6.3	JR6-2570	22	B	P3	820	Pent. Sect.
{6X8	6.3	EV2-3861	15	...	D	P3	2840	{7E7	6.3	JR0-4072	0	A	P2	Diode	Diode No. 1
{6Y5	6.3	JR0-5040	0	56	A	P7	Rect.	{7E7	6.3	JR0-3072	0	A	P2	Diode	Diode No. 2
{6Y5	6.3	JR0-3040	0	56	A	P7	Rect.	{7F7	6.3	JR5-6073	0	B	P3	820	Triode No. 1
6Y6	6.3	JR5-3470	33	...	D	P3	3800	{7F7	6.3	JR4-3026	0	B	P3	820	Triode No. 2
{6Y7	6.3	JR5-6073	15	...	B	P3	630	{7F8	6.3	HS8-6050	10	D	P3	3150	Triode No. 1
{6Z4	6.3	JR0-3040	0	35	B	P3	630	{7F8	6.3	HS1-3040	10	D	P3	3150	Triode No. 2
{6Z4	6.3	JR0-2040	0	35	A	P7	Rect.	7G7	6.3	JR6-2374	18	B	P3	1260	Triode No. 1
{6Z5	6.3	JR0-2040	0	20	A	P7	Rect.	{7G8	6.3	JR5-7362	10	B	P3	1320	Tetrode No. 1
{6Z5	12.6	JS0-5040	0	20	A	P7	Rect.	{7G8	6.3	JR4-2367	10	B	P3	1320	Tetrode No. 2
{6Z5	12.6	JS0-3040	0	20	A	P7	Rect.	7H7	6.3	JR6-2374	10	D	P3	2400	Triode No. 1
{6Z7	6.3	JR5-6070	0	...	B	P3	760	{7J7	6.3	JR6-2574	18	B	P3	500	Heptode Sect.
{6Z7	6.3	JR4-3070	0	...	B	P3	760	{7J7	6.3	JR4-3576	18	B	P3	630	Triode Sect.
{6ZY5	6.3	JR0-5070	0	9	A	P7	Rect.	{7K7	6.3	JR4-3020	10	D	P3	1000	Triode Sect.
{6ZY5	6.3	JR0-3070	0	9	A	P7	Rect.	{7K7	6.3	JR0-5070	0	A	P2	Diode	Diode No. 1
7A4	6.3	JR6-2070	22	...	D	P3	1640	{7K7	6.3	JR0-6070	0	A	P2	Diode	Diode No. 2
7A5	6.3	JR6-2370	25	...	D	P3	3800	7L7	6.3	JR6-2374	12	B	P3	1260	Triode No. 1
{7A6	6.3	JR0-6075	0	62	A	P2	Diode	{7N7	6.3	JR5-6073	29	B	P3	1260	Triode No. 2
{7A6	6.3	JR0-3025	0	62	A	P2	Diode	{7N7	6.3	JR6-2374	12	B	P3	1260	Triode No. 2
7A7	6.3	JR6-2374	27	...	B	P3	1100								
{7A8	6.3	JR6-2574	24	...	B	P3	630	{7Q7	6.3	JR6-2374	21	B	P3	500	Ampl. Sect.
{7A8	6.3	JR4-3576	26	...	B	P3	315	{7Q7	6.3	JR4-2376	21	B	P3	500	Osc. Sect.
7AB7	6.3	HS5-3140	10	...	B	P3	1140	{7R7	6.3	JR6-2570	10	C	P3	1900	Pent. Sect.
7AD7	6.3	JR6-2374	0	...	D	P3	3900	{7R7	6.3	JR0-4072	0	A	P2	Diode	Diode No. 1
{7AF7	6.3	JR5-6070	21	...	C	P3	1640	{7R7	6.3	JR0-3072	0	A	P2	Diode	Diode No. 2
{7AF7	6.3	JR4-3020	21	...	C	P3	1640	{7S7	6.3	JR6-2574	18	B	P3	950	Heptode Sect.
7AG7	6.3	JR6-2374	0	...	C	P3	1900	{7T7	6.3	JR4-3576	0	B	P3	950	Triode Sect.
7AH7	6.3	JR6-2374	0	...	C	P3	2100	7V7	6.3	JR6-2374	9	C	P3	1900	Triode Sect.
7AJ7	6.3	JR6-2374	0	...	C	P3	1430	7W7	6.3	JR6-2374	6	C	P3	2500	Triode Sect.
7AK7	6.3	JR6-2374	0	...	C	P3	2500								
{7AU7	6.3	EV7-6080	24	...	B	P3	1400	{7X6	6.3	JR6-2375	10	D	P3	2200	Plate No. 1
{7AU7	6.3	EV2-1030	24	...	B	P3	1400	{7X6	6.3	JR0-6075	0	A	P7	Rect.	Plate No. 2
7B4	6.3	JR6-2070	10	...	D	P3	940	{7X7	6.3	JR3-2040	10	A	P7	Rect.	Triode Sect.
7B5	6.3	JR6-2370	34	...	D	P3	1000	{7X7	6.3	JR0-5040	0	A	P2	Diode	Diode No. 1
{7B6	6.3	JR3-2070	11	...	D	P3	700	{7X7	6.3	JR0-6070	0	A	P2	Diode	Diode No. 2
{7B6	6.3	JR0-6072	0	0	A	P2	Diode	{7Y4	6.3	JR0-6070	0	A	P7	Rect.	Plate No. 1
{7B6	6.3	JR0-5072	0	0	A	P2	Diode	{7Y4	6.3	JR0-3070	0	A	P7	Rect.	Plate No. 2
7B7	6.3	JR6-2374	27	...	B	P3	1070	{7Z4	6.3	JR0-6070	0	A	P7	Rect.	Plate No. 1
{7B8	6.3	JR6-2574	18	...	B	P3	950	{7Z4	6.3	JR0-3070	0	A	P7	Rect.	Plate No. 2
{7B8	6.3	JR4-3576	18	...	B	P3	410	{8AU8	7.5	EV7-9860	10	D	P3	3800	Pent. Sect.
7C4	6.3	JR0-4070	0	51	A	P2	Diode	{8AU8	7.5	EV2-3010	9	D	P3	3100	Triode Sect.

TABLE 3-7 (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
{6AW8A	7.5	EV7-9860	14	.....	P3	4700	Pent. Sect.	12AD6	12.6	JR7-6523	30	0	A	P2	Make no gas test
{8AW8A	7.5	EV2-3010	9	.....	P3	2500	Triode Sect.	{12AD7	12.6	OK Above 700 on 3000 Scale	.....	.....	.....	.....	.....
{8BA8A	7.5	EV7-9860	11	.....	P3	3800	Pentode Sect.	{12AD7	12.6	EV7-6080	8	.....	D	P3	950 Triode No. 1
{8BH8	7.5	EV2-3010	29	.....	P3	1700	Triode Sect.	{12AE6	12.6	EV2-1030	8	.....	D	P3	950 Triode No. 2
{8BH8	7.5	EV7-9860	8	.....	P3	3800	Pent. Sect.	{12AE6	12.6	JR0-7023	0	0	A	P2	Make no gas test.
{8BH8	7.5	EV2-3010	29	.....	P3	2100	Triode Sect.	{12AE6	12.6	OK Above 300 on 3000 Scale.	.....	.....	.....	.....	.....
{8BN8	7.5	EV8-7090	15	.....	P3	1600	Triode Sect.	{12AE6	12.6	JR0-6020	0	0	A	P2	Diode Diode No. 1
{8BN8	7.5	EV0-6030	0	70	A	Diode	Diode No. 1	{12AE6	12.6	JR0-5020	0	0	A	P2	Diode Diode No. 2
{8BN8	7.5	EV0-1020	0	70	A	Diode	Diode No. 2	{12AE7	12.6	EV0-6087	0	45	A	P2	Triode No. 1
{8CG7	7.5	EV7-6089	22	.....	P3	1650	Triode No. 1	{12AE7	12.6	Emission Test — Read as Diode.	.....	.....	.....	.....	Make no gas test.
{8CG7	7.5	EV2-1039	22	.....	P3	1650	Triode No. 2	{12AF6	12.6	EV0-1032	0	58	A	P2	Triode No. 2
{8CM7	7.5	EV7-6030	24	.....	P3	1260	Triode No. 1	{12AG6	12.6	JR3-5672	27	.....	B	#	725
{8CM7	7.5	EV8-1090	22	.....	P3	2800	Triode No. 2	{12AH6	12.6	Hold Down P2 And Press P4	.....	.....	.....	.....	.....
{8CN7	7.5	EV7-8060	11	.....	P3	760	Triode Sect.	{12AH7	12.6	OK Above Diodes OK	.....	.....	.....	.....	.....
{8CN7	7.5	EV0-2030	0	70	A	Diode	Diode No. 1	{12AJ6	12.6	JR0-6020	0	0	A	P2	Make no gas test.
{8CN7	7.5	EV0-1030	0	70	A	Diode	Diode No. 2	{12AJ6	12.6	JR0-5020	0	0	A	P2	Diode Diode No. 1
{8CS7	7.5	EV7-6080	17	.....	P3	1400	Triode No. 1	{12AL5	12.6	JR0-7030	0	67	A	P2	Diode Diode No. 1
{8CS7	7.5	EV3-1090	26	.....	P3	2840	Triode No. 1	{12AL5	12.6	JR0-2050	0	67	A	P2	Diode Diode No. 2
{8CY7	7.5	EV7-6080	21	.....	P3	440	Triode No. 1	{12AL8	12.6	EV0-3672	0	68	A	P2	Tetrode Sect.
{8CY7	7.5	EV2-1090	63	.....	P3	2500	Triode No. 2	{12AL8	12.6	Emission Test — Read as Diode.	.....	.....	.....	.....	Make no gas test.
{8SN7	7.5	JX4-5061	22	.....	P3	1650	Triode No. 1	{12AQ5	12.6	EV0-1098	0	0	A	P2	Make no gas test.
{8SN7	7.5	JX2-1035	22	.....	P3	1650	Triode No. 2	{12AT6	12.6	EV0-1098	0	0	A	P2	Make no gas test.
{9AU7	10.0	EV7-6080	24	.....	P3	1400	Triode No. 1	{12AT6	12.6	OK Above 250 on 3000 Scale.	.....	.....	.....	.....	.....
{9AU7	10.0	EV2-1030	24	.....	P3	1400	Triode No. 2	{12AT6	12.6	JR3-5620	21	.....	C	P3	2320
{9CL8	10.0	EV9-6780	8	.....	P3	2500	Tetrode Sect.	{12AT6	12.6	JR3-7020	11	.....	B	P3	750 Triode Sect.
{9CL8	10.0	EV1-2030	12	.....	P3	4400	Triode Sect.	{12AT6	12.6	JR0-6020	0	0	A	P2	Diode Diode No. 1
{9U8	10.0	EV2-6370	15	.....	P3	1420	Pent. Sect.	{12AT7	12.6	JR0-5020	0	0	A	P2	Diode Diode No. 2
{9U8	10.0	EV9-1080	16	.....	P3	2840	Triode Sect.	{12AT7	12.6	EV7-6080	14	.....	D	P3	2500 Triode No. 1
{9X8	10.0	EV7-9861	9	.....	P3	2900	Pentode Sect.	{12AT7	12.6	EV2-1030	14	.....	D	P3	2500 Triode No. 2
{9X8	10.0	EV2-3861	15	.....	P3	2840	Triode Sect.	{12AU6	12.6	JR3-5672	10	.....	D	P3	2050
{10C8	7.5	JR3-2000	39	.....	P3	790	Triode Sect.	{12AU7	12.6	EV7-6080	24	.....	B	P3	1400 Triode No. 1
{10C8	10.0	EV8-6790	8	.....	P3	3800	Triode Sect.	{12AU7	12.6	EV2-1030	24	.....	B	P3	1400 Triode No. 2
{10DA7	10.0	EV2-1030	13	.....	P3	2800	Triode Sect.	{12AV5	12.6	JR2-5730	50	.....	C	P3	2450
{10DA7	10.0	EV3-1090	55	.....	P3	1650	Triode No. 1	{12AV6	12.6	JR3-7025	12	.....	B	P3	790 Triode Sect.
{10DE7	10.0	EV7-6080	31	.....	P3	3000	Triode No. 2	{12AV6	12.6	JR3-6025	0	0	A	P2	Diode Diode No. 1
{10DE7	10.0	EV2-1090	55	.....	P3	1260	Triode No. 1	{12AV6	12.6	JR3-5026	0	0	A	P2	Diode Diode No. 2
{10Y	7.5	JR3-2000	12	.....	P3	4100	Triode No. 2	{12AV7	12.6	EV7-6082	18	.....	D	P3	2580 Triode No. 1
{11C5	10.0	JR2-7630	32	.....	P3	950	Pent. Sect. Cap=G	{12AV7	12.6	EV2-1037	18	.....	D	P3	2580 Triode No. 2
{12A	5.0	JR3-2000	44	.....	P3	2830	Rect. Sect.	{12AW6	12.6	JR3-5627	10	.....	D	P3	2500
{12A4	12.6	EV2-9010	25	.....	P3	1040	Pent. Sect. Cap=G	{12AX4	12.6	JX0-5030	0	46	A	P7	Rect.
{12A5	12.6	JR4-2350	51	.....	P3	4900	Osc. Sect.	{12AX7	12.6	EV7-6080	8	.....	D	P3	950 Triode No. 1
{12A6	12.6	JR5-3472	12	.....	P3	1130	Make no gas test	{12AX7	12.6	EV2-1030	8	.....	D	P3	950 Triode No. 2
{12A7	12.6	JR0-2365	48	.....	P3	1900	Make no gas test	{12AY7	12.6	EV7-6080	15	.....	D	P3	1100 Triode No. 1
{12A7	12.6	JR0-5042	0	35	A	Rect.	Rect. Sect.	{12AY7	12.6	EV2-1030	15	.....	D	P3	1100 Triode No. 2
{12A8	12.6	JR0-3475	22	.....	P3	630	Rect. Sect.								
{12A8	12.6	JR5-6473	37	.....	P3	190	Osc. Sect.								
{12AB5	12.6	EV3-9170	21	.....	P3	2300	Make no gas test								
{12AC6	12.6	JR2-6573	35	.....	A	†	Make no gas test								

TABLE 3-7 (Cont.) TUBE TEST DATA CHART

Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	
{12AZ7	12.6	EV7-6080	14	...	P3	2500	Triode No. 1	{12CR6	12.6	JR7-5632	18	...	B	P3	1400	Pent. Sect.
{12AZ7	12.6	EV2-1030	14	...	P3	2500	Triode No. 2	{12CR6	12.6	JR0-2030	0	0	A	P2	Diode	Diode Sect.
12B4	12.6	EV2-9010	50	...	P3	4100		{12CS6	12.6	JR3-5627	20	...	B	#	190	Grid No. 1
12B7	12.6	JR6-2374	22	...	P3	1200		{12CS6	#	Hold Down P2 And Press P3						
{12B8	12.6	JR0-3420	22	...	P3	1140	Pent. Sect. Cap=G	{12CS6	12.6	JR7-5623	0	...	B	#	315	Grid No. 3
{12B8	12.6	JR7-5060	0	...	P3	1260	Triode Sect.	{12CT8	#	Hold Down P2 And Press P3						
12BA6	12.6	JR3-5672	9	...	P3	2070		{12CT8	12.6	EV7-9860	10	...	D	P3	3800	Pent. Sect.
{12BA7	12.6	EV7-9132	17	...	P3	470	Ampl. Sect.	{12CT8	12.6	EV2-3010	9	...	D	P3	3100	Triode Sect.
{12BA7	12.6	EV2-9137	25	...	P3	470	Osc. Sect.	{12CU5	12.6	JR2-7630	10	...	D	#	5650	
12BD6	12.6	JR3-5672	13	...	P3	1260		{12CU5	#	Hold Down P2 And Press P3						
{12BE6	12.6	JR7-5623	11	...	P3	900	Ampl. Sect.	12CU6	12.6	JR5-0470	50	...	C	P3	2800	Cap=P
{12BE6	12.6	JR3-5627	0	...	P3	1000	Osc. Sect.	12D4	12.6	JX0-5030	0	50	A	P7	Rect.	
12BF6	12.6	JR3-7020	14	...	P3	1200	Triode Sect.	12DB5	12.6	EV3-9120	10	...	D	#	5650	
{12BF6	12.6	JR3-6020	0	0	P2	Diode	Diode No. 1	{12DF5	#	Hold Down P2 And Press P3						
{12BF6	12.6	JR3-5020	0	0	P2	Diode	Diode No. 2	{12DF5	12.6	EV0-6080	0	0	A	P7	Rect.	Plate No. 1
{12BH7	12.6	EV7-6082	29	...	P3	1500	Triode No. 1	{12DF5	12.6	EV0-1030	0	0	A	P7	Rect.	Plate No. 2
{12BH7	12.6	EV2-1037	29	...	P3	1500	Triode No. 2	12DM5	12.6	JR2-7630	0	...	D	#	5650	
12BK5	12.6	EV3-1860	0	...	P3	3450		{12DM5	#	Hold Down P2 And Press P3						
{12BK6	12.6	JR3-7025	6	...	P3	790	Triode Sect.	12DQ6	12.6	JR5-0470	36	...	D	P3	3800	Cap=P
{12BK6	12.6	JR0-6025	0	0	P2	Diode	Diode No. 1	12F5	12.6	JR0-4070	10	...	D	P3	950	Cap=G
{12BK6	12.6	JR0-5027	0	0	P2	Diode	Diode No. 2	{12F8	12.6	EV9-2378	30	0	A	P2	†	Pent. Sect.
12BL6	12.6	JR2-6573	30	0	P2	†	Make no gas test	{12F8	†	OK Above 300 on 3000 Scale.						
		† OK Above Diodes OK						{12F8	12.6	EV0-6070	0	0	A	P2	†	Make no gas test.
{12BN6	12.6	JR2-7536	0	...	P3	440	Limiter Grid	{12F8	†	OK Above 500 on 3000 Scale						
{12BN6	12.6	JR6-7532	0	...	P3	570	Quadrature Grid	{12F8	12.6	EV0-1070	0	0	A	P2	†	Diode No. 2
12BO6	12.6	JR5-0470	50	...	P3	2800	Cap=P	{12G4	12.6	JR6-3070	22	...	D	P3	1640	Triode No. 1
{12BR7	12.6	EV2-1030	14	...	P2	2500	Triode Sect.	{12G8	12.6	EV0-6078	0	50	A	P2	†	Triode No. 2
{12BR7	12.6	EV0-7080	0	70	P2	Diode	Diode No. 1	{12G8	†	OK Above Diodes OK.						
{12BR7	12.6	EV0-6080	0	70	P2	Diode	Diode No. 2	{12G8	12.6	EV0-1023	0	0	A	P2	†	Triode No. 2
{12BT6	12.6	JR3-7020	13	...	P3	820	Triode Sect.	{12H6	†	OK Above 500 on 3000 Scale.						
{12BT6	12.6	JR3-6020	0	35	P2	Diode	Diode No. 1	{12H6	12.6	JR0-5072	0	62	A	P2	Make no gas test.	
{12BT6	12.6	JR3-5020	0	35	P2	Diode	Diode No. 2	{12H6	12.6	JR0-3042	0	62	A	P2	Diode	
{12BU6	12.6	JR3-7020	34	...	P3	940	Triode Sect.	{12H6	12.6	JR0-3042	0	62	A	P2	Diode	
{12BU6	12.6	JR3-6020	0	25	P2	Diode	Diode No. 1	12J5	12.6	JR5-3072	22	...	D	P3	1640	Triode No. 2
{12BU6	12.6	JR3-5020	0	25	P2	Diode	Diode No. 2	12J7	12.6	JR0-3475	22	...	D	P3	770	Diode
12BV7	12.6	EV2-7813	9	...	P3	5700		{12J8	12.6	EV0-3621	0	45	A	P2	†	Cap=G
{12BW4	12.6	EV0-7091	0	0	P7	Rect.	Plate No. 1	{12J8	†	Emission Test — Read as Diode.						
{12BW4	12.6	EV0-1097	0	0	P7	Rect.	Plate No. 2	{12J8	12.6	EV0-9070	0	56	A	P2	Make no gas test.	
12BY7	12.6	EV2-7813	9	...	P3	5700		{12J8	12.6	EV0-8070	0	56	A	P2	Diode	
{12BZ7	12.6	EV7-6080	8	...	P3	2200	Triode No. 1	{12K5	12.6	JR2-7530	10	...	C	#	1900	Diode No. 2
{12BZ7	12.6	EV2-1030	8	...	P3	2200	Triode No. 2	{12K5	#	Hold Down P2 And Press P3.						
12C5	12.6	JR2-7630	10	...	P3	5650		{12K5	12.6	JR2-7530	10	...	C	#	1900	Make no gas test
		# Hold Down P2 And Press P3						12K7	12.6	JR0-3475	19	...	B	P3	920	Release P3 Before P2
{12C8	12.6	JR0-3672	24	...	P3	725	Pent. Sect. Cap=G	{12K8	12.6	JR5-3476	11	...	B	P3	630	Cap=G
12C8	12.6	JR0-5073	0	0	P2	Diode	Diode No. 1	{12K8	12.6	JR5-6473	0	...	C	P3	1500	Heptode Sect. Cap=G
{12CA5	12.6	JR2-7630	25	...	P3	3800	Diode No. 2	{12L6	12.6	JR5-3470	10	...	D	#	5650	Triode Sect.
12CM6	12.6	EV3-9170	21	...	P3	2320		{12L8	#	Hold Down P2 And Press P3						
12CN5	12.6	JR0-6732	0	40	P2	†	Make no gas test	{12L8	12.6	JW2-7513	10	...	B	P3	1340	Pent. No. 1
		† OK Above Diodes OK						{12L8	12.6	JW3-4512	10	...	B	P3	1340	Pent. No. 2

TABLE 3-7 (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
12Q7	12.6	JR0-3070	17		P3	500	Triode Sect. Cap=G	14A5	12.6	JR6-2370	12		P3	1900	
12Q7	12.6	JR0-5070	0	0	P2	Diode	Diode No. 1	14A7	12.6	JR6-2374	22		P3	1200	
12Q7	12.6	JR0-4070	0	0	A	Diode	Diode No. 2	14AF7	12.6	JR5-6070	21		P3	1640	Triode No. 1
12R5	12.6	JR2-7630	20		#	4400		14AF7	12.6	JR4-3020	21		P3	1640	Triode No. 2
		# Hold Down P2	And Press P3					14B6	12.6	JR3-2070	11		P3	700	Triode Sect.
12S8	12.6	JX0-6010	10		P3	570	Triode Sect. Cap=G	14B6	12.6	JR0-6072	0	0	P2	Diode	
12S8	12.6	JX0-3050	0	0	A	Diode	Diode No. 1	14B6	12.6	JR0-5072	0	0	P2	Diode	Diode No. 2
12S8	12.6	JX0-4010	0	0	A	Diode	Diode No. 2	14B8	12.6	JR6-2574	27		P3	630	Pent. Sect.
12S8	12.6	JX0-2010	0	0	A	Diode	Diode No. 3	14B8	12.6	JR4-3576	18		P3	315	Osc. Sect.
12SA7	12.6	JR7-3465	21		B	470	Ampl. Sect.	14C5	12.6	JR6-2370	23		P3	2330	
12SA7	12.6	JR5-3467	21		B	470	Osc. Sect.	14C7	12.6	JR6-2374	20		P3	990	
12SC7	12.6	JX4-5061	10		D	840	Triode No. 1	14E6	12.6	JR3-2070	12		P3	1380	Triode Sect.
12SC7	12.6	JX3-1065	10		D	840	Triode No. 2	14E6	12.6	JR0-6072	0	0	P2	Diode	Diode No. 1
12SF5	12.6	JX3-5010	10		D	950		14E6	12.6	JR0-5072	0	0	P2	Diode	Diode No. 2
12SF7	12.6	JX1-6432	0		B	1260	Pent. Sect.	14E7	12.6	JR6-2570	24		P3	820	Pent. Sect.
12SF7	12.6	JX0-5036	0	0	A	Diode	Diode Sect.	14E7	12.6	JR0-4072	0	0	P2	Diode	Diode No. 1
12SG7	12.6	JR4-7652	0		C	2100		14E7	12.6	JR0-3072	0	0	P2	Diode	Diode No. 2
12SH7	12.6	JR4-7652	0		C	2150		14F7	12.6	JR5-6073	0		P3	1000	Triode No. 1
12SJ7	12.6	JR4-7653	20		D	1050		14F7	12.6	JR4-3026	0		P3	1000	Triode No. 2
12SK7	12.6	JR4-7653	10		D	1260		14F8	12.6	HS8-6050	10		P3	3150	Triode No. 1
12SL7	12.6	JX4-5061	7		D	1000	Triode No. 1	14F8	12.6	HS1-3040	10		P3	3150	Triode No. 2
12SL7	12.6	JX2-1035	7		D	1000	Triode No. 2	14H7	12.6	JR6-2374	10		P3	2400	
12SN7	12.6	JX4-5061	22		D	1650	Triode No. 1	14J7	12.6	JR6-2574	18		P3	500	Heptode Sect.
12SN7	12.6	JX2-1035	22		D	1650	Triode No. 2	14J7	12.6	JR4-3576	18		P3	630	Triode Sect.
12SQ7	12.6	JX1-6032	11		D	700	Triode Sect.	14N7	12.6	JR5-6073	20		P3	1640	Triode No. 1
12SQ7	12.6	JX0-5036	0	0	A	Diode	Diode No. 1	14N7	12.6	JR4-3026	20		P3	1640	Triode No. 2
12SQ7	12.6	JX0-4036	0	0	A	Diode	Diode No. 2	14O7	12.6	JR6-2374	21		P3	500	Pent. Sect.
12SR7	12.6	JX1-6032	18		B	1200	Triode Sect.	14O7	12.6	JR4-2376	21		P3	1900	Osc. Sect.
12SR7	12.6	JX0-5036	0	0	A	Diode	Diode No. 1	14R7	12.6	JR6-2570	10		P3	500	Pent. Sect.
12SR7	12.6	JX0-4036	0	0	A	Diode	Diode No. 2	14R7	12.6	JR0-4072	0	0	P2	Diode	Diode No. 1
12SW7	12.6	JX1-6032	14		B	1200	Triode Sect.	14R7	12.6	JR0-3072	0	0	P2	Diode	Diode No. 2
12SW7	12.6	JX0-5036	0	0	A	Diode	Diode No. 1	14S7	12.6	JR6-2574	18		P3	950	Heptode Sect.
12SW7	12.6	JX0-4036	0	0	A	Diode	Diode No. 2	14S7	12.6	JR4-3576	0		P3	950	Triode Sect.
12SX7	12.6	JX4-5061	21		D	1640	Triode No. 1	14V7	12.6	JR6-2374	6		P3	2500	
12SX7	12.6	JX2-1035	21		D	1640	Triode No. 2	14W7	12.6	JR6-2375	10		P3	2200	
12SY7	12.6	JR7-3465	21		B	470	Ampl. Sect.	14X7	12.6	JR3-2040	10		P3	630	Triode Sect.
12SY7	12.6	JR5-3467	21		B	470	Osc. Sect.	14X7	12.6	JR0-5040	0	67	P2	Diode	Diode No. 1
12U7	12.6	EV0-6087	0	0	A	†	Triode No. 1	14X7	12.6	JR0-6070	0	67	P2	Diode	Diode No. 2
		† OK Above 300	on 3000 Scale.		A	Make no gas test.		14Y4	12.6	JR0-6070	0	0	A	P7	Rect.
12U7	12.6	EV0-1032	0	0	A	†	Triode No. 2	14Y4	12.6	JR0-3070	0	0	A	P7	Rect.
		† OK Above 300	on 3000 Scale.		A	Make no gas test.		14Z3	12.6	JR0-2030	0	46	A	P7	Rect.
12V6	12.6	JR5-3472	21		C	2320		15	2.0	JR0-2340	10		#	390	Cap=G
12W6	12.6	JR5-3470	10		D	5650		15A6	12.6	EV2-7136	7		P3	6300	
		# Hold Down P2	And Press P3					15R	5.0	JR0-0000	0	86	A	P4	Rect.
12X4	12.6	JR0-6073	0	16	A	Rect.	Plate No. 1	17AV5	20.0	JR2-5730	35		D	P3	3450
12X4	12.6	JR0-3076	0	16	A	Rect.	Plate No. 2		Test" at 1400 on 3000 Scale.						
12Z3	12.6	JR0-2030	0	46	A	Rect.		17AX4	20.0	JX0-5030	0	30	A	P7	Rect.
12Z5	12.6	JR0-6050	0	25	A	Rect.	Plate No. 1		Test" at 1400 on 3000 Scale.						
12Z5	12.6	JR0-2030	0	25	A	Rect.	Plate No. 2								
14A4	12.6	JR6-2070	17		C	1650									

TABLE 3-7 (Cont.) TUBE TEST DATA CHART

Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations
17C5	20.0	JR2-7630	10	D	#	5000	# Hold down P2	25AX4	25.0	JX0-5030	0	46	A	P7	Rect.
		And Press P3.	Make "Line Test" at 1400 on 3000 Scale.					25B5	25.0	JR4-2350	0		B	P3	1570
17CA5	20.0	JR2-7630	15	D	P3	3150	Make "Line Test" at 1400 on 3000 Scale.	25B6	25.0	JR5-3470	52		C	P3	2500
		Test" at 1400 on 3000 Scale.						{25B8	25.0	JR0-3420	22		B	P3	1260
17DQ6	20.0	JR5-0470	36	D	P3	3800	Cap=P	{25B8	25.0	JR7-5060	10		B	P3	950
17H3	20.0	EV0-3010	0	A	P7	Rect.	Make "Line Test" at 1400 on 3000 Scale.	25BK5	25.0	EV3-1860	0		D	P3	3450
		Test" at 1400 on 3000 Scale.						25BQ6	25.0	JR5-0470	50		C	P3	2800
17L6	20.0	JR5-3470	10	D	#	4700	# Hold down P2	25C5	25.0	JR2-7630	10		D	#	5650
		And Press P3.	Make "Line Test" at 1400 on 3000 Scale.					25C6	25.0	JR5-3470	33		D	P3	3800
17R5	20.0	JR2-7630	20	D	#	3150	# Hold down P2	25CA5	25.0	JR2-7630	25		D	P3	3800
		And Press P3.	Make "Line Test" at 1400 on 3000 Scale.					25CD6	25.0	JR5-0730	42		D	P3	4100
18A5	20.0	JR2-5730	43	C	P3	3000		25CU6	25.0	JR5-0470	50		C	P3	2800
{19	2.0	JR4-5000	15	B	P3	630	Triode No. 1	{25D8	25.0	JR0-3420	18		B	P3	1200
{19	2.0	JR3-2000	15	B	P3	630	Triode No. 2	{25D8	25.0	JR5-6020	0		B	P3	700
19AU4	20.0	JX0-5030	0	A	P7	Rect.	Cap=P	{25D8	25.0	JR5-7020	0	25	A	P2	Diode
19BG6	20.0	JR5-0730	18	D	P3	3800	Triode Sect.	{25DN6	25.0	JR5-0730	28		D	#	5650
{19C8	20.0	EV8-9070	12	D	P3	790	Triode Sect.	25DQ6	25.0	JR5-0470	36		D	P3	3800
{19C8	20.0	EV8-6070	0	A	P2	760	Triode Sect.	25EC6	25.0	JR5-0730	50		D	P3	3800
19C8	20.0	EV8-2030	0	A	P2	Diode	Diode No. 1	25F5	25.0	JR2-7630	35		C	P3	2500
19C8	20.0	EV8-1070	0	A	P2	Diode	Diode No. 2	25L6	25.0	JR5-3472	10		D	#	5650
19J6	20.0	JR5-2076	17	D	P3	3350	Triode No. 1	25N6	25.0	JR5-3470	0		B	P3	1570
19J6	20.0	JR6-3075	17	D	P3	3350	Triode No. 2	25T	6.3	JR3-0000	0		B	P3	630
19T8	20.0	EV8-9076	11	B	P3	760	Triode Sect.	25W4	25.0	JX0-5030	0	56	A	P7	Rect.
19T8	20.0	EV0-6071	0	A	P2	Diode	Diode No. 1	25W6	25.0	JR5-3470	10		D	#	5650
19T8	20.0	EV0-2037	0	A	P2	Diode	Diode No. 2	{25Y5	25.0	JR0-5040	0	0	A	P7	Rect.
19T8	20.0	EV0-1078	0	A	P2	Diode	Diode No. 3	25Y5	25.0	JR0-2030	0	0	A	P7	Rect.
19V8	20.0	EV6-1038	11	B	P3	760	Triode Sect.	25Z3	25.0	JR0-2030	0	46	A	P7	Rect.
19V8	20.0	EV0-9032	0	A	P2	Diode	Diode No. 1	25Z4	25.0	JR0-5070	0	56	A	P7	Rect.
19V8	20.0	EV0-7086	0	A	P2	Diode	Diode No. 2	{25Z5	25.0	JR0-5040	0	51	A	P7	Rect.
19V8	20.0	EV0-2038	0	A	P2	Diode	Diode No. 3	{25Z5MG	25.0	JR0-2030	0	51	A	P7	Rect.
19X3	20.0	EV0-9030	0	A	P7	Rect.		{25Z5MG	25.0	JR0-5070	0	51	A	P7	Rect.
{19X8	20.0	EV7-9861	9	D	P3	2900	Pent. Sect.	{25Z6	25.0	JR0-3040	0	51	A	P7	Rect.
{19X8	20.0	EV2-3861	15	D	P3	2840	Triode Sect.	{25Z6	25.0	JR0-5072	0	51	A	P7	Rect.
19Y3	20.0	EV0-9030	0	A	P7	Rect.		26	1.5	JR3-2000	43		B	P3	725
20	3.0	JR3-2000	77	A	P3	330		26A6	25.0	JR3-5672	9		C	P3	2500
RK20A	7.5	JR3-0240	0	C	P3	1600	Cap=P	{26A7	25.0	JW2-7513	11		D	#	3450
VX21	1.1	CX0-4000	0	A	P2	Diode	Pins: F=-2,	26A7	# Hold Down P2 And Press P3	25.0	JW3-4512	11		D	#
		F+=7, P=4, OK Above 250 On 3000 Scale.						26A7	# Hold Down P2 And Press P3	25.0	JW3-4512	11		D	#
21A6	20.0	EV2-0839	45	D	P3	3800	Cap=P	{26BK6	25.0	JR3-7025	6		B	P3	790
22	3.0	JR0-2300	20	B	#	315	Cap=G	26BK6	25.0	JR0-6025	0	0	A	P2	Diode
		# Hold Down P2 And Press P3						26BK6	25.0	JR0-5027	0	0	A	P2	Diode
24	2.5	JR0-2340	12	B	P3	630	Cap=G	26C6	25.0	JR3-7020	18		B	P3	1200
24A	2.5	JR0-2340	12	B	P3	630	Cap=G	26C6	25.0	JR3-6020	0	0	A	P2	Diode
HK24	6.3	JR3-0000	10	B	P3	620	Pin=P	26C6	25.0	JR3-5020	0	0	A	P2	Diode
VT25A	7.5	JR3-2000	30	B	P3	1260		26C6	25.0	JR3-6020	0	0	A	P2	Diode
25A6	25.0	JR5-3470	43	B	P3	1450		26C6	25.0	JR3-5020	0	0	A	P2	Diode
{25A7	25.0	JR5-3476	50	B	P3	1130	Pent. Sect.	26C6	25.0	JR3-5020	0	0	A	P2	Diode
{25A7	25.0	JR0-6023	0	A	P7	Rect.	Rect. Sect.	26C6	25.0	JR3-6020	0	0	A	P2	Diode
25AC5	25.0	JR5-3070	0	B	P3	950		26C6	25.0	JR3-5020	0	0	A	P2	Diode
25AV5	25.0	JR2-5730	50	C	P3	2450									

TABLE 3-7 (Cont.) TUBE TEST DATA CHART

Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations
{26D6	25.0	JR7-5623	11		P3	900	Ampl. Sect.	{40Z5	BLST	JR0-5370					Short on 1-2-3-4-5
{26D6	25.0	JR3-5627	0		P3	1000	Osc. Sect.	{40Z5	50.0	JR0-5070	0	56			Rect.
26E6	25.0	JR5-3470	30		P3	3800		41	6.3	JR4-2350	34				1000
26E6WG	25.0	JR5-3470	30		P3	3800		42	6.3	JR4-2350	29				1260
{26Z5W	25.0	EVO-6080	0	50	P7	Rect.	Plate No. 1	43	25.0	JR4-2350	43				1450
{26Z5W	25.0	EVO-1030	0	50	A	Rect.	Plate No. 2	45	2.5	JR3-2000	61				1170
27	2.5	JR3-2040	41		B	630		45Z3	50.0	HT0-2080	0	51			Rect.
27S	2.5	JR3-2040	41		B	630		{45Z5	BLST	JR0-5370					Short on 1-2-3-4-5
{28D7	25.0	JR7-5362	20		D	2140	Pent. No. 1	{45Z5	50.0	JR0-5070	0	56			Rect.
{28D7	# Hold Down P2	And Press	P3		#	2140	Pent. No. 2	46	2.5	JR3-2400	30				1260
{30	2.0	JR3-2000	40		D	570		47	2.5	JR3-2400	22				1260
31	2.0	JR3-2000	65		B	580		48	25.0	JR4-2350	58				1260
32	2.0	JR0-2300	19		B	400	Cap = G	49	2.0	JR3-2400	49				710
{32L7	35.0	JR5-3470	34		P3	3000	Ampl. Sect.	50	7.5	JR3-2000	61				950
{32L7	35.0	JR0-6023	0	51	C	Rect.	Rect. Sect.	50A5	50.0	JR6-2370	10				5650
33	2.0	JR3-2400	35		A	900		# Hold Down P2	And Press	P3					
{RK33	6.3	JR4-6050	38		B	860	Triode No. 1	50B5	50.0	JR3-5620	10				5650
{RK33	6.3	JR0-3020	38		B	860	Triode No. 2	50BK5	50.0	EV3-1860	0				3450
34	2.0	JR0-2300	17		B	380	Cap = G	50C5	50.0	JR2-7630	10				5650
{RK34	6.3	JR3-0040	18		B	1670	Triode No. 1	50C6	50.0	JR5-3472	33				3800
{RK34	6.3	JR5-0040	18		B	1670	Triode No. 2	50L6	50.0	JR5-3472	10				5650
35	2.5	JR0-2340	24		B	650	Cap = G	{50X6	50.0	JR0-6075	0	51			Rect.
35A5	35.0	JR6-2370	33		D	3700		{50X6	50.0	JR0-3025	0	51			Rect.
35B5	35.0	JR3-5620	32		D	2830		{50Y6	50.0	JR0-5070	0	51			Rect.
35C5	35.0	JR2-7630	32		D	2830		{50Y6	50.0	JR0-3040	0	51			Rect.
35CD6	35.0	JR5-0730	42		D	4100	Cap = P	{50Y7	50.0	JR0-0600	0	51			Rect.
35L6	35.0	JR5-3470	33		D	3700		{50Z7	50.0	JR0-5070	0	51			Rect.
35T	5.0	JR3-0000	11	0	B	620	Pin = P	{50Z7	50.0	JR0-3040	0	51			Rect.
{35W4	BLST	JR0-3670			A	Rect.	Short on 1-2-3-4-5	51/51S	2.5	JR0-2340	24				640
{35W4	35.0	JR0-5070	0	56	A	Rect.	Rect. Sect.	52	6.3	JR3-2400	33				1500
{35Y4	BLST	JR0-2470			A	Rect.	Short on 1-2-3-4-5	53	2.5	JR5-6042	12				950
{35Y4	35.0	JR0-2070	0	56	A	Rect.	Rect. Sect.	53	2.5	JR3-2046	12				950
35Z3	35.0	JR0-2070	0	56	A	Rect.		55	2.5	JR0-2050	39				610
35Z4	35.0	JR0-5070	0	56	A	Rect.		55	2.5	JR0-4050	0	0			Diode
{35Z5	BLST	JR0-5370			A	Rect.	Short on 1-2-3-4-5	55	2.5	JR0-3050	0	0			Diode
{35Z5	35.0	JR0-5070	0	56	A	Rect.	Rect. Sect.	56	2.5	JR3-2040	29				920
{35Z6	35.0	JR0-5070	0	56	A	Rect.	Plate No. 1	57	2.5	JR0-2354	21				770
{35Z6	35.0	JR0-3040	0	56	A	Rect.	Plate No. 2	57A	6.3	JR0-2354	21				770
36	6.3	JR0-2340	24		B	660	Cap = G	58	2.5	JR0-2354	24				900
37	6.3	JR3-2040	41		B	570		58A/58AS	6.3	JR0-2354	24				900
38	6.3	JR0-2340	39		B	660	Cap = G	59	2.5	JR4-2365	22				1260
39/44	6.3	JR0-2340	28		B	630	Cap = G	HY65	6.3	JR5-0407	0				1900
T40	7.5	JR3-0000	0		B	760	Cap = P	KT66	6.3	JR5-3472	15				4000
40	5.0	JR3-2000	32		B	125		VT67	2.0	JR3-2000	40				570

TABLE 3-7 (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	
HY69	6.3	JR3-0240	0	...	P3	1900	Cap=P	{CK113	50.0	JR5-3476	48	...	B	P3	1130	Pent. Sect.
{70A7	75.0	JR5-3470	50	...	P3	1900	Pent. Sect.	{CK113	50.0	JR0-6020	0	46	A	P7	Rect.	Rect. Sect.
70A7	75.0	JR0-2000	0	56	#	Rect.	Rect. Sect.	114B	1.4	JR0-0000	24	0	B	P3	560	{Cap=P {Adj. to Pins 2 & 3 Right Cap=P
{70L7	75.0	JR5-3460	41	...	P3	3150	Pent. Sect.	HY114	1.5	JR0-0000	19	...	B	P3	700	Rect.
70L7	75.0	JR0-7023	0	56	A	Rect.	Rect. Sect.	{117L7	117.0	JR4-3570	37	...	C	P3	2500	Pent. Sect.
71A	5.0	JR3-2000	73	...	P3	1040	Cap=P	{117L7	117.0	JR4-3570	0	56	A	P7	Rect.	Rect. Sect.
72	2.5	JR0-0000	0	86	A	Rect.	Cap=P	{117M7	117.0	JR4-3570	37	...	C	P3	2500	Pent. Sect.
{75	6.3	JR0-2050	11	...	P3	470	Triode Sect. Cap=G	{117M7	117.0	JR0-6020	0	56	A	P7	Rect.	Rect. Sect.
{75	6.3	JR0-4052	0	0	A	Diode	Diode No. 1	{117N7	117.0	JR4-3560	37	...	D	P3	3150	Pent. Sect.
{75	6.3	JR0-3052	0	0	A	Diode	Diode No. 2	{117N7	117.0	JR0-7000	0	56	A	#	Rect.	Rect. Sect.
{75MG	6.3	JR0-4070	11	...	P3	470	Triode Sect. Cap=G	{117P7	117.0	JR4-3560	37	...	C	P3	2500	Pent. Sect.
{75MG	6.3	JR0-5070	0	0	A	Diode	Diode No. 1	{117P7	117.0	JR0-7000	0	67	A	#	Rect.	Rect. Sect.
{75MG	6.3	JR0-6070	0	0	A	Diode	Diode No. 2	{117P7	117.0	JR0-7000	0	67	A	#	Rect.	Rect. Sect.
HY75	6.3	JR0-0000	40	0	B	700	{Right Cap=P {Left=G	117Z3	117.0	JR0-5060	0	56	A	P7	Rect.	Rect.
76	6.3	JR3-2040	29	...	P3	900	Cap=G	117Z4	117.0	JR0-5070	0	56	A	P7	Rect.	Rect.
77	6.3	JR0-2354	21	...	P3	770	Cap=G	{117Z6	117.0	JR0-5070	0	56	A	P7	Rect.	Plate No. 1
78	6.3	JR0-2354	24	...	P3	900	Cap=G	{117Z6	117.0	JR0-3040	0	56	A	P7	Rect.	Plate No. 2
{79	6.3	JR0-5040	15	...	P3	630	Triode No. 1 Cap=G	C182	5.0	JR3-2000	83	...	B	P3	630	Cap=G
{79	6.3	JR3-2040	15	...	P3	630	Triode No. 2	C182A	5.0	JR3-2000	79	...	B	P3	950	Cap=G
{80	5.0	JR0-3000	0	0	A	Rect.	Plate No. 1	182B	5.0	JR3-2000	58	...	B	P3	950	Cap=G
{80	5.0	JR0-2000	0	0	A	Rect.	Plate No. 2	183	5.0	JR3-2000	79	...	B	P3	950	Cap=G
81	7.5	JR0-2000	0	35	A	Rect.	Plate No. 1	205F	5.0	JR3-2000	34	...	B	P3	920	Cap=G
{82	2.5	JR0-3000	0	46	A	Rect.	Plate No. 2	231D	3.0	JR3-2000	49	...	B	P3	340	Cap=G
{82	2.5	JR0-2000	0	46	A	Rect.	Plate No. 1	244A	2.0	JR3-2040	42	...	B	P3	570	Cap=G
{83	5.0	JR0-3000	0	64	A	Rect.	Plate No. 2	245A	2.0	JR0-2340	55	...	B	P3	460	Cap=G
{83	5.0	JR0-2000	0	51	A	Rect.	Plate No. 1	247A	2.0	JR3-2040	33	...	B	P3	580	Cap=G
{83V	5.0	JR0-3000	0	59	A	Rect.	Plate No. 2	{TS251	50.0	JR5-3476	50	...	B	P3	1130	Pent. Sect.
{83V	5.0	JR0-2000	0	59	A	Rect.	Plate No. 1	{TS251	50.0	JR0-6023	0	51	A	P7	Rect.	Rect. Sect.
{84	6.3	JR0-3040	0	35	A	Rect.	Plate No. 2	252A	5.0	JR3-2000	53	0	B	P3	1240	Cap=G
{84	6.3	JR0-2040	0	35	A	Rect.	Plate No. 1	257A	3.0	JR0-2000	49	...	B	P3	340	Cap=G
{85	6.3	JR0-2050	39	...	P3	620	Triode Sect. Cap=G	259A	2.0	JR0-2340	33	...	B	P3	700	Cap=G
{85	6.3	JR0-4052	0	0	A	Diode	Diode No. 1	262B	10.0	JR0-2030	31	...	B	P3	630	Cap=G
{85	6.3	JR0-3052	0	0	A	Diode	Diode No. 2	264B	1.5	JR3-2000	49	...	B	P3	365	Cap=G
{85AS	6.3	JR0-2050	28	...	P3	700	Triode Sect. Cap=G	264C	1.5	JR3-2000	54	...	B	P3	365	Cap=G
{85AS	6.3	JR0-4052	0	0	A	Diode	Diode No. 1	271A	5.0	JR3-2040	32	...	C	P3	1830	Cap=G
{85AS	6.3	JR0-3052	0	0	A	Diode	Diode No. 2	272A	10.0	JR3-2040	51	...	C	P3	600	Cap=G
89/89Y	6.3	JR0-2354	37	...	P3	980	Cap=G	{274A	5.0	JR0-2000	0	0	A	P7	Rect.	Plate No. 1
99	3.0	JR3-2000	55	...	P3	270	{Top Cap=P {Side Cap=G	{274A	5.0	JR0-3000	0	0	A	P7	Rect.	Plate No. 2
HF100	10.0	JR0-0000	22	0	B	620	{Top Cap=P {Side Cap=G	{274B	5.0	HR0-6000	0	14	A	P7	Rect.	Plate No. 1
101D	4.3	JR3-2000	55	...	P3	700	Cap=G	{274B	5.0	HR0-4000	0	14	A	P7	Rect.	Plate No. 2
101F	4.3	JR3-2000	53	...	P3	700	Cap=G	275A	5.0	JR3-2000	68	...	C	P3	1700	Cap=P
102D	2.0	JR3-2000	25	...	P3	315	Cap=G	282A	10.0	JR3-0200	45	0	B	P3	620	Cap=P
102F	2.0	JR3-2000	25	...	P3	365	Cap=G	283A	2.0	JR0-2340	28	...	B	P3	630	Cap=G
104D	4.3	JR3-2000	75	...	P3	700	Cap=G	285A	2.0	JR0-2304	40	...	B	P3	570	Cap=G
CK108	6.3	JR0-2354	21	...	P3	770	Cap=G	286A	2.0	JR0-2354	31	...	B	P3	570	Cap=G
112A	5.0	JR3-2000	44	...	P3	1040	Cap=G	290A	10.0	JR0-2354	31	...	B	P3	640	Cap=G

TABLE 3-7 (Cont.) TUBE TEST DATA CHART

Tube Type	Fill Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations
291A	10.0	JR0-2365	21	...	B	#	Ampl. Sect.
	#	Cap=G, Hold Down P2	...	...	And Press P3	...	
291A	10.0	JR5-4362	47	...	B	P3	Osc. Sect.
292A	10.0	JR0-2050	36	...	B	P3	{Triode Sect. Cap=G
292A	10.0	JR0-4052	0	0	A	P2	Diode
292A	10.0	JR0-3052	0	0	A	P2	Diode No. 1
293A	10.0	JR4-2350	43	...	B	P3	Diode No. 2
294A	10.0	JR0-2340	43	...	B	P3	Cap=G
300B	5.0	JR3-2000	60	...	C	P3	{Triode Sect. Cap=G
303A	2.0	JR0-2050	36	...	B	P3	Cap=G
303A	2.0	JR0-4052	0	0	A	P2	Diode
303A	2.0	JR0-3052	0	0	A	P2	Diode No. 1
307A	5.0	JR3-0204	32	...	B	P3	Diode No. 2
309A	10.0	JR0-2340	31	...	B	P3	Cap=P
310A	10.0	JR0-2354	19	...	D	P3	Cap=G
310B	10.0	JR0-2354	26	...	B	P3	Cap=G
311A	10.0	JR0-2340	38	...	B	P3	Cap=G
313CA	.....	AP8-2010	0	72	A	P4	Rect.
316	2.0	JR3-5000	42	0	B	P3	Cap=P
328A	7.5	JR0-2354	19	...	D	P3	Cap=G
329A	7.5	JR0-2340	38	...	C	P3	Cap=G
336A	10.0	JR4-2350	10	...	D	P3	Cap=G
337A	10.0	JR0-2354	21	...	D	P3	Cap=G
339A	5.0	JR3-0240	0	...	C	P3	Cap=P
347A	6.3	JR0-4070	30	...	B	P3	Cap=G
348A	6.3	JR0-3475	19	...	D	P3	Cap=G
349A	6.3	JR5-3470	10	...	D	P3	Cap=G
350A	6.3	JR3-0240	21	...	D	P3	Cap=P
350B	6.3	JR5-3470	25	...	D	P3	Cap=P
351A	6.3	JR0-5072	0	46	A	P7	Plate No. 1
351A	6.3	JR0-3072	0	46	A	P7	Plate No. 2
352A	10.0	JR0-2050	36	...	B	P3	Triode Sect. Cap=G
352A	10.0	JR0-4050	0	25	A	P2	Diode
352A	10.0	JR0-3050	0	25	A	P2	Diode
367A	6.3	JV6-1470	24	...	D	P3	3800
373A	2.0	JR4-7603	17	...	D	P3	850
374A	3.0	JR4-7602	40	...	D	P3	1700
375A	20.0	JR5-3470	53	...	C	P3	2330
381A	6.3	HR0-5020	0	67	A	P2	Diode
383A	6.3	HR4-6020	25	...	D	P3	1770
SN383E★	6.3	EW3-0512	17	...	D	P3	1825
385A	6.3	HR5-0328	15	...	D	P3	1480
387A	6.3	HR5-0328	15	...	D	P3	2000
396A	6.3	KR3-4028	17	...	D	P3	3300
396A	6.3	KR7-6082	17	...	D	P3	3300
398A	6.3	JR4-7603	35	...	D	P3	3350
399A	1.1	DX6-2100	9	...	B	#	440
	#	Hold Down P2 And Press P3	...	...	...	...	...
{400A	1.1	DX6-2185	35	...	B	P3	315
{400A	1.1	DX8-2165	35	...	B	P3	315
401A	6.3	JR3-5670	12	...	B	#	1260
	#	Hold Down P2 And Press P3	...	...	...	...	...
403A	6.3	JR3-5620	10	...	D	P3	2750
409A	6.3	JR3-5627	10	...	D	P3	1540
{412A	6.3	EV0-9073	0	49	A	P7	Rect.
{412A	6.3	EV0-1037	0	49	A	P7	Rect.
{420	2.5	JR0-3000	0	56	A	P7	Rect.
{420	2.5	JR0-2000	0	56	A	P7	Rect.
{420A	12.6	EV6-8073	0	...	B	P3	630
{420A	12.6	EV3-1026	0	...	B	P3	630
{421A	6.3	JX4-5061	63	...	D	P3	5000
{421A	6.3	JX2-1035	63	...	D	P3	5000
{422A	5.0	HR0-6000	0	54	A	P7	Rect.
{422A	5.0	HR0-4000	0	54	A	P7	Rect.
446A	6.3	JR0-0070	0	...	C	P3	1510
482A	5.0	JR3-2000	79	...	B	P3	950
482B	5.0	JR3-2000	57	...	B	P3	950
483	5.0	JR3-2000	79	...	B	P3	850
484	3.0	JR3-2040	37	...	B	P3	820
484A	3.0	JR3-2040	37	...	B	P3	820
485	3.0	JR3-2040	37	...	B	P3	820
486	3.0	JR3-2040	43	...	B	P3	280
GL502A	6.3	JR5-3076	#	90	A	P4	Thyr.
	#	Should Strike Between 43 and 33. Read as Rectifier	...	...	...	...	...
CK502AX	1.1	DV4-1200	18	...	B	#	380
	#	Hold Down P2 And Press P3	...	...	...	...	...
CK503AX	1.1	DV4-1200	30	...	B	#	150
	#	Hold Down P2 And Press P3	...	...	...	...	...
CK505AX	0.6	DV4-1200	0	...	B	#	100
	#	Hold Down P2 And Press P3	...	...	...	...	...
CK506AX	1.1	DV4-1200	33	...	B	#	315
	#	Hold Down P2 And Press P3	...	...	...	...	...
{CK510AX	0.6	EX1-2300	0	0	A	P4	†
{CK510AX	0.6	EX6-5300	0	0	A	P4	†
	†	Section No. 1 OK Above 100 On 3000 Scale	...	...	...	...	...
	†	Section No. 2 OK Above 100 On 3000 Scale	...	...	...	...	...
CK512AX	0.6	DV4-1200	30	0	A	P4	†
	†	OK Above 500 On 3000 Scale	...	...	...	...	...
CK518AX	1.1	DV4-1200	43	0	A	P4	#
CK522AX	1.1	DV4-1200	38	0	A	P4	#
CK523AX	1.1	DV4-1200	46	0	A	P4	#
CK524AX	1.1	DV4-1200	73	0	A	P4	#

TABLE 3-7 (Cont.) TUBE TEST DATA CHART

Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations
CK525AX	1.1 DV4-1200	48	0	A	P4	#	#OK over Diodes OK	807	6.3 JR3-0240	33	...	C	P3	2400	Cap=P
CK526AX	1.1 DV4-1200	59	0	A	P4	#	#OK over Diodes OK	809	6.3 JR3-0000	0	...	B	P3	1050	Cap=P
CK527AX	1.1 DV4-1200	32	0	A	P4	#		811	6.3 JR3-0000	0	...	B	P3	900	Cap=P
	# OK Over 500 On 3000 Scale							812	6.3 JR3-0000	0	...	B	P3	1400	Cap=P
CK528AX	1.1 DV4-1200	37	0	A	P4	#	#OK over Diodes OK	814	10.0 JR3-0240	0	...	C	P3	1900	Cap=P
CK529AX	1.1 DV4-1200	64	0	A	P4	#	#OK over Diodes OK	815	6.3 HV8-0431	31	...	C	P3	2500	Pent. No. 1
CK533AX	1.1 DV4-1200	40	0	A	P4	†	†OK above Diodes OK		Left Cap=P, Short on 3						
CK541DX	1.1 DV4-1200	40	0	A	P4	†		815	6.3 CV1-0438	31	...	C	P3	2500	Pent. No. 2
	† OK Above 300 On 3000 Scale								Right Cap=P						
CK542DX	1.1 DV4-2100	0	0	A	P2	†		816	2.5 JR0-0000	0	62	A	P7	Rect.	Cap=P
	† OK Above 300 On 3000 Scale							828	10.0 JR3-0204	26	0	B	P3	930	Cap=P
CK543DX	0.6 DV4-2100	0	0	A	P2	†		SD828A★	6.3 EW3-1520	18	...	D	P3	2080	E Basing
	† OK Over 275 On 3000 Scale.							SD828E★	6.3 EW3-0512	17	...	D	P3	1825	
CK544DX	1.1 DV4-1200	30	0	A	P4	#			E Basing, Top Lead=P						
	# OK Over 500 On 3000 Scale														
GL546	6.3 JR3-7520	# 46	A	P7	Thyr.			829	6.3 JR4-5620	0	...	D	P3	2500	Plate No. 1
	# Should Strike Between 70 and 60. Read As Rectifier.								Use adapters.						
CK547DX	1.1 DV4-1200	37	0	A	P4	†		829	6.3 JR4-7620	0	...	D	P3	2500	Plate No. 2
	† OK Above 300 on 3000 Scale								Use adapters.						
CK548DX	1.1 DV4-1200	52	0	A	P4	†		829A	6.3 JR4-5620	0	...	D	P3	2500	Plate No. 1
	† OK Above 300 on 3000 Scale								Use adapters.						
CK551AX	1.1 EW5-1200	20	...	B	#	250	Pent. Sect.	829A	6.3 JR4-7620	0	...	D	P3	2500	Plate No. 2
	# Hold Down P2 And Press P3								Use adapters.						
CK551AX	1.1 EW0-3000	0	0	A	P2	Diode	Diode Sect.	829B	6.3 JR4-5620	0	...	D	P3	2500	Plate No. 1
	OK Over 150 On 3000 Scale								Use adapters.						
CK553AX	1.1 DV4-1200	0	...	B	#	250		829B	6.3 JR4-7620	0	...	D	P3	2500	Plate No. 2
	# Hold Down P2 And Press P3								Use adapters.						
CK556AX	1.1 ES3-1000	31	...	D	P3	1000		832	6.3 JR4-5620	0	...	C	P3	2200	Plate No. 1
559	6.3 JR0-0070	0	62	A	P2	Diode	Cap=P		Use adapters.						
CK568AX	1.1 ES3-1000	40	...	B	P3	280		832	6.3 JR4-7620	0	...	C	P3	2200	Plate No. 2
CK569AX	1.1 DV4-1200	18	...	D	P3	630			Use adapters.						
CK571AX	1.1 DU7-1200	92	...	B	P3	100		832A	6.3 JR4-5620	0	...	C	P3	2200	Plate No. 1
CK573AX	1.1 CU3-1000	34	...	B	P3	1260			Use adapters.						
CK574AX	0.6 DV4-2100	0	0	A	P2	†		832A	6.3 JR4-7620	0	...	C	P3	2200	Plate No. 2
	† OK Over 275 On 3000 Scale								Use adapters.						
CK605CX	6.3 DU7-1265	10	...	D	P3	2780		834	7.5 JR0-0000	0	...	B	P3	1140	{Near Cap=G Far Cap=P
CK606BX	6.3 CT0-1040	0	67	A	P2	Diode									
CK608CX	6.3 DU5-1060	21	...	D	P3	3150		836	4.3 JR0-0000	0	40	A	P7	Rect.	Cap=P
CK619CX	6.3 CT4-1050	8	...	D	P3	2500		837	12.6 JR4-0365	0	...	C	P3	2500	Cap=P
629	2.5 JR3-2040	# 92	A	P4	Thyr.	Read As Rectifier.		841	7.5 JR3-2000	0	...	B	P3	630	Cap=P
	# Should Strike Between 35 and 25.							842	7.5 JR3-2000	61	...	D	P3	750	
704A	4.3 JR0-5000	0	34	A	P2	Diode	{Pin=P Use Adapter Metal Shell=G Use Adapter	843	2.5 JR3-2040	12	...	B	P3	1050	
								864	1.1 JR3-2000	45	...	B	P3	410	
708A	2.0 JR0-5000	34	0	B	P3	900		865	7.5 JR3-0200	34	...	B	P3	390	Cap=P
								866A	2.5 JR0-0000	0	51	A	P7	Rect.	Cap=P
713A	6.3 JR4-7630	0	...	C	P3	2200		871	2.5 JR0-0000	0	51	A	P7	Rect.	Cap=P
717A	6.3 JR4-7630	0	...	C	P3	2200		878	2.5 JR0-0000	0	66	A	P4	Rect.	Cap=P
801A	7.5 JR3-2000	0	...	B	P3	950		879	2.5 JR0-0000	0	80	A	P4	Rect.	Cap=P
802	6.3 JR4-0365	22	...	B	P3	1260		884	6.3 JR5-3070	# 92	...	A	P4	Thyr.	
804	7.5 JR3-0204	17	0	B	P3	1240			# Should Strike Between 77 and 67. Read As Rectifier.						

TABLE 3-7 (Cont.) TUBE TEST DATA CHART

Tube Type	Fill Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations
885	2.5	JR3-2040	# 92	A	P4	Thyr.	
	# Should Strike Between 77 and 67. Read As Rectifier.						
SD917A★	6.3	DU2-1050	17	D	P3	950	C Basing
SN944★	6.3	EW3-0512	15	D	P3	1500	
	E Basing Top Lead=P						
SN946★	6.3	CT0-1040	0	A	P2	Diode	
SN947C★	6.3	CW6-1350	54	C	P3	1900	A Basing
SN947D★	6.3	DU1-5782	54	C	P3	1900	F Basing
SN948★	6.3	FT4-1020	16	D	P3	950	D Basing
SN949C★	6.3	DW7-1250	# 56	A	P7	Thyr.	F Basing
	# Should Strike Between 70 and 60. Read As Rectifier.						
950	2.0	JR3-2400	45	B	P3	600	
951	2.0	JR0-2300	18	B	P3	410	Cap=G
	# Hold Down P2 And Press P3						
SN953D★	6.3	DW1-5720	25	D	P3	2650	F Basing
954	6.3	JR7-0364	21	B	P3	700	Cap=P
SN954★	6.3	ES0-1030	0	A	P7	Rect.	B Basing
SN954B★	6.3	DW0-2050	0	A	P7	Rect.	F Basing
955	6.3	JR4-3060	22	D	P3	1200	
SN955B★	6.3	DW1-7084	16	D	P3	2200	F Basing Triode No. 1
SN955B★	6.3	DW2-5084	16	D	P3	2200	F Basing Triode No. 2
956	6.3	JR7-0364	17	B	P3	950	Cap=P
SN956B	1.1	BS0-0000	0	A	P7	Rect.	Top Lead=P
	OK Over 100 On 3000 Scale.						
957	1.5	JR4-3000	28	B	P3	400	
SN957A★	6.3	FT4-1020	29	D	P3	1380	D Basing
958	1.5	JR4-3000	41	D	P3	750	
958A	1.5	JR4-3000	41	B	P3	750	
959	1.5	JR7-0300	25	B	#	380	
	# Cap=P Hold Down P2 And Press P3						
SN972D★	6.3	DW1-5740	21	B	P3	1260	F Basing
SN973B★	6.3	GT1-5740	21	D	P3	1900	F Basing
SN976C★	6.3	DW1-5740	49	C	P3	2500	F Basing
SD993C★	6.3	DW1-8050	20	D	P3	3660	F Basing
SD995B★	6.3	DW1-5740	21	B	P3	1260	F Basing
FM1000	6.3	JR2-4536	12	B	P3	950	No. 1 Grid
FM1000	6.3	JR6-4532	12	B	P3	950	No. 2 Grid
1003	JR0-5070	0	70	A	P6	Rect.	Plate No. 1
	Hold Button Down For 5 Seconds						
1003	JR0-3070	0	70	A	P6	Rect.	Plate No. 2
	Hold Button Down For 5 Seconds						
CK1005	6.3	GX0-3050	0	A	P4	Rect.	Plate No. 1
CK1005	6.3	GX0-5030	0	A	P4	Rect.	Plate No. 2
SN1006★	6.3	FT4-1020	28	B	P3	300	D Basing
1007	1.1	JX0-3020	0	A	P6	Rect.	Plate No. 1
1007	1.1	JX0-5020	0	A	P6	Rect.	Plate No. 2
CK1027	AP0-8070	0	85	A	P4	Rect.	Cap=P
CK1042	AP0-1050	0	40	A	P6	Rect.	
E1148	6.3	JR0-0070	14	B	P3	1390	{ Upper Cap=P Lower Cap=G
1201	6.3	JS1-3040	18	D	P3	1900	
1203	6.3	JR0-4070	0	A	P2	Diode	
1204	6.3	HS5-3140	10	D	P3	1150	
{1206	6.3	JR5-7362	10	B	P3	1320	Tetrode No. 1
{1206	6.3	JR4-2367	10	B	P3	1320	Tetrode No. 2
1229	2.0	JR0-2300	19	B	#	400	
	# Cap=G Hold Down P2 And Press P3						
1230	2.0	JR3-2000	40	B	P3	570	
1231	6.3	JR6-2374	0	C	P3	1600	
1232	6.3	JR6-2374	18	B	P3	1250	
{1237	2.5	JR0-3000	0	A	P7	Rect.	Plate No. 1
	Short On 1-2-4-5						
1237	2.5	JR0-6000	0	A	P7	Rect.	Plate No. 2
	Short On 1-2-4-5						
1247★	0.6	EV0-0000	0	A	P2	Diode	{ F Basing Top Lead=P
HY1269	12.6	JR3-0240	0	C	P3	2500	
1273	6.3	JR6-2374	11	B	P3	1450	
{1274	6.3	JR0-5073	0	A	P7	Rect.	Plate No. 1
{1274	6.3	JR0-3075	0	A	P7	Rect.	Plate No. 2
1280	12.6	JR6-2374	11	B	P3	1450	
1282	6.3	JR6-2375	10	D	P3	2200	
1284	12.6	JR6-2374	28	B	P3	1250	
1285	25.0	JR5-3470	36	D	P3	3650	
{1291	2.5	BY6-7000	25	B	P3	950	Triode No. 1
{1291	2.5	JR3-2000	25	B	P3	950	Triode No. 2
1293	1.5	JR6-2000	30	B	P3	820	
1294	1.5	JR0-4070	0	A	P2	Diode	
1299	2.5	JR6-2300	37	B	P3	1300	
SRI553D	6.3	JR2-3050	0	D	P3	4700	
1602	7.5	JR3-2000	39	D	P3	790	
1603	6.3	JR0-2354	21	B	P3	770	Cap=G
1609	1.1	JR3-2400	0	B	#	440	
	# Hold Down P2 And Press P3						
1610	2.5	JR3-2400	22	B	P3	1260	
1611	6.3	JR5-3472	29	B	P3	1260	
1612	6.3	JR0-3475	23	B	P3	410	Cap Grid Cap=G
{1612	6.3	JR5-3472	27	B	P3	410	Pin Grid
1613	6.3	JR5-3470	0	B	P3	1400	
1614	6.3	JR5-3472	23	D	P3	3150	
1616	4.2	JR0-0000	0	A	P6	Rect.	Cap=P
1619	2.5	JR5-3407	12	C	P3	2150	
1620	6.3	JR0-3475	22	B	P3	770	Cap=G
1621	6.3	JR5-3470	29	B	P3	1250	
1622	6.3	JR5-3470	23	D	P3	3150	
1623	6.3	JR3-0000	0	B	P3	1400	Cap=P

TABLE 3-7 (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
1624	2.5	JR3-0200	17	...	P3	2500	Cap=P	5603	6.3	JR4-7603	35	...	P3	3350	
1625	12.6	JR4-0360	33	...	P3	2000	Cap=P	{5608A	2.5	JR5-6042	12	...	P3	950	Triode No. 1
1626	12.6	JR5-3070	52	...	P3	1325		{5608A	2.5	JR3-2046	12	...	P3	950	Triode No. 2
{1629	12.6	JR5-4070	0	100	A	Eye	Eye Open	5610	6.3	JR6-3020	27	...	P3	2500	
{1629	12.6	JR5-4370	0	100	A	Eye	Eye Closed	5618	6.3	DX6-2180	24	...	P3	1900	
1631	12.6	JR5-3472	23	...	P3	3150		5633★	6.3	EW3-0512	15	...	P3	1500	
1632	12.6	JR5-3470	10	...	D	5650			E	Basing Top Lead=P		...			
{1633	#	Hold Down P2	And Press	P3				5634★	6.3	EW3-0512	17	...	P3	1825	
{1633	25.0	JX4-5060	23	...	D	1650	Triode No. 1	{5635★	E	Basing Top Lead=P		...			
1634	25.0	JX2-1030	23	...	D	1650	Triode No. 2	{5635★	6.3	DW1-7084	16	...	P3	2200	
1634	12.6	JX4-5062	0	...	B	650	Triode No. 1	{5635★	F	Basing Triode No. 1		...			
1634	12.6	JX3-1062	0	...	B	650	Triode No. 2	{5635★	6.3	DW2-5084	16	...	P3	2200	
1635	6.3	JR4-3070	0	...	B	540	Triode No. 1	{5636★	F	Basing Triode No. 2		...			
1635	6.3	JR5-6070	0	...	B	540	Triode No. 2	{5636★	6.3	DW1-5724	22	...	P3	820	Grid No. 1, F Basing
1641	5.0	JR0-0000	0	42	A	Rect.	{Plate No. 1	{5636★	6.3	DW4-5721	22	...	#	315	Grid No. 3, F Basing
							{Right Cap.		#	Hold Down P2	And Press	P3			
1641	5.0	JR0-0000	0	35	A	Rect.	{Plate No. 2	5637★	6.3	DU2-1050	17	...	P3	950	C Basing
							{Left Cap	5638★	6.3	EW3-1520	18	...	P3	2080	E Basing
1642	6.3	JR4-5060	38	...	B	875	Triode No. 1	5639★	6.3	DW1-5720	25	...	P3	2650	F Basing
1642	6.3	JR0-3020	38	...	B	875	Triode No. 2	5640★	6.3	DW1-5782	54	...	P3	1900	F Basing
1644	12.6	JW2-7513	10	...	B	1350	Pentode No. 1	5641★	6.3	ES0-1030	0	20	A	P7	Rect.
1644	12.6	JW3-4512	10	...	B	1350	Pentode No. 2	5642	1.1	BS0-0000	0	0	A	P7	Rect.
1649	6.3	JR4-7653	10	0	D	3800			OK	Over 100 On 3000 Scale		...			
1650	6.3	JR4-3060	22	...	B	1200		5643★	6.3	DW7-1250	#	56	A	P7	Thyr.
1654	1.5	DX0-0000	0	56	A	Rect.	Cap=P Short on 3	5644★	#	Should Strike	Between 70 and 60.	...	P3	950	Rectifier.
{1655	6.3	JX4-5061	10	...	D	840	Triode No. 1	5645★	6.3	FT4-1020	16	...	P3	1380	D Basing
{1655	6.3	JX3-1065	10	...	D	840	Triode No. 2	5646★	6.3	FT4-1020	29	...	P3	300	D Basing
1657	6.3	JR5-3076	#	90	A	Thyr.		5647★	6.3	CT0-1040	0	67	A	P2	D Basing
	#	Should Strike	Between 43 and 33.	...				5654	6.3	JR3-5620	10	...	P3	2700	A Basing
1658	2.0	JR3-2000	40	...	B	570	Read as Rectifier.	5659	12.6	JR5-3470	22	...	P3	1900	
{1659	2.5	JR0-2050	11	...	B	470	Triode Sect. Cap=G	{5660	12.6	JR0-3670	8	...	P3	840	Pent. Sect. Cap=G
{1659	2.5	JR0-4050	0	0	A	Diode	Diode No. 1	{5660	12.6	JR0-5670	0	0	A	P2	Diode
{1659	2.5	JR0-3050	0	0	A	Diode	Diode No. 2	{5660	12.6	JR0-4670	0	0	A	P2	Diode
1662	2.5	DX8-2100	33	...	B	1260		5661	12.6	JR4-7653	21	...	P3	1250	Diode No. 2
1851	6.3	JR0-3475	10	...	D	3150	Cap=G	5662	6.3	JR3-7050	#	92	A	P4	Thyr.
1852	6.3	JR4-7653	0	...	D	3800			#	Should Strike	Between 35 and 25.	...			
	#	Hold Down P2	And Press	P3				5663	6.3	JR3-7520	#	56	A	P7	Read As Rectifier.
1853	6.3	JR4-7653	0	...	C	2200		{5670	#	Should Strike	Between 70 and 60.	...	P3	3300	Triode No. 1
2050	6.3	JR5-3076	#	90	A	Thyr.		{5670	6.3	KR7-6080	17	...	D	3300	Triode No. 2
	#	Should Strike	Between 43 and 33.	...				5672	6.3	KR3-4020	17	...	D	3300	Triode No. 2
2051	6.3	JR5-3076	#	90	A	Thyr.		5676	1.1	DV4-1200	55	...	B	350	
	#	Should Strike	Between 39 and 29.	...				5676	1.1	ES3-1000	31	...	D	1000	
5516	6.3	JR5-0320	20	...	C	2500	Read as Rectifier.	5677	1.1	ES3-1000	40	...	B	280	
5517	BLST	AP0-8070	0	51	A	Rect.	Cap=P Short on 3	5678	1.1	DV4-1200	18	...	D	630	
5556	4.3	JR3-2000	26	...	B	625	Cap=P	{5679	6.3	JR0-6075	0	62	A	P2	Diode
5590	6.3	JR3-5670	12	...	B	1260		{5679	6.3	JR0-3025	0	62	A	P2	Diode
	#	Hold Down P2	And Press	P3				5686	6.3	EV2-7630	18	...	C	1950	
5591	6.3	JR3-5620	10	...	D	2650						...			

Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations
{5687	12.6	EV7-9061	23	...	P3	4800	Triode No. 1
{5687	12.6	EV2-1039	23	...	P3	4800	Triode No. 2
{5690	6.3	JW0-5073	0	63	P7	Rect.	Unit No. 1
{5690	6.3	BS0-3045	0	63	P7	Rect.	Unit No. 2
{5691	6.3	JX4-5061	7	...	P3	1000	Triode No. 1
{5691	6.3	JX2-1035	7	...	P3	1000	Triode No. 2
{5692	6.3	JX4-5061	22	...	P3	1650	Triode No. 1
{5692	6.3	JX2-1035	22	...	P3	1650	Triode No. 2
{5693	6.3	JR4-7653	20	...	P3	1040	
{5694	6.3	JR4-3020	0	...	P3	1500	Triode No. 1
{5694	6.3	JR5-6070	0	...	P3	1500	Triode No. 2
5696	6.3	JR3-6025	# 56	...	P7	Thyr.	
# Should Strike Between 70 and 60.							
5702	6.3	DU7-1265	10	...	P3	2780	Read As Rectifier.
5703	6.3	DU5-1060	21	...	P3	3150	
5704	6.3	CT0-1040	0	67	P2	Diode	
5718★	6.3	DW1-8057	22	...	P3	3460	F Basing
5719★	6.3	DW1-8057	23	...	P3	500	F Basing
5722	5.0	JR0-3000	0	87	A	#	Diode
# OK Above 520 on 3000 Scale							
5725	6.3	JR3-5627	10	...	P3	1540	
{A5726	6.3	JR7-5623	20	...	P3	760	Ampl. Sect.
{A5726	6.3	JR3-5627	10	...	P3	940	Osc. Sect.
{5726	6.3	JR0-7030	0	67	A	Diode	Diode No. 1
{5726	6.3	JR0-2050	0	67	A	Diode	Diode No. 2
5727	6.3	JR3-6025	# 90	...	A	P4	Thyr.
# Should Strike Between 40 and 30.							
5731	6.3	JR4-3060	20	...	P3	1400	Read As Rectifier.
5732	6.3	JR0-3475	19	...	P3	910	Cap=G
5742	4.3	JR3-2000	10	...	P3	530	
5744	6.3	CT4-1050	8	...	P3	2500	
5749	6.3	JR3-5672	9	...	P3	2070	
{5750	6.3	JR7-5623	11	...	P3	900	Ampl. Sect.
{5750	6.3	JR3-5627	0	...	P3	1000	Osc. Sect.
{5751	12.6	EV7-6080	8	...	P3	950	Triode No. 1
{5751	12.6	EV2-1030	8	...	P3	950	Triode No. 2
{5755	12.6	EV6-8073	0	...	P3	630	Triode No. 1
{5755	12.6	EV3-1026	0	...	P3	630	Triode No. 2
5763	6.3	EV9-1673	8	...	P3	4400	
5767	6.3	JR3-5000	20	0	B		{ Top Ring=P Use Adapter
5784	6.3	DU7-1265	20	...	P3	1130	
5785	1.1	GX0-1000	0	0	A	Rect.	
OK Over 500 On 3000 Scale							
5812	6.3	JR3-5602	34	...	C	2700	
{5814	12.6	EV7-6080	24	...	B	1400	Triode No. 1
{5814	12.6	EV2-1030	24	...	B	1400	Triode No. 2
5823	BLST	AP8-3010	100	87	A	Thyr.	Read As Rectifier
5824	25.0	JR5-3470	52	...	C	2500	
5825	1.5	JR0-0000	0	0	A	Rect.	Cap=P
OK Above 250 On 3000 Scale							
{5829	6.3	DV0-6070	0	67	A	P2	Diode
{5829	6.3	DV0-1020	0	67	A	P2	Diode
{5839	25.0	JR0-5073	0	30	A	P7	Rect.
{5839	25.0	JR0-3075	0	30	A	P7	Rect.
5840★	6.3	DW1-5740	22	...	C	P3	1575
5842	6.3	DZ4-1020	12	0	E	P3	15000
{5844	6.3	JR5-2070	26	...	C	P3	1900
{5844	6.3	JR6-3070	26	...	C	P3	1900
5847	6.3	DE1-6844	15	...	D	P3	3750
5851★	2.5	HR8-3600	30	...	B	P3	1000
{5852	6.3	JR0-5070	0	0	A	P7	F Basing
{5852	6.3	JR0-3070	0	0	A	P7	Plate No. 1
5854★	1.1	DV4-1200	38	...	B	P3	350
{5873★	6.3	BY6-7050	20	...	D	P3	1650
{5873★	6.3	BY -2040	20	...	D	P3	1650
5879	6.3	EV1-8739	21	...	B	P3	630
5881	6.3	JR5-3472	23	...	D	P3	3150
5886	1.1	DU7-2100	34	0	A	P2	†
† OK Above 250 on 3000 Scale.							
{5896★	6.3	DW0-5074	0	52	A	P7	Rect.
{5896★	6.3	DW0-1024	0	52	A	P7	Rect.
5897★	6.3	DW1-8050	20	...	D	P3	3660
5898★	6.3	DW1-8050	23	...	B	P3	500
5899★	6.3	DW1-5740	21	...	B	P3	1260
5900★	6.3	DW1-5740	21	...	B	P3	1260
5901★	6.3	DW1-5740	22	...	C	P3	1575
5902★	6.3	DW1-5720	43	...	C	P3	2650
{5903★	25.0	DW0-5074	0	48	A	P7	F Basing
{5903★	25.0	DW0-1024	0	48	A	P7	Rect.
5904★	25.0	DW1-8050	43	...	B	P3	630
5905★	25.0	DW1-5720	13	...	D	#	1640
# Hold Down P2 And Press P3							
5906★	25.0	DW1-5720	6	...	D	P3	3150
5907★	25.0	DW1-5720	12	...	D	#	1900
# Hold Down P2 And Press P3							
5908★	25.0	DW1-5724	18	...	D	#	1400
# Hold Down P2 And Press P3							
5910	1.5	DX6-2100	19	...	B	P3	440
{5915	6.3	JR7-5623	20	...	B	P3	760
{5915	6.3	JR3-5627	10	...	B	P3	950
5916★	25.0	DW1-5724	22	...	B	P3	820
5930	2.5	JR3-2000	67	...	C	P3	1900
{5931	5.0	HR0-6000	0	35	A	P7	Rect.
{5931	5.0	HR0-4000	0	27	A	P7	Rect.
5932	6.3	JR -3472	23	...	D	P3	3150
5933	6.3	JR3-0240	33	...	C	P3	2400
Cap=P							

TABLE 3-7 (Cont.) TUBE TEST DATA CHART

Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations	Tube Type	FH Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations
{5963	12.6 EV1-6080	30			P3	1260	Triode No. 1	{6110★	6.3 DW0-5074	0	65	A	P2	Diode	F Basing Diode No.1
{5963	12.6 EV2-1030	30			P3	1260	Triode No. 2	{6110★	6.3 DW0-1024	0	65	A	P2	Diode	F Basing Diode No.2
{5964	6.3 JR5-2076	16			P3	3150	Triode No. 1	{6111★	6.3 DW7-8050	24		D	P3	3150	F Basing Triode No.1
{5964	6.3 JR6-3075	16			P3	3150	Triode No. 2	{6111★	6.3 DW2-1040	24		D	P3	3150	F Basing Triode No.2
{5965	12.6 EV7-6081	13			P3	4100	Triode No. 1	{6112★	6.3 DW7-8050	27		B	P3	500	F Basing Triode No.1
{5965	12.6 EV2-1036	13			P3	4100	Triode No. 2	{6112★	6.3 DW2-1040	27		B	P3	500	F Basing Triode No.2
{5967★	1.1 ES6-8013	32			P3	1260	F Basing Triode No.1	{6113	6.3 JX4-5061	7		D	P3	1000	Triode No. 1
{5967★	1.1 ES3-1068	32			P3	1260	F Basing Triode No.2	{6113	6.3 JX2-1035	7		D	P3	1000	Triode No. 2
5971	1.1 FT2-1000	18			P3	1130		6134	6.3 JR4-7653	0		D	#	3800	
5975	6.3 EV3-1020	29			P3	2500		# Hold Down P2 And Press P3							
5977★	6.3 DW1-8053	29			P3	2840	F Basing	6135	6.3 JR6-3070	24		B	P3	1380	
5987★	6.3 DW1-2050	74			P3	1160	F Basing	6136	6.3 JR3-5672	10		D	P3	2050	
5992	6.3 JR5-3470	21			P3	2200		6137	6.3 JR4-7653	10		D	P3	1260	
{5993	6.3 DX0-9051	0	24		P7	Rect.	Plate No. 1	6145	6.3 JR6-2374	0		D	P3	4100	
{5993	6.3 DX0-1059	0	24		P7	Rect.	Plate No. 2	6146	6.3 JR5-0327	30		D	P3	4400	Cap=P
5995	6.3 ET0-1050	0	0		P7	Rect.	Leads=1-3-4-5	6147	2.5 HR8-3600	33		B	P3	1200	
{5998	6.3 JX4-5061	63			P3	5000	Triode No. 1	6152	6.3 EV3-1020	29		D	P3	2500	
{5998	6.3 JX2-1035	63			P3	5000	Triode No. 2	6159	25.0 JR5-0327	30		D	P3	4400	Cap=P
6005	6.3 JR3-5620	21			P3	2320		6169★	6.3 DW1-2040	12		D	P3	3800	
6012	6.3 JR3-5027	#	93		P4	Thyr.		{6184★	6.3 DW0-2048	0	70	A	P2	Diode	F Basing Diode No.1
{6021★	6.3 DW7-8050	25			P3	1575	Read as Rectifier.	{6184★	6.3 DW0-7058	0	70	A	P2	Diode	F Basing Diode No.2
{6021★	6.3 DW2-1040	25			P3	1575	F Basing Triode No.1	6186	6.3 JR3-5620	10		D	P3	2500	
{6026★	6.3 EV7-8030	21			P3	3700	F Basing Triode No.2	{6188	6.3 JX4-5061	7		D	P3	1000	Triode No. 1
6028	20.0 JR3-5627	11			P3	2480	F Basing	{6188	6.3 JX2-1035	7		D	P3	1000	Triode No. 2
6029	1.1 CU3-1000	34			P3	1260		{6189	12.6 EV7-6080	24		B	P3	1400	
{6052★	6.3 DW0-5074	0	52		P7	Rect.	F Basing Plate No. 1	6197	12.6 EV2-1030	24		D	P3	3800	
{6052★	6.3 DW0-1024	0	52		P7	Rect.	F Basing Plate No. 2	{6201	6.3 EV2-6317	10		D	P3	2500	
{6055★	25.0 DW1-8050	43			P3	630	F Basing	{6201	12.6 EV7-6080	14		D	P3	2500	
{6072	12.6 EV7-6080	15			P3	1100	Triode No. 1	{6202	6.3 JR0-6073	0	14	A	P7	Rect.	Plate No. 1
{6080	7.5 JX4-5061	100			P3	2150	Triode No. 2	{6202	6.3 JRO-3076	0	14	A	P7	Rect.	Plate No. 2
{6080	7.5 JX2-1035	100			P3	2150	Triode No. 1	{6203	6.3 EV0-9071	0	40	A	P7	Rect.	Plate No. 1
{6082	25.0 JX4-5061	100			P3	2150	Triode No. 2	{6203	6.3 EV0-1079	0	40	A	P7	Rect.	Plate No. 2
{6082	25.0 JX2-1035	100			P3	2150	Triode No. 1	{6205★	6.3 DW1-5724	22		C	P3	1575	F Basing
6084	6.3 EV9-6138	20			P3	820	Triode No. 2	{6211	12.6 EV7-6082	22		D	P3	2270	Triode No. 1
{6085	12.6 EV7-6080	11			P3	1575	Triode No. 1	{6211	12.6 EV2-1037	22		D	P3	2270	Triode No. 2
{6085	12.6 EV2-1030	11			P3	1575	Triode No. 2	6216	6.3 EV2-1730	23		D	P3	6300	
6086	20.0 EV2-6139	20			P3	2840	Triode No. 2	6247★	6.3 DW2-8050	7		D	P3	1675	F Basing
{6087	5.0 HR0-6000	0	15		P7	Rect.	Plate No. 1	6265	6.3 JR3-5627	15		B	P3	1260	
{6087	5.0 HR0-4000	0	15		P7	Rect.	Plate No. 2	6293	6.3 JR5-0320	25		D	P3	4600	Cap=P
6088	1.1 DV4-1200	20			#	250		{6350	12.6 EV8-6073	25		D	P3	2900	Triode No. 1
6094	6.3 DV1-4280	21			Press P3	2320		{6350	12.6 EV3-1028	25		D	P3	2900	Triode No. 2
6098	6.3 GX8-3520	34			C	3400		6355	6.3 FR3-8270	0	100	A	P3	Eye	{Eye 1 Open Eye 2 Open
6100	6.3 JR6-3070	24			C	1380		6355	6.3 FR8-3270	0	100	A	P3	Eye	{Eye 1 Closed Triode No. 1
{6101	6.3 JR5-2076	16			B	3150	Triode No. 1	{6386	6.3 KR7-6085	25		C	P3	2500	Triode No. 2
{6101	6.3 JR6-3075	16			D	3150	Triode No. 2	{6386	6.3 KR3-4025	25		C	P3	2500	
{6106	5.0 HR0-6000	0	25		A	Rect.	Plate No. 1	6397	2.5 HR8-3600	33		B	P3	1200	
{6106	5.0 HR0-4000	0	25		A	Rect.	Plate No. 2	6417	12.6 EV9-1673	8		D	P3	4400	

Tube Type	File Volts	Selectors	Bias	Shunt Scale	Press	Mut. Cond.	Notations
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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 figure 3-2, 3-3 of instructions.

Test Data For Voltage Regulator Tubes

See Note Below

874	AP0-3010	0	62	A	P4	Volt reg.	Read as Rectifier
5651	AP0-3070	0	56	A	P4	Volt ref.	Read as Rectifier
5651W	AP0-3070	0	56	A	P4	Volt ref.	Read as Rectifier
5783	AP0-3050	0	72	A	P4	Volt reg.	Read as Rectifier
5783WA	AP0-3050	0	72	A	P4	Volt reg.	Read as Rectifier
5787	Blist JP0-3010	0	67	A	P4	Volt reg.	Read as Rectifier
5787WABlist	JP0-3010	0	67	A	P4	Volt reg.	Read as Rectifier
6073	Blist KR0-3020	---	42	A	P4	Volt reg.	Read as Rectifier
6074	JP0-5020	---	42	A	P4	Volt reg.	Read as Rectifier
6213	AP0-3010	---	66	A	P4	Volt reg.	Read as Rectifier
6308	ER0-3010	0	70	A	P4	Volt reg.	Read as Rectifier
6626	Blist KR0-3020	---	42	A	P4	Volt reg.	Read as Rectifier
6627	JP0-5020	---	42	A	P4	Volt reg.	Read as Rectifier

NOTE: The TV-10 /U meter indication for voltage regulator tubes is not a true and conclusive measurement of the tube condition and value. For a complete test of voltage regulator tubes substitute known good tubes of the same type and evaluate results in terms of equipment performance.

Test Data For Voltage Regulator Tubes

See Note Below

0A2/VR150Blist	KR0-3020	0	42	A	P4	Volt reg.	Read as Rectifier
0A2W Blist	KR0-3020	0	42	A	P4	Volt reg.	Read as Rectifier
0A3/VR75	JP0-5010	0	67	A	P4	Volt reg.	Read as Rectifier
0B2	JP0-5020	0	42	A	P4	Volt reg.	Short on 3. Read as Rectifier
0B2W	JP0-5020	0	42	A	P4	Volt reg.	Short on 3. Read as Rectifier
0B3/VR90	JP0-5010	0	69	A	P4	Volt reg.	Read as Rectifier
0C3/VR105	JP0-5010	0	65	A	P4	Volt reg.	Read as Rectifier
0C3W	JP0-5010	0	65	A	P4	Volt reg.	Read as Rectifier
0D3	JP0-5010	0	46	A	P4	Volt reg.	Read as Rectifier
0D3W	JP0-5010	0	46	A	P4	Volt reg.	Read as Rectifier
HD51 Blist	KR0-3020	0	42	A	P4	Volt reg.	Read as Rectifier

NOTE: The TV-10 /U meter indication for voltage regulator tubes is not a true and conclusive measurement of the tube condition and value. For a complete test of voltage regulator tubes substitute known good tubes of the same type and evaluate results in terms of equipment performance.

{ 6463	12.6 EV8-6071	24	...	P3	3300	Triode No. 1
{ 6463	12.6 EV3-1026	24	...	P3	3300	Triode No. 2
6485	6.3 JR3-5672	10	...	P3	3800	
6660	6.3 JR3-5672	9	...	P3	2070	
6661	6.3 JR3-5621	15	...	P3	1260	
6662	6.3 JR3-5627	0	...	P3	2400	
{ 6663	6.3 JR0-7036	0	67	P2	Diode	Diode No. 1
{ 6663	6.3 JR0-2056	0	67	P2	Diode	Diode No. 2
6669	6.3 JR3-5620	21	...	P3	2320	
6677	6.3 EV2-6317	10	...	P3	3800	
{ 6678	6.3 EV2-6370	15	...	P3	1420	Pentode Sect.
{ 6678	6.3 EV9-1080	16	...	P3	2840	Triode Sect.
{ 6679	12.6 EV7-6080	14	...	P3	2500	Triode No. 1
{ 6679	12.6 EV2-1030	14	...	P3	2500	Triode No. 2
{ 6680	12.6 EV7-6080	24	...	P3	1400	Triode No. 1
{ 6680	12.6 EV2-1030	24	...	P3	1400	Triode No. 2
{ 6681	12.6 EV7-6080	8	...	P3	950	Triode No. 1
{ 6681	12.6 EV2-1030	8	...	P3	950	Triode No. 2
{ 6690★	6.3 DW7-5080	22	...	P3	1575	F Basing Triode No. 1
{ 6690★	6.3 DW2-1040	22	...	P3	1575	F Basing Triode No. 2
{ 6754	6.3 EV0-9070	0	53	P7	Rect.	Plate No. 1
{ 6754	6.3 EV0-1030	0	53	P7	Rect.	Plate No. 2
{ 6829	12.6 EV7-6080	13	...	P3	4200	Triode No. 1
{ 6829	12.6 EV2-1030	13	...	P3	4200	Triode No. 2
7193	6.3 JR0-0070	13	...	P3	1900	{ Upper Cap=P Lower Cap=P
8005	10.0 JR3-0000	22	...	P3	1260	Cap=P
8013A	3.0 JR0-0000	0	75	P4	Rect.	Cap=P
8016	1.1 JR0-0000	0	67	P4	Rect.	Cap=P
9001	6.3 JR3-5670	21	...	P3	700	Cap=P
9002	6.3 JR6-3070	22	...	P3	1200	
9003	6.3 JR3-5620	17	...	P3	950	
9004	6.3 JR0-3040	0	67	P2	Diode	Triode No. 1
9005	4.3 JR0-4030	0	51	P2	Diode	Triode No. 2
9006	6.3 JR0-3070	0	51	P2	Diode	Triode No. 1
38142	7.5 JR3-2000	37	...	P3	1400	Triode No. 2
{ XXB	2.5 BY5-6000	10	...	P3	700	Triode Sect.
{ XXB	2.5 JR4-3000	10	...	P3	700	Diode No. 1
{ XXD	12.6 JR5-6070	21	...	P3	1640	Diode No. 2
{ XXD	12.6 JR4-3020	21	...	P3	1640	
{ XXFM	6.3 JR3-2040	10	...	P3	630	
{ XXFM	6.3 JR0-5040	0	67	P2	Diode	Diode No. 1
{ XXFM	6.3 JR0-6070	0	67	P2	Diode	Diode No. 2
XXL	6.3 JR6-2070	18	...	P3	1900	

SECTION 4

PRINCIPLES OF OPERATION

4-1. TUBE TESTER REQUIREMENTS

a. Electron tubes supplied to the Armed Forces are procured under military specifications which impose rigid controls to insure delivery of the highest possible quality tubes to the Services. To adequately determine the condition of tubes which have been in service for some time and of new replacement tubes, a tube tester should provide the following:

- (1) A dynamic mutual conductance test for amplifier-type tubes.
- (2) An emission test for tubes of the diode type which have no grid.
- (3) A means of testing for shorted elements.
- (4) A means of testing amplifier-type tubes for excessive gas content.
- (5) A means of adjusting the input voltage to the test set so that standard test potentials can be maintained despite variations in source voltage.

b. Electron Tube Test Set TV-10/U fulfills all the requirements set forth above.

4-2. BASIC THEORY OF MUTUAL CONDUCTANCE TEST

a. Figure 4-1 is a simple full-wave rectifier circuit. The inner ends of the two power transformer secondary windings are connected to a d-c milliammeter shunted by a center-tapped resistor R_m . Load resistor R_L is connected between the center tap of the transformer and the rectifier filament as in any usual 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 plate P_1 is positive, electron flow is through the lower half of R_m , and the meter tends to deflect in the opposite direction. With the load resistance fixed and equal forces acting on the meter in both cases, the meter needle indicates zero. It cannot follow variations at the lower line frequency because of the inertia of the movement.

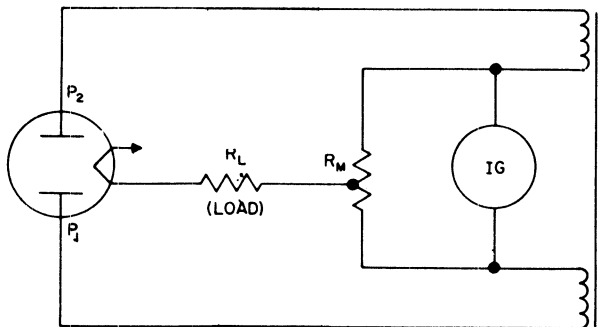


Figure 4-1. Rectifier Diagram Illustrating Theory

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 (figure 4-2), the meter will still read zero because the tube under steady-state conditions acts like a fixed resistance.

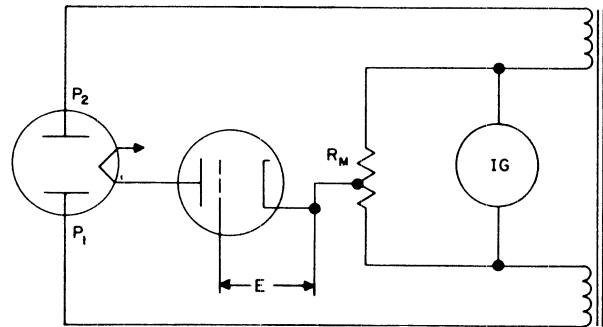
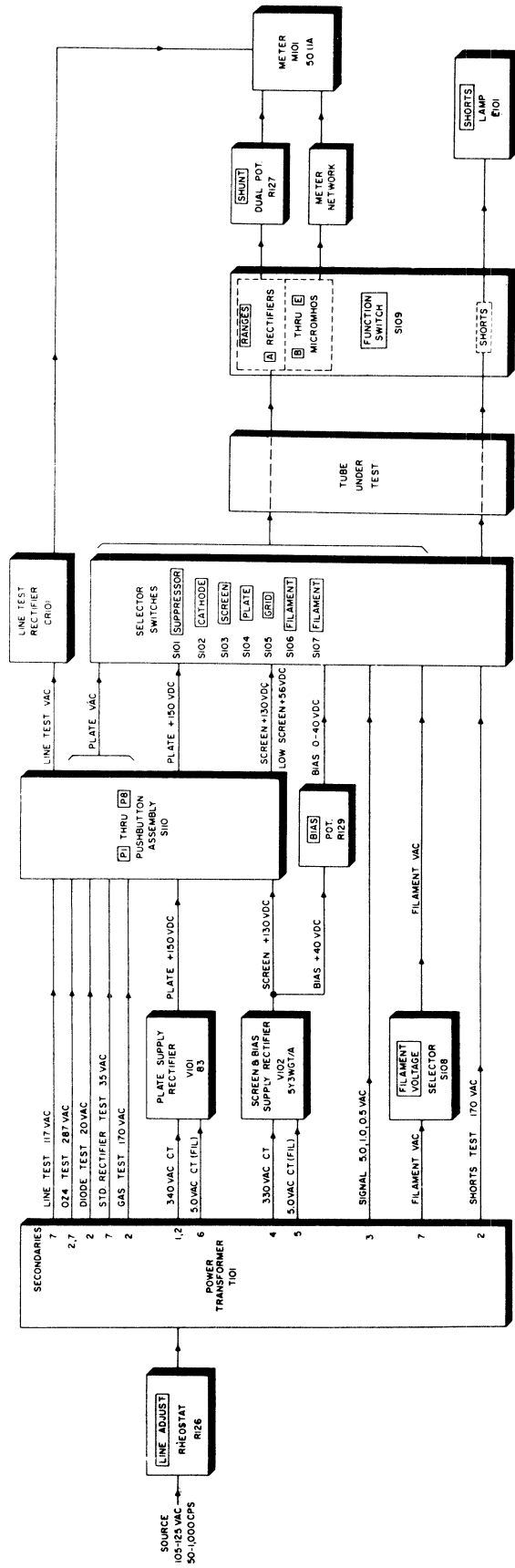


Figure 4-2. Basic Mutual Conductance Circuit Illustrating Theory

c. If an a-c potential is applied to the grid of the tube under test in addition to the d-c bias, the circuit becomes equivalent to that employed for quality and mutual conductance tests in the Electron Tube Test Set TV-10/U. When the a-c potential swings the grid in a positive direction, the plate current of the tube is increased, the plate-cathode resistance is lowered, more current flows through R_m , and the deflecting force on the meter needle is greater than before the a-c signal was applied. 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 needle is smaller. With unbalanced currents on adjacent half-cycles resulting in unequal forces applied to the meter needle, the deflection becomes proportional to the difference in currents. Since this difference is created by the difference of a-c potential applied to the grid, the meter indicates the plate-current changes produced by the applied grid voltage change; or, in other words, the deflection of the meter gives a measure of the mutual conductance of the tube under test.

NOTE

MUTUAL CONDUCTANCE, OR TRANSCONDUCTANCE, IS DEFINED AS THE RATIO OF A SMALL CHANGE IN PLATE CURRENT TO THE CORRESPONDING CHANGE IN CONTROL GRID VOLTAGE WHICH PRODUCES IT. VALUES OF MUTUAL CONDUCTANCE ARE EXPRESSED IN MICROMHOS.



NOTES:
1. TRANSFORMER VOLTAGES SHOWN
ARE NO-LOAD VALUES.

Figure 4-3. Electron Tube Test Set TV-10/U, Functional Block Diagram

4-3. OVERALL FUNCTIONAL DESCRIPTION

(See figure 4-3.)

a. Voltage from a nominal 115-volt, 50 to 1000-cps power source is applied through LINE ADJUST rheostat R126 to power transformer T101. Input voltage is set to a standard value (93 vac) for testing by pressing LINE ADJUST pushbutton P1 and rotating LINE ADJUST rheostat R126 until the output of line test rectifier CR101 causes meter M101 to indicate at the LINE TEST mark at center scale.

b. The TV-10/U power supply consists of power transformer T101, plate supply rectifier tube V101, and screen and bias supply rectifier tube V102. Seven secondary windings on power transformer T101 provide filament, signal, and other necessary a-c voltages for the various tubes and tests, and input power for the rectifier tubes. Rectifiers V101 and V102 provide required d-c plate, screen, and bias voltages.

c. BIAS potentiometer R129 controls the d-c bias applied to the tube under test. It is part of a voltage divider network at the output of screen and bias supply rectifier V102.

d. Pushbutton switch assembly S110 provides a selection of various plate and screen voltages for each test, a line voltage measurement, and meter reversing.

e. FILAMENT VOLTAGE switch S108 selects proper filament voltage for the tube under test. This switch also has an OFF position and a BLST position for testing ballast tubes.

f. Filament, plate, screen, bias, signal, and shorts test voltages as required are applied to selected terminals of the tube under test by means of selector switches S101 through S107, collectively called SELECTORS in this handbook.

g. FUNCTION SWITCH S109 serves a dual purpose:

(1) The SHORTS positions permit the application of an a-c test voltage to various combinations of elements of the tube under test. Inter-electrode shorts are indicated by neon SHORTS lamp E101.

(2) The RANGES positions provide proper meter sensitivity and signal voltages for emission and mutual conductance tests. With the switch at the RANGES—A SHUNT position, SHUNT dual potentiometer R127 governs the meter sensitivity for all emission tests on rectifiers and other diode-type tubes. With the switch at micromho ranges B through E, the meter scale is governed by the meter network for micromho measurements and by the magnitude of the a-c signal applied to the amplifier-type tube under test.

b. In addition to indicating the standard line voltage adjustment, meter M101 reveals the condition of the tube under test.

i. A roll chart contained in the equipment lists proper control settings and rejection limits for each type of tube that can be tested on the TV-10/U.

4-4. POWER SUPPLY CIRCUIT ANALYSIS

(See figure 4-4.)

a. Power at 115 vac $\pm 10\%$, 50 to 1000 cps, is applied to the primary of power transformer T101 through fuse F101, POWER ON-OFF switch S111, LINE ADJUST rheostat R126, and FUSE lamp E103. POWER ON-OFF switch S111 opens and closes the input circuit. Fuse F101 and FUSE lamp E103 protect the test set and the tube

under test from overloads. LINE ADJUST rheostat R126, operated in conjunction with the line test circuit, establishes a standard input of 93 vac across the transformer primary for test purposes.

b. Secondaries No. 1 and No. 2 of power transformer T101 supply approximately 154 vac (measured under load) to the plates of plate supply rectifier tube V101. Type 83 rectifier V101 supplies d-c plate voltage for the tube under test. Secondary No. 2 is tapped at 20 volts to supply plate voltage for detector diode emission tests through current-limiting resistor R117. Secondary No. 2 also supplies voltage for the shorts and noise tests.

c. Secondary No. 3 supplies a 5-volt a-c signal for mutual conductance tests. Resistors R120, R121, and R122 form a voltage divider across this winding to provide additional signal voltages of 1 volt and 0.5 volt.

d. Secondary No. 4, 330 vac center-tapped, supplies the plates of screen and bias supply rectifier tube V102. Across the output of this type 5Y3WGT/A rectifier, a voltage divider network consisting of BIAS potentiometer R129 and tapped resistor R130 provides adjustable bias voltage for mutual conductance tests, and normal and low screen voltages for the tubes to be tested. BIAS FUSE F102, in the bias supply return line, protects rectifier V102 and the tube under test from overloads. A built-in neon lamp lights when fuse F102 is blown.

e. Secondary No. 5, a center-tapped, 5-volt winding, supplies the filament of screen and bias supply rectifier tube V102.

f. Secondary No. 6, 5 vac center-tapped, supplies filament voltage for plate supply rectifier tube V101.

g. Secondary No. 7 is a multitapped winding designed to provide the various filament or heater voltages for the tube under test. A-c plate voltage for rectifier emission tests is also from this winding. PILOT lamp E102 connected across terminals 22 and 28 lights when the transformer is energized.

b. By means of FILAMENT VOLTAGE switch S108, Proper filament voltage is tapped from Secondary No. 7 and applied through selector switches to the tube under test. Center-tapped resistor R110 is connected across the selected filament voltage taps to provide a center tap for filament-type tubes and prevent injection of filament voltage into the grid signal circuit.

i. All voltages are applied to proper terminals of the tube under test through selector switches, pushbutton switches, and contacts of FUNCTION SWITCH S109. The inner ends of Secondaries No. 1 and No. 2 are coupled together either across SHUNT dual potentiometer R127 for emission tests, or across the meter network for micromho measurements during mutual conductance tests.

4-5. LINE VOLTAGE TEST CIRCUIT ANALYSIS

(See figure 4-5.)

a. Input voltage is applied to the TV-10/U Test Set in the manner described in paragraph 4-4a.

b. Meter rectifier CR101 and resistors R123 and R125 form a bridge network. When LINE ADJUST pushbutton P1 is pressed, voltage from transformer T101 terminals 19 and 37 is applied to the bridge input through variable calibrating resistor R134 and current-limiting resistor R124. Across the output of the bridge circuit, meter compensat-

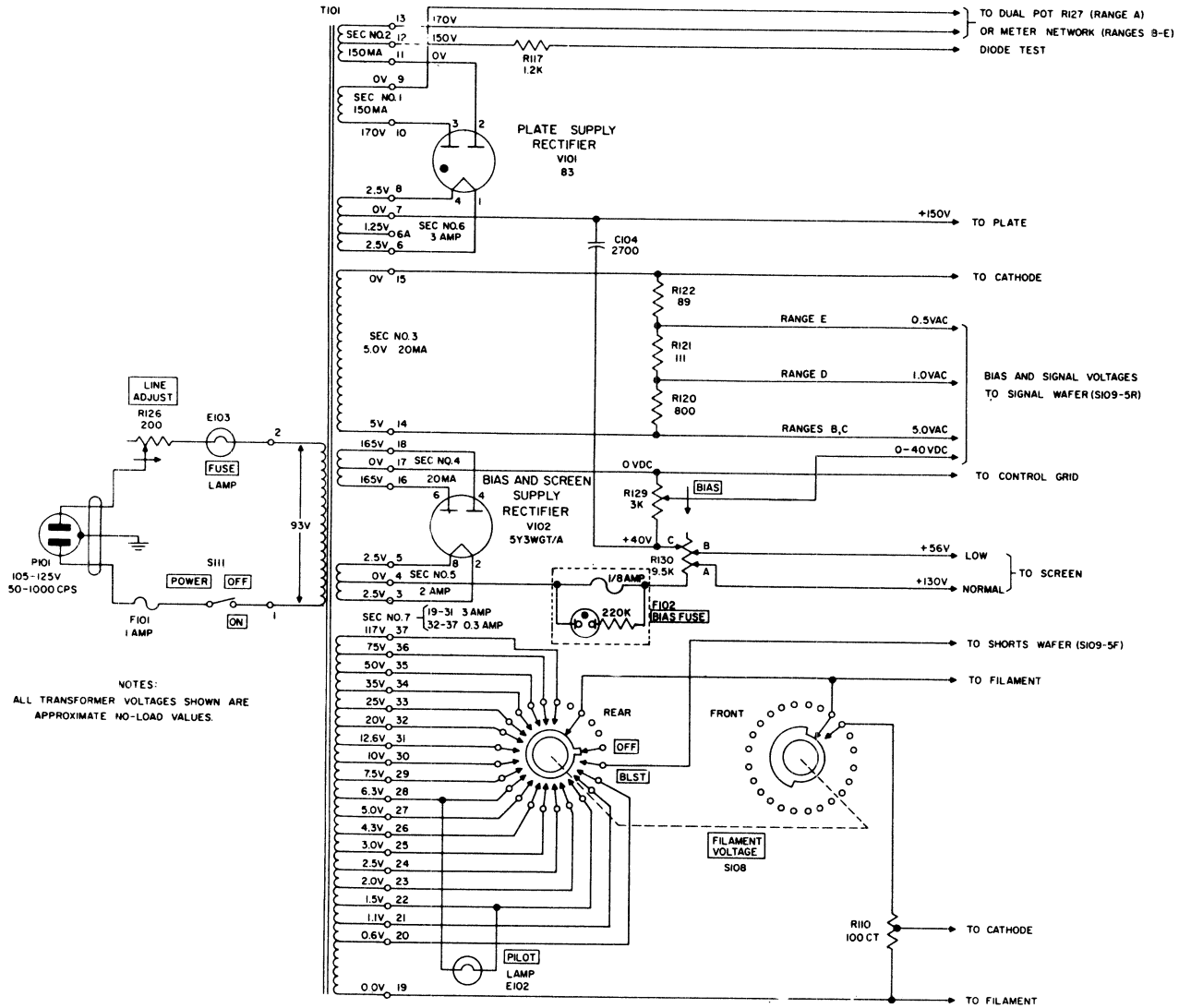


Figure 4-4. Simplified Power Supply Circuit

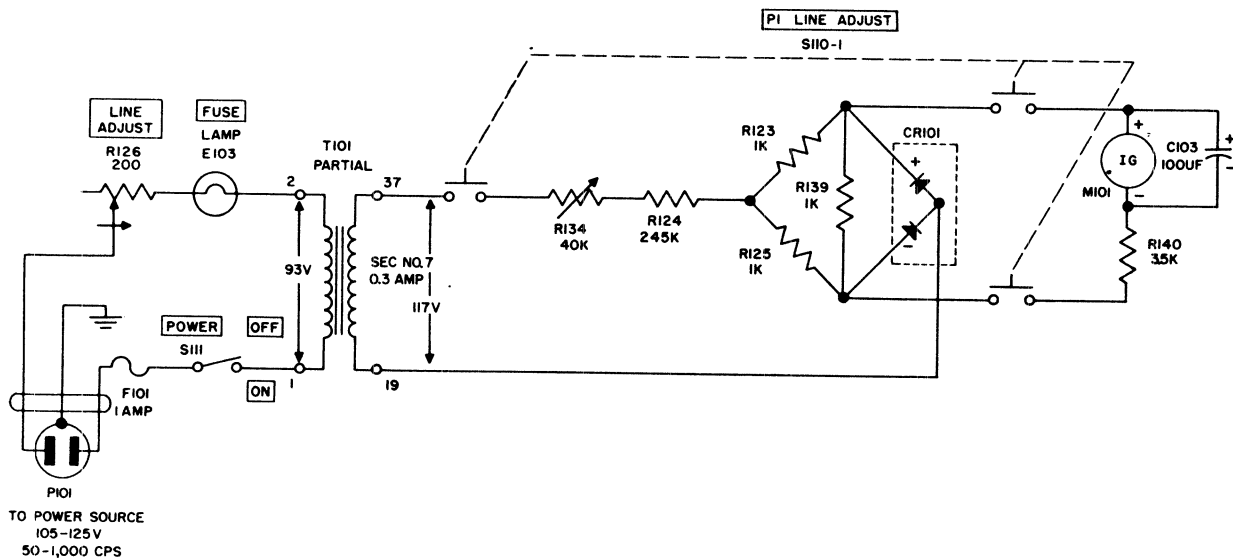


Figure 4-5. Simplified Line Voltage Test Circuit

ing resistor R139 shunts the combination of meter M101, meter bypass capacitor C103, and series compensating resistor R140. Meter M101 records the average value of current flowing in the output circuit. The a-c input to the bridge, the d-c output, and the meter indication will increase with clockwise rotation of the LINE ADJUST rheostat R126.

c. Calibration is such that the LINE ADJUST rheostat is first adjusted to produce 150 vdc plate voltage at the test socket terminals. With the LINE ADJUST rheostat maintained at this setting, LINE ADJUST pushbutton P1 is then pressed, and variable resistor R134 is set so that the needle of meter M101 rests over the LINE TEST mark at midscale. After calibration is accomplished, whenever the line test circuit is used, a meter indication at the LINE TEST mark indicates that standard test voltages are established in the test set.

NOTE

CALIBBRATION WAS ACCOMPLISHED AT THE FACTORY PRIOR TO SHIPMENT, BUT SHOULD BE CHECKED FROM TIME TO TIME.

4-6. SHORTS AND NOISE TEST CIRCUIT ANALYSIS
(See figure 4-6.)

a. When FUNCTION SWITCH S109 is placed at any SHORTS position 1 through 5, approximately 154 vac from transformer T1801 terminals 11 and 13 is applied across voltage divider resistors R107 and R108 through contacts of the shorts test on-off wafer (section 4 front).

b. Approximately 93 vac developed across resistor R107 is applied to a series circuit including blocking capacitor C102, neon SHORTS lamp E101 shunted by resistor R109, and elements of the tube under test through contacts of the shorts wafer (section 5 front). Capacitor C105 acts

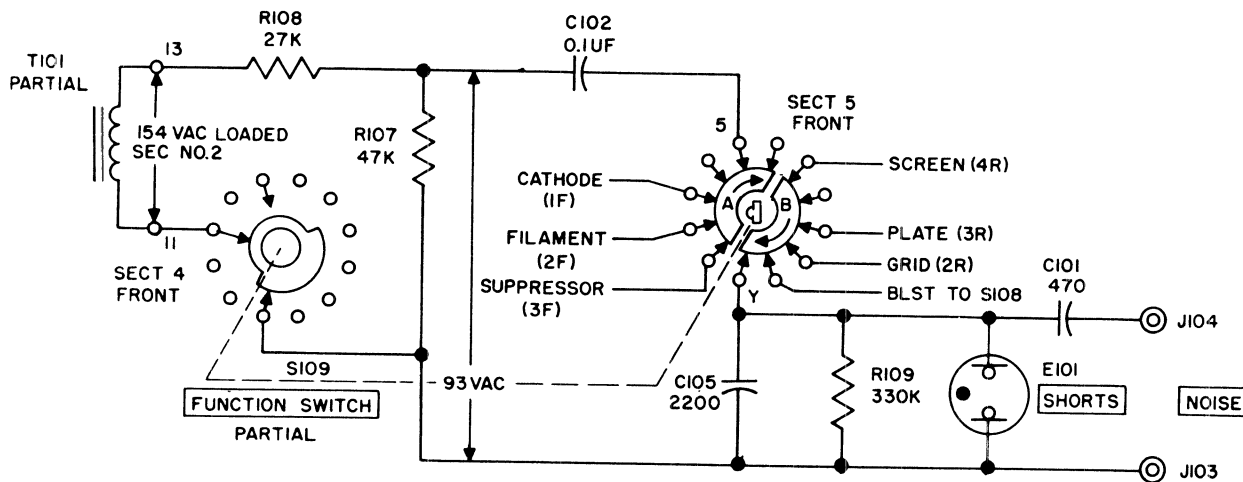
as an oscillation suppressor.

c. The SELECTORS are set correctly for the particular tube. As FUNCTION SWITCH S109 is set to each SHORTS position, different combinations of elements of the tube under test are connected to shorts wafer segments A and B. For SHORTS position 1 shown in the diagram, the cathode, filament, and suppressor are in contact with segment A; the screen, plate, and grid are in contact with segment B. If an inter-electrode short exists between any element connected to segment A and any element connected to segment B, the series circuit is completed and the neon SHORTS lamp will glow steadily.

d. Different types of shorts will cause the neon lamp to glow at different switch positions; for example, a screen-suppressor short will cause the lamp to glow at all five positions while a grid-plate short causes a glow at position 4 only. To identify the various types of shorts, refer to Table 3-3.

e. For purposes of testing the SHORTS lamp and circuit without inserting a test tube, the SELECTORS are positioned at JR 1-1111. At positions 2 and 3 of the FUNCTION SWITCH, external connections complete the circuit across contacts 5 and Y of the shorts wafer and the neon lamp should light.

f. NOISE test jacks J103 and J104 provide means of connecting the test circuit to the antenna and ground posts of a radio receiver. As the FUNCTION SWITCH is rotated through the SHORTS positions and the tube under test is tapped, oscillation of the electrodes may cause intermittent shorts too brief to register on the neon lamp. Such disturbances are coupled through capacitor C101 and the NOISE jacks to the radio receiver, where they are reproduced by the loudspeaker or headphones as an audible signal similar to static.



- NOTES:
1. SHORTS WAFERS (SECT 5F) CONNECTS TO DESIGNATED ELEMENTS OF TUBE UNDER TEST THROUGH INDIVIDUAL S109 WAFERS AND SELECTORS S101 THRU S107.
 2. INFORMATION IN () SIGNIFIES SECTION AND WAFER OF FUNCTION SWITCH S109.

Figure 4-6. Simplified Shorts and Noise Test Circuit

4-7. EMISSION TEST CIRCUITS

(See figures 4-7, 4-8, and 4-9.)

a. Electron Tube Test Set TV-10/U provides three separate but similar emission test circuits for rectifiers and diode detector tubes: one for standard power rectifiers such as type 5Y3, one for detector diodes such as type 6H6, and one for cold cathode rectifiers such as type OZ4. In each test circuit, a different a-c potential is applied across the plate and cathode of the tube under test. The rectifying action of the tube causes a pulsating current to flow through the meter circuit. Because the current indicated by the meter is proportional to the electron emission of the tube, the meter reading is a measure of the efficiency of the tube.

b. For all emission tests, FUNCTION SWITCH S109 is set to the RANGES—A SHUNT position, and SHUNT control R127, which varies the sensitivity of the meter circuit, must be set as indicated in the tube roll chart. SHUNT control R127 is set specifically for each tube so that minimum acceptable emission results in meter deflection at the RECTIFIERS & DIODES mark on the A scale.

c. The diagrams which follow illustrate each emission test circuit, but are designed principally to aid maintenance personnel when signal tracing is necessary. Each diagram shows all switches and other components in their proper relationship in the flow path. The blocks represent switches and wafers through which each circuit is completed. Wafers within each block are designated by numbers and letters which identify their section, location on the switch shaft, and segment, if applicable. Wafers or wafer segments have been given a functional name noted in parentheses near the number and letter designations. To interpret these designations, for example, 6FA (METER-) identifies Section 6 front wafer, segment A, which functions in the negative line to the meter. Pushbutton switches have been simplified and contacts not used in the specific test circuit

eliminated.

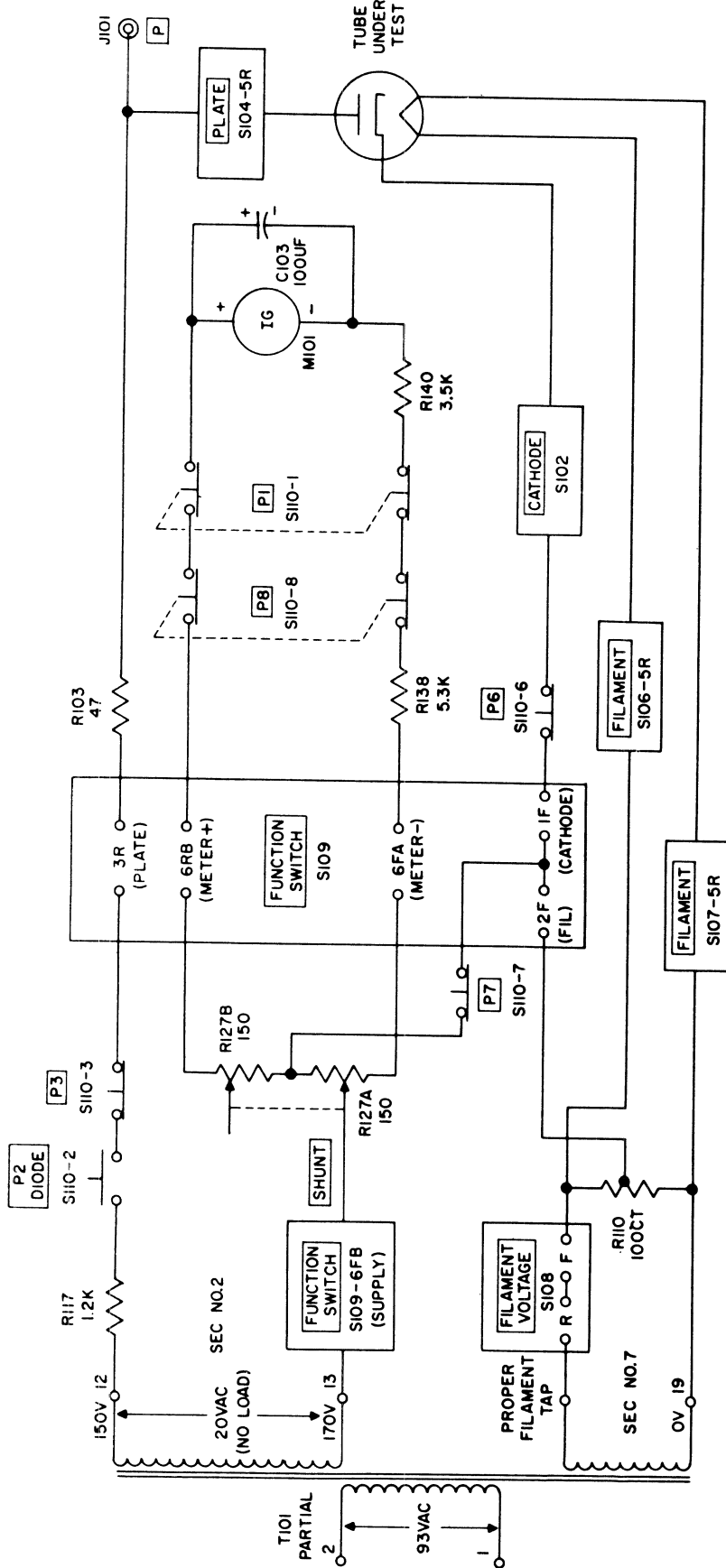
d. STANDARD POWER RECTIFIER TEST CIRCUIT ANALYSIS. (See figure 4-7).

(1) Proper filament voltage from transformer T101 secondary No. 7 is applied to the tube under test through FILAMENT VOLTAGE switch S108 and FILAMENT selectors S107 and S106. The cathode line to the tube is completed from the center tap of resistor R110 through wafers of FUNCTION SWITCH S109, normally-closed contacts of pushbutton P6, and CATHODE selector S102.

(2) When STD pushbutton P7 is pressed, approximately 35 vac from transformer T101 secondary No. 7 is applied across the tube under test, and the metering circuit is completed. The plate circuit is closed through load resistor R106, SHUNT control R127, wafers of FUNCTION SWITCH S109, normally-closed contacts of pushbutton P3, and plate circuit oscillation neutralizing resistor R103. The meter circuit, including series compensating resistors R138 and R140 and normally-closed contacts of pushbuttons P1 and P8, is connected across SHUNT control R127 through contacts of the FUNCTION SWITCH. SHUNT control R127 and meter shunt resistor R112 control the sensitivity of the meter circuit for this test.

(3) Plate jack J101, the red jack marked P on the panel, provides connection for tubes requiring external plate leads. Test meters may also be connected at this jack.

e. DETECTOR DIODE TEST CIRCUIT ANALYSIS (See figure 4-8.) — This circuit is basically quite similar to that of figure 4-7. Major differences are as follows: when DIODE pushbutton P2 is pressed, approximately 20 vac from transformer T101 secondary No. 2 is applied to the tube under test through limiting resistor R117 and the other components noted in sub-paragraph d (2) above. Meter shunt resistor R112 is not used in this circuit.



- NOTES:
1. FUNCTION SWITCH S109 IS IN RANGE A POSITION. SELECTOR SWITCHES ARE IN POSITIONS DESIGNATED ON ROLL CHART FOR TUBE UNDER TEST.
 2. INTERPRET SWITCH BLOCKS AS FOLLOWS:

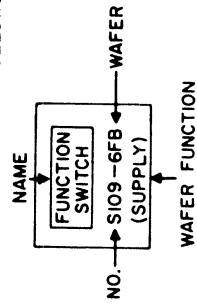
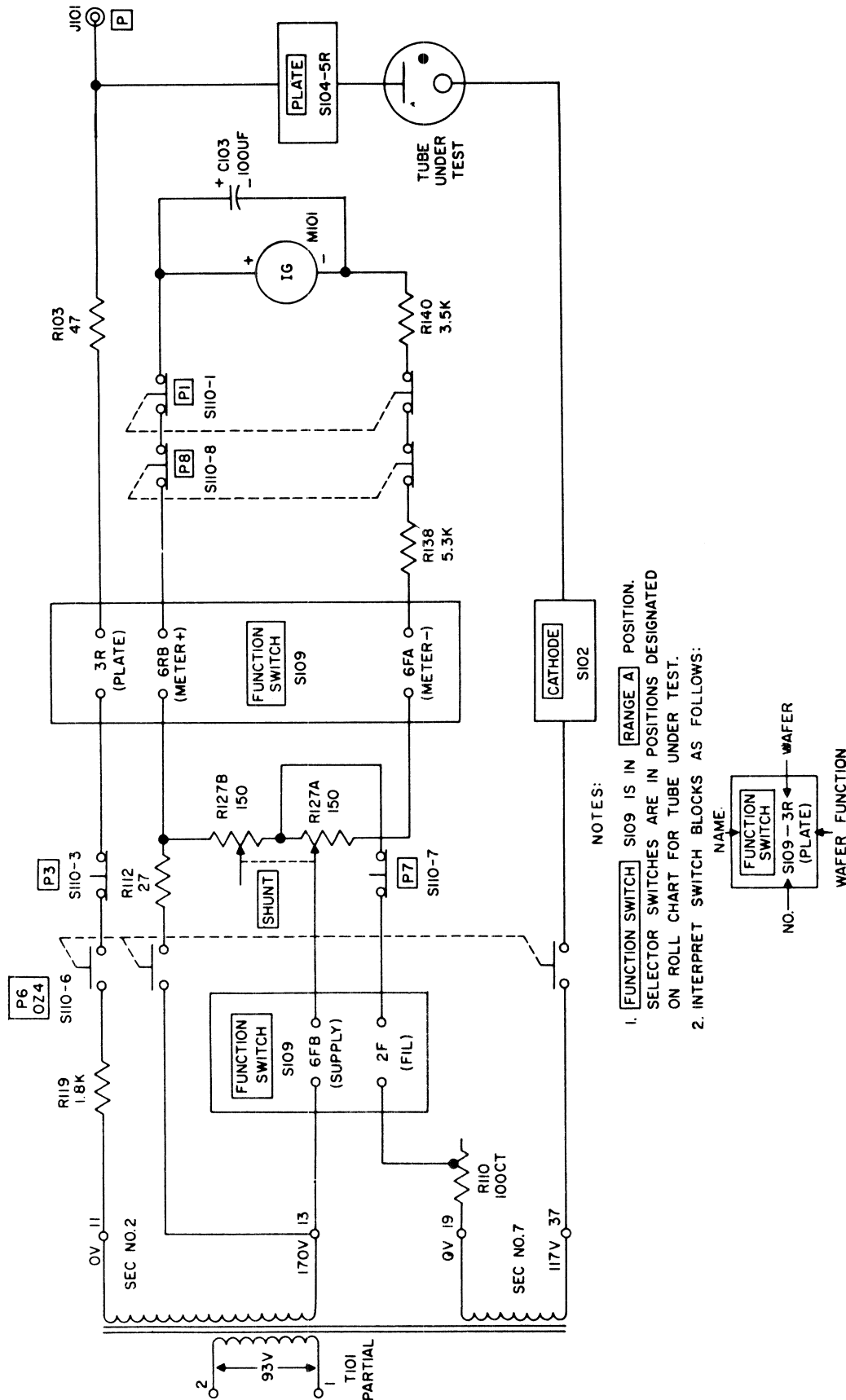


Figure 4-8. Simplified Detector Diode Test Circuit



- NOTES:
1. FUNCTION SWITCH S109 IS IN RANGE A POSITION. SELECTOR SWITCHES ARE IN POSITIONS DESIGNATED ON ROLL CHART FOR TUBE UNDER TEST.
 2. INTERPRET SWITCH BLOCKS AS FOLLOWS:

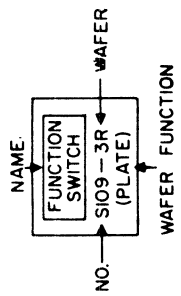


Figure 4-9. Simplified Cold Cathode Rectifier (OZ4) Test Circuit

f. COLD CATHODE RECTIFIER TEST CIRCUIT ANALYSIS. (See figure 4-9.) — When OZ4 pushbutton P6 is pressed, voltages tapped from transformer T101 secondaries No. 2 and No. 7 are applied in series across the plate and cathode of the tube under test through limiting resistor R119 and other components mentioned before. Higher voltage is required to ionize the gas in the tube and cause conduction. The metering circuit again includes shunt resistor R112. No filament voltage is required for this test.

4-8. MUTUAL CONDUCTANCE TEST CIRCUIT ANALYSIS
(See figures 4-4 and 4-10).

a. Refer to figure 4-4. For mutual conductance tests on amplifier-type tubes, full-wave rectifier tube V101 supplies d-c plate voltage, full-wave rectifier tube V102 supplies d-c screen and bias voltages, transformer T101 secondary No. 3 supplies a-c signal voltage, and secondary No. 7 supplies filament voltages. FUNCTION SWITCH S109 must be set at RANGES B, C, D, or E, and red MUT. COND. pushbutton P3 must be pressed.

b. Setting BIAS potentiometer R129 according to the roll chart establishes proper d-c bias for the tube under test. Proper a-c signal voltage, tapped from voltage divider resistors R120, R121, and R122, is applied in series with the d-c grid voltage. This signal voltage alternately swings the grid above and below the d-c bias value and produces the change in grid voltage required for a dynamic test.

c. Refer to figure 4-10. The meter circuit, including meter shunt network resistors R111, R113, R115, R118, R136, R137, and range C shunt resistor R114, is connected in the cathode return of the tube, and measures the change in plate current produced by the signal voltage. Mutual conductance of the tube in micromhos is read directly on the proper scale of the test set meter. The meter range depends upon the a-c signal voltage applied to the tube under test, and upon the value of shunt resistance presented by the meter network for micromho measurements. Both these factors are governed by FUNCTION SWITCH S109 as follows:

(1) At RANGES B, a 5-volt, a-c signal is applied to the tube under test, the entire shunt network except for range C shunt resistor R114 is connected, and the meter range is 0 to 3,000 micromhos.

(2) At RANGES C, the same 6-volt, a-c signal is applied, but range C shunt resistor R114 is inserted, the resistance of the meter shunt network is halved, and the scale is therefore doubled, or 0 to 6,000 micromhos.

(3) At RANGES D, resistor R114 is disconnected, and signal voltage applied from the junction of resistors R120 and R121 (see figure 4-4) provides 20% (200/1000) of the original value, or 1 vac. Reducing the signal by a factor of five increases the original B range of the meter by the same factor to 5 x 3,000, or 15,000 micromhos.

(4) At RANGES E, resistor R121 is shorted out, and signal voltage tapped from the junction of resistors R120 and R122 is approximately 10% (89/889) of the original value, or 0.5 vac. Accordingly, meter range B is increased, by a factor of 10 x 3,000, or 30,000 micromhos.

d. With all controls properly set, filament, bias, and signal voltages are applied to the proper terminals of the tube under test through the selector switches. When MUT.

COND. pushbutton P3 is pressed, plate and normal screen voltages are applied, and the meter circuit is completed. If DIODE pushbutton P2 is pressed and held while P3 is pressed, low screen voltage is substituted for normal screen voltage. Resistors R102, R103, and R104 are oscillation suppressors in the screen, plate, and grid lines, respectively. In the meter circuit, resistors R138 and R140 provide series compensation; variable resistors R113, R114, and R115 permit recalibration. Action of pushbutton P3 shorts out R116, a limiting resistor in the plate supply rectifier circuit. R101, connected between SUPPRESSOR selector S101 and CATHODE selector S102, is a grid resistor used when testing converter tubes.

4-9. GAS TEST CIRCUIT ANALYSIS (See figure 4-10.)

a. With all controls correctly set for the amplifier-type tube to be tested, filament voltage and proper d-c bias are supplied. When GAS NO. 1 pushbutton P4 is pressed, a-c plate voltage from transformer T101 terminals 11 and 13 is applied through series resistor R119. A definite value of plate current flows, and is indicated on meter M101.

b. With P4 held down and GAS NO. 2 pushbutton P5 pressed, series resistor R128 is inserted in the grid circuit. If the tube contains gas, grid current will flow from the bias voltage source through the grid circuit to the cathode, and create a voltage drop across resistor R128. This drop reduces the negative bias on the grid, causes an increase in plate current, and the needle of meter M101 moves up-scale. If the increase exceeds one scale division, the gas content is too great.

4-10. SELECTOR SWITCH CIRCUIT ANALYSIS
(See figure 4-11.)

a. FILAMENT switches S107 and S106, GRID switch S105, PLATE switch S104, SCREEN switch S103, CATHODE switch S102, and SUPPRESSOR switch S101 are collectively called SELECTORS. Each selector is composed of single-pole, 10-position wafers. Switches S101 and S102 have one wafer only; S103-S107 each consist of 5 sections (10 wafers — 5 front and 5 rear). To simplify the illustration, only certain portions of selectors S103-S107 have been shown. Switch positions are either numbered "0" through "9", or are designated by letters. On switches S103-S107, wafer 5 rear is identical to switches S101 and S102, and is connected to the voltage supply for that element. Each of the remaining 9 wafers is associated with a specific pin on the tube test sockets. The voltage applied to each selector will eventually connect, through contacts and wafers of other selectors, to the element bearing the same name on the tube under test. In most cases, the numbered position to which each selector is set corresponds to the tube socket pin to which it connects; however, some differences in wiring exist as outlined in Table 4-1.

b. Refer to figure 4-11. Selectors S101 and S102 and the section 5 rear wafer (5R) of selectors S103-S107 are of the "make" type. All other wafers are of the "break" type. Each "break" type wafer is associated with a different switch position on its "make" wafer. Furthermore, each "break" type wafer is connected in series with the identical "break" wafer on the remaining selectors, the series path being in the same order as reference symbols (from S103 to S107). The resulting nine separate series paths eventually end at the tube test socket pins (only the NOVAL

socket is indicated in the drawing for simplicity). Each "make" type wafer serves to connect a specific tube element voltage source or connection to a particular series circuit of "break" type wafers. When any selector is set to a given position, the source connected to that selector supply wafer is coupled to a tube test socket pin through the associated series "break" wafers of all higher-numbered selectors. At the same time, the associated series path to the left of the chosen selector is broken, and all lower-numbered selectors are denied connection to that specific series path and tube socket pin. This means, in effect, that if any two selectors are set to the same position, only the source coupled to the selector bearing the higher reference number will be connected to the corresponding tube test socket pin. Because of this, two different test voltages cannot be connected to a given tube pin at once, and all possibility of accidental shorts is eliminated.

c. The position "1" contacts of selectors S101 and S102 are interconnected to permit checking the shorts test circuit

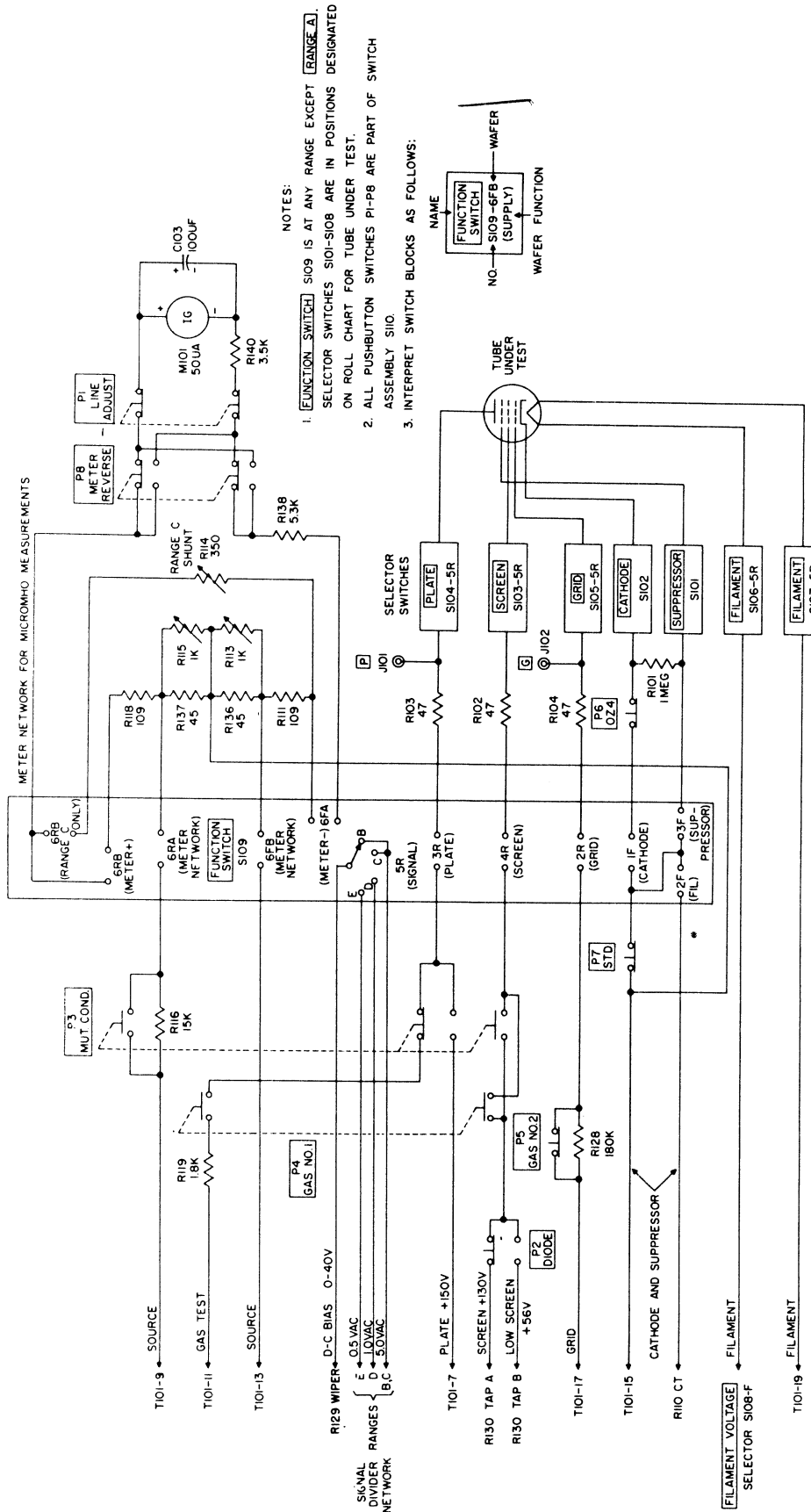
without inserting a tube into any test socket.

4-11. FUNCTION SWITCH OPERATION
 (See overall schematic diagram.)

FUNCTION SWITCH S109 establishes proper connections for shorts tests and for tube tests. In SHORTS positions 1 through 5, each element of the tube under test is connected through an individual wafer to the shorts and noise test circuit (see paragraph 4-6). In the RANGES—A SHUNT position, SHUNT control R127 is connected into the metering circuit and emission tests can be made. When set to RANGES B-E, proper a-c signal voltages and meter network resistances are established for making mutual conductance tests. To aid both the operator and maintenance man in connection tracing, Table 4-2 lists the switch contacts which make contact on each wafer for each FUNCTION SWITCH position, and also keys the function of each wafer. If troubleshooting is necessary, refer to this connection chart. Table 4-3 lists the function of each wafer in greater detail.

TABLE 4-1. TEST SOCKET PINS CONNECTED BY POSITIONING SELECTORS

TEST SOCKET		SELECTOR SWITCH POSITION								
		1	2	3	4	5	6	7	8	9
X103	4	1	2	3	-	-	-	-	4	-
X104	5	1	2	3	4	-	-	-	5	-
X105	6	1	2	3	4	5	-	-	6	-
X106	7	1	2	3	4	5	6	-	7	-
		Panel lamp center							Panel lamp edge	
X107	7 PIN MIN	3	2	1	-	5	6	7	4	-
X108	ACORN	1	2	3	4	5	7	8	6	-
X109	SUB	1	2	3	4	5	6	7	-	-
X110	MIN	1	2	3	4	5	6	7	8	-
X111	OCTAL	2	1	3	4	5	6	8	7	-
X112	LOKTAL	1	2	3	4	5	6	7	8	Center stud
X113	NOVAL	1	2	3	4	5	6	7	8	9



- NOTES:
1. FUNCTION SWITCH S109 IS AT ANY RANGE EXCEPT RANGE A. SELECTOR SWITCHES S101-S108 ARE IN POSITIONS DESIGNATED ON ROLL CHART FOR TUBE UNDER TEST.
 2. ALL PUSHBUTTON SWITCHES P1-P8 ARE PART OF SWITCH ASSEMBLY S10.
 3. INTERPRET SWITCH BLOCKS AS FOLLOWS:

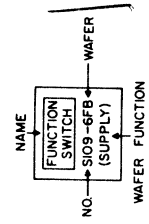
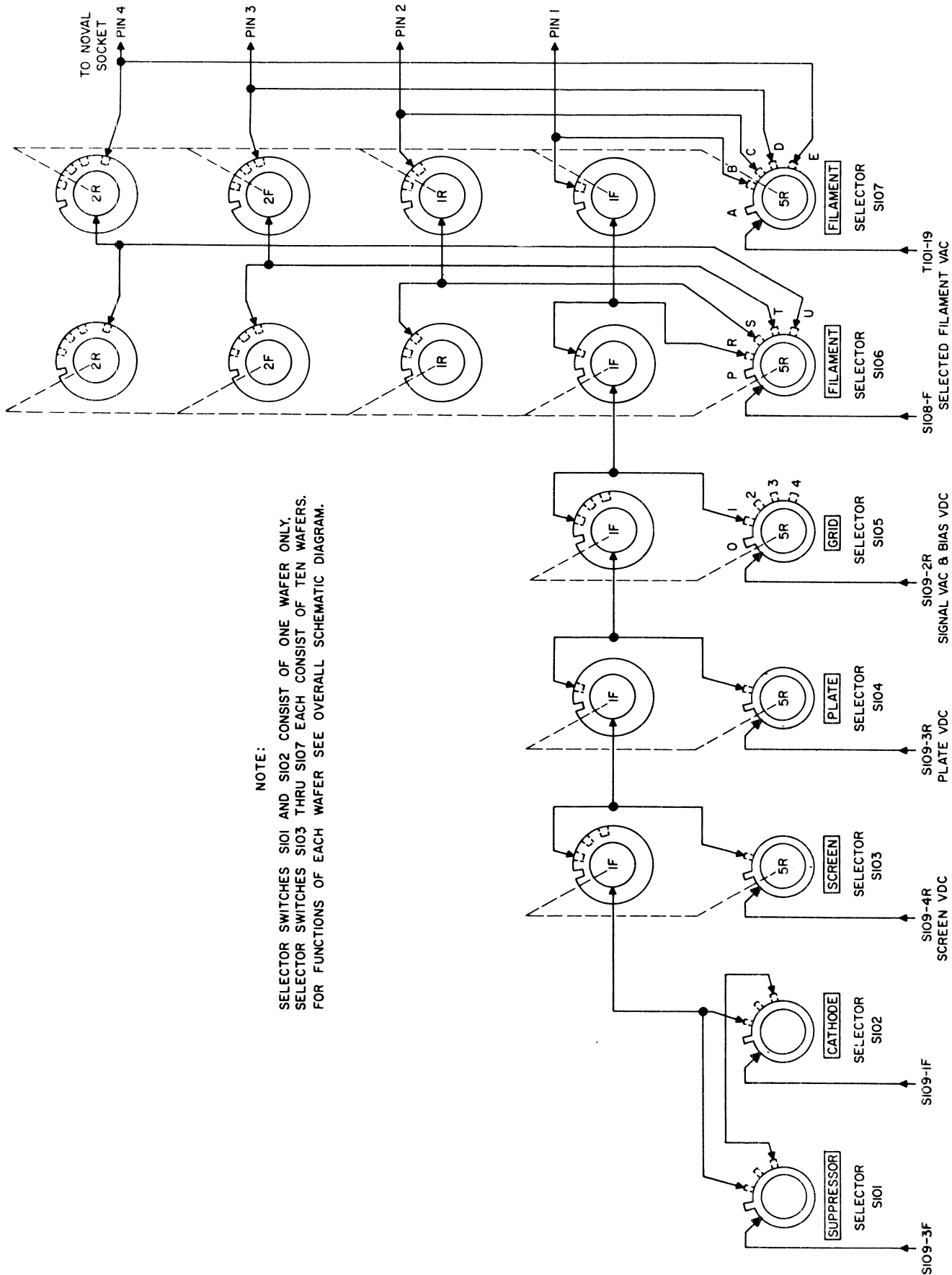


Figure 4-10. Simplified Mutual Conductance and Gas Test Circuit



NOTE:
SELECTOR SWITCHES SIO1 AND SIO2 CONSIST OF ONE WAFER ONLY.
SELECTOR SWITCHES SIO3 THRU SIO7 EACH CONSIST OF TEN WAFERS.
FOR FUNCTIONS OF EACH WAFER SEE OVERALL SCHEMATIC DIAGRAM.

Figure 4-11. Simplified Selector Switch Circuit

TABLE 4-2. FUNCTION SWITCH S109 CONNECTION CHART —
CONTACTS MAKING

KNOB POSITION	SECTION, WAFER, WAFER POSITION, AND WAFER FUNCTION					
	1		2		3	
	FRONT (CATHODE)	REAR (CONVERTER GRID)	FRONT (FILAMENT)	REAR (GRID)	FRONT (SUPPRESSOR)	REAR (PLATE)
1	3&G	D&A	3&G	D&A	3&G	D&A
2	3&G	D&A	3&G	D&A	3&G	D&A
3	3&G	D&A	3&G	D&A	3&G	D&A
4	3&G	D&A	3&G	D&A	3&G	D&A
5	3&G	D&A	3&G	D&A	3&G	D&A
A	3&5	D&F	3&5	D&F	3&5	D&F
B	3&5	D&F	3&5	D&F	3&5	D&F
C	3&5	D&F	3&5	D&F	3&5	D&F
D	3&5	D&F	3&5	D&F	3&5	D&F
E	3&5	D&F	3&5	D&F	3&5	D&F

KNOB POSITION	SECTION, WAFER, WAFER POSITION, AND WAFER FUNCTION					
	4		5		6	
	FRONT (SHORTS ON-OFF)	REAR (SCREEN)	FRONT (SHORTS-NOISE)	REAR (SIGNAL)	FRONT (METER NEG.)	REAR (METER POS.)
1	3&G	D&A	1-A B-G		5&A F&G	2&3 C&D
2	3&G	D&A	2-B C-1		5&A F&G	2, 3&G C&D
3	3&G	D&A	3-C D-2		5&A F&G	2&3 C&D
4	3&G	D&A	4-D E-3		5&A F&G	2&3 C&D
5	3&G	D&A	5-E F-4		5&A F&G	
A		D&F	A-F G-5	5&B	B&F 1&5	4&C E&2
B		D&F	B-G 1-A	5&B	F&G 5&A	C&D 2&3
C		D&F	C-1 2-B	5&B	F&G 5&A	C&D 2, 3&G
D		D&F	D-2 3-C	B&C	F&G 5&A	C&D 2&3
E		D&F	E-3 4-D	B, C&D	F&G 5&A	C&D 2&3

TABLE 4-3. ELECTRON TUBE TEST SET TV-10/U, FUNCTION SWITCH
 WAFER SECTIONS

SWITCH SECTION, WAFER, AND WAFER SECTION	POSITIONS	
	SHORTS	RANGES
1F	Connects CATHODE line to shorts wafer 5F.	Connects CATHODE line for rectifier & diode tests.
1R	Connects CATHODE selector to CATHODE line.	Connects CATHODE and SUPPRESSOR selectors.
2F	Connects FIL CT line to shorts wafer 5F.	Connects FIL CT to signal line.
2R	Connects GRID selector to shorts wafer 5F.	Connects GRID selector to grid supply line.
3F	Connects SUPPRESSOR selector to shorts wafer 5F.	Connects SUPPRESSOR selector to signal line.
3R	Connects PLATE selector to shorts wafer 5F.	Connects PLATE selector line to plate supply.
4F	ON-OFF switch for shorts and noise tests.	-----
4R	Connects SCREEN selector to shorts wafer 5F.	Connects SCREEN selector line to screen supply.
5FA-5FB	Connects various elements for shorts test.	-----
5R	-----	Connects signal to bias line.
6FA	-----	Connects meter neg. to SHUNT control or network.
6FB	-----	Connects source to R127A wiper or network.
6RA	-----	Connects source to R127B wiper or network.
6RB	-----	Connects meter pos. to SHUNT control or network.

TROUBLESHOOTING

SECTION 5

5-1. TROUBLESHOOTING PROCEDURES.

The first step in servicing any equipment is to sectionalize the fault. Sectionalization means tracing the difficulty to the *major circuit* responsible for abnormal operation of the unit. The second step is to localize the fault. Localization means tracing the difficulty to the defective *part* responsible for the abnormal condition. Some faults, such as burned-out resistors, overheated capacitors, blown fuses, a shorted transformer, loose connections and mechanical damage, often can be located by visual inspection, smell, and touch. The majority of faults, however, must be localized through voltage and resistance checks.

a. **CIRCUIT SECTIONALIZATION** — Accomplish circuit sectionalization by applying the procedures noted in Table 3-6, the Performance Checklist.

b. **COMPONENT LOCALIZATION** — The tests summarized below aid in isolating the source of trouble. Follow the procedures in the order given.

(1) **OPERATIONAL TEST** — The operational test is important because it frequently indicates the general location of the trouble. In many cases, the information gained will determine the exact nature of the fault. To utilize this information fully, interpret all symptoms in relation to each other.

(2) **VISUAL INSPECTION** — Visual inspection will often disclose the defective portion of the circuit. Make a thorough visual inspection before proceeding with troubleshooting to prevent additional damage.

(3) **TROUBLESHOOTING CHART** — The procedures listed in this chart (Table 5-2) will localize the trouble to a particular circuit or to a specific faulty component.

(4) **INTERMITTENT TROUBLES** — Faulty operation may result from intermittent conditions. This type of trouble can be made to appear by tapping or jarring the equipment.

5-2. TEST EQUIPMENT AND SPECIAL TOOLS.

Voltage measurements are to be made with a multimeter, or individual meters of 1,000 ohm-per-volt sensitivity, having suitable a-c and d-c ranges. No special tools are required for servicing this equipment.

5-3. OVERALL TROUBLESHOOTING.

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT. HIGH VOLTAGES ARE PRESENT AT EXPOSED TRANSFORMER TERMINALS, RECTIFIER V101 AND V102 SOCKET TERMINALS, LINE ADJUST RHEOSTAT R126, AND ASSOCIATED CIRCUITS. THE HIGHEST VOLTAGE (330v ac) APPEARS BETWEEN TRANSFORMER T101 TERMINALS 16 AND 18. DO NOT TAKE CHANCES!

Step 1. — Operationally test the equipment by following the procedures set forth in Table 3-6, the Performance Checklist. This table includes the typical troubles most likely to be encountered.

Step 2. — To further isolate the faulty components, remove the tester from its case and make a thorough visual inspection of all components.

Step 3. — To troubleshoot the tube test set, refer to Table 5-2 and follow the procedures as noted. Refer also to the over-all schematic diagram, figure 6-2, and, when specified, to the simplified schematic indexed opposite the step. Each simplified schematic has been laid out to aid the service man in isolating a defective part.

5-4. LOCATION OF PARTS.

Figures 5-1 through 5-4 illustrate parts location and identification. Table 5-1 is a parts location cross reference chart in which all components are listed by reference designation together with the figures in which they appear. When any component is to be located, find its reference designation in the appropriate schematic diagram. Next, locate this reference designation in Table 5-1, and opposite the entry will be found the figure or figures in which this part is shown. Figure 5-5, a diagram of transformer T101, illustrates the location of each transformer terminal and the nominal voltages available.

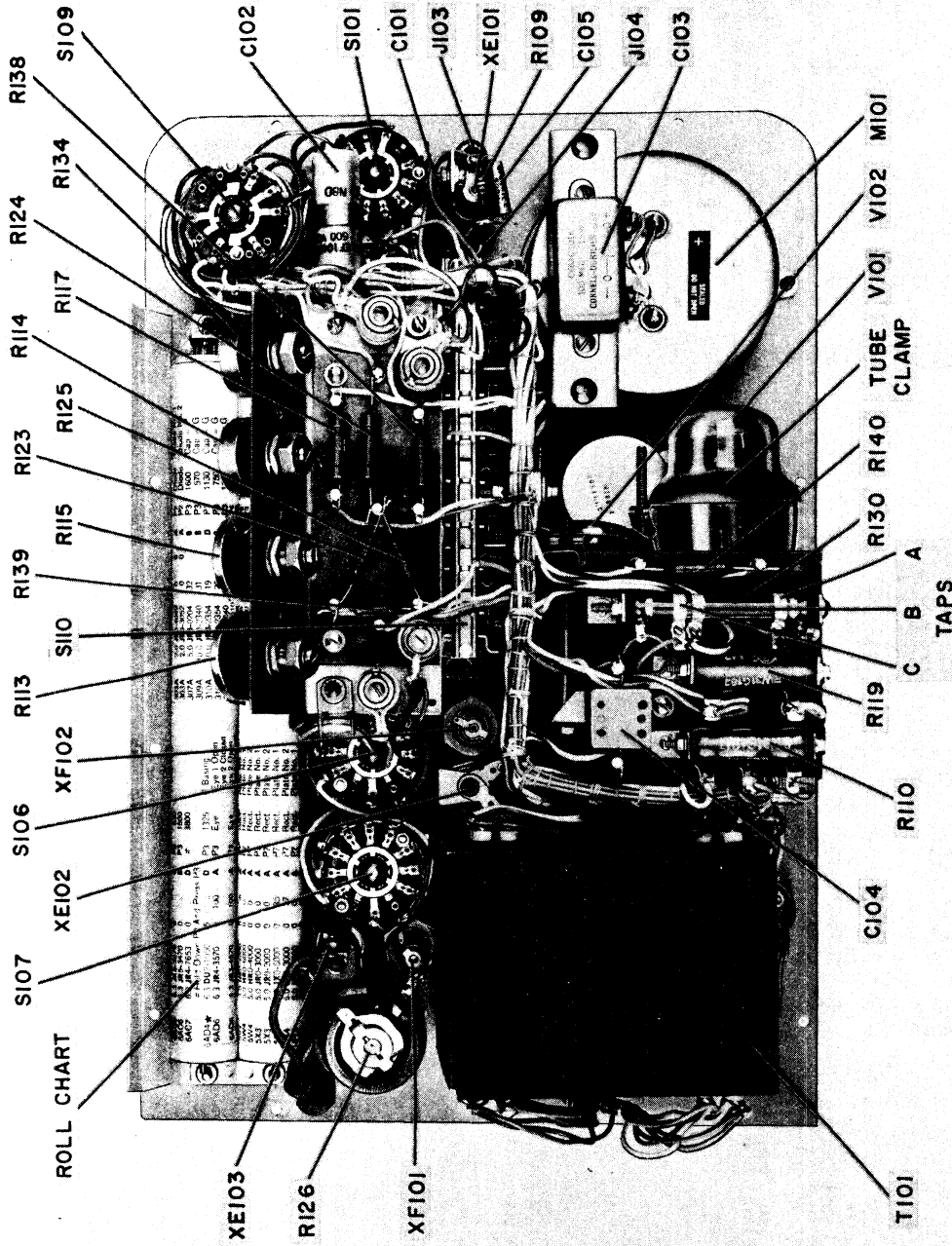


Figure 5-1. Electron Tube Test Set TV-10/U, Internal Direct Rear View

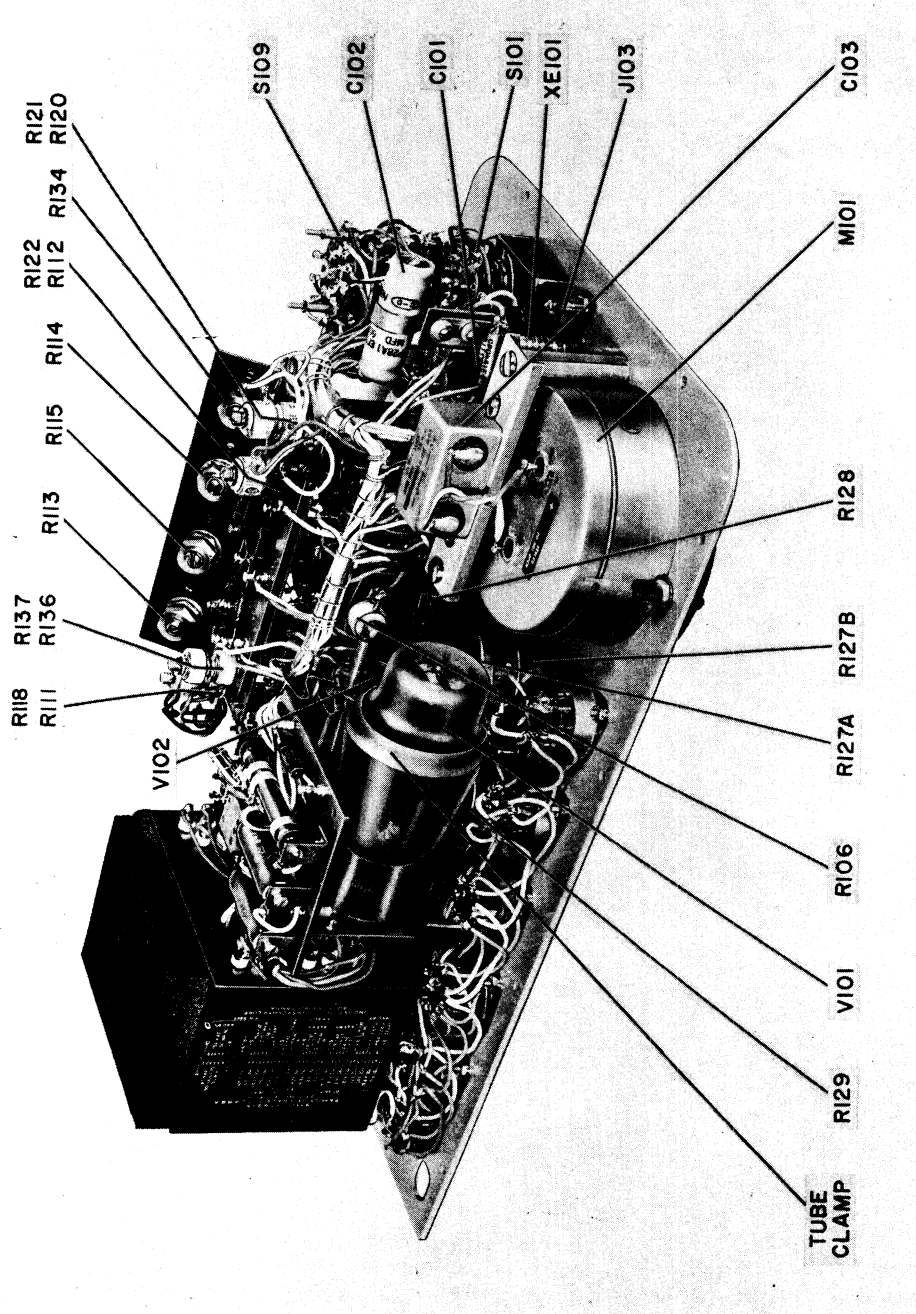


Figure 5-2. Electron Tube Test Set TV-10/U, Internal Right Rear Oblique View

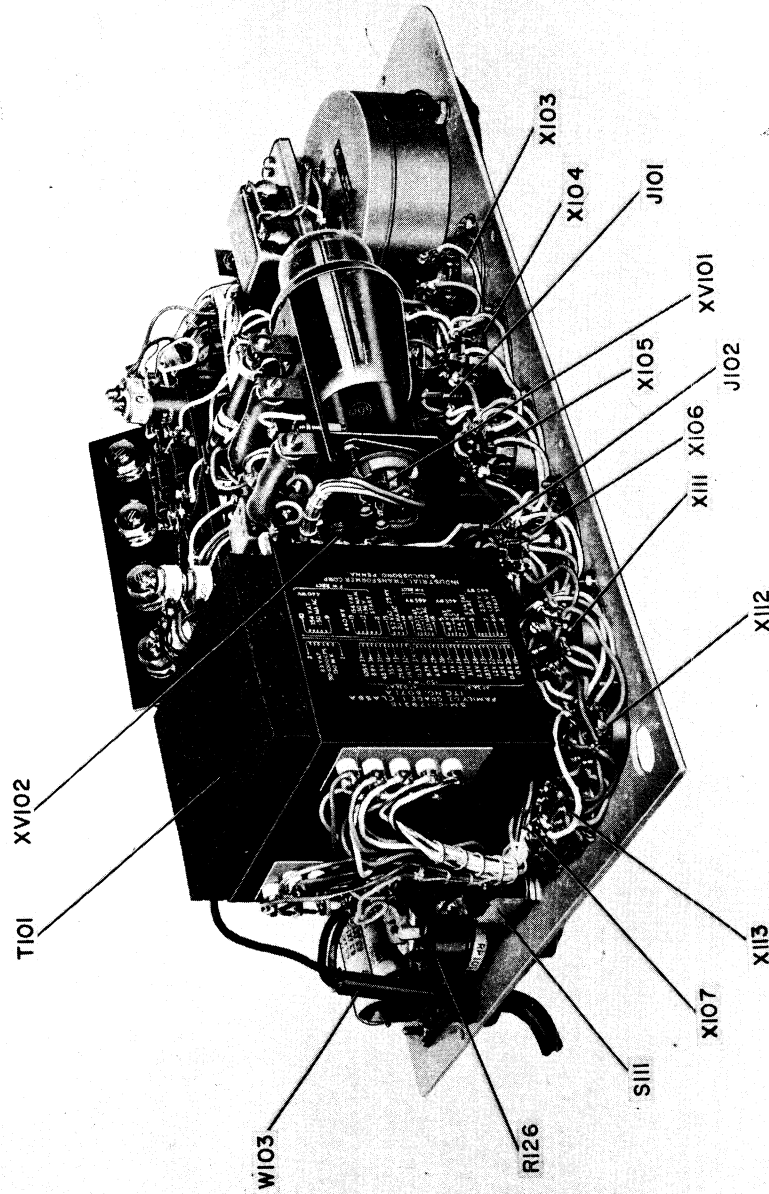


Figure 5-3. Electron Tube Test Set TV-10/U, Internal Rear Oblique View

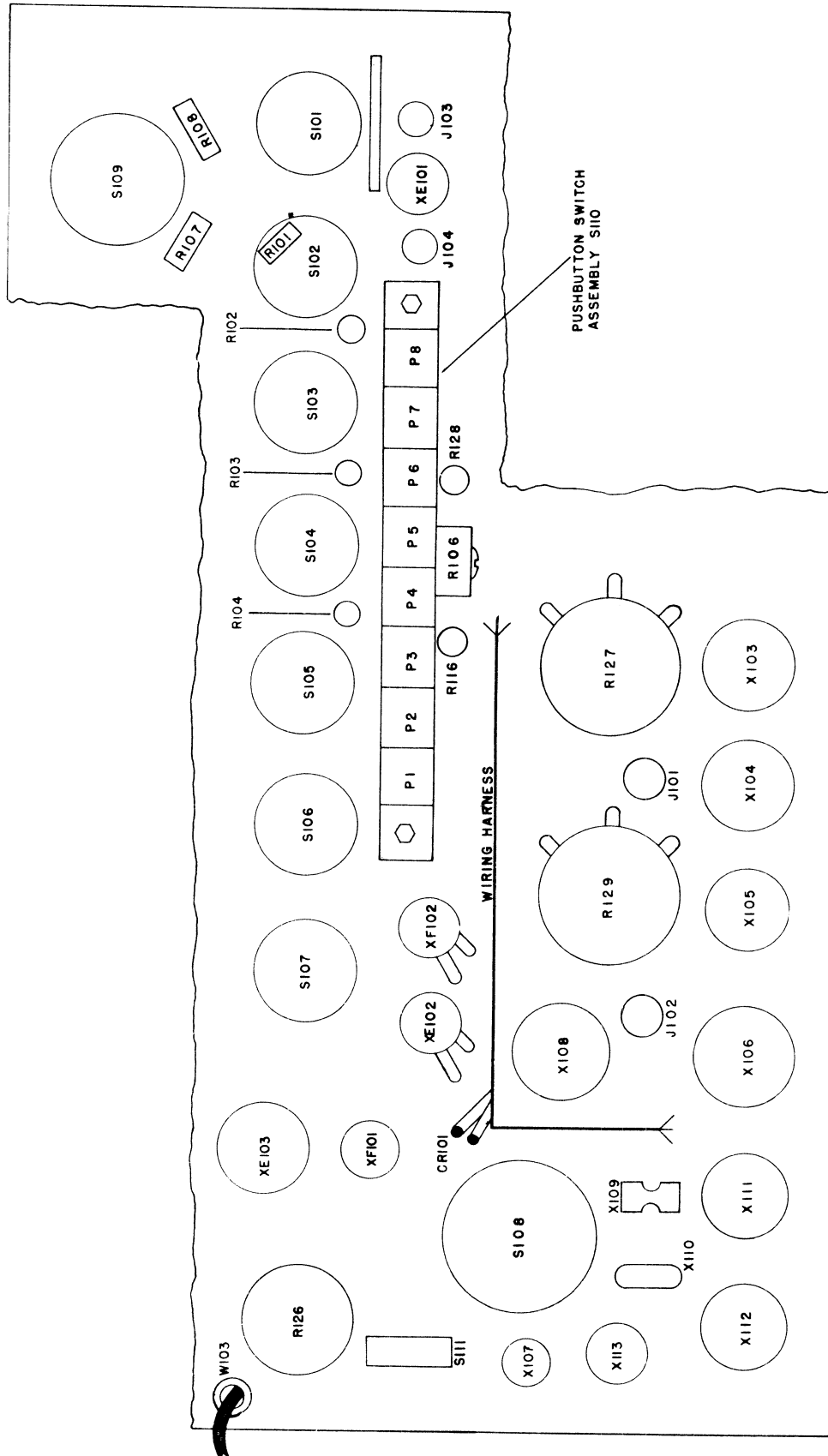
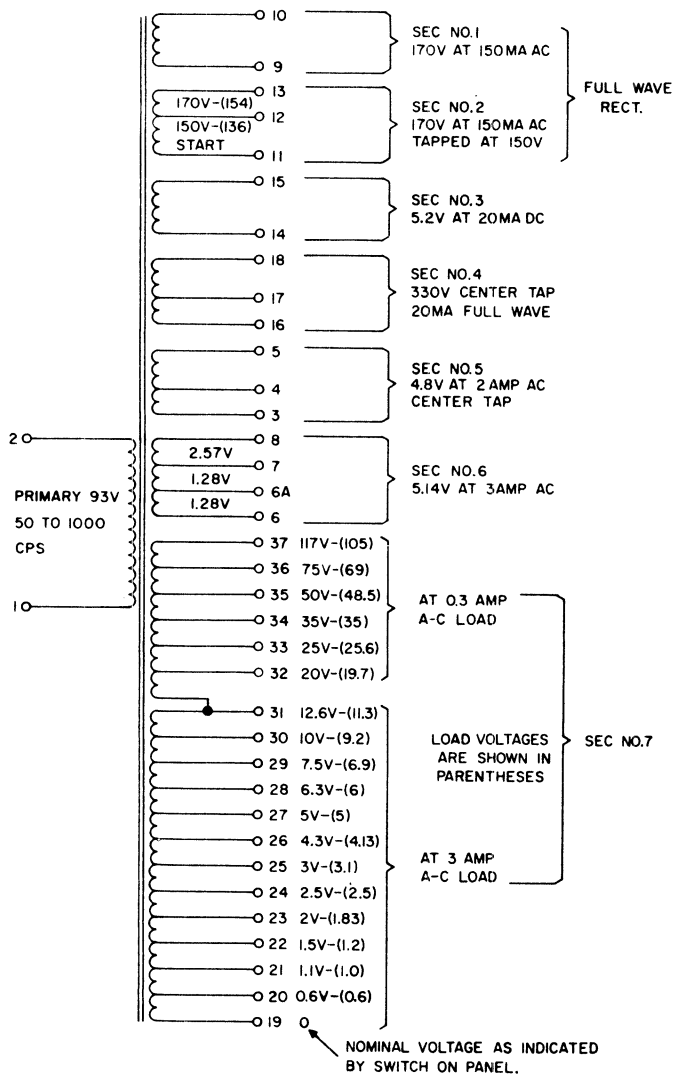


Figure 5-4. Electron Tube Test Set TV-10/U, Internal Direct Rear View with Certain Components Removed to Show Parts Not Visible in Photograph



FULL WAVE
RECT.

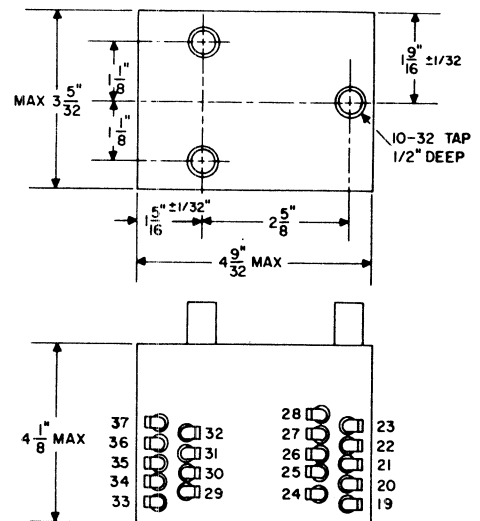
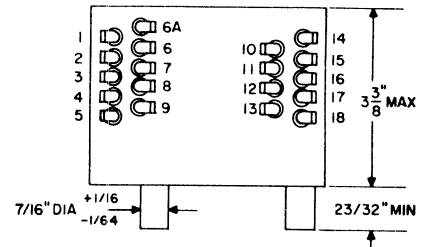


Figure 5-5. Electron Tube Test Set TV-10/U, Transformer Diagram Showing Terminal Location and Voltages

TABLE 5-1. ELECTRON TUBE TEST SET TV-10/U, PARTS LOCATION
CROSS-REFERENCE CHART

REF SYMBOL	FIGURE	REF SYMBOL	FIGURE	REF SYMBOL	FIGURE
C101	5-1, 5-2	R123	5-1	X112	3-1, 5-3, 5-4
C102	5-1, 5-2	R124	5-1	X113	3-1, 5-3, 5-4
C103	5-1, 5-2	R125	5-1	XE101	5-1, 5-2, 5-4
C104	5-1	R126	3-1, 5-1, 5-3, 5-4	XE102	5-1, 5-4
C105	5-1	R127	3-1, 5-2, 5-4	XE103	5-1, 5-4
CR101	5-4	R128	5-2, 5-4	XF101	5-1, 5-4
E101	3-1	R129	3-1, 5-2, 5-4	XF102	5-1, 5-4
E102	3-1	R130	5-1	XV101	5-3
E103	3-1	R134	5-1, 5-2	XV102	5-3
E105	1-1	R136	5-2		
E107	1-1	R137	5-2	R127 sections A and B	5-2
F101	3-1	R138	5-1		
F102	3-1	R139	5-1	R130 taps A, B, C	5-1
J101	3-1, 5-3, 5-4	R140	5-1		
J102	3-1, 5-3, 5-4	S101	3-1, 5-1, 5-2, 5-4	Tube clamp	5-1, 5-2
J103	3-1, 5-1, 5-2, 5-4	S102	3-1, 5-4		
J104	3-1, 5-1, 5-4	S103	3-1, 5-4	Roll chart	3-1, 5-1
M101	3-1, 5-1, 5-2	S104	3-1, 5-4		
P101	1-1	S105	3-1, 5-4	Roll chart drive gear	3-1
R101	5-4	S106	3-1, 5-1, 5-4		
R102	5-4	S107	3-1, 5-1, 5-4	Meter zero adjust	3-1
R103	5-4	S108	3-1, 5-4		
R104	5-4	S109	3-1, 5-1, 5-2, 5-4	Spare fuses and lamps	1-1
R106	5-2, 5-4	S110	3-1, 5-1, 5-4		
R107	5-4	S111	3-1, 5-3, 5-4		
R108	5-4	T101	5-1, 5-3		
R109	5-1	V101	5-1, 5-2		
R110	5-1	V102	5-1, 5-2		
R111	5-2	W101	1-1		
R112	5-2	W102	1-1		
R113	5-1, 5-2	W103	1-1, 3-1, 5-3, 5-4		
R114	5-1, 5-2	X103	3-1, 5-3, 5-4		
R115	5-1, 5-2	X104	3-1, 5-3, 5-4		
R116	5-4	X105	3-1, 5-3, 5-4		
R117	5-1	X106	3-1, 5-3, 5-4		
R118	5-2	X107	3-1, 5-3, 5-4		
R119	5-1	X108	3-1, 5-4		
R120	5-2	X109	3-1, 5-4		
R121	5-2	X110	3-1, 5-4		
R122	5-2	X111	3-1, 5-3, 5-4		

TABLE 5-2. TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP OR PROBABLE TROUBLE
1a	See overall schematic and figure 4-4.	Insert power plug P101 into 105-125 volt, 50-1000 cycle source. Set POWER ON-OFF switch S111 to ON.	PILOT lamp E102 lights.	PILOT lamp E102 defective. Any component in primary circuit of transformer T101 defective. To isolate proceed to step 1b.
1b		Disconnect power plug P101 from source. Connect ohmmeter across terminals of power plug P101. Rotate the LINE ADJUST resistor wiper R126 to its limits.	Ohmmeter indicates finite resistance which varies uniformly. Resistance decreases with clockwise rotation of rheostat.	A non uniform variation indicates resistor R126 defective. If resistance is infinite proceed to step 1c.
1c		Remove and check the following: 1. Fuse F101. 2. FUSE lamp E103.		1. Fuse F101 defective. 2. FUSE lamp E103 defective.
1d		Check continuity of each of the following items in turn: 1. Primary of transformer T101. 2. Power ON-OFF switch S111. 3. Power cable.	1. Ohmmeter indicates continuity. 2. - 3. -	1. Transformer T101 defective. 2. POWER ON-OFF switch S111 defective. 3. Power cable defective.
1e		Remove PILOT lamp E102 Connect ohmmeter to transformer T101-22 and T101-28. Replace PILOT lamp after test.	Ohmmeter indicates continuity.	Transformer T101 defective.
2a	See overall schematic and figure 4-5.	Connect test set to a power source. Place POWER ON-OFF switch to ON. 1. Perform a LINE VOLT-AGE test. (Paragraph 2-3. Step 2). 2. Connect an ac voltmeter to the voltage source.	1. Meter needle can be set to the LINE TEST mark. 2. Read 105-125 vac.	1. If meter indicates properly proceed to step 3a; otherwise proceed to step 2b. 2. If power source is not within the range limits, test set cannot be used.
2b		Disconnect power from test set. Connect an ohmmeter across transformer T101-19 and T101-37.	Ohmmeter indicates continuity.	Transformer T101 defective.
2c		1. Connect an ohmmeter to transformer T101-37 and the junction of resistors R124 and R123. Depress LINE ADJ pushbutton P1. 2. Release LINE ADJ pushbutton P1.	1. Ohmmeter indicates approx 245-285K ohms. 2. Ohmmeter indicates infinity.	1. Infinite resistance indicates resistor R124, R134 or pushbutton P1 defective. 2. Pushbutton P1 defective.
2d		Connect an ohmmeter across resistor R123. Release LINE ADJ pushbutton P1.	Ohmmeter indicates approx 667 ohms.	A reading of 2000 ohms indicates resistor R123 defective. A reading of 1000 ohms indicates resistor R125 or R139 defective.
2e		Connect an ohmmeter across resistor R140.	Ohmmeter indicates approx 3500 ohms.	Infinite resistance indicates resistor R140 defective.

TABLE 5-2. TROUBLESHOOTING CHART (CONT.)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP OR PROBABLE TROUBLE
2f	See overall schematic and figure 4-5.	Connect an ohmmeter in series with a 100,000 ohm resistor across meter M101. (Positive terminal of ohmmeter to positive terminal of the meter.)	Ohmmeter indicates approx 100,000 ohms, and meter M101 gradually deflects up scale.	Infinite resistance indicates meter M101 open. A proper ohmmeter indication, but no deflection on meter M101 indicates capacitor C103 shorted. If meter M101 needle does not deflect gradually, capacitor C103 is open. If none of the above checks isolates the trouble, rectifier CR101 defective.
3a	See overall schematic and figure 4-6.	Connect set to power source. Set POWER ON-OFF switch to ON. Set the selectors to position JR1-1111. Rotate FUNCTION SWITCH S109 from position 1 through 5 in turn.	Neon SHORTS lamp E101 glows in positions 2 and 3.	If proper indication is obtained, proceed to step 4a; if not, proceed to step 3b.
3b		Replace SHORTS lamp E101 with a spare known to be good.		SHORTS lamp E101 defective.
3c		Connect an ac voltmeter across transformer T101-11 and T101-13.	Voltmeter indicates approx 170 vac.	Transformer T101 defective.
3d		Connect ac voltmeter to transformer T101-11 and each terminal of capacitor C102.	Voltmeter indicates approx 110 vac.	Resistor R107, R108 defective, capacitor C102 open, FUNCTION SWITCH S109 defective.
3e		Connect an ac voltmeter across capacitor C105.	Voltmeter indicates approx 100 vac.	Zero volts indicates C105 shorted, FUNCTION SWITCH S109 dirty or defective.
3f		Connect an ac voltmeter to NOISE jacks J103 and J104.	Voltmeter indicates approx 100 vac.	Capacitor C101 open.
3g	See overall schematic and figure 4-6.	Place POWER ON-OFF switch to OFF. Connect an ohmmeter across resistor R109.	Ohmmeter indicates approx 330K ohms.	Infinite resistance indicates resistor R109 open. Approx 45 K ohms indicates capacitor C102 shorted.
4a	See overall schematic and figure 4-10.	Connect test set to power source. Place POWER ON-OFF switch to ON. Place selector switches to JS53460. Place FUNCTION SWITCH to RANGE B. Connect a dc voltmeter to NOVAL socket X113-3 (+) and 6 (-). Depress and hold MUT. COND. push-button P3.	Voltmeter indicates 150 ±2 vdc.	If reading is correct proceed to step 5a. If reading is approx correct but not within the tolerance, refer to calibration procedures (paragraph 6-4). If reading is improper or zero, proceed to step 4b.
4b		Remove and test plate supply rectifier tube V101.		Plate supply rectifier tube V101 defective.
4c		Connect an ac voltmeter to each of the following pairs of transformer T101 terminals: 1. T101-11, -13 2. T101-9, -10	1. Voltmeter indicates approx 170 vac. 2. Voltmeter indicates approx 170 vac.	Transformer T101 defective.

TABLE 5-2. TROUBLESHOOTING CHART (CONT.)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP OR PROBABLE TROUBLE
4c (cont)		3. T101-7, -8 4. T101-6, -7	3. Voltmeter indicates approx 2.5 vac. 4. Voltmeter indicates approx 2.5 vac.	
4d	See overall schematic and figure 4-10.	Replace a plate supply rectifier tube V101 known to be good. 1. Connect a dc voltmeter to transformer T101-7 (+) and T101-15 (-). 2. Depress MUT. COND. pushbutton P3.	1. Voltmeter indicates approx 150 vdc. 2. Voltmeter indicates approx 150 vdc.	1. Resistor R116 or FUNCTION SWITCH S109 defective. 2. FUNCTION SWITCH S109 defective.
4e		Connect a dc voltmeter to each of the following pairs of test points in turn: 1. Transformer T101-7 (+), NOVAL tube socket X113-6 (-). 2. NOVAL tube socket X113-6 (-), plate P jack J101 (+). Depress MUT COND. pushbutton P3. 3. NOVAL socket X113 terminals 3 (+), 6 (-),	Voltmeter indicates approx 150 vdc.	1. Any selector switch S102-S107 dirty or defective. (Cathode circuits.) 2. Resistor R103 or MUT. COND. pushbutton P3 defective. 3. Any selector switch S104-S107 defective.
5a	See overall schematic.	Connect test set to power source. Place POWER ON-OFF switch to ON. Place selector switches to JR53460. Place FUNCTION SWITCH to range B. Connect a dc voltmeter to NOVAL socket X113 3 (+) and 6 (-). 1. Depress and hold MUT. COND. pushbutton P3. 2. Depress and hold DIODE pushbutton P2.	1. Voltmeter indicates approx 130 vdc. 2. Voltmeter indicates approx 56 vdc.	If both voltages are high, resistor R129 is open at positive end, resistor R130 open. If both voltages are low, rectifier tube V102 weak. If both voltages are about one half the normal voltage, transformer secondary 3 or 4 open. If no voltage for step 5a1 or 5a2 (voltage evident for one), resistor R130 or DIODE pushbutton P2 defective. If no voltage is evidenced for both 5a1 and 5a2, proceed to step 5c.
5b	See overall schematic and figure 4-10.	Connect voltmeter to junction resistor R102 and switch S103 (+) and NOVAL socket X113 (-).	Voltmeter indicates approx 56 volts.	Switches S103 - S106 dirty or defective (screen circuit).
5c		Remove power from test set, Connect an ohmmeter to resistor R130-A and junction of resistor R102 and switch S103. Depress MUT. COND. pushbutton P3.	Ohmmeter indicates 47 ohms.	Infinite ohms indicates resistor R130, R102 defective, FUNCTION switch S109 defective, DIODE pushbutton P2 or MUT. COND. pushbutton P3 dirty or defective.
5d		Connect ohmmeter to resistor R130B and junction of resistor R102 and switch S103. Depress MUT, COND. pushbutton P3 and DIODE pushbutton P2.	Ohmmeter indicates 47 ohms.	Resistor R130 defective, DIODE pushbutton P2 dirty or defective.
6a	See overall schematic and figure 4-10.	Connect test set to power source. Place POWER ON-OFF switch to ON. Set the selectors to JS53460. Set the FUNCTION switch to RANGE B. Set the BIAS control at 100. Connect a dc voltmeter to NOVAL socket X113-6 (+), 5 (-).	Dc voltmeter indicates a nominal bias voltage.	Proceed to step 6b.

TABLE 5-2. TROUBLESHOOTING CHART (CONT.)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP OR PROBABLE TROUBLE
6b		Connect dc voltmeter to NOVAL socket X113-6 (+) and J103 (-).	Dc voltmeter indicates a nominal voltage.	Selector switch S105-S107 defective (grid circuit).
6c		Remove power from the test set. Connect an ohmmeter to J102 and R129 wiper.	Read a nominal resistance.	Infinite resistance indicates resistor R104, R128, FUNCTION switch S109 defective.
6d		Depress GAS 2 pushbutton P5.	Resistance increases approx 180 K ohms.	If resistance is unchanged, GAS 2 pushbutton P5 defective. Infinite resistance indicates resistor R128 defective.
7a	See overall schematic.	1. Repeat procedure 6a using an ac voltmeter (FUNCTION switch at RANGE B). Rotate the BIAS control to zero. Set FUNCTION switch to RANGE. 2. C 3. D 4. E	1. Ac voltmeter indicates 5 vac. Ac voltmeter indicates: 2. 5 vac 3. 1-1/2 vac 4. 0.5 vac	If ac voltmeter indicates no voltage at any one range position only, FUNCTION switch S109 dirty or defective. If ac voltmeter indicates no voltage for all switch positions, proceed to step 7b.
7b		Remove power from test set. Connect an ohmmeter across transformer T101-14 and junction of R122 and R127. 1. Depress and hold STD pushbutton P7. 2. Release STD pushbutton P7.	1. Ohmmeter indicates approx 1000 ohms. 2. Resistance decreases.	1. Infinite resistance indicates resistor R120, R121, R122 defective. 2. STD pushbutton P7 dirty or defective.
7c		Connect ohmmeter across transformer T101-14 and T101-15.	Read finite resistance.	Infinite resistance indicates transformer T101 defective.
7d		Connect ohmmeter across resistor R114. Vary the resistance to its limits.	Nominal resistance varies evenly.	Infinite resistance at any point indicates resistor R114 defective.
8		Connect test set to power source. Place POWER ON-OFF switch to ON. Set the selectors to JR53460. Connect an ac voltmeter to NOVAL socket X113-2 and -8. Rotate the FILAMENT VOLTAGE switch to each switch position in turn, noting the ac voltage reading. Remove power from test set.	Ac voltmeter indicates approx ac voltage as indicated on panel markings for the FILAMENT VOLTAGE switch. See Table 6-1.	Transformer T101, FILAMENT VOLTAGE switch S108, selector switch S106, S107 (filament circuit) defective.
9a	See overall schematic and figure 4-10.	Set the selectors to JR53460. Connect an ohmmeter to resistor R110 center tap and NOVAL socket X113 terminal 6.	Ohmmeter indicates zero ohms.	Selector switch S102, S103, S104, S105, S106, S107 (cathode circuit), FUNCTION switch S109, OZ4 pushbutton P6, dirty or defective.
9b		Depress OZ4 pushbutton P6.	Ohmmeter indicates infinite resistance.	OZ4 pushbutton P6 dirty or defective.

TABLE 5-2. TROUBLESHOOTING CHART (CONT.)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP OR PROBABLE TROUBLE
9c		Connect ohmmeter to CATHODE switch S102 wiper and fixed contact number 2. Depress and hold OZ4 pushbutton P6. Rotate CATHODE switch S102 to each position in turn.	Position Ohmmeter Reading 0 Infinite 1 1 meg ohm 2 zero ohms 3-9 1 meg ohm	Infinite resistance at all switch positions indicates CATHODE switch S102, resistor R101 defective. Reading other than zero at CATHODE switch position 2 indicates OZ4 pushbutton P6 dirty or defective.
9d	See overall schematic and figure 4-10.	Connect ohmmeter to CATHODE switch S102 wiper and NOVAL socket X113 terminal 6.	Ohmmeter indicates zero ohms.	Selector switch S102, S103, S104, S105, S106, S107 dirty or defective (cathode circuit).
10a	See overall schematic.	Connect an ohmmeter to NOVAL socket X113 terminal 6 and transformer T101-15. Set selector switches to JR 53460. Set FUNCTION switch to RANGE B.	Ohmmeter indicates zero ohms.	STD pushbutton P7, selector switch S102, S103, S104, S105, S106, S107 dirty or defective.
10b		Depress STD pushbutton P7.	Ohmmeter indicates infinite ohms.	STD pushbutton P7 defective.
11a	See overall schematic and figure 4-6.	Connect test set to power source. Place POWER ON-OFF switch to ON. Set FUNCTION switch to SHORTS A. Set the selectors to JR 11111. Connect an ac voltmeter across resistor R107.	Ac voltmeter indicates approx 110 volts.	Resistor R107, R108, FUNCTION switch, transformer T101-11, T101-13, defective.
11b		Remove power from test set. Connect an ohmmeter across resistor R109.	Ohmmeter indicates 330 K ohms.	Zero ohms indicates capacitor C105 shorted. Infinite resistance indicates resistor R109 open.
12a	See overall schematic and figure 4-7.	Connect test set to power source. Place POWER ON-OFF switch to ON. Connect an ac voltmeter to transformer T101-19 and T101-34.	Ac voltmeter indicates 35 volts.	Transformer T101 defective.
12b	See overall schematic and figure 4-7.	Remove power from test set. Connect an ohmmeter to transformer T101-34 and junction resistor R127A and R127B.	Ohmmeter indicates infinite ohms.	STD pushbutton P7 defective.
12c		Depress P7. Release after test.	Ohmmeter indicates 150 ohms.	Resistor R106, STD pushbutton P7 defective.
12d		Connect one ohmmeter lead to the junction of resistor R127A and R127B. Connect the other lead to the junction of resistor R112 and R103. Vary the SHUNT control to its limits.	Ohmmeter indicates an even variation between 0-75 ohms.	If resistance does not vary, resistor R127 defective. If resistance varies between 0-150 ohms resistor R127 or R112 defective.
12e		Connect one lead of the ohmmeter to the junction of resistor R103 and R112. Connect the other lead to jack J101.	Ohmmeter indicates 47 ohms.	Infinity indicates resistor R103, jack J101 defective.

TABLE 5-2. TROUBLESHOOTING CHART (CONT.)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP OR PROBABLE TROUBLE
13a	See overall schematic and figure 4-8.	Connect test set to power source. Place POWER ON-OFF to ON. Connect an ac voltmeter across transformer T101-12 and 13.	Ac voltmeter indicates 20 vac.	Transformer T101 defective.
13b		Remove power from test set. Connect an ohmmeter to transformer T101-12 and FUNCTION switch SECT 3, position E.	Ohmmeter indicates infinite ohms.	DIODE pushbutton P2 defective.
13c	See figure 4-8.	Depress DIODE pushbutton P2.	Ohmmeter indicates 1.2K ohms.	DIODE pushbutton P2, MUT. COND. pushbutton P3, resistor R117 defective.
14a	See overall schematic and figure 4-9.	Connect test set to power source. Set POWER ON-OFF switch to ON. Connect an ac voltmeter across the following transformer T101 terminals: 1. 19 and 37 2. 11 and 13	1. Voltmeter indicates 117 volts. 2. Voltmeter indicates 170 volts.	Transformer T101 defective.
14b		Remove power from test set. Connect one lead of an ohmmeter to transformer T101-11. Connect the other lead to jack J101.	Infinite ohms.	
14c		Depress OZ4 pushbutton P6.	Ohmmeter indicates 1.8K ohms.	Resistor R119, R103 defective.
14d		1. Connect an ohmmeter between transformer T101-37 and the junction of resistor R101 and OZ4 pushbutton P6. 2. Depress OZ4 pushbutton P6.	1. Infinite ohms. 2. Zero ohms.	OZ4 pushbutton P6 defective.
14e	See overall schematic and figure 4-9.	1. Connect an ohmmeter to transformer T101-13 and the junction of resistor R112 and OZ4 pushbutton P6. 2. Depress OZ4 pushbutton P6.	1. Ohmmeter indicates infinite ohms. 2. Ohmmeter indicates zero ohms.	OZ4 pushbutton P6 dirty or defective.
15a	See overall schematic and figure 4-10.	Connect an ohmmeter from transformer T101-13 to the junction of resistor R118 and R115.	Ohmmeter indicates 82 ohms.	Resistor R113, R115, R136, R137 defective.
15b		Vary screw driven adjustment of resistors R113 and R115 in turn.	Note slight variations in ohmmeter reading.	Resistor R113, R115 defective.
15c		Connect an ohmmeter across R111 and R118 in turn.	Ohmmeter indicates approx 110 ohms.	Resistor R111, R118 defective.
15d		Connect an ohmmeter across resistor R128.	Ohmmeter indicates zero ohms.	GAS 2 pushbutton P5 defective.
15e		Depress GAS 2 pushbutton P5.	Ohmmeter indicates 180 K ohms.	Infinite resistance indicates resistor R128 open. Zero ohms indicates GAS 2 pushbutton P5 defective.

SECTION 6

REPAIR

6-1. FAILURE REPORT

FAILURE REPORT

"Report each failure of the equipment, whether caused by a defective part, wear, improper operation, or an external cause. Use ELECTRONIC FAILURE REPORT form DD787. Each part of the form includes full instructions for filling out the forms and forwarding them to the Bureau of Ships. However, the importance of providing complete informa-

tion cannot be emphasized too much. Be sure that you include the model designation and serial number of the equipment (from the equipment identification plate), the type number and serial number of the major unit (from the major unit identification plate), and the type number and reference designation of the particular defective part (from the technical manual). Describe the cause of the failure completely, continuing on the back of the form if necessary. Do not substitute brevity for clarity. And remember—there are two sides to the failure report —

"YOUR SIDE"

"Every FAILURE REPORT is a boost for you:

1. It shows that you are doing your job.
2. It helps make your job easier.
3. It insures available replacements.
4. It gives you a chance to pass your knowledge to every man on the team.

"BUREAU SIDE"

"The Bureau of Ships uses the information to:

1. Evaluate present equipment.
2. Improve future equipment.
3. Order replacements for stock.
4. Prepare field changes.
5. Publish maintenance data.

Always keep a supply of failure report forms on board. You can get them from the nearest District Publications and Printing Office."

6-2. GENERAL PRECAUTIONS

Carelessness in making repairs or in replacing parts often creates new faults. Note the following points:

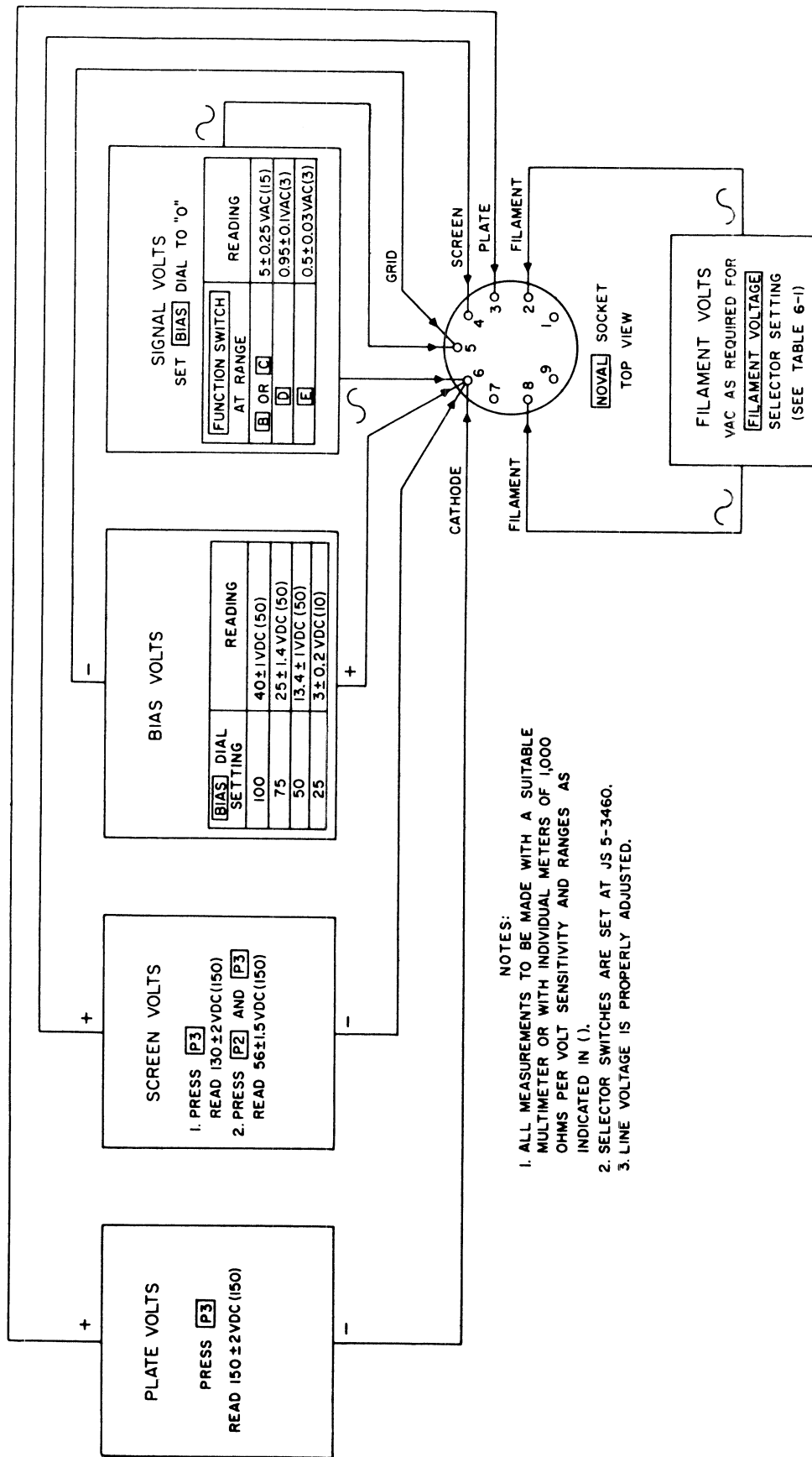
- a. Before unsoldering a part, note the position of the leads. If a part, such as a transformer, has a number of connections, tag each of the leads.
- b. Be careful not to damage other leads by pulling or pushing them out of the way.
- c. Do not allow drops of solder to fall into the equipment, since they may cause short circuits.
- d. A carelessly soldered connection may create a new fault. It is very important to make properly soldered joints, since a poorly soldered joint is one of the most difficult faults to find.
- e. Do not disturb the adjustable contacts on resistor R150 unless readjustment is indicated as a result of voltage calibration checks.

6-3. TEST PROCEDURES

- a. Operate the set as directed in Table 3-6, the Performance Checklist. This operational test is very important because it will in most cases indicate the presence and general location of the trouble.
- b. Using tubes which are known to be satisfactory, test several different types in the equipment being serviced and note the results. This procedure will often localize the trouble to one particular test circuit.
- c. The voltage calibration test diagram (figure 6-1) provides a rapid means of determining if proper voltages are supplied to the test sockets. The use of this diagram in conjunction with Tables 3-6 and 5-2 will provide all the information necessary to locate trouble in the test set.
- d. Table 6-1 is a filament voltage table giving maximum and minimum voltages that should be obtained for each setting of the FILAMENT VOLTAGE switch.

TABLE 6-1. NO LOAD FILAMENT VOLTAGE TABLE

FILAMENT VOLTAGE SWITCH SETTING	AC VOLTAGE		AC VOLTMETER RANGE
	MINIMUM	MAXIMUM	
0.6	0.65	0.72	0-3V
1.1	1.06	1.16	0-3V
1.5	1.26	1.42	0-3V
2.0	1.90	2.10	0-3V
2.5	2.58	2.85	0-3V
3.0	3.25	3.60	0-15V
4.3	4.30	4.75	0-15V
5.0	5.15	5.68	0-15V
6.3	6.20	6.80	0-15V
7.5	7.32	8.10	0-15V
10.0	9.60	10.80	0-15V
12.6	12.30	13.50	0-15V
20.0	19.00	21.00	0-30V
25.0	25.30	28.00	0-50V
35.0	35.20	39.00	0-150V
50.0	51.50	57.00	0-150V
75.0	74.00	82.00	0-150V
117.0	116.00	128.00	0-150V



- NOTES:
1. ALL MEASUREMENTS TO BE MADE WITH A SUITABLE MULTIMETER OR WITH INDIVIDUAL METERS OF 1,000 OHMS PER VOLT SENSITIVITY AND RANGES AS INDICATED IN ().
 2. SELECTOR SWITCHES ARE SET AT JS 5-3460.
 3. LINE VOLTAGE IS PROPERLY ADJUSTED.

Figure 6-1. Voltage Calibration Check Diagram

6-4. CALIBRATION PROCEDURES

From time to time, it may be necessary to check calibration of the various circuits of the tube test set, and, when certain parts must be replaced, recalibration is mandatory. In some cases, calibration of a particular function depends upon one adjustment control only; in other cases, several steps must be taken and several adjustment controls reset to accomplish proper alignment. Table 6-2 lists the critical controls together with the calibration procedures that must be performed when any of these is disturbed or replaced.

TABLE 6-2. COMPONENT CHANGED & RESULTING RECALIBRATION

ADJUSTMENT CONTROL DISTURBED OR REPLACED	SUBSEQUENT CALIBRATION NECESSARY
Variable resistor R134 Meter rectifier CR101	<u>Step a, b</u>
Tapped resistor R130 BIAS control R129	<u>Step c, d, e</u>
SHUNT control R127	<u>Step f</u>
Variable resistor R113 Variable resistor R115	<u>Step g</u>
Variable resistor R114	<u>Step h</u>

NOTE

Before proceeding with calibration procedures, check that the pointer of test set meter M101 is zeroed, and that the knobs of the BIAS and SHUNT controls point to zero when the controls are rotated fully counterclockwise. If necessary, zero the meter pointer by rotating the meter zero adjust screw, and align the control knobs by loosening the set screw, rotating each knob counterclockwise until it points to zero, and tightening the set screw.

To calibrate the tube test set, proceed as follows. Connect the tester to a source delivering 103.5 to 126.5 volts at 50 to 1000 cycles per second. Set the POWER switch to ON. Set the FUNCTION SWITCH to range B. Set the SELECTORS at JR5-3460. Refer to figure 6-1.

a. PLATE VOLTAGE.

- (1) Connect a d-c voltmeter (150-volt range) to NOVAL socket 3 (+), 6(—).
- (2) Press MUT. COND. pushbutton P3. Rotate LINE ADJUST rheostat R126 to obtain $150 \pm 2V$ on the d-c voltmeter. Do not disturb the setting of the LINE ADJUST rheostat.

b. LINE ADJUST.

- (1) With LINE ADJUST rheostat R126 set as in subparagraph *a* above, press and hold LINE ADJ pushbutton P1.
- (2) If necessary, loosen the lock nut on variable resistor R134 and adjust R134 so that test set meter M101 indicates at the LINE TEST mark. If this cannot be accomplished, check rectifier CR101 and resistor R134 and replace, if necessary. If either part is replaced, repeat subparagraphs *a* and *b*.

c. BIAS VOLTAGE.

- (1) Set the BIAS control knob to 100.

- (2) Connect a d-c voltmeter (50-volt range) to NOVAL socket 6(+), 5(—).
- (3) If necessary, loosen resistor R130 clamp C and adjust it to obtain a voltmeter reading of $40 \pm 1v$; then tighten the clamp screw and recheck the voltage.
- (4) Check voltages at the other settings of the BIAS control indicated in figure 6-1. If voltages are not within the tolerances indicated, replace BIAS control R129 and repeat subparagraph *c*.

d. SCREEN VOLTAGE. — Perform this step only after *c* above.

- (1) Set the BIAS control knob to zero.
- (2) Connect a d-c voltmeter (150-volt range) to NOVAL socket 4(+), 6(—).
- (3) Press and hold MUT. COND. pushbutton P3. The voltmeter should indicate $130 \pm 2v$. If necessary, loosen resistor R130 clamp A and adjust the clamp to obtain the proper voltmeter reading. Then tighten the clamp and recheck the voltage.

e. LOW SCREEN VOLTAGE. — Perform this step only after *c* and *d* above. Keep the BIAS control knob and the voltmeter connection as indicated in *d* above.

- (1) Press and hold both DIODE and MUT. COND. pushbuttonsd P2 and P3. The voltmeter should indicate $56 \pm 1.5v$.
- (2) If necessary, loosen resistor R130 clamp B and adjust the clamp to obtain the proper voltage. Tighten the clamp and recheck the voltage.

f. SHUNT CONTROL ALIGNMENT.

- (1) Set the FUNCTION SWITCH to RANGES — A SHUNT.
- (2) Set the SHUNT control knob to 100.
- (3) Connect a 6,000-ohm, 10-watt resistor between NOVAL socket pins 3 and 6.
- (4) Adjust the line voltage.
- (5) Press and hold MUT. COND. pushbutton P3 and check for zero deflection on the test set meter M101. If the meter pointer does not indicate zero, carefully unsolder the rear movable cap that covers the casing of the dual potentiometer and rotate the cap to obtain zero deflection on the test set meter. (One of the two windings of the dual potentiometer is mounted in the cap.)
- (6) Maintain the cap setting by carefully soldering it to the casing, and recheck the test set meter indication.

g. RANGE B CALIBRATION.

- (1) Remove power. Connect an ohmmeter across variable resistors R113 and R115 in turn. The ohmmeter should read 41 ± 0.41 ohms in each case. If either reading is incorrect, loosen the lock nuts, adjust the resistor to obtain the required reading, tighten the lock nuts and recheck the reading.
- (2) Apply power to the test set. Set the BIAS control knob to zero, the FUNCTION SWITCH to RANGES B, and adjust the line voltage.
- (3) Apply a 60-cycle a-c signal of 50 volts rms in series with a 10,000-ohm, 10-watt resistor to NOVAL socket contacts 3 and 6.

- (4) Press MUT. COND. pushbutton P3. Test set meter M101 should read $1,000 \pm 25$ units on the B scale.

NOTE

If the test set meter deflects to the left when P3 is pressed, reverse the line plug of the test set.

- (5) If meter M101 reads more than 1,025 units, loosen lock nut and adjust R113 to obtain the required reading. If meter M101 reads less than 975 units, loosen lock nut and adjust R115 to obtain the proper reading. Lock R113 and R115 after adjustments are made.
- b.* RANGE C CALIBRATION. — Temporarily lay aside the test equipment used in *g* above. Then proceed as follows:
- (1) Set FILAMENT VOLTAGE switch to 6.3 and SELECTORS to JR5-3472.
 - (2) Set the FUNCTION SWITCH to RANGES B. Insert a 6L6 electron tube into the OCTAL socket.
 - (3) Adjust line voltage. Set BIAS control knob to any point above 50.
 - (4) Press and hold MUT. COND. pushbutton P3 and adjust BIAS control knob until test set meter M101 reads 3,000 on the B scale.
 - (5) Set FUNCTION SWITCH to RANGES C. If the

test set meter does not indicate at midscale ($1,500 \pm 50$ units on the B scale), loosen lock nut and adjust resistor R114 to obtain this reading. Tighten lock nut after setting and remove 6L6 tube from test socket.

i. SIMULATED TUBE TEST.

- (1) Repeat the procedures outlined in *g* (2) and (3).
- (2) Set FUNCTION SWITCH to RANGES C and press P3. The test set meter should indicate 500 ± 25 units on the B scale.
- (3) Set FUNCTION SWITCH to RANGES D and press P3. The test set meter should indicate $1,000 \pm 25$ units on the B scale.
- (4) Set FUNCTION SWITCH to RANGES E and press P3. Meter M101 should read $1,000 \pm 25$ units on the B scale.

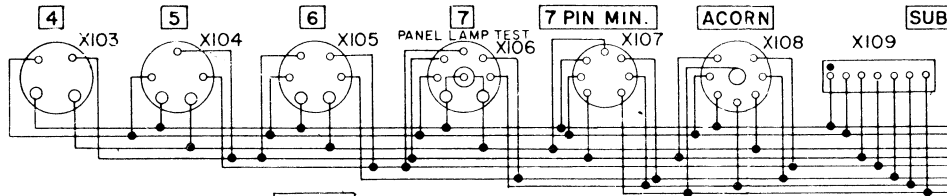
6-5. FINAL TESTING.

- a.* Check line voltage adjustment.
- b.* Make voltage calibration checks.
- c.* If a second Electron Tube Test Set TV-10/U is available and known to be good, make a comparison check. Test several tubes of various types known to be good first on the tester under repair, then on the second unit. If both test meters indicate nearly the same, the repaired tester may be returned to service.



FUNCTION SWITCH S109 WAFER FUNCTIONS

WAFER	1F	1R	2F	2R	3F	3R
LINE OR FUNCTION	CATHODE	CONVERTER GRID	FILAMENT	GRID	SUPPRESSOR	PLATE
WAFER	4F	4R	5F	5R	6F	6R
LINE OR FUNCTION	SHORTS TEST ON-OFF	SCREEN	SHORTS TEST	SIGNAL	METER-	METER+

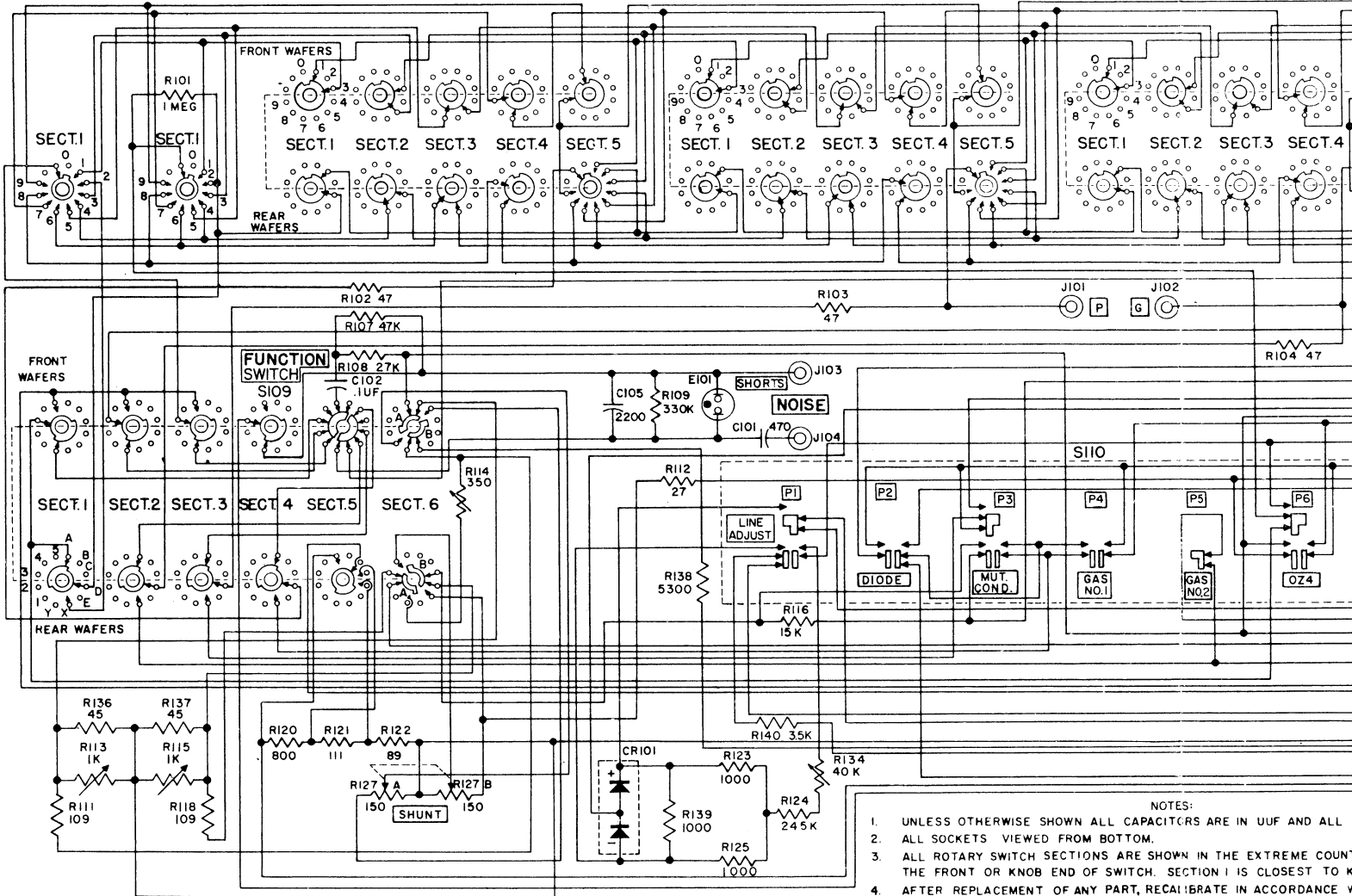


SUPPRESSOR SWITCH S101 CATHODE SWITCH S102

SCREEN SWITCH S103

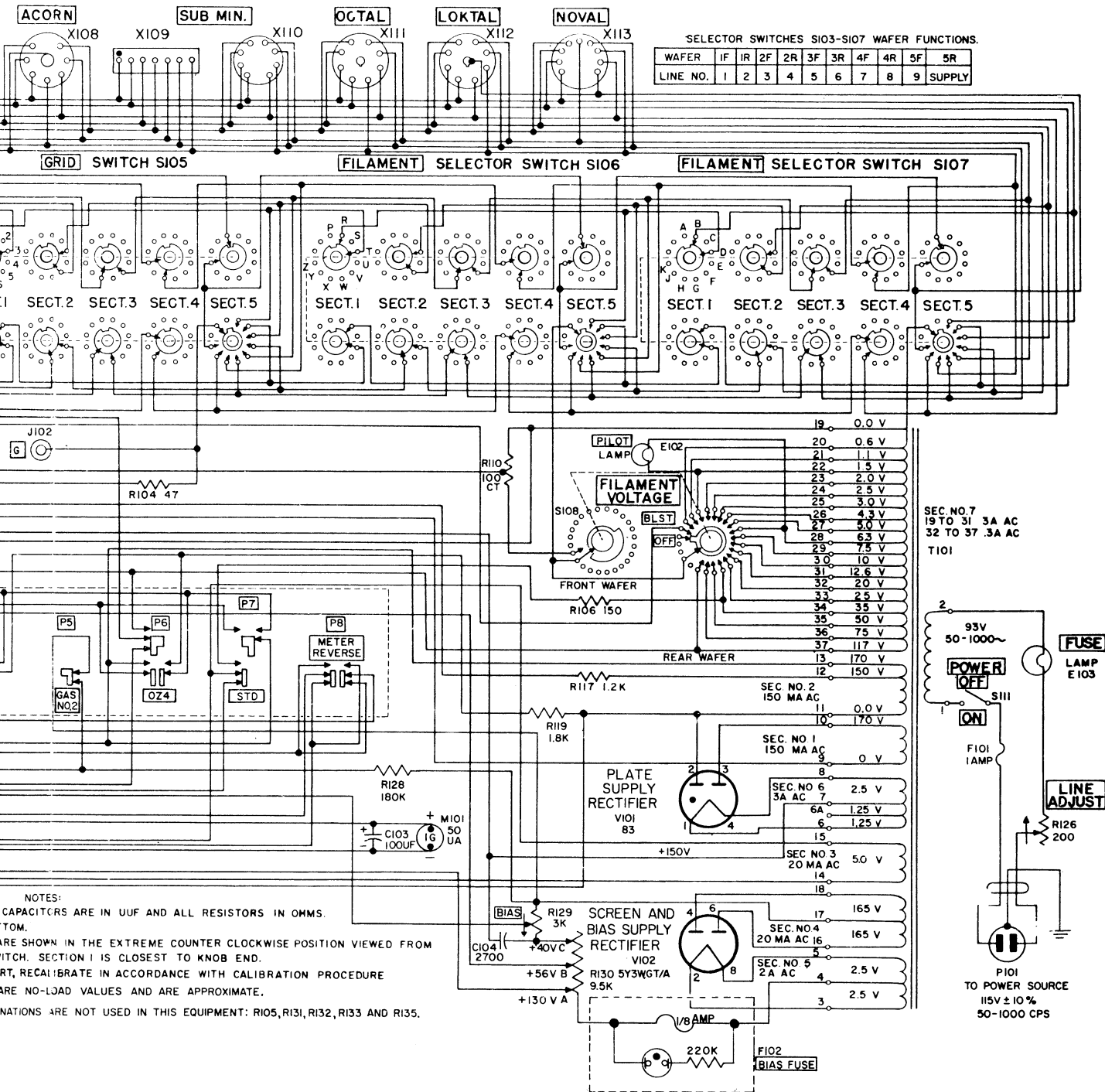
PLATE SWITCH S104

GRID SWITCH S105



- NOTES:
1. UNLESS OTHERWISE SHOWN ALL CAPACITORS ARE IN UUF AND ALL RESISTORS ARE IN OHMS.
 2. ALL SOCKETS VIEWED FROM BOTTOM.
 3. ALL ROTARY SWITCH SECTIONS ARE SHOWN IN THE EXTREME COUNT POSITION. SECTION 1 IS CLOSEST TO THE FRONT OR KNOB END OF SWITCH. SECTION 1 IS CLOSEST TO KNOB.
 4. AFTER REPLACEMENT OF ANY PART, RECALIBRATE IN ACCORDANCE WITH INSTRUCTIONS.
 5. TRANSFORMER VOLTAGES SHOWN ARE NO-LOAD VALUES AND ARE APPROXIMATE.
 6. THE FOLLOWING REFERENCE DESIGNATIONS ARE NOT USED IN THIS EQUIPMENT: R106, R107, R108, R109, R110, R111, R112, R113, R114, R115, R116, R117, R118, R119, R120, R121, R122, R123, R124, R125, R126, R127, R128, R129, R130, R131, R132, R133, R134, R135, R136, R137, R138, R139, R140, R141, R142, R143, R144, R145, R146, R147, R148, R149, R150, R151, R152, R153, R154, R155, R156, R157, R158, R159, R160, R161, R162, R163, R164, R165, R166, R167, R168, R169, R170, R171, R172, R173, R174, R175, R176, R177, R178, R179, R180, R181, R182, R183, R184, R185, R186, R187, R188, R189, R190, R191, R192, R193, R194, R195, R196, R197, R198, R199, R200.

Figure 6-2. Electron Tube Test Set TV-10/U, Over-all Schematic Diagram



TV-19/U, Over-all Schematic Program

PARTS LIST

SECTION 7

7-1. INTRODUCTION.

Reference designations have been assigned to identify all maintenance parts of the equipment. They are used for marking the equipment (adjacent to the part they identify), and are included on drawings, diagrams, and the parts list. The letters of a reference designation indicate the kind of part (generic group), such as resistor, electron tube, switch; the number differentiates between parts of the same generic group. Sockets associated with a specific plug-in device, such as an electron tube, fuse or lamp, are identified by a reference designation which includes that of the plug-in device. For example, the socket for plate supply rectifier tube V101 is designated VX101. As a contrast to this, the test sockets for all electron tubes to be tested on this unit are simply designated X103 through X113, because none of these is associated with a single electron tube that is a functioning part of the equipment. "NOTE 1" means the item is a Low Failure item. If required, requisition from ESO referencing NAVSHIPS 900, 180A.

7-2. MAINTENANCE PARTS LIST.

Table 7-1 lists all maintenance parts of Tube Tester TV-10/U by reference designation, in alphabetical-numerical order. Column 3 gives the name and description of each part. Column 4 indicates how the part is used and gives its functional location in the equipment.

7-3. STOCK NUMBER IDENTIFICATION AND LIST OF PARTS SUPPLIED

Table 7-2 is arranged by reference designation. The "PARTS SUPPLIED" column locates those maintenance parts that are supplied as a permanent part of the equipment. These items should be replaced as soon as they are used. The "STOCK NUMBER" column gives stock numbers for the various key parts. Stock numbers preceded by an asterisk (*) apply to replacement items which differ from those initially supplied in the equipment.

7-4. LIST OF MANUFACTURERS.

Table 7-3 lists manufacturers of parts used in the equipment. The first column includes the abbreviations used in table 7-2 to identify manufacturers.

TABLE 7-1. ELECTRON TUBE TEST SET TV-10/U, MAINTENANCE PARTS LIST

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C101		CAPACITOR, FIXED MICA; 470 uuf $\pm 10\%$; 500 VDCW; CLD; SPEC MIL-C-5; CM20B471K	Isolating capacitor for noise test.
C102		CAPACITOR, FIXED PAPER: 100,000 uuf $\pm 10\%$; 600 VDCW; SPR; SPEC MIL-C-25; CP28A1EF104K	Isolating capacitor for shorts test. Blocks flow of dc.
C103		CAPACITOR, FIXED ELECTROLYTIC: 100 uf; 15 VDCW; JETRONICS A-E7918	Meter by-pass capacitor.
C104		CAPACITOR, FIXED MICA: 2700 uuf $\pm 10\%$; 500 VDCW; CLD; SPEC MIL-C-5; CM30B272K	Neutralizing capacitor for tube under test.
C105		CAPACITOR, FIXED PAPER: 2200 uuf $\pm 20\%$; 400 VDCW SPR; SPEC MIL-C-25; CP04A1EE222M; replace with CP05A1EE222K	Suppresses oscillation for shorts and noise tests.
CR101		RECTIFIER, SELENIUM DIODE: max a-c input 26V rms; output 20V dc; ITRC Type 1T1; 2 units used for bridge.	Meter rectifier for line voltage test circuit.
E101		LAMP, NEON: 115V; 1/4 W; candelabra screw base; T-4-1/2 clear; GE Type NE-45	Short test indicator.
E102		LAMP, INCANDESCENT: 6.3V; 1 W; 0.15 amp; 0.5 CP; miniature bayonet base; GE Type 47	Pilot lamp.
E103		LAMP, INCANDESCENT: 6-8V; 6 CP; 1.14 amp; miniature single contact bayonet base; GE Type 81	Fuse and overload indicator in primary circuit of transformer T101.
E104		Not used in this equipment.	
E105		ADAPTER, TUBE SOCKET: adapts 829-type tube base to standard octal socket; ELCL per Dwg SM-C-179195; SPEC MIL-P-14D; JAN-S-28A (Par. F-61); JETEC JO-63-1	Provides means for testing special base tubes in standard octal socket.
E106		Not used in this equipment.	
E107		ADAPTER, TUBE SOCKET: adapts 2C39-type tube base to standard octal socket; SUI per Dwg SM-B-179230; SPEC MIL-P-14D; JAN-S-28A (Par. F-61); JETEC JO-G3-1	Provides means for testing special contact tubes in standard octal socket.
F101		FUSE, CARTRIDGE: 1 amp; 250V; 1/4 in. dia by 1-1/4 in. lg; LTF Type 3AG, No. 312001.	Protects test set and tubes under test from overloads.
F102		FUSE, CARTRIDGE: 1/8 amp; 250V; 1/4 in. dia by 1-1/4 in. lg; BUS Type AGC.	Protects bias and screen supply and tube under test from overloads.
J101		CONNECTOR, RECEPTACLE: single female contact; phone type; red phenolic head; brass nickel plated body; straight type; 41/64 in. lg; 1 mtg hole 5/16 in. dia; SHHI Type No. 202.	Panel connection for insertion of plate cap lead.
J102		CONNECTOR, RECEPTACLE: single female contact; phone type; black phenolic head, brass nickel plated body; straight type; 41/64 in. lg; 1 mtg hole 5/16 in. dia; SHHI Type No. 202.	Panel connection for insertion of grid cap lead.
J103		Same as J102.	
J104		Same as J102.	
M101		METER, ELECTRON TUBE TESTER: 3-1/2 in. panel mounted; 50ua; four scale ranges 0 to 3000/6000/15,000/30,000 micromhos; internal resistance 1500 ohms $\pm 2\%$; SPEC MIL-M-10304; MIL-M-6A; PHC Model 410-04580, modified.	Indicator for line test and electron tube tests.

TABLE 7-1. ELECTRON TUBE TEST SET TV-10/U, MAINTENANCE PARTS LIST
(CONT.)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
O101		CLIP, ELECTRICAL: Battery type; 150V; 40amp; jaw spread 9/16 in. , 2 in. lg; MUE Type No. 48C.	Part of assy connecting top caps to plate and grid jacks.
O102		CLIP, ELECTRICAL: coil test type, 5/32 in. jaw spread; 1-11/16 in. lg; MUE PEE-WEE Type No. 88.	Used on adapter E-105
O103		INSULATOR, CLIP: black; polyvinyl chloride; 2-5/8 in. lg; straight type; MUE Type No. 49.	Clip insulator.
O104		INSULATOR, CLIP: red; polyvinyl chloride; 2-5/8 in. lg; straight type; MUE Type No. 49.	Clip insulator.
O105		INSULATOR, CLIP: black; 2 in. lg; 5/16 in. ID; MUE Type No. 93.	Insulator for tube adapters.
O106		KNOB: Pointer type; black phenolic; white index line; 1-1/4 in. lg by 3/4 in. wd by 5/8 in. thick; 1/4 in. dia shaft opening with 8-32 set screw; KK Type No. S-292-3L.	Selector for filament, grid, plate, screen, cathode, and suppressor connections.
O107		KNOB: pointer type; black phenolic; white index line; 1-1/4 in. lg by 3/4 in. wd by 5/8 in. thick; 1/4 in. dia shaft opening with two 8-32 set screws; KK Type No. S-392-3L-BB.	Adjustment knob for (1) bias, (2) shunt, (3) function controls.
O108		KNOB: round; black phenolic; 1-1/8 in. dia by 5/8 in. thick; 1/4 in. dia shaft opening with two 8-32 set screws; KK Type No. S-308-64-B-BB.	Adjustment knob for line adjust rheostat R126.
O109		KNOB: round; black phenolic; nickel plated pointer; 1-1/8 in. dia by 5/8 in. thick; 1/4 in. dia shaft opening with two 8-32 set screws; KK Type No. S-308-64-BB-40281.	Adjustment knob for filament selector switch S108.
O110		KNOB, PUSHBUTTON: push-on type; round; red phenolic 15/32 in. lg, 29/64 in. dia; accommodates flat shaft 3/16 in. wd by 0.052 in. thick; KK Type No. S-330-30.	Operation button for S110, section 3.
O111		KNOB, PUSHBUTTON: Push-on type; round, black phenolic; 15/32 in. lg, 29/64 in. dia; accommodates flat shaft 3/16 in. wd by 0.052 in. thick; KK Type S-330-30.	Operation button for S110, Sections 1, 2, 4, 5, 6, 7, 8.
P101		CONNECTOR, PLUG: 3 poles; 2 flat parallel blades, 1 ground blade, 250V AC, 15 amps, SPEC MIL-C-3767; UP 121M; AUPM Type No. 921.	A C supply plug.
P102		CONNECTOR, PLUG: single male contact, phone type; black handle; straight type; 1 in. lg excl contact; 3/8 in. dia; 3/16 in. max cable opening; SHHI Type No. 203.	Part of assembly connecting (1) tube top cap to grid jack (2) tube top cap to plate jack.
P103		CONNECTOR, PLUG: single male contact, phone type; red handle; straight type; 1 in. lg excl contact; 3/8 in. dia; 3/16 in. max cable opening; SHHI Type No. 203.	Same as P102.
R101		RESISTOR, FIXED COMPOSITION: 1 megohm $\pm 10\%$; 1/2 W; IRC type BTS; SPEC MIL-R-11, Type RC20BF-105K.	Grid resistor for converter tubes.
R102		RESISTOR, FIXED COMPOSITION: 47 ohms $\pm 10\%$; 1/2 W; AB; SPEC MIL-R-11, Type RC20BF470K.	Screen circuit neutralizing resistor.
R103		Same as R102.	Plate circuit neutralizing resistor.
R104		Same as R102.	Grid circuit neutralizing resistor.
R105		Not used in this equipment.	

TABLE 7-1. ELECTRON TUBE TEST SET TV-10/U, MAINTENANCE PARTS LIST
(CONT.)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R106		RESISTOR, FIXED WIREWOUND: 150 ohms $\pm 1\%$; 1/4W; RRSC type RJ; SPEC MIL-R-93A, Type RB15K150ROF; for replacement use Type RB15AE150ROF.	Load resistor for rectifier test circuit.
R107		RESISTOR, FIXED, COMPOSITION: 47,000 ohms $\pm 5\%$; 1/2W; IRC MIL type RC20BF473J; SPEC MIL-R-11.	Part of shorts test circuit voltage divider.
R108		RESISTOR, FIXED COMPOSITION: 27,000 ohms $\pm 5\%$; 1/2W; IRC MIL type RC20BF273J; SPEC MIL-R-11.	Part of shorts test circuit voltage divider.
R109		RESISTOR, FIXED, COMPOSITION: 330,000 ohms $\pm 10\%$; 1/2W; IRC type BTS; SPEC MIL-R-11, Type RC20BF334K.	Neon shorts lamp shunt.
R110		RESISTOR, FIXED, WIREWOUND: 100 ohms $\pm 5\%$, 10W; center tapped; MAL type SPL; SPEC MIL-R-26B, Type RW31G101T.	Provides center tap for filament type tubes. Prevents injection of filament voltage into grid signal circuits.
R111		RESISTOR, FIXED, WIREWOUND: 109 ohms $\pm 1\%$; 1/4W; RRSC type RJ; SPEC MIL-R-93A, Type RB15AK-109ROF; for replacement use Type RB15AE109ROF.	Part of meter shunt network for micromho measurements.
R112		RESISTOR, FIXED, WIREWOUND: 27 ohms $\pm 1\%$; 1/4W; RRSC type RJ; SPEC MIL-R-93A, Type RB15AK27ROOF.	Meter shunt for rectifier test circuit.
R113		RESISTOR, VARIABLE, WIREWOUND: 1 sect; 1000 ohms $\pm 10\%$; 2W; CLR type CM17326-140602.	Part of meter shunt network for micromho measurements.
R114		RESISTOR, VARIABLE, WIREWOUND: 1 sect; 350 ohms $\pm 10\%$; 1/2W; resistance at points of rotation 90° -50 ohms, 180° -100 ohms, 270° -150 ohms, 285° -250 ohms, 300° -350 ohms; CLR type CM14478.	Meter shunt for C range.
R115		Same as R113.	Same as R113.
R116		RESISTOR, FIXED, COMPOSITION: 15,000 ohms $\pm 5\%$; 1W; IRC, SPEC MIL-R-11, Type RC32BF153J.	Limiting resistor, plate voltage rectifier circuit.
R117		RESISTOR, FIXED, FILM: 1200 ohms $\pm 1\%$; 1W; AEV type DCF1201F, SPEC MIL-R-10509A, Type RN25R1201F.	Limiting resistor, diode test circuit.
R118		Same as R111.	Same as R111.
R119		RESISTOR, FIXED, WIREWOUND: 1800 ohms $\pm 5\%$; 10W; IRC, SPEC MIL-R-26B, Type RW31G182.	Limiting resistor, OZ4 test circuit.
R120		RESISTOR, FIXED, WIREWOUND: 800 ohms $\pm 0.5\%$; 1/4W; RRSC Type RJ; SPEC MIL-R-93A, Type RB15AK800 ROD.	Part of signal voltage divider.
R121		RESISTOR, FIXED, WIREWOUND: 111 ohms $\pm 0.5\%$; RRSC Type RJ; SPEC MIL-R-93A, Type RB15AK111ROD.	Part of signal voltage divider.
R122		RESISTOR, FIXED, WIREWOUND: 89 ohms $\pm 0.5\%$; RRSC Type RJ; SPEC MIL-R-93A, Type RB15AK89ROOD.	Part of signal voltage divider.
R123		RESISTOR, FIXED, FILM: 1000 ohms $\pm 1\%$; 1/2W; GPS Type CD 1/2 MR; SPEC MIL-R-10509A, Type RN20X-1001F.	Part of bridge network for line test circuit.
R124		RESISTOR, FIXED, FILM: 245,000 ohms $\pm 1\%$; 1W; AEV Type Hi Q; SPEC MIL-R-10509A, Type RN25X-2453F.	Current limiting resistor for line test circuit.

TABLE 7-1. ELECTRON TUBE TEST SET TV-10/U, MAINTENANCE PARTS LIST
(CONT.)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R125		Same as R123.	Same as R123.
R126		RESISTOR, VARIABLE, WIREWOUND: rheostat; 200 ohms; 1000 V rms; 25W; 7.9 to 0.35 amps; OM; SPEC MIL-R-22, Type RP101FD201KK.	Line adjust rheostat.
R127		RESISTOR, VARIABLE, WIREWOUND: 2 sections; 150 ohms each $\pm 5\%$; 4W; MAL Type QMM150P.	Shunt potentiometer. Controls meter sensitivity for rectifier and diode tests.
R128		RESISTOR, FIXED, COMPOSITION: 180,000 ohms $\pm 10\%$; 1/2W; AB; SPEC MIL-R-11, Type RC20BF184K.	Series grid resistor, gas test circuit.
R129		RESISTOR, VARIABLE, WIREWOUND: 1 section; 3000 ohms $\pm 10\%$; 4W; MAL type QM3MP; SPEC MIL-R-19 (6).	Bias potentiometer. Controls bias voltage.
R130		RESISTOR, ADJUSTABLE, WIREWOUND: 9500 ohms $\pm 10\%$; 10W; 3 slides; MAL Type SPL-AV9500.	Part of voltage divider used for calibrating bias and screen voltage.
R131- R133		Not used in this equipment.	
R134		RESISTOR, VARIABLE, WIREWOUND: 1 section; 40,000 ohms $\pm 10\%$; 1/2W; CLR Type CM16187.	Dropping resistor, line test circuit.
R135		Not used in this equipment.	
R136		RESISTOR, FIXED, WIREWOUND: 45 ohms $\pm 1\%$; 1/4W; RRSC Type RJ; SPEC MIL-R-93A, Type RB15K45ROOF; for replacement use Type RB15AE-45ROOF.	Part of meter shunt network for micromho measurements.
R137		Same as R136.	Same as R136.
R138		RESISTOR, FIXED, FILM: 5300 ohms $\pm 1\%$; 1/2W; AEV Hi Q Type CP 1/2; SPEC MIL-R-10509A.	Meter multiplier for tube test circuit.
R139		Same as R123.	Meter shunt for line test circuit.
R140		RESISTOR, FIXED, FILM: 3500 ohms $\pm 1\%$; 1/2W; AEV Hi Q Type CP 1/2; SPEC MIL-R-10509A.	Meter multiplier for tube test circuit.
S101		SWITCH, ROTARY: 1 section, 10 positions, 1500 vac; non pile-up; 1 moving contact; 10 fixed contacts; 1 pole, 9 throws; 1-13/32 in. lg by 1-31/32 in. dia; bushing mounting; OAK Type 72405-N1, FORWAY Type A-670.	Connects suppressor voltage to selected socket contact.
S102		Same as S101.	Connects cathode voltage to selected socket contact.
S103		SWITCH, ROTARY: 5 sections; 10 positions; 1500 vac; non pile-up; 10 moving contacts; 28 fixed contacts; 10 poles, 10 throws; 3-9/16 in. lg by 1-13/32 in. dia, bushing mounted; OAK Type 72404-N5; FORWAY Type A-671.	Connects screen voltage to selected socket contact.
S104		Same as S103.	Connects plate voltage to selected socket contact.
S105		Same as S103.	Connects grid voltage to selected socket contact.
S106		Same as S103.	Connects one side of filament voltage to selected socket contact.
S107		Same as S103.	Connects one side of filament voltage to selected socket contact.

TABLE 7-1. ELECTRON TUBE TEST SET TV-10/U, MAINTENANCE PARTS LIST
(CONT.)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
S108		SWITCH, ROTARY: 1 section; 20 positions, non-pile-up; 2 moving contacts; 22 fixed contacts; 2 poles, 20 throws; 500 VDC; 10 amp; 1-1/2 in. lg by 1-15/16 in. wd by 2-5/16 in. high; bushing mounted; OAK Type 72403-MF1.	Selects proper filament voltage for tube under test.
S109		SWITCH, ROTARY: 6 sections; 10 positions; non-pile-up; 15 moving contacts; 22 fixed contacts; 18 poles, 10 throws; 1500 VAC; 7 amp; 3-13/16 in. dia; bushing mounted; OAK Type 72406-K6; FORWAY Type A-672.	Function selector for shorts tests and meter ranges.
S110		SWITCH, PUSH: 8 sections; 8 pushbuttons; momentary action; normally open except SPST section normally closed; 6-9/32 in. lg by 15/16 in. wd; OAK Type 455-35-130.	Establishes proper conditions for various tests.
S111		SWITCH, TOGGLE: SPST; on-off position; AC; 125V; 6 amps; AHH Type 82653; SPEC JAN-S-23, Type ST42A; MS35058.	Power ON-OFF switch.
T101		TRANSFORMER, POWER: Step down and step up; primary 93V, 50-1000 cycles, single phase; sec No. 1, 154V, 150 ma; sec No. 2, 154V, 150 ma, tapped at .36V; sec No. 3, 5.2V, 20 ma; sec No. 4, 330V, 20 ma, tapped at .36V; sec No. 5, 4.8V, 2 amps, center tapped; sec No. 6, 5.14V, 3 amps, center tapped; sec No. 7, 117V, tapped at 0.6/1.1/1.5/2.0/2.5/3.0/4.3/5.0/6.3/7.5/10.0/12.6/20.0/25.0/35.0/50.0/75.0/117.0V; 3 amps from 0.6V through 12.6V, 0.3 amp from 20V through 117V; INTR Type SP6071; SPEC MIL-T-27.	Supplies power to test set.
V101		TUBE, ELECTRON: full wave mercury vapor rectifier; RCA Type 83; SPEC MIL-E-1B, Type 83.	Rectifier, plate voltage supply.
V102		TUBE, ELECTRON: full wave rectifier; HYT Type 5Y3WGT; SPEC MIL-E-1B, Type 5Y3WGT/G.	Rectifier, screen voltage and bias supply.
X101 * Should be XV101		SOCKET, ELECTRON TUBE: 4 phosphor bronze silver plated contacts; 1-1/4 in. dia by 0.420 in. high excl terminals; molded mica filled phenolic body; saddle mtg; AMP Type No. 78RS4TM.	Socket for tube V101.
X102 * Should be XV102		SOCKET, ELECTRON TUBE: 8 phosphor bronze silver plated contacts; 1-7/8 in. lg by 1-1/4 in. wd; molded mica filled body; plate mtg; AMP Type No. 77MIP8TM.	Socket for tube V102.
X103		SOCKET, ELECTRON TUBE: 4 phosphor bronze silver plated contacts; 1-7/8 in. lg by 1-9/32 in. wd by 31/64 in. high; molded mica filled phenolic body; plate mtg; AMP Type No. 77MIP4TM.	4-pin tube test socket.
X104		SOCKET, ELECTRON TUBE: 5 phosphor bronze silver plated contacts; 1-7/8 in. lg by 1-9/32 in. wd by 5/8 in. high; molded mica filled phenolic body; plate mtg; AMP Type No. 77MIP5TM.	5-pin tube test socket.
X105		SOCKET, ELECTRON TUBE: 6 phosphor bronze silver plated contacts; 1-7/8 in. lg by 1-9/32 in. wd by 31/32 in. high; molded mica filled phenolic body; plate mtg; AMP Type No. 77MIP6TM.	6-pin tube test socket.
X106		SOCKET, ELECTRON TUBE: 7 phosphor bronze silver plated contacts; has special additional contacts for pilot lamp testing in center of socket; 1-7/8 in. lg by 1-1/2 in. wd by 7/16 in. high; molded mica filled phenolic body; AMP Type No. 78RS7CDT.	Test socket for large and small-radius 7-pin tubes. Also provides test socket for miniature bayonet- or screw-base pilot lamps.

TABLE 7-1. ELECTRON TUBE TEST SET TV-10/U, MAINTENANCE PARTS LIST
(CONT.)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
X107		SOCKET, ELECTRON TUBE: 7 phosphor bronze contacts; miniature; w/small center shield; 1-1/4 in. dia by 0.420 in. high; molded mica filled phenolic body; AMP Type No. 147-505.	7-pin miniature tube test socket.
X108		SOCKET, ELECTRON TUBE: 7 phosphor bronze silver plated contacts; for acorn type tube with either 5 or 7 radial contacts; 1-7/8 in. dia by 1-1/2 in. high; molded mica filled phenolic body; ALP Type No. 457V-1.	Acorn-type tube test socket.
X109		SOCKET, ELECTRON TUBE: 7 phosphor bronze silver plated contacts; subminiature; inline type; 3/4 in. lg by 9/16 in. wd by 9/32 in. high; molded mica filled phenolic body; saddle mtg; CIN Type No. EXP-8736-B1.	Test socket for subminiature tubes with inline contacts or leads.
X110		SOCKET, ELECTRON TUBE: 8 phosphor bronze silver plated contacts; subminiature; 7/8 in. lg by 1/2 in. wd by 9/32 in. high; molded mica filled phenolic body; saddle mtg; CIN Type No. 8694.	Test socket for subminiature tubes with round contacts.
X111		Same as X102.	Test socket for octal tubes.
X112		SOCKET, ELECTRON TUBE: 8 phosphor bronze silver plated contacts; loktal type; 1-5/8 in. lg by 1-3/16 in. wd by 3/8 in. high; molded mica filled phenolic body; saddle mtg; AMP Type No. 88-8XTM.	Test socket for loktal base tubes.
X113		SOCKET, ELECTRON TUBE: 9 phosphor bronze contacts; miniature noval size; 0.930 in. dia by 0.357 in. high; molded mica filled phenolic body; bottom mtg; AMP Type No. 59-410.	Test socket for miniature noval tubes.
XE101		LAMPHOLDER: candelabra screw base; 125V; 75W; insulated; brass shell; 1-3/4 in. lg by 5/8 in. wd; DMC Type No. 414L-CH-LT.	Socket for neon shorts indicator lamp.
XE102		LIGHT: Indicator; 125V; 75W; with 1/2 in. faceted green jewel lens; for miniature bayonet base; 1-11/32 by 7/8 by 1-1/16 in. behind mtg surface; DMC Type No. 40.	ON-OFF indicator and socket.
XE103		LAMPHOLDER: Candelabra bayonet base; 115V; 75W; insulated; 2-3/16 by 1-1/4 by 5/8 in., DMC Type No. XA-614-CH-LT.	Socket for fuse lamp E103.
XF101		FUSEHOLDER: Extractor post; finger operated; 250V; 15A; LTF Type 342001.	Holder for fuse F101.
XF102		FUSEHOLDER, LAMP INDICATING: neon lamp lights when fuse is blown; panel mounted, bayonet-type, flat-sided, clear knob; 220K ohm series lamp resistor; 2-13/16 in. lg by 13/16 in. dia; BUS Type HKL-X.	Holder for fuse F102.
XV101		See X101.	
XV102		See X102.	

TABLE 7-2. ELECTRON TUBE TEST SET TV-10/U, STOCK NUMBER
IDENTIFICATION AND LIST OF PARTS SUPPLIED

* Replacement item differs from item originally supplied.

REF. DESIG.	PARTS SUPPLIED		STOCK NUMBERS			
	BOX NO.	QUANT.	FEDERAL	STANDARD NAVY	SIGNAL CORPS	U S A F
C101			*N5910-101-4890			
C102			N5910-112-7483			
C103			N5910-112-8448			
C104			*N5910-101-5796			
C105			*N5910-643-8685			
CR101			N6130-635-4366			
E101		1	G6240-179-1814			
E102		1	G6240-155-8706			
E103		1	*G6240-797-4370			
E105			N5935-643-7096			
E107			N5935-283-3400			
F101		1	N5920-280-5000			
F102		1	N5920-142-4838			
J101			N5935-504-3501			
J102			N5935-698-5492			
J103			N5935-698-5492			
J104			N5935-698-5492			
M101			*N6625-643-3201			
O101			*G5940-220-9767			
O102			*N5940-186-8960			
O103			N5975-504-7781			
O104			N5975-504-7782			
O105			N5975-504-7783			
O106			N5355-644-4061			
O107			N5355-284-4575			
O108			*N5355-644-3866			
O109			N5355-644-1038			
O110						
O111						
P101			N5935-636-7145			
P102			N5935-504-3498			
P103			N5935-504-3497			
R101			*N5905-192-0390			
R102			*N5905-252-4018			
R103			*N5905-252-4018			
R104			*N5905-252-4018			
R106			*N5905-202-0336			
R107			*N5905-254-9201			
R108			*N5905-195-9482			
R109			*N5905-192-0379			
R110			*N5905-157-0850			
R111			*N5905-202-0332			
R112			N5905-549-6571			
R113			N5905-502-2353			
R114			N5905-503-9175			
R115			N5905-502-2353			
R116			N5905-299-2058			
R117			N5905-636-6170			
R118			*N5905-202-0332			
R119			*N5905-157-5662			
R120			*N5905-204-9490			
R121			N5905-549-9201			
R122			N5905-549-4386			
R123			*N5905-539-4563			
R124			*N5905-258-9343			
R125			*N5905-539-4563			
R126			*N5905-195-2312			
R127			*N5905-158-5741			
R128			*N5905-192-0660			
R129			*N5905-144-1638			
R130			N5905-646-5848			
R134			N5905-502-2351			
R136			*N5905-100-7963			
R137			*N5905-100-7963			
R138			N5905-202-0615			
R139			*N5905-539-4563			
R140			N5905-636-5749			
S101			*N5930-549-0286			

TABLE 7-2. ELECTRON TUBE TEST SET TV-10/U, STOCK NUMBER
IDENTIFICATION AND LIST OF PARTS SUPPLIED (CONT.)

* Replacement item differs from item originally supplied.

REF. DESIG.	PARTS SUPPLIED		STOCK NUMBERS			
	BOX NO.	QUANT.	FEDERAL	STANDARD NAVY	SIGNAL CORPS	U S A F
S102			*N5930-549-0286			
S103			*N5930-259-7198			
S104			*N5930-259-7198			
S105			*N5930-259-7198			
S106			*N5930-259-7198			
S107			*N5930-259-7198			
S108			N5930-569-1430			
S109			N5930-569-9334			
S110			N5930-665-4181			
S111			N5930-050-2680			
T101			N5950-504-8909			
V101			N5960-100-7323			
V102			N5960-272-9178			
X103			N5935-129-3081			
X104			N5935-220-9837			
X105			N5935-256-2103			
X106						
X107			N5935-237-3056			
X108			N5935-224-0838			
X109			N5935-258-3050			
X110			N5935-224-0846			
X111			N5935-280-2868			
X112			N5935-129-3116			
X113			N5935-173-8237			
XE101			N6250-233-5078			
XE102		Lampholder Lens	N6210-231-4643			
			N6210-299-5802			
XE103	LFI		N5920-763-5155			
XF101			*N5920-280-4099			
XF102						
XV101			N5935-280-2868			
XV102			N5935-222-9961			

TABLE 7-3. ELECTRON TUBE TEST SET TV-10/U, LIST OF MANUFACTURERS

ABBREVIATION	NAME	ADDRESS
AB	Allen-Bradley Co.	136 W. Greenfield Ave., Milwaukee 4, Wis.
AEV	Aerovox Fi Q Div.	Orlean, N. Y.
AFH	Arrow-Hart & Hegeman Electric Co.	103 Hawthorn St., Hartford 6, Conn.
ALP	Alden Products Co.	112 N. Main St., Brockton, Mass.
AMP	American Phenolic Corp.	1830 S. 54th Ave., Chicago 50, Ill.
AUPM	Automatic & Precision Mfg. Co.	252 Hawthorne Ave., Yonkers 5, N. Y.
BUS	Bussmann Mfg. Co.	St. Louis 7, Mo.
CIN	Cinch Mfg. Corp.	1026 S. Homan Ave., Chicago 24, Ill.
CLD	Cornell-Dubilier Electric Corp.	900 Hamilton Blvd., S. Plainfield, N. J.
CLR	Clarostat Mfg. Co., Inc.	Dover, N. H.
DMC	Drake Mfg. Corp.	1713 Hubbard St., Chicago 22, Ill.
ELCL	Elco Corp.	198 W. Glenwood Ave., Philadelphia 40, Pa.
GE	General Electric Co., Lamp Div.	Nelk. Park, Cleveland 12, Ohio
GPS	Texas Instruments, Inc.	6000 Lemmon Ave., Dallas 9, Texas
HYT	CBS-Hytron	100 Endicott St., Danvers, Mass.
INTR	Industrial Transformer Corp.	Gouldsboro, Pa.
IRC	International Resistance Co.	401 N. Broad St., Philadelphia 8, Pa.
ITRC	International Rectifier Corp.	1521 E. Grand Ave., El Segundo, Calif.
KK	Kurz-Kasch, Inc.	1421 S. Broadway, Dayton 1, Ohio
LTF	Littelfuse, Inc.	Des Plaines, Ill.
MAL	Mallory & Co., Inc., P. R.	3029 E. Washington St., Indianapolis 6, Ind.
MUE	Mueller Electric Co.	1583 E. 31st St., Cleveland, Ohio
OAK	Oak Mfg. Co.	Chicago, Ill.
OM	Ohmite Mfg. Co.	3601 Howard St., Skokie, Ill.
PHC	Phaostron Co.	151 Pasadena Ave., S. Pasadena, Calif.
RCA	Radio Corp. of America	Plant St., Harrison, N. J.
RRSC	Reon Resistor Corp.	117 Stanley Ave., Yonkers, N. Y.
SHHI	Smith, Herman H., Inc.	2326 Nostrand Ave., Brooklyn 10, N. Y.
SPR	Sprague Electric Co.	367 Marshall St., North Adams, Mass.
SUI	Supreme, Inc.	Greenwood, Miss.



