

# TUBE TESTER I-177



WAR DEPARTMENT

3 AUGUST 1944

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**RESTRICTED.** *DISSEMINATION OF RESTRICTED MATTER.*

The information contained in restricted documents and the essential characteristics of restricted materiel may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or the press except by authorized military public relations agencies. (See also par. 28, AR 280-5, 15 Mar. 1944.)

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TECHNICAL MANUAL  
TUBE TESTER I-177

CHANGES  
No. 1

WAR DEPARTMENT  
WASHINGTON 25, D. C., 24 October 1945

TM 11-2627, 3 August 1944, is changed as follows:

The classification RESTRICTED is removed from the manual by Section IX, War Department Circular 186, 1945.

*Figure 1.—Tube Tester I-177 in wooden case, with cover raised.*



*Figure 1.1—Tube Tester I-177 in metal case, with cover raised.*

**1. PURPOSE.** Tube Tester I-177 \* \* \* of vacuum tube. Later equipments are inclosed in metal cases instead of the original

\*This change supersedes TB 11-2627-1, June 1945.

wooden cases but all operate the same. The purpose of \* \* \* of this instrument.

## 2. TUBE TESTER I-177 (figs. 1 and 1.1).

a. (Superseded.) This instrument is furnished either as an individual unit or as part of Test Set I-56-K. As a part of Test Set I-56-K it fits into a compartment of Carrying Case CS-130 (fig. 1.2). The weights and dimensions of the tube tester and other components of the test set are given below.

Equipment	Dimensions (in.)			Volume (cu. ft.)	Weight (lb)	
	Height	Width	Depth		Wooden case	Metal case
Voltohmmeter I-166-----	5.5	6.0	7.0	0.13	4.75	5.5
Test Unit I-176-----	5.5	11.5	8.5	0.31	9.0	10.0
Tube Tester I-177-----	5.75	15.5	8.5	0.44	15.75	16.5
Case CS-130-----	14.75	20.5	9.75	1.76	-----	25.6

The following table gives the dimensions and approximate weight of the packed units:

Equipment	Dimensions (in.)			Volume (cu. ft.)	Weight (lb)
	Height	Width	Depth		
Tube Tester I-177 (packed for domestic shipment)-----	8	17.9	10.5	0.87	17
Tube Tester I-177, two in carton (packed for domestic shipment)-----	13.5	17	10.5	1.39	37
Test Set I-56-K, one in a wooden case-----	15	21	11	2.01	73
Test Set I-56-K, three in a wooden case-----	17.5	23.5	35	8.33	215

b. Tube Tester I-177 \* \* \* and 0-15,000 microohms. Most tube testers operate on 105- to 125-volt, 60-cycle alternating current. Some equipments on Orders No. 12139-Phila-45-10 and 28948-Phila-45-10 may be operated on 105 to 125 volts or on 210 to 250 volts, the range being determined by the setting of the switch mounted to the right of the SHORTS indicator. Tube testing data \* \* \* of the cover.

## 4. SHORTS TEST.

\* \* \* \* \*

c. Determine the type \* \* \* of the instrument. If the tube is marked with Signal Corps nomenclature, use the table in section V of this manual or the table on the back of the first card in the tester to determine the commercial equivalent.

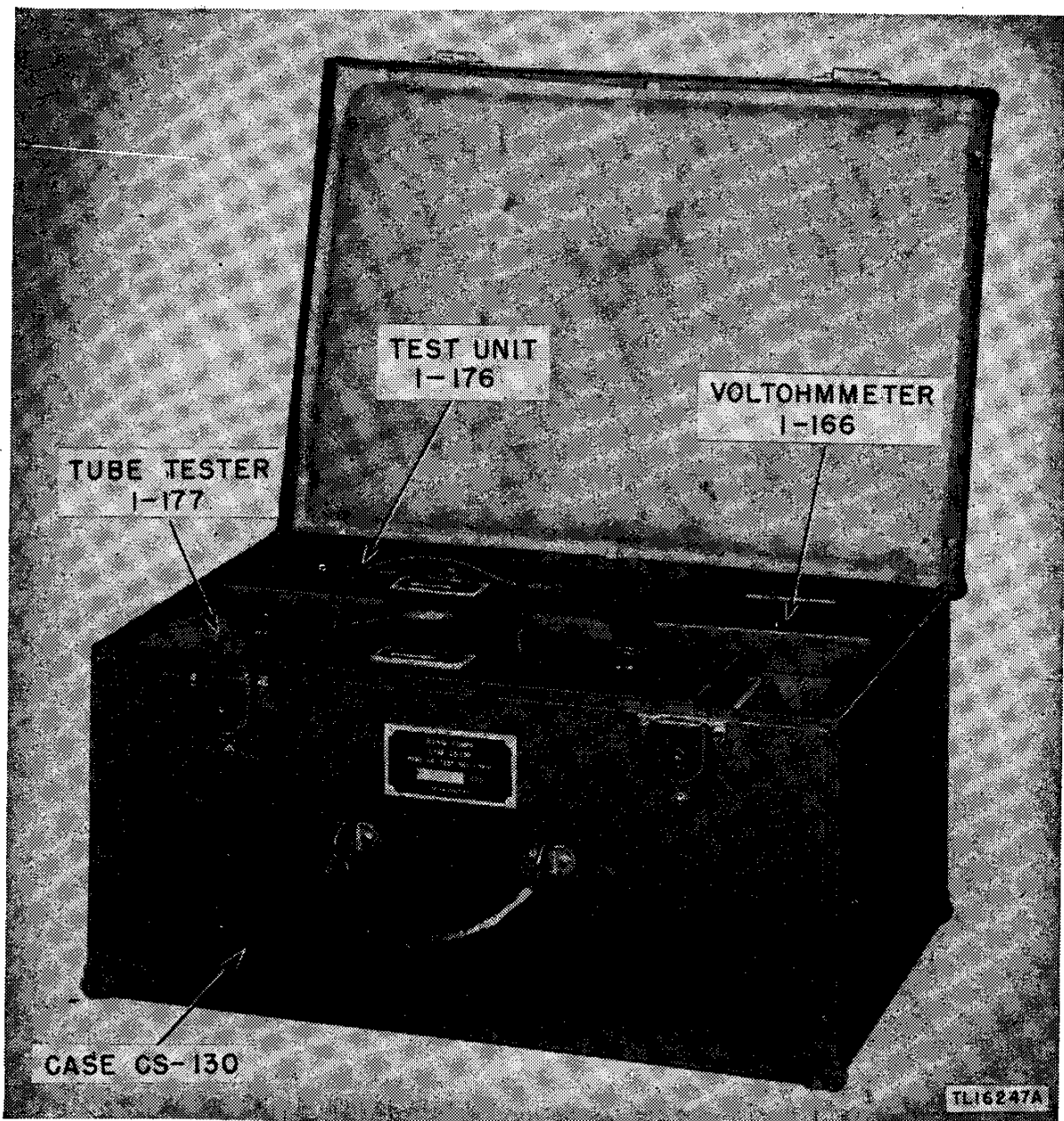


Figure 1.2.—Test Set I-56-K.

\* \* \* \* \*

g. Insert the tube \* \* \* headed Socket Letter. If the column headed Notations of the tube test data indicates the use of Adapter M-418\* plug the adapter into the octal socket of the tester, and the tube into the adapter. Connect the left-hand lead to the left-hand plate pin and the right-hand lead to the right-hand plate pin. Proceed with the test in the normal manner.

## 7. GAS TEST.

\*Adapter, Tube Socket: Signal Corps Adapter M-418. Signal Corps Stock No. 2Z299-418.

WAR DEPARTMENT UNSATISFACTORY EQUIPMENT REPORT									
FOR	TECHNICAL SERVICE Signal Corps					MATERIEL		DATE 1 Feb 45	
FROM	ORGANIZATION 175 Signal Repair Co					STATION		APO 102	
TO	NEXT SUPERIOR HEADQUARTERS Supply Sec, Hq Fourth Army Sig Sv					STATION APO 110		TECHNICAL SERVICE Signal Corps	
COMPLETE MAJOR ITEM									
NOMENCLATURE Radio Transmitter BC-123-A					TYPE Ground, vehicular		MODEL A		
MANUFACTURER American Radio Corp					U. S. A. REG. NO. 1234-Phila-45		SERIAL NO. 12345		DATE RECEIVED 5 Jan 45
EQUIPMENT WITH WHICH USED (If applicable) Radio Set SCR-456-A in Tank, Medium, M4									
DEFECTIVE COMPONENT—DESCRIPTION AND CAUSE OF TROUBLE									
PART NO. Sig C Stk No. 3E47-2		TYPE Capacitor C20; fixed; 1-mf; 500 vdcw			MANUFACTURER American Radio Corp			DATE INSTALLED When manufactured	
DESCRIPTION OF FAILURE AND PROBABLE CAUSE (If additional space is required, use back of form) Capacitor C20 shorts out due to humid operating conditions									
DATE OF INITIAL TROUBLE 15 Jan 45		TOTAL TIME INSTALLED			TOTAL PERIOD OF OPERATION BEFORE FAILURE				
		YEARS MONTHS DAYS			YEARS MONTHS DAYS HOURS MINUTES SECONDS				
		0 0 0			0 0 5 - -				
BRIEF DESCRIPTION OF UNUSUAL SERVICE CONDITIONS AND ANY REMEDIAL ACTION TAKEN Operation in tropics; heavy rainfall. Was replaced and set given moistureproofing and fungiproofing treatment, 20 Jan 45.									
TRAINING OR SKILL OF USING PERSONNEL		RECOMMENDATIONS (If additional space is required, use back of form)							
POOR FAIR GOOD		Substitute capacitor designed for tropical operation							
		X							
TYPED NAME, GRADE, AND ORGANIZATION E.A. Wilson, 1st Lt, Sig C 175 Signal Repair Co					SIGNATURE E.A. Wilson				
FIRST ENDORSEMENT									
TO CHIEF					OFFICE				
NAME, GRADE, AND STATION					STATION				
					DATE				
Instructions									
<p>1. It is imperative that the chief of technical service concerned be advised at the earliest practical moment of any constructional, design, or operational defect in material. This form is designed to facilitate such reports and to provide a uniform method of submitting the required data.</p> <p>2. This form will be used for reporting manufacturing, design, or operational defects in material, petroleum fuels, lubricants, and preserving materials with a view to the improving and correcting such defects, and for use in recommending modifications of material.</p> <p>3. This form will not be used for reporting failures, isolated material defects or malfunctions of material resulting from life wear-and-tear or accidental damage nor for the replacement, repair or the issue of parts and equipment. It does not replace currently authorized operational or performance records.</p> <p>4. Reports of malfunctions and accidents involving ammunition will continue to be submitted as directed in the manner described in AR 750-10 (change No. 3).</p> <p>5. It will not be practicable or desirable in all cases to fill all blank spaces of the report. However, the report should be as complete as possible in order to expedite necessary corrective action. Additional pertinent information not provided for in the blank spaces should be submitted as inclosures to the form. Photographs, sketches, or other illustrative material are highly desirable.</p> <p>6. When cases arise where it is necessary to communicate with a chief of service in order to assure safety to personnel, more expeditious means of communication are authorized. This form should be used to confirm reports made by more expeditious means.</p> <p>7. This form will be made out in triplicate by using or service organization. Two copies will be forwarded direct to the technical service; one copy will be forwarded through command channels.</p> <p>8. Necessity for using this form will be determined by the using or service troops.</p>									
<p>W. D., A. G. O. Form No. 468 20 August 1944</p> <p>U. S. GOVERNMENT PRINTING OFFICE 16-41240-1</p> <p>This form supersedes W. D., A. G. O. Form No. 466, 1 December 1944, which may be used until existing stocks are exhausted.</p> <p>TL9589C</p>									

Figure 8.1. WD AGO Form 468, with sample entries.

repair. On the other hand, the prime function of trouble shooting and repair is to locate and correct *existing* defects. The importance of preventive maintenance cannot be overemphasized. The entire system of communications depends upon the readiness and operating efficiency of each item of equipment when it is needed. In a similar manner, the test equipment by which this condition of readiness in

communications equipment is realized must be kept in excellent operating condition at all times.

**NOTE:** The operations in paragraphs 26.1 and 26.2 are user maintenance.

*b. Description of Preventive Maintenance Techniques.*

(1) GENERAL. Most of the electrical parts used in Tube Tester I-177 require routine preventive maintenance. This preventive maintenance varies. Some require a different kind of maintenance than others. Some require more, some less. Definite and specific instructions must be followed. Hit-or-miss techniques cannot be applied. This change contains specific instructions to guide personnel assigned to perform the six basic maintenance operations: Feel, Inspect, Tighten, Clean, Adjust, and Lubricate. Throughout this change the lettering system for the six operations will be as follows:

F—Feel\*

I—Inspect

T—Tighten

C—Clean

A—Adjust

L—Lubricate

The first two operations show if the other four are needed. Selection of operations is based on a knowledge of field needs. For example, dust encountered on dirt roads during cross-country travel filters into equipment no matter how much care is taken to prevent it. Rapid changes in weather (such as heavy rain followed by blistering heat), excessive dampness, snow, and ice tend to cause corrosion of exposed surfaces and parts. Without frequent inspections and the necessary tightening, cleaning, and lubricating operations, equipment becomes undependable and subject to break-down when it is needed most.

(2) FEEL\*. The feel operation is used most often to check rotating machinery such as dynamotors, blower motors, and drive motors, also to determine whether electrical connections and bushings are overheated. Feeling will show the need for lubrication or the existence of other defects requiring correction. The maintenance man *must* become familiar with the normal operating temperatures of motors, transformers, and other parts to recognize signs of overheating.

**NOTE:** It is important to perform the feel operation as soon as possible after shut-down and always before any other maintenance is done.

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\*The Feel operation does not apply to Tube Tester I-177.

(3) **INSPECT.** Inspection is the most important operation in preventive maintenance. A careless observer will overlook evidences of minor trouble. Although these defects may not at the moment interfere with performance of the equipment, invaluable time and effort can be saved if they are corrected *before* they lead to major and costly break-downs. To be able to recognize the signs of a defective set, make every effort to become thoroughly familiar with indications of *normal* functioning. Inspection consists of *carefully* observing all parts of the equipment, noticing their color, placement, state of cleanliness, etc. Inspect for the following conditions:

(a) Overheating, as indicated by discoloration, blistering, or bulging of the parts or surface of the container; leakage of insulating compounds; and oxidation of metal contact surfaces.

(b) Placement, by observing that all leads and cabling are in their original positions.

(c) Cleanliness, by carefully examining all recesses in the units for accumulation of dust, especially between connecting terminals and binding posts. Parts, connections, and joints should be free of dust, corrosion, and other matter. In tropical and high-humidity areas, look for fungus growth and mildew.

(d) Tightness, by testing any connection or mounting which appears to be loose.

(4) **TIGHTEN, CLEAN, AND ADJUST.** These operations explain themselves. Specific procedures to be followed in performing them are given wherever necessary throughout paragraph 26.1.

**CAUTION:** Screws, bolts, and nuts should not be tightened carelessly. Fittings tightened beyond the pressure for which they are designed will be damaged or broken.

Whenever a loose connection is tightened, it should be moisture-proofed and fungiproofed again by applying the varnish with a small brush. See paragraph 27 for details of moistureproofing and fungi-proofing.

(5) **LUBRICATE.** Lubrication refers to the application of grease or oil to the bearings of motors or rotating shafts. It may also mean the application of a light oil to door hinges or other sliding surfaces on the equipment.

## **26.1. ITEMIZED PREVENTIVE MAINTENANCE** (Added).

*a. Introduction.* For ease and efficiency of performance, preventive maintenance on Tube Tester I-177 will be broken down into operations that can be performed at different time intervals. In this section the preventive maintenance work to be performed on the tube tester at the specified time intervals is broken down into units

of work called items. The general techniques involved and the application of the FITCAL operations in performing preventive maintenance on individual parts are discussed in this paragraph. When performing preventive maintenance, refer to *c* through *f* below. Perform all work with the power removed from the equipment. After preventive maintenance has been performed on a given day, put the equipment into operation and check it for satisfactory performance.

*b. Preventive Maintenance Tools and Materials.* The following materials will be needed in performing preventive maintenance: common hand tools, #0000 sandpaper, Solvent, Dry-cleaning.

**NOTE:** Gasoline will not be used as a cleaning fluid for any purpose. Solvent, Dry-cleaning, is available as a cleaning fluid through established supply channels. Oil, Fuel, Diesel, may be used for cleaning purposes when dry-cleaning solvent (SD) is not at hand. Carbon tetrachloride will be used as a cleaning fluid only in the following cases: where inflammable solvents cannot be used because of the fire hazard, and for cleaning electrical contacts including relay contacts, plugs, commutators, etc.

*c. Item 1, Exterior of Case.*

(1) INSPECT (I). Inspect for general cleanliness and condition of protective coating of paint. See that the hinges, the snap fastener, and the carrying handle are firmly secured to the case.

(2) TIGHTEN (T). If the hinges, the snap fastener, or the carrying handle are loose and cannot be tightened by the using personnel, return the tube tester to a higher echelon as soon as possible; otherwise, damage to controls on the panel may result.

(3) CLEAN (C). Do not allow dust, grease, mud, etc., to accumulate on the case. The tester contains small sliding contact switches and a delicately pivoted meter; thus, every effort must be made to keep the instrument free of foreign matter.

(4) LUBRICATE (L). Apply a light coat of oil to the hinge pins and pivots of the snap fastener. *If the equipment is used in an extremely dusty location omit this operation.*

*d. Item 2, Panel.*

(1) INSPECT (I). Check the tube sockets and pin jacks for proper tension of contact surfaces. Check all switches for smooth and positive action. (See CAUTION, par. 21, before doing any work on the equipment.) Check neon lamp and fuse lamp for tightness. See that all parts mounted on the panel are secure.

(2) TIGHTEN (T). Loose parts which can be tightened from the outside are to be taken care of by using personnel, otherwise the work is to be done by a higher echelon.



(3) CLEAN (C). Remove all dirt and grease from the panel and cover with a dry cloth or, if necessary, a cloth dampened with dry-cleaning solvent (SD).

*e. Item 3, Meter.*

(1) INSPECT (I). Check the glass cover for cracks or looseness. Since dust and moisture may enter through a defective glass, the accuracy and efficiency of the meter may be seriously affected.

(2) CLEAN (C). Clean the glass and case with a dry cloth or, if necessary, one *slightly* dampened with dry-cleaning solvent (SD).

(3) ADJUST (A). The meter in Tube Tester I-177 should indicate zero when the tester is not connected to the line or when the POWER ON-OFF switch is in the OFF position. The procedure for setting a meter to zero is not difficult. The tool required is the thinnest bladed screw driver available. Before deciding that a meter needs readjusting, tap the meter case *lightly* with the tip of one finger. This will help the meter to overcome the slight friction existing at the bearings which may prevent an otherwise normal unit from coming to rest at zero. If readjustment is needed, insert the tip of the screw driver in the slotted screw head located below the meter glass and *slowly* turn the adjusting screw until the pointer is at zero. Lightly tap the meter case again and view the meter face and pointer *full on* and not from either side. Avoid turning the screw too far, because the needle may be bent or the hairspring damaged.

*f. Item 4, Cords.*

(1) INSPECT (I). Inspect the length of the a-c cord and the short leads for cracked or worn insulation. Check a-c plug to see that the prongs are secure and clean. Check clips for cleanliness and proper tension.

(2) TIGHTEN (T). Any loose connections should be tightened.

(3) CLEAN (C). Corroded connections should be cleaned before tightening. Clips and prongs may be cleaned with #0000 sandpaper. Sand only enough to remove the corrosion.

**26.2. PREVENTIVE MAINTENANCE CHECK LIST.** The following check list is a summary of the preventive maintenance operations to be performed on Tube Tester I-177. The time intervals shown on the check list may be reduced at any time by the local commander. For best performance of the equipment, perform operations at least as frequently as called for in the check list. Operations are indicated by the letters of the word FITCAL. For example, if the letters ITCA appear in the "Operations" column, the item to be treated must be inspected (I), tightened (T), cleaned (C), and adjusted (A).

Item No.	Operations	Item	When performed			
			Before operation	Daily	Weekly	Monthly
1	ITC	Outside of case		X		
1	L	Outside of case				X
2	ITC	Panel		X		
3	A	Meter	X			
3	IC	Meter		X		
4	ITC	Cords			X	

Note: X indicates when operations are to be performed.

F            I            T            C            A            L  
Feel\*    Inspect    Tighten    Clean    Adjust    Lubricate

## 27. MOISTUREPROOFING AND FUNGIPROOFING.

\*            \*            \*            \*            \*            \*            \*

### c. Step-by-step Instructions.

\*            \*            \*            \*            \*            \*            \*

### (5) VARNISHING.

(a) Apply three coats of moistureproofing and fungiproofing varnish (**Lacquer, Fungus-resistant, Signal Corps stock No. 6G1005.3, or equal**) to all equipment to be treated, including inside of cases, allowing a 15- to 20-minute drying period after each coat.

\*            \*            \*            \*            \*            \*            \*

### (6) REASSEMBLY.

\*            \*            \*            \*            \*            \*            \*

(c) (Superseded.) Mark the letters MFP and the date of treatment on the case, just above the nameplate.

EXAMPLE: MFP—30 May 45.

\*            \*            \*            \*            \*            \*            \*

e. *Moistureproofing and Fungiproofing After Repair* (Added). If, during repair, the coating of protective varnish has been punctured or broken, and if complete treatment is not needed to reseal the equipment, apply a brush coat to the affected part. Be sure the break is completely sealed.

On figure 12.3, delete the tube-base diagrams for 8BH and 8BO.

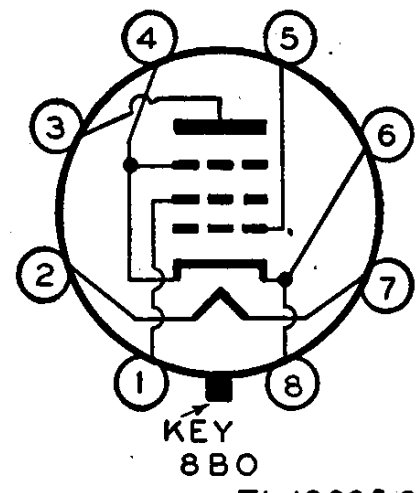
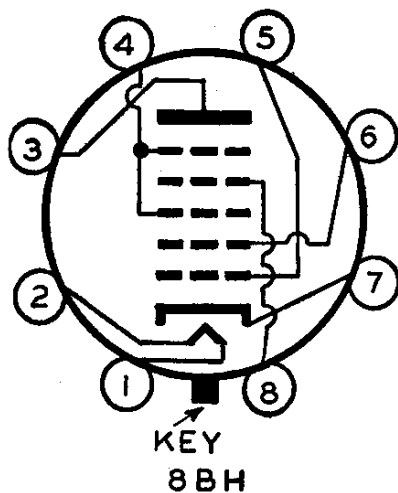
*Figure 12.3. Tube-base diagrams, 7AT to 8BU except 8BH and 8BO.*

## 31. TUBE TEST DATA.

**NOTE 1:** A star (★) appearing \* \* \* for that purpose.

**NOTE 2** (Added): The values listed in the MUT. COND. column

\*The Feel operation does not apply to Tube Tester I-177.



TL 12805-S

Figure 12.4—Tube-base diagrams, 8BH and 8BO.

of this tube test data differ from those appearing in Specification JAN-1A because the voltages applied to the tube under test are not the same as the voltages applied for mutual conductance values under Specification JAN-1A. *Disregard MUT. COND. values when checking tube quality.*

Tube Type	Socket Letter	Select. A	Select. B	Fil. Volts	Potent. L	Potent. R	Mut. Cond.	Press	Notations
*	*	*	*	*	*	*	*	*	*
0C3/VR-105	G	7	1	Off	30	0		Gas No. 1	Shorts on 4-5
0D3/VR-150	G	7	1	Off	30	0	*	Gas No. 1	Shorts on 4-5
3B7/1291	F	6	6	2.5	35	25		Diode	Shorts on 4-5 Plate No. 1 Reads in Green
3B7/1291	F	1	6	2.5	35	25		Diode	Shorts on 4-5 Plate No. 2 Reads in Green
3B24	A	7	1	2.5	5	0		Rect. Std.	Shorts on 4-5
3D6/1299	F	6	2	2.5	55	30	2000	Ampl.	Shorts on 1
3E29	E	7	2	12.6	70	14		Ampl.	Plate No. 1 Use Adapter M-418
3E29	E	4	2	12.6	70	14		Ampl.	Plate No. 2 Use Adapter M-418
3Q4	H	4	6	2.5	40	82		Press diode	Short on 3-4-5 But Reads in Green
*	*	*	*	*	*	*	*	*	*
6AC7	E	4	2	6.3	40	24		Ampl.	*
*	*	*	*	*	*	*	*	*	*
6AG5	K	1	9	6.3	53	22		Ampl.	Shorts on 4-5
*	*	*	*	*	*	*	*	*	*
6AK5	K	1	9	6.3	44	23	*	Ampl.	Shorts on 4-5
6AL5	K	9	2	6.3	60	0		Diode	Shorts on 2-3
6AL5	K	4	2	6.3	60	0		Diode	Shorts on 2-3
*	*	*	*	*	*	*	*	*	*
6AS6	K	1	9	6.3	42	15		Ampl.	*
*	*	*	*	*	*	*	*	*	*

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select.</i>		<i>Fil. Volts</i>	<i>Potent.</i>		<i>Mut. Cond.</i>	<i>Press</i>	<i>Notations</i>
A	B	L	R						
7F7	F	12	5	6.3	50	0	1600	Ampl.	No. 1 Plate
7F7	F	2	9	6.3	50	0	1600	Ampl.	No. 2 plate, Short on 1-4-5
7F8	E	12	5	6.3	72	0		Ampl.	Adapter No. 2 described below
7F8	E	2	9	6.3	72	0		Ampl.	Adapter No. 2 described below
*	*	*	*	*	*	*	*	*	*
12AH7GT	E	11	9	12.6	60	35	2000	Press Gas No. 1	Plate No. 1
12AH7GT	E	7	9	12.6	60	35	2000	Press Gas No. 1	Plate No. 2
*	*	*	*	*	*	*	*	*	*
12L8GT	E	11	6	12.6	58	15		Ampl.	Plate No. 1 (Use Adapt- er No. 1 De- scribed Be- low)
12L8GT	E	8	8	12.6	58	15		Ampl.	Plate No. 2 (Use Adapt- er No. 1 De- scribed Be- low)
*	*	*	*	*	*	*	*	*	*
12SF5	E	7	4	12.6	62	13	1600	Ampl.	*
*	*	*	*	*	*	*	*	*	*
12SL7	G	10	4	12.6	49	0	1400	Ampl.	Short on 2-3 Plate No. 1
12SL7	G	4	1	12.6	49	0	1400	Ampl.	Plate No. 2
*	*	*	*	*	*	*	*	*	*
117P7GT	E	8	10	117	70	25	4000	Ampl.	
117P7GT	E	4	3	117	40	0		Rect. Std	Also Press 117N7 but. Shorts on 2-3
*	*	*	*	*	*	*	*	*	*
811	A	9	4	6.3	17	15	700	Ampl.	*
*	*	*	*	*	*	*	*	*	*
829/829B	E	7	2	12.6	70	14		Ampl.	Plate No. 1 (Use Adapt- er M-418)
829/829B	E	4	2	12.6	70	14		Ampl.	Plate No. 2 (Use Adapt- er M-418)
832	E	7	2	12.6	67	14	3000	Ampl.	Plate No. 1 (Use Adapt- er M-418)
832	E	4	2	12.6	67	14	3000	Ampl.	Plate No. 2 (Use Adapt- er M-418)
*	*	*	*	*	*	*	*	*	*
885	B	1	6	2.5	40	*		Rect. Std.	Strikes be- tween 60-65 on R
*	*	*	*	*	*	*	*	*	*
1006	A	2	7	1.5	68	0		OZ4 Button	

Tube Type	Socket Letter	Select. A B	Fil. Volts	Potent. L R	Mut. Cond.	Press	Notations
1006	A	3 7	1.5	68 0		OZ4 Button	
*	*	* *	*	* *	*	*	*
1291	F	6 6	2.5	35 25		Diode	Short on 4-5 Reads in Green, Plt. No. 1
1291	F	1 6	2.5	35 25		Diode	Shorts on 4-5 Reads in Green, Plt. No. 2
*	*	* *	*	* *	*	*	*
1299	F	6 2	2.5	55 30	2000	Ampl.	Short on 1

**31.1 CONSTRUCTION OF ADAPTER NO. 1** (Added). Adapter No. 1 for use in testing Tube Type 12L8GT can be fabricated from an octal (8-pin) socket and an octal (8-pin) plug or tube base. (Adapter No. 2 is used when testing Tube Type 7F8. This is fabricated from an octal (8-pin) socket and an octal plug or tube base). Connections made between socket lugs and plug pins in each case are indicated in the table below:

Socket lug No.	Plug pin No.	
	Adapter No. 1	Adapter No. 2
1	5	4
2	1	2
3	4	3
4	3	8
5	8	1
6	2	6
7	7	7
8	6	5

### 32. MAINTENANCE PARTS LIST FOR TUBE TESTER I-177.

**NOTE:** (Superseded) This list is for reference only. When ordering parts, refer to paragraph 33.

\* \* \* \* \*

### 33. MAINTENANCE PARTS FOR TUBE TESTER I-177 (Added).

The following information was compiled on 22 June 1945. The appropriate pamphlets of the ASF Signal Supply Catalog for Tube Tester I-177 are:

*Organizational Spare Parts*

SIG 7-I-56

*Higher Echelon Spare Parts*

SIG 8-I-177

For an index of available catalog pamphlets see the latest issue of ASF Signal Supply Catalog SIG 2.



# SECTION I

## DESCRIPTION

**1. PURPOSE.** Tube Tester I-177 is an instrument used to test and measure mutual conductance values of vacuum tubes. The purpose of this manual is to acquaint the repairman with the construction, operating principles, maintenance, and use of this instrument.

### **2. TUBE TESTER I-177 (fig. 1).**

*a.* This instrument is furnished both as an individual unit or as a part of Test Set I-56-K. As a part of Test Set I-56-K it fits into a compartment of Carrying Case CS-130. The weights and dimensions of the tube tester and carrying case are given below.

<i>Equipment</i>	<i>Height</i>	<i>Dimension (in.)</i>		<i>Weight (lb.)</i>
		<i>Width</i>	<i>Depth</i>	
Tube Tester I-177	5¾	15½	8½	15.75
Carrying Case CS-130	14¾	20½	9¾	25.6

*b.* Tube Tester I-177 is fundamentally a dynamic mutual conductance tube tester designed to provide either REPLACE-GOOD readings or mutual conductance values in micromhos for Signal Corps and commercial receiving tubes and small transmitting tubes. Noise tests of tubes can be made by connecting the input of a radio receiver to two NOISE TEST jacks. An extra topcap lead permits testing of transmitting tubes having plate connections to envelope topcaps. Special switches are provided for making gas tests of tubes. Mutual conductance values of tubes can be measured in three ranges: 0-3,000 micromhos, 0-6,000 micromhos and 0-15,000 micromhos. The tube tester operates on 105- to 125-volt, 60-cycle alternating current. Tube testing data is given in a loose-leaf booklet attached to the inside of the cover of the instrument. The power cord is wound on brackets on the inside of the cover.

# SECTION II

## OPERATION

**3. PRELIMINARY INSTRUCTIONS.** Before handling Tube Tester I-177, read the operating instructions carefully. This is a delicate electrical instrument containing a meter and parts that can easily be damaged by mishandling. Pay particular attention to caution notices.

**CAUTION:** After testing tubes *always* set all controls to off or safety positions as indicated in the following table. Tubes may be burned out if inserted in test sockets before the controls have been properly set.

<i>Control</i>	<i>Safety position</i>
POWER	OFF
SHORT-TUBE TEST	1
LINE ADJUSTMENT	Extreme counterclockwise
A	1
B	1
FIL	OFF
MICROMHOS	15,000
L	80
R	80

### 4. SHORTS TEST.

- Make sure all controls are in safety positions (par. 3).
- Plug the power cord of the tester into a suitable a-c power outlet (105 to 125 volts).
- Determine the type number of the tube to be tested, and locate this type number in the column headed Tube Type on the loose-leaf test data cards fastened inside the cover of the instrument. If the tube is marked



with Signal Corps nomenclature, use the table in section V or the table on the back of the first card in the tester to determine the commercial equivalent.

- d. Set selector switch A to the number indicated in column A.
- e. Set selector switch B to the number indicated in column B.
- f. Set selector switch FIL to the number indicated in the column headed Fil. volts.
- g. Insert the tube in the socket indicated in the column headed Socket Letter.

**NOTE:** When inserting or removing a loctal or acorn tube from a socket, handle the tube as gently as possible. Tube pins pass directly through the glass seals and excessive force will crack the glass. A slight sidewise pressure applied to a loctal tube will release the lock and permit easy removal of the tube from the socket.

h. If the tube has a topcap, attach the clip of the CAP lead to the cap. For acorn tubes, use the ACORN CAP lead and clip. For tubes having a star in the Notations column (such as 807, 871, etc.), connect the plate topcap of the tube to the upper left contact of 6-pin socket C with the 12-inch lead having a clip and banana plug.

- i. Set POWER switch to ON position.
- j. To adjust the line voltage, press and hold down the LINE TEST button and turn the LINE ADJUSTMENT knob until the meter pointer is exactly at the LINE TEST position (at 1,500, not at the ? on the scale); then release LINE TEST button.

k. After allowing at least 30 seconds for the tube to warm up, turn the SHORT-TUBE TEST switch slowly from position 1 to positions 2, 3, 4, and 5 successively while tapping the tube with a finger and watching the SHORTS neon lamp. If the neon lamp burns continuously or glows during tapping in any of the five positions, the tube contains shorted electrodes and should be discarded without further testing (to prevent damage to the meter) unless an exception is noted on the test data card. Disregard a momentary flash of the neon lamp while the switch is being turned from one position to the next, since this is due to charging of a capacitor in the lamp circuit.

**NOTE:** Before discarding the tube, refer to the Notations column on the test data card to see if the tube being tested normally appears to

be shorted on certain positions of the switch. Thus, for the 1LN5, the notation "Short on 4-5" on the card means that the neon lamp will normally glow at positions 4 and 5 for good tubes. This tube has no shorts if the neon lamp stays out for positions 1, 2, and 3.

*l.* On tubes having several sections, the shorts test need be made only once.

## 5. QUALITY TEST.

*a.* Test the tube for shorts by following the complete procedure given in paragraph 4. If the tube is shorted, discard it without making further tests.

*b.* If the tube is not shorted, turn the SHORT-TUBE TEST switch to the TUBE TEST position. Do not change any of the other controls used for the shorts test.

*c.* Set potentiometer L to the number indicated in column L on the test data card.

*d.* Set potentiometer R to the number indicated in column R.

*e.* Set the MICROMHOS range switch at 3,000.

*f.* Press the button indicated in the Press column on the test data card, and read the meter on the RED-GREEN scale.

*g.* Normally, if the pointer stops in the GREEN sector the tube is good; if in the RED sector, the tube is defective and should be discarded. If the pointer stops in the ? sector, the tube is usable for a few more hours but should be replaced soon. For tubes in the Notations column having a note such as "OK over 160" (for example, type 40), read the meter on the 0-3,000 micromhos scale. Tubes reading higher than the value given in the Notations column are good. Good diode sections may read in the portion of the RED scale marked DIODES O.K. Only diodes reading to the left of this section (to the left of A in REPLACE on the scale) should be considered defective.

**CAUTION:** Do not press the red AMPL. TEST button while testing rectifier tubes. When testing small diodes, do not press either the AMPL. TEST or a RECTIFIER TEST button, because the high voltage would damage the delicate cathode. Press only the DIODE TEST button as called for on the test data card.

*h.* If a tube is listed two or more times on the test data card, it has two or more sections requiring individual tests, or has two input grids (for example, 6A8 pentagrid converter) requiring separate dynamic tests.

*Remove the tube from the socket after the first test is completed. Then repeat the quality test in paragraph 5 for each additional listing in turn. The shorts test should be made *only* for the first listing, however. The tube section covered by a listing is identified in the Notations column on the test data cards.*

**6. MEASURING MUTUAL CONDUCTANCE.** This procedure gives a mutual conductance reading in micromhos for an amplifier tube or amplifier section, instead of a RED-GREEN reading.

*a. Test the amplifier tube or section for shorts by following the complete procedure given in paragraph 4. If the tube is shorted, discard it without making further tests.*

*b. If the tube is not shorted, turn the SHORT-TUBE TEST switch to the TUBE TEST position. Do not change any of the other controls used for the shorts test.*

*c. Set potentiometer L at  $G_M$  (replaces 60 on dial).*

*d. Set potentiometer R to the number indicated in column R on the test data card.*

*e. Set the MICROMHOS range switch to an appropriate range for measuring the value given in the Mut. Cond. column on the test data card.*

*f. Press the button called for in the Press column, and read the meter on the scale to which the MICROMHOS switch is set. This reading is the mutual conductance of the tube in micromhos under the element voltage conditions provided by the tube tester.*

*g. If a tube is listed two or more times on the test data card, remove the tube from its socket after the first test. Then repeat all tests except the shorts test for the next listing, as if testing another tube.*

**7. GAS TEST.** This procedure determines whether or not an amplifier tube contains too much gas.

*a. Carry out the shorts test procedure given in paragraph 4. If dealing with a multisection tube, the shorts test and gas test must be made on an amplifier section. The gas test does not apply to diode sections or to rectifiers.*

*b. Set potentiometer L at  $G_M$  (replaces 60 on dial).*

*c. Set the MICROMHOS range switch at 3000.*

*d. Hold down the GAS NO. 1 button and adjust potentiometer R until the meter reads 100 micromhos on the 0-3000 scale.*

*e. While holding down GAS NO. 1 button, press GAS NO. 2 button.*

If the meter pointer moves upward more than one scale division, the tube contains too much gas for satisfactory operation. If the pointer movement is less than one division, the tube can be considered sufficiently free from gas.

**NOTE:** If the pointer cannot be brought down to 1000 micromhos by adjusting potentiometer R, set R at 82, note the position of the pointer, and press GAS NO. 2 button to see if the pointer moves upward more than one scale division. In some cases it may be necessary to let the tube warm up for a few minutes before making the gas test, since the tubes may develop gas only after filament current has been on for a period of time.

**8. NOISE TEST.** This procedure detects intermittent contacts between tube electrodes during the shorts test, even though the shorts are too brief to be detected by the neon SHORTS lamp.

a. After completing the conventional shorts test in paragraph 4, connect the NOISE TEST jacks on the panel of Tube Tester I-177 to the antenna and ground terminals of a radio receiver.

b. With the radio receiver turned on, with volume advanced, and with the tube tester still set as in paragraph 4*k*, tap the tube while turning the SHORT-TUBE TEST switch slowly from position 1 to 5. Loud static noises coming from the loudspeaker indicate intermittent shorts between electrodes, and mean that the tube is bad.

**9. TESTING CATHODE-RAY INDICATOR TUBES.** Since the function of these tubes is to indicate rather than amplify, conventional mutual conductance or quality tests cannot be made. Test data is therefore given on the last test data card rather than in numerical sequence, and is repeated here in greater detail. No shorts tests are made. The meter and controls L, R, and MICROMHOS are not used in this test. The procedure checks only the opening and closing action of the eye.

a. Turn on the tube tester and adjust the line voltage as in paragraph 4*j*.

b. Set the FIL switch at the correct filament voltage (2.5 for the 2E5 tube; 6.3 for tube types starting with 6).

c. For 2E5, 6AB5, 6E5, 6G5, 6H5, 6N5, and 6U5 tubes, set selector switch A at 12, set selector switch B at 3, and press the red AMPL. TEST button. The eye should open. Release the button, set selector switch B at 2, and again press the AMPL. TEST button. The eye should now close if the tube is good.

d. For 6AD6 and 6AF6 tubes, set selector switch B at 8, set selector switch A at 2, and press the red AMPL. TEST button. Eye No. 1 should

open, and eye No. 2 should close. Release the button, set selector switch A at 3, and again press the AMPL. TEST button. Eye No. 2 should open and eye No. 1 should close if the tube is good.

## 10. TESTING PILOT LAMPS.

a. To check a pilot lamp or other type of lamp having a miniature base, set selector switch FIL to the correct voltage for the lamp. This voltage is generally marked on the lamp base.

b. Turn ON the POWER switch, adjust line voltage as instructed in paragraph 4j and hold the lamp in the center of socket D. If the lamp lights with normal brilliancy, it is good; if it does not light, it is bad.

## 11. SERVICING RADIO EQUIPMENT WITH TUBE TESTER I-177.

Almost all receiving tubes and the lower-powered transmitting tubes may be tested with Tube Tester I-177. The repairman should be thoroughly familiar with the operation of the tube tester as outlined in previous paragraphs of this section before attempting to make any tests.

a. *Receiver Tubes.* Test all tubes in the receiver for internal shorts and for quality. Install new tubes in place of those found to be defective. To prevent replacing a tube in the wrong socket, check one tube at a time.

b. *Transmitter Tubes.* Test all tubes that can be handled by Tube Tester I-177 and check the remaining tubes by replacing them one at a time with good tubes of the same type, noting the effect on the transmitter performance.

**WARNING:** Voltages high enough to cause death on contact are used in transmitters. Before touching any part of a transmitter circuit or attempting to remove a tube from the transmitter or its power supply, *turn off all power.* Discharge capacitors and ground exposed circuit components with a tool having a well-insulated handle. Remove shorts and grounds after a repair has been made or a tube replaced, before applying power to the transmitter.

## SECTION III

### FUNCTIONING OF PARTS

**12. GENERAL.** Individual circuits of Tube Tester I-177 are presented and described below as they function for the various types of tests made with this instrument. The circuit diagrams in this section are included primarily for a better understanding of this equipment, and therefore have been simplified in some instances. These diagrams must not be used for unauthorized repairs.

**13. LINE TEST (fig. 2).** Pushing the LINE TEST button connects the meter of the tube tester in series with the type 83 rectifier across a secondary winding of the power transformer, with suitable series and shunt resistors 75 and 74 in this calibrating circuit so the meter will receive a d-c voltage proportional to the a-c voltage across the transformer primary. Factory calibration is such that, when 200-ohm LINE ADJUSTMENT rheostat 47 in series with the power transformer primary is adjusted so the meter pointer is exactly at 1500 (near the center of the scale), the a-c input voltage of the transformer is exactly 93 volts, the value at which the instrument was designed to operate. A small automobile-type lamp 20 is included in the transformer primary circuit as the FUSE LAMP to protect the entire instrument from dangerous overloads. It will burn out during an overload. Setting the FIL. switch to the rated filament voltage value of a tube, followed by the setting of the LINE ADJUSTMENT

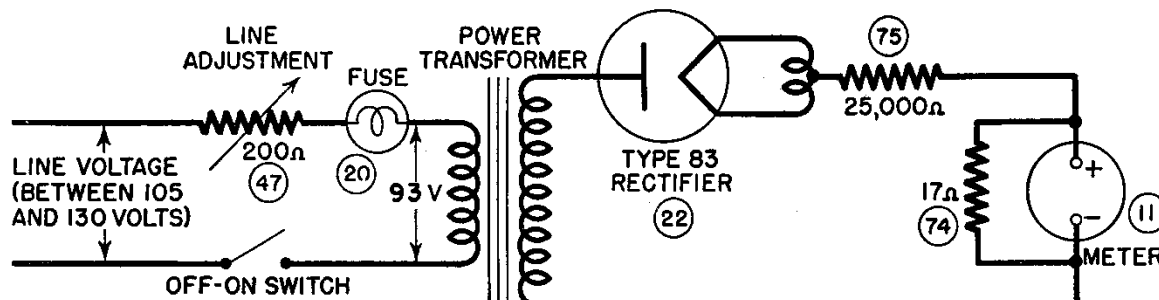
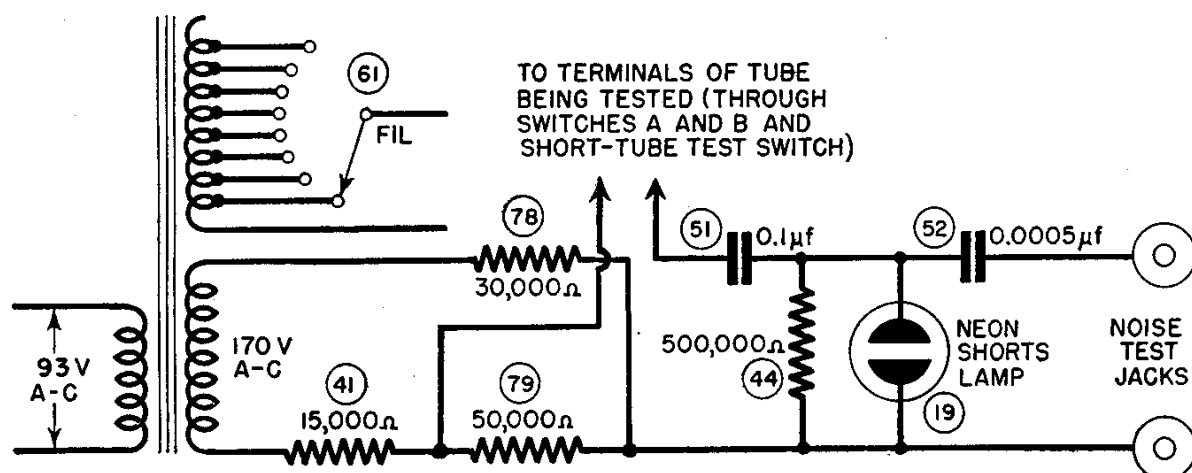


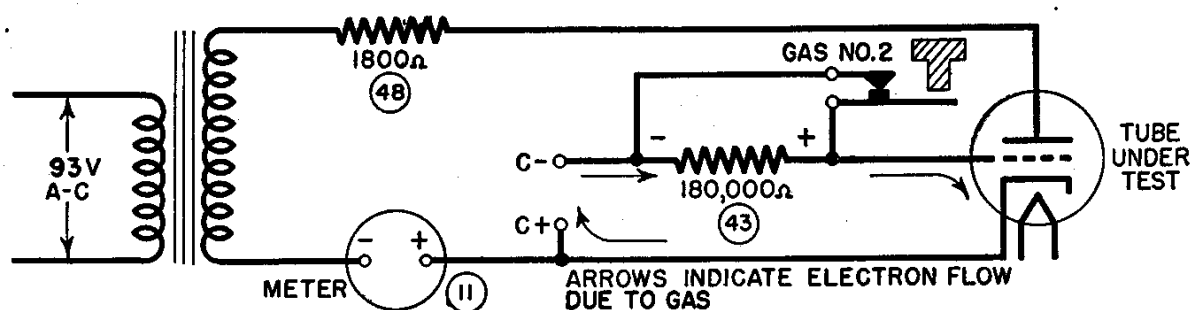
Figure 2. Tube Tester I-177, simplified line test circuit.

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TL-14595

Figure 3. Tube Tester I-177, simplified noise and shorts test circuit.



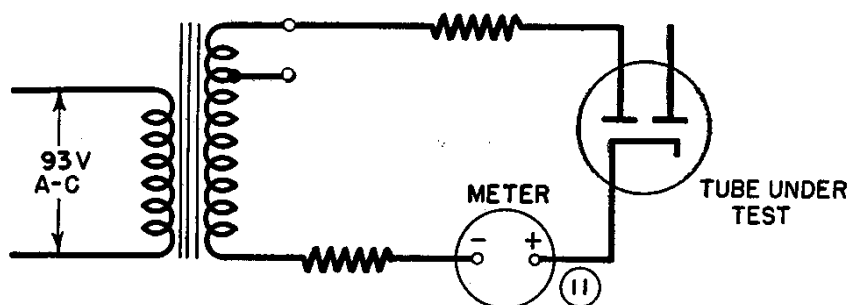
TL-14596

Figure 4. Tube Tester I-177, gas test circuit.

control, provides the correct filament voltage. For filament voltages of 12.6 volts and less, the switch places a center-tapped resistor in the filament circuit for use as a cathode return terminal.

**14. SHORT TEST (fig. 3).** Turning the SHORT-TUBE TEST switch through positions 1, 2, 3, 4, and 5 connects various pairs of tube electrodes in turn across the test terminals of the circuit. Tubes having shorts between elements complete the circuit and apply transformer voltage to neon SHORTS lamp 19, causing it to glow. Good tubes do not complete the circuit, and the lamp does not glow. Switches A and B (not shown) provide the proper tube socket connections for the tube under test, and the FIL. switch connects the tube filament to the correct tap on the filament winding.

**15. NOISE TEST (fig. 3).** This circuit is also used for making a noise test of vacuum tubes. With the antenna and ground terminals of a radio receiver connected to the NOISE TEST jacks, any intermittent short between tube electrodes momentarily permits alternating voltage from the power transformer to be applied to the neon lamp, causing a brief oscillation that will be reproduced as an audible signal in the receiver speaker.



TL-14597

Figure 5. Tube Tester I-177, simplified rectifier test circuit.

**16. GAS TEST (fig. 4).** Pressing GAS NO. 1 button applies definite values of plate and grid voltages to the tube under test, causing a definite value of plate current to flow. Pressing GAS NO. 2 button inserts 180,000-ohm resistor 43 in the grid circuit. If the grid bias voltage source is sending current through the grid circuit due to gas in the tube, this current develops a voltage drop across resistor 43 that reduces the negative bias, causing a corresponding increase in the plate current being measured by the meter. A tube with negligible gas gives less than a scale division of plate current increase when GAS NO. 2 button is depressed.

**17. RECTIFIER TEST (fig. 5).** This circuit is used for making emission tests of standard full-wave rectifiers, diodes and 0Z4 tubes. An a-c voltage of definite value is applied between a cathode and plate of the tube under test, through resistors and the meter. The total resistance and the voltage are set automatically to the correct values for a GOOD-REPLACE meter reading when selector switches A and B are set at the positions specified on the test data card for the tube being tested. As an example, one plate of a four-prong full-wave rectifier is connected into the circuit when selector A is set at position 1. The second plate is connected into the circuit when selector A is set at 3. The special pushbutton for 0Z4 rectifier tubes provides a higher plate-cathode voltage than is used for heater or filament-type rectifiers, with a resistor in the circuit to limit the current if the tube elements are shorted. The special pushbutton for diodes provides a lower voltage than for regular tubes. It also provides a protective series resistance.

## 18. QUALITY TEST FOR AMPLIFIER TUBES (fig. 6).

a. The mutual conductance ( $g_m$ ) of an amplifier-type vacuum tube, also called the grid-plate transconductance, is an expression representing the efficiency of performance of a tube as indicated by the *change in plate current* ( $\Delta I_p$ ) divided by the *change in grid voltage* ( $\Delta E_g$ ). The relation is generally written  $g_m = \Delta I_p / \Delta E_g$ . The value is expressed in micromhos



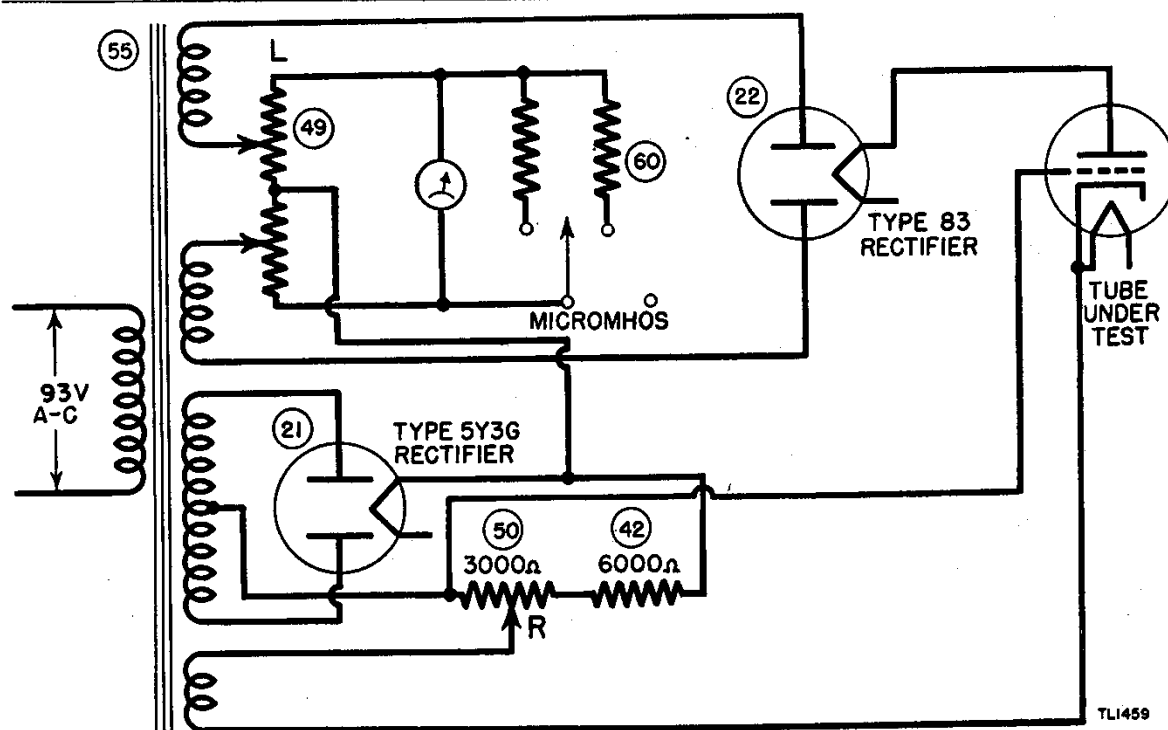


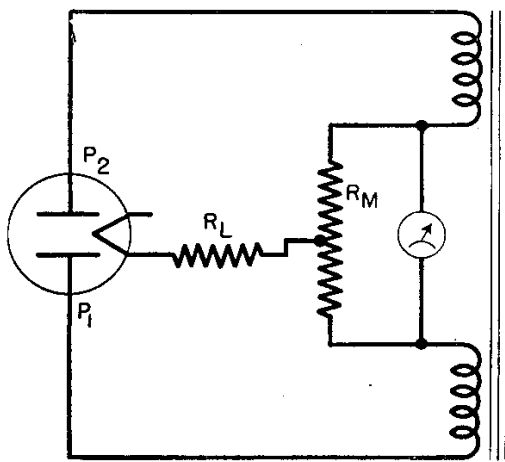
Figure 6. Tube Tester I-177, simplified quality test circuit.

and is a performance indication because it shows how effective a tube is in converting a small change in grid voltage (grid signal) to a large change in plate current. The mutual conductance values given on the test data cards are those supplied by tube manufacturers, and can be checked directly with Tube Tester I-177 by setting its controls for mutual conductance measurements. These values also form the basis for the dynamic quality tests during which the controls are adjusted so that the meter automatically reads GOOD if the mutual conductance is satisfactorily near the rated value for a particular tube.

b. For the RED-GREEN quality test based upon dynamic mutual conductance or for measurement of the mutual conductance value directly, the proper d-c grid voltage for the tube under test is supplied by a full-wave rectifier circuit using a 5Y3G tube. Setting potentiometer R at the value called for on the test data card adjusts this negative bias voltage to the correct value for the particular tube under test.

c. An alternating voltage of 4.7 volts rms, obtained from a separate secondary winding on the power transformer, acts in series with the grid bias as required for this type of test. This voltage alternately swings the grid in positive and negative directions from the d-c bias value, thereby producing the grid-voltage change ( $\Delta E_g$ ) required for a dynamic test.

d. The plate voltage for the tube under test is supplied by another full-wave rectifier circuit, using a type 83 tube. The return lead contains the meter circuit which serves to measure the plate-current change ( $\Delta I_p$ ). The meter circuit consists essentially of dual potentiometer L shunted across the meter. Adjusting control L on the panel adjusts the effective shunt



TL-14599

Figure 7. Tube Tester I-177, rectifier diagram illustrating theory.

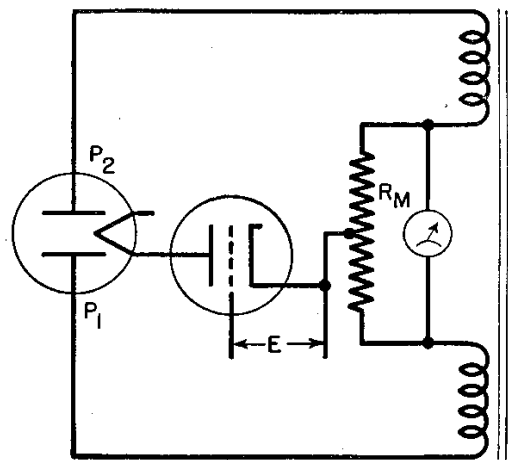
TL-14600  
TL-14600

Figure 8. Tube Tester I-177, simplified mutual conductance test circuit.

resistance so the meter pointer will read in the GREEN section of the scale if the tube under test is good. Pressing the AMPL. test button completes the circuit as just outlined, and the meter then reads the quality of the tube.

## 19. THEORY OF OPERATION OF QUALITY TEST CIRCUIT.

a. Examine first the simple full-wave rectifier circuit shown in figure 7. The two power transformer secondary windings have their inner ends connected to a direct-current milliammeter. Across the milliammeter is a center-tapped resistor  $R_M$ . The load is shown as a resistance  $R_L$ , connected between the center tap and the rectifier filament as in any full-wave rectifier circuit. When rectifier plate  $P_2$  is positive, electron flow is through the upper half of  $R_M$ , and the meter tends to deflect in one direction. When  $P_1$  is positive, electron flow is through the lower half of  $R_M$ , and the meter tends to deflect in the other direction. With the load resistance fixed and equal forces acting on the meter in both cases, the meter stays at zero because it cannot follow variations at the power line frequency.

b. If the vacuum tube to be tested is substituted for the fixed load resistance, and a fixed bias  $E$  is applied to the tube as in figure 8, the meter will still read zero because a vacuum tube under steady-state conditions acts like a fixed resistance.

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 Tube Tester I-177. When this a-c potential swings the grid positive, the plate current of the tube is increased, and when the plate-cathode resistance is correspondingly lowered, more current flows through  $R_M$  and the deflecting force on the meter is greater

than before. When the grid swings negative on the other half-cycle, the resistance of the tube under test is increased and the deflecting force on the meter is less. With unbalanced currents on adjacent half-cycles and consequent unequal forces on the meter, the meter reading becomes proportional to the difference in currents. Since this difference is created by the a-c grid potential, the meter indicates the plate-current changes produced by the applied grid voltage change, or in other words, the meter indicates mutual conductance.

**20. MUTUAL CONDUCTANCE MEASUREMENTS.** For mutual conductance measurements, the MICROMHOS switch places additional fixed shunt resistors across the meter as required for the three ranges.

## SECTION IV

# MAINTENANCE

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

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**21. GENERAL DESCRIPTION.** Tube Tester I-177 contains two tubes, a fuse lamp, a neon lamp, and tube charts, all of which may require replacement. The fuse lamp, neon lamp, and tube charts can be replaced directly without removing the panel. The tubes can be replaced by removing the 10 screws that fasten the panel to the case, then lifting out the panel assembly.

**CAUTION:** The tube tester panel must be opened only to make necessary tube replacements. No other repairs should be attempted except by authorized Signal Corps repair shops or by the manufacturer.

**22. FUSE LAMP REPLACEMENT.** To replace the No. 81 6-8-volt, 6-cp auto bulb used as a fuse, press down on the bulb and twist it counterclockwise, then lift out the bulb. Insert the new bulb so its pins fit into the slots in the socket, then press down and twist clockwise.

**23. NEON LAMP REPLACEMENT.** The  $\frac{1}{4}$ -watt, 105- to 125-volt neon lamp serving as a SHORTS indicator is replaced by unscrewing the lamp from its socket and screwing in a new lamp. This lamp should last indefinitely unless its glass bulb is broken.

**24. TUBE CHART REPLACEMENT.** Test data cards for Tube Tester I-177 may be replaced by opening the binding rings.

**25. TUBE REPLACEMENT.** To replace either the type 83 or 5Y3GT tubes, remove the panel mounting screws and lift the panel assembly carefully out of the case. Loosen the tube clamp bolt, then carefully pull the tube out of the socket and clamp, rocking the tube from side to side while pulling. Insert the new tube in its clamp and socket, and tighten the tube clamp bolt. Put the panel back in the case and replace all panel screws. If replacement of tubes does not restore correct operation, return the tester as defective. Do not attempt to repair the instrument because considerable damage can be done to the tube tester if the operator is not entirely familiar with the repair of this type of precision instrument.

## 26. PREVENTIVE MAINTENANCE.

*a. General Instructions.* The performance of the items of maintenance outlined in these paragraphs will provide, periodically, an indication of the operational condition of this test equipment and assure proper mechanical and electrical upkeep.

(1) The communication officer should schedule definite times for checks. The operator should take the readings indicated and check in the appropriate columns in the check sheets.

(2) Equipment not in use must be checked once a month for deterioration, rust, broken parts, and general operation.

(3) The maintenance items are listed in subparagraphs 26 *b*, *c*, *d*, and *e*. In paragraphs *b* and *c* the maintenance items are numbered consecutively with an explanation of the appropriate action appearing opposite each item. The items, arranged in the same order in check list form, appear in paragraphs *d* and *e*.

(4) Deficiencies must be reported to the communication officer of the unit.

### *b. Weekly Checks.*

<i>Item</i>	<i>Action</i>
(1) External surfaces.	Remove dust, dirt, grease, and rust. Note under remarks on weekly check list if touch-up painting is necessary.
(2) Meter.	See that the pointer is not bent, operates freely, and always returns to zero.
(3) Leads, clips, and cord.	Check condition of cord, plug, leads, and clips. Look for broken conductors inside insulation at sharp bends.
(4) Tube sockets.	Check contacts in all tube sockets. Note under remarks on weekly check-list if any contacts are loose or broken.
(5) Control knobs, switches, and pushbuttons.	See that all control knobs are tight and that all switches and pushbuttons operate normally.

## SECTION V

### SUPPLEMENTARY DATA

#### 28. TUBE-BASE CHART FOR SIGNAL CORPS AND COMMERCIAL TUBES.

*a. Signal Corps Tubes.* (See tube-base connection diagrams in Fig. 12.)

<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>
VT-7 .....	4D	VT-51 .....	4D	VT-86-A .....	7R	VT-105 .....	8S
VT-24 .....	4D	VT-52 .....	4D	VT-86-B .....	7R	VT-107 .....	7AC
VT-25 .....	4D	VT-54 .....	4M	VT-87 .....	7T	VT-107-A ..	7AC
VT-25-A .....	4D	VT-56 .....	5A	VT-87-A .....	7T	VT-107-B ...	7AC
VT-26 .....	4K	VT-57 .....	6F	VT-88 .....	7V	VT-112 .....	8N
VT-27 .....	4D	VT-58 .....	6F	VT-88-A .....	7V	VT-114 .....	5T
VT-28 .....	5E	VT-62 .....	4D	VT-89 .....	6F	VT-115 .....	7AC
VT-29 .....	5A	VT-63 .....	5C	VT-90 .....	7Q	VT-115-A ..	7AC
VT-30 .....	4D	VT-65 .....	6Q	VT-91 .....	7R	VT-116 .....	8N
VT-31 .....	4D	VT-66 .....	7S	VT-91-A .....	7R	VT-116-B ....	8N
VT-33 .....	5K	VT-67 .....	4D	VT-92 .....	7V	VT-117 .....	8N
VT-35 .....	5E	VT-68 .....	7D	VT-92-A .....	7V	VT-119 .....	4AB
VT-36 .....	5E	VT-69 .....	6F	VT-93 .....	8E	VT-120 .....	5BB
VT-37 .....	5A	VT-70 .....	7E	VT-94 .....	6Q	VT-121 .....	5BC
VT-38 .....	5F	VT-72 .....	4D	VT-94-A .....	6Q	VT-124 .....	6X
VT-40 .....	4D	VT-73 .....	5A	VT-94-D .....	6Q	VT-125 .....	6X
VT-41 .....	4K	VT-74 .....	5L	VT-95 .....	4D	VT-126 .....	6S
VT-44 .....	4K	VT-75 .....	6G	VT-96 .....	8B	VT-126-A ....	6S
VT-45 .....	4D	VT-76 .....	5A	VT-97 .....	5T	VT-126-B ....	6S
VT-46 .....	4P	VT-77 .....	6F	VT-98 .....	6R	VT-131 .....	8N
VT-46-A .....	4P	VT-78 .....	6F	VT-99 .....	8G	VT-132 .....	8K
VT-47 .....	5B	VT-80 .....	4C	VT-100 ....	5AW	VT-133 .....	8Q
VT-48 .....	6B	VT-83 .....	4C	VT-101 ....	6BM	VT-134 .....	7AC
VT-49 .....	5F	VT-84 .....	5D	VT-103 .....	8Q	VT-135 .....	6Q
VT-50 .....	4D	VT-86 .....	7R	VT-104 .....	8Q	VT-135-A ....	6Q

## SUPPLEMENTARY DATA

<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>
VT-136 .....	5AZ	VT-173 .....	6AR	VT-201 .....	7AC	VT-235 .....	3P
VT-137 .....	6Q	VT-174 .....	7BA	VT-201-C ...	7AC	VT-237 .....	5BD
VT-138 .....	7AL	VT-175 .....	7S	VT-202 .....	7BS	VT-238 .....	5BB
VT-139 .....	4AJ	VT-176 .....	8N	VT-203 .....	7BD	VT-239 .....	4AA
VT-145 .....	4C	VT-177 .....	5AG	VT-205 .....	8Q	VT-241 .....	8BN
VT-146 .....	5Y	VT-178 .....	7AK	VT-206-A ....	5L	VT-243 .....	4AH
VT-147 .....	7E	VT-179 .....	7AO	VT-207 .....	8BE	VT-244 .....	5T
VT-148 .....	8AJ	VT-180 .....	6BB	VT-208 .....	8X	VT-245 .....	8BA
VT-149 .....	8AS	VT-181 .....	5AB	VT-209 .....	8BK	VT-247 .....	8Y
VT-150 .....	8R	VT-182 .....	7BE	VT-210 .....	7AV	VT-260 .....	4AJ
VT-151 .....	8A	VT-183 .....	4AH	VT-211 .....	8BK	VT-264 .....	7BA
VT-151-B ....	8A	VT-184 .....	4AJ	VT-212 .....	5BD	VT-266 .....	4P
VT-152 .....	7S	VT-185 .....	6BB	VT-213-A ....	6Q	VT-268 .....	8S
VT-153 .....	8E	VT-188 .....	8W	VT-214 .....	7Q	VT-269 .....	8BK
VT-161 .....	8R	VT-189 .....	8AC	VT-215 .....	6R	VT-288 .....	8BK
VT-162 .....	8N	VT-190 .....	8V	VT-216 .....	4P	VT-289 .....	8BD
VT-163 .....	8G	VT-192 .....	5AC	VT-221 .....	7AP		
VT-167 .....	8K	VT-193 .....	8V	VT-223 .....	5Z		
VT-168 .....	7AC	VT-194 .....	8AR	VT-224 .....	7BL		
VT-168-A ..	7AC	VT-195 .....	5AQ	VT-225 .....	5J		
VT-169 .....	8E	VT-196 .....	6S	VT-227 .....	6BO		
VT-170 .....	5Y	VT-197-A ....	5T	VT-229 .....	8BD		
VT-171 .....	7AT	VT-198-A ....	7S	VT-231 .....	8BD		
VT-171-A ..	7AT	VT-199 .....	8N	VT-233 .....	8Q		
VT-172 .....	6AU	VT-200 .....	4AJ	VT-234 .....	2T		

*b. Commercial Tubes.* (See tube-base connection diagrams in Fig. 12.)

<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>
AD .....	4G	PZ .....	5B	1 .....	4G	1B4 .....	4M
AF .....	4C	PZH .....	5B	D-1 .....	4C	1B5/25S .....	6M
AG .....	4C	Wnd A .....	6N	KR-1 .....	4G	1B7-G .....	7Z
AX .....	4Q	XXD .....	8AC	RA-1 .....	4Q	1B8 .....	8AW
B .....	4E	XXL .....	5AC	RE-1 .....	4C	1C1 .....	4A
BA .....	4J	00 .....	4D	SO-1 .....	4Q	1C5-G .....	6X
BH .....	4J	00A .....	4D	1A1 .....	4A	1C6 .....	6L
BR .....	4H	0A4 .....	4V	1A3 .....	5AP	1C7 .....	7Z
BX .....	4D	0Z3 .....	5N	1A4-P .....	4M	1C21 .....	4V
DE .....	4D	0Z4 .....	4R	1A4-T .....	4K	1D1 .....	4A
E .....	4D	01 .....	4D	1A5-G .....	6X	1D5, 1D5-GP ..	5Y
G .....	4D	01A .....	4D	1A6-GT .....	6L	1D5-GT .....	5R
GA .....	5B	01AA .....	4D	1A6-S .....	6L	1D7-G .....	7Z
H .....	4D	01B .....	4D	1A7-G .....	7Z	1D8-GT .....	8AJ
LA .....	5B	D-1/2 .....	4B	1B1 .....	4A	1E1 .....	4A

<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>
1E4-G .....	5S	1S4 .....	7AV	0A3/VR75 ..	4AJ	6A4/LA .....	5B
1E5-G .....	5R	1S5 .....	6AU	0B3/VR90 ..	4AJ	6A5-G .....	6T
1E5-GP .....	5Y	1SA6 .....	6BD	0C3/VR105 ..	4AJ	6A6 .....	7B
1E7-G .....	8C	1SB6 .....	6BE	0D3/VR150 ..	4AJ	6AB5 .....	6R
1F1 .....	4A	1T1-G .....	4T	3A4 .....	7BB	6AB6 .....	7AU
1F4 .....	5K	1T4 .....	6AR	3A5 .....	7BC	6AB7/1853 ...	8N
1F5-G .....	6X	1T5 .....	6AF	3A8-GT ....	8AS	6AC5-G .....	6Q
1F6 .....	6W	1T5-GT ....	6X	3B5-GT ....	7AP	6AC6-G .....	7W
1F7-G, GH, GV		1-V .....	4G	3B7/1291 ....	7BE	6AC7/1852 ...	8N
7AD		1V1 .....	4A	3B21 .....	4C	6AD5-G .....	6Q
1G1 .....	4A	1Y1 .....	4A	3B22 .....	4C	6AD6-G ....	7AG
1G4-G .....	5S	1Z1 .....	4A	3B23/RK22 .	4AN	6AD7-G ....	8AY
1G5-G .....	6X	2 .....	4A	3C5-GT ....	7AQ	6AE5-GT ....	6Q
1G6-G .....	7AB	G-2 .....	5D	3D6/1299 ...	6BB	6AE6-G ....	7AH
1H4-G .....	5S	G-2S .....	5D	3LE4 .....	6BA	6AE7-GT ...	7AX
1H5-G .....	5Z	KR-2 .....	4G	3LF4 .....	6BB	6AF5-G .....	6Q
1H6-G .....	7AA	RE-2 .....	4B	3Q4 .....	7BA	6AF6-G ....	7AG
1J1 .....	4A	SO-2 .....	4D	3Q5-GT ....	7AP	6AF7 .....	8AG
1J5-G .....	6X	2A3 .....	4D	3S4 .....	7BA	6AG5 .....	7BD
1J6-G .....	7AB	2A3-H .....	4Q	4 .....	4A	6AG7 .....	8Y
1K1 .....	4A	2A4-G .....	5S	G-4 .....	5D	6AH5-G ....	6AP
1L1 .....	4T	2A5 .....	6B	G-4 S .....	5D	6AH7-GT ..	8BE
1L4 .....	6AR	2A6 .....	6G	4A6-G .....	8L	6AK5 .....	6BD
1LA4 .....	5AD	2A7 .....	7C	4B24 .....	4C	6AK6 .....	7BK
1LA6 .....	7AK	2B4 .....	5A	4B25 .....	4C	6AL6-G ....	6AM
1LB4 .....	5AD	2B6 .....	7J	4S .....	5D	6A7 .....	7C
1LB6 .....	8AX	2B7 .....	7D	5 .....	4A	6A7-M .....	8A
1LC5 .....	7AO	2C4 .....	5AS	A(5) .....	5H	6A7-S .....	7C
1LC6 .....	7AK	2C21/RK33 .	7BH	KR5 .....	5B	6A8 .....	8A
1LD5 .....	6AX	2C22 .....	4AM	IN5-GT .....	5Y	6B4-G .....	5S
1LE3 .....	4AA	2C34/RK34 ..	7BL	5R4-GY .....	5T	6B5 .....	6AS
1LH4 .....	5AG	2E5 .....	6R	5T4 .....	5T	6B6-G .....	7V
1LN5 .....	7AO	2E22 .....	5J	5U4-G .....	5T	6B7 .....	7D
1N1 .....	4T	2G5 .....	6R	5V4-G .....	5L	6B8 .....	8E
1N5-G .....	5Y	2S/4S .....	5D	5W4 .....	5T	6C4 .....	6BG
1N6-G .....	7AM	2V3-G .....	4Y	5X3 .....	4C	6C5 .....	6Q
1P1 .....	4T	2W3 .....	4X	5X4G .....	5Q	6C5-G .....	6Q
1P5-G .....	5Y	2X2/879 ....	4AB	5Y3-G .....	5T	6C6 .....	6F
1Q1 .....	4T	2X3 .....	4E	5Y4-G .....	5Q	6C7 .....	7G
1Q5-GT ....	6AF	2Y2 .....	4AB	5Z3 .....	4C	6C8-G .....	8G
1R1-G .....	4T	2Y3 .....	4C	5Z4 .....	5L	6D5 .....	6Q
1R4/1294 ...	4AH	2Y4 .....	5D	6 .....	4A	6D6 .....	6F
1R5 .....	7AT	2Z2 .....	4B	A(6) .....	6N	6D7 .....	7H
1S1-G .....	4T	3 .....	4A	6A3 .....	4D	6D8-G .....	8A



## SUPPLEMENTARY DATA

<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>
6E5 .....	6R	6S7-G .....	7R	7A6 .....	7AJ	12C8 .....	8E
6E6 .....	7B	6SA7 .....	8R	7A7-LM .....	8V	12E5-GT .....	6Q
6E7 .....	7H	6SA7-GT ...	8AD	7A8 .....	8U	12F5-GT .....	5M
6F5 .....	5M	6SC7 .....	8S	7B4 .....	5AC	12G7 .....	7V
6F5-G .....	5M	6SD7-GT ....	8N	7B5 .....	6AE	12H6 .....	7Q
6F6 .....	7S	6SE7-GT ....	8N	7B6 .....	8W	12J5-GT .....	6Q
6F7 .....	7E	6SF5 .....	6AB	7B7 .....	8V	12J7-GT .....	7R
6F7-S .....	7E	6SF7 .....	7AZ	7B8 .....	8X	12K7-GT .....	7R
6F8-G .....	8G	6SG7 .....	8BK	7C4/1203A ..	4AH	12K8 .....	8K
6G5 .....	6R	6SH7 .....	8BK	7C5 .....	6AA	12L8-GT ...	8BU
6G6-G .....	7S	6SJ7 .....	8N	7C6 .....	8W	12Q7-GT .....	7V
6G7 .....	7N	6SK7 .....	8N	7C7 .....	8V	12SA7 .....	8R
6G7-S .....	7N	6SL7-GT ...	8BD	7E5/1201 ...	8BN	12SA7-GT ..	8AD
6H4-GT ....	5AF	6SN7-GT ...	8BD	7E6 .....	8W	12SC7 .....	8S
6H5 .....	6R	6SQ7 .....	8Q	7E7 .....	8AE	12SF5 .....	6AB
6H6 .....	7Q	6SR7 .....	8Q	7F7 .....	8AC	12SF7 .....	7AZ
6H7 .....	7P	6SS7 .....	8N	7G7 .....	8V	12SG7 .....	8BK
6H7-S .....	7P	6ST7 .....	8Q	7H7 .....	8V	12SH7 .....	8BK
6H8 .....	8F	6T5 .....	6R	7J7 .....	8AR	12SJ7 .....	8N
6J5 .....	6Q	6T7-G .....	7V	7K7 .....	8BF	12SK7 .....	8N
6J6 .....	7BF	6U5/6G5 ....	6R	7L7 .....	8V	12SL7-GT ..	8BD
6J7 .....	7R	6U6-GT ....	7AC	7N7 .....	8AC	12SN7-GT ..	8BD
6J7-G .....	7R	6U7-G .....	7R	7P7 .....	8V	12SQ7 .....	8Q
6J7-GT .....	7R	6V4 .....	5D	7Q7 .....	8AL	12SR7 .....	8Q
6J8-G .....	8H	6V6 .....	7AC	7R7 .....	8AE	12Z3 .....	4G
6K5-G .....	5U	6V7-G .....	7V	7S7 .....	8BL	12Z5 .....	6K
6K6-G .....	7S	6W5-G .....	6S	7T7 .....	8V	14 .....	5E
6K7 .....	7R	6W6-GT ....	7AC	7V7 .....	8V	14A4 .....	5AC
6K8 .....	8K	6W7-G .....	7R	7W7 .....	8BJ	14A5 .....	6AA
6L5-G .....	6Q	6X5 .....	6S	7Y4 .....	5AB	14A7 .....	8V
6L6 .....	7AC	6X6 .....	7AL	7Z4 .....	5AB	14AF7 .....	8AC
6L6-GX .....	7S	6Y3 .....	4AG	8 .....	4A	14B6 .....	8W
6L7 .....	7T	6Y5 .....	6J	9 .....	4A	14B8 .....	8X
6N5 .....	6R	6Y6-G .....	7AC	10 .....	4D	14C5 .....	6AA
6N6-G .....	7AU	6Y7-G .....	8B	WX-12 .....	4D	14C7 .....	8V
6N7 .....	8B	6Z3 .....	4G	12A .....	4D	14E6 .....	8W
6P5-G .....	6Q	6Z4 .....	5D	12A5 .....	7F	14E7 .....	8AE
6P7-G .....	7U	6Z5 .....	6K	12A6 .....	7AC	14F7 .....	8AC
6Q5 .....	6Q	6Z6 .....	7Q	12A7 .....	7K	14H7 .....	8V
6Q6-G .....	6Y	6Z7-G .....	8B	12A8-GT .....	8A	14J7 .....	8AR
6Q7 .....	7V	6ZY5-G .....	6S	12AH7-GT ..	8BE	14N7 .....	8AC
6R6-G .....	6AW	7 .....	4A	12B6 .....	6Y	14Q7 .....	8AL
6R7 .....	7V	7A4 .....	5AC	12B7 .....	8V	14R7 .....	8AE
6S6-GT ....	5AK	7A5 .....	6AA	12B8-GT .....	8T	14S7 .....	8BL

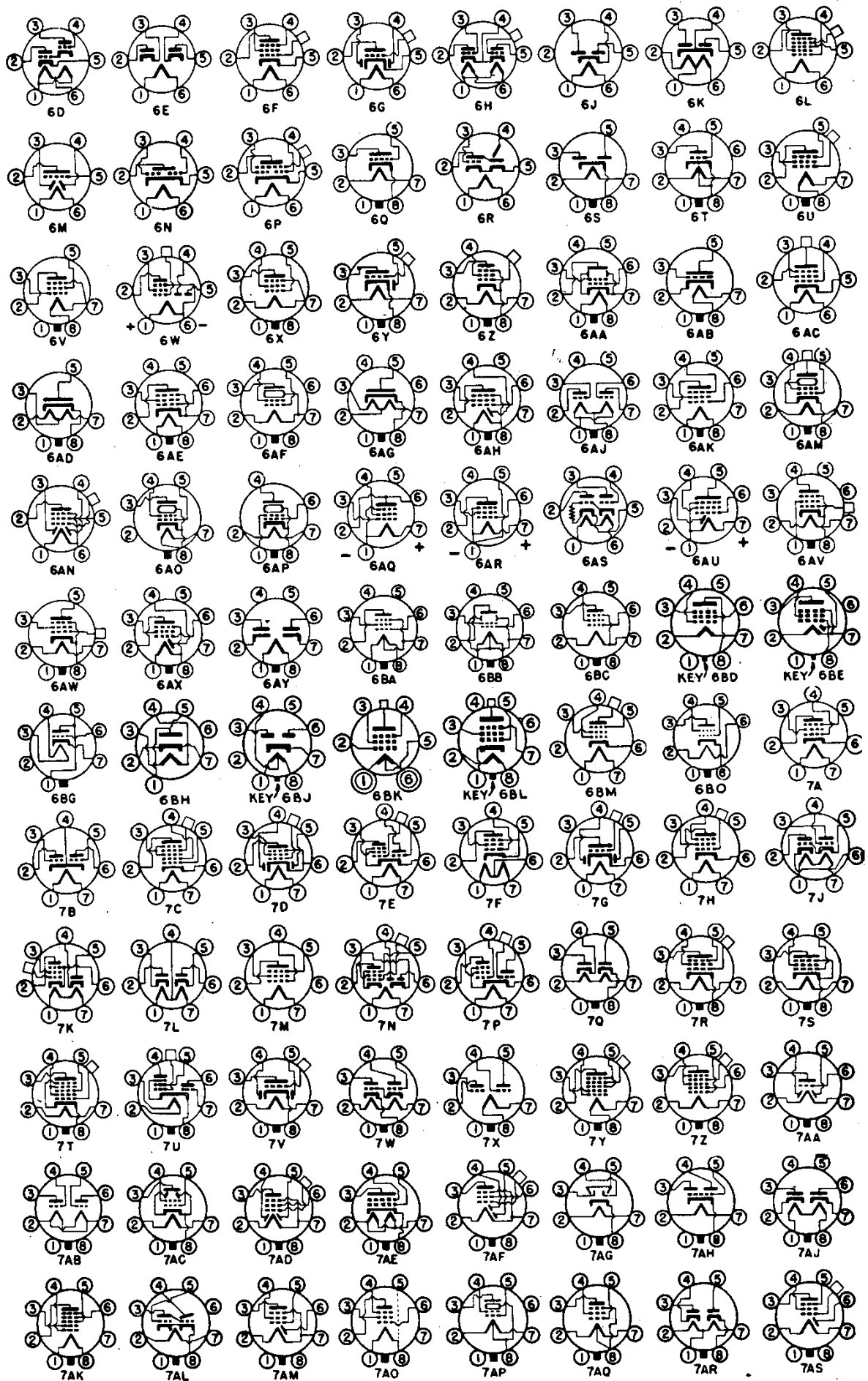
<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>
14W7 .....	8BJ	27S .....	5A	46 .....	5C	75S .....	6G
14Y4 .....	5AB	K27 .....	5A	46A1 .....	2S	VR75-30 ....	4AJ
14Z3 .....	4G	A28 .....	4D	46B1 .....	2S	76 .....	5A
15 .....	5F	29 .....	6N	47 .....	5B	77 .....	6F
17 .....	5A	30 .....	4D	RK47 .....	5J	77M .....	7R
18 .....	6B	A-30 .....	4Q	48 .....	6A	78 .....	6F
19 .....	6C	R-30 .....	4D	A48 .....	4Q	78S .....	6F
RK19 .....	4AN	31 .....	4D	50 .....	4D	79 .....	6H
20 .....	4D	KR31 .....	4G	VR50 .....	4W	80 .....	4C
KR20 .....	6N	32 .....	4K	50A5 .....	6AA	81 .....	4B
RK21 .....	4AB	A32 .....	4Q	50C6-G .....	7AC	82V .....	4L
22 .....	4K	32L7-GT .....	8Z	50L6-GT .....	7AC	83 .....	4C
A-22 .....	4D	33 .....	5K	50Y6-GT .....	7Q	83V .....	4L
AC22 .....	5E	RK33/2C21 ..	7BH	50Z6-G .....	7Q	84/6Z4 .....	5D
KR22 .....	6N	34 .....	4M	50Z7-G .....	8AN	G-84 .....	5D
RK22/3B23 ..	4AN	RK34/2C34 ..	7BL	51 .....	5E	85 .....	6G
K24 .....	5E	35 .....	5E	52 .....	5C	85AS .....	6G
RK24 .....	4D	35A5-LT ...	6AA	53 .....	7B	85L7 .....	8AB
24A .....	5E	35L6-GT ....	7AC	55 .....	6G	85M .....	7V
24S .....	5E	35Y4 .....	5AL	56 .....	5A	85S .....	6G
25 .....	6M	35Z3-LT ....	4Z	56AS .....	5A	86M .....	6Q
KR25 .....	6B	35Z4-GT ...	5AA	56S .....	5A	87S .....	6F
25A6 .....	7S	35Z5-GT ....	6AD	57 .....	6F	88 .....	4C
25A7-G .....	8F	35Z6-G .....	7Q	57AS .....	6F	88M .....	7R
25AC5-GT ...	6Q	36 .....	5E	57S .....	6F	88S .....	6F
25B5 .....	6D	37 .....	5A	58 .....	6F	89 .....	6F
25B6-G .....	7S	38 .....	5F	58AS .....	6F	89RS .....	7N
25B8-GT .....	8T	39/44 .....	5F	58S .....	6F	VR105-30 ...	4AJ
25C6-G .....	7AC	RK-39 .....	5AW	59 .....	7A	112A .....	4D
25D8-GT ...	8AF	40 .....	4D	59A .....	7A	113HY .....	5K
25L6 .....	7AC	A40 .....	4Q	59S .....	7A	HY-114B ....	2T
25N6-G .....	7W	40Z5 .....	6AD	HY61/807 ..	5AW	115HY .....	5K
25S .....	6M	41 .....	6B	RK62 .....	4D	117L7-GT ..	8AO
25X6-GT .....	7Q	41M .....	7S	64 .....	5E	117M7-GT ..	8AO
25Y4-GT ...	5AA	42 .....	6B	65 .....	5E	117N7-GT ..	8AV
25Y5 .....	6E	42A2 .....	3S	67 .....	5A	117P7-GT ..	8AV
25Z3 .....	4G	42B2 .....	3S	68 .....	5E	117Z4-GT ..	5AA
25Z4 .....	5AA	43 .....	6B	69 .....	5E	117Z6-GT ....	7Q
25Z5 .....	6E	43-MG .....	7S	70 .....	6N	125HY .....	5K
25Z6 .....	7Q	44 .....	5F	70A7-GT ...	8AB	VR150-30 ...	4AJ
26 .....	4D	45 .....	4D	70L7-GT ...	8AA	165R .....	4A
A26 .....	4D	45 special ....	4D	71A .....	4D	165R4 .....	4A
27 .....	5A	45Z3 .....	5AM	75 .....	6G	165R8 .....	4A
27HM .....	5A	45Z5-GT ...	6AD	75M .....	7V	181 .....	4D

## SUPPLEMENTARY DATA

<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>	<i>Tube</i>	<i>Base</i>
182A .....	4D	310A .....	6F	840 .....	5J	1299/3D6 ...	6BB
182B .....	4D	311A .....	5F	841 .....	4D	1602 .....	4D
183/483 .....	4D	312A .....	6BK	842 .....	4D	1603 .....	6F
185R .....	4A	323A .....	5AU	843 .....	5A	1608 .....	4D
185R4 .....	4A	328 .....	6F	864 .....	4D	1609 .....	5K
185R8 .....	4A	348A .....	7R	865 .....	4AR	1610 .....	5B
210T .....	4D	349A .....	7S	866, 866A ....	4P	1612 .....	7T
213, 213B .....	4C	350A, WE 350A		874 .....	4S	1613 .....	7S
216, 216B ....	4B	5AW		878 .....	4AU	1614 .....	7AC
231D, WE 231D		350B .....	7S	879 .....	4AB	1616 .....	4P
4D		351A .....	6S	884 .....	6Q		
239A .....	4G	383A .....	5AT	885 .....	5A	1619 .....	7AC
242C .....	4D	385A .....	6BL	941 .....	4D	1620 .....	7R
244A .....	5A	482A, 482B ...	4D	942 .....	4D	1621 .....	7S
245A .....	4D	483 .....	4D	950 .....	5K	1622 .....	7AC
249B .....	4AU	484 .....	5A	951 .....	4K	1625 .....	5AZ
						1626 .....	6Q
252A .....	4D	485 .....	5A	954 .....	5BB	1629 .....	7AL
257 .....	5B	486 .....	5S	955 .....	5BC	1631 .....	7AC
257A, WE 257A		WL578/8020 ..	4P	956 .....	5BB	1632 .....	7AC
3Q		585 .....	4D	957 .....	5BD	1633 .....	8BD
259A .....	5E	586 .....	4D	958 .....	5BD	1634 .....	8S
264 .....	4D	HY-615B ....	3P	959 .....	5BE	1635 .....	8B
271A .....	5A	713, 713A, WE-		985 .....	5D	1642 .....	7BH
274-A .....	4C	713A ....	8BK	986 .....	4C	1851 .....	7R
274-B .....	5T	717, 717A, WE-		1005, CK1005	5AQ	1852 .....	8N
275-A .....	4D	717A ....	8BK	1201/7E5 ...	8BN	1853 .....	8N
282-A .....	4AR	801, 801A ....	4D	1203 .....	4AH	2050 .....	8BA
283-A .....	5A	802 .....	6BM	1203/7C4 ...	4AH	7184, KR 7184	6BO
287A .....	5AU	803 .....	5J	1204 .....	8BO	8005 .....	3O
291 .....	5G	804 .....	5J	1221 .....	6F	8013A .....	4P
293 .....	5G	807 .....	5AW	1223 .....	7R	8020/WL578 ..	4P
295 .....	5G	811 .....	3O	1231 .....	8V	9001 .....	7BD
WE 300A ....	4D	812 .....	3O	1232 .....	8V	9002 .....	7BS
WE 300B ....	4D	813 .....	5BA	1284 .....	8V	9003 .....	7BD
301A .....	4C	814 .....	5J	1291/3B7 ...	7BE	9004 .....	4BJ
307A, WE 307-A		816 .....	4P	1293 .....	4AA	9005 .....	5BG
5J							
310 .....	4D	837 .....	6BM	1294 .....	4AH	9006 .....	6BH

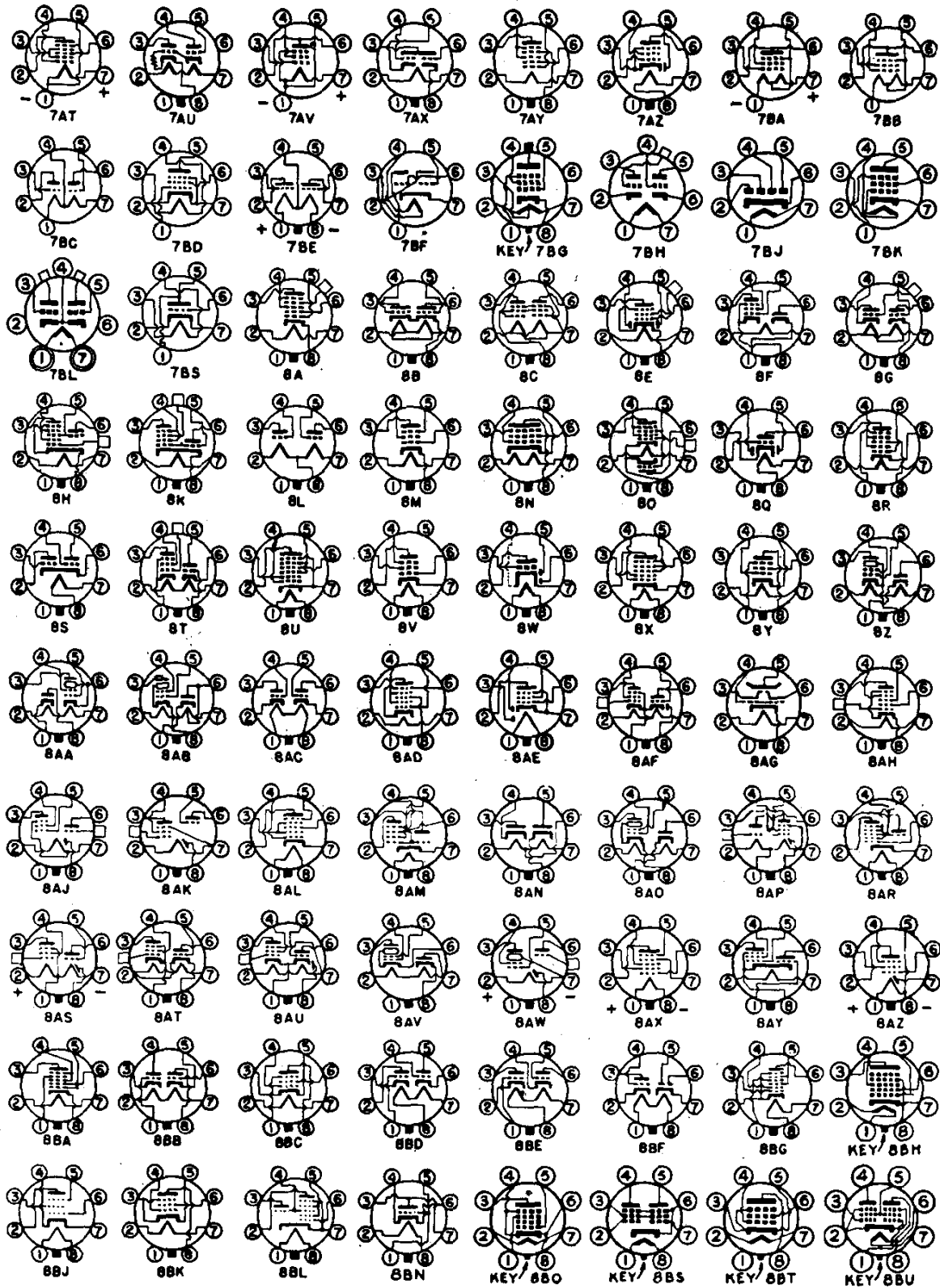
Figure 12.1. Tube base diagrams, 2S to 6C.

**TL-7493a**



TL-7494a

Figure 12.2. Tube base diagrams, 6D to 7AS.



TL-7495a

Figure 12.3. Tube base diagrams, 7AT to 8BU

## 29. COMMERCIAL EQUIVALENTS OF SIGNAL CORPS TUBES.

<i>Signal Corps tube</i>	<i>Commercial tube equivalent</i>	<i>Signal Corps tube</i>	<i>Commercial tube equivalent</i>	<i>Signal Corps tube</i>	<i>Commercial tube equivalent</i>
VT-2 .....	WE205B	VT-51 ..	841, PT841, 941	VT-90-A	
VT-4-B ..	211, 242A, 311	VT-52 .....	45 Special		6H6GT, 6H6GT/G
VT-4-C .....	211 Special	VT-54 .....	34	VT-91 .....	6J7
VT-5 ...	WE215A, 215A	VT-55 .....	865	VT-91-A .....	6J7GT
VT-7 .....	WX12	VT-56 .....	56	VT-92 .....	6Q7
VT-17 .....	860	VT-57 .....	57	VT-92-A .....	6Q7G
VT-19 .....	861	VT-58 .....	58	VT-93 .....	6B8
VT-22 .....	204A	VT-60 .....	850	VT-93-A .....	6B8G
VT-24 .....	864	VT-62 ....	801, 801A, 310	VT-94 .....	6J5
VT-25 .....	10	VT-63 .....	46	VT-94-A .....	6J5G
VT-25-A 10	Special, 10Y	VT-64 .....	800, RK30	VT-94-D .....	6J5GT
VT-26 .....	22	VT-65 .....	6C5	VT-95 .....	2A3
VT-27 .....	30	VT-65-A .....	6C5G	VT-96 .....	6N7
VT-28 .....	24, 24A	VT-66 .....	6F6	VT-97 .....	5W4
VT-29 .....	27	VT-66-A .....	6F6G		
VT-30 .....	01A, 01	VT-67 .....	30 Special	VT-98	
VT-31 .....	31	VT-68 .....	6B7		6U5/6G5, 6G5, 6U5
VT-33 .....	33	VT-69 .....	6D6	VT-99 .....	6F8G
VT-34 .....	207, F307	VT-70 .....	6F7	VT-100 ....	807, RK39,
VT-35 .....	35/51	VT-72 .....	842, 942		HY61, HY61/807
VT-36 .....	36, 36A	VT-73 .....	843	VT-100-A	
VT-37 .....	37, 37A	VT-74 .....	5Z4		807, 807A, Modified
VT-38 .....	38, 38A	VT-75 .....	75	VT-101 ....	837, RK44
VT-39 .....	869	VT-76 .....	76	VT-103 .....	6SQ7
VT-39-A ..	869A, F369B	VT-77 .....	77	VT-104 .....	12SQ7
VT-40 .....	40	VT-78 .....	78	VT-105 .....	6SC7
VT-41 .....	851, 951	VT-80 .....	80	VT-106	
VT-42 ....	872, F-353A	VT-83 .....	83		803, RKE8A, WE322A
VT-42-A		VT-84 .....	84/6Z4	VT-107 .....	6V6
	872 Special filament	VT-86 .....	6K7		
VT-43 ...	A45, 845, 945,	VT-86-A .....	6K7G	VT-107-A	
	WE284D, 384D	VT-86-B .....	6K7GT		6V6GT, 6V6GT/G
VT-44 .....	32	VT-87 .....	6L7	VT-107-B .....	6V6G
VT-45 .....	45	VT-87-A .....	6L7G	VT-108 .....	450TH,
VT-46 .....	866, 966	VT-88 .....	6R7		WL450, HK854H
VT-46-A ...	866A, 966A	VT-88-A .....	6R7G	VT-109 ...	2051, WL630
VT-47 .....	47	VT-88-B .....	6R7GT	VT-111 .....	2525D5,
VT-48 .....	41	VT-89 .....	89		5BP4/1808P4, 1802P4
VT-49 .....	39/44	VT-90 .....	6H6	VT-112	6AC7/1852, 1852
VT-50 ....	50, 585, 586			VT-114 .....	5T4

<i>Signal Corps tube</i>	<i>Commercial tube equivalent</i>	<i>Signal Corps tube</i>	<i>Commercial tube equivalent</i>	<i>Signal Corps tube</i>	<i>Commercial tube equivalent</i>
VT-115 .....	6L6	VT-141 ....	53L, WL531	VT-178 .....	1LC6
VT-115-A	6L6G, 6L6GA	VT-142 ....	WE31DY1	VT-179 .....	1LN5
VT-116, VT-116-B...	6SJ7	VT-143		VT-180 .....	3LF4
VT-116A .....	6SJ7GT		805, WE331A, 905, RK57	VT-181 .....	7Z4
VT-116-B		VT-144 .....	813	VT-182	
6SJ7Y, 6SJ7 special		VT-145 .....	5Z3	3B7/1291, 3B7, 1291	
(micanol or ceramic		VT-146		VT-183	
base)		IN5GT, IN5GT/G		1R4/1294, 1294, 1R4	
VT-117 .....	6SK7	VT-147 .....	1A7GT	VT-184 .....	VR90-30, OB3/VR90, VR90
VT-117-A ....	6SK7GT	VT-148 .....	1D8GT	VT-185	
VT-118 .....	832	VT-149 .....	3A8GT	3D6/1299, 3D6, 1299	
VT-119 .....	2X2/879	VT-150 .....	6SA7	VT-187 .....	575A, F375A, 975A, GL512
VT-120 .....	954	VT-150-A ....	6SA7GT	VT-188 .....	7E6
VT-121 .....	955	VT-151 .....	6A8G	VT-189 .....	7F7
VT-122 ....	WL530, 530	VT-151-B .....	6A8GT	VT-190 .....	7H7
VT-124		VT-152		VT-191 .....	316A
1A5GT, 1A5GT/G		6K6GT, 6K6GT/G		VT-192 .....	7A4
VT-125		VT-152-A .....	6K6G	VT-193 .....	7C7
1C5GT, 1C5GT/G		VT-153 ....	12C8 special	VT-194 .....	7J7
VT-126 .....	6X5	VT-154		VT-195 ..	CK1005, 1005
VT-126-A .....	6X5G	814, 12C8Y, RK47		VT-196 .....	6W5C
VT-126-B		VT-161.814(GL), 12SA7		VT-197-A	
6X5GT, 6X5GT/G		VT-162 .....	12SJ7	5Y3GT/G, 5Y3GT	
VT-127 .....	100TS	VT-163 .....	6C8G	VT-198-A .....	6G6G
VT-127-A		VT-164 .....	1619	VT-199 .....	6SS7
100TS modified		VT-165 .....	1624	VT-200	
VT-128 ....	1630, A5588	VT-166 .....	371A,	VR105-30, VR105	
VT-129		Amperex 221A, WE371A		VT-201 .....	25L6
304TL, WL525, HK304L		VT-167 .....	6K8	VT-201-C	
VT-130 250TL, HK454L		VT-167-A .....	6K8G	25L6GT, 25L6GT/G	
VT-131 .....	12SK7	VT-168-A .....	6Y6G	VT-202 .....	9002
VT-132		VT-169 .....	12C8	VT-203 .....	9003
12K8 special, 12K8		VT-170 .....	1E5GP	VT-204 ...	3C24, HK24G
VT-133 .....	12SR7	VT-171 .....	1R5	VT-205 .....	6ST7
VT-134 .....	12A6	VT-171-A ...	1R5 loctal	VT-206-A ..	5V4G, 274B
VT-135 .....	12J5GT	VT-172 .....	1S5	VT-207 ....	12AH7GT
VT-135-A .....	12J5	VT-173 .....	1T4	VT-208 .....	7B8
VT-136 .....	1625	VT-174 .....	3S4	VT-209 .....	12SG7
VT-137 .....	1626	VT-175 ...	1613, 6L6GX	VT-210 .....	1S4
VT-138 .....	1629	VT-176		VT-211 .....	6SG7
VT-139 ..	OD3/VR150, VR150-30, VA150	6AB7/1853, 6AB7, 1853			
		VT-177 .....	1LH4		



## SUPPLEMENTARY DATA

<i>Signal Corps tube</i>	<i>Commercial tube equivalent</i>	<i>Signal Corps tube</i>	<i>Commercial tube * equivalent</i>	<i>Signal Corps tube</i>	<i>Commercial tube equivalent</i>
VT-212 .....	958	VT-232		VT-251 ..	WL441 series,
VT-213-A .....	6L5G	1148, E1148, HYE1148		2J30 to 2J34S "K" series	
VT-214 .....	12H6	VT-233 .....	6SR7	VT-252 .....	923
VT-215 .....	6E5	VT-234		VT-254 .....	304TH,
VT-216..816, 866JR, 2B26		HY/114B, NU114B		WL535, HK304M	
VT-217 .....	811	VT-235..HY615, NU615		VT-255	
VT-218 ..	100TH, RK38	VT-236 .....	836	705A, 8021, WE705A	
VT-219 .....	8007	VT-237 .....	957	VT-256...GL486, ZP486	
VT-220		VT-238 .....	956	VT-257 .....	K-7
250TH, RK63, HK454		VT-239 .....	1LE3	VT-259 .....	829
VT-221		VT-240 .....	710A,	VT-260 .....	VR75-30
3Q5GT, 3Q5GT/G		WL538, 8011, WE710A		VT-264 .....	3Q4
VT-222 .....	884	VT-241		VT-266..1616, 866JR, 660	
VT-223		7E5/1201, 7E5, 1201		VT-267 ....	578, WL578
1H5GT, 1H5GT/G		VT-243		VT-268 .....	12SC7
VT-224 .....	RK34	7C4/1203A, 7C4, 1203		VT-269 .717A, WE717A	
VT-225....WE307A, 307A		VT-244 .....	5U4G	VT-277 ....	417, WL417
VT-226 ..	3EP1/1806P1,	VT-245 .....	2050	VT-279 ..	GY2, D161831
3EP1, 1806P1		VT-246 ..	918, CE1, PJ23	VT-282 .....	ZG489
VT-227 ...	7184, KR7184	VT-247 .....	6AG7	VT-286 .....	832A
VT-228 .....	8012	VT-248 ..	3CP1/1808P1,	VT-287 .....	815
VT-229 .....	6SL7GT	3CP1-S1, 3CP1, 1808P1		VT-288 .....	12SH7
VT-230 .....	350A	VT-249 ...	CK1006, 1006	VT-289 .....	12SL7GT
VT-231 .....	6SN7GT	VT-250 .....	EF50		

### 30. SIGNAL CORPS EQUIVALENTS OF COMMERCIAL TUBES.

<i>Commercial type</i>	<i>Signal Corps equivalent</i>	<i>Commercial type</i>	<i>Signal Corps equivalent</i>	<i>Commercial type</i>	<i>Signal Corps equivalent</i>
01, 01A .....	VT-30	1LE3 .....	VT-239	2A3 .....	VT-95
CE1 .....	VT-246	1LH4 .....	VT-177	2B26 .....	VT-46-A
1A5GT, 1A5GT/G		1LN5 .....	VT-179	2J30 to 2J34 "K"	
VT-124		1N5GT, 1N5GT/G		series .....	VT-251
1A7GT .....	VT-147	VT-146		2X2/879, 2X2 ..	VT-119
1C5GT, 1C5GT/G		1R4, 1R4/1294 ..	VT-183	OA3/VR75 ....	VT-260
VT-125		1R5 .....	VT-171	OB3/VR90 ....	VT-184
1D8GT .....	VT-148	1R5 (loctal) ..	VT-171-A	OC3/VR105 ...	VT-200
1E5GP .....	VT-170	1S4 .....	VT-210	OD3/VR150 ...	VT-139
1H5GT, 1H5GT/B		1S5 .....	VT-172	3A8GT .....	VT-149
VT-223		1T4 .....	VT-173	3B7, 3B7/1291 ..	VT-182
1LC6 .....	VT-178	GY2 .....	VT-279	3C24 .....	VT-204

<i>Commercial type</i>	<i>Signal Corps equivalent</i>	<i>Commercial type</i>	<i>Signal Corps equivalent</i>	<i>Commercial type</i>	<i>Signal Corps equivalent</i>
3CP1, 3CP1/1808P1, 3CP1-S1 ..... VT-248		6G6G ..... VT-198-A		6U5, 6U5/6G5 .. VT-98	
3D6, 3D6/1299 .. VT-185		6H6 ..... VT-90		6V6 ..... VT-107	
3EP1, 3EP1/1806P1		6H6GT, 6H6GT/G		6V6GT, 6V6GT/G	
VT-226		VT-90-A		VT-107-A	
		6J5 ..... VT-94		6V6G ..... VT-107-B	
3LF4 ..... VT-180		6J5G ..... VT-94-A		6W5-6 ..... VT-196	
3Q4 ..... VT-264		6J6GT ..... VT-94-D		6X5 ..... VT-126	
3Q5GT,		6J7 ..... VT-91		6X5G ..... VT-126-A	
3Q5GT/G .... VT-221		6J7GT ..... VT-91-A		6X5GT, 6X5GT/G	
3S4 ..... VT-174		6K6G ..... VT-152-A		VT-126-B	
5BP4, 5BP4/1802P4		6K6GT, 6K6GT/G		6Y6G ..... VT-168-A	
VT-111		VT-152		6Z4, 6Z4/84 ..... VT-84	
5T4 ..... VT-114		6K7 ..... VT-86		K-7 ..... VT-257	
5U4G ..... VT-244		6K7G ..... VT-86-A		7A4 ..... VT-192	
5V4G ..... VT-206-A		6K7G F ..... VT-86-B		7B8 ..... VT-208	
5W4 ..... VT-97		6K8 ..... VT-167		7C4, 7C4/1203A .. VT-243	
5Y3-GT, 5YGT/G		6K8G ..... VT-167-A		7C7 ..... VT-193	
VT-197-A		6L5G ..... VT-213-A		7E5, 7E5/1201 .. VT-241	
5Z3 ..... VT-145		6L6 ..... VT-115		7E6 ..... VT-188	
5Z4 ..... VT-74		6L6G, GL6GA..VT-115-A		7F7 ..... VT-189	
6A8G ..... VT-151		6L6GX ..... VT-175		7H7 ..... VT-190	
6A8GT ..... VT-151-B		6L7 ..... VT-87		7J7 ..... VT-194	
6AB7, 6AB7/1853		6Q7 ..... VT-92		7Z4 ..... VT-181	
VT-176		6Q7G ..... VT-92-A		10 ..... VT-25	
6AC7, 6AC7/1852		6R7 ..... VT-88		10Y, 10 special..VT-25-A	
VT-112		6R7GT ..... VT-88-B		WX12 ..... VT-7	
6AG7 ..... VT-247		6SA7 ..... VT-150		12A6 ..... VT-134	
6B7 ..... VT-68		6SA7GT .... VT-150-A		12AH7GT ..... VT-207	
6B8 ..... VT-93		6SC7 ..... VT-105		12C8 ..... VT-169	
6B8G ..... VT-93-A		6SG7 ..... VT-211		12C8Y, 12C8 special	
6C5 ..... VT-65		6SJ7 ..... VT-116		VT-153	
6C5G ..... VT-65-A		6SJ7GT ..... VT-116-A		12H6 ..... VT-214	
6C8G ..... VT-163		6SJ7Y, 6SJ7 special		12J5 ..... VT-135-A	
6D6 ..... VT-69		VT-116-B		12J5-GT ..... VT-135	
6E5 ..... VT-215		6SK7 ..... VT-117		12K8, 12K8 special	
6F6 ..... VT-66		6SK7GT, 6SK7GT/G		VT-132	
		VT-117-A			
6F6G ..... VT-66-A		6SL7GT ..... VT-229		12SA7 ..... VT-161	
6F7 ..... VT-70		6SN7GT ..... VT-231		12SC7 ..... VT-268	
6F8G ..... VT-99		6SQ7 ..... VT-103		12SG7 ..... VT-209	
6L7G ..... VT-87-A		6SR7 ..... VT-233		12SH7 ..... VT-288	
6N7 ..... VT-96		6SS7 ..... VT-199		12SJ7 ..... VT-162	
				12SK7 ..... VT-131	
6G5 ..... VT-98		6ST7 ..... VT-205		12SL7-GT ..... VT-289	

## SUPPLEMENTARY DATA

<i>Commercial type</i>	<i>Signal Corps equivalent</i>	<i>Commercial type</i>	<i>Signal Corps equivalent</i>	<i>Commercial type</i>	<i>Signal Corps equivalent</i>
12SQ7 .....	VT-104	57 .....	VT-57	310 .....	VT-62
12SR7 .....	VT-133	58 .....	VT-58	311 .....	VT-4-B
22 .....	VT-26	HY61, HY61/807..	VT-100	WE316A .....	VT-191
PJ23 .....	VT-246	RK63 .....	VT-220	WE322A .....	VT-106
24, 24A .....	VT-28	75 .....	VT-75	WE331A .....	VT-143
HK24G .....	VT-204	VR75-30 .....	VT-260	WE350A .....	VT-230
25L6 .....	VT-201	76 .....	VT-76	F353A .....	VT-42
25L6GT, 25L6GT/G	VT-201-C	77 .....	VT-77	F369B .....	VT-39-A
27 .....	VT-29	78 .....	VT-78	371A, WE371A..	VT-166
		80 .....	VT-80	F375A .....	VT-187
RK28A .....	VT-106	83 .....	VT-83	384D .....	VT-43
30 .....	VT-27	84, 84/6Z4 .....	VT-84	417, WL417 ....	VT-277
30 special .....	VT-67	89 .....	VT-89	WL441 series ..	VT-251
RK30 .....	VT-64	VR90, VR90-30..	VT-184	450TH, WL450	VT-108
31 .....	VT-31	98 .....	VT-84	HK454H .....	VT-220
32 .....	VT-44	100TH .....	VT-218	HK454L .....	VT-130
33 .....	VT-33	100TS .....	VT-127	ZP486, GL486 ..	VT-256
34 .....	VT-54	100TS modified	VT-127-A	ZG489 .....	VT-282
RK34 .....	VT-224	VR105, VR105-30	VT-200	GL512 .....	VT-187
35, 35/51 .....	VT-35	•		WL525 .....	VT-129
36, 36A .....	VT-36	HY114B, NU114B	VT-234	530, WL530 ....	VT-122
37, 37A .....	VT-37	VR150, VR150-30	VT-139	531, WL531 ....	VT-141
38, 38A .....	VT-38	204A .....	VT-22	WL535 .....	VT-254
RK38 .....	VT-218			WL538 .....	VT-240
39, 39/44 .....	VT-49	WE205B .....	VT-2	575A .....	VT-187
WE39DY1 ....	VT-142	207 .....	VT-34	578, WL578 ....	VT-267
RK39 .....	VT-100	211 .....	VT-4-B	585, 586 .....	VT-50
40 .....	VT-40	211 special .....	VT-4-C	HY615, NU615 ..	VT-235
41 .....	VT-48	215A, WE215A ...	VT-5	WL630 .....	VT-109
44 .....	VT-49	Amperex 221A ..	VT-166	WE705A .....	VT-255
RK44 .....	VT-101	242A .....	VT-4-B	710A, WE710A .	VT-240
45 .....	VT-45	250TH .....	VT-220	WE717A .....	VT-269
A45 .....	VT-43	250TL .....	VT-130	800 .....	VT-64
45 special .....	VT-52	274B .....	VT-206-A	801, 801A .....	VT-62
46 .....	VT-63	WE284D .....	VT-43	803 .....	VT-106
47 .....	VT-47	HK304L .....	VT-129	805 .....	VT-143
RK47 .....	VT-154	304TH, HK304M	VT-254	807 .....	VT-100
50 .....	VT-50	304TL .....	VT-129	807A, 807 modified	VT-100-A
EF50 .....	VT-250			811 .....	VT-217
51 .....	VT-35	F307 .....	VT-34	813 .....	VT-144
56 .....	VT-56	307A, WE307A..	VT-225	814, 814 (GL)...	VT-154
RK57 .....	VT-143				

<i>Commercial type</i>	<i>Signal Corps equivalent</i>	<i>Commercial type</i>	<i>Signal Corps equivalent</i>	<i>Commercial type</i>	<i>Signal Corps equivalent</i>
815 .....	VT-287	905 .....	VT-143	1613 .....	VT-175
816 .....	VT-216	918 .....	VT-246	1616 .....	VT-266
829 .....	VT-259	923 .....	VT-252	1619 .....	VT-164
832 .....	VT-118	CW931 .....	VT-2	1624 .....	VT-165
832A .....	VT-286	941 .....	VT-51	1625 .....	VT-136
836 .....	VT-236	942 .....	VT-72	1626 .....	VT-137
837 .....	VT-101	945 .....	VT-43	1629 .....	VT-138
841, PT841 .....	VT-51	951 .....	VT-41	1630 .....	VT-128
842 .....	VT-72	954 .....	VT-120	1802P4 .....	VT-111
843 .....	VT-73	955 .....	VT-121	1806P1 .....	VT-226
845 .....	VT-43	956 .....	VT-238	1808P1 .....	VT-248
850 .....	VT-60	957 .....	VT-237	1852 .....	VT-112
851 .....	VT-41	958 .....	VT-212	1853 .....	VT-176
HK854H .....	VT-108	966 .....	VT-46	2050 .....	VT-245
860 .....	VT-17	966A .....	VT-46-A	2051 .....	VT-109
861 .....	VT-19	972 .....	VT-42	2525D5 .....	VT-111
864, 864 special ..	VT-24	975A .....	VT-187	A5586 .....	VT-123
865 .....	VT-55	1005, CK1005 ..	VT-195	A5588 .....	VT-128
866 .....	VT-46	1006, CK1006 ..	VT-249	7184, KR7184 ..	VT-227
866A, 866JR ...	VT-46-A	1148, E1148, HY-		8007 .....	VT-219
869 .....	VT-39	E1148 .....•	VT-232	8011 .....	VT-240
869A .....	VT-39-A	1201 .....	VT-241	8012 .....	VT-228
872 .....	VT-42	1203A .....	VT-243	8021 .....	VT-255
872A .....	VT-42-A	1291 .....	VT-182	9002 .....	VT-202
879 .....	VT-119	1294 .....	VT-183	9003 .....	VT-203
884 .....	VT-222	1299 .....	VT-185	D161831 .....	VT-279

### 31. TUBE TEST DATA.

**NOTE:** A Star (★) appearing in Notations Column indicates that the PLATE CAP of the tube should be connected to the UPPER LEFT CONTACT of the 6-pin socket. A 12-inch lead with clip and banana plug is provided for that purpose.

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select. A B</i>		<i>Fil. Volts</i>	<i>Potent. L R</i>		<i>Mut. Cond. Press</i>	<i>Notations</i>
00A	A	2	10	5	23	27	666	Ampl.
0A4G	E	10	2	†	15	0	....	Diode †Tube strikes at 50V.
01A	A	2	10	5	26	39	725	Ampl.
0Z4	E	4	8	...	...	...	....	Check for Shorts
0Z4	E	2	9	...	60	0	....	0Z4 Button
0Z4	E	10	2	...	60	0	....	0Z4 Button
1A3	H	10	5	1.5	0	0	....	Diode Also Press 117N7 But.
1A4	A	2	5	1	27	24	750	Ampl.
1A5G	E	8	5	1.5	32	35	800	Ampl.
1A6	C	1	5	2	0	29	500	Ampl. Section
1A6	C	9	7	2	60	29	150	Ampl. Osc. Sec. OK over 120
1A7G	E	7	7	1.5	32	20	800	Ampl. Pent. Section
1A7G	E	12	7	1.5	60	38	300	Ampl. Osc. Sec. OK over 240
1B4	A	2	5	2	18	29	640	Ampl.
1B5	C	7	8	2	60	23	475	Ampl. Sec. OK over 380
1B5	C	10	8	2	0	0	....	Diode But.
1B5	C	12	3	2	0	0	....	Diode But.
1B7G	E	7	7	1.5	32	20	800	Ampl. Pent. Section
1B7G	E	12	7	1.5	60	38	300	Ampl. Osc. Sec. OK over 240
1C5G	E	8	5	1.5	55	36	1550	Ampl.
1C6	C	1	5	2	20	24	560	Ampl. Section
1C6	C	9	7	2	60	41	300	Ampl. Osc. Sec. OK over 240
1C7G	E	2	5	2	20	24	650	Ampl. Section
1C7G	E	12	7	2	60	41	300	Ampl. Osc. Sec. OK over 240
1D5G	E	2	5	2	27	24	750	Ampl.
1D7G	E	2	5	2	0	29	500	Ampl. Section
1D7G	F	12	7	2	60	35	200	Ampl. Osc. Sec. OK over 160
1D8GT	F	8	5	1.5	35	41	925	Ampl. Pent. Section
1D8GT	F	11	5	1.5	11	9	575	Ampl. Triode Section
1D8GT	E	5	1	1.5	0	0	....	Diode Section
1E4G	E	7	5	1.5	32	30	825	Ampl.
1E5G	E	2	5	2	18	29	640	Ampl.
1E7G	E	8	8	2	45	17	1150	Ampl. No. 1 Plate
1E7G	E	11	6	2	45	17	1150	Ampl. No. 2 Plate
1F4	B	1	5	2	51	19	1400	Ampl.
1F5G	E	8	5	2	51	19	1400	Ampl.
1F6	C	1	7	2	20	21	650	Ampl. Section
1F6	C	11	1	2	0	0	....	Diode But. OK over 500
1F6	C	5	5	2	0	0	....	Diode But. OK over 500

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select. A B</i>		<i>Fil. Volts</i>	<i>Potent. L R</i>		<i>Mut. Cond.</i>	<i>Press</i>	<i>Notations</i>
1F7G	E	1	5	2	20	21	650	Ampl. Pentode Sec.	
1F7G	E	4	5	2	0	0	....	Diode Button	
1F7G	E	7	1	2	0	0	....	Diode Button	
1G4G	E	7	5	1.5	33	40	825	Ampl.	
1G5G	E	8	5	2	54	30	1500	Ampl.	
1G6G	E	2	9	1.5	22	13	675	Ampl. No. 1 Plate	
1G6G	E	12	5	1.5	22	13	675	Ampl. No. 2 Plate	
1H4G	E	7	5	2	36	33	900	Ampl.	
1H5G	E	8	5	1.5	60	13	275	Ampl. OK over 220	
1H5G	E	8	1	1.5	0	0	....	Diode Button	
1H6G	E	7	8	2	60	23	475	Ampl. Section	
1H6G	E	10	8	2	0	0	....	Diode Button	
1H6G	E	11	3	2	0	0	....	Diode Button	
1J5G	E	8	5	2	37	37	950	Ampl.	
1J6G	E	8	8	2	42	12	1000	Ampl. No. 1 Plate	
1J6G	E	11	6	2	42	12	1000	Ampl. No. 2 Plate	
1L4	H	1	7	1.5	43	16	1025	Ampl. Short on 4-5	
1LA4	F	6	2	1.5	32	35	800	Ampl.	
1LA6	F	6	3	1.5	32	20	800	Ampl. Pent. Section	
1LA6	F	2	8	1.5	60	38	300	Ampl. Osc. Sec. OK over 240	
1LB4	F	6	2	1.5	38	42	925	Ampl.	
1LC5	F	6	2	1.5	30	24	775	Ampl. Short on 4-5	
1LC6	F	6	3	1.5	41	19	1000	Ampl. Pent. Sect.	
1LC6	F	2	8	1.5	10	19	550	Ampl. Osc. Sect.	
1LD5	F	6	2	1.5	14	23	600	Ampl. Pent. Sec.	
1LD5	F	4	9	1.5	0	0	....	Diode	
1LE3	F	6	2	1.5	50	0	1300	Ampl.	
1LH4	F	6	3	1.5	60	13	275	Ampl. Sec. OK over 220	
1LH4	F	10	10	1.5	0	0	....	Diode Section	
1LN5	F	6	2	1.5	28	9	750	Ampl. Short on 4-5	
1N5G	E	8	5	1.5	28	9	750	Ampl.	
1N6G	E	8	5	1.5	31	35	800	Ampl.	
1P5G	E	8	5	1.5	31	9	800	Ampl.	
1Q5G	E	8	5	1.5	61	30	2100	Ampl.	
1R4	F	10	5	1.5	0	0	....	Diode	
1R5	H	7	7	1.5	19	29	650	Ampl. No. 1 Grid, Short on 4-5	
1R5	H	1	7	1.5	0	29	500	Ampl. No. 2 Grid	
1S4	H	4	6	1.5	34	82	850	Diode Button, Short on 3-4-5	
1S5	H	6	6	1.5	9	28	525	Ampl. Pent. Section	
1S5	H	3	6	1.5	0	0	....	Diode	
1SA6GT	E	3	4	1.5	39	19	950	Ampl.	
1SB6GT	E	2	5	1.5	20	22	650	Ampl.	
1T4	H	1	7	1.5	28	28	750	Ampl. Short on 4-5	
1T5GT	E	8	5	1.5	46	37	1150	Ampl.	
1V	A	1	5	6.3	40	0	....	Rect. St.	
2A3	A	2	10	2.5	67	55	3000	Ampl.	
2A4G	E	7	5	2.5	76	*	....	Press Rect. Std. But. Tube strikes at about 60	
2A5	C	8	5	2.5	60	24	2000	Ampl.	

## SUPPLEMENTARY DATA

Par. 31

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select. A B</i>		<i>Fil. Volts</i>	<i>Potent. L R</i>		<i>Mut. Cond.</i>	<i>Press</i>	<i>Notations</i>
2A6	C	7	6	2.5	28	9	750		Ampl. Section
2A6	C	10	6	2.5	0	0	....		Diode Button
2A6	C	10	3	2.5	0	0	....		Diode Button
2A7	D	7	6	2.5	41	18	1000		Ampl. Section
2A7	D	10	6	2.5	60	25	400		Ampl. Osc. OK over 320
2B6	D	3	2	2.5	15	30	600		Ampl. Input Section
2B6	D	7	6	2.5	64	12	2500		Ampl. Output Sec. Short on 3
2B7	D	7	6	2.5	41	25	1000		Ampl. Pentode Section
2B7	D	10	6	2.5	0	0	....		Diode Button
2B7	D	10	3	2.5	0	0	....		Diode Button
2C21	D	10	3	6.3	51	14	1375		Ampl. Plate No. 1
2C21	D	3	3	6.3	51	14	1375		Ampl. Plate No. 2
2C22	E	7	2	6.3	67	11	3000		Ampl. NOTE A
2V3G	E	7	1	2.5	0	0	....		Rect. Std. OK over 1000
2W3	E	4	11	2.5	33	0	....		Rect. Std. Button
2X2	A	7	1	2.5	0	0	....		Rect. Std. OK over 1000 ★
2Z2	A	2	7	2.5	35	0	....		Rect. Std. Button
3A4	H	11	2	1.1	0	0	....		Diode Short on 3-4-5
3A5	H	8	8	3	60	12	2000		Ampl. Plt. No. 1 Short on 4-5
3A5	H	6	2	3	60	18	2000		Ampl. Plt. No. 2 Short on 4-5
3A8GT	E	8	5	2.5	28	10	750		Ampl. Pent. Sec. Short on 1
3A8GT	E	11	5	2.5	0	10	500		Ampl. Triode Section
3A8GT	E	5	1	2.5	0	0	....		Diode Section
3B5GT	E	8	5	2.5	54	49	1500		Ampl. Short on 4-5
3D6	F	6	2	1.5	61	30	2100		Ampl. Short on 1
3Q4	H	4	6	1.5	34	82	850		Press Diode But Short on 3-4-5
3Q5GT	E	8	5	3	58	31	1800		Ampl. Short on 4-5
3S4	H	4	6	2.5	28	82	750		Press Diode But Short on 3-4-5
4A6G	E	2	9	3	41	0	1000		Ampl. No. 1 Plate
4A6G	E	12	5	3	41	13	1000		Ampl. No. 2 Plate
5R4GY	E	4	11	5	40	0	....		Rect. Std. Plt. No. 1
5R4GY	E	5	11	5	40	0	....		Rect. Std. Plt. No. 2
5T4	E	4	11	5	40	0	....		Rect. Std.
5T4	E	5	11	5	40	0	....		Rect. Std.
5U4G	E	4	11	5	40	0	....		Rect. Std.
5U4G	E	5	11	5	40	0	....		Rect. Std.
5V4G	E	4	11	5	40	0	....		Rect. Std.
5V4G	E	5	11	5	40	0	....		Rect. Std.
5W4	E	4	11	5	33	0	....		Rect. Std.
5W4	E	5	11	5	33	0	....		Rect. Std.
5X4G	E	7	9	5	40	0	....		Rect. Std.
5X4G	E	12	4	5	40	0	....		Rect. Std.
5Y3	E	4	11	5	40	0	....		Rect. Std.
5Y3	E	5	11	5	40	0	....		Rect. Std.
5Y4G	E	7	9	5	35	0	....		Rect. Std.
5Y4G	E	12	4	5	35	0	....		Rect. Std.
5Z3	A	2	7	5	40	0	....		Rect. Std.
5Z3	A	3	7	5	40	0	....		Rect. Std.

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select. A B</i>		<i>Fil. Volts</i>	<i>Potent. L R</i>		<i>Mut. Cond.</i>	<i>Press</i>	<i>Notations</i>
5Z4	E	4	11	5	40	0	....	Rect. Std.	
5Z4	E	5	11	5	40	0	....	Rect. Std.	
6A3	A	2	10	6.3	67	55	3000	Ampl.	
6A4	B	1	5	6.3	60	23	2000	Ampl.	
6A5G	E	7	5	6.3	67	55	3000	Ampl.	
6A6	D	1	5	6.3	53	10	1500	Ampl. No. 1 Plate	
6A6	D	12	5	6.3	53	10	1500	Ampl. No. 2 Plate	
6A7	D	7	6	6.3	41	18	1000	Ampl. Pent. Section	
6A7	D	10	6	6.3	60	25	400	Ampl. Osc. Sec. OK over 320	
6A8	E	7	7	6.3	41	18	1000	Ampl. Pent. Section	
6A8	E	12	7	6.3	60	30	300	Ampl. Osc. Sec. OK over 240	
6AB6G	E	8	5	6.3	53	0	1450	Ampl.	
6AB7	E	4	2	6.3	69	0	3500	Ampl.	
6AC5G	E	8	5	6.3	40	0	1000	Ampl.	
6AC6G	E	8	5	6.3	63	0	2400	Ampl.	
6AC7	E	4	2	6.3	71	0	3500	Ampl.	
6AD7G	E	8	5	6.3	60	24	2000	Ampl. Pent. Sect.	
6AD7G	E	5	5	6.3	60	65	325	Diode Triode Sec. OK over 260	
6AE5G	E	7	5	6.3	47	56	1200	Ampl.	
6AE6G	E	7	5	6.3	34	0	850	Ampl. No. 1 Plate	
6AE6G	E	10	5	6.3	28	0	750	Ampl. No. 2 Plate	
6AE7GT	E	1	8	6.3	54	27	1500	Ampl. No. 1 Cathode	
6AE7GT	E	8	8	6.3	54	27	1500	Ampl. No. 2 Cathode	
6AF5G	E	8	5	6.3	53	42	1500	Ampl.	
6AG7	E	4	2	6.3	72	15	5000	Ampl.	
6AH7GT	E	7	9	6.3	60	35	2000	Press Gas No. 1 Short on 2-3	
6AH7GT	E	11	9	6.3	60	35	2000	Press Gas No. 1 Short on 3-4-5	
6AK5	K	1	9	6.3	71	0	4500	Ampl. Short on 4-5	
6AL6G	E	8	5	6.3	73	19	5000	Ampl. Connect Cap to Plate Contact of 5 Pin Socket	
6B4G	E	7	5	6.3	67	55	3000	Ampl.	
6B5	C	8	5	6.3	52	0	1500	Ampl.	
6B6	E	7	5	6.3	28	9	750	Ampl. Section	
6B6	E	10	5	6.3	0	0	....	Diode Button	
6B6	E	10	2	6.3	0	0	....	Diode Button	
6B7	D	7	6	6.3	41	25	1000	Ampl. Pent. Section	
6B7	D	10	6	6.3	0	0	....	Diode Button	
6B7	D	10	3	6.3	0	0	....	Diode Button	
6B8	E	7	5	6.3	42	25	1000	Ampl. Pent. Section	
6B8	E	10	5	6.3	0	0	....	Diode Button	
6B8	E	10	2	6.3	0	0	....	Diode Button	
6C4	L	2	9	6.3	67	20	3000	Ampl.	
6C5	E	7	5	6.3	60	17	2000	Ampl.	
6C6	C	1	7	6.3	49	17	1225	Ampl.	
6C7	D	7	6	6.3	49	24	1250	Ampl. Section	
6C7	D	10	6	6.3	0	0	....	Diode Button	
6C7	D	10	3	6.3	0	0	....	Diode Button	



## SUPPLEMENTARY DATA

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select. A B</i>		<i>Fil. Volts</i>	<i>Potent. L R</i>		<i>Mut. Cond. Press</i>	<i>Notations</i>
6C8G	E	8	7	6.3	42	14	1000	Ampl. No. 1 Plate
6C8G	E	11	7	6.3	42	14	1000	Ampl. No. 2 Plate
6D5	E	7	5	6.3	60	47	2000	Ampl.
6D6	C	1	7	6.3	56	17	1600	Ampl.
6D7	D	7	6	6.3	48	20	1225	Ampl.
6D8G	E	7	7	6.3	41	22	1000	Ampl. Pentode Section
6D8G	E	12	7	6.3	60	20	300	Ampl. Osc. Sec. OK over 240
6E6	D	1	5	6.3	52	23	1400	Ampl. No. 1 Plate
6E6	D	12	5	6.3	52	23	1400	Ampl. No. 2 Plate
6E7	D	7	6	6.3	55	20	1500	Ampl.
6F5	E	10	5	6.3	43	10	1000	Ampl.
6F6	E	8	5	6.3	60	24	2000	Ampl.
6F7	D	7	6	6.3	45	23	1100	Ampl. Pent. Section
6F7	D	10	6	6.3	60	23	450	Ampl. Tri. Sec. OK over 360
6F8G	E	8	7	6.3	60	13	2000	Ampl. No. 1 Plate
6F8G	E	11	7	6.3	60	13	2000	Ampl. No. 2 Plate
6G6G	E	8	5	6.3	61	19	2100	Ampl.
6H4GT	E	4	8	6.3	50	0	....	Diode Section
6H6	E	7	2	6.3	50	0	....	Diode Button
6H6	E	7	5	6.3	50	0	....	Diode Button
6J5G	E	7	5	6.3	60	24	2000	Ampl.
6J6	K	1	2	6.3	72	0	5000	Ampl. Plt. No. 1
6J6	K	11	8	6.3	72	0	5000	Ampl. Plt. No. 2
6J7	E	1	9	6.3	48	18	1225	Ampl.
6J8G	E	8	5	6.3	41	15	1000	Ampl. Heptode Section
6J8G	E	11	5	6.3	0	25	500	Ampl. Triode Section
6K5G	E	7	5	6.3	40	17	1000	Ampl.
6K6G	E	8	5	6.3	55	28	1600	Ampl.
6K7	E	8	5	6.3	54	16	1450	Ampl.
6K8	E	8	5	6.3	41	9	1000	Ampl. Hexode Section
6K8	E	11	5	6.3	63	9	2400	Ampl. Triode Section
6L5G	E	7	5	6.3	56	22	1500	Ampl.
6L6	E	8	5	6.3	73	19	5000	Ampl.
6L7	E	1	9	6.3	20	19	650	Ampl. Cap Grid
6L7	E	8	5	6.3	20	22	650	Ampl. Pin Grid
6N6MG	E	8	5	6.3	52	0	1500	Ampl.
6N7	E	2	9	6.3	53	10	1500	Ampl. No. 1 Plate
6N7	E	12	5	6.3	53	10	1500	Ampl. No. 2 Plate
6P5G	E	7	5	6.3	53	24	1450	Ampl.
6P7	E	3	12	6.3	45	23	1100	Ampl. Pent. Section
6P7	E	6	12	6.3	60	23	450	Ampl. Tri. Sec. OK over 360
6Q6G	E	7	5	6.3	40	14	1000	Ampl. Section
6Q6G	E	7	2	6.3	0	0	....	Diode Button
6Q7	E	7	5	6.3	33	14	800	Ampl. Section
6Q7	E	10	5	6.3	0	0	....	Diode Button
6Q7	E	10	2	6.3	0	0	....	Diode Button

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select. A</i>	<i>Select. B</i>	<i>Fil. Volts</i>	<i>Potent. L</i>	<i>Potent. R</i>	<i>Mut. Cond.</i>	<i>Press</i>	<i>Notations</i>
6R7	E	7	5	6.3	60	17	1900	Ampl.	Section
6R7	E	10	5	6.3	0	0	....	Diode	Button
6R7	E	10	2	6.3	0	0	....	Diode	Button
6S7G	E	8	5	6.3	57	22	1750	Ampl.	
6SA7	E	1	7	6.3	28	17	750	Ampl.	Section
6SA7	E	7	7	6.3	28	17	750	Ampl.	Osc. Section
6SC7	G	10	3	6.3	42	0	1000	Ampl.	
6SC7	G	1	3	6.3	42	0	1000	Ampl.	
6SD7GT	E	4	2	6.3	64	13	2500	Ampl.	
6SF5	E	7	4	6.3	56	13	1600	Ampl.	
6SF7	E	6	7	6.3	60	0	2000	Ampl.	
6SF7	E	8	1	6.3	0	0	....	Diode	
6SG7	E	4	2	6.3	68	10	3300	Ampl.	
6SH7	E	4	2	6.3	69	0	3400	Ampl.	
6SJ7	E	4	2	6.3	56	18	1575	Ampl.	
6SK7	E	4	2	6.3	59	18	1900	Ampl.	
6SL7	G	4	1	6.3	36	0	900	Ampl.	
6SL7	G	10	4	6.3	53	0	1400	Ampl.	Short on 2-3
6SN7	G	4	1	6.3	56	24	1650	Ampl.	Plt. No. 1
6SN7	G	10	4	6.3	56	24	1650	Ampl.	Plt. No. 2 Short on 2-3
6SQ7	G	6	6	6.3	42	0	1000	Ampl.	Triode Sec.
6SQ7	G	3	7	6.3	0	0	....	Diode	Diode No. 1
6SQ7	G	7	1	6.3	0	0	....	Diode	Diode No. 2
6SR7	G	6	6	6.3	59	15	1900	Ampl.	Triode Sect.
6SR7	G	3	7	6.3	0	0	....	Diode	Diode No. 1
6SR7	G	7	1	6.3	0	0	....	Diode	Diode No. 2
6SS7	E	4	2	6.3	58	16	1850	Ampl.	
6ST7	G	6	7	6.3	59	12	1900	Ampl.	Triode Section
6ST7	G	3	7	6.3	0	0	....	Diode	Diode No. 1
6ST7	G	7	1	6.3	0	0	....	Diode	Diode No. 2
6T7G	E	7	5	6.3	40	14	1000	Ampl.	Triode Section
6T7G	E	10	5	6.3	0	0	....	Diode	Button
6T7G	E	10	2	6.3	0	0	....	Diode	Button
6U6GT	E	8	5	6.3	73	27	6200	Ampl.	
6U7G	E	8	5	6.3	56	17	1600	Ampl.	
6V6G	E	8	5	6.3	67	25	3000	Ampl.	
6V7G	E	7	5	6.3	40	32	975	Ampl.	Section
6V7G	E	10	5	6.3	0	0	....	Diode	Button
6V7G	E	10	2	6.3	0	0	....	Diode	Button
6W5	E	2	9	6.3	40	0	....	Rect.	Std.
6W5	E	10	2	6.3	40	0	....	Rect.	Std.
6W6GT	E	8	5	6.3	67	46	3000	Ampl.	
6W7G	E	1	9	6.3	41	20	1000	Ampl.	
6X5	E	2	9	6.3	40	0	....	Rect.	Std.
6X5	E	10	2	6.3	40	0	....	Rect.	Std.
6Y5	C	9	8	6.3	40	0	....	Rect.	Std.
6Y5	C	12	8	6.3	40	0	....	Rect.	Std.
6Y6G	E	8	5	6.3	74	36	7000	Ampl.	
6Y7G	E	2	9	6.3	39	12	1000	Ampl.	No. 1 Plate
6Y7G	E	12	5	6.3	39	12	1000	Ampl.	No. 2 Plate

## SUPPLEMENTARY DATA

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select. A B</i>		<i>Fil. Volts</i>	<i>Potent. L R</i>		<i>Mut. Cond.</i>	<i>Press</i>	<i>Notations</i>
6Z3	A	1	5	6.3	40	0	....	Rect. Std.	
6Z4-84	B	7	7	6.3	40	0	....	Rect. Std.	
6Z4-80	B	5	1	6.3	40	0	....	Rect. Std.	
6Z5	C	9	12	6.3	40	0	....	Rect. Std.	
6Z5	C	12	12	6.3	40	0	....	Rect. Std.	
6Z7G	E	2	9	6.3	45	0	1200	Ampl. No. 1 Plate	
6Z7G	E	12	5	6.3	45	0	1200	Ampl. No. 2 Plate	
6ZY5G	E	7	2	6.3	40	0	....	Rect. Std.	
6ZY5G	E	7	5	6.3	40	0	....	Rect. Std.	
7A4	F	6	2	6.3	66	14	2600	Ampl.	
7A5	F	6	2	6.3	71	23	6000	Ampl.	
7A6	F	8	5	6.3	40	0	....	Diode Short 1-4-5	
7A6	F	11	5	6.3	40	0	....	Diode	
7A7	F	6	2	6.3	58	22	1750	Ampl.	
7A8	F	5	3	6.3	41	20	1000	Ampl. Section	
7A8	F	8	10	6.3	0	21	500	Ampl. Osc. Section	
7B4	F	6	2	6.3	43	10	1000	Ampl.	
7B5	F	6	2	6.3	56	28	1600	Ampl.	
7B6	F	2	3	6.3	28	9	750	Ampl. Sec. Short 1-4-5	
7B6	F	8	3	6.3	0	0	....	Diode	
7B6	F	6	10	6.3	0	0	....	Diode	
7B7	F	5	4	6.3	57	22	1700	Ampl.	
7B8	F	5	3	6.3	40	22	1000	Ampl. Pentode Section	
7B8	F	8	10	6.3	0	15	500	Ampl. Osc. Section	
7C4	F	9	5	6.3	25	0	....	Diode	
7C5	F	6	2	6.3	67	25	3000	Ampl.	
7C6	F	2	3	6.3	15	8	600	Ampl. Sec. Short 1-4-5	
7C6	F	8	3	6.3	0	0	....	Diode	
7C6	F	6	10	6.3	0	0	....	Diode	
7C7	F	6	2	6.3	49	18	1300	Ampl. Section	
7E5	N	12	4	6.3	67	0	3000	Ampl. Short on 1-2-5	
7E6	F	2	3	6.3	59	15	1900	Ampl. Sec. Short 1-4-5	
7E6	F	8	3	6.3	0	0	....	Diode	
7E6	F	12	10	6.3	0	0	....	Diode	
7E7	F	6	3	6.3	49	18	1300	Ampl. Pent. Section	
7E7	F	1	8	6.3	0	0	....	Diode	
7E7	F	4	8	6.3	0	0	....	Diode	
7F7	F	2	9	6.3	56	0	1600	Ampl. No. 1 Plate Short on 1	
7F7	F	12	5	6.3	56	0	1600	Ampl. No. 2 Plate	
7H7	F	6	2	6.3	67	0	3000	Ampl.	
7J7	F	6	3	6.3	31	15	800	Ampl. Hexode Section	
7J7	F	2	8	6.3	42	15	1000	Ampl. Triode Section	
7K7	F	2	8	6.3	41	0	1000	Ampl. Triode Short on 1-4-5	
7K7	F	9	2	6.3	0	0	....	Diode Diode No. 1	
7K7	F	5	9	6.3	0	0	....	Diode Diode No. 2	
7L7	F	6	2	6.3	60	10	2000	Ampl.	
7N7	F	2	9	6.3	60	13	2000	Ampl. Plate No. 1 Short on 1-4-5	
7N7	F	12	5	6.3	60	13	2000	Ampl. Plate No. 2	

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select. A B</i>		<i>Fil. Volts</i>	<i>Potent. L R</i>		<i>Mut. Cond. Press</i>	<i>Notations</i>
7Q7	F	6	2	6.3	33	17	800	Ampl.
7R7	F	6	3	6.3	67	8	3000	Ampl. Pentode Section
7R7	F	1	8	6.3	0	0	....	Diode Diode No. 1
7R7	F	4	8	6.3	0	0	....	Diode Diode No. 2
7S7	F	6	3	6.3	15	53	1500	Ampl. Hexode
7S7	F	2	8	6.3	0	53	1500	Ampl. Triode
7V7	F	6	2	6.3	72	5	4400	Ampl.
7W7	F	6	2	6.3	67	9	3000	Ampl. Short on 1-4-5
7Y4	F	1	6	6.3	40	0	....	Rect. Std.
7Y4	F	6	6	6.3	40	0	....	Rect. Std.
7Z4	F	1	6	6.3	40	0	....	Rect. Std.
7Z4	F	6	6	6.3	40	0	....	Rect. Std.
10	A	2	10	7.5	50	32	1250	Ampl.
10Y	A	2	10	7.5	53	10	1500	Ampl. (Also 10 special)
12A	A	2	10	5	57	36	1650	Ampl.
12A5	D	1	12	6.3	...	...	....	Check for Shorts
12A5	D	2	10	12.6	58	42	1800	Ampl.
12A6	E	8	5	12.6	67	10	3000	Ampl.
12A7	D	7	6	12.6	39	39	975	Ampl. Pent. Section
12A7	D	7	3	12.6	40	0	....	Rect. Std.
12A8GT	E	7	7	12.6	41	18	1000	Ampl. Pent. Section
12A8GT	E	12	7	12.6	60	30	300	Ampl. Osc. Sec. OK over 240
12AH7GT	E	7	9	12.6	60	35	2000	Press Gas No. 1 Short on 2-3
12AH7GT	E	11	9	12.6	60	35	2000	Press Gas No. 1 Short on 3-4-5
12B7	F	6	2	12.6	59	18	1900	Ampl.
12B8GT	E	7	7	12.6	0	0	....	Test for Shorts
12B8GT	E	1	7	12.6	58	18	1800	Ampl. Pent. Section
12B8GT	E	11	1	12.6	60	0	2000	Ampl. Triode Section
12C8	E	7	5	12.6	45	20	1150	Ampl. Pent. Section
12C8	E	10	5	12.6	0	0	....	Diode
12C8	E	10	2	12.6	0	0	....	Diode
12F5GT	E	10	5	12.6	41	10	1000	Ampl.
12H6	E	7	2	12.6	50	0	....	Diode
12H6	E	7	5	12.6	50	0	....	Diode
12J5GT	E	7	5	12.6	60	24	2000	Ampl.
12J7GT	E	1	9	12.6	48	18	1225	Ampl.
12K7GT	E	8	5	12.6	54	20	1450	Ampl.
12K8	E	8	5	12.6	41	9	1000	Ampl. Hex. Sec.
12K8	E	11	5	12.6	63	9	2400	Ampl. Triode Sec.
12Q7GT	E	7	5	12.6	33	14	800	Ampl. Triode Sec.
12Q7GT	E	10	5	12.6	0	0	....	Diode
12Q7GT	E	10	2	12.6	0	0	....	Diode
12SA7	E	1	7	12.6	28	17	750	Ampl. No. 1 Grid
12SA7	E	7	7	12.6	28	17	750	Ampl. No. 2 Grid
12SC7	G	10	3	12.6	42	0	1000	Ampl.
12SC7	G	1	3	12.6	42	0	1000	Ampl.
12SF5	E	7	4	12.6	56	13	1600	Ampl.

## SUPPLEMENTARY DATA

Par. 31

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select. A B</i>		<i>Fil. Volts</i>	<i>Potent. L R</i>		<i>Mut. Cond. Press</i>	<i>Notations</i>
12SF7	G	6	7	12.6	60	0	2000	Ampl.
12SF7	G	8	1	12.6	0	0	....	Diode
12SG7	7	4	2	12.6	68	10	3300	Ampl.
12SH7	E	4	2	12.6	69	0	3400	Ampl.
12SJ7	E	4	2	12.6	56	18	1575	Ampl.
12SK7	E	4	2	12.6	59	18	1900	Ampl.
12SL7	G	4	1	12.6	53	0	1400	Ampl. Short on 2-3
12SL7	G	10	4	12.6	53	0	1400	Ampl. Short on 2-3
12SN7	G	4	1	12.6	67	0	3000	Ampl. Plt. No. 1
12SN7	G	10	4	12.6	67	0	3000	Ampl. Plt. No. 2 Short on 2-3
12SQ7	G	6	6	12.6	42	0	1125	Ampl. Triode Sect.
12SQ7	G	3	7	12.6	0	0	....	Diode Diode No. 1
12SQ7	G	7	1	12.6	0	0	....	Diode Diode No. 2
12SR7	G	6	6	12.6	59	15	1900	Ampl. Triode Sect.
12SR7	G	3	7	12.6	0	0	....	Diode Diode No. 1
12SR7	G	7	1	12.6	0	0	....	Diode Diode No. 2
12Z3	A	1	5	12.6	40	0	....	Rect. Std.
12Z5	D	6	1	6.3	40	0	....	Check for Shorts
12Z5	D	1	8	12.6	40	0	....	Rect. Std.
12Z5	D	12	8	12.6	40	0	....	Rect. Std.
14A4	F	6	2	12.6	66	14	2600	Ampl.
14A7	F	6	2	12.6	59	18	1900	Ampl.
14B6	F	2	3	12.6	44	0	1100	Ampl. Triode Sec. Short on 1-4-5
14B6	F	8	3	12.6	0	0	....	Diode No. 1
14B6	F	12	10	12.6	0	0	....	Diode No. 2
14B8	F	5	3	12.6	40	22	1000	Ampl. Pentode Section
14B8	F	8	10	12.6	0	15	500	Ampl. Osc. Section
14C5	F	6	2	12.6	69	19	3700	Ampl.
14C7	F	6	2	12.6	63	9	2275	Ampl.
14E6	F	2	3	12.6	58	10	1800	Ampl. Triode Sect. Short on 1-4-5
14E6	F	8	3	12.6	0	0	....	Diode Diode No. 1
14E6	F	6	10	12.6	0	0	....	Diode Diode No. 2
14E7	F	6	3	12.6	50	20	1300	Ampl.
14E7	F	1	8	12.6	0	0	....	Diode
14E7	F	10	10	12.6	0	0	....	Diode
14F7	F	2	9	12.6	56	0	1600	Ampl. Plate 1
14F7	F	12	5	12.6	56	0	1600	Ampl. Plate 2
14H7	F	6	2	12.6	67	0	3000	Ampl.
14J7	F	6	3	12.6	31	15	800	Ampl. Hex. Sec.
14J7	F	2	8	12.6	42	15	1000	Ampl. Triode Sec.
14N7	F	2	9	12.6	60	13	2000	Ampl. Short on 1-4-5 Plt. 1
14N7	F	12	5	12.6	60	13	2000	Ampl. Plt. 3
14Q7	F	6	2	12.6	31	14	800	Ampl.
14R7	F	6	3	12.6	67	8	3000	Ampl. Pentode Section
14R7	F	1	8	12.6	0	0	....	Diode Diode No. 1
14R7	F	4	8	12.6	0	0	....	Diode Diode No. 2
14S7	F	6	3	12.6	53	15	1500	Ampl. Heptode Section
14S7	F	2	8	12.6	53	0	1500	Ampl. Triode Section

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select. A B</i>		<i>Fil. Volts</i>	<i>Potent. L R</i>		<i>Mut. Cond. Press</i>	<i>Notations</i>
14W7	F	6	2	12.6	67	9	3000	Ampl.
14Y4	F	1	6	12.6	40	0	....	Rect. Std.
14Y4	F	6	6	12.6	40	0	....	Rect. Std.
14Z3	A	1	5	12.6	40	0	....	Rect. Std.
15	B	7	6	2	16	18	625	Ampl.
19	C	8	8	2	42	12	1000	Ampl.
19	C	11	6	2	42	12	1000	Ampl.
22	A	2	5	3	0	37	500	Ampl.
24	B	7	6	2.5	42	10	1000	Ampl. Also 24A
25A6	E	8	5	25	62	35	2300	Ampl.
25A7	E	11	5	25	40	0	....	Check for Shorts
25A7	E	11	5	25	40	0	....	Rect. Std.
25A7	E	8	5	25	58	35	1800	Ampl.
25AC5	E	7	5	25	52	0	1500	Ampl.
25B5	C	8	5	25	64	0	2500	Ampl.
25B6G	E	8	5	25	71	43	4000	Ampl.
25B8GT	E	1	7	25	60	18	2000	Ampl. Pentode Section
25B8GT	E	11	1	25	54	8	1500	Ampl. Triode Section
25C6G	E	8	5	25	74	36	7000	Ampl.
25D8GT	E	8	5	25	59	15	1900	Ampl. Pent. Section
25D8GT	E	11	5	25	45	0	1100	Ampl. Triode Section
25D8GT	E	5	1	25	0	0	....	Diode
25L6	E	8	5	25	75	15	8000	Ampl.
25N6G	E	8	5	25	64	0	2500	Ampl.
25X6	E	7	2	25	40	0	....	Rect. Std. Plate No. 1
25X6	E	7	5	25	40	0	....	Rect. Std. Plate No. 2
25Y5	C	7	8	25	40	0	....	Rect. Std.
25Y5	C	12	8	25	40	0	....	Rect. Std.
25Z3	A	1	5	25	40	0	....	Rect. Std.
25Z4	E	7	2	25	35	0	....	Rect. Std.
25Z5	C	7	8	25	40	0	....	Rect. Std.
25Z5	C	12	8	25	40	0	....	Rect. Std.
25Z5MG	E	7	2	25	40	0	....	Rect. Std.
25Z5MG	E	7	5	25	40	0	....	Rect. Std.
25Z6	E	7	2	25	40	0	....	Rect. Std.
25Z6	E	7	5	25	40	0	....	Rect. Std.
26	A	2	10	1.5	46	35	1150	Ampl.
27	B	1	6	2.5	40	34	1000	Ampl. Also 27S
28D7	F	8	1	25	60	12	2000	Diode Plt. No. 1
28D7	F	3	6	25	60	12	2000	Ampl. Plt. No. 2
30	A	2	10	2	36	33	900	Ampl.
30 special	A	2	10	2	43	30	1025	Ampl.
31	A	2	10	2	35	53	925	Ampl.
32	A	2	5	2	19	30	640	Ampl.
32L7GT	E	11	5	35	0	0	....	Test for Shorts
32L7GT	E	8	5	35	71	18	4800	Ampl.
32L7GT	E	11	5	35	40	0	....	Rect. Std.
33	B	1	5	2	50	29	1450	Ampl.

## SUPPLEMENTARY DATA

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select.</i>		<i>Fil. Volts</i>	<i>Potent.</i>		<i>Mut. Cond.</i>	<i>Press</i>	<i>Notations</i>
<i>A</i>	<i>B</i>				<i>L</i>	<i>R</i>			
RK33	D	3	3	6.3	42	28	1000	Ampl.	
RK33	D	9	3	6.3	42	28	1000	Ampl.	
34	A	2	5	2	14	27	600	Ampl.	
35	B	7	6	2.5	42	20	1020	Ampl.	Also 35S
35A5	F	6	2	35	74	27	5900	Ampl.	
35L6GT	E	8	5	35	71	32	5800	Ampl.	
35Z3	F	1	1	35	35	0	....	Rect. Std.	
35Z4GT	E	10	2	35	40	0	....	Rect. Std.	
35Z5GT	E	1	3	BLST	40	0	....	Short Test—Should light on 1-2-3-4-5	
35Z5GT	E	11	1	35	40	0	....	Rect. Std.	
35Z6G	E	7	2	35	40	0	....	Rect. Std. Plate No. 1	
35Z6G	E	7	5	35	40	0	....	Rect. Std. Plate No. 2	
36	B	7	6	6.3	43	20	1050	Ampl.	
37	B	1	6	6.3	36	34	900	Ampl.	
38	B	7	6	6.3	41	32	1050	Ampl.	
39-44	B	7	6	6.3	41	23	1000	Ampl.	
40	A	2	10	5	60	26	200	Ampl.	OK over 160
41	C	8	5	6.3	55	28	1600	Ampl.	
42	C	8	5	6.3	60	24	2000	Ampl.	
43	C	8	5	25	62	35	2300	Ampl.	
45	A	2	10	2.5	59	50	1850	Ampl.	
45Z3	H	10	2	35	35	0	....	Rect. Std. also Press 117N7	
45Z5GT	E	11	1	35	40	0	....	Rect. Std.	
45Z5GT	E	1	3	BLST	40	0	....	Short Test—Should light on 1-2-3-4-5	
46	B	1	5	2.5	60	25	2000	Ampl.	
47	B	1	5	2.5	60	18	2000	Ampl.	
48	C	8	5	25	60	48	2000	Ampl.	
49	B	1	5	2	45	40	1125	Ampl.	
50	A	2	10	7.5	53	50	1500	Ampl.	
50A5	F	6	2	50	74	25	7500	Ampl.	
50C6G	E	8	5	50	74	36	7000	Ampl.	
50L6GT	E	8	5	50	74	25	7500	Ampl.	
50Y6GT	E	7	2	50	40	0	....	Rect. Std. Plate No. 1	
50Y6GT	E	7	5	50	40	0	....	Rect. Std. Plate No. 2	
50Z7G	E	7	6	50	40	0	....	Rect. Std. Plate No. 1	
								Short on 4-5	
50Z7G	E	10	2	50	40	0	....	Rect. Std. Plate No. 2	
51	B	7	6	2.5	42	20	1020	Ampl.	Also 51S
52	B	1	5	6.3	63	27	2400	Ampl.	
53	D	1	5	2.5	53	10	1500	Ampl. No. 1 Plate	
53	D	12	5	2.5	53	10	1500	Ampl. No. 2 Plate	
55	C	7	6	2.5	40	32	975	Ampl.	
55	C	10	6	2.5	0	0	....	Diode OK over 500	
55	C	10	3	2.5	0	0	....	Diode OK over 500	
56	B	1	6	2.5	53	26	1450	Ampl.	
57.	C	2	5	2.5	48	17	1225	Ampl.	Also 57S

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select.</i>		<i>Fil. Volts</i>	<i>Potent.</i>		<i>Mut. Cond.</i>	<i>Press</i>	<i>Notations</i>
<i>A</i>	<i>B</i>	<i>L</i>	<i>R</i>						
57A	A	2	5	6.3	48	17	1225	Ampl.	Also 57AS
58	C	2	5	2.5	54	20	1450	Ampl.	Also 58S
58A	C	2	5	6.3	54	20	1450	Ampl.	Also 58AS
59	D	8	8	2.5	60	18	2000	Ampl.	
70A7GT	E	8	5	75	71	17	5800	Ampl.	Short on 1-4-5
70A7GT	E	11	5	75	0	0	....	Diode	OK over 300
70L7GT	E	6	12	75	71	34	....	Check for	Shorts
70L7GT	E	7	7	75	71	34	5000	Ampl.	
70L7GT	E	5	1	75	40	0	....	Rect. Std.	
71A	A	2	10	5	56	60	1650	Ampl.	
75	C	7	6	6.3	28	9	750	Ampl.	Section
75	C	10	6	6.3	0	0	....	Diode	
75	C	10	3	6.3	0	0	....	Diode	
75MG	E	9	5	6.3	28	9	750	Ampl.	Section
75MG	E	12	2	6.3	0	0	....	Diode	
75MG	E	12	5	6.3	0	0	....	Diode	
76	B	1	6	6.3	53	24	1450	Ampl.	
77	C	2	5	6.3	48	17	1225	Ampl.	
78	C	2	5	6.3	54	20	1450	Ampl.	
79	C	2	10	6.3	39	12	1000	Ampl.	No. 1 Plate
79	C	5	10	6.3	39	12	1000	Ampl.	No. 2 Plate
80	A	2	7	5	35	0	....	Rect. Std.	
80	A	3	7	5	35	0	....	Rect. Std.	
81	A	2	7	7.5	33	0	....	Rect. Std.	
82	A	2	7	2.5	40	0	....	Rect. Std.	
82	A	3	7	2.5	40	0	....	Rect. Std.	
82V	A	2	7	2.5	40	0	....	Rect. Std.	
82V	A	2	7	2.5	40	0	....	Rect. Std.	
83	A	2	7	5	40	0	....	Rect. Std.	
83	A	3	7	5	40	0	....	Rect. Std.	
83V	A	2	7	5	40	0	....	Rect. Std.	
83V	A	3	7	5	40	0	....	Rect. Std.	
84-6Z4	B	7	7	6.3	40	0	....	Rect. Std.	
84-6Z4	B	5	1	6.3	40	0	....	Rect. Std.	
85	C	7	6	6.3	40	32	975	Ampl.	Section
85	C	10	6	6.3	0	0	....	Diode	
85	C	10	3	6.3	0	0	....	Diode	
89	C	2	5	6.3	54	30	1550	Ampl.	
99	A	2	10	3	60	45	425	Ampl.	OK over 340
112A	A	2	10	5	57	36	1650	Ampl.	
117L7GT	E	2	8	117	72	30	4000	Ampl.	Short on 1-4-5
117L7GT	E	5	8	117	40	0	....	Rect. Std.	
117M7GT	E	2	8	117	73	28	6000	Ampl.	Short on 1-4-5
117M7GT	E	5	8	117	40	0	....	Rect. Std.	
117N7GT	E	8	10	117	74	25	7000	Ampl.	
117N7GT	E	4	3	117	40	0	....	Rect. Std.	Also Press 117N7 But.



## SUPPLEMENTARY DATA

Par. 31

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select. A B</i>		<i>Fil. Volts</i>	<i>Potent. L R</i>		<i>Mut. Cond. Press</i>	<i>Notations</i>
117P7GT	E	8	10	117	70	25	4000	Ampl.
117P7GT	E	4	3	117	40	0	....	Rect. Std. Also Press 117N7
117Z4GT	E	10	2	117	40	0	....	Rect. Std.
117Z6G	E	2	7	117	75	0	....	Press Gas No. 1
117Z6G	E	10	2	117	75	0	....	Press Gas No. 1 Early Tubes Short 1-3 Late Tubes Short 3
717A	E	4	2	6.3	69	0	3500	Ampl.
801A	A	2	10	7.5	53	0	1500	Ampl.
802	D	10	3	6.3	60	18	2000	Ampl. ★
807	B	12	1	6.3	70	27	3800	Ampl. ★
816	A	7	1	2.5	20	0	....	Rect. Std. ★
837	D	10	3	12.6	71	0	4000	Ampl. ★
841	A	2	10	7.5	42	0	1000	Ampl.
842	A	2	10	7.5	46	50	1150	Ampl.
843	B	1	6	2.5	56	10	1625	Ampl.
864	A	2	10	1.5	18	37	650	Ampl.
865	A	10	4	7.5	16	28	625	Ampl. ★
866A	A	7	1	2.5	40	0	....	Rect. Std. ★
871	A	7	1	2.5	20	0	....	Rect. Std. ★
XXB	F	2	10	2.5	30	30	800	Ampl.
XXB	F	12	6	2.5	31	60	400	Ampl. OK over 320
XXD	F	12	5	12.6	64	0	2500	Ampl. Plt. No. 1 Short on 1-4-5
XXD	F	2	9	12.6	64	0	2500	Ampl. Plt. No. 2
XXFM	F	1	2	6.3	30	0	900	Ampl. Short 1-4-5
XXFM	F	12	8	6.3	0	0	....	Diode
XXFM	F	7	3	6.3	0	0	....	Diode
XXL	F	6	2	6.3	67	0	3000	Ampl.
879	A	7	1	2.5	0	0	....	Rect. Std. OK over 1000 ★
884	E	7	5	6.3	40	*	....	Rect. Std. Strikes at 60 on R
885	B	1	6	2.5	40	*	....	Rect. Std. Strikes at 60 on R
950	B	1	5	2	37	37	950	Ampl.
951	A	2	5	2	18	29	640	Ampl.
954	M	6	7	6.3	44	17	1100	Ampl.
955	M	9	7	6.3	59	18	1900	Ampl.
956	M	6	7	6.3	53	14	1500	Ampl.
957	M	9	7	1.1	19	23	650	Ampl. Short on 4-5
958	M	9	7	1.1	47	34	1200	Ampl. Short on 4-5
959	M	6	7	1.1	14	23	600	Ampl. Short on 4-5
1201	N	12	4	6.3	67	0	3000	Ampl. Short on 1-2-5
1203	F	9	5	6.3	25	0	....	Diode
1204	N	3	9	6.3	58	0	1800	Ampl. Short on 4-5
1231	F	5	4	6.3	71	10	4000	Ampl.
1232	F	5	4	6.3	60	15	2000	Ampl.
1284	F	6	2	12.6	60	23	2000	Ampl.
1291	F	1	6	1.5	0	15	2000	Diode Short on 4-5 Reads in Green Plt. No. 1
1291	F	6	6	1.5	0	15	2000	Diode Reads in Green Plt. No. 2
1293	F	6	2	1.5	50	25	1300	Ampl.

<i>Tube Type</i>	<i>Socket Letter</i>	<i>Select. A B</i>		<i>Fil. Volts</i>	<i>Potent. L R</i>		<i>Mut. Cond. Press</i>	<i>Notations</i>
1294	F	10	5	1.5	0	0	....	Diode
1299	F	6	2	1.5	61	30	2100	Ampl. Short on 1
1609	B	1	5	1.5	26	18	725	Ampl.
1612	E	1	9	6.3	20	19	650	Ampl. Cap Grid
1612	E	8	5	6.3	20	22	650	Ampl. Pin Grid
1613	E	8	5	6.3	62	0	2250	Ampl.
1616	A	7	1	2.5	35	0	....	Rect. Std. ★
1619	E	8	5	2.5	69	10	3400	Ampl.
1620	E	1	9	6.3	48	18	1225	Ampl.
1621	E	8	5	6.3	60	24	2000	Ampl.
1622	E	8	5	6.3	73	19	5000	Ampl.
1624	B	12	1	2.5	71	14	4000	Ampl. ★
1625	D	10	3	12.6	70	27	3800	Ampl. ★
1626	E	8	5	12.6	61	43	2100	Ampl.
1631	E	8	5	12.6	73	19	5000	Ampl.
1632	E	8	5	12.6	75	15	8000	Ampl.
1633	G	4	1	25	75	0	8500	Ampl. Plt. No. 1
1633	G	10	4	25	69	0	3400	Ampl. Plt. No. 2 Short on 2-3
1634	G	10	3	12.6	42	0	1000	Ampl. Plt. No. 1
1634	G	1	3	12.6	42	0	1000	Ampl. Plt. No. 2
1851	E	8	5	6.3	71	10	4000	Ampl.
1852	G	4	2	6.3	71	0	3500	Ampl.
1853	E	4	2	6.3	71	10	3500	Ampl.
HY113	O	7	5	1.5	0	40	500	Ampl.
HY115	O	7	5	1.5	60	32	370	Ampl. OK over 290
HY125	O	7	5	1.5	60	45	450	Ampl. OK over 360
HY145	O	7	5	1.5	60	32	370	Ampl. OK over 290
HY155	O	7	5	1.5	60	45	450	Ampl. OK over 360
2050	E	8	5	6.3	40	*	....	Rect. Std. Strikes at 32 on R
2051	E	8	5	6.3	40	*	....	Rect. Std. Strikes at 32 on R
7193	E	7	2	6.3	67	0	3000	Ampl. ★
9001	K	1	9	6.3	44	17	1100	Ampl. Short on 4-5
9002	L	2	9	6.3	59	18	1900	Ampl. Short on 4-5
9003	K	1	9	6.3	54	14	1500	Ampl. Short on 4-5
9006	L	2	9	6.3	20	0	....	Diode Short on 4-5
38142	A	2	10	7.5	62	30	2200	Ampl.

TO TEST MAGIC EYE TUBES: Insert in Socket C. Set proper Filament Voltage.

Press "Amp." Button

2E5—6AB5—6E5—6G5—6H5—6N5—6T5—6U5

A	B	
12	3	Eye Open.
12	2	Eye Closed.

6AD6—6AF6.

A	B	
2	8	Eye No. 1 Open, No. 2 Closed.
3	8	Eye No. 2 Open, No. 1 Closed.