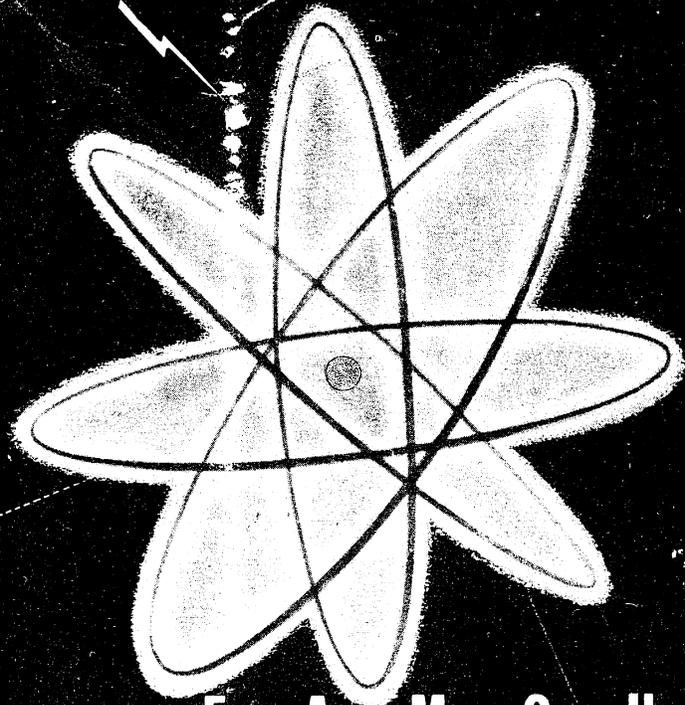


# OPERATING INSTRUCTIONS

for  
DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER  
AND ANALYZER  
MODEL 605A

# HICKOK



W O R L D F A M O U S

**THE HICKOK ELECTRICAL INSTRUMENT COMPANY**

10514 DUPONT AVENUE

• CLEVELAND 8, OHIO

The Standard of Quality for Over 40 Years

*Your Guarantee*

**THE HICKOK ELECTRICAL INSTRUMENT CO.**

10514 Dupont Avenue • Cleveland 8, Ohio

*The Standard of Quality for Over Forty Years*

# HICKOK

## Your Guarantee

The Hickok Electrical Instrument Company warrants instruments manufactured by it to be free from defective material or factory workmanship and agrees to repair such instruments which under normal use and service, disclose the defect to be the fault of our manufacturing. Our obligation under this warranty is limited to repairing any instrument or test equipment which proves to be defective, when returned to us, transportation prepaid, within ninety (90) days from the date of original purchase and provided the serial number has been made known to us promptly for our records.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons or service stations in any way so as, in our judgment, to injure their stability or reliability or which have been subject to misuse, negligence, or accident, or which have had the serial number altered, effaced, or removed. Neither does this warranty apply to any of our products which have been connected, installed, or adjusted otherwise than in accordance with the instructions furnished by us. Accessories including all vacuum tubes not of our manufacture used in this product are not covered by this warranty.

This warranty is in lieu of all other warranties expressed or implied and no representatives or person is authorized to assume for us any other liability in connection with the sale of our products.

Parts will be made available for a minimum period of five (5) years after the manufacture of this equipment has been discontinued. Parts include all materials, charts, instructions, diagrams, accessories, etc., which have been furnished in the standard model.

Before returning any equipment for service, under warranty or otherwise, the factory must first be contacted giving the nature of the trouble. Instructions will then be given for either correcting the trouble or returning the equipment. This equipment should be forwarded directly to the Hickok factory, The Hickok Electrical Instrument Company, 10514 Dupont Avenue, Cleveland 8, Ohio. In order to speed the return of the instrument to you, it is recommended that on all repairs you deal directly with the factory at this address, or with an authorized service station in your locality.

### REGISTRATION CARD

Be Sure to Return Your Warranty Card Immediately.

The above guarantee is contingent upon the attached registration card being returned to the factory immediately upon receipt of the equipment.

**OPERATING INSTRUCTIONS**

**for**

**DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER AND ANALYZER**

**MODEL 605A**

**THE HICKOK ELECTRICAL INSTRUMENT COMPANY**

10514 DUPONT AVENUE

CLEVELAND 8, OHIO

**NOTE**

SEE INSTRUCTIONS FOR FILAMENT CONTINUITY  
ON PAGE 4, PARAGRAPH 14.

TO TEST ACORN TUBES, TYPE NUMBERS 6F4, 954,  
955, 956, 957, 958, 959 and 9005 ON THE MODEL 605A  
TUBE TESTER REQUIRES THE USE OF ADAPTER,  
CODE NUMBER 1050-9.

THIS ADAPTER WILL BE SUPPLIED ON SPECIAL  
ORDER.

**FUSE IN BIAS CIRCUIT**

This tube tester is equipped with a fuse in the Grid Bias Circuit as a protection for the Bias potentiometer in case an attempt is made to test a shorted tube.

NOTE: Always make short check before making quality test.

The fuse is mounted in the main control panel where it is readily visible.

A burned out bias fuse lamp will result in failure of the mutual conductance meter to read when the GM button is pressed. If the fuse lamp burns out, replace only with a No. 49 panel lamp.

1. Model 605A Vacuum Tube Tester and Analyzer. \_\_\_\_\_

Accessories included with the Model 605A Tester are:

1 — Booklet of Instructions for Model 605A. \_\_\_\_\_

2 — Leads with Prods. \_\_\_\_\_

1 — Capacity Lead Assembly \_\_\_\_\_

1 — Grid Lead with Clip \_\_\_\_\_

Serial Number \_\_\_\_\_

Signed: \_\_\_\_\_

**Instructions for operation of Model 605A.**

Read These Instructions Through Before Attempting to Operate the Tester.

## SECTION I DESCRIPTION

### 1. PURPOSE

a. The Model 605A Tube Tester and Analyzer is used to test and measure mutual conductance values of vacuum tubes used in radio receivers and transmitting tubes delivering less than 25 watts of power. It is used also as a complete radio set analyzer measuring volts, ohms, milliamperes, and microfarads.

b. The Model 605A Tester is fundamentally of the Dynamic Mutual Conductance type designed to provide either REPLACE-GOOD readings or mutual conductance values in micromhos. Provision is made for locating shorts and leakages between tube elements.

c. This instrument is designed to operate on 60 cycles, 105-125 volt power source.

### 2.

There are two rectifier tubes, an 83 and a 5Y3GT, necessary to operate this tester. They are included. The fuse lamp is a standard #81 auto lamp. The neon lamp is a General Electric ¼ watt, 110 volt, candelabra base signal lamp.

There is a BIAS FUSE located near the BIAS dial. This serves as a protection for the bias potentiometer in case it is attempted to test a shorted tube. Replace only with a No. 49 panel lamp. Always check tubes for shorts before making mutual conductance test.

## SECTION II FUNCTIONS OF THE COMPONENTS USED AS A TUBE TESTER

### 3. LINE VOLTAGE ADJUSTMENT

The Model 605A Tube Tester and Analyzer operates from A.C. power lines of 105 to 125 volts, 60 cycles. Turn the Analyzer switch, located below the meter on the control panel of the Model 605A, to the point designated TUBE TEST. After the power is turned on, press the push switch P7 (LINE ADJ.) which will cause the indicating meter pointer to move up scale. The button P7 is held down and the knob, LINE ADJUST, is turned until the meter pointer rests exactly over the mark, LINE TEST, at 1500 on the meter scale. This establishes standard voltages to the tube elements. This adjustment is made with the control settings properly arranged for the tube being tested and with the tube in its test socket.

### 4. SELECTORS

The row of selector knobs across the center of the control panel is for the purpose of conducting proper voltages to the tube's base pins. The operation of setting these selector knobs is similar to dialing a telephone number. On the roll chart, below the word SELECTORS appear the dialing numbers. These dialing numbers consist of two letters and five figures. Example: JR-6237-5. Starting at the left, the first knob (FIL) is turned until it points at the letter J, the second knob (FIL) is turned to R, the third knob (GRID) to 6, the fourth (PLATE) to 2, the fifth (SCREEN) to 3, the sixth (CATHODE) to 7, and the seventh (SUPPRESSOR) to 5. These selector switches are electrically interlocked so that it is impossible to connect two different voltages to the same tube pin. Thus accidental shorts are avoided.

The selector system is designed to minimize selector settings. For example, the filament setting is nearly always JR. These two knobs seldom need resetting. Also in testing duo-diode-triode tubes the amount of selector setting has been reduced to a minimum.

### 5. SHORT TEST

The SHORTS switch has six positions. The first five are used in testing the tube for shorts. The sixth position TUBE TEST is used when indicating mutual conductance. Use the TUBE TEST position only if the tube has no shorts.

Turning the SHORTS switch successively through the positions 1-2-3-4-5 connects the various elements in turn across the test voltage. Tubes having shorted elements will complete the circuit and cause the neon lamp to glow. Tubes may be tested for shorts either hot or cold. A short is indicated by a steady glow on both plates of the neon lamp. A momentary flash of the neon lamp as the SHORTS switch is turned from one position to another should be disregarded. This flashing is caused by the charging of a condenser in the short test circuit. A shorted tube should be discarded without further test. With tubes having more than one section such as the 6J6, make short tests for each section.

### LOCATING SHORTED ELEMENTS

In the following table, (X) under any SHORT switch position indicates that the neon lamp glows in that position.

KIND OF SHORT	1	2	3	4	5
FIL — CATHODE			X		
FIL — GRID	X	X			X
FIL — PLATE	X	X		X	X
FIL — SCREEN	X		X	X	X
FIL — SUP		X			
GRID — CATHODE	X	X	X		X
GRID — PLATE				X	
GRID — SCREEN		X	X	X	
GRID — SUP	X				X
PLATE — SCREEN		X	X		
PLATE — SUP	X			X	X
SCREEN — SUP	X	X	X	X	X

## 6. MUTUAL CONDUCTANCE

Tubes having SHORTS should be discarded without further tests.

If the tube passes the preliminary short test it is then tested for MUTUAL CONDUCTANCE which is the best test for amplifier tubes. Turn the SHORTS switch to the TUBE TEST position. On the roller chart, reading from left to right, opposite the tube type appear: FIL. VOLTAGE; SELECTORS, which were explained in paragraph (4) above; BIAS, which gives the setting for the BIAS dial; ENG, which gives the setting for the ENGLISH dial; PRESS, which indicates the push button to be pressed for meter reading; MUT. COND., which gives the AVERAGE MUTUAL CONDUCTANCE in MICROMHOS of the tube being tested. Under the heading NOTATIONS appear special notes pertaining to the testing of the tube.

The ENGLISH setting is used when it is desired to read the value of the tube on the RED-GREEN (ENGLISH) sector of the meter scale. When using the ENGLISH scale the MICROMHO readings are disregarded.

### NOTE

Tubes having less than 500 Micromhos cannot be made to read in the GREEN sector of the meter scale. Such tubes list micromho reading only and are good if the reading is above a specified minimum.

Micromhos are indicated in three ranges: 0-3000, 0-6000, 0-15,000.

a. On the English dial are three dots, stamped into the metal and filled with red lacquer. These dots are the points used in setting the micromho ranges.

b. The dot near 73 on the dial is the setting point for the 3000 micromho scale.

c. The dot near 86 is the point for the 6000 micromho scale.

d. The dot near 93 is the point for the 15,000 micromho scale.

e. When reading micromhos the RED and GREEN sectors of the meter scale are disregarded.

f. When testing for mutual conductance the push button switch P4-Gm is pressed. GM is the symbol for mutual conductance.

g. Tubes having more than one section, such as the 6J6, require different dial settings for each section.

h. Certain pentode tubes, such as the 6AJ5, are tested with reduced screen voltage. This is accomplished by holding down P1 and pressing P4. Specific instructions are printed in the NOTATIONS column for each tube requiring reduced screen voltage.

## 7. RECTIFIER TUBE TEST

Rectifier tubes, including diode tubes and diode sections of multiple element tubes, having no mutual conductance are tested for emission only.

a. The push switch P1 is used when testing detector diodes. It applies a low voltage which will not injure the delicate cathode. Good diodes will cause the pointer of the meter to move above the point marked DIODES O. K.

b. The push switch P2 is used when testing cold cathode rectifiers such as the OZ4. This applies a voltage sufficiently high to ionize the tube and start conduction. Good tubes will read in the green (GOOD) sector of the meter scale.

c. The push switch P3 is used when testing ordinary rectifier tubes such as the 5Y3. This applies a medium voltage which is best adapted to reveal defects in this type of tube. Good tubes will read in the green (GOOD) sector of the meter scale.

d. In checking thyratrons, such as the 884 and 885, the BIAS dial should be set initially at its highest negative value (100). The designated button is held down while the bias dial is gradually turned counter clockwise until the tube "strikes", that is, begins to conduct which is indicated by a sudden deflection of the meter. The chart indicates the approximate point at which the tube strikes. There may be a small variation above or below this point. After it strikes, a good tube should produce a steady meter reading in the green sector of the scale.

### CAUTION

**Do Not Press P4 When Testing Rectifier Tubes.**

## 8. GAS TEST

The push switches P5 and P6 are used to test an amplifier tube for gas content.

a. Set the English dial at the red dot near 73.

b. The push switch P5 is pressed and held down while the BIAS dial is turned to cause the pointer of the meter to indicate 100 micromhos on the 0-3000 scale.

c. Hold down P5 and press P6.

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

### NOTE

With some tubes, such as the type 45, the micromho reading cannot be brought down to 100 by turning the BIAS dial. In such case, turn the BIAS dial to 100 and test for gas.

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

## 9. METER REVERSE

Directly to the left of the indicating meter is a switch marked REVERSE-NORMAL. With certain tubes, such as the 117N7, the meter, when this switch is set on NORMAL, will deflect backwards (to the left) when push switch P3 is pressed for rectifier test. In such case, turn the meter switch to REVERSE which will cause the pointer of the meter to move up the scale. After the test has been made, return the switch to NORMAL.

### 10. TOP CAPS

There are two jacks in the upper center of the control panel marked GRID and PLATE. These are used when making connection to the top cap of the tube being tested. On the data chart in the NOTATIONS column opposite tube types having top caps is the notation CAP=G or CAP=P. G means that the top cap is connected to GRID jack and P that it is connected to the PLATE jack.

### 11. SOCKET NUMBERING

In order to reduce selector set-up to a minimum, the socket contacts are numbered as shown on Plate 1 which shows the bottom views. The numerical values of the lettered dials are as follows:

- 0 — A — P
- 1 — B — R
- 2 — C — S
- 3 — D — T
- 4 — E — U
- 5 — F — V
- 6 — G — W
- 7 — H — X
- 8 — J — Y
- 9 — K — Z

The letter I was omitted because of its resemblance to the figure 1. The letter Q was omitted because of its resemblance to the figure 0.

### NOTE

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

### 12. SPECIAL NOTES

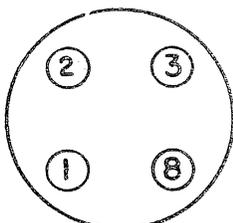
Power line voltage varies with different localities. It may also vary with different hours of the day.

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

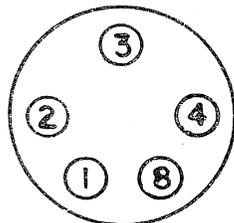
Occasionally we have had the complaint that a used tube will test GOOD, but will not work in the radio receiver; but when a NEW tube is substituted, the receiver will operate correctly. The answer is this: Tubes are built to specifications. Our tube testers are designed to test tubes in conformity with these specifications.

The used tube that would not perform in a certain receiver was not receiving its specified filament voltage. The new tube performed because of its initial reserve capacity.

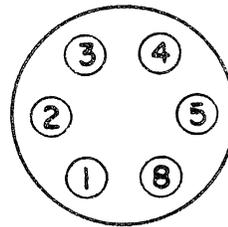
## SOCKET NUMBERING BOTTOM VIEWS



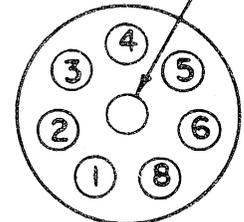
4 PIN



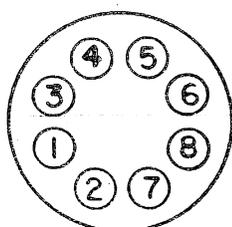
5 PIN



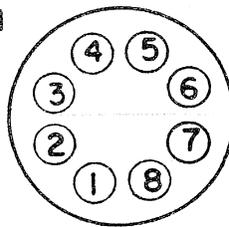
6 PIN



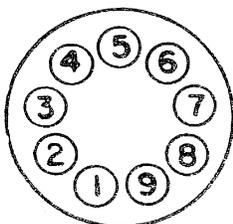
7 PIN  
STANDARD



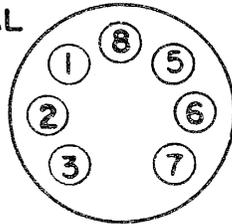
OCTAL



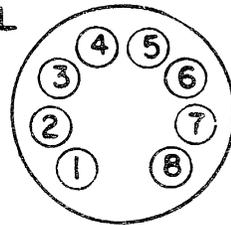
LOKTAL



NOVAL



7 PIN  
MINIATURE



CIRCULAR  
SUB MINIATURE



IN LINE  
SUB MINIATURE

The used tube would have performed if it had received its specified filament voltage.

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

13.

The versatility of the Hickok Dynamic Mutual Conductance Tube Tester makes possible a special test that will reveal a tube's ability to perform under adverse conditions as mentioned above. This is possible because the tester measures mutual conductance instead of emission.

**THE TEST**

- a. Measure the mutual conductance in the ordinary way.
- b. Press P4 and adjust the ENGLISH dial until the tube reads in the GREEN (GOOD) sector at 2000 on the 0-3000 scale.
- c. While holding everything else constant, reduce the FILAMENT voltage and note the new reading.
- d. If the meter still reads in the GREEN (GOOD) sector, the tube has a large life reserve and will perform satisfactorily.

e. The filament voltage reductions to be made are shown in the following table:

NORMAL FIL. VOLTS	REDUCE TO
1.5	1.1
2.0	1.5
2.5	2.0
3.0	2.5
5.0	4.3
6.3	5.0
7.5	6.3
10.0	7.5
12.6	10.0
35.0	25.0
50.0	35.0

**14. FILAMENT AND HEATER CONTINUITY**

- a. Turn the tester on.
- b. Set the selectors as per chart for the tube to be tested.
- c. Set the FILAMENT switch on BLST instead of the voltage indicated on the chart.
- d. Set the SHORT TEST switch on position 1.
- e. Place the tube in the proper socket.

If the neon lamp glows, the filament is good and a complete test should then be made on the tube by setting the FILAMENT switch on the proper tap, and while the tube heats, rotate the SHORT TEST switch several times through all positions. If no shorts are indicated, set the switch in the TUBE TEST position and proceed to test the tube.

If the neon lamp does not glow, the filament is open and further test is unnecessary. Certain tubes such as the 35Z5, 50Z7, etc., with tapped filaments have special continuity test settings (see roll chart).

**TO TEST BALLAST TUBES**

- 1. Turn the tester on.
- 2. Set the filament switch to BLST.
- 3. Set the SHORT TEST switch to 1.
- 4. Set the first selector switch (lettered A to K) to the letter shown in the column marked (first selector)—  
Set all numbered selectors on zero.
- 5. Rotate the second selector switch (lettered P to Z).  
from P to Z. The NEON LAMP SHOULD LIGHT  
IN POSITIONS NOTED.

TUBE TYPE	First Selector	Neon lamp should light in these positions							
1A1-1B1-1C1-1E1-1F1-1G1- 1J1-1K1-1L1-1N1-1P1-1Q1- 1R1G-1S1G-1T1G-1U1G-1V1- 1Y1-1Z1-2	J	R							
2UR224	J			T					X
2LR212	H	R	S		U				
3	J	R							
03G	J			T					
4-5	J	R							

TUBE TYPE	First Selector	Neon lamp should light in these positions							
		R	S	T	U	V	X		
6-133	J			T					
6-6AA	J	R							
7-8-9	J	R							
10A-10AG	J			T					
10AB	J			T					X
K-17B-M17C-BM17C	J			T					X
M17HG-M17H	J		S						X
	D	R							
K23B-K23C-KX23B-KX30C	J			T					X
M30H	J		S						X
	D	R							
30A-K30A	J			T					
K30D	J	R		T					X
33A-33AG	J			T					
K34B	J			T					X
36A	J			T					
K36B-BK36B-L36B-BM-L36C-KX36C	J			T					X
KX36A	J	R							
36D-L36D	J	R		T					X
L36DJ	J	R	S	T	U				X
K36H-M36H-M36HG	J		S						X
	D	R							
L40S1-L40S2	J	R		T		V			
42A	J			T					
42A1	H				U				
42A2-42B2	H		S		U				
K42B-L42B-M42B-KX42B-LX42B-L42BX-									
K42C-L42C-M42C	J			T					X
KB42D-K42D-L42D	J	R		T					X
LX42D-L42DX	J	R	S	T					
K42E-L42E	J			T					X
L42F	J								X
	D	R							
42HA-K42HJ-M42H-M42HG	J		S						X
	E	R		T					
KX42C	J			T					X
L42S1	J	R		T		V			
49A-49AJ-K49AJ	J			T					
KX49A	J			T					X
49A1	H				U				
49A2-49B2	H		S		U				
K49B-L49B-M49B-BM49B-K49C-M49C-	J			T					X
BM49C-BK49C-K49E-L49E									
K49D-BK49D-L49D	J			T					X
L49F	J								X
	D	R							
M49H-M49HG	J		S						X
	D	R							
KZ49B-KZ49C	J	R				V			
K49BJ-L49BJ	J			T	U				X
L49S2	J	R		T		V			
49AJ-K49AJ	J			T					
KX49B-LX49B-LX49C	J			T					X
L49DJ	J	R		T	U				X
L49S3	J	R		T		V			

TUBE TYPE	First Selector	Neon lamp should light in these positions							
		R		T		V			
50A2	J	R		T					
50A2MG-50B2	J	R				V			
50X3	J	R							
K52H-M52H	J		S						X
	D	R							
K54B	J			T					X
55A-K55A	J			T					
55A1	H				U				
KX55A	J	R							
55B-K55B-M55B-BM55B-L55BG-LX55B	J			T					X
55A2-55B2	H		S		U				
K55C-L55C-KX55C	J			T					X
K55CP	J			T		V			X
K55D-L55D	J	R		T					X
L55E-M55E	J			T					X
L55F-M55F-BL55F	J								X
	D	R							
K55H-M55H-M55HG	J		S						X
	D	R							
L55S1-L55S2	J	R		T		V			X
60R30G	J	R		T					
64.23	J			T					
67A	J			T					
K67B-L67B	J			T					X
L73B-K74B-L74B-CX74C	J			T					X
80A	J			T					
K79B-K80B-M80B-K80C-KX80B-L80B	J			T					X
K80F	J								X
	D	R							
KX87B-LX87B-L90B	J			T					X
K90F-M90F-K92F-M92F	J								X
	D	R							
92A	J			T					
L92B-95K2	J			T					X
L99D	J	R		T					X
100R8	J			T					X
120R	J	R							
120RS-135K1	J			T					X
135K1A	J			T	U				X
140L4-140L8-140R4-140R8	J	R		T					
140R	J	R							
140L44-140R44	J	R	S	T					
165L4-165R4-165R8	J	R		T					
165R	J	R							
165L44-165R44	J	R	S	T					
185L4-185L8-185R4-185R8	J	R		T					
185R	J	R							
185L44-185R44	J	R	S	T					
200R-250R	J	R							
250R8-290L4	J			T					X
300R4-320R4	J			T					X
340	J	R							
808-1	J			T	U				X
E14980-W43357-W4588-3613	J			T					X
3334-3334A	J	R		T					X

TUBE TYPE	First Selector	Neon lamp should light in these positions							
8593-8598-8601-8664	J			T					X
3ER248	J	R		T	U				X
3CR241	J	R		T					X
B9M15822	B			T					
	E					V			
	G							X	Y
B9M16067	J	R		T		V	W	X	
B9M16275	B			T	U	V	W	X	Y
B9M16534	J	R		T		V	W	X	
B9M17571	H	R		T					
	J				U	V		X	
B9M18941	B		S	T					
	E					V			
	G							X	Y
17A470303	J	R	S			V			
	D				U				
	G							X	
17A485459	J	R	S				W		
	D				U				
TBR102D	B		S	T	U	V			
	G							X	Y
TBR103D	B		S		U	V			
	G							X	Y
TBR104D	B		S	T	U	V			
	G							X	Y
397021	B		S	T					
397022	E					V	W		
397023	J							X	
397036	C					V			
407100	J	R	S			V			
408100	J	R	S			V			
	D				U				
SW507300	J	R		T		V	W	X	
571606	B		S	T					
	E					V	W		
	J							X	

### SECTION III FUNCTIONS OF THE COMPONENTS USED AS AN ANALYZER

15.

The seventeen position ANALYZER SWITCH at the right of the main panel is used to select the range used in making measurements. It switches the indicating meter into different circuits. The meter has a sensitivity of 50 micro-amperes and an internal resistance of 5000 ohms.

When used a a tube tester, the ANALYZER SWITCH must be set on the point TUBE TEST.

16.

The two jacks in the lower right side of the panel are used when measuring VOLTS, OHMS, MILLIAMPERES or CAPACITY. The RED jack is positive when D.C. measurements are made.

17. VOLTS D.C.

When measuring —D.C. volts the circuit has a sensitivity of

20,000 ohms per volt.

a. Set the ANALYZER SWITCH to the appropriate D.C. range: 10, 100, 500 or 1000.

b. Insert the test leads into the test jacks at the lower right hand cover of the main panel. The RED jack is POSITIVE. The BLACK one is COMMON or NEGATIVE.

18. VOLTS A.C.

The sensitivity is 1000 ohms per volt.

3. Set the ANALYZER SWITCH to the appropriate A.C. range: 10, 100, 500 or 1000.

b. Insert the test leads into the test jacks. In measuring A.C. volts the polarity does not matter.

## 19. OHMS

Ohms are measured in three overlapping ranges, the center scale readings of which are respectively 25 ohms, 2500 ohms and 0.5 megohms. No batteries are used. The power is obtained from a built-in power supply. Therefore, when measuring ohms the power must be turned on.

When the ANALYZER SWITCH is set on OHMS  $\div$  100, the ohms scale reading is divided by 100. The center of the scale is 25 ohms and may be read from 0.1 ohm to 5000 ohms.

When the ANALYZER SWITCH is set on OHMS X1, the scale is read directly. The center of the scale is 2500 ohms and may be read from 100 ohms to 500,000 ohms.

When the ANALYZER SWITCH is set on MEGS, the meter scale marked MEGOHMS is used and reads directly to 100 megohms. 100 MEGS is indicated by a meter reading midway between 50 and INF.

### TO OPERATE:

- Set the ANALYZER SWITCH on the appropriate point (OHMS  $\div$  100, OHMS X1 or MEGS).
- Plug the line cord of the tester into a 110 volt A.C. socket and turn the power ON.
- The pointer of the meter will move to the top of the scale.
- Turn the LINE ADJUST knob until the meter pointer rests exactly over the end of the scale marked INF. (infinity).
- Insert the test leads into the two jacks in the lower right hand corner of the panel, marked VOLTS, OHMS, MILS, CAP.
- Touch the prods of the test leads to the terminals of the resistance to be measured. The meter pointer will indicate the resistance. The resistance being measured should not be shunted by other resistance, capacitance or inductance.

## 20. CAPACITY

Capacity is measured in two ranges: 0-5 and 0-50 microfarads. It is necessary to apply a standard voltage to the capacitor being measured, therefore:

- Turn the ANALYZER SWITCH to MEGS and turn the LINE ADJUST knob to bring the meter pointer to the INF. mark. This establishes standard voltage across the capacitor.
- Turn the ANALYZER SWITCH to the appropriate point (5 MFD or 50 MFD).
- Insert the test leads in the two jacks marked VOLTS, OHMS, MILS, CAP.
- Touch the prods of the test leads to the terminals of the capacitor being measured. The pointer of the meter will indicate the value of the capacitance in microfarads. The capacitor being measured should not be shunted by other capacitance, resistance or inductance.
- The capacity scale is calibrated for use on 60 cycles.

## TO CHECK SMALL CAPACITORS

- Capacitors from .0001 to 0.1 may be checked as follows:
- Make Line Adjustment as for tube testing. See paragraph 3, page 1.
  - Set Selector Switches: JR-0204-0.
  - Furnished with the Model 605A tester is a special cable. One end of this cable is equipped with a 5-pin plug. The black wire terminates in a pin tip. The red wire terminates in an alligator clip.
  - Insert the plug into the 5-pin socket. Insert the pin tip into the black test jack.
  - Connect the alligator clip to one terminal of the capacitor to be measured. Insert one of the voltmeter leads into the red test jack and hold the prod on the other terminal of the capacitor.
  - Set the analyzer switch on VOLTS A.C. 100.
  - Press button marked P5 and note meter reading on the 0-5 MICRO-FARAD scale. The value of the capacitor is found in the following table:

CAPACITY IN MFD	METER READING ON 0-5 MFD SCALE
.001	.3
.002	.6
.003	.85
.004	1.15
.005	1.45
.006	1.75
.007	2.0
.008	2.3
.009	2.6
.010	2.85

- h. Capacitors smaller than .001 M.F. are measured as follows:
- Set analyzer switch on VOLTS A.C. 100.
  - Press button marked P2 and note meter reading on 0-5 MICRO-FARAD scale. The value of the capacitor is found in the following table:

CAPACITY IN MFD	METER READING ON 0-5 MFD SCALE
.0001	.05
.0002	.1
.0003	.15
.0004	.2
.0005	.25
.0006	.3
.0007	.35
.0008	.4
.0009	.45
.0010	.5

CAUTION: Before pressing P2 or P5, be sure that the analyzer switch is set on AC VOLTS 100 to avoid damage to the meter in case the capacitor is shorted.

- i. Capacitors between .01 and 0.1 M.F. are measured as follows:
- Set analyzer switch on VOLTS A.C.-10.
  - Press button marked P1 and note meter reading on 0-5 MICROFARAD scale. The value of the capacitor is found in the following table:

CAPACITY IN MFD	METER READING ON 0-5 MFD SCALE
.01	.3
.02	.6
.03	.9
.04	1.2
.05	1.5
.06	1.8
.07	2.1
.08	2.4
.09	2.7
.10	3.

CAUTION: Never press P2 or P5 when analyzer switch is set on VOLTS A.C.-10.

## 21. INDUCTANCE

To measure the inductance of choke coils, set the analyzer switch on CAPACITY—5 MFD. Turn the tester ON and proceed exactly as for measuring capacity. Insert the two test leads into the test jacks and touch the prods to the terminals of the choke coil. Note the reading of the meter on the 0-5 M.F. scale. The value of the choke is found in the table below:

METER READING MICROFARADS	INDUCTANCE HENRYS
.1	70.
.2	35.
.3	23.
.4	17.
.5	14.
.6	12.
.7	10.
.8	8.8
.9	7.8
1.0	7.0

## 22. MILLIAMPERES, D.C.

Milliamperes D.C. are measured in three ranges: 0-10, 0-100 and 0-500.

- Turn the power switch to OFF position.
- Turn the ANALYZER SWITCH to the appropriate position. In case of doubt it is best to try the 500 MILS range first.
- Connect the current being measured to the jacks marked VOLTS, OHMS, MILS, CAP.
- The RED jack is positive.

## PARTS LIST FOR MODEL 605A TUBE TESTER AND ANALYZER

NOTE: There is a minimum billing charge of \$1.50 for any one parts order. Prices will be furnished upon request.

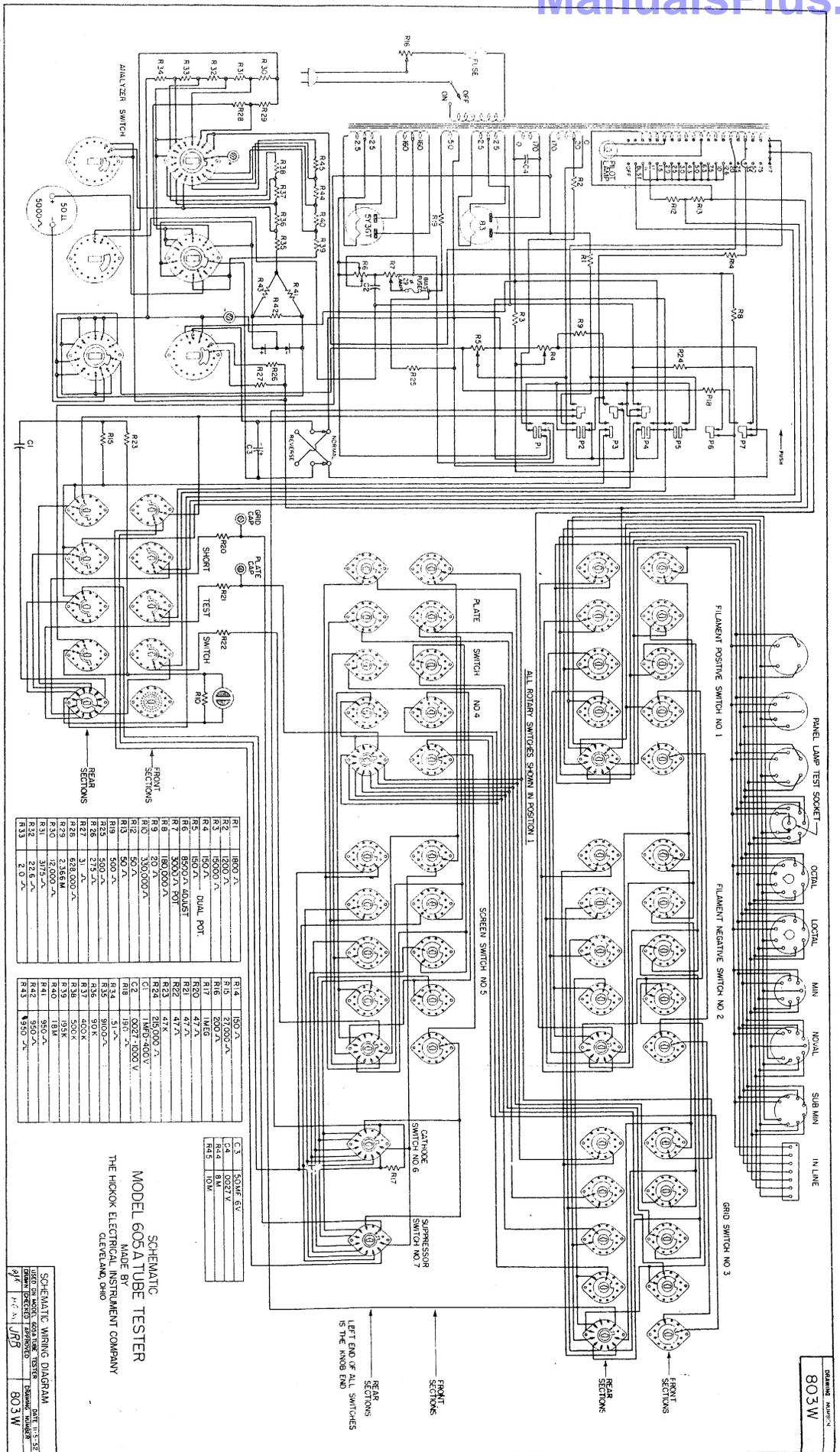
HICKOK CODE NC	NAME AND DESCRIPTION	FUNCTION OR REF. SYMBOL
2490-213	BOOKLET: Instruction	
2920-7	BUTTON, Push: molded, black	
2920-8	BUTTON, Push: molded, red	
3095-41	CAPACITOR: 2700 mmf, 500 V, 10%, mica	C 2
3105-24	CAPACITOR: .1 mfd, 400 V, paper	C 1
3200-40	CHART, Roll: Tube Data	
4160-67	DIAL, Ass'y: beveled, with knob	BIAS
4160-73	DIAL, Ass'y: beveled, with knob	ENGLISH
10300-1	JACK, Pin: red, Eby #52	
10300-2	JACK, Pin: black, Eby #52	
12270-1	LAMP: neon glow, ¼ watt, 115 V.	
12270-2	LAMP: auto, Tung-Sol #81	
12270-17	LAMP: #49 pilot, .06 mils, 2 volts	
12450-152	LEAD, Ass'y: red	
12450-153	LEAD, Ass'y: black	
12450-180	LEAD, Ass'y: grid	
12450-223	LEAD, Ass'y: capacity	
660-001	METER: D.C. microammeter, 5000 ohms, 50 microamps	
16925-90	POTENTIOMETER: 150-150 ohms, dual, linear, wire wound, Mallory MM150P	R4, R5
16927-3	POTENTIOMETER, Ass'y: 3000 ohms	BIAS, R7
18150-14	RECTIFIER: double half-wave, Bradley CX2ED	CR1
18410-472	RESISTOR: 47 ohms, ½ W, 10%, fixed, comp.	R20, R21, R22
18413-271	RESISTOR: 27,000 ohms, ½ W, 5%	R15
18413-471	RESISTOR: 47,000 ohms, ½ W, 5%	R23
18414-182	RESISTOR: 180,000 ohms, ½ W, 10%	R8
18414-332	RESISTOR: 330,000 ohms, ½ W, 10%	R10
18415-102	RESISTOR: 1 megohm, ½ W, 10%	R17
18422-122	RESISTOR: 1200 ohms, 1 W, 10%	R2
18423-151	RESISTOR: 15,000 ohms, 1 W, 5%	R3
18525-345	RESISTOR: 180,000 ohms, ½ W, 1%	R39
18525-528	RESISTOR: 1.8 meg, ½ W, 1%	R40
18525-392	RESISTOR: 500,000 ohms, ½ W, 1%	R38
18525-423	RESISTOR: 950 ohms, ½ W, 1%	R41, R42, R43
18525-529	RESISTOR: 9,100 ohms, ½ W, 1%	R35
18525-351	RESISTOR: 90,000 ohms, ½ W, 1%	R36
18525-364	RESISTOR: 400,000 ohms, ½ W, 1%	R37
18525-427	RESISTOR: 500 ohms, ½ W, 1%	R19, R25
18550-89	RESISTOR: 215,000 ohms, 1 W, 1%	R24
18550-107	RESISTOR: 3175 ohms, 1 W, 1%	R31
18550-108	RESISTOR: 2.366 megohms, 1 W, 1%	R29

## PARTS LIST FOR MODEL 605A TUBE TESTER AND ANALYZER

NOTE: There is a minimum billing charge of \$1.50 for any one parts order. Prices will be furnished upon request.

HICKOK CODE NO.	NAME AND DESCRIPTION	FUNCTION OR REF. SYMBOL
18550-109	RESISTOR: 628,000 ohms, 1 W, 1%	R28
18550-128	RESISTOR: 8 meg, 1 W, 1%	R44
18550-129	RESISTOR: 10 meg, 1 W, 1%	R45
18575-12	RESISTOR: 1800 ohms, 10 W, 10%, vitreous enamel	R1
18575-19	RESISTOR: 100 ohms, 10%, center tapped	R12, R13
18575-89	RESISTOR: 8500 ohms, 10 W, 10%, wire wound, vitreous enamel	R6
18575-99	RESISTOR: 12,00 ohms, 2 W, 1%	R30
18670-101	RESISTOR: Spool: small, .51 ohms	R34
18670-102	RESISTOR: Spool: small, 2.0 ohms	R33
18670-108	RESISTOR: Spool: small, 22.6 ohms	R32
18670-107	RESISTOR: Spool: small, 20 ohms	R9
18670-119	RESISTOR: Spool: 190 ohms	R18
18670-418	RESISTOR: Spool: medium, 150 ohms	R14
18673-221	RESISTOR: Spool: ceramic, 275 ohms	R26
18673-410	RESISTOR: Spool: ceramic, 31 ohms	R27
18750-2	RHEOSTAT: 200 ohms, 25 W, Mod. D, Ohmite #2898-3SC	R16
19350-1	SOCKET: small bayonet, Drake 614L-CH-LT	
19350-2	SOCKET: candelabra, Drake 414-14L-LT	
19350-62	SOCKET: 9-pin, Cinch, black	
19350-76	SOCKET: 7-pin, miniature, Amphenol 147-170-24	
19350-93	SOCKET: 4-pin, black, Amphenol 78-S4	
19350-94	SOCKET: 5-pin, Amphenol 78-S5	
19350-95	SOCKET: 6-pin, Amphenol 78-S6	
19350-96	SOCKET: 7-pin, Amphenol 78-7CD	
19350-97	SOCKET: 8-pin loktal, Amphenol 78-8L	
19350-99	SOCKET: 8-pin octal, Amphenol 78-S8	
19350-101	SOCKET: sub-miniature, Cinch EXP-8694	
19350-119	SOCKET: sub-miniature, in-line, Cinch EXP-8736-B1	
19910-54	SWITCH: gang, 7 buttons	PUSHBUTTON
19911-7	SWITCH: snap D.P.D.T., Oak 16743-78	METER REVERSE
19911-9	SWITCH: toggle, S.P.S.T., Arrow, Hart & Hegemann 20994-DA	ON-OFF
19912-259	SWITCH: rotary, 5 section, 17 position	ANALYZER
19912-202	SWITCH: rotary, 1 section, 2 pole, 20 position	FILAMENT
19912-203	SWITCH: rotary, 5 section, 6 position	SHORT TEST
19912-204	SWITCH: rotary, 5 section, 10 position	SELECTORS
19912-205	SWITCH: rotary, 1 section, 10 position	CATHODE-SUPPRESSOR
20800-101	TRANSFORMER: power	
20875-6	TUBE: 5Y3GT/G	RECTIFIER
20875-28	TUBE: #83	RECTIFIER

NOTE: In ordering parts or material for this instrument, the serial number must be given in order to identify properly the material required.



SCHEMATIC  
 MODEL 605A TUBE TESTER  
 MADE BY  
 THE HICKOK ELECTRICAL INSTRUMENT COMPANY  
 CLEVELAND, OHIO

803 W

## FOREIGN TUBE DATA

SUPPLEMENTARY DATA - MODEL 533A-533DM (Series 600)-535-600A-605-605A

NOTE: No adapters necessary to test the following tubes.

TUBE	FIL	SELECTORS	BIAS	ENG.	PRESS	AVG. MUT.COND.	NOTATIONS
5AR4	5.0	HR-0600-0	0	60	P3 ☆	---	Plate No. 1
5AR4	5.0	HR-0400-0	0	60	P3 ☆	---	Plate No. 2
6AJ8	6.3	EV-2613-7	17	65	P4	1500	Heptode Sect.
6AJ8	6.3	EV-9803-2	23	81	P4	3000	Triode Sect.
6AK8	6.3	EV-8907-6	11	56	P4	1200	Triode Sect.
6AK8	6.3	EV-0607-1	0	26	P1 ☆	---	Diode No. 1
6AK8	6.3	EV-0203-7	0	77	P1 ☆	---	Diode No. 2
6AK8	6.3	EV-0107-8	0	77	P1 ☆	---	Diode No. 3
6AM5	6.3	JR-3572-0	26	79	P4	2600	
6AM6	6.3	JR-3572-6	11	81	P4	3000	
6AQ8	6.3	EV-7608-9	10	85	P4	4000	Triode No. 1
6AQ8	6.3	EV-2103-9	10	85	P4	4000	Triode No. 2
6BQ5	6.3	EV-2793-0	14	91	P4	7500	
6BR5	6.3	EV-1902-0	Vary	100	P5 ☆	----	Connect a 1-megohm resistor from plate jack to octal test socket Pin No. 8
							Vary bias to vary beam angle.
6CA4	6.3	EV-0703-0	0	47	P3 ☆	----	Plate No. 1
6CA4	6.3	EV-0103-0	0	47	P3 ☆	----	Plate No. 2
8D3	6.3	JR-3572-6	11	81	P4	3000	
9D6	6.3	JR-3572-6	15	65	P4	1500	
D77	6.3	JR-0703-6	0	78	P1 ☆	----	Diode No. 1
D77	6.3	JR-0205-6	0	78	P1 ☆	----	Diode No. 2
DAF91	1.5	DX-6580-0	11	18	---	625	Pent. Sect. Hold down P1 and Press P4
DAF91	1.5	HT-0100-0	0	22	P1 ☆	---	Diode Sect.
DC70	1.1	EV-1800-0	26	83	P4	3400	
DF91	1.5	DX-6210-0	0	33	---	775	Hold down P1 and Press P4
DH77	6.3	JR-3702-0	10	60	P4	1300	Triode Sect.
DH77	6.3	JR-0602-0	0	26	P1 ☆	---	Diode No. 1
DH77	6.3	JR-0502-0	0	26	P1 ☆	---	Diode No. 2
DK91	1.5	DX-8106-2	55	53	P4	1100	
DL96	2.5	DX-6210-0	41	56	P4	1200	
E80CC	12.6	EV-7608-0	18	80	P4	2700	Triode No. 1
E80CC	12.6	EV-2103-0	18	80	P4	2700	Triode No. 2
E8QF	6.3	EV-9613-8	18	71	P4	1850	
EAA91	6.3	JR-0703-6	0	78	P1 ☆	---	Diode No. 1
EAA91	6.3	JR-0205-6	0	78	P1 ☆	---	Diode No. 2
EABC80	6.3	EV-8907-6	11	56	P4	1200	Triode Sect.
EABC80	6.3	EV-0607-1	0	26	P1 ☆	---	Diode No. 1
EABC80	6.3	EV-0203-7	0	77	P1 ☆	---	Diode No. 2
EABC80	6.3	EV-0107-8	0	77	P1 ☆	---	Diode No. 3
EB91	6.3	JR-0703-6	0	78	P1 ☆	---	Diode No. 1
EB91	6.3	JR-0205-6	0	78	P1 ☆	---	Diode No. 2
EBC91	6.3	JR-3702-0	12	58	P4	1250	Triode Sect.
EBC91	6.3	JR-0602-0	0	26	P1 ☆	---	Diode No. 1
EBC91	6.3	JR-0502-0	0	26	P1 ☆	---	Diode No. 2
EBF80	6.3	EV-2613-9	10	75	P4	2200	Pent. Sect.
EBF80	6.3	EV-0703-0	0	25	P1 ☆	---	Diode No. 1
EBF80	6.3	EV-0803-0	0	25	P1 ☆	---	Diode No. 2
EC80	6.3	EV-2903-0	13	88	P4	5000	
EC81	6.3	EV-1803-0	24	85	P4	4000	
EC92	6.3	JR-6307-0	10	85	P4	4000	
ECC81	12.6	EV-7608-0	10	85	P4	4000	Triode No. 1
ECC81	12.6	EV-2103-0	10	85	P4	4000	Triode No. 2
ECC82	12.6	EV-7608-0	24	75	P4	2200	Triode No. 1
ECC82	12.6	EV-2103-0	24	75	P4	2200	Triode No. 2
ECC83	12.6	EV-7608-0	12	58	P4	1250	Triode No. 1
ECC83	12.6	EV-2103-0	12	58	P4	1250	Triode No. 2
ECC85	6.3	EV-7608-9	10	85	P4	4000	Triode No. 1
ECC85	6.3	EV-2103-9	10	85	P4	4000	Triode No. 2
ECC91	6.3	JR-5207-0	21	81	P4	3000	Triode No. 1
ECC91	6.3	JR-6307-0	21	81	P4	3000	Triode No. 2

ECF82	6.3	EV-2637-0	7	80	P4	2800	Pentode Sect.
ECF82	6.3	EV-9108-0	12	90	P4	6200	Triode Sect.
ECH81	6.3	EV-2613-7	17	65	P4	1500	Heptode Sect.
ECH81	6.3	EV-9803-2	23	81	P4	3000	Triode Sect.
ECL80	6.3	EV-9683-7	18	83	P4	3300	Pent. Sect.
ECL80	6.3	EV-2103-0	27	61	P4	1350	Triode Sect.
EP80	6.3	EV-2781-9	10	86	P4	4200	
EP85	6.3	EV-2781-9	17	81	P4	3000	
EP86	6.3	EV-9613-8	17	65	P4	1500	
EP89	6.3	EV-2783-9	13	78	P4	2500	
EP91	6.3	JR-3572-6	11	81	P4	3000	
EP92	6.3	JR-3572-6	15	65	P4	1500	
EP93	6.3	JR-3567-2	0	79	P4	2700	
EP94	6.3	JR-3567-2	11	76	P4	2300	
EP95	6.3	JR-3562-0	24	65	P4	1500	
EK90	6.3	JR-7562-3	0	35	---	800	Ampl. Sect. Hold down Pl and Press P4 Osc. Sect.
EK90	6.3	JR-3602-7	20	90	P4	6500	
EL34	6.3	JR-5347-2	23	90	P4	6000	
EL37	6.3	JR-5347-2	17	88	P4	5000	
EL84	6.3	EV-2793-0	14	91	P4	7500	
EL91	6.3	JR-3572-0	26	79	P4	2600	
EM80	6.3	EV-1902-0	Vary	100	P5 ☆	----	Connect a 1-megohm resistor from Plate Jack to Octal Test Socket Pin no. 8 Vary Bias to vary Beam angle.
EQ80	6.3	EV-7163-9	29	48	P4	1000	
EZ80	6.3	EV-0703-1	0	21	P3 ☆	----	Plate No. 1
EZ80	6.3	EV-0103-7	0	21	P3 ☆	----	Plate No. 2
EZ81	6.3	EV-0703-0	0	47	P3 ☆	----	Plate No. 1
EZ81	6.3	EV-0103-0	0	47	P3 ☆	----	Plate No. 2
EZ90	6.3	JR-0607-3	0	20	P3 ☆	----	Plate No. 1
EZ90	6.3	JR-0307-6	0	20	P3 ☆	----	Plate No. 2
GZ34	5.0	HR-0600-0	0	60	P3 ☆	----	Plate No. 1
GZ34	5.0	HR-0400-0	0	60	P3 ☆	----	Plate No. 2
N77	6.3	JR-3572-0	26	79	P4	2600	
N78	6.3	JR-3572-0	10	90	P4	6000	
PCF82	10.0	EV-2637-0	7	80	P4	2800	Pentode Sect.
PCF82	10.0	EV-9108-0	12	90	P4	6200	Triode Sect.
PL81	20.0	EV-2083-9	42	90	P4	6000	CAP = P
PL83	12.6	EV-2713-6	8	91	P4	7500	
PY80	20.0	EV-0903-0	0	60	P3 ☆	----	
PY82	20.0	EV-0903-0	0	60	P3 ☆	----	
U78	6.3	JR-0607-3	0	30	P3 ☆	----	Plate No. 1
U78	6.3	JR-0307-6	0	30	P3 ☆	----	Plate No. 2
W77	6.3	JR-3572-6	15	65	P4	1500	
Z77	6.3	JR-3572-6	11	81	P4	3000	
Z729	6.3	EV-9613-8	17	65	P4	1500	
6064	6.3	JR-3572-6	11	81	P4	3000	
6267	6.3	EV-9613-8	17	65	P4	1500	
6516	6.3	JR-3572-0	26	79	P4	2600	
18042	20.0	EV-2613-9	10	90	P4	6500	

Part No.	Description	Used With	Net Price
NL-635L	H.W.R.	NL-1051	14.15
NL-635P	H.W.R.	NL-1051P	13.50
NL-643	H.W.R.	NL-1051AP	9.20
NL-649/5834	H.W.R.	NL-1052	12.90
NL-651	Order NL-1052A	NL-1052A	13.00
NL-653/5835	H.W.R.	NL-1052P	13.50
NL-655	Order NL-1053A	NL-1053	14.15
NL-660	H.W.R.	NL-1053A	26.00
NL-660L/7786	H.W.R.	NL-1061	27.30
NL-660P	H.W.R.	NL-1062	20.15
NL-664L	H.W.R.		
NL-664P	H.W.R.		
NL-673	H.V.H.W.R.		

Part No.	Description	Used With	Net Price
NL-1051	"B" Ign.	NL-1051A	110.00
NL-1051P	"B" Ign.	NL-1051AP	65.00
NL-1052	"C" Ign.	NL-1052A	65.00
NL-1052P	"C" Ign.	NL-1052AP	99.00
NL-1053	"D" Ign.	NL-1053A	99.00
NL-1053A	"E" Ign.		245.00
NL-1054	Ign.		750.00
NL-1061	Ign.		65.00
NL-1062	Ign.		65.00
NL-1062	Ign.		99.00

Part No.	Description	Used With	Net Price
7021 or 7021/714		Order NL-740L	
7022 or 7022/740L		Order NL-760L	
7023 or 7023/760L		Order NL-5884/C33/A	
7306A/5884/C33/A		Order NL-760L/6011	
7307A/8011/710		Order NL-588/L	
7321/C63/L		Order NL-110L	
7312		Order NL-C33/AL	
7556		Thy.	19.60
NL-7556A-Ne		Order NL-610/7723	13.10
7723		H.W.R.	
NL-7723-Ne		Order NL-710A	
7726		Order NL-710AL	
7733		Order NL-660L/7786	
NL-7786-Ne		H.W.R.	15.50

t = For replacement only. Data sheets available on request.

QUICK CHANGE IGNITRON WATER CONNECTORS

Type No.	Description	Used With Tube Type	Net Price
BHK	Brass Socket	NL-1051A&NL-1052A	\$2.75
BKI1	Brass Plug	NL-1051A&NL-1052A	1.25
B2HK	Brass Socket	NL-1053A	4.15
B2KI6	Brass Plug	NL-1053A	2.05

LUG BASE TUBE SOCKETS

Type No.	Description	Used With	Net Price
LBT5-1	Socket with Cover (Rectifiers and Thyatrons with)		\$2.60
LBT5-2	Socket (Suffix Letter L)		3.00

All prices subject to change without notice.

IGNITRON THERMOSTAT KITS

Type No.	Function	Connections	Net Price
C439IN7-51	Water Saver Terminal Block	3 ft. Leads	\$9.30
C439IN7-52	Protection Terminal Block	3 ft. Leads	8.00
C439IN7-58	Water Saver	3 ft. Leads	7.30
C439IN7-59	Protection	3 ft. Leads	5.15

Above type numbers and prices include mounting brackets.

**BUY THE FINEST TOWER MADE BUY TRI-EX!**

**THERE IS A TRI-EX TOWER TO FIT YOUR ANTENNA REQUIREMENTS**



**NOW! NEW LOWER PRICES ON ALL GUYED TOWERS!**

EXAMPLE: TRI-EX H AND HS SERIES GUYED TOWERS WITHSTAND HEAVY WIND LOADS WITH REALLY BIG ANTENNAS TOPSIDE!

MODEL NO.	HEIGHT (ft.)	WEIGHT (lbs.)	NEW LOW PRICE
H-237	37	150	\$140.00
H-354	54	250	190.00
H-471	71	365	270.00
HS-237	37	200	175.00
HS-354	54	305	240.00
HS-471	71	440	343.00
HS-588	88	620	475.00
HS-6105	105	870	745.00

GUY CABLE, PLATES, CLAMPS, ANCHORS, ETC. AVAILABLE IN KIT FORM AT LOW ADDITIONAL COST.

FREIGHT PREPAID WEST OF THE CONTINENTAL DIVIDE ON SHIPMENTS OF 100 LBS. OR MORE. Three dollars per hundred weight will be allowed on shipments of 100 lbs. or more East of the Continental Divide. Towers will be drop-shipped from California.

