

*Quality
Performance
Accuracy*



INSTRUCTION MANUAL
DYNAMIC
MUTUAL CONDUCTANCE
TUBE TESTER
MODELS 9-66A & 9-66AU

STARK ELECTRONIC INSTRUMENTS LTD
AJAX, ONTARIO.

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NOTE

Your tube tester is equipped with a DUAL MUTUAL CONDUCTANCE chart.

Average Mutual Conductance (Avg. Gm) readings are represented in standard type adjacent to the "Notation" column.

Minimum Mutual Conductance (JAN MIN) readings based on minimum JAN specifications are shown in bold type to the left of the average readings. A Gm reading below the JAN MIN limit is indication of a completely defective tube.

IMPORTANT

**SEE INSTRUCTIONS FOR TESTING
FILAMENT CONTINUITY ON PAGE 10**

AUTOMOBILE RADIO TUBES

IT OFTEN HAPPENS THAT AUTOMOBILES OPERATED AT NIGHT WITH RADIO, LIGHT, FANS, ETC., ALL TURNED ON AT THE SAME TIME, PUT SUCH A SEVERE LOAD ON THE AUTO BATTERY THAT THE BATTERY IS UNABLE TO DELIVER FULL VOLTAGE, ESPECIALLY IN SLOW MOVING TRAFFIC OR WHEN WAITING FOR TRAFFIC LIGHT. IF AUTO RADIO TROUBLE IS EXPERIENCED, MUCH TIME CAN BE SAVED BY FIRST CHECKING THE TUBES AT 6.3 VOLTS, THEN SWITCHING THE FILAMENT VOLTAGE TO 5 VOLTS. IF TUBE READING DROPS MARKEDLY AT 5 VOLTS, THE TUBE SHOULD BE REPLACED.

IF THE AUTOMOBILE HAS A 12 VOLT RADIO SYSTEM, FIRST CHECK THE TUBES AT 12.6 VOLTS, THEN DROP TO 10 VOLTS FOR RECHECK.



MODELS 9-66A & 9-66AU

MICROMHO DYNAMIC MUTUAL CONDUCTANCE TUBE CHECKER

NOTE

**READ INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING TO OPERATE
THIS TUBE TESTER**

SECTION 1

DESCRIPTION

1. PURPOSE

a) The Models 9-66A and 9-66AU Tube Testers are 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.

b) The Models 9-66A and 9-66AU Tube Testers are 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. A sensitive noise test is also provided.

c) The Model 9-66A Tube Tester incorporates sockets to test the following American tube types; 4 pin, 5 pin, 6 pin, 7 pin, octal, loctal, 7 pin miniature, 9 pin miniature, 10 pin header, compactron, novar, 5 pin nuvistor, 7 pin nuvistor and sub-miniature. The Model 9-66A will also test European tubes having the above American type bases. In addition to the sockets incorporated in the Model 9-66A, the Model 9-66AU also contains the following European base types: B9G, B8A, B8G, MO, B7, B4-5 and B3G.

In both models, subminiature tubes are tested using the subminiature adaptor provided. The adaptor is plugged into the standard octal socket and the tester set up as normally.

d) Mutual conductance values in three ranges can be measured: 0-3000, 0-6000, and 0-15,000 micromhos. Included in this tube tester is an ENGLISH reading range. By means of this range, a good tube will cause the pointer of the indicating meter to rest in the GREEN (GOOD) sector of the meter scale. A bad tube will read in the RED (REPLACE) or doubtful (?) sector.

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e) Gas Test: Provision is made to test amplifying vacuum tubes for gas content. Gassy tubes will ruin the automatic volume control or intermediate stages of a radio receiver.

2. TUBE COMPLEMENT

The Models 9-66A and 9-66AU require one #83 Mercury vapor rectifier and one 5Y3GT vacuum rectifier tube for their operation. These tubes are supplied and installed in the tube tester. The fuse lamp is a standard #81 auto lamp. The neon lamp is a G. E. 1/4 watt, 105-125 volts, candelabra base.

3. TUBE DATA

Data for setting the selectors for testing the most commonly used and for newer American tube types is listed on the roll chart mounted in the tube tester. Data for older American tubes, Western Electric tubes, industrial tubes, subminiature tubes and for European tubes is listed in the accompanying Additional Tube Data Booklet.

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SECTION 11

FUNCTIONS OF THE COMPONENTS

1. Line Voltage Adjustment:

The Models 9-66A and 9-66AU Tube Testers operate from A.C. power lines of 105 to 125 volts, 60 cycles. 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.

2. Selectors:

The row of selector dials 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 dials is similar to DIALING A TELEPHONE NUMBER. On the roll data 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 dial is turned to the letter "J". The second dial is turned to "R". The third dial indicates 6; the fourth, 2; the fifth, 3; the sixth, 7 and the seventh, 5. The lettered dials control the filament or heater connections. The numbered dials control the GRID, PLATE, SCREEN, CATHODE and SUPPRESSOR in that order. In the example given above the heater terminals are connected to pins 8 and 1. The GRID is connected to pin 6; PLATE to pin 2; SCREEN, to pin 3; CATHODE, to pin 7 and SUPPRESSOR, to pin 5.

These dials switches are electrically interlocked in such a way that it is impossible to connect two different voltage elements to the same pin. Thus accidental shorts are avoided.

The dialing system is designed so that a minimum of dial setting is required. For example: the heater setting is practically always JR so that these two dials seldom need resetting. It will also be noticed that when testing duo-diode triode tubes the amount of dialing has been reduced to a minimum.

3. Short Test

Turning the SHORTS switch successively through the position 1-2-3-4-5 connects the various pairs of elements in turn across the test voltage. Tubes having shorted elements will complete the circuit and cause the neon SHORT lamp to glow. Tubes may be tested for shorts, either hot or cold.

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A short is indicated by a steady glow of the neon lamp in certain positions of the SHORTS switch. A momentary flash of the lamp as the switch is turned from one position to another should be disregarded. This flashing is caused by the charging of a capacitor in the test circuit. A shorted tube should be discarded without further test.

4. 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

5. Noise Test:

The short test circuit is also used in making noise tests on vacuum tubes. Connections are made from the noise test jacks to the antenna and ground posts of any radio receiver. The tube under test is tapped with the finger as the SHORTS switch is turned through positions 1-2-3-4-5.

Intermittent disturbances which are too brief to register on the neon lamp will be reproduced by the loud speaker as static.

6. Gas Test

The push switch P5 (Gas 1) and P6 (Gas 2) are used to test an amplifier tube for gas content.

a) The MICROMHO switch is set on 3000.

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b) The push switch P5 is pressed and held down while the BIAS dial is turned to cause the pointer of the indicating meter to read 100 micromhos.

c) P5 is held down and P6 is pressed.

d) If the tube contains gas the meter pointer will move up the scale. If the pointer movement is not more than one small 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 a case turn the BIAS dial to 100 and test for gas.

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.

7. Dynamic Mutual Conductance

The push switch P4 is used when testing for mutual conductance value. The indicating meter will register the tube's value in MICROMHOS in three ranges: 0-3000, 0-6000 and 0-15,000. The range to be used is controlled by the MICROMHO switch. When measuring micromhos in any of the three ranges listed above, no setting of the ENGLISH dial is required.

The fourth range, ENGLISH, on the MICROMHO switch, is used when it is desired to test the tube in terms of GOOD-REPLACE. In this case the ENGLISH dial must be set in accordance with the figures given on the data chart under the heading, ENG. When using the ENGLISH range, good tubes will cause the meter pointer to read in the GOOD sector. Worn out tubes will read in the REPLACE sector. Those tubes which read in the sector marked (?) have some useful life but should be replaced soon. The ENGLISH reading scale is also based on Dynamic Mutual Conductance. It is not an emission test.

Two Micromho values are printed on the Data Charts. The Average Mutual Conductance (Avg. Gm) readings are represented in standard type adjacent to the "Notation" Column.

Minimum Mutual Conductance (JAN MIN) readings based on minimum JAN (Joint Army-Navy) specifications are shown in bold type to the left of the average readings. A Gm reading below the JAN MIN limit is indication of a completely defective tube.

The ENGLISH scale is designed to make tubes read at the left edge of the GREEN (GOOD) sector when 20% below average for amplifier tubes and 35% below average for power tubes.

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8. Rectifier Test

The push switch P1, P2 and P3 are used to test various types of rectifier elements.

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 meter pointer to read above the mark, DIODES OK.

b) 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.

c) Push switch P3 is used when testing ordinary rectifier tubes such as the 5Y3. This switch 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.

NOTE:

On data chart a star (★) following P1, P2 and P3 indicates that the MICROMHO switch is to be set on ENGLISH.

9. Socket Numbering

In order to reduce dialing to a minimum, the socket in Models 9-66A & 9-66AU Tube Testers are numbered as shown in Figure 1, which shows the bottom views. The numerical values of the lettered dials are as shown:

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 " O ".

SOCKET NUMBERING BOTTOM VIEWS

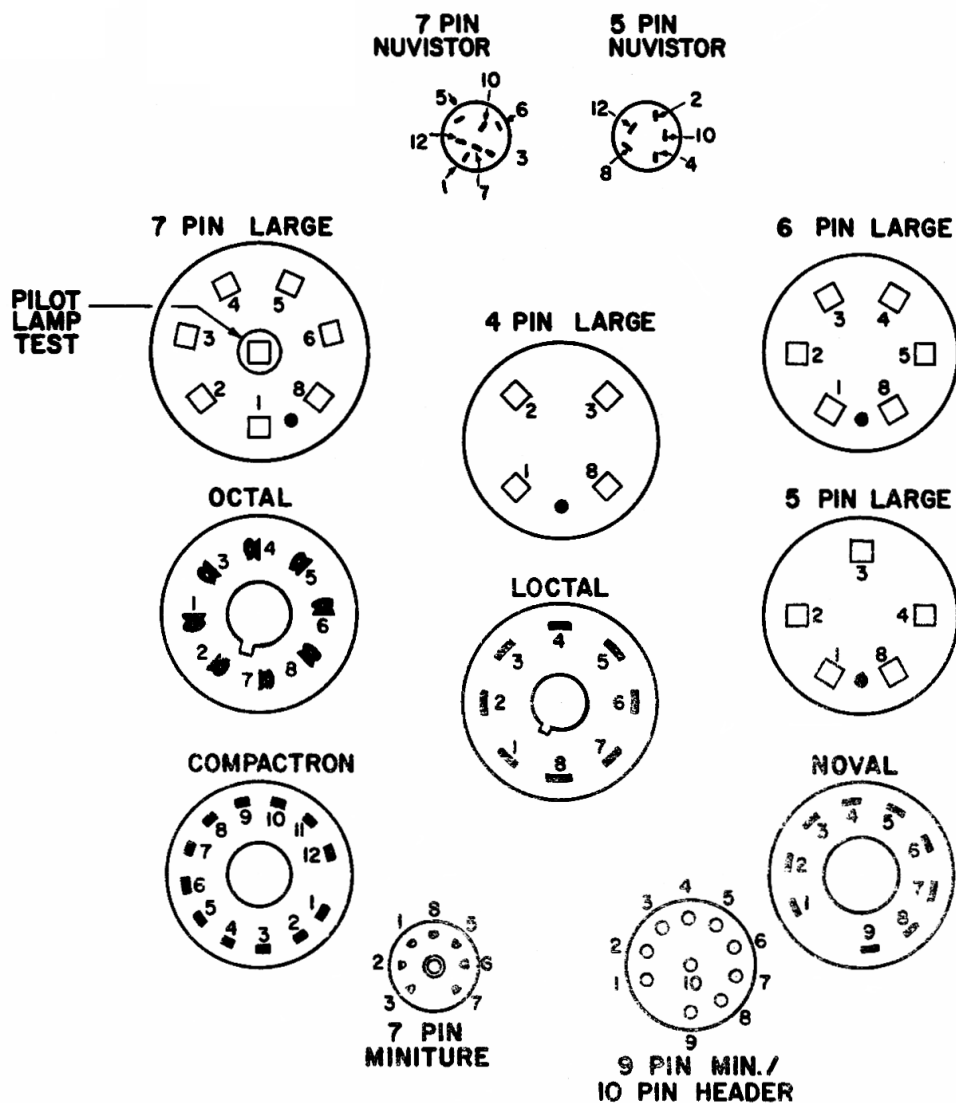


Figure 1

b) - Figure 2 is a diagram of the bottom view of the European Socket bases of Model 9-66AU

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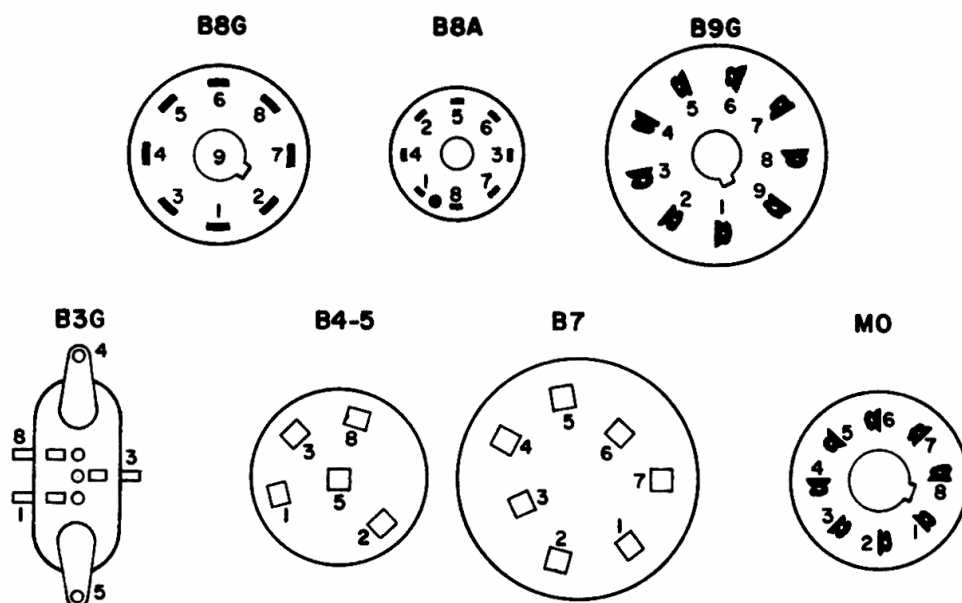


Figure 2

10. Meter Reverse

Directly below the indicating meter is a switch marked **REVERSE-NORMAL**. With certain tubes such as the 117N7, the meter, when 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 to move up the scale. After this test has been made, return the switch to **NORMAL**.

11. Top Caps

There are two jacks at the top 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 the **GRID** and P, to the **PLATE** jack.

NOTE:

The center of the seven pin socket is used to check pilot lamps. Voltages up to 12.6 are available for pilot lamp tests. These voltages are controlled by the filament switch. No further switch setting is necessary.

12. Special Notes

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

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

Occasionally the complaint is made 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. Stark 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. The used tube would have performed if it has 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.

The models 9-66A and 9-66AU MICROMHO DYNAMIC MUTUAL CONDUCTANCE TUBE TESTERS are equipped with a special feature to enable LIFE TEST to be made on the tube. In the Lower Right of the control panel is a switch designated NORMAL and LIFE TEST.

13. LIFE TEST -(Does Not Apply to Rectifier Tubes)

a) Measure the mutual conductance in the ordinary way with switch on NORMAL.

b) Set the MICROMHO range switch on ENGLISH.

c) Press P4 and adjust the ENGLISH dial until the tube reads in the GREEN (GOOD) sector at 2000 on the scale.

d) While holding everything else constant, throw switch to LIFE TEST. This reduces cathode temperature.

e) If the meter still reads in the GREEN (GOOD) sector, the tube has a large life reserve and will perform satisfactorily.

f) After making LIFE TEST return the switch to NORMAL for all other tests.

g) Rectifier tubes have no mutual conductance. In making life test on rectifier tubes, first set FILAMENT switch to normal value. After tube is thoroughly heated, make test, then reduce filament voltage by one position on the FILAMENT switch and note loss of reading on the meter. It should not drop more than 25 percent.

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14. Continuity Test

The Models 9-66A and 9-66AU Tube Testers can be used to test for continuity through resistance up to 200,000 ohms.

- a) Set SHORTS switch on position 4.
- b) Connect two leads having prods and pin tips to the jacks marked PLATE and GRID.
- c) Touch the prods to the terminals through which continuity is to be determined.
- d) The neon lamp will glow if circuit is continuous.

15. Filament and Heater Continuity

1. Turn Tester ON
2. Set selectors as per chart for tube to be tested.
3. Set FILAMENT switch on BLST instead of voltage indicated on chart.
4. Set SHORT TEST switch on position 1.
5. Place tube in proper socket.

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

If Neon lamp does not glow, 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.

Note: It sometimes happens that a filament will show continuity when cold, but will open when it warms up.

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TO TEST BALLAST TUBES

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

TEST DATA FOR BALLAST TUBES

TUBE TYPE	First Selector	Neon lamp should light in these positions.						
1A1-1B1-1C1-1E1-1F1-1G1-1J1-1K1-1L1-1N1-1P1-1Q1-1R1G-1S1G-1T1G-1U1G-1V1-1Y1-1Z1-2	J	R						
2UR224	J			T				X
2LR212	H	R	S		U			
3	J	R						
03G	J			T				
4-5	J	R						
6-133	J			T				
6-6AA	J	R						
7-3-S	J	R						
10A-10AG	J			T				
10AB	J			T				X
K17B-M17C-BM17C	J			T				X
M17HG-M17H	J D	R	S					X
K23B-K23C-KX23B-KX30C	J			T				X
M30H	J D	R	S					X
30A-K30A	J			T				
K30D	J	R		T				X
33A-33AG	J			T				
K34B	J			T				X

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TUBE TYPE	First Selector	Neon lamp should light in these positions.					
36A	J			T			
K36B-BK36B-L36C-BM-L36C-KX36C	J			T			X
KX36A	J	R					
36D-L36D	J	R		T			X
L36DJ	J	R		T	U		X
K36H-M36H-M36HG	J D	R	S				X
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
BK42D-K42D-L42D	J	R		T			X
LX42D-L42DX	J	R	S	T			
K42E-L42E	J			T			X
L42F	J D	R					X
42HA-K42HJ-M42H-M42HG	J E	R	S	T			X
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-BM49C-BK49C-K49E-L49E	J			T			X
K49D-BK49D-L49D	J			T			X
L49F	J D	R					X
M49H-M49HG	J D	R	S				X
KZ49B-KZ49C	J	R				V	
K49BJ-L49BJ	J			T	U		X
L49S2	J	R		T		V	
49AJ-K49AJ	J			T			
KX49B-LX49B-LX49C	J			T			X
L49DJ	J	R		T	U		X
L49S3	J	R		T		V	
50A2	J	R		T			
50A2MF-50B2	J	R				V	
50X3	J	R					
K52H-M52H	J D	R	S				X

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TUBE TYPE	First Selector	Neon lamp should light in these positions.					
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 D	R					X
K55H-M55H-M55HG	J D	R	S				X
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 D	R					X
KX87B-LX87B-L90B	J			T			X
K90F-M90F-K92F-M92F	J D	R					X
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-L40R4-140R8	J	R		T			
140R	J	R					
140L44-140R44	J	R	S	T			
165L4-165R4-165R8	J	R		T			
165R	J	R					
165L44-165R44	J	R	S	T			
185L4-185L8-185R4-185R8	J	R		T			
185R	J	R					
185L44-185R44	J	R	S	T			
200R-250R	J	R					
250R8-290L4	J			T			X
300R4-320R4	J			T			X
340	J	R					
808-1	J			T	U		X
E14980-W43357-W4588-3613	J			T			X
3334-3334A	J	R		T			X
8593-8598-8601-8664	J			T			X
3ER248	J	R		T	U		X
3CR241	J	R		T			X

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TUBE TYPE	First Selector	Neon Lamp Should Light in These Positions							
B9M15822	B			T					
	E					V			
	G							X	Y
B9M16067	J	R		T		V	W	X	
B9M16275	B			T	U	V	W	X	Y
B9M16534	J	R		T		V	W	X	
B9M17571	H	R		T					
	J				U	V		X	
B9M18941	B		S	T					
	E					V			
	G							X	Y
17A470303	J	R	S			V			
	D			/	U				
	G							X	
17A485459	J	R	S				W		
	D				U				
TBR102D	B		S	T	U	V			
	G							X	Y
TBR103D	B		S		U	V			
	G							X	Y
TBR104D	B		S	T	U	V			
	G							X	Y
397021	B		S	T					
397022	E					V	W		
397023	J							X	
397036	C					V			
407100	J	R	S			V			
408100	J	R	S			V			
	D				U				
SW507300	J	R		T		V	W	X	
571606	B		S	T					
	E					V	W		
	J							X	

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PARTS LIST

Part #	Description	Ref. Symbol or Function
107-1-17	Cabinet	
112-1-7	Capacitor, 500 mmf, mica, 500 VDC	C2
112-3-7	Capacitor, 2700 mmfd, mica	C3
112-9-3	Capacitor, 1 mfd, 400 VDC, paper	C1
119-4-89	Instruction Manual	
120-3-1	Roll Chart & Tube Data Booklet	
121-3-5	Knob, pointer, black	
121-3-7	Knob, push, button, black	
121-3-8	Knob, push button, red	
125-1-2	Bulb neon, 1/4 watt, type NE48	Short indicator PL-2
125-2-2	Lamp, bayonet base, #44, 6-8 volts	Pilot light PL-1
125-9-1	Lamp, auto, 6 volts, type 81	Fuse
132-1-5	Pinjack, black	Noise Test
132-2-5	Pinjack, red	Noise Test
134-1-7	Potentiometer, 200 ohms, 25 watt	R25 Line adjust
134-2-5	Potentiometer, 3000 ohms, special taper	Bias R7
134-5-16	Potentiometer, dual, 150-150 ohms, linear taper 4 watt.	English R4, R5
140-2-1	Socket, 4 pin, Amphenol 78-54	L1
140-2-5	Socket, octal, Amphenol 78-58	L2
140-2-8	Socket, 7 pin miniature, Amphenol 78-7P	V7
140-2-24	Socket, 4 pin Amphenol 78-S4-111	V1
140-2-25	Socket, 5 pin Amphenol 78-S5-111	V2

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Part #	Description	Ref. Symbol or Function
140-2-26	Socket, 6 pin, Amphenol 78-S6-111	V3
140-2-27	Socket, octal, Amphenol 78-S8-111	V5
140-2-28	Socket, 7 pin, with pilot test, Amphenol 78-7CD-111	V4
140-2-29	Socket, loctal, Amphenol 78-58L-111	V6
140-2-30	V Adaptor for subminiature tubes	
140-5-96	Socket, 5 pin, nuvistor, Cinch 133-65-10-001	V22
140-5-99	Socket, novar, Cinch 149-10-00-033	V18
140-6-5	Socket, 7 pin, nuvistor, Cinch 133-67-90-004	V23
140-6-6	Socket, compactron, Cinch 149-10-30-025	V19
140-6-7	Socket, 10 pin header, Sylvania X7460-G 347	V8
144-1-9	Switch, toggle, SPST	Power, SW12
144-5-1	Switch, rotary, 5 deck, 6 position	Shorts, SW2
144-5-5	Switch, rotary, 1 deck, 4 position	Micromho, SW1
144-5-7	Switch, rotary, 2 deck, 20 position	Filament Voltage
144-5-8	Switch, push button, 7 gang	
144-5-9	Switch, slide, DPDT	Meter Reverse SW11
144-9-70	Switch, toggle, DPDT	Life Test SW13
144-9-93	Switch, 14 position, 1 deck	SW3 to SW7
144-9-94	Switch, 14 position, 1 deck	SW8, SW9
148-2-13	Transformer, power, 117 volt primary	
161-1-27	Meter, Model 804, 1.4 ma, 80 ohms	
163-1-9	Tube 5Y3	

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Part #	Description	Ref. Symbol or Function
163-1-10	Tube #63	
	Resistor, 15 ohms, wire wound, precision	R9
	Resistor, fixed, 47 ohms, 10%, 1/2 watt	R21, R22, R23
	Resistor, fixed, 62 ohms, 1%, 1/2 watt	R19
	Resistor, fixed, 100 ohms, 10 watt, center tapped	R12, R13
	Resistor, wire wound, dual, 109 ohms and 41 ohms precision	R15, R16, R17, R18
	Resistor, wire wound, precision, 150 ohms	R14
	Resistor, fixed, 1200 ohms, 10%, 1 watt	R2
	Resistor, fixed, 1800 ohms, 10%, 10 watt	R1
	Resistor, fixed, 6000 ohms, 10%, 10 watt	R6
	Resistor, fixed, 15K ohms, 10%, 1/2 watt	R3
	Resistor, fixed, 15K ohms, 5%, 1 watt	R11
	Resistor, fixed, 33K ohms, 10%, 1/2 watt	R26
	Resistor, fixed, 180K ohms, 10%, 1/2 watt	R8
	Resistor, fixed, 215 K ohms, 1%, 1/2 watt	R24
	Resistor, fixed, 470K ohms, 20%, 1/2 watt	R10

When ordering replacement parts, be sure to list the model number of the tube tester, Serial number as well as the Part Number, Symbol and complete description of the item.

