



The tube testing processes used for the Hickok 539A are very similar to those used by many of the other Hickok and Military tube testers.

So what are all these dials and meters?

Lets start at the top left and work our way through.



Adjust to the red line – 100 volts.



Once the power is switched on, we set the line voltage to 100 volts AC.



Note: No NUVISTOR, COMPACTRON, nor NOVAR sockets; tester

predates these tubes.

Older tube sockets include....

Always connect the Top Caps connector (when used) IAW the roll chart (G=Grid, P=Plate).



Mohs are the inverse of Ohms (amplification instead of resistance).

Note the four Mutual Conductance (Gm) ranges, and the Rectifiers & Diodes O.K. mark. Only use the Reverse setting when specified in the roll chart (rare).



The pin settings are guided by the roll chart.

Left to right, Two Filament pin selectors,

and five other tube element pin selectors (Signal Grid, Plate, Screen, Cathode, and Suppressor).

The Selector Switches are electrically interlocked so that it is impossible to connect 2 different voltage elements to the same pin, eliminating accidental shorts.



The bias setting is guided by the roll chart.

Bias voltage is adjustable in two ranges (10 and 50 volts).

Use the lowest one you can.

Can also self bias using identified resistor value (rarely used).

The Plate Current can be read, but has little significance since the tube is tested at such low plate and screen voltages (150 and 135).



All tubes must be tested for shorts.

Tubes with multiple settings must be shorts tested every time the settings are changed. The neon Shorts lamp is the indicator.



Note the steady glow on shorts test selector position 3 indicating a shorted tube. A table in the User Manual shows that this tube has a Filament to Cathode Short. What do you do with a shorted tube? Dispose of it.

Do not try to test a shorted tube.

Once you let the smoke out of the testers transformer, its hard to get it back in, and it is expensive smoke.



The shunt setting is guided by the roll chart. Used when testing diodes and rectifiers.



The filament setting is guided by the roll chart.



The switch to push is guided by the roll chart settings.

The P1, P2, and P3 push switches are used to test diodes and rectifiers.

The non lock and lock P4 push switches are used to test amplifier tubes.

The P5 and P6 push switches are used to test the tube for gas. The gas test is insensitive, complex, and seldom necessary (not covered in this presentation).

The P7 push switch shows actual line voltage on the small Power Control AC Voltmeter.



The range selection is guided by the roll chart. Always use the setting identified in the roll chart. Each range setting also adjusts the test voltages as indicated. Note that there are two 6000 micromho ranges with different test voltages.



The tubes are listed alphanumerically and the listing contains all the required settings. Pay special attention to the notations.



This roll chart is dated 1961. No tubes that came out after that date are on the roll chart. Foreign tube (i.e., ECC83) and Obsolete tube (i.e., 10, 24, 45, 2A3, etc.) settings are in Appendices added to the User Manual.



Roll Chart Notes are found at the very beginning of the roll chart.

Note 1 is important in that it is not marked on the tester itself.

Note 2 is related specifically to the testing of Thyratron tubes.

Note 3 indicates that Rectifiers and Diodes are tested for emission and to use the Rectifiers and Diodes O.K. mark as the indicator.

Note 4 indicates the Mutual Conductance (Gm) readings on the roll chart are minimum values.

Note 5 and user manual clearly state that the bias voltage needs to be adjusted during the actual test of amplifier tubes, after pressing the P4 test push switch.

The user manual clearly states that the line voltage needs to be adjusted during the actual test of amplifier tubes, after pressing the P4 test push switch.

This is particularly critical when testing high power tubes such as the 6L6.



The Cathode Activity control switch reduces the filament voltages by 10% when switched to the TEST mode for an amplifier tube Life Test. Leave it in the NORM setting for normal testing.

Roll	Chart – K	ey to	Tube 1	Testing	setup	
TUBE TYPE	FIL. SELECTO	BIAS RS VOLTS SI	HUNT PRESS	MIN. MUT. COND	. NOTATIONS	
53	2.5 JR-3204-	6 2.3	P4 P4	E 950	Triode No. 2 Triode Sect Can B	1
55 55	2.5 JR-0405-	0 0.0	P1 P1	BR	Diode No. 1 Diode No. 2	
540				- 000		-
Nr.			aletta sittem	un en an		
	1.4.	U. 9	S. PAT. I	NO. 1,99	9,858	

Select the tube to be tested.

Tube Type					
UBE TYPE	FIL. SELECTOR	BIAS S VOLTS SHUNT	PRESS	MIN. MUT. COND.	NOTATIONS
6,5	6.3 JR-230	07-0 6.0	P4	E 950	-
6L6 (6L7	6.3 JR-534 6 3 JR-034 6 3 JR-534	47-2 3.0 47-5 5.0 47-2 1.1	- P4 - P4 - P4	E 410 E 410	Cap Grid Cap Pin Grid
(())))))					

6L6 tube settings selected Filament Voltage - 6.3 Volts



Set Filament to 6.3 volts

		Selector	rs			
UBE TYPE	FIL.	SELECTORS	BIAS VOLTS SH	UNT PRESS	MIN. MUT. COND.	NOTATIONS
6L5	6.3	0R-200	-0 5.0		E 950	
6L6 6L7 6L7	6.3 6.3 6.3	JR-5347 JR-0347 JR-5347	7-2 3.0 7-5 5.0 7-2 1.1	P4 P4 P4	E 410 E 410	Cap Grid Can Pin Grid
	11////	//////				

6L6 tube settings selected.

the 1	Jeit	ectors B	IAS		MIN.	
IBE TYPE	FIL. SE	LECTORS VO	LTS SHUNT	PRESS	MUT. COND.	NOTATIONS
61.5	6.3	-5307-0	6.0	P4	E 950	-
6L6	6.3	R-0347-2	5.0	P4	E 410	Cap Grid Can
16L7	0.3	IR-5347-2		<u>F4</u>	E 410	Fundado

6L6 tube settings selected. Filament settings in letters - JR



Filament Selectors set to JR

		Plat Catho and "(Seleo	te, ode, Grid" tors					
UBE TYPE	FIL. S	SELECTOR	BIAS VOLTS	SHUNT	PRESS	MUT.	IN. COND.	NOTATIONS
6L5	-0.3 6.3	JR-030	7-0 (5.0	P4	E	950	
6L6 (6L7 (6L7	6.3 6.3 6.3	JR-534 JR-034 JR-534	7-2 3 7-5 5 7-2 1	3.0 5.0 1.1	P4 P4 P4	BEE	3800 410 410	Cap Gria Cap Pin Grid
	/////	//////						

6L6 tube settings selected.

Settings for Plate, Screen, Grid, Cathode, and Suppressor in order



Set to 5347-2

Question?

How many elements does a Pentode have? 5 – Gride, Plate, Screen, Cathode, and Suppressor

How many elements does a Triode have? 3 – Grid, Plate, and Cathode How many elements does a Tetrode have? 4 – Grid, Plate Screen, and Cathode



6L6 tube settings selected. Bias voltage set to 3.0 volts.



Use the lowest scale you can. Set to 3.0 volts.

				:	Range Selector	
UBE TYPE	FIL. S	ELECTORS VC	IAS DLTS SHUNT	PRESS	MIN. MLT. COND.	NOTATIONS
6L5	6.3	JR-2300-0	0 6.0	P4	£ 950	-
6L6 {6L7 6L7	6.3 6.3 6.3	JR-5347-2 JR-0347-5 JR-5347-2	2 3.0 5 5.0 2 1.1	P4 P4 P4	E 410 E 410	Cap Grid Cap Pin Grid
	()////					

6L6 tube settings selected. Letter indicates the Range Scale to use – B.



Letter indicates the Range Scale to use.

Note that the B Range uses the 15,000 Scale and .25 Signal Volts.

UBE TYPE	FIL.	SELECTORS	BIAS	SHUNT	PRESS	MUT.	IN. Cond.	NOTATIONS
0L4 6L5	0.3 6.3	JR-530	7-0 6	5.0	P4	DER	950	
6L7	6.3	JR-034 JR-534	7-5 5 7-2 1	5.0	P4 P4	E IN	410 410	Cap Grid Cap Pin Grid

6L6 tube settings selected. Always best to double check your settings.



Note that once the tube is inserted, the line voltage has to be adjusted. Once the P4 switch is pushed, the line will have to be readjusted again.



Note the intermittent flashes (Caused by the charging of a capacitor). Those flashes are normal.



6L6 tube settings selected.

Use P4 Push Switch to test Amplifier Tubes.



The switch to push is guided by the roll chart settings.

The non lock and lock P4 push switches are used to test amplifier tubes.



Note 5 and user manual clearly state that the bias voltage needs to be adjusted during the actual test of amplifier tubes, after pressing the P4 test push switch.

User manual clearly states that the Power voltage needs to be adjusted during the actual test of amplifier tubes, after pressing the P4 test push switch.

This is particularly critical when testing high power tubes such as the 6L6.



Use P4 Push Switch to test Amplifier Tubes. Wait for it to stabilize. Range Scale B is the 15,000 Mho scale. Tube has a Mutual Conductance (Gm) of 6,000

TUBE TYPE	FIL.	SELECTORS	BIAS VOLTS	SHUNT	PRESS	MUT.	IN. Cond.	NOTATIONS
6L5	0.3 6.3	JR-2300	7-0 6	.0	P4	DWD	950	
6L6 6L7 6L7	6.3 6.3	JR-0347 JR-5347	-2 3 -5 5 7-2 1	.0	P4 P4 P4	L L	410	Cap Grid Cap Pin Grid
(((((((((((((((((((((((((((((((((((((((1111	111111	1111				Min.	
							Gm	

6L6 tube settings selected.

Compare the test results to the Minimum Mutual Conductance (Gm). 6,000 vs 3,800 – tube is good.



Use P4 Push Switch to test Amplifier Tubes. Wait for it to stabilize. Range Scale B is the 15,000 Mho scale. The minimum Mutual Conductance (Gm) is 3,800 Tube has a Gm of 3,700. Tube tests below minimum value.



Note how a one volt change in Bias effects the Mutual Conductance Reading (High of 7,000, low of 5,500).



The 80 tube is a full wave Rectifier.

Each plate has separate tube settings, so it has 2 lines of data on the roll chart. Half wave rectifiers like the 35W4 and the 35Z5 only have one line of tube settings.



The 80 tube uses 5.0 for filament voltage.



Set to 5.0 Volts.

Question? What is the fastest way to destroy a vacuum tube.? Set the filament voltage too high.



Filament Selectors for the 80 tube are set to JR.



Filament Selectors for the 80 tube are set to JR.



Note that for the 80 tube, only the plate selector is set – Pin 3 for plate No. 1, Pin 2 for plate No. 2.



Plate set to Pin 3.



Bias is always set to 0.0 volts for rectifiers and diodes.



Set Bias to 0.0 for Rectifiers and Diodes.

		Shunt			
TUBE TYPE	FIL. SELECTORS VI 6.3 JR-0235-4 5.0 JR-0300-0 5.0 JR-0300-0	BIAS DLTS SHUILT 3.3 4.0 0.0 40 0.0 40	PRESS P4 P4 P3 P3 P3	MIN. MUT. COND. E 770 E 900 F + F +	NOTATIONS Cap = G Plate No. 1 Plate No. 2
183	.5.0 JR-0300-0	0.0 77	83	E	· 1000

The Shunt setting for the 80 tube is 40.



Set the shunt control to the setting from the tube chart,

			Rai Sele	nge ector	
TUBE TYPE	FIL. SELECTORS VI 6.3 JB-0235-4 6.3 JB-0235-4 5.0 JR-0300-0 5.0 JR-0200-0 5.0 JB-0300-0	IAS blts shunt 3.3 4.0 0.0 40 0.0 40 0.0 40 0.0 77	PRESS M P4 E P3 I P3 I P3 I	MIN. UT. COND. 770 Ca 900 Ca Pla Pla Pla	NOTATIONS p=G ate No. 1 ate No. 2

Use the F Range selector for diodes and rectifiers.



Range Selector is set to F for the test of Diodes and Rectifiers.

At this point we put the tube in the socket and readjust the Line control to 100 Volts.



At this point we put the tube in the socket and readjust the Line control to 100 Volts.



A Shorts Test is required any time any Pin Selectors are changed.



Rectifiers are tested using the P3 Push Switch.



Rectifiers are tested using the P3 Push Switch.



This 80 tube was previously tested for shorts. Running through the steps...



80 tube selected. What does the ★ Mean?



Note 3 - \star indicates that Rectifiers and Diodes are tested for emission and to use the Rectifiers and Diodes O.K. mark as the indicator.



80 tube tests above Rectifiers & Diodes O.K. mark



Tubes such as the 6Q7 contain multiple sections. In this case an amplifier and two diodes.



With the settings all made, the tube inserted, and the Line adjustments made, here is how a diode section of a 6Q7 Tube is tested.

