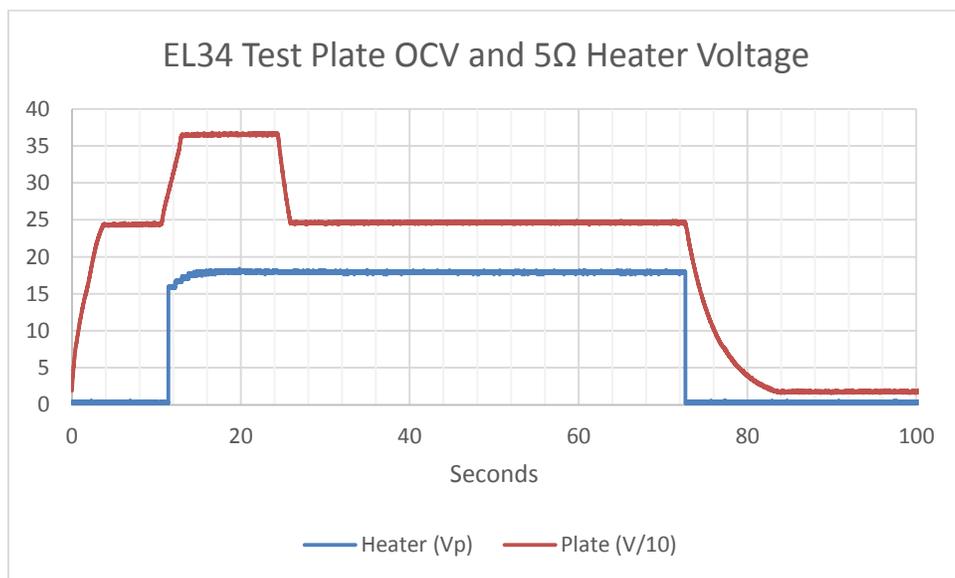
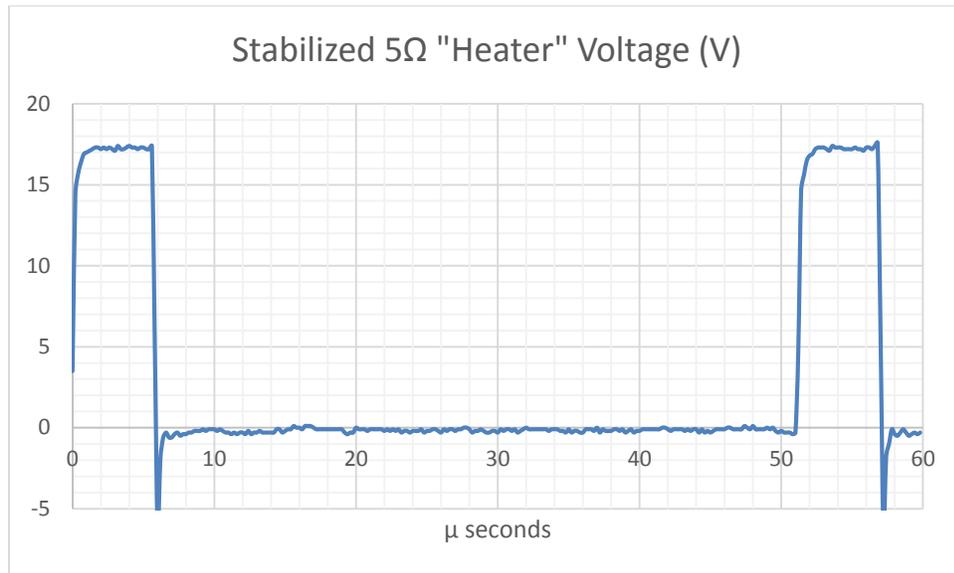


Orange VT1000 Valve Tester

How it tests "Power" Tubes,

1. When not connected the power supply measures 19.0 VDC.
 2. When connected, 18.7 VDC is present on Pin 7 of the octal tube socket (one side of the heater).
 3. When the "OK" switch is pressed, the voltages between Pin 5 (grid) and Pin 8 (cathode) builds from ~ 0 VDC to the following levels in ~ 5 seconds, depending upon which type of tube was selected when "OK" was pressed. (Subsequent changes in tube type selection have no impact – which could be problematic.)
 - a. Octal power tube: -51.1 VDC (-55.7 VDC)
 - b. EL84: -48.9 VDC (-53.3 VDC)
 - c. Preamp Tube: -32.1 VDC (-35.0 VDC)
- (The numbers in parentheses compensate for the loading effect of 10 M Ω measurement probe on VT1000's ~ 900 k Ω grid source resistance – lower load impedances will cause additional decreases.)
4. When "OK" is pressed again to start testing, the test will terminate and "Fail" will illuminate almost immediately if the heater is open circuited.
 5. If the heater is not open circuited, the test proceeds as follows:
 - a. The voltages from Pin 3 (plate) and Pin 4 (screen) to Pin 8 (cathode) increase form ~ 18 VDC to the following ("normal test") levels in ~ 5 seconds depending on the tube type selected:
 - i. "Power" tubes except KT88 and 6550: ~ 249 VDC
 - ii. KT88 and 6550: ~ 295 VDC
 - b. Then these voltages are increased to the ~ 366 VDC ("high voltage test") levels as indicated below:
 - i. For "Power" tubes except KT88 and 6550: After 4-6 seconds at ~ 249 VDC, the ~ 4 seconds increase begins.
 - ii. For KT88: After 16 seconds at ~ 295 VDC, the ~ 1 second increase begins.
 - iii. For 6550: After 9 seconds at ~ 295 VDC, the ~ 1 second increase begins.
 - c. Concurrent with the beginning of these plate and screen voltage increases, power is applied to the heater. I.e. the voltage between Pins 7 and 2 increases (via PWM) from 0V to ~ 1.7 VRMS (17 Vp @ 10% duty cycle) in ~ 5 seconds. (Note - that's $\sim 27\%$ of the 6.3 VRMS specified by the tube manufacturers!)





6. Leakages were individually simulated with varying resistances generating the following results with the EL34 test selected:
 - a. Plate to cathode:
 - i. 10k Ω caused test "Fail" 7 seconds after initiation (during the first plate voltage increase - from 18 toward 249 VDC). Plate and screen voltages decrease to \sim 18 VDC upon "Fail"
 - ii. 15k Ω caused test "Fail" 20 seconds after initiation (during the second plate voltage increase - from 172 VDC toward 366 VDC. The decrease in the "normal test" voltage from \sim 249 VDC to 172 VDC suggests that the VT1000's plate drive circuit has \sim 6.8k Ω source resistance.
 - iii. 20k Ω caused test "Fail" 32 seconds after initiation (during the second plate voltage increase - from 187 VDC toward 366 VDC. The decrease in the "normal test" voltage from \sim 248 VDC to 187 VDC suggests that the VT1000's plate drive circuit has \sim 6.7k Ω source resistance.
 - iv. 23k Ω was adequate to prevent test "Fail". The 191 VDC and 282 VDC levels achieved suggest 6.8 Ω and 6.9 k Ω plate voltage source impedances.
 - b. Screen to cathode:
 - i. 20k Ω caused test "Fail" 8 seconds after initiation (during the first plate voltage increase - from 18 toward 248 VDC).
 - ii. 46k Ω caused test "Fail" 18 seconds after initiation (during the second plate voltage increase - from 212 VDC toward 363 VDC. The decrease in the "normal test" voltage from \sim 248 VDC to 212 VDC suggests that the VT1000's plate drive circuit has \sim 7.8 k Ω source resistance.
 - iii. 51k Ω was adequate to prevent test "Fail". The 216 VDC and 320 VDC levels achieved suggest 7.4 k Ω and 6.9 k Ω plate voltage source impedances.
 - c. 0 Ω Grid to cathode, plate, or screen does not stop the test sequence
7. If the heater isn't open circuit and the equivalent leakage resistances between the cathode and the plate and screen exceed 23k Ω and 51k Ω respectively, the grid - cathode voltage is increased from -51.1 VDC to 0 VDC linearly at 5V/second starting at the following times into the test:
 - a. For "Power" tubes except KT88 and 6550: 30-40 seconds
 - b. KT88: 48 seconds
 - c. 6550: 40 seconds
8. If the heater resistance is below \sim 1 Ω or somewhere between 27 Ω and 54 Ω when the grid - cathode voltage gets to 0 VDC (or sometimes earlier for the lower resistances), the heater current and plate/screen voltages will