

## **Problems:**

- The + 5 volt supply current will double and the regulator may overheat unless certain things are done.
- The removal of the Nixie tube load from the +300 volt supply will destroy the voltage regulation and cause the transmit tube plate current to overshoot. The load must be replaced with a large wattage resistor.
- The extra current on the +5 volt line will result in less than minimum voltage applied to the LED counter due to a 10 microhenry choke at the rear of the counter cage. This must be corrected.
- The extra +5 volt current drain will require changing the size of the series resistor on the power board to 7.5 Ohms, 10 watts. This is R29 on CX7/A board or R21 on Johnson CX7B board.

## **Installation:**

- Looking at the inside of the cage, rear terminals. Remove violet wire #402. Use extreme care not to break the fragile ceramic feedthru capacitor. Splice and extend wires #395, #479, and #481 to reach the terminals on the new LED board.
- Add new 10 microhenry choke, less than 1 Ohm type, across the feedthru capacitors that hold the existing choke. The new choke may be mounted outside the rear of the cage. Add new 15k Ohm, 10 watt resistor outside the rear of the cage, from terminal #402 (the violet wire was removed inside the cage) to one of the existing solder lug grounds. Use Teflon tubing to prevent shorts and mechanically stabilize the resistor. This gets very hot, so space it out properly.
- Due to different amounts of current the new 15k Ohm resistor draws vs the Nixie tubes, the Zero on the SCREEN meter reading will read upscale usually. Select new size for R4 (was 47k Ohms) to better zero the meter. Values from 36k to 43k Ohms. There is no problem letting the meter read up scale slightly if you allow for the error when reading SCREEN current.
- Cunningham recommended adding a 70 to 100  $\mu$ fd, 50 Volt capacitor from the voltage regulator side of R29 (CX7A) or R21 (CX7B) to ground to filter and stabilize the +5 Volt regulator. He also recommends that the METER LAMP, which draws 100 ma. be removed from the +5 Volt supply (brown wire at rear of cage is the buss) and connected, thru a resistor, to the 13 VAC tube filament buss. This is heavy wire to feedthru capacitor at tube box. Use care not to break the feedthru capacitor at the tube box. Depending on the lamp used, 100 Ohms, 2 Watt is typical size, but 47 Ohms to 82 Ohms has been used. Optional is to replace lamp with 12 volt type and series resistor about 27 Ohms, 1/2 to 1 watt. Mount resistor near meter.

## **LED Counter Problems:**

- Verify that all 4 corner ground screw holes are connected. Some were not. Add jumper wires under the board if required. Many boards had wrong size capacitors at C1, C2, & C3. These should be .001  $\mu$ fd. If diodes D1 & D2 are silicon types (1N4148/1N914), R1 & R2 are 2.7k Ohms, this is OK.

Diode D11 should be germanium type (1N270). Capacitor C14 should be 15  $\mu$ fd. Verify that I.C. U18 is 7490 standard type, not "LS" variety. The LS type may be used everywhere but U5 and U18 to reduce heating. U19 may be removed entirely. Most problems are poorly soldered socket pins on top of board, under I.C.'s. Verify +5 Volts on all Vcc pins. In many cases, the left LED display has a right hand decimal for OVERRANGE. A left hand digit may be substituted (#5082-7750).

W8CXS