SB220 Rectifier Meter Board

16 JUN 2024 CTR Engineering Inc W8JI Rev1

Circuit board trace spacing is the most common mistake inexperienced HV circuit board designers make. Circuit boards should have at least 1/10th inch foil trace spacing for every 1000-volt gradient between any two bare traces. Spacing can be reduced if one or both traces are completely coated by insulation, such as a quality solder mask. Spacing must be increased with sharp-edged traces.

Failure to follow good design procedures can result in carbon tracking, creepage, and eventually result in a board failure like this:

Figure 1 carbon tracked board

This board meets or exceeds accepted voltage spacing rules.

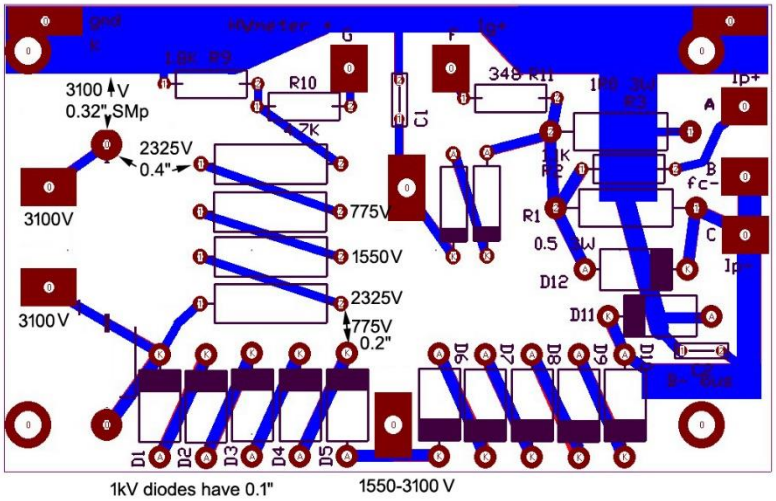


Figure 2 Maximum Voltage Gradient Map

This board retains OEM Heathkit wiring and metering. This board produces precise meter readings while using standard off-the-shelf part values for components while being easy to install and service. This board fully protects the meters and other parts from damaging high-voltage shorts such as tube arcs.

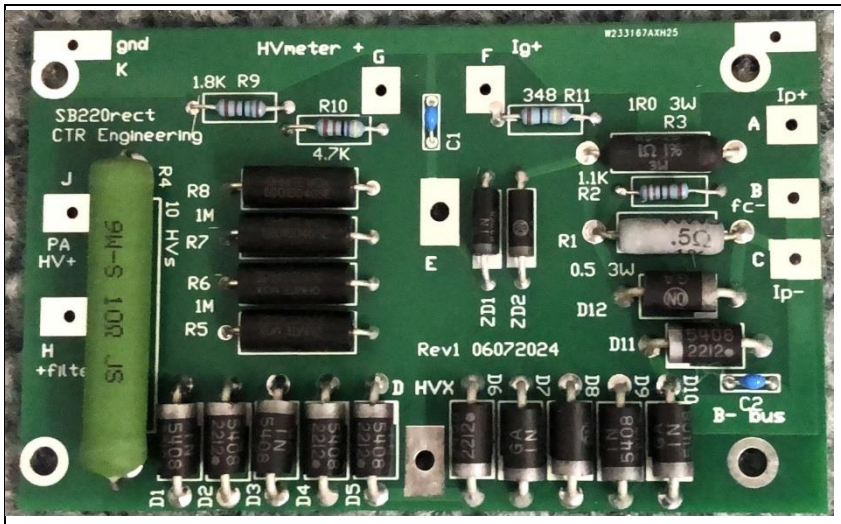


Figure 3

This board has the following features:

1. Internal bias using two 5-watt 3.9Vdc Zener diodes
2. Board trace spacing conforms to standards of 100 mils per kV. This ensures long reliable board life. E.g. 3kV requires 0.3” board spacing
3. Use of standard fixed resistors with precise metering results
4. Full meter protection with clamp diodes. There is no need to clamp at meters
5. Easily adapted for accurate use with replacement meters up to 1mA and 350mV
6. Rectifier headroom over 1.6 times at the SSB HV setting
7. Retains OEM Heathkit wiring size, letters, and positions
8. 10-ohm on-board 9kV rated flameproof fault resistor designed for exact application
9. Ground trace redundancy with wide double-layer grounds
10. RF bypassing on filament center tap and B- rail
11. Full solder mask high-quality printed circuit board
12. Clean properly-engineered layout

Installation

While this board can be worked in without dropping the front panel, removing the front panel (and possibly side panel) is much better.

This board is a wire-for-wire replacement. It retains OEM wire letter designations. This board works with the OEM filter board, our filter capacitor board, or any aftermarket filter board.

1. Remove Tune, Load, and Band knobs

Figure 4 remove knobs

2. The panel will be retained by two recessed screws and nuts in the bottom corners. Remove them and carefully lay the panel forward to unsolder and remove the OEM board. Once the OEM board is removed the front panel can lay to the side.

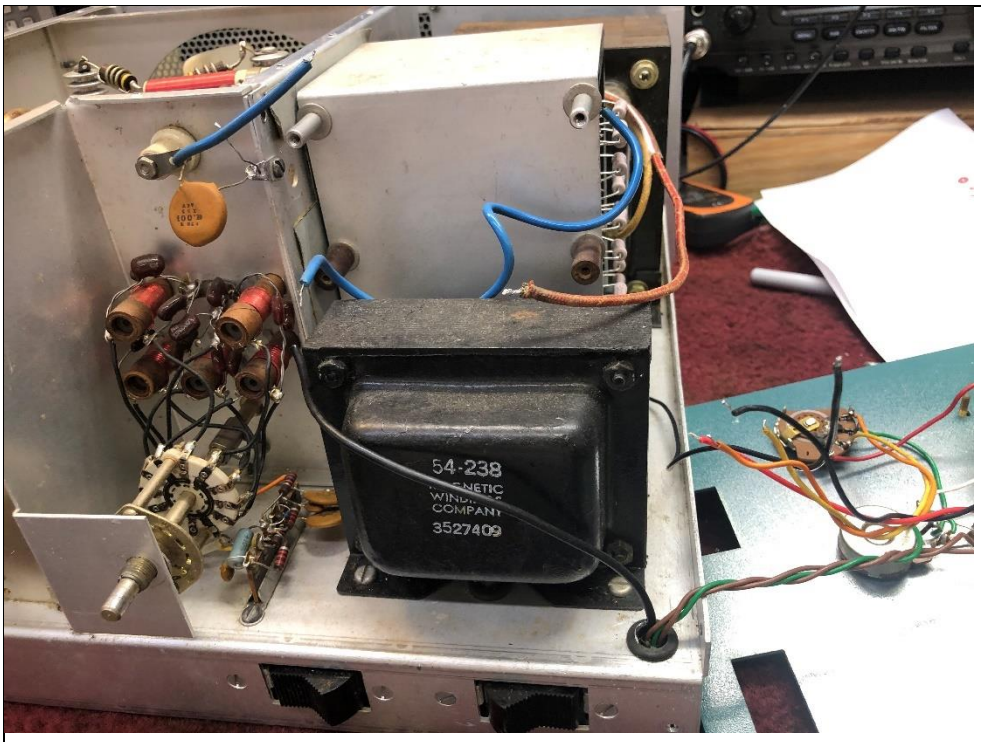


Figure 5 OEM Board out

3. I like to flip the ground lug around (wire K) for added room.

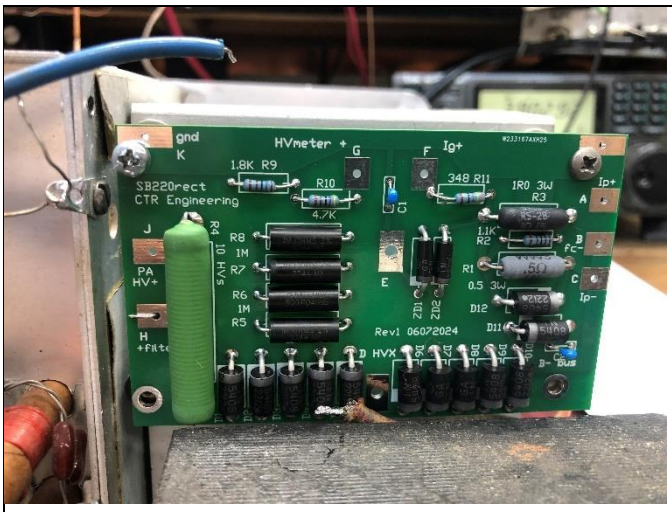


Figure 6

4. This is a double-sided board. Wires can be soldered from either side. Wiring will look neater if the two filter capacitor board wires (Fc+ Fc-) and the heavy power transformer wire connect on the back side.

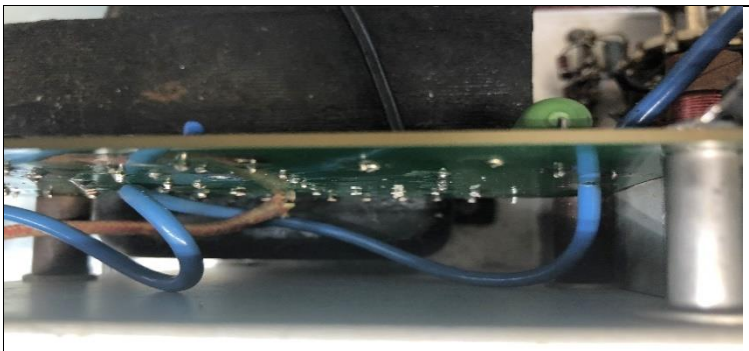


Figure 7

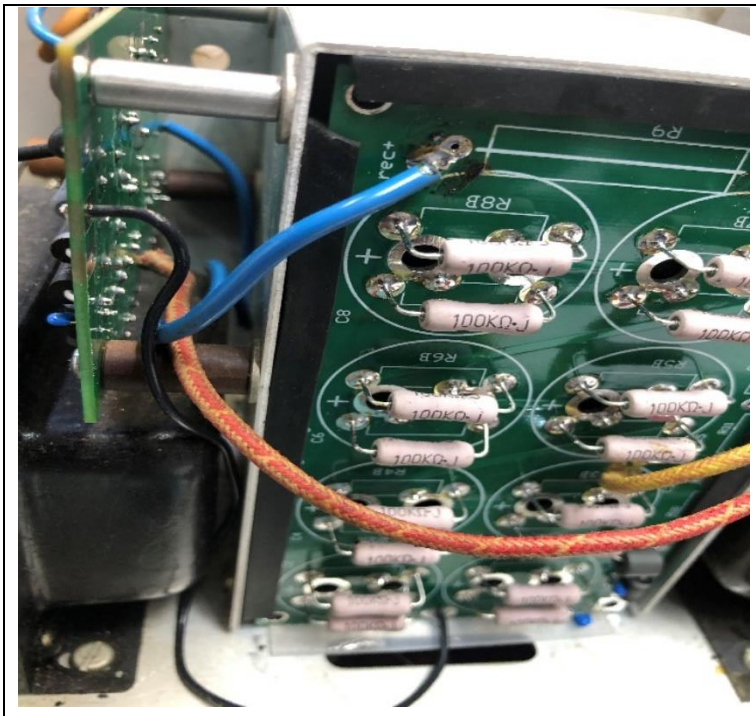


Figure 8

5. A gentle twist to meter switch wires and Plate Current meter wires will make the SB220 wiring look more orderly.

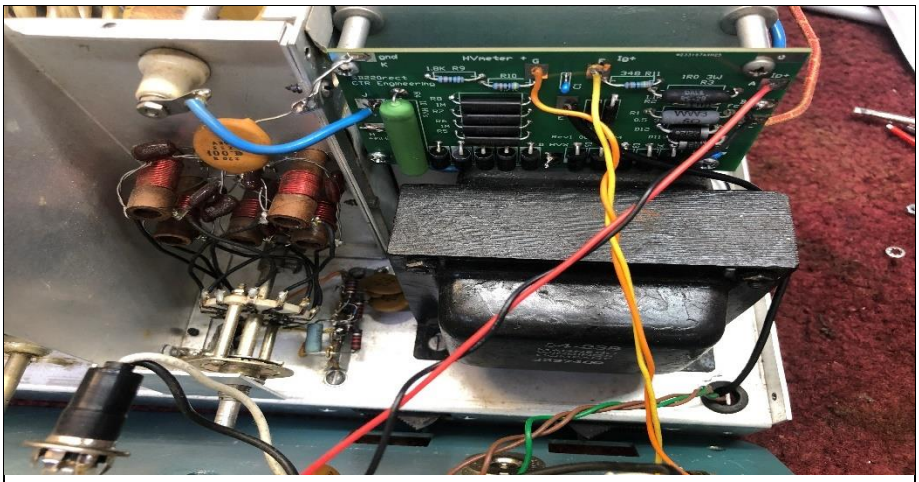


Figure 9

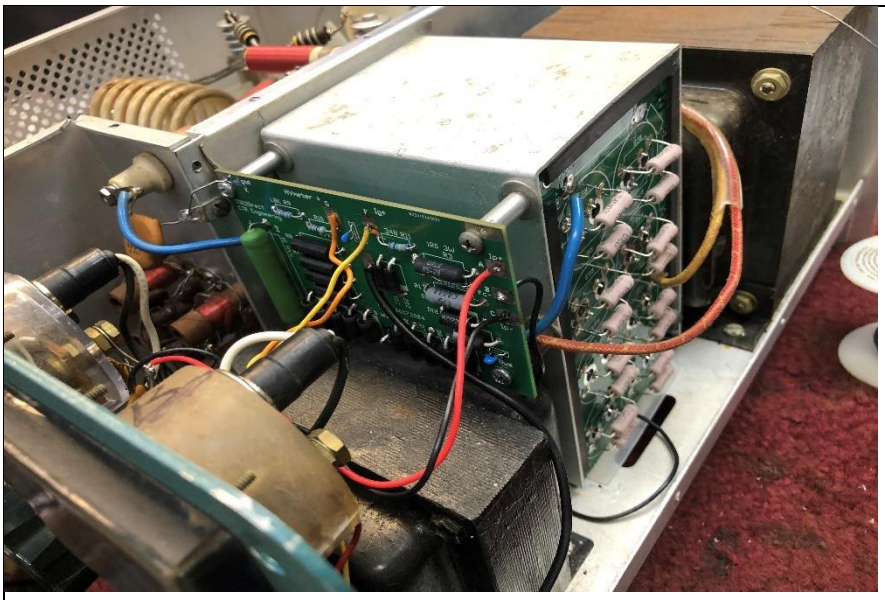
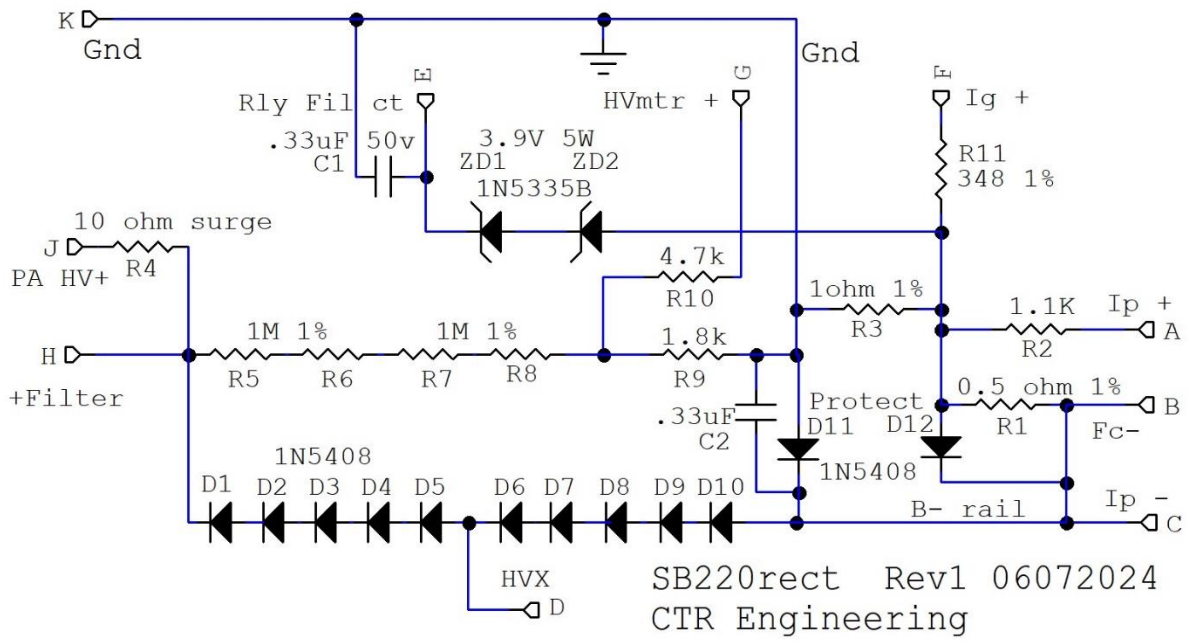


Figure 10

Please contact me if you have different meters or meter movements. This board is shipped for original meters.

Metering verification with calibrated 5kV 1/2 % probe. Do not do this at home!

Schematic



Connection Pictorial is same as OEM