

At the Repair Bench – MFI-941E – July 2024

A short while ago, one of our fellow GCARC Club members asked me about making a repair to his MFJ antenna tuner, a model 941E Versa Tuner II. It seems that he had grown tired of having to shine a flashlight on the panel meter to read the crossed needles at night. Apparently, the factory illumination for the panel meter, a 12V incandescent lamp, had failed, as they are prone to do. I decided to make a far more permanent repair by fitting a white LED in place of the incandescent lamp. I also noted that one of the four rubber bumper “feet” for the unit was missing.



Figure 1 - MFJ 941E Versa Tuner II

I opened up the unit – a total of eight screws, with three on each side and two across the top front of the cover – and checked to make sure that the lamp had actually failed and that there was not some other problem. With 13.8V supplied to the rear panel power inlet for the lamp, and with the lamp switch in its “ON” position, I had the full 13.8V across the (dead) lamp. Lamp failure was confirmed.



Figure 2 - Lamp holder in meter housing

I removed the lamp holder from its place in the meter housing, and then set about removing the lamp from the holder. That took a little bit of doing because of the manner in which the lamp's bare wire leads had been fed through the holder and wrapped around the socket terminals of the holder. In addition, there is a 0.01 μ F ceramic disc capacitor across the lamp, and that had to be dealt with as well. I worked at it, and eventually had the holder completely stripped and disassembled.

Disassembly of the holder was necessary in order to make a provision for the LED leads to pass through the holder base alongside the socket terminals. The LED leads are much heavier than were the lamp wire leads, and I needed to make holes for the leads to run through. That was simple enough, using a “T” pin and a pair of long-nose pliers to push the pin through the plastic alongside the terminal contacts.

I gathered up the necessary parts – a white 5mm LED, a 510 Ω 250mW 5% resistor for current limiting, and a replacement for the 0.01 μ F capacitor that was unavoidably damaged in removal. The LED fit perfectly into the lamp holder, and I wrapped the LED leads around the terminal contacts. I then added the resistor to the cathode terminal, after which I installed the capacitor across the LED. I soldered the components in place and formed a small hook on the opposite end of the resistor, so as to facilitate connection of the cathode lead there. Finally, I soldered

the lamp circuit wires to the lamp holder terminal (anode) and to the resistor (cathode), cleaning up the excess lead lengths.

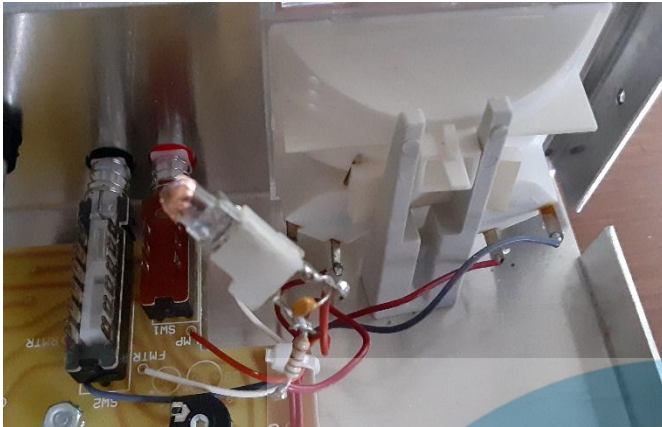


Figure 3 - Copper tape on end of LED

The incandescent lamp and the LED emit light in different patterns. The incandescent lamp emits its light in a diffuse pattern all around the lamp envelope without any particular focus. The LED, on the other hand, emits most of its light in the forward direction off the end of the LED envelope. This caused an objectionable “white spot” to appear in the center of the meter when the LED was powered up. I resolved that issue by applying a dome cap of copper tape to the very end of the LED envelope, blocking most if not all of the light in the immediate forward direction. As a result, the illumination

of the meter is now more diffuse while still being sufficiently bright for reading the meter under any ambient light level. I installed the cover and gave the unit a final look-over.

At that point, I remembered the missing rubber bumper “foot” on the unit. I removed the remaining three bumpers, which were barely holding on, and cleaned the surface thoroughly with some 99.9% IPA. Then, I installed a matched set of four new bumpers to the bottom of the unit. Job done.

Sometimes, repairs can make a piece of equipment better than the factory design level. I am not sure, in today’s electronic world, why MFJ chose to use incandescent illumination other than maybe the fact that it made diffusion of the produced light a non-issue and therefore cut some minor expense. However, it also built in some planned failures, which could easily have been avoided. This unit should never suffer another panel meter illumination failure.

See you next month!