MEP-805B keypad stops working and how to fix it

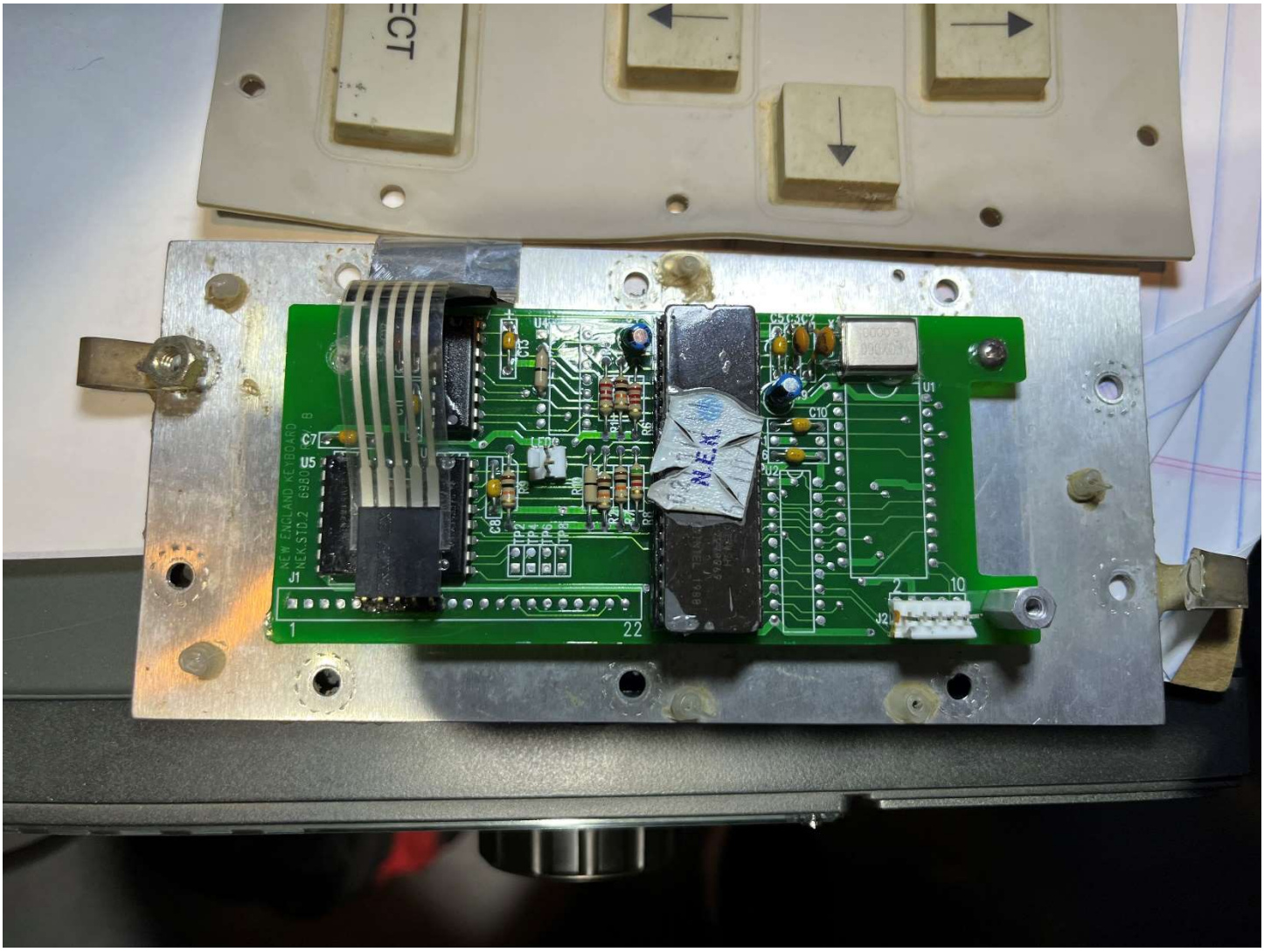
Bill C. - 6/12/2024

The SELECT button on my MEP-805B keypad stopped working. This is a common occurrence. This document explains how I fixed it, and what the design flaws are that causes this problem to occur. The designers did a horrible job on this module, the details of which I will describe momentarily.

Remove the 10 screws that hold the keypad to the front panel and unplug the two connectors from the keypad module. This is easily done by peeling back the aluminum tape and unplugging the two cables from the PC board, as shown below:

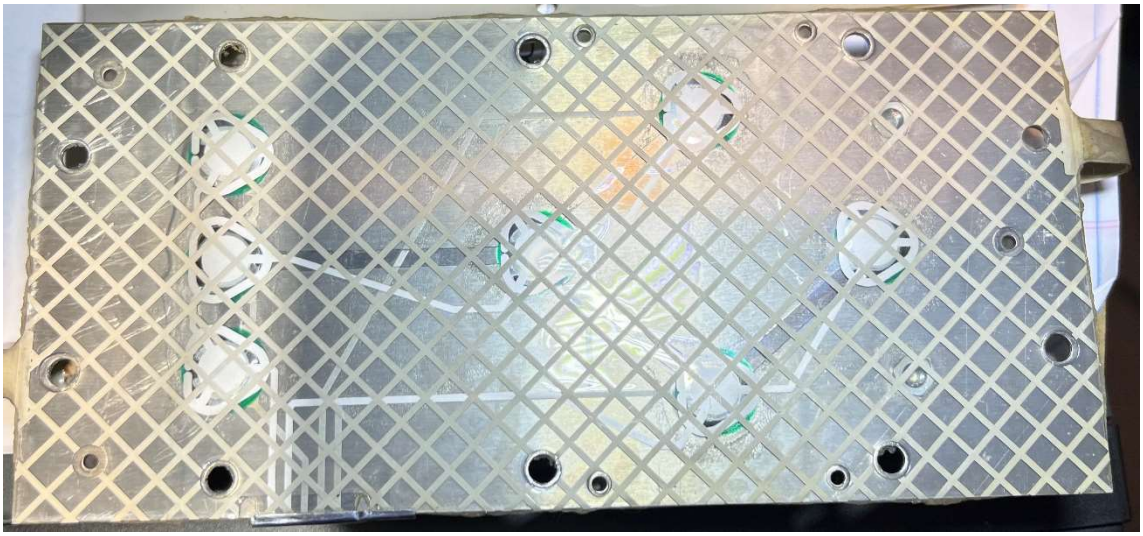
The aluminum back cover is held in place by two 4-40 screws to standoffs in opposite corners. When I removed them on my unit, the problem was immediately obvious. The larger connector in the corner has a yellow wire with a small screw lug on it so that this wire can be GNDed to the aluminum cover. It is fastened in place using the 4-40 standoff, but it had snapped-off. The aluminum cover has far too much weight to be held in place with such small hardware (4-40) and only two fasteners. There is no good way to fix this because any jarring movement or prolonged engine vibration is going to break these standoffs. The best course of action is to simply jettison the aluminum cover and do without it. You can get away with this because the whole assembly is conformal-coated inside, just like the rest of the generator electronics. Conformal-coating is commonly done to all military electronics and it offers a huge amount of protection from moisture and the elements.

When you remove the aluminum cover, it looks like this:



You can see the shiny conformal coating sprayed and/or dipped over the entire PCB.

The front of the keypad looks like this:

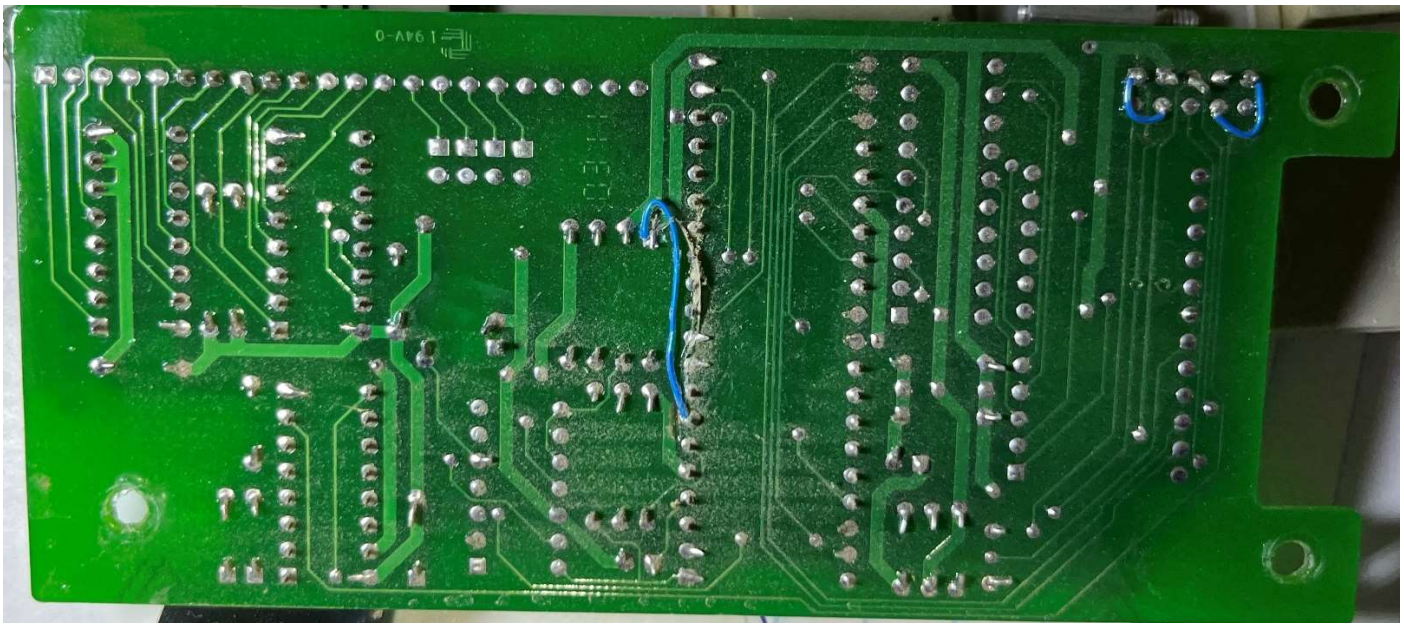


I disconnected the flex cable running from the keypad to the PCB and verified with an ohmmeter that the keys made a proper connection. You can do this by choosing any two pins and pressing buttons until you get a low-resistance connection

indicated by the ohmmeter. If you find that one button is bad, *i.e.,* no low resistance connection on any combination of the 5 lines in the flex cable, then the keypad is bad. This can be tedious because you don't know which pin is which in the flex connector. **But please note that the keypad is not likely to fail.** Unlike the rest of the module, it appears to be very well engineered. The cross-hatched conductors are an attempt by the manufacturer to form a Faraday shield around the keypad module. This mesh connects to GND at only two of the 10 mounting screws, one at the top and one at the bottom via the feathery metal links with captive nut. The purpose of this mesh (and the aluminum back cover) is threefold: (1) ESD protection, (2) improve RF susceptibility, and (3) reduce RF emissions.

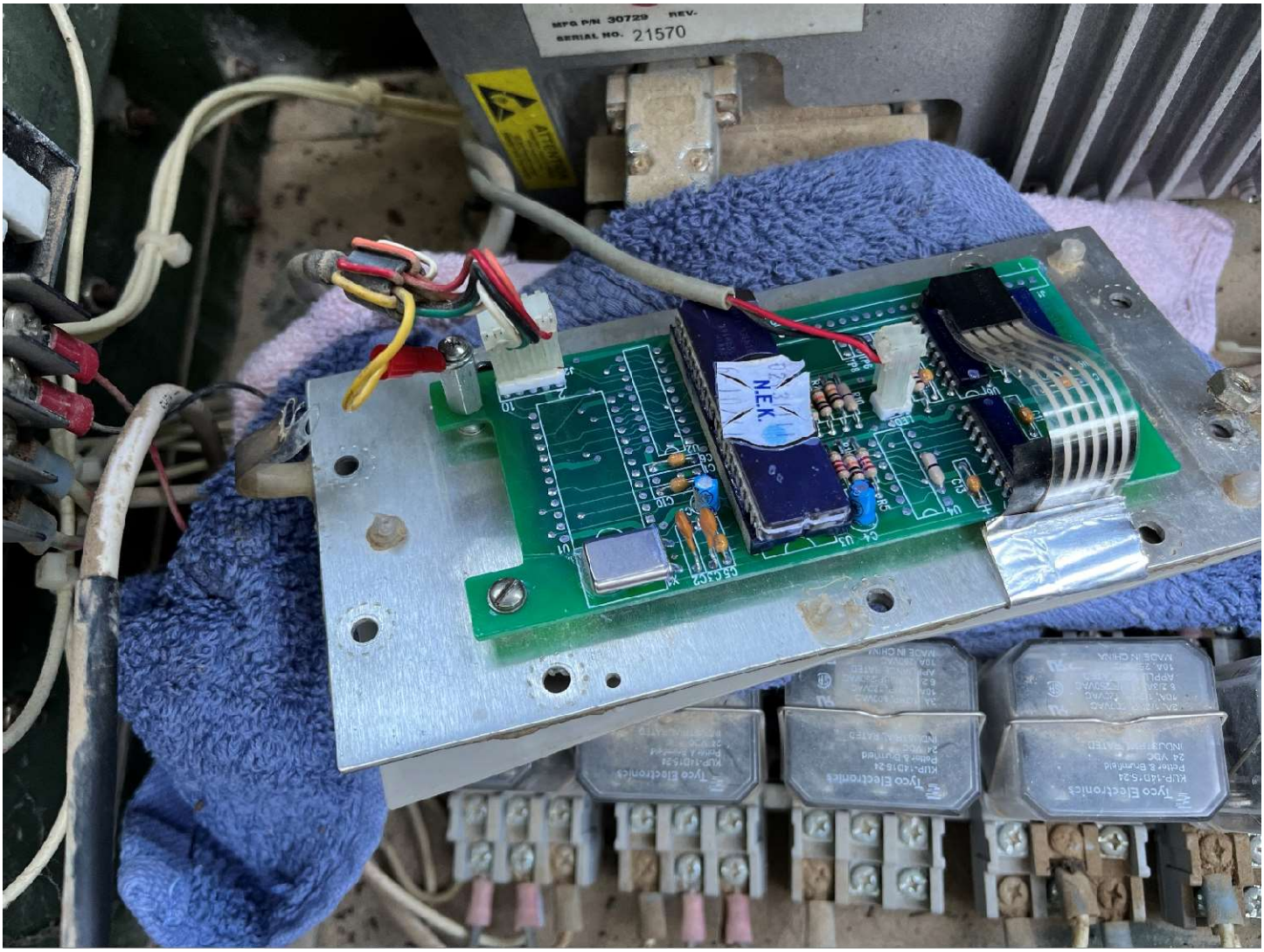
The mesh gives the keypad a considerable amount of ESD immunity to the Human Body Model (±15kV 150pF 330Ω) in case the elastomeric membrane buttons fail to stop an ESD discharge. It also prevents the buttons from being activated by the mere presence of a person's charged-up finger coming near it. The mesh reduces radiated emissions from the keypad circuitry to only a small degree, because the whole module is mostly open to the outside world. It has seams and gaps and the two I/O cables connecting to it are not shielded. Suffice it to say that you can remove the aluminum back cover and do without it. This will prevent its weight from snapping the 4-40 hardware again during vibration. Definitely not a manufacturing friendly design!

If this design weren't bad enough, there are three blue wires on the back-side of the PCB. Blue wires are used to correct a PCB layout error once the design goes into production. I can't tell if the manufacturer reused a similar design from another program and had to modify it, or if there were simply three routing errors in the layout that were never fixed. Regardless, this is simple carelessness. (I'm an electrical engineer designing electronics for over 40 years -- my designs are batting 1000 for No Blue Wires™.)



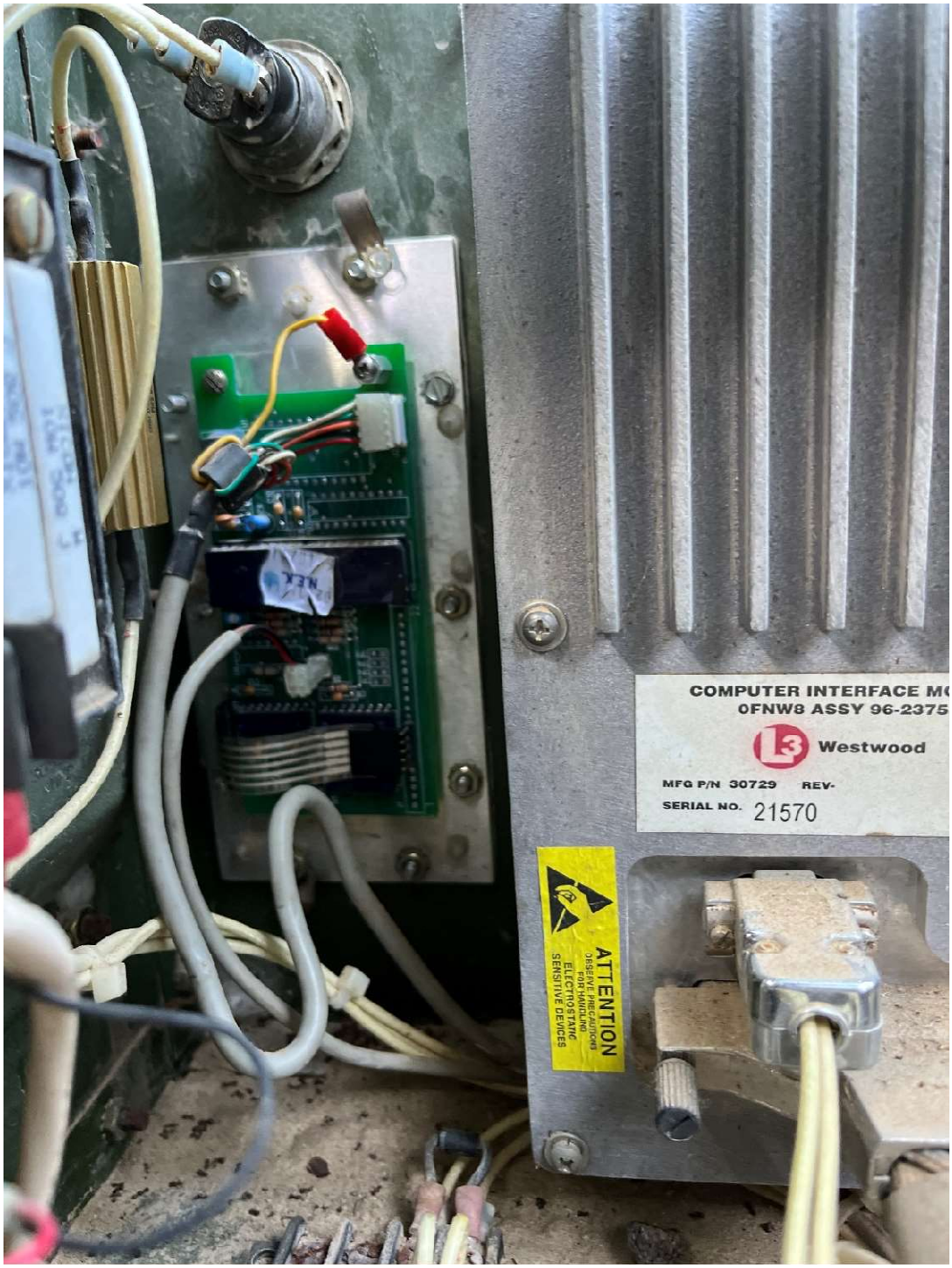
The workmanship for the blue wire in the middle of the PCB is poor. There may have been a short from this wire to a pad underneath. I had problems getting the keypad to work until I pried the blue wire up from its glue trail and moved it over slightly to the left as shown above.

Testing of the keypad module “in situ” to see if it works:



It works! You can see the yellow wire from the I/O cable that connects to the standoff in order to make contact with GND. I found that this standoff had snapped-off when I first opened it up. The DC power cable with the black and red wires supplies +5VDC power to the PCB. Red is +5VDC and black is GND. There is a ferrite bead on the I/O cable to help suppress common-mode RF energy from radiating off the I/O cable. This can sometimes help reduce RF emissions by up to 15 dB in the VHF range. After all, you wouldn’t want the enemy to track a radio emission back to your location!

Placing the keypad back into the front panel:



The keypad went back in surprisingly easy and most of the 10 screws around the perimeter were easy to fasten. Be sure to tie-wrap the cables to other nearby cables so that they do not vibrate too much. Also keep them away from the power resistors on the side wall so that they do not get charred or melted.

I hope you find this information helpful. If no luck, other posts indicate that you can plug in an old-fashioned computer mouse that has a DB-9 connector and use the mouse to navigate the computer screen.

Bill C.