

Fluke 8840A/42A IEEE 488 Card Assembly Instructions

Thank you for purchasing this kit form of our IEEE 488 card for the Fluke 8840A/8842A multimeter. In order to successfully complete the kit assembly and install the device, you will need soldering equipment with both wide tips and fine tips, a PCB vise or holder, water-soluble or rosin flux solder 20mil diameter or similar, clamps for holding components in place. We estimate 2-3 hours to assemble given modest skills. Everything is through-hole assembly, but following a sequence will aid in inserting components and avoiding mistakes. We have included sockets for all of the ICs so that you can feel a bit more comforted in testing the board as you assemble it. They are not strictly necessary, but do use them for the 40-pin devices at least.

Fluke produced 3-4 versions of the HPIB card over the ~20 year sales life of these meters. **All but the final version required 4KB firmware specific to the model (8840A, 8840AF, 8842A).** The final revision, which we have replicated, is universal with an 8KB firmware image. It also supports a slightly more extensive 488 command set.

We have run numerous HPIB bus tests against this replica adapter including exercising almost all of the available HPIB commands. Some commands are intended primarily for automated calibration and present certain difficulties in functional operation verification. These are not fully tested. We have made no attempt to verify bus timing specifications as it is entirely impractical for such a kit design. However, the components supplied are identical to those specified in the original Fluke parts list. With an 8Mhz clock and a high quality PCB, we expect that the untested functions will perform as well as the tested ones.

This assembly sequence sets up the HWC replica identical to the factory configuration. As referenced in the Service manual, there are several unused jumpers that can alter functionality. Please consult a Service manual to implement any such changes.

Cautions:

Use reasonable ESD protection methods like mats & wrist bands when handling the semiconductor devices. Read all of the instructions first! **It is important that the sequence is followed for ease of assembly and testing!**

Recommended Assembly Sequence

1. Insert the 1/4W resistors, zener diodes, signal diodes, power diodes. Recheck placement and orientation and solder them in place.
 - a. R911/912 33K
 - b. R913/914 1.5K
 - c. R915/916/919 470
 - d. R917/918/938 100
 - e. R920 3.3K
 - f. R943 68K

- g. R944 51K
 - h. R945/946/947 10K
 - i. CR901/902 1N748 3.9V zener
 - j. CR903/904/905/906/910 1N914 (1N4448) signal-diode
 - k. CR908/909 1N4002A power diode
2. Insert the small capacitors one value at a time. (1u, 0.01u, 430p, 0.22u, 1000pf, 47u, 18pf). Check the polarity of the 1u & 47u solid tantalum capacitors and then solder all into place.
- a. C901 1uF tant (polarized!)
 - b. C902/903/907/908 0.01uF
 - c. C909 430pF
 - d. C911/918/919/920/923/925/926/927/928 0.22uF
 - e. C914 0.001uF
 - f. C915 47uF tant (polarized)
 - g. C921/922 18pF
3. Insert jumper E902 and noise filter RV901 and solder them in place.
- a. E905 jumper
 - b. RV901 EMI filter
4. Insert sockets, check orientation, solder in place. Use a spring clamp to hold them against the PCB.
- a. XU901/905/908/909/910/911/912/913
5. Install Z903 DIP resistor network. Check orientation. Solder.
- a. Z903 3.3K DIP resistor pack
6. Insert 5 test points and solder in place. Insure that there is solder on the top rectangular pad for support.
- a. TP901/902/903/905/906
7. Insert heatsink and solder with wide tip. Use a daub of thermal compound and screw VR901 in place about mid-way in slot using 6-32 screw & nut. Solder in place.
- a. XVR901 regulator heat sink
 - b. XH4/XH5 6-32 screw & nut
 - c. VR901 1.5A 5V 3-pin regulator
8. Install connectors J901, J903, J904 using clamps and solder with wide and narrow tips as needed. Note that these connectors mount to the component side and when the PCB is flipped upside down these connectors fit through the provided openings in the back of the meter. Use clamps to hold against PCB while soldering. Put jack screws & lock washers XH10 into J901 so they don't get lost.
- a. J901 HPIB 24 pin RA connector (pin protector retracts into connector)
 - b. XH10 #6-32 jack screws & lock washers (2pr)

- c. J903/904 RA BNC connector
9. Install J902 which has a pre-installed **polarity key** that aligns with the IDC ribbon cable connector. Insert J902 into the top component side of the PCB with the **key** against the PCB edge. Consult photos and get this correct. Clamp and solder in place.
 - a. J902 10 pin header connector
10. Install C910 and solder. Leave the leads about ¼" long to allow testing. Trim after final testing.
 - a. C910 4700uF filter capacitor (polarized)
11. Install the 8 Mhz crystal Y901 and solder.
 - a. Y901 8Mhz crystal
12. With an ohmmeter and continuity checker check nodes associated with VAC, VDC, VCC to GND insuring there are no shorts and that the incoming AC from J902 properly passes through the rectifiers to C910. Check that there are no shorts to VCC & GND at any of the ICs.
13. We have intentionally not installed S901 yet as it is not safe against water ingress. This is a good time to clean away solder flux using soap & water for water flux or flux remover for rosin flux. (You can fully test the assembled board before installing S901 as all open S901 switches is BUS address 1). We recommend blowing off the PCB with air and drying in a 50C oven for 30 minutes before continuing.
14. Connect a current limited supply of 10VDC 100mA to C901 and measure for 5VDC from the 7805 regulator between TP902 & TP903. Supply current should be < 25mA with no ICs installed. Check for 5VDC at all IC socket power pins.
15. If all is ok so far, install U905, U908, U909, U910. Increase current limit to ~ 300mA and re-test power.
 - a. U905/908/909/910 78LS368/LM339A/74LS14/74LS32
16. Install U912 & U913. **NOTE that the location of these devices is different from an OEM Fluke PCB.** Re-check power and adjust current limit as needed.
 - a. U912 SN75LS160
 - b. U913 SN75LS161
17. If all is ok, install U901 & U911. Total current draw should be under 350mA with all components installed. If anything is out of order here stop immediately and determine the fault. You may have a reversed IC, or a solder bridge, or missed a solder joint.
 - a. U901 Z86E21 microprocessor
 - b. U911 UDP7210C (NAT7210B)
18. If all is ok, insert the rivets H6 & H7 into MH1 & MH2 **from the backside**. Insert the plungers into the rivets only ½ way. Mount the PCB into the test position with components toward the rear of the meter. Press the plungers fully in to lock the PCB into the test position. With the meter unplugged, connect the 884XA HPIB ribbon cable. No other connections are needed for preliminary testing. Plug in the meter and power it on. Your meter should breeze through the POST with no errors. Pressing the local key should display the current BUS address. If you are getting POST errors with the board connected but not with it disconnected you likely have an assembly error. Re-visit all of the assembly steps.
 - a. XH6/7 rivet

b. XH8/9 pin

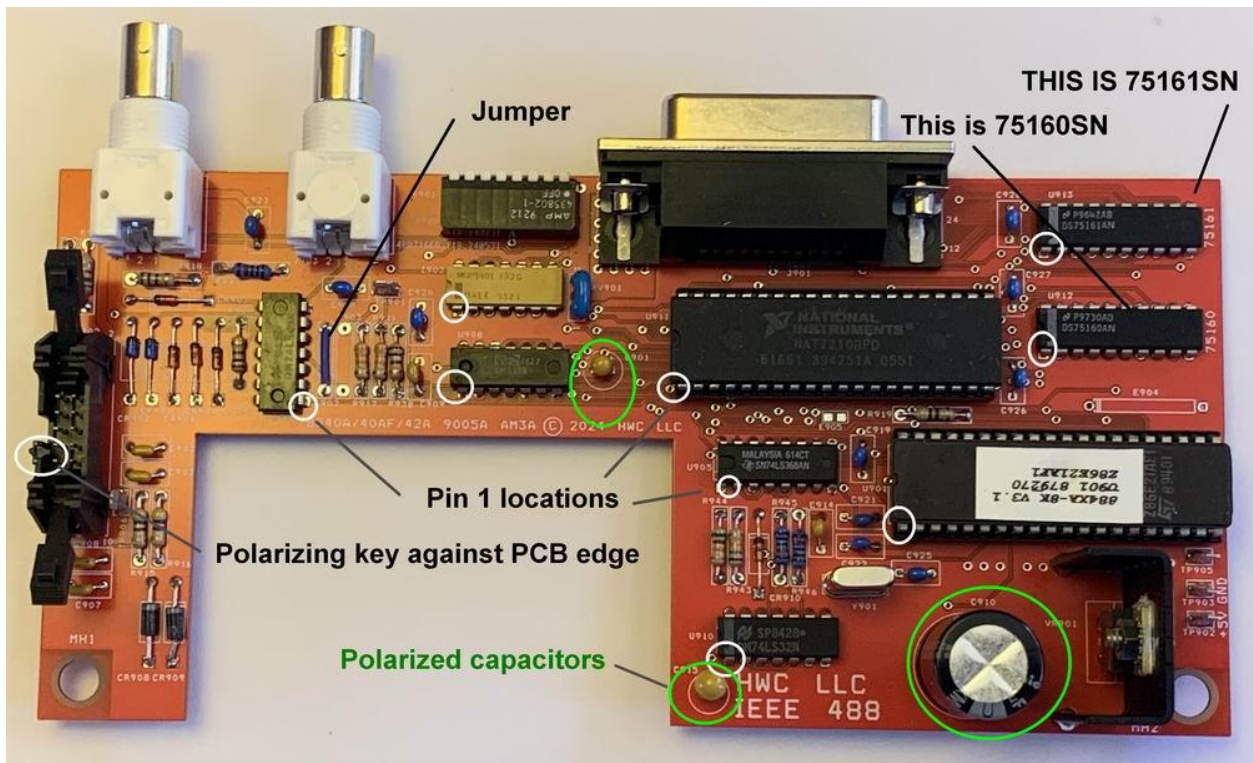
19. Once you can verify that the HPIB interface passes the POST you can unplug the meter, remove the PCB and install the S901 switch array with switch levers against the PCB edge.

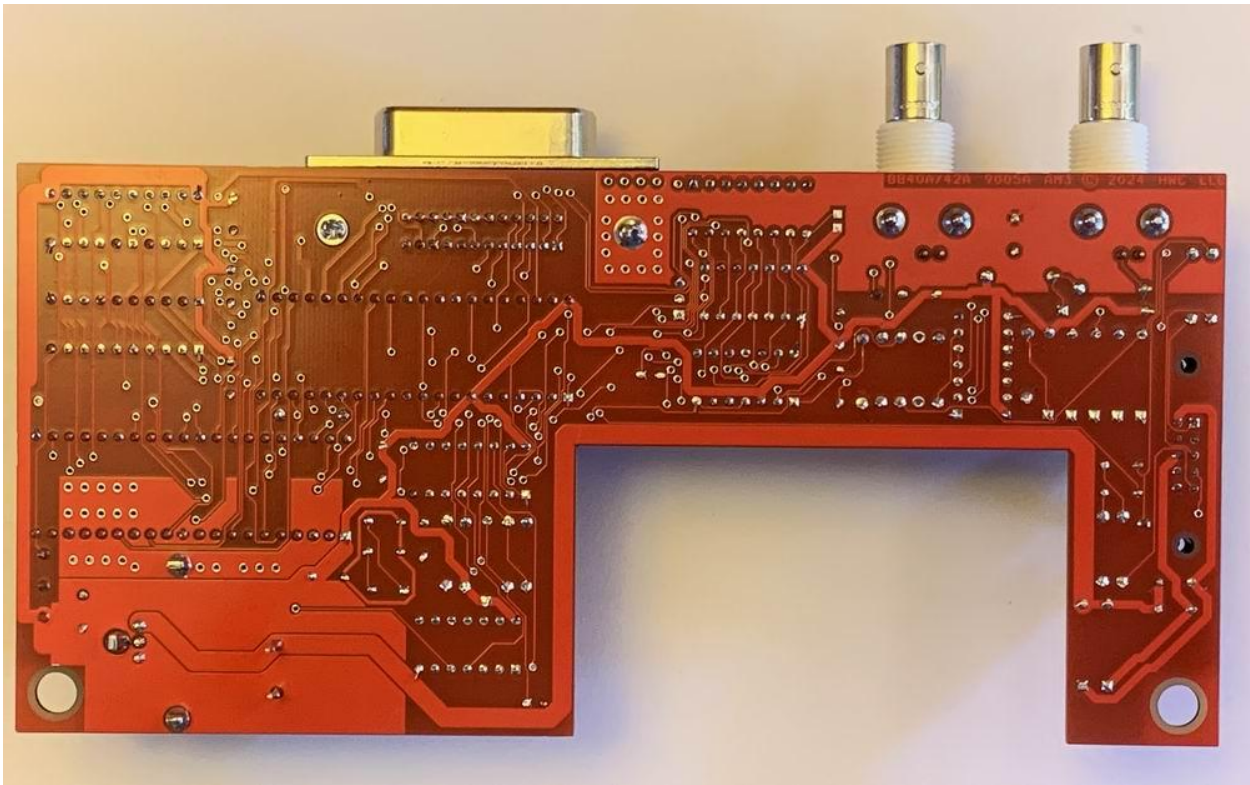
a. S901 8-position DIP switch array

20. Clean the flux residue with IPA and re-assemble the HPIB PCB in its normal position up-side-down into the back panel. You may have a filler panel to remove. Use the 2 #6 jack screws and split washers to retain the PCB. Re-fit the black PCB rivets to hold the PCB to the frame mounts.

Please refer to the following photos as guidance.

Feedback on these instructions is always encouraged!





HWC LLC
Sedona, AZ