

Assembly Instructions for the Continuity Tester Project (PICAXE Primer, Nuts & Volts Magazine, August 2014)

Read through the complete list of assembly instructions to be sure you understand the entire procedure before beginning to assemble the board. Refer to the full-size stripboard layout as you carry out the following instructions:

- ☐ Cut & sand a piece of stripboard to size (6 traces with 21 holes each).
- ☐ Sever the traces on the bottom of the board as indicated in the layout.
- ☐ Clean the bottom of the board with a plastic abrasive pad.
- ☐ Install all the jumpers on the top of the board, **except the two that will later be installed across the top of the two banana jack tabs** (i.e., the jumpers in columns A & U), solder them in place, & snip the excess leads.
- ☐ Solder the four resistors in place, and snip the excess leads.
- ☐ Sand trace 6 a little at a time, until the board fits snugly into the bottom position in the battery holder. (Again, be careful not to sand through the three leads that are soldered into row 6.)
- ☐ Insert the by-pass cap at locations O1 & P1, bend the lead on the bottom of the board from P1 to P2, & snip it so that it does not extend past row 2. Solder the leads at O1, P1, and P2, and snip the excess lead at O1.
- ☐ Solder the IC socket in place, and snip the excess pin length.
- ☐ Observing the correct polarity, solder the LED in place, and snip its leads.
- ☐ Solder the CPC1002N stripboard in place, and snip the excess pin length.
- ☐ Observing the correct polarity, solder the piezo in place, and snip its leads.
- ☐ **Do not yet solder the two 2-pin female headers in place.**
- ☐ Insert an 08M2 into the IC socket, and then insert the switch.
- ☐ See if it feels comfortable to press the switch, or if the switch seems too low to reach. If it does seem too low, snap off a two-pin male header, pull out both pins, and insert the black plastic piece onto the switch's pins, so that the switch is about 0.1" taller.
- ☐ Solder the switch in place, and snip the excess leads.

- ☐ Sand or file the bottom of the stripboard, so that it will sit as low as possible in the battery header.
- ☐ Clean the flux from the bottom of the board and allow it to dry.
- ☐ Inspect the board for accidental solder connections or other problems.

Now we get to the part that I didn't think of until I had finished struggling with my banana jacks! We're going to prepare each banana jack tab so that it can be soldered to the top of the stripboard, with its round hole in line with the hole in the side of the battery holder. However, before we do that, we need to make a minor adjustment to the battery holder. In the Primer article, the last thing we did was to enlarge the two battery holder holes to 1/8-inch to accommodate the small bolts on the banana jacks. However, it turns out that the banana jacks that are available on my website require a 3/16-inch hole. Therefore, if you're using those banana jacks, re-drill the two holes before moving on. When you have done that, we're ready to proceed:

- ☐ Place the stripboard in the lowest battery slot, making sure that it sits as low as it can, and that it's reasonably level.
- ☐ Straighten one of the metal tabs that comes with the banana jacks, insert its narrower end between the left edge of the stripboard and the edge of the battery holder, so that the narrow end of the tab passes through the slot in the bottom of the battery holder at that point.
- ☐ Adjust the tab so that its round hole lines up with the hole you drilled earlier in the battery holder.
- ☐ Insert the small bolt of one of the banana jacks through the hole in the battery holder, and temporarily finger-tighten the nut so the metal tab of the banana jack is held firmly against the side of the battery holder. (We won't be using the small lock washers that come with the banana jacks, because there just isn't enough room to include one on the right side of the battery holder!)
- ☐ Make sure that the metal tab is positioned at a right angle relative to the top of the stripboard, and then draw a line across the tab where it passes the edge of the stripboard.
- ☐ Remove the banana jack and the metal tab from the battery box.
- ☐ Make a right-angle bend in the metal tab by using a pair of needle-nose pliers to grab it, so that the pliers are holding the narrower end of the tab, with one edge of the pliers lined up with the line you just drew. Bend the tab at a right angle in line with the edge of the pliers.

- ❑ Snip off the narrow end of the tab, 0.1" away from the bend, and parallel to it. You should end up with an L-shaped tab, with the wider portion and the round hole on the long side of the "L," and a 0.1" narrower portion on the shorter side of the "L."

At this point, repeat the above sequence of steps, using the other banana jack, so that you end up with two identically shaped tabs.

Now, we're ready to solder the tabs to the stripboard:

- ❑ Cut and bend two pieces of bare jumper wire (one for the A2 to A5 jumper, and the other for the U2 to U5 jumper. Make sure to allow enough extra length for the jumper wires to be extended on the bottom of the board (one from A2 to A3, and the other from U5 to U4).
- ❑ Insert each jumper into the stripboard, and bend and snip each one as shown in the layout.
- ❑ Solder the two jumper wires in place (one at A2, A3, & A5, and the other at U2, U4, and U5).
- ❑ If necessary, sand the solder joints so that the board still sits level in the slot of the battery holder.
- ❑ Slide the 0.1" section of each L-shaped tab under each of the two jumpers. Line up the long section of the tab on the left with the left edge of the board, and the long section of the tab on the right with the right edge of the board.
- ❑ Insert the stripboard (with the two tabs) back into the battery holder, and make sure that you can insert the small banana jack bolt into each pair of holes. If necessary, adjust the bend in the tabs, and/or **slightly** enlarge the holes in the holder or tabs so that everything fits together properly.
- ❑ Carefully remove the stripboard/tab assembly (so that the tabs do not shift position), and solder each jumper wire to the tab underneath.
- ❑ Solder the two 2-pin female headers as shown in the layout. (Since the tabs are higher than the headers, you will need to support the headers as you solder them in place.) If necessary, sand the solder joints so that the board still sits level in the slot of the battery holder.
- ❑ **Finally!** Place the completed stripboard circuit back into the battery holder, and tighten the each banana jack to one of the tabs. Polarity doesn't matter, but you may want to place the red jack on the left, to remind yourself that the female header on that side is the power connection. (As you can see in Figure 11 of the article, I didn't think of that detail until after I took the photo. When it did occur to me, I simply reversed the two jacks.)

In order to install the banana jack on the right side, you will need to shorten its bolt, so that it fits in the space between the side of the battery holder and the edge of the piezo. One way to do that is to insert the banana jack into the left side of the holder, tighten the nut, and mark the bolt at the edge of the nut. Then, disassemble the jack, cut the bolt (I used a Dremel tool and cut-off wheel.), file the cut end (if necessary), and then install the jack on the right side of the battery holder. The bolt on the left side does not need to be shortened, but if you're like me, you will have to do that anyway! ☺

As I mentioned earlier, it's a good idea to tin the ends of the two battery connection wires (+V on the left, and ground on the right) before inserting them into the holder. Also, if the wire on the left side isn't long enough, you will need to extend it slightly. If the 08M2 is still in the IC socket, remove it before you insert the three AA-cells into the battery holder (observing the correct polarity, which is embossed on the bottom of each battery slot). Next, use a multi-meter to check that V+ is connected to pin 1 of the IC socket, and ground is connected to pin 8. If so, insert the pre-programmed 08M2 into the IC socket, attach a set of probes to the banana jacks, and press the pushbutton switch. The LED should begin to blink occasionally, and the piezo should beep whenever you touch to two probe tips together; if not, have fun troubleshooting!