

Stuffing Procedure

As long as the parts have been properly kitted and there is a layout design to follow, figuring out which part goes where is relatively simple. Still, if there are any questions, consult either Ralph or Kevin. However, this procedure will cover the process of actually placing the parts on the electronics boards.

1. The first step is to turn on the solder pot, since all of the part leads must be “tinned” (covered in a thin layer of solder). Make sure the solder pot is plugged in, then turn the dial on the front all the way up. Once the solder has fully melted (should take about 10-15 min), turn the dial down so that the red dots on the dial and the pot are lined up.
2. While waiting for the solder to melt, get the workstation set up. Make sure the board to be stuffed is elevated with “stilts” that go through its corner-holes. Also find and open the jar of flux embedded in a blue foam square and position it near the solder pot, as the leads will be dipped in the flux before they are dipped in the solder. This process will create a small amount of smoke, so be sure to have a fan going to keep from inhaling anything. Make sure there is a soldering iron nearby to use if needed, and ensure that the sponge in the base of its stand is moistened. Also find a pair of small pliers to handle the parts with (Ralph usually keeps a great pair of pliers with yellow and black handles in one of the cups behind the workbench) and the plastic bending device in step 4 (see Ralph or Dave for this). Lastly, before touching the board or any of the parts, make sure you are wearing a static wristband and latex gloves (ask Ralph for some).
3. Find the yellow envelope containing the part to be placed on the board. Note that some parts are directional and some are not. Here is a quick overview:
 - Resistors: Marked by a square box on the board layout. It doesn't matter how these are placed into the board, since they are omni-directional.
 - Capacitors: Marked by an oval shape on the board layout. Some capacitors are directional and some are not – the thin, vertical, circular capacitors are typically not directional, but some of the cylindrical, horizontal ones are. If there is an arrow inside of the oval on the board layout, then that capacitor is directional. These capacitors will have a small bulge of material on one end. Imagine this bulge is the tip of an arrow pointing along the length of the capacitor, and align this “arrow” *opposite* of the direction indicated by the arrow on the board layout.
 - Diodes: Marked on the board layout by a rectangular shape with a point on one end and a bar on the opposite end. All diodes are directional, and will have a dark or black band on one end. Line this band up with the bar on the board layout.
 - Large, multi-pin devices: Marked by the large rectangular spaces on the board layout. Each device will have a small circle imprinted on the plastic at one of its corners. The pin at this corner lines up with the hole that has a small square surrounding it.
 - Other: If any other parts are encountered, ask Ralph or Kevin about their directionality and placement.
4. Once the desired part is located, the leads may need to be bent to fit the part into the board. You can do this before tinning the leads, but you may find it easier to tin before bending, so you can get the lead up near the body of the part without the part itself touching the solder.

For instance, most resistors have leads that stick straight out of either end of the part, and these leads will need to be bent downward at ninety-degree angles in order to fit in the board. Ralph and Dave have a plastic tool that can set the right bend width, and the plastic prevents nicking the metal while bending, so use this whenever possible. This process is the same for diodes and some capacitors. For the tall, thin, circular capacitors, the leads will already be pointing straight down, and will occasionally fit without bending. However, these sometimes need to be adjusted too, and may either have to be bent “out and then down again” or “in and then down again,” depending on whether the spacing of the leads is too wide or too narrow for the holes. In all cases, though, make sure the part sits as close to the board as possible. Try not to bend the leads back and forth too much, as that can damage them (in other words, try to make the first bend the last bend). The multi-pin devices shouldn’t need to be adjusted, though they can be tricky to fit into the board: insert the pins on one side of the device into its respective row of holes, then use a long, thin object to gently bend all the pins on the other side into their holes as well.

5. Once the leads have been bent so that the part will fit into the board, it’s time to tin the leads. Be sure to handle the part with pliers. Hold one of the leads as close to the body of the part as possible, and tilt the pliers so that the lead you’re not holding can be fully submerged in the flux. Dip this lead all the way into the flux, and try not to get any onto the part itself. Now dip the same lead all the way into the solder, being careful not to submerge any of the part into the solder. Remove the part quickly and let it cool, then hold onto the lead you just tinned, and follow the same process to tin the lead you were just holding. Once both leads have been tinned, examine them for bumps or impurities, and if any are found, melt them off with the solder iron and re-tin that lead. When both leads are smoothly tinned, place the part into the board. After a while there might be some buildup on the surface of the solder pot – just scoop it away with the spoon hanging on the side of the pot.

(NOTE: tinning the multi-pin devices is a slightly different process. Apply flux to the pins on one side of the device using a cotton swab, and dip the entire row of pins into the solder at a forty-five degree angle while holding onto the pins on the opposite side. Then change sides and repeat.)

6. Once the part has been tinned and placed into the board, it is important to make sure the part will not fall out if the board is turned over. This is done by bending the leads slightly outwards underneath the board (with the exception of the multi-pin devices, which should already fit snugly). Tip the board on its side and, using the pliers, bend the leads of the part you just placed outwards from their holes. The clinch should be between thirty and forty-five degrees from vertical for each lead. It’s a good idea to turn the board over for a moment to ensure that the part will stay.

One Last Note:

Inevitably, some flux will get on the pliers. When this becomes noticeable, just rinse the pliers with some ethyl alcohol and dry thoroughly.