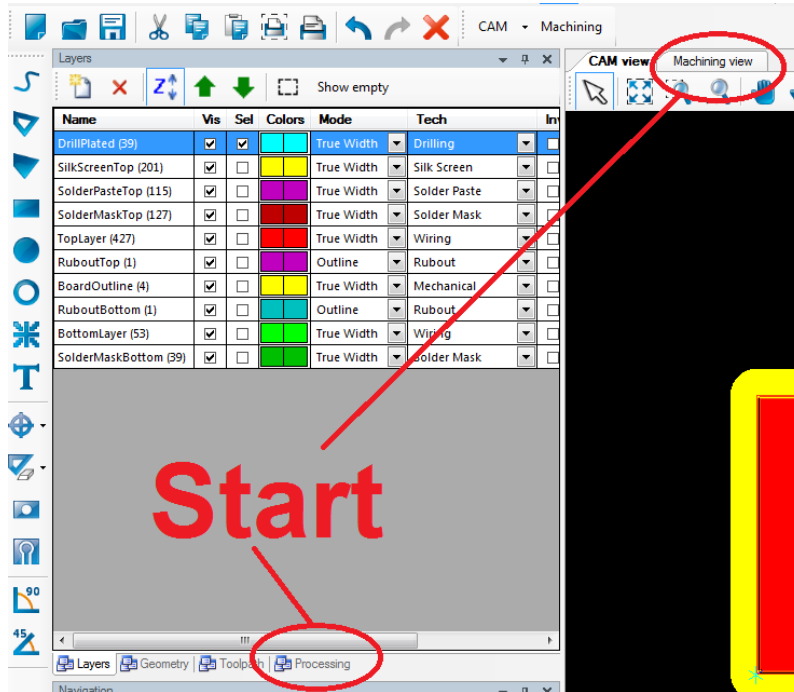# LPKF Machining Procedures:

## How to start/pause milling:

Once you are happy with how your generated toolpaths look we can move over to the processing tab to start our milling. You may also have to switch over to machining view if you have not calibrated any tools yet.



You should see your board on a CAD view of the table area. You want to make sure you have at least a half inch of clearance all around the outside edge of the board. I typically leave at least an inch if possible because you might have to remill left behind copper on the outer edges of the board. Before starting a process it is good practice to check on your material settings and tool rack to make sure all data is correct. CircuitPro has many bugs and sometimes your tool calibration data can be lost and it reverts to the last stored value. For this reason I hate CP but if you are paying attention it is easy to catch. Calibrate all tools before starting any process, Hit the middle play button and CP will ask you to enter your material settings which you should have already done prior to calibrating your tools. Ensure all of the information is correct and continue to mounting material which you also should have done prior to tool calibration. At this point press the stop button and check one Universal milling tool to validate your calibration data is still saved (9 times out of 10 it will be). Now press the middle play button again and when it asks you if you want to resume your last process click yes. Once it starts milling you should visually check that the mill width is consistent around the panel and is the same as your previous calibrated mill width. To pause the machine you can just simply hit the red stop button and the head will return to the home position with the vacuum on so you don't have to reread your fudicial

holes. Turning the vacuum off can cause your panel to move and the machine should check fudicial data before resuming. If this is not the case restart the current process from the beginning. It is highly recommended not to pause the machine in between tool changes as it can confuse the machine into thinking it doesn't have a bit in the chuck and cause a crash.

## How to save a half complete process:

Sometimes you will have to leave the machine before it has completed a process. This can be very annoying especially if the program crashes on you. To save your current progress, do a normal SaveAs using a timestamp and current step as a naming convention. You can shut down the machine and close out of CicuitPro and reopen that file to continue the next day. I highly recommend recalibrating all tools in the rack as some of this data can get corrupted if CircuitPro terminates in a funky way.

## How to pull/rewire door open stop:

Currently I have the door open safe stop disengaged which means the machine will keep running even with the door open. This is dangerous if you are not careful and if you are concerned about hurting yourself please reconnect the stop which is located on the left hinge. If you are using the machine with the door open and you need to shut the machine down immediately, pull the jumper wire located on the left side of the machine which is a direct connection to the safe stop line.

## How to adjust camera for fiducial recognition:

Once you start the process the first thing the machine will do is drill the fiducial holes. Once it has done this it will use the camera to set the camera to mill head offset. Sometimes the camera will be unable to read the hole because of a bad picture. Reasons can be, a dirty board (clean with alcohol or scotch brite), camera brightness, and focus height. These can all be controlled from the processing head with the camera button selected. You can also adjust camera default numbers in the machine settings.

## How to make a hole on your board into a fiducial:

In the works

## How to dispense paste:

This is a huge time sink. If you are doing a large board quantity or a large board that will take over a day to put on paste by hand then this may be a better option. Typically it takes me anywhere from one hour to an entire day for calibration. Variables are paste temperature, needle size, amount of paste in dispenser, board levelness after solder mask, and air pressure. My best advice is to not use this but if you are still wanting to I have a few tips. Put 100PSI to the machine, turn down the air pressure on the machines regulator down to 50 PSI and calibrate off of that using the dispense wizard. If the paste drops are sticking to the tip it may need to warm up a bit more if it was in the fridge, you may need a higher air pressure (use the LPKF regulator to move up in 5PSI increments), you may have to adjust the wait time

in between drops (machine settings), another option is trying a different tip or tapering it with a milling tool. Once you can create consistent dots at the size you want you can begin the dispense process. You will have to remain by the machine continually adjust the PSI to keep the dots consistent. If you are placing drops too close to each other they can interfere with the dispense and get stuck on the tip making a mess of things. The amount of spacing between dots is configured in the toolpath operation so adjust the drop size there to a larger one and try again. Too large of a drop size here will cause the machine to ignore smaller pads which is ok if it only skips a few for you to hand dispense. The idea is to get as much of the board done as possible so don't worry about miss some pads.