1. Introduction

It is important to make sure that your build is operational before using your printer. For each step, you will attempt something and watch the result. *If the result is not what is expected, you will need to identify and fix the problem before proceeding.*

2. Workflow

A. Mechanical checks

1. Make sure the frame it solidly connected: there should be no slop in any of the fittings.
2. Verify that the belts are neither too loose nor too tight. They should make a low pitch musical note when plucked. Move the component by hand. If the component feels unsteady, tighten the belt; if its movement is bumpy, loosen the belt.
3. Check that all the wires are not interfering with the motion of the head and bed.
4. Make sure all the setscrews connecting the threaded rods to the z-motors are tight.

B. Turn on

1. Turn on the "Single Board Computer (SBC)" (usually as Raspberry PI) by plugging in the usb power supply into an outlet and your SBC.
2. After giving your SBC a little time to power up, turn on the printer (which also starts the "Microcontroller Unit (MCU)" with the switch on the power supply ("heart").
3. Verify that LCD ("face") lights up.
4. On a computer, connect to the printer by opening a browser to the site MCPxx.local (where "xx" is the number of your printer). [Make sure you are connected to the local WiFi network.]
5. Verify the interface ("Mainsail") starts up and fix any errors that it identifies.
6. You may need to use Mainsail to issue a "FIRMWARE_RESTART" to get them MCU working properly.
7. When the printer turns on, the sensor (the BLTouch) should light up and extend and retract (making audible clicks) a few times.

C. Fans

1. When the printer is on, the hotend fan (on the left side of the "hand") should always be on. Verify that it is turning.
2. In Mainsail, navigate to the bottom of the DASHBOARD tab to the fan section. Turn on the fan (to 100%). Verify that the extrusion cooling fan (on the right side of the "hand") is turning.
3. Verify that the printer can be shutdown by software. In Mainsail, navigate to the command console and issue an "M112" command in the terminal box. This command requests Klipper to go into a "shutdown" state. It will cause an error to show, which can be cleared with a FIRMWARE_RESTART command in the command console.

D. Temperature

In the Mainsail DASHBOARD tab, there is a section on Temperatures. Look at this section.

1. Look at Temperatures: Extruder: Current. It should be around 20 °C.
2. Look at Temperatures: Heater Bed: Current. It should be around 20 °C.
3. Change the Temperature: Extruder: target to 50 °C. Watch the temperature of the extruder rise. IF IT DOESN'T, TURN OFF THE PRINTER IMMEDIATELY, then fix the problem (which might be that the heater is not connected to the extruder, which will be a fire hazard). The temperature should smoothly rise, overshoot 50 °C then settle to $\sim$ 50 °C.
4. Change the Temperature: Heater Bed: target to 30 °C. Watch the temperature of the Heater Bed rise. IF IT DOESN'T, TURN OFF THE PRINTER IMMEDIATELY, then fix the problem. The temperature should smoothly rise, possibly overshoot 30 °C then settle to $\sim$ 30 °C.

Optional: Verify the calibration of the thermometers.

E. Motors

You will test that each motor is working by using the "STEPPER_BUZZ" command. Go to the Mainsail CONSOLE (either within the DASHBOARD tab or in the CONSOLE tab).

1. Issue a "STEPPER_BUZZ STEPPER=stepper_x" command by typing this into the console (followed by typing "Enter"). The "hand" should move, going right-left-pause ten times. Verify the the hand moves and that it is moving in the correct direction.
2. Issue a "STEPPER_BUZZ STEPPER=stepper_y" command. The "belly" should move, going forward-backward-pause ten times. Verify the the belly moves and that it is moving in the correct direction.
3. Issue a "STEPPER_BUZZ STEPPER=stepper_z" command. The left leadscrew should turn, moving the left side of the x-carriage. It should move up-down-pause ten times. Verify the the carriage moves and that it is moving in the correct direction.
4. Issue a "STEPPER_BUZZ STEPPER=stepper_z1" command. The right leadscrew should turn, moving the right side of the x-carriage. It should move up-down-pause ten times. Verify the the carriage moves and that it is moving in the correct direction.

Optional: If there is not filament in your printer, you can also test the extruder stepper by using a "STEPPER_BUZZ STEPPER=extruder" command. The extruder motor will turn clockwise-counterclockwise-pause ten times.

F. Home

After verifying all stepper motors the homing mechanism should be tested. Issue a "G28" command to home all axes. Remove power from the printer if it does not home properly. Rerun the endstop and stepper motor verification steps if necessary.

3. Result

You now have a printer that correctly communicates between the computer (with Mainsail web interface), the single board computer, and the microcontroller. You are now ready to calibrate your printer to enable it to make successful prints.