



3D PLATFORM TRAINING INSTRUCTION

PRINTING THE CALIBRATION CHIP

3DPT-0001

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APPROVALS			
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APPLICABLE MODELS	
Legacy	Work Series
<input checked="" type="checkbox"/> X1000	<input checked="" type="checkbox"/> 100
<input checked="" type="checkbox"/> X1000 CE	<input checked="" type="checkbox"/> 200
<input checked="" type="checkbox"/> WorkBench	<input checked="" type="checkbox"/> 300
	<input checked="" type="checkbox"/> 400

CONTROL STATUS
<input type="checkbox"/> Confidential
<input type="checkbox"/> Internal use only
<input checked="" type="checkbox"/> Uncontrolled

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Introduction & Purpose

The calibration chip is the first of the standard calibration prints. It is designed to test the first layer height, test bed adhesion, and illustrate the importance of the first layer. In FFF printing, ensuring the first layer is correct is critical to successful prints.

This training instruction will instruct and prepare the user to successfully validate a first layer and to identify and correct common issues.

Tools & Materials

- Knife or razor scraper to remove completed prints.
- Calipers or micrometer.
- Print material (PLA material is recommended for calibration prints).
- Calibration chip gcode file
- SD card or network connection to the web interface (WorkSeries and later) to load print files.

Process

Printing the part

Prepare the printer

1. Prepare print bed. Clean the print area and apply adhesion agent if used.
2. Load material. Load print material and ensure extruder is extruding material properly.

Prepare the part

1. Prepare gcode file. Use supplied gcode if available. If using alternate nozzle sizes, slice the file using just a single perimeter and bottom layer, no infill.
2. Load file using SD card or web interface.

Start print

Print the gcode file and observe during the print. Ask these questions during the print.

- Are the beads of filament adhering to the bed?
- Are the beads of filament adhering to each other, or leaving gaps?

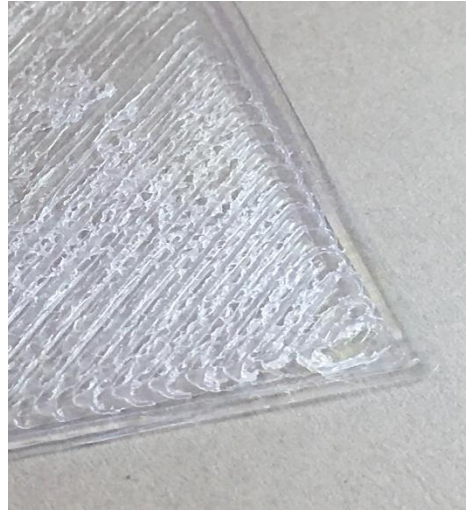
If the beads of material are not connecting during diagonal fill, try babystepping down by .1mm at a time. When the part completes, wait for print bed to cool down and then remove it, being careful not to damage the part. Removing a part when warm can warp the part and potentially affect measurements.

Inspecting the part

Visual inspection:

Look at the chip after removal. There are visual and tactile clues to indicate whether the nozzle is at the correct height. There are three possibilities

1. Nozzle is too low. Chip will come off the print bed in one piece, but there will be ridges and gouging which can be felt on the part itself, especially near the edges of the diagonal fill. Because the nozzle is too close to the glass, the material is pushing out and up around the nozzle rather than laying down a flattened bead.



2. Nozzle is too high. Chip may fall apart after removing from the print bed. Diagonal fill lines will not be joined together, and will pull apart like strings. Because the nozzle is too high, the bead of material is not flattening as it should.



3. Nozzle is at correct height. Chip will come off print bed in one piece, and will be smooth and consistent. There may be minor ridges around the edges of the print, but the center diagonal fill will be smooth and the lines connected.

Tool inspection:

1. Use a set of calipers or a micrometer to measure the thickness of the center portion of the chip. Exact dimension will depend on which gcode file is printed, but will be displayed on the machine control once the print is complete (look for current z height). A common measurement is 0.36mm for a 0.6mm nozzle. It may be easier to measure the center of the chip by cutting the chip in half diagonally and measuring along the long edge, as the perimeter of the print may distort readings if using calipers. Desired measurement is ± 0.02 mm of nominal thickness.

Correcting the part

Corrections will depend on what is found during inspection.

1. **Nozzle too low.** If the nozzle is too low, either reset the extruder to a higher height or babystep up. Increments of .2mm or lower for adjustments.
2. **Nozzle too high.** Use the measurement of the part to indicate the adjustment to make. Example: If the desired thickness is .36 mm and the measured thickness of the chip is .46mm, either lower the nozzle or babystep down by .1mm.
3. **Part did not stick to bed.** If the part did not adhere, try cleaning the glass and re-applying adhesion agent such as Hairspray. Check to ensure you are using PLA material. Consider adding BuildTak sheets to the bed to promote better adhesion.

If corrections are made to the extruders, either by resetting the extruder or by babysteping, the chip print process must be repeated and the new chip inspected.



Wrapping up

Chip print is complete when chips from all nozzles adhere to bed properly, pass visual inspection, and measure within .02mm of nominal thickness.

Conclusion

The chip is a simple but powerful tool to validate nozzle height and first layer settings. This print demonstrates the importance of the first layer, and provides a foundation for proper print process settings.