
End User Training Manual

Bits from Bytes 3D Touch Printer

ARC SPACESHOP



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I. Introduction

This document is for the user qualification training of the Bits from Bytes 3D Touch Printer located at the Ames SpaceShop facility on the 2nd floor in Building 220. Before a user operates the machine, he/she must have signed the required documentation as described in the "SpaceShop Standard Operating Procedures". For additional information, please see a SpaceShop staff member.

II. Bits from Bytes 3D Touch Printer

The Bits from Bytes 3D Touch Printer is a 3D Printer that allows you to print your designs in ABS or PLA plastic. ABS is a well-known plastic with excellent toughness characteristics and is used as a build material for small prints. If you do use ABS for a larger print area (greater than 100 cm²), since ABS has relatively high shrinkage on cooling, larger prints tend to warp on the bottom, so it is recommended to use PLA. PLA is a hard plastic with a low environmental impact. As a build material, it is good for large and small prints. For most prints, you would choose PLA as a build material (material which the actual part is made out of), and ABS as the raft (material bed in which the parts get printed on) and support (material scaffold for complicated parts) (Table 1).

The specifications of the printer are as follows:

- Material: ABS or PLA plastic, multiple colors
- Three Extruder heads
- Maximum Build Size: 18.5 x 27.5 x 20.1 cm
- Z axis Resolution: 0.125 mm
- Weight: 84 lbs

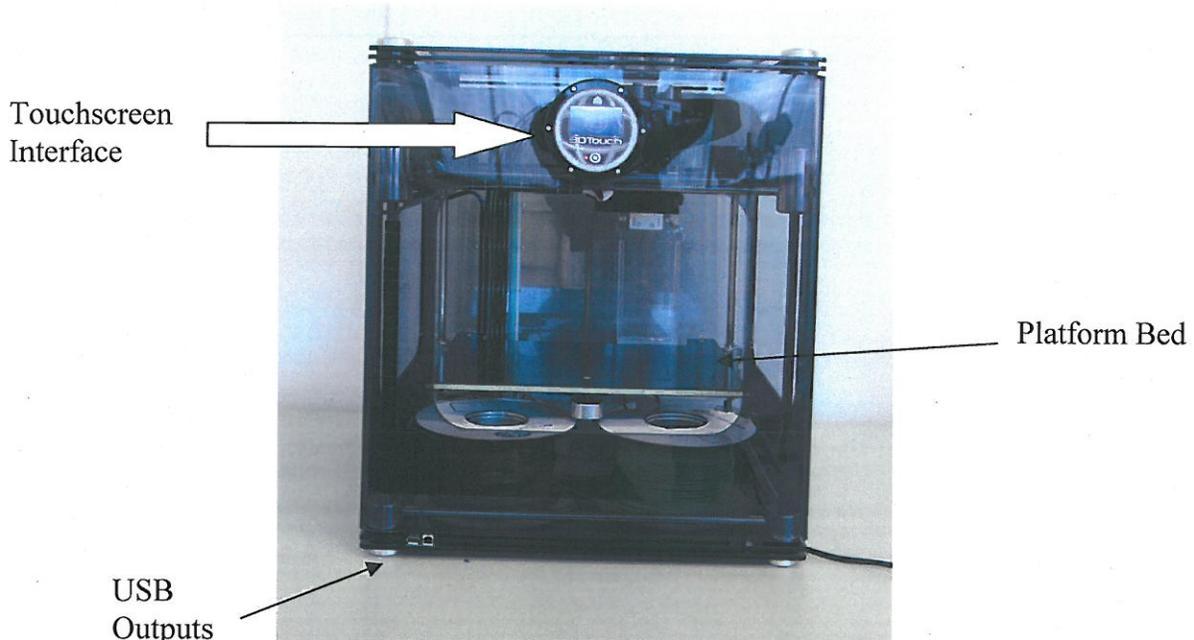


Figure 1: Bits from Bytes 3D Touch Printer

III. Safety Precautions

a. *Bits from Bytes 3D Touch Printer Safety*

SHALL...

- You **SHALL** notify SpaceShop staff prior to running any job operation.
- You **SHALL** notify SpaceShop staff when printing a time-consuming job (several hours) so that we know to keep an eye on it and is left undisturbed.
- You **SHALL** wear closed-toe shoes at all times.
- You **SHALL** wear eye protection when working with tools and processes and when working with chemicals, metal shards, wood chips or sawdust.
- You **SHALL** clean up your space after every job session, and leave 10-15 minutes for cleanup prior to shop closure.
- You **SHALL** secure badge and any loose items that might get caught in moving machinery.
- You **SHALL** check to make sure there is enough plastic spool material for your print, and make sure it is appropriately placed in the printer head tube.

SHALL NOT...

- You **SHALL NOT** use the machine with a damaged AC adapter, power cord, of power-plug or with a loose electrical outlet.
- You **SHALL NOT** modify the electrical power cord, nor subject it to excessive bends, twists, pulls, binding, or pinching, nor place any object of weight on it.
- You **SHALL NOT** touch the tip of the nozzle head with your fingers while printing as the nozzle is extremely hot.
- You **SHALL NOT** remove the Bits from Bytes Tool Case from the 3D Printer station.
- You **SHALL NOT** work alone while in the SpaceShop.

IV. Step-by-Step Tutorial

a. Tools Required

- UP! Desktop 3D Printer
- ABS or PLA plastic spool
- Computer with Axon Software
- Bits from Bytes Tool Case, which includes all tools required for part removal
- Bits from Bytes USB stick, required for transfer of files from computer to printer.

b. Getting Started

1. **CHECK** the following:
 - a. The power cord is plugged into the wall
 - b. The print bed has been cleared and all debris has been removed.
 - c. There is material in the spools below the platform bed.
 - d. The Bits from Bytes USB stick is at the 3D Printer station.
2. **TRANSFER** your **STL** file to the 3D Printer computer.

NOTE: You must have designed your object using other 3D CAD software (Solidworks, Pro-Engineer, AutoCAD, Rhino, Sketchup, etc.) and save it as an STL file.

3. **OPEN** the **AXON** software (Figure 2).

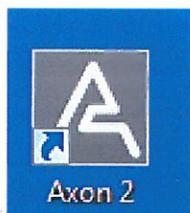


Figure 2: Desktop Icon

4. The software may ask you to do a **PRINTER CONFIGURATION**. Configure the settings appropriately (Figure 3).

NOTE: The Extruder materials may be different than depicted in Figure 3. The extruders are set in a specific position such that they match up to the appropriate extruder number. Please confirm this prior to printing your part. (Figure 4).

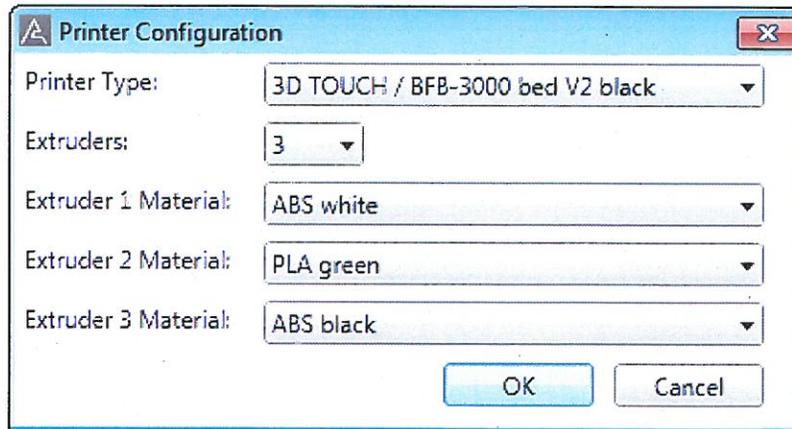


Figure 3: Printer Configuration Menu



Figure 4: Extruder Positions

5. The initial start-up screen will load (Figure 5).

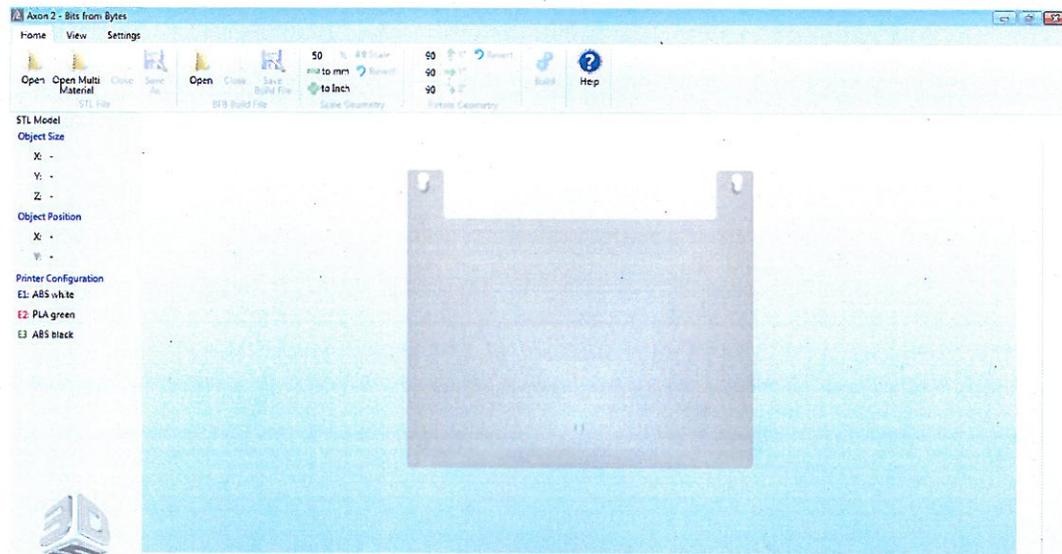


Figure 5: Initial Screen

6. Open your **STL** file by clicking **OPEN** and navigating to the correct location on the computer (Figure 6).

NOTE: If you know you have a multi-material piece, or you would like to print out multiple parts in the same print with different materials, choose **OPEN MULTI-MATERIAL**.

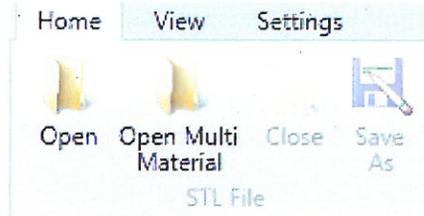


Figure 6: Open Icons

7. **PAN** around the object by holding the left mouse button down and drag around the object (Figure 7).

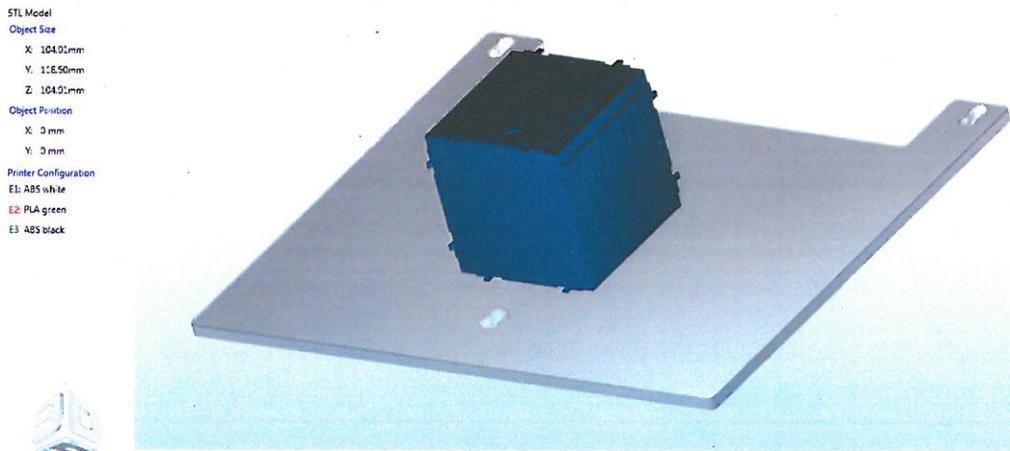


Figure 7: Sample Object Loaded on Platform

8. To **ROTATE** the object in the X, Y, or Z-axis, or to scale the object, choose the appropriate options located on the top of the screen (Figure 8).

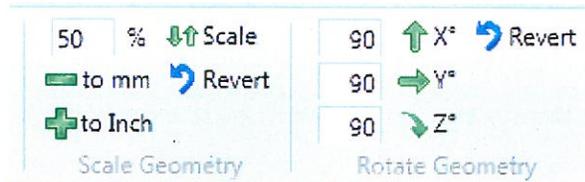


Figure 8: Rotate and Scale Options

9. Click **BUILD** next to the rotate section (Figure 9).



Figure 9: Build Icon

10. **CHECK** settings (Figure 10 and Table 1).

NOTE: To help guide you through which material combination you should use, please see Table 1. Besides the material settings, it is recommended to keep the default settings. If you would like to use settings other than the default, please see a SpaceShop staff member for assistance.

NOTE: If you choose your model material to be ABS and your raft or support material is PLA, and you have an intricate part where support material is in a difficult place to remove, you may want to use the Ultrasonic Support Material Tank after the printing is completed. Please notify a SpaceShop staff member if you are requiring the use of the Ultrasonic Support Material Tank.

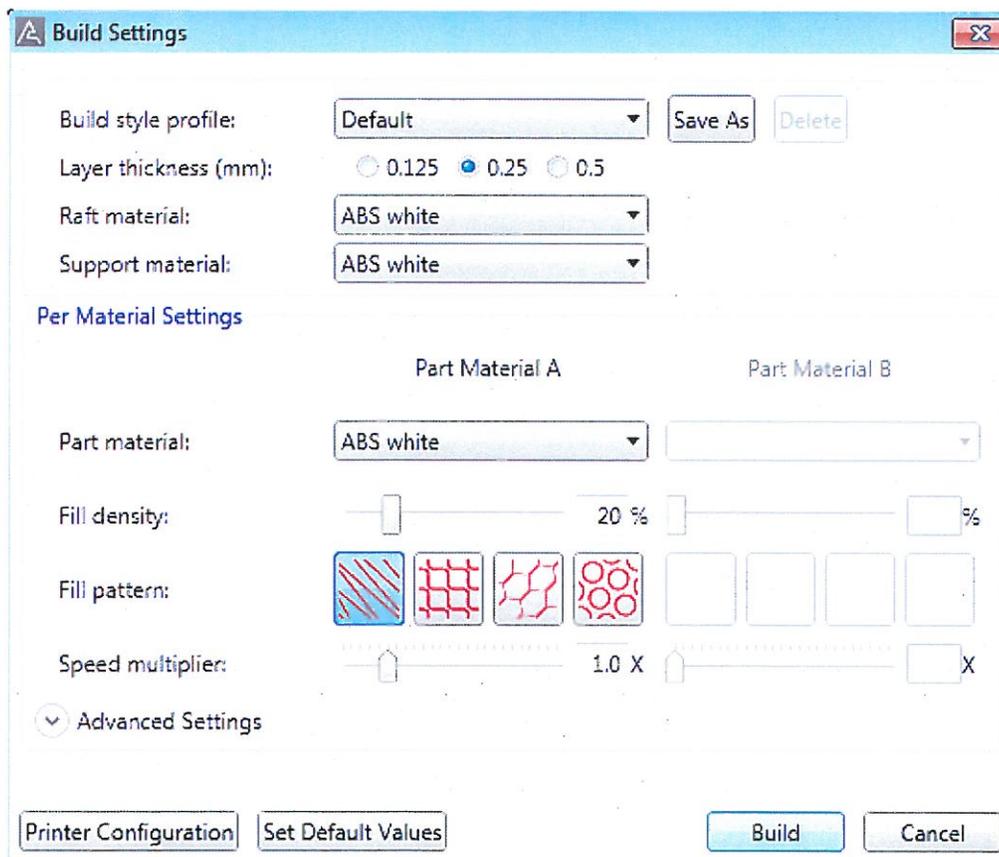


Figure 10: Build Settings

Table 1: Material Combinations and Information

Model Material	Raft Material	Support Material	Benefits	Cautions
PLA	PLA	None	Available for single head prints.	Raft may require sanding for complete removal
PLA	ABS	None	RECOMMENDED: Large PLA print size possible. Model peels away well from the ABS raft.	
PLA	ABS	ABS	Large PLA print size possible. Model peels away well from the ABS raft.	Avoid large support material areas due to ABS warping
ABS	ABS	None	Available for single head prints.	Raft may require sanding for complete removal. Do not print beyond 100 cm ² due to ABS warping.
ABS	PLA	None	Model peels away well from the PLA raft.	Do not print beyond 100 cm ² due to ABS warping.
ABS	PLA	PLA	Model peels away well from the ABS raft.	Do not print beyond 100 cm ² due to ABS warping

11. Click **BUILD**.

NOTE: The Build Progress screen will appear, which will show you how long the print will take and how much material it will use. It may take several minutes to complete this process, so please be patient. If you would like to lower the time it would take, you can make modifications to the STL file and Build file, such as scale down and minimize support structures (Figure 11).

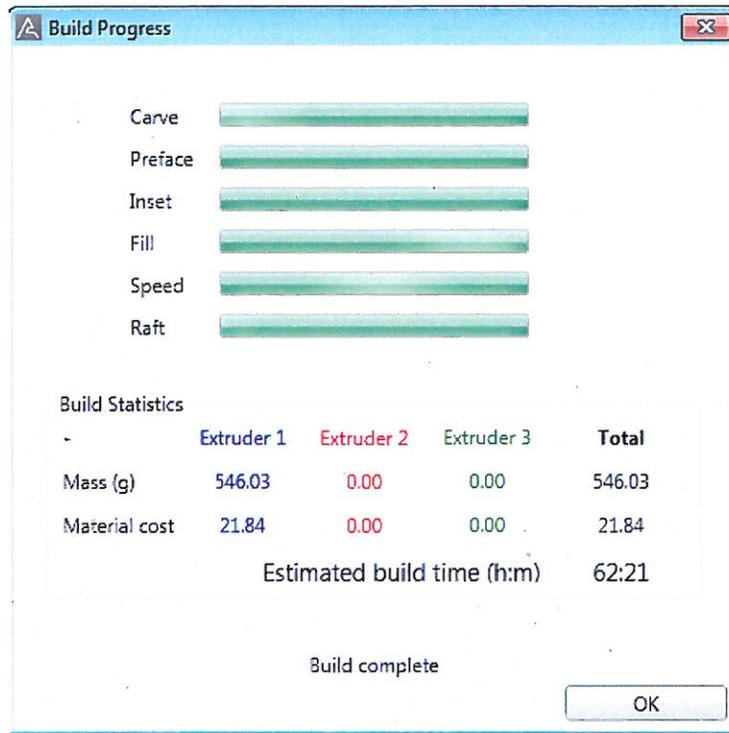


Figure 11: Build Progress

12. Click **SAVE BUILD FILE** and save the build file on the Bits from Bytes USB stick (Figure 12).

NOTE: Make sure you have the Bits from Bytes USB stick plugged into the computer prior to Step 12 so that you can save the file to the USB stick.



Figure 12: Save Build File

13. Safety **EJECT** the USB stick from the computer.

14. **INSERT** the Bits from Bytes USB Stick into the 3D Touch Printer (Figure 13).



Figure 13: USB Stick and Port on Printer

15. Press the **FUNCTION BUTTON** located on the touchscreen interface area (Figure 14).

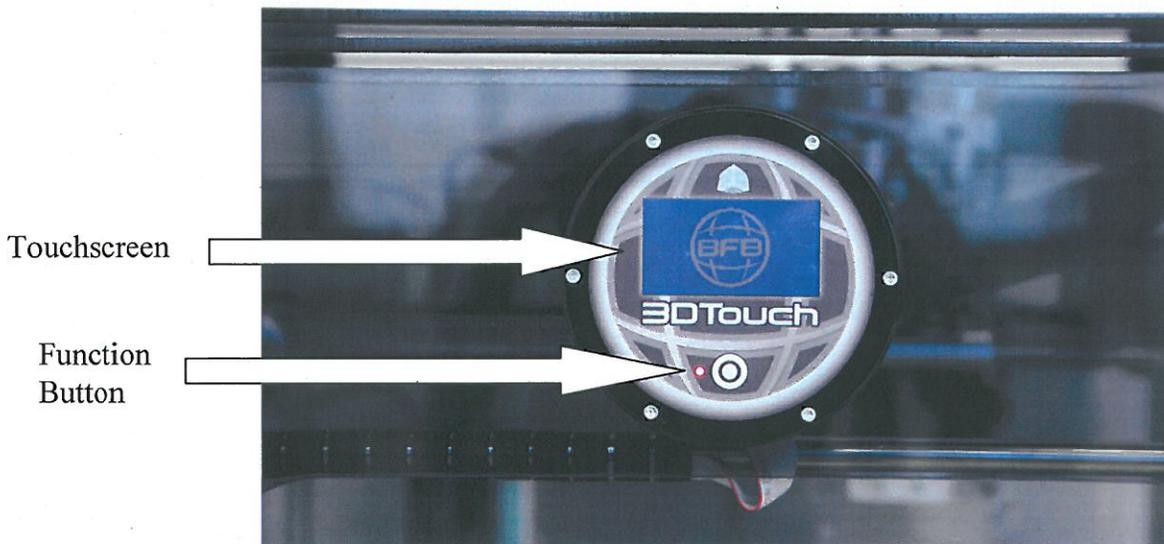


Figure 14: Touchscreen Interface

16. **PRESS** the touchscreen to go to the main printer interface (Figure 15).

17. Choose the **PRINT** box by touching the icon.



Figure 15: Print Icon on Touchscreen

18. Choose the **TEST** file depending on material in Extruder 1 position:
 - a. For **ABS**, choose "RaftABS_CheckFile"
 - b. For **PLA**, choose "RaftPLA_CheckFile"

NOTE: To choose the test file, press the file name on the touchscreen. The printer will print the test object. Below are examples of what a test object might look like. If the test object looks like Figure 16a, please consult a member of the SpaceShop staff. If the test print looks smooth and does not have wavy tracks, like Figure 16b, then the nozzle is set at the correct height and no modification is needed.

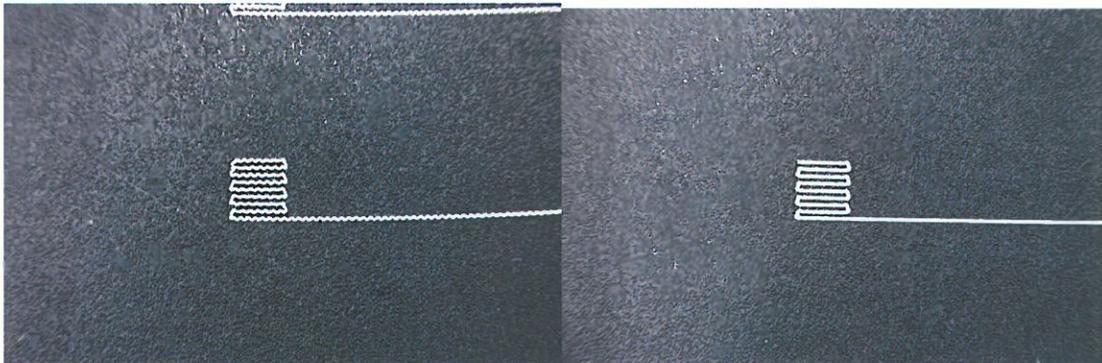


Figure 16: a) To the left is the bad test coupon and b) to the right is the good test coupon

19. After testing, go back to the **PRINT** icon on the printer and find and **PRESS** your file on the touchscreen (Figures 17-19).

NOTE: Your part will start printing. Depending on the settings from the software, you may have multiple materials and multiple colors printing. If at anytime your print is not correct while printing, press the Function button and select **PAUSE**. After the print is

paused, press the Function Button again and select **CANCEL**. It will then say "Are you sure you want to cancel the print?" Select the **CHECK** button in the bottom right corner to cancel the print.



Figure 17: Screen During Printing



Figure 18: Screen After Pressing Function Button



Figure 19: Screen After Pausing and Selecting Cancel

20. Once complete, use the **PART REMOVAL TOOL** located in the **3D TOUCH TOOL CASE**, next to the 3D Touch Printer, and carefully scrape the part off of the platform.

WARNING: Make sure to always scrape away from your body and to not impact your skin using the tool as it does have sharp edges. Please locate a nearby trash container to put the support and raft material in (Figures 20 and 21).



Figure 20: 3D Touch Tool Case



Figure 21: Inside 3D Touch Tool Case

21. You may need to peel off the raft and support material after printing is done. To do this, use your fingers and peel off the support and raft material.

22. Congratulations! You have successfully completed the Bits from Bytes 3D Touch Printer Training!

To learn more advanced techniques, such as how to print in different ways, please consult a SpaceShop staff member for more information.