

# Cura-CubePrinterPlugin

<https://github.com/mirdoc/Cura-CubePrinterPlugin/>

This is a plugin for [Cura](#) that adds the 3D Systems Cube, CubePro, and CubeX printers to Cura and enables Cura to export to the proprietary .cube, .cube3, .cubex, and .cubepro print file formats.

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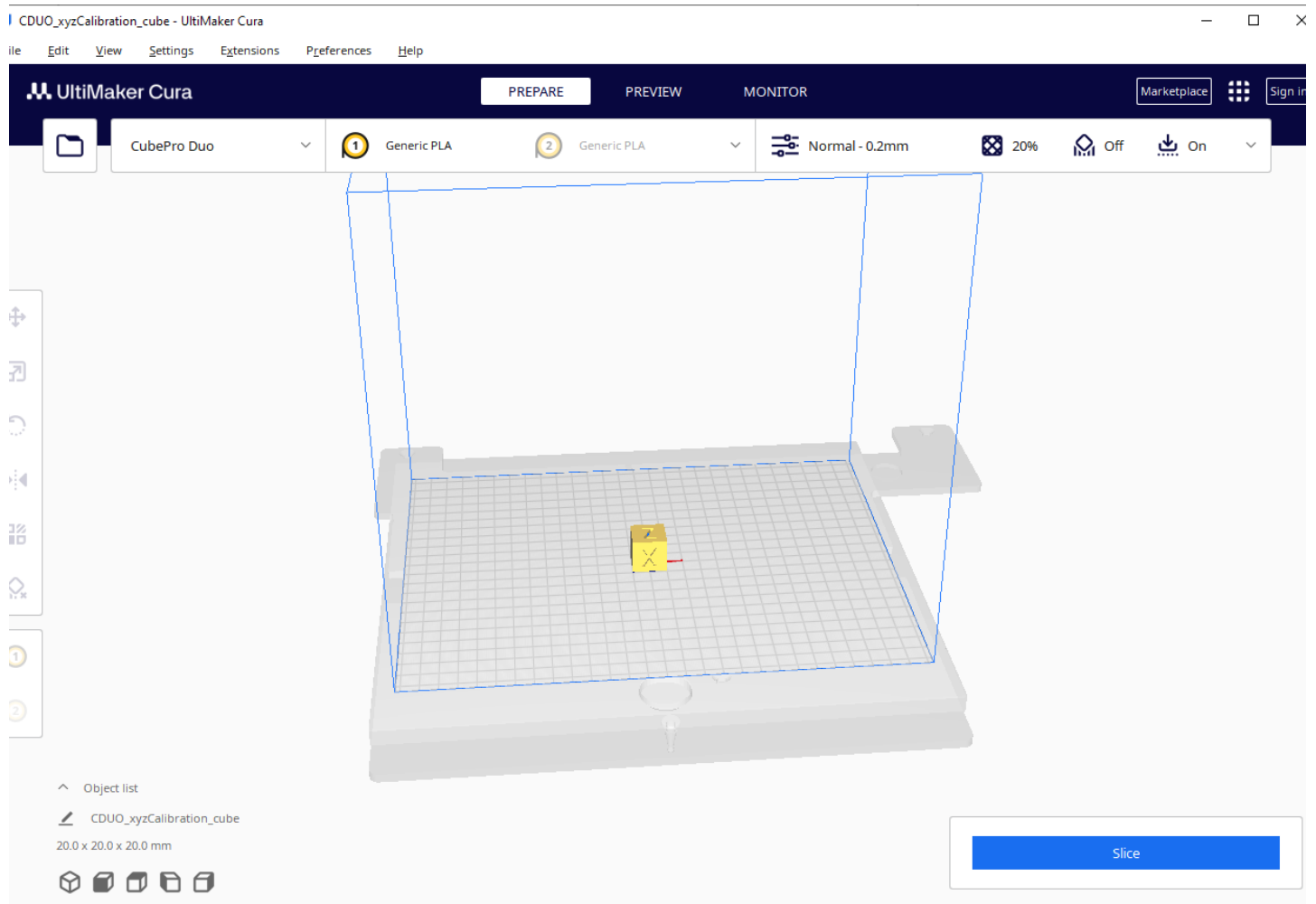
## Introduction

This software is released as a plugin for the [Ultimaker Cura](#) Software. The Cura-CubePrinterPlugin contains the necessary printer files to add the 3D Systems Cube, CubePro, and CubeX printers to Cura and enables Cura to export the proprietary .cube, .cube3, .cubex, and .cubepro print file formats.

The author of this software is not affiliated with 3D Systems or Ultimaker. Although the software has been tested to function well for the author, it should be considered experimental and is released without guarantee. Using the software and the files that it produces may damage your printer, set property on fire, or do other **really\_bad\_things**.

This software is supplied without warranty and the user is responsible if they use this software and injury happens to their person or another person or damage occurs to any property as a result of using this software and/or the files that it creates. Please remain near the 3D printer while using files generated by this software, and pay close attention to the 3D printer while it is on to verify that the machine is functioning properly. The software is provided AS-IS and any usage of this software or its output files is strictly at the user's own risk. The developer makes no other warranties, express or implied, and hereby disclaims all implied warranties, including any warranty of merchantability and warranty of fitness for a particular purpose.

This plugin borrows heavily from the [Cura-Dremel-Printer-Plugin Cura gcode writer plugin](#) which itself contains code that is based upon the [Cura gcode writer plugin](#) and is released under a LGPL-3.0 license. Source code for this plugin can be found [here](#).



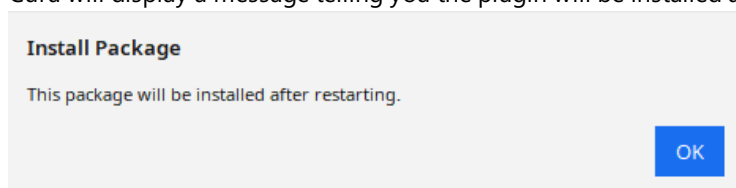
As this plugin is currently in the testing stages it is not yet available within the Cura Marketplace. Whilst this will hopefully change in the near future, for the timebeing the plug-in can be installed using the package available through the release page on this plugin's website.

This plugin was written for Cura 5.6 and has been tested on Windows 10 Professional 64 bit edition, but should work equally well on any other operating system that Cura supports.

## Installation

To install the plugin, follow the instructions below:

1. [Download and install Cura](#) on your machine
2. [Download the latest plugin package](#) from the plugin release page
3. Open the Cura application and drag and drop the plugin file *CubePrinterPlugin-x.x.x.curapackage* into the Cura window
4. Cura will display a message telling you the plugin will be installed after restarting



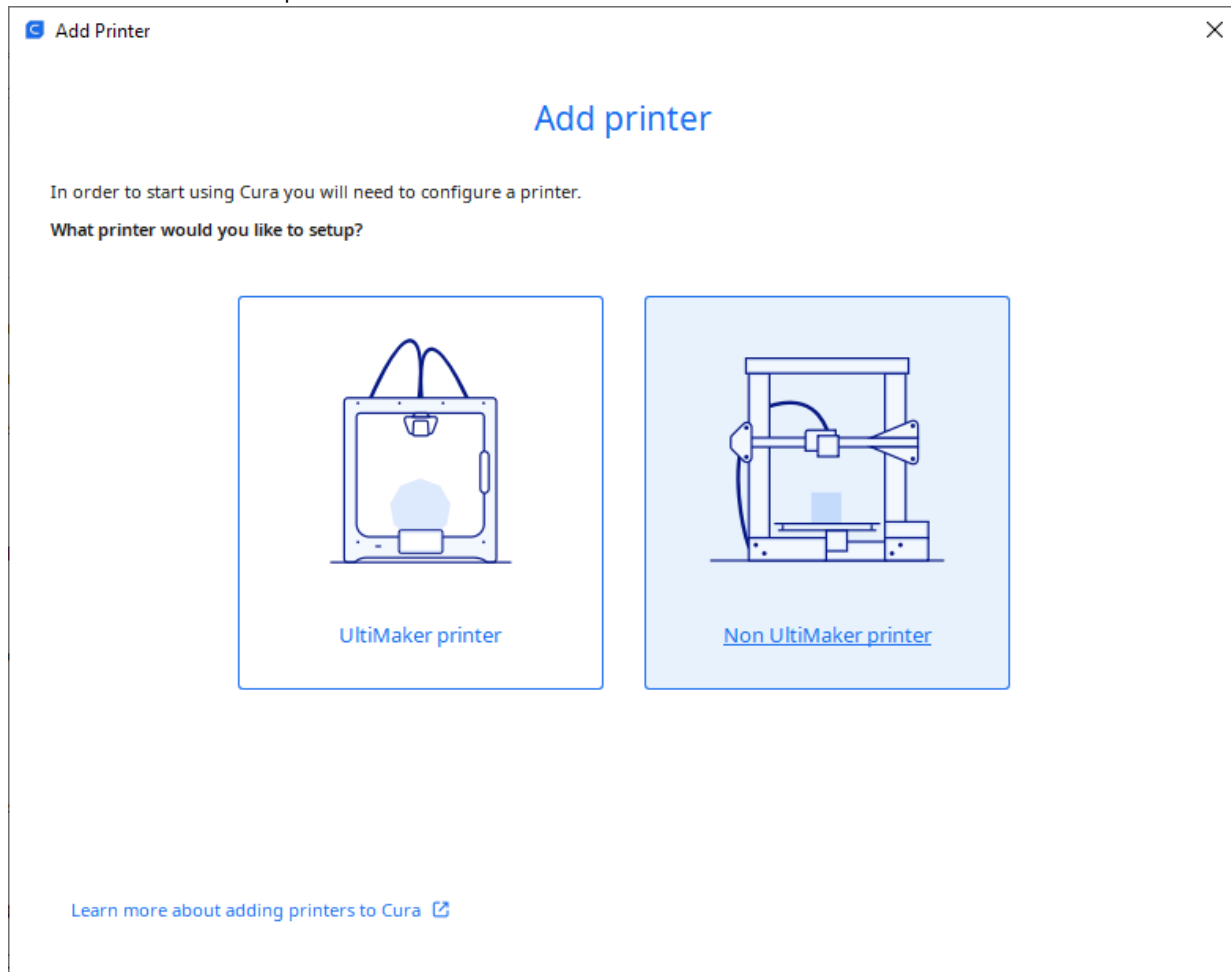
5. Close the Cura application and re-launch Cura
5. Upon restart you should have an option to add a Cube, CubePro, and CubeX printers (see "Using the Plugin" section below) - Congratulations, the plugin is now installed!

**IMPORTANT:** If have freshly installed Cura it will prompt you to add a printer when you first open it. Make sure you complete the step above before selecting a printer to add.

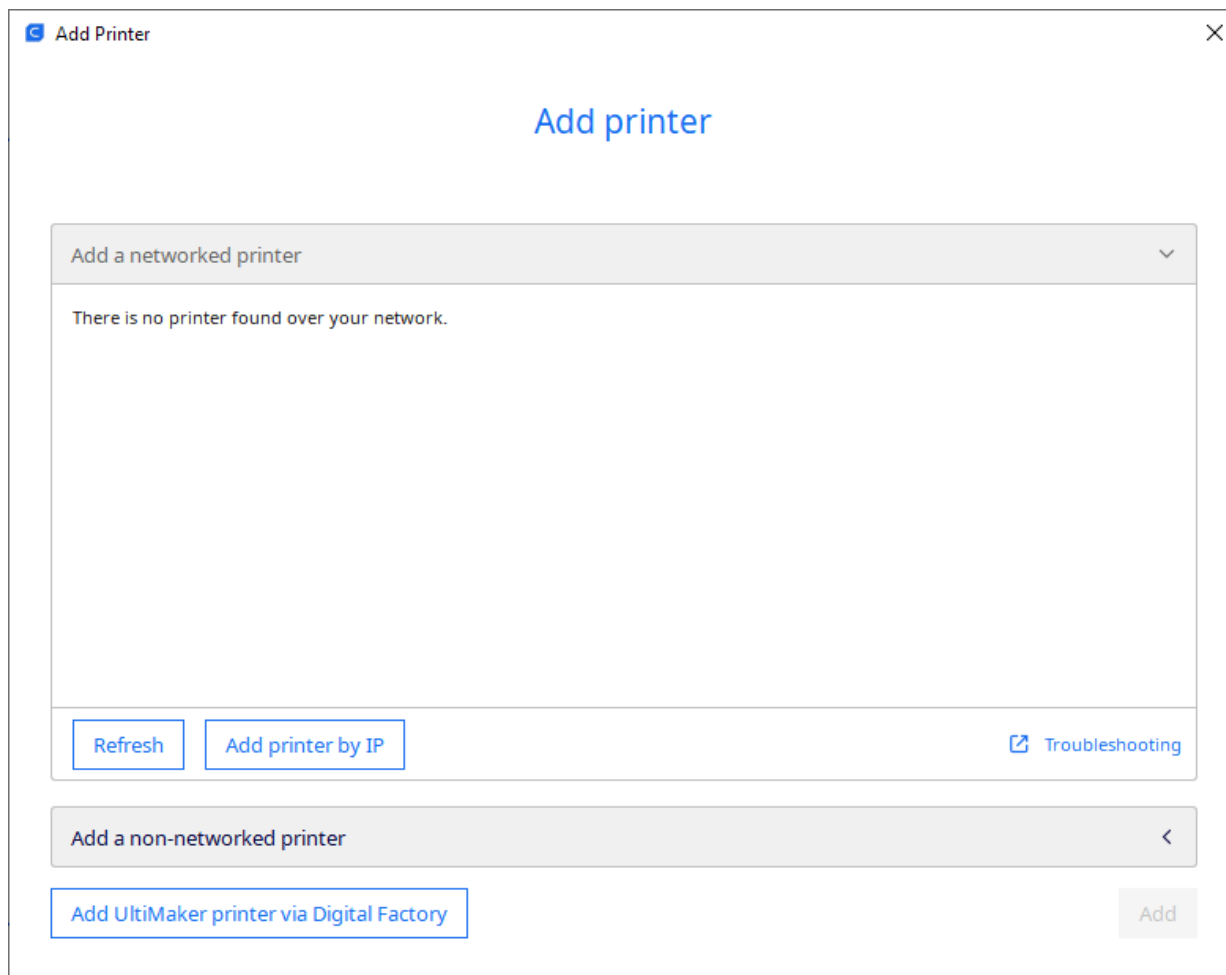
## Using the Plugin

To add your printer to use in Cura follow the steps outlined below:

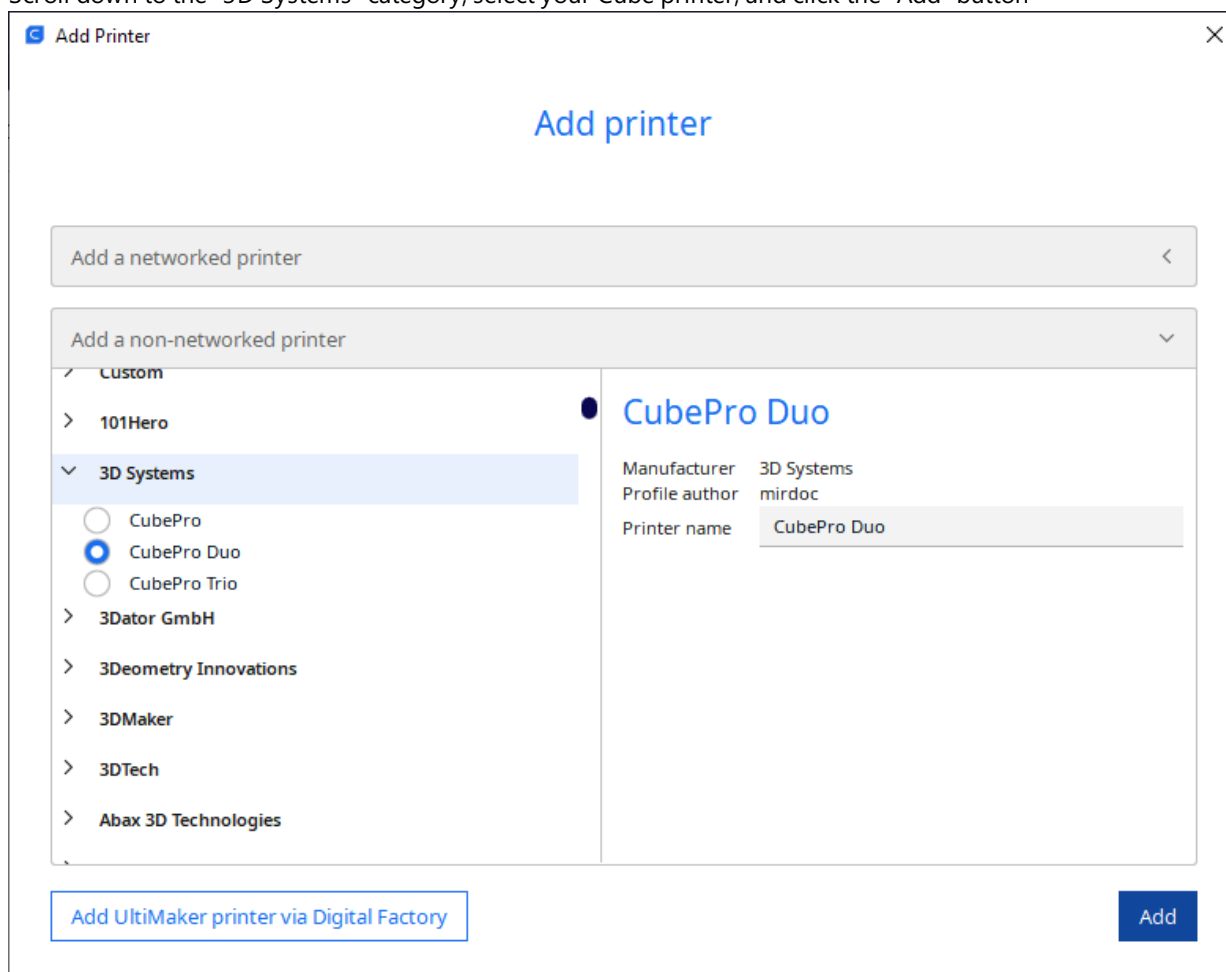
1. Open Cura and navigate through the menu to Settings -> Printer -> Add Printer to open the Add Printer Window
2. Click the "Non Ultimaker printer" button



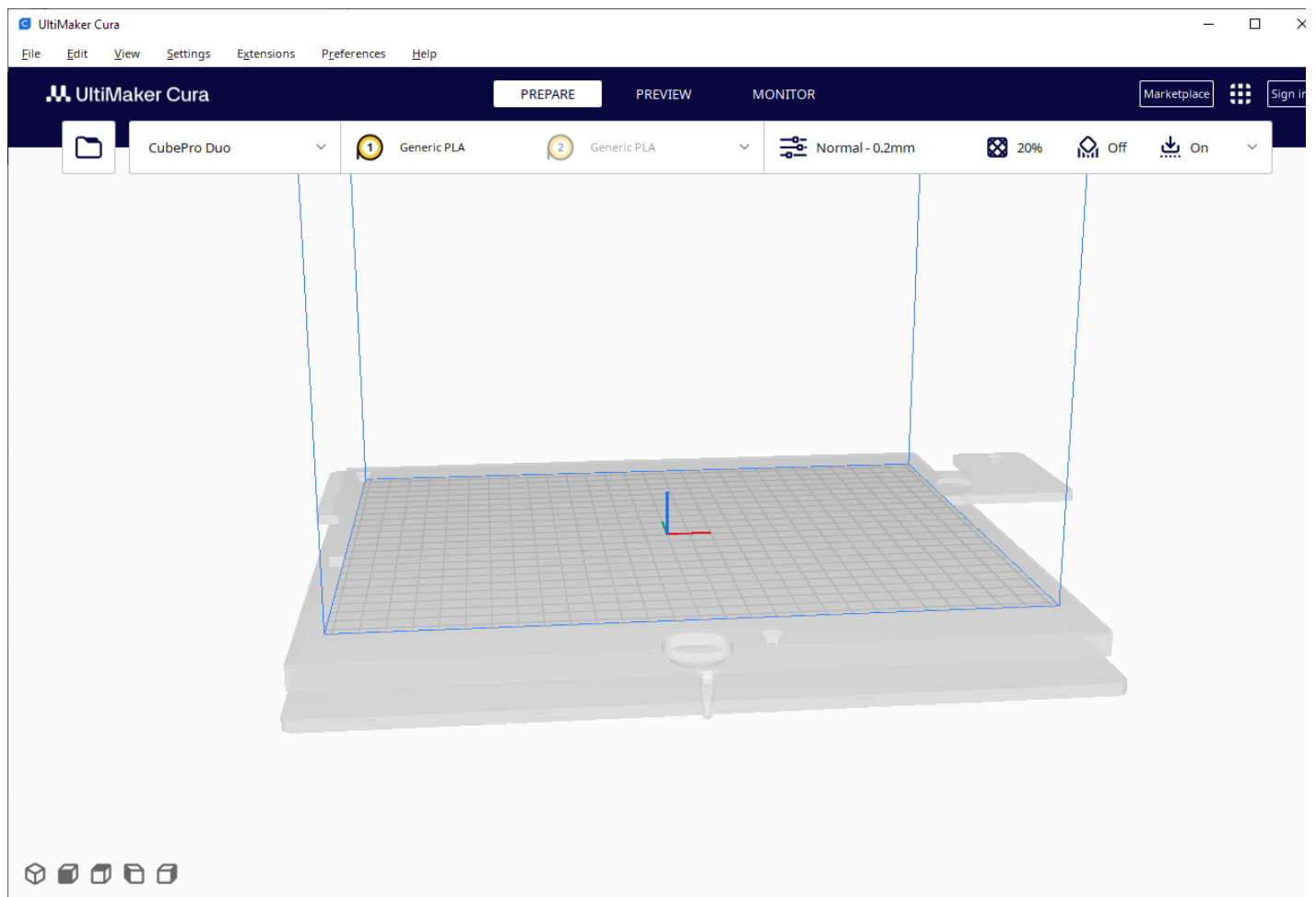
3. Click the "Add a non-networked printer" button



4. Scroll down to the "3D Systems" category, select your Cube printer, and click the "Add" button

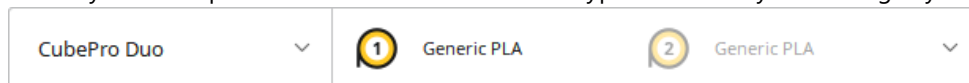


5. You have now installed a Cube printer, your Cura should look something like this:

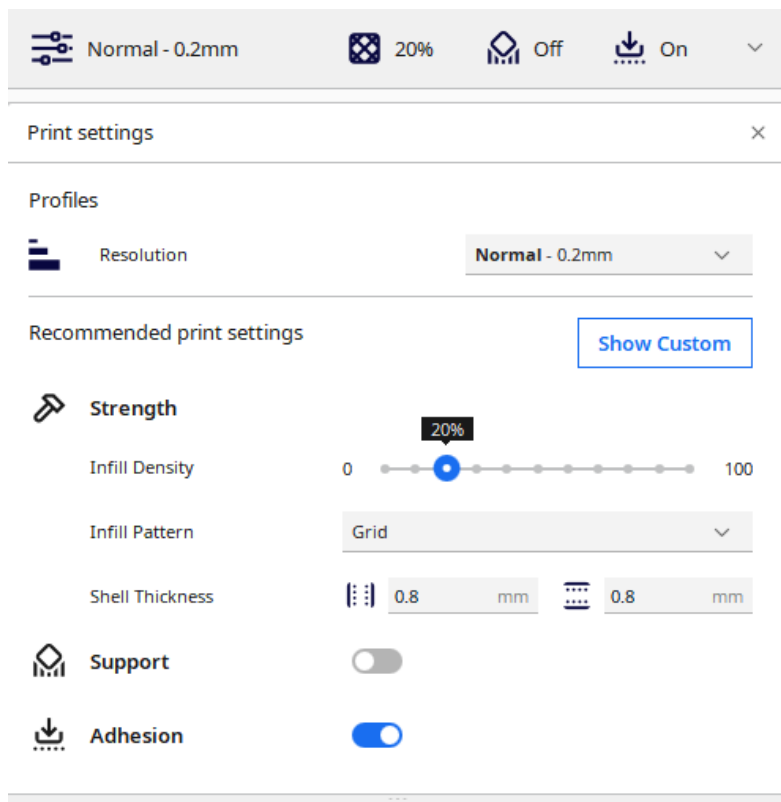


to print a model follow the steps outlined below:

1. Open Cura and use the File menu to open a model file to print
2. Ensure your Cube printer is selected and choose the type of filament you're using in your printer



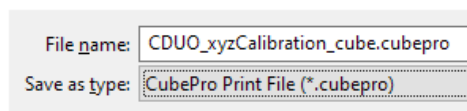
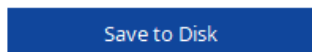
3. Set the slicing options that you want from the print settings in the upper right corner of the screen



4. Press the slice button in the lower-right corner to tell Cura to slice the object using the selected settings



5. Click the "save to file" or "save to removable drive" button. Ensure that file format that is appropriate for your printer (.cube, .cube:, .cubex, or .cubepro) is chosen as the output file format



**Note:** Saving the file can take several seconds or substantially longer depending on the size and complexity of the object you are printing. Please be patient and wait for the message that tells you that the file has been saved.

5. Save or copy this file to a removable USB drive
7. Insert the removable drive into your Cube printer's USB port
3. Turn on the printer
3. Select "Print" and choose the appropriate file to print
2. Enjoy - if you encounter issues, feel free to raise them in the ["Issues" section](#)

## Note

Please note the following:

- This plugin has been tested using the latest version of Cura noted in this README on Windows 10 x64 but testing and feedback for other platforms is welcomed!
- This plugin has been tested to work in the basic print case, however users may (and probably will) encounter problems with complex printing tasks and/or when using changing from default print settings. If you encounter any issues with the plugin, feel free to [raise an issue](#).

## Frequently Asked Questions

1. **Question:** *I have encountered a problem with this plugin, what should I do?* **Answer:** This plugin is very much a work-in-progress and should be considered experimental. Feel free to raise any problems or issues encountered in the ["Issues" section](#).
2. **Question:** *Does this plugin support USB-connected printing/Octoprint/Wifi Printing? Do I need an SD card/USB thumb drive?* **Answer:** The plugin only supports creating proprietary print files and using a removable USB drive to get the files into the printer. It does not currently support direct USB or WiFi communication with the printer. The author may consider adding Wifi support in the future if enough users request this.
3. **Question:** *I'm using an older version of Cura, can I use this plugin?* **Answer:** This plugin has been written for the latest version of Cura. At this stage there are no plans to provide support for older versions of Cura.
4. **Question:** *What print materials/settings are supported?* **Answer:** The author has tested the settings for generic PLA and ABS. Testing of other materials and settings is very much encouraged and the author would appreciate feedback so this document can be updated with more information about material/setting compatibility or incompatibility. If you have any suggested improvements to the settings please submit a Github issue or Pull Request and the changes will get tested.
5. **Question:** *I want to help make this plugin better. What can I do?* **Answer:** Any help to continue to improve this plugin is greatly appreciated. Feel free to report any problems, tweaks, or feature suggestions through the ["Issues" section](#). If you're a coder and have written some bugfixes or improvements submit a pull request and I'll incorporate your changes.

## Technical Details of the Proprietary Cube, CubeX, and CubePro File Formats

The .cube format, along with that of the .cube3, .cubex, and the original .cubepro are simply BFB style plain text g-code that has been encrypted with the BlowFish cipher. The .cube, .cube3, and .cubepro format use the encryption key "221BBakerMycroft", whereas the .cubex format uses the encryption key "kWd\$qG\*25Xmgf-Sg"

At some point 3D Systems introduced a revised .cubepro format which is essentially several files bundled together in a simple compressed archive. Included in this archive is a Blowfish encrypted g-code text file which is produced in the exact same manner as the original file format. With the release of CubePro v1.90 the format was revised once again with a change in the way the g-code is ordered and encrypted. Attempting to decrypt it in the usual fashion only generates approximately 20 lines of readable g-code while the remainder of the file appears jumbled.

For simplicity and compatibility this plugin generates files using the old format, as all CubePro printer firmware versions are able to read and process these files.

This is the first 288 bytes of a revised format .cubepro file generated by CubePro v1.87. A description of the current understanding of this file format is below:

Offset	Binary Data	ASCII
00000000	06 00 00 00 82 b0 04 00 08 01 7c 06 00 00 69 6e	....,°..... ...in
00000010	64 65 78 2e 78 6d 6c 00 00 00 00 00 00 00 00 00	dex.xml.....
00000020	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
00000030	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
00000040	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
00000050	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
00000060	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
00000070	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
00000080	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
00000090	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
000000A0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
000000B0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
000000C0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
000000D0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
000000E0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
000000F0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000100	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000110	00 00 3c 3f 78 6d 6c 20 76 65 72 73 69 6f 6e 3d	..<?xml version=

## Header

- 06 00 00 00 = four-byte little-endian uint which is presumably a version number, possible values are 0x00000006 in files generated by CubePro version <= 1.87 and 0x00000007 in files generated by CubePro version > 1.87
- 82 b0 04 00 = four-byte little-endian uint containing total size of the file in bytes
- 08 01 = two-byte little-endian ushort containing the offset in the file of the first file in the archive5. b0 38 00 00 = four-byte little-endian uint containing the offset in the file to the start of the gcode

## File Block

- 7c 06 00 00 = four-byte little-endian uint containing the size in bytes of a file in the archive
- 69 6e 64 65 78 2e 78 6d 6c 00 00 ... = 260 character null padded string containing the name of a file in the archive
- 3c 3f 78 6d 6c 20 76 65 72 73 69 6f 6e 3d ... = array of bytes containing the data of a file in the archive

There can be any number of *File Blocks* stored until EOF is reached.

The files typically stored in a .cubepro are as follows:



Filename	Description
index.xml	Print information file in XML format that contains a number of print settings, materials used, extruder configuration, and details of the other files included in the archive. A sample index.xml is included below.
*.cubepro	Plain text file containing g-code which is encrypted with Blowfish cipher. This file has the same name as the .cubepro archive
isoimage.png	Isometric view of the print in PNG format.
frontimage.png	Front view of the print in PNG format.
frontimage.png	Front view of the print in MRL^ format.
frontimage_g.mrl	Front grayscale view of print in MRL^ format.

**ote:** ^ MRL files are image files used by the CubePro's firmware to display images on the printer's LCD screen

#### imple File: index.xml

```
<?xml version="1.0" ?>
<build_package>
  <build>
    <type>cubepro</type>
    <version>1494</version>
    <build_file>printfile.cubepro</build_file>
    <build_crc32>3809665710</build_crc32>
    <preview_isometric>isoimage.png</preview_isometric>
    <preview_elevation>frontimage.mrl</preview_elevation>
    <preview_elevation_greyscale>frontimage_g.mrl</preview_elevation_greyscale>
    <preview_elevation_large>frontimage.png</preview_elevation_large>
    <materials>
      <extruder1>
        <code>209</code>
        <length>0</length>
        <recycled>0</recycled>
        <weight>6.76858</weight>
      </extruder1>
      <extruder2>
        <code>-1</code>
        <length>0</length>
        <recycled>0</recycled>
        <weight>0</weight>
      </extruder2>
      <extruder3>
        <code>-1</code>
        <length>0</length>
        <recycled>0</recycled>
        <weight>0</weight>
      </extruder3>
    </materials>
    <preview_elevation_filled_percent>100</preview_elevation_filled_percent>
    <build_time>16</build_time>
    <build_style>1</build_style>
    <layer_count>98</layer_count>
    <layer_height>0.2</layer_height>
    <hatch_pattern>1</hatch_pattern>
    <supports>-1</supports>
    <rafts>-1</rafts>
    <sidewalk>-1</sidewalk>
    <x_extents>20</x_extents>
    <y_extents>20</y_extents>
    <z_extents>19.8</z_extents>
  </build>
</build_package>
```

# Technical Details of 3D Systems specific g-code commands

The function of this plugin is to convert the G-code instructions output by Cura into a format that is compatible with the Cube series of printers.

Following 3D Systems' acquisition of Bits From Bytes in 2010, the G-code flavor used by the Cube series of printers is derived from the instruction set developed by Bits From Bytes or BFB.

Cura is capable of outputting BFB flavor G-code, and while similar, 3D Systems added and modified several command codes.

Command	Description
M104/M204/M304 Sxxx [P1]	Sets temperature for extruder 1/2/3 respectively to value in Sxxx. By default this will pause printing until the target temperature is reached (similar to the M109 command used in many G-code flavors) but this behaviour can be overridden using the optional <i>P1</i> parameter.
M106 Pxxx	Sets hot end fan speed to value in Pxxx parameter which has a range from 0-100.
M228 Px Sx	Disable global/firmware retraction. Yet to be fully defined.
M227 Pxxx Sxxx Gxxxx Fxxxx	Set global/firmware retraction. Yet to be fully defined.
M231 P0 S0	Not yet defined. Raise bed to Z0 to set zero point?
M232 P2500 S2500	Not yet defined. Lower bed to glue position?
M233 P1850	Not yet defined. Display glue message and wait for confirmation?
M240	Not yet defined.
M404 Sxxx [P1]	Sets build chamber to temperature to value in value in Sxxx. By default this will pause printing until the target temperature is reached (similar to the M191 command used in many G-code flavors) but this behaviour can be overridden using the optional <i>P1</i> parameter.
M551/M552/M553 Pxxx Sxxx	Primes/feeds filament in extruder 1/2/3. Value in Pxxx represents number of steps. Value in Sxxx represents speed in rpm.
M561/M562/M563 Pxxx Sxxx	Retracts/reverses filament in extruder 1/2/3. Value in Pxxx represents number of steps. Value in Sxxx represents speed in rpm.
M601 Px Sxx Fx	Not yet defined.

## Code Header

The G-Code starts with a plain text header which contains print information and material settings most of which do not seem to be required and can be omitted. However if the header is omitted entirely an "Invalid Format" will occur when the print file is being read by the printer.

*Example Header*

^Minifirmware:V1.00  
^DRM:000000000000  
^ConfigAndConfiguration:F403-F396  
^PrinterModel:CUBEPRO  
^MaterialCodeE1:200  
^MaterialCodeE2:209  
^MaterialCodeE3:-1  
^MaterialLengthE1: 586.656  
^MaterialLengthE2: 604.156  
^MaterialLengthE3: 0.000  
^ExtruderTypeE1:0  
^ExtruderTypeE2:0  
^ExtruderTypeE3:0  
^ModelHeight: 31.600  
^LayerCount: 158  
^LayerHeight:0.2  
^XSize:19.9936  
^YSize:9.9968  
^Supports:-1  
^Raft:-1  
^Sidewalks:-1  
^Density:Strong  
^Pattern:Diamond  
^Version:1494  
^Time:155

#### Minimal Header

^Minifirmware:V1.00  
^DRM:000000000000  
^PrinterModel:CUBEPRO

#### General Information

Comments in must be prefixed with ^, lines starting with ; will cause an "Invalid Format" error when the print file is being read by the interpreter.

The tool change command Tx and is not supported and instead extruder specific instruction are used as noted above. Similarly Tx is not used as a parameter in M104 to specify an extruder to set as is the case in many G-code flavors.

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