3D PRINTING HANDBOOK

USER MANUAL FOR 3D PrintERS:
- ORIGINAL PRUSA i3 MK3 MULTI MATERIAL UPGRADE 2.0
- ORIGINAL PRUSA i3 MK2.5 MULTI MATERIAL UPGRADE 2.0

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Please always refer to http://www.prusa3d.com/drivers/ for an updated version of this 3D printing handbook (PDF download).

Translated versions of the handbook are available at:

Czech: www.prusa3d.cz/ovladace/
French: www.prusa3d.fr/drivers/
German: www.prusa3d.de/treiber/
Polish: pl.prusa3d.com/sterowniki/
Italian: www.prusa3d.it/driver/
Spanish: www.prusa3d.es/drivers-y-manuales/

Assembly manual is available at http://manual.prusa3d.com

USEFUL LINKS

- Official website: www.prusa3d.com
- Newest drivers: www.prusa3d.com/drivers
- Knowledge base: help.prusa3d.com
- E-shop: shop.prusa3d.com
- Slic3r PE @ GitHub: www.github.com/prusa3d
- MMU2 Objects: www.prusa3d.com/printable-3d-models/

Symbols used in this handbook:

ℹ️ Important notice, tip, hint or information that helps you print with ease.

⚠️ Read carefully! This part of the text has the greatest importance - either for user safety or for proper printer service.
About the author

**Josef Prusa** (born Feb 23rd, 1990) became interested in the 3D printing phenomenon before joining Prague’s University of Economics in 2009. At first, 3D printing was a hobby, a new technology open to changes and improvements. This hobby soon became a passion and Josef grew into one of the leading developers of Adrien Bowyer’s international, open source, RepRap project. Today, you can see the Prusa design in different versions all around the world. It is one of the most popular printers, and thanks to Josef Prusa’s machines, the knowledge of the 3D printing technology significantly increased among the public.

Jo’s work on self-replicating printers (you can print the other printer parts with your printer) is still ongoing. Currently, the Original Prusa i3 MK3 is on the market - the third and latest iteration of the original 3D printer. It is constantly updated with the latest innovations, such as the brand new Multi-Material Upgrade 2.0, which you have just purchased.

Josef Prusa also organizes workshops for the public, participates in professional conferences dedicated to the popularization of 3D printing. For example, Josef lectured at the TEDx conference in Prague and Vienna, at World Maker Faire in New York, Maker Faire in Rome and at the Open Hardware Summit hosted by MIT. In addition, Josef teaches Arduino at Charles University and was a lecturer at the Academy of Arts in Prague.

In his own words, he imagines that 3D printers will be available in every home in the not-too-distant future. “If anything is needed, you can simply print it. In this field, you just push the boundaries every day... We're glad you're part of it with us!”
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1 About the product

Multi Material Upgrade 2.0 (MMU2) is the second generation of our unique multi-material printing solution compatible with the Original Prusa i3 MK2.5 and MK3 3D printers.

MMU2 went through a major revision, resulting in a simpler and more reliable design. The number of simultaneously supported filaments increased to the total of five, which enables the users to print even more complex and more colorful objects.

To unlock the maximum potential of your printer with the MMU2, use our latest Slic3r Prusa Edition slicing software. Offering a multitude of unique features, Slic3r PE is your go-to solution for single and multi-material printing. The latest version introduces options such as Wipe to infill or Wipe object and helps you save time and filament by utilizing various smart routines.

The new generation of Multi Material Upgrade comes with a reworked body and improved controls. See the picture below to learn the official names for each part. We will be referring to these names in our guide.

![Picture 1 - The Multi Material Upgrade 2.0](image1)

![Picture 2 - Location of the Reset button and of the micro USB port](image2)
2 Quick-start instructions

We get it. You just assembled the MMU2 according to Assembly Guide, connected it to your printer and now you are eager to start printing :) But give us just a second! There’s a couple of important steps you need to take before you can print your first multi-material G-Code. Please note that these instructions are just a quick overview for users who already have experience with 3D printing. We highly recommend reading the full instructions.

1. Download and install Drivers & Apps from [www.prusa3d.com/drivers](http://www.prusa3d.com/drivers), update printer firmware with Slic3r PE 1.41+

![Firmware and Drivers](image1)

2. Place filament spools behind the printer and load filaments

![Filament Spools](image2)

3. Run Filament length, Z-axis and First Layer calibrations

![Calibrations](image3)

4. Print your first test object!
3 Placement and setup

Arrange the spool holders next to each other at least 40 cm behind the back of the printer.

**Pict. 3 - Placement of the spool holder**

During filament changes, all of the filament is unloaded from the orange PTFE tube. The printed parts attached to the spool holders are designed to create loops of filament instead of letting it fall down from the spool and possibly getting tangled up.

**Pict. 4 - Spool unwinding protection**
4 Flashing the firmware

Before you start using the MMU2, the **printer’s firmware needs to be updated**, otherwise the printer won’t communicate with the new unit. The MMU2 motherboard can be also updated with a new firmware, which comes as a separate file. Please keep in mind that there are slightly different flashing procedures for each board and that firmware files for the printer and the MMU2 can be released independently. Drivers, apps and firmware files can be downloaded from [www.prusa3d.com/drivers](http://www.prusa3d.com/drivers)

WARNING: Do not disconnect the printer during the flashing process!

MAKE SURE YOU HAVE THE CORRECT FIRMWARE FILE FOR THE DEVICE YOU WANT TO UPDATE

4.1 Flashing firmware on Windows

1. Go to [www.prusa3d.com/drivers](http://www.prusa3d.com/drivers) and download the correct firmware for your printer and/or MMU2 unit. Please note that there is a different firmware for each of our printers and also a different type of firmware for the MMU2.

2. Download the latest **Drivers & Apps package** from the same page and install it. Make sure that **Slic3r PE and Drivers are selected** in the installation wizard

3. Connect your printer to your PC using a USB cable. The type of USB cable and the port depend on which type of firmware you want to flash.
   a. **TO FLASH PRINTER FIRMWARE**: Use the standard procedure - connect the printer mainboard (RAMBo) to your PC using a square-shaped USB-B 2.0 cable
   b. **TO FLASH MMU2 UNIT FIRMWARE**: Use a microUSB cable to connect the MMU2 unit to your PC

4. Start Slic3r PE and select Configuration -> Flash Printer Firmware

5. A new window will appear. Your printer should be detected in the ‘Serial Port’ box

6. Click Browse to select the downloaded firmware file

7. Press Flash! and wait for the process to finish

8. Once the flashing process is finished, you can disconnect the printer from your PC
To flash firmware on MacOS or Linux, please download the latest version of Slic3r PE for your system, then download the firmware files and follow the procedure described above. Downloading and installing USB drivers is not necessary.

The firmware for our lineup of printers is updated regularly. To ensure the best possible experience when working with the printer and the MMU2, it is necessary to always use the latest firmware.

5 Loading/Unloading/Selecting/Ejecting filament

It’s essential that you cut the end of the filament as shown in the picture. The sharp tip ensures proper insertion of the filament into the MMU2 unit. Also, try to straighten the filament string with your fingers and make it as straight as possible.

You don’t need to preheat the nozzle as filament loading only pushes the filament to the MMU2 unit. Insertion of the filament to the extruder is done automatically during print.

5.1 Loading all five filaments at once

1. Go to LCD Menu - Load filament - Load All
2. The selector will move to the first position, the first LED will start blinking red
3. Insert the filament to the first PTFE tube and push it until it’s caught by the drive gear
4. The filament will be pushed until it’s detected by the FINDA, then it will be retracted from the selector, ready to be extruded when needed
5. The LED indicator will turn green, signaling successful filament load, the selector will move to the 2nd position
6. Repeat the process for the remaining 4 filaments
5.2 Loading one of the filaments using the LCD Menu

1. Go to **LCD Menu - Load filament - Load filament 1/2/3/4/5**
2. The selector will move to the first position, the corresponding LED will start blinking red
3. Insert the filament into the correct PTFE tube and push it until it’s caught by the drive gear
4. The filament will be pushed until it’s detected by the FINDA, then it will be retracted from the selector, ready to be extruded when needed
5. The LED will turn green

5.3 Loading one of the filaments using the MMU control buttons

1. Using the left and right control buttons, move the selector to the position corresponding with the filament number you’d like to load.
2. Insert the filament inside the white PTFE tube and continue pushing it until it’s not possible to push it any further.
3. **Press and hold the middle control button for a few seconds.**
4. The corresponding LED indicator will start **blinking red.**
5. Push the filament a little bit further into the white PTFE tube until it’s caught by the extruder.
6. The LED indicator should turn green after a short while, signaling successful filament load.

To **unload** filament simply pull the filament string from the white PTFE tube manually.

*Pict. 7 - Inside of the MMU2 unit with properly loaded filament*
If you want to verify proper load of all five filaments before print, select **LCD Menu - Load filament - Load all**. The MMU unit should quickly try loading and unloading all 5 filaments one after another without any user interaction. After the last position, the LCD Menu should quickly try loading and unloading all 5 filaments one after another without any user interaction. Green LED should signal success of load after each position.

5.4 Ejecting filament

Found in **LCD Menu - Eject Filament - Eject Filament 1/2/3/4/5**. It’s advised to run this procedure after you use up filament scraps through the automatic depletion function ([LCD Menu - Settings - Auto Deplete [on/off]](9.1 Filament spool auto-deplete)). It allows you to remove the last remaining piece of filament from the loading tubes after a filament spool is completely used up. Select the desired slot from the menu and the last remaining piece of filament string will be pushed out of the slot. In case the selector is blocking the slot, it will be automatically moved aside.

Please note that the nozzle has to be preheated in order to perform a filament ejection procedure, because the filament may still be in loaded in the printer’s extruder.

5.5 F.I.N.D.A explained

F.I.N.D.A is an older design P.I.N.D.A probe repurposed as a filament sensor. When the filament is pushed through the selector, it raises a stainless steel ball. Its movement is detected by the F.I.N.D.A. There is a small red LED light on the back of the probe. As soon as the filament is detected, the light turns off.

When the filament is removed, the stainless steel ball falls back down. Please note that the ball is pulled down by gravity, that means the filament sensor won’t work if you for whatever reason turn the MMU2 unit upside down.

![Pict. 8 - F.I.N.D.A.](image-url)
6 Calibration

Since the assembly of the MMU2 requires the printer’s extruder to be disassembled in the process, it’s very likely that your printer’s Z-axis is now shifted. It’s essential to set up PTFE tube length and re-calibrate the Z-axis and run the First Layer Calibration routine before you start printing!

6.1 Individual filament calibration

Before you start, please ensure that you have updated the MMU2 unit’s firmware to version 1.0.1-117 or higher. Keep in mind that MMU2 is flashed separately (please see Chapter 4 to learn more). You can check current MMU2 firmware version in LCD Menu - Support.

![MMU2 firmware version displayed in LCD Menu - Support](image)

In order to ensure that the filament will always reach Bondtech gears in the printer’s extruder, it’s vital to calibrate the PTFE length. This is done individually for each of the five loaded filaments. If your MMU2 skips certain filaments during printing, it’s because the PTFE tube length needs to be calibrated.

The procedure described below may seem difficult, but generally speaking, all you have to do is to enter the service menu, select one of the filaments, load it into the extruder, adjust the length, double-check the length by re-loading the filament, then unload and repeat for the rest of filaments.

1. Load all five filaments according to instructions in the previous chapter
2. Turn the printer off and open the printer’s extruder idler
3. Turn the printer back on and observe the MMU2 booting sequence: the selector will move to the end of the lead screw, then back to the centre. Wait for it to start moving again and press and hold the middle MMU2 button.
4. Keep holding the middle button during the whole initialization sequence until LED 1 (green and red) and LED 5 (red) light up, then release the button
5. Use the left button to select LED 4 (it will light up)
6. Press the middle button to confirm the selection and load the filament into extruder. Successful filament load is indicated by first and fourth LEDs flashing.
7. Now, check (in the printer’s extruder) where the loaded filament string stopped
8. Use left and right buttons on the MMU2 to move the filament by tiny increments into the ideal position: the end of the filament string must reach the Bondtech gear as depicted on the picture below (it should lightly touch the Bondtech gear teeth)

9. To reach the optimal position and to compensate for the tension in the PTFE tube, **the last few movements should be downwards** (e.g. up-up-down-down-down)

10. Once you tweak the optimal position, press the middle MMU2 button to unload the filament and save the values.

11. Now press the middle button again to return the same filament back to the Bondtech gear, so you can double-check whether the length has been set correctly. If not, adjust the length with left and right MMU2 button again. Tolerance of +/- 1 mm is ok.

12. Press the middle button again to unload the filament.

13. Press the right MMU2 button to move the selector into the next position and repeat the steps 6-12 for each of the filaments

14. When all five filaments are calibrated, move the selector all the way to the right and wait for the diode to start flashing. Then press the middle button to exit the service menu. No restart is needed. Finally, close the extruder idler.

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**Pict. 10 - Press and hold the middle MMU2 button during start-up to enter the service menu**

**Pict. 11 - Correct position of the filament tip during the calibration process**
6.2 Calibrate the Z-axis

In your printer's LCD menu, go to Menu - Calibration - Calibrate Z and let the printer run the calibration procedure. The procedure consists of raising and lowering the Z-Axis and measuring 9 points on the print bed.

![Z calibration](image)

Alternatively, you can run a “manual” Z-axis calibration. After you power on the printer, press and hold the knob for 2 seconds. A new menu will be displayed, showing the letter ‘Z’ and a number representing the current height of the Z-axis. Rotate the knob clockwise until both ends of the Z-axis hit the top part of the frame.

Once the Z-axis is calibrated, you can proceed with the First Layer Calibration.

6.3 First Layer Calibration

1. Load a PLA filament into at least one MMU2 slot
2. Check if your printer’s print surface is completely clean. Please refer to your model’s handbook to learn more about surface maintenance
3. On your printer, go to LCD Menu - Calibration - First Layer Cal.
4. The printer will warm up and ask you which filament should be used. Use the on-screen menu to choose the desired PLA filament for the test
5. The printer will probe the bed and start printing a zig-zag pattern on the print surface. The nozzle must not by any means touch the printing surface.
Pict. 13 - How to tune the nozzle height in real time during the test print. Note: -0.640 mm is only for illustration. Your setting will be different!

Observe the line which is being extruded on the print surface. A new menu will automatically show up, with an option to tune the nozzle height in real time by turning the knob. The aim is to adjust the nozzle height until the extruded plastic sticks nicely to the bed and you can see that it is being slightly squished. The value should not exceed -2.000 mm. If you have to adjust it more (e.g. -2.500), move the P.I.N.D.A probe slightly higher. Please refer to our knowledge base in case the P.I.N.D.A probe needs to be realigned.

Pict. 14 - The properly-tuned first layer
If your printer was working without any issues before adding the MMU2 unit, these two calibrations should be everything you need to start printing. In case you still have trouble calibrating the first layer height, please refer to the printer’s handbook or our knowledge base at help.prusa3d.com.

7 First Print

First Print checklist:

- ✔ MMU2 Unit attached
- ✔ New printer firmware flashed
- ✔ Filaments loaded
- ✔ Performed Filament, Z-Axis and First Layer calibrations

For your first print, we recommend using one of our G-codes.

If you have installed the latest driver package with the MMU2 option selected, you can use the ‘3D Objects’ shortcut on your desktop that will take you to a folder containing MMU2 objects and G-codes.

Place the desired G-code(s) on your printer's SD card, insert it into your printer's SD card slot and select the object to print in LCD Menu - Print from SD Card. Wait for the printer to start the process.

Do not leave your printer unattended during the first print. Watch the process closely and in case of any kind of trouble, use the Menu - Stop print function to cancel the process immediately.

8 Printing in Multi Material Mode

With the MMU2 unit mounted, you can print in two different modes: Multi-material mode and Single mode (which works as a regular 3D printer). To print in Multi-material mode, at least two filaments have to be loaded. Both modes have the same set of features like the standard MK3, such as variable layer height and many others.

You can download multi-material G-codes ready for printing from our website. To generate your own multi-material G-Codes, you should use our slicer software - Slic3r PE. You can always get the latest stable version in our Drivers & Apps package at prusa3d.com/drivers/.

8.1 Importing objects into Slic3r PE - STL, 3MF, AMF

Objects ready for multi-material printing come in three file formats
1. **.3MF/.AMF** - preferred format which includes all of the parts in a single file
2. **.STL** - several separate files, each file for a different part of the object

3MF files are automatically loaded with all the parts already aligned. To load multi-part model saved as multiple STLs simply drag and drop all of the files inside Slic3r's window and confirm multi-part object auto-detection.

![Multi-part object detected](image)

*Pict. 15 - Loading multi part object*

If the files aren't automatically detected as multi-part object, follow these steps:

1. Open Slic3r PE and make sure the Original Prusa i3 MK3 MMU2 profile is selected in the menu on the right
2. Click the ‘Add…’ button to open the file browser
3. Select the main part of the object and click Open to import it into Slic3r
4. Position the main part on the virtual print surface
5. Double-click the imported object to open the Settings window
6. Click the ‘Load part’ button
7. Select all remaining parts of the object and click Open
8. Check the preview window to see whether the object has been imported successfully and no parts are missing

In the next step, we'll set up colors for each part of the object.

![Settings for multi-material part](image)

*Pict. 16 - Multi-part object correctly imported to Slic3r PE*
8.2 Setting up colors

Double-click the imported object to open the Settings window. If you have already imported all parts, you will see them listed in a tree view.

1. Select a part of the object in the list
2. In the Object Settings section, choose the corresponding extruder (=filament)
3. Assign an extruder to each part of the object. Assigning the same extruder to two parts will result in those parts being printed in the same color. Once you’re done, press OK
4. Use the Filament menu on the right side of the Slic3r window to change colors for each part of the object by left-clicking the small red box next to the filament’s name. Try to match these colors to the colors of your filaments to get a better idea how your 3D object will look once it’s printed. Keep in mind the order of filaments!
5. Slice the object as usual. Once you are happy with the result, export the G-code

Pict. 17 - Assigning colors in Slic3r and the corresponding PTFE tubes

If your object has a solid-green color in Slic3r, it means it’s selected. Click anywhere in the Slic3r 3D view to deselect the object.

8.3 Slicing a multi-material object

You can use the standard procedure to slice a multi-material object. Press the Slice now button and wait until the process finishes.
8.4 Smart wipe tower

The smart wipe tower ensures sharp color transitions and stable filament flow after a color change, while aiming to waste as little filament as possible. There is always only one wipe tower no matter how many objects are being printed at once. The size of the wipe tower is independent of the size of the object being printed. Printing multiple copies at once or printing big objects therefore improves the overall efficiency of the filament use.

8.4.1 Wipe tower placement

As soon as you select Original Prusa i3 MMU 2.0 in the Printer selection box, the smart wipe tower will appear in the 3D preview. The preview shows its maximum footprint, because the size may decrease after slicing, based on the number of color changes in each layer. The size will decrease from the edge with the polyline.

You can change the placement of the wipe tower by dragging it with left mouse button. Make sure the wipe tower doesn’t intersect any of the objects. To shorten the travel moves between the object and the wipe tower, place it in the near proximity of the object.

![Pict. 18 - Smart wipe tower preview and real size after slicing](image)

8.4.2 Purging volumes

In the panel on the right side you’ll find a Purging volumes button. In the Simplified settings you can simply set how much filament will be purged when filament is being unloaded or loaded. This lets you optimize the amount of wasted filament by, for example, decreasing the amount to purge when loading black filament. On the other hand you can increase the value when transitioning to very light colors, to ensure they are not contaminated by previous colors.
By default, 70mm$^3$ is used for both loading and unloading. When using water soluble supports we suggest using at least 100mm$^3$.

In the table below you can see suggested values for some of the commonly used colors/filaments.

<table>
<thead>
<tr>
<th>Color</th>
<th>Unloaded</th>
<th>Loaded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td>White</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Yellow</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Silver</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>High gloss filaments</td>
<td>90</td>
<td>70</td>
</tr>
<tr>
<td>PVA/BVOH</td>
<td>120</td>
<td>100</td>
</tr>
</tbody>
</table>
The **Advanced settings** let you set the purging values for each combination of filaments in a matrix view. E.g. purge more when transitioning from black to white (e.g. 100mm³), but purge less when transitioning from white to black (e.g. 60mm³).

![Advanced settings, a purging volumes matrix](image)

8.5 Wipe to infill

Since the inside of the model isn’t visible, it can be used to wipe the nozzle during the color transition. The wipe tower cannot be eliminated completely, because some models do not have enough infill, but wipe to infill can **greatly reduce the amount of wasted material**. To enable this feature, double click on a model in the 3D view and tick **Wipe to infill**. Please note that dark filament purged into infill may be visible through light colored walls. To avoid this issue, we suggest to increase the amount of perimeters.

![Wipe to infill](image)
8.6 Wipe object

To further decrease the amount of material used for the smart wipe tower, you can choose to wipe residual filament into an object. The so-called ‘wipe object’ will be used during the color transition to wipe the nozzle. As a result, the colors of the object will be mixed - this is handy in case you don’t care about the surface color (e.g. mechanical parts). To turn a regular object into a wipe object, open it in Slic3r, double-click on the model in the 3D view and tick Wipe to object.

Wipe object taller than the multi-colored object
- The wipe object will be finished with the last filament used during the multi-colored print.

Multi-colored object taller than the wipe object
- After the wipe object is finished printing, wiping will move to the smart wipe tower

8.7 Supported Materials

MMU2 supports the most common materials (such as PLA, PETG and ABS) along with soluble materials (BVOH) from the start. In addition, we’re working on expanding the range of supported materials (Flex and PVA+ coming soon). Support for additional materials is delivered through software updates.

Please, keep in mind that mixing different types of materials is not recommended due to different temperatures for bed and nozzle.

Check our website and blog regularly to get the latest news about supported materials.

8.8 Soluble Supports

We strongly suggest to use Verbatim BVOH support material. The second best option is Prima Select PVA, both available in our e-shop. Unfortunately, the quality of different PVA
brands can vary greatly and we cannot guarantee good results when working with soluble materials from other brands

**8.8.1 Soluble support interface only**

Water soluble filament us usually fairly expensive. In order to greatly reduce the amount of water soluble filament needed, you can choose to print soluble support interface only. With this option turned on, only the last few layers in contact with the model will be printed using soluble filament.

![Pict. 24 - Water soluble support interface](image)

**8.8.2 Completely soluble supports**

When removing soluble supports, try to break away as much material as possible while the object is still dry. Then continue peeling the material under running warm water. The last bits can be removed by letting the print soak in warm water. Water soluble filaments must be **always** stored in dry conditions.

![Pict. 25 - Water soluble supports](image)
9 Printing in Single Mode

Even with the MMU2 unit mounted, you can still use the printer for single-color printing, also known as ‘Single Mode’. The best option is to have 5 of your favorite filaments loaded, so once you start printing, you can choose which filament to use via an on-screen menu.

To prepare a Single Mode G-code, follow these steps:

1. Open Slic3r PE and choose ‘Original Prusa i3 MK3 MMU2 Single’ in the Printer menu on the right side of the window
2. Import object(s) and slice them as usual
3. Once you are happy with the results, export the G-code
4. Place the G-code on an SD card and insert it into your printer
5. Go to LCD Menu - Print from SD card and select the desired object
6. The printer will ask you which filament (extruder) you wish to use. Select the desired filament spool in the on-screen menu and confirm it by pressing the knob.
7. The printer will load the selected filament and proceed with single-color printing

Multi-material G-codes cannot be printed in single color mode. The object has to be sliced again and re-exported as a Single Mode G-code.

9.1 Colorprint

The web version of Colorprint tool is compatible with the MMU2 Single Mode.

1. Import an object into Slic3r and choose ‘Original Prusa i3 MK3 MMU2 Single’ in the ‘Printer’ menu on the right side of the window
2. Slice an object and export the resulting G-code from Slic3r as usual
3. Upload the G-code to the ColorPrint webapp https://www.prusaprinters.org/color-print/
4. Click the Add color change button
5. Set the layer height at which the color change should happen
6. Continue adding as many color changes as you like
7. Download the G-code, upload it to SD card and you’re ready to print
8. During the print, the printer will automatically pause the print and prompt you to change/select the filament
9.2 Filament spool auto-deplete

When printing in Single mode, an auto-deplete function can be switched on in **LCD Menu - Settings - Auto Deplete [on/off]**. This function enables automatic switching of filament spools in case one of the filaments runs out. This is especially useful when you want to get rid of filament scraps that are still on spools without paying close attention to the printer during the printing process.

The auto-deplete function cycles through all filament slots in a loop, so e.g. if you run out of filament in slot 1, the printer will automatically move to slot 2. In the meantime, you can replace the spool of filament in slot 1, so once the printer reaches slot 5, it will go back to slot 1 and continue printing.

10 Handling

10.1 Mounting/Unmounting the MMU2 unit

1. Unscrew the Festo coupling from the extruder body
2. Unplug the two connectors from the MMU2 board that transfer power and data from the EINSY board.
   a. Use an allen key to push on the connector release
3. Tilt the MMU2 unit forward to unclip it from the frame

If you wish to print without the MMU units installed, please replace the filament sensor cover with the original one (the one without the thread for the FESTO coupling). Using the FESTO coupling to load filament directly (without the PTFE tube attached) is not recommended as it can lead to various issues.

10.2 Transporting the printer

To transport the printer with the MMU2 unit attached, please follow these instructions:

1. Unload all filaments completely - see chapter 5 Loading and Unloading filaments
2. Take all white PTFE tubes and push them through one of the hexagonal openings at the top of the printer
3. Use the middle part of the frame to lift the printer with one hand
11 Menu structure

- Info screen
- Live adjust Z (during the printing process only)
- Tune (during the printing process only)
  - Speed
  - Nozzle
  - Bed
  - Fan speed
  - Flow
  - Change filament
  - Mode
- Pause print (during the printing process only)
- Stop print (during the printing process only)
- Preheat
  - PLA - 215/60
  - PET - 230/85
  - ABS - 255/100
  - HIPS - 220/100
  - PP - 254/100
  - FLEX - 230/50
  - Cooldown
- Print from SD
- Load filament
  - Load All (only when MMU2 is connected)
  - Load filament 1 (only when MMU2 is connected)
  - Load filament 2 (only when MMU2 is connected)
  - Load filament 3 (only when MMU2 is connected)
  - Load filament 4 (only when MMU2 is connected)
  - Load filament 5 (only when MMU2 is connected)
- Eject filament (only when MMU2 is connected)
  - Eject filament 1
  - Eject filament 2
  - Eject filament 3
  - Eject filament 4
  - Eject filament 5
- Unload filament
- Settings
  - Temperature
    - Nozzle
    - Bed
    - Fan speed
  - Move axis
    - Move X
    - Move Y
- Move Z
- Extruder
- Disable steppers
- Filament sensor - On / Off
- F. autoloading - On / Off
- Auto deplete - On / Off (only when MMU2 is connected)
- Fans check - On / Off
- Mode - Normal / Stealth
- Crash detection - On / Off
- Lin. correction
- Temperature calibration - On / Off
- RPI port - On / Off
- Live adjust Z
- Select language
- SD card - Normal / FlashAir
- Sort - Time / Alphabet / None
- Sound

- Calibration
  - Wizard
  - First layer calibration
  - Auto home
  - Selftest
  - Calibrate XYZ
  - Calibrate Z
  - Mesh Bed Leveling
  - Bed level correction
  - PID Calibration
  - Show pinda state
  - Reset XYZ calibration
  - Temperature Calibration

- Statistics
  - Fail stats

- Support
  - Firmware version
  - XYZ calibration detail
  - Extruder info
  - Belt status
  - Temperatures
  - Voltages
12 Troubleshooting

12.1 Selector not moving

If the selector is not moving smoothly or if it cannot reach a certain position, the cause is usually one of following issues:

**The selector motor isn’t working** - first, try powering the printer off and moving the selector by hand. If that didn’t help or you were unable to move the selector, release the olding the selector motor in place, pull the motor out. Then push the smooth rods out with and allen key. You can now easily remove the selector. Clean the stuck filament and reassethree screws holding the selector motor in place, pull the motor out and try pressing the left and right control buttons. See if the motor’s shaft rotates. If not, the motor may be defective, or it is plugged in incorrectly.

**The selector blade is loose** - if you haven’t secured the blade properly during assembly, it may fall out of the socket and block the movement of the selector. Release the three screws holding the selector motor in place and pull the motor out. Then pull both smooth rods out. Place the blade back in place and tighten it properly. Then reassemble the unit back to the original state.

**Filament is bent and stuck in the selector** - release the three screws hble the MMU2 unit.

12.2 All five LEDs blinking red after power on

If there is filament present in the selector during power up, it’s detected and the standard booting move sequence is interrupted, as it would bend or break the filament.

1. Try to pull the problematic filament out from the back
2. If you’re unable to pull the filament out, try powering the printer off and try again
3. You can unscrew the FESTO coupling from the MMU2 selector and instead pull the filament out from this side
   a. If you’re able to pull the filament out in this direction, cut it at near the spot where the filament enters the white PTFE tube
4. As a last resort, remove the selector motor by unscrewing the 3 screws holding it and push the smooth rods out with an allen key. You can then easily remove any debris stuck in the selector.

12.3 Crash detection

When the printer encounters a crash during printing (nozzle hits the printed object), the printer will pause the print and ask the user to confirm whether it’s safe to continue printing. If the user chooses no, the print is completely stopped. The filament will remain loaded in the extruder. To unload the filament from the extruder, preheat the nozzle first and then select Unload filament in the printer’s LCD menu.
12.4 Blinking red LED

In a situation when the nozzle stops at the wipe tower and seemingly nothing is happening for several minutes, see if one of the MMU LEDs is blinking red. Blinking red light signalizes that filament got stuck during loading/unloading.

- **Slow flashing** - fault during filament **load**
- **Rapid flashing** - fault during filament **unload**

The print will remain paused until the problem is resolved.

How to solve a problem during filament **unload** - rapid flashing:

1. Remove the orange PTFE tube by unscrewing the silver fittings from MMU2 body
2. Check whether there’s a filament string stuck in the MMU2’s selector
3. Pull the filament out from the orange PTFE tube
   a. If you’re unable to remove the filament from the tube, proceed to the other end of the tube
   b. Release the Festo fitting on the extruder and if needed open the extruder idler
   c. Then pull the filament out from the extruder body
4. Using fingers move the filament back in the MMU unit and leave about 1 cm sticking out.
5. If the filament is stuck inside the selector and you’re unable to move it, press the **left button** - this will start load/unload
   a. If the printer failed at the loading stage the button works in loading mode
   b. If the printer failed at the unloading stage, the button is in unloading mode
6. The **middle button** will be used now. Press it once and wait for the printer to finish the auto-check procedure.
7. If the procedure **finishes correctly**, the LED above affected filament will turn to **red-green flashing**, if the **procedure fails** it will remain **red**.
8. Finally, screw the Festo fitting back in and press the right button to continue the print

How to solve a problem related to filament **load** - slow flashing:

1. Pull the problematic filament out from the PTFE tube and cut the end to create a sharp tip
2. Insert the filament back into the white PTFE tube
3. Press the **middle button** to start the loading sequence
4. Push the filament until it’s caught by the drive gear
5. If the LED turns green, press the **right button** to continue the print
6. If the LED turns red, repeat the process

12.5 Loud clicking and barrel unable to move freely

If the printer makes a loud clicking noise as the selector changes positions, and you see that the barrel was unable to rotate into the correct position, it’s likely that your MMU idler is overtightened. Loosen the two screws (one on each side of the MMU2 unit) a little bit and try
again. If the barrel still can’t rotate freely, you can open the idler completely and verify that nothing’s blocking it.

Pict. 27 - Idler opening

12.6 Replacing the blade in the selector

The blade in the selector will wear over time. When the blade can’t cut the filament anymore, it is time to replace it. Please refer to the assembly manual for more detailed description of each step.

1. **Disconnect the orange PTFE tube** from the selector by removing the silver fitting on top of the selector
2. Remove **three screws** holding the selector motor in place
3. **Pull out the selector motor and two shafts** to release the selector
4. **Loosen two screws on the blade-holder** and carefully remove the blade. Use needle-nose pliers to remove it, if possible
5. **Insert a new blade**, tighten the blade-holder and re-assemble the selector unit

12.7 Setting the PTFE tube length - filament not reaching Bondtech gears

If the filament doesn’t reach the Bondtech gears (e.g. the printer cannot load certain filaments) or you choose to use a different length PTFE tube, you need to update the PTFE length settings. Please see the chapter 6.1 Individual filament calibration to learn how to calibrate the filament length.
Print and share!

Do not forget to tag your prints with #mmu2 while sharing so we can find, pin and showcase them with our

http://www.prusa3d.com/original-prusa-i3-prints/

Happy Printing :)