



with Christopher Matthes

DDG Ultimaker V1.0



Assembly and installation manual

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Table of Contents

Acknowledgements	2
Introduction	2
Compatibility	2
What's in the box?	2
Ultimaker 2+ and Ultimaker 2 Extended + Upgrade Kit	2
Ultimaker 3	2
Mechanical Installation	3
What you need	3
Ultimaker 2+ and Ultimaker 2 Extended + Ultimaker 3	3 10
Software Configuration	11
Ultimaker 2+ and Ultimaker 2 Extended + Ultimaker 3	11 12
PC	12
MAC and Linux	18
General usage advice	18

Acknowledgements

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Introduction

The Bondtech DDG Ultimaker V1.0, which was developed by Bondtech and Christopher Matthes, is the simplest way to increase the performance of your Ultimaker machine in a matter of minutes.

This new revolution in design utilizes the proven **Bondtech Dual Drive Technology** with precision CNC-manufactured parts. This gives the market's best feeder performance and reliability.

The Upgrade allows you to prototype even faster and print with peace of mind.

Compatibility

The upgrade is compatible with the following machines:

- Ultimaker 2 with Extrusion Upgrade Kit
- Ultimaker 2 Extended with Extrusion Upgrade Kit
- Ultimaker 2+
- Ultimaker 2 Extended +
- Ultimaker 3
- Ultimaker 3 Extended

What's in the box?

Ultimaker 2+ and Ultimaker 2 Extended + Upgrade Kit

1x Bondtech DDG Righthand extruder kit

Ultimaker 3

1x Bondtech DDG Righthand extruder kit

1x Bondtech DDG Lefthand extruder kit

Mechanical Installation

What you need

To install the upgrade you are only going to need a M2.0- Hex Wrench.

Ultimaker 2+ and Ultimaker 2 Extended +

This guide shows the installation on an Ultimaker 2 with Extrusion Upgrade Kit.

Start by removing the material from your printer(<https://ultimaker.com/en/resources/18013-removing-the-filament>). After the filament is removed, power off the printer.



- Rotate the printer so you can access the rear side.



- Remove the collet clip, which locks the bowden tube into place.



- Unplug the bowden tube.



- Unscrew the 2 x M3 screws that hold the original geared Ultimaker feeder into place.



- Remove the feeder.



The Bondtech upgrade uses many of the components shipped with the original feeder. Therefore we need to disassemble the original feeder first.

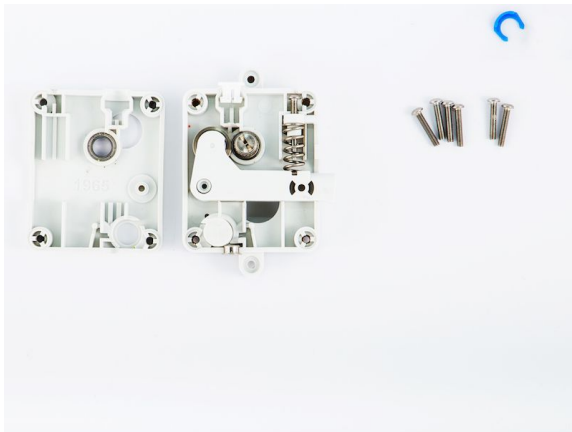
- Unscrew the 4 x M3 screws of the feeder.

Tip: Set the spring tension to its lowest setting (white indicator is at the top) before unscrewing the 4 x M3 screws as it makes removing the top part slightly easier.



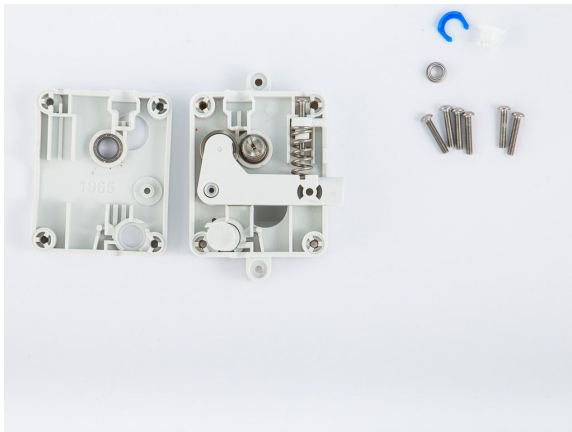
- Open the feeder assembly.

Info: You might need to slightly wiggle the top part out of the bottom part of the feeder.

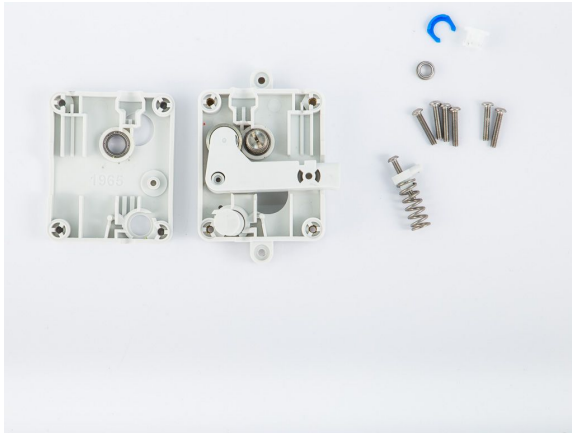


You should now have the opened feeder in front of you as well as the blue collet clip and 6 x M3 screws.

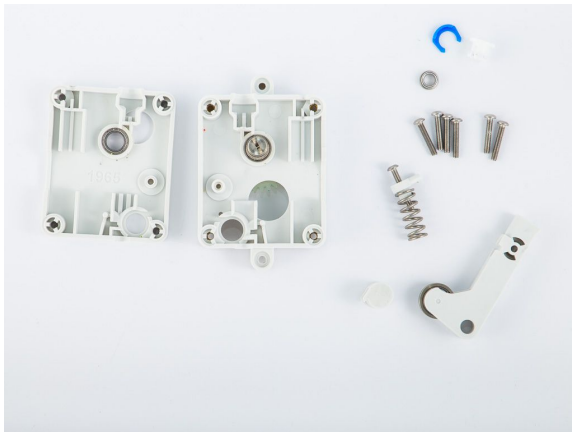
- Remove the bowden coupling as well as the metal grommet.



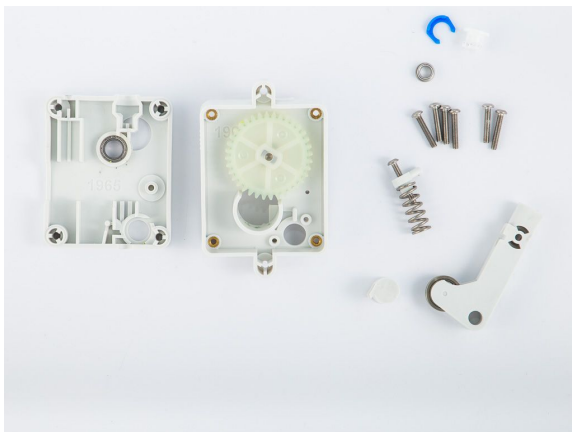
- Remove the spring and spring tension system (1x M3 screw, 1x M3 nut, white indicator)



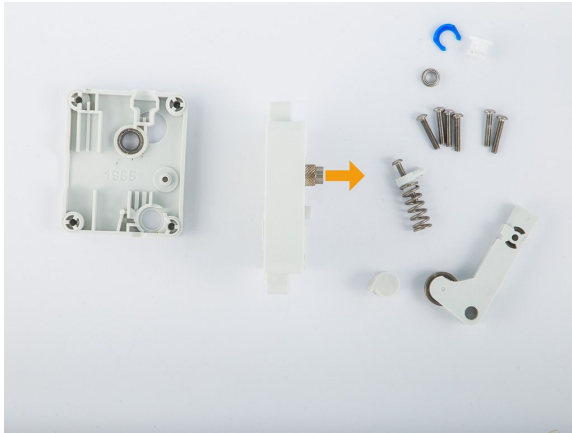
- Remove the lever which normally pushes the filament against the drive gear.
- Also remove the small white plastic piece.



- Turn the bottom part of the feeder upside down.



- Now it is time to remove the 36 toothed gear. Start by turning the bottom part of the feeder to sideways.



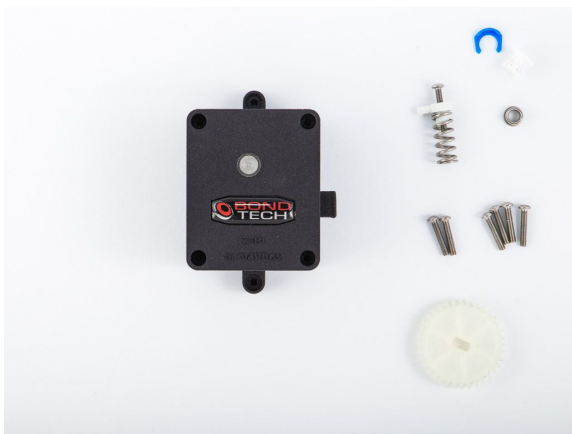
- Grab the drive gear shaft firmly and pull the shaft in the direction of the arrow. Therefore also removing the gear.



Congratulations you successfully disassembled your original Ultimaker feeder!

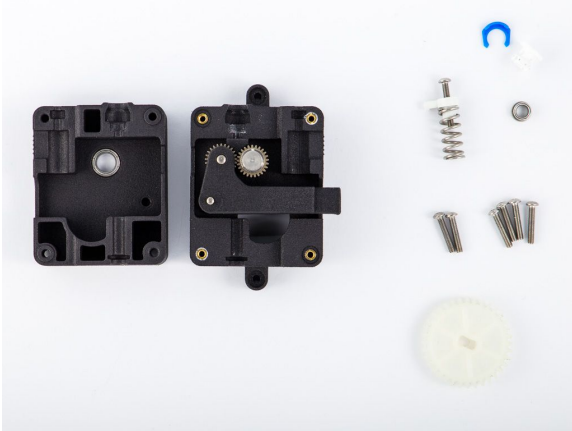
To assemble your Bondtech upgrade you are going to need the following parts:

- blue collet clip
- Bowden coupling
- 6 x M3 screws
- spring and spring tension assembly
- 36 toothed gear

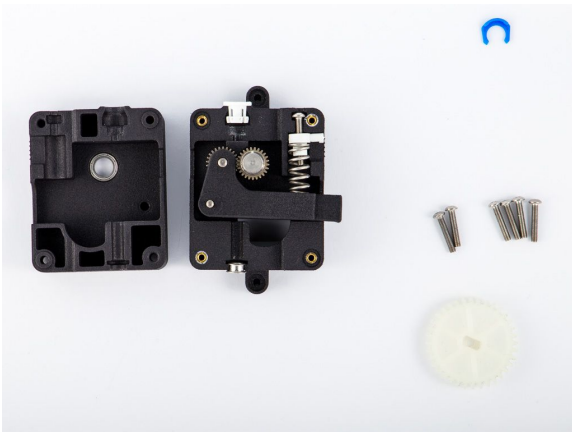


Let's start assembling your Bondtech feeder upgrade.

- Open the feeder.



- Insert the bowden coupling, metal grommet, spring and spring tension assembly.



- Take the top part of the feeder and carefully put the two pieces back together.



- Insert the 4 x M3 screws into the holes.



- Tighten down the 4 x M3 screws.
- Turn the assembly upside down.



- Gently press the 36 toothed gear on the precision made drive shaft.



Congratulations you successfully assembled your Bondtech upgrade!



- Place the Bondtech feeder assembly against the rear back plate.



- Insert the remaining 2 x M3 screws and tighten down.



- Insert the bowden tube.



- Add the blue collet clip to lock the the bowden tube into place.

You successfully upgraded your feeder!
Now you just need to configure the software of your 3d printer to start printing again.

Ultimaker 3

Follow the guide for the Ultimaker 2+ and Ultimaker 2 Extended + twice. Use the feeder labeled 2 the second time you follow the guide.

Software Configuration

Ultimaker 2+ and Ultimaker 2 Extended +

The Ultimaker's firmware needs to be changed since the new feeder uses another E-step value and also the speed for loading/unloading material needs to be lowered in order not to stall the stepper motor. The reason for this is that the Bondtech Dual Drive system has a different drive gear diameter and needs a bit more torque while loading due to gripping the filament on both sides. The additional grip allows to push the material with higher force and reliability.

Below you will find links to the latest firmware that is based on original Ultimaker 2.1 firmware.

The following is changed when compared to the original:

E-step is now 311 and Loading speed is 50 mm/sec

Attention!

Please make sure that you use the correct version for Ultimaker 2+ or Ultimaker 2 Extended +, if you load the firmware for Ultimaker 2 Extended + into a Ultimaker 2+ you will crash the head into the printing surface.

Ultimaker 2+ Firmware: [Link](#)

Ultimaker 2 Extended + Firmware: [Link](#)

Once you have downloaded the firmware use Cura to install the new custom firmware on your printer.

After the firmware has been installed you need to perform a "Factory reset" on the printer to ensure that the printer uses the new values in the firmware.



After the restore to factory settings is complete you will have to level your build plate and load material (the same procedure as when the printer was new).

Ultimaker 3

PC

Start the printer.

We recommend to download and install the latest firmware as it fixes problems and adds extra functionality. Please read the Ultimaker guide (<https://ultimaker.com/en/resources/20500-upgrade-firmware>) on how to update the firmware if you are not sure how to install the latest firmware.

Once firmware is installed enable the developer mode.

- System -> Maintenance -> Diagnostics -> Developer mode

Your Ultimaker 3 will reboot.

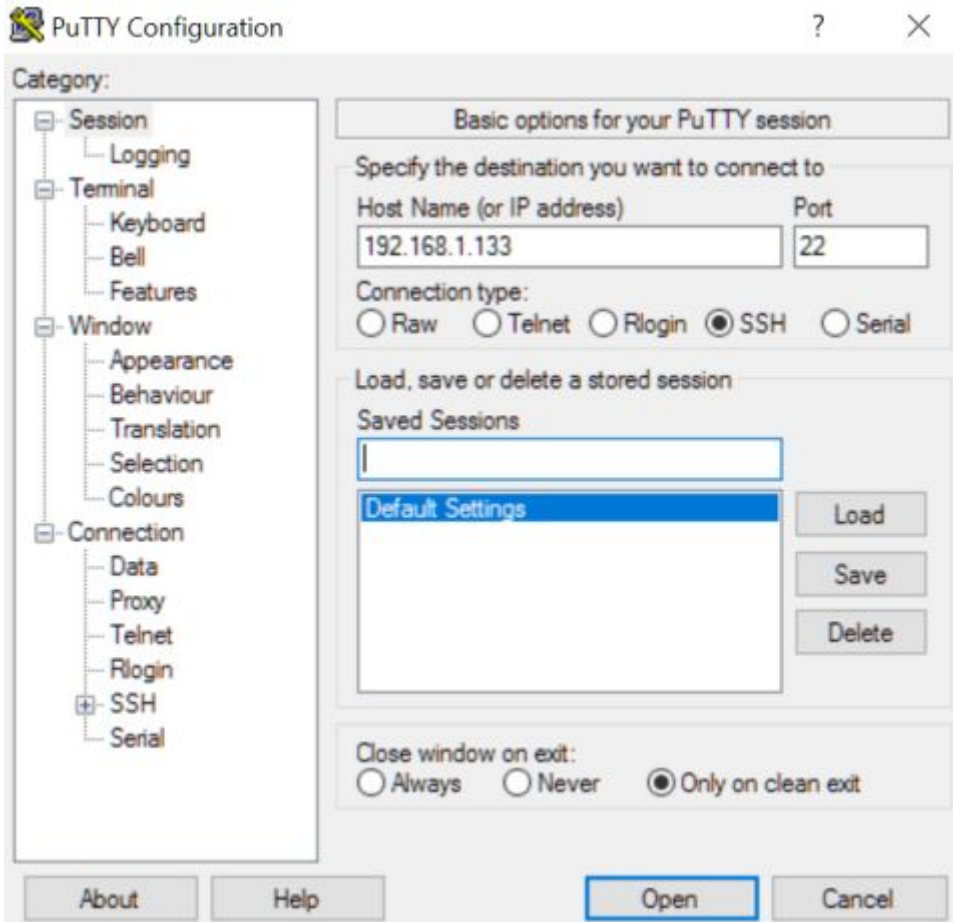
Download a SSH/Telnet client like Putty (<http://www.putty.org>) and install it on your computer.

Locate the IP number of your Ultimaker 3. The IP address is shown on the main screen of the printer on the first line as well as in System -> Network on the last line.

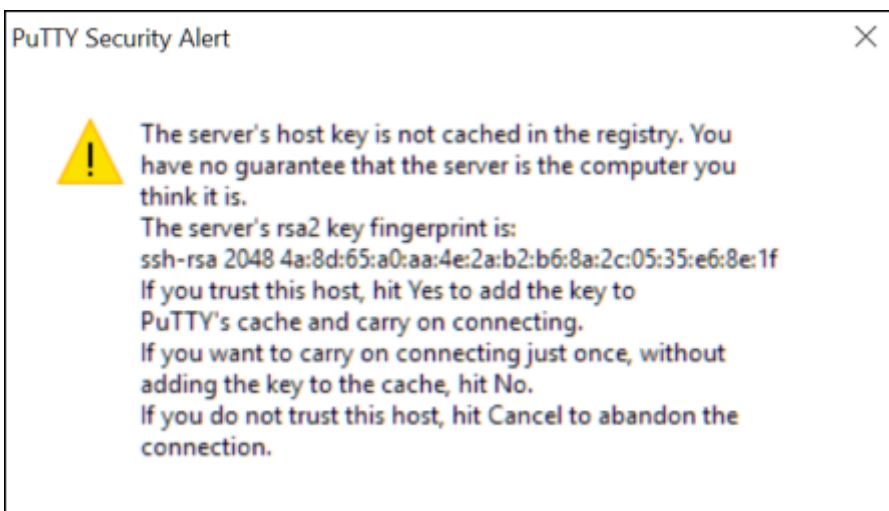
For this example we use the following IP address: 192.168.1.133

Please read the whole guide from this point at least once before changing the values on your own machine.

Open Putty and enter the IP-address in the Host Name field and click on Open.



The first time this Alert will pop-up and you need to click OK to accept the connection.



The connection window opens up. Enter root as the username and ultimaker as the password.

```
192.168.1.133 - PuTTY
login as: root
root@192.168.1.133's password: █
```

```
192.168.1.133 - PuTTY
login as: root
root@192.168.1.133's password:
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.

Debian
Welcome to our kingdom. Please be responsible.
root@ultimakersystem-ccbdd30007b8:~# █
```

Type in the command matching the firmware version of your Ultimaker 3 and press enter.

Firmware Version	Command
3.6	<code>vi /usr/share/griffin/griffin/machines/jedi.json</code>
3.7	<code>vi /usr/share/griffin/griffin/machines/um3.json</code>

```
192.168.1.133 - PuTTY
login as: root
root@192.168.1.133's password:

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.

Welcome to our kingdom. Please be responsible.
root@ultimakersystem-ccbdd30007b8:~# vi /usr/share/griffin/griffin/machines/jedi
.json
```

The editor opens the configuration file. Scroll down using the arrow keys until you find

“default_steps_per_mm” row and use the arrow key to move the cursor to the value for the extruder “369.0”, then press the “i” key to go into edit mode and update the value to “311.0”.

```
192.168.1.133 - PuTTY
"default_travel_speed": 150,
"nominal_nozzle_z_offset": 1.5,

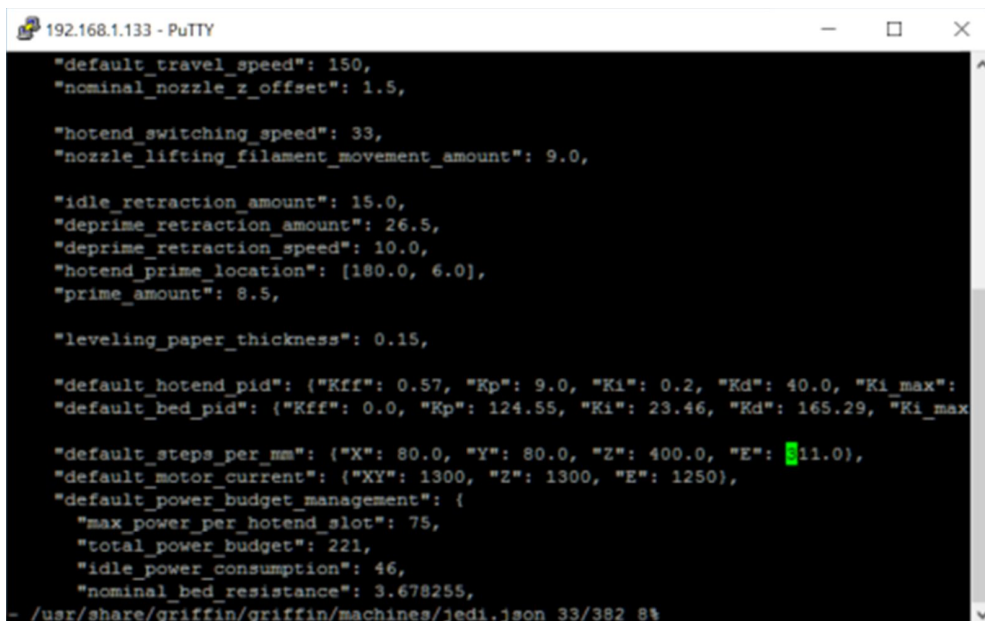
"hotend_switching_speed": 33,
"nozzle_lifting_filament_movement_amount": 9.0,

"idle_retraction_amount": 15.0,
"deprime_retraction_amount": 26.5,
"deprime_retraction_speed": 10.0,
"hotend_prime_location": [180.0, 6.0],
"prime_amount": 8.5,

"leveling_paper_thickness": 0.15,

"default_hotend_pid": {"Kff": 0.57, "Kp": 9.0, "Ki": 0.2, "Kd": 40.0, "Ki_max":
"default_bed_pid": {"Kff": 0.0, "Kp": 124.55, "Ki": 23.46, "Kd": 165.29, "Ki_max

"default_steps_per_mm": {"X": 80.0, "Y": 80.0, "Z": 400.0, "E": 369.0},
"default_motor_current": {"XY": 1300, "Z": 1300, "E": 1250},
"default_power_budget_management": {
  "max_power_per_hotend_slot": 75,
  "total_power_budget": 221,
  "idle_power_consumption": 46,
  "nominal_bed_resistance": 3.678255,
- /usr/share/griffin/griffin/machines/jedi.json 33/382 8%
```

```
"default_travel_speed": 150,
"nominal_nozzle_z_offset": 1.5,

"hotend_switching_speed": 33,
"nozzle_lifting_filament_movement_amount": 9.0,

"idle_retraction_amount": 15.0,
"deprime_retraction_amount": 26.5,
"deprime_retraction_speed": 10.0,
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"prime_amount": 8.5,

"leveling_paper_thickness": 0.15,

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"default_power_budget_management": {
  "max_power_per_hotend_slot": 75,
  "total_power_budget": 221,
  "idle_power_consumption": 46,
  "nominal_bed_resistance": 3.678255,
- /usr/share/griffin/griffin/machines/jedi.json 33/382 8%
```

Press the Escape key to go back to command mode and then enter “:x” and press enter to save the file and exit the editor.

If you make a mistake you can use ctrl+z to exit without saving and start again.

We also need to change the value for the speed used when loading/unloading material.

Type “vi

/usr/share/griffin/griffin/printer/procedures/wizard/moveMaterialProcedure.py” and press enter.

Change the speed on line 16 from 85/u to 70/u. Press the Escape key to go back to command mode and then enter “:x” to save the file. Press enter and reboot your printer. To reboot your printer type “reboot” and press enter. Wait until the printer has rebooted. **Do not shutdown the printer by turning of the power!!**

```
192.168.1.208 - PuTTY
from griffin.printer.controller import Controller
from griffin.printer.procedures.procedure import Procedure
from griffin.printer.procedures.wizard.moveMaterialStep import MoveMaterialStep
from griffin.printer.procedures.waitForQueueEmptyStep import WaitForQueueToBeEmp
from griffin.printer.procedures.steps.setPropertyStep import SetPropertyStep
import math
import time
import logging

log = logging.getLogger(__name__.split(".")[1])

class MoveMaterialProcedure(Procedure):
    # values roughly chosen to also work with the (old/first) drybox.
    __LONG_MOVE_ACCELERATION = 10 # mm/s^2
    __LONG_MOVE_SPEED = 25 # mm/s
    __LONG_MOVE_MINIMUM_LENGTH = 100 # mm
    __LONG_MOVE_MOTOR_POWER_PERCENTAGE = 66 # 66% of the motor power, this match

    def __init__(self, key, hotend = 0, speed = 25.0, length = 1.0):
        super().__init__(key, Procedure.TYPE_UNKNOWN)
        self._step = MoveMaterialStep("MOVING_MATERIAL")
        self.setFirstStep(self._step)
I moveMaterialProcedure.py 16/131 12%
```

```
192.168.1.208 - PuTTY
from griffin.printer.controller import Controller
from griffin.printer.procedures.procedure import Procedure
from griffin.printer.procedures.wizard.moveMaterialStep import MoveMaterialStep
from griffin.printer.procedures.waitForQueueEmptyStep import WaitForQueueToBeEmp
from griffin.printer.procedures.steps.setPropertyStep import SetPropertyStep
import math
import time
import logging

log = logging.getLogger(__name__.split(".")[1])

class MoveMaterialProcedure(Procedure):
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    __LONG_MOVE_ACCELERATION = 10 # mm/s^2
    __LONG_MOVE_SPEED = 20 # mm/s
    __LONG_MOVE_MINIMUM_LENGTH = 100 # mm
    __LONG_MOVE_MOTOR_POWER_PERCENTAGE = 66 # 66% of the motor power, this match

    def __init__(self, key, hotend = 0, speed = 25.0, length = 1.0):
        super().__init__(key, Procedure.TYPE_UNKNOWN)
        self._step = MoveMaterialStep("MOVING_MATERIAL")
        self.setFirstStep(self._step)
I moveMaterialProcedure.py 16/131 12%
```

Important notes:

1. after changing the settings you can disable dev mode
2. after a firmware update, you must enable dev mode and change the settings again!
3. in vi, there is command mode and type mode. You start in command mode. Move your cursor to where you want to edit, then press "I". change the value, then use the escape key to go back into command mode. In command mode use ":" to save and exit. If you make a mistake you can use ctrl+z to exit without saving and start again.

MAC and Linux

Follow the instructions of the [PC](#) guide, but use the terminal instead of Putty. Connect to your Ultimaker 3 via the terminal with the following command:

```
ssh root@your_ip_adress
```

General usage advice

While testing the upgrade we got great printing results by setting the tension halfway of the scale. Due to the difference between materials you may want to adjust the tension of the spring. Flexible filament for example does not need as much tension.

Filament loading gets even easier with this upgrade. Insert the filament and wait until the filament is gripped by the Bondtech Dual Drive system. Confirm and you are done. The Bondtech Dual Drive system will automatically guide the filament into the PTFE tube.

If you want to push or pull the filament out of the PTFE tubing you can pull the lever up to release the firm grip of the Bondtech Dual Drive system. Releasing the grip will allow you to move the filament through the tube by hand.

Good luck with your Bondtech feeder!

If you have any questions please first read the FAQ (<http://www.bondtech.se/en/faq/>). If the question still hasn't been answered feel free to contact us by email or telephone.



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