BONDTECH

with Christopher Matthes

DDG Ultimaker V2.0

Assembly and installation manual

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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.

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+ Firmware with reveresed rotation direction: 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.
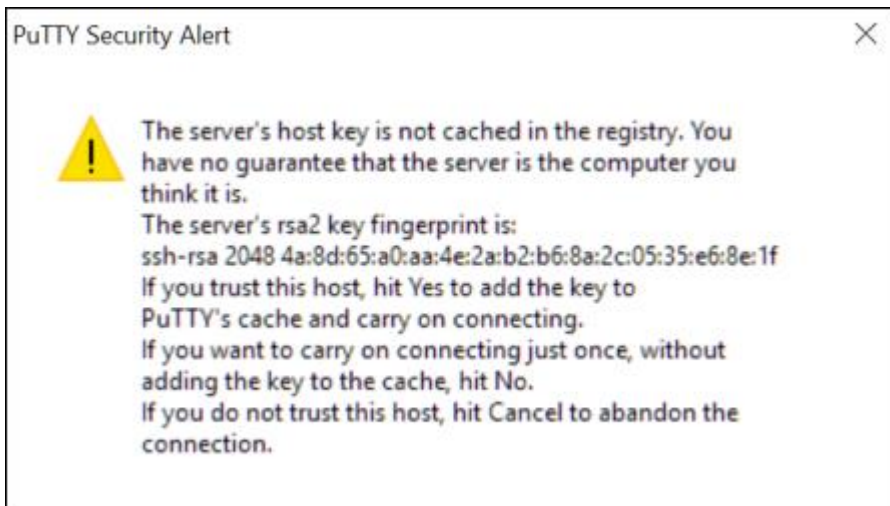
For this example we use the following IP address: 192.168.1.133

Please read the whole guide from this point at least once before changing the values on your own machine.
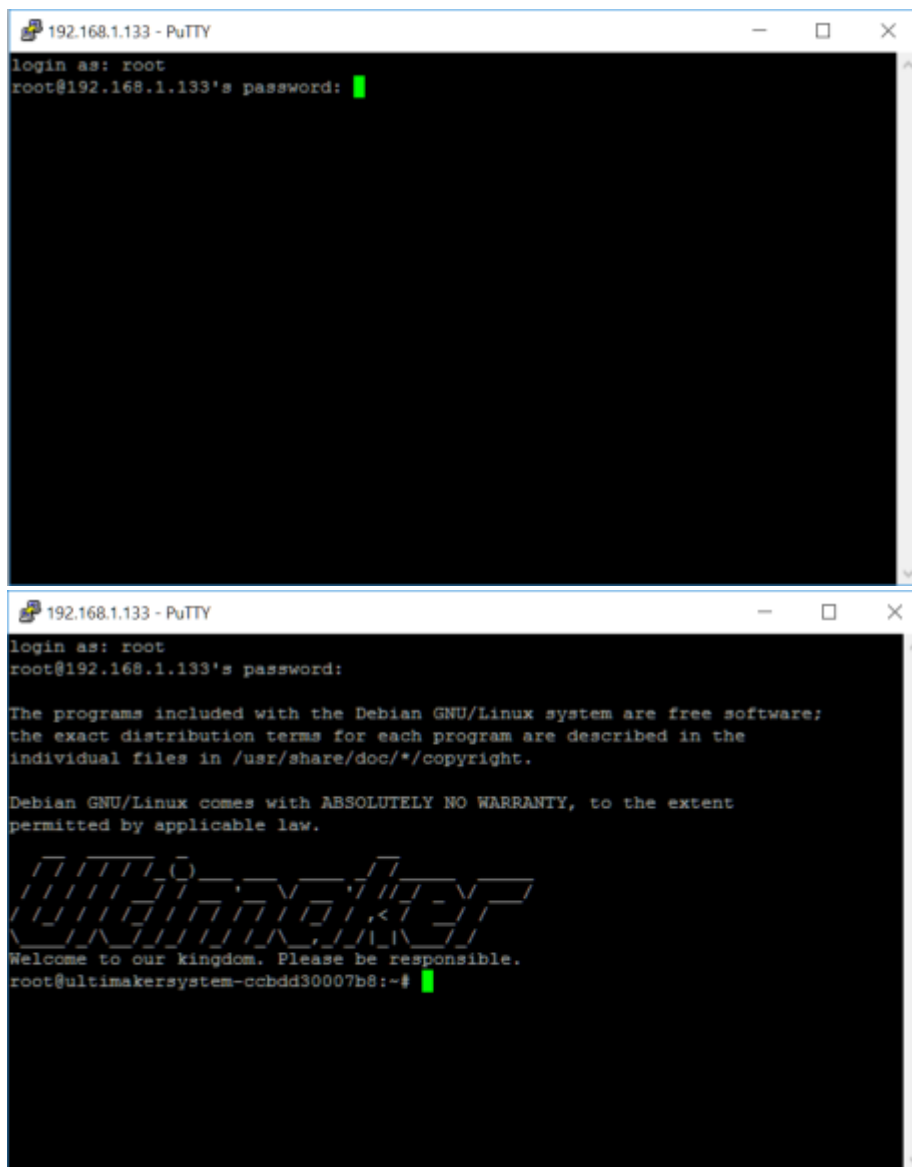
Open Putty and enter the IP-address in the Host Name field and click on Open.
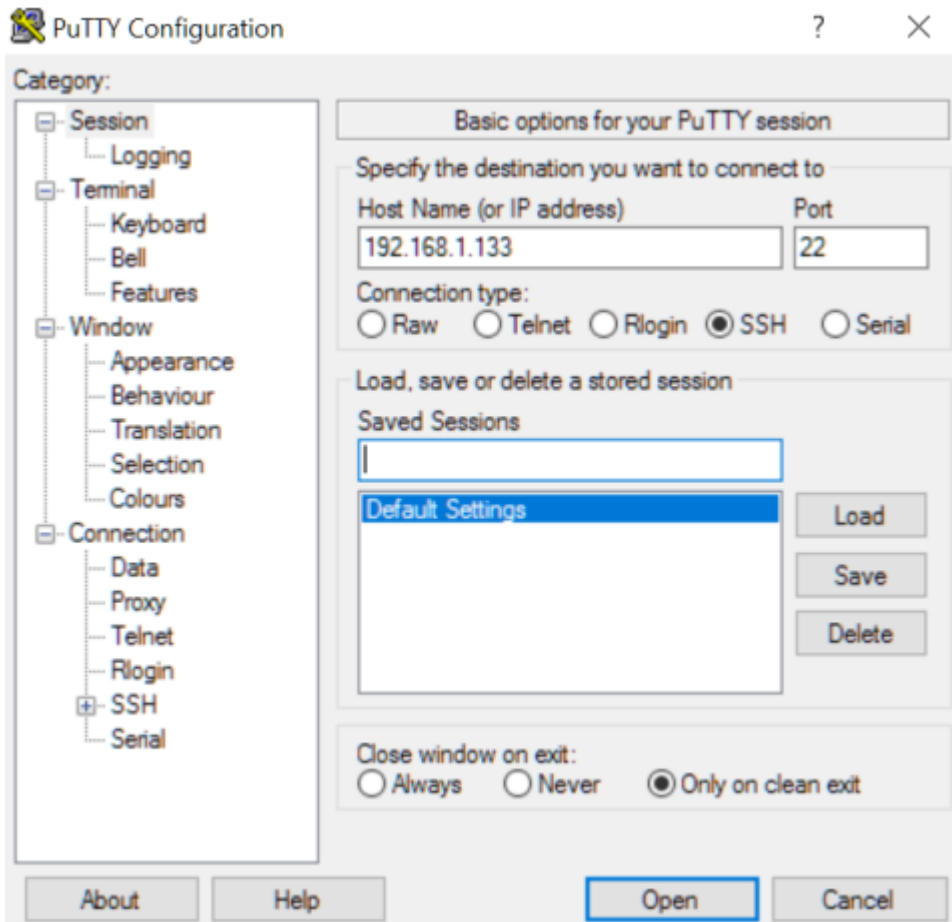
The first time this Alert will pop-up and you need to click OK to accept the connection.

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

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

Firmware Version	Command
3.6	vi /usr/share/griffin/griffin/machines/jedi.json
3.7 – 4.2.5	vi /usr/share/griffin/griffin/machines/um3.json

Tip! If you copy the command above you can paste it directly into Putty console by pressing right mouse-button in the window.

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": 311.0},
  "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%
```

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.

To change the lenght that the material feeds during a material change you can edit the parameter Bowden_tube_lenght, as default it is 700, if you want it to feed 30 mm more edit the value to 730.The parameter is located at row 23.
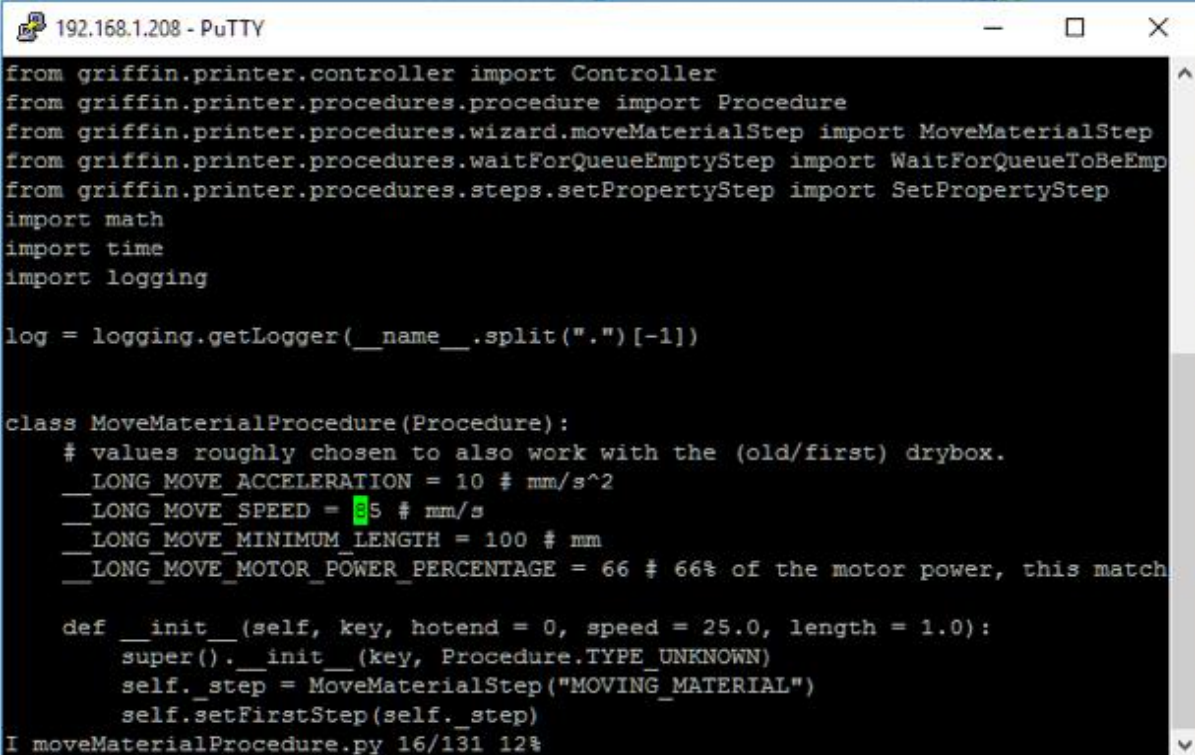


```
192.168.1.208 - PuTTY
{
    "properties": {
        "machine_manufacturer_name": "Ultimaker B.V.",
        "machine_type_name": "Ultimaker 3 unknown",
        "hardware": {
            "motion_controller": {
                "initialization": {
                    "class": "ucFirmwareUpgrade.avr.MultiStageProgrammer",
                    "firmware": "/usr/share/griffin/griffin/machines/jedi.hex",
                    "parameters": {
                        "softspi": "/dev/gpio/avr",
                        "reset": "/dev/gpio/avr_reset",
                        "port": "/dev/ttyS1",
                        "speed": "250000",
                        "bootloader": {"ATMegal280": "bootloader-atmegal280-uart250000-2.hex", "ATM
                    }
                }
            }
        },
        "hotend_count": 2,
        "feature_bed_leveling_sensor": true,
        "feature_filament_flow_sensor": false,
        "bowden_tube_length": 700,
        "build_volume": {"x": 215, "y": 215, "z": 210},
        "movement_volume": {
            "min": {"x": 0, "y": 0, "z": 0},
            "max": {"x": 215, "y": 215, "z": 210}
        },
        "active_leveling_settings": {
            "locations": [
                {"x": 40,  "y": 185},
                {"x": 40,  "y": 25},
                {"x": 200, "y": 105}
            ]
        },
        "hotend_offset_1_x": 18,
        "hotend_offset_1_y": 0,
        "default_travel_speed": 150,
```

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 = 85 # 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):
    # values roughly chosen to also work with the (old/first) drybox.
    __LONG_MOVE_ACCELERATION = 10 # mm/s^2
    __LONG_MOVE_SPEED = 70 # 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%
```

<table>
<tr><td>Important notes:</td></tr>
</table>

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 ":x" 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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