**INSTRUCTIONS FOR INDEPENDENT EXTRUDER MOTOR CONTROL**

You will need to copy files to the Raspberry Pi and access its shell/command line - we recommend PuTTY and WinSCP to accomplish this, which you should already be familiar with from the Voron manual. In the following instructions, all console commands are written in *cursive font.*

* First install and configure the printer as described in the official online manual up to the 'Initial startup - stepper motor check' section. While configuring printer.cfg, it is unnecessary to configure the extruder stepper motor.
* Disconnect the Printer from power.
* Invert the Enable pin on your TMC2209 extruder stepper driver board (**Instructions Figure 1a**) and remove all jumpers for the corresponding spider motor driver socket.
* Connect the extruder stepper motor driver pins to the raspberry PI GPIO pins (Instructions **Figure 1b and c**):

A picture containing diagram

Description automatically generated

**Instructions Figure 1**. a) Example of extruder stepper driver board inversion, b) raspberry PI GPIO pins resume, c) summary of stepper motor driver pins to the raspberry PI GPIO connections.

* Power up the Printer and access it through Putty
* Install and update software packages by executing the following commands:
* *sudo apt update*
* *sudo apt full-upgrade*
* *sudo apt-get install python3-pip*
* *pip3 install TMC-2209-Raspberry-Pi*
* *pip3 install bitstring*
* *sudo pip3 install gpiozero*
* Install the following Octoprint plugins by executing the following **two** commands (ignore line breaks!)
* */home/pi/oprint/bin/python3 -m pip --disable-pip-version-check install* [*https://github.com/vitormhenrique/OctoPrint-Enclosure/archive/master.zip*](https://github.com/vitormhenrique/OctoPrint-Enclosure/archive/master.zip) *--no-cache-dir*
* */home/pi/oprint/bin/python3 -m pip --disable-pip-version-check install* [*https://github.com/kantlivelong/OctoPrint-GCodeSystemCommands/archive/master.zip*](https://github.com/kantlivelong/OctoPrint-GCodeSystemCommands/archive/master.zip) *--no-cache-dir*
* Enable passwordless sudo for the pi user:
* *sudo nano /etc/sudoers*
* Navigate to the line “# includedir /etc/sudoers.d” and write the following statement in the next line, then save and exit nano:
* *pi ALL=(ALL) NOPASSWD: ALL*
* Enable serial port:
* *sudo raspi-config*
* (Navigate and select -> 3. Interface options -> P6. Serial port -> Login shell to be accessible over serial? -> No -> Serial port hardware to be enabled? -> Yes -> Finish)
* Install missing features:
* *sudo apt-get install python3-pip*
* *sudo pip3 install gpiozero*
* use WinSCP and copy the provided “emotor” folder in this directory on the Pi: /home/pi/scripts
* use WinSCP to copy the following files to the same emotor folder:
* The TMC2209\_Raspberry\_Pi Library *(Located in: /home/pi)*
* The src folder inside the TMC2209\_Raspberry\_Pi Library
* The bitstring.py file *(Located in: /home/pi/oprint/lib/python3.7/site-packages)*
* The serial folder *(Located in: /home/pi/oprint/lib/python3.7/site-packages)*
* The RPi folder *(Located in: /home/pi/oprint/lib/python3.7/site-packages)*
* Connect to the printer via Octoprint, and navitage to settings -> GCODE system commands
* Press the plus sign and configure the G-Code: *OCTO1* to System:
* *sh /home/pi/scripts/emotor/speed.sh*
* Test the command by running gcodes: OCTO1 10000 to start, OCTO1 0 to stop.
* Finish