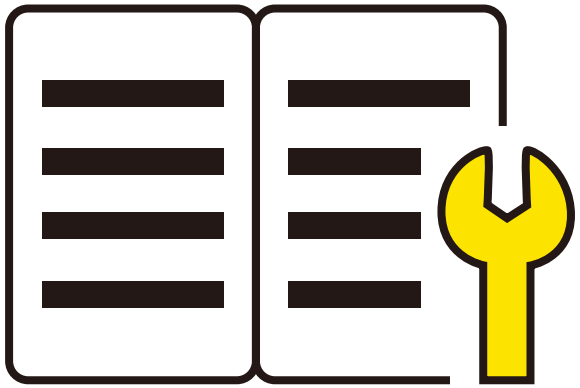
BIGTREETECH

EBB SB2209 CAN V1.0 (RP2040)

BUILD GUIDE

VERSION 2024-06-26

Version	Date	Revisions
v1.0	2023.11	Original
v1.2	2024.02	• Corrected: Pinout diagram for the 4-wire PT100 DIP switch selection. • Added: Specifications for the optimal diameter and length of steel wire to securely fix the CAN bus cable. • Updated: All mentions of 'CanBoot' in the manual have been updated to 'Katapult'.
v1.3	2024.06	Revised BLTouch and MicroProbe connection methods.



Thanks to CHAOTICLAB for providing guidance on Voron's official style build guide, and designing the printed part model for EBB SB2209 CAN V1.0 (RP2040).

- Highlighted in blue are included in this EBB SB2209 CAN V1.0 (RP2040).
- Highlighted in red are other accessories of the Voron StealthBurner, which are not included in this EBB SB2209 CAN V1.0 (RP2040) and will need to be purchased by yourself.

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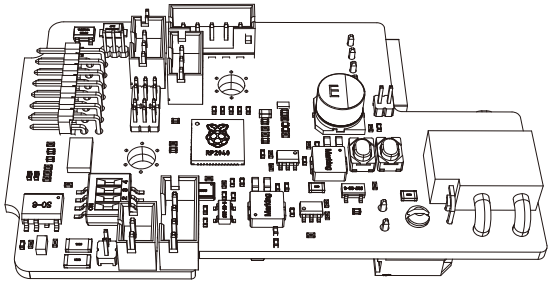
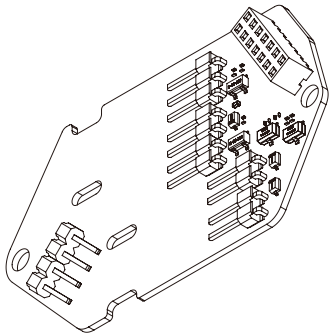
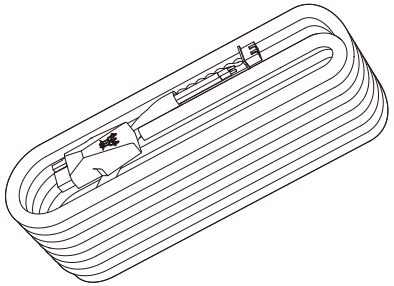
Packing List



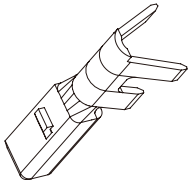
BIGTREETECH EBB SB2209 CAN V1.0（RP2040） 1pc



BIGTREETECH EBB SB0000 CAN V1.0 1pc

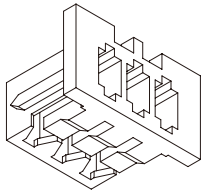


CAN bus Cable 1pc



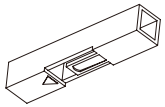
Crimp Terminal

2.0 mm pitch	30pcs
3.0 mm pitch	5pcs
2.54 mm pitch	20pcs



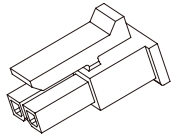
2.0 mm Pitch Connector Housing

2Way	1pc
3Way	2pcs
4Way	1pc
5Way	1pc



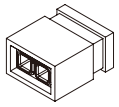
2.54mm Pitch Connector Housing

1Way	15pcs

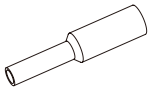


3.0 mm Pitch Connector Housing

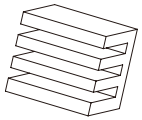
2Way	1pc



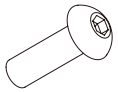
Jumper 15pcs



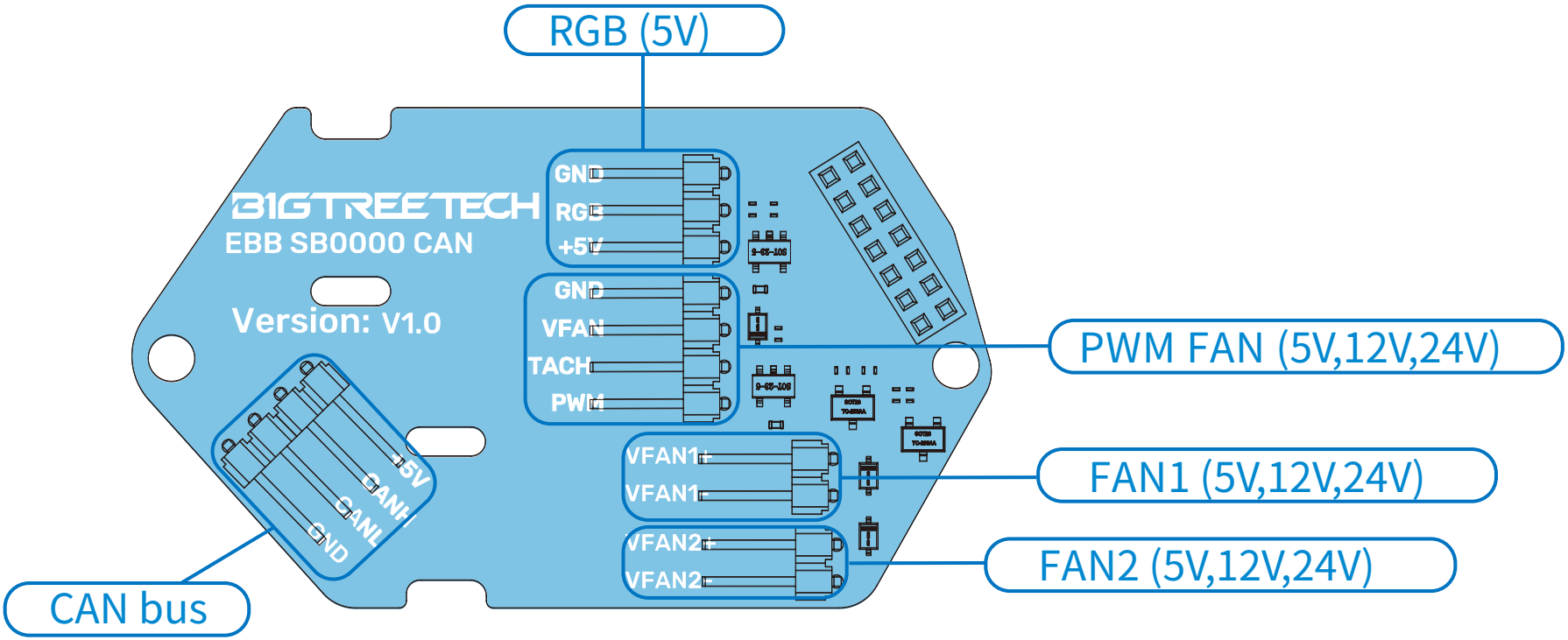
Insulated Wire Ferrule 2pcs



Heat Sink 1pc

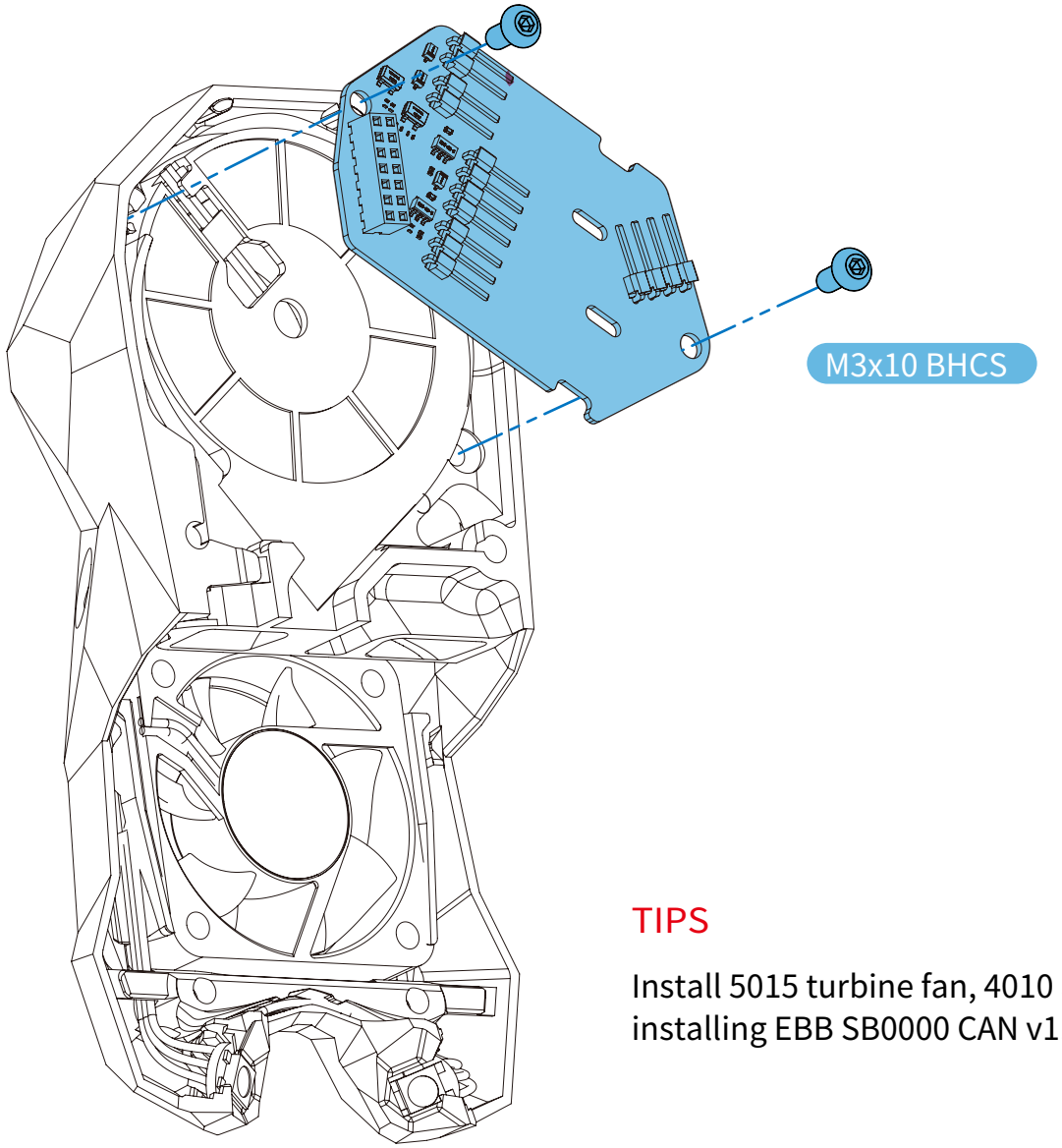


M3 x 10 Button Head Cap Screw (BHCS) 4pcs



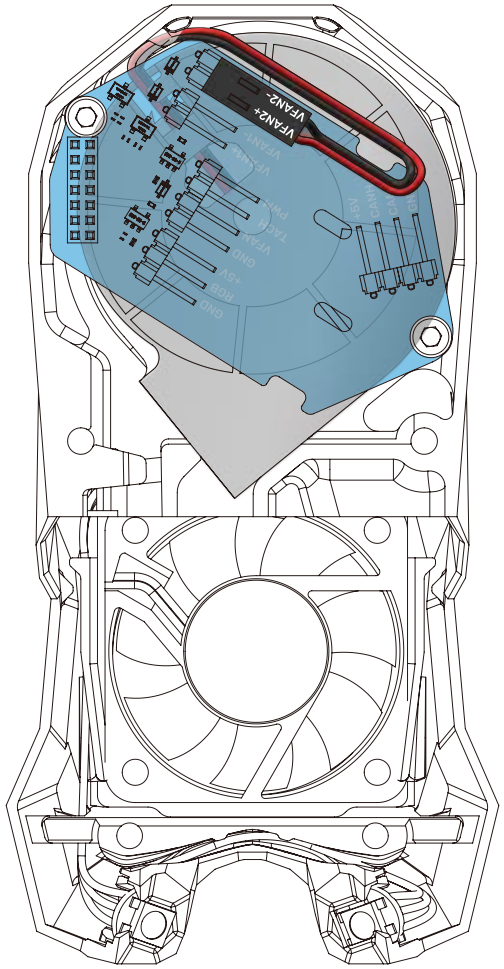
WIRE TERMINAL

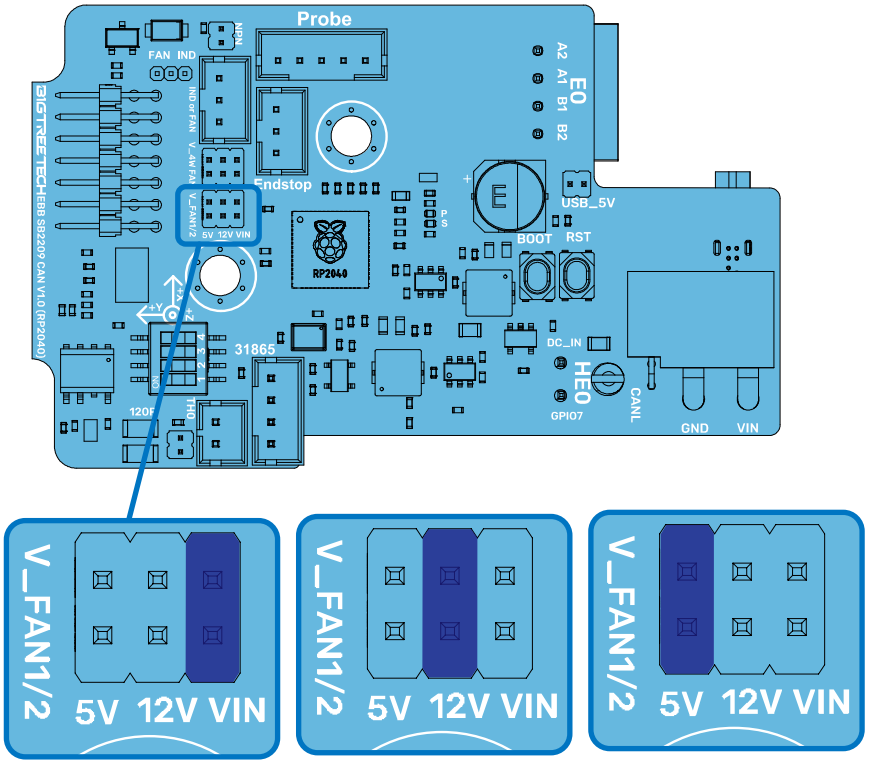
EBB SB0000 CAN v1.0 use 2.54 pitch DuPont connector. Therefore, all fans and LED lights on StealthBurner Body should be 2.54 pitch DuPont connector.



TIPS

Install 5015 turbine fan, 4010 axial fan, and LED lamp before installing EBB SB0000 CAN v1.0.



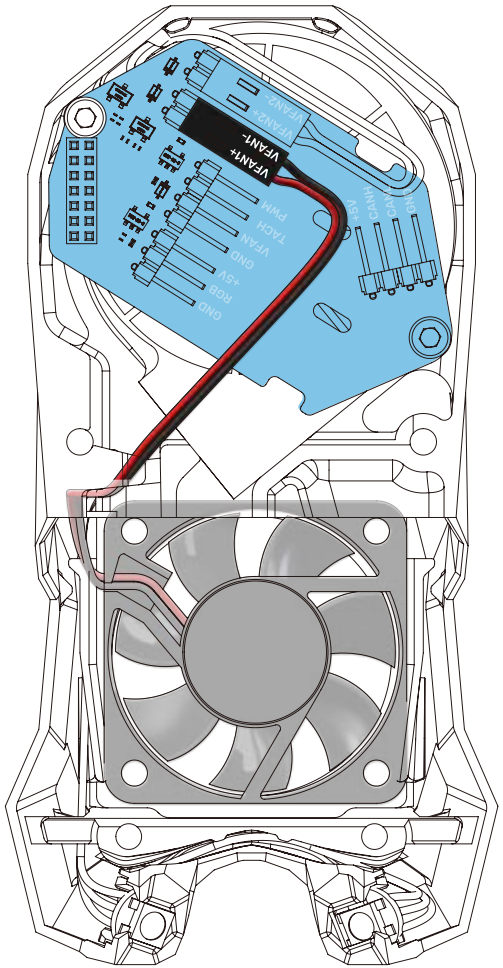


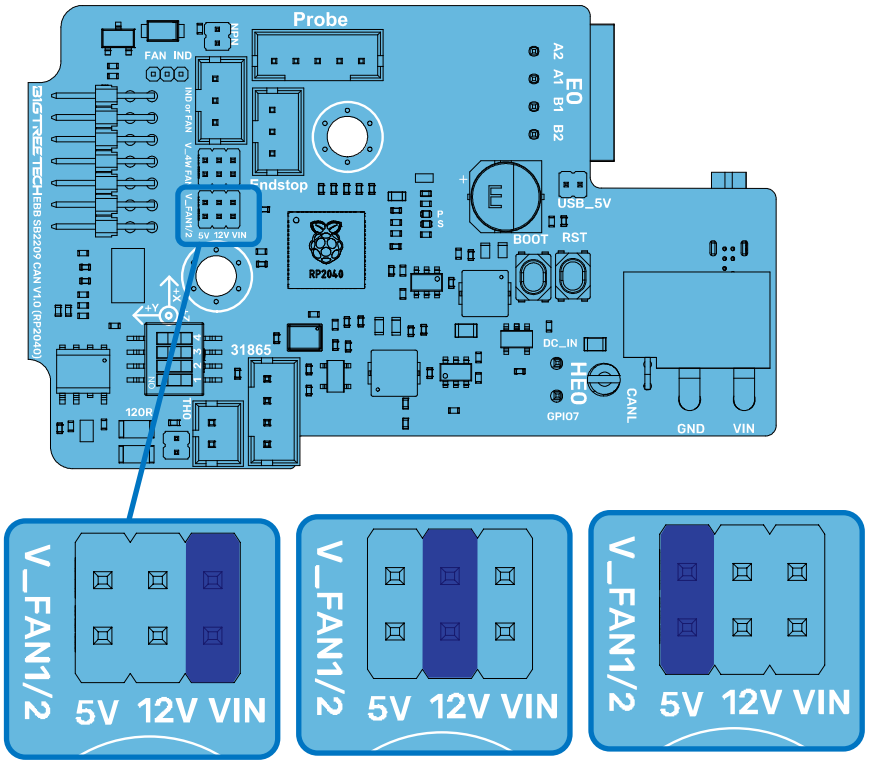
Fan Voltage: 24V　　Fan Voltage:12V　　Fan Voltage: 5V

FAN VOLTAGE

All fans on the EBB SB0000 CAN v1.0 support multi voltage selection, as shown in the figure, and jumper caps are inserted or removed according to the actual voltage used.

Note: The voltage for both the turbine fan and axial fan will be simultaneously set to 5/12/24V.



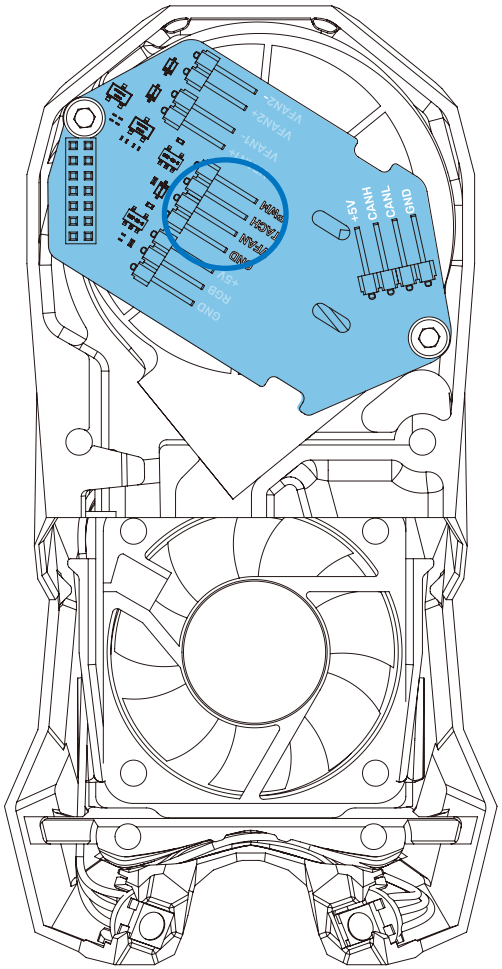


Fan Voltage: 24V Fan Voltage:12V Fan Voltage: 5V

FAN VOLTAGE

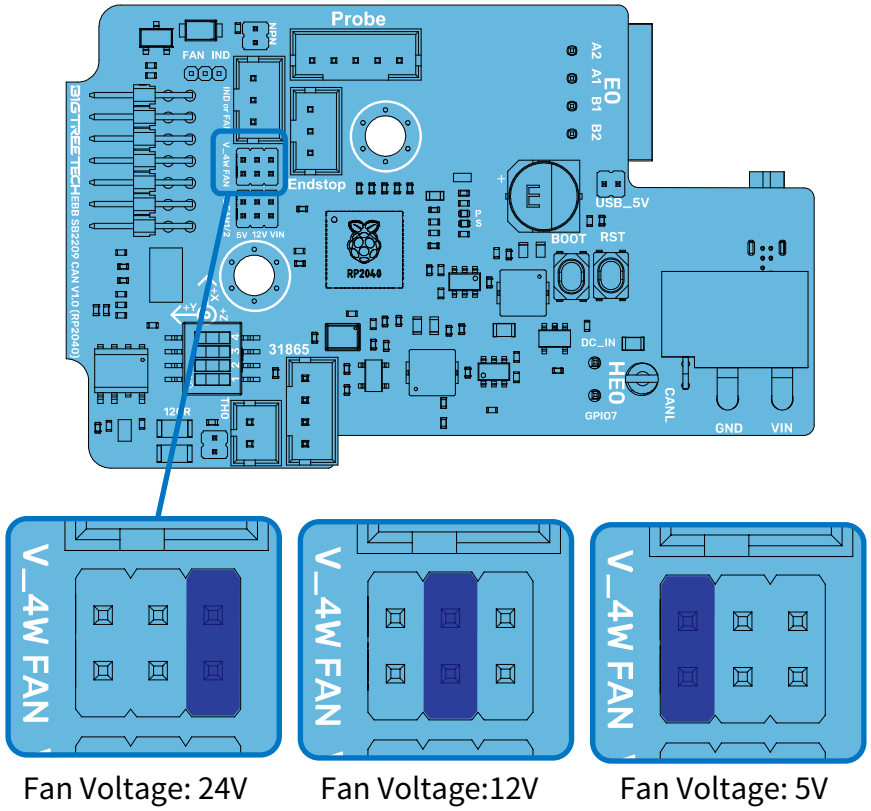
All fans on the EBB SB0000 CAN v1.0 support multi voltage selection, as shown in the figure, and jumper caps are inserted or removed according to the actual voltage used.

Note: The voltage for both the turbine fan and axial fan will be simultaneously set to 5/12/24V.



PWM FAN

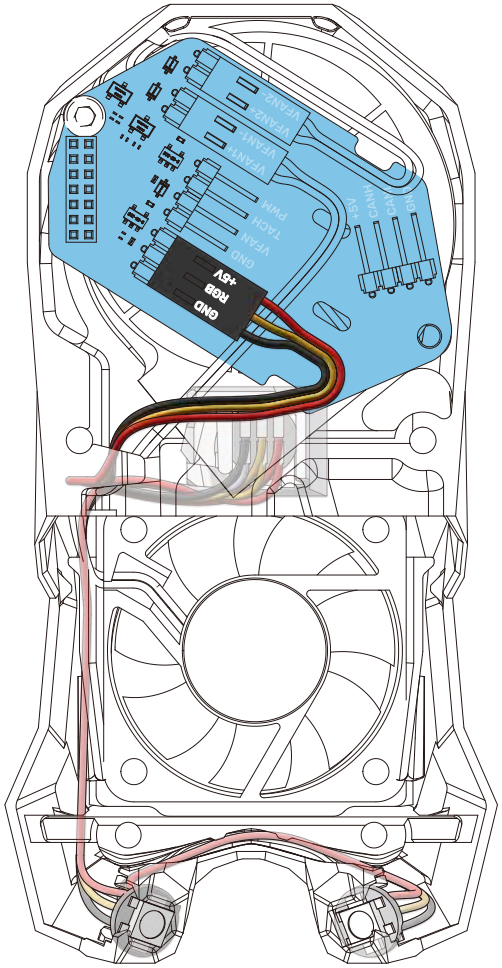
You can also use PWM fan on EBB SB0000 CAN v1.0. As shown in the figure, it contains a 4 pins PWM fan header (2.54 pitch and 4 pins DuPont connector).

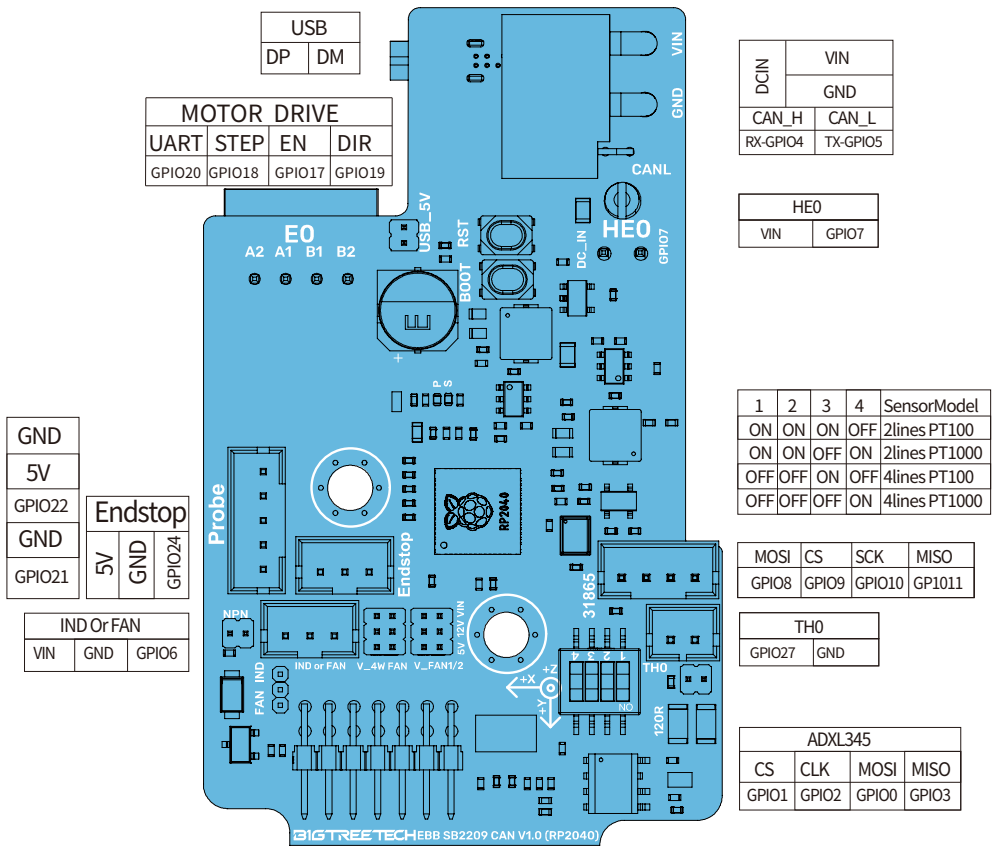


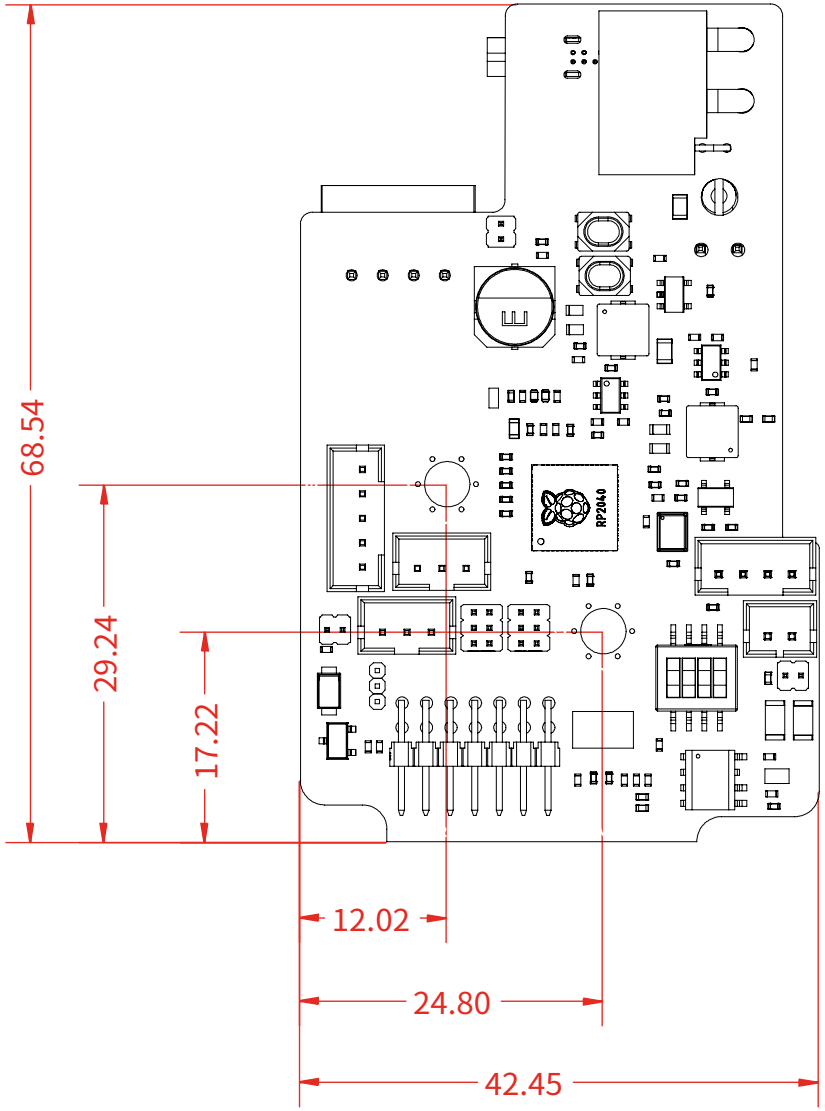
Fan Voltage: 24V Fan Voltage:12V Fan Voltage: 5V

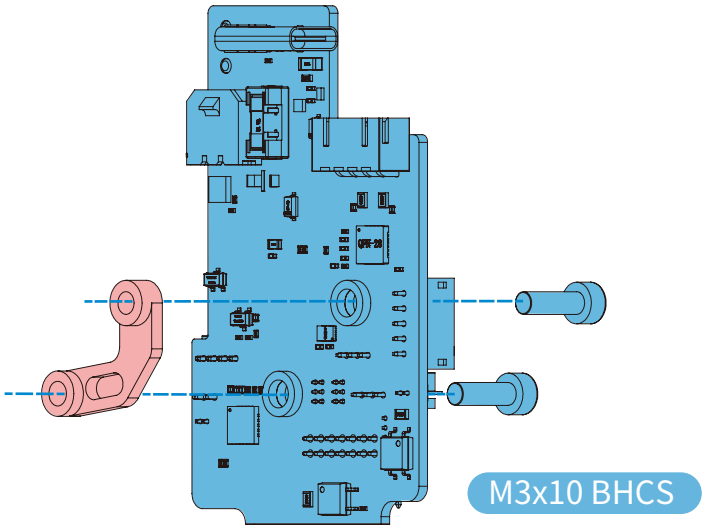
FAN VOLTAGE

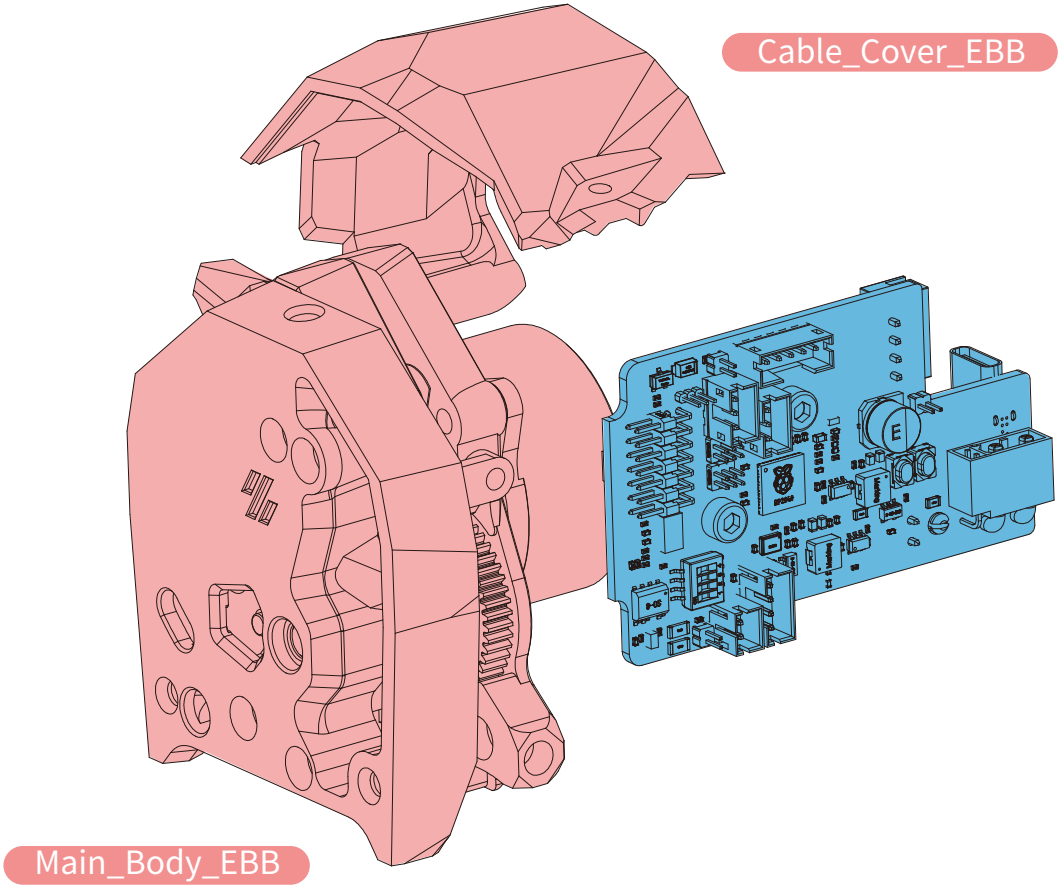
All fans on the EBB SB0000 CAN v1.0 support multi voltage selection, as shown in the figure, and jumper caps are inserted or removed according to the actual voltage used.


GND
RGB
+5V


USB
DP DM
MOTOR DRIVE
UART STEP EN DIR
GPIO20 GPIO18 GPIO17 GPIO19
DCIN VIN GND
CAN_H CAN_L
RX-GPIO4 TX-GPIO5
HE0
VIN GPIO7
1 2 3 4 SensorModel
ON ON ON OFF 2lines PT100
ON ON OFF ON 2lines PT1000
OFF OFF ON OFF 4lines PT100
OFF OFF OFF ON 4lines PT1000
MOSI CS SCK MISO
GPIO8 GPIO9 GPIO10 GP1011
TH0
GPIO27 GND
ADXL345
CS CLK MOSI MISO
GPIO1 GPIO2 GPIO0 GPIO3
GND
5V
GPIO22
GND
GPIO21
Endstop
5V GND GPIO24
IND Or FAN
VIN GND GPIO6
GND GND CAN-P +5V V-4W-FAN V-FAN V-FAN
GND CAN-N GPIO13 GPIO14 GPIO16 GPIO12 GPIO15
E0
HE0
Probe
Endstop
RP2040
BIGTREETECH EBB SB2209 CAN V1.0 (RP2040)

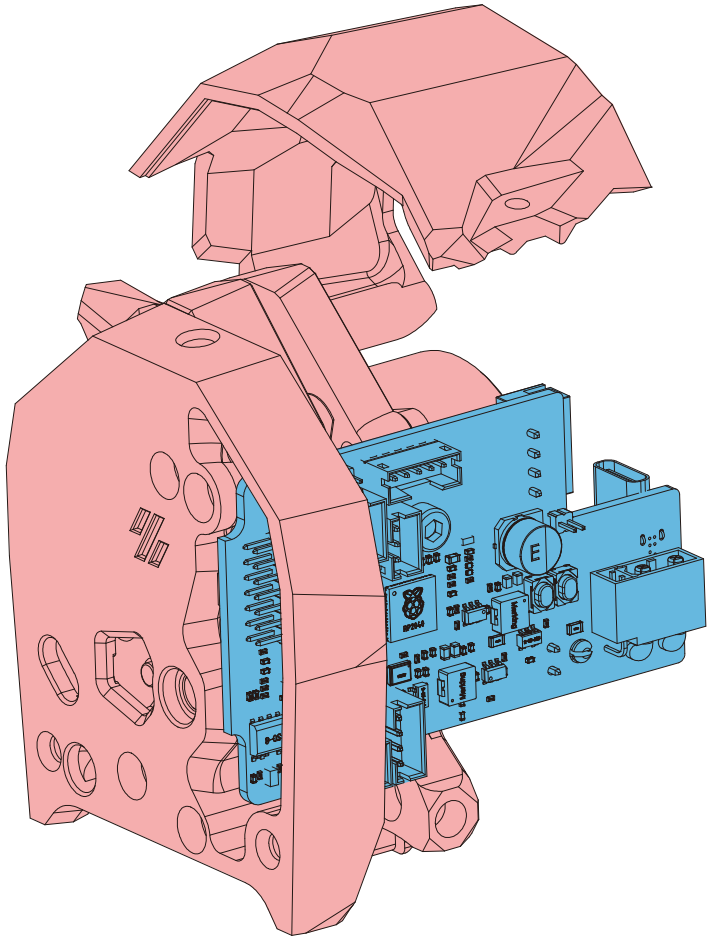

68.54
29.24
17.22
12.02
24.80
42.45

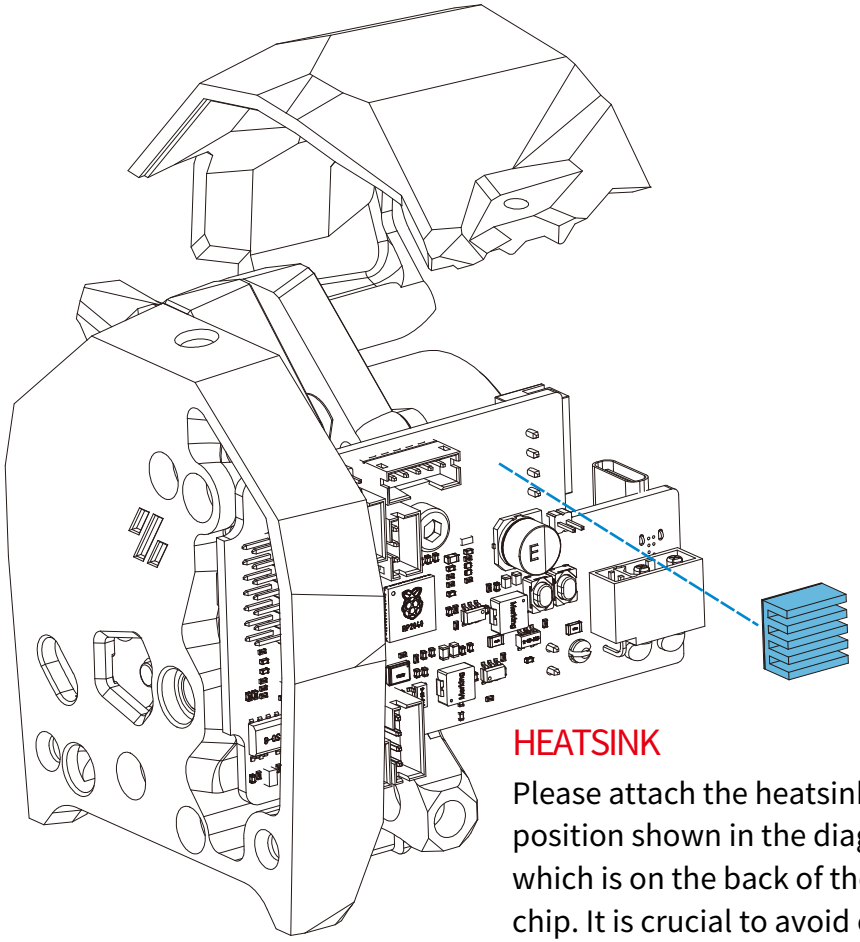




TIPS

The Cable_Cover_EBB and Main_Body_EBB are modified from official VORON prints to be compatible, but have slight differences to facilitate easier wiring.

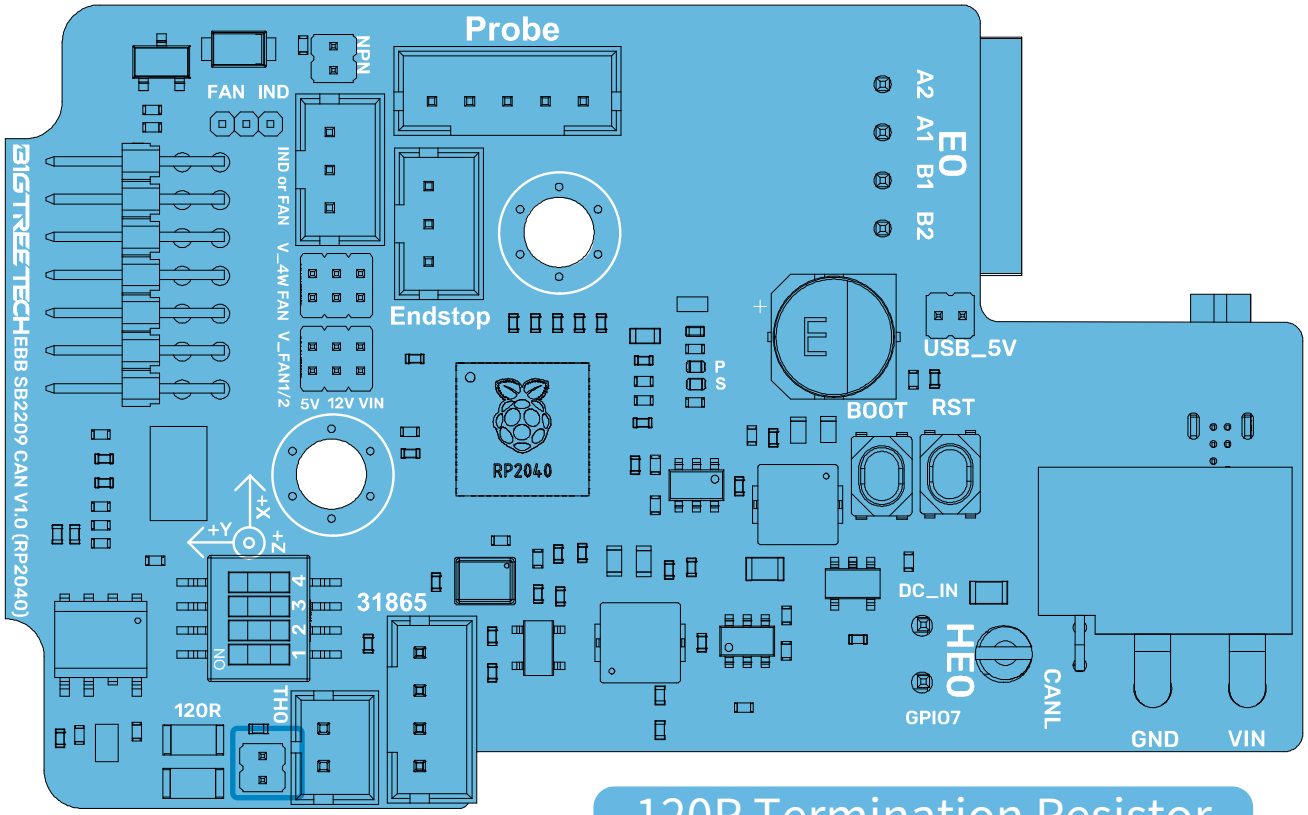


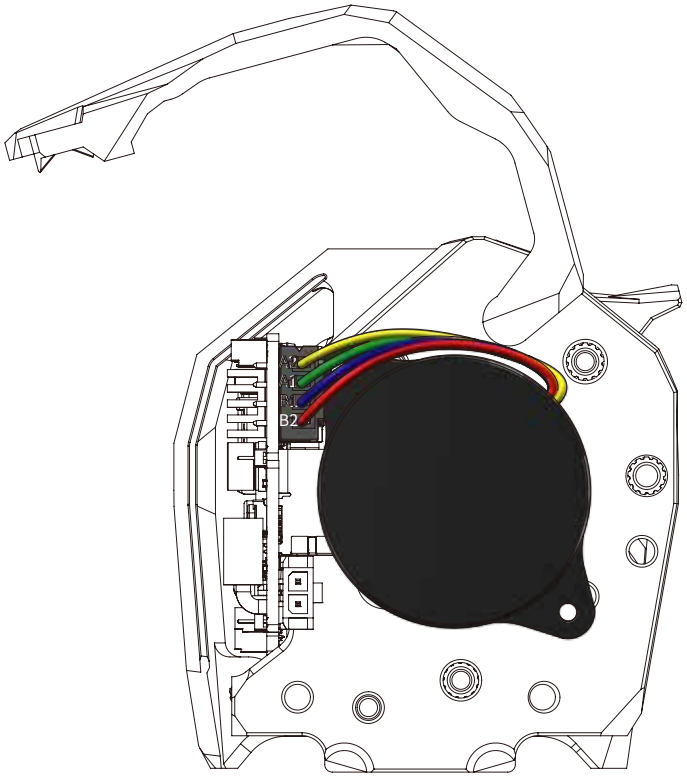


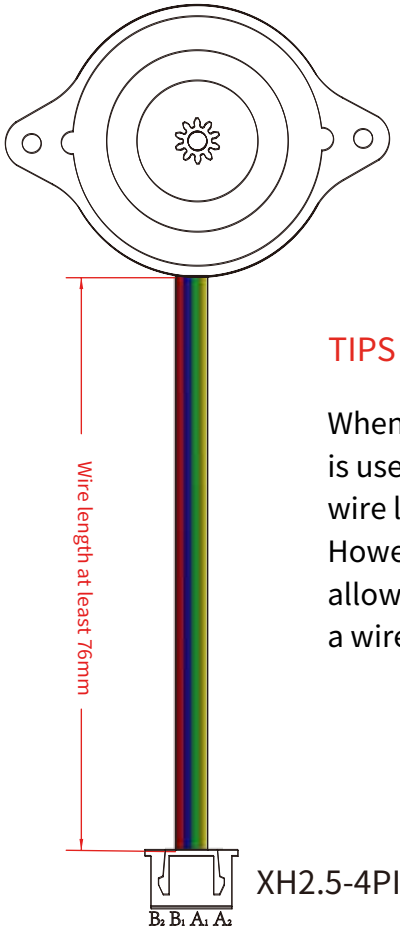
HEATSINK

Please attach the heatsink to the position shown in the diagram, which is on the back of the driver chip. It is crucial to avoid contacting the connector pins of the motor when installing the heatsink.

When the EBB SB2209 CAN V1.0 (RP2040) device uses CAN bus communication, if it is the final device in the CAN bus chain, you must plug a jumper at the 120R position.



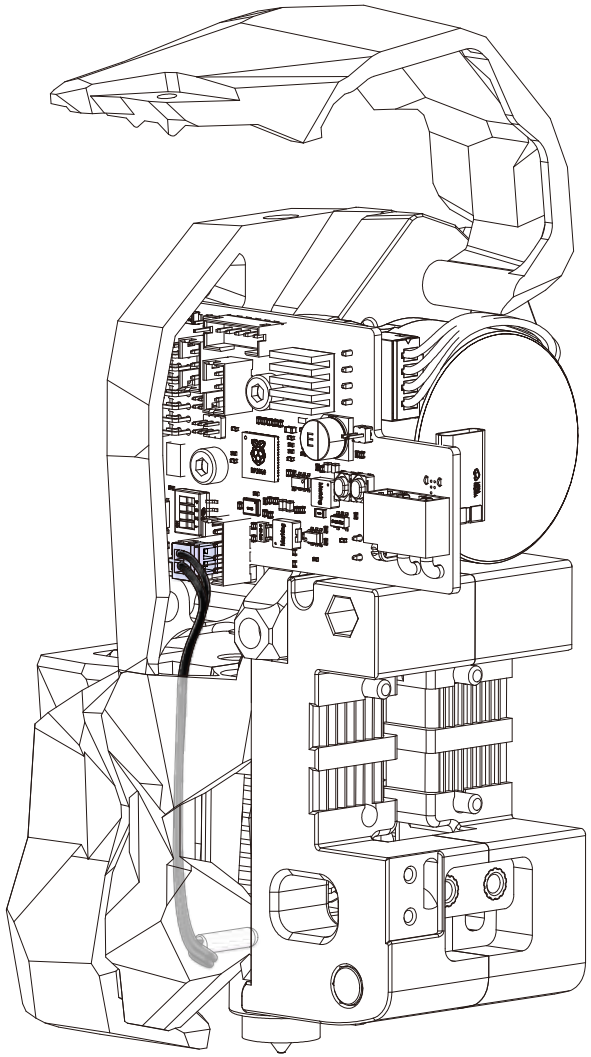




XH2.5-4PIN

TIPS

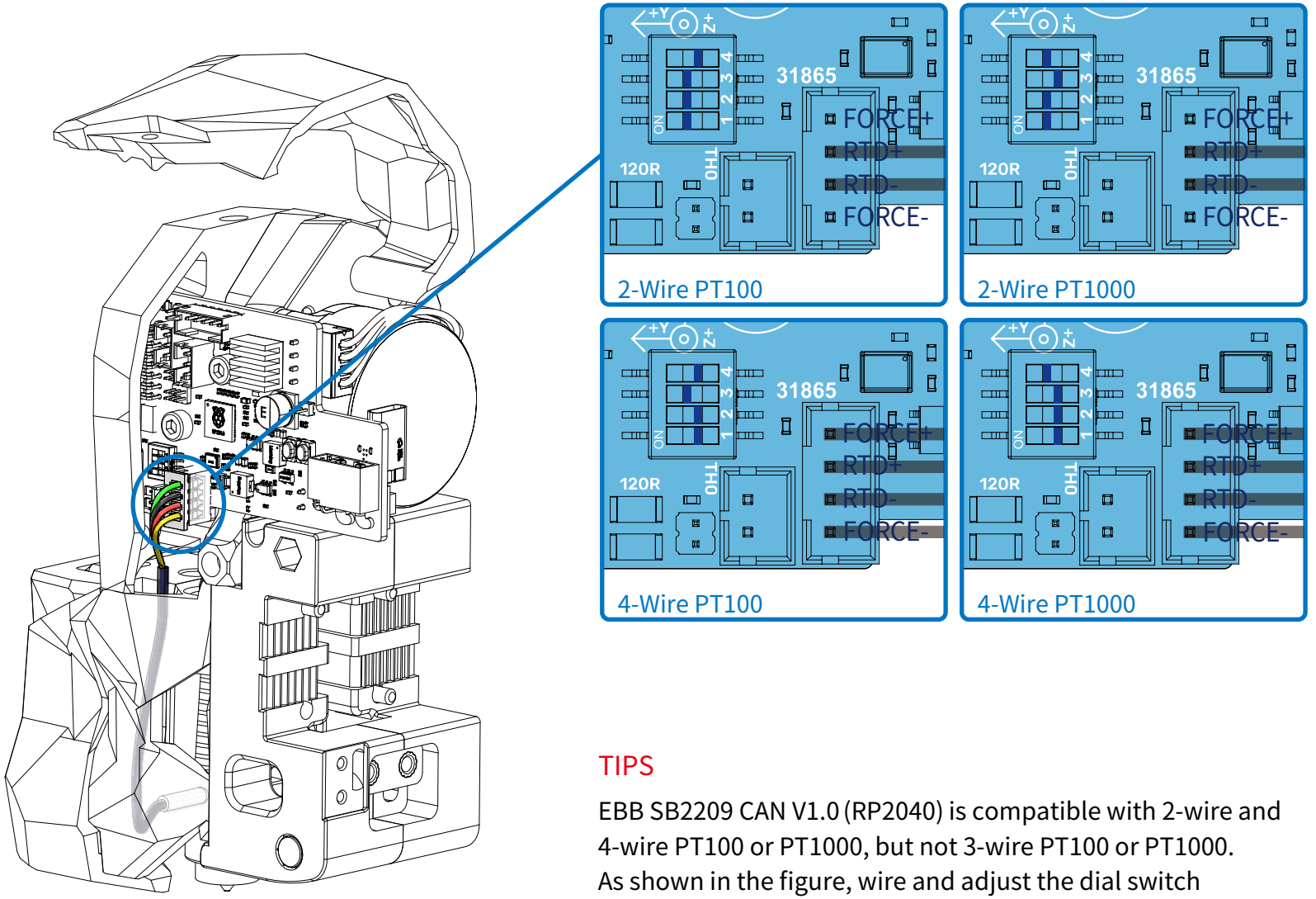
When EBB SB2209 CAN V1.0 (RP2040) is used on StealthBurner, the minimum wire length of the motor is 76mm. However, it is recommended to leave some allowance for wiring and assembly, such as a wire length of 100mm or 110mm.



PH2.0-2PIN

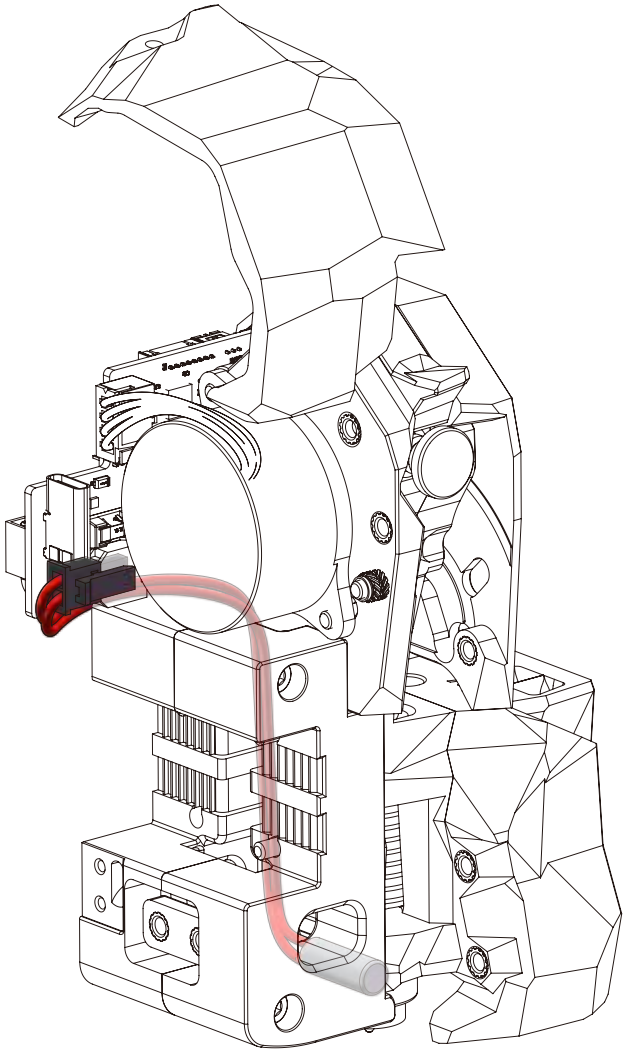
TIPS

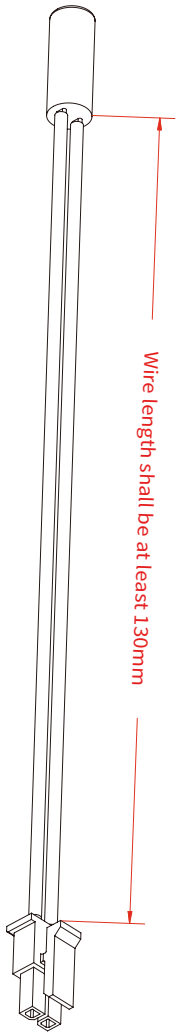
When EBB SB2209 CAN V1.0 (RP2040) is used on StealthBurner, the minimum wire length of the thermistor is 103mm. However, it is recommended to leave some allowance for wiring and assembly, such as a wire length of 120mm or 130mm.



TIPS

EBB SB2209 CAN V1.0 (RP2040) is compatible with 2-wire and 4-wire PT100 or PT1000, but not 3-wire PT100 or PT1000.
As shown in the figure, wire and adjust the dial switch according to the actual model. And the terminals are PH2.0.

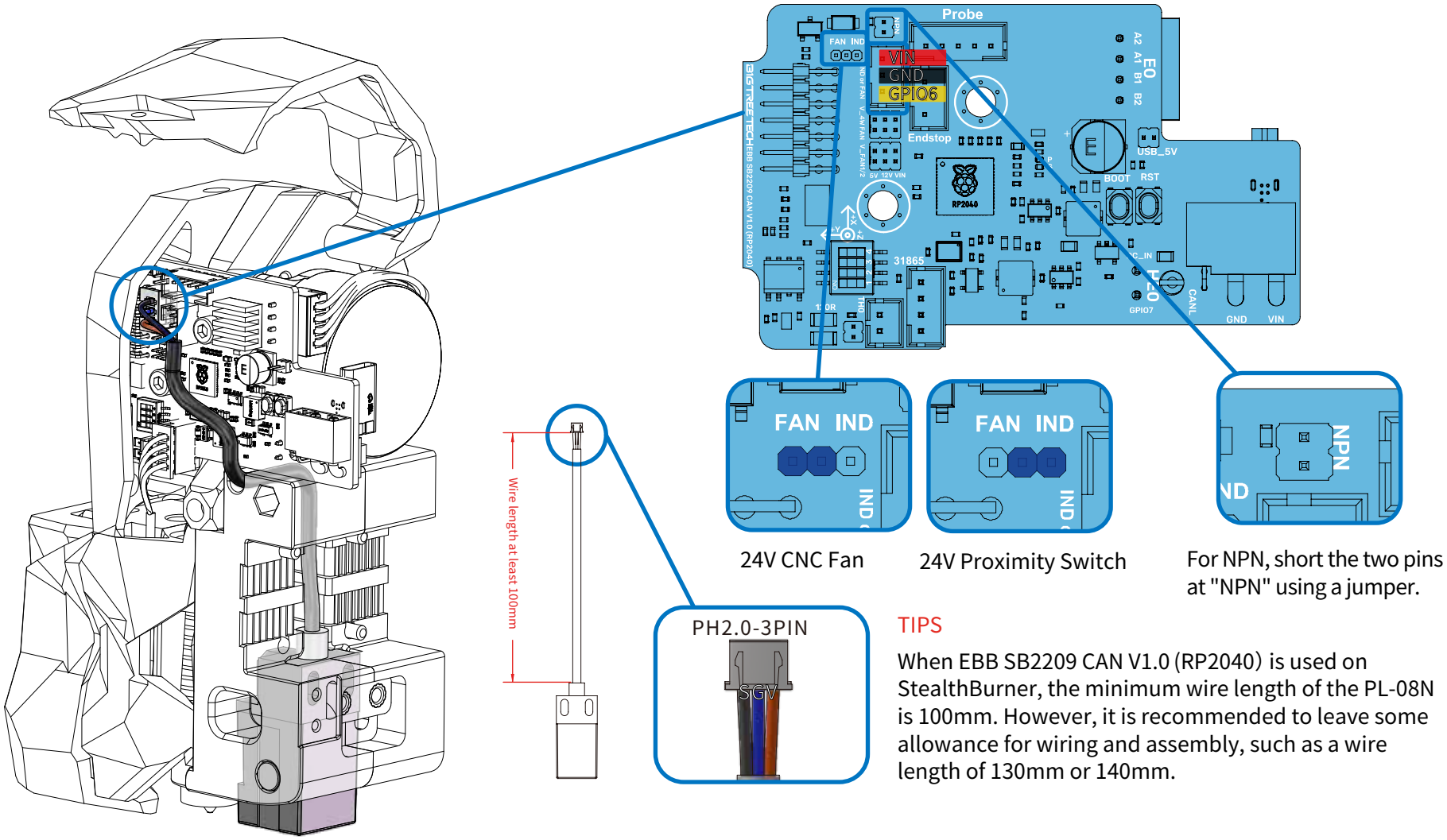




MX3.0-2PIN

TIPS

When EBB SB2209 CAN V1.0 (RP2040) is used on StealthBurner, the minimum wire length of the heater cartridge is 130mm. However, it is recommended to leave some allowance for wiring and assembly, such as a wire length of 150mm or 160mm.



24V CNC Fan

24V Proximity Switch

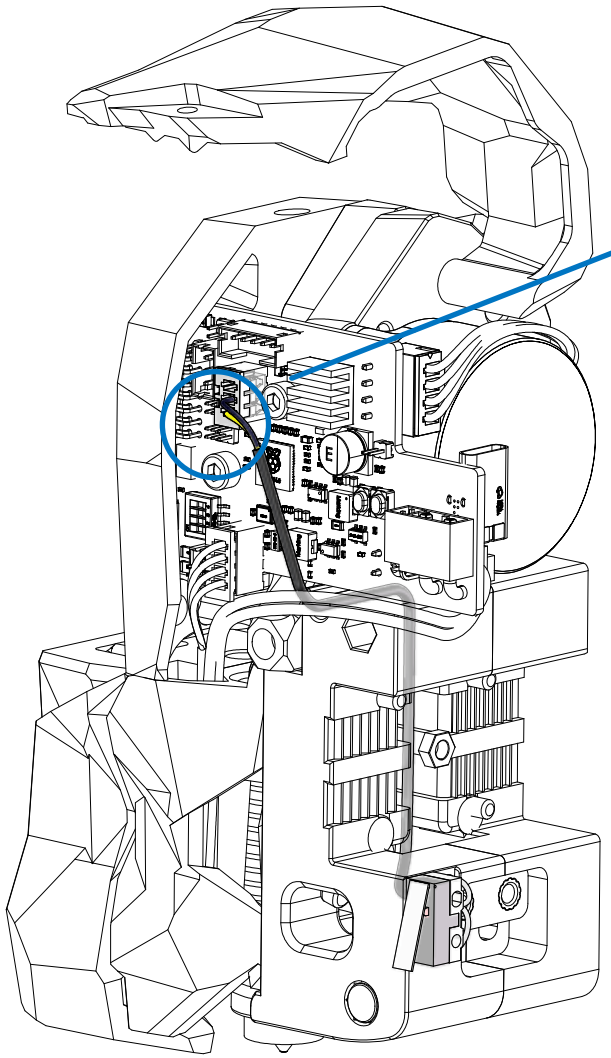
For NPN, short the two pins at "NPN" using a jumper.

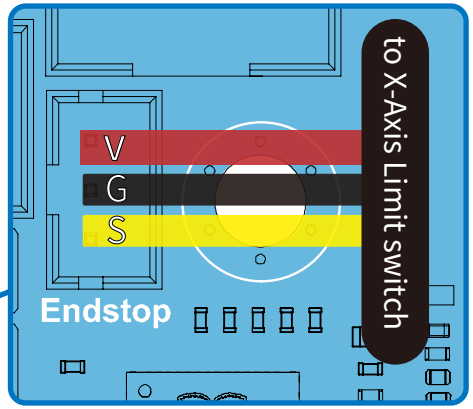
TIPS

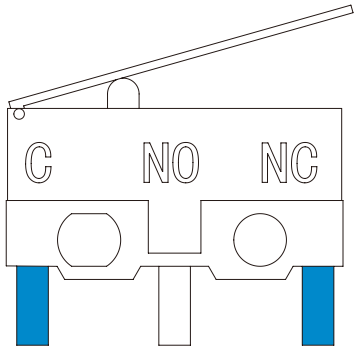
When EBB SB2209 CAN V1.0 (RP2040) is used on StealthBurner, the minimum wire length of the PL-08N is 100mm. However, it is recommended to leave some allowance for wiring and assembly, such as a wire length of 130mm or 140mm.

FUNCTION SELECTION

Supports both NPN and PNP types. For NPN, short the two pins at "NPN" using a jumper; for PNP, remove the jumper.
Note: This interface can also be used for 24V CNC fans. By shorting the left two-pin connector with a jumper (FAN), it can be used for a 24V CNC fan. By shorting the right two-pin connector with a jumper (IND), it can be used for a 24V proximity switch.

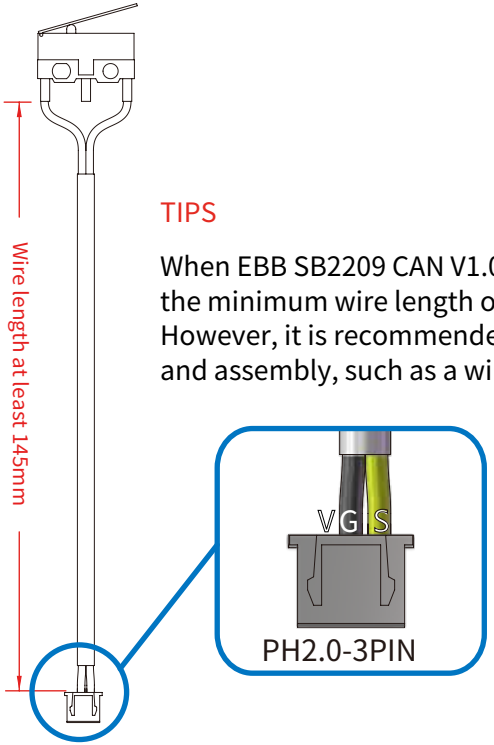






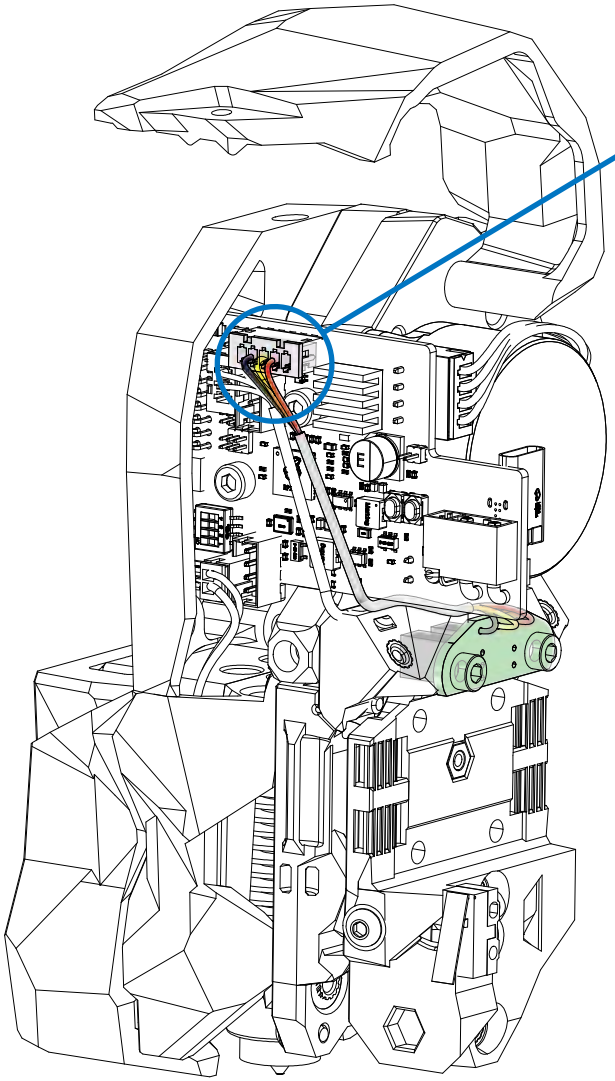
END-STOP SWITCHES FOR X

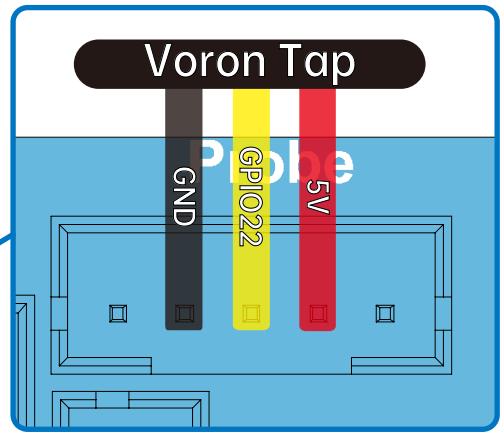
End-stops are wired in a "Normally Closed" configuration. On microswitches those are the 2 outer terminals indicated by C and NC.



TIPS

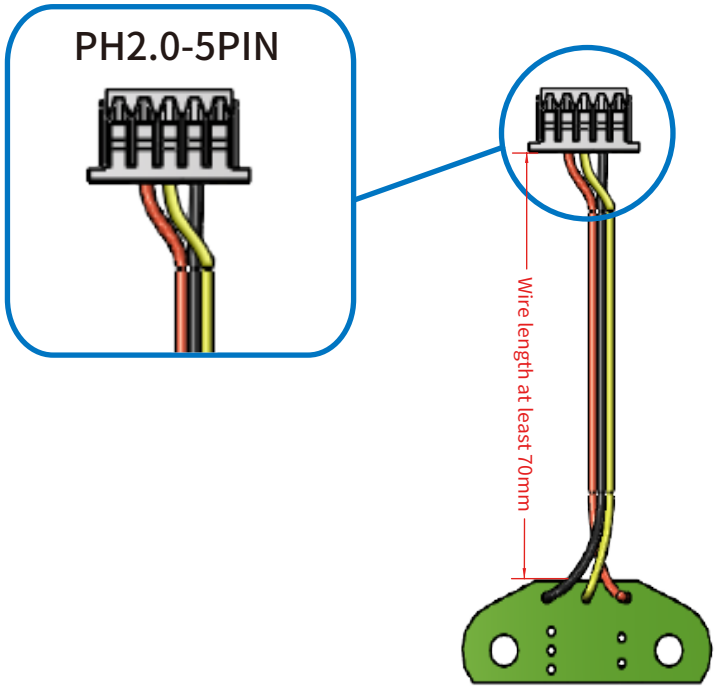
When EBB SB2209 CAN V1.0 (RP2040) is used on StealthBurner, the minimum wire length of the X Axis Limit Switch is 145mm. However, it is recommended to leave some allowance for wiring and assembly, such as a wire length of 165mm or 175mm.

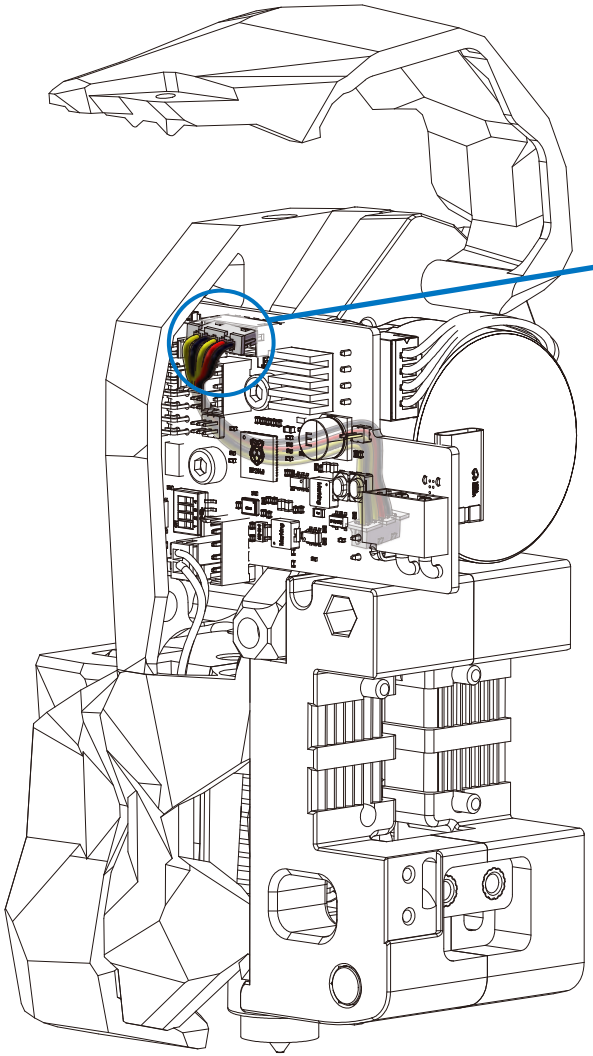




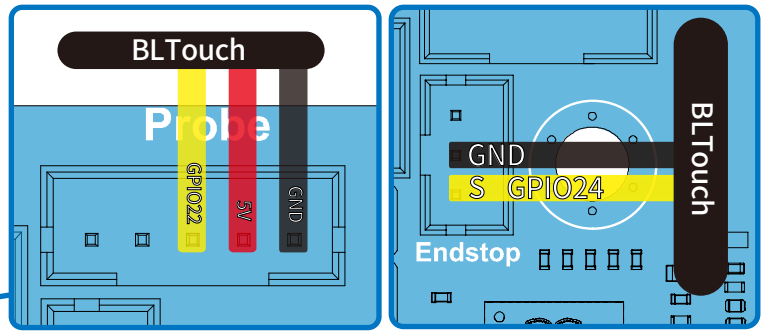
TIPS

When using the EBB SB2209 CAN V1.0 (RP2040) with StealthBurner, a Tap wire length of 70mm or above will work. However, for ease of subsequent wiring and assembly, a length of 100mm or 110mm is recommended.

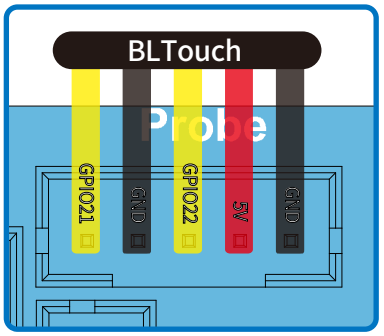


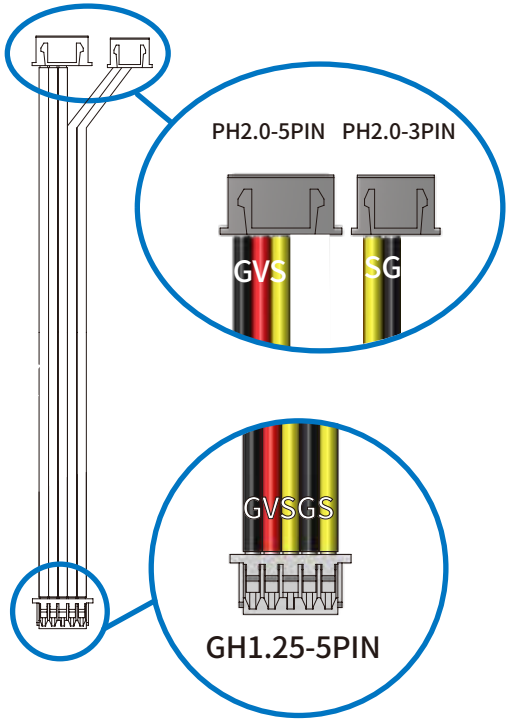


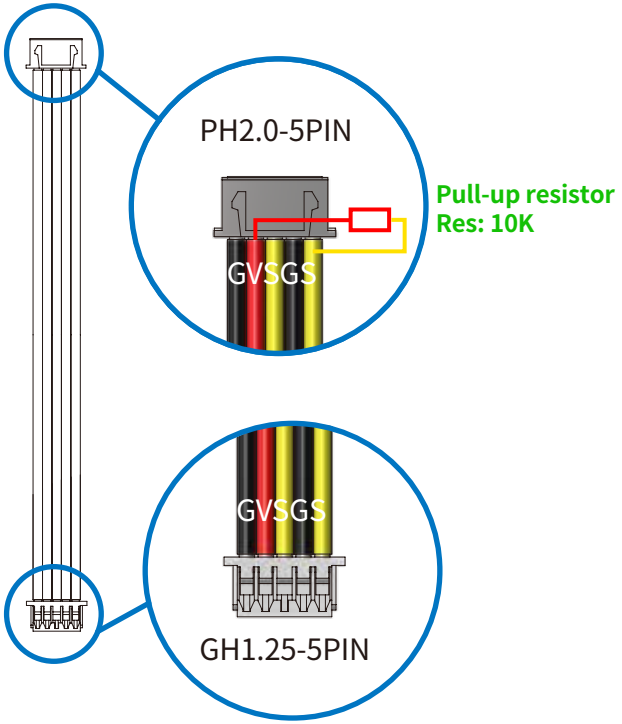
Method 1:

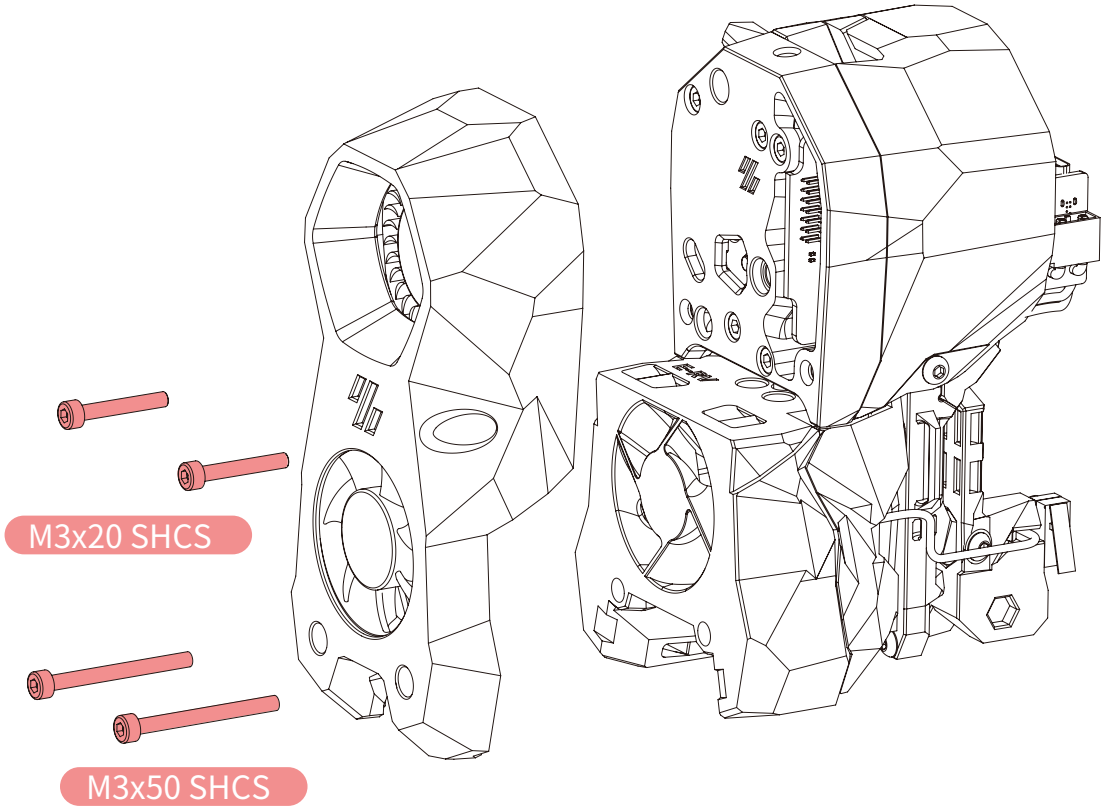


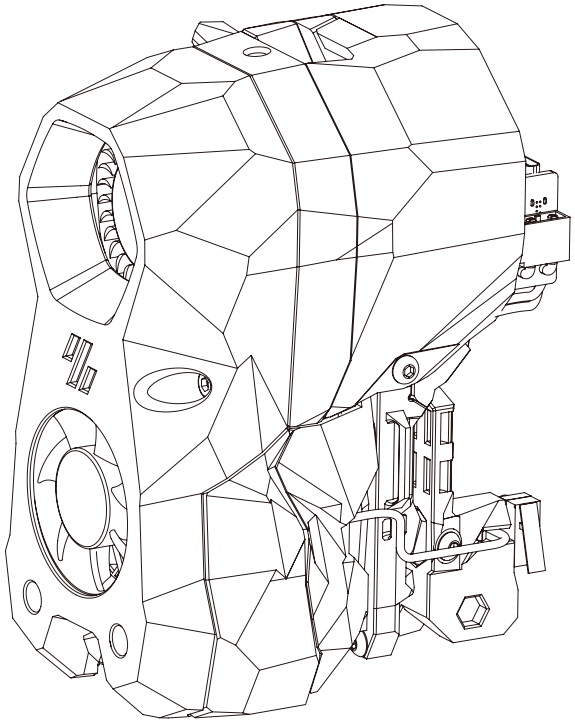
Method 2:

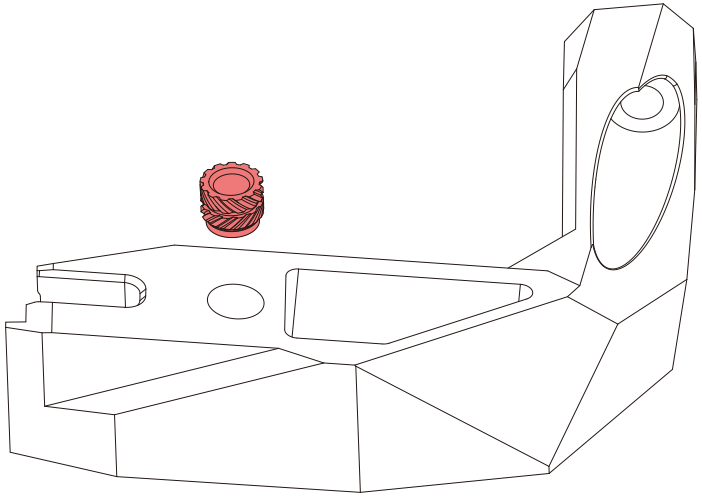


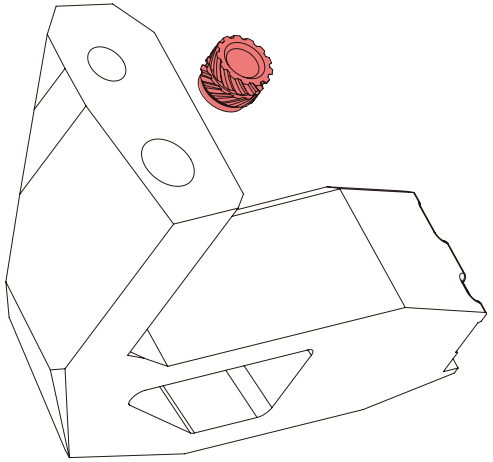


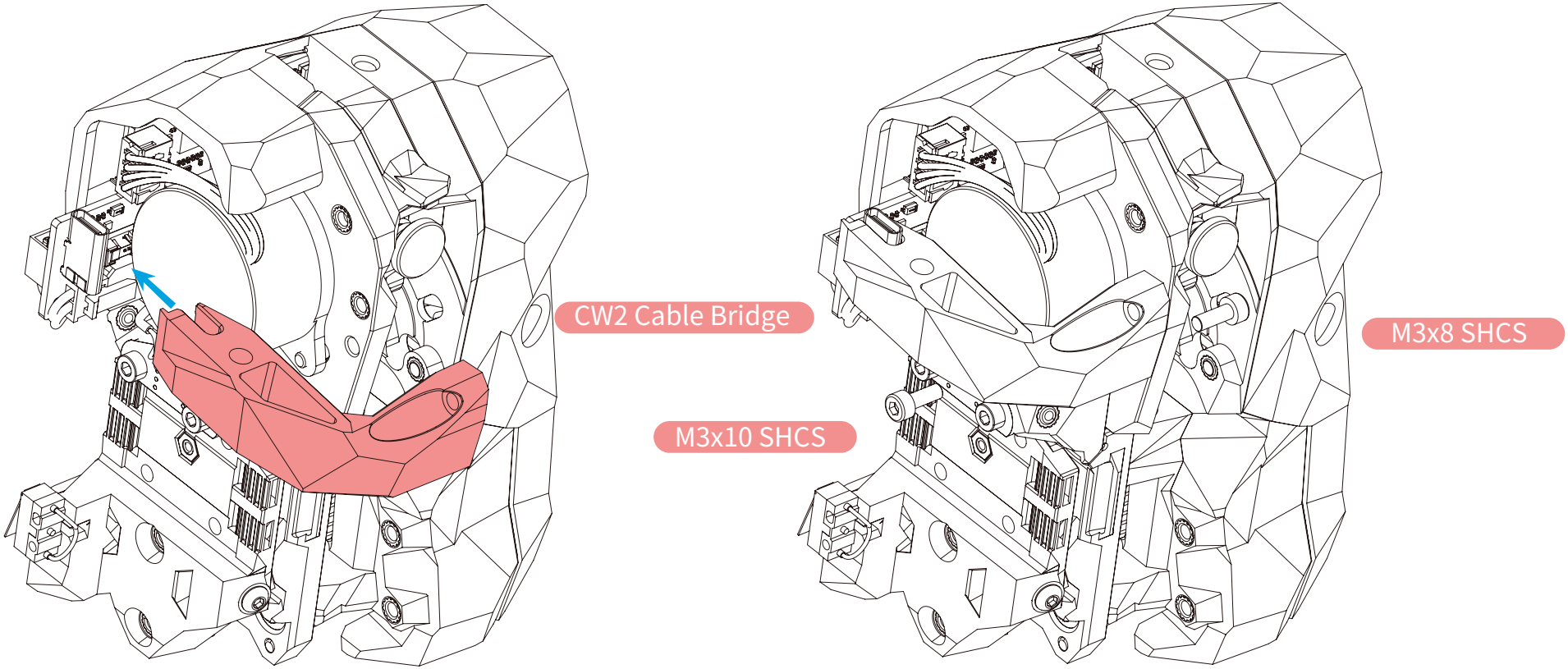



M3x20 SHCS
M3x50 SHCS



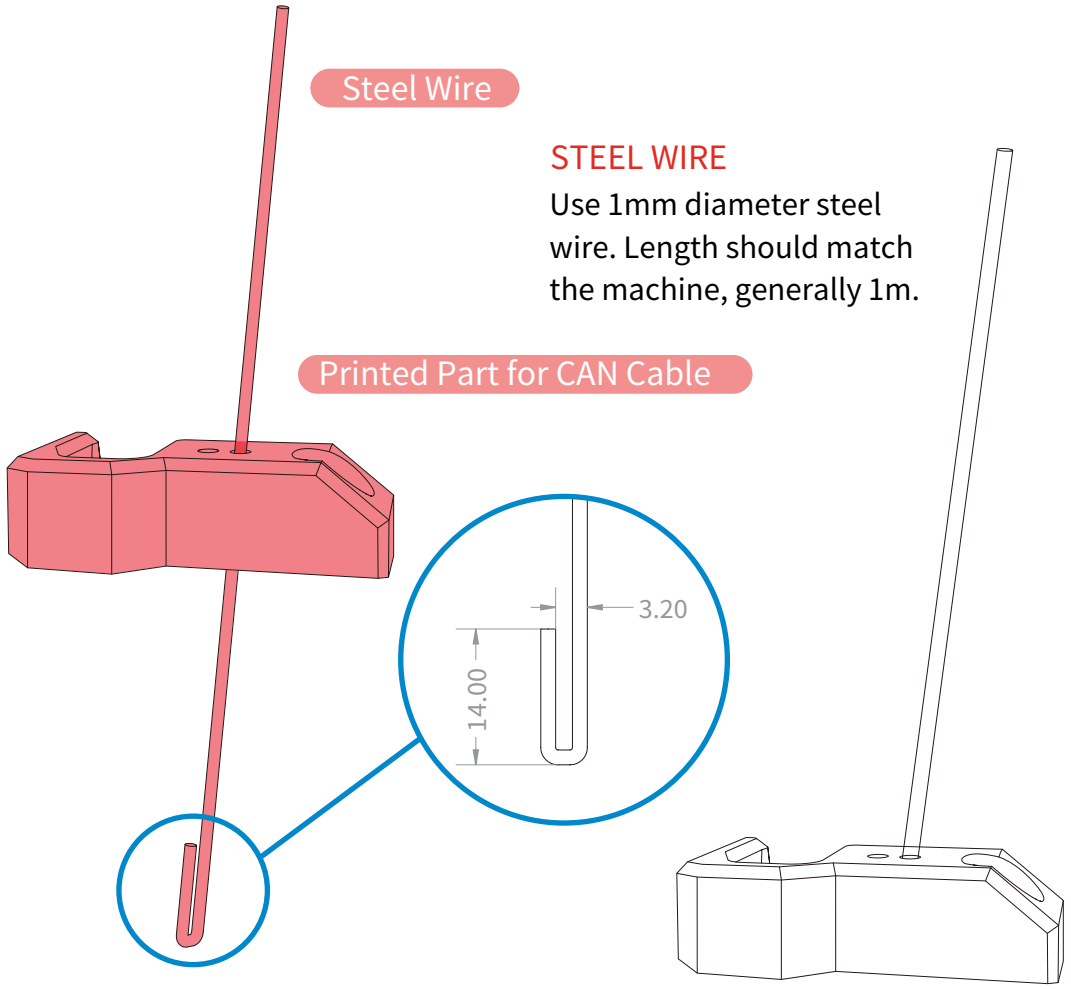






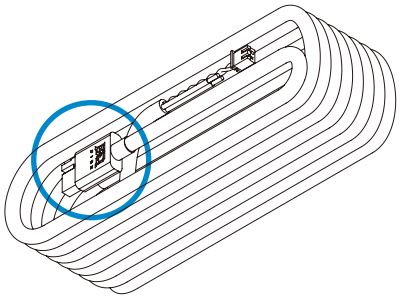
TIPS

The CW2 Cable Bridge differs slightly from the original CW version and is available for download on BIGTREETECH's GitHub in the EBB\EBB SB2240_2209 CAN\CAD or STL folders.



STEEL WIRE

Use 1mm diameter steel wire. Length should match the machine, generally 1m.

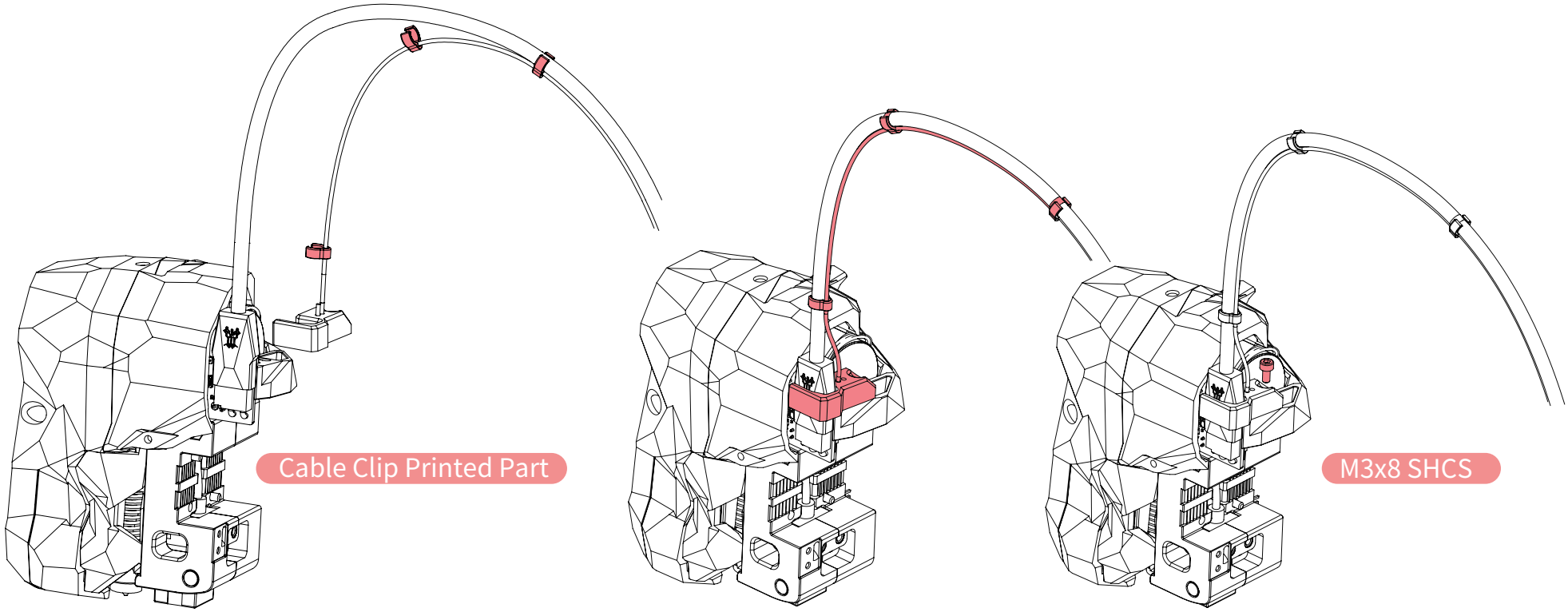


TIPS

If you are using the previous version of the CAN cable, as shown in the above image, please download the: Printed Part for CAN Cable.

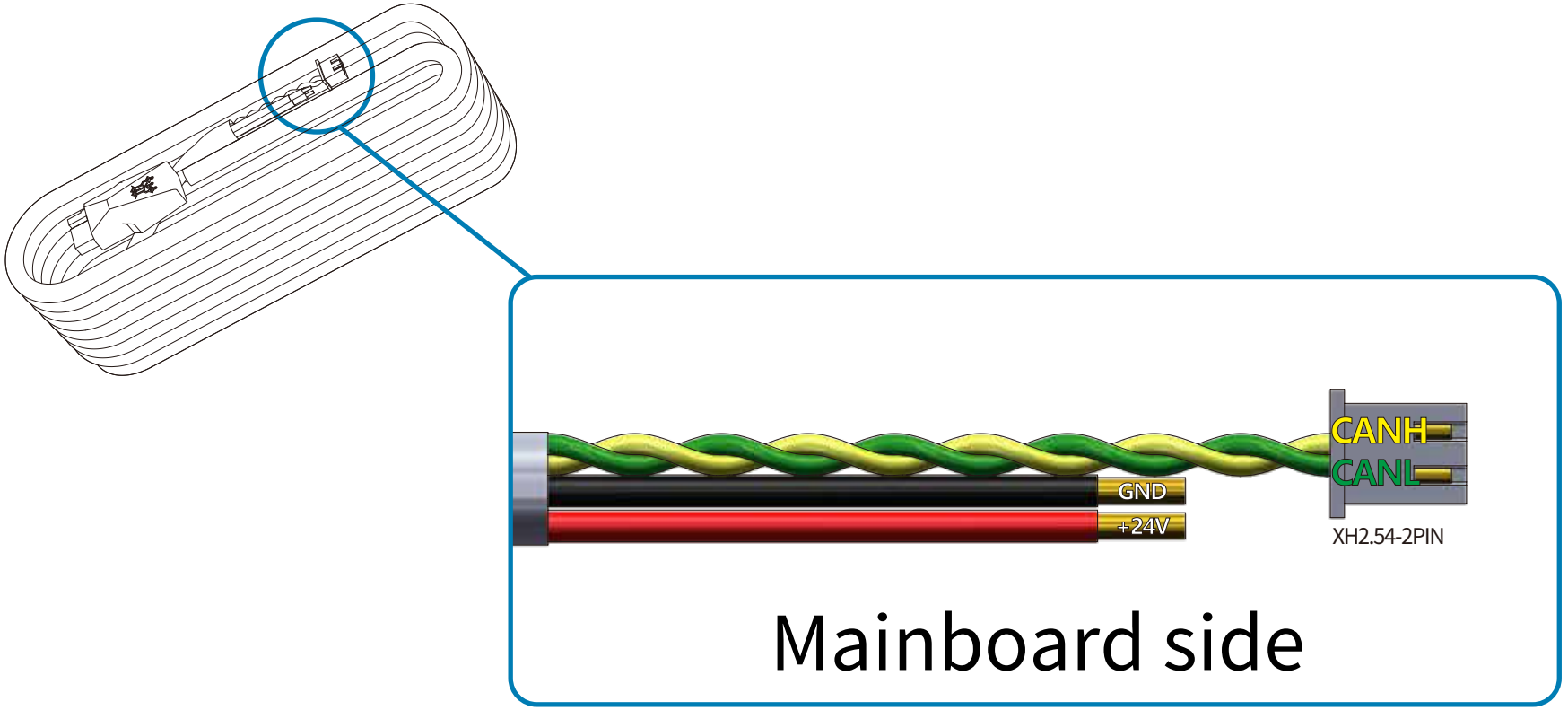
TIPS

The Printed Part for CAN Cable and Printed Part for USB-C Cable are custom-printed parts, available for download on BIGTREETECH's GitHub in the EBB\EBB SB2240_2209 CAN\CAD or STL folders.



CABLE CLIP

The Cable Clip Printed Part is a custom-printed part, available for download on BIGTREETECH's GitHub in the EBB\EBB SB2240_2209 CAN\CAD or STL folders. Alternatively, zip ties can also be used to secure the cables.


CANH
CANL
GND
+24V
XH2.54-2PIN
Mainboard side

"Katapult" is the New Name for "CanBoot"

Note: Please note that Katapult is designed for the purpose of directly updating the MCU firmware via the CAN bus interface. If you prefer the DFU update method, you may skip this step.

"Flashing Katapult on a CB1/Raspberry Pi"

Refer to the instructions here to download the Katapult project

https://github.com/Arksine/Katapult

1.Run:

```
cd ~
```

to enter the home directory, then run:

```
git clone https://github.com/Arksine/Katapult
```

to download Katapult project.

run:

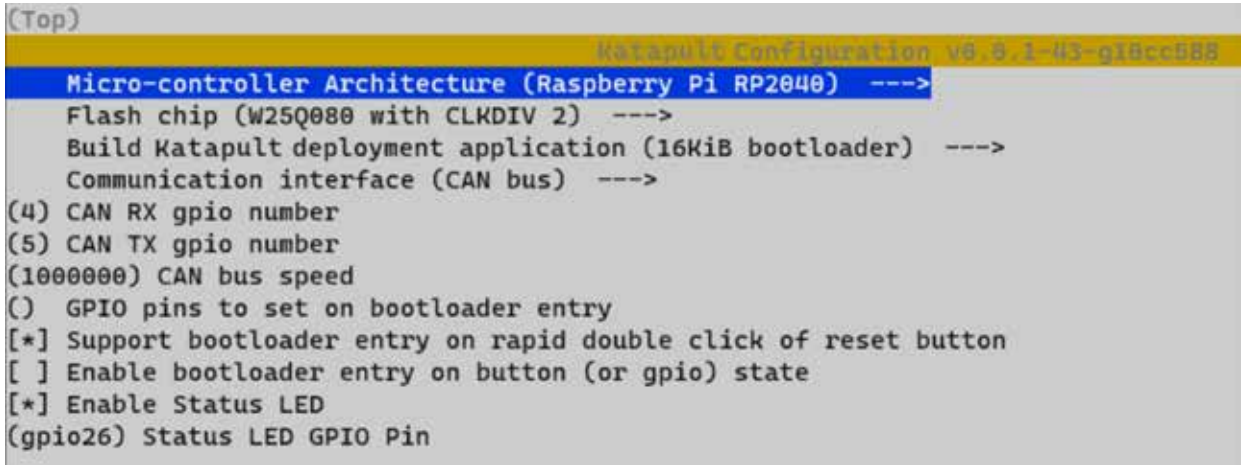
```
cd Katapult
```

to enter the Katapult directory.

2.Run:

```
make menuconfig
```

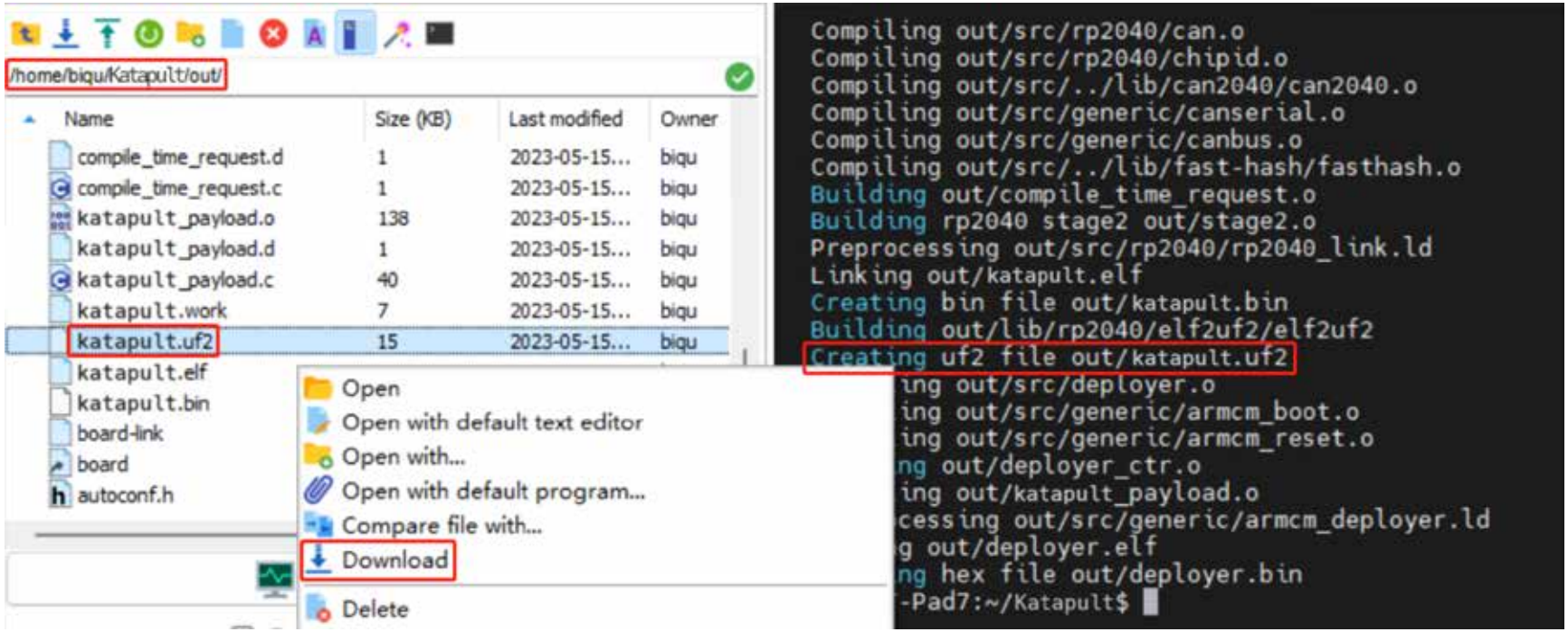
and configure according to the following figure



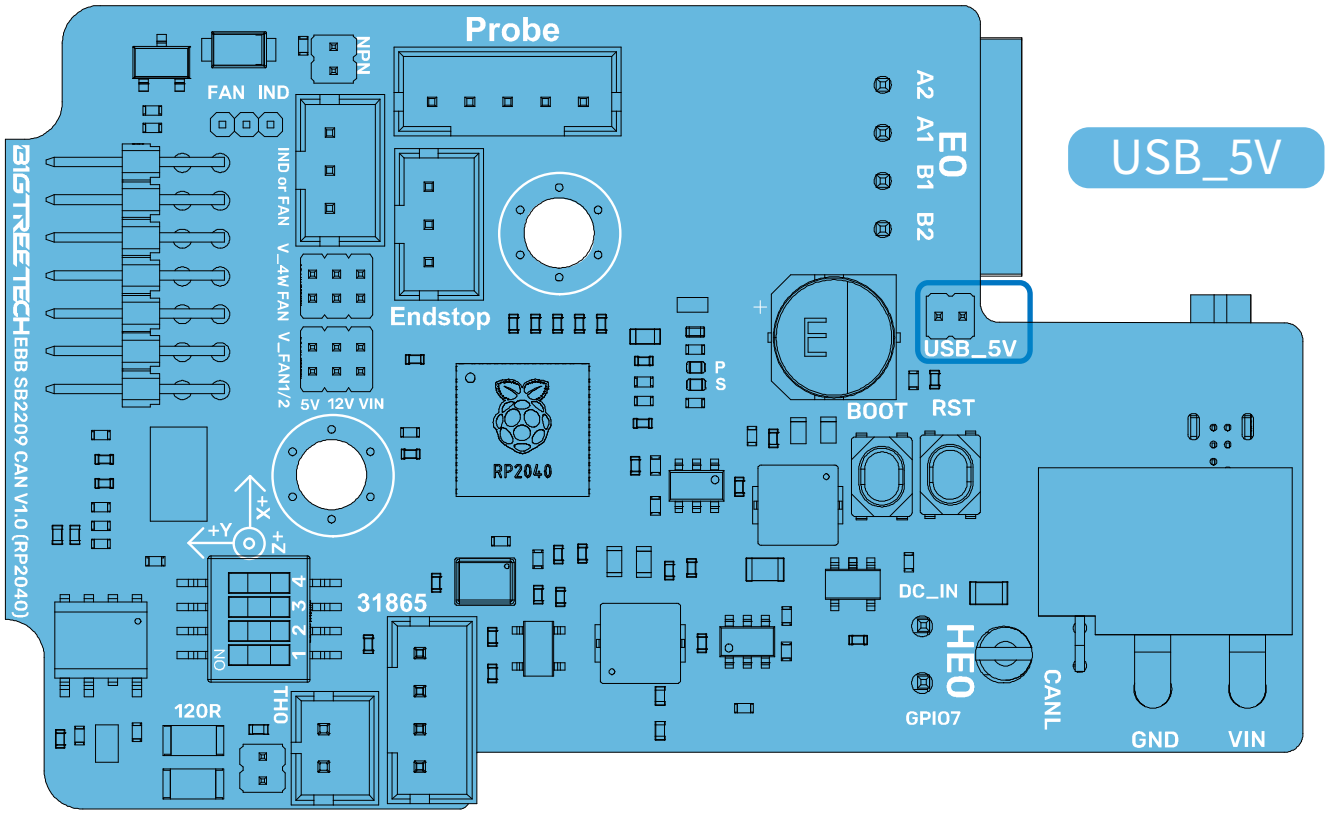
3.Run

`make`

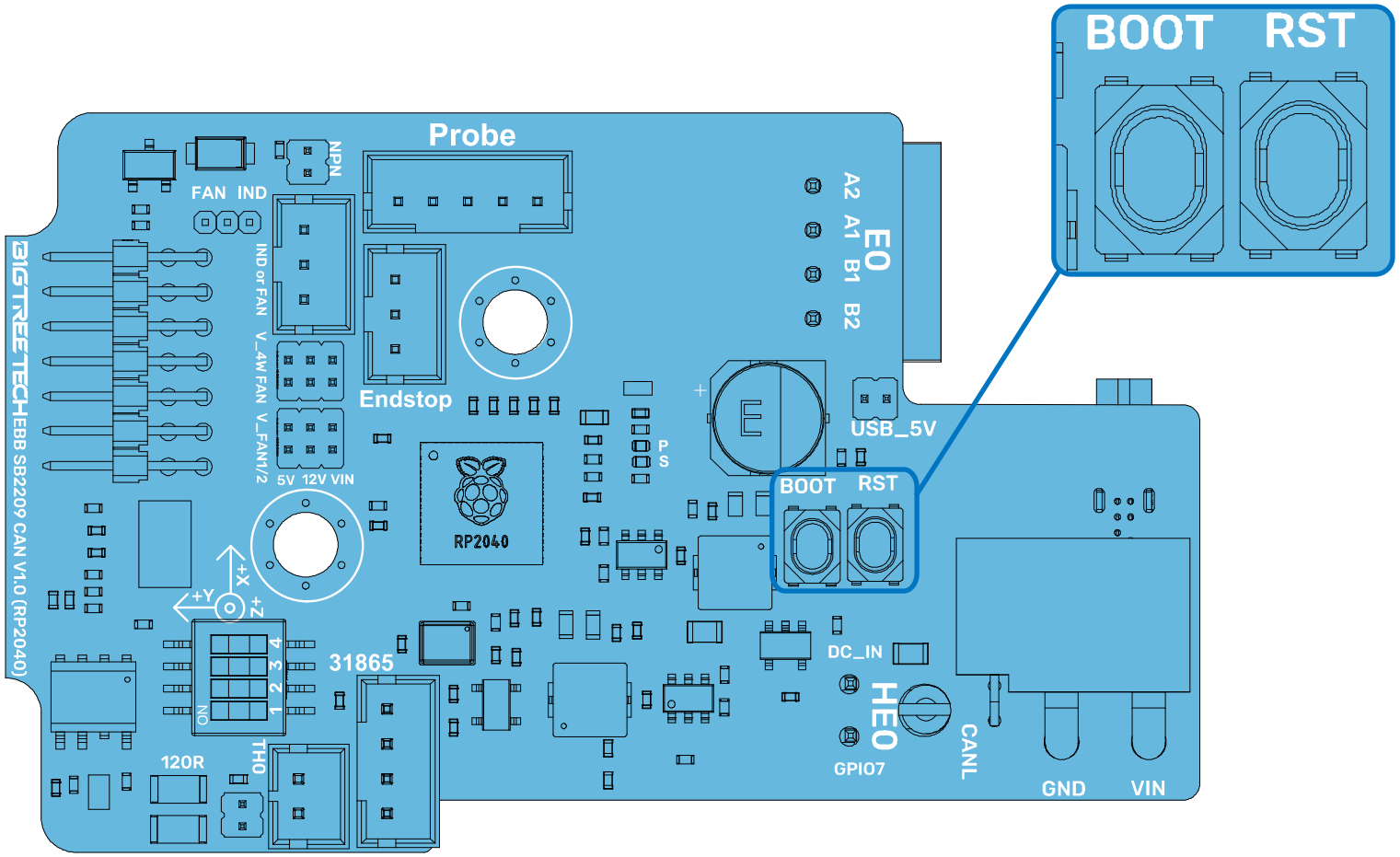
to compile firmware, 'katapult.uf2' file will be generated in `home/biqu/Katapult/out` folder when `make` is finished, download it onto your computer using the SSH application.



4.1 Please use a Type-C cable to connect the EBB SB2209 CAN V1.0(RP2040) to the Raspberry Pi/CB1, and ensure that the USB_5V jumper is connected, in order to supply power to the EBB SB2209 CAN V1.0(RP2040) via Type-C.



4.2. Press and hold the Boot button, and then click the Reset button to enter the DFU mode.



4.3. Enter in the SSH terminal command line

```
lsusb
```

Query DFU device ID

```
pi@fluiddpi:~$ lsusb
Bus 001 Device 005: ID 2e8a:0003 Raspberry Pi RP2 Boot
Bus 001 Device 004: ID 1d50:6061 OpenMoko, Inc. Geschwister Schneider CAN adapter
Bus 001 Device 003: ID 0424:0c00 Microchip Technology, Inc. ( formerly SMSC ) SMC9512/9514 Fast Ethernet Adapter
Bus 001 Device 002: ID 0424:9514 Microchip Technology, Inc. ( formerly SMSC ) SMC9514 Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
pi@fluiddpi:~$
```

4.4. Please enter the following command to flash Katapult:

```
make flash FLASH_DEVICE=2e8a:0003
```

where "2e8a:0003" should be replaced with the actual device ID obtained in step 4.3.

4.5. After flashing is complete, remove the USB_5V jumper and the Type-C cable.

1.) After SSH is successfully connected to Raspberry Pi, run

```
cd ~/klipper/
make menuconfig
```

Compile the firmware with the following configuration (if the options below are not available, please update your Klipper source code to the newest version).

[*] Enable extra low-level configuration optionsMicro-controller Architecture (Raspberry Pi RP2040) --->

If you do not use Katapult

Bootloader offset (No bootloader) --->
Flash chip (W25Q080 with CLKDIV 2) --->

If Katapult is used

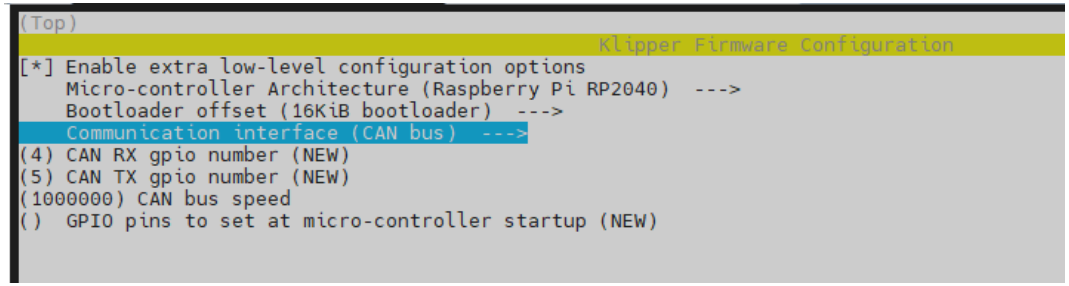
Bootloader offset (16KiB bootloader) --->

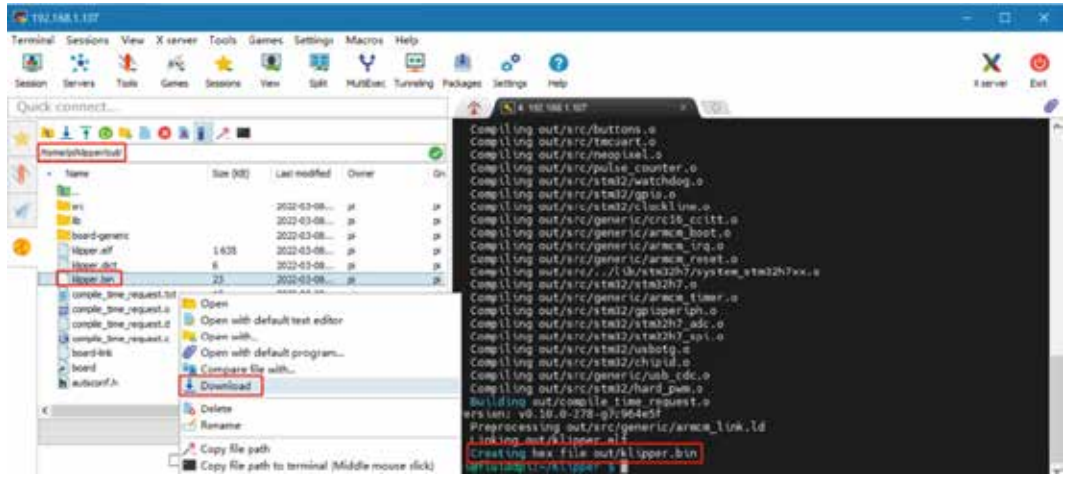
If USB communication on Type-C is used

Communication interface (USB) --->

If CAN-Bus communication is used

Communication interface (CAN bus) --->
(4) CAN RX gpio number
(5) CAN TX gpio number
(1000000) CAN bus speed





2.) Press 'q' to exit, and "Yes" when asked to save the configuration.

3.) Run `make` to compile firmware, "klipper. bin" file will be generated in `home/pi/klipper/out` folder when `make` is finished, download it onto your computer using the SSH application.

1.To use the CAN bus, you need to connect the CAN bus cable and insert a jumper at the position of the 120R termination resistor.

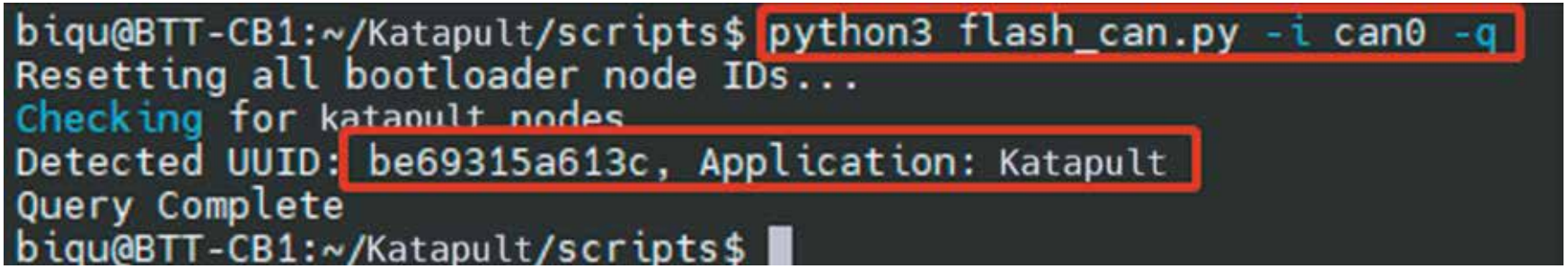
2. Run:

```
cd ~/Katapult/scripts
```

then run:

```
python3 flash_can.py -i can0 -q
```

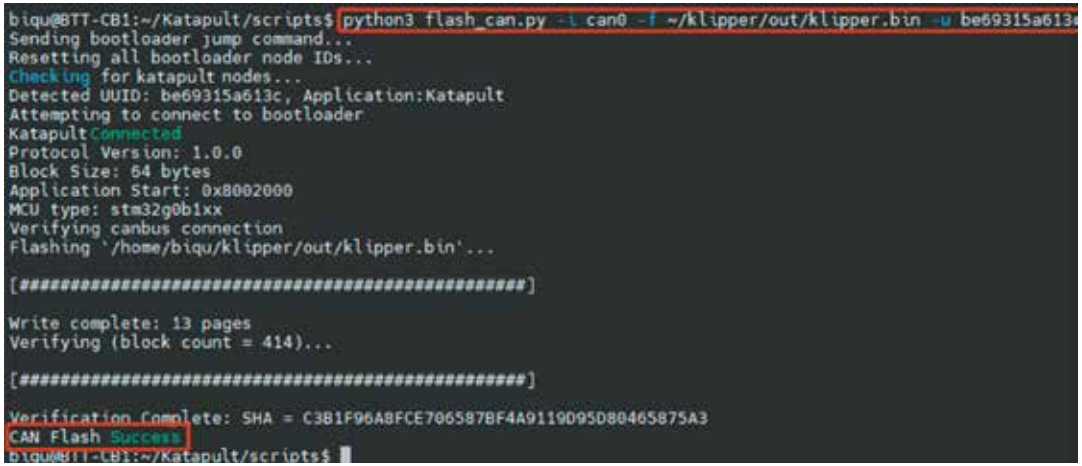
to query the canbus ID (connect the CAN cable and power it on in advance), as shown in the figure below, the UUID of the device has been found



3. Run:

```
python3 flash_can.py -i can0 -f ~/klipper/out/klipper.bin -u be69315a613c
```

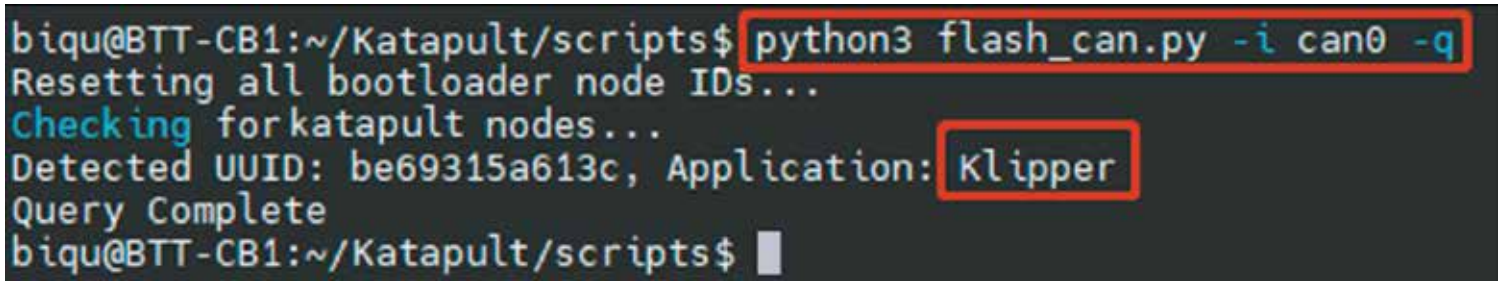
The be69315a613c is replaced with the actual UUID. Note: klipper.bin needs to be made in advance, and the application start offset of Katapult is 16KiB offset, so Klipper's menuconfig Bootloader offset should also be 16KiB bootloader, as shown in the following figure.



4. Run:

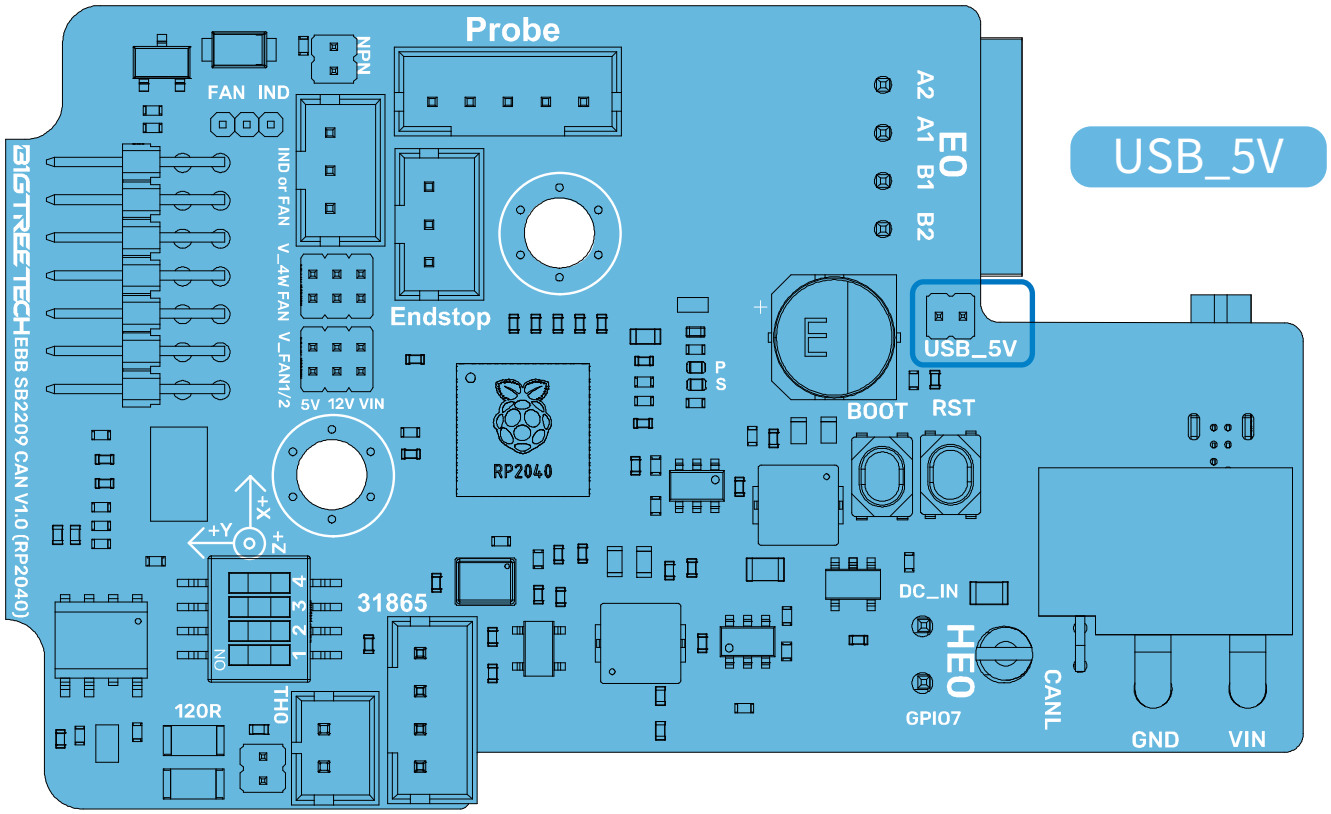
```
python3 flash_can.py -i can0 -q
```

to query. At this time, the Application changes from Katapult to Klipper, indicating that Klipper has been running normally

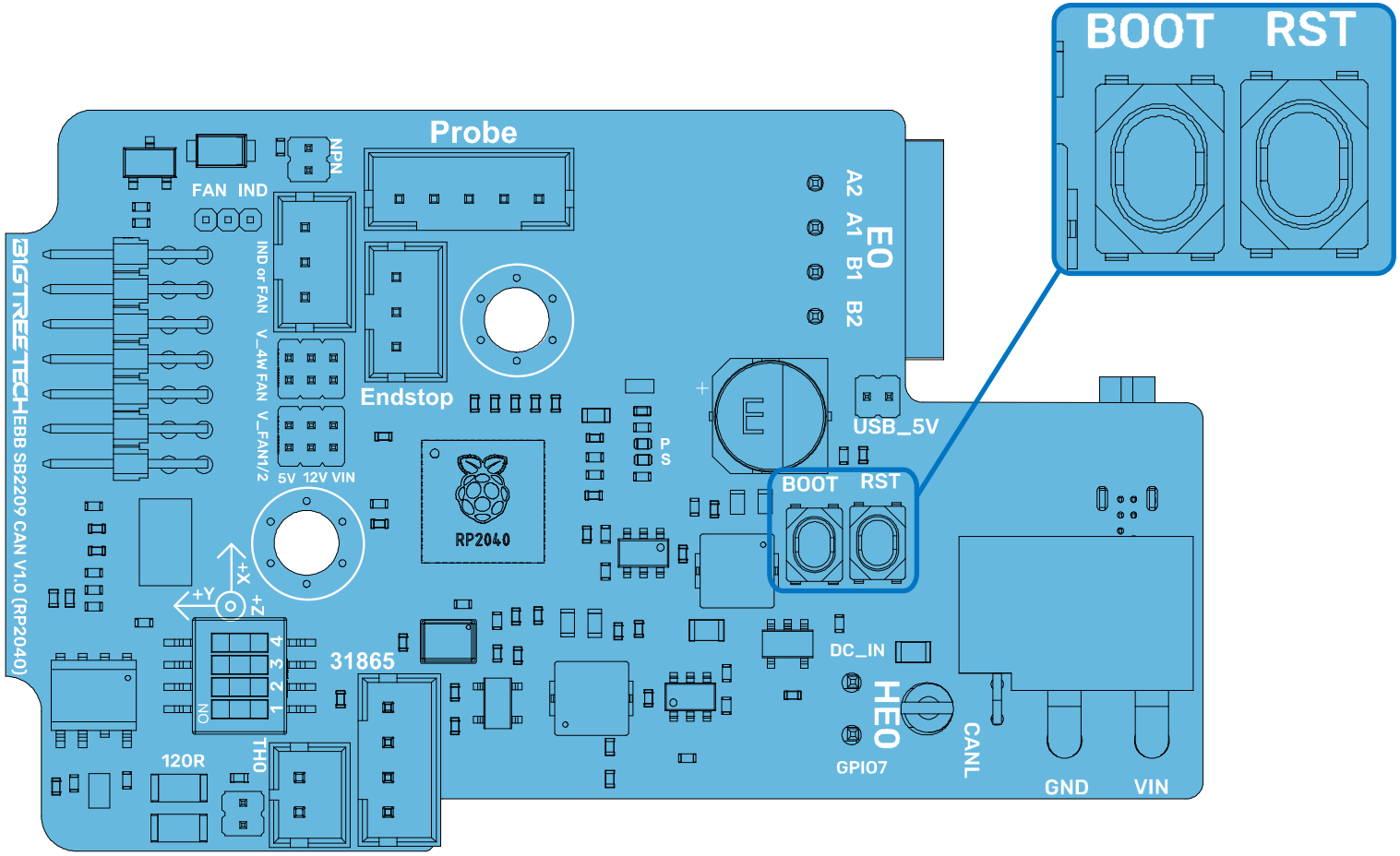


Raspberry Pi or CB1 update via DFU.

1. Please use a Type-C cable to connect the EBB SB2209 CAN V1.0 (RP2040) to the Raspberry Pi/CB1, and ensure that the USB_5V jumper is connected, in order to supply power to the EBB SB2209 CAN V1.0 (RP2040) via Type-C.



2. Press and hold the Boot button, and then click the Reset button to enter the DFU mode.



3.Enter in the SSH terminal command line

```
lsusb
```

Query DFU device ID

```
pi@fluiddpi:~$ lsusb
Bus 001 Device 005: ID 2e8a:0003 Raspberry Pi RP2 Boot
Bus 001 Device 004: ID 1d50:6061 OpenMoko, Inc. Geschwister Schneider CAN adapter
Bus 001 Device 003: ID 0424:0c00 Microchip Technology, Inc. ( formerly SMSC ) SMC9512/9514 Fast Ethernet Adapter

Bus 001 Device 002: ID 0424:9514 Microchip Technology, Inc. ( formerly SMSC ) SMC9514 Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
pi@fluiddpi:~$
```

4.Run:

```
cd klipper
```

to enter to the klipper directory, then run the following command to write the firmware:

```
make flash FLASH_DEVICE=2e8a:0003
```

Note: Replace 2e8a:0003 with the actual device ID found in the previous step.

5. After the firmware is written, run

```
ls /dev/serial/by-id/
```

to query the serial ID of the device (this ID can only be found in the USB communication mode, and this step is ignored in CANBus mode).

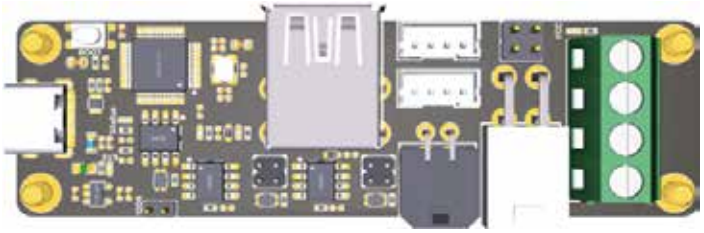
6. If USB communication is used, after the first writing, it is not necessary to manually press the Boot and Reset buttons to enter the DFU mode when updating again.
You can directly enter

```
make flash FLASH_DEVICE=/dev/serial/by-id/usb-Klipper_rp2040_4550357128922FC8-if00
```

to write the firmware (Note: replace/dev/serial/by id/xxx with the actual ID found in the previous step).

After flashing is complete, remove the USB_5V jumper and the Type-C cable.

Used with BIGTREETECH U2C module.



1. Enter the command

```
sudo nano /etc/network/interfaces.d/can0
```

in the SSH terminal and execute

```
allow-hotplug can0
iface can0 can static
  bitrate 1000000
  up ifconfig $IFACE txqueuelen 1024
```

Set the CAN-BUS speed to 1M (it must be consistent with the speed set in the firmware (1000000) CAN bus speed), save (Ctrl+S) and exit (Ctrl+X) after modification, and enter

```
sudo reboot
```

to restart Raspberry Pi.

2. Each device on CAN bus will generate a canbus_uuid according to the UID of MCU, to find each microcontroller device ID, make sure the hardware is powered on and wired correctly, and then run:

```
~/klippy-env/bin/python ~/klipper/scripts/canbus_query.py can0
```

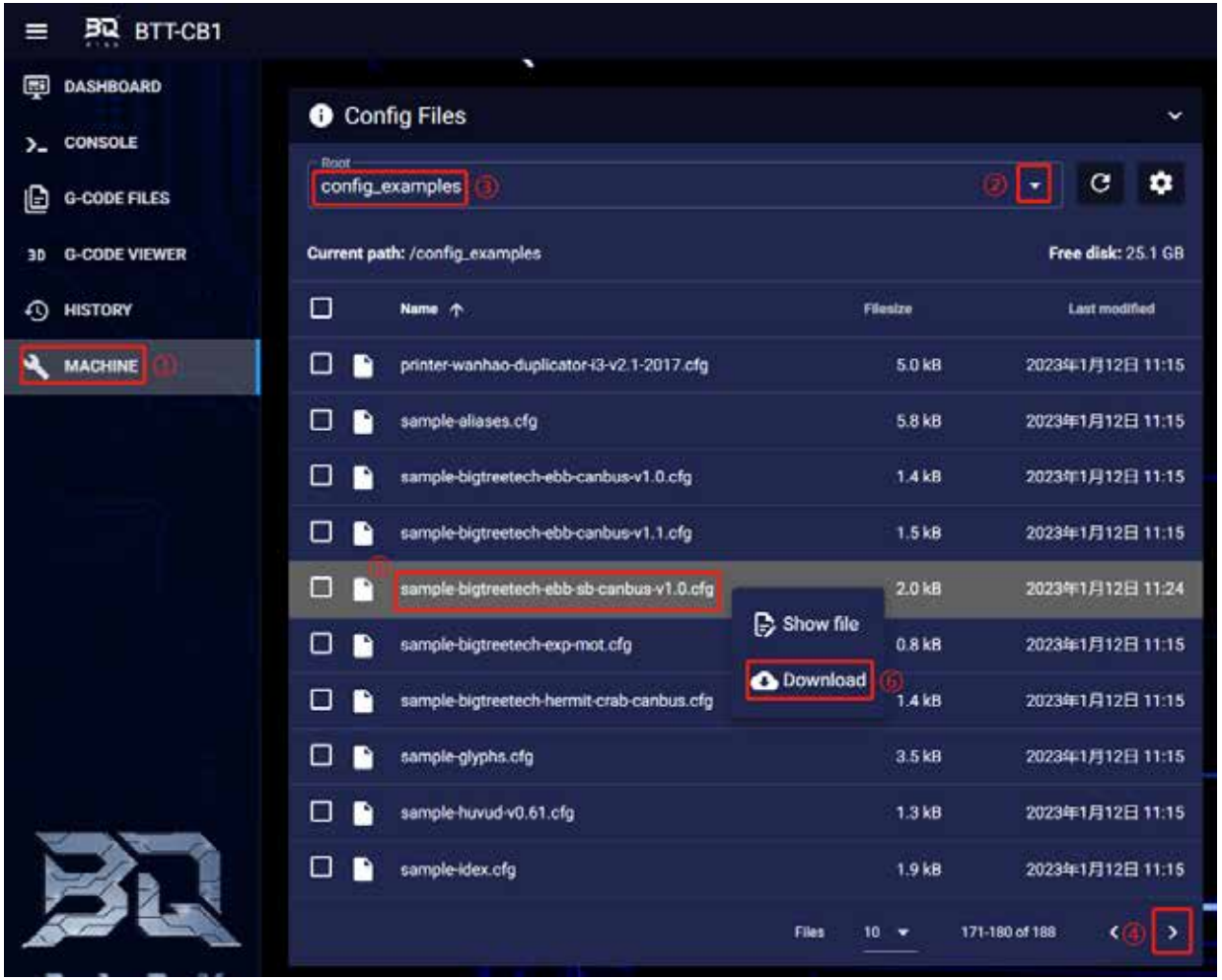
3. If an uninitialized CAN device is detected, the above command will report the device's canbus_uuid.

```
Found canbus_uuid=0e0d81e4210c
```

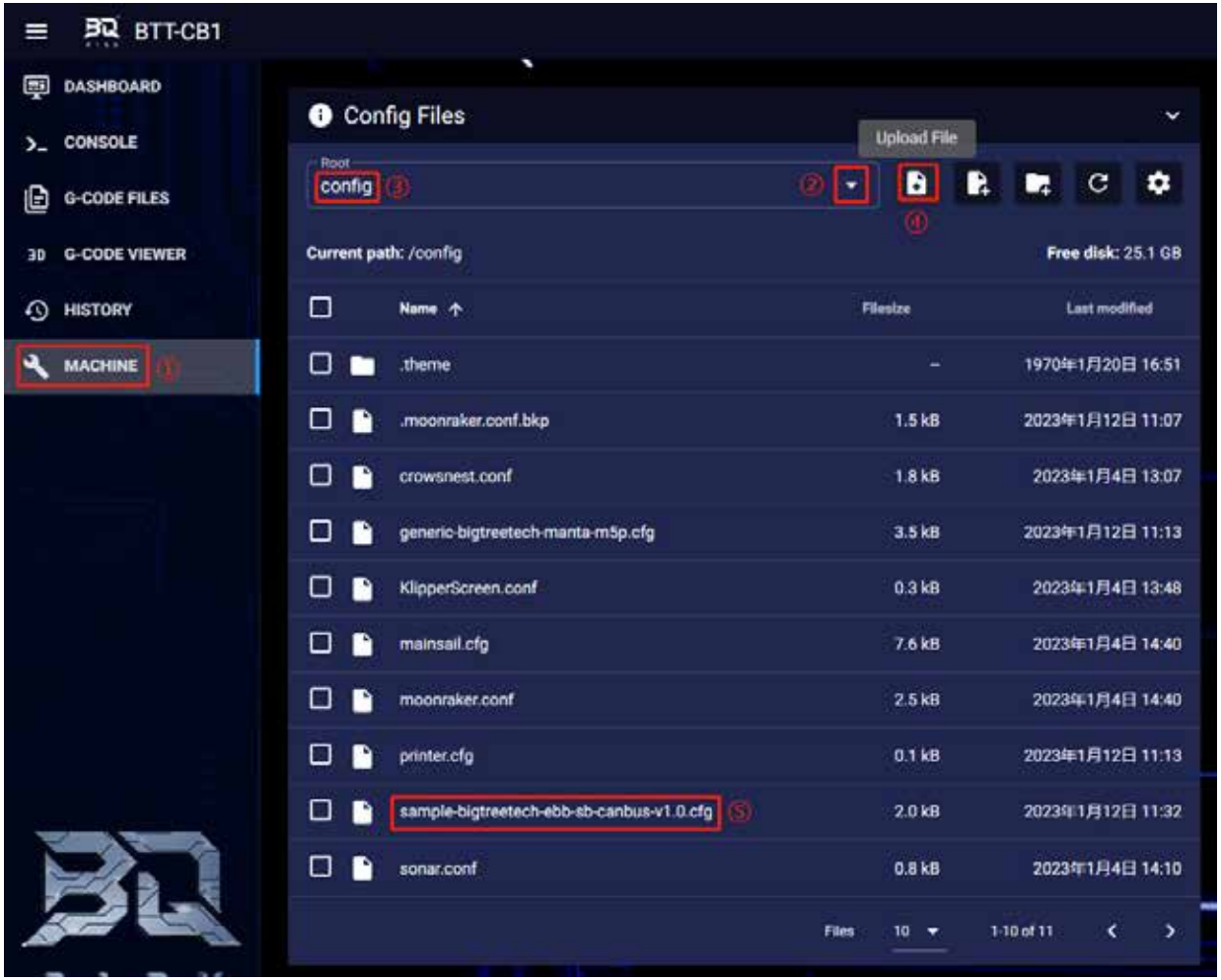
4. If Klipper has been running normally and connected to this device, then canbus_uuid will not be reported, which is normal.

1. Enter Raspberry Pi IP address into your browser, and find the reference config for the motherboard in the directory shown below, if there is no such config available, update your Klipper source code to the newest version or download it from GitHub:

```
https://github.com/bigtreetech/EBB
```



2. Upload the configuration file of the motherboard to Configuration Files.



3. Add the configuration of this motherboard in the "printer. cfg" file:

```
[include sample-bigtreetech-ebb-sb-canbus-v1.0.cfg]
```

X printer.cfg

```
11
12  [include sample-bigtreetech-ebb-canbus-v1.0.cfg]
13
```

4. Enter the correct ID (USB serial or canbus).

X sample-bigtreetech-ebb-sb-canbus-v1.0.cfg

```
8       [ mcu EBBCan]
9       serial    : /dev/serial/by-id/usb-Klipper_firmware_12345-if00
10      #canbus_uuid:  0e0d81e4210c
```

5. Configure the module's specific functions according to

```
https://www.klipper3d.org/Overview.html
```

Website
www.bigtree-tech.com

GitHub
www.github.com/bigtreetech

Discord
www.discord.gg/5jdwbYYZuv