Hermit Crab 2 Series

User Manual

CONTENT

Revision Log

Version	Date	Revisions
v1.00	14th June 2023	Initial Version
v1.01	May 7th, 2025	Modify the menuconfig to **Flash chip (GENERIC_03H with CLKDIV 4)**

Product Profile

The Hermit Crab 2 series is made for fast and simple swapping of print heads on 3D printers. It has a fixed plate and multiple tool plates that let you quickly change between different print heads. The 2 series is lighter, more compact, and more robust.

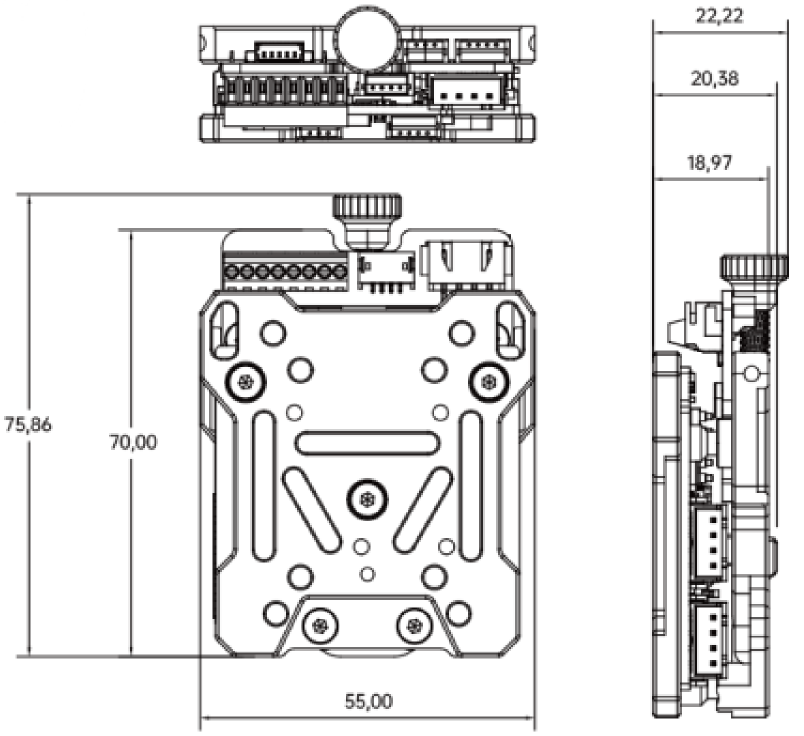
Feature Highlights

- The board contains a ‘BOOT’ button to enter DFU mode when updating firmware using USB.
- The thermistor circuit has added protection to prevent the MCU from burning out due to heater cartridge leakage.
- Interfaces such as I^{2}C and RGB are provided for DIY capabilities.
- Fan voltage is compatible with various fan types by selecting the suitable voltage.
- USB power can be isolated from the DC-DC using a jumper.
- The proximity switch, 2-pin fans, and 4-pin fans support voltage selections of VIN/12V/5V.
- Heater cartridge and fan ports have reverse protection diodes and fuses that protect MOSFETs from reverse voltage damage.
- The XT30 power input port supports a higher current and has reverse polarity protection which prevents boards from burning out.
- Supports 2-wire PT100/PT1000/NTC100K selection.
- Offers CAN or USB communication. CAN has a selectable 120R terminal resistor via jumper along with an expansion interface.
- The USB port contains ESD protection which prevents static discharge damage.
- The 5V and 12V rails each have an eFuse which greatly reduces the risk of circuit damage from short circuits or sparks.
- A more precise LIS2DW accelerometer allows for an improved resonance compensation.

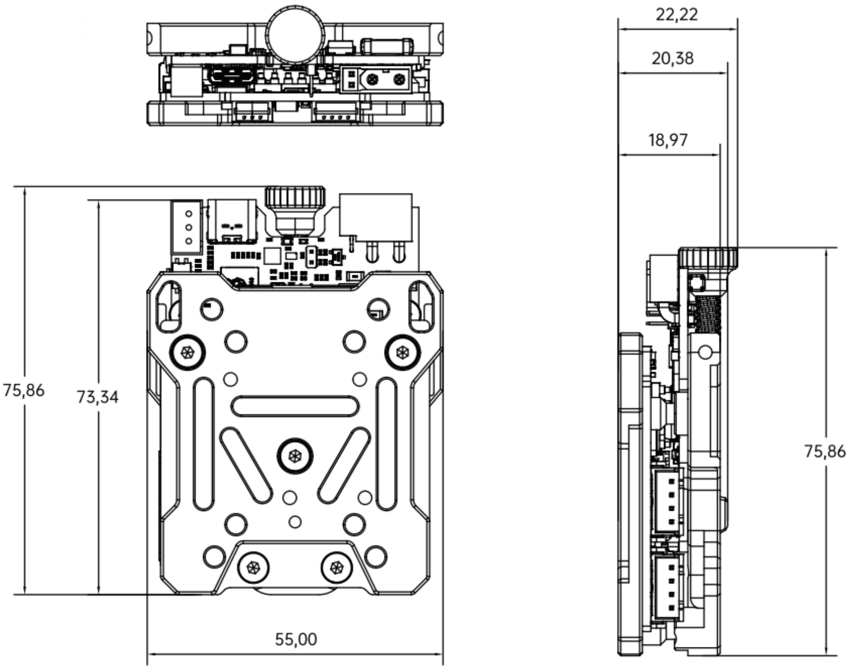
Specifications

	Hermit Crab 2	**Hermit Crab 2 CAN**
Firmware Support	Klipper, Marlin, RRF	Klipper
Onboard Accelerometer	-	LIS2DW
Onboard Max31865	-	√
CAN Interface	-	XT30
MCU	-	RP2040 Dual ARM Cortex-M0+@133MHz
Material	Aluminum Alloy	Aluminum Alloy
Input Voltage	DC12V-24V	DC12V-24V
Logic Voltage	-	DC 3.3V
Heating Interface	Heater Cartridge(HE0), maximum output current: 3A	Heater Cartridge(HE0), maximum output current: 6A
Fan Interface	2x 2-Pin CNC Fans (FAN1, FAN2), 1x 4-Pin Fan (FAN0), selectable voltage	2x 2-Pin CNC Fans (FAN1, FAN2), 1x 4-Pin Fan (FAN0), selectable voltage
Maximum Fan Interface	0.75A, peak 0.9A	0.75A, peak 0.9A
Expansion Interface	RGB, I2C, Probe	I2C，Probe，RGB，USB，CAN，STOP
Motor Driver	-	TMC2209
Driver Operating Mode	-	UART
Stepper Motor Interface	E0	E0
Temperature Sensor Interface	-	1x NTC100K/PT100/PT1000 Selectable
USB Communication	-	USB Type-C
DCDC 5V Maximum Output Current	1A	1A

Dimension



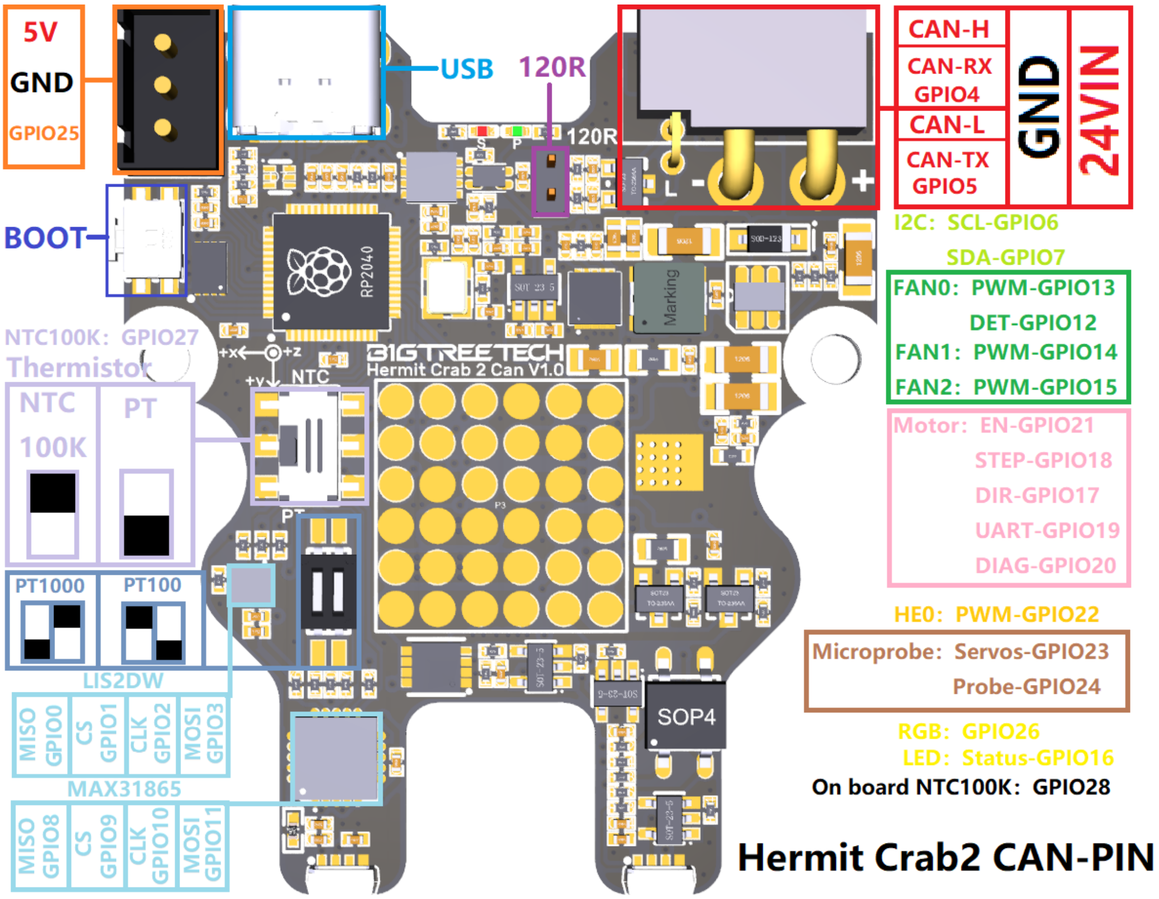
Hermit Crab 2



Hermit Crab 2 CAN

Peripheral Interface

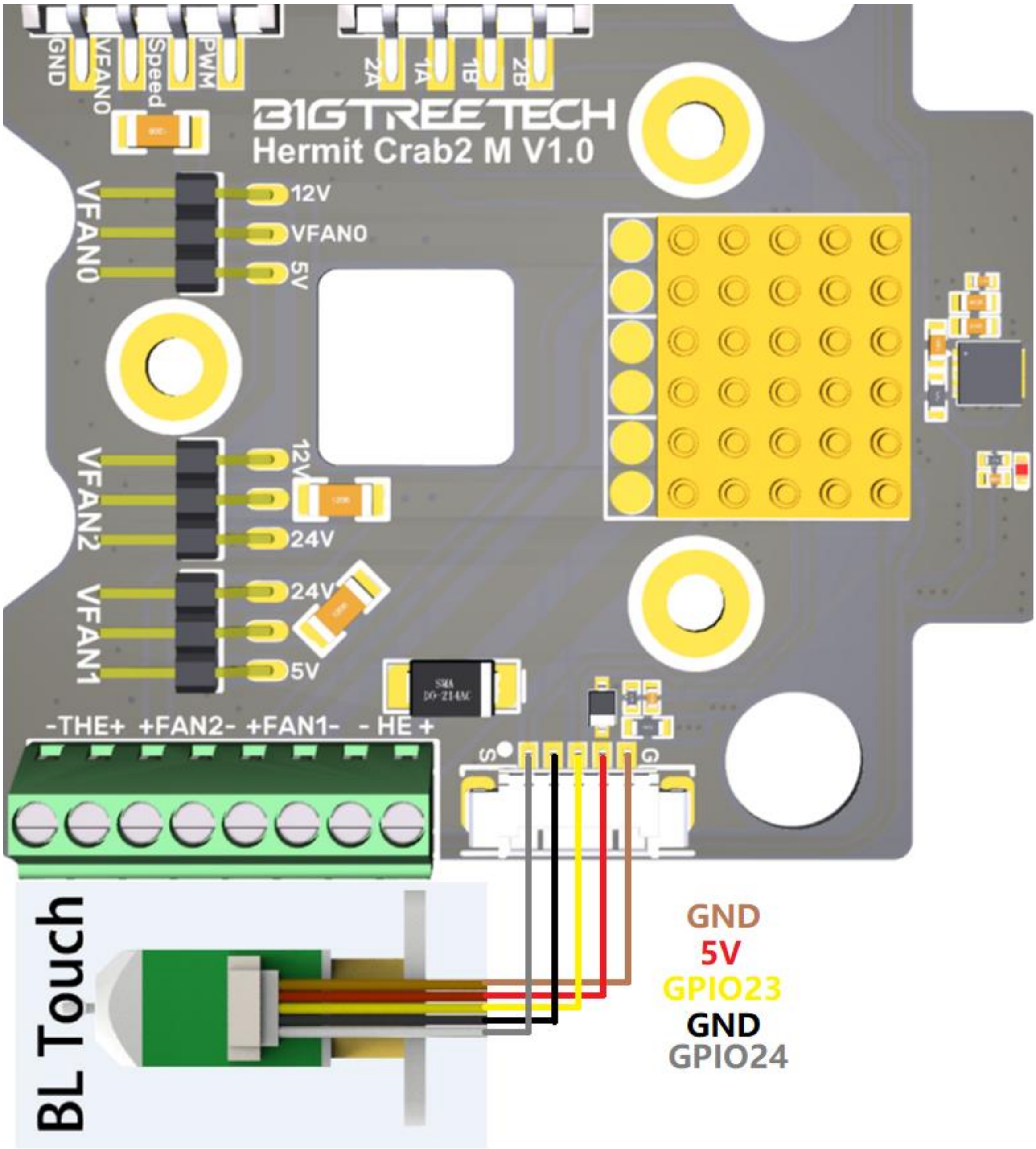
Pin Description



Hermit Crab 2 CAN-PIN

Wiring

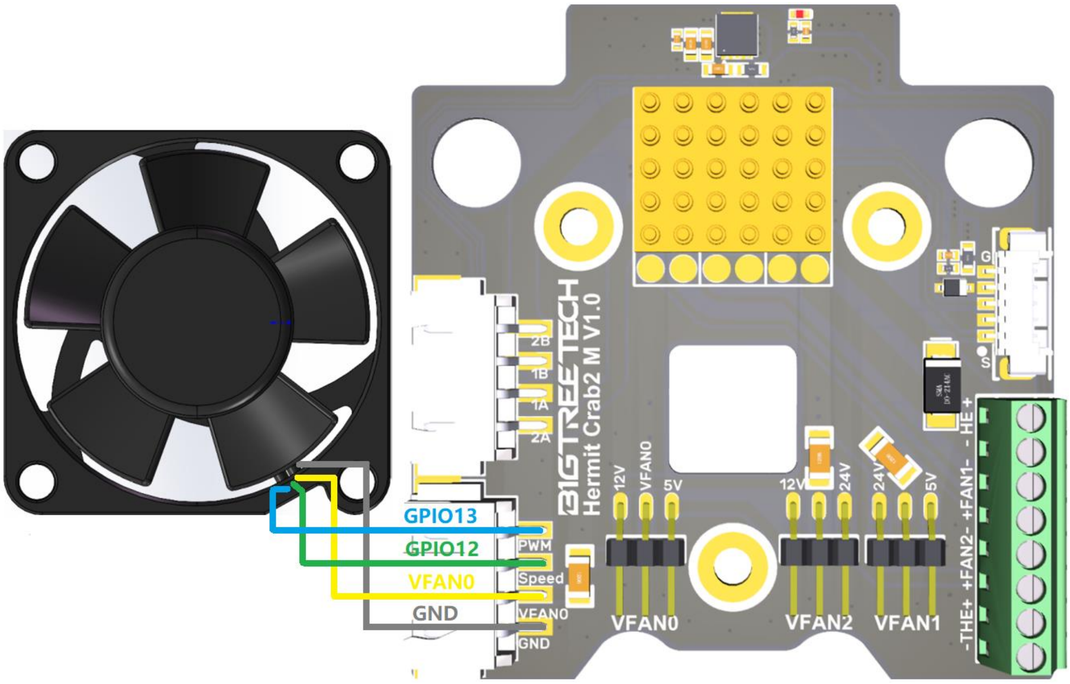
BLTouch Wiring



Fan Voltage Selection

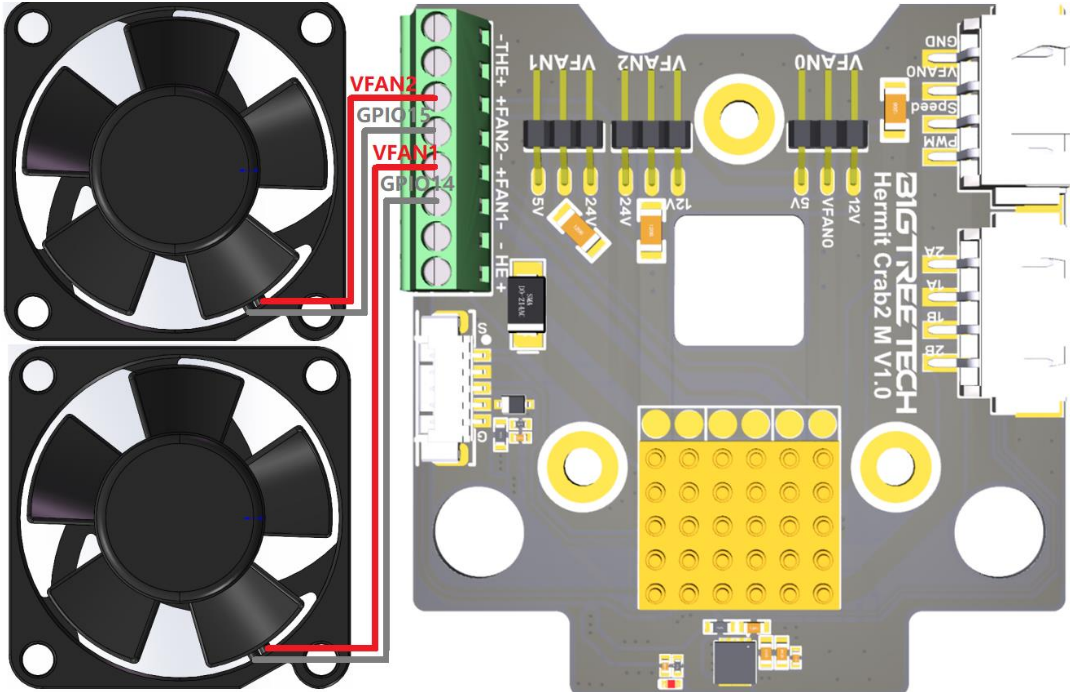
4-Pin Fan

Use jumper to select voltage for VFAN0 between 5V or 12V.

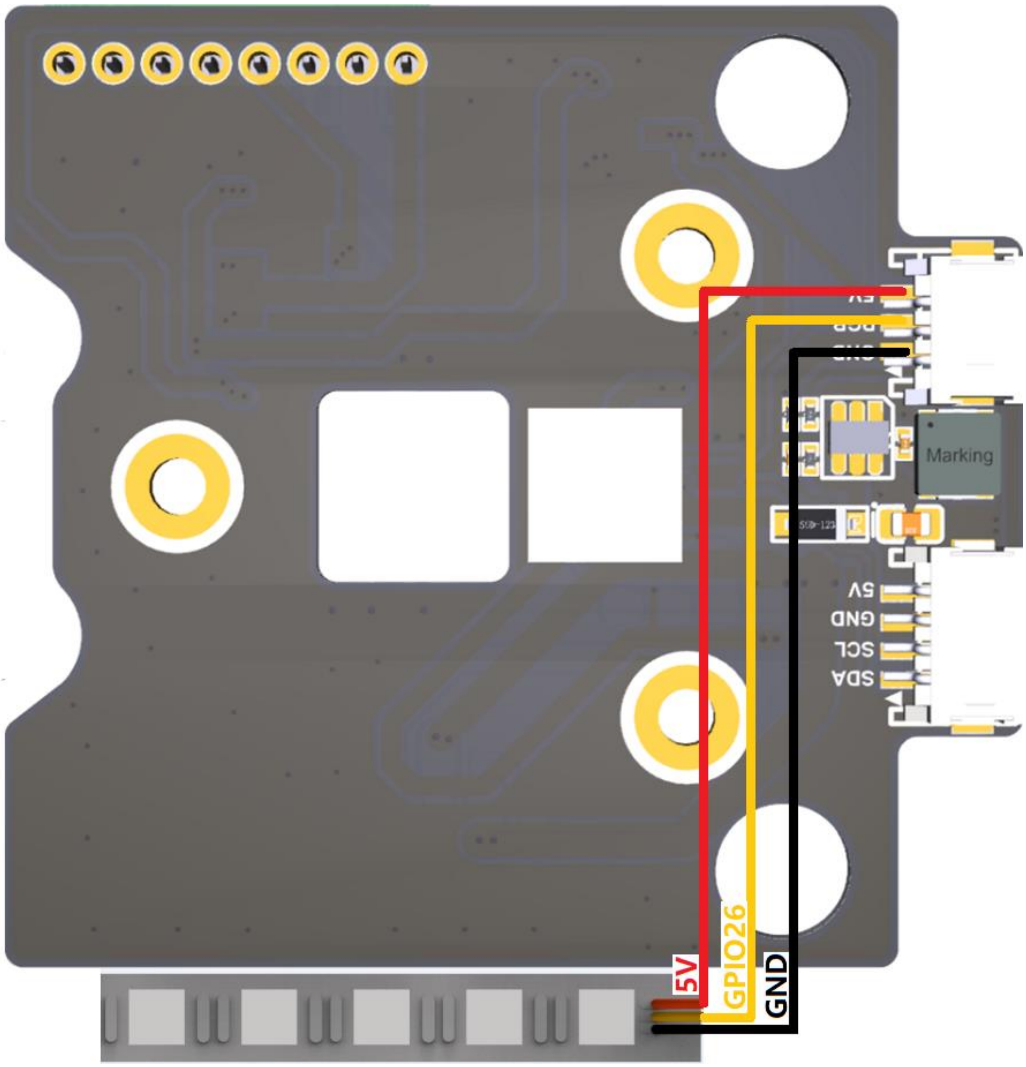


2-Pin Fans

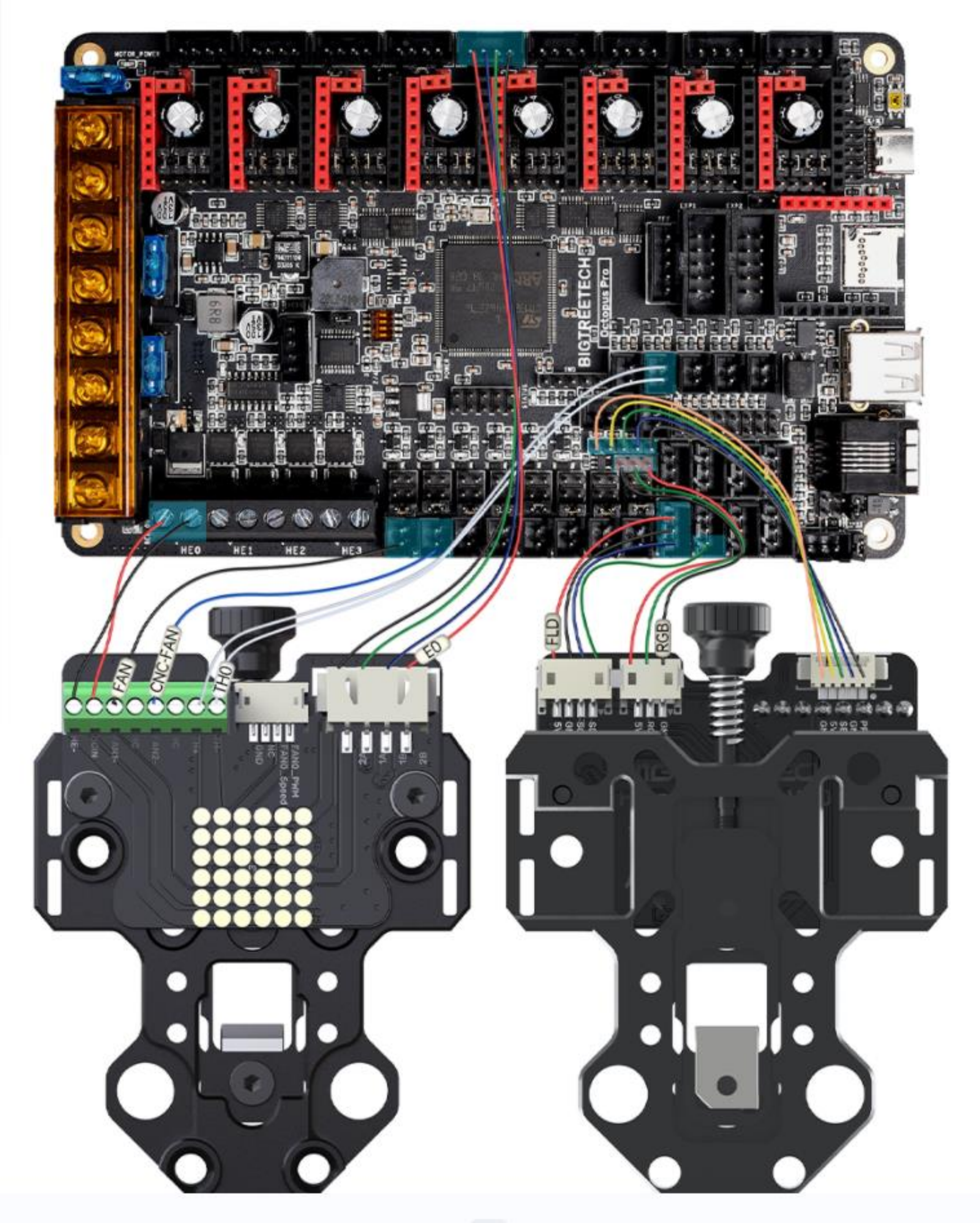
Use jumper to select voltage for VFAN1 (5V or 24V) and VFAN2 (12V or 24V).



RGB Wiring



Octopus Pro to Hermit Crab 2 Wiring



Firmware Setup

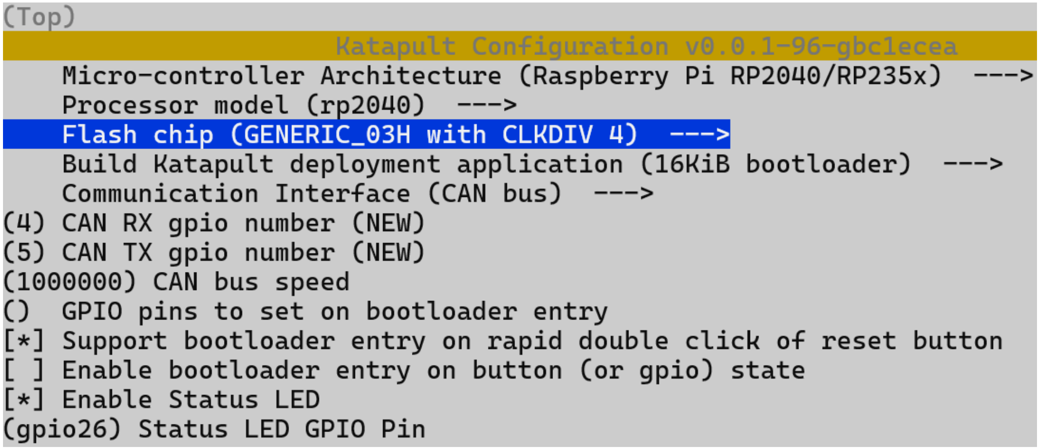
Flash Katapult

Note: Katapult is for direct firmware updates via CAN bus. Skip this step if using DFU.

To flash Katapult on Raspberry Pi or CB1, refer to the following instructions to download the Katapult project:
https://github.com/Arksine/Katapult

(1) Enter
cd ~
to go to the home directory, enter
git clone https://github.com/Arksine/Katapult
to download the Katapult project, then enter
cd Katapult
to navigate to the Katapult directory.

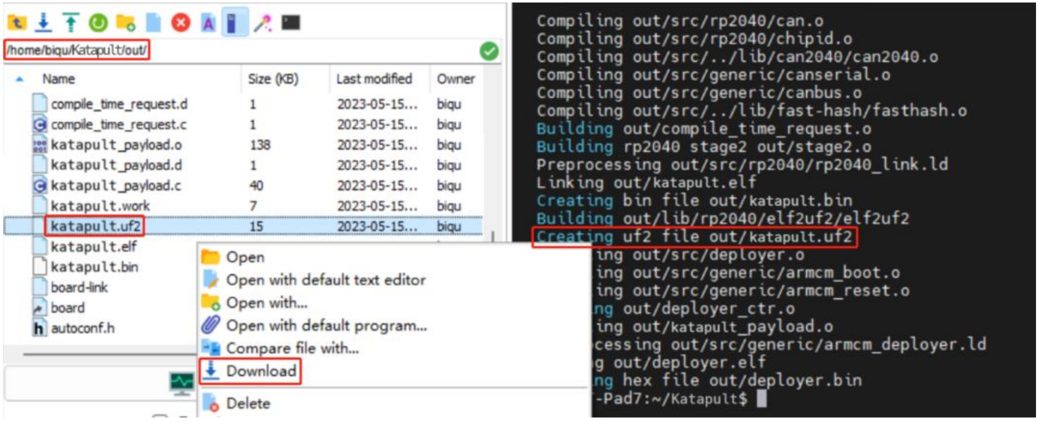
(2) Enter
make menuconfig
and configure as shown in the image below.



```
(Top)
                      Katapult Configuration v0.0.1-96-gbc1ecea
    Micro-controller Architecture (Raspberry Pi RP2040/RP235x)  --->
    Processor model (rp2040)  --->
    Flash chip (GENERIC_03H with CLKDIV 4)  --->
    Build Katapult deployment application (16KiB bootloader)  --->
    Communication Interface (CAN bus)  --->
(4) CAN RX gpio number (NEW)
(5) CAN TX gpio number (NEW)
(1000000) CAN bus speed
()  GPIO pins to set on bootloader entry
[*] Support bootloader entry on rapid double click of reset button
[ ] Enable bootloader entry on button (or gpio) state
[*] Enable Status LED
(gpio26) Status LED GPIO Pin
```

(3) Enter **make** to compile the firmware. When **make** is completed, the required **katapult.uf2** firmware will be generated in the **home/biqu/Katapult/out** folder and can be directly downloaded to the

computer on the left side of the SSH software.



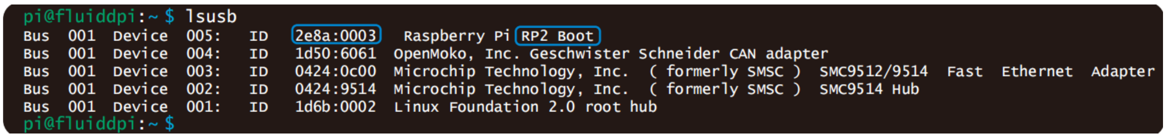
/home/biqu/Katapult/out/

Name	Size (KB)	Last modified	Owner
compile_time_request.d	1	2023-05-15...	biqu
compile_time_request.c	1	2023-05-15...	biqu
katapult_payload.o	138	2023-05-15...	biqu
katapult_payload.d	1	2023-05-15...	biqu
katapult_payload.c	40	2023-05-15...	biqu
katapult.work	7	2023-05-15...	biqu
katapult.uf2	15	2023-05-15...	biqu
katapult.elf			
katapult.bin			
board-link			
board			
autoconf.h			

```
Compiling out/src/rp2040/can.o
Compiling out/src/rp2040/chipid.o
Compiling out/src/../lib/can2040/can2040.o
Compiling out/src/generic/canserial.o
Compiling out/src/generic/canbus.o
Compiling out/src/../lib/fast-hash/fasthash.o
Building out/compile_time_request.o
Building rp2040 stage2 out/stage2.o
Preprocessing out/src/rp2040/rp2040_link.ld
Linking out/katapult.elf
Creating bin file out/katapult.bin
Building out/lib/rp2040/elf2uf2/elf2uf2
Creating uf2 file out/katapult.uf2
          ing out/src/deployer.o
          ing out/src/generic/armcm_boot.o
          ing out/src/generic/armcm_reset.o
          ng out/deployer_ctr.o
          ing out/katapult_payload.o
          cessing out/src/generic/armcm_deployer.ld
          g out/deployer.elf
          ng hex file out/deployer.bin
          -Pad7:~/Katapult$
```

(4) Hold down the Boot button and connect to Raspberry Pi/CB1 with a Type-C cable. This allows the chip to enter DFU mode.

(5) In the SSH terminal command line, enter **lsusb** to query the DFU device ID.



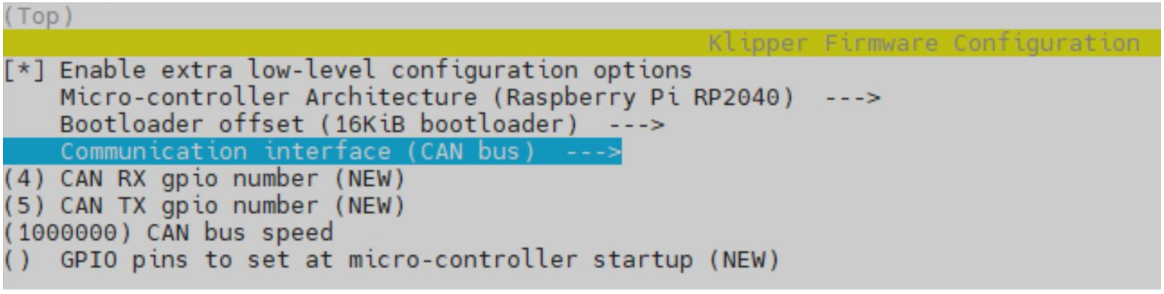
```
pi@fluiddpi:~ $ lsusb
Bus 001 Device 005: ID 2e8a:0003  Raspberry Pi RP2 Boot
Bus 001 Device 004: ID 1d50:6061 OpenMoko, Inc. Geschwister Schneider CAN adapter
Bus 001 Device 003: ID 0424:0c00 Microchip Technology, Inc. ( formerly SMSC ) SMC9512/9514 Fast Ethernet Adapter
Bus 001 Device 002: ID 0424:9514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

(6) Enter the following command to flash Katapult
make flash FLASH_DEVICE=2e8a:0003
Replace **2e8a:0003** with the actual device ID obtained in the previous step.

(7) After flashing, unplug the Type-C data cable.

Compiling Klipper Firmware

(1) After SSH connects to CB1/Raspberry Pi, enter the following in the command line:
cd ~/klipper/
make menuconfig
Compile the firmware using the configuration below (if these options are not available, update the Klipper firmware source code to the latest version).



```
(Top)
                                                  Klipper Firmware Configuration
[*] Enable extra low-level configuration options
    Micro-controller Architecture (Raspberry Pi RP2040)  --->
    Bootloader offset (16KiB bootloader)  --->
    Communication interface (CAN bus)  --->
(4) CAN RX gpio number (NEW)
(5) CAN TX gpio number (NEW)
(1000000) CAN bus speed
()  GPIO pins to set at micro-controller startup (NEW)
```

[*] Enable extra low-level configuration options
Micro-controller Architecture (Raspberry Pi RP2040/RP235x) --->

Processor model (rp2040) --->

If not using Katapult:

Bootloader offset (No bootloader) --->
Flash chip (GENERIC_03H with CLKDIV 4) --->

If using Katapult:

Bootloader offset (16KiB bootloader) --->

If using USB communication on Type-C:

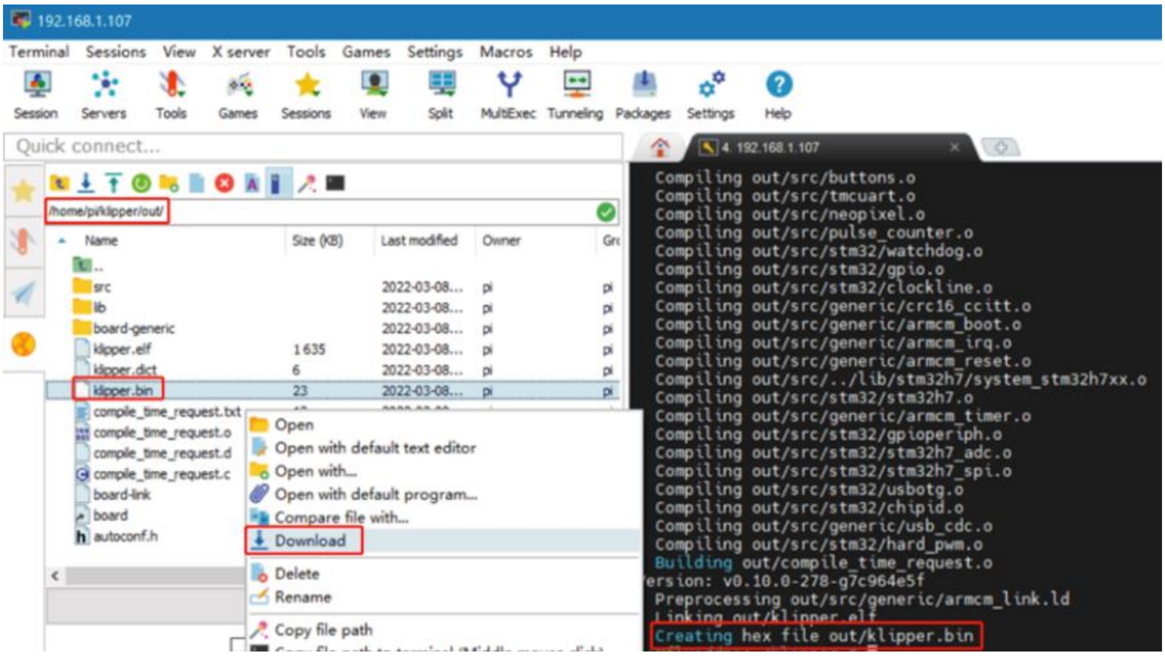
Communication interface (USBSERIAL) --->

If using CAN bus communication:

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

(2) After configuring, enter ‘q’ to exit the configuration interface. When asked to save configuration, select ‘Yes’.

(3) Enter make to compile the firmware. When **make** is completed, the required **klipper.bin** firmware will be generated in the **home/pi/klipper/out** folder and can be directly downloaded to the computer on the left side of the SSH software.


192.168.1.107
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
Quick connect...
4. 192.168.1.107
Open
Open with default text editor
Open with...
Open with default program...
Compare file with...
Download
Delete
Rename
Copy file path

/home/pi/klipper/out/

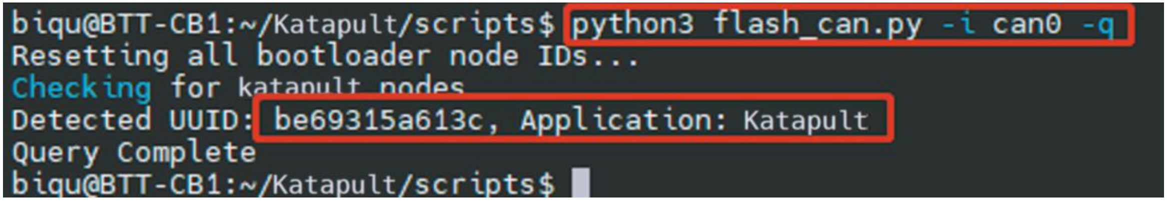
Name	Size (KB)	Last modified	Owner	Gr
..				
src		2022-03-08...	pi	pi
lib		2022-03-08...	pi	pi
board-generic		2022-03-08...	pi	pi
klipper.elf	1 635	2022-03-08...	pi	pi
klipper.dict	6	2022-03-08...	pi	pi
klipper.bin	23	2022-03-08...	pi	pi
compile_time_request.txt				
compile_time_request.o				
compile_time_request.d				
compile_time_request.c				
board-link				
board				
autoconf.h				

```
  Compiling out/src/buttons.o
  Compiling out/src/tmcuart.o
  Compiling out/src/neopixel.o
  Compiling out/src/pulse_counter.o
  Compiling out/src/stm32/watchdog.o
  Compiling out/src/stm32/gpio.o
  Compiling out/src/stm32/clockline.o
  Compiling out/src/generic/crc16_ccitt.o
  Compiling out/src/generic/armcm_boot.o
  Compiling out/src/generic/armcm_irq.o
  Compiling out/src/generic/armcm_reset.o
  Compiling out/src/../lib/stm32h7/system_stm32h7xx.o
  Compiling out/src/stm32/stm32h7.o
  Compiling out/src/generic/armcm_timer.o
  Compiling out/src/stm32/gpioperiph.o
  Compiling out/src/stm32/stm32h7_adc.o
  Compiling out/src/stm32/stm32h7_spi.o
  Compiling out/src/stm32/usbotg.o
  Compiling out/src/stm32/chipid.o
  Compiling out/src/generic/usb_cdc.o
  Compiling out/src/stm32/hard_pwm.o
  Building out/compile_time_request.o
ersion: v0.10.0-278-g7c964e5f
  Preprocessing out/src/generic/armcm_link.ld
  Linking out/klipper.elf
  Creating hex file out/klipper.bin
```

Firmware Update via KATAPULT

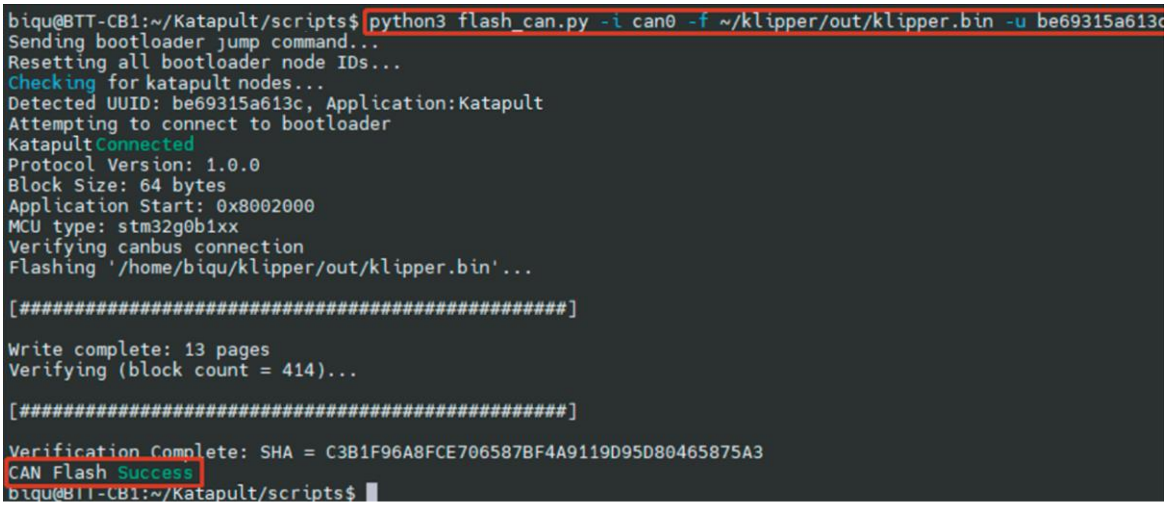
(1) To use the CAN bus, ensure that the CAN bus cables are properly connected and that the jumper is inserted at the position of the 120R termination resistor. Enter
cd ~/Katapult/scripts
and then enter

python3 flash_can.py -i can0 -q
to query the CAN bus ID (connect the CAN cable and power-on in advance). As shown in the image below, the UUID of the device is found.



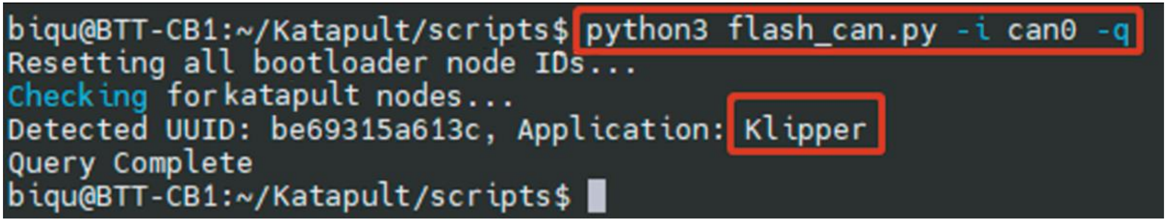
```
biqu@BTT-CB1:~/Katapult/scripts$ python3 flash_can.py -i can0 -q
Resetting all bootloader node IDs...
Checking for katapult nodes
Detected UUID: be69315a613c, Application: Katapult
Query Complete
biqu@BTT-CB1:~/Katapult/scripts$
```

(2) Enter
python3 flash_can.py -i can0 -f ~/klipper/out/klipper.bin -u be69315a613c
replacing the UUID parameter after "-u" with the actual UUID on your board. Note: by this point, you should have already compiled **klipper.bin** using "make". Additionally, when selecting the bootloader offset in the Klipper menuconfig, use the 16KiB option since Katapult's Application start offset is 16KiB. The image below shows a successful flashing sequence.



```
biqu@BTT-CB1:~/Katapult/scripts$ python3 flash_can.py -i can0 -f ~/klipper/out/klipper.bin -u be69315a613c
Sending bootloader jump command...
Resetting all bootloader node IDs...
Checking for katapult nodes...
Detected UUID: be69315a613c, Application:Katapult
Attempting to connect to bootloader
KatapultConnected
Protocol Version: 1.0.0
Block Size: 64 bytes
Application Start: 0x8002000
MCU type: stm32g0b1xx
Verifying canbus connection
Flashing '/home/biqu/klipper/out/klipper.bin'...

[##################################################]

Write complete: 13 pages
Verifying (block count = 414)...

[##################################################]

Verification Complete: SHA = C3B1F96A8FCE706587BF4A9119D95D80465875A3
CAN Flash Success
biqu@BTT-CB1:~/Katapult/scripts$
```

(3) Re-enter
python3 flash_can.py -i can0 -q
to query. At this stage, the ‘Application’ has changed from Katapult to Klipper, indicating that Klipper is running normally.



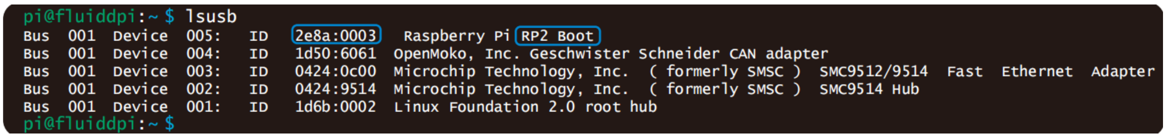
```
biqu@BTT-CB1:~/Katapult/scripts$ python3 flash_can.py -i can0 -q
Resetting all bootloader node IDs...
Checking for katapult nodes...
Detected UUID: be69315a613c, Application: Klipper
Query Complete
biqu@BTT-CB1:~/Katapult/scripts$
```

Firmware Update via DFU

Raspberry Pi or CB1 firmware update through DFU:

(1) Hold down the Boot button and connect to Raspberry Pi/CB1 with a Type-C cable. This allows the chip to enter DFU mode.

(2) In the SSH terminal command line, enter **lsusb** to query the 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:~ $
```

(3) Enter **cd klipper** to navigate to the klipper directory, then enter
make flash FLASH_DEVICE=2e8a:0003
to start flashing the firmware (note: replace 2e8a:0003 with the actual device ID obtained in the previous step).

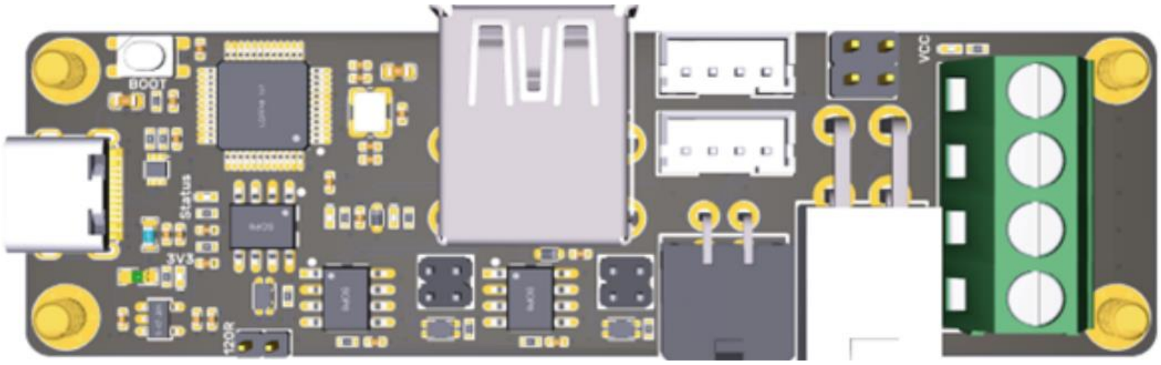
(4) After flashing, enter
ls/dev/serial/by-id/
to query the device Serial ID (this ID is only available for USB communication, this step can be ignored when using CAN bus communication).

(5) If using USB communication, there is no need to manually press the Boot button to enter DFU mode for subsequent updates after the first flashing is completed. Directly enter
make flash FLASH_DEVICE=/dev/serial/by-id/usb-Klipper_rp2040_4550357128922FC8-if00
to flash the firmware (note: replace **/dev/serial/by-id/xxx** with the actual ID obtained in the previous step).

(6) If using CAN bus communication, unplug the Type-C data cable after flashing.

CAN Bus Configuration

For use with BIGTREETECH U2C module:



(1) In the SSH terminal, enter
sudo nano /etc/network/interfaces.d/can0
and add the following content:

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

Set the CAN bus speed to 1M (speed must match the speed set in the firmware (1000000) CAN bus speed). Save the changes (Ctrl + S) and exit (Ctrl + X), then enter

sudo reboot

to restart Raspberry Pi.

(2) Each device on the CAN bus will generate a canbus_uuid based on the MCU's UID. To find each microcontroller device ID, ensure the hardware is powered on and properly wired, then run:

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

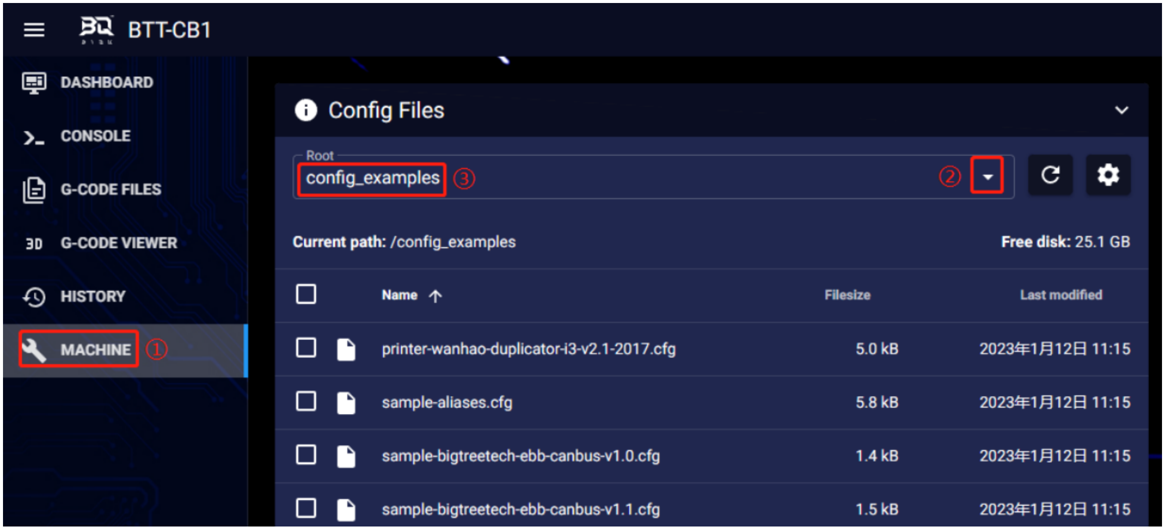
(3) If an uninitialized CAN device is detected, the above command will report the device's canbus_uuid:

Found canbus_uuid=0e0d81e4210c

(4) If Klipper is already running and connected to this device, the canbus_uuid will not be reported.

Configuring Klipper

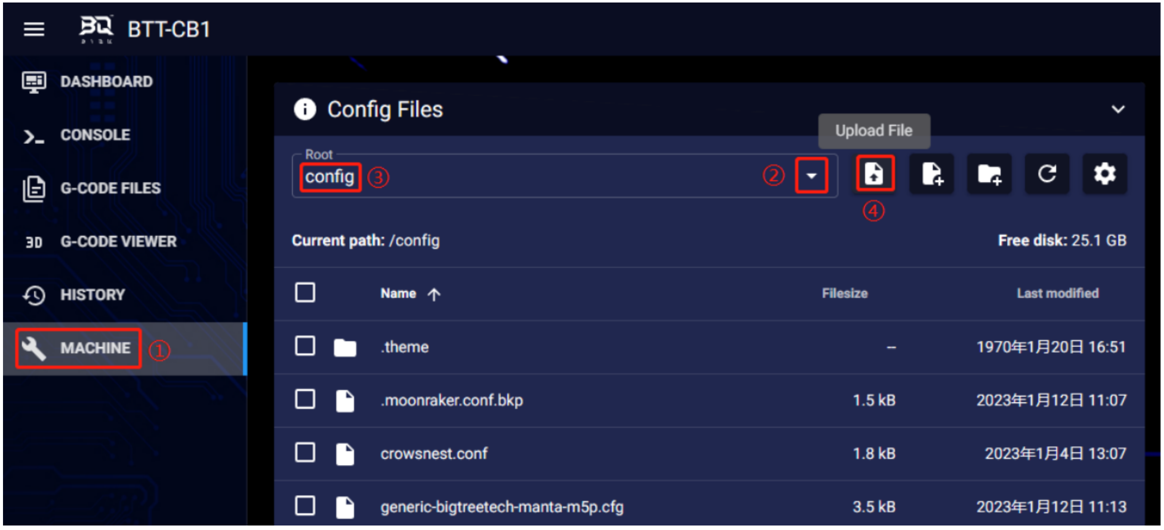
(1) Access the mainsail web UI by entering the IP address of the BTT Pi or Raspberry Pi into the browser. Using the path shown in the image below, download the reference configuration named **sample-bigtreetech-hermit-crab-2-canbus.cfg**. If this file is not found, update the Klipper firmware source code to the latest version or use the link to download it from GitHub: https://github.com/bigtreetech/HermitCrab



Current path: /config_examples   Free disk: 25.1 GB

Name	Filesize	Last modified
printer-wanhao-duplicator-i3-v2.1-2017.cfg	5.0 kB	2023年1月12日 11:15
sample-aliases.cfg	5.8 kB	2023年1月12日 11:15
sample-bigtreetech-ebb-canbus-v1.0.cfg	1.4 kB	2023年1月12日 11:15
sample-bigtreetech-ebb-canbus-v1.1.cfg	1.5 kB	2023年1月12日 11:15

(2) Upload the motherboard configuration file to **Configuration Files**.



Current path: /config

Free disk: 25.1 GB

□	Name ↑	Filesize	Last modified
□	.theme	–	1970年1月20日 16:51
□	.moonraker.conf.bkp	1.5 kB	2023年1月12日 11:07
□	crowsnest.conf	1.8 kB	2023年1月4日 13:07
□	generic-bigtreetech-manta-m5p.cfg	3.5 kB	2023年1月12日 11:13

(3) Add the Hermit Crab configuration to the **printer.cfg** file:
[include sample-bigtreetech-hermit-crab-2-canbus.cfg]

(4) Change the USB serial or CAN UUID within the configuration file to match the actual ID of the motherboard (USB serial or canbus).

(5) Configure the specific functions of the module according to the instructions in the following link:
https://www.klipper3d.org/Overview.html

Precautions

1. When using CAN communication, check if this is used as a terminating device (one of the two devices at either end of the bus). If it is, ensure that the 120R position has a jumper inserted.

2. When wiring, pay attention to the wire sequence and follow the Pin diagram for DIY instructions to avoid reversing the power line or connecting it to the CAN signal since this could cause damage to the Hermit Crab.

3. When flashing the firmware through the USB port without an external power supply, short the VUSB with a jumper to provide working voltage to the module.

4. The load current of the heater cartridge and fan interface should not be greater than the maximum rated current to prevent burning out the MOS tube.

FAQ

Q: Maximum current for heater cartridge and fan ports.

A: Maximum output current for heater cartridge port: 6 A.

Fan interface maximum output current: 1A, peak 1.5A.

Total current of heater cartridge + driver + fan should be less than 9A.

Q: Unable to update firmware through USB interface.

A: Ensure to short the VUSB with a jumper, and check that the power indicator light on the motherboard is on.

If you need further resources for this product, you can find them at [GitHub](https://github.com/bigtreetech/). If you cannot find what you need, you may contact our after-sales support(service005@biqu3d.com).

If you encounter any other problems during use or have suggestions or feedback, please contact us. Thank you for choosing BIGTREETECH products.