深圳市必趣科技有限公司
BIGTREETECH

BIGTREETECH Raspberry pad 5 V1.0

Instruction Manual

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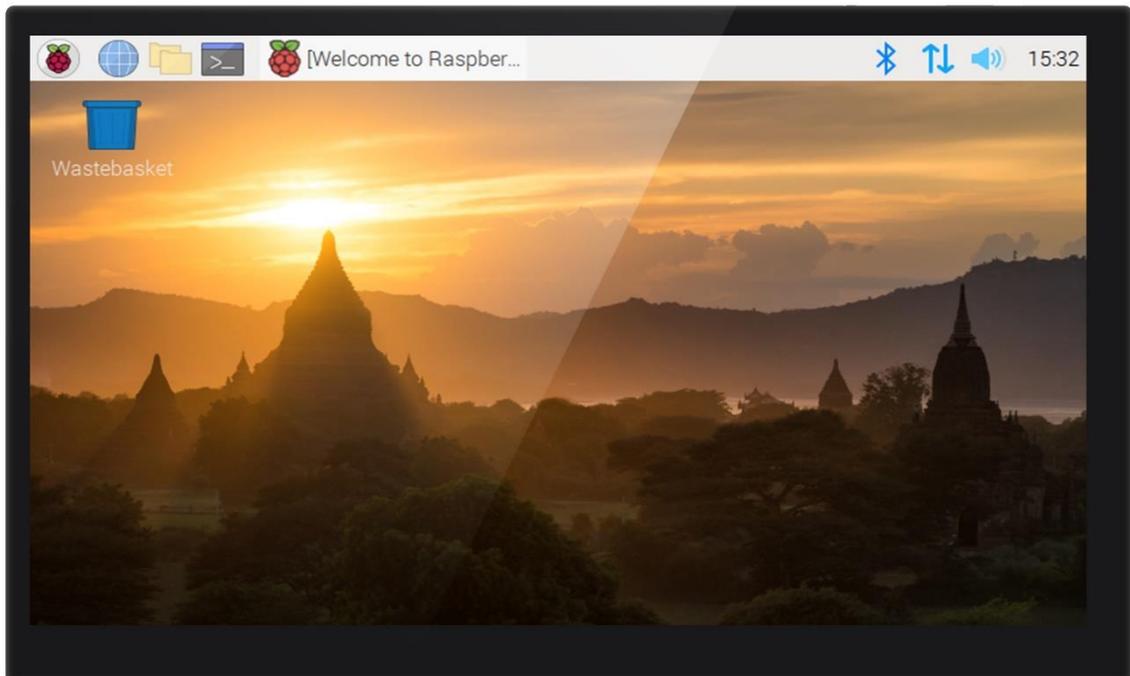
DOCUMENT CHANGE HISTORY

VERSION	CHANGES	RELEASE DATE
01.00	Initial release	2022/02/23
01.01	The latest bullseye version image (**2022-01-28-raspios-bullseye-armhf.zip**) supports enabling DSI/CSI/RTC on the same I2C at the same time	2022/03/17
01.02	Add the pin out description of 40 pin GPIO	2022/04/07
01.03	Added the description of the new version **Raspberry Pi Imager** setting menu	2022/04/08

1. Introduction

BIGTREETECH Raspberry pad 5 V1.0 is an Raspberry pi CM4 module expansion board with IPS HD display developed by Shenzhen Bigtree Technology Co.,Ltd

1.1 Features

1. 800*480 IPS HD Captive display with wider viewing angle，Brightness & display direction adjustable，Driven by DSI1 port on CM4 module.

2. HDMI0 port，Connection to external Display supported up to 2K resolution.

3. 15Pin 1.0mm CSI1 port

4. 3xUSB 2.0 port

5. Gigabit Ethernet port

6. USB & Ethernet port equipped with ESD protection.

7. Onboard RTC chip PCF8563 powered by CR1220 battery

8. 40Pin I/O pins identical to Raspberry pi

9. Multipurpose USB Type-C connection for flashing eMMC OS onto CM4 or CANbus connection, and power supply

10. Type-C function selection by switch：eMMC OS flashing / CANBus

11. BTB(Board to Board) connection to CM4 reinforced with screw stud

12. Onboard mounting stud for fixture onto outer casing

13. Fully SMT produced.

1.2 Specification

1. Outer dimension： 121*75.9mm

2. Mounting dimension： 113*67.9mm

3. Display Area Dimension：108*64.8mm

4. Input voltage： Type-C 5±0.25V

5. Captive touch screen spec：IC-GT911 Structure：G+G

1.3 Peripheral Port

1.3.1 Dimensions
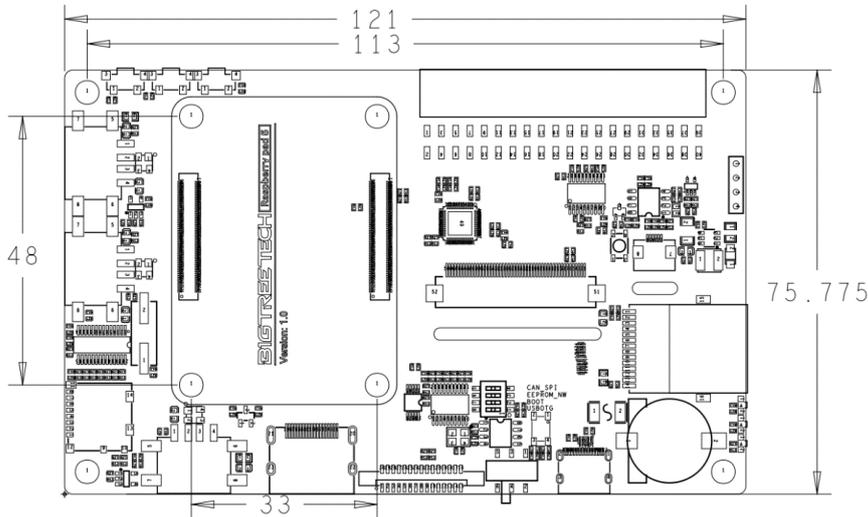
1.3.2 Port diagram

*Warning: The voltage of the Type-C is ONLY 5V, Please don't wire to the Type-C of the HermitCrab Canbus(24/12V). Otherwise it will cause irreversible damage to Pad5 & CM4.
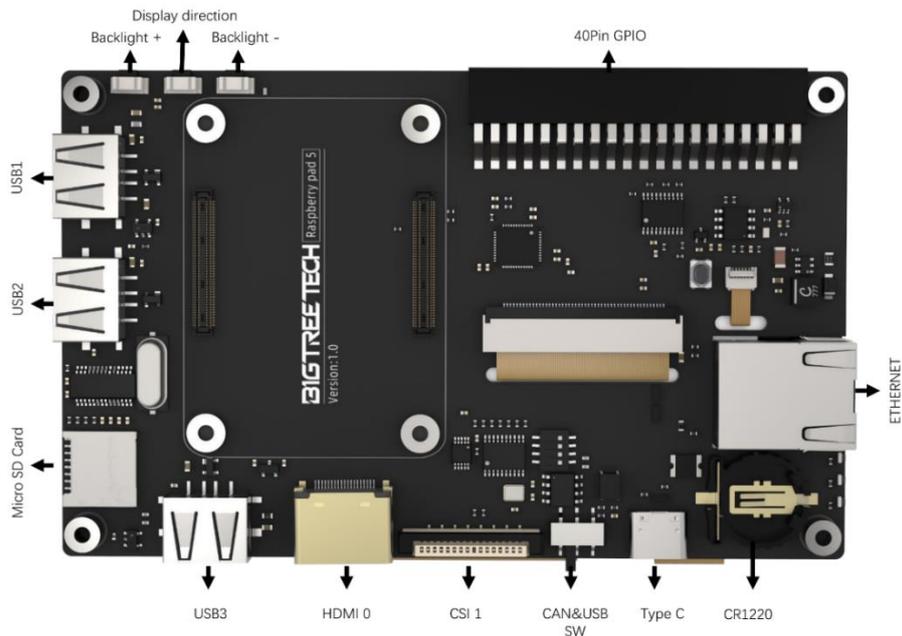
1.3.3 Indicator lights

Equipped with 3 onboard indicator light for system diagnostics, RED led indicating power source connected, Blue led indicating raspberry pi powered on, Green led indicating OS is running.

2. Port specification

2.1 CM4 installation

CM4 module Mounting orientation："Made in UK" marking on the CM4 module should face the USB-A port on the Pad 5。Four screws can be used to fix the CM4 module more securely on to the Pad5.
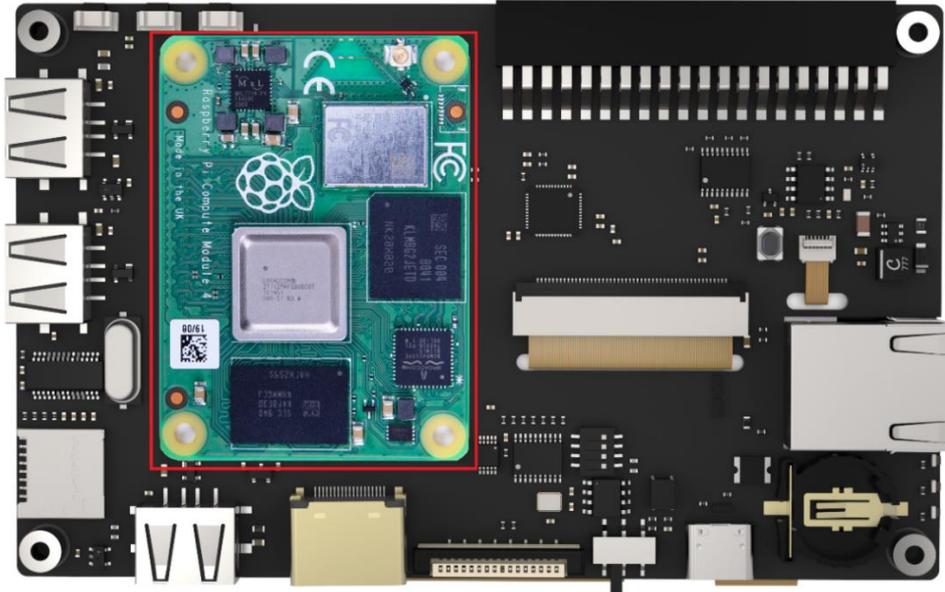
2.2 USB & CANBus mode of Type-C port

To ensure maximum expandability，the onboard Type-C port supports both USB（EMMC flashing）and CANBus mode。Please refer to switch position of USB/CANBus mode shown below in the picture.
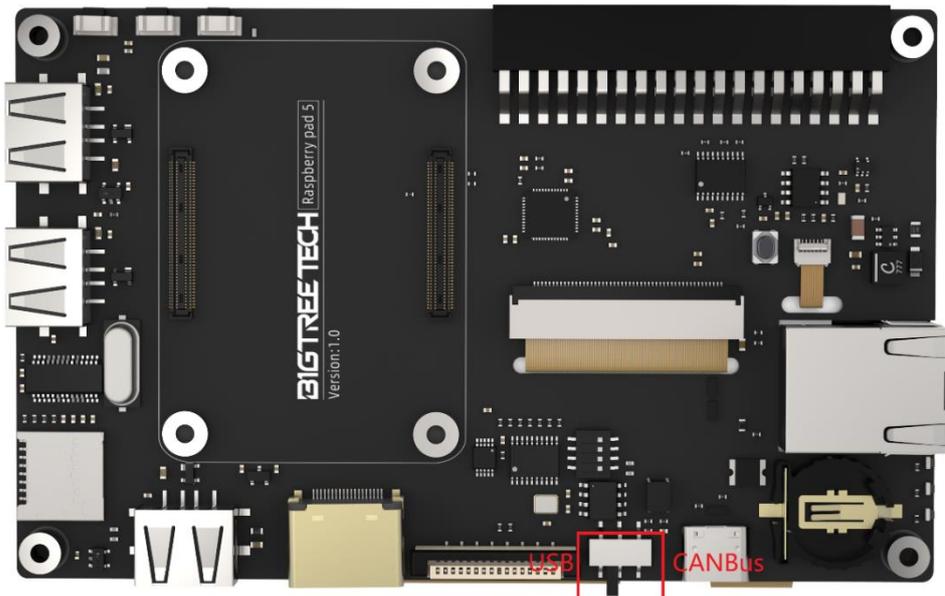
2.3 Onboard CANBus

When using CANBus Mode，set switch 4（CAN_CS highlighted in picture below）to ON position(To the left)，the onboard MCP2515 will use GPIO9（MISO）、GPIO10（MOSI）、GPIO11（SCK）、GPIO8（CS）、GPIO25（INT）as SPI IO. If you wish to use said IOs for other functions，Set the switch to OFF position (To the right) to set the TypeC port to CANBus mode.
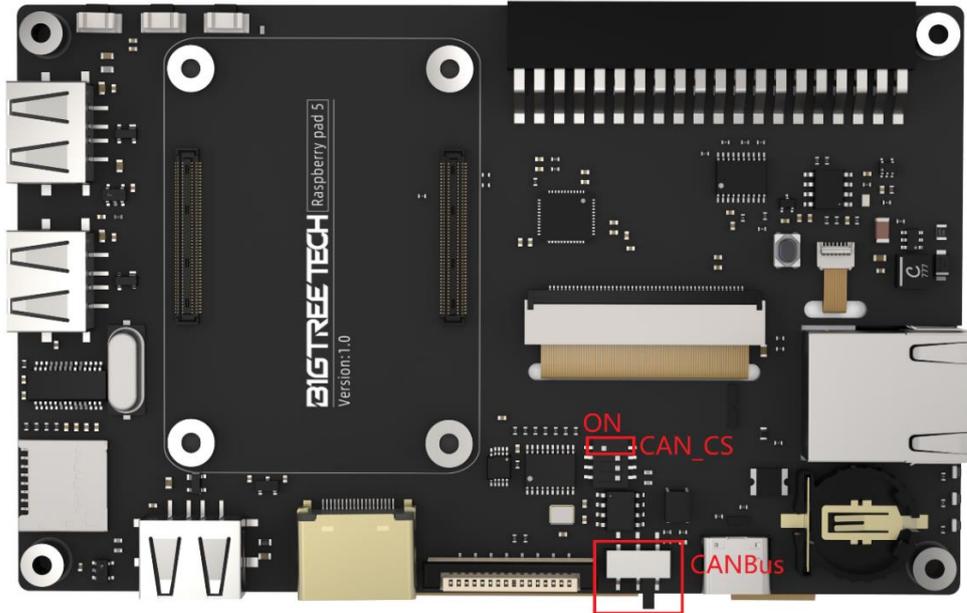
2.4 MCU Reset

The board utilizes the MCU to control the conversion of MIPI DSI signal to RGB signal which controls the onboard screen. If any errors were to occur, please reset the MCU by pressing the highlighted button in the picture below.
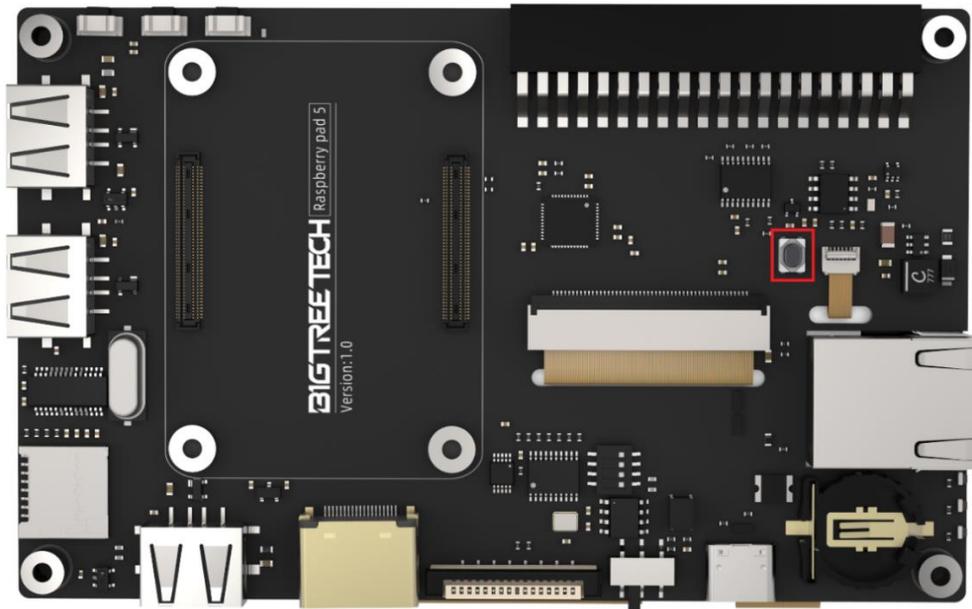
2.5 40 pin GPIO

The 40 pin GPIO port pin sorting is exactly the same as the raspberry pi.

3v3 Power	1	2	5v Power	
GPIO 2 (I2C1 SDA)	3	4	5v Power	
GPIO 3 (I2C1 SCL)	5	6	Ground	
GPIO 4 (GPC1 K0)	7	8	GPIO 14 (UART TX)	
Ground	9	10	GPIO 15 (UART RX)	
GPIO 17	11	12	GPIO 18 (PCM CLK)	
GPIO 27	13	14	Ground	
GPIO 22	15	16	GPIO 23	
3v3 Power	17	18	GPIO 24	
GPIO 10 (SPI0 MOSI)	19	20	Ground	
GPIO 9 (SPI0 MISO)	21	22	GPIO 25	
GPIO 11 (SPI0 SCLK)	23	24	GPIO 8 (SPI0 CE0)	
Ground	25	26	GPIO 7 (SPI0 CE1)	
GPIO 0 (EEPROM SDA)	27	28	GPIO 1 (EEPROM SCL)	
GPIO 5	29	30	Ground	
GPIO 6	31	32	GPIO 12 (PWM0)	
GPIO 13 (PWM1)	33	34	Ground	
GPIO 19 (PCM FS)	35	36	GPIO 16	
GPIO 26	37	38	GPIO 20 (PCM DIN)	
Ground	39	40	GPIO 21 (PCM DOUT)	

3. System Installation

3.1 Preparations

3.1.1 OS image download

Download the OS image from raspberry pi official website
https://www.raspberrypi.com/software/operating-systems (you can also download Fluidd or Mainsail OS image directly , the installation procedure is slightly different from standard RPi 3B or 4B, please refer to the procedure shown below to enable ports(USB,DSI etc) for the Pad5.

Raspberry Pi OS

Our recommended operating system for most users.

Compatible with:

All Raspberry Pi models

Raspberry Pi OS with desktop

Release date: January 28th 2022
System: 32-bit
Kernel version: 5.10
Debian version: 11 (bullseye)
Size: 1,246MB
Show SHA256 file integrity hash:
Release notes

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Raspberry Pi OS with desktop and recommended software

Release date: January 28th 2022
System: 32-bit
Kernel version: 5.10
Debian version: 11 (bullseye)
Size: 3,267MB
Show SHA256 file integrity hash:
Release notes

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Raspberry Pi OS Lite

Release date: January 28th 2022
System: 32-bit
Kernel version: 5.10
Debian version: 11 (bullseye)
Size: 482MB
Show SHA256 file integrity hash:
Release notes

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3.1.2 Download and install Raspberry Pi Imager

Download and install the official Imaging flashing software from Raspberry pi official website: https://www.raspberrypi.com/software/

3.2 LITE Version(Micro SD card)

1. Insert the Micro SD cad in to your computer

2. Click "CHOOSE OS"
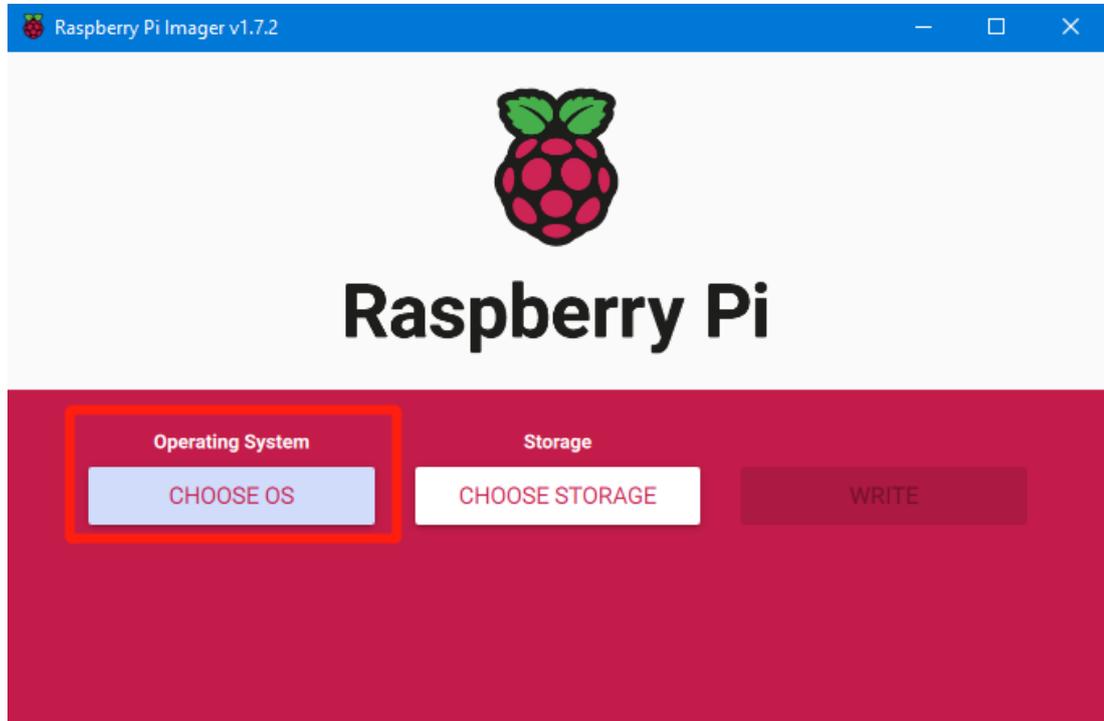
3. Select "Use custom", and select the OS image downloaded in previous steps
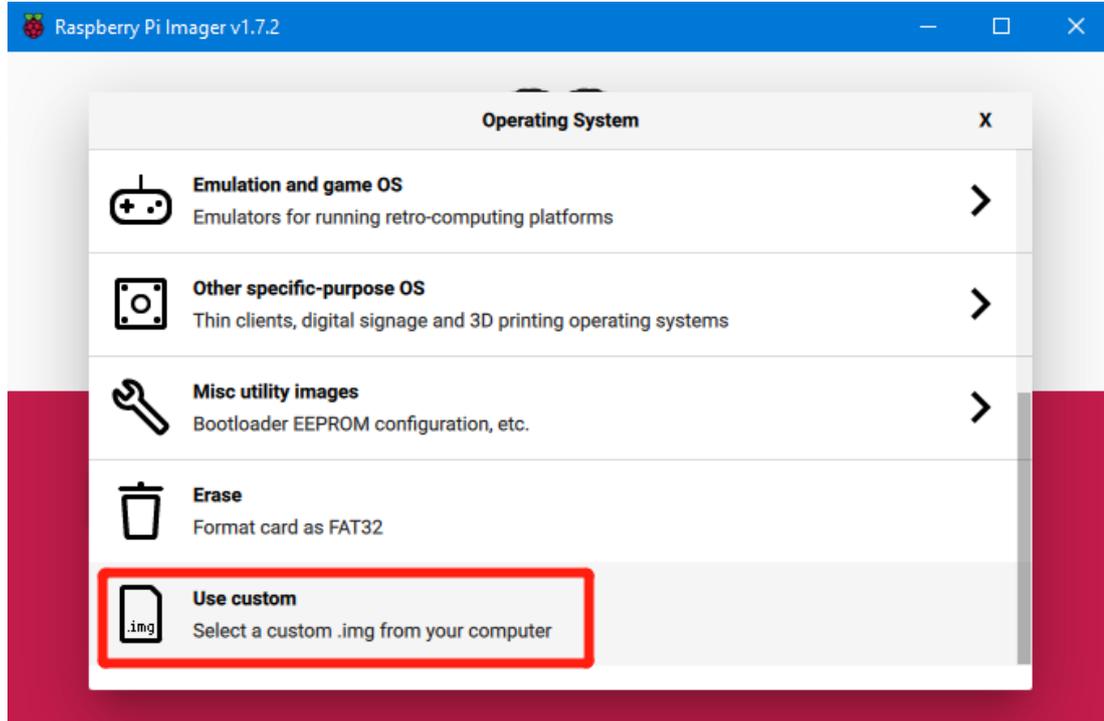
4. Click the setting icon in the lower right corner

5. "Enable SSH" and click "SAVE", There are other features that can be set in this menu. Please modify them according to your own needs. Details are as follows:

Set hostname: raspberrypi.local //Custom hostname Default:raspberrypi.local

Enable SSH

Set username and password // Custom username and password，Default username: pi password：raspberrypi

Configure wireless LAN // Custom the SSID and password of WLAN
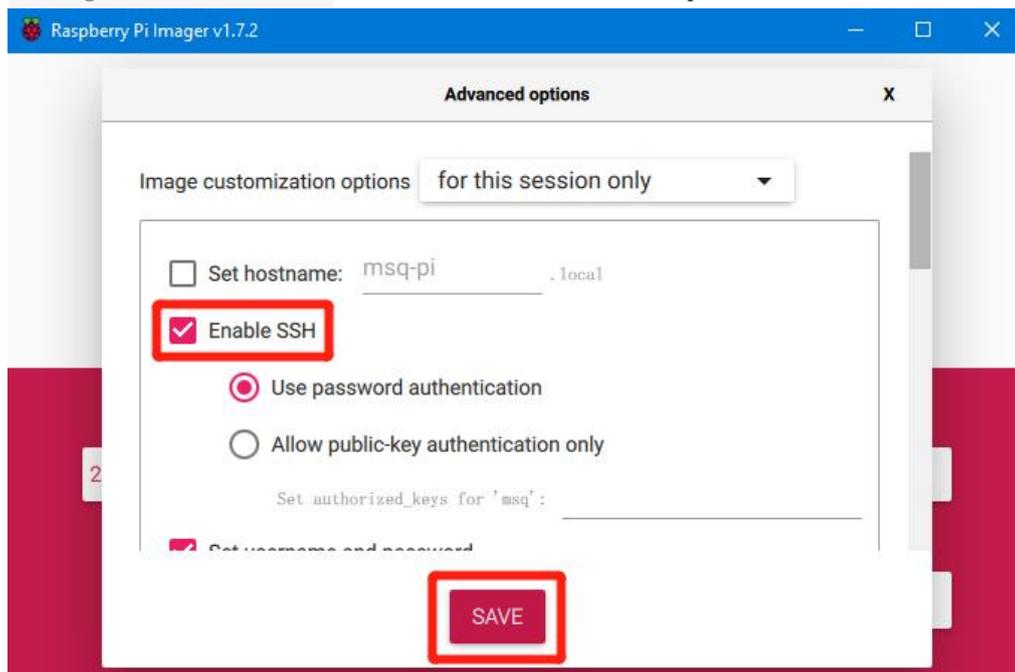
6. Select the correct SD card (The selected storage device (i.e. the SD card) will be formatted and all data remaining on that storage device will be wiped. Be careful to not select the wrong storage device to prevent losing valuable data),Click "WRITE"

7. Wait patiently for the writing process to complete
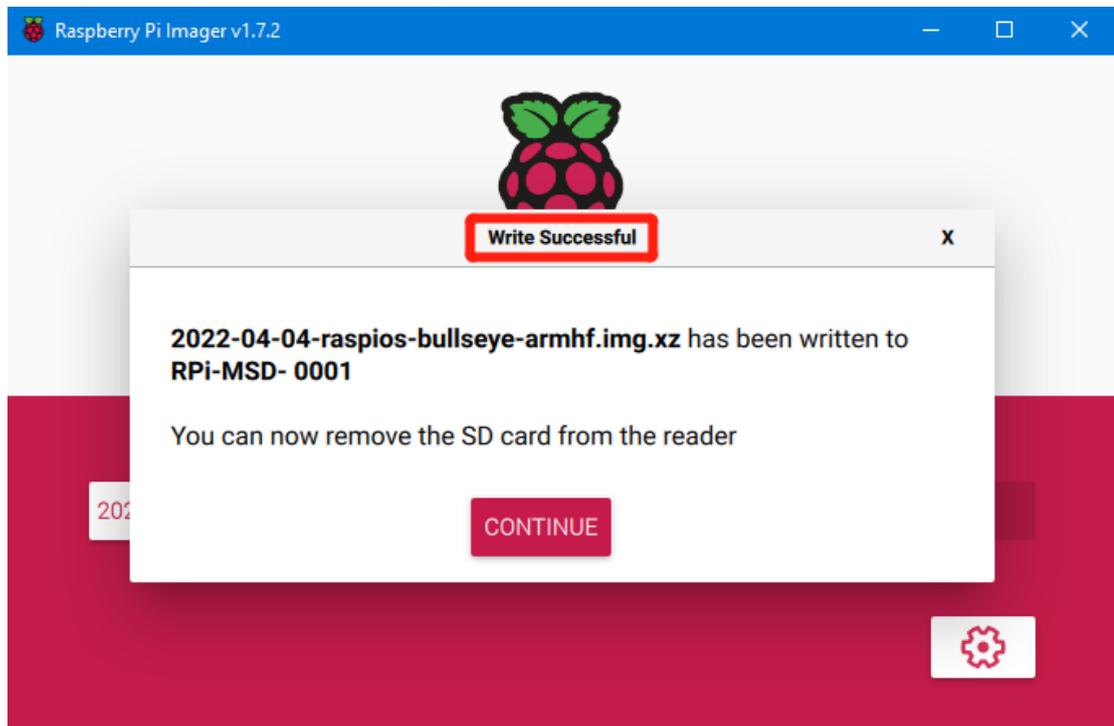
3.3 eMMC version

note: OS on the SD card will not run with eMMC version

1. Install rpiboot
    Windows download and install:
    http://github.com/raspberrypi/usbboot/raw/master/win32/rpiboot_setup.exe
    Mac & Linux download and install:
    https://github.com/raspberrypi/usbboot#building

2. Set switch 1（USBOTG） and switch 2（BOOT）to On position(to the left) to enter BOOT mode. Double check that Type-C port is in USB mode,not CANBus mode.
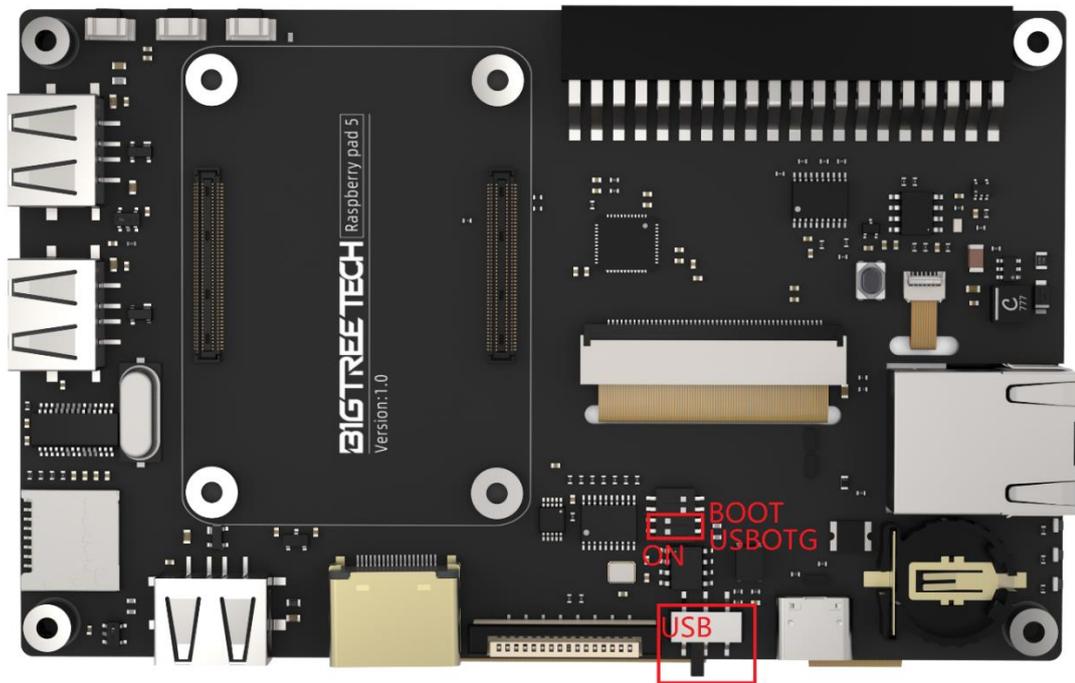
3. Connect the TypeC port to your computer USB port(To prevent insufficient power supply from the Computer USB port causing error，please plug the cable into a USB hub with independent power supply，or power the CM4 with external 5v power supply through the 5V terminal on the 40pin IO)，Run sudo ./rpiboot（On Mac/Linux）or rpiboot.exe（on windows），The eMMC on CM4 will be recognized by the computer as a storage device（If rpiboot report error，please unplug and reinsert the USB）。

4. The procedures to Writing image using Raspberry Pi Imager is identical to LITE Version,SSH feature also needs to be enabled。

5. After successfully installed the OS，set the switch 1（USBOTG）、2（BOOT） back to Off position(to the right) to enter normal operating mode。

4. System Settings

4.1 USB 2.0 Hub

Pad5 is equipped with a onboard USB 2.0 Hub. The USB interface is disabled to save power by default on the CM4 . To enable it you need to add the following to the config.txt file :
`dtoverlay=dwc2,dr_mode=host`

4.2 DSI1 display

The default display connection is HDMI，But the Pad5 integrated display utilizes the DSI1 port. To install the driver for the DSI1, enter the below command into the terminal：
`sudo wget https://datasheets.raspberrypi.com/cmio/dt-blob-disp1-cam1.bin -O /boot/dt-blob.bin`
Reboot the system after the driver is successfully downloaded，the Pad5 display should now work correctly , to switch back to using HDMI port, the downloaded `/boot/dt-blob.bin` needs to be deleted.

4.3 CSI1 Camera

The DSI1 driver downloaded in step 4.2 also contains the driver for CSI1. If you desire to download only the CSI1 driver, Find the desired driver in https://datasheets.raspberrypi.com/licence.html download in to the boot folder on CM4 and rename to `dt-blob.bin`，and follow the guide in the link below:
https://projects.raspberrypi.org/en/projects/getting-started-with-picamera/

4.4 RTC

The onboard RTC on the Pad 5 is PCF8563. For the RTC to work correctly , a CR1220 button cell needs to be installed. The RTC and DSI/CSI is sharing the same set of I2C, we can enable DSI/CSI/RTC on the same I2C at the same time using the latest bullseye version of image (**2022-01-28-raspios-bullseye-armhf.zip**), the lines below needs to be added in config.txt:
`dtparam=i2c_vc=on`
`dtoverlay=i2c-rtc,pcf8563,i2c_csi_dsi`
The system clock will sync with the RTC clock after the above procedure.

4.5 CANBus

The Pad5 uses MCP2515 for SPI to CANBus conversion，set switch 4 （CAN_CS）to ON position(to the left)，And set CANBus switch to the right to set TypeC port to CANBus mode.
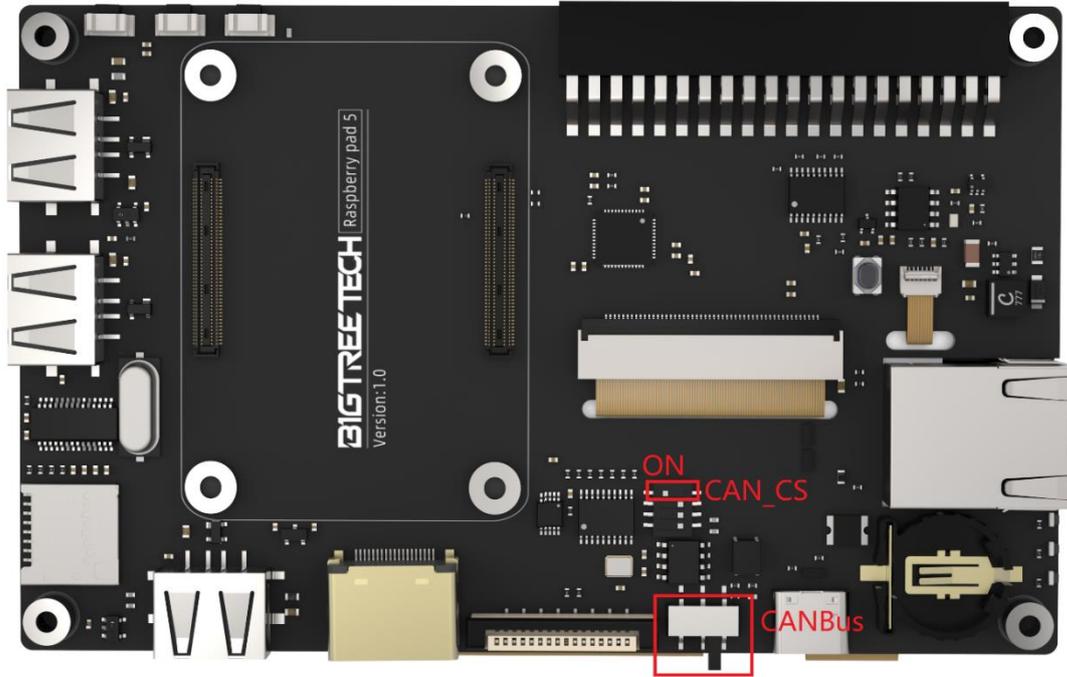
Add the following configurations in config.txt to enable CANBus:

dtparam=spi=on

dtoverlay=mcp2515-can0,oscillator=12000000,interrupt=25,spimaxfrequency=1000000

After reboot，enter dmesg | grep -i '\(can\|spi\)' in terminal to check if MCP2515 is operating，correct return should be as following:

[8.680446] CAN device driver interface
[8.697558] mcp251x spi0.0 can0: MCP2515 successfully initialized.
[9.482332] IPv6: ADDRCONF(NETDEV_CHANGE): can0: link becomes ready

5. Precautions

1. Do NOT plug and unplug any connecters when powered on, Including flashing EMMC

2. Please provide sufficient cooling to the CM4 module, The CM4 module needs additional cooling aid when under heavy workload.

3. Please be careful when handling the Pad5 as the screen is very delicate.

If you inquire any other resources about this product, please go to https://github.com/bigtreetech/ .Our technical support team will also be happy to assist you with any further inquiries if you can't find what you need on our GitHub page.

And Please contact us if you encounter any other problem or have any suggestions or complaints，we would happily assist you to resolve the issue, Thank you for choosing BIGTREETECH product!