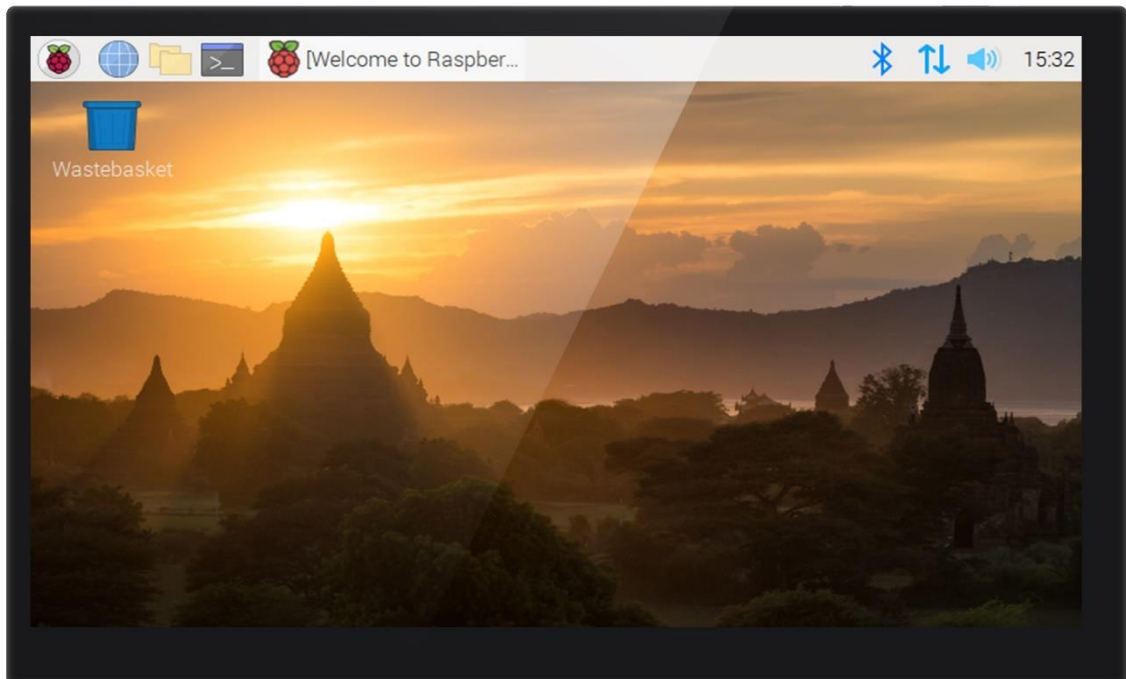


# BIGTREETECH

## 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

## 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

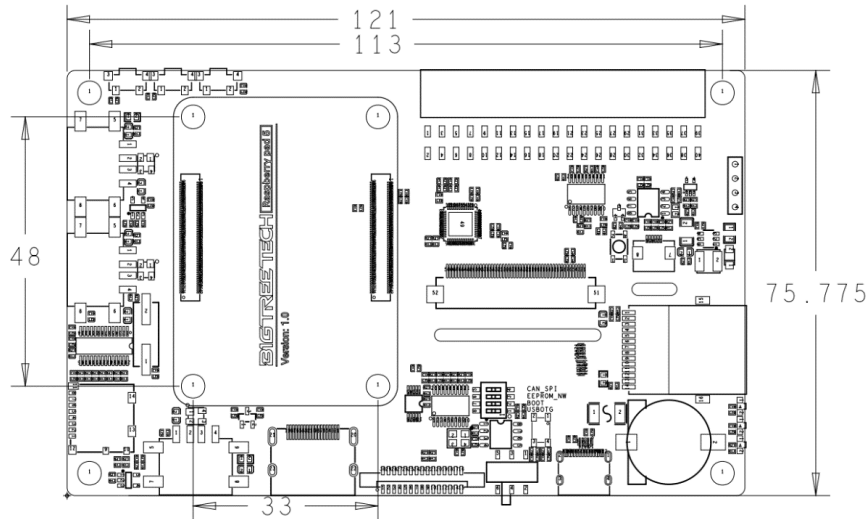
1. 800\*480 IPS HD Captive display with wider viewing angle, Brightness & display direction adjustable, Driven by DSI1 port on CM4 module.
2. HDMI0 port, Connection to external Display supported up to 2K resolution.
3. 15Pin 1.0mm CSI1 port
4. 3xUSB 2.0 port
5. Gigabit Ethernet port
6. USB & Ethernet 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  $5\pm 0.25V$
5. Captive touch screen spec: IC-GT911 Structure: G+G

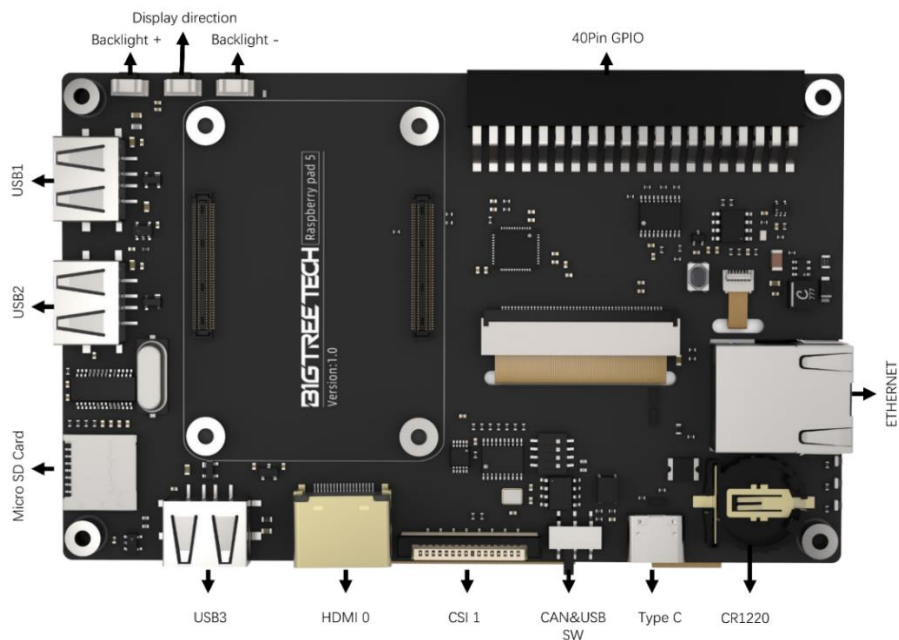
## 1.3 Peripheral Port

### 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.



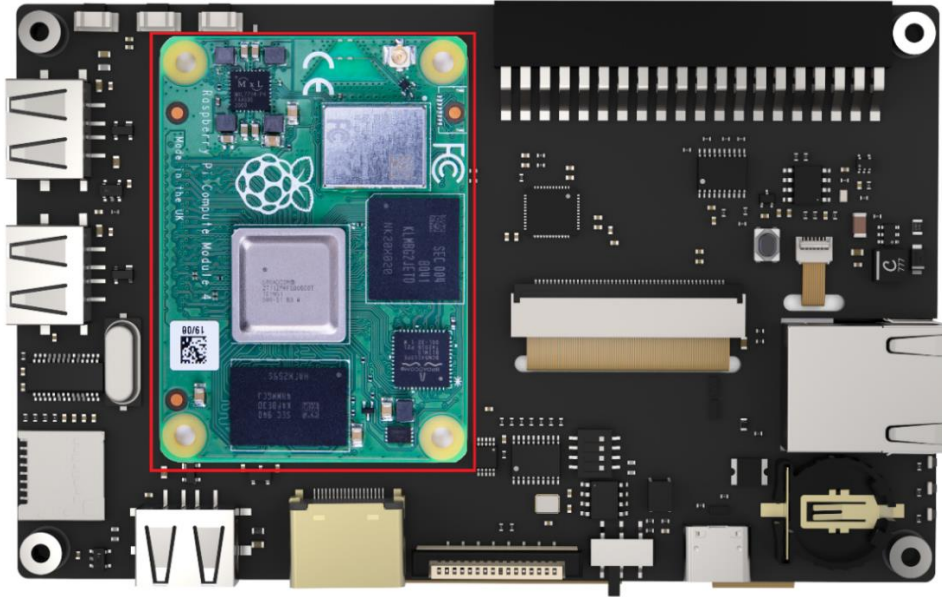
### 1.3.3 Indicator lights

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

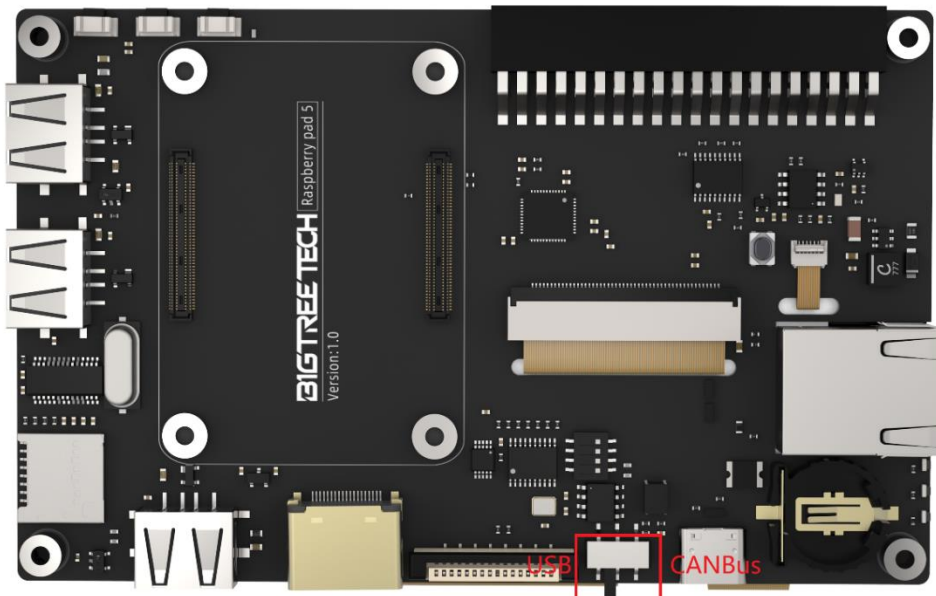
### 2.1 CM4 installation

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.



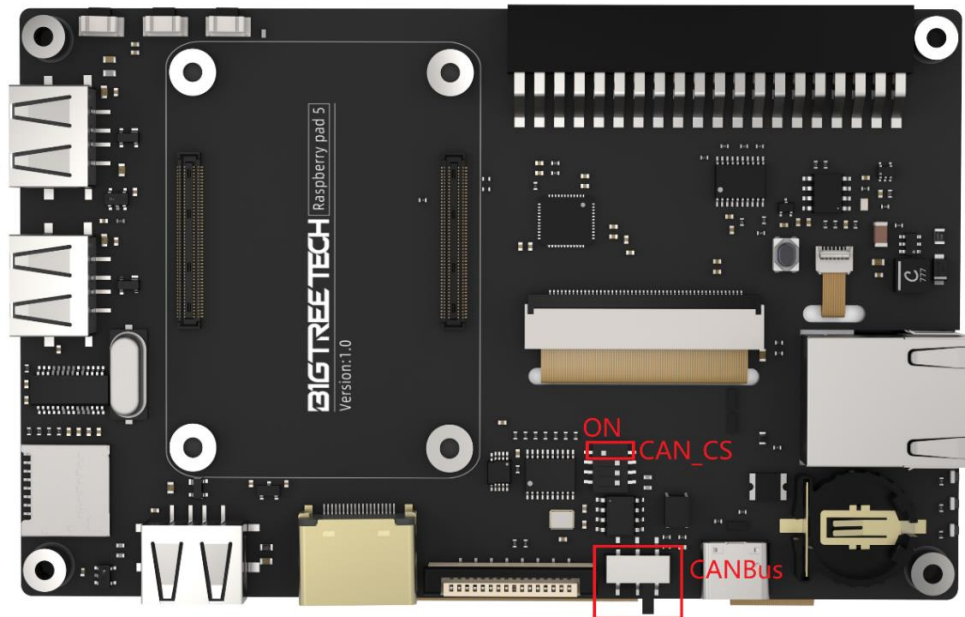
### 2.2 USB & CANBus mode of Type-C port

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.



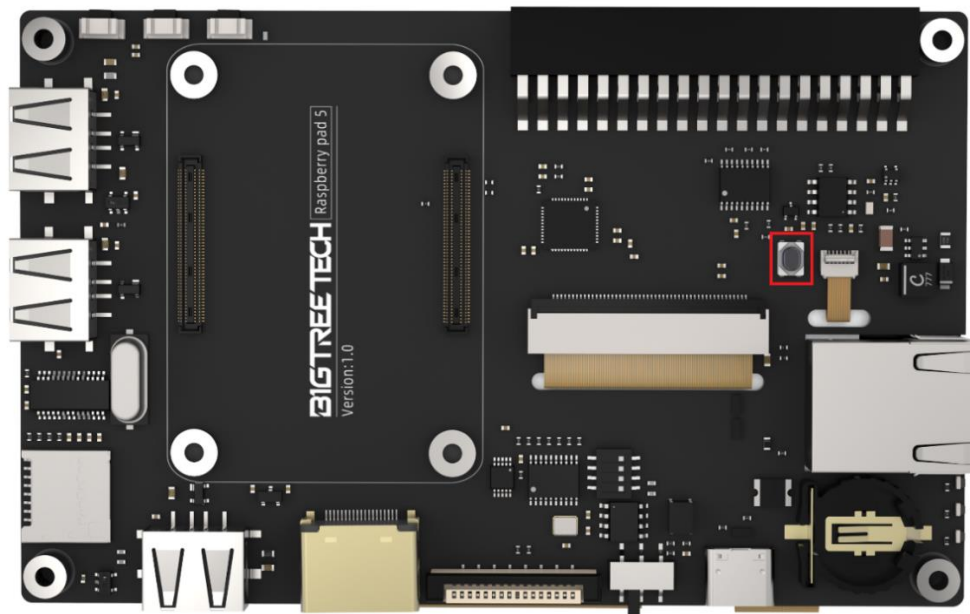
## 2.3 Onboard CANBus

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.



## 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 Fluid OS 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 Pi 5).

#### 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: 1.246GB  
[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: 3.267GB  
[Show SHA256 file integrity hash:](#)  
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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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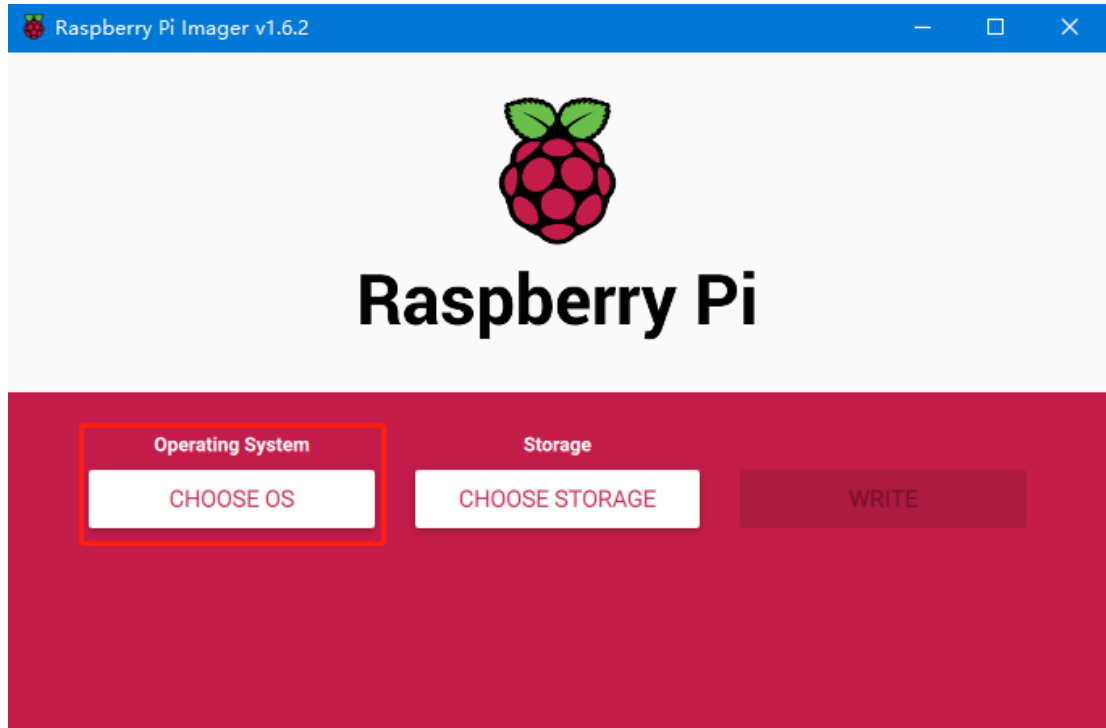
#### 3.1.2 Download and install Raspberry Pi Imager

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

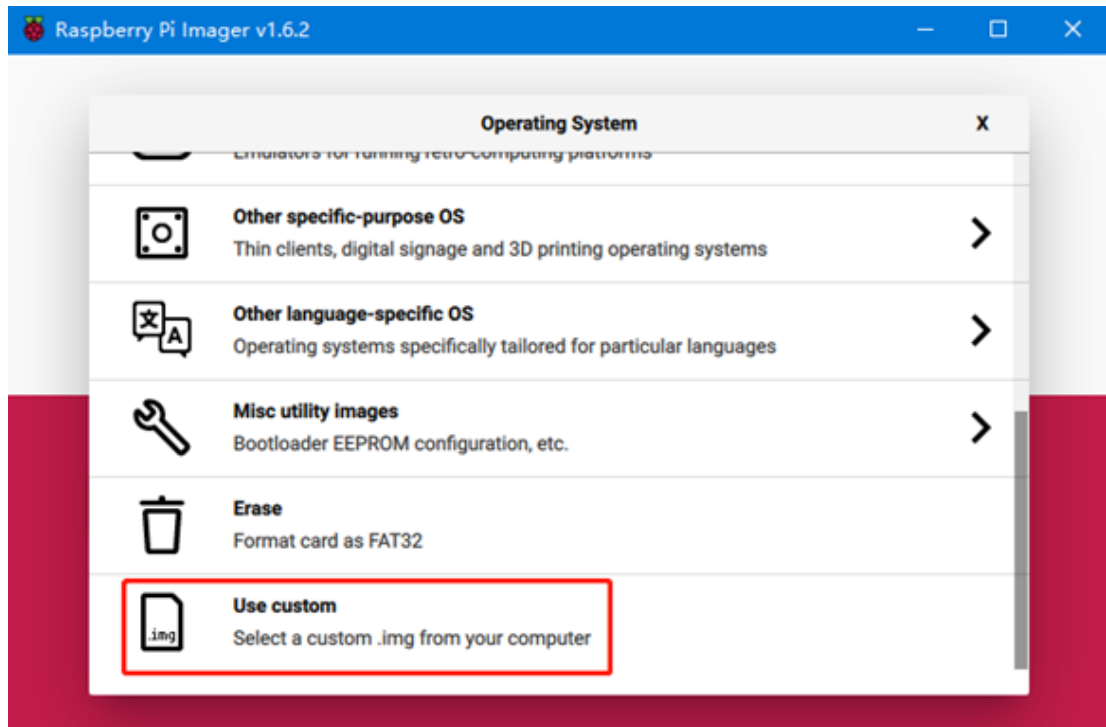


### 3.2 LITE Version(Micro SD card)

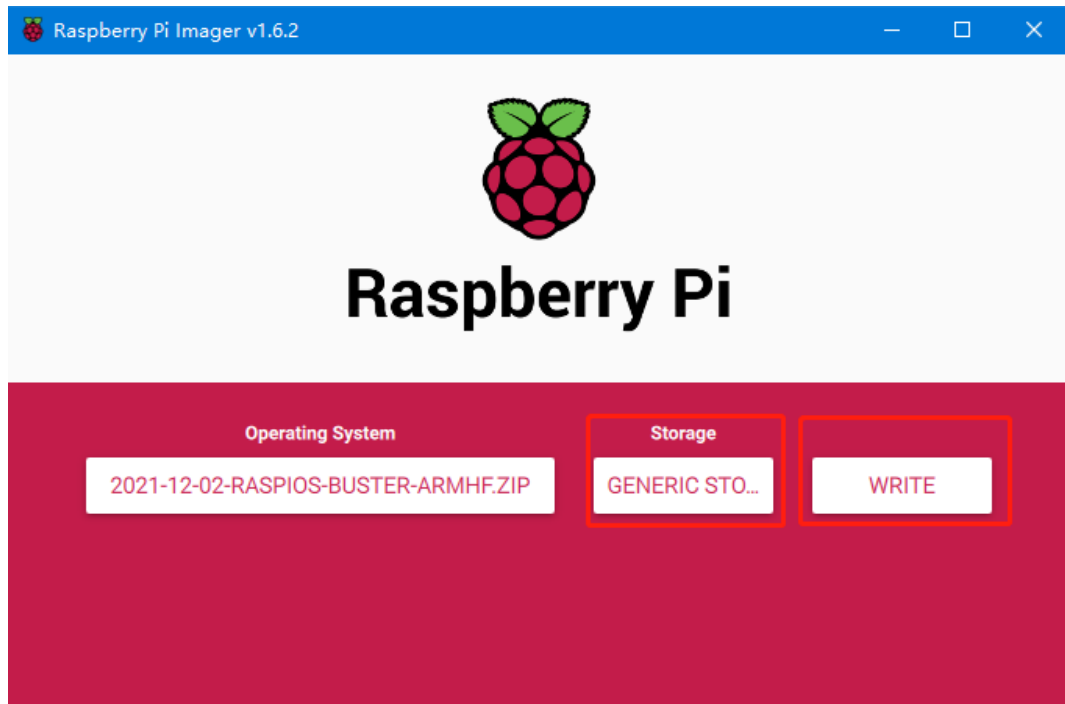
1. Insert the Micro SD card in to your computer
2. Click “CHOOSE OS”。



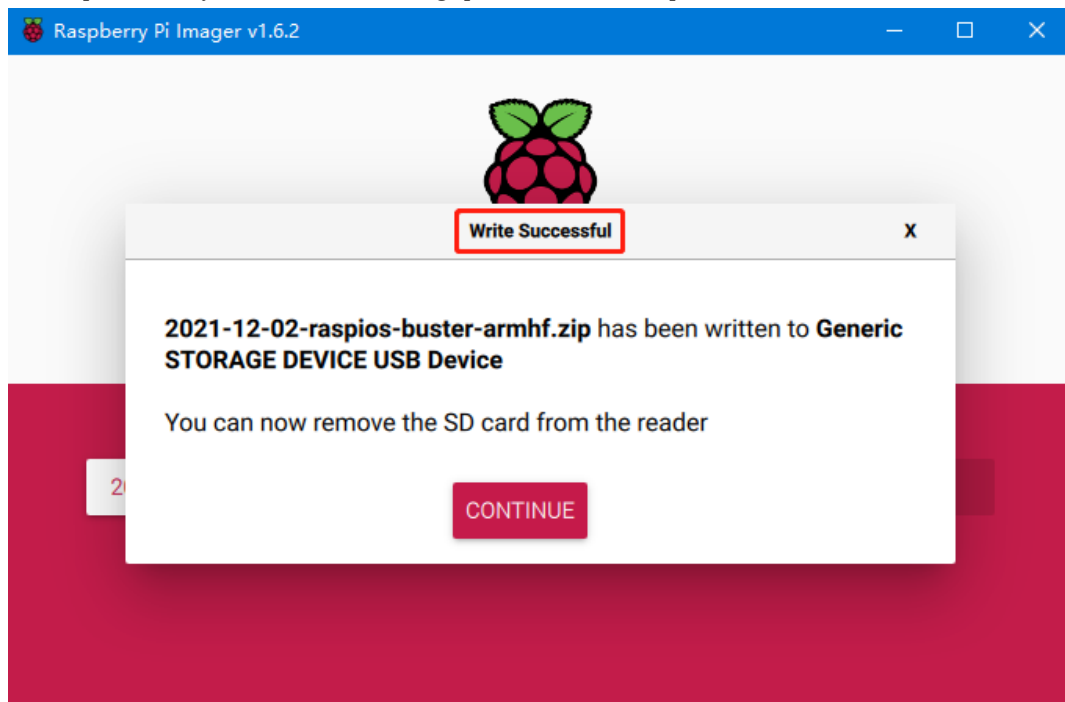
3. Select “Use custom”, and select the OS image downloaded in previous steps



4. 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”.



5. Wait patiently for the writing process to complete.

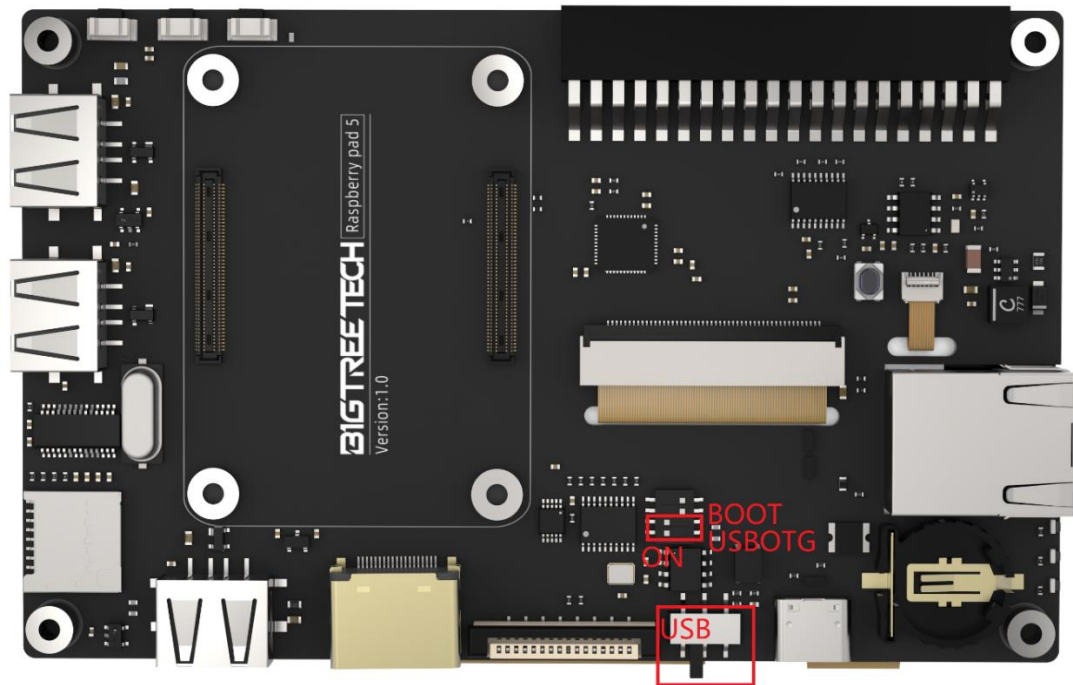


6. Create a new file named “SSH” (without any suffix!) in the “Boot” drive to enable the SSH feature.

### 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](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-displ-caml.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, currently the RTC and DSI/CSI can not be used simultaneously, The DSI/CSI driver needs to be deleted when using RTC and the lines below needs to be added in config.txt:

```
dtparam=i2c_vc=on  
dtoverlay=i2c-rtc,pcf8563,i2c_csi_dsi
```

Enter in terminal:

```
sudo nano /etc/modules
```

Add lines:

```
i2c-bcm2835  
i2c-dev
```

Enter in terminal:

```
sudo nano /etc/rc.local
```

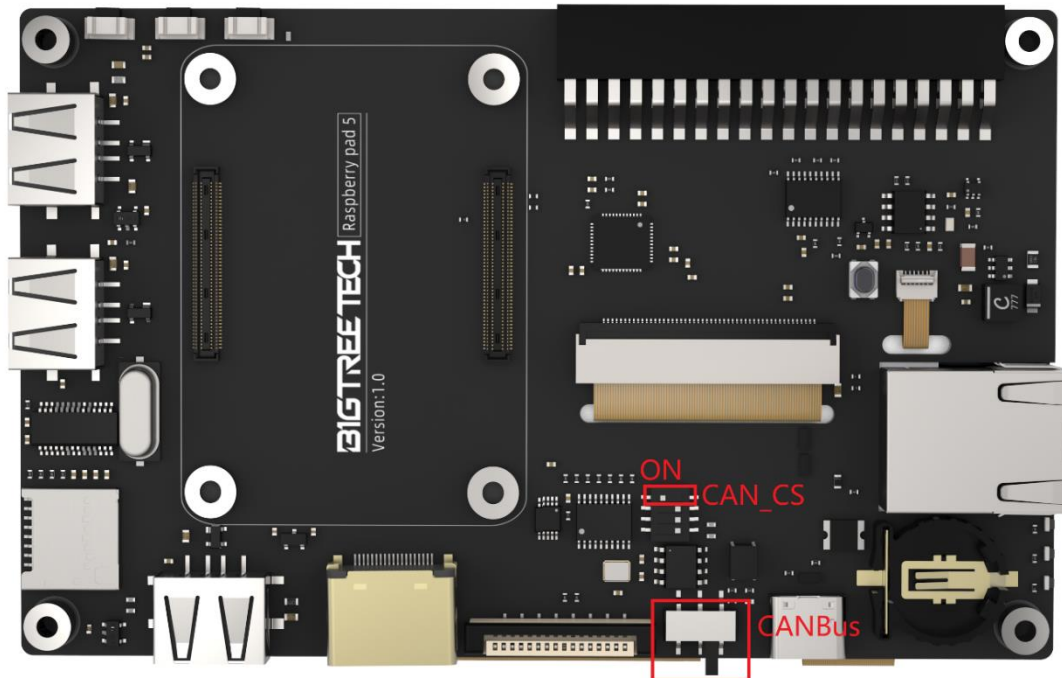
Before exit 0, Add lines:

```
sudo modprobe i2c-dev
sudo modprobe i2c-bcm2835
echo pcf8563 0x51 | sudo tee /sys/class/i2c-adapter/i2c-22/new_device
sudo hwclock -r
sudo hwclock -s
```

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:

```
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
```

```
pi@fluidppi:~ $ dmesg | grep -i '\(can\|spi\)'
[ 8.426216] CAN device driver interface
[ 8.470380] mcp251x spi0.0 can0: MCP2515 successfully initialized.
[ 9.330545] IPv6: ADDRCONF(NETDEV_CHANGE): can0: link becomes ready
[ 25.441341] can: controller area network core
[ 25.467933] can: raw protocol
```

## 5. Precautions

1. Do NOT plug and unplug any connectors 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/bigtreotech/>. 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!