

Raspberry mounted PCIE

Hardware connection PCIE

1. Connect the Raspberry Pi's ribbon cable interface using ribbon cables, as shown in the following figure



2. Connect the solid state to PCIE and secure it onto the board. After confirming its accuracy, power supply Raspberry Pi 5 as shown in the figure

Reminder: Remember to connect the Raspberry Pi to an SD card that can boot into the

system.



System mounting (used as expansion space)

1. Raspberry Pi 5 does not have the PCIe interface enabled by default, Select one of the statements in /boot/firmware/config.txt and add it under the last file:

```
sudo nano /boot/firmware/config.txt
```

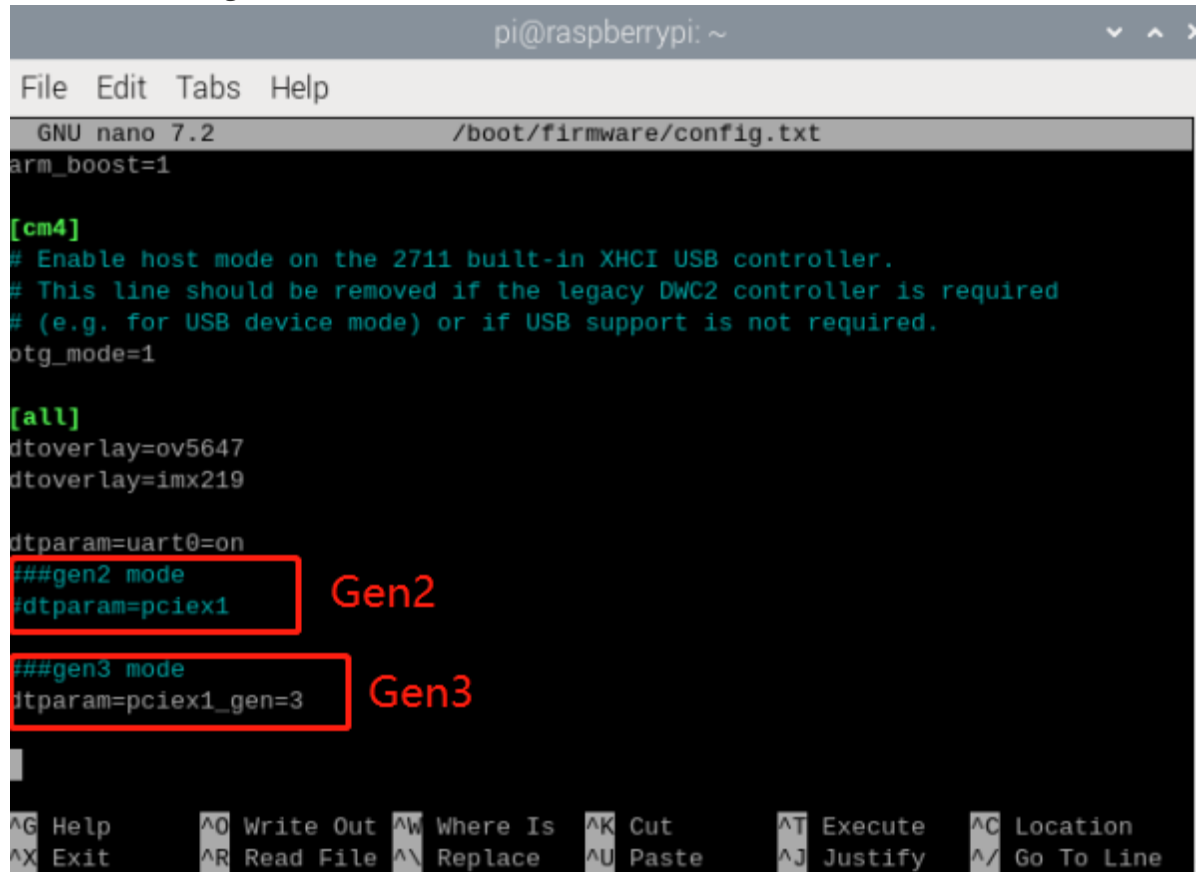
```
#Gen2 slow mode
```

```
dtparam=pciex1
```

```
#Gen3 High speed mode
```

```
dtparam=pciex1_gen=3
```

As shown in the figure:



```
pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 7.2 /boot/firmware/config.txt
arm_boost=1

[cm4]
# Enable host mode on the 2711 built-in XHCI USB controller.
# This line should be removed if the legacy DWC2 controller is required
# (e.g. for USB device mode) or if USB support is not required.
otg_mode=1

[all]
dtoverlay=ov5647
dtoverlay=imx219

dtparam=uart0=on
##gen2 mode
#dtparam=pciex1
Gen2

##gen3 mode
#dtparam=pciex1_gen=3
Gen3

^G Help      ^O Write Out ^W Where Is  ^K Cut       ^T Execute   ^C Location
^X Exit      ^R Read File ^\ Replace   ^U Paste     ^J Justify   ^_ Go To Line
```

2. reboot pi5

```
sudo reboot
```

3. Enter the following command to detect PCIE

```
lspci
```

As shown in the figure below, it is recognized that SM2263 is my SSD solid-state, and the other PI5 is an RPI chip

```
pi@raspberrypi:~$ lspci
0000:00:00.0 PCI bridge: Broadcom Inc. and subsidiaries Device 2712 (rev 21)
0000:01:00.0 Non-Volatile memory controller: Silicon Motion, Inc. SM2263EN/SM2263XT SSD Controller (rev 03)
0001:00:00.0 PCI bridge: Broadcom Inc. and subsidiaries Device 2712 (rev 21)
0001:01:00.0 Ethernet controller: Device 1de4:0001
```

4. Start mounting

```
#Create mounting directory
sudo mkdir yahboomba
#Mount device
sudo mount /dev/nvme0n1p1 ./yahboomba
#Check disk status
df -h
```

Before mounting

```
pi@raspberrypi:~ $ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            1.9G   0    1.9G   0% /dev
tmpfs           405M  6.0M  399M   2% /run
/dev/mmcblk0p2   21G   17G   3.1G  85% /
tmpfs           2.0G  256K  2.0G   1% /dev/shm
tmpfs           5.0M   48K   5.0M   1% /run/lock
/dev/mmcblk0p1  510M   74M  437M  15% /boot/firmware
tmpfs           405M  160K  404M   1% /run/user/1000
pi@raspberrypi:~ $
```

After mounting

```
pi@raspberrypi:~ $ sudo mkdir toshiba
pi@raspberrypi:~ $ sudo mount /dev/nvme0n1p1 ./toshiba
The disk contains an unclean file system (0, 0).
The file system wasn't safely closed on Windows. Fixing.
mount: (hint) your fstab has been modified, but systemd still uses
the old version; use 'systemctl daemon-reload' to reload.
pi@raspberrypi:~ $ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            1.9G   0    1.9G   0% /dev
tmpfs           405M  6.0M  399M   2% /run
/dev/mmcblk0p2   21G   17G   3.1G  85% /
tmpfs           2.0G  256K  2.0G   1% /dev/shm
tmpfs           5.0M   48K   5.0M   1% /run/lock
/dev/mmcblk0p1  510M   74M  437M  15% /boot/firmware
tmpfs           405M  160K  404M   1% /run/user/1000
/dev/nvme0n1p1  120G   93M  120G   1% /home/pi/toshiba
pi@raspberrypi:~ $
```

The difference between Gen2 and Gen3 modes

- Gen2 mode:

TF:

```
pi@raspberrypi:~ $ sudo hdparm -t /dev/mmcblk0p1
/dev/mmcblk0p1:
Timing buffered disk reads: 264 MB in 3.01 seconds = 87.76 MB/sec
pi@raspberrypi:~ $ sudo hdparm -t /dev/mmcblk0p1
/dev/mmcblk0p1:
Timing buffered disk reads: 264 MB in 3.01 seconds = 87.83 MB/sec
pi@raspberrypi:~ $ sudo hdparm -t /dev/mmcblk0p1
/dev/mmcblk0p1:
Timing buffered disk reads: 264 MB in 3.01 seconds = 87.68 MB/sec
pi@raspberrypi:~ $
```

SD卡的速度

nvme:

```
pi@raspberrypi:~ $ sudo hdparm -t /dev/nvme0n1
/dev/nvme0n1:
Timing buffered disk reads: 1188 MB in 3.00 seconds = 395.41 MB/sec
pi@raspberrypi:~ $ sudo hdparm -t /dev/nvme0n1
/dev/nvme0n1:
Timing buffered disk reads: 1186 MB in 3.00 seconds = 395.29 MB/sec
pi@raspberrypi:~ $ sudo hdparm -t /dev/nvme0n1
/dev/nvme0n1:
Timing buffered disk reads: 1186 MB in 3.00 seconds = 395.25 MB/sec
pi@raspberrypi:~ $
```

- Gen3 mode:

SD:

```
pi@raspberrypi:~ $ sudo hdparm -t /dev/mmcblk0p1
/dev/mmcblk0p1:
Timing buffered disk reads: 264 MB in 3.01 seconds = 87.66 MB/sec
pi@raspberrypi:~ $ sudo hdparm -t /dev/mmcblk0p1
/dev/mmcblk0p1:
Timing buffered disk reads: 228 MB in 3.03 seconds = 75.32 MB/sec
pi@raspberrypi:~ $ sudo hdparm -t /dev/mmcblk0p1
/dev/mmcblk0p1:
Timing buffered disk reads: 266 MB in 3.02 seconds = 88.01 MB/sec
^[[A
pi@raspberrypi:~ $ sudo hdparm -t /dev/mmcblk0p1
/dev/mmcblk0p1:
Timing buffered disk reads: 262 MB in 3.02 seconds = 86.73 MB/sec
pi@raspberrypi:~ $
```

nvme:

```
pi@raspberrypi:~ $ sudo hdparm -t /dev/nvme0n1
/dev/nvme0n1:
Timing buffered disk reads: 2310 MB in 3.00 seconds = 769.25 MB/sec
pi@raspberrypi:~ $ sudo hdparm -t /dev/nvme0n1
/dev/nvme0n1:
Timing buffered disk reads: 2326 MB in 3.00 seconds = 774.70 MB/sec
pi@raspberrypi:~ $ sudo hdparm -t /dev/nvme0n1
/dev/nvme0n1:
Timing buffered disk reads: 2334 MB in 3.00 seconds = 777.93 MB/sec
pi@raspberrypi:~ $
```

Conclusion: The SD card slot is not affected by the mode, The PCIE board is influenced by the mode, Gen3 mode is much faster than Gen2 mode.

Using NVME solid-state as the system boot disk

1. Modify the boot information by entering the following command

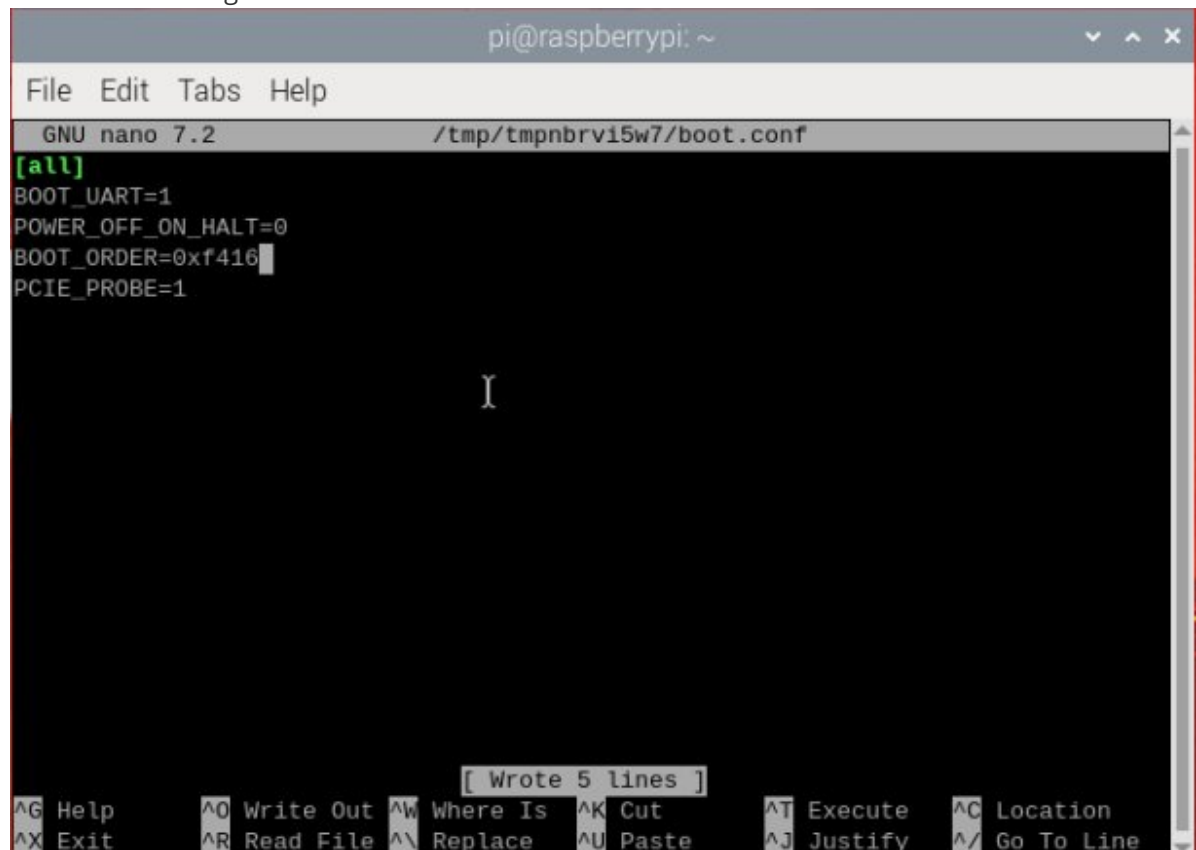
```
sudo rpi-eeprom-config --edit
```

Modify BOOT-ORDER to: BOOT_ORDER=0xf416

Enable PCIE_PROBE: PCIE_PROBE=1

Then save, exit, and restart.

As shown in the figure:

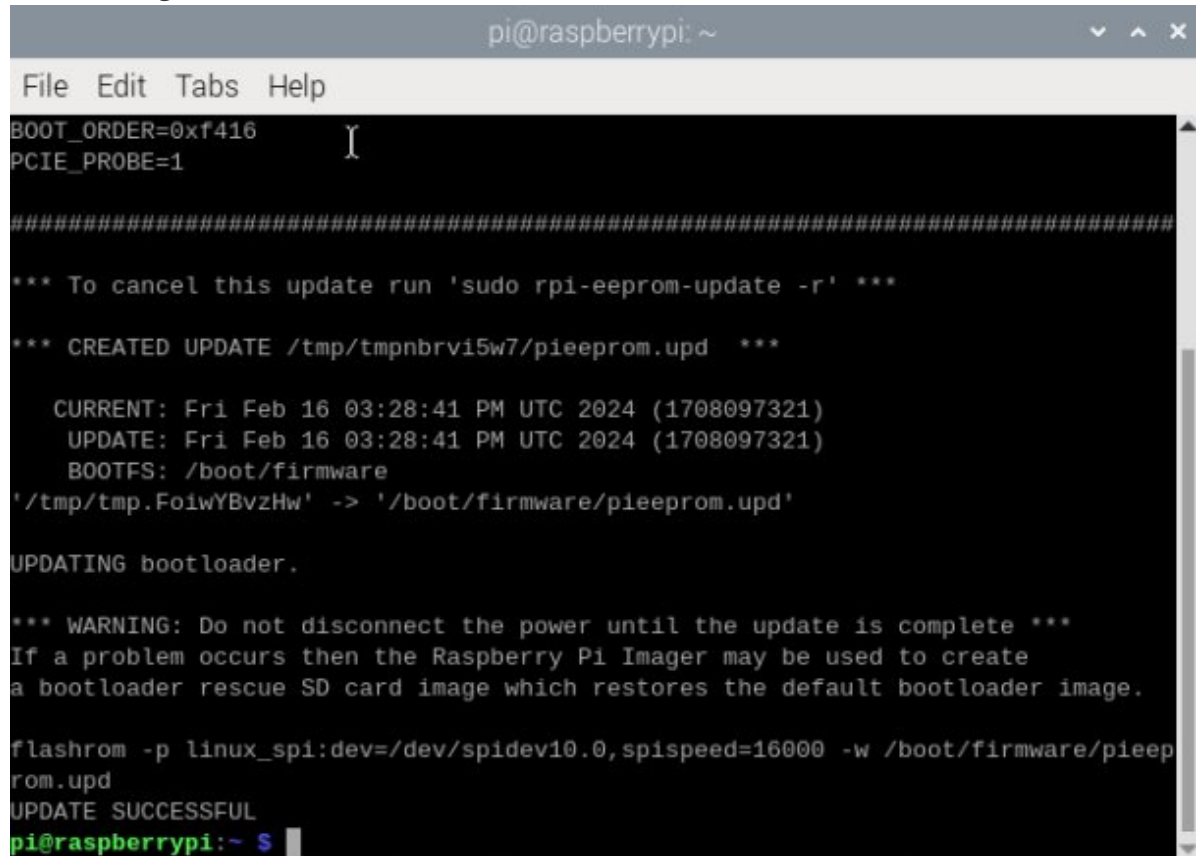


```
pi@raspberrypi: ~  
File Edit Tabs Help  
GNU nano 7.2 /tmp/tmpnbrv15w7/boot.conf  
[all]  
BOOT_UART=1  
POWER_OFF_ON_HALT=0  
BOOT_ORDER=0xf416  
PCIE_PROBE=1  
  
[ Wrote 5 lines ]  
^G Help      ^O Write Out  ^W Where Is   ^K Cut        ^T Execute    ^C Location  
^X Exit      ^R Read File  ^\ Replace    ^U Paste      ^J Justify    ^_ Go To Line
```

Attention:

If multiple modifications are found to be unable to be made, please connect to the network before making the changes (wait for network self calibration), or set the correct time before making the changes to the file.

The following is a screenshot of the successful modification:



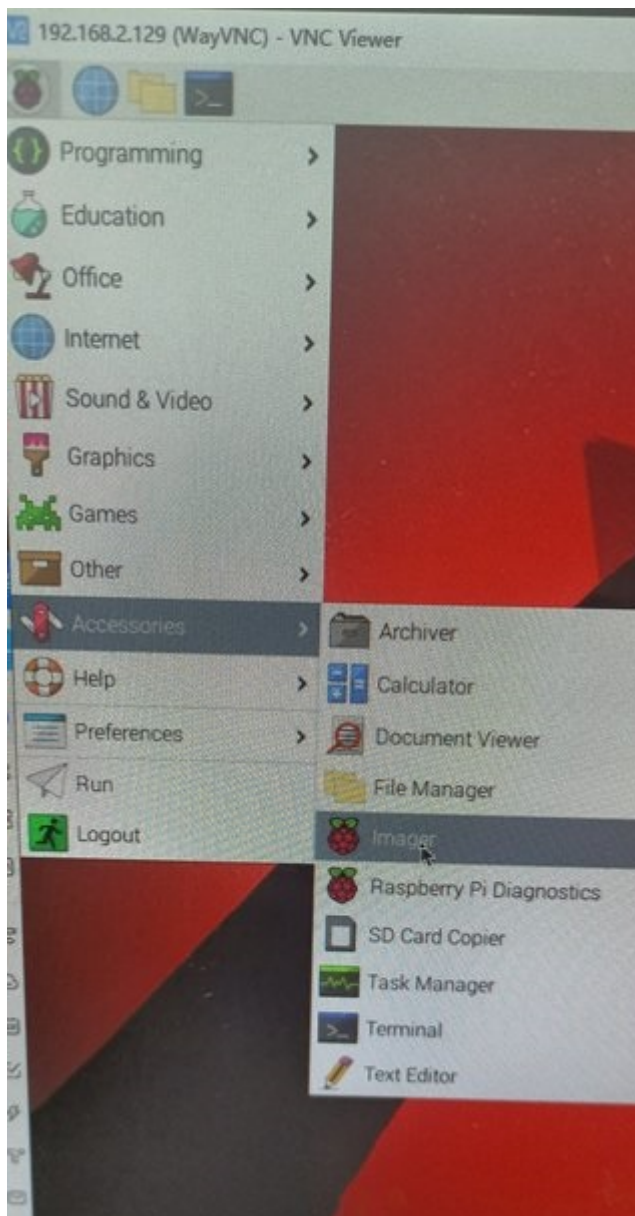
```
pi@raspberrypi: ~  
File Edit Tabs Help  
BOOT_ORDER=0xf416  
PCIE_PROBE=1  
#####  
*** To cancel this update run 'sudo rpi-eeprom-update -r' ***  
*** CREATED UPDATE /tmp/tmpnbrvi5w7/pieeprom.upd ***  
CURRENT: Fri Feb 16 03:28:41 PM UTC 2024 (1708097321)  
UPDATE: Fri Feb 16 03:28:41 PM UTC 2024 (1708097321)  
BOOTFS: /boot/firmware  
'/tmp/tmp.FoiwYBvzHw' -> '/boot/firmware/pieeprom.upd'  
UPDATING bootloader.  
*** WARNING: Do not disconnect the power until the update is complete ***  
If a problem occurs then the Raspberry Pi Imager may be used to create  
a bootloader rescue SD card image which restores the default bootloader image.  
flashrom -p linux_spi:dev=/dev/spidev10.0,spispeed=16000 -w /boot/firmware/pieep  
rom.upd  
UPDATE SUCCESSFUL  
pi@raspberrypi:~ $
```

2. The method of NVME downloading system

way 1:

```
sudo apt update  
sudo apt install rpi-imager
```

Then, by clicking on the image installation on the desktop, the system can be downloaded into NVME



Specific operating methods:

- <https://blog.csdn.net/timelockerCSDN/article/details/135793432>

way 2:

Alternatively, use a solid-state box to create a Raspberry Pi system for NVME.

3. Remove the SD card from the Raspberry Pi Card slot, Install PCIE on Raspberry Pi 5 and then turn it on.

As shown in the figure:



You can see that the startup disk of Raspberry Pi 5 is nvme.



4. If you want to switch back to SD card startup, you can simply unplug the PCIE and it will return to SD card startup.

