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Overview

The SBCPoE RPi hat is a power over Ethernet based power supply for the Raspberry Pi 5 computer combined with the possibility to use an add-in card. The following variants are available:

Part Number	Description
sbcpoe-rpi5-mpcie	mini PCIe slot
sbcpoe-rpi5-m2-b	M.2 B-Key slot, typically for WWAN cards
sbcpoe-rpi5-m2-e	M.2 E-Key slot, typically for Wifi or accelerator cards
sbcpoe-rpi5-m2-m	M.2 M-Key slot, typically memory cards (SSDs)

Hardware Set-up

1. Disconnect any power source from the Raspberry Pi.
2. Snap on the 40 pin interposition header to the hat so that it can be mated with Raspberry Pi's header.
3. Insert the standoff spacers and snap on the hat and tighten them with the screws.
4. Insert the FPC cable on the Raspberry Pi with the contacts pointing to the center of the Pi, on the hat with the contacts pointing down.
5. Insert the add-in card in the M.2 or mini PCIe slot and tighten it with the screw(s).
6. Connect the USB cable using the small USB connector board and the 4-wire cable.

The last two steps are optional.

Power Options



Never connect a power supply to the USB type C connector and the PoE hat **with a PoE injector** connected at the same time.

A Raspberry Pi 5 can either be powered by the USB type C connector or by a 802.3af/at/bt compliant PoE injector connected to the RPi's Ethernet jack. So you can power the device via USB and use the Ethernet port at the same time, but only if there is no PoE injector on the other end of the cable.

Software Set-up

This guide assumes a Raspberry Pi OS Bookworm is used. In order to make the Raspberry Pi deliver maximum power on its USB ports and don't show under-voltage warnings, do the following:

1. Edit the EEPROM configuration via `sudo rpi-eeprom-config --edit`.
2. Add the line `PSU_MAX_CURRENT=5000` and exit the editor saving the changes.

Then reboot.

SSD Installation



Note that not all SSD models, although physically compatible, will work with the Raspberry Pi 5. For example models with a *Phison* controller might not work.

Make sure you are using an NVMe SSD, a SATA SSD will not work.

1. Disconnect the Raspberry from any power source.
2. Insert the SSD and tighten it with the provided M 2 screw.
3. Power it up.
4. Check with the command `lspci` and inspect the output and make sure you can see your SSD.
5. Partition and format the SSD to use it.

Example output for `lspci` with the SSD device highlighted in red:

```
0000:00:00.0 PCI bridge: Broadcom Inc. and subsidiaries Device 2712 (rev 21)
0000:01:00.0 Non-Volatile memory controller: Seagate Technology PLC FireCuda 520
SSD (rev 01)
0001:00:00.0 PCI bridge: Broadcom Inc. and subsidiaries Device 2712 (rev 21)
0001:01:00.0 Ethernet controller: Device 1de4:0001
```

The device will have the name `/dev/nvme0`.

Booting from an SSD

To boot off of an NVMe SSD, you need an SSD with an OS image loaded onto it and the following configuration changes are required:

```
sudo raspi-config
```

Then select **6 Advanced Options** → **A4 Boot Order** → **B2 NVMe/USB Boot** answer **Yes**, then reboot.

Performance Testing

The following command stress tests the SSD with read/ write

```
sudo fio --filename=/mnt/data --size=5GB --direct=1 --rw=randrw --bs=4k --ioengine=libaio
--iodepth=256 --runtime=120 --numjobs=4 --time_based --group_reporting --name=iops-test-job
--eta-newline=1
```

Here is an example of what results you can expect with a good SSD:

```
iops-test-job: (groupid=0, jobs=4): err= 0: pid=2324: Fri Jun 28 19:49:33 2024
read: IOPS=67.6k, BW=264MiB/s (277MB/s)(30.9GiB/120009msec)
  slat (nsec): min=1759, max=156594k, avg=5009.11, stdev=63416.85
  clat (usec): min=229, max=435136, avg=7702.41, stdev=17151.43
  lat (usec): min=245, max=435139, avg=7707.42, stdev=17151.72
  clat percentiles (msec):
  | 1.00th=[ 4], 5.00th=[ 5], 10.00th=[ 5], 20.00th=[ 6],
  | 30.00th=[ 6], 40.00th=[ 6], 50.00th=[ 6], 60.00th=[ 7],
  | 70.00th=[ 10], 80.00th=[ 11], 90.00th=[ 11], 95.00th=[ 11],
  | 99.00th=[ 15], 99.50th=[ 17], 99.90th=[ 426], 99.95th=[ 426],
  | 99.99th=[ 430]
bw ( KiB/s): min=33304, max=422587, per=100.00%, avg=271182.87, stdev=25985.60, samples=956
iops      : min= 8326, max=105646, avg=67795.42, stdev=6496.40, samples=956
write: IOPS=67.5k, BW=264MiB/s (276MB/s)(30.9GiB/120009msec); 0 zone resets
  slat (usec): min=2, max=208603, avg= 6.49, stdev=83.39
```

```

clat (usec): min=53, max=434943, avg=7446.10, stdev=17193.55
lat (usec): min=56, max=434947, avg=7452.59, stdev=17194.00
clat percentiles (msec):
| 1.00th=[ 4], 5.00th=[ 5], 10.00th=[ 5], 20.00th=[ 5],
| 30.00th=[ 5], 40.00th=[ 6], 50.00th=[ 6], 60.00th=[ 6],
| 70.00th=[ 10], 80.00th=[ 10], 90.00th=[ 11], 95.00th=[ 11],
| 99.00th=[ 15], 99.50th=[ 18], 99.90th=[ 426], 99.95th=[ 426],
| 99.99th=[ 430]
bw ( KiB/s): min=33484, max=421031, per=100.00%, avg=270958.83, stdev=25997.18, samples=956
iops      : min= 8371, max=105257, avg=67739.37, stdev=6499.29, samples=956
lat (usec) : 100=0.01%, 250=0.01%, 500=0.01%, 750=0.01%, 1000=0.01%
lat (msec) : 2=0.30%, 4=2.18%, 10=78.32%, 20=18.80%, 50=0.17%
lat (msec) : 100=0.01%, 250=0.01%, 500=0.16%
cpu       : usr=7.98%, sys=17.11%, ctx=12337233, majf=0, minf=34
IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=0.1%, 32=0.1%, >=64=100.0%
submit    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete  : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.1%
issued rwts: total=8107309,8100680,0,0 short=0,0,0,0 dropped=0,0,0,0
latency   : target=0, window=0, percentile=100.00%, depth=256

Run status group 0 (all jobs):
  READ: bw=264MiB/s (277MB/s), 264MiB/s-264MiB/s (277MB/s-277MB/s), io=30.9GiB (33.2GB), run=120009-120009msec
  WRITE: bw=264MiB/s (276MB/s), 264MiB/s-264MiB/s (276MB/s-276MB/s), io=30.9GiB (33.2GB), run=120009-120009msec

Disk stats (read/write):
nvme0n1: ios=8105012/8098582, merge=0/46, ticks=59128395/56880435, in_queue=116008946, util=100.00%

```

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