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Raspberry Pi 5 — Booting from SSD



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Finally the time has come where we can boot our Raspberry Pi's off of PCIe peripherals natively!

I am presently working on a few Raspberry Pi projects that require faster read/write speeds and larger storage capacity. If your interested in doing the same, read on. Since there are many different hardware options for this, I won't walk you through the connectivity and assembly. Assuming you are using the Raspberry Pi 5 and the single-lane PCI Express 2.0

interface, follow along for how to configure the Operating System to use your new drive.

What is RPI5

Raspberry Pi is a tiny and affordable computer that was created to encourage people of all ages and abilities to learn programming and computing skills. The latest version of the Raspberry Pi, known as the Raspberry Pi 5 (RPI5), has been designed with a focus on improved performance and enhanced connectivity capabilities.

RPI Hats

A Raspberry Pi HAT, or Hardware Attached on Top, is an add-on board that adds extra functionality to your Raspberry Pi computer. It connects to the Pi's GPIO (General Purpose Input/Output) pins and provides additional features such as WiFi, Bluetooth, and sensors. There are many different types of HAT boards available for use with the Raspberry Pi, each designed for a specific purpose or application.

M.2 Hats

There are many different Raspberry Pi M.2 HATs out there. They are add-on board that allow you to connect M.2 peripherals such as NVMe drives and AI accelerators to Raspberry Pi 5's PCIe 2.0 interface. Paired with the Raspberry Pi 5 single-lane PCI Express 2.0 interface they support up to 500 MB/s data transfer to and from NVMe drives and other PCIe accessories.

GeekPi

The HAT or Kit that I have selected for this project is the GeekPi for Raspberry Pi 5 8GB Kit. Additionally, I have a SAMSUNG 970 EVO Plus SSD 1TB NVMe M.2 drive laying around from a laptop who's motherboard bit the dust.

I have included affiliate links below if you want to check out these items and their specs.

[GeekPi Store](#) on Amazon.com

[GeekPi for Raspberry Pi 5 8GB Kit](#)

[SAMSUNG 970 EVO Plus SSD 1TB NVMe M.2](#)

Let's Get Started!

First you will need to connect your HAT and M.2 SSD drive to your Raspberry Pi 5. Follow instructions provided to you by the vendor as these may vary between products.

Once everything is connected, you may power on your Raspberry Pi.

Enabling PCIe

The external PCIe is not enabled by default. In order to do so, follow these instructions:

1. From the Raspberry Pi Desktop, open Terminal
2. Type the following:

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

3. Add the following command(s) to the config file where indicated in the image below. To enable the PCIe type the following.

dtparam=pciex1

Additionally, add the following line after, only if your M.2 Hat and SSD support Gen 3 Speeds

dtparam=pciex1_gen=3

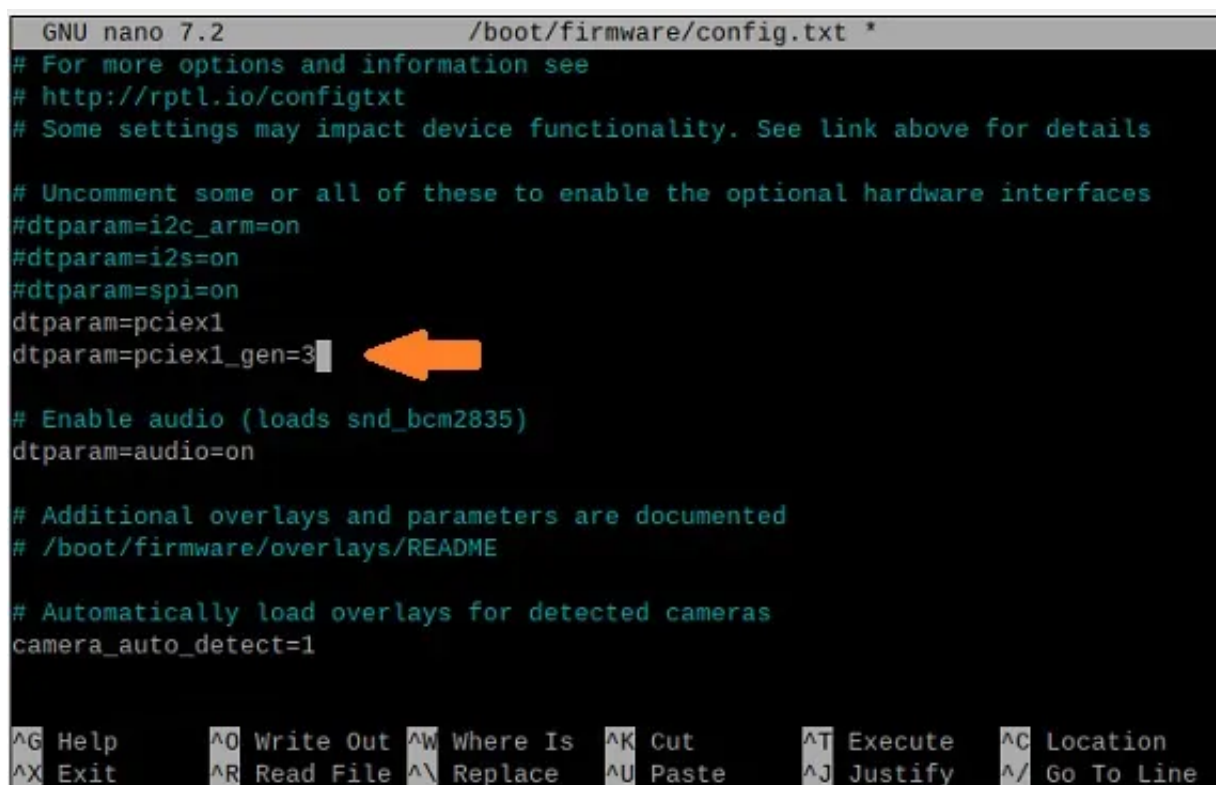
4. On your keyboard, enter the following key combinations to save and exit.

Ctrl + x

Y

Enter

5. Now restart your Raspberry Pi



```
GNU nano 7.2 /boot/firmware/config.txt *
# For more options and information see
# http://rptl.io/configtxt
# Some settings may impact device functionality. See link above for details

# Uncomment some or all of these to enable the optional hardware interfaces
#dtparam=i2c_arm=on
#dtparam=i2s=on
#dtparam=spi=on
dtparam=pciex1
dtparam=pciex1_gen=3
# Enable audio (loads snd_bcm2835)
dtparam=audio=on

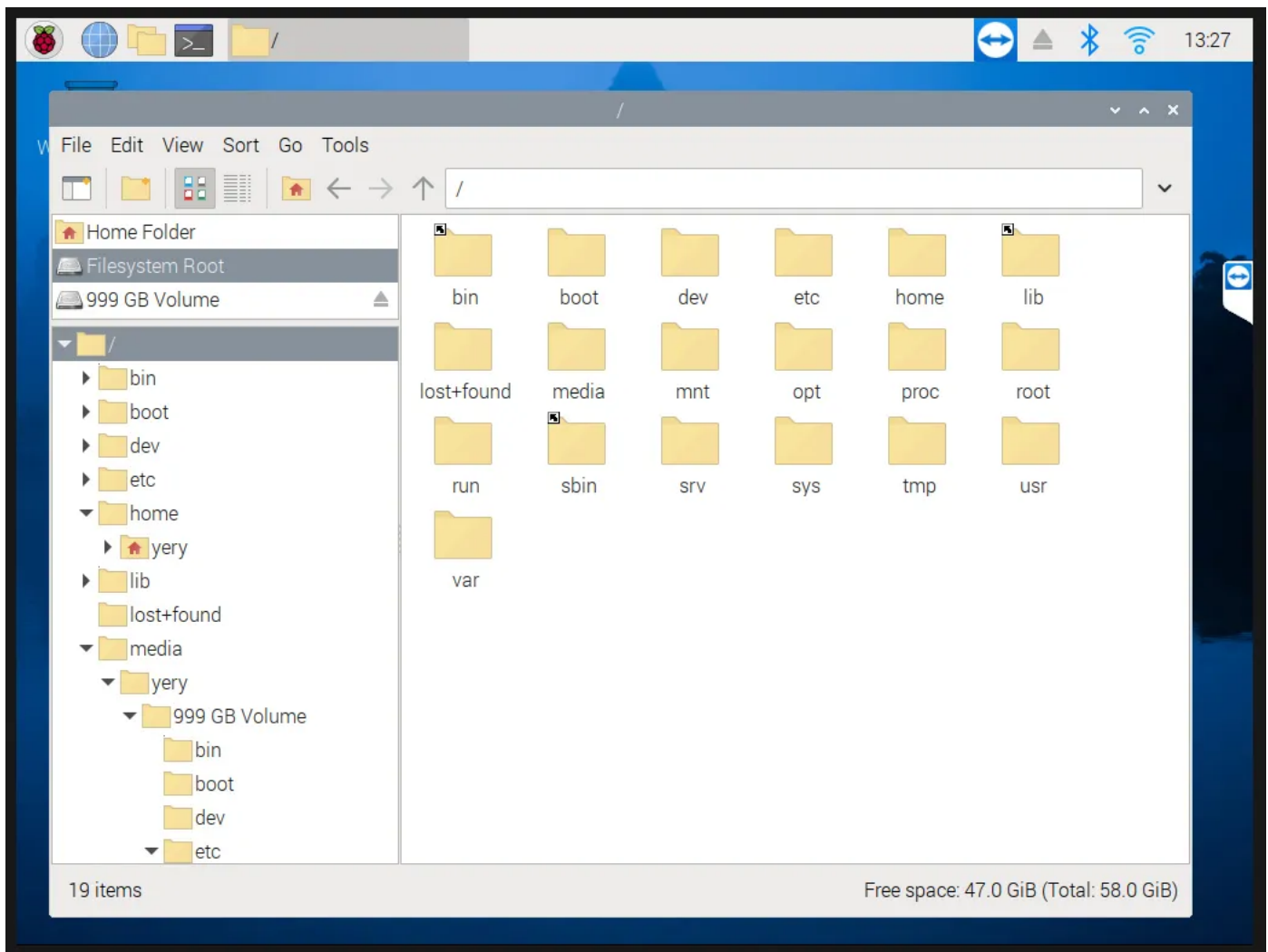
# Additional overlays and parameters are documented
# /boot/firmware/overlays/README

# Automatically load overlays for detected cameras
camera_auto_detect=1

^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
```

Once reloaded, launch your File Manager. You should see your Filesystem

Root loaded and in our case 999 GB Volume.



Booting from SSD

Intro



Follow these steps to install Raspberry Pi OS on your SSD:

1. From your Applications Menu, go to **Accessories** → **Imager**
2. Select **RASPBerry PI 5** from the device selection
3. Select **RASPBERRY PI OS (64-BIT)** from the Operating System selection
4. Select the appropriate storage device from the Storage selection
5. Select **NEXT**
6. If you wish to modify any of the OS Customizations, select **EDIT SETTINGS**. Be sure to **SAVE** when completed.

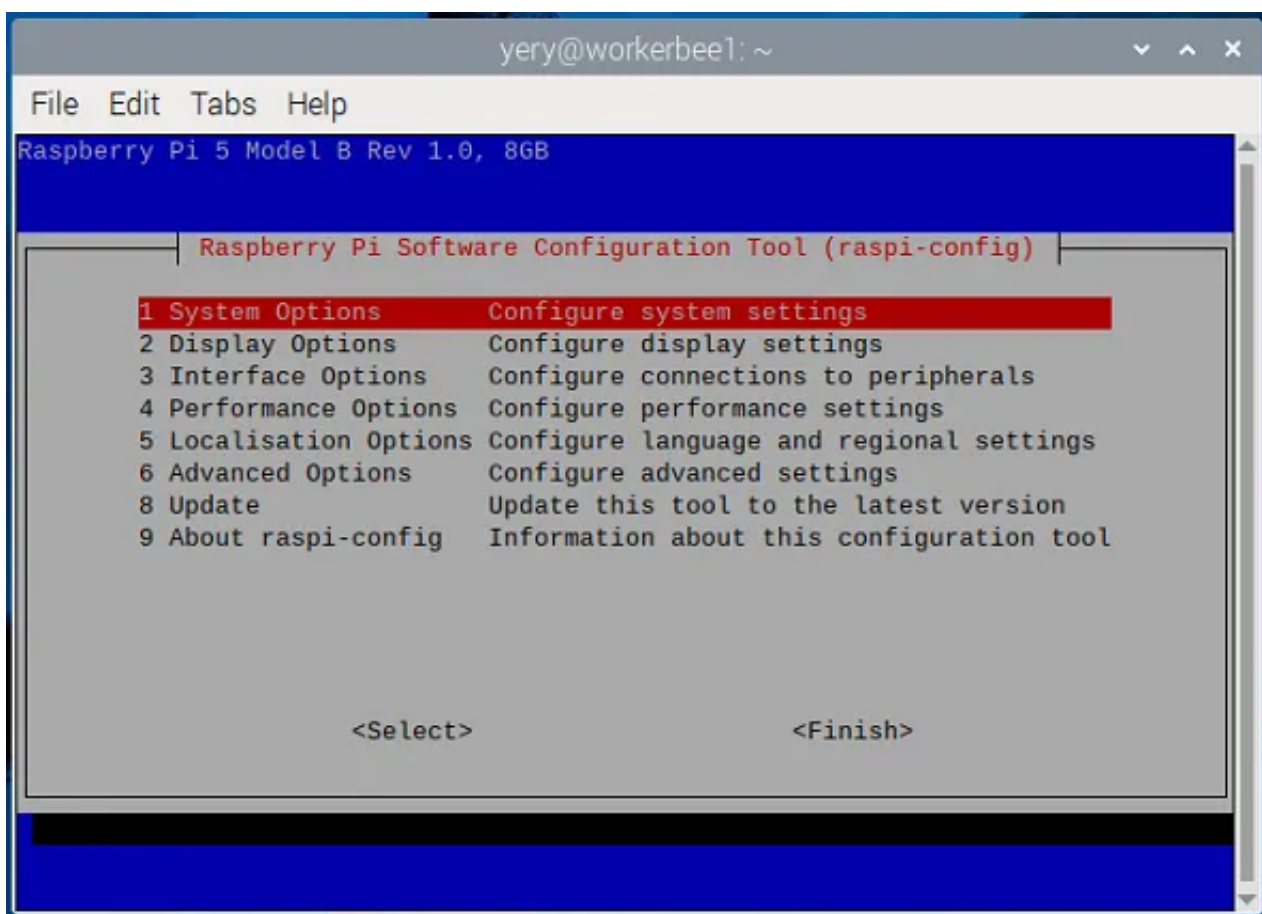
7. Select **YES** or **NO** to applying OS customizations.
8. Select **YES** to erase all data on the selected drive.

Once your drive is configured, launch Terminal. First update your repositories, and run updates.

```
sudo apt update
```

```
sudo apt upgrade -y
```

Now we will select the boot order, by telling the device to load directly off of the SSD, rather than from the Micro SD Card. From terminal do the following:



1. Type:

sudo raspi-config

2. Using your arrow-keys and Enter button, select **Advanced Options** → **Boot Order** → **NVMe/USB Boot**
3. You will press the Enter button twice. Once to select the boot options, and then to acknowledge the change has occurred.
4. Now press your right-arrow key on your keyboard twice to select **<Finish>**, and then press Enter.
5. Press Enter again to reboot now

You can now remove the Micro SD Card from the Raspberry Pi at any time, as now you are booting directly from the M.2 SSD.

Conclusion

From here you can continue whatever fun project or application that you are using your Pi 5 for. Leave a comment to let me know what your working on.

Hi there!

My name is Yery O'Dell and I am a Systems Engineer. I deeply enjoy automation, programming, and teaching others. If you find value in my writing, you can show your support by clapping for and commenting on my articles. You may also [buy me a coffee sometime](#). Follow me if you want to see more articles like this one.

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