

# Upgrading to the Raspberry Pi 3B or Pi 3B+<sup>1</sup>

By Sandy McCauley  
April 30, 2018

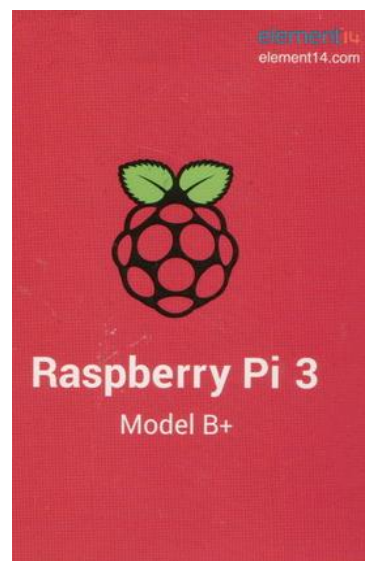
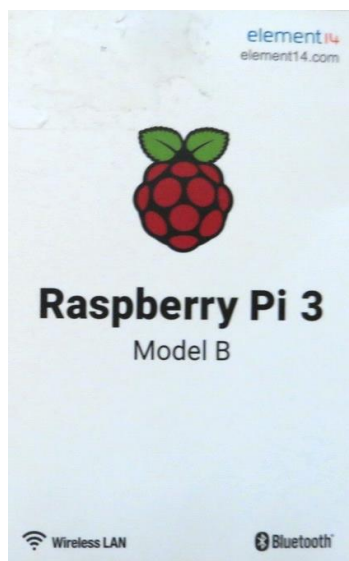
**NOTE:** This is NOT a KNK USA-published procedure. Any questions should be directed to me at [smccauley45@cox.net](mailto:smccauley45@cox.net) or posted at the [KNK Force Facebook group](#).

## Part 1: Before you commit to doing this

- This tutorial can be used to upgrade to the Pi 3B or the Pi 3B+ model. The Pi 3B (currently ~ \$36 on Amazon) offers faster startup (~ 23 sec vs ~ 93 sec) and faster loading of larger files. The Pi 3B+ (currently ~ \$45 on Amazon) has the same faster startup, along with dual band Wi-Fi and will connect to 5 GHz networks (as well as the standard 2.4 GHz). Its CPU clock is specified to be 1.4 GHz, the Pi 3B is 1.2 GHz, while the original Pi B+ which came with your Force, is 700 MHz.
- With this upgrade, you will initially only be able to connect via Ethernet or Wireless LAN to your network. It will not initially connect in stand-alone mode to your computer or smart device. If you need to use stand-alone mode, the instructions are provided in the last part of this tutorial.
- The process of replacing your existing Pi B+ with a Pi 3B or 3B+ involves removing a lot of screws. Be methodical and organized. The tutorial recommends when to start a new grouping of screws so that it will be easier to reassemble your Force. You might want to use sticky notes for each pile indicating in which steps those screws were removed.
- **IMPORTANT:** Before starting the process, make sure you have your various calibrations in the **Machine Settings** window of C3 written down. Then you can easily re-enter those calibrations after the upgrade.

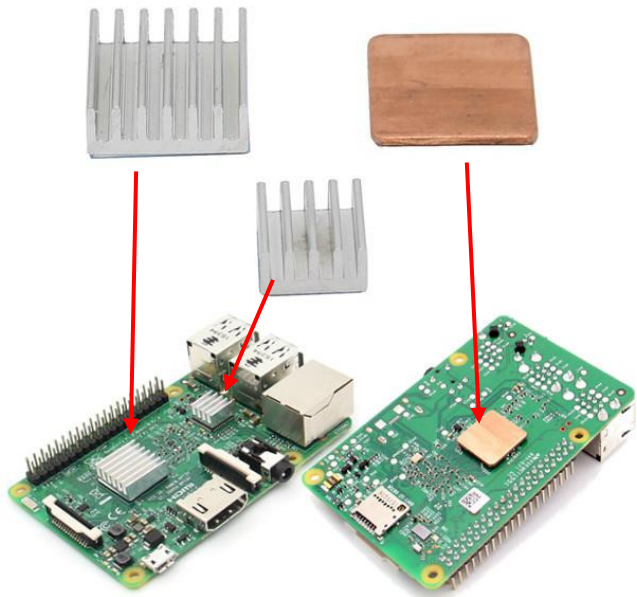
## Part 2: What to purchase

- You will need to flash a micro SD card. Unless your computer has an SD card drive, you will need to buy an [SD card reader/writer](#).
- You can use the existing micro SD card inside your Force or purchase any class 10 or UHS-1 micro SD card 8 Gb up to 32 Gb.
- Below is the model of Raspberry Pi 3B or 3B+that you will need:



<sup>1</sup> In this tutorial, the term "Pi 3" will refer to either the Pi 3B model or the Pi 3B+ model as the same procedure applies to both. The term "Pi" will refer to the original Pi B+ that came with your Force.

- It is highly recommended you purchase and install Raspberry Pi 3 heat sinks on the IC chips that can run warm. These heat sinks are attached by removing a protective tape from the underlying thermal pad, centering them over the IC chips and pressing down. The Pi 3 will slow down if the chips get too warm; the heat sinks help keep them cool. The following photo shows you where these heat sinks are placed on the Pi 3:



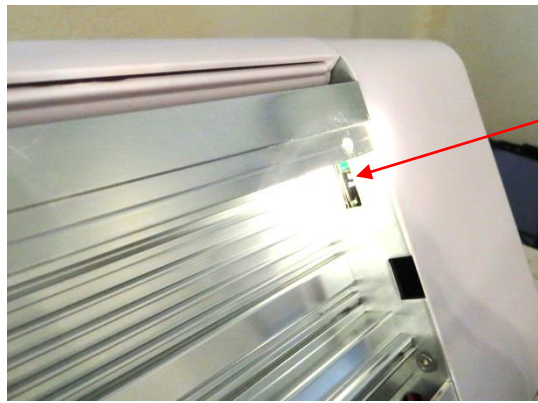
**Part 3 Removing the Current Micro SD Card**

If you decided not to purchase a new micro SD card, use the following steps to extract your current one. Otherwise, proceed to Part 4.

- (1) Unplug the power cable and Ethernet cable (if in use) from the Force.
- (2) Turn the Force upside down as shown below and remove the 6 screws indicated by the red arrows. The bottom plate can now be removed.



- (3) On the right side you'll see an opening near what is now the "top."



Micro SD card slot

- (4) Gently push in the micro SD card and then slide it out. If you inadvertently drop it inside the right end cap, do not fret as that part of the Force will need to be opened anyhow. Just follow Steps (2) – (5) in Part 5. You should then be able to locate the micro SD card.

## **Part 4 Flashing the Micro SD Card**

### **Windows Instructions**

- (1) Insert the micro SD card into your computer's micro SD card reader and check which drive letter was assigned. You can easily see the drive letter, such as G: by looking in the left column of Windows Explorer. You can use the micro SD card slot if you have one, or an inexpensive micro SD adapter in a USB port.
- (2) Download SD Formatter from here: [SD Formatter for Windows](#)
- (3) Format the card using SD Formatter. Be **very sure** to select the drive letter that contains the SD card!
- (4) Download the Pi 3 Image file from here: [Pi 3 Image File for C3](#) and extract. Note where the extracted file is located. Also, this file is 1.64 GB in size and will take some time to download.
- (5) Download the Win32DiskImager utility from here: [Sourceforge Project page](#)
- (6) Extract the executable from the zip file and run the Win32DiskImager utility; you may need to run this as administrator. Right-click on the file and select **Run as administrator**.
- (7) Select the image file you extracted in Step (4).
- (8) Select the drive letter of the SD card in the device box. Again, be **very careful** to select the correct drive. If you get the wrong one you can destroy the data on your computer's hard disk! If you are using an SD card slot in your computer and can't see the drive in the Win32DiskImager window, try using an external SD adapter.
- (9) Click **Write** and wait for the write to complete.
- (10) Exit the imager and eject the micro SD card.

### **Mac Instructions**

- (1) Insert the micro SD card into your SD card reader or into a built-in SD card reader, if your computer has one.
- (2) From the Apple menu, choose **About This Mac**, then click on **More info...**; if you are using Mac OS X 10.8.x Mountain Lion or newer, then click on **System Report**.

- (3) In the left column, click on **USB** (or **Card Reader**) and search for your micro SD card in the right section of the window. Click on it, then search for the **BSD name** in the lower-right section; it will look something like `diskn` where `n` is a number (for example, `disk4`). Make sure you take a note of this number.
- (4) Download SD Formatter from here: [SD Formatter for Mac](#)
- (5) Format the card using SD Formatter. Be **very sure** to select the drive that contains the SD card!
- (6) Download the zipped Pi 3 Image file from here: [Pi 3 Image File for C3](#) and extract, if needed. Also, this file is 1.64 GB in size and will take some time to download.
- (7) Unmount the partition so that you will be allowed to overwrite the disk. To do this, go to **Applications>Utilities>Disk Utility** and **Unmount** that drive. Do not eject it, or you will have to reconnect it.
- (8) Go to **Applications>Utilities>Terminal** and run the command below. First note the following:
  - An easy way to enter the path of the Pi 3 Image file is to highlight it in **Finder** and then drag and drop after you've typed in the first part of the command (i.e. right after you've entered the "`if=`").
  - Remember to replace `n` with the number that you noted before.
  - Command to enter into **Terminal**:
    - a. `sudo dd bs=1m if=path_of_your_image.img of=/dev/rdiskn`
    - b. If this command fails, try using `disk` instead of `rdisk`:  
`sudo dd bs=1m if=path_of_your_image.img of=/dev/diskn`
- (9) After entering the command and pressing **Return**, you may receive a **Password** prompt. Enter your Mac password, noting that it won't actually appear as you type it. Just enter and press **Return**, anyhow. Then wait. The flashing process takes quite some time. Eventually, you'll see messages displayed indicating the process has completed. At this point, you can go to **Disk Utility** and **Unmount** the SD card.

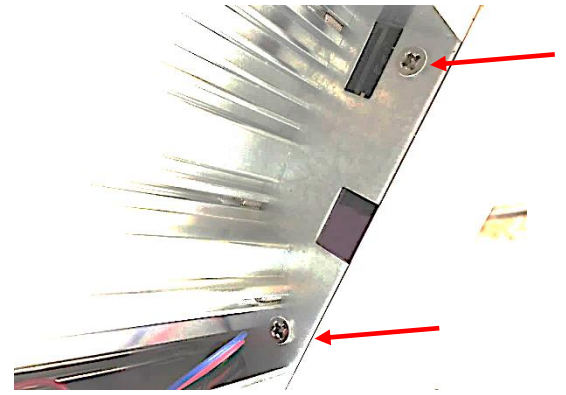
## **Part 5 Linda Calderone's Instructions on Removing the Current Raspberry Pi**

(1) Unplug the power cable and Ethernet cable. Turn the Force upside down so that you have access to the bottom panel.

Remove the six screws as indicated by the red arrows. Note that two have black risers. The bottom panel can now be set aside.



(2) With the bottom plate removed, you'll see two screws, one at the top right and one at the bottom right. Remove these and start a new grouping of screws.



(3) Return the Force to the upright position and remove the three screws on the right faceplate as indicated by the red arrows. These can be placed with the screws from the prior step.



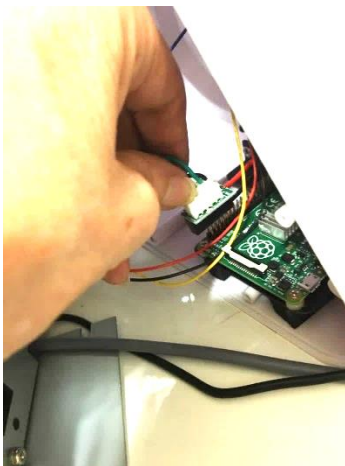
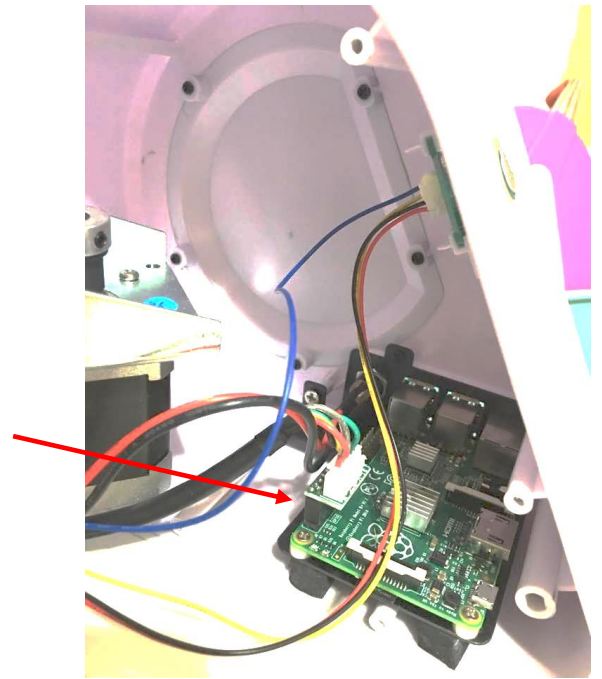
(4) On the same right-side faceplate, a 4<sup>th</sup> screw can be removed from behind the Force and added to the same grouping which should now have 6 screws.



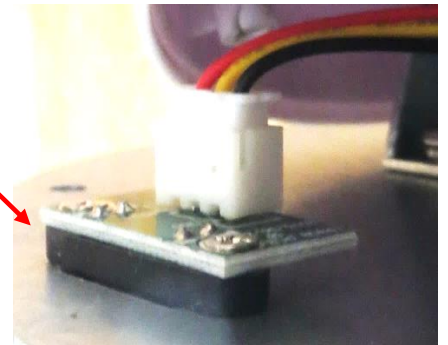


(5) The right-side panel can now be opened and slid to the side. Be careful of the cables still connecting the right panel to the rest of the Force. You will not be touching the connected wires at the top at any time during this process.

Note where and how the jumper is connected to the Pi as you will later connect it the exact same way to your new Pi 3.

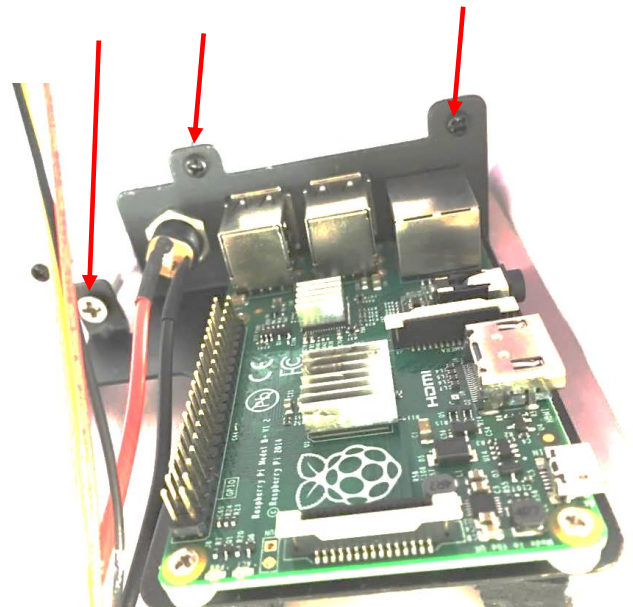


(6) Carefully remove the jumper cable from the Pi. Note the photo to the right shows the entire part that is pulled away... it's not just the top white part.

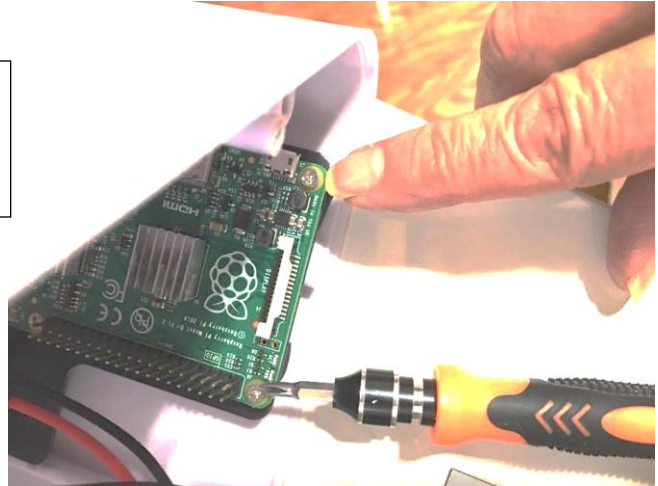


(7) The next step is to separate the black baseplate that has the Pi relay jumpers and wires attached from the Force panel. Be careful to keep the wires intact and connected to the board adapter.

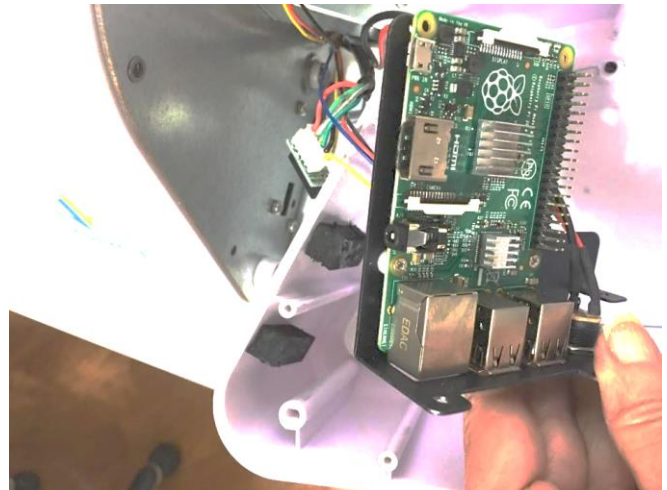
Remove the three screws shown and place in a new separate grouping.



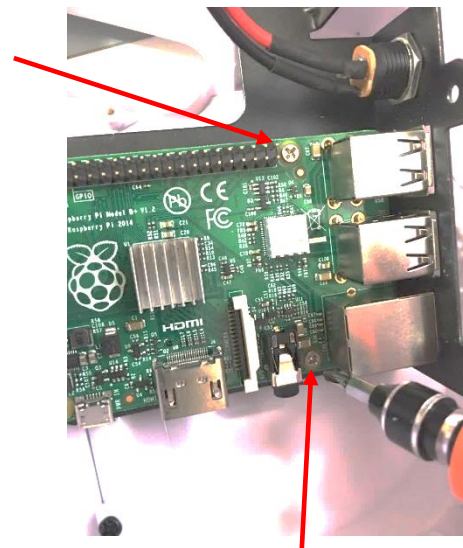
(8) To separate the Pi from the baseplate, start by removing the two screws shown by my finger and by the screwdriver. Place these into a new grouping.



(9) Before removing the final two screws, gently pull the black baseplate away from the panel to make it more accessible. Again, be cautious of the wires.



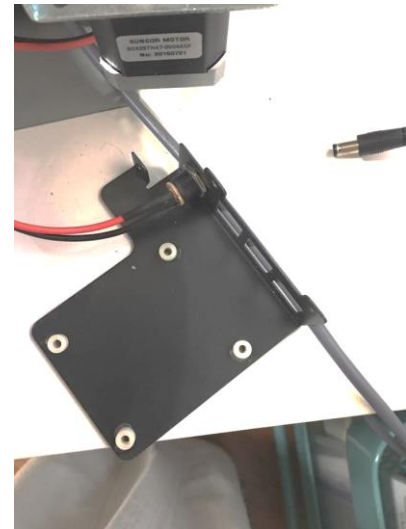
(10) Remove the last two screws that are towards the back of the Pi board as shown. These can be placed in the same grouping as those from Step 8.



(11) The original Pi board is now completely separated from the baseplate and the Force.



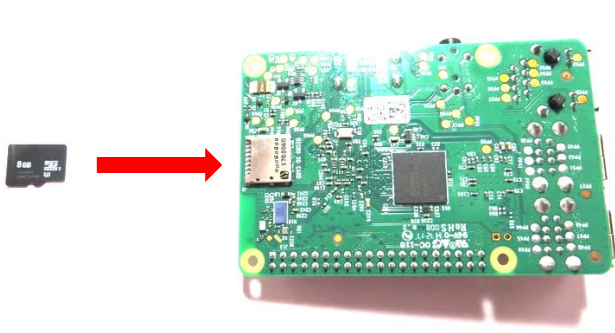
(12) This is the baseplate. The white risers were originally glued to the baseplate but one or more may have come loose. You can either glue them back into place over the holes in the baseplate or, before attaching the new Pi 3, align them so that the screws will pass through them and into the threaded holes.



(13) If you haven't already done so, apply the heat sinks to the Pi 3 as shown in Part 2.

(14) Turn the Pi 3 over so that the micro SD card can be inserted. Note the orientation of the card in the following photo: Also note that unlike in the original Pi, the SD card is now just push-pull and not spring loaded.





Note how the micro SD card will be inserted into the slot on the bottom of the Pi 3



Micro SD card in place

(16) Flip the Pi 3 back over and reverse the steps, beginning with (12), in order to re-assemble the Force.

(17) Before attempting to reattach the endcap to the Force, check any wires that might get pinched in the process and gently push them out of the way.

## **Part 6 Connecting the Force**

- Initially, set up the Force using Ethernet. Once that is successful, you can then set it up via Wi-Fi. If for some reason you need to use your Force in stand-alone mode, refer to Part 7.

### **6.1 Ethernet Connection**

- (1) Attach an Ethernet cable from your router to the Pi 3 Ethernet connector.
- (2) Do not attach anything to the USB ports. You will be using the Pi 3 internal Wi-Fi and it needs to find only the on-board Wi-Fi during that important first boot. Otherwise it will almost always find the externally connected USB adapter first and may cause problems.
- (3) Power on the Force and wait for the white light which takes about 23 seconds.
- (4) Log onto your router and get the assigned IP address.
- (5) Open a browser on your PC and go to that address. C3 should open and you're all set to use your Force in Ethernet mode. Enjoy a much faster KNK Force.

### **6.2 Wi-Fi Connection**

- (6) Complete the prior *Steps (1) – (5)* to establish an Ethernet connection and open C3.
- (7) In C3 click on the **Settings** tab and then open **Network Settings**.
- (8) Under **Wireless networking mode**, switch from **Standalone** to **LAN**.
- (9) Click on **Scan for networks**. Select your network and enter your network password to the right. Click on **Apply Changes**.

- (10) Click on the **Status** tab and scroll down to the **Wireless (Wi-Fi) networking status** section. Write down your assigned **IP Address**, along with the other settings.
- (11) Enter the IP Address in your browser and verify that you can open C3 with that address.
- (12) Proceed with other instructions regarding setting a static IP Address using the instructions in the *Force with C3 User Manual, Section 2.05.2*. You can now disconnect the Ethernet cable.
- (13) Enjoy a much faster KNK Force.

## **Part 7 Switching to Stand-Alone Mode, if needed**

- If you absolutely need to connect in stand-alone mode, the following procedure should work.
  - (1) Complete *Part 6* first.
  - (2) After installing the Pi 3 with the newly written micro SD card, attach the power cable and external USB Wi-Fi adaptor that came with your Force.
  - (3) Start the Force and wait for the white lights.
  - (4) Remove the adaptor and wait for the lights to turn red.
  - (5) Insert the adapter into the same slot and wait for the green lights. If the light turns white instead of green, power off the Force. Repeat Steps (2) - (4) until the light turns green. It usually takes at least two times.
  - (6) Continue to follow the directions in the *KNK Force with C3 User Manual, Section 2.02.3, Step (5)*.
- To go back to Ethernet or Wi-Fi mode:
  - (1) In C3, go to **Settings>Network Settings** and select **LAN** mode. Click on **Apply Changes**.
  - (2) Turn off the Force and remove the external USB Wi-Fi adaptor.
  - (3) Connect the Ethernet cable to the Force and to your router.
  - (4) Turn on the Force and find the IP Address assigned by the wireless router and connect using your browser.

## **Acknowledgments**

Thank you to the following people for their contributions:

- Robert Thomas who initiated this project by sending me a Pi 3 along with the needed details on formatting an SD card, the image file to flash, and the additional instructions in Parts 6 and 7.
- Linda Calderone who created the original document on removing the Pi from the Force.
- Liz Ackerman, Bart Gabriëls, and Rachel Turpin for volunteering to “go first” and test out this written procedure.

All questions or issues should be addressed to [smccauley45@cox.net](mailto:smccauley45@cox.net) or posted at the [KNK Force Facebook group](#).