

Pianoteq 6

Raspberry Pi 3

Station

By
Edgar Bustamante



Contents

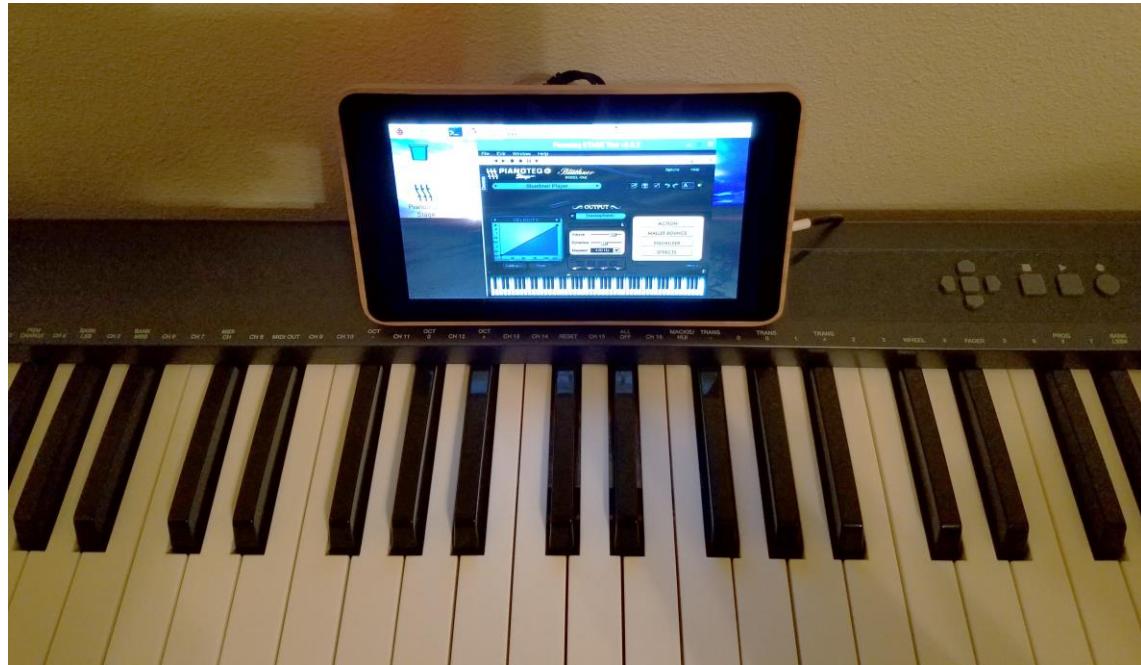
1	<i>Introduction</i>	4
2	<i>Parts</i>	5
2.1	Raspberry Pi 3	5
2.2	Fan/Heat Sinks	5
2.3	Digital to Analog Converter (DAC)	5
2.4	Micro SD Card with USB Adapter	6
2.5	Display	6
2.6	Display Case (Optional)	7
2.7	Keyboard	7
2.8	Mouse	7
2.9	Power Supply	7
3	<i>Computer Downloads</i>	8
3.1	NOOBS	8
3.2	SD Card Formatter	9
4	<i>Installation of Raspbian</i>	11
4.1	Format an SD Card	11
4.2	Unzip NOOBS	11
4.3	Copy NOOBS to an SD Card	12
4.4	Install Raspbian	12
5	<i>Raspbian Downloads</i>	14
5.1	Raspbian Libraries Download	14
5.2	Pianoteq Download	16
6	<i>Installation of Pianoteq</i>	17
6.1	Elevate Account Privileges	17
6.2	Set Maximum CPU Frequency	18
6.3	Configure Ethernet Driver	18
6.4	Extract Pianoteq	19
6.5	Create a Pianoteq Desktop Shortcut	20
6.6	Change Desktop Icons Text Color	24
7	<i>Digital to Analog Converter (DAC)</i>	27

7.1 Hardware Setup	27
7.2 Software Setup	27
7.3 Other sound cards (USB type).....	29
8 Pianoteq Settings	31
8.1 Recommended Settings.....	31
8.2 Overclocking the CPU	32
9 Raspberry Pi 7" Touchscreen Display.....	35
9.1 Hardware Setup	35
9.2 Rotate Display.....	35
10 Additional Information	38
10.1 Create a Backup	38

1 Introduction

This document will explain in detail how to install and setup **Pianoteq 6 Stage** in a Raspberry Pi 3 although the process is very similar for the Standard and Pro versions of **Pianoteq 6**. This can be of great benefit if you do not want to use your computer solely to run **Pianoteq**. A Raspberry Pi 3 is one of the answers for this purpose while keeping the price relatively inexpensive.

The outcome of this document is a nice looking **Pianoteq** station running on a Raspberry Pi 3 with a high quality audio output signal and a touchscreen display embedded in a gorgeous bamboo case. This takes **Pianoteq** to a new level!



2 Parts

This section will cover the parts that you will need to install **Pianoteq** on a Raspberry Pi 3. Some of these are required and some are optional like the touchscreen display or the bamboo case. The optional parts will help you create a nice looking **Pianoteq** Raspberry Pi 3 station.

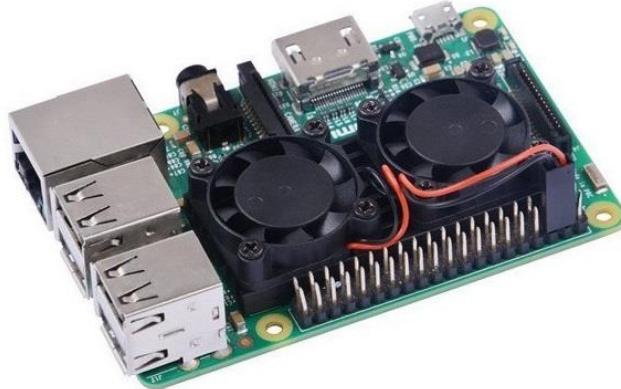
2.1 Raspberry Pi 3

Due to the weak processing power of other Raspberry Pi models (1, 2, Zero, etc.), you will only be able to run **Pianoteq 6** on a Raspberry Pi 3 model.



2.2 Fan/Heat Sinks

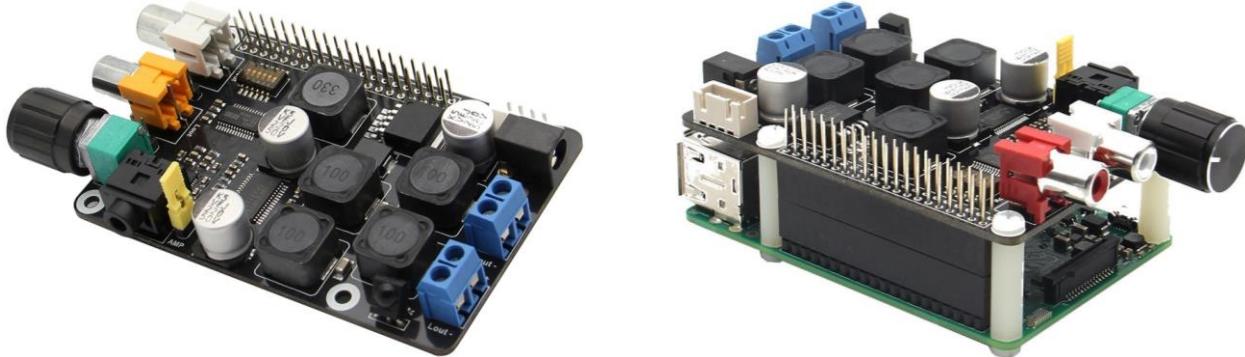
A fan and/or heat sink is highly recommended to cool off the CPU due to the high amount of computations **Pianoteq** requires. The Raspberry Pi 3 will begin to throttle once it reaches a temperature of 85 °C and ultimately affect **Pianoteq** by creating pops and crackles. The fans shown below have a thin copper heat sink under the fans and it is all one unit.



2.3 Digital to Analog Converter (DAC)

I do not recommend the use of the Raspberry Pi 3's internal sound card because of the poor audio quality and the increase of CPU usage; this can affect the performance of **Pianoteq**. An external sound card/digital to analog converter (DAC) would remove this CPU load and transfer

it to the external sound card. In this document, the external sound card Suptronics X400 is used. This sound card fits on top of the Raspberry Pi 3 due to its Pi HAT design.



2.4 Micro SD Card with USB Adapter

A micro SD card with a minimum of 8 GB and a micro SD card to USB adapter are required. You will copy the operating system (OS) Raspbian unto the micro SD card and then install it on the Raspberry Pi 3.



2.5 Display

You will need a computer monitor or TV that has HDMI connection to connect the Raspberry Pi 3. I will use the Raspberry Pi 7" Touchscreen Display for the system but this specific display is not required.



2.6 Display Case (Optional)

I will use a bamboo case from Eleduino for the Raspberry Pi 7" Touchscreen Display for aesthetic purposes only; it is not required.



2.7 Keyboard

You will need a regular computer keyboard that connects via USB to type commands in the Raspbian terminal.

2.8 Mouse

You will need a regular computer mouse that connects via USB to navigate and select things in Raspbian.

2.9 Power Supply

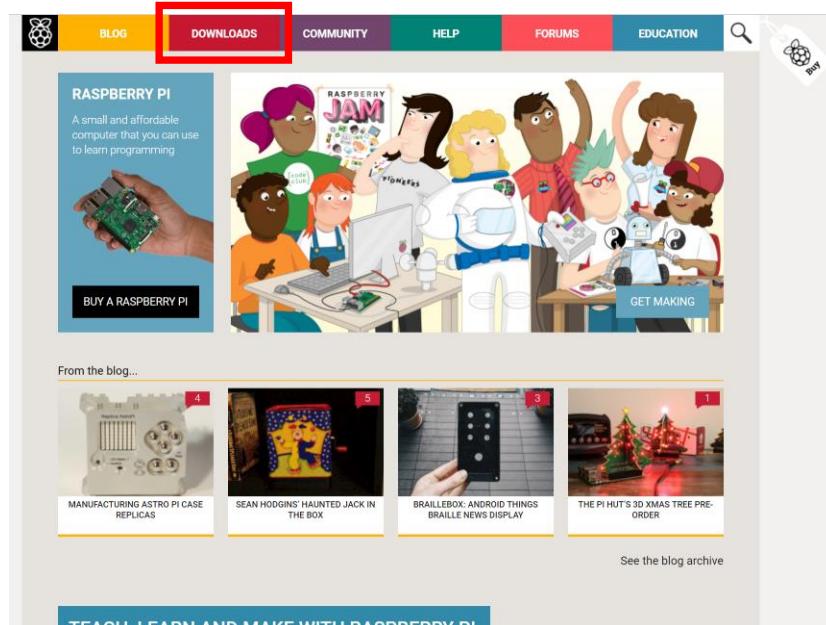
The power supply will depend on the power consumption of the Raspberry Pi 3, external sound card, and other electronics (touchscreen display, digital keyboard, etc) attached to the raspberry pi. The Suptronics X400 expansion board requires an input power of 6V to 24V DC 3A. The Suptronics X400 will power the Raspberry Pi 3, touchscreen display, and a digital keyboard (M-Audio Keystation 88 MKII) via a 12V 3A power supply. **Connecting the Raspberry Pi 3 and the Suptronics X400 to two different power supplies can damage some if not all of the electronics in your system.** PLEASE FOLLOW THE INSTRUCTION OF YOUR EXTERNAL SOUND CARD/DAC.



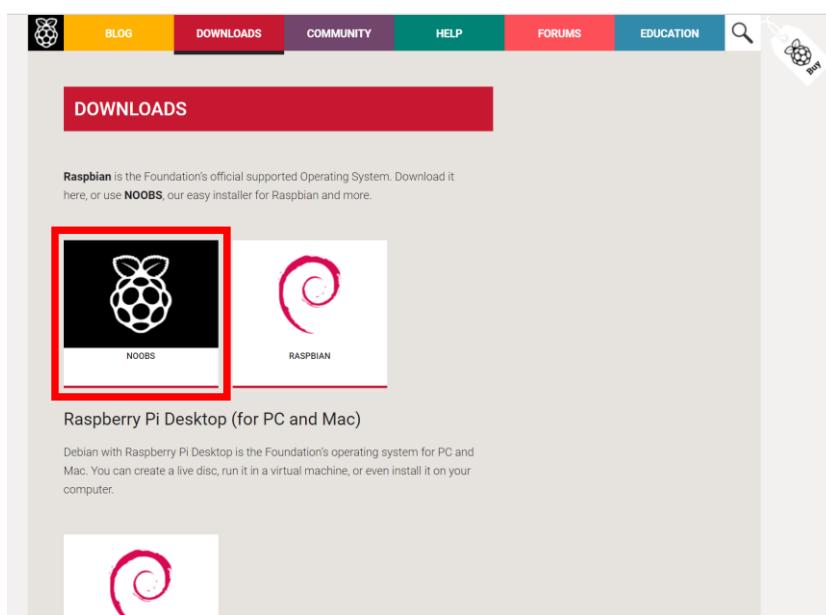
3 Computer Downloads

3.1 NOOBS

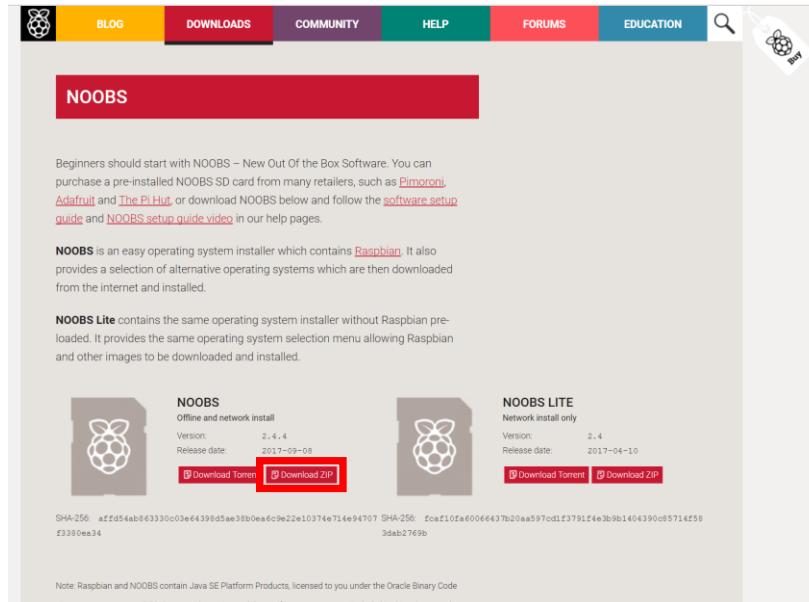
New Out Of the Box Software (NOOBS) is an operating system (OS) installer that contains Raspbian, the Raspberry Pi OS that will be used. To download NOOBS go to the raspberry pi website, www.raspberrypi.org and click on the Downloads tab.



Click on NOOBS.

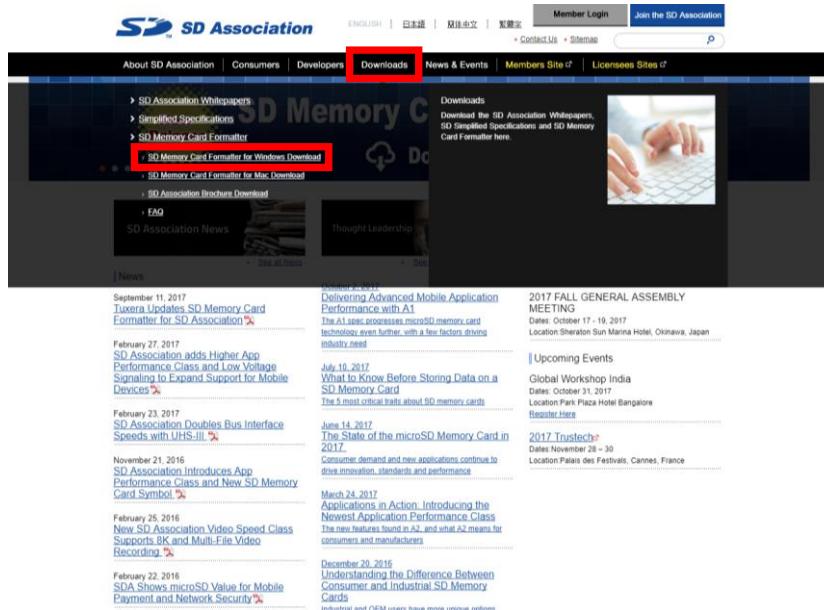


Click on Download Zip for the NOOBS version and wait for the download to finish.



3.2 SD Card Formatter

You will need to download the SD card formatter from the SD Association to ensure that the SD card you use is entirely compliant. A compliant SD card can result in better read and write speeds, buffering, and the total amount of storage available in the SD card. Go to www.sdcard.org, hover the mouse over the Downloads tab, and select SD Memory Card Formatter for Windows Download.



Scroll down to the bottom of the page, accept the User License Agreement, and once it finishes downloading install the program.

13. MISCELLANEOUS TERMS. The parties hereto are independent contractors. You shall abide by all local, state, federal, and international laws, rules, regulations, and orders applying to Your use of the Products. This Agreement will be governed and construed in accordance with the laws of the State of California without regard to any conflict of laws principles that would require the application of the laws of another jurisdiction. The United Nations on Contracts for the International Sale of Goods and any laws based on the Uniform Computer Information Transactions Act shall not apply to this Agreement. This Agreement constitutes the entire agreement between You and SDA and supersedes any prior or contemporaneous negotiations or agreements, whether oral, written, or displayed electronically, concerning the Product and related subject matter. No modification or waiver of any provision hereof will be effective unless made in a writing signed by both SDA and You. You may not assign or transfer this Agreement or a License to a third party without SDA's prior written consent. Should any provision of this Agreement be invalid or unenforceable, the remainder of the provisions will remain in effect. The parties have agreed that this Agreement and the documents related thereto be drawn up in the English language. Les parties exigent que la présente convention ainsi que les documents qui s'y rattachent soient rédigés en anglais.

YOU ACKNOWLEDGE AND AGREE THAT YOU HAVE READ THIS AGREEMENT AND INTEND TO BE BOUND AS IF YOU HAD SIGNED THIS AGREEMENT IN WRITING. IF YOU ARE ACTING ON BEHALF OF AN ENTITY, YOU WARRANT THAT YOU HAVE THE AUTHORITY TO ENTER INTO THIS AGREEMENT ON BEHALF OF SUCH ENTITY AND BIND SUCH ENTITY TO THE TERMS OF THIS AGREEMENT.

[Decline](#)

[Accept](#)

*SD, SDHC and SDXC Logos are trademarks or registered trademarks of SD-3C LLC in the United States, other countries or both. Also, miniSD, microSD, miniSDHC, microSDHC, microSDXC, smartSD, smartSDHC, SDIO and miniSDIO Logos are all trademarks or registered trademarks of SD-3C LLC in the United States, other countries or both.
Copyright (c) SD Association. All Rights Reserved.

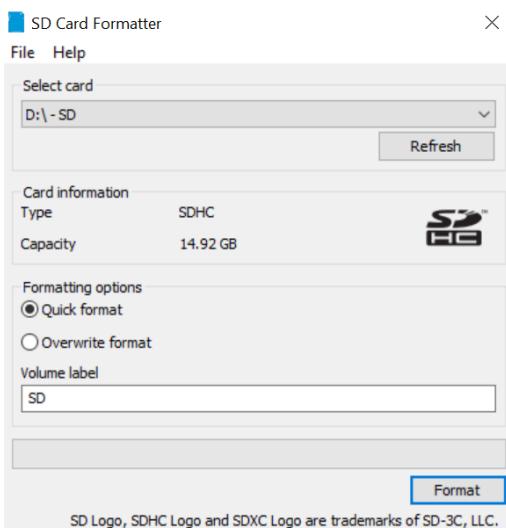
[Contact Us](#) | [Sitemap](#) | [Legal](#) | [Privacy Policy](#)



4 Installation of Raspbian

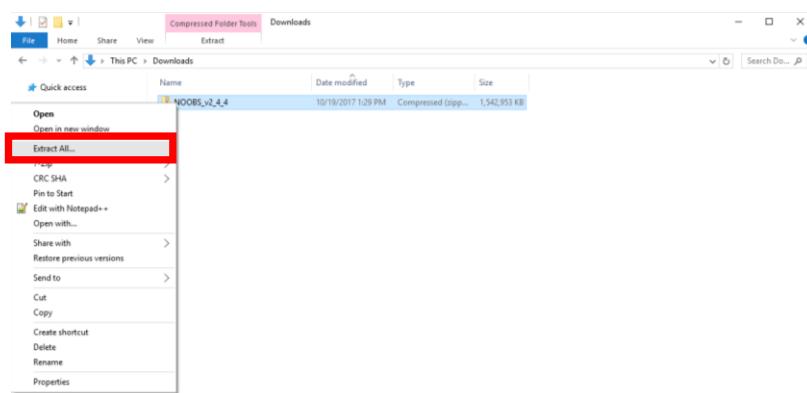
4.1 Format an SD Card

Insert the micro SD card in the USB adapter and connect it to the computer. Open the SD Card Formatter and select the SD card you connected to the computer. **Before proceeding make sure that the SD card you insert is selected and NOT the computer drive (C:) or any other memory devices because this will wipe everything in them!** Select Quick format, label the SD card anything you want or leave it blank, and click Format. Your SD card is ready for NOOBS.



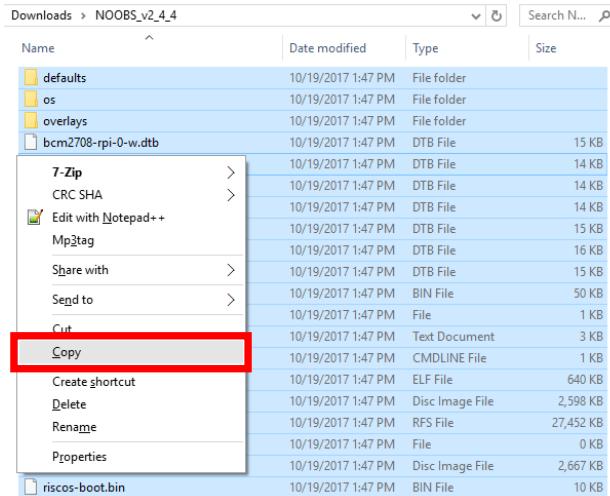
4.2 Unzip NOOBS

Unzip the NOOBS file downloaded in section 3.1 using the computer built in Compress Folder Tools, WinZip, or any other software able to extract NOOBS. I will use the built in Compress Folder Tools, right click on the compressed NOOBS folder in the default downloads folder and select Extract All....



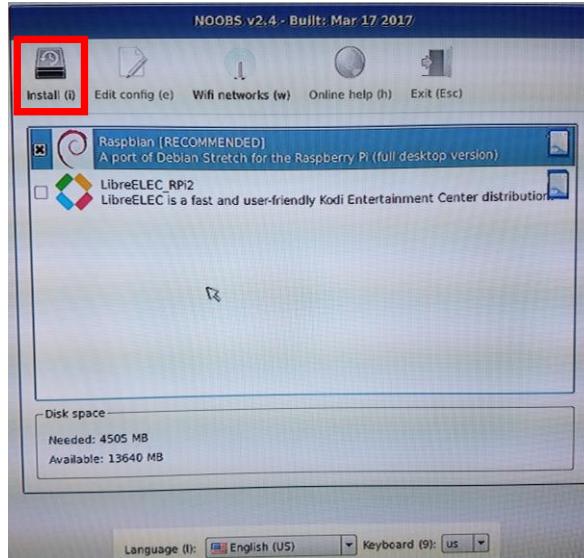
4.3 Copy NOOBS to an SD Card

Select the content of the extracted NOOBS folder, right click on the content, and copy this into the SD card. Do not copy the NOOBS folder; copy the contents of the NOOBS folder. When the files finish copying, eject the SD card.

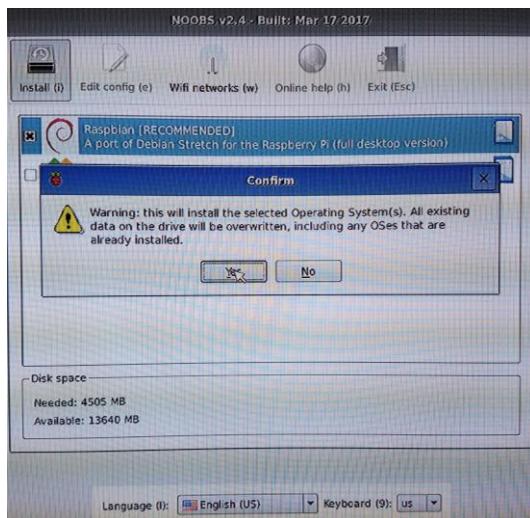


4.4 Install Raspbian

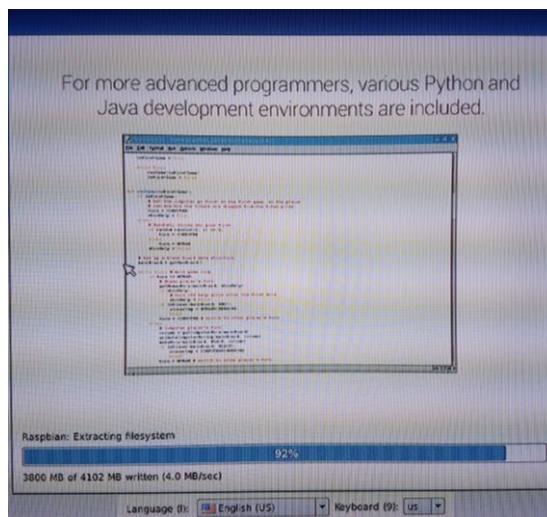
Insert the SD card in the Raspberry Pi 3, connect the mouse, connect the keyboard, connect the display (computer monitor, TV, touchscreen display, etc) via HDMI or DSI ribbon cable, and power it. Select the Raspbian OS and click Install.



Confirm the installation by clicking Yes.



The installation will take about 10-20 minutes.

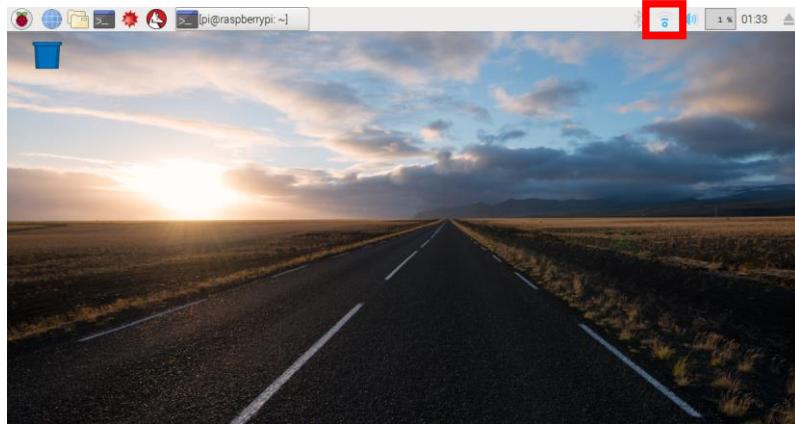


When the installation finishes click Ok.



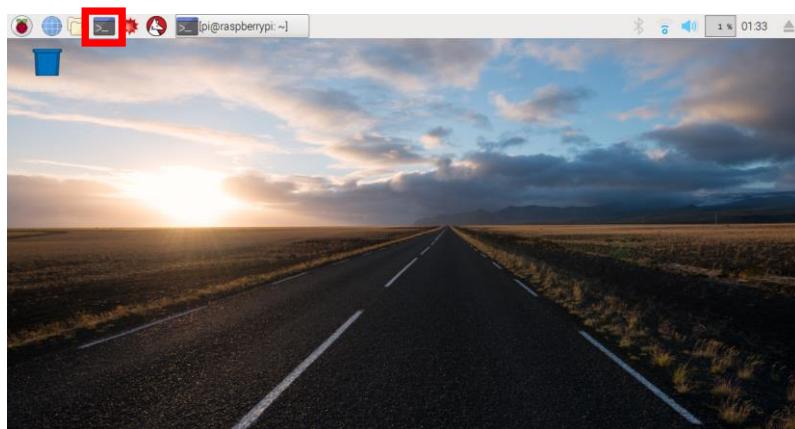
5 Raspbian Downloads

You will first need to connect to the internet either through Wi-Fi or through the Ethernet port on the Raspberry Pi 3 to update the Raspberry Pi 3, download some libraries you will need, and download Pianoteq. You can see the Wi-Fi settings button below.



5.1 Raspbian Libraries Download

The Raspberry Pi 3 needs to be up to date to ensure it is running the latest software. Open the terminal.



Type the following line of code in the terminal and press Enter.

A screenshot of a terminal window. The title bar says "pi@raspberrypi: ~". The window contains the following text:

```
pi@raspberrypi:~$ sudo apt-get update && sudo apt-get dist-upgrade
```

When the terminal asks if you want to continue, type y, and press Enter.

```

pi@raspberrypi: ~
File Edit Tabs Help
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following NEW packages will be installed:
  gstreamer1.0-omx-rpi gstreamer1.0-omx-rpi-config libwayland-cursor0
The following packages will be upgraded:
  bluez curl dbus dbus-user-session dbus-x11 desktop-base dhcpcd5
  gir1.2-gdkpixbuf-2.0 git git-man gstreamer1.0-omx libatspi2.0-0
  libbluetooth3 libcurl3 libcurl3-gnutls libdb5.3 libdbus-1-3 libfm-data
  libfm-extra4 libfm-gtk-data libfm-gtk4 libfm-modules libfm4
  libgdk-pixbuf2.0-0 libgdk-pixbuf2.0-common libgnutls30 libidn2-0
  libjavascriptcoregtk-4.0-18 libncurses5 libncursesw5 libnss3 libperl5.24
  libservlet3.1-java libsmclient libtinfo5 libwbclient0 libwebkit2gtk-4.0-37
  libwpd-0.10-10 libxfont2 linux-libc-dev lxpanel-data
  lxplug-bluetooth lxplug-ejector lxplug-network lxplug-volume ncurses-base
  ncurses-bin ncurses-term pcmanfm perl perl-base perl-modules-5.24 pigpio
  python3-jwt python-pigpio python3-pip raspi-config raspicopies-and-fills
  realvnc-vnc-server realvnc-vnc-viewer rpi-chromium-mods samba-common
  samba-libs scratch2 vim-common vim-tiny wpasupplicant xkb-data xxd
74 upgraded, 3 newly installed, 0 to remove and 0 not upgraded.
Need to get 131 MB of archives.
After this operation, 3,187 kB of additional disk space will be used.
Do you want to continue? [Y/n] y

```

When the terminal finishes updating the Raspberry Pi 3 type the following line of code and press Enter. This will install the libraries needed to extract [Pianoteq](#) after you download it from the [Pianoteq](#) website, section 5.2.

```

pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudo apt-get install p7zip-full

```

When the terminal asks if you want to continue, type y, and press Enter.

```

pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudo apt-get install p7zip-full
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  p7zip
Suggested packages:
  p7zip-rar
The following NEW packages will be installed:
  p7zip p7zip-full
0 upgraded, 2 newly installed, 0 to remove and 74 not upgraded.
Need to get 1,262 kB of archives.
After this operation, 4,383 kB of additional disk space will be used.
Do you want to continue? [Y/n] y

```

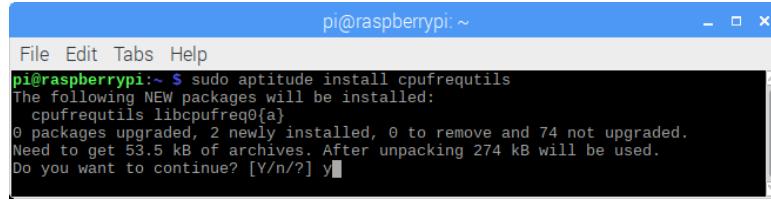
When the terminal finishes installing the 7z libraries type the following line of code and press Enter. This will install the libraries needed to disable CPU frequency throttling.

```

pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudo aptitude install cpufrequtils

```

When the terminal asks if you want to continue, type y, and press Enter.

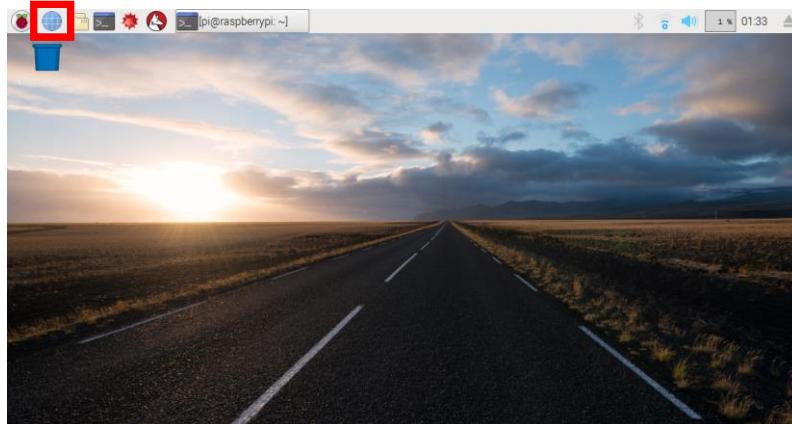


```
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~$ sudo aptitude install cpufrequtils
The following NEW packages will be installed:
cpufrequtils libcpufreq0{a}
0 packages upgraded, 2 newly installed, 0 to remove and 74 not upgraded.
Need to get 53.5 kB of archives. After unpacking 274 kB will be used.
Do you want to continue? [Y/n/?] y
```

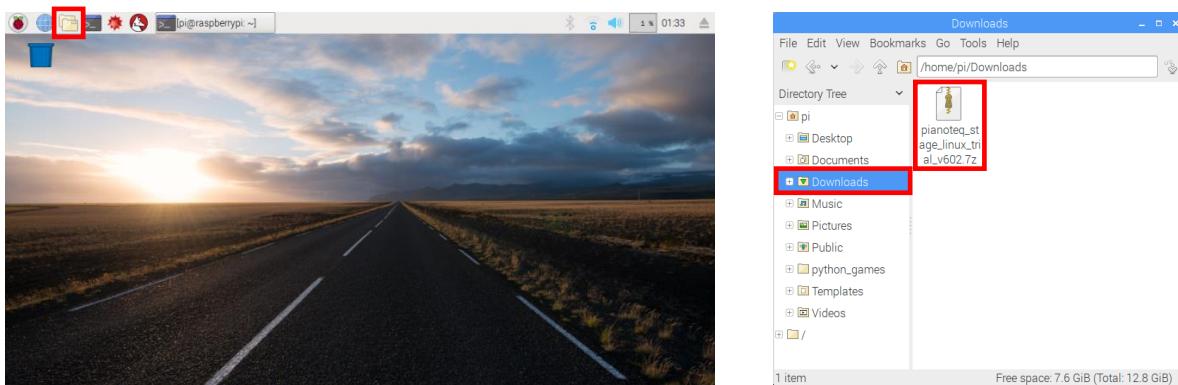
You now have all the libraries needed to install Pianoteq.

5.2 Pianoteq Download

Use Chromium to download the Linux version of your version of **Pianoteq 6** from www.Pianoteq.com. I will use the **Pianoteq 6 Stage** Linux trial version.



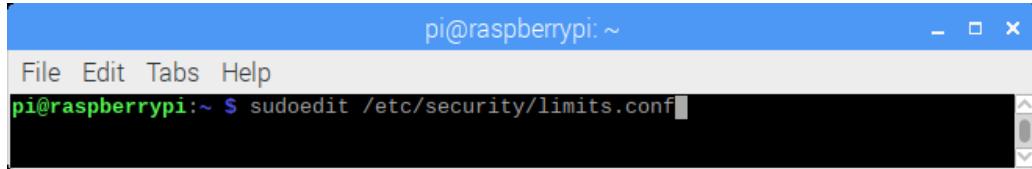
A compressed file (.7z) containing **Pianoteq** will be in the default Downloads folder of Raspbian after you have download **Pianoteq**. You are now ready to install **Pianoteq**. **Note: The name of the downloaded Pianoteq file will be the name used in section 6.1, in this case it is “pianoteq_stage_linux_trial_v602.7z”.**



6 Installation of Pianoteq

6.1 Elevate Account Privileges

Your account privileges need to be elevated in the Raspberry Pi 3, to do this you need to modify a document containing these settings. Type the following line of code in the terminal and press Enter.



The terminal will show the contents of the document. Using the arrow keys in the keyboard scroll down and add the last three lines of code starting with @pi. "pi" is the default username Raspbian creates. If you created a new user or changed the default username, replace "pi" to the new username. When you finish adding the three lines of code press CTRL+X.

A screenshot of the nano text editor window. The title bar shows "pi@raspberrypi: ~", "GNU nano 2.7.4", "File: /var/tmp/limitsXXZgsVr1.conf", and "Modified". The main area displays the contents of the limits configuration file. A red box highlights the last three lines of code added to the file:

```
#       - chroot - change root to directory (Debian-specific)
#
#<domain>      <type>    <item>          <value>
#
#*          soft   core        0
#root      hard   core        100000
#*          hard   rss         10000
#@student   hard   nproc       20
#@faculty   soft   nproc       20
#@faculty   hard   nproc       50
#ftp        hard   nproc       0
#ftp        -      chroot     /ftp
#@student   -      maxlogins   4
@pi        -      rtprio      90
@pi        -      nice        -10
@pi        -      memlock     500000
#
# End of file
```

The bottom of the screen shows the nano command bar with various keyboard shortcuts.

Save the modified file by pressing y and then pressing Enter.

```
pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 2.7.4          File: /var/tmp/limitsXXZgsVr1.conf      Modified
#
#       - chroot - change root to directory (Debian-specific)
#
#<domain>      <type>  <item>      <value>
#
#*          soft    core        0
#root      hard    core    100000
#*          hard    rss     10000
#@student    hard   nproc     20
#@faculty    soft   nproc     20
#@faculty    hard   nproc     50
#ftp        hard   nproc     0
#ftp        -      chroot   /ftp
#@student    -      maxlogins  4
@pi         -      rtprio    90
@pi         -      nice     -10
@pi         -      memlock  500000

# End of file
Save modified buffer? (Answering "No" will DISCARD changes.) [Y/N/C]
Y Yes
N No      ^C Cancel
```

6.2 Set Maximum CPU Frequency

Set the maximum CPU frequency to 1200 MHz by typing the next line of code and pressing Enter.

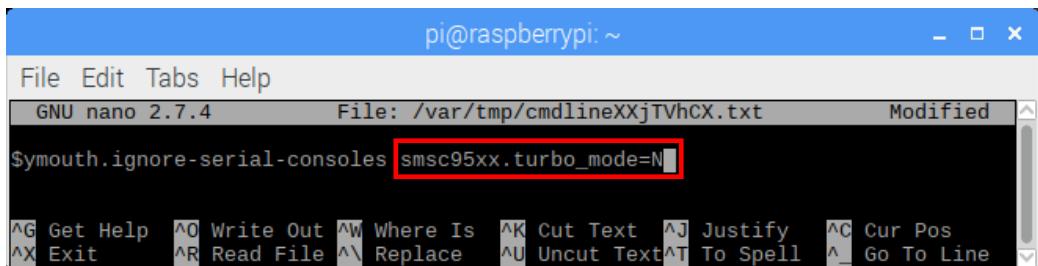
```
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudo cpufreq-set -f 1200MHz
```

6.3 Configure Ethernet Driver

Edit the Ethernet driver to prevent possible pops and crackles by typing the following line of code and pressing Enter.

```
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudoedit /boot/cmdline.txt
```

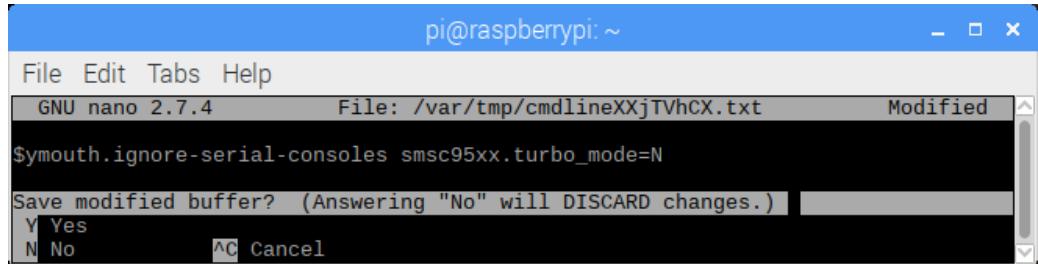
Using the keyboard arrow keys go to the end of the document, add the following text and press CTRL+X.



```
pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 2.7.4      File: /var/tmp/cmdlineXXjTVhCX.txt      Modified
$ymouth.ignore-serial-consoles smsc95xx.turbo_mode=N

^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit        ^R Read File ^\ Replace ^U Uncut Text^T To Spell ^_ Go To Line
```

Save the document by pressing y and then pressing Enter.

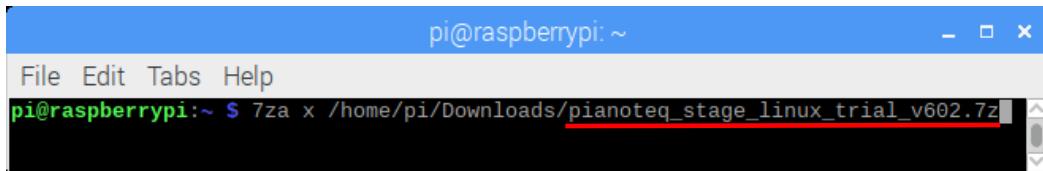


```
pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 2.7.4      File: /var/tmp/cmdlineXXjTVhCX.txt      Modified
$ymouth.ignore-serial-consoles smsc95xx.turbo_mode=N

Save modified buffer? (Answering "No" will DISCARD changes.)
Y Yes          AC Cancel
```

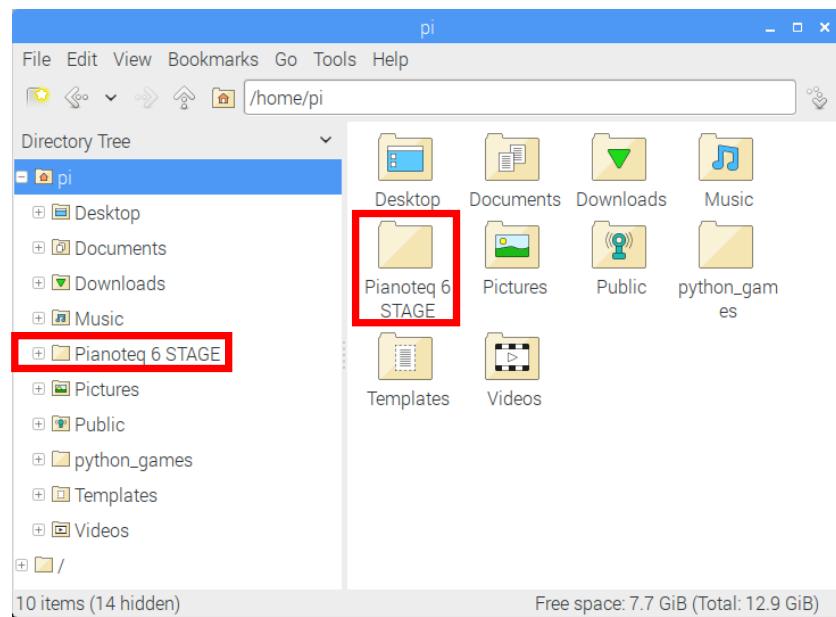
6.4 Extract Pianoteq

Type the following line of code in the terminal and change the highlighted text to the name of the file you downloaded from the [Pianoteq](#) website, see section 5.2. When you change this to your version of [Pianoteq](#), press Enter. This will extract the files containing the trial version of [Pianoteq 6 Stage](#) Linux.

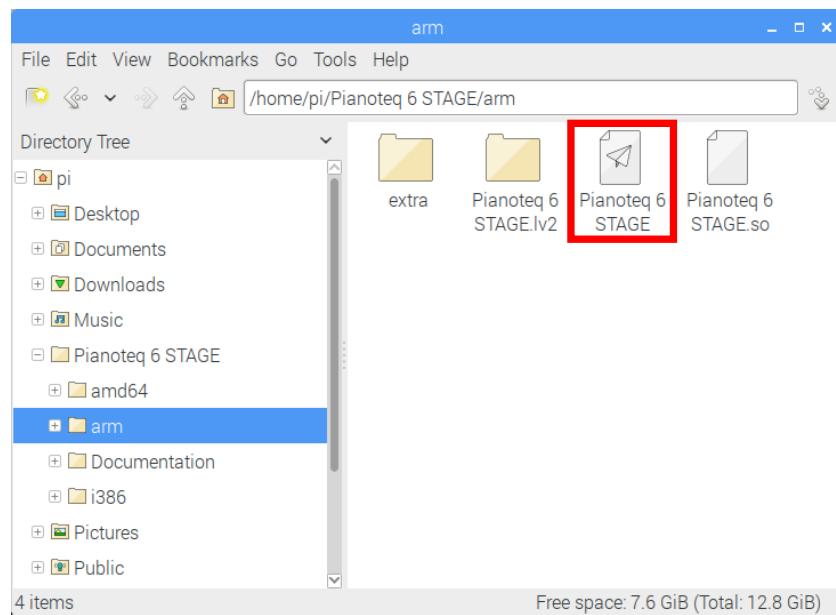


```
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ 7za x /home/pi/Downloads/pianoteq_stage_linux_trial_v602.7z
```

When [Pianoteq](#) finishes extracting, a new folder named after the version of [Pianoteq](#) you downloaded will be in the /home/pi directory. In this case, it is the stage version of [Pianoteq 6](#). **Note: The name of the main folder where [Pianoteq](#) was extracted will be used in section 6.5, in this case it is “[Pianoteq 6 STAGE](#)”.**

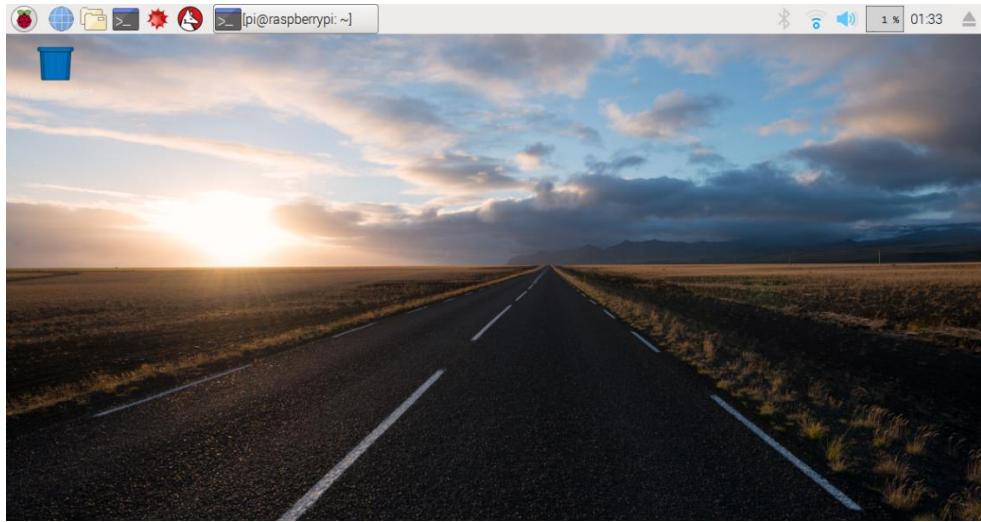


The arm folder (Raspberry Pi 3 uses an Arm processor) inside the main Pianoteq folder will contain the executable file that will open the standalone Pianoteq application.



6.5 Create a Pianoteq Desktop Shortcut

There is no Pianoteq desktop shortcut if you look at the desktop therefore you will create a desktop shortcut for Pianoteq. This desktop shortcut will also make sure that every time you launch Pianoteq all four cores are running at its maximum.



A shell script will be created that will run the command to start **Pianoteq** with all four cores at its maximum. Type the following line of code in the terminal but change the highlighted text with the name of the main folder explained in section 6.5, make sure to use quotations if the name has spaces. When this finishes press Enter.

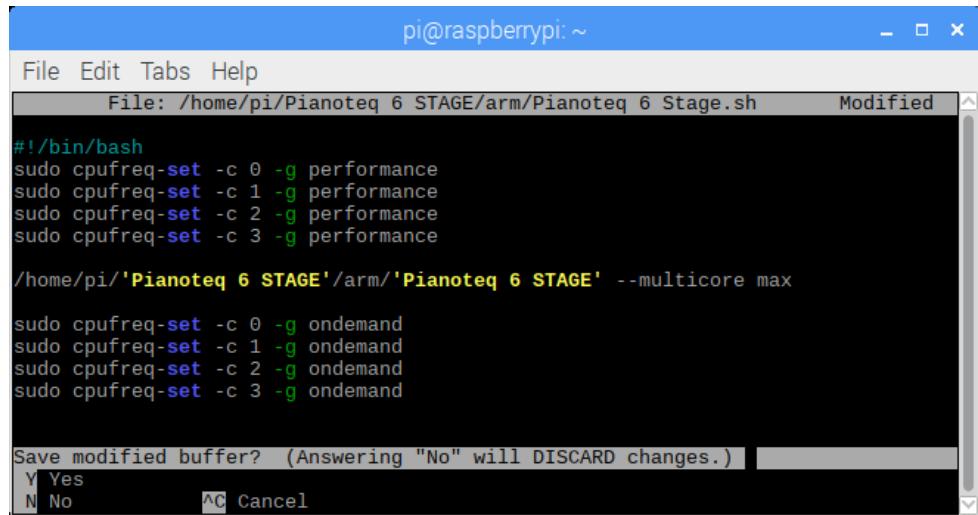


Type the following lines of code in the shell script but change the highlighted text to the path containing the executable of your version of **Pianoteq**, this is explained in section 6.5. Use quotations if a name has spaces. To prevent CPU frequency throttling (will create pops and crackles) when **Pianoteq** is running, you need to make sure that the CPU is always running in performance mode, which will make the CPU run at the maximum frequency, the first four lines of code take care of this. When **Pianoteq** is not running, the CPU frequency will return to its normal state (ondemand), the last four lines of code do this. When you finish press CTRL+X.

```
pi@raspberrypi: ~
File Edit Tabs Help
File: /home/pi/Pianoteq 6 STAGE/arm/Pianoteq 6 Stage.sh Modified
#!/bin/bash
sudo cpufreq-set -c 0 -g performance
sudo cpufreq-set -c 1 -g performance
sudo cpufreq-set -c 2 -g performance
sudo cpufreq-set -c 3 -g performance
/home/pi/'Pianoteq 6 STAGE'/arm/'Pianoteq 6 STAGE' --multicore max
sudo cpufreq-set -c 0 -g ondemand
sudo cpufreq-set -c 1 -g ondemand
sudo cpufreq-set -c 2 -g ondemand
sudo cpufreq-set -c 3 -g ondemand

^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Linter ^_ Go To Line
```

Save the shell script by pressing y and then pressing Enter.



```
pi@raspberrypi: ~
File Edit Tabs Help
File: /home/pi/Pianoteq 6 STAGE/arm/Pianoteq 6 Stage.sh Modified
#!/bin/bash
sudo cpufreq-set -c 0 -g performance
sudo cpufreq-set -c 1 -g performance
sudo cpufreq-set -c 2 -g performance
sudo cpufreq-set -c 3 -g performance

/home/pi/'Pianoteq 6 STAGE'/arm/'Pianoteq 6 STAGE' --multicore max

sudo cpufreq-set -c 0 -g ondemand
sudo cpufreq-set -c 1 -g ondemand
sudo cpufreq-set -c 2 -g ondemand
sudo cpufreq-set -c 3 -g ondemand

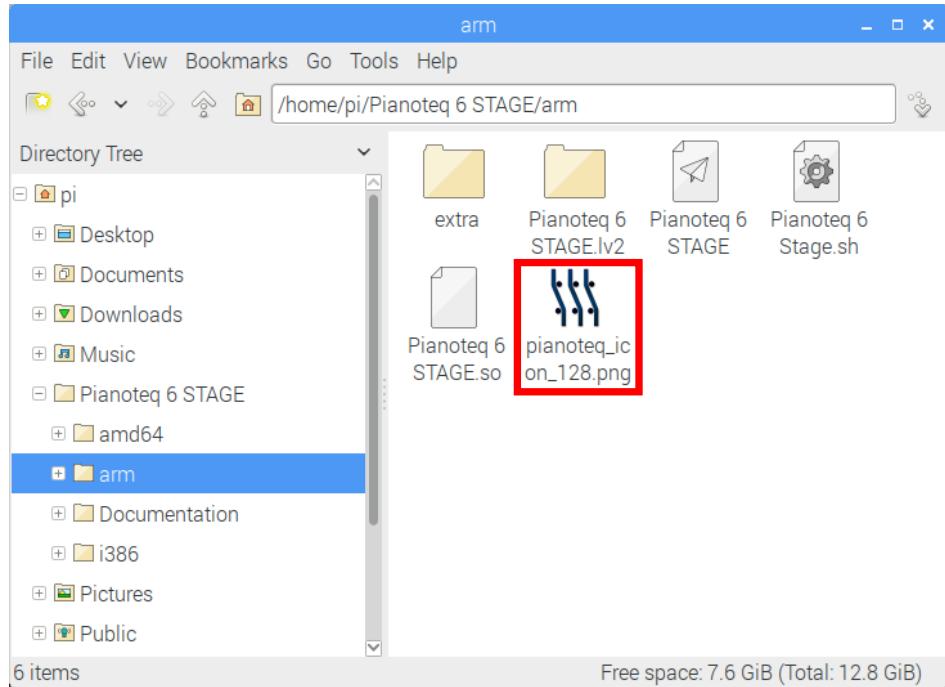
Save modified buffer? (Answering "No" will DISCARD changes.)
Y Yes
N No      ^C Cancel
```

You need to turn the shell script into an executable for the desktop shortcut. To do this, type the following line of code in the terminal but change it to the path where the shell script is located. Notice that it is almost the same line of code that you used to create the shell script but with “nano” replaced for “chmod +x”. When you finish press Enter.

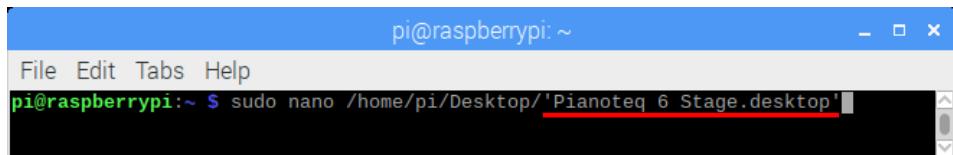


```
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudo chmod +x /home/pi/'Pianoteq 6 STAGE'/arm/'Pianoteq 6 Stage.sh'
```

Go to Google images using Chromium, type **Pianoteq** icon, and download the **Pianoteq** Icon. Save it in the same folder where the **Pianoteq** executable and the shell script are saved. In this case, the icon was saved as “pianoteq_icon_128.png” in the folder “/home/pi/Pianoteq 6 STAGE/arm/”. The desktop shortcut will use this image as the icon.



To create the desktop shortcut for **Pianoteq**, type the following line of code. Change the highlighted text to the name to your version of **Pianoteq** but include the “.desktop” at the end and include the quotations if you have spaces in the name. When you finish press Enter.

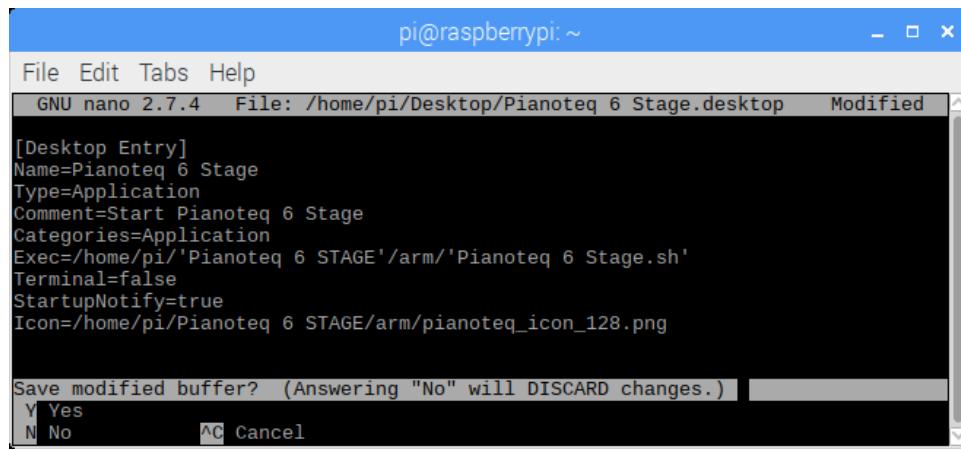


Type the following lines of code and change the highlighted text. Name is the name of the shortcut. Comment just explains what the shortcut does. Exec is the directory path to the executable shell script you created. Icon is the directory path to the **Pianoteq** image you downloaded (this is the only place where quotations are not needed for names with spaces). When you finish press CTRL+X.

```
pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 2.7.4  File: /home/pi/Desktop/Pianoteq 6 Stage.desktop  Modified
[Desktop Entry]
Name=Pianoteq 6 Stage
Type=Application
Comment=Start Pianoteq 6 Stage
Categories=Application
Exec=/home/pi/'Pianoteq 6 STAGE'/arm/'Pianoteq 6 Stage.sh'
Terminal=false
StartupNotify=true
Icon=/home/pi/Pianoteq 6 STAGE/arm/pianoteq_icon_128.png

^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^V Replace ^U Uncut Text ^T To Spell ^L Go To Line
```

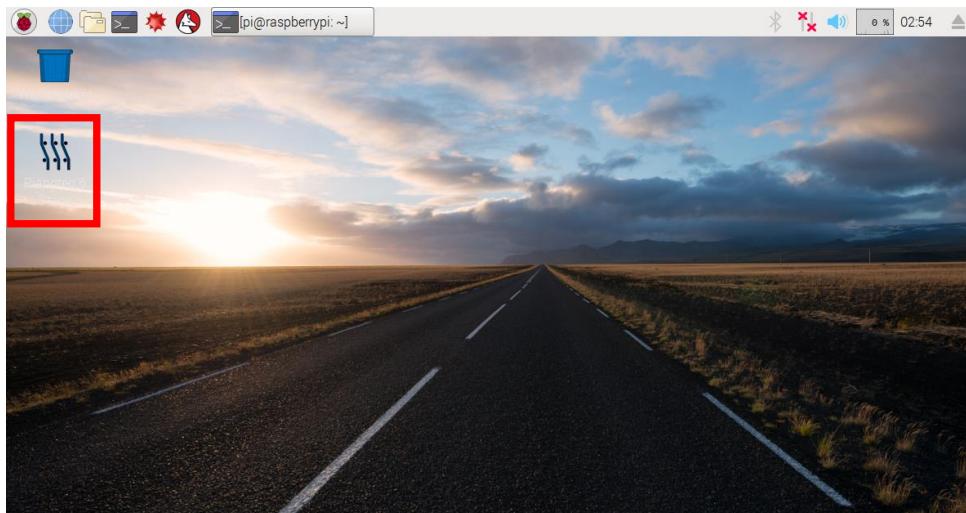
Save the desktop shortcut by pressing y and then pressing Enter.



```
pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 2.7.4  File: /home/pi/Desktop/Pianoteq 6 Stage.desktop  Modified
[Desktop Entry]
Name=Pianoteq 6 Stage
Type=Application
Comment=Start Pianoteq 6 Stage
Categories=Application
Exec=/home/pi/'Pianoteq 6 STAGE'/arm/'Pianoteq 6 Stage.sh'
Terminal=false
StartupNotify=true
Icon=/home/pi/Pianoteq 6 STAGE/arm/pianoteq_icon_128.png

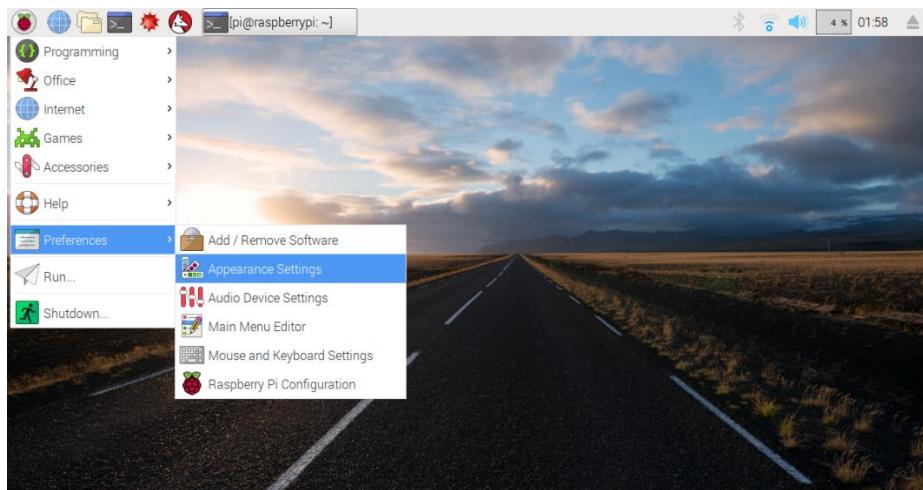
Save modified buffer? (Answering "No" will DISCARD changes.)
Y Yes
N No      ^C Cancel
```

A new desktop shortcut with the **Pianoteq** logo is on the desktop now. Double clicking on it will start **Pianoteq** with all four cores in performance mode (at maximum frequency) with an aggressive multithreading strategy. For optimal results do not run CPU-intensive applications along with **Pianoteq**.

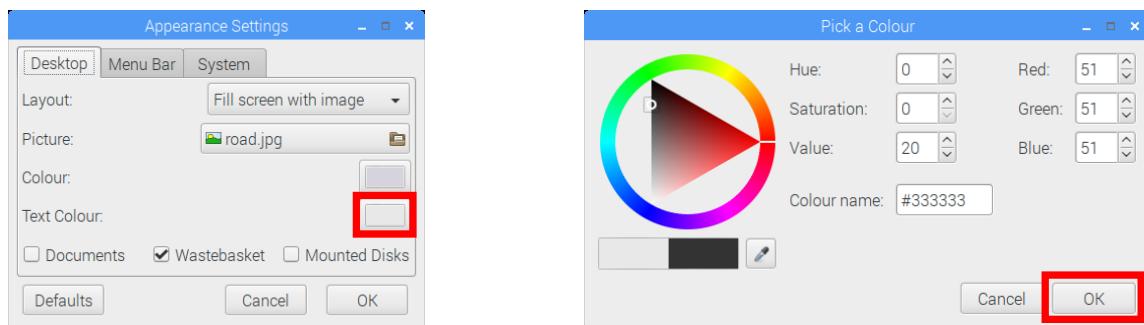


6.6 Change Desktop Icons Text Color

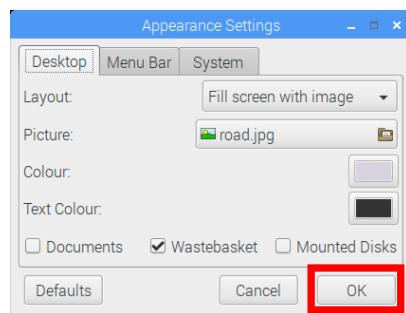
If the desktop icons text are hard to head due to the background color, you can change the desktops shortcuts' text color. Press the Raspberry Pi logo, go to Preferences and then to Appearance Settings.



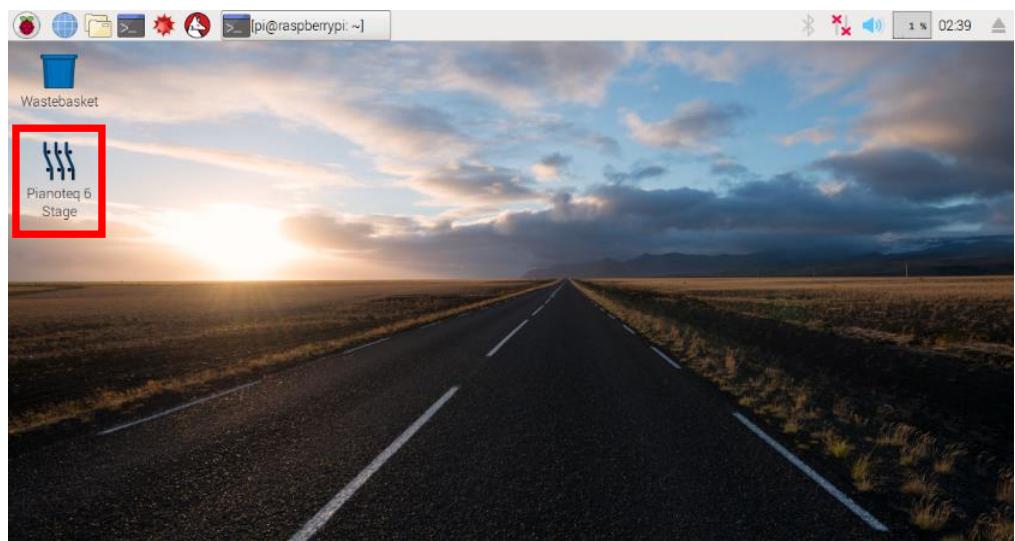
In here, you can change the background picture and/or the text color. I will change the text color to a dark color instead of the background picture.



When you change the color press Ok.



The text of all the desktop shortcuts will now be dark and visible.



7 Digital to Analog Converter (DAC)

A high fidelity DAC can take the Pianoteq sound quality to a completely new level while helping lower the CPU load to allow Pianoteq to use higher internal sampling rates. The Suptronics X400 expansion board connects via I2S through the Raspberry Pi pins but other DACs that connect through a USB port can be connected such as the Audioengine D1.

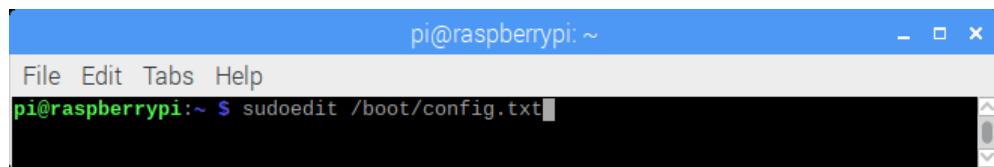
7.1 Hardware Setup

Take the X400 board and stack on top of the Raspberry Pi 3 so that it looks like the picture below. **Remember not to power the Raspberry Pi 3 using the micro USB port anymore!** **Power the system through the power port on the X400.** From now on, the X400 board will supply power through the pins to the Raspberry Pi 3 and any other electronic devices connected to the system.



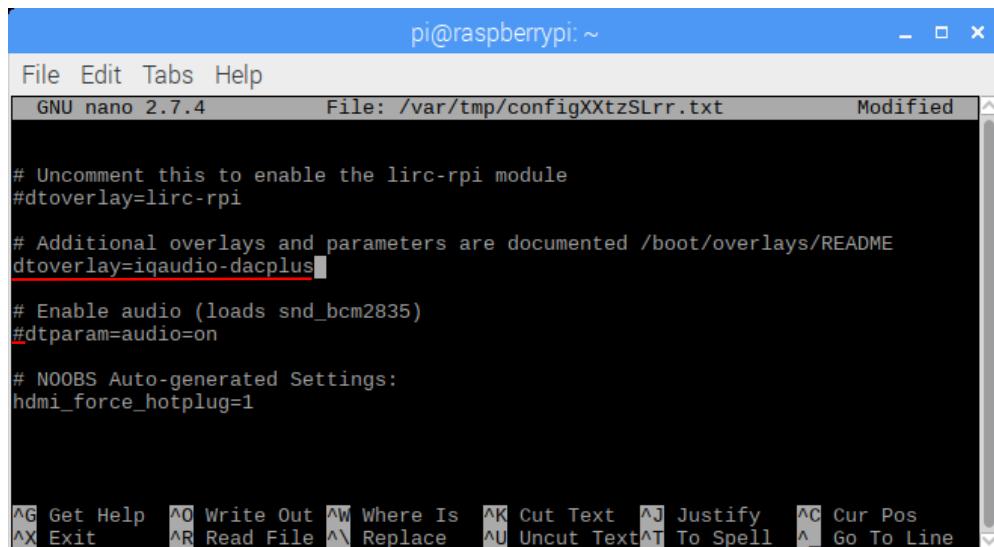
7.2 Software Setup

The Raspberry Pi's latest kernels and firmware use something called a Device Tree (DT), which simplifies the use of modules. To setup the X400 board type the following line in the terminal and press Enter.



```
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudoedit /boot/config.txt
```

Scroll down to section of the config.txt file where it says “# Additional overlays...” using the arrow keys and type the following line of code and comment “dtparam=audio=on” with a “#” in front of it. Commenting this line of code will disable the Raspberry Pi 3 driver for the onboard sound, I want this because I will be using the X400 as the main sound card. You can always go back and uncomment this if you want to use the onboard sound card. Press CTRL+X when you have made the changes to the config.txt file.



```
pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 2.7.4      File: /var/tmp/configXXtzSLrr.txt      Modified
# Uncomment this to enable the lirc-rpi module
#dtoverlay=lirc-rpi

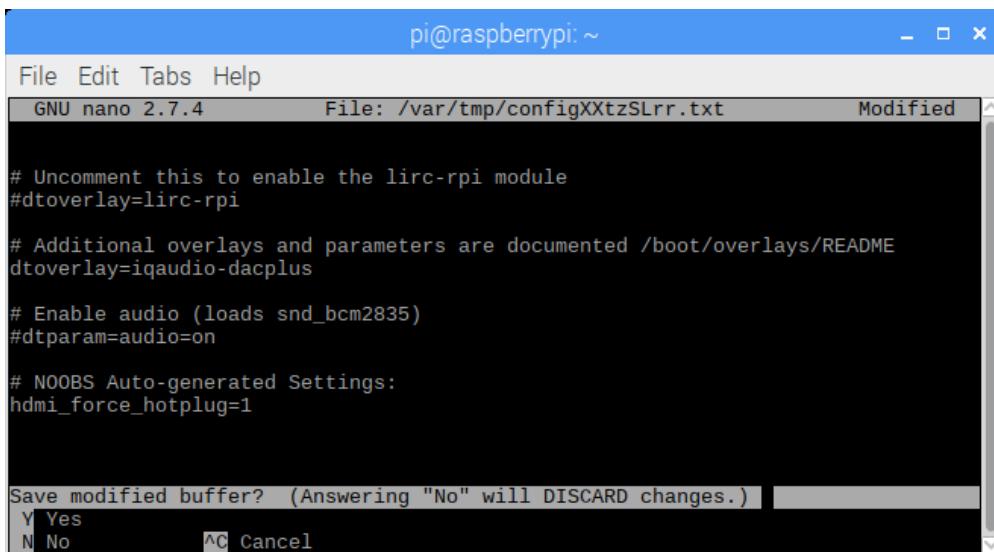
# Additional overlays and parameters are documented /boot/overlays/README
dtoverlay=iqaudio-dacplus

# Enable audio (loads snd_bcm2835)
#dtparam=audio=on

# NOOBS Auto-generated Settings:
hdmi_force_hotplug=1

^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify  ^C Cur Pos
^X Exit     ^R Read File  ^\ Replace   ^U Uncut Text ^T To Spell  ^_ Go To Line
```

Save the config.txt file by pressing y and then pressing Enter.



```
pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 2.7.4      File: /var/tmp/configXXtzSLrr.txt      Modified
# Uncomment this to enable the lirc-rpi module
#dtoverlay=lirc-rpi

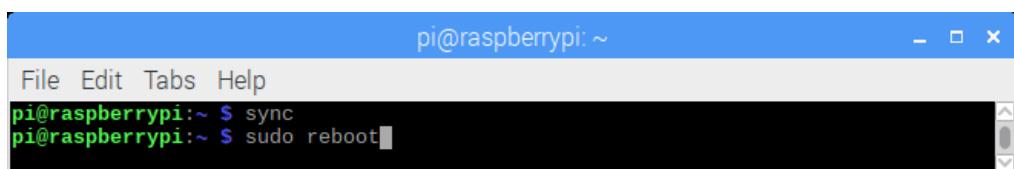
# Additional overlays and parameters are documented /boot/overlays/README
dtoverlay=iqaudio-dacplus

# Enable audio (loads snd_bcm2835)
#dtparam=audio=on

# NOOBS Auto-generated Settings:
hdmi_force_hotplug=1

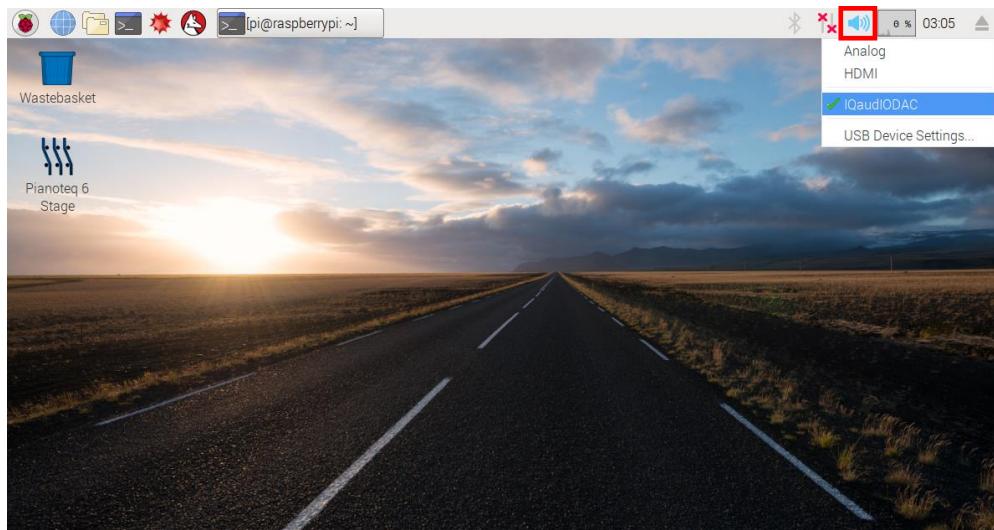
Save modified buffer? (Answering "No" will DISCARD changes.)
Y Yes
N No
C Cancel
```

Flush the file system changes you made and reboot the Raspberry Pi by typing the following lines of code and pressing Enter.



```
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sync
pi@raspberrypi:~ $ sudo reboot
```

When the system reboots make sure that the X400 sound card is selected as the sound output by right clicking on the sound icon and selecting “IQaudIODAC”.

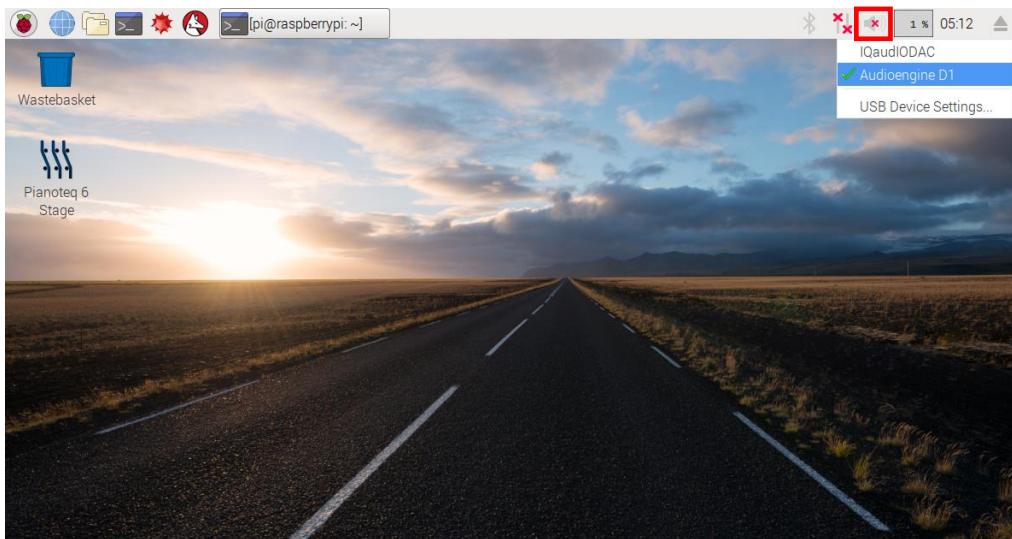


7.3 Other sound cards (USB type)

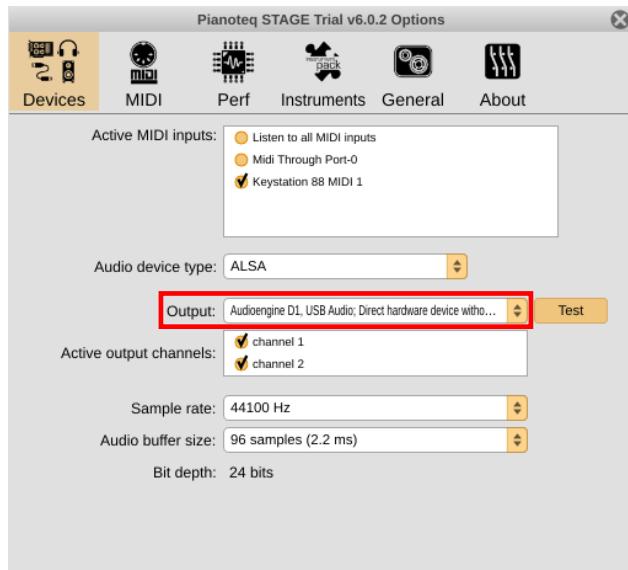
Sound cards such as the Audioengine D1 (USB) are as simple as plug and play.



To use these type of DACs connect the DAC through the USB Input to the Raspberry Pi 3 USB port and select the DAC as the sound output by right clicking in the sound icon. In this case I have both, the X400 board and the Audioengine D1 connected.



Make sure that you select the sound card you are using as the output in the **Pianoteq** settings, in this case it is the “Audioengine D1, USB Audio; Direct hardware device without any conversions“. The signal sent to the sound card needs to be without any conversions. This makes the sound card do all the work, reducing the CPU load.



8 Pianoteq Settings

8.1 Recommended Settings

To access the **Pianoteq** settings click on the following tab under File.



The following settings are the recommended **Pianoteq** settings with the default Raspberry Pi 3 settings. Make sure that the Output option in the Devices tab is selected to the sound card that you are using and without conversions, in this case, is the X400 sound card “IQaudIODAC, ; Direct hardware device without any conversions”.

Two side-by-side screenshots of the Pianoteq STAGE Trial v6.0.2 Options dialog box. The left screenshot shows the "Devices" tab selected. It has sections for "Active MIDI inputs" (with "Keystation 88 MIDI 1" checked), "Audio device type" (set to "ALSA"), and "Output" (set to "IQaudIODAC, ; Direct hardware device without any conversions..."). The right screenshot shows the "Perf" tab selected. It displays CPU information (CPU identification: ARM, x4; CPU frequency: 1200MHz), a "Multicore rendering (MAX)" checkbox, and sample rate settings (Internal sample rate: 29400 Hz, Host sample rate: 44100 Hz, Buffer size: 96 samples). Both screenshots have a red box highlighting the "Output" field in the left one.

If you would like to increase the default recommended settings for **Pianoteq** while preventing pops and crackles to go to section 8.2 for more information on how to do this.

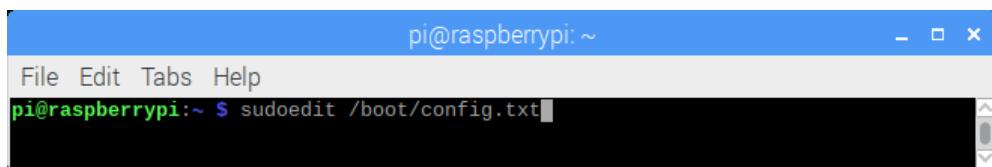
8.2 Overclocking the CPU

Pianoteq and/or myself are not responsible for voiding the warranty on your Raspberry Pi 3, any injuries or damage caused to you, anyone, property, or your Raspberry Pi 3 due to overclocking your Raspberry Pi 3 CPU; proceed at your own risk.

Not all Raspberry Pi are created equal due to quality controls and this will work for some Raspberry Pi and not for others. The following things can void the warranty of your Raspberry Pi 3.

1. Setting the over_voltage setting above 6. This setting provides more voltage to the CPU and Core in increments of 0.025V.
2. Enabling the force_turbo setting. This setting forces the CPU to run at the max CPU frequency always.
3. Disabling the current_limit_override setting. This setting offers hardware protection.
4. Setting the temp_limit above 85 °C. This is a CPU overheat protection.

Overclocking the CPU of the Raspberry Pi 3 can help Pianoteq be setup to higher internal sampling rates. This however will create more heat inside the CPU, which is why you need fan/heat sink to maintain the CPU temperature at working conditions. The CPU will begin to throttle if the CPU reaches 85 °C. The settings used to overclock the CPU might be slightly different for every Raspberry Pi 3 because every Raspberry Pi is slightly different when it comes to overclocking it. You will have to play around with the settings to find the optimal settings. To change the settings to overclock the CPU type the following line of code in the terminal.



```
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudoedit /boot/config.txt
```

Mainly, two parameters need to be changed to overclock the Raspberry Pi 3. These are the speed of the ARM core and the voltage of the ARM core. You can change other parameters but these two are the only ones needed to boost Pianoteq. In section 6.2, the maximum CPU frequency was set to 1200 MHz; overclocking the device will automatically change that frequency to the new max frequency you define here.

```

pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 2.7.4          File: /var/tmp/configXXSbaTnr.txt          Modified
# uncomment for composite PAL
#sdtv_mode=2

#uncomment to overclock the arm. 700 MHz is the default.
arm_freq=1400
core_freq=500
sram_freq=500
gpu_freq=400
over_voltage=6

# Uncomment some or all of these to enable the optional hardware interfaces
#dtparam=i2c_arm=on
#dtparam=i2s=on
#dtparam=spi=on

# Uncomment this to enable the lirc-rpi module
#dtoverlay=lirc-rpi

^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit      ^R Read File ^L Replace ^U Uncut Text ^T To Spell ^_ Go To Line

```

Save the config.txt file by pressing y and then pressing Enter.

```

pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 2.7.4          File: /var/tmp/configXXSbaTnr.txt          Modified
# uncomment for composite PAL
#sdtv_mode=2

#uncomment to overclock the arm. 700 MHz is the default.
arm_freq=1400
core_freq=500
sram_freq=500
gpu_freq=400
over_voltage=6

# Uncomment some or all of these to enable the optional hardware interfaces
#dtparam=i2c_arm=on
#dtparam=i2s=on
#dtparam=spi=on

# Uncomment this to enable the lirc-rpi module
#dtoverlay=lirc-rpi
Save modified buffer? (Answering "No" will DISCARD changes.)
Y Yes
N No      AC Cancel

```

Reboot your system for the changes to take effect by typing the following line of code in the terminal.

```

pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudo reboot

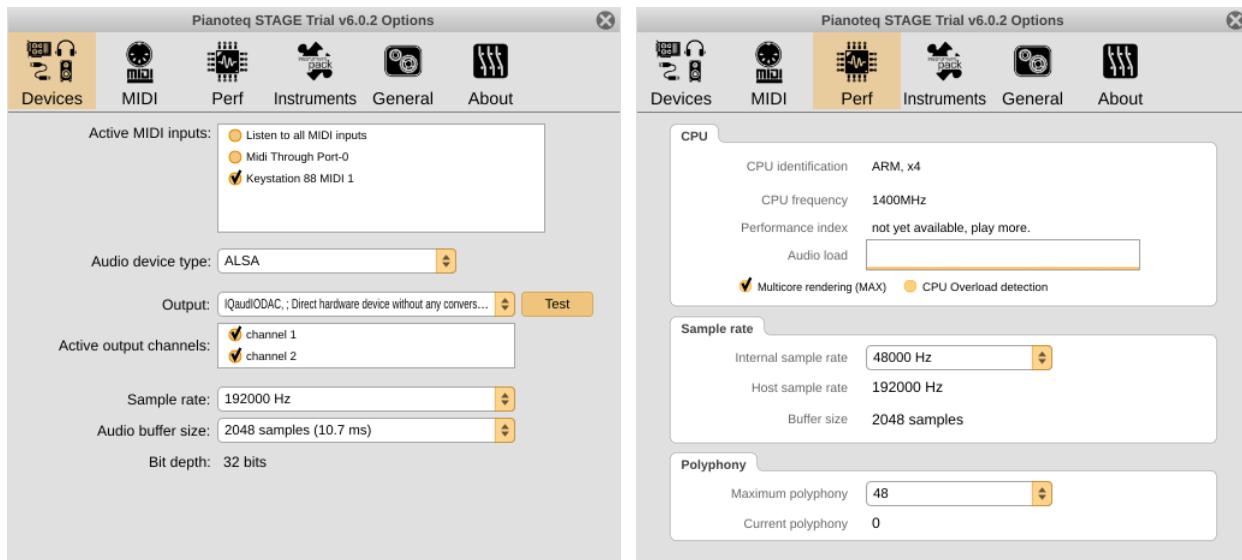
```

The following setups are there to serve as a guide and not as absolute settings. You will have to play with the settings, remember, not all Raspberry Pi 3 are created equal. Some Raspberry Pi 3 can overheat fast with a frequency of 1250 and in some cases a Raspberry Pi 3 can reach a

frequency of 1450 with proper cooling. Start with the first setting, move up the list, try **Pianoteq**, and reboot the system every time you change these settings. Also try changing the Maximum polyphony and Audio buffer size for better results.

arm_freq=1250	over_voltage=2
arm_freq=1300	over_voltage=3
arm_freq=1350	over_voltage=4
arm_freq=1400	over_voltage=5
arm_freq=1450	over_voltage=6

In my setup, I was able to overclock the Raspberry Pi 3 to a frequency of 1400MHz with an overvoltage of 6. The following images show my setup in **Pianoteq**. What worked for me may not necessarily work for you. To optimize your system look at the Audio load in the Performance tab as you play while tweaking the parameters, this will give you a good idea if the parameters you set are too much for the CPU (red lines) or not. To learn about more overclocking a Raspberry Pi go to <https://www.raspberrypi.org/documentation/configuration/config-txt/overclocking.md>.



9 Raspberry Pi 7" Touchscreen Display

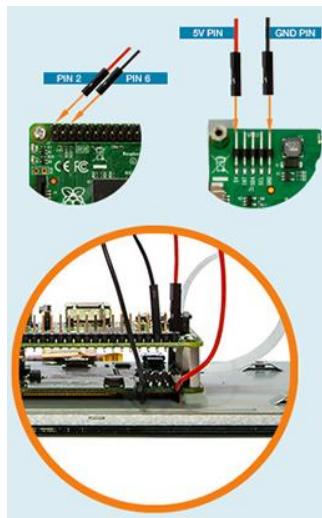
This section will explain how to connect and setup the Raspberry Pi 7" touchscreen display with the Raspberry Pi 3. Some cases for this display require the display to be rotated physically or through a command. I will show you how to rotate the display using a command.

9.1 Hardware Setup

Start by connecting the DSI ribbon cable to the display board and then connect the DSI ribbon cable to the Raspberry Pi 3 DSI connector.



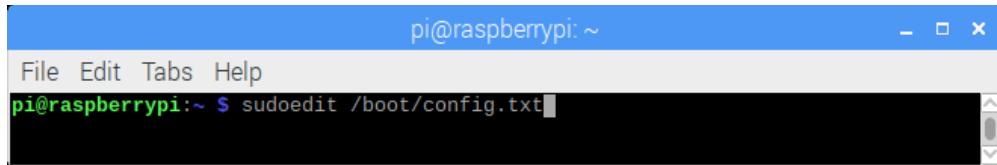
This display can receive power through the 5V and GND pins on the board or the micro USB input. In this configuration, I will connect the 5V and GND pins on the X400 board to the 5V and GND pins on the display board.



When the Raspberry Pi 3 gets powered on, the touchscreen display will be working.

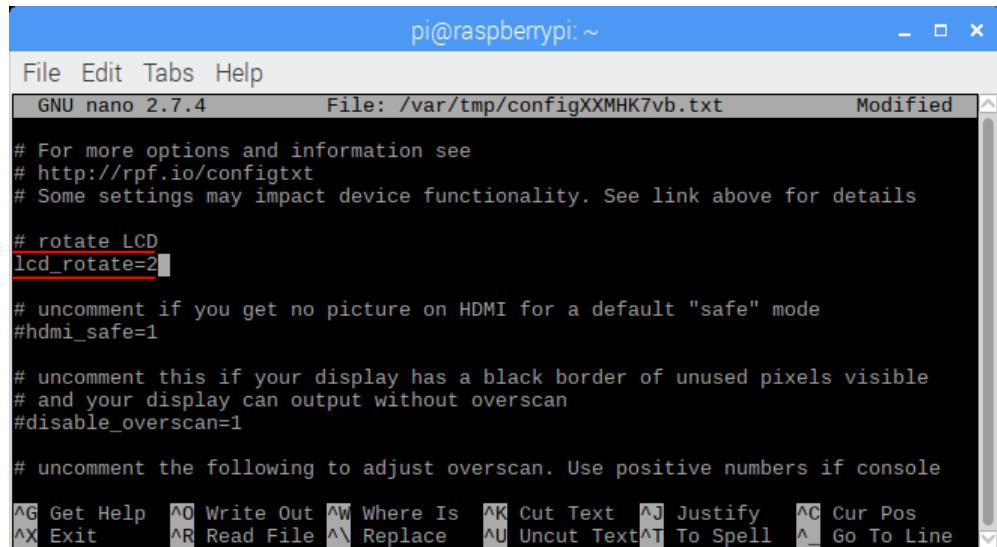
9.2 Rotate Display

Some cases for the touchscreen display will show the display upside down, this happened to me with the Eleduino bamboo case. If this is the case with your system, you can rotate the display by editing the config.txt file. Type the following line of code in the terminal.



```
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudoedit /boot/config.txt
```

Add the following two lines of code in the config.txt file and press CTRL+X.



```
pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 2.7.4      File: /var/tmp/configXXMHK7vb.txt      Modified
# For more options and information see
# http://rpfi.io/configtxt
# Some settings may impact device functionality. See link above for details

# rotate LCD
lcd_rotate=2

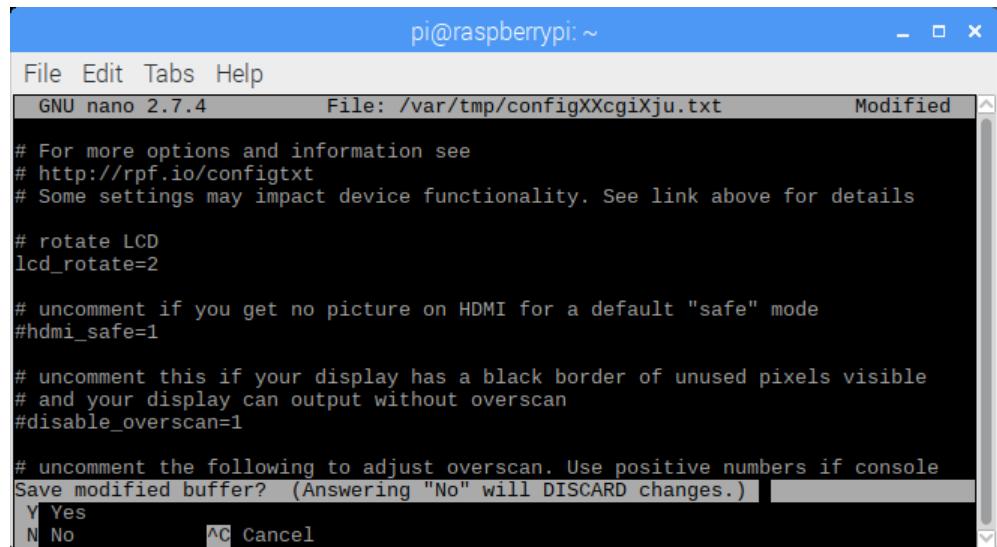
# uncomment if you get no picture on HDMI for a default "safe" mode
#hdmi_safe=1

# uncomment this if your display has a black border of unused pixels visible
# and your display can output without overscan
#disable_overscan=1

# uncomment the following to adjust overscan. Use positive numbers if console

^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit      ^R Read File ^\ Replace   ^U Uncut Text^T To Spell  ^_ Go To Line
```

Save the config.txt file by pressing y and then pressing Enter.



```
pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 2.7.4      File: /var/tmp/configXXcgiXju.txt      Modified
# For more options and information see
# http://rpfi.io/configtxt
# Some settings may impact device functionality. See link above for details

# rotate LCD
lcd_rotate=2

# uncomment if you get no picture on HDMI for a default "safe" mode
#hdmi_safe=1

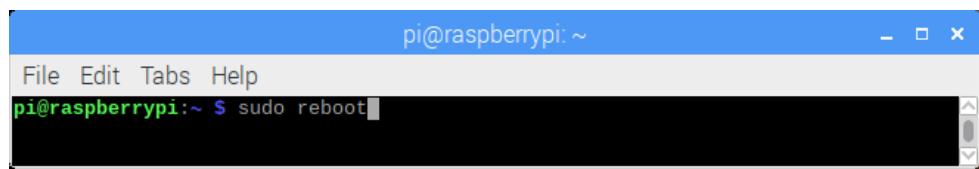
# uncomment this if your display has a black border of unused pixels visible
# and your display can output without overscan
#disable_overscan=1

# uncomment the following to adjust overscan. Use positive numbers if console
Save modified buffer? (Answering "No" will DISCARD changes.)
```

Y Yes
N No

Cancel

Type the following line of code to reboot the system. The display will be rotated 180° when the system reboots.

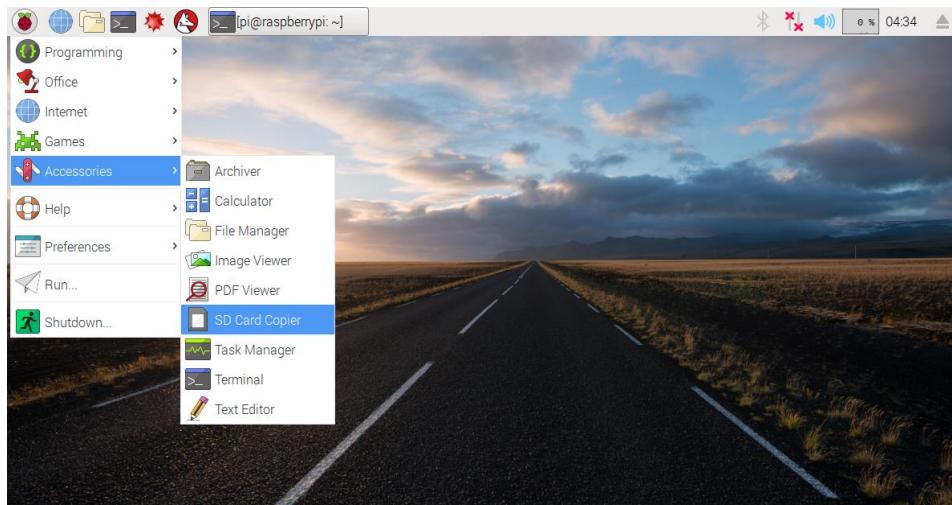


A screenshot of a terminal window titled "pi@raspberrypi: ~". The window has a blue header bar with the title and standard window controls (minimize, maximize, close). Below the header is a grey menu bar with "File", "Edit", "Tabs", and "Help". The main area is a black terminal window. In the top left corner of the terminal, the text "pi@raspberrypi:~ \$ sudo reboot" is visible, indicating the user is about to execute a system reboot command.

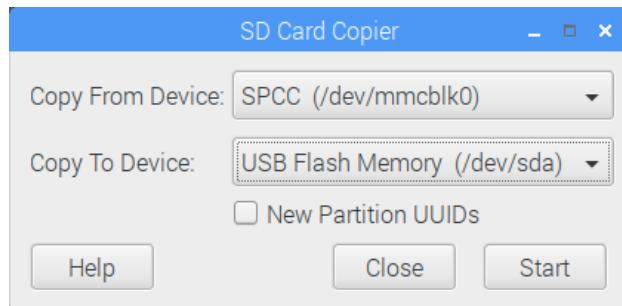
10 Additional Information

10.1 Create a Backup

Creating a backup of your system is very important; it can save you from having to redo this tutorial all over again. You can create a backup on another SD card by using the SD Card Copier that is built into Raspbian. Connect a new SD card using a USB adapter to one of the Raspberry Pi 3 USB ports and select the following program.



Once the SD Card Copier program starts select the SD card containing Raspbian in “Copy From Device” and select the SD card that will contain the back up in “Copy To Device” and click on Start. This process will take a few minutes.



When the SD card finishes copying, close the SD Card Copier, and eject the SD card pressing on the following icon. You can now remove the SD card adapter from the Raspberry Pi 3 USB port and you now have a backup of your entire **Pianoteq 6** Raspberry Pi 3 system.

