adafruit learning system

PiMiner Raspberry Pi Bitcoin Miner

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Guide Contents

Guide Contents 2
Initial Setup & Overview 3
What you'll need: 3
A note about USB mining devices 4
Install Software 5
cgminer 5
PiMiner 6
Configure Settings 7
Start Mining 8
Run cgminer 8
Run PiMiner 9
Controls 11
Up/Down Buttons 11
Screen 1: 11
Left/Right Buttons 13
Select Button 14
Configure Auto-start 15
How do you stop it? 17
Option 1: Stop mining & shutdown via the SELECT button 17
Option 2: Stop mining without shutting down 17
Next, we can find cgminer's process ID by entering the following: 18

Initial Setup & Overview

WARNING - this project is for historical reference only. The mining process has changed considerably since this guide written and project code will need to be overhauled before use.

First off, if you're wondering what bitcoins are, Learn more here (https://adafru.it/cgM).

Building this project will allow you to use a Raspberry Pi as a 'headless' controller and status monitor for your USB bitcoin mining devices. The project incorporates an LCD to display hashrate, error rate, share data, network difficulty, mining duration, & current exchange rates.

What you'll need:

- Raspberry Pi (http://adafru.it/998)+ SD Card running Raspbian (http://adafru.it/1121) configured for network access
- Adafruit 16x2 LCD + Keypad Kit (any color style will work) assembled & installed
- I2C, & Adafruit Pi Code libraries installed on Pi (https://adafru.it/aTI)
- USB Bitcoin Mining Device
- Powered USB Hub (needed for USB powered miners) (http://adafru.it/961) - most hubs can power up to 4 of these miners (others may use more or less current). You can always get more hubs, one for every 4 miners!
- Mining Pool Account (Login/Password)
- Your Computer (for configuration and setup)

Before you start this tutorial you'll need a fully working Pi with network setup and also an assembled Adafruit LCD Pi Plate.

For help with initial setup, check out the following tutorials:

- Lesson 1. Preparing an SD Card for your Raspberry Pi (https://adafru.it/aWq)
- Lesson 2. First Time Configuration (https://adafru.it/aUa)
- Lesson 3. Network Setup (https://adafru.it/aUB)
- Lesson 4. GPIO Setup (https://adafru.it/aTH)
- Adafruit 16x2 Character LCD + Keypad for Raspberry Pi (https://adafru.it/cgw)

When you've got all that working, come back here!

A note about USB mining devices

At the time of this writing, dedicated bitcoin mining hardware can be somewhat hard to find, but they are becoming more common as next generation ASIC-based devices are released. A number of open source projects and related info can be found in the BitcoinTalk forums (https://adafru.it/cgx).

For this tutorial I'll be using ASICMiner Block Erupter USB devices. Though this tutorial uses details specific to the Block Erupter USB, a few small modifications should make it work with any hardware compatible with cgminer v3.1.1

Install Software

cgminer

Cgminer (https://adafru.it/diY) is a cross-platform program for mining crypto-currency with support for SHA-256 (https://adafru.it/cgB) and scrypt (https://adafru.it/cgC) algorithms, as well as drivers for a broad range of mining hardware.

To install cgminer on the Pi, we'll first need to connect to the Pi via ssh (https://adafru.it/aWc) or console cable (https://adafru.it/aUA).

Once you're logged in, ensure all preexisting software is up to date by entering the following:

```
sudo apt-get update
```

After the update has completed, Install the all of cgminer's software dependencies by entering:

```
sudo apt-get install libusb-1.0-0-dev libusb-1.0-0 libcurl4-openssl-dev libncurses5-dev libudev-dev
```

Once dependencies are installed, download the cgminer software using:

```
cd
```

```
wget http://ck.kolivas.org/apps/cgminer/3.1/cgminer-3.1.1.tar.bz2
```

Note: this is not the latest version of cgminer, at the time of this writing, the current version (3.3.1) has issues communicating with Block Erupter USB on Raspbian

After the download is complete, decompress it by entering the following:

```
tar xvf cgminer-3.1.1.tar.bz2
```

Move to the decompressed cgminer directory:

```
cd cgminer-3.1.1
```

Configure the software for use with Block Erupter USB devices:

```
./configure --enable-icarus
```

Note: Other device types will require specific "--enable" parameters, see cgminer's README files for more info

Finally, make the program:

```
make
```

... and that's all for the cgminer install. Return to the home directory by entering:

```
cd
```

PiMiner

The PiMiner software continuously gathers info from cgminer, formats it for display, and responds to button presses on the 16x2 Character LCD Plate.

To install it, enter the following commands:

```
git clone https://github.com/adafruit/PiMiner.git
```

Once the download is complete, we're ready to configure settings for our miner.

Configure Settings

Now we can create a configuration file to store the settings we'll use with cgminer.
Create the file and begin editing it by entering the following command:

```
sudo nano cgminer.conf
```

Update the below template with your mining pool credentials by replacing "PoolAddress:Port", "UserName.WorkerName", and "Password" with your info, then copy & paste into the nano editor:

```
{
"pools" : [
        {
                "url" : "PoolAddress:Port",
                "user" : "UserName.WorkerName",
                "pass" : "Password"
        }
]
,
 "api-listen" : true,
 "api-port" : "4028",
 "expiry" : "120",
 "failover-only" : true,
 "log" : "5",
 "no-pool-disable" : true,
 "queue" : "2",
 "scan-time" : "60",
 "worktime" : true,
 "shares" : "0",
 "kernel-path" : "/usr/local/bin",
 "api-allow" : "0/0",
 "icarus-options" : "115200:1:1",
 "icarus-timing" : "3.0=100"
}
```

> The above lines containing "icarus" were included for Block Erupter USB devices, be sure to update them if you are using a different mining device!

For example, if you mine using Slush's pool (https://adafru.it/cgD) you would replace "PoolAddress:Port", with:

```
"http://stratum.bitcoin.cz:3333",
```

Once you've updated and pasted the above text, do the following:

1. press ctl+x to begin exiting the file
2. press y to confirm changes
3. press return to save the file

Settings are now saved. We'll reference them later when starting cgminer.

Start Mining

Now connect your USB mining device(s) to your Raspberry Pi.

If you're mining device is powered via USB (such as the Block Erupter USB, or Klondike1), you'll need to connect it to a powered hub, which then connects to the Pi. Mining devices which use external power should be happy with either direct or hub connection.

Run cgminer

Once everything is connected, we'll need to find the address of each device. To List all serial USB devices, enter the following command:

```
ls /dev/*USB*
```

You should see something like this:

The above shows two USB serial addresses; /dev/ttyUSB0 and /dev/ttyUSB1
We'll pass these to cgminer using the "-S" parameter.

To start cgminer running as a background process using Block Erupter USBs, enter the following command:

```
sudo nohup ./cgminer-3.1.1/cgminer --config /home/pi/cgminer.conf -S /dev/ttyUSB0 -S /dev/ttyUSB1 >/dev/n
```

Replace "/dev/ttyUSB0" and "/dev/ttyUSB1" with your device addresses

For other types of USB miners, check out the cgminer README files to determine which parameters to use and include them in the following format (and remove the curly braces!):

```
sudo nohup ./cgminer-3.1.1/cgminer --config /home/pi/cgminer.conf {add parameters here!} >/dev/null 2>&1&
```

We'll be using the cgminer startup command later on to configure auto-start. If you customized it, be sure to paste a copy of it into a scrap text document for later reference.

If you're using USB Block Erupters, you should see the green idle LEDs turn off at this point, indicating that cgminer has started using them.

Run PiMiner

Now start PiMiner as a background process by entering the following command:

```
sudo python PiMiner/PiMiner.py &
```

The LCD should now light up and display your mining info, like so:

Controls

The LCD Plate's buttons can be used to adjust the info displayed and control the backlight.

Up/Down Buttons

Pushing the Up or Down buttons will cycle through the available info screens:

Screen 1:

- Accepted shares, Rejected shares, Hardware errors
- Average hashrate (hashes per second)

Screen 2:

- Active pool address & port
- Current worker name

Screen 3:

- Continuous Uptime formatted as: days:hours:minutes
- Current network difficulty

Screen 4:

- Number of mining devices
- Error percentage

Screen 5:

- Last bitcoin price via MtGox exchange
- High & Low prices via MtGox exchange

Left/Right Buttons

The left & right buttons are used to adjust text position when a line contains more than 16 characters. This occurs most

often with pool addresses (see Screen 2)

After several seconds the text position will automatically reset to its original position

Select Button

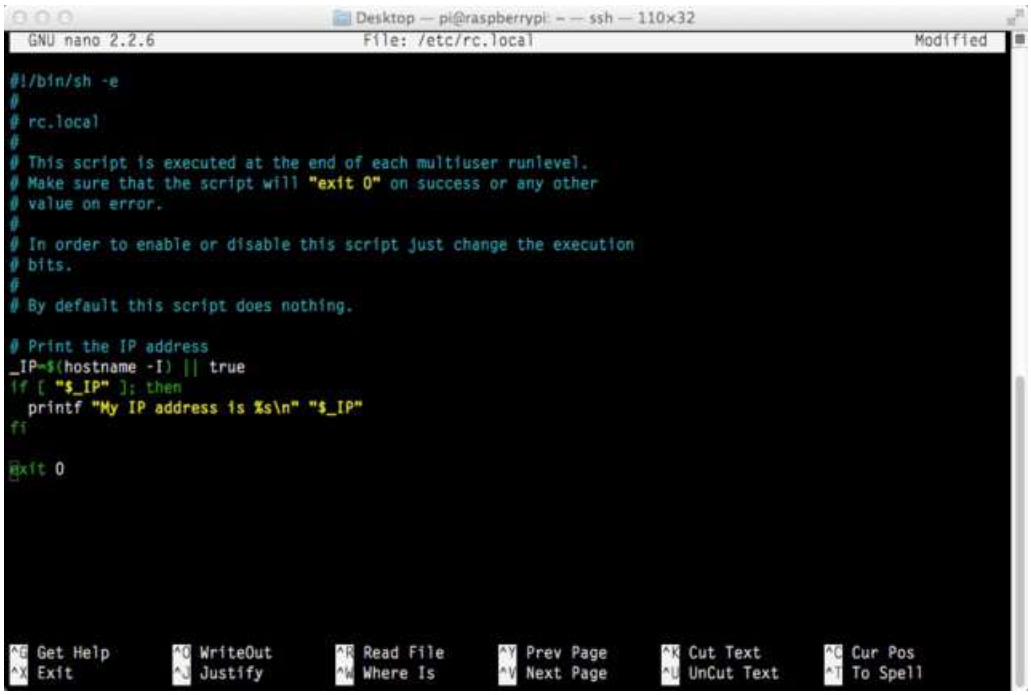
Pushing the select button will toggle the display backlight on/off when using a single color display and will cycle colors on RGB displays.

Configure Auto-start

Now that you've tested and confirmed your miner is working, we can set it to begin mining automatically on startup. To do so, we'll need to edit a file named **rc.local**.

Open **rc.local** in the **nano** editor by entering the following command:

```
sudo nano /etc/rc.local
```



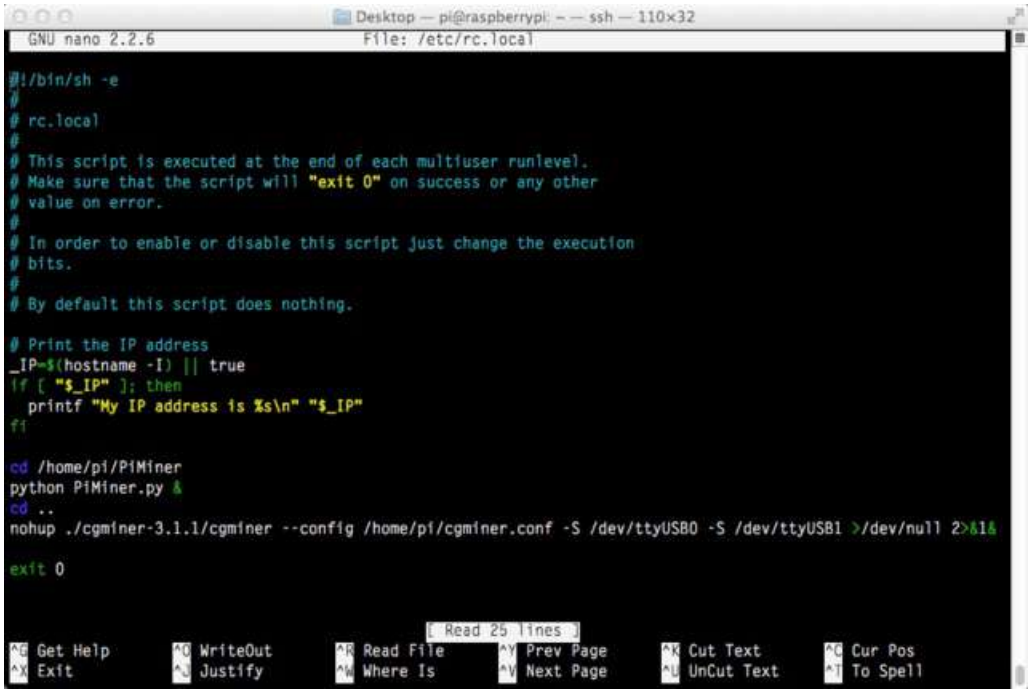
We'll need to add our custom startup commands above the last line which reads "**exit 0**"

The block of code shown below will start PiMiner & cgminer using two USB Block Erupters and is similar to what we used to start mining manually.

Simply replace the last line with the command you used to start cgminer earlier, but remove the leading "**sudo**"

```
cd /home/pi/PiMiner
python PiMiner.py &
cd ..
nohup ./cgminer-3.1.1/cgminer --config /home/pi/cgminer.conf -S /dev/ttyUSB0 -S /dev/ttyUSB1 >/dev/null 2
```

Paste the updated code into the nano editor above "**exit 0**" so that it looks like the following:



Once you've finished updating the file, do the following:

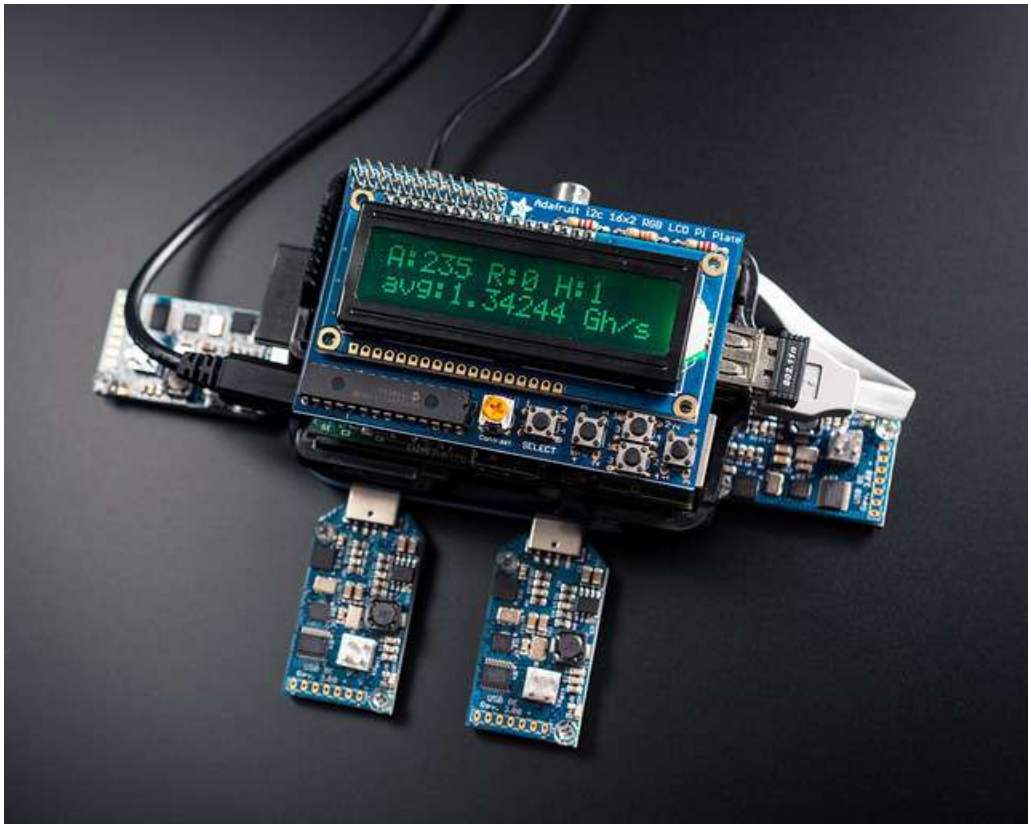
1. press ctl+x to begin exiting the file
2. press y to confirm changes
3. press return to save the file

Now when the Pi boots up, it will automatically start cgminer & the PiMiner scripts.

> Note: the mining startup process can take a minute or two, during which you may notice your mining devices start, go idle, and then start again.

How do you stop it?

Cgminer 3.1.1 does not support USB hot swapping (https://adafru.it/cgE). So before adding or removing USB miners, you'll need to shut down mining operations.



Option 1: Stop mining & shutdown via the SELECT button

(courtesy of the Raspberry Pi WiFi Radio project (https://adafru.it/c7J))

The easiest way to stop mining is to press & hold the **SELECT** button for three seconds. After doing so, you should briefly see this message before the LCD backlight turns off:

At this point, the Raspberry Pi will run through its shutdown routine and halt all processes. You'll need to wait up to 30 seconds before unplugging and/or restarting your Pi.

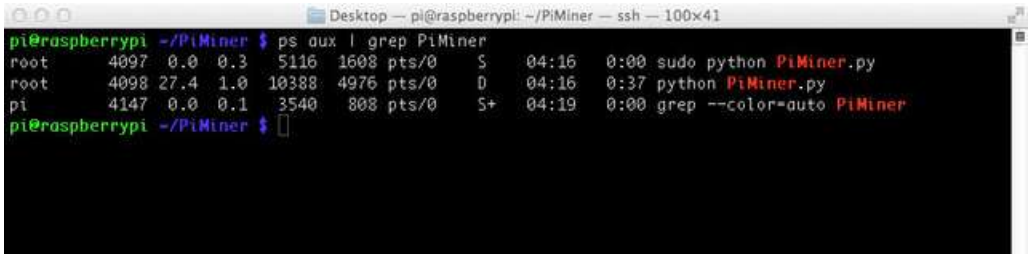
Option 2: Stop mining without shutting down

Alternatively, if you wish to stop mining without shutting down your Pi, connect to the Pi using ssh (https://adafru.it/aWc) or console cable (https://adafru.it/aUA) and enter the following commands.

First, to stop the PiMiner script currently running in the background, we'll need to find its process ID by entering the following:

```
ps aux | grep PiMiner
```

Entering the command should return a list like this one:



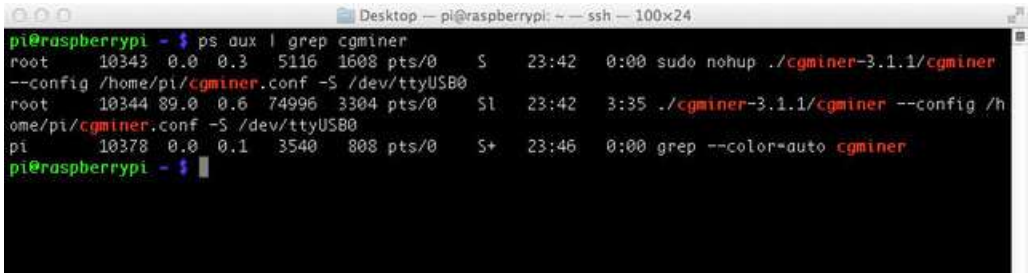
The top entry in the list tells us the PiMiner's process ID (4097, in this example).

Use it to stop PiMiner by entering:

```
sudo kill 4097
```

Next, we can find cgminer's process ID by entering the following:

```
ps aux | grep cgminer
```



Now use the top listed process ID to stop cgminer:

```
sudo kill 10343
```

That's all - mining has ceased!