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Author

Topic: (Review/Guide) AvalonMiner 851 14.5 Th/s, 1450W Bitcoin (SHA-256) ASIC miner (Read 2 times)

HagsFIN
Legendary

(Review/Guide) AvalonMiner 851 14.5 Th/s, 1450W Bitcoin (SHA-256) ASIC miner
Today at 10:03:46 PM

#1

Activity: 1036
Merit: 1175



Electrical engineer (B.E.),
Mining since 2014.



(Review/Guide) AvalonMiner 851 14.5 Th/s, 1450W Bitcoin (SHA-256) ASIC miner



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Last updated in: October 5, 2018.

1) General information, other items needed [\(top\)](#)

AvalonMiner 851 is a Bitcoin (SHA-256) ASIC miner using 16nm ASIC chip technology. It is manufactured by **Canaan Creative** (headquarters in Beijing, China). This miner is the third 8th generation AvalonMiner model, and it uses a 16nm Bitcoin ASIC chip called **A3210M**.

The chip performance and power efficiency is quite close to the A3210HP chip used in the AvalonMiner 841 model.

AvalonMiner 851 does not have a built-in controller included and you need a separate controller unit, like AvalonMiner Controller or any of the Raspberry Pi single-board computer models to run it. This feature makes it possible to connect up to max. 20 AvalonMiners to be controlled by the controller unit. Five miners per one AUC3 converter and four AUC3 converters per one controller unit. This saves some money in network infrastructure cost especially if you have a large mining operation.

AvalonMiner 851 weights 4.7 kg and outer dimensions are 370mm x 150mm x 136mm. The nominal hashrate is 14.5 Th/s (-5% - +10%) with a nominal power consumption of 1450 W (+0% - +20%).

This is a review and also a setup instructions guide for the AvalonMiner 851.

There is also a separate troubleshooting guide for AvalonMiner 7 and 8 series.
Link: <https://bitcointalk.org/index.php?topic=3224256>

Technical specifications:

Code:

```

AvalonMiner 851
Hash rate: 14.5 Th/s, -5% ~ +10%
Power consumption: 1450 W, +0% ~ +20% @ 14.5TH/s, 25°C, 93% PSU Efficiency, 12V AC, Wall-Plug
Power efficiency: 0.1 J / Gh/s Wall-Plug
DC voltage input: 12 ~ 12.6 VDC
ASIC chip type: A3210M (16nm SHA-256 ASIC chip)
ASIC chip quantity per unit (miner): 104 chips
Number of hash boards per unit: 4 hash boards
Cooling: 1x 120mm x 38mm 12VDC 2.7A fan; manufacturer & model: Delta QFR1212GHE (mounted in rear for a p
Weight: 4.7 kg
Dimensions: 370 mm (L) x 150 mm (H) x 136 mm (W)
Operating temperature: -5 to 30 degrees Celsius.

```

Other items needed:

- One server grade 12 Vdc power supply with at least 8x PCI-E 6-pin connectors, every connector with a dedicated cable and at least 18AWG wire gauge. The power capacity is recommended to be at least 1600 W.
Sorcerer Power Supply Unit is the official 1600 W custom power supply unit for AvalonMiners.
- C13 power cord suitable to your country's electrical socket. Use only good quality, large wire gauge power cords.
- AvalonMiner Controller or Raspberry Pi single-board computer.
- 5 Vdc 2.4 A USB wall wart for the controller unit.
- USB Type-A -> Micro USB cable between the controller unit and the 5 Vdc 2.4 A USB wall wart.
- Ethernet cable to go from the controller unit to your router/switch device.
- Computer to set initial pool and configuration settings.

2) Unpacking (top)

This AvalonMiner 851 unit was received as a sample unit and I decided to do a review for this new 8 series model.

The packaging is done in the same way as with the previous AvalonMiner 8 series miners. So these notes and images are quite the same as in the AvalonMiner 841 review.

There are two pieces of foam in both ends of the miner supporting and protecting it, and also one piece of foam in the middle section. The cardboard box is just the right size for this packing setup and there is no extra space. This is important as we don't want the miner to move inside the cardboard box during the shipping.

The large courier companies are able to do the delivery pretty fast internationally even with the standard service and it took DHL only 5 working days to deliver shipment from China to Finland. even though the straight line distance between these countries is roughly 6000 kilometers.

After unpacking and unwrapping the miner was ready to be setup and tested.



Unpacking the miner. Click for a higher resolution image. Pictures taken by HagssFIN.

When you buy a A851 unit, you get the miner and one AUC3 cable.

It is important to notice that you also need the AUC3 converter, a controller unit and of course a power supply unit. With previous AvalonMiner series models there used to be one AUC3 and AUC3 converter in the same cardboard box with the miner, but now you need to buy AUC3 converters separately or buy the AvalonMiner Controller kit.

With AvalonMiner Controller kit you get this following list of items:

AvalonMiner Controller	
Product	Quantity
AvalonMiner Controller (RPI 3 based device)	1
Micro SD memory card with preinstalled OpenWrt based controller firmware	1
AUC3 I2C-USB converter dongle	4
USB Type-A -> Micro USB cable	5

AvalonMiner Controller product list.

As mentioned earlier, if you want to use your own Raspberry Pi single-board computer as the controller unit, it is also possible to buy AUC3 Converter dongles separately from both Canaan and their official distributors.

3) Overview (top)

This following chapter focuses on having a close look at the miner and the controller gear that I used with the miner.

Click the image to show a higher resolution image. Pictures taken by HagssFIN.





4) Controller unit setup (top)

When it comes to the controller unit, you have two options:

1. You can use the AvalonMiner Controller.

Using it is very straight forward, because it is ready assembled and the OpenWrt based firmware is already installed on the Micro SD card.



AvalonMiner Controller. Click for a higher resolution image.. Pictures taken by HagssFIN.

2. You can build one yourself by using a Raspberry Pi single-board computer and other supplies.

So in this next part you can see how to build a controller by yourself, using a Raspberry Pi 3 single-board computer and some other supplies needed.

It is fairly easy to source these parts needed and you can use a local electronics store to find these supplies.

Here is an example for the shopping list:

- Raspberry Pi 3 single-board computer
- Case for the Raspberry Pi 3
- 8GB Micro SD card
- 5 Vdc 2.4 A USB wall wart

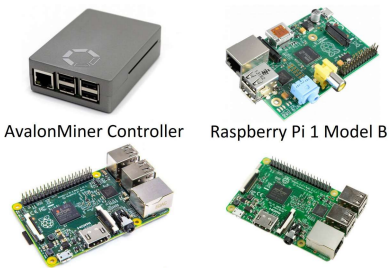
- USB Type-A -> Micro USB cable



Supplies. Click for a higher resolution image. Pictures taken by HagssFIN.

List of supported controller devices:

- AvalonMiner Controller (RPI 3 based device)
- Raspberry Pi 1 Model B
- Raspberry Pi 2 Model B
- Raspberry Pi 3 Model B



Raspberry Pi 2 Model B Raspberry Pi 3 Model B
Supported controller devices. Click for a higher resolution image.

Controller setup instructions:

1.

AvalonMiner Controller's OpenWrt based firmware supports the following types of Raspberry Pi single-board computer:

- AvalonMiner Controller
- Raspberry Pi 1 Model B
- Raspberry Pi 2 Model B
- Raspberry Pi 3 Model B

2.

A minimum capacity of 4GB memory card is required.

There is no requirement for brands, speed rating is recommended for Class 10.

(Please be select type of memory card based upon your selected Raspberry Pi model)

- Raspberry Pi 1 Model B using a SD card
- Raspberry Pi 2 Model B using a Micro SD card
- Raspberry Pi 3 Model B using a Micro SD card
- AvalonMiner Controller using a Micro SD card

3.

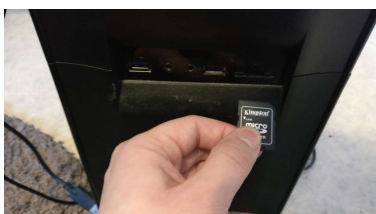
You need to have a SD card reader.

When you buy the Micro SD card, you want to make sure it comes with a SD card adapter.



Micro SD card with a SD card adapter. Click for a bigger version. Picture taken by HagssFIN.

Put your memory card to the SD card reader.



Integrated SD card reader. Click for a higher resolution image. Picture taken by HagssFIN.

4.

Depending on your Raspberry Pi model, select and download the firmware version.

Raspberry Pi 1 Model B Firmware:

<https://canaan.io/downloads/software/avalon851/openwrt/latest/rpi1-modelb/openwrt-brcm2708-bcm2708-rpi-ext4-sdcard.img>

Raspberry Pi 2 Model B Firmware:

<https://canaan.io/downloads/software/avalon851/openwrt/latest/rpi2-modelb/openwrt-brcm2708-bcm2709-rpi-2-ext4-sdcard.img>

Raspberry Pi 3 Model B Firmware:

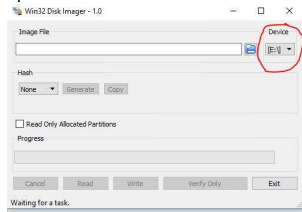
<https://canaan.io/downloads/software/avalon851/openwrt/latest/rpi3-modelb/openwrt-brcm2708-bcm2710-rpi-3-ext4-sdcard.img>

5.

Install a tool for writing a image to SD card, if you don't have one installed already.
Win32 Disk Imager: <https://sourceforge.net/projects/win32diskimager/>

6.

Open the tool software and select your SD card reader device letter.

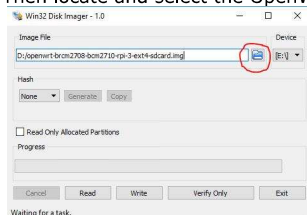


Click for a higher resolution image.

7.

First click the folder icon.

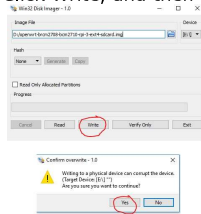
Then locate and select the OpenWrt firmware you downloaded earlier.



Click for a higher resolution image.

8.

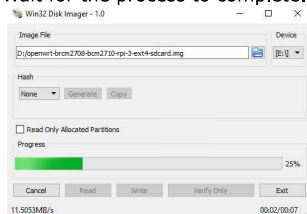
Click Write, and then click Yes, to start writing your image.



Click for a higher resolution image.

9.

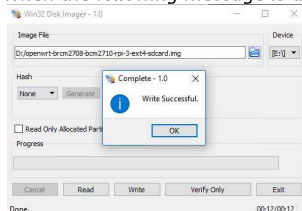
Wait for the process to complete.



Click for a higher resolution image.

10.

When the following message is displayed, it means that you managed to write the OpenWrt firmware successfully.



Click for a higher resolution image.

Click ok and exit.

If you followed these steps successfully, you now have a working controller unit.

5) Physical setup for the miner and controller (top)

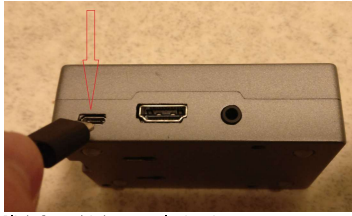
Connecting everything together is quite simple, if you are familiar with ASIC miner hardware.

These instructions have a picture for each to make each step simple and straight forward as possible.

Single miner setup instructions:

1.

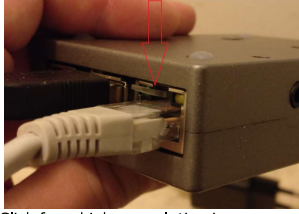
Connect the 5Vdc wall wart to the controller unit.



Click for a higher resolution image.

2.

Connect a Ethernet cable to the controller unit.



Click for a higher resolution image.

3.

Connect the USB Type-A -> Micro USB cable and 5-pin AUC3 cable to the AUC3 I2C-USB communication converter unit.



Click for a higher resolution image.

4.

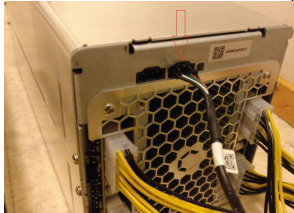
Connect that USB Type-A -> Micro USB cable other end to the controller unit. You can use any of the four USB ports available.



Click for a higher resolution image.

5.

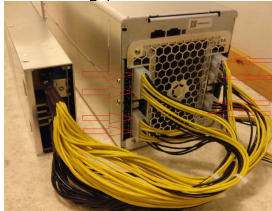
Connect the other end of the 5-pin AUC3 cable to the miner unit.



Click for a higher resolution image.

6.

Connect eight pieces 6-pin PCI-E power cables with individual cables to the miner. It is strongly advised to use a server grade power supply with at least 1400W power capacity.



Click for a higher resolution image.

7.

Plug in the 5 VDC wall wart to power on the controller unit.

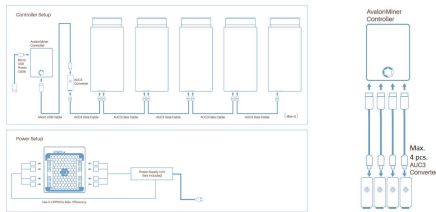
8.

Connect a C13 power cord first to the power supply unit and then to the wall socket. Make sure that the power switch in the power supply unit is turned on.

How to do a setup for twenty miners and one controller unit:

If your setup is going to have more than one miner, you can daisy chain max. five miners per one AUC3 converter and you can connect max. four AUC3 converters to one controller unit.

The setup principles are pretty easy to understand by looking at these following two diagrams:



Click for a higher resolution image.

If you like a video tutorial better, there are two good setup tutorial videos made official Canaan distributors Blokforge (Blokforge official channel) and Cryptouniverse (video released in TechMagnet channel, presenter Stefan is the CTO of Cryptouniverse).

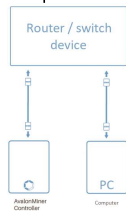
Blokforge tutorial video link: <https://www.youtube.com/watch?v=z8r0tbUmgCU>
Cryptouniverse tutorial video link: <https://www.youtube.com/watch?v=-wa2L97ReOw>

6) Configuration (top)

Controller configuration instructions:

1.

Connect the power to the controller, and make sure that the controller and computer are connected to the same local area network. The other option is that you can also connect the controller directly to the computer with a network cable.



Click for a higher resolution image.

2.

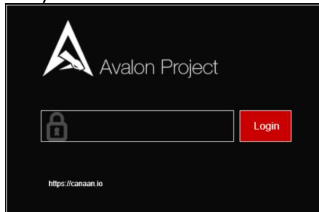
The default IP for the controller is 192.168.0.100. The IP address of the computer needs to be adjusted to access the controller.



Click for a higher resolution image.

3.

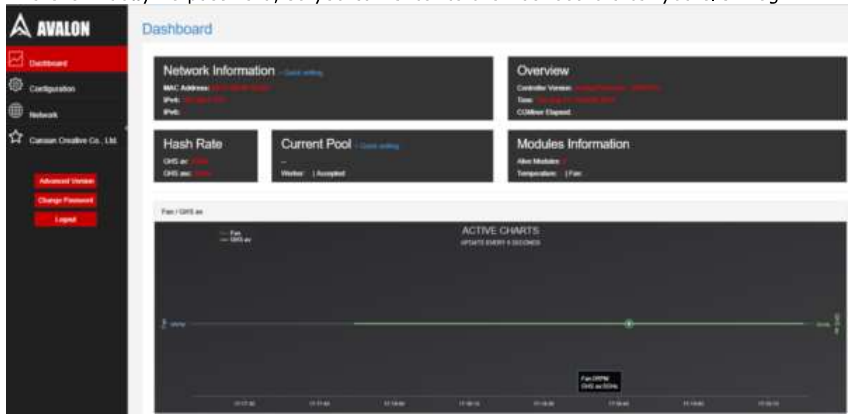
Use your web browser to access "192.168.0.100", and you will see the following login screen.



Click for a higher resolution image.

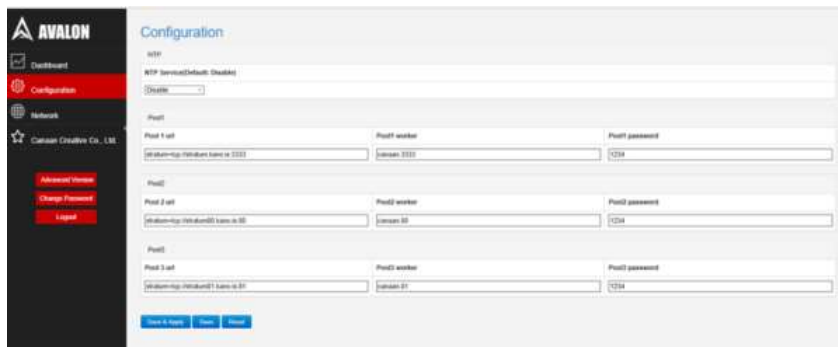
4.

There is initially no password, so you can enter to the Dashboard after you click Login.



5.

You can click Configuration to configure your miners and see your pool information. For example, you can set up three pools and corresponding miners with the default execution priority pool1> pool2> pool3.



6.

If you need to change the network settings for the controller, click on Network to configure, click Save & Apply, and then power down your unit, and manually restart the controller.



7.

After the configuration you can change your computer back to the automatic IP address acquisition.

8.

If the controller is properly connected to the Internet, you can access different sections in the miner web configuration page, for example the Cgminer configuration page and the miner status page. As long as a miner is correctly connected via AvalonMiner USB Converter to this controller unit, you will see them on the overview page and see relevant information on these devices.

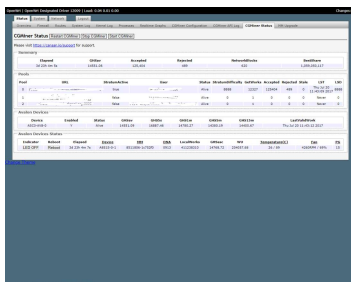


7) Performance test (top)

After all the setup and configuration is ready, it is time to test the miner. Mining was started using the default settings.

The average hash rate after close to four days of running time was 14.55 Th/s.

The advertised hash rate for the AvalonMiner 851 is 14.5 Th/s, which is the minimum hash rate for every sold unit. They say that the actual hash rate is always above the nominal value, and the unit tested here was able to perform 0.05 Th/s better than the advertised value. So I'd say it performed as advertised.



Cgminer status page. Click for a higher resolution image.

The power supply unit used in this test was **Bitmain APW3++** 1600 W power supply.

The power measurements were done with **Perel E305EM6-G** energy meter. [Click here for Perel E305EM6-G technical specs data sheet.](#)

The miner was set with default settings. Hash board frequency is controlled automatically to make each hash board perform best as possible. The default value for Voltage Offset setting is 0.



Perel E305EM6-G. Click for a higher resolution image. Picture taken by HagssFIN.



Power measurement. Click for a higher resolution image. Picture taken by HagssFIN.

The result for the power consumption (at wall) was 1669 W, when the average hash rate was 14,55 Th/s.

With these results the power efficiency at wall can be calculated.

1669 / 14550 = 0.1147 J per Gh/s.

8] Conclusion [\(top\)](#)

Once again I would like to give big thanks to Canaan, especially to Steven and Lily. They really do solid work in the mining hardware field.

The 851 is leading the way for bigger hash rate & power load AvalonMiners. But while the design is improved further a little, the down side with this particular model is that the power efficiency is not as good as it was with the 841.

Canaan is already developing and producing the following AvalonMiner series, the 9 series, and time will tell us what kind of designs that series consists of.

I'm willing to bet on one thing: they will continue to make rock solid quality mining gear compared to some of the competition.

If you got any questions or comments, feel free to drop them here in this thread.

9) How to order [\(top\)](#)

Bulk quantity orders:

If you want to buy bulk quantity of miners, you can buy them directly from the manufacturer **Canaan Creative**. <https://canaan.io/shop/>

Small quantity orders:

If you want to buy less than the minimum bulk sales quantity, you will need to order from your local official Canaan hardware distributor.

[Click here to find out the up-to-date official distributor list.](#)

Canaan Creative:

www.canaan.io

[\(Review/Guide\) Antminer A3 miner](#) | | [\(Review/Guide\) Antminer S9 miner](#) | | [\(Review/Guide\) AvalonMiner 741 miner](#) | | [\(Review/Guide\) AvalonMiner 821 miner](#) | [\(Review/Guide\) AvalonMiner 841 miner](#) | | [Troubleshooting & repair guide for AvalonMiner 721 741 761 821 & 841](#) | | [\(Review/Guide\) BW.com BW-L21 miner](#)

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