(Review/Guide) AvalonMiner 741 7.3 Th/s, 1150W Bitcoin (SHA-256) ASIC miner

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Date:
February 18, 2018.

The most up-to-date version of this review/guide is available at Bitcointalk.org forum:
https://bitcointalk.org/index.php?topic=2937129

Figure 1 AvalonMiner 741. Picture copyright (c) Canaan Creative.

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1. General information, other items needed

AvalonMiner 741 is a Bitcoin (SHA-256) ASIC miner using 16nm ASIC chip technology, manufactured by Canaan Creative (headquarters in Beijing, China).

AvalonMiner 741 does not have a built-in controller and you need a separate controller, AvalonMiner Controller or any of the Raspberry Pi versions to run it. A good feature is that several AvalonMiners can by chained to be controlled by one Raspberry Pi.

AvalonMiner 741 weights 4.3 kg and outer dimensions are 320mm (L) x 136mm (W) x 150mm (H).
The nominal hashrate is between 7.3 to 8.0 Th/s with a nominal power consumption of 1150 Watts.

These products were included with the miner:
- AvalonMiner 741   1 piece
- AvalonMiner USB Converter 3 (AUC3)   1 piece
- Micro USB Cable   1 piece
- AUC3 I2C 5PIN Cable   1 piece

This is a review for both the hardware and for the buying experience from a local official Canaan distributor, Cryptouniverse.

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AvalonMiner 741

Hash rate: 7.3 (min.) - 8.0 (max.)  Th/s
Power consumption: 1150W, +0% ~ +15% (with 93% PSU efficiency @ 25 C)
Power efficiency: 0.16 J / Gh/s  (at the wall)
DC voltage input: 12 VDC (max. 12.53 V)
ASIC chip type: A3212 (16nm SHA-256 ASIC chip)
ASIC chip quantity per unit (miner): 88 chips
Number of hash boards per unit: 2 hash boards
Cooling: 1x 120mm x 38mm 12VDC 2.7A fan; manufacturer & model: Cooler Master A12038-60BB-4RP-F1
Weight: 4.3 kg                                        (mounted in rear for a pull configuration).
Dimensions: 320mm (L) x 136mm (W) x 150mm (H)
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Figure 2 Technical specifications.

Other items needed:
- A server grade power supply with at least 6x PCI-E 6-pin connectors, everyone with a dedicated cable, preferably at least 16AWG wires.
  I used a 1600W power supply called Sorcerer Power Supply Unit to power my miner.
  This is a custom power supply manufactured by Canaan Creative.
- C13 power cord suitable to your country's electrical socket
- AvalonMiner Controller or Raspberry Pi.
- 5V 2.4A USB wall wart for the Controller.
- Micro USB cable between controller and the 5V 2.4A USB wall wart.
- Ethernet cable to go from the controller to your router/switch.
- Computer to set initial pool and configuration settings.

2. Unpacking

So, as Canaan Creative has changed their strategy by selling small quantity orders via their official distributors, I bought this kit from their distributor called Cryptouniverse.
Cryptouniverse is located in Austria and their main area is the EU area,
but they also accept international orders.

Canaan Creative: www.canaan.io

Cryptouniverse: www.cryptouniverse.at

I bought a kit, which also included the power supply and the controller, which you would normally have to buy separately.

BITCOIN Mining Set Avalon 741: https://www.cryptouniverse.at/shop/bitcoin-mining-set-avalon-741/
(Link dead in February 18, 2018).

> **Quote from: Cryptouniverse**
>
> This product contains:
>
> Avalonminer 741   1 piece
>
> Avalonminer USB Converter 3 (AUC3)   1 piece
>
> Micro USB Cable   1 piece
>
> AUC3 I2C 5PIN Cable   1 piece
>
> Controller   1 piece
>
> Sorcerer Power Supply   1 piece
>
> This product DOES NOT contain (You will need it to power the SET):
>
> Mico USB Cable + 5V 2A Adapter   1 piece
>
> Powercable for the Powersupply   1 piece

As I live in Finland, I'm really happy to see an European distributor selling Canaan hardware.
It makes the buying process so much easier, no need to go through the process with customs.

The delivery time from Austria to here in Finland was quick enough, seven days.
It was sent from Austria in December 5.
In December 12 it arrived via GLS (GLS Standard service) to their local delivery partner, Finnish postal service Posti and I was able to pick it up at the post office.

All the goods were packed in a big cardboard box and there was lots of foam for support and protection.
Packaging for the miner was good as it usually is with Canaan products.
The power supply was also packed nicely in foam.

And of course there is a basic setup instructions paper included.
More specific setup instructions can be found online at Canaan website www.canaan.io

Here are some picture showing the packaging material used in the delivery.
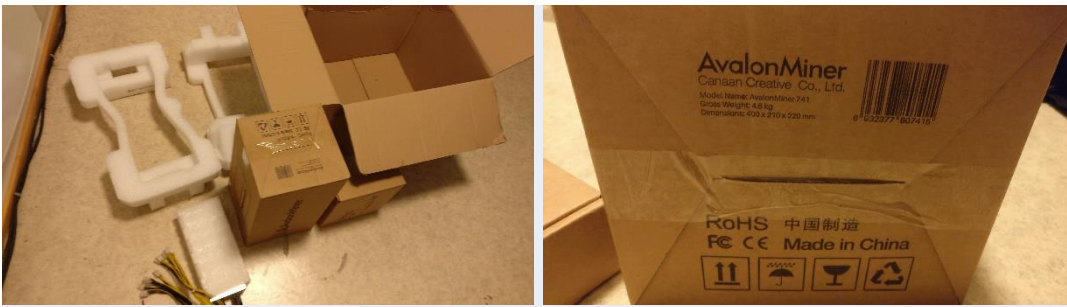
Figure 3 Packaging material, picture set 1.

Figure 4 Packaging material, picture set 2.
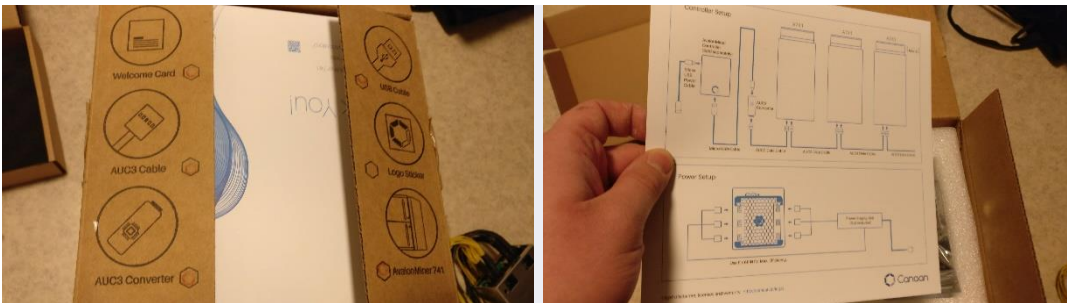
Figure 5 Packaging material, picture set 3.

Figure 6 Packaging material, picture set 4.

3. Overview

Here are some pictures showing the AvalonMiner 741, AUC3 converter, AvalonMiner Controller (Raspberry Pi 3 inside a metal case) and the Sorcerer Power Supply Unit.

You can click these pictures invidually to show a high resolution version of the picture located in a Imgur.com picture album.

Figure 7 AvalonMiner 741 picture set 1.

Figure 8 AvalonMiner 741 picture set 2.

Figure 9 AvalonMiner 741 picture set 3.

Figure 10 AvalonMiner 741 and AvalonMiner Controller picture set.

Figure 11 AvalonMiner Controller picture set

Figure 12 AvalonMiner Controller and Sorcerer PSU picture set.

Figure 13 Sorcerer PSU picture set 1.

Figure 14 Sorcerer PSU picture set 2.

The Sorcerer Power Supply Unit was something that I had not bought and tried before.
So it was nice to buy one in this occasion.

Only minus side that I can find about the power supply is that they have used CapXon capacitors in it.

Some other brand, better quality capacitors would be a nice change.
When I look at the product page for the power supply at www.canaan.io, I can see that there are Rubycon capacitors installed.

So I suggest they ditch those CapXon capacitors and continue with using only Rubycon capacitors.
Rubycon capacitors have better quality.

Otherwise the power supply looks very nice and well made.

I bought a C13 to Type F (schuko) power cord for the power supply.

I also had to buy a wall wart for the AvalonMiner Controller (Raspberry Pi 3) and one Micro USB Cable.

Figure 15 Wall wart and micro usb cable. Controller setup done.

I also did a quick disassembly for the miner, took some pictures and then assembled it back together to continue the mining.

The disassembly and assembly was quite easy, only one screw driver (with Phillips screw head tip) was only needed.

I took some close up pictures of the daughterboard and hash boards.

I really like the robust cooling solution that Canaan has come up with the latest AvalonMiners.
Those are some big ass sized heat sinks with fine fins. Very effective.
They call their solution **Airforming Cooling Technology**.

Figure 16 AvalonMiner 741 disassembled, picture set 1.

Reminder: You can click these pictures invidually to show a high resolution version of the picture located in a Imgur.com picture album.
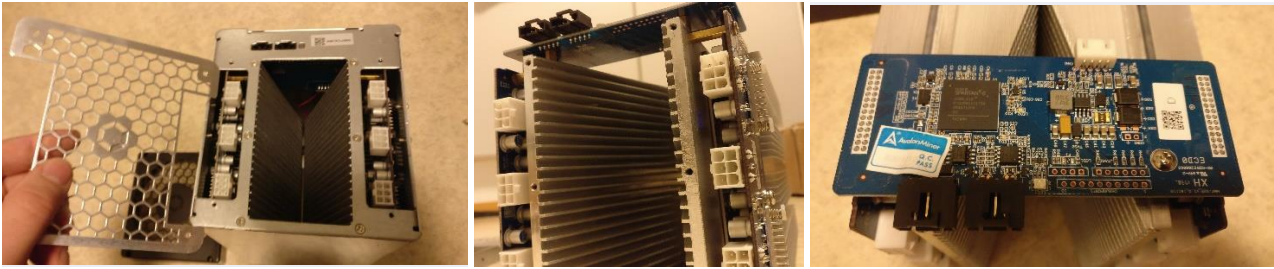
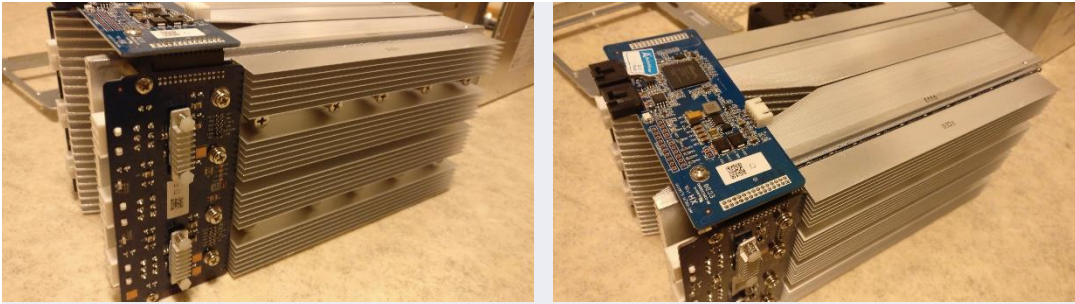*Figure 17 AvalonMiner 741 disassembled, picture set 2.*

Figure 18 AvalonMiner 741 disassembled, picture set 3.

Figure 19 AvalonMiner 741 disassembled, picture set 4.
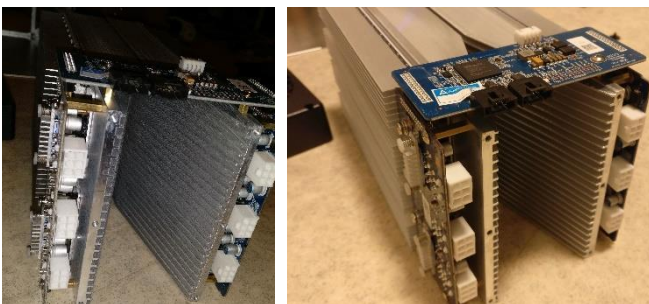
Figure 20 AvalonMiner 741 disassembled, picture set 5.
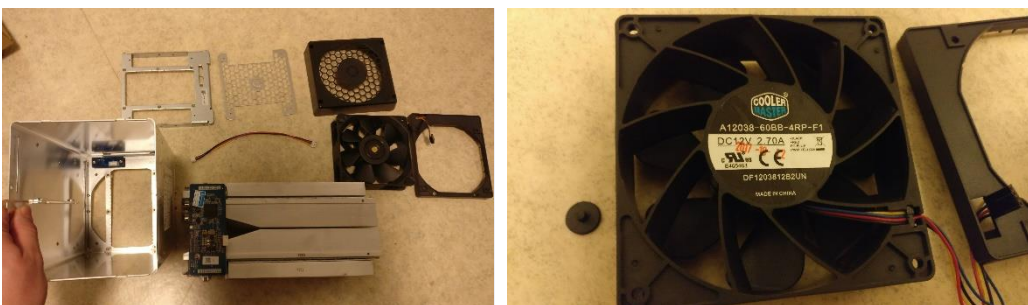
Figure 21 AvalonMiner 741 disassembled, picture set 6.

4. Controller unit setup

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 software is already installed on the Micro SD card.

Figure 22 AvalonMiner Controller picture set.

2. You can build one yourself by using a Raspberry Pi 3 and other supplies.

So in this next part I'm gonna show you how to build a controller by myself,
using a Raspberry Pi 3 single-board computer and some other supplies.

It's really easy to source these parts needed and I used my local electronics store to find these supplies.

Here is my shopping list:
- Raspberry Pi 3
- Transparent plastic case for the Raspberry Pi 3
- 8GB Kingston Micro SD card
- 5VDC 2.4A USB wall wart
- USB-A to Micro USB-B cable

Figure 23 Supplies picture set.

Here are the instructions for doing the controller setup from scratch.

Instructions:

1.
AvalonMiner Controller's firmware supports the following types of Raspberry Pi single-board computer:
- AvalonMiner Controller (Canaan Creative)
- Raspberry Pi 1 Model B
- 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 and 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.
We need a SD card reader.
When you buy a Micro SD card, you want to make sure it comes with a SD card adapter.

Figure 24 Micro SD card with a SD card adapter.

Put your memory card to the SD card reader.

Figure 25 Integrated SD card reader in my PC case front panel.

4.

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

- Raspberry Pi 1 Model B Firmware:
  https://canaan.io/downloads/software/avalon741/openwrt/latest/rpi1-modelb/openwrt-brcm2708-bcm2708-rpi-ext4-sdcard.img

- Raspberry Pi 2 Model B Firmware:
  https://canaan.io/downloads/software/avalon741/openwrt/latest/rpi2-modelb/openwrt-brcm2708-bcm2709-rpi-2-ext4-sdcard.img

- Raspberry Pi 3 Model B Firmware:
  https://canaan.io/downloads/software/avalon741/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.
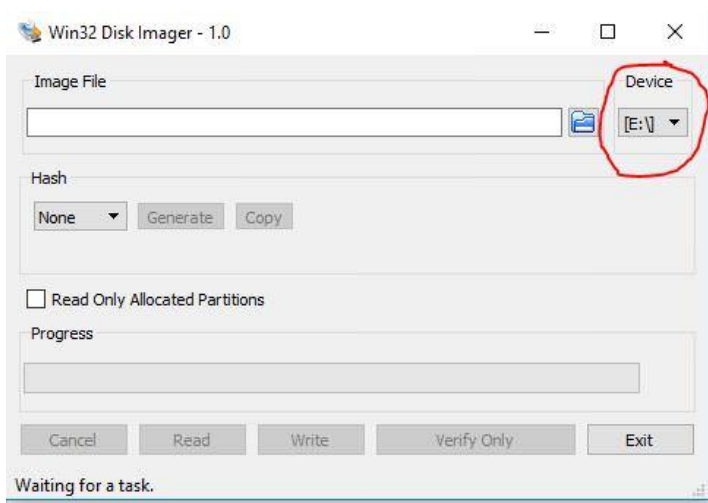
Figure 26 Win32 Disk Imager, picture 1.

7.

First click the folder icon.
Then locate and select your downloaded Openwrt firmware for the Raspberry Pi.

Figure 27 Win32 Disk Imager, picture 2.

8.

Click Write, and then click Yes, to start writing your image.
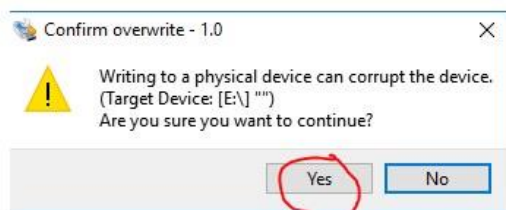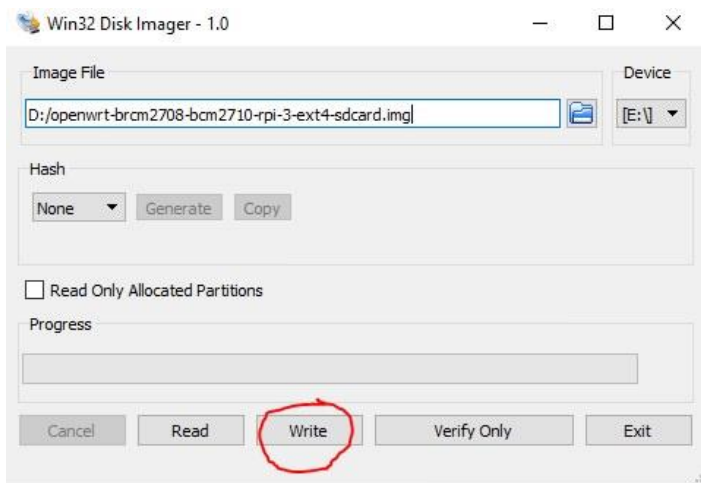
Figure 28 Win32 Disk Imager, picture 3.

9.

Wait for the process to complete.
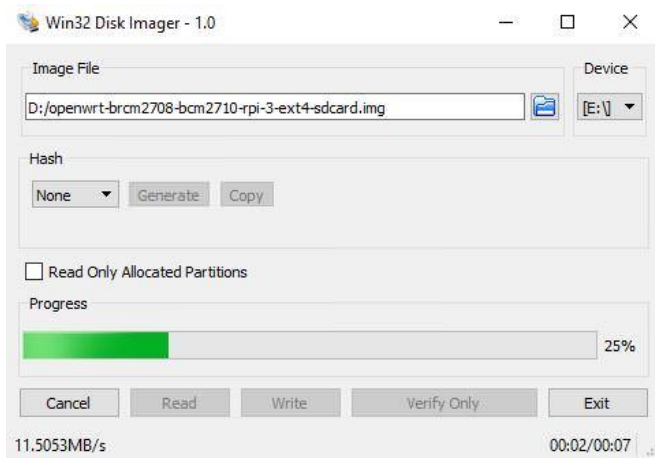
Figure 29 Win32 Disk Imager, picture 4.

10.

When the following message is displayed, your program was successfully written.
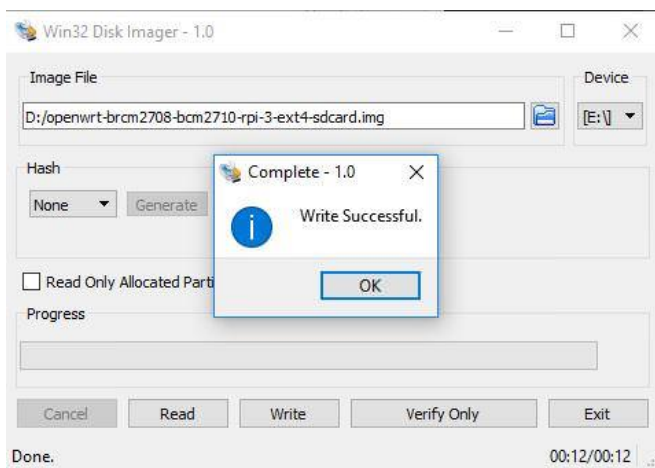
Figure 30 Win32 Disk Imager, picture 5.

Click ok and exit.

If you followed these steps successfully, your controller is initially completed.

5. Install

The installation process was pretty straight forward as it has been for several AvalonMiner generations now.

Connect the AUC3 (AvalonMiner USB Converter) to the AvalonMiner with a 5-pin cable.

Connect the AUC3 other end to the controller (Raspberry Pi) with a micro usb cable.

Connect the Ethernet cable to your controller (Raspberry Pi) and the other end to the router or switch device.

Connect the wall wart to the controller (Raspberry Pi).

And then you need a high power server grade power supply. Install all six pieces PCI-E 6-pin power cables to the power headers found at the front side of the miner.

Connect the power cord to the power supply and to the electrical wall outlet.

Canaan Creative has also made a nice tutorial video for visual instructions.
Video link: https://www.youtube.com/watch?v=Iz9ujCdRXn8

6. Configuration

You can follow these instructions for the controller configuration:

1.
Connect the power to the controller, and make sure the controller and computer is configured to be connected to the same network.
(You can also use the controller connected directly to the computer with a network cable).

2.
The default IP for the controller is 192.168.0.100. The IP address of the computer needs to be adjusted access to the controller.

3.
Use your browser to access "192.168.0.100", and you will see the following login screen.

4.
There is initially no password, so you can enter after click Login Overview screen.

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, 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.

Canaan Creative controller instructions for the A721 and A741:
https://canaan.io/question/how-do-i-connect-an-avalonminer-721-and-avalonminer-controller-including-raspberry-pi-1-2-and-3/

7. Testing

After all the configurations were made, it was time to test the miner.
I started mining with default settings.
The average hash rate was after two hours was close to 8 Th/s.

So this specific unit is definitely in the best perfomance area, when you look at the nominal expected
performance mentioned in technical specifications.

| OpenWrt | OpenWrt Designated Driver 50019 | Load: 0.08 0.02 0.01 | | | | | | | | | Changes: 0 |

Status | System | Network | | Logout

Overview | Firewall | Routes | System Log | Kernel Log | Processes | Realtime Graphs | CGMiner Configuration | CGMiner API Log | **CGMiner Status** | MM Upgrade

CGMiner Status [Restart CGMiner]

Please visit https://canaan.io/support for support.

Summary

Elapsed	GHSav	Accepted	Rejected	NetworkBlocks	BestShare
2h 42m 43s	7975.11	3,340	39	19	13,429,289

Pools

Pool	URL	StratumActive	User	Status	StratumDifficulty	GetWorks	Accepted	Rejected	Stale	LST	LSD
0	stratum+tcp://eu.stratum.slushpool.com:3333	true		Alive	5921	355	3340	39	0	Wed Dec 14 02:02:18 2016	5921
1	stratum+tcp://us-east.stratum.slushpool.com:3333	false		Alive	0	2	0	0	0	Never	0
2	stratum+tcp://de.ckpool.org:3333	false		Alive	0	1	0	0	0	Never	0

Avalon Devices

Device	Enabled	Status	GHSav	GHS5s	GHS1m	GHS5m	GHS15m	LastValidWork
ASC0-AV7-0	Y	Alive	7978.28	6951.28	8069.92	7987.32	7963.40	Wed Dec 14 02:02:24 2016

Avalon Devices Status

Indicator	Reboot	Elapsed	Device	MM	DNA	LocalWorks	DH	GHSasc	WU	Temperature(C)	Fan	PG
LED OFF	Reboot	2h 42m 45s	A741S-0-1	7411706-3162860	735f	432018	2.173%	8377.93	112738.39	33 / 95	5850RPM / 100%	15

Change Theme

Powered by LuCI trunk-38010-g851a890647 Release (git-17.114.43691-ffc1d59)

Figure 31 Miner status page.

8. Power consumption measurement

The power measurement was done with Perel E305EM6-G energy meter.

Technical specs data sheet (.pdf document):
https://www.perel.eu/downloads/22/e305em6e305em6ggbnlfresdptpl.pdf

Figure 32 Perel E305EM6-G.

Figure 33 Power measurement.

Stable result for the power consumption (at wall) was 1382 W, when the hash rate was close to 8 Th/s.

With these results we can calculate the power efficiency at wall.

1382 / 8000 = 0.17275 J per Gh/s.

9. Conclusion

AvalonMiner 741 might be close to EOL (end of life) as a new generation AvalonMiner model is coming available soon, but I think that it is still profitable
for some time and it is definitely one of the most robust Bitcoin mining hardware available and I wanted give it tribute by doing this review.

I would like to thank **Canaan Creative** and **Cryptouniverse** for a nice miner and I was happy to give a review for it here at the forum.
I really appreciate the sturdy design and reliability with the AvalonMiner.

My first experience buying from a official Canaan distributor was really easy and pleasant experience.
I hope to do business again in the future.

If you got any questions, feel free to drop them here in the Bitcointalk.org forum thread.

10.   How to order

Edit (February 18, 2018):
AvalonMiner 741 is EOL (end of life) product, only used secondhand units can be found for sale.
No more new units are produced, as Canaan Creative is now manufacturing the next, 8th AvalonMiner
generation devices.

~~If you want to buy 60 units or more, you can buy them directly from the manufacturer Canaan Creative.~~
~~https://canaan.io/shop/~~

~~If you want to buy less than 60 units, you need to go to your local official Canaan hardware distributor.~~
~~You can find the up-to-date official distributor list here: https://canaan.io/official-distributors/~~

~~I used an European distributor Cryptouniverse, since I live in Finland.~~

~~Cryptouniverse:~~ www.cryptouniverse.at

~~Canaan Creative:~~ www.canaan.io