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Instruction Manual and Setup Guide:

Bitaxe Ultra Bitcoin Miner
All versions (201-205)

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About the Bitaxe Ultra Bitcoin Miner:

The BitAxe Ultra is a fully open-source hardware Bitcoin ASIC miner, notable for its sleek design & utilizing the BM1366 ASIC chip from Bitmain's Antminers S19XP.

ASIC Chip: The BitAxe Ultra is powered by the BM1366 ASIC chip, offering a high level of efficiency.

Hashrate and Efficiency: The Bitaxe can achieve up to 550 GH/s with an impressive efficiency of 20 J/TH.

Power Supply: A 5V 4a DC power supply with a 2.1/5.5mm barrel jack connector is included.

WiFi Capability: It features an ESP32-S3-WROOM-1 WiFi microcontroller onboard for direct mining to your pool over WiFi, without the need for an external computer. A 2.4Ghz wifi network is required.

Voltage and Power Measurement: The Bitaxe includes a TI INA260 power meter for measuring input voltage and current, and a Maxim DS4432U+ current DAC for digitally adjusting the core voltage of the BM1366 from 0.04V to 2.4V.

Display: SSD1306 OLED I2C Display Module.

Cooling: The device comes with a heatsink and fan, and the enclosure is designed for sufficient airflow, even when overclocking.

Open-Source Firmware: Powered by AxeOS, an open-source firmware that allows full control over mining settings and performance monitoring through a web interface.
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Requirements:

Internet Connection: A 2.4Ghz Wifi connection is required to allow the Bitaxe to connect to your pool / solo mining host of choice. Bandwidth is minimal, stability is more important than speed.

Bitcoin Wallet Address: You must have your own Bitcoin Wallet Address that you are in control of to allow the mining pool / solo mining host to pay your bitcoin to if you mine a block. If you input the wrong address when setting up your Bitaxe and you do mine a block, you will have no access to it as it would've been paid to the BTC address YOU input. This is VERY important!

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Note: We are in no way responsible if you do not enter your BTC address correctly and you mine a block. If you mine a block, the BTC will be deposited to the BTC wallet YOU input as per the instructions given. If you have no access to that wallet, your BTC WILL BE LOST. YOU HAVE BEEN WARNED!
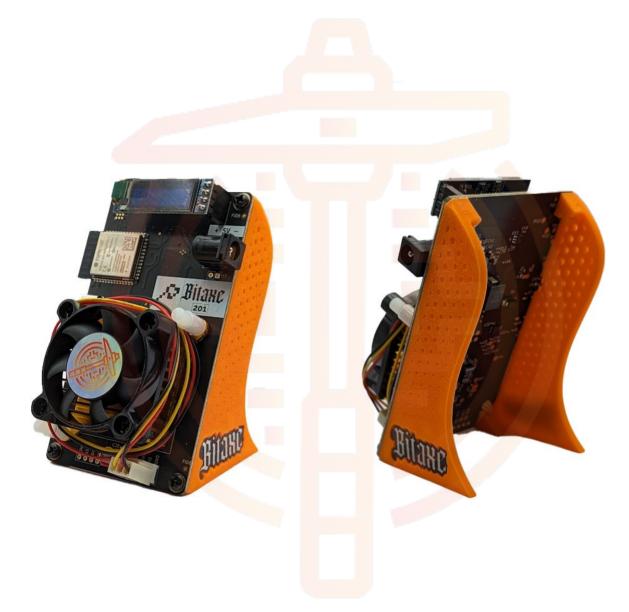www.thesolomining.co   /   @thesolominingco

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Quick Bitaxe Setup:

1. Unbox Bitaxe & plug in screen. Then, attach stand. You will need a screwdriver for this.

2. Connect Bitaxe to power supply and plug in to outlet.

3. Once powered on, the Bitaxe will create a wireless network which will be shown on the OLED Screen.

4. With a wireless device (laptop, phone, pc, etc) Connect to the Bitaxe's wireless network. A setup window should appear. *If so, go to step 6.*

5. If the setup window does not appear, from the same device navigate to 192.168.4.1 via your web browser.

6. Change the necessary settings (your Wifi SSID, Wifi Password, User (which is your Bitcoin wallet address) and also the pool/server you want to mine to. If you want to solo mine, leave it as-is. Public Pool is a free, open source solo mining server/pool. It just works and is great.

7. Once all of this is input, save everything and restart.

8. Once restarted, the Bitaxe will begin hashing. You can now enter the Bitaxe's new IP address (shown on the screen) on any computer / device on the same network to see the Bitaxes web interface. Do this via the device's web browser.

If you kept the mining pool as "public-pool.io", you can navigate to https://web.public-pool.io/ to see your realtime pool stats.

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Guided Setup:

1: Attach stand. You will require a phillips / cross head screwdriver to do this. The stand has 4 x M3 6mm screws included.

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Guided Setup:

2: Plug in Power Supply to Bitaxe, plug into wall outlet. Switch on.

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Guided Setup:

3: Once powered on, the Bitaxe will create a wireless network which will be shown on the OLED Screen.

4: Using your personal device (phone or wifi enabled computer), connect to this wireless network your Bitaxe has created. Your wifi network will NOT be called Bitaxe_706D, it will be unique to your own device.

5: Once connected, if you are presented with a pop-up page, great, proceed to step **6.** If not, you need to navigate to 192.168.4.1 from your device's web browser.

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Guided Setup:

6: From the setup web page (192.168.4.1) Change the necessary settings (your Wifi SSID, Wifi Password, User - which is your Bitcoin wallet address - and also the pool/server you want to mine to). If you want to solo mine, leave it as-is. Public Pool is a free, open source solo mining server/pool. It just works and is great.

Enter your Wifi network

Enter your Wifi password

Your chosen pool / solo server

The pool / solo server's port

Your pool's username (use BTC wallet address if using public-pool.io)

Bitaxe Overclock frequency (leave for now)

Bitaxe Core Voltage (leave for now)

7: Once everything is entered, click "save" and then "restart".

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Guided Setup:

8: Once restarted, the Bitaxe will begin hashing. You can now enter the Bitaxe's new IP address (shown on the Bitaxe's screen) on any computer / device on the same network to see the Bitaxes web interface. Do this via the device's web browser. Congratulations, you are now mining. Enjoy!

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Advanced settings:

Frequency and Core Voltage: Accessible via the Bitaxe's web user interface.

Core Voltage Tuning:

This allows you to adjust the voltage supplied to the BM1366 ASIC chip. Lowering the voltage can reduce power consumption and heat generation, while potentially decreasing mining performance. Increasing the voltage can enhance performance but at the cost of higher power consumption and heat. Note: more heat = less longevity.

Frequency Tuning:

Frequency tuning changes the operating frequency of the BM1366 ASIC chip. Higher frequencies can lead to better mining performance but increase power consumption and heat. Lower frequencies reduce power usage and heat but can decrease mining efficiency.

Similar to voltage tuning, frequency adjustments are made via the Bitaxe's web user interface. You can select from various frequency settings to find the balance between power consumption and mining performance,

It's important to note that both voltage and frequency tuning require a balance. Over-tuning can lead to instability, increased wear and tear, or even permanent damage to the Bitaxe. Users often need to experiment with different settings to find the optimal configuration for their specific hardware, considering factors like electricity cost, ambient temperature, and desired mining performance.

Side note, every BM1366 ASIC is unique. Just because one chip responds well to 'X' settings does not guarantee those settings work well with Bitaxe.

FAQ: What's all this "stuff on the screen?"

GH: Hash Rate & **W/Th** Watts per Terahash
A/R: Accepted and Rejected Shares
UT: Uptime
BD: Best Difficulty

Fan: Fan Speed
Temp: Core Temp
Pwr: Real time power draw
Voltage **(mv) &** Current **(mA)**

FH: Free Memory
vCore: Core Voltage
IP: Bitaxe's IP Address
V2.0.4 - Software version

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FAQ:
What is "Best Difficulty" & "Shares Accepted"?

Overview

Model:	BM1366
Uptime:	20 minutes
WiFi Status:	Connected!
Free Heap Memory:	179272
Version:	v2.0.4

Power

Power Consumption:	10.55 W
Input Voltage:	4,993 mV
Input Current:	2,134 mA
Frequency:	485 Mhz
Core Voltage:	1200 mV
Measured Core Voltage:	1206 mV
Fan Speed:	5630 RPM
Chip Temperature:	45 C

Pool Information

Quick Link:	https://web.public-pool.io/#/app/bc1q99n3pu025yyu0jlywpmwzalyhm36tg5u37w20d
URL:	public-pool.io
Port:	21496
User:	bc1q99n3pu025yyu0jlywpmwzalyhm36tg5u37w20d.osm-bitaxe
Shares Accepted:	133
Shares Rejected:	0

Results

Hash Rate:	498.74 Gh/s
Efficiency:	21.15 W/Th
Best Difficulty:	108k

What is Best Difficulty and What is "Shares Accepted"? A very simple analogy:

Imagine you're in a vast underground network with 75 trillion doors (representing the network difficulty). Each door has a unique lock, but they all look identical. Hidden behind one of these doors is a prize: a Bitcoin block worth 6.25 bitcoins.

Every miner in the world is equipped with an infinite bundle of keys. Each key represents a potential solution or 'guess' to open one of these doors. The challenge is that there's no map or indication of which key might open the door with the prize behind it. Miners must try keys on different doors, billions of times per second (known as the hashrate). The faster a miner's equipment, the more keys they can try in a shorter amount of time.

When a miner selects a key from their bundle, they rush to a door, try the key, and if it doesn't work (which is almost always the case), they discard that key, rush back to their bundle, grab another key, and try a different door. This process repeats at an astonishing speed - this is the "GH/s" speed - or "Hashrate". "*Shares Accepted*" can be seen as finding an exact key that opens a door.

This frantic search continues until one miner somewhere in the network successfully finds the right key for a door and then finding the Bitcoin block in that room. On average, this should happen every 10 minutes (the block time). The lucky miner who finds the correct key and door gets to claim the 6.25 Bitcoin reward. After this, the underground network changes; a new Bitcoin block is hidden behind a different door and the search begins anew.

The Bitaxe keeps track of how close its 'keys' (*best difficulty*) where to unlocking the door and finding a bitcoin block. This is like a best attempt score, showing the closest a miner has come to finding the right room since their equipment was last started. When the mining equipment is turned off, this score resets. You mine a block when your "*best difficulty*" score is higher than the network difficulty level (70.3 trillion as of 25th Jan 2024).

If miners worldwide are consistently finding the right key too quickly (say, in 8 minutes on average), the network increases the difficulty of the locks every 2016 blocks, which is roughly every two weeks. This adjustment aims to ensure that, on average, it takes about 10 minutes to find the right key. Conversely, if it's taking too long (like 20 minutes on average), the network makes the locks a bit easier. This is why the mining difficulty level fluctuates over time."

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A few more frequently asked questions:

Can I mine other coins like Ethereum, Doge, etc? Yes and no. You can only mine SHA-256 algorithm based coins such as Bitcoin, Bitcoin Cash, Digibyte, etc. You cannot mine coins with different algorithms as the Bitaxe Ultra miner can only work with SHA-256 coins. Ethereum is ETHash, Litecoin is Scrypt, etc. Look here for mineable SHA-256 coins https://cryptodelver.com/algorithm/sha256.

If I mine a block and my Bitaxe gets broken, do I lose my bitcoin? No, the Bitaxe is purely hardware trying to mine a block. The pool you are mining to (be it a solo pool or a PPLNS pool) is responsible for managing your bitcoin payout. No bitcoins can be stored on the Bitaxe or the web interface. Do not try to take the Bitaxe apart to find your bitcoin, you won't find them (yes, this happened…!) Anyway, see your pool details for info. **Note:** If you use public-pool.io which the unit is preconfigured to, if you solo mine a block, public-pool.io will automatically pay you your bitcoin to your wallet address you entered in the initial setup as described earlier in this document. You are responsible for your own bitcoin wallet! Ensure you know how to set this up!

Can I upgrade the Bitaxe? No, you cannot upgrade the Bitaxe Ultra's hardware. You can adjust the clock speed and core voltage which will change its hashrate.

Can I mine to a pool rather than solo mining? Yes! You are free to mine to any pool you like. Enter your pool settings in the web config page as previously mentioned. Remember, this is a SHA-256 based miner and will only work with coins that run on that algorithm.

What is the difference between solo mining and pool mining? Solo Mining: You have a small shovel and you are trying to find a big lump of gold in the hills all by yourself. You find it, it's yours. **Pool mining - aka PPLNS:** You and 10000 other people have lots of shovels of different sizes, all looking for the same lump of gold. When one person finds it, that gold is divided proportionally by the amount of people there are working together on that team (pool) and how big their shovels are (speed of miners). The bigger the shovel the bigger your payout. The shovel analogy implies a big shovel is a really powerful but really expensive miner, a small shovel is an R909 and so on.

What are the odds of solo mining a bitcoin block? Go to http://www.solochance.com, enter your speed and you will see the real time odds of solo mining a block. The R909 sits at around 1.6-2.1TH/s.

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More FAQ

What is the point of the the hardware supplied by us at The Solo Mining Co'? Not everyone has £100,000+ to invest in serious mining hardware that will probably never make a return. These monster machines cost £thousands a month in electricity to run and is a massive gamble. If you own a power station or get free power, use it to your advantage - legally of course.
The hardware we supply, such as the Bitaxe, SmartHub, CompacF's, R909's, etc are all cost effective and presentable ways of any enthusiast getting into bitcoin mining. Our whole product range has been designed as a talking / conversation piece as well as a fun desktop trinket that has a genuine chance of getting you a huge life changing amount of money.

Did someone actually mine a bitcoin block using a Compac F Mining stick? Yes - block number 706369 on solo.ckpool.org (https://btc.com/btc/block/706369. It really is possible! Sadly, it wasn't me. (Sad noises).

Any questions or comments? Let us know.
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Cheers!
IAmGPIO

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