

Open-source Rust firmware for ESP32-S3 Bitcoin miners

Installation & User Manual

Bitaxe · Nerd series · BitForge Nano · NerdNOS

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1 · What is WarpAxe?

dvb-WarpAxe is a replacement firmware for small Bitcoin miners built around the **ESP32-S3** microcontroller and the **BM1370**, **BM1373** or **BM1397** mining chips — the Bitaxe, the Nerd series, the BitForge Nano and the NerdNOS. It is written from scratch in Rust, is open source (GPL-3.0-or-later), and takes the place of the firmware your miner came with.

"Firmware" is the software that lives on the miner itself: it talks to the mining chips, drives the fans and the voltage regulator, connects to your Wi-Fi and to a mining pool, shows numbers on the little display and serves a web page you open in your browser to control everything. The firmware your miner shipped with is called the **stock firmware** in this manual — **AxeOS** on a Bitaxe, **NerdOS** on the Nerd boards, **ForgeOS** on the BitForge Nano, and the maker's own firmware on the NerdNOS.

WarpAxe speaks the same web interface (the "AxeOS API") as the stock firmware, so dashboards, tuners and fleet tools that know how to talk to a Bitaxe keep working. That includes **WarpTune**, dvb-WarpPool's clock-and-voltage tuner (chapter 8).

What it does differently

- **Signed online updates.** The miner looks for new releases itself, shows them in its web UI, and installs one only when you click. Before it writes anything, it checks the file's checksum and a cryptographic signature, and an update that does not start rolls back to the previous version (chapter 7).
- **One image for every board.** There is one firmware file for all supported boards; on first boot, the miner works out which board it is running on and checks it against the parts on the board before the ASICs get power.
- **Your settings carry over.** Wi-Fi, pools, hostname, clock and voltage, fan settings, temperature limits and display orientation are read from what AxeOS, NerdOS or ForgeOS left on the miner.
- **A password-protected setup hotspot.** When there is no Wi-Fi to join, the miner opens its own Wi-Fi network for setup, protected by a password that is shown only on the miner's display.
- **Careful with sensor readings.** A temperature or regulator value that cannot be real is rejected instead of acted on.
- **The web UI over the USB cable** as well as over Wi-Fi.
- **Ethernet with the Bitronics NerdHat** on the NerdQAxe++, the NerdQAxe+ (without its CAN extension), the NerdOCTAXE-γ up to Rev 3.3 and the NerdAxe Gaia, with Wi-Fi as the fallback.
- **Discord notifications** for a found block, a new best difficulty, a switch to the fallback pool and back, a solo pool that stops paying your address, and a restart after a crash, sent only to the webhook you set (chapter 5.5).
- **A payout check for solo pools**: if a solo pool stops paying your address, or keeps more than the fee limit you set (2 % by default), the miner moves to the other pool and tells you (chapter 5.4).
- **A static IPv4 address** if you want one, with a guard: if nothing answers on it, the miner goes back to DHCP until the next restart, so a typo cannot lock you out (chapter 5.3).
- **One web UI in eight languages** for the Bitaxe and the Nerd series, and animated special screens on the display (a found block gets a warp jump).

Which boards are supported

"Runs" means WarpAxe has mined on that board for real. "Profile only" means the pins, the voltage regulator's operating range and the limits were taken from the board's stock firmware, but nobody has run WarpAxe on one yet.

Board	Chips	Status
Bitaxe Gamma (601/602)	1× BM1370	**runs 24/7**
NerdQAxe++ (every revision except Rev 7)	4× BM1370	**runs 24/7** (on a Rev 6.1)
NerdOCTAXE-γ Rev 3.1	8× BM1370	**runs** since 28 September 2026; a v2.2 board with the 4-phase regulator also runs on a user's desk. With the 4-phase regulator, the factory values are now NerdOS's 600 MHz, 1150 mV and 250 W (before: the 6-phase board's 700 MHz, 1210 mV and 300 W); not yet tested on hardware with these values, and settings you saved stay as they are
BitForge Nano (800)	2× BM1370	**runs** since 29 September 2026; recognised automatically on first boot from v0.1.35
NerdAxe Gaia	1× BM1373	**runs** since 29 September 2026; clock and voltage capped at 420 MHz / 970 mV; recognised automatically on first boot from v0.1.35 (by its 12 V input)
NerdNOS (T-Display-S3 carrier, rev 1.3)	1× BM1397	**runs** since 8 October 2026; clock set by hand, power is an estimate
Bitaxe Gamma Duo (650)	2× BM1370	profile; runs on a user's board, not yet on our bench
Bitaxe Gamma Turbo (801)	2× BM1370	profile; runs on a user's board, not yet on our bench
NerdQAxe++ Rev 7	4× BM1370	profile only, not run yet
NerdQAxe+	4× BM1368	profile only, not run yet; WarpAxe's first board with the BM1368
Bitaxe Naja Duo (1201)	2× BM1373	**runs** on our bench since 12 November 2026; still marked untested in the web interface until it has run for some days
Bitaxe Gamma Hex (1300)	6× BM1370	profile only, not run yet
NerdAxe Gamma	1× BM1370	profile only, not run yet
NerdQX (Q1370 / Q1373)	4× BM1370 / BM1373	profile only, not run yet
LilyGO T-Display-S3 (NerdMiner hardware)	none	**experimental** (see below)

"Profile only" boards: please don't flash one of them unless you can put the stock firmware back over USB yourself. The installer's backup (chapter 3) gives you exactly that way back.

Experimental: the T-Display-S3 without a mining chip. The LilyGO T-Display-S3, the board NerdMiner runs on, has no mining chip. There, WarpAxe hashes on the ESP32-S3 itself, at about **340 kH/s**. That is a lottery ticket, not a miner: at today's network difficulty the expected time to a block is far longer than the age of the universe. The back of the board reaches about 60 °C while hashing — put it in a case and don't hold it in your hand while it mines. It only accepts online updates for releases that were tested on a T-Display-S3.

An honest comparison with the stock firmware

As of 28 October 2026, checked against the source of AxeOS (ESP-Miner v2.15.4), NerdOS (v1.1.0.1) and ForgeOS (v1.7, the BitForge Nano's firmware, built on ESP-Miner). All three move fast.

	AxeOS	NerdOS	ForgeOS	WarpAxe
Stratum V2, Stratum V1 over TLS, fallback pool	yes	yes	TLS and fallback pool yes, Stratum V2 no	yes; TLS also to a pool with a self-signed certificate (WarpPool on Umbrel) once you trust its key
Saved pools (more than main + fallback)	up to 8, switching needs a restart	no	no	up to 8, each with its coin, **one click, no restart**
Shows who a found block pays out to	yes, Bitcoin addresses only	opt-in, Bitcoin addresses only	yes, partly (up to six outputs, your share not marked), Bitcoin addresses only	yes, **any SHA-256 coin** (BCH, eCash, DigiByte …)
Shows a found block in the web UI	yes (banner with the count; not kept after a restart)	no (only on the display; count kept)	no	yes (banner with height, coin and time; **kept after a restart**)
Chip error rate on the dashboard	yes	no	no	yes
Overheat stop	chip 75 °C, regulator 105 °C	chip 70 °C (settable), regulator 70 °C on two-fan boards	chip 75 °C, regulator 105 °C	the stock firmware's values per board; the Nano's chips read on ForgeOS's diode scale since v0.1.36
Miner fetches updates itself	no	yes	yes	yes (install on a click)
Update signature checked before flashing	no	no	no	**yes**
Failed update falls back to the previous version	no	no	no	**yes** (needs bootloader v0.1.22 or later)
One image for all boards, board detected on first boot	no	no	no (one board)	**yes**, and checked against the board's parts before the ASICs get power
Wi-Fi setup without a network	open hotspot, or Bluetooth	open hotspot	open hotspot for seven minutes after every start, or Bluetooth	**WPA2 hotspot**, password on the display
Web UI over the USB cable	not found	not found	not found	**yes**

Power supply rating in the settings	no	no	no	**yes**
What the device display shows	fixed pages	fixed pages	no display; two status LEDs	**customisable** (pages, order, start page, cockpit values, OLED slides)
Other makers' miners on the swarm page	AxeOS devices only	not found	AxeOS devices only	AxeOS, NerdOS, ForgeOS, WarpAxe — and an **Avalon** (read-only, found by the network search)
Web UI languages	1	9	1	8
Supported boards	~20 board versions	11 boards	1 (BitForge Nano)	6 run, 7 more with a profile

Where the stock firmware is ahead. AxeOS and NerdOS support far more boards and have years of use by a large community behind them. AxeOS has a scoreboard, themes, the BAP accessory port and Wi-Fi setup over Bluetooth; NerdOS has two-factor login for updates, dual-pool mining, InfluxDB/Grafana export and alerts; ForgeOS has dual-pool mining, Wi-Fi and pool setup over Bluetooth, and share and self-test signals on the Nano's two LEDs. **WarpAxe is early.** If you need any of that, stay with the stock firmware.

About the screenshots. The web screenshots come from real miners on a test network (a NerdQAxe++ and its neighbours); wallet addresses are masked. Some were taken on earlier 0.1.x versions, so the version numbers in them differ from v0.1.50. The display images are drawn by the firmware's own drawing code with sample values.

2 · Before you start

You need five things. All of them are quick to check.

Requirement	Details
A supported board	One of the boards in the table in chapter 1. If yours is "profile only", read the warning there first.
A USB *data* cable	Needed once, for the first install. Many cheap cables only carry power and no data — if your computer does not see the miner, the cable is the first suspect. **Bitaxe Gamma:** use a USB-A to USB-C cable and keep the miner's power supply connected (the Gamma does not power up its USB port from a C-to-C cable). **Nerd series:** use the USB-C port of the display board.
A computer with Chrome or Edge	The installer runs in the browser and uses "Web Serial" to talk to the miner over USB. Only **Chrome** and **Edge** on a desktop or laptop can do that. **Safari, Firefox and phones cannot**.
Your Wi-Fi name and password	Not needed if the stock firmware already has them — WarpAxe carries them over.
A pool address and your wallet	The pool's host name and port (for example `pool.example.org` port `3333`), and your Bitcoin receive address, which usually goes into the worker field as `address.name`. Only ever a *public receive address* — never a private key or seed words.

Optional: WarpPool and WarpTune

WarpAxe works with any Stratum pool. If you run **dvb-WarpPool**, your own solo pool, you can point the miner at it; the web UI's hints already name WarpPool's ports (3334 for TLS, 3336 for Stratum V2). **WarpTune**, WarpPool's clock-and-voltage tuner, can then tune the miner. Neither is required. See chapter 8.

> **Write down your stock settings.** WarpAxe carries them over automatically, but a photo of the stock firmware's pool and Wi-Fi settings page costs nothing and helps if you ever need to type them in again.

3 · Installing with the browser installer

The first install is done over the USB cable, from a web page: **warppool.org/warpaxe**. The page is titled **"Install WarpAxe"** and has a language switch at the top. It always serves the current release, and the image it writes carries the same signature the online update checks. After this one time, updates come from the miner's own web UI. The miner's web UI calls this page the **web flasher**; it is the same thing.

Step 1 — Open the page and read "Before you start"

The first card sums up the current status honestly: WarpAxe is at an early stage, which boards run, which have only a profile, and that you should keep a way back. The second card, **"Prepare"**, lists the browser and cable notes from chapter 2. If you opened the page in Safari or Firefox, the page says: "This browser cannot talk to USB devices. Use Chrome or Edge on a computer."

Step 2 — Connect the miner (download mode)

To write firmware, the ESP32-S3 has to be in its **download mode**, a special state in which it listens on USB instead of running the firmware.

- **Coming from the stock firmware**, the installer usually switches the miner into download mode by itself. Just plug in the cable.
- **If connecting fails**, do it by hand: hold the `BOOT` button, press `RST` briefly, then release `BOOT`.
- **If the miner already runs WarpAxe**, use **System → Download mode** in its web UI, or open `http://<miner>/bootloader`. (For a normal update, the online update is easier — chapter 7.)

Step 3 — The backup (on by default)

In the **"Install"** card there is a tick box: **"Save a full backup of the miner first (recommended)"**. Leave it on. Before anything is written, the installer reads the miner's whole flash memory — the stock firmware *and* its settings — into a file on your computer: 16 MB, about 2–3 minutes. Every block is checked against the chip. With this file, the "Restore a backup" section on the same page puts the miner back exactly as it was (chapter 9). Keep the file somewhere safe and name it after the miner.

Step 4 — Install

1. Click **"Connect and install"**.
2. With the backup on, the browser first asks where to save the backup file. Then click **"Choose the miner"** to continue.
3. Chrome or Edge opens a list of USB devices. Choose the miner — it is listed as **"USB JTAG/serial debug unit"**.
4. The status line follows each phase: "Connecting…", "Backing up… n%", "Backup saved", "Writing… n%", "Written and checked. Restarting the miner…". Don't unplug anything while a bar is running.
5. At the end it says: "Done: WarpAxe v0.1.50 is installed; your backup is in …". The miner starts now; its web UI is reachable after about a minute.

The installer writes the bootloader, the partition table and the firmware, checks every part against the flash, and leaves the **settings partition alone**. That is why WarpAxe can read what AxeOS, NerdOS or ForgeOS stored there on first boot. If the installer finds a chip that is not an ESP32-S3, it stops: "This is not an ESP32-S3 … Nothing was written."

Boards WarpAxe cannot run. Before the backup and before anything is written, the installer reads the board model that the stock firmware (AxeOS) stored on the miner. On a Bitaxe with another chip (Max, Ultra, Hex, Supra, Supra Hex) or a TinyChipHub Zyber it stops, for example: "This miner is a Bitaxe Supra Hex (6× BM1368), which WarpAxe cannot run. Nothing was written; its firmware stays as it was." It restarts the miner into its own firmware. The same goes for the StarMiner (board version 601a), a Bitaxe Gamma for 12 V: "This miner is a StarMiner (Bitaxe Gamma for 12 V), which WarpAxe cannot run." WarpAxe's Gamma profile would set its regulator up for 5 V, which makes the regulator shut off at 12 V. A miner without such settings installs as before. If reading the flash fails at this point, the install stops before anything is written.



If there are no Wi-Fi settings to carry over, the display shows the setup hotspot on first boot (chapter 4).

Step 5 — The first boot

The display shows the WarpAxe logo (on the colour-display boards with the maker's wordmark under it; on the Bitaxe Naja Duo the Bitaxe logo with "1201"). After that you get either the mining cockpit, the setup hotspot, or — in the web UI — the board-choice question. Chapter 4 explains each case.

If connecting fails

- **No device in the list:** try another cable (it must carry data), a different USB port, and on the Gamma a USB-A to USB-C cable with the power supply connected. Then put the miner into download mode by hand (BOOT/RST, above) and try again.
- **"No answer from the miner":** it is not in download mode yet — use BOOT/RST, or System → Download mode if it runs WarpAxe.
- **Miner stays dark after a cancelled install:** it is still in download mode. Take it off power **completely — power supply *and* USB cable** — for a few seconds.
- **"Backup failed" / "Could not load the firmware":** nothing was written to the miner. Fix the cause and start again.

> **Without a browser.** Advanced users can write `warpaxe-factory.bin` from the release at offset 0 with esptool (this one starts with *empty* settings), or build from source. The repository's `tools/flash-backup.sh` makes the same full backup with esptool.

4 · First boot: board, Wi-Fi and pool

On first boot WarpAxe does three things: it carries over your old settings, finds out which board it runs on, and gets onto your network.

Settings carried over from AxeOS, NerdOS and ForgeOS

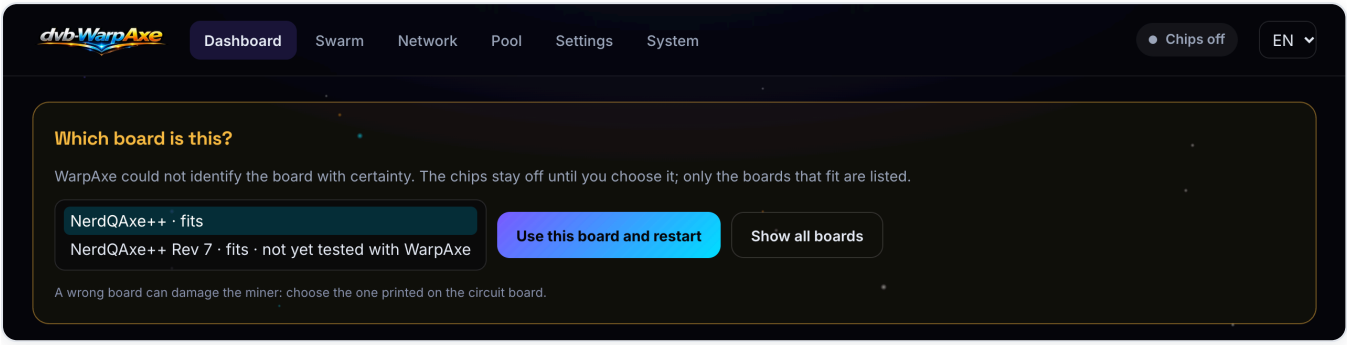
WarpAxe reads **Wi-Fi, pools (main and fallback), hostname, clock and voltage, fan settings, temperature limits and display orientation** from what the stock firmware left behind. (Not the fan controller's internal gains — those belong to WarpAxe's own loop.) Stratum V2 settings from NerdOS carry over too. So do NerdOS's Discord notifications: the webhook and the switches for a found block, a new best difficulty and a restart (here the restart after a crash); NerdOS's switch for its coinbase check becomes the switch for the payout check's message; the switch for the fallback pool, which NerdOS does not have, stays on. On the board-choice banner, they show as "Discord notifications" in the line "Taken from the previous firmware: …". A pool the stock firmware ran over TLS stays on TLS, with WarpAxe's built-in certificates. If a pool's certificate was not issued by a public authority (it is self-signed, as WarpPool creates it on Umbrel), the miner does not connect at first; the Pool tab then shows the fingerprint of the pool's key, and you can trust it there (chapter 5.4). If the stock firmware was left in its overheat mode (1000 mV, 50 MHz, fans at 100 %), WarpAxe does not take over clock, voltage and fans; the board's own defaults apply. In most cases the miner is simply back on your network, mining to the same pool, a minute after the install.

Board detection and the board-choice banner

WarpAxe identifies the board from the model name that AxeOS stored at the factory, or by asking which chips answer on the board's internal I²C bus (read-only probes that switch nothing).

- **Clearly identified** (a Bitaxe Gamma, a BitForge Nano or a NerdAxe Gaia, for instance): it starts at once, with the cautious first start described below.
- **Not sure:** some boards look alike on the bus (the NerdQAxe++, the NerdOCTAXE-γ and the NerdQAxe+), and a board that has never run WarpAxe is only offered, never selected automatically. Then the web UI shows a yellow banner on every page, **"Which board is this?"**, and **the ASICs stay off until you answer**. Only the boards that fit are listed ("fits"); **"Show all boards"** adds the others, with a warning that a board that does not fit is refused at the next start. Boards that have only a profile are marked "not yet tested with WarpAxe". A line "Taken from the previous firmware: …" tells you which settings were imported.
- Pick the board **printed on the circuit board** and press **"Use this board and restart"**, then answer the question that appears on the page ("Start as …? The miner restarts and powers the ASICs.") with **"Yes, go ahead"**. The banner warns: "A wrong board can damage the miner: choose the one printed on the circuit board."
- **"Recognised: …"** with the text "WarpAxe cannot run this board yet" means the board is known but not supported: flash the previous firmware back (chapter 9), or choose a board only if you are sure it was recognised wrongly. This is how WarpAxe treats a Bitaxe with another chip — Max (BM1397), Ultra or Hex (BM1366), Supra or Supra Hex (BM1368) — and TinyChipHub's Zyber boards (Zyber8S, 8G, 8G+, 12G). It reads the board model the stock firmware (AxeOS) left behind, before any chip gets power, and shows for example "Recognised: Bitaxe Supra Hex (6× BM1368)". A board version it does not know by name is recognised by its chip instead and shown as, for example, "Bitaxe (BM1368)". Since v0.1.48 WarpAxe also recognises the StarMiner (board version 601a, a Bitaxe Gamma for 12 V): "Recognised: StarMiner (Bitaxe Gamma for 12 V)", and its chips stay off. A StarMiner that was already set up as a

Bitaxe Gamma under an earlier version keeps that choice and is not recognised; flash its stock firmware back (chapter 9).



The board-choice banner "Which board is this?": the ASICs stay off until you pick the board printed on the circuit board and press "Use this board and restart".

While the banner waits, any core voltage the stock firmware left on is switched off, and the display is already running — so the setup hotspot's name and password show while you choose.

The first start on a board

Whether WarpAxe found the board or you chose it, it first checks the board against the parts that answer on its bus, before it switches anything on. Then it starts the chips at a cautious voltage and counts them; a card "First start as …" says so ("The chips start at … mV until their number matches the board's profile; the self-test then runs once."). When the number and type of the chips match, the board counts as verified: your voltage applies, and the self-test (chapter 5, System tab) runs once by itself; its result appears on the System page and in the event log.

- **"… does not fit this miner"**: the check refused the board before its ASICs got power, and the card gives the reason, for example a part that did not answer. "The ASICs stay off. Choose the right board below."
- **"…: the chips do not match"**: the chips that answered do not fit the board (another board's number, another chip type, or none at all), and the ASICs were switched off again. Choose the right board, or press **"Restart and try again"**.

The NerdQAxe+. On the bus it looks just like the NerdQAxe++ and the NerdOCTAXE-γ, so on its first start the banner offers all three; choose the one printed on the circuit board. Among these three, a wrong choice is caught: the chips start at a cautious voltage, the chip type does not match, and the ASICs are switched off again before they get the full voltage ("…: the chips do not match"). Take the CAN extension off for the first start: with it fitted, the board looks like a NerdQX and the NerdQAxe+ is refused. Once the board is verified, this check does not run again. WarpAxe does not use the CAN extension; do not fit it together with the NerdHat, as both use the same pins. The NerdQAxe+ starts at 490 MHz and 1250 mV, the stock firmware's settings; its stock firmware rates it at 70 W. Until WarpAxe reads the BM1368's own temperature diode, the chip temperature is estimated from the board's temperature sensor, as on the NerdQAxe++.

Already running WarpAxe? A board set up by an earlier version is taken as verified on the update to v0.1.35 or later; nothing changes for it.

The setup hotspot

If WarpAxe has **no Wi-Fi network in its settings**, it opens its own Wi-Fi network straight away. If it has one but **cannot join it within three minutes of starting up**, it opens the hotspot then. (A router outage later on

does not open it — only a startup that never got onto the network does.) With the NerdHat fitted, the cable counts like Wi-Fi: even with no Wi-Fi network set, the hotspot opens only if neither the cable nor Wi-Fi has a connection three minutes after the start; an open hotspot closes a minute after one of them has a connection. A cable pulled later does not open it. A static IPv4 address (chapter 5.3) that nothing has answered yet does not count as a connection here.

- The network is called `WarpAxe-XXXX` (XXXX are the last four hexadecimal characters of the miner's hardware address, for example `WarpAxe-6C98`).
- It is protected by **WPA2** with a **ten-digit password**, generated anew at every boot and **shown only on the miner's display**. Anyone standing at the miner can get in; your neighbours cannot.
- On the LCD boards the screen reads "Wi-Fi setup", "Join WarpAxe-…", the password, and "then open http://192.168.4.1". On the small Bitaxe OLED, the name, password and address take turns.



On the Bitaxe's small OLED the hotspot name, password and address take turns. (Example values.)

Connecting a phone (captive portal)

1. On your phone, open the Wi-Fi settings and join `WarpAxe-XXXX` with the password from the display.
2. The phone opens the setup page by itself (a "captive portal", as in a hotel). If it doesn't, open `http://192.168.4.1` in the browser.
3. The page opens on the **Network** tab with a card **"Wi-Fi setup"**: "Choose your network below, enter its password if it is new, and press Save."
4. Pick your network under "Networks found", type the **Wi-Fi password**, press **Save**.
5. The message reads "Saved. The miner restarts and joins …; this hotspot closes. Put your phone back on your home Wi-Fi." The hotspot closes once the miner has stayed connected to your network for a minute.

Setting the pool

If no pool was carried over, open the web UI (chapter 5) and go to the **Pool** tab: enter **Pool host**, **Port** and **Worker (address.name)**, press **Save**. Pool changes apply at once — the miner reconnects without a restart.

Finding the miner on your network

- **By name:** the miner announces itself over mDNS as `<hostname>.local` — for a hostname "bitaxe", open `http://bitaxe.local`. Only letters, digits and "-" of the hostname are used; if the name is already taken on the network, "-2" is appended. Your router's device list shows the same name.
- **By address:** the IP address (for example `http://192.168.1.50`) is on the display's pool page and in your router.

- **Over the USB cable:** on boards with native USB, the miner shows up on your computer as a USB network adapter. Open `http://192.168.7.1`. A second WarpAxe on the same computer needs a different number in **Network** → **USB address**, for example 8 for 192.168.8.1. The USB link gives your computer only an address, no internet route, so your computer keeps using its own network for everything else.
- **Over an Ethernet cable:** the NerdQAxe++, the NerdQAxe+ (without its CAN extension), the NerdOCTAXE-γ up to Rev 3.3 and the NerdAxe Gaia (over its interposer board) can take the "Bitronics NerdHat - Ethernet Expansion Board", a small add-on board with a W5500 Ethernet chip. Fit it while the miner is off: WarpAxe looks for it at every start and finds it by itself; there is nothing to set. With a cable in, the miner gets an address of its own from your router over the cable (or the static address you set, chapter 5.3), under the same hostname, and the pool connection, the update check and the BTC price go over the cable. Wi-Fi stays connected as the fallback: if you pull the cable, the miner carries on over Wi-Fi within seconds; when the cable is back, it moves the pool connection to the cable once the cable has held its address for 30 seconds (a brief drop does not make it switch back and forth). The web UI answers on both addresses. The display shows "Ethernet · 100 Mbit/s" where it otherwise shows the Wi-Fi network and signal. Do not fit the NerdHat on a NerdOCTAXE-γ from Rev 3.4: its temperature multiplexer sits on the same pins. WarpAxe leaves Ethernet off when the multiplexer answers at start-up. On WarpAxe's first start on a board, before its chips have been counted (see "The first start on a board" above), the cable is not used yet: set up Wi-Fi first; Ethernet works from the next restart.

Run the self-test once. As soon as the miner is mining, open System → Self-test and click **Run self-test**. In about 80 seconds it checks the chips, the voltage, the fans and the sensors and shows ✓ or ✗ for each (chapter 5.6).

5 · The web UI, tab by tab

The web UI is the miner's control panel, served by the miner itself. Open it at the miner's address in any browser (phones work too). The browser tab names the miner — for example "NerdAxe Gaia · WarpAxe" — so you can tell several open tabs apart.

The header (on every page)

Element	What it tells you
Logo and tabs	Dashboard, Swarm, Network, Pool, Settings, System — in the same order as the stock firmware. The active tab is highlighted.
Status pill	"Mining" (green) in normal operation. Other states: "Starting", "Powering the ASICs", "ASICs off", "No pool reachable: ASICs off", "Overheated", "Overheated 3× in an hour: ASICs stay off", "Regulator fault: ASICs off", "Offline" (the browser cannot reach the miner).
"Update available"	A pill that appears when a newer release is found (chapter 7).
Language	EN, DE, ES, FR, IT, PT-BR, JA, ZH — switches the web UI language.

Banners can appear above the page: the board choice (chapter 4), the power-supply notice, the clock notice and the block banner (all explained below).

Questions before an action — restart, switching the ASICs off, installing an update, download mode, resetting the best difficulty, restarting to join a new Wi-Fi network, and the board choice — appear as a box on the page with **"Yes, go ahead"** and **"Cancel"** (Escape or a click outside the box cancels too). Because the box is part of the page, it also works in the sign-in window a phone opens on the setup hotspot.

5.1 Dashboard

The dashboard is the miner's home screen: everything at a glance, updated live.



Dashboard of a NerdOCTAXE-γ: the nameplate with hashrate and history, the Temperature, Fans and Pool cards, and the hash counters per chip and domain.

The notices at the top

Power supply — "Enter your power supply's rating in the settings, so WarpTune knows how far it may go." It stays until you enter the rating in Settings (**Settings** button) or hide it (**×**). **Time** — appears if the miner's clock is not set while a pool uses TLS or Stratum V2 with authentication ("The time is not set: a Stratum V2 pool with authentication waits for it, and TLS connects without checking the certificate's validity dates."), or if the clock is more than five minutes off. Clicking it opens the Network tab. **Static IPv4** — appears in yellow when the static address got no answer: "The static address … got no answer from the gateway … or the pool, so the miner took an address from the router's DHCP to stay reachable. Check the static settings; the

next restart tries the static address again." Until then the miner is reachable at the address DHCP gave it (your router's device list and the display show it). Clicking the note opens the Network tab. **"Block found!"** — once the miner has found a block, every page shows this banner with the block height, the coin and the time, in gold with confetti (without animation if your computer is set to reduce motion). It stays until you click **Dismiss**; that hides it in this browser until the next block or the next status change.

When your miner finds a block, WarpAxe stores the block's hash and follows what becomes of it. The banner on the dashboard shows the status and the shortened hash; for Bitcoin it links to the block on mempool.space. The status is "waiting" right after the find, "confirmed" once the pool builds its next job on your block, and "orphaned" if the chain continued on another block instead. "Unknown" means the miner was offline or without a pool for more than one block, so it could not see what happened; check the hash on a block explorer.

If the pool reports a block below height 900,000 while the coin is set to BTC, the block is probably from another coin (a pool for another coin, with the ticker left on BTC). The banner then shows the coin as "?", leaves out the mempool.space link and says: "Height … does not match Bitcoin: probably another coin. Check the Coin setting on the Pool page."

The banner shows again whenever the status changes, and each change is in the event log. In the API you find it under `lastBlock.hash` and `lastBlock.status`. The count of found blocks is kept even if you go back to an older WarpAxe version.

The nameplate

Top left: the chip grid icon, the **board name** and a coloured **series badge** ("BITAXE SERIES", "NERD SERIES", "BITFORGE SERIES", "DEVKIT"). Under it a line with the chips and the regulator, for example "BM1370 × 4 · TPS53647 · 3 phases · 12 V". Top right:

Value	Meaning
Uptime	Time since the last restart.
Firmware	The running version, e.g. "warpaxe 0.1.45".
Wi-Fi signal	Signal strength in dBm with bars. Closer to 0 is better: –50 is excellent, –70 is still fine, below about –80 the connection becomes unreliable. While the miner uses the Ethernet cable, the cell reads **Ethernet** with a plug icon and the link speed, for example "100 Mbit/s".

The big number is the **Hashrate (10 min)** — the average number of hashes per second over the last ten minutes. Under it, "expected … · … %": the **expected** rate is what the chips should do at the set clock (cores × clock × number of chips), and the percentage is how close the real rate comes. Around 95–105% is normal; the number fluctuates a little because hash counting is statistical. Next to it, **Error** — the chips' error rate over the last minute, as AxeOS shows it: green below 1%, yellow from 1%, red from 5%. A rising error rate is the first sign of a core voltage that is too low for the clock. The BM1373 (NerdAxe Gaia, Bitaxe Naja Duo) naturally runs a higher error rate, so it has its own limits: green below 5%, yellow from 5%, red from 9%.

Tile	Meaning
Efficiency	Energy per hash in J/TH (joules per terahash). Lower is better.
Power	What the miner draws now, in watts.
Shares	Shares accepted by the pool since startup; below, how many were rejected and the rejected percentage. A few rejects right after a new block are normal.
Best difficulty	The hardest share since boot (large) and the all-time best, which survives restarts. It is a "luckiest attempt" score: a block needs a share that reaches the network difficulty. Once the miner has found a block, the tile also shows the number of blocks found ("blocks: 1"). The count and the last block survive restarts.

The **History** chart shows **Hashrate** (solid line, left axis) and **Chip temperature** (dashed line, right axis) over the last hour or three hours — switch with **1 h** / **3 h**. The hashrate is drawn as a two-minute average so counting noise does not fill the chart. Right after startup it reads "Collecting data — one point every 10 s."

The Temperature card

One bar each for **Chips** and **Voltage regulator**, with the current value. A white mark is the fan's **Target**, a red mark the **Shutdown at** temperature. If a value reaches the red mark, the miner switches the ASICs off to protect itself (see Overheat in chapter 6). On a board without a fan to drive (NerdNOS) there is no target mark; on the T-Display-S3 the bar shows the ESP32-S3's own temperature. On the **Voltage regulator** bar, the white mark is the temperature the fan holds the regulator at: 80 °C on boards with one fan output, 65 °C for M1 on the two-fan Nerd boards, or the **Target regulator temperature** you set in the Expert section. Since v0.1.50 it shows on every board with a fan and a regulator.

The Bitaxe Naja Duo and the Bitaxe Gamma Turbo have two ASICs, each with its own temperature sensor. WarpAxe reads both. The fans and the overheat stop follow the hotter chip, as on the stock firmware. The dashboard temperature (`temp` in the API) is the hotter chip; `temp2` is the second chip on its own and `asicTemps` lists both. Their chip sensors count only once the chips are running: with the core voltage off or the chips still starting they give no usable reading, while the regulator's sensor watches throughout. After an overheat stop, the regulator and the minute off therefore decide when the chips start again; if a chip is still too hot once running, the miner stops again, and that stop counts towards the three in an hour.

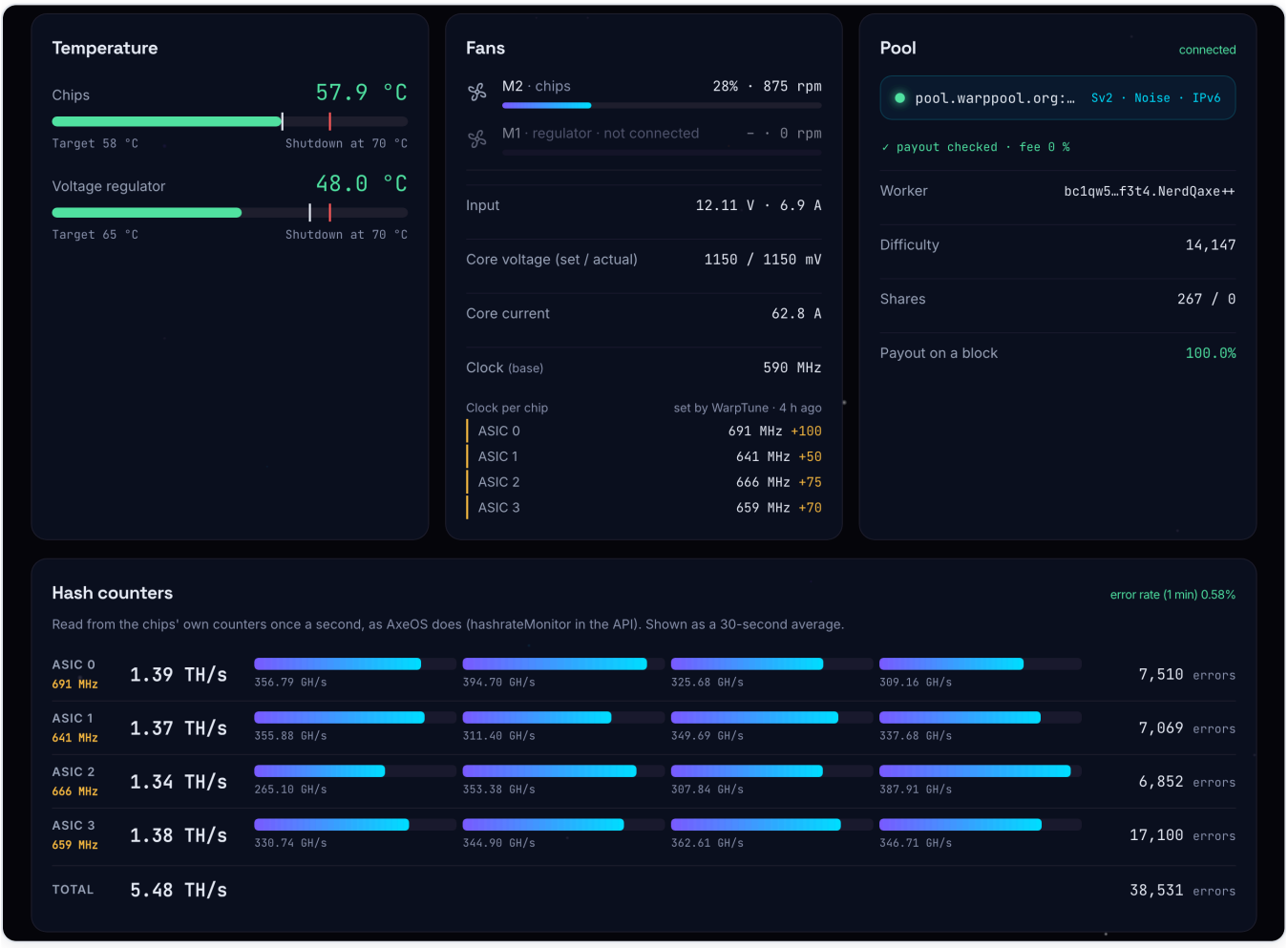
If one sensor stops giving readings, the miner treats the temperature as unknown, runs the fans at full speed and stops after a minute if no reading comes back. If one sensor never gives a reading after a start, the fans run at 100% after a minute and the dashboard shows a notice; the chips keep running. In that case please send us your `temp2` and `asicTemps` from `/api/system/info`.

The Fans card (with power values)

Each fan output with its speed in % and rpm: on the Nerd boards with two fan outputs **M2 · chips** and **M1 · regulator**; on boards with one fan output **Fan · chips · regulator** (on the BitForge Nano **Fan 1** and **Fan 2**, both labelled that way), because since v0.1.50 that fan also follows the regulator in automatic mode. "not connected" means no fan was found on that output; **"stopped!"** means the fan should turn but does not — check it. Below:

Row	Meaning
Input	Voltage from the power supply and, where the board measures it, the current drawn from it (on the NerdAxe an estimate, marked ≈).
Core voltage (set / actual)	The chip voltage you asked for and what the regulator delivers, in mV.
Core current	The current into the chips at core voltage. It is large (a Bitaxe shows tens of amps) because the voltage is low — it is *not* what the power supply delivers.
Clock	The chips' frequency in MHz. After an overheat on a board without a fan to drive, a note says the clock was stepped down, and that a restart brings back the set value.

Clock per chip. While at least one chip runs at a clock of its own (**Clock per chip**, chapter 5.5), the row reads **Clock (base)**: the frequency set for the whole chain. Under it follows **Clock per chip** with who set the offsets ("set by hand", "set by WarpTune" or "set through the API") and how long ago, then one line per chip: ASIC 0, 1, … with its clock, the offset in yellow for a chip that has one, and, where the board measures a temperature per chip (Bitaxe Naja Duo and Bitaxe Gamma Turbo), that temperature. A chip with an offset has a yellow bar on its left. With every chip at the chain's clock the card looks as before.



Clock per chip on a NerdQAxe++: ASIC 1 and ASIC 3 run 15 and 25 MHz below the base clock of 590 MHz; WarpTune set the offsets two hours ago. The hash counters show each chip's clock under its name.

The Pool card

The pool the miner is connected to, with a dot (green = connected) and a badge for the protocol and encryption (e.g. "Sv2 · Noise"). Below: **Worker**, the share **Difficulty** the pool currently asks for, **Shares** (accepted / rejected) and **Payout on a block** — the share of a found block that goes to your address (green from 95%, red below). On a solo pool it should read 100%. If your worker name is a pool account rather than an address, it reads "paid by the pool". While the payout check watches this pool and the pool pays your address (chapter 5.4), a green line of its own under the pool name reads "✓ payout checked · fee 0 %". The fee is what the pool keeps of the coinbase in its newest job, rounded up to a tenth of a percent. Hovering over it shows "This solo pool's coinbase pays your address; the miner checks every block." If the line is missing, the pool is either not checked or failing the check right now.

The Hash counters card (optional)

Off by default; switch it on under **Settings → Dashboard → Hash counters on the dashboard**. For each chip (ASIC 0, 1, …) it shows the rate from the chip's own counters and a bar per **domain** (a chip is divided into four domains, the BM1373 into eight), plus the chip's **errors**. Values are a 30-second average, read once a second. A domain clearly weaker than its neighbours is marked in colour. Top right: the **error rate** over the last minute, the same figure as next to the hashrate. The colours are the same as there: for the BM1370 green below 1%, yellow from 1%, red from 5%; for the BM1373 (NerdAxe Gaia, Bitaxe Naja Duo), which naturally runs a higher error rate, green below 5%, yellow from 5%, red from 9%. "The counters start a few seconds after the chips."

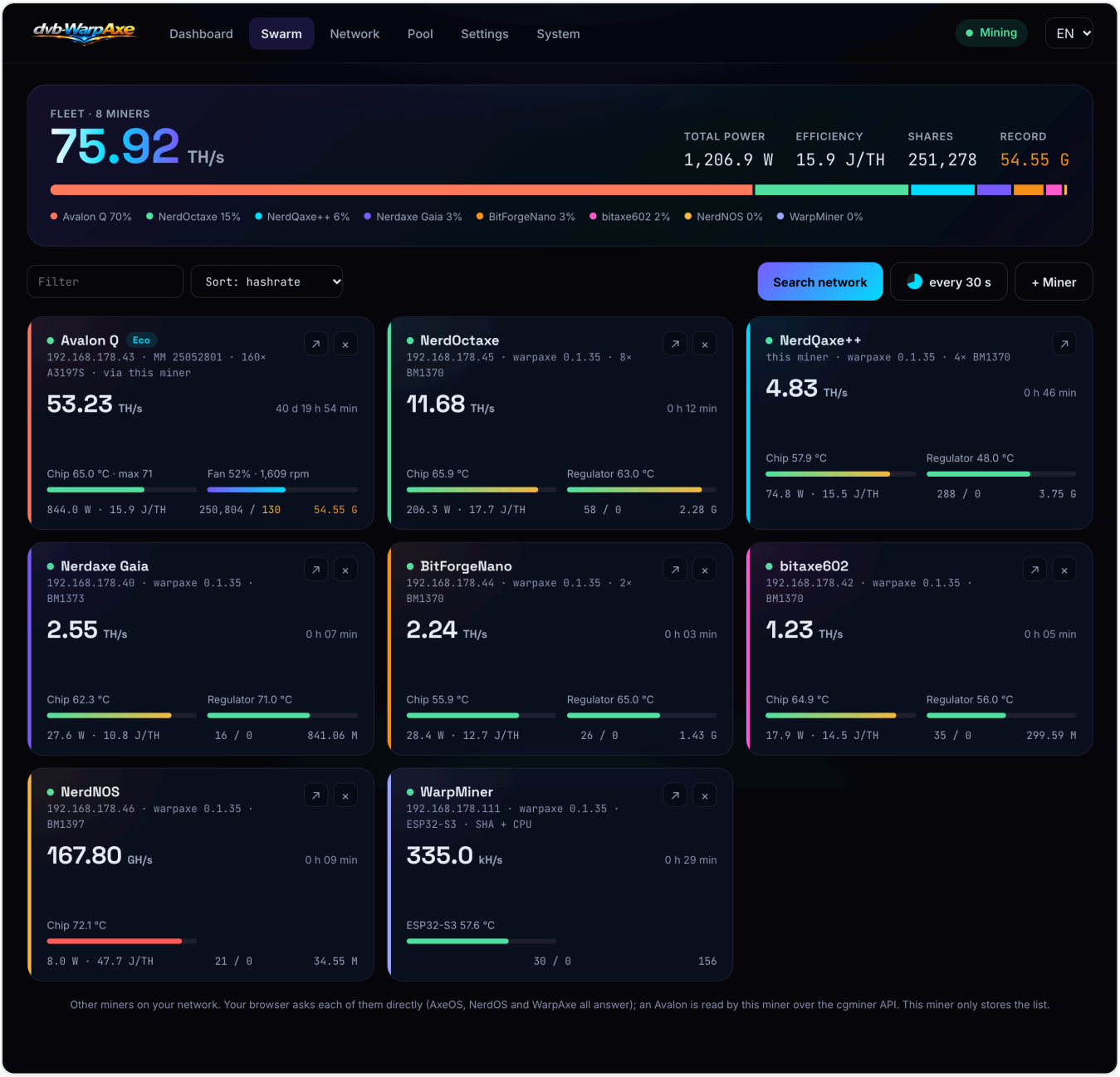
While a chip runs at a clock of its own, each chip's clock appears under its name (ASIC 0, 1, …), in yellow for a chip with an offset. That way you can compare a slowed chip's rate and errors with its clock.

A BM1370 or BM1373 chip splits its work into four or eight hash domains. If one domain stops counting while the rest of the chip hashes, WarpAxe switches the ASICs off and on, which takes about six seconds; clock and voltage stay the same. A domain that is dead right after the chain starts (under 5% of the chip's other domains) is healed after about three minutes. A domain that is only weak (under 25%) or that stops later is healed after ten minutes.

There is at most one such restart an hour, shared with the restart for a silent chip. If a domain sticks again after three restarts, the miner leaves it alone until the next boot or a new clock or voltage. In the cases seen so far, the clock was well above stock, and in an ESP-Miner report a domain that stuck after the start went away at a lower clock. So if a domain keeps sticking, a lower clock is worth a try.

5.2 Swarm

The Swarm tab shows **other miners on your network** next to this one — WarpAxe, AxeOS, NerdOS or ForgeOS miners alike, and even an Avalon. Your browser asks each of them directly (AxeOS, NerdOS, ForgeOS and WarpAxe all answer); an Avalon is read by this miner over the cgminer API. This miner only stores the list (up to 32 miners). It is read-only: it never changes or restarts another miner.



Swarm: the fleet's total at the top, the share of each miner, and one card per miner, here with an Avalon Q that this miner reads over the cgminer API.

Fleet · N miners is the fleet's total hashrate, with **Total power**, **Efficiency**, **Shares** and the **Record** (the best difficulty of any miner). The coloured bar shows each miner's share of the total.

Controls: **Filter** (type part of a name or address), **Sort: hashrate / name / temperature**, **Search network** (scans your local network, x.x.x.1–254, and lists the miners it found with **Add** or **Add all**), the refresh button **"every 30 s"** (a click refreshes now and steps through 10, 30, 60 and 120 s; nothing is polled while the tab is hidden), and **+ Miner** to add one by IP address or host name. When adding, you choose the kind: **"AxeOS · NerdOS · WarpAxe (HTTP)"** (the default) or **"Avalon (cgminer API)"**.

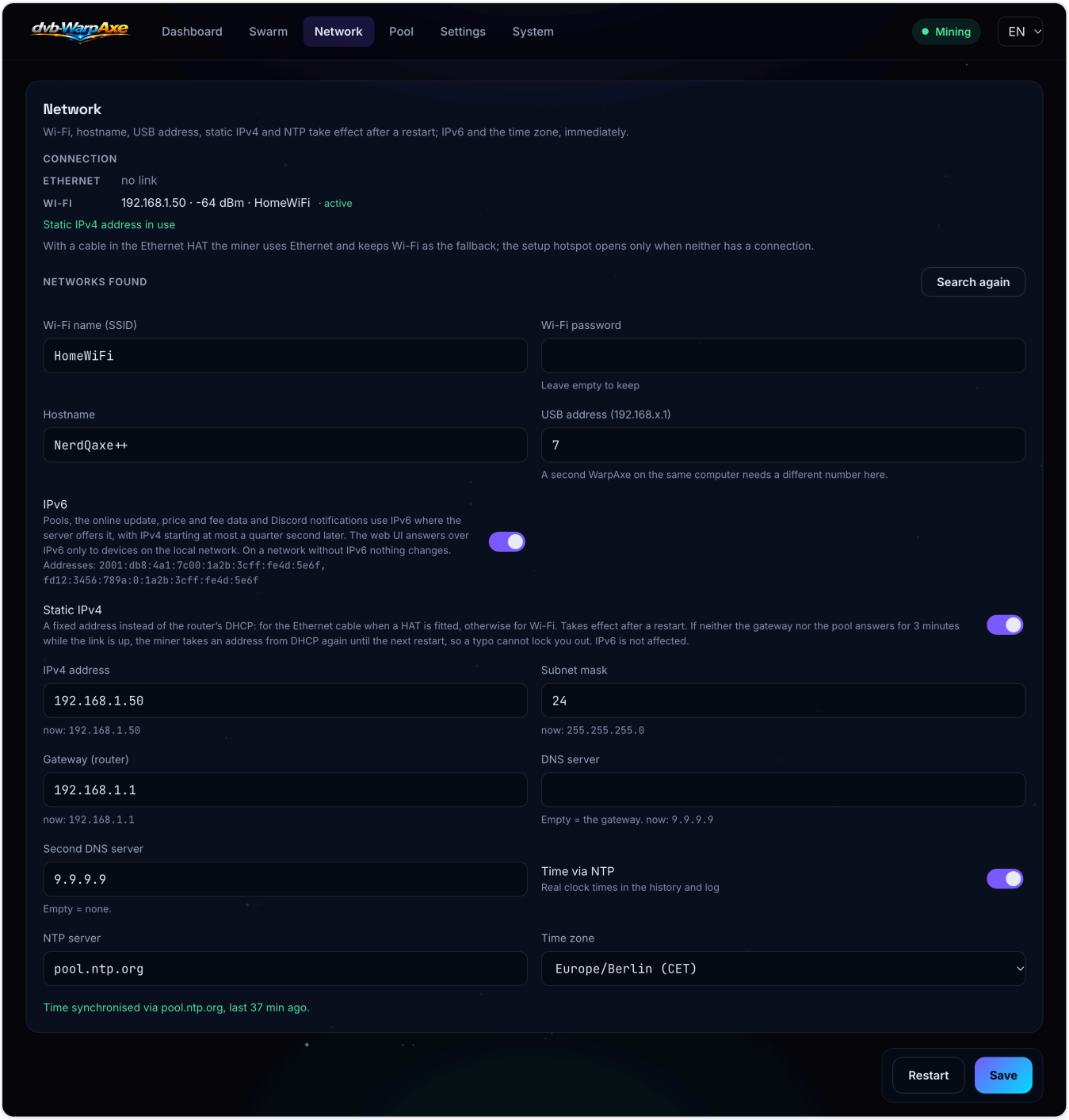
Each card shows the miner's name, address, firmware and chips, its hashrate and uptime, bars for **Chip** and **Regulator** temperature against their limits, power and J/TH, shares (accepted / rejected) and best difficulty. "this miner" marks the one you are on. ↗ ("Open its web UI") opens the miner's own page; **×** removes it from the list. A miner that does not answer reads "not reachable".

An Avalon. An Avalon speaks the cgminer API on port 4028, which a browser cannot reach. So this miner reads it on the page's behalf: its summary, stats and pools, and nothing else — read-only, at most once every 10 s. **Search network** finds an Avalon by itself: while your browser looks for AxeOS, NerdOS, ForgeOS and WarpAxe miners, this miner checks its own /24 (private address ranges only) on port 4028 and asks only the read command `version`; a /24 takes about 15 s. A hit appears under **Found** marked **"Avalon · cgminer"**, with the product, the cgminer and API version and the MM firmware, and you add it with **Add** or **Add all** like the others. You can still add one by hand with the kind "Avalon (cgminer API)" and its IP address. Its card says "via this miner" and shows the model, the work mode as a badge (Eco, Standard or Super), the chip temperature with the hottest chip, the fans instead of the regulator, power and J/TH, shares and best share. Below the bars, the card shows what the Avalon itself reports: why it stopped ("Stopped: chips overheated"; the dot turns red for a fault; a pause by command or schedule shows as a grey line), a supply error, the error bits it reports by name ("Reports: fan, overheating, Board 1: communication error") and its power supply ("Supply 22.95 V · 34 A · 94% efficiency"; on a Nano 3S the chips' core voltage). An error bit appears once it is reported in two reads in a row, so a single bad sensor reading does not flash up. The names follow Canaan's own tables; a bit without a name shows as "bitN". Its hashrate, power, shares and record count into the totals at the top. Only the first module of an Avalon is read.

The search may report addresses it did not check for an Avalon, for example "N addresses were not checked for an Avalon: the miner was short of memory. Search again later." or "N addresses have port 4028 open but did not answer." Searching again later covers them.

5.3 Network

"Wi-Fi, hostname, USB address, static IPv4 and NTP take effect after a restart; IPv6 and the time zone, immediately."



Network: Wi-Fi, hostname, USB address, IPv6, static IPv4, and time by NTP.

At the top, the **Connection** block lists every way the miner is on the network: **Ethernet** on boards that take the NerdHat (address, speed and hardware address, or "no Ethernet HAT found", "no link", "waiting for an address", "driver failed, see the log"), **Wi-Fi** (address, signal and network, or "not connected") and **USB** while a computer is connected; the one the miner uses right now is marked "active". On boards that take the NerdHat, a line below says: "With a cable in the Ethernet HAT the miner uses Ethernet and keeps Wi-Fi as the fallback; the setup hotspot opens only when neither has a connection." With **Static IPv4** on, a line below the interfaces says "Static IPv4 address in use" (green), "Static IPv4 address set, waiting for the gateway to answer" (grey), "Static IPv4 address got no answer: DHCP until the next restart" (yellow), or "Static IPv4 settings invalid: DHCP in use. Check the fields below." (yellow: the stored settings did not pass the check at start, so the miner uses DHCP).

Field	What it does
Networks found / **Search again**	The Wi-Fi networks the miner can see; click one to fill in the name.
Wi-Fi name (SSID) and **Wi-Fi password**	The network to join. The password field stays empty — "Leave empty to keep" the saved one. Saving a new Wi-Fi asks "Restart now and join …?".
Hostname	The miner's name on the network and for `<hostname>.local`.
USB address (192.168.x.1)	The x in the address for the web UI over USB; default 7. "A second WarpAxe on the same computer needs a different number here."
IPv6	On by default. "Pools, the online update, price and fee data and Discord notifications use IPv6 where the server offers it, with IPv4 starting at most a quarter second later." The first pool connection after a start or a new Wi-Fi connection waits up to 10 seconds for the IPv6 address, which some routers hand out several seconds late, and gives IPv6 a one-second head start. On a network without IPv6 nothing changes, apart from that wait, once per connection. If the update, the price data or a Discord message fails over IPv6 (no connection, no answer, an error answer or a transfer that breaks off), the miner tries again over IPv4 at once and uses IPv4 for that server for the next 30 minutes; a Discord message is never sent twice. The time (NTP) stays on IPv4. Under the switch you see the miner's IPv6 addresses. The pool page shows whether the connection runs over IPv4 or IPv6. Over IPv6 the web UI answers only devices on your own network. Switched off, pools and everything else go over IPv4 at once. The switch takes effect without a restart.
Static IPv4	Off by default. "A fixed address instead of the router's DHCP: for the Ethernet cable when a HAT is fitted, otherwise for Wi-Fi. Takes effect after a restart." Switched on, it shows five fields for the address, the mask, the gateway and two DNS servers; see "Static IPv4" below.
Time via NTP and **NTP server**	Sets the clock from the internet (default `pool.ntp.org`): "Real clock times in the history and log". It matters more than it looks: **an authenticated Stratum V2 pool waits for a set clock, and TLS checks a certificate's dates only once NTP has set the clock** (chapters 5.4 and 10).
Time zone	For the times on the display, in the chart and the log.

Below, a status line: "Time synchronised via …, last … ago." (green), or a warning that the time is not synchronised yet, that NTP is off, or how far the miner's clock differs from your computer's. **Restart** and **Save** sit at the bottom of the page.

Static IPv4

Off by default: the router hands out the address (DHCP). Switch **Static IPv4** on, below the IPv6 switch, and five fields appear: **IPv4 address**, **Subnet mask** (`255.255.255.0` , `24` or `/24`), **Gateway (router)**, **DNS server** ("Empty = the gateway.") and **Second DNS server** ("Empty = none."). Under each field, "now: …" shows the value the miner uses at the moment, so you can copy what DHCP gave it. Switched off, the fields keep what you typed.

The address applies after a restart: on the Ethernet cable if the HAT answered at start, otherwise on Wi-Fi. The other interface stays on DHCP; IPv6, the setup hotspot and the USB address are not affected. With the

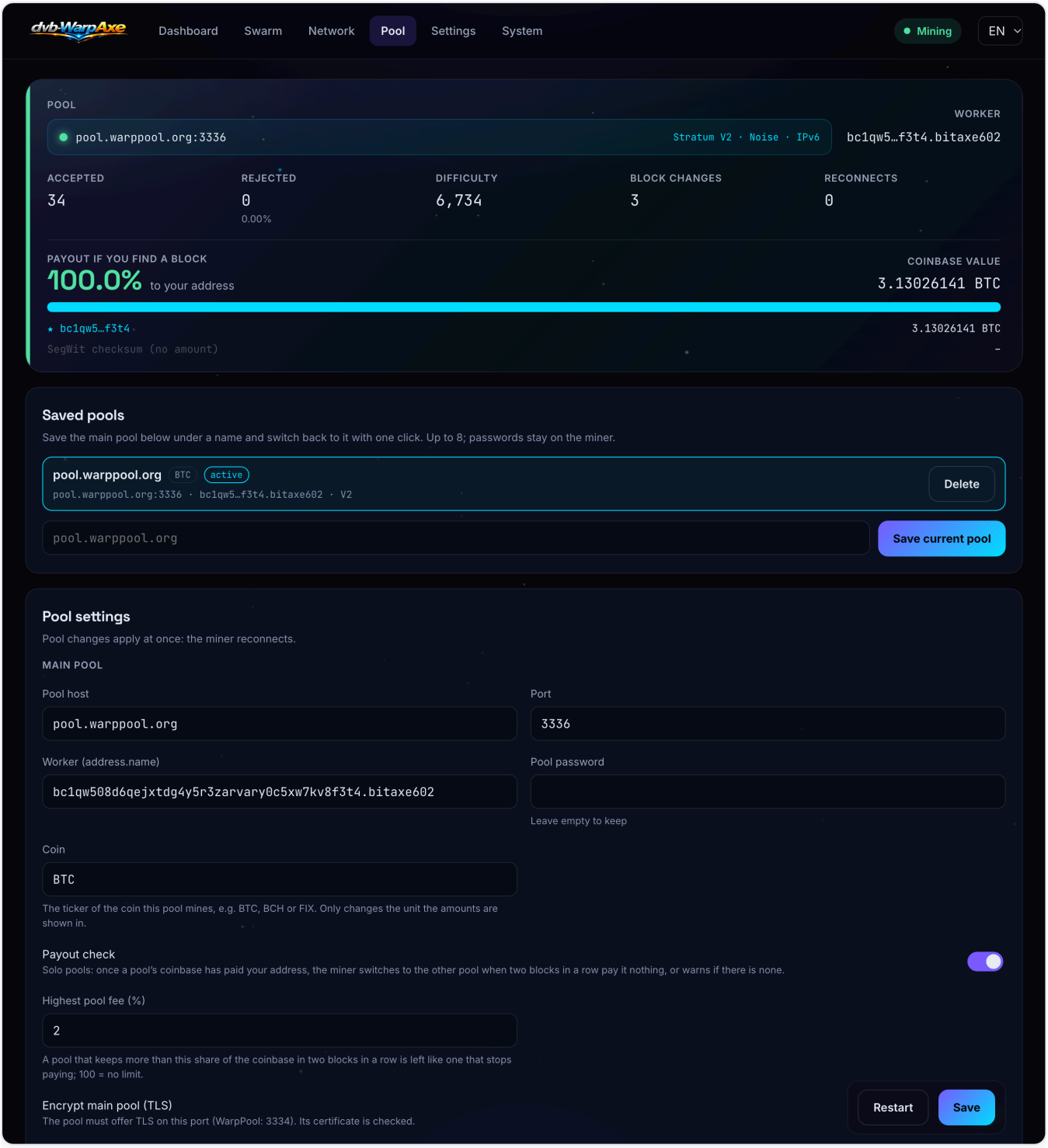
HAT fitted but no cable plugged in, the address waits for the cable, and Wi-Fi stays on DHCP.

Saving refuses settings that cannot work, with a message that names the problem: an address or gateway that a device cannot have; a mask with gaps or outside /8 to /30; a gateway outside the subnet or equal to the address; the subnet's network or broadcast address; a subnet that overlaps the setup hotspot (192.168.4.0/24) or the USB link (192.168.x.0/24). This last check also excludes eero's default network, 192.168.4.0/22: there, leave Static IPv4 off and reserve the address in the router (a DHCP reservation); see chapter 10.

So that a typo cannot lock you out, the miner tries the gateway every 10 seconds until something answers on the new address. The router answering counts, and so does a pool connection over the address, or the web UI opened on the address from a device on your network (not from the setup hotspot or over USB). If nothing answers within 180 seconds with the link up (time without a link, for example while the router is still starting, does not count), the interface goes back to DHCP until the next restart: the event log records it ("static IPv4 … on …: no answer from the gateway … or the pool for … s, back to DHCP until the next restart"), and the dashboard shows a yellow note that links here. If DHCP gives no address either, the setup hotspot opens three minutes after the start as usual; a static address that nothing has answered yet does not count as a connection. The next restart tries the static address again.

The miner does not check whether another device already uses the address; choose one outside your router's DHCP range. After a downgrade to a version before v0.1.50, the miner is back on DHCP.

5.4 Pool



Pool: the live connection, the coinbase payout, and the settings for main and fallback pool.

The connection card

The active pool with its protocol ("Stratum V1" or "Stratum V2", with "TLS" or "Noise" for encryption), the **Worker**, and the counters: **Accepted**, **Rejected** (with %), **Difficulty**, **Block changes** (how often the pool sent work for a new block — about every ten minutes on average) and **Reconnects**. If the miner is on its fallback pool, it says "Mining on the fallback pool". If shares have been rejected, **Reject reasons** and the **Last reject** show why. After you save the pool settings, the card updates by itself, without reloading the page.

Payout if you find a block: the share of a found block that goes "to your address", the **Coinbase value** (block reward plus fees in the current work) and each output of the coinbase transaction with its amount — the "SegWit checksum (no amount)" line is a technical output worth nothing. The list shows at most 32 outputs: yours, the SegWit checksum, then the largest; the rest are added up in one row. On a solo pool you should see 100% to your address; on a pool that takes a fee, less.

This works for other SHA-256 coins as well: WarpAxe decodes the address in your worker name (Bitcoin, Bitcoin Cash and eCash CashAddr, DigiByte, FixedCoin and other forks) and compares it with the outputs, so solo mining BCH or FIX shows your real share. The amounts are shown in the coin set in the **Coin** field below. If your worker name is a pool account and not an address, the card says **"paid by the pool"**: a found block goes to the pool, which pays you according to its own scheme.

Saved pools

Up to eight pools you can switch between with one click — handy if you mine different coins or pools now and then. **Save current pool** saves the current main pool under a name (empty name = the pool's address); saving under an existing name replaces it after asking for confirmation. **Use** makes a saved pool the main pool — the miner reconnects at once — and **Delete** removes one. The pool in use is marked "active". Each entry shows the coin it mines. Passwords stay on the miner and are never shown. If you are coming from AxeOS 2.15, its saved pools appear here after first boot.

Pool settings

"Pool changes apply at once: the miner reconnects." There is a **Main pool** and a **Fallback pool** section with the same fields:

Field	What to enter
Pool host / **Fallback host**, **Port**	The pool's address without `stratum+tcp://`, and its port.
Worker (address.name)	Usually your Bitcoin address, a dot, and a name for this miner. Some pools use an account name instead — follow the pool's instructions.
Pool password	Most pools ignore it ("x" is common). "Leave empty to keep" the saved one.
Coin	The ticker of the coin this pool mines (BTC, BCH, FIX …). It only changes the unit the payout amounts are shown in; default BTC.
Payout check	"Solo pools: once a pool's coinbase has paid your address, the miner switches to the other pool when two blocks in a row pay it nothing, or warns if there is none." On by default; see "The payout check" below. Only in the Main pool section, but it covers both pools.
Highest pool fee (%)	"A pool that keeps more than this share of the coinbase in two blocks in a row is left like one that stops paying; 100 = no limit." Default 2, in steps of 0.1. Shown only while **Payout check** is on.
Encrypt main pool (TLS)	Stratum V1 over TLS. "The pool must offer TLS on this port (WarpPool: 3334). Its certificate is checked." The certificate's dates are checked once NTP has set the clock after a boot: an expired certificate, or one not valid yet, is refused. Until then the dates are not checked; in the first five minutes after a boot, a TLS connection waits up to 15 s for NTP. A pool you trust by its key (see below) does not depend on dates.
Protocol	Stratum V1 or Stratum V2. "Stratum V2 is always encrypted and needs its own port (WarpPool: 3336). The TLS switch applies to V1 only."
Sv2 authority key of the pool	For Stratum V2: the pool's public key as the pool publishes it (Base58). The pool's certificate is checked against it.
Require pool authentication	On (default): connect only once the pool's certificate has been checked against the key. Off: a key that is set is still checked once the clock is set; without a key the pool is trusted unchecked.
Use a fallback pool	"Switches over after three failed attempts on the main pool, and back once the main pool answers again" — the miner tries the main pool every five minutes.

Stratum V2 with authentication needs a key and a set clock. With "Require pool authentication" on, there is no connection without the authority key, or before the clock has been set by NTP.

ASICs off without a pool

If no pool answers, WarpAxe switches its ASICs off instead of hashing for nothing. This happens when the main pool and the fallback pool (if you set one) have each failed at least twice and at least a minute has passed since the first failure. The core voltage goes off, the ASICs are held in reset and the fans go to their lowest speed. The rest of the board keeps running, so the web interface stays reachable. A short Wi-Fi drop does not trigger this. The same happens when no pool is set up at all.

While the ASICs are off, the miner tries both pools every 30 seconds. As soon as one sends a job, the ASICs come back with the same clock and voltage; you do not need to do anything. The dashboard shows a notice,

the display shows "NO POOL" with "ASICs off until a pool answers", and the event log records when the ASICs went off and when they came back. In the API this is `poolsUnavailable: true` and `chainPhase: "NOPOOL"`. Note: a pool that accepts the connection but never sends a job counts as a failed attempt, and after two failures on the fallback the miner tries both pools in turn.

A pool that sends nothing

Some pools accept the connection and then send nothing, for example a proxy whose backend is gone, or the IPv6 side of a pool that only works over IPv4. If no first job arrives within 30 seconds, the miner drops such a connection; once work arrives, quiet periods of up to three minutes are fine. The log (System tab) then says "no data from the pool for 30 s" (or 180 s). A pool that sent no work over IPv6 is tried over IPv4 first for the next hour. While the miner is on the fallback pool, a main pool that accepts the connection but sends no work gets one try; the miner then stays on the fallback and waits twice as long before the next check: 10, 20, then 40 minutes. Work from the main pool sets the wait back to five minutes.

A pool that stops sending work

Some pools keep the connection but stop sending new jobs, for example a ckpool-based pool whose node has failed: it sends a ping every ten seconds and no work. If no new job arrives for ten minutes, the miner reconnects (for a pool that only sends a job with a new block, the miner waits an hour instead); if the next five minutes bring no fresh work either, it switches to the fallback pool (or, from a fallback that is stuck, back to the main pool). It then checks the main pool after 10, 20 and then every 40 minutes, counted from the switch, and stays there only once that pool sends fresh work again. The event log says what happened, for example "no new job from the pool for 600 s, reconnecting" and "main pool sent no new job for 300 s, switched to the fallback pool" (the seconds may read a little higher). This works with Stratum V1 and Stratum V2.

The payout check

On a solo pool, a block you find should pay your address. The payout check makes sure, block by block, that the pool keeps doing so. It is on by default (**Payout check** in the Main pool section).

- **Which pools.** A pool is checked once the coinbase of one of its jobs has paid more than half of its value to your address: that is a solo pool, with a fee or a donation output if it has one. The miner remembers this, even across restarts; a change of host, port or worker makes it a new pool. Never checked: a worker name that is a pool account and not an address, a pool that pays its miners by share in the coinbase (it never pays one small miner most of the reward), a pool that has never paid your address, and an address for a different coin than the one set under **Coin**.
- **Counted per block.** Each new block counts once, however many jobs the pool sends for it. Only jobs whose coinbase the miner could read count, and only once the pool has accepted the worker.
- **When it acts.** When the jobs of two different blocks in a row pay your address nothing, or leave the pool more than **Highest pool fee (%)**. A fee exactly at the limit is still allowed. A block that pays within the limit starts the count over.
- **What it does.** It records an event, sends a Discord message if a webhook is set and "Solo pool stops paying your address" is on (chapter 5.5), and leaves the pool: from the main pool to the fallback pool, from the fallback pool back to the main pool. Leaving does not count as a pool failure. If there is no other pool, or the other one was left for its payout too, the miner keeps mining, and the connection card shows a red note **Payout**: "This pool’s coinbase pays your address nothing (2 blocks in a row). No other pool to switch to: the miner keeps mining here." For the fee it says "This pool keeps … % of the coinbase, more than your limit of … % (2 blocks in a row). …".

- **No automatic return.** The miner does not go back on its own to a main pool it left over its payout until one of that pool's jobs pays your address within the limit again, you change the pool, the switch or the fee limit, or the miner restarts. After a restart it starts on the main pool again; a pool that still does not pay is left again after two blocks.
- **One report.** A pool is reported once for the same reason, and reports on the same pool are at least ten minutes apart; the switch still happens. A grey line on the connection card shows the last report since the last restart, for example "Payout: … paid your address nothing in 2 blocks in a row, … ago."

The fee is everything in the coinbase that does not go to your address. The SegWit checksum carries no amount and changes nothing. The limit is 2 % by default, in steps of 0.1; 0 allows no fee at all, and 100 means no limit, so only a missing payout counts. The 2 % also applies to pools that were checked before the update: if your solo pool keeps more and you accept that, raise the limit.

Leaving takes two blocks, about 20 minutes on Bitcoin; a block found meanwhile still pays the pool. The check compares the exact address in your worker name: a pool that once paid that address and then pays the same key in another address form counts as not paying. With the switch off, nothing is checked and no pool is left.

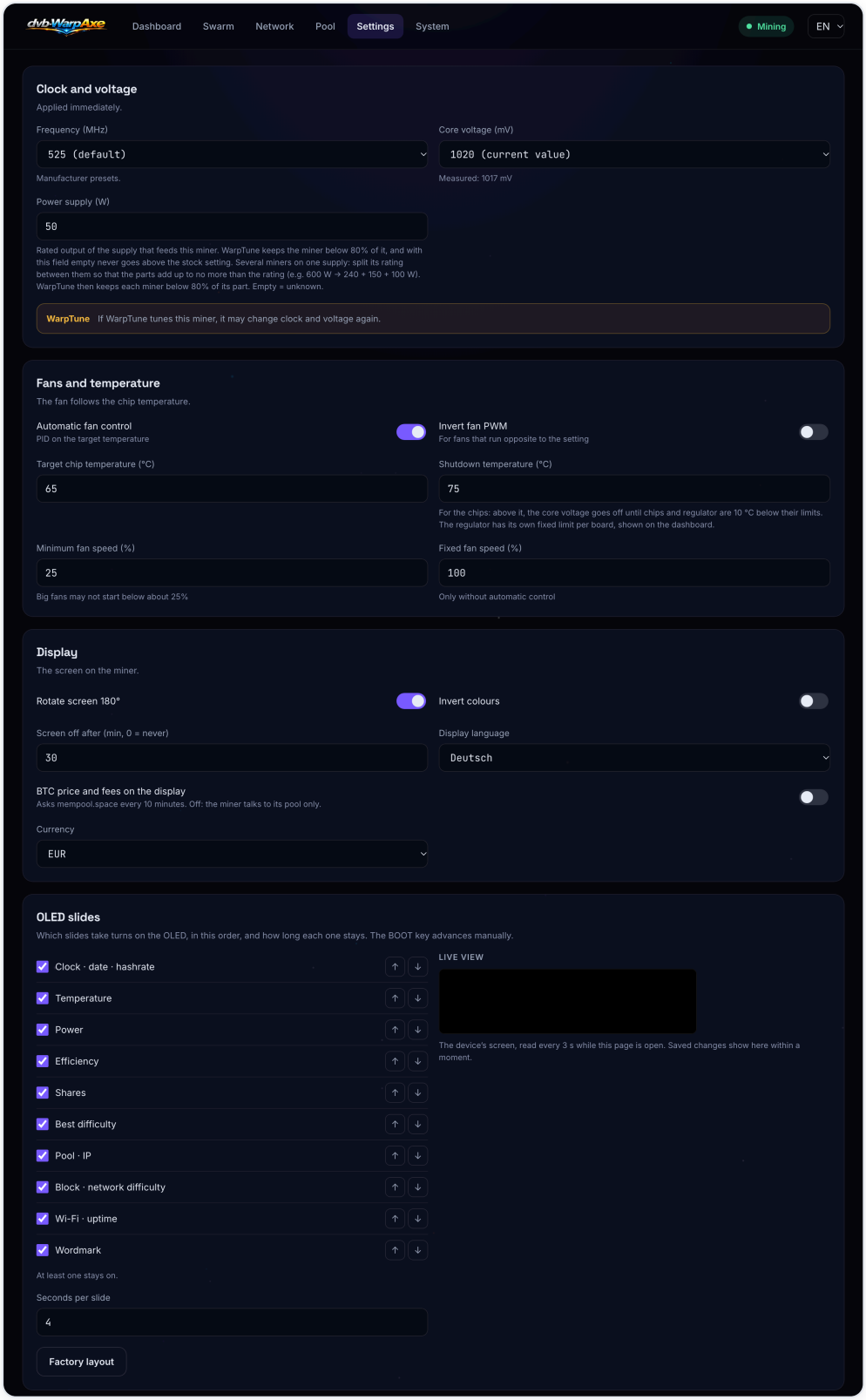
A pool with a self-signed certificate

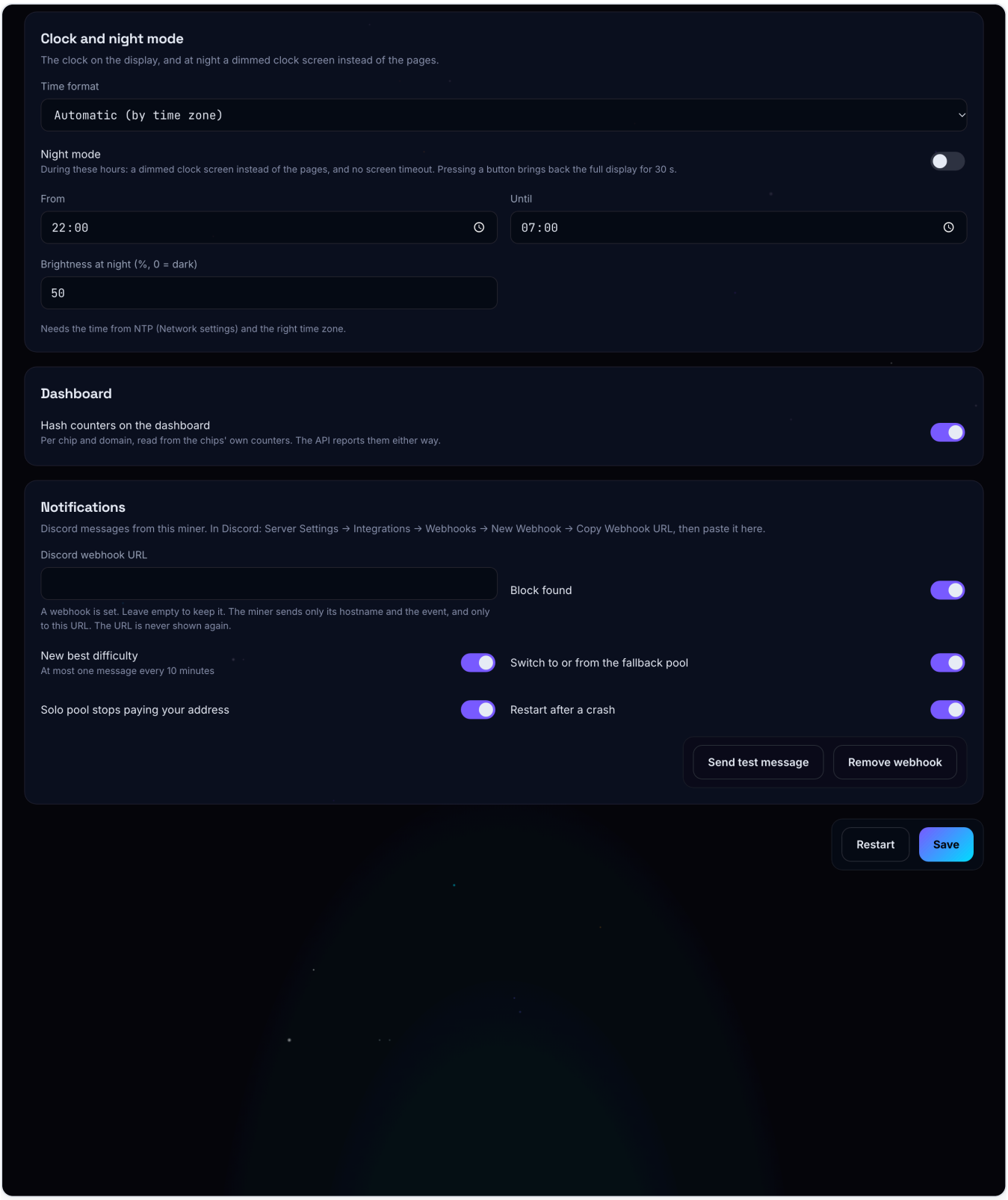
A pool over TLS (Stratum V1) normally presents a certificate from a public certificate authority, and the miner checks it against its built-in list. WarpPool on Umbrel creates its own certificate instead (self-signed). The miner then does not connect, and the main or fallback pool's settings show the box **"Certificate not from a public authority"** with the **"Fingerprint of the pool’s key (SHA-256)"**, a string like `AB:CD:…`. Compare it with the value in WarpPool's Connect window. If they match, press **"Trust this pool"** and confirm ("Trust the key … for …? The miner then connects to this pool with this key only."). From then on the miner accepts this pool only with this key. The host name is not checked, so you can also enter the pool by its IP address.

If the pool later presents a different key, the miner does not connect and shows **"The pool’s key has changed"** with the key **"Presented now"** and the one **"Trusted so far"**. Press **"Trust the new key"** only if you renewed the pool's certificate yourself or pointed this entry at another pool; otherwise ask the pool's operator first. While a key is trusted, the box **"Trusted key"** shows its fingerprint; **"Forget"** removes the trust after a confirmation question, and the pool's certificate is refused again until you trust it anew.

Main and fallback pool each keep their own key, and a pool you store with **Save current pool** takes its key along. A pool with a certificate from a public authority works as before, and none of these boxes appear.

5.5 Settings


dvb-WarpAxe
Dashboard
Swarm
Network
Pool
Settings
System
Mining
EN
Clock and voltage
Applied immediately.
Frequency (MHz)
525 (default)
Manufacturer presets.
Core voltage (mV)
1020 (current value)
Measured: 1017 mV
Power supply (W)
50
Rated output of the supply that feeds this miner. WarpTune keeps the miner below 80% of it, and with this field empty never goes above the stock setting. Several miners on one supply: split its rating between them so that the parts add up to no more than the rating (e.g. 600 W → 240 + 150 + 100 W). WarpTune then keeps each miner below 80% of its part. Empty = unknown.
WarpTune
If WarpTune tunes this miner, it may change clock and voltage again.
Fans and temperature
The fan follows the chip temperature.
Automatic fan control
PID on the target temperature
Invert fan PWM
For fans that run opposite to the setting
Target chip temperature (°C)
65
Shutdown temperature (°C)
75
For the chips: above it, the core voltage goes off until chips and regulator are 10 °C below their limits. The regulator has its own fixed limit per board, shown on the dashboard.
Minimum fan speed (%)
25
Big fans may not start below about 25%
Fixed fan speed (%)
100
Only without automatic control
Display
The screen on the miner.
Rotate screen 180°
Invert colours
Screen off after (min, 0 = never)
30
Display language
Deutsch
BTC price and fees on the display
Asks mempool.space every 10 minutes. Off: the miner talks to its pool only.
Currency
EUR
OLED slides
Which slides take turns on the OLED, in this order, and how long each one stays. The BOOT key advances manually.
Clock · date · hashrate
Temperature
Power
Efficiency
Shares
Best difficulty
Pool · IP
Block · network difficulty
Wi-Fi · uptime
Wordmark
At least one stays on.
Seconds per slide
4
Factory layout
LIVE VIEW
The device's screen, read every 3 s while this page is open. Saved changes show here within a moment.



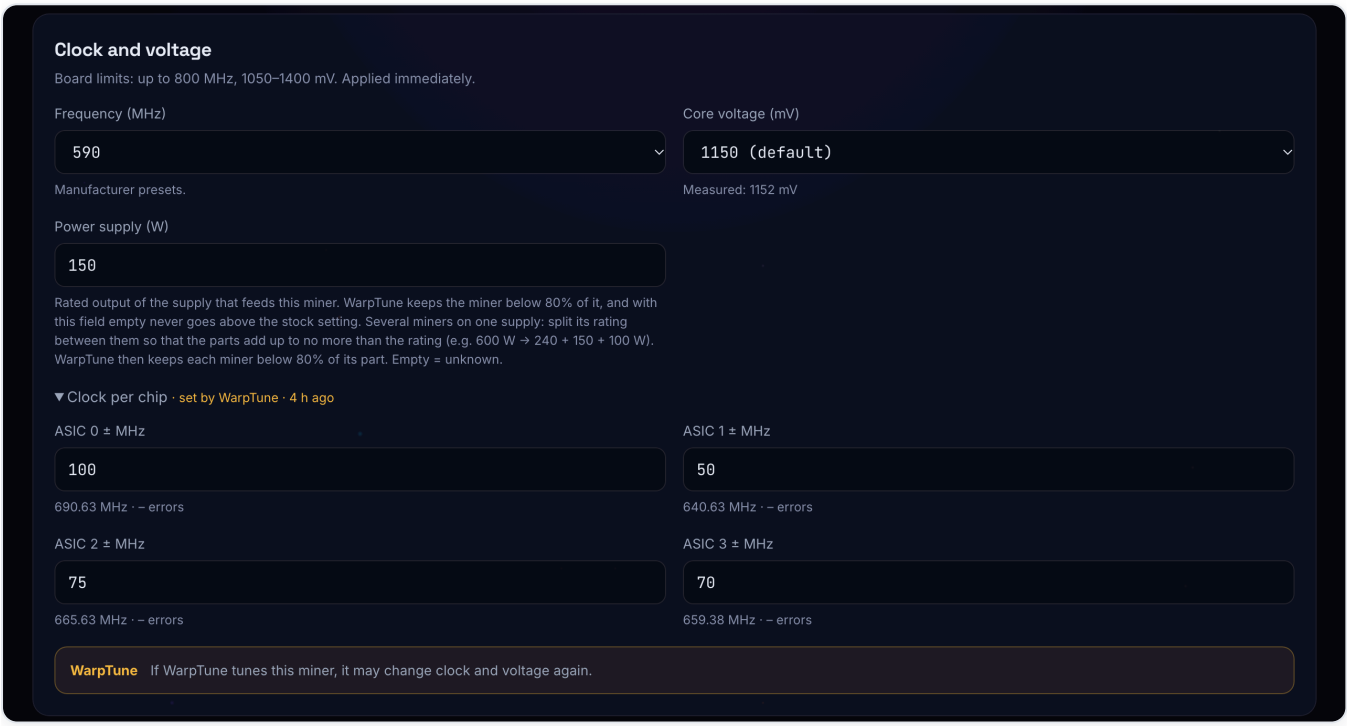
Settings: clock and voltage with the power supply, fans and temperature, display, the Pages with the live view of the screen, the Cockpit values, the Dashboard option, and the Discord notifications.

Clock and voltage

The line under the title gives the board's limits ("Board limits: up to … MHz, … mV. Applied immediately."). **Frequency (MHz)** and **Core voltage (mV)** are drop-down lists with the manufacturer's presets ("Manufacturer presets."); "default" marks the factory value. Under the voltage, "Measured: … mV" shows

what the regulator delivers. Changes apply immediately — no restart. A higher clock means more hashrate, more power and more heat; change in small steps and watch the temperatures.

Clock per chip — on boards with more than one ASIC (BM1370 and BM1373, so also the Bitaxe Naja Duo) a fold-out **Clock per chip** sits below frequency and core voltage. The NerdQAxe+ does not have it yet: WarpAxe will set its chips' clocks one by one only once this has been measured on a real board. Each chip has a field **ASIC 0 ± MHz**, **ASIC 1 ± MHz**, … for an offset in steps of 5 MHz that is added to the frequency above: –25 lets that one chip run 25 MHz slower than the others, 0 means no offset. Under each field a line such as "600 MHz · 2.16 % errors" shows the clock the chip really runs at and its error rate over the last minute. While a chip has an offset, the fold-out opens by itself and its title says who set the offsets and when, for example "Clock per chip · set by WarpTune · 2 h ago"; the dashboard then shows each chip's clock as well (chapter 5.1).



Clock per chip in the settings: the fold-out opens by itself while an offset is set, and its title says who set the offsets and when.

Why? The chips of one board are never quite alike. They share one core voltage, so the weakest chip decides how low that voltage can go. If one chip shows clearly more errors than the others, a slightly lower clock for that chip alone can let the whole board run at a lower voltage, and so with less power. The miner applies a change at once, without restarting the chips, and keeps it across restarts. A change by hand also goes into the event log, and so does a change over the API (at most one entry every 10 minutes); WarpTune's own steps do not. Leave the fields at 0 and the miner works as it always has.

Limits: no chip may go above the board's highest clock or below half the set frequency. On boards whose chips sit in series (Bitaxe Naja Duo, Gamma Hex, NerdQAxe++ Rev 7) the chips' clocks may also lie at most 25 MHz apart (8 % of the frequency where that is less): there, a chip that is slowed takes a larger share of the voltage, at the other chips' cost. The miner refuses a value outside these limits with a message that names the chip. For now you set the offsets by hand; a later WarpPool release lets WarpTune search them on boards whose chips run in parallel (chapter 8).

Power supply (W) — the rated output of the supply that feeds this miner (printed on it). WarpTune keeps the miner below 80% of it, and with this field empty, WarpTune never goes above the stock setting. **Several**

miners on one supply: split its rating between them so that the parts add up to no more than the rating — for example a 600 W supply feeding three miners → 240 + 150 + 100 W. WarpTune then keeps each miner below 80% of its part. Empty = unknown.

A yellow note reminds you: "If WarpTune tunes this miner, it may change clock and voltage again."

> **Unrestricted values (OC mode).** Adding `?oc` to the address (as on AxeOS and NerdOS) unlocks unrestricted clock and voltage values and an **Expert** section: fan PID gains, the target regulator temperature (on every board with a fan and a regulator), a second fan output, the suggested pool difficulty, the job interval, and a preview of the display's special screens. "Values outside the manufacturer's range can overheat or damage the miner." "Leave OC mode" switches back.

Fans and temperature

The line under the title says how the fans are wired, for example "Two fan outputs: M2 follows the chips, M1 the voltage regulator." On a board with one fan output (the Bitaxe boards, the BitForge Nano, the NerdAxe Gamma and the NerdAxe Gaia) it reads "The fan follows the chip temperature and, in automatic mode, also the voltage regulator once the regulator passes its target temperature." This is new in v0.1.50: under automatic control the fan runs at the higher of the two speeds that the chips and the regulator need, and keeps the regulator at or below 80 °C (or below the **Target regulator temperature (°C)** in the Expert section, if you set it). In normal mining the regulator stays below 80 °C and the fan runs as before; only a regulator heading for its overheat stop (an overclock, or the two chips of a Gamma Turbo) turns it up before the chips have to go off. A fixed fan speed stays as set. The exception is the NerdAxe Gamma and the NerdAxe Gaia: while the chips run and the regulator temperature cannot be read, the fan runs at 100 %, even with a fixed fan speed. **Link the fans** does not apply to these one-fan boards.

Field	Meaning
Automatic fan control	"PID on the target temperature": the miner speeds the fan up and down to hold the target. Recommended.
Invert fan PWM	"For fans that run opposite to the setting." Only if your fan runs fast when it should run slow.
Target chip temperature (°C)	The temperature the fan control aims for.
Shutdown temperature (°C)	The chips' safety limit: "For the chips: above it, the core voltage goes off until chips and regulator are 10 °C below their limits. The regulator has its own fixed limit per board, shown on the dashboard." (the red mark on the Temperature card). The defaults match the stock firmware: on a Bitaxe and the BitForge Nano, 75 °C for the chips and 105 °C for the regulator, the values at which AxeOS shuts down; on the NerdQAxe++, NerdQAxe+, NerdOCTAXE-γ and NerdQX, 70 °C for both, as on NerdOS. You can lower the chip limit; on the Nerd boards you can also raise it to 90 °C, as NerdOS allows, but on a Bitaxe not above its default. Since v0.1.36 the BitForge Nano reads its chip temperature the way ForgeOS does: about 8 °C lower than before at the same operating point, and the 75 °C chip limit applies on that scale, as in ForgeOS. Its target temperature moved with the scale to 52 °C, so the chips stay as warm as before and the fans run as before. A stored 60 is changed to 52 once; a target you set yourself stays and now counts on the new scale.
Minimum fan speed (%)	The fan never runs slower. "Big fans may not start below about 25%."
Fixed fan speed (%)	"Only without automatic control."
Link the fans	(Nerd boards with two outputs.) "M1 runs at the speed of M2, which follows the chip temperature. On by default, as on NerdOS." Turn it off only if M1 cools the voltage regulator alone; M1 then follows the regulator's temperature.

Display

Rotate screen 180°, **Invert colours**, **Screen off after (min, 0 = never)**, **Display language**, **BTC price and fees on the display** with its **Currency**. The price option "Asks mempool.space every 10 minutes. Off: the miner talks to its pool only." It is off by default — with it off, the miner talks to its pool and nothing else (apart from the update check and NTP, both of which you can switch off).

Two more cards choose **what the display shows** (chapter 6). Beside them, a **Live view** shows the device's screen, read every 3 s while the page is open; saved changes show there within a moment ("Screen off or not drawing right now." while the display sleeps).

- **Pages** (colour LCD) — tick the pages the page key cycles through (Cockpit, Bitcoin, Device, Pool, Log, and Clock, which is off until you tick it) and put them in order with the arrows (**Move up** / **Move down**). **Start** marks the start page, shown at boot and after a minute without a key press. "At least one stays on." The special screens (overheat, ASICs off, no pool, update, block found, Wi-Fi setup) always show.
- **Cockpit values** (colour LCD) — "The layout stays; choose what each slot shows." **Large number**: Hashrate, Efficiency (J/TH) or Power (W); the curve under it follows the choice. **Slot 1–3**: chip or regulator temperature, power, efficiency, fan (rpm or %), shares, best difficulty, block height, BTC price (needs the

price switch above), pool difficulty, uptime, input voltage or shares per hour. **Footer line**: a combination of pool, shares, IP address, uptime and worker. A value this board does not have shows as "–"; the list offers only what the board can measure.

- **OLED slides** (Bitaxe OLED, instead of the two cards above) — which slides take turns, in which order, and **Seconds per slide** (1–60, default 4). The BOOT key still advances them manually. The slide **Clock · date · hashrate** is off until you tick it.
- **Clock and night mode** — **Time format** (**Automatic (by time zone)**, **24 hours**, **12 hours (AM/PM)**), **Night mode** with **From** and **Until**, and **Brightness at night (%, 0 = dark)**. "Needs the time from NTP (Network settings) and the right time zone." While night mode is on, the line also says "active now" or "inactive now". Chapter 6 describes the clock and night mode.

Factory layout resets all of these to the factory defaults in one go and saves them.

Dashboard

Hash counters on the dashboard — switches the hash-counter card on the Dashboard on or off. "The API reports them either way."

Notifications

"Discord messages from this miner. In Discord: Server Settings → Integrations → Webhooks → New Webhook → Copy Webhook URL, then paste it here." The miner can post a short message to a channel on your Discord server when something worth a look happens. Each event has its own switch; all five are on by default:

- **Block found** — once for each block found.
- **New best difficulty** — a new all-time best. "At most one message every 10 minutes"; the message gives the newest value.
- **Switch to or from the fallback pool** — when the miner moves to the fallback pool because the main pool failed or sent no new job, and when it goes back. At most one message a minute; switches in between are counted in the next message.
- **Solo pool stops paying your address** — when the payout check leaves a pool, or only warns because there is no other pool (chapter 5.4): the pool paid your address nothing, or kept more than your fee limit, in two blocks in a row. A separate message, never lumped in with the pool switches, for example "⚠️ bitaxe602: the main pool's coinbase stopped paying this miner's address, mining on the fallback pool" or "⚠️ bitaxe602: the main pool keeps 3.5 % of the coinbase (limit 2 %), mining on the fallback pool". It does not name the pool.
- **Restart after a crash** — after a restart caused by a panic or the watchdog, with the reason, sent once the network is back. A normal restart, an update or a power cut sends nothing.

The messages are in English and begin with the miner's hostname, for example "⛏ bitaxe602: new best difficulty 14.8M (network 102.3T)". They mention nobody in the channel.

To set it up:

1. In Discord, open **Server Settings** → **Integrations** → **Webhooks**, click **New Webhook**, choose the channel, and click **Copy Webhook URL**.
2. In WarpAxe, paste the URL into **Discord webhook URL** and press **Save** at the bottom of the page. Only Discord's own webhook URLs (`https://discord.com/api/webhooks/…`) are accepted; anything else is refused on saving, with the reason.

3. Press **Send test message** ("Test message queued; it should show up in Discord within seconds."). The button works once a webhook is saved.

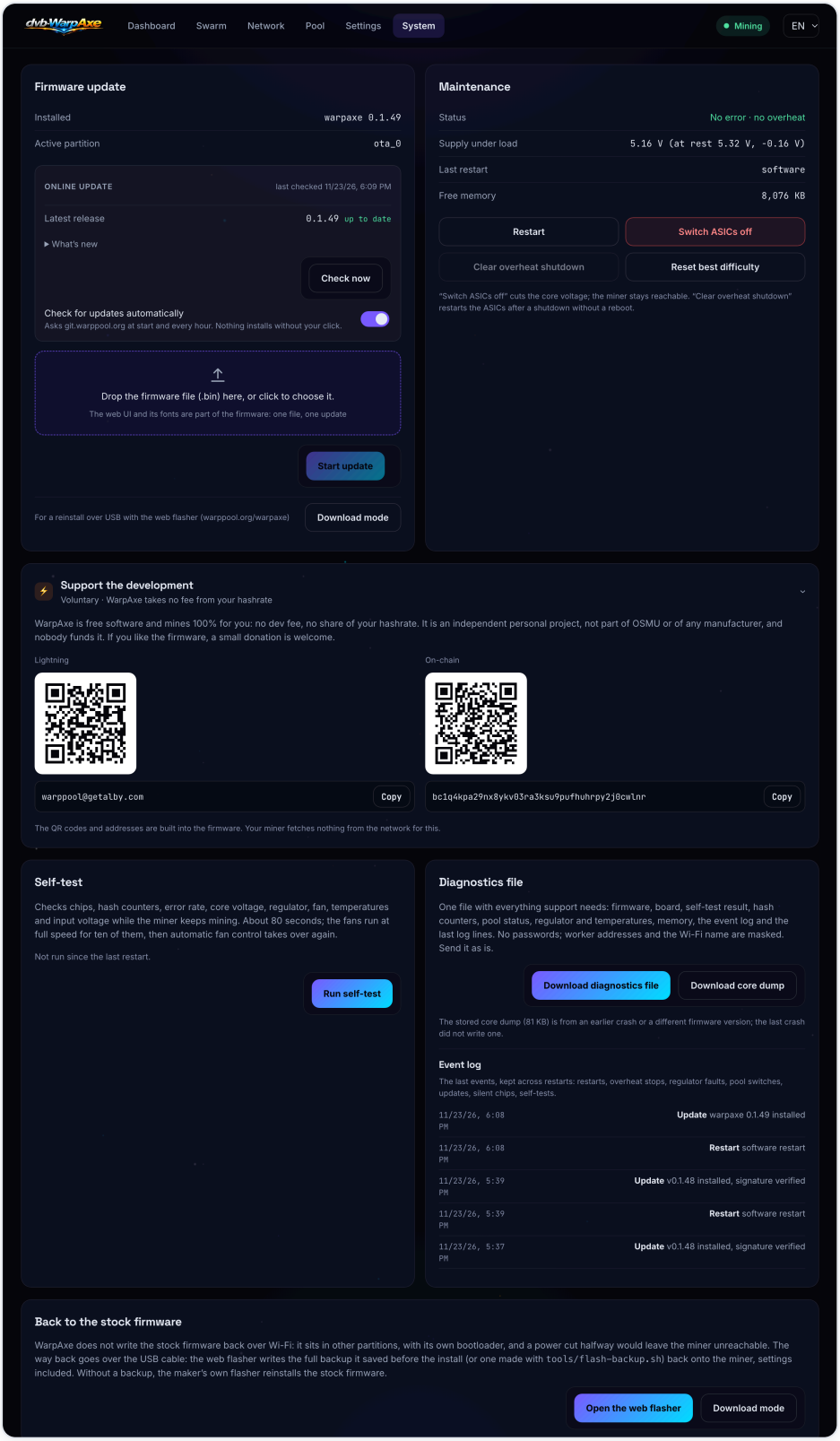
Under the switches, a line tells you how the last message went: "Last message delivered … ago (…)" in green, or "Last message failed … ago (…): …" in red, with the kind of message in brackets and, after the colon, the reason. This line is kept only until the next restart.

The field stays empty even when a webhook is set; the line under it then says "A webhook is set. Leave empty to keep it.", otherwise "No webhook set: no messages are sent." To change the webhook, paste a new URL and save. **Remove webhook** (shown only while one is set) asks "Remove the Discord webhook? No more messages will be sent." and removes it at once ("Webhook removed."). To stop only some messages, switch them off and save.

"The miner sends only its hostname and the event, and only to this URL. The URL is never shown again." A message carries the event and its figures (block height, difficulty, how long a pool sent no job, the reason for a restart), but no IP or MAC address, worker name or pool. The URL contains the webhook's key: anyone who has it can post to your channel. So the miner never shows it again, does not write it to the log, and leaves it out of the diagnostics file and the core dump download. Without a webhook, nothing about this feature leaves the miner.

Press **Save** at the bottom. Fan and display changes apply at once.

5.6 System



System: firmware update, maintenance, the donation card, the way back to the stock firmware, the live log and the Bitcoin whitepaper.

Firmware update

Installed (the running version) and **Active partition** (which of the two firmware slots is running, ota_0 or ota_1). The **Online update** box shows **Latest release** with "up to date" or "new", "What's new" (the release notes), **Check now**, **Install …** when there is a newer one, and the switch **Check for updates automatically**

— "Asks git.warppool.org at start and every hour. Nothing installs without your click." Below, the upload area "Drop the firmware file (.bin) here, or click to choose it." with **Start update**, and **Download mode** "For a reinstall over USB with the web flasher". Chapter 7 explains updates in full.

Maintenance

Item	Meaning
Status	"No error · no overheat" in green, otherwise the reason (overheat, regulator warning with its conditions, ASICs off, board error).
Supply under load	(Boards whose regulator measures the input voltage.) The input voltage while the chips hash, the voltage at rest (chips off) and the drop between them, for example "11.82 V (at rest 12.05 V, –0.23 V)". If the drop reaches 8% of the board's nominal input for a full minute, the value turns yellow and a warning says: "The input voltage drops … V under load: the power supply or its cable may be too weak." The warning goes again below 6%. It only reports; nothing is switched off. In the API: `vinIdle`, `vinLoad`, `vinSag` (in volts) and `psuSagWarning`.
Last restart	Why the miner last restarted (e.g. "software" for a normal restart; a crash or watchdog shows here too).
Free memory	Free RAM. Only interesting for bug reports.
Restart	"Mining pauses for about 40 s."
Switch ASICs off / **Switch ASICs on**	Cuts the core voltage; mining stops but the miner stays reachable. Useful before you touch the board, or to pause mining.
Clear overheat shutdown	Restarts the ASICs after an overheat shutdown without rebooting — required after the third shutdown within an hour, after which the ASICs stay off until you clear it.
Reset best difficulty	Sets the best-difficulty record back to zero.

Support the development

A card **"Support the development"**, with the line "Voluntary · WarpAxe takes no fee from your hashrate". WarpAxe has no dev fee: it mines 100% for you. It is an independent personal project, not part of OSMU or of any manufacturer, and nobody funds it; if you like the firmware, you can leave a small donation here. The card shows two ways to give, **Lightning** and **On-chain**, each with a QR code to scan and the address with a **Copy** button ("Address copied"; if the browser does not allow copying, select the address and copy it yourself). The QR codes and addresses are built into the firmware: the miner fetches nothing from the network for this card. A click on the title collapses the card; it then stays collapsed in this browser.

Self-test

Run self-test checks the miner while it keeps mining: chip count, hashrate per chip, hash domains, error rate, core voltage, regulator, fan, temperatures and input voltage. It takes about 80 seconds: for a minute it reads the chips' hash counters at the clock and voltage you set, then the fans run at full speed for ten seconds ("Fan test") before automatic fan control takes over again. Clock and voltage stay as they are, and the miner does not restart.

The result lists every check with ✓ or ✗ and the figure behind it (for example "lowest 98.7% (chip 0), limit 80%"; chips are counted from 0, as on the dashboard's chip grid), then **PASS** or **FAIL** with "9 of 9 checks passed". A check the board cannot do — a fan the firmware does not drive, domain counters the BM1397 does not have — shows as "skipped". The device display shows the running test and then the result, for five minutes or until you press a button. **Download result** saves it as a file; the miner keeps it until the next test or restart. If the clock or the voltage changes during the test (for example because a tuner sets a new point), the test stops with "clock or voltage changed during the test": run it again once the point stays put.

You can run the self-test before a pool is set up, for example on the bench. If no pool answers, the self-test switches the ASICs on for the test. Without work from a pool the chips cannot hash, so the checks that count hashes (hashrate, domains, error rate) are marked "skipped" with the note "no work from the pool" instead of failed. Everything else is checked as usual: chip count, voltages, regulator, fan and temperatures. For a full test including the hash checks, run it again once the miner has a working pool.

Diagnostics file and event log

Download diagnostics file saves one file with everything support needs: firmware, board, the last self-test result, hash counters, pool status, regulator and temperatures, memory, the event log and the last log lines. It contains no passwords and no Discord webhook; worker addresses and the Wi-Fi name are masked (for example `bc1q…5mdq.worker`). Send it as it is. If a crash left a core dump on the miner, **Download core dump** appears next to it. From v0.1.38 the download replaces the passwords, the Wi-Fi name and the worker addresses in the dump with `x`, so you can send it as well. A dump stays stored until the next one replaces it, and not every crash writes one: if the stored dump is from an earlier crash or another firmware version, the line below the buttons says so. If the firmware panicked or a task ran out of stack, the file also carries the firmware's last words (`lastWords`): which task crashed and, for a panic, where in the code, even when no dump was written.

The **Event log** below lists the last 32 events, newest first, and keeps them across restarts: restarts with their reason, overheat stops, regulator faults and lost regulator settings, a missing fan chip, a static IPv4 address given up for DHCP, pool switches and pools left by the payout check, updates and rollbacks, chips that went silent, self-test results, board checks and found blocks. The details appear in the language of the web UI; the diagnostics file keeps them in English.

After a crash (a panic or the watchdog; a normal restart, an update or a power cut are not crashes), every page shows the notice "The miner crashed" with the reason, the time and the download buttons. The notice offers **Download core dump** only if this crash wrote the dump; otherwise it says "No core dump was written for this crash." From v0.1.37 the reset at the end of an install over USB no longer counts as a crash, unless you reinstall the version that was already running without starting at **System** → **Download mode**. **Dismiss** hides the notice until the next crash.

Back to the stock firmware

Explains the way back and has **Open the web flasher** and **Download mode** buttons. See chapter 9.

Log

The miner's live log: pool messages, new jobs, warnings. **Pause** stops the scrolling, **Download** saves it as a file — attach it to a bug report. The log also records the IP address behind every restart, update, download-mode or settings request.

Bitcoin whitepaper

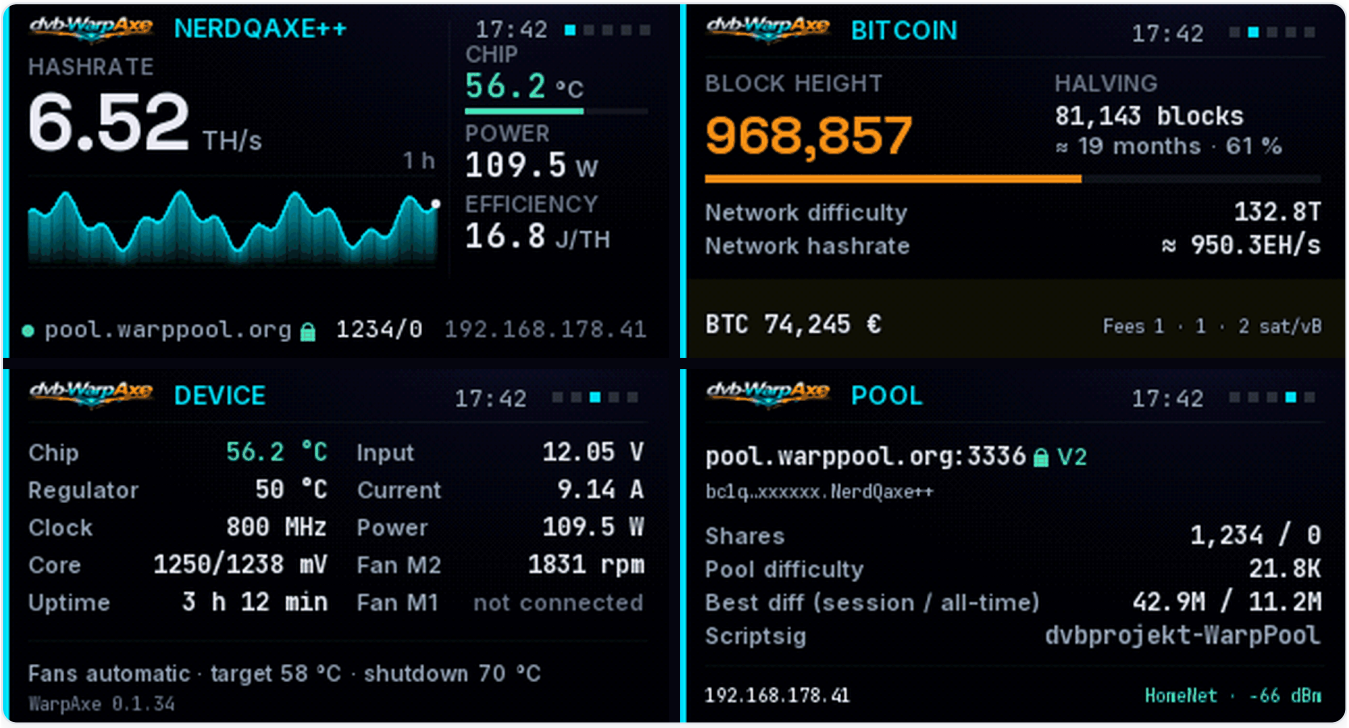
Satoshi Nakamoto's 2008 paper as a PDF (184 KB), opened from warppool.org.

6 · The device display

Every supported board has a small screen. WarpAxe shows the most important numbers there, so you can check the miner without a computer.

The colour LCD (Nerd boards, NerdNOS, Bitaxe Naja Duo and Gamma Hex)

The 320×170 LCD has five pages, and a clock page you can add:



The cockpit and three more pages: Bitcoin, Device and Pool (a log page follows).

Page	What it shows
Cockpit	Board name, the hashrate in large digits with the last hour as a chart, chip temperature, power and efficiency; at the bottom the pool (with a lock when encrypted), shares accepted/rejected and the miner's IP address.
Bitcoin	Block height, blocks and time to the next halving, network difficulty and an estimated network hashrate — all taken from the pool's work. The BTC price and fee line appears only if you switched it on (Settings → Display).
Device	Chip and regulator temperature, clock, core voltage (set/actual), uptime, input voltage, current, power, fan speeds, the fan mode with target and shutdown temperature, and the firmware version.
Pool	Pool address and protocol, worker, shares, pool difficulty, best difficulty (session / all-time), the pool's coinbase tag ("Scriptsig"), the IP address, Wi-Fi name and signal.
Log	The latest log lines.
Clock	Off until you tick it (Settings → Display). The time in large digits, the weekday, date, calendar week and hashrate; below them the block height and the BTC price and fee, or the pool and uptime. See "Clock and night mode" below.

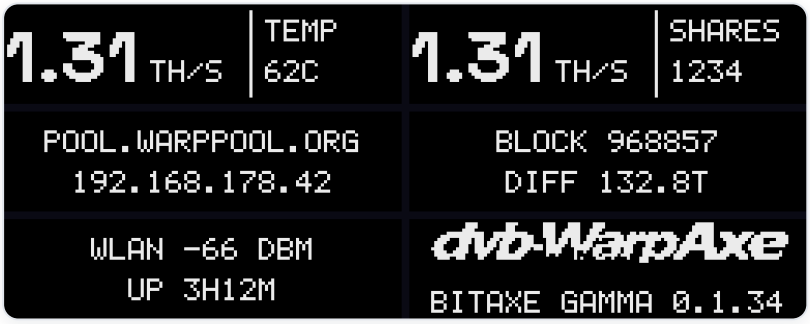
The keys. The **page key** next to the LCD steps through the pages. The **BOOT key** goes back to the start page (the cockpit unless you chose another), and a minute without a key press does too. On the NerdNOS (no regulator, no fan) the device page shows what the board has instead: the ESP32-S3's temperature, the effective rate, the Wi-Fi signal and the shutdown temperature.

Keys on the Bitaxe Naja Duo and Gamma Hex. These boards have no page key next to the display, only the boot key. A short press goes to the next page. Hold the key for one second to go back to the start page; the display switches while you are still holding it. If the display is off, or dimmed at night, the first press only wakes it up. The reset key restarts the miner and cannot be used for the display.

The OLED (Bitaxe)

The Bitaxe's 128×32 OLED shows the hashrate in large digits on the left and a rotating value on the right (temperature, shares, …), followed by full-width info slides: pool and IP address, block height and network difficulty, Wi-Fi signal and uptime, and the wordmark with board and version. It flashes briefly on each new share. The BOOT key advances to the next slide. A clock slide, "Clock · date · hashrate", can be added to the rotation.

To prevent burn-in, the picture moves by one pixel every ten minutes. It goes through twelve positions: at most one pixel left or right, one up or two down. The screens leave room for this, so nothing is cut off. For the first ten minutes after a start, the picture stays in place.



Bitaxe Gamma OLED: hashrate with rotating values, then the info slides.

Clock and night mode

Clock. The display's page list has a "Clock" page. It is off until you tick it. It shows the time in large digits, with a bar that fills over the current minute. Next to it you see the weekday, the date, the calendar week and the hashrate. Below that are the block height and, if BTC price and fees are switched on, the price and the fee for the next block. If they are off, the page shows the pool and the uptime instead. If you mainly want your miner as a clock, make this page the start page. On the Bitaxe's small OLED, "Clock · date · hashrate" is a slide you can add to the rotation.

The clock needs the time from NTP (network settings, on by default) and the right time zone. Until the miner has the time, the page shows dashes and "Check NTP".

Time format. "Automatic" uses the 12-hour clock with AM/PM in the time zones of the USA, Canada, Australia, New Zealand, India, Pakistan and the Philippines, and the 24-hour clock everywhere else. It goes by the time zone you set. If that gives the wrong format for your country, choose 24 or 12 hours yourself.

Night mode. Night mode is off until you switch it on. Between "From" and "Until" (22:00 to 07:00 unless you change it), the display then shows only the time, the date and one line with hashrate and chip temperature, on black and dimmed to the brightness you set (50% unless you change it). 0% turns the display off for the night. On the colour LCD the backlight follows the percentage: on the Nerd boards it dims in 16 steps, on the

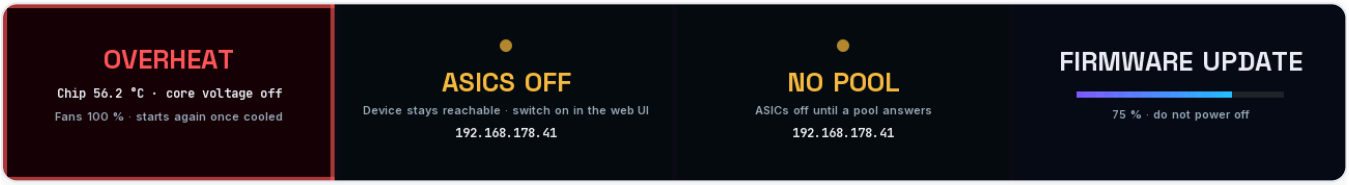
Bitaxe Naja Duo and Gamma Hex smoothly. On the Bitaxe's OLED, each pixel is either on or off, so the miner turns down the contrast and the current that drives the pixels instead; 100%, 75% and 50% look clearly different.

The screen timeout does not apply during this window; at night you choose the brightness instead. A key press on the device brings back the full display for 30 seconds; it does not change the page. Changes over the API, such as those from WarpTune, do not light up the display at night. Night mode does nothing while the miner does not know the time. A found block, an overheat stop, a firmware update and a self-test still show at full brightness at night, even at 0%.

In the API: `clockFormat` ("auto", "24h", "12h"), `nightMode` (true/false), `nightStart` and `nightEnd` (minutes of the local day, 0–1439), `nightBrightness` (0–100). Read-only: `clock12h` (12-hour clock in force now), `nightActive` (night mode in force now). The page name is `clock` in `displayPages`; the OLED slide is `clock` in `oledSlides`.

Special screens

While one of these states lasts, its screen replaces every page:



Overheat (pulsing red frame), ASICs off, no pool, firmware update with progress.

- **OVERHEAT** — the chips or the regulator reached the shutdown temperature; the core voltage is off and the fans run at 100%. The ASICs start again by themselves once both are 10 °C below their limits (after at least 60 s). After the third shutdown within an hour, the ASICs stay off until you press **Clear overheat shutdown** (System tab). Find the cause first: a stuck fan, blocked airflow, too high a clock or voltage, a hot room.
- **ASICS OFF** — switched off in the web UI, or while the board choice waits. "Device stays reachable · switch on in the web UI", with the IP address.
- **NO POOL** (since v0.1.42) — no pool answers, the ASICs are off until one does ("ASICs off until a pool answers").
- **FIRMWARE UPDATE** — progress of an update. **Do not power off.**
- **Block found** — stars accelerate into a warp jump, a flash, then the block height with shock rings. It stays on screen for up to ten minutes, or until you press a key. The web UI shows a "Block found!" banner as well (chapter 5.1).



Block found: the warp jump.

Display settings — rotation, inverted colours, screen timeout, language (the device display supports the six Latin-script languages) and the optional BTC price — are on Settings → Display. There you also choose which pages the key steps through, their order and the start page, the cockpit's large number, its three value slots and its footer line, and on the OLED which slides rotate and for how long (section 5.5). The clock page, the OLED clock slide, the time format and night mode are set there as well. The tables above describe the factory layout.

7 · Updates and rollback

After the first USB install, you never need the cable again for updates.

How the online update works

1. The miner checks the WarpAxe releases page (git.warppool.org) **at startup and every hour**, if "Check for updates automatically" is on.
2. When a newer release exists, a pill **"Update available"** appears in the header on every page, and **System → Online update** shows the version with "new" and its notes under "What's new".
3. **Nothing installs by itself.** Click **Install …** and confirm ("Install firmware … now? The miner restarts afterwards.").
4. The miner downloads the image (up to three tries), then **checks its SHA-256 checksum and its BIP-340 signature** against the key built into the firmware. Only then does it write it ("Writing …% · do not power off").
5. It switches the ASICs off and restarts. A bar under the header follows the update on every page and finally says "Update done: the miner runs WarpAxe …". The page reloads by itself.

> **Unsigned releases.** A release without a signature still installs for now and is flagged: "This release is not signed; it installs, but the miner cannot check who built it." That tolerance ends once every release carries one.

> **"not yet released for this board"** — every release lists the boards it was tested on. The experimental T-Display-S3 does not install a release that was not tested on it.

Manual upload

Download `warpaxe.bin` from the releases page, drop it on the upload area on the System tab and press **Start update**. One file holds everything — the web UI and its fonts are part of it. A manual upload is treated as your own image and is **not** signature-checked.

Rollback: an update that does not start

A new version first boots "on trial". It marks itself as good once the chips are running (or, at the latest, after three minutes of uptime). If the miner resets before that — a crash, the watchdog, a power cut — the **previous version comes back**, and the System tab says: "The last update failed to boot: the miner went back to this version."

> **This needs the bootloader of v0.1.22 or later.** The bootloader is only written by a USB install. If your miner reached its current version via online updates from an older one, reinstall once with the browser installer (settings are kept) to give it the new bootloader.

Settings across updates

Settings are kept on an online update and on a reinstall with the web installer. Every settings change is logged with the IP address it came from.

If the miner restarts but still runs the old version, the bar says "the update did not take. The log on the System page says why." If the miner does not answer for five minutes, check its display, or take it off power

for a few seconds.

8 · Working with WarpTune and WarpPool

The AxeOS-compatible API

WarpAxe answers the same web requests as AxeOS and NerdOS — `/api/system/info`, `PATCH /api/system`, `/api/system/asic`, `/api/v2/settings`, NerdOS's `/api/v2/dashboard`, restart and firmware upload. Tools that manage Bitaxes therefore work with it, and it is found by name on the network (mDNS `<hostname>.local`, announced the way AxeOS does, so Bitaxe discovery tools find it).

WarpTune

WarpTune, dvb-WarpPool's clock-and-voltage tuner, works fully with the stock firmware too. The difference is what the firmware reports about itself: WarpAxe **reports these states explicitly**, so WarpTune does not have to guess them from the power draw:

- **Overheat stop**, how many stops in the last hour, and the cause (too hot, a lost sensor, or a regulator fault). WarpTune pauses during the shutdown and steps the clock down after a heat-related one; a lost sensor is no reason to step down.
- **ASICs off** or **the chain still coming up**, so a chain that is powering up is not mistaken for a dead chip.
- **Fallback pool** in use and **reject reasons**, as on current AxeOS.
- The **chip error rate over a minute**, from the chips' own counters: a voltage that is too low shows in minutes, not after hundreds of pool shares.
- The **power supply rating** you entered in Settings, so WarpTune knows its 80% limit without its own configuration.
- The **clock of each chip**; WarpAxe also takes an offset per chip (chapter 5.5): with a later WarpPool release, WarpTune will be able to slow down just the one or two chips that would otherwise hold the whole board's voltage up, on boards whose chips run in parallel.

When WarpTune tunes a miner, it may change clock and voltage again — the Settings tab reminds you of that.

Limits on the Bitaxe Naja Duo. WarpTune takes the highest clock option and the board's highest core voltage from the firmware. On the Naja Duo these are 550 MHz and 1120 mV, and WarpTune stays below 94.5 W (90% of the board's `maxPower` of 105 W). The Settings tab no longer accepts a core voltage above 1120 mV; a higher value stored before v0.1.45 is set to 1120 mV at start. At 550 MHz, with the factory target temperature of 50 °C, the fan runs close to full speed and the chips stay at about 50 °C. In OC mode (chapter 5.5) you can still enter a clock up to 600 MHz by hand.

WarpPool

To mine on your own dvb-WarpPool, enter its host and port on the Pool tab: plain Stratum V1 on the pool's normal port, Stratum V1 over TLS on 3334 (switch "Encrypt main pool (TLS)" on; on Umbrel, trust the pool's key once, chapter 5.4), or Stratum V2 on 3336 with the pool's authority key. Check the pool's own connect panel for the exact values.

9 · Going back to the stock firmware

Open **System** → **Back to the stock firmware**. WarpAxe does not write the stock firmware back over Wi-Fi: it sits in other partitions with its own bootloader, and a power cut halfway through would leave the miner unreachable. The way back goes **over the USB cable**.

With the backup (recommended)

1. On the System tab, click **Open the web flasher**; it opens the installer's "Restore a backup" section.
2. Put the miner into download mode: **Download mode** on the same card ("The miner stops mining and waits for the web flasher on the USB cable"), or BOOT/RST by hand.
3. Under **Backup file (.bin)** choose the backup the installer saved before the install (or one made with `tools/flash-backup.sh`). The page checks that it looks like a full flash backup of the right size — a backup from another board with a different flash size is refused.
4. Click **Connect and restore** and choose the miner. The whole flash is written back — firmware, settings and all — and checked against the chip.
5. "Done: the backup is back on the miner and checked. It will now boot into its previous firmware."

Without a backup

The maker's own flasher reinstalls the stock firmware — for the Bitaxe the Bitaxe web flasher, for the NerdQAxe series the NerdQAxe web flasher, for other boards the maker's flasher or image. You then enter Wi-Fi and pool again in the stock firmware.

> If a restore stops, start it again — download mode always answers. If the miner stays dark, take it off power completely first (power supply *and* USB cable).

10 · Troubleshooting & FAQ

The installer cannot find the miner / no port in the list

Use Chrome or Edge on a computer (not Safari, Firefox or a phone). Try a different cable — many carry power only — and another USB port. On a Bitaxe Gamma use a USB-A to USB-C cable with the power supply connected; on the Nerd boards the USB-C port of the display board. Then put the miner into download mode by hand: hold BOOT, press RST, release BOOT. The miner appears as "USB JTAG/serial debug unit".

The miner stays dark after a cancelled install

It is still in download mode. Take it off power **completely** — power supply **and** USB cable — for a few seconds, then plug it back in. The same applies after you used "Download mode" without flashing.

Where is the hotspot password?

Only on the miner's own display, and a new one is generated at every boot. The Bitaxe OLED shows name, password and address in turn — wait for the next round. The hotspot opens immediately when no Wi-Fi is configured, otherwise only three minutes after a startup that did not reach the network. A router outage while the miner runs does not open it — restart the miner if you need it.

The board-choice banner ("Which board is this?")

WarpAxe could not tell the board for sure, so the ASICs stay off until you choose. Pick the model printed on the circuit board and press "Use this board and restart". Never guess — a wrong board can damage the miner. If the card then says "… does not fit this miner" or "…: the chips do not match", the board you chose is not the one in the miner: the ASICs stay off until you choose again (chapter 4).

The pool does not connect with TLS or Stratum V2

An authenticated Stratum V2 pool checks certificates, and for that the miner needs the correct time. Until NTP has set the clock, the miner does not connect to it; the dashboard shows a "Time" notice. Check **Network → Time via NTP** is on and the NTP server is reachable. For Stratum V2 with "Require pool authentication" on, the pool's authority key must be entered. TLS needs a port on which the pool offers TLS. Once NTP has set the clock, a TLS pool with an expired certificate is refused. If the Pool tab shows "Certificate not from a public authority" or "The pool’s key has changed", see chapter 5.4.

The log says "no data from the pool for 30 s"

The pool accepted the connection but sent no work within 30 seconds (with "180 s": nothing for three minutes while mining). The miner tries again and, after three failed attempts, switches to the fallback pool if you set one. Check the pool's address and port and whether the pool is up. If the pool only answers over IPv4, the miner switches to IPv4 on its own (chapter 5.4).

The event log says "no new job from the pool for … s"

The pool kept the connection but sent no new work for ten minutes; the miner reconnected, and after five more minutes without fresh work it moved to the fallback pool, if one is set. Nothing is wrong with the miner. Check the pool's status page, or set a fallback pool if you have none. Once the main pool sends work again, the miner goes back to it by itself at its next check.

What does "payout checked" mean?

The green line "✓ payout checked · fee … %" under the pool name on the dashboard's Pool card means: this pool's coinbase has paid your address before, the payout check is watching it, and in its newest job it pays your address and keeps no more than your fee limit. The fee is what the pool keeps of the coinbase; on a solo pool without a fee it reads 0 %. A missing green line is not a fault: the pool may pay you through an account or by share, it may not have paid your address yet, or **Payout check** is off (Pool tab, Main pool). Such a pool is simply not checked.

The event log says a pool "paid your address nothing" or "kept … % of the coinbase"

In two blocks in a row, the pool's coinbase paid your address nothing ("pool … paid your address nothing in 2 blocks in a row (pool keeps all … sat)"), or left the pool more than your fee limit ("pool … kept … % of the coinbase in 2 blocks in a row (limit … %)"). After the comma, the entry says what the miner did: "switched to the fallback", "switched back to the main pool", or "no other pool, keeps mining here". What to do:

1. Open the Pool tab and look at "Payout if you find a block" to see whom the coinbase pays now.
2. Check the worker name: it must begin with your address, in the form the pool pays it to.
3. Check the pool's own pages for a changed fee, maintenance or a new operator.
4. If you accept the higher fee, raise **Highest pool fee (%)** (100 = no limit) and save. Otherwise set up another pool.

The miner does not go back to that main pool by itself. Changing the fee limit or the switch, or editing the pool, makes it judge the pool afresh at once; so does a restart.

Status "Overheated 3× in an hour: ASICs stay off"

Fix the cause (fan, airflow, clock/voltage, room temperature), then press **System → Clear overheat shutdown**.

"Regulator fault: ASICs off"

The voltage regulator reported a fault (the System status names it, e.g. output overcurrent or input undervoltage). WarpAxe treats it like an overheat stop: core voltage off, and after the minute off the ASICs come back on by themselves, as after an overheat; after the third stop within an hour they stay off (status "Regulator fault 3× in an hour: ASICs stay off"). Input undervoltage often points to a weak power supply.

The event log says "core regulator lost its settings"

On boards with a TPS546 voltage regulator (Bitaxe Gamma, Gamma Duo, Gamma Turbo, Naja Duo and Gamma Hex, the BitForge Nano, the NerdAxe Gamma, the NerdAxe Gaia and the NerdQAxe++ Rev 7), the miner reads the regulator's settings back every 10 seconds while the ASICs run, and compares them with what it set. If the regulator has fallen back to its stored defaults (because it restarted on its own), the core voltage no longer matches the setting; the entry gives both: "core regulator lost its settings (core at … mV instead of … mV), reconfigured, ASICs power-cycled". The miner then sets the regulator up again and switches the ASICs off and on, with the same clock and voltage; you do not need to do anything. One bad reading does not trigger this: two readings in a row must agree. If it happens three times with no quiet half hour in between, the miner stops checking until the next restart, so that the ASICs are not switched off and on over and over; the log says so. An occasional entry is harmless. If it keeps coming back, check the power supply, its cable and the regulator's temperature, and send the diagnostics file (see "Something seems

wrong — what should I send?"). The other Nerd boards have a different regulator and are not checked this way.

A fan shows "stopped!"

The fan should turn but reports no rpm. Check its plug and that nothing blocks it. Big fans may not start below about 25% — raise "Minimum fan speed".

"Fan chip not found: ASICs stay off" and the event log says "fan chip (…) not found"

Every board with a fan drives it through a fan chip: the Bitaxe boards, the BitForge Nano with its two such chips, the NerdAxe Gamma and the NerdAxe Gaia through one that also reads the chip temperature, and the NerdQAxe+, NerdQAxe++, NerdOCTAXE-γ and NerdQX through their EMC2302 (checked this way since v0.1.50). At start the miner tries to reach it three times, 100 ms apart. If it does not answer, the miner cannot drive the fan, so the ASICs stay off until the next restart. The status at the top of the page reads **Fan chip not found: ASICs stay off**, the dashboard shows a red note with the same words, a short explanation and a link to **System**, the event log names the chip ("fan chip (…) not found: no fan control, ASICs stay off"), and **Switch ASICs on** is refused: "the fan chip did not answer at start; the chips stay off until a restart". The rest of the miner keeps running, so the web UI stays reachable. What to check:

- Restart the miner once (**System** → **Restart**): a single disturbance on the board's bus at start can cause it.
- Check that the board is supported and was chosen correctly (chapter 4). A board that looks like a supported one but has a different fan chip ends up here; WarpAxe does not support it. Put its stock firmware back (chapter 9).
- If the board ran WarpAxe before and now shows this after every restart, the fan chip or its connection on the board may be damaged. Contact the board's maker.

An update shows "not yet released for this board"

The release was not tested on your board type (this applies to the experimental T-Display-S3). Wait for a release that lists it.

An update says "not enough internal memory"

After running for a long time, the miner's internal memory can be too fragmented to start the update writer. Nothing is changed and the miner keeps mining. Restart it (**System** → **Restart**) and start the update again right after; a freshly started miner always has room. This happens only with firmware up to v0.1.31, so at most once, on the update to v0.1.32: from v0.1.32 on the update writer has its memory set aside from the start.

The web UI over USB does not open

Open `http://192.168.7.1` with the miner on a USB data cable. Two WarpAxe miners on the same computer need different USB addresses (Network → USB address).

The miner does not use the Ethernet cable

Look at **Network** → **Connection**. "no Ethernet HAT found": the NerdHat is not seated properly, or it was fitted while the miner was running; switch the miner off, reseat the NerdHat, and switch the miner back on. "no link": check the cable and the port on the router or switch. "waiting for an address": the port gives no address (no DHCP); after a minute the miner restarts the Ethernet driver and tries again, and Wi-Fi carries

everything meanwhile. No Ethernet line at all: the board does not take the NerdHat (a NerdOCTAXE-γ from Rev 3.4, for example), or it is WarpAxe's first start on the board and the chips have not been counted yet; Ethernet works from the next restart. The Ethernet connection has its own hardware address, so your router shows the miner a second time, with a different address; the web UI answers on both.

Static IPv4: "subnet overlaps the setup hotspot's 192.168.4.0/24"

The setup hotspot uses 192.168.4.1 and runs beside Wi-Fi whenever it is open, so a static address in a network that includes 192.168.4.x cannot work. This includes eero's default network, 192.168.4.0/22. On such a network, leave **Static IPv4** off and give the miner a fixed address in the router instead: a DHCP reservation for the miner's hardware address, which the router's device list shows. The same check refuses a subnet that overlaps the USB address 192.168.x.1; there, choose another number in **Network → USB address**.

A miner on the Swarm tab says "not reachable"

Your browser asks each miner directly, so the miner must be reachable from the computer you are on. Check its address, or that it is powered. An Avalon is read by this miner instead, so it must be reachable from this miner, and it must have been added with the kind "Avalon (cgminer API)".

The test message does not arrive in Discord

Look at the line under the switches in **Settings → Notifications**; the reason after the colon comes from the miner in English.

- No line at all: nothing has been sent yet. The miner sends only once it has been on the network for a few seconds; reload the page after a moment.
- "Discord does not know this webhook (deleted?)": the webhook was deleted in Discord, or the URL was not copied completely. Copy it again with **Copy Webhook URL** (or create a new webhook), paste it, save, and send a test message again.
- "rate limited by Discord": Discord holds this webhook back for the moment. The miner waits as long as Discord asks; try again later.
- "HTTP" with a number: another response from Discord. Try again later; if it persists, create a new webhook.
- Any other text: the miner did not reach Discord. Check that it can reach the internet, not only your local network, and that no firewall blocks discord.com.

If the line says "delivered" but you see nothing, check which channel the webhook posts to (Server Settings → Integrations → Webhooks) and that you can see that channel. If saving refuses the URL, you copied something other than the webhook URL, for example a channel link.

Is the higher error rate on my NerdAxe Gaia a problem?

No. The BM1373 runs a higher error rate than the BM1370 (a Gaia typically shows about 3–4%), rising steeply at low core voltage. That is why it has its own limits: green below 5%, yellow from 5%, red from 9%. The BM1370's limits (yellow from 1%, red from 5%) would mark a healthy Gaia yellow all the time.

Does WarpAxe phone home?

The miner talks to its pool. The update check asks git.warppool.org at startup and hourly — you can switch it off (System). The BTC price on the display asks mempool.space and is off by default. NTP asks the time

server you set. The donation card on the System page fetches nothing; its QR codes and addresses are part of the firmware. Discord is contacted only when you have set a webhook for notifications (Settings), and only at that webhook's address.

Is solo mining with a small miner worth it?

Solo mining is a lottery: a block is found rarely and unpredictably, in proportion to your share of the whole network's hashrate. No firmware can change those odds.

Something seems wrong — what should I send?

Run the self-test first (System → **Run self-test**), then click **Download diagnostics file** on the same page; the file includes the test result. Send it unchanged on our Discord (#warpaxe), with a few words on what you noticed. It contains no passwords, and addresses are masked.

11 · Support & links

Installer	warppool.org/warpaxe
Source & issues	git.warppool.org/dvb-projekt/dvb-WarpAxe
Mirror on GitHub	github.com/dvb-projekt/dvb-WarpAxe — issues and pull requests welcome
Releases	git.warppool.org/dvb-projekt/dvb-WarpAxe/releases — `warpaxe.bin`, `.sha256`, `.sig`, `tested-on.txt`, `warpaxe-factory.bin`
dvb-WarpPool & WarpTune	git.warppool.org/dvb-projekt/dvb-WarpPool
Licence	GPL-3.0-or-later; the drivers in `crates/drivers`: MIT OR Apache-2.0

Reporting a problem? Send the diagnostics file (System → Download diagnostics file): it holds the board, the version, the self-test result and the log. Ideally run the self-test first.

dvb-WarpAxe is free and open-source software (GPL-3.0-or-later). This manual describes version v0.1.50. WarpAxe is early software; screens may differ slightly between releases. The makers' names and wordmarks remain their trademarks. Mining is inherently probabilistic; nothing here is a promise of reward. Always keep control of your own Bitcoin keys.



Happy mining — and may your best share be a block.