



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, and the maker's own firmware on the BitForge Nano and 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**, the clock-and-voltage regulator of dvb-WarpPool (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; the miner finds out on its first start which board it is running on.
- **Your settings are taken over.** Wi-Fi, pools, hostname, clock and voltage, fan settings, temperature limits and display orientation are read from what AxeOS or NerdOS 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.
- **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 window 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 runs at a user's
BitForge Nano (800)	2× BM1370	runs since 29 September 2026; offered on the first start, never chosen on its own
NerdAxe Gaia	1× BM1373	runs since 29 September 2026; clock and voltage capped at 420 MHz / 970 mV
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 at a user's, not on our bench
Bitaxe Gamma Turbo (801)	2× BM1370	profile; runs at a user's, not on our bench
NerdQAxe++ Rev 7	4× BM1370	profile only, not run yet
Bitaxe Naja Duo (1201)	2× BM1373	profile only, not run yet
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) is 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. WarpAxe hashes on the ESP32-S3 itself there, 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 board gets about 60 °C on its back while hashing — put it in a case and don't hold it in your hand while it mines. It takes online updates only for releases that were tested on a T-Display-S3.

An honest comparison with the stock firmware

As of 15 October 2026, checked against the source of AxeOS (ESP-Miner v2.15.3) and NerdOS (v1.1.0.1). Both move fast.

	AxeOS	NerdOS	WarpAxe
Stratum V2, Stratum V1 over TLS, fallback pool	yes	yes	yes
Miner fetches updates itself	no	yes	yes (install on a click)
Update signature checked before flashing	no	no	yes
Failed update falls back to the previous version	no	no	yes (bootloader from v0.1.22)
One image for all boards, board found on first start	no	no	yes
Wi-Fi setup without a network	open hotspot, or Bluetooth	open hotspot	WPA2 hotspot , password on the display
Web UI over the USB cable	not found	not found	yes
Power supply rating in the settings	no	no	yes
Web UI languages	1	9	8
Supported boards	~20 board versions	11 boards	6 run, 7 more with a profile

Where the stock firmware is ahead. It supports far more boards and has years of use by a large community behind it. 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. **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 v0.1.30. 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 <i>data</i> 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	Unless the stock firmware already has them — WarpAxe takes them over.
A pool address and your wallet	The pool's host name and port (for example <code>pool.example.org</code> port <code>3333</code>), and your Bitcoin receive address, which usually goes into the worker field as <code>address.name</code> . Only ever a <i>public receive address</i> — 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 regulator, can then tune the miner. Neither is required. See chapter 8.

Write down your stock settings. WarpAxe takes them over by itself, 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 goes 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 repeats the honest status: 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.)

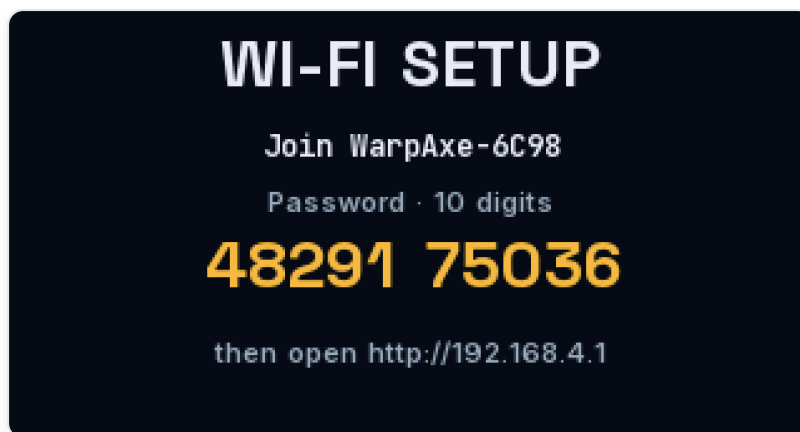
Step 3 — The backup (on by default)

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/Edge open 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 ... %", "Backup saved", "Writing ... %", "Written and checked. Restarting the miner ...". Don't unplug anything while a bar is running.
5. At the end it says: "Done: WarpAxe v0.1.30 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 or NerdOS stored there on its first start. If the installer finds a chip that is not an ESP32-S3, it stops: "This is not an ESP32-S3 ... Nothing was written."



If there is no Wi-Fi to take over, the display shows the setup hotspot after the first start (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), then either the mining cockpit, the board-choice question in the web UI, or the setup hotspot. 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 start: board, Wi-Fi and pool

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

Settings taken over from AxeOS/NerdOS

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 are taken over too. 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 finds the board from the model AxeOS stored at the factory, or by asking which chips answer on the board's internal I²C bus (read-only probes that switch nothing).

- **Found for sure** (a Bitaxe Gamma, for instance): it starts mining at once.
- **Not sure:** some boards look alike on the bus (the NerdQAxe++ and the NerdOctaxe), and a board that has never run WarpAxe is only offered, never taken on its own. Then the web UI shows a yellow banner on every page, **"Which board is this?"**, and **the chips stay off until you answer**. The boards that fit are listed first ("fits"); boards that have only a profile are marked "not run with WarpAxe yet". 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"**. The miner restarts and powers the chips. 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.

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

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 **does not reach it within three minutes of a start**, it opens it then. (A later outage of your router does not open it — only a start that never got onto the network.)

- 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**, made new at every start and **shown only on the miner's display**. Whoever stands at the miner gets in; the neighbours do not.
- 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, 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", like 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 held your network for a minute.

Setting the pool

If no pool was taken 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, it gets "-2". 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 another number in **Network** → **USB address**, for example 8 for 192.168.8.1.

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 several open tabs tell their miners 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 chips", "Chips off", "Overheated", "Overheated 3x within an hour: stays off", "Regulator fault: chips 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 and the clock notice (both explained below).

5.1 Dashboard

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



Dashboard of a NerdQaxe++: the power-supply notice, the type plate with hashrate and history, the Temperature, Fans and Pool cards, and the optional hash counters.

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 shows 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 connection waits for it ("The time is not set and the pool connection (TLS or

Stratum V2 with authentication) waits for it"), or if the clock is more than five minutes off. Clicking it opens the Network tab.

The type plate

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 0.1.29".
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 gets unreliable.

The big number is the **Hashrate (10 min)** — how many hashes per second the miner did on average 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 swings a little because counting is statistical.

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 the start; 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. A "luckiest attempt" score; a block needs a share at the network difficulty.

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 a start 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 chips 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.

The Fans card (with power values)

Each fan output with its speed in % and rpm: on the Nerd boards **M2 · chips** and **M1 · regulator**. "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 <i>not</i> 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.

The Pool card

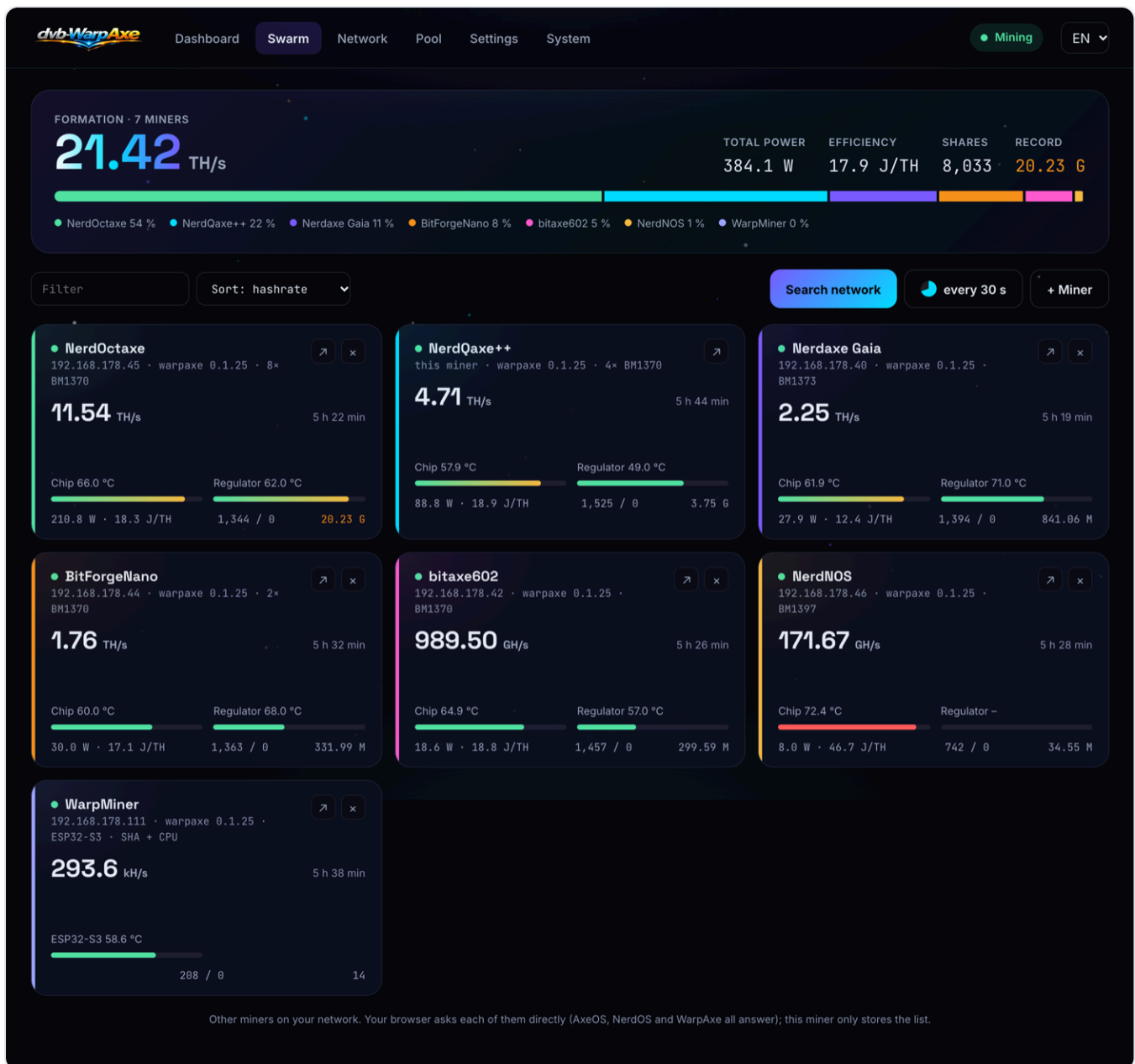
The pool the miner is connected to, with a dot (green = connected) and a badge for the protocol and encryption (e.g. "Sv2 · Noise"). Below: **Worker**, the share **Difficulty** the pool currently asks for, **Shares** (accepted / rejected) and **Payout on a block** — the share of a found block that goes to your address (green from 95 %, red below). On a solo pool it should read 100 %.

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 — a voltage that is too low shows here within minutes. The BM1373 (NerdAxe Gaia) naturally runs a higher error rate (around 2.5 %) and is shown without a colour. "The counters start a few seconds after the chips."

5.2 Swarm

The Swarm tab shows **other miners on your network** next to this one — WarpAxe, AxeOS or NerdOS miners alike. Your browser asks each of them directly; 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.

Formation · 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.

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".

5.3 Network

"Network changes take effect after a restart."

dvb-WarpAxe

DashboardSwarmNetworkPoolSettingsSystem

MiningEN

Network

Network changes take effect after a restart.

NETWORKS FOUND

Search again

Wi-Fi name (SSID)

Home WiFi

Wi-Fi password

Leave empty to keep

Hostname

NerdQaxe++

USB address (192.168.x.1)

7

A second WarpAxe on the same computer needs another number here.

Time by NTP

Real clock times in the history and log

NTP server

pool.ntp.org

Time zone

Europe/Berlin (CET)

Time synchronised via pool.ntp.org, last 45 min ago.

RestartSave

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

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 <code><hostname>.local</code> .
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 another number here."
Time by NTP and NTP server	Sets the clock from the internet (default <code>pool.ntp.org</code>): "Real clock times in the history and log". It matters more than it looks: TLS and an authenticated Stratum V2 pool wait for a set clock (chapter 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.

5.4 Pool

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". When shares were rejected, **Reject reasons** and the **Last reject** show why.

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 "witness commitment (OP_RETURN)" line is a technical output worth nothing. On a solo pool you should see 100 % to your address; on a pool that takes a fee, less.

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 <code>stratum+tcp://</code> , 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.
Encrypt main pool (TLS)	Stratum V1 over TLS. "The pool must offer TLS on this port (WarpPool: 3334). Its certificate is checked."
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 after three failed attempts on the main pool and returns when it 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.

5.5 Settings

dvb-WarpAxe

DashboardSwarmNetworkPoolSettingsSystem

MiningEN

Clock and voltage

Board limits: up to 800 MHz, 1050–1400 mV. Applied immediately.

Frequency (MHz)

600 (default)

Core voltage (mV)

1170

Manufacturer steps.

Measured: 1169 mV

Power supply (W)

150

Rated output of the supply that feeds this miner. WarpTune keeps the miner below 80 % of it, and without it searches no higher than the stock point. 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 regulates this miner, it may change clock and voltage again.

Fans and temperature

Two fan outputs: M2 follows the chips, M1 the voltage regulator.

Automatic fan control

PID on the target temperature

Target chip temperature (°C)

58

Lowest fan speed (%)

25

Big fans may not start below about 25 %

Link the fans

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.

Invert fan PWM

For fans that run opposite to the setting

Shutdown temperature (°C)

70

Chips or regulator above it: core voltage off until both are 10 °C cooler

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)

0

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

Dashboard

Hash counters on the dashboard

Per chip and domain, read from the chips' own counters. The API reports them either way.

Restart

Save

Settings: clock and voltage with the power supply, fans and temperature, display, dashboard.

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 steps ("Manufacturer

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steps."); "default" marks the factory value. Under the voltage, "Measured: ... mV" shows what the regulator delivers. Changes apply immediately — no restart. Higher clock means more hashrate, more power and more heat; change in small steps and watch the temperatures.

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 without it searches no higher than the stock point. **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 regulates this miner, it may change clock and voltage again."

Free values (OC mode). Adding `?oc` to the address (as on AxeOS and NerdOS) unlocks free clock and voltage values and an **Expert** section: fan PID gains, 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."

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)	"Chips or regulator above it: core voltage off until both are 10 °C cooler." The safety limit.
Lowest 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, which you can switch off too).

Dashboard

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

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

5.6 System

Active partition ota_0

checked 10/11/26 1:41 PM

0.1.25 up to date

► What's new

Check now

☐ Look for updates automatically

Asks git.warppool.org at start and every hour. Installing is always your click.

Drop the firmware file (.bin) here or click

The web UI and its fonts are part of the firmware: one file, one update.

Start update

For a reinstall over USB with the web flasher (warppool.org/warpaxe)

Download mode

Status No error · no overheat

Last restart	software
--------------	----------

Free memory 7,883 KB

Restart

Switch chips off

Clear overheat shutdown

Reset best difficulty

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 would leave the miner unreachable. The way back goes over the USB cable: the web flasher writes the full backup it saved before the install (or one made with `tools/flash-backup.sh`) back onto the miner, settings included. Without a backup, the maker's own flasher installs a fresh stock firmware.

Open the web flasher

Download mode

Log

Pause

Download

```
I (18260802) warpaxe::stratum: stratum: difficulty 13147.967
I (18557618) warpaxe::stratum: stratum: sv2 job 114 ntime 1791719369 clean true
I (18679107) warpaxe::stratum: stratum: difficulty 51968.077
I (17556961) warpaxe::stratum: stratum: sv2 job 121 ntime 1791719568 clean true
I (18896677) warpaxe::stratum: stratum: sv2 job 126 ntime 1791719702 clean true
I (18947109) warpaxe::stratum: stratum: difficulty 19439.31
I (19192596) warpaxe::stratum: stratum: sv2 job 137 ntime 1791720004 clean true
I (19253294) warpaxe::stratum: stratum: difficulty 12225.668
I (19604574) warpaxe::stratum: stratum: difficulty 37689.785
I (19721630) warpaxe::stratum: stratum: sv2 job 155 ntime 1791720533 clean true
I (19901064) warpaxe::stratum: stratum: difficulty 20360.581
I (20047662) warpaxe::stratum: stratum: sv2 job 166 ntime 1791720859 clean true
I (20176964) warpaxe::stratum: stratum: sv2 job 171 ntime 1791720987 clean true
I (20258726) warpaxe::stratum: stratum: sv2 job 174 ntime 1791721070 clean true
```

Bitcoin whitepaper

Open

System: firmware update, maintenance, 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 runs, 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 **Look for updates automatically** — "Asks git.warppool.org at start and every hour. Installing is always your click." Below, the upload area "Drop the firmware file (.bin) here or click" 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, chips off, board error).
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 chips off / Switch chips on	Removes 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 chips after an overheat stop without a reboot — needed after the third stop within an hour, which stays off.
Reset best difficulty	Sets the best-difficulty record back to zero.

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 names the address behind every restart, update, download-mode and settings request.

Bitcoin whitepaper

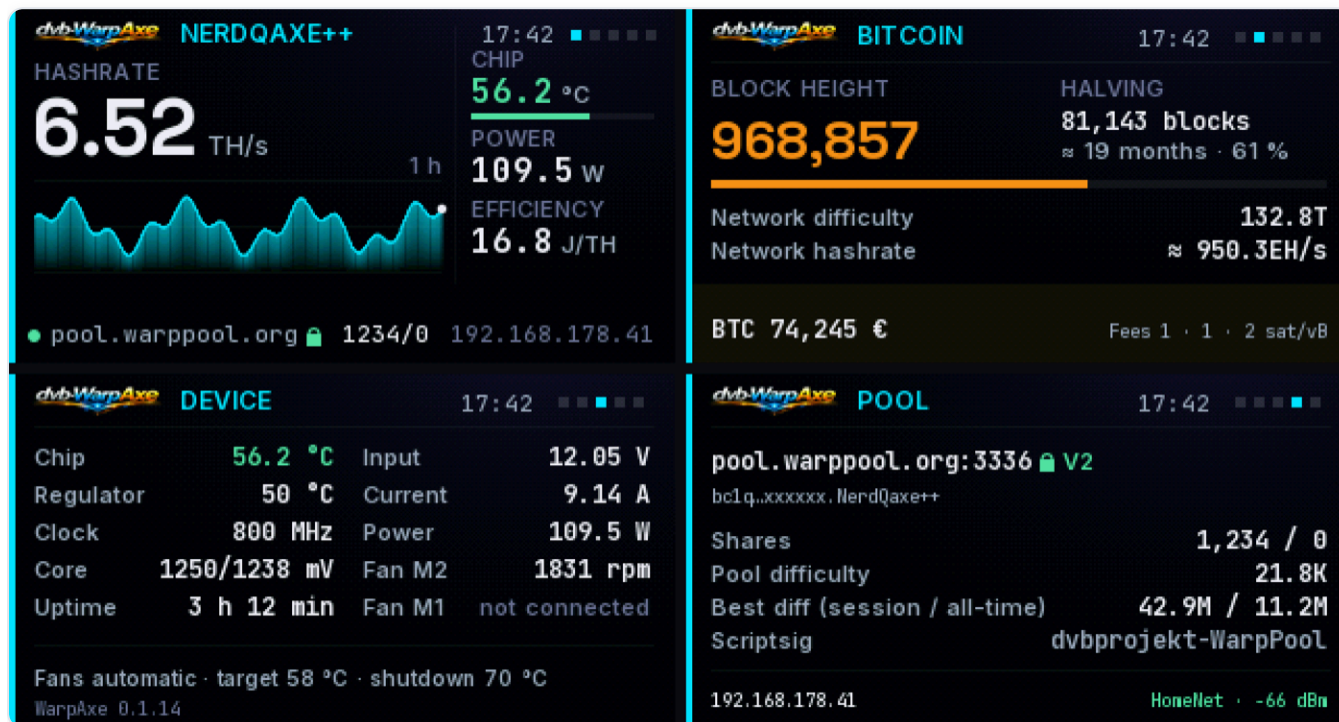
Satoshi Nakamoto's 2008 paper as a PDF (184 KB), opened from warppool.org.

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, Bitaxe Naja Duo and Gamma Hex)

The 320×170 LCD has five pages:



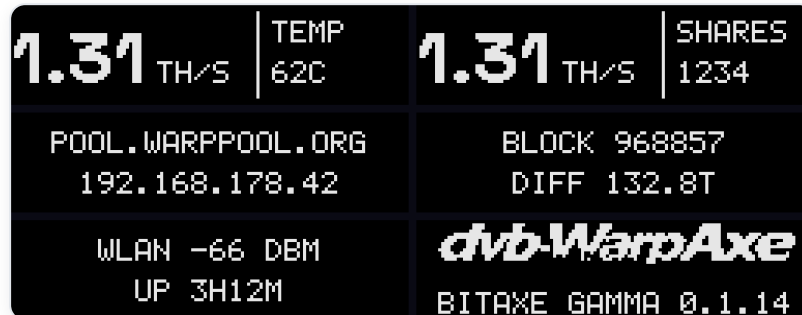
The cockpit and three more pages: Bitcoin, Device and Pool (a log page follows).

Page	What it shows
Cockpit	Board name, the hashrate large 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.

The keys. The **page key** next to the LCD steps through the pages. The **BOOT key** goes back to the cockpit, 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.

The OLED (Bitaxe)

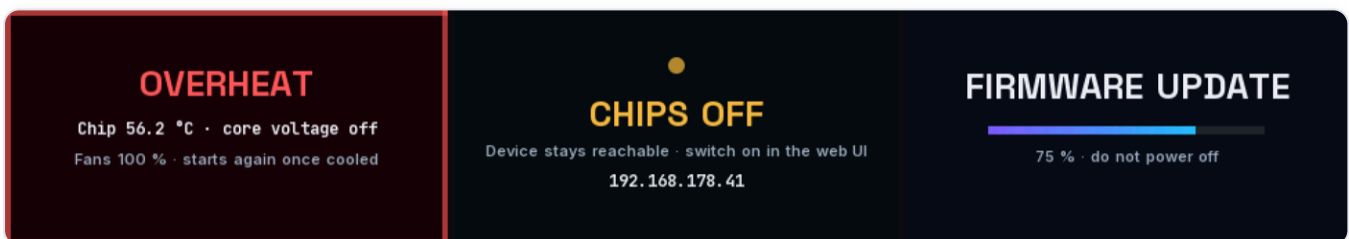
The Bitaxe's 128x32 OLED shows the hashrate large on the left and a rotating value on the right (temperature, shares, ...), followed by full-width info slides: pool and IP address, block height and network difficulty, Wi-Fi signal and uptime, and the wordmark with board and version. A new share makes it blink. The BOOT key steps on.



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

Special screens

While one of these states lasts, it covers every page:



Overheat (pulsing red frame), chips off, 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 chips start again by themselves once both are 10 °C below their limits (after at least 60 s). The third stop within an hour stays off until you press **Clear overheat shutdown** (System tab). Find the cause first: a stuck fan, a blocked airflow, too high a clock or voltage, a hot room.
- **CHIPS OFF** — the chips were switched off (by you, or while the board choice waits). "Device stays reachable · switch on in the web UI", with the IP address.
- **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 up to ten minutes, or until you press a key.



Block found: the warp jump.

Display settings — rotation, inverted colours, screen timeout, language (the device display speaks the six Latin-script languages) and the optional BTC price — are on Settings → Display.

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 start and every hour**, if "Look 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 chips 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 marked: "This release carries no signature; 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 good once the chips run (at the latest after three minutes up). 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 came to its current version by online update 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 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, the clock-and-voltage regulator of dvb-WarpPool, works on the stock firmware in full. The difference is what the firmware says 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 holds during the stop and steps the clock down after a hot stop; a lost sensor is no reason to step down.
- **Chips off or the chain still coming up**, so a chain that is powering up is not taken 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.

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

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), 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 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 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 now starts its old firmware."

Without a backup

The maker's own flasher installs a fresh 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 it is new at every start. 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 start 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 chips 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.

The pool does not connect with TLS or Stratum V2

TLS and an authenticated Stratum V2 pool check certificates, and for that the miner needs the correct time. Until NTP has set the clock, the miner does not connect to them; the dashboard shows a "Time" notice. Check **Network** → **Time by 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.

Status "Overheated 3× within an hour: stays off"

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

"Regulator fault: chips 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, then a retry after a minute; the third within an hour stays off. Input undervoltage often points to a weak power supply.

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 "Lowest fan speed".

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.

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).

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.

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

No. The BM1373 runs a higher error rate than the BM1370 (about 2.5 % at its normal point), rising steeply at low core voltage. That is why it is shown without a colour.

Does WarpAxe phone home?

The miner talks to its pool. The update check asks `git.warppool.org` at start 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.

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. A firmware does not change those odds.

11 · Support & links

Installer	warppool.org/warpaxe
Source & issues	git.warppool.org/dvb-projekt/dvb-WarpAxe
Releases	git.warppool.org/dvb-projekt/dvb-WarpAxe/releases — <code>warpaxe.bin</code> , <code>.sha256</code> , <code>.sig</code> , <code>tested-on.txt</code> , <code>warpaxe-factory.bin</code>
dvb-WarpPool & WarpTune	git.warppool.org/dvb-projekt/dvb-WarpPool
Licence	GPL-3.0-or-later

Reporting a problem? Include the board, the version (System → Installed), and the log (System → Log → Download).

dvb-WarpAxe is free and open-source software (GPL-3.0-or-later). This manual describes version v0.1.30. WarpAxe is early software; screens may differ slightly between releases. The makers' names and wordmarks remain their trade marks. 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.