

The automatic tuner for your home miners

WarpTune Desktop User Manual

macOS · Windows · Linux

WarpTune Desktop v1.41.0 · 2026-10-17

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1 · What is WarpTune Desktop?

WarpTune Desktop is a small program for your computer. It watches your Bitcoin home miners over your home network and adjusts their clock (MHz) and core voltage (mV) for you. The goal is the same hashrate for less power, or a little more hashrate where your hardware has room.

You set up and control it in your web browser, on a page that only your own computer can open. You do not need a terminal, and you do not need to run a mining pool.

Some words used in this manual

Word	Meaning
Point	The pair of clock and core voltage a miner runs at, for example `525 MHz @ 1150 mV`.
Hand point	The point you set yourself in the miner's own web page (or the factory setting, if you never changed it). WarpTune takes the point the miner runs at when WarpTune starts as the hand point. It is the *ceiling* for the voltage and the point WarpTune writes back when it stops.
Step	One rung on WarpTune's ladder of clock values. WarpTune moves a miner one step up or down at a time.
Dry run	WarpTune only watches and writes down what it *would* do. Nothing is sent to the miner.
Live	WarpTune writes clock and voltage to the miner, within its limits.
Journal	A file next to the settings file (`warptune-journal.jsonl`) where WarpTune records every reading and decision.
Share	A small proof of work the miner sends to its pool. Counting accepted shares is the most honest way to see how much a miner really hashes.

What WarpTune does

- It reads each miner every few seconds: hashrate, chip temperature, power, voltage regulator temperature, fan, chip errors.
- It decides, about every 30 seconds, whether the miner should stay, step down or step up.
- In live mode it writes the new point and reads it back to check that the miner took it.
- With a calibration (chapter 10) it searches, step by step, for the lowest core voltage that still runs cleanly, and offers you the result to apply. This works on whatever pool the miner mines.
- On each card it shows what its modes save against your hand point: in watts, and per year in kWh and, once you enter your electricity price or a coupled pool reports one, in money (chapter 11).
- When it stops (logout, shutdown, update, uninstall) it writes the hand point back to every live miner.

What WarpTune never does

These limits are built in. You cannot switch them off from the page.

- **Never above your hand voltage.** The voltage you validated by hand is the top. WarpTune only goes down from there.

- **Never below the voltage regulator's clean range** and never below the firmware's lowest offered voltage.
- **Power limits for every step up:** at most 90 % of the board's power limit and at most 80 % of the power supply's continuous rating.
- **Temperature band.** WarpTune holds a target chip temperature (62 °C by default). It only climbs when the chip is more than 2 °C below the target. It steps down when the chip is 1.5 °C over the target, steps down urgently at 2 °C over, and drops to the lowest step at 74 °C. A voltage regulator at 100 °C blocks the way up; at 103 °C WarpTune steps down.
- **At most 12 writes per hour** per miner. More than that, or a write the miner does not confirm, switches live control off for that miner.
- **Only the miners you add.** WarpTune never touches a device that is not in its list.

> **Saving power, not finding blocks.** WarpTune makes a miner more efficient. It does not change your chance of finding a block in any meaningful way. Solo mining stays a lottery. What you get is a lower power bill for the same hashrate, or a bit more hashrate inside safe limits.

2 · Before you start

Which miners work

WarpTune talks to miners that run an **AxeOS-family firmware**. It reads their web API (`/api/system/info`) and writes clock and voltage through the same API.

Firmware	Typical boards	Notes
AxeOS (ESP-Miner)	Bitaxe (Gamma and others)	Full support.
NerdOS	NerdAxe, NerdAxe Gaia, NerdQAxe++, NerdOctaxe	Full support. NerdOS reports no 1-minute chip error rate; from NerdOS 1.1.1-alpha4 WarpTune reads per-chip errors instead.
Forge-OS	BitForge boards	Supported; publishes no list of clock options.
WarpAxe	Bitaxe Gamma, NerdQAxe++, BitForge Nano and others	Reports the most state directly (chips off on purpose, overheat stops, the power supply you entered), so WarpTune has to guess least.

WarpTune regulates all of them the same way. They differ in how much they report. Where a firmware says less, WarpTune infers it from power and hashrate.

Avalon Q

The Canaan **Avalon Q** is supported in a different way. It does not speak the AxeOS API but the cgminer API on port `4028`. Its own control board sets frequency and voltage per chip, so WarpTune never touches them. WarpTune only switches between the Avalon's three **work modes** (Eco, Standard, Super). There is no calibration and no power supply field for an Avalon Q. Its power cap is the `max_watts` setting in the settings file. The network search finds an Avalon Q too (chapter 6).

> **Not supported:** devices that are not in the list above, for example small ESP32 lottery miners without an ASIC, or Antminer/Whatsminer machines. The **Check** button (chapter 6) tells you if WarpTune cannot use a device.

A computer that stays on

WarpTune runs on your computer, not on the miner. It can only regulate while it runs. Use a computer that is on whenever the miners mine and that is in the **same home network** (LAN) as the miners. A Mac, a Windows PC, a mini PC or a Raspberry Pi with a 64-bit Linux all work.

- **macOS:** Apple silicon or Intel.
- **Windows:** 64-bit Windows; Windows on ARM runs it through the built-in emulation.
- **Linux:** Debian, Ubuntu or Raspberry Pi OS (64-bit) with the `.deb`; other distributions with the AppImage.

> **Sleep stops WarpTune.** If the computer goes to sleep, WarpTune stops reading the miners, and miners stay on whatever point they had last. Turn sleep off, or at least do not let the computer sleep while miners are live.

WarpTune Desktop is meant for a computer with **one user account**. On macOS and Windows another account on the same computer could open the page too (chapter 5).

Set your hand point first

Before you add a miner, set it in its own web page to the point you trust: the factory setting, or your own tuned point that you know runs stable. WarpTune reads that point at its start and keeps it as the ceiling and the restore point. WarpTune will not go above that voltage.

Any pool works — a dvb-WarpPool adds a few extras

WarpTune needs no pool of your own. Accepted shares are the most honest measure of real hashrate, and WarpTune reads them from the **miner's own counters**: how many shares the pool accepted, and at which difficulty. That works on **whatever pool** the miner mines. With these counters WarpTune regulates, runs the **calibration**, the quick check and the re-check (chapter 10), and shows the **savings** on each card (chapter 11).

A **dvb-WarpPool** (your own pool, or the public pool) is optional. If the miner mines on it and you couple it (chapter 6), WarpTune prefers the pool's worker row and adds:

- **reject reasons** on every firmware: the pool tells a stale or low-difficulty share apart from a real error,
- the **Energy** mode, which reads the pool's electricity page (chapter 9),
- the WarpTune badge on your wallet page of a public pool.

Two exceptions: a firmware that reports no share difficulty (`poolDifficulty`) gives no share verdict, so it can only be calibrated through a dvb-WarpPool coupling. And an Avalon Q is never calibrated; it only switches work modes.

One WarpTune per miner

> **Only one WarpTune may regulate a miner.** Two WarpTune instances writing to the same miner fight each other. If a miner is already tuned by another WarpTune — for example the one that comes with a dvb-WarpPool installation, or a second computer — leave it in dry run here, or remove it there first.

On one computer this is enforced: only one WarpTune process runs per settings file and port. A second start ends with an error (chapter 14). Across two computers nothing can enforce it; that is up to you.

3 · Downloading and checking the file

WarpTune Desktop is part of every dvb-WarpPool release. Download it from the release page:

git.warppool.org/dvb-projekt/dvb-WarpPool/releases

Open the newest release and pick the file for your system. `<tag>` stands for the version, for example `v1.41.0`.

System	File
macOS, Apple silicon (M1 and newer)	`WarpTune-Desktop-<tag>-aarch64.dmg`
macOS, Intel	`WarpTune-Desktop-<tag>-x86_64.dmg`
Windows (installer)	`WarpTune-Desktop-<tag>-x86_64-setup.exe`
Windows (portable, no installer)	`WarpTune-Desktop-<tag>-x86_64-windows.zip`
Debian / Ubuntu / Raspberry Pi OS 64-bit	`dvb-warptune_<version>_amd64.deb` (PC) or `…_arm64.deb` (Raspberry Pi)
Other Linux	`WarpTune-Desktop-<tag>-x86_64.AppImage` or `…-aarch64.AppImage`

> **The macOS files come a little later.** The `.dmg` files are added to the release shortly after it is published. If you do not see them yet, check again later.

The release also lists files named `dvb-warppool-tune-…tar.gz`. Those hold only the command-line program, without the page launcher; they are for people who run WarpTune as a service by hand. This manual is about WarpTune Desktop.

Checking the download

The files are not signed with a paid Apple or Microsoft certificate. Instead, every release lists a checksum file, `SHA256SUMS`, and a signature for it, `SHA256SUMS.bundle`. Check your file before you open it.

Step 1 — the checksum

Download `SHA256SUMS` next to your file. Then compute the checksum of your file:

- **macOS / Linux** (Terminal): `shasum -a 256 <file>`
- **Windows** (Command Prompt): `certutil -hashfile <file> SHA256`

Compare the long number with the line for your file in `SHA256SUMS`. They must match exactly. If they do not match, delete the file and download it again. Never open a file whose checksum does not match.

Step 2 — the signature (optional, recommended)

If you have the `cosign` tool, you can also check that `SHA256SUMS` really comes from the project. Get the project's public key `cosign.pub` from the repository and run:

```
cosign verify-blob --key cosign.pub --bundle SHA256SUMS.bundle SHA256SUMS
```

It must answer *Verified OK*. Together, the two steps prove the file is the one the project published.

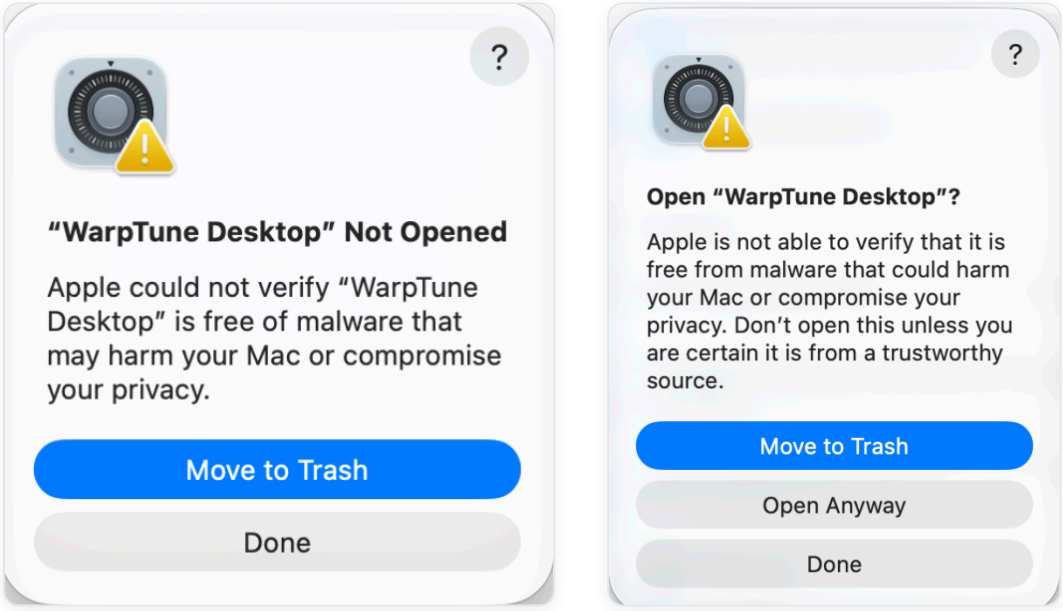
4 · Installing and the first start

Every package contains two programs. **WarpTune itself** (`dvb-warppool-tune`) does the work and serves the page. The small **launcher** (`dvb-warptune-launcher`) is what you click: it makes sure WarpTune runs, then opens the page `http://127.0.0.1:8766/` in your browser. A second click only opens the page again; it never starts WarpTune a second time.

The launcher's own questions and notes (start at login, service update, port in use, start failure) come in your system's language: English, German, Spanish, French, Italian, Japanese, Portuguese (Brazil) or Chinese, the same eight languages as the page. The screenshots here show the English version.

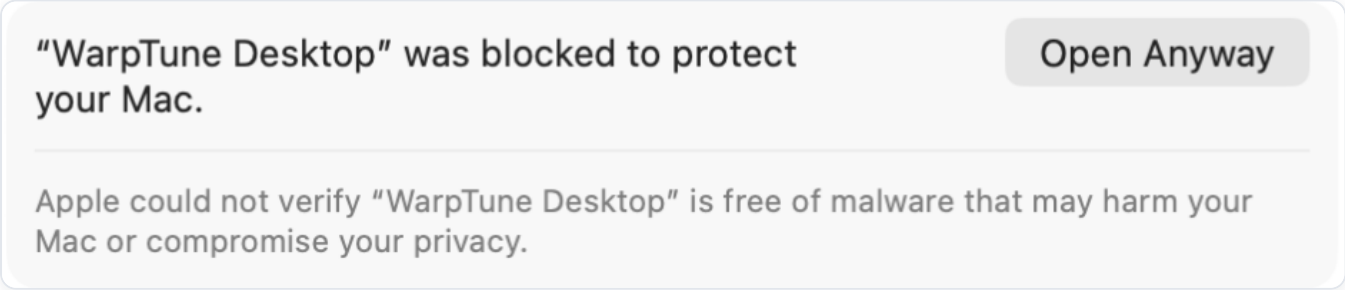
macOS

1. Open the `.dmg` and drag **WarpTune Desktop** onto **Applications**.
2. Open **WarpTune Desktop** from Applications. macOS refuses the first time, because it does not know the publisher. Click **Done** (not **Move to Trash**).



Left: the first refusal (click Done). Right: the last question after "Open Anyway" (click Open Anyway).

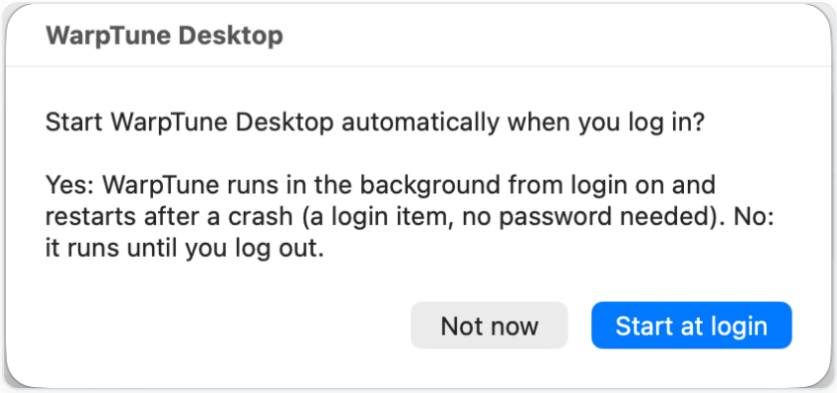
3. Open **System Settings** → **Privacy & Security**, scroll to the bottom and click **Open Anyway** next to *"WarpTune Desktop" was blocked*.



System Settings → Privacy & Security: the "Open Anyway" button for WarpTune Desktop.

4. Open **WarpTune Desktop** from Applications **once more**. macOS asks a last time. Click **Open Anyway** and confirm with your password or Touch ID. If nothing seems to happen after step 3, the question is waiting behind other windows: open the app again from Applications.

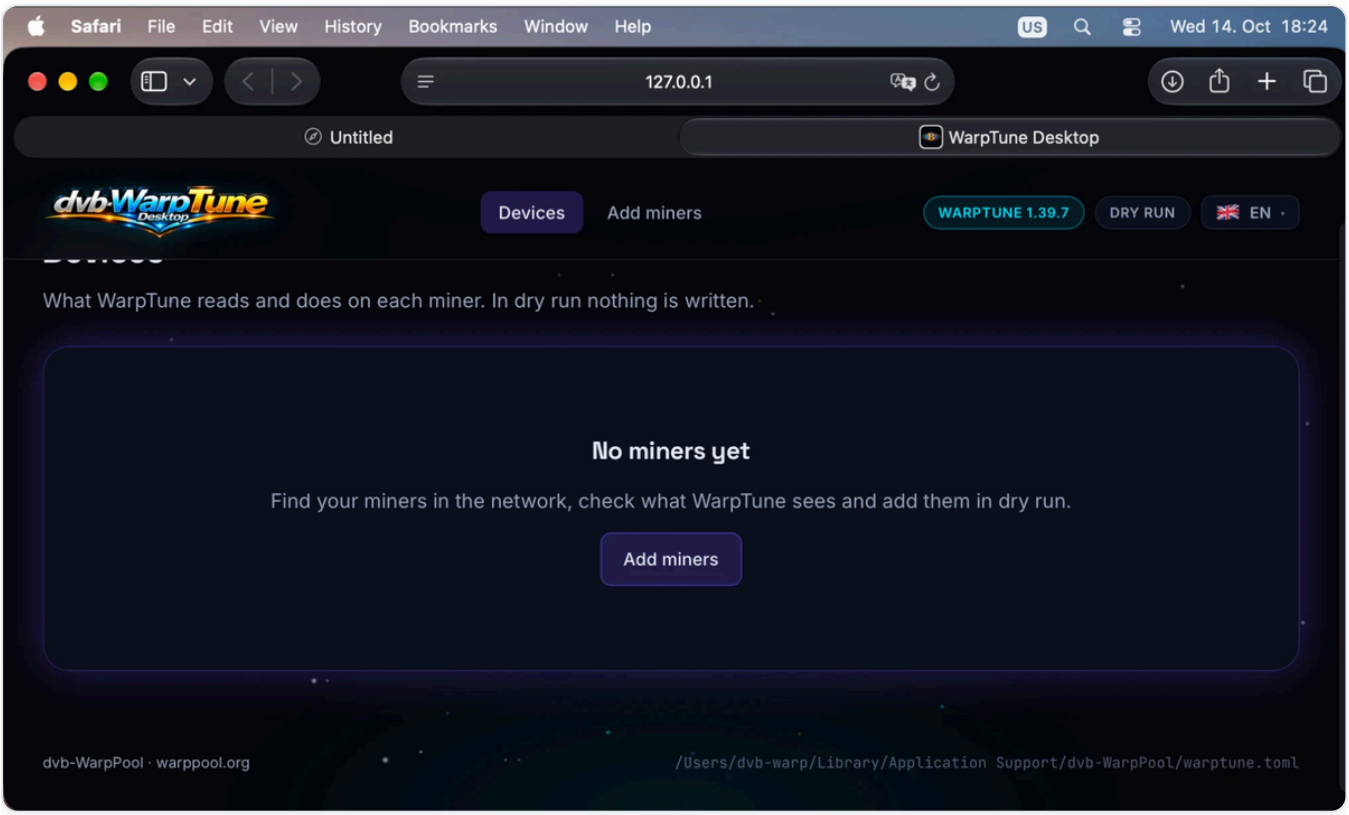
5. WarpTune asks: *Start WarpTune Desktop automatically when you log in?*



The one-time question on the first start.

- **Start at login** installs a login item (`com.dvb.warptune.desktop` , no password needed). WarpTune then runs in the background from every login on, restarts after a crash, and at logout stops cleanly: every live miner gets its hand point back. **Choose this if you plan to switch miners to live.**
- **Not now** runs WarpTune only until you log out. A logout then ends it at once, **without** writing the hand points back. Live miners would stay on their last point.

6. Your browser opens `http://127.0.0.1:8766/` . With no miners yet the page says *No miners yet* and offers **Add miners**.



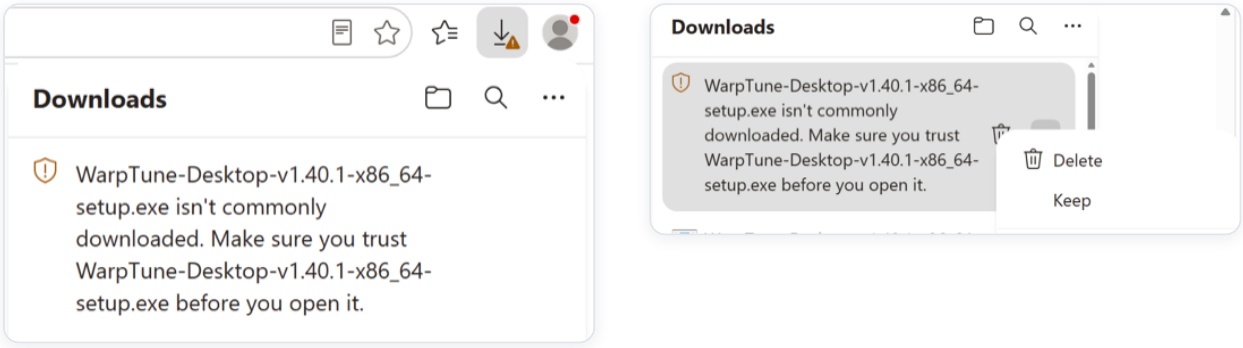
The first page on macOS: no miners yet, and the button to add them.

From now on a double-click on the app only opens the page.

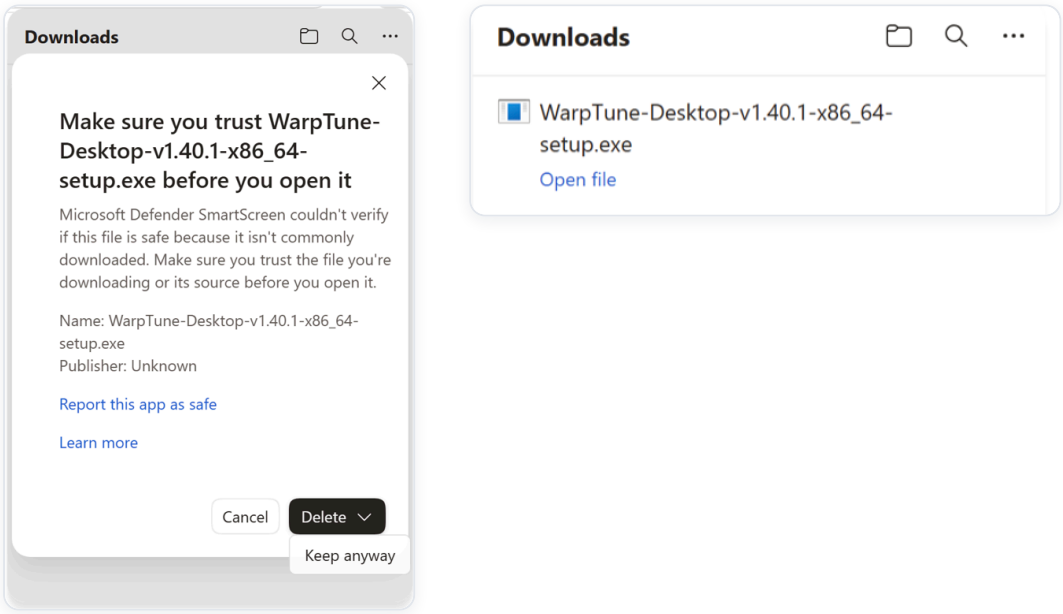
> **Already running WarpTune as a service?** If you installed WarpTune earlier with the setup script (`scripts/setup-warptune.sh`, service `com.dvb.warptune`), the app uses that service and never adds a second one. If that service is older than 1.40, the app offers to update it (chapter 12).

Windows

1. **Download with Edge.** Microsoft Edge holds the installer back before SmartScreen does: the download list says *… isn't commonly downloaded. Make sure you trust … before you open it.* Point at the entry, click **…** and choose **Keep**. Edge asks once more (*Make sure you trust … before you open it*, Publisher: Unknown): open the arrow next to **Delete** and choose **Keep anyway**. Then click **Open file**. Other browsers may show a similar warning.

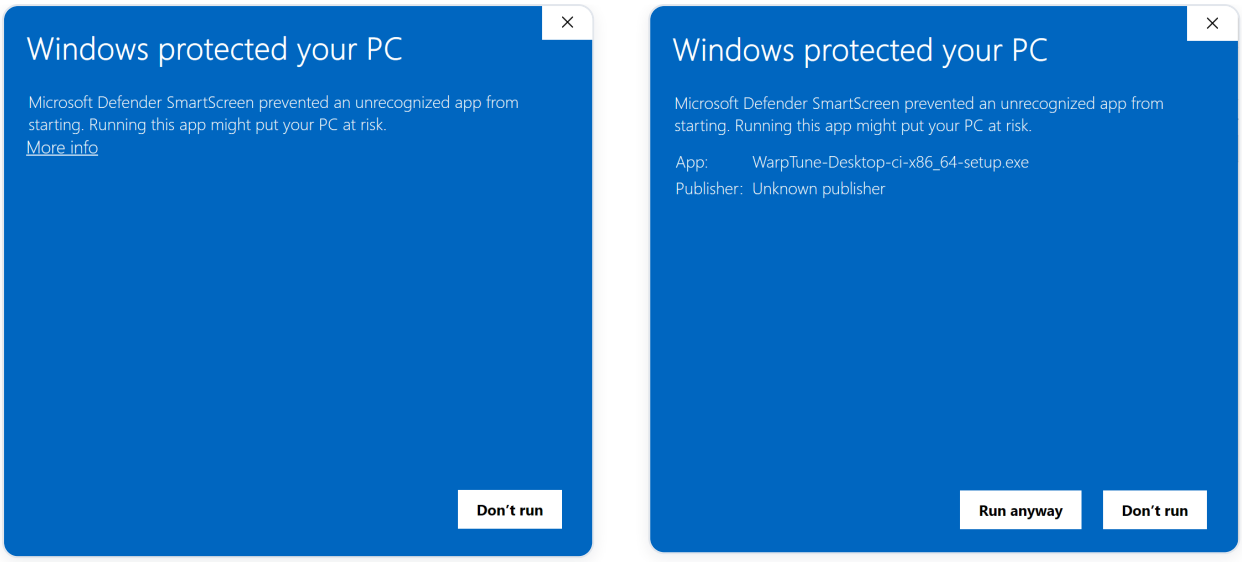


Edge download list: the warning (left), then "…" → "Keep" (right).



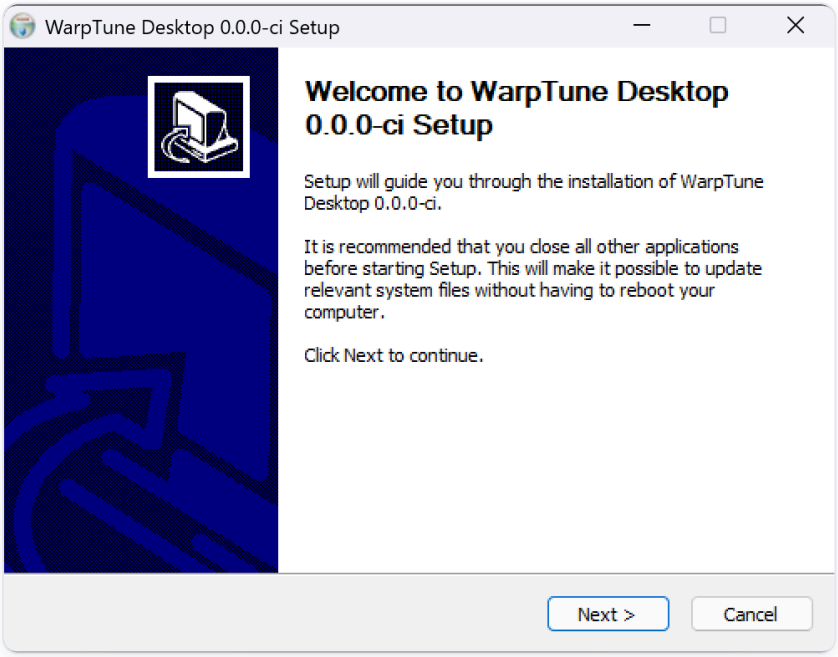
The arrow next to "Delete" → "Keep anyway" (left), then "Open file" (right).

2. Open `WarpTune-Desktop-<tag>-x86_64-setup.exe`. SmartScreen stops it with *Windows protected your PC*. Click **More info**.
3. Click **Run anyway**.



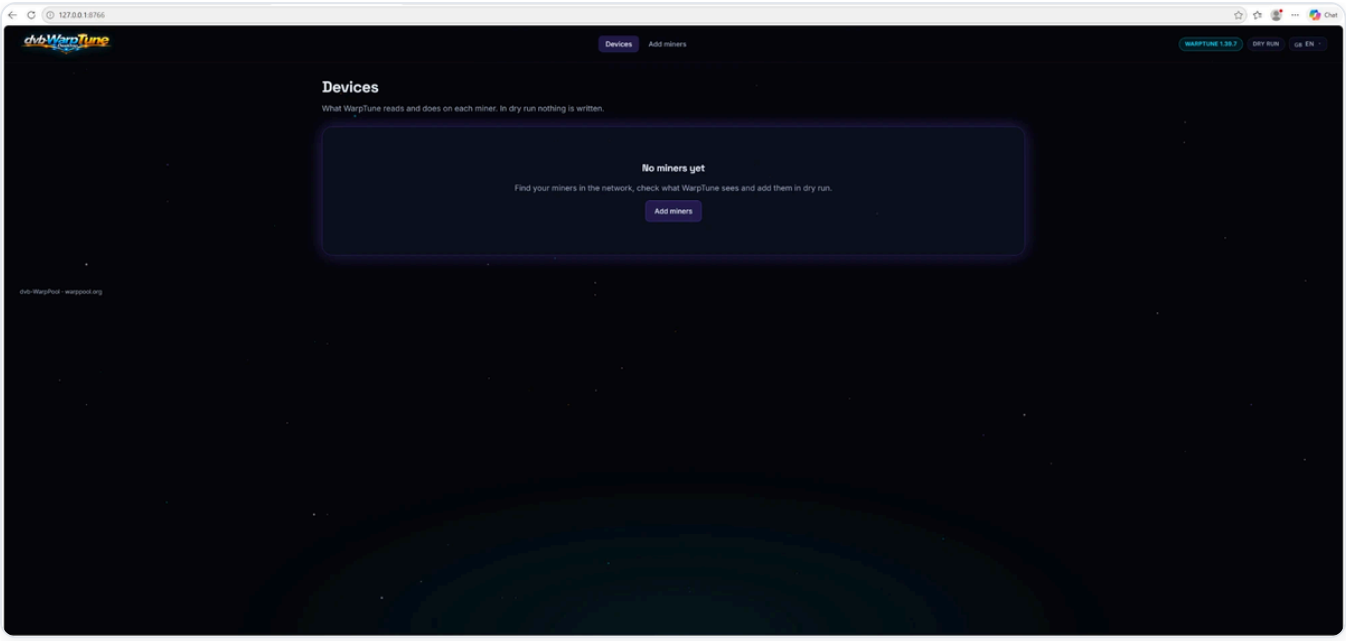
SmartScreen: first "More info" (left), then "Run anyway" (right).

4. The installer needs no administrator rights. It installs for your user only, into `%LOCALAPPDATA%\Programs\WarpTune Desktop`, adds a Start menu entry, and adds a Startup shortcut that starts WarpTune at every sign-in without a window.



The per-user installer. No administrator password is asked.

5. At the end your browser opens WarpTune Desktop.



The first page on Windows.

- The Startup shortcut can be turned off in **Task Manager** → **Startup apps**, if you prefer to start WarpTune by hand from the Start menu.
- On Windows WarpTune opens **no port** to the network. The page is served to this computer only, and miners are found without the mDNS listener. So the Windows firewall does not ask anything.
- A logoff or shutdown ends WarpTune cleanly: live miners get their hand point back first.
- The portable `.zip` holds the same two programs without an installer. Start `dvb-warptune-launcher.exe`. It does not add a Startup shortcut.

Linux

Debian, Ubuntu, Raspberry Pi OS (.deb)

1. Install the package: `sudo apt install ./dvb-warptune_<version>_<arch>.deb`
2. Click **WarpTune Desktop** in your applications menu. The first click enables and starts the user service `dvb-warptune-desktop` and opens the page.
3. To keep WarpTune running when nobody is logged in (for example on a headless Raspberry Pi), run once: `loginctl enable-linger $USER`

Any distribution (AppImage)

1. Make the file executable: `chmod +x WarpTune-Desktop-<tag>-<arch>.AppImage`
2. Double-click it. It writes the same user service, pointing at the AppImage file, and opens the page. Keep the file where it is: the service starts it from that path.

Linux shows no publisher warning. A stop of the user service (logout without linger, shutdown, `systemctl --user stop`) writes the hand points back first.

> **No desktop?** On a headless machine the page still runs, but only a browser on that same machine may open it (chapter 5). WarpTune Desktop is made for a computer with a screen.

Where things are stored

System	Settings file and journal	Logs
macOS	`~/Library/Application Support/dvb-WarpPool/warptune.toml`	Same folder: `warptune-desktop.log`, `warptune-launcher.log`
Windows	`%APPDATA%\dvb-WarpPool\warptune.toml`	Same folder
Linux	`~/.config/dvb-warppool/warptune.toml`	`journalctl --user -u dvb-warptune-desktop`

On the first start WarpTune creates an empty settings file. The page changes it for you; you do not need to open it. If you do edit it by hand, WarpTune keeps your comments, and each change from the page keeps the previous version as `warptune.toml.bak`.

5 · The page at 127.0.0.1:8766

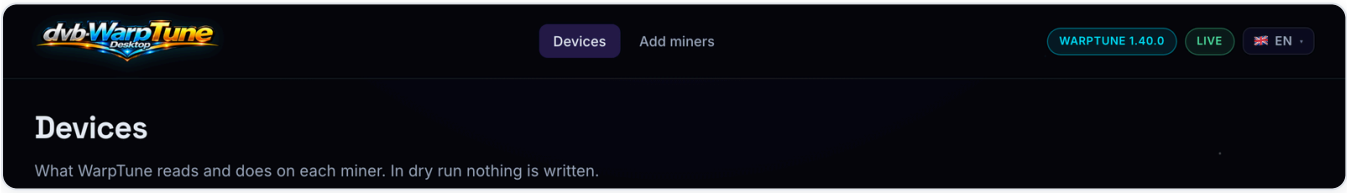
Everything in WarpTune Desktop happens on one page in your browser: `http://127.0.0.1:8766/`. The launcher opens it for you. You can also type the address yourself, or bookmark it. `http://localhost:8766/` works too.

Only this computer can open it

The page answers only a browser on the same computer. A phone or a second PC in your network cannot open it, and that is on purpose: the page can switch miners to live. In detail:

- Only connections from this computer itself are served.
- The address in the browser must be `127.0.0.1`, `localhost` or `[::1]`.
- Every action carries a session key that the running WarpTune makes at its start. Other web pages in your browser cannot read it, so they cannot send commands to WarpTune.
- Requests through a proxy are refused. Do not put a reverse proxy, an Umbrel app proxy or a Tor service in front of port 8766.

> **One user per computer.** On Linux the page also checks that the connecting program belongs to your user account. On macOS and Windows it cannot check that. Another account on the same computer could open the page. Use WarpTune Desktop on a computer that only you use.



The header: wordmark, the two sections, the version, the live state and the language.

The header, left to right

Element	What it shows or does
dvb-WarpTune Desktop wordmark	Click it to go back to the device list.
Devices	The list of your miners, one card each (chapter 7). This is the start page.
Add miners	The setup assistant: find, check and add miners, and the optional pool coupling (chapter 6).
WARPTUNE 1.41.0	The version of the running WarpTune. Hold the mouse over it to see the full path of the settings file.
LIVE or **DRY RUN**	The state of the WarpTune process as a whole. **DRY RUN**: *WarpTune only watches and journals; nothing is written to any miner.* **LIVE**: WarpTune writes clock and voltage to the miners you switched to live (for an Avalon Q: its work mode). A miner still in dry run stays untouched, even when the process is live.
WarpTune not reachable (red)	The page is open, but the WarpTune process behind it does not answer. It was stopped, or the computer was asleep. See chapter 14.

Language	English, German, Spanish, French, Italian, Japanese, Portuguese (Brazil), Chinese. The choice is stored in this browser.

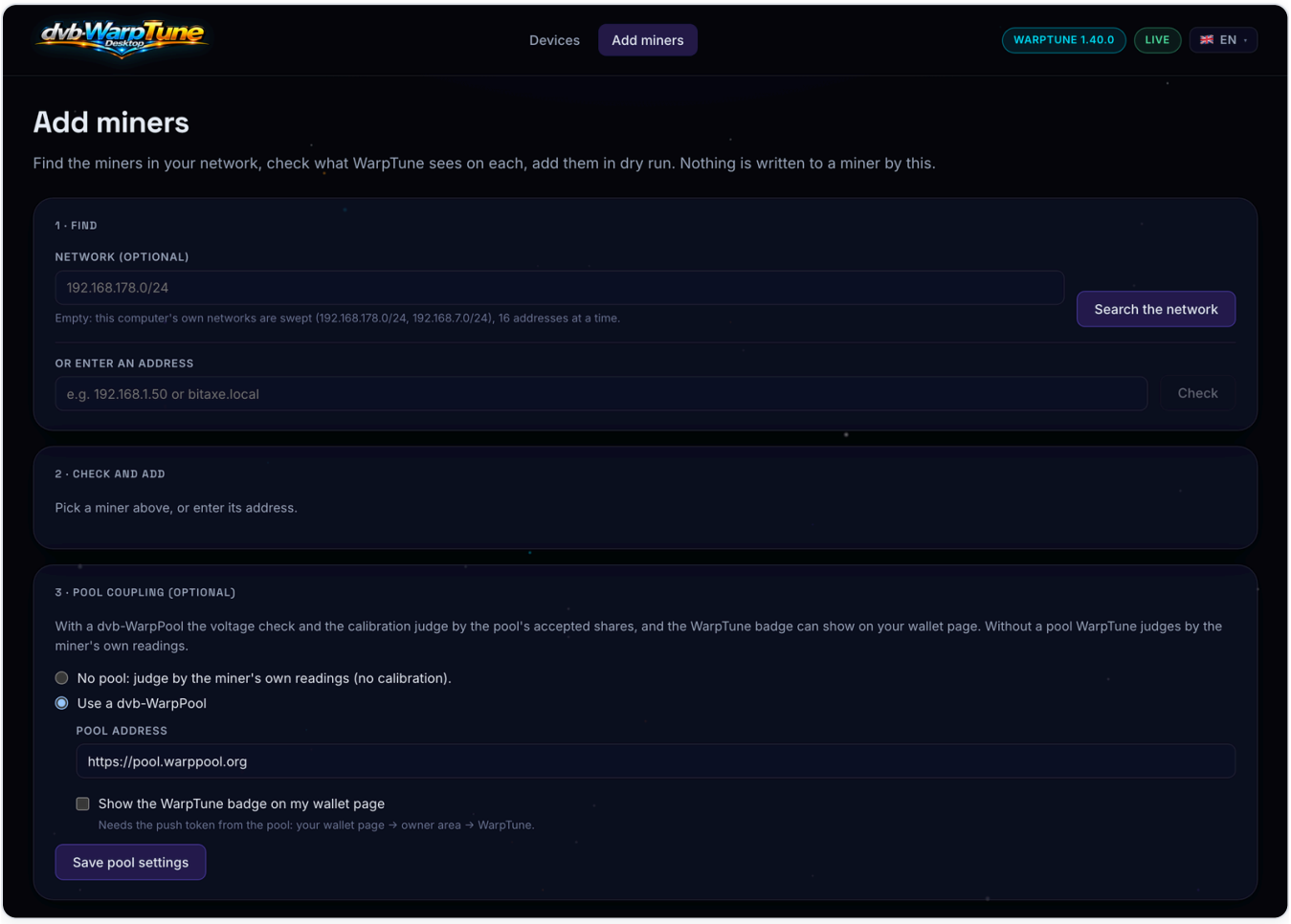
Banners under the header

- *Settings changed. Apply them to WarpTune now?* with the button **Apply now**. This appears only for the global settings: the pool settings on the setup page (pool address, push token), the live switch of the WarpTune process as a whole (`[sidecar] live` — the first time you switch a miner to live while the process is still in dry run), and the `[defaults]` and `[energy]` sections. Such a change is saved in the file at once, but the running WarpTune keeps its old settings until you press **Apply now**. A change on one miner's card (live switch, mode, power supply, clock search, schedule) and adding or removing a miner need no banner: the saved entry reaches the running WarpTune at once, for that miner alone (chapter 7). The banner also appears when such a change could not be applied — a calibration runs on that miner, the miner's pool address is one the running WarpTune does not poll, or the process cannot reload. The card then names the reason and says *Saved. Apply the settings to make it count.*
- The **Apply settings** dialog explains what happens: *All miners go back to their hand point for a moment and WarpTune starts again from the new settings. A running calibration blocks this: finish it first.* Confirm with **Apply now**, or **Cancel**. Afterwards a green banner says *Settings applied.*
- **A running calibration blocks Apply.** While a calibration runs, or while its result waits for **Apply** or **Discard**, the reload is refused. Finish or stop the calibration first.
- *The settings file has an error: …* (red) means the file could not be loaded, usually after a hand edit. The running WarpTune keeps its last good settings. Fix the file, or restore `warptune.toml.bak`.

At the bottom of every page you see the path of the settings file.

6 · Adding miners

Click **Add miners** in the header (or the button on the empty device list). The assistant has three cards. Nothing on this page writes to a miner. It only reads from miners and writes the settings file.



The Add miners page before a search: 1 · Find, 2 · Check and add, 3 · Pool coupling (here with a pool address entered).

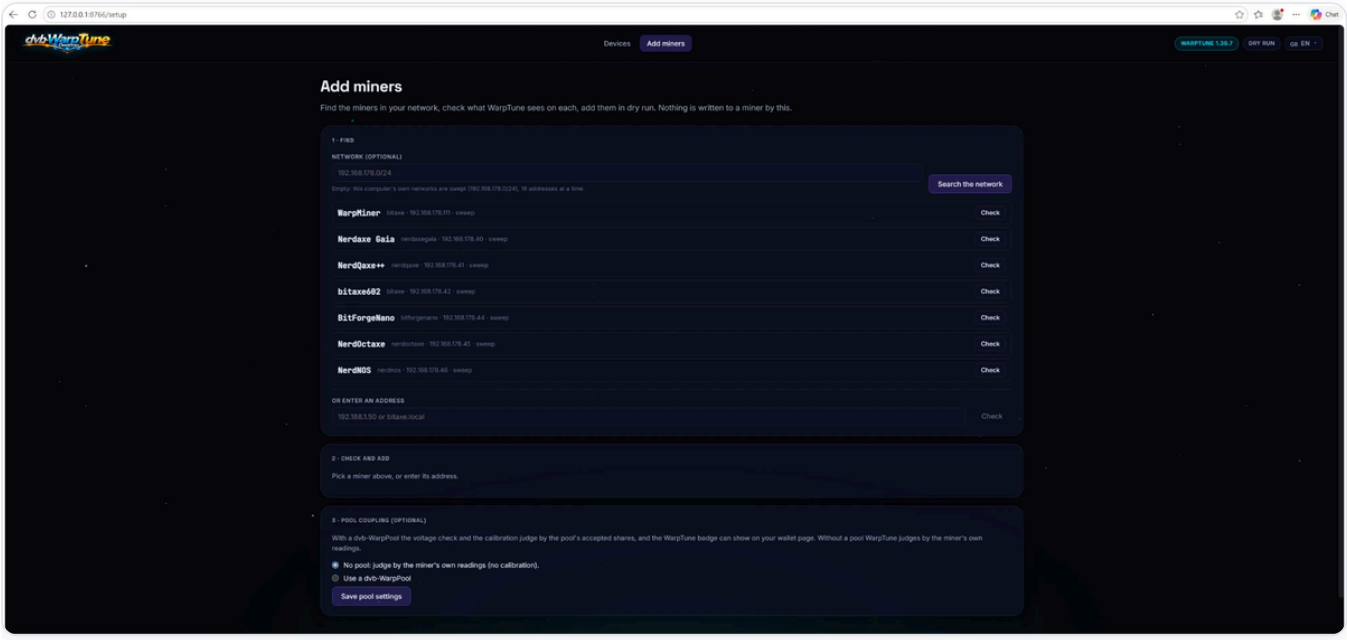
1 · Find

Click **Search the network**. The button shows **Searching…** while it works. WarpTune searches in two ways, and only when you press the button — it never scans your network on its own:

- **Network sweep.** WarpTune asks every address of this computer's own home networks for `/api/system/info`, the address every AxeOS-family miner answers. It asks at most 16 addresses at a time and waits 1.5 seconds per address, so your router is not flooded. At the same time it sends the read-only cgminer command `version` to port 4028 of the same address, which is how an **Avalon Q** answers (it has no web API). Nothing is written to any device. The small text under the field names the networks it sweeps, for example *Empty: this computer's own networks are swept (192.168.178.0/24), 16 addresses at a time.*
- **mDNS** (the "Bonjour" announcements some miners send). On a Mac the system's own mDNS service hides these from WarpTune, and on Windows WarpTune leaves mDNS out so the firewall does not ask. The page then says *mDNS found nothing on this system (normal on macOS/Windows); the list comes from the network sweep.* That is fine: the sweep finds AxeOS-family miners anyway.

Network (optional): leave it empty in most cases. If your miners are in a different private network than the computer (for example a separate IoT network), type it here, like `192.168.10.0/24`. It must be a private network of size /22 to /30.

Only one search runs at a time. If nothing answers, the page says *No miner answered. Check that the miners are on and in the same network as this computer, or enter the network above.*



Search results (from a test on Windows with a pre-release build, hence the older version badge).

Each line of the result shows the miner's name, then its type, its address and how it was found (`sweep` or `mdns`). An Avalon Q appears as *Avalon Q* followed by the last characters of its network (MAC) address, with the type `avalonq`. A miner that is already in your list shows *already added*. For the others click **Check**.

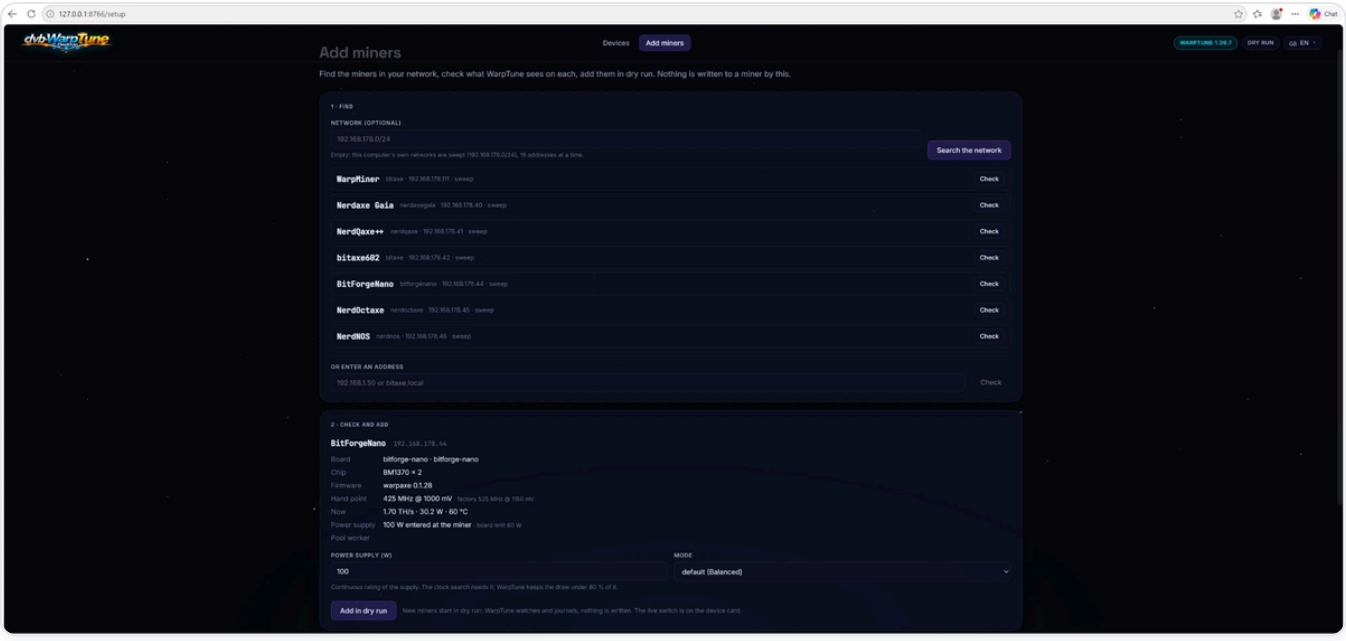
Adding a miner by its address

Under **Or enter an address** type the miner's IP address or name (for example `192.168.1.50` or `bitaxe.local`) and click **Check**. Use this for a miner the search did not list, for example one in another network. If the address has no AxeOS API, **Check** tries the Avalon Q's cgminer API on port 4028.

> **Give your miners fixed addresses.** WarpTune stores the address you add. If your router gives the miner a new address later, WarpTune loses it. Reserve a fixed address for each miner in your router (often called "DHCP reservation").

2 · Check and add

Check reads the miner once and shows what WarpTune sees. Nothing is written.



The check of a BitForge Nano, with the power supply field and the mode before adding it.

Line	Meaning
Board	The board model and version the firmware reports.
Chip	The ASIC chip type and how many there are, for example `BM1370 × 2`.
Firmware	Name and version of the firmware.
Hand point	The point the miner runs at right now. This becomes WarpTune's ceiling and restore point. Behind it, in small text, the factory point if the firmware reports one (*factory 525 MHz @ 1150 mV*).
Now	Current hashrate, power and chip temperature.
Power supply	The power supply rating WarpTune will use, and where it comes from: *… W entered at the miner* (WarpAxe has a field for it), *… W, the board's stock supply* (a known board), or *no supply rating known*. Behind it the board's power limit (*board limit 60 W*).
Pool worker	The pool login the miner uses (address.worker). With a coupled dvb-WarpPool, WarpTune finds the miner's worker row on the pool with this name.

If WarpTune cannot use the device, a red line says why: *WarpTune cannot use this device: ….*

Before you press "Add in dry run"

- **Power supply (W)**: the **continuous rating** of the miner's power supply in watts (1 to 2500). It is pre-filled with the board's stock supply where WarpTune knows it. Check the label on your supply and correct it if you use a different one. WarpTune keeps the draw under 80 % of this number for every step up, and the clock search (chapter 10) needs it. If the rating was entered on the miner itself (WarpAxe: Settings → Power supply), the field is not offered here: change it on the miner.
- **Mode**: how WarpTune should run this miner (chapter 9). **default (Balanced)** is a good start. **Energy** is greyed out until the settings can take it; the text under the field says why (chapter 9).

Then click **Add in dry run**. The page confirms: *… added — WarpTune is watching it in dry run.* New miners always start in **dry run**: WarpTune watches and journals, nothing is written. The live switch is on the device

card.

The running WarpTune starts watching the new miner at once; nothing needs to be applied. Go to **Devices** to see its card.

3 · Pool coupling (optional)

Here you tell WarpTune whether your miners mine on a dvb-WarpPool. The card explains: *Calibration and the voltage check judge by accepted shares: from the miner's own counters on any pool, or, with a dvb-WarpPool, from its worker row, which also tells reject reasons apart and can show the WarpTune badge on your wallet page.*

- **No pool: judge by the miner's own share counters, on any pool.** The right choice when your miners mine on any other pool (or on a dvb-WarpPool you do not want to couple). Calibration, the quick check, the re-check and the savings line all work; WarpTune reads the accepted shares and their difficulty from the miner itself.
- **Use a dvb-WarpPool**: enter the **Pool address**, starting with `http://` or `https://`. Examples: the public pool `https://pool.warppool.org`, or your own pool on your network, like `http://192.168.1.20:18334`. WarpTune then prefers each miner's worker row on the pool, which also tells reject reasons apart. If a miner has no row there (it mines elsewhere, or the row went idle), WarpTune uses that miner's own counters instead.

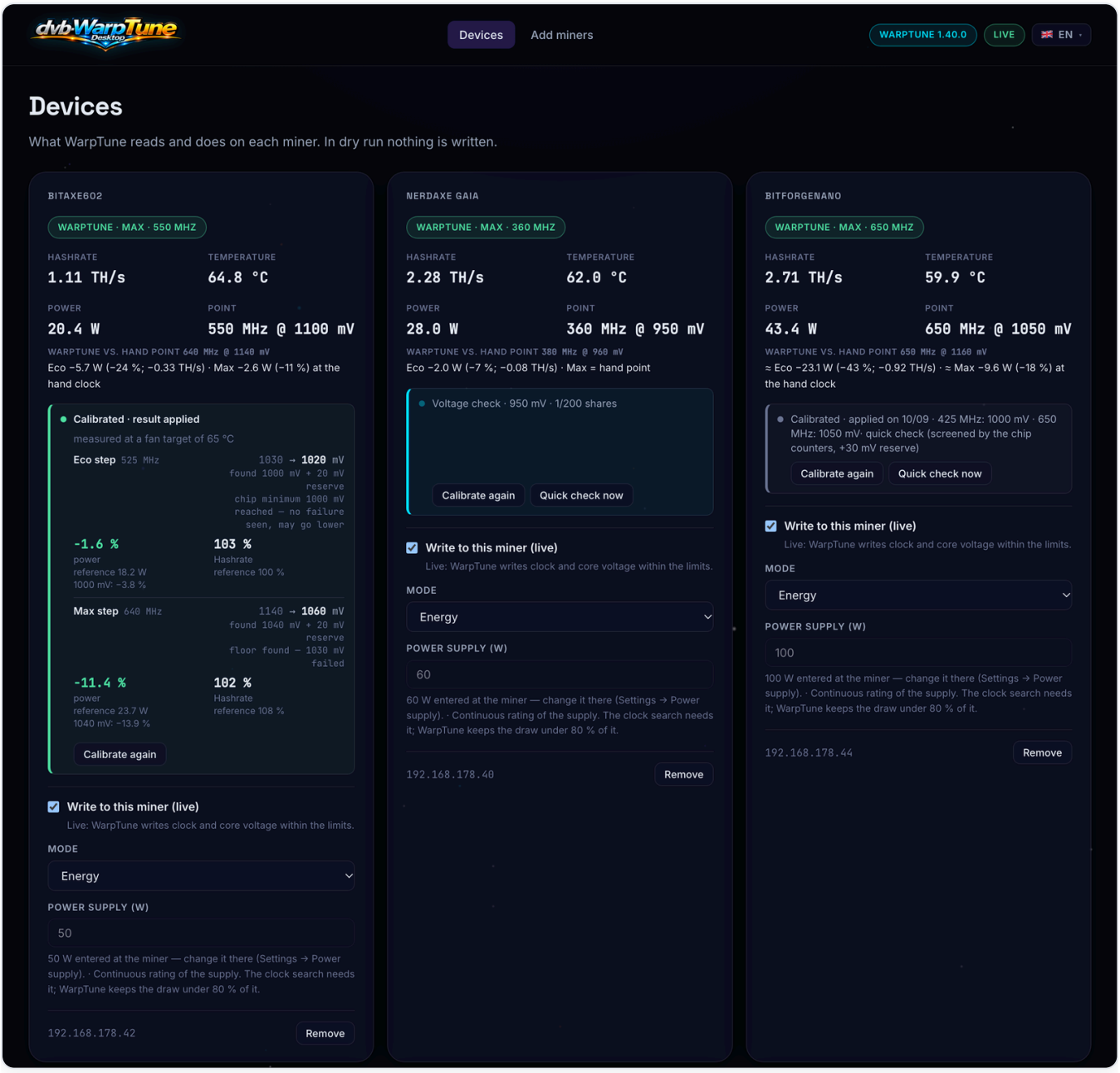
> **Pool on Umbrel?** The Umbrel app hides the pool's data behind its login. From version 1.28.0 the Umbrel pool offers the data without login on port `18335`. Use `http://<umbrel-address>:18335` as the pool address.

Show the WarpTune badge on my wallet page is for a **public** pool: WarpTune then sends its status to the pool every 30 seconds, and your wallet page there shows a WarpTune badge per miner. It needs a **Push token**, which you get on the pool: your wallet page → owner area → WarpTune. Paste it into the field. The token is stored in `warptune.env` next to the settings file (readable only by you), not in the settings file. **Remove token** deletes it again. Nothing flows from the pool back to a miner.

Click **Save pool settings**, then **Apply now** on the Devices page. The pool settings are global, so they are one of the few changes that still need the banner (chapter 5).

7 · The device card, value by value

The **Devices** page shows one card per miner in your list: *What WarpTune reads and does on each miner. In dry run nothing is written.* The page refreshes on its own every few seconds.



The Devices page (first row): a Bitaxe Gamma with an applied calibration, a NerdAxe Gaia with a running voltage check, a BitForge Nano calibrated by a quick check. All three are live, in Energy mode.

If no pool is set, a line above the cards says *No pool coupling: the share verdict comes from the miner's own counters (accepted shares and their difficulty), on whatever pool it mines. A dvb-WarpPool adds reject reasons and the badge on your wallet page (Add miners → Pool).* This is a note, not a warning: everything on the cards works without a pool.

Under it a line shows your electricity price, for example *Electricity price: 0.28 EUR/kWh — the cards show the yearly savings in money.* Without an entry of your own, a coupled dvb-WarpPool that has an electricity tariff lends its price: *Electricity price from the pool: 0.2744 EUR/kWh — the cards show the yearly savings in*

money. An entry of your own replaces it. Without either (for example on `pool.warppool.org`, which has no tariff) the line says *No electricity price set: the cards show kWh per year only.* The button **Electricity price** next to it opens the price form (chapter 11).

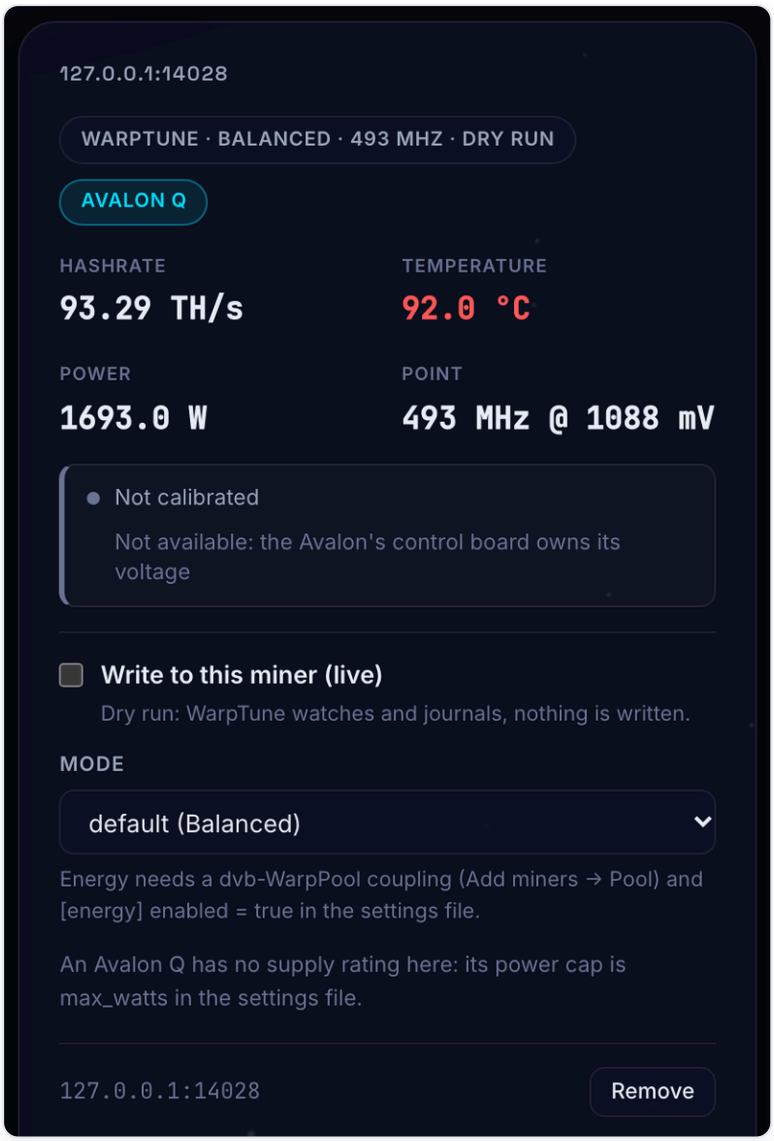


One complete card (Bitaxe Gamma): name, WarpTune badge, the four values, the savings line, the calibration block, the live switch, mode, power supply and the address with Remove.

Title and badges

The card title is the miner's name (its hostname), or its address when it reports no name. Under it, one badge:

Badge	Meaning
WarpTune · Max · 550 MHz (green)	WarpTune regulates this miner live. It shows the mode it runs in right now and the clock. In Energy mode it shows the mode Energy picked (Eco, Balanced or Max).
WarpTune · … · dry run (grey)	WarpTune watches this miner but writes nothing.
… · waiting for PV surplus	Energy mode with solar: the miner waits until the surplus covers the next step.
… · paused / **stopped** / **excluded** (yellow)	WarpTune is holding, has stopped, or has left this miner out. The tooltip says why.
… · standby (green)	An Avalon Q in standby by the schedule, the Energy mode or its own timer (v1.46); the line under the chip says until when.
… · no telemetry (red)	The miner does not answer. Check that it is on and still at the same address.
… · control off (red)	Live control was switched off for this miner by a safety rule (too many writes in an hour, or a write the miner did not confirm). It stays off until WarpTune restarts.
… · stale (grey)	The last reading is old.
waiting for the first reading…	The miner was just started; the first reading is on its way.
not running: apply the settings	The miner is in the file, but the running WarpTune does not run it: a saved change on its card could not be applied (the card names the reason), or the process cannot reload. Press **Apply now**.
disabled	The miner is switched off in the settings file (`enabled = false`).
Avalon Q	This miner is an Avalon Q, regulated by work modes.



An Avalon Q card (test miner, dry run): the Avalon Q badge, no calibration, no power supply field, no clock search.

Hold the mouse over the WarpTune badge for details: the **Last decision** with its reason (for example why it held or stepped down), the target temperature, the core current against its warning line, and the configured mode if it is Energy.

The four values

Value	Meaning
Hashrate	What the miner reports right now. Small miners swing a lot; judge over minutes, not seconds.
Temperature	Chip temperature in °C. Shown in red above 75 °C.
Power	The power the miner reports, in watts.
Point	Clock and core voltage right now, for example `550 MHz @ 1100 mV`.

The savings line

WARPTUNE VS. HAND POINT 640 MHz @ 1140 mV followed by a short line such as *Eco –5.7 W (–24 %; –0.33 TH/s) · Max –2.6 W (–11 %) at the hand clock*. It compares WarpTune's points with your hand point.

Under it a second line turns the watts into a year, for example *Eco saves 50 kWh/year ≈ €13.98 · Max saves 23 kWh/year ≈ €6.38 — running 24/7 in that mode, at grid price*, and a small line names where the hashrate comes from. Chapter 11 explains it. It works with or without a pool.

Warning lines

A red-edged box appears only when something needs your attention:

- *chip … domain … off*: a part of a chip stopped hashing at this point. WarpTune counts the voltage as too low there. If it keeps happening, the card tells you to switch the miner off at the power supply for a few seconds.
- *hand point … draws about … W, over the … W board limit*: your hand point draws more than the limit allows. WarpTune then restores the highest step under the limit instead.
- *core current … A is near the … A warn line (… %): no step up from here*: the chip's power stage is close to its limit.
- *chain re-initialised …* (WarpAxe boards): WarpTune switched the chips off and on to bring a dropped chip part back. At most three times an hour, never during a calibration. Close it with **×**.

The calibration block

The framed box in the middle of the card shows the state of the calibration and its buttons: **Not calibrated**, progress while one runs, the result, or **Calibrated · result applied**. Chapter 10 explains every part.

Write to this miner (live)

The checkbox **Write to this miner (live)** is the live switch for this one miner. The small text under it says the state:

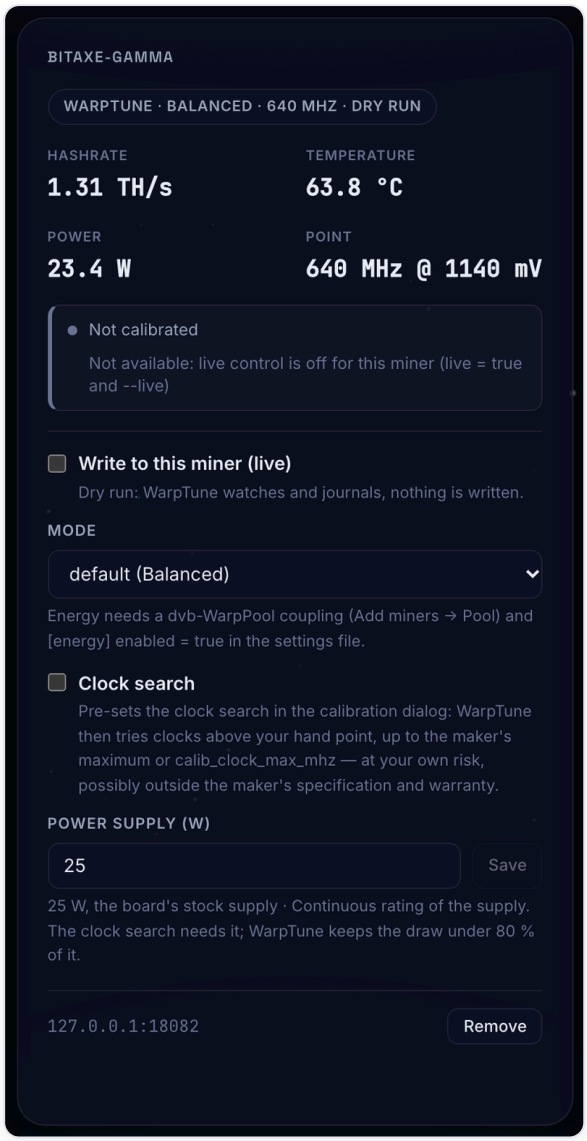
- *Dry run: WarpTune watches and journals, nothing is written.*
- *Live after you apply the settings: WarpTune still runs the old ones.* — you switched the first miner to live while the WarpTune process itself was still in dry run; the process switch needs **Apply now**. Once the process is live, a miner's own live switch takes effect at once and this text does not appear.
- *Live: WarpTune writes clock and core voltage within the limits.* For an Avalon Q: *Live: WarpTune switches this miner's work mode (Eco / Standard / Super) within the limits.*

Switching on always asks first. Chapter 8 explains the dialog. Switching off (back to dry run) does not ask; it takes effect at once: the miner gets its hand point back and is only watched from then on (*Saved — WarpTune restarted its control of this miner with the new settings.*).

Mode

A drop-down with **default (Balanced)**, **Eco**, **Balanced**, **Max** and **Energy**. The choice is saved and active at once: WarpTune stops this one miner's loop (its hand point is written back if WarpTune had changed the device) and starts it again with the new mode; the card says *Saved — WarpTune restarted its control of this miner with the new settings.* The other miners run on untouched. See chapter 9.

Energy is greyed out unless the settings can take it. The text under the field then says: *Energy needs a dvb-WarpPool coupling (Add miners → Pool) and [energy] enabled = true in the settings file.* A miner that already runs in Energy keeps the option selectable.

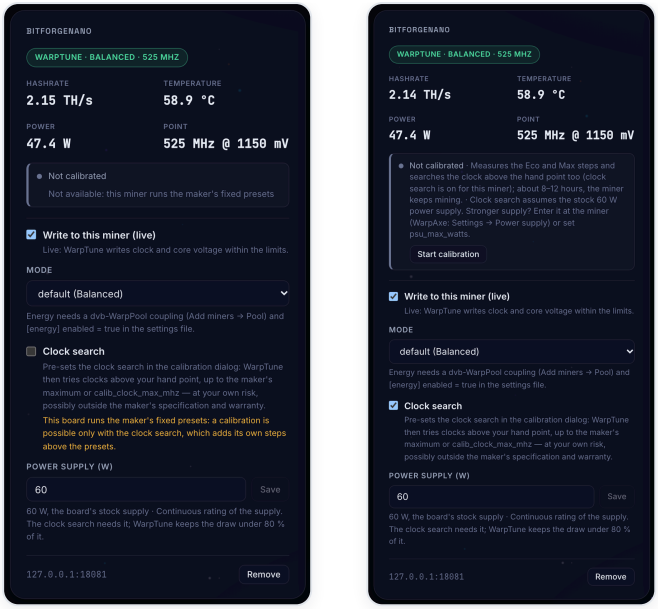


A Bitaxe Gamma card in dry run (test miner): Energy is greyed out, the reason is shown under the mode; the Clock search switch below it.

Clock search

The checkbox **Clock search** pre-sets the clock search in the calibration dialog (chapter 10). The text under it: *Pre-sets the clock search in the calibration dialog: WarpTune then tries clocks above your hand point, up to the maker's maximum or calib_clock_max_mhz — at your own risk, possibly outside the maker's specification and warranty.* The switch alone changes nothing on the miner; it only matters when you start a calibration. It is saved and active at once (the card says *Saved — WarpTune restarted its control of this miner with the new settings.*). An Avalon Q has no such switch.

On a board that runs the maker's fixed presets, the **BitForge Nano**, a note in orange adds: *This board runs the maker's fixed presets: a calibration is possible only with the clock search, which adds its own steps above the presets.* Tick the box; the card then offers **Start calibration**.



BitForge Nano (test miner): left with the clock search off (calibration not available, orange note), right after ticking it (Start calibration offered).

In Max the Nano runs at **625 MHz**, WarpAxe's highest preset, with the voltage its calibration found (about 1050 mV), instead of Forge-OS's 636 MHz at 1160 mV. That is about 2.55 instead of the advertised 2.6 TH/s (636 → 625 MHz, –1.7 %), with about 11 % less core current than the Forge-OS preset, which sits right at the voltage regulator's (TPS546D24A) 38 A warning line, and a clear margin to its 40 A protective shutdown. WarpTune takes no further clock step up once the core current passes 90 % of that warning line (34.2 A). Since 625 MHz is also WarpAxe's top preset for the Nano, the clock search finds no room above it; the calibration measures the voltage of the Eco and Max steps.

Power supply (W)

The continuous rating of the miner's power supply. The text under the field says where the number comes from:

Text	What it means / what you can do
… W entered at the miner — change it there (Settings → Power supply).	WarpAxe firmware lets you enter the rating on the miner. The field is locked here; change it on the miner. A change there is picked up without a restart.
… W from the settings	The number you entered on this page. Change it and click **Save**. Empty the field and save to remove it.
… W, the board's stock supply	A guess from the board type (for example 25 W for a Bitaxe Gamma, 60 W for a BitForge Nano). If your supply is different, type the real rating and click **Save**.
no supply rating known	Enter it. Without a rating there is no clock search.

Save stays grey until you change the number. Allowed values are 1 to 2500 W. For an Avalon Q there is no field: *An Avalon Q has no supply rating here: its power cap is max_watts in the settings file.*

> **Several miners on one power supply?** Split its rating among them so the shares add up to no more than the supply's rating, and enter each share at its miner. Example: a 600 W supply as 240 W + 150 W + 100 W. WarpTune then keeps each miner under 80 % of its share.

Address and Remove

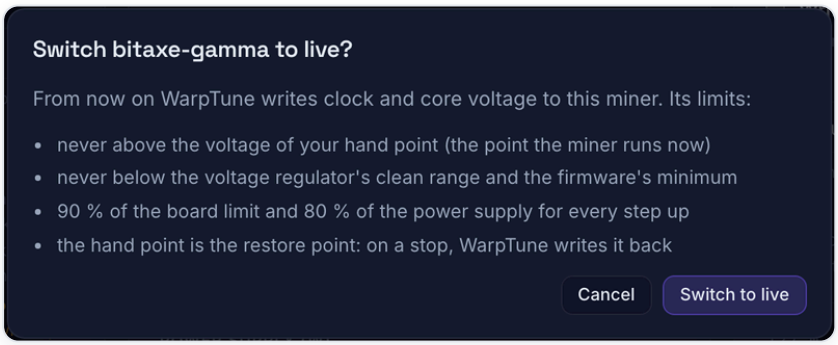
At the bottom the card shows the address WarpTune uses for the miner, and **Remove**. Remove asks *Remove miner …?* and deletes the miner's entry from the settings file. WarpTune stops regulating it at once; a live miner gets its hand point back as its loop stops. The other miners run on untouched. The journal keeps the miner's history.

8 · Dry run and going live

Every miner starts in **dry run**. WarpTune reads it and writes down, in the journal, every decision it would take. Use this time to see what WarpTune would do — for a few hours, or a day. Hold the mouse over the WarpTune badge to see the last decision.

Switching a miner to live

1. Tick **Write to this miner (live)** on its card.
2. A dialog opens: **Switch … to live?** It says: *From now on WarpTune writes clock and core voltage to this miner. Its limits:*
   - never above the voltage of your hand point (the point the miner runs now),
   - never below the voltage regulator's clean range and the firmware's minimum,
   - 90 % of the board limit and 80 % of the power supply for every step up,
   - the hand point is the restore point: on a stop, WarpTune writes it back.
3. If the WarpTune process itself is still in dry run, the dialog adds: *This also switches the WarpTune process itself to live ([sidecar] live = true in the settings file).* If other miners in your file are already marked live, it names them: they go live too with this step.
4. Click **Switch to live** (or **Cancel**).
5. The miner's own switch takes effect at once: WarpTune starts this miner's loop again with live on, and the card text changes to *Live: WarpTune writes clock and core voltage within the limits.* Only when the dialog also switched the WarpTune process itself to live does the banner appear: the card then says *Live after you apply the settings* until you press **Apply now**. The header shows **LIVE**.

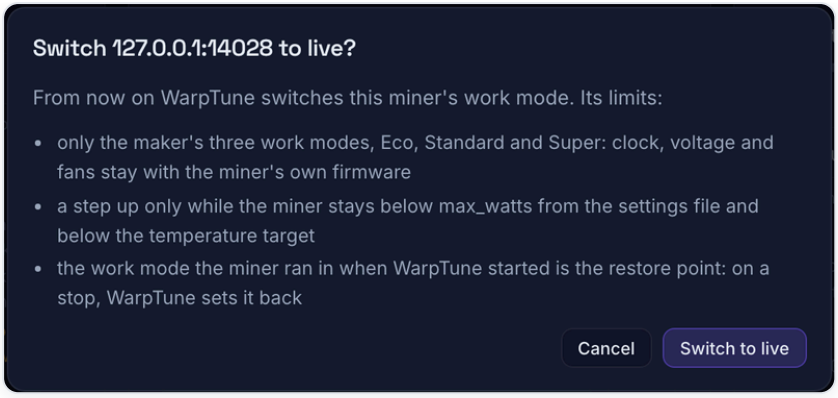


The question before a miner goes live (test miner; here the process is already live, so the extra note about the process switch is not shown).

An Avalon Q goes live differently

For an Avalon Q the dialog names what WarpTune really does there: *From now on WarpTune switches this miner's work mode. Its limits:*

- only the maker's three work modes, Eco, Standard and Super: clock, voltage and fans stay with the miner's own firmware,
- a step up only while the miner stays below `max_watts` from the settings file and below the temperature target,
- the Eco work mode is the restore point, whatever mode the miner ran in when WarpTune started: on a stop, WarpTune sets Eco.



The live question for an Avalon Q (test miner): work modes only.

Two switches, both needed

A miner is written to only when **both** are on: the miner's own live switch, and the process switch. The first live switch on the page sets both. Turning one miner back to dry run leaves the process live; the other live miners keep going.

Going back to dry run

Untick **Write to this miner (live)**. The miner gets its hand point back at once and is only watched from then on; the other miners run on untouched.

When WarpTune stops

On a clean stop WarpTune writes the hand point back to every live miner and reads it back to confirm. This happens:

- at every **Apply now** (briefly, then it starts again),
- for one miner alone, when you change its settings on its card or remove it (chapter 7): that miner's loop stops, writes the hand point back if WarpTune had changed the device, and starts again from the new entry,
- macOS with the login item: at logout and shutdown,
- Windows: at sign-out and shutdown,
- Linux: when the user service stops,
- on an update and on uninstall.

macOS with "Not now": a logout ends WarpTune at once, **without** the restore. Live miners then stay on their last point. For live miners on a Mac, choose **Start at login**.

Changing a miner by hand while WarpTune runs is possible. WarpTune sees the new point on its next reading, lets the miner settle and judges it afresh. But remember: WarpTune treats the point the miner runs at *when WarpTune starts* as the hand point. If you want a new hand point, set it while WarpTune is stopped or in dry run.

When WarpTune stops writing by itself

When something is wrong, WarpTune switches off its writes to a miner on its own and from then on only watches it. The card then says why, for example **WarpTune stopped writing to this miner (10/21, 07:36**

AM): the write breaker tripped — 12 writes within an hour. The reasons are:

- **the write breaker tripped:** more than 12 writes within an hour. This protects against a miner that swings back and forth. Restoring the old point after a device restart does not count towards this, for up to three restarts an hour,
- **too many device restarts**,
- **writes kept failing** (the miner did not answer),
- **the device did not take a write** (it answered, but runs at a different point).

Once you have found the cause, press **Switch writes on again** on the card and confirm. The count starts over, and you don't need to restart WarpTune. If the cause is still there, WarpTune stops again.

Self-test on the miner (WarpAxe)

WarpAxe v0.1.34 and later can test itself while it mines. The test takes about 80 seconds; clock and voltage stay as they are. While it runs, the card shows **Self-test running on the miner — WarpTune writes nothing meanwhile**: WarpTune holds back every step and pauses a running calibration, so the test is not disturbed. Afterwards the card shows the result, for example **Last self-test 10/21, 10:00 AM: passed**.

9 · The modes

The mode tells WarpTune what to aim for. You pick it per miner, on the card or when you add the miner. Every mode keeps all the limits from chapter 1.

Mode	What WarpTune does	Good for
default (Balanced)	Uses the mode set for all miners in the settings file. Out of the box that is Balanced.	Most people.
Eco	Aims for the lowest energy per terahash (J/TH). It weighs the steps by their measured efficiency and only climbs when efficiency does not get worse. It keeps 2 °C more distance to the target temperature.	Lowest power bill, quieter fan, a bit less hashrate.
Balanced	Holds the target temperature and takes the highest step that the temperature and power budget allow.	A good everyday setting.
Max	Like Balanced. In addition it may use clock steps above the maker's table, where you allowed that, and a higher clock found by a calibration with clock search (chapter 10).	Most hashrate inside the limits.
Energy	Switches between Eco, Balanced and Max by your electricity situation, as reported by a dvb-WarpPool: Max on solar surplus, Eco when power is expensive, Balanced otherwise.	Homes with solar or a time-based tariff and a dvb-WarpPool with its energy page set up.

The clock can go above your hand clock, the voltage never above your hand voltage. If the maker's table has higher clock steps and power, temperature and current leave room, Balanced and Max may use them — always at or below your hand voltage.

Energy mode in detail

Energy mode needs three things:

1. a pool address under **Add miners → 3 · Pool coupling**,
2. that pool must have its **electricity view** set up (tariff and, if you have one, the solar feed). WarpTune reads it from the pool's `/api/energy`,
3. the line `enabled = true` under `[energy]` in the settings file. **The page has no switch for this**; you have to add it to `warptune.toml` by hand:

   ```
   [energy]
   enabled = true
   ```

Until then, Energy is greyed out. On the device card and in the setup assistant the option **Energy** cannot be picked while the pool address or `[energy] enabled = true` is missing. The text under the field says: *Energy needs a dvb-WarpPool coupling (Add miners → Pool) and [energy] enabled = true in the settings file.* After you added the line, reload the page; the option becomes available. A miner that already runs in Energy keeps the option selectable.

How Energy decides, with the default settings:

- **Solar surplus** reported by the pool → Max (only as far as the surplus carries the miner; a step that would need grid power is not taken),
- **electricity at or above 0.30 €/kWh** → Eco,
- otherwise → Balanced,
- at least 10 minutes between two switches, so a passing cloud does not flip the miner back and forth,
- if the pool's feed is lost, or until the first reading after a start, → Eco.

While a calibration runs, Energy mode pauses; it comes back when the calibration ends.

Avalon Q

For an Avalon Q the modes map to its work modes: WarpTune moves between Eco, Standard and Super by the same rules. A mode switch gets a minute to show and three minutes to settle. The Avalon's own fan control stays in charge; its failsafe temperature is 100 °C, because the Avalon Q runs at 85–95 °C by design.

Avalon Q: schedule, standby and quiet windows

An Avalon Q can go to **standby**: the hash board switches off, the fans stop, and the miner's API keeps answering. From v1.46 WarpTune uses this in three ways, all on the Avalon's card.

Schedule. Add a schedule on the card opens a plan with its own switch and any number of windows: on chosen weekdays or every day, from a start to an end time (an end at or before the start runs over midnight), optionally only between two dates (*11-01* to *02-28* every winter, or two full dates once). A window is **Off (standby)** or **Quiet (Eco + fan cap)**. In an off-window WarpTune sets the Eco work mode, writes the window's end into the miner as its wake time and only then puts the miner into standby — the Avalon never sleeps without its wake and wakes on its own even when WarpTune or this computer is off; while it sleeps WarpTune checks that the miner still holds the wake time, and writes it again if not. A window cannot start and end at the same time. The card says *Standby until 06:00 (schedule)*. If you wake the miner from the Avalon app inside a window, WarpTune leaves it awake until the window ends. A standby you set on the miner yourself is left alone until the miner wakes. After a wake — by the miner's own timer, by WarpTune or by you — WarpTune clears the standby and wake times it wrote into the miner, and waits for the hashrate to come back (about three minutes) before it judges the board again; the card says *coming up after a wake or boot* meanwhile. In a quiet window WarpTune runs Eco and caps the fan (default 40 %); when the chips come within 2 °C of the target the cap is released at once and set again after five cool minutes, and leaving the window always restores the automatic fan. With **Schedule on** switched off, the plan stays in the file and applies nothing. A saved schedule — like the two switches below — takes effect on the Avalon's next tick; nothing needs to be applied and the miner's loop does not restart.

Standby instead of Eco on grid power. In Energy mode, and only when the pool's electricity view has a solar feed, the card offers the switch **Standby instead of Eco on grid power**. With it, the miner goes to standby instead of Eco while the pool reports no solar surplus at an expensive rate, and wakes when the surplus comes back and would still cover the miner's own Eco draw — after 30 minutes at the least, and it then stays awake for 30 minutes too, so clouds do not make it sleep and wake all afternoon. A safety wake six hours out is written into the miner and renewed while it sleeps, so it never sleeps forever if WarpTune stops. If the pool's electricity feed goes dark, that neither wakes the miner nor keeps it asleep beyond that safety wake. An off-window of the schedule wins over solar surplus; outside the windows the Energy mode decides.

Reboot when it hangs. Off by default; the switch on the card turns it on per miner. If the miner is awake, its API answers, its pool is alive and keeps sending work, but it reports no hashrate for ten minutes, WarpTune

reboots it once — at most once an hour and three times in 24 hours, never in standby and never in the first fifteen minutes after a boot or a wake. A pool or node outage is not a hang: the card says so and nothing is rebooted. The card also shows the fan duty, the power supply's watts and 12 V bus, and the miner's own hardware error rate since boot, and warns from 8 % on (not in the first hour after a boot). In place of the hand-point comparison (the hand point of an Avalon is its Eco mode) the card sums what the control did over the last seven days: *12 h Super on PV surplus · 40 h standby (~1.9 kWh instead of ~34 kWh in Eco)* — recorded time only; a younger journal says how many hours or days it covers.

10 · Calibration

A calibration finds out how low the core voltage of a miner can go while it still hashes cleanly. Lower voltage means less power and less heat for the same clock. Every chip is different, so WarpTune measures it on your miner instead of guessing.

What you need

- The miner is **live** (chapter 8).
- A firmware that reports its accepted shares and their difficulty (`poolDifficulty`). AxeOS, NerdOS and WarpAxe do. The miner can mine on **any pool**: the accepted shares judge each voltage, read from the miner's own counters or, with a dvb-WarpPool coupling, from the pool's worker row. **No pool coupling is needed.**
- Not an Avalon Q (its control board owns the voltage).
- For a BitForge Nano, which runs on the maker's fixed presets: only with the **Clock search** switch on its card ticked (chapter 7) and the settings applied.

If something is missing, the card says *Not available: …* with the reason, for example *Not available: live control is off for this miner (live = true and --live)* or *Not available: the firmware reports no share difficulty, so there is no share verdict (a dvb-WarpPool coupling supplies one)*.

Where the share verdict comes from

The calibration dialog names the source of the shares in one line:

The dialog says	Meaning
Share verdict: the coupled pool's worker row	A dvb-WarpPool is coupled and has a row for this miner. The pool tells rejects apart (stale, low difficulty) on every firmware.
Share verdict: the miner's own counters (accepted shares × difficulty), on whatever pool it mines	No pool row: WarpTune counts the shares the miner itself reports, each at the difficulty in force. The firmware names its reject reasons.
Share verdict: the miner's own counters; this firmware gives no reject reasons, so every reject counts and the reject window is larger	For example NerdOS. WarpTune counts every reject as a sign of a too-low voltage and judges rejects over 150 shares instead of 40. That is the careful side: in doubt the voltage stays higher.

The limits, share counts and reserves are the same for all three sources.

> **A high pool difficulty slows the calibration.** Every verdict waits for its shares. On a pool with a high fixed difficulty a small miner finds shares only now and then. If the shares cannot arrive within the stage's time limit, WarpTune refuses the start and gives the numbers, for example *Start refused …: the shares come too slowly for a verdict within the stage's timeout (difficulty 65536 at 1200 GH/s: 400 shares take 26.1 h, the stage's timeout is 4.0 h); a lower pool difficulty or a dvb-WarpPool coupling helps*. Pools with variable difficulty (most solo pools, every dvb-WarpPool) adjust it to the miner, so this rarely happens there.

How a full calibration works

A calibration measures up to two **stages**, one after the other: the miner's **Eco step** and its **Max step** (the top step, usually your hand point). Each stage goes like this:

1. **Hold the step.** WarpTune holds the miner on the stage's clock. Safety moves (heat, current, a dead chip) still happen and end the stage.
2. **Reference.** WarpTune first judges the starting voltage on **200 accepted shares**. This is the "before" for the comparison: hashrate, watts, efficiency.
3. **Search.** Then it lowers the voltage by 10 mV at a time. Each voltage is judged on 200 shares. A close call is confirmed on a second window (400 shares in total). The chip error counters of the firmware count as well. The search goes down until a voltage fails, and never below the chip's minimum or the voltage regulator's clean range.
4. **Result.** The result is the lowest voltage that was good above the highest voltage that failed. Where chip errors cost more hashrate than the lower voltage saves, WarpTune picks the voltage with the most hashrate per watt instead, and says so.

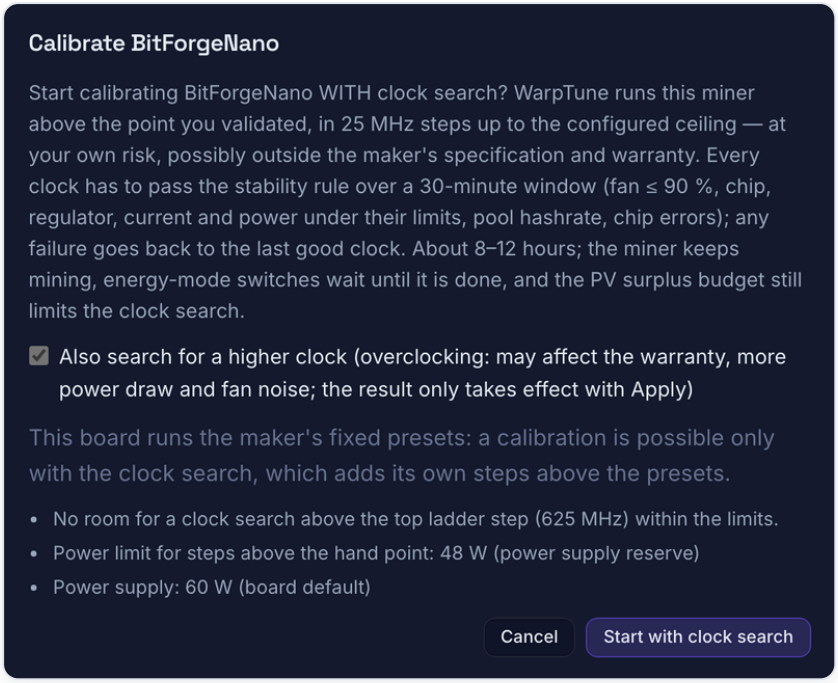
The miner keeps mining the whole time. A full calibration takes about **6–8 hours**, with clock search about **8–12 hours**. A stage that reaches nothing in 4 hours is given up.

Starting it

In the calibration block click **Start calibration** (after an earlier result: **Calibrate again**). Under the button a hint says *Measures the Eco and Max steps one after the other, about 6–8 hours; the miner keeps mining.* A dialog opens, titled **Calibrate …**:

- A short text of what will happen; Energy mode pauses meanwhile.
- The checkbox **Also search for a higher clock (overclocking: may affect the warranty, more power draw and fan noise; the result only takes effect with Apply)**.
- Lines with the ceiling of the clock search, the power limit for steps above the hand point, and the power supply rating, each with its source.
- **Cancel** and **Start calibration** (with the box ticked: **Start with clock search**).

The checkbox starts ticked when the **Clock search** switch on the card is on. On a **BitForge Nano** (maker's fixed presets) it is ticked and **locked**, with the note *This board runs the maker's fixed presets: a calibration is possible only with the clock search, which adds its own steps above the presets.* Without a known power supply rating it is off and greyed out.



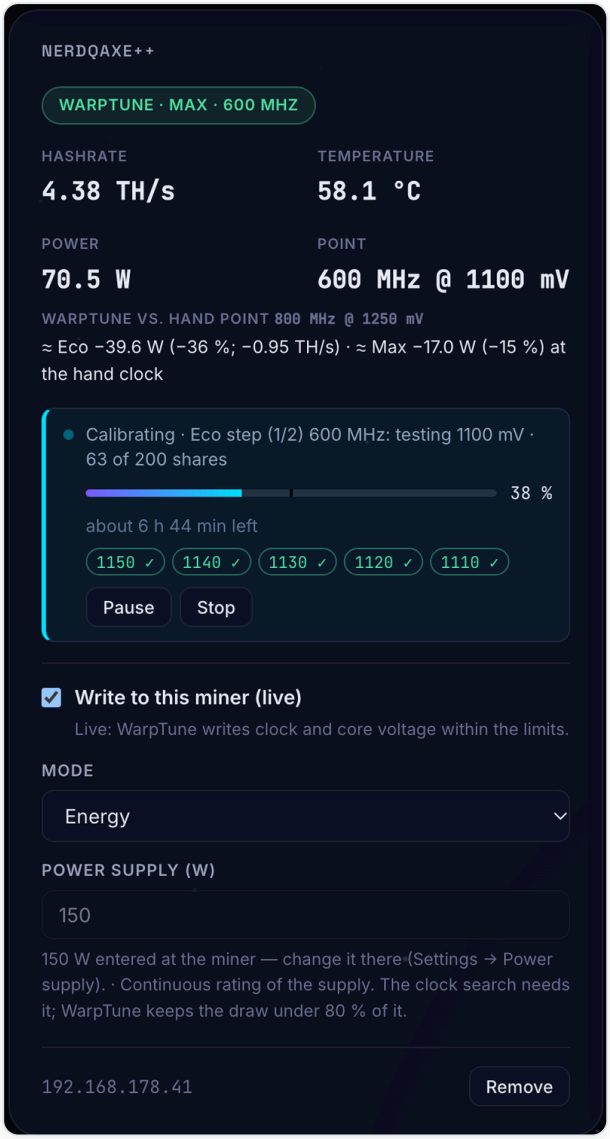
The calibration dialog of a BitForge Nano (test miner): clock search ticked and locked, the presets note, and the lines for ceiling, power limit and power supply. Here the test miner already sits at its power limit, so the dialog reports no room for a higher clock.

The clock search (optional)

With the box ticked, WarpTune also tries clocks **above** your hand clock, in 25 MHz steps, before each voltage stage. Each clock is watched for 30 minutes and must pass every rule: fan at most 90 %, chip and voltage regulator temperature, core current and power under their limits, power supply draw under 80 % of its rating, healthy share hashrate, chip errors not up. Any failure goes back to the last good clock. The voltage still never goes above your hand voltage.

> **Overclocking is at your own risk.** A clock above the point you validated, and above the maker's table where allowed, may be outside the specification and the warranty. It means more power and more fan noise. Without a known power supply rating the checkbox is off and greyed out, and the dialog says where to enter one.

While it runs



A calibration under way on a NerdQAxe++: stage, voltage under test, shares counted, progress, time left, the voltages judged so far, Pause and Stop.

The block shows, for example: *Calibrating · Eco step (1/2) 600 MHz: testing 1100 mV · 63 of 200 shares*.

- **Stage** and its number (1/2), the clock, the voltage under test, and the shares counted towards the verdict.
- A **progress bar** with a percentage and *about … left*.
- Small tags for every voltage judged so far: `1150 ✓` = good, a cross = short of good.
- *Close call — a second window is confirming it (400 shares in total)* when a verdict needs more shares.
- With clock search: *testing … MHz at … mV for 30 min* and the maxima seen so far (fan, chip, voltage regulator, power).

Buttons:

- **Pause**: WarpTune tunes the miner as usual again (*Calibration paused · WarpTune tunes the miner as usual*). **Resume** starts the open stage's reference again.
- **Stop** asks first: *Stop the calibration of …? The miner goes back to its hand voltage. Finished steps keep their result and the miner's card offers Apply / Discard; the step under way is lost.* It ends the calibration and puts the miner back on its hand voltage. **Stages that were already finished keep their result**: the

card shows it with *Stopped early (…) · the result of the finished stages can still be applied; the stages not reached are listed without one*, and offers Apply / Discard. A stop before any stage finished leaves nothing to apply.

A calibration survives a restart of WarpTune: it continues where it was. If WarpTune restarts with live control off, the calibration stops.

The result

When all stages are through, the miner returns to its starting voltage and the block says *Calibration finished · apply the result?*. Each stage gets a row:



A result (here already applied) on a Bitaxe Gamma: Eco step and Max step, each with voltages, power and hashrate against the reference.

Part	Example	Meaning
Stage and clock	**Eco step 525 MHz**	Which step was measured.
Voltages	`1030 → 1020 mV`	The starting (reference) voltage → the voltage the miner will run at after Apply.
Found + reserve	*found 1000 mV + 20 mV reserve*	The lowest good voltage, plus a safety reserve of 20 mV for a warmer day. The reserve never goes above the reference (*reserve capped at the starting voltage*).

How the floor was found	*floor found — 1030 mV failed*	A lower voltage failed, so the floor is known.
	chip minimum 1000 mV reached — no failure seen, may go lower	The search hit the chip's minimum without a failure.
	firmware minimum — … mV not accepted, no failure seen	The firmware refused to go lower.
	ended early — floor not determined	A timeout or a safety move ended the stage first.
Power	`−11.4 %` power, *reference 23.7 W*	Power at the new voltage against the reference.
Hashrate	`102 %` Hashrate, *reference 108 %*	Hashrate from the accepted shares against the expected rate, at the new voltage and at the reference. Share counts are noisy; a few percent up or down is normal.

A stage without a result says *… no result (…)* with the reason, for example *the reference … mV is short of good* — then nothing lower can be better.

Under the rows you may see *measured at a fan target of 65 °C*. The fan target is part of the measurement; if you change it on the miner, the card says *… the result is for the old target; calibrate again?*. After a clock search the card may suggest a different fan target with a button **Set fan target … °C**; that is an estimate, not a measurement.

Apply or Discard

- **Apply** asks *Apply the result for …? The voltages found, plus a 20 mV reserve, become the operating point; the hand point stays the ceiling.* After confirming, the block says *Calibrated · result applied* and later *Calibrated · applied on 10/09 · …*.
- **Discard** keeps the hand voltages: *Calibrated · result discarded on … · hand voltages kept*.

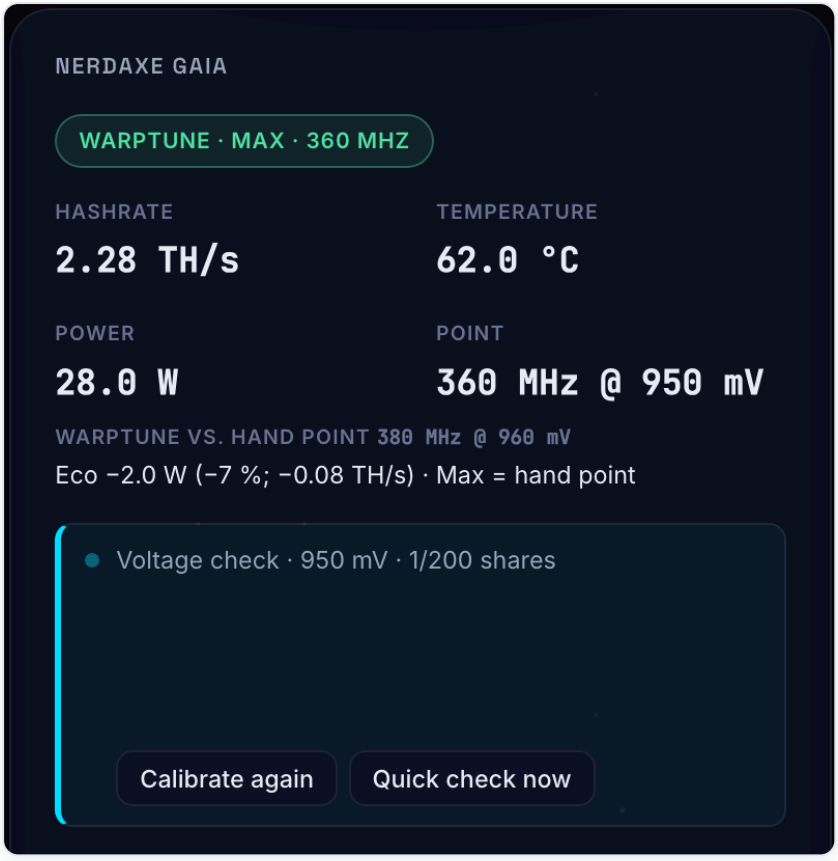
The hand point stays the ceiling and the restore point either way. A stopped or failed calibration message can be closed with **×**; that only hides it in this browser.

A calibrated voltage is watched

After Apply, WarpTune keeps checking. If a calibrated step falls short on the shares later, WarpTune raises that step's voltage by 10 mV (never above the reference) and keeps the new value.

Besides calibrations, WarpTune runs its own **voltage check** in normal operation. The block then shows one of these lines. They are not a calibration, and the calibration buttons stay available next to them:

- *Voltage check · 950 mV · 1/200 shares*: the voltage being judged and the shares counted so far, with a bar.
- *Point monitored · … mV · confirmed, keeps watching (… shares)*: the voltage is confirmed; WarpTune keeps counting.
- *Voltage checked · 350 MHz needs 960 mV (table 940)* (or *runs at …*): the voltage found against the maker's table. It may add why, for example *at 950 mV too many chip errors (4.8 %, now 3.1 %)*, and an estimate like *approx. +4 % power draw*.



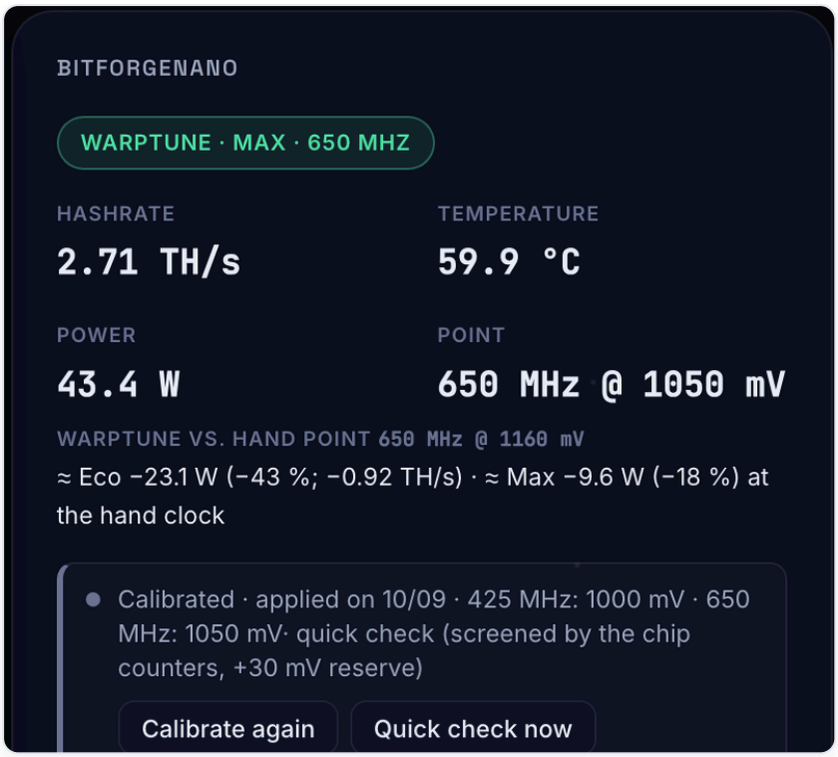
The ongoing voltage check on a NerdAxe Gaia: the voltage being judged and the shares counted so far.

Quick check now

Quick check now is a faster calibration. It is offered only on firmware that reports chip error counters (a 1-minute error rate or per-chip readings).

1. **Screen.** From the voltage the miner runs at now, it goes down 10 mV at a time and watches the chip error counters for about 10 minutes per step, as long as the errors stay near the starting level.
2. **Candidate.** The last step that screened good.
3. **Confirm.** Only the candidate gets the full share verdict (200 shares). If it falls short, one step up and again.

It takes about **1.5–2 hours per stage**, never searches the clock, and **Apply** adds a reserve of **30 mV** instead of 20. The result is tagged *quick check (screened by the chip counters, +30 mV reserve)*.



A BitForge Nano calibrated by a quick check: date, the points taken over, and the quick-check tag.

The automatic re-check

28 days after an Apply, WarpTune starts a quick check on its own, one step below the applied voltage — once per Apply, only on a live miner with chip counters, and never while another calibration is open. Its result is only a suggestion and waits on the card like any other result. The card explains: *passed means the step below still runs without errors and there is nothing to change; failed means the applied voltage has become tight*.

When a start is refused

The card says *Start refused …: …*, for example *a calibration is running or a result waits for apply or discard*, *live control is off*, or *nothing to measure — …* (the stage's voltage is already at its floor), *the shares come too slowly for a verdict within the stage's timeout …* (see the note above) or *no share verdict: the firmware reports no share difficulty and no pool row stands in*. See chapter 14.

11 · Reading the savings

Each card shows what WarpTune changes against your own hand point. The line reads, for example:

WARPTUNE VS. HAND POINT 640 MHz @ 1140 mV
Eco –5.7 W (–24 %; –0.33 TH/s) · Max –2.6 W (–11 %) at the hand clock

The three points compared

- **Hand point**: the point the miner runs at without WarpTune. It is named in the heading. If it equals the factory setting, the heading adds *(= factory setting)*.
- **Eco point**: WarpTune's Eco step at its present voltage.
- **Max point**: WarpTune's top step at its present voltage.

How to read the line

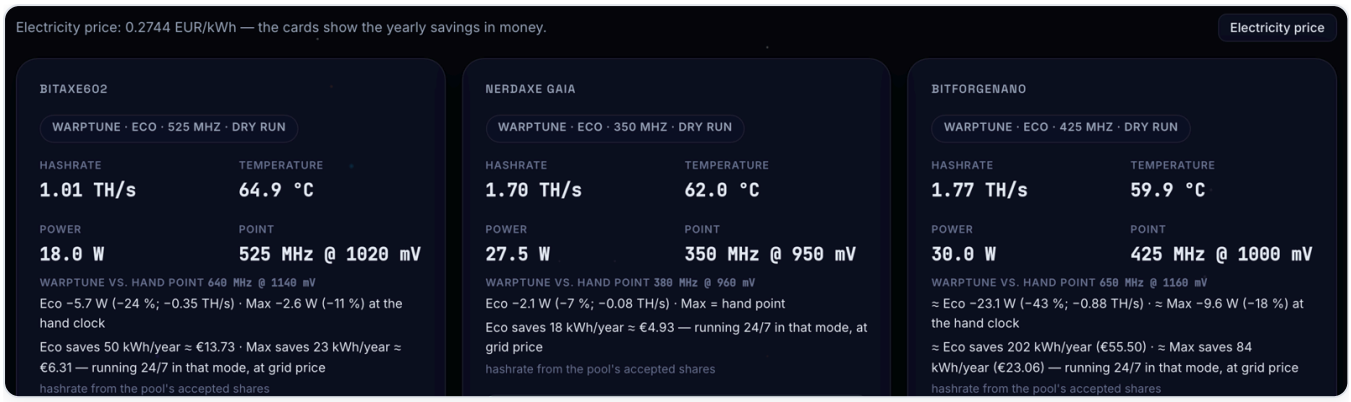
Part	Meaning
Eco –5.7 W (–24 %; –0.33 TH/s)	In Eco the miner draws 5.7 W less than at the hand point (24 % less), and hashes 0.33 TH/s less. Eco trades a bit of hashrate for a lot less power.
Max +0.12 TH/s (+5 % ±3 %; +2.1 W)	In Max the miner hashes more than at the hand point; ± is the share noise. Behind it the extra power.
Max –2.6 W (–11 %) at the hand clock	Max runs at the same clock as your hand point, so it adds no hashrate, but it saves power through the lower calibrated voltage.
Eco = hand point / *Max = hand point*	That point is the hand point itself; nothing to compare.
≈ in front	Estimated: the point is no longer visited (for example the hand voltage after a calibration), so WarpTune scaled it from the nearest measured point at the same clock.
not enough data yet (… shares, … min)	A point counts from 200 shares and 30 minutes on it. Wait.

Hold the mouse over the line for the basis of each point: watts, TH/s, shares, minutes and the last stay.

Per year, in kWh and money

Under the line a second line turns the watts into a year:

Eco saves 50 kWh/year ≈ €13.98 · Max saves 23 kWh/year ≈ €6.38 — running 24/7 in that mode, at grid price



The price line above the cards and, on each card, the yearly line under the watts: "Eco saves 50 kWh/year ≈ €13.73 · Max saves 23 kWh/year ≈ €6.31 — running 24/7 in that mode, at grid price". A leading ≈ marks an estimate; the amount then stands in brackets.

Part	Meaning
Eco saves 50 kWh/year ≈ €13.98	If the miner ran in Eco all year, 24 hours a day, it would use 50 kWh less than at the hand point; at your price that is about €13.98.
Max costs 9 kWh/year ≈ €2.52 more	Max draws more than the hand point (for more hashrate); this is what that extra power costs in a year.
running 24/7 in that mode, at grid price	The figure assumes the mode all year round and your full grid price. Solar power, a time-based tariff and the hours the miner really spends in each mode are not counted in.
running 24/7 in that mode; enter your electricity price to see it in money	No price is known yet, neither your own nor one from a coupled pool: you see the kWh only.
≈ in front	The point is estimated, as in the line above.

A mode whose difference is under half a kWh a year is left out of this line.

Entering your electricity price

Above the cards, on the **Devices** page, click **Electricity price**. A small form opens:

- **Price per kWh**: what you pay for one kWh from the grid, for example `0.28`. Leave it empty (or 0) and save to remove the price again.
- **Currency (ISO code)**: the three-letter code of your currency, for example `EUR`, `USD`, `CHF`. The page suggests one from your browser's region; check it.
- **Save**. The text under the form says: *Your grid price and its currency, a setting, not a guess. The cards use it at once; WarpTune does not need it, so there is nothing to apply.*

The line above the cards then says *Electricity price: 0.28 EUR/kWh — the cards show the yearly savings in money.* A wrong entry gives *Enter a price of 0 or more and a three-letter currency code such as EUR.* The price is stored in the settings file (`[energy]`, keys `price_per_kwh` and `currency`). WarpTune never guesses a price from your location. Without your entry it takes the electricity price a coupled dvb-WarpPool reports, if the pool has a tariff; the line above the cards then says *Electricity price from the pool: 0.2744 EUR/kWh — the cards show the yearly savings in money. An entry of your own replaces it.* A pool without a tariff (for example `pool.warppool.org`) changes nothing: you see kWh only. Your own entry always wins.

The amounts are written in your page language's number format, with the currency you entered or the pool's.

> **On a dvb-WarpPool's devices page** the same yearly line uses the pool operator's single default electricity tariff (Admin → Electricity tariff; time-of-use slots do not count there). If the operator set none, the line says *running 24/7 in that mode; the pool operator has set no electricity tariff*.

Where the numbers come from

- Hashrate comes from **accepted shares** over the last 7 days: from a coupled dvb-WarpPool's worker row where there is one, otherwise from the miner's own share counters, on whatever pool it mines. A small line under the card's line names the source: *hashrate from the pool's accepted shares* or *hashrate from the miner's own share counters*.
- Power comes from the miner's own readings.
- WarpTune recomputes the line every 30 minutes.

Why the hand point and not the factory point? The hand point is the honest "without WarpTune": it is where your miner runs when WarpTune is not running. If you never tuned by hand, it *is* the factory point.

> **Always "not enough data"?** A point counts from 200 shares and 30 minutes on it; on a pool with a high difficulty that takes longer. With a pool coupling, also check that the miner mines on the pool you entered and that its worker name is exactly the one the pool shows (address.worker, same spelling). A private pool that hides its data needs a read token (setting `pool_token_env` in the settings file). Without a pool row WarpTune falls back to the miner's own counters.

12 · Updating

Download the new version from the release page and check it, as in chapter 3. Your settings file, journal and calibration results stay; they are not part of the program. After an update, check the version badge in the header.

Windows

Run the new `…-setup.exe` over the old one. The installer stops the running WarpTune cleanly first (live miners get their hand point back, up to 20 seconds), then copies the new files, then you start it from the Start menu (or at the next sign-in).

macOS

1. Drag the new **WarpTune Desktop** from the `.dmg` into Applications and replace the old one. The running WarpTune keeps running the old version for now.
2. Restart WarpTune so the new version runs. In Terminal:
   `"/Applications/WarpTune Desktop.app/Contents/MacOS/dvb-warptune-launcher" --stop`
   This stops it cleanly; live miners get their hand point back.
   - With the login item, macOS starts WarpTune again by itself, now from the new app.
   - Without the login item, open **WarpTune Desktop** again.
3. The first time, macOS may ask again (chapter 4). Check the version badge in the header.

> **Simpler, if you do not mind a logout:** replace the app, log out and log in again. With the login item the logout stops WarpTune cleanly and the login starts the new version.

Linux

- **.deb:** `sudo apt install ./dvb-warptune_<new>_<arch>.deb`, then `systemctl --user restart dvb-warptune-desktop`. The restart writes the hand points back before the new version starts.
- **AppImage:** stop it with `./WarpTune-Desktop-<old>.AppImage --stop` or `systemctl --user stop dvb-warptune-desktop`, then put the new AppImage **at the same path** as the old one (rename it to the old file name) and start it. The user service points at that path.

The "Update service" question

If you installed WarpTune before version 1.40 as a service (with the setup script), that old service answers on port 8766 but has no page. The app then does not open an empty page. It asks (on Linux as a small window if `zenity` is installed, else as a message):

A WarpTune service without the Desktop page is running (a version before 1.40, …). Update it to the version in this app? The service restarts: live miners get their hand point written back and are regulated again from there. Not possible while a calibration runs.

- **Update service** copies the program from the app over the service's program and restarts the service. Then the page opens.
- **Not now** leaves everything as it is.
- While the old service runs a calibration, or a result waits for Apply / Discard, the update is refused: finish it on the pool's devices page first, then open the app again.

13 · Uninstalling

Uninstalling removes the program. It writes the hand points back to all live miners first. Your settings file and journal stay, so a later reinstall finds everything again. Delete that folder by hand if you want it gone (paths in chapter 4).

macOS

1. In Terminal:
   `"/Applications/WarpTune Desktop.app/Contents/MacOS/dvb-warptune-launcher" --uninstall`
   This removes the login item and stops WarpTune.
2. Drag **WarpTune Desktop** from Applications to the Trash.

A service installed with the setup script (`com.dvb.warptune`) is not touched by this; remove that with `scripts/setup-warptune.sh --uninstall`.

Windows

Settings → **Apps**, find **WarpTune Desktop**, click **Uninstall**. The uninstaller stops WarpTune cleanly first, then removes the program, the Start menu entry and the Startup shortcut.

Linux

1. First: `dvb-warptune-launcher --uninstall` (for the AppImage: `./WarpTune-Desktop-<tag>.AppImage --uninstall`). This stops the user service with the restore and disables it.
2. Then: `sudo apt remove dvb-warptune`, or delete the AppImage.

> **Do step 1 first.** `apt remove` alone cannot reach your user session. It would leave the user service enabled and WarpTune running on a deleted program.

14 · Troubleshooting & FAQ

The page does not open.

- Type `http://127.0.0.1:8766/` into your browser yourself. The launcher may have started WarpTune without opening the browser (the Windows Startup shortcut does that on purpose).
- Open it on **this** computer. From another device it does not open; that is by design (chapter 5).
- Click the app or Start menu entry once more. If WarpTune does not run, that starts it.
- A message *WarpTune started but its page did not answer in time; see the log next to warptune.toml.* means WarpTune did not come up. Look into the log (chapter 4). A common cause is the next point.

"Port in use" / "already running".

Only one WarpTune runs per settings file and port. A second start ends with an error. Causes: a WarpTune service from the setup script still runs, a second copy (for example the portable zip next to the installed one), or another program uses port 8766. Stop the other one, or use only one way to run WarpTune. The app itself never starts a second copy: if a WarpTune with a page already answers, it only opens the page.

The header says "WarpTune not reachable".

The page is still open, but WarpTune stopped, or the computer was asleep. Click the app again to start it. On macOS without the login item, a logout ends it.

macOS says the app "can't be opened" or "Not Opened".

That is Gatekeeper, because the app is not signed with a paid certificate. Follow the steps in chapter 4: **Done**, then **System Settings** → **Privacy & Security** → **Open Anyway**, then open the app again and confirm. Check the download first (chapter 3).

The search finds no miner, or not all of them.

- Are the miners on, and in the same network as the computer? A guest Wi-Fi or a separate IoT network is a different network. Type that network into **Network (optional)**, or add the miner by its address.
- mDNS finds nothing on macOS and Windows: normal. On Windows WarpTune leaves mDNS out, so the firewall does not ask; the network sweep of this computer's own /24 networks finds the miners.
- A VPN on the computer can hide the home network. Pause it for the search.
- An Avalon Q is found through its cgminer port 4028. If it does not show, check that its API is reachable from this computer (some routers or VLANs block the port), or enter its address.

Will the firewall ask?

Normally not. WarpTune serves its page on 127.0.0.1 only, and on Windows it does not listen for mDNS. On macOS and Linux the mDNS search may listen briefly on the network while you search. Only if you change the settings file to serve WarpTune's status to a pool on another machine (`bind = "0.0.0.0:8766"`) will Windows ask; allow it for private networks only.

A miner is already tuned by another WarpTune.

Leave it in dry run here, or remove it from the other WarpTune first. Two WarpTune instances on one miner write against each other (chapter 2).

Why is calibration not available, or why was the start refused?

The card says	What to do
live control is off for this miner	Switch the miner to live on its card; that takes effect at once (the first time, the process switch may still need **Apply now**).
the firmware reports no share difficulty	This firmware gives no share verdict of its own. Update the firmware, or let the miner mine on a dvb-WarpPool and couple it (Add miners → 3 · Pool coupling).
the shares come too slowly for a verdict within the stage's timeout	The pool's difficulty is too high for this miner. Set a lower difficulty at the pool, if it offers one, or mine on a pool with variable difficulty (for example a dvb-WarpPool).
the Avalon's control board owns its voltage	Nothing; the Avalon Q is regulated by work modes only.
this miner runs the maker's fixed presets	BitForge Nano: tick **Clock search** on its card; it takes effect at once.
no fresh WarpTune snapshot	The miner does not answer right now. Check it.
a calibration is running or a result waits for apply or discard	Finish the open one: Stop, or Apply / Discard.
nothing to measure — …	The step's voltage is already at its floor; there is nothing below to try.
Quick check now missing	The firmware reports no chip error counters. Use the full calibration.

Do I need a pool for the calibration?

No. Since v1.41 the calibration, the quick check and the re-check judge each voltage on the miner's own share counters, on whatever pool it mines. A dvb-WarpPool coupling is only preferred where it exists: it tells reject reasons apart on every firmware and can show the WarpTune badge on your wallet page. Exceptions: a firmware without a share difficulty, and the Avalon Q, which only switches work modes.

The savings show kWh but no money.

No electricity price is set. Click **Electricity price** above the cards, enter your grid price and currency, and save (chapter 11). Nothing needs to be applied.

"Apply now" is refused.

A calibration runs, or its result waits for Apply / Discard. Finish it first. If the banner says the settings file has an error, the running WarpTune keeps its old settings until the file is fixed. A change on one miner's card normally needs no **Apply now** at all; if it could not be applied (a calibration runs on that miner, its pool address is one the running WarpTune does not poll, or the process cannot reload), the card shows the reason, the badge says **not running: apply the settings**, and the banner stays until you press **Apply now**.

"Energy" is greyed out.

Energy needs a pool address (Add miners → 3 · Pool coupling) and `[energy] enabled = true` in the settings file. See chapter 9.

The badge says "control off".

A safety rule switched live control off for this miner: more than 12 writes in an hour, or a write the miner did not confirm. Check the miner (does its web page respond, is the firmware busy with an update?). Live control comes back when WarpTune restarts: after the next **Apply now** (it appears when you change the global settings, chapter 5), after a logout and login, or after a stop with `dvb-warptune-launcher --stop` and a new start of the app.

Is it safe to change settings on the miner while WarpTune runs?

Yes. WarpTune sees the change and judges the new point. But the hand point WarpTune restores is the one it saw at its own start (chapter 8). The fan target is part of a calibration; changing it ends a running one.

Does WarpTune work when the computer sleeps?

No. While the computer sleeps, WarpTune does nothing, and live miners stay on their last point. Turn off sleep on the computer that runs WarpTune.

15 · Support & links

Documentation	docs.warppool.org
First start with pictures	docs.warppool.org/warptune-desktop-open.html
WarpTune	warppool.org/warptune/
Downloads	git.warppool.org/dvb-projekt/dvb-WarpPool/releases
Report a problem	git.warppool.org/dvb-projekt/dvb-WarpPool/issues
Technical guide (settings file, service, journal)	scripts/warptune-setup.md
WarpAxe firmware	warppool.org/warpaxe/
Contact	dvbprojekt@gmx.de

When you report a problem, please add: your system (macOS / Windows / Linux), the version from the header, the miner's board and firmware (from **Check**), and the last lines of the log (chapter 4). The log contains your miners' local addresses, but no passwords; tokens are kept in `warptune.env`, which you should never share.

WarpTune Desktop is part of dvb-WarpPool, free and open-source software (AGPL-3.0-or-later, with a commercial licence available). This manual describes WarpTune Desktop v1.41.0. Screens may differ slightly between releases; the screenshots show real miners on a home network. Changing clock and voltage of a miner is at your own risk; WarpTune's limits reduce that risk but do not remove it. Mining is probabilistic; nothing here is a promise of reward.

Same hashrate, less heat. Happy mining.