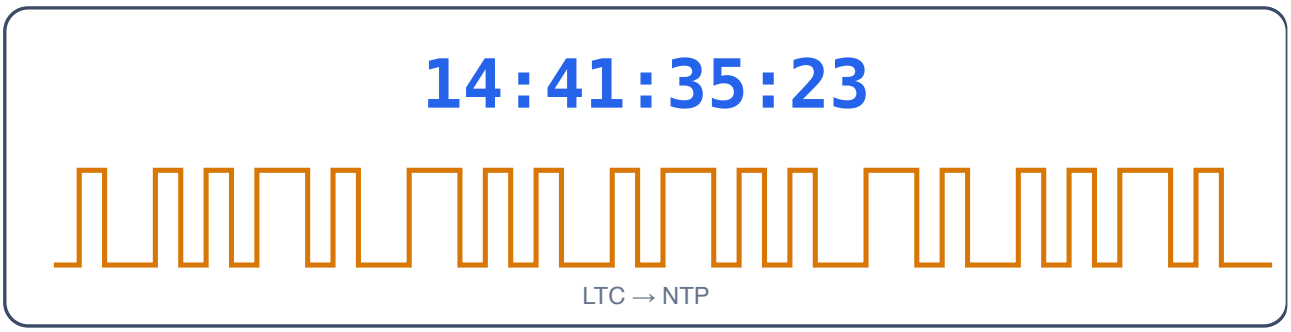
ELETTRONICA MANGIONE



NTP ⇄ LTC Time Converter

User manual

LTC to NTP time server with Ethernet / PoE

Firmware	3.1.5
Document	29 October 2026
Language	English

Contents

1. Introduction 4
- 1.1 What the unit does 4
- 1.2 Typical uses 4
- 1.3 Main features 5
- 1.4 About this manual 5

2. The unit and its connections 6
- 2.1 Connections 6
- 2.2 Connecting the LTC signal 7
- 2.3 Network and power 7
- 2.4 Display, buttons and LED 7

3. Quick start: LTC → NTP 8
- 3.1 Typical settings 9

4. How it works 10
- 4.1 What is LTC? 10
- 4.2 What is NTP? 10
- 4.3 From LTC to NTP 11
- 4.4 Time zone and the UTC offset 11
- 4.5 The date 12
- 4.6 When does the server give time? 13
- 4.7 LTC formats 13
- 4.8 Accuracy 13

5. Operating modes 14
- 5.1 LTC → NTP 14
- 5.2 NTP → LTC 14
- 5.3 AUTO 15

6. Web interface 16
- 6.1 Status 16
- 6.2 Mode 17
- 6.3 Network 18
- 6.4 Time 19
- 6.5 System 20
- 6.6 Update 21

7. Using the unit without a computer 22
- 7.1 Start-up and display pages 22
- 7.2 The settings menu 23
- 7.3 Recovering the network address 24
- 7.4 LED 24

8. Setting up the devices that use the time 25
- 8.1 Example: Wharton 4000-series NTP clocks 25
- 8.2 Windows PC 25
- 8.3 Linux 25
- 8.4 macOS 26
- 8.5 Other devices 26

9. Network configuration 27

10. Alarms and status messages 28

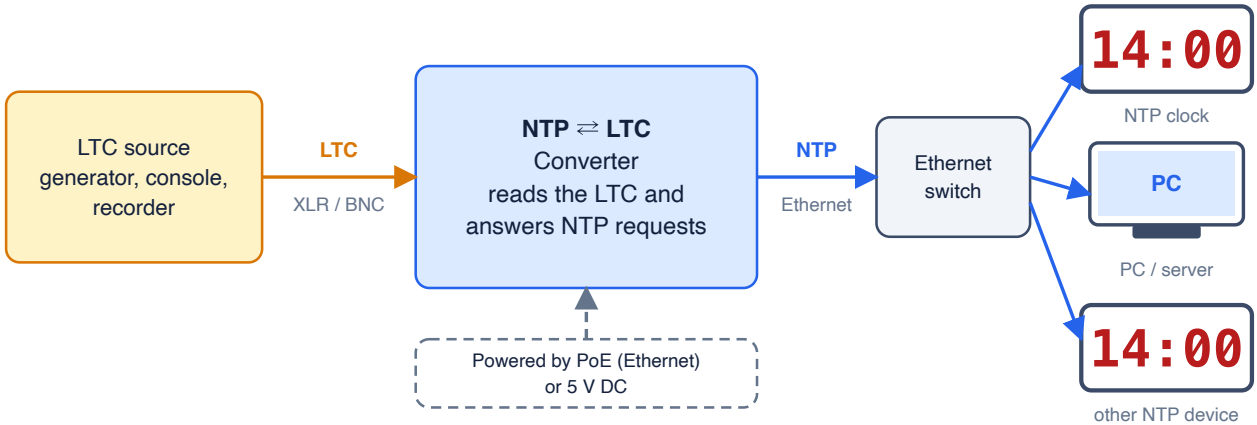
11. Troubleshooting 29

12. Maintenance **30**
12.1 Firmware update 30
12.2 Behaviour after a power loss 30
12.3 Self-protection 30
12.4 Cleaning and handling 30
13. Technical specifications **31**
14. Frequently asked questions **32**
15. Glossary **33**
Appendix A. Quick reference **34**
Appendix B. Date and time zone in the LTC user bits **35**

1. Introduction

1.1 What the unit does

> **In simple words.** You already have a timecode (LTC) running on a cable. Many devices – wall clocks, computers, servers – cannot read LTC, but they can ask the time over a network. This unit listens to your LTC and, when a clock or a computer asks *"what time is it?"*, it answers with the time from the LTC. Nothing else is needed: no Internet, no GPS, no router.



The converter turns the timecode you already have into network time that clocks and computers understand.

Figure 1 – The converter sits between the LTC source and the network devices that need the time.

The unit works in three ways, chosen on its web page or with its buttons:

Mode	What it does
LTC → NTP	Reads the LTC at the input and becomes an NTP/SNTP server (stratum 1) on the network. **This is the main use described in this manual.**
NTP → LTC	Reads the time from an NTP server on the network and generates an LTC signal on the output.
AUTO	Uses the input LTC while it is present and locked; otherwise uses the network time. The LTC output never stops.

1.2 Typical uses

Situation	What you get
A studio or site has an LTC generator, and a clock that accepts only NTP	The clock shows exactly the LTC time. Example: Wharton 4000-series NTP clocks (section 8.1).
Computers must follow the timecode of a production	PCs, servers and recorders set their clocks from the converter over the network.
A network has NTP but a recorder needs LTC	Use NTP → LTC mode: the unit generates a continuous LTC from network time.

Network time with LTC as the preferred source	Use AUTO mode.

1.3 Main features

- LTC input on **XLR** (balanced) and LTC output on **XLR**; a BNC connector can be set as unbalanced input or output; all six LTC formats are recognised automatically.
- NTP server on Ethernet, **NTP versions 1, 2, 3 and 4** (each answered in the version the client uses), stratum 1, reference ID `LTC`.
- Works on an **isolated network** with a fixed address; no router and no Internet are required.
- Powered over Ethernet (PoE) or from 5 V DC.
- Settings from any web browser, **or** on the unit with an OLED display and three buttons.
- Safe by design: if the LTC is missing for more than 60 seconds the server says *“I do not know the time”*, so clients are never given a wrong time.
- Watchdogs, automatic recovery, and firmware updates that return to the previous version by themselves if they fail.

1.4 About this manual

Chapters 1 to 3 are enough to install the unit. Chapter 4 explains, in plain words, *how* the unit works and why some settings (UTC offset, date) matter. Chapters 5 to 12 are the reference. Boxes marked **In simple words** give the short version; **Important** boxes are things that commonly go wrong.

2. The unit and its connections

2.1 Connections

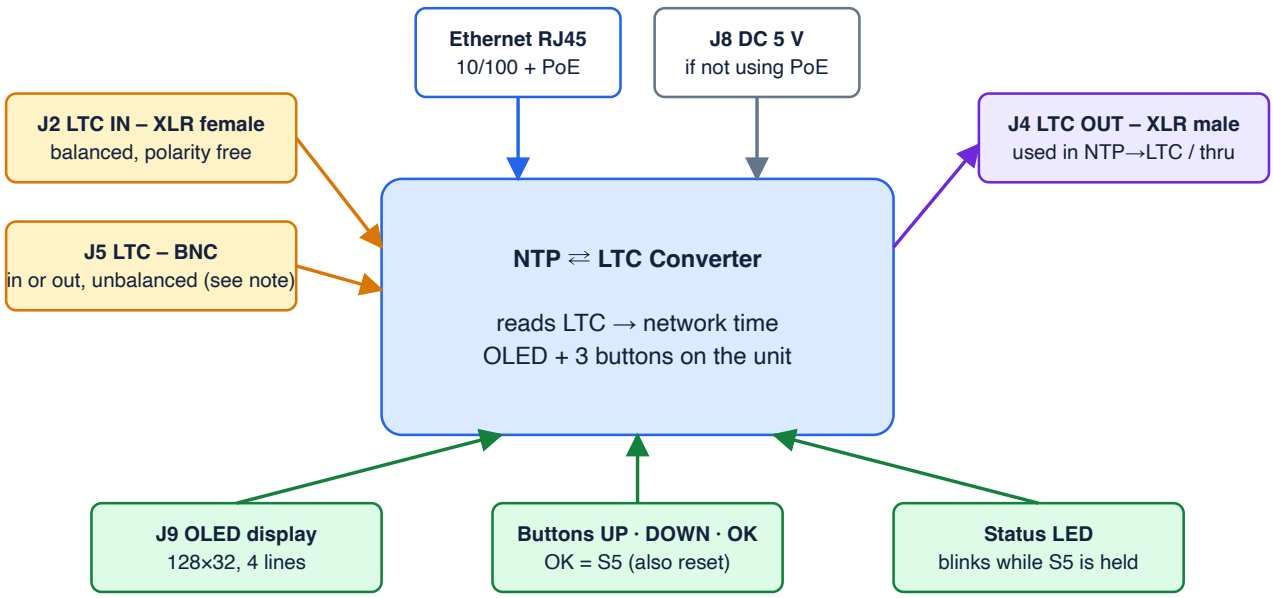


Figure 2 – What connects where.

Connector	Function
Ethernet (RJ45)	Network, NTP, web page. Also supplies power when connected to a PoE switch or injector.
J2 – LTC IN, XLR female	Linear timecode input, balanced (RS-422 receiver). Polarity does not matter.
J5 – LTC, BNC	Unbalanced LTC input or output, chosen by links on the board (see the note below).
J4 – LTC OUT, XLR male	LTC output, used in NTP → LTC and AUTO mode, and in LTC → NTP mode when *pass-through* is on. Off in a plain LTC → NTP setup.
J8 – DC power	5 V DC, only if PoE is not used.
OLED display	Shows address, mode, timecode and status; shows the menu.
Buttons UP, DOWN, OK (S5)	Browse the display, open the settings menu, and recover the network address.
LED	Blinks while the OK button is held (see section 7.4).

> **BNC connector.** The BNC connector J5 is set by two links on the board: **JP2** connects it to the LTC input (the same receiver as the XLR), **JP3** connects it to the LTC output (unbalanced, taken from J4 pin 2). The **XLR** input is the tested input. If you need the BNC input, check the link setting (JP2, JP3) of your unit with your supplier before connecting.

2.2 Connecting the LTC signal

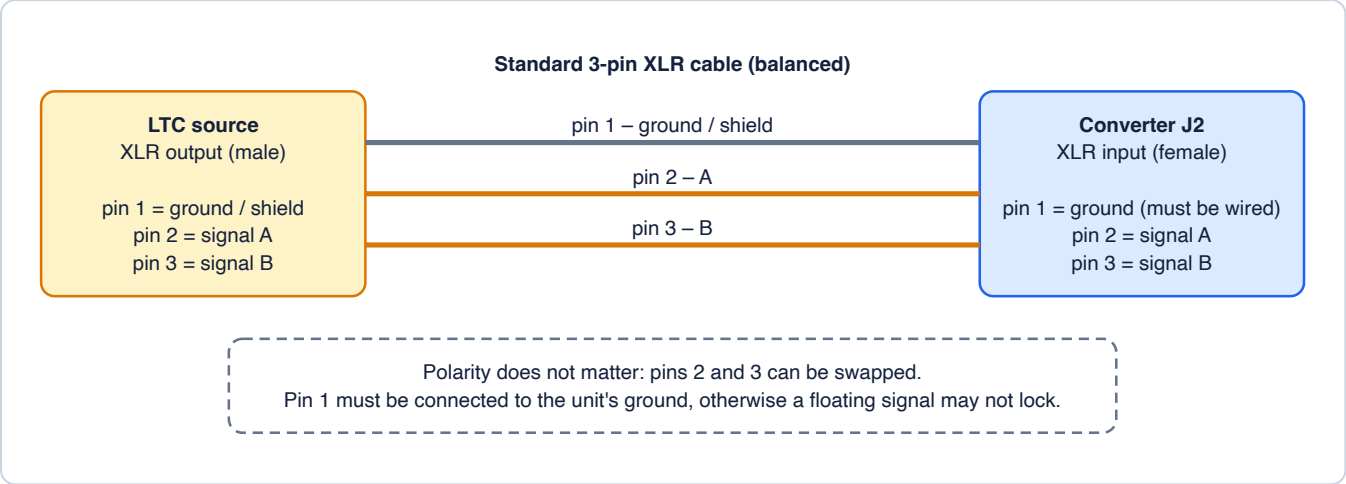


Figure 3 – XLR wiring between the LTC source and the converter input J2.

- Use a normal 3-pin balanced XLR cable. The source output goes to the converter's **XLR female** input.
- **Pin 1 (ground) must be connected.** Without it the signal can float and the input may not lock.
- Pins 2 and 3 can be swapped: LTC works with either polarity.
- Use a normal **line-level** LTC signal, as from a timecode generator or an audio console output. Never connect a microphone input or a loud speaker output. If the Status page shows *no signal* with the cable connected, check that the source is running and its level is not very low.
- The LTC lines are **not galvanically isolated**. Avoid ground loops between the converter's PoE switch and the LTC equipment; if you hear or see interference, use an isolation transformer on the LTC line.

2.3 Network and power

- Plug the Ethernet cable into the RJ45 connector. A PoE switch (IEEE 802.3af) or PoE injector powers the unit; otherwise supply 5 V DC to J8. Use one power source only.
- The unit starts in about 10 seconds. The display shows *Elettronica Mangione, NTP <-> LTC, ver. 3.1.5* and then the address.
- The unit needs no battery and no setup of the time: it takes the time from the LTC.

2.4 Display, buttons and LED

Everything shown on the web pages can also be read on the OLED display, and the main settings can be changed with the three buttons. This is described in chapter 7.

3. Quick start: LTC → NTP

> **In simple words.** Connect the LTC and the network cable, open the unit's web page, choose *LTC → NTP*, tell it the time zone of your LTC and today's date, then point your clocks and computers at the unit's address. Five minutes.

1. **Connect.** LTC source → XLR input J2. Ethernet → switch (or directly to a PC). The unit powers up from PoE or from J8.
2. **Reach the web page.** With a DHCP server the unit takes an address from it and shows it on the display. **Without a DHCP server (no router) the unit uses `192.168.1.100`, mask `255.255.255.0`, after about 10 seconds.** Give your PC a fixed address in the same network (for example `192.168.1.50`, mask `255.255.255.0`) and open `http://192.168.1.100/` in a browser. Use `http`, not `https`.
3. **Choose the mode.** *Mode* page → select **LTC → NTP** → *Save operating mode*.
4. **Tell it the time zone and the date.** *Time* page. In *LTC input → NTP server* enter **LTC time = UTC + (minutes)**: **0** if your LTC carries UTC, the number of minutes of your local time if it carries local time, for example **240** for UTC+4 (no daylight saving). Tick *Trust the saved date after a power loss*. Save. Then in *Set the LTC date* enter today's date and press *Set LTC date*.
5. **Check.** *Status* page: **LTC input = locked**, **NTP server = ON**, **no active alarms** (the page is shown in section 6.1).
6. **Point the clients to the unit.** In each clock or computer, set the **NTP server address** to the address of the unit (chapter 8).

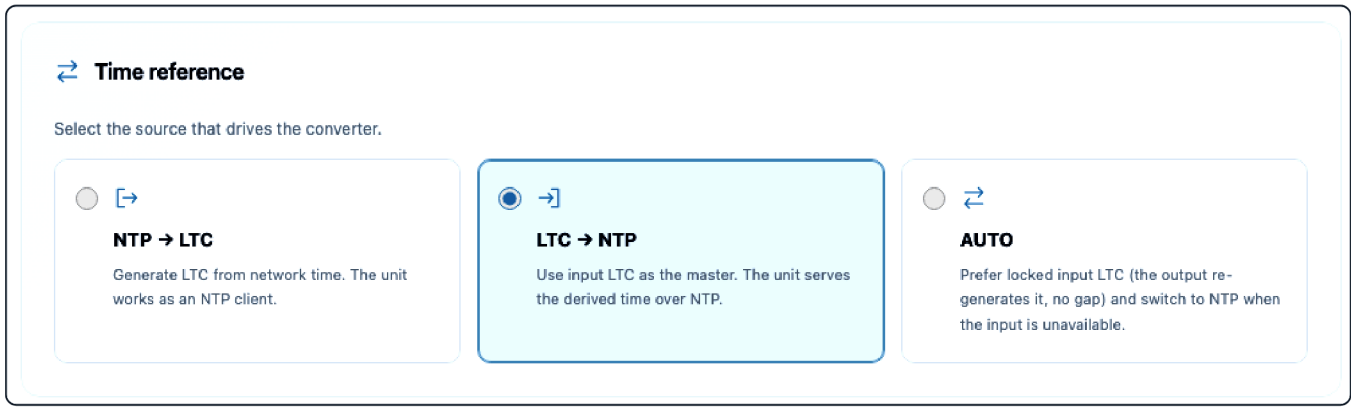


Figure 4 – Step 3 – Mode page: LTC → NTP selected.

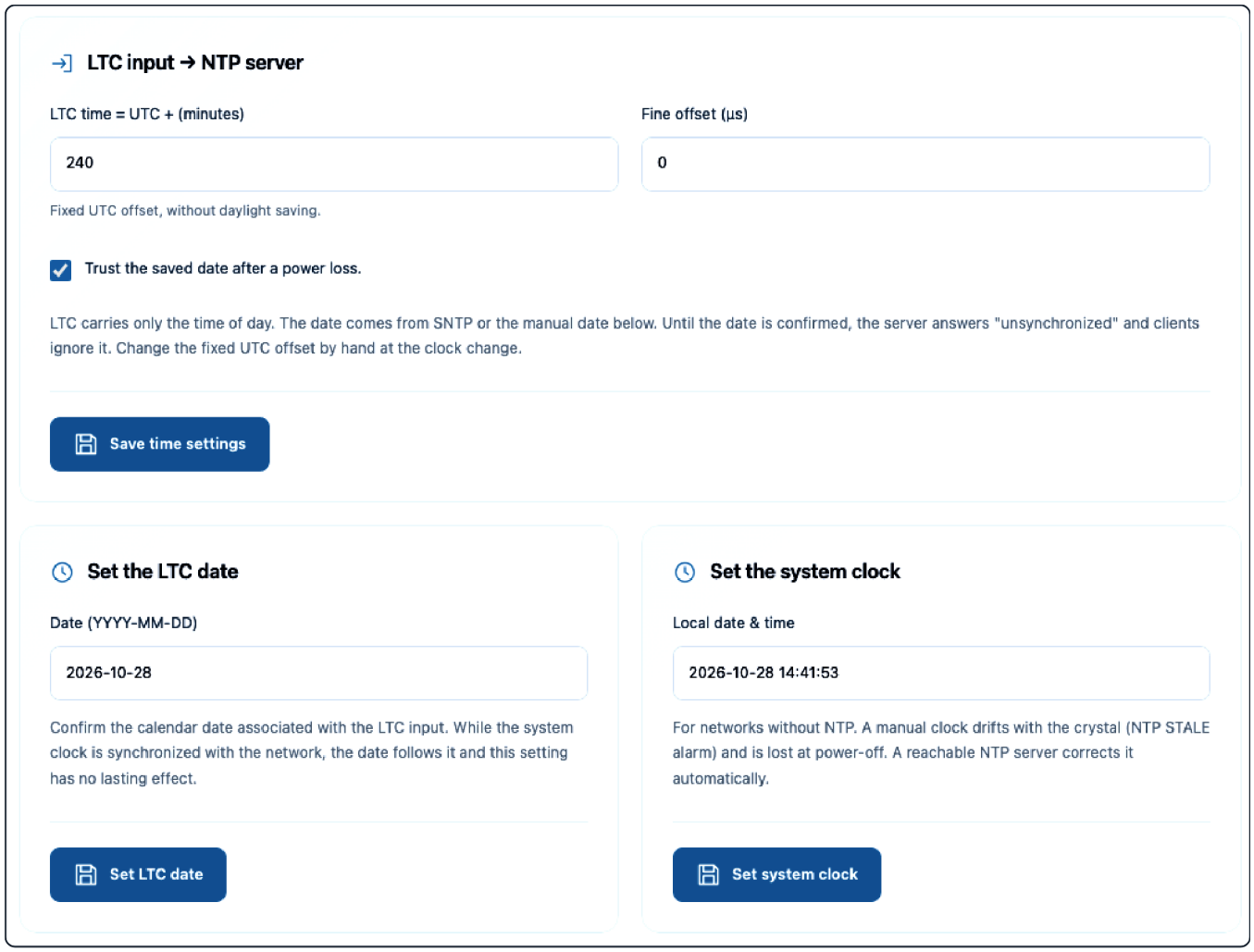


Figure 5 – Step 4 – Time page: LTC time = UTC + 240 minutes (example: an LTC in UTC+4), trust the saved date, and the LTC date.

> **Important.** The **UTC offset** is the most common source of error. A typical NTP clock expects **UTC** from the server and adds its own local offset. If your LTC shows local time and you leave the offset at 0, the clocks will be wrong by hours. See section 4.4.

3.1 Typical settings

Setting	Value
Mode	LTC → NTP (output off)
Address	Fixed, for example `192.168.1.100`, mask `255.255.255.0`, gateway none
LTC time = UTC + (minutes)	Set to match your LTC: 0 for UTC, or the minutes of your local time (240 for UTC+4)
Trust the saved date after a power loss	On
LTC date	Set once; the day then advances by itself at midnight while the LTC runs
Web password	None by default (set one in *System* if the network is shared)

A typical installation without a router. All of these can be changed at any time, from the web pages or with the buttons.

4. How it works

This chapter explains the ideas behind the settings. It is not necessary for installation, but it makes every setting easy to understand.

4.1 What is LTC?

> **In simple words.** LTC (Linear Timecode) is the time of day written as a stream of pulses on an audio-like cable. Every video frame it sends one packet of 80 bits that says *hours : minutes : seconds : frames*, for example `14:41:35:23`.

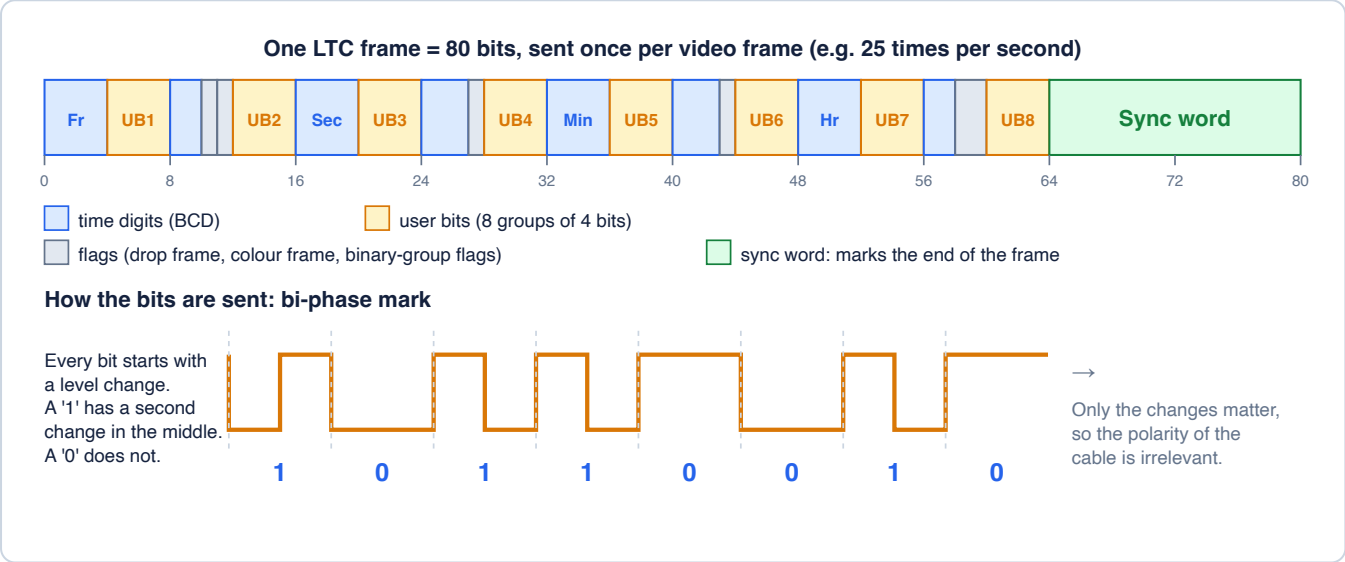


Figure 6 – The 80 bits of one LTC frame and the bi-phase mark coding.

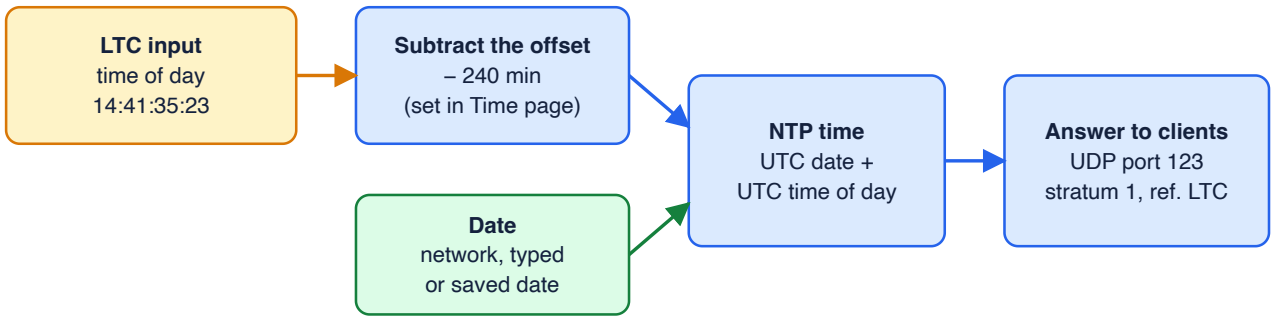
LTC contains the **time of day** and the **frame rate**, but normally **no date** and **no time zone**. This matters for NTP, which needs both. The 32 “user bits” may carry a date, but many generators leave them at zero (see section 4.5).

4.2 What is NTP?

> **In simple words.** NTP is the standard way a computer or clock asks a server for the time over a network. The client sends a small message; the server replies with the exact time. The client then corrects its own clock.

- The unit answers on **UDP port 123** and understands NTP **versions 1 to 4**. It always replies in the same version as the request, so old and new clients both work.
- **Stratum 1** means “I am directly connected to a time source”. Here the source is the LTC, and the reference ID shown to clients is `LTC`.
- The server also tells clients whether it is trustworthy: **LI = 0** (“time is valid”) or **LI = 3 / stratum 16** (“I do not know the time”). Clients ignore a server that says LI = 3.
- It only **replies** to requests (unicast). It does not broadcast or multicast. A client must know the unit’s address.
- Each client may ask about twice per second at most; normal clients ask every few seconds to every few minutes, far below that.

4.3 From LTC to NTP



LTC carries only the time of day. The unit adds the date and converts to UTC, which is what NTP clients expect.

Figure 7 – How the unit builds the NTP answer.

For every request the unit takes the **time of day** from the LTC, converts it to **UTC** by subtracting the offset you entered, combines it with the **date**, and sends the result. The LTC always has priority: the unit never invents a time.

4.4 Time zone and the UTC offset

> **In simple words.** NTP always speaks **UTC**. Your LTC may show local time. The offset tells the unit *how far your LTC is from UTC*, so it can translate. The clocks then add their own local offset again.

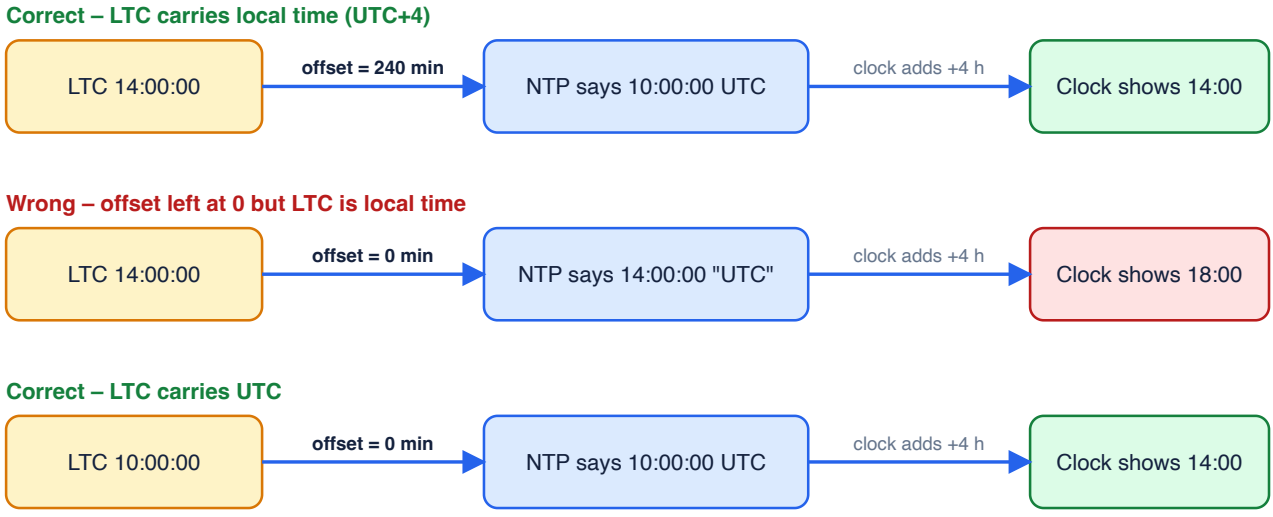


Figure 8 – The same LTC with the right and the wrong offset (example: an LTC in UTC+4).

Your LTC carries…	Enter as “LTC time = UTC + (minutes)”
UTC	**0**
Dubai (UTC+4, no daylight saving)	**240**
Central Europe, winter (UTC+1)	60

Central Europe, summer (UTC+2)	120
UK, winter / summer	0 / 60
India (UTC+5:30)	330
New York, winter / summer	–300 / –240

> **No automatic daylight saving.** The offset is a fixed number. If your LTC follows a local time that changes with the seasons, change the offset by hand when the clocks change (Time page, or menu item *LTC offset*). Where there is no daylight saving (for example Dubai, UTC+4), the offset never changes. If the LTC is UTC the problem does not exist.

A **Fine offset** in microseconds is also available (Time page) to compensate a known fixed delay in the LTC source. Leave it at 0 unless you have measured a delay.

4.5 The date

> **In simple words.** The LTC knows the time but not today's date. The unit needs the date to complete the NTP answer. Computers check the date; some clocks (like clocks that show only the time) do not. So: tell the unit the date once, and it keeps the calendar by itself.

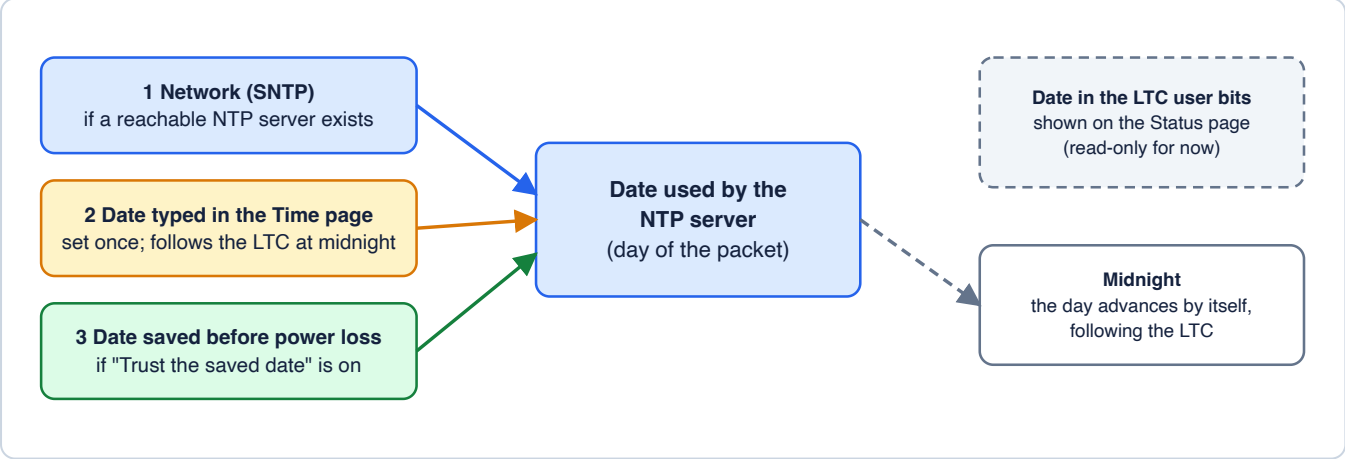


Figure 9 – Where the date comes from.

- If the unit can reach a normal NTP server (for example on the Internet), the date follows the network automatically.
- Otherwise **type the date** once in the Time page. The unit then counts days by itself: at midnight (LTC `23:59:59` → `00:00:00`) the date advances.
- The unit has **no battery**. After a power loss it starts with the **saved date** if *Trust the saved date* is on (the date is saved at most every 10 minutes). If the unit stays switched off for days, the saved date is old: **the time of day is right but the day is wrong.** The same happens if no LTC is running at midnight: the day only advances when the LTC passes midnight. Set the date again in that case, on the *Time* page or with the buttons (menu item *LTC date*). Clocks that only display the time are not affected; computers may refuse a server whose day is wrong.
- Until the date is confirmed the server answers *"unsynchronised"* and clients ignore it. The alarm **DATE UNCONFIRMED** shows this.

> **Date in the LTC user bits.** Some generators send the date and time zone inside the LTC (SMPTE 309M). The Status page shows it, for example `date 2026-10-28, LTC is local time, UTC+04:00`, or `no date in the LTC`. In this firmware version it is **shown but not used**; the date comes from the sources above (Appendix B).

4.6 When does the server give time?

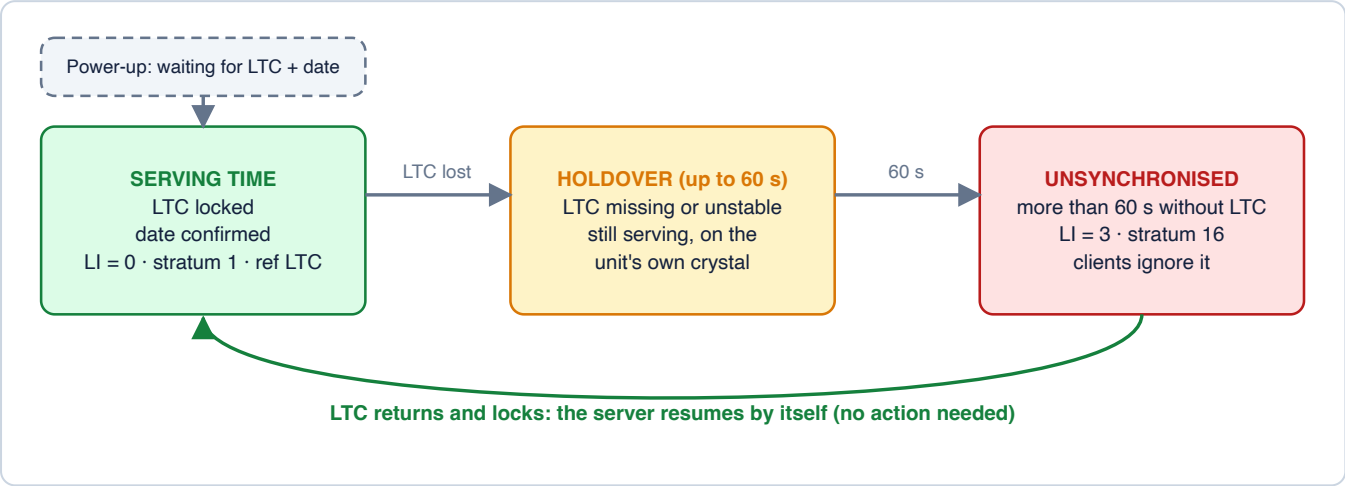


Figure 10 – The three states of the NTP server.

- **Serving time:** the LTC is locked and the date is confirmed. Clients receive the time.
- **Holdover (up to 60 s):** the LTC disappears or is disturbed. The unit keeps serving on its own crystal.
- **Unsynchronised:** more than 60 seconds without LTC. The server says *LI = 3, stratum 16* so that correct clients **ignore it** rather than take a wrong time. When the LTC returns and locks, the server resumes by itself.

Clients keep running on their own clock while the server is unsynchronised and resynchronise when it returns; how a clock displays this is described in its own manual.

4.7 LTC formats

The input detects the format by itself; the **output format** (NTP → LTC, AUTO) is set on the Mode page.

Format	Notes
24, 25, 30 fps	Exact.
29.97 fps drop frame	Exact; the frame labels follow the clock by definition and restart at midnight.
29.97 fps non-drop	The label skips one frame about once a minute to stay on the clock. This is inherent to non-drop timecode; the NTP time can be up to one frame (about 33 ms) different from the label.
23.976 fps	Same behaviour as 29.97 non-drop (up to one frame, about 42 ms).

4.8 Accuracy

- The unit's own conversion error is well below one video frame (bench test of the whole chain: about 0.2 ms).
- On a small wired network a client typically sees a few milliseconds of error; avoid Wi-Fi.
- The server is only as accurate as the LTC source it listens to.

5. Operating modes

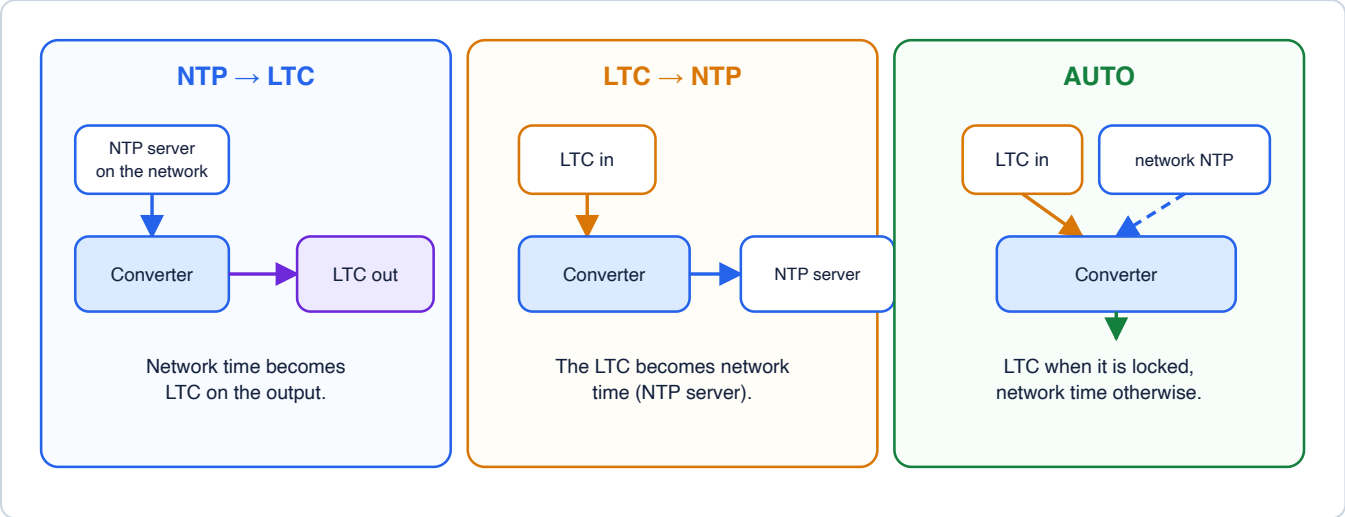


Figure 11 – The three operating modes.

5.1 LTC → NTP

The input LTC drives the NTP server (chapter 4). Settings: **UTC offset**, **fine offset**, **trust the saved date**, **date**. The LTC output is off, unless **Pass-through** is selected on the Mode page: then the unit also re-generates the input LTC on the output connector (useful to feed a second device).

5.2 NTP → LTC

The unit asks an NTP server for the time and generates LTC on the output. Settings: **output frame rate** (Mode page); **NTP servers**, **time zone**, **daylight saving**, **sync interval** (Time page).

- The output stays **silent until a valid time is known**, so a downstream device never receives a false `00:00:00:00`.
- If the network or the NTP server disappears, the output **keeps running** on the unit's crystal (*holdover*, alarm **NTP STALE**) and resynchronises by itself.
- Blank NTP server fields use the public servers (`pool.ntp.org` and others). On a network without Internet enter the address of a local NTP server, or set the clock by hand on the Time page.

5.3 AUTO

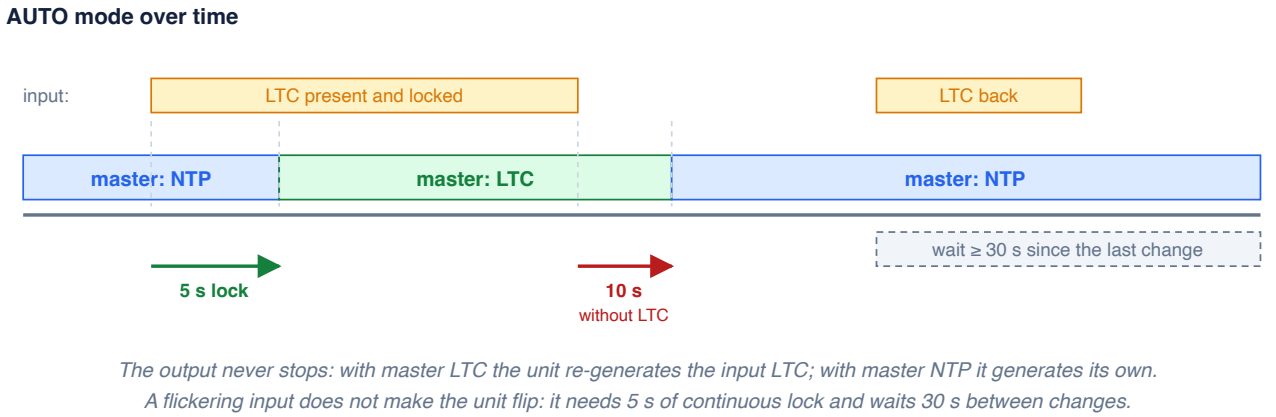


Figure 12 – AUTO mode switches with hysteresis.

While the LTC input is locked for **5 seconds** it becomes the master and the output re-generates it. After **10 seconds** without LTC the unit returns to network time. At least **30 seconds** pass between two changes, so an unstable input does not cause flipping. Each change of source gives one clean correction of at most a frame on the output.

6. Web interface

Open `http://<address of the unit>/` (or `http://ntpltc-<last number of the address>.local`, for example `http://ntpltc-100.local`). Use `http`, not `https`. Any modern browser works, on a PC, tablet or phone.

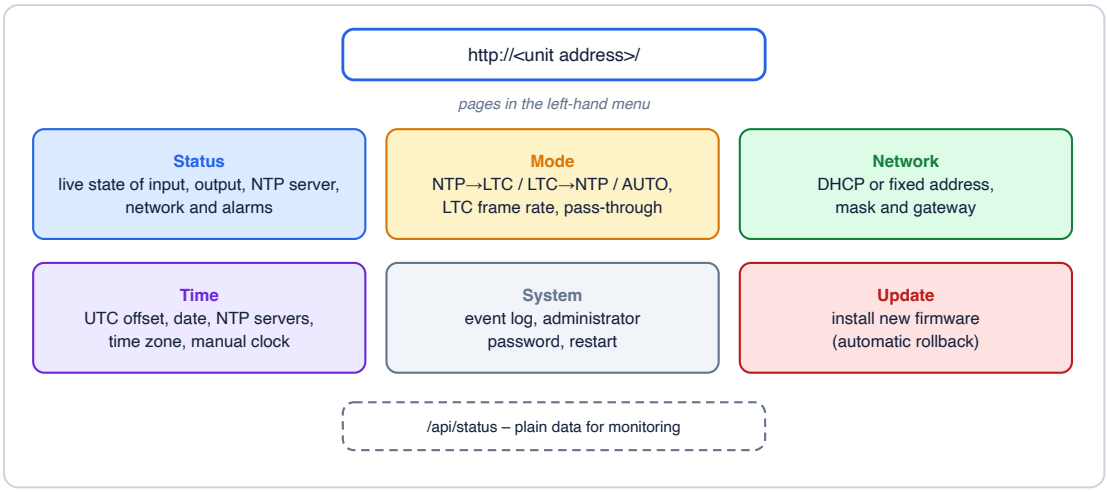


Figure 13 – The pages of the unit.

6.1 Status

Updated every second. The label *Live* at the top confirms that the page is receiving data.

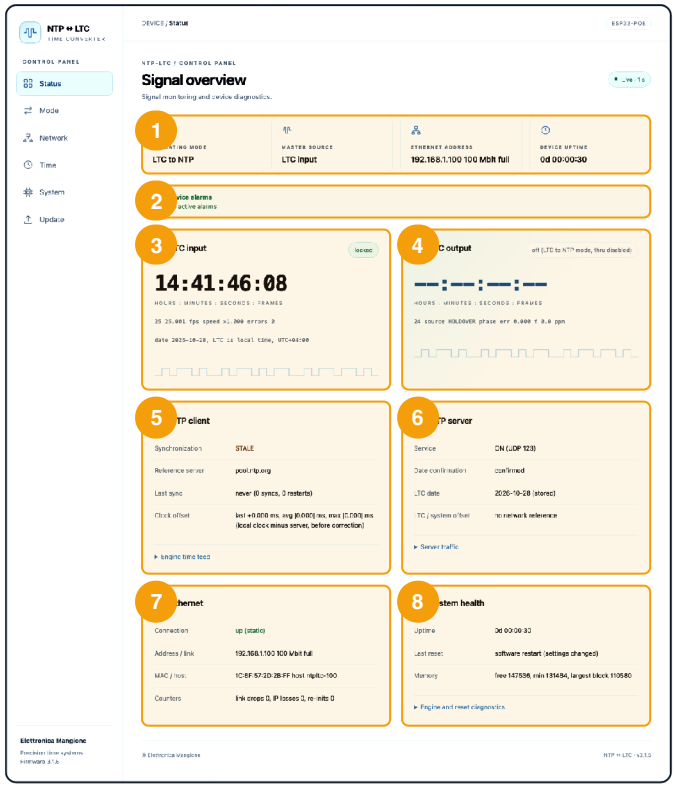


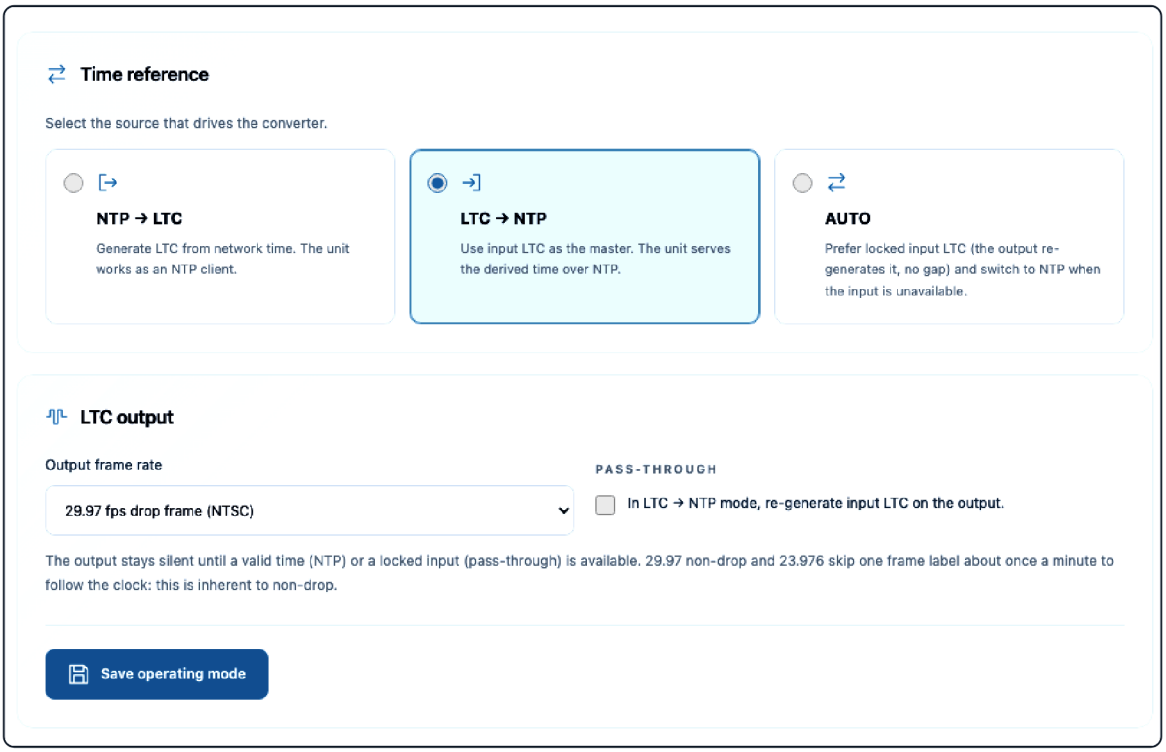
Figure 14 – The Status page in LTC → NTP mode with a locked input.

1. **Mode and master.** Operating mode, which source is the master, the address, and the time since power-up.
2. **Alarms.** Green when there is none; otherwise the alarms are listed (chapter 10).
3. **LTC input.** State (*locked* / *no signal*), time of the incoming LTC, frame rate, number of errors, and the date/time zone carried by the LTC user bits, if any.
4. **LTC output.** State and time of the output; here it is off because the mode is LTC → NTP.
5. **NTP client.** Used in NTP → LTC and AUTO mode. In LTC → NTP mode without Internet it shows *STALE* and *never*: this is normal and does not matter.
6. **NTP server. ON** when it is giving time, date confirmation, the date in use and the number of requests answered.
7. **Ethernet.** Address, speed, MAC address and link statistics.
8. **System health.** Uptime, reason of the last restart, memory.



Figure 15 – The cards to watch: the locked LTC input (with the date carried by the LTC), and the NTP server that is ON with a confirmed date.

6.2 Mode

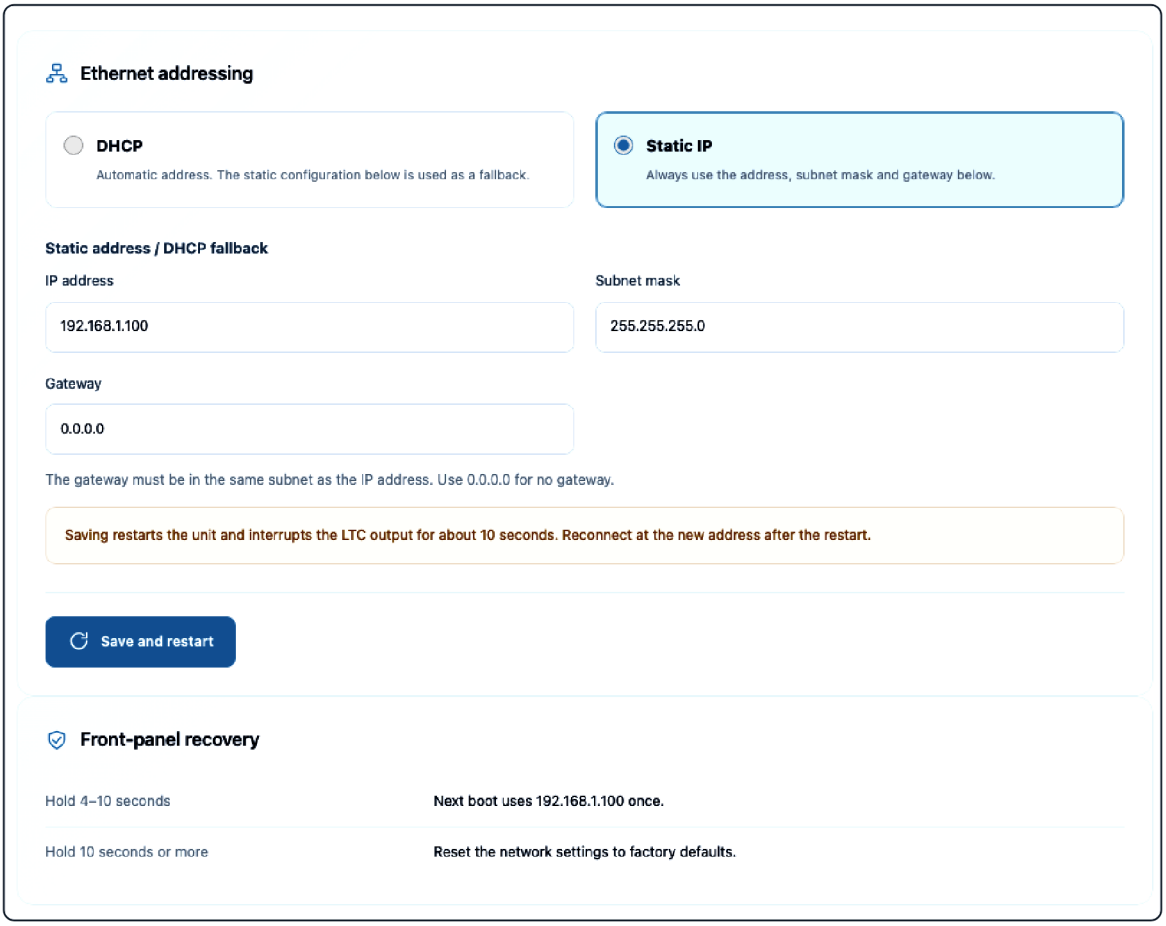


Field	Meaning
Time reference	NTP → LTC, LTC → NTP or AUTO (chapter 5).
Output frame rate	Format of the generated LTC: 24, 25, 29.97 DF, 29.97 non-drop, 30, 23.976 fps. Not needed for the NTP server.

Pass-through	In LTC → NTP mode, also re-generate the input LTC on the output.

Changes apply immediately; they do not restart the unit.

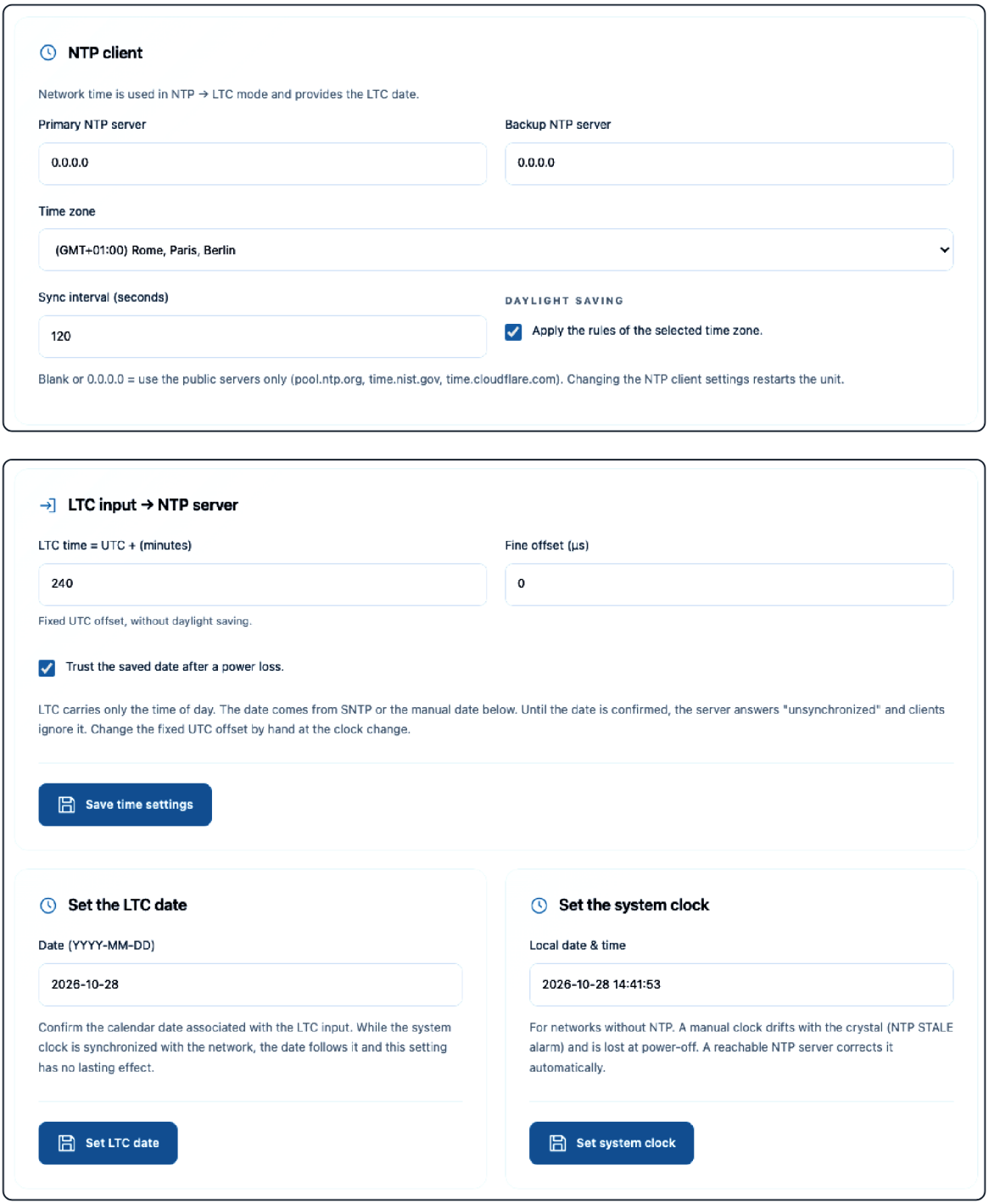
6.3 Network



Field	Meaning
DHCP	The address comes from the network's DHCP server. If none answers within about 10 s the unit uses the fixed values below as a fallback.
Static IP	The unit always uses the address, mask and gateway entered below.
IP address, Subnet mask	The address of the unit; **this is the address the clients must use as NTP server.**
Gateway	The router address. It must be in the same subnet as the IP address. Enter `0.0.0.0` for none (isolated network).

Save and restart restarts the unit (about 10 s). Reconnect at the new address. The page refuses invalid combinations (for example a gateway outside the subnet) and shows why.

6.4 Time



Field	Meaning
NTP client (NTP → LTC and AUTO mode; also gives the date in LTC → NTP mode when a server is reachable)	
Primary / Backup NTP server	Address of the server(s). `0.0.0.0` = use the public servers.
Time zone, Daylight saving	Local time of the LTC output in NTP → LTC mode (33 zones, each with its own daylight-saving rule).
Sync interval	How often the unit asks the server (seconds).
LTC input → NTP server (LTC → NTP mode)	
LTC time = UTC + (minutes)	The offset of the LTC from UTC (section 4.4).

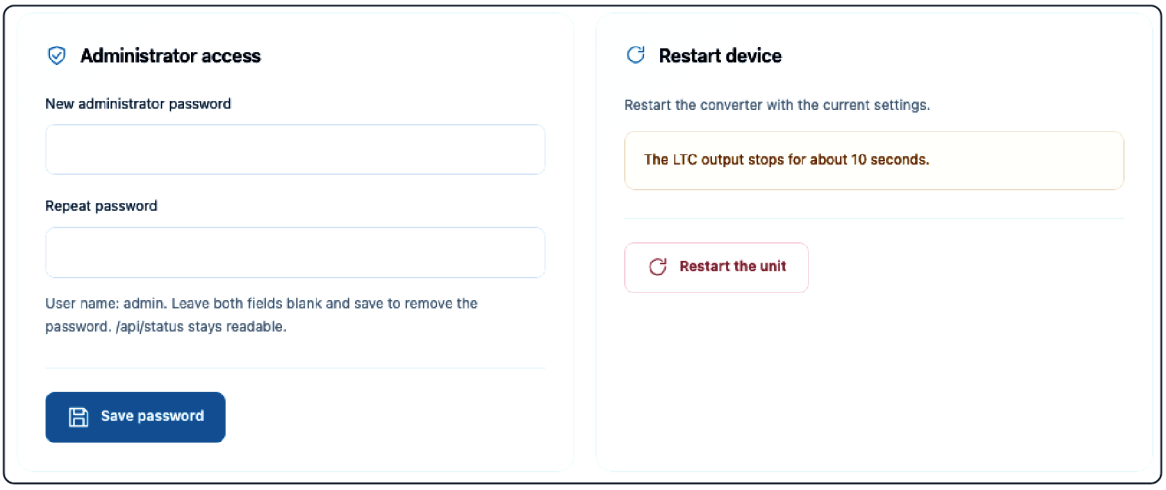
Fine offset (µs)	Fixed delay compensation, normally 0.
Trust the saved date after a power loss	Start with the saved date after a power loss (section 4.5).
Set the LTC date / Set the system clock	
Set the LTC date	Today's date `YYYY-MM-DD` for the NTP server.
Set the system clock	For NTP → LTC on a network without NTP: set the local date and time by hand. It drifts with the crystal and is lost at power-off.

Changing the NTP client fields restarts the unit; the offset, fine offset, trust option and date apply immediately.

6.5 System

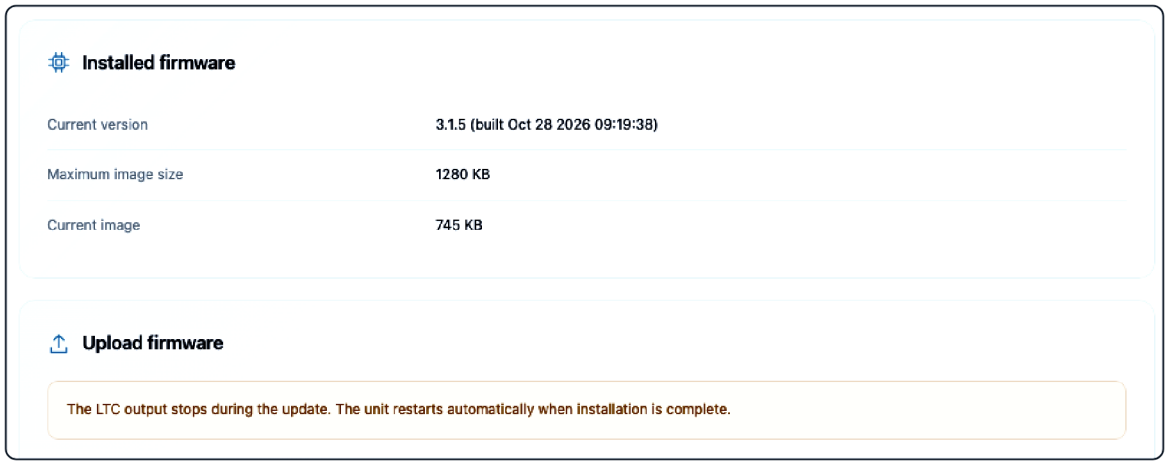


Device information shows firmware version, uptime, last restart reason and whether the firmware was confirmed. The **Event log** records what the unit did (start, lock, mode changes, network events); it is the first thing to send to support in case of problems.



- **Administrator access:** set a password (user name `admin`) to protect all pages that change something. Leave both fields blank and save to remove it. The page `/api/status` stays readable for monitoring. **Write the password down:** it cannot be reset from the buttons or the web page.
- **Restart the unit:** restarts with the current settings; the output stops for about 10 seconds.

6.6 Update



Shows the installed firmware and lets you upload a new one (section 12.1).

7. Using the unit without a computer

> **In simple words.** The small display shows what the unit is doing and rotates through a few pages. The three buttons let you change the main settings, including the IP address, without a computer or a network.

7.1 Start-up and display pages

At power-up the display shows the name and firmware version. Then it rotates through the pages every 3 seconds. **UP** and **DOWN** turn the pages by hand (rotation pauses for 10 seconds).

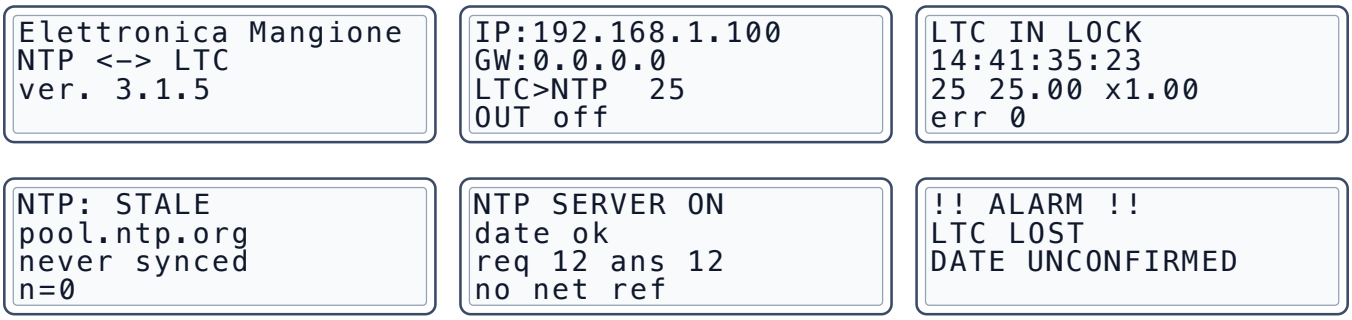


Figure 16 – Illustration of the display pages (LTC → NTP mode). Start-up, then: address and mode · LTC input · NTP client · NTP server · alarms (this page appears only when there is an alarm).

Page	What it shows
Address and mode	IP address, gateway, mode and LTC format, state of the LTC output.
LTC IN	**LOCK** (locked), *read* (reading but not yet locked) or ---- (no signal); the incoming time, format, speed and error count.
LTC OUT	State and time of the output, source and format.
NTP client	Synchronised or not, server used, time since the last synchronisation.
NTP SERVER	Shown only when the server is on: *date ok* or *UNCONFIRMED*, requests received and answered.
ALARM	Shown only while there is at least one alarm (chapter 10).

7.2 The settings menu

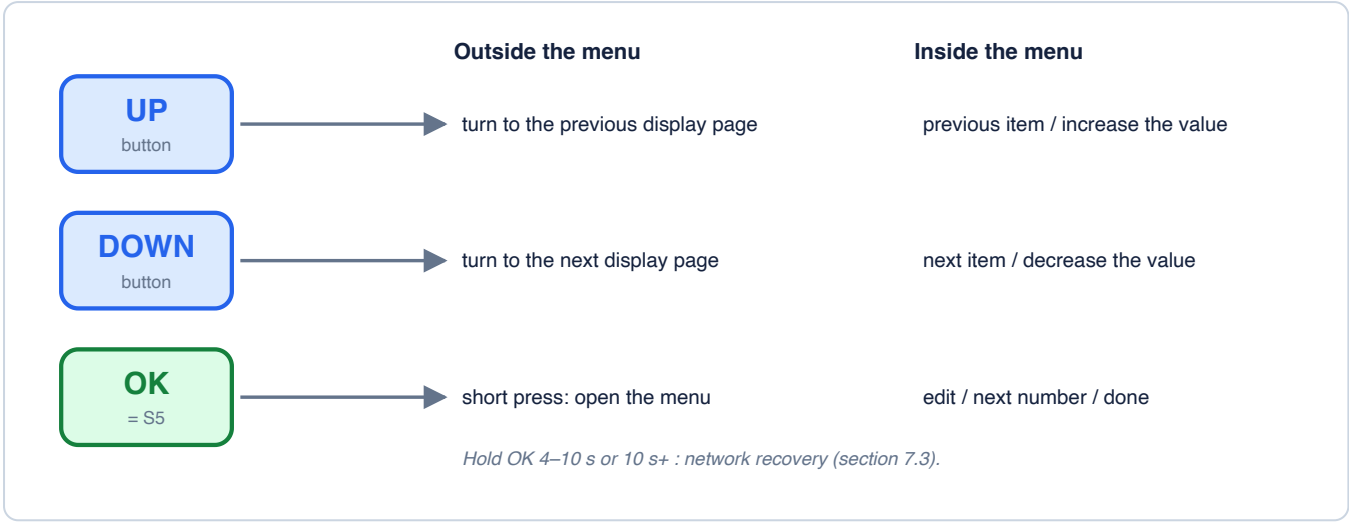


Figure 17 – The three buttons.

1. **Open:** short press on **OK** (S5) while the pages are rotating.
2. **Browse: UP** = previous item, **DOWN** = next item.
3. **Edit:** press **OK** on an item. **UP** increases and **DOWN** decreases the value (hold the button to repeat and accelerate). Press **OK** again to finish. For IP addresses, **OK** moves to the next number (4 numbers).
4. **Save:** go to *Save & apply* and press **OK**. The unit checks the values like the web page does; if something is wrong it stays in the menu and shows why. *Exit, no saving* leaves without changes.
5. After **30 seconds** without a key the menu closes **without saving**.

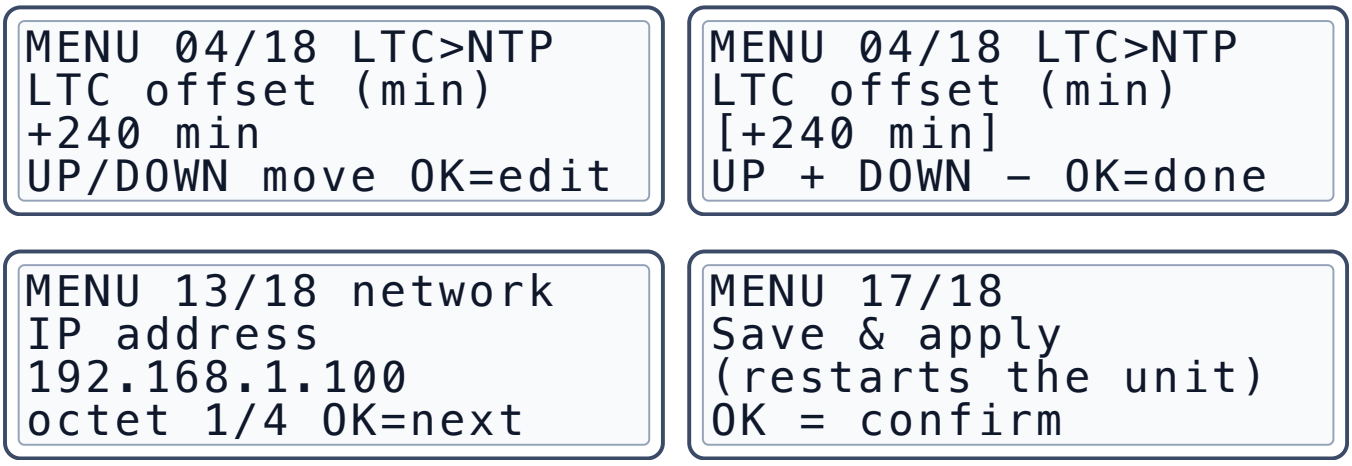


Figure 18 – Menu screens: browsing, editing a value, editing an IP address, saving.

Menu item	Used in	Meaning
Mode	all	NTP > LTC, LTC > NTP, AUTO
LTC frame rate	all	Output format (24, 25, 29.97 DF, 29.97 ND, 30, 23.976)
Pass-through	LTC > NTP	Re-generate the input LTC on the output
LTC offset (min)	LTC > NTP	LTC time = UTC + minutes (steps of 15)
Fine offset (us)	LTC > NTP	Fixed delay compensation
Trust saved date	LTC > NTP	Use the saved date after a power loss

LTC date	LTC > NTP	Set the calendar date: year, then month, then day (OK = next field)
Time zone, Daylight saving	NTP > LTC	Local time of the output
NTP server 1 / 2	NTP > LTC	0.0.0.0 = public servers
NTP sync (s)	NTP > LTC	Synchronisation interval
DHCP	network	On / off
IP address, Subnet mask, Gateway	network	Fixed address settings
Save & apply, Exit	–	Confirm or leave the menu

Mode, frame rate, pass-through and the offsets apply immediately. Time zone, daylight saving, NTP servers, sync interval and the network settings **restart the unit** (the display says so). The date is applied at once with *Save & apply* and does not restart the unit. The menu does **not** set the password: use the web page. The web password does not protect the buttons: whoever can touch the unit can use them.

7.3 Recovering the network address

If the address is unknown or unreachable, hold the **OK** button (S5) while the unit is running:

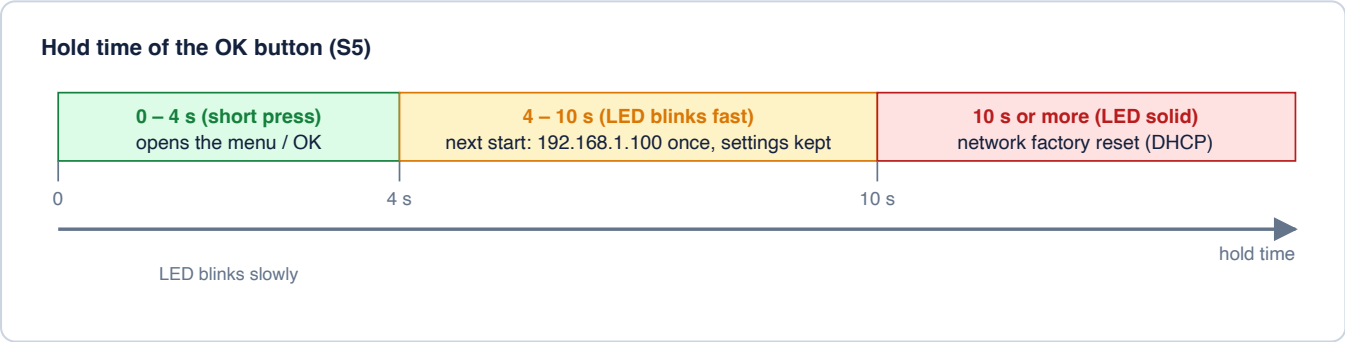


Figure 19 – Effect of holding the OK button.

- **4 to 10 seconds** (the LED blinks fast; then release): the unit restarts and, for this start only, uses `192.168.1.100 / 255.255.255.0`. Your saved settings are kept. Open that address in the browser.
- **10 seconds or more** (the LED is solid; then release): the network settings return to the factory default (DHCP, with `192.168.1.100` as fallback) and the unit restarts. Mode, offsets and password are kept.

7.4 LED

The LED is off in normal operation. While OK is held it blinks slowly (0–4 s), blinks fast (4–10 s) and then stays on (10 s or more).

8. Setting up the devices that use the time

On every client set the **NTP server** to the **address of the converter** (for example `192.168.1.100`). The client must be able to reach the unit (same network, or a route to it) and nothing may block UDP port 123.

8.1 Example: Wharton 4000-series NTP clocks

> **In simple words.** The Wharton clock is an NTP client. You give it its own address, and the address of the converter as the time server, and tell it which time zone it is in. It then shows the time from the LTC.

Clock setting	Value
Menu	`Fu Sy` → `NTP` (use the clock's buttons or remote)
Network mode	`dh No` = fixed address (enter the clock's IP address, mask and gateway by hand) – the normal choice without a router. `dh Ye` = address by DHCP, server entered by hand.
NTP server (first server)	The **address of the converter**, for example `192.168.1.100`. Only one server is needed.
Location (`Fu Lo`)	Choose the code of your own location from the clock's manual (for example **11** = UTC+4, no daylight saving).

- The clock calculates its local time from **UTC**. The converter must therefore deliver UTC: set the **UTC offset** in the converter correctly (section 4.4). For example, an LTC in UTC+4 local time needs offset 240.
- The colon of the display **flashes until the clock is synchronised** and then stays steady.
- Some models show only hours, minutes and seconds. The date is then not displayed and the date setting of the converter has no visible effect on the clock (computers still check it).
- The exact key sequence, and what the clock does while the server is unsynchronised, are described in the clock's own manual (*4000x Series Digital Clock*).

8.2 Windows PC

Open a command prompt **as administrator** and type:

```
w32tm /config /manualpeerlist:"192.168.1.100" /syncfromflags:manual /update
w32tm /resync
w32tm /query /status
```

Or: *Control Panel → Date and Time → Internet Time → Change settings*, enter the address as the server, then *Update now*.

8.3 Linux

With chrony: add `server 192.168.1.100 iburst` to `chrony.conf`, restart the service and check with `chronyc sources -v`. With ntpd: `server 192.168.1.100 iburst` in `ntp.conf`. With systemd-timesyncd: `NTP=192.168.1.100` in `/etc/systemd/timesyncd.conf`.

8.4 macOS

System Settings → *General* → *Date & Time* → set the time source to the address of the converter.

8.5 Other devices

Any device with an NTP or SNTP client (v1 to v4) can use the unit: IP cameras, servers, recorders, network switches. Enter the address of the converter as the time server. The unit has no authentication and does not broadcast: the client must be configured with the address.

9. Network configuration

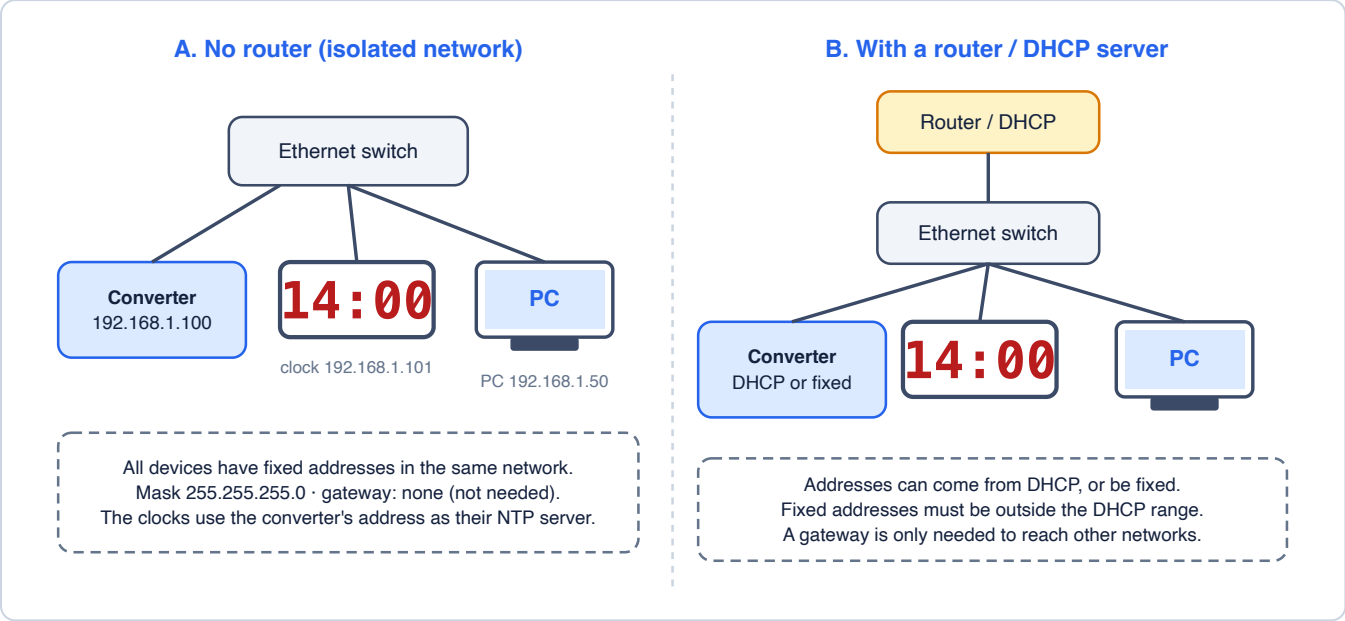


Figure 20 – The two common network layouts.

- **No router (fixed address, recommended for an isolated installation).** Give every device a fixed address in the same network, for example `192.168.1.x` with mask `255.255.255.0`. Leave the converter's gateway at `0.0.0.0`. Clients use the converter's address as NTP server.
- **With a router.** Either leave the converter on DHCP (find its address on the display, and consider a fixed lease in the router so that it does not change) or give it a fixed address outside the DHCP range.
- Changing the address restarts the unit. Write the new address on the unit's label.
- If the address is lost: section 7.3.

10. Alarms and status messages

Alarms appear on the Status page, in the alarm banner, and on the display's alarm page.

Alarm	Meaning	What to do
LTC LOST	LTC → NTP: the input is missing or not locked.	Check the source, the cable and pin 1. The server gives time again when the LTC returns.
DATE UNCONFIRMED	The NTP server is on but the date is not confirmed.	Set the date in the Time page.
NO TIME	NTP → LTC: the clock has never been set.	Check the NTP server and network, or set the clock by hand.
NTP STALE	The last synchronisation is old; the output runs on its crystal.	Check the network and the NTP server.
NO LINK	No Ethernet link.	Check the cable and the switch.
NO IP	The unit has no network address yet.	Check DHCP, or use a fixed address.
FALLBACK IP	No DHCP server answered; the fixed fallback address is in use.	Expected on a network without a router.
ENGINE FAULT / TASK FAULT	An internal fault; the unit restarts itself.	If it repeats, send the event log to support.
REBOOT BLOCKED	The unit restarted several times in a row and stopped restarting to avoid a loop.	Power-cycle the unit; send the event log to support.

11. Troubleshooting

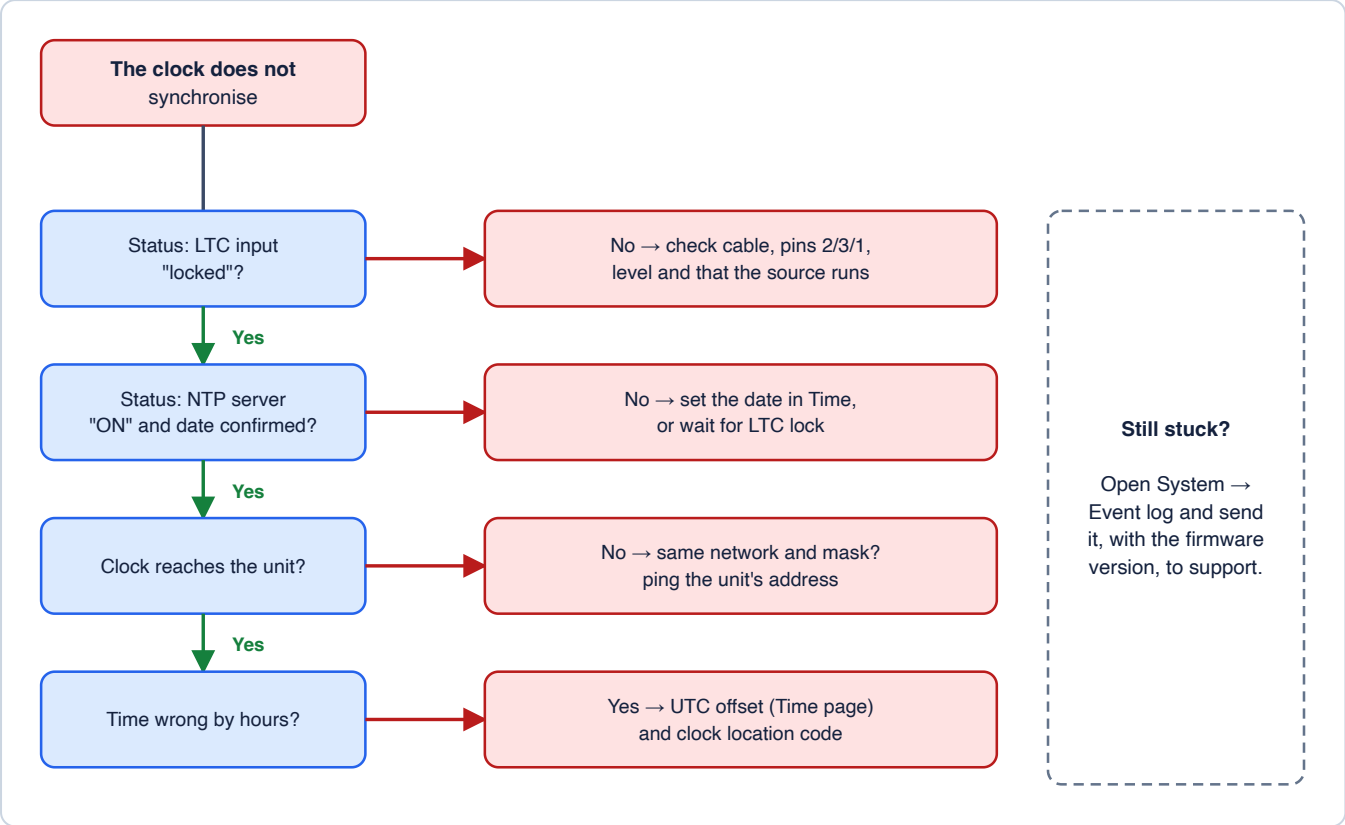


Figure 21 – First checks when a clock does not synchronise.

Symptom	Check
Web page does not open	Is the PC in the same network (for example `192.168.1.50 / 255.255.255.0`)? Is the address typed with `http://`? On macOS allow *Local Network* for the browser (System Settings → Privacy & Security). Otherwise recover the address (section 7.3).
LTC input shows *no signal*	Source running? Cable on J2? Pin 1 connected? Signal level not very low? Output of the source set to LTC, not to audio?
Input *locked* but NTP server *off*	Mode must be LTC → NTP (or AUTO with a locked input). The server also stays closed until the date is confirmed.
DATE UNCONFIRMED after a power-up	Is *Trust the saved date* ticked? If the unit was off for a long time, set the date in the Time page.
Clock shows the wrong hour	The UTC offset (Time page) and the clock's location code (section 4.4).
Clock colon keeps flashing	The clock cannot reach the server: check the clock's own address, mask and server address; check the network; check that the Status page shows *NTP server ON*.
Time off by exactly one frame occasionally	Normal with 29.97 non-drop and 23.976 sources (section 4.7).
PC refuses the time	The server may be unsynchronised (LTC missing) or the date is wrong: check the Status page and the date.
Unit restarted by itself	See System → *Last reset* and the Event log.

12. Maintenance

12.1 Firmware update

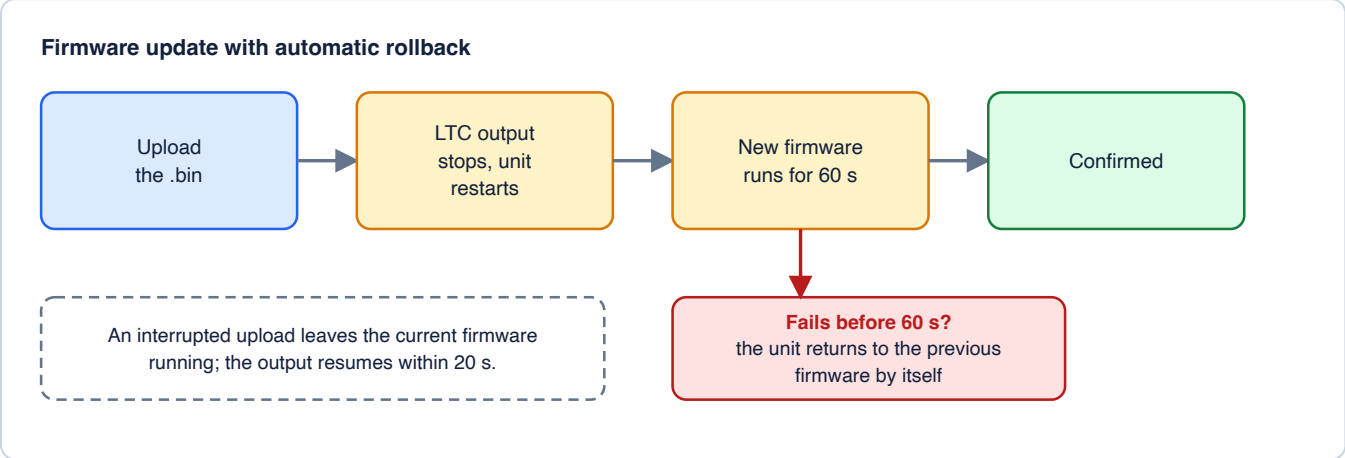


Figure 22 – An update is confirmed only after 60 seconds of correct operation.

1. Get the firmware file (`.bin`, the “application” image) from the supplier.
2. Open the *Update* page, choose the file and press *Upload and update*. Do not remove power.
3. The LTC output stops, the unit restarts by itself. Wait about 90 seconds.
4. In *System* check that the firmware version is the new one and that *Firmware check* says *confirmed*.

Invalid files are rejected. If the new firmware does not work, the unit goes back to the previous one by itself. A password, if set, is requested for the update.

12.2 Behaviour after a power loss

- The unit restarts by itself when power returns; settings are kept in flash memory.
- In LTC → NTP mode the server says *unsynchronised* until the LTC is locked and the date is confirmed (with *Trust the saved date* this is a few seconds after the LTC locks).
- In NTP → LTC mode the output starts as soon as a valid time is known.

12.3 Self-protection

The unit supervises itself: a stuck internal part causes an automatic restart (at most one every 30 minutes; after three in a row without stable operation it stops restarting and shows **REBOOT BLOCKED** instead of looping). Settings are written to flash only when they change, and saving a setting can disturb the LTC output for about one frame, so avoid changing settings during a critical recording.

12.4 Cleaning and handling

Keep the unit dry and ventilated. Remove power before opening it. Handle the board by its edges.

13. Technical specifications

Item	Specification
LTC input	Bi-phase mark, balanced RS-422 receiver on XLR (J2); BNC (J5) alternative with link JP2. Polarity free. Formats detected automatically: 29.97 DF, 29.97 NDF, 30, 25, 24, 23.976 fps.
LTC output	Generated by software, balanced on XLR (J4), AC coupled; unbalanced on BNC (J5) with link JP3. Level about 2 V p-p (calculated, into 600 Ω), source impedance about 70 Ω, rise time about 25 µs (SMPTE 12M). Not galvanically isolated.
NTP server	UDP port 123; NTP v1 to v4, answered in the version of the request; stratum 1; reference ID `LTC`; LI 0 when valid, LI 3 / stratum 16 when not; per-client rate limit; unicast only.
LTC holdover	60 s on the internal crystal; after that the server becomes unsynchronised.
Offset	Fixed UTC offset from –720 to +840 minutes (web page in steps of 1 minute, menu in steps of 15), plus a fine offset of up to ±2 s in µs.
NTP client (NTP → LTC, AUTO)	SNTP, up to two servers, 60 s to 24 h interval, 33 time zones with their own daylight-saving rules.
Network	10/100 Mbit Ethernet, DHCP or fixed address, mDNS name `ntpltc-<n>.local`, web server on port 80 (http).
Power	PoE (IEEE 802.3af) or 5 V DC (J8).
Display and controls	OLED 128×32 (4 lines of 21 characters), buttons UP, DOWN, OK (S5), status LED.
Configuration	Web browser, or buttons and display. Optional administrator password (user `admin`) for the web pages.
Reliability	Hardware and software watchdogs, restart protection, firmware update with automatic rollback.
Firmware	3.1.5

14. Frequently asked questions

Do I need Internet or a router?
No. The unit takes the time from the LTC and needs only a network between itself and the clocks. Without Internet, set the date once.

Does the unit stop if the LTC disappears?
It keeps answering for 60 seconds, then it tells clients it is unsynchronised (they ignore it). It resumes by itself when the LTC returns.

Can many devices use it at the same time?
Yes. Each client is limited to about two requests per second, which is far more than a clock or PC needs.

My LTC is local time with daylight saving. What offset do I use?
The current offset from UTC in minutes, and update it when the clocks change (section 4.4). If you can, use an LTC in UTC.

The clock shows the wrong hour.
Almost always the offset (section 4.4) or the clock's location code.

Why does the NTP client box say *STALE*?
In LTC → NTP mode the unit does not need a network time source, so that box is not used. It is not an alarm.

What happens to the date if the unit stays off for days?
The time of day is always right (it comes from the LTC), but the day is the one saved before power-off. Set the date again on the Time page. Clocks that show only the time are not affected.

Can the unit read the date from my LTC?
It shows the date and zone if the LTC carries them (Status page), but does not use them in this firmware version (section 4.5).

I forgot the web password.
It cannot be reset from the buttons or the web. Contact the supplier, who can restore access by reprogramming the unit.

Is the connection secure?
The web page uses plain http and the NTP server has no authentication. Use the unit on a trusted local network, and set a password.

15. Glossary

LTC	Linear Timecode: time of day (and frame number) carried as an audio-like signal, defined by SMPTE 12M.
NTP / SNTP	Network Time Protocol and its simple client version: the standard way to set clocks over a network.
Stratum	Distance from the original time source. 1 = directly connected to it; 16 = “unsynchronised”.
LI (Leap Indicator)	A field in the NTP answer. 0 = normal; 3 = “clock not synchronised”.
UTC	Coordinated Universal Time: the world reference. NTP always carries UTC.
Offset	The difference between two times, here between the LTC and UTC, in minutes.
Drop frame	A way of counting 29.97 fps timecode so that it stays close to the clock, by skipping two labels every minute except every tenth minute.
User bits	32 bits of the LTC frame free for other data, such as a date.
Holdover	Continuing to count time on the unit’s own crystal while the source is missing.
DHCP	A service (usually in a router) that gives network addresses automatically.
Gateway	The router address, needed only to reach other networks.
PoE	Power over Ethernet: power supplied through the network cable.
RS-422	A balanced (differential) electrical standard, used here for the LTC lines.

Appendix A. Quick reference

Connect

LTC → XLR J2 (pin 1 ground, pins 2/3 signal).
Ethernet → switch (PoE) or 5 V on J8.

Open the web page

`http://192.168.1.100/`
PC: `192.168.1.50 / 255.255.255.0`

Set (3 steps)

1. **Mode** → LTC → NTP
2. **Time** → offset (minutes of your LTC from UTC; 0 = UTC), trust saved date, save
3. **Time** → LTC date = today

Check

Status: input **locked**, server **ON**, no alarms.

Clients

NTP server = unit's address.
Wharton: `Fu Sy → NTP`, `dh No`, server = unit, `Fu Lo` = your location code.

Buttons

UP / DOWN: pages. OK short: menu.
OK 4–10 s: address 192.168.1.100 once.
OK 10 s+: network factory reset.

Remember

- Offset: clocks need UTC.
- No LTC for 60 s → server unsynchronised.
- Date: set again after days without power.
- Set a password on a shared network.

Appendix B. Date and time zone in the LTC user bits

SMPTE 309M defines how the 32 user bits of the LTC frame can carry a date and a time zone. The unit reads and displays them (section 4.5).

Item	Content
Flags	The binary-group flags must indicate “date and time zone present” (BGF2 = 1 and BGF0 = 0).
Groups 1–6	Date, as **YYMMDD** in BCD, or as a six-digit **Modified Julian Date** (MJD) in BCD.
Groups 7–8	Time zone code (six bits, table 2 of the standard, for example 25 hex = UTC+01:00, 22 hex = UTC+04:00) and one bit that says whether groups 1–6 are YYMMDD or MJD.
Meaning of the time	With YYMMDD the LTC is **local time** shifted by the zone code; with MJD the LTC is **UTC**.

Examples shown on the Status page: `date 2026-10-28, LTC is local time, UTC+04:00` · `date 2026-10-28 (MJD), LTC is UTC` · `no date in the LTC`.