0x513 by Dave Gold / https://513.ooo/0x513

ETH Ticker

Features and how they work — firmware v10.6.27 (reference build), Waveshare ESP32-S3-Touch-AMOLED-1.75C, 7 November 2026

A live ETH/USDT ticker on a 466 × 466 round AMOLED. Everything is computed on the device itself, with no server of its own: the live price, candle charts, a 24-hour floor / ceiling forecast, order-book walls, a four-page analytics engine, news and an economic calendar, alerts with sound, and the battery management. The two processor cores share the work: core 1 draws the screen and reads the touch panel and the buttons; core 0 runs the network (the live price stream and the downloads) and the analytics.

1. Controls

Input	What it does
PWR short press	Screen off / on. Data, analytics and alerts keep running with the screen off.
PWR hold 4 s	Power off (done by the power chip itself). The key or the cable switches it on again.
BOOT single press	Clock / settings panel: open, close.
BOOT double press	Analytics screens: open; double press again: close (no timer closes them). Inside: swipe left / right or tap the left / right 2 cm of the screen.
BOOT hold	Walls screen while the button is held.
Swipe up from the bottom	News (swipe down or tap the top tab: close).
Swipe down from the top	Clock / settings panel (swipe up on its red bottom: close).
Tap 1h / 1d	Chart of 24 hourly or 31 daily candles.
Tap NEWS / EVENTS	Switches the page of the news sheet.
Tap the calendar	Opens the EVENTS page.

2. Main screen (the ticker)

- **Price.** From the Binance live stream, updated about once a second. Green after an up move, red after a down move.
- **Candle chart.** 1h (24 candles) or 1d (31 candles), with a timer to the close of the current candle (Binance candles close on UTC: the daily one at 04:00 Dubai time).
- **Price grid.** Six dashed lines: the high, the low and four equal sectors between them, with their prices in a grey column on the right; the tag with the live price moves along that column.
- **Floor / ceiling.** The 24-hour estimate (section 6). Under each: 1d = lowest / highest of the last 24 hours, 1m = lowest / highest of the last 31 daily candles.
- **Battery arc** along the top edge: fills with the charge, red (0 %) to orange (50 %) to green (100 %); a red disc with a white bolt while charging.
- **Wi-Fi icon:** white when connected, red when not.
- **Data loss:** no fresh price for 5 seconds turns the bottom dark red and shows a refresh button (tap = reconnect).

- **Offline:** 20 seconds without Wi-Fi dims the chart and shows a red “connect” button that opens the Wi-Fi list.
- **News tab** at the bottom: a megaphone with sound waves means news that have not been opened yet.

3. Start-up

The loading screen (red / light, “0x513”) shows the real progress of what the main screen needs: Wi-Fi 10 %, live price 20 %, candle history 15 %, walls 25 %, analytics 30 %. The number only goes up; at 100 % the two halves slide apart over the already live ticker. News and the time zone are not waited for. With no saved network in reach the interface opens after 10 seconds, offline, and Wi-Fi keeps trying in the background; if some other source does not answer, the screen opens anyway and the rest loads in the background.

4. Clock panel, calendar and settings

- **Clock panel:** battery arc and percent, local time and date, a Wi-Fi pill (the network name, or a red “connect” when offline).
- **Calendar** of the current month, weeks from Monday: today in a red circle, weekday letters in red (the weekend in bold), days of the neighbouring months in grey, rings on the days with events. A tap opens EVENTS.
- **Time zone:** found online from the device’s IP address (worldtimeapi.org, then ipwho.is / ipapi.co) at start, every 6 hours and whenever the network changes; daylight saving included; kept in flash.
- **Settings** (the gear tab): brightness 10–100 %, sound volume (0 = silent; sliding plays a preview), a Wi-Fi switch (radio off, back on by itself after 10 s or by hand), the Wi-Fi networks and the saved networks. Brightness and volume are kept in flash.
- Notifications are not drawn over the clock panel and the screens it opens; their sound still plays.

5. Wi-Fi

- Up to 10 networks are kept in flash, the most recently used first.
- Connecting: a short drop gets 8 seconds for the driver’s own reconnect; then a scan, and the saved networks are tried strongest first (within 8 dB the more recently used one wins), straight to the access point found by the scan. A wrong password or a missing network moves on at once; after every third failed round the radio is restarted.
- After connecting, an internet check (connectivitycheck.gstatic.com). Connected but no data for 90 seconds: the radio is restarted.
- The list: the connected network first, the saved ones next, then by signal; a lock for secured networks, 1–3 signal bars, a scroll arc. A new network asks for its password on a full keyboard (abc / ABC / 123 / #+=).
- On the battery the radio uses modem sleep. A network that drops twice within an hour while sleeping gets 24 hours without it, then it is tried again.

6. The 24-hour floor / ceiling forecast

The floor and the ceiling on the main screen are where the price is expected to stay within the next 24 hours. They are recomputed every 5 minutes (every 10 with the screen off), and at once when the screen comes on with an older value.

- **Volatility (sigma)** from three measures: the implied volatility index of Deribit (DVOL), the average true range (ATR) and the realised volatility. If Deribit does not answer, its last value of the past 2 hours

is used.

- **Direction (bias)** from ten signals: trend, MACD, RSI, Bollinger bands, the order book, funding, the long / short ratio, the taker flow, open interest and BTC. Nine data sources in all (the log shows sources 0x1ff when all of them answered).
- **Self-calibration.** Every hourly forecast is compared 24 hours later with the range the price really made. A multiplier k (0.6–1.8) follows the market: the corridor narrows in quiet periods and widens in volatile ones, with that 24-hour delay.
- A 24-hour direction check is written to the log (how often the bias was right).

7. Order-book walls

- **Source:** the Binance spot and futures order books (compressed downloads, about 56 KB per round).
- **Only confirmed walls:** every wall carries an age score; a wall that blinks in and out is ignored. A touch or a wick is not a break: a wall stays while the price is less than $3 beyond it for fewer than 2 refreshes.
- **Walls screen** (hold BOOT): ceilings green, floors red, the middle zoomed between the first floor and the first ceiling, labels on their lines; when the price passes the first wall the walls are recomputed (the second becomes the first).
- **Refresh:** 10 s with the walls screen open, 20 s otherwise; with the screen off 60 s, but 20 s as soon as a known wall is within 0.25 % of the live price.

8. Analytics screens (double press BOOT)

Four round pages over the ticker. The maths is re-evaluated every second at the live price and the latest order book; the candle data behind it (15 m, 1 h, 4 h candles, funding and open interest) is downloaded in the background. Data up to 15 minutes old is shown and used for notifications; opening the screens asks for a fresh round at once when the data is older than 60 seconds.

Page	What it shows
0 SNIPER ENGINE	The composite edge (-100 to +100) and the action: WAIT / NO EDGE, LIMIT BUY READY, BUY ZONE, BUY NOW, SELL / TP, VETO: USE LIMIT BUY, WAIT / OVERHEATED. The reversal FLOOR (MIN) and CEILING (MAX) on a gradient arc with the live price marker; the BUY, SELL and STOP levels; the hold percent; exhaustion.
1 COMPASS	The market phase (ACCUMULATION, BREAKOUT, OVERHEATED, DISTRIBUTION, NEUTRAL RANGE) and the daily VWAP corridor; funding, open interest, the relative-volume impulse.
2 ORDER FLOW	Book imbalance, the CVD delta, taker buys of the last hour, the wall above and the wall below.
3 TIMING	The multi-timeframe trend matrix, RSI (1H / 4H), the VWAP band, volatility (SQUEEZE ON / EXPANDING).

How the levels are built

- The floor is anchored to the strongest confirmed wall below the price, blended with the statistical floor (VWAP and ATR). The anchor is never closer than the larger of 0.3 hourly ATR and 0.4 % of the price, and never farther than one hourly ATR beyond the statistical floor. The ceiling follows the same rules upwards.
- LIMIT BUY READY is replaced by WAIT / OVERHEATED in an overheated market or with the price in the upper half of the corridor; the BUY level stays on the screen.
- Self-check: every BUY level is checked an hour later (filled, held, stopped) and the totals are written to the log.

- The hold percent and the levels are fixed formulas (a heuristic), not a calibrated probability.

Refresh

With the analytics screens open: every 60 s on the cable, every 90 s on the battery. Closed: every 60 s on the cable, every 3 minutes on the battery with the screen on, every 5 minutes with it off. Between rounds the numbers still follow the live price every second. "15m only" in the log means that only the 15-minute candles were needed that round; the hourly and 4-hour candles and the funding are fetched again when they age.

9. Alerts

Alert	When it fires
Sharp move (to the moon / to the hell)	At least 0.4 % in 10 s, 0.5 % in 30 s, 0.6 % in 1 min, 0.8 % in 3 min or 1 % in 5 min. The same direction repeats only after another $15 or 3 minutes.
Strong move	At least 1 % within 15 minutes, 1.25 % within 1 hour or 1.7 % within 4 hours; also a new 24-hour high or low. Repeats only after another $20 or 1 hour.
Wall break	The price reaches the first ceiling or floor. Heavy volume or takers behind the move make it count at once; on thin volume it must hold longer. The same level is not repeated for 5 minutes.
Sniper zone	The price enters a window of ±$30 around the analytics' BUY or SELL level. Once per entry; armed again after leaving by $15 and 5 minutes.
Sniper Alert	The edge reaches ±90. Armed again below 50; 5 minutes between two of the same kind.

- **Sound:** price up, price down or the sniper sound.
- **Picture:** a notification on top of the ticker, the news and the analytics (not over the clock panel and its screens).
- **Dark screen:** it lights up for the alert, 10 s (the sniper cards 30 s), and goes dark again unless it is touched. Only the loading and the charging screens are never interrupted.
- Big market moves are also written into the EVENTS page.

10. News and events

News

- Four Russian-language feeds: BeInCrypto, Investing, CoinSpot, Incrypted, every 10 minutes.
- Filtered: older than 24 hours, the same story told twice, advertising, minor projects and items with nothing market-moving are dropped; the rest is ranked by weight and age.
- At least six cards when there are that many real stories; on a quiet day the list is filled first with stories that only missed the bar for their age.
- Each card: title, text, source and age, a counter. A news feed that does not answer keeps its items until they are 24 hours old.

Events

- The macro calendar: Fed decisions, minutes and the Chair speaking, CPI, PPI, jobs, PCE, the Bank of Japan, the quarterly options expiry; the weekly calendar feed (this week and next week).
- Your own events from data/events.txt (up to 10).
- Dynamic events (kept 6 hours): breaking news, the Fed's press releases, big market moves from the alerts.

- Every event in local time with the city; the event days are marked in the calendar.
- Refresh: the calendar every 30 minutes, the Fed feed every 15 minutes; twice as rarely on the battery, four times as rarely with the screen off.

11. Sound

Three sounds: price up, price down and the sniper alert (MP3 files in flash, played by their own task). The volume is set in the settings (0 = silent). On the battery the audio chip rests between sounds and wakes up for each one.

12. Power and battery (locked in the reference build)

Mode	When	Processor	Wi-Fi and refresh
Full	On the cable	240 MHz	No power save; the fastest refresh.
Active Eco	Battery, screen on	240 MHz, fixed	Modem sleep; analytics every 3 min, forecast every 5 min.
Eco	Battery, screen off	80 MHz, 240 MHz during each job	Modem sleep; forecast every 10 min, sniper every 5 min, walls 60 s (20 s near a wall).

- **Battery percent:** from the power chip's own fuel gauge, smoothed. On the battery it only goes down, at most 2 % a minute; while charging it only goes up, at most 2 % a minute; 100 % when the charger reports that it is done. Once a battery has been seen, the indicator never disappears. Near empty the voltage overrules the gauge (below 3.37 V).
- **Power chip (AXP2101):** no shutdown by its own gauge; the system power-off threshold at 2.9 V; no power-off on a short dip of the 3.3 V rail; up to 2 A from USB, so the board runs and charges at the same time; charge current 200 mA.
- **Clean shutdown** when the battery is really empty: 3.30 V on average for a minute.
- **Charging screen:** plugging the cable in shows a short charging animation (a dark screen lights up for 3 seconds).
- **Measured** with the original cell (full discharges, 7–8 November 2026): with the screen off about 7 hours from full, with the screen on about 4.5–5 hours. The gauge falls more slowly near the top and faster in the middle, so the first hour is not a good guide. A new cell of 900 mAh should give roughly twice as much.

13. Reliability and diagnostics

- **Memory:** the secure (TLS) connections keep their buffers in the 8 MB PSRAM, so the scarce internal memory stays free (about 50 KB at its lowest in the logs). The memory, the task stacks and the drawing speed are reported in the log.
- **Restart log** (12 entries in flash): the processor's reason, the power chip's own record of why it last switched off, and how the previous run ended (its length, the battery voltage, the mode). Printed with the diary when the cable comes in.
- **Black box:** the last log lines before an unexpected restart are kept in RTC memory and printed after it.
- **Power diary:** 24 hours of 10-minute entries (battery percent and voltage, minutes per mode, screen seconds, seconds at 240 MHz, traffic and secure handshakes, Wi-Fi sleep, drops, alerts). Printed when the cable comes in, or by typing diary in the Serial Monitor.
- **Watchdog** on the main loop; the Wi-Fi and the price stream reconnect by themselves.
- Log prefixes: [app] [boot] [net] [wifi] [tz] [power] [diary] [restarts] [mem] [perf] [an] [sniper] [walls] [flow] [day] [news] [events] [alert] [audio] [ui] [swipe] [board].

14. Builds and setup

- **Reference build:** ETH_Ticker_v10.6.27_STABLE.zip. Earlier references: v10.6.26_STABLE, v10.6.18_STABLE.
- Arduino IDE with the esp32 package 3.3.11. Board ESP32S3 Dev Module; USB CDC On Boot: Enabled; Flash Size: 32MB; Partition Scheme: 32M Flash (13MB APP / 6.75MB SPIFFS); PSRAM: OPI PSRAM.
- Libraries: the Waveshare 1.75C set (GFX_Library_for_Arduino, SensorLib, XPowersLib, board_config, lvgl 8.4) with the lv_conf.h from the package, ArduinoJson 7.4.2, WebSockets 2.7.3.
- If an upload cannot connect: hold BOOT, press PWR, release BOOT, then upload again.

All numbers in this document are those of the reference firmware v10.6.27. Battery times depend on the cell, the brightness and the Wi-Fi signal.