Walkie One 06 — Build instructions

Board revision 06 (the board files are labelled 05E inside) · 30 October 2026

> **Prototype status.** The first assembled 06 boards arrived on 30 October 2026 and are in bring-up now. The board test firmware in this package has been checked against the schematic but not yet run on a real board, so expect corrections. Device firmware for the 06 board is still being ported; the Firmware download is the device client source, which runs on earlier prototypes today. The board has no radio certification (FCC, ISED, CE). Build it for personal experiments.

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1. What you need

The six Walkie One Open downloads fit together like this:

Download	Use it for
Gerber files	Ordering and assembling the board: Gerbers, drill files, fabrication and assembly notes, pick-and-place, paste layers, assembly drawings
Bill of materials	The 137 parts on the board, plus the parts that plug into it
Electronics	The editable KiCad project, schematic PDF, layer plots, 3D model and design-check reports
Build instructions	This guide and the board test firmware
Firmware	Device client source
CAD files	The enclosure

Parts that plug into the board

These are not on the board's bill of materials. `Device-Parts.csv` in the Bill of materials download lists them too.

Part	Manufacturer and part number	Plugs into
Battery, 3.7 V 2000 mAh Li-ion, JST PH	Adafruit 2011	J3 (top side)
Speaker, 30 mm, 4 Ω, 2 W	Challenge Electronics CS30-02P65-04-1X	J2, through the speaker cable
Speaker cable: 3-pin plug housing	JST GHR-03V-S	J2 (top side)
Speaker cable: pre-crimped lead, 305 mm	JST AGHGH28K305 (one lead makes both wires)	—
LTE antenna, U.FL	TE Connectivity 2372112-1	J110 (bottom side)
GNSS antenna, U.FL (optional; only needed for location)	Quectel YFGA003AA	J111 (bottom side)
Nano-SIM with an LTE data plan	Any carrier that supports LTE Cat-1	J100 (bottom side)
USB-C cable	Any data-capable cable	J1

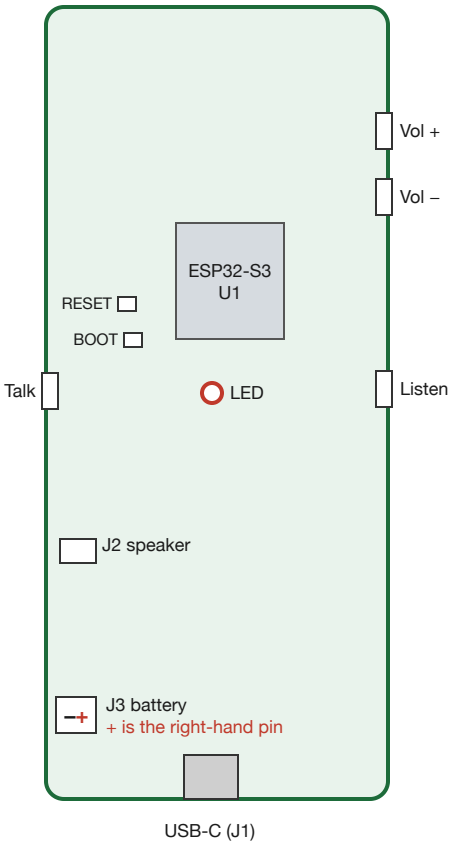
Tools

- A soldering iron, solder and heat-shrink (for the two speaker wires only)
- A multimeter
- A computer with a USB port, Python 3 and `esptool` (`pip install esptool`)
- A serial terminal, such as the Arduino IDE Serial Monitor, `screen` or PuTTY

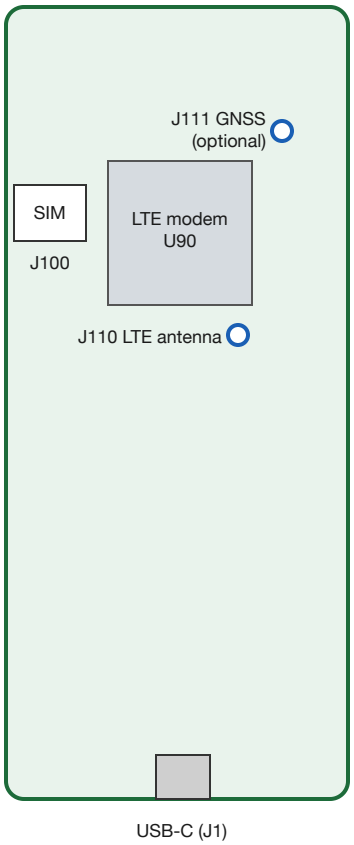
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2. Find your way around the board

In these instructions, "top side" is the side with the ESP32 module and the USB-C connector's opening. Hold the board top side up with USB-C toward you. The bottom view shows the board flipped over left to right, so USB-C still faces you.



Top side



Bottom side (flipped left to right)

Simplified to scale; part bodies and the board outline are approximate. The assembly drawings in the Gerber download show every part.

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3. Order the bare boards

Send the Gerber download to a board fabricator. It contains `Fabrication-and-Assembly-Notes.pdf` with the details below, so you can attach it as is.

- 4 layers, 1.6 mm finished thickness, 57 × 131.9 mm, ENIG finish, green solder mask, white silkscreen.
- Cut to the outline in `Edge_Cuts`, including the USB-C tongue. Do not let the fabricator substitute a rectangle.
- Epoxy-fill, planarize and cap the 63 vias listed in `Hole-Maps/fill-cap-common-origin.csv`. Tenting alone is not enough.
- Keep the 7 openings in `Hole-Maps/functional-open-common-origin.csv` clear, including the 0.6 mm microphone hole.
- Impedance targets: 90 Ω differential for USB, 50 Ω single-ended for the antenna traces. Ask the fabricator to confirm its stackup can meet them.

4. Have the boards assembled

The board has 137 parts: 83 on the top side and 54 on the bottom. Some are hard to place by hand, including a 0.4 mm-pitch chip-scale part (U9) and the LGA modem (U90), so use an assembly service. Give it the Gerber download plus `Board-BOM.csv` from the Bill of materials download.

- **Do not fit:** U12, R21, R46, L1, C38, C39, C41, C42, C43. Print no paste on these.
- **Each module may go through reflow only once.** The ESP32 module (U1, top) and the modem (U90, bottom) sit over each other, and both manufacturers allow one reflow. A normal two-pass double-sided process breaks that limit. Agree on a staged process with your assembler before the build.
- The modem is moisture-sensitive (MSL 3, 168 hours out of the bag). Bake it per SIMCom's instructions if that time has passed.
- Do not wash the boards, and keep the microphone hole free of solder, flux and adhesive.

5. Make the speaker cable

1. Cut the AGHGH28K305 lead in half. Each half has one crimped end.
2. Push the crimped ends into the GHR-03V-S housing at **positions 1 and 3**, so that they click in. Leave position 2, the middle, empty; it is not connected on the board.
3. Strip the cut ends and solder them to the speaker's tabs. Put the wire from position 1 on the speaker's + tab. Cover both joints with heat-shrink.

6. Check the board before powering it

1. Look over both sides under good light, especially around USB-C and the two modules. Look for solder bridges, missing parts and parts that are rotated.
2. With nothing connected, measure resistance from each of J3's two pins to the other. It should not be a dead short (under 10 Ω). A short means a solder bridge; do not power the board until it is found.

7. Connect USB and flash the board test firmware

Do this with **no battery**, USB only. The board test firmware is in the `board-test` folder of this package.

1. Plug the board into your computer with USB-C. The ESP32-S3 shows up as a USB serial port named "USB JTAG/serial debug unit", even when the module is blank. On a Mac it appears as `/dev/cu.usbmodem…`; on Windows, as a COM port.
2. If no port appears, hold BOOT, press and release RESET, then release BOOT. Both buttons are on the top side, next to the ESP32 module.
3. Check that the chip answers:

   ```
   esptool --chip esp32s3 -p <port> chip-id
   ```

4. Flash the image at address 0:

   ```
   esptool --chip esp32s3 -p <port> write-flash 0x0 WalkieOne06_Test_v1.0.bin
   ```

With esptool 4.x the commands are `esptool.py`, `chip_id` and `write_flash`.

5. Press RESET. The LED blinks green once when the test firmware starts.

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8. Connect the battery

> **Check polarity first. A reversed battery can destroy the board.** JST PH batteries do not all use the same wiring. With the board top side up and USB-C toward you, J3's **right-hand pin is + (pin 1)**, the pin nearer the middle of the board. The left-hand pin, nearer the edge, is –. Before you plug the battery in, check with a meter that its red (+) wire lands on the right-hand pin.

- Use a battery charged to between 3.6 and 3.9 V for the first test.
- Never puncture, crush or short a Li-ion battery. Don't leave it charging unattended while you are testing.

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9. Fit the antennas, speaker and SIM

1. Press the LTE antenna's U.FL plug straight down onto J110 (bottom side) until it clicks. **Always fit the LTE antenna before the modem powers on.** Running the modem's transmitter without an antenna can damage it.
2. For location, fit the GNSS antenna to J111 (bottom side) the same way. You can skip it otherwise.
3. Plug the speaker cable into J2 (top side). It only fits one way; don't force it.
4. Slide a nano-SIM into J100 (bottom side) if you have one. The test runs without it, but the SIM and signal step needs it.

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10. Run the board test

Open the board's serial port at 115200 baud and press Enter. Press Enter again to run all 11 steps, or type a step number and press Enter to run just that step. Answer the prompts with `y` or `n`. Where a step is optional, `s` skips it.

Step	What it checks	What you do
1 Status LED	Red, green, blue and white	Confirm each colour
2 Buttons	Talk, Vol +, Vol – and Listen	Press each one when asked
3 Speaker	Amplifier, J2 and the speaker	Confirm you hear the tone
4 Microphone	Microphone and its sound hole	Stay quiet, then speak or tap near the hole
5 Fuel gauge	Battery voltage and charge reading	Compare the voltage with your meter
6 USB detect	USB plug-in detection	Unplug USB for 5 s; the LED turns blue. Then reconnect.
7 Modem on	Modem power-up and IMEI	Confirm the antennas are fitted when asked
8 SIM and signal (optional)	SIM detected and signal strength	Needs a SIM
9 GNSS (optional)	Location fix	Needs the GNSS antenna and open sky
10 Modem USB path	USB-C switched to the modem for 15 s	The serial port disappears, then returns
11 Modem off	Modem shutdown	Nothing

Steps 6 and 10 make the serial port disappear on purpose. If your terminal closes, reopen it and press Enter. The test ends with a summary that shows each step's result, the ESP32's MAC address and the modem's IMEI. Save the whole output; it is the record for that board.

If a step fails, look at the parts it names on the schematic in the Electronics download, then check them on the board for solder faults first.

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11. Device firmware

The 06 board port of the device firmware is not finished. The Firmware download contains the device client source as it stands today, with its own README and build instructions. Those instructions target earlier prototypes, so don't flash a build for another board onto a 06. Watch the Walkie One repository on GitHub for the 06 release.

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12. Put it in the enclosure

The enclosure files are in the CAD files download. Route the speaker cable and the antenna leads so that nothing pinches them when the case closes. Don't kink the antenna leads sharply, especially at the U.FL plugs.

Licence

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