

Technical appendix

Eliau supplied baseline evidence

The following notes retain the v11.0 baseline revision. No claim of a fresh v11.4 interference or physical-fit audit is made. Original section PNGs and dimension-provenance CSV remain available in the package.

Quiet Orb v11.0 — three-round engineering audit

Audit date: 2026-09-04

Coordinate convention: the tables use the design-local Fusion axes. The saved presentation view is front-up.

Outcome

The v11 rebuild passes the CAD-level interference, retention, button, USB-C, wall, mesh, and assembly-order checks described below. The former raised front perimeter bridge and bottom pry gap are gone. Each shell exports as one solid body, and the closed seam uses a continuous exterior guard with a concealed clearance.

This is a prototype engineering pass, not an IP-rating or production-tool release. Final validation still requires the actual electrical assembly, real cables/connectors, and a physical print.

Round 1 — packaging and positive location

Pass 1: interference detection

Result: PASS — zero detected solid volume interference.

Fusion interference checks returned zero intersections for:

- front shell versus back shell;
- both shells versus the supplied PCB assembly;
- both shells versus the fully inserted USB-C plug gauge;
- both shells versus every button and the removable front-switch clamp.

The supplied STL hardware was converted to BRep for the audit copy and checked body-by-body, avoiding false occurrence-level results from multi-body mesh conversions. Battery, speaker, LTE antenna, microphone, RGB LED, front switch, PTT switch, volume-up switch, and volume-down switch each returned 0 intersections and 0.0 mm³ interference volume.

The final eight STLs were then independently checked for closed topology. Every part has zero boundary edges, zero non-manifold edges, and zero degenerate triangles; see `MESH\_VALIDATION\_v11\_0.txt`.

Pass 2: six-direction constraint audit

Result: PASS — no free rigid-body axis in the closed assembly.

| Component | +X constraint | -X constraint | +Y constraint | -Y constraint | +Z constraint | -Z constraint |

|---|---|---|---|---|---|

| PCB | right edge channel | left edge channel | upper end stop | lower end stop | rear-shell ledges | front-shell ledges |

| Battery | right cradle rail | left cradle rail | upper end rail | lower end rail | broad rear pads | rounded front supports |

| Front B3F-4000 switch | corner guides | corner guides | upper guide faces | lower guide faces | removable clamp | front reaction bridge |

| PTT B3F-3150 switch | outward actuator shoulder | inward reaction wall | cage rail | cage rail | rear cage roof | front cage floor |

| Volume-up B3F-3150 switch | inward reaction wall | outward actuator shoulder | cage rail | cage rail | rear cage roof | front cage floor |

| Volume-down B3F-3150 switch | inward reaction wall | outward actuator shoulder | cage rail | cage rail | rear cage roof | front cage floor |

| Speaker | circular pocket wall | circular pocket wall | circular pocket wall | circular pocket wall | four retention lips | front acoustic seat |

| Microphone | pocket wall | pocket wall | pocket wall | pocket wall | two retention lips | front acoustic seat |

| RGB LED | guide bore | guide bore | guide bore | guide bore | captive flange hooks | flange shoulder |

| LTE antenna film | side rail | side rail | end stop | end stop | rear lands | front lips |

The battery lead and antenna coax have dedicated escape gates. Battery-contact surfaces use rounded supports and broad pads; no sharp rib bears on the pouch.

Round 2 — controls and connector

Pass 3: button sections, travel, capture, and switch retention

Result: PASS at CAD level.

- All three side-switch actuator axes point outward: PTT toward +X; volume up/down toward -X.
- The installed B3F-3150 actuator center is measured at Z = 16.70 mm. The guide opening is 2.80 mm from the measured 2.40 mm actuator span plus 0.20 mm sliding clearance per side.
- Side buttons have a 0.14 mm rest gap and a 0.65 mm hard stop. This covers the 0.45 mm worst-case switch pretravel plus a 0.06 mm actuation margin.
- The front button has a 0.14 mm rest gap and a 0.70 mm hard stop. This covers the 0.50 mm worst-case switch pretravel plus a 0.06 mm actuation margin.
- Isolated pushers contact the actuators without the cosmetic caps intersecting the switch bodies.
- Guide shoes prevent yaw and end tabs make the side caps captive. Split front/rear cages lock the unsoldered side switches when the case closes.
- The front cap is captive at the front opening. Its B3F-4000 is positively located by the front reaction bridge, corner guides, and removable rear clamp.

Evidence: `audit\_section\_ptt\_y12.png`, `audit\_section\_volume\_up\_y23.png`, `audit\_section\_volume\_down\_y-6.png`, and `audit\_section\_front\_button\_y-47.png`.

Physical validation still required: print the buttons in the intended material and verify return force, audible click, no binding after finishing, and at least 100 repeated actuations before the cosmetic demo set.

Pass 4: USB-C alignment and fully inserted plug

Result: PASS at CAD level.

The USB-C connector position comes directly from the USB component in the supplied PCB STEP, not from the board outline. Its measured design-local center is Y = -21.014267 mm and Z = 12.6764 mm. The opening is 9.38 × 4.793 mm after applying the named sliding allowance.

The wall is recessed locally by 2.752733 mm so the 6.65 mm reference mating shell can reach the connector datum. A full plug gauge—metal shell plus 12.85 × 7.0 mm housing envelope—was inserted in Fusion. The plug gauge, PCB, front shell, and back shell show zero interference.

Evidence: `audit\_section\_usb\_c\_y-21\_014.png`.

Physical validation still required: test the actual intended cable because commercial overmoulds vary, and confirm full electrical engagement without the overmould touching the case first.

Round 3 — manufacture and assembly

Pass 5: wall thickness, overhangs, and stiffness

Result: PASS for SLS/MJF prototype; conditional for FDM.

- Nominal wall: 2.20 mm.
- Outer/inner soap-bar perimeter rolls: 10.0/7.8 mm, preserving the nominal wall through the curved perimeter.
- Minimum structural rib target: 1.20 mm.
- Minimum hardware-contact fillet: 0.45 mm.
- Guarded seam overlap: 1.25 mm with 0.20 mm concealed radial assembly clearance.
- Front shell: one closed solid body. Back shell: one closed solid body.

- Four corner screw posts and continuous edge geometry provide closing stiffness; the PCB channels do not carry case-closing screw load.

SLS or MJF PA12 is recommended because the clips, captive side-button tabs, grille, and curved shells print without internal support removal. FDM is acceptable for a fit prototype only after slicer review; the curved exterior and snap features may require supports and PETG/nylon is preferred over brittle PLA.

Pass 6: assembly-order walkthrough

Result: PASS — the sequence is feasible without trapping a required fastener or component.

1. Finish and clean all printed parts; keep locating faces dimensionally intact.
2. From the inside of the front shell, place the front action cap outward through its opening and seat its retaining flange.
3. Insert the status lens/collector from inside and snap the LED into its guide until its flange is held by the captive hooks.
4. Seat the speaker and microphone against their front acoustic seats; engage their retention lips.
5. Load each side cap through its opening by engaging one end guide first and gently flexing the second captive tab. Do not use brittle material for these tabs.
6. Place the PTT, volume-up, and volume-down switches into the front cage floors with their actuators pointing outward and aligned to the isolated pushers.
7. Place the front B3F-4000 switch in its corner guides and secure the removable switch clamp.
8. Lower the PCB into the front edge channels and end stops. Confirm the USB-C port is centered in its opening.
9. Route the microphone, speaker, and antenna leads through the designed cable gates; keep all leads below the closing ledges.
10. Place the antenna film between its side/end stops and front lips. Place the battery in its four-sided cradle with the lead through the split lead gate.
11. Bring the back shell straight onto the front. The rear PCB ledges, switch cage roofs, battery pads, and antenna lands engage simultaneously.
12. Install the four M2.5 case screws in a cross pattern. Cycle all buttons and fully insert the intended USB-C plug before final cosmetic finishing.

No assembly-order deadlock was found. The actual cable bundle was not supplied as a fully routed harness, so cable dressing must be confirmed on the first physical build.

Release decision

Released for prototype printing and physical verification. Do not treat it as production-ready until the button-cycle, cable-seat, drop, thermal, acoustic, and environmental tests are completed on real hardware.

Quiet Orb v11.0 — assembly guide

Before assembly

- Use the v11.0 parts only; do not mix parts from older versions.
- Clean powder/resin/support material out of the speaker grille, guide slots, screw holes, USB opening, and snap features.
- Dry-fit every printed moving part before installing electronics. Do not sand the hard-stop surfaces unless the CAD checks are repeated.
- Prepare four M2.5 case screws of a length appropriate to the selected insert/post method.

Front-shell subassembly

1. Insert the front action button from the inside so its cap projects through the front and its larger flange stays captive behind the opening.
2. Insert the status lens from inside. Fit the LED through its measured guide until its 5.90 mm flange seats at the shoulder and the two hooks retain it.
3. Place the speaker on its front acoustic seat with its terminals in the terminal-relief area. Engage all four retention lips.
4. Place the microphone breakout on its seat with its port aligned to the front opening. Engage both retention lips.
5. Install the PTT and two volume caps. Engage one end guide, gently flex the opposite captive tab through the aperture, and verify free return.
6. Place the three B3F-3150 switches into their front cage floors. PTT points out of the left side; volume up/down point out of the right side.
7. Place the B3F-4000 front switch in its four corner guides. Install the separate front-switch clamp.
8. Lower the PCB into the front channels and end stops. The board must sit flat on its front ledges and the USB-C connector must align without force.

Rear-shell subassembly

1. Place the LTE antenna film into its mechanical pocket and route its coax through the upper cable gate.
2. Place the battery into the four-sided cradle. Route its lead through the split lead gate; do not fold the lead across a cradle rail.
3. Confirm the broad rear pads will contact only the intended battery face and no sharp edge touches the pouch.

Closing

1. Lay every cable inside a cable gate and below the closing ledges.
2. Bring the shells together straight, without sliding one shell across the battery or switches.
3. Check the perimeter. The exterior guard must overlap continuously; no open bottom gap should be visible.
4. Install the four case screws in a diagonal sequence and tighten only until the seam is uniformly seated.
5. Verify the PTT, volume up, volume down, and front action button each click and return freely.
6. Insert the intended USB-C cable fully and confirm it reaches the connector before the overmould contacts the case.

First-build acceptance checks

- No rattle when shaken gently.
- No button remains depressed after release.
- No shell gap accepts a fingernail or thin pry tool.
- USB-C cable fully seats and charges/communicates.
- Speaker and microphone openings are unobstructed.
- Battery and cables show no pinch marks after one open/close cycle.

v11.4 source release note

Quiet Orb v11.4 — Bauhaus Los Angeles branding

This release updates only the rear branding from v11.3. Enclosure dimensions, component locations, retention geometry, button travel, USB-C geometry, and all other mechanical features are unchanged.

Master CAD

- `Walkie\_Talkie\_Enclosure\_Fusion\_v11\_4\_Bauhaus\_LA.f3d` — editable Fusion assembly.
- `Walkie\_Talkie\_Enclosure\_Fusion\_v11\_4\_Bauhaus\_LA.step` — neutral CAD exchange.

Rear branding

- The supplied outlined `WALKIE ONE` wordmark is centered at Y = -52.00 mm, 42.02 x 5.23 mm, and debossed 0.35 mm.
- `Designed in Los Angeles` is centered beneath it in upright Arial at a 1.6 mm nominal text height. The resulting outline is 24.47 x 2.07 mm, centered at Y = -58.74 mm, and debossed 0.25 mm.
- The tagline is intentionally smaller and narrower to match the supplied visual reference.

For best reproduction of the small tagline, use resin/SLA, MJF/SLS, or an FDM printer with a fine nozzle and tuned small-feature settings. Ask the print shop to preserve the debossed text and not apply automatic smoothing that fills it.

Approved color mapping

- Front and back shells: Bauhaus Light Grey, `#D9DBD7`.
- Long push-to-talk button: Bauhaus Red, `#D84332`.
- Front action button: Bauhaus Blue, `#2854C5`.
- Volume-up and volume-down buttons: Bauhaus Yellow, `#E1B735`.
- Status-light lens: Frosted Neutral, `#BEC4C5`, translucent.

STL files do not contain appearance data. Print or finish each named part using the mapping above. The lens should remain translucent.

Printable parts — 8 total

1. Front shell
2. Back shell with both rear engravings
3. Front action button
4. Long PTT button
5. Volume-up button
6. Volume-down button
7. Translucent status-light lens
8. Front-switch clamp

STL and 3MF versions are included. Dimensions are millimetres; do not scale.

Validation

- Every supplied fit-check component remains inside the verified enclosure envelope.
- All eight STLs have zero open edges, zero non-manifold edges, and zero degenerate triangles.
- All eight 3MF containers pass an archive-integrity check.
- See `MESH\_VALIDATION\_v11\_4.txt`, `Fusion\_Build\_Log\_v11\_4.txt`, and `Engineering\_Evidence/`.