A coordinated, buildable front

Concept 5.2 - R6 engineering handoff. Body baseline remains **88 x 136 x 27.2 mm**; side keys extend overall width to about 89.16 mm. Prepared as a controlled prototype revision of the preserved R5 package.

Build authorization: geometry fit parts, process coupons and one instrumented front sample. Physical finish approval and optical, acoustic, control life and complete harness qualification are pending. This document does not declare production readiness.

Updated: flat-underface PMMA guide and lowered LED seat; captive support pads; grille backing pocket and dark hidden-land finish; explicit microphone foam/PSA stack and placement tool; measured play-seat and stop shims; process-specific manufacturing folders and critical inspection budgets.

Geometry source: code/build_r6.py plus baseline_R5/parts. Neutral editable assembly: step/Walkie_One_5_2_R6_CASE_ONLY.step. All quantities and finish routes: docs/BOM_R6.csv and Material_Finish_Schedule_R6.csv.

Build sequence and release gates

One matched assembly uses 34 modeled fabrication/cut envelopes: 15 nylon, 8 cast PU, 1 aluminum, 1 PMMA, 4 foam, 1 porous mesh, 1 PSA and 3 PET shim bodies. Exact sheet stock thickness and stack quantities are set on the build record. Ten purchased references and print artwork are excluded from fabrication.

1. Supplier makes F01/F04 grille coupons, F02 optical nest, F03 gasket locator, F05 screw coupon and F06 cable gauge. Condition and finish a dry-fit nylon set. Finish approval comes after the fit and optical checks.

2. Install the gasket using F03 from outside before the light guide or microphone board. Remove the fixture and inspect the clear bore. Insert guide from rear; fit pads and LED carrier, then microphone breakout. Install play key before its calibrated holder. Fit side controls before PCB/battery.

3. Assemble the actual speaker, breathable backing and gasket. Fit PCB, cell and antenna; route complete leads with photographs before closure. Keep the speaker-to-cell gap free of wires. Install rear cover only after control and optical measurements.

4. Make one fully finished A01 front assembly and a rear print sample. Record supplier substitutions, hand fitting, resin/paint batch, shim values, cable SKU and all measurements. Feed any accepted geometry adjustment back into CAD.

Gate / owner	Required evidence
G1 - supplier + mechanical	Fit dimensions, valid cut coupons, stable switch calibration; no unrecorded material change.
G2 - electrical / acoustic	Guide optical measurements, speaker-on microphone isolation, real cable seating, complete harness and battery approval.
G3 - design owner + supplier	Signed P1/U1/K1/O1/M1 physical master set and assembled A01 sample; rear print/rub sample.
G4 - mechanical + electrical	Durability, retention, return, thermal and RF tests on final materials before repeat finished units.

Appearance: preserve the approved form

Left: supplied front-right inspiration. Right: R6 CAD from a comparable front-right angle. Perspective and scale are illustrative; dimensions govern. R6 preserves the current body, front layout and every R5 visible grille surface above Z11.91. The new pocket is hidden on the rear.

The source R5 pattern is a 473-aperture hex field. No separate W grille geometry was found in its editable source or manifest; R6 preserves that supplied field exactly and adds no solid badge. The user-requested W treatment has not been removed or redrawn.

Approved departures from inspiration remain: 34 mm raised key, 5 mm indicator at(0,-13), 1.8 mm microphone at(0,-18.25), side-control positions, side USB recess and four rear screws. Both mic-to-adjacent-edge gaps remain 1.85 mm. Rear artwork is byte-preserved.

Finish reduces the pieced-together appearance through consistent P1 color/gloss on all rigid A faces, common U1 grain across bumper/collars and controlled flushness. It does not invent a different face curvature.

Material and finish authority

Proposed combination: warm satin champagne PA12 center and grille; lighter, matte ivory flexible polyurethane perimeter; light champagne anodized aluminum play key with restrained metallic contrast; clear diffused indicator. This explicitly replaces the ambiguous clear-anodize instruction.

Use a PA12 SLS powder grade confirmed by the supplier; EOS PA2200 is the proposed quotation baseline, subject to confirmation. Record actual powder, orientation, conditioning and batch. RPS Elastomer remains the cast polyurethane baseline at 40 +/-5 Shore A; exact resin and pigment system must be entered before the coupon run.

Full part-by-part instructions are in Material_Finish_Schedule_R6.csv (34 entries). The table below is a routing summary. No identical-hex match is assumed across metal, nylon or elastomer.

Route / parts	Preparation, finish and controls
P1: 01, 02	Depowder; dry; fine blast; fill/sand broad faces only. Adhesion promoter, thin epoxy sealer, nonconductive 2K PU satin.40..60 um total dry build; 15..25 GU at 60 deg. Mask all functional and bond lands.
P2: 05	Same P1 face stack, no web-filling. Matte black concealed land/floors belowZ12.45, excluding underside seal land. Detailed bore masking and coupon requirements on next sheet.
N1: 07, 09, 10 s, 12 s, 15, 16, 17, 19	Hidden PA12 normally uncoated. Machine functional datums. Nonconductive matte black only on optical baffle and speaker-facing surfaces. No paint in switch contact stacks.
U1/U2: 03, 04, 11 s, 21 s	Through-pigmented cast PU; no external paint. Ivory bumper/collars, orange PTT, sage volume. Mold grainRa 3..6 um trial and 3..8 GU. Gates/parting lines on hidden bonding edges.
K1: 13 / O1: 27	K1: 6061-T6 fine bead blast, 8..12 um light champagne dyed anodize and seal. Mask actuator/flange contacts. O1: optical-clear PMMA, polished transport faces; diffuse output only.
F1/M1/S1: cut parts	Foam/PSA, breathable black mesh and PET shim stock; no coating. Stock thickness is separately controlled; installed-envelope STLs are not material recipes.

Physical appearance master A01

Assemble fixtures/A01_front_appearance_sample.step using the actual tub, full grille, ivory bumper, finished aluminum key, guide, speaker support, speaker and final mesh. It is a full-size front assembly, not a flat color chip. Add the calibrated play mechanism before judging seams.

Inspect P1, U1 and K1 together under D65 daylight and 3000K warm light, at 300 mm distance and at 0/30/60 deg viewing angles. Check dry and damp touch, dust pickup, fingerprint visibility, gloss, metallic flop, hole halos, key recess, seam steps and illuminated guide. Retain one signed assembly and supplier duplicate.

Screen references: P1#C6BEAD, U1#EDE5D5, K1#C1B5A0, orange#BE754E, sage#839078. These locate the design intent only. Set instrumental L*a*b* and gloss from each approved substrate sample; then use a within-material production target DeltaE00<=2 and gloss within+/-5 GU as a starting proposal. Visual agreement under both lights governs the boundary.

Rear: print the supplied outlined artwork on a fully P1-coated rear panel. WALKIE is#948D80 intent; ONE and Designed in Los Angeles are#AAA293 intent. Do not redraw the typography or add a W symbol. Wordmark 36 mm wide atY2.964; inscription 28 mm atY-4.036; registration+/-0.5 mm, size+/-0.2 mm.

Print test: confirm ink/primer compatibility and full cure. Trial 100 dry and 100 damp microfiber rubs with documented load and cleaner; inspect legibility, gloss halo and adhesion. This is a proposed prototype screen, not a claimed durability rating.

Grille: make the full process repeatable

Keep PA12 nylon.473 face apertures nominal 1.6 mm on 2.6 mm hex pitch give 1.0 mm adjacent web and 34.3% theoretical lattice open area. The preserved internal sealing land partly backs 49 of 473 sampled aperture locations; 424 clear a 1.4 mm probe throughZ11.1..13.6. These are geometry counts, not measured acoustic area.

F01 is a 36x 30 mm crop of the actual grille including curved boundary/flange/land transitions. F04 is a flat hole witness. Print at the same orientation, powder/refresh ratio and wall thickness as the complete part. Run the entire cleaning, primer, color, dark-land treatment and backing process. The full A01 grille proves visual consistency across the speaker region.

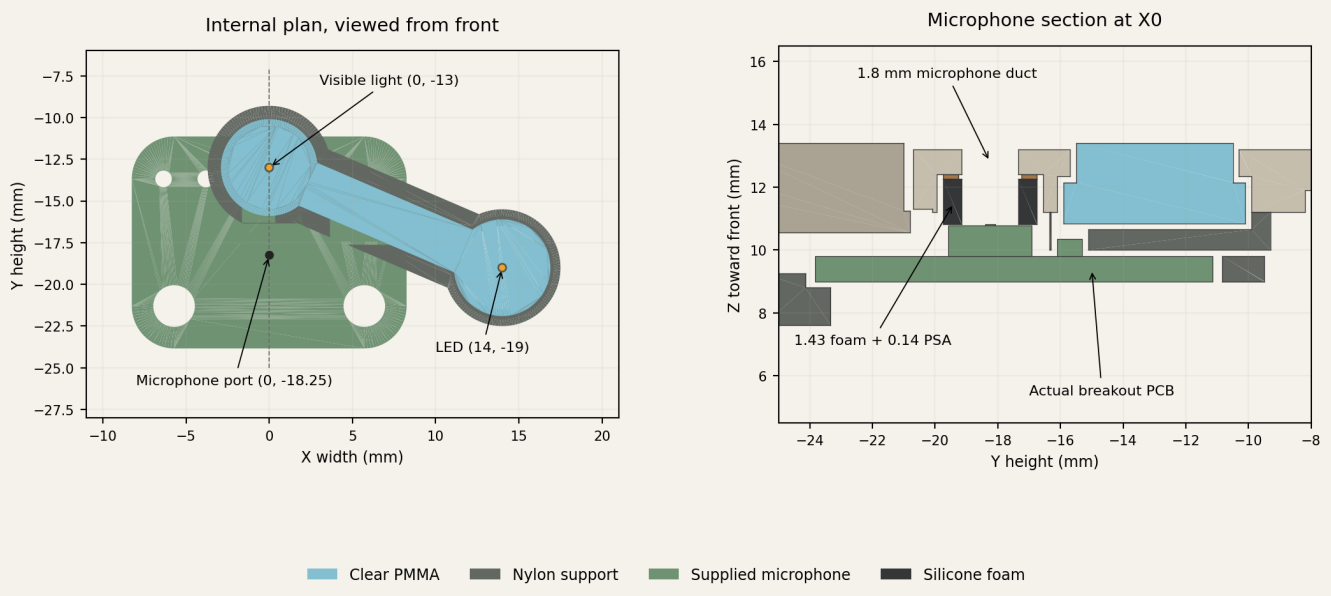
Process targets: before coating diameter 1.60 +/-0.05, edge break 0.05..0.10 max, no sharp powder nodules. Mask bores with removable silicone pins during front sealer/color; mask the rear adhesive/seal lands. Keep paint build inside a bore <=0.03 per wall. Finished unobstructed diameter target 1.49..1.65; inspect all holes with transmitted light and 10x images. Do not drill through the intentional rear sealing land.

Remove masks before paint bridges lock them; clean with nylon bristle and filtered air. Ream only confirmed through bores when needed; avoid metal picking that chips the edge. Reject clogged webs, lifted coating, visible bore halos and loose particles. Measure coupon loss/gain; never sand thin webs to hide a failed paint process.

P2 dark treatment covers the concealed nylon floors seen through backed apertures. It must be nonconductive and matte<=5 GU. The 0.10 mm porous mesh sits in the added 0.15 mm rear pocket atZ11.78..11.88; bond only outside active apertures. Candidate: black SAATI Acoustex, thickness<=0.10 mm, acoustic impedance target<=50 Pa*s/m for screening. Exact grade/color/impedance require supplier data and audio sample.

Grille retention keeps the original rear flange and 0.20 mm nominal pocket allowance. Use a supplier-qualified PA adhesive on the flange only, with 0.10..0.20 mm cured bondline and 0.5 mm setback from holes. Acoustic test compares bare speaker, grille alone, grille+mesh and complete shell at equal electrical drive; proposed added mesh loss<=1dB averaged500Hz..4kHz, with no new peak/dip>3 dB. No metal grille substitution is included.

Optical route: flat, supported PMMA



R6 removes the original inlet counterbore that left an approximately 0.45 mm cap above the LED. The unchanged purchased Kingbright WP154A4SUREQBFZGW moves rearward 0.75 mm tobaseZ2.15. Its nominal dome top isZ10.75; guide undersideZ10.85 gives 0.10 mm air gap. The visible 5 mm output stays at(0,-13), topZ13.4.

Bridge remains 15.2315 mm in plan, 2.8 mm wide and 1.3 mm thick, with 5.8 mm end pads. The guide now has a uniform, flat underside: 3-axis machining from optical PMMA with full support is possible without a tiny blind inlet pocket. F02 supports the bridge while the second face/contour is machined. Use small sharp polished cutters, air cooling and sacrificial holding tabs outside final contour; finish tabs while nested. Do not laser-cut or flame-polish the finished optical piece.

Polish transport faces toRa<=0.05 um trial; leave only the 5 mm output lightly diffused. R0.1 max edge breaks keep sections intact. No solvent cement or cyanoacrylate near PMMA. Check polarized stress, haze and chips at 10x before assembly.

The original opaque carrier supports the guide from behind; shell pocket captures its flange from the front. Two 0.25 mm-free pads occupy 0.20 mm installed gaps at non-optical lands. Bond the carrier perimeter to the shell after a dry fit, using a qualified adhesive and 0.20 mm cured gap. Do not glue the optical surfaces. Retention therefore depends on the carrier bond and captive flange, not a fragile PMMA glue joint.

Local unmodified roofs remain 0.85 mm above guide and 0.80 mm above microphone. Do not sand these areas unsupported or drill through them. Finished guide/pocket minimum nominal clearance is 0.20 mm. Gauge actual LED-to-guide gap 0.05..0.20; reject contact. LED height variation requires measured seating, not an assumption from the mesh.

Optical and retention test plan

Run at least 3 guides from the complete machining/finishing route, then one A01 front assembly. Use the actual LED, drive circuit and firmware; record current per RGB die and supply voltage. Confirm datasheet limits with the electrical owner. No brightness or RGB mixing performance is inferred from the render.

Fixture: dark box, fixed camera exposure, photometer atnormal incidence and +/-45 deg, device at 300 mm. Test R/G/B, white, amber and commanded low/high brightness. Also inspect under 500 lux indoor light and 10000 lux daylight simulation. Proposed indoor output target>=50 cd/m 2 at nominal brightness; set final target from the approved sample and intended power budget.

Uniformity: compare 9 equal output regions; trial minimum/maximum luminance>=0.5. For white and mixed colors, trial chromaticity spread Delta u*v*<=0.02 across output; inspect visible color fringes by eye. Adjust diffuser recipe or drive balance only after recording baseline. Emission in renders is illustrative.

Leakage: measure the microphone port, key seam and bumper boundary with output atmaximum planned brightness. Trial leakage luminance<1% of output and no visible colored hotspot at 300 mm in a dark room. Check the backed aperture floors and opaque pocket walls after coating.

Retention: on a sacrificial front sample apply 2 N axial inward/outward load to output for 10 s and inspect for motion>0.10 mm, carrier peel or cracks. Then 10000 control operations, 10 cycles 5..45C and 10 service openings as prototype screens; repeat optical readings. Proposed brightness drift<=10%. These targets require engineering agreement before qualification.

Route decision: the revised flat-underface guide is a concrete manufacturable candidate and passes the digital packaging screen. Its 15 mm lateral transport remains an optical experiment. If the test fails, use the separate ALT1 direct-emitter mechanical demonstrator in alternates/ALT1_direct_emitter. It has a 2x 2x 0.65 Inolux LED envelope on 0.15 mm custom flex and a short PMMA diffuser cup at the same visible output. Its mechanical fit screen passes; electrical layout, real lead routing and optical tests remain required. See its README and editable geometry. It is not installed in baseline R6.

Microphone: locate the seal and count adhesive

Foam footprint stays 4x 3 mm, R0.4 with 1.8 mm bore. Nominal narrow-side ligament is 0.60 mm. Candidate stock isRogers BISCO HT-800 medium cellular silicone, 2.00 +/-0.10 mm converter-screened thickness. Exact stock, cut process and acoustic seal must be demonstrated; the original generic foam instruction was insufficient.

R6 explicitly allocates 0.14 mm to 3M9731 tape (silicone adhesive to foam; acrylic side to clean qualified panel). The installed foam becomes 1.43 mm, maintaining the original total 1.57 mm stack from microphone faceZ10.83 to pocket roofZ12.40. Nominal foam compression becomes 28.5%, not 21.5%. With 1.50..1.64 installed total, 0.12..0.16 tape and 1.90..2.10 free foam, the conservative compression screen is 20.0..36.2%.

Cut foam and PSA on release liner using matched precision tools; PSA opening 2.0 mm gives 0.1 mm radial setback. No heat/laser seal around the acoustic bore. Inspect every piece at 10x for torn webs, partial cuts, shifted liner and adhesive intrusion. Reject off-center cuts that leave any ligament<0.45 mm.

F03 registers to the existing indicator opening with a 5.10 mm pin and microphone passage with a 1.60 mm pin. Place from outside while guide/microphone are absent; from inside, slide the liner-backed seal over the mic pin, seat against pocket and press only around the foam perimeter. Withdraw fixture, inspect passage, then install guide and microphone board. The fixture must never contact a powered/installed MEMS element.

Seal test: same microphone/firmware/gain, external speech or calibrated source at 60 and 75 dBA at 1m; compare against open-port reference. Proposed response deviation<=3dB across300Hz..4kHz. With no external source, run speaker speech/pink noise atintended maximum playback, log mic spectrum and clipping. Compare correctly sealed and deliberately unsealed assembly; target>=10 dB reduction in internal playback coupling. Evaluate echo-cancellation performance separately.

Inspect compression with a sacrificial section or witness film around the seal, never over the MEMS port. Repeat after 20 disassemblies and temperature cycling. Acoustic acceptance requires the assembled speaker-on result, not merely a clear-looking hole.

Play control: calibrated freeplay and stop

Omron B3F-4000 specifies pretravel 0.3 +0.2/-0.1 mm (0.20..0.50), plunger height 4.3 +/-0.2 mm, operating force 1.27 +/-0.49 N and release force>=0.29 N. The datasheet does not establish an allowable housing-imposed overtravel. Original 0.75-0.20 gave 0.55 mm nominal switch motion and only 0.05 mm beyond maximum pretravel.

R6 lowers the carrier seat fromZ3.70 toZ3.50 and provides paired PET seat shims plus an independent stop ring. Finished tip/seat differential is controlled to 4.70 +/-0.025 mm by machining and measurement. For switch height 4.10..4.50 and freeplay 0.10..0.14, calculated seat shims span 0.035..0.525 mm, within the selected 0.025..0.525 mm stack family. Use 0.025 increments, measure actual freeplay and select the nearest acceptable pair. Out-of-range parts are reworked/rejected, never preloaded.

Calibration formula: **s = measured key-tip Z - measured seat Z - measured switch height - g**. Nominal s=8.20-3.50-4.30-0.12=0.28 mm. The CAD illustrates 0.28; fabricate a measured stack rather than a printed thin shim. Match left/right stack within 0.01 and seat flatness<=0.03.

Measure first electrical contact C from the resting key. Trial hard-stop travel T=C+0.03 mm; verify post-contact 0.02..0.04 after cure. Required T across g/pretravel ranges is 0.32..0.68 mm, below the 0.75 raw limit. Stop ring is measured raw travel minusT; the 0.05..0.525 available ring family covers the calculated 0.07..0.43 requirement. Nominal exampleT0.45 uses 0.30 ring. Post-contact target is a qualification proposal, not a manufacturer safe-overtravel rating.

Inspect freeplay 0.10..0.14 and electrical release atrest after cure. Use force/displacement gauge atcenter and eight evenly spaced edge points at 14 mm radius; 10 operations each, then 10000-cycle prototype screen. No binding or missed contact; freeplay remains positive; rest return within 0.5 s. Confirm hard-stop load is carried by the flange/ring, not the plunger. Reject excessive lateral switch load or creep.

Side B3F-3150 controls retain approved geometry and 0.8 mm raw stop. Apply the same measurement procedure; 0.15..0.45 mm switch pretravel and 0.15..0.20 freeplay leave trial stop 0.32..0.69, within raw travel. Set carrier and stop with measured shims before bonding; side endurance remains physical.

Hardware, seams and finished fit

The 0.50 mm speaker-to-cell gap is unchanged. A provisional +/-0.15 speaker edge, +/-0.20 cell edge and 0.15 placement budget consumes it entirely. It is not a qualified wiring space or battery swelling provision. No leads, solder tabs, tape folds or strap edges may be routed in this gap. Use the speaker ear-side spaces and existing tray exits, photograph actual bends/insulation and secure wires away from moving keys and the diaphragm.

Battery owner must confirm actual pack/protection dimensions, manufacturer swelling/thermal requirements and non-preloading retention. Keep removable PET straps and 0.20 mm insulating support; do not compress the pouch to make the closure fit. The 1.10 mm nominal protection-to-front headroom remains unqualified for swelling.

USB: candidate StarTech USB2CC1M has supplier-listed 6x 12 mm overall cross-section. F06 sweeps a 6.5x 12.5 mm gauge through the side passage with zero nominal shell/bumper overlap. It does not prove the 14.17 mm recessed mating face is reachable: measure cable tip exposure, overmold length/shoulder and strain-relief transition. Test full seating in both orientations, cable pull and charging/data with actual hardware. The approved socket remainsY-32.139, Z-4.740.

Screws: select AccuSPK-M2.5-10-A2, DIN965Z, PZ1, 90 deg, head 4.4..4.7 mm. Select incoming heads 4.65..4.70 to keep all four seats visually alike. In the original 5.00 mm countersink the expected recess from a 40..60 um finished panel is 0.19..0.24 mm. A uniformly recessed screw is the intentional proposal; do not tighten until it falsely appears flush. Typical ISO10642 heads can exceed the 5 mm seat.

F05 coupon: run 10 actual screws in representative tapped nylon bosses plus finished cover coupon. Start 0.03 Nm, increase 0.01 Nm until seated; measure head recess, seam closure, witness marks and thread condition. Establish allowable torque from observed seating and destructive strip samples; production trial torque must remain below 50% of the minimum measured strip torque. No final torque value is released before this test.

Finished feature	Proposed inspection requirement
Rear closure	0.30 nominal; 0.22..0.38 gap. Adjacent surface step<=0.10; four quadrants measured without squeezing bumper.
Bumper / panel	Bumper proud 0.25..0.45 of coated panel. Continuous radius, no adhesive squeeze-out. Exterior side bumper stays 88x 136x 27.2 baseline.
Grille / panel	Grille proud 0.22..0.38; finished seam 0.16..0.34 per side after position error. Flange bond 0.10..0.20.
Play radial clearance	Opening 34.60 +/-0.05; key 34.00 +/-0.04; bore coating<=0.015/side; concentricity offset<=0.05. Minimum clearance 0.19/side; inspect 360 deg.

Digital evidence and outstanding tests

Digital evidence is produced from R6 geometry, not copied R5 pass labels. All 34 exported parts reopen as valid single solids; their STL meshes are watertight. Static fabricated-part overlaps: 0 above 0.005 mm 3. Sampled play/side motion overlaps: 0 above 0.005 mm 3. Purchased-hardware/case and hardware-pair conservative screens: 0 above 0.02 mm 3.

Body bounds 88x 136x 27.2 within CAD kernel tolerance. Four exterior body shells unchanged by exact solid difference. Visible grille aboveZ11.91 has zero symmetric difference. Guide-to-shell minimum 0.20; mic foam-to-guide 0.85; mesh-to-speaker-gasket 0.18 nominal. Seven rear-approach samples for guide, play key, holder and LED support clear the bare front tub; these do not prove cable insertion or adhesive-tool access in a fully assembled device.

All original purchased files and rear artwork are preserved. LED and play switch use rigid translations only; rotation matrices remain orthonormal. Thin optical/foam parts have process-specific instructions; validity does not certify machining quality, strength or acoustic transparency.

Physical work still required: exact powder/resin/mesh selection, finish and artwork samples, optical efficiency/RGB/leakage, gasket conversion and speaker-on isolation, calibrated contact/return/overtravel force, screw torque, real cable/harness fit, battery retention/swelling/thermal review, final RF and durability. Assign an owner and record results before repeat finished parts.

Editable delivery includes Python/CadQuery revision source, immutable R5 BRep dependencies, per-part and assembly STEP, OpenCascade XML assembly and Blender appearance scene. No new Fusion native archive or parametric Fusion timeline is claimed. STEP and source are editable in compatible CAD workflows.

Files	Authority / use
step / code	R6 installed-geometry BReps and rebuild source. baseline_R5 is a dependency only, never fabricate it.
manufacturing	Only SLS and cast-master routes contain fabrication/master STLs. CNC STEP and cut-sheet DXFs control their processes.
fixtures	F01..F09 STEP/STL plusA01 sample assembly. F06 is a cable gauge, not a purchased cable model.
validation / docs	Raw reports, dimensional budgets, source hashes, BOM, finish schedule and proposed test records.
previews / artwork	Geometry-derived render scene/views; original actual-size print SVGs and display-only glyph geometry.

Sources and change record

R6 was derived only from Walkie_One_5_2_Rapid_R5 and the general/5.2 findings of CAD_Expert_Review_2026-09-06/Expert_Review.md. R5 and shared website/Git content are preserved. Current digital checks supersede source validation only for this new revision.

Geometry changes:05 hidden mesh pocket; 15 lowered switch seat; 16 lowered LED flange seat; 18 split foam/adhesive thickness; 27 uniform underside guide. Added 28 mesh, 29 PSA, 30 support pads x 2, 31 seat shims x 2 and 32 stop ring. All visible control centers remain unchanged. No purchased component was resized.

New process controls: explicit dyed-anodized key, coordinated physical sample, dark grille support treatment, coupon/fixture set, calibrated control and screw procedures, cut-stock separation, finished seams and documented battery/cable limits.

Primary component/process sources, checked 06 Sep 2026:
Omron B3F datasheet: B3F operating characteristics and dimensions.
Kingbright: WP154A4SUREQBFZGW.
Rogers: BISCO HT-800.
3M: 9731 silicone/acrylic tape, 0.14 mm.
Accu: SPK-M2.5-10-A2 head geometry.
StarTech: USB2CC1M dimensions.
SAATI: Acoustex material family.

Acceptance ranges not explicitly attributed to a component datasheet are proposed R6 engineering targets. Material supplier capability and physical testing must confirm them. Do not treat a rendering, nominal mesh or spreadsheet budget as a signed physical approval.