Release sheet - start here

Scope. Walkie One Concept 21.2 Astra R6 / 06 September 2026. Engineering prototype and coupon package. R5 preserved. Nominal grip envelope 90.4 x 152.4 x 28.8 mm; controls bring width to 93.2 mm. Finished depth must not exceed 30.0 mm. Geometry changes are in R6 only.

Allowed next build. Unpowered fit parts and the six coupon sets may be fabricated to evaluate this revision. The package does not establish a complete powered-device fit or authorize production tooling. Assign named people to the owner roles below before testing.

G1 | Electrical owner | OPEN INPUT. Supply board maker/part/revision, populated assembly CAD or measured two-face component map, module identity/orientation/XYZ and solder stack, connector/pinout schedule, mated plugs and wire data. Close with signed coverage comparison and rerun packaging/service checks.

G2 | Mechanical + supplier | OPEN TEST. Test C01 PTT/USB and C02 J3 in actual PA12 process: real cable mating/load, lower PTT presses, distortion and cracks. Ribs spread load; the 1.226 mm in-plane web and sampled 1.466 mm J3 wall remain qualification points.

G3 | Mechanical + electrical | OPEN TEST. Record both PTT switch traces, end/center force-displacement, positive rest clearance, stop loading, release and endurance. Confirm parallel OR behavior. Pad compression curve and switch permissible loading remain required.

G4 | Battery + mechanical owner | OPEN TEST. Resolve foam load balance and cell pressure limits. Tray area 1456 mm2 versus 48 mm2 total lid area; modeled compressions are not validated equilibrium. No foam displacement is credited as swelling allowance.

G5 | Supplier + design owner | OPEN SAMPLE. Approve finished grille/pocket/backing C03, grip/bond C04 and rear marking C05. Sign physical master color, grain, sheen, adhesion and audio results; proposed grades are not approved samples.

G6 | Supplier | OPEN TEST. Audit all 14 inserts; qualify temperature, force, depth stop, floor/witness marks and joint torque. C06 represents vulnerable side-carrier floors. Minimum side floor remains a physical gate.

G7 | Electrical / RF owner | OPEN INTEGRATION. Close board memory variant, connector nets, carrier electrical retention, physical volume firmware, cell charging/thermal, microphone alignment, optical and final installed RF/audio tests. No firmware was changed or flashed.

What changed and what governs

CAD changes. Grille pocket grows from 62 x 64 R16 to 62.6 x 64.6 R16.3. Original 61.7 x 63.7 R15.85 plate and all 721 W holes are preserved. The selected adhesive provision grows to 0.13 mm, recessed within the skins; grille seats on a new 0.15 mm-deep chassis recess, moving the blank 0.12 mm inward. The shallow recess leaves 1.85 mm of the original 2.0 mm front wall where flat. Grille adhesive is set back 0.25 mm with a 0.95 mm ring width.

Local support. Internal PA12 buttresses flank the USB/PTT region without changing the port cutout or outer shell. A rounded inboard J3 rib supports adjacent cover material while leaving its clearance pocket intact. Side-boss collars increase local nominal diameter from 6.4 to 7.2 mm. Two microphone blind holes shorten from 6 to 5 mm, retaining the specified 4 mm insert plus 1 mm bottom space.

PTT setup. Both PTT pads start at 2.25 mm versus 2.30 mm in R5, creating 0.05 mm nominal free gap to the source plungers. The left carrier mounting slots increase to 4.0 x 2.4 mm, providing +/-0.8 mm nominal X adjustment. The paddle, switch positions, 0.6 mm stops and exterior controls remain unchanged.

Authority. cad/custom_parts STEP defines nominal part geometry; drawings and this report add finished-condition tolerances and process requirements. source/build_R6.py is the editable feature-delta definition applied to the frozen baseline_R5 B-reps. The original editable R5 generator is included as supporting source. No direct history-based FreeCAD/Fusion file is claimed.

Reference limits. Assembly electronics are source references at scale 1. The absent modem and unverified mated plugs are excluded. CAD represents installed foam thickness, not die-cut stock. Smooth grip solids define the outside envelope; subtractive grain is a controlled finish operation. Metal STEP is the 0.8 mm blank before coating; finished coating is budgeted in the drawings.

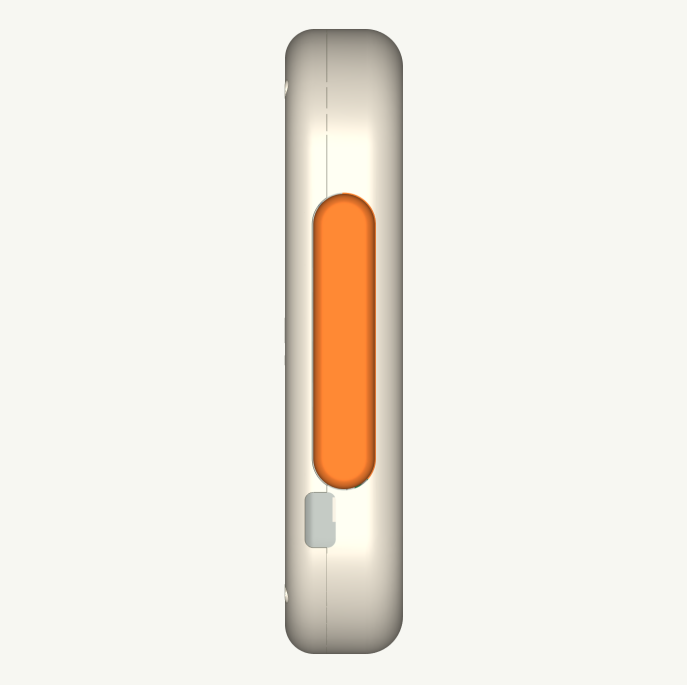
Files. Full, mechanical and presentation exploded STEP; 40 per-part STEP/STL; six coupon sets; BOM, insert audit, numerical validation, inspection records, matched CAD renders and this PDF. Coupon cuts are test boundaries, not changes to the product. No website was edited or published.

R6 geometry and appearance

Front Right

Front

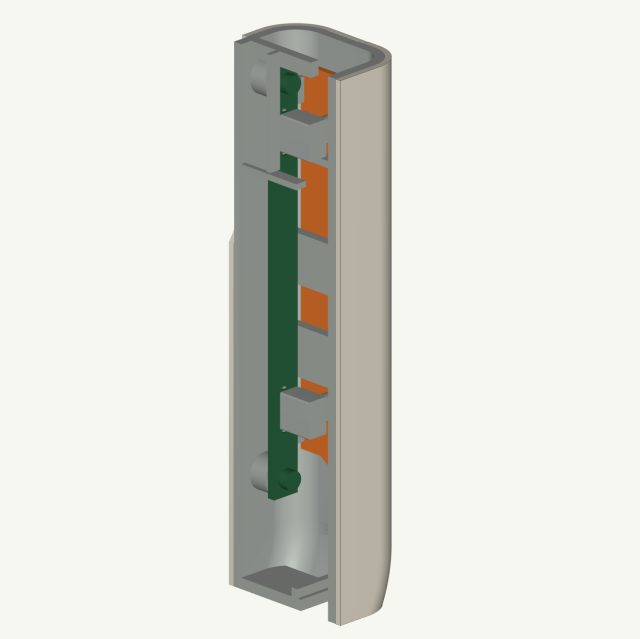
Rear



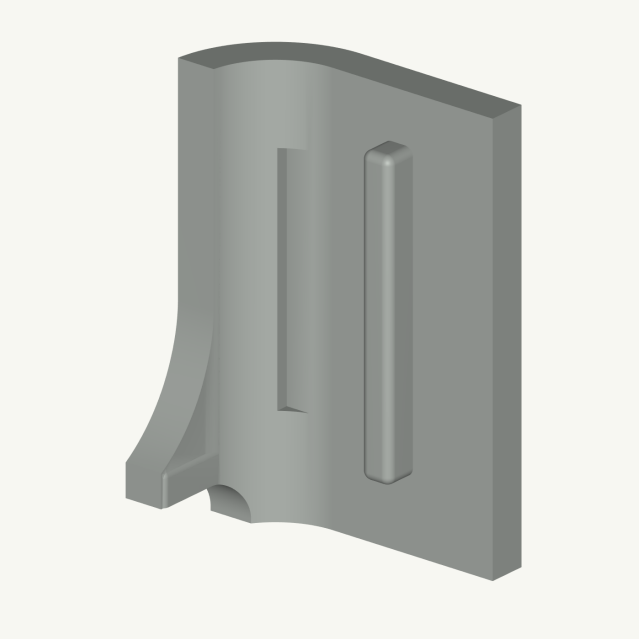
Left

R6 CAD-derived views. Smooth geometry shows the maximum skin envelope; finish colors indicate intent. Grain, coating and tactile behavior require the physical samples. Status lens is shown illuminated; rear deboss edges are enhanced for visibility, not paint-filled.

Local CAD test sections



C01 PTT USB



C02 J3

C03 GRILLE

C05 REAR DEBOSS

Literal crops from revised CAD. Fixture boundaries reduce full-case stiffness; repeat acceptance on the complete enclosure. The optional mesh disk is a porous-material reference envelope, not a solid printable backing.

Electronics evidence and exact missing inputs

Search performed. Searched project filenames for SIM7670/voice-terminal and all Eagle/KiCad board/schematic files, then checked the Downloads originals cited by R5. electronics_source_search.json records 88 matching STEP files and five hashes including derived/assumed references. Two actual board-source exports were found: 19,673,834-byte earlier export and 21,463,451-byte R5 export. Downloads reproduce these same hashes.

What the files establish. R5 retains the 306-solid supplied board. The older export names the voice terminal, ESP32 and SIM8066 SIM-card socket; a filename or a SIM-card connector does not establish a cellular module body. Neither searched export supplies a signed populated revision, placement table or modem installation definition. The only native EDA board found in the project search is the Adafruit microphone design, not the mainboard.

Manufacturer resources. Waveshare publishes CAD and schematics for an ESP32-S3-SIM7670G development board [S7]. No source record ties that commercial board/revision to this customer 60 x 80 mm substrate. It is not substituted for the supplied assembly. Public module dimensions alone cannot establish this installation.

Required reconciliation packet. One actual board with legible maker, part, PCB revision and module suffix; orthogonal photographs of both populated faces with scale; PCB fabrication thickness and assembly tolerances; component centroid/rotation and maximum installed heights; SIM7670G drawing/CAD including shield, pads/solder, connectors, orientation and XYZ tied to two board datums. Include any rework wires and underside solder protrusions.

Connector packet. Provide actual board-side and mating housing/crimp/contact part numbers per refdes, keyed pinout, wire gauge/OD, boot and latch envelopes, plug seating depth, removal direction, permitted bend radius and strain-relief requirement. Identify the LTE port electrically, not by connector shape. No unverified pinout is wired in this package.

Coverage release. EE signs a row for each board occurrence: populated, absent, corrected or unmodeled. Add approved rigid bodies at source scale 1; then sweep all controls and cover service path with the complete harness. G1 remains open until that evidence is attached.

Connector bodies, routes and service plan

Bodies preserved. R5 board includes J7 USB-SMD_TYPE-C16PIN-1 and J3 B5B-PH-K-S(LF)(SN), plus RF U.FL geometry at J5/J6. These are CAD-library names, not procurement approval. Installed J7 bounds are approximately X -41.127 to -33.477, Y 3.600 to 7.951, Z -47.984 to -39.044. J3 reaches Y +10.715. Actual bodies are retained in assembly STEP.

USB mating. Port is 7.5 Y x 13.5 Z, R2, centered Y 5.7755 / Z -43.5145. It straddles seam Y 4.2. Socket front is about 4.073 mm behind the outer grip side at X -45.2. This depth makes plug nose and boot dimensions critical. Do not assume a nominal USB-C metal tongue establishes boot fit.

Routing definition status. No arbitrary installed wire tubes are added. Harness_Register.csv contains endpoint evidence, available original lead budget, unassigned endpoints and closure inputs. Battery lead 100 mm, speaker lead 152 mm and LTE coax 150 mm are source budgets, not free service slack. Other conductors require a selected wire/cable specification.

Required route construction. Start at actual termination exits; include connector body, fully mated plug, insulation barrel, boot and swept bend arc. Place service loops in verified free volume, away from the battery pouch, PTT sweep and four board clamp lands. Measure installed centerline length including bends and subtract termination take-up and retained loops from actual lead length.

Service slack calculation. Usable slack = measured lead length - installed routed length - termination take-up. Required slack is the increase of route length over the complete support/open/unplug path plus assembly margin. A provisional target is a supported 30 mm cover separation before antenna disconnection; verify with real harness geometry. If it cannot be met, define a smaller supported opening fixture and reachable disconnect sequence.

Physical check. With power disconnected, demonstrate full USB seating and withdrawal, then remove four closure screws, support the rear cover, disconnect battery first when accessible, then other interconnects in the validated order. Nothing may pull on solder joints, a pouch tab or RF jack. Closure must seat by hand before screw torque; no trapped or tensioned lead. Record video and measured service opening distance.

PTT / USB and J3 local reinforcement

Measured geometry. The 1.225604 mm distance is between projected PTT and USB aperture profiles on side datum X -44. It is not material thickness. The J3 sampled shortest rigid wall is 1.466048 mm at X -40.45, Y 11.015, Z -27.5 in R5; the new inboard support rib does not thicken that exact corner.

R6 support detail. Front USB buttress occupies the local box X -43.8..-41.9, Y -0.8..4.2, Z -48.5..-34; rear buttress X -43.8..-41.9, Y 4.2..10.5, Z -51..-35. R0.4 box edges blend the added support. Both are cropped to the existing outer body and USB opening. The front support also excludes the entire nominal PTT swept solid.

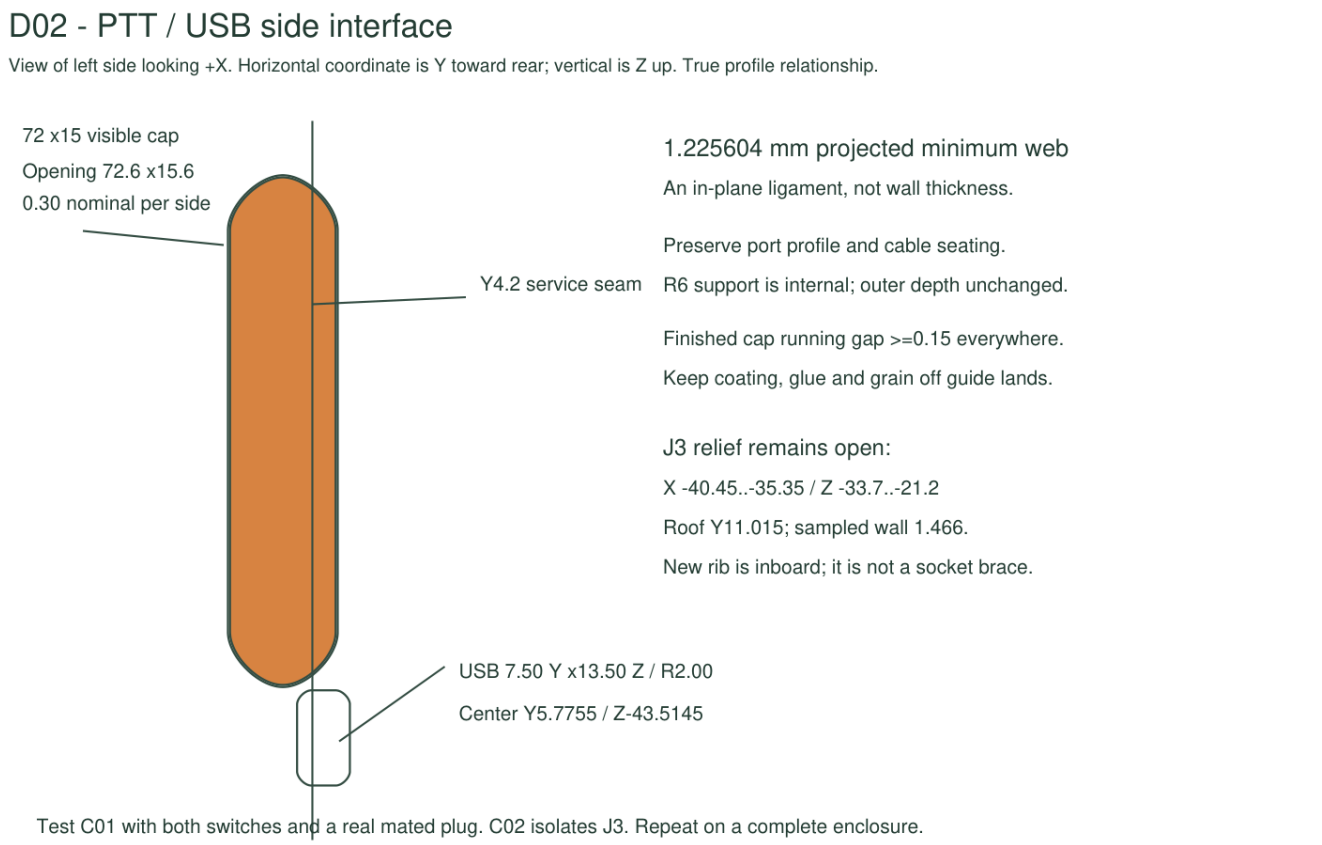
J3 rib. Inboard rounded rib envelope X -35.15..-33.5, Y 9.55..12.1, Z -35.3..-19.6; R0.45 on its box edges. The existing relief X -40.45..-35.35, Y up to 11.015, Z -33.7..-21.2 stays open. New material transfers adjacent cover bending into a broader region. It is not a socket brace and is not claimed to remove solder-joint cable loads.

Material/process. Trial route: EOS PA 2200 SLS PA12 [S6], with process orientation and finishing recorded by the supplier. Coupon and full chassis must use the same build orientation relative to the local walls, powder refresh, cleaning and finishing. Smooth cable-facing edges; do not machine away the buttresses or enlarge openings by undocumented hand work.

C01 and C02 fixtures. C01 is a literal left-side crop including full paddle, both switch stations, carrier, USB region and local skins. Clamp its cut X -28 plane with distributed padded fixture support, leaving the tested web free. Mount a verified socket/board to its actual support datums. C01_TEST_SETUP_WITH_REFERENCE_BOARD.step shows the full unmodified source board with the coupon; do not fabricate a cropped PCB. C02 isolates the J3 corner and rib; hold cut boundaries, then load via the actual plug/board assembly. Coupons do not reproduce full-case stiffness; repeat on complete case.

Development tests - proposed, not product ratings. Three specimens per process. Mate selected smallest and largest intended cable boots 100 cycles; then apply 5 N cable force in +/-Y and +/-Z at 30 mm from socket for 10 seconds (0.15 N m), stopping at any damage or lower connector-rated load. Apply PTT at Z -30/0/+30 with cable installed/unplugged. Record peak displacement and 60-second residual; development limits: <=0.30 mm local deflection, <=0.10 mm residual, no visible cracking at 10x, no cap rub or missed release. These loads require EE/supplier approval against the actual connector ratings.

PTT / USB and J3 detail



Drawing file: **D02_PTT_USB_J3.svg**. Use the editable vector drawing together with the corresponding STEP. Unshown geometry follows CAD. All dimensions are millimetres; process targets and physical release requirements are described on the adjacent engineering pages.

Grille finished fit and manufacture

Chosen prototype proposal. 0.80 +/-0.04 mm AISI 304 stainless sheet, annealed 2B stock. Nitrogen-assisted fine laser cut, all 721 holes and outline from preserved DXF. Supplier to prove 0.90 mm minimum blank holes and 0.60 mm minimum nominal ligaments. No punched substitution or altered W layout without a new pattern review.

Edge and flatness. Remove dross both sides; edge break 0.03-0.08 mm, residual burr <=0.02 mm, no sharp tactile edge, no polishing that merges adjacent holes. Flatness <=0.10 mm over the full finished plate, checked unloaded on a reference plate. Protect the plate in a support frame during cleaning/coating; measure again after cure.

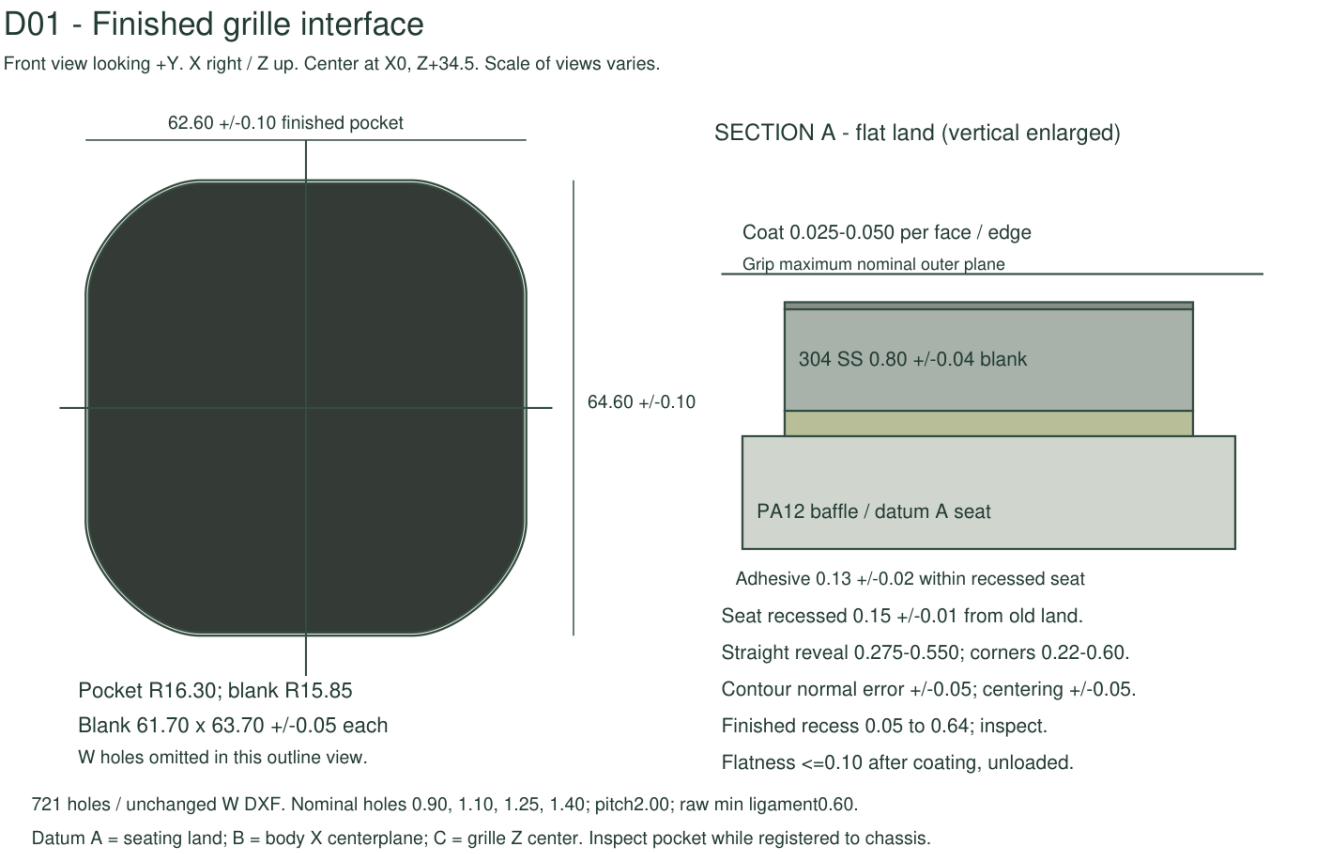
Finish proposal. Cerakote H-146 Graphite Black for the charcoal metal trial. Apply/cure per current H-series instructions [S5] on metal only before bonding; nominal dry film 0.0375 mm per face/edge, permitted 0.025-0.050 mm. No extra clearcoat. Inspect witness coupons and hole edges. Final color/satin appearance must match an approved adjacent cream/sage/orange sample; H-146 is a candidate, not an approved master.

Worst-case in-plane fit. Blank outline tolerance +/-0.05; finished pocket 62.60 +/-0.10 by 64.60 +/-0.10, including skin molding/registration distortion; lateral centering error <=0.05 per axis. Per-side minimum = (62.50 - (61.75 + 2 x 0.050))/2 - 0.05 = 0.275 mm. Maximum = (62.70 - (61.65 + 2 x 0.025))/2 + 0.05 = 0.550 mm. Height has the same budget. R5 under these assumptions gives -0.025 mm minimum.

Finished reveal control. Uncoated nominal reveal grows from 0.15 to 0.45 per side; with nominal edge coating it is 0.4125. Center using a removable four-sided gauge fixture. Opposing-side reveal difference <=0.10 mm; inspect all four sides and rounded corners. Both contours require +/-0.05 mm normal profile error in addition to size limits. At a corner, combine X/Y centering as 0.071 mm: clearance bounds are 0.45-0.05-0.05-0.05-0.071=0.229 to 0.45+0.05+0.05-0.025+0.071=0.596 mm. Inspect all-around reveal 0.22-0.60. Corner outlines are concentric offset profiles (R16.3 pocket / R15.85 blank); approve their finished optical uniformity on C03.

Adhesive and depth. 3M 9472LE acrylic transfer adhesive, 0.132 mm typical [S4], represented as 0.13 +/-0.02 in CAD. Grille ring setback 0.25, width 0.95. Raw ring runs on unperforated perimeter land. Finished plate stack ranges 0.76+0.05+0.11=0.92 to 0.84+0.10+0.15=1.09 mm above the recessed seat before flatness. Seat depth is 0.15 +/-0.01 below the former land; secondary skim/finish the seat in a supported nest and demonstrate that tolerance. It is not an as-printed SLS capability claim. With 1.20 +/-0.10 skin and 0.10 flatness, minimum recess is 1.10+0.14-1.09-0.10=0.05 mm. Maximum conservatively including flatness is 1.30+0.16-0.92+0.10=0.64 mm; inspect 0.05-0.64 mm and approve the visual master. Never force a bowed plate. Finished-fit capability remains a coupon gate.

Finished grille interface



Drawing file: **D01_Grille_Finished_Interface.svg**. Use the editable vector drawing together with the corresponding STEP. Unshown geometry follows CAD. All dimensions are millimetres; process targets and physical release requirements are described on the adjacent engineering pages.

Grille backing and acoustic coupon

C03 geometry. Full grille and pocket crop preserves the actual R6 blank, adhesive, flexible pocket and D38.5 acoustic baffle. Reference backing disk is 38 mm diameter x 0.10 mm nominal at Y -13.20..-13.10; a removable PA12 trial retaining ring is included. The disk is a solid envelope for a porous fabric, not a printable solid sheet.

Backing proposal and procurement gate. Request black SAATIfil Acoustex woven acoustic mesh samples [S8] with measured thickness <=0.10 mm and lot-specific airflow resistance. Exact mesh code remains open until supplier data and acoustic samples select it. Trial retainer is a coupon fixture, not adopted product geometry. Its retention, bond and spacing must be integrated in a future controlled CAD update if approved.

Compare the complete stack. Measure the same real speaker at fixed drive, microphone position and distance in four states: open reference, enclosure without plate, finished plate without mesh, and finished plate with each candidate mesh. Preserve gasket compression and eliminate cable/fixture rattles. Record response from 300 Hz to 4 kHz, level at representative voice content, buzz and blind-listening intelligibility.

Proposed comparison criteria. At equal drive, investigate any additional broad-band loss >2 dB over the speech band or new narrow peak/dip >3 dB relative to the approved no-mesh enclosure. Compare recordings and listen for grille buzz at intended maximum playback. These are engineering screening criteria, not a loudness/sound-quality certification. EE/audio owner approves final limits.

Appearance checks. Inspect from front and +/-45 degrees under diffuse and grazing light, device both off and operating. Backing should suppress distracting hardware silhouettes without filling the W holes. 16.93% raw plate open area is descriptive only; baffle blockage, mesh resistance, cavity and speaker coupling determine the acoustic result.

Production limits. Do not bond opaque films over holes, paint after installing fabric, or infer water/dust sealing from mesh. Record fabric code, thickness, bond system, speaker/gasket lot, grille coating thickness, response plot and approval sample ID.

Two-switch PTT: behavior and mechanics

Exact intended behavior. S1 at Z -23 and S2 at Z +31 are normally open momentary contacts wired in parallel to one approved PTT input: pressed = S1 OR S2. Either closure starts/maintains transmit; transmit ends only after both reopen and the approved debounce interval expires. Simultaneous closure is not required; disagreement monitoring is unavailable with parallel wiring. Separate test leads are required during bench characterization.

Firmware boundary. R5 reviewed source used recording while LOW on GPIO2; that is not a verified net assignment for this board. Propose 10 ms stable-input debounce for initial EE trial; verify short presses and release latency on actual firmware. A second click from the other switch must not create another PTT command. All intended ground/common terminal pairs require continuity verification before wiring.

Geometry and asymmetric loading. Visible paddle remains 72 x 15 centered at Y/Z zero. Two supports span 54 mm but are centered Z +4. Stops are at Z -29 and +37. Test points Z -30, 0, +30: the bottom test point is 7 mm beyond the lower switch, while the top test point is 1 mm inside the upper switch. This asymmetry permits different end feel; symmetric outer shape does not establish symmetric actuation.

Rigid pose and stiffness checks. validation/geometry_R6.json records axial sweep against revised parts and a sampled +/-0.1/0.2 degree tilt study across the 0..0.6 mm travel. Tilted poses can hit a stop or guide; they are diagnostics, not allowed motion. Measure both end displacements in C01 and the full enclosure. A first-order beam screen using actual mesh sections gives I_y=186.42 mm4 and about 0.041 mm center flex under 4 N with EOS PA2200 E=1650 MPa, a=23/b=31 mm span split. This assumes simple bilateral supports and omits pad compliance, guide friction and contact lift-off; it is not FEA or proof of end-press behavior. The paddle is retained pending measured force/tilt results.

Finished guide targets. Keep original 0.30 mm nominal cap-to-opening gap. Finish only visible cap face; mask guide/flange/stop surfaces. Inspect assembled running clearance >=0.15 mm everywhere, no adhesive or grain protrusion into sliding lands. Stop travel trial acceptance 0.60 +/-0.03 measured at both tabs. Do not infer a permitted switch overtravel from this stop setting.

Mechanical versus electrical release. Mechanical acceptance requires cap retention, return, no rubbing and controlled force/deflection at all test points. Electrical acceptance requires the single OR command, no chatter/retrigger, correct transmit end, and correct pin mapping. Passing one does not close the other.

PTT pad specification and calibration

Candidate. WACKER ELASTOSIL LR 3003/50 A/B molded solid silicone, die-cut/molded 5.00 +/-0.05 diameter, starting axial thickness 2.25 +/-0.03. Vendor guide data: Shore A 50, rebound resilience 62%, compression set 13% under its stated 22 h / 175 C post-cured test [S3]. This LSR benchmark requires its specified cure/post-cure route; an RTV substitute is a separate candidate.

Force-based release requirement. Omron B3F-3150 operating force is 0.98 +/-0.29 N, release force >=0.20 N, pretravel 0.25 +0.20/-0.10 mm [S1]. At nominal 0.60 stroke and 0.05 free gap, only 0.10 mm pad compression remains at maximum pretravel. Therefore the actual 5 mm pad must transmit 1.27 N with <=0.10 mm compression in this nominal stack. With 0.57 minimum stop and 0.08 maximum gap it must do so within 0.04 mm, or the tolerance combination must be rejected/calibrated.

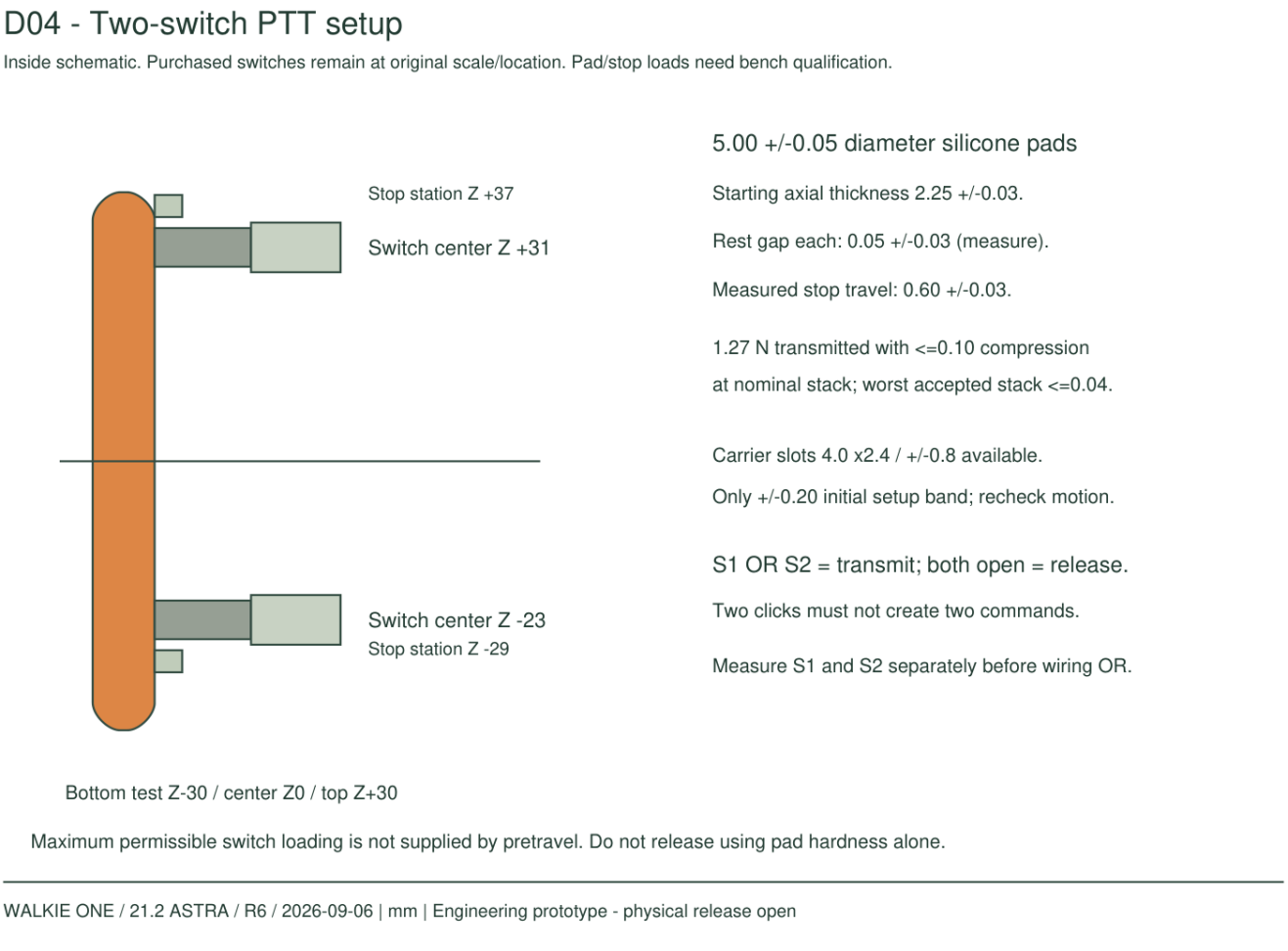
No hardness-only approval. Measure each candidate F(delta) from 0 to 0.45 mm between actual contact geometries at 23 C and intended hot/cold conditions, with load/unload curves and 1/60/600-second recovery. Measure five pads per lot. Record compression under 0.69, 0.98 and 1.27 N. Hardness, rebound and high-temperature compression set do not supply this curve. Manufacturer permissible plunger force/displacement beyond actuation is required to set the upper pad-load limit.

Calibration steps. Install paddle and dry-fit individually identified pads. Install switches on the FR4 carrier with approved terminal retention. Connect S1/S2 to separate measurement channels. Use the enlarged carrier slots to set a common rest gap of 0.05 +/-0.03 mm, measured independently at both plungers. Match-select pad thickness or use documented die-cut shims for station differences; do not preload either switch. Measure gaps with the cap at its outer retention stop, then record its free settled position in upright, inverted and side orientations. Positive clearance can create free play because the switches provide no restoring force across the gap; check light-shake rattle and reliable release. Slot adjustment moves the entire carrier; it cannot correct station-to-station pad errors by itself.

Bounded adjustment and inspection. Nominal carrier center X -33.85; slot travel +/-0.8 is available geometry, not a universally collision-free setting. Start within +/-0.20 mm for physical setup, recheck actual switch/PCB/stop clearances after any adjustment. Record carrier X, pad lot/thickness, gaps, switch-contact displacement, stop displacement and force. The remaining gap between contact and stop must be at least 0.05 mm and must not exceed the supplier-approved load envelope.

Recovery and endurance. Development target: return to both contacts open within 100 ms, residual paddle displacement <=0.05 mm at 60 seconds, peak actuation-force drift <=20% after 10,000 end/center cycles and a 24 h depressed hold. Use five-position tests (three Z stations plus front/back edge). Complete-device lifetime still needs a product-level endurance requirement. Stop if safe switch loading cannot be established; do not cure it with forced preload.

PTT calibration drawing



Drawing file: **D04_PTT_Pads_Stops.svg**. Use the editable vector drawing together with the corresponding STEP. Unshown geometry follows CAD. All dimensions are millimetres; process targets and physical release requirements are described on the adjacent engineering pages.

Battery foam and PCB clamp loads

Current installed geometry. Tray foam 52 x 28 mm, free 0.8 to installed 0.5: 37.5% compression. Three lid pads each 4 x 4, free 3.0 to installed 2.5: 16.67%. Four PCB pad lands are 2 x 6, 2 x 6, 1.5 x 6 and 1.5 x 6 mm: total 42 mm2; 1.0 to 0.8 is 20% compression. These are prescribed CAD shapes, not equilibrium results.

Thickness-specific PORON candidates. Tray trial: PORON 4701-30, density 400 kg/m3, thickness 0.79 mm category, published +/-15% thickness; lid trial: 4701-30 density 320 kg/m3, 3.0 mm within its 1.57-3.18 range, +/-10% thickness [S2]. Do not substitute the softer 240 kg/m3 density at 0.8 mm; that datasheet lists it only at substantially greater thickness. Exact converter order codes remain to be supplied.

What published force data says. At 25% compression, tray-grade CFD is 35-83 kPa, typical 62: for 1456 mm2 this is 50.96-120.85 N, typical 90.27 N. Lid-grade CFD is 21-55 kPa, typical 35: across 48 mm2 this is 1.008-2.640 N, typical 1.680 N. These loads apply only at 25%, not at the modeled 37.5%/16.67%. Actual load curves and the assembled equilibrium are missing.

Load-balance finding. With ordinary rising compression-force curves, the proposed stock grades cannot simply be assumed to realize the two independently prescribed compressed thicknesses together. The floating cell must balance opposing forces; its position changes until loads balance, or unintended hard contacts develop. Retain geometry as an unqualified packaging study; do not force the cover to obtain nominal foam thickness. Determine a smaller/distributed pad area or alternative grade only with cell pressure limits and measured curves, then revise CAD.

Cell retention release. Use a dimensionally accurate inert cell surrogate and thin load cells/pressure film first. Obtain actual cell tolerances, protected tab geometry, allowable face/edge loads and aging expansion from cell supplier. Record thickness before/after charge/thermal trials under the electrical owner. No part of foam compression is allocated to swelling. Verify no load enters speaker magnet or pouch tab zone.

PCB clamp candidate and loads. Retain LR 3003/50 solid-silicone benchmark for clamp trials with compression curves at 20%; F_total[N] = 0.042 x sigma[kPa]. No numerical clamp force is claimed without that data. For example, a measured 100 kPa would imply 4.2 N total; this is arithmetic, not material data. Check each land on the actual board for copper/components/solder and board bow; require 0.3 mm keepaway from populated features and no observable preload before screw tightening.

Fourteen inserts and controlled installation

Exact insert. ruthex RX-M2x4 / GE-M2x04-001, official STEP preserved, nominal 4.00 length and 3.60 overknurl OD. R5 manufacturer basis lists 3.20 receiving hole, 1.30 minimum radial wall and blind depth >=5.00. Four side-boss collars now nominal OD7.20; all other nominal boss ODs remain 6.40. Axis-specific floors and actual driver/tool checks are in INSERT_AUDIT_R6.csv.

Floor and engagement definitions. Pilot bottom to exterior is an actual section measurement along the insertion axis; it differs from R5 bottom-to-inner-wall values. Side bores remain 5.00 deep and thin-floor trials remain mandatory. Microphone bores shorten to 5.00, restoring 1.00 mm of floor material. Nominal geometric thread overlap is up to 4.00 mm; full effective thread engagement is less if lead-in or runout consumes length. Inspect vendor thread geometry or gauge actual joints before crediting engagement.

Depth-controlled insertion. Use a rigid nest supporting the outer shell around each boss. Align insertion tip to the boss axis; all inserts enter toward -Y from the open rear. Use a mechanical stop referenced to the measured boss top. Seat insert top flush to 0.05 mm below boss top, never proud. Thus insertion depth is 4.00..4.05 mm, leaving at least 0.95 mm to a 5.00 mm nominal hole floor before tolerances. Do not press against the blind floor.

Process trial. Record PA12 lot/orientation, actual pilot diameter/depth, insert lot, tip diameter, temperature, insertion force/speed and cooling dwell. Start with coupon matrix chosen by supplier material/insert instructions; no temperature or torque value is invented here. Hold aligned until cool. Then gauge M2 thread, measure depth, inspect at 10x and section one coupon per setup for polymer flow and floor/witness marks.

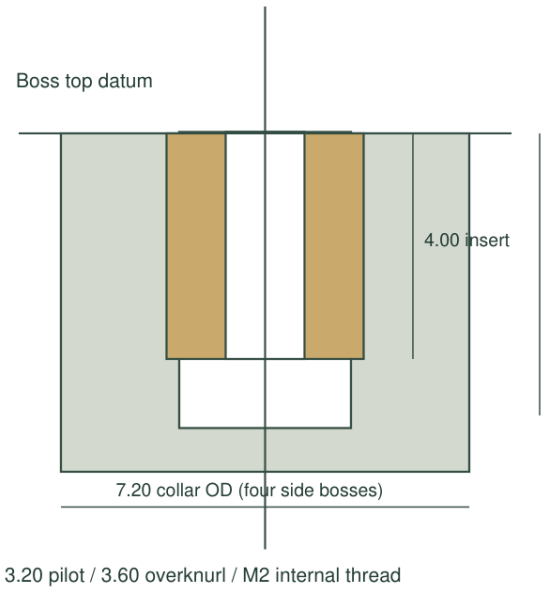
Tool access. Audit uses a proposed 4.6 mm diameter insertion mandrel with 20 mm free approach on bare chassis. This envelope must match the selected actual tool. Install all 14 inserts before hardware and skins. Closure service uses 1.5 mm hex driver; specify a narrow shaft compatible with the 4.2 counterbore and 4.6 skin hole. Demonstrate access after skin bonding.

Joint test. Use genuine M2x12 closure screws (4) and M2x6 carrier/bracket screws (10). Trial clamp torque with destructive pull-out/spin tests on process coupons, then release a bounded assembly torque from the measured joint margin. Nominal screw-tip margins and insert-bottom clearances are distinct columns in the audit. Reject proud insert, cracked boss, thread jam, bottomed screw or exterior witness mark.

Insert section drawing

D03 - Insert receiving details

Section through side-carrier boss axis (schematic). All 14 axes / actual floor sections: INSERT_AUDIT_R6.csv.



Seat flush to 0.05 below boss top.

Fixture stop controls depth; no bottom pressing.

Minimum nominal insert-to-floor: 1.00.

Minimum with 0.05 inset: 0.95 before tolerances.

Side floor remains thin: inspect actual section.

Mic bores: 6.00 -> 5.00, restore 1.00 floor.

Other bosses: 6.40 nominal OD; 6.00 bore.

Mandrel trial envelope D4.60 x20 approach.

Install toward -Y before electronics and skins.

Temperature / force / torque: coupon-derived.

No generic torque setting is released. Floor length, thread engagement and screw-tip margin are separate checks.

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Drawing file: **D03_Insert_Section.svg**. Use the editable vector drawing together with the corresponding STEP. Unshown geometry follows CAD. All dimensions are millimetres; process targets and physical release requirements are described on the adjacent engineering pages.

Flexible grip, color and texture system

Primary prototype route. ReoFlex 50 dry-formulation cast polyurethane rubber for the first appearance/bond trial, with compatible SO-Strong pigmentation [S9]. Nominal 1.20 mm skin, preserving the existing rounded outer envelope. Supplier confirms thin-section cure, demolding, contact-use suitability and full pigment/cure recipe. This is a flexible skin trial, not a final production grade or a hard painted substitute.

Alternative chemistry. LR 3003/50 A/B platinum-cure LSR [S3] is the silicone comparison route. It needs its own processing and silicone-compatible adhesive/primer development; 9472LE acrylic is not assumed to bond silicone. Do not silently substitute silicone for the PU skin or reuse the same attachment instructions. Comparative tactile coupons precede material selection.

Fine-pebble trial drawing. Recessed irregular pebble grain: 0.04-0.07 mm maximum valley depth, nominal cell size 0.3-0.6 mm, no positive peaks beyond CAD. No grain on bond faces, cap guides, stop lands or screw recesses. Preserve the outer soft radii. Smooth CAD coupon is the finished maximum envelope; tool texture is negative/compensated so the cast outside does not grow.

Sheen and color. Trial target 5-12 gloss units at 60 degrees on flat witness coupons; validate visual sheen on curved skin. Retain warm cream, charcoal grille, orange PTT and sage keys. Render RGB values are not color specifications. Measure the approved physical masters under D65 and warm indoor light, retain both supplier and design-owner samples, then set lot color limits (proposed Delta E00 <=2 to the signed master). No approved master IDs exist yet.

Bond system. PU route candidate: 3M 9472LE, 0.13 +/-0.02 mm including any primer contribution within that allowance. Vacuum clean PA12, wash/fully dry, lightly abrade concealed lands if supplier validates, remove release residues from PU, and solvent-clean only after compatibility trial. Compare clean-only and supplier-selected plasma/primer routes. Freeze actual cleaner/primer SKU and process from peel-aging results, not an assumed generic primer.

Registration and service. Use cradle fixture referencing rigid chassis centerplane and closure features, with removable opening masks to align skin cutouts. Bond each skin only to its own case half using revised recessed patches. Require edge registration <=0.15 mm and no adhesive bridging seam Y4.2, screw access holes or moving caps. Inspect seam after five opening/reclosing service cycles. No full wrap or overmold may permanently lock the halves.

Grip and rear-marking coupons

C04 curved-edge coupon. A literal left upper-side cut includes the R6 skin, revised 0.13 bond patch, PA12 substrate, curvature and a skin edge. Use the same preparation, pigment, mold grain and cure as the full skins. Add flat witness strips from the same material batch for gloss/color and 180-degree peel measurement.

Proposed bond screening. Three coupons per chemistry/preparation. Measure peel after 24 h and 72 h, after 7 days at 50 C, after damp handling/cleaning and after five service cycles. Development target >=1 N/mm peel and no edge lift >0.2 mm; adapt the test to thin-skin tearing and report cohesive versus adhesive failure. Do not report a stronger substrate-tearing result as a repeatable peel value. Final target follows approved use conditions.

C05 exact rear artwork. Approved WALKIE ONE outlines and Designed in Los Angeles inscription preserved, centered X/Z zero. Wordmark 48.0 mm wide; smaller line approx. 26.7525 mm wide and 2.38 mm high, line gap 3.0 mm. Deboss 0.25 mm, no invented typeface replacement, mirror or fill color.

Texture and residual section. Revised rear adhesive recess is 0.13 mm. Nominal skin below flat deboss floor and above bondline is 1.20 - 0.25 - 0.13 = 0.82 mm. If the full 0.07 mm grain were applied to the deboss floor, it would be 0.75 mm; therefore exclude grain from the recessed letter floors and keep their edges crisp. Small-character counters/edge grain still require the actual textured sample.

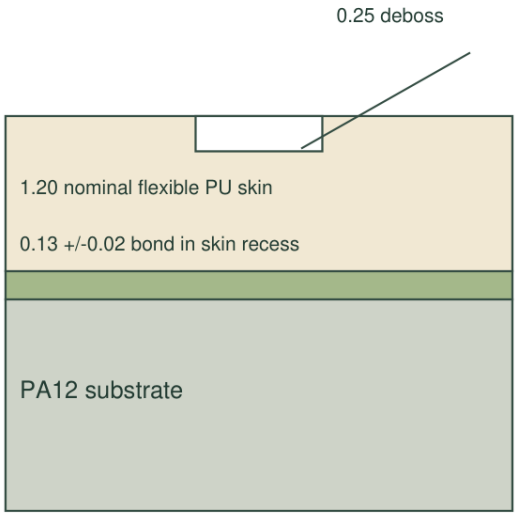
Inspection. Inspect frontally and at 30 degrees from 300 mm in diffuse D65 and warm indoor illumination. Two reviewers must read the complete small inscription unaided; inspect under 10x for missing counters, flash, ragged letters and print-through from adhesive. Measure section depth and minimum residual on a sacrificial coupon. Accept only a signed appearance sample.

Tactile trial. Compare dry and lightly damp grip with the full rounded shell, pocket insertion, lint pickup and approved cleaning. Record friction/drag observations with material and texture codes. A smooth 3D-printed skin is a dimensional sample only; painted PA12 is a separately labeled visual model and cannot close flexible-grip approval.

Grip and finished-depth drawing

D05 - Grip / bond / deboss and depth

Schematic sections; all dimensions are finished. Color, grain and touch require physical master samples.



Depth allocation

28.80 nominal complete grip depth

+0.25 rigid shell variation

+0.20 both skins

+0.04 bond / preparation excess

+0.25 closure / assembled warp

+0.00 subtractive texture

29.54 allocated worst finished depth

0.46 reserve to30.00 maximum

0.82 nominal residual below deboss and above bond.

Exclude grain from letter floors; texture valleys0.04-0.07.

Measure actual finished article; do not compress grip.

Each skin bonds only to its own service half.

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Drawing file: **D05_Grip_Depth_Budget.svg**. Use the editable vector drawing together with the corresponding STEP. Unshown geometry follows CAD. All dimensions are millimetres; process targets and physical release requirements are described on the adjacent engineering pages.

First article assembly and inspection

1 / Incoming and chassis. Identify R6 parts against BOM and source hashes. Record all purchased part/revision labels and compare full populated geometry before powered assembly. Clean and inspect the PTT/USB and J3 regions. Measure finished openings, seam, boss floors and guide lands. Install and qualify the 14 inserts in a supported fixture before skins/hardware.

2 / Controls. Insert retained caps from inside. Install matched pad lots; assemble handwired FR4 carriers only with EE-approved solder/terminal fixation. Set and record both PTT gaps and carrier adjustment, then test top/center/bottom and edge presses with separate switch traces. Test volume and action controls too. No forceful preload or uncontrolled sanding.

3 / Front internals. Fit clear lens and verified LED orientation/circuit. Fit speaker rim gasket and hooks without loading diaphragm. Confirm actual microphone revision/port, align foam duct, and install bracket with controlled torque. Keep the 0.4 mm nominal optical gap and the reconciled mic aperture under incoming inspection.

4 / Board and battery. Seat the unmodified board on original ledges. Check all four PCB clamp contacts against populated parts and record bow/load. Use inert cell surrogate until G4 pressure/retention evidence is accepted; do not force actual cell into prescribed foam compression. Keep speaker magnet clearance and tab zone free.

5 / Harness and rear cover. Fit antenna and the electrically assigned RF connector. Install approved plugs and retained harness route with measured service loops. With power isolated, demonstrate supported opening and disconnection. Seat cover by hand before four M2x12 closure screws; stop if it rocks or requires screw force to close.

6 / Appearance and final inspection. After functional geometry acceptance, clean bond lands and use registered fixtures to attach each grip to its own half, then grille. Confirm 0.05-0.64 actual grille recess, accepted reveal, no blocked holes, no cap rub, exact rear text and accessible screws. Record as-built material/finish/firmware/BOM revisions and any hand fitting. Repeat all controls with representative cable plugged in, then service opening.

7 / Release evidence. Each G1-G7 row needs measurement file, serial number, owner name, date, acceptance threshold and disposition. A nominal CAD pass cannot close a physical or electrical row. Failed or substituted parts require a documented revision and rerun of affected checks.

Validation scope and depth budget

Digital verification. See geometry_R6.json for reopened STEP solids, STL watertightness/winding, changed-part interference tests against the full assembly, source-component preservation, continuous axial PTT clearance and sampled tilt diagnostics. BOM measured bounds/volumes and render input hashes associate the delivered files. No unrun test is marked passed.

Depth allocation - proposed manufacturing budget. 28.80 mm nominal. Allow +0.25 rigid-shell/depth variation, +0.20 total skin variation, +0.04 unmodeled bond/preparation contribution and +0.25 assembled warp/closure variation. Subtractive grain adds zero. Allocated maximum = 29.54 mm; reserve to 30.00 = 0.46 mm. These are purchase/inspection allocations requiring supplier capability, not measured process statistics.

Direct final limit. Measure complete finished article across all Y extrema including controls, lens, coating and warp, using light-contact fixtures that do not compress the grip. Reject any >30.00 mm. Coated grille must remain recessed; otherwise its protrusion must be included explicitly. Nominal control width 93.2 is distinct from body depth 28.8.

Service access. No external screw openings or service split are removed. Insertion tools are checked on the bare shell; final driver and cable access require actual tools/plugs. Exploded STEP offsets are for presentation only. Supported removal paths and harness strain are still G1/G2 physical acceptance items.

Preserved components and appearance. No purchased reference is scaled or relocated. W hole pattern, grille blank, exterior paddle shape, sage controls, approved rear artwork and rounded shell remain baseline-derived. Plate moves 0.12 mm inward to accommodate the revised bondline and recessed seating surface. New material remains inside the original body envelope.

Remaining limitations. Missing populated geometry and mated connectors prevent a complete packaging-fit claim. Pads/foam, inserts, reinforcement, adhesives, finish, grip, optics, acoustics, RF, charging and service have no new physical test evidence. R6 is an improved engineering handoff with testable changes, not a qualified manufacturing release.

Measured digital validation results

Delivered geometry. 40 custom STEP files. Valid single solids: 40. Watertight STL: 40. Full assembly solids: 429.

Affected nominal fit. Changed-part geometric check passed: True. Unintended changed overlaps: 0. The complete nominal axial PTT sweep was tested against revised obstacles. Missing module and mated connectors remain outside the checked scope.

Tilt diagnostic. 25 rigid poses tested. 16 include guide/stop/other collisions. These poses include physically constrained states, and are not a permitted tilt range. Inspect the detailed JSON and perform off-axis force tests.

Component preservation. 39 unchanged purchased/reference groups compared by label, solid count, volume and bounds after assembly re-export. Source inputs retained byte-for-byte; no purchased geometry resized. Reference re-export tolerance is 0.0001 mm3 in volume and 0.00001 mm in bounds; detailed residuals are retained.

Source and remaining scope. Full exports reopened; every changed custom part vs all full-assembly groups. Unchanged R5 pair checks retained with source preservation. PTT tilt is a sampled rigid-pose diagnostic, not force, deformation or physical validation. Complete populated electronics and harness are absent.

Measured PTT rest gaps. ptt_pad_silicone_1: 0.05000 mm, ptt_pad_silicone_2: 0.05000 mm. These are source-CAD gaps, not measurements of assembled hardware.

Rear service movement. 48 sampled pair checks at 0.5, 2, 5 and 10 mm rearward separation: 0 overlaps. Screws removed; rigid cover and skin only. Actual harness, plugs and supported opening procedure still require physical qualification.

Complete insert measurement schedule

closure_+34_+62. X 34.00, Z 61.50; boss Y 4.20; blind depth 6.00; axis residual solid 10.769; screw-tip margin 1.20; insert bottom gap 2.00; mandrel overlap 0.0000 mm3.

closure_-34_+62. X -34.00, Z 61.50; boss Y 4.20; blind depth 6.00; axis residual solid 10.769; screw-tip margin 1.20; insert bottom gap 2.00; mandrel overlap 0.0000 mm3.

closure_+34_-62. X 34.00, Z -61.50; boss Y 4.20; blind depth 6.00; axis residual solid 10.769; screw-tip margin 1.20; insert bottom gap 2.00; mandrel overlap 0.0000 mm3.

closure_-34_-62. X -34.00, Z -61.50; boss Y 4.20; blind depth 6.00; axis residual solid 10.769; screw-tip margin 1.20; insert bottom gap 2.00; mandrel overlap 0.0000 mm3.

front_carrier_+22. X 22.50, Z -32.00; boss Y -4.20; blind depth 6.00; axis residual solid 3.000; screw-tip margin 1.60; insert bottom gap 2.00; mandrel overlap 0.0000 mm3.

front_carrier_-22. X -22.50, Z -32.00; boss Y -4.20; blind depth 6.00; axis residual solid 3.000; screw-tip margin 1.60; insert bottom gap 2.00; mandrel overlap 0.0000 mm3.

left_carrier_-36. X -33.85, Z -36.50; boss Y -7.20; blind depth 5.00; axis residual solid 1.000; screw-tip margin 0.60; insert bottom gap 1.00; mandrel overlap 0.0000 mm3.

left_carrier_+40. X -33.85, Z 40.50; boss Y -7.20; blind depth 5.00; axis residual solid 1.000; screw-tip margin 0.60; insert bottom gap 1.00; mandrel overlap 0.0000 mm3.

right_carrier_-16. X 33.85, Z -16.00; boss Y -7.20; blind depth 5.00; axis residual solid 1.000; screw-tip margin 0.60; insert bottom gap 1.00; mandrel overlap 0.0000 mm3.

right_carrier_+26. X 33.85, Z 26.00; boss Y -7.20; blind depth 5.00; axis residual solid 1.000; screw-tip margin 0.60; insert bottom gap 1.00; mandrel overlap 0.0000 mm3.

led_carrier_+10. X 10.00, Z -2.50; boss Y -1.20; blind depth 6.00; axis residual solid 6.000; screw-tip margin 1.60; insert bottom gap 2.00; mandrel overlap 0.0000 mm3.

led_carrier_-10. X -10.00, Z -2.50; boss Y -1.20; blind depth 6.00; axis residual solid 6.000; screw-tip margin 1.60; insert bottom gap 2.00; mandrel overlap 0.0000 mm3.

mic_bracket_-46. X 22.00, Z -46.30; boss Y -5.70; blind depth 5.00; axis residual solid 2.500; screw-tip margin 1.00; insert bottom gap 1.00; mandrel overlap 0.0000 mm3.

mic_bracket_-66. X 22.00, Z -65.80; boss Y -5.70; blind depth 5.00; axis residual solid 2.500; screw-tip margin 1.00; insert bottom gap 1.00; mandrel overlap 0.0000 mm3.

Source register and traceability

Local authority. baseline_R5 contains the unchanged supplied CAD package, including source, BOM, original component inputs and validation. evidence/R5_handoff.txt captures all 49 pages; selected pages were rendered for visual review. Expert_Review.md general recommendations and complete Concept 21.2 section guided R6. The comparison image preserves inspiration-versus-CAD context.

S1 / Switch. Omron B3F, A070-E1: https://components.omron.com/sites/default/files/datasheet_pdf/A070-E1.pdf - force, pretravel, release and contact behavior. Accessed 06 September 2026.

S2 / Foam. Rogers PORON 4701-30, publication 17-006: https://www.rogerscorp.com/-/media/project/rogerscorp/documents/elastomeric-material-solutions/poron/english/data-sheets/17-006-poron-4701-30-very-soft.pdf - thickness-specific density and 25% CFD. Saved in evidence.

S3 / Silicone. WACKER ELASTOSIL LR3003/50 A/B, 16 June 2024 technical data: https://www.wacker.com/h/en-us/medias/ELASTOSIL-LR-300350-AB-en-2024.06.16.pdf - guide properties, cure and recovery data; no small-pad force curve supplied.

S4 / Adhesive. 3M 9472LE TDS: https://multimedia.3m.com/mws/media/2522805O/3m-adhesive-transfer-tape-9472le.pdf - 0.132 mm typical acrylic transfer adhesive. Saved in evidence.

S5-S6 / Finish and PA12. Cerakote H-series TDS: https://www.cerakote.com/resources/files/tech_sheets/H-Series_TDS_Master.pdf . EOS PA2200: https://store.eos.info/products/pa-2200-polyamide-12 . Process suitability and part-specific performance still require coupon data.

S7-S9 / Alternatives and grip. Waveshare: https://docs.waveshare.com/ESP32-S3-SIM7670G-4G/Resources-And-Documents . SAATI: https://www.saati.com/products/filtration/brands/saatifil-acoustex/ . Smooth-On: https://www.smooth-on.com/products/reoflex-50/ . These inform candidate sourcing; they do not establish source-board identity or approved skin/mesh selection.

Final records. MANIFEST_SHA256.json freezes delivered files. CHANGELOG.md records geometry and specification changes. INSPECTION_RECORD.csv is blank by design: physical results must be entered by the person who performs the test, never populated from CAD inference.