Sheet Metal PC Case

Formed STEP and provisional reference drawings. No flat cutting files. Not a complete fabrication kit.

Planning reference, not machine-cut authority

Develop and qualify shop cutting patterns from the formed STEP and dimensions. These development drawings are provisional references, not machine instructions. Actual fabrication, fit and electrical safety remain unqualified.

Front connections and power button

The I01 fascia and concealed I03 plate support two USB-C ports, two USB-A ports, stereo audio and a power button. Clearances use supplier dimensions and conservative allowances. The actual hardware still needs fit and electrical tests.

Key envelope	Current nominal dimensions
Main shell / sled	302 W × 410 D × 520 H
With ordinary heads / PCI rail	306.8 W × 422 D × 520 H
Upper outside width	290
Main sheet set	19 instances / 18 IDs; 3 optional
Supplied design files	2 formed STEP files; no flat patterns

The 2.4 mm screw heads add 2.2 mm to the earlier width estimate without moving the sides or changing the case outline. The handles are not load rated. Use them for an empty case only until tested. Check the power switch and all purchased hardware for fit.



Purchased components & assembly orientation

Current model views show the approved architecture; component envelopes are not detailed OEM replicas.

Purchased item	Quantity	Status / gate
PV0F24011 + supplied nut / O-ring	1	Insulated PWR_SW pair
Newnex U4S5C01C08-010 / 1 m	2	Panel-C female → C male
Delock 67234	2	One Type-E host per C
Newnex USR2-AA-1M / 1 m	2	Panel-A female → A male
Delock 82941 / 45 cm	1	19-pin → two A females
FRONTX P0902_036 / 914.4 mm	1	Rear stereo pass-through
140 × 140 × 25 fans, 124.5 pitch	2	Bottom and rear targets
120 × 120 × 25 fan, 105 pitch	1	Optional F01 module
Real full-height PCI blank covers	7 less occupied	Gauge tips and notches
Releasable 2.5 mm ties / broad straps	8 / 6	Cushion + abrasion sleeves
Bonding lug / contact hardware	1 set	Electrical qualification
1 mm fascia back pads, 2 × 12	4	Captive; no structural glue
2 mm GPU pad, 12 × 20 nominal	1	Optional contact gate

INTERNAL / EXPLODED: CURRENT MODEL



Fasteners, shims, gasket, bosses and standoffs are on the hardware and sheet-part planning BOM pages. The current carrier uses ordinary M3×10 through-bolts; no welding is needed. The full I/O BOM is the default; mutually exclusive variants change quantities as tabulated later.

Compatibility targets: not qualified combinations

Retail examples below illustrate individual dimensions only; they are not approved bills of computer components.

System	Target / reserve	Retail dimensional example	Selection gate
Motherboard	ATX 304.8 × 243.84; microATX; Mini-ITX	Select the actual board drawing and mounting subset.	Socket, RAM, VRM, rear shield and header locations.
GPU	340 length × 150 projection × 65 thick; 35 connector reserve	NVIDIA RTX 4080 Founders Edition: 304 × 137 × 61 mm (maker dimensions).	Real bracket gauge, plug bend radius and support contact.
CPU cooler	170 height target from board component envelope	Noctua NH-D15 165 mm height with fans (maker nominal).	RAM clearance may raise fans; check socket position.
PSU	ATX, 140–180 depth + 60 front cable reserve	Corsair RM750e (2023): 150 × 86 × 140 mm.	Exact revision, rear hole hand and allowed screw penetration.
Fans	Two 140 × 140 × 25; optional 120 × 120 × 25	Noctua NF-A14 PWM: 140 × 140 × 25, 124.5 pitch.	Actual hole passage, head size and finished stack.
SSD	One 7 mm-class 2.5-inch; 69.85 × 100 body envelope	Samsung 870 EVO: 100 × 69.85 × 6.8 mm.	Bottom boss pattern, screw limit, plug size and seating.

Electrical resources are not interchangeable

Two Type-C ports require TWO independent Type-E / Key-A headers or a qualified add-in controller. No passive Y splitter. No Thunderbolt, USB4 or Power Delivery claim.

Check before ordering

Use exact product revision drawings and samples. Retail dimensions above do not establish combined fit, cooling, cable routing or a modern GPU bracket interface. See references and the physical qualification checklist.

Retail dimensional references: nvidia.com (RTX 4080 FE); noctua.at (NH-D15, NF-A14 PWM); corsair.com (RM750e 2023); semiconductor.samsung.com (870 EVO). Verify exact revision.

Sheet-part planning bill of materials

Provisional developed sizes, not cutting patterns. The 18 IDs / 19 instances include three optional parts.

ID	Qty	Material	t (mm)	Reference developed size (mm)	Set
S01-S02	2	5052-H32 aluminium	1.5	410.0000 × 521.2264	Main
W01	1	mild steel	1	338.0611 × 1238.0503	Main
I01	1	aluminium	1	46.0000 × 168.0000	Main
C01	1	mild steel	1	20.0000 × 38.2305	Main
C02	1	mild steel	1	20.0000 × 38.2305	Main
C03	1	mild steel	1	20.0000 × 38.2305	Main
C04	1	mild steel	1	20.0000 × 38.2305	Main
T01	1	mild steel	1	16.0000 × 29.7305	Main
T02	1	mild steel	1	16.0000 × 29.7305	Main
M02	1	mild steel	1	151.0000 × 42.4982	Main
M03	1	mild steel	3	14.0000 × 151.0000	Main
F01	1	mild steel	1	120.0000 × 176.2305	Optional
I02	1	mild steel	1	180.0000 × 115.4611	Main
G01	1	mild steel	3	24.0000 × 182.0973	Optional
G02	1	mild steel	3	20.0000 × 109.0973	Optional
M01	1	mild steel	1	277.0000 × 479.4611	Main
R01	1	mild steel	1	298.0000 × 431.0000	Main
I03	1	mild steel	1	68.0000 × 88.0000	Main

Ancillary requirements: ten SH01 conductive shims, nominal 0.2 mm (Ø8 / Ø3.4), and one GSK01 closed-cell fascia gasket, nominal 0.5 mm. Default full I01 is supplied in STEP. One-C, power-only and blank faces are documented configurations, not alternate STEP or cutting files. Coupon pages are provisional shop references. Finish: sand sleds / charcoal wrap; mask required contacts.

Hardware bill of materials: 1 / 3

Quantities shown or required, including optional assemblies. Full per-item qualification remains in hardware-bom.csv.

Hardware description	Qty
9.525 mm female-M3 / male-M3 x 5 standoff	9
Bond lug washer	1
Bond stud M4 nut	1
Bottom fan M4 nut	4
Bottom fan M4 washer	4
Bottom 140 M4 x 35	4
Dedicated chassis bonding M4 x 10	1
Delock 67234 Type-E Key A male 20 p to USB-C female	2
Delock 82941 19 p female to two USB-A female 45 cm	1
E-Switch PV0F24011 existing power switch	1
FRONTX P0902_036 (P0902-036) 36 in stereo panel female to male	1
Fascia captive compression pad 1 mm	4
Fascia captive perimeter gasket 0.5	1
GPU contact pad 2 mm	1
GPU ledge M4 nut	2
GPU ledge clamp M4 x 12	2

Hardware description	Qty
GPU ledge washer	2
GPU post floor M4 x 10	2
GPU post floor nut	2
GPU post washer	2
I/O carrier 2.5 mm spacer	2
I/O carrier removable M3 nut	2
I/O carrier washer	2
I/O shell M3 x 10 pan screw	2
IO I03 attachment M3 x 6 ISO7380-1	4
IO M3 flat washer OD7 ID3.4 x 0.5	12
IO M3 plain nut AF5.5 H2.4	4
IO broad cushioned hook-loop service/connector straps	6
IO module M3 x 4 ISO7380-1	8
IO protective cable sleeves / split abrasion wrap	1
IO releasable nylon ties width 2.5 mm	8
Newnex U4S5C01C08-010 panel-C female to C male 1 m	2

Nominal fastener envelopes, not OEM models. Verify head height, usable thread and actual stack. PCB screw / locknut positions A,C,F,G,H,J,K,L,M are the depicted ATX subset; do not install unused standoffs.

Hardware bill of materials: 2 / 3

Quantities shown or required, including optional assemblies. Full per-item qualification remains in hardware-bom.csv.

Hardware description	Qty
Newnex USR2-AA-1M panel-A female to A male 1 m	2
Optional bracket nut	2
Optional bracket roof M3 x 8	2
Optional bracket washer	2
Optional fan M4 nut	4
Optional fan M4 washer	4
Optional fan M4 x 35	4
PCB M3 x 6 A	1
PCB M3 x 6 C	1
PCB M3 x 6 F	1
PCB M3 x 6 G	1
PCB M3 x 6 H	1
PCB M3 x 6 J	1
PCB M3 x 6 K	1
PCB M3 x 6 L	1
PCB M3 x 6 M	1

Hardware description	Qty
PCI bracket-notch M3 washer	7
PCI nutstrip end M3 x 5	2
PCI rail to rear M3 x 10	2
PCI rear 2 mm spacer	2
PCI rear nut	2
PCI rear washer	2
PCI retention M3 x 6	7
PSU 8 mm blind-M3 support	4
PSU rear #6-32 x 1/4 nominal envelope	4
PSU support M3 x 6	4
Purchased standard full-height PCI slot blank covers	7
Rear audio grommet nominal 12 mm panel hole	1
Rear clip M3 x 8	4
Rear clip nut	4
Rear clip washer	4
Rear fan M4 nut	4

Nominal fastener envelopes, not OEM models. Verify head height, usable thread and actual stack. PCB screw / locknut positions A,C,F,G,H,J,K,L,M are the depicted ATX subset; do not install unused standoffs.

Hardware bill of materials: 3 / 3

Quantities shown or required, including optional assemblies. Full per-item qualification remains in hardware-bom.csv.

Hardware description	Qty
Rear fan M4 washer	4
Rear 140 M4 x 30	4
SSD bottom M3 x 4	4
Side captive RRE03-1	10
Side captive conductive shim 0.2	10
Side removable M3 x 8	10
Standoff locknut A	1
Standoff locknut C	1
Standoff locknut F	1
Standoff locknut G	1
Standoff locknut H	1
Standoff locknut J	1
Standoff locknut K	1
Standoff locknut L	1
Standoff locknut M	1
Tray angle M3 x 8	2

Hardware description	Qty
Tray angle nut	2
Tray angle washer	2
Tray back M3 x 8	2
Tray back nut	2
Tray back washer	2
Tray service M3 x 8	4
Tray service nut	4
Tray service washer	4
Wrap clip M3 x 8	4
Wrap clip nut	4
Wrap clip washer	4

Nominal fastener envelopes, not OEM models. Verify head height, usable thread and actual stack. PCB screw / locknut positions A,C,F,G,H,J,K,L,M are the depicted ATX subset; do not install unused standoffs.

Fastener stacks & access: 1 / 2

All lengths and engagements are nominal millimetres; purchased hardware and finished stacks must be measured.

Joint	Hardware	Stack / engagement	Access / qualification
Sides → wrap	10 M3×8; 10 RRE03-1; 10 shims	1.5 side + 0.7 head/shim gap + 1 flange; 4.8 useful engagement	Outside ±X. Qualify insert upset and finished shim stack.
Rear → wrap via C clips	8 M3×8 / washers / nuts	Two 1 mm sheets + 0.5 washer + 2.4 nut; 3.1 tip	Roof, floor, rear and open sides.
Tray flanges → wrap	4 M3×8 / washers / nuts	Two 1 mm sheets + 0.5 washer + 2.4 nut	External driver, left-side spanner. Nuts not captive.
Tray → rear via T clips	4 M3×8 / washers / nuts	Two 1 mm sheets per joint + 0.5 washer + 2.4 nut	Rear / component side; cable-side nut.
PCI rail → rear	2 M3×10; 2 mm spacers; washers / nuts	1 + 2 + 1 + 0.5 + 2.4 = 6.9; 3.1 tip	Rear access.
M03 strip → M02	2 M3×5	1 rail + 3 tapped strip; 3 engagement / 1 tip	+X outside rail. Nine holes tapped M3×0.5.
PCI covers / card → rail	7 M3×6; Ø7 washers	1 nominal cover + 0.5 washer + 1 rail + 3 strip = 5.5; 0.5 tip	+X rail. Real notch / locating-tip gauge first.
Fascia capture	0.5 gasket; four 1 mm pads	Face Y−197.5…−196.5; pads to carrier Y−195.5	Remove carrier from right interior; no structural adhesive.
I02 → wrap	2 ordinary M3×10; 2.5 spacers; washers / nuts	1 + 2.5 + 1 + 0.5 + 2.4 = 7.4; 2.6 tip	Front driver / right-side nut. NO WELDING.
F01 → roof (optional)	2 M3×8 / washers / nuts	1 roof + 1 bracket + 0.5 washer + 2.4 nut	Roof driver / side spanner. Remove as module.
120 fan → F01 (optional)	4 M4×35 / 0.8 washers / 3.2 nuts	25 + 1 + 0.8 + 3.2 = 30; 5 tip	Bench assembly. 3 mm head leaves 0.5 to side.

Keep nuts and tool approach accessible during assembly. Isolate power before service. Use appropriate removable locking where specified; do not infer a universal tightening torque from the nominal CAD envelopes.

Fastener stacks & access: 2 / 2

All lengths and engagements are nominal millimetres; purchased hardware and finished stacks must be measured.

Joint	Hardware	Stack / engagement	Access / qualification
G01 → floor (optional)	2 M4×10 / washers / nuts	1 floor + 3 foot + 0.8 + 3.2 = 8; 2 tip	Floor driver / open right side; shared 54 mm slot.
G02 → G01 (optional)	2 M4×12 / washers / nuts	3 ledge + 3 post + 0.8 + 3.2 = 10; 2 tip	Open right side; 2 mm nonconductive contact pad.
PSU supports → floor	4 M3×6; Ø8 × 8 blind-M3 bosses	1 floor + 5 thread; 6 bore depth / 2 top wall	Underside. Supports top Z34; never drill PSU.
PSU → rear	4 #6-32 UNC × 1/4 inch	1 rear sheet; 5.35 nominal PSU penetration	Rear. Actual PSU permitted depth is mandatory.
SSD → tray	4 M3×4	1 tray gives 3 nominal drive penetration	Before board. Check drive limit; no extra nuts.
Standoffs → tray	9 male-M3×5; 9 locknuts	1 tray + 2.4 nut; 1.6 tip; 9.525 stand height	Cable side before board; only actual board subset.
Board → standoffs	9 M3×6	1.6 PCB gives 4.4 female engagement	Component side; supplier bore / thread depth gate.
Bottom 140 fan → floor	4 M4×35 / 0.8 washers / 3.2 nuts	1 + 25 + 0.8 + 3.2 = 30; 5 tip	Underside / open case.
Rear 140 fan → rear	4 M4×30 / 0.8 washers / 3.2 plain nuts	1 + 25 + 0.8 + 3.2 = 30; nominal flush	No thick nyloc. M4×35 clashes with optional bridge.
Bond lug → rear	M4×10; suitable conductive lug / washer / nut	Dedicated Ø4.5, X130 / Z250	Rear / open side. Check actual lug thickness and engagement.

Keep nuts and tool approach accessible during assembly. Isolate power before service. Use appropriate removable locking where specified; do not infer a universal tightening torque from the nominal CAD envelopes.

Build sequence: qualify, form, assemble

Do not start a full case cut until the process and physical-interface gates pass.

01 Qualify the process

Cut coupons in actual material, grain direction, tooling and finish. Establish inside radius, K, springback and joggle offsets. Verify segmented-tool access for the 1238.0503 mm wrap. Laser or CNC metal cutting requires suitable metal tooling, workholding and chip control, not a generic wood router.

02 Cut, deburr and form

Use shop-developed and qualified cutting patterns, not PDF traces. Deburr handles, grille webs, cable exits and PCI pockets. Form opposite-handed sleds. Preform all ten wrap ears downward; then joggle, floor and roof. Form tray, clips, carrier and selected optional supports to their section views.

03 Prepare threads and finish

Finish-drill and tap all nine M03 holes M3×0.5 through 3 mm steel; do not use the 1 mm rail as a structural tap. Fit-test before coating. Mask shield bands and bonding contacts. Check finished Ø5 insert pilots and Ø12.1 power-switch hole.

04 Fit inserts while access is open

Set ten RRE03-1 inserts in the fixed wrap ears, never through removable sides. The CAD shows only unset envelopes. Qualify nose access, bulb formation, spin resistance, mandrel travel and repeated removal before closing the chassis.

05 Join the chassis

Bolt four C clips between rear and wrap. Attach tray flanges with four M3 joints and connect rear through two T clips. Keep side access for plain nuts. Install M03 behind M02, then attach rail to rear on its spacers; dry-gauge the real covers/card.

06 Fit supported components

Install PSU bosses and bottom fan, standoffs and SSD before the motherboard. Check screw penetration and seating. Use only the selected board mounting subset. Install rear fan with M4×30 plain-nut stack; longer rear screws interfere with the optional bridge.

Complete the build & preserve service access

These sequences are practical access plans, not an automated assembly-sweep validation.

07 Complete I/O pod

Bench-assemble I03, USB modules and washers to I02; fit audio with its supplied nut and retain the power switch. Trial plug insertion and screw bottoming. Capture I01 with the 0.5 mm gasket and four 1 mm pads. Refit I02 on the existing two M3×10 joints at X68/132, Z336, with 2.5 mm spacers. See I/O stack sheets.

08 Optional modules and GPU

Bench-assemble the optional 120 mm fan to F01, then attach the whole unit to the roof. Install GPU / real bracket; adjust G01/G02 only to a stiff, nonfan card surface. A 2 mm insulating pad contacts the nominal Z195 underside. It is not a shipping restraint.

09 Wiring, bonding and closure

Strain-relieve harnesses at carrier Ø3 tie points. Keep leads clear of fans; verify SATA connector space above Z300. Preserve PSU earth; never open or drill the PSU. Test continuity of chassis, both sleds, tray and carrier after finish. Add serviceable bonding braids if the electrical review requires them.

Fit nominal 0.2 mm conductive shims over 0.5 mm insert heads to close the 0.7 mm side gap. Do not pull the sled planes inward to hide a bad coated stack.

Tray removal

Isolate power and disconnect external cables. Remove side panels, unplug internal leads and remove GPU/support as needed. Release rear shield and cables, the two T connections and four flange bolts. Move forward enough to disengage rear interfaces, then extract through the open side; never force a connected board sideways.

Fascia / fan service

With the right side off, hold the two front screw heads and undo interior carrier nuts. Unplug and release restrained leads; withdraw the cage/face inward and service all module screws and nuts on the bench. Remove optional fan roof connections and service the fan/bracket on the bench, rather than reaching through its frame.

Before energizing or handling

Check fastener tips, cable insulation, grommet retention, grounding and actual selected-component fit. Run controlled loaded thermal tests after electrical checks. Handles are UNRATED: empty-case handling only until a controlled proof/load programme establishes a limit.

Source interfaces & controlling assembly datums

Global axes: front −Y, rear +Y, up +Z, motherboard component side +X. Do not substitute aperture centres for retention axes.

Hole	Y (global)	Z (global)
A	189.7318	141.51
B	189.7318	220.25
C	189.7318	265.97
F	166.8718	423.45
G	34.7918	141.51
H	34.7918	265.97
J	34.7918	423.45
K	-37.5982	141.51
L	-37.5982	265.97
M	-37.5982	423.45
R	34.7918	199.93
S	34.7918	220.25

All 12 tray positions are retained. Depicted ATX installs A,C,F,G,H,J,K,L,M only. Historical B and microATX R/S are not populated under that board. Check the actual motherboard subset; unused standoffs can short a PCB.

ATX / shield interface

A = (Y189.7318, Z141.51), NOT Z146.51. PCB Z125…429.8; rear Y199.8918; rear inner Y202; gap 2.1082. Tray component face X−116.5; PCB underside X−106.975, top X−105.375; 9.525 standoff height.

Rear I/O opening

X−109.2102…−64.7602; Z273.4884…432.2384. Opening 44.45 × 158.75, corner R0.8 in 1 mm steel. Preserve ATX’s 2.54 mm clear band on BOTH faces and mask coating. Source opening tolerance ±0.2032 and datum-chain tolerances apply; no blanket shop tolerance overrides them.

PCI retention and physical gauge

Seven screw axes: Y206.1148, Z147.4841 + n × 20.32 (n = 0…6). Aperture centres instead use Z139.1656 + n × 20.32. M03 lies Y203…217, X−1.7677…1.2323; outer retention face X2.2323. End fixings: Y214, Z130 / 272. Rear slit: X1…4.2, Z124…277 for Ø7 washers. Original M02 bracket reliefs remain.

PSU handed pattern / gauge stop

External AC-face source maps as X = 95 − drawing X; Z = 34 + drawing Y. Global (X,Z): (−49,114), (89,114), (89,50), (−25,40). Do not flip the PSU and assume this asymmetric pattern still fits. PCI legacy setback chains differ 0.4572 mm: gauge real cover/card locating tips and notches; if failed, revise rear, rail and tray tip-pocket set together before cutting.

Nominal clearances & physical fit gates

Values are current digital envelope separations, not tolerances or guarantees of detailed retail component fit.

Measured nominal separation	mm
PCB rear → rear inner	2.1082
PCB top → roof inner	27.2
GPU front → upper front inner	57.8918
GPU 35 reserve → side inner	63.875
170 cooler tip → side inner	70.875
170 cooler tip → optional fan	42.375
170 cooler tip → optional bracket	41.375
Optional fan frame → rear fan frame	7
Optional fan pan head → side	0.5
Bottom fan → front inner	8
Bottom fan → PSU 60 reserve	16
SSD body → left side inner	19
GPU support foot → bottom fan (X)	6

SSD: relocated clear of standoff L

Body Y60…129.85, Z200…300, X−124.5…−117.5; relocated 104.065 mm rearward. Bottom holes Y64.065 / 125.785, Z286 / 209.4: 61.72 × 76.6. Rows 14 / 90.6 from connector-end Z300. Inferred 4.065 edge offset and drive boss seating require a sample.

Fan: small finished clearance

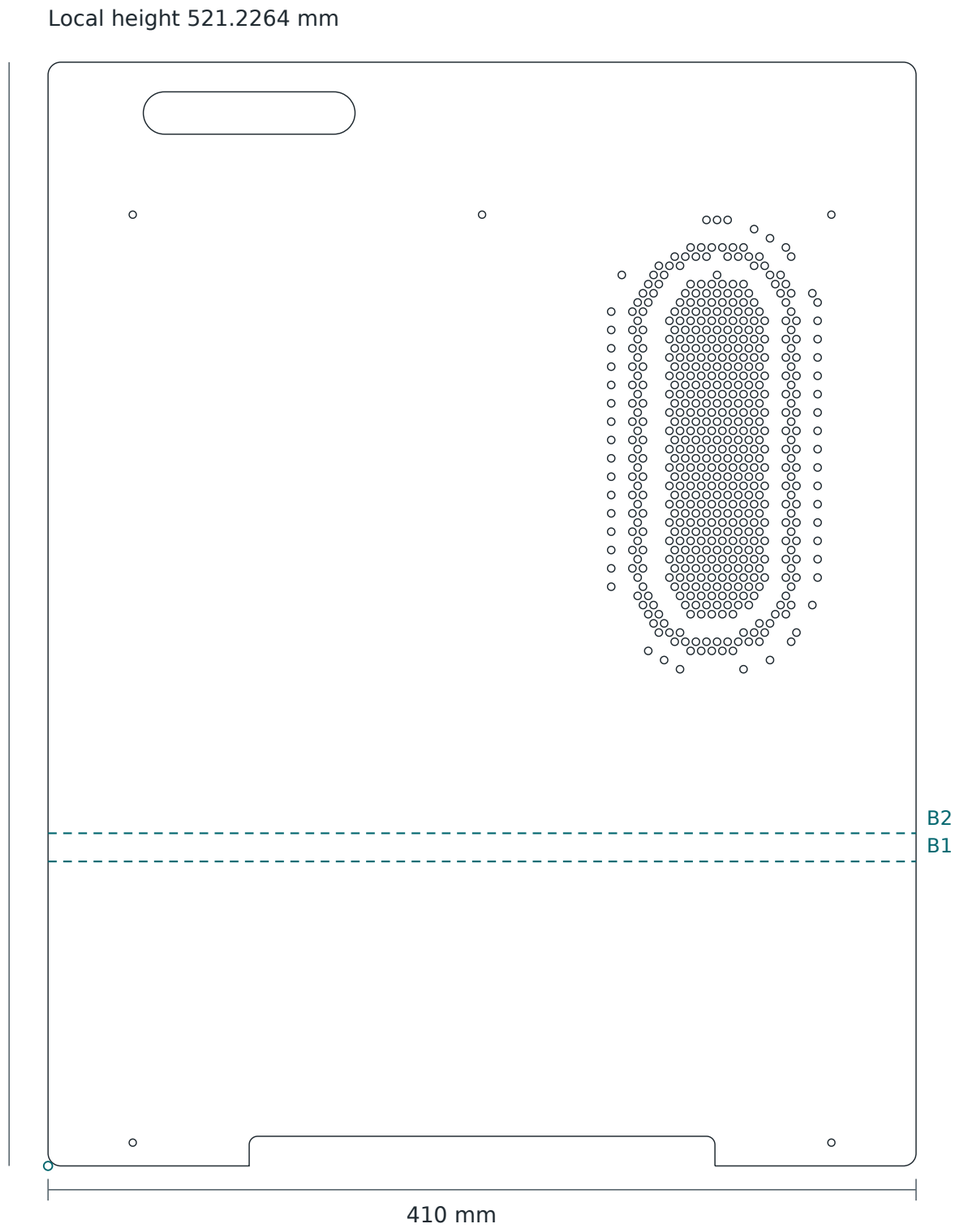
Optional fan frame X115…140; bracket X114…115. Ordinary 3 mm heads reach X143, leaving only 0.5 mm to the inner side at X143.5 before finish. Verify actual heads, coating and fan thickness. Rear M4×30 stack must give full plain-nut engagement.

What remains unknown

PSU support contact passes digitally for 140 / 160 / 180 mm depth. No reserve collisions are reported. Real socket, RAM, VRM, plugs, cables and GPU contact surfaces require physical checks. Integrated I/O uses published bounds plus explicit allocations; these are not OEM-exact bodies. Four SSD and four PSU fastener intrusions are intentional reference-envelope overlaps, not waived penetration limits.

S01-S02 / Sand sled right / radiused joggle

5052-H32 aluminium . t = 1.5 mm . quantity 2 . REFERENCE development only . no cutting file; do not scale the PDF



+local X →, +local Y ↑ | O = lower-left local (0,0)

REFERENCE DATUM & LEGEND

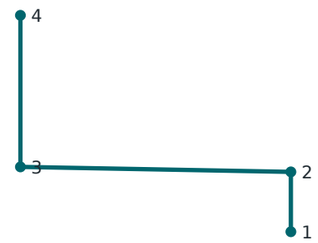
Raw local origin = (-205, 0). local = raw − origin.
u=global Y; v=developed upward from Z0

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

Cut TWO identical blanks; form OPPOSITE hands. Right outside planes X151 / 145; left X−151 / −145. Preserve the 6 mm joggle and original handle / 546 grille bores per side. Handles are unrated.

B / step	Turn	R / K / BA	local axis
B1 / 1	26.5651°	2.25 / 0.4 / 1.3214	(0, 143.7754) → (410, 143.7754)
B2 / 2	-26.5651°	2.25 / 0.4 / 1.3214	(0, 157.0968) → (410, 157.0968)

ASSEMBLED SECTION / XZ

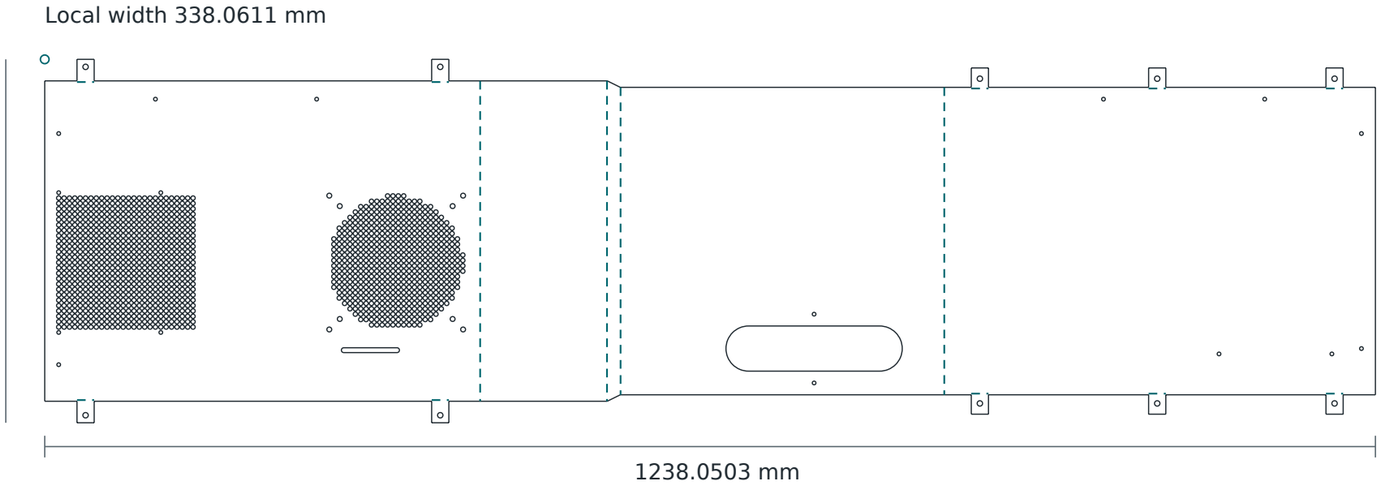


Schematic, not to scale
Virtual midline vertices
1: 150.25, 0
2: 150.25, 143.8229
3: 144.25, 155.8229
4: 144.25, 520
Tangency radii per table.

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

W01 / Single charcoal wrap / four main bends and ten downward ears

mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF



REFERENCE DATUM & LEGEND

Raw local origin = (-169.0305, 0). local = raw − origin.
u=global X; v follows floor rear to front, then upward, then roof toward rear

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

One continuous wrap. All ten ears fold DOWN in the assembled case; roof ears lie below the roof. Form ears first, front joggle next, floor then roof. Detailed 14-bend schedule follows the main drawing sheets.

14 bends: see dedicated wrap forming sheet. The two opposed low-angle bends are closely spaced in this overview.

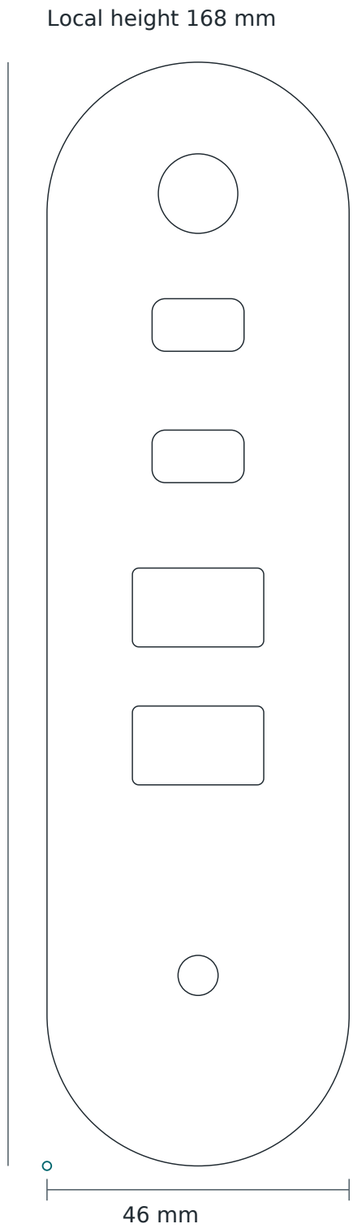
Ø	local X	local Y
5	7	38
5	7	368
5	331.0611	38
5	331.0611	368
5	18	870.0503
5	18	1035.0503

ROTATED: +local X ↓, +local Y → | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

I01 / Full 2C / 2A / stereo audio / power fascia

aluminium . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF



+local X →, +local Y ↑ | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

REFERENCE DATUM & LEGEND

Raw local origin = (77, 252). local = raw − origin.
u=global X; v=global Z; visible plane Y-197.5

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

Full 2C/2A/stereo/power; 46 × 168 flange behind 42 × 164 shell opening. C14×8 R2; A20×12 R1 are designer access cuts. Audio Ø6.1; power Ø12.1. Finished audio panel STRICTLY <1.2. Global port centres and rear mounting on I/O sheets.

NO BENDS: FLAT PART

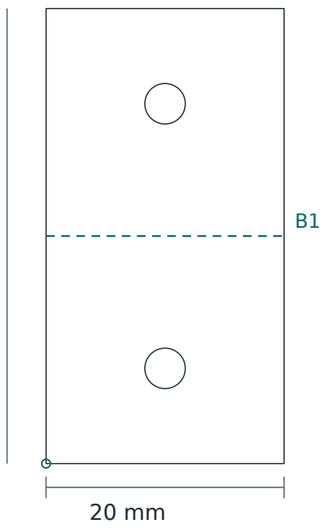
Ø	local X	local Y
6.1	23	29
12.1	23	148

C01 / Rear to floor angle

mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF

Ø	local X	local Y
3.4	10	8
3.4	10	30.2305

Local height 38.2305 mm



REFERENCE DATUM & LEGEND

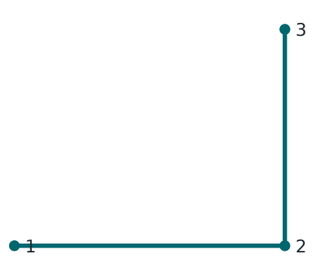
Raw local origin = (-10, 0). local = raw − origin.
u=X-center; v=from Y182 toward rear then along Z

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

One M3 joint per leg, with through screws, washers and accessible nuts. Form to the assembled section shown; preserve the identified floor / roof / tray hand. See joint schedule for service access.

B / step	Turn	R / K / BA	local axis
B1 / 1	90°	1 / 0.42 / 2.2305	(0, 19.1153) → (20, 19.1153)

ASSEMBLED SECTION / YZ



Schematic, not to scale
Virtual midline vertices
1: 182, 26.5
2: 201.5, 26.5
3: 201.5, 46
Tangency radii per table.

+local X →, +local Y ↑ | O = lower-left local (0,0)

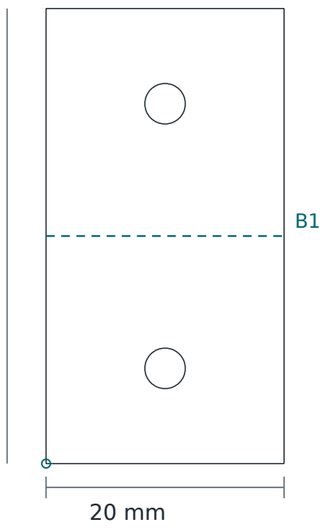
B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

C02 / Rear to floor angle

mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF

Ø	local X	local Y
3.4	10	8
3.4	10	30.2305

Local height 38.2305 mm



REFERENCE DATUM & LEGEND

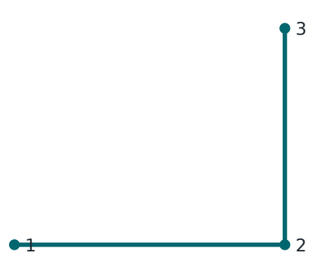
Raw local origin = (-10, 0). local = raw − origin.
u=X-center; v=from Y182 toward rear then along Z

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

One M3 joint per leg, with through screws, washers and accessible nuts. Form to the assembled section shown; preserve the identified floor / roof / tray hand. See joint schedule for service access.

B / step	Turn	R / K / BA	local axis
B1 / 1	90°	1 / 0.42 / 2.2305	(0, 19.1153) → (20, 19.1153)

ASSEMBLED SECTION / YZ



Schematic, not to scale
Virtual midline vertices
1: 182, 26.5
2: 201.5, 26.5
3: 201.5, 46
Tangency radii per table.

+local X →, +local Y ↑ | O = lower-left local (0,0)

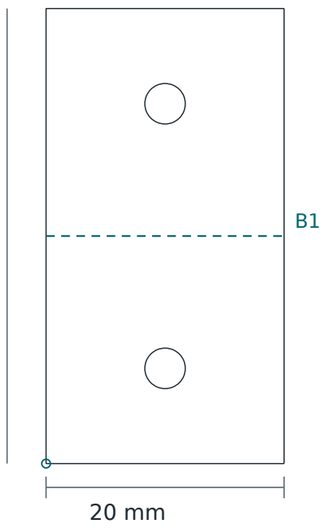
B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

C03 / Rear to roof angle

mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF

Ø	local X	local Y
3.4	10	8
3.4	10	30.2305

Local height 38.2305 mm



REFERENCE DATUM & LEGEND

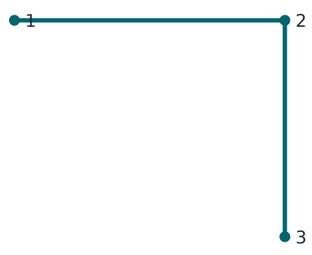
Raw local origin = (-10, 0). local = raw − origin.
u=X-center; v=from Y182 toward rear then along Z

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

One M3 joint per leg, with through screws, washers and accessible nuts. Form to the assembled section shown; preserve the identified floor / roof / tray hand. See joint schedule for service access.

B / step	Turn	R / K / BA	local axis
B1 / 1	-90°	1 / 0.42 / 2.2305	(0, 19.1153) → (20, 19.1153)

ASSEMBLED SECTION / YZ



Schematic, not to scale
Virtual midline vertices
1: 182, 456.5
2: 201.5, 456.5
3: 201.5, 437
Tangency radii per table.

+local X →, +local Y ↑ | O = lower-left local (0,0)

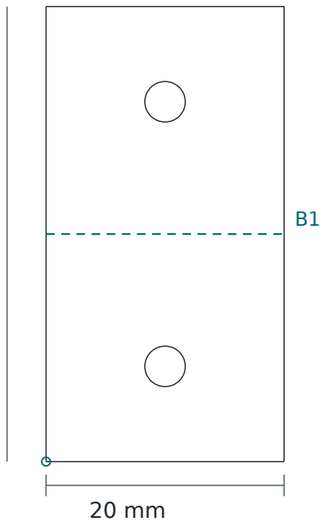
B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

C04 / Rear to roof angle

mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF

Ø	local X	local Y
3.4	10	8
3.4	10	30.2305

Local height 38.2305 mm



REFERENCE DATUM & LEGEND

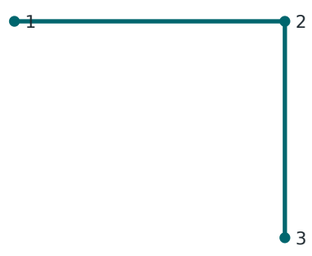
Raw local origin = (-10, 0). local = raw − origin.
u=X-center; v=from Y182 toward rear then along Z

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

One M3 joint per leg, with through screws, washers and accessible nuts. Form to the assembled section shown; preserve the identified floor / roof / tray hand. See joint schedule for service access.

B / step	Turn	R / K / BA	local axis
B1 / 1	-90°	1 / 0.42 / 2.2305	(0, 19.1153) → (20, 19.1153)

ASSEMBLED SECTION / YZ



Schematic, not to scale
Virtual midline vertices
1: 182, 456.5
2: 201.5, 456.5
3: 201.5, 437
Tangency radii per table.

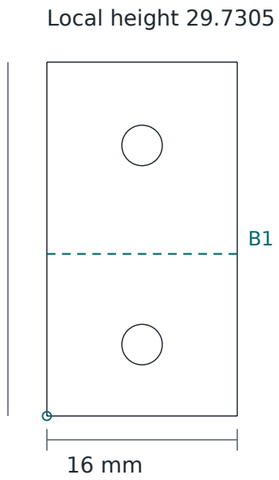
+local X →, +local Y ↑ | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

T01 / Tray rear service angle

mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF

Ø	local X	local Y
3.4	8	6
3.4	8	22.7305



REFERENCE DATUM & LEGEND

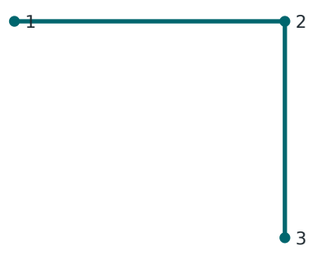
Raw local origin = (-8, 0). local = raw − origin.
u=Z-center; v cross-section path

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

One M3 joint per leg, with through screws, washers and accessible nuts. Form to the assembled section shown; preserve the identified floor / roof / tray hand. See joint schedule for service access.

B / step	Turn	R / K / BA	local axis
B1 / 1	-90°	1 / 0.42 / 2.2305	(0, 13.6153) → (16, 13.6153)

ASSEMBLED SECTION / XY



Schematic, not to scale
Virtual midline vertices
1: -132, 201.5
2: -118, 201.5
3: -118, 185
Tangency radii per table.

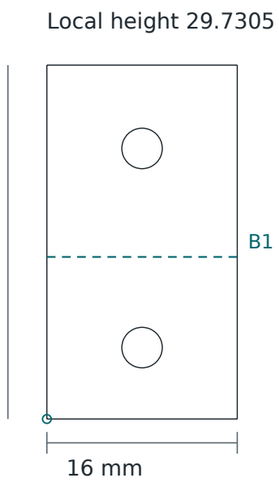
+local X →, +local Y ↑ | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

T02 / Tray rear service angle

mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF

Ø	local X	local Y
3.4	8	6
3.4	8	22.7305



REFERENCE DATUM & LEGEND

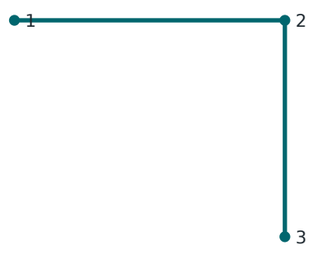
Raw local origin = (-8, 0). local = raw − origin.
u=Z-center; v cross-section path

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

One M3 joint per leg, with through screws, washers and accessible nuts. Form to the assembled section shown; preserve the identified floor / roof / tray hand. See joint schedule for service access.

B / step	Turn	R / K / BA	local axis
B1 / 1	-90°	1 / 0.42 / 2.2305	(0, 13.6153) → (16, 13.6153)

ASSEMBLED SECTION / XY



Schematic, not to scale
Virtual midline vertices
1: -132, 201.5
2: -118, 201.5
3: -118, 185
Tangency radii per table.

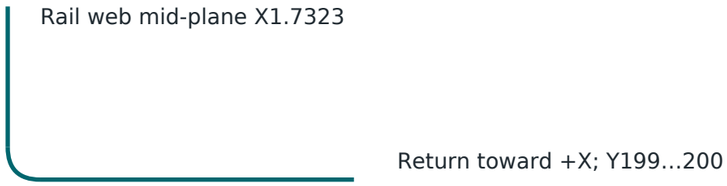
+local X →, +local Y ↑ | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

M02 / 1mm PCI formed interface with clearance holes

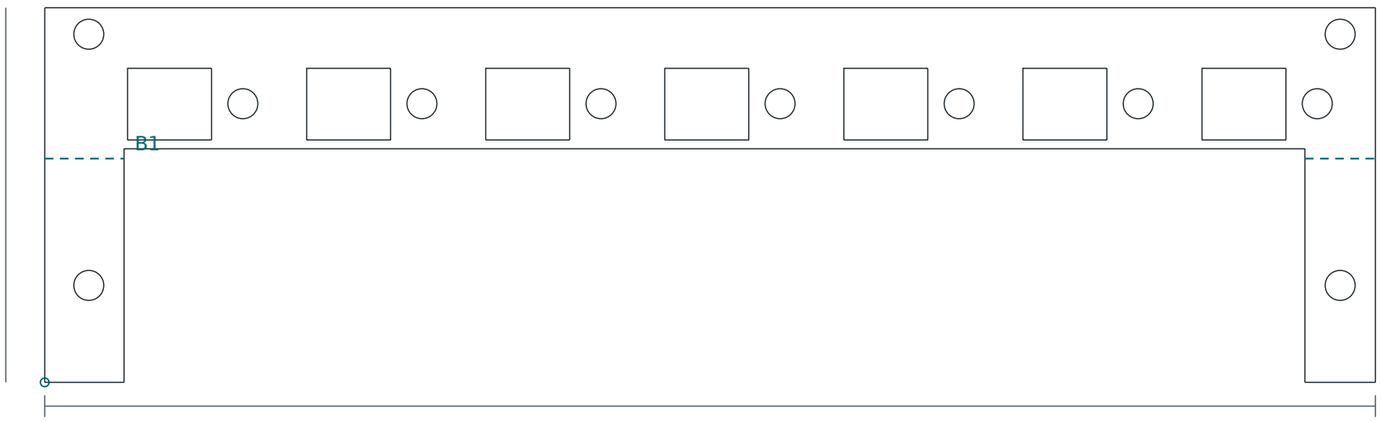
mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF

END-RETURN SECTION / XY: SCHEMATIC



+X → +Y ↑ / rear wall inner Y202; 2 mm spacer to return

Local height 42.4982 mm



REFERENCE DATUM & LEGEND

Raw local origin = (125, -26.4982). local = raw − origin.
u=global Z; v=Y-201 on rail web; negative v develops terminal ears

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

Keep original bracket-relief profiles. Seven retention axes Y206.1148, Z147.4841 + n20.32, not aperture centres. Two end-return bend segments share an axis. Real cover/GPU gauge is mandatory for the 0.4572 mm legacy discrepancy.

B / step	Turn	R / K / BA	local axis
B1 / 1	90°	1 / 0.42 / 2.2305	(0, 25.383) → (9, 25.383); (143, 25.383) → (151, 25.383)

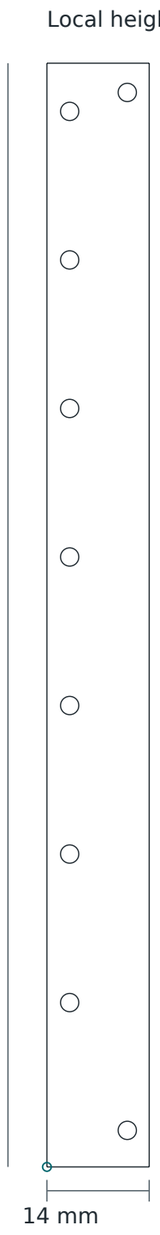
FORM DIRECTION: rail web is the YZ plane at X1.7323 mid-thickness. End returns extend toward +X to meet the rear interface. Preserve the radiused ends and bracket reliefs. Use the assembly STEP in CAD/ for the full formed interface and gauge the purchased bracket before cutting.

+local X →, +local Y ↑ | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

M03 / 3mm steel M3 tapped PCI nutstrip

mild steel . t = 3 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF



REFERENCE DATUM & LEGEND

Raw local origin = (203, 125). local = raw − origin.
u=global Y; v=global Z

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

Finish-drill and tap all NINE Ø2.5 pilots M3×0.5 through 3 mm steel. Seven retention axes and two separate end fixings; strip lies entirely rearward at Y203…217. Do not tap the 1 mm rail as structure.

NO BENDS: FLAT PART

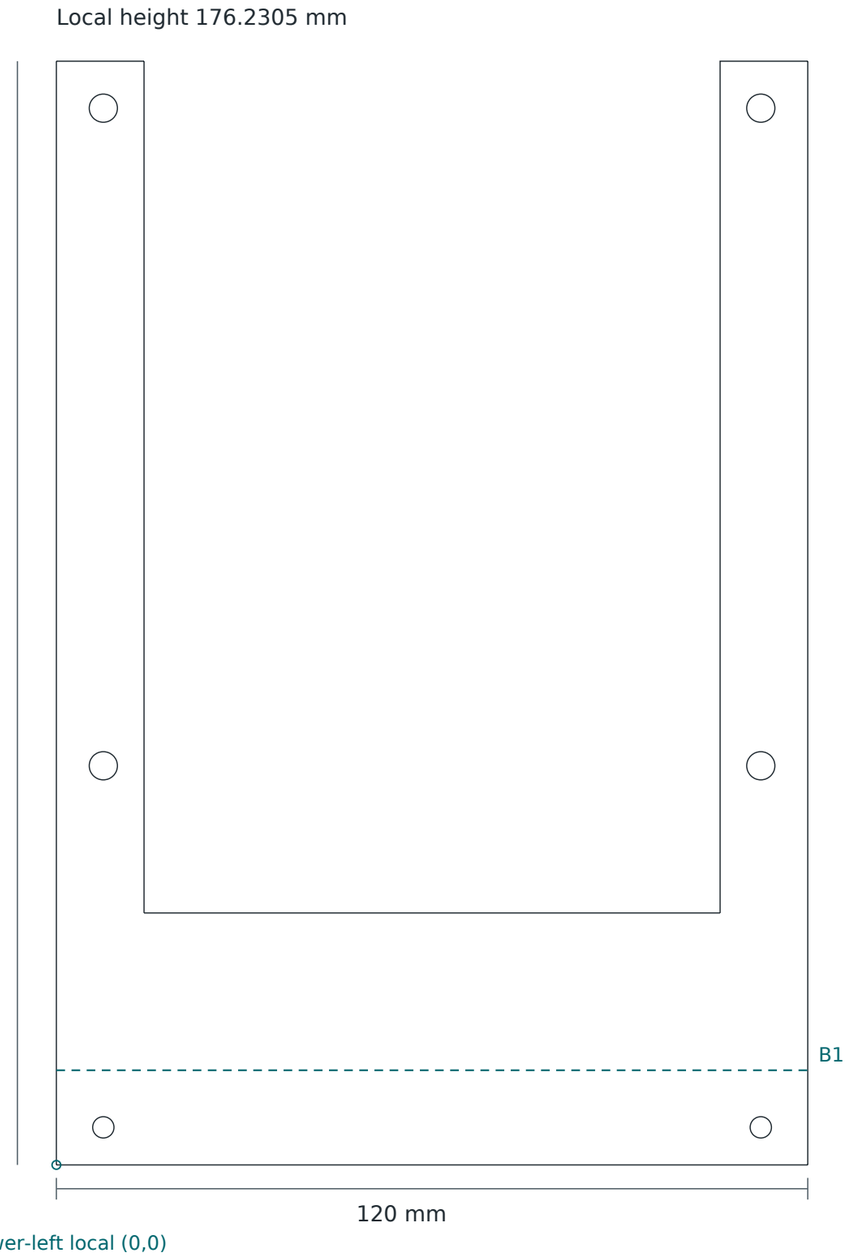
Ø	local X	local Y
2.5	3.1148	22.4841
2.5	3.1148	42.8041
2.5	3.1148	63.1241
2.5	11	5
2.5	3.1148	83.4441
2.5	3.1148	103.7641

+local X →, +local Y ↑ | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

F01 / Removable120 side fan bridge

mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF



+local X →, +local Y ↑ | O = lower-left local (0,0)

REFERENCE DATUM & LEGEND

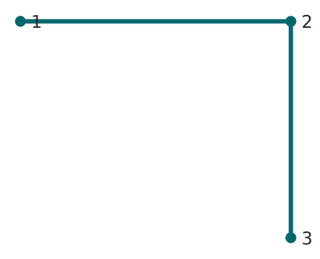
Raw local origin = (50, 0). local = raw − origin.
u=Y; v roof inward edge to downward legs

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

OPTIONAL. Bench-mount 120 mm fan with four M4×35, then two M3 roof joints. Frame X115…140; ordinary head to side only 0.5 mm before finish. Remove whole module for service.

B / step	Turn	R / K / BA	local axis
B1 / 1	-90°	1 / 0.42 / 2.2305	(0, 15.1153) → (120, 15.1153)

ASSEMBLED SECTION / XZ

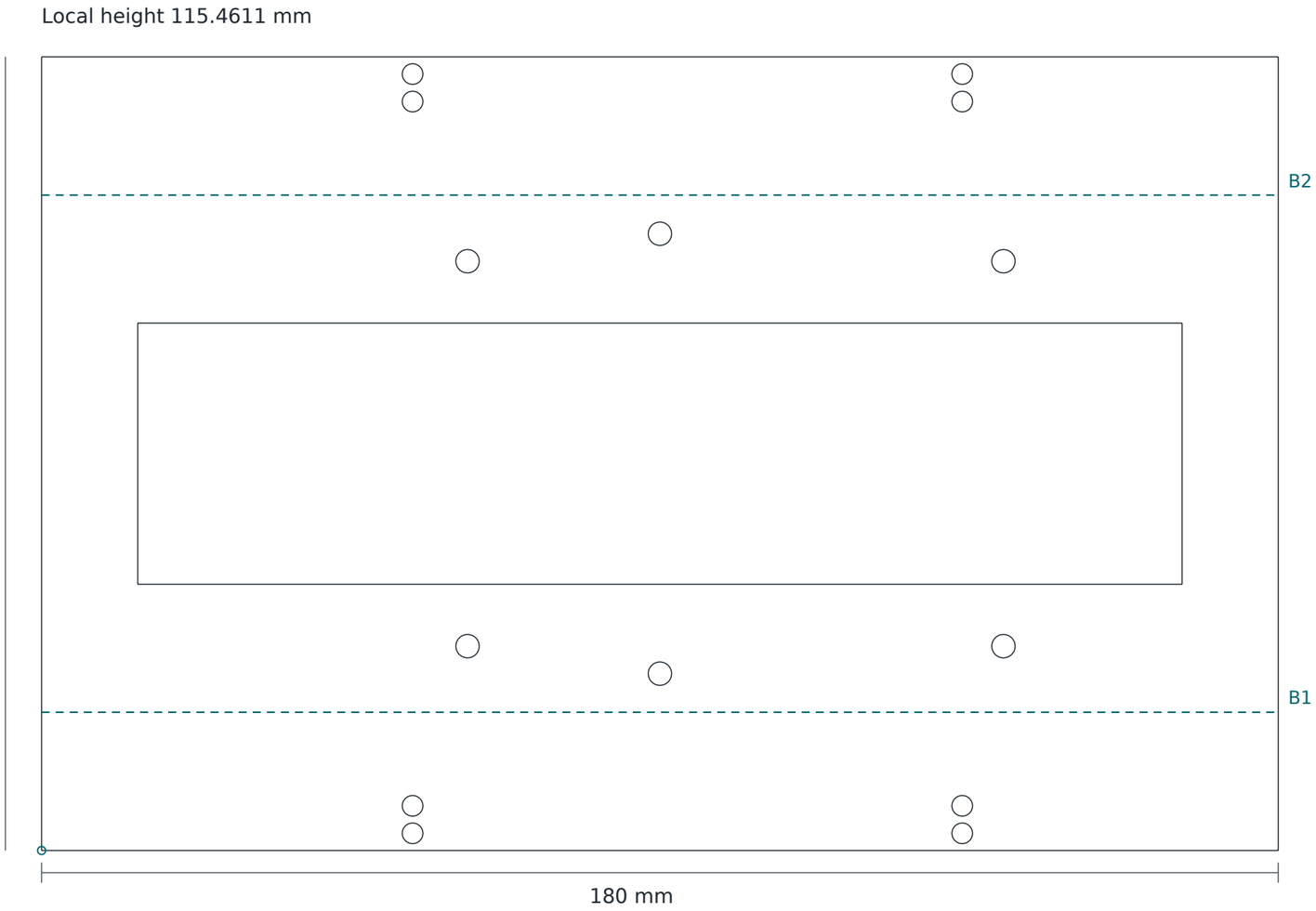


Schematic, not to scale
Virtual midline vertices
1: 99, 456.5
2: 114.5, 456.5
3: 114.5, 295
Tangency radii per table.

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

I02 / Concealed folded carrier / common I03 ladder attachment

mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF



REFERENCE DATUM & LEGEND

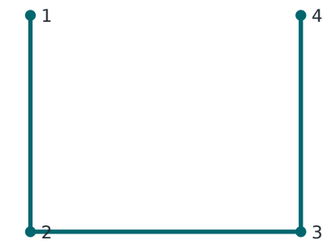
Raw local origin = (246, 0). local = raw − origin.
u=global Z; v from left rear return around front to right rear return

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

Existing shell joints X68/132,Z336 retained: two M3×10 with 2.5 spacers. Four added Ø3.4 holes X72/128,Z308/386 match I03. Use the reference local coordinates and formed STEP. No welding or additional shell holes.

B / step	Turn	R / K / BA	local axis
B1 / 1	90°	1 / 0.42 / 2.2305	(0, 20.1153) → (180, 20.1153)
B2 / 2	90°	1 / 0.42 / 2.2305	(0, 95.3458) → (180, 95.3458)

ASSEMBLED SECTION / XY



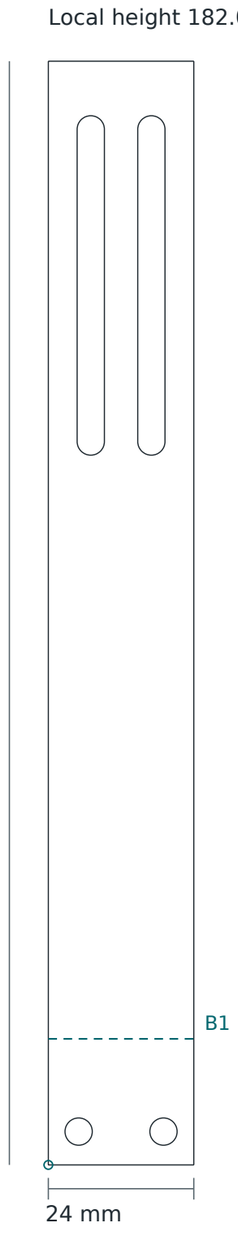
Schematic, not to scale
Virtual midline vertices
1: 62, -174.5
2: 62, -195
3: 138, -195
4: 138, -174.5
Tangency radii per table.

+local X →, +local Y ↑ | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

G01 / Optional GPU support post

mild steel . t = 3 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF



REFERENCE DATUM & LEGEND

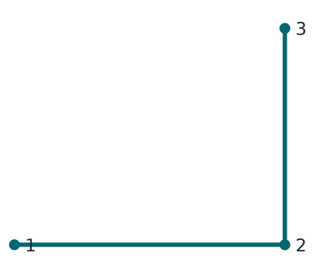
Raw local origin = (-112, 0). local = raw − origin.
u=Y; v from X96 base toward post then upward

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

OPTIONAL. Two M4×10 floor bolts share a 54 mm adjustment slot. Foot starts X96, 6 mm clear of bottom fan. Test stiffness and card contact; no transport or lifting rating.

B / step	Turn	R / K / BA	local axis
B1 / 1	90°	3 / 0.4 / 6.5973	(0, 20.7987) → (24, 20.7987)

ASSEMBLED SECTION / XZ



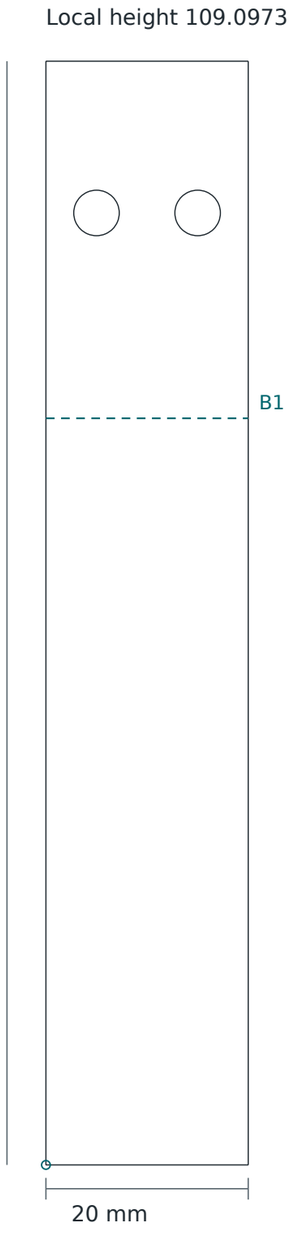
Schematic, not to scale
Virtual midline vertices
1: 96, 27.5
2: 118, 27.5
3: 118, 190
Tangency radii per table.

+local X →, +local Y ↑ | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

G02 / Adjustable GPU ledge

mild steel . t = 3 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF



REFERENCE DATUM & LEGEND

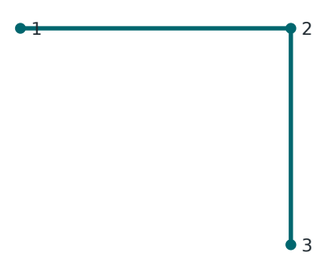
Raw local origin = (-110, 0). local = raw − origin.
u=Y; v fromX40 ledge tip towardpost then down

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

OPTIONAL. Clamp to G01 with two M4×12. Top Z193 + 2 mm insulating pad to nominal GPU underside Z195. Contact only a stiff nonfan surface; remove if unsuitable.

B / step	Turn	R / K / BA	local axis
B1 / 1	-90°	3 / 0.4 / 6.5973	(0, 73.7987) → (20, 73.7987)

ASSEMBLED SECTION / XZ



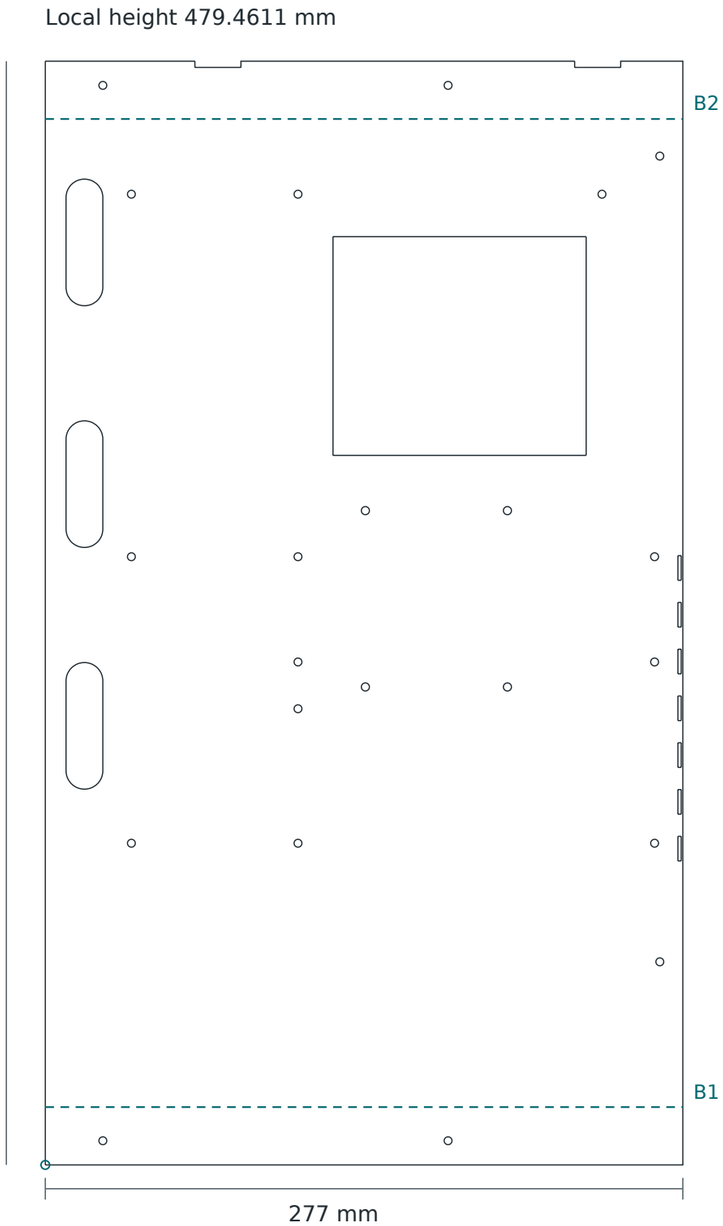
Schematic, not to scale
Virtual midline vertices
1: 40, 191.5
2: 115, 191.5
3: 115, 155
Tangency radii per table.

+local X →, +local Y ↑ | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

M01 / Removable motherboard tray / radiused channel

mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF



+local X →, +local Y ↑ | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

REFERENCE DATUM & LEGEND

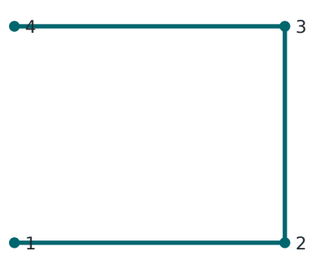
Raw local origin = (-75, 0). local = raw − origin.
u=global Y; v follows bottom flange to tray up and across top flange

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

Plain clearance holes only; 9.525 mm standoffs need rear locknuts. Fit only actual board subset. SSD holes and all 12 board datums are maintained. Upper-flange reliefs clear downward wrap ears. Remove GPU / cables before tray extraction.

B / step	Turn	R / K / BA	local axis
B1 / 1	90°	1 / 0.42 / 2.2305	(0, 25.1153) → (277, 25.1153)
B2 / 2	90°	1 / 0.42 / 2.2305	(0, 454.3458) → (277, 454.3458)

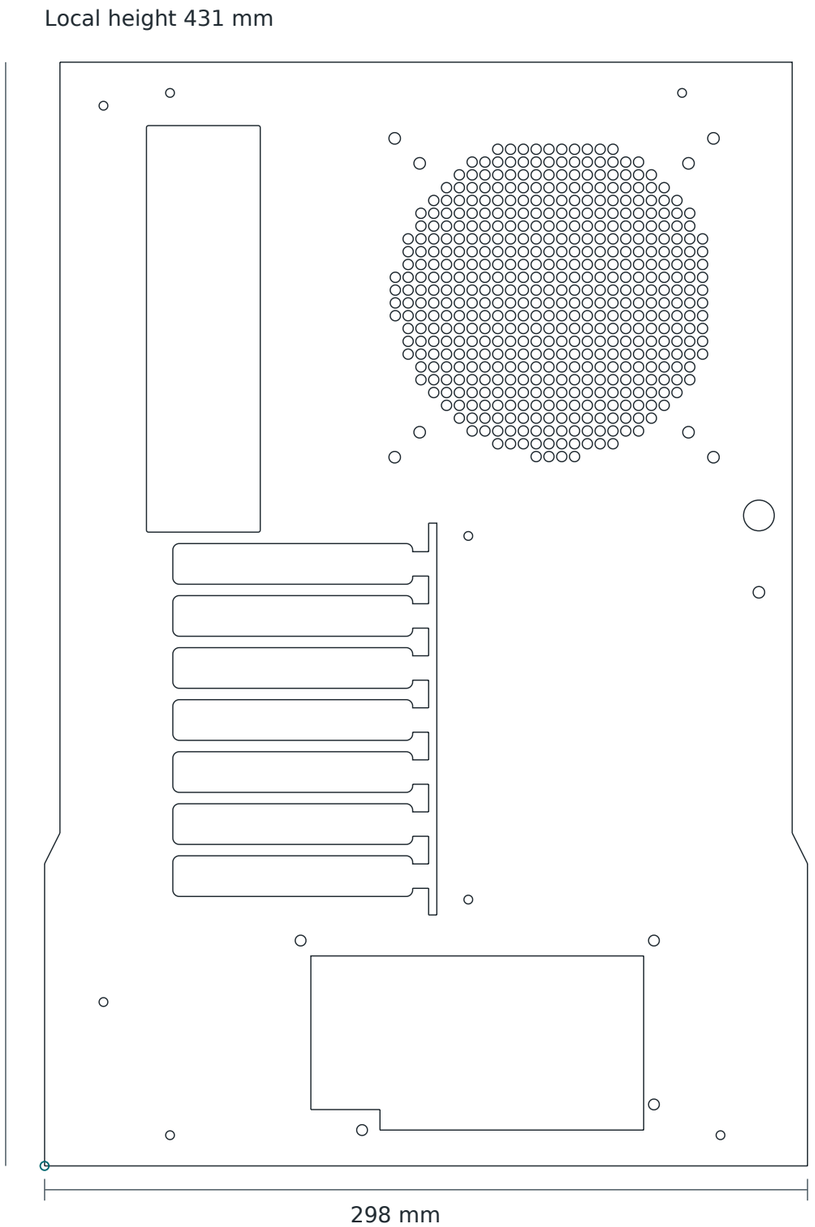
ASSEMBLED SECTION / XZ



Schematic, not to scale
Virtual midline vertices
1: -142.5, 26.5
2: -117, 26.5
3: -117, 456.5
4: -142.5, 456.5
Tangency radii per table.

R01 / Rear hardware interface / fastened to wrap and tray

mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF



+local X →, +local Y ↑ | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

REFERENCE DATUM & LEGEND

Raw local origin = (-149, 26). local = raw − origin.
u=global X; v=global Z

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

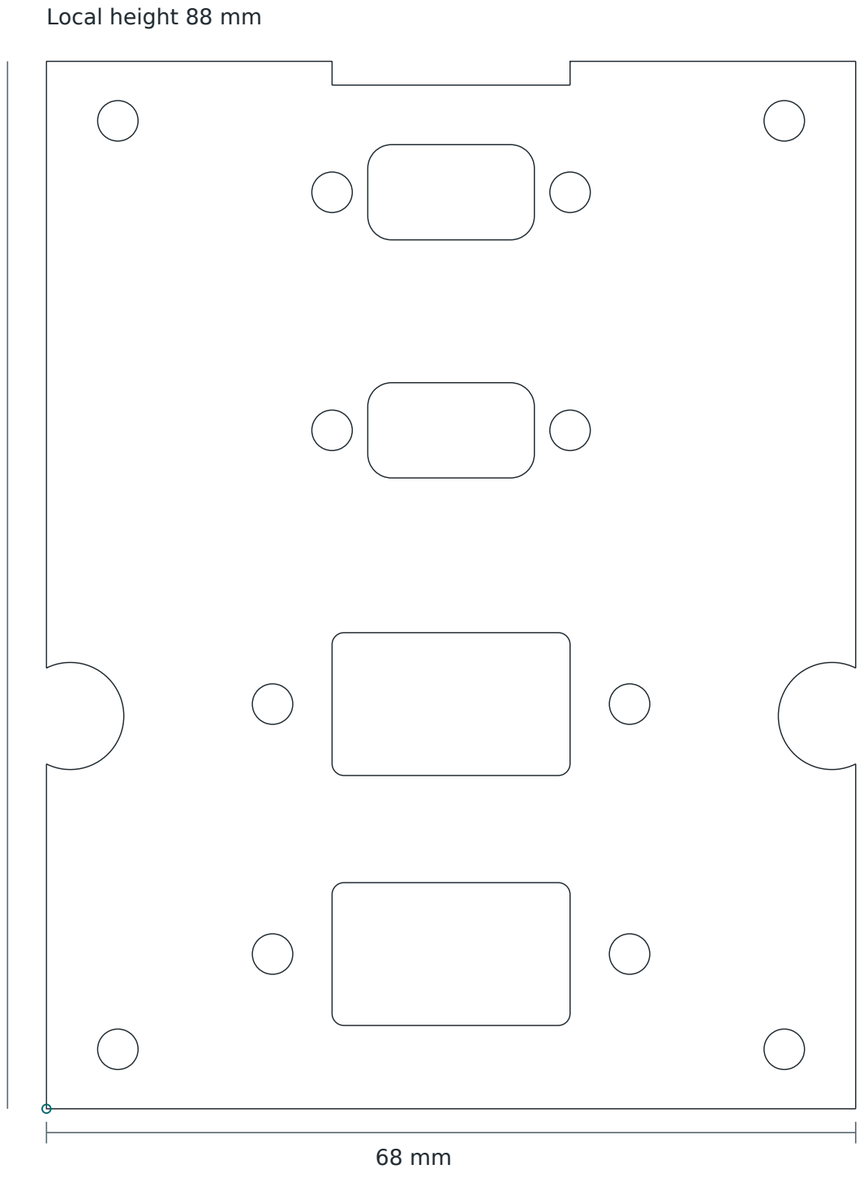
Rear inner plane Y202. Shield clear band 2.54 mm each face; mask coating. PCI clearance slit X1…4.2, Z124…277 clears Ø7 washers without moving apertures. Protected Ø12 audio exit X130/Z280 and bonding hole X130/Z250.

NO BENDS: FLAT PART

Ø	local X	local Y
4.5	136.75	401.25
4.5	146.5	391.5
4.5	136.75	276.75
4.5	146.5	286.5
4.5	251.5	391.5
4.5	261.25	401.25

I03 / Common concealed USB ladder / 1mm steel

mild steel . t = 1 mm . quantity 1 . REFERENCE development only . no cutting file; do not scale the PDF



REFERENCE DATUM & LEGEND

Raw local origin = (66, 303). local = raw − origin.
u=global X; v=global Z

Black = nominal development outline / holes. Teal dashed = provisional neutral-BA bend midlines. Reference only, not NC authority. Develop and qualify shop patterns from formed STEP and dimensions.

One common 68×88×1 steel plate. R4.5 open-edge scallops at X68/132,Z336 clear existing cage hardware. Top 20×2 notch clears power-tool allocation. Twelve Ø3.4 holes; no taps or bends. See I/O matching-hole table and concealed button-head stacks.

NO BENDS: FLAT PART

ALL 12 HOLES / Ø3.4

Group	local X pair	local Y pair
Attach	6 / 62	5 / 83
C module	24 / 44	57 / 77
A module	19 / 49	13 / 34

Each row is all four X × Y combinations. Global coordinates = local + (66,303). Matching carrier holes are on the neutral-developed I02 flat.

+local X →, +local Y ↑ | O = lower-left local (0,0)

B = sheet-local bend index. Turn is SIGNED PATH-TURN, not an automatic UP/DOWN code. Use assembled section, axes and mirror hand; R/K/springback require shop coupons.

W01 / Complete forming schedule

Four main bends + ten ears. R = inside radius; K = provisional neutral factor; BA = neutral allowance. Reference local development coordinates only.

Axis / hand	Step	Turn °	R / K / BA	local start (X,Y)	local end (X,Y)
Ear 1 / left / Y-165 roof	1	90	1 / 0.42 / 2.2305	(27.1153, 862.0503)	(27.1153, 878.0503)
Ear 2 / left / Y-165 floor	1	90	1 / 0.42 / 2.2305	(21.1153, 360)	(21.1153, 376)
Ear 3 / left / Y0 roof	1	90	1 / 0.42 / 2.2305	(27.1153, 1027.0503)	(27.1153, 1043.0503)
Ear 4 / left / Y165 roof	1	90	1 / 0.42 / 2.2305	(27.1153, 1192.0503)	(27.1153, 1208.0503)
Ear 5 / left / Y165 floor	1	90	1 / 0.42 / 2.2305	(21.1153, 30)	(21.1153, 46)
Ear 6 / right / Y-165 roof	1	-90	1 / 0.42 / 2.2305	(310.9458, 862.0503)	(310.9458, 878.0503)
Ear 7 / right / Y-165 floor	1	-90	1 / 0.42 / 2.2305	(316.9458, 360)	(316.9458, 376)
Ear 8 / right / Y0 roof	1	-90	1 / 0.42 / 2.2305	(310.9458, 1027.0503)	(310.9458, 1043.0503)
Ear 9 / right / Y165 roof	1	-90	1 / 0.42 / 2.2305	(310.9458, 1192.0503)	(310.9458, 1208.0503)
Ear 10 / right / Y165 floor	1	-90	1 / 0.42 / 2.2305	(316.9458, 30)	(316.9458, 46)
Main 1	4	-90	1 / 0.42 / 2.2305	(20.0305, 405.1153)	(318.0305, 405.1153)
Main 2	2	-18.4349	1 / 0.42 / 0.4569	(20.0305, 523.1344)	(318.0305, 523.1344)
Main 3	3	18.4349	1 / 0.42 / 0.4569	(26.0305, 535.7536)	(312.0305, 535.7536)
Main 4	5	-90	1 / 0.42 / 2.2305	(26.0305, 836.935)	(312.0305, 836.935)

Actual assembled fold direction

All ten ears point DOWN (−Z), including those at the roof. Their opposite signed angles distinguish left/right path hand, not up/down. Fixed flange outer X planes are ±142.8 upper / ±148.8 lower. Ear pilots assemble at Y−165/0/165, Z448 upper and Y−165/+165, Z11 lower.

Form order: ears → lower joggle → upper joggle → floor → roof. Confirm brake / segmented-finger access before the full wrap cut. No weld studs are used.

YZ SECTION: +Y → / +Z ↑



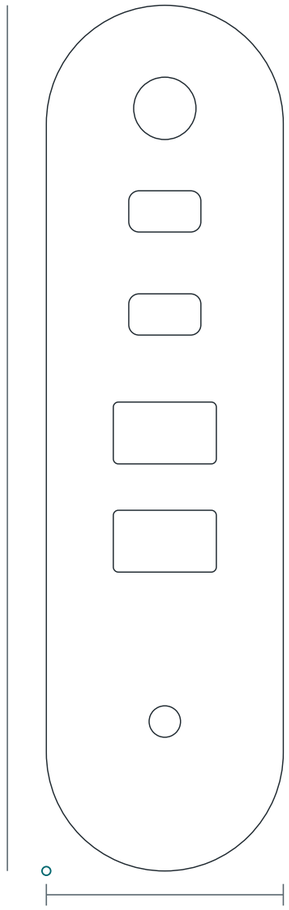
Front planes Y−203 / −199
Floor outside Z25
Roof outside Z458
Lower width 298
Upper width 286
Joggle offset 4
Taper only on straight inclined web.

Front I/O: completed pod & matching interfaces

Reference development drawings; global interfaces in io-interfaces.json. Formed STEP is supplied, not cutting patterns. Do not scale the PDF.

I01 / FULL FASCIA

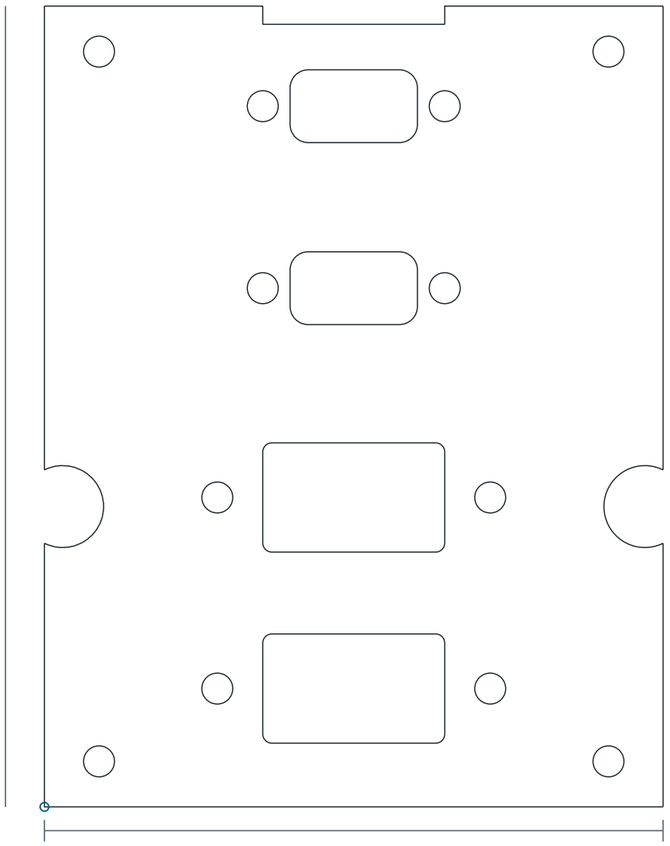
Local height 168 mm



+local X →, +local Y ↑ | O = lower-left local (0,0)

I03 / COMMON CONCEALED PLATE

Local height 88 mm



+local X →, +local Y ↑ | O = lower-left local (0,0)

GLOBAL MATCHING DATUMS / X,Z

Interface	Centres / cut
I01, all X100	P400; C380 / 360; A337 / 316; audio281
I02 ↔ I03	X72 / 128 × Z308 / 386; four Ø3.4
I03 ↔ C flanges	X90 / 110 × Z380 / 360; four Ø3.4
I03 ↔ A flanges	X85 / 115 × Z337 / 316; four Ø3.4
Retained cage joints	X68 / 132, Z336; R4.5 scallops around hardware
Top notch bounds	X90…110; Z389…391

Plug access is a design allocation

C14 × 8 R2; A20 × 12 R1. Trial C hoods ≤12.2 × 6.4; A ≤18 × 10. C rectangular hood corners have ~0.37 mm nominal clearance, not a coated-tolerance guarantee. Larger / locking hoods need separate qualification.

I01 1 mm aluminium; finished audio panel STRICTLY <1.2 mm. I03 one 68 × 88 × 1 mm steel plate, no bends or taps. The top 20 × 2 notch and two R4.5 edge scallops are actual cut geometry, not separate crossbars.

I02 window X81…119 / Z260…412 and shell joints are unchanged. See reference panel sheets and formed STEP; no flat cutting files.

I/O exploded section: concealed ordinary hardware

Exploded offset-section schematic through mounting axes: spacing exaggerated; labelled global Y planes control. Heads are hidden by fascia / wrap in the assembled case.

I01 / 1 mm Al

Y−197.5…−196.5

I02 / 1 mm steel

Y−195.5…−194.5

I03 / 1 mm steel

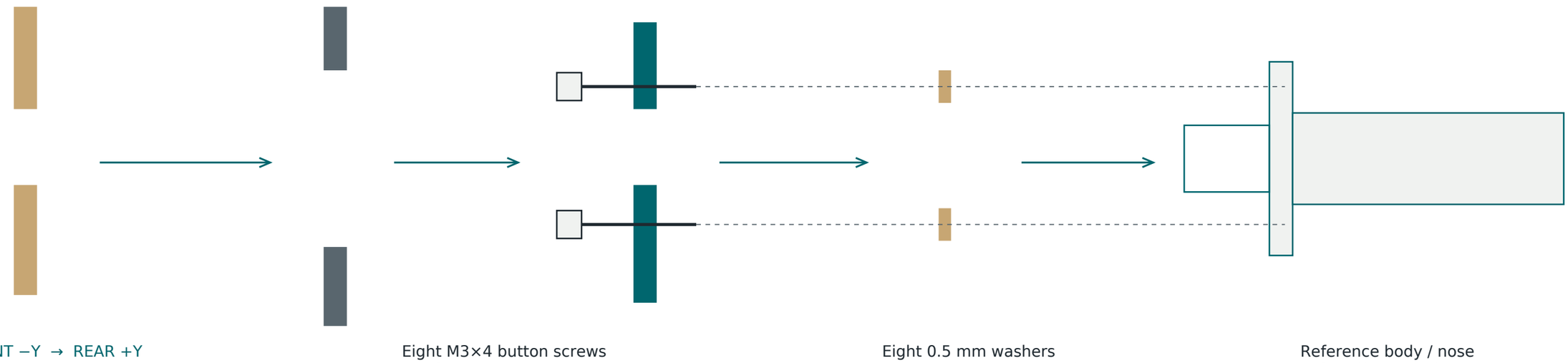
Y−194.5…−193.5

Spacer washers

0.5 → flange Y−193

USB module

Flange Y−193



FRONT −Y → REAR +Y
I02 window clears modules.

Eight M3×4 button screws
Front hex-key access on bench.

Eight 0.5 mm washers
Two under each module flange.

Reference body / nose
Not an OEM-exact model.

Module stack / finish-sensitive gap

M3×4 ISO 7380-1: head max Ø5.7 × 1.65. I03 1 + washer 0.5 → 2.5 nominal engagement into embedded M3 nut. Head front Y−196.15 clears I01 back by only 0.35. C nose Y−196.2 gives 1.3 recess. A forward projection is unpublished: 4.5 is a RESERVE recess, not an OEM-exact setback.

I03 attachment stack / concealed by wrap

Four M3×6 ISO 7380-1 through I02 + I03, rear 0.5 washer + plain 2.4 nut: 4.9 stack / 1.1 tip. Head Y−197.15 clears wrap inner Y−198 by 0.85. R4.5 scallops clear retained carrier hardware by 1 nominal; the top notch clears the R10 power-tool allocation by 1.

ASSEMBLY / SERVICE: deburr and trial first; attach I03 to removed I02, then modules; install audio / power on the removed face before closing the carrier. Capture I01 with existing gasket/pads, then refit carrier. Disconnect leads and release two existing I02 nuts to withdraw inward for bench service. Qualify coating, flatness, screw bottoming and actual power nut/tool; keep the Y−193 flange datum if factory screws/spacers are needed.

Typed electrical topology & mutually exclusive variants

Commercial passive extension / header-adapter architecture, NOT a direct harness or USB-IF-certified cable chain.

C1 / Z380	U4S5C01C08-010 / 1 m Panel-C female → C male	67234 C female → Type-E 20p male	Independent supported Type-E host #1
C2 / Z360	U4S5C01C08-010 / 1 m Panel-C female → C male	67234 C female → Type-E 20p male	Independent supported Type-E host #2
A1 + A2	2 × USR2-AA-1M / 1 m Panel-A female → A male	82941 / 45 cm incl. ends 2 A females → 19p female	One supported 19-pin host header / two A ports
Stereo	FRONTX P0902_036 3.5 mm female → male / 914.4 mm	Protected rear exit Supplied nut at fascia	Actual rear stereo output NOT HD_AUDIO / headset mic / amp
Power	PV0F24011 momentary Existing switch retained	Separate insulated pair Not mains or USB power	Actual motherboard PWR_SW pin pair

ONE FASCIA PER CASE / QUANTITIES FOR EACH CONFIGURATION

Reference fascia	C / A / audio / P	I03	67234 / 82941	M3×4 / spacers	I03 M3×6 / nut / washer
I01	2 / 2 / 1 / 1	1	2 / 1	8 / 8	4 / 4 / 4
I01-C1	1 / 2 / 1 / 1	1	1 / 1	6 / 6	4 / 4 / 4
I01-power-only	0 / 0 / 0 / 1	0	0 / 0	0 / 0	0 / 0 / 0
I00-fully-blank-option	0 / 0 / 0 / 0	0	0 / 0	0 / 0	0 / 0 / 0

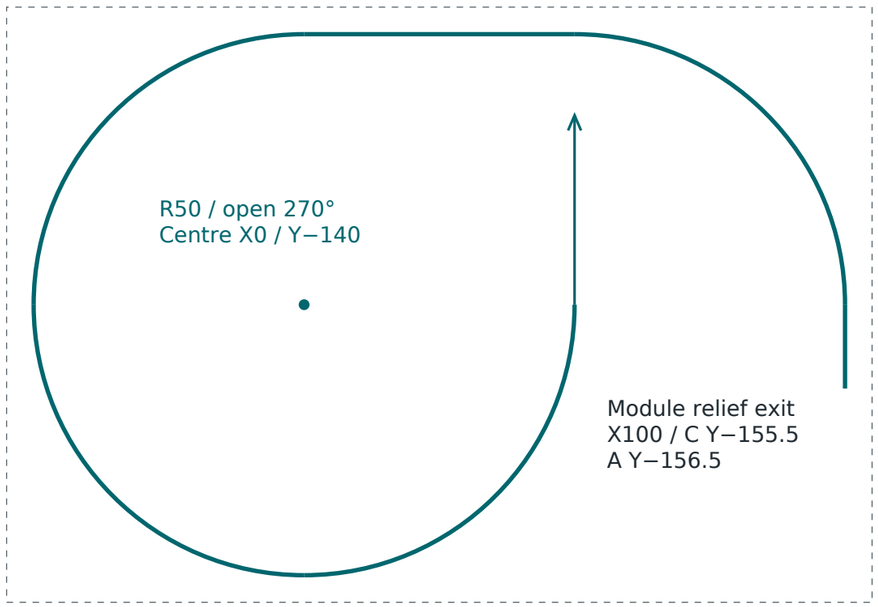
C1 keeps the upper C380; lower C360 is blank. Alternatives are reference configurations only, not supplied STEP or cuts. I02, gasket and pads remain. Omit absent-port cables / restraints. NO Y splitter, legacy-A-to-C-socket adapter or A-male/A-male cable. Standard 5 V only; no PD / Alt Mode / USB4 / Thunderbolt claim.

Cable paths, service loops & controlled rear exit

Construction paths are nonmaterial design allocations, excluded from solid STEP. They do not certify unplaced tails or vendor minimum bend radii.

USB ENTRY + ONE LOOP / TOP VIEW (+X →, +Y ↑)

Flexible tail → actual supported host location
Header positions are BOARD DEPENDENT.
Repeat at Z380, 360, 337 and 316.



USB swept loop bounds: X±55 / Y−195…−85. Reserve Ø10 around centreline; R50 and Ø10 are designer allocations, NOT OEM minimum bend / cable OD. Each OPEN 270° loop consumes 235.62 mm; ends X50/Y−140 without crossing its entry. A 1 m lead leaves ~619–620 mm after entry + loop; deduct provisional connector-end allowances of 85 C / 90 A → ~529–535 mm flexible tail, subject to actual length datum.

Secure the mating pairs and support the headers

Use existing I02 return holes: left X62 / Y−181,−177 / Z300,380 for a cushioned lacing spine. Four broad straps retain loops; two retain the A mated pairs in a tethered insulated cradle above the GPU. Supply 8 releasable 2.5 mm ties, 6 broad straps and protective sleeves. Support Type-E leads near actual headers; never lever the PCB sockets.

Audio / power lanes: right perimeter

Audio exits at (X100,Y−149.5,Z281), follows the protected right lane to rear X130/Z280 below the optional fan, then reaches the actual stereo output outside. Secure and sleeve the external run. Power has a separate insulated pair route to PWR_SW. Neither route is a safety-earth conductor.

REAR AUDIO: ASSEMBLE IN THIS ORDER

1 BARE Ø12

Remove split grommet; deburr. Pass hood ≤Ø11.

2 SPLIT ID9

Fit grommet around cable AFTER the plug passes.

3 RESTRAIN

Verify cable OD fit; sleeve and strain-relieve both sides.

Never force the plug through nominal ID9. Reject hoods >Ø11 under this design. Verify actual cable OD / bend radius, length and all final fan clearances. Continuous-route checks cover the shown allocations, not every board-specific tail; distribute slack in separate supported loops rather than tight coils.

I/O evidence, allocations & prototype acceptance

Public source links only. No supplier PDF / STEP is reproduced or relicensed; no dimensions are inferred by scaling photographs or drawings.

Selected item	Published controlling information	Explicit allocation / physical acceptance
Newnex C U4S5C01C08-010	30 × 8 flange; M3 pitch20; 3.2 nose; rear37.5 incl. Ø9.3 relief; 1 m. Male hood35 × 12.2 × 6.4. CC/VCONN + four SS pairs in wire table.	C body/relief partition, corners, mouth detail and flange thickness are not OEM-exact. Confirm plug insertion, all 4 local C orientations (2 rear × 2 front) and actual thread bottoming. Nominal recess1.3; C hood limit12.2 × 6.4.
Newnex A USR2-AA-1M	Catalogue links USR2-A family: flange38.5 × 13.7; M3 pitch30; nose width17.8; body26.5 / rear36.5; 1 m.	Retail variant must match family drawing. Forward projection unpublished: zero projection allocated → 4.5 RESERVE recess, not OEM-exact. A relief diameter and detailed mouth are allocations.
Delock 67234 / 82941	67234 approx18 × 15 × 7. 82941 dual A female / 19-pin female, 45 cm incl. connectors. Manufacturer-indexed nominal dimensions.	67234 + hood service reserve55 × 20 × 15; A cradle96 × 25 × 18. No OEM CAD or actual header positions claimed. Secure added connections and test the whole host chain.
FRONTX P0902_036	36 in / 914.4 mm; Ø6.1 hole; body Ø11.5 ×32 +15 relief. Supplied nut Ø8 ×1.8; exposed thread3.	Finished panel STRICTLY <1.2. Use supplied nut; thread designation unpublished. Nominal1 panel +1.8 nut leaves0.2 tip. Body ends Y−149.5. Rear-output stereo only.

PUBLIC PRIMARY / COMMERCIAL SOURCE LINKS

Newnex catalogue

Newnex C drawing / rev A

Newnex USR2-A family drawing

Selected USR2-AA-1M listing

Delock 67234 manufacturer sheet

Delock 82941 manufacturer sheet

FRONTX 36 in product

FRONTX audio dimensions

M3×4 button screw / TR00004815-000

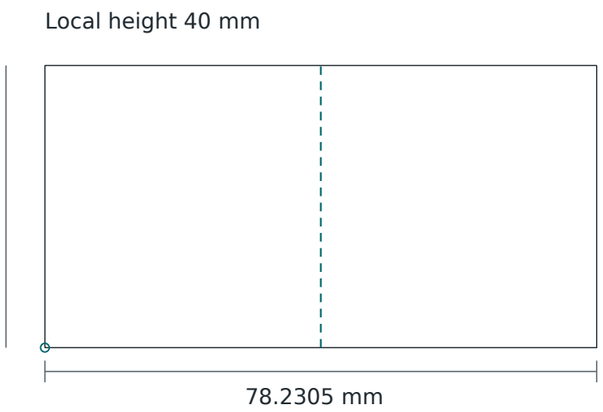
ACCEPTANCE: measure finished 0.35 / 0.85 head gaps, washer stack, screw engagement/bottoming, hood corners/recess and audio thickness. Test enumeration, speed, hot-plug, all 4 local C orientations (2 rear × 2 front) and host current budget. Component ratings do not establish chain performance. Mechanical, thermal, bonding and safety prototype checks remain mandatory.

Process coupons & qualification: 1 / 2

REFERENCE coupon examples, not supplied cutting files. Develop shop patterns; record material, tooling, springback, finish and results.

QC01-steel-R1

1 mm mild steel; qty 1

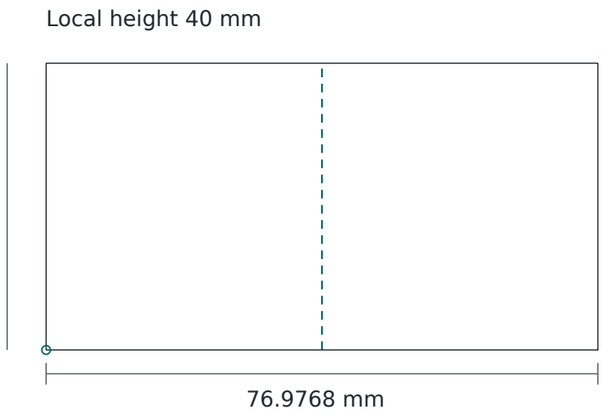


+local X →, +local Y ↑ | O = lower-left local (0,0)

90° to 40 × 40 outside legs. Bend at local X39.115265392; R1 / K0.42 / BA2.230530784. All coupon local origins are (0,0); do not scale from this PDF.

QC02-side-R2p25

1.5 mm 5052-H32; qty 1

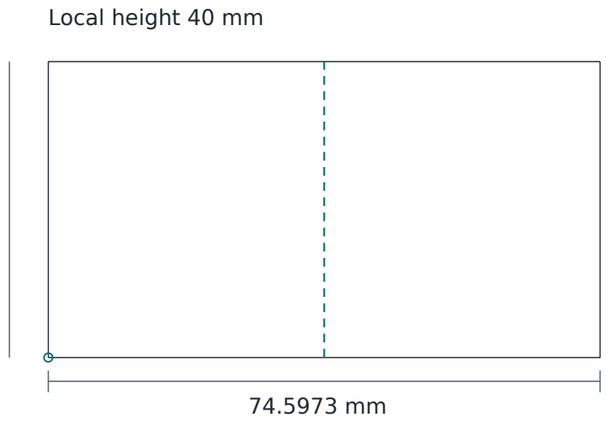


+local X →, +local Y ↑ | O = lower-left local (0,0)

90° to 40 × 40 outside legs. Bend at local X38.488384766; R2.25 / K0.40 / BA4.476769531. All coupon local origins are (0,0); do not scale from this PDF.

QC03-support-R3

3 mm mild steel; qty 1



+local X →, +local Y ↑ | O = lower-left local (0,0)

90° to 40 × 40 outside legs. Bend at local X37.298672286; R3 / K0.40 / BA6.597344573. All coupon local origins are (0,0); do not scale from this PDF.

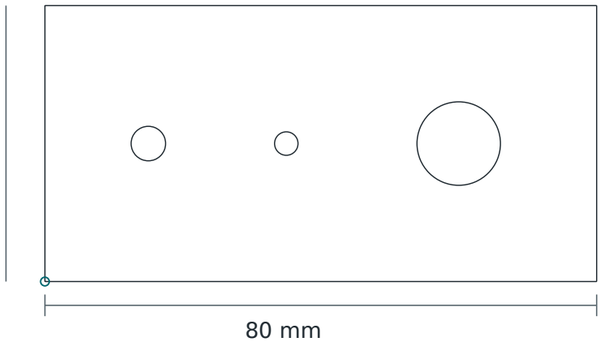
Pass gate: establish the actual R/K and springback before main cutting; verify the low-angle joggle offsets, not only the 90° bend tests. Qualify the bolted carrier stack with actual spacers/pads/gasket. If outcomes require geometry changes, update CAD, flats and schedules together.

Process coupons & qualification: 2 / 2

REFERENCE coupon examples, not supplied cutting files. Develop shop patterns; record material, tooling, springback, finish and results.

QC04-rivnut-power

1 mm mild steel; qty 1

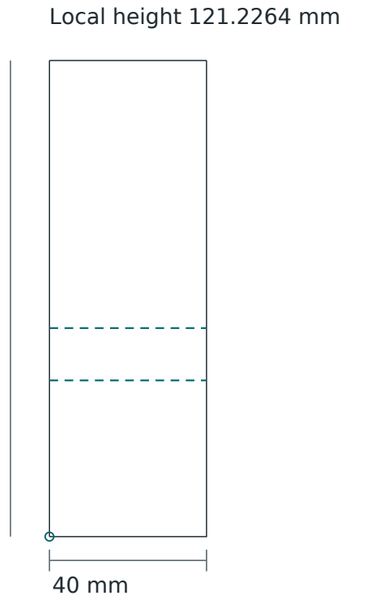


+local X →, +local Y ↑ | O = lower-left local (0,0)

Ø5 insert / Ø3.4 side clearance / Ø12.1 power hole. Qualify setter, bulb, spin, torque, finished head stack and removal. Separately test the switch on 1 mm aluminium. All coupon local origins are (0,0); do not scale from this PDF.

QC05-side-joggle

1.5 mm 5052-H32; qty 1

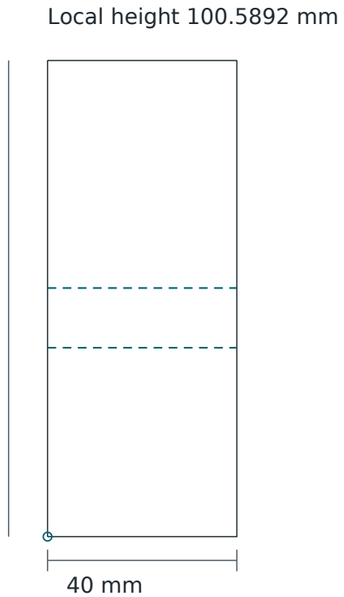


+local X →, +local Y ↑ | O = lower-left local (0,0)

Opposed 26.5651° turns, R2.25 / K0.40. local Y39.775442927 and 53.096838613. Virtual Z40…52, offset 6; BA1.321395686 per bend. All coupon local origins are (0,0); do not scale from this PDF.

QC06-wrap-joggle

1 mm mild steel; qty 1



+local X →, +local Y ↑ | O = lower-left local (0,0)

Opposed 18.4349° turns, R1 / K0.42. local Y39.903887573 and 52.523051021. Virtual Z40…52, offset 4; BA0.456885787 per bend. All coupon local origins are (0,0); do not scale from this PDF.

Pass gate: establish the actual R/K and springback before main cutting; verify the low-angle joggle offsets, not only the 90° bend tests. Qualify the bolted carrier stack with actual spacers/pads/gasket. If outcomes require geometry changes, update CAD, flats and schedules together.

Qualification record & digital export status

Fresh STEP import results and retained prior assembly / I/O checks. No new clearance tests, physical tests or certification.

Digital result	Current value
Assembly / sheet STEP solids	290 / 19
Assembly STEP summed volume	10,045,657.470 mm³
STEP import and solid validity	PASS
Assembly STEP envelope	306.8 × 422 × 520 mm
Sheet STEP summed volume	1,228,467.629 mm³
Sheet STEP envelope	302 × 422 × 520 mm
Supplied flat cutting files	None
Retained assembly sheet clashes	0; prior digital record
Retained I/O clearance check	PASS

Interpretation and explicit intersections

Current STEP: 19 valid formed sheet solids. Prior records: no structural-sheet collisions; nine intentional M03 tap-drill/thread overlaps; eight SSD/PSU screw-envelope intrusions. Actual permitted penetration requires checks. I/O: zero unexpected solid clashes; 10 route allocations / 41 different-route checks; USB minimum 3 mm, audio ~2.994 mm. Board-dependent tails remain unqualified. No new clearance checks, flat-file validation or physical tests are claimed.

Current STEP: export-validation.json. Retained assembly and I/O checks are identified in validation-summary.json. No flat cutting files are supplied.

MANDATORY PHYSICAL SIGN-OFF

- ☐ Material / bend / joggle / forming-tool coupons
- ☐ Insert setting, finished shim stack, repeated removal
- ☐ Bolted carrier stack and exact switch fit / insulation
- ☐ Real PCI cover / GPU bracket and rear shield gauge
- ☐ PSU support seating and permitted screw penetration
- ☐ Motherboard / cooler / RAM and standoff subset
- ☐ SSD boss seating, screw limit and SATA cables
- ☐ Fan thickness / heads / full nut engagement
- ☐ GPU support contact and stiffness, if installed
- ☐ I/O hood fit, finished head gaps, screw bottoming, headers
- ☐ Cable protection, grommet, strain relief and reach
- ☐ Grounding continuity with actual finish
- ☐ Loaded thermal tests; handling proof/load programme

No physical prototype, load rating, fatigue, vibration, acoustics, thermal, EMI/ESD or electrical-safety certification is represented. Record actual results before declaring any build ready.

References, design files & document control

Supplier drawings are cited, not redistributed. The full CERN-OHL-P v2 licence is included separately as LICENSE.txt.

ATX motherboard and rear I/O: Intel ATX v2.2, Figures2–4

https://www.synthmind.com/developer_specs_atx2_2.pdf

microATX: Intel microATX v1.2

https://xdevs.com/doc/_PC_HW/Form_factors/matxspe1.2.pdf

MiniITX: Intel Mini-ITX Addendum v1.1

https://content.instructables.com/ORIG/FJD/TETT/GU59XBKK/FJDTETTGU59XBKK.pdf

PCI bracket: PCI Local Bus3.0 Figure5-8

https://e2e.ti.com/cfs-file.ashx/__key/communityserver-discussions-components-files/639/1016.PCI.Local.Bus.Specification.Revision.3.0.pdf

PCI chassis implementation: Protocase motherboard enclosure guide

https://www.protocase.com/resources/how-to-design-for-motherboards/How-to-Design-Enclosures-for-Motherboard.pdf

PSU rear pattern: Intel336521-002 Fig12-1

https://www.intel.com/content/dam/www/public/us/en/documents/design-guides/resellers-power-supply-design-guide-changes.pdf

Fan mounting: Noctua NF-A14 / NV-FM1

https://cdn.noctua.at/media/noctua_nf-a14_pwm_infosheet_en_web-1.pdf

Side inserts: Harrison Silverdale RRE03-1

https://www.harrisonsilverdale.com/pdf/view-product.php?itemid=31322

SSD bottom pattern: Seagate Nytro1361 manual / Innodisk3IE2-P

https://www.seagate.com/www-content/support-content/enterprise-storage/solid-state-drives/nytro-1361/_shared/files/203864400-A.pdf

Power switch: E-Switch exact52-PV0F24011 revA

https://configured-product-images.s3.amazonaws.com/2D/specs/PV0F24011.pdf

License: CERN-OHL-P-2.0 full text

https://raw.githubusercontent.com/spdx/license-list-data/main/text/CERN-OHL-P-2.0.txt

Read IO-ASSEMBLY.md / io-interfaces.json, ASSEMBLY-NOTES.md and the BOM / joint schedules with the two formed STEP files in CAD/. PDF developments and bend coordinates are provisional references. No flat cutting files or automated unfolding are included. The fabricator must develop and qualify shop patterns.

Carrier fasteners are two ordinary M3×10 through-bolts, already included in the hardware BOM. The purchasing list is not an additional quantity. No welding is required.