

HabitatHalo™

Universal-Fit & Environment-Scan System

Complete Build Values • All Segments • Adapter Architecture • AutoFit Scanning

A Romeo Foundation Innovation • Conceived by Nathaniel Jerome Romeo Fell III
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COMPLIANCE: All hardware figures in this book are **PROPOSED ENGINEERING TARGETS PENDING BENCH VALIDATION**. All animal-care behaviors are **PENDING PROFESSIONAL VETERINARY REVIEW**. HabitatHalo™ is an environmental monitoring & enrichment system — it is **never a medical device** and does not diagnose disease. 100% of all proceeds are permanently and legally directed to the Romeo Foundation in perpetuity.

1. Your Two Questions — Answered

Q1 — Can the unit scan the environment to provide care?

Yes. Every HabitatHalo™ size runs an **AutoFit Environment Scan** on install and continuously thereafter. Using its onboard IR thermal camera, LiDAR/ToF depth sensor, visual camera and environmental sensor mast, the unit builds a 3-D spatial + thermal model of the actual enclosure — measuring internal dimensions, locating real hot/cool spots, water features, basking zones and substrate type — then auto-calibrates coverage and care set-points to *that specific* enclosure. This is the same ThermalMap™ / SpatialScan engine described in the master spec, extended to drive fit & calibration.

Q2 — Can fixed unit sizes fit adjustable sizes with an adapter system?

Yes. Five fixed canopy chassis (HH-S → HH-Commercial) each ship with a **Universal Adapter System** — telescoping end-caps, expandable rail brackets and clamp/standoff adapters — that let one canopy fit a *continuous range* of enclosure widths and rim styles. The adapters overlap so that **every enclosure from 10"/10-gal to 120"+/720-gal is covered with no gaps**.

2. Complete Product Family — Build Values by Size Class

Every size runs the identical AI brain, cassette architecture, SelfSense™ diagnostics and app platform. Only the physical footprint scales.

Model	Enclosure Fit (with adapters)	Canopy L × D × H	Cassette Bays	Rail Pitch	Max Power	Mounting
HH-S (Nano/Small)	10–30" / 10–40 gal	457 × 152 × 102 mm (18 × 6 × 4")	3	200 mm	≤75–150 W	Top-rail or rear-wall bracket

HH-M (Medium)	30–48" / 40–120 gal	914 × 203 × 114 mm (36 × 8 × 4.5")	5	200 mm	≤300 W	Top-rail or rear-wall bracket
HH-L (Large)	48–72" / 120–240 gal	1219 × 254 × 127 mm (48 × 10 × 5")	6	200 mm	≤600 W	Rear-wall bracket
HH-XL (XL)	72–96" / 240–480 gal	1524 × 305 × 140 mm (60 × 12 × 5.5")	8	200 mm	≤600 W+	Rear-wall bracket + side supports
HH-Commercial (Mega/Zoo)	96–120"+ / 480–720 gal+	1829 mm+ × 356 × 152 mm (72"+ × 14 × 6")	10 (dual)	200 mm	Facility-fed	Truss / ceiling / free-span

Figures reconciled with Engineering v2.5 §1.1 & §8B.3. PROPOSED ENGINEERING TARGETS PENDING BENCH VALIDATION.

3. Universal Adapter System — Continuous Coverage Map

Because each canopy uses telescoping end-caps and expandable brackets, its fit range **overlaps** the next size up. The result is a single continuous span from nano desktop tanks to zoo enclosures — no enclosure falls between sizes.

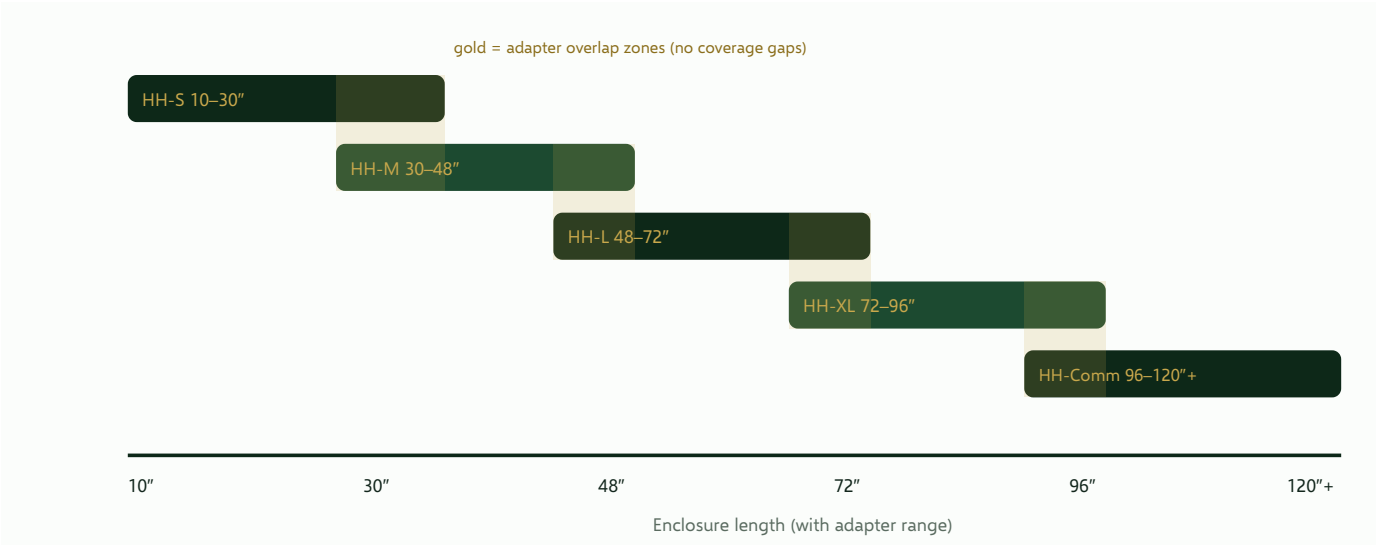


Fig. 3.1 — Adapter overlap creates continuous fit coverage across the entire product family.

4. Adapter Mechanisms — Build Detail

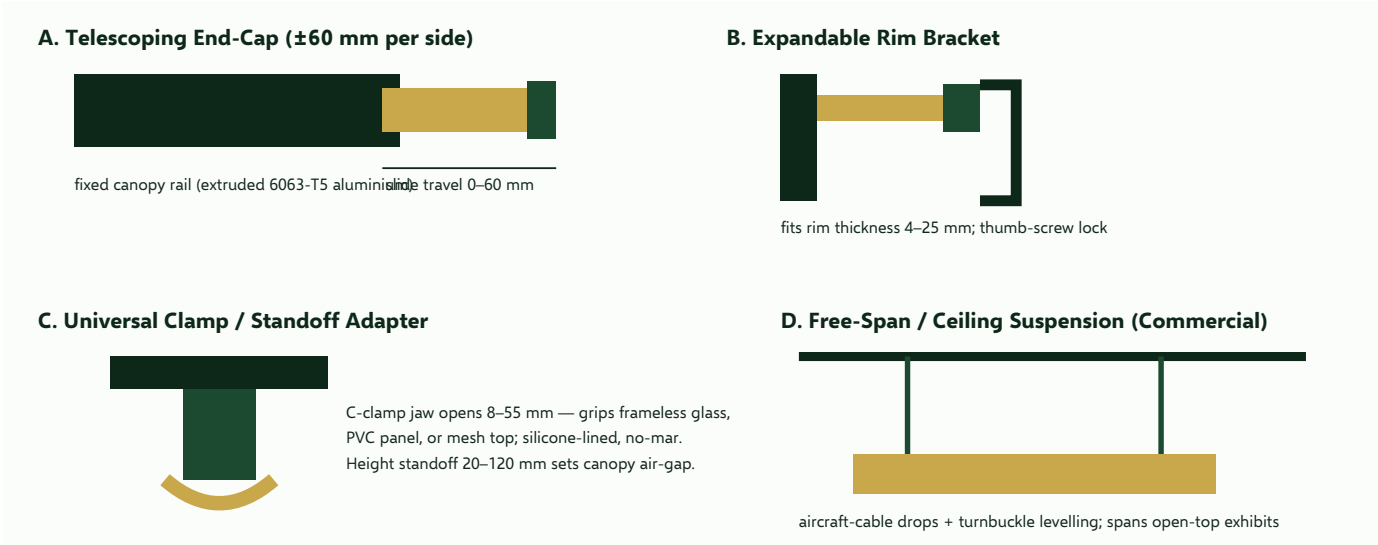


Fig. 4.1 — Four adapter families cover every rim style and mounting condition. Dimensions are PROPOSED ENGINEERING TARGETS PENDING BENCH VALIDATION.

Adapter kit contents (ships with every canopy)

Adapter	Adjustment Range	Material	Fits
Telescoping end-caps (2×)	0–60 mm per side (120 mm total)	6063-T5 aluminium + POM slider	Bridges canopy-to-enclosure length gap
Expandable rim brackets (2–4×)	Rim 4–25 mm thick	Glass-filled nylon, SS thumb-screw	Framed & frameless top rails
Universal clamps (2–4×)	Jaw 8–55 mm; standoff 20–120 mm	Silicone-lined zinc alloy	Frameless glass, PVC, mesh tops
Suspension kit (Commercial)	Drop 0.3–3 m, free-span	SS aircraft cable + turnbuckles	Open-top & walk-in exhibits

5. AutoFit Environment Scan — How the Unit Reads the Enclosure

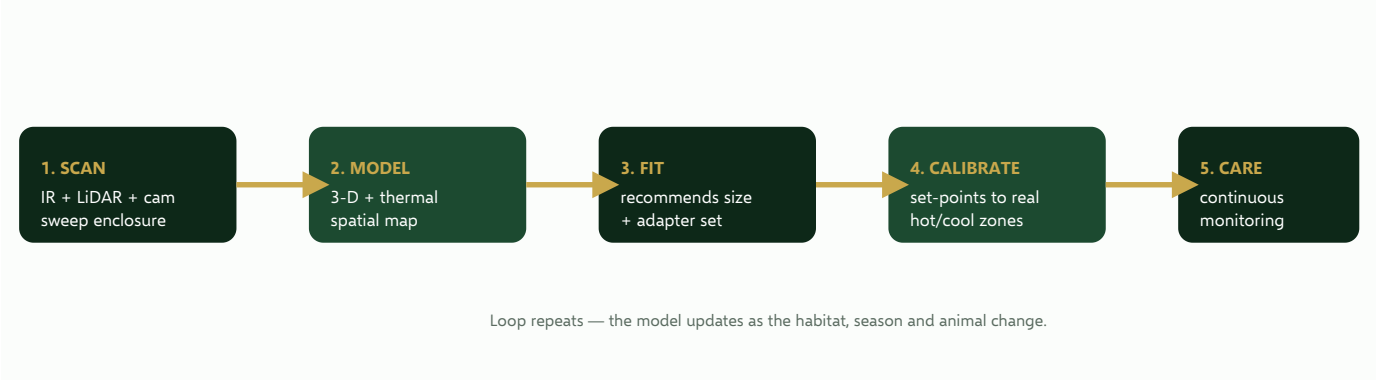


Fig. 5.1 — AutoFit five-stage scan-to-care loop. Care behaviors *PENDING PROFESSIONAL VETERINARY REVIEW*.

Scan sensor payload (build values)

Sensor	Spec (target)	Role in scan
Thermal IR camera	160×120 microbolometer, ±0.5 °C	Locates real basking / cool zones
ToF / LiDAR depth	0.1–4 m, ±1 cm	Measures internal dimensions & volume
Visual camera	1080p, 850 nm IR ring, pan-tilt	Substrate/water-feature recognition
Environmental mast	Temp/RH/VOC/CO ₂ /lux/UV	Baseline atmosphere calibration

6. Exploded Assembly — All Segments

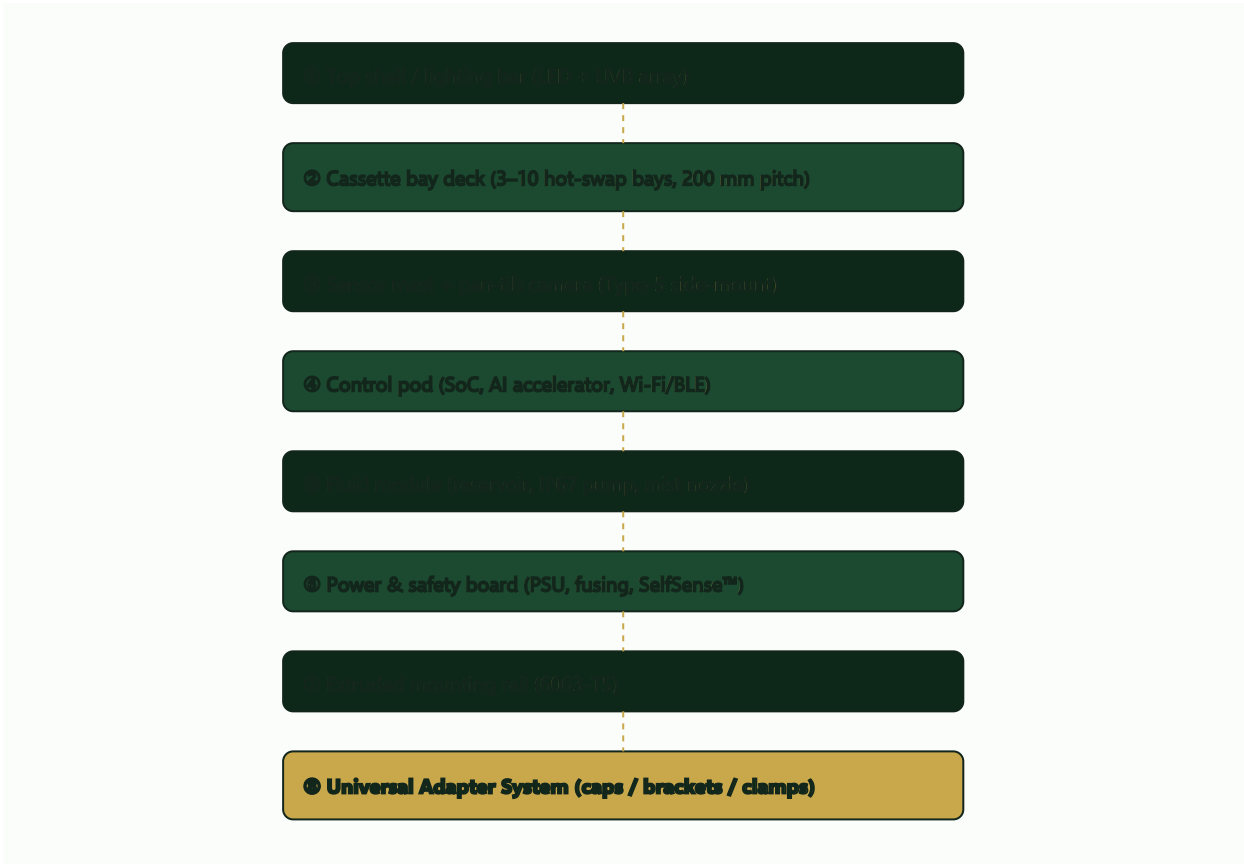


Fig. 6.1 — Eight-segment stack, top shell to adapter layer. All units share this architecture; bay count scales with size.

7. Cross-Section — Canopy Mounted Over Enclosure

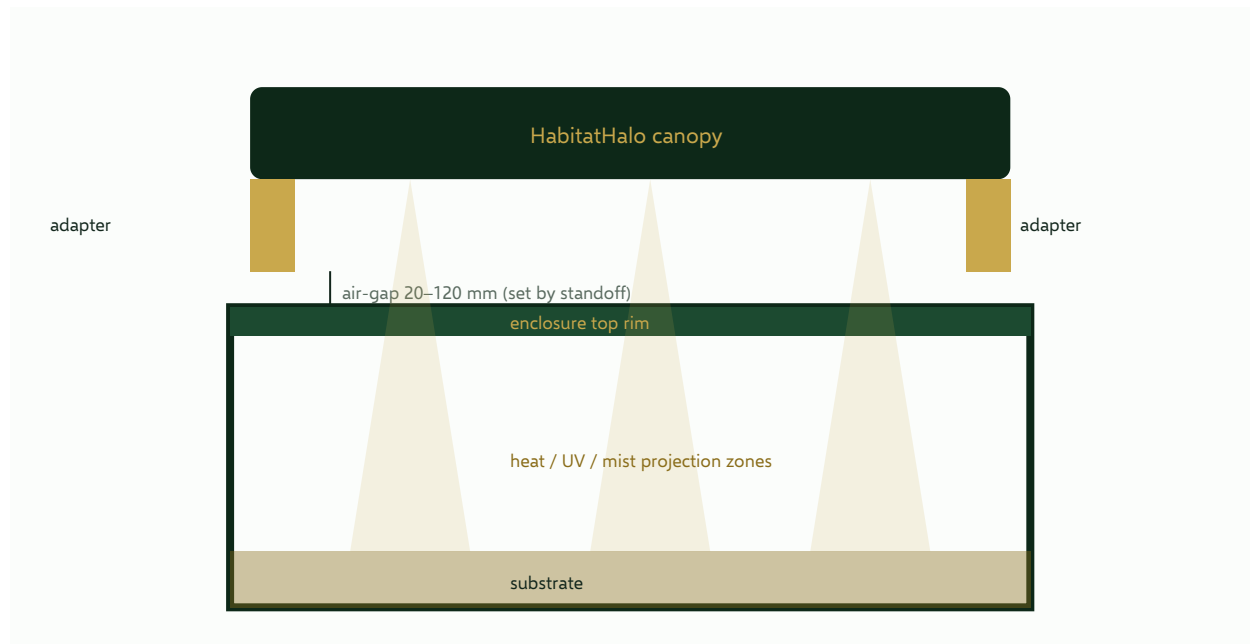


Fig. 7.1 — Adapters set canopy length to enclosure and hold a calibrated air-gap; projection zones align to the scanned map.

8. Power & Data Block Diagram

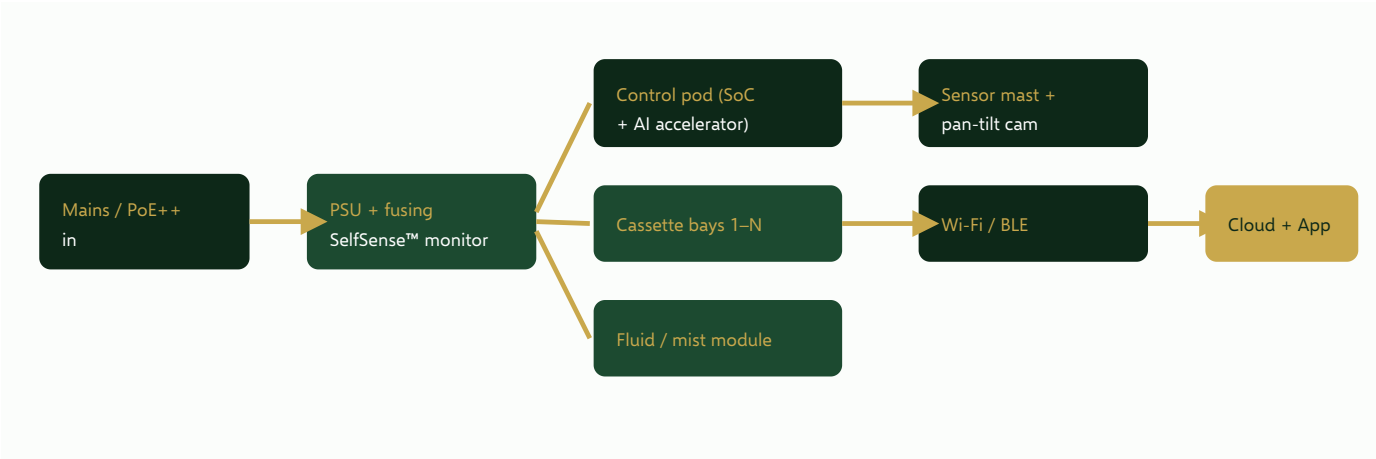


Fig. 8.1 — Power distribution (green/gold) and data path. SelfSense™ watches every rail. PROPOSED ENGINEERING TARGETS PENDING BENCH VALIDATION.

9. Complete Build Values — Bill of Segments

#	Segment	Key components	Build value (target)
①	Top shell / lighting bar	LED channels, UVB array, diffuser, ABS/aluminium shell	Per-size length; IP54 top
②	Cassette bay deck	3–10 hot-swap bays, blind-mate connectors	200 mm bay pitch
③	Sensor mast	Thermal IR, ToF/LiDAR, 1080p cam + 850 nm ring, pan-tilt	Type-5 side-mount
④	Control pod	SoC + AI accelerator, Wi-Fi/BLE, storage	On-device inference
⑤	Fluid module	Reservoir, IP67 pump, check valve, fine-mist nozzle, float switch	Scales w/ size
⑥	Power & safety board	PSU, fusing, GFCI logic, SelfSense™ diagnostics	≤75–600 W by model
⑦	Mounting rail	Extruded 6063-T5 aluminium, T-slot	Full canopy length
⑧	Universal Adapter System	Telescoping caps, rim brackets, clamps, suspension kit	See \$4 ranges

This diagram book harmonizes with HabitatHalo_APEX_v5_ULTIMATE and Engineering v2.5. Every dimension, power figure and range is a **PROPOSED ENGINEERING TARGET PENDING BENCH VALIDATION**; every care behavior is **PENDING PROFESSIONAL VETERINARY REVIEW**. HabitatHalo™ is never a medical device. 100% of all proceeds are permanently and legally bound to the Romeo Foundation in perpetuity.